

Shop Manual

GALEO

HD785-7

DUMP TRUCK

SERIAL NUMBERS HD785-7 7001 and up

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DUMP TRUCK

HD785-7

Machine model	Serial number
HD785-7	7001 and up

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Composition of shop manual

The contents of this shop manual are shown together with Form No. in a list.

Note 1: Always keep the latest version of this manual in accordance with this list and utilize accordingly.

The marks shown to the right of Form No. denote the following:

○: New issue (to be filed additionally) ●: Revision (to be replaced for each Form No.)

Note 2: This shop manual can be supplied for each Form No.

Note 3: To file this shop manual in the special binder for management, handle it as follows:

- Place a divider on the top of each section in the file after matching the Tub No. with No. indicated next to each Section Name shown in the table below:
- File overview and other materials in sections in the order shown below and utilize them accordingly.

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HD785-7 Dump truck

Form No. SEN01276-03

DUMP TRUCK

HD785-7

Machine model	Serial number
HD785-7	7001 and up

00 Index and foreword

Foreword and general information

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Safety notice

(Rev. 2007/02)

Important safety notice

Proper service and repair are extremely important for safe machine operation. The service and repair techniques recommended by Komatsu and described in this manual are both effective and safe. Some of these techniques require the use of tools specially designed by Komatsu for the specific purpose.

To prevent injury to workers, the symbol  is used to mark safety precautions in this manual. The cautions accompanying these symbols should always be followed carefully. If any dangerous situation arises or may possibly arise, first consider safety, and take the necessary actions to deal with the situation.

1. General precautions

 **Mistakes in operation are extremely dangerous. Read the Operation and Maintenance Manual carefully before operating the machine.**

- 1) Before carrying out any greasing or repairs, read all the safety plates stuck to the machine. For the locations of the safety plates and detailed explanation of precautions, see the Operation and Maintenance Manual.
- 2) Decide a place in the repair workshop to keep tools and removed parts. Always keep the tools and parts in their correct places. Always keep the work area clean and make sure that there is no dirt, water, or oil on the floor. Smoke only in the areas provided for smoking. Never smoke while working.
- 3) When carrying out any operation, always wear safety shoes and helmet. Do not wear loose work clothes, or clothes with buttons missing.
 - Always wear safety glasses when hitting parts with a hammer.
 - Always wear safety glasses when grinding parts with a grinder, etc.
- 4) When carrying out any operation with 2 or more workers, always agree on the operating procedure before starting. Always inform your fellow workers before starting any step of the operation. Before starting work, hang UNDER REPAIR warning signs in the operator's compartment.
- 5) Only qualified workers must carry out work and operation which require license or qualification.
- 6) Keep all tools in good condition, learn the correct way to use them, and use the proper ones of them. Before starting work, thoroughly check the tools, machine, fork-lift, service car, etc.

- 7) If welding repairs are needed, always have a trained and experienced welder carry out the work. When carrying out welding work, always wear welding gloves, apron, shielding goggles, cap and other clothes suited for welding work.
- 8) Before starting work, warm up your body thoroughly to start work under good condition.

Safety points

1	Good arrangement
2	Correct work clothes
3	Following work standard
4	Making and checking signs
5	Prohibition of operation and handling by unlicensed workers
6	Safety check before starting work
7	Wearing protective goggles (for cleaning or grinding work)
8	Wearing shielding goggles and protectors (for welding work)
9	Good physical condition and preparation
10	Precautions against work which you are not used to or you are used to too much

2. Preparations for work

- 1) Before adding oil or making any repairs, park the machine on hard and level ground, and apply the parking brake and block the wheels or tracks to prevent the machine from moving.
- 2) Before starting work, lower the work equipment (blade, ripper, bucket, etc.) to the ground. If this is not possible, insert the lock pin or use blocks to prevent the work equipment from falling. In addition, be sure to lock all the control levers and hang warning signs on them.

- 3) When disassembling or assembling, support the machine with blocks, jacks, or stands before starting work.
- 4) Remove all mud and oil from the steps or other places used to get on and off the machine. Always use the handrails, ladders or steps when getting on or off the machine. Never jump on or off the machine. If it is impossible to use the handrails, ladders or steps, use a stand to provide safe footing.

3. Precautions during work

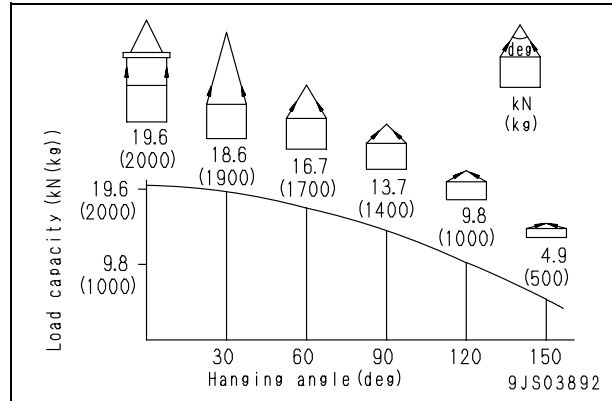
- 1) Before disconnecting or removing components of the oil, water, or air circuits, first release the pressure completely from the circuit. When removing the oil filler cap, a drain plug, or an oil pressure pickup plug, loosen it slowly to prevent the oil from spurting out.
- 2) The coolant and oil in the circuits are hot when the engine is stopped, so be careful not to get scalded. Wait for the oil and coolant to cool before carrying out any work on the oil or water circuits.
- 3) Before starting work, stop the engine. When working on or around a rotating part, in particular, stop the engine. When checking the machine without stopping the engine (measuring oil pressure, revolving speed, temperature, etc.), take extreme care not to get rolled or caught in rotating parts or moving parts.
- 4) Before starting work, remove the leads from the battery. Always remove the lead from the negative (–) terminal first.
- 5) When raising a heavy component (heavier than 25 kg), use a hoist or crane. Before starting work, check that the slings (wire ropes, chains, and hooks) are free from damage. Always use slings which have ample capacity and install them to proper places. Operate the hoist or crane slowly to prevent the component from hitting any other part. Do not work with any part still raised by the hoist or crane.
- 6) When removing a cover which is under internal pressure or under pressure from a spring, always leave 2 bolts in diagonal positions. Loosen those bolts gradually and alternately to release the pressure, and then remove the cover.
- 7) When removing components, be careful not to break or damage the electrical wiring. Damaged wiring may cause electrical fires.
- 8) When removing piping, stop the fuel or oil from spilling out. If any fuel or oil drips onto the floor, wipe it up immediately. Fuel or oil on the floor can cause you to slip and can even start fires.
- 9) As a general rule, do not use gasoline to wash parts. Do not use it to clean electrical parts, in particular.
- 10) Be sure to assemble all parts again in their original places. Replace any damaged parts and parts which must not be reused with new parts. When installing hoses and wires, be sure that they will not be damaged by contact with other parts when the machine is operated.
- 11) When installing high pressure hoses, make sure that they are not twisted. Damaged tubes are dangerous, so be extremely careful when installing tubes for high pressure circuits. In addition, check that connecting parts are correctly installed.
- 12) When assembling or installing parts, always tighten them to the specified torques. When installing protective parts such as guards, or parts which vibrate violently or rotate at high speed, be particularly careful to check that they are installed correctly.
- 13) When aligning 2 holes, never insert your fingers or hand. Be careful not to get your fingers caught in a hole.
- 14) When measuring hydraulic pressure, check that the measuring tools are correctly assembled.
- 15) Take care when removing or installing the tracks of track-type machines. When removing the track, the track separates suddenly, so never let anyone stand at either end of the track.
- 16) If the engine is operated for a long time in a place which is not ventilated well, you may suffer from gas poisoning. Accordingly, open the windows and doors to ventilate well.

4. Precautions for sling work and making signs

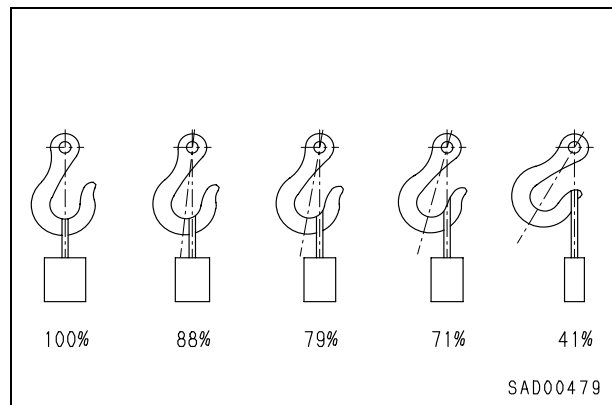
- 1) Only one appointed worker must make signs and co-workers must communicate with each other frequently. The appointed sign maker must make specified signs clearly at a place where he is seen well from the operator's seat and where he can see the working condition easily. The sign maker must always stand in front of the load and guide the operator safely.
 - Do not stand under the load.
 - Do not step on the load.
- 2) Check the slings before starting sling work.
- 3) Keep putting on gloves during sling work. (Put on leather gloves, if available.)
- 4) Measure the weight of the load by the eye and check its center of gravity.
- 5) Use proper sling according to the weight of the load and method of slinging. If too thick wire ropes are used to sling a light load, the load may slip and fall.
- 6) Do not sling a load with 1 wire rope alone. If it is slung so, it may rotate and may slip out of the rope. Install 2 or more wire ropes symmetrically.

⚠ Slings with 1 rope may cause turning of the load during hoisting, untwisting of the rope, or slipping of the rope from its original winding position on the load, which can result in a dangerous accident.

- 7) Limit the hanging angle to 60°, as a rule. Do not sling a heavy load with ropes forming a wide hanging angle from the hook. When hoisting a load with 2 or more ropes, the force subjected to each rope will increase with the hanging angle. The table below shows the variation of allowable load in kN {kg} when hoisting is made with 2 ropes, each of which is allowed to sling up to 9.8 kN {1,000 kg} vertically, at various hanging angles. When the 2 ropes sling a load vertically, up to 19.6 kN {2,000 kg} of total weight can be suspended. This weight is reduced to 9.8 kN {1,000 kg} when the 2 ropes make a hanging angle of 120°. If the 2 ropes sling a 19.6 kN {2,000 kg} load at a lifting angle of 150°, each of them is subjected to a force as large as 39.2 kN {4,000 kg}.



- 8) When installing wire ropes to an angular load, apply pads to protect the wire ropes. If the load is slippery, apply proper material to prevent the wire rope from slipping.
- 9) Use the specified eyebolts and fix wire ropes, chains, etc. to them with shackles, etc.
- 10) Apply wire ropes to the middle portion of the hook.
 - Slings near the tip of the hook may cause the rope to slip off the hook during hoisting. The hook has the maximum strength at the middle portion.



- 11) Do not use twisted or kinked wire ropes.
- 12) When lifting up a load, observe the following.
 - Wind in the crane slowly until wire ropes are stretched. When settling the wire ropes with the hand, do not grasp them but press them from above. If you grasp them, your fingers may be caught.
 - After the wire ropes are stretched, stop the crane and check the condition of the slung load, wire ropes, and pads.

- If the load is unstable or the wire rope or chains are twisted, lower the load and lift it up again.
 - Do not lift up the load slantingly.
- 13) When lifting down a load, observe the following.
- When lifting down a load, stop it temporarily at 30 cm above the floor, and then lower it slowly.
 - Check that the load is stable, and then remove the sling.
 - Remove kinks and dirt from the wire ropes and chains used for the sling work, and put them in the specified place.

5. Precautions for using mobile crane

- ★ Read the Operation and Maintenance Manual of the crane carefully in advance and operate the crane safely.

6. Precautions for using overhead hoist crane

⚠ When raising a heavy part (heavier than 25 kg), use a hoist, etc. In Disassembly and assembly, the weight of a part heavier than 25 kg is indicated after the mark of .

- 1) Before starting work, inspect the wire ropes, brake, clutch, controller, rails, over wind stop device, electric shock prevention earth leakage breaker, crane collision prevention device, and power application warning lamp, and check safety.
- 2) Observe the signs for sling work.
- 3) Operate the hoist at a safe place.
- 4) Check the direction indicator plates (east, west, south, and north) and the directions of the control buttons without fail.
- 5) Do not sling a load slantingly. Do not move the crane while the slung load is swinging.
- 6) Do not raise or lower a load while the crane is moving longitudinally or laterally.
- 7) Do not drag a sling.
- 8) When lifting up a load, stop it just after it leaves the ground and check safety, and then lift it up.
- 9) Consider the travel route in advance and lift up a load to a safe height.
- 10) Place the control switch on a position where it will not be an obstacle to work and passage.
- 11) After operating the hoist, do not swing the control switch.
- 12) Remember the position of the main switch so that you can turn off the power immediately in an emergency.

- 13) If the hoist stops because of a power failure, turn the power switch OFF. When turning on a switch which was turned OFF by the electric shock prevention earth leakage breaker, check that the devices related to that switch are not in operation state.
- 14) If you find an obstacle around the hoist, stop the operation.
- 15) After finishing the work, stop the hoist at the specified position and raise the hook to at least 2 m above the floor. Do not leave the sling installed to the hook.

7. Selecting wire ropes

- 1) Select adequate ropes depending on the weight of parts to be hoisted, referring to the table below.

Wire ropes
(Standard "Z" twist ropes without galvanizing)
(JIS G3525, No. 6, Type 6X37-A)

Nominal diameter of rope mm	Allowable load	
	kN	ton
10	8.8	0.9
12	12.7	1.3
14	17.3	1.7
16	22.6	2.3
18	28.6	2.9
20	35.3	3.6
25	55.3	5.6
30	79.6	8.1
40	141.6	14.4
50	221.6	22.6
60	318.3	32.4

- ★ The allowable load is one-sixth of the breaking strength of the rope used (Safety coefficient: 6).

8. Precautions for disconnecting and connecting hoses and tubes in air conditioner circuit

1) Disconnection

⚠ Collect the air conditioner refrigerant (R134a) from the air conditioner circuit in advance.

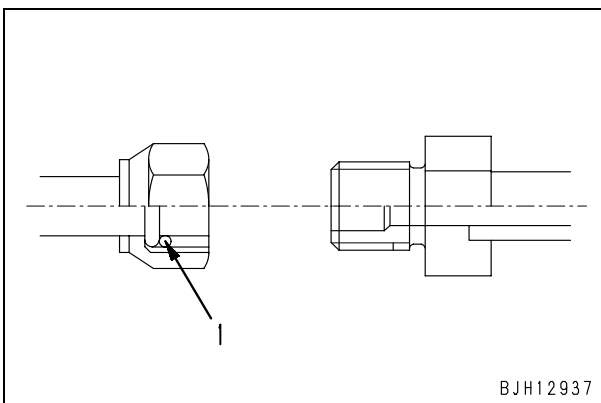
- ★ Ask professional traders for collecting and filling operation of refrigerant (R134a).
- ★ Never release the refrigerant (R134a) to the atmosphere.

⚠ If the refrigerant gas (R134a) gets in your eyes, you may lose your sight. Accordingly, when collecting or filling it, you must be qualified for handling the refrigerant and put on protective goggles.

2) Connection

- 1] When installing the air conditioner circuit hoses and tubes, take care that dirt, dust, water, etc. will not enter them.
- 2] When connecting the air conditioner hoses and tubes, check that O-rings (1) are fitted to their joints.
- 3] Check that each O-ring is not damaged or deteriorated.
- 4] When connecting the refrigerant piping, apply compressor oil for refrigerant (R134a) (**DENSO: ND-OIL8, ZEXEL: ZXL100PG (equivalent to PAG46)**) to its O-rings.

- ★ Example of O-ring (Fitted to every joint of hoses and tubes)



- ★ For tightening torque, see the precautions for installation in each section of "Disassembly and assembly".

How to read the shop manual

- Some attachments and optional parts in this shop manual may not be delivered to certain areas. If one of them is required, consult KOMATSU distributors.
- Materials and specifications are subject to change without notice.
- Shop manuals are divided into the “Chassis volume” and “Engine volume”. For the engine unit, see the engine volume of the engine model mounted on the machine.

1. Composition of shop manual

This shop manual contains the necessary technical information for services performed in a workshop. For ease of understanding, the manual is divided into the following sections.

00. Index and foreword

This section explains the shop manuals list, table of contents, safety, and basic information.

01. Specification

This section explains the specifications of the machine.

10. Structure, function and maintenance standard

This section explains the structure, function, and maintenance standard values of each component. The structure and function sub-section explains the structure and function of each component. It serves not only to give an understanding of the structure, but also serves as reference material for troubleshooting. The maintenance standard sub-section explains the criteria and remedies for disassembly and service.

20. Standard value table

This section explains the standard values for new machine and judgement criteria for testing, adjusting, and troubleshooting. This standard value table is used to check the standard values in testing and adjusting and to judge parts in troubleshooting.

30. Testing and adjusting

This section explains measuring instruments and measuring methods for testing and adjusting, and method of adjusting each part. The standard values and judgement criteria for testing and adjusting are explained in Testing and adjusting.

40. Troubleshooting

This section explains how to find out failed parts and how to repair them. The troubleshooting is divided by failure modes. The “S mode” of the troubleshooting related to the engine may be also explained in the Chassis volume and Engine volume. In this case, see the Chassis volume.

50. Disassembly and assembly

This section explains the special tools and procedures for removing, installing, disassembling, and assembling each component, as well as precautions for them. In addition, tightening torque and quantity and weight of coating material, oil, grease, and coolant necessary for the work are also explained.

90. Diagrams and drawings (chassis volume)/Repair and replacement of parts (engine volume)

- Chassis volume
This section gives hydraulic circuit diagrams and electrical circuit diagrams.
- Engine volume
This section explains the method of reproducing, repairing, and replacing parts.

2. Revision and distribution

Any additions, revisions, or other change of notices will be sent to KOMATSU distributors. Get the most up-to-date information before you start any work.

3. Filing method

File by the brochures in the correct order of the form number printed in the shop manual composition table.

- **Revised edition mark**

When a manual is revised, the ones and tens digits of the form number of each brochure is increased by 1. (Example: 00, 01, 02 ...)

- **Revisions**

Revised brochures are shown in the shop manual composition table.

4. Symbols

Important safety and quality portions are marked with the following symbols so that the shop manual will be used practically.

Symbol	Item	Remarks
	Safety	Special safety precautions are necessary when performing work.
	Caution	Special technical precautions or other precautions for preserving standards are necessary when performing work.
	Weight	Weight of parts of component or parts. Caution necessary when selecting hoisting wire, or when working posture is important, etc.
	Tightening torque	Places that require special attention for tightening torque during assembly.
	Coat	Places to be coated with adhesives, etc. during assembly.
	Oil, coolant	Places where oil, etc. must be added, and capacity.
	Drain	Places where oil, etc. must be drained, and quantity to be drained.

5. Units

In this shop manual, the units are indicated with International System of units (SI). For reference, conventionally used Gravitational System of units is indicated in parentheses { }.

Explanation of terms for maintenance standard

The maintenance standard values necessary for judgment of products and parts are described by the following terms.

1. Standard size and tolerance

- To be accurate, the finishing size of parts is a little different from one to another.
- To specify a finishing size of a part, a temporary standard size is set and an allowable difference from that size is indicated.
- The above size set temporarily is called the "standard size" and the range of difference from the standard size is called the "tolerance".
- The tolerance with the symbols of + or – is indicated on the right side of the standard size.

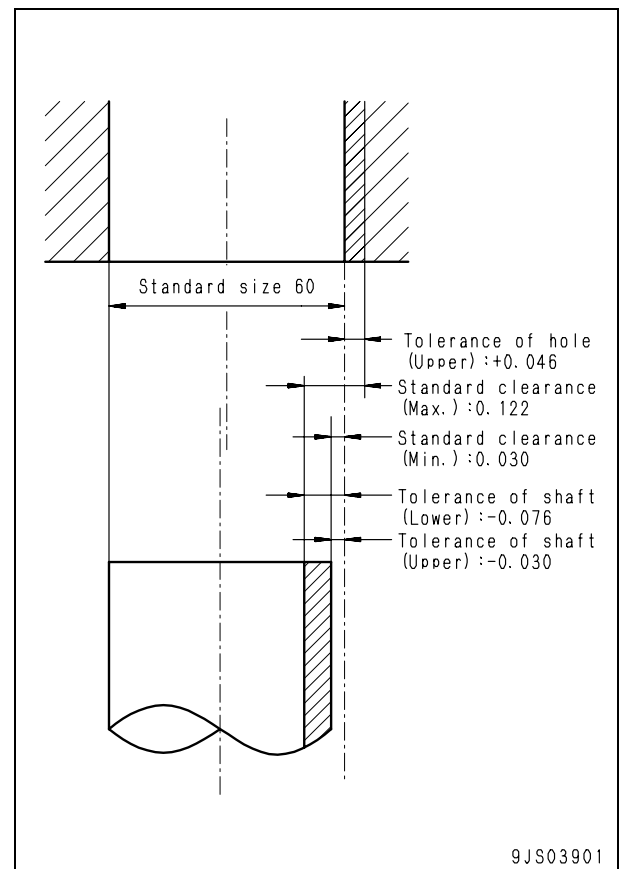
Example:

Standard size	Tolerance
120	–0.022 –0.126

- ★ The tolerance may be indicated in the text and a table as [standard size (upper limit of tolerance/lower limit of tolerance)].
Example) 120 (–0.022/–0.126)
- Usually, the size of a hole and the size of the shaft to be fitted to that hole are indicated by the same standard size and different tolerances of the hole and shaft. The tightness of fit is decided by the tolerance.
- Indication of size of rotating shaft and hole and relationship drawing of them

Example:

Standard size	Tolerance	
	Shaft	Hole
60	–0.030 –0.076	+0.046 0



2. Standard clearance and standard value

- The clearance made when new parts are assembled is called the “standard clearance”, which is indicated by the range from the minimum clearance to the maximum clearance.
- When some parts are repaired, the clearance is generally adjusted to the standard clearance.
- A value of performance and function of new products or equivalent is called the “standard value”, which is indicated by a range or a target value.
- When some parts are repaired, the value of performance/function is set to the standard value.

3. Standard interference

- When the diameter of a hole of a part shown in the given standard size and tolerance table is smaller than that of the mating shaft, the difference between those diameters is called the “interference”.
- The range (A – B) from the difference (A) between the minimum size of the shaft and the maximum size of the hole to the difference (B) between the maximum size of the shaft and the minimum size of the hole is the “standard interference”.
- After repairing or replacing some parts, measure the size of their hole and shaft and check that the interference is in the standard range.

4. Repair limit and allowable value

- The size of a part changes because of wear and deformation while it is used. The limit of changed size is called the “repair limit”.
- If a part is worn to the repair limit must be replaced or repaired.
- The performance and function of a product lowers while it is used. A value below which the product can be used without causing a problem is called the “allowable value”.
- If a product is worn to the allowable value, it must be checked or repaired. Since the permissible value is estimated from various tests or experiences in most cases, however, it must be judged after considering the operating condition and customer's requirement.

5. Clearance limit

- Parts can be used until the clearance between them is increased to a certain limit. The limit at which those parts cannot be used is called the “clearance limit”.
- If the clearance between the parts exceeds the clearance limit, they must be replaced or repaired.

6. Interference limit

- The allowable maximum interference between the hole of a part and the shaft of another part to be assembled is called the “interference limit”.
- The interference limit shows the repair limit of the part of smaller tolerance.
- If the interference between the parts exceeds the interference limit, they must be replaced or repaired.

Handling electric equipment and hydraulic component

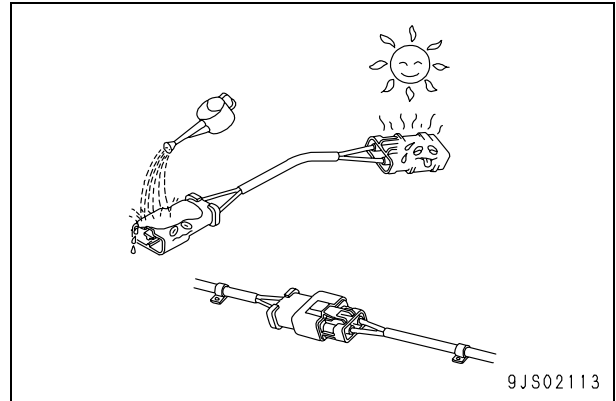
To maintain the performance of the machine over a long period, and to prevent failures or other troubles before they occur, correct “operation”, “maintenance and inspection”, “troubleshooting”, and “repairs” must be carried out. This section deals particularly with correct repair procedures for mechatronics and is aimed at improving the quality of repairs. For this purpose, it gives sections on “Handling electric equipment” and “Handling hydraulic equipment” (particularly gear oil and hydraulic oil).

Points to remember when handling electric equipment

1. Handling wiring harnesses and connectors

Wiring harnesses consist of wiring connecting one component to another component, connectors used for connecting and disconnecting one wire from another wire, and protectors or tubes used for protecting the wiring.

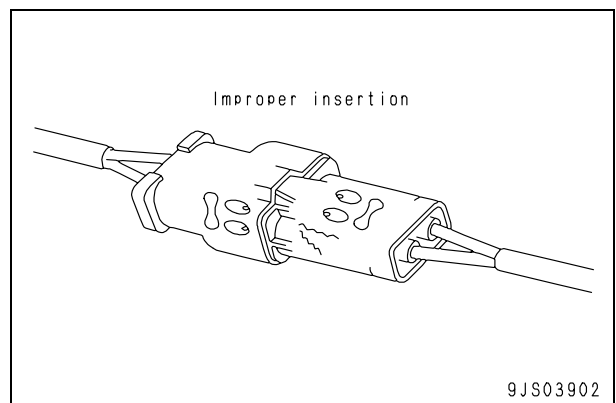
Compared with other electrical components fitted in boxes or cases, wiring harnesses are more likely to be affected by the direct effects of rain, water, heat, or vibration. Furthermore, during inspection and repair operations, they are frequently removed and installed again, so they are likely to suffer deformation or damage. For this reason, it is necessary to be extremely careful when handling wiring harnesses.



2. Main failures occurring in wiring harness

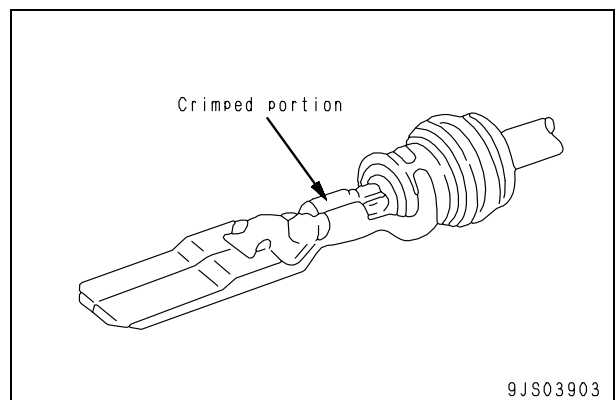
1) Defective contact of connectors (defective contact between male and female)

Problems with defective contact are likely to occur because the male connector is not properly inserted into the female connector, or because one or both of the connectors is deformed or the position is not correctly aligned, or because there is corrosion or oxidization of the contact surfaces. The corroded or oxidized contact surfaces may become shiny again (and contact may become normal) by connecting and disconnecting the connector about 10 times.



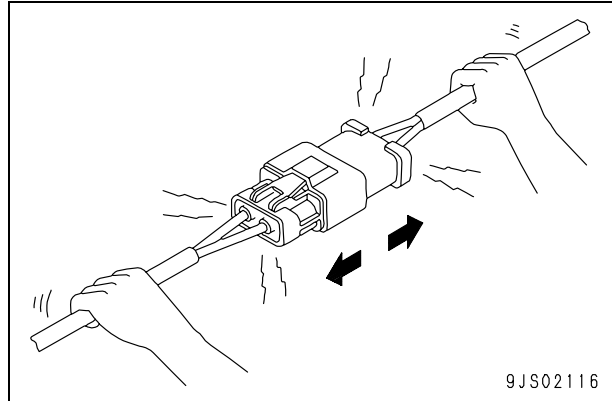
2) Defective crimping or soldering of connectors

The pins of the male and female connectors are in contact at the crimped terminal or soldered portion, but if there is excessive force brought to bear on the wiring, the plating at the joint will peel and cause improper connection or breakage.



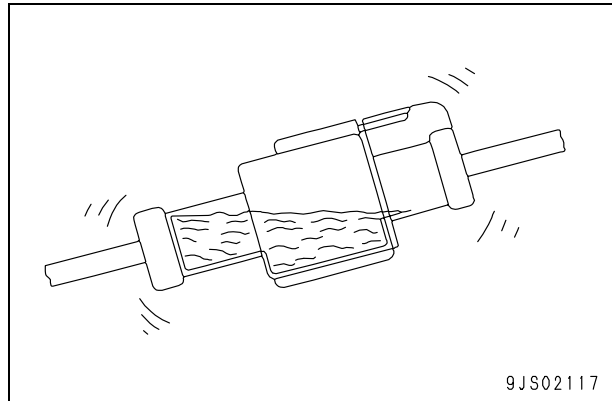
3) Disconnections in wiring

If the wiring is held and the connectors are pulled apart, or components are lifted with a crane with the wiring still connected, or a heavy object hits the wiring, the crimping of the connector may separate, or the soldering may be damaged, or the wiring may be broken.



4) High-pressure water entering connector

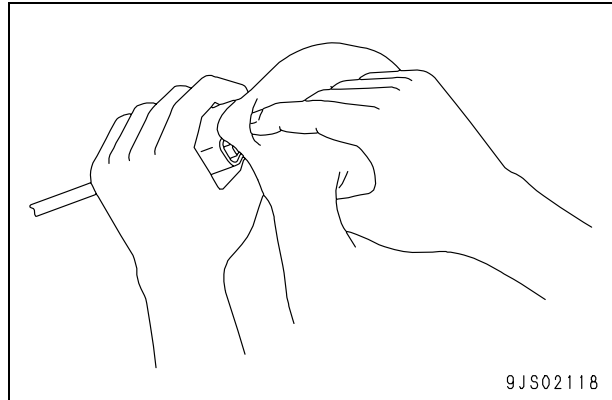
The connector is designed to make it difficult for water to enter (drip-proof structure), but if high-pressure water is sprayed directly on the connector, water may enter the connector, depending on the direction of the water jet. Accordingly, take care not to splash water over the connector. The connector is designed to prevent water from entering, but at the same time, if water does enter, it is difficult for it to be drained. Therefore, if water should get into the connector, the pins will be short-circuited by the water, so if any water gets in, immediately dry the connector or take other appropriate action before passing electricity through it.



5) Oil or dirt stuck to connector

If oil or grease are stuck to the connector and an oil film is formed on the mating surface between the male and female pins, the oil will not let the electricity pass, so there will be defective contact. If there is oil or grease stuck to the connector, wipe it off with a dry cloth or blow it dry with compressed air and spray it with a contact restorer.

- ★ When wiping the mating portion of the connector, be careful not to use excessive force or deform the pins.
- ★ If there is oil or water in the compressed air, the contacts will become even dirtier, so remove the oil and water from the compressed air completely before cleaning with compressed air.



3. Removing, installing, and drying connectors and wiring harnesses

1) Disconnecting connectors

- 1] Hold the connectors when disconnecting.

When disconnecting the connectors, hold the connectors. For connectors held by a screw, loosen the screw fully, then hold the male and female connectors in each hand and pull apart. For connectors which have a lock stopper, press down the stopper with your thumb and pull the connectors apart.

★ Never pull with one hand.

- 2] When removing from clips

- Both of the connector and clip have stoppers, which are engaged with each other when the connector is installed.

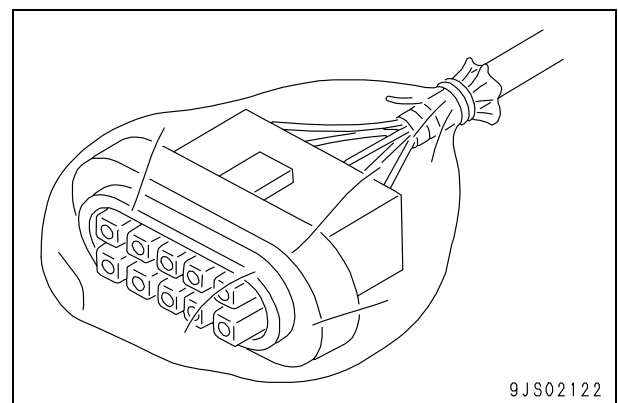
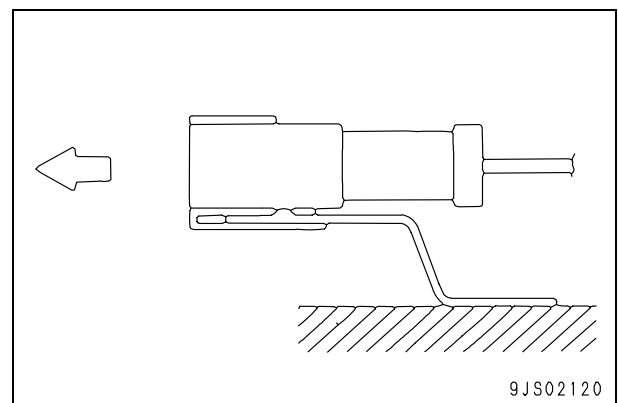
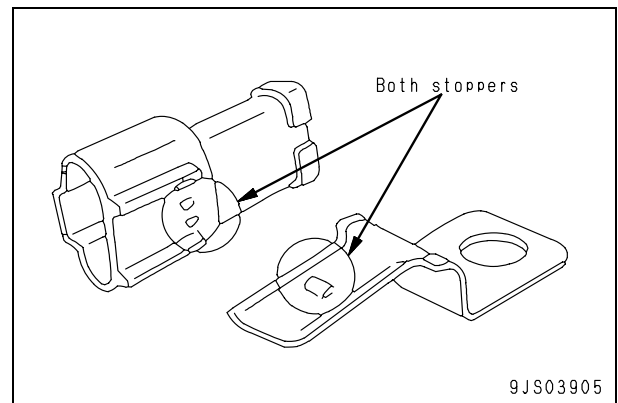
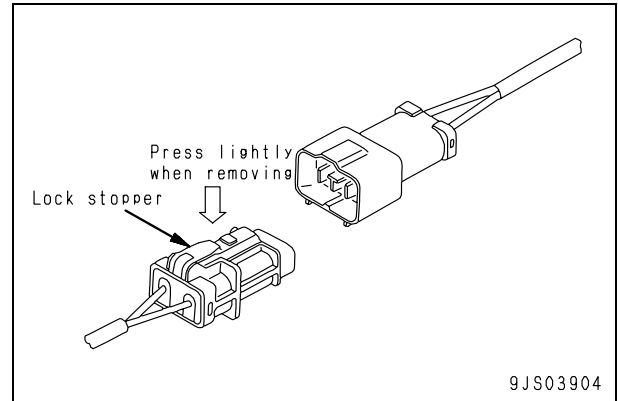
- When removing a connector from a clip, pull the connector in a parallel direction to the clip for removing stoppers.

★ If the connector is twisted up and down or to the left or right, the housing may break.

- 3] Action to take after removing connectors

After removing any connector, cover it with a vinyl bag to prevent any dust, dirt, oil, or water from getting in the connector portion.

★ If the machine is left disassembled for a long time, it is particularly easy for improper contact to occur, so always cover the connector.



2) Connecting connectors

1] Check the connector visually.

Check that there is no oil, dirt, or water stuck to the connector pins (mating portion).

Check that there is no deformation, defective contact, corrosion, or damage to the connector pins.

Check that there is no damage or breakage to the outside of the connector.

★ If there is any oil, water, or dirt stuck to the connector, wipe it off with a dry cloth. If any water has got inside the connector, warm the inside of the wiring with a dryer, but be careful not to make it too hot as this will cause short circuits.

★ If there is any damage or breakage, replace the connector.

2] Fix the connector securely.

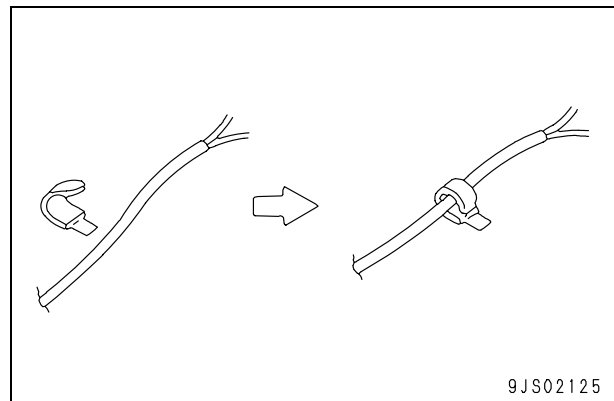
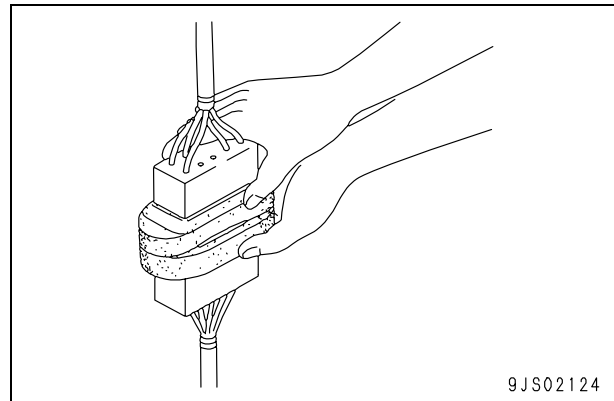
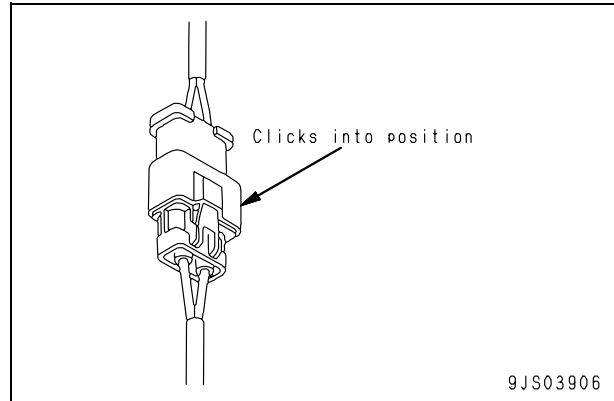
Align the position of the connector correctly, and then insert it securely. For connectors with the lock stopper, push in the connector until the stopper clicks into position.

3] Correct any protrusion of the boot and any misalignment of the wiring harness.

For connectors fitted with boots, correct any protrusion of the boot. In addition, if the wiring harness is misaligned, or the clamp is out of position, adjust it to its correct position.

★ If the connector cannot be corrected easily, remove the clamp and adjust the position.

● If the connector clamp has been removed, be sure to return it to its original position. Check also that there are no loose clamps.



- 3) Heavy duty wire connector (DT 8-pole, 12-pole)

Disconnection (Left of figure)

While pressing both sides of locks (a) and (b), pull out female connector (2).

Connection (Right of figure)

- 1] Push in female connector (2) horizontally until the lock clicks.

Arrow: 1)

- 2] Since locks (a) and (b) may not be set completely, push in female connector (2) while moving it up and down until the locks are set normally.

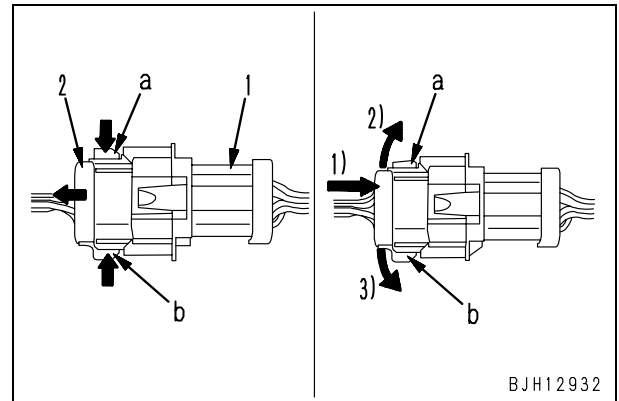
Arrow: 1), 2), 3)

★ Right of figure: Lock (a) is pulled down (not set completely) and lock (b) is set completely.

- (1): Male connector
(2): Female connector
(a), (b): Locks

- Disconnection

- Connection (Example of incomplete setting of (a))



4) Drying wiring harness

If there is any oil or dirt on the wiring harness, wipe it off with a dry cloth. Avoid washing it in water or using steam. If the connector must be washed in water, do not use high-pressure water or steam directly on the wiring harness. If water gets directly on the connector, do as follows.

- 1] Disconnect the connector and wipe off the water with a dry cloth.

★ If the connector is blown dry with compressed air, there is the risk that oil in the air may cause defective contact, so remove all oil and water from the compressed air before blowing with air.

- 2] Dry the inside of the connector with a dryer.

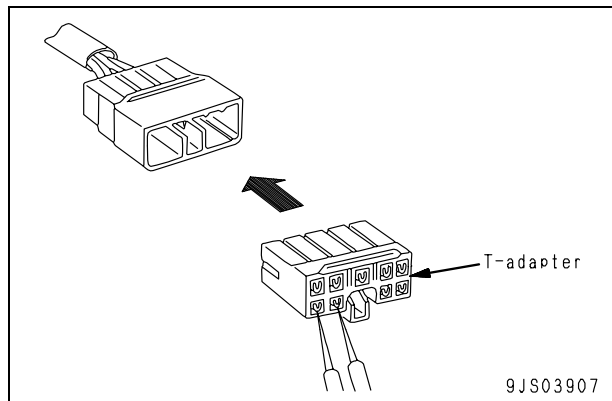
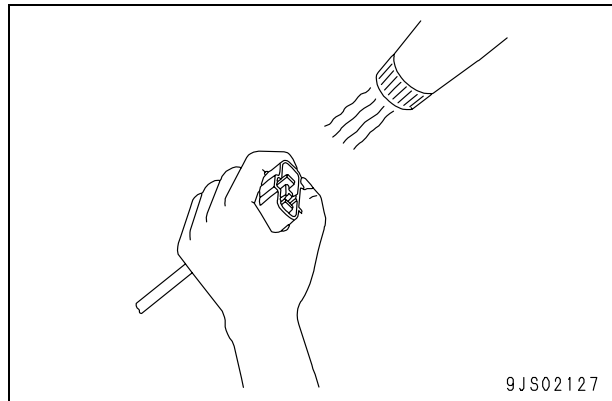
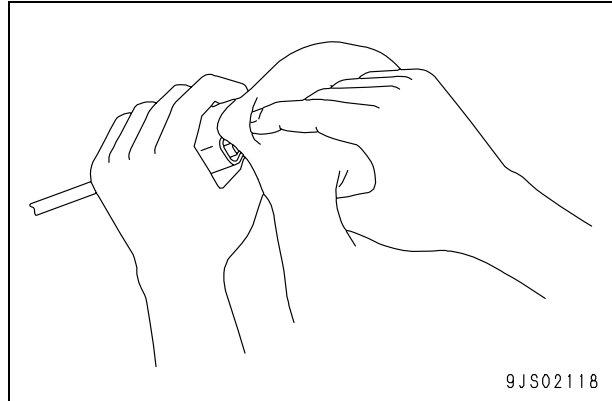
If water gets inside the connector, use a dryer to dry the connector.

★ Hot air from the dryer can be used, but regulate the time that the hot air is used in order not to make the connector or related parts too hot, as this will cause deformation or damage to the connector.

- 3] Carry out a continuity test on the connector.

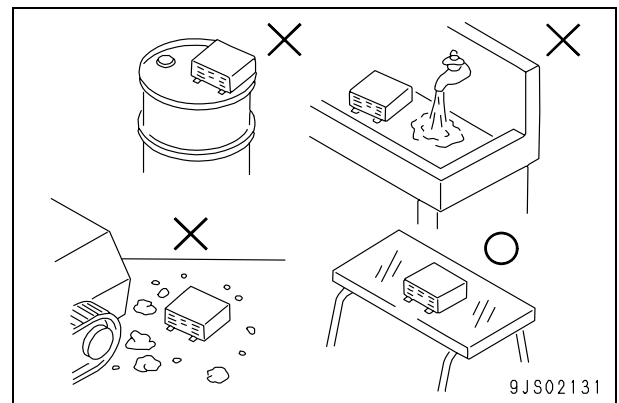
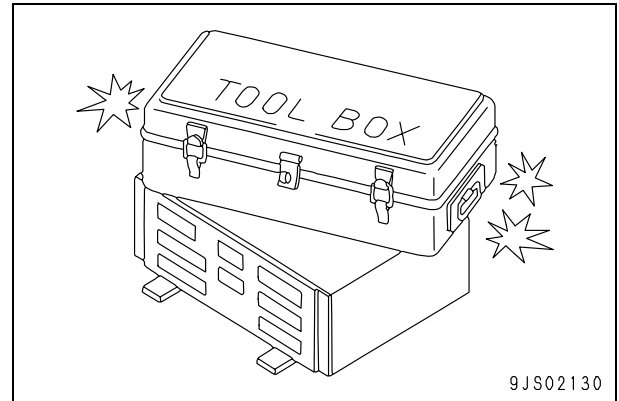
After drying, leave the wiring harness disconnected and carry out a continuity test to check for any short circuits between pins caused by water.

★ After completely drying the connector, blow it with contact restorer and reassemble.



4. Handling controller

- 1) The controller contains a microcomputer and electronic control circuits. These control all of the electronic circuits on the machine, so be extremely careful when handling the controller.
- 2) Do not place objects on top of the controller.
- 3) Cover the control connectors with tape or a vinyl bag. Never touch the connector contacts with your hand.
- 4) During rainy weather, do not leave the controller in a place where it is exposed to rain.
- 5) Do not place the controller on oil, water, or soil, or in any hot place, even for a short time. (Place it on a suitable dry stand).
- 6) Precautions when carrying out arc welding
When carrying out arc welding on the body, disconnect all wiring harness connectors connected to the controller. Fit an arc welding ground close to the welding point.



5. Points to remember when troubleshooting electric circuits

- 1) Always turn the power OFF before disconnecting or connecting connectors.
- 2) Before carrying out troubleshooting, check that all the related connectors are properly inserted.
 - ★ Disconnect and connect the related connectors several times to check.
- 3) Always connect any disconnected connectors before going on to the next step.
 - ★ If the power is turned ON with the connectors still disconnected, unnecessary abnormality displays will be generated.
- 4) When carrying out troubleshooting of circuits (measuring the voltage, resistance, continuity, or current), move the related wiring and connectors several times and check that there is no change in the reading of the tester.
 - ★ If there is any change, there is probably defective contact in that circuit.

Points to remember when handling hydraulic equipment

With the increase in pressure and precision of hydraulic equipment, the most common cause of failure is dirt (foreign material) in the hydraulic circuit. When adding hydraulic oil, or when disassembling or assembling hydraulic equipment, it is necessary to be particularly careful.

1. Be careful of the operating environment.

Avoid adding hydraulic oil, replacing filters, or repairing the machine in rain or high winds, or places where there is a lot of dust.

2. Disassembly and maintenance work in the field

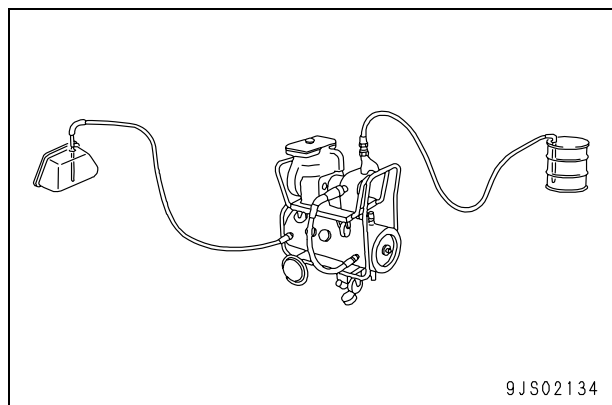
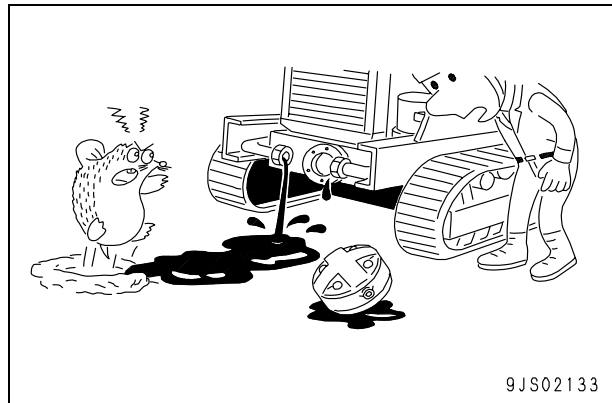
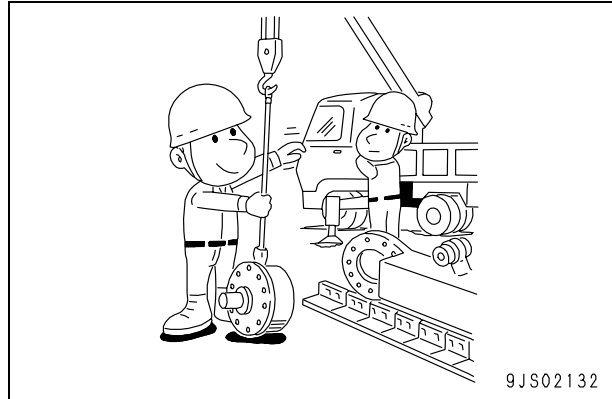
If disassembly or maintenance work is carried out on hydraulic equipment in the field, there is danger of dust entering the equipment. It is also difficult to check the performance after repairs, so it is desirable to use unit exchange. Disassembly and maintenance of hydraulic equipment should be carried out in a specially prepared dustproof workshop, and the performance should be checked with special test equipment.

3. Sealing openings

After any piping or equipment is removed, the openings should be sealed with caps, tapes, or vinyl bags to prevent any dirt or dust from entering. If the opening is left open or is blocked with a rag, there is danger of dirt entering or of the surrounding area being made dirty by leaking oil so never do this. Do not simply drain oil out onto the ground, but collect it and ask the customer to dispose of it, or take it back with you for disposal.

4. Do not let any dirt or dust get in during refilling operations

Be careful not to let any dirt or dust get in when refilling with hydraulic oil. Always keep the oil filler and the area around it clean, and also use clean pumps and oil containers. If an oil cleaning device is used, it is possible to filter out the dirt that has collected during storage, so this is an even more effective method.

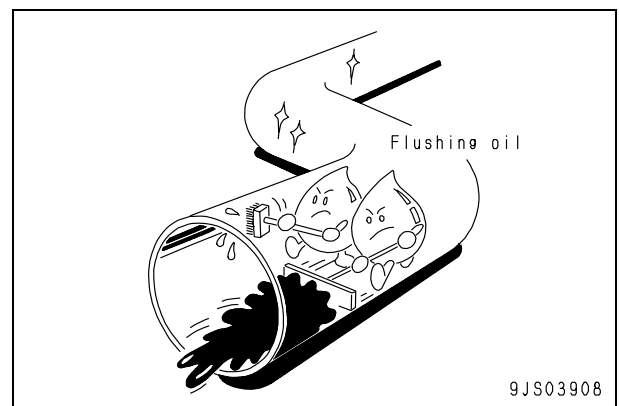


5. Change hydraulic oil when the temperature is high

When hydraulic oil or other oil is warm, it flows easily. In addition, the sludge can also be drained out easily from the circuit together with the oil, so it is best to change the oil when it is still warm. When changing the oil, as much as possible of the old hydraulic oil must be drained out. (Drain the oil from the hydraulic tank; also drain the oil from the filter and from the drain plug in the circuit.) If any old oil is left, the contaminants and sludge in it will mix with the new oil and will shorten the life of the hydraulic oil.

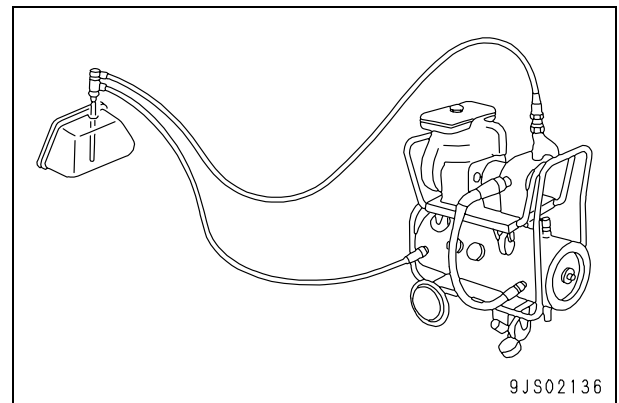
6. Flushing operations

After disassembling and assembling the equipment, or changing the oil, use flushing oil to remove the contaminants, sludge, and old oil from the hydraulic circuit. Normally, flushing is carried out twice: primary flushing is carried out with flushing oil, and secondary flushing is carried out with the specified hydraulic oil.



7. Cleaning operations

After repairing the hydraulic equipment (pump, control valve, etc.) or when running the machine, carry out oil cleaning to remove the sludge or contaminants in the hydraulic oil circuit. The oil cleaning equipment is used to remove the ultra fine (about 3 μ) particles that the filter built in the hydraulic equipment cannot remove, so it is an extremely effective device.



Connectors newly used for Tier 3 engines

1. Slide lock type

(FRAMATOME-3, FRAMATOME-2)

- 107 – 170, 12V140 engines
 - Various pressure sensors and NE speed sensor

Examples)

Intake air pressure in intake manifold:

PIM (125, 170, 12V140 engines)

Oil pressure sensor: POIL
(125, 170, 12V140 engines)

Oil pressure switch
(107, 114 engines)

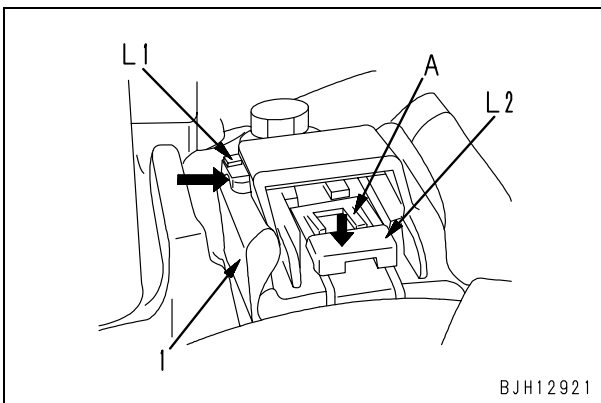
Ne speed sensor of flywheel housing:
NE (107 – 170, 12V140 engines)

Ambient pressure sensor: PAMB
(125, 170, 12V140 engines)

Disconnect connector (1) according to the following procedure.

- 1) Slide lock (L1) to the right.
- 2) While pressing lock (L2), pull out connector (1) toward you.

★ Even if lock (L2) is pressed, connector (1) cannot be pulled out toward you, if part A does not float. In this case, float part A with a small screwdriver while press lock (L2), and then pull out connector (1) toward you.



2. Pull lock type (PACKARD-2)

- 107 – 170, 12V140 engine
 - Various temperature sensors

Example)

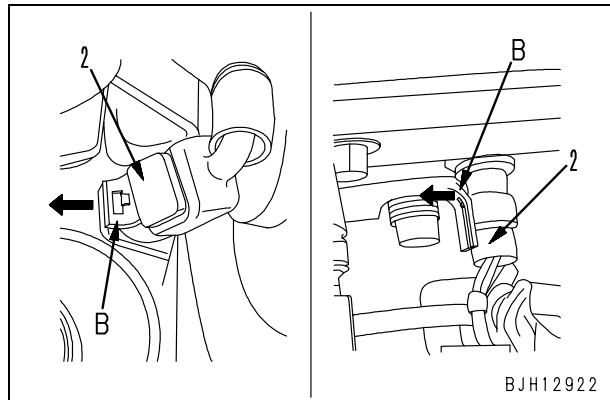
Intake air temperature sensor in intake manifold: TIM

Fuel temperature sensor: TFUEL

Oil temperature sensor: TOIL

Coolant temperature sensor: TWTR, etc.

Disconnect the connector by pulling lock (B) (on the wiring harness side) of connector (2) outward.



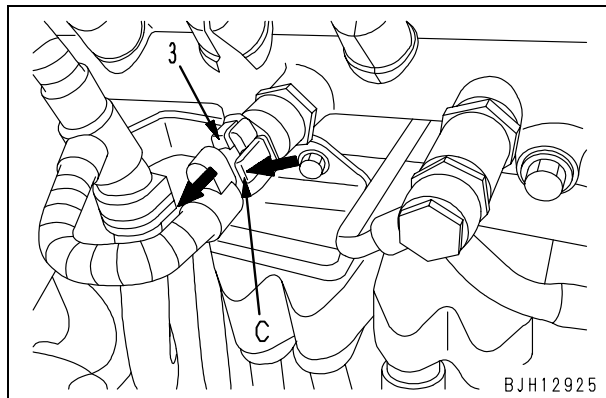
3. Push lock type

- 107, 114 engines
Example)
Fuel pressure sensor in common rail
(**BOSCH-03**)

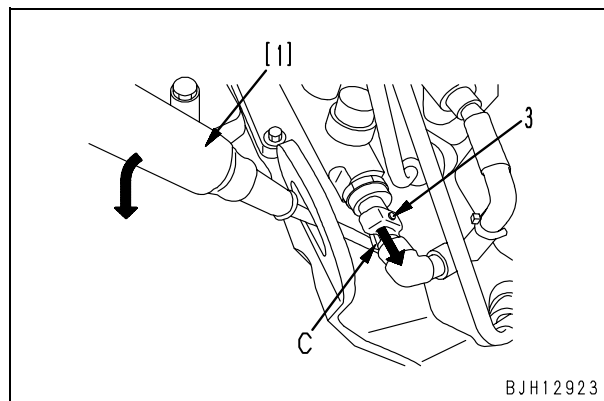
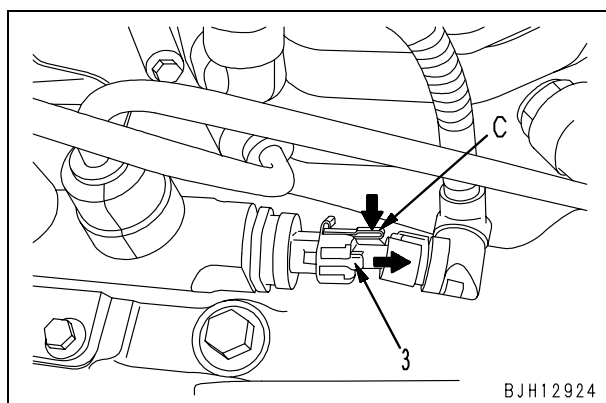
Disconnect connector (3) according to the following procedure.

- 1) While pressing lock (C), pull out connector (3) in the direction of the arrow.

- 114 engine

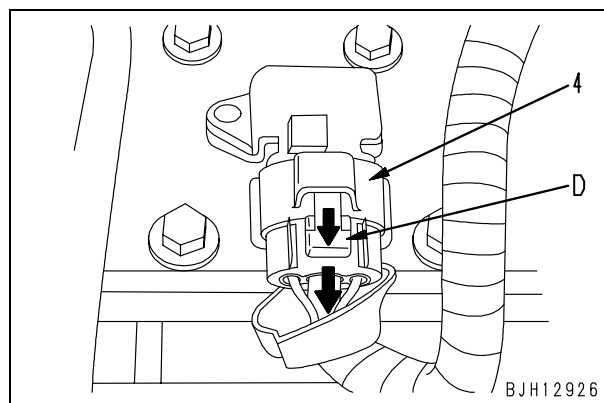


- 107 engine



- 107, 114 engine
Example)
Intake air pressure/temperature sensor in
intake manifold
(**SUMITOMO-04**)

- 3) While pressing lock (D), pull out connector (4) in the direction of the arrow.



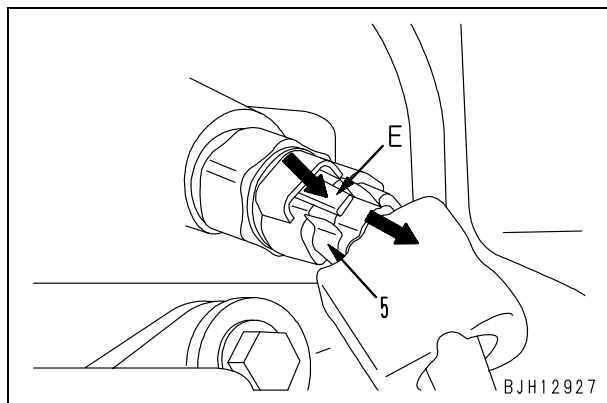
★ If the lock is on the underside, use flat-head screwdriver [1] since you cannot insert your fingers.

- 2) While pressing up lock (C) of the connector with flat-head screwdriver [1], pull out connector (3) in the direction of the arrow.

- 125 – 170, 12V140 engine
- 4) While pressing lock (E) of the connector, pullout connector (5) in the direction of the arrow.

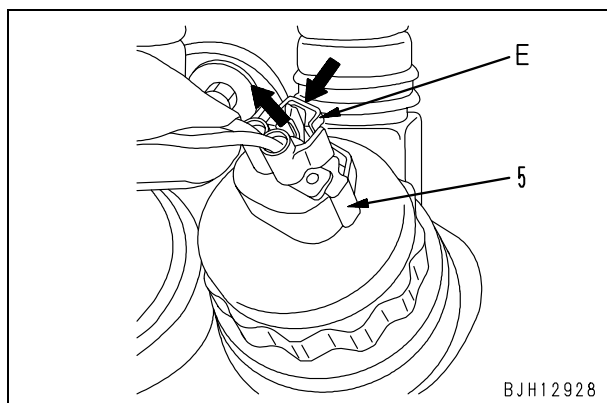
Example)

Fuel pressure in common rail: PFUEL etc.
(AMP-3)



Example)

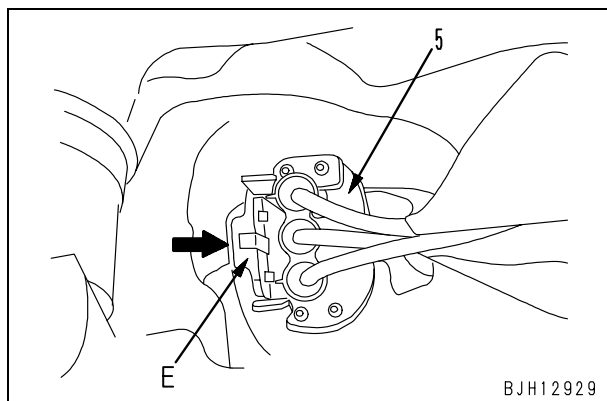
Injection pressure control valve of fuel supply pump: PCV (SUMITOMO-2)



Example)

Speed sensor of fuel supply pump:
G (SUMITOMO-3)

- ★ Pull the connector straight up.



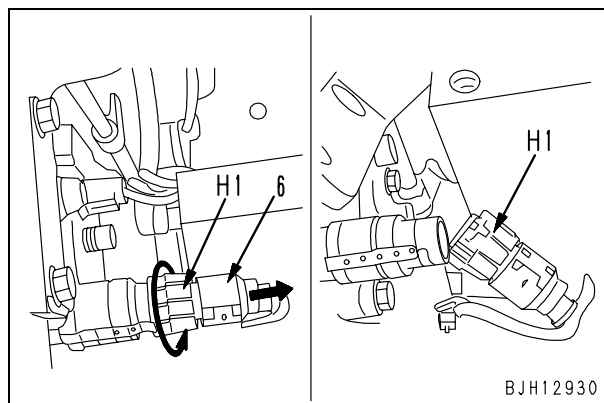
4. Turn-housing type (Round green connector)

- 140 engine

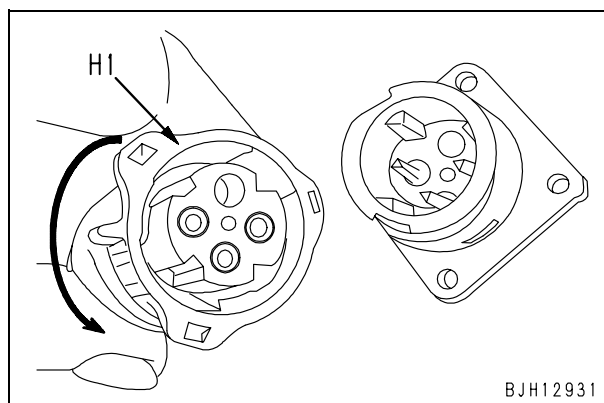
Example)

Intake air pressure sensor in intake manifold (CANNON-04): PIM etc.

- 1) Disconnect connector (6) according to the following procedure.
 - 1] Turn housing (H1) in the direction of the arrow.
 - ★ When connector is unlocked, housing (H1) becomes heavy to turn.
 - 2] Pull out housing (H1) in the direction of the arrow.
 - ★ Housing (H1) is left on the wiring harness side.



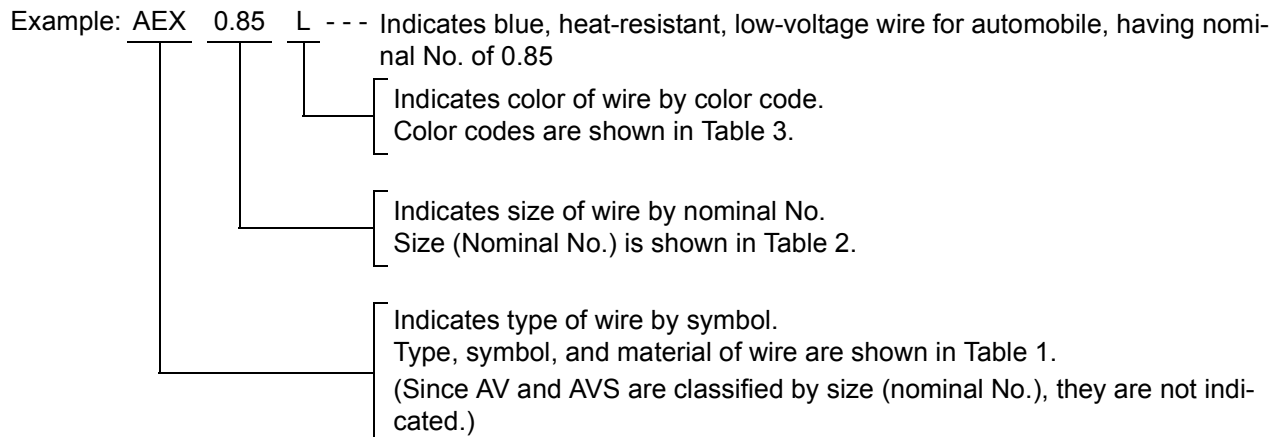
- 2) Connect the connector according to the following procedure.
 - 1] Insert the connector to the end, while setting its groove.
 - 2] Turn housing (H1) in the direction of the arrow until it "clicks".



How to read electric wire code

- ★ The information about the wires unique to each machine model is described in Troubleshooting section, Relational information of troubleshooting.

In the electric circuit diagram, the material, thickness, and color of each electric wire are indicated by symbols. The electric wire code is helpful in understanding the electric circuit diagram.



1. Type, symbol, and material

AV and AVS are different in only thickness and outside diameter of the cover. AEX is similar to AV in thickness and outside diameter of AEX and different from AV and AVS in material of the cover.

(Table 1)

Type	Sym- bol	Material		Using temperature range (°C)	Example of use
Low-voltage wire for automobile	AV	Conduc- tor	Annealed copper for elec- tric appliance	-30 to +60	General wiring (Nominal No. 5 and above)
		Insulator	Soft polyvinyl chloride		
Thin-cover low-voltage wire for automobile	AVS	Conduc- tor	Annealed copper for elec- tric appliance		General wiring (Nominal No. 3 and below)
		Insulator	Soft polyvinyl chloride		
Heat-resis- tant low-volt- age wire for automobile	AEX	Conduc- tor	Annealed copper for elec- tric appliance	-50 to +110	General wiring in extremely cold district, wiring at high-tem- perature place
		Insulator	Heat-resistant crosslinked polyethylene		

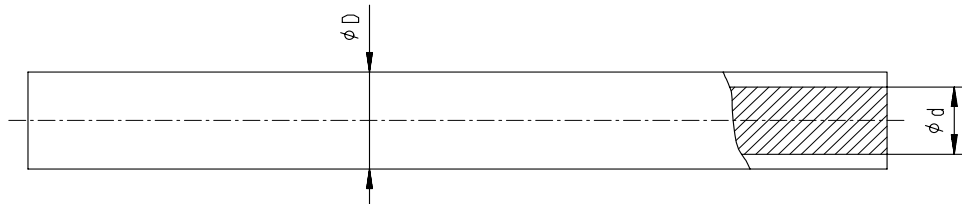
2. Dimensions

(Table 2)

Nominal No.		0.5f	(0.5)	0.75f	(0.85)	1.25f	(1.25)	2f	2	3f	3	5
Conductor	Number of strands/Diameter of strand	20/0.18	7/0.32	30/0.18	11/0.32	50/0.18	16/0.32	37/0.26	26/0.32	58/0.26	41/0.32	65/0.32
	Sectional area (mm ²)	0.51	0.56	0.76	0.88	1.27	1.29	1.96	2.09	3.08	3.30	5.23
	d (approx.)	1.0		1.2		1.5		1.9	1.9	2.3	2.4	3.0
Cover D	AVS Standard	2.0		2.2		2.5		2.9	2.9	3.5	3.6	—
	AV Standard	—		—		—		—	—	—	—	4.6
	AEX Standard	2.0		2.2		2.7		3.0	3.1	—	3.8	4.6

Nominal No.		8	15	20	30	40	50	60	85	100
Conductor	Number of strands/Diameter of strand	50/0.45	84/0.45	41/0.80	70/0.80	85/0.80	108/0.80	127/0.80	169/0.80	217/0.80
	Sectional area (mm ²)	7.95	13.36	20.61	35.19	42.73	54.29	63.84	84.96	109.1
	d (approx.)	3.7	4.8	6.0	8.0	8.6	9.8	10.4	12.0	13.6
Cover D	AVS Standard	—	—	—	—	—	—	—	—	—
	AV Standard	5.5	7.0	8.2	10.8	11.4	13.0	13.6	16.0	17.6
	AEX Standard	5.3	7.0	8.2	10.8	11.4	13.0	13.6	16.0	17.6

“f” of nominal No. denotes flexible”.



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3. Color codes table

(Table 3)

Color Code	Color of wire	Color Code	Color of wire
B	Black	LgW	Light green & White
Br	Brown	LgY	Light green & Yellow
BrB	Brown & Black	LR	Blue & Red
BrR	Brown & Red	LW	Blue & White
BrW	Brown & White	LY	Blue & Yellow
BrY	Brown & Yellow	O	Orange
Ch	Charcoal	P	Pink
Dg	Dark green	R	Red
G	Green	RB	Red & Black
GB	Green & Black	RG	Red & Green
GL	Green & Blue	RL	Red & Blue
Gr	Gray	RW	Red & White
GR	Green & Red	RY	Red & Yellow
GW	Green & White	Sb	Sky Blue
GY	Green & Yellow	Y	Yellow
L	Blue	YB	Yellow & Black
LB	Blue & Black	YG	Yellow & Green
Lg	Light green	YL	Yellow & Blue
LgB	Light green & Black	YR	Yellow & Red
LgR	Light green & Red	YW	Yellow & White

Remarks: In a color code consisting of 2 colors, the first color is the color of the background and the second color is the color of the marking.

Example: "GW" means that the background is Green and marking is White.

4. Types of circuits and color codes

(Table 4)

Type of wire		AVS or AV						AEX	
Type of circuit	Charge	R	WG	–	–	–	–	R	–
	Ground	B	–	–	–	–	–	B	–
	Start	R	–	–	–	–	–	R	–
	Light	RW	RB	RY	RG	RL	–	D	–
	Instrument	Y	YR	YB	YG	YL	YW	Y	Gr
	Signal	G	GW	GR	GY	GB	GL	G	Br
	Others	L	LW	LR	LY	LB	–	L	–
		Br	BrW	BrR	BrY	BrB	–	–	–
		Lg	LgR	LgY	LgB	LgW	–	–	–
		O	–	–	–	–	–	–	–
		Gr	–	–	–	–	–	–	–
		P	–	–	–	–	–	–	–
		Sb	–	–	–	–	–	–	–
		Dg	–	–	–	–	–	–	–
		Ch	–	–	–	–	–	–	–

Precautions when carrying out operation

[When carrying out removal or installation (disassembly or assembly) of units, be sure to follow the general precautions given below when carrying out the operation.]

1. Precautions when carrying out removal work

- If the coolant contains antifreeze, dispose of it correctly.
- After disconnecting hoses or tubes, cover them or fit plugs to prevent dirt or dust from entering.
- When draining oil, prepare a container of adequate size to catch the oil.
- Confirm the match marks showing the installation position, and make match marks in the necessary places before removal to prevent any mistake when assembling.
- To prevent any excessive force from being applied to the wiring, always hold the connectors when disconnecting the connectors. Do not pull the wires.
- Fit wires and hoses with tags to show their installation position to prevent any mistake when installing.
- Check the number and thickness of the shims, and keep in a safe place.
- When raising components, be sure to use lifting equipment of ample strength.
- When using forcing screws to remove any components, tighten the forcing screws uniformly in turn.
- Before removing any unit, clean the surrounding area and fit a cover to prevent any dust or dirt from entering after removal.

★ Precautions when handling piping during disassembly

Fit the following plugs into the piping after disconnecting it during disassembly operations.

1) Face seal type hoses and tubes

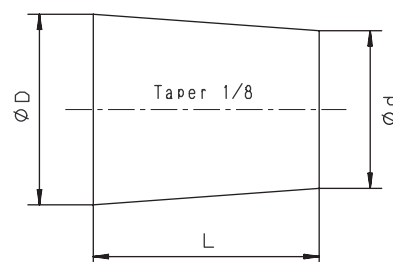
Nominal number	Plug (nut end)	Sleeve nut (elbow end)
02	07376-70210	02789-20210
03	07376-70315	02789-20315
04	07376-70422	02789-20422
05	07376-70522	02789-20522
06	07376-70628	02789-20628
10	07376-71034	07221-21034
12	07376-71234	07221-21234

2) Split flange type hoses and tubes

Nominal number	Flange (hose end)	Sleeve head (tube end)	Split flange
04	07379-00400	07378-10400	07371-30400
05	07379-00500	07378-10500	07371-30500

3) If the part is not under hydraulic pressure, the following corks can be used.

Nominal number	Part Number	Dimensions		
		D	d	L
06	07049-00608	6	5	8
08	07049-00811	8	6.5	11
10	07049-01012	10	8.5	12
12	07049-01215	12	10	15
14	07049-01418	14	11.5	18
16	07049-01620	16	13.5	20
18	07049-01822	18	15	22
20	07049-02025	20	17	25
22	07049-02228	22	18.5	28
24	07049-02430	24	20	30
27	07049-02734	27	22.5	34



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2. Precautions when carrying out installation work

- Tighten all bolts and nuts (sleeve nuts) to the specified (KES) torque.
 - Install the hoses without twisting or interference and fix them with intermediate clamps, if there are any.
 - Replace all gaskets, O-rings, cotter pins, and lock plates with new parts.
 - Bend the cotter pins and lock plates securely.
 - When coating with adhesive, clean the part and remove all oil and grease, then coat the threaded portion with 2 – 3 drops of adhesive.
 - When coating with gasket sealant, clean the surface and remove all oil and grease, check that there is no dirt or damage, then coat uniformly with gasket sealant.
 - Clean all parts, and correct any damage, dents, burrs, or rust.
 - Coat rotating parts and sliding parts with engine oil.
 - When press fitting parts, coat the surface with anti-friction compound (LM-P).
 - After fitting snap rings, check that the snap ring is fitted securely in the ring groove.
 - When connecting wiring connectors, clean the connector to remove all oil, dirt, or water, then connect securely.
 - When using eyebolts, check that there is no deformation or deterioration, screw them in fully, and align the direction of the hook.
 - When tightening split flanges, tighten uniformly in turn to prevent excessive tightening on one side.
- ★ When operating the hydraulic cylinders for the first time after reassembling cylinders, pumps and other hydraulic equipment removed for repair, always bleed the air as follows:
- 1) Start the engine and run at low idle.
 - 2) Operate the work equipment control lever to operate the hydraulic cylinder 4 – 5 times, stopping the cylinder 100 mm from the end of its stroke.
 - 3) Next, operate the hydraulic cylinder 3 – 4 times to the end of its stroke.
 - 4) After doing this, run the engine at normal speed.
- ★ When using the machine for the first time after repair or long storage, follow the same procedure.

3. Precautions when completing the operation

- 1) Refilling with coolant, oil and grease
 - If the coolant has been drained, tighten the drain valve, and add coolant to the specified level. Run the engine to circulate the coolant through the system. Then check the coolant level again.
 - If the hydraulic equipment has been removed and installed again, add engine oil to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.
 - If the piping or hydraulic equipment have been removed, always bleed the air from the system after reassembling the parts.
 - ★ For details, see Testing and adjusting, “Bleeding air”.
 - Add the specified amount of grease (molybdenum disulphide grease) to the work equipment parts.
- 2) Checking cylinder head and manifolds for looseness

Check the cylinder head and intake and exhaust manifold for looseness.
If any part is loosened, retighten it.

 - For the tightening torque, see “Disassembly and assembly”.
- 3) Checking engine piping for damage and looseness

Intake and exhaust system
Check the piping for damage, the mounting bolts and nuts for looseness, and the joints for air suction and exhaust gas leakage.
If any part is loosened or damaged, retighten or repair it.

Cooling system
Check the piping for damage, the mounting bolts and nuts for looseness, and the joints for coolant leakage.
If any part is loosened or damaged, retighten or repair it.

Fuel system
Check the piping for damage, the mounting bolts and nuts for looseness, and the joints for fuel leakage.
If any part is loosened or damaged, retighten or repair it.

- 4) Checking muffler and exhaust pipe for damage and looseness
 - 1] Visually check the muffler, exhaust pipe and their mounting parts for a crack and damage.
If any part is damaged, replace it.
 - 2] Check the mounting bolts and nuts of the muffler, exhaust pipe and their mounting parts for looseness.
If any bolt or nut is loosened, retighten it.
- 5) Checking muffler function
Check the muffler for abnormal sound and sound different from that of a new muffler.
If any abnormal sound is heard, repair the muffler, referring to "Troubleshooting" and "Disassembly and assembly".

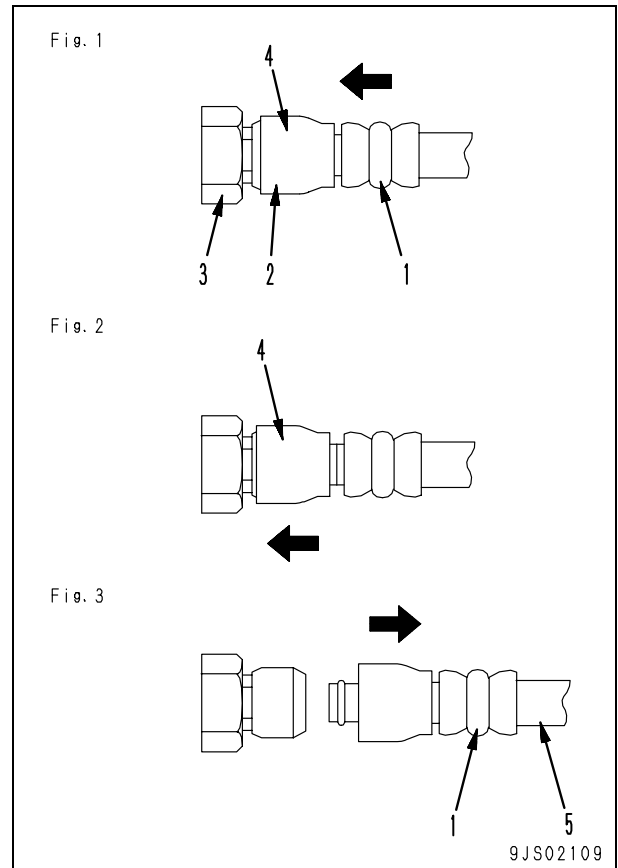
Method of disassembling and connecting push-pull type coupler

- ⚠ Before carrying out the following work, loosen the oil filler cap of the hydraulic tank gradually to release the residual pressure from the hydraulic tank.
- ⚠ Even if the residual pressure is released from the hydraulic tank, some hydraulic oil flows out when the hose is disconnected. Accordingly, prepare an oil receiving container.

Type 1

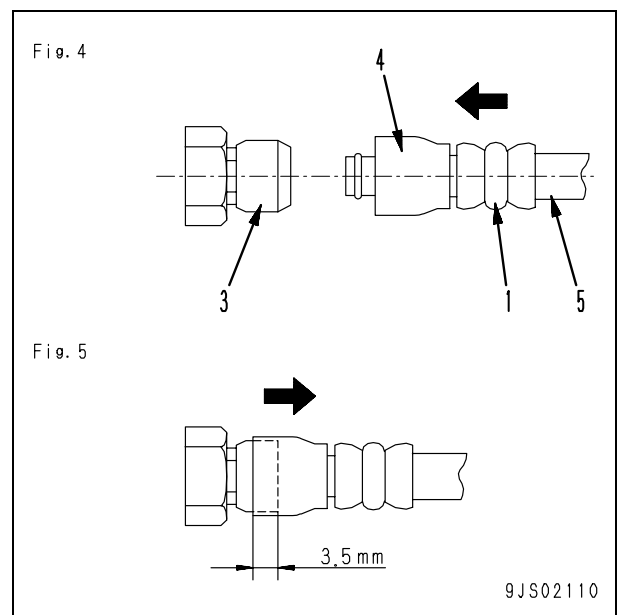
1. Disconnection

- 1) Hold adapter (1) and push hose joint (2) into mating adapter (3). (Fig. 1)
 - ★ The adapter can be pushed in about 3.5 mm.
 - ★ Do not hold rubber cap portion (4).
- 2) After hose joint (2) is pushed into adapter (3), press rubber cap portion (4) against adapter (3) until it clicks. (Fig. 2)
- 3) Hold hose adapter (1) or hose (5) and pull it out. (Fig. 3)
 - ★ Since some hydraulic oil flows out, prepare an oil receiving container.



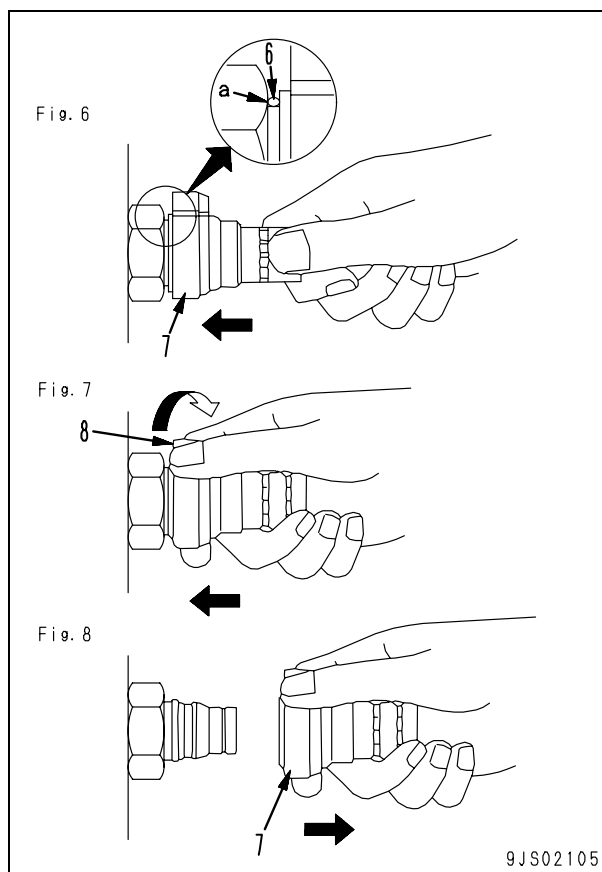
2. Connection

- 1) Hold hose adapter (1) or hose (5) and insert it in mating adapter (3), aligning them with each other. (Fig. 4)
 - ★ Do not hold rubber cap portion (4).
- 2) After inserting the hose in the mating adapter perfectly, pull it back to check its connecting condition. (Fig. 5)
 - ★ When the hose is pulled back, the rubber cap portion moves toward the hose about 3.5 mm. This does not indicate abnormality, however.

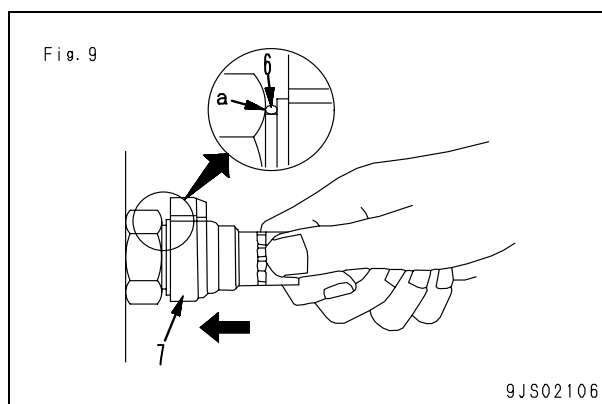


Type 2**1. Disconnection**

- 1) Hold the tightening portion and push body (7) straight until sliding prevention ring (6) contacts contact surface (a) of the hexagonal portion at the male end. (Fig. 6)
- 2) While holding the condition of Step 1), turn lever (8) to the right (clockwise). (Fig. 7)
- 3) While holding the condition of Steps 1) and 2), pull out whole body (7) to disconnect it. (Fig. 8)

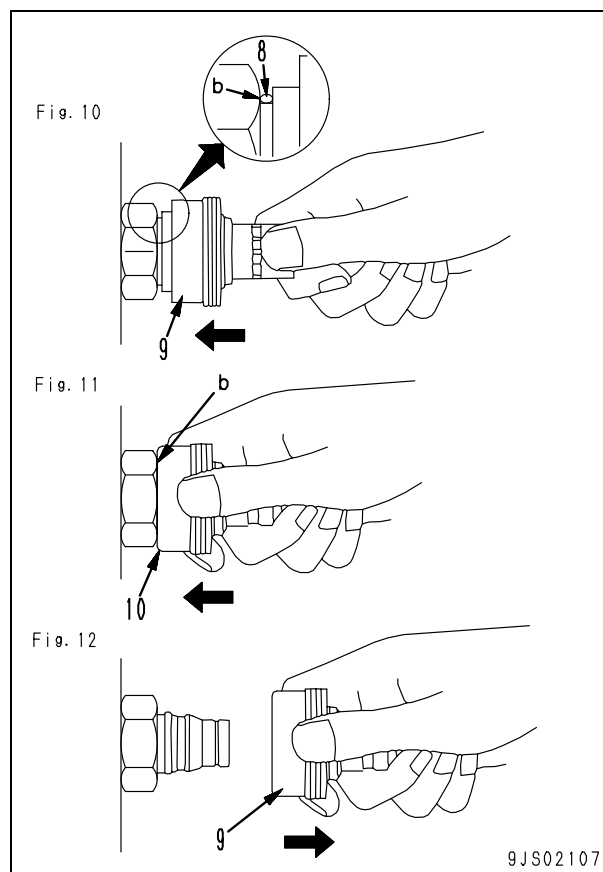
**2. Connection**

- Hold the tightening portion and push body (7) straight until sliding prevention ring (6) contacts contact surface (a) of the hexagonal portion at the male end. (Fig. 9)

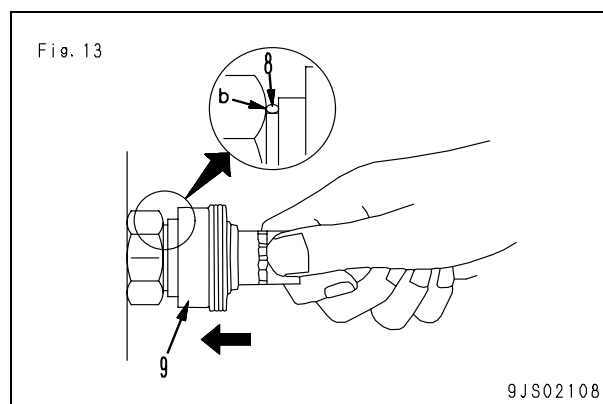


Type 3**1. Disconnection**

- 1) Hold the tightening portion and push body (9) straight until sliding prevention ring (8) contacts contact surface (b) of the hexagonal portion at the male end. (Fig. 10)
- 2) While holding the condition of Step 1), push cover (10) straight until it contacts contact surface (b) of the hexagonal portion at the male end. (Fig. 11)
- 3) While holding the condition of Steps 1) and 2), pull out whole body (9) to disconnect it. (Fig. 12)

**2. Connection**

- Hold the tightening portion and push body (9) straight until the sliding prevention ring contacts contact surface (b) of the hexagonal portion at the male end. (Fig. 13)



Standard tightening torque table

1. Table of tightening torques for bolts and nuts

★ Unless there are special instructions, tighten metric nuts and bolts to the torque below. (When using torque wrench)

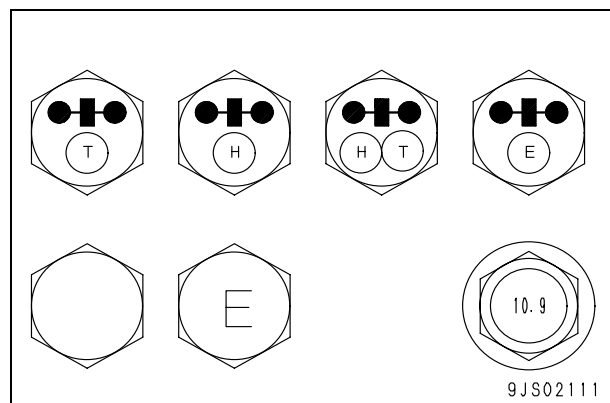
★ The following table corresponds to the bolts in Fig. A.

Thread diameter of bolt mm	Width across flats mm	Tightening torque	
		Nm	kgm
6	10	11.8 – 14.7	1.2 – 1.5
8	13	27 – 34	2.8 – 3.5
10	17	59 – 74	6.0 – 7.5
12	19	98 – 123	10.0 – 12.5
14	22	153 – 190	15.5 – 19.5
16	24	235 – 285	23.5 – 29.5
18	27	320 – 400	33.0 – 41.0
20	30	455 – 565	46.5 – 58.0
22	32	610 – 765	62.5 – 78.0
24	36	785 – 980	80.0 – 100.0
27	41	1,150 – 1,440	118 – 147
30	46	1,520 – 1,910	155 – 195
33	50	1,960 – 2,450	200 – 250
36	55	2,450 – 3,040	250 – 310
39	60	2,890 – 3,630	295 – 370

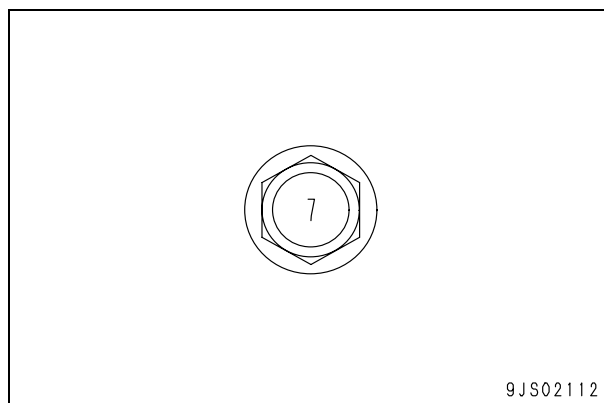
★ The following table corresponds to the bolts in Fig. B.

Thread diameter of bolt mm	Width across flats mm	Tightening torque	
		Nm	kgm
6	10	5.9 – 9.8	0.6 – 1.0
8	13	13.7 – 23.5	1.4 – 2.4
10	14	34.3 – 46.1	3.5 – 4.7
12	27	74.5 – 90.2	7.6 – 9.2

★ Fig. A



★ Fig. B



2. Table of tightening torques for split flange bolts

★ Unless there are special instructions, tighten split flange bolts to the torque below.

Thread diameter of bolt	Width across flats	Tightening torque	
mm	mm	Nm	kgm
10	14	59 – 74	6.0 – 7.5
12	17	98 – 123	10.0 – 12.5
16	22	235 – 285	23.5 – 29.5

3. Table of tightening torques for O-ring boss piping joints

★ Unless there are special instructions, tighten O-ring boss piping joints to the torque below.

Nominal No.	Thread diameter	Width across flats	Tightening torque Nm {kgm}	
	mm	mm	Range	Target
02	14	Varies depending on type of connector.	35 – 63 { 3.5 – 6.5 }	44 { 4.5 }
03,04	20		84 – 132 { 8.5 – 13.5 }	103 { 10.5 }
05,06	24		128 – 186 { 13.0 – 19.0 }	157 { 16.0 }
10,12	33		363 – 480 { 37.0 – 49.0 }	422 { 43.0 }
14	42		746 – 1,010 { 76.0 – 103 }	883 { 90.0 }

4. Table of tightening torques for O-ring boss plugs

★ Unless there are special instructions, tighten O-ring boss plugs to the torque below.

Nominal No.	Thread diameter	Width across flats	Tightening torque Nm {kgm}	
	mm	mm	Range	Target
08	8	14	5.88 – 8.82 { 0.6 – 0.9 }	7.35 { 0.75 }
10	10	17	9.81 – 12.74 { 1.0 – 1.3 }	11.27 { 1.15 }
12	12	19	14.7 – 19.6 { 1.5 – 2.0 }	17.64 { 1.8 }
14	14	22	19.6 – 24.5 { 2.0 – 2.5 }	22.54 { 2.3 }
16	16	24	24.5 – 34.3 { 2.5 – 3.5 }	29.4 { 3.0 }
18	18	27	34.3 – 44.1 { 3.5 – 4.5 }	39.2 { 4.0 }
20	20	30	44.1 – 53.9 { 4.5 – 5.5 }	49.0 { 5.0 }
24	24	32	58.8 – 78.4 { 6.0 – 8.0 }	68.6 { 7.0 }
30	30	32	93.1 – 122.5 { 9.5 – 12.5 }	107.8 { 11.0 }
33	33	–	107.8 – 147.0 { 11.0 – 15.0 }	127.4 { 13.0 }
36	36	36	127.4 – 176.4 { 13.0 – 18.0 }	151.9 { 15.5 }
42	42	–	181.3 – 240.1 { 18.5 – 24.5 }	210.7 { 21.5 }
52	52	–	274.4 – 367.5 { 28.0 – 37.5 }	323.4 { 33.0 }

5. Table of tightening torques for hoses (taper seal type and face seal type)

- ★ Unless there are special instructions, tighten the hoses (taper seal type and face seal type) to the torque below.
- ★ Apply the following torque when the threads are coated (wet) with engine oil.

Nominal No. of hose	Width across flats	Tightening torque Nm {kgm}		Taper seal Thread size (mm)	Face seal	
		Range	Target		Nominal No. - Number of threads, type of thread	Thread diameter (mm) (Reference)
02	19	34 – 54 { 3.5 – 5.5 }	44 { 4.5 }	–	9/16-18UN	14.3
		34 – 63 { 3.5 – 6.5 }		14	–	–
03	22	54 – 93 { 5.5 – 9.5 }	74 { 7.5 }	–	11/16-16UN	17.5
	24	59 – 98 { 6.0 – 10.0 }	78 { 8.0 }	18	–	–
04	27	84 – 132 { 8.5 – 13.5 }	103 { 10.5 }	22	13/16-16UN	20.6
05	32	128 – 186 { 13.0 – 19.0 }	157 { 16.0 }	24	1-14UNS	25.4
06	36	177 – 245 { 18.0 – 25.0 }	216 { 22.0 }	30	1-3/16-12UN	30.2
(10)	41	177 – 245 { 18.0 – 25.0 }	216 { 22.0 }	33	–	–
(12)	46	197 – 294 { 20.0 – 30.0 }	245 { 25.0 }	36	–	–
(14)	55	246 – 343 { 25.0 – 35.0 }	294 { 30.0 }	42	–	–

6. Table of tightening torques for 102, 107 and 114 engine series (Bolts and nuts)

- ★ Unless there are special instructions, tighten the metric bolts and nuts of the 102, 107 and 114 engine series to the torque below.

Thread size	Tightening torque	
	Bolts and nuts	
mm	Nm	kgm
6	10 ± 2	1.02 ± 0.20
8	24 ± 4	2.45 ± 0.41
10	43 ± 6	4.38 ± 0.61
12	77 ± 12	7.85 ± 1.22
14	—	—

7. Table of tightening torques for 102, 107 and 114 engine series (Eye joints)

- ★ Unless there are special instructions, tighten the metric eye joints of the 102, 107 and 114 engine series to the torque below.

Thread size	Tightening torque	
	Nm	kgm
6	8 ± 2	0.81 ± 0.20
8	10 ± 2	1.02 ± 0.20
10	12 ± 2	1.22 ± 0.20
12	24 ± 4	2.45 ± 0.41
14	36 ± 5	3.67 ± 0.51

8. Table of tightening torques for 102, 107 and 114 engine series (Taper screws)

- ★ Unless there are special instructions, tighten the taper screws (unit: inch) of the 102, 107 and 114 engine series to the torque below.

Thread size	Tightening torque	
	Nm	kgm
1/16	3 ± 1	0.31 ± 0.10
1/8	8 ± 2	0.81 ± 0.20
1/4	12 ± 2	1.22 ± 0.20
3/8	15 ± 2	1.53 ± 0.20
1/2	24 ± 4	2.45 ± 0.41
3/4	36 ± 5	3.67 ± 0.51
1	60 ± 9	6.12 ± 0.92

Conversion table

Method of using the conversion table

The conversion table in this section is provided to enable simple conversion of figures. For details of the method of using the conversion table, see the example given below.

Example: Method of using the conversion table to convert from millimeters to inches

1. Convert 55 mm into inches.

- 1) Locate the number 50 in the vertical column at the left side, take this as (A), and then draw a horizontal line from (A).
- 2) Locate the number 5 in the row across the top, take this as (B), then draw a perpendicular line down from (B).
- 3) Take the point where the 2 lines cross as (C). This point (C) gives the value when converting from millimeters to inches. Therefore, 55 mm = 2.165 inches.

2. Convert 550 mm into inches.

- 1) The number 550 does not appear in the table, so divide it by 10 (move the decimal point one place to the left) to convert it to 55 mm.
- 2) Carry out the same procedure as above to convert 55 mm to 2.165 inches.
- 3) The original value (550 mm) was divided by 10, so multiply 2.165 inches by 10 (move the decimal point one place to the right) to return to the original value. This gives 550 mm = 21.65 inches.

Millimeters to inches

(B)

1 mm = 0.03937 in

	0	1	2	3	4	5	6	7	8	9
0	0	0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929
(A) 50	1.969	2.008	2.047	2.087	2.126	2.165	2.205	2.244	2.283	2.323
60	2.362	2.402	2.441	2.480	2.520	2.559	2.598	2.638	2.677	2.717
70	2.756	2.795	2.835	2.874	2.913	2.953	2.992	3.032	3.071	3.110
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898

Millimeters to inches

1 mm = 0.03937 in

	0	1	2	3	4	5	6	7	8	9
0	0	0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929
50	1.969	2.008	2.047	2.087	2.126	2.165	2.205	2.244	2.283	2.323
60	2.362	2.402	2.441	2.480	2.520	2.559	2.598	2.638	2.677	2.717
70	2.756	2.795	2.835	2.874	2.913	2.953	2.992	3.032	3.071	3.110
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898

Kilogram to pound

1 kg = 2.2046 lb

	0	1	2	3	4	5	6	7	8	9
0	0	2.20	4.41	6.61	8.82	11.02	13.23	15.43	17.64	19.84
10	22.05	24.25	26.46	28.66	30.86	33.07	35.27	37.48	39.68	41.89
20	44.09	46.30	48.50	50.71	51.91	55.12	57.32	59.53	61.73	63.93
30	66.14	68.34	70.55	72.75	74.96	77.16	79.37	81.57	83.78	85.98
40	88.18	90.39	92.59	94.80	97.00	99.21	101.41	103.62	105.82	108.03
50	110.23	112.44	114.64	116.85	119.05	121.25	123.46	125.66	127.87	130.07
60	132.28	134.48	136.69	138.89	141.10	143.30	145.51	147.71	149.91	152.12
70	154.32	156.53	158.73	160.94	163.14	165.35	167.55	169.76	171.96	174.17
80	176.37	178.57	180.78	182.98	185.19	187.39	189.60	191.80	194.01	196.21
90	198.42	200.62	202.83	205.03	207.24	209.44	211.64	213.85	216.05	218.26

Liters to U.S. Gallons

1 ℓ = 0.2642 U.S. Gal

	0	1	2	3	4	5	6	7	8	9
0	0	0.264	0.528	0.793	1.057	1.321	1.585	1.849	2.113	2.378
10	2.642	2.906	3.170	3.434	3.698	3.963	4.227	4.491	4.755	5.019
20	5.283	5.548	5.812	6.076	6.340	6.604	6.869	7.133	7.397	7.661
30	7.925	8.189	8.454	8.718	8.982	9.246	9.510	9.774	10.039	10.303
40	10.567	10.831	11.095	11.359	11.624	11.888	12.152	12.416	12.680	12.944
50	13.209	13.473	13.737	14.001	14.265	14.529	14.795	15.058	15.322	15.586
60	15.850	16.115	16.379	16.643	16.907	17.171	17.435	17.700	17.964	18.228
70	18.492	18.756	19.020	19.285	19.549	19.813	20.077	20.341	20.605	20.870
80	21.134	21.398	21.662	21.926	22.190	22.455	22.719	22.983	23.247	23.511
90	23.775	24.040	24.304	24.568	24.832	25.096	25.361	25.625	25.889	26.153

Liters to U.K. Gallons

1 ℓ = 0.21997 U.K.Gal

	0	1	2	3	4	5	6	7	8	9
0	0	0.220	0.440	0.660	0.880	1.100	1.320	1.540	1.760	1.980
10	2.200	2.420	2.640	2.860	3.080	3.300	3.520	3.740	3.950	4.179
20	4.399	4.619	4.839	5.059	5.279	5.499	5.719	5.939	6.159	6.379
30	6.599	6.819	7.039	7.259	7.479	7.699	7.919	8.139	8.359	8.579
40	8.799	9.019	9.239	9.459	9.679	9.899	10.119	10.339	10.559	10.778
50	10.998	11.281	11.438	11.658	11.878	12.098	12.318	12.528	12.758	12.978
60	13.198	13.418	13.638	13.858	14.078	14.298	14.518	14.738	14.958	15.178
70	15.398	15.618	15.838	16.058	16.278	16.498	16.718	16.938	17.158	17.378
80	17.598	17.818	18.037	18.257	18.477	18.697	18.917	19.137	19.357	19.577
90	19.797	20.017	20.237	20.457	20.677	20.897	21.117	21.337	21.557	21.777

kgm to ft.lb

1 kgm = 7.233 ft.lb

	0	1	2	3	4	5	6	7	8	9
0	0	7.2	14.5	21.7	28.9	36.2	43.4	50.6	57.9	65.1
10	72.3	79.6	86.8	94.0	101.3	108.5	115.7	123.0	130.2	137.4
20	144.7	151.9	159.1	166.4	173.6	180.8	188.1	195.3	202.5	209.8
30	217.0	224.2	231.5	238.7	245.9	253.2	260.4	267.6	274.9	282.1
40	289.3	296.6	303.8	311.0	318.3	325.5	332.7	340.0	347.2	354.4
50	361.7	368.9	376.1	383.4	390.6	397.8	405.1	412.3	419.5	426.8
60	434.0	441.2	448.5	455.7	462.9	470.2	477.4	484.6	491.8	499.1
70	506.3	513.5	520.8	528.0	535.2	542.5	549.7	556.9	564.2	571.4
80	578.6	585.9	593.1	600.3	607.6	614.8	622.0	629.3	636.5	643.7
90	651.0	658.2	665.4	672.7	679.9	687.1	694.4	701.6	708.8	716.1
100	723.3	730.5	737.8	745.0	752.2	759.5	766.7	773.9	781.2	788.4
110	795.6	802.9	810.1	817.3	824.6	831.8	839.0	846.3	853.5	860.7
120	868.0	875.2	882.4	889.7	896.9	904.1	911.4	918.6	925.8	933.1
130	940.3	947.5	954.8	962.0	969.2	976.5	983.7	990.9	998.2	1005.4
140	1012.6	1019.9	1027.1	1034.3	1041.5	1048.8	1056.0	1063.2	1070.5	1077.7
150	1084.9	1092.2	1099.4	1106.6	1113.9	1121.1	1128.3	1135.6	1142.8	1150.0
160	1157.3	1164.5	1171.7	1179.0	1186.2	1193.4	1200.7	1207.9	1215.1	1222.4
170	1129.6	1236.8	1244.1	1251.3	1258.5	1265.8	1273.0	1280.1	1287.5	1294.7
180	1301.9	1309.2	1316.4	1323.6	1330.9	1338.1	1345.3	1352.6	1359.8	1367.0
190	1374.3	1381.5	1388.7	1396.0	1403.2	1410.4	1417.7	1424.9	1432.1	1439.4

kg/cm² to lb/in²

1 kg/cm² = 14.2233 lb/in²

	0	1	2	3	4	5	6	7	8	9
0	0	14.2	28.4	42.7	56.9	71.1	85.3	99.6	113.8	128.0
10	142.2	156.5	170.7	184.9	199.1	213.4	227.6	241.8	256.0	270.2
20	284.5	298.7	312.9	327.1	341.4	355.6	369.8	384.0	398.3	412.5
30	426.7	440.9	455.1	469.4	483.6	497.8	512.0	526.3	540.5	554.7
40	568.9	583.2	597.4	611.6	625.8	640.1	654.3	668.5	682.7	696.9
50	711.2	725.4	739.6	753.8	768.1	782.3	796.5	810.7	825.0	839.2
60	853.4	867.6	881.8	896.1	910.3	924.5	938.7	953.0	967.2	981.4
70	995.6	1,010	1,024	1,038	1,053	1,067	1,081	1,095	1,109	1,124
80	1,138	1,152	1,166	1,181	1,195	1,209	1,223	1,237	1,252	1,266
90	1,280	1,294	1,309	1,323	1,337	1,351	1,365	1,380	1,394	1,408
100	1,422	1,437	1,451	1,465	1,479	1,493	1,508	1,522	1,536	1,550
110	1,565	1,579	1,593	1,607	1,621	1,636	1,650	1,664	1,678	1,693
120	1,707	1,721	1,735	1,749	1,764	1,778	1,792	1,806	1,821	1,835
130	1,849	1,863	1,877	1,892	1,906	1,920	1,934	1,949	1,963	1,977
140	1,991	2,005	2,020	2,034	2,048	2,062	2,077	2,091	2,105	2,119
150	2,134	2,148	2,162	2,176	2,190	2,205	2,219	2,233	2,247	2,262
160	2,276	2,290	2,304	2,318	2,333	2,347	2,361	2,375	2,389	2,404
170	2,418	2,432	2,446	2,460	2,475	2,489	2,503	2,518	2,532	2,546
180	2,560	2,574	2,589	2,603	2,617	2,631	2,646	2,660	2,674	2,688
190	2,702	2,717	2,731	2,745	2,759	2,773	2,788	2,802	2,816	2,830
200	2,845	2,859	2,873	2,887	2,901	2,916	2,930	2,944	2,958	2,973
210	2,987	3,001	3,015	3,030	3,044	3,058	3,072	3,086	3,101	3,115
220	3,129	3,143	3,158	3,172	3,186	3,200	3,214	3,229	3,243	3,257
230	3,271	3,286	3,300	3,314	3,328	3,343	3,357	3,371	3,385	3,399
240	3,414	3,428	3,442	3,456	3,470	3,485	3,499	3,513	3,527	3,542

Temperature

Fahrenheit-Centigrade conversion: A simple way to convert a Fahrenheit temperature reading into a Centigrade temperature reading or vice versa is to enter the accompanying table in the center (boldface column) of figures. These figures refer to the temperature in either Fahrenheit or Centigrade degrees.

When convert from Fahrenheit to Centigrade degrees, consider the center column to be a table of Fahrenheit temperatures and read the corresponding Centigrade temperature in the column at the left.

When convert from Centigrade to Fahrenheit degrees, consider the center column to be a table of Centigrade values, and read the corresponding Fahrenheit temperature on the right.

1°C = 33.8°F

°C		°F	°C		°F	°C		°F	°C		°F
-40.4	-40	-40.0	-11.7	11	51.8	7.8	46	114.8	27.2	81	177.8
-37.2	-35	-31.0	-11.1	12	53.6	8.3	47	116.6	27.8	82	179.6
-34.4	-30	-22.0	-10.6	13	55.4	8.9	48	118.4	28.3	83	181.4
-31.7	-25	-13.0	-10.0	14	57.2	9.4	49	120.2	28.9	84	183.2
-28.9	-20	-4.0	-9.4	15	59.0	10.0	50	122.0	29.4	85	185.0
-28.3	-19	-2.2	-8.9	16	60.8	10.6	51	123.8	30.0	86	186.8
-27.8	-18	-0.4	-8.3	17	62.6	11.1	52	125.6	30.6	87	188.6
-27.2	-17	1.4	-7.8	18	64.4	11.7	53	127.4	31.1	88	190.4
-26.7	-16	3.2	-7.2	19	66.2	12.2	54	129.2	31.7	89	192.2
-26.1	-15	5.0	-6.7	20	68.0	12.8	55	131.0	32.2	90	194.0
-25.6	-14	6.8	-6.1	21	69.8	13.3	56	132.8	32.8	91	195.8
-25.0	-13	8.6	-5.6	22	71.6	13.9	57	134.6	33.3	92	197.6
-24.4	-12	10.4	-5.0	23	73.4	14.4	58	136.4	33.9	93	199.4
-23.9	-11	12.2	-4.4	24	75.2	15.0	59	138.2	34.4	94	201.2
-23.3	-10	14.0	-3.9	25	77.0	15.6	60	140.0	35.0	95	203.0
-22.8	-9	15.8	-3.3	26	78.8	16.1	61	141.8	35.6	96	204.8
-22.2	-8	17.6	-2.8	27	80.6	16.7	62	143.6	36.1	97	206.6
-21.7	-7	19.4	-2.2	28	82.4	17.2	63	145.4	36.7	98	208.4
-21.1	-6	21.2	-1.7	29	84.2	17.8	64	147.2	37.2	99	210.2
-20.6	-5	23.0	-1.1	30	86.0	18.3	65	149.0	37.8	100	212.0
-20.0	-4	24.8	-0.6	31	87.8	18.9	66	150.8	40.6	105	221.0
-19.4	-3	26.6	0	32	89.6	19.4	67	152.6	43.3	110	230.0
-18.9	-2	28.4	0.6	33	91.4	20.0	68	154.4	46.1	115	239.0
-18.3	-1	30.2	1.1	34	93.2	20.6	69	156.2	48.9	120	248.0
-17.8	0	32.0	1.7	35	95.0	21.1	70	158.0	51.7	125	257.0
-17.2	1	33.8	2.2	36	96.8	21.7	71	159.8	54.4	130	266.0
-16.7	2	35.6	2.8	37	98.6	22.2	72	161.6	57.2	135	275.0
-16.1	3	37.4	3.3	38	100.4	22.8	73	163.4	60.0	140	284.0
-15.6	4	39.2	3.9	39	102.2	23.3	74	165.2	62.7	145	293.0
-15.0	5	41.0	4.4	40	104.0	23.9	75	167.0	65.6	150	302.0
-14.4	6	42.8	5.0	41	105.8	24.4	76	168.8	68.3	155	311.0
-13.9	7	44.6	5.6	42	107.6	25.0	77	170.6	71.1	160	320.0
-13.3	8	46.4	6.1	43	109.4	25.6	78	172.4	73.9	165	329.0
-12.8	9	48.2	6.7	44	111.2	26.1	79	174.2	76.7	170	338.0
-12.2	10	50.0	7.2	45	113.0	26.7	80	176.0	79.4	175	347.0

HD785-7 Dump truck

Form No. SEN01277-02

DUMP TRUCK

HD785-7

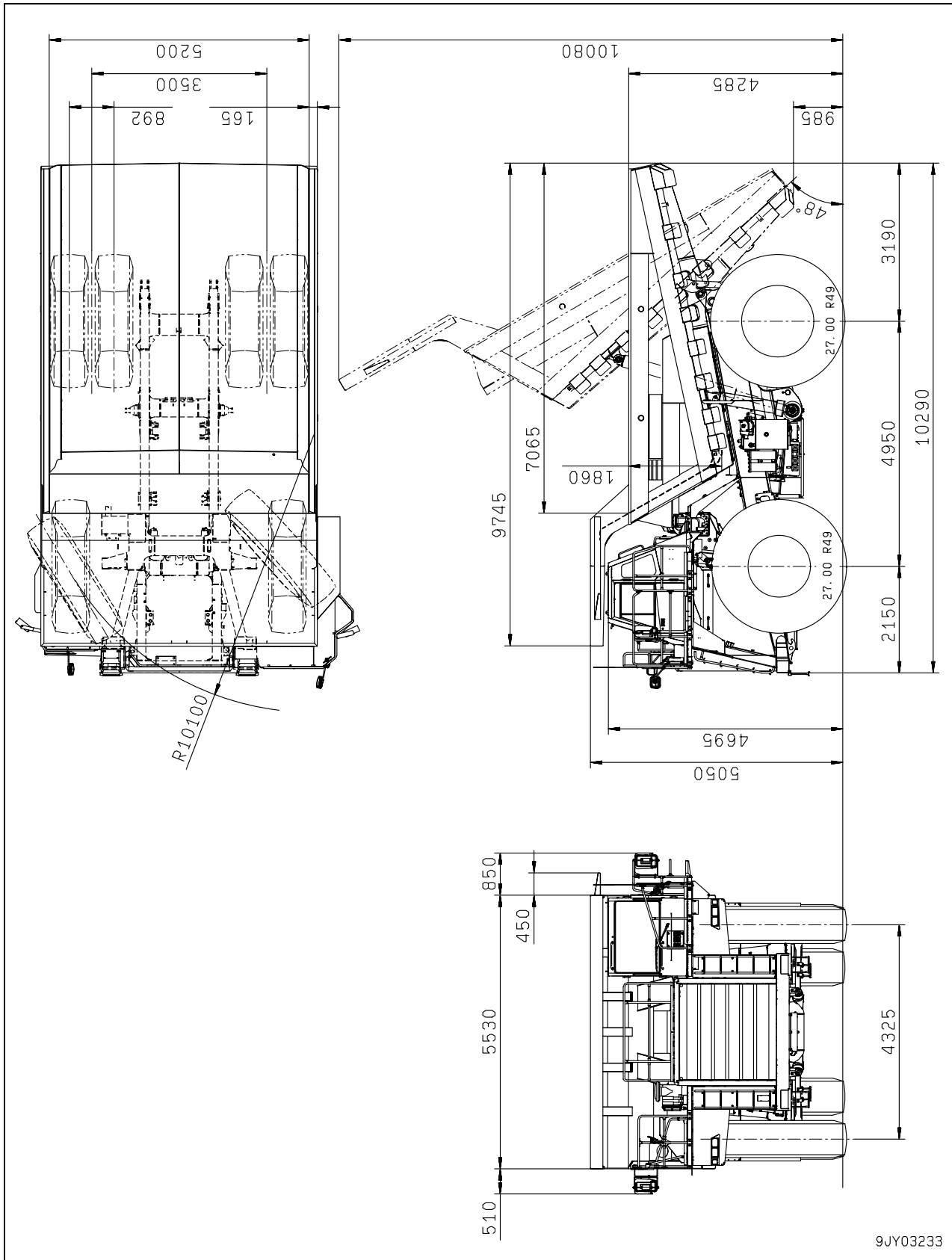
Machine model	Serial number
HD785-7	7001 and up

01 Specification

Specification and technical data

Specification drawing	2
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Fuel, coolant and lubricants	7

Specification drawing



Specifications

Machine model				HD785-7		
Serial No.				7001 and up		
Weight	Empty		kg	72,300		
	Max. load		kg	91,000		
	Gross		kg	163,300		
	Weight distribution	Empty	(front)	kg	33,980 (47%)	
			(rear)	kg	38,320 (53%)	
		Gross	(front)	kg	51,440 (31.5%)	
(rear)			kg	111,860 (68.5%)		
Performance	Dump body capacity	Struck	m ³	40		
		Heaped (2 : 1)	m ³	60		
	Max. travel speed		km/h	65		
	Gradeability (sin θ)		%	35		
	Min. turning radius		m	10.1		
	Dumping angle		°	48		
	Adaptation to highland (high altitude)		m	2,350		
Dimensions	Overall length		mm	10,290		
	Overall width		mm	6,885		
	Overall height		mm	5,050		
	Wheel base		mm	4,950		
	Tread	Front wheel	mm	4,326		
		Rear wheel	mm	3,500		
Ground clearance (Empty)		mm	775			
Engine	Model			KOMATSU SAA12V140E-3		
	Type			4-cycle, water-cooled, V type in-line 12-cylinder, direct injection, with turbocharger and after-cooler		
	No. of cylinders – Bore x stroke			12 – 140 x 165		
	Piston displacement		mm	30.5 {30,500}		
	Rated output		ℓ{cc}	895/1,900 {1,200/1,900}		
	Max. torque		kW/rpm{HP/rpm}	5,076/1,350 {518/1,350}		
	Fuel consumption (Min.)		Nm/rpm{kgm/rpm}	206 {154}		
	Stating motor		g/kWh {g/HPh}	24V, 7.5 kW x 2 units		
	Alternator			24V, 90A		
	Battery			12V, 200Ah x 4 units		

Machine model				HD785-7
Serial No.				7001 and up
Power train	Torque converter	Structure Lock- up clutch		3-element, 1-stage, 2-phase Hydraulically actuated, wet-type, multiple-disc clutch
	Transmission	Type		TORQFLOW planetary gear 〔 Fully automatic, electrically-hydraulically actuated, force-feed type pump 〕 F7, R2
		No. of speeds		
	Reduction gear	Type		Spiral bevel gear, splash lubrication 3.357 Straight bevel gear, splash lubrication
		Reduction ratio Differential type		
Final drive	Type Reduction ratio		Planetary gear, splash lubrication 6.333	
Steering system	Type			Fully hydraulic steering system
Suspension	Axle type	Front axle Rear axle		Independent suspension (Mac Pherson type) Full floating Hydropneumatic (Automatic damping force selection type) Hydropneumatic
	Suspension method	Front axle Rear axle		
Tires	Size and No.	Front tire Rear tire	kPa {kg/cm ² }	27.00R49★★E4 27.00R49★★E4 686 {7}
	Tire pressure	Front and rear tire		
Breke system	Service brake	Front wheel		Oil cooled multiple disc brake, Hydraulically controlled
		Rear axle		Oil cooled multiple disc brake, Hydraulically controlled
	Parking brake			Multiple disc wet type disc brake, Hydraulically released spring type
Retarder				Oil cooled multiple disc type, Hydraulically controlled

Machine model				HD785-7
Serial No.				7001 and up
Hydraulic system	Hydraulic pump	For both steering and work equipment	ℓ/min	Gear pump 580
		Type		
		Delivery (at engine rated speed 1,900 rpm)		
		For charging torque converter	ℓ/min	Gear pump 380
		Type		
		Delivery (at engine rated speed 1,900 rpm)		
	For brake cooling	ℓ/min	Gear pump 580	
	Type			
	Delivery (at engine rated speed 1,900 rpm)			
	Cylinder	Hoist cylinder		2-stage piston type (only 2nd stage: double-acting) 2 – 215 mm x 1,045 mm – 180 mm x 1,040 mm Piston type, double acting 2 – 110 mm x 475 mm
Type				
No. 1st bore x stroke – 2nd bore x stroke				
Steering cylinder				
Type				
No. – bore x stroke				

Weight table



This weight table is a guide for use when transporting or handling component.

Unit: kg

Machine model	HD785-7
Serial Number	7001 and up
Engine assembly	3,365
Output shaft assembly	171
Radiator assembly	920
Fuel tank	495
Torque converter	626
Transmission assembly	1,812
Drive shaft assembly (front)	42
Drive shaft assembly (rear)	211
Rear axle assembly	10,930
• Differential	1,127
• Final drive (one-side)	2,870
• Rear brake (one-side)	1,170
Front axle (one-side) (with A frame, knuckle arm)	2,530
Front brake (one-side)	742
Front suspension cylinder (one-side)	706
Rear suspension cylinder (one-side)	246
Frame assembly (with rear support, mount bracket)	9,194
Cab assembly	1,585
Operator's seat	45
Steering cylinder (one-side)	87
Hoist cylinder (one-side)	336
Demand valve	66
Steering valve	24
Hoist valve	63
Hydraulic pump (SAR180+180+1)	49
Hydraulic pump (SDR100+100+SAR25)	46
Hydraulic pump (SAR180+180)	45
Dump body	15,200

Fuel, coolant and lubricants

Reservoir	Fluid Type	Ambient Temperature, degrees Celsius									Recommended Komatsu Fluids
		-22	-4	14	32	50	68	86	104	122 °F	
		-30	-20	-10	0	10	20	30	40	50 °C	
Engine oil pan	Engine oil	(Note.1)									Komatsu EOS0W30
		(Note.1)									Komatsu EOS5W40
											Komatsu EO10W30DH
											Komatsu EO15W40DH
											Komatsu EO30DH
Transmission Case Brake sub tank	Power train oil (Note.2)										TO10
											TO30
Steering, hoist oil tank	Power train oil										TO10
	Hydraulic oil										HO46-HM
											HO-MVK
Front suspension Rear suspension	Hydraulic oil										HO-MVK
Differential case Final drive case	Power train oil										TO30
											TO50
Grease fitting	Hyper grease (Note.3)										G2-T, G2-TE
	Lithium EP grease										G2-LI
Cooling system	Supercoolant AF-NAC (Note.4)										AF-NAC
Fuel tank	Diesel fuel										ASTM Grade No.1-D S15 ASTM Grade No.1-D S500
											ASTM Grade No.2-D S15 ASTM Grade No.2-D S500

- ASTM: America Society of Testing and Material

	Engine oil pan	Transmission case	Steering, hoist oil tank	Front suspension	Rear suspension
Specified capacity (ℓ)	134	368	270	29.8 each for right and left	16.5 each for right and left
Refill capacity (ℓ)	129	205	175	—	—

	Brake sub tank	Differential case	Final drive case	Fuel tank	Cooling system
Specified capacity (ℓ)	36	137	64 each for right and left	1,308	283
Refill capacity (ℓ)	36	137	64 each for right and left	—	279

Notice**Use only diesel fuel.**

The engine mounted on this machine employs electronic control and a high-pressure fuel injection device to obtain good fuel consumption and good exhaust gas characteristics. For this reason, it requires high precision for the parts and good lubrication. If kerosene or other fuel with low lubricating ability is used, there will be a big drop in durability.

Note 1: SAE0W30EOS and SAE5W40EOS must be fully synthetic and HTHS (High-Temperature High-Shear Viscosity @ 150 °C), specified by ASTM D4741 must be equal to or higher than 3.5mPa-S(3.5cP).

Komatsu EOS0W30 and EOS5W40 are the most suitable oils.

Note 2: Power train oil has different properties from engine oil. Be sure to use the recommended oils.

Note 3: Hyper grease (G2-T, G2-TE) has a high performance.

When it is necessary to improve the lubricating ability of the grease in order to prevent squeaking of pins and bushings, the use of G2-T or G2-TE is recommended.

Note 4: Supercoolant (AF-NAC)

- 1) The coolant has the important function of preventing corrosion as well as preventing freezing. Even in the areas where freezing is not an issue, the use of antifreeze coolant is essential. Komatsu machines are supplied with Komatsu Super coolant (AF-NAC). Komatsu Super coolant (AF-NAC) has excellent anticorrosion, antifreeze and cooling properties and can be used continuously for 2 years or 4,000 hours. Komatsu Super coolant (AF-NAC) is strongly recommended wherever available.
- 2) For details of the ratio when diluting super coolant with water, see "Mixing rate of water and super coolant".
When the machine is shipped from the factory, it may be filled with coolant containing 30% or more Super coolant (AF-NAC). In this case, no adjustment is needed for temperatures down to -10°C (14°F). (never dilute with water)
When temperature is below -10°C (14°F), adjust the ratio of Super coolant and water, see "Mixing rate of water and super coolant".
- 3) To maintain the anticorrosion properties of Super coolant (AF-NAC), always keep the density of Super coolant between 30% and 68%.

Mixing rate of water and super coolant

Min. atmospheric temperature	°C	−10	−15	−20	−25	−30
	°F	14	5	−4	−13	−22
Amount of antifreeze	Liters	83.7	97.65	111.6	125.55	139.5
	US gal	22.113	25.799	28.484	33.170	36.855
Amount of water	Liters	195.3	181.35	167.4	153.45	139.5
	US gal	51.597	47.911	44.226	40.540	36.855
Volume ratio	%	30	35	40	45	50

HD785-7 Dump truck

Form No. SEN01279-01

DUMP TRUCK

HD785-7

Machine model Serial number

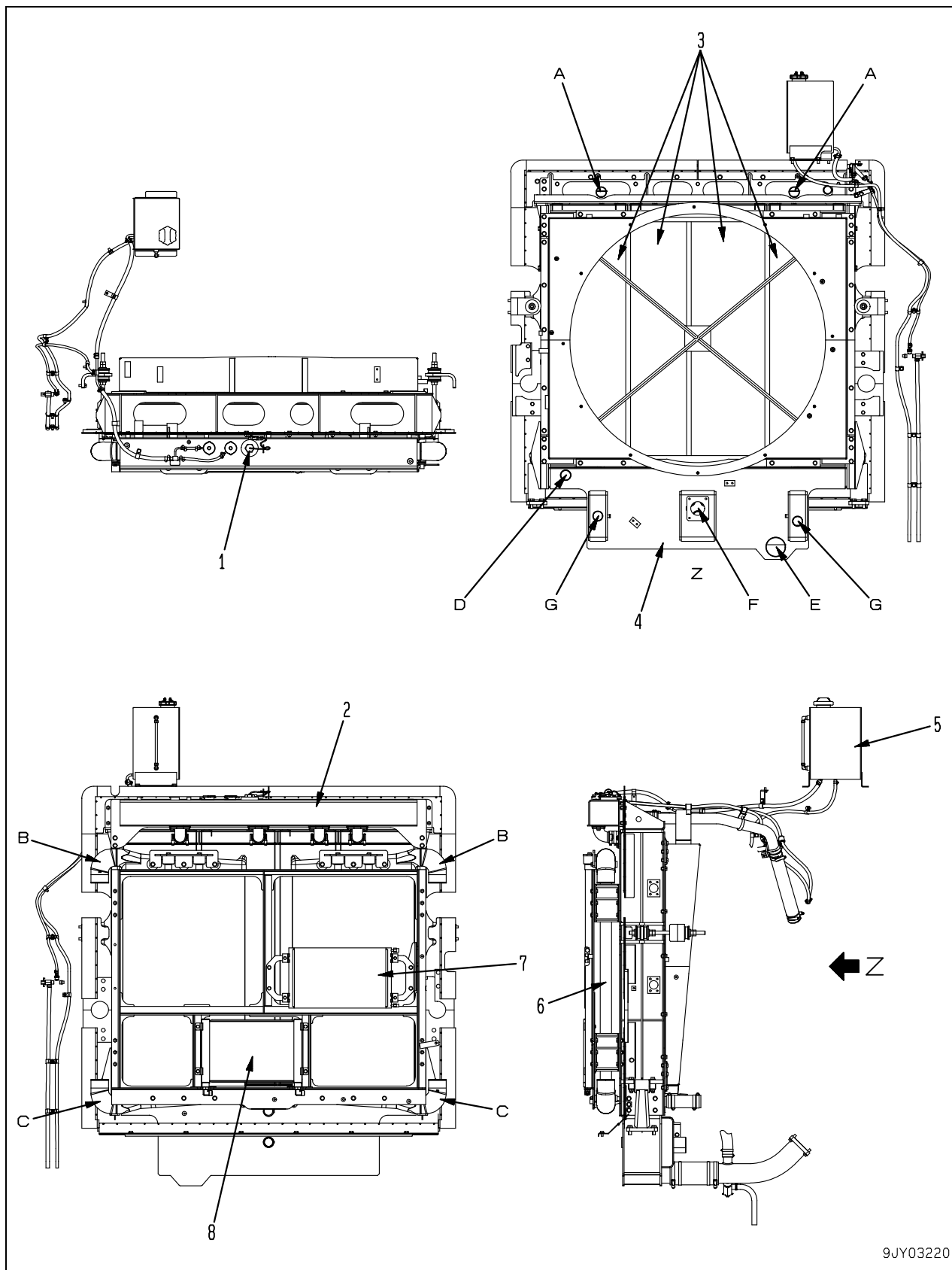
HD785-7 7001 and up

10 Structure, function and maintenance standard

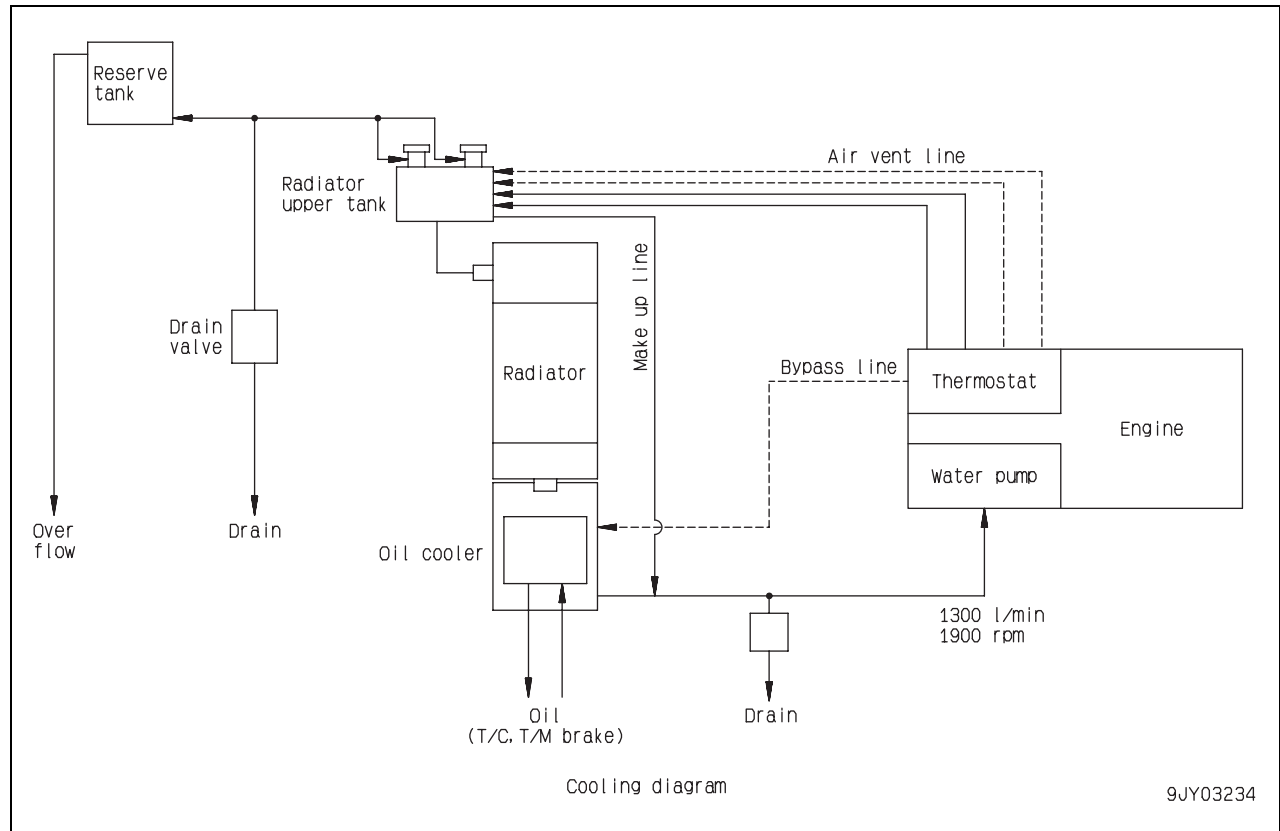
Engine and cooling system

Radiator, brake, torque converter oil cooler, aftercooler, steering, hoist oil cooler.....	2
Fuel system.....	4

Radiator, brake, torque converter oil cooler, aftercooler, steering, hoist oil cooler



9JY03220



1. Pick up for radiator coolant level sensor
2. Upper tank
3. Radiator core
4. Oil cooler (brake, torque converter)
5. Reservoir tank
6. Aftercooler (engine intake air)
7. Air conditioner condenser
8. Steering hoist oil cooler

- A: Coolant inlet port (From engine)
 B: Aftercooler inlet port (From turbocharger)
 C: Aftercooler outlet port
 (To engine air intake manifold)
 D: Coolant bypass inlet port (From engine)
 E: Coolant outlet port (To water pump)
 F: Oil inlet port (From rear and front brakes)
 G: Oil outlet port (To transmission)

Specifications

Radiator

Core type: 5 lines of aluminum waved tube
 Total radiation surface: 334.8 m²

Torque converter, transmission, brake oil cooler

Core type: PTO-LS
 Total radiation surface: 16.26 m²

Steering hoist oil cooler

Core type: CF40-1
 Total radiation surface: 5.18 m²

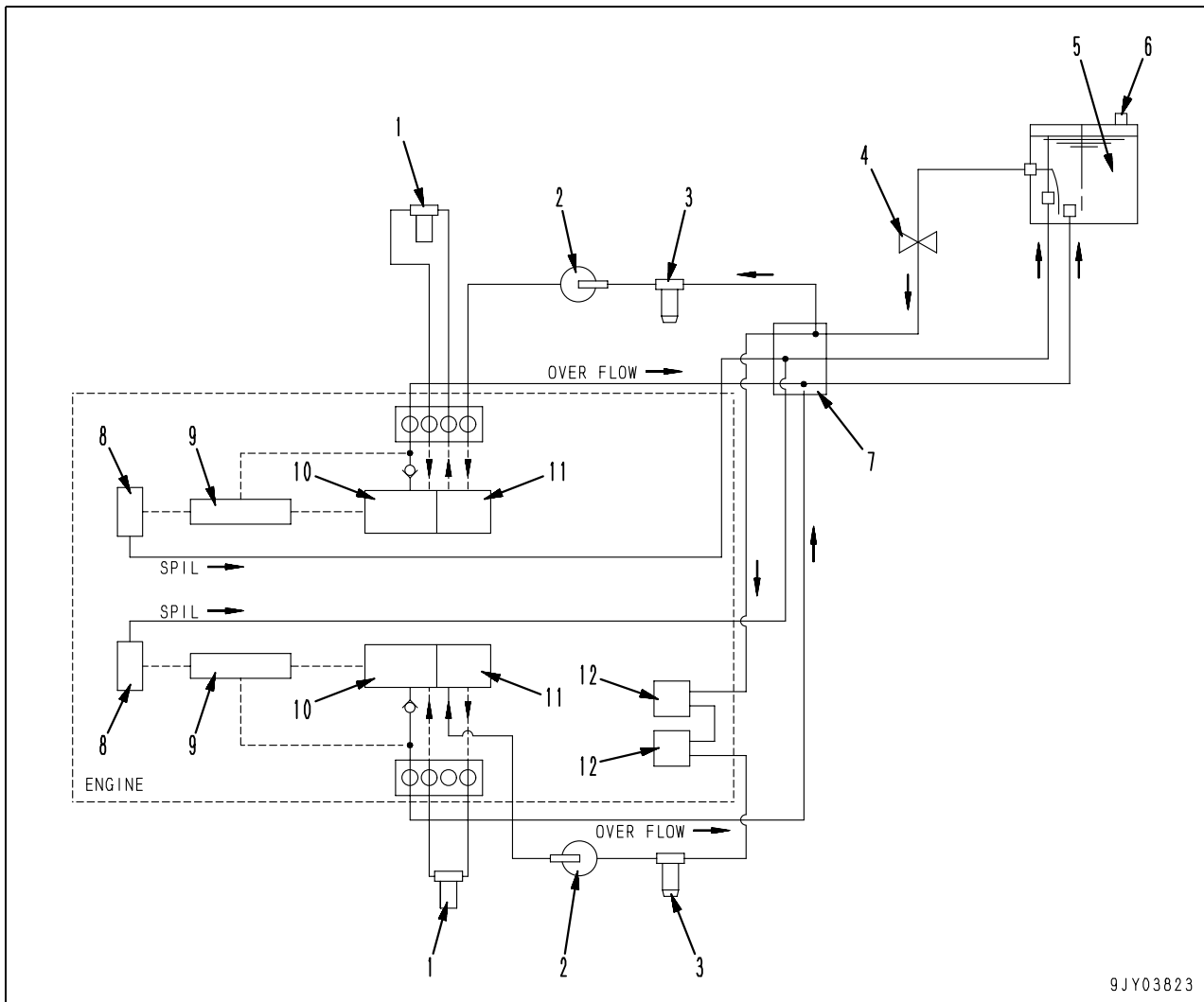
Aftercooler

Total radiation surface: 85.8 m²

Air conditioner

Gas charge weight (HFC-134a): 900 ± 50 g

Fuel system (Standard specification)



9JY03823

1. Fuel filter
2. Priming pump
3. Fuel pre-filter (with water separator)
4. Valve
5. Fuel tank
6. Breather
7. Block
8. Injector
9. Common rail
10. Supply pump
11. Feed pump
12. Fuel cooling plate

HD785-7 Dump truck

Form No. SEN01281-01

DUMP TRUCK

HD785-7

Machine model Serial number

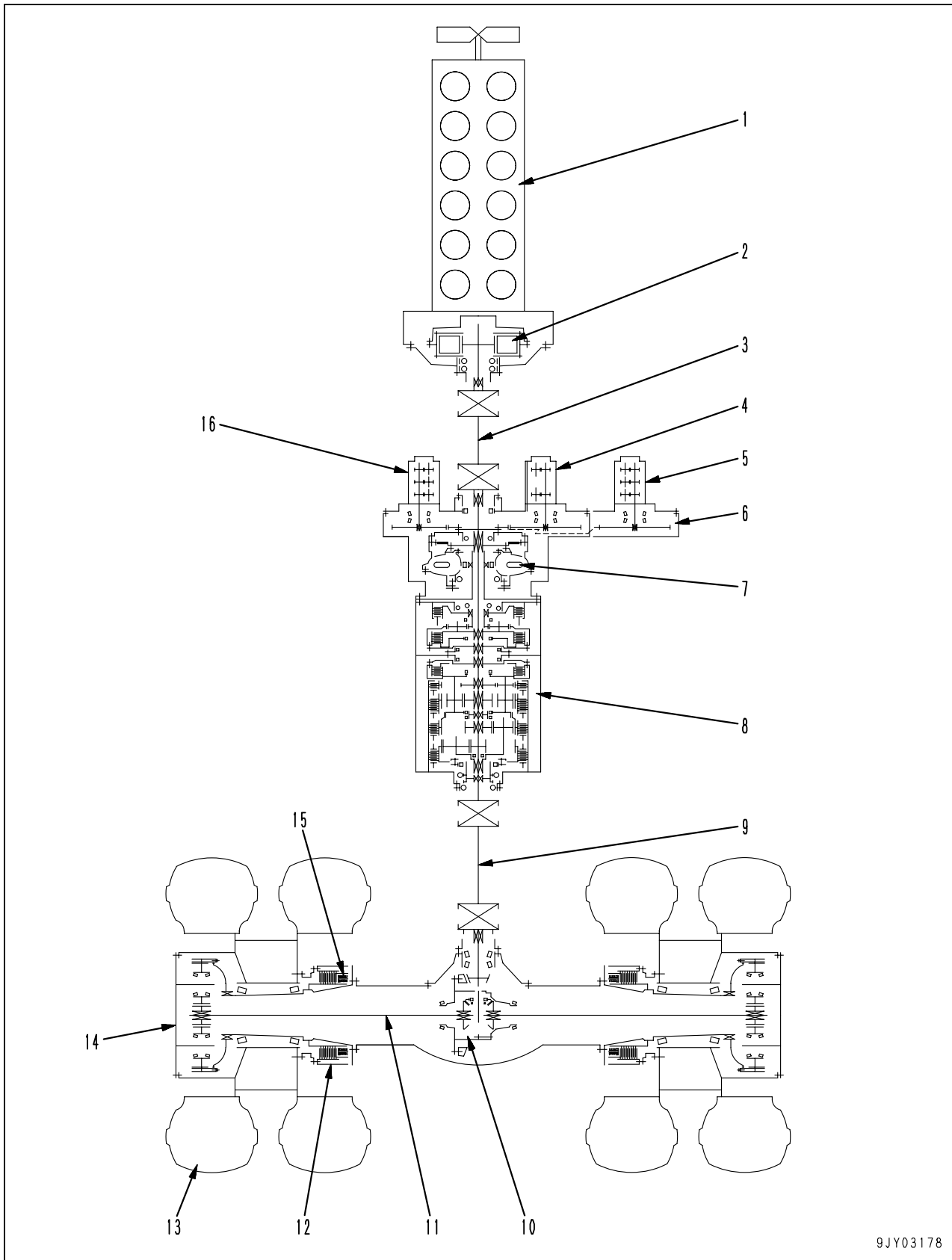
HD785-7 7001 and up

10 Structure, function and maintenance standard

Power train, Part 1

Power train skeleton	2
Output shaft	4
Drive shaft	6
Torque converter and transmission hydraulic piping	8
Brake cooling oil control valve (BCV)	10
Torque converter	11
Torque converter valve	19
Transmission	22
Transmission control valve	50
ECMV	52
Lubricating oil amount selector valve	59

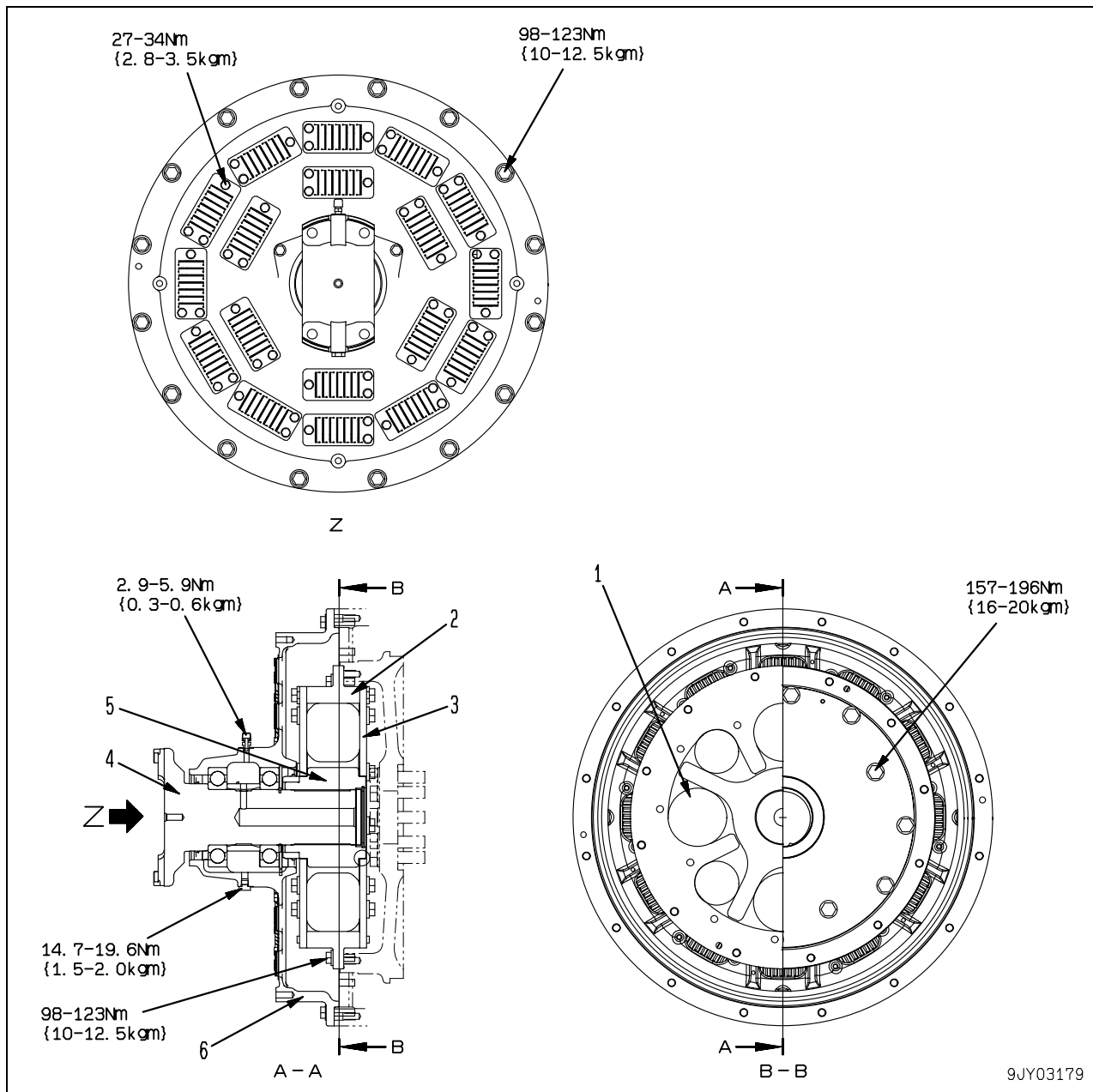
Power train skeleton



9JY03178

1. Engine (SAA12V140)
2. Output shaft
3. Front drive shaft
4. Brake cooling pump
(SAR(4)180+180)
5. Torque converter, transmission + brake cooling
and brake control pump
(SDR(30)100+100+SAR(1)25)
6. PTO
7. Torque converter
8. Transmission
9. Rear drive shaft
10. Differential gear
11. Drive shaft
12. Brake
13. Tire
14. Final drive
15. Parking brake
16. Steering, hoist and hoist control pump
(SAR(4)180+180+(1)6)

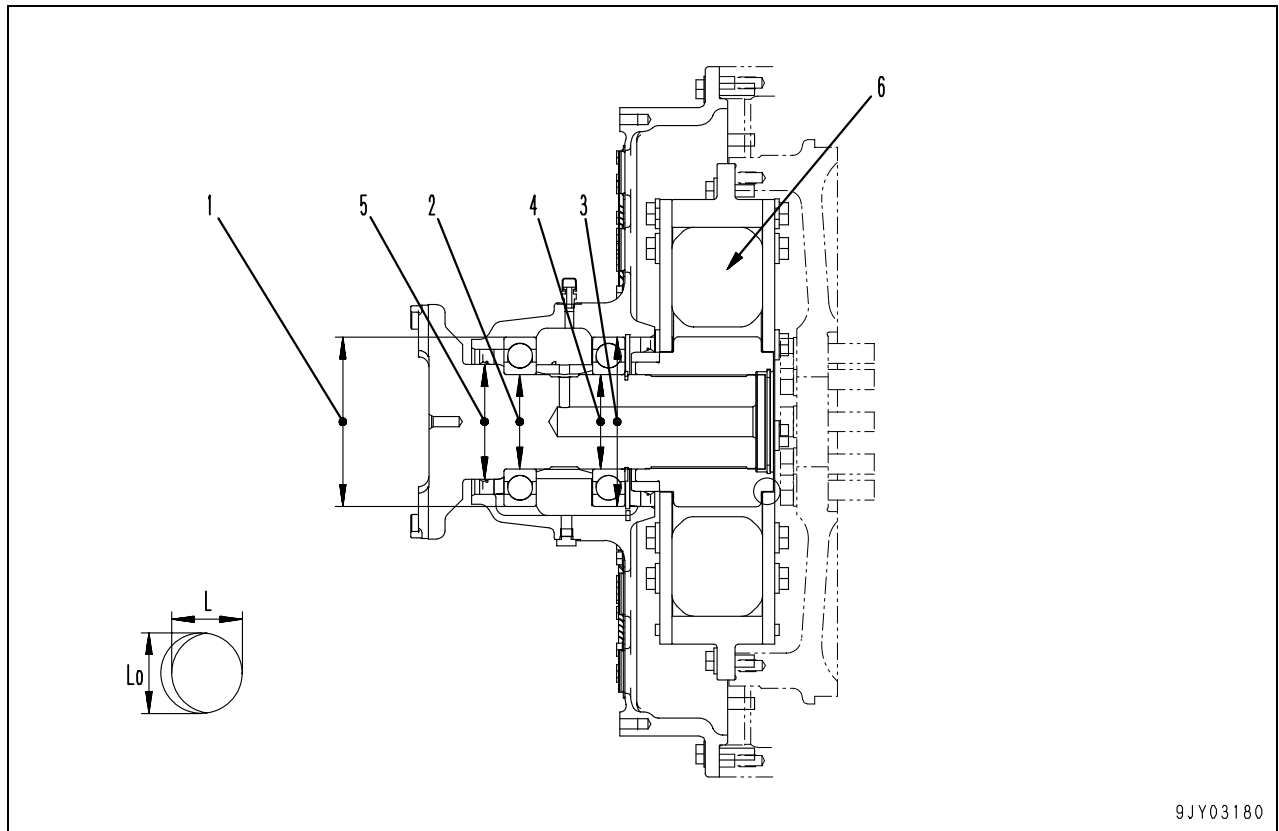
Output shaft



1. Rubber cushion
2. Outer body
3. Flange
4. Shaft
5. Inner body
6. Cover

Function

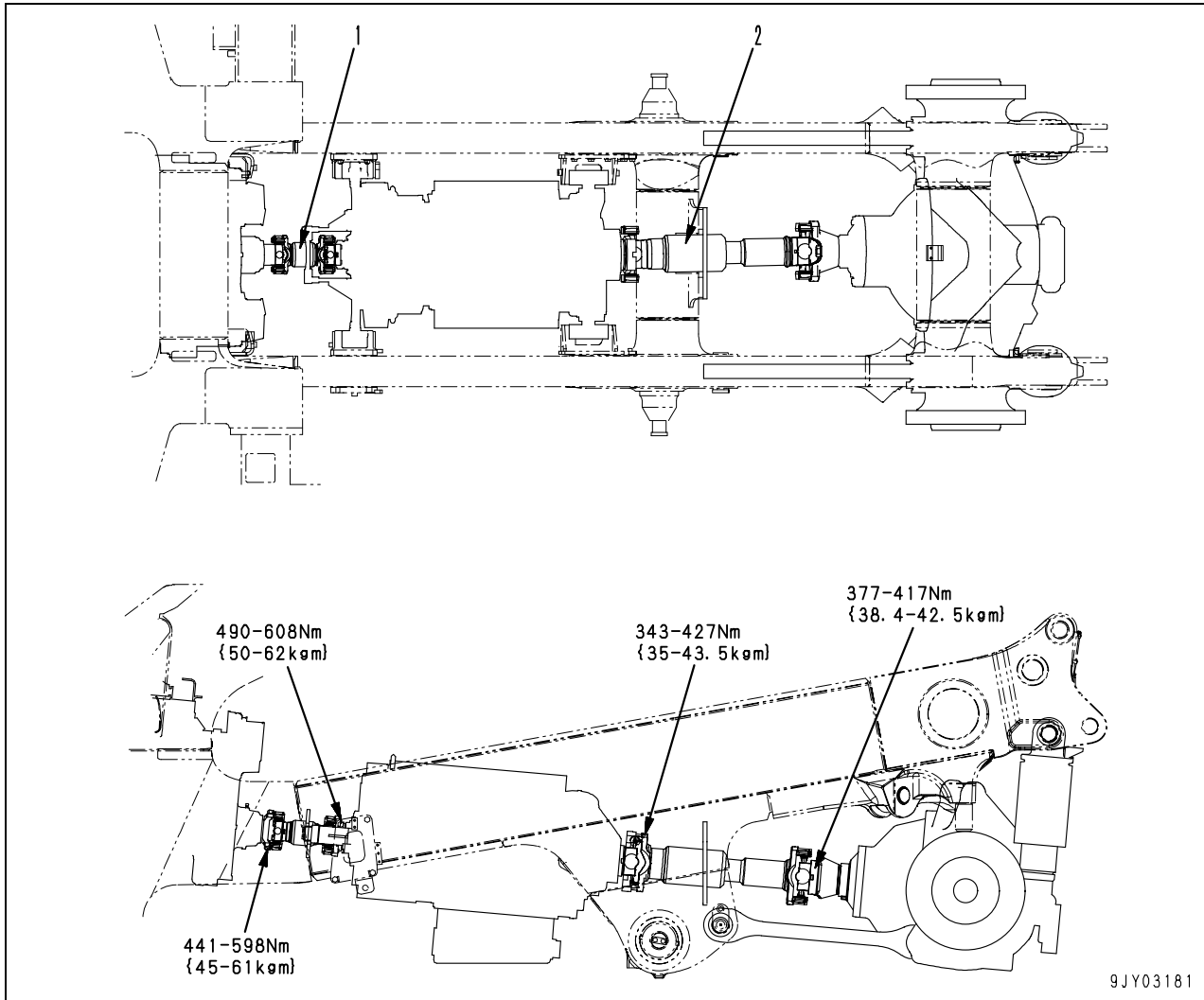
The output shaft is installed to the engine flywheel, and absorbs the torsional vibration caused by changes in the engine torque.



Unit: mm

No.	Check item	Criteria					Remedy
1	Clearance between bearing and cover	Standard size	Tolerance		Standard clearance	Clearance limit	Replace
			Shaft	Hole			
		170	0 −0.025	−0.008 −0.033	−0.033 0.017	—	
2	Clearance between shaft and bearing	95	−0.015 −0.003	0 −0.02	−0.017 −0.003	—	
3	Clearance between bearing and cover	170	0 −0.025	−0.008 −0.033	−0.033 0.017	—	
4	Clearance between bearing and shaft	95	+0.015 +0.003	0 −0.02	−0.017 −0.003	—	
5	Wear of oil seal contact surface of shaft	Standard size			Repair limit		Repair or replace
		115			0 −0.087		
6	Defomation of rubber cushion	Original dimension: Lo			Standard backlash (Dimension at smallest width: L)		Replace
		90			81		
		75			67		
	External		No cracks				

Drive shaft

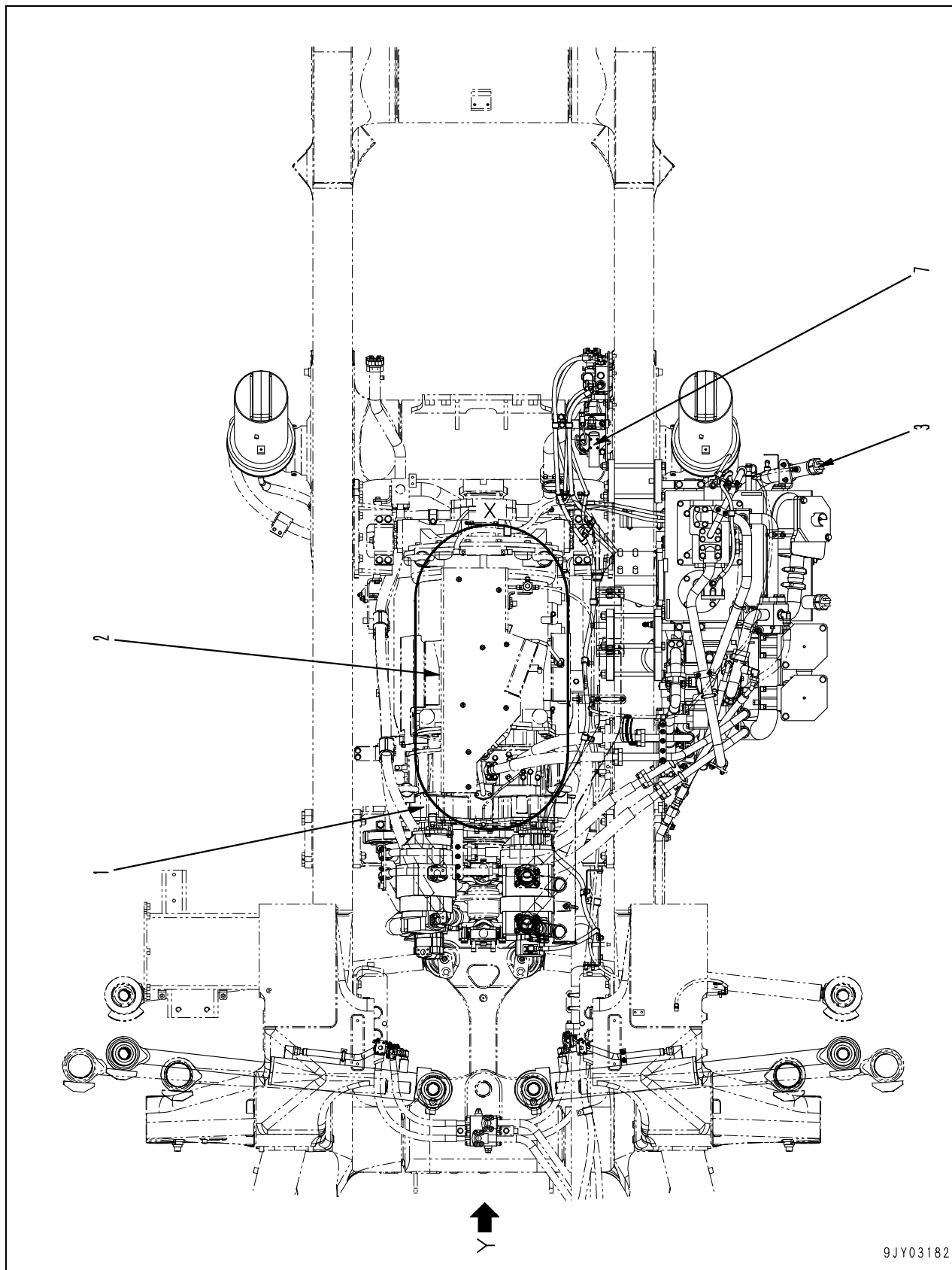


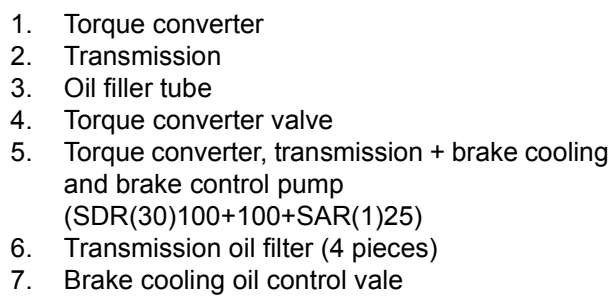
1. Front drive shaft
2. Rear drive shaft

Outline

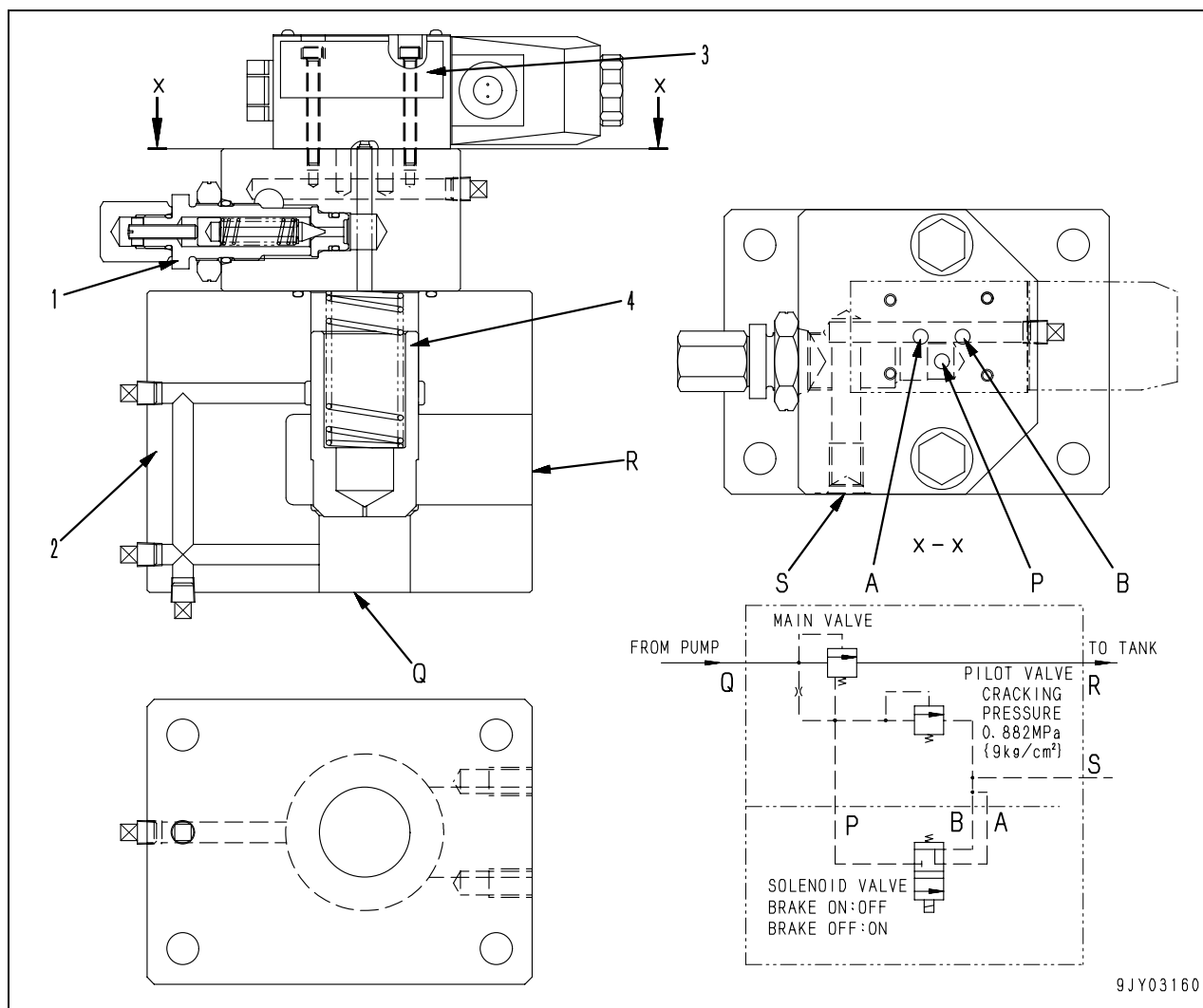
- The power from the engine is transmitted through the output shaft, the front drive shaft (1) and the transmission, to the rear drive shaft (2).

Torque converter and transmission hydraulic piping





Brake cooling oil control valve (BCV)



1. Pilot relief valve assembly
2. Body
3. Solenoid valve
4. Main valve spool

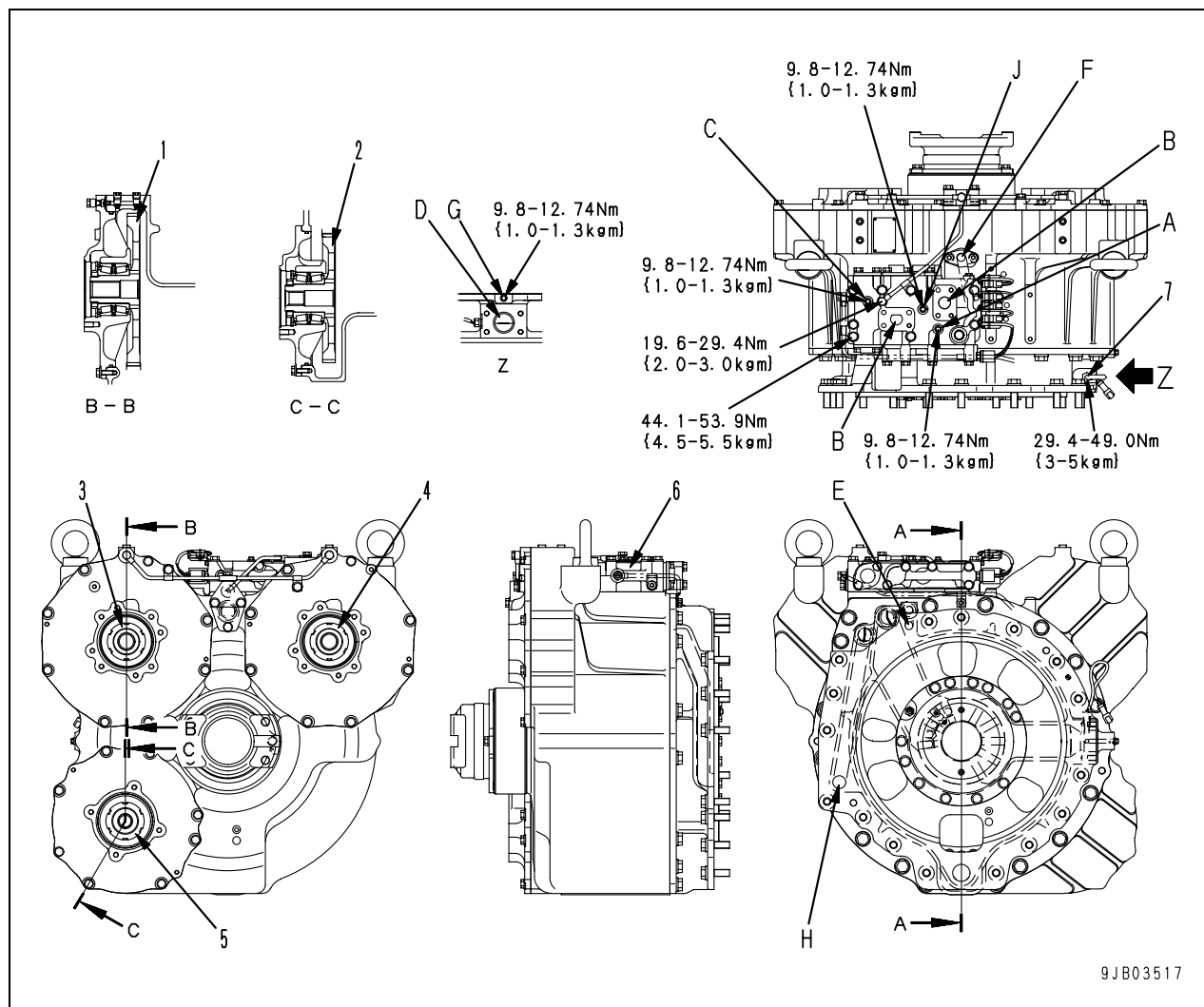
- A: Pilot port
 B: Pilot port
 S: To transmission oil pan
 P: Pilot port
 Q: From pump
 R: To transmission oil pan

Function

When the retarder is not being used, this valve bypasses part of the brake cooling oil to reduce the power loss when traveling. The main valve spool (4) is actuated by switching the solenoid valve (3) ON/OFF.

If abnormal pressure is generated in the retarder because of a trouble in the rear retarder, oil cooler, etc., pilot relief valve (1) operates to operate main valve spool (4). Accordingly, the brake cooling oil control valve (BCV) works as an unload valve, too. The figure shows the state when the brake is ON. In this state, if the pressure of the oil from the pump is below the pilot pressure (9 kg/cm²), the brake cooling oil control valve does not bypass the brake cooling oil.

Torque converter



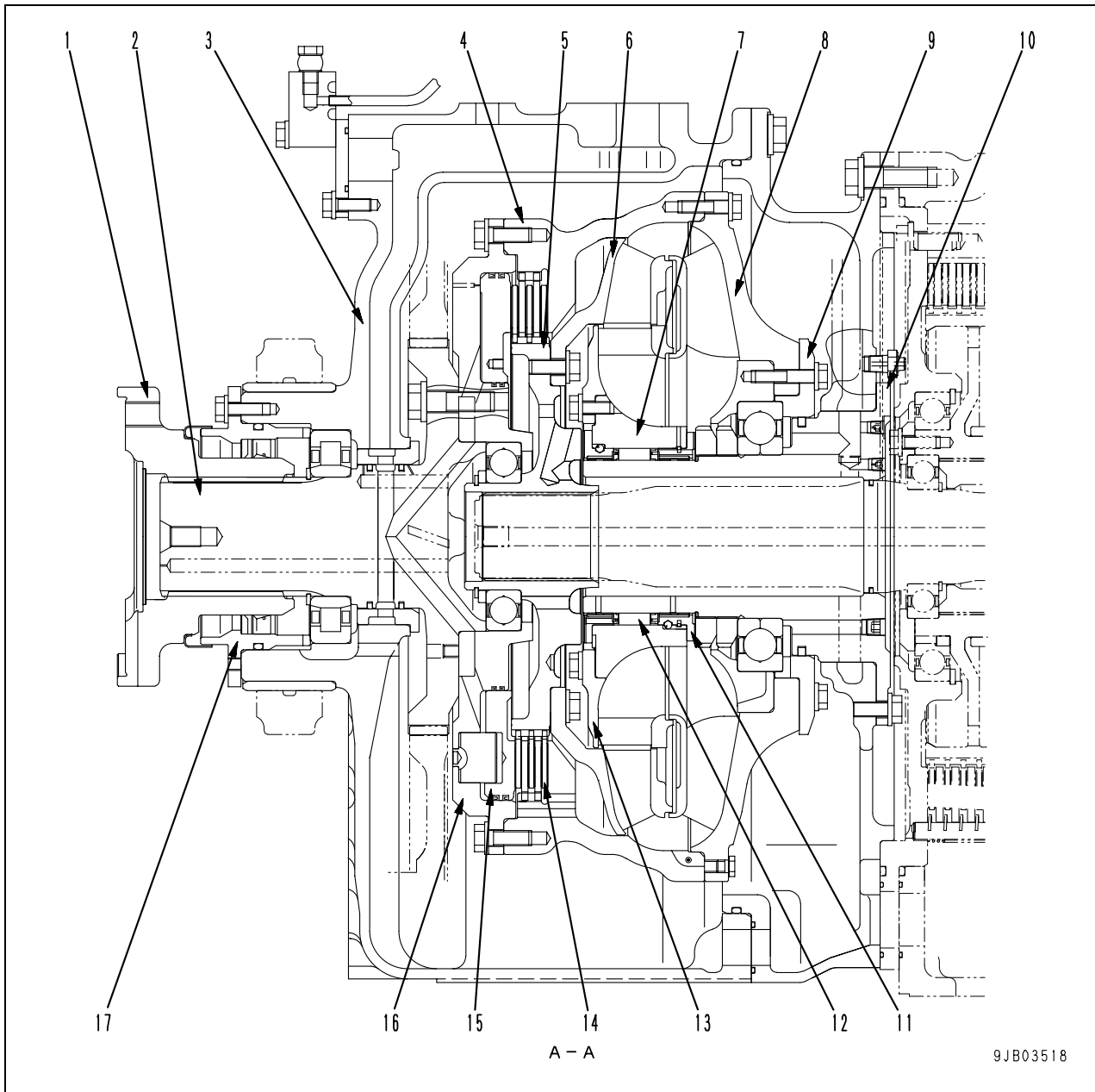
- A: Main oil pressure pickup port
- B: Torque converter oil inlet port
- C: Torque converter inlet oil pressure pickup port
- D: Torque converter oil outlet port
- E: To transmission control valve
- F: To lockup clutch
- G: Torque converter outlet oil pressure pickup port
- H: To transmission lubrication circuit
- J: Main flow rate selector valve inlet pressure pickup port

Specifications

Type: 3-element, 1-stage, 2-phase
with modulation and lockup clutch
Lockup clutch: Wet type multiple disc clutch
hydraulic pressure control
(with modulation valve)

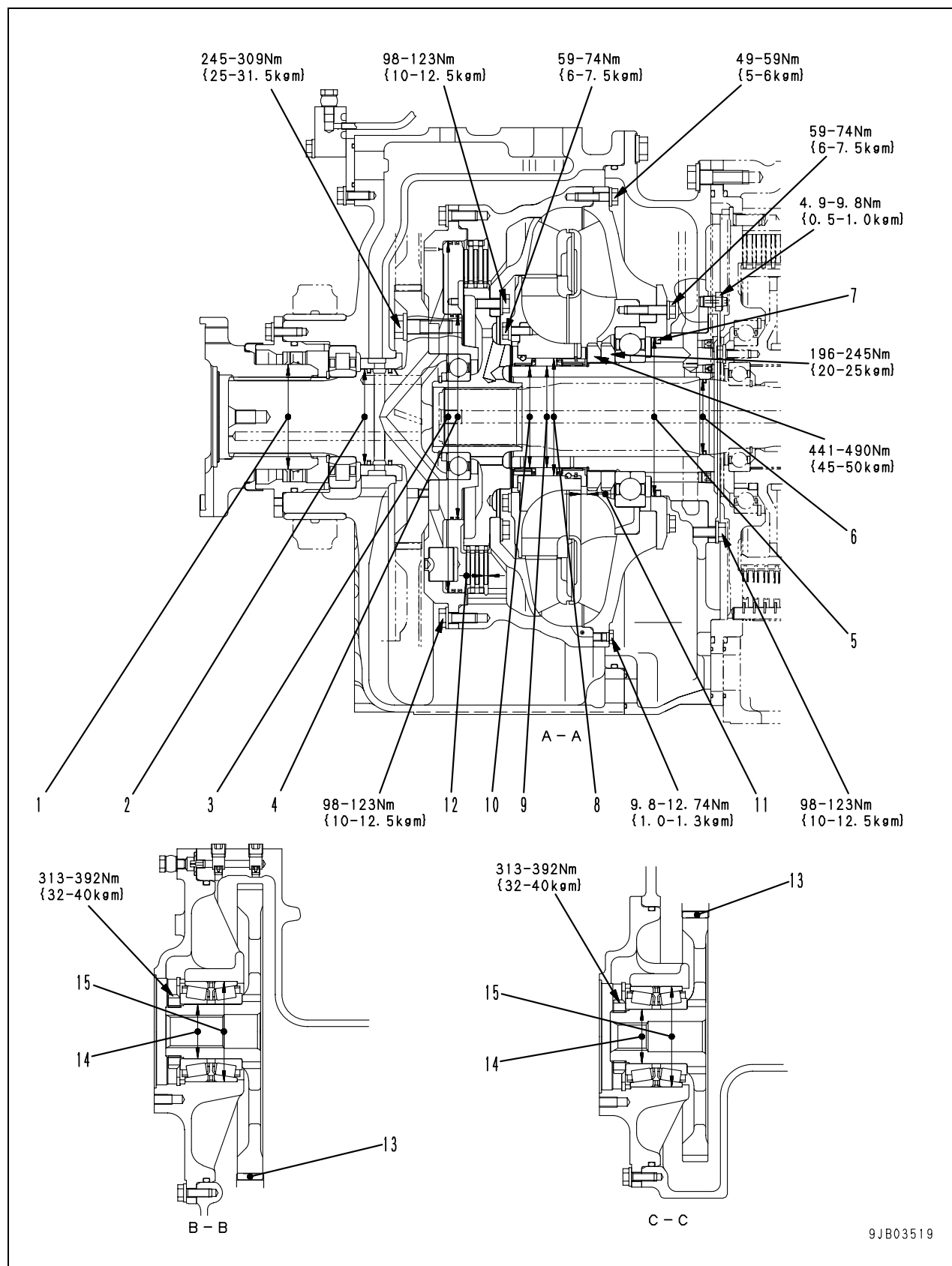
Stall torque ratio: 1.99

1. PTO gear (Number of teeth: 108)
2. PTO gear (Number of teeth: 91)
3. Brake cooling pump mounting port
4. Steering, hoist and hoist control pump mounting port
5. Torque converter, transmission charge, brake cooling, transmission lubrication and brake control pump mounting port
6. Torque converter valve
7. Torque converter outlet oil temperature sensor



1. Coupling
2. Input shaft (Number of teeth: 96)
3. Case
4. Drive case
5. Boss
6. Turbine
7. Outer race
8. Pump
9. Retainer

10. Stator shaft
11. Stator bushing
12. Free wheel
13. Stator
14. Lockup clutch disc
15. Lockup clutch piston
16. Lockup clutch housing
17. Retainer



10 Structure, function and maintenance standard

SEN01282-01

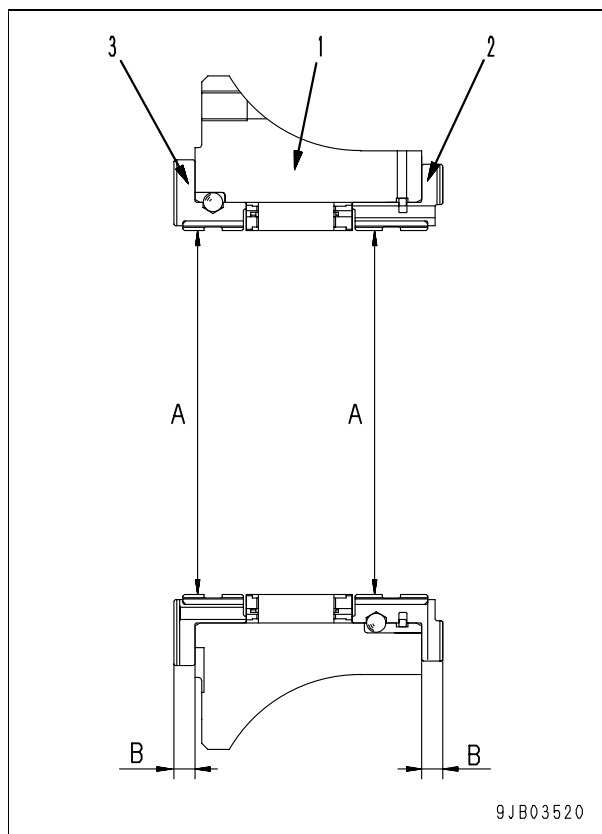
Unit: mm

No.	Check item		Criteria					Remedy	
1	Outside diameter of coupling oil seal contact surface		Standard size		Tolerance		Repair limit	Replace	
			125		0 −0.1		124.8		
2	Inside diameter of input shaft seal ring contact surface		115		+0.035 0		115.5		
3	Clearance between clutch housing and piston (outside)		Standard size	Tolerance		Standard clearance	Clearance limit		
				Shaft	Hole				
4	Clearance between clutch housing and piston (inside)		245	−0.100 −0.172		+0.072 0	0.110 − 0.242		0.27
				−0.5 −0.7					
5	Inside diameter of retainer seal ring contact surface		190		+0.046 0		190.5		
6	Inside diameter of stator shaft seal ring contact surface		90		+0.035 0		90.1		
7	Wear of stator shaft seal ring	Width	5.95		0 -0.1		5.45		
		Thickness	6.5		±0.1		6.2		
8	Inside diameter of free wheel transmission surface of outer race		140.53		±0.013		140.56		
9	Outside diameter of stator shaft free wheel transmission surface		121.53		±0.008		121.50		
10	Inner diameter sliding portion of bushing (*1)		121.65		+0.013 −0.005		121.73		
11	Thickness of sliding portion of bushing (*1)		7		0 −0.1		6.5		
12	Thickness of clutch disc		5.4		±0.1		4.8		
13	Backlash between input shaft and PTO gear		0.18 − 0.46						
14	Clearance between PTO gear and bearing		Standard size	Tolerance		Standard clearance	Clearance limit		
				Shaft	Shaft				
15	Clearance between bearing and case		120	0 −0.015		+0.010 −0.025	−0.025 − 0.025	—	
				+0.030 +0.011					0 −0.015

*1 Refer to "Method of measuring dimension of bushing sliding portion"

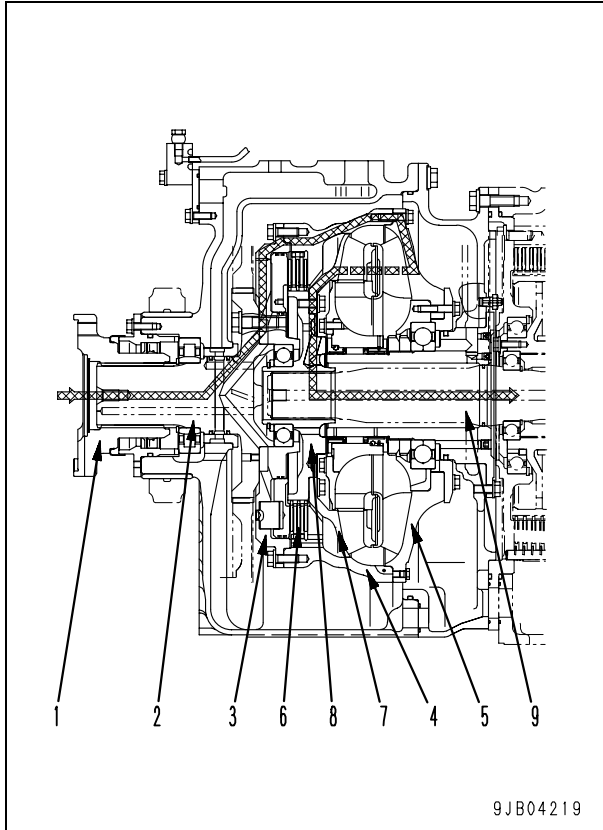
Method of measuring dimension of bushing sliding portion

Measure inner diameter (A) and thickness (B) of bushing sliding portion with output side bushing (2) and input side bushing (3) installed to outer race (1).



Power transmitting route

When lockup clutch is "disengaged"



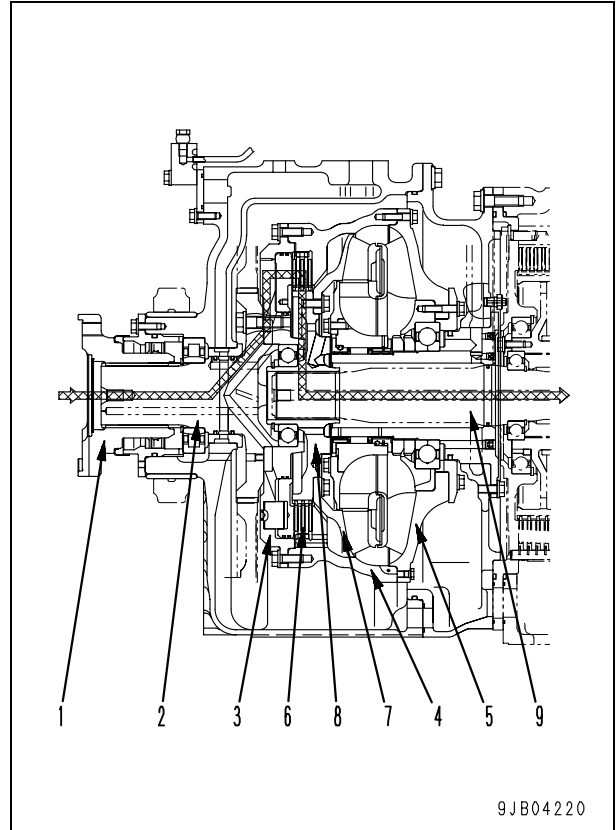
Drive case (4) is disconnected from boss (8) and turbine (7) and lockup torque converter works as an ordinary torque converter.

The power from engine

↓
 Output shaft
 ↓
 Front drive shaft
 ↓
 Coupling (1)
 ↓
 Input shaft (2), clutch housing (3), drive case (4) and pump (5) rotate together
 ↓
 Oil is used as medium
 ↓
 Turbine (7) and boss (8)
 ↓
 Transmission input shaft (9)

- The power transmitted to input shaft (2) is also used as power for driving the pump after being transmitted through PTO gear.

When lockup clutch is "engaged"

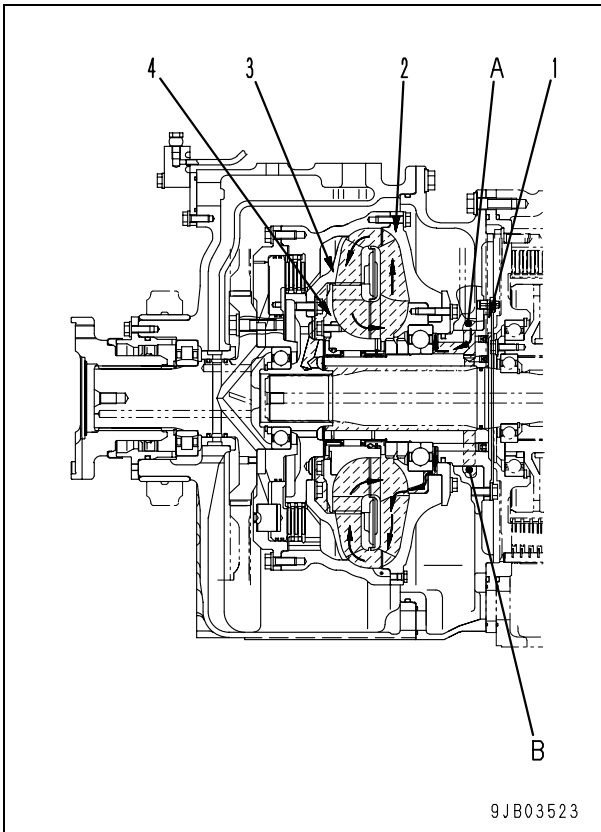


Drive case (4) is connected to boss (8) and turbine (7) and lockup torque converter is locked up.

The power from engine

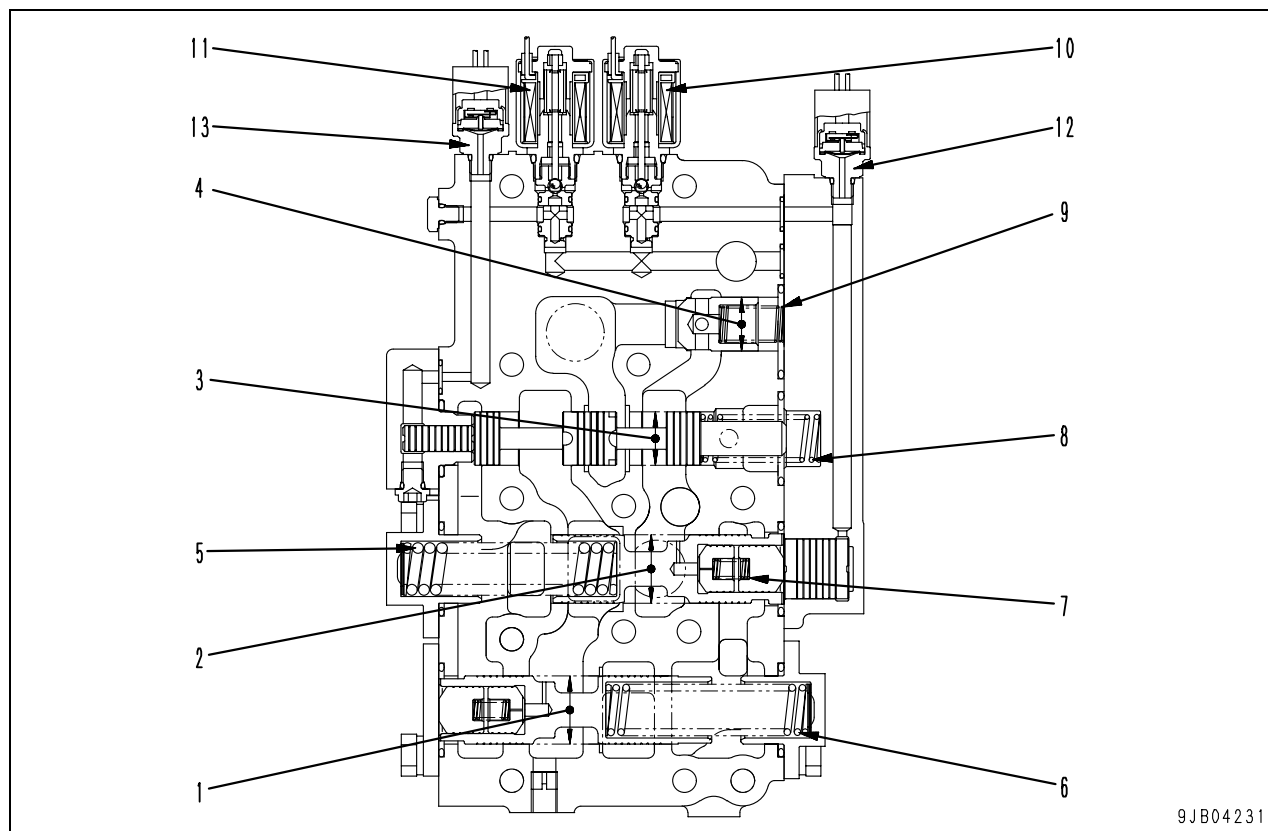
↓
 Output shaft
 ↓
 Front drive shaft
 ↓
 Coupling (1)
 ↓
 Input shaft (2), clutch housing (3), drive case (4) and pump (5) rotate together
 ↓
 Lockup clutch (6)
 ↓
 Boss (8)
 ↓
 Transmission input shaft (9)

- The power transmitted to input shaft (2) is also used as power for driving the pump after being transmitted through PTO gear.

Oil flow

- The oil flows through the main relief valve and its pressure is reduced to below the set pressure by the torque converter relief valve. It then flows into inlet port (A), goes through the oil passages of stator shaft (1), and flows into pump (2).
- The oil is given a centrifugal force by pump (2), and then it enters turbine (3) to transmit its energy to turbine (3).
- The oil from turbine (3) is sent to stator (4) and flows into pump (2) again. However, part of the oil passes between turbine (3) and stator (4) and is sent from outlet port (B) to the oil cooler to be cooled. It is then used to lubricate the transmission.

Torque converter valve



9JB04231

Unit: mm

No.	Check item	Criteria					Remedy
1	Clearance between the torque converter relief valve and valve body	Standard size	Tolerance		Standard clearance	Clearance limit	Replacement
			Shaft	Hole			
2	Clearance between the main relief valve and valve body	32	-0.035 -0.045	+0.016 0	0.035 – 0.061	0.081	
3	Clearance between main flow rate selector valve and valve body	25	-0.035 -0.045	+0.013 0	0.035 – 0.058	0.078	
4	Clearance between check valve and valve body	25	-0.020 -0.041	+0.052 0	0.020 – 0.093	0.113	
5	Main relief valve spring	Standard size			Repair limit		
		Free length	Installed length	Installed load	Free length	Installed load	
		123	99.5	1213.2 N {123.8 kg}	119.3	1153.8 N {117.6 kg}	
6	Torque converter relief valve spring	137	93.5	331.2 N {33.8 kg}	132.9	315.0 N {32.1 kg}	
7	Poppet spring (Torque converter relief and main relief)	26	17.0	32.0 N {3.3 kg}	25.2	30.8 N {3.1 kg}	
8	Main flow rate selector valve spring	95	55.5	96.7 N {9.87 kg}	92.2	91.9 N (9.38 kg)	
9	Check valve spring	45	30	3.97 N {0.41 kg}	43.7	3.82 N {0.39 kg}	

10. Solenoid valve for main relief valve

11. Solenoid valve for main flow rate selector valve

12. Oil pressure switch for main relief valve

13. Oil pressure switch for main flow rate selector valve

Main flow rate selector valve

Outline

This valve switches the amount of oil to be fed to the main relief valve.

If one of the 2 charge pumps is enough to secure the main pressure, oil from the remaining pump is flown to the torque converter bypassing the main relief valve. This arrangement reduces the pump load and improves the fuel consumption.

This switching takes place automatically responding to the engine speed being set at each gear speed.

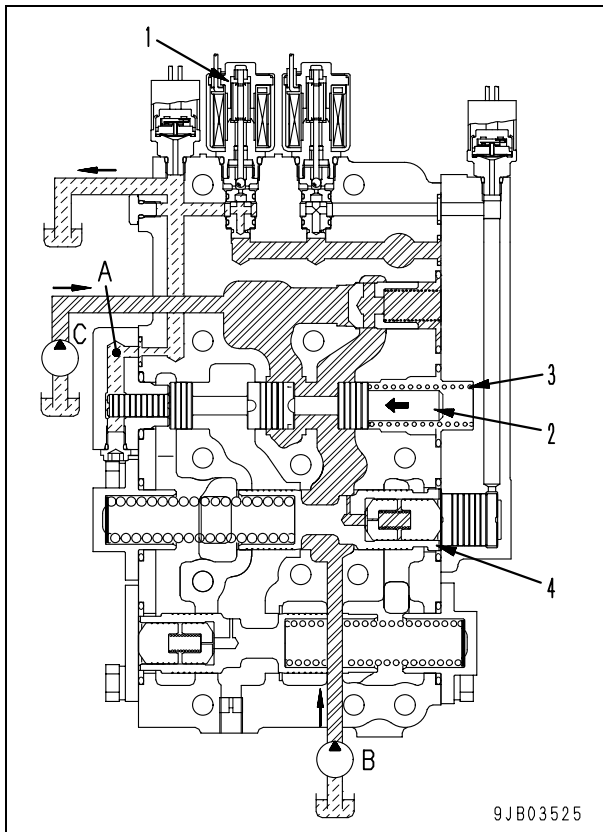
Operating condition

Gear Speed	Engine speed (rpm)	
	From ON to OFF	From OFF to ON
F1, F2, RL, RH	1,000	1,100
N	1,450	1,550

Normal operation takes place at F3 - F7.

Principle of operation

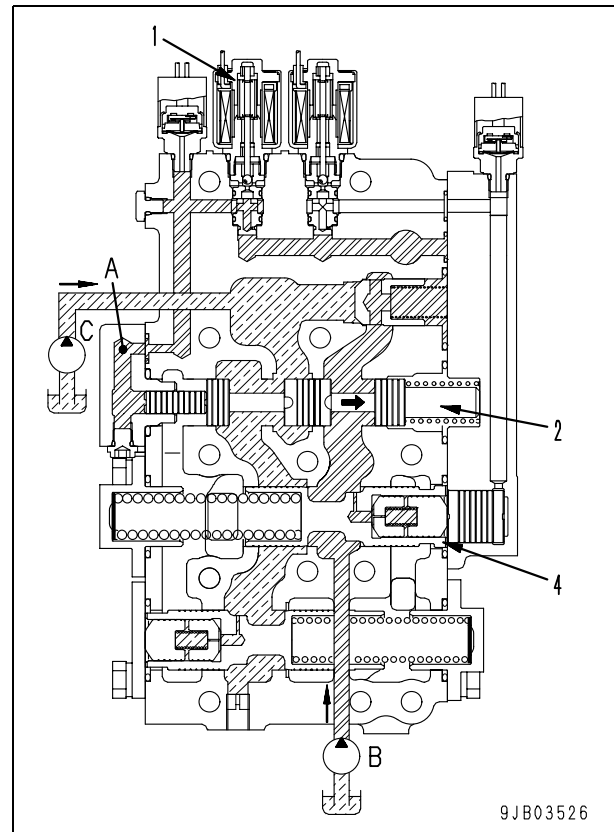
When the solenoid is "de-energized"
(When oil from the pump is merged)



- When current is not conducted to solenoid (1), oil pressure force does not work on chamber (A). Thus, main flow rate selector valve (2) is pushed to the left by spring (3).

In this case, all of oil delivered from pumps (B) and (C) flows through main relief valve (4) to the torque converter.

When the solenoid is "energized"
(When oil from the pump is divided)



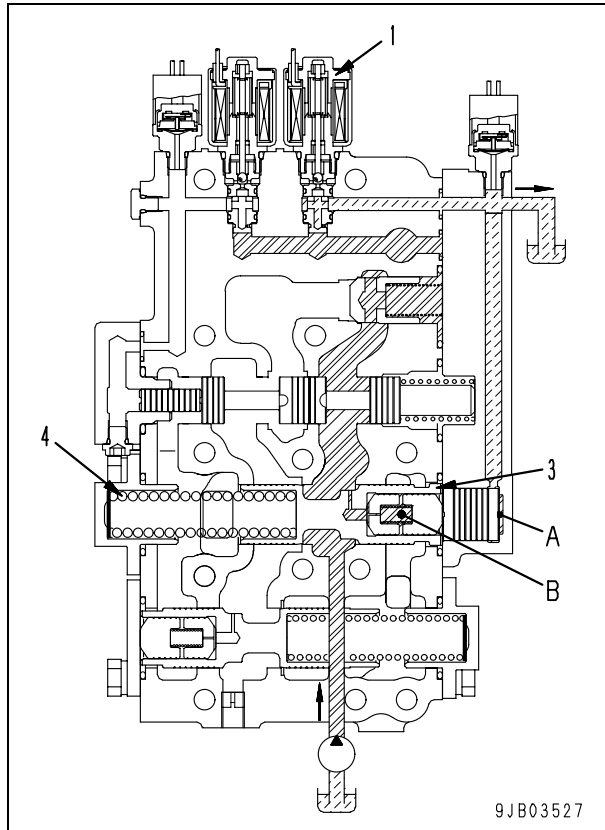
- Conducting current to solenoid (1) generates oil pressure in chamber (A). Thus, main flow rate selector valve (2) is pushed to the right.

In this case, oil from pump (B) alone flows through main relief valve (4). And oil from pump (C) flows to the torque converter, bypassing main relief valve (4).

Main relief valve**Outline**

This valve has the function of switching the main relief pressure. When a high gear speed (F4 - F7) is selected and, thus, a lower clutch holding pressure is required, function of this valve reduces the main relief oil pressure, which decreases the pump load and enhances the fuel consumption.

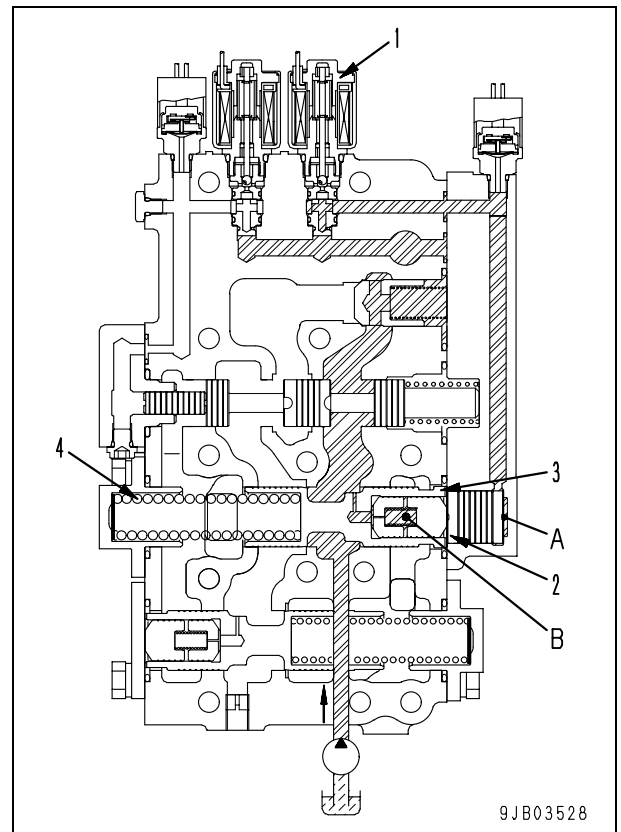
When solenoid is "de-energized" (RL, RH, N, F1, F2 or F3)



- When current is not conducted to solenoid (1), chamber (A) is connected to the drain port and no oil pressure is generated. Thus, oil pressure in chamber (B) is balanced against force of spring (4), starting pressure regulation by main relief valve (3).

★ Main relief pressure: 3.53 MPa {36.0 kg/cm²}
(At engine speed 1,900 rpm)

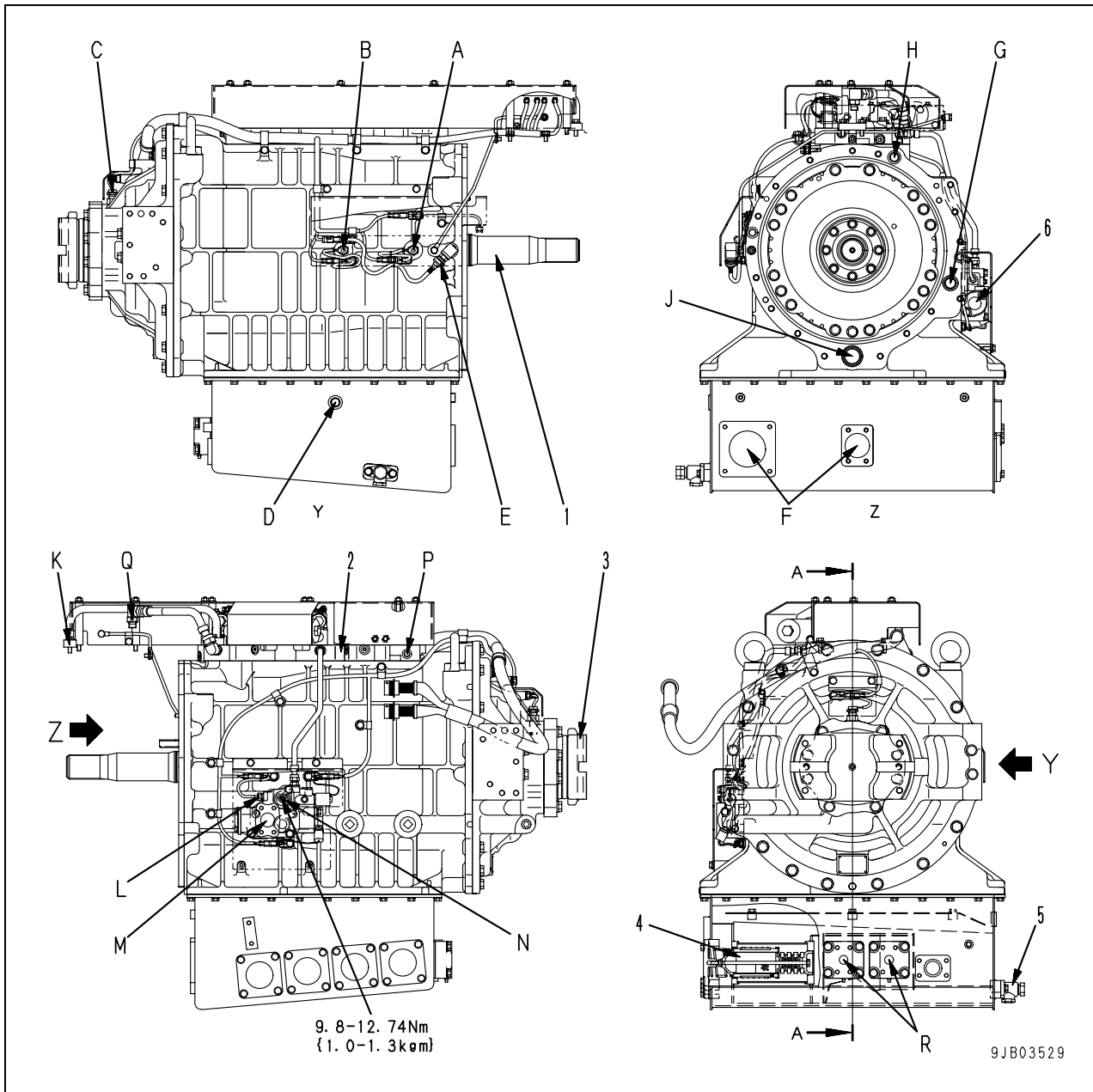
When solenoid is "energized" (F4, F5, F6 or F7)



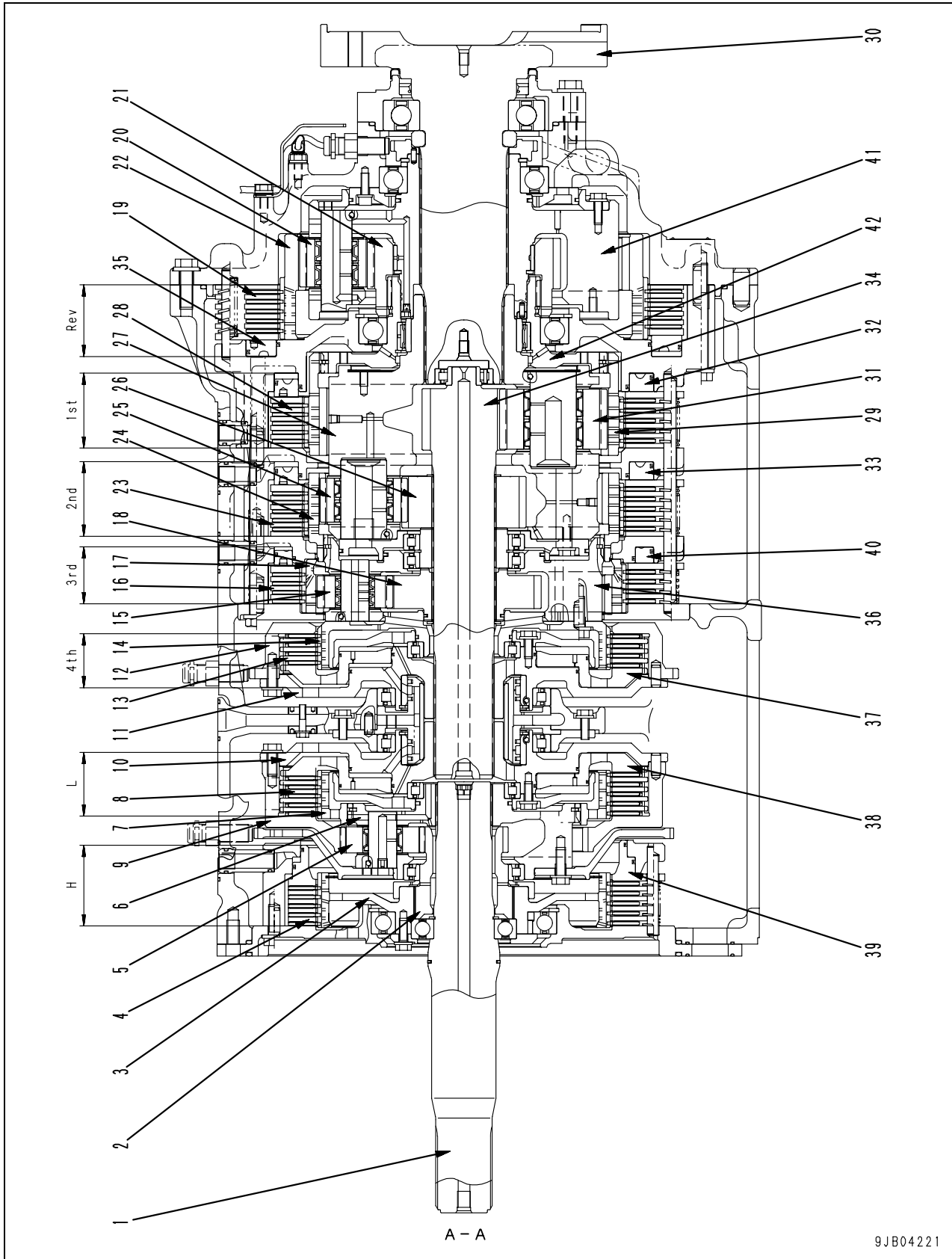
- As current is conducted to solenoid (1), oil pressure is generated in chamber (A). Thus, oil pressure in chamber (A) is balanced against force of spring (4), starting pressure regulation by main relief valve (3). Since diameter of piston (2) at this point is larger than diameter of chamber (B), the oil pressure as current is conducted to solenoid (1) is adjusted to a level lower than that when current is not conducted.

★ Main relief pressure: 2.16 MPa {22.0 kg/cm²}
(At engine speed 1,900 rpm)

Transmission



- A: Speed sensor (for input shaft speed)
 - B: Speed sensor (for intermediate shaft speed)
 - C: Speed sensor (for output shaft speed)
 - D: From sub-tank
 - E: Torque converter intermediate oil pressure sensor
 - F: To pump (suction)
 - G: From torque converter (lubrication circuit)
 - H: From torque converter (main circuit)
 - J: From torque converter (drain circuit)
 - K: To lockup clutch
 - L: Lubricating oil temperature sensor
 - M: From oil cooler
 - N: Lubricating oil pressure pickup port
 - P: To breather
 - Q: To torque converter valve
(To pilot circuit of main flow rate selector valve
and main oil pressure selector valve)
 - R: Lubrication relief valve
-
- 1. Transmission input shaft
 - 2. Transmission control valve
 - 3. Transmission output shaft
 - 4. Strainer
 - 5. Drain valve
 - 6. Lubricating oil amount selector valve



1. Transmission input shaft
2. H sun gear (Number of teeth: 34)
3. H hub
4. H clutch
5. H planetary pinion (Number of teeth: 32)
6. H carrier
7. L ring gear (hub)
8. L clutch
9. H ring gear (Number of teeth: 98)
10. L clutch housing
11. 4th clutch housing
12. 4th clutch drum
13. 4th clutch
14. 4th hub
15. 3rd planetary pinion (Number of teeth: 20)
16. 3rd clutch
17. 3rd ring gear (Number of teeth: 86)
18. 3rd sun gear (Number of teeth: 46)
19. R clutch
20. R planetary pinion (Number of teeth: 20)
21. R sun gear (Number of teeth: 58)
22. R ring gear (Number of teeth: 98)
23. 2nd clutch
24. 2nd ring gear (Number of teeth: 98, 97)
25. 2nd planetary pinion (Number of teeth: 28)
26. 2nd sun gear (Number of teeth: 42)
27. 1st, 2nd carrier
28. 1st clutch
29. 1st ring gear (Number of teeth: 85)
30. Transmission output shaft
31. 1st planetary pinion (Number of teeth: 31)
32. 1st clutch piston
33. 2nd clutch piston
34. Intermediate shaft (1st sun gear's number of teeth: 23)
35. R clutch piston
36. 3rd carrier
37. 4th clutch piston
38. L clutch piston
39. H clutch piston
40. 3rd clutch piston
41. R carrier
42. Hub

Outline

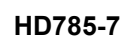
- The transmission employed consists of the unit planetary mechanism and disc clutch that provides "7 forward gear speeds and 2 reverse gear speeds".
- Among the 7 sets of planetary gear system and disc clutches of the transmission, 2 clutches are fixed hydraulically with the ECMV to select 1 rotating direction and gear speed.
- The transmission transmits the power being transmitted to the transmission input shaft to the output shaft after selecting a single speed in the range of the 1st – 7th speed in the forward and the L – H speed in the reverse travel. In this case, the gear speed change is done through the combination of H and L clutches, 4 speed clutches and R clutch.

Number of plates and discs used

Clutch No.	Number of plates	Number of discs
H clutch	4	5
L clutch	4	5
4th clutch	3	4
3rd clutch	3	4
2nd clutch	5	5
1st clutch	5	5
R clutch	5	5

Combinations of clutches at respective gear speeds and reduction ratio

Gear Speed	Clutch used	Reduction ratio
Forward 1st	L x 1st	4.696
Forward 2nd	L x 2nd	3.333
Forward 3rd	H x 2nd	2.475
Forward 4th	L x 3rd	1.838
Forward 5th	H x 3rd	1.365
Forward 6th	L x 4th	1.000
Forward 7th	H x 4th	0.742
Revers L	L x R	5.244
Revers H	H x R	3.894



10 Structure, function and maintenance standard

SEN01282-01

Unit: mm

No.	Check item		Criteria				Remedy
1	H clutch spring		Standard size			Repair limit	
			Free length	Installed length	Installed load	Free length	Installed load
			90	53.5	63.3 N {6.5 kg}	84.6	53.9 N {5.5 kg}
2	3rd clutch spring		48.9	43	125.4 N {12.8 kg}	46	106.8 N {10.9 kg}
3	2nd clutch spring		85.3	62.3	203.8 N {20.8 kg}	80.2	173.4 N {17.7 kg}
4	1st clutch spring		85.3	62.8	199.2 N {20.4 kg}	80.2	169.5 N {17.3 kg}
5	R clutch spring		85	74	247.2 N {25.2 kg}	79.9	209.7 N {21.4 kg}
6	Total assembled thickness of 5 discs and 4 plates for H clutch		Standard size		Tolerance		Repair limit
			50.2		±0.30		46.4
7	Total assembled thickness of 5 discs and 4 plates for L clutch		50.2		±0.30		46.4
8	Total assembled thickness of 4 discs and 3 plates for 4th clutch		39		±0.26		36.0
9	Total assembled thickness of 4 discs and 3 plates for 3rd clutch		39		±0.26		36.0
10	Total assembled thickness of 5 discs and 5 plates for 2nd clutch		56		±0.40		52.0
11	Total assembled thickness of 5 discs and 5 plates for 1st clutch		56		±0.40		52.0
12	Total assembled thickness of 5 discs and 5 plates for R clutch		55		±0.32		51.0
13	Thickness of a single disc	H,L,4th	5.4	±0.1		4.8	
		3rd	5.4	±0.1		4.8	
		2nd,1st	5.4	±0.15		4.8	
		R	5.2	±0.1		4.6	
14	Thickness of a single plate	H	5.8	±0.1		5.6	
		L,4th	5.8	±0.1		5.6	
		3rd	5.8	±0.1		5.6	
		2nd,1st	5.8	±0.1		5.6	
		R	5.8	±0.1		5.6	
15	Wear of transmission input shaft seal ring	Width	3	-0.01 -0.03		2.7	
		Thickness	3.7	±0.12		3.55	
16	Wear of H carrier seal ring	Width	3.95	0 -0.1		3.56	
		Thickness	4.95	±0.1		4.8	

Replace

Unit: mm

No.	Check item		Criteria			Remedy
			Standard size	Tolerance	Repair limit	
17	Wear of 4th ring gear seal ring	Width	4.36	0 −0.1	3.92	Replace
		Thickness	3	±0.1	2.85	
18	Wear of 3rd sun gear seal ring	Width	3	−0.01 −0.03	2.7	
		Thickness	4	±0.12	3.85	
19	Wear of L and 4th clutch collars seal ring	Width	4.5	−0.04 −0.08	4.05	
		Thickness	5	±0.15	4.85	
20	Wear of 3rd car-rier seal ring	Width	3.95	0 −0.1	3.56	
		Thickness	5.3	±0.15	5.15	
21	Wear of 2nd and 1st carriers seal ring	Width	4	−0.01 −0.04	3.6	
		Thickness	4	±0.15	3.85	
22	Wear of R carrier seal ring (inside)	Width	4.45	0 −0.1	4.01	
		Thickness	6	±0.15	5.85	
23	Wear of R carrier seal ring (outside)	Width	4	−0.01 −0.04	3.6	
		Thickness	4	±0.15	3.85	
24	Backlash between H sun gear and planetary pinion		0.11 – 0.33			
25	Backlash between H planetary pinion and ring gear		0.12 – 0.43			
26	Backlash between 3rd sun gear and planetary pinion		0.11 – 0.36			
27	Backlash between 3rd plane-tary pinion and ring gear		0.12 – 0.46			
28	Backlash between 2nd sun gear and planetary pinion		0.13 – 0.37			
29	Backlash between 2nd plane-tary pinion and ring gear		0.13 – 0.46			
30	Backlash between 1st sun gear and planetary pinion		0.14 – 0.33			
31	Backlash between 1st plane-tary pinion and ring gear		0.14 – 0.49			
32	Backlash between R sun gear and planetary pinion		0.16 – 0.36			
33	Backlash between R planetary pinion and ring gear		0.13 – 0.46			
34	Deterioration of disc internal gear		Repair limit: 0.5			
35	Thickness of thrust washer (H and 3rd planetary pinions)		Standard size	Tolerance	Repair limit	
			2	±0.1	1.5	
36	Thickness of thrust washer (2nd and 1st planetary pinions)		3	±0.1	2.5	
37	Thickness of thrust washer (R planetary pinion)		2	±0.1	1.5	

10 Structure, function and maintenance standard

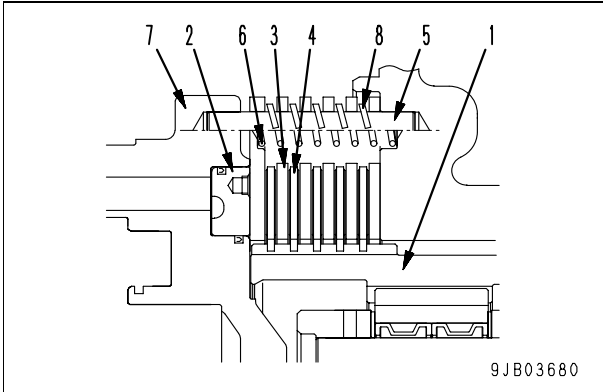
SEN01282-01

Unit: mm

No.	Check item		Criteria					Remedy
38	Side clearance on planetary pinion		Location		Standard clearance		Clearance limit	Replacement of thrust washer or carrier
			H gear train		0.30 – 0.80		1.5	
			3rd gear train		0.30 – 0.80		1.5	
			2nd gear train		0.30 – 0.80		1.5	
			1st gear train		0.30 – 0.80		1.5	
			R gear train		0.30 – 0.80		1.5	
39	Stepped-type wear on seal ring mating surface		Standard size			Amount of wear		
			—			Max. 0.05		
40	Contact surface of output shaft oil seal		Standard size		Tolerance		Amount of wear	Replace
			130		0 –0.100		129.8	
41	Clearance between cylinder and piston	Clutch No.	Standard size	Tolerance		Standard clearance	Clearance limit	In case there is damage on the surface such as streaks by seizure, but the clearance can be maintained within the specified limit after the repair, the parts can be reused. Replace if damaged severely.
				Shaft	Hole			
		H (outside)	425	–0.5 –0.7	+0.097 0	0.5 – 0.797	0.88	
		H (inside)	405	–0.135 –0.232	+0.097 0	0.135 – 0.329	0.36	
		L and 4th (outside)	310	–0.1 –0.5	+0.081 0	0.1 – 0.581	0.64	
		L and 4th (middle)	285	–0.110 –0.191	+0.081 0	0.11 – 0.272	0.30	
		L and 4th (inside)	180	–0.5 –0.7	+0.063 0	0.5 – 0.763	0.84	
		3rd, 2nd and 1st (outside)	470	–0.5 –0.7	+0.063 0	0.5 – 0.763	0.84	
		3rd (inside)	425	–0.135 –0.198	+0.097 0	0.135 – 0.295	0.32	
		2nd and 1st (inside)	410	–0.135 –0.198	+0.063 0	0.135 – 0.261	0.29	
		R (outside)	540	–0.5 –0.7	+0.110 0	0.5 – 0.81	0.89	
		R (inside)	465	–0.135 –0.232	+0.097 0	0.135 – 0.329	0.36	

Disc clutch

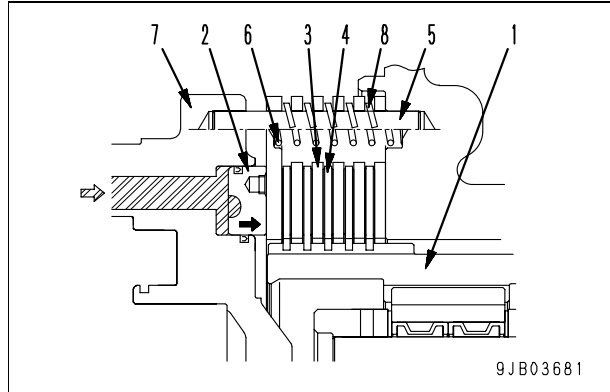
Structure



- Disc clutch is used for fixing ring gear (1). It consists of piston (2), plate (3), disc (4), pin (5), return spring (6) and washer (8).
- Inside teeth of disc (4) are engaged with outside teeth of ring gear (1).
- Plate (3) is assembled to clutch housing (7) with pin (5).

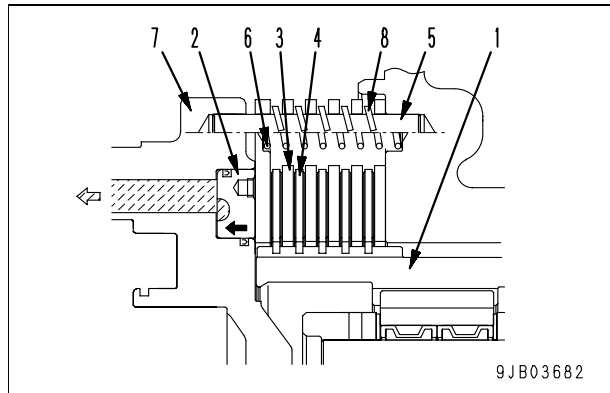
Operation

When clutch is "engaged" (fixed)



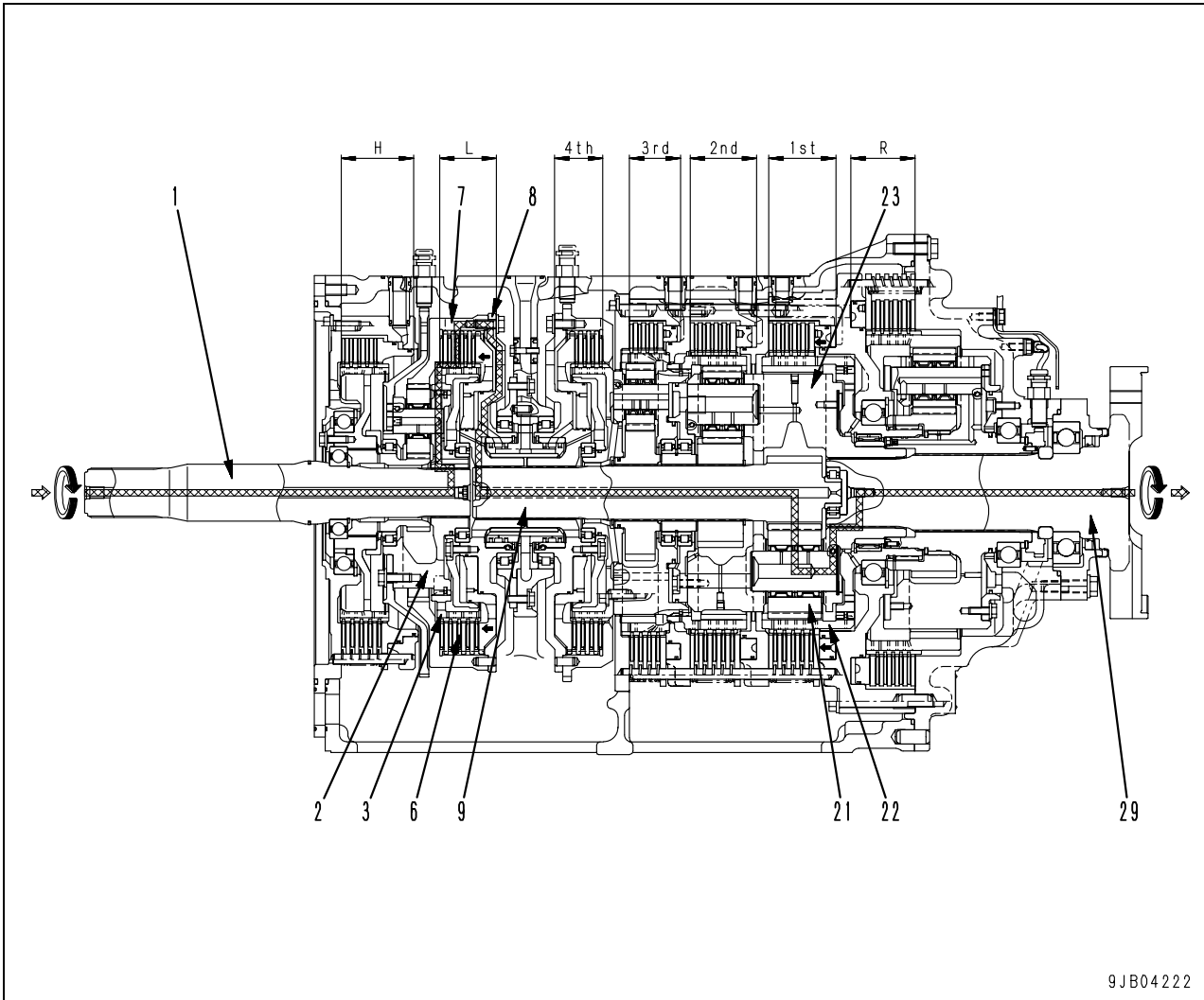
- The oil from ECMV is sent with pressure to the rear side of piston (2) through the oil passage of housing (7) and pushes piston (2) rightward.
- Piston (2) contacts plate (3) closely against disc (4) to stop rotation of disc (4) by use of the friction force generated between them.
- Since inside teeth of disc (4) are engaged with outside teeth of ring gear (1), move of ring gear (1) is stopped.

When clutch is "disengaged" (released)



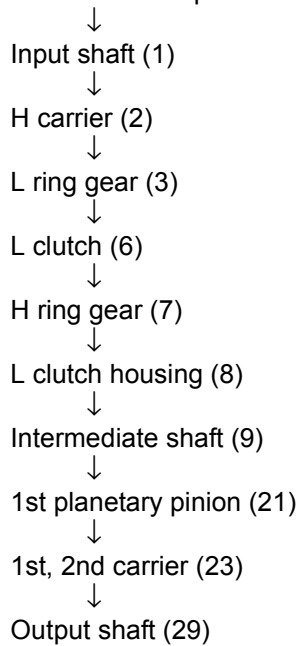
- As the oil from ECMV is stopped, piston (2) is pushed back leftward by return spring (6).
- The friction force between plate (3) and disc (4) is released and ring gear (1) is released.
- Washer spring (8) is installed between plate (3) of the pin block and plate (3). This spring quickens return of piston (2) as the clutch is disengaged by providing smooth separation of plate (3) and disc (4). At the same time, it is used for preventing the dragging.

Power transmitting route
Forward 1st speed

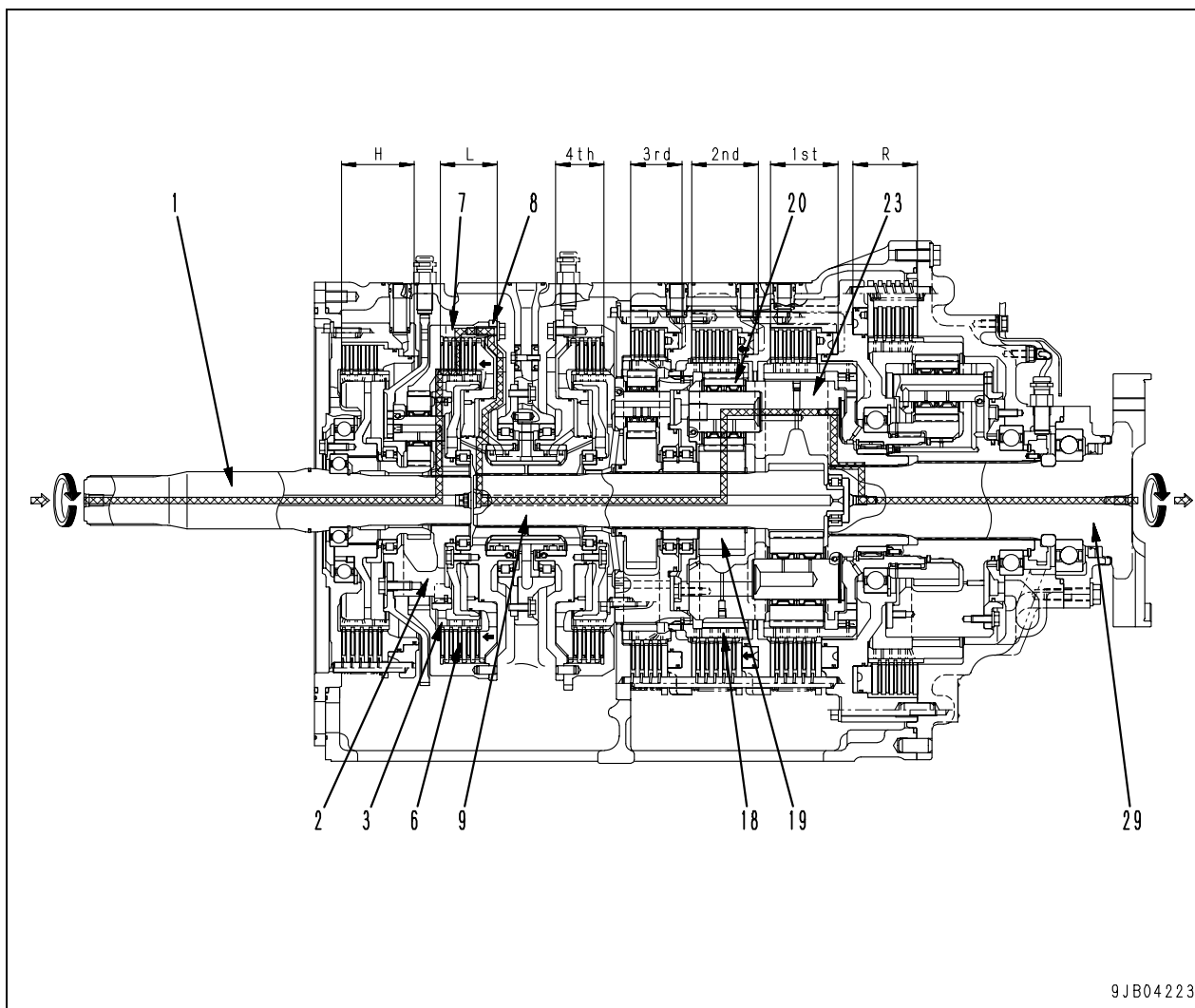


L ring gear (3) of the L clutch and 1st ring gear (22) of the 1st clutch are fixed hydraulically.

Power from torque converter

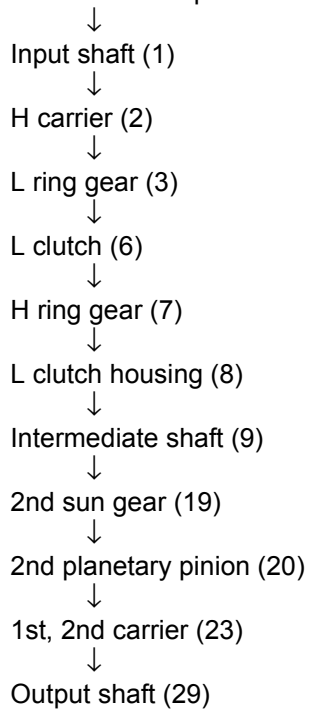


Forward 2nd speed

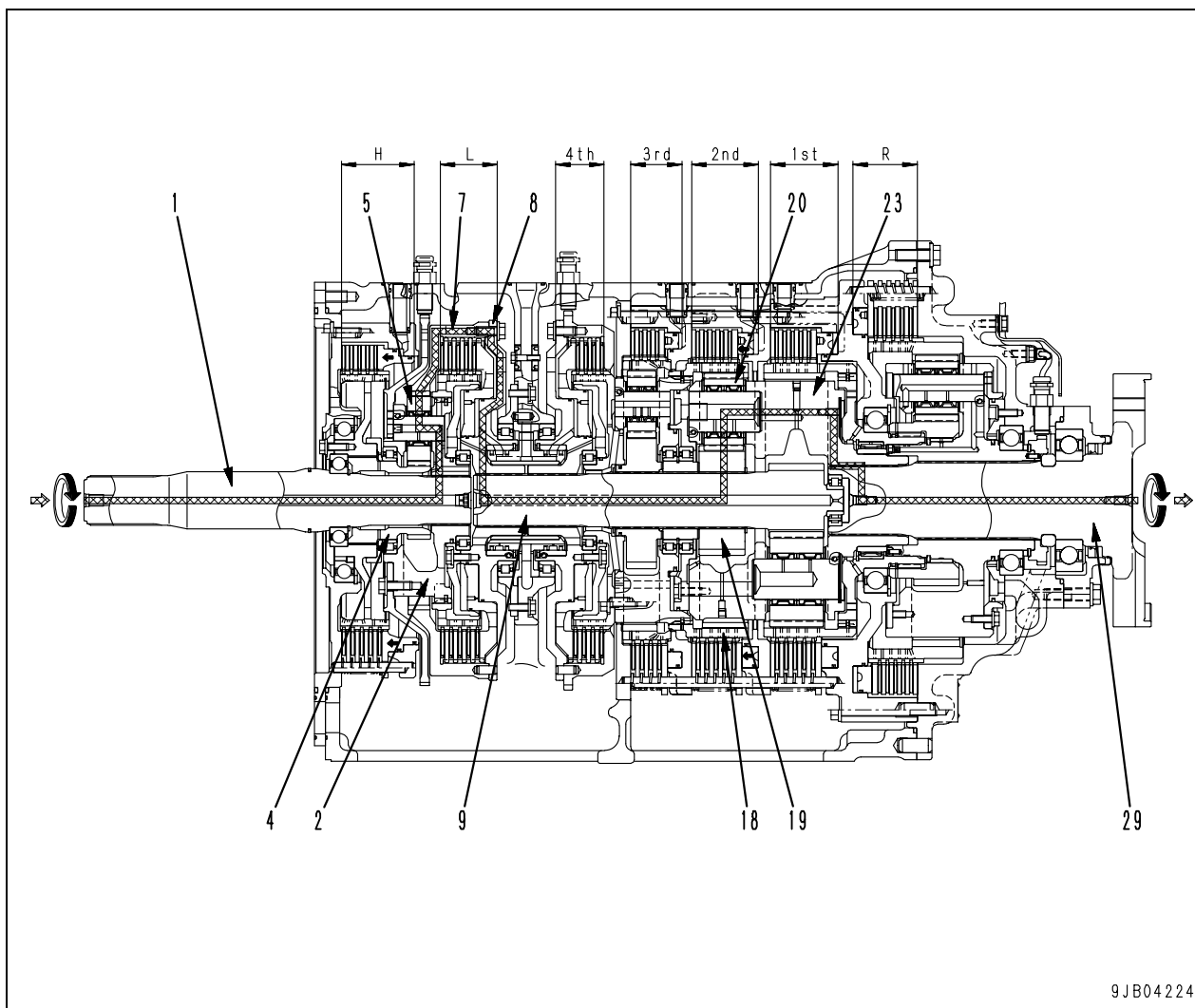


L ring gear (3) of the L clutch and 2nd ring gear (18) of the 2nd clutch are fixed hydraulically.

Power from torque converter

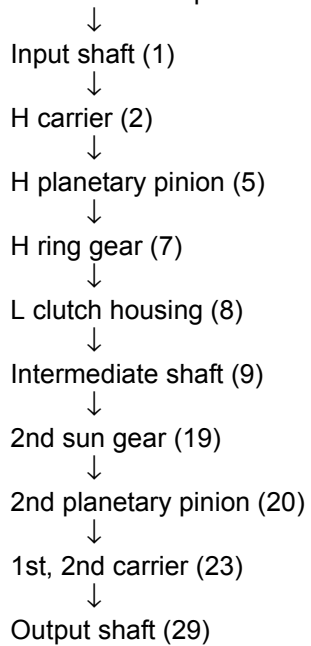


Forward 3rd speed

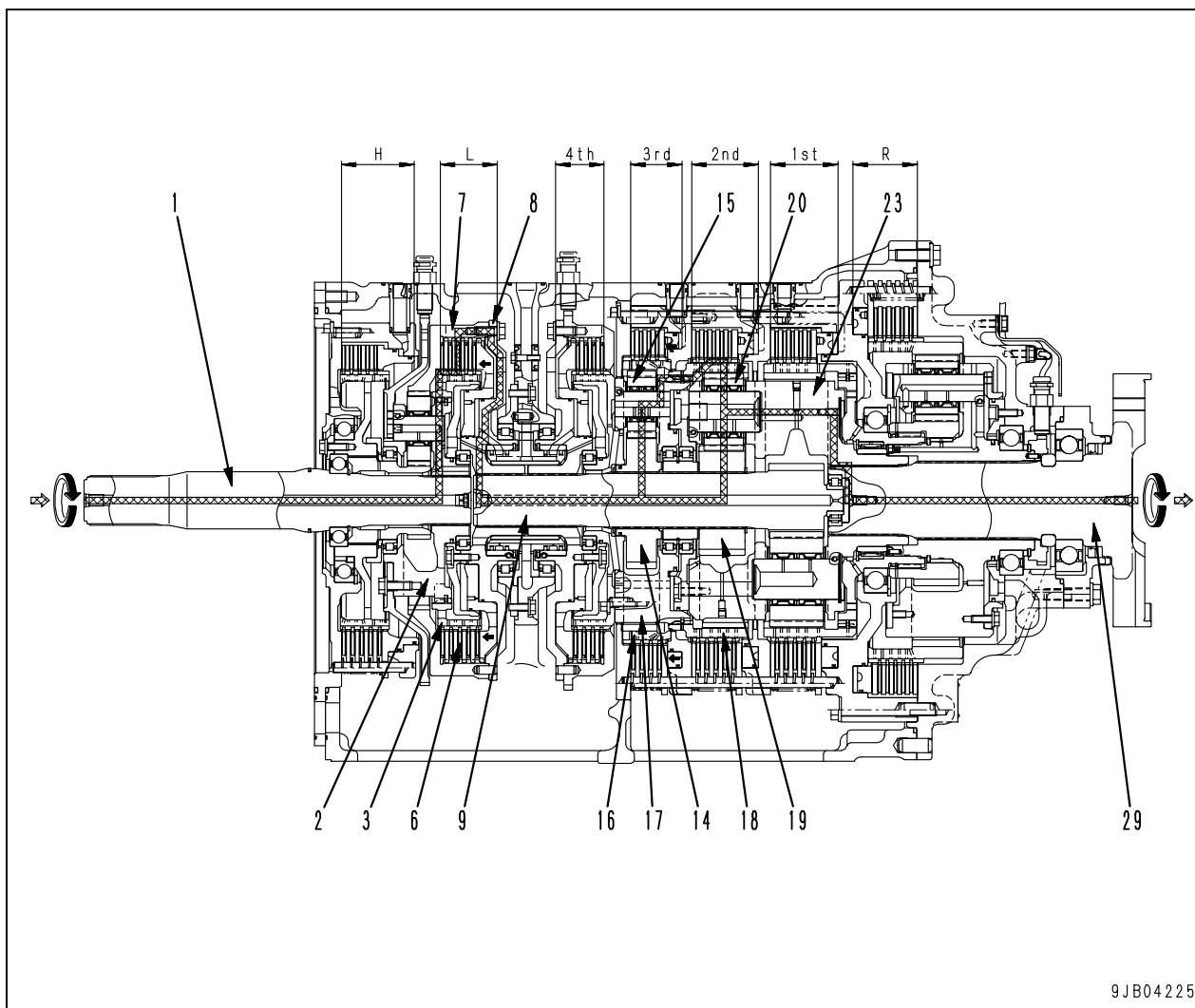


H sun gear (4) of the H clutch and 2nd ring gear (18) of the 2nd clutch are fixed hydraulically.

Power from torque converter

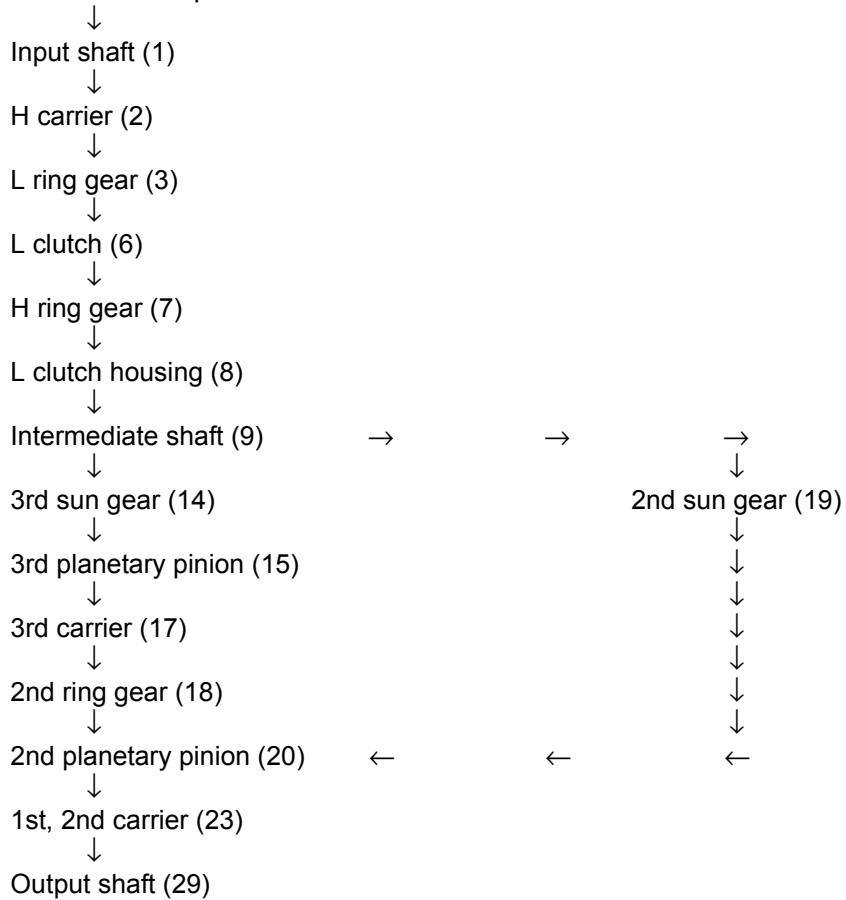


Forward 4th speed

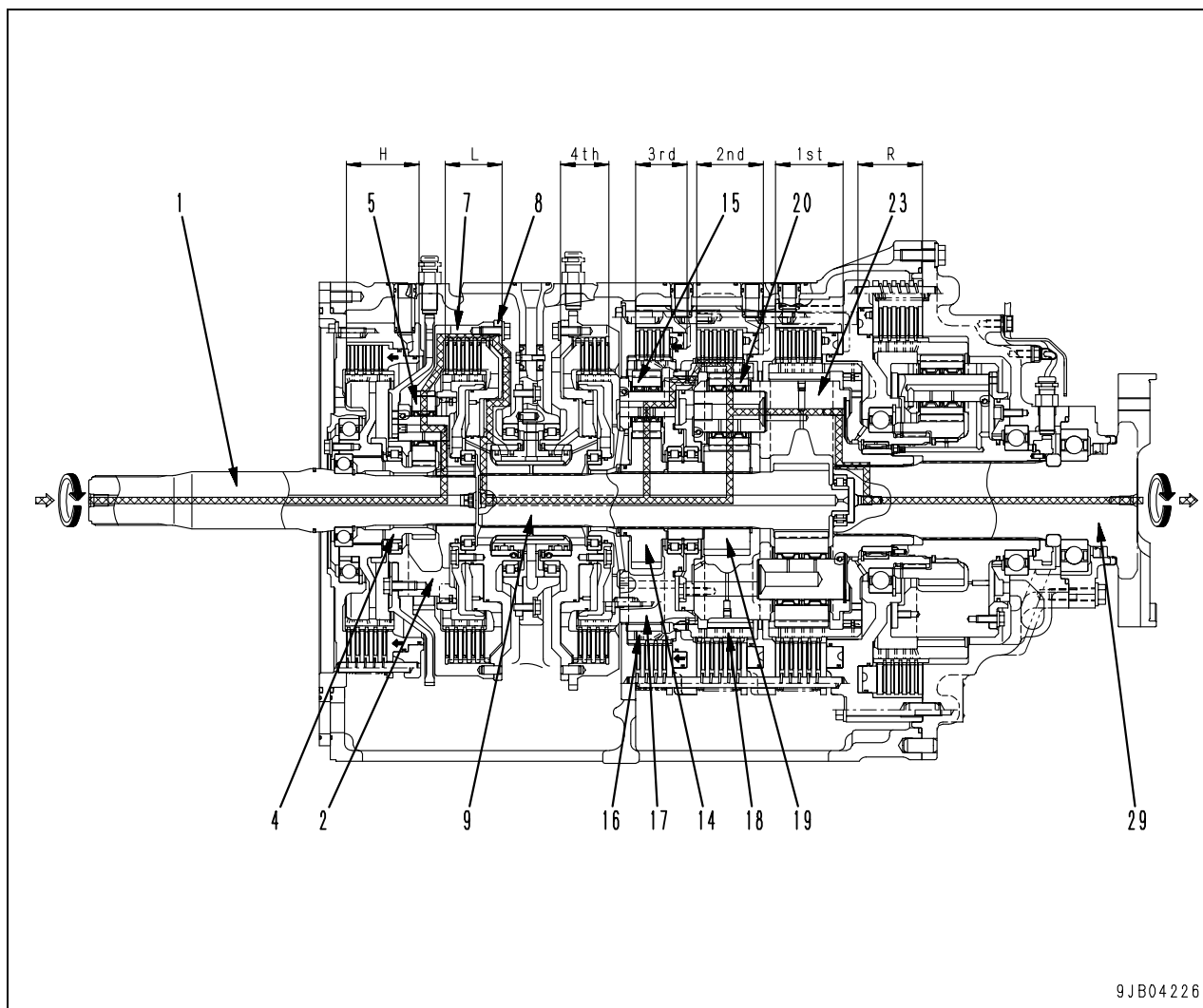


L ring gear (3) of the L clutch and 3rd ring gear (16) of the 3rd clutch are fixed hydraulically.

Power from torque converter

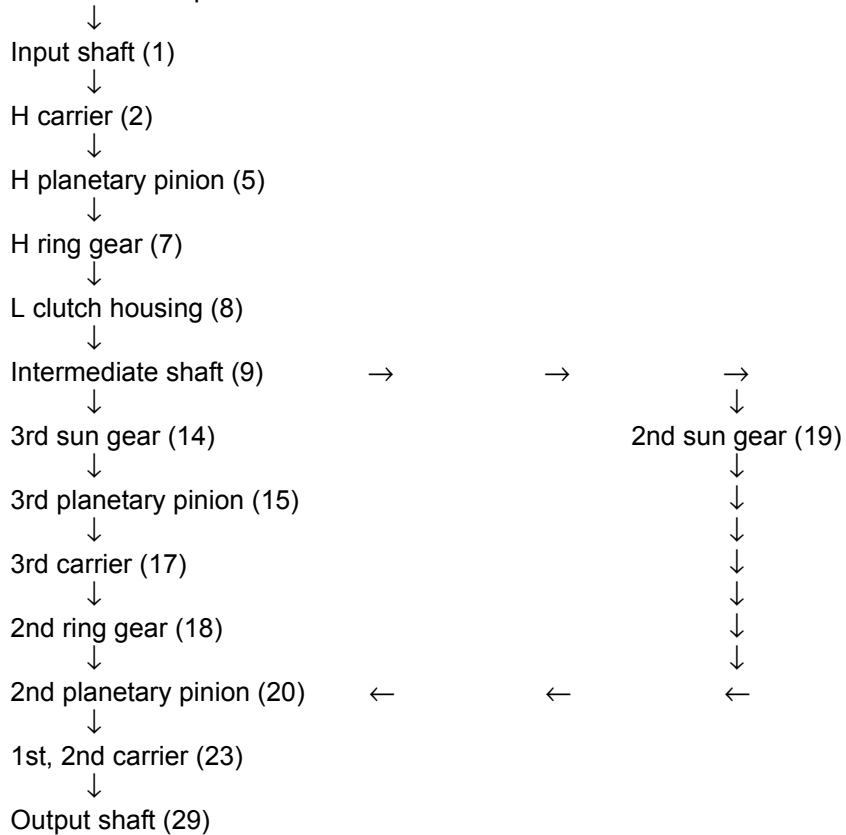


Forward 5th speed

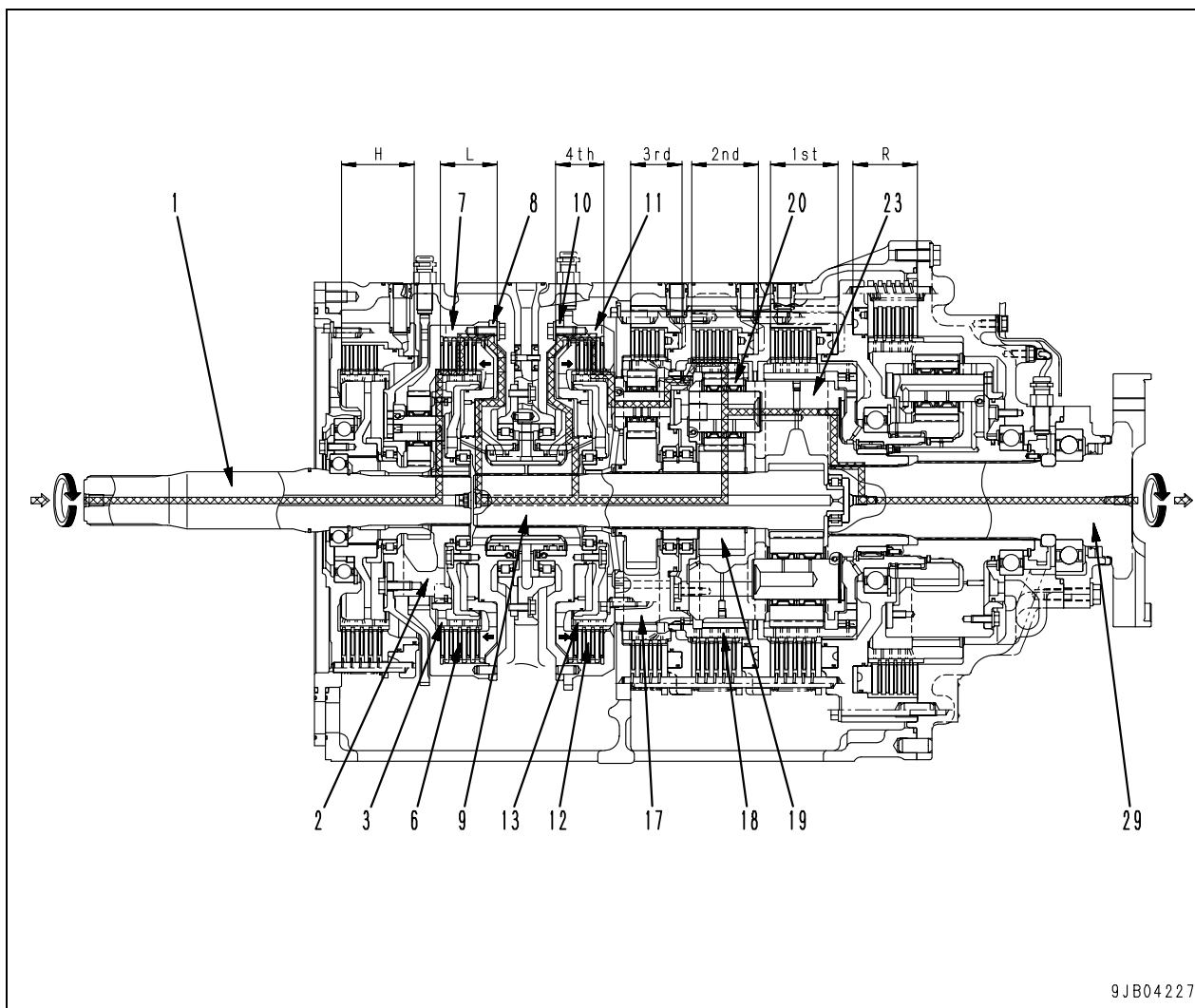


H sun gear (4) of the H clutch and 3rd ring gear (16) of the 3rd clutch are fixed hydraulically.

Power from torque converter

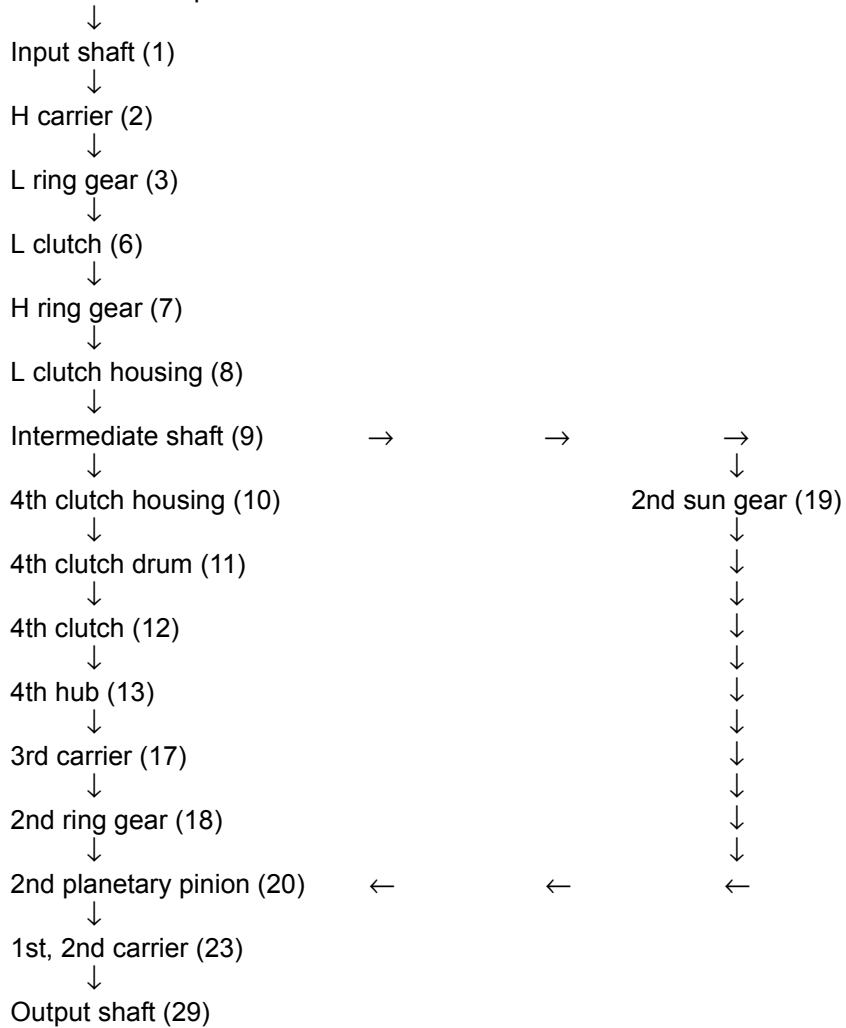


Forward 6th speed

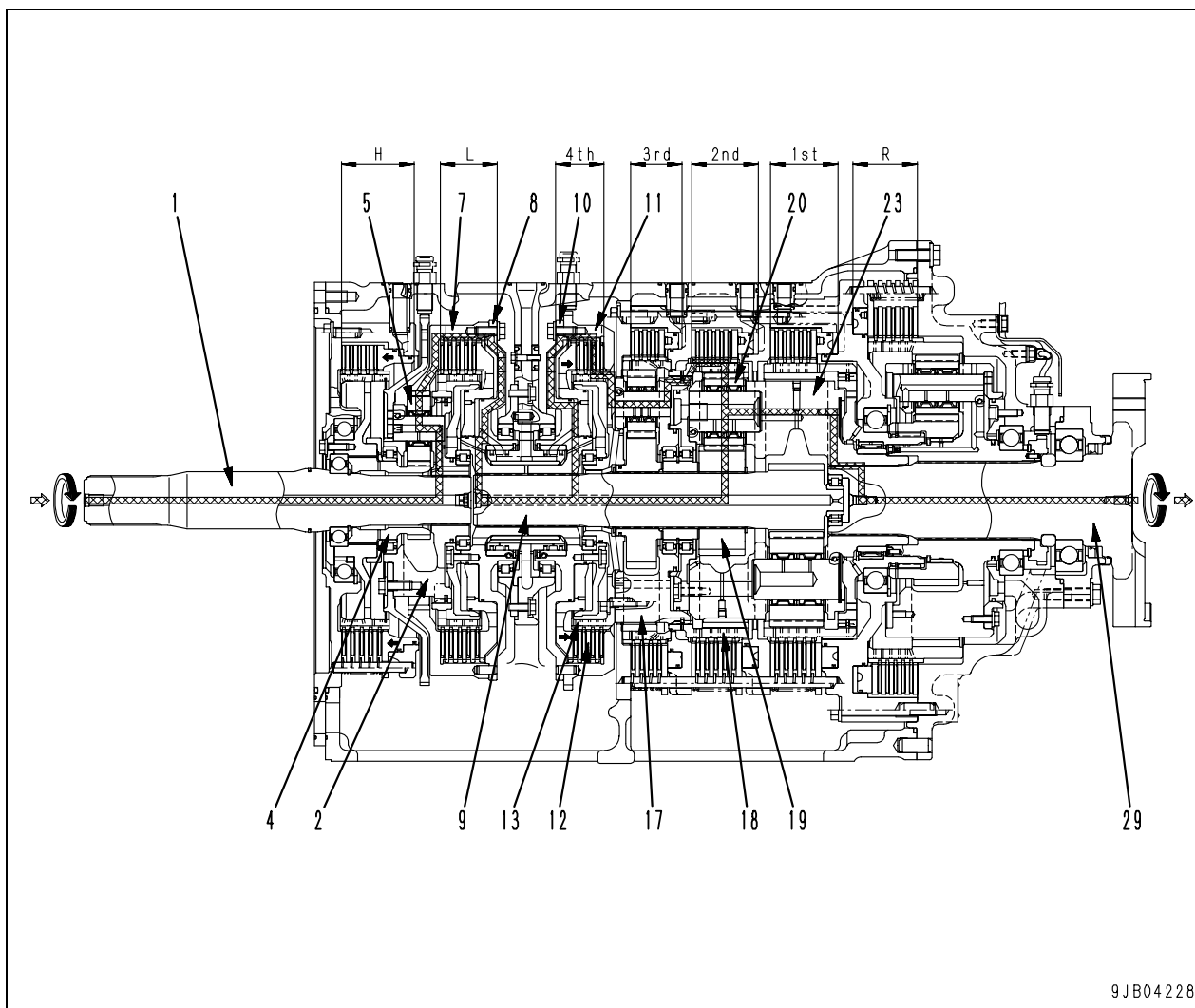


L ring gear (3) of the L clutch and 4th clutch drum (11) of the 4th clutch are fixed hydraulically.

Power from torque converter

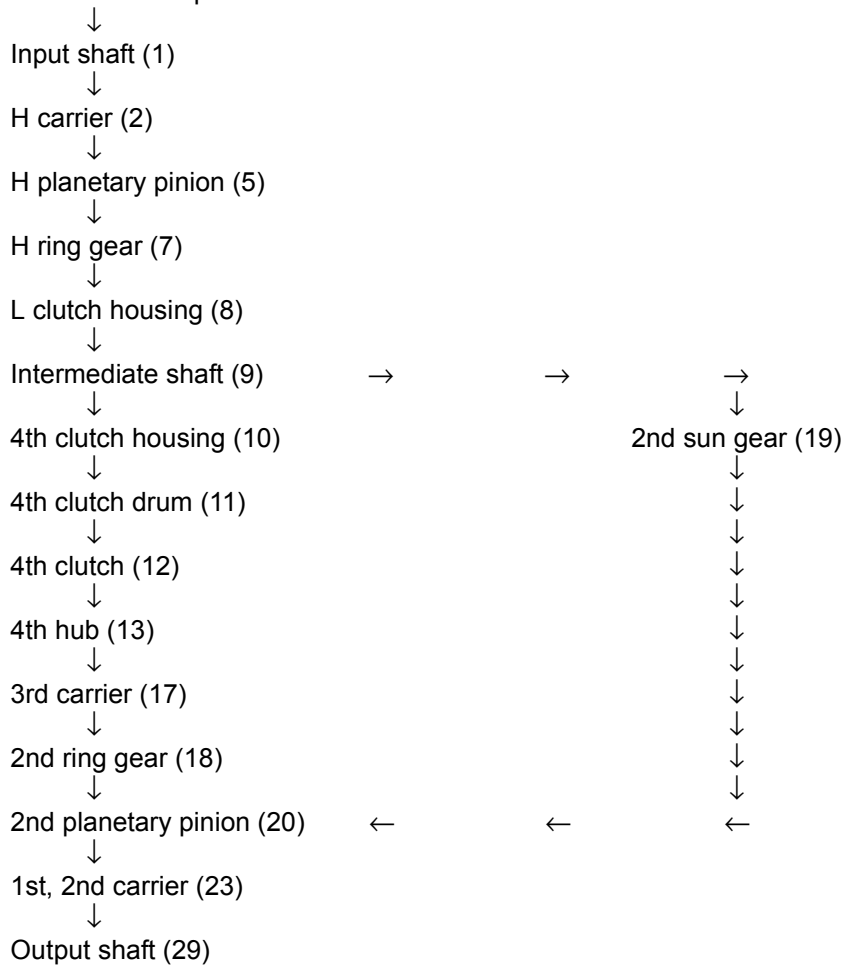


Forward 7th speed

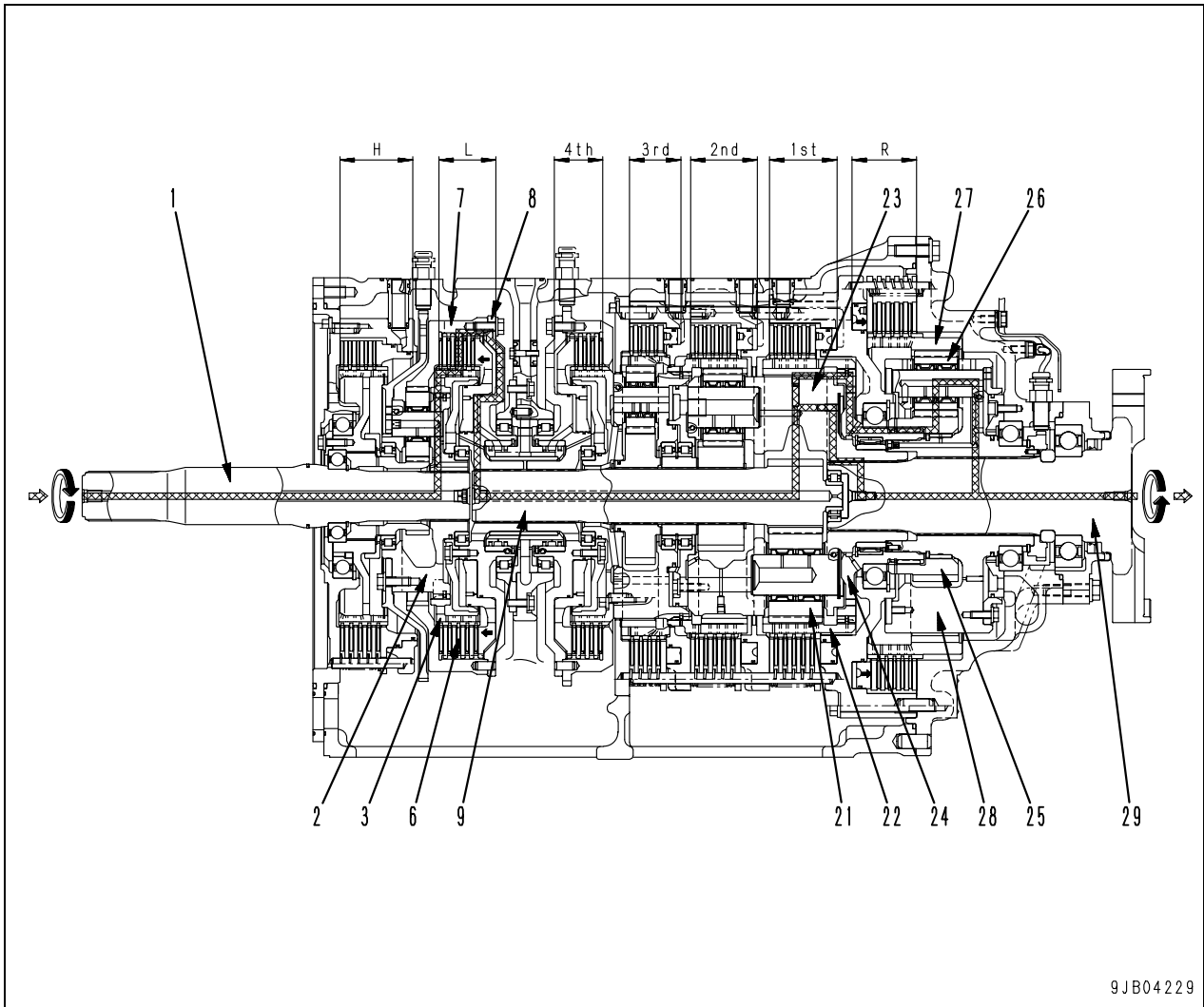


H sun gear (4) of the H clutch and 4th clutch drum (11) of the 4th clutch are fixed hydraulically.

Power from torque converter

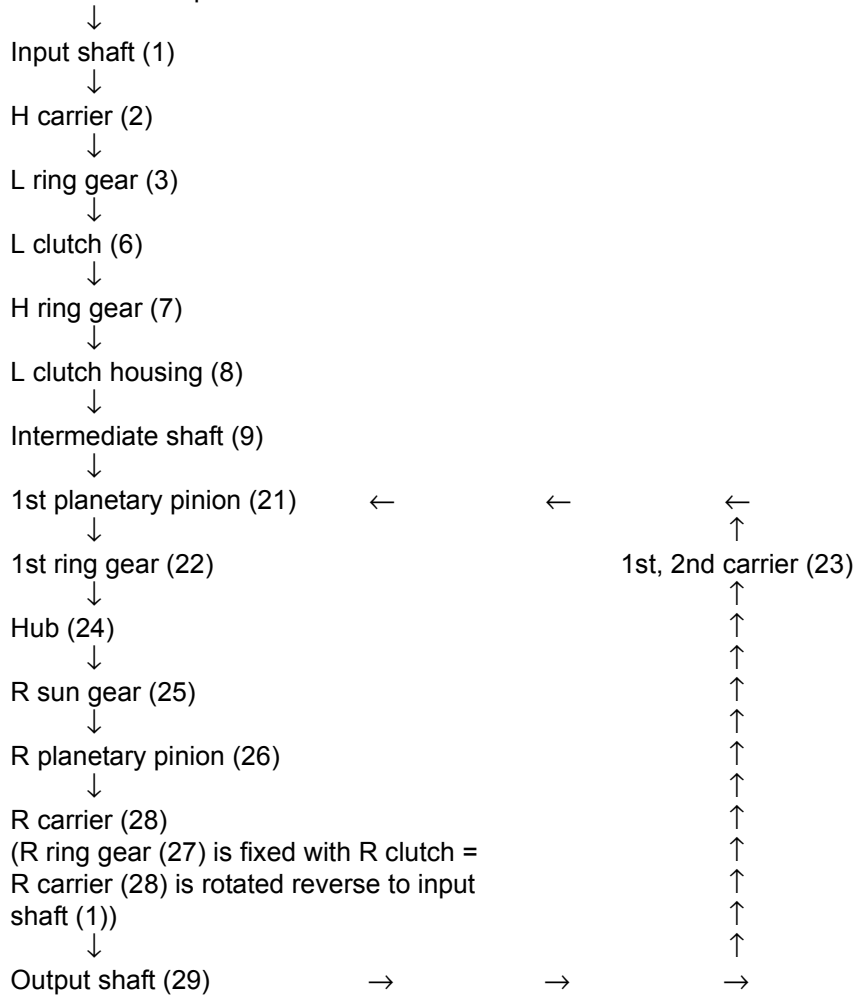


Reverse L speed

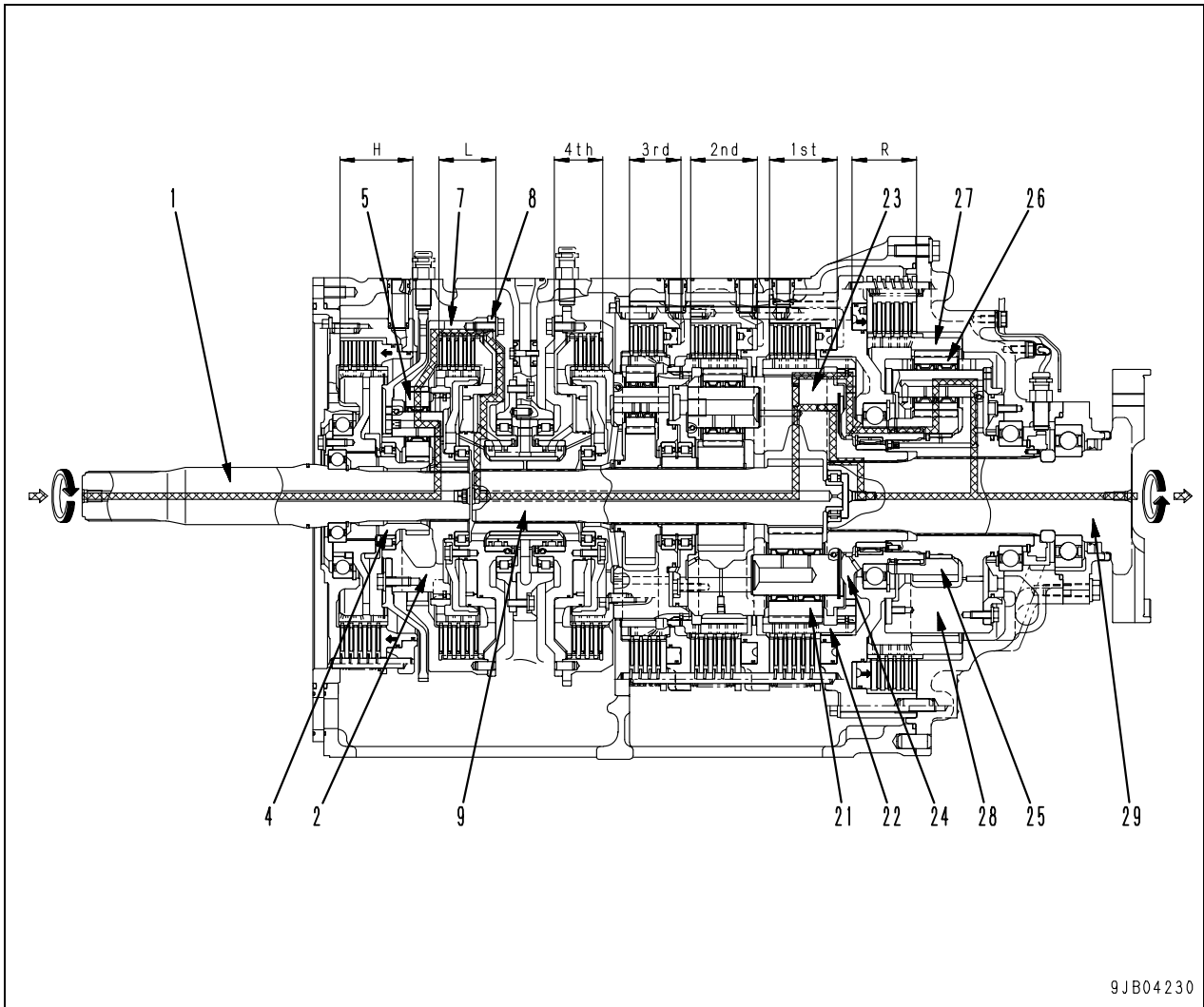


L ring gear (3) of the L clutch and R ring gear (27) of the R clutch are fixed hydraulically.

Power from torque converter

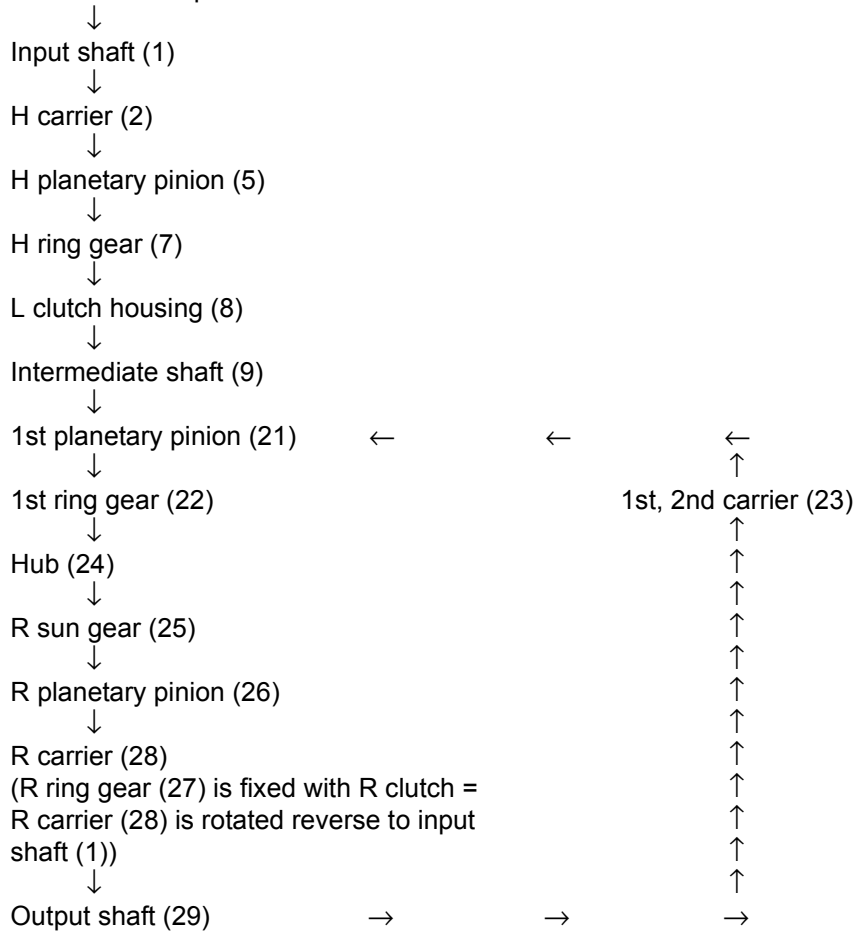


Reverse H speed

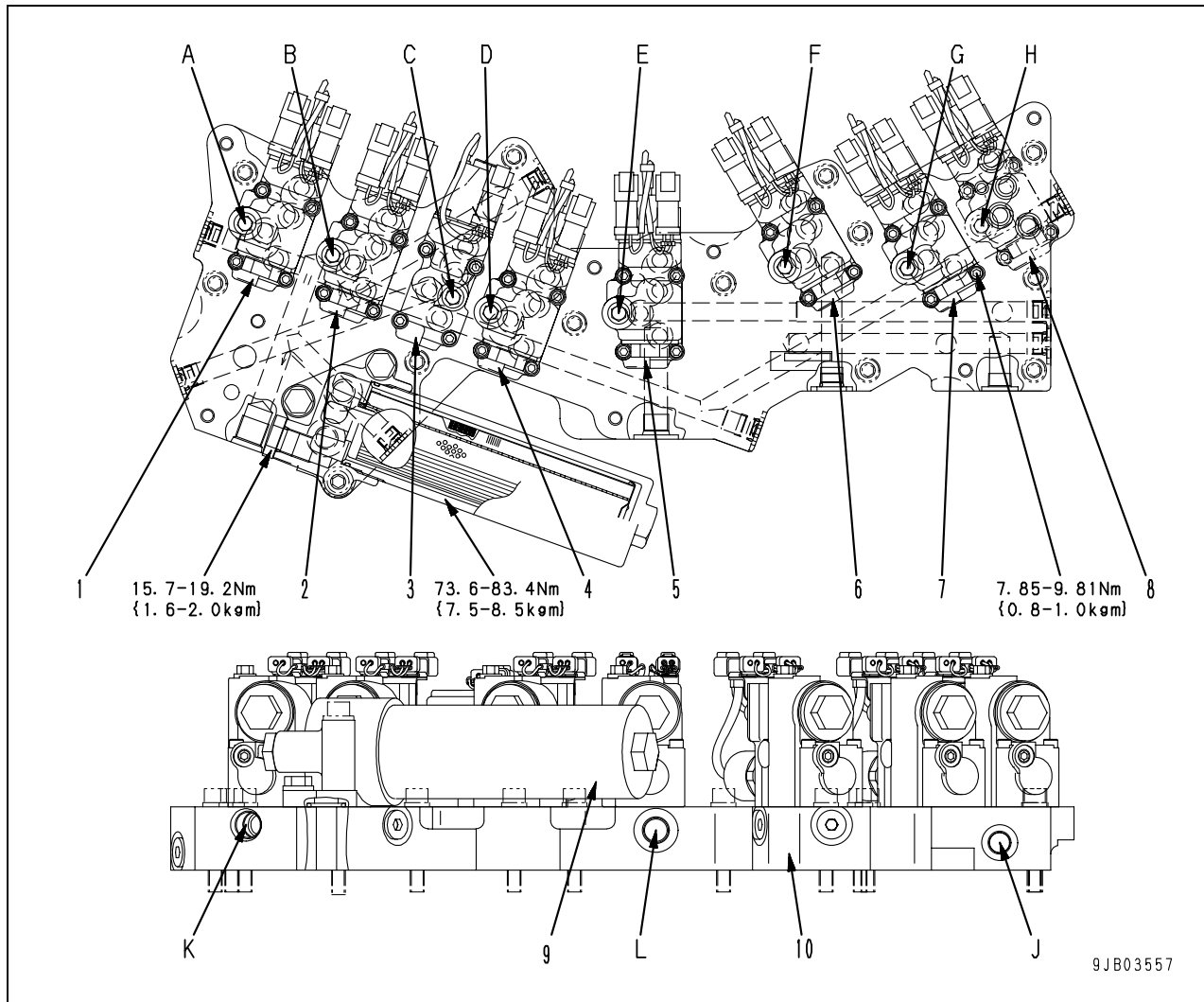


H sun gear (4) of the L clutch and R ring gear (27) of the R clutch are fixed hydraulically.

Power from torque converter



Transmission control valve



- A: H clutch oil pressure pickup port
- B: L clutch oil pressure pickup port
- C: Lockup clutch oil pressure pickup port
- D: 4th clutch oil pressure pickup port
- E: R clutch oil pressure pickup port
- F: 3rd clutch oil pressure pickup port
- G: 2nd clutch oil pressure pickup port
- H: 1st clutch oil pressure pickup port
- J: To breather
- K: To torque converter valve
(To pilot circuit of main flow rate selector valve
and main oil pressure selector valve)
- L: To Lubricating oil amount selector valve

- 1. H clutch ECMV
- 2. L clutch CMV
- 3. Lockup clutch ECMV
- 4. 4th clutch ECMV
- 5. R clutch ECMV
- 6. 3rd clutch ECMV
- 7. 2nd clutch ECMV
- 8. 1st clutch ECMV
- 9. Last chance filter
- 10. Valve seat

Operation table of ECMV

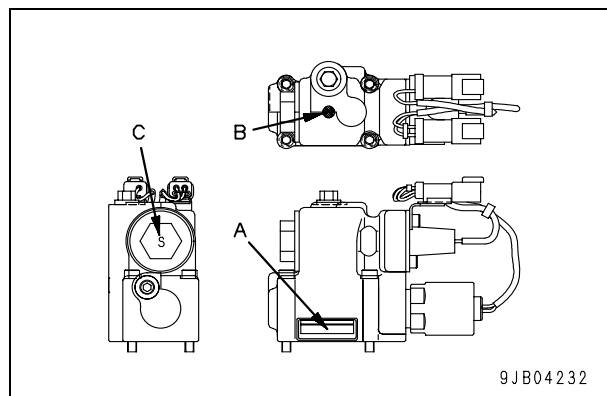
ECMV gear speed	L	H	1st	2nd	3rd	4th	R	L/U
F1	○		○					○
F2	○			○				○
F3		○		○				○
F4	○				○			○
F5		○			○			○
F6	○					○		○
F7		○				○		○
N								
R1	○						○	○
R2		○					○	○

L/U: Indicates the lockup clutch ECMV

Outline

- In the forward and reverse travel, lockup clutch ECMV operates at a speed faster than the travel speed being set from the transmission controller.
- There are 3 types of ECMV's used, which have the following distinctions and differences.

Printing on nameplate (A)	Color (B)	Stamp (C)	Flow detection valve	Fill switch (Operation pressure: MPa {kg/cm ² })	Used clutch
D*****	—	—	Equipped (Without slit)	Equipped (0.24 {2.45})	H, 1st, 2nd, 3rd, R
K*****	—	—	Not equipped	Not equipped	L/U
Q*****	Pink	S	Equipped (With slit)	Equipped (0.24 {2.45})	L, 4th

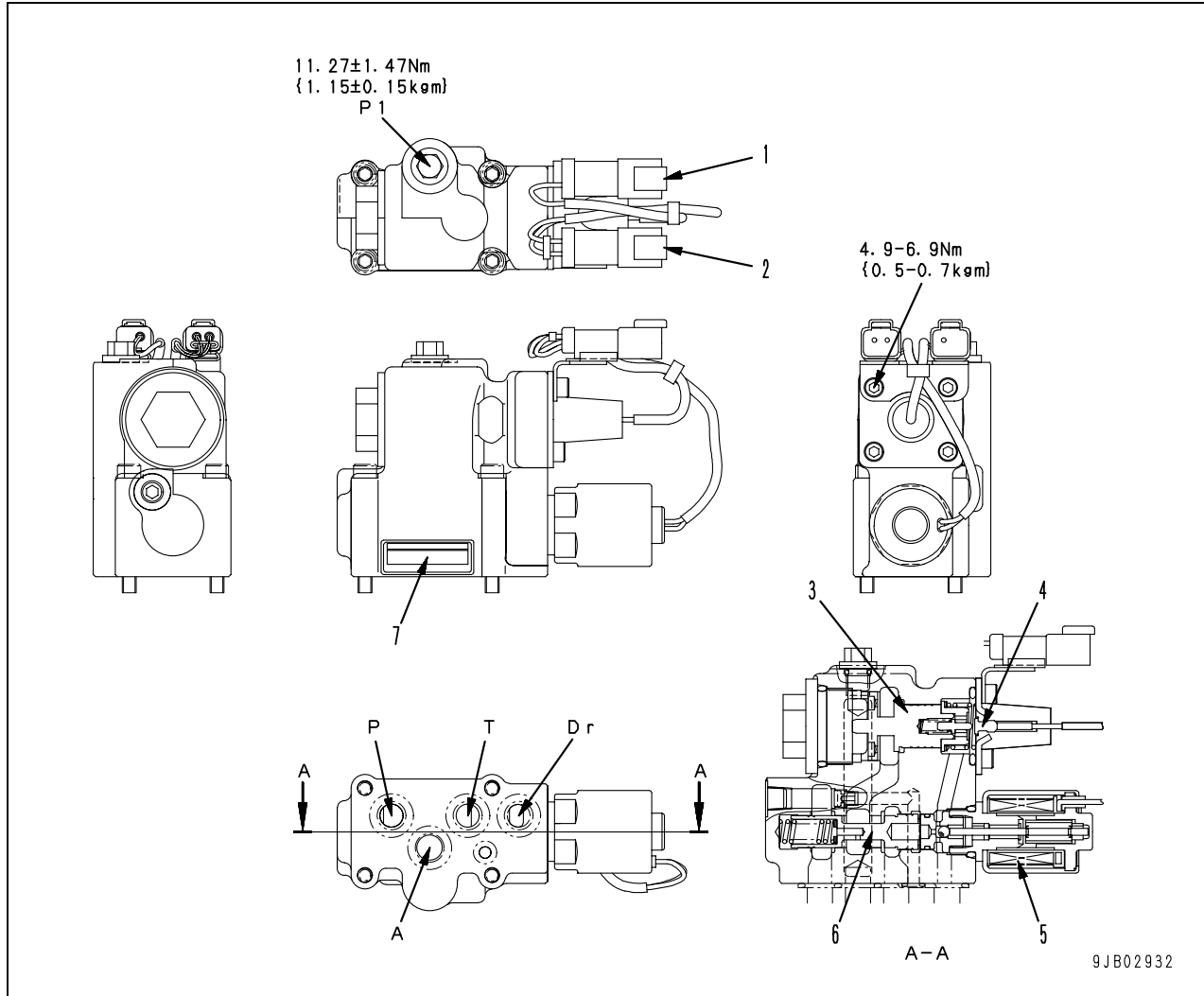


ECMV

★ ECMV: Abbreviation for Electronic Control Modulation Valve

For L, H, 1st, 2nd, 3rd and 4th clutch

★ Don't try to disassemble it since adjustment for maintaining the performance will be needed.



A: To clutch
P: From pump
T: Drain
Dr: Drain
P1: Clutch oil pressure pickup port

1. Fill switch connector
2. Proportional solenoid connector
3. Flow detection valve
4. Fill switch
5. Proportional solenoid
6. Pressure control valve (*1)
7. Nameplate (*2)

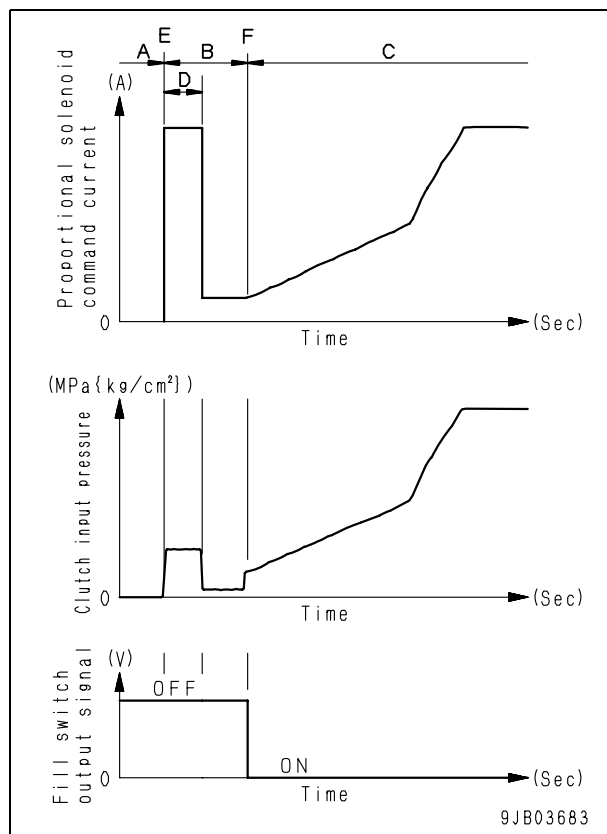
*1: The pressure control valve spool of the unit for H, 1st, 2nd, 3rd and R clutches is different from one for L and 4th clutches.

*2: The nameplate stamp of unit for H, 1st, 2nd, 3rd and R clutches is different from one for L and 4th clutches.

Clutch used	Printing on nameplate
H, 1st, 2nd, 3rd, R	D*****
L, 4th	Q*****

Outline of ECMV

- The ECMV consists of 1 pressure control valve and 1 fill switch.
- **Pressure control valve**
This valve receives the current sent from the transmission controller with a proportional solenoid, and then converts it into oil pressure.
- **Fill switch**
This switch detects that the clutch is filled with oil and has the following functions.
 1. Outputs a signal (a fill signal) to the controller to notify that filling is completed when the clutch is filled with oil.
 2. Keeps outputting signals (fill signals) to the controller to notify whether oil pressure is applied or not while oil pressure is applied to the clutch.



Range A : Before shifting gear (When draining)

Range B : During filling

Range C : Pressure regulation

Range D : During filling (During triggering)

Point E : Start of filling

Point F : Finish of filling

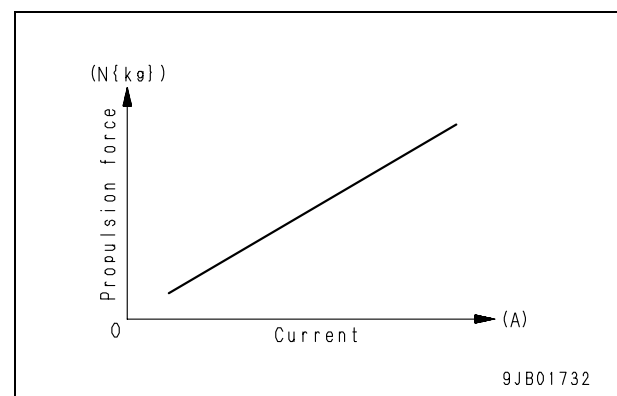
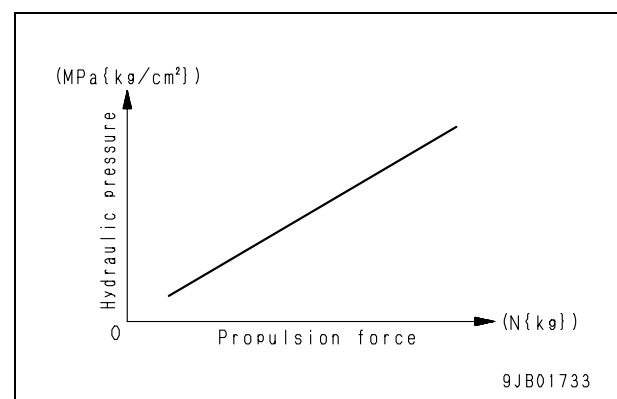
- ★ The logic is so made that the controller will not recognize completion of filling even if the fill switch is turned "ON" during triggering (Range D).

ECMV and proportional solenoid

- For each ECMV, 1 proportional solenoid is installed.

The proportional solenoid generates thrust shown below according to the command current from the controller.

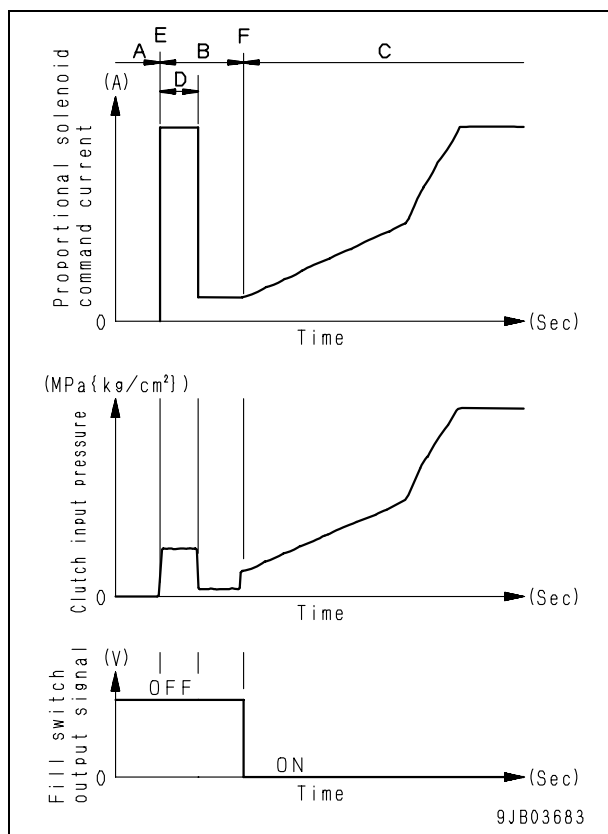
The thrust generated by the proportional solenoid is applied to the pressure control valve spool to generate oil pressure as shown in the figure below. Accordingly, the thrust is changed by controlling the command current to operate the pressure control valve to control the flow and pressure of the oil.

Current - propulsion force characteristics of proportional solenoid**Propulsion force - Hydraulic pressure characteristics of proportional solenoid****ECMV and fill switch**

- For each ECMV, 1 fill switch is installed.
If the clutch is filled with oil, the fill switch is turned "ON" by the pressure of the clutch. The oil pressure is built up according to this signal.

Operation of ECMV

- ECMV is controlled with the command current sent from the controller to the proportional solenoid and the fill switch output signal. The relationship between the proportional solenoid command current of ECMV, clutch input pressure, and fill switch output signal is shown below.



Range A : Before shifting gear (When draining)

Range B : During filling

Range C : Pressure regulation

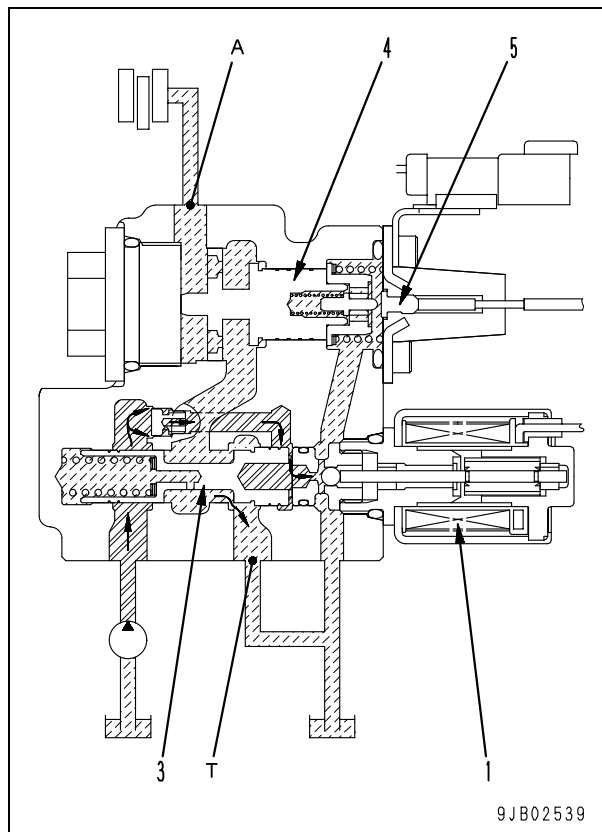
Range D : During filling (During triggering)

Point E : Start of filling

Point F : Finish of filling

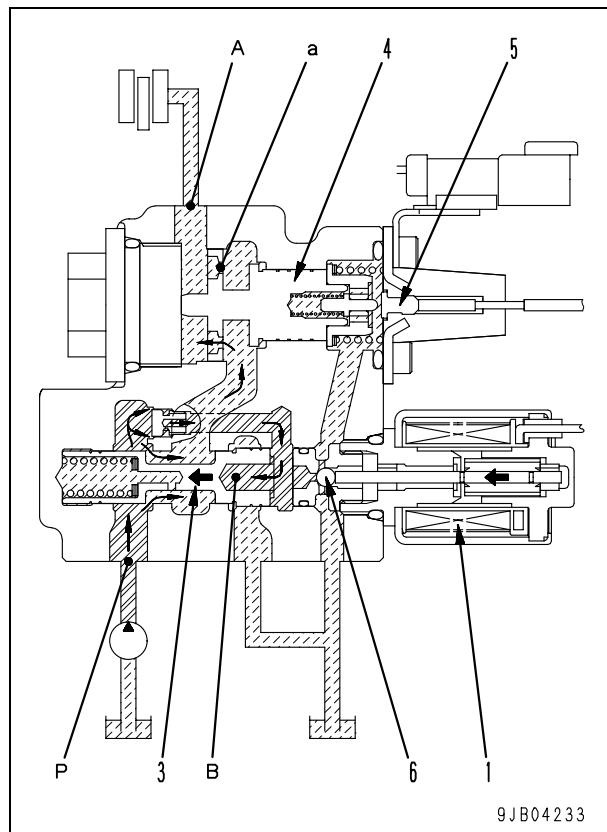
- ★ The logic is so made that the controller will not recognize completion of filling even if the fill switch is turned "ON" during triggering (Range D).

Before shifting gear (when draining) (Range A in chart)



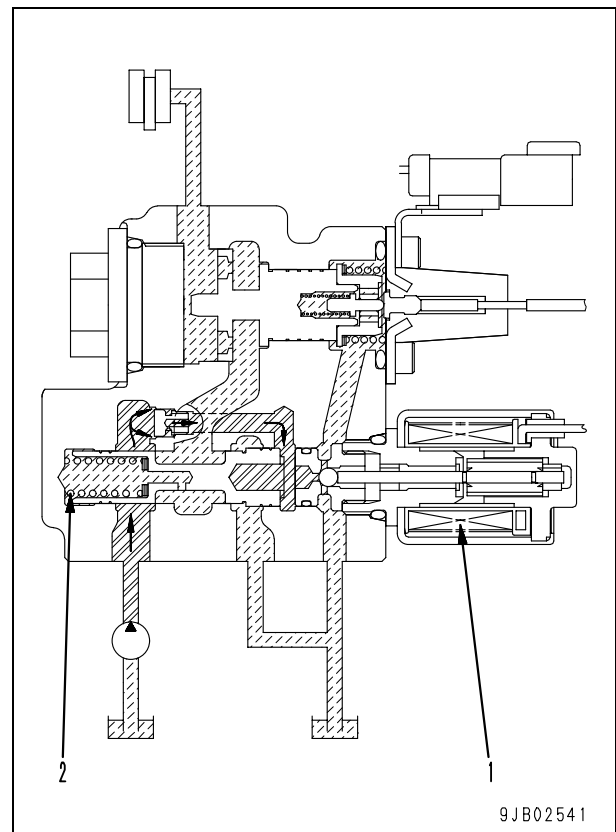
- While no current is flowing in proportional solenoid (1), pressure control valve (3) drains the oil from clutch port (A) through drain port (T). At this time, since no oil pressure is applied to flow rate pickup valve (4), fill switch (5) is turned "OFF".

During filling (Range B in chart)



- If current is applied to proportional solenoid (1) while no pressure is applied to the clutch piston, the thrust of the solenoid pushes ball (6) to the left to choke the drain circuit.
- Hydraulic force balanced with the thrust of the solenoid is applied to chamber (B) and pressure control valve (3) moves to the left.
- Oil starts flowing from pump port (P) through orifice (a) of flow detection valve (4) into the clutch chamber.
- Differential pressure is generated between the upstream side and downstream side of orifice (a) of flow detection valve (4) and flow detection valve (4) moves to the left.
- If the clutch chamber is filled with oil and no oil flows from pump port (P) into clutch port (A), the differential pressure between both sides of orifice (a) of flow detection valve (4) lowers to zero.
- Flow detection valve (4) is pushed to the right by the hydraulic force generated by the area difference between clutch port (A) side and drain port side of flow detection valve and the fill switch (5) is turned "ON".

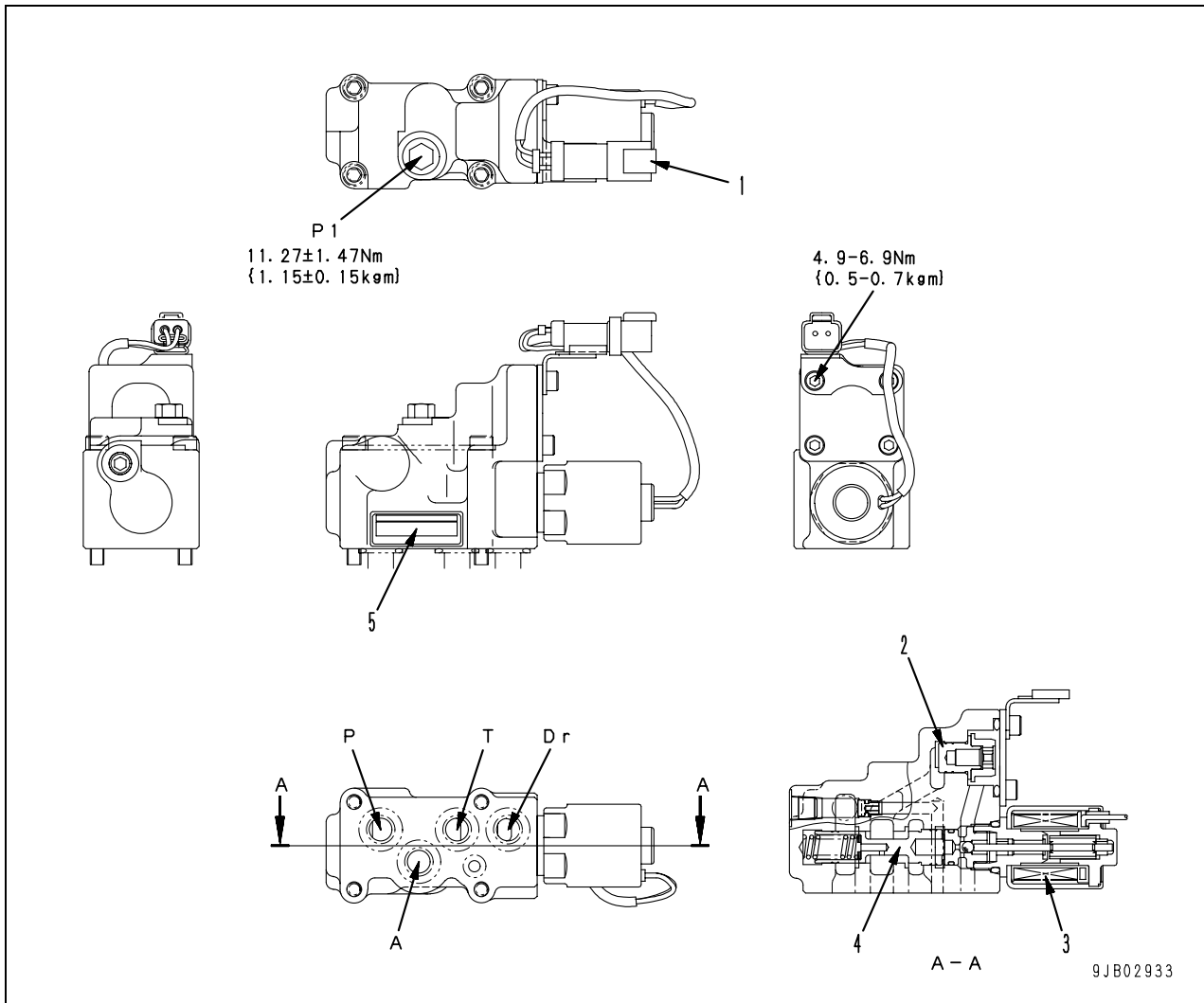
Pressure adjustment (Range C in chart)



- As current is conducted to proportional solenoid (1), the solenoid generates thrust in proportion to the current. The pressure is settled as the sum of this thrust of the solenoid, thrust generated by the oil pressure in clutch port and the repulsive force of pressure control valve spring (2) is balanced.

For lockup clutch

★ Don't try to disassemble it since adjustment for maintaining the performance will be needed.



A: To clutch
P: From pump
T: Drain
Dr: Drain
P1: Clutch oil pressure pickup port

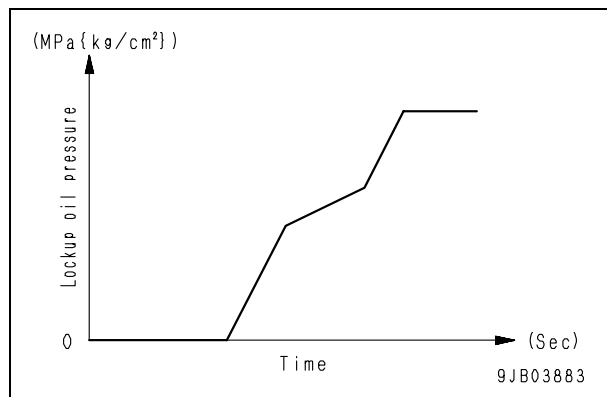
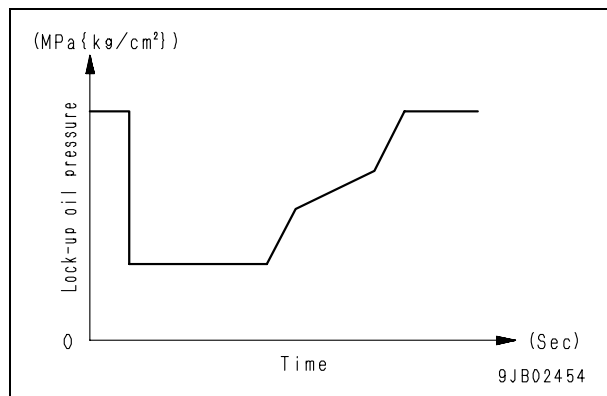
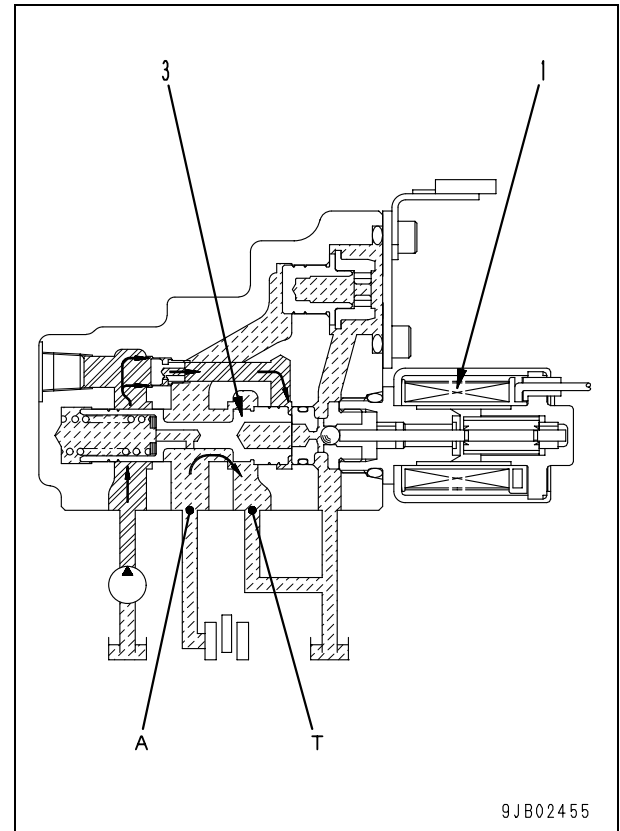
*1:

Clutch used	Printing on nameplate
Lockup	K*****

1. Proportional solenoid connector
2. Sleeve
3. Proportional solenoid
4. Pressure control valve
5. Nameplate (*1)

Outline

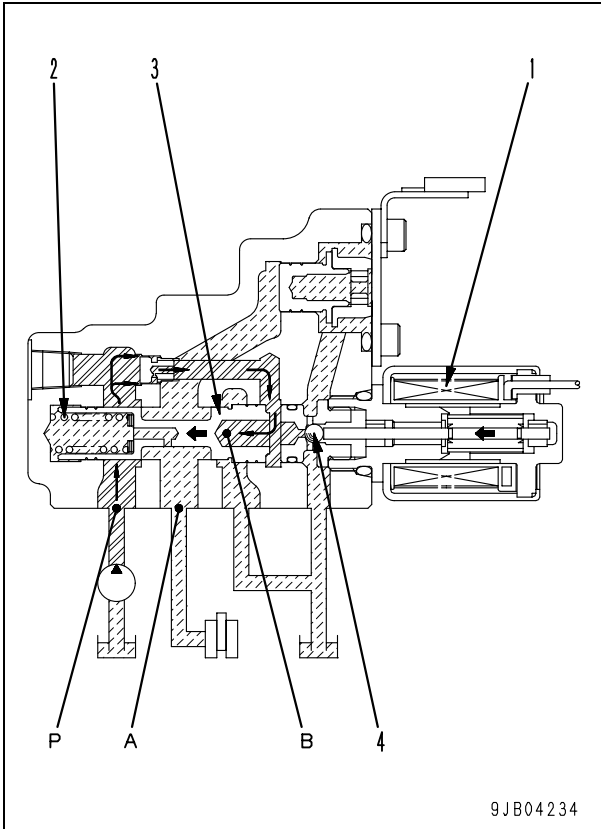
- This valve is used to switch the clutch in order to regulate the clutch oil pressure to the set pressure. Since the modulation waveform is used for the pressure application characteristics to the clutch, ECMV is capable of connecting the lockup clutch smoothly, thereby reducing shocks resulting from gear shift. Above also prevents generation of peak torque in the power train. These arrangements make the machine comfortable to operator and enhance durability of the power train.

When changing from torque converter travel to direct travel**At gear shift (in direct travel)****Operation****When traveling in torque converter range**

- While no current is flowing into proportional solenoid (1), pressure control valve (3) drains the oil from clutch port (A) through drain port (T).

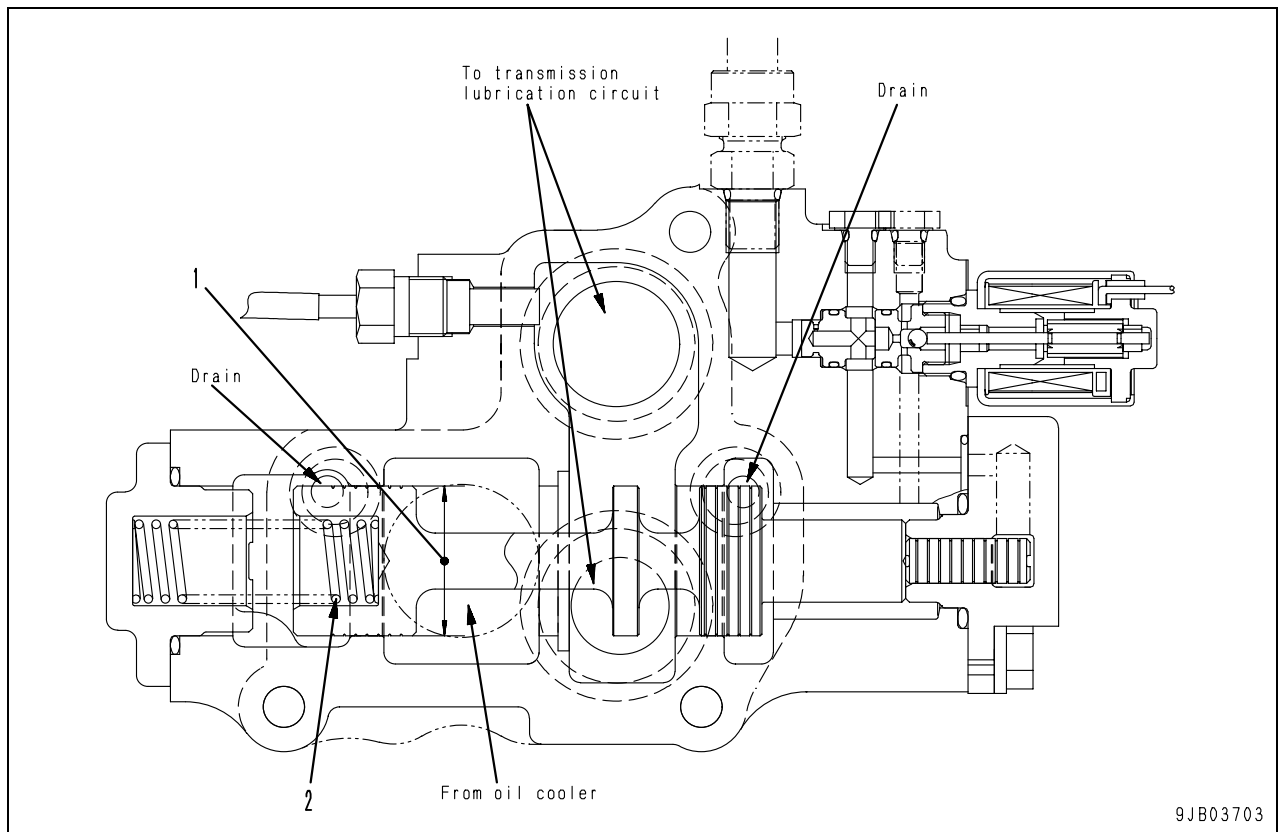
When traveling in direct range

(Torque converter travel → direct travel)



- If current is applied to proportional solenoid (1), the thrust of the solenoid pushes ball (4) to the left to choke the drain circuit.
- Hydraulic force balanced with the thrust of the solenoid is applied to chamber (B) and pressure control valve (3) moves to the left.
- Pump port (P) and clutch port (A) open and oil starts flowing into the clutch.
- As the clutch is filled with oil, the solenoid thrust is balanced with the sum of the thrust generated from oil pressure of the clutch port and the tension of the pressure control valve spring (2), then the pressure is settled.
- To reduce gear shift shocks, the hydraulic pressure applied to the clutch piston is lowered temporarily when the gear is shifted. At this time, the force pressing the clutch piston is balanced with the internal pressure of the torque converter.

Lubricating oil amount selector valve



Unit: mm

No.	Check item	Criteria					Remedy	
1	Clearance between the spool and valve body	Standard size	Tolerance		Standard clearance	Clearance limit	Replace	
			Shaft	Hole				
		40	−0.035 −0.045	+0.016 0	0.035 − 0.061	0.081		
2	Lubricating oil amount selector valve spring	Standard size			Repair limit			
		Free length	Installed length	Installed load	Free length	Installed load		
		103.5	65	134.3 N {13.7 kg}	100.4	127.4 N {13.0 kg}		

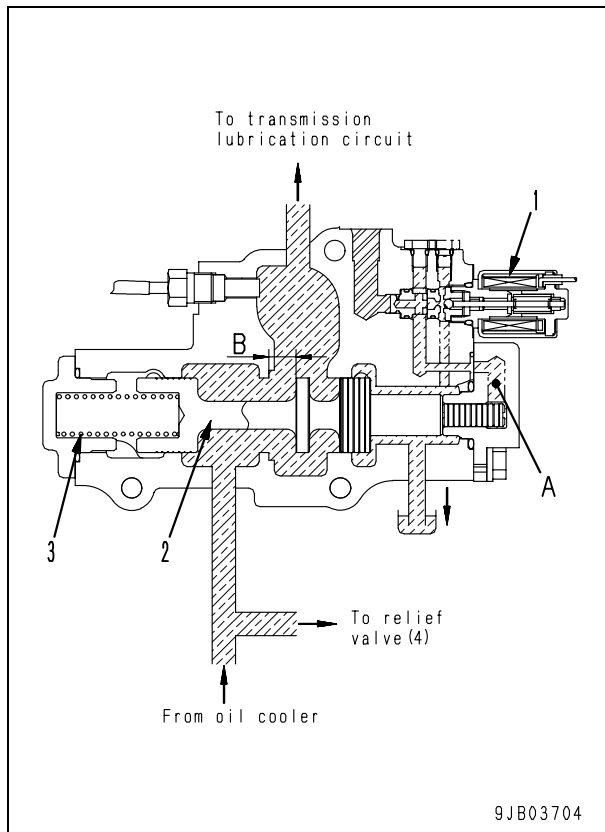
Outline

This valve switches the amount of lubricating oil to be fed to the transmission.

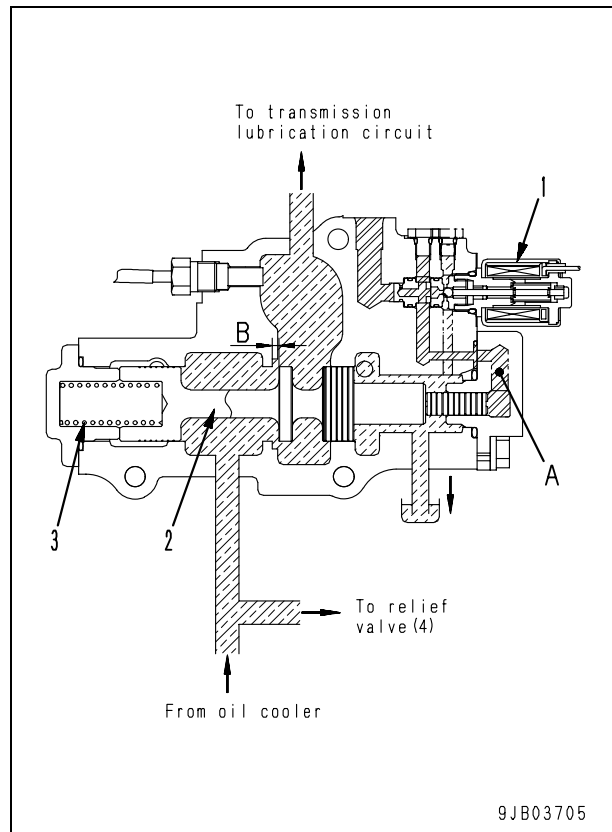
If the amount of oil needed for lubricating the transmission is small, it reduces the oil less than the normal level.

This arrangement reduces oil loss in the operation and improves the fuel consumption.

This switching takes place automatically when F6 or F7 is selected.

Principle of operation**When the solenoid is "de-energized"**

- While current is not conducted to solenoid (1), chamber (A) is connected to the drain port. Thus oil pressure is not generated. Thus, spool (2) is constantly pushed rightward by force of spring (3).

When the solenoid is "energized"

- As current is conducted to solenoid (1), oil pressure is generated in chamber (A) and spool (2) is pushed to the left. As the result, space of passage (B) of lubricating oil is reduced.

Unlike when the solenoid is de-energized, the reduced passage flows a large amount of oil to relief valve (4) in front of the valve, reducing the lubricating oil in the transmission.

HD785-7 Dump truck

Form No. SEN01282-01

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

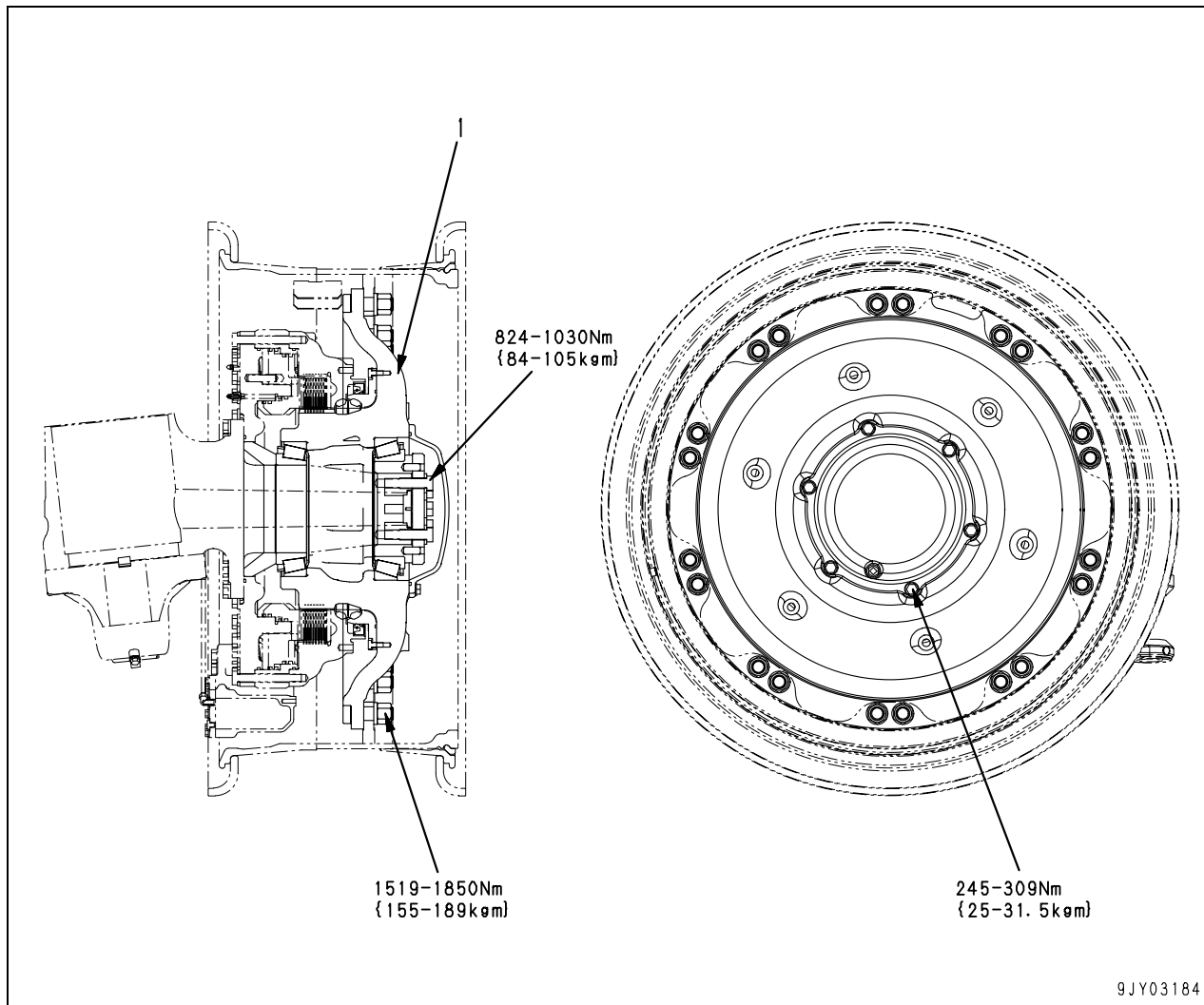
10 Structure, function and maintenance standard

Power train, Part 2

Axle	2
Differential	4
Final drive	5
Wheels	6

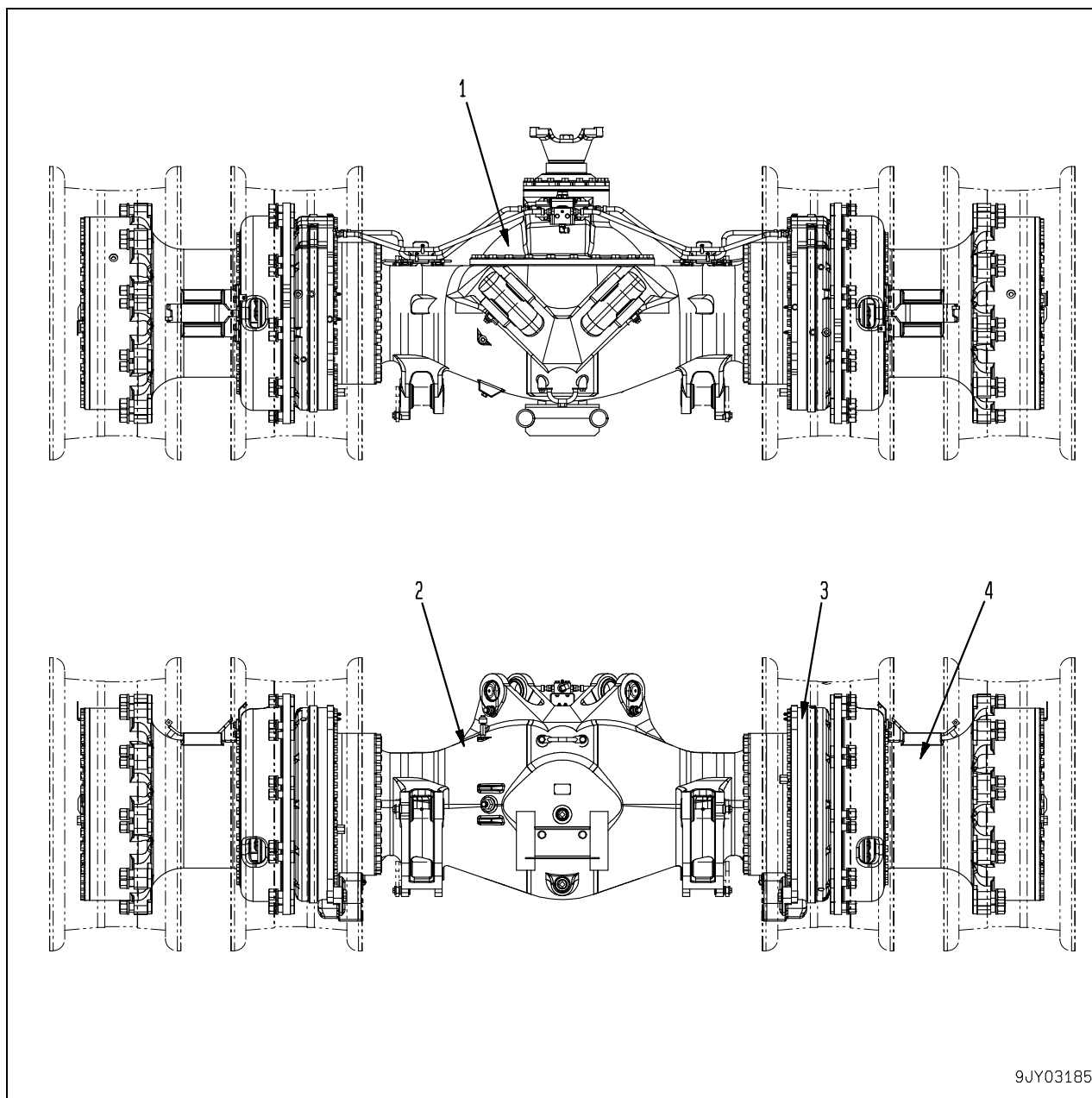
Axle

Front



1. Wheel hub

Rear



1. Differential
2. Axle housing
3. Brake
4. Final drive

Specifications

Reduction ratio

Differential: 3.357

Final drive : 6.333

Oil

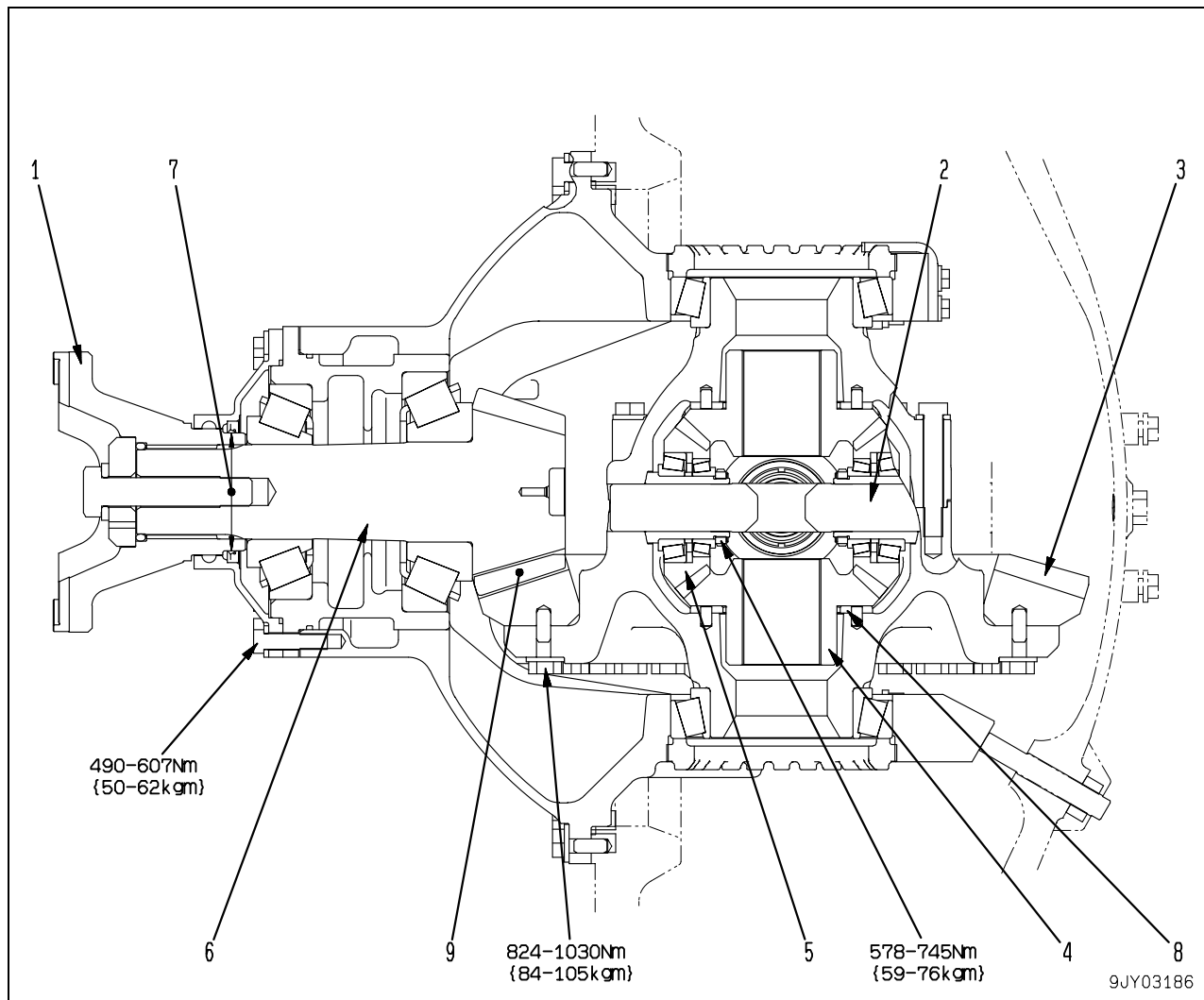
Differential: T030 (137 liters)

Final drive : T030 (64 liters each side)

Tire size : 27.00R49

Rim size: 19.50 x 49

Differential



1. Coupling
2. Cross shaft
3. Bevel gear (No. of teeth: 47)
4. Side gear (No. of teeth: 24)
5. Pinion gear (No. of teeth: 20)
6. Bevel pinion (No. of teeth: 14)

Specifications

Type: Spiral bevel gear, splash-type lubrication

Reduction ratio: 3.357

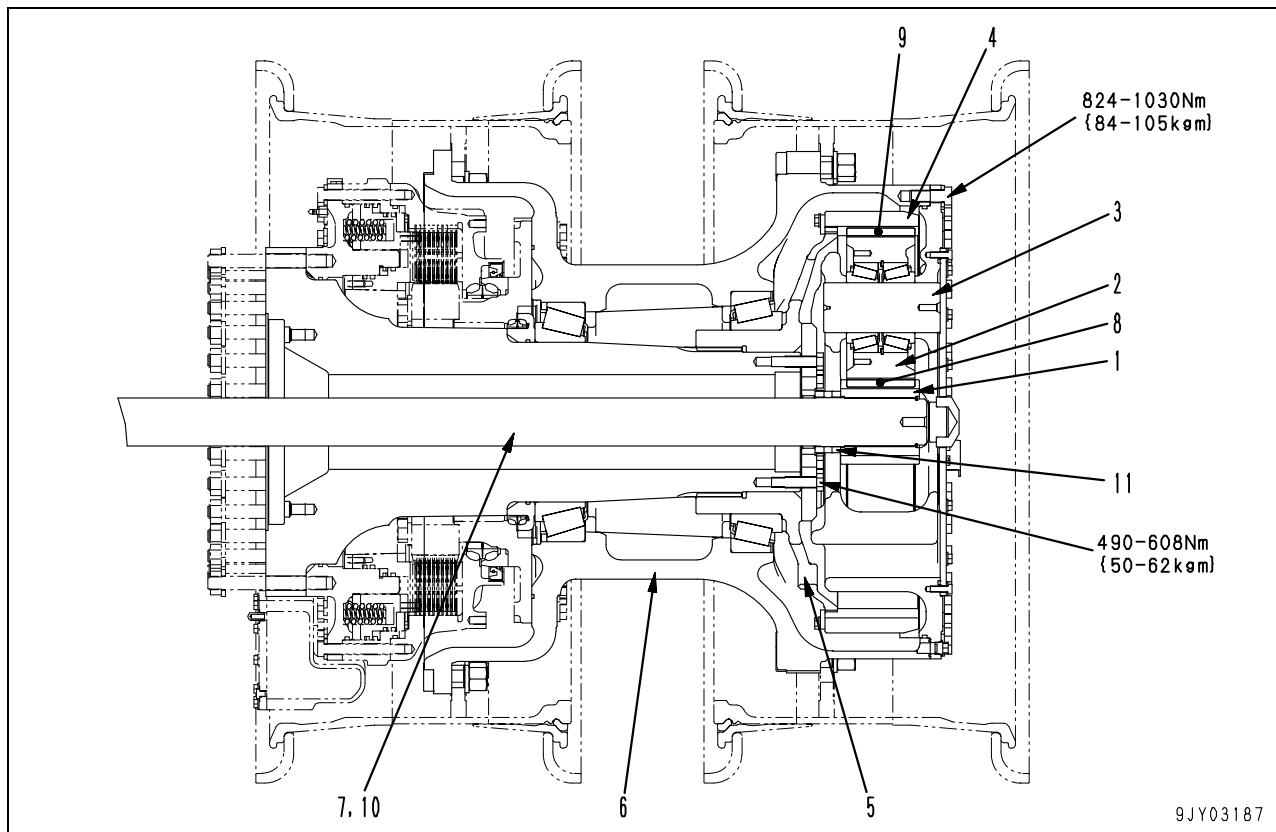
Differential: Straight bevel gear, splash-type lubrication

Oil: T030 (137 liters)

Unit: mm

No.	Check item	Criteria			Remedy
		Standard size	Tolerance	Repair limit	
7	Wear of oil seal contact surface of coupling	150	0 -0.100	—	Repair or replace
8	Thickness of side gear thrust washer	9	0 -0.050	8.5	Replace
9	Backlash between bevel gear and pinion	0.41 – 0.56			Adjust

Final drive



1. Sun gear (No. of teeth: 18)
2. Planetary gear (No. of teeth: 37)
3. Planetary gear shaft
4. Ring gear (No. of teeth: 96)
5. Inner hub
6. Wheel hub
7. Drive shaft

Specification

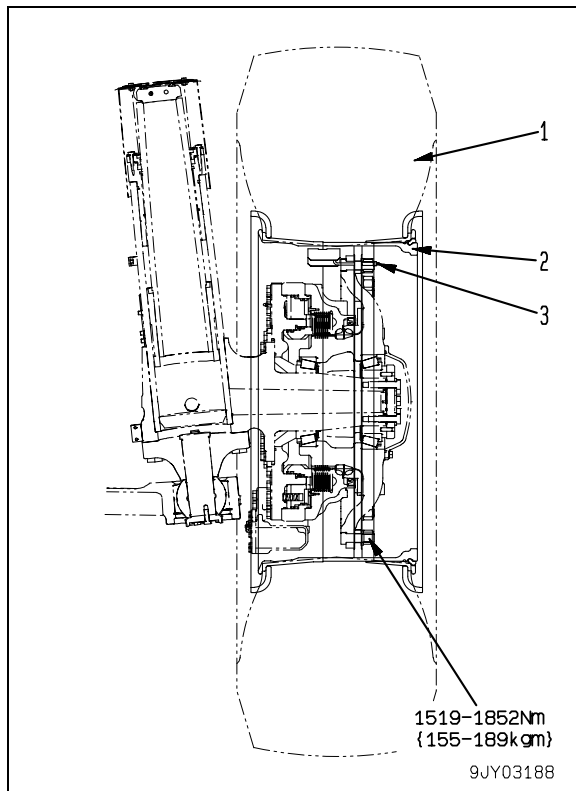
Type: Planetary gear, splash-type lubrication
 Reduction ratio: 6.333
 Oil: T030 (64 liters each side)

Unit: mm

No.	Check item	Criteria			Remedy
8	Backlash between planetary gear and sun gear	Standard backlash	Repair limit		Replace
		0.21 – 0.73	0.8		
9	Backlash between planetary gear and ring gear	0.25 – 0.83	1.0		
10	Curvature of drive shaft	Repair limit: 1.5 TIR			Repair or replace
11	Thickness of spacer	Standard size	Tolerance	Repair limit	Replace
		51	±0.1	49	

Wheels

Front wheel



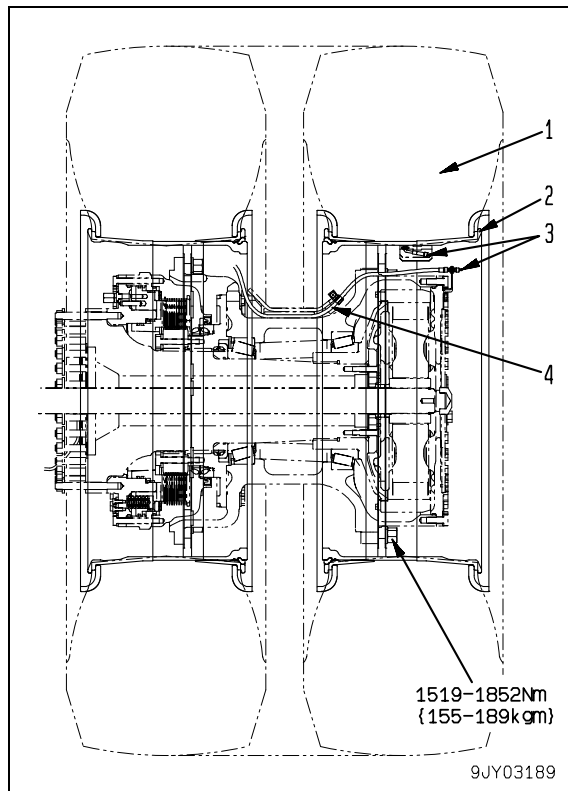
1. Tire
2. Rim assembly
3. Valve

Specifications

Rim size: 19.50 x 49

Tire size: 27.00R49

Rear wheel



1. Tire
2. Rim assembly
3. Valve
4. Extension

Specifications

Rim size: 19.50 x 50

Tire size: 27.00R49

HD785-7 Dump truck

Form No. SEN01283-01

DUMP TRUCK

HD785-7

Machine model Serial number

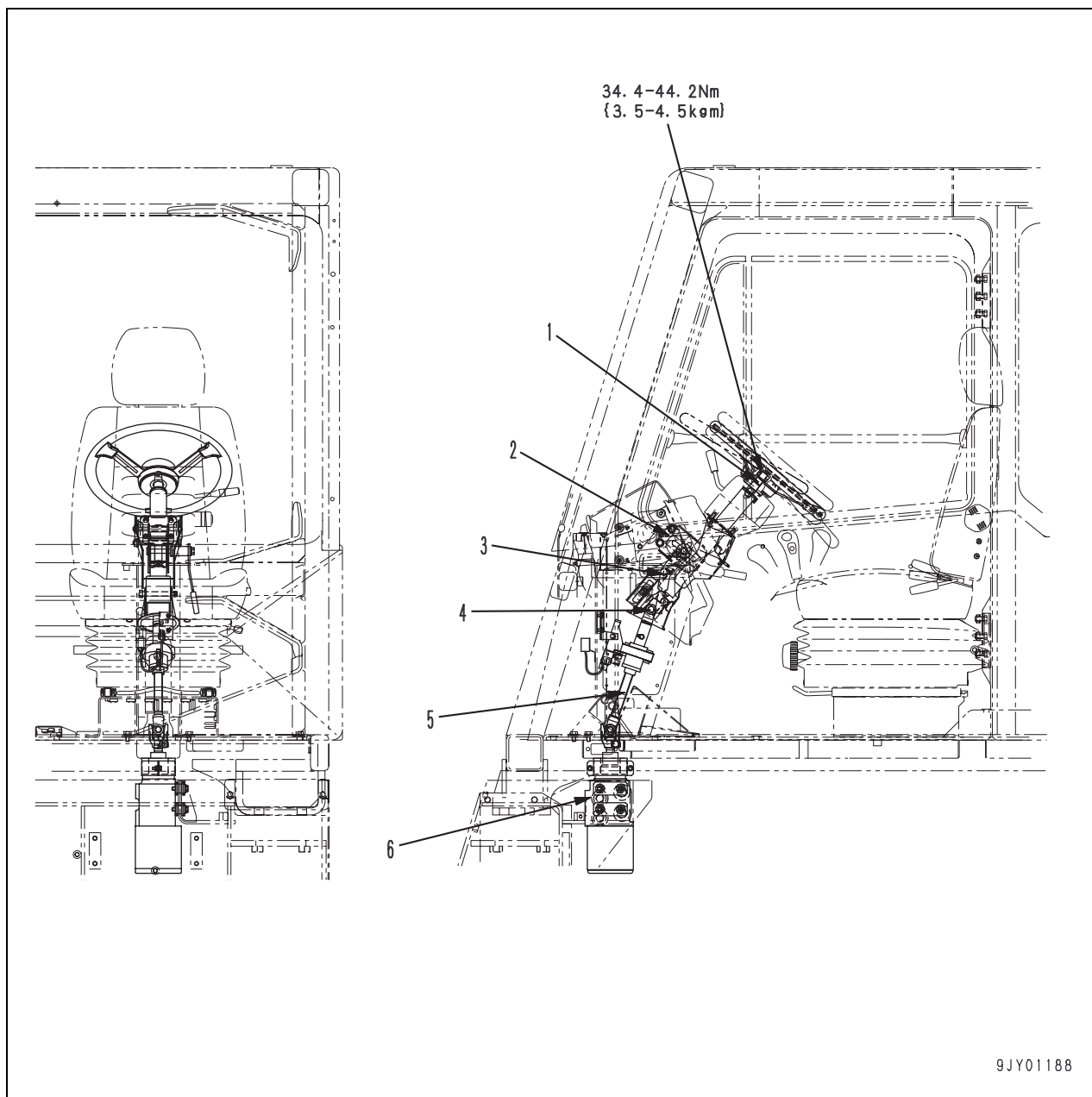
HD785-7 7001 and up

10 Structure, function and maintenance standard

Steering system

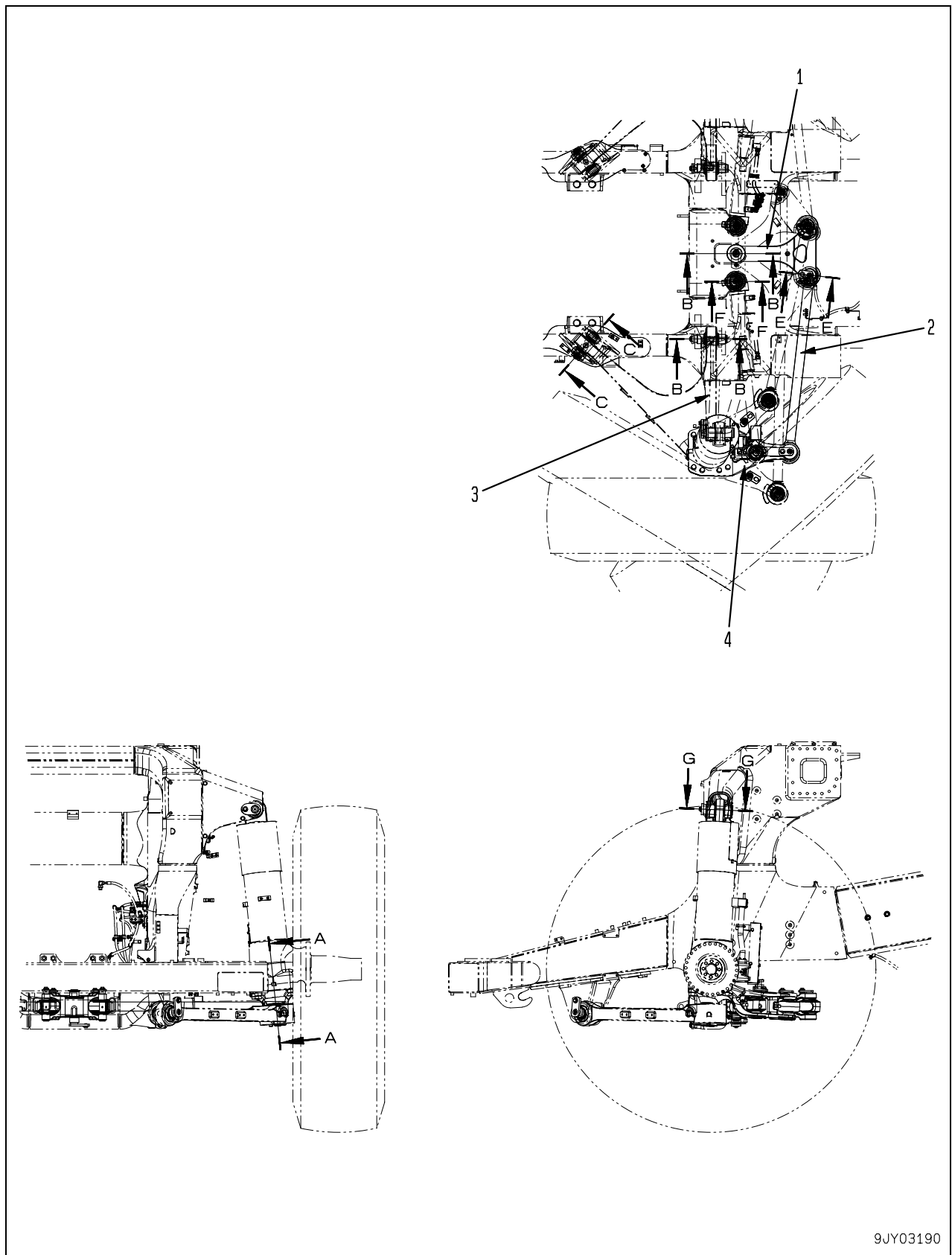
Steering column	2
Steering linkage	3

Steering column



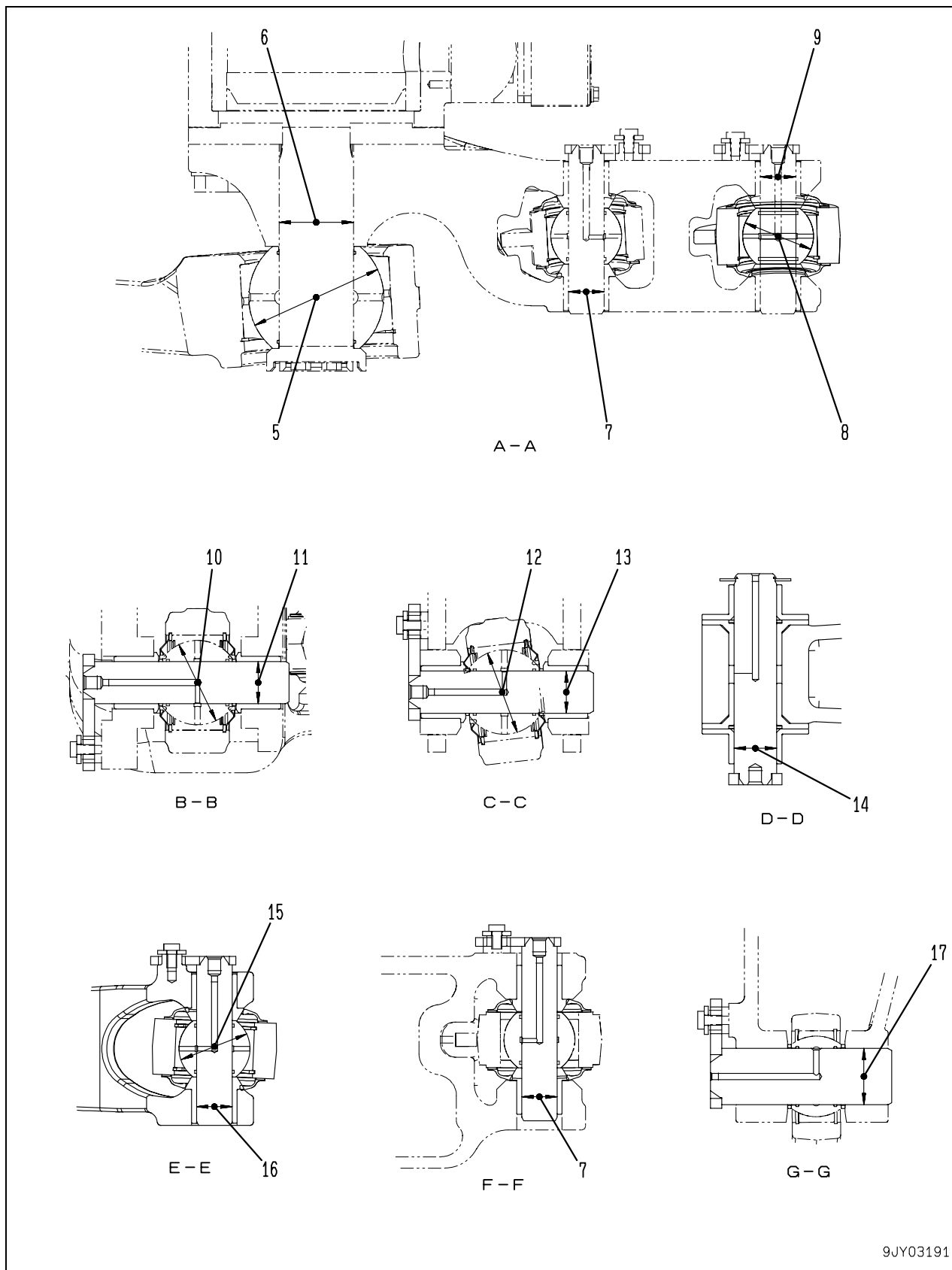
1. Steering shaft
2. Steering column
3. Lock lever
4. Yoke
5. Joint shaft
6. Steering valve

Steering linkage



- 1. Center lever
- 2. Tie rod

- 3. Arm (A-frame)
- 4. Knuckle arm



10 Structure, function and maintenance standard

SEN01284-01

Unit: mm

No.	Check item	Criteria					Remedy
5	Clearance between inner and outer for knuckle arm bushing	Standard size	Tolerance		Standard clearance	Clearance limit	Replace
			Shaft	Hole			
		190			0.150 – 0.270	0.7	
6	Clearance between bushing and pin	105	0 –0.022	+0.054 0	0 – 0.076	0.3	
7	Clearance between steering cylinder mounting pin and bushing	50	–0.025 –0.064	+0.069 +0.030	0.055 – 0.133	0.3	
8	Clearance between inner and outer bushing	100			0.120 – 0.250	0.4	
9	Clearance between tie rod mounting pin and bushing	50	–0.025 –0.064	+0.069 +0.030	0.055 – 0.133	0.3	
10	Clearance between inner and outer bushing	120			0.120 – 0.250	0.4	
11	Clearance between arm mounting pin and bushing	60	–0.030 –0.076	+0.076 +0.030	0.060 – 0.152	0.3	
12	Clearance between inner and outer bushing	120			0.120 – 0.250	0.4	
13	Clearance between arm mounting pin and bushing	60	–0.030 –0.076	+0.076 +0.030	0.060 – 0.152	0.3	
14	Clearance between center lever mounting pin and bushing	60	–0.030 –0.076	+0.197 +0.137	0.167 – 0.273	1.0	
15	Clearance between inner and outer bushing	100			0.120 – 0.250	0.4	
16	Clearance between tie rod mounting pin and bushing	50	–0.025 –0.064	+0.069 +0.030	0.055 – 0.133	0.3	
17	Clearance between suspension cylinder mounting pin and bushing	80	–0.030 –0.076	+0.046 0	0.030 – 0.122	0.3	

HD785-7 Dump truck

Form No. SEN01284-01

DUMP TRUCK

HD785-7

Machine model Serial number

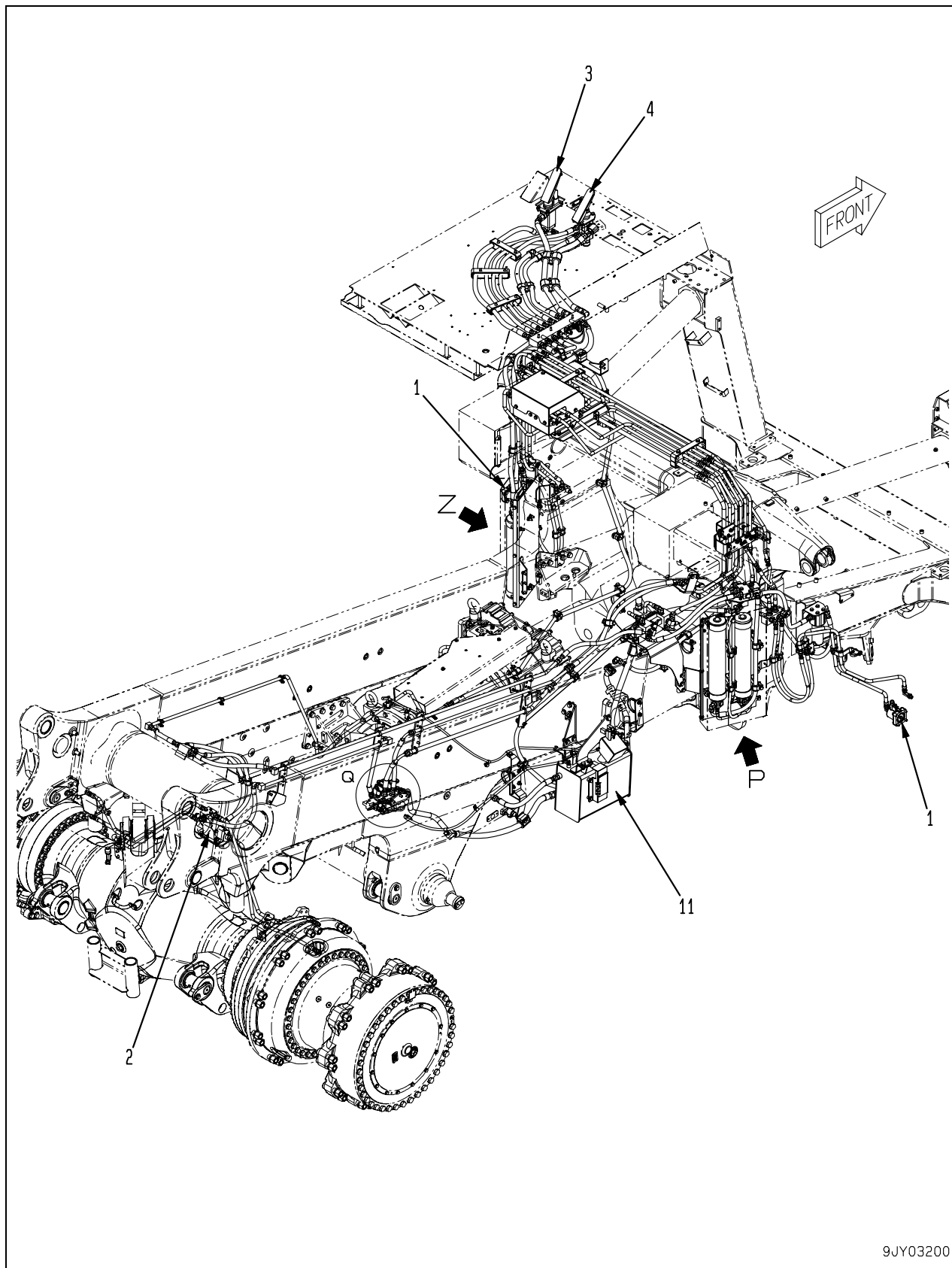
HD785-7 7001 and up

10 Structure, function and maintenance standard

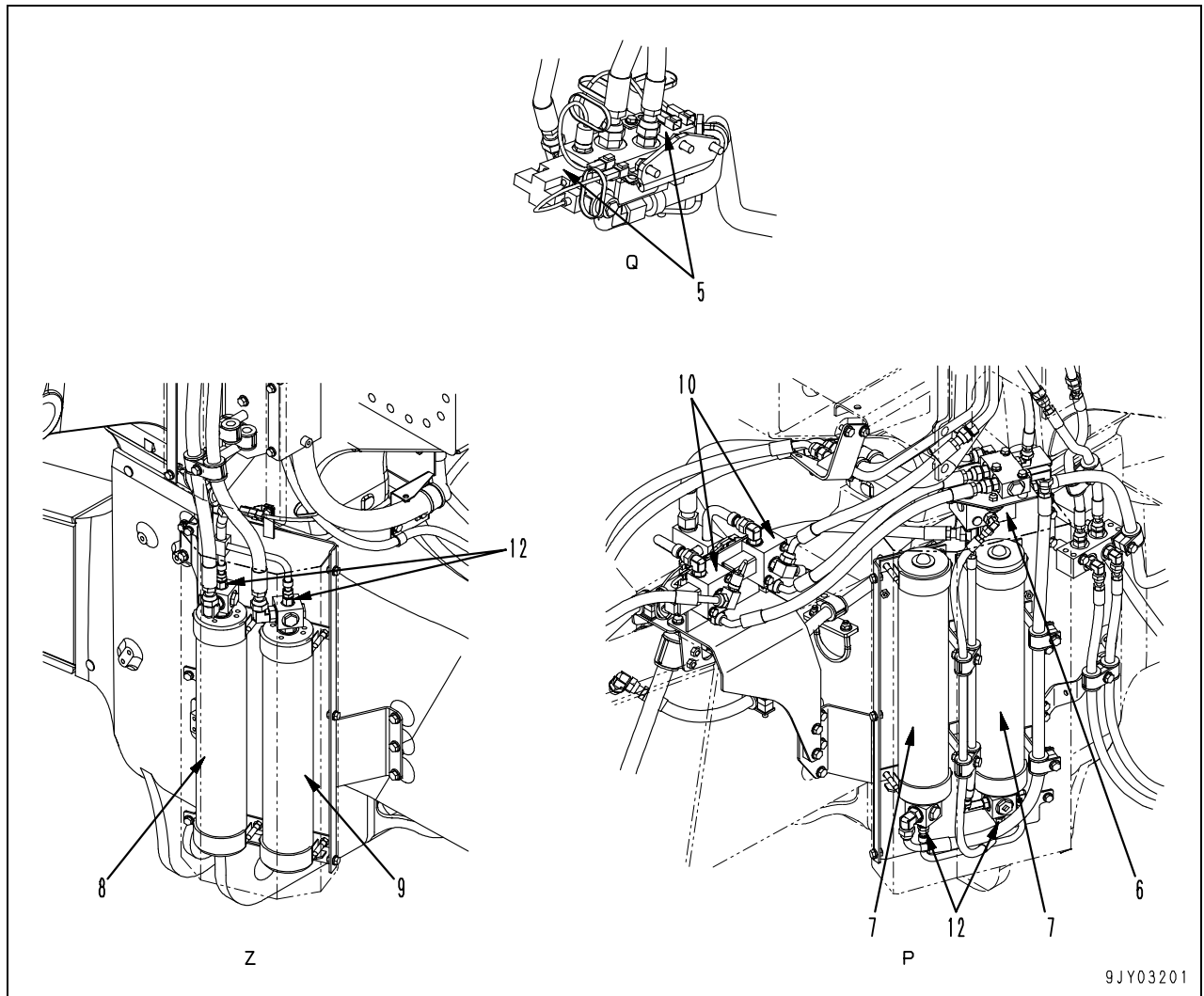
Brake system

Brake piping	2
Brake valve	4
Secondary brake valve	7
Accumulator charge valve.....	8
Accumulator	12
Slack adjuster	13
Brake, parking brake.....	17
Parking brake solenoid	23
Solenoid valve.....	24
Exhaust brake	26

Brake piping



9JY03200

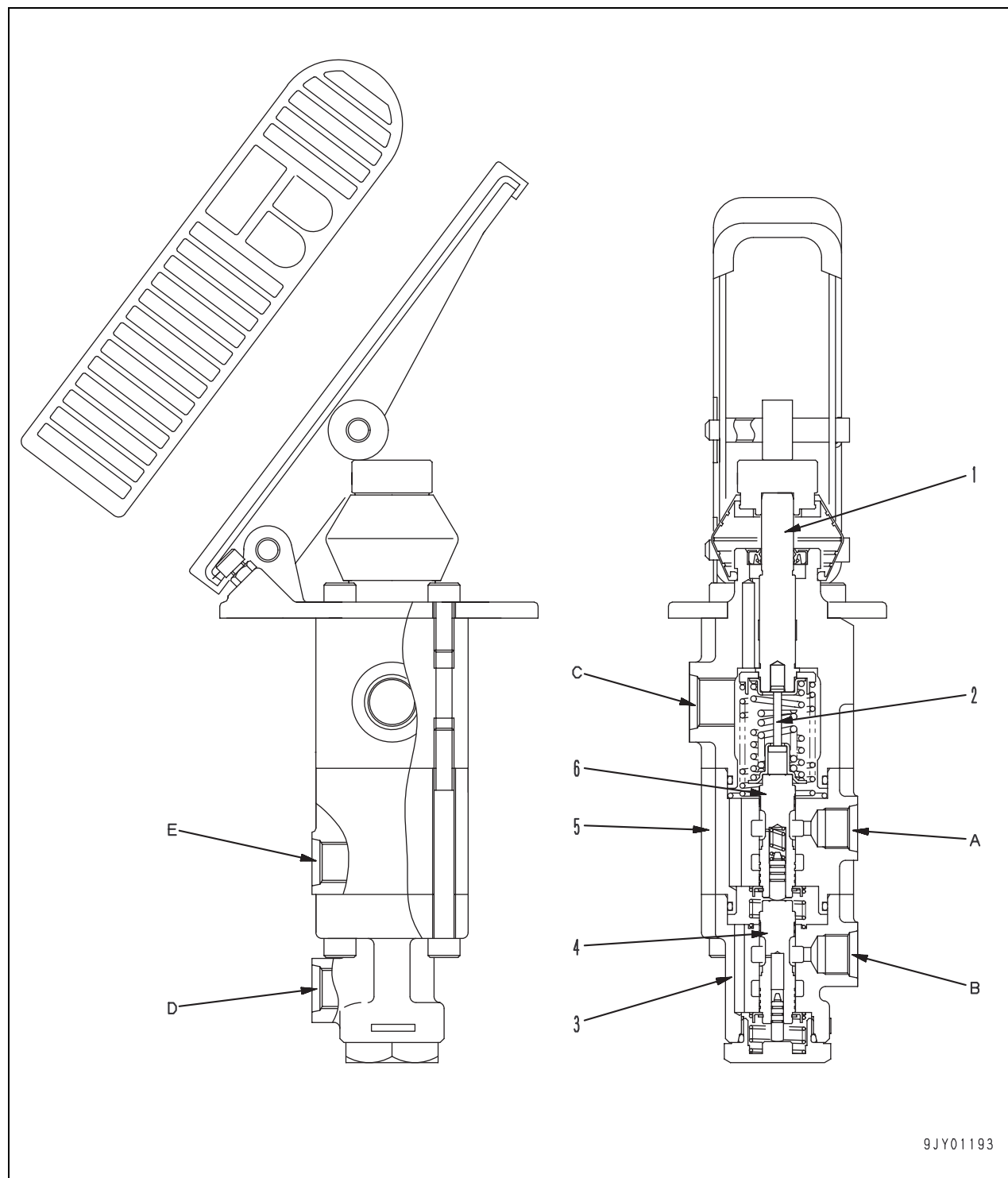


1. Slack adjuster (Front)
2. Slack adjuster (Rear)
3. Secondary brake valve
4. Brake valve (Service brake valve)
5. Parking brake valve
6. Accumulator change valve

7. Accumulator (parking brake)
8. Accumulator (rear brake)
9. Accumulator (front brake)
10. Solenoid valve (for retarder)
11. Brake system tank
12. Check valve

★ For the brake control hydraulic circuit diagram, see the hydraulic circuit diagram in the circuit diagram collection.

Brake valve



1. Pilot piston
2. Rod
3. Lower cylinder
4. Spool
5. Upper cylinder
6. Spool

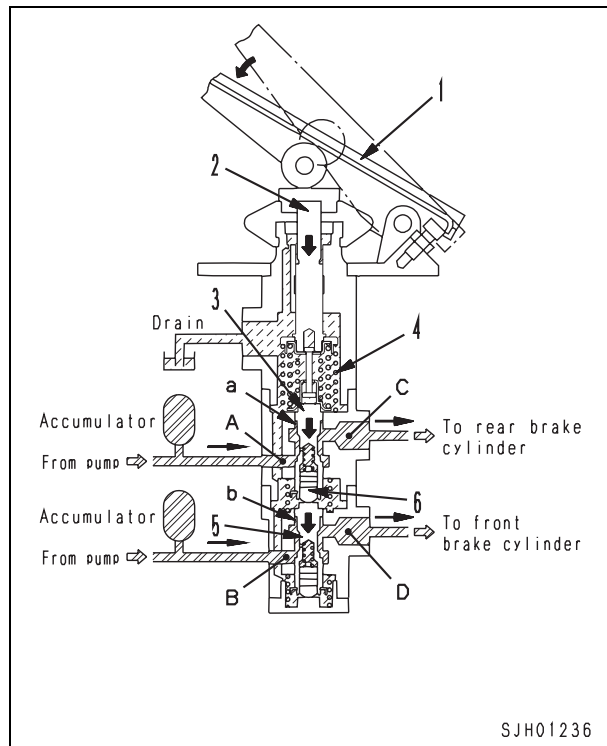
- A: To rear brake
- B: To front brake
- C: To brake system tank
- D: From front accumulator
- E: From rear accumulator

Operation**Upper portion**

- When brake pedal (1) is depressed, the operating force is transmitted to spool (3) through rod (2) and spring (4). When spool (3) goes down, drain port (a) is closed, and the oil from the pump and accumulator flows from port (A) to port (C) and actuates the rear brake cylinders.

Lower portion

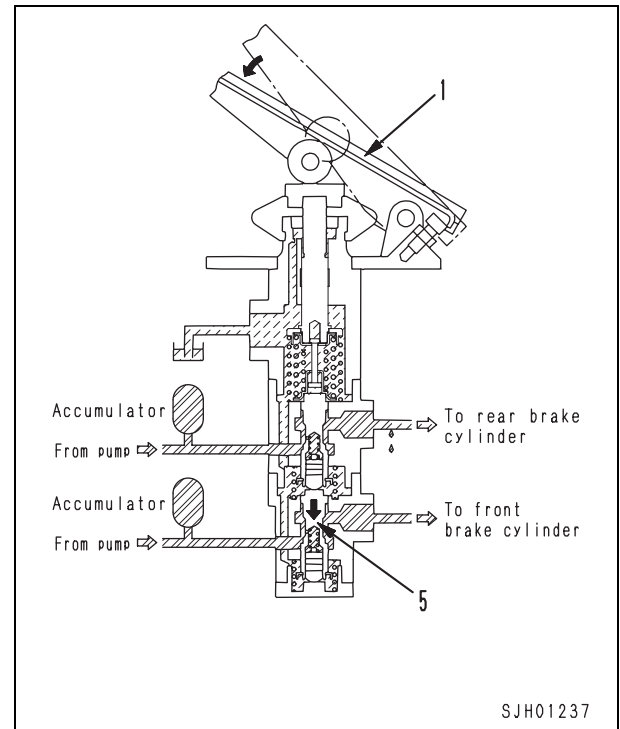
- When brake pedal (1) is depressed, the operating force is transmitted to spool (3) through rod (2) and spring (4). When spool (3) goes down, spool (5) is also pushed down by plunger (6). When this happens, drain port (b) is closed, and the oil from the pump and accumulator flows from port (B) to port (D) and actuates the front brake cylinders.

**Applying brake when upper valve fails**

- Even if there is leakage of oil in the upper piping, spool (5) is moved down mechanically when pedal (1) is depressed, and the lower portion is actuated normally. The upper valve is not actuated.

Applying brake when lower valve fails

- Even if there is leakage of oil in the lower piping, the upper portion is actuated normally.

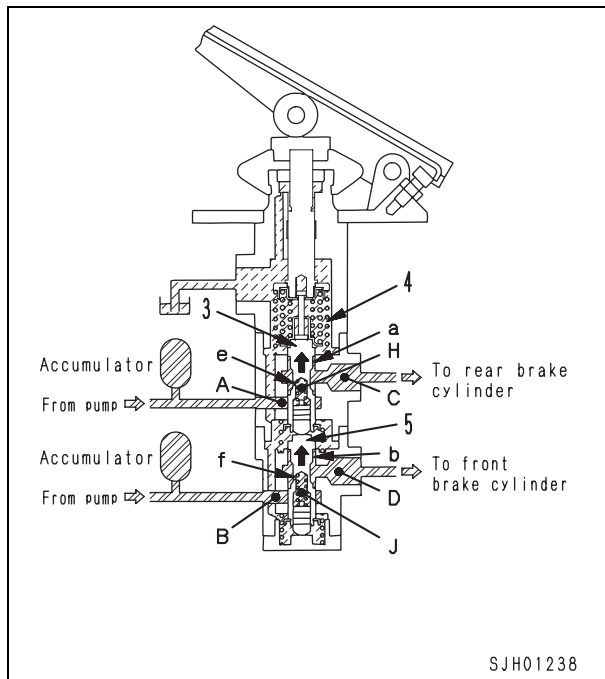
**When actuation is balanced****Upper portion**

- When oil fills the rear brake cylinders and the pressure between port (A) and port (C) becomes high, the oil entering port (H) from orifice (e) of spool (3) pushes against spring (4). It pushes up spool (3) and shuts off the circuit between port (A) and port (C). When this happens, drain port (a) stays closed, so the oil entering the brake cylinder is held and the brake remains applied.

Lower portion

- When spool (3) in the upper portion moves up and the circuit between port (A) and port (C) is shut off, oil also fills the front brake cylinder at the same time, so the pressure in the circuit between port (B) and port (D) rises. The oil entering port (J) from orifice (f) of spool (5) pushes up spool (5) by the same amount that spool (3) moves, and shuts off port (B) and port (D). Drain port (b) is closed, so the oil entering the brake cylinder is held, and the brake is applied.
- The pressure in the space in the upper portion is balanced with the operating force of the pedal, and the pressure in the space in the lower portion is balanced with the pressure in the space in the upper portion. When spools (3) and (5) move to the end of their stroke, the circuits between ports (A) and (C) and between ports (B) and (D) are fully opened, so the pressure in the space in the upper and lower portions and the pressure in the left and right brake cylinders is the same as the pressure from the pump.

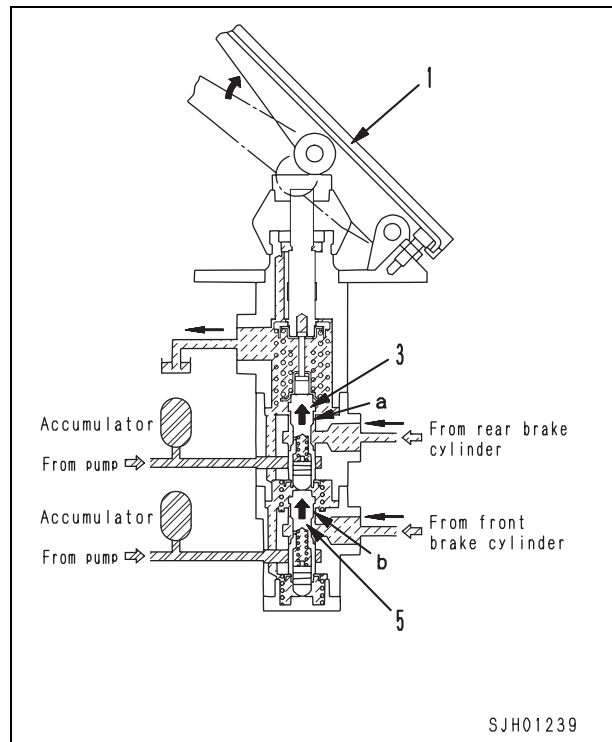
Therefore, up to the point where the piston moves to the end of its stroke, the effect of the brake can be adjusted by the amount that the pedal is depressed.

**Brake released****Upper portion**

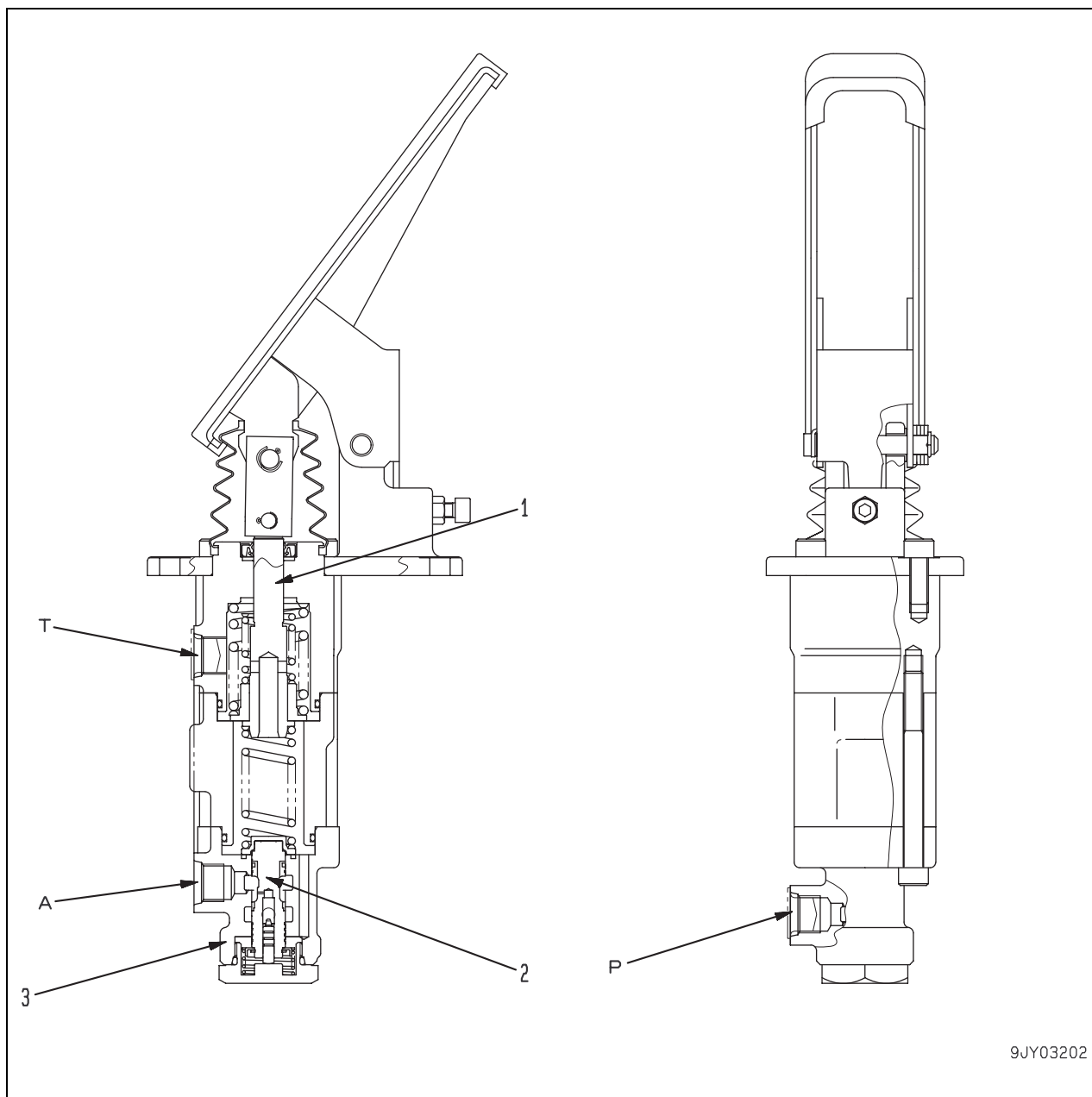
- When pedal (1) is released and the operating force is removed from the top of the spool, the back pressure from the brake cylinder and the force of the spool return spring move spool (3) up. Drain port (a) is opened and the oil from the brake cylinder flows to the brake system tank return circuit to release the rear brakes.

Lower portion

- When the pedal is released, spool (3) in the upper portion moves up. At the same time, the back pressure from the brake cylinder and the force of the spool return spring move spool (5) up. Drain port (b) is opened and the oil from the brake cylinder flows to the brake system tank return circuit to release the front brake.



Secondary brake valve



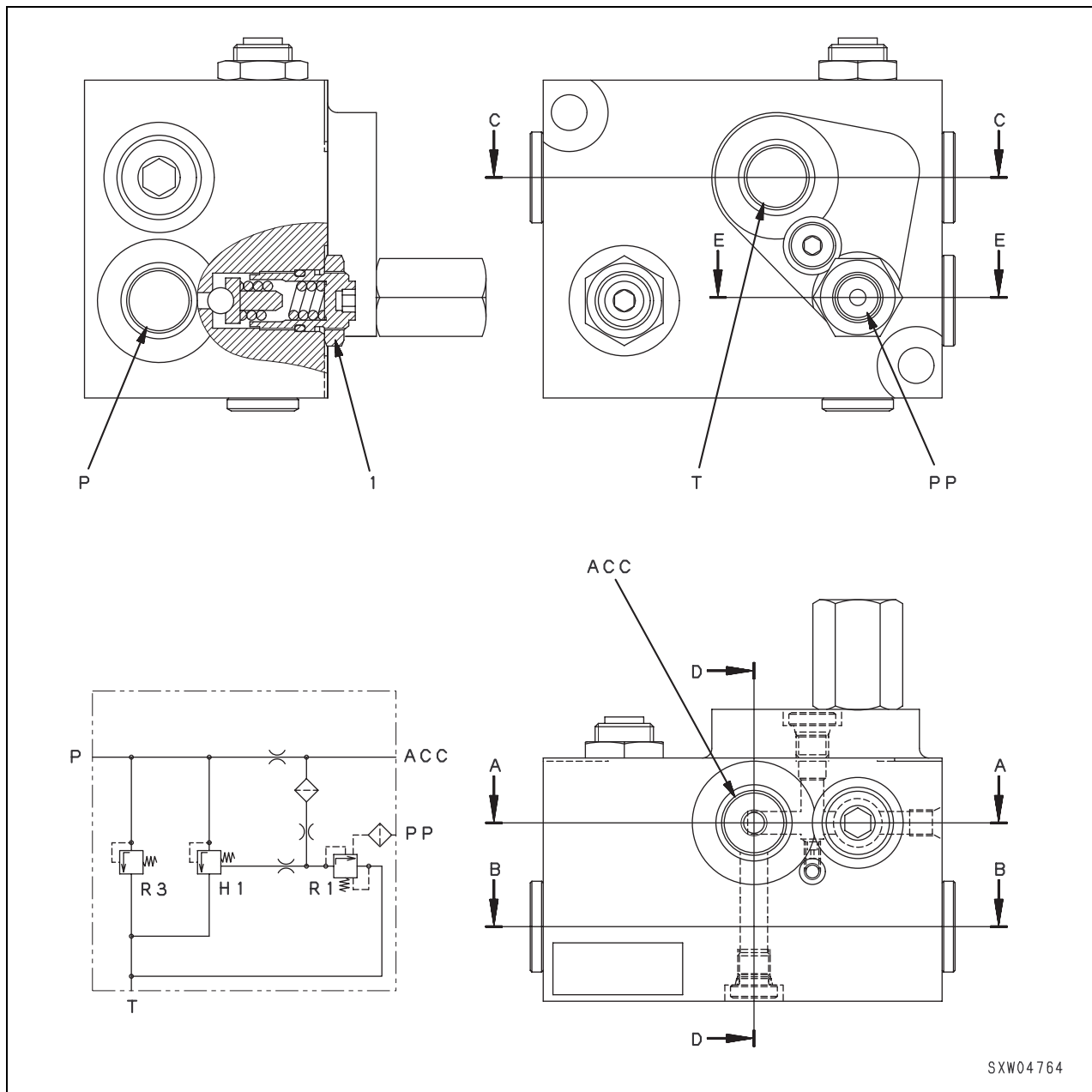
1. Rod
2. Spool
3. Cylinder

A: To parking brake valve
P: From accumulator
T: To brake system tank

Function

- This valve operates the brake depending on the parking brake release pressure controlled by the secondary brake pedal.

Accumulator charge valve



1. Main relief valve (R3)
2. Valve body
3. Relief valve (R1)
4. Relief valve (H1)
5. Filter
6. Filter

ACC: To parking brake accumulator (right)

P: From hydraulic pump

PP: From parking brake accumulator (right)

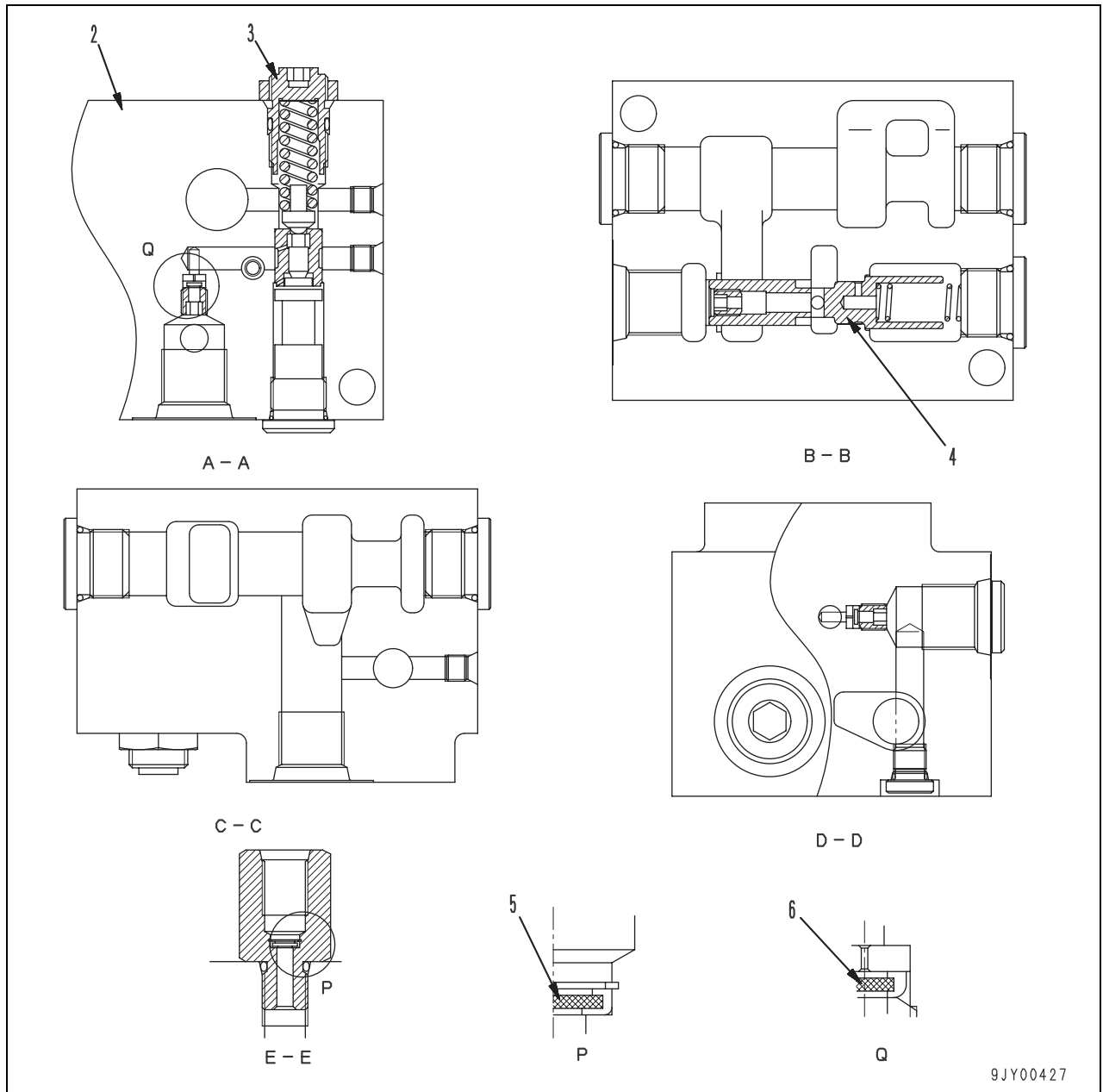
T: To brake system tank

Specification

- Cut in pressure: 11.8 MPa {120 kg/cm²}
- Cut out pressure: 20.6 MPa {210 kg/cm²}

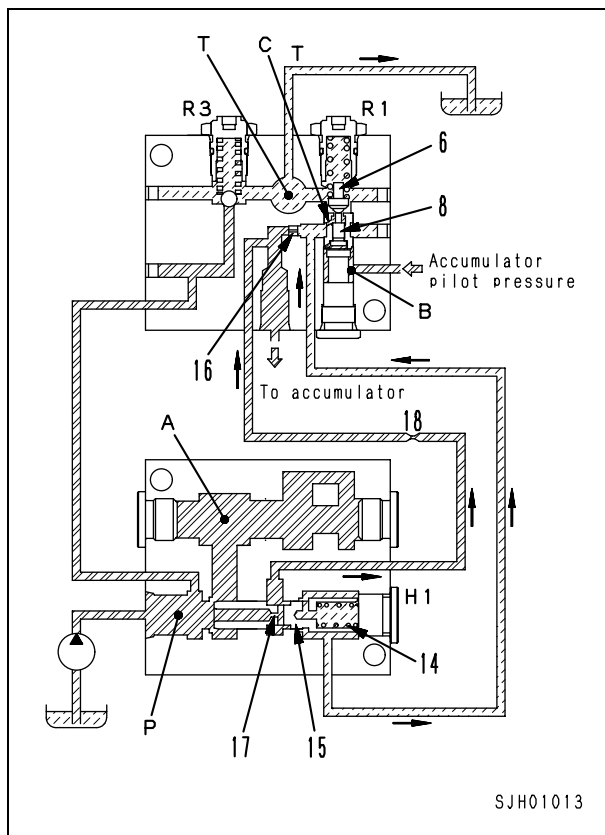
Function

- The accumulator charge valve is actuated to maintain the oil pressure from the pump at the specified pressure and to store it in the accumulator.
- When the oil pressure reaches the specified pressure, the oil from the pump is connected to the drain circuit to reduce the load of the pump.

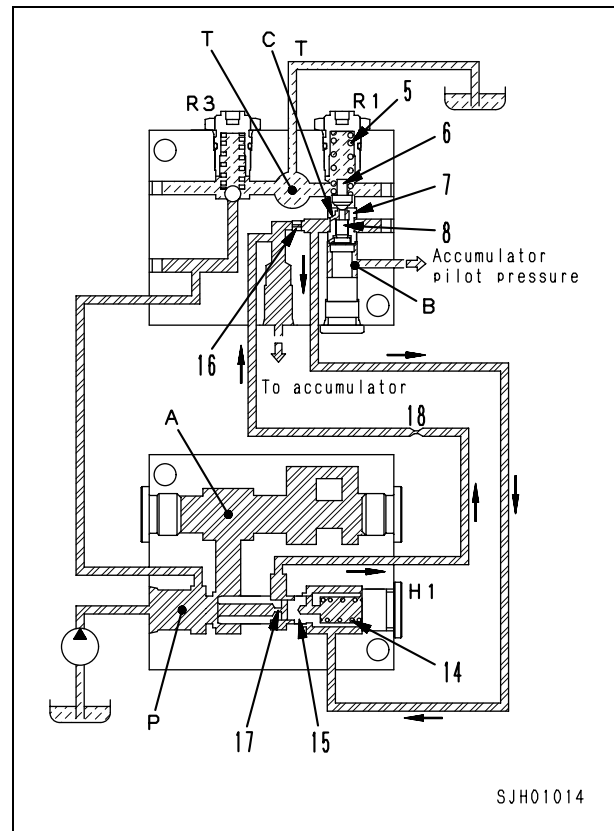


Operation**1. When no oil is being supplied to accumulator (cut-out condition)**

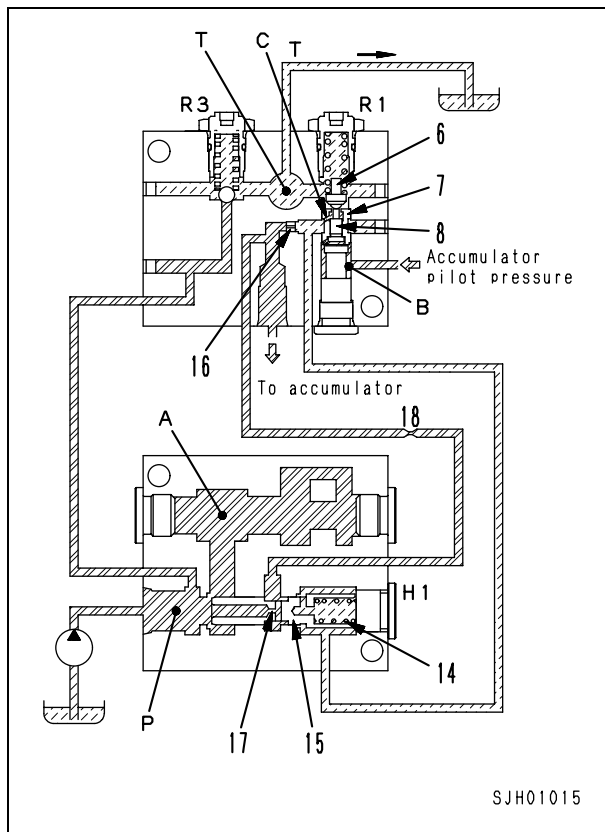
- The pressure at port (B) is higher than the set pressure of the relief valve (R1), so piston (8) is forcibly pushed up by the oil pressure at port (B). Poppet (6) is opened, so port (C) and port (T) are short circuited.
- The spring chamber at the right end of spool (15) is connected to port (C) of the relief valve (R1), so the pressure becomes the brake oil tank pressure. The oil from the pump enters port (P), pushes spool (15) to the right at a low pressure equivalent to the load on spring (14).
- It also passes through orifices (17), (18) and (16), and flows to the brake oil tank.

**2. When oil supplied to accumulator****1) Cut-in condition**

- When the pressure at port (B) is lower than the set pressure of the relief valve (R1), piston (8) is pushed back down by spring (5). Valve seat (7) and poppet (6) are brought into tight contact, and port (C) and port (T) are shut off.
- The spring chamber at the right end of spool (15) is also shut off from port (T), so the pressure rises, and the pressure at port (P) also rises in the same way.
- When the pressure at port (P) goes above the pressure at port (B) (accumulator pressure), the supply of oil to the accumulator starts immediately. In this case, it is decided by the size (area) of orifice (17) and the pressure difference (equivalent to the load on spring (14)) generated on both sides of the orifice. A fixed amount is supplied regardless of the engine speed.

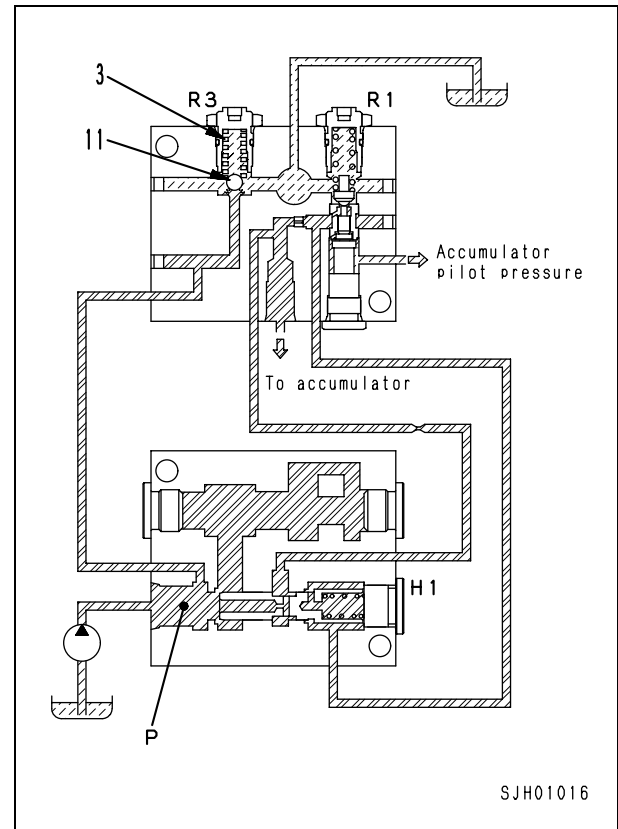


- 2) When cut-out pressure is reached
 - When the pressure at port (B) (accumulator pressure) reaches the set pressure of the relief valve (R1), poppet (6) separates from valve seat (7), so an oil flow is generated and the circuit is relieved.
 - When the circuit is relieved, a pressure difference is generated above and below piston (8), so piston (8) moves up, poppet (6) is forcibly opened, and port (C) and port (T) are short circuited.
 - The spring chamber at the right end of spool (15) is connected to port (C) of the relief valve (R1), so the pressure becomes the brake oil tank pressure.
 - The pressure at port (P) drops in the same way to a pressure equivalent to the load on spring (14), so the supply of oil to port (B) is stopped.

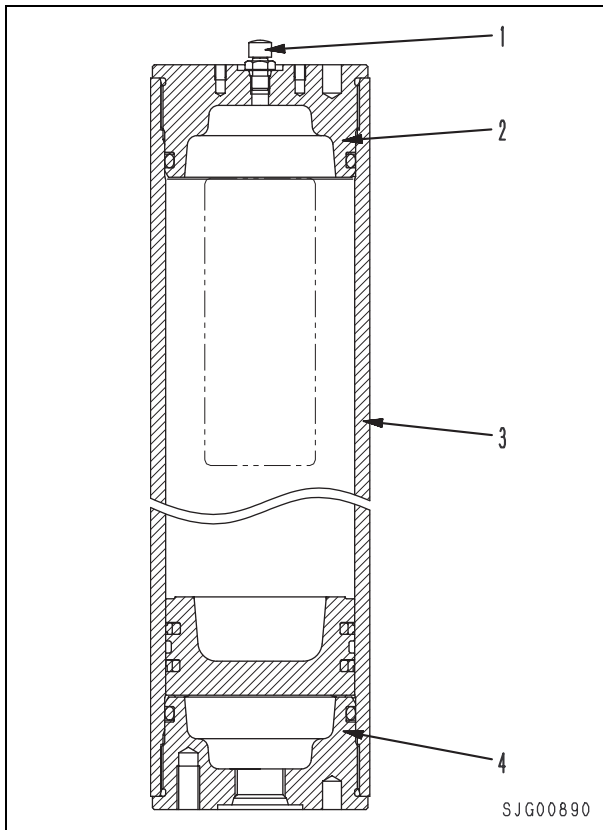


3. Main relief valve (R3)

- If the pressure at port (P) (pump pressure) goes above the set pressure of the relief valve (R3), the oil from the pump pushes spring (3). Ball (11) is pushed up and the oil flows to the brake oil tank circuit, so this set the maximum pressure in the brake circuit and protects the circuit.



Accumulator



1. Valve
2. Top cover
3. Cylinder
4. Piston

Function

- The accumulator is installed between the accumulator charge valve and the brake valve. It is charged with nitrogen gas between cylinder (3) and free piston (4), and uses the compressibility of the gas to absorb the pulse of the hydraulic pump or to maintain the braking force and to make it possible to operate the machine if the engine should stop.

Specifications

Front brake, rear brake, parking brake

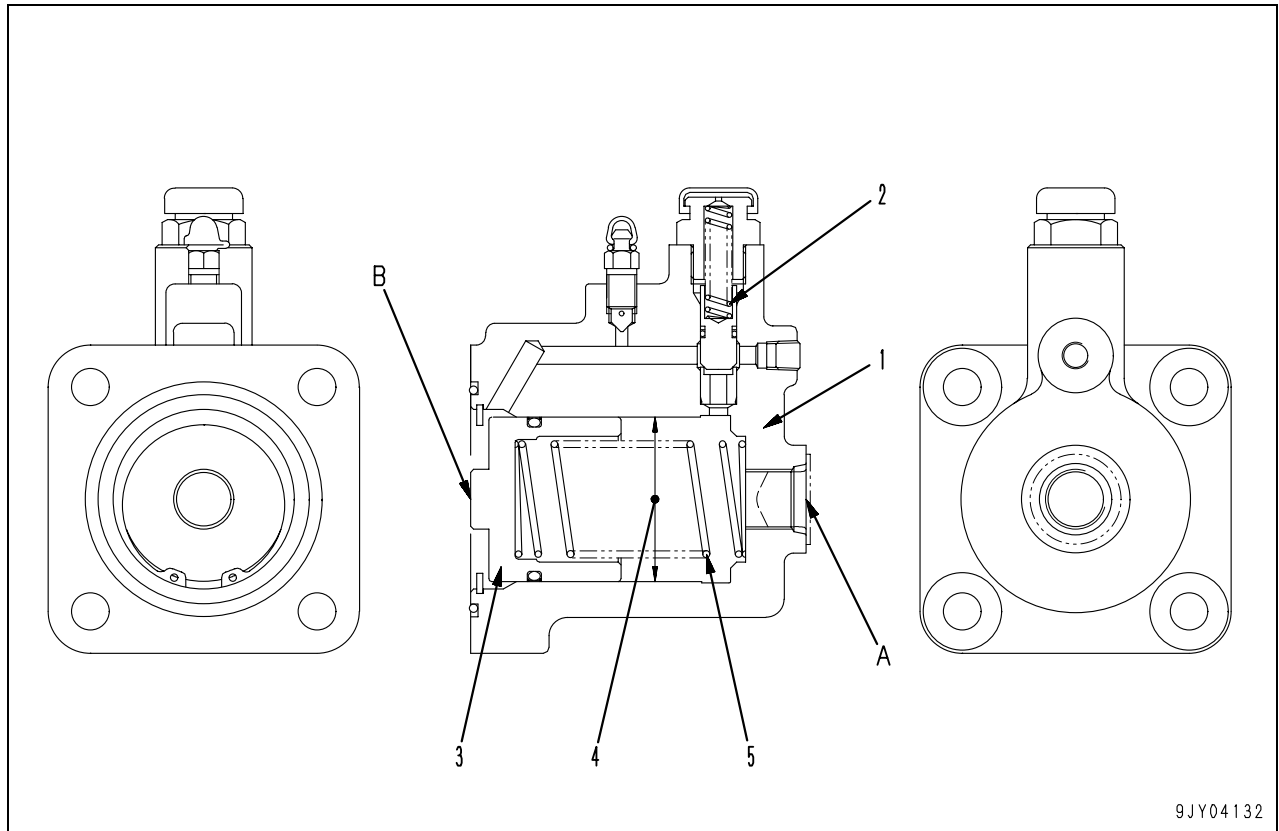
Gas used : Nitrogen gas

Charge amount : 4,000 cc

Charging pressure: 6.9 MPa {70 kg/cm²}

Slack adjuster

Front



1. Cylinder
2. Check valve
3. Piston

- A: Inlet port
B: Outlet port

Specifications

Piston operation pressure:

9.8 – 19.6 kPa {0.1 – 0.2 kg/cm²}

Check valve cracking pressure

(When cooling pressure is 0):

1.74 ± 0.05 MPa {17.8 ± 0.5 kg/cm²}

Check valve closing pressure:

1.09 ± 0.05 MPa {11.1 ± 0.5 kg/cm²}

Unit: mm

No.	Check item	Criteria					Remedy	
4	Clearance between body and piston	Standard size	Tolerance		Standard clearance	Clearance limit	Replace	
			Shaft	Hole				
		55	−0.030 −0.076	+0.074 0	0.030 – 0.150	0.25		
5	Slack adjuster spring	Standard size			Repair limit			
		Spring coefficient	Installed length	Installed load	Free length	Installed load		
		0.45 N/mm {0.046 kg/mm}	76.3	54.9 N {5.6 kg}	—	—		

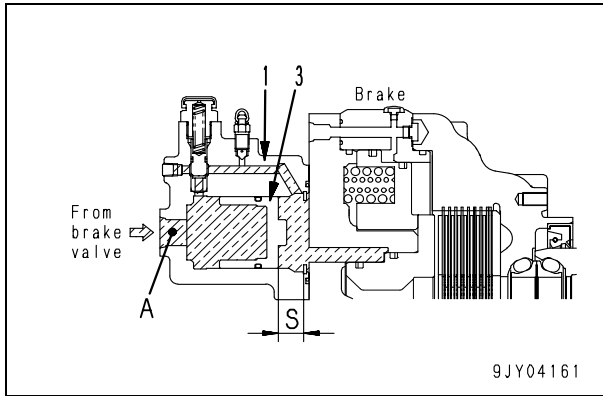
Function

- The slack adjuster is installed to the brake cylinder directly and used to keep the brake time lag constant.

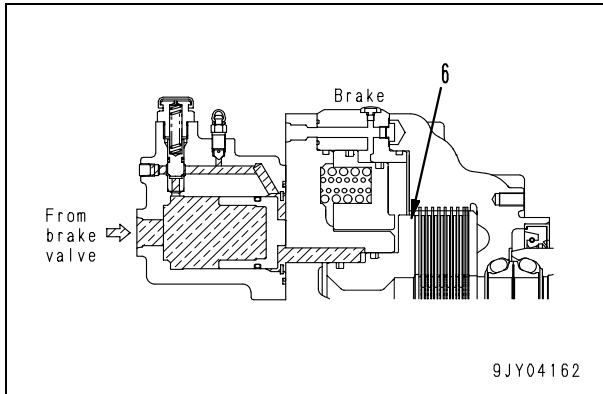
Operation

1. When brake pedal is depressed

- Before the brake pedal is depressed, piston (3) is kept returned by stroke (S) (full stroke). If the brake pedal is depressed, the oil discharged from the brake valve flows through port (A) of the slack adjuster into cylinder (1) and moves piston (3) in the braking direction by stroke (S).

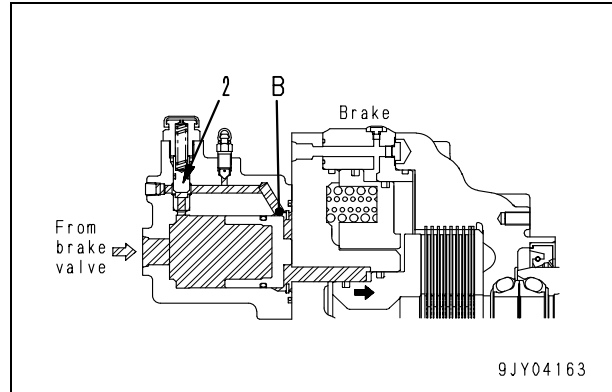


- As a result, brake piston (6) moves by stroke (S). At this time, the clearance between the brake piston and disc is reduced to 0 but no braking force is generated.



- If the brake pedal is depressed further, and the oil pressure discharged from the brake valve goes above to set pressure, check valve (2) opens and the pressure is applied to port (B) to act as the braking force.

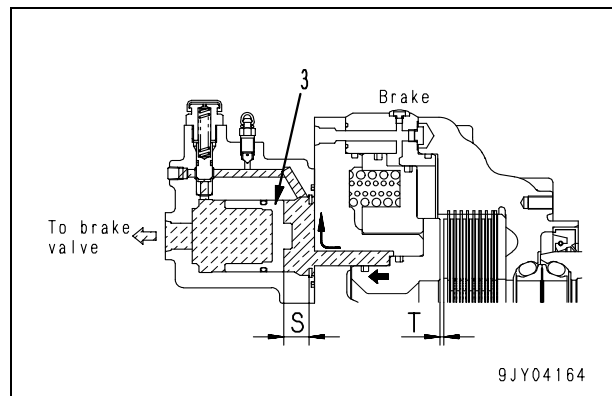
Therefore, when the brake is applied, the time lag is a fixed value.



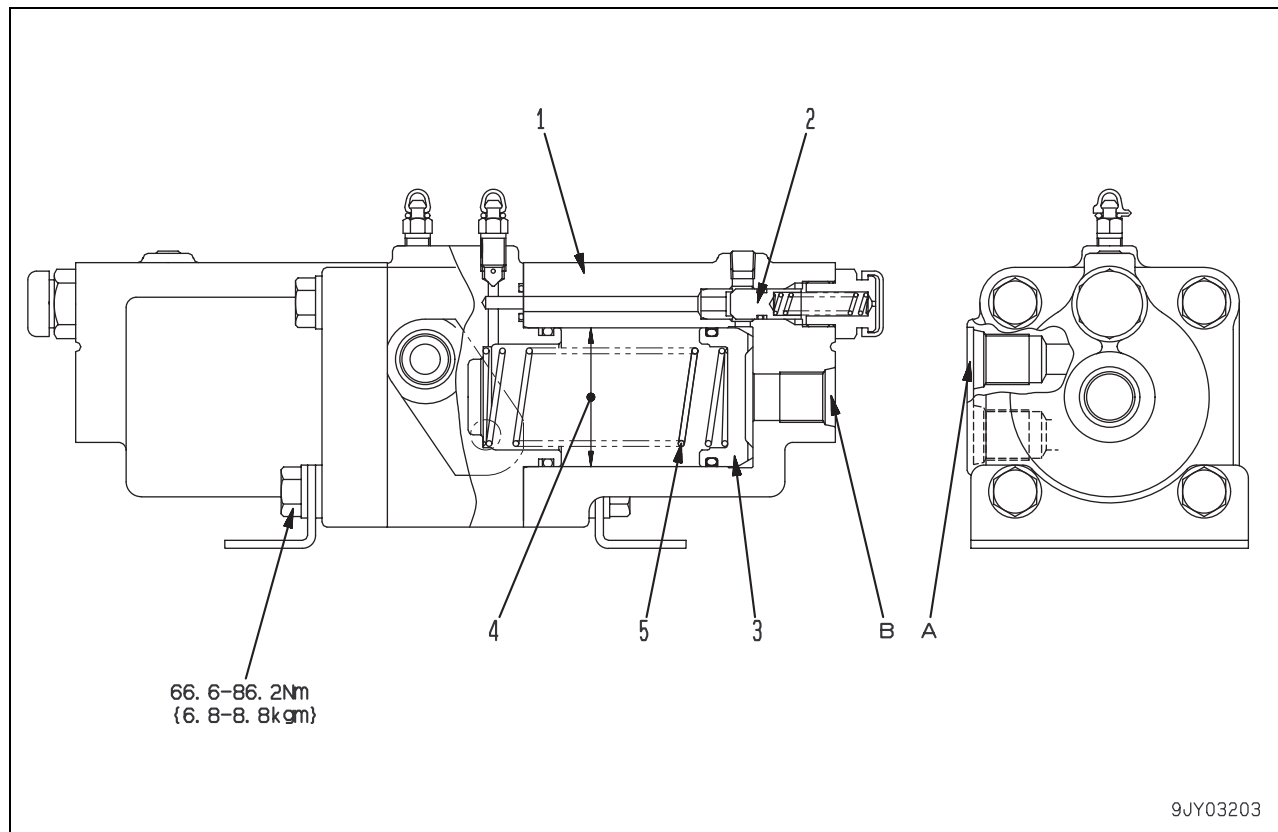
2. When brake pedal is released

- If the brake pedal is released, the brake cooling oil pressure returns piston (3) by the distance equivalent to the oil in stroke (S) to release the brake.

In other words, return stroke (T) of brake piston (6) is determined by the amount of oil for stroke (S) of the slack adjuster. The time lag of the brake is always kept constant regardless of the wear of the brake disc.



Rear



- 1. Cylinder
- 2. Check valve
- 3. Piston

- A: Inlet port
- B: Outlet port

Specifications

Piston operation pressure:

9.8 – 19.6 kPa {0.1 – 0.2 kg/cm²}

Check valve cracking pressure

(When cooling pressure is 0):

1.74 ± 0.05 MPa {17.8 ± 0.5 kg/cm²}

Check valve closing pressure:

1.09 ± 0.05 MPa {11.1 ± 0.5 kg/cm²}

Unit: mm

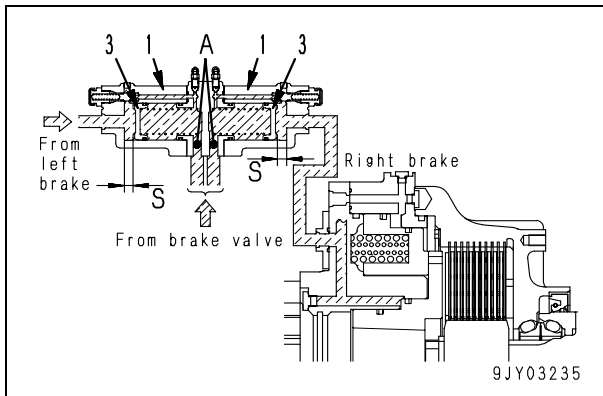
No.	Check item	Criteria					Remedy	
4	Clearance between body and piston	Standard size	Tolerance		Standard clearance	Clearance limit	Replace	
			Shaft	Hole				
		55	−0.030 −0.076	+0.074 0	0.030 − 0.150	0.25		
5	Slack adjuster spring	Standard size			Repair limit			
		Spring coefficient	Installed length	Installed load	Free length	Installed load		
		0.45 N/mm {0.046 kg/mm}	97	45.6 N {4.7 kg}	—	—		

Function

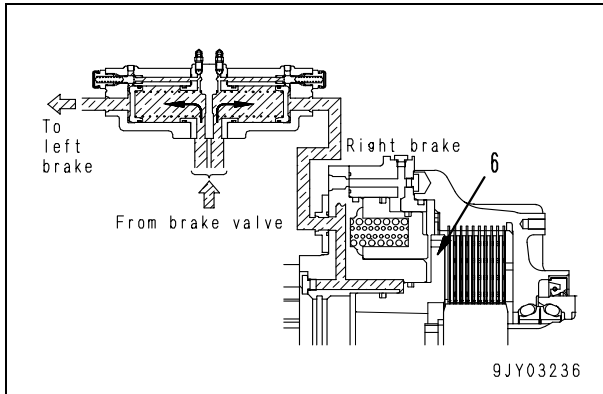
- The slack adjuster is installed to the brake oil line from the brake valve to the brake piston and used to keep the brake time lag constant.

Operation**1. When brake pedal is depressed**

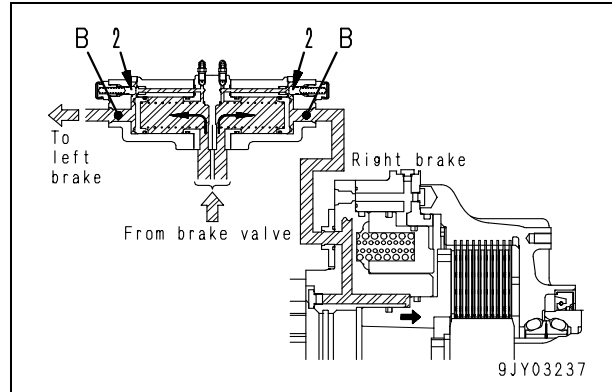
- Before the brake pedal is depressed, piston (3) is returned by stroke (S) (full stroke). If the brake pedal is depressed, the oil discharged from the brake valve flows through port (A) of the slack adjuster into right and left cylinders (1) and moves pistons (3) to the right and left by stroke (S).



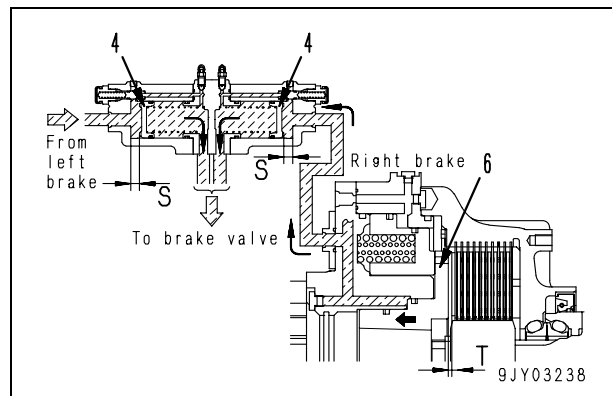
- As a result, brake piston (6) moves by stroke (S). At this time, the clearance between the brake piston and disc is reduced to 0 but no braking force is generated.



- If the brake pedal is depressed further, and the oil pressure discharged from the brake valve goes above to set pressure, check valve (2) opens and the pressure is applied to port (B) to act as the braking force. Therefore, when the brake is applied, the time lag is a fixed value.

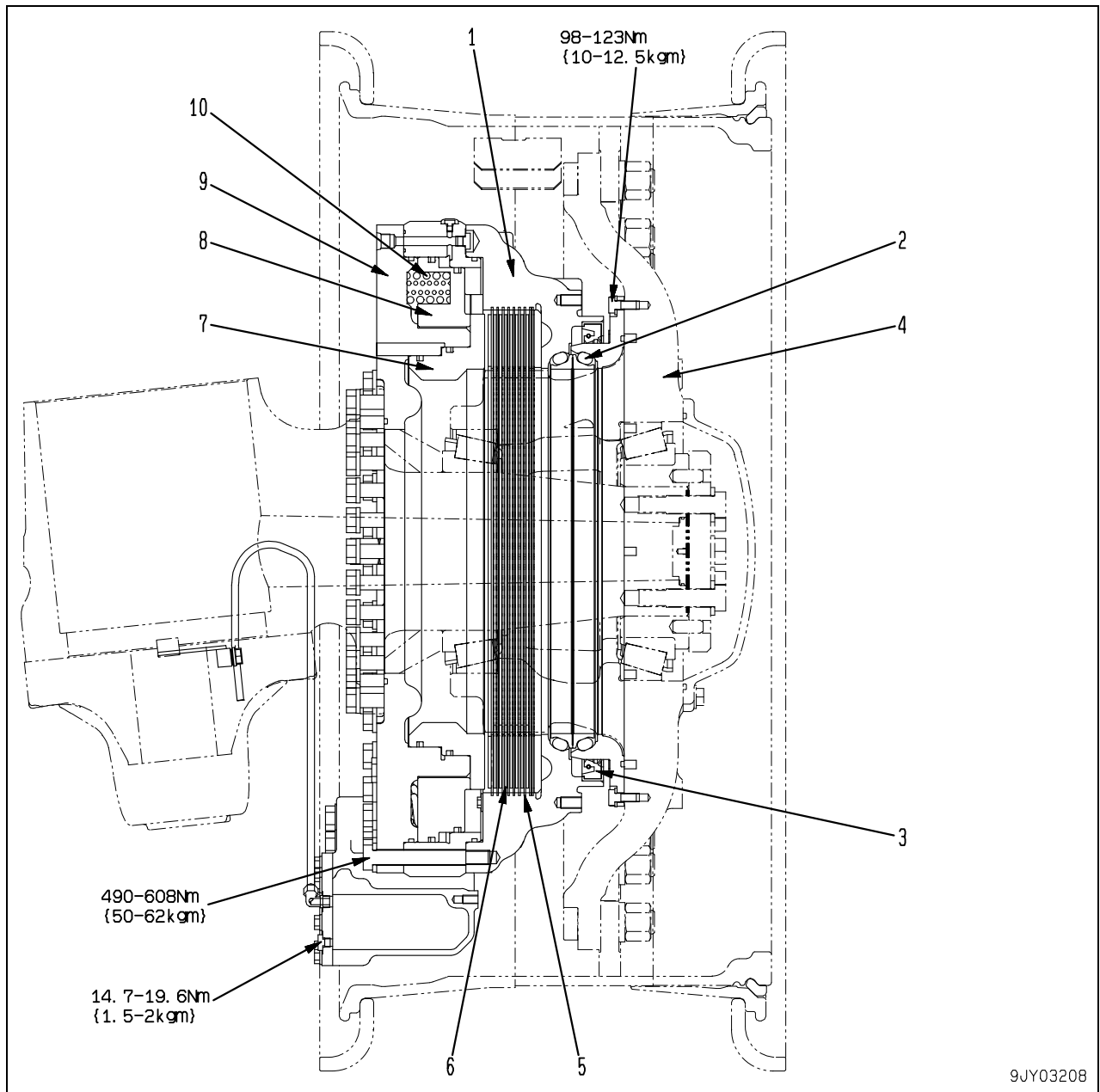
**2. When brake pedal is released**

- If the brake pedal is released, the brake cooling oil pressure returns piston (3) by the distance equivalent to the oil in stroke (S) to release the brake. In other words, return stroke (T) of brake piston (6) is determined by the amount of oil for stroke (S) of the slack adjuster. The time lag of the brake is always kept constant regardless of the wear of the brake disc.

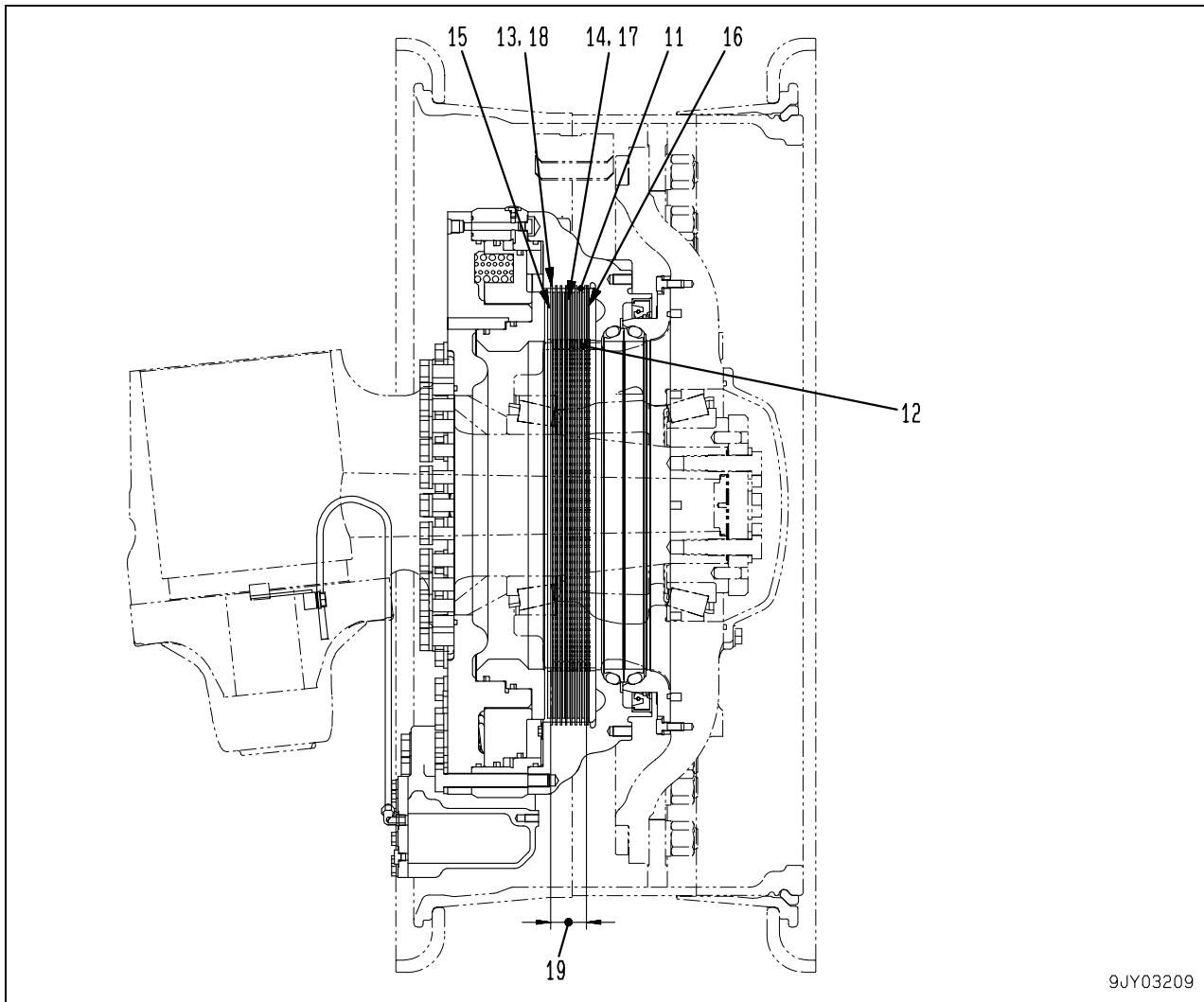


Brake, parking brake

Front



1. Outer gear
2. Floating seal
3. Oil seal
4. Hub (inner gear)
5. Plate
6. Disc
7. Piston (for service brake and retarder brake)
8. Piston (for parking brake)
9. Cylinder
10. Spring



9JY03209

Unit: mm

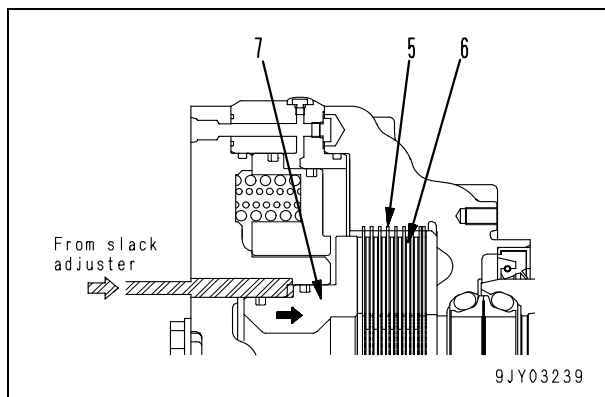
No.	Check item	Criteria		Remedy
11	Transformation of outer gear spline	No transformation		Replace
12	Transformation of inner gear spline	No transformation		
13	Thickness of plate	Standard size	Repair limit	
		2.4	2.15	
14	Thickness of disc	5.1	4.6	
15	Thickness of damper	6.9	5.1	
16	Thickness of plate	4.4	3.9	
17	Distortion of disc friction surface	Standard distortion	Repair limit	
		Max. 0.45	0.7	
18	Distortion of plate and damper friction surface	Max. 0.5	0.7	
19	Assemble thickness of plate and disc	Standard size	Repair limit	
		63.8	59.0	

Function

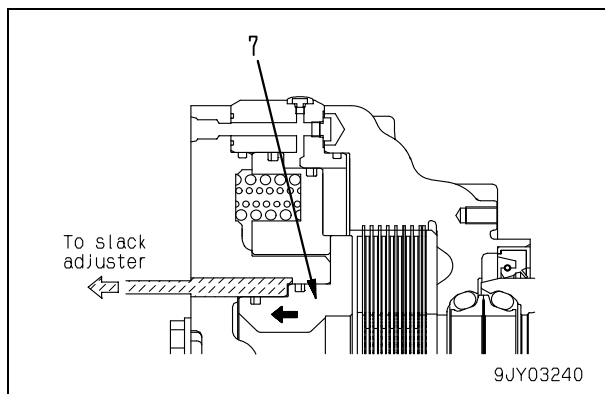
- The front brake is of an oil cooled multiple disc type, and it operates as a parking brake by use of spring.

Operation of brake

- When the brake pedal is depressed, oil pressure from the brake valve moves brake piston (7) to the right in the direction of the arrow. This presses disc (6) and plate (5) together and generates friction between the disc and plate. The wheel is rotating together with the disc, so this friction reduces the travel speed and stops the machine.

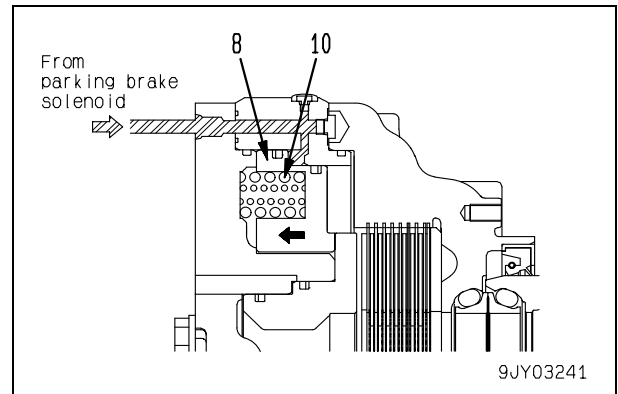


- If the brake pedal is released, the hydraulic pressure on brake piston (7) is released and the piston is moved to the left by the brake cooling oil pressure and consequently the brake is released.

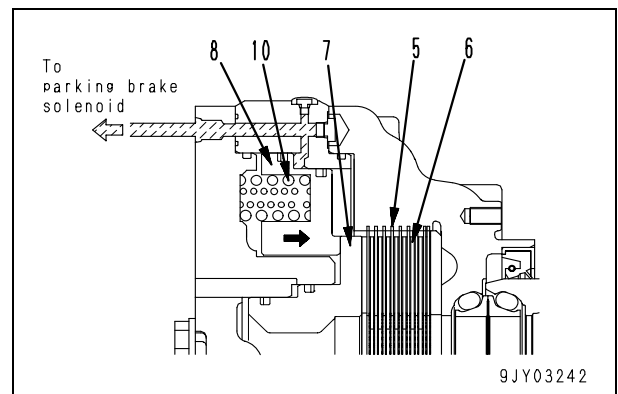


Operation of parking brake

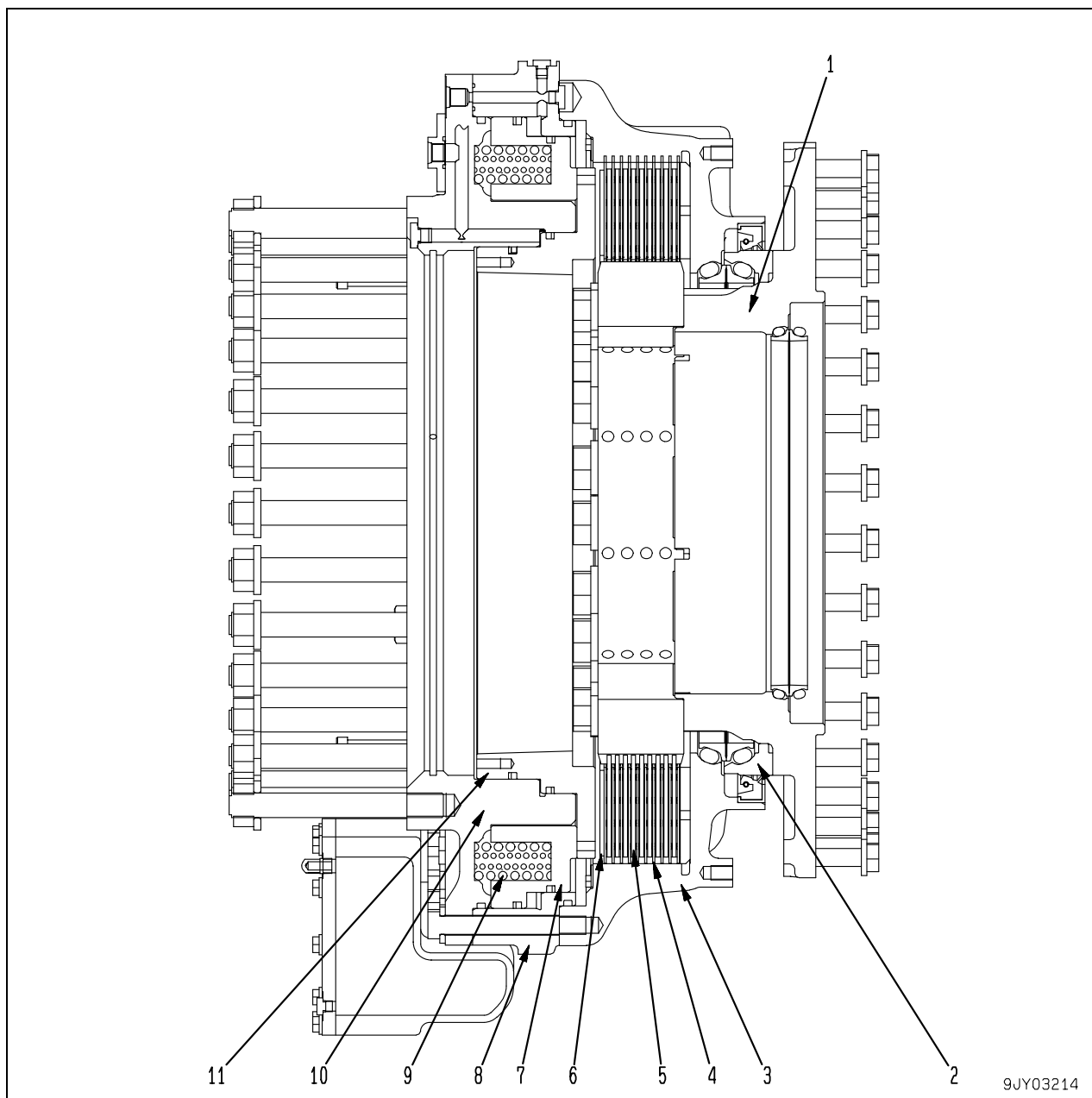
- The parking brake contained in the front brake is structurally designed to operate mechanically by spring (10) force and to be released by hydraulic pressure.
- The parking releasing hydraulic pressure acts on the parking brake piston (8) from the accumulator through the secondary brake valve and parking brake solenoid.
- With the parking brake switch at the driver's seat in the travel position, the parking releasing hydraulic pressure releases the parking brake by pressing the parking brake piston (8) and retracting the spring (10).



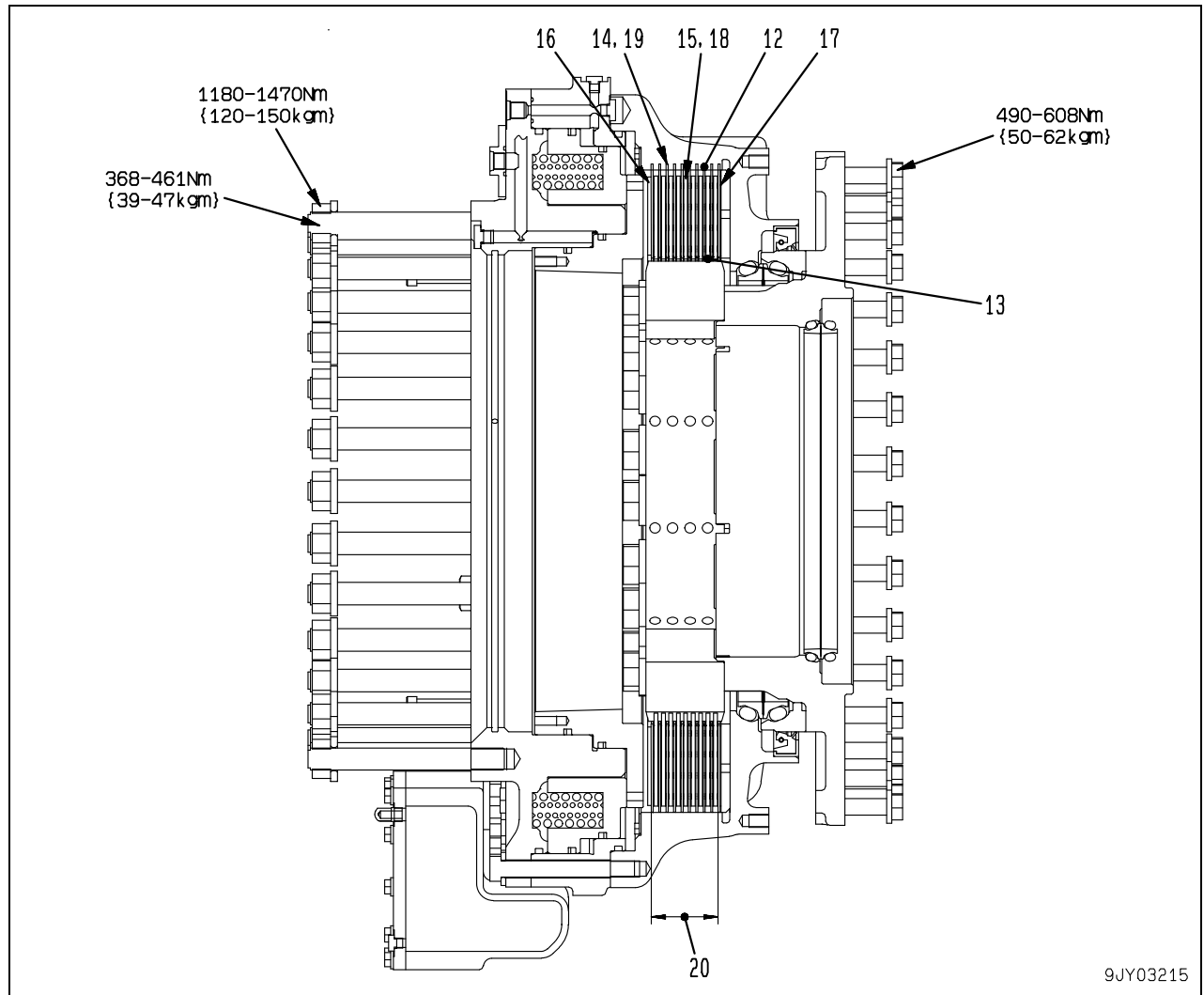
- With the parking brake switch in the parking position, the parking brake solenoid is demagnetized and the parking releasing hydraulic pressure is released. Then, the parking brake is engaged through the parking brake piston (8), brake piston (7), plate (5), and disc (6) pressed by spring (10) force.



Rear



1. Inner gear
2. Retainer
3. Outer gear
4. Plate
5. Disc
6. Damper
7. Piston (for parking brake)
8. Cylinder (for parking brake)
9. Spring (for parking brake)
10. Cylinder
11. Piston



Unit: mm

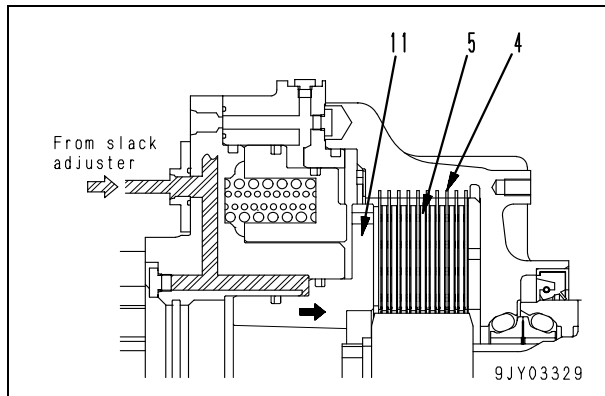
No.	Check item	Criteria		Remedy
12	Transformation of outer gear spline	No transformation		Replace
13	Transformation of inner gear spline	No transformation		
14	Thickness of plate	Standard size	Repair limit	
		2.4	2.15	
15	Thickness of disc	6.5	6	
16	Thickness of damper	6.9	5.1	
17	Thickness of damper	3.4	3.0	
18	Distortion of disc friction surface	Standard distortion	Repair limit	
		Max. 0.45	0.7	
19	Distortion of plate and damper friction surface	Max. 0.50	0.7	
20	Assemble thickness of plate and disc	Standard size	Repair limit	
		88	82.3	

Function

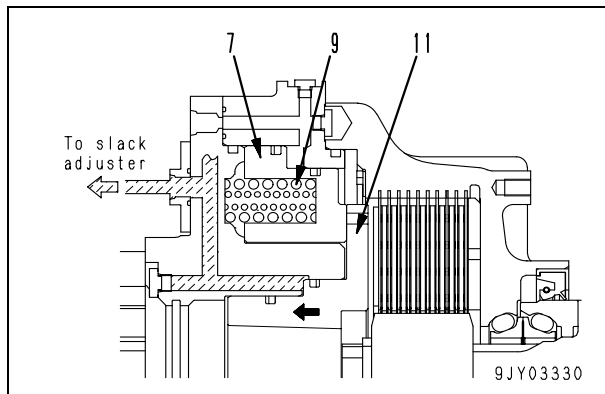
- The rear brake is of an oil cooled multiple disc type, and it operates as a parking brake by use of spring.

Operation of brake

- When the brake pedal is depressed, oil pressure from the brake valve moves brake piston (11) to the right in the direction of the arrow. This presses disc (5) and plate (4) together and generates friction between the disc and plate. The wheel is rotating together with the disc, so this friction reduces the travel speed and stops the machine.

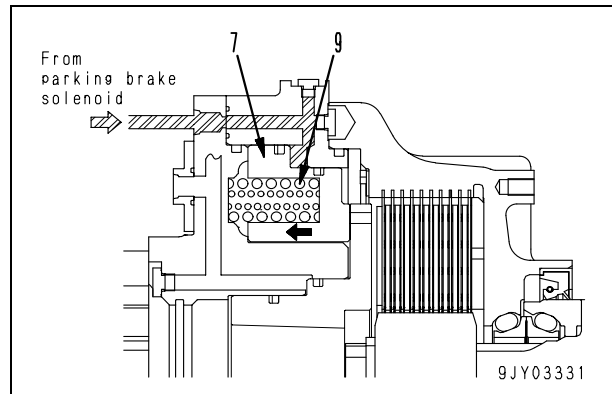


- If the brake pedal is released, the hydraulic pressure on brake piston (11) is released and the piston is moved to the left by the brake cooling oil pressure and consequently the brake is released.

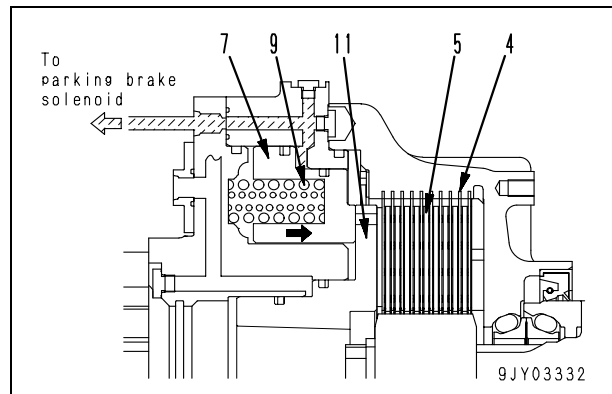


Operation of parking brake

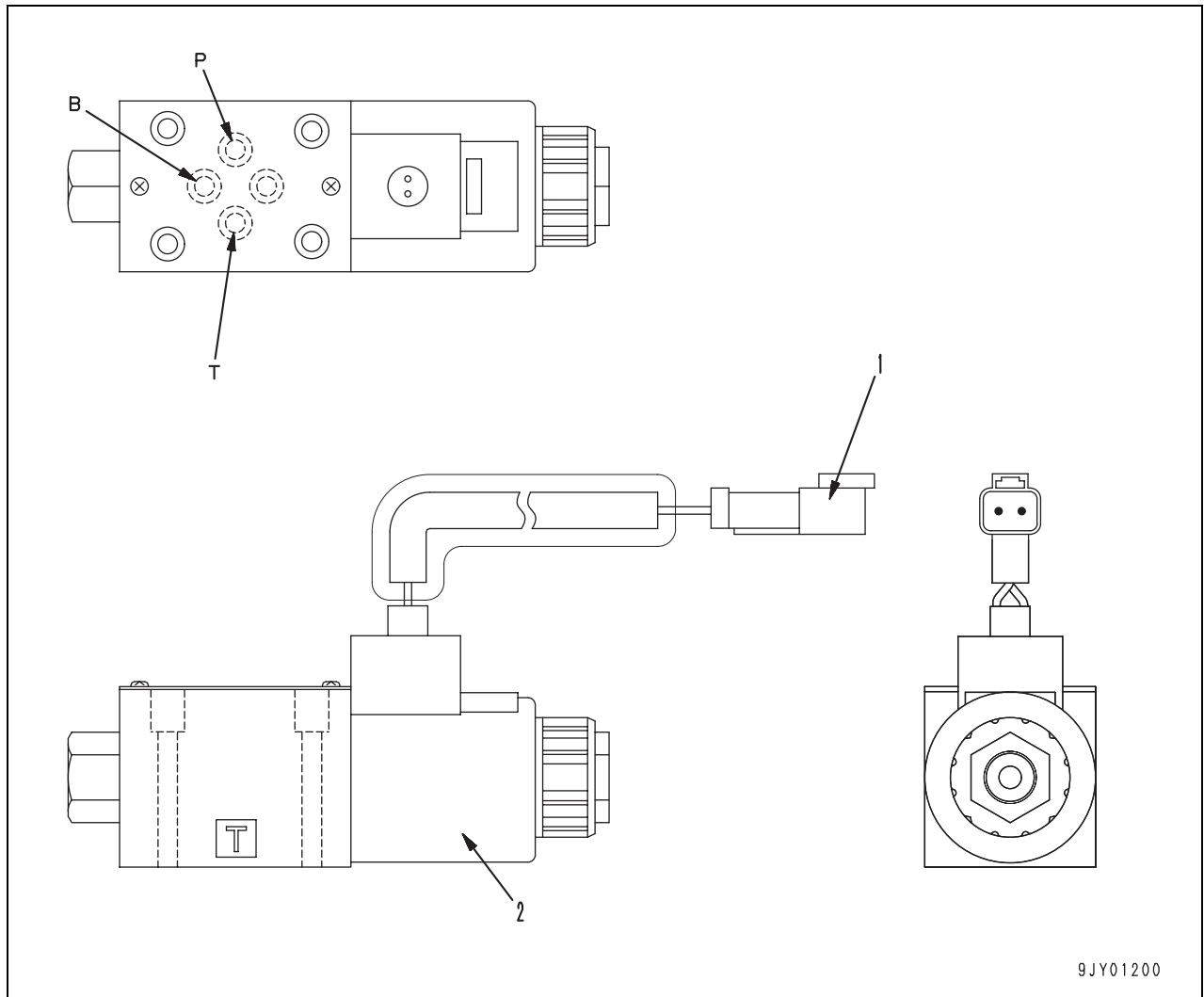
- The parking brake contained in the rear brake is structurally designed to operate mechanically by spring (9) force and to be released by hydraulic pressure.
- The parking releasing hydraulic pressure acts on the parking brake piston (7) from the accumulator through the secondary brake valve and parking brake solenoid.
- With the parking brake switch at the driver's seat in the travel position, the parking releasing hydraulic pressure releases the parking brake by pressing the parking brake piston (7) and retracting the spring (9).



- With the parking brake switch in the parking position, the parking brake solenoid is demagnetized and the parking releasing hydraulic pressure is released. Then, the parking brake is engaged through the parking brake piston (7), brake piston (11), plate (4), and disc (5) pressed by spring (9) force.



Parking brake solenoid



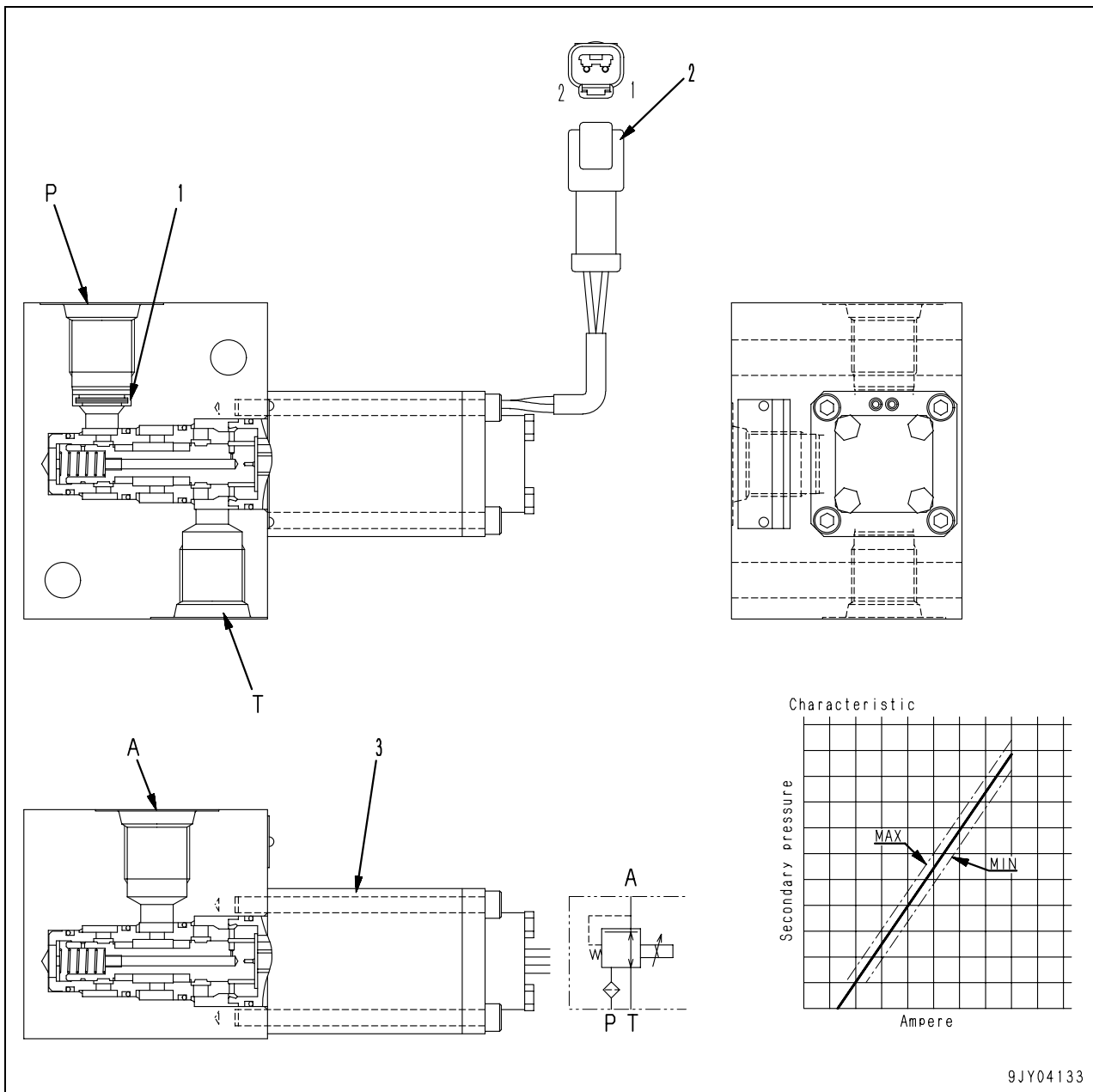
1. Connector
2. Solenoid

B: To parking brake
P: From secondary brake valve
T: To brake system tank

Function

- The parking brake solenoid is installed in the brake oil circuit between the secondary brake valve and the brake. When the parking brake switch is set to PARK, the solenoid valve is demagnetized and cut off the parking brake release oil pressure. Then, the spring force of brake will operate the parking brake.

Solenoid valve



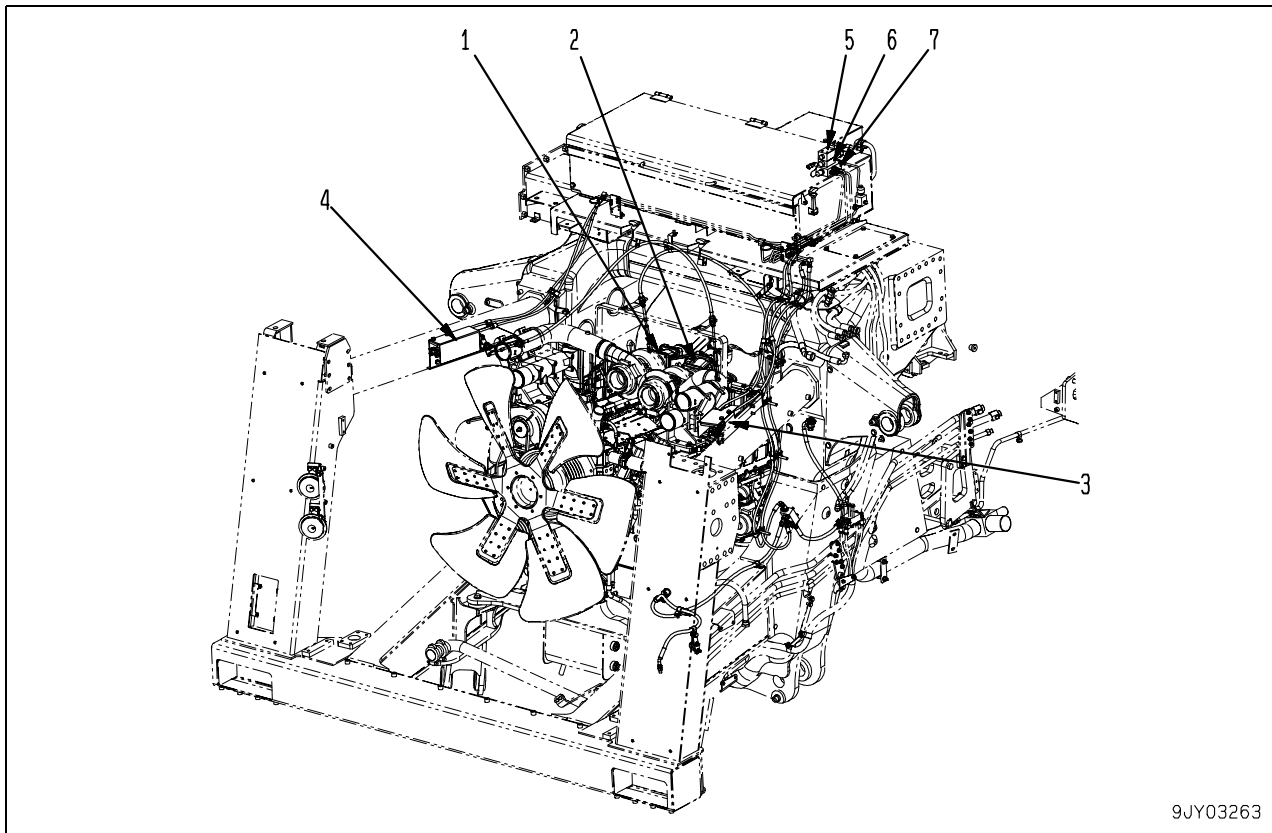
1. Filter
2. Connector
3. Solenoid assembly

A: To slack adjuster
 P: From accumulator
 T: To brake system tank

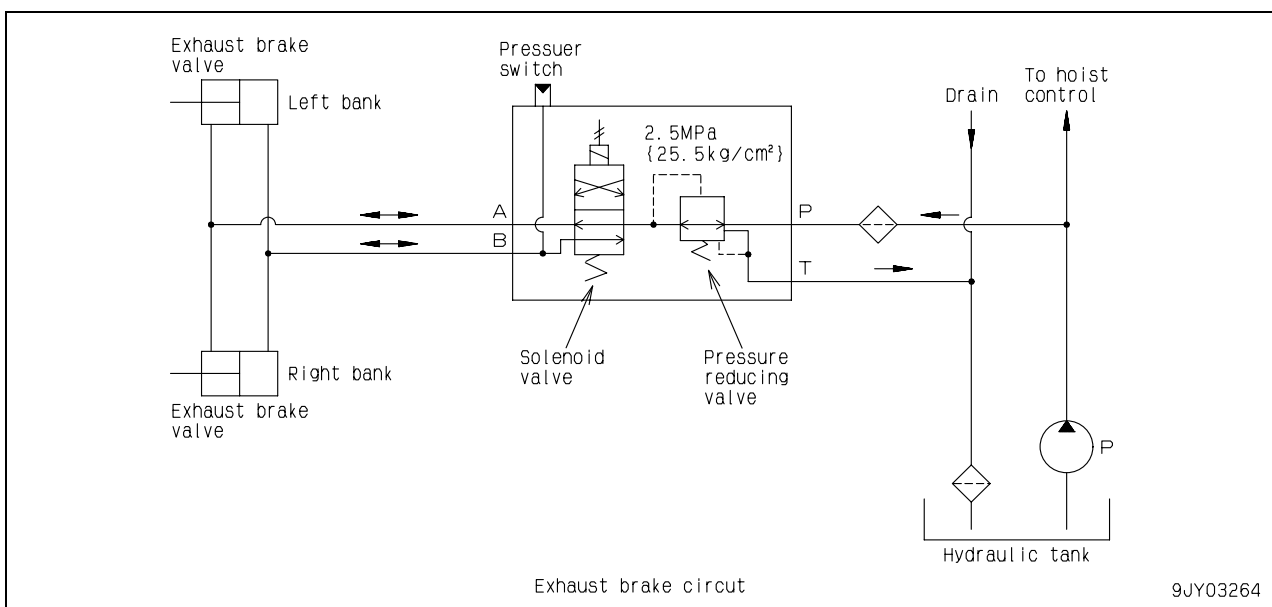
Function

- The solenoid valve is a valve used for retarder control. It is installed between the brake valve and the system tank in the brake circuit. It varies the discharge pressure of the pressure oil in accordance with the turning angle of the retarder control lever, so the retarder control can be carried out as desired.

Exhaust brake (If equipped)



9JY03263



Exhaust brake circuit

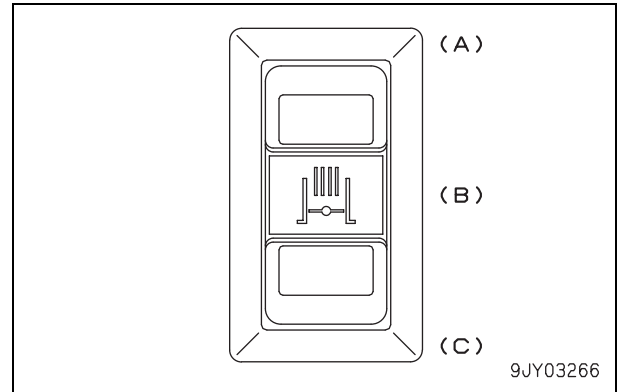
9JY03264

1. Exhaust brake valve (right bank)
2. Exhaust brake valve (left bank).
3. Cylinder(For right bank)
4. Cylinder(For left bank)

5. Exhaust brake solenoid valve
6. Pressure reducing valve
7. Pressure switch

Outline

- The exhaust brake is a device to block the outlet exhaust pipe of the turbocharger of the engine with exhaust brake valves (1) and (2) to utilize the exhaust stroke of the engine as a compressor to improve the effect of the engine used as a brake.
- The exhaust brake is used as the retarder for traveling down slopes.
- Hydraulic pressure used to move the cylinder is taken out of the dump control circuit and adjusted with pressure reducing valve (6). The exhaust brake solenoid changes the passage of this pressure to operate the exhaust brake cylinder. As a result, exhaust valves (1) and (2) are closed and the exhaust brake operates.
- If the exhaust brake operates, pressure is applied to pressure switch (7). Upon receiving the pressure switch signal, the exhaust brake pilot lamp of the monitor panel in the operator's cab lights up to notify the operator that the exhaust brake is in operation.



Operation

Operating condition of exhaust brake

The operation of the exhaust brake depends on the exhaust brake switch position.

- Position A: While the accelerator pedal is released and the torque converter is locked up, the solenoid valve opens to operate the exhaust brake upon receiving the signal from the retarder controller.
- Position B: While the accelerator pedal is released and the torque converter is locked up, if the foot brake is depressed or the retarder control lever is operated, the solenoid valve opens to operate the exhaust brake upon receiving the signal from the retarder controller.
- Position C: The exhaust brake does not operate.

HD785-7 Dump truck

Form No. SEN01285-02

DUMP TRUCK

HD785-7

Machine model Serial number

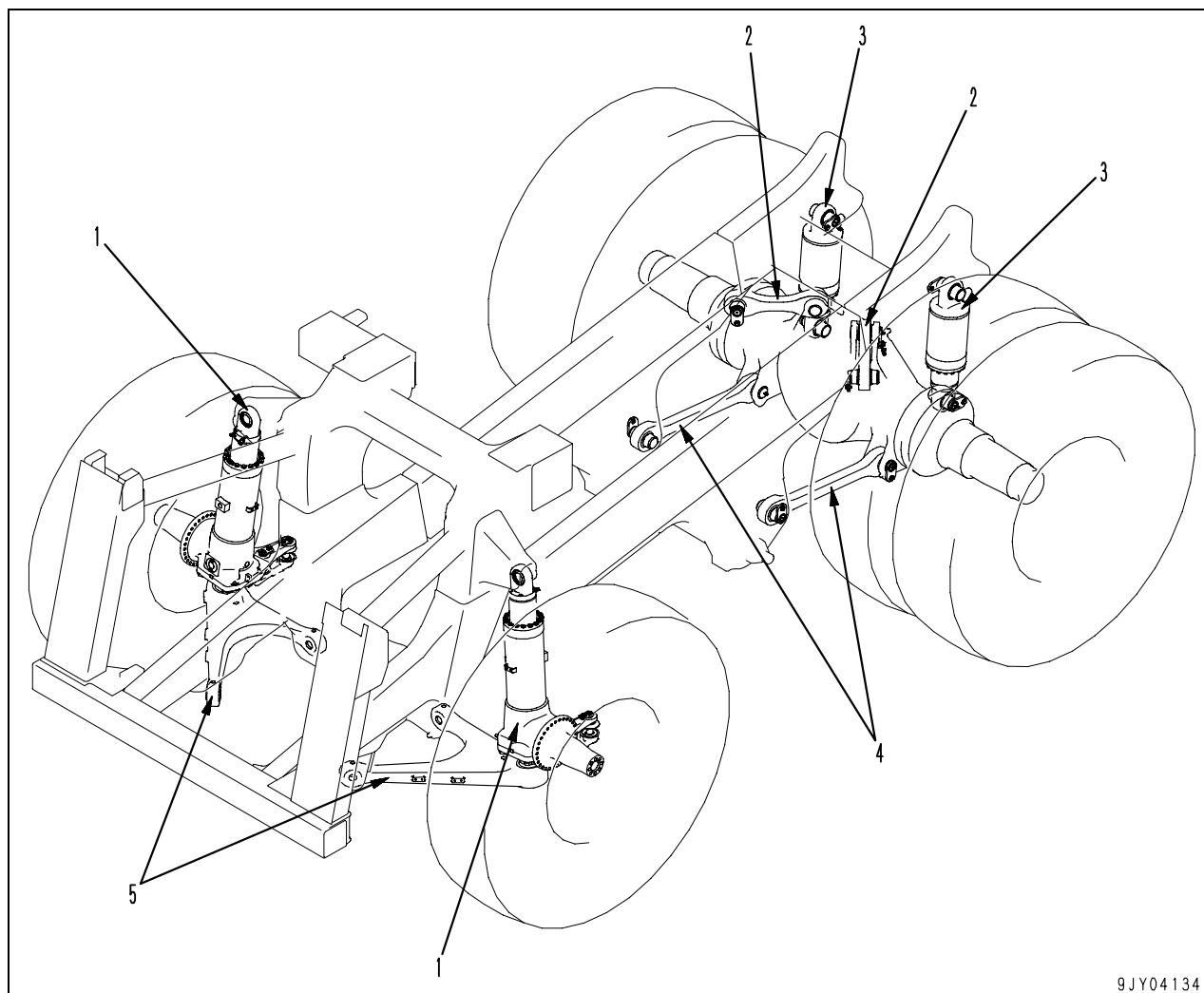
HD785-7 7001 and up

10 Structure, function and maintenance standard

Undercarriage and frame

Suspension	2
Suspension cylinder	4
Rear axle support.....	12

Suspension



9JY04134

1. Front suspension cylinder
2. Radius rod (Upper rod)
3. Rear suspension cylinder
4. Radius rod (Lower rod)
5. Arm (A-frame)

Outline

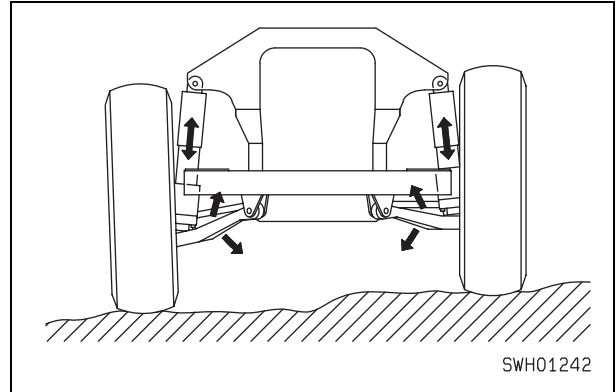
- The suspension system supports the weight of the machine, and absorbs the shock from uneven road surfaces to provide a comfortable ride for the operator. At the same time, it maintains the stability of the machine by ensuring that all four wheels are always in contact with the ground surface. In this way, it allows the machine to demonstrate its full performance in items such as acceleration, braking, and turning, even when traveling at high speed.
- Hydropneumatic cylinders are used for the suspension cylinders to reduce the shock. With hydropneumatic cylinders, the suspension cylinder is charged (sealed) with oil and nitrogen

gas. This acts as a shock absorber (spring and damper) by contracting and expanding the nitrogen gas and oil to absorb the load from the road surface.

- In addition to these functions, the front suspension employs an automatic suspension system. In this system, the force of the suspension is automatically changed by selecting the dumping force to match the travel conditions and load conditions. This further increases the stability and riding comfort of the machine.

Function**1. Front suspension**

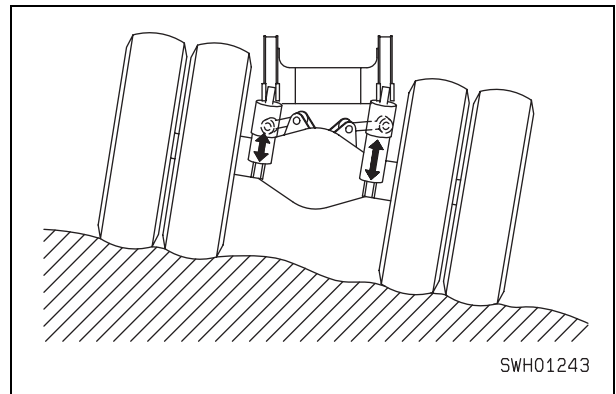
The front suspension cylinder functions as a shock absorber and spring, and is connected by spherical bearings to the lower arm (A-frame) and main frame. The wheels move up and down in accordance with the retraction and extension of the suspension cylinder to maintain the proper alignment for the wheels and to improve the stability of the machine.

**2. Rear suspension**

The differential housing is supported by the frame and two radius rods at the bottom, and at the top by two inverted-V-shaped rods and two suspension cylinders. It is connected to these at both ends by spherical bearings. It transmits the load and motive force through the top and bottom rods.

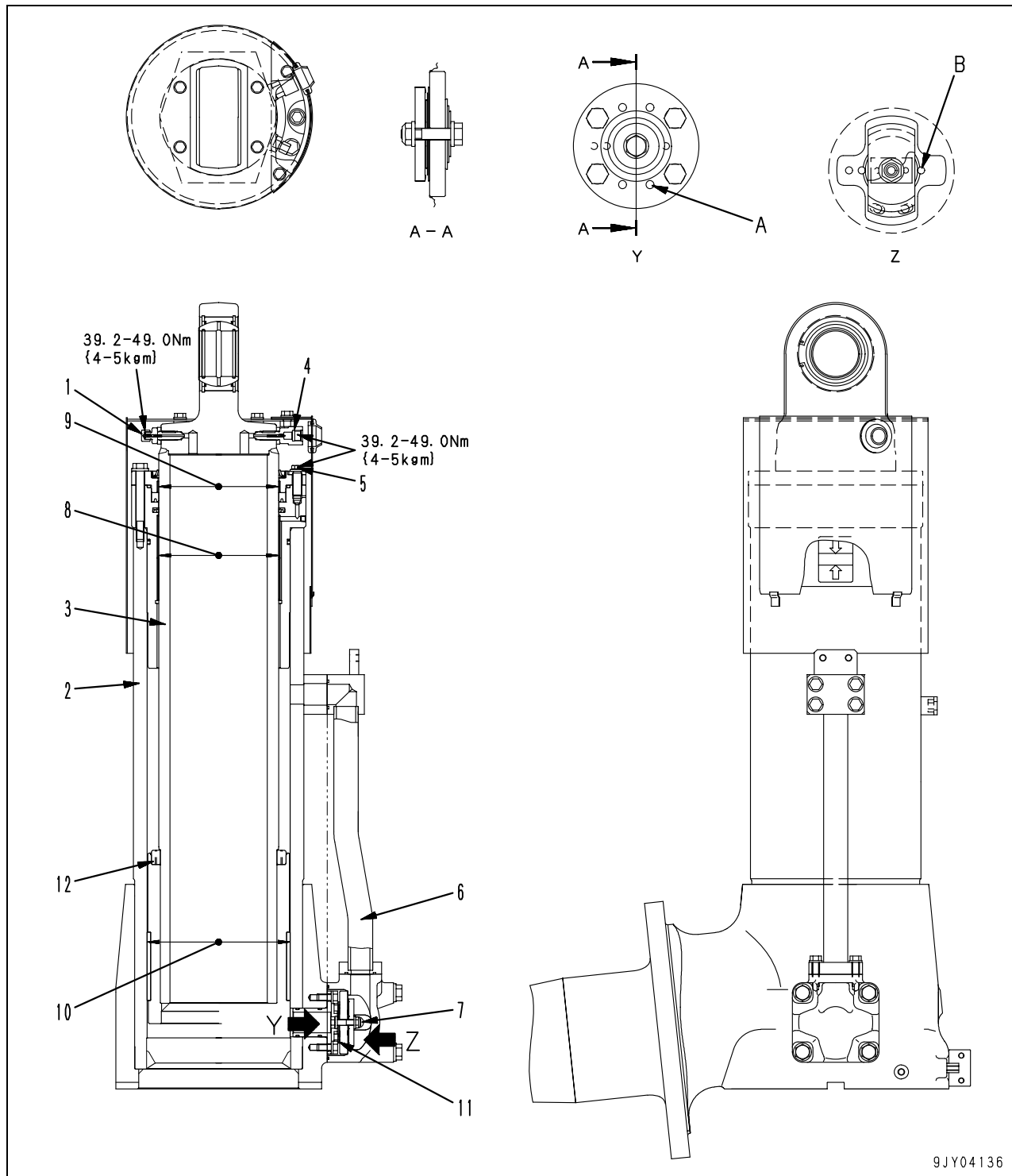
The inverted-V-shaped rods at the top also function to maintain the center of the machine (axle).

Employment of the inverted-V-shaped link improves the rolling steering characteristics.



Suspension cylinder

Front



1. Feed valve
2. Cylinder
3. Rod
4. Valve (for bleeding air and mounting pressure sensor)
5. Air bleeding valve
6. Tube

7. Valve assembly

- A: Port
B: Port

10 Structure, function and maintenance standard

SEN01286-01

Unit: mm

No.	Check item	Criteria					Remedy
8	Clearance between piston rod and bushing	Standard size	Tolerance		Standard clearance	Clearance limit	Replace bushing
			Shaft	Hole			
		210	+0.050 -0.122	+0.96 +0.36	0.31 – 1.082	1.1	
9	Clearance between piston rod and bushing	210	+0.050 -0.122	+0.186 +0.060	0.010 – 0.308	0.4	Replace bushing
10	Clearance between cylinder and wear ring	238	-0.05 -0.10	+0.275 0	0.05 – 0.375	0.5	Replace wear ring
11	Elasticity of leaf spring	Measuring method: Place the spring on a flat bench and measure the amount that the spring curves. (See Fig. 1)				Repair limit	Replace
						Max. 0.3 mm	
12	Deformation of stopper	Measuring method: Measure protrusion and elongation of stopper. (See Fig. 2)				Elongation : Max. 5 mm Protrusion: Max. 2 mm No cracks	

Fig. 1

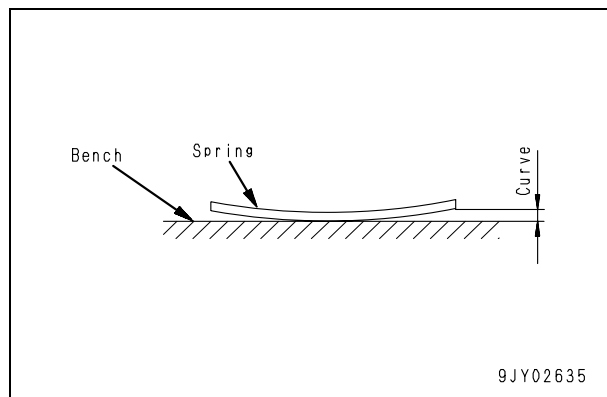
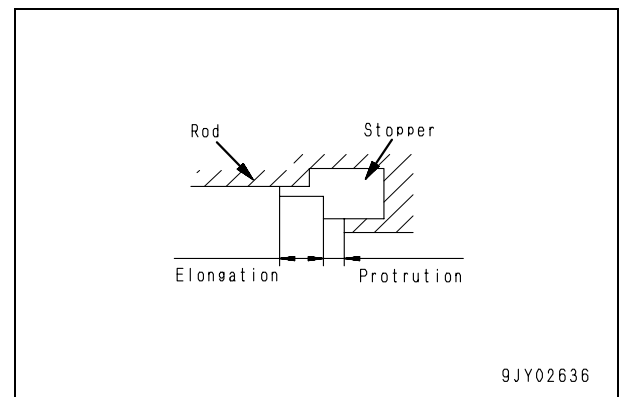
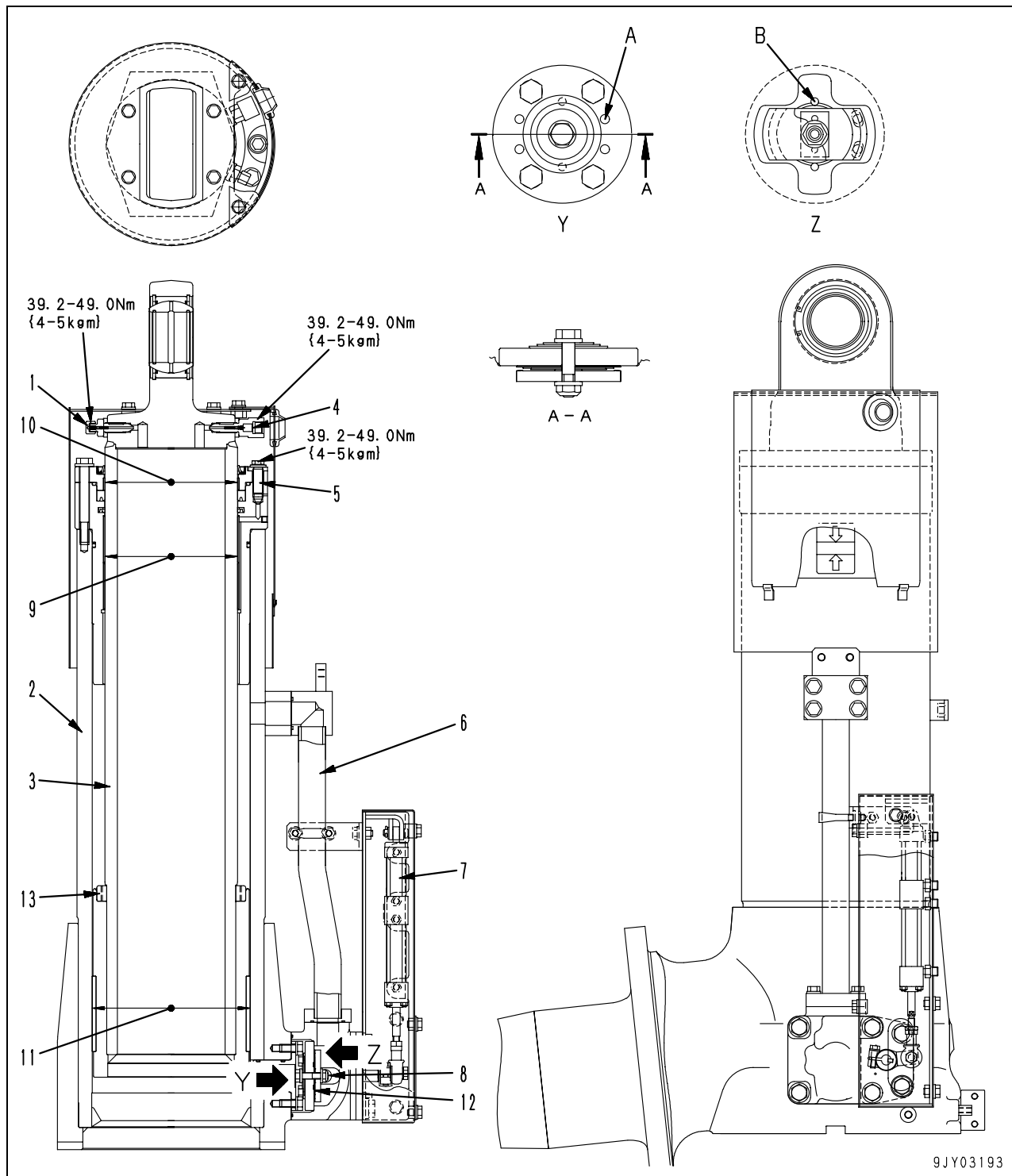


Fig. 2



Auto suspension (If equipped)



1. Feed valve
2. Cylinder
3. Rod
4. Valve (for bleeding air and mounting pressure sensor)
5. Air bleeding valve
6. Tube

7. Hydraulic cylinder
8. Valve assembly

- A: Port
B: Port

Unit: mm

No.	Check item	Criteria					Remedy
9	Clearance between piston rod and bushing	Standard size	Tolerance		Standard clearance	Clearance limit	Replace bushing
			Shaft	Hole			
		210	+0.050 -0.122	+0.96 +0.36	0.31 – 1.082	1.1	
10	Clearance between piston rod and bushing	210	+0.050 -0.122	+0.186 +0.060	0.010 – 0.308	0.4	Replace bushing
11	Clearance between cylinder and wear ring	238	-0.05 -0.10	+0.275 0	0.05 – 0.375	0.5	Replace wear ring
12	Elasticity of leaf spring	Measuring method: Place the spring on a flat bench and measure the amount that the spring curves. (See Fig. 1)				Repair limit	Replace
						Max. 0.3 mm	
13	Deformation of stopper	Measuring method: Measure protrusion and elongation of stopper. (See Fig. 2)				Elongation : Max. 5 mm Protrusion: Max. 2 mm No cracks	

Fig. 1

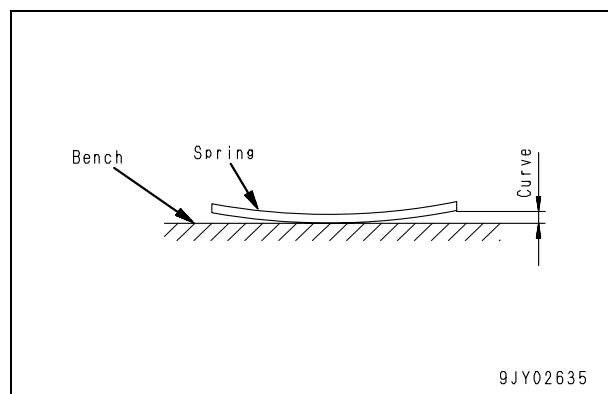
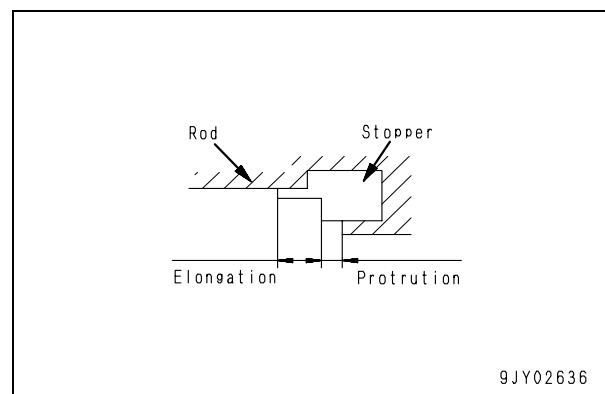


Fig. 2



★ For the auto-suspension system, see Structure, function and maintenance standard, Electrical system, Part 2.

Structure and operation

The suspension cylinder acts as a shock absorber and spring. The inside of the cylinder is divided into gas chamber (A) which is charged with nitrogen gas, and oil chamber (B) which is filled with oil. Oil chamber (B) and oil chamber (C) are connected by tube (6) and valve body (8).

1. Nitrogen gas

When the machine is traveling, the wheels follow the unevenness of the road surface, and an external force in the updown direction is applied to the suspension cylinder. When this happens, the volume of the nitrogen in gas chamber (A) changes elastically under the input force, and absorbs the external force. The nitrogen gas is sealed by a rod and oil, so it is always subjected to a pressure corresponding to the external force, and acts as an air spring.

2. Principle of generation of damping force

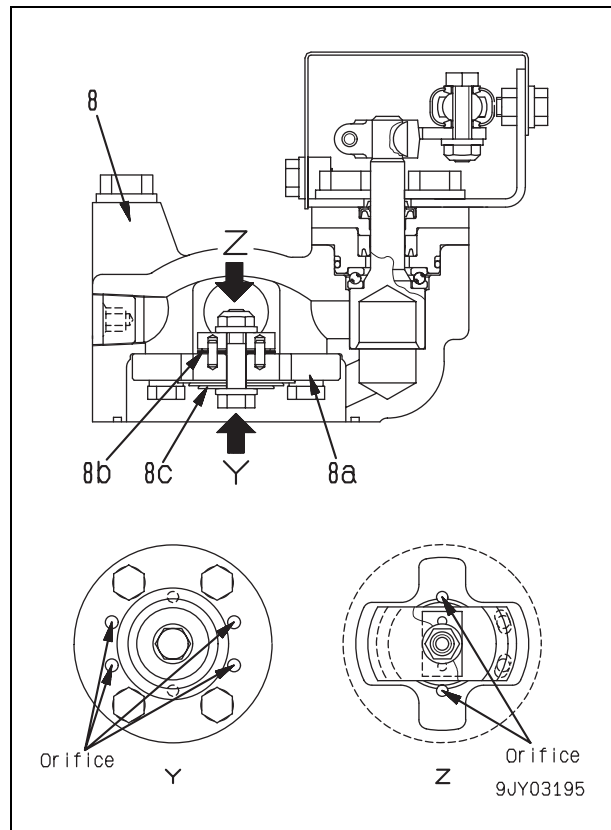
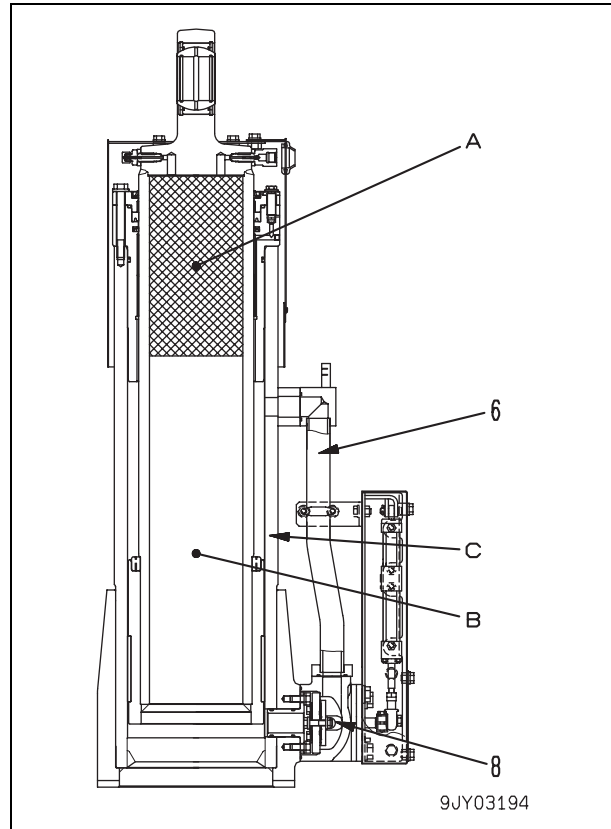
Inside valve body (8) are orifice plate (8a) and leaf springs (8b) and (8c). They restrict the flow of oil between oil chamber (B) and oil chamber (C), and create a damping force.

1) Action when retracting

When the nitrogen gas is compressed by the external force from the road surface, the oil in oil chamber (B) flows from oil chamber (B) through the valve (8) and tube (6) to oil chamber (C). The oil flowing through the valve from direction (Z) to orifice plate (8a) is throttled by orifices in four places to generate a damping force.

2) Action when extending

When the external force from the road surface gets weak, the pressure of the nitrogen gas extends the rod, and the oil in oil chamber (C) passes through tube (6) and valve (8) and flows to oil chamber (B). The oil inside the valve flows from direction (X) and passes through two orifices from orifice plate (8a) to generate a damping force.



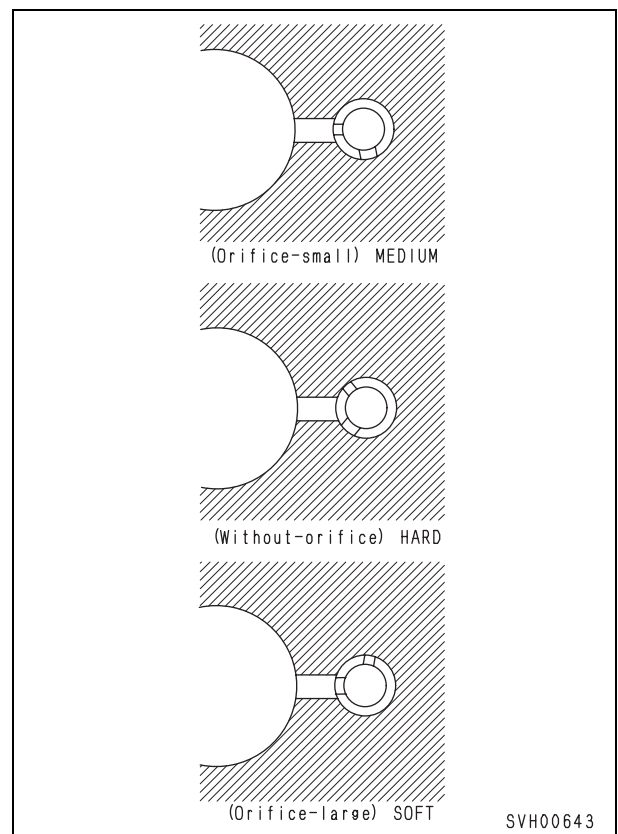
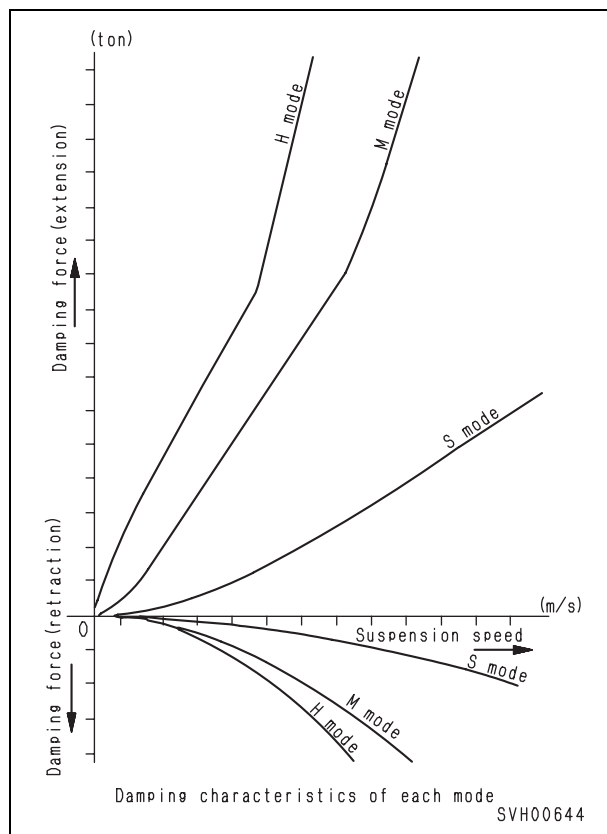
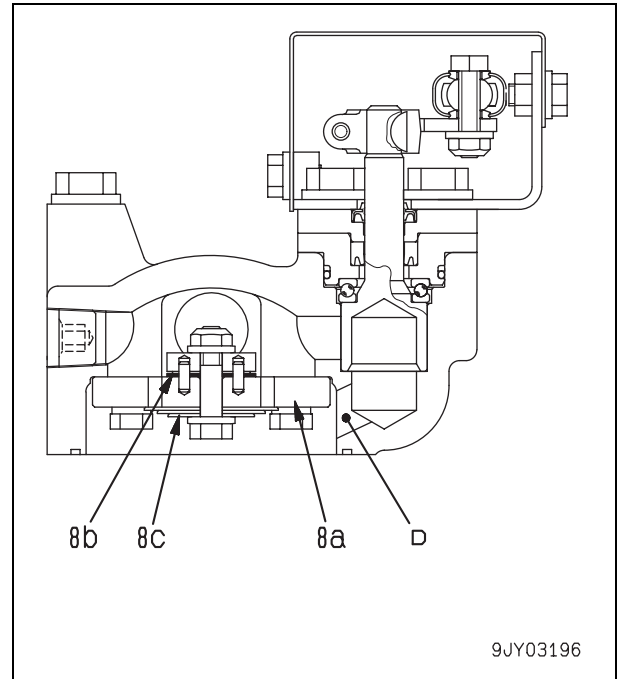
3. Variable shaft mechanism

In the valve body, bypass circuit (D) is provided before and after orifice plate (8a), so the oil flow is divided into oil flowing through orifice plate (8a) and oil flowing through the bypass circuit (D).

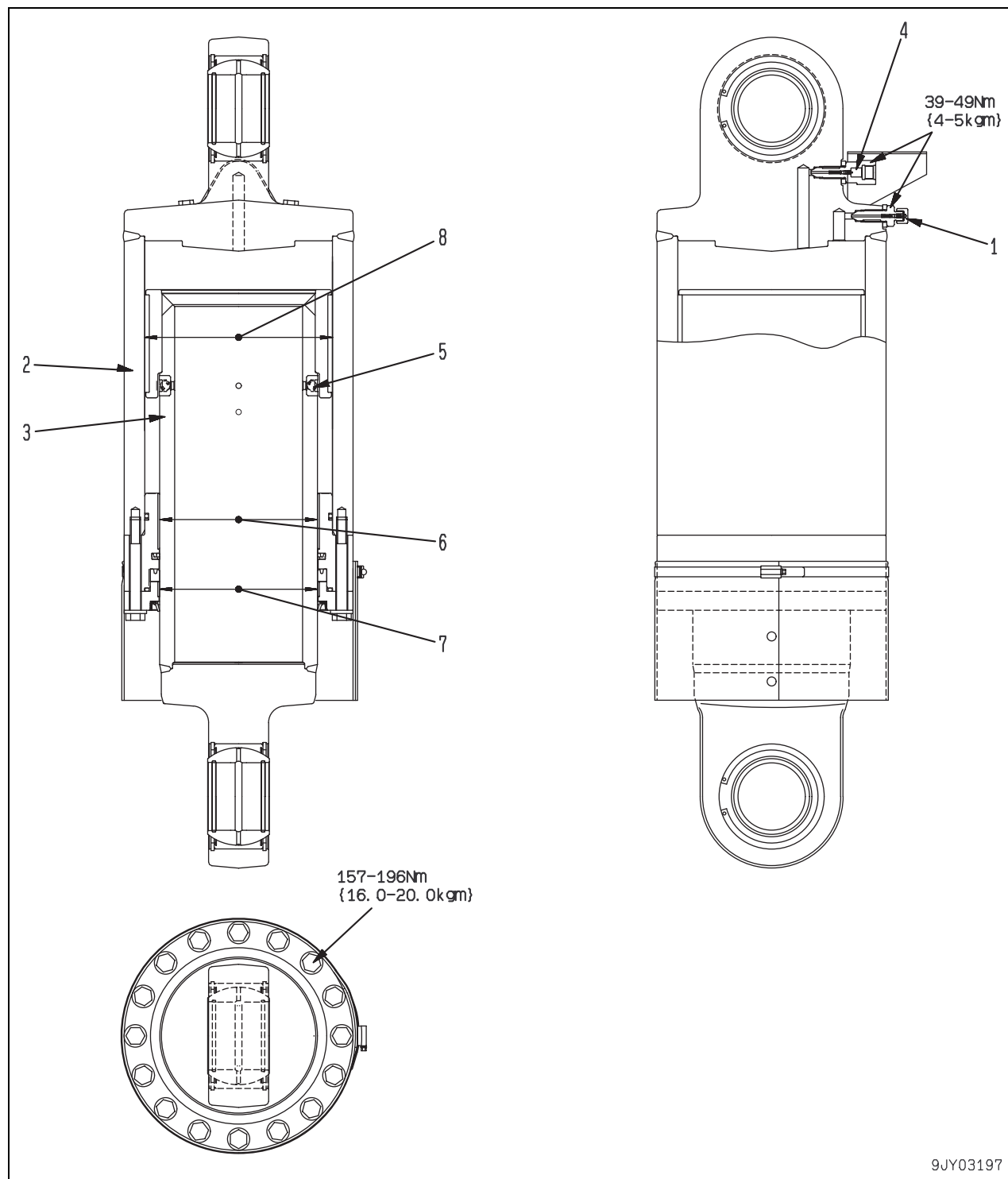
The oil flowing through bypass circuit (D) passes through a shaft with orifices at two places on the inside circumference, and flows to oil chamber (C) or oil chamber (B) according to whether it is retracting or extending.

The shaft is connected to an air cylinder driven by a signal from the retarder controller, and the size of the orifices automatically changes according to the condition of the machine.

The damping force is set at three levels (MEDIUM, HARD, SOFT) according to the size of the orifices through which the oil is passing.



Rear



1. Feed valve
2. Cylinder
3. Rod
4. Valve (for bleeding air and mounting pressure sensor)
5. Ball

Unit: mm

No.	Check item	Criteria					Remedy
6	Clearance between piston rod and bushing	Standard size	Tolerance		Standard clearance	Clearance limit	Replace
			Shaft	Hole			
		210	-0.050 -0.122	+0.306 +0.060	0.110 – 0.428	0.5	
7	Clearance between piston rod and bushing	210	-0.050 -0.122	+0.306 +0.060	0.110 – 0.428	0.5	
8	Clearance between cylinder and wear ring	250	-0.050 -0.260	+0.115 0	0.05 – 0.375	0.8	

Structure and operation

The suspension cylinder has the function of both a shock absorber and spring.

When a fixed amount of oil is sent from oil chamber (6) through orifices (4) and (5) to cavity (2), the oil is throttled by the orifices and a shock-absorbing effect is obtained.

a) Retracting action

When the machine is traveling and it hits a bump or object on the road, the wheels are pushed up, and the cylinder rod is pushed inside the cylinder.

When this happens, the nitrogen gas inside chamber (7) is compressed, the oil in chamber (6) is sent through both orifices (4) and (5) to cavity (2), and cavity (2) is filled more quickly than when extending.

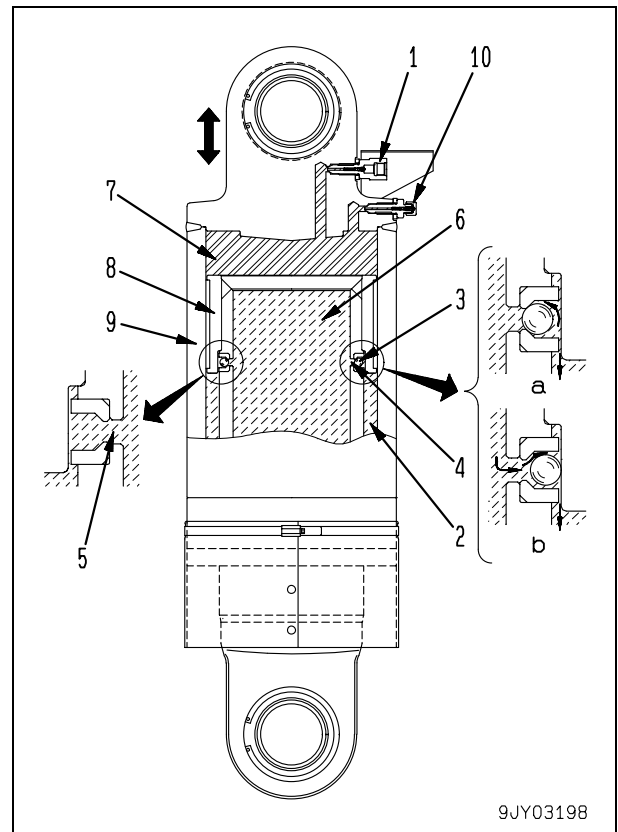
b) Extending action

When the machine has passed any bump or object on the road surface, the cylinder rod is pushed up by the weight of the wheels and axle and the pressure of the nitrogen inside chamber (7).

As a result, the amount of oil in cavity (2) is reduced, and pressure is applied to the oil remaining in cavity (2).

This pressurized oil closes orifice (4) with check ball (3), and is sent to chamber (6) through only orifice (5), so the flow of oil passing through the orifice is controlled so that it is less than during retraction.

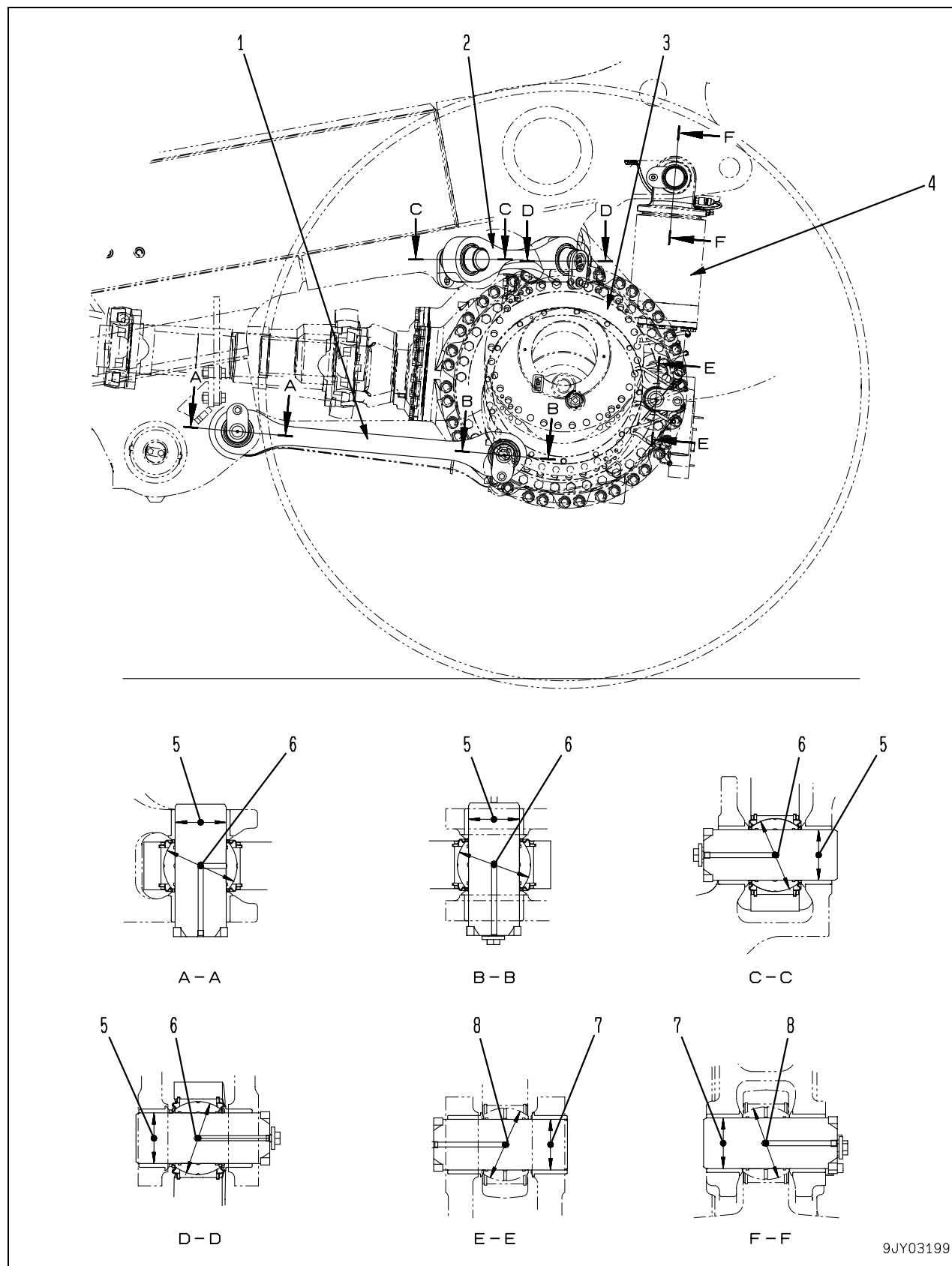
In this way, the amount of oil returning to chamber (6) is restricted to provide a shock absorbing effect.



9JY03198

- | | |
|---------------------|-------------------------|
| 1. Air intake valve | 7. Nitrogen gas chamber |
| 2. Cavity | 8. Cylinder rod |
| 3. Check ball | 9. Cylinder |
| 4. Orifice | 10. Air bleeding valve |
| 5. Orifice | |
| 6. Oil chamber | a: When extending |
| | b: When retracting |

Rear axle support



1. Lower rod
2. Upper rod

3. Axle
4. Suspension cylinder

10 Structure, function and maintenance standard

SEN01286-01

Unit: mm

No.	Check item	Criteria					Remedy
5	Clearance between rod mounting pin and bushing	Standard size	Tolerance		Standard clearance	Clearance limit	Replace
			Shaft	Hole			
		90	-0.030 -0.060	+0.091 +0.045	0.075 – 0.970	1.1	
6	Clearance between inner and outer bushing	130	—	—	0.120 – 0.190	0.3	
7	Clearance between suspension cylinder mounting pin and frame or axle	90	-0.030 -0.060	+0.091 +0.045	0.075 – 0.970	1.1	
8	Clearance between inner and outer bushing	130	—	—	0.120 – 0.190	0.3	

HD785-7 Dump truck

Form No. SEN01286-01

DUMP TRUCK

HD785-7

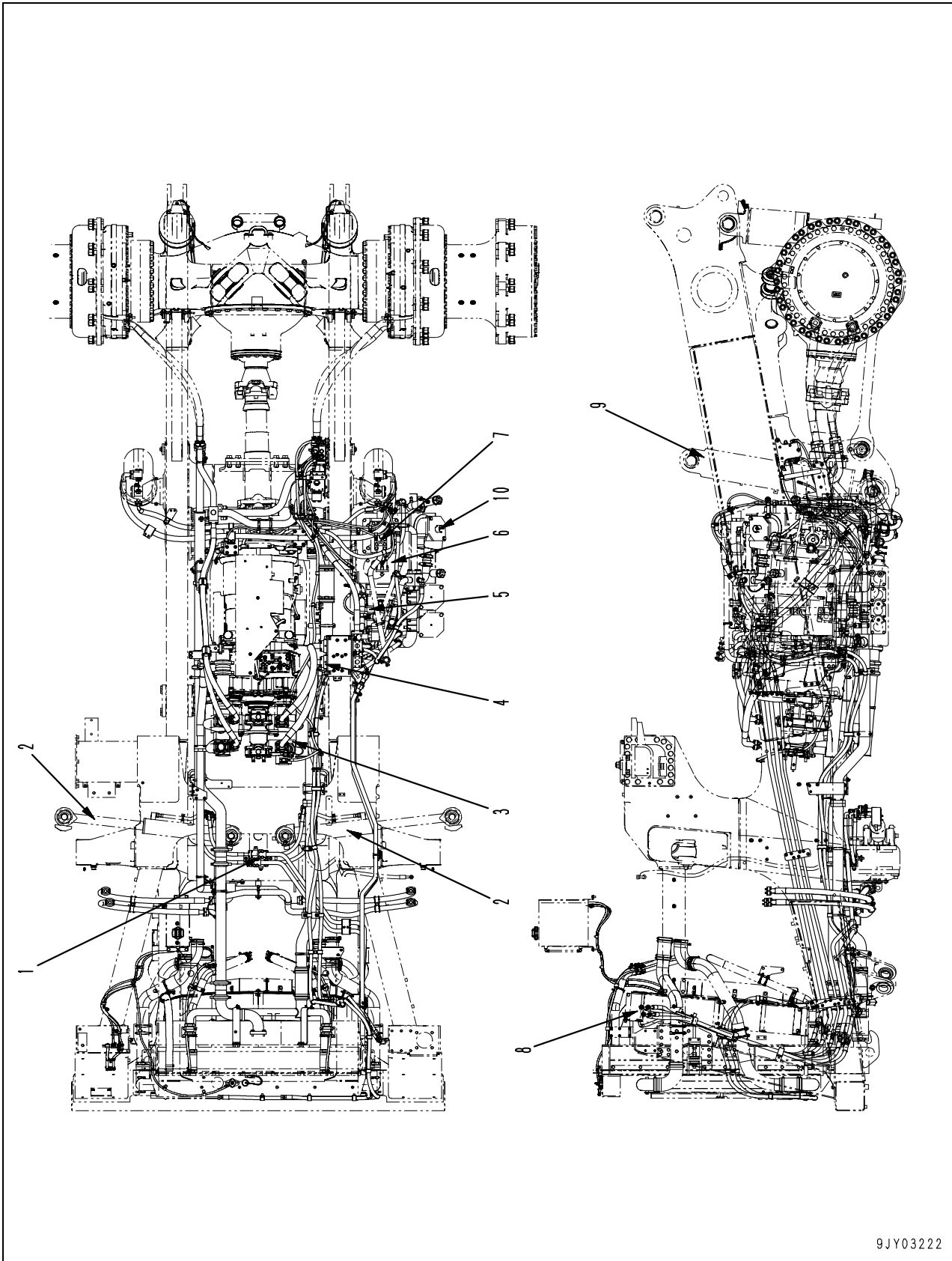
Machine model	Serial number
HD785-7	7001 and up

10 Structure, function and maintenance standard

Hydraulic system

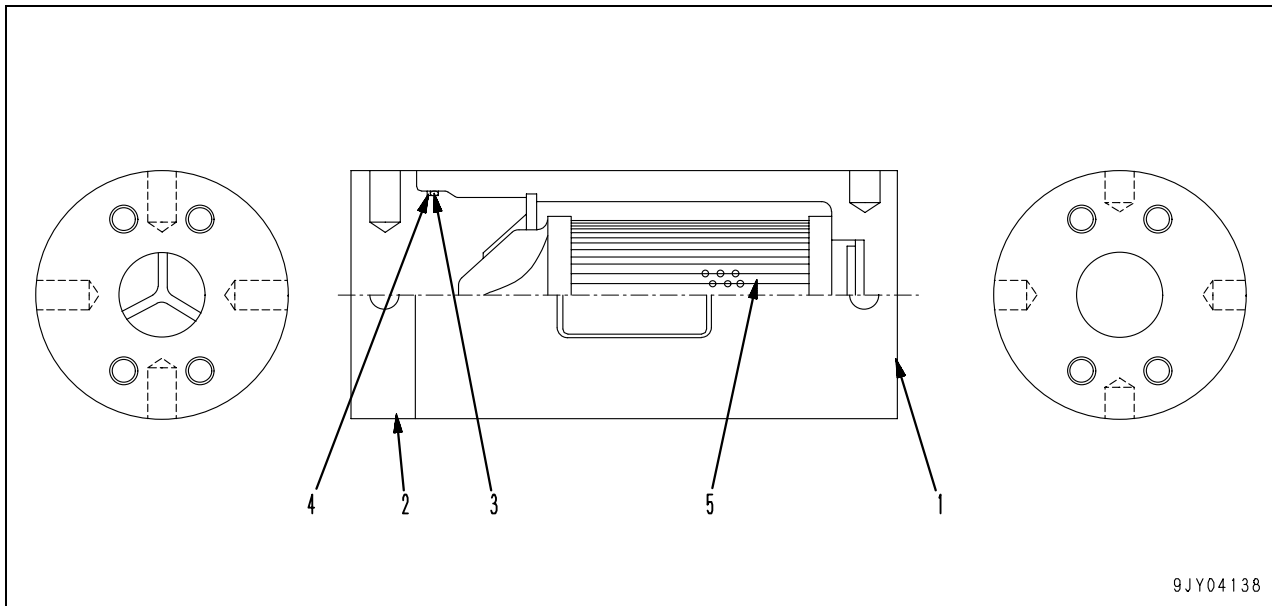
Steering and hoist hydraulic piping	2
Steering, hoist filter (high pressure circuit).....	4
Dump body control	6
Hydraulic tank	8
Steering valve	9
Crossover relief valve	13
Steering cylinder	14
Steering control valve.....	15
Hoist valve	24
Dump control valve (EPC valve)	30
Hoist cylinder	31
Hydraulic pump	32

Steering and hoist hydraulic piping



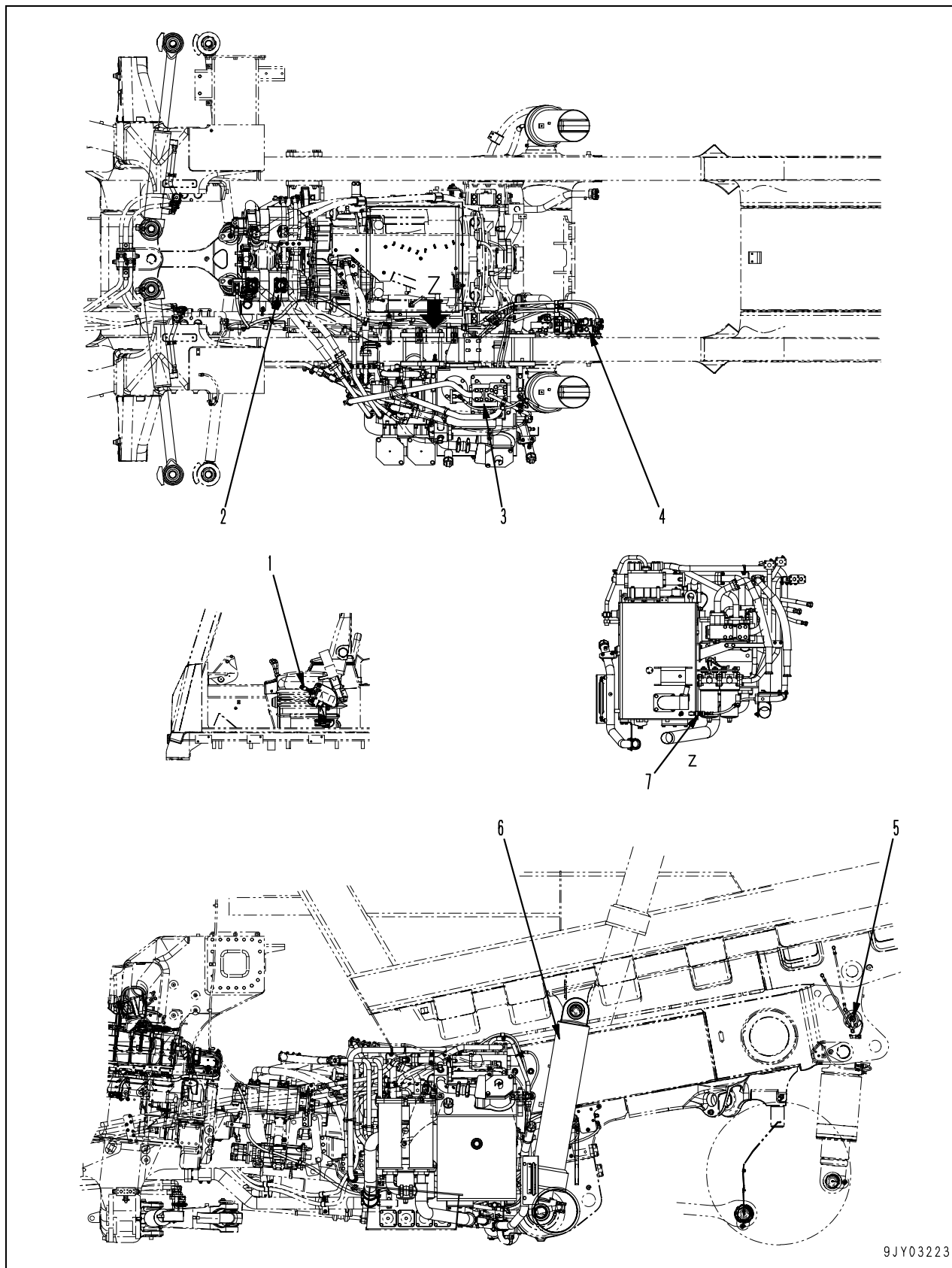
1. Cross-over relief valve
2. Steering cylinder
3. Steering, hoist and hoist control pump
(SAR(4)180+180+(1)6)
4. Steering hoist filter (high pressure circuit)
5. Steering control valve
6. Hydraulic tank
7. Hoist valve
8. Steering valve
9. Hoist cylinder
10. Steering hoist filter (low pressure circuit)

Steering, hoist filter (high pressure circuit)



1. Case
2. Cover
3. O-ring
4. Ring
5. Element

Dump body control

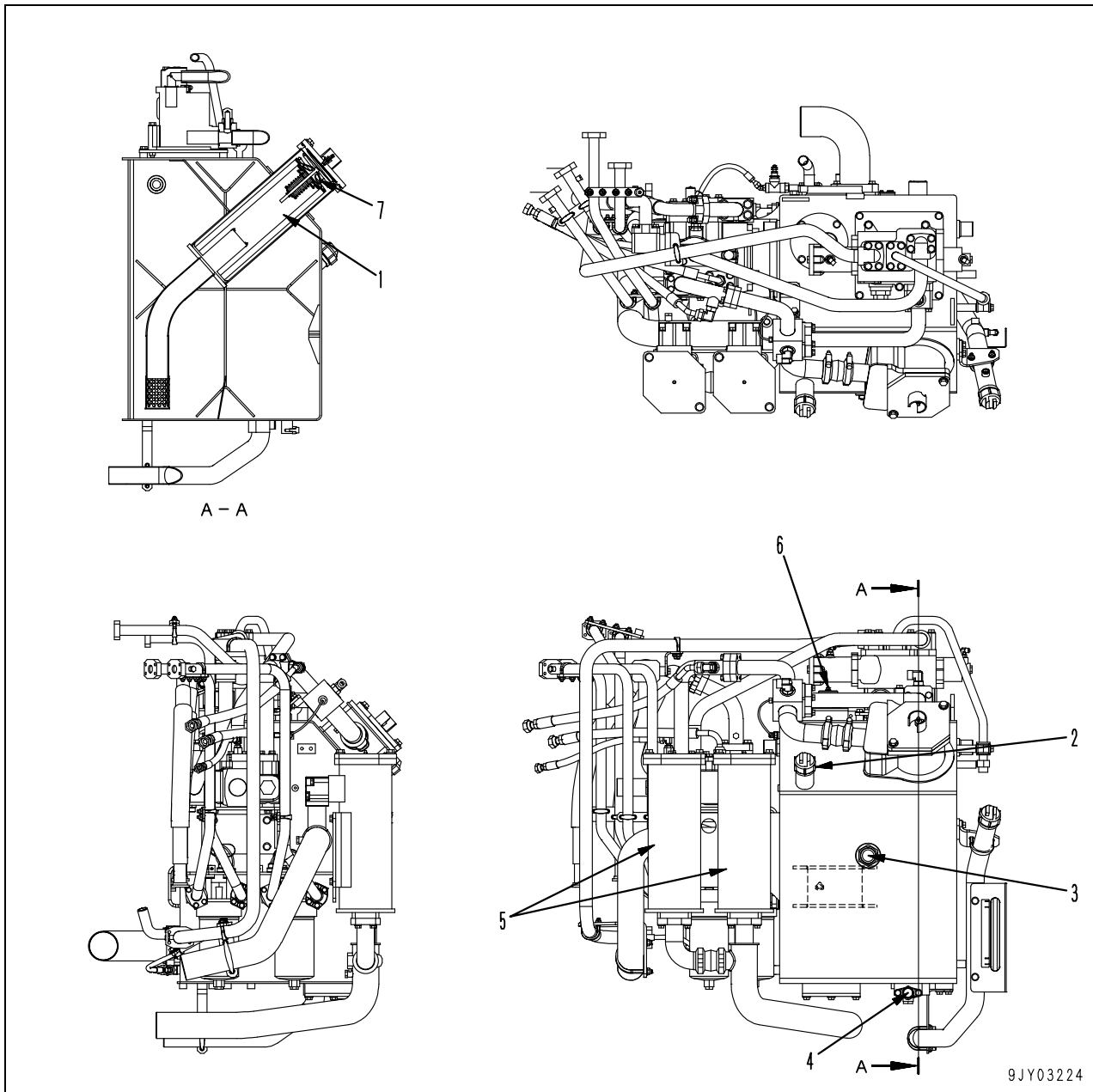


1. Dump control lever
2. Hydraulic pump (SAR(4)180+180+(1)6)
3. Hoist valve
4. Dump control valve (EPC valve)
5. Body positioner sensor
6. Hoist cylinder
7. Manual body lowering valve

Function

- The positioner sensor senses the body control operation, and from this data the retarder controller controls output to the dump control valve (EPC valve).
As a result, the body lowering speed is controlled to reduce the seating shock.
- The signal from the dump lever is controlled by the retarder controller, and actuates the dump control valve (EPC valve). The pilot pressure generated by the dump control valve (EPC valve) moves the spool of the hoist valve and controls the hoist cylinder.
- If the body does not lower because of a trouble in the controller or electrical equipment, open manual body lowering valve (7) and drain the body holding oil in hoist cylinder (6) to the tank to lower the body.
(For the operating procedure, see Testing and adjusting.)

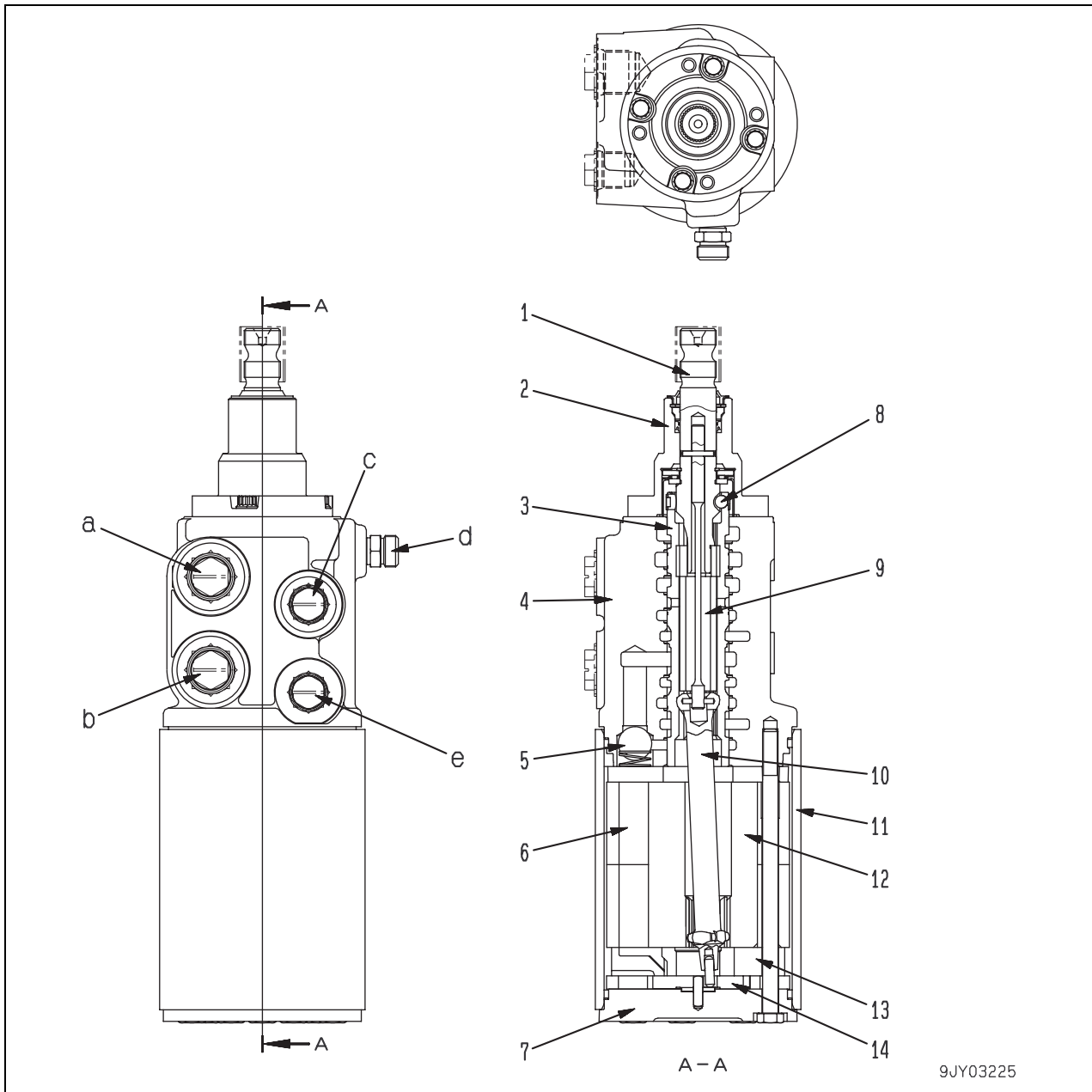
Hydraulic tank



1. Steering, hoist oil filter (low pressure circuit)
2. Oil filter
3. Oil level gauge
4. Drain
5. Transmission, brake cooling oil filter
6. Breather
7. By-pass valve

Capacity: 156ℓ

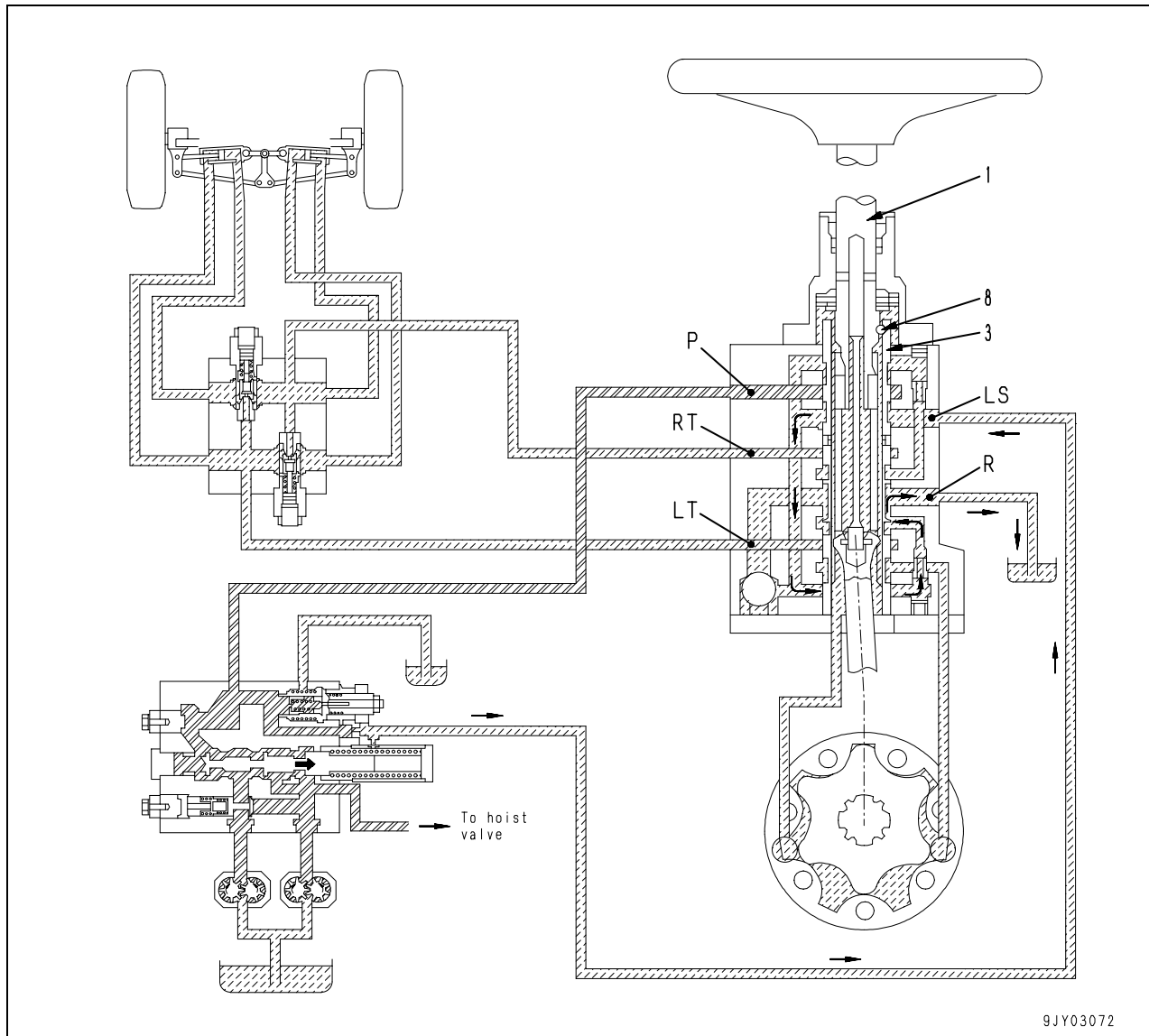
Steering valve



- | | | |
|----------------|----------------|--|
| 1. Input shaft | 8. Ball | a: From demand valve (P port) |
| 2. Upper cover | 9. Torsion bar | b: To tank (R port) |
| 3. Valve spool | 10. Link | c: To steering cylinder (RT port) |
| 4. Housing | 11. Sleeve | d: To steering control valve (LS port) |
| 5. Ball | 12. Rotor | e: To steering cylinder (LT port) |
| 6. Stator | 13. Manifold | |
| 7. Lower cover | 14. Commutator | |

Operation

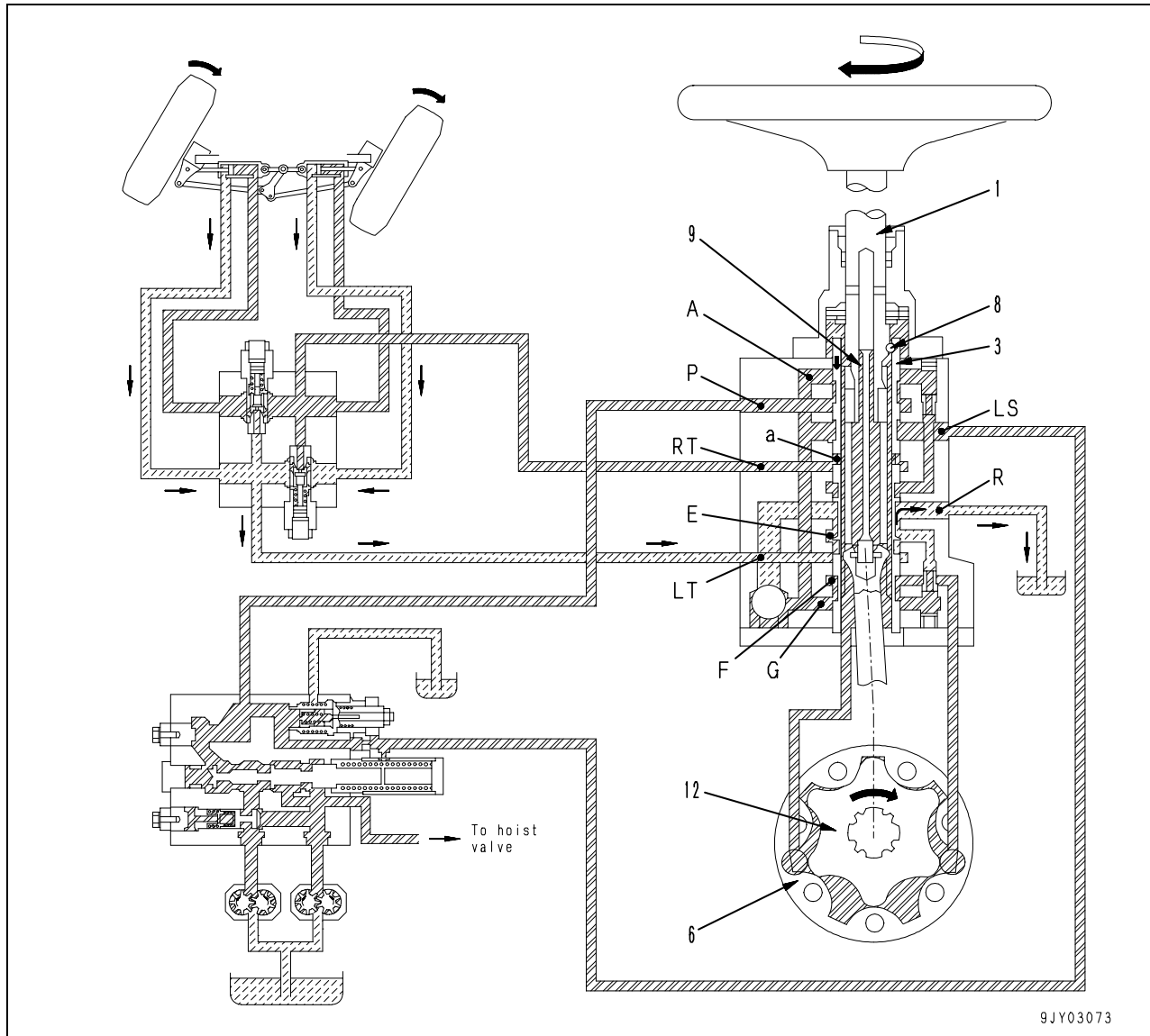
1. When steering is at neutral



- The oil from the pump passes through the steering control valve and enters port (P) of the steering valve
- Valve spool (3) is at the neutral position, so port (P) and the port (RT and LT) to steering cylinder are closed. No oil flows to the steering cylinder, so the steering cylinder does not move.
- At the same times, port (LS) is connected through port (R) to the tank. As a result, there is no oil pressure at port (LS), so all the oil from the pump at the steering control valve flows to the hoist valve.

2. Steering to right

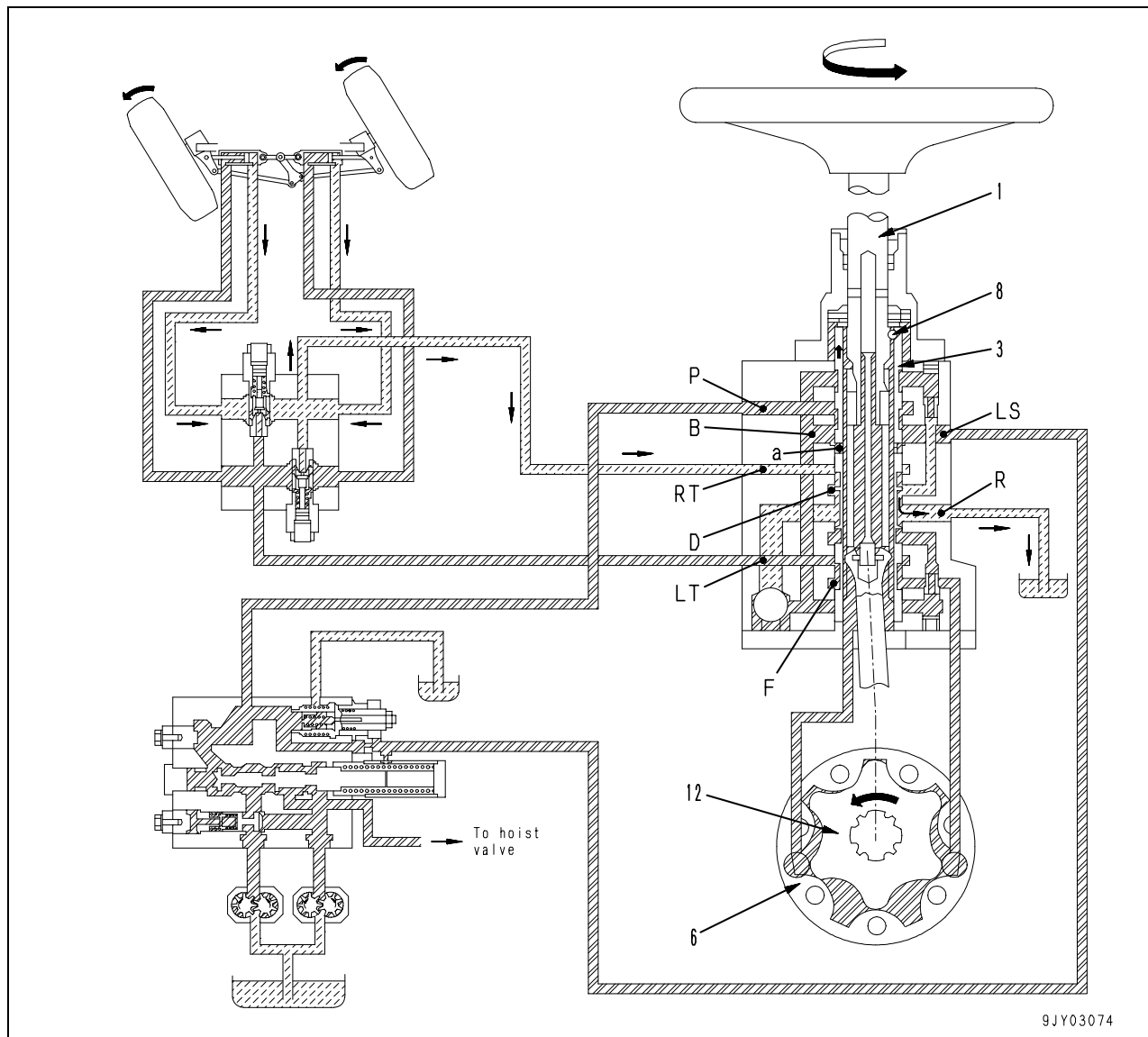
(When steering wheel is turned to the right)



- When the steering wheel is turned (to the right), input shaft (1) rotates. When this happens, valve spool (3) moves down. (Input shaft (1) has a spiral groove in which ball (8) moves, so when input shaft (1) rotates, torsion bar (9) is twisted, and ball (8) moves up or down to move valve spool (3).)
- The oil from the steering control valve flows from port (P) through port (A) and port (G) and goes to port (F).
- The oil at port (F) then passes between stator (6) and rotor (12) in the metering position. After the amount of oil flowing to steering cylinder is measured here, it enters the inside of valve spool (3), passes through drill hole (a) in the valve spool through port (RT) and flows to the steering cylinder.
- In this way, the two cylinders are actuated and the wheels turn to the right.
- The oil returning from the steering cylinder flows from port (LT) through port (E) and port (R) and goes back to the tank.
- At the same time, the oil pressure at port (P) is restricted by valve spool (3), and passes through port (A), so a lower oil pressure (the drop in pressure (pressure difference) differs according to the area of the opening of the spool) than the pressure at port (P) is applied to port (LS).
- The steering control valve spool is actuated by the difference in pressure between the oil pressure at port (P) end and the oil pressure at the port (LS) end. As a result, only the necessary amount of oil flows to the steering circuit, and remaining oil flows from the steering control valve to the hoist valve.

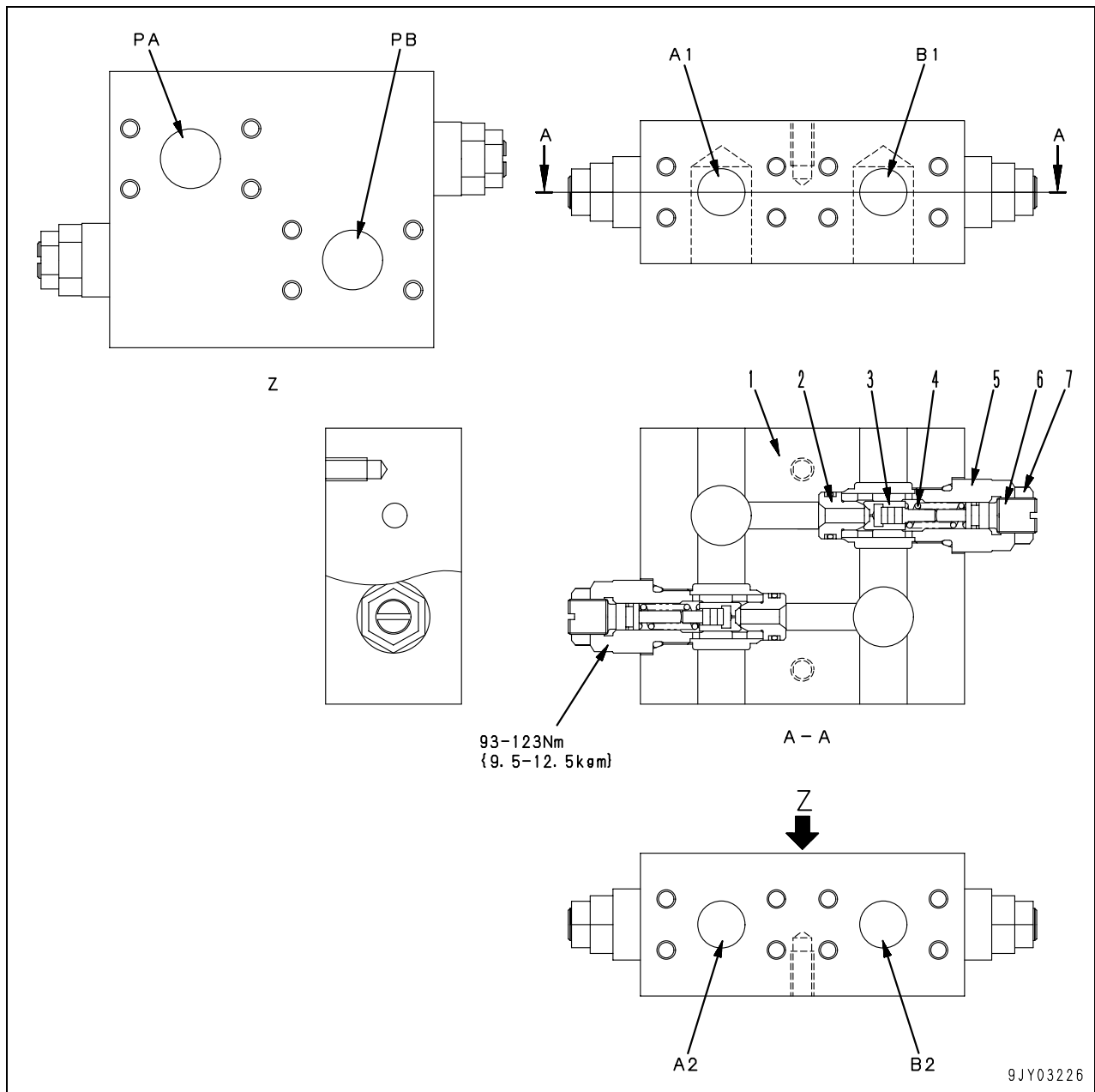
3. Steering to left

(When the steering wheel is turned to the left.)



- When steering wheel is turned (to the left), input shaft (1) rotates. When this happens, valve spool (3) moves up.
- The oil from the steering control valve flows from port (P) enters port (B) passes through drill hole (a) in valve spool (3), and enters the inside of the valve spool.
- The oil inside valve spool (3) passes between stator (6) and rotor (12) in metering portion. After the amount of oil flowing to the steering cylinder is measured here, it flows to port (F).
- The oil at port (F) passes through port (LT) and flows to steering cylinder.
- In this way, the two cylinders are actuated and the wheels turn to the left.
- The oil returning from the steering cylinder flows from port (RT) through port (D) and port (R) and goes back to the tank.
- At the same time, the oil pressure at port (P) is restricted by valve spool (3), so a lower oil pressure than the pressure at port (P) is applied to port (LS).
- The steering control valve spool is actuated by the difference in pressure between the oil pressure at port (P) end and the oil pressure at the port (LS) end. As a result, only the necessary amount of oil flows to steering circuit, and remaining oil flows from the steering control valve to the hoist valve.

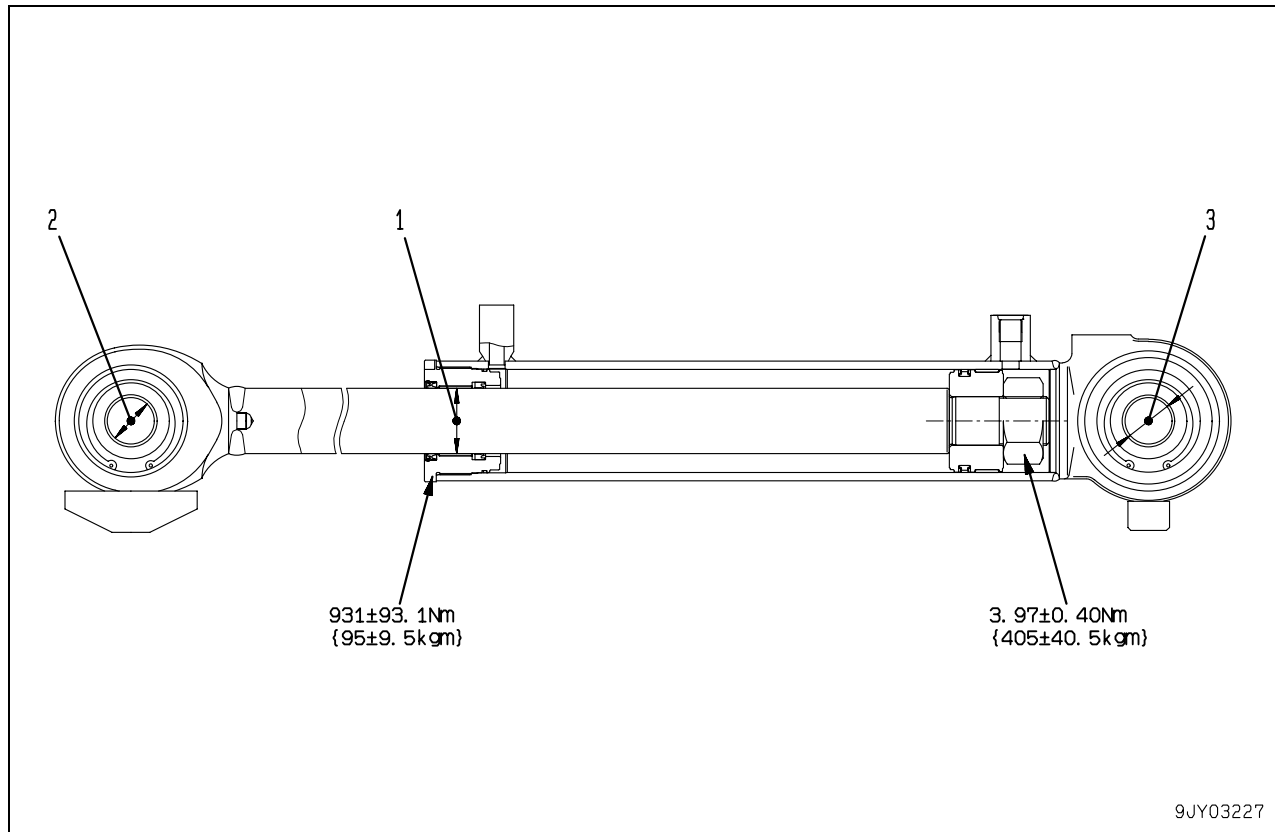
Crossover relief valve



A1: To steering cylinder
A2: To steering cylinder
B1: To steering cylinder
B2: To steering cylinder
PA: From steering valve
PB: From steering valve

1. Valve body
2. Valve seat
3. Relief valve
4. Valve spring
5. Sleeve
6. Adjustment screw
7. Lock nut

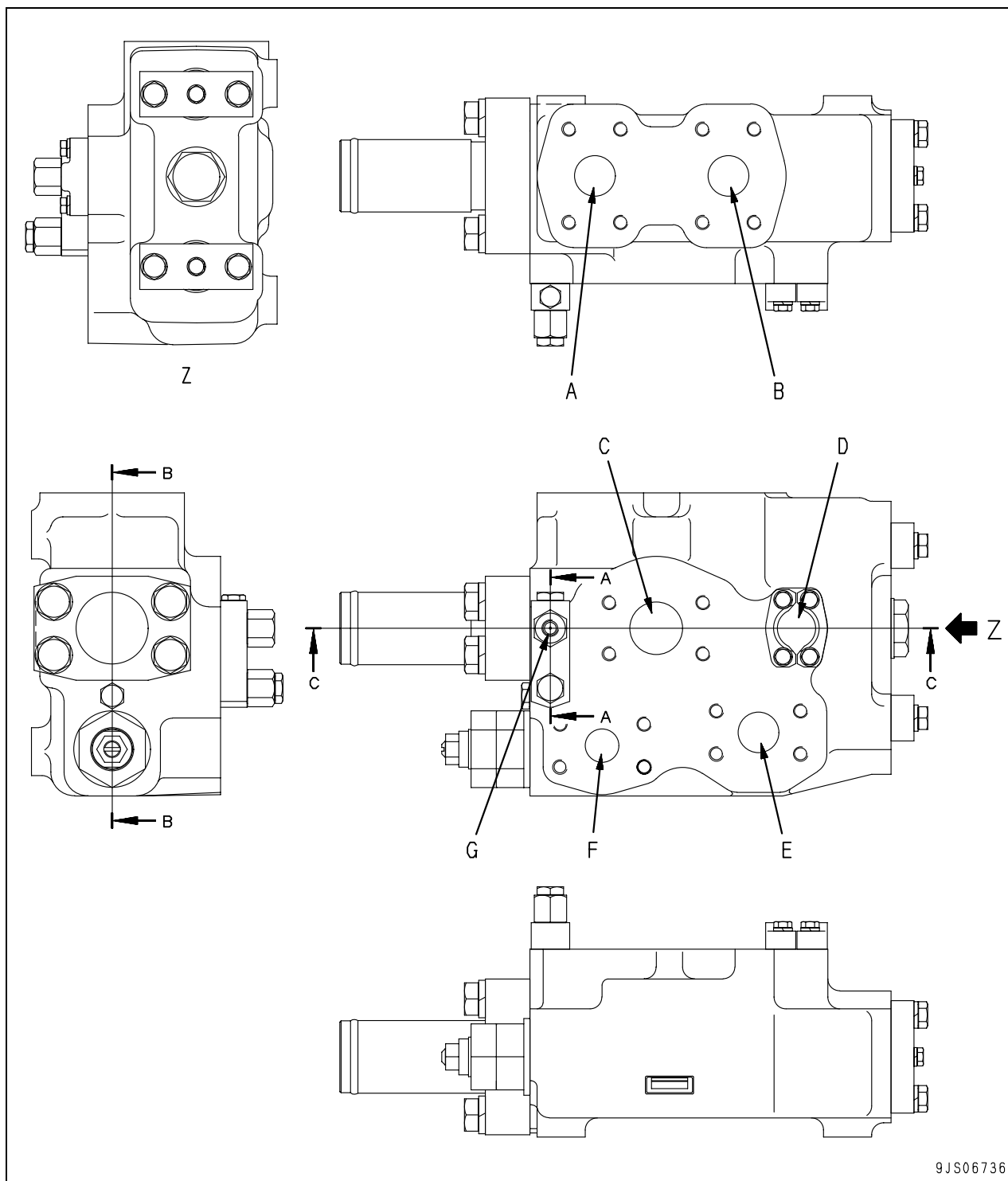
Steering cylinder



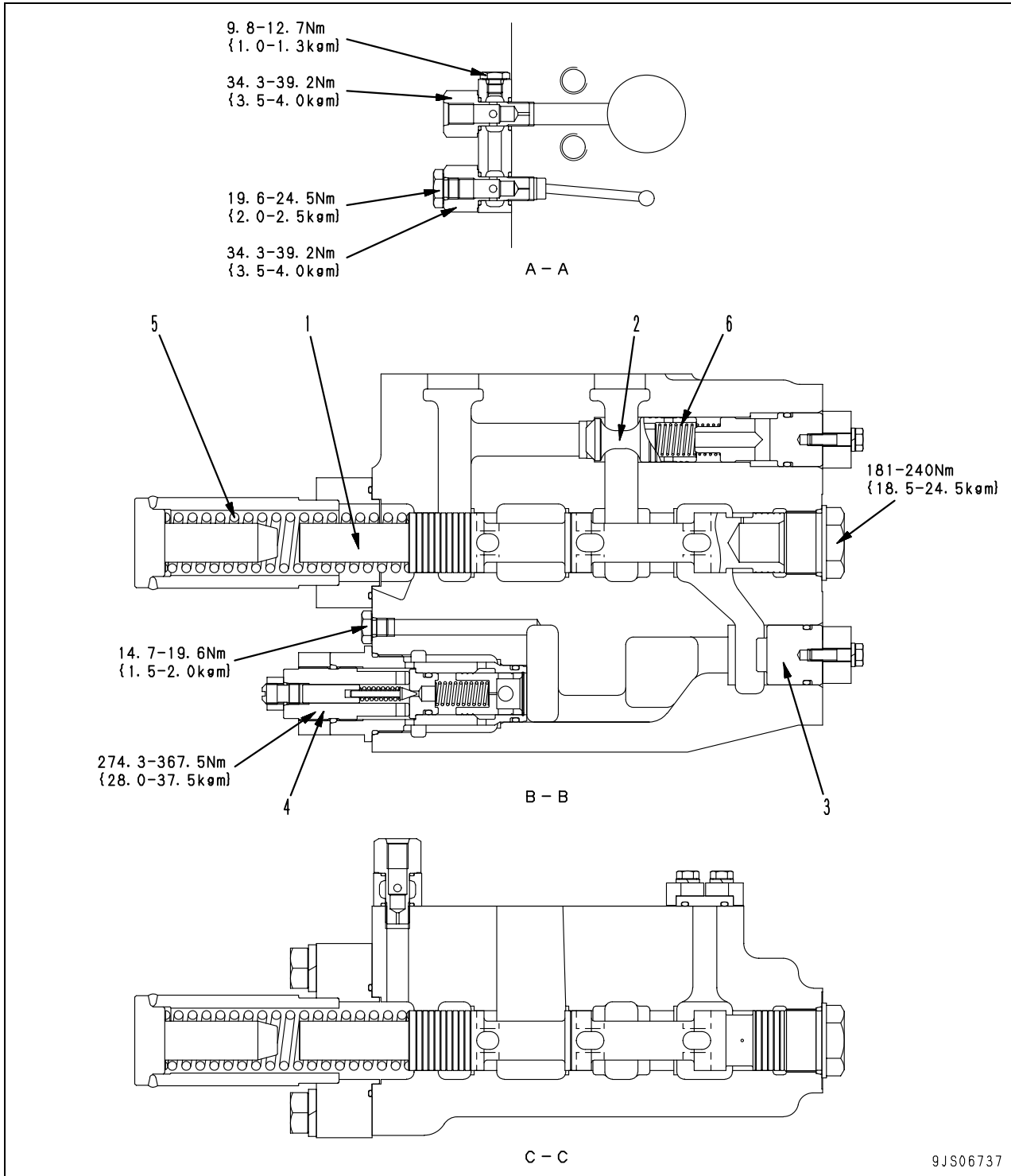
Unit: mm

No.	Check item	Criteria					Remedy
1	Clearance between piston rod and bushing	Standard size	Tolerance		Standard clearance	Clearance limit	Replace bushing
			Shaft	Hole			
		70	-0.030 -0.076	+0.075 +0.271	0.105 – 0.347	0.647	
2	Clearance between piston rod supports shaft and bushing	50	—	+0.039 0	—	1.0	Replace
3	Clearance between cylinder bottom support shaft and bushing	50	—	+0.039 0	—	1.0	

Steering control valve



- A: From steering and hoist pump
- B: From steering and hoist pump
- C: To hoist valve
- D: From emergency steering pump
- E: To steering valve
- F: Drain port
- G: LS port



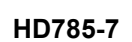
1. Spool
2. Check valve
3. Plug
4. Relief valve

Unit: mm

No.	Check item	Criteria					Remedy
5	Spool return spring	Standard size			Repair limit		If damaged or deformed, replace spring.
		Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	
		221.7 x 40	155	1,230 N {125.6 kg}	—	986 N {100.5 kg}	
6	Check valve spring	56 x 21.4	47	3.38 N {0.345 kg}	—	2.71 N {0.276 kg}	

Function

- The steering control valve distributes the hydraulic oil from the steering and hoist pump to the steering circuit and hoist circuit according to pressure signals from the steering valve.
- The steering control valve is a load sensing type valve, which controls spool (1) by operating the steering system.
- While the machine is not being steered (While the steering circuit does not need the pressurized oil), the steering control valve supplies all of the pressurized oil from the pump to the hoist valve.
- If the machine is steered, the steering control valve supplies the necessary hydraulic oil for the steering operation to the steering valve and supplies the rest to the hoist valve.
- The above operation reduces the hydraulic horsepower lost in the steering circuit.



Operation

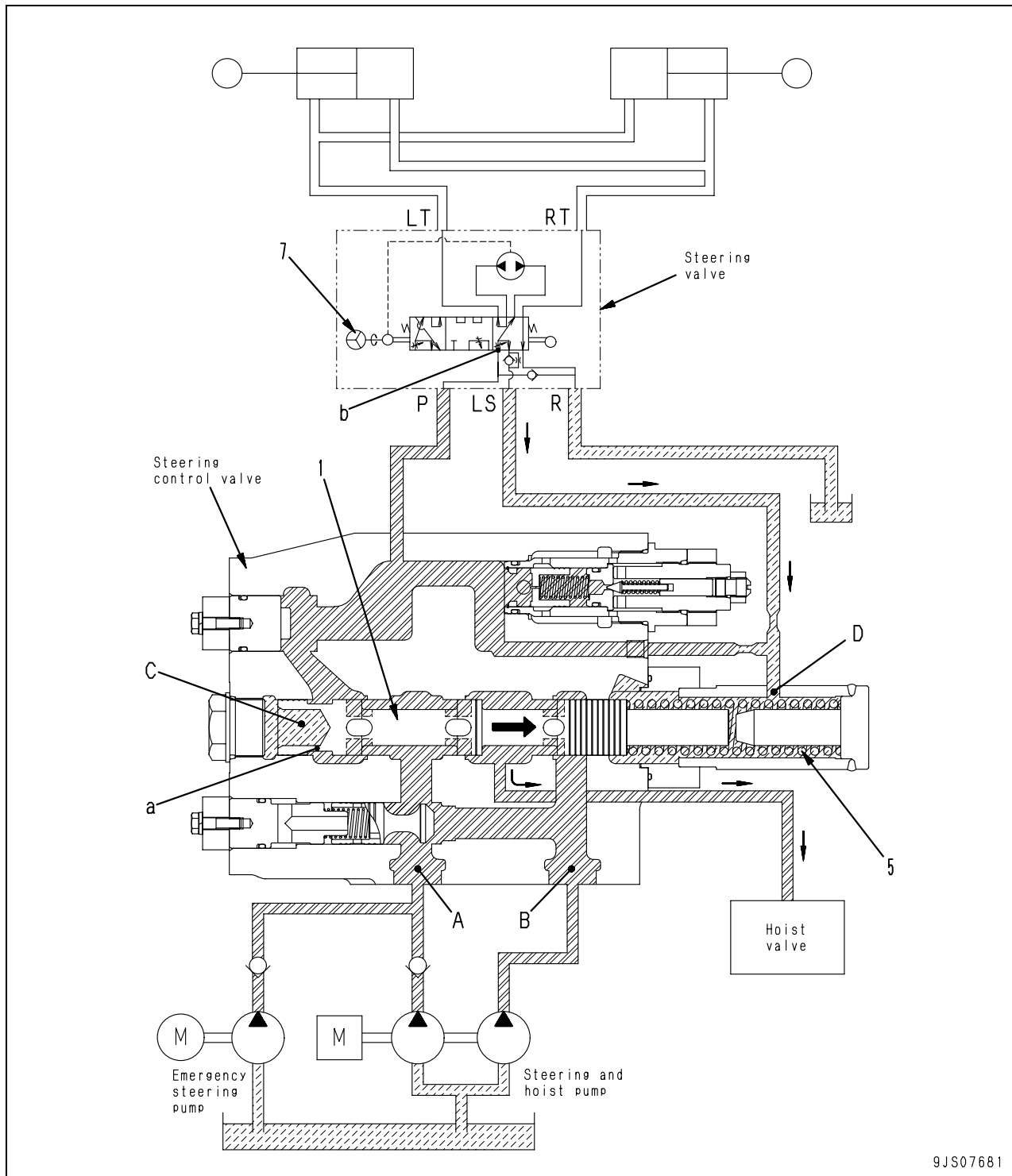
1. When steering valve is in neutral

- The pressurized oil from the steering and hoist pump flows in ports (A) and (B).
- Since port (P) of the steering valve is closed while the steering valve is in neutral, the pressure in port (P) rises.
- The pressurized oil in port (A) flows through orifice (a) to chamber (C) and moves spool (1) to the right.
- Since port (LS) and chamber (D) are connected to the tank, only the force of spool return spring (5) is used to move spool (1) to the left.
- The pressure in chamber (C) rises until it exceeds the force of spool return spring (5).
- Spool (1) stops in the position shown in the figure and all of the pressurized oil from the steering and hoist pump flows to the hoist valve.

2. When steering valve is operated

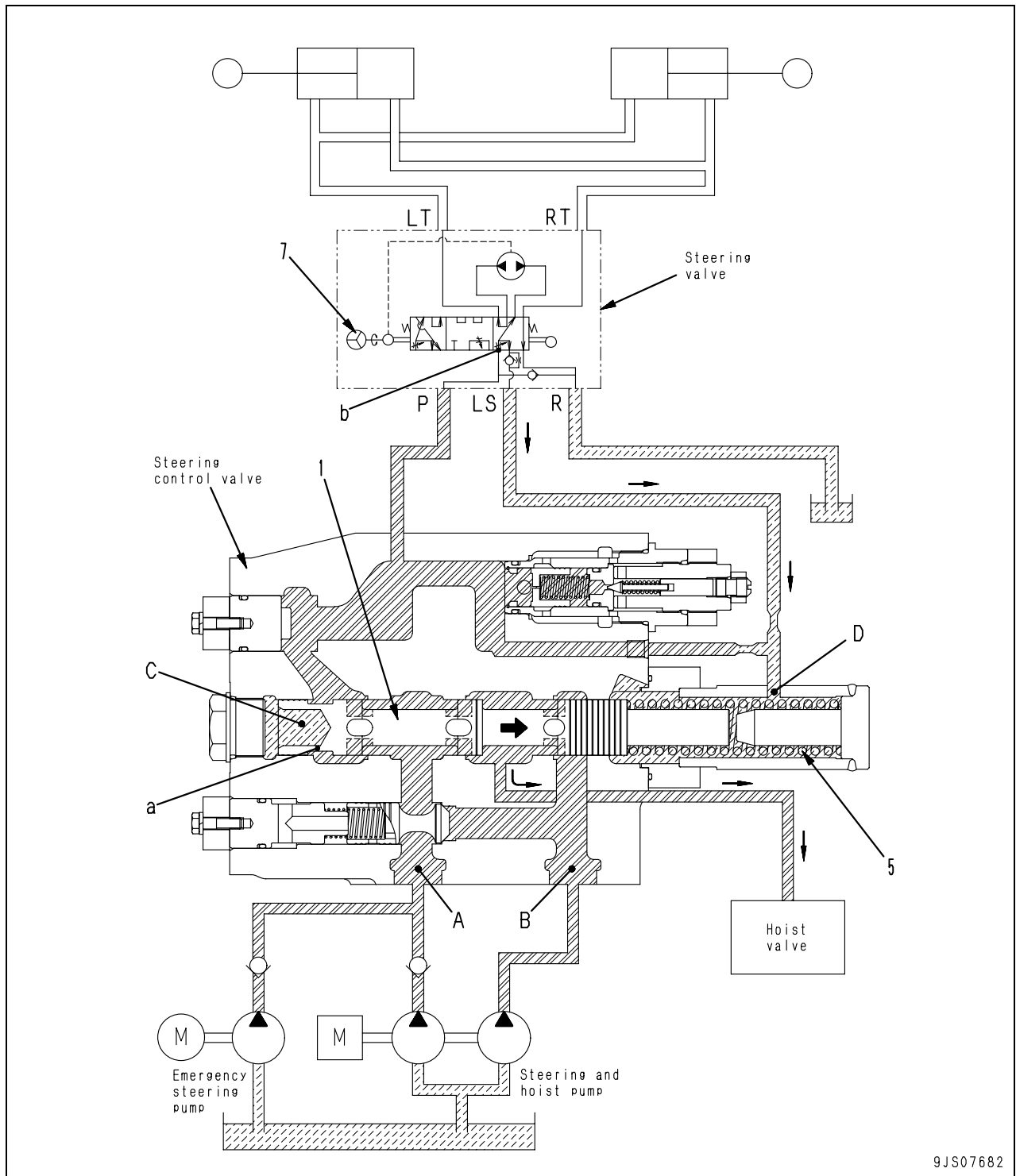
- If the machine is steered, port (P) is connected to port (LS) and tank port (R) is disconnected from port (LS).
- The pressurized oil in port (P) of the steering valve acts on chamber (C) of spool (1).
- The pressurized oil in port (LS) of the steering valve acts on chamber (D).
- The open area of orifice (b) changes according to the turning speed of the steering wheel.
- The pressurized oil changes when it flows through orifice (b) and consequently differential pressure is generated.
- Spool (1) moves until [the rightward force of the pressurized oil in chamber (C)] is balanced with [the leftward force of the pressurized oil in chamber (D) + the force of spool return spring (5)].
- The higher the pressurized oil in port (P) of the steering valve is, the more spool (1) moves to the right.

1) When steering wheel is turned quickly



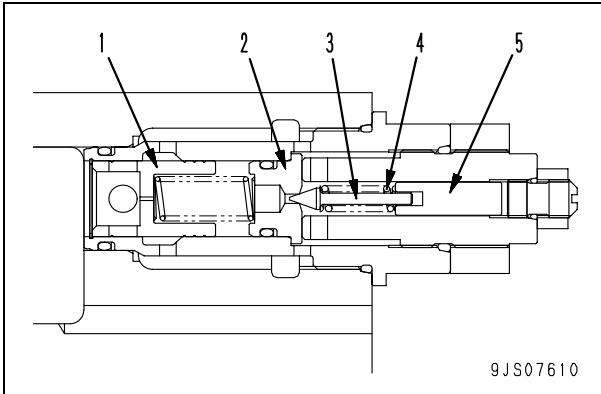
- The open area of orifice (b) is wide.
- Spool (1) moves much to the right until the differential pressure between before and after orifice (b) is balanced with spool return spring (5).
- The pressurized oil flows according to the operation of steering wheel (7).

2) When steering wheel is turned slowly



- The open area of orifice (b) is narrow.
- Spool (1) moves a little to the right until the differential pressure between before and after orifice (b) is balanced with spool return spring (5).
- The pressurized oil flows according to the operation of steering wheel (7).

Steering relief valve



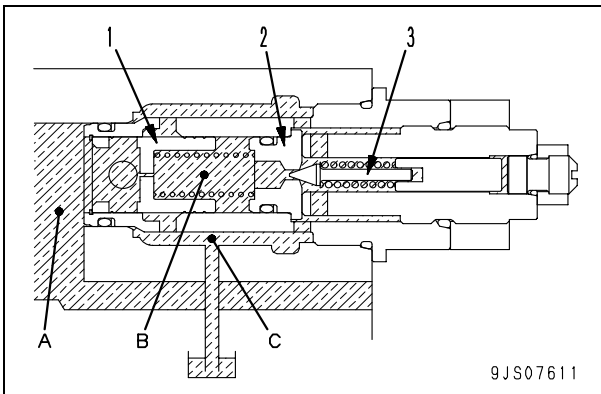
1. Main valve
2. Valve seat
3. Pilot poppet
4. Spring
5. Adjustment screw

Function

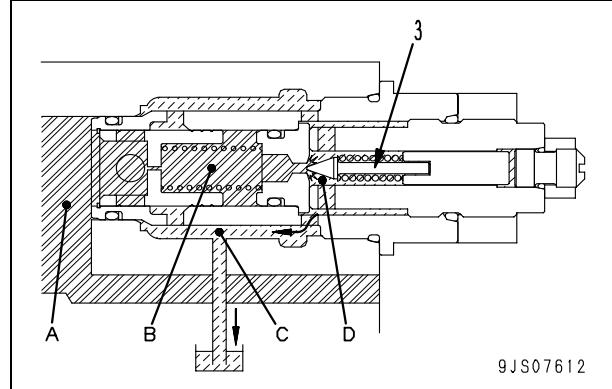
- The steering relief valve is in the demand valve. When the steering cylinder is at the stroke end or when abnormal pressure is generated, the pressurized oil sent from the pump is relieved through this valve to prevent breakage of the pump etc. (This valve sets the maximum circuit pressure).

Operation

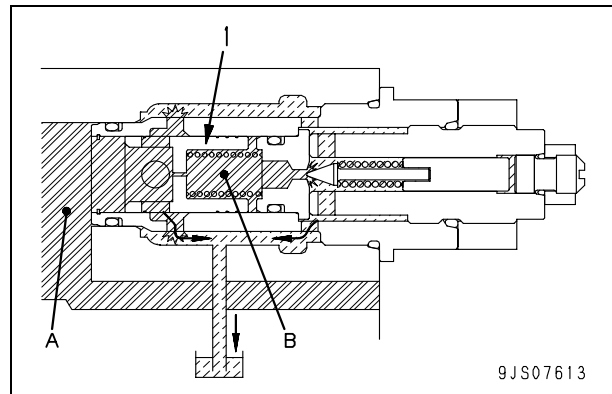
- Port (A) is connected to the pump circuit and port (C) is connected to the tank drain circuit.
- The pressurized oil fills port (B) through the orifice of main valve (1).
- Pilot poppet (3) is in contact with valve seat (2).



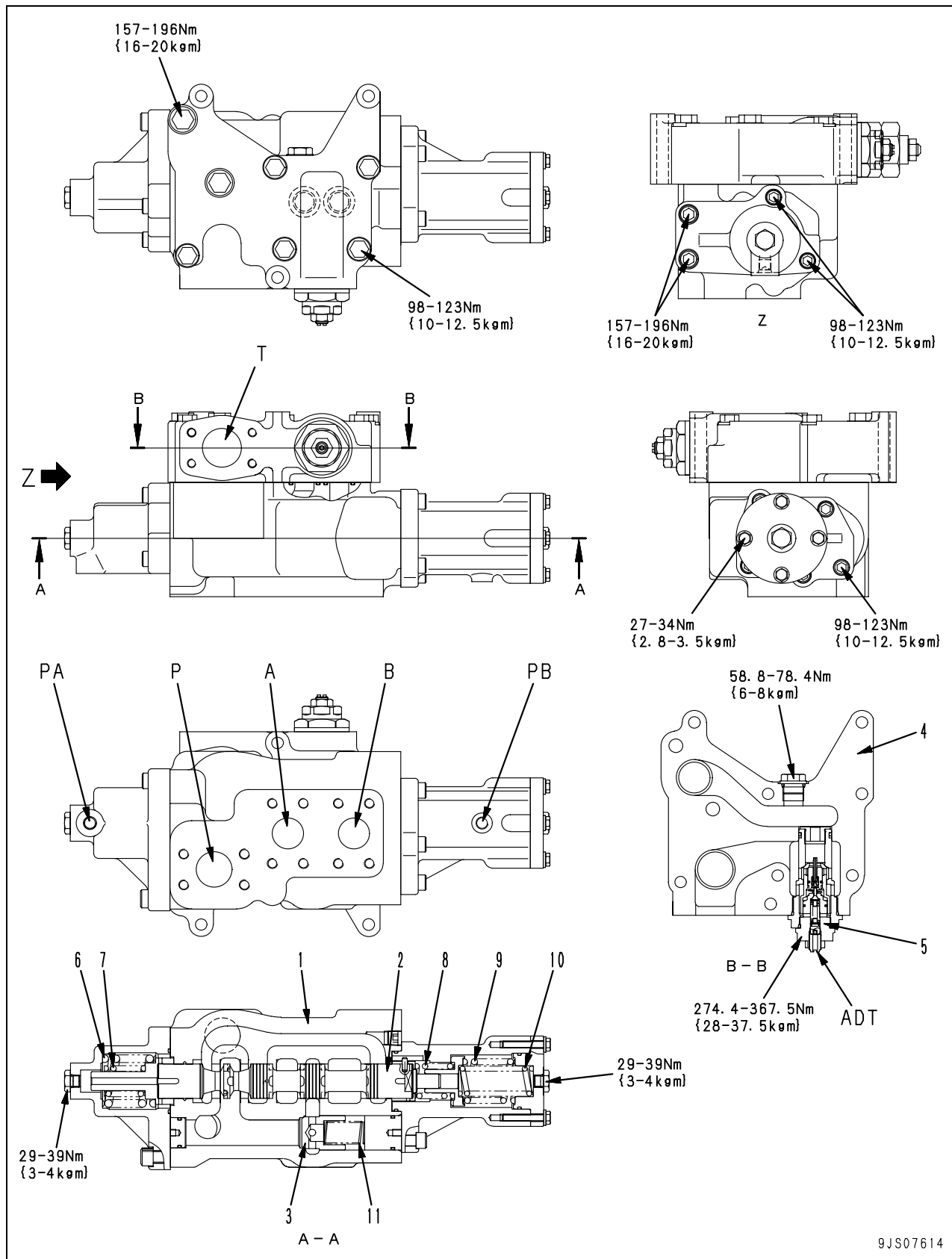
- If the pressure in ports (A and B) reaches the set poppet spring force (set pressure), pilot poppet (3) opens and the pressurized oil in port (B) is relieved through port (D) to port (C), and consequently the pressure in port (B) lowers.



- If the pressure in port (B) lowers, differential pressure is generated in ports (A and B) because of the orifice of main valve (1), and then main valve (1) is pushed open by the pressure of port (A) and the pressurized oil in port (A) is relieved.



Hoist valve



★ ADT: Set pressure is increased or decreased by 19.6 MPa {200 kg/cm²} per turn.

10 Structure, function and maintenance standard

SEN01287-01

A: To hoist cylinder head
 B: To hoist cylinder bottom
 P: From steering control valve
 PA: From EPC valve (LOWER, FLOAT)
 PB: From EPC valve (RAISE)
 T: To tank

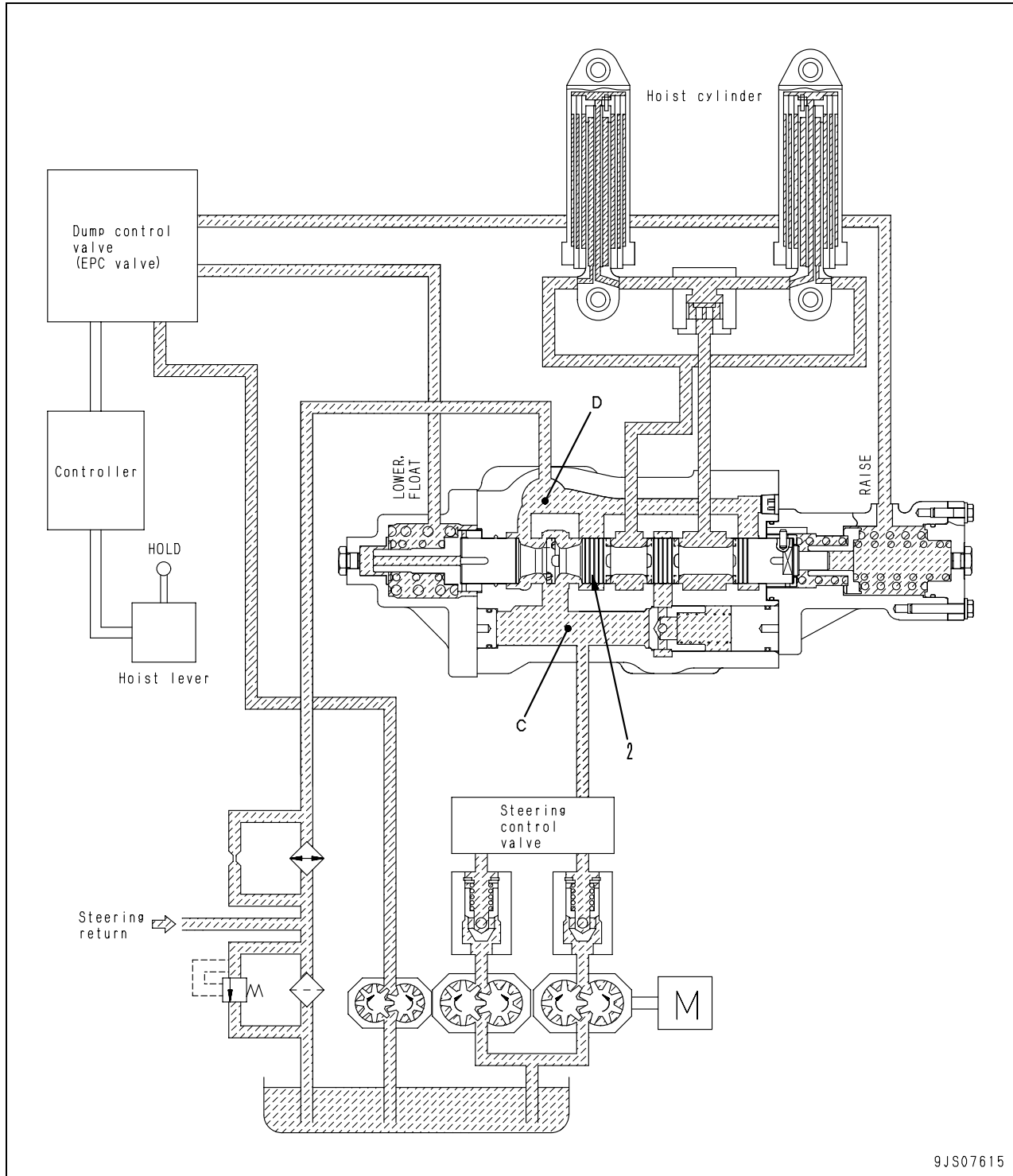
1. Valve body
2. Hoist spool
3. Check valve
4. Housing
5. Relief valve

Unit: mm

No.	Check item	Criteria					Remedy
6	Spool return spring	Standard size			Repair limit		If damaged or deformed, replace spring.
		Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	
		63.4 x 61	61	308 N {31.4 kg}	—	246 N {25.1 kg}	
7	Spool return spring	47 x 36	45	340 N {34.7 kg}	—	273 N {27.8 kg}	
8	Spool return spring	47.5 x 41	45.2	308 N {31.4 kg}	—	246 N {25.1 kg}	
9	Spool return spring	87.6 x 52	60	1,370 N {140 kg}	—	1,100 N {112 kg}	
10	Spool return spring	97.8 x 35	86	823 N {83.9 kg}	—	658 N {67.1 kg}	
11	Check valve return spring	84.7 x 26.6	47.5	12.7 N {1.3 kg}	—	10.2 N {1.04 kg}	

Operation

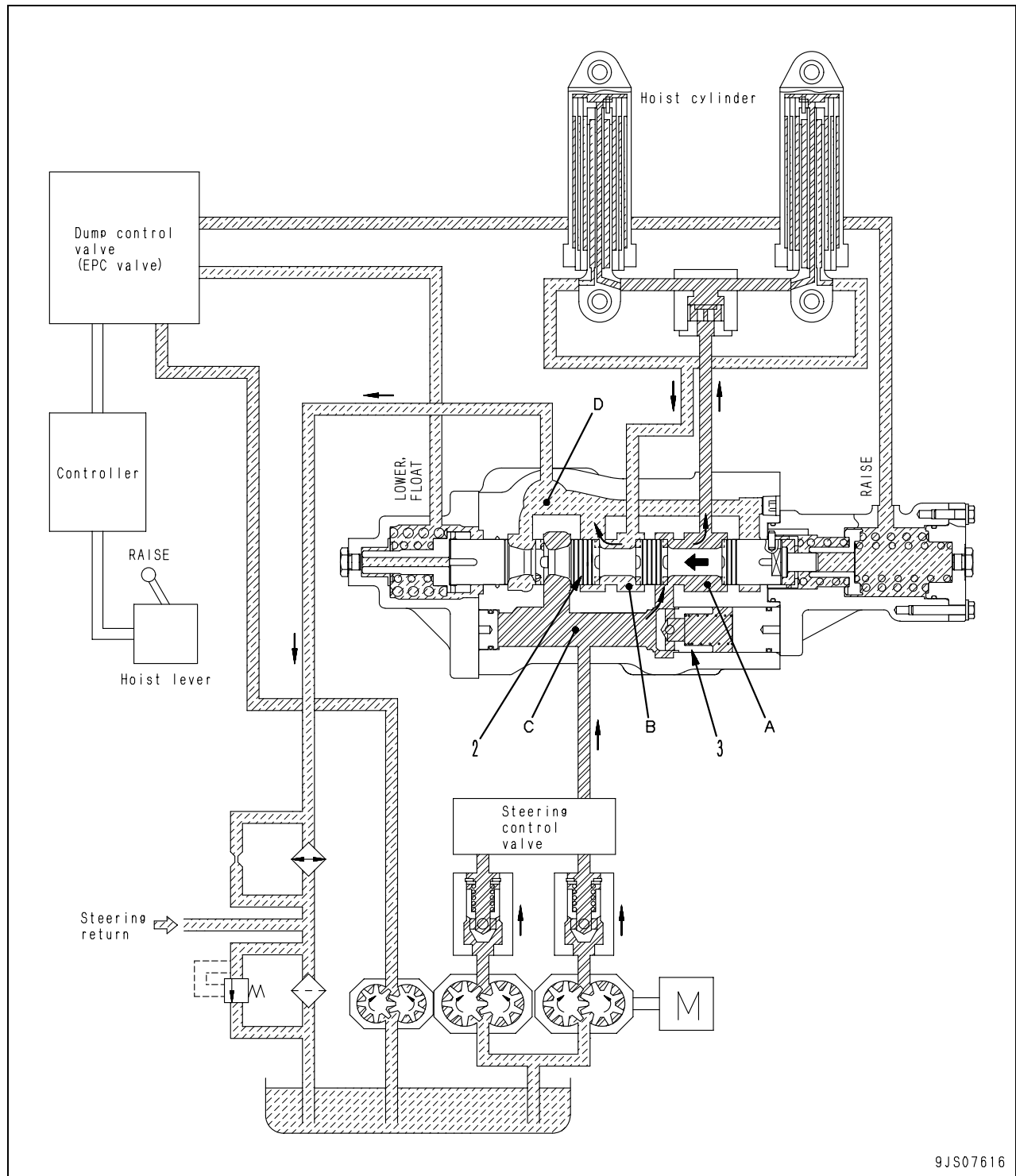
1. When hoist valve is in "HOLD" position



9JS07615

- The pressurized oil from the steering control valve flows in chamber (C). Since the passage to the hoist cylinder is blocked by hoist spool (2), the pressurized oil flows through chamber (D) to the tank.
- Since the port to the hoist cylinder is blocked on both bottom side and head side, the hoist cylinder is held in the current position.

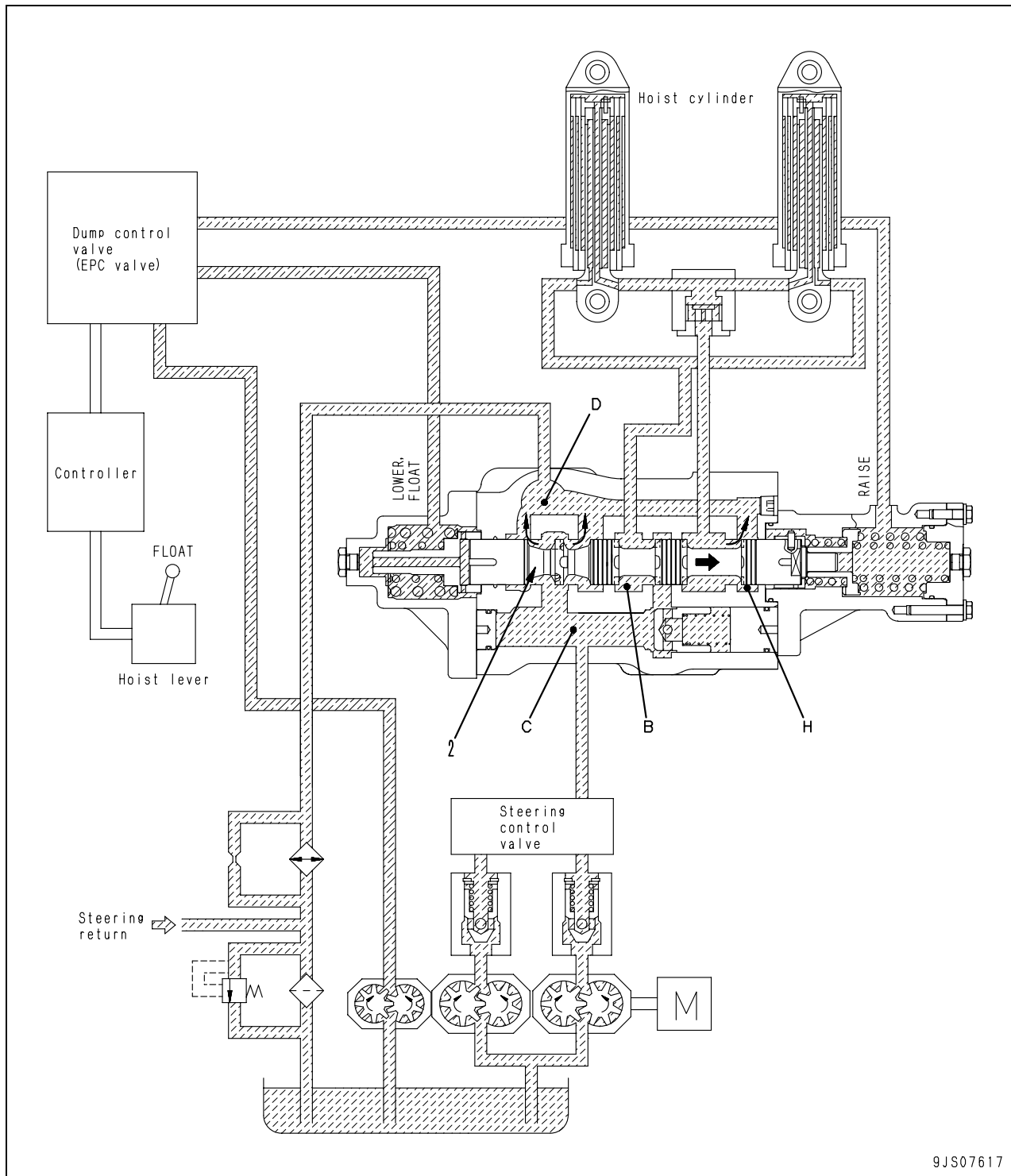
2. When hoist valve is in "RAISE" position



9JS07616

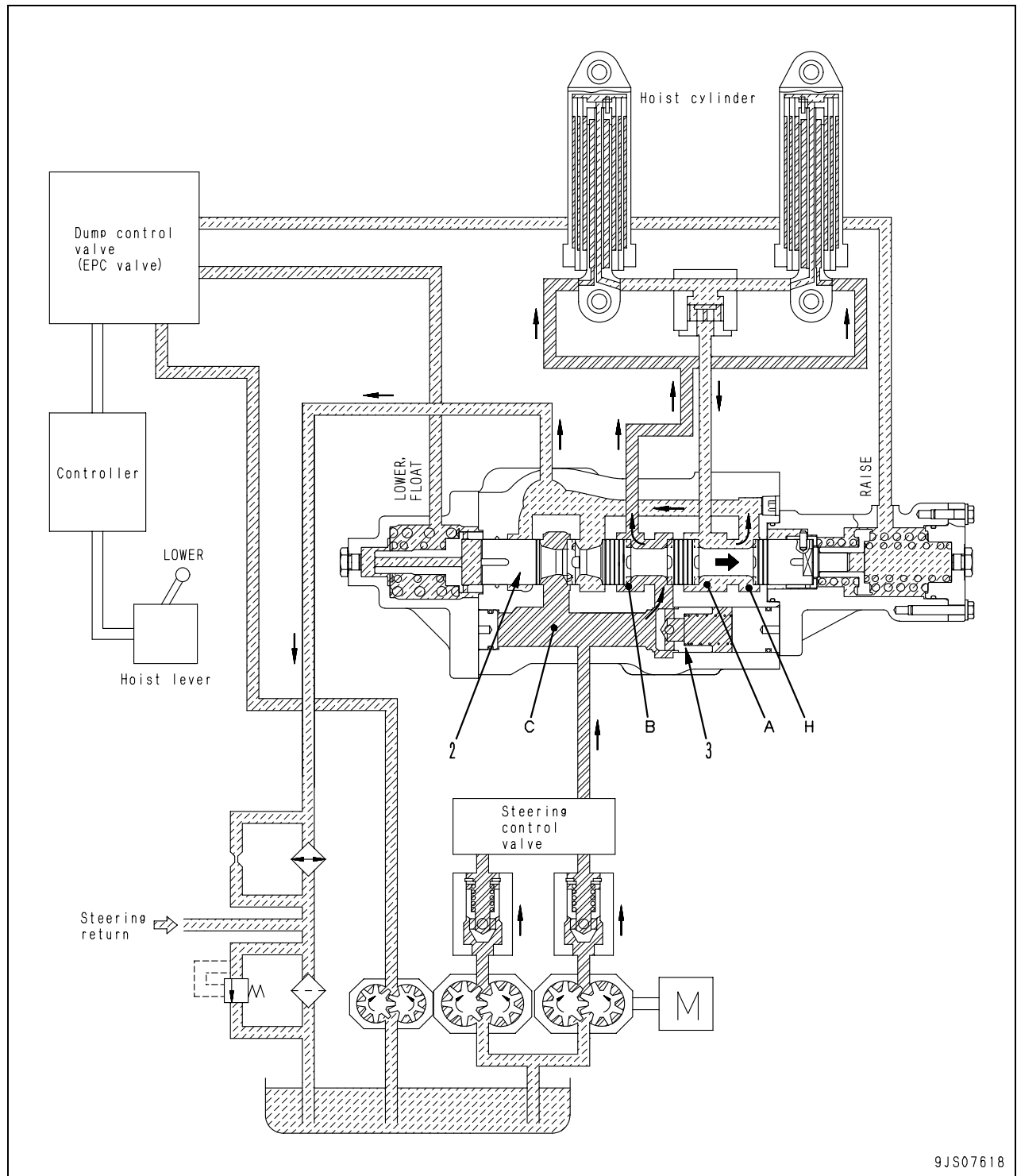
- If the hoist lever in the cab is set in the "RAISE" position, the pressurized oil from the EPC valve moves hoist spool (2) to the left.
- Accordingly, the pressurized oil flows through chamber (C), opens check valve (3), and enters chamber (A).
- The pressurized oil flows through chamber (A) to the bottom side of the hoist cylinder to extend the hoist cylinder and raise the body.
- The pressurized oil returning from the head side flows through chambers (B) and (D) to the tank.

3. When hoist valve is in "FLOAT" position



- If the hoist lever in the cab is set in the "FLOAT" position, the pressurized oil from the EPC valve moves hoist spool (2) to the right. Then, chamber (C) is connected to chamber (D), and chambers (B) and (H) are connected to chamber (D).
- The pressurized oil from the steering control valve flows through chambers (C) and (B) to the hoist cylinder. A part of it flows through chambers (C) and (D) to the steering oil cooler, too.
- Since the bottom side and head side of the hoist cylinder are connected by the hoist valve, the hoist cylinder is free.

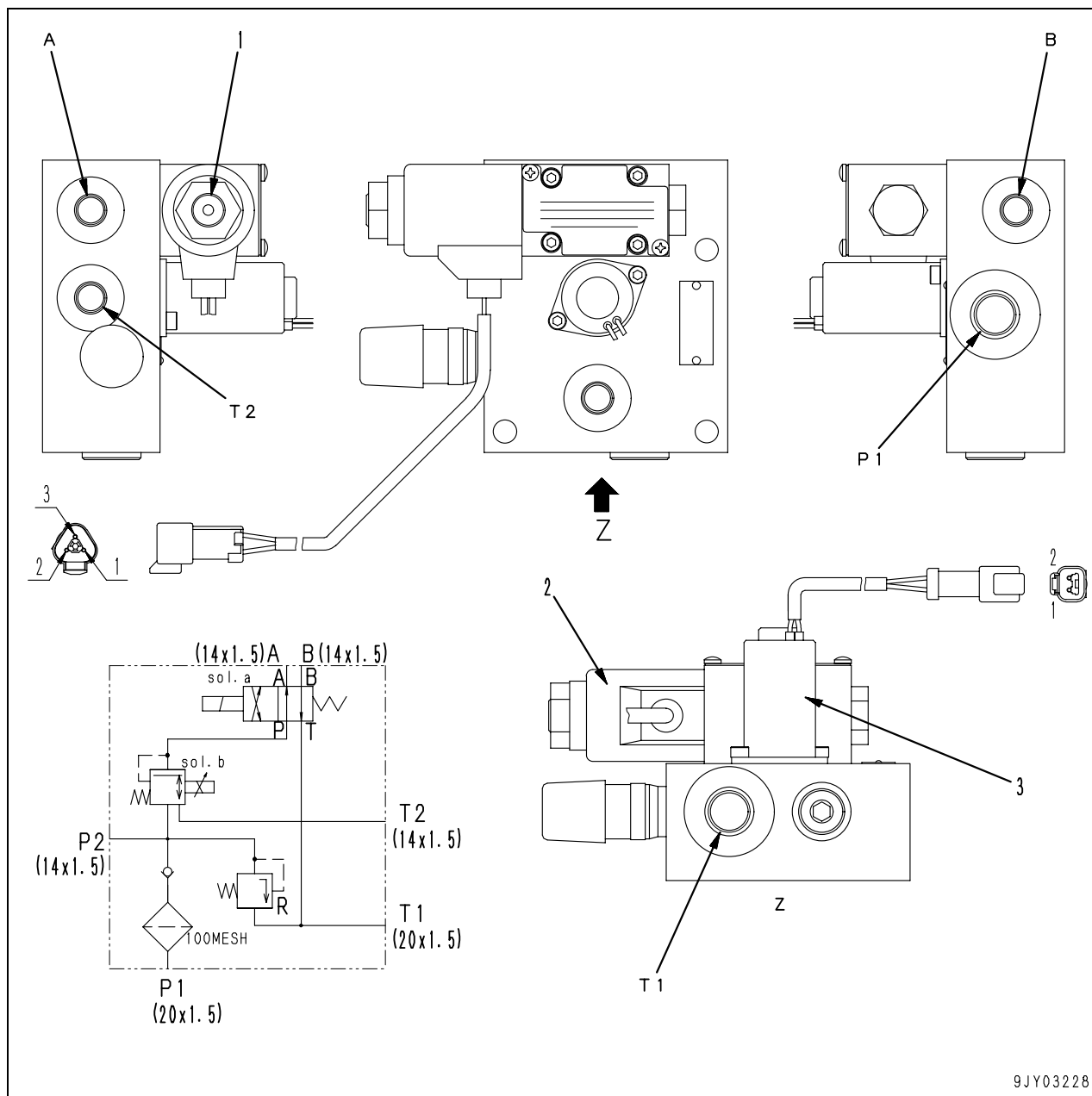
4. When hoist valve is in "LOWER" position



9JS07618

- If the hoist lever in the cab is moved from the "FLOAT" position to the "LOWER" position, the pressurized oil from the EPC valve moves hoist spool (2) to the right further from the "FLOAT" position. Accordingly, the pressurized oil flows through chamber (C), opens check valve (3), and enters chamber (B).
- The pressurized oil flows through chamber (B) to the head side of the hoist cylinder to retract the hoist cylinder and lower the body.
- The pressurized oil returning from the head side of the hoist cylinder flows through chamber (A) to chamber (H).

Dump control valve (EPC valve)



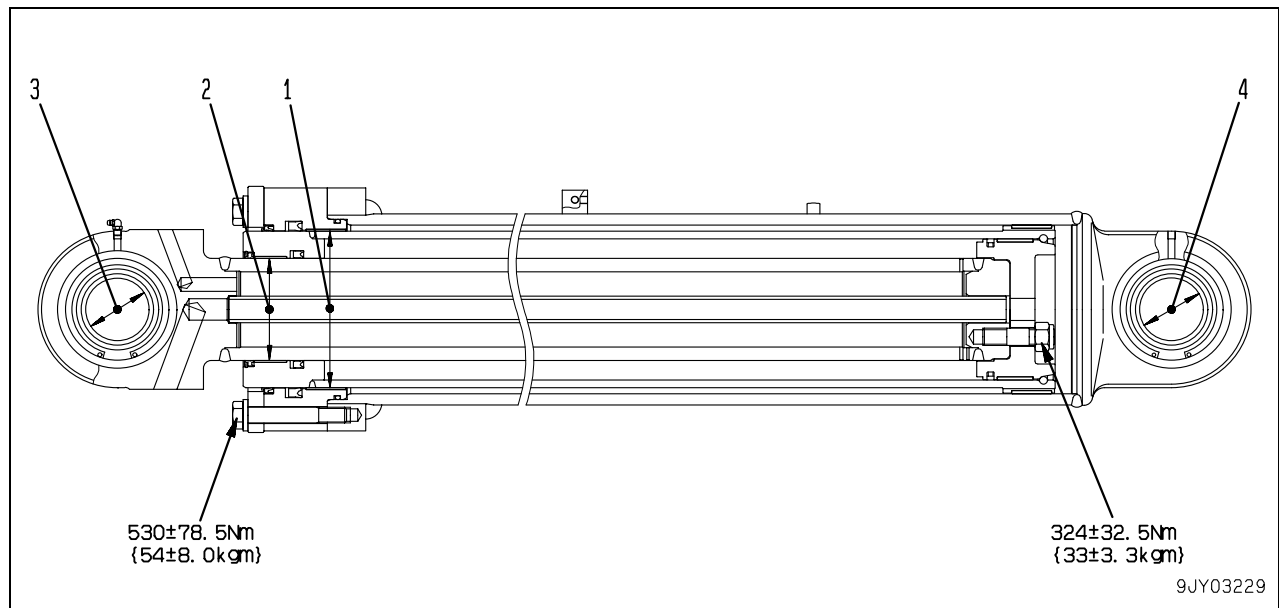
1. Manual operation button
2. Solenoid assembly (Solenoid a)
3. Solenoid assembly (Solenoid b)

A: To hoist valve (RAISE side)
 B: To hoist valve (LOWER side)
 P1: From hydraulic tank
 T1: To hydraulic tank
 T2: To hydraulic tank

Function

- The dump control valve (EPC valve) controlled by the retarder controller switches the pilot pressure of the hoist valve, and controls pressure, and controls the hoist valve.

Hoist cylinder



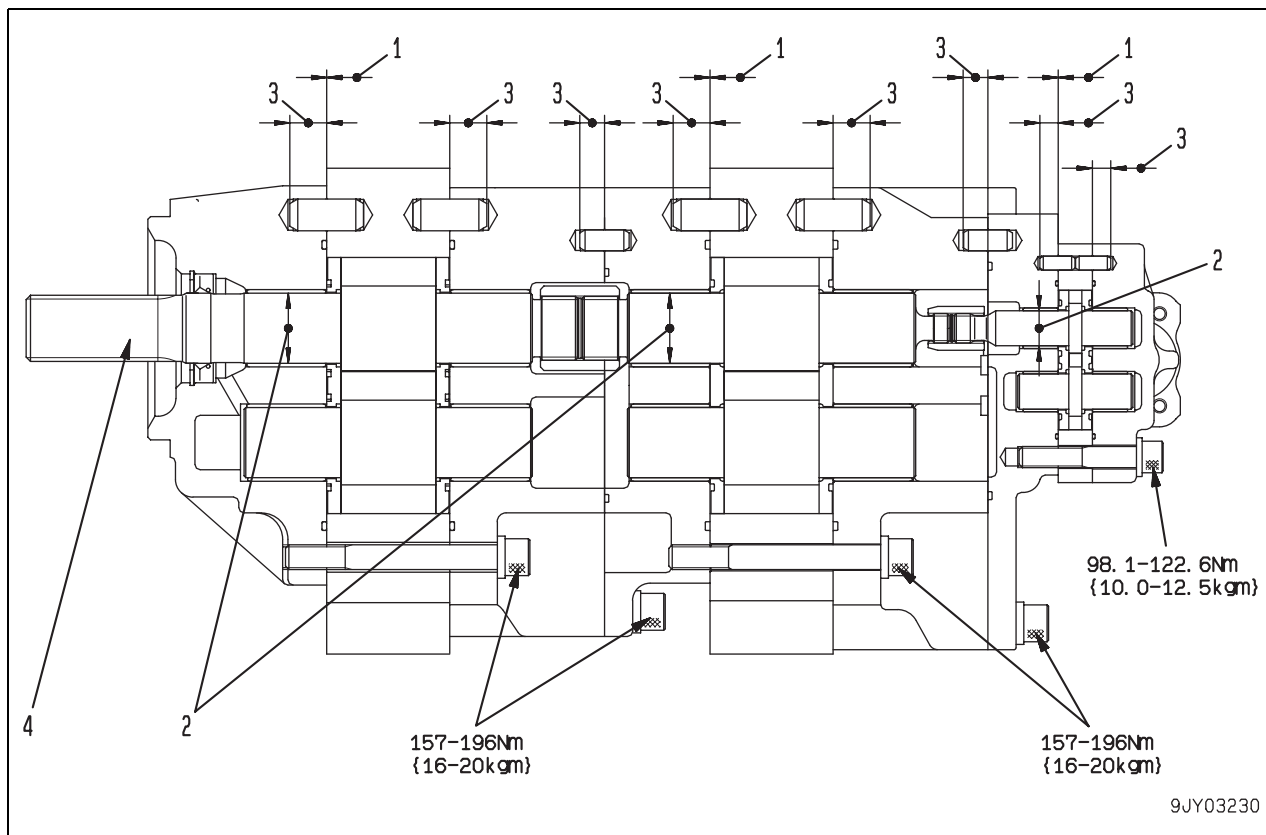
Unit: mm

No.	Check item	Criteria					Remedy
		Standard size	Tolerance		Standard clearance	Clearance limit	
1	Clearance between cylinder and bushing	200	-0.050 -0.165	+0.056 +0.260	0.106 – 0.425	0.725	Replace
2	Clearance between piston rod and bushing	130	-0.043 -0.143	+0.034 +0.214	0.077 – 0.357	0.657	
3	Clearance between piston rod support pin and bushing	80	—	0 -0.015	—	1.0	
4	Clearance between cylinder support pin and bushing	80	—	0 -0.015	—	1.0	

Hydraulic pump

Steering, hoist and hoist control pump

SAR(4)180+180+(1)6



10 Structure, function and maintenance standard

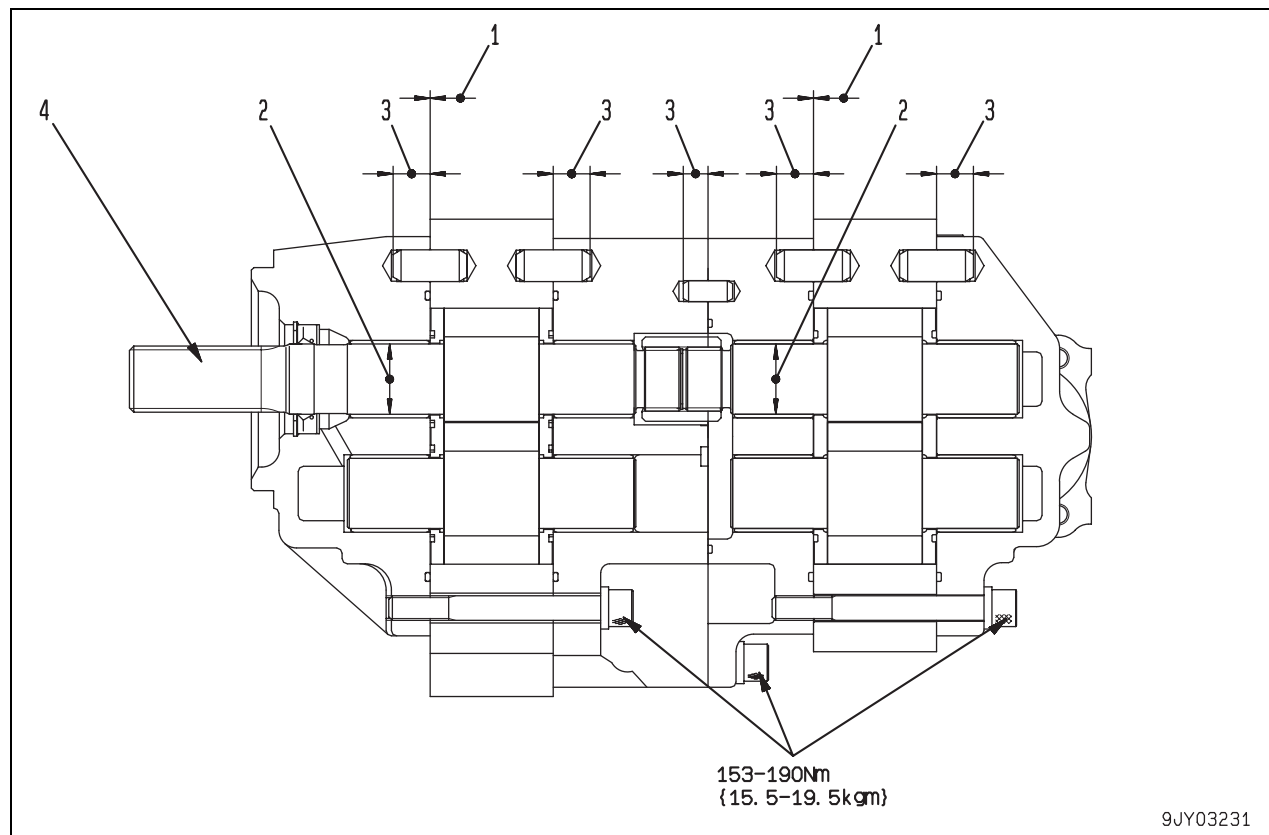
SEN01287-01

Unit: mm

No.	Check item	Criteria					Remedy	
1	Side clearance	Model		Standard clearance		Clearance limit	Replace	
		SAR(4)-180		0.11 – 0.16		0.20		
		SAR(4)-180						
		SAR(1)-6		0.10 – 0.15		0.19		
2	Clearance between inside diameter of plain bearing and outside of diameter of gear shaft	SAR(4)-180		0.06 – 0.141		0.20		
		SAR(4)-180						
		SAR(1)-6		0.06 – 0.119		0.20		
3	Depth to knock in pin	Model		Standard size	Tolerance			Repair limit
		SAR(4)-180		21	0 –0.5			—
		SAR(4)-180/ SAR(4)-180		14	0 –0.5			
		SAR(4)-180/ SAR(1)-6						
		SAR(1)-6		10	0 –0.5			
4	Rotating torque of spline shaft	21.6 – 34.3 Nm {2.2 – 3.5 kgm}					—	
—	Discharge amount Oil: EO10-CD Oil temperature: 45–55°C	Model		Rotating speed (rpm)	Delivery pressure MPa {kg/cm ² }	Standard delivery amount (ℓ/min)		Delivery amount limit (ℓ/min)
		SAR(4)-180		2,000	20.6 {210}	335.8		310.2
		SAR(4)-180			24.5 {250}	10.1		9.4
		SAR(1)-6						

Brake cooling pump

SAR(4)180+100

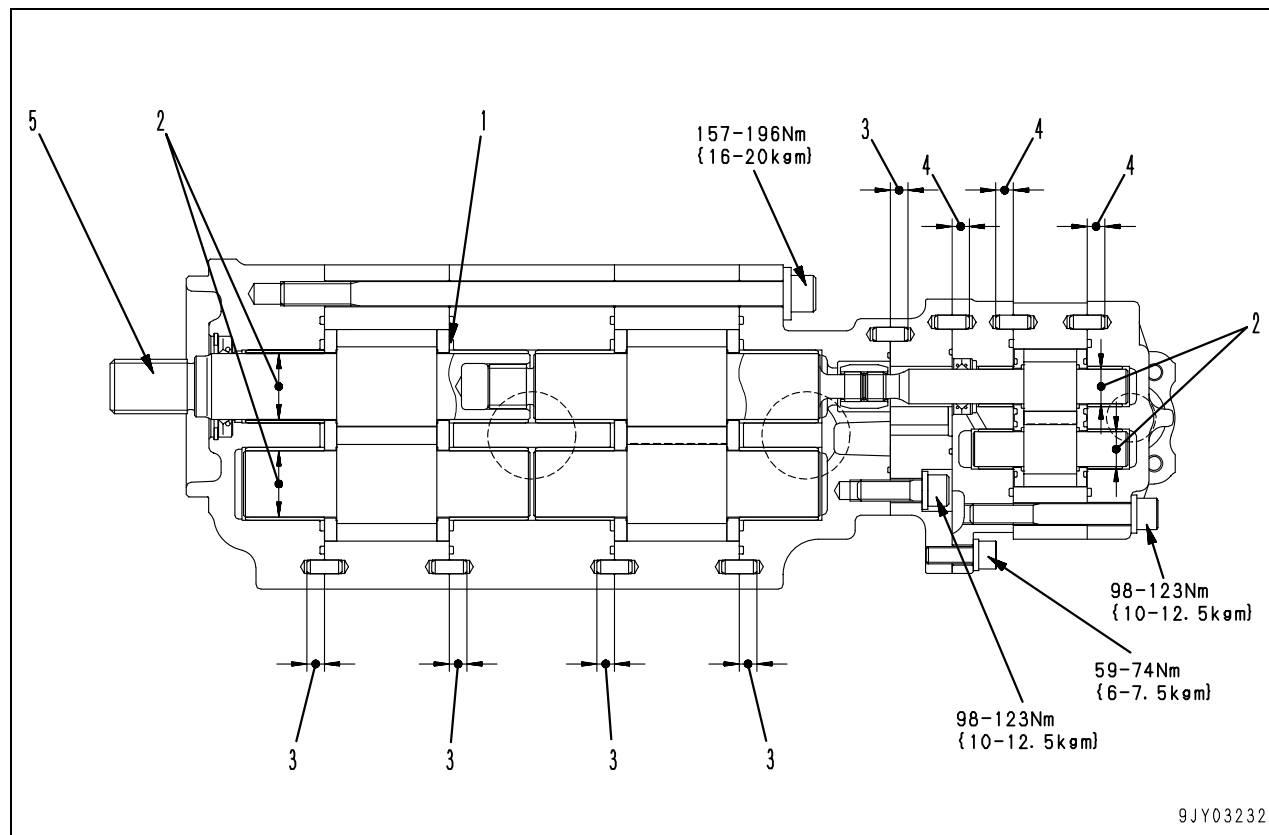


Unit: mm

No.	Check item	Criteria					Remedy
1	Clearance between gear case and side plate, gear	Model	Standard clearance		Clearance limit		Replace
		SAR(4)-180	0.11 – 0.16		0.20		
2	Clearance between inside diameter of plain bearing and outside diameter of gear shaft	SAR(4)-180		0.06 – 0.14		0.20	
3	Depth to knock in pin	Model	Standard size	Tolerance		Repair limit	
		SAR(4)-180	21	0 –0.5	—		
		SAR(4)-180/ SAR(4)-180	14				
4	Rotating torque of splined shaft	19.6 – 29.4 Nm {2.0 – 3.0 kgm}					
—	Delivery amount Oil: EO10-CD Oil temperature: 45 – 55°C	Model	Rotating speed (rpm)	Delivery pressure MPa {kg/cm ² }	Standard delivery amount (ℓ/min.)	Delivery amount limit (ℓ/min.)	—
		SAR(4)-180	2,000	2.9 {30}	350.4	310.2	

Torque converter, transmission, brake cooling and brake control pump

SDR(30)100+100+SA(1)25



Unit: mm

No.	Check item	Criteria					Remedy	
1	Side clearance	Model		Standard clearance		Clearance limit	Replace	
		SDR(30)-100		0.16 – 0.20		0.24		
		SA(1)-25		0.10 – 0.15		0.19		
2	Clearance between inside diameter of plain bearing and outside of diameter of gear shaft	SDR(30)-100		0.06 – 0.131		0.20		
		SA(1)-25		0.06 – 0.119				
3	Depth to knock in pin	Model		Standard size		Tolerance		
4		SDR(30)-100		10		—		
		SA(1)-25						
5	Rotating torque of spline shaft	15.6 – 28.4 Nm {1.6 – 2.9 kgm}						
—	Discharge amount Oil: EO10-CD Oil temperature: 45–55°C	Model		Rotating speed (rpm)		Delivery pressure MPa {kg/cm ² }	Standard delivery amount (ℓ/min)	Delivery amount limit (ℓ/min)
		SDR(30)-100		2,500		20.6 {210}	230.9	213.3
		SA(1)-25				24.5 {250}	56.5	50.7

HD785-7 Dump truck

Form No. SEN01287-01

DUMP TRUCK

HD785-7

Machine model Serial number

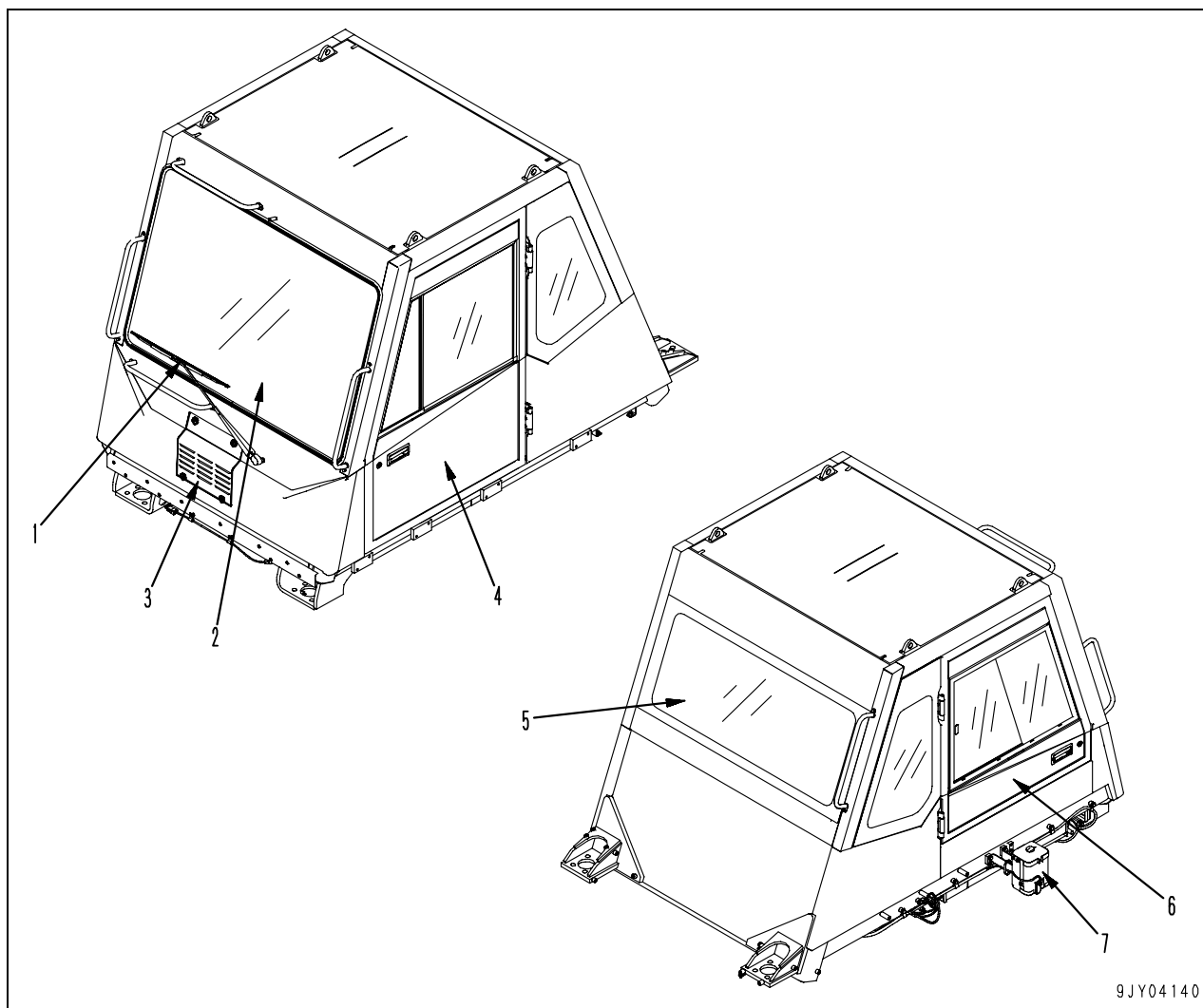
HD785-7 7001 and up

10 Structure, function and maintenance standard

Cab and its attachments

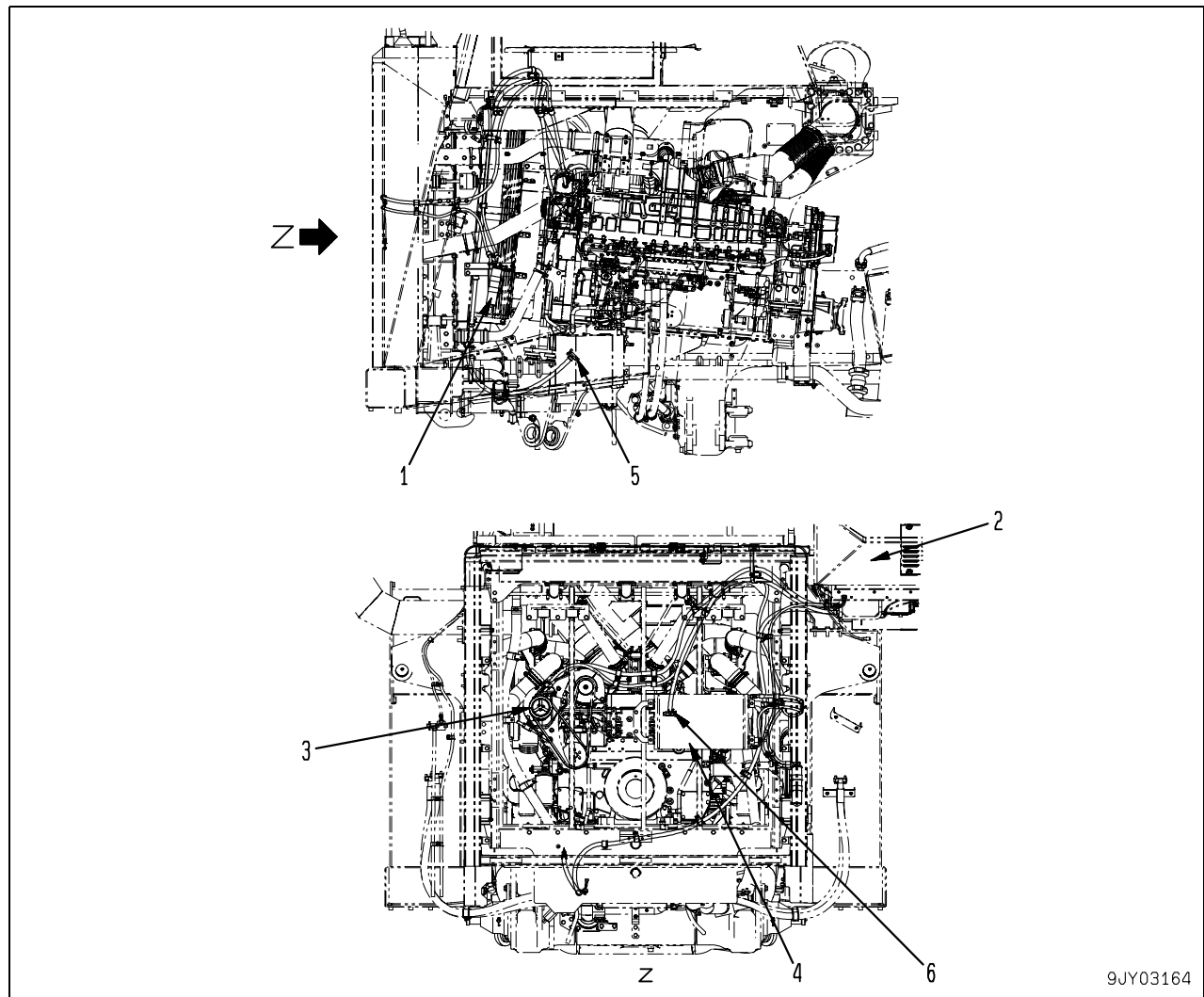
ROPS cab	2
Air conditioner	3
Rear view monitor	12
Controller related	15

ROPS cab



1. Front wiper
2. Front glass
3. Air conditioner fresh air filter
4. Door (Left)
5. Rear glass
6. Door (Right)
7. Washer tank

Air conditioner (If equipped)



1. Receiver dryer
2. Air conditioner unit
3. Compressor
4. Condenser
5. Hot water take-off port
6. Hot water return port

Specifications

Refrigerant used	HFC134a (R134a)
Refrigerant refilling level (g)	900 ± 50

Function

- The air conditioner makes a pleasant operating environment for the operator and acts to reduce fatigue.

Heating

- Heating is carried out using the coolant from the engine.
High-temperature coolant from the hot water take-off port flows to the air conditioner unit, and hot air is blown out by a fan.
When the temperature of the coolant drops, it is returned to the hot water return port.

Cooling

- The refrigerant gas compressed and pressurized by the air conditioner compressor enters the air conditioner condenser where it is cooled by dissipating the heat. It then enters the air conditioner unit and cold air is blown out by the fan. When the temperature of the refrigerant gas rises, it is returned to the compressor.

Refrigerant flow system

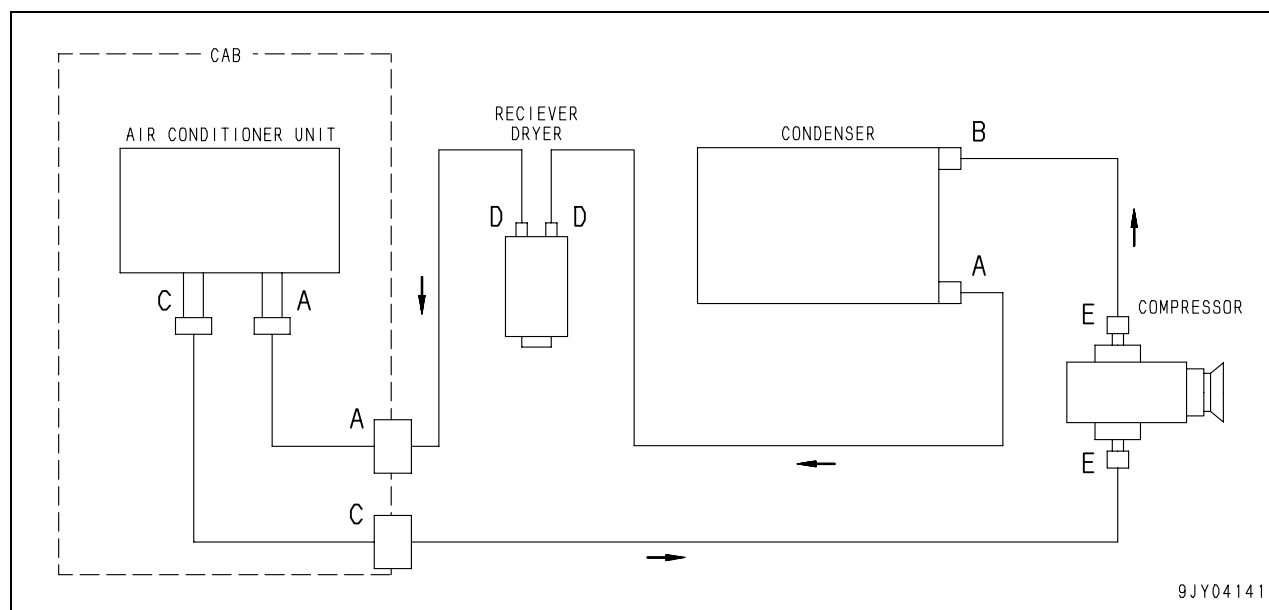
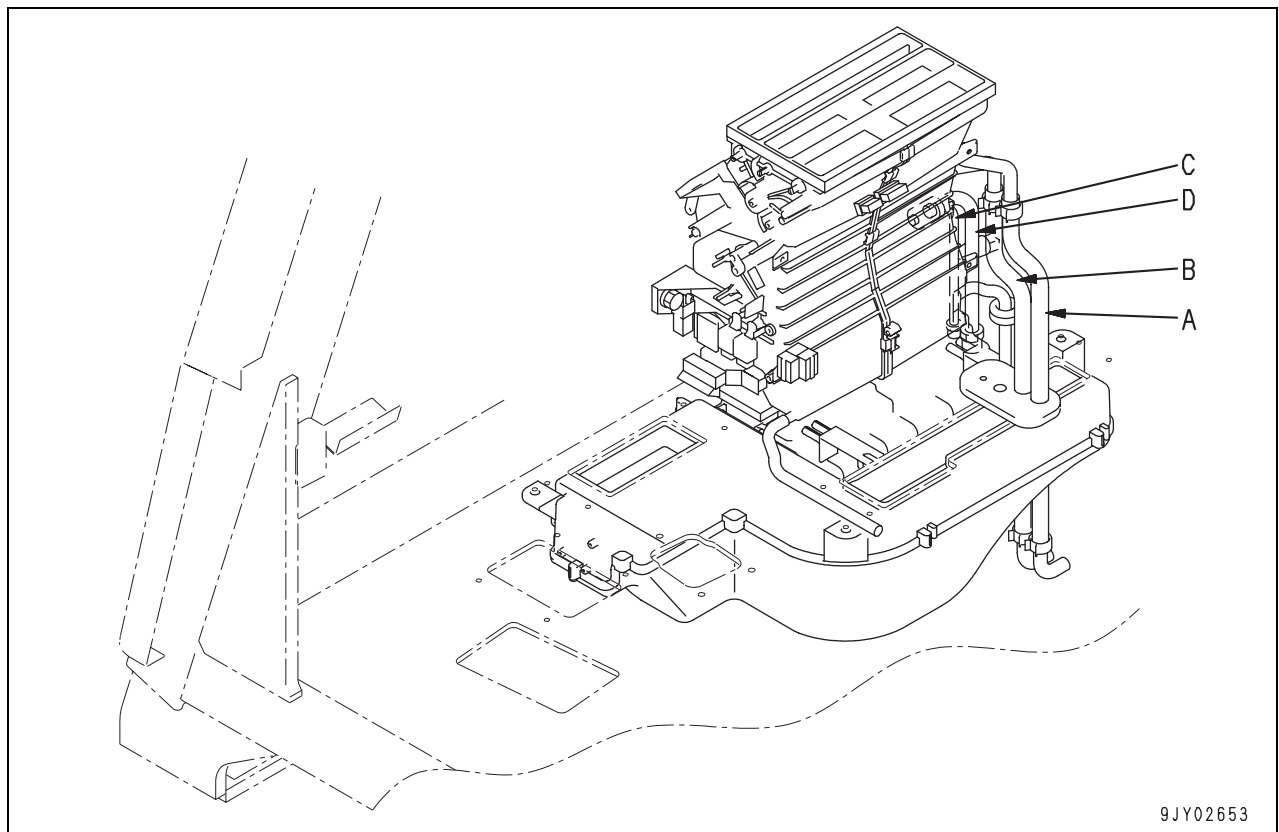


Table of tightening torque for refrigerant piping adapter

Unit: Nm {kgm}

No.	Check item	Criteria	Remedy
A	- Condenser refrigerant outlet side - Air conditioner unit refrigerant inlet side - Connecting part to cab (Between receiver drier and air conditioner unit)	12 – 15 {1.2 – 1.5} (Screw size: M16 x 1.5)	Retighten
B	Condenser refrigerant inlet side	20 – 25 {2.0 – 2.5} (Screw size: M22 x 1.5)	
C	- Air conditioner unit refrigerant outlet side - Connecting part to cab (Between air conditioner unit and compressor)	30 – 35 {3.0 – 3.5} (Screw size: M24 x 1.5)	
D	Receiver refrigerant pipe set bolt	4.0 – 7.0 {0.4 – 0.7} (Screw size: M6 bolt of receiver)	
E	Compressor refrigerant piping lock bolt	20 – 25 {2.0 – 2.5} (Screw size: M8 bolt of compressor)	

Air conditioner unit



1. Hot water outlet port
2. Hot water inlet port
3. Refrigerant gas inlet side
4. Refrigerant gas outlet side

Outline

- The vertical air conditioner unit on which evaporator and heater core is synchronized with the blower and intake unit to generate cool and hot air.
- The temperature adjusting switch on the air conditioner panel controls air mix dampers to adjust the spurting out temperature.

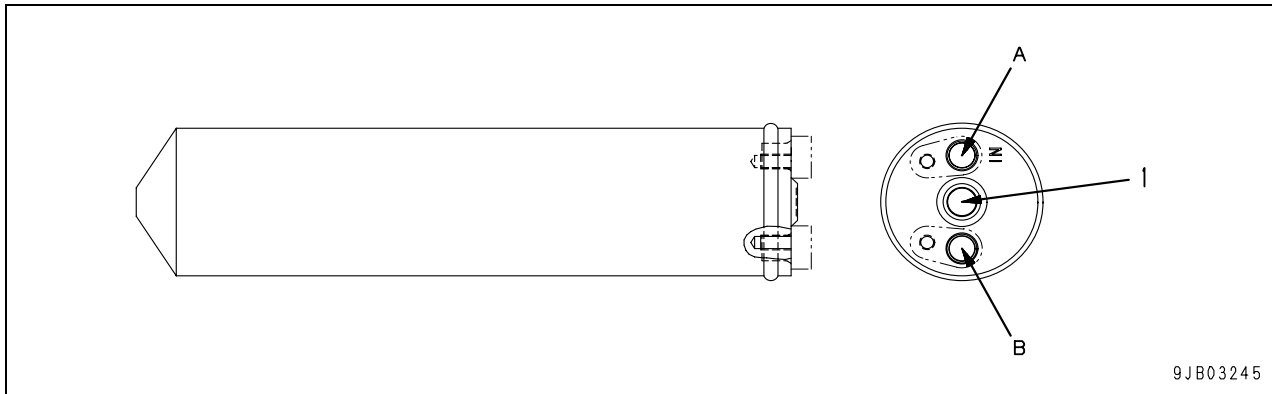
Cooler

- The cooler circulates refrigerant through evaporator to cause heat exchange (dehumidification and cooling).
- Air taken in by the blower and intake unit is cooled with evaporator and then blown out from the grille through the duct.

Heater

- The heater circulates engine coolant in heater core to cause heat exchange (heating).
- Air taken in by the blower and intake unit is heated with heater core and then blown out from the grille through the duct.

Receiver dryer



1. Sight glass

- A: Refrigerant gas inlet port
B: Refrigerant gas outlet port

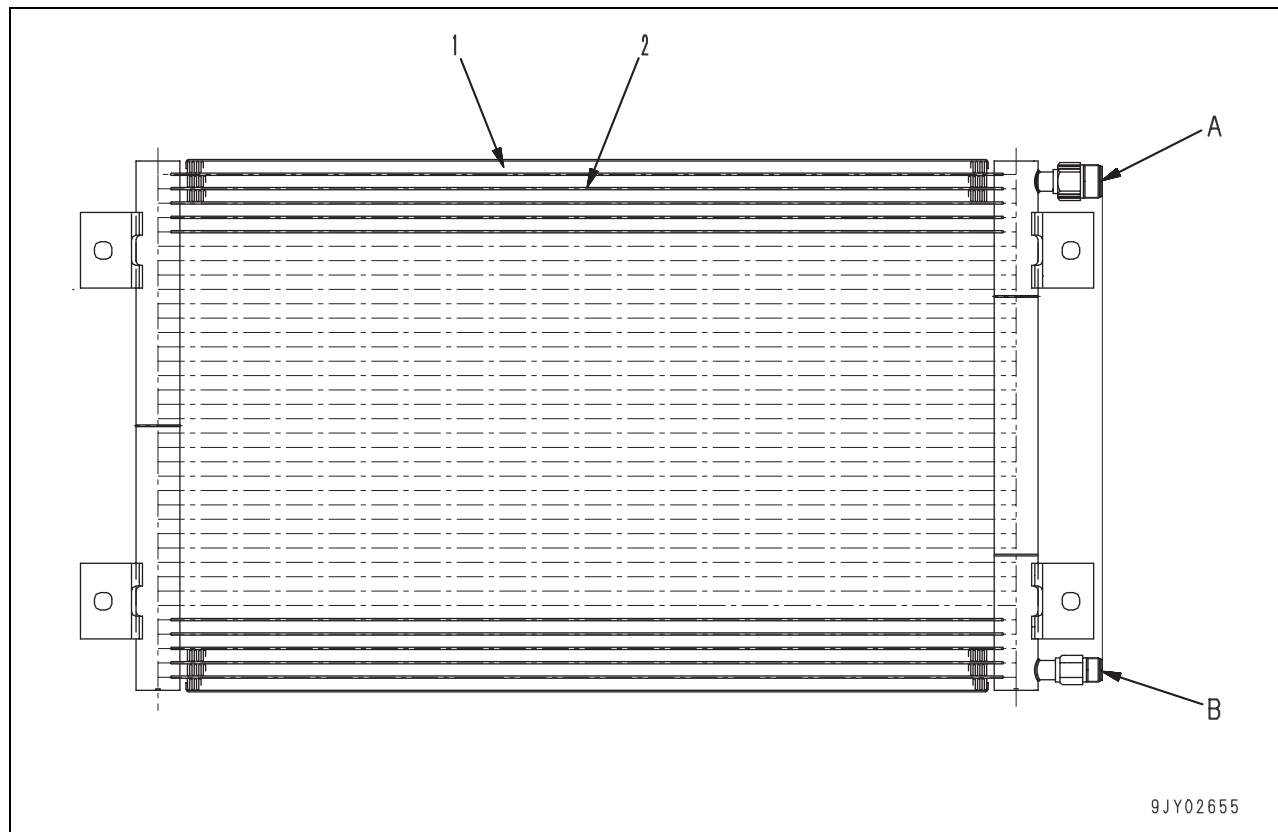
Function

- It is used to store liquefied high-pressure, high-temperature misty refrigerant from the condenser. It is capable of completely liquefying the refrigerant even when bubbles are contained in the refrigerant due to the condenser condition in heat dissipation.
- It eliminates foreign substances in the circulation circuit and water content in the refrigerant by use of the built-in filter and desiccating agent.
- Sight glass (1) allows inspecting flow of the refrigerant.

Specifications

Effective cubic capacity (cm ³)	578
Weight of desiccating agent (g)	300

Condenser



- 1. Fin
- 2. Tube

A: Refrigerant gas inlet port
B: Refrigerant gas outlet port

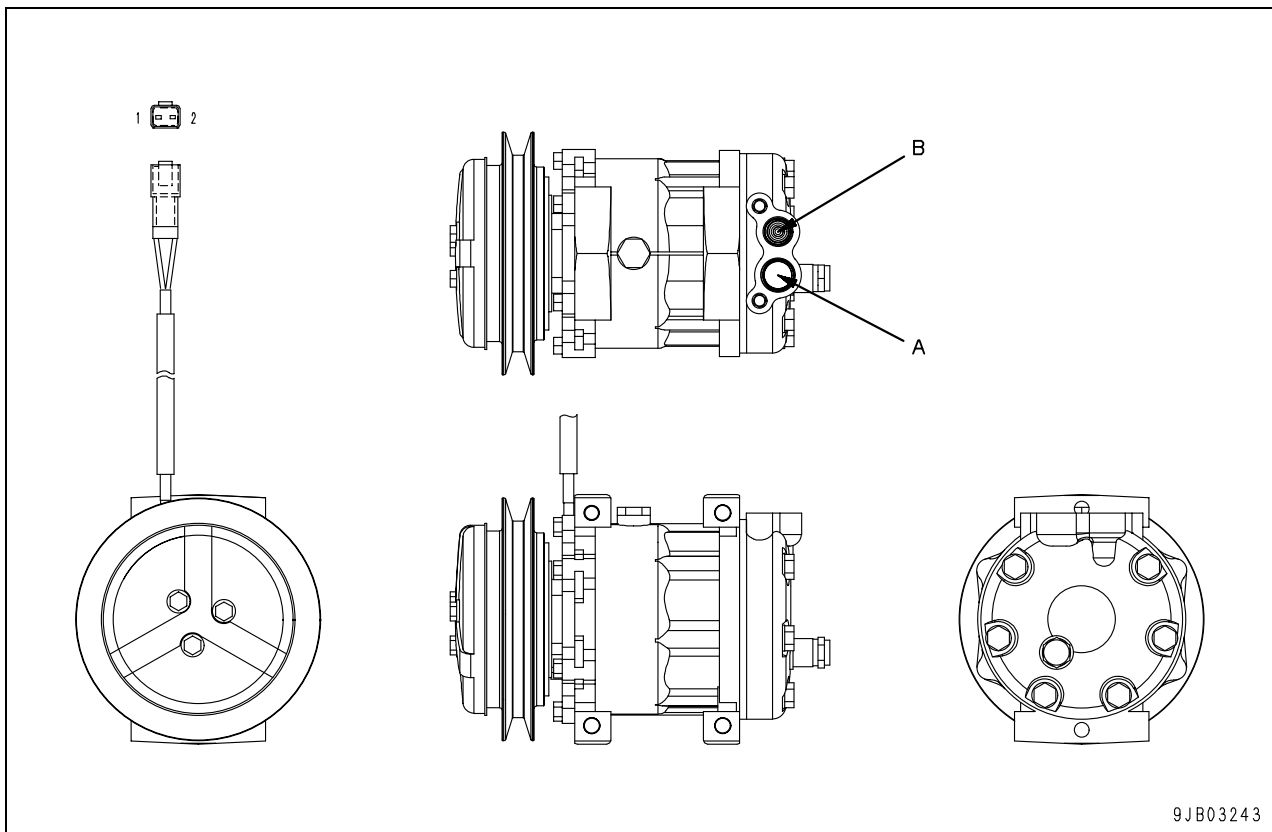
Function

- The condenser cools and liquefies the high-pressure and high-temperature refrigerant gas compressed by the compressor.
- ★ If the fin crushes or is clogged with dusts, heat exchange efficiency is degraded and complete liquefaction of refrigerant becomes unavailable. As the result, pressure in the refrigerant circulation circuit will be increased, applying extra load to the engine or degrading the cooling effect. Thus, care must be used in its handling and daily inspection.

Specifications

Fin pitch (mm)	1.5
Total heat dissipation surface (m ²)	6.55
Max. pressure used (MPa {kg/cm ² })	3.6 {36}

Compressor



A: From air conditioner unit
B: To condenser

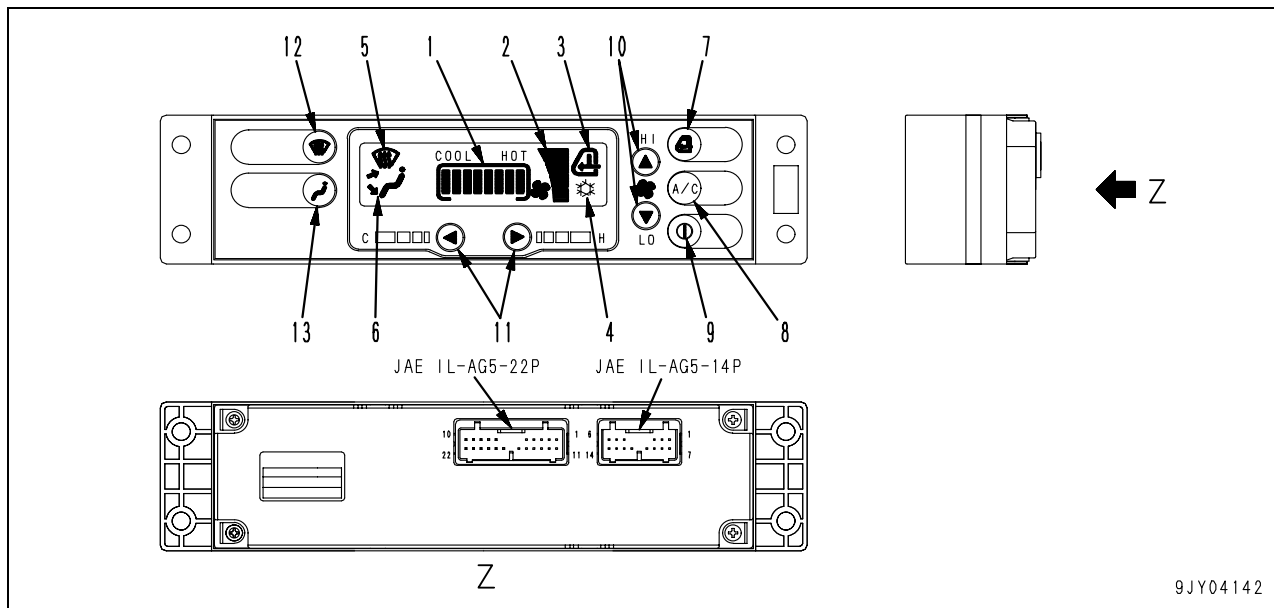
Function

- Other than circulating the refrigerant, it compresses the refrigerant gas from the evaporator to high-pressure, high-temperature gas so that it may be easily regenerated (liquefied) at normal temperature.
- Its built-in magnet clutch turns on or off depending on the evaporator temperature and refrigerant pressure.

Specifications

Number of cylinders – Bore x Stroke (mm)	7 – 29.3 x 27.4
Piston capacity (cc/rev)	129.2
Allowable maximum speed (rpm)	4,000

Air conditioner panel



9JY04142

Display section

No.	Display type	Display item	Display range	Display method	Display color	Remarks
1	Gauges	Outlet air temperature	See above figure	All segments of current level and below light up (Display in 8 levels).	Black	LCD
2		Air flow rate	See above figure	All segments of current level and below light up (Display in 4 levels).		
3	Pilot	RECIRC and FRESH air	RECIRC or FRESH air	RECIRC or FRESH is displayed according to RECIRC/FRESH selector switch position.		
4		Air conditioner	Turning "ON" of air conditioner switch	When air conditioner switch is turned "ON", lamp lights up.		
5		DEF air flow	Turning "ON" of DEF switch	When DEF switch is turned "ON", lamp lights up.		
6		Mode	FACE, FAC/FOOT or FOOT mode	FACE, FACE/FOOT or FOOT air outlet is displayed according to mode selector switch position.		

Switch section

No.	Name	Function	Operation
7	RECIRC/FRESH switch	Switch to select RECIRC or FRESH air (Pilot display on display section changes according to setting)	RECIRC ↑ ↓ FRESH
8	Air conditioner switch	Switch to turn ON and OFF air-conditioning function.	OFF ↔ ON
9	ON/OFF switch	Switch to turn ON and OFF main power supply for air conditioner ON: Setting in "OFF" state is displayed on display section. OFF: Display section is turned OFF and fan is stopped.	OFF ↔ ON
10	Fan switch	Switch to control air flow from fan (Control in 4 levels [LO, M1, M2, HI])	LO ↔ HI
11	Temperature control switch	Switch to control outlet air temperature (Control in 8 levels)	Low temperature ↑ ↓ High temperature
12	DEF switch	Switch to turn ON and OFF defroster	OFF ↔ ON
13	Mode selector switch	Switch to change air outlet position (3 modes [FACE, FACE/FOOT, FOOT]) If pressed in DEF mode, setting before DEF mode is selected.	FACE ← ↓ FACE/FOOT ↓ FOOT —

Outline

- CPU (central processing unit) installed on the panel processes input signals from respective sensors and operation signals of the panel switches to display and output them.
- The self-diagnosis function of CPU makes the troubleshooting easier.

Input and output signals

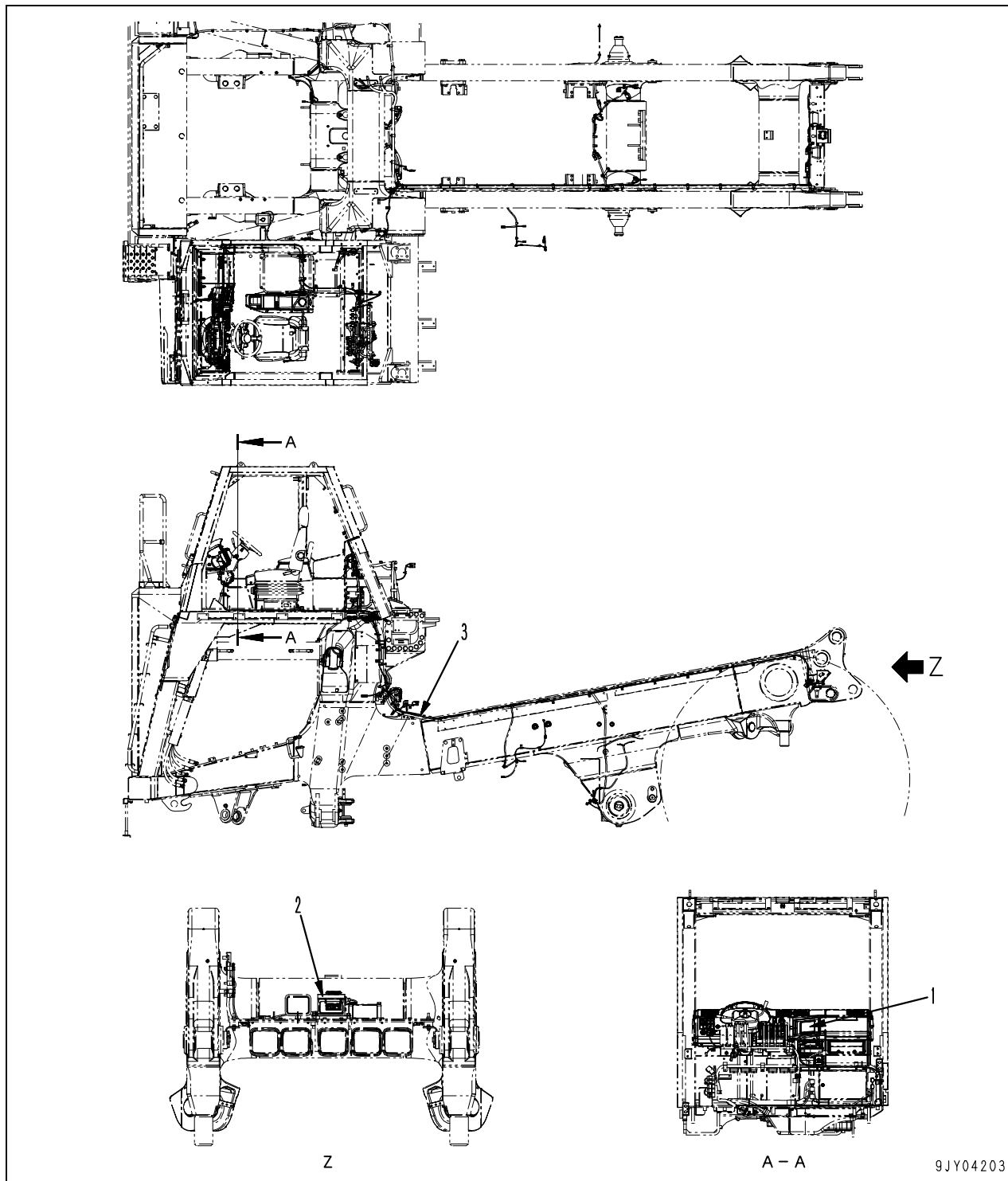
JAE IL-AG5-14P

Pin No.	Signal name	Input/output signals
1	GND	—
2	Sensor ground	—
3	Internal/external air changeover damper actuator limiter	Input
4	NC	—
5	Evaporator temperature sensor	Input
6	NC	—
7	Starting switch (ON)	Input
8	Night lamp signal	Input
9	NC	—
10	NC	—
11	NC	—
12	NC	—
13	NC	—
14	NC	—

JAE IL-AG5-22P

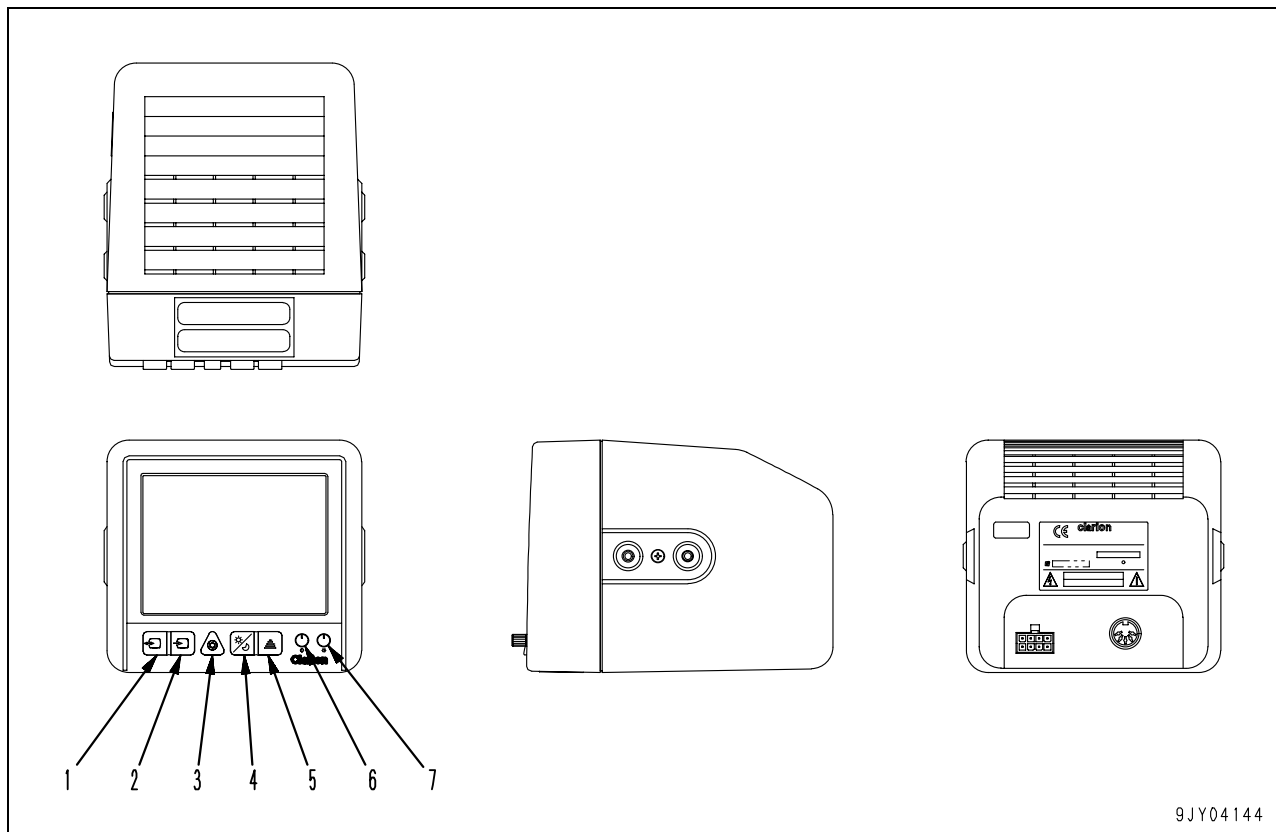
Pin No.	Signal name	Input/output signals
1	NC	—
2	NC	—
3	Blower motor relay	Input
4	Internal/external air changeover damper actuator output 1	Output
5	Internal/external air changeover damper actuator output 2	Output
6	Mode selector actuator output 2	Output
7	Mode selector actuator output 1	Output
8	Air mix damper actuator output 2	Output
9	Air mix damper actuator output 1	Output
10	Actuator potentiometer power supply (5V)	—
11	NC	—
12	NC	—
13	NC	—
14	NC	—
15	Magnet clutch	Input
16	Air mix damper actuator limiter	Input
17	Mode selector actuator limiter	Input
18	Air mix damper actuator potentiometer	Input
19	Mode selector actuator potentiometer	Input
20	Blower gate	Input
21	Blower feedback	Input
22	Actuator potentiometer ground	—

Rear view monitor (If equipped)



- 1. Monitor
- 2. Camera
- 3. Cable

Monitor



1. Auto switch
2. Manual switch
3. Zoom/Iris switch
(Reverse light compensation switch)
4. Bright/Dim light selector switch
5. Mark switch
6. Contrast adjustment knob
7. Brightness adjustment knob

Specifications

TV signal method:

As per Japanese standard TV method

Scanning method: 2:1 Interlace method

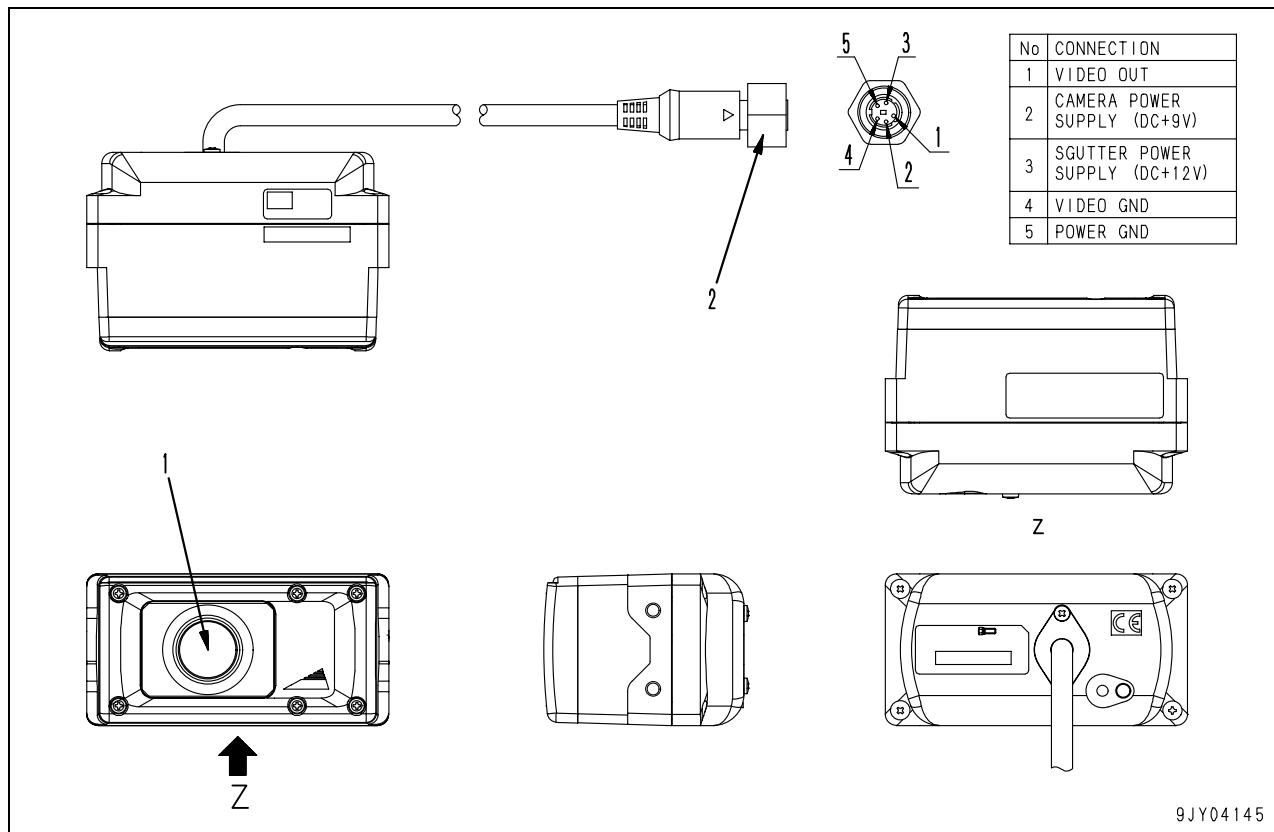
CRT: 4.5 inch, black and white, 90-deg. deflection

Resolution:

Horizontal 400 lines and vertical 300 lines

Power supply voltage: DC 24/12 V

Camera



1. Camera
2. Connector

Specifications

TV signal method:

As per Japanese standard TV method

Scanning method: 2:1 Interlace method

Image sensor:

1/4 inch color CCD with 250,000 pixels

Lens: 1.7 mm, 1:2.8

Angle of view: Horizontal; Approx. 118 deg.,

Vertical; Approx. 97.6 deg.

Electronic zoom: Approx. 1.4 power

Using luminance range:

Min. luminance of object; 3 lux

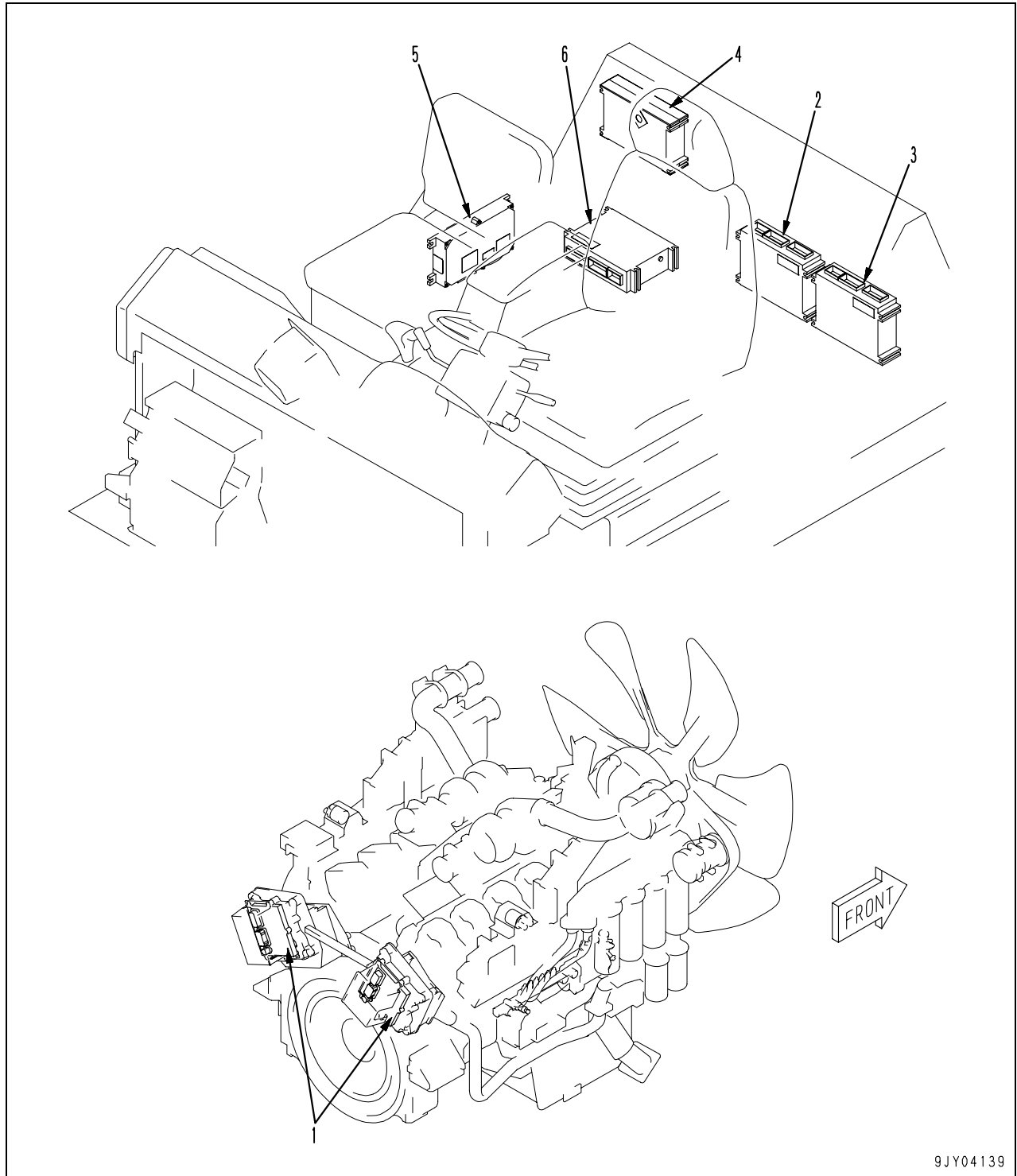
Power supply voltage:

DC 5.5 V – 99.5 V for main unit
(supplied by monitor)

Power consumption: Max. 120 mA

Controller related

Controller layout



HD785-7 Dump truck

Form No. SEN01288-01

DUMP TRUCK

HD785-7

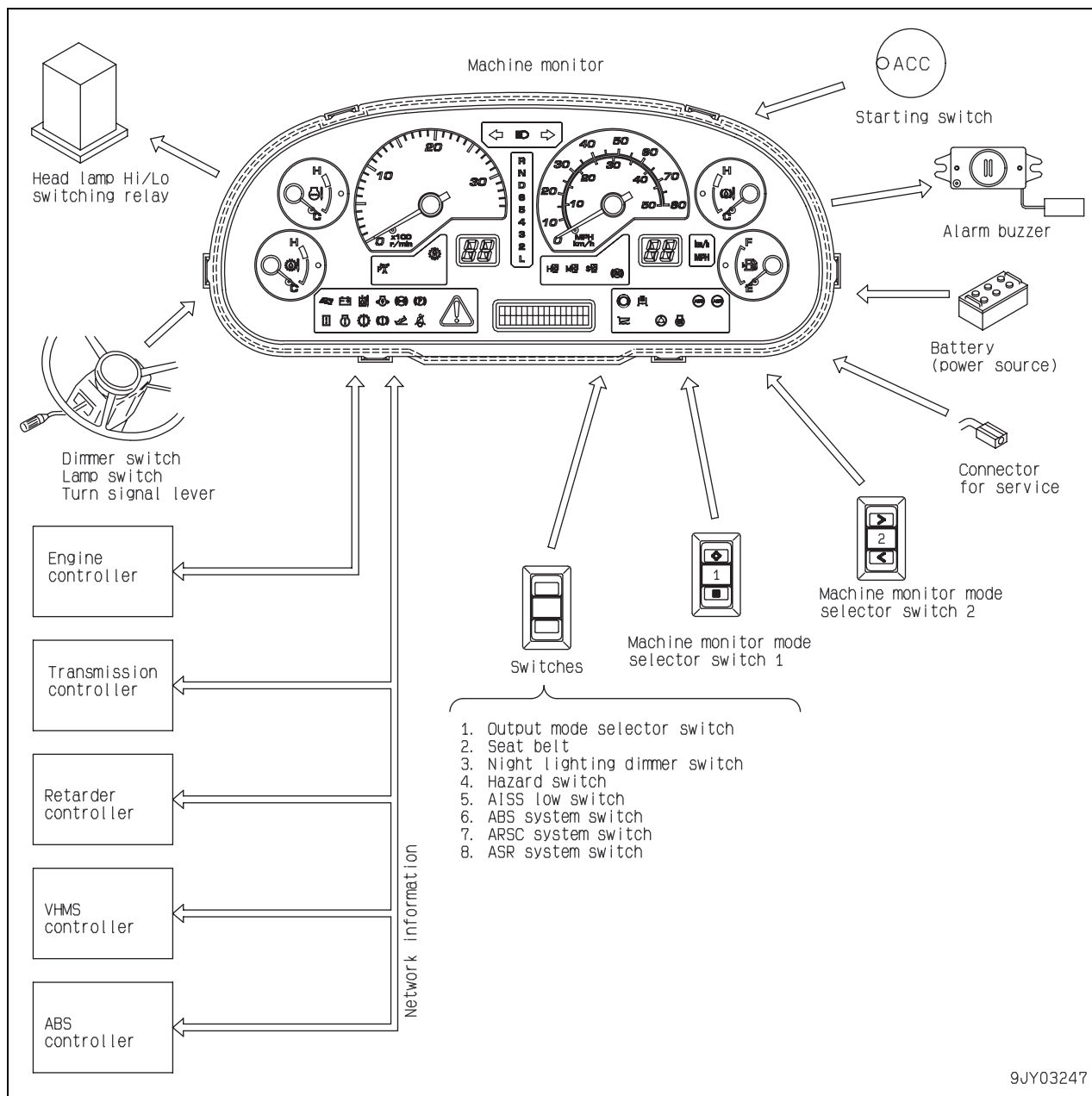
Machine model	Serial number
HD785-7	7001 and up

10 Structure, function and maintenance standard

Electrical system, Part 1

Machine monitor system	2
------------------------------	---

Machine monitor system



Network data

1. From machine monitor to each controller
 - Switch input data
 - Option setting data
2. From each controller to machine monitor
 - Display data related to each controller
 - Service mode data
 - Troubleshooting data
3. From transmission controller to machine monitor
 - Model selection data

Outline

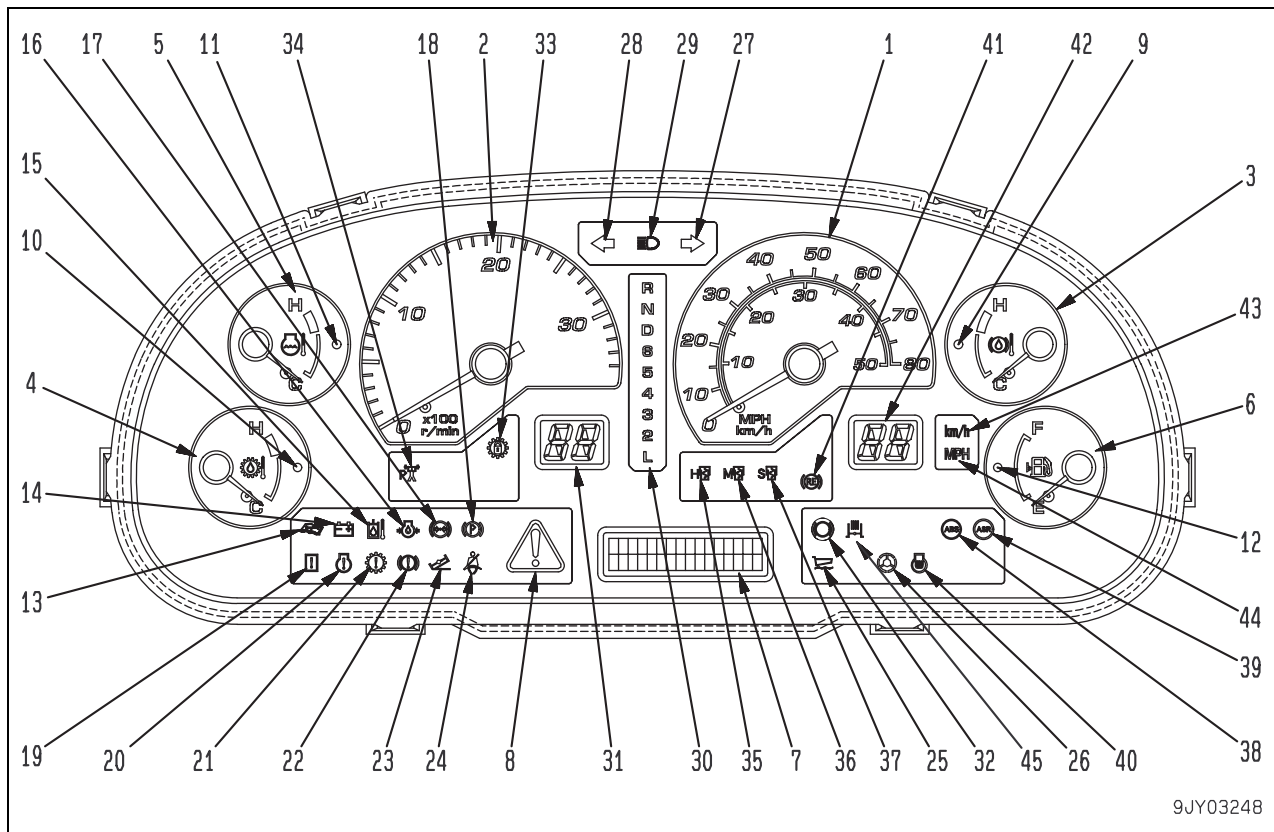
The controllers on the network use the data from the sensors installed to all parts of the machine to observe and control the condition of the vehicle and transmit those data as network data to the machine monitor. The machine monitor, in return, displays these data and inform the operator of the condition of the machine.

- There are two types of display on the machine monitor: the normal mode and the service mode.
- The items that are always displayed for the operator are the normal mode items. Their main content is as follows.

(For details, see "Operation and Maintenance Manual", "Operation".)

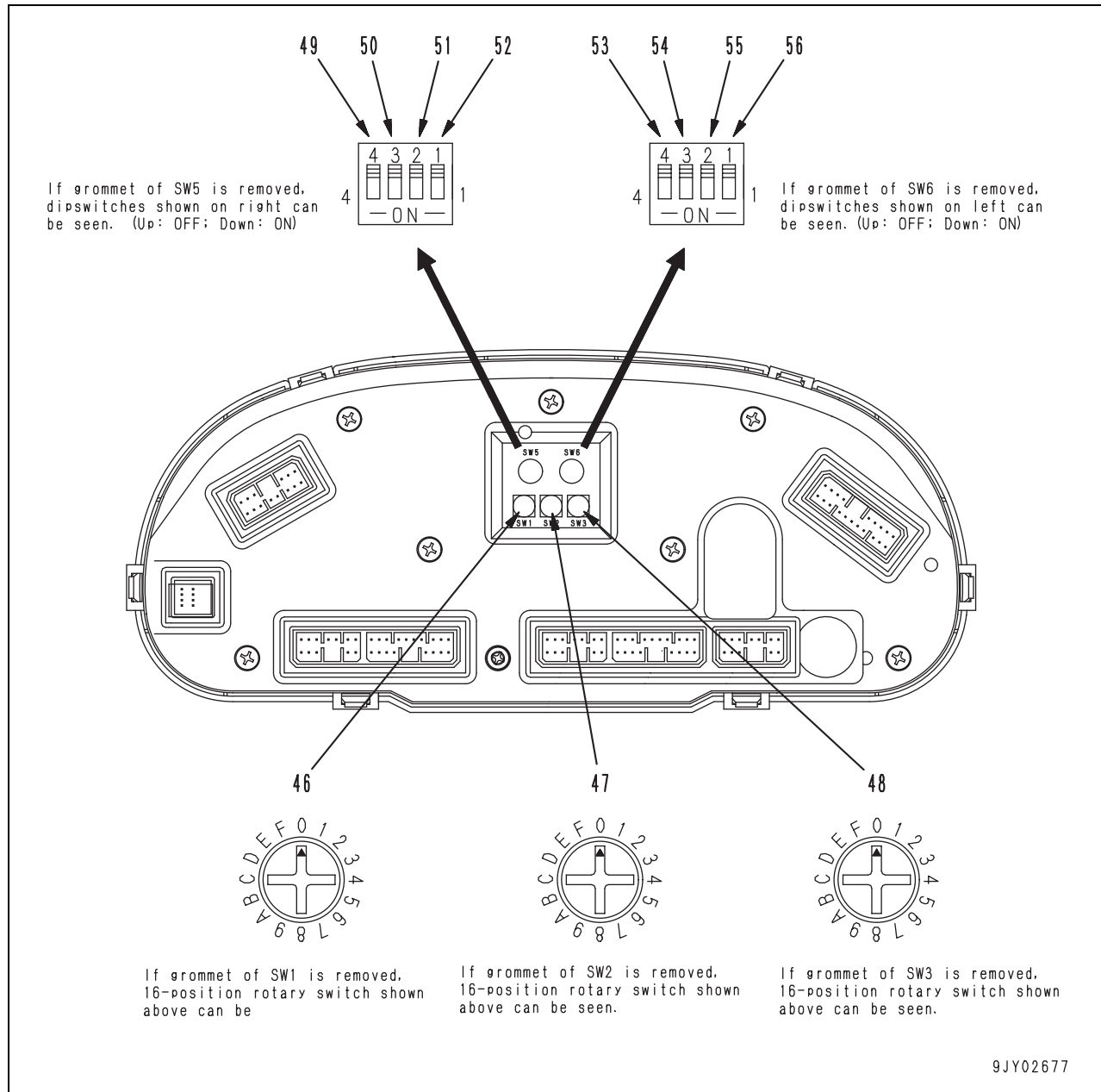
1. Normal display items
 - Meters (speedometer, tachometer)
 - Gauges (engine coolant temperature, torque converter oil temperature, retarder oil temperature, fuel level)
 - Pilot display
 - Service meter, odometer (character display)
2. Items displayed when there is abnormality
Caution, action code display (while an action code is being displayed, press machine monitor mode selector switch (>). A failure code (6-digit) is then displayed.)
3. Maintenance monitor function
When the filter, oil replacement interval is reached, the item needing replacement is displayed in the character display.
4. Others
In combination with the character display and the machine monitor mode selector switch, which is used to operate the character display, the following items can be displayed, set, and adjusted.
 - 1) Dumping counter (if equipped)
 - 2) Display reverse travel distance measurement value
 - 3) Reset filter oil replacement interval
 - 4) Input telephone number
 - 5) Select language
 - 6) Reverse R1/R2 selection
 - 7) Payload meter calibration ID setting (if equipped)
- To make it easier to carry out troubleshooting of the controllers on the network (including the machine monitor itself), a service mode function is provided. Its main content is as follows. For detail, see "Special function of machine monitor" of "Testing and adjusting".
 1. Displaying trouble history data for electrical components
 - Displays electrical component failure occurrence data from each controller that is saved in machine monitor.
 2. Displaying trouble history data for machine
 - Deletes data from memory
 3. Real-time monitor
Takes input, output signal, and calculation values recognized by each controller on network and displays them in real time.
 4. Reduced cylinder mode
This function is used to stop the supply of fuel sprayed from the fuel injector to each of the cylinders. This function is used for the purpose of, for example, determining the cylinder where there is defective combustion.
 5. No injection cranking
This function is used to lubricate an engine without starting the engine to drive a vehicle after a long-term storage.
 6. Adjusting function
This function is used to correct installation errors of sensors, solenoid valves, and compensate production tolerances of parts and components.
 7. Maintenance monitor
This function is used to change filter oil replacement interval and stop the function.
 8. Operation information display function
This function is used to display fuel consumption amount per operation hour.
 9. Engine mode fixing function
This function is used to check the performance.
 10. Snapshot function
For details of this function, see "Testing and adjusting" of "Manual snapshot".
 11. Payload meter function (if equipped)
This function is used to setting and adjusting of payload meter.
For details of this function, see "Operation and maintenance manual" or "Structure, function and maintenance standard" of "Payload meter (having VHMS)".
 12. Option selection function
This function is used to select controller information and optional equipment to be operated.
 13. Model selection function
Input model information to be mounted.
 14. Initialize
This function is used to set the machine monitor when the machine is shipped from the factory.

Machine monitor



9JY03248

- | | |
|---|--|
| 1. Speedometer | 26. Emergency steering pilot lamp |
| 2. Engine tachometer | 27. Turn signal pilot lamp (right) |
| 3. Retarder oil temperature gauge | 28. Turn signal pilot lamp (left) |
| 4. Torque converter oil temperature gauge | 29. Head lamp high beam pilot lamp |
| 5. Coolant temperature gauge | 30. Shift lever position pilot lamp |
| 6. Fuel gauge | 31. Shift indicator |
| 7. Character display | 32. Retarder pilot lamp |
| 8. Centralized warning lamp | 33. Lockup pilot lamp |
| 9. Retarder oil temperature caution lamp | 34. Output mode pilot lamp (power mode) |
| 10. Torque converter oil temperature caution lamp | 35. Suspension mode pilot lamp (hard) (if equipped) |
| 11. Coolant temperature caution lamp | 36. Suspension mode pilot lamp (medium) (if equipped) |
| 12. Fuel level caution lamp | 37. Suspension mode pilot lamp (soft) (if equipped) |
| 13. Maintenance caution lamp | 38. ABS pilot lamp (if equipped) |
| 14. Battery charging circuit caution lamp | 39. ASR pilot lamp (if equipped) |
| 15. Steering oil temperature caution lamp | 40. Preheater pilot lamp |
| 16. Engine oil pressure caution lamp | 41. Automatic retarder READY pilot lamp |
| 17. Retarder oil pressure caution lamp | 42. Automatic retarder set speed indicator |
| 18. Parking brake caution lamp | 43. Automatic retarder set speed unit indicator (km/h) |
| 19. Machine monitor option system caution lamp | 44. Automatic retarder set speed unit indicator (MPH) |
| 20. Engine system caution lamp | 45. Exhaust brake pilot lamp (if equipped) |
| 21. Transmission system caution lamp | |
| 22. Retarder system caution lamp | |
| 23. Inclination caution lamp (if equipped) | |
| 24. Seat belt caution lamp | |
| 25. Body caution lamp | |



- 46. Rotary switch [SW1]
- 47. Rotary switch [SW2]
- 48. Rotary switch [SW3]
- 49. Dipswitch [SW5-4]
- 50. Dipswitch [SW5-3]
- 51. Dipswitch [SW5-2]
- 52. SI Spec, Non-SI Spec selection switch [SW5-1]
- 53. Dipswitch [SW6-4]
- 54. Dipswitch [SW6-3]
- 55. Dipswitch [SW6-2]
- 56. Dipswitch [SW6-1]

★ Setting do not change them.

Machine monitor normal display functions

○ : Lighted up △ : Discontinuous sounds

☆1: The ○ mark shows that the light is lit up while the machine monitor check switch is ON.

☆2: The ○ mark shows that all lights are lit up for 2 seconds at start-up and then go off for 1 second.

No.	Display item	Display category	Device	Color	Display range/ conditions	Display method	Related operation		☆1 When machine monitor check switch is operated.	☆2 Immediately after turning key ON.	Remarks
							Central warning lamp	Alarm buzzer			
1	Machine speed	Meter	Move-ment	Scale: white Back-ground color: black	0 – 80 km/h or 0 – 50 MPH (MPH is displayed when non-SI is used.)	Analog display	—	—	◇ (Note)	—	Note: When machine monitor check switch is operated, pointer starts at current position and moves around indication range and then returns to starting point.
		Backlight	LED	Amber	When the small lamp is lit up.	Lit up during operation	—	—	○	○	
2	Engine speed	Meter	Move-ment	Scale: white, red Back-ground color: black	0 – 3,400 rpm	Analog display * When the overrun prevention brake is operated, the buzzer and central warning lamp are turned ON.	○	△	◇ (Note)	—	Note: When machine monitor check switch is operated, pointer starts at current position and moves around indication range and then returns to starting point.
		Backlight	LED	Amber	When the small lamp is lit up.	Lit up during operation	—	—	○	○	
3 9	Oil temperature of retarder	Gauge	Move-ment	Scale: white, red Back-ground color: black	50 – 150°C (120°C or higher in the red zone)	Analog display	—	—	◇ (Note)	—	Note: When machine monitor check switch is operated, pointer starts at current position and moves around indication range and then returns to starting point.
		Caution	LED	Red	At 120°C or higher	Lit up during warning	○	△	◇	○	
		Backlight	LED	Amber	When the small lamp is lit up.	Lit up during operation.	—	—	○	○	
4 10	Oil temperature of torque converter	Gauge	Move-ment	Scale: white, red Back-ground color: black	50 – 135°C (120°C or higher in the red zone)	Analog display	—	—	◇ (Note)	—	Note: When machine monitor check switch is operated, pointer starts at current position and moves around indication range and then returns to starting point.
		Caution	LED	Red	At 120°C or higher	Lit up during warning	○	△	○	○	
		Backlight	LED	Amber	When the small lamp is lit up.	Lit up during operation.	—	—	○	○	

10 Structure, function and maintenance standard

SEN01289-01

No.	Display item	Display category	Device	Color	Display range/ conditions	Display method	Related operation		When machine monitor check switch is operated.	Immediately after turning key ON.	Remarks
							Central warning lamp	Alarm buzzer			
5 11	Coolant temperature	Gauge	Move-ment	Scale: white, red Back-ground color: black	50 – 135°C (102°C or higher in the red zone)	Analog display	—	—	◇ (Note)	—	Note: When machine monitor check switch is operated, pointer starts at current position and moves around indication range and then returns to starting point.
		Caution	LED	Red	At 102°C or higher	Lit up during warning	○	△	○	○	
		Backlight	LED	Amber	When the small lamp is lit up.	Lit up during operation.	—	—	○	○	
6 12	Fuel level	Gauge	Move-ment	Scale: white Back-ground color: black	EMPTY – FULL	Analog display	—	—	◇ (Note)	—	Note: When machine monitor check switch is operated, pointer starts at current position and moves around indication range and then returns to starting point.
		Caution	LED	Red	Specified level or less (At 76.2 L or higher)	Lit up during operation	—	—	○	○	
		Backlight	LED	Amber	When the small lamp is lit up.	Lit up during operation.	—	—	○	○	
7	Service meter (Regular display item)	Service meter	LCD	Display character: black Back-ground color: green	0 – 65535.0h * Displayed in the "upper column" on the character display	Operates when the engine is running. 1:1 against clock time	—	—	Note 1	Note 2	When 65535.0h is exceeded, fixed at 65535.0h.
	Odometer (Regular display item)	Odometer			0 – 999999.9 km * Displayed in the "lower column" on the character display	Operates during traveling.	—	—	Note 1	Note 2	When 999999.9 km is exceeded, fixed at 999999.9 km.
	Action code	Action code			When any problem or failure occurs on the machine, * Displayed in the upper and lower columns on the character display.	When any problem or failure occurs, the action code is displayed in the upper column and remedies or description of problem in the lower column.	—	—	Note 1	Note 2	

Note 1: Nothing is displayed in the " upper column " and Program No, is displayed in the " lower column ".
But, if equipped the payload meter and when detect the load, display Program No, and Service meter alternately.

Note 2: KOMATSU is displayed in the " upper column " and Nothing is displayed in the " lower column ".

No.	Display item	Display category	Device	Color	Display range/ conditions	Display method	Related operation		When machine monitor check switch is operated.	Immediately after turning key ON.	Remarks
							Central warning lamp	Alarm buzzer			
7	Failure code	Failure code	LCD	Display character: black Background color: green	Press machine monitor mode selector switch > during the occurrence of the problem or failure on the machine. * Appears in the upper and lower columns on the character display.	The failure code (6 digits) and detection controller are displayed in the upper column and the faulty system or description of problem in the lower column.	—	—	Note 1	Note 2	For information on how to operate display, see the Operation & Maintenance Manual.
	Other displays	Reverse travel integrating meter Reset of time to change filter and oil. Telephone number setting Language selection			Press machine monitor mode selector switch "◇"	Switch screen by operating machine monitor mode selector switch ">" or "<".			Note 1	Note 2	For details, see the Operation & Maintenance Manual.
	Night lighting	Backlight	LED	Green	When the small lamp is lit up.	Dimmed down by a step when the small lamp is lit up.	—	—	○	○	
8	Central warning lamp		LED	Red	During system is abnormal	Lit up when abnormal.	○	△	○	○	
13	Maintenance caution	Caution	LED	Red	When maintenance-related alarm is given or the time to change filter and oil has elapsed.	Lit up or flashed	—	—	○	○	Note 3: The moment when the lamp lights up, the action code: E01 and the location where an alarm has been given appear on the character display. Note 4: For details on the target items, etc., see the Operation & Maintenance Manual.
14	Battery charging circuit caution		LED	Red	During battery charging circuit being abnormal	Lit up when abnormal.	○	△	○	○	
15	Steering oil temperature caution		LED	Red	When the steering oil temperature rises.	Lit up when abnormal.	○	△	○	○	

Note 1: Nothing is displayed in the " upper column " and Program No, is displayed in the " lower column ".
But, if equipped the payload meter and when detect the load, display Program No, and Service meter alternately.

Note 2: KOMATSU is displayed in the " upper column " and Nothing is displayed in the " lower column ".

10 Structure, function and maintenance standard

SEN01289-01

No.	Display item	Display category	Device	Color	Display range/ conditions	Display method	Related operation		When machine monitor check switch is operated.	Immediately after turning key ON.	Remarks
							Central warning lamp	Alarm buzzer			
16	Engine oil pressure caution	Caution	LED	Red	When the engine oil pressure drops.	Lit up when abnormal.	○	△	○	○	
17	Retarder oil pressure caution		LED	Red	When the retarder oil pressure drops.	Lit up when abnormal.	○ (Note)	△ (Note)	○	○	Note : Operates when the alternator R terminal is ON.
18	Parking brake caution		LED	Red	When the parking brake is operated.	Lit up during operation.	○ (Note)	△ (Note)	○	○	Note : Operates when the parking brake is operated and the shift lever is in other than the "N" position.
19	Machine monitor or optional system caution		LED	Red	During being abnormal in machine monitor or optional controller system	Lit up when abnormal.	△	△	○	○	Under present conditions, used in the event of failure of the machine monitor.
20	Engine system caution		LED	Red	During being abnormal in engine control system.	Lit up when abnormal.	△	△	○	○	
21	Transmission system caution		LED	Red	When transmission control system is abnormal	Lit up when abnormal.	△	△	○	○	
22	Retarder system caution		LED	Red	When retarder control system is abnormal	Lit up when abnormal.	△	△	○	○	
23	Inclination caution (if equipped)		LED	Red	When the body is lifted and inclined excessively from side to side.	Lit up when abnormal.	○	△	○	○	
24	Seatbelt caution		LED	Red	When the seatbelt is not fastened.	During operation: lit up During non-operation: turned OFF.	—	—	○	○	
25	Body caution		LED	Red	See the instruction manual	During operation: lit up During non-operation: turned OFF.	○ (Note)	△ (Note)	○	○	Note: Operates when the shift lever is in other than the "N" position.
26	Emergency steering	Pilot	LED	Red	When the emergency steering is operated.	During operation: lit up During non-operation: turned OFF.	—	—	○	○	
27	Turn signal, right		LED	Green	During operation	During operation: lit up During non-operation: turned OFF.	—	—	○	○	
28	Turn signal, left		LED	Green	During operation	During operation: lit up During non-operation: turned OFF.	—	—	○	○	

No.	Display item	Display category	Device	Color	Display range/ conditions	Display method	Related operation		When machine monitor check switch is operated.	Immediately after turning key ON.	Remarks
							Central warning lamp	Alarm buzzer			
29	Head-light, high beam	Pilot	LED	Blue	During operation	During operation: lit up During non-operation: turned OFF.	—	—	○	○	
30 (R)	Shift lever position R		LED	Green	When the shift lever is in the "R" position	Lit up (*)	—	—	○	○	* Blinks when the neutral safety is operated.
30 (N)	Shift lever position N		LED	Orange	When the shift lever is in the "N" position	Lit up	—	—	○	○	
30 (D)	Shift lever position D		LED	Green	When the shift lever is in the "D" position	Lit up (*)	—	—	○	○	* Blinks when the neutral safety is operated.
30 (6)	Shift lever position 6		LED	Green	When the shift lever is in the "6" position	Lit up (*)	—	—	○	○	* Blinks when the neutral safety is operated.
30 (5)	Shift lever position 5		LED	Green	When the shift lever is in the "5" position	Lit up (*)	—	—	○	○	* Blinks when the neutral safety is operated.
30 (4)	Shift lever position 4		LED	Green	When the shift lever is in the "4" position	Lit up (*)	—	—	○	○	* Blinks when the neutral safety is operated.
30 (3)	Shift lever position 3		LED	Green	When the shift lever is in the "3" position	Lit up (*)	—	—	○	○	* Blinks when the neutral safety is operated.
30 (2)	Shift lever position 2		LED	Green	When the shift lever is in the "2" position	Lit up (*)	—	—	○	○	* Blinks when the neutral safety is operated.
30 (L)	Shift lever position L		LED	Green	When the shift lever is in the "L" position	Lit up (*)	—	—	○	○	* Blinks when the neutral safety is operated.
31	Shift indicator		LCD	Background color: gray	F1, F2, F3, F4, F5, F6, F7, N, R * According to the gear shift signal received from the transmission controller. * When an alarm is raised in the event of emergency escape, "E-" and the "gear speed range" are alternatively displayed.	When the gear shift range signal is received from the transmission controller.	—	—	○ All lit up.	○ All lit up.	
	Night lighting	Backlight	LED	Amber	When the small lamp is lighted up.	During operation: lit up	—	—	○	○	

10 Structure, function and maintenance standard

SEN01289-01

No.	Display item	Display category	Device	Color	Display range/conditions	Display method	Related operation		When machine monitor check switch is operated.	Immediately after turning key ON.	Remarks
							Central warning lamp	Alarm buzzer			
32	Retarder	Pilot	LED	Orange	When the retarder brake is operated.	During operation: lit up During non-operation: turned OFF	—	—	○	○	
33	Lockup		LED	Green	When lockup of the torque converter is activated and direct drive is effective	During operation: lit up During non-operation: turned OFF	—	—	○	○	
34	Output mode (power mode)		LED	Green	At high-power mode	High-power mode in operation: lit up During non-operation: turned OFF	—	—	○	○	
35	Suspension mode (hard) (if equipped)		LED	Green	At suspension "hard" mode	Lit up in "hard" mode	—	—	○	○	
36	Suspension mode (medium) (if equipped)		LED	Green	In suspension "medium" mode	Lit up in "medium" mode	—	—	○	○	
37	Suspension mode (soft) (if equipped)		LED	Green	In suspension "soft" mode	Lit up in "soft" mode	—	—	○	○	
38	ABS (if equipped)		LED	Orange	When ABS is operated.	During operation: lit up During non-operation: turned OFF	—	—	○	○	
39	ASR (if equipped)		LED	Orange	When ASR is operated.	During operation: lit up During non-operation: turned OFF					
40	Preheating		LED	Red	When electric intake air heater for preheating engine is operated.	During operation: lit up During non-operation: turned OFF	—	—	○	○	
41	Automatic retarder being ready		LED	Green	When automatic retarder is ready to be operated.	When ready to be operated: lit up	—	—	○	○	
42	Automatic retarder set speed		LCD	Background color: gray	When automatic retarder switch is turned ON.	Display of set speed (*)	—	—	○	○	* Zero is displayed when the set speed is cancelled.

No.	Display item	Display category	Device	Color	Display range/ conditions	Display method	Related operation		When machine monitor check switch is operated.	Immediately after turning key ON.	Remarks
							Central warning lamp	Alarm buzzer			
43	Automatic retarder unit display (km/h)	Pilot	LED	Green	When automatic retarder switch is turned ON and the unit km/h is selected.	During operation: lit up During non-operation: turned OFF	—	—	○	○	
44	Automatic retarder display unit (MPH)		LED	Green	When automatic retarder switch is turned on and the unit MPH is selected.	During operation: lit up During non-operation: turned OFF	—	—	○	○	
45	Exhaust brake (if equipped)		LED	Orange	When exhaust brake is operated	During operation: lit up During non-operation: turned OFF	—	—	○	○	

Self-diagnostic function when starting switch is operated

1. When the starting switch is turned to the ON position before starting the engine, the system check is carried out for 3 seconds.
2. If the starting switch is turned to the START position before 3 seconds have passed with the starting switch at the ON position, everything will go to the normal operating condition. However, even if everything goes to the normal operating condition, the indicator gauges and meters will not work until 3 seconds have passed after the starting switch is turned to the ON position.

Check function of central warning lamp, alarm buzzer, monitor lamps, and meters

To check the normal display function of the machine monitor, press the machine monitor check switch to check the actuation. For details of the actuation, see "Machine monitor normal display functions when machine monitor check switch is operated".

Table of signals for each monitor connector

No.	Machine monitor				Specification
	CN	PIN	I/O	A/D	
1	CN1	1	–	–	–
2	CN1	2	–	–	–
3	CN1	3	–	–	–
4	CN1	4	–	–	NSW power supply (+24 V)
5	CN1	5	–	–	NSW power supply (+24 V)
6	CN1	6	–	–	SW power supply (+24 V)
7	CN1	7	–	–	SW power supply (+24 V)
8	CN1	8	–	–	–
9	CN1	9	–	–	GND
10	CN1	10	–	–	GND
11	CN1	11	0	D	D_OUT_3, (Sync 200 mA)
12	CN1	12	0	D	D_OUT_2, (Sync 200 mA)
13	CN1	13	0	D	D_OUT_1, (Sync 200 mA)
14	CN1	14	0	D	D_OUT_0, (Sync 200 mA)
15	CN1	15	–	–	Sensor power output (+24 V, 100 mA)
16	CN1	16	–	–	Sensor power output (+5 V, 100 mA)
17	CN1	17	–	–	GND
18	CN1	18	–	–	GND
19	CN1	19	–	–	GND
20	CN1	20	–	–	GND
21	CN2A	1	I	D	D_IN_0, (+24 V, 5 mA, PULL DOWN)
22	CN2A	2	I	D	D_IN_2, (+24 V, 5 mA, PULL DOWN)
23	CN2A	3	I	D	D_IN_4, (+24 V, 5 mA, PULL DOWN)
24	CN2A	4	I	D	D_IN_6, (+24 V, 5 mA, PULL DOWN)
25	CN2A	5	I	D	D_IN_8, (+24 V, 5 mA, PULL DOWN)
26	CN2A	6	I	D	D_IN_10, (+24 V, 5 mA, PULL DOWN)
27 *1	CN2A	7	I	D	D_IN_12, (NSW+24 V, 5 mA, PULL DOWN)
28 *1	CN2A	8	I	D	D_IN_14, (NSW+24 V, 5 mA, PULL DOWN)

*1: NSW +24 V input port is active even if the setting is made to KEY OFF when power is supplied directly from battery.

Signal and model					Remarks
Signal name	Model name				
	HD325-7 HD405-7	HD465-7E0 HD605-7E0	HD465-7R HD605-7R	HD785-7	
—	—	—	—	—	(-) : NON CONNECT
—	—	—	—	—	OPEN (RESERVED)
—	—	—	—	—	OPEN (RESERVED)
BAT DIRECT +24 V	○	○	○	○	Directly from battery +24 V
BAT DIRECT +24 V	○	○	○	○	Directly from battery +24 V
POWER SUPPLY +24 V	○	○	○	○	Key switch +24 V (ACC)
POWER SUPPLY +24 V	○	○	○	○	Key switch +24 V (ACC)
—	—	—	—	—	(-) : NON CONNECT
GND (for power supply)	○	○	○	○	+24 V POWER CONNECT
GND (for power supply)	○	○	○	○	+24 V POWER CONNECT
—	—	—	—	—	(-) : NON CONNECT
—	—	—	—	—	(-) : NON CONNECT
BUZZER OUTPUT	○	○	○	○	Warning buzzer (Max. 200 mA sync)
HEAD LIGHT H/L SWITCHING	○	○	○	○	
—	—	—	—	—	(-) : NON CONNECT
—	—	—	—	—	(-) : NON CONNECT
—	—	—	—	—	(-) : NON CONNECT
—	—	—	—	—	(-) : NON CONNECT
—	—	—	—	—	(-) : NON CONNECT
—	—	—	—	—	(-) : NON CONNECT
HI BEAM	○	○	○	○	
AISS SW	○	○	○	○	
EXHAUST SW2	—	—	—	○	Exhaust brake switch lower side
PASSING SW	○	○	○	○	
CONNECTER CHECK	○	○	○	○	Used to detect improper connector, connection
MODE SW2-1 >	○	○	○	○	Mode SW2 upper side
RIGHT TURN	○	○	○	○	
MODE SW1-1 ◇	○	○	○	○	Mode SW1 upper side

No.	Machine monitor				Specification
	CN	PIN	I/O	A/D	
29	CN2A	9	–	–	GND
30	CN2A	10	I	D	D_IN_1 (+24 V, 5 mA, PULL DOWN)
31	CN2A	11	I	D	D_IN_3 (+24 V, 5 MA, PULL DOWN)
32	CN2A	12	I	D	D_IN_5 (+24 V, 5 MA, PULL DOWN)
33	CN2A	13	I	D	D_IN_7 (+24 V, 5 MA, PULL DOWN)
34	CN2A	14	I	D	D_IN_9 (+24 V, 5 MA, PULL DOWN)
35	CN2A	15	I	D	D_IN_11 (+24 V, 5 MA, PULL DOWN)
36 *1	CN2A	16	I	D	D_IN_13 (NSW+24 V, 5 MA, PULL DOWN)
37 *1	CN2A	17	I	D	D_IN_15 (NSW+24 V, 5 MA, PULL DOWN)
38	CN2A	18	I	A	D_IN_0 (0 – 30 V)
39	CN2B	1	I	D	D_IN_16 (+24 V, 5 MA, PULL UP)
40	CN2B	2	I	D	D_IN_18 (+24 V, 5 MA, PULL UP)
41	CN2B	3	I	D	D_IN_20 (+24 V, 5 MA, PULL UP)
42	CN2B	4	I	D	D_IN_22 (+24 V, 5 MA, PULL UP)
43	CN2B	5	I	D	D_IN_24 (+24 V, 5 MA, PULL DOWN)
44	CN2B	6	–	–	GND
45	CN2B	7	I	D	D_IN_17 (+24 V, 5 MA, PULL UP)
46	CN2B	8	I	D	D_IN_19 (+24 V, 5 MA, PULL UP)
47	CN2B	9	I	D	D_IN_21 (+24 V, 5 MA, PULL UP)
48	CN2B	10	I	D	D_IN_23 (+24 V, 5 MA, PULL UP)
49	CN2B	11	I	D	D_IN_25 (+24 V, 5 MA, PULL DOWN)
50	CN2B	12	I	A	A_IN_1 (0 – 30 V)
51	CN3A	1	I	D	D_IN_26 (+24 V, 5 MA, PULL DOWN)
52	CN3A	2	I	D	D_IN_28 (+24 V, 5 MA, PULL DOWN)
53	CN3A	3	I	D	D_IN_30 (+24 V, 5 MA, PULL DOWN)
54 *2	CN3A	4	I	D	D_IN_32 (GND, 5 MA, PULL UP)
55 *2	CN3A	5	I	D	D_IN_34 (GND, 5 MA, PULL UP)
56 *2	CN3A	6	I	D	D_IN_36 (GND, 5 MA, PULL UP)

*1: NSW +24 V input port is active even if the setting is made to KEY OFF when power is supplied directly from battery.

*2: Setting is made to PULL UP.

Signal and model					Remarks
Signal name	Model name				
	HD325-7 HD405-7	HD465-7E0 HD605-7E0	HD465-7R HD605-7R	HD785-7	
SENSOR GND	○	○	○	○	
CHECK SW	○	○	○	○	
EXHAUST BRAKE SW1	—	—	—	○	Exhaust brake switch upper side
ABS CHECK SW	○	○	○	○	
ENGINE MODE SW	○	○	○	○	
MODE SW1-2 ■	○	○	○	○	Mode SW1 lower side
MODE SW1-2 <	○	○	○	○	Mode SW1 lower side
LEFT TURN	○	○	○	○	
—	—	—	—	—	(-) : NON CONNECT
—	—	—	—	—	(-) : NON CONNECT
ARSC SYSTEM SW1	○	○	○	○	ARSC system switch (upper)
ABS SYSTEM SW1	○	○	○	○	ABS system switch (upper)
ASR SYSTEM SW1	○	○	○	○	ASR system switch (upper)
FRONT BRAKE CUT OFF	○	○	○	—	(-) : NON CONNECT
NIGHT LIGHTING SW +24 V	○	○	○	○	Head Light SW recognition for Night Lighting function
SENSOR GND	○	○	○	○	
ARSC SYSTEM SW2	○	○	○	○	ARSC system switch (lower)
ABS SYSTEM SW2	○	○	○	○	ABS system switch (lower)
ASR SYSTEM SW2	○	○	○	○	ASR system switch (lower)
—	—	—	—	—	(-) : NON CONNECT
SEAT BELT	○	○	○	○	
PANEL DIMMER SWITCH	○	○	○	○	
—	—	—	—	—	(-) : NON CONNECT
—	—	—	—	—	(-) : NON CONNECT
—	—	—	—	—	(-) : NON CONNECT
—	—	—	—	—	(-) : NON CONNECT
CONNECTOR CHECK 2 (OPEN)	○	○	○	○	(-) : NON CONNECT, Used to detect improper connector connection
—	—	—	—	—	(-) : NON CONNECT

No.	Machine monitor				Specification
	CN	PIN	I/O	A/D	
57 *2	CN3A	7	I	D	D_IN_38 (GND, 5 mA, PULL UP)
58	CN3A	8	I	P	P_IN_0 (0.5 Vp-p)
59	CN3A	9	–	–	GND
60	CN3A	10	I	D	D_IN_27 (+24 V, 5 mA, PULL DOWN)
61	CN3A	11	I	D	D_IN_29 (+24 V, 5 mA, PULL DOWN)
62	CN3A	12	I	D	–
63 *2	CN3A	13	I	D	D_IN_33 (GND, 5 mA, PULL UP)
64 *2	CN3A	14	I	D	D_IN_35 (GND, 5 mA, PULL UP)
65 *2	CN3A	15	I	D	D_IN_37 (GND, 5 mA, PULL UP)
66 *2	CN3A	16	I	D	D_IN_39 (GND, 5 mA, PULL UP)
67	CN3A	17	I	P	P_IN_0 (0.5 Vp-p)
68	CN3A	18	–	–	NC
69	CN3B	1	I	A	A_IN_2 (High resistance input)
70	CN3B	2	I	A	A_IN_4 (High resistance input)
71	CN3B	3	I	A	A_IN_6 (Low resistance input)
72	CN3B	4	I	A	A_IN_8 (0 – 5 V)
73	CN3B	5	I	A	A_IN_10 (0 – 5 V)
74	CN3B	6	–	–	GND
75	CN3B	7	I	A	A_IN_3 (High resistance input)
76	CN3B	8	I	A	A_IN_5 (High resistance input)
77	CN3B	9	I	A	A_IN_7 (0 – 5 V)
78	CN3B	10	I	A	A_IN_9 (0 – 5 V)
79	CN3B	11	–	–	GND
80	CN3B	12	–	–	NC
81	CN4	1	–	–	S_NET (+)
82	CN4	2	–	–	S_NET (+)
83	CN4	3	–	–	CAN (+)
84	CN4	4	–	–	S_NET (–)

*2: Setting is made to PULL UP.

Signal and model					Remarks
Signal name	Model name				
	HD325-7 HD405-7	HD465-7E0 HD605-7E0	HD465-7R HD605-7R	HD785-7	
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
OP7	○	○	○	○	For service mode
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
-	-	-	-	-	(-) : NON CONNECT
CAN (+)	○	○	○	○	
-	-	-	-	-	(-) : NON CONNECT

No.	Machine monitor				Specification
	CN	PIN	I/O	A/D	
85	CN4	5	–	–	S_NET (–)
86	CN4	6	–	–	GND
87	CN4	7	–	–	GND
88	CN4	8	–	–	CAN (–)
89	CN4	9	–	–	NC
90	CN4	10	–	–	NC
91	CN4	11	–	–	NC
92	CN4	12	–	–	NC
93	CN5	1	–	–	NC
94	CN5	2	–	–	RA232C_1_RTS
95	CN5	3	–	–	RA232C_1_RD
96	CN5	4	–	–	RA232C_2_RD
97	CN5	5	–	–	RA232C_2_RTS
98	CN5	6	–	–	NC
99	CN5	7	–	–	NC
100	CN5	8	–	–	RA232C_1_CTS
101	CN5	9	–	–	RA232C_1_TX
102	CN5	10	–	–	RA232C_1_SG
103	CN5	11	–	–	RA232C_2_SG
104	CN5	12	–	–	RA232C_2_TX
105	CN5	13	–	–	RA232C_2_CTS
106	CN5	14	–	–	NC
107	CN6	1	–	–	–
108	CN6	2	–	–	–
109	CN6	3	–	–	–
110	CN6	1	–	–	NC
111	CN6	5	–	–	–
112	CN6	6	–	–	NC
113	CN6	7	–	–	–
114	CN6	8	–	–	GND

[illegible]

★ Switch input on monitor panel board

No.	SW	Position	I/O	A/D	Specification
1	SW1	0	I	D	Rotary switch (16 positions)
2	SW1	1	I	D	
3	SW1	2	I	D	
4	SW1	3	I	D	
5	SW1	4	I	D	
6	SW1	5	I	D	
7	SW1	6	I	D	
8	SW1	7	I	D	
9	SW1	8	I	D	
10	SW1	9	I	D	
11	SW1	A	I	D	
12	SW1	B	I	D	
13	SW1	C	I	D	
14	SW1	D	I	D	
15	SW1	E	I	D	
16	SW1	F	I	D	
17	SW2	0	I	D	Rotary switch (16 positions)
18	SW2	1	I	D	
19	SW2	2	I	D	
20	SW2	3	I	D	
21	SW2	4	I	D	
22	SW2	5	I	D	
23	SW2	6	I	D	
24	SW2	7	I	D	
25	SW2	8	I	D	
26	SW2	9	I	D	
27	SW2	A	I	D	
28	SW2	B	I	D	
29	SW2	C	I	D	
30	SW2	D	I	D	
31	SW2	E	I	D	
32	SW2	F	I	D	

23

No.	SW	Position	I/O	A/D	Specification
33	SW3	0	I	D	Rotary switch (16 positions)
34	SW3	1	I	D	
35	SW3	2	I	D	
36	SW3	3	I	D	
37	SW3	4	I	D	
38	SW3	5	I	D	
39	SW3	6	I	D	
40	SW3	7	I	D	
41	SW3	8	I	D	
42	SW3	9	I	D	
43	SW3	A	I	D	
44	SW3	B	I	D	
45	SW3	C	I	D	
46	SW3	D	I	D	
47	SW3	E	I	D	
48	SW3	F	I	D	
49	SW5	1	I	D	Dip switch (2 positions)
50	SW5	2	I	D	Rotary switch (16 positions)
51	SW5	3	I	D	
52	SW5	4	I	D	
53	SW6	1	I	D	
54	SW6	2	I	D	
55	SW6	3	I	D	
56	SW6	4	I	D	

[illegible]

HD785-7 Dump truck

Form No. SEN01289-01

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

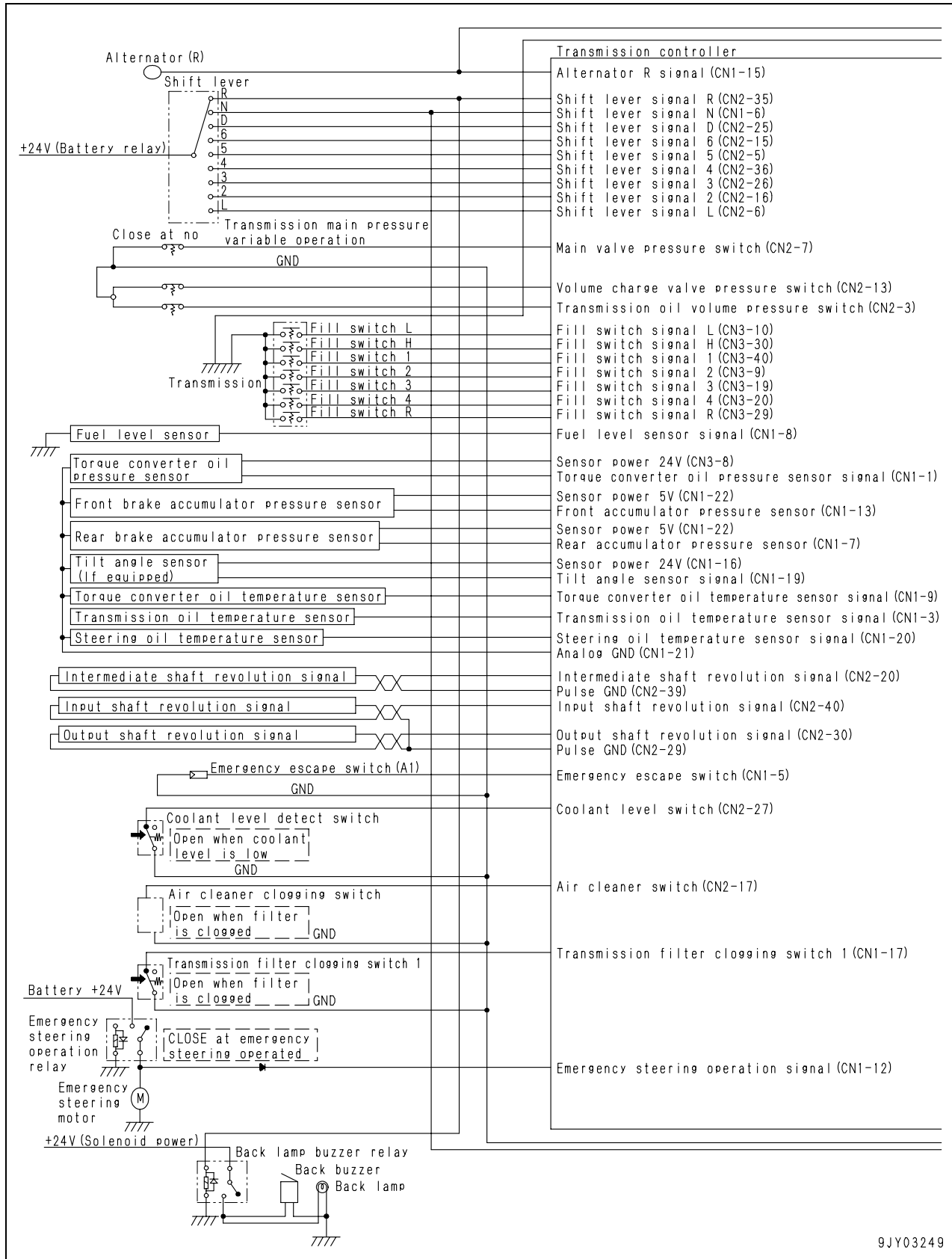
10 Structure, function and maintenance standard

Electrical system, Part 2

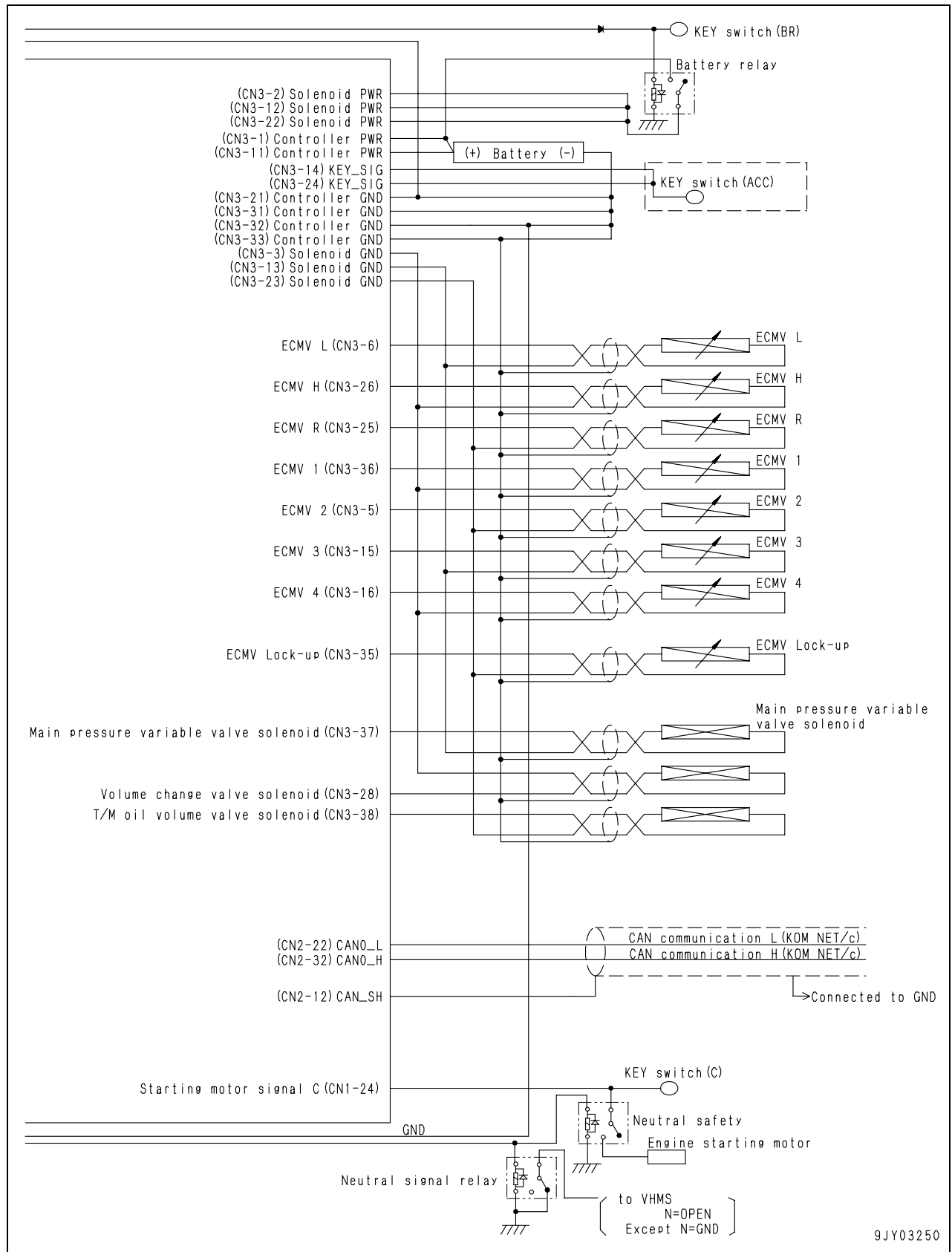
Automatic shift control system	2
Automatic emergency steering system	20
Automatic suspension system	24
Retarder control system	27
Dump control lever	40

Automatic shift control system

1. Electrical circuit diagram



9JY03249



Outline

- Upon receiving the shift position signal of the gear shift lever, acceleration signal of the accelerator pedal, speed signal of the transmission, and signals of various switches and sensors, the transmission controller automatically sets the transmission in the most suitable gear speed.
- The transmission controller controls the torque converter lockup system and the brake to prevent overrun, as well as the transmission. Each of the clutch packs of the transmission and the torque converter lockup clutch pack has the electronically controlled modulation valves to control the clutches independently. Those valves control the initial pressure, build-up rate, and torque-off time of each clutch according to the condition of the machine to reduce the gearshift shocks, prevent gearshift hunting, and improve the durability of the clutch.
- Upon receiving the signals of the switches and sensors to drive the display, cautions, and pilot lamps of the machine monitor, the transmission controller sends them to the network.

Data items transmitted from transmission controller to network

RTCDB1(Machine monitor, retarder controller, and other) (Updated every 10 msec)

No.	Item
1	Output shaft speed
2	Brake command (Front wheel)
3	Brake command (Rear wheel)
4	Exhaust brake operation command

RTCDB1(Special to engine controller)
(Updated for 10 msec)

No.	Item
1	Throttle correction value
2	Throttle lower limit
3	Throttle upper limit
4	2nd method throttle
5	HSI line / brake point speed
6	Torque curve select (engine mode)
7	ABS reference type
8	Droop switch
9	ABS droop trim

RTCDB2(Machine monitor, retarder controller, and other) (Updated every 100 msec)

No.	Item
1	Gear speed
2	Shift lever position
3	Lock-up operation state
4	—
5	Emergency escape state
6	Operating state of overrun prevention brake
7	Model setting abnormality state
8	Option setting abnormality state
9	Neutral safety alarm
10	Operation of overrun alarm
11	Reverse gear speed select state
12	Torque converter oil temperature
13	Alternator R terminal
14	Key switch C terminal
15	Emergency steering operation
16	Tilting alarm command
17	Fuel level
18	Control state of grid heater
19	Engine coolant temperature
20	Engine speed
21	Momentary fuel consumption
22	Body seating
23	Float caution
24	Auto suspension mode
25	Retarder brake signal
26	Parking brake signal
27	Exhaust brake operation
28	Tail lamp operation (secondary brake operation recognition)
29	ARSC operation (ready lamp)
30	ASR command (operation ON/OFF)
31	ABS operation state
32	Retarder controller model setting abnormality state
33	Retarder controller option setting abnormality state
34	Accumulator oil temperature drop state (front,rear)
35	ARSC overheat alarm
36	ABS controller model setting abnormality state
37	ABS controller option setting abnormality state
38	ARSC setting travel speed
39	Retarder oil temperature (front)
40	Retarder oil temperature (rear)
41	Body positioner signal

RTCDB2(Special to engine controller)
(Updated every 100 msec)

No.	Item
1	Automatic warm-up cancel flag

Data items sent from network to transmission controller

RTCDB1 (Updated every 10 msec)

No.	Item
1	Engine speed
2	Accelerator position
3	Seat unoccupied judgment
4	Reverse not-permitted command
5	Retarder switch (front) state
6	Retarder switch (rear) state
7	Foot brake (service brake) state

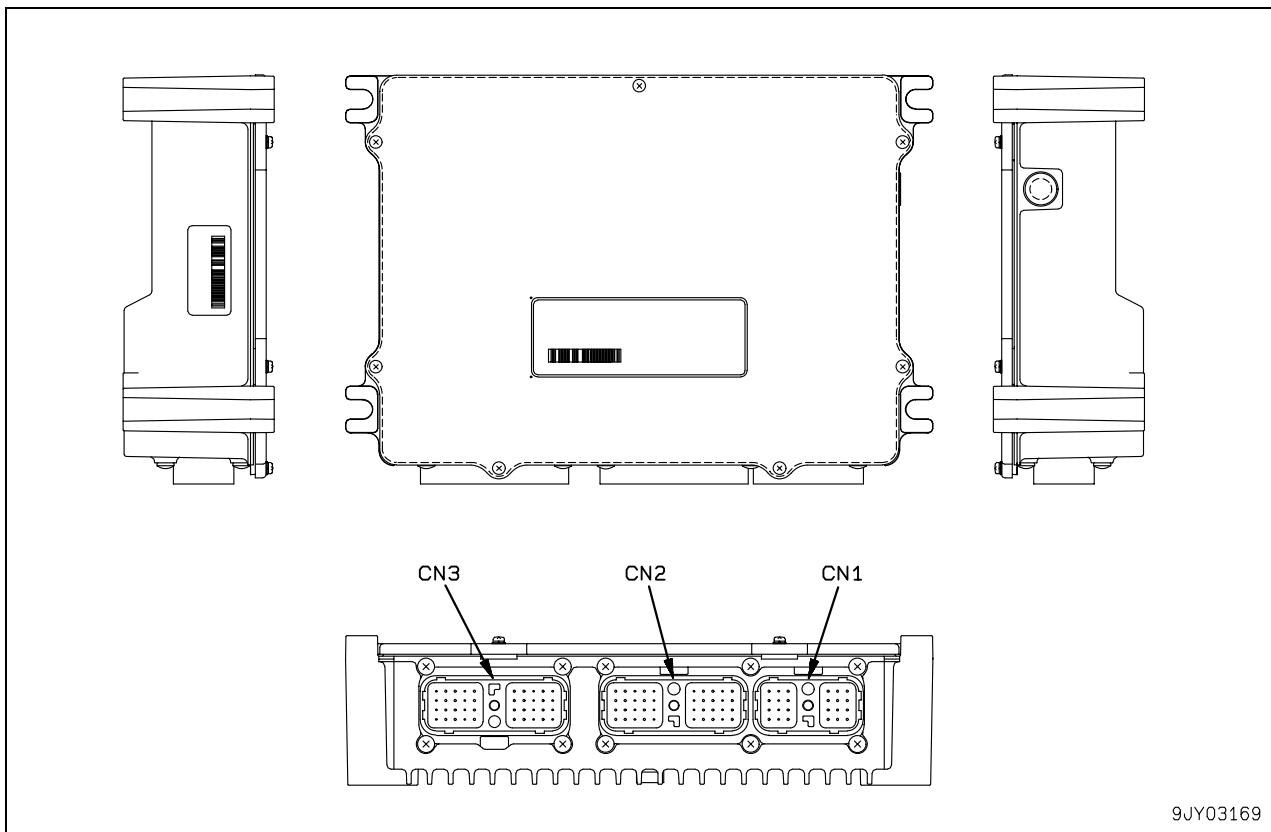
RTCDB2 (Updated for 100 msec)

No.	Item
1	Service meter
2	Engine mode switch
3	Exhaust brake switch 1 (Pressed up)
4	Exhaust brake switch 1 (Pressed down)
5	AISS inhibit switch
6	Reverse travel speed gear selector switch
7	Accelerator sensor abnormality state
8	Engine coolant temperature
9	Control state of grid heater
10	Momentary fuel consumption
11	Parking brake operation
12	Retarder brake operation
13	Body seating
14	Hoist lever state
15	Tail lamp output (secondary brake operation recognition)
16	Float caution
17	ASR command (operation ON/OFF)
18	ARSC operation (ready lamp)
19	ARSC setting travel speed
20	ARSC overheat alarm
21	Exhaust brake operation
22	Retarder oil temperature (front)
23	Retarder oil temperature (rear)
24	Auto suspension mode
25	Retarder controller option setting abnormality state
26	Retarder controller model setting abnormality state
27	Body position sensor
28	ABS operation state
29	ABS controller option setting abnormality state
30	ABS controller model setting abnormality state

RPC-k (irregularly updated)

No.	Item
1	Model selection information
2	Option selection information [Option item] a. Maximum gear speed setting b. Maximum gear speed setting for the body-up state c. Exhaust brake equipped / not equipped d. Correction amount of tire size e. Tilting alarm function Installed/Not installed f. ABS function Installed/Not installed g. Parking brake interlock provided / not provided
3	Adjustment mode information (Adjustment mode information) a. Trigger correction amount leaning value reset b. Auto IP mode command c. Manual IP mode command d. Torque converter stall command

Transmission controller



9JY03169

Outline

- The transmission controller controls the transmission system.
It has the following features and functions.
 1. The gear shifting pattern is set in the power mode or economy mode.
 2. In the braking mode, the brake is used and the gear shifting point is heightened to increase the brake cooling pump speed. Accordingly, the retarder cooling effect is increased and the engine is used as a brake efficiently.
 3. It controls the brake through the retarder controller for the torque converter lock-up solenoid valve, exhaust brake (if equipped) and overrun prevention.
 4. To reduce the gear shift shocks, the throttle correction command is output to the engine controller to adjust the engine speed during gear shifting operation.
 5. Speed sensors are installed to 3 places of the transmission input shaft, intermediate shaft and output shaft to sense slip of the transmission clutch and protect the transmission when the hydraulic system has a trouble.
 6. It connects to the network and shares various data with other controllers.
 7. It receives the model selection data (what model it is mounted on) through the network.
 8. The self-diagnostic function is installed for each of the input and output systems.
 9. The self-diagnostic function is displayed on the monitor.
 10. If a trouble is detected, its contents are sent to the network.
 11. It uses the machine monitor to display if the failure is still existing.
 12. It provides an escape function for use when there is a failure in the electrical system.

Input and output signal

CN1

Pin No.	Signal name	Input/output signal
1	Torque converter oil pressure	Input
2	—	—
3	Transmission oil temperature	Input
4	—	—
5	Emergency escape switch	Input
6	Shift lever position N	Input
7	Accumulator oil pressure sensor (rear)	Input
8	Fuel level sensor	Input
9	Torque converter oil temperature	Input
10	—	—
11	Transmission filter clogging switch 2	Input
12	Emergency steering operation	Input

CN2

Pin No.	Signal name	Input/output signal
1	—	—
2	—	—
3	Transmission oil quantity variable valve operation	Input
4	—	—
5	Shift lever position 5	Input
6	Shift lever position L	Input
7	Transmission main variable valve operation	Input
8	—	—
9	—	—
10	—	—
11	—	—
12	—	—
13	Main oil quantity exchange valve operation	Input
14	—	—
15	Shift lever position 6	Input
16	Shift lever position 2	Input
17	Air cleaner clogging switch	Input
18	—	—
19	—	—
20	Transmission intermediate shaft speed	Input

CN3

Pin No.	Signal name	Input/output signal
1	Power supply 24V	Input
2	Proportional solenoid power supply 24 V	Input
3	ECMV output Hig 1st, 4th, main oil quantity change valve (-)	Output
4	—	—
5	ECMV 2nd (+)	Output
6	ECMV Low (+)	Output
7	—	—
8	Torque converter oil pressure sensor power supply (24V)	Output
9	Fill switch 2nd	Input
10	Fill switch Low	Input
11	Power supply 24V	Input
12	Proportional solenoid power supply 24 V	Input
13	ECMV output Low, 3rd, transmission main pressure variable valve (-)	Output
14	KEY switch ACC	Input
15	ECMV 3rd (+)	Output
16	ECMV 4th (+)	Output
17	—	—
18	—	—
19	Fill switch 3rd	Input
20	Fill switch 4th	Input

Pin No.	Signal name	Input/output signal
13	Accumulator oil pressure sensor (front)	Input
14	—	—
15	Alternator R terminal	Input
16	Sensor power supply	Output
17	Transmission filter clogging switch 1	Input
18	—	—
19	Machine inclination angle	Input
20	Steering oil temperature	Input
21	GND (for sensor)	—
22	Sensor power supply (5V)	Output
23	—	—
24	Start	Input

Pin No.	Signal name	Input/output signal
21	—	—
22	Network Low	Input/output
23	—	—
24	—	—
25	Shift lever position D	Input
26	Shift lever position 3	Input
27	Coolant level	Input
28	—	—
29	GND (for input shaft speed, output shaft speed)	—
30	Transmission output shaft speed	Output
31	—	—
32	Network High	Input/output
33	—	—
34	—	—
35	Shift lever position R	Input
36	Shift lever position 4	Input
37	—	—
38	—	—
39	GND (intermediate shaft speed)	Input
40	Transmission input shaft speed	Input

Pin No.	Signal name	Input/output signal
21	GND	Input
22	Proportional solenoid power supply 24 V	Input
23	ECMV output Rev. 2nd, lock-up, T/M lubrication oil quantity variable valve (-)	Output
24	KEY switch ACC	Input
25	ECMV Rev (+)	Output
26	ECMV High (+)	Output
27	—	—
28	Main oil quantity exchange valve	Output
29	Fill switch Rev	Input
30	Fill switch High	Input
31	GND	Input
32	GND	Input
33	GND	Input
34	—	—
35	ECMV lock-up (+)	Output
36	ECMV 1st (+)	Output
37	Transmission main pressure variable valve	Output
38	Transmission oil quantity variable valve	Output
39	—	—
40	Fill switch 1st	Input

Gear shift lever position and automatic gearshifting range

- The relationship between each gearshift position and the automatic gearshifting range is as shown in the table below.

Gear shift lever position	Gear speed									
	R H	R L	N	F 1	F 2	F 3	F 4	F 5	F 6	F 7
R										
N										
D										
6										
5										
4										
3										
2										
L										

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(When the gear shift lever is in the reverse position, the default is RH. RL can be selected for the reverse travel, however, with the machine monitor.)

Gearshifting characteristics

- Shifting the transmission up and down is carried out according to the shift map saved in the controller memory.
There are five types of shift map, depending on the condition of the input signals.
The settings for each mode are as shown in the table below.

Mode	Set conditions
Braking mode	Brake signal ON
Coasting mode	When the following conditions are fulfilled 1. Brake signal OFF 2. Accelerator idle
Partial delay	When the following conditions are fulfilled 1. Within certain time after brake signal is turned OFF 2. Accelerator pedal is not in idle position or full position
Power mode	When the following conditions are fulfilled 1. Certain time after brake signal is turned OFF 2. Accelerator pedal depressed 3. Power mode selector switch is at power
Economy mode	When the following conditions are fulfilled 1. Certain time after brake signal is turned OFF 2. Accelerator pedal depressed 3. Power mode selector switch is at economy

Braking mode:

The shift-down point and the shift-up point are both raised, the engine speed is maintained at a higher level, and the amount of cooling oil for the retarder is ensured to provide greater effect when the engine is used as a brake.

Coasting mode:

The difference between the shift-down point and the shift-up point is increased to reduce the number of unnecessary gear shifting operations.

Partial delay:

The number of unnecessary gear shifting operations caused by change of the mode is reduced and hunting caused by repeated gear shifting is prevented.

Power mode:

The power mode uses the power of the machine to the maximum to provide the maximum payload. In addition, the acceleration sensitive type variable shifting point is employed, which senses the machine acceleration and shifts up the gear early to accelerate the machine sharply and reduce the fuel consumption, noise and gear shift shock when the machine is empty or loaded little (when the acceleration is high).

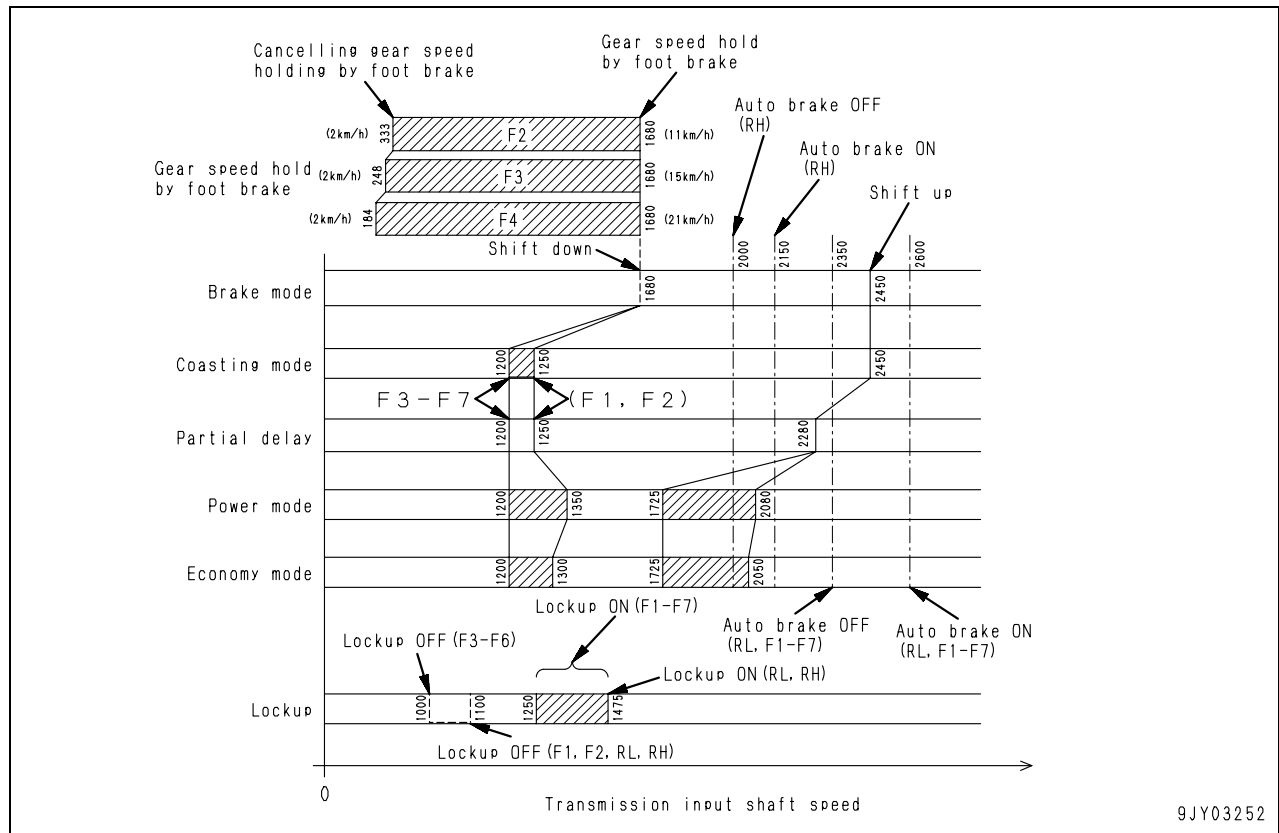
Economy mode:

This standard mode uses for normal work. Compare with power mode, the engine speed is maintained at a lower level, and the fuel consumption, noise, and transmission shock are improved optimum.

In addition, the acceleration sensitive type variable shifting point is employed, which senses the machine acceleration and shifts up the gear early to accelerate the machine sharply and reduce the fuel consumption, noise and gear shift shock when the machine is empty or loaded little (when the acceleration is high).

Automatic gearshifting graph

- The shift-up/shift-down points, the torque converter lock-up ON/OFF points, and the automatic braking (for overrun prevention) ON/OFF points of each mode are as shown in the figure below.

**Note:**

- Power mode**
 - The optimum shift-up point is selected between 1,725 and 2,080 rpm according to the accelerating condition of the machine and gear speed.
 - The optimum shift-down point is selected between 1,200 and 1,350 rpm according to the accelerator pedal position and gear speed.
- Economy mode**
 - The optimum shift-up point is selected between 1,725 and 2,050 rpm according to the accelerating condition of the machine and gear speed.
 - The optimum shift-down point is selected between 1,200 and 1,300 rpm according to the accelerator pedal position and gear speed.
- Braking mode**
 - While the foot brake is operated, if the travel speed lowers below about 21 km/h at the 4th gear speed, about 15 km/h at 3rd gear speed, or 11 km/h at the 2nd gear speed, the current gear speed (F4, F3, or F2) is maintained. Accordingly, if the operator drives the machine down a slope with the foot brake applied and the engine speed is kept low by the gear speed maintaining function, the cooling oil becomes insufficient and the engine tends to overheat.
- Lockup**
 - If the travel speed lowers below 2 km/h or the foot brake is not applied or the lock-up is kept turned on for a long period, the lock-up is turned off and a gear speed proper for the travel speed is selected.
- Cooling mode**
 - The shift-down point is set to 1,200 rpm or 1,250 rpm, depending on the current gear speed.
- Partial delay mode**
 - The shift-down point is set to 1,200 rpm or 1,250 rpm, depending on the current gear speed.
- Lock-up**
 - The optimum lock-up ON point is selected between 1,250 and 1,475 rpm according to the torque converter inlet speed (engine speed) and outlet speed (transmission input shaft speed).
 - The lockup point in RL, RH, F1 and F2 is 1,100 rpm.
 - If the accelerator pedal is released to start traveling down a slope in RL, RH, F1 or F2, the torque converter is not locked up until the accelerator pedal is depressed or the brake is applied.

Gear shift lever positions and method of shifting

- 1) Gear shift lever position D
When shifting up (in power mode)
- I) When the gear shift lever is set at position D, the transmission is set to F2 torque converter range.
- II) When the accelerator pedal is depressed, the engine speed rises and accelerates. When the transmission input shaft speed reaches 1,250 – 1,475 rpm, the lock-up clutch is engaged, so the torque converter is directly engaged and the transmission is set to direct travel.
- III) As the engine speed rises further and reaches 1,750 – 2,030 rpm, the transmission shifts up to F3.
While the transmission is shifting up, the engine speed is also lowered (a command is output to the engine controller) in order to reduce the shock when shifting gear.
- IV) Immediately after shifting up, the engine speed momentarily goes down, but as the machine accelerates, it rises again and the transmission shifts up to F4 to F7 in the same way as in III) above.

When shifting down (in power mode)

- I) When the load increases and the engine speed drops to 1,200 – 1,350 rpm, the transmission shifts down one speed.
(For example, when traveling in F7, the transmission shifts down to F6.)
While the transmission is shifting down, the engine speed is also raised (a command is output to the engine controller) in order to reduce the shock when shifting gear.
- II) As the engine speed goes down further and the transmission shifts down to F2, the torque converter lock-up clutch is disengaged and the transmission enters the torque converter drive.

★ The set speed and operating condition in the above explanation are subject to change, depending on the travel condition. For details, see the automatic gear shifting graph.

- 2) Gear shift lever positions 6, 5, 4, 3, 2, L
The method of shifting automatically from F1 to F6 (F5, F4, F3, F2) is the same as for "gear shift lever position D" above.
- 3) Gear shift lever positions R
There is the gear shift lever position for traveling in reverse (RH). (By setting it changeable to RL position.)
The safety functions related to travel in reverse are the directional inhibitor and reverse safety.

If the operation is not correct, gear shifting is restricted.

- 4) Gear shift lever position N
At the neutral position, none of the transmission clutches are actuated.

No - shift time

- In the automatic shift range, no-shift time is secured during each gear shifting operation to prevent a malfunction caused by transient change of the speed at the gear shifting operation. The gear is not shifted in this no-shift time.
- The no-shift time is controlled finely for each gear shift pattern by the all-range electronic modulation system.

The no-shift time for each gear shift pattern is roughly shown below.

Gearshifting pattern	No-shift time (sec)	Example of gearshifting (No-shift time)
Shift up → shift up	0.20	F 3 → F 4 F 4 → F 5 (short)
Shift up → shift down	2.55	F 3 → F 4 F 4 → F 3 (long)
Shift down → shift down	0.05~0.2	F 5 → F 4 F 4 → F 3 (short)
Shift down → shift up	0.2~2.55	F 5 → F 4 F 4 → F 5 (long)

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Safety functions

- 1) Down-shift inhibitor function
If gear shift lever is operated D → 6 - L, 6 → 5 - L, 5 → 4 - L, 4 → 3 - L, 3 → 2 - L, 2 → L
For example, when traveling in D (F7), even if the gear shift lever is operated to 5, the transmission does not shift directly F7 → F5. It shifts down F7 → F6 → F5 according to the travel speed.
(Even if the operator makes a mistake in operation of the gear shift lever, the transmission does not skip a gear speed. This is to prevent overrunning of the engine.)
- 2) Neutral safety function
This circuit prevents the engine from starting if the gear shift lever is not at the N position, even if the starting switch is turned to the START position.
(This is a safety circuit to prevent the machine from moving unexpectedly when the engine is started.)
- 3) Directional inhibit function
When traveling in reverse at a speed of more than 4.0 km/h, even if the gear shift lever is operated to D or positions 6 to L, the transmission will not be shifted immediately to travel forward. The engine speed is lowered to reduce the travel speed, and when the travel speed goes below 4.0 km/h, the transmission is shifted to FORWARD.
(To prevent overload on power train, to improve durability and reliability)

When traveling forward at a speed of more than 4.0 km/h, even if the gear shift lever is operated to position R, the transmission will not be shifted immediately to travel in reverse. The speed range is shifted to N and the engine speed is lowered to reduce the travel speed. When the travel speed goes below 4.0 km/h, the transmission is shifted to REVERSE.

When starting the engine, if the machine is already traveling forward or in reverse at a speed of more than 4.0 km/h, even if the gear shift lever is operated to a position R, the machine will not move and the transmission will be held at N.

When the travel speed goes below 4.0 km/h, it is permitted to move the machine off.

(To prevent overload on power train, to improve durability and reliability)

- 4) Power train overrun prevention brake function
If the engine speed rises to more than 2,350 rpm (at RH speed, engine speed rises to more than 2,000 rpm), the central warning lamp flashes and the alarm buzzer sounds.
If the engine speed rises to more than 2,600 rpm (at RH speed, engine speed rises to more than 2,150 rpm), the brake is automatically actuated.
(To prevent overrun of engine, torque converter, and transmission, to improve durability and reliability)
If a symptom of overrun is detected, the brake is actuated automatically to prevent overrun even if the engine speed is below the above value.
- 5) REVERSE safety
The machine will not travel in reverse if the dump control lever is not at FLOAT and the dump body is not completely lowered.
(Turnover prevention function)
- 6) Speed range limit function when dump body is raised
After dumping the load, if the body is not completely lowered, shifting up is limited.
If the gear shift lever is at D, the machine starts in F1. If the former is at positions 6 to L, the latter starts in F1. The gear is not shifted up until the body is completely lowered.

Self-diagnostic function

- The controller carries out self-diagnosis of the system and displays any abnormalities.
- The details of the self-diagnosis are displayed on a monitor.
- If any abnormality is detected by the self-diagnosis function, the abnormality data is transmitted to the network and is displayed as an action code on the machine monitor. The transmission system caution, warning lamp, or alarm buzzer may also be actuated.

Transmission controller list of real-time monitoring display contents

The input and output signal states of the transmission controller can be checked with the real-time monitoring function of the machine monitor.

Real-time monitoring display items related to transmission controller and contents displayed in normal state are as follows.

No.	Item	ID number	Displayed spec	Data contents
1	Software part number	20201	VERSION	Mass production software part number is output
2	Application version	20223	VERSION (APP)	Software version No. is output (Soft logic part version No.)
3	Data version	20224	VERSION (DATA)	Software version No. is output (Soft data part version No.)
4	Transmission input shaft speed	31200	T/M SPEED:IN	Input shaft speed is output
5	Transmission intermediate shaft speed	31300	T/M SPEED:MID	Intermediate rotation speed is output
6	Transmission output shaft speed	31400	T/M SPEED:OUT	Output shaft speed is output
7	Fuel level	04201	FUEL SENSOR	Resistance-converted value of fuel level sensor (A_IN_5) is output
8	Fuel level	04201	FUEL SENSOR	Input voltage of fuel level sensor (A_IN_5) is output
9	Alternator R	04301	ALTERNATOR R	Alternator R terminal input state (A_IN_0) is output
10	Torque converter oil temperature	30100	T/C OIL TEMP	Torque converter oil temperature (A_IN_1) is output
11	Torque converter oil temperature	30101	T/C OIL TEMP	Torque converter oil temperature (A_IN_1) voltage is output
12	Transmission oil temperature	32500	T/M OIL TEMP	Transmission oil temperature is output
13	Transmission oil temperature	32501	T/M OIL TEMP	Transmission oil temperature voltage is output
14	Steering oil temperature	32701	STRG OIL TEMP	Steering oil temperature (A_IN_3) is output
15	Steering oil temperature	32702	STRG OIL TEMP	Steering oil temperature (A_IN_3) voltage is output
16	Torque converter oil pressure	32600	T/C OIL PRESS	Torque converter oil pressure (A_IN_10) conversion value is output
17	Torque converter oil pressure	32605	T/C OIL PRESS	Torque converter oil pressure (A_IN_10) input voltage is output
18	Accumulator oil pressure (front)	35500	ACC OIL PRE F	Pressure-converted value of front accumulator oil pressure (A_IN_8) is output
19	Accumulator oil pressure (rear)	35501	ACC OIL PRE R	Pressure-converted value of rear accumulator oil pressure (A_IN_9) is output
20	Accumulator oil pressure (front)	35504	ACC OIL PRE F	Voltage sensed by front accumulator oil pressure (A_IN_8) is output
21	Accumulator oil pressure (rear)	35505	ACC OIL PRE R	Voltage sensed by rear accumulator oil pressure (A_IN_9) is output
22	Solenoid output (H)	31600	ECMV H DIR	ECMV output command current to HIGH clutch is output
23	Solenoid output (L)	31601	ECMV L DIR	ECMV output command current to LOW clutch is output
24	Solenoid output (1st)	31602	ECMV 1 DIR	ECMV output command current to 1st clutch is output
25	Solenoid output (2nd)	31603	ECMV 2 DIR	ECMV output command current to 2nd clutch is output

Data range	Remarks
Depending upon software part number	
Depending upon software version No.	
Depending upon software version No.	
x1 [min-1] (0 – 32767 [min-1]) ---- [Other than above]	
x1 [min-1] (0 – 32767 [min-1]) ---- [Other than above]	
x1 [min-1] (0 – 32767 [min-1]) ---- [Other than above]	
x1 [Ω] (0 – 250 [Ω]) ---- [Other than above]	
x.001 [V] (0 – 5 [V]) ---- [Other than above]	
0:OFF 1:ON	
x1 [°C] (0 – 150 [°C]) ---- [Other than above]	
x1 [mV] (0.00 – 5.00 [V]) ---- [Other than above]	
4.72 V = 0 °C 4.33 V = 30 °C 3.55 V = 60 °C 2.20 V = 100 °C 1.61 V = 120 °C	
x1 [°C] (0 – 150 [°C]) ---- [Other than above]	
x1 [mV] (0.00 – 5.00 [V]) ---- [Other than above]	
4.72 V = 0 °C 4.33 V = 30 °C 3.55 V = 60 °C 2.20 V = 100 °C 1.61 V = 120 °C	
x1 [°C] (0 – 150 [°C]) ---- [Other than above]	
x1 [mV] (0.00 – 5.00 [V]) ---- [Other than above]	
4.72 V = 0 °C 4.33 V = 30 °C 3.55 V = 60 °C 2.20 V = 100 °C 1.61 V = 120 °C	
x1 [MPa] (0.00 – 5.00 [MPa]) ---- [Other than above]	
x1 [mV] (0.00 – 5.00 [V]) ---- [Other than above]	
x1 [MPa] (0.00 – 5.00 [MPa]) ---- [Other than above]	
x1 [MPa] (0.00 – 5.00 [MPa]) ---- [Other than above]	
x1 [mV] (0.00 – 5.00 [V]) ---- [Other than above]	
x1 [mV] (0.00 – 5.00 [V]) ---- [Other than above]	
x1 [mA] (0 – 1000 [mA]) ---- [Other than above]	
x1 [mA] (0 – 1000 [mA]) ---- [Other than above]	
x1 [mA] (0 – 1000 [mA]) ---- [Other than above]	
x1 [mA] (0 – 1000 [mA]) ---- [Other than above]	

No.	Item	ID number	Displayed spec	Data contents
26	Solenoid output (3rd)	31604	ECMV 3 DIR	ECMV output command current to 3rd clutch is output
27	Solenoid output (4th)	31605	ECMV 4 DIR	ECMV output command current to 4th clutch is output
28	Solenoid output (R)	31606	ECMV R DIR	ECMV output command current to REV clutch is output
29	Solenoid output (Lockup)	31609	ECMV LU DIR	ECMV output command current to Lockup clutch is output
30	Transmission main oil pressure variable solenoid output	31643	ECMV MAIN P	Transmission main oil pressure variable solenoid output condition is output
31	Main oil quantity exchange solenoid output	31644	ECMV MAIN V	Main oil quantity exchange solenoid output condition is output
32	Angle sensor	32900	ANGLE SENSOR	Converted pitch angle of pitch angle sensor input for pitch alarm (A_IN_7) is output
33	Angle sensor	32903	ANGLE SENSOR	Voltage of pitch angle sensor input for pitch alarm (A_IN_7) is output
34	Brake output (front wheel) command value	33807	BK OUTP DIR F	Brake command amount of brake (retarded) controller
35	Brake output (rear wheel) command value	33808	BK OUTP DIR R	Brake command amount of brake (retarded) controller
36	Exhaust brake	35900	EXH BRAKE	Exhaust brake output (ON/OFF output) condition is output
37	Throttle modified value	36000	THROTTLE MOD	Throttle modified value to be sent to engine controller is output
38	Transmission oil quantity variable solenoid output	38001	ECMV LUB V	Transmission oil quantity variable solenoid output is output
39	Low clutch trigger modification value	38900	TRIGGER MOD L	Low clutch trigger modification value is output (all oil temperature mode)
40	High clutch trigger modification value	38901	TRIGGER MOD H	High clutch trigger modification value is output (all oil temperature mode)
41	1st clutch trigger modification value	38902	TRIGGER MOD 1	1st clutch trigger modification value is output (all oil temperature mode)

Data range	Remarks
x1 [mA] (0 – 1000 [mA]) ---- [Other than above]	
x1 [mA] (0 – 1000 [mA]) ---- [Other than above]	
x1 [mA] (0 – 1000 [mA]) ---- [Other than above]	
x1 [mA] (0 – 1000 [mA]) ---- [Other than above]	
x1 [mA] (0 – 100 [mA]) ---- [Other than above]	
x1 [mA] (0 – 100 [mA]) ---- [Other than above]	
x1 [°] (-25.0 – +25.0 [°]) ---- [Other than above]	
x1 [mV] (0.00 – 5.00 [V]) ---- [Other than above]	
x1 [%] (0 – +100.0 [%]) ---- [Other than above]	
x1 [%] (0 – +100.0 [%]) ---- [Other than above]	
0: OFF 1: ON	
x1 [%] (-100.0 – +100.0 [%]) ---- [Other than above]	
x1 [mA] (0 – 100 [mA]) ---- [Other than above]	
Hexadecimal numbers show below Display of 8 characters AABBCCDD AA: Low temperature correction value [x10msec] BB: Medium temperature correction value [x10msec] CC: Normal temperature correction value [x10msec] DD: High temperature correction value [x10msec] 00000000 – FFFFFFFF [00000000 – FFFFFFFF] (Each range: -1.28 (80) – +1.27 (7F) [sec]) 7F=127 (MAX) 01=1 00=0 FF=-1 FE=-2 80=-128 (MIN)	
Hexadecimal numbers show below Display of 8 characters AABBCCDD AA: Low temperature correction value [x10msec] BB: Medium temperature correction value [x10msec] CC: Normal temperature correction value [x10msec] DD: High temperature correction value [x10msec] 00000000 – FFFFFFFF [00000000 – FFFFFFFF] (Each range: -1.28 (80) – +1.27 (7F) [sec]) 7F=127 (MAX) 01=1 00=0 FF=-1 FE=-2 80=-128 (MIN)	
Hexadecimal numbers show below Display of 8 characters AABBCCDD AA: Low temperature correction value [x10msec] BB: Medium temperature correction value [x10msec] CC: Normal temperature correction value [x10msec] DD: High temperature correction value [x10msec] 00000000 – FFFFFFFF [00000000 – FFFFFFFF] (Each range: -1.28 (80) – +1.27 (7F) [sec]) 7F=127 (MAX) 01=1 00=0 FF=-1 FE=-2 80=-128 (MIN)	

No.	Item	ID number	Displayed spec	Data contents
42	2nd clutch trigger modification value	38903	TRIGGER MOD 2	2nd clutch trigger modification value is output (all oil temperature mode)
43	3rd clutch trigger modification value	38904	TRIGGER MOD 3	3rd clutch trigger modification value is output (all oil temperature mode)
44	4th clutch trigger modification value	38905	TRIGGER MOD 4	4th clutch trigger modification value is output (all oil temperature mode)
45	Revolution clutch trigger modification value	38906	TRIGGER MOD R	Revolution clutch trigger modification value is output (all oil temperature mode)
46	Clutch FILL switch	38919	FILL HL1234R	FILL SW recognition condition of each clutch is output [H,L,1,2,3,4,R]

Data range	Remarks
Hexadecimal numbers show below Display of 8 characters AABBCDD AA: Low temperature correction value [x10msec] BB: Medium temperature correction value [x10msec] CC: Normal temperature correction value [x10msec] DD: High temperature correction value [x10msec] 00000000 – FFFFFFFF [00000000 – FFFFFFFF] (Each range: -1.28 (80) – +1.27 (7F) [sec]) 7F=127 (MAX) 01=1 00=0 FF=-1 FE=-2 80=-128 (MIN)	
Hexadecimal numbers show below Display of 8 characters AABBCDD AA: Low temperature correction value [x10msec] BB: Medium temperature correction value [x10msec] CC: Normal temperature correction value [x10msec] DD: High temperature correction value [x10msec] 00000000 – FFFFFFFF [00000000 – FFFFFFFF] (Each range: -1.28 (80) – +1.27 (7F) [sec]) 7F=127 (MAX) 01=1 00=0 FF=-1 FE=-2 80=-128 (MIN)	
Hexadecimal numbers show below Display of 8 characters AABBCDD AA: Low temperature correction value [x10msec] BB: Medium temperature correction value [x10msec] CC: Normal temperature correction value [x10msec] DD: High temperature correction value [x10msec] 00000000 – FFFFFFFF [00000000 – FFFFFFFF] (Each range: -1.28 (80) – +1.27 (7F) [sec]) 7F=127 (MAX) 01=1 00=0 FF=-1 FE=-2 80=-128 (MIN)	
Hexadecimal numbers show below Display of 8 characters AABBCDD AA: Low temperature correction value [x10msec] BB: Medium temperature correction value [x10msec] CC: Normal temperature correction value [x10msec] DD: High temperature correction value [x10msec] 00000000 – FFFFFFFF [00000000 – FFFFFFFF] (Each range: -1.28 (80) – +1.27 (7F) [sec]) 7F=127 (MAX) 01=1 00=0 FF=-1 FE=-2 80=-128 (MIN)	
Corresponding data is displayed by [1 (ON), 0 (OFF)] just under HLR1234R. Example 0110000: when in F1 0001001: when in R2 0000000: when in N 1000010: when in F4	H: H Fill switch recognition [1:ON, 0:OFF] L: L Fill switch recognition [1:ON, 0:OFF] 1: One Fill switch recognition [1:ON, 0:OFF] 2: Two Fill switch recognition [1:ON, 0:OFF] 3: Three Fill switch recognition [1:ON, 0:OFF] 4: FOUR Fill SW recognition [1:ON, 0:OFF] R: R Fill switch recognition [1:ON, 0:OFF]

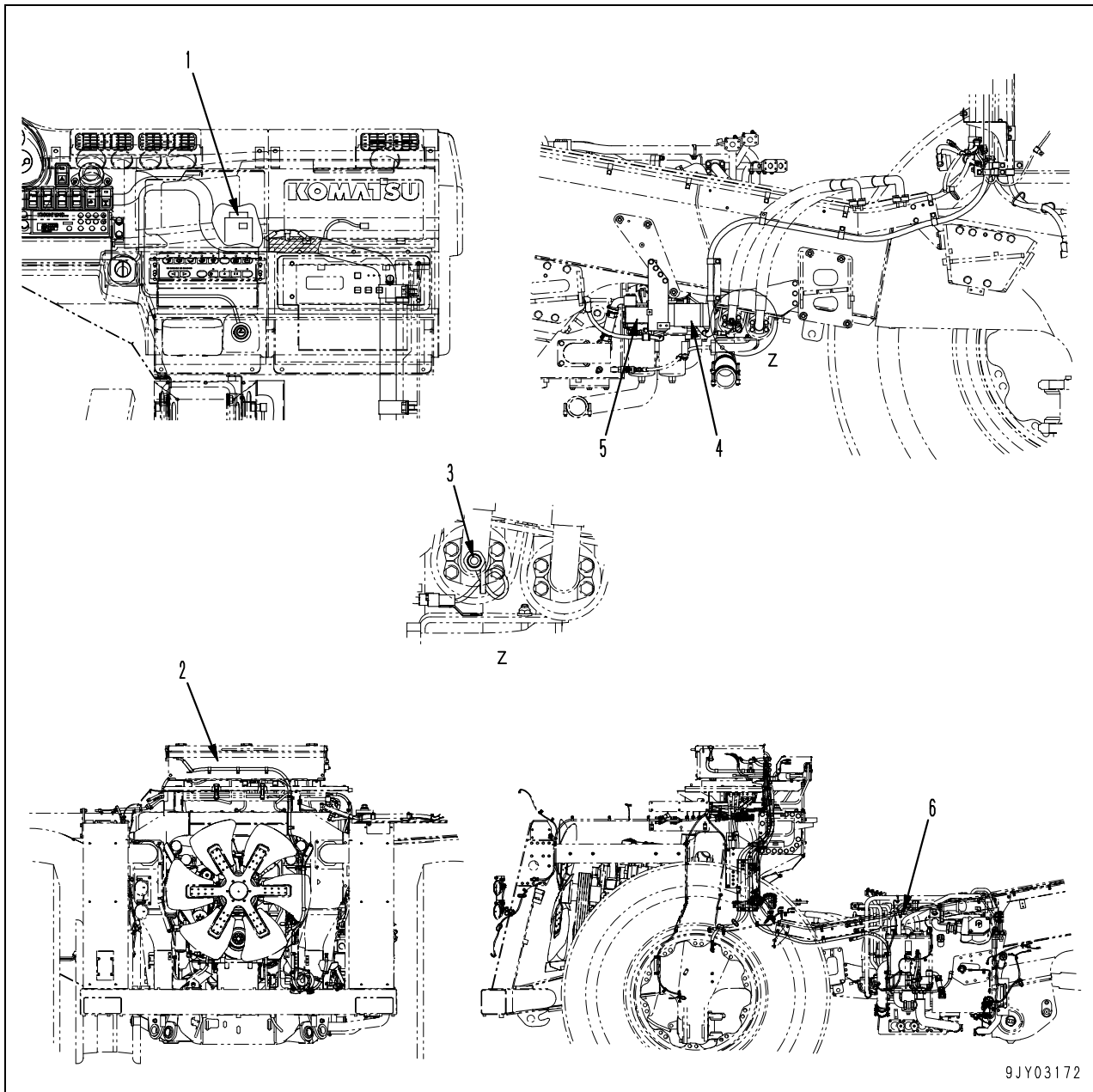
No.	Item	ID number	Displayed spec	Data contents
47	Trigger initial learning flag	38920	TRIG HL1234R	Trigger time initial learning flag state for each clutch is output [H, L, 1, 2, 3, 4, R] 8 characters are displayed in following order [HLR123] H: H flag [1:ON, 0:OFF] L: L flag [1:ON, 0:OFF] R: R flag [1:ON, 0:OFF] 1: One flag [1:ON, 0:OFF] 2: Two flag [1:ON, 0:OFF] 3: Three flag [1:ON, 0:OFF]
48	Fill time (L)	41800	FILL TIME L	LOW clutch fill time is output (Last gear shifting condition) x10 [msec] (0 – 2.55 [sec], No fill :0)
49	Fill time (H)	41801	FILL TIME H	HIGH clutch fill time is output (Last gear shifting condition) x10 [msec] (0 – 2.55 [sec], No fill :0)
50	Fill time (1)	41802	FILL TIME 1	1st clutch fill time is output (Last gear shifting condition) x10 [msec] (0 – 2.55 [sec], No fill :0)
51	Fill time (2)	41803	FILL TIME 2	2nd clutch fill time is output (Last gear shifting condition) x10 [msec] (0 – 2.55 [sec], No fill :0)
52	Fill time (3)	41804	FILL TIME 3	3rd clutch fill time is output (Last gear shifting condition) x10 [msec] (0 – 2.55 [sec], No fill :0)
53	Fill time (4)	41805	FILL TIME 4	4th clutch fill time is output (Last gear shifting condition) x10 [msec] (0 – 2.55 [sec], No fill :0)
54	Fill time (R)	41806	FILL TIME R	REV clutch fill time is output (Last gear shifting condition) x10 [msec] (0 – 2.55 [sec], No fill :0)
55	Throttle lower limit output	44201	THROT LIMIT LO	Throttle lower limit to be sent to engine controller is output x0.1 [%] (0 – +100.0 [%])
56	Throttle higher limit output	44200	THROT LIMIT HI	Throttle upper limit to be sent to engine controller is output x0.1 [%] (0 – +100.0 [%])
57	Input signal D_IN_0-7	40905	D-IN-0-----7	Input signal condition is output
58	Input signal D_IN_8-15	40906	D-IN-8-----15	Input signal condition is output
59	Input signal D_IN_16-23	40907	D-IN-16-----23	Input signal condition is output
60	Input signal D_IN_24-31	40908	D-IN-24-----31	Input signal condition is output
61	Input signal D_IN_32	40942	D-IN-32	Input signal condition is output
62	Output signal D_OUT_0-7	40949	D-OUT-0-----7	ON/OFF output state of SOL_OUT_0 - 7. When power supply output is set, 0 is displayed.
63	Output signal D_OUT_8-15	40950	D-OUT-8-----15	Corresponds to SOL_OUT_8, 9, 10A, 10B, 11A, 11B, SIG_OUT_0 and SIG_OUT1. When power supply output is set, 0 is displayed.
64	Output signal D_OUT_16-23	40951	D-OUT-16-----23	Corresponds to SIG_OUT_2, 3, HSW_OUT_0, 1, BATT_RY_OUT. Not used D_OUT_21 - 23. When power supply output is set, 0 is displayed.

10 Structure, function and maintenance standard

SEN01290-02

Data range	Remarks
Corresponding clutch learning flag ON/OFF state is displayed by [1 or 0] just below HLR1234R. HLR1234R 1111111 (All clutches have been learned) HLR1234R 0000000 (No clutch has been learned)	
x10 [msec] (0 – 2550 [msec]) ---- [Other than above]	
x10 [msec] (0 – 2550 [msec]) ---- [Other than above]	
x10 [msec] (0 – 2550 [msec]) ---- [Other than above]	
x10 [msec] (0 – 2550 [msec]) ---- [Other than above]	
x10 [msec] (0 – 2550 [msec]) ---- [Other than above]	
x10 [msec] (0 – 2550 [msec]) ---- [Other than above]	
x10 [msec] (0 – 2550 [msec]) ---- [Other than above]	
x0.1 [%] (0 – +100.0 [%]) ---- [Other than above]	
x0.1 [%] (0 – +100.0 [%]) ---- [Other than above]	
*0*****: Transmission oil filter 1 clogging ****1***: Cranking *****0*: Emergency steering not operated *****1*: Emergency steering operated *****1: Shift lever N	D_IN_1: Transmission oil filter switch 1 D_IN_3: Emergency escape switch D_IN_4: C terminal signal D_IN_6: Emergency steering relay D_IN_7: Shift lever N
1*****: L fill *1*****: 4th fill **1*****: H fill ***1****: 1st fill ****1***: 2nd fill *****1*: 3rd fill *****1*: R fill Example 10010000: When in F1 00010010: When in R1 00000000: When in N 11000000: When in F6	D_IN_8: Fill signal L D_IN_9: Fill signal 4th D_IN_10: Fill signal H D_IN_11: Fill signal 1st D_IN_12: Fill signal 2nd D_IN_13: Fill signal 3rd D_IN_14: Fill signal R
10000000: Shift lever R 01000000: Shift lever D 00100000: Shift lever 6 00010000: Shift lever 5 00001000: Shift lever 4 00000100: Shift lever 3 00000010: Shift lever 2 00000001: Shift lever L	D_IN_16: Shift range R D_IN_17: Shift range D D_IN_18: Shift range 6 D_IN_19: Shift range 5 D_IN_20: Shift range 4 D_IN_21: Shift range 3 D_IN_22: Shift range 2 D_IN_23: Shift range L
*0*****: Lowering of coolant level **0*****: Clogging of air cleaner ***0*****: Operation of main pressure variable valve ****0****: Operation of main oil flow selector valve *****0*: Operation of lubricating oil flow variable valve	D_IN_25: Coolant level D_IN_26: Air cleaner switch D_IN_27: Main pressure variable valve pressure switch D_IN_28: Main oil flow selector valve pressure switch D_IN_29: Lubricating oil flow variable valve pressure switch
*	Not used
*	Not used
*	Not used
*	Not used

Automatic emergency steering system



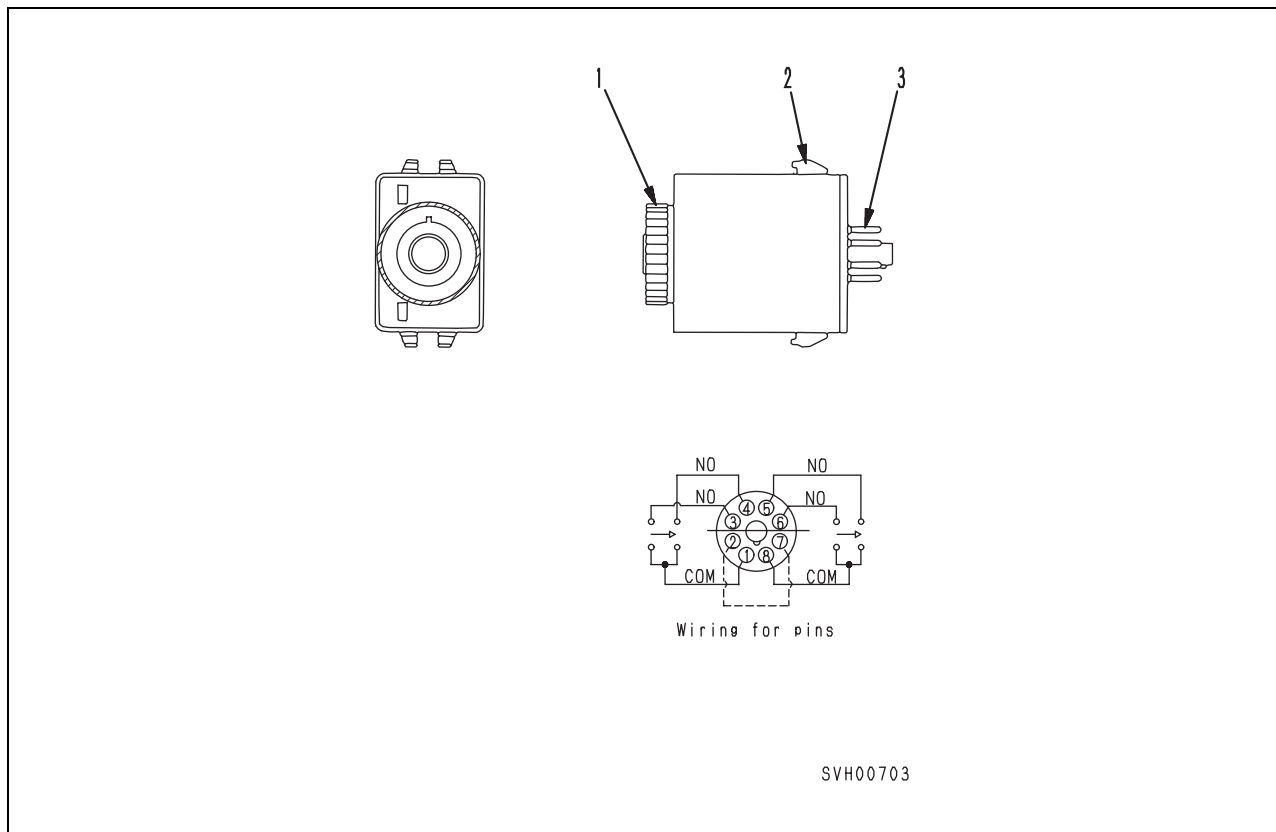
9JY03172

1. Timer
2. Battery
3. Emergency steering oil pressure switch
4. Emergency steering motor
5. Emergency steering pump
6. Steering control valve

Outline

If the engine should stop when the machine is traveling, or there is any abnormality in the hydraulic pump and the steering circuit oil pressure is become below the specified value, the emergency system automatically actuates an electric pump to ensure the hydraulic pressure for the steering, thereby making it possible to use the steering. This system can also be operated manually.

Relay timer



1. Dial
2. Lock
3. Pin

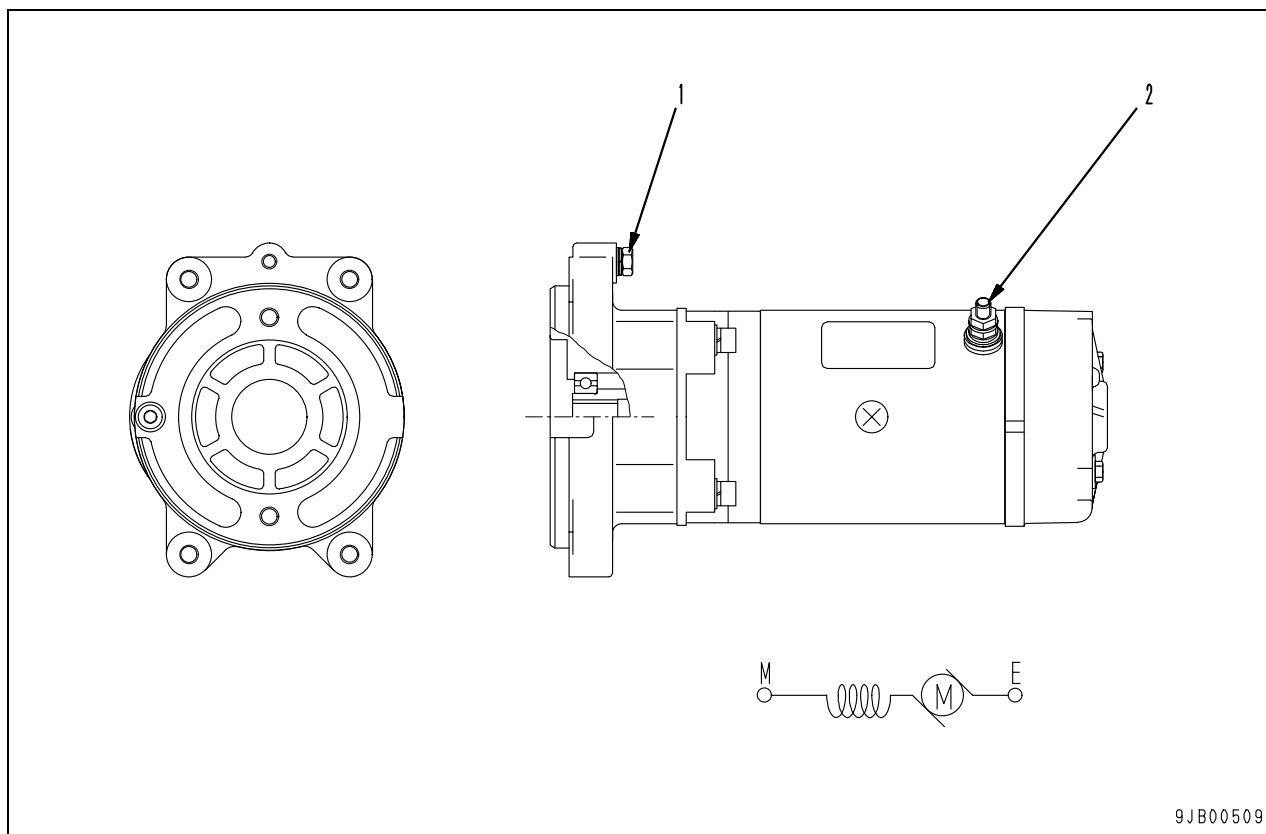
Set time: 1 seconds

Outline

The relay timer is a delay timer which prevents the emergency steering system from operating when the oil pressure switch malfunctions because of oil pulsation etc.

After power is applied to the timer coil for the set time, the relay contacts are changed.

Emergency steering motor



1. Terminal E
2. Terminal M

Function

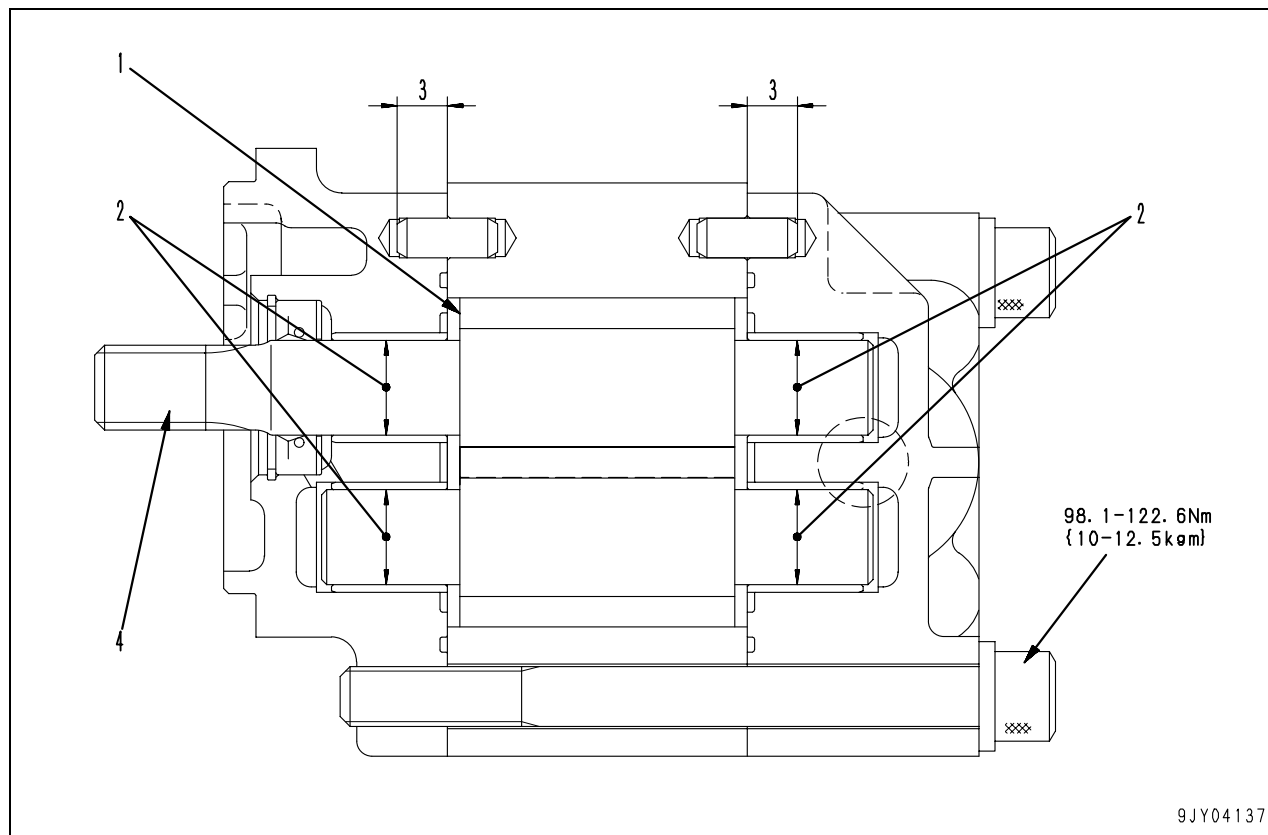
- If there is an abnormal drop in the oil pressure in the steering circuit, the emergency steering motor receives a signal from the transmission controller and drives the emergency pump.

Specifications

Type	DC motor
Rated voltage	24V
Rated output	0.9kW

Emergency steering pump

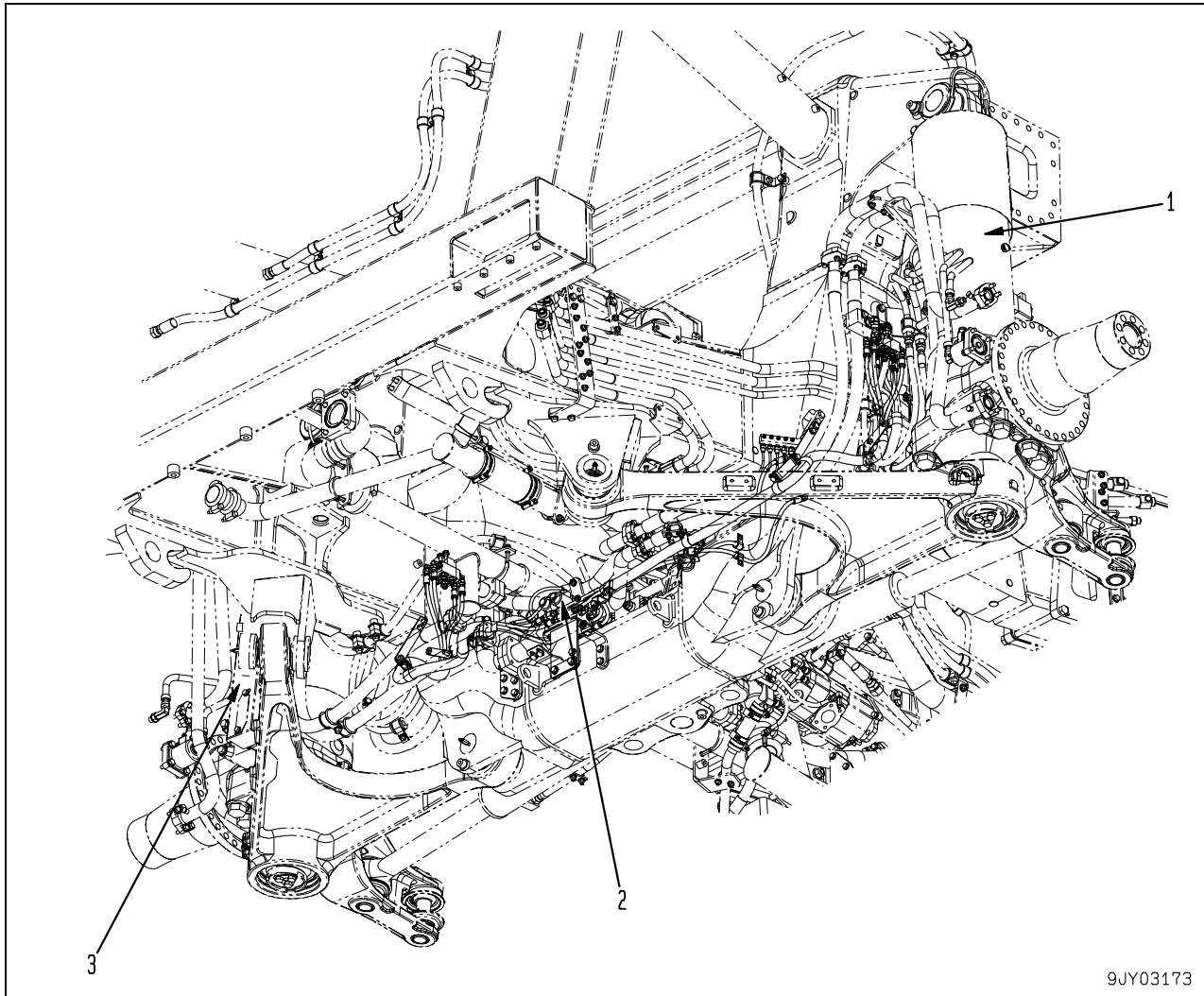
SBL(1)-24



Unit: mm

No.	Check item	Criteria					Remedy	
1	Clearance between gear case and side plate, gear	Model		Standard clearance		Clearance limit	Replace	
		SBL(1)-24		0.10 – 0.15		0.19		
2	Clearance between inside diameter of plain bearing and outside diameter of gear shaft	SBL(1)-24		0.06 – 0.119		0.20		
3	Depth to knock in pin	Model		Standard size	Tolerance	Repair limit		
		SBL(1)-24		10	0 –0.5	—		
4	Rotating torque of splined shaft	2.0 – 4.9 Nm {0.2 – 0.5 kgm}						
—	Delivery amount Oil: EO10-CD Temperature: 45 – 55°C	Model		Rotating speed (rpm)	Delivery pressure MPa {kg/cm ² }	Standard delivery amount (ℓ/min.)	Delivery amount limit (ℓ/min.)	—
		SBL(1)-24		3,000	20.6 {210}	67.9	62.7	

Automatic suspension system (If equipped)



1. Suspension cylinder (Left)
2. Solenoid valve
3. Suspension cylinder (Right)

Outline

The front suspension mode (damper force) is automatically switched according to the travel condition and load condition to give a more comfortable ride to the operator and to improve the travel stability.

★ For details of the internal mechanism of the suspension, see Suspension

Automatic suspension mode selection control

With the front suspension, the mode (damping force) is automatically changed according to the travel conditions and load conditions to ensure a comfortable ride and to improve the travel stability of the machine. The control patterns and functions of the modes (damping force) are as shown in the table below.

S: Soft
M: Medium
H: Hard

Control pattern	Function	Content of control	Set mode					
			Empty			Loaded		
			S	M	H	S	M	H
Distinguishing empty/loaded	To set damping force according to load on machine	Internal pressure of front suspension cylinder is measured and compared with standard value	○				○	
Anti-roll	To prevent the chassis from rolling when turning at high speed	This detects the travel speed and steering angle, and switches the mode according to certain conditions. (Not controlled when traveling empty) (See Fig. 1)	○				○ → ○ (When turning)	
Anti-dive	To prevent nose-diving when braking	The damping force is made stronger when the brakes are applied.	○ → ○ (Brake OFF)	○ (Brake ON)			○ → ○ (Brake OFF)	○ (Brake ON)
Anti-lift	To prevent the front from lifting up when dumping	The damping force is made stronger when the dump control lever is at any position except FLOAT.	○ (Float)		○ (Other than Float)		○ → ○ (Float)	○ (Other than Float)
High speed stability	To improve stability when traveling at high speed	Detects travel speed and selects damping force. (No control when traveling empty) (See Fig. 2)	○				○ → ○	

Fig. 1

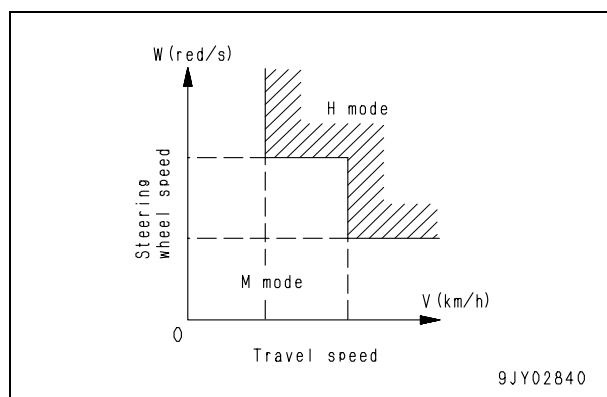
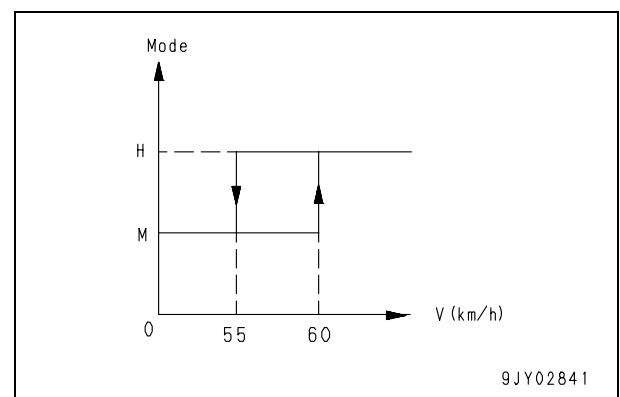
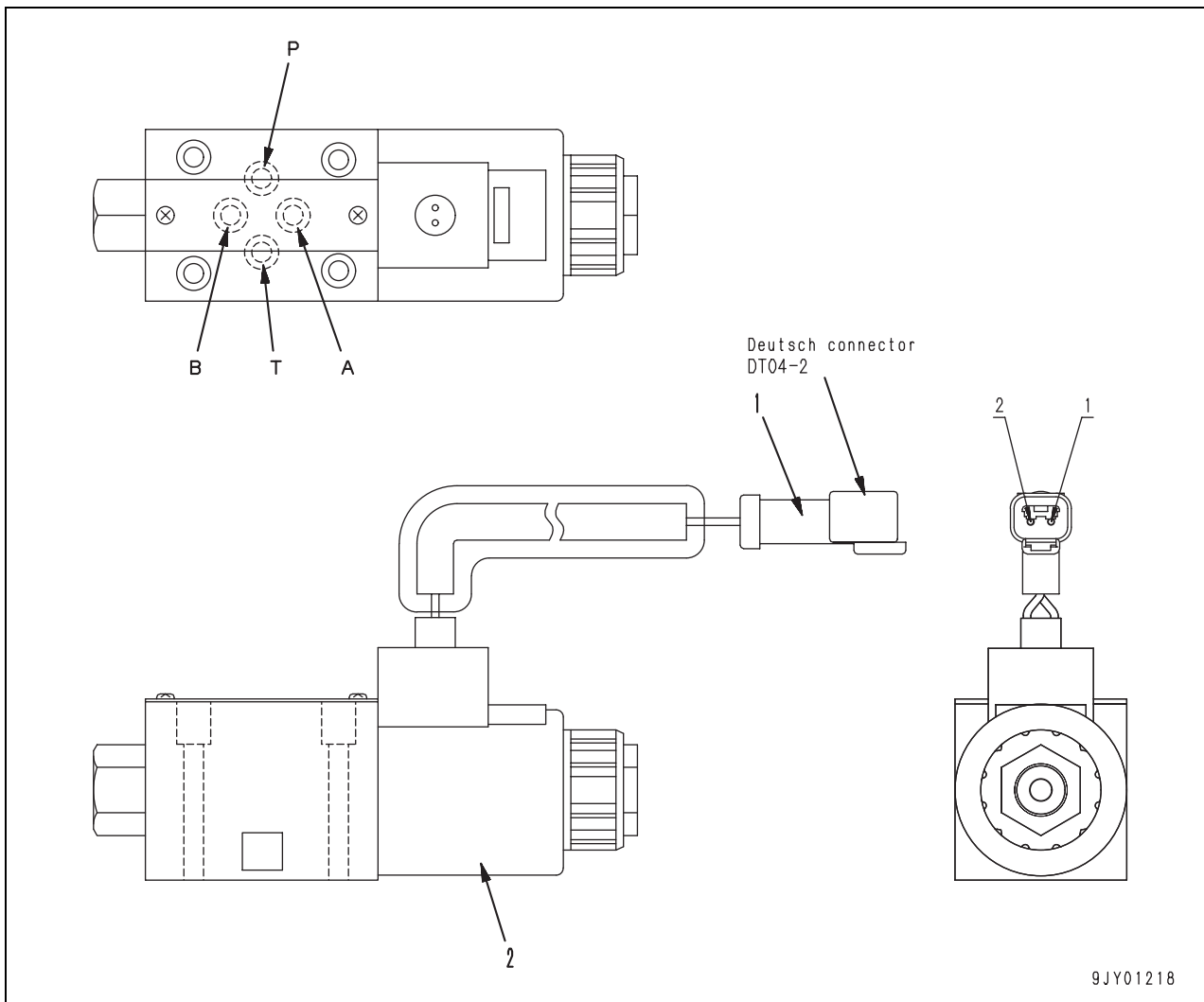


Fig. 2



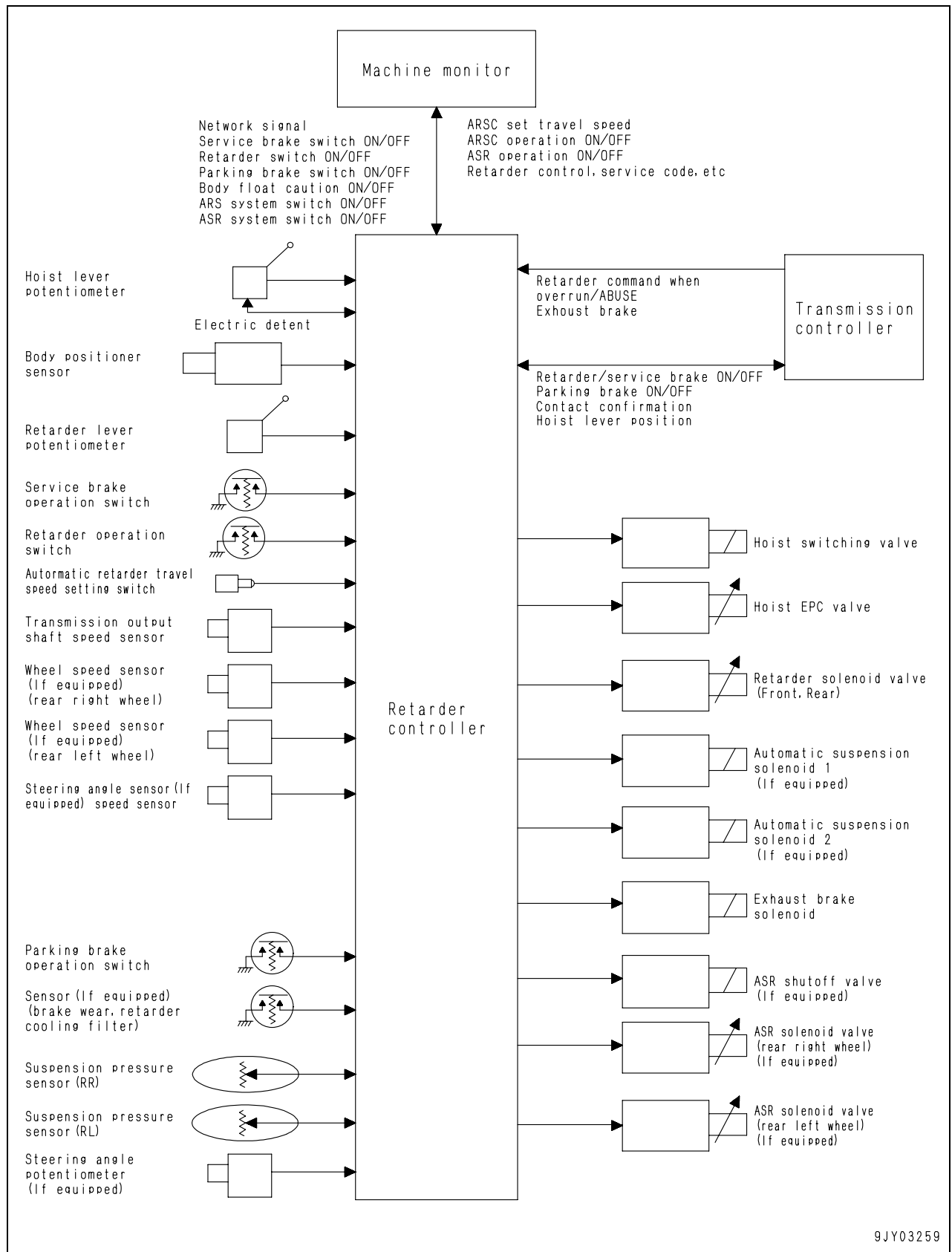
Auto suspension solenoid valve



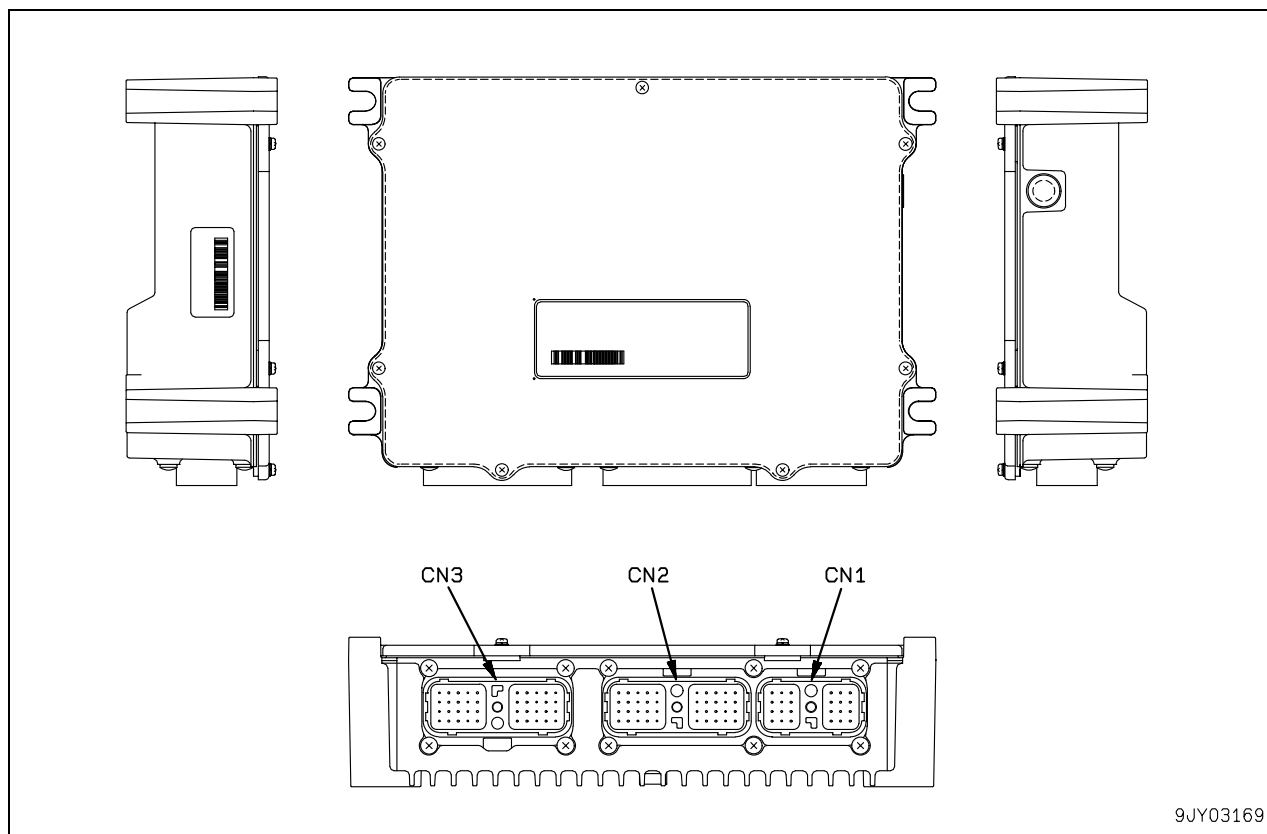
Function

- The automatic suspension solenoid valve is installed in the circuit between the hydraulic pump and the suspension cylinder. The valve switches oil pressure of the hydraulic cylinder which is installed to the front suspension, according to signal from the retarder controller. Two solenoid valves are combined to select three modes of Soft, Medium and Hard.

Retarder control system



Retarder controller



Outline

The retarder controller has the following functions.

1. Retarder control
The solenoid valve is controlled according to the operating angle of the retarder control lever and actuates the retarder.
2. Overrun prevention and retarder control when there is transmission abuse
The retarder controller controls the solenoid valve to operate the retarder according to the command of the transmission controller.
3. Hoist control
The retarder controller controls the hoist EPC valve (solenoid valve) and hoist selector valve (ON/OFF valve) according to the position of the dump control lever and actuates the dump body.
4. Automatic retarder speed control (ARSC)
The retarder controller controls the solenoid valve to control the retarder braking force and keep the downhill travel speed at the speed set with the automatic retarder travel speed set switch.
5. Automatic suspension control (if equipped)
The retarder controller changes the signals for the automatic suspension solenoid valve according to the travel conditions and load conditions such as the load weight, turning, braking, etc. sent from various sensors to set the damping force of the front suspension to 1 of 3 levels of SOFT, MEDIUM, and HARD.
6. ASR Control (if equipped)
The retarder controller detects slips of the right and left drive wheels from their speed and steering angle and controls the ASR solenoid valve to maintain the speed difference between both wheels constant.
The wheel slipping at higher speed is braked and the brake torque is transmitted to the wheel rotating at lower speed to improve the travel performance.
7. Transmission of network data
 - 1) The retarder controller transmits the information of operation of the retarder, float caution, and operation of the parking brake to the machine monitor.
 - 2) The retarder controller receives information of overrun prevention, retarder command when there is abuse, etc. from the transmission controller.
 - 3) The retarder controller transmits information of reverse inhibition, etc. to the transmission controller.

Input and output signal

CN1

Pin No.	Signal name	Input/output signal
1	SUS press sensor (RL)	Input
2	Strg potentio	Input
3	Retard oil temp (R)	Input
4	GND (SIG)	–
5	Retard SW (rear)	Input
6	Brake system filter	Input
7	SUS press sensor (RR)	Input
8	Body position sensor	Input
9	Retard oil temp (F)	Input
10	GND (SIG)	–
11	Retard SW (F)	Input
12	Memory clear SW	Input

CN2

Pin No.	Signal name	Input/output signal
1	–	Output
2	Strg hoist filter SW	Input
3	Strg hoist lever SW	Input
4	232C RxD	Input
5	Brake wear SW (RL)	Input
6	–	Input
7	ENG oil level SW	Input
8	–	Output
9	Body float signal	Output
10	Wheel speed (RR)	Input
11	–	Output
12	–	–
13	Eng oil filter	Input
14	–	Output
15	Brake wear SW (FR)	Input
16	–	Input
17	Retard cooling filter	Input
18	Stop lamp relay	Output
19	–	Output
20	Wheel speed (RL)	Input

CN3

Pin No.	Signal name	Input/output signal
1	VB (controller PWR)	Input
2	VIS (solenoid PWR)	Input
3	SOL_COM (solenoid common GND)	Input
4	–	Output
5	Hoist EPC valve	Output
6	–	Output
7	Auto SUS SOL1	Output
8	+24 V for sensor	Output
9	Parking brake press SW	Input
10	ASR press SW (RL)	Input
11	VB (controller PWR)	Input
12	VIS (solenoid PWR)	Input
13	SOL_COM (solenoid com- mon GND)	Input
14	Key SIG	Input
15	ASR shut off valve	Output
16	Retard valve (R)	Output
17	Hoist change valve	Output
18	BCV relay	Output
19	–	Input
20	ASR press SW (RR)	Input

Pin No.	Signal name	Input/output signal
13	ARSC set SW	Input
14	Retard lever	Input
15	Alternator R	Input
16	Sens PWR	Output
17	Service brake press SW	Input
18	Validation SW2	Input
19	Hoist lever (main)	Input
20	Hoist lever (SUB)	Input
21	GND (Analog GND)	–
22	Pot PWR	Output
23	Exhaust brake SW	Input
24	Validation SW1	Input

Pin No.	Signal name	Input/output signal
21	–	Input/Output
22	CAN0 L	Input/Output
23	–	Input/Output
24	PWR CTR EXT	Input
25	Brake wear SW (FL)	Input
26	Parking brake sol status	Input
27	–	Input
28	TM & Brake oil level SW	Input
29	GND (pulse GND)	–
30	T/M output shaft speed	Input
31	–	–
32	CAN0_H	Input/Output
33	–	Input/Output
34	–	–
35	Key SW C (Engine start)	Input
36	Steering speed	Input
37	–	Input
38	Battery requid level SW	Input
39	GND (pulse GND)	–
40	–	Input

Pin No.	Signal name	Input/output signal
21	GND (controller GND)	Input
22	VIS (solenoid PWR)	Input
23	SOL_COM (solenoid common GND)	Input
24	Key SIG	Input
25	–	Output
26	ASR valve (RL)	Output
27	Lever kick out sol	Output
28	–	Output
29	–	Input
30	Shut off valve SW	Input
31	GND (controller GND)	Input
32	GND (controller GND)	Input
33	GND (controller GND)	Input
34	Power out 5V1	–
35	–	Output
36	ASR valve (RR)	Output
37	Auto SUS SOL2	Output
38	Exhaust brake valve	Output
39	Secondary brake SW	Input
40	ASR check SW	Input

Retarder controller list of real-time monitoring display contents

The input and output signal states of the retarder controller can be checked with the real-time monitoring function of the machine monitor.

Real-time monitoring display items related to retarder controller and contents displayed in normal state are as follows.

No.	Item	ID number	Display spec.	Data contents
1	Part No. of software	20214	VERSION	Mass production software part number is output
2	Application version	20231	VERSION (APP)	Software version No. is output (soft logic part version No.)
3	Data version	20232	VERSION (DATA)	Software version No. is output (soft data part version No.)
4	ARSC set switch	37701	ARSC SET SP SW	A_IN_8
5	Transmission output shaft speed	31403	T/M SPEED:OUT	PLS_IN1 Transmission output shaft speed is output
6	Wheel speed (left)	39705	WHEEL SPEED L	PLS_IN2 Wheel speed is output.
7	Wheel speed (right)	39704	WHEEL SPEED R	PLS_IN3 Wheel speed is output.
8	Retarder cooling oil temperature (front)	30201	BRAKE OIL T F	Converted temperature of retarder oil temperature sensor (front) (A_IN_6) is output.
9	Retarder cooling oil temperature (front)	30204	BRAKE OIL T F	A_IN_1
10	Retarder cooling oil temperature (rear)	30211	BRAKE OIL T R	Converted temperature of retarder oil temperature sensor (rear) (A_IN_2) is output.
11	Retarder cooling oil temperature (rear)	30212	BRAKE OIL T R	A_IN_2
12	Brake output (front wheel)	33700	BK OUTP DIR F	SOL_OUT_6
13	Brake output (rear wheel)	33806	BK OUTP DIR R	SOL_OUT_7
14	Retarder lever	33900	RETARD LEVER	A_IN_4
15	Body positioner	34602	BODY POSITION	A_IN_5
16	Dump lever (hoist lever) potentiometer 1	34304	DUMP LEVER 1	A_IN_3
17	Dump lever (hoist lever) potentiometer 2	34305	DUMP LEVER 2	A_IN_7
18	Hoist EPC output	45600	HOIST EPC DIR	SOL_OUT10A
19	Seating control command γ (Hi)	45102	S CNT DIR H	
20	Seating control command γ (Lo)	45103	S CNT DIR L	
21	Seating condition calibration value (α)	45201	S CNT A	
22	Cylinder stopper calibration value (β)	45301	S CNT B	
23	Seating control time (Hi)	45402	S CNT TIME H	
24	Seating control time (Lo)	45403	S CNT TIME L	
25	Shutoff valve output	45700	SHUT OFF VALVE	SOL_OUT10B

Data range	Remarks
Depending upon software part number	
Depending upon software version No.	
Depending upon software version No.	
0.00 – 5.00 [V] ---- [ARSC setting OFF or other than above]	
0 – 32767 [rpm] ---- [ARSC option setting OFF or other than above]	
0 – 32767 [rpm] ---- [Other than above]	
0 – 32767 [rpm] ---- [Other than above]	
0 – 160 [°C] ---- [Other than above]	
0.00 – 5.00 [V] ---- [Other than above]	
0 – 160 [°C] ---- [Other than above]	
0.00 – 5.00 [V] ---- [Other than above]	
0 – 1000 [mA] [command value] --- [Other than above]	
0 – 1000[mA] [command value] ---- [Other than above]	
0.00 – 5.00[V] ----[Other than above]	
0.00 – 5.00[V] ----[Other than above]	
0.00 – 5.00 [V] ---- [Other than above]	
0.00 – 5.00 [V] ----[Other than above]	
0 – 1000[mA] [command value] ----[Other than above]	
0 – 1000[mA] [command value] ----[Other than above]	
0 – 1000[mA] [command value] ----[Other than above]	
0.00 – 5.00 [V] ----[Other than above]	
0.00 – 5.00 [V] ----[Other than above]	
0.0 – 10.00 [s] ----[Other than above]	Down to 2 decimal places are displayed.
0.0 – 10.00 [s] ----[Other than above]	Down to 2 decimal places are displayed.
ON [1] OFF [0]	Unit is not displayed.

No.	Item	ID number	Display spec.	Data contents
26	Steering position sensor	35402	STRG ANGLE	Converted angle of steering angle sensor (A_IN_6) is output.
27	Steering position sensor	35400	STRG ANGLE	A_IN_6
28	Steering speed	35403	STRG ANG SPEED	PLS_IN0 Steering speed is output.
29	Suspension pressure (left)	32814	SUS PRESS (L)	Converted pressure of suspension pressure sensor (A_IN_10) is output.
30	Suspension pressure (left)	32815	SUS PRESS (L)	A_IN_10
31	Suspension pressure (right)	32816	SUS PRESS (R)	Converted pressure of suspension pressure sensor (A_IN_9) is output.
32	Suspension pressure (right)	32817	SUS PRESS (R)	A_IN_9
33	Judgment of empty/loaded truck	39400	EMPTY OR LOAD	Judgment of empty/loaded truck is output.
34	ASR output (L) command	39601	ASR OUTP DIR L	Output command value to ASR (L) solenoid is output.
35	ASR output (R) command	39603	ASR OUTP DIR R	Output command value to ASR (R) solenoid is output.
36	Input signal D_IN_0 – 7	40932	D - IN-0-----7	Input signal stats of D_IN_0 – D_IN_7 are output as they are.
37	Input signal D_IN_8 – 15	40933	D - IN-8-----15	Input signal stats of D_IN_8 – D_IN_15 are output as they are.
38	Input signal D_IN_16 – 23	40934	D - IN-16-----23	Input signal stats of D_IN_16 – D_IN_23 are output as they are.
39	Input signal D_IN_24 – 31	40935	D - IN-24-----31	Input signal stats of D_IN_24 – D_IN_31 are output as they are.
40	Input signal D_IN_32 – 39	40943	D - IN-32-----39	Input signal stats of D_IN_32 – D_IN_39 are output as they are.
41	Output signal D_OUT_0 – 7	40955	D-OUT-0-----7	D_OUT_0 – 7 refer to SOL_OUT_0 – 7 of CR710.

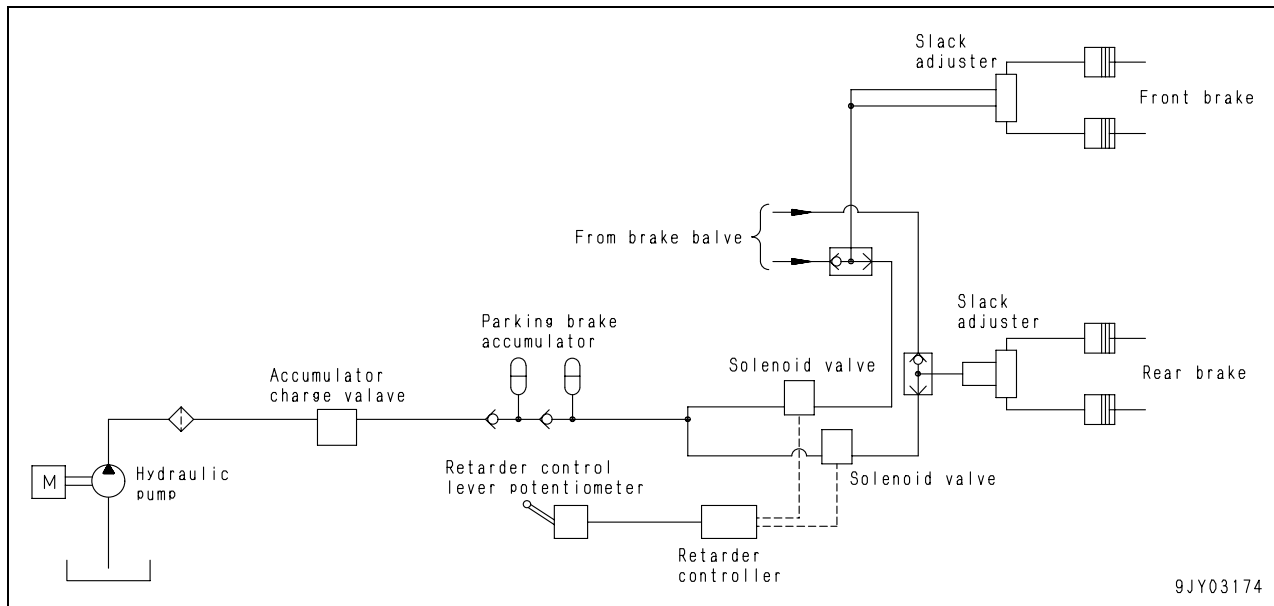
Data range	Remarks
-180.0 – +180.0 [°] --- [Other than above]	
0.00 – 5.00 [V] ----[Other than above]	
0.0 – 99.99 [rad/s] --- [Other than above]	Down to 2 decimal places are displayed.
0.00 – 20.10 [MPa] --- [Automatic suspension option setting OFF and ARSC option setting OFF, or other than above]	
0.00 – 5.00 [V] ---[Automatic suspension option setting OFF and ARSC option setting OFF, or other than above]	
0.00 – 20.10 [MPa] --- [Automatic suspension option setting OFF and ARSC option setting OFF, or other than above]	
0.00 – 5.00 [V] -- [Automatic suspension option setting OFF and ARSC option setting OFF, or other than above]	
LOAD[1] EMPTY[0] ---[Other than above]	Unit is not displayed.
Command value 0 - 1020[mA][00 - FF] ---[Other than above]	
Command value 0 - 1020[mA][00 - FF] ---[Other than above]	
01010101 [1.0 is displayed under corresponding display (number)] Input signal ON [1], Input signal OFF [0], 0 is displayed on unused part.	Unit is not displayed.
01010101 [1.0 is displayed under corresponding display (number)] Input signal ON[1], Input signal OFF[0], 0 is displayed on unused part.	Unit is not displayed.
01010101 [1.0 is displayed under corresponding display (number)] Input signal ON[1], Input signal OFF[0], 0 is displayed on unused part.	Unit is not displayed.
01010101 [1.0 is displayed under corresponding display (number)] Input signal ON[1], Input signal OFF[0], 0 is displayed on unused part.	Unit is not displayed.
10000000 [1.0 is displayed under corresponding display (number)] Input signal ON[1], Input signal OFF[0], 0 is displayed on unused part.	Unit is not displayed.
01010101 [1.0 is displayed under corresponding display (number)] Input signal ON[1], Input signal OFF[0], 0 is displayed on unused part.	Unit is not displayed.

No.	Item	ID number	Displayed spec	Data contents
42	Output signal D_OUT_8 – 15	40956	D-OUT-8-----15	D_OUT_8 – 15 refer to SOL_OUT_8, 9, 10A, 10B, 11A, 11B, SIG_OUT_0 and SIG_OUT_1 of CR710.
43	Output signal D_OUT_16 – 23	40957	D-OUT-16-----23	D_OUT_16 – 23 refer to SIG_OUT_2, 3, HSW_OUT_0, 1 and BATT_RY_OUT of CR710. D_OUT_21, 22 and 23 are not used.

Data range	Remarks
01010101 [1.0 is displayed under corresponding display (number)] Input signal ON[1], Input signal OFF[0], 0 is displayed on unused part.	Unit is not displayed.
01010101 [1.0 is displayed under corresponding display (number)] Input signal ON[1], Input signal OFF[0], 0 is displayed on unused part.	Unit is not displayed.

Retarder control function

Retarder control system diagram



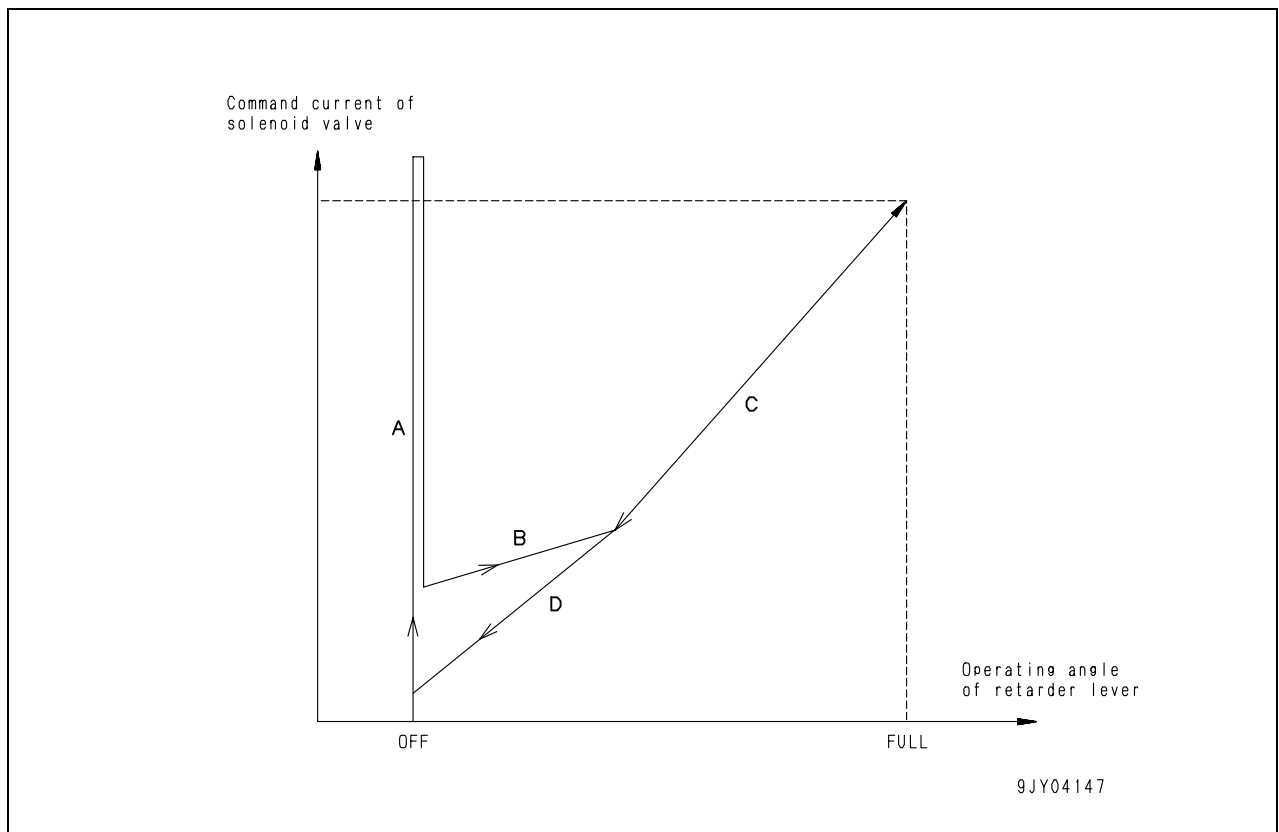
Retarder lever control

- The operating angle of the retarder lever is detected by the potentiometer and a current corresponding to this is output to the solenoid valve to actuate the retarder.
- The solenoid valve outputs pressure to control the retarding action according to the input current (retarder lever angle).

Overrun prevention and retarder control when there is transmission abuse

- The retarder controller controls the solenoid valve to operate the retarder according to the command of the transmission controller.

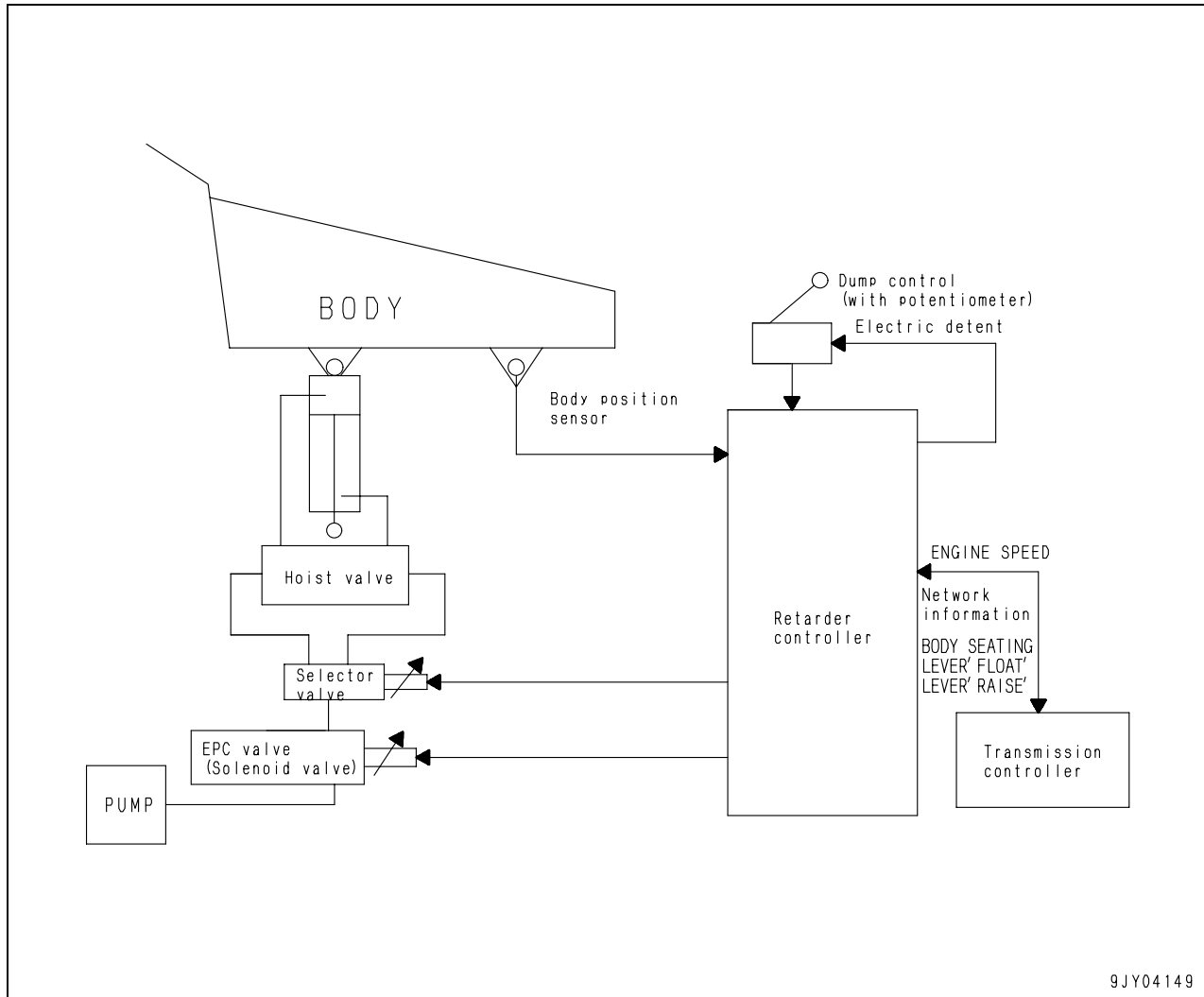
Relationship between retarder lever potentiometer and output to solenoid valve



- A: To improve the initial response of the solenoid reducing valve, the output (trigger output) is set to a high value.
- B: To operate the hydraulic equipment smoothly in the low pressure range, the output is set to a high value.
- C: In the range where the retarder is normally used, the output is proportional to the angle of the lever.
- D: To release the hydraulic pressure smoothly in the low pressure range, the output is set to a low value.

Hoist control function

Hoist control system diagram



1. Hoist control function

When the engine is running, the EPC valve (solenoid valve) and selector valve are controlled according to the operation of the dump control lever and operate the dump body.

2. Lever positioner function

The dump control lever has four positions: RAISE, HOLD, FLOAT, and LOWER.

If the dump control lever is operated to the RAISE position, the dump body is raised, and when the top of the dump body reaches the set position of the body position sensor, the lever is returned to the HOLD position.

If the lever is kept at the RAISE position, the RAISE output continues to be given.

3. Body seating speed control

When the body is lowered to near the seat, the open area of the EPC valve is reduced to control the lowering speed of the body and reduce the seating shock.

4. Control when starting switch is turned to ON, OFF, or START

Starting switch at ON:

The output is set to HOLD, regardless of the position of the lever.

If the engine is not started, even if the hoist lever is operated, the condition remains at HOLD.

Starting switch at OFF:

The hoist valve is closed and the dump body is held in position regardless of the position of the lever.

Engine started:

Immediately after the engine is started, the output is set to HOLD, regardless of the position of the lever.

After the lever is moved to the HOLD position, it becomes possible to carry out normal operations.

5. Reverse inhibit function

The retarder controller judges if it is permissible to travel in reverse or not, and transmits the result of the judgment through the network to the transmission controller.

"FLOAT OUTPUT" or "SEATED" and "LEVER NOT RAISED" → Reverse travel permitted

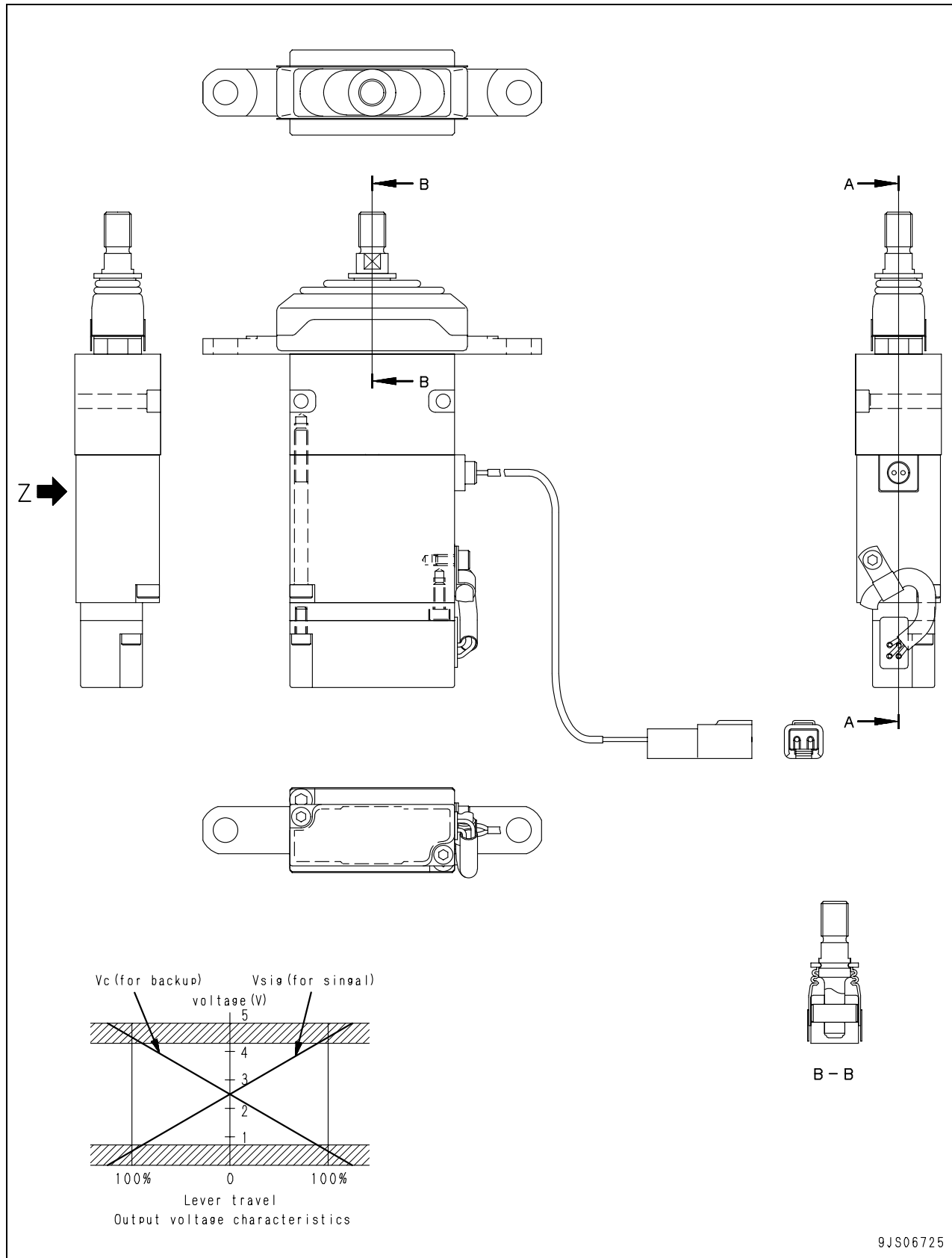
"NOT FLOAT OUTPUT" and "NOT SEATED" or "LEVER RAISED" and "SEATED" → Reverse travel prohibited

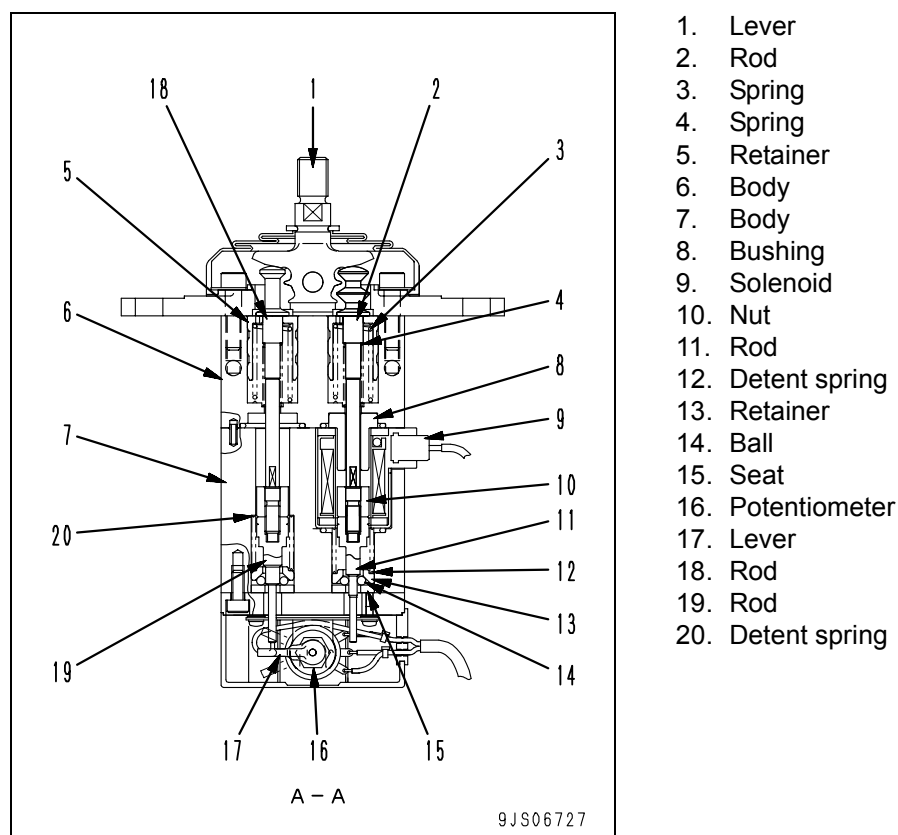
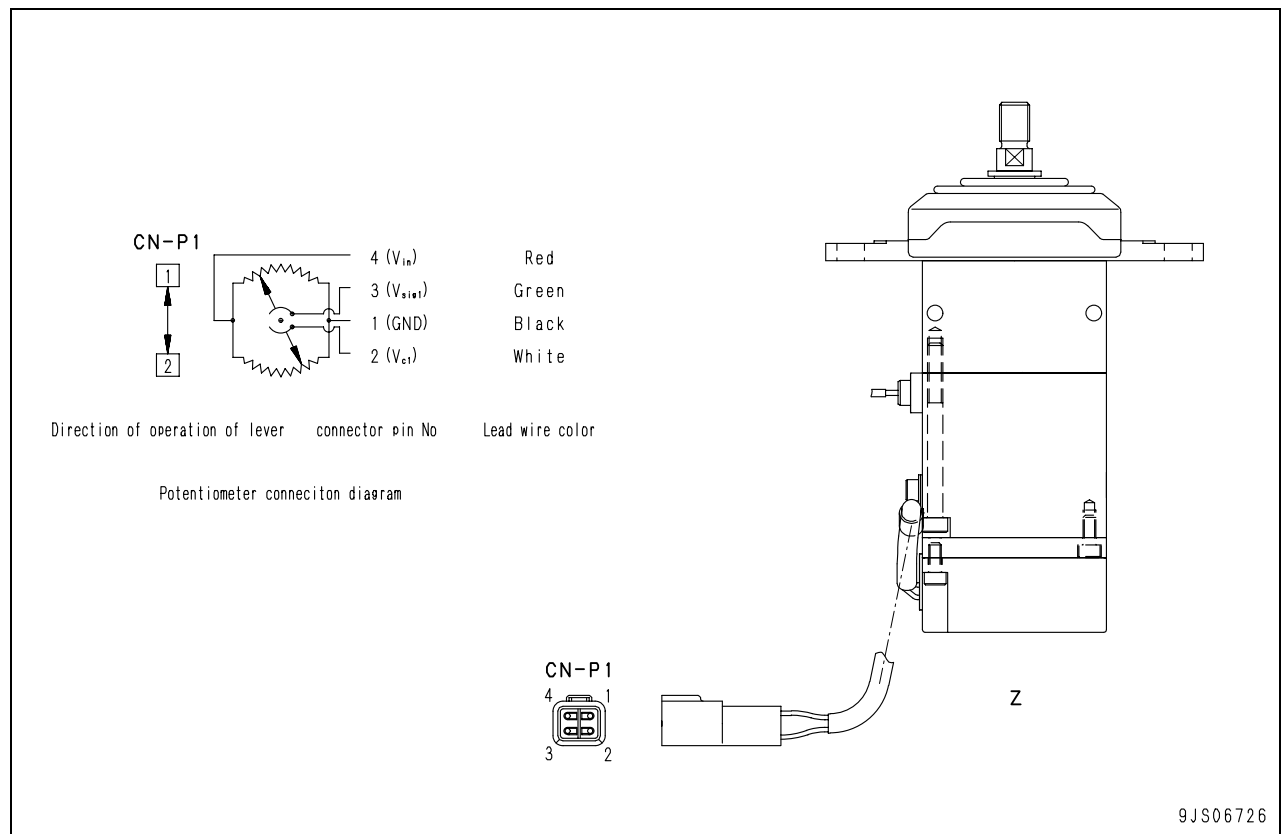
6. Calibration function

To absorb any inherent error in the dump body potentiometer, calibration is carried out to recognize the dump body seating and the body cylinder stopper condition.

After adjusting the installation of the body potentiometer or replacing the retarder controller, carry out calibration. For the calibration procedure, see Testing and adjusting.

Dump control lever





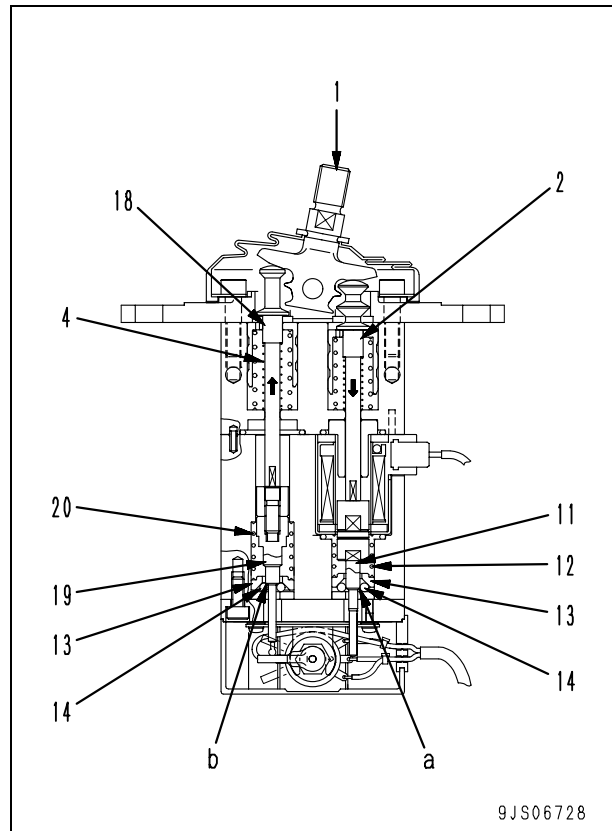
Function

- If lever (1) is operated, rod (18) moves up and down to rotate potentiometer (16) according to the operation stroke of the lever.
- The operation angle (stroke) of the control lever is sensed with the potentiometer and it is output in the form of signal voltage to the controller.
- One potentiometer is installed to output 2 opposite signal voltages shown in "Output voltage characteristics".

Operation

1. When dump control lever is set in "FLOAT" position

- If rod (2) on the LOWER side is pushed and moved down with lever (1), ball (14) touches projection (a) of rod (11) on the stroke. (Before start of mechanical detent)
- If rods (2) and (11) are pushed further, ball (14) pushes up retainer (13) held on detent spring (12) and escapes out to go over projection (a) of rod (11).
- At this time, rod (18) on the opposite side is pushed up by spring (4) and ball (14) is moved to the small diameter side of projection (b) of rod (19) by retainer (13) held on detent spring (20).
- Even if the operator releases the lever, rod (18) is held by projection (b) of rod (19) and ball pressing force, and consequently the lever is held in the "FLOAT" position.

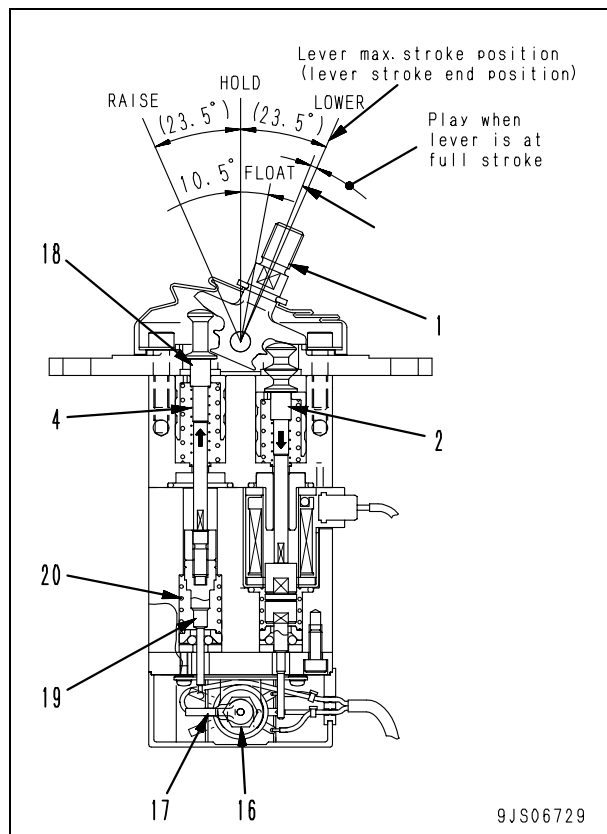


2. When dump control lever is returned from "FLOAT" position

- To return lever (1) from the "FLOAT" position, push it down with a force larger than the holding force of rod (19), detent spring (20), retainer (13) and ball (14).

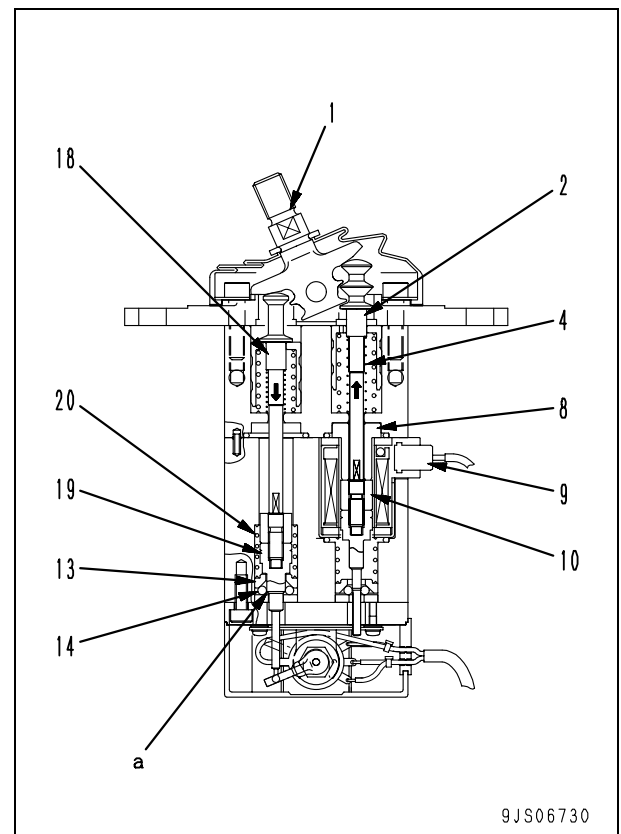
3. When dump control lever is set in "LOWER" position

- If lever (1) is leaned further from the "FLOAT" position, it is set in the "LOWER" position.
- Rod (18) is pushed up by spring (4) according to the operation stroke of lever (1).
- Since lever (17) and rod (19) installed to the turning shaft of potentiometer (16) are connected to each other, potentiometer (16) outputs voltages according to the vertical stroke of the rod.



4. When dump control lever is set in "RAISE" position

- If rod (18) on the RAISE side is pushed and moved down with lever (1), ball (14) touches projection (a) of rod (19) on the stroke. (Before start of electric detent)
- If rods (18) and (19) are pushed further, ball (14) pushes up retainer (13) held on detent spring (20) and escapes out to go over projection (a) of rod (19).
- At this time, rod (2) on the opposite side is pushed up by spring (4).
- If rod (2) is pushed up while current is flowing in solenoid (9), nut (10) is attracted by bushing (8).
- As a result, rod (2) is kept pushed up. Accordingly, even if the operator releases the lever, the lever is held in the "RAISE" position.



5. When dump control lever is returned from "RAISE" position

- To return lever (1) from the "RAISE" position, push it down with a force larger than the attraction of the solenoid. It is also returned to the "HOLD" position when the solenoid power supply is turned "OFF" and the "RAISE" operation is reset.

HD785-7 Dump truck

Form No. SEN01290-02

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

10 Structure, function and maintenance standard

Electrical system, Part 3

VHMS controller related	2
ABS/ASR system	28
Altitude setting function	46

VHMS controller related

- ★ For details of basic precautions, outlines, see "Testing and adjusting".

VHMS controller

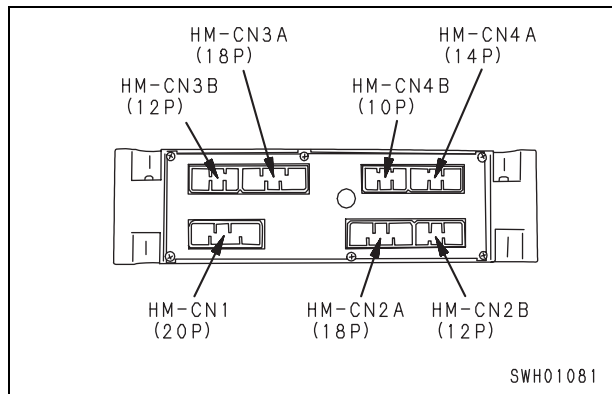
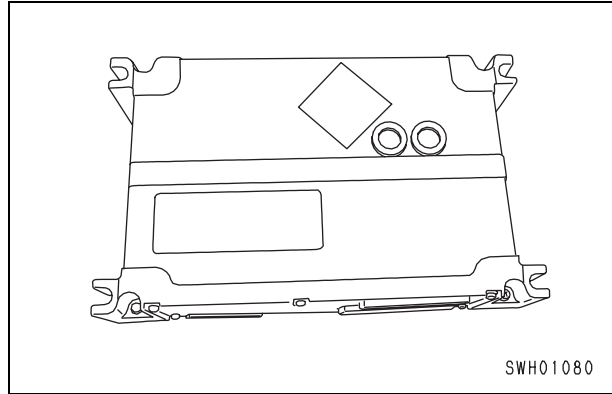
- ★ For details of the basic precautions, outlines, method of sending and receiving data, and the procedure for the initial setup, see Testing and adjusting.

Specifications

1. Voltage of power supply: DC20V - DC30V
2. Size (mm): W272 x D169 x H72

Function

The VHMS controller collects and stores signals from each sensor and signals from the machine controller. It also gives commands for transmitting the accumulated data through the communications satellite.



Communications (ORB: Orbcomm) Controller/Antenna (If equipped)

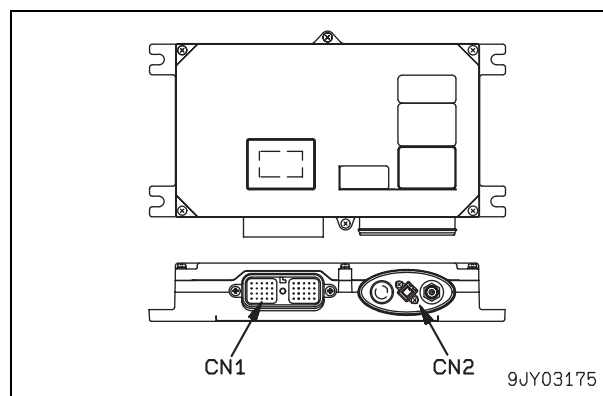
Controller

Specifications

1. Power supply voltage: DC12V – DC30V
2. Size: W306 x D177 x H50 (mm)

Installation location

Install the controller to rear right bottom of operator's cab.



Connector portion

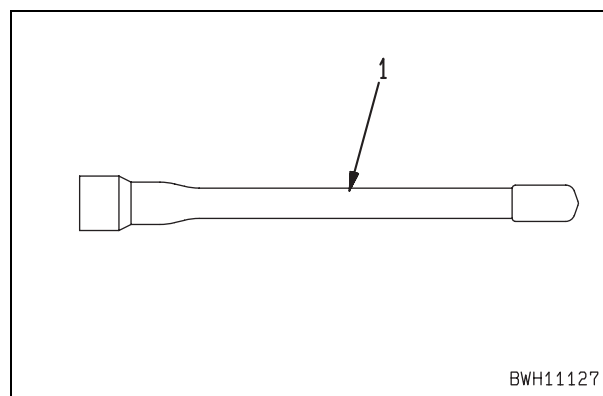
CN1: DRC23-40PA

CN2: Communications antenna cable connector

Antenna

Specifications

1. Type : Helical whip antenna
2. Impedance : 50 Ω
3. Input terminal: M-P type
4. Length : 165 $\pm$ 20 mm



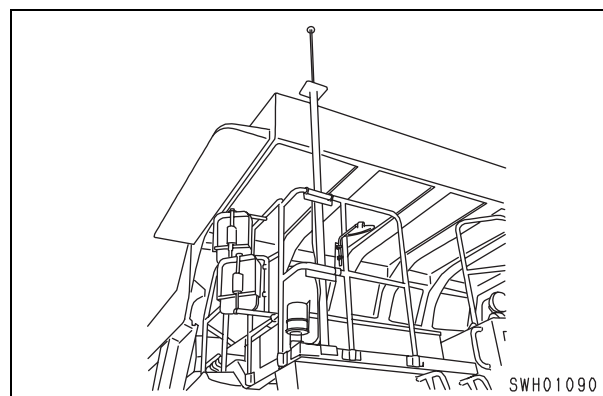
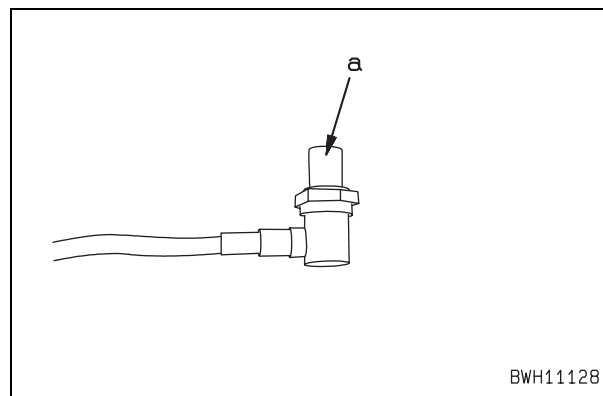
a : Communications antenna mount

Installation location

Install pole at right front of machine and set antenna on top of it.

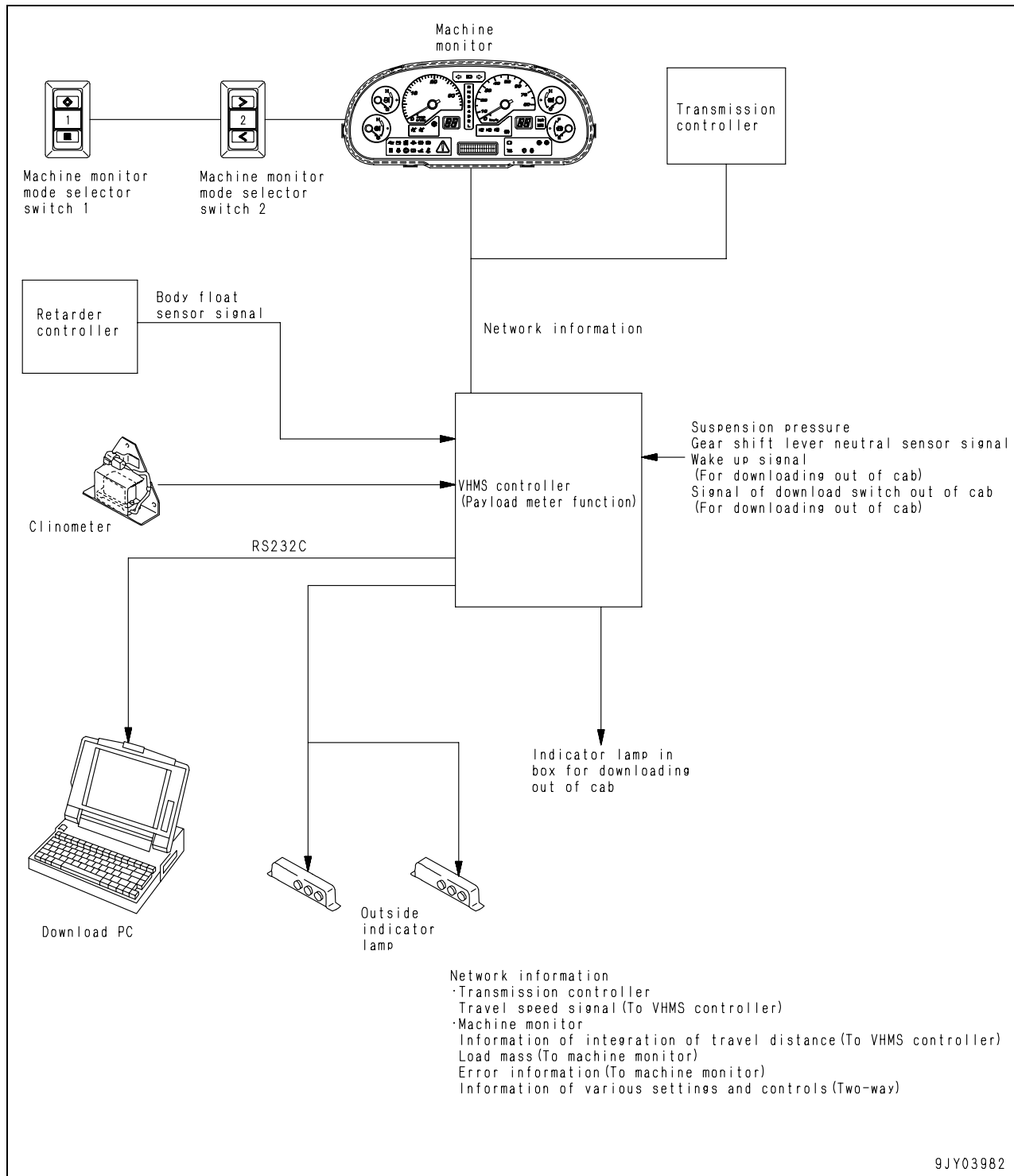
Function

The antenna transmits the data collected and accumulated by the VHMS controller through the communications satellite to the computer center.



Payload meter (having VHMS) (If equipped)

System configuration



Outline

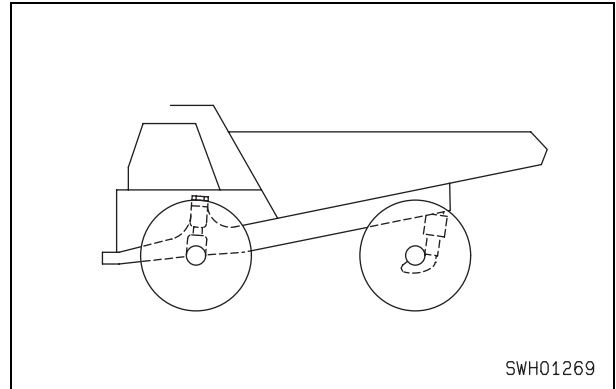
- A dump truck is supported by 4 suspension cylinders. By measuring the total of the loads on each cylinder, it is possible to know the mass on the springs of the dump truck.
The measurement of the load mass is obtained by calculating the difference between the mass when empty and the mass when full.
Payload meter displays the load mass calculated as above on the monitor screen and displays the load level on the outside indicator lamps.
It also has an estimation display function: when loading the next load, the new total load mass is estimated and the appropriate lamp flashes. This prevents overloading.
- The operation data, including the load mass of each transportation cycle, can be saved in the internal memory and downloaded with special software (if equipped).
The hauled load weight is obtained by statistically processing the data sampled during travel from the loading place to the dumping place and then saved.
- The VHMS controller executes the functions of the payload meter and saves the data of each transportation cycle. It displays, sets, and operates various items through the machine monitor and network.
When the payload meter is installed for the first time or the VHMS controller is replaced, the necessary items of the VHMS controller must be set again.
- The payload meter (having VHMS) cannot be installed to a dump truck which is not equipped with the VHMS controller.

Electric circuit diagram

See Troubleshooting, Troubleshooting of VHMS controller system.

Principle of calculation**1. Outline**

A dump truck is supported by 4 suspension cylinders. By measuring the total of the loads on each cylinder, it is possible to know the load mass on the springs of the dump truck.
The measurement of the load mass is obtained by calculating the difference between the mass when empty and the mass when full.
The load on each cylinder can be calculated from the internal pressure and sectional area of the suspension cylinder.



SWH01269

[Load bearing on suspension cylinder]

$$W = P_B S_B - P_T (S_B - S_T)$$

Where

W = Load bearing on suspension cylinder

P_B = Bottom pressure

P_T = Top pressure

S_B = Cross-sectional area of cylinder

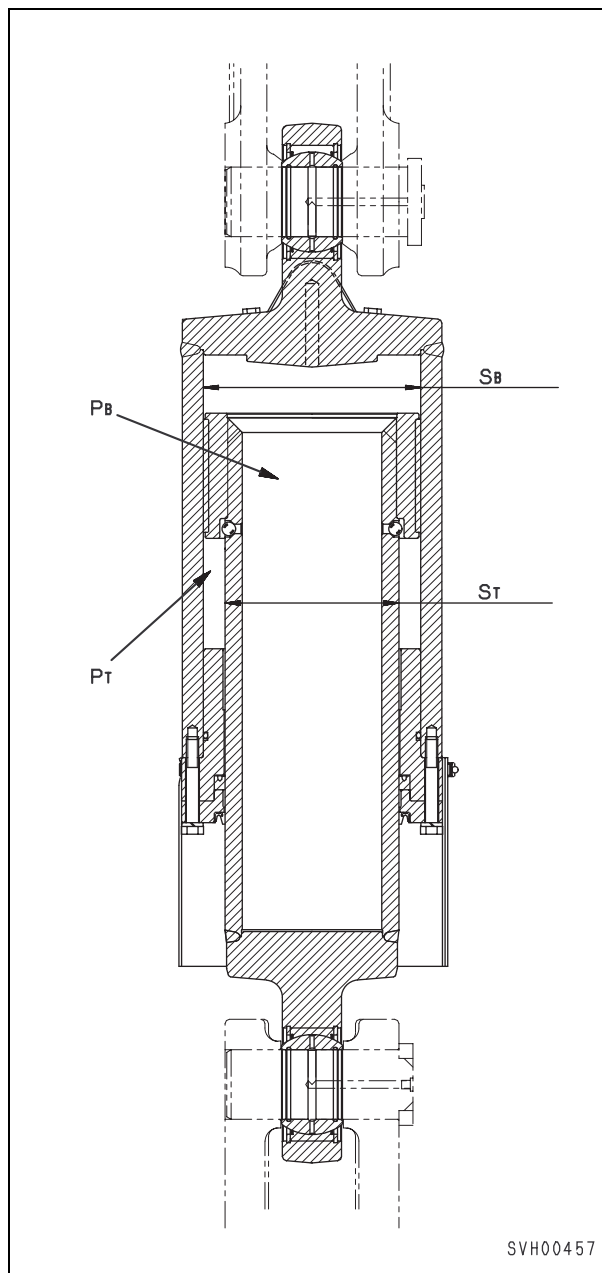
S_T = Cross-sectional area of rod

Because of the structure of the suspension cylinder,

$$P_B \doteq P_T$$

Therefore, the load can be calculated as follows.

$$W = P_B S_T$$

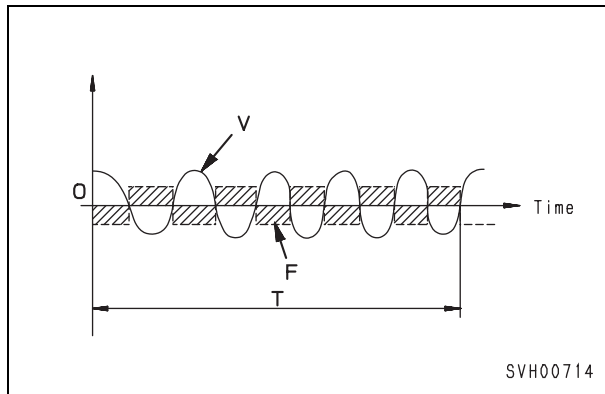


2. Measurement of mass when empty (Calibration)

Drive the empty dump truck at a speed of about 10 km/h for about 30 seconds, and then measure the average load and use it as the mass when empty.

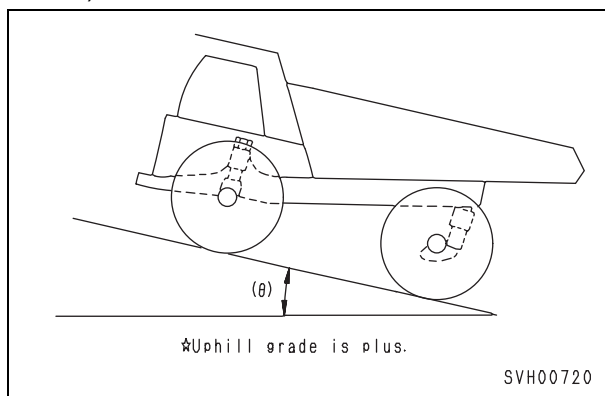
The reason why the mass is measured while the dump truck is traveling is that the sliding resistance of the suspension cylinders must be averaged by extracting and retracting the cylinders by changing the condition of the dump truck.

The measured mass when empty is saved as a calibration data in the memory in the controller.



3. Correction on slope

If the dump truck is loaded on a slope, the measured mass is different from the mass measured on a level ground. To solve this problem, the longitudinal inclination of the dump truck is measured and the measured mass is corrected according to the inclination angle. (Correction range of inclination angle: $\pm 5^\circ$)



4. Detecting distance, travel speed

The travel speed and distance are detected from the travel signal sensor on the truck.

★ Travel signal sensor:

Transmission output shaft speed sensor

Initial setting of payload meter

In the following cases, carry out "Testing and adjusting, Setting and adjusting of devices" and "Testing and adjusting, VHMS controller initial setting procedure" according to the table shown below.

1. When the payload meter (having VHMS) is installed for the first time
2. When the payload meter (having VHMS) is removed
3. When the VHMS controller or transmission controller is replaced
4. When setting of VHMS controller is changed

Setting of payload meter	VHMS controller	Optional device setting of machine monitor (*1)	Setting with VHMS initial setting tool (*2)			
			Model	Serial No.	Variation code	Date Time difference Summer time
Payload meter function is not installed	Not installed	NON	—	—	—	—
	Installed	VHMS	HD785	7	ST	Set properly
Payload meter function is installed VHMS	Installed	+ PLM			PV	

(*1) See "Testing and adjusting, Setting and adjusting of devices".

(*2) See "Testing and adjusting, VHMS controller initial setting procedure".

When there is not a problem in installation and wiring of the payload meter but there are the following problems, check the above setting again.

1. Items related to the payload meter are not displayed on the machine monitor.
"The payload is not displayed when the machine is loaded and stopped", "There are not the menus related to the payload meter on the machine monitor", etc.
2. While the payload meter (having VHMS) is not set, there are the menus related to the payload meter on the machine monitor.
3. Data cannot be downloaded.
★ Wrong setting of the model, serial No., and variation code with the VHMS initial setting tool.
4. Date and time of the downloaded data are wrong.
★ Wrong setting of the date and time with the VHMS initial setting tool.

Reference

Testing and adjusting

Setting and adjusting of devices

VHMS controller initial setting procedure

Basic functions of payload meter

For details, see Operation and Maintenance Manual.

Various setting functions

(Service functions)

1. Setting of travel distance to recognize completion of loading

When the dump truck travels 160 m from the loading area, the payload meter judges that the loading operation is finished. If the dump truck is unloaded before it travels 160 m, the payload meter does not judge that the dump truck is unloaded and the cycle data is not completed at this time. This function is used to change the travel distance to recognize completion of loading when the distance between the loading area and dump area is very short.

2. Correction of calculation of load mass

If the load mass indicated by the payload meter is different from that indicated by the user's load meter, measure the operating mass (when the truck is empty) and gross truck mass (when the truck is loaded with the rated load mass) with the user's load meter, then correct the relation table of the suspension pressure and load mass forcibly with the measured masses.

3. Correction of level of inclination sensor

This function is used to correct the level of the inclination sensor.

4. Setting of criterion of maximum travel speed

This function is used to set a criterion of the maximum travel speed for the machine control system.

5. Setting of load mass to recognize start of loading

The payload meter recognizes that loading is completed when the load mass changes by certain amount. This function is used to change that amount. Since an easy change can cause wrong recognition of loading, verify the machine condition thoroughly when changing.

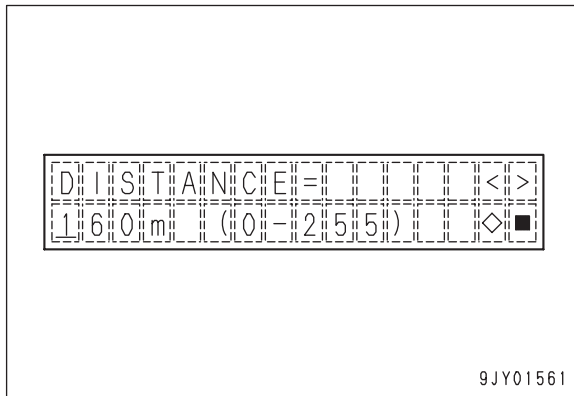
6. Setting of indication range of outside indicator lamp

This function is used to change the indication range of the outside indicator lamp. The condition for turning on the red lamp cannot be changed. If it is changed, the red lamp cannot warn of overloading.

7. Setting of OFFSET range

This function is used to adjust the calculated load mass by a set amount.

1. Setting of travel distance to recognize completion of loading

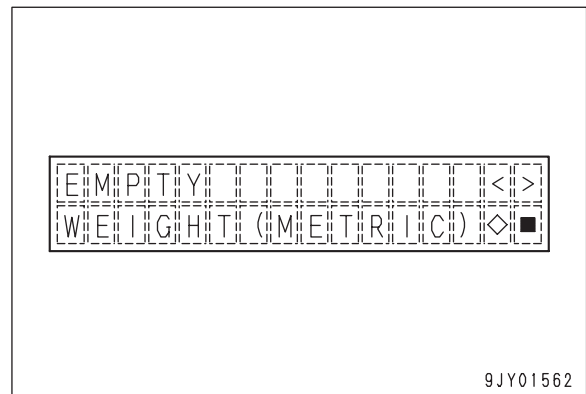


Input a travel distance to recognize completion of loading by pressing the following switches. The setting range is 0 – 255 m (0.0 – 0.158 miles).

- [➤] switch:
Number at cursor moves forward.
 - [➤] switch:
Number at cursor moves backward.
 - [◇] switch: Enter number at cursor.
 - [■] switch: Stop inputting number.
- ★ If the set value is too small, the system may recognize that loading is completed while the dump truck is still being loaded.

2. Correction of calculation of payload

- ★ Since this function affects the accuracy directly, execute the following procedure securely.
- ★ Be sure to measure the weight of the empty dump truck and that of the fully loaded dump truck "as a set" according to the following procedure.
- ★ The dump truck must travel for about 3 minutes each after the weight of the empty dump truck and that of the fully loaded dump truck are measured. Accordingly, secure a road for this purpose.
- ★ The relationship between the suspension pressure and payload corrected with this function cannot be returned to the condition at the time of shipment. Accordingly, perform the following procedure very carefully.
- ★ This function is used to match the calculation result to the indication of the load meter to be used. It does not always heighten the absolute accuracy.
 - 1) Measure the weight of the empty dump truck with the load meter and record it (Write it on a sheet of paper, etc.)
 - 2) Input the measured weight of the empty dump truck and drive the dump truck for about 3 minutes.
 - i) Select "EMPTY WEIGHT".



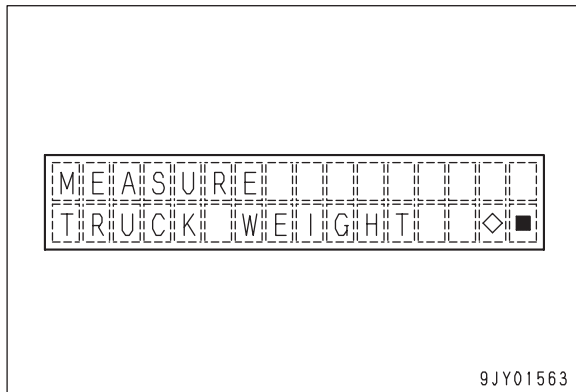
- [➤], [➤] switches:
Select "EMPTY WEIGHT" or "LOADED WEIGHT".
- [◇] switch: Enter the selection.
- [■] switch:
Return to the previous screen.

If the weight of the empty dump truck has been input and the dump truck has been driven for about 3 minutes, "LOADED WEIGHT" is displayed when the menu is selected.

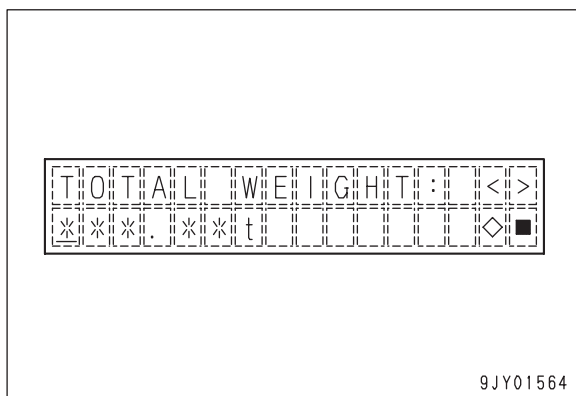
Check the unit of the input value. The unit is indicated in the () on the right side of WEIGHT.

(METRIC): metric ton
(SHORT): short ton

- ii) Check that measurement of the weight of the empty dump truck has been completed.

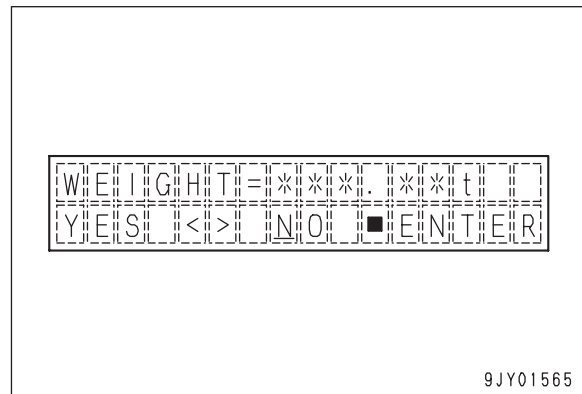


- [◇] switch:
Check that measurement has been completed and go to the next step.
 - [■] switch:
Return to the previous screen.
- iii) Input the measured weight of the empty dump truck.

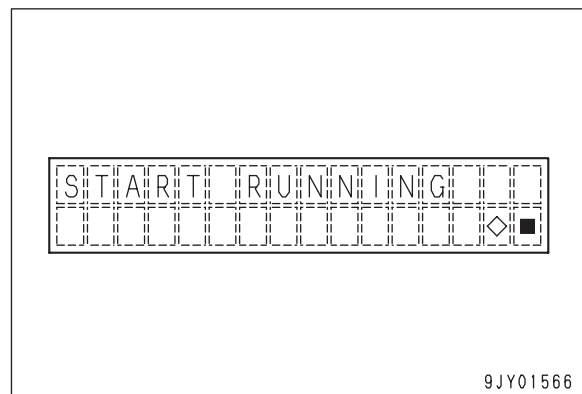


- [>] switch:
Number at cursor moves forward.
- [<] switch:
Number at cursor moves backward.
- [◇] switch: Enter number at cursor.
- [■] switch:
Return to the largest position of the number to input the value again. If this switch is pressed again, inputting of the value is stopped and the previous screen appears.
- Inputtable range
HD785-7:
91 [t] (Operating weight $\pm 13\%$)
(metric ton)

- iv) Check the input value.

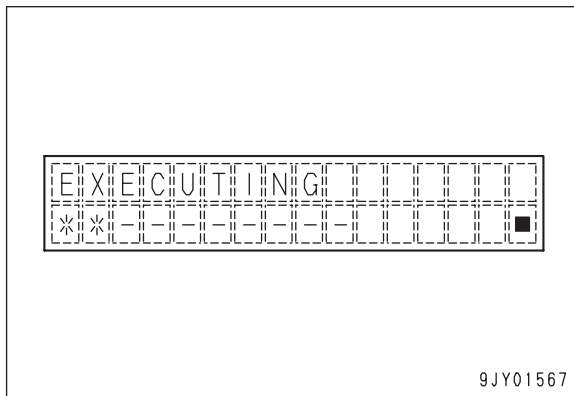


- [<] switch: Select "YES".
 - [>] switch: Select "NO".
 - [■] switch: Enter.
- v) Move the dump truck to a place where you can drive it for about 3 minutes.



- [◇] switch:
After getting ready for drive, press this switch and start driving the dump truck.
 - [■] switch:
Return to the screen for inputting values.
- Drive the dump truck for about 3 minutes (at a speed higher than 8 km/h) to enter the relationship between the weight of the dump truck and the suspension pressure under that weight.

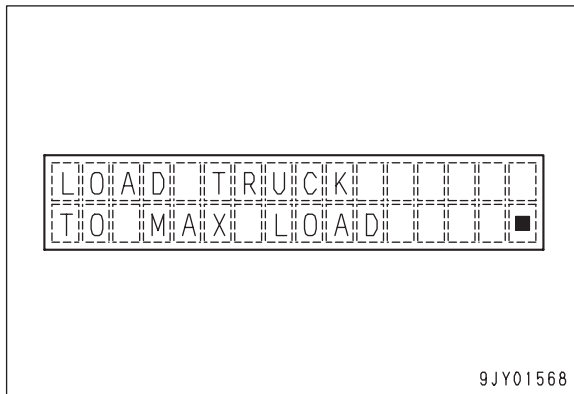
- vi) Display the progress of measurement.



- [■] switch:
Stop measurement and return to the previous screen.

As measurement is executed, the number of [*] increases. When measurement is finished, the next screen appears automatically.

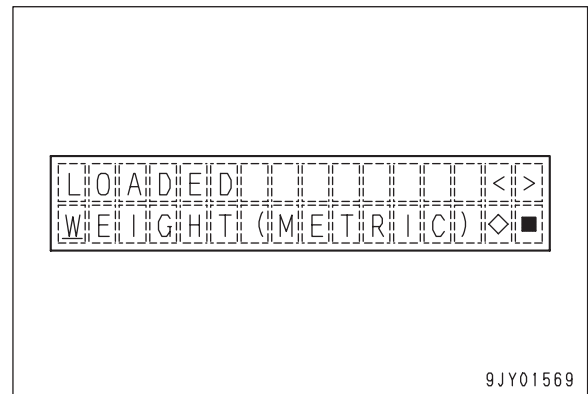
- 3) Load the dump truck to measure the weight of the fully loaded dump truck.



- [■] switch:
Return to the menu screen.
When loading is started, the menu screen appears automatically. When indicating the current load for reference while the dump truck is being loaded, go out of "Service mode 1" temporarily and return to "Display of load/integrated odometer". On this screen, you can check the current load.

- 4) Measure the weight of the fully loaded dump truck with the load meter and record it (Write it on a sheet of paper, etc.)
- 5) Input the measured weight of the fully loaded dump truck and drive the dump truck for about 3 minutes.

- i) Select "LOADED WEIGHT".
For the method of displaying the following screen, see the steps up to the above step.



- [>], [<] switches:
Select "EMPTY WEIGHT" or "LOADED WEIGHT".

- [◇] switch: Enter the selection.

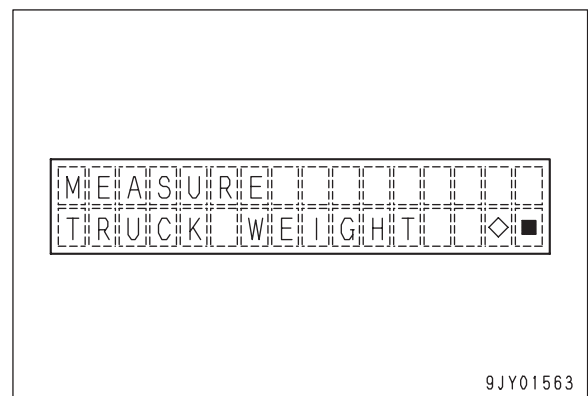
- [■] switch:
Return to the previous screen.
If the weight of the empty dump truck has been input and the dump truck has been driven for about 3 minutes, "LOADED WEIGHT" is displayed when the menu is selected.

Check the unit of the input value. The unit is indicated in the () on the right side of WEIGHT.

(METRIC): metric ton

(SHORT): short ton

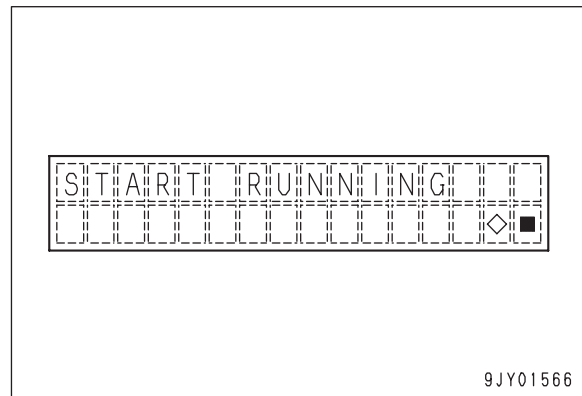
- ii) Check that measurement of the weight of the fully loaded dump truck has been completed.



- [◇] switch:
Check that measurement has been completed and go to the next step.

- [■] switch:
Return to the previous screen.

v) Move the dump truck to a place where you can drive it for about 3 minutes.



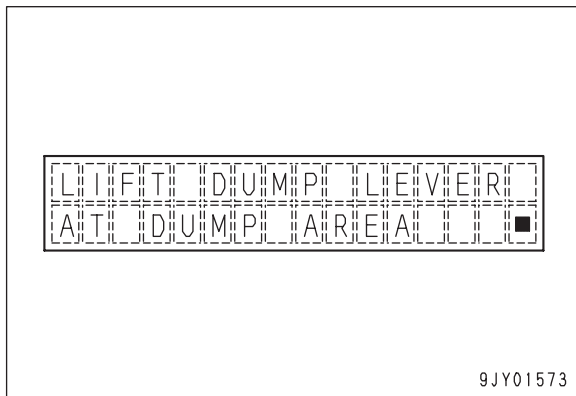
- [◇] switch:
After getting ready for drive, press this switch and start driving the dump truck.
- [■] switch:
Return to the screen for inputting values.

- vi) Display the progress of measurement.

EXECUTING

- **[■]** switch:
Stop measurement and return to the previous screen.
- As measurement is executed, the number of **[*]** increases. When measurement is finished, the next screen appears automatically.

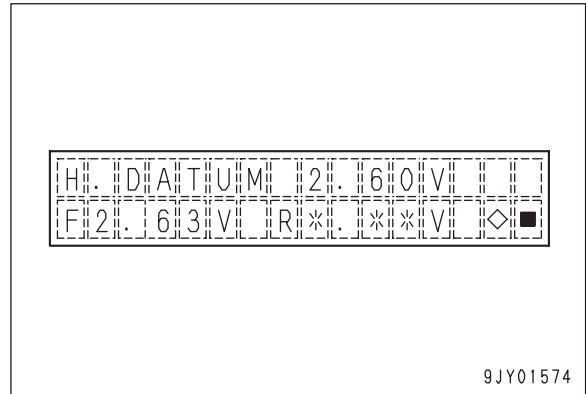
- 6) Dump the load in the dump area.



- [■] switch:
Return to the menu screen.
If the load is dumped with the dump lever, the menu screen appears automatically.
If the load is dumped normally, correction is finished.

3. Correction of level of inclination sensor

- 1) Move the dump truck to a level place.
- 2) Input the clinometer reading (F) at the current position and that (R) after turning 180 degrees (stopping it in the opposite direction) on the same position and use the average value as the standard level.
 - i) Enter value of (F).

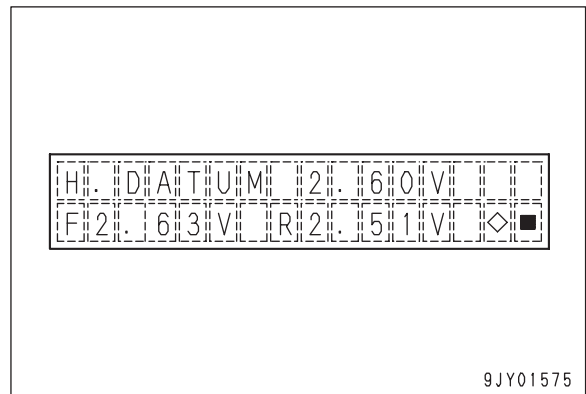


- [◇] switch: Enter the flashing value.
- [■] switch:

Return to the menu screen.

The current standard level value is displayed on the upper line. The clinometer value (F) at the current position flashes. Enter it when it is stabilized.

- ii) Turn the dump truck 180 degrees (Stop it in the opposite direction).
- iii) Enter value of (R).

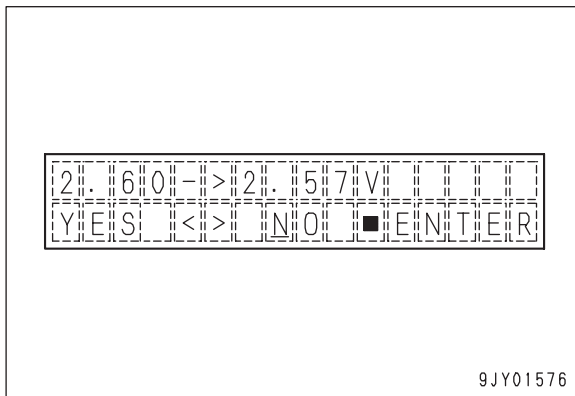


- [◇] switch: Enter the flashing value.
- [■] switch:

Return to the menu screen.

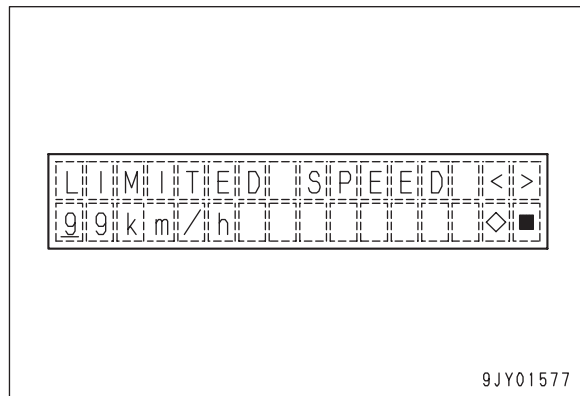
The current standard level value is displayed on the upper line. The clinometer value at the current position flashes. Enter it when it is stabilized.

iv) Enter the standard level value.



- [<] switch: Select "YES".
- [>] switch: Select "NO".
- [■] switch: Enter.

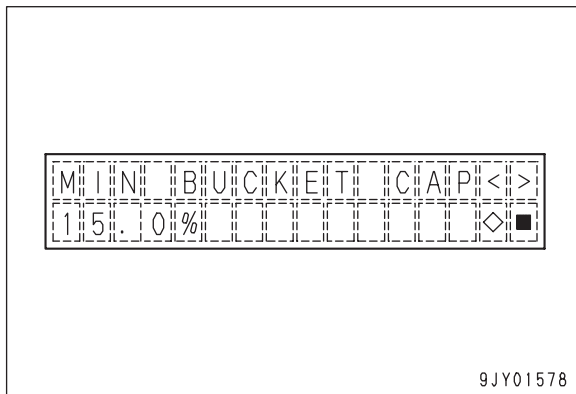
4. Setting of criterion of maximum travel speed



Input a criterion of the maximum travel speed by pressing the following switches.

- [>] switch:
Number at cursor moves forward.
 - [<] switch:
Number at cursor moves backward.
 - [◇] switch: Enter number at cursor.
 - [■] switch: Stop inputting number.
- The setting range is 0 – 99 km/h (0 – 62 MPH).
(Default: 99 km/h)

5. Setting of payload to recognize start of loading



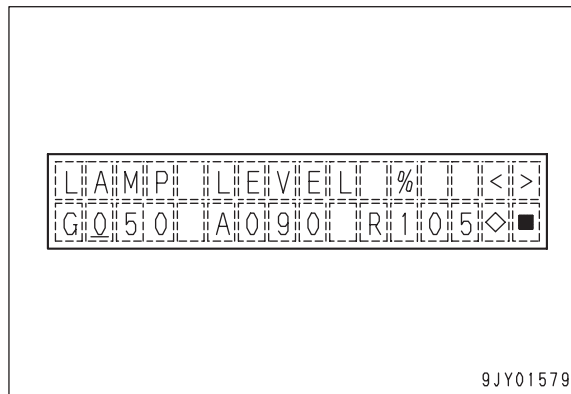
Input a payload to recognize start of loading by pressing the following switches.

- [➤] switch: Number at cursor moves forward.
- [➤] switch: Number at cursor moves backward.
- [◇] switch: Enter number at cursor.
- [■] switch: Stop inputting number.

The setting range is 6 – 25.5%.
(Default: 15%)

- ★ This function does not assure the operation because of the contrary phenomena shown below.
 - If the value is reduced, start of loading may be recognized wrongly.
 - If the value is increased and a loader having a small-capacity bucket is used, the forecast function of the outside indicator lamps and the MMS communication may not operate normally.

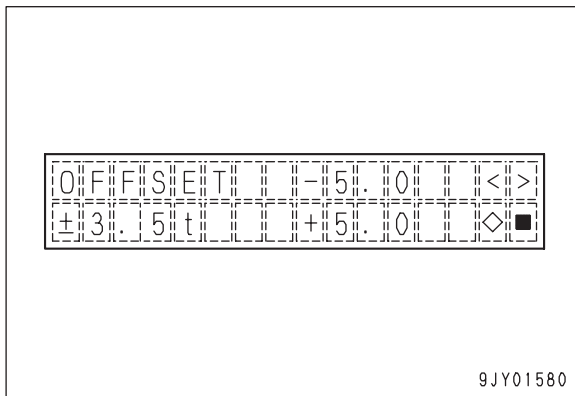
6. Setting of indication range of outside indicator lamps



Input an indication range of the outside indicator lamps by pressing the following switches.

- [➤] switch: Number at cursor moves forward.
- [➤] switch: Number at cursor moves backward.
- [◇] switch: Enter number at cursor.
- [■] switch: Stop inputting number.
- ★ The setting range is 0 – 130% of the load capacity.
Set (A) (Yellow lamp) higher than (G) (Green lamp) and set (R) (Red lamp) higher than (A) (Yellow lamp), however.

7. Setting of OFFSET range



Input an offset range by pressing the following switches.

- [$\rightarrow$] switch:
Number at cursor moves forward.
- [$\leftarrow$] switch:
Number at cursor moves backward.
- [$\diamond$] switch: Enter number at cursor.
- [$\blacksquare$] switch: Stop inputting number.
- ★ The setting range is - 5.0 – +5.0 [t].
Check the unit of the input value on the previous menu screen.
- ★ The unit is indicated in the () on the right side of the input value [t].
(METRIC): metric ton
(SHORT): short ton

Functions of communicating with external devices for purposes other than downloading

The following 2 functions of communicating with external devices are installed. They use the RS232C communication port which is installed to download the data of the payload meter.

1. Automatic transmission

When dumping is finished, the data of the concerned cycle are transmitted automatically.

The data saved in the payload meter can be made by accumulating the above cycle data with the system on the user side.

2. MMS communication

If the mass of a bucketful is recognized, the load mass at that time is transmitted automatically.

If the final load mass (hauled load mass of the concerned cycle) is entered, its value is transmitted automatically.

Upon receiving a request command, the load mass is transmitted in real time.

RS232C is used for only the selected one of data downloading, automatic transmission, and MMS communication.

- Specifications of RS232C connection

Baud rate: 9600 bps

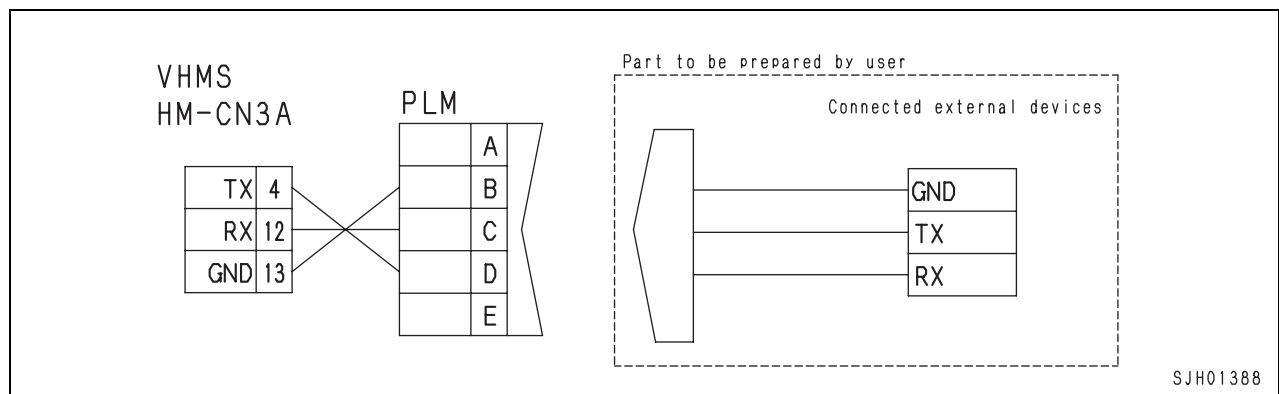
Data length: 8 bits

Stop bit: 2 bits

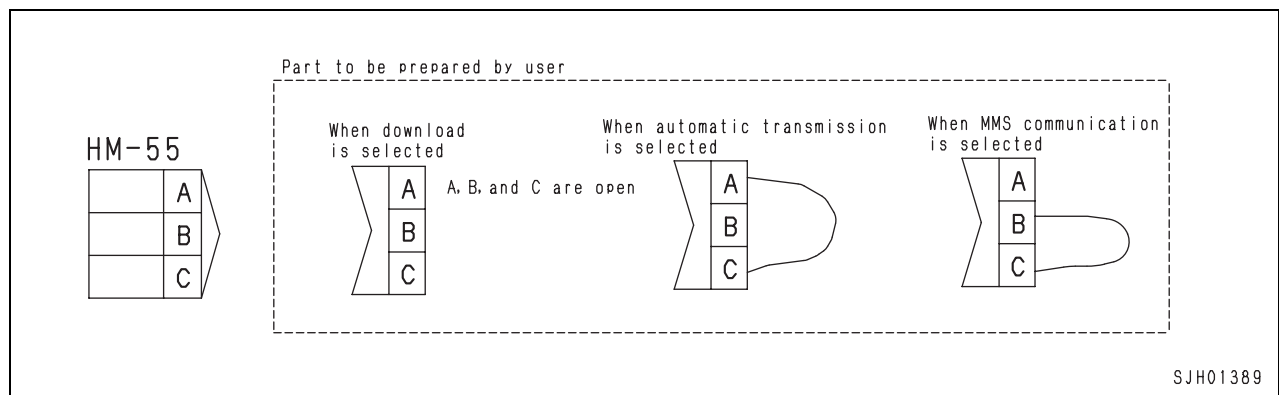
Parity: Not applied

Flow control: Not executed

- Connection of RS232C (communication line) (3-wire method)



- Selecting wiring harness for downloading/automatic transmission/MMS communication



- **Distinction of communication control codes**

The transmitting side transmits data as explained below so that the data in a communication frame beginning with STX and finishing with ETX and BCC will have permeability.

- 1) If there is a code which is the same as STX or ETX in the data area of the communication frame, DLE (10h) is inserted just before that code.
- 2) If there is a code which is the same as DLE in the data area of the communication frame, DLE (10h) is inserted just before that code.
- 3) Calculation of BCC
XOR (Exclusive-or) is checked in order from STX at the head of the frame to ETX just before BCC, including inserted DLE.

When one of 02h (STX), 03h (ETX), and 10h (DLE) is included in the data

Original frame

STX (02h)	...	STX (02h)	...	ETX (03h)	BCC
-----------	-----	-----------	-----	-----------	-----

Transmitted frame

STX (02h)	...	DLE (10h)	STX (02h)	...	ETX (03h)	BCC
-----------	-----	-----------	-----------	-----	-----------	-----

- **Automatic transmission**

- (a) Timing of transmission

The operation data of the concerned cycle are transmitted automatically when the concerned cycle data are entered (when dumping is finished).

- (b) Contents of communication

Format (VHMS controller → External device)

STX (02h)	[1]	ETX (03h)	BCC
-----------	-----	-----------	-----

[1]: Cycle data {39 bytes including header (ASCII L)}

Item	Unit	Range	Number of byte	Remarks
Header "L"	ASCII		1	L (Fixed)
Unused	Integer	1 – 65535	2	0 (Fixed)
Month	Month (BCD)		1	
Day	Day (BCD)		1	
Time, hour	Hour (BCD)	0 – 23 expression	1	
Time, minute	Minute (BCD)		1	
Truck ID	Integer	0 – 200	1	
Open ID	Integer	0 – 200	1	
Load mass	Metric ton (10-time value)	0 – 6553.5	2	
Empty travel time	MIN (10-time value)	0 – 6553.5	2	
Empty travel distance	km (10-time value)	0 – 25.5	1	
Empty max. travel speed	km/h	0 – 255	1	
Empty ave. travel speed	km/h	0 – 255	1	
Empty stoppage time	MIN (10-time value)	0 – 6553.5	2	
Stoppage time for loading	MIN (10-time value)	0 – 6553.5	2	
Loaded travel time	MIN (10-time value)	0 – 6553.5	2	
Loaded travel distance	km (10-time value)	0 – 25.5	1	
Loaded max. travel speed	km/h	0 – 255	1	
Loaded ave. travel speed	km/h	0 – 255	1	
Loaded stoppage time	MIN (10-time value)	0 – 6553.5	2	
Dumping time	MIN (10-time value)	0 – 25.5	1	
Limited speed	km/h	0 – 99	1	
Cycle warning code		0 – FFFF (HEX)	2	
Unused	V (10-time value)	0 – 4.0	1	0 (Fixed)
Unused	V (10-time value)	0 – 4.0	1	0 (Fixed)
Unused	V (10-time value)	0 – 4.0	1	0 (Fixed)
Unused	V (10-time value)	0 – 4.0	1	0 (Fixed)
Unused	V (10-time value)	0 – 4.0	1	0 (Fixed)
Unused	V (10-time value)	0 – 4.0	1	0 (Fixed)
Unused	Time	0 – 255	1	0 (Fixed)
Unused	Time	0 – 255	1	0 (Fixed)

[BCC]: EX-OR of each bit from STX to ETX

Answer (External device → VHMS controller)

STX (02h)	NAK (15h)	31H (ASCII 1)	ETX (03h)	BCC
-----------	-----------	---------------	-----------	-----

Action that VHMS controller takes when answer is abnormal

If "NAK" is returned, the VHMS controller transmits up to 2 more times. If "NAK" is still returned, the VHMS controller stops transmission.

● MMS communication

Transmission of unit distinction setting

(a) Timing of transmission

After the VHMS controller is started by turning the key to the ON position, it transmits the unit distinction setting information automatically.

(b) Contents of communication

Format (VHMS controller →)

STX (02h)	[1]	[2]	ETX (03h)	BCC
-----------	-----	-----	-----------	-----

[1]: K (ASCII) fixed

[2]: 02 (h) fixed (Unit classification [HEX])

The unit classification is the same as one used for PLM2. It is fixed to 02 (h) in the VHMS controller.

[BCC]: EX-OR of each bit from STX to ETX

Answer (→ VHMS controller)

STX (02h)	ACK (06h)	31H (ASCII 1)	ETX (03h)	BCC
-----------	-----------	---------------	-----------	-----

or

STX (02h)	NAK (15h)	31H (ASCII 1)	ETX (03h)	BCC
-----------	-----------	---------------	-----------	-----

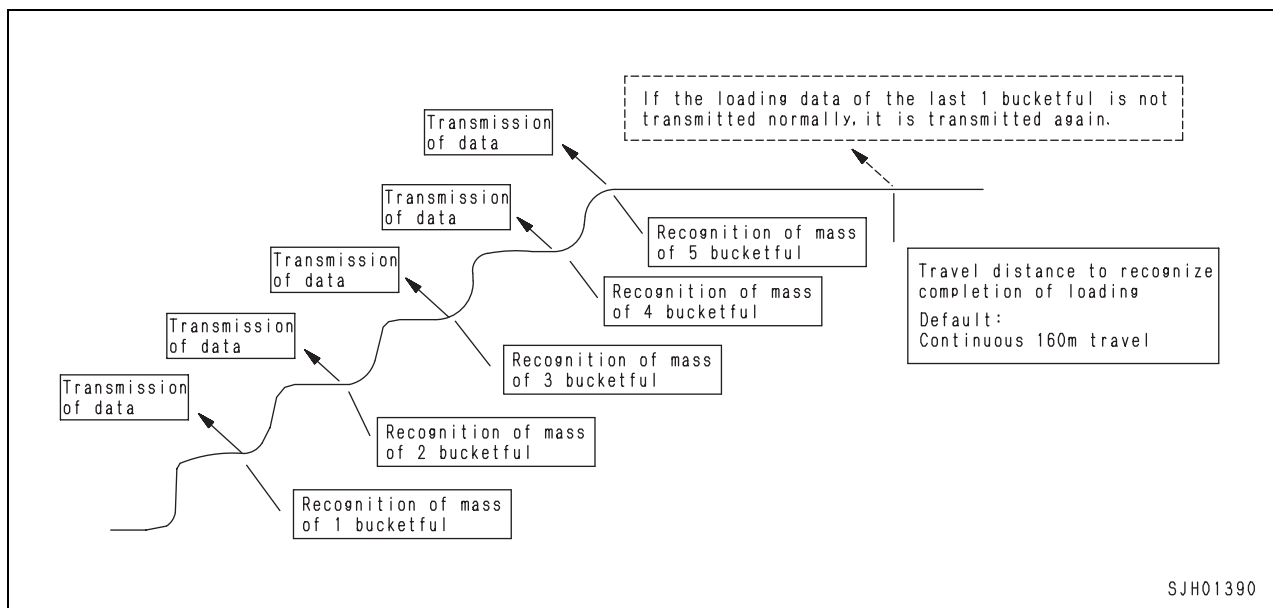
Action that VHMS controller takes when answer is abnormal

If "NAK" is returned or either of "ACK" and "NAK" is not returned in 3 seconds, the VHMS controller transmits up to 2 more times. If an answer is still not returned, the VHMS controller stops transmission.

Transmission of load mass, estimated load mass, and suspension pressure

(a) Timing of transmission

When mass of 1 bucketful is recognized.



(b) Contents of communication

Format (VHMS controller)

STX (02h)	[1]	[2]	[3]	[4]	[5]	[6]	ETX (03h)	BCC
-----------	-----	-----	-----	-----	-----	-----	-----------	-----

[1]: M (ASCII) fixed

[2]: 4 (ASCII) fixed

[3]: 02 (h) fixed (Unit classification [HEX])

[4]: Load mass (B) [HEX] (2 BYTES) (Unit: Metric ton, 10-time value, 1 decimal place)

[5]: Estimated load mass (C) [HEX] (2 BYTES) (Unit: Metric ton, 10-time value, 1 decimal place)

[6]: (B) Calculated suspension pressure [HEX] [8 BYTES]

From head

Signal name	Position	Name	HEX
P FL	(Lower position) (Upper position)	Front left suspension pressure (kg/cm ²)	[10-time value] 0 – 6553.5
P FR	(Lower position) (Upper position)	Front right suspension pressure (kg/cm ²)	[10-time value] 0 – 6553.5
P RL	(Lower position) (Upper position)	Rear left suspension pressure (kg/cm ²)	[10-time value] 0 – 6553.5
P RR	(Lower position) (Upper position)	Rear right suspension pressure (kg/cm ²)	[10-time value] 0 – 6553.5

[BCC]: EX-OR of each bit from STX to ETX

Answer (→ VHMS controller)

STX (02h)	ACK (06h)	31H (ASCII 1)	ETX (03h)	BCC
-----------	-----------	---------------	-----------	-----

or

STX (02h)	NAK (15h)	31H (ASCII 1)	ETX (03h)	BCC
-----------	-----------	---------------	-----------	-----

Action that VHMS controller takes when answer is abnormal

If "NAK" is returned or either of "ACK" and "NAK" is not returned in 3 seconds, the VHMS controller transmits up to 2 more times. If an answer is still not returned, the VHMS controller stops transmission.

Transmission of final load mass

(a) Timing of transmission

When the concerned cycle data are entered (When dumping is finished), the final load mass (= the load mass to be saved as the hauled load mass of the concerned cycle in the memory) is transmitted automatically.

(b) Contents of communication

Format (VHMS controller)

STX (02h)	[1]	[2]	ETX (03h)	BCC
-----------	-----	-----	-----------	-----

[1]: P (ASCII) fixed

[2]: Load mass [HEX] (2 BYTES) (Unit: Metric ton, 10-time value, 1 decimal place)

Order: Lower position → upper position from the head byte of [2]

[BCC]: EX-OR of each bit from STX to ETX

Answer (→ VHMS controller)

STX (02h)	ACK (06h)	31H (ASCII 1)	ETX (03h)	BCC
-----------	-----------	---------------	-----------	-----

or

STX (02h)	NAK (15h)	31H (ASCII 1)	ETX (03h)	BCC
-----------	-----------	---------------	-----------	-----

Action that VHMS controller takes when answer is abnormal

If "NAK" is returned or either of "ACK" and "NAK" is not returned in 3 seconds, the VHMS controller transmits up to 2 more times. If an answer is still not returned, the VHMS controller stops transmission.

Transmission of real-time data

(a) Outline of communication procedure

- 1) The VHMS controller receives a request for the real-time data from MMS.
- 2) After receiving the request for the real-time data, the VHMS controller transmits the real-time data at intervals of 0.2 seconds.
- 3) When the VHMS controller receives a request for finishing transmission of the real-time data, it finishes transmission of the real-time data. When the key is turned to the OFF position, transmission of the real-time data is finished, too.

(b) Contents of communication

- 1) Request for real-time data (→ VHMS controller)

Format

STX (02h)	[1]	[2]	ETX (03h)	BCC
-----------	-----	-----	-----------	-----

[1]: M (ASCII) fixed

[2]: 2 (ASCII) fixed

[BCC]: EX-OR of each bit from STX to ETX

Answer (VHMS controller →)

Transmission of the real-time data from the VHMS controller is used as a substitute for the answer.

- 2) Transmission of real-time data (VHMS controller →)
Format (VHMS controller →)

STX (02h)	[1]	[2]	[3]	[4]	ETX (03h)	BCC
-----------	-----	-----	-----	-----	-----------	-----

[1]: M (ASCII) fixed

[2]: 2 (ASCII) fixed

[3]: 02 (h) fixed (Unit classification [HEX])

[4]: Real-time data (17 BYTES)

From head

Signal name	Position	Name	HEX
P FL	(Lower position) (Upper position)	Front left suspension pressure (kg/cm ²)	[10-time value] 0 – 6553.5
P FR	(Lower position) (Upper position)	Front right suspension pressure (kg/cm ²)	[10-time value] 0 – 6553.5
P RL	(Lower position) (Upper position)	Rear left suspension pressure (kg/cm ²)	[10-time value] 0 – 6553.5
P RR	(Lower position) (Upper position)	Rear right suspension pressure (kg/cm ²)	[10-time value] 0 – 6553.5
INC	(Lower position) (Upper position)	Inclination angle (degree)	[Complement of 2 of 100-time value] -9.99 – +9.99
PAYLD	(Lower position) (Upper position)	Real-time load mass (Metric ton)	[10-time value, to 1 decimal place]
SP		(Current) Travel speed (km/h)	0 – 99
DIG STST		Status of digital signals	See (*1)
ANA 1		Unused	0
ANA 2		Unused	0
VEH STAT		Status of dump truck	See (*2)

(*1) Status of digital signals [HEX]

bit 0: N signal1: N (OPEN) 0: Other than N (GND)

bit 1: BODY FLOAT signal 1: FLOAT (OPEN) 0: Other than FLOAT N (GND)

bit 2: Unused

bit 3: Unused

bit 4: Unused

bit 5: Unused

bit 6: Unused

bit 7: Unused

(*2) Status of dump truck [HEX]

00 (h): Engine stopped

01 (h): Empty and stopped

02 (h): Empty and traveling

03 (h): Loading

04 (h): Loaded and traveling

05 (h): Loaded and stopped

06 (h): Unloading

[BCC]: EX-OR of each bit from STX to ETX

Answer (→ VHMS controller)

STX (02h)	ACK (06h)	ETX (03h)	BCC
-----------	-----------	-----------	-----

or

STX (02h)	NAK (15h)	ETX (03h)	BCC
-----------	-----------	-----------	-----

Action that VHMS controller takes when answer is abnormal

Even if "NAK" is returned or any of "ACK", "NAK", and a request for finishing RTM is not returned in RTM transmission timing, the VHMS controller transmits the real-time data normally after 0.2 seconds. If this condition is repeated 10 times, the VHMS controller stops transmission.

3) Request for finishing transmission of real-time data (→ VHMS controller)

Format

STX (02h)	[1]	[2]	ETX (03h)	BCC
-----------	-----	-----	-----------	-----

[1]: Q (ASCII) fixed

[2]: 2 (ASCII) fixed

[BCC]: EX-OR of each bit from STX to ETX

Answer (VHMS controller →)

STX (02h)	ACK (06h)	ETX (03h)	BCC
-----------	-----------	-----------	-----

or

STX (02h)	NAK (15h)	ETX (03h)	BCC
-----------	-----------	-----------	-----

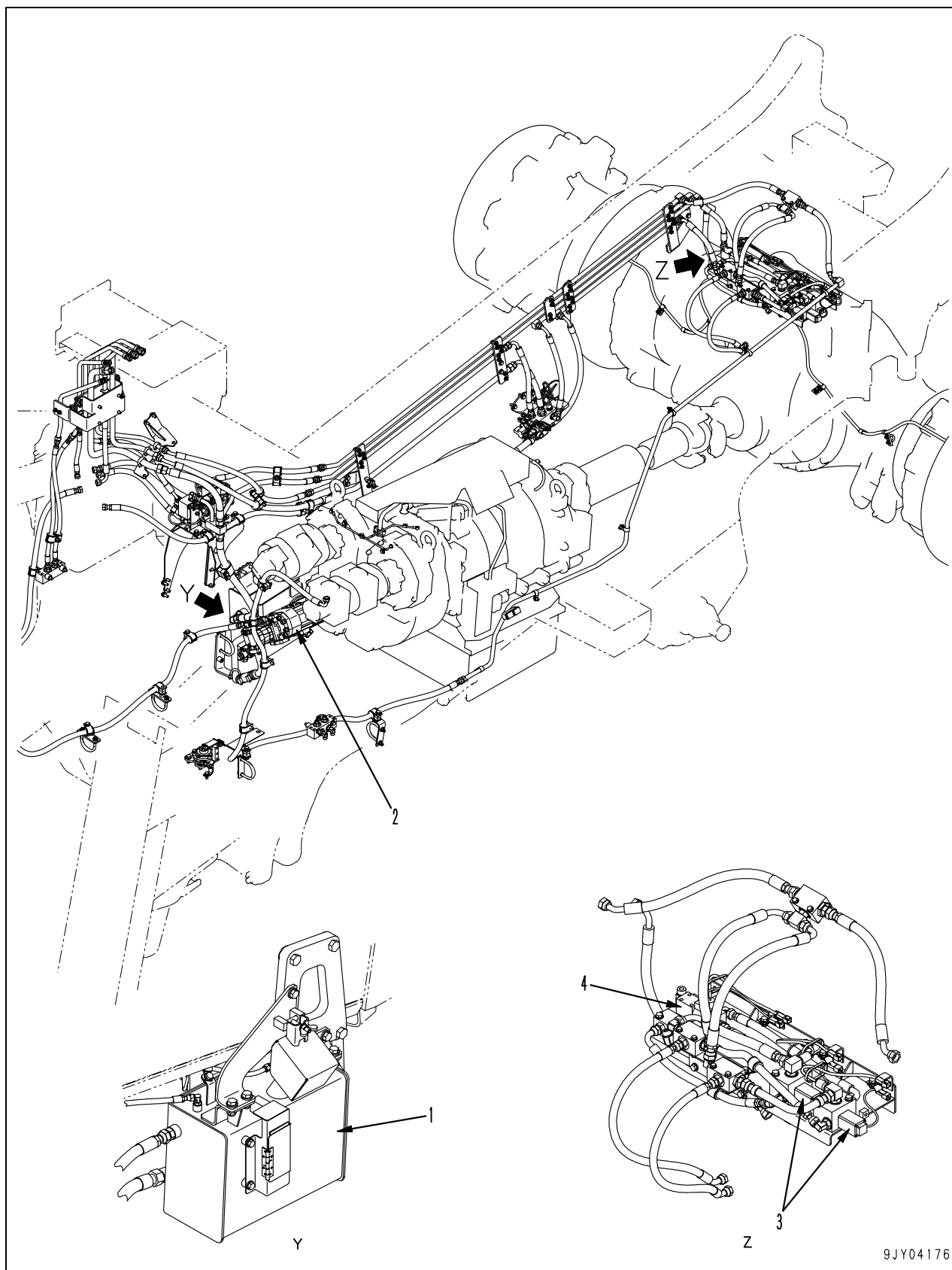
ABS/ASR system (If equipped)

ABS specification



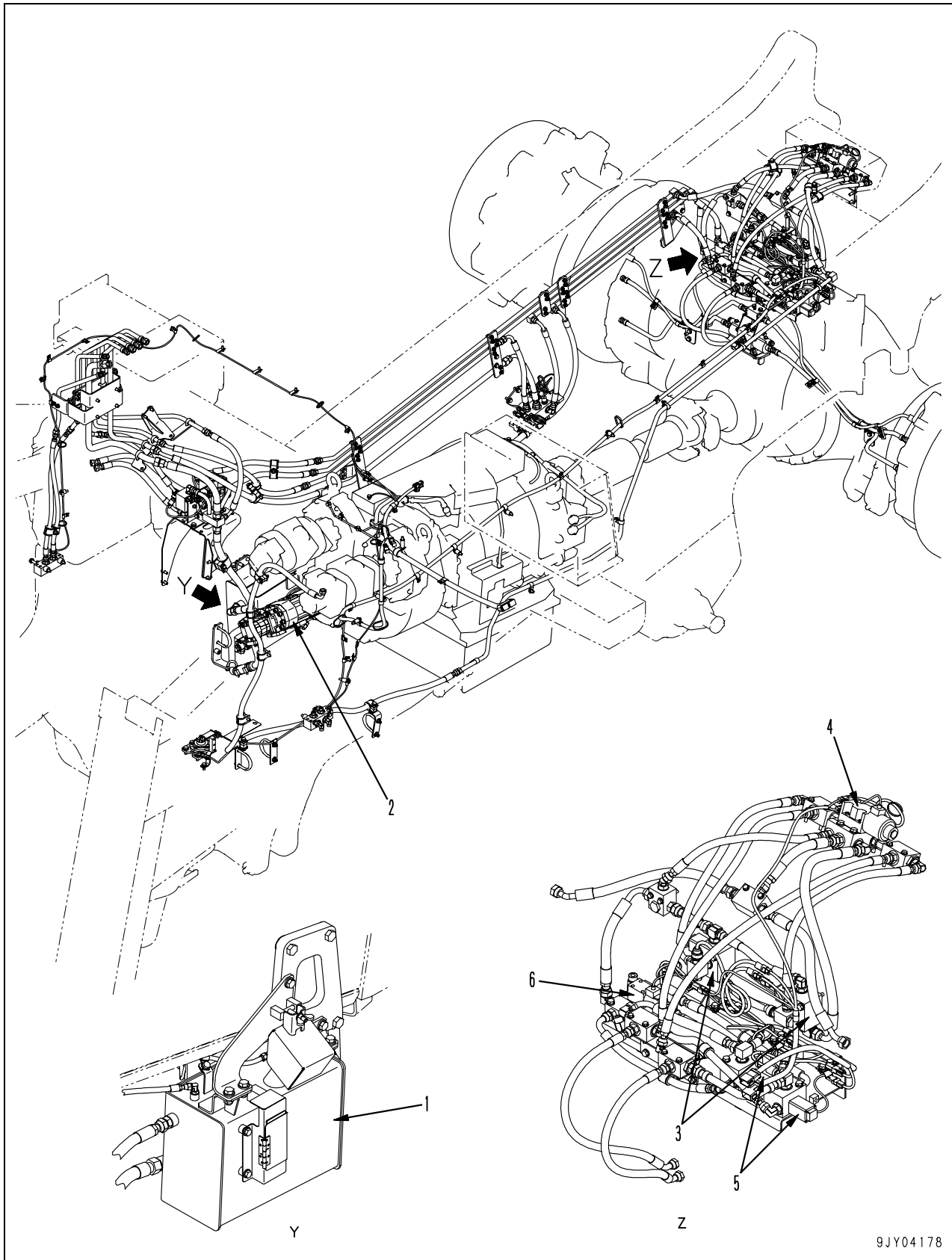
1. Brake system tank
2. Torque converter, transmission + brake cooling, brake control pump
(SDR(30)100+100SA(1)25)
3. ABS control valve
4. ABS ON/OFF valve

ASR specification



1. Brake system tank
2. Torque converter, transmission + brake cooling, brake control pump
(SDR(30)100+100SA(1)25)
3. ASR control valve
4. ASR shut-off valve

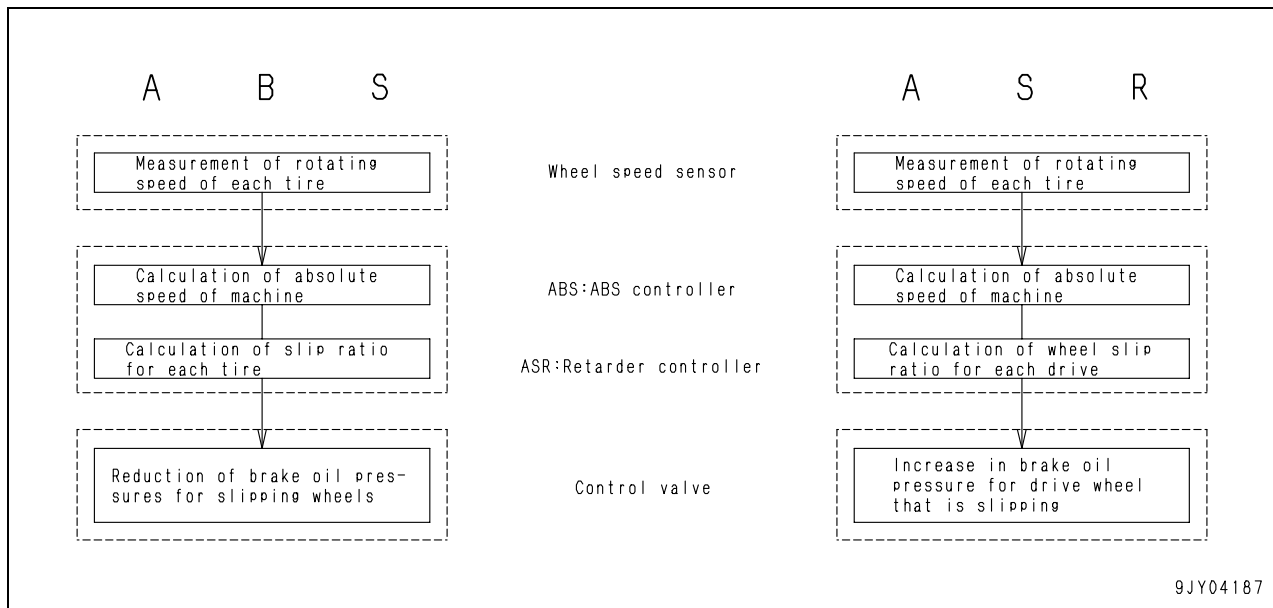
ABS and ASR specification



9JY04178

1. Brake system tank
2. Torque converter, transmission + brake cooling, brake control pump
(SDR(30)100+100SA(1)25)
3. ABS control valve
4. ABS ON/OFF valve
5. ASR control valve
6. ASR shut-off valve

System operation logic



Outline

ABS (Anti-skid Brake System)

- The ABS automatically controls slippage that is caused by locking of the wheels when the brakes are applied suddenly or on snow or other slippery road surfaces. In this way, the ABS keeps the machine stable and insures that it can be steered.
 - With the ABS, the ABS controller calculates the machine travel speed and the speed of each wheel from the signals sent by the wheel speed sensors installed to each wheel. It then sends a signal to the pressure control valve for the wheel where the brakes may possibly lock, thereby controlling the brakes on the four wheels independently.
- ★ When the ABS is actuated on a slippery road surface, the braking distance becomes slightly longer.
- ★ When traveling at extremely low speed, the wheels may lock.

ASR (Automatic Spin Regulator)

- The ASR prevents the drive wheels from slipping when there is excessive torque. In this way it improves the starting ability and drive-through ability on poor or frozen road surfaces.
 - When the machine starts to move on snow-covered or split road surfaces (where the condition of the road surface is different on the left and right: such as when one side is snow and the other side is dry road), if an excessive torque is applied to the wheels, both or one of the wheels will spin and it may be impossible for the machine to start. However, if the machine is equipped with an ASR, the brake is automatically applied to the wheel that is spinning and the torque applied to the wheel is controlled, so the machine can move off.
- ★ If both rear wheels slip at the same speed, the ASR function is not actuated, so reduce the pressure on the accelerator to control the engine output.

Operation**ABS (Anti-skid Brake System)**

When not actuated

(when there is normal braking)

- If the tires do not tend to skid when the brake is applied normally, the ABS control valve does not operate and the oil pressure is supplied from the brake valve directly to the slack adjuster.

When actuated

- The oil pressure applied to the brake is controlled as shown in the graph to prevent a skid of the tires automatically.

t1: Braking is started and the brakes start to have effect on the wheels. At the same time, the wheel speed shows a possibility of locking.

t2: If the wheel acceleration exceeds (a_0), the controller judges that the wheels have started to be unstable and sets the electric signal constant to check the condition.

t3: If the wheel speed lowers further to slip ratio (λ_1), the controller judges that the wheels are unstable and changes the electric signal to release the brake.

t4: Since the brake is released, the wheel speed tends to recover. If the wheel acceleration passes (a_0), the controller judges that the wheels have entered the stable range and sets the electric signal constant.

t5, t6: After the wheel acceleration passes (a_1), it lowers and returns to (a_1) again since the brake pressure is held. At this time, the controller judges that the wheel acceleration is stabilized and changes the electric signal to apply the brake. The signal is changed gradually so that the wheel speed will not change sharply (since the controller has judged that the road surface is slippery).

t7: Since the brake is applied, the wheels tend to skid again. If the wheel acceleration passes (a_0), the controller judges that the wheels are unstable and changes the electric signal to release the brake.

t8: Since the brake is released, the wheel speed tends to recover. When the wheel acceleration returns to (a_0) again, the controller judges that the wheels have entered the stable range and sets the electric signal constant.

t9: Same as t6

Stages t4 – t9 are repeated.

V : Travel speed

V (Ref) : Calculated machine speed

V (Rad): Wheel speed

a_0 : Acceleration (–)

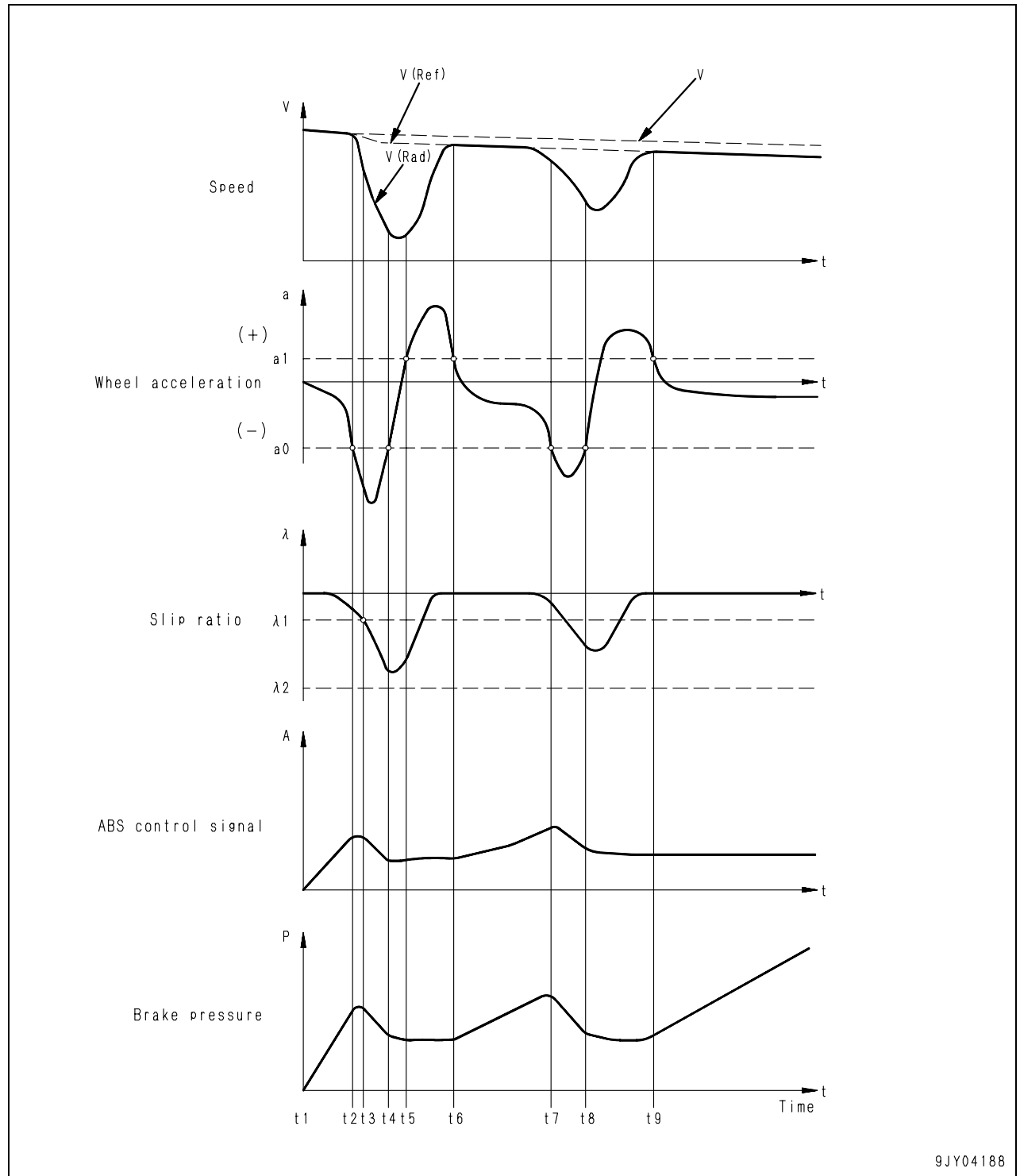
The signal for the condition when the wheel deceleration speed has exceeded the set limit.

a_1 : Acceleration

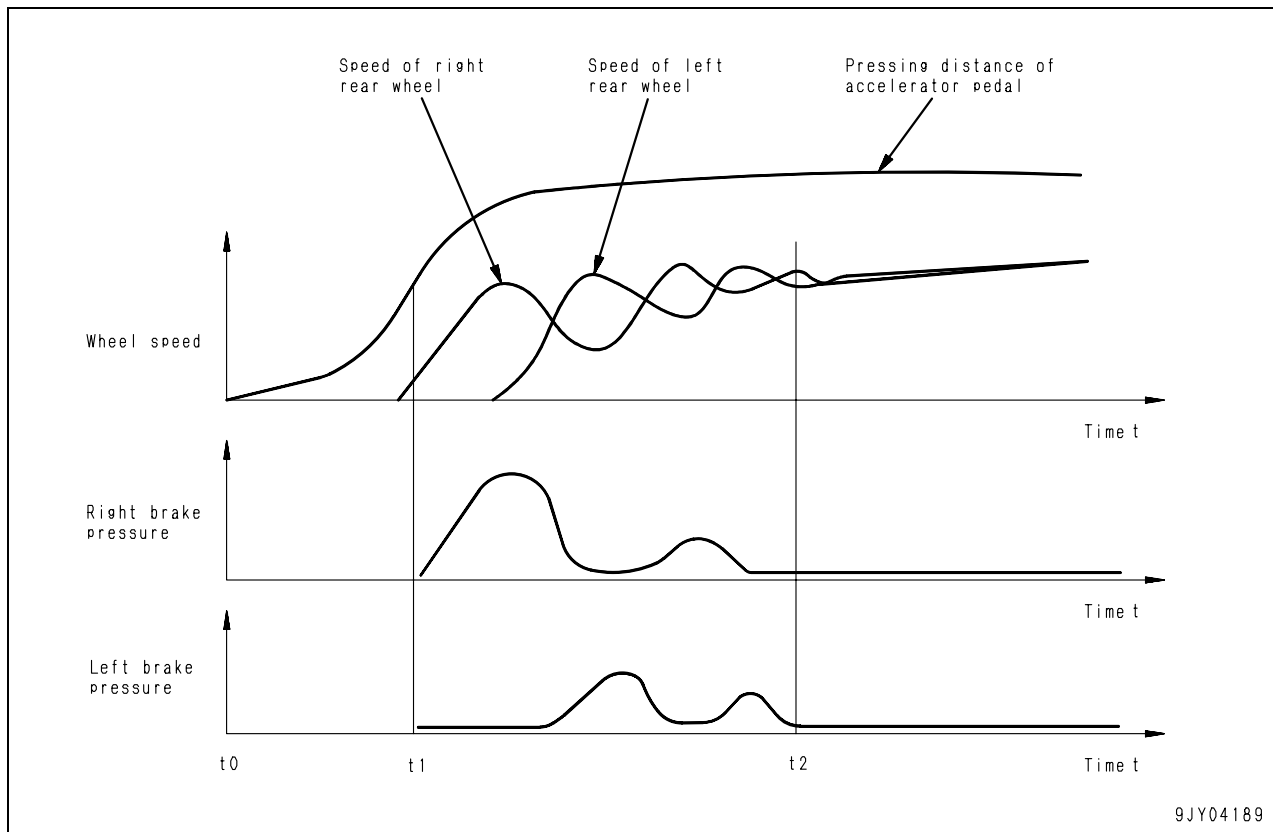
The signal for the condition when the wheel acceleration speed has exceeded the set limit.

λ_1 : Slip ratio

The signal for the condition where the wheel speed is less than the travel speed and has exceeded the set limit.



ASR (Automatic spin regulator)



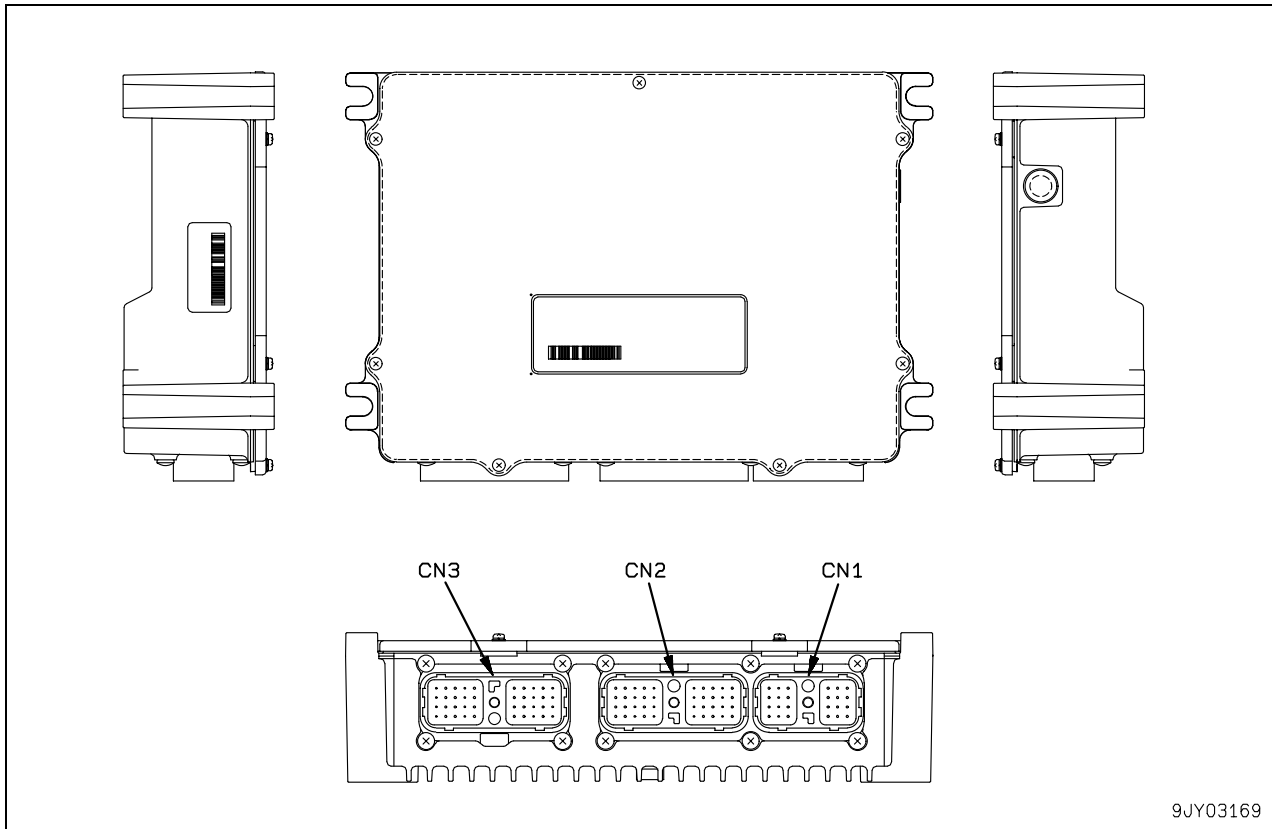
When ASR does not operate

- While the vehicle is travelling normally and the speeds of both rear wheels are not much different from each other, ASR does not operate and the brake is not applied to the drive wheels.
- When the vehicle turns, ASR still does not operate since the condition for starting the control changes according to the steering angle. ASR will operate if the vehicle turns on a slippery road and the speeds of the drive wheels become greater from each other than what they should at a given steering angle.

When ASR operates (When vehicle starts)

- If the speeds of both drive wheels become different from each other while the accelerator pedal is depressed as shown in the graph, the slipping wheel is braked so that the speeds of both wheels will be the same.

ABS controller



Outline

- This calculates the wheel speed and dummy machine speed from the signals sent by the wheel speed sensors installed to each wheel. It then sends a control signal to the control valve for the wheel which is slipping or where there is a possibility of locking. If the system becomes abnormal, the ABS controller displays related error codes and stops the system and then works as a normal brake.

Input and output signal

CN1

Pin No.	Signal name	Input/output signal
1	ABS CONTROL PRESSURE (RL)	Input
2	NC	Input
3	NC	Input
4	GND_SIG_D	—
5	NC	Input
6	NC	Input
7	ABS CONTROL PRESSURE (RR)	Input
8	NC	Input
9	NC	Input
10	GND_SIG_D	—
11	NC	Input
12	NC	Input

CN2

Pin No.	Signal name	Input/output signal
1	NC	Output
2	NC	Input
3	NC	Input
4	NC	Input
5	NC	Input
6	NC	Input
7	NC	Input
8	NC	Output
9	NC	Output
10	WHEEL SPEED (RL)	Input
11	NC	Output
12	NC	—
13	NC	Input
14	NC	Output
15	NC	Input
16	NC	Input
17	NC	Input
18	NC	Output
19	NC	Output
20	WHEEL SPEED (RR)	Input

CN3

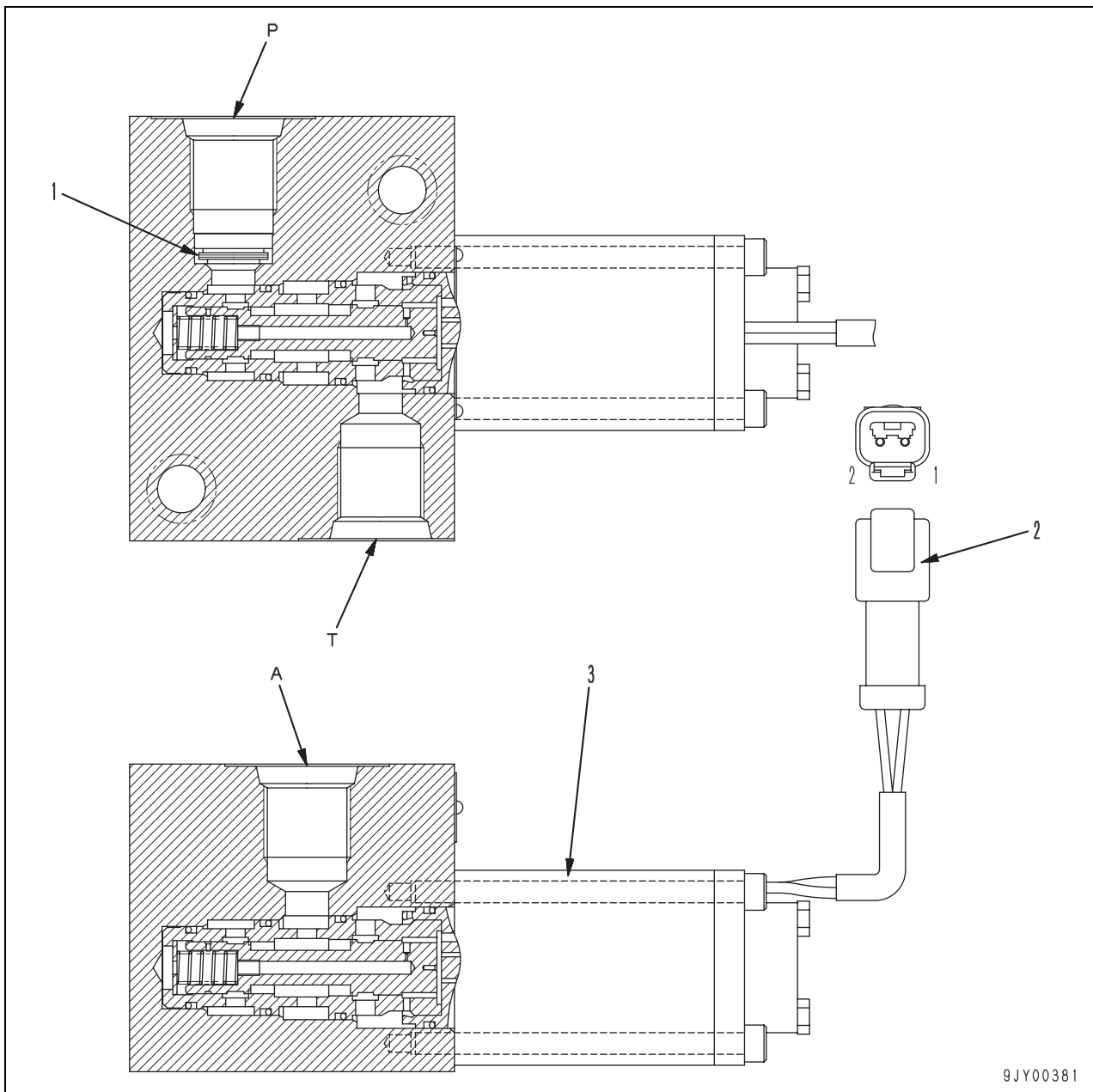
Pin No.	Signal name	Input/output signal
1	PWR_IN_BATT	Input
2	PWR_IN_BRY	Input
3	GND_ACT	Input
4	NC	Output
5	NC	Output
6	ABS CONTROL VALVE (FR)	Output
7	NC	Output
8	ABS CUT VALVE (F)	Output
9	NC	Input
10	NC	Input
11	PWR_IN_BATT	Input
12	PWR_IN_BRY	Input
13	GND_ACT	Input
14	PER_CTR_KEY	Input
15	NC	Output
16	ABS CONTROL VALVE (FL)	Output
17	NC	Output
18	ABS CUT VALVE (F)	Output
19	NC	Input
20	NC	Input

Pin No.	Signal name	Input/output signal
13	ABS CONTROL PRESSURE (FL)	Input
14	NC	Input
15	R TERMINAL SIGNAL	Input
16	PWR_OUT_SENS	Output
17	ABS CUT PRESS SW (R)	Input
18	NC	Input
19	ABS CONTROL PRESSURE (FR)	Input
20	NC	Input
21	GND_SIG_A	—
22	POT_PWRO	Output
23	ABS CUT PRESS SW (F)	Input
24	NC	Input

Pin No.	Signal name	Input/output signal
21	NC	Input/output
22	COMM_CAN_L_O	Input/output
23	NC	Input/output
24	PER_CTR_EXT	Input
25	NC	Input
26	NC	Input
27	NC	Input
28	NC	Input
29	GND_SIG_P	—
30	WHEEL SPEED (FL)	Input
31	GND (S_NET_GND)	—
32	COMM_CAN_H_O	Input/output
33	NC	Input/output
34	NC	—
35	KEY SW C (ENGINE START)	Input
36	NC	Input
37	NC	Input
38	NC	Input
39	GND_SIG_P	Input
40	WHEEL SPEED (FR)	Input

Pin No.	Signal name	Input/output signal
21	GND_PWR	Input
22	PWR_IN_BRY	Input
23	GND_ACT	Input
24	PWR_CTR_KEY	Input
25	NC	Output
26	ABS CONTROL VALVE (RR)	Output
27	NC	Output
28	NC	Output
29	NC	Input
30	NC	Input
31	GND_PWR	Input
32	GND_PWR	Input
33	GND_PWR	Input
34	NC	Output
35	NC	Output
36	ABS CONTROL VALVE (RL)	Output
37	NC	Output
38	NC	Output
39	NC	Input
40	NC	Input

ABS control valve



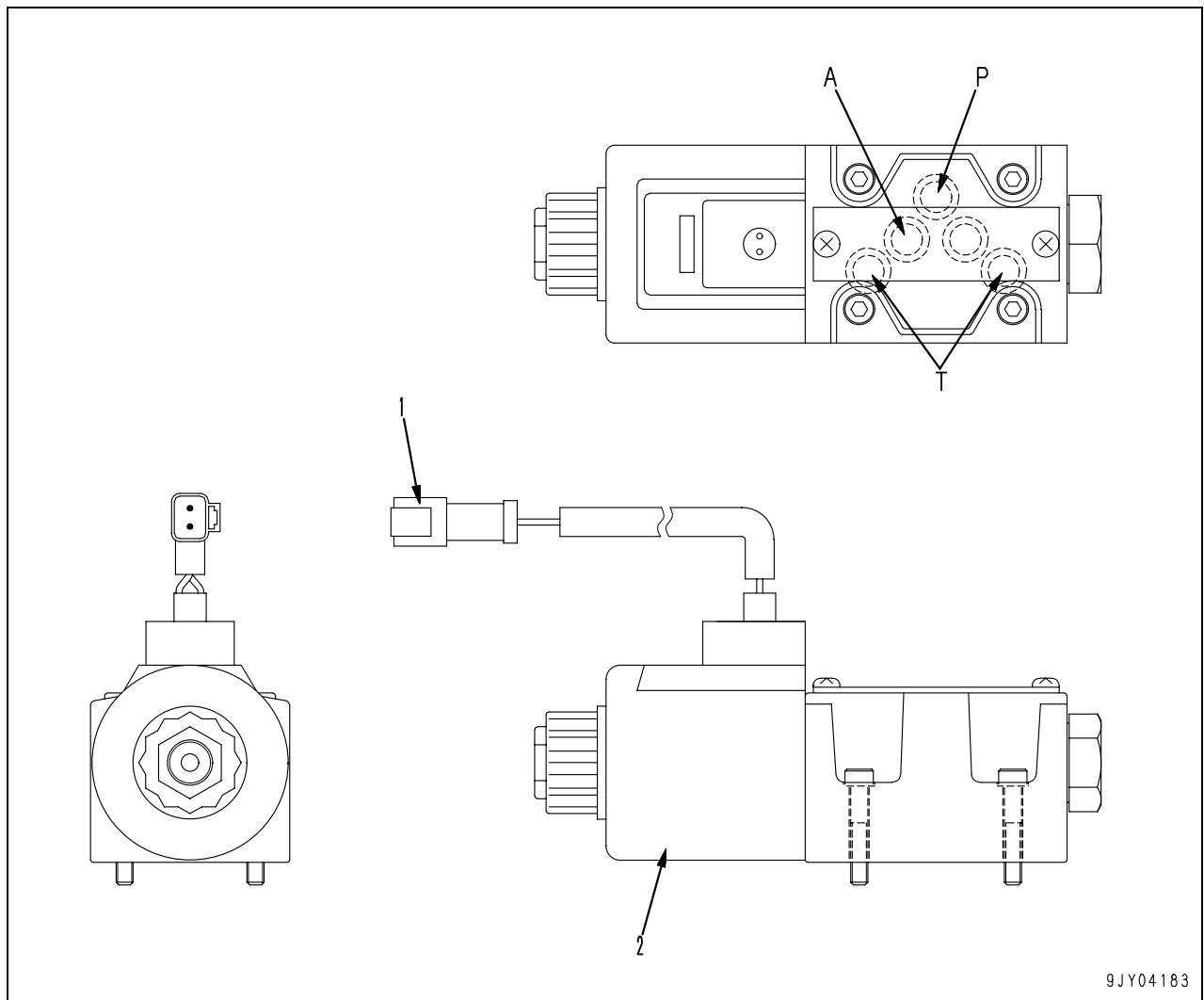
1. Filter
2. Connector
3. Solenoid assembly

A: To slack adjuster
P: From brake valve
T: To brake system tank

Function

- The ABS control valve is installed between the brake valve and slack adjuster. It changes the discharge oil pressure to control the braking force according to the electric output from the ABS controller.

ABS ON/OFF valve



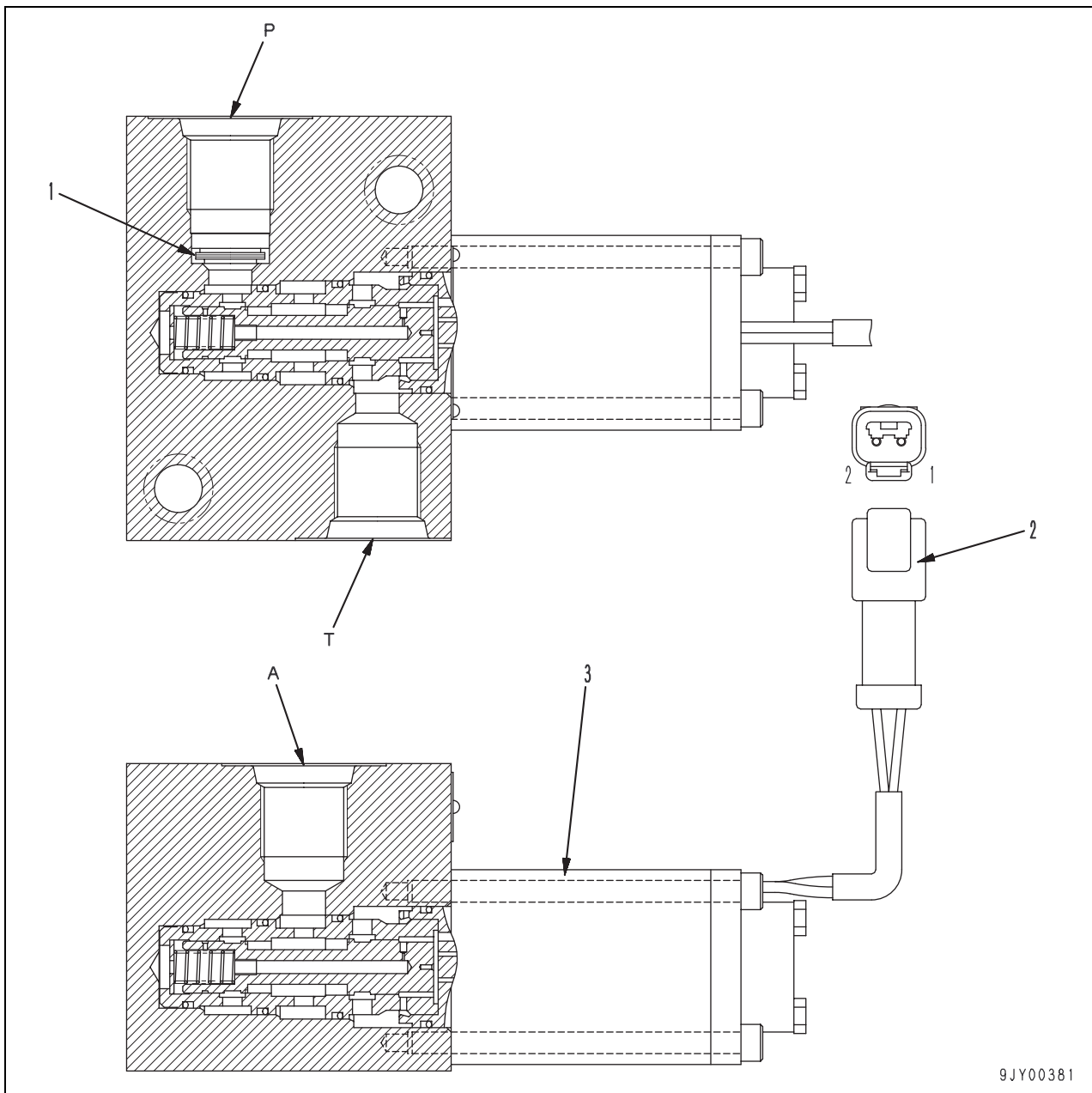
1. Connector
2. Solenoid

A: To slack adjuster
P: From brake valve
T: To brake system tank

Function

- The ABS ON/OFF valve is installed between the brake valve and slack adjuster.
- If the ABS switch is turned ON, the solenoid valve is energized to make the ABS hydraulic circuit effective.
- If the ABS switch is turned OFF, the solenoid valve is de-energized and the ABS control valve output is minimized to make the ABS hydraulic circuit ineffective.

ASR control valve



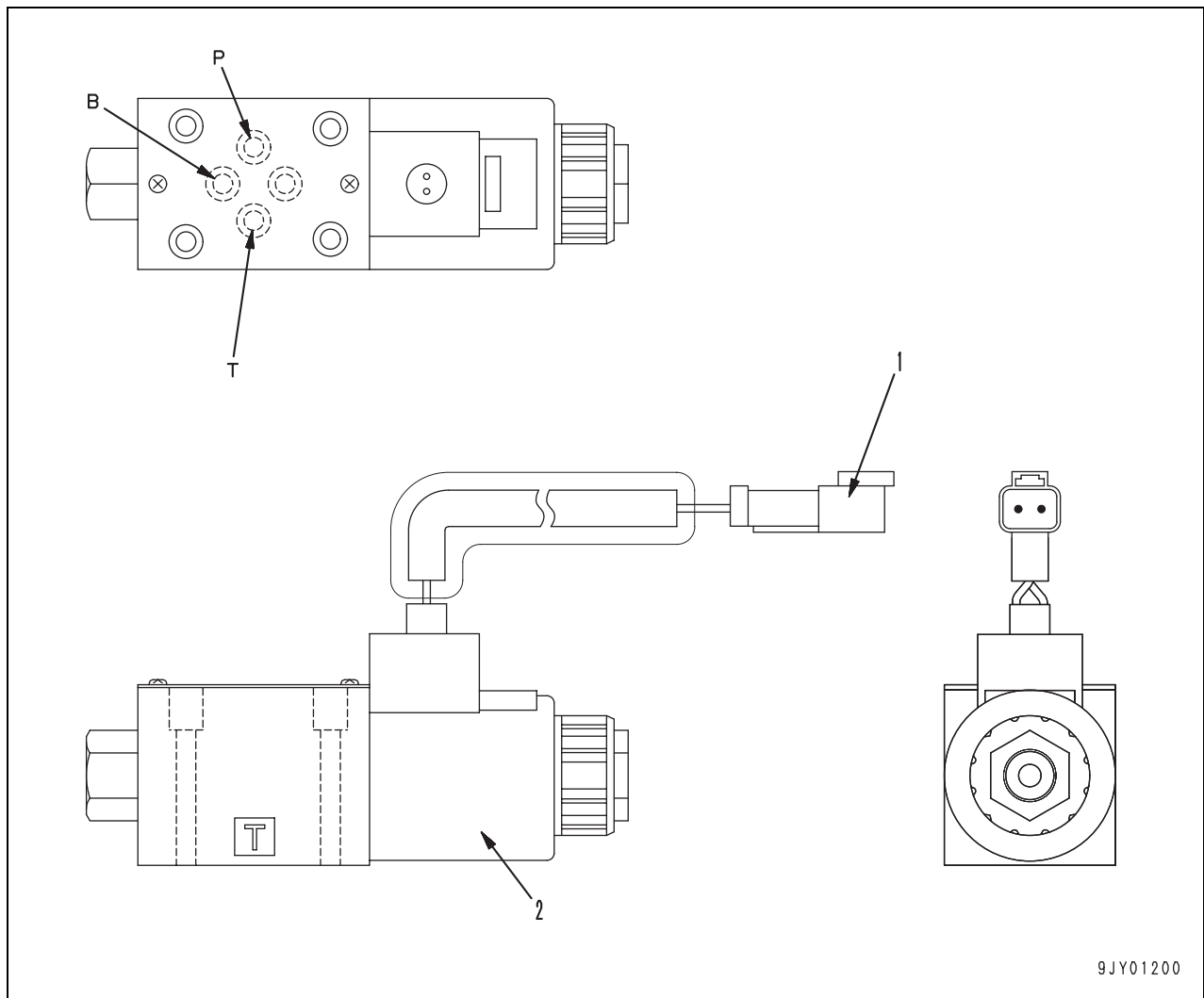
1. Filter
2. Connector
3. Solenoid assembly

A: To slack adjuster
P: From accumulator
T: To brake system tank

Function

- The ASR control valve is installed between the accumulator and slack adjuster. It changes the discharge oil pressure to control the braking force according to the ASR control electric output from the retarder controller.

ASR shut-off valve



1. Connector
2. Solenoid

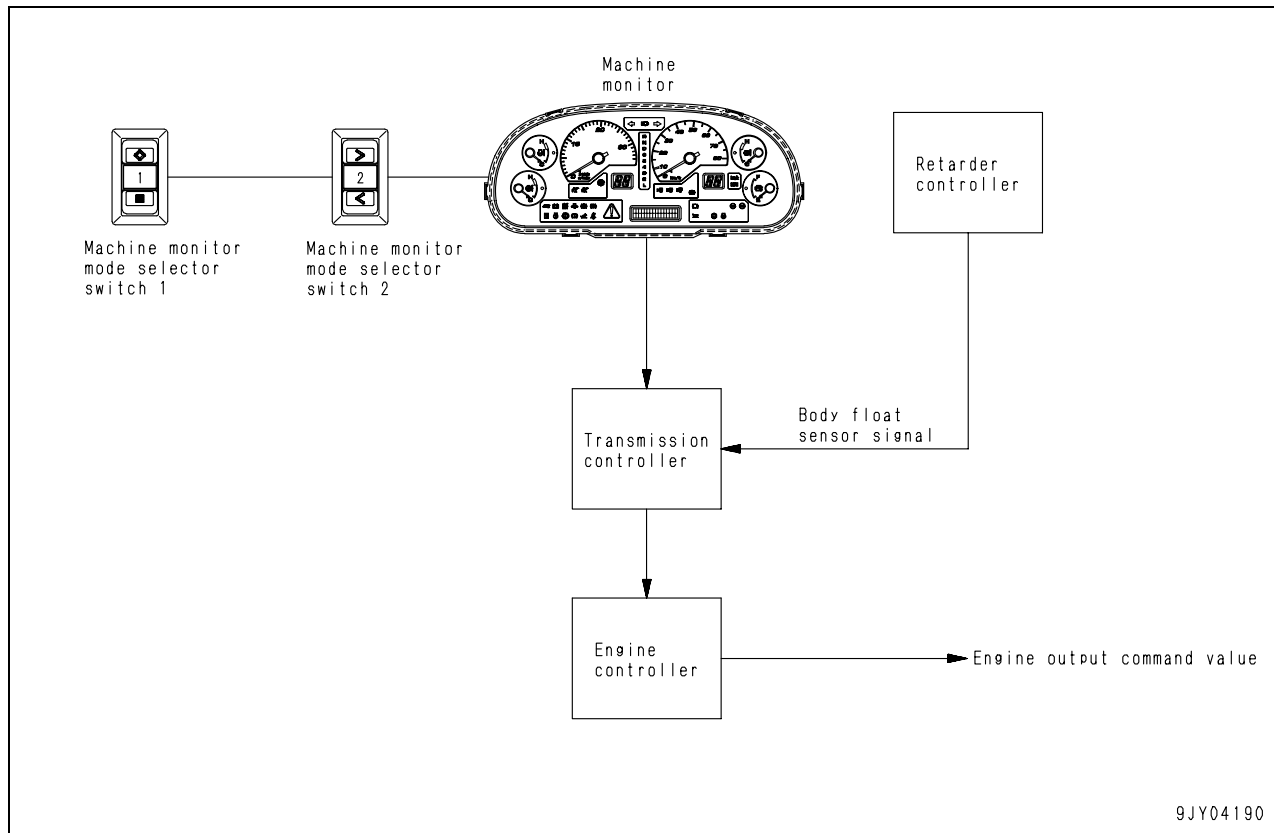
A: To ASR control valve
 P: From accumulator
 T: To brake system tank

Function

- The ASR shut-off valve is installed between the accumulator and ASR control valve.
- If the ASR switch is turned ON, the solenoid valve is energized to make the ASR hydraulic circuit effective.
- If the ASR switch is turned OFF, the solenoid valve is de-energized to make the ASR hydraulic circuit ineffective.

Altitude setting function

System configuration



Outline

- This function is used to prevent breakage of the pump caused by cavitation which occurs when the machine is used at high altitude and the pump suction pressure lowers below the cavitation limit.
 - If the machine is used at a high altitude, the internal pressure of the hydraulic tank lowers and the oil level in the hydraulic tank also lowers when the dump body is raised and consequently the suction pressure of the hydraulic pumps (steering and hoist) lowers. Accordingly, while the dump body is not seated at an altitude of 2,350 m or higher, the engine speed is lowered to lower the hydraulic pump speed and prevent cavitation in the hydraulic pumps.
 - The setting changes as follows according to the job site altitude.
 - From lowland to altitude of 2,350 m (Standard)
 - Above altitude of 2,350 m to 3,000 m
 - Above altitude of 3,000 m to 4,500 m.
- ★ For the setting method, see "Testing and adjusting".

High idle no-load engine speed at each altitude while body is not seated

Unit: rpm

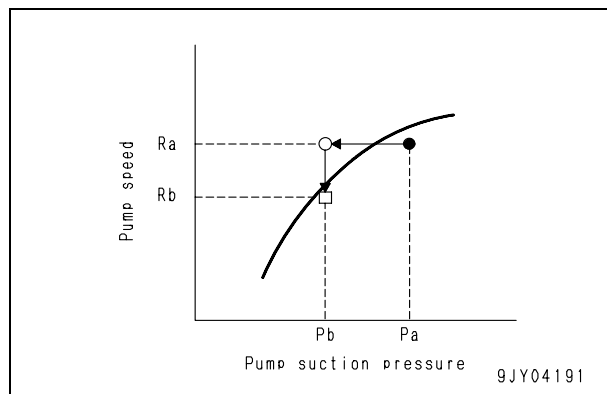
	Power mode		Economy mode	
	Loaded	Empty	Loaded	Empty
From lowland to altitude of 2,350 m (Standard)	2,250 ± 50	2,250 ± 50	2,250 ± 50	2,100 ± 50
Above altitude of 2,350 m to 3,000 m	2,220 ± 50	2,220 ± 50	2,220 ± 50	2,100 ± 50
Above altitude of 3,000 m to 4,500 m	1,825 ± 50	1,825 ± 50	1,825 ± 50	1,825 ± 50

- While the body is seated, this function does not control the engine speed and the engine speed is set to the standard speed (the value of "From lowland to altitude of 2,350 m (Standard)" in the above table), regardless of the altitude setting.
If the retarder controller CAN communication has an error, however, the engine speed is lowered to the speed of the set altitude.

Principle of prevention of cavitation

- Occurrence of cavitation in a pump depends on the relationship between the pump speed and pump suction pressure. Accordingly, when the job site is at a high altitude and reduction of the pump suction pressure is expected, the engine speed is reduced to reduce the pump speed and prevent cavitation.
- At a low altitude, the pump is used in the lower area of the pump cavitation limit curve and cavitation does not occur. (Position ● in the figure)
If the pump is operated at a high altitude without changing its speed, however, its suction pressure lowers by the increase of the altitude and it is used in the higher area of the pump cavitation limit curve and cavitation occurs. (Position ○ in the figure)
Accordingly, the engine speed is controlled to lower the pump speed below the cavitation limit curve and prevent cavitation. (Position □ in the figure)

Cavitation occurrence limit curve



- : Pump speed and suction pressure at low altitude
- : Pump speed and suction pressure expected at high altitude
- : Pump speed and suction pressure when pump speed is changed by altitude setting

Control flow**<Machine monitor>**

- Transmits the altitude data.
From lowland to altitude of 2,350 m (Standard)
Above altitude of 2,350 m to 3,000 m
Above altitude of 3,000 m to 4,500 m
- Transmits the engine mode data.
Power mode
Economy mode

<Retarder controller>

- Transmits the body seating data.
Seated
Not seated
- Transmits the truck load data.
Empty
Loaded

<Transmission controller>

Selects the engine speed upper limit according to the information from the machine monitor and retarder controller.

<When body is not seated>

Depends on the altitude setting.

<When body is seated>

Selects "From lowland to altitude of 2,350 m (Standard)", regardless of the altitude setting.

<When retarder controller CAN communication has error>

Selects the value of the set altitude, regardless of the seating condition.

<Engine controller>

Outputs a command value to select the lower one of the high idle no-load engine speed determined by the input to the engine controller and that determined by the signal from the transmission described above.

High idle no-load engine speed

<When body is not seated>

Unit: rpm

	Power mode		Economy mode	
	Loaded	Empty	Loaded	Empty
From lowland to altitude of 2,350 m (Standard)	2,250	2,250	2,250	2,100
Above altitude of 2,350 m to 3,000 m	2,220	2,220	2,220	2,100
Above altitude of 3,000 m to 4,500 m	1,825	1,825	1,825	1,825

<When body is seated>

Selects "From lowland to altitude of 2,350 m (Standard)", regardless of the altitude setting.

<When retarder controller CAN communication has error>

Selects the value of the set altitude, regardless of the seating condition.

HD785-7 Dump truck

Form No. SEN01291-01

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

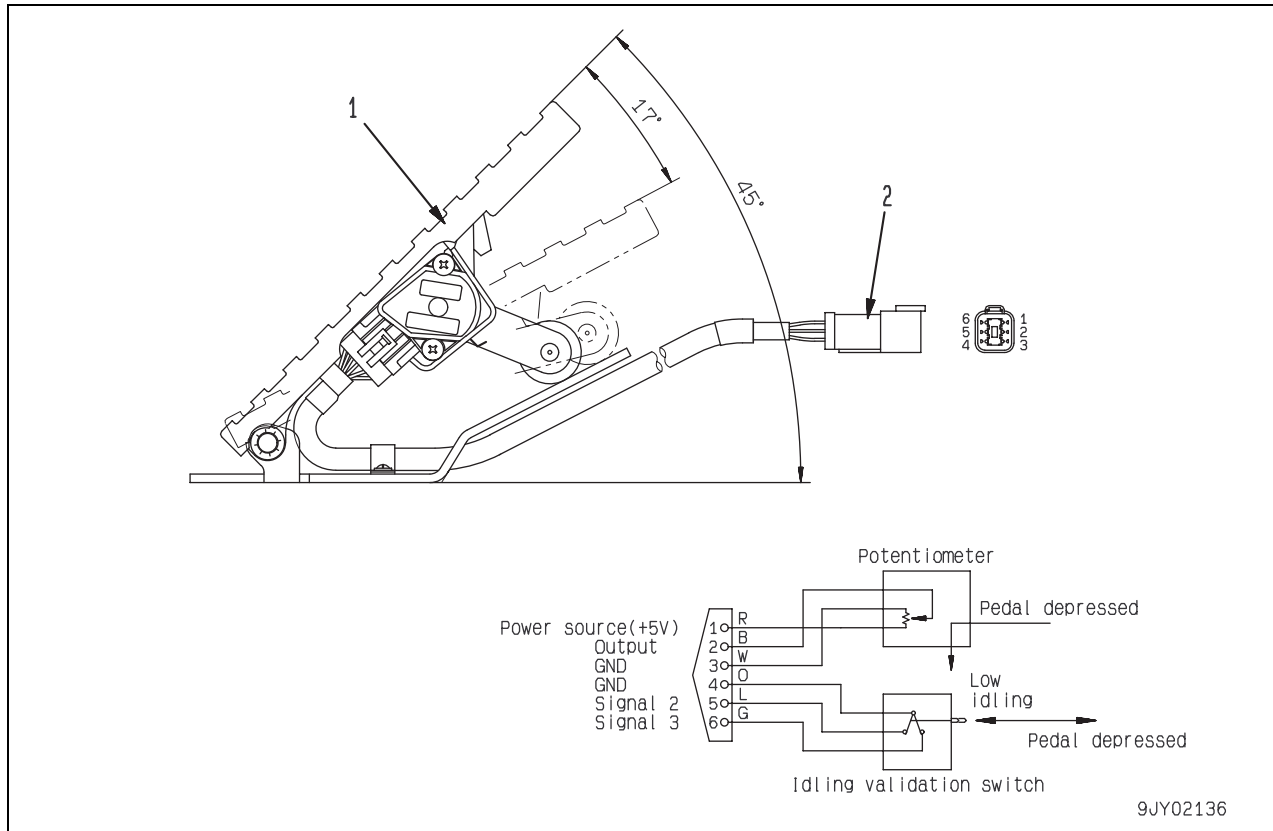
10 Structure, function and maintenance standard

Electrical system, Part 4

Sensors, switches	2
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Sensors, switches

Accelerator sensor



1. Pedal
2. Connector

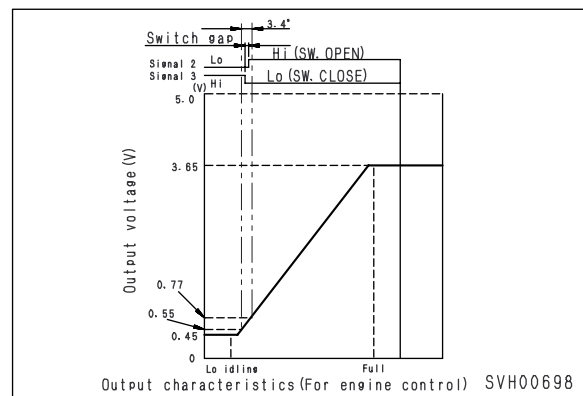
Outline

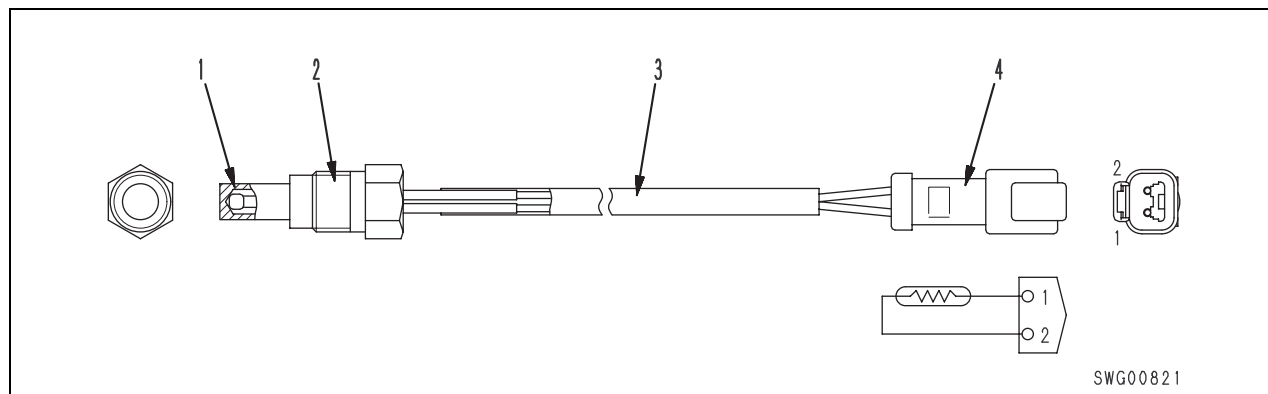
Accelerator signal

- This is installed under the operator's cab. The accelerator pedal and accelerator sensor are connected by a link. When the accelerator pedal is depressed, the movement is passed through the link and rotates the shaft of the potentiometer inside the accelerator sensor. As a result, the resistance changes. A fixed voltage is impressed between the No. 1 – 3 pins of the potentiometer. A voltage signal corresponding to the angle of the accelerator pedal is sent from the No. 2 pin to the engine controller.

Idle validation signal

- This is installed under the accelerator pedal. When the accelerator pedal is released, signal 2 (No. 5 pin) is connected to the ground; when the accelerator pedal is depressed, signal 3 (No. 6 pin) is connected to the ground. The engine controller then detects the condition.



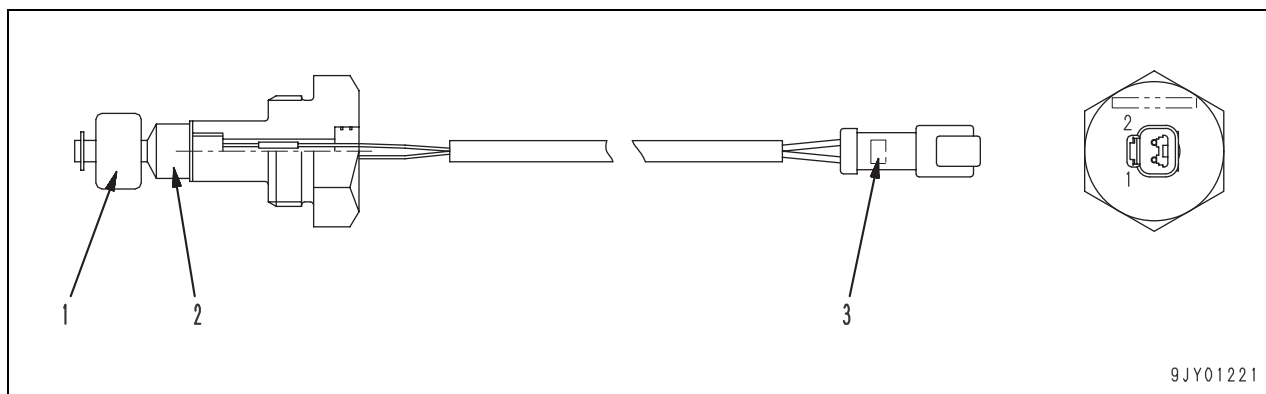
Retarder oil temperature sensor**Steering oil temperature sensor**

1. Thermistor
2. Plug
3. Wiring harness
4. Connector

Function

- The retarder oil temperature sensor is installed on the retarder pipe. It converts a temperature change into a change of thermistor resistance, and transmits a signal to the retarder controller. The retarder controller transmits the signal via the network to the machine monitor panel, and the machine monitor panel displays a temperature level. The temperature level displayed on the monitor panel reaches a predetermined position, the lamp flashes and the warning buzzer sounds.
- The steering oil temperature sensor is installed to the steering and hoist piping. The sensor portion detects the temperature, and when the oil temperature goes above the specified level, the warning lamps lights up and a message is displayed on the character display of the monitor panel.

Coolant level sensor

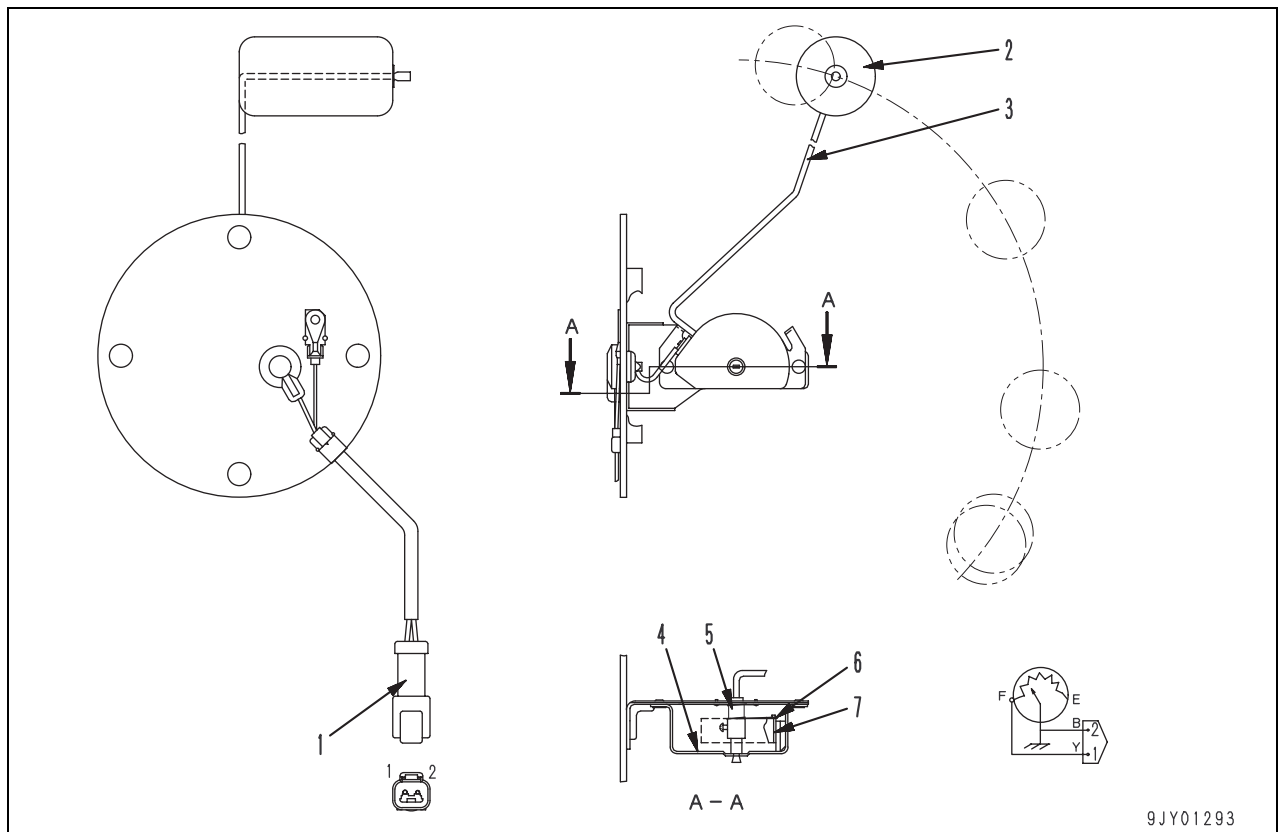


1. Float
2. Sensor
3. Connector

Function

- This sensor is installed to the top of the radiator, and when the coolant level goes below the specified level, the float goes down and the switch goes OFF. The maintenance caution lamp lights up and the character display shows message to warn of abnormality.

Fuel level sensor

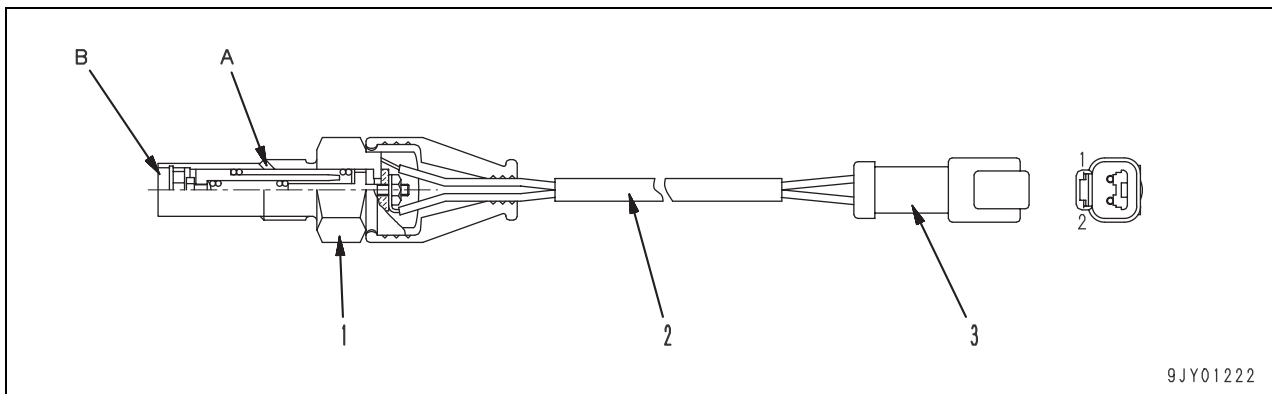


1. Connector
2. Float
3. Arm
4. Body
5. Spring
6. Contact
7. Spacer

Function

- The fuel sensor is installed to the side face of the fuel tank. The float moves up and down according to the fuel level. This movement of the float is transmitted by the arm and actuates a variable resistance. This sends a signal to the monitor panel to indicate the remaining fuel level. When the display of the monitor panel reaches a certain level, a warning lamp flashes.

Transmission oil filter clogging sensor



1. Body
2. Tube
3. Connector

A: Low pressure pickup port
B: High pressure pickup port

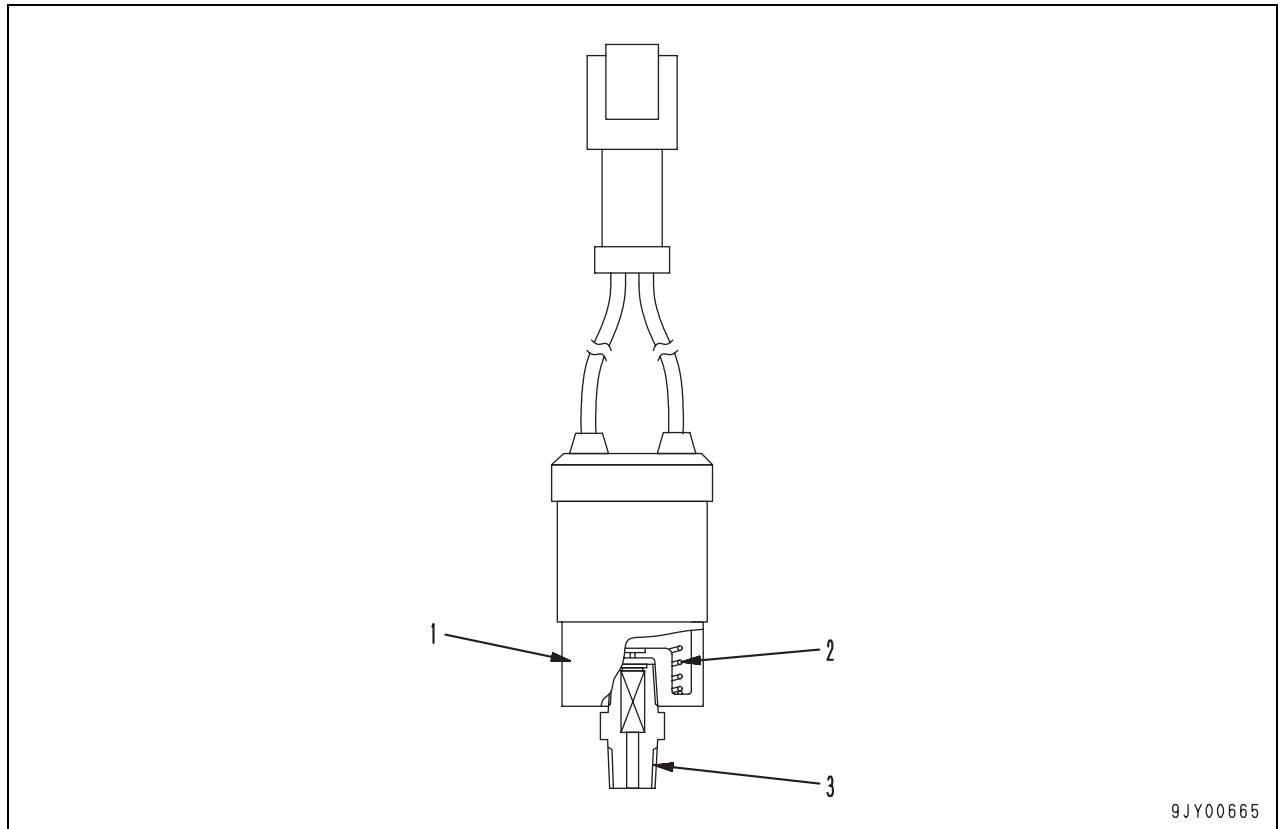
Function

- This sensor are installed to each filter, and when the filter becomes clogged, and the difference in pressure between the low-pressure side and high-pressure side reaches the specified pressure, the switch goes OFF. The maintenance caution lamp lights up and the character display shown message to warn of abnormality.

Actuating pressure: 275 kPa {2.8 kg/cm²}

Principle of switch: Pressure difference sliding piston type

Air cleaner clogging sensor



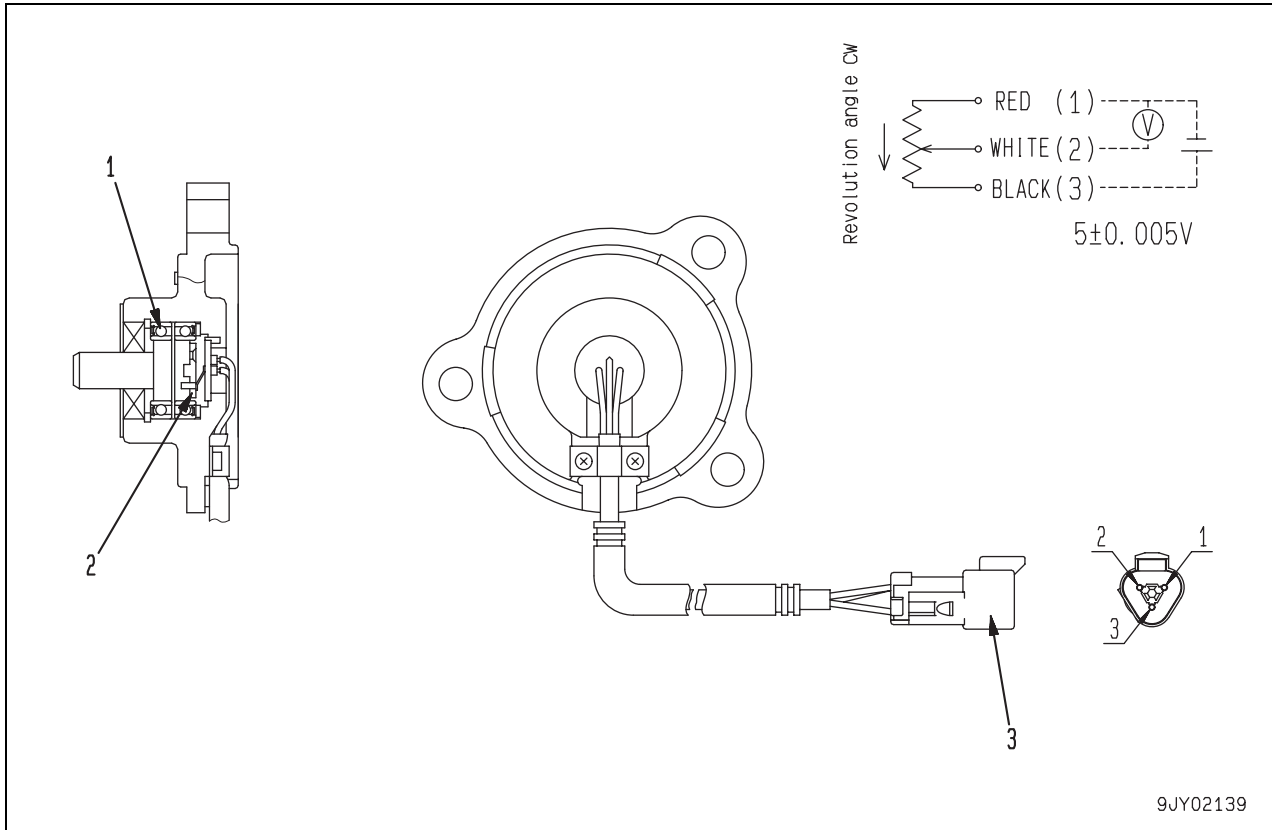
1. Indicator
2. Spring
3. Adapter

Function

- The air cleaner clogging sensor is installed to the outward port of the air cleaner. If the air cleaner becomes clogged and reaches the set pressure (negative pressure), the maintenance caution lamp lights up and character display shows message to warn of the abnormality.

Body positioner sensor

Steering angle sensor (for ASR)

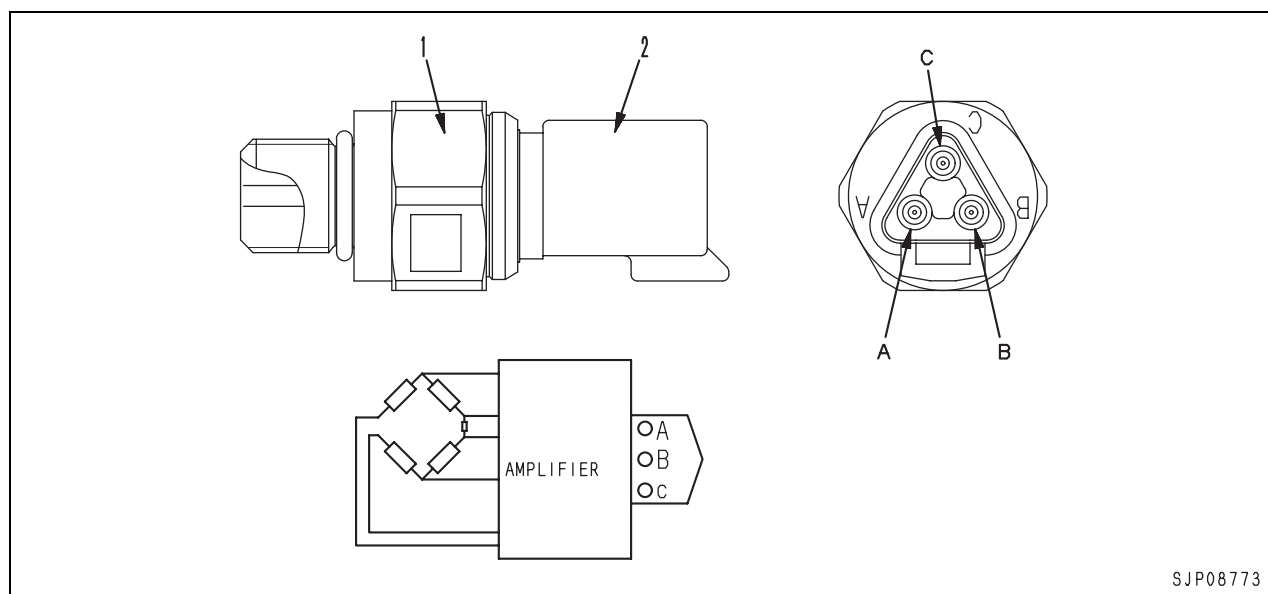


1. Bearing
2. Brush Assembly
3. Connector

Function

- The body position sensor is installed to the rear of the chassis. When the angle of the dump body changes, the shaft rotates through the link installed to the dump body, and the dump body angle is detected.
- The steering angle sensor is installed to the center lever and transmits voltage signals to the controller according to the center lever angle.

Accumulator oil pressure sensor

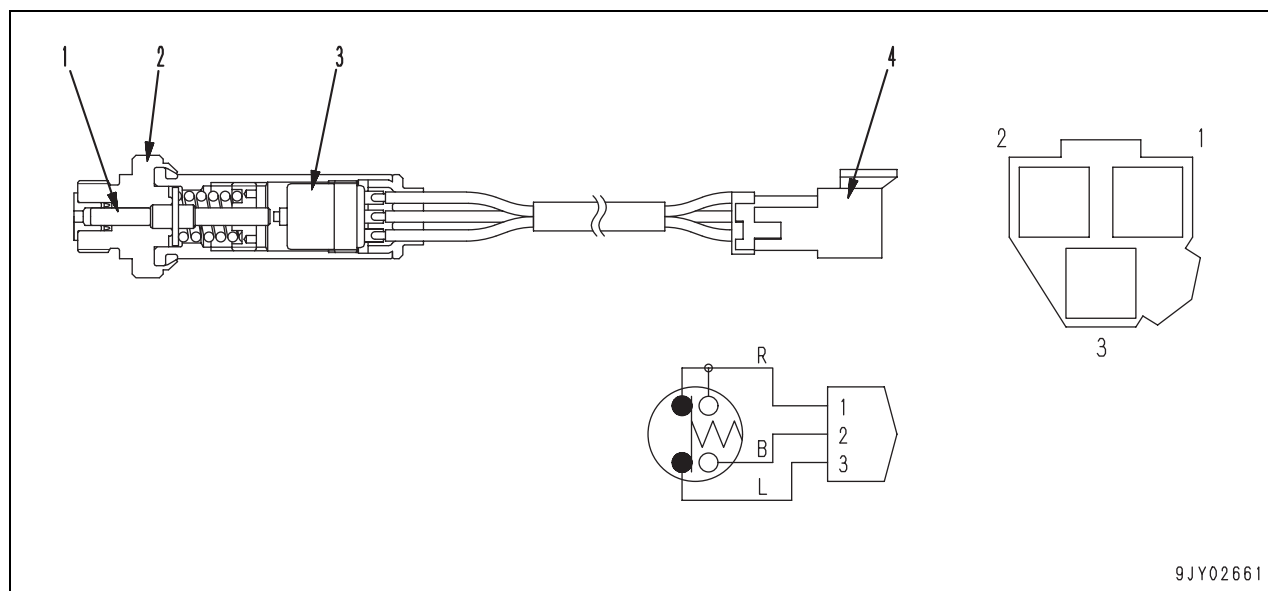


1. Sensor
2. Connector

Function

- The accumulator oil pressure sensor is installed to the accumulator piping on the right side of the machine and its sensor section senses the oil pressure. If the oil pressure lowers below the set level, the warning lamp lights up and the message is indicated on the character display of the monitor panel.

Steering oil pressure switch (For auto emergency steering system)

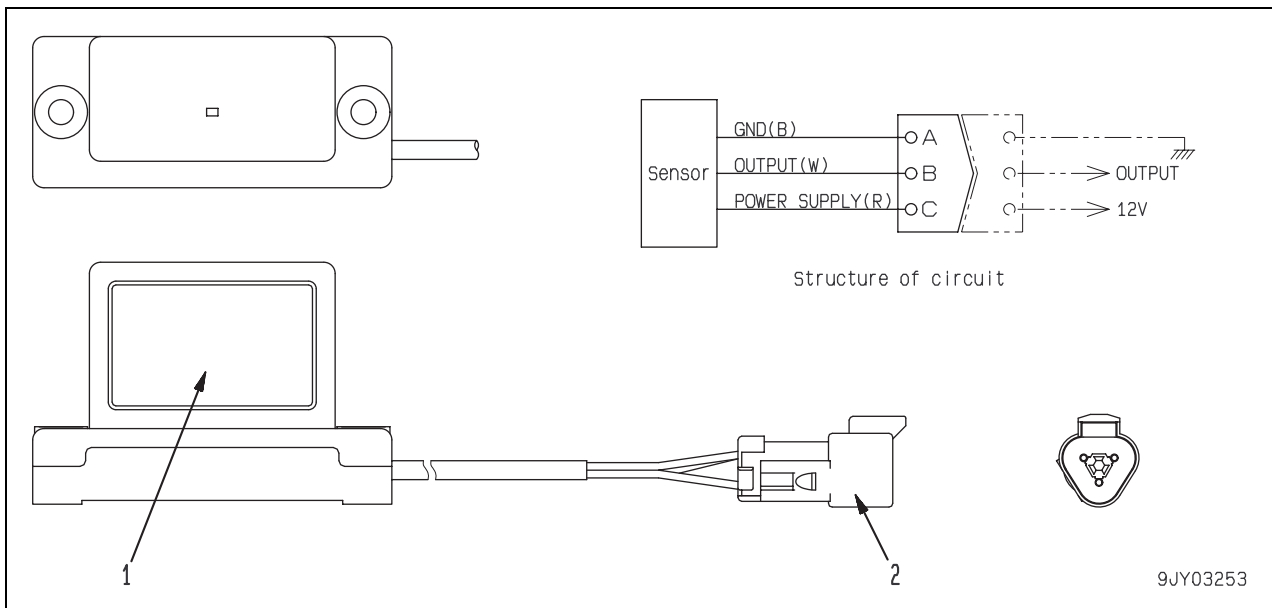


1. Piston
2. Body
3. Switch
4. Connector

Function

- The steering oil pressure switch is installed to the steering and hoist piping. While the engine is running, if the steering circuit oil pressure lowers below the set level, the steering oil pressure switch operates the electric pump to secure the oil pressure for steering.

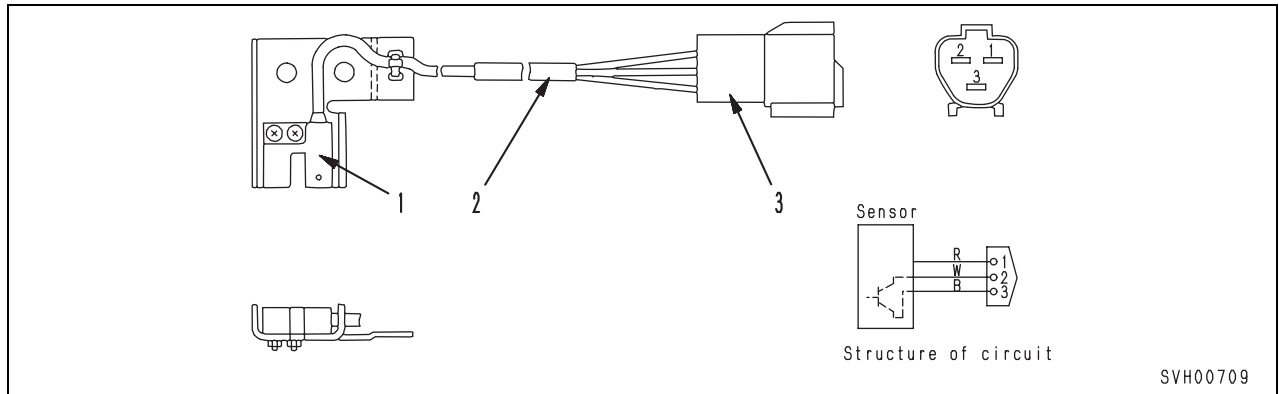
Tilt switch



Function

- When the machine tilts to the left or right and become into the roll-over danger range, If the dump lever is operated to the RAISE position in this condition, the lamp lights up and the buzzer sounds to warn of the danger.

Steering angle sensor (For auto suspension system)



1. Body
2. Tube
3. Connector

Principle of operation:

Magnetic contactless proximity switch

Form of output:

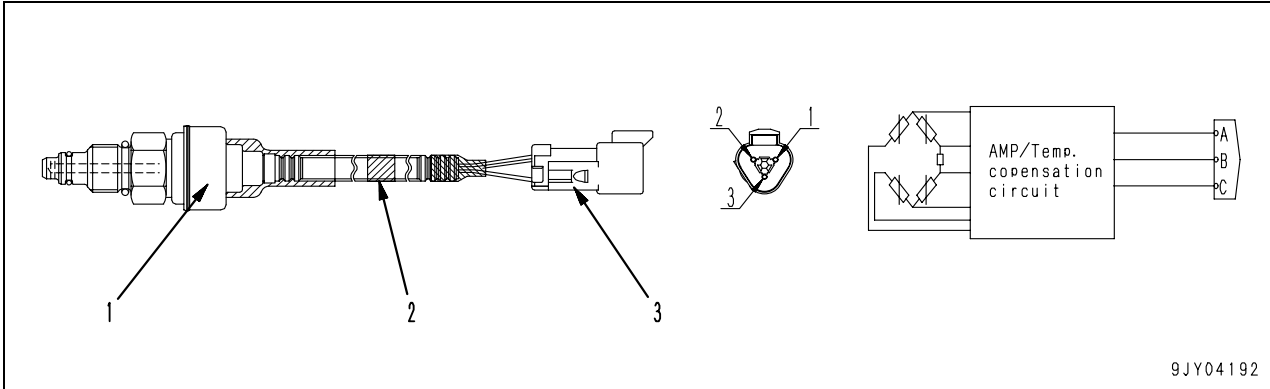
Turning ON when object of sensing approaches.

Function

- A round disc with teeth like a comb is installed to the steering column. As this disc passes through the slit in the sensor, the sensor outputs a pulse signal. The suspension controller can obtain the steering speed from the number of pulses per time.

Pressure sensor (For auto suspension system, for ARSC, for ABS)

Suspension oil pressure sensor

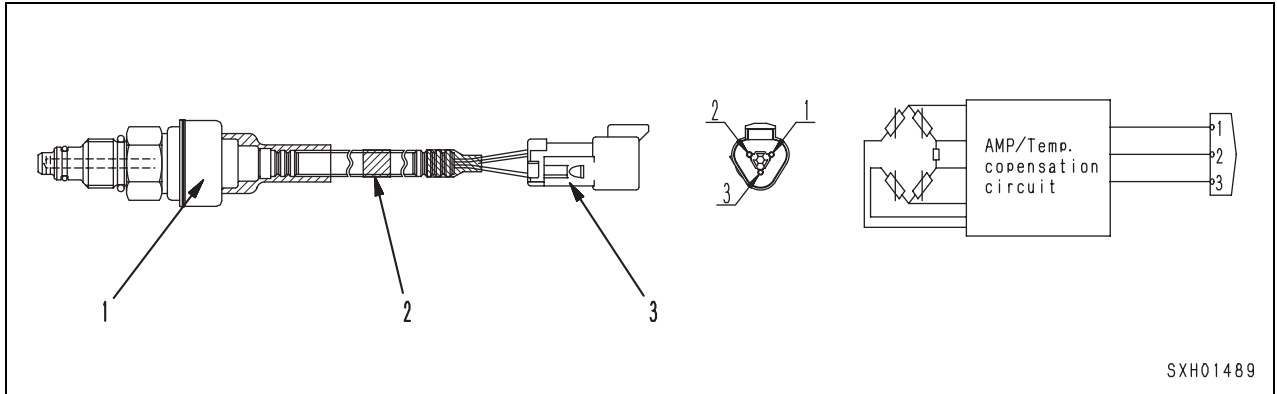


1. Sensor
2. Tube
3. Connector

Function

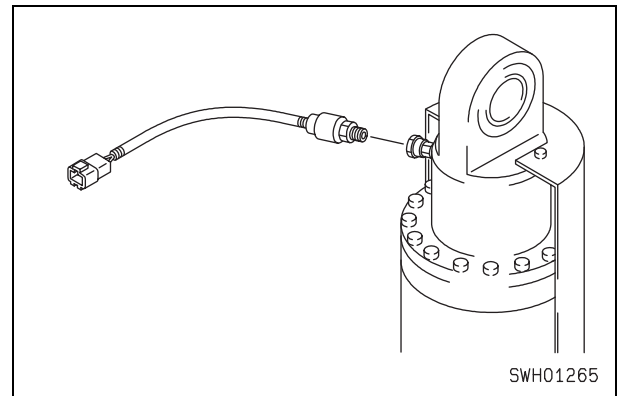
- The suspension oil pressure switch is installed to the suspension cylinder. If the pressure supplied through the pressure inlet is applied to the diaphragm of the pressure sensor section, the diaphragm is deflected and deformed. A bridge consisting of strain gauges is installed on the opposite side of the diaphragm. If the diaphragm is deflected, the resistance of the strain gauges changes. A constant voltage is applied to the strain gauges and the change of the resistance of the strain gauges is sent as a change of voltage to the amplifier. The amplifier amplifies the change of the voltage and outputs it to the controller.
- The pressure sensor for ABS is installed to the output line of each ABS control valve. If the pressure supplied through the pressure inlet is applied to the diaphragm of the pressure sensor section, the diaphragm is deflected and deformed. A bridge consisting of strain gauges is installed on the opposite side of the diaphragm. If the diaphragm is deflected, the resistance of the strain gauges changes. A constant voltage is applied to the strain gauges and the change of the resistance of the strain gauges is sent as a change of voltage to the amplifier. The amplifier amplifies the change of the voltage and outputs it to the controller.

Pressure sensor (For payload meter)



1. Sensor
2. Tube
3. Connector

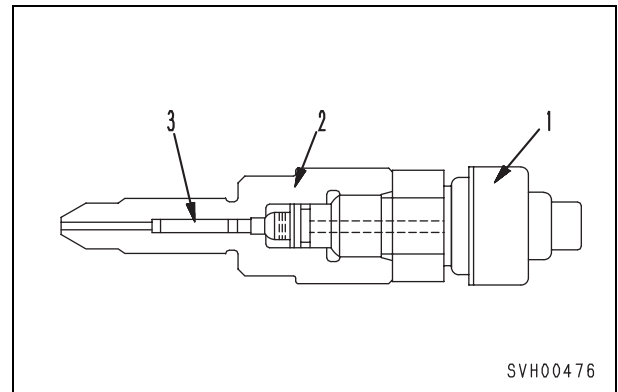
The pressure sensor is installed at the bottom end of the suspension cylinder and acts to measure the pressure at the cylinder bottom.



When replacing pressure sensor (1), leave the valve (2) installed to the suspension and remove only pressure sensor (1).

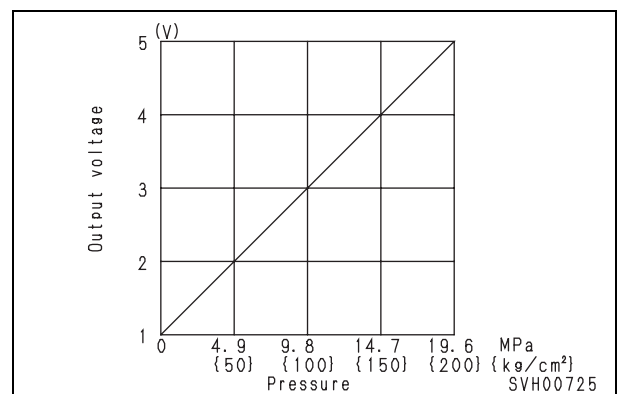
When removing or installing pressure sensor (1), be careful not to let valve (2) rotate.

When removing pressure sensor (1), the action of valve core (3) prevents the suspension pressure from going down.



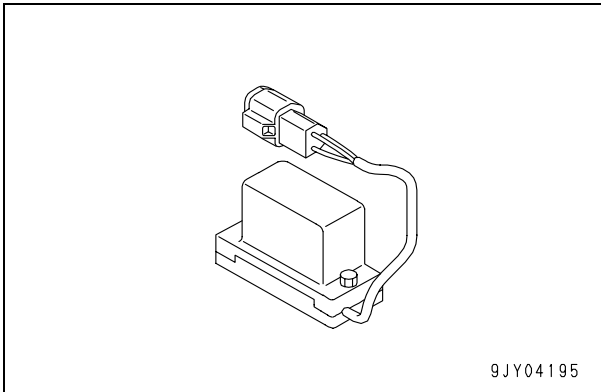
The output characteristics of the sensor are as shown in the diagram on the right.

Voltage between pin 1 (GND) and pin 3 (Output) of each pressure sensor connector or output voltage of each sensor (1, 2, 7, 8) when pin 9 of VHMS controller connector (CN2B) is grounded.



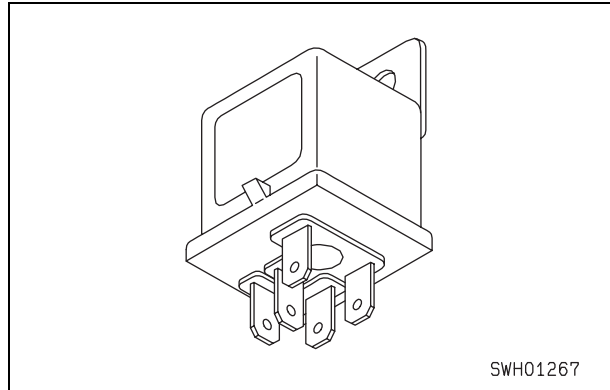
Clinometer (For payload meter)

To carry out compensation on slopes, the clinometer measures the tilt angle of the chassis in the front-to-rear direction.



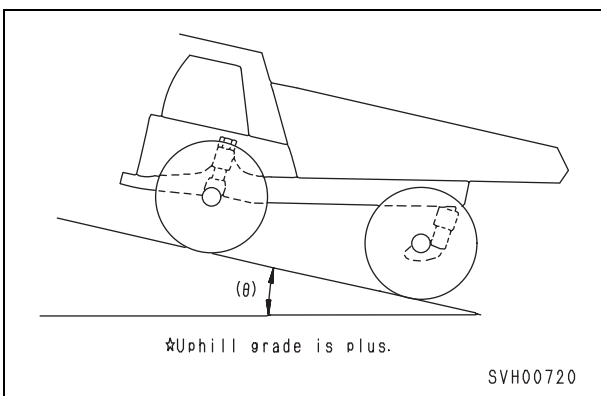
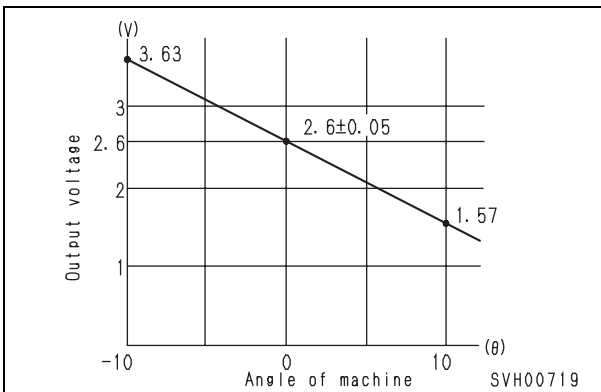
Lamp drive relay (For payload meter II)

The external display lamps are driven by a signal from the payload meter.



The output characteristics of the clinometer are as shown in the diagram.

Voltage between clinometer connector pin 1 (GND) and pin 2 (output) or voltage of output (pin (3)) of clinometer when pin (9) of VHMS controller connector (CN2B pin) is grounded

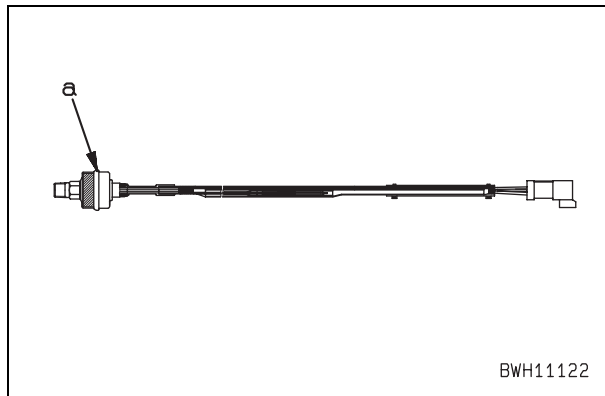


Blow-by pressure sensor (For VHMS)**Specifications**

1. Voltage of power supply: DC5V
2. Output voltage : 0.5V(engine stopped)
or more
3. Size: Mount (portion a) : R 1/4
: Outside diameter of
seat receiving pres-
sure: 37 mm
: Length of cable:
1,110 mm

Function

The blow-by sensor converts the pressure inside the engine crankcase into a voltage and inputs this into the VHMS controller as the blow-by pressure.

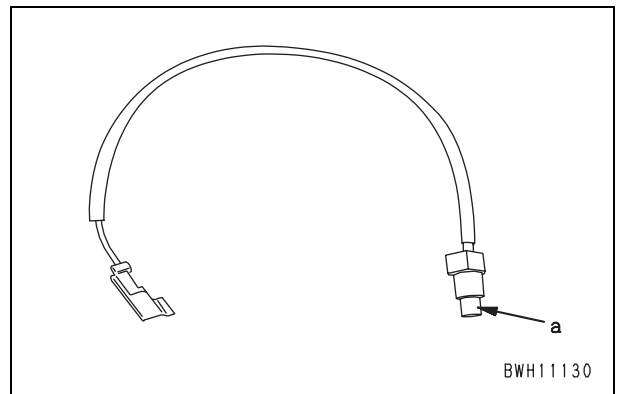
**Engine oil temperature sensor (For VHMS)****Specifications**

1. Type of sensor : Thermistor
2. Range of measurement : 40 – 130 °C
: 80 – 130 °C
(guaranteed precision
± 2 °C)
3. Max. power consumption: 0.5 mW
4. Pressure resistance : 4.9 MPa {50 kg/cm²}
5. Temperature range : -30 to 140 °C
6. Performance table

Tempera- ture (°C)	Resis- tance (kΩ)	Tempera- ture (°C)	Resis- tance (kΩ)	Tempera- ture (°C)	Resis- tance (kΩ)
30	35.27	80	6.571	110	2.887
40	24.28	85	5.682	115	2.544
50	17.05	90	4.931	120	2.248
60	12.20	95	4.293	125	1.992
70	8.884	100	3.750	130	1.769

Function

The engine oil temperature sensor is installed to the engine oil filter. It inputs the change in temperature to the VHMS controller as a change in the resistance of the thermistor.



- a: Heat sensing portion of sensor, outside diameter of mount R 1/4

Exhaust temperature sensor (For VHMS)

Specifications

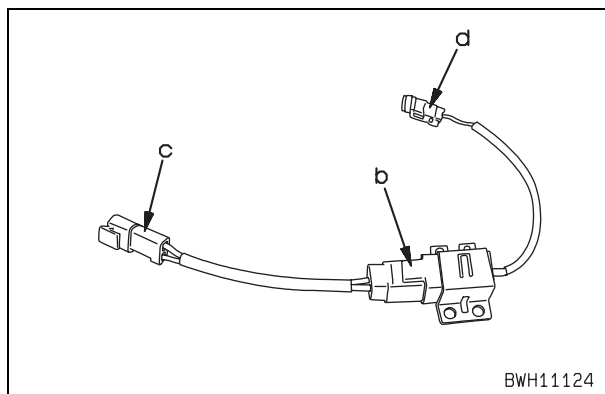
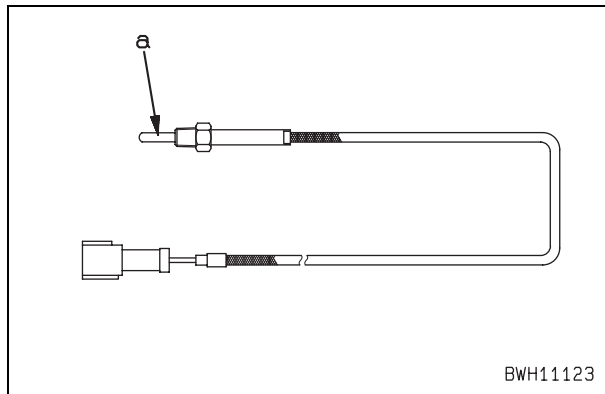
1. Rated voltage : DC24V
2. Detection temperature range : 100 – 1,000 °C
: 300 – 800 °C
(guaranteed accuracy ± 10 °C)
3. Output voltage characteristics: See table below
4. Actuation temperature range : -40 to 110 °C
5. Consumption current : Max. 30 mA
- a: Heat sensing portion of sensor, outside diameter of mount R 1/8
- b: Amp
- c: Connector (power source end)
- d: Connector (sensor end)

Output voltage characteristics
(ambient temperature: 20 °C) ... Reference value

Detection temperature (°C)	50	100	400	700	800
Output voltage (V)	1.191	1.397	2.626	3.899	4.316

Function

The exhaust temperature sensor is a thermoelectric type temperature sensor. It is installed to the turbo-charger inlet port and outputs the exhaust temperature data to the VHMS controller.



Ambient temperature sensor (For VHMS)

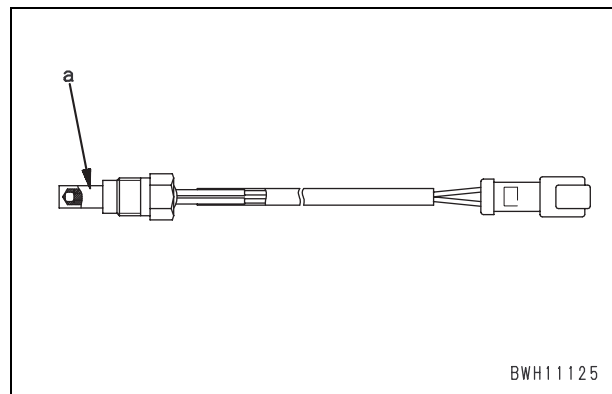
Specifications

1. Electricity consumption : Max. 0.5 mW
2. Pressure resistance : 0.98 MPa
{10 kg/cm²}
3. Detected temperature range (surrounding) : -30 to 120°C
4. Retention temperature range : -30 to 140°C
5. Performance table below

Detection temperature (°C)	-20	-10	0	10	20	50
Resistance (kΩ)	30.32	18.58	11.74	7.623	5.077	1.712

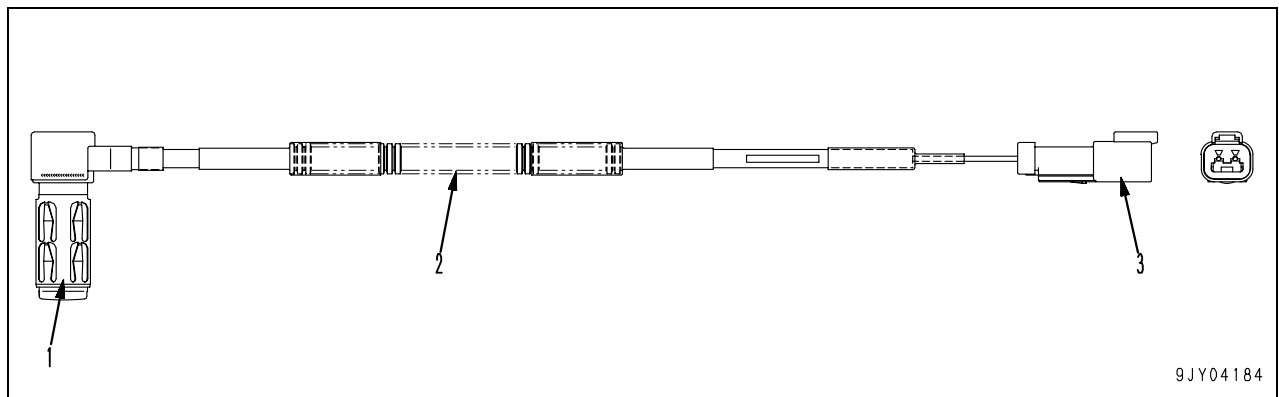
Function

The ambient temperature sensor inputs the ambient temperature to the VHMS controller as a change in the resistance of the thermistor.



- a: Heat sensing portion of sensor, diameter of mount 16 x 1.5

Wheel speed sensor (For ABS/ASR)

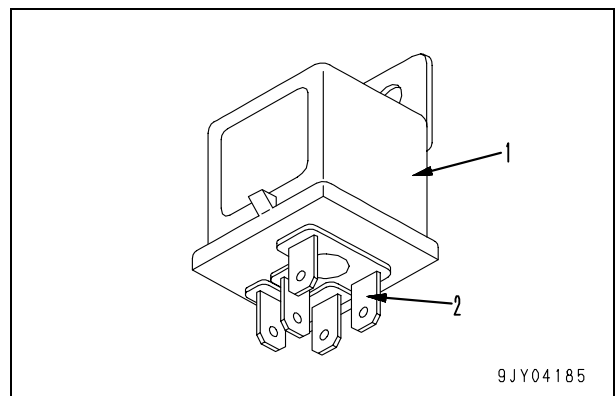


1. Spring spacer
2. Tube
3. Connector

Function

- This is non-conduct sensor. A pulse voltage is generated by rotation of the teeth of the gear installed to the outside of the pulse wheel, and a signal is sent to the controller.

Relay (For ABS ON/OFF valve)



1. Body
2. Terminal

HD785-7 Dump truck

Form No. SEN01292-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

20 Standard value table

Standard service value table

Standard value table for engine	2
Standard value table for machine	4

Standard value table for engine

Machine model					HD785-7		
Engine					SAA12V140E-3		
Classi- fication	Check item	Measurement conditions			Unit	Standard value for new machine	Permissible value
Engine	Engine speed	• Coolant temperature: Within operating range	High idle	Power mode (High load/ Low load)	rpm	2,250/2,250 ± 50	2,250/2,250 ± 50
				Economy mode (High load/ Low load)		2,250/2,100 ± 50	2,250/2,100 ± 50
				Reverse (RH) (High load/ Low load)		2,050/2,050 ± 50	2,050/2,050 ± 50
				Reverse (RL) Power mode (High load/ Low load)		2,250/2,250 ± 50	2,250/2,250 ± 50
				Reverse (RL) Economy mode (High load/ Low load)		2,250/2,100 ± 50	2,250/2,100 ± 50
		Low idle	High side	945 ± 50		945 ± 50	
			Low side	650 ± 25		650 ± 25	
		Rated speed	Power mode (High load/ Low load)	1,900/1,900 ± 50		1,900/1,900 ± 50	
			Economy mode (High load/ Low load)	1,900/1,800 ± 50		1,900/1,800 ± 50	
	Intake air pressure (Boost pressure)	• Engine coolant temperature: Within operating range • Power train oil temperature: Within oper- ating range • At rated speed			kPa {mmHg}	Min. 165.40 {Min. 1,250}	Min. 165.40 {Min. 1,250}
	Exhaust temperature	• Whole speed range (Ambient tempera- ture: 20 °C)			°C	Max. 700	750
	Exhaust gas color	• Engine coolant temper- ature: Within operat- ing range		At sudden acceleration (Low → High)	Bosch index	Max. 4.5	5.5
				At rated output		Max. 1.0	2.0
				At high idle		Max. 1.0	2.0
	Valve clearance	• Normal temperature		Intake valve	mm	0.35 ± 0.02	—
				Exhaust valve		0.57 ± 0.02	—
	Compression pressure	• Engine oil temperature: 40 – 60 °C • Engine speed: 210 – 250 rpm			MPa {kg/cm²}	Min. 4.1 {Min. 42}	2.8 {29}
	Blow-by gas pres- sure	• Engine coolant temperature: Min. 70 °C • At rated output			kPa {mmH₂O}	Max. 2.94 {Max. 300}	5.88 {600}

Machine model					HD785-7	
Engine					SAA12V140E-3	
Classification	Check item	Measurement conditions		Unit	Standard value for new machine	Permissible value
Engine	Engine oil pressure	- SAE0W30E0S, SAE5W40E0S, SAE10W30DH, SAE15W40DH, SAE30DH oil - Engine oil temperature: Min 80 °C	At torque converter stalling	MPa {kg/cm ² }	0.29 – 0.44 {3.0 – 4.5}	0.2 {2.0}
			At low idle		Min. 0.08 {Min. 0.8}	0.07 {0.7}
	Oil temperature	Whole speed range (Inside oil pan)		°C	80 – 110	120
	Fan belt tension	Between fan pulley and tension pulley		mm	— (Automatic adjustment)	—
	Alternator belt tension	- Between alternator pulley - drive pulley - Deflection under finger pressure of 58.8 N {6 kg}		mm	About 20	—
	Air conditioner compressor belt tension	- Between compressor pulley - drive pulley - Deflection under finger pressure of 59 N {6 kg}		mm	About 10	—

Standard value table for machine

Machine model					HD785-7								
Check item			Measurement conditions	Unit	Standard value for new machine	Permissible value							
Travel speed	Max. speed at each gear speed		F1	- On flat, dry road surface - Engine coolant temperature: Within operating range - Transmission oil temperature: 60 – 80 °C - Mode: Power mode (Economy mode) - Body: When unloaded - Travel resistance 3.3 % - Standard tire	km/h	10.9 ± 5 % (9.8 ± 5 %)	10.9 ± 5 % (9.8 ± 5 %)						
			F2			15.2 ± 5 % (13.9 ± 5 %)	15.2 ± 5 % (13.9 ± 5 %)						
			F3			20.4 ± 5 % (18.7 ± 5 %)	20.4 ± 5 % (18.7 ± 5 %)						
			F4			27.2 ± 5 % (25.1 ± 5 %)	27.2 ± 5 % (25.1 ± 5 %)						
			F5			36.2 ± 5 % (33.8 ± 5 %)	36.2 ± 5 % (33.8 ± 5 %)						
			F6			48.7 ± 10 % (46.2 ± 10 %)	48.7 ± 10 % (46.2 ± 10 %)						
			F7			65.0 ± 10 % (60.6 ± 10 %)	65.0 ± 10 % (60.6 ± 10 %)						
			RL			9.7 ± 5 % (8.8 ± 5 %)	9.7 ± 5 % (8.8 ± 5 %)						
			RH			11.7 ± 5 % (11.7 ± 5 %)	11.7 ± 5 % (11.7 ± 5 %)						
			Engine speed			Automatic shift control Power mode (When machine is empty)			rpm	F1 → F2		2,050 ± 50 (1,950 ± 50)	2,050 ± 50 (1,950 ± 50)
Shift up	F2 → F3 F3 → F4 F4 → F5 F5 → F6 F6 → F7	2,020 ± 50 (1,900 ± 50)		2,020 ± 50 (1,900 ± 50)									
	Shift down	F7 → F6 F6 → F5 F5 → F4 F4 → F3 F3 → F2 F2 → F1		1,350 ± 50	1,350 ± 50								
		Shift up		F1 → F2 F2 → F3 F3 → F4 F4 → F5 F5 → F6 F6 → F7	2,000 ± 50 1,800 ± 50					2,000 ± 50 1,800 ± 50			
				Shift down	F7 → F6 F6 → F5 F5 → F4 F4 → F3 F3 → F2 F2 → F1					1,725 ± 50	1,725 ± 50		
					Accelerator full								
Accelerator partial													
Accelerator OFF (Coasting run)													

20 Standard value table

SEN01769-00

Machine model								HD785-7		
Check item						Measurement conditions	Unit	Standard value for new machine	Permissible value	
Engine speed	Automatic shift control	Power mode (When machine is loaded)	Accelerator full	Shift up	F1 → F2	• Engine coolant temperature: Within operating range • Transmission oil temperature: 60 – 80 °C • Hydraulic oil temperature: 45 – 55 °C • (): At high acceleration	rpm	2,080 ± 50 (1,950 ± 50)	2,080 ± 50 (1,950 ± 50)	
					Shift down			F2 → F3 F3 → F4 F4 → F5 F5 → F6 F6 → F7	2,030 ± 50 (1,950 ± 50)	2,030 ± 50 (1,950 ± 50)
								F7 → F6 F6 → F5 F5 → F4 F4 → F3 F3 → F2	1,350 ± 50	1,350 ± 50
				Shift up				F1 → F2	2,000 ± 50	2,000 ± 50
								F2 → F3	1,800 ± 50	1,800 ± 50
					F3 → F4 F4 → F5 F5 → F6 F6 → F7			1,725 ± 50	1,725 ± 50	
			Shift down	F7 → F6 F6 → F5 F5 → F4 F4 → F3	1,200 ± 50			1,200 ± 50		
				F3 → F2 F2 → F1	1,250 ± 50			1,330 ± 50		
				Accelerator OFF (Coasting run)	Shift up			F1 → F2 F2 → F3 F3 → F4 F4 → F5 F5 → F6 F6 → F7	2,450 ± 50	2,450 ± 50
			Shift down					F7 → F6 F6 → F5 F5 → F4 F4 → F3	1,200 ± 50	1,200 ± 50
								F3 → F2 F2 → F1	1,250 ± 50	1,250 ± 50

Machine model							HD785-7			
Check item						Measurement conditions	Unit	Standard value for new machine	Permissible value	
Engine speed	Automatic shift control	Power mode (When machine is empty)	Accelerator full	Shift up	F1 → F2	• Engine coolant temperature: Within operating range • Transmission oil temperature: 60 – 80 °C • Hydraulic oil temperature: 45 – 55 °C • (): At high acceleration	rpm	1,950 ± 50 (1,800 ± 50)	1,950 ± 50 (1,800 ± 50)	
					Shift down			F2 → F3 F3 → F4 F4 → F5 F5 → F6 F6 → F7	1,900 ± 50 (1,750 ± 50)	1,900 ± 50 (1,750 ± 50)
				Shift down				F7 → F6 F6 → F5 F5 → F4 F3 → F2 F2 → F1	1,250 ± 50	1,250 ± 50
								F4 → F3	1,280 ± 50	1,280 ± 50
				Accelerator partial				Shift up	F1 → F2	2,000 ± 50
					F2 → F3				1,800 ± 50	1,800 ± 50
					Shift down			F3 → F4 F4 → F5 F5 → F6 F6 → F7	1,725 ± 50	1,725 ± 50
								Shift down	F7 → F6 F6 → F5 F5 → F4 F4 → F3	1,200 ± 35
			Accelerator OFF (Coasting run)	Shift up	F3 → F2 F2 → F1				1,250 ± 50	1,250 ± 50
					F1 → F2 F2 → F3 F3 → F4 F4 → F5 F5 → F6 F6 → F7			2,450 ± 50	2,450 ± 50	
				Shift down	F7 → F6 F6 → F5 F5 → F4 F4 → F3			1,200 ± 50	1,200 ± 50	
					Shift down			F3 → F2 F2 → F1	1,250 ± 50	1,250 ± 50

20 Standard value table

SEN01769-00

Machine model							HD785-7				
Check item						Measurement conditions	Unit	Standard value for new machine	Permissible value		
Engine speed	Automatic shift control	Power mode (When machine is loaded)	Accelerator full	Shift up	F1 → F2	• Engine coolant temperature: Within operating range • Transmission oil temperature: 60 – 80 °C • Hydraulic oil temperature: 45 – 55 °C • (): At high acceleration	rpm	2,050 ± 50 (1,850 ± 50)	2,050 ± 50 (1,850 ± 50)		
					F2 → F3 F3 → F4 F4 → F5 F5 → F6 F6 → F7			2,000 ± 50 (1,800 ± 50)	2,000 ± 50 (1,800 ± 50)		
				Shift down				F7 → F6 F6 → F5 F5 → F4 F4 → F3 F3 → F2 F2 → F1	1,300 ± 50	1,300 ± 50	
								Shift up	F1 → F2	2,000 ± 50	2,000 ± 50
					F2 → F3				1,800 ± 50	1,800 ± 50	
			Accelerator partial	Shift up	F3 → F4 F4 → F5 F5 → F6 F6 → F7			1,725 ± 50	1,725 ± 50		
					Shift down			F7 → F6 F6 → F5 F5 → F4 F4 → F3	1,200 ± 50	1,200 ± 50	
								F3 → F2 F2 → F1	1,250 ± 50	1,250 ± 50	
				Accelerator OFF (Coasting run)	Shift up			F1 → F2 F2 → F3 F3 → F4 F4 → F5 F5 → F6 F6 → F7	2,450 ± 50	2,450 ± 50	
								Shift down	F7 → F6 F6 → F5 F5 → F4 F4 → F3	1,250 ± 50	1,250 ± 50
		F3 → F2 F2 → F1	1,250 ± 50		1,250 ± 50						
		Braking mode	Shift up					2,450 ± 50	2,450 ± 50		
			Shift down					1,680 ± 50	1,680 ± 50		

- Engine coolant temperature: Within operating range
- Transmission oil temperature: 60 – 80 °C
- Hydraulic oil temperature: 45 – 55 °C
- (): At high acceleration

Machine model						HD785-7				
Check item				Measurement conditions		Unit	Standard value for new machine	Permissible value		
Engine speed	Auto lock-up	Set	F1 – F7	- Engine coolant temperature: Within operating range - Transmission oil temperature: 60 – 80 °C - Hydraulic oil temperature: 45 – 55 °C		rpm	1,250 – 1,475	1,250 – 1,475		
			RL, RH				1,475	1,475		
		Reset	F1, F2				1,100	1,100		
			F3 – F7				—	—		
			RL, RH				1,100	1,100		
	Overrun prevention brake	Set	F1 – F7, RL	- Engine coolant temperature: Within operating range - Transmission oil temperature: 60 – 80 °C - Hydraulic oil temperature: 45 – 55 °C			2,600 ± 10	2,600 ± 10		
			RH				2,150 ± 10	2,150 ± 10		
		Reset	F1 – F7, RL				2,350 ± 10	2,350 ± 10		
			RH				2,000 ± 10	2,000 ± 10		
	Downshift inhibitor						Same as shift-down in "Automatic shift control"	Same as shift-down in "Automatic shift control"		
	Torque converter stall speed	Power mode	Low load				- Engine coolant temperature: Within operating range - Transmission oil temperature: 85 – 110 °C - Hydraulic oil temperature: 45 – 55 °C		1,780 ± 100	1,780 ± 100
			High load						1,845 ± 100	1,845 ± 100
		Economy mode	Low load						1,695 ± 100	1,695 ± 100
			High load	1,730 ± 100	1,730 ± 100					
		At inspection with engine mode fixing function set by machine monitor		- Engine coolant temperature: Within operating range - Transmission oil temperature: 85 – 110 °C - Hydraulic oil temperature: 45 – 55 °C ★ For details, see Testing and adjusting, "Special functions of machine monitor (EMMS)".	A mode	1,845 ± 100	1,845 ± 100			
					B mode	1,780 ± 100	1,780 ± 100			
					C mode	1,730 ± 100	1,730 ± 100			
					D mode	1,695 ± 100	1,695 ± 100			
Operating force and stroke	Accelerator pedal		Operating farce	Point at 150 mm from fulcrum of pedal	Starting to depress	N {kg}	29.3 (+13.0/0) {3.0 (+1.4/0)}	29.3 (+13.0/0) {3.0 (+1.4/0)}		
					Full		58.7 (0/-13.3) {6.0 (0/-1.4)}	58.7 (0/-13.3) {6.0 (0/-1.4)}		
			Stroke		Starting to depress → Full	mm	45 ± 5	45 ± 5		
	Shift lever		Operating farce	At center of knob	N {kg}	Max. 29.4 {3.0}	Max. 29.4 {3.0}			
			Stroke			mm	24.5 ± 1	24.5 ± 2		

Machine model						HD785-7				
Check item				Measurement conditions	Unit	Standard value for new machine	Permissible value			
Oil pressure	Torque convertor	Inlet oil pressure		- Oil temperature: 80 °C - Brake: OFF (When oil bypasses brake and cooler through BCV) - Engine speed: 1,900 rpm (Rated speed)	MPa {kg/cm²}	Max. 0.85 {Max. 8.67}	Max. 0.85 {Max. 8.67}			
		Outlet oil pressure		- Oil temperature: 80 °C - Brake: OFF (When oil bypasses brake and cooler through BCV) - Engine speed: 1,900 rpm (Rated speed)		0.49 ± 0.04 {5.0 ± 0.41}	0.49 ± 0.04 {5.0 ± 0.41}			
				- Oil temperature: 80 °C - Brake: ON (When oil does not bypass brake and cooler through BCV) - Engine speed: 1,900 rpm (Rated speed)		0.52 ± 0.07 {5.3 ± 0.71}	0.52 ± 0.07 {5.3 ± 0.71}			
		Lock-up oil pressure		- Oil temperature: 80 °C - Engine speed: 1,900 rpm (Rated speed)		1.52 ± 0.2 {15.5 ± 2.0}	1.52 ± 0.2 {15.5 ± 2.0}			
		Main relief oil pressure	N, F1 – F3, RL, RH	- Oil temperature: 80 °C - Engine speed: 1,900 rpm (Rated speed)		3.53 ± 0.2 {36.0 ± 2.0}	3.53 ± 0.2 {36.0 ± 2.0}			
			F4 – F7			2.16 ± 0.2 {22.0 ± 2.0}	2.16 ± 0.2 {22.0 ± 2.0}			
		Oil pressure	Transmission	Control valve set pressure		Lo, Hi, 4th clutch	- Oil temperature: 80 °C - Engine speed: 1,900 rpm (Rated speed)	MPa {kg/cm²}	1.61 ± 0.2 {16.5 ± 2.0}	1.61 ± 0.2 {16.5 ± 2.0}
						3rd clutch			2.01 ± 0.2 {20.5 ± 2.0}	2.01 ± 0.2 {20.5 ± 2.0}
2nd clutch	3.29 ± 0.25 {33.5 ± 2.5}				3.29 ± 0.25 {33.5 ± 2.5}					
1st, R clutch	3.43 ± 0.2 {35.0 ± 2.0}				3.43 ± 0.2 {35.0 ± 2.0}					
Lubricating valve set pressure				- Oil temperature: 60 – 80 °C (T010) - Oil temperature: 80 – 100 °C (T030) - Engine speed: 1,900 rpm (Rated speed)	0.17 ± 0.05 {1.7 ± 0.5}	0.17 ± 0.05 {1.7 ± 0.5}				
Air pressure	Tire			Standard tire	27.00-R49 (Front, rear wheel)	MPa {kg/cm²}	0.69 {7.0}		0.69 {7.0}	
				If equipped tire	31/90-R49 (Front, rear wheel)		0.69 {7.0}		0.69 {7.0}	

Machine model					HD785-7		
Check item			Measurement conditions	Unit	Standard value for new machine	Permissible value	
Stop slope angle	Parking brake	Braking capacity		• With 91 t payload • Machine can be stopped at standard value	%	Min. 20	Min. 20
Engine speed		Starting test		• F2 • Torque converter stall • Machine can be stopped at standard value	rpm	Min. 1,335	Min. 1,335
I		Releasing pressure		(See "Brake")	MPa {kg/cm ² }	(See "Brake")	
Dimension	Suspension cylinder	Installed length	Front	• On flat dry load surface • When unloaded • Dimension see Fig. 1 in "A"	mm	247 ± 10	247 ± 20
			Rear	• On flat dry load surface • When unloaded • Dimension see Fig. 1 in "B"		199 ± 10	199 ± 20
Pressure		Pressure	Front	• On flat dry load surface • When unloaded	MPa {kg/cm ² }	3.56 ± 0.36 {36.4 ± 3.6}	3.56 ± 0.36 {36.4 ± 3.6}
			Rear			2.98 ± 0.3 {30.4 ± 3.0}	2.98 ± 0.3 {30.4 ± 3.0}
Operating force	Steering wheel	Stationary steering effort (If stationary steering is impossible, measure steering effort at low speed)		• On flat dry load surface • Steering wheel speed: 30 rpm • Engine low idle	N {kg}	14.7 – 29.4 {1.5 – 3.0}	Max. 35.3 {Max. 3.6}
Dimension		Play		• Engine: Stopped • Dimension on periphery of grip • Until front wheel starts moving	mm	Max. 150	Max. 150
Number of rotation		Rotation range		• Lock → Lock	Number of rotation	3.4	3.4 ± 0.34
Time		Turning time		• Lock → Lock • Engine speed: All range	sec.	Max. 4	Max. 5

20 Standard value table

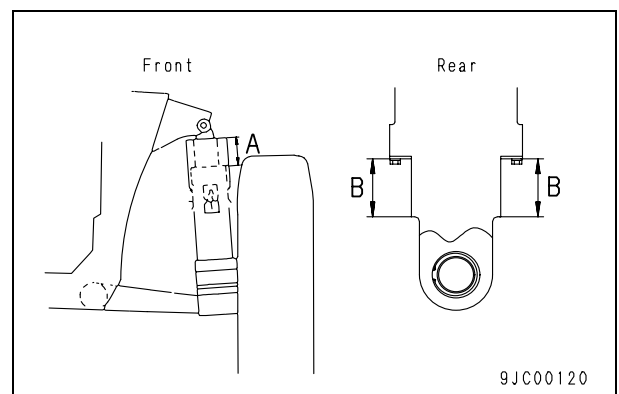
SEN01769-00

Machine model						HD785-7	
Check item				Measurement conditions	Unit	Standard value for new machine	Permissible value
Oil pressure	Steering valve	Relief oil pressure	At rated speed (1,900 rpm)	• Oil temperature: 50 – 80 °C	MPa {kg/cm ² }	20.2 – 21.1 {206 – 215}	20.2 – 21.1 {206 – 215}
			At low idle (650 rpm) [Reference value]			18.1 – 19.1 {185 – 195}	18.1 – 19.1 {185 – 195}
Operating force	Brake pedal	Operating force		• Measuring point: Point at 150 mm from fulcrum of pedal	N {kg}	234 ± 29.4 {23.8 ± 3.0}	234 ± 29.4 {23.8 ± 3.0}
Dimension		Stroke			mm	40 ± 5	40 ± 10
Operating force	Retarder control lever	Operating force		• Measuring point: Point at 10 mm from lever end	N {kg}	5.9 – 9.8 {0.6 – 1.0}	3.0 – 14.7 {0.3 – 1.5}
Angle		Stroke (Operating range)			° (degree)	0 – 78 (0/-2)	0 – 78 (0/-4)
Operating force	Emergency brake pedal	Operating force		• Measuring point: Point at 150 mm from fulcrum of pedal	N {kg}	294 ± 29.4 {30 ± 3.0}	294 ± 29.4 {30 ± 3.0}
Gas pressure	Accumulator	Nitrogen gas pressure	For front • rear service brake	• Gas temperature (atmosphere temperature): 20 ± 5 °C	MPa {kg/cm ² }	6.2 ± 0.20 {63 ± 2.0}	6.2 ± 0.20 {63 ± 2.0}
			For parking brake			6.2 ± 0.20 {63 ± 2.0}	6.2 ± 0.20 {63 ± 2.0}
Oil pressure	Accumulator charge valve	Cut-in pressure		• Oil temperature: 45 – 55 °C • High idle	MPa {kg/cm ² }	11.8 (+0.98/0) {120 (+10/0)}	11.8 (+0.98/0) {120 (+10/0)}
		Cut-out pressure				20.6 (+0.98/0) {210 (+10/0)}	20.6 (+0.98/0) {210 (+10/0)}

Machine model						HD785-7		
Check item			Measurement conditions		Unit	Standard value for new machine	Permissible value	
Distance	Brake	Stopping distance with service brake [Reference value]		Dry flat road • At max. brake operation pressure Front: 9.8 MPa {100 kg/cm²} Rear: 9.8 MPa {100 kg/cm²} • From check of sign to stop • Initial speed: 32 km/h	When unloaded	m	Max. 16.5	17.5
				With 91 t payload	Max. 20.4		24	
Operating pressure		Front • Rear (Service brake)	• At full stroke	MPa {kg/cm ² }	9.8 ± 0.69 {100 ± 7}	9.8 ± 0.69 {100 ± 7}		
		Front • Rear (Retarder)			6.4 (+0.69/-0.59) {65 (+7/-6)}	6.4 (+0.69/-0.59) {65 (+7/-6)}		
Parking brake releasing pressure		• Stop engine	MPa {kg/cm ² }	9.85 (+0.98/-0.49) {100.4 (+10/-5)}	9.85 (+0.98/-0.49) {100.4 (+10/-5)}			
Stopping distance when secondary brake is applied [Reference value]		Dry flat road • From start of braking to stop • Initial speed: 25 km/h • With 91 t payload	m	Max. 60.9	Max. 60.9			
Brake oil pressure		Front • Rear (Service brake)	Charge accumulator and operate brake first time • At full stroke	MPa {kg/cm ² }	9.8 ± 0.69 {100 ± 7}	9.8 ± 0.69 {100 ± 7}		
		Front • Rear (Retarder)			6.4 (+0.69/-0.59) {65 (+7/-6)}	6.4 (+0.69/-0.59) {65 (+7/-6)}		
Engine speed		At brake starting test	Service brake	Empty machine • Concrete road • At max. brake operation pressure • Gear speed: F2 • Machine must not start at standard speed stall	rpm	1,760	Max. 1,570	
			Retarder brake			1,345	Max. 1,200	
			Parking brake			1,610	Max. 1,440	
			Emergency brake			Above torque converter stall speed	Above torque converter stall speed	
Visual inspection		Wear limit	Front	Check with disc wear gauge (mounted on machine)	—	Must be in normal range of wear gauge.		
			Rear			Must be in normal range of wear gauge.		

Machine model						HD785-7	
Check item				Measurement conditions	Unit	Standard value for new machine	Permissible value
Operating force	Dump lever	Operating force	Hold → Raise	- Engine: Stopped - Measuring point: Center of grip	N {kg}	Max. 29.4 {Max. 3.0}	Max. 35.3 {Max. 3.6}
			Raise → Hold			Must return smoothly when engine speed is high idle.	
			Hold → Float			Max. 29.4 {Max. 3.0}	Max. 35.3 {Max. 3.6}
			Float → Hold			Max. 29.4 {Max. 3.0}	Max. 35.3 {Max. 3.6}
			Float → Lower			Max. 29.4 {Max. 3.0}	Max. 35.3 {Max. 3.6}
			Lower → Float	Measuring point: Center of grip		Must return smoothly when engine speed is 1,900 rpm (rated speed).	
Dimension		Stroke	Raise → Hold	Engine: Stopped	mm	44.8 ± 1.9	44.8 ± 1.9
			Hold → Lower	Measuring point: Center of grip		44.8 ± 1.9	44.8 ± 1.9
Oil pressure	Hoist valve	Relief pressure	At rated speed (1,900 rpm)	Oil temperature: 50 – 80 °C	MPa {kg/cm ² }	20.2 – 21.1 {206 – 215}	20.2 – 21.1 {206 – 215}
			At low idle (650 rpm) [Reference value]			18.1 – 19.1 {185 – 195}	18.1 – 19.1 {185 – 195}
	Dump EPC valve	Relief pressure (root pressure)	At high idle (2,250 rpm)			3.4 ± 0.49 {35 ± 5}	3.4 ± 0.49 {35 ± 5}
			At low idle (650 rpm) [Reference value]			2.6 ± 0.49 {27 ± 5}	2.6 ± 0.49 {27 ± 5}
Time	Body	Lifting speed		- Oil temperature: 50 – 80 °C - Engine speed: 1,900 rpm (Rated speed)	sec.	13 ± 1.5	13 ± 1.5
		Lowering speed		- Oil temperature: 50 – 80 °C - Engine speed: 650 rpm - Dump lever: "Float"		14 ± 1.5	14 ± 1.5
Dimension		Hydraulic drift		- Oil temperature: 50 – 80 °C - From 20 mm of extension of 2nd cylinder - Measuring time: 5 minutes	mm	Max. 85	Max. 170

Fig. 1: Installed length (A) of front suspension cylinder rod and installed length (B) of rear suspension cylinder rod



HD785-7 Dump truck

Form No. SEN01769-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

30 Testing and adjusting

Testing and adjusting, Part 1

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Testing and adjusting tools list

Testing/Adjusting item	Sym- bol	Part No.	Part name	Q'ty	Remarks
Testing air boost pressure	A	799-201-2202	Boost gauge kit	1	-101 – 200 kPa {-760 – 1,500 mmHg}
		799-401-2220	Hose	1	
Testing exhaust temperature	B	799-101-1502	Digital thermometer	1	-99.9 – 1,299 °C
		6215-11-8171	Sensor	1	Wire length: 490 mm
		799-201-1110	Wiring harness	1	
Testing exhaust color	C	1 799-201-9001	Handy smoke checker	1	Bosch index: 0 – 9
		2 795-502-1350	Smoke meter	1	
Adjusting valve clearance	D	Commercially available	Thickness gauge	1	Intake: 0.35 mm Exhaust: 0.57 mm
Testing compression pressure	E	1 795-502-1590	Compression gauge	1	0 – 6.9 MPa {0 – 70 kg/cm ² }
		2 795-471-1310	Adapter	1	For 140E-3, 5
		6261-71-6150	Gasket	1	
Testing blow-by pressure	F	1 799-201-1590	Gauge	1	0 – 10 kPa {0 – 1,000 mmH ₂ O}
		2 799-201-1450	Adapter	2	
		3 799-201-1511	Nozzle	2	
		4 799-201-1571	Tube	1	
Testing engine oil pressure	G	1 799-101-5002	Oil pressure gauge KIT (Analog)	1	Pressure gauge: 2.5, 5.9, 39.2, 58.8 MPa {25, 60, 400, 600 kg/cm ² }
		790-261-1204	Oil pressure gauge KIT (Digital)	1	Pressure gauge: 58.8 MPa {600 kg/cm ² }
		2 799-401-2320	Gauge	1	Pressure gauge: 1 MPa {10 kg/cm ² }
Testing fuel pressure	H	1 799-101-5002	Oil pressure gauge KIT (Analog)	1	Pressure gauge: 2.5, 5.9, 39.2, 58.8 MPa {25, 60, 400, 600 kg/cm ² }
		790-261-1204	Oil pressure gauge KIT (Digital)	1	Pressure gauge: 58.8 MPa {600 kg/cm ² }
		2 795-471-1450	Adapter	1	8 x 1.25 (male) – PT1/8 (female)
		3 799-101-5220	Nipple (10 x 1.25 mm)	1	Size: 10 x 1.25 mm
		07002-11023	O-ring	1	
		4 799-401-2320	Gauge	1	Pressure gauge: 1 MPa {10 kg/cm ² }
Testing leakage through pressure limiter and return rate from injector	J	1 6151-51-8490	Spacer	1	ø 14
		2 6141-71-1710	Joint	1	ø 10
		3 Commercially available	Hose	1	Inside diameter: Approx. 11 mm
		4 Commercially available	Hose	1	Inside diameter: Approx. 17 mm
		5 Commercially available	Measuring cylinder	1	
		6 Commercially available	Stopwatch	1	
		7 07376-70315	Plug	1	Size: 03

Testing/Adjusting item	Sym- bol	Part No.	Part name	Qty	Remarks
Testing power train oil pressure	1	799-101-5002	Oil pressure gauge KIT (Analog)	1	Pressure gauge: 2.5, 5.9, 39.2, 58.8 MPa {25, 60, 400, 600 kg/cm ² }
		790-261-1204	Oil pressure gauge KIT (Digital)	1	Pressure gauge: 58.8 MPa {600 kg/cm ² }
	2	799-101-5220	Nipple	1	M10 × 1.25
		07002-11023	O-ring	1	
Testing brake oil pressure	1	799-101-5002	Oil pressure gauge KIT (Analog)	1	Pressure gauge: 2.5, 5.9, 39.2, 58.8 MPa {25, 60, 400, 600 kg/cm ² }
		790-261-1204	Oil pressure gauge KIT (Digital)	1	Pressure gauge: 58.8 MPa {600 kg/cm ² }
		566-35-43561	Nipple	1	18 × 1.5 (Female: PT 1/8)
Testing steering, hoist oil pressure circuit	1	799-101-5002	Oil pressure gauge KIT (Analog)	1	Pressure gauge: 2.5, 5.9, 39.2, 58.8 MPa {25, 60, 400, 600 kg/cm ² }
		790-261-1204	Oil pressure gauge KIT (Digital)	1	Pressure gauge: 58.8 MPa {600 kg/cm ² }
Testing dump EPC oil pressure circuit	1	799-101-5002	Oil pressure gauge KIT (Analog)	1	Pressure gauge: 2.5, 5.9, 39.2, 58.8 MPa {25, 60, 400, 600 kg/cm ² }
		790-261-1204	Oil pressure gauge KIT (Digital)	1	Pressure gauge: 58.8 MPa {600 kg/cm ² }
	4	799-101-5230	Nipple	1	14 × 1.5
	5	799-401-3100	Adapter	1	Face seal type (# 02) (Female: PT 1/8)
		02896-11008	O-ring	1	
Suspension cylinder of adjustment	1	792-610-1000	Suspension tool	1	L2 – L6 Pump assembly KIT part No. 792-610-1100
		792-610-1130	Pump assembly	1	
		792-610-1110	Hose	1	
		792-610-1120	Joint	1	
		07020-21732	Fitting	1	
		792-610-1140	Joint	1	
		792-610-1250	Valve assembly	1	L7 – L13 Charging tool assembly KIT part No. 792-610-1200
	2	792-610-1260	Nipple	1	
		792-610-1480	Stem	1	
		792-610-1640	Joint	1	
	1	792-610-1400	Regulator assembly	1	
		792-610-1430	Gauge	1	24.5 MPa {250 kg/cm ² }
	3	792-610-1440	Gauge	1	9.81 MPa {100 kg/cm ² }
At raise of emergency dump body	M	792T-691-1110	Plug	1	Refer to the skech
Initial set up of VHMS controller and, at repair set up	N	799-608-3211	Discket		
		799-608-3220	Harness		
		Commercially available	Lap top type personal computer		OS: Windows 98/2000/Me/XP Terminal "RS232C" is with it

30 Testing and adjusting

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Testing/Adjusting item	Sym- bol	Part No.	Part name	Qty	Remarks
Gas pressure check and filling of the accumulator	P	1 792-610-1700	Gas charge tool	1	
		792-610-1310	Nipple (For Russia)		GOST
		792-610-1320	Nipple (For USA)		CGA No. 351
		792-610-1330	Nipple (For USA)		ASA B-571-1965
		2 792-610-1350	Nipple (For Germany)	1	DIN 477-1963 NEN 3268-1966 SIS-SMS 2235/2238
		792-610-1360	Nipple (For UK)		BS341 Part 1-1962
Engine related controller, sensor and actuator diagnosis	Q	799-601-4100 or 799-601-4200	T-adapter Ass'y	1	
		799-601-4130	•T-adapter	1	For Ne sensor
		799-601-4330	•Socket	1	For G (Bkup) sensor
		799-601-4240	•Socket	1	For Atmospheric sensor
		799-601-4250	•Socket	1	For boost pressure sensor
		799-601-9420	•T-adapter	1	For common rail pressure sensor (Include 799-601-9000 and 799-601-9200)
		799-601-4150	•T-adapter	1	For oil pressure sensor
		799-601-9430	•Socket	1	For supply pump PCV
		799-601-9020	•T-adapter	1	For injector
		799-601-4260	•T-adapter	1	For controllerl (4-pole)
		799-601-4211	•T-adapter	1	For controllerl (50-pole) (799-601-4100 only)
		799-601-4220	•T-adapter	1	For controllerl (60-pole) (799-601-4100 only)
		799-601-4350	•T-adapter	1	For 60-pole (799-601-4100 only)
		799-601-9000 or 799-601-9100 or 799-601-9300	T-adapter Ass'y		
		799-601-9320	•T-adapter	1	For 24-pole
		799-601-9310	•Plate	1	
		795-799-5540	Socket	1	For boost temperrature sensor For intake-air temperrature sensor
		795-799-5530	Socket	1	For water temperrature sensor For fuel temperrature sensor For oil temperrature sensor
		799-601-2500 or 799-601-2700 or 799-601-2800 or 799-601-2900 or 799-601-7100 or 799-601-7400 or 799-601-8000	T-adapter Ass'y	1	799-601-2900 is not supply

Testing/Adjusting item	Sym- bol	Part No.	Part name	Q'ty	Remarks
Engine related controller, sensor and actuator diag- nosis	Q	799-601-2600	•T-box	1	For Econo (799-601-2700 is not include)
		799-601-2740	•For MIC adapter	1	For MIC-5P
		799-601-4100	T-adapter Ass'y	1	
		799-601-4211	•For DRC adapter	1	For DRC50
		799-601-9020	•For DT adapter	1	For DT2P
		799-601-9030	•For DT adapter	1	For DT3P
		799-601-7000 or 799-601-7100 or 799-601-7400 or 799-601-8000	T-adapter Ass'y	1	
		799-601-7020	•For X adapter	1	For X2P
		799-601-7030	•For X adapter	1	For X3P
		799-601-7040	•For X adapter	1	For X4P
		799-601-7060	•For SWP adapter	1	For SW8P (799-601-8000 is not include)
		799-601-7080	•For M adapter	1	For M1P (799-601-7000 and 799-601-7100 are not include)
		799-601-7090	•For M adapter	1	For M2P
		799-601-7110	•For M adapter	1	For M3P
		799-601-7120	•For M adapter	1	For M4P
		799-601-7130	•For M adapter	1	For M6P
		799-601-7180	•For AMP040 adapter	1	For A8P (799-601-7400 only)
		799-601-7190	•For AMP040 adapter	1	For A12P (799-601-7000 and 799-601-7100 are not include)
		799-601-7330	•For S adapter	1	For S16PW
		799-601-7320	For AMP040 adapter	1	For SW16P (799-601-8000 only)
		799-601-7340	•For M adapter	1	For M8P
		799-601-7360	For relay adapter	1	For REL-5P
		799-601-7370	For relay adapter	1	For REL-6P
		799-601-7500	T-adapter Ass'y	1	
		799-601-7520	•For 070 adapter	1	For 07-12P
		799-601-7540	•For 070 adapter	1	For 07-18P
		799-601-7550	•For 070 adapter	1	For 07-20P
		799-601-9000 or 799-601-9200	T-adapter Ass'y	1	
		799-601-9020	•For DT adapter	1	For DT2P (Include 799-601-9020 and 799-601-7000)
		799-601-9030	•For DT adapter	1	For DT3P
		799-601-9040	•For DT adapter	1	For DT4P (Include 799-601-9020 and 799-601-7000)
		799-601-9050	•For DT adapter	1	For DT6P
		799-601-9060	•For DT adapter (Gray)	1	For DT8PGR
		799-601-9070	•For DT adapter (Black)	1	For DT8PB
		799-601-9080	•For DT adapter (Green)	1	For DT8PG
		799-601-9110	•For DT adapter (Gray)	1	For DT12PGR
		799-601-9120	•For DT adapter (Black)	1	For DT12PB

30 Testing and adjusting

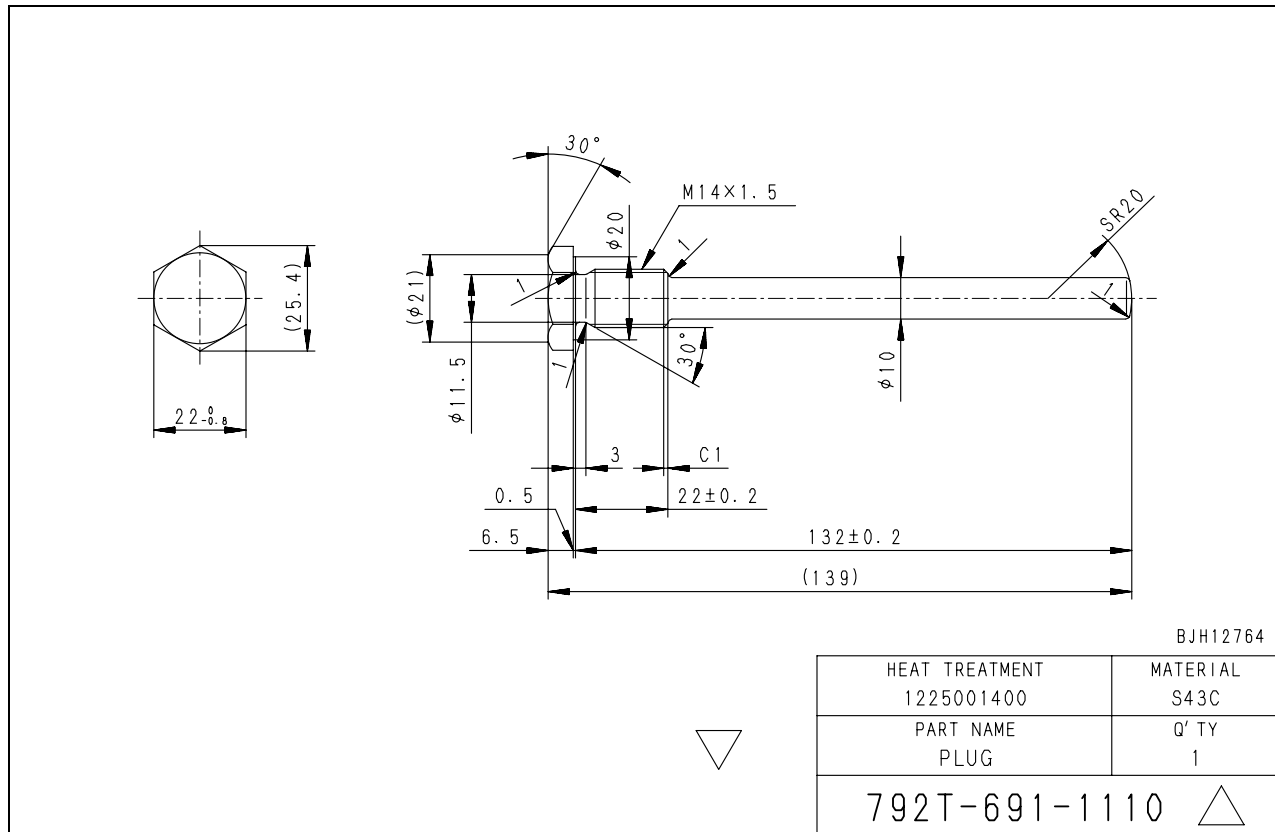
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Testing/Adjusting item	Sym- bol	Part No.	Part name	Qty	Remarks
Engine related controller, sensor and actuator diagnosis	Q	799-601-9130	•For DT adapter (Green)	1	For DT12PG
		799-601-9140	•For DT adapter (Brown)	1	For DT12P
		799-601-9300	T-adapter Ass'y	1	
		799-601-9350	•For DRC adapter	1	For DRC-40
		799-601-9360	•For DRC adapter	1	For DRC-24
Testing coolant temperature and oil temperature	–	799-101-1502	Digital temperature gauge	1	-99.9 – 1,299 °C
Testing operation force and pedal force	–	79A-264-0021	Push-pull scale	1	0 – 294 N {0 – 30 kg}
	–	79A-264-0091	Push-pull scale	1	0 – 490 N {0 – 50 kg}
Testing stroke and hydraulic drift	–	Commercially available	Scale	1	
Testing work equipment speed	–	Commercially available	Stopwatch	1	
Testing voltage and resistance	–	Commercially available	Circuit tester	1	

Sketch of special tool

Note: Komatsu cannot accept any responsibility for special tools manufactured according to these drawings.

M Plug



Testing engine speed

⚠ **Stop the machine on flat ground, turn the parking brake switch PARKING, and block the tires.**

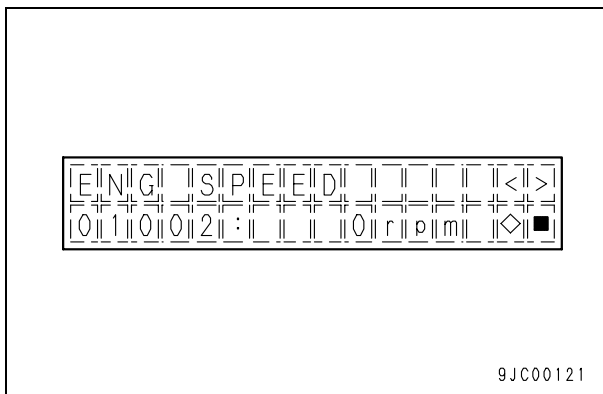
★ Test the engine speed under the following condition.

- Engine coolant temperature:
Within operating range
- Torque converter oil temperature:
Within operating range
- Hydraulic oil temperature: 45 – 55 °C

1. Preparation work

Turn the starting switch ON and set the machine monitor (EMMS) in the "Monitoring function of service mode" to prepare for testing of the engine speed.

- Monitoring system: **ENGINE**
- Monitoring code: **01002 (ENG SPEED)**
- ★ For the operating method, see "Special functions of machine monitor (EMMS)".



2. Testing low idle speed

- 1) Set the shift lever "N" and dump lever in HOLD.
- 2) Start the engine and measure the engine speed without pressing the accelerator pedal.

3. Testing high idle speed

- 1) Set the shift lever "N" and dump lever in HOLD.
- 2) Start the engine and set the accelerator pedal in the high idle position and measure the engine speed.

4. Testing torque converter stall speed

See "Testing of torque converter stall speed" (in "Testing and adjusting (Part 2)").

Testing air supply pressure (boost pressure)

★ Testing instrument

Symbol	Part No.	Part name
A	799-201-2202	Boost gauge kit
	799-401-2220	Hose

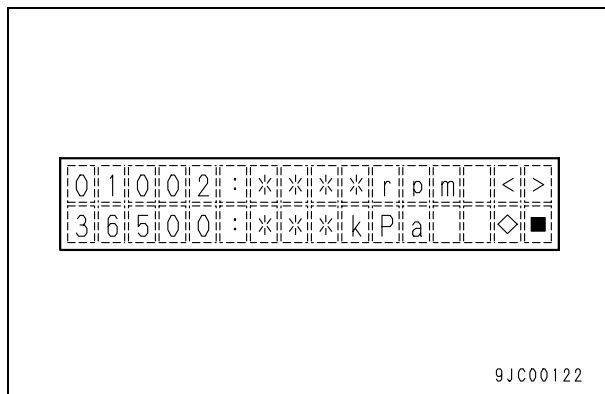
▲ Stop the machine on the level ground, turn the parking brake switch **PARKING**, and set chocks to the tires.

▲ Be careful not to touch any hot parts when removing or installing the testing tools.

- ★ Test the air supply pressure (boost pressure) under the following conditions.
- Coolant temperature: Within operating range
 - Torque converter oil temperature: Within operating range
 - Hydraulic oil temperature: 45 – 55 °C

(Testing with monitor panel)

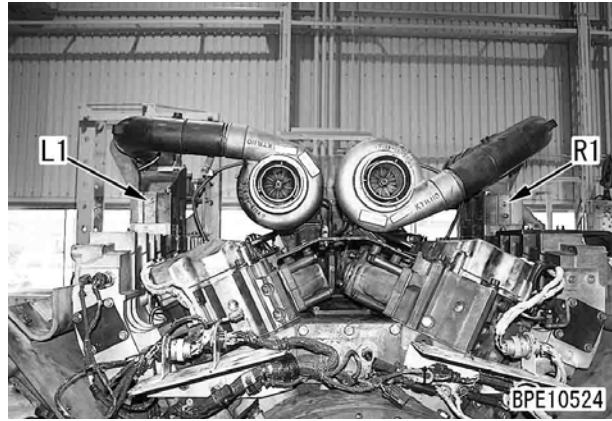
- Change the machine monitor to "Service mode" and display the following 2 items simultaneously with the "Monitoring function".
 - Monitoring system: **2 ITEMS**
 - Monitoring code: **01002 (ENG SPEED)**
 - Monitoring code: **36500 (CHG PRESS-A)**
- ★ For the operating method, see "Special functions of machine monitor (EMMS)".



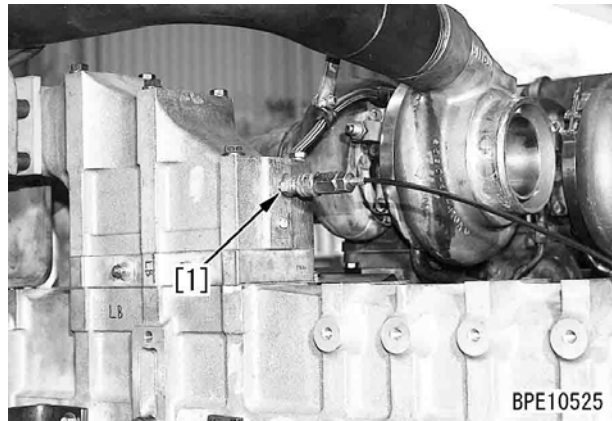
- ★ For the method of testing, see "Method with testing instruments".

(Method with testing instruments)

- Open the engine hood.
- Remove air boost pressure pickup plug ((L1) on left bank or (R1) on right bank) from the bottom of the air intake connector.



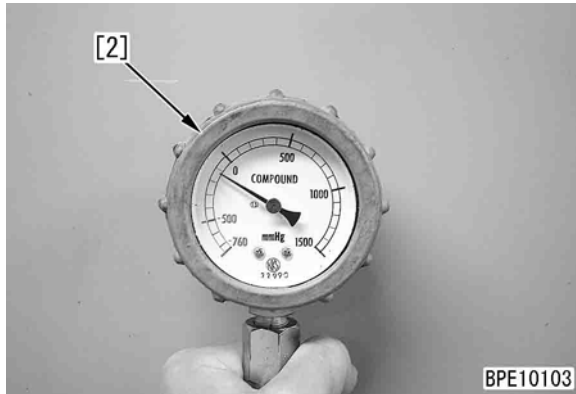
- Install nipple [1] of boost gauge kit **A** and connect it to gauge [2].
 - ★ Example of (L1) on the left bank



- Run the engine at a mid-range speed or above to bleed the oil from the hose.
 - ★ Insert the connection of the hose and pressure gauge about half way, repeat the action to open the self-seal portion at the hose end, and bleed the oil.
 - ★ If Pm kit is available, the air bleed coupling (790-261-1130) inside the kit can be used.
 - ★ If there is oil inside the hose, the gauge will not work, so always bleed the oil.

5. Run the engine at high idle to stall the torque converter, and test the air supply pressure (boost pressure).

★ For details of the procedure for stalling the torque converter, see "Testing torque converter stall speed".



6. After completing the testing, remove the testing equipment and set to the original condition.

Testing exhaust temperature

★ Testing instrument

Symbol	Part No.	Part name
B	799-101-1502	Digital temperature gauge
	6215-11-8171	Sensor
	799-201-1110	Wiring harness

⚠ **Stop the machine on the level ground, turn the parking brake switch PARKING, and set chocks to the tires.**

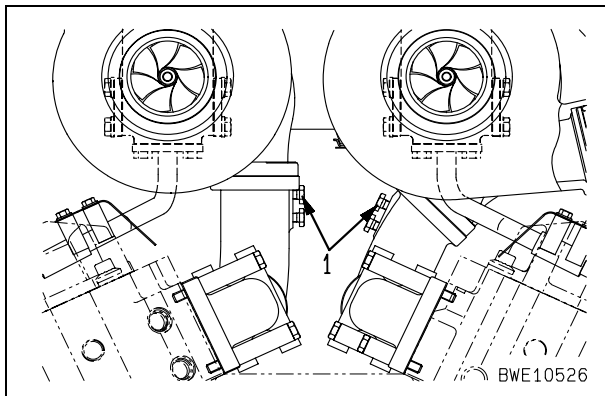
⚠ **Wait for the temperature of the exhaust manifold to go down before removing or installing the testing equipment.**

★ Test the exhaust temperature under the following conditions.

- Coolant temperature:
Within operating range
- Torque converter oil temperature:
Within operating range
- Hydraulic oil temperature: 45 – 55 °C

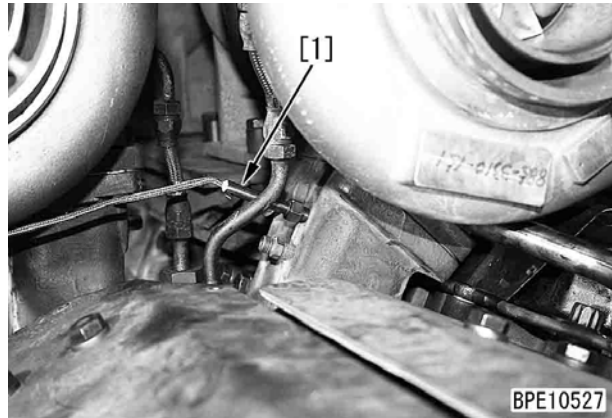
(Method with testing instruments)

1. Open the engine hood.
2. Remove an exhaust temperature pickup plug (1) of the subject section for measuring from the top of the exhaust manifold.
 - ★ Subject section for measuring includes front left, rear left, front right and rear right (4 points in total).



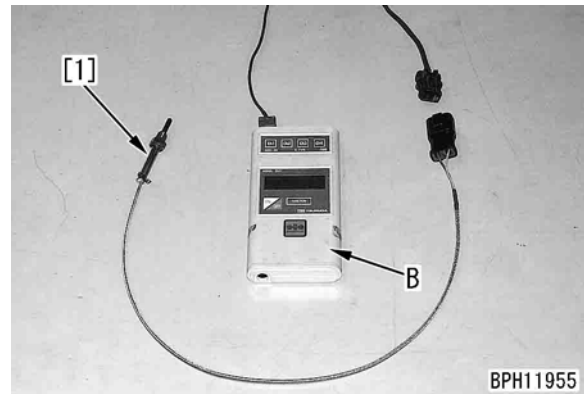
3. Install sensor [1] of digital thermometer **B** and connect it to thermometer [2].

★ Installation example to the rear right-hand side (RR)



★ For engines mounted with the exhaust temperature sensor, connect temperature gauge [2] to the sensor on machine.

4. Run the engine and test the exhaust temperature in the whole speed range.



5. Method of periodic testing for preventive maintenance service.

★ To prevent the torque converter from overheating, use the full stall (torque converter stall + hydraulic relief) to stabilize the exhaust temperature, then stall only the torque converter and test the temperature.

- 1) Turn the power mode switch to the HIGH POWER position.
- 2) Start the engine and raise the temperature of the coolant to the operating range.
- 3) Depress the parking brake pedal, turn the parking brake switch OFF, then set the gearshift lever to the **D** position.

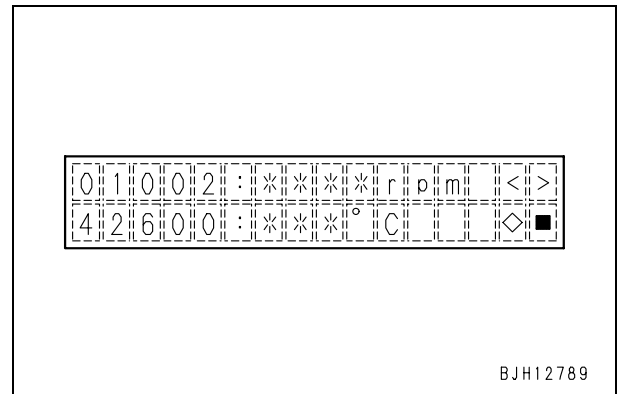
⚠ **If the gearshift lever is operated to any position other than the **D** position, the machine may move off even if the brake is being depressed, so always test at the **D** position.**

- 4) Depress the accelerator pedal gradually, run the engine at high idle and stall the torque converter. At the same time, operate the dump lever to the LOWER position and relieve the oil pressure (full stall).
 - ★ Continue the above operation until the exhaust temperature is stabilized.
 - ⚠ **If the torque converter is stalled while the gearshift indicator is indicating "F1", the inside of the transmission may be broken.**
 - Accordingly, when stalling the torque converter, seat the body securely and check that the body pilot lamp is turned OFF, and then set the gearshift lever in the D position and check that the gearshift indicator is indicating "F2".**
- 5) When the temperature stabilizes at near the target temperature, return the dump lever to FLOAT and test the temperature with only the torque converter stalled.
 - ★ The exhaust temperature will start to go down from the full stall condition, so measure the temperature when it stabilizes.
 - ★ If the exhaust temperature does not go down but rises, make the set temperature at full stall higher.
 - ★ After completing the testing, lower the engine speed to low idle, then return the gearshift lever to the **N** position.

6. When testing the maximum value for the exhaust temperature during troubleshooting, do as follows.
Carry out actual work and record the maximum exhaust temperature during operation.
 - ★ Use the PEAK mode of the digital temperature gauge. (Set the temperature gauge to the PEAK mode. The maximum temperature automatically recorded.)
 - ★ The exhaust temperature largely depends on the outside air temperature (intake air temperature of the engine). Accordingly, if any abnormal value is obtained, correct it by the following calculation.
 - Corrected value [°C] = Tested value + $2 \times (20 - \text{ambient temperature})$
7. After completing the testing, remove the testing equipment and set to the original condition.

(Method using monitoring)

1. Switch the machine monitor display to "Service mode" and use the "Monitoring function" to display the following two items at the same time.
 - Monitoring system: **2 ITEMS**
 - Monitoring code: **01002 (ENG SPEED)**
 - Monitoring code:
 - 42600 (EXHAUST TEMP FL)**
 - 42601 (EXHAUST TEMP RR)**
 - 42602 (EXHAUST TEMP FR)**
 - 42606 (EXHAUST TEMP RL)**
- ★ For the operating method, see "Special functions of machine monitor (EMMS)".



BJH12789

- ★ For other testing methods, see "Methods with testing tools".

Testing exhaust gas color

★ Testing instrument

Symbol		Part No.	Part name
C	1	799-201-9001	Handy smoke checker
	2	795-502-1350	Smoke meter

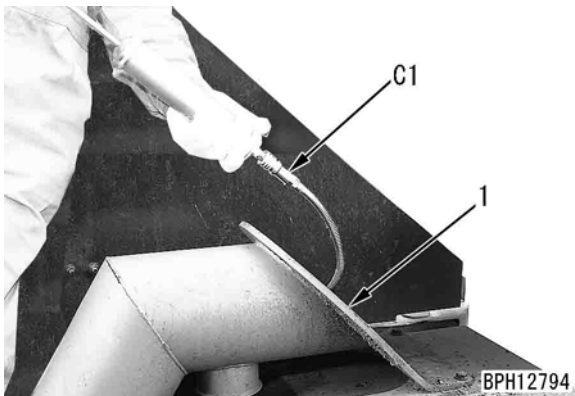
▲ **Stop the machine on the level ground, turn the parking brake switch **PARKING**, and set chocks to the tires.**

▲ **When installing and removing the testing instrument, take care not to touch a hot part.**

★ If an air source and an electric power source are not available in the field, use handy smoke checker **C1**. When recording official data, use smoke meter **C2**.

1. Testing with handy smoke checker C1

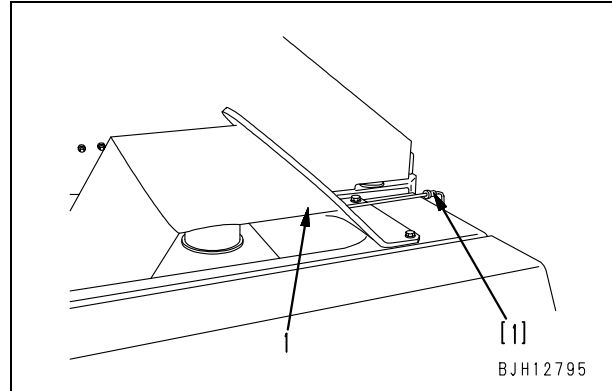
- 1) Raise the body and fix it with the lock pin securely.
- 2) Attach a sheet of filter paper to handy smoke checker **C1**.
- 3) Insert the exhaust gas intake pipe in exhaust pipe (1).
- 4) Start the engine and raise the temperature of the engine to the operating range.
- 5) As increasing the engine speed rapidly or running it at high idle, operate the handle of handy smoke checker **C1** so that the filter paper absorbs the exhaust gas.



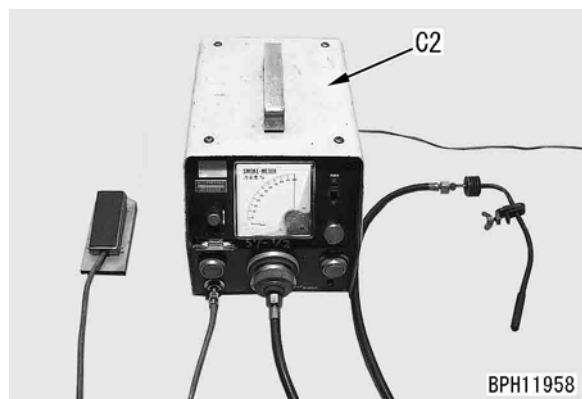
- 6) Remove the filter paper and compare it with the attached scale to make a judgment.
- 7) When the testing is completed, remove the instruments and set to the original condition.

2. Testing with smoke meter C2

- 1) Raise the body and fix it with the lock pin securely.
- 2) Insert probe [1] of smoke meter **C2** in the outlet of exhaust pipe (1) and fix it to the exhaust pipe with a clip.



- 3) Connect the probe hose, receptacle of the accelerator switch, and air hose to smoke meter **C2**.
 - ★ Restrict the supplied air pressure below 1.5 MPa {15 kg/cm²}.
- 4) Connect the power cable to a receptacle of power source.
 - ★ Before connecting the cable, check that the power switch of the smoke meter is turned off.
- 5) Loosen the cap nut of the suction pump and fit the filter paper.
 - ★ Fit the filter paper securely so that the exhaust gas does not leak.
- 6) Turn on the power switch of smoke meter **C2**.



- 7) Start the engine and raise the coolant temperature of the engine to the operating range.
- 8) As increasing the engine speed rapidly or running it at high idle, press the accelerator pedal of smoke meter **C2** and collect the exhaust gas with the filter paper.
- 9) Place the contaminated filter paper on the clean filter paper (at least 10 sheets) in the filter paper holder and read the indicated value.
- 10) When the testing is completed, remove the instruments and set to the original condition.

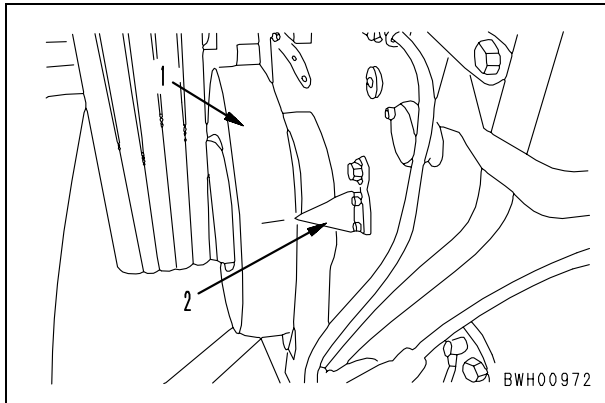
Adjustment of valve clearance

★ Testing instrument

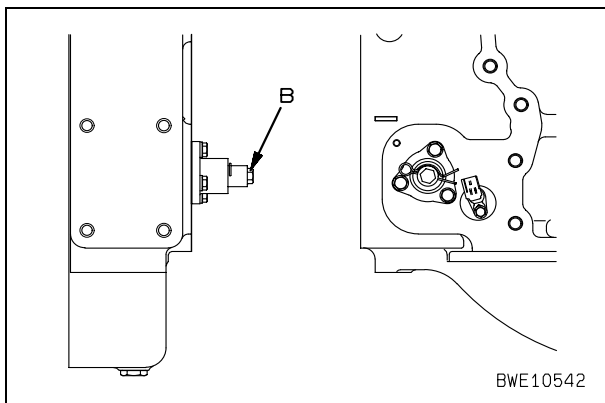
Symbol	Part No.	Part name
D	Commercially available	Thickness gauge

▲ **Stop the machine on the level ground, turn the parking brake switch **PARKING**, and set chocks to the tires.**

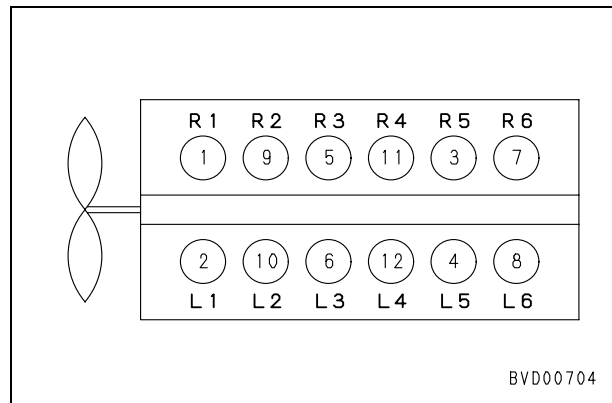
1. Remove cylinder head cover.
2. Rotate the crankshaft forward and match stamped line of R1.6 TOP on vibration damper (1) to pointer (2), by setting RH No. 1 cylinder to the compression top dead center while watching the movement of the intake valve of RH No. 6 cylinder.



★ Crank the engine using the barring tool (B) mounted to the front right-hand side of the flywheel housing.



★ At near the compression top dead center of the RH No. 1 cylinder, the intake valve of RH No. 6 cylinder moves.(opens).

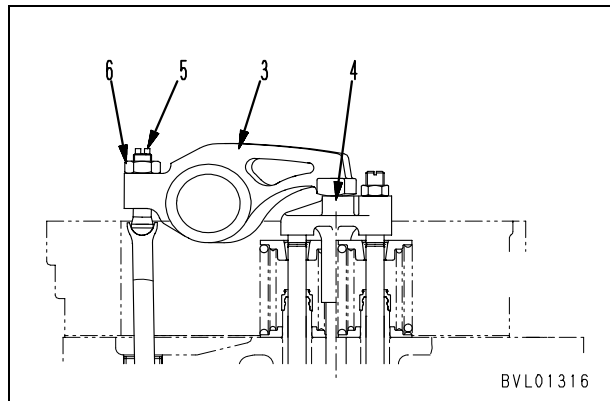


3. Loosen locknut (6) of RH No. 1 cylinder adjust screw (5). Insert a clearance gauge **D** of specified clearance between the crosshead (4) and rocker arm (3) and adjust the adjustment screw to the degree that the clearance gauge can be moved lightly.

★ Valve clearance

Intake valve: 0.35 mm

Exhaust valve: 0.57 mm

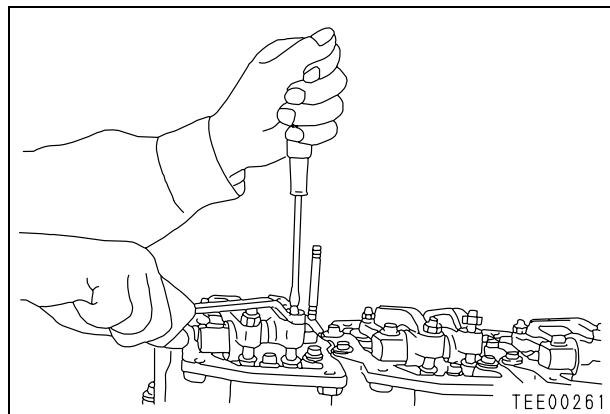


4. Tighten locknut (6) to secure adjustment screw.

Locknut tightening torque:

52.9 – 64.7 Nm {5.4 – 6.6 kgm}

★ After tightening the locknut, check the valve clearance again.



5. Hereafter crank the engine similar way in the firing order. Match the stamped line of the damper to the pointer and adjust the valve clearance of each cylinder.
 - ★ Firing order
 - R1 – L1 – R5 – L5 – R3 – L3 – R6 – L6 –
 - R2 – L2 – R4 – L4
6. After finishing adjustment, return the removed parts.
 -  Cylinder head cover mounting bolt:
14.7 – 34.3 Nm {1.5 – 3.5 kgm}

Testing compression pressure

★ Testing instruments

Symbol	Part No.	Part name
E	1	795-502-1590 Compression gauge
	2	795-471-1310 Adapter
		6261-71-6150 Gasket

⚠ **Stop the machine on the level ground, turn the parking brake switch **PARKING**, and set chocks to the tires.**

⚠ **When measuring the compression pressure, take care not to burn yourself on the exhaust manifold, muffler, etc. or get caught in a rotating part.**

★ Measure the compression pressure after the engine is warmed up.
(Engine oil temperature: 40 – 60°C).

1. Remove cylinder head cover (1) of the cylinder to be tested for compression pressure.



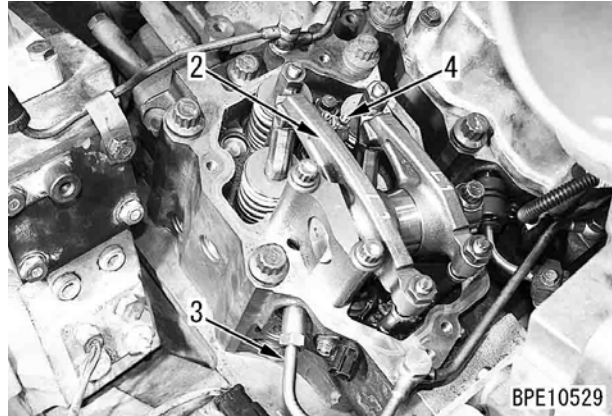
2. Bring the cylinder to be tested to the compression top dead center and remove rocker arm assembly (2).

★ See "Adjusting valve clearance".

3. Disconnect fuel high-pressure tube (3) and injector wiring harness and remove injector (4).

★ Disconnect the terminal of the injector wiring harness on the injector side and the bracket on the rocker housing side and remove the injector wiring harness (Loosen the 2 terminal nuts alternately) from the injector.

★ Pass injector under the fuel path projected sideways and pull up the injector through wire (Do not pry the injector top up).



4. Install adapter **E2** to the mounting hole on the injector and compression gauge **E1**.

★ Fit the gasket to the injector end without fail

★ Fix the adapter with the injector holder.

⇨ Holder mounting bolt:

58.8 – 73.5 Nm {6.0 – 7.5 kgm}

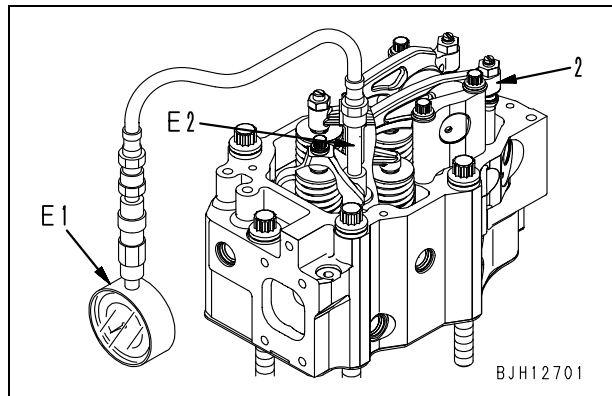
★ Apply a little amount of engine oil to the connecting parts of the adapter and gauge so that air will not leak easily.

5. Install rocker arm assembly (2) and adjust the valve clearance.

⇨ Rocker arm assembly mounting bolt:

93 – 103 Nm {9.5 – 10.5 kgm}

★ See "Adjusting valve clearance".

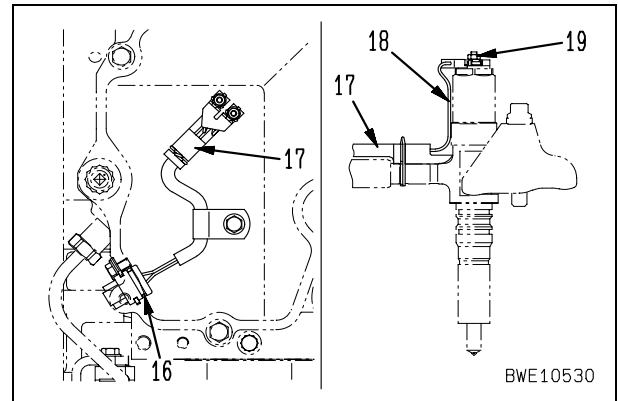
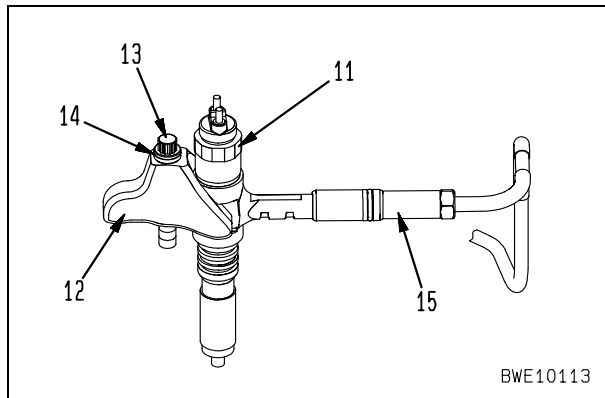


6. Set the engine in the no-injection cranking mode.

⚠ **If the engine is not set in the no-injection cranking mode, it will start and will be dangerous. Accordingly, be sure to set the engine in this mode.**

★ For the setting method, see "Special functions of machine monitor (EMMS)".

7. Rotate the engine with the starting motor and measure the compression pressure.
 - ★ Read the pressure gauge pointer when it is stabilized.
8. After finishing testing, remove the testing tools and return the removed parts.
 - ★ Install the injector and fuel high-pressure tube according to the following procedure.
 - 1) Push in injector (11) with the hand to assemble holder (12) temporarily.
 - 2) Tighten bolt (13) and washer (14) temporarily.
 - 🔧 Spherical part of washer: **Engine oil**
 - 3) Tighten sleeve nut (15) of the fuel high-pressure tube temporarily.
 - 4) Tighten bolt (13) permanently.
 - 🔧 Bolt: **58.8 – 73.5 Nm {6.0 – 7.5 kgm}**
 - 5) Tighten sleeve nut (15) permanently.
 - 🔧 Sleeve nut: **39.2 – 49.0 Nm {4 – 5 kgm}**



- 4) Tighten the clamp and spacer with the bolt.
- 5) Install rocker arm assembly.
 - 🔧 Rocker arm assembly mounting bolt: **93 – 103 Nm {9.5 – 10.5 kgm}**
- ★ Adjust the valve clearance. For details, see "Adjusting valve clearance".
- 6) Install head cover.
 - 🔧 Cylinder head cover mounting bolt: **29.4 – 34.3 Nm {3.0 – 3.5 kgm}**

- ★ Install the injector wiring harness according to the following procedure
 - 1) Install the injector wiring harness to the cylinder head and fix the connector side with the plate. Install O-ring (16).
 - 2) Install cap (17) with clip on the injector side. Press wiring harness (18) between the injector top and cap to the injector main body without slack.
 - 3) Tighten nut (19) on the injector side.
 - 🔧 Nut: **2 ± 0.2 Nm {0.2 ± 0.02 kgm}**

Testing blow-by pressure

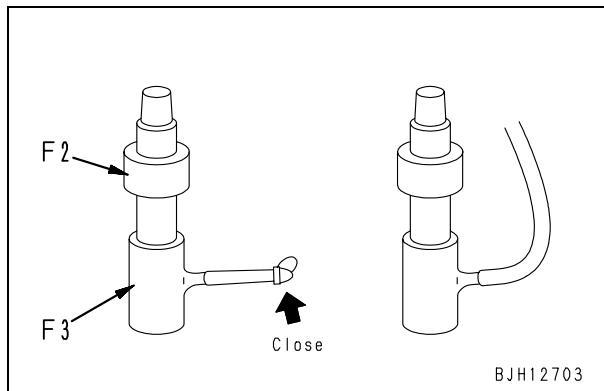
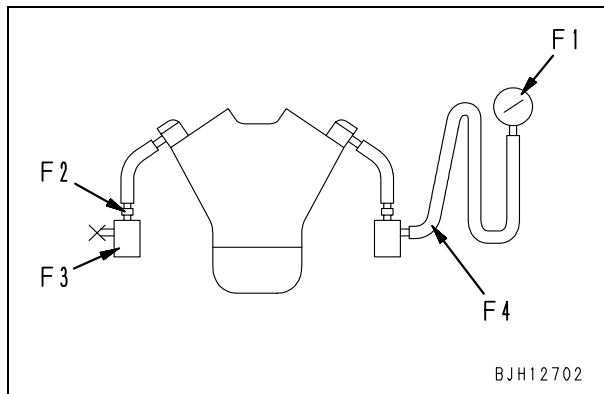
★ Testing instruments

Symbol	Part No.	Part name
F	1	799-201-1590 Gauge
	2	799-201-1450 Adapter
	3	799-201-1511 Nozzle
	4	799-201-1571 Tube

⚠ **Stop the machine on the level ground, turn the parking brake switch **PARKING**, and set chocks to the tires.**

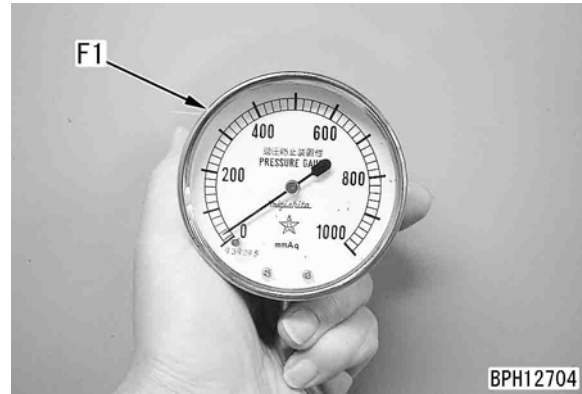
- ★ The test point is subject to machine models.
- ★ Measure blow-by pressure after the engine is warmed up.
(Engine coolant temperature: Min. 70°C)
- ★ Breather is provided to each RH and LH banks. Test the breather on either one of the banks.

1. Install adaptor **F2** and nozzle **F3** to the tip of each breather hose on the RH and LH.
2. Connect tube **F4** and gauge **F1** to either one of the nozzles. Close the tube connecting mate of other nozzle with a piece of short cut tube, etc.



3. Run the engine at the rated output and test the blow-by pressure.

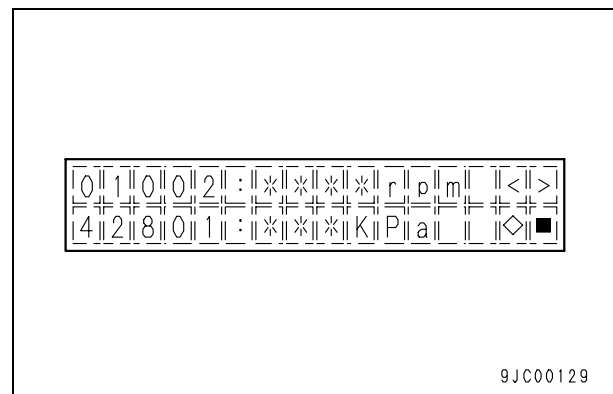
- ★ When testing with the engine mounted on the machine, test on the condition described in the shop manual for the machine.



4. After finishing testing, remove the testing tools and return the removed parts.

(Method using monitoring)

1. Switch the machine monitor display to "Service mode 1" and use the "Monitoring function" to display the following two items at the same time.
 - Monitoring system: **2 ITEMS**
 - Monitoring code: **01002 (ENG SPEED)**
 - Monitoring code: **42801 (BLOWBY PRESS)**
 - ★ For the operating method, see "Special functions of machine monitor (EMMS)".



- ★ For details of the method of testing, see "Method using testing equipment".

Testing engine oil pressure

★ Testing instruments

Symbol		Part No.	Part name
G	1	799-101-5002	Hydraulic tester
		790-261-1204	Digital hydraulic tester
	2	799-401-2320	Hydraulic tester

⚠ **Stop the machine on the level ground, turn the parking brake switch **PARKING**, and set chocks to the tires.**

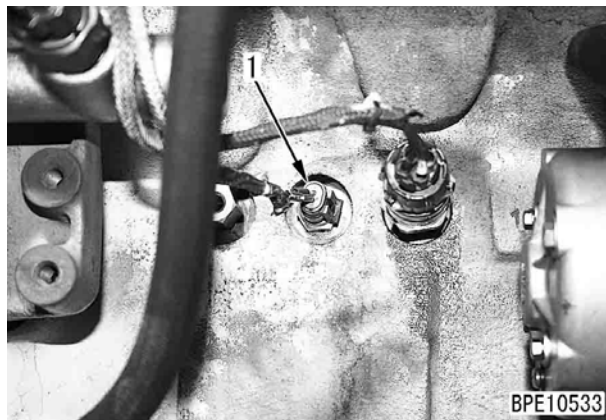
★ Test the engine oil pressure under the following conditions.

- Engine oil temperature: Min. 80 °C
- Coolant temperature:
Within operating range

1. Remove oil temperature sensor (1) on the LH side of the cylinder block.

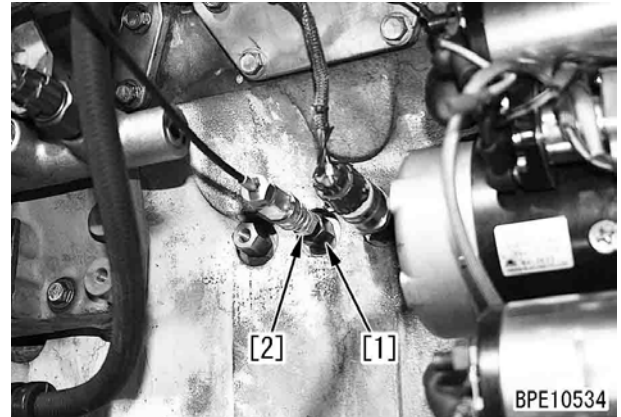
Keep the removed oil temperature sensor and the wiring harness connector connected to each other.

★ Don't remove the oil pressure sensor right side from the block because the engine controller detects abnormal low pressure error of the oil pressure sensor.



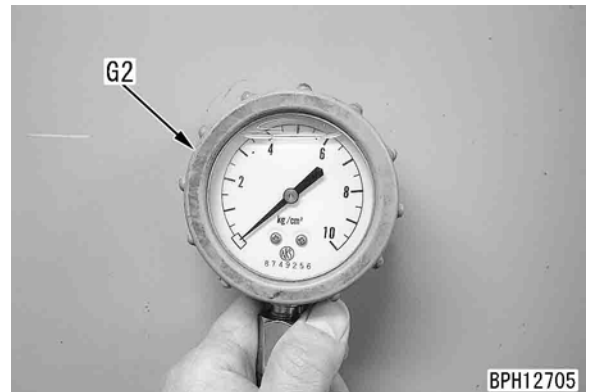
2. Install nipples [1] and [2] of hydraulic tester **G1** and connect them to hydraulic tester **G2**.

★ Since the screw size of the sensor mount is 14 x P1.5, nipple (799-101-5230) may be used.



3. Run the engine at the rated output and low idle and test the oil pressure.

★ When testing with the engine mounted on the machine, test on the condition described in the shop manual for the machine.



4. After finishing testing, remove the testing tools and return the removed parts.

Handling of fuel system devices

- ★ Precautions for testing and maintaining fuel system
The common rail fuel injection system (CRI) consists of more precise parts than the conventional fuel injection pump and nozzle. If foreign matter enters this system, it can cause trouble. When testing and maintaining the fuel system, take care more than the past. If dust, etc, sticks to any part, wash that part thoroughly with clean fuel.
- ★ Precaution for replacing fuel filter cartridge.
Be sure to use Komatsu genuine fuel filter cartridge. Since the common rail fuel injection system (CRI) consists of more precise parts than the conventional fuel injection pump and nozzle, it employs a high-efficiency special filter to prevent foreign matter from entering it. If a filter other than the genuine one is used, the fuel system may have trouble. Accordingly, never use such a filter.

Releasing residual pressure from fuel system

- ★ Pressure is generated in the low pressure circuit and high pressure circuit of the fuel system while the engine is running.
Low-pressure circuit:
Feed pump – Fuel filter – Fuel supply pump
High pressure circuit:
Fuel supply pump – Common rail – Fuel injector
- ★ The pressure in both low-pressure circuit and high-pressure circuit lowers to a safety level automatically 30 seconds after the engine is stopped.
- ★ Before the fuel circuit is tested and its parts are removed, the residual pressure in the fuel circuit must be released completely. Accordingly observe the following.
- ⚠ **When testing the fuel line or removing or installing equipment of fuel system, wait for at least 30 seconds after the engine is stopped to release the remaining pressure in the fuel circuit before starting operation. (There is still pressure remaining in the circuit, so do not start operations immediately after the engine is stopped.)**

Testing fuel pressure

★ Testing instruments

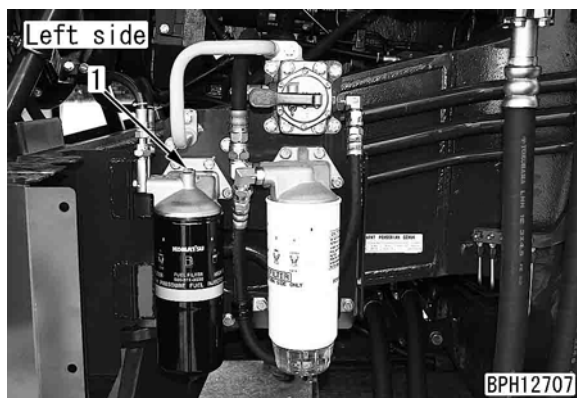
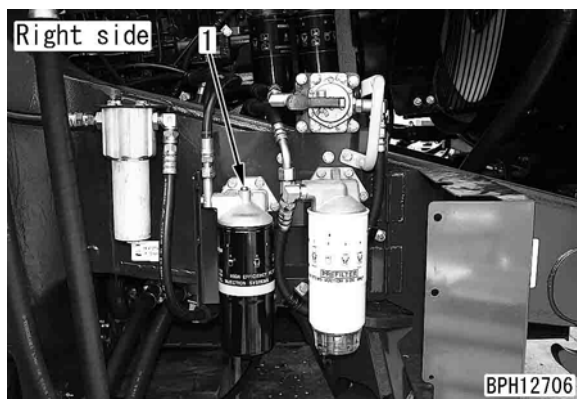
Symbol		Part No.	Part name
H	1	799-101-5002	Hydraulic tester
		790-261-1204	Digital hydraulic tester
	2	795-471-1450	Adapter
	3	799-101-5220	Nipple
		07002-11023	O-ring
	4	799-401-2320	Gauge

★ Test only the fuel pressure in the low-pressure circuit from the feed pump through the engine controller cooler and fuel filter to the supply pump.

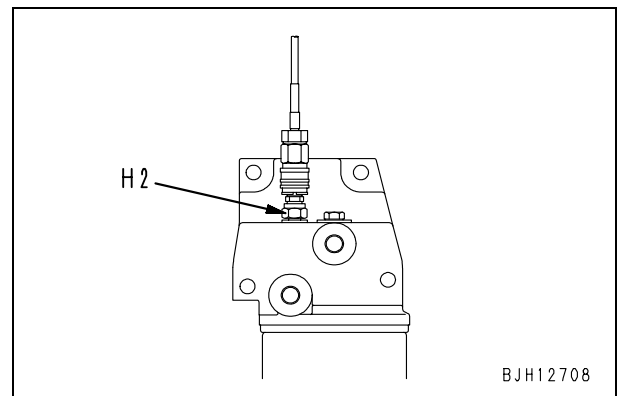
⚠ **Stop the machine on the level ground, turn the parking brake switch PARKING, and set chocks to the tires.**

⚠ **Since the pressure in the high-pressure circuit from the supply pump through the common rail to the injector is very high, it cannot be measured.**

1. Remove air bleeder plug (1) on the top of fuel filter.



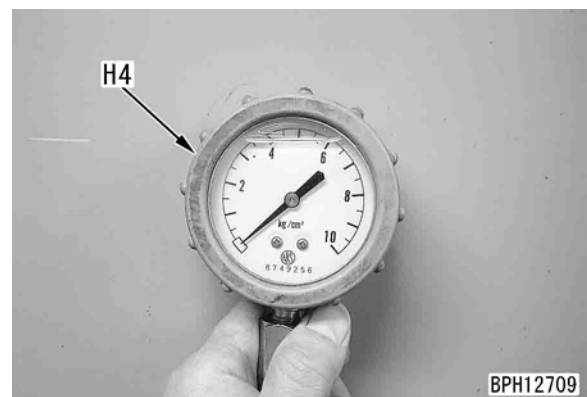
2. Install adapter H2 and connect to gauge H4.



3. Run the engine at high idle and measure the fuel pressure.

★ If the fuel pressure is in the following range, it is normal.

Engine speed	Fuel pressure
High idle	0.15 – 0.3 MPa {1.5 – 3 kg/cm ² }



4. Since the fuel circuits on the LH and RH banks after the priming pump are independent, test each circuit.
5. After finishing testing, remove the testing tools and return the removed parts.

Reduced cylinder mode operation

- ★ Reduced cylinder mode operation means to run the engine with the fuel injectors of 1 or more cylinders disabled electrically to reduce the number of effective cylinders. The purposes and effects of this operation are as follows.
1. This operation is used to find out a cylinder which does not output power normally (or, combustion in it is abnormal).
 2. When a cylinder is selected for the reduced cylinder mode operation, if the engine speed and output do not change from the normal operation (all-cylinder operation), that cylinder has 1 or more defects. The possible defects are as follows.
 - Leakage through cylinder head gasket
 - Defective injection
 - Defective piston, piston ring or cylinder liner
 - Defective valve mechanism (Moving valve system)
 - Defect in electrical system
 3. Since the common rail fuel injection system controls the injector of each cylinder electronically, the operator can perform the reduced cylinder mode operation easily with switches to find out a defective cylinder.
 - ★ For the setting method, see "Special functions of machine monitor (EMMS)".

No-injection cranking

- ★ No-injection cranking means to crank the engine with the starting motor while all the injections are stopped electrically. The purpose and effect of this operation are as follows.
- Before the engine is started after it or the machine has been stored for a long period, the no-injection cranking is performed to lubricate the engine parts and protect them from seizure.
- ★ For the setting method, see "Special functions of machine monitor (EMMS)".

Testing leakage-from pressure limiter and return rate from injector

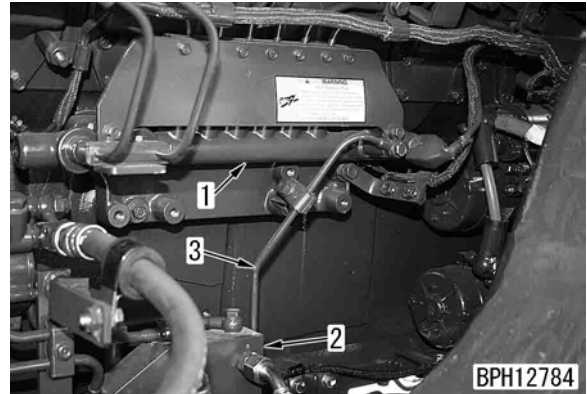
★ Testing instruments

Symbol	Part No.	Part name
J	1	6151-51-8490 Spacer
	2	6141-71-1710 Joint
	3	Commercially available Inside diameter of the hose: Approx. 11 mm
	4	Commercially available Inside diameter of the hose: Approx. 17 mm
	5	Commercially available Measuring cylinder
	6	Commercially available Stopwatch
	7	07376-70315 Plug

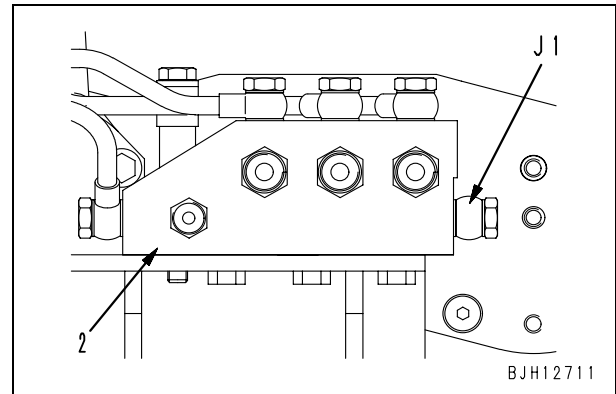
- ★ If the engine is of a type that returns the fuel spilling from the injector from the return block installed to the front of intake manifold, check the engine according to the following.
- ★ The above figure and procedure are for the left bank.
- ★ Prepare an oil pan of about 20 ℓ to receive the fuel flowing out during the test.

1. Preparation work

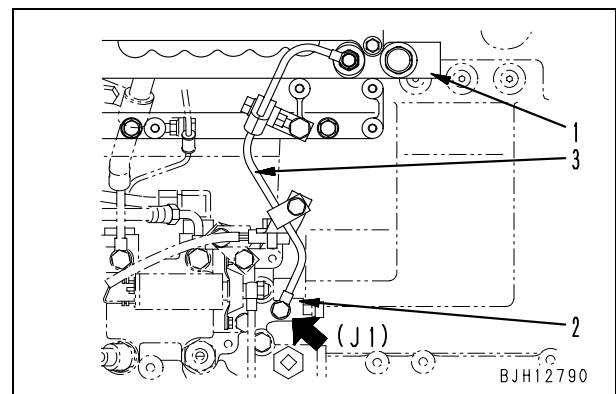
- 1) Remove tube (3) between common rail (1) and fuel block (2). (Standard spec.)



- 2) Insert spacer J1 on fuel block (2) side and tighten the removed joint bolt again. (Standard spec.)

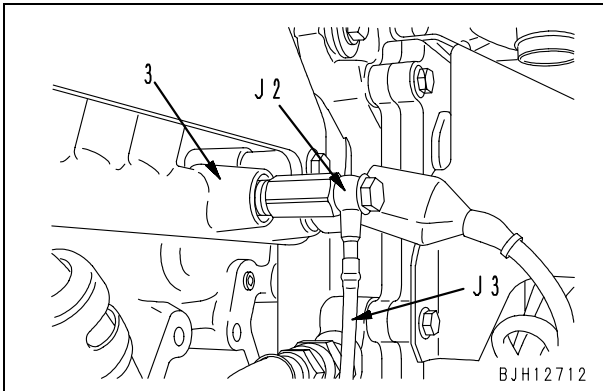


- ★ For the extra low-grade fuel specification, remove tube (3) between common rail (1) and fuel block (2) and install spacer J1 to the arrowed part. (For the procedure, see the standard specification.)



- ★ Connect the return pipe to the fuel tank again, too.
- ★ Be sure to provide a gasket to both ends of the spacer.

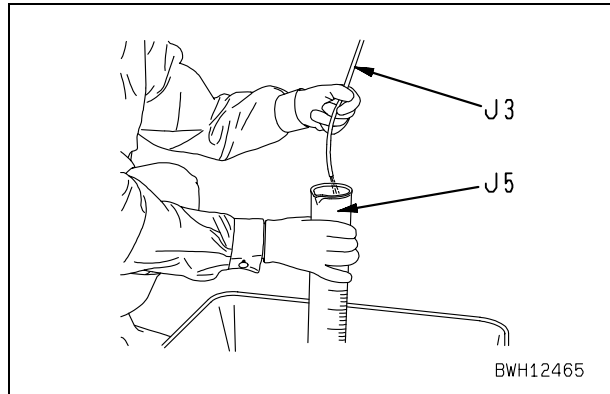
- 3) Insert joint **J2** on common rail (3) side and tighten the removed joint bolt again.
 - ★ Be sure to fit the gaskets to both ends of the joint.
- 4) Connect test hose **J3** to the end of joint **J2**.
 - ★ Bind the connecting part of the test hose with a wire, etc. to prevent it from coming off.
 - ★ The above is the preparation work for testing the leakage from the pressure limiter.



2. Testing leakage from pressure limiter

- 1) Lay test hose **J3** so that it will not slacken and put its end in the oil pan.
- 2) Referring to "Measurement of engine speed", prepare for measurement of the engine speed.
- 3) Start the engine and keep its speed to 1,600 rpm with no load.
- 4) After the engine speed is stabilized, test the leakage in 1 minute with measuring cylinder **J5**.
 - ★ You may test for 20 seconds and judge by multiplying the result by 3.
 - ★ If the leakage from the pressure limiter is in the following range, it is normal.

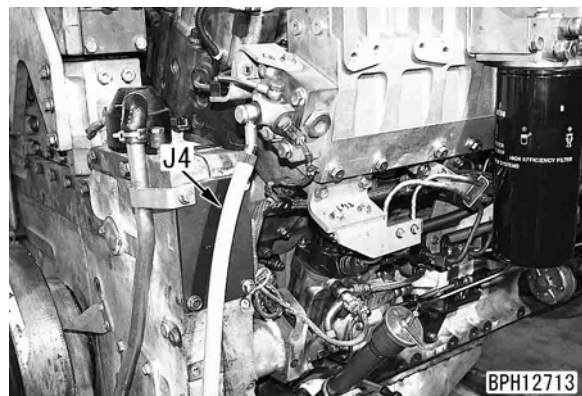
Engine speed (rpm)	Leakage (cc/min)
1,600	Max. 10



- 5) After finishing testing, stop the engine.

3. Testing return rate from injector

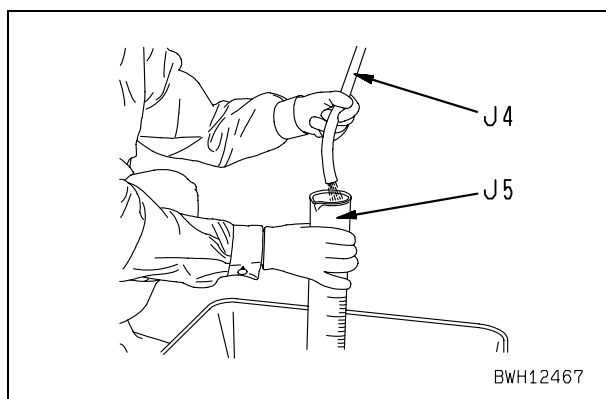
- ★ Keep the hose on the pressure limiter side connected and keep its end in the oil pan while testing the return rate from the injector.
- 1) Disconnect return hose (2) of return block (1) and connect test hose **J4**.
 - ★ Apply plug **J7** to the return hose side to stop oil, and fix it to the fuel tank.
 - ★ Bind the connecting part of the test hose with a wire, etc. to prevent it from coming off.
 - 2) Lay test hose **J4** so that it will not slacken and put its end in the oil pan.



- 3) Referring to "Measurement of engine speed", prepare for measurement of the engine speed.
- 4) Run the engine at the rated output.
- 5) After the engine speed is stabilized, test the return rate in 1 minute with measuring cylinder **J5**.
 - ★ You may test for 20 seconds and judge by multiplying the result by 3.
 - ★ If the supply pump is not supplying fuel, the engine speed may not rise. In this case, record the engine speed, too, during the test.

- ★ If the return rate (spill) from the injector is in the following range, it is normal.

Engine speed (rpm)	Limit of return rate (spill) (cc/min)
1,600	960
1,700	1,020
1,800	1,080
1,900	1,140
2,000	1,200

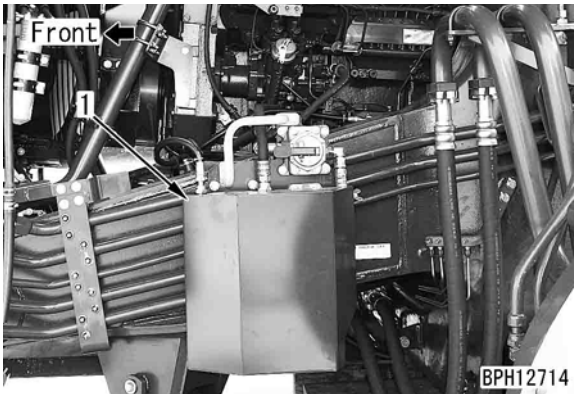


- 6) After finishing testing, stop the engine.
- 4. Work after finishing testing**
After finishing all testing, remove the testing tools and return the removed parts.
- 5.** Check the RH bank following the identical procedure.

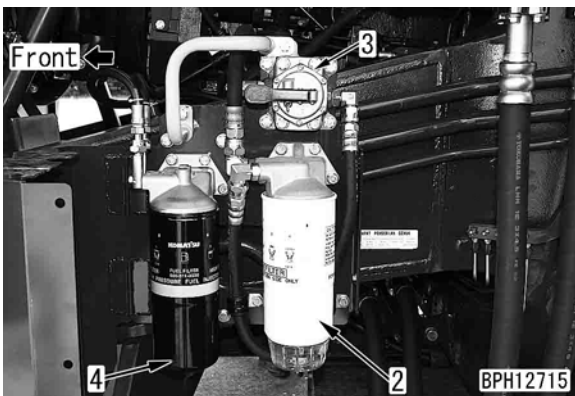
Bleeding air from fuel circuit (Standard spec.)

- ★ If fuel is used up or if a fuel circuit part is removed and installed, bleed air from the fuel circuit according to the following procedure.
- ★ Work similarly on the right and left side (The figure shows the left side).

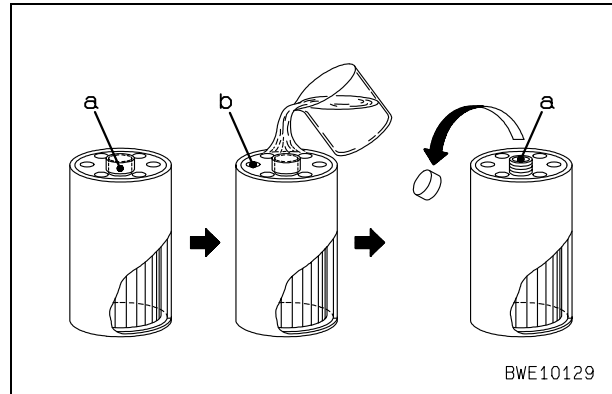
1. Remove cover (1).



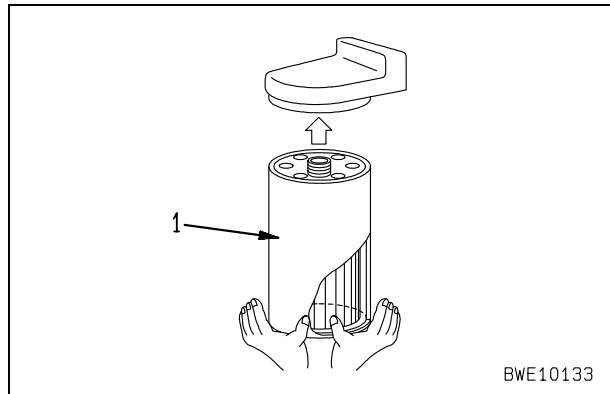
2. Remove fuel pre-filter (2) and fill it with fuel.



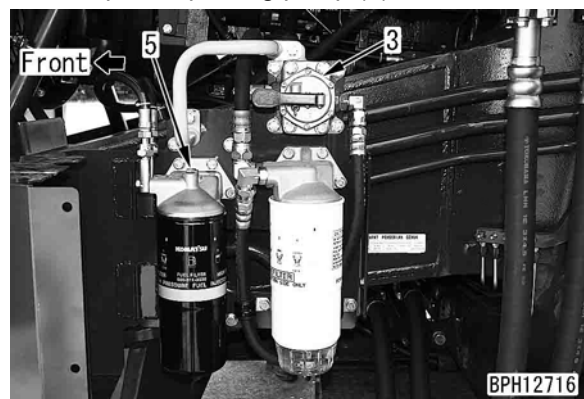
- ★ Fill the fuel filter with clean fuel and take care that dirt will not enter it.
- ★ Check that the cap is fitted to part (a) (central hole) of the fuel pre-filter (2), and then add fuel through part (b) (holes around the central hole).
- ★ After filling the fuel pre-filter (2) with fuel, remove the cap from part (a).
- ★ If clean fuel is not available, do not remove the filter but fill it with the fuel by operating priming pump (3).
- ★ Don't fill fuel directly after removing main filter (4).



3. Install fuel pre-filter (2) to the pre-filter head.
 - ★ Apply engine oil thinly over the packing on the fuel pre-filter side.
 - ★ After the packing of the fuel pre-filter touches the sealing face of the filter head, tighten the fuel filter 1/2 – 3/4 turns.



4. Loosen air bleed plugs (5) of the fuel main filter and operate priming pump (3).

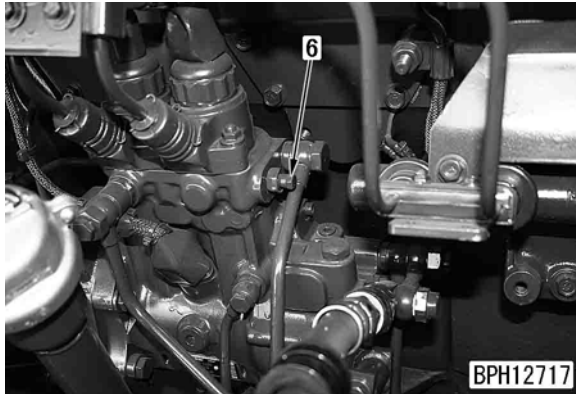


- ★ Operate the priming pump until the fuel flows out of the hole of plug (5). When bubbles stop coming out, tighten plug.

☞ Air bleeding plug:

2.0 – 3.9 Nm {0.2 – 0.4 kgm}

5. Loosen air bleeder (6) of the fuel supply pump and operate priming pump (3) 90 – 100 times.



- ★ Operate the priming pump until the fuel flows out of the air bleeder and tighten the air bleeder. Then, operate the priming pump several times more until it becomes heavy.

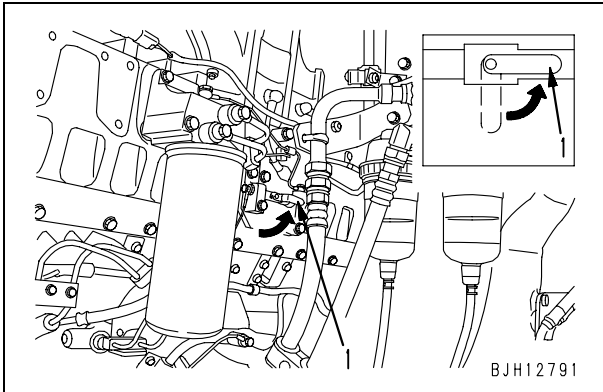
⌚ Air bleeder:

4.9 – 6.9 Nm {0.5 – 0.7 kgm}

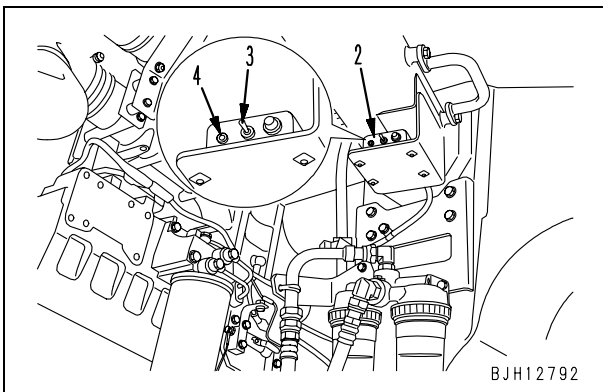
6. Work on the opposite side similarly according to steps 1 – 5.
7. Crank the engine with the starting motor to start engine.
 - ★ The air in the high-pressure circuit is bled automatically if the engine is cranked.
 - ★ If the engine does not start, there may be still air in the low-pressure circuit. In this case, repeat the above procedure from step 4.

Bleeding air from fuel circuit (Extra low-grade fuel spec.)

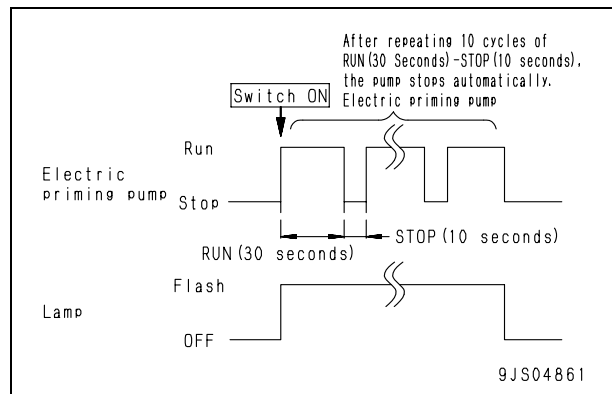
- ★ Bleed air from the fuel circuit in the following cases according to this procedure.
 - When the fuel filter is replaced
 - When fuel is used up
 - When the engine is started for the first time after the fuel piping or supply pump is replaced
 - ★ If the fuel filter was replaced, do not fill the main filter and prefilter with the fuel.
1. Turn the starting switch to the "OFF" position.
 2. Check that the fuel valve on the fuel tank side is open.
 3. Turn lever (1) of the air bleeding piping to the horizontal position to open the circuit valve.



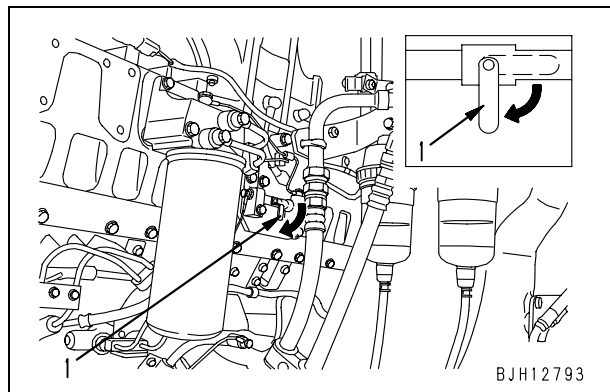
4. Turn "ON" switch (3) of electric priming pump (2) installed in the left front fender.
 - ★ The electric priming pump operates and lamp (4) blinks.



- ★ The electric priming pump has a timer in it to start and stop itself automatically (See the following figure).
- ★ The electric priming pump stops while the lamp is blinking. This phenomenon is not abnormal, however.
- ★ If the switch is turned to the "OFF" position while the lamp is blinking, the lamp goes off and the electric priming pump stops.
- ▲ **While the electric priming pump is operation, pressure is applied to the fuel circuit. Do not loosen the air bleeding plug at this time, since the fuel may spout out.**



5. After the specified time (approx. 7 minutes), lamp (4) goes off and the electric priming pump stops automatically.
 - ★ If only the fuel filter was replaced, the air bleeding work is completed now.
6. If the fuel was used up or the fuel piping or supply pump was replaced and there is not fuel in the fuel circuit, turn switch (3) "ON" after the electric priming pump stops automatically.
7. When lamp (4) goes off, the air bleeding work is completed.
8. Turn lever (1) of the air bleeding piping to the vertical position to close the circuit valve.



9. Start the engine with the starting motor.
 - ★ Do not operate the starting motor continuously for more than 20 seconds.
 - After starting the engine, run it at low idle for about 5 minutes to bleed all air from the fuel circuit.
 - Stop the engine and check that the air bleeding valve is closed.
10. If the engine does not start, try to start it again according to the following procedure.
 - ⚠ **When starting the engine, check that there is no person around it.**
 - ★ Carry out the work with the air bleeding valve closed. (Do not open the air bleeding valve after step 7.)
 - ★ After the engine fails to start, wait for about 2 minutes before trying to start again.
 - 1) Turn the electric priming pump switch ON.
 - 2) While the electric priming pump is operating, crank the engine.
 - If the engine does not start, repeat the above operation.
 - ★ Do not operate the starting motor continuously for more than 20 seconds.
 - ★ If the engine fails to start, wait for about 2 minutes and try to start again.
 - 3) After starting the engine, run it at low idle for about 5 minutes to bleed all air from the fuel circuit.
 - 4) Stop the engine and check that the air bleeding valve is closed.
 - 5) After the above operation, start the engine normally.

Testing the fuel circuit for leakage

- ★ If any fuel leakage is not detected, inspection is completed.

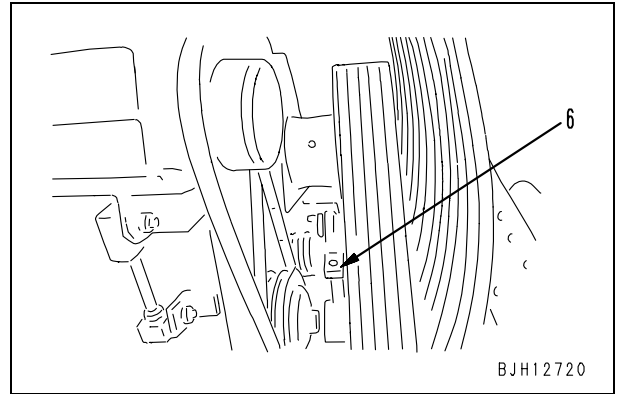
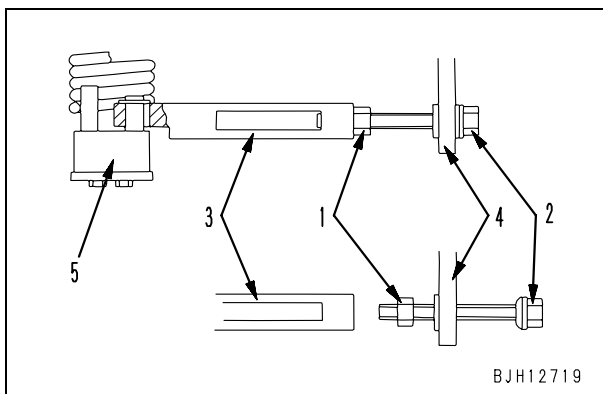
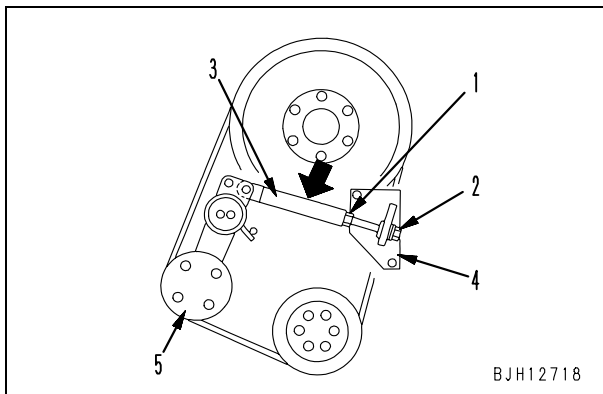
⚠ Very high pressure is generated in the high-pressure circuit of the fuel system. If fuel leaks while the engine is running, it is dangerous since it can catch fire.

- ★ After testing the fuel system or removing and installing its components, check for fuel leakage according to the following procedure.
1. Spray color checker (developer) over the supply pump, common rail, injector, and joints of the high-pressure piping.
 2. Run the engine at a speed less than 1,000 rpm and stop it after its rotation is stabilized.
 3. Check the fuel piping and the devices for fuel leakage.
 - ★ Check the high-pressure circuit parts concentrating on the areas coated with the color checker, for fuel leakage.
 - ★ If any fuel leakage is detected, repair it and test again from step 1.
 4. Run the engine at low idle.
 5. Check the fuel piping and the devices for fuel leakage.
 - ★ Check the high-pressure circuit parts concentrating on the areas coated with the color checker, for fuel leakage.
 - ★ If any fuel leakage is detected, repair it and test again from step 1.
 6. Run the engine at high idle.
 7. Check the fuel piping and the devices for fuel leakage.
 - ★ Check the high-pressure circuit parts concentration on the areas coated with the color checker, for fuel leakage.
 - ★ If any fuel leakage is detected, repair it and test again from step 1.
 8. While keeping the engine speed at high idle, apply a load to the engine by stalling the torque converter or relieving the oil from the hydraulic pump.
 9. Check the fuel piping and the devices for fuel leakage.
 - ★ Check the high-pressure circuit parts concentrating on the areas coated with the color checker, for fuel leakage.
 - ★ If any fuel leakage is detected, repair it and test again from step 1.

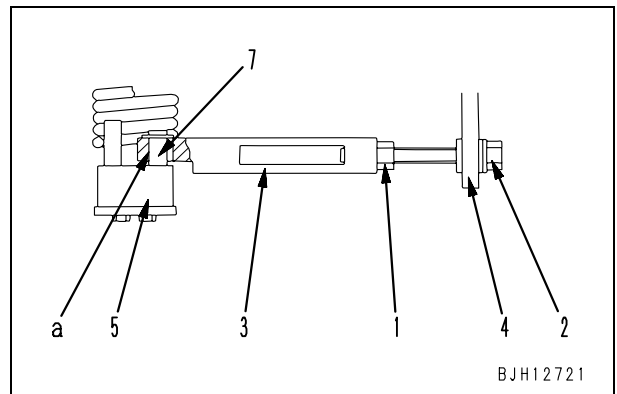
Replacement and adjustment of fan belt

- ★ The fan belt tension usually does not need to be adjusted, since the auto-tensioner is installed.
- ★ The procedures for replacing the belt and adjusting the auto-tensioner after replacing the belt are described here.

1. Loosen locknut (1).
2. Remove adjustment bolt (2) from yoke (3) without removing locknut (1).
 - ★ Keep adjustment bolt (2) installed to bracket (4) so that it will not be lost.
3. Insert a bar about 50 cm long in tension bracket hole (6) ($\varnothing$ 24) and pull it strongly to move tension pulley (5) inward and hold it.
 - ★ Take care that the bar will not come off.
4. Replace the fan belts.
 - ★ Replace all the belts as a set.
 - ⚠ **Do not put your hands or fingers between the pulley and belts. If the bar comes off, your hands or fingers will be caught between the pulleys and belts.**



5. Install adjustment bolt (2) to yoke (3) in the reverse order to removal.
6. After the clearance between slot end face (a) of yoke (3) and side of pin (7) is eliminated, tighten adjustment bolt (2) 1.5 more turns and then tighten locknut (1).

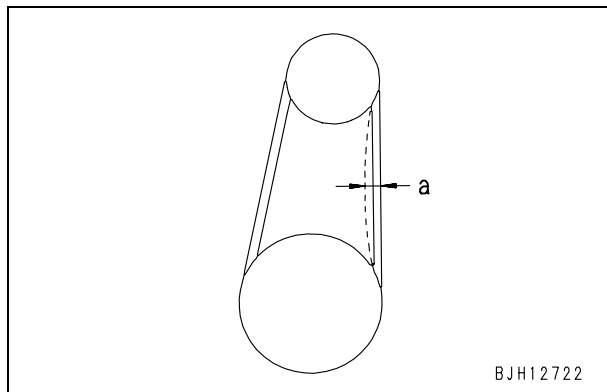


Testing and adjusting alternator belt tension

Testing

Press the intermediate point of the belt between alternator pulley and drive pulley with a finger and measure deflection (a) of the belt.

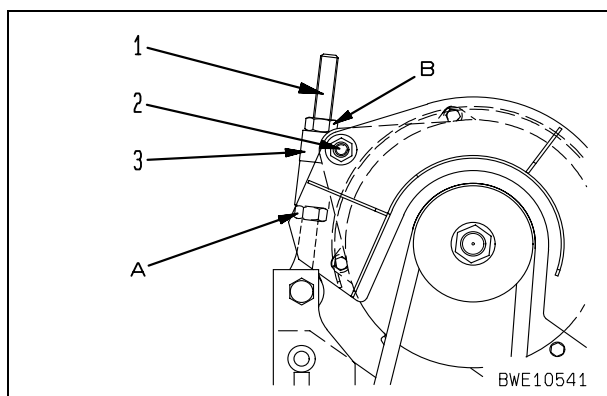
- ★ Pressing force: Approx. 59 Nm {Approx. 6 kg}
- ★ Deflection (a): approx. 20 mm (1 piece)



Adjusting

- ★ If the deflection is out of the standard range, adjust it according to the following procedure.

1. Loosen nut (B) and bolt (2) alternately.
2. Adjust belt tension using nut (A).
3. Tighten bolt (2) to have adjust bolt (1) and plate (3) made orthogonal to each other.
4. Tighten nut (B) to fix plate (3).
 - ★ After adjusting, test the belt tension again.

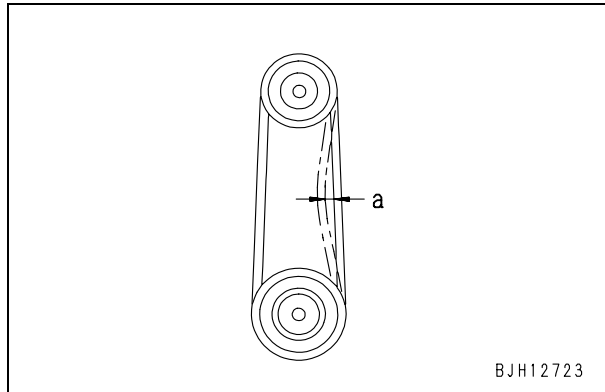


Testing and adjusting air conditioner compressor belt

Testing

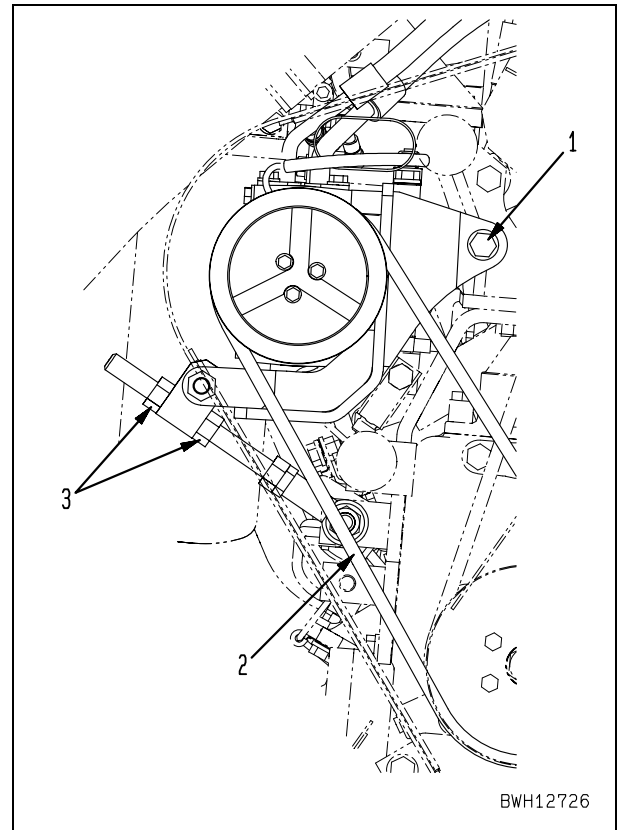
Press the intermediate point of the belt between air conditioner compressor pulley and drive pulley with a finger and measure deflection (a) of the belt.

- ★ Pressing force: Approx. 59 Nm {Approx. 6 kg}
- ★ Deflection (a): Approx. 10 mm



Adjusting

1. Loosen bolt (1), and then loosen adjustment nuts (3).
2. Turn adjustment nuts (3) to set the tension of belt (2) to the standard value.
3. Tighten adjustment nuts (3) and bolt (1).
 Bolt (1): **98 – 123 Nm {10 – 12.5 kgm}**
 ★ After adjusting, check the belt tension again.



HD785-7 Dump truck

Form No. SEN01770-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

30 Testing and adjusting

Testing and adjusting, Part 2

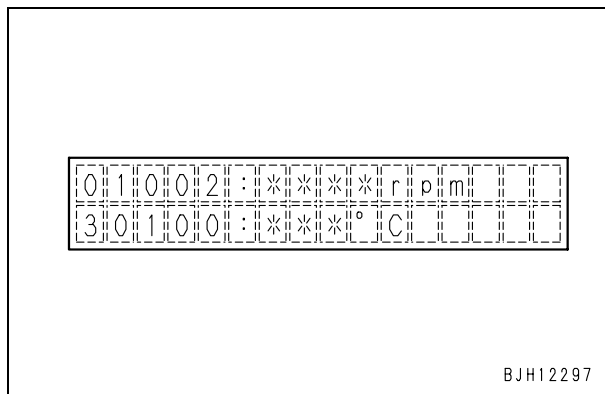
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Testing torque converter stall speed

⚠ **Stop the machine on the level ground, turn the parking brake switch PARKING, and set chocks to the tires.**

- Turn the starting switch ON and set the monitor panel in the real-time monitoring function (REAL-TIME MONITOR) of the service mode.
 - Monitoring functions: **2 ITEMS**
 - Monitoring code 1: **01002 (ENG SPEED)**
 - Monitoring code 2: **30100 (T/C OIL TEMP)**
 - ★ For the operation method, see "Special functions of machine monitor".



- Start the engine and raise the temperature of the torque converter oil and hydraulic oil.
 - Torque converter oil temperature: 60 – 80 °C
 - Hydraulic oil temperature: 45 – 55 °C
- Turn the parking brake switch ON, depress the brake pedal, then set the gear shift lever to the D position.

⚠ **If the gearshift lever is operated to any position other than the D position, the machine may move off even if the brake is being depressed, so always inspect at the D position.**

⚠ **If the torque converter is stalled while the gearshift indicator is indicating "F1", the inside of the transmission may be broken.**

Accordingly, when stalling the torque converter, seat the body securely and check that the body pilot lamp is turned OFF, and then set the gearshift lever in the D position and check that the gearshift indicator is indicating "F2".

- Depress the accelerator pedal gradually, run the engine at high idle and stall the torque converter to raise the torque converter oil temperature.

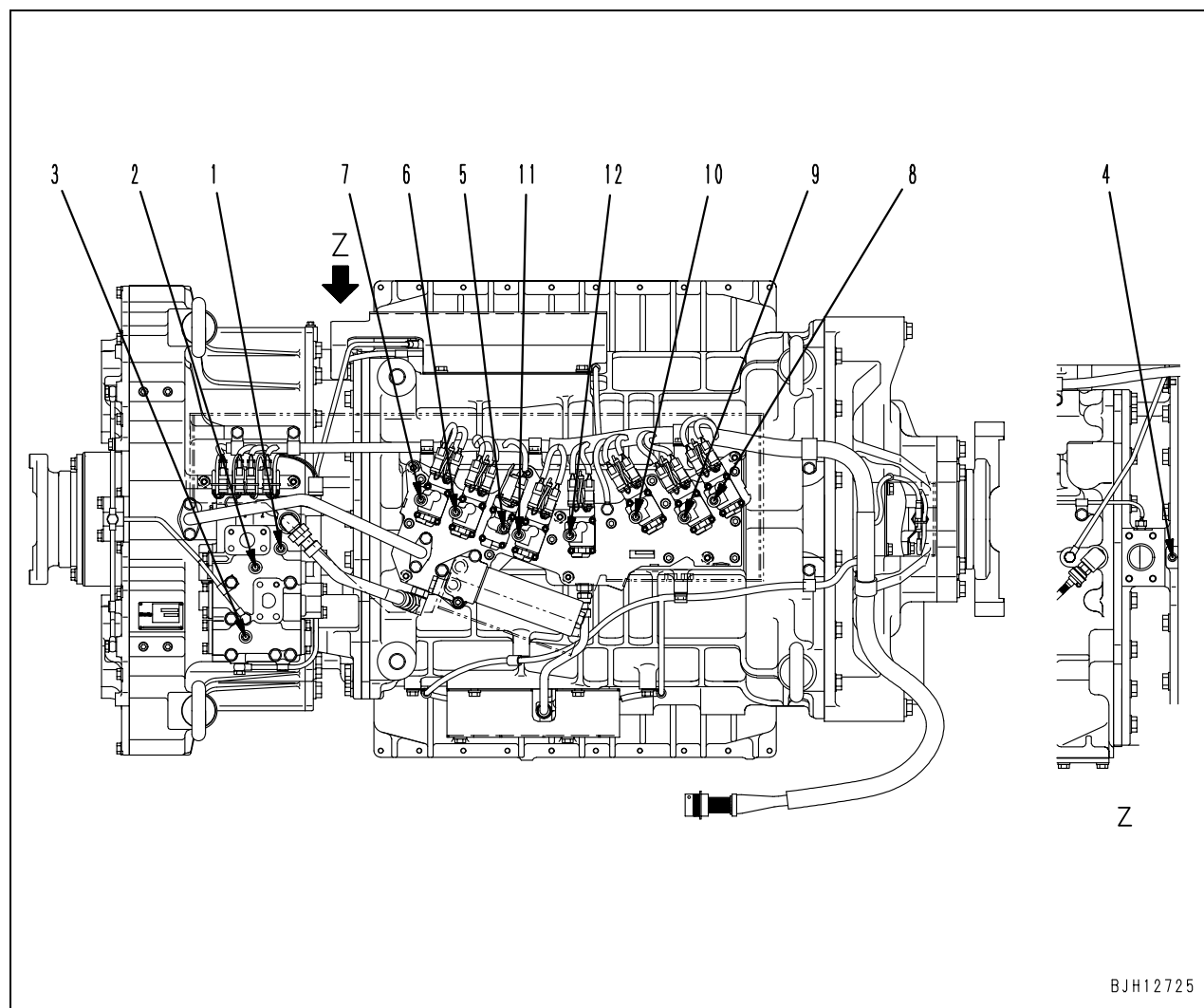
⚠ **There is danger of damage to the internal parts of the transmission, so never operate the gear shift lever to any position other than the D position during the stall operation.**

- When the torque converter oil temperature goes above 90 °C, run the engine immediately at low idle and return the gear shift lever to the N position.

⚠ **Never operate the gear shift lever with the accelerator pedal depressed. Otherwise it may create a large shock and may also become the cause of shortening the machine's service life.**

- Run the engine at a medium speed, and when the torque converter oil temperature goes down to approx. 80 °C, run at low idle.
 - ★ Keep the gear shift lever at the "N" position.
- Repeat Steps 3 – 6 and equalize the oil temperature in the torque converter and transmission.
- At the same time as repeating Steps 3 and 4, inspect the stall speed when the torque converter oil temperature is 80 °C.
 - ★ Inspect the stall speed 2 or 3 times.
 - ★ The stall speed may vary according to the following conditions, so always inspect the stall speed at the time of delivery.
 - Variations according to the engine serial number
 - Variations due to atmospheric pressure and temperature
 - Variations due to the torque consumed by accessories
 - Variations due to characteristics of the torque converter
 - Variations due to the method of inspection

Testing power train oil pressure



★ Testing instrument

Symbol	Part No.	Part name
K	1	799-101-5002 Analog hydraulic meter
		790-261-1204 Digital hydraulic meter
	2	799-101-5220 Nipple
		07002-11023 O-ring

★ Table of oil pressure testing port positions and gauges to use

No.	Testing location	Use a gauge (MPa{kg/cm ² })
1	Main relief pressure	5.9{60}
2	Flow selector valve inlet pressure	5.9{60}
3	Torque converter inlet port pressure	2.45{25}
4	Torque converter outlet port pressure	2.45{25}
5	Torque converter lock-up clutch pressure	5.9{60}
6	Transmission Lo clutch pressure	5.9{60}
7	Transmission Hi clutch pressure	5.9{60}
8	Transmission 1st clutch pressure	5.9{60}
9	Transmission 2nd clutch pressure	5.9{60}
10	Transmission 3rd clutch pressure	5.9{60}
11	Transmission 4th clutch pressure	5.9{60}
12	Transmission R clutch pressure	5.9{60}

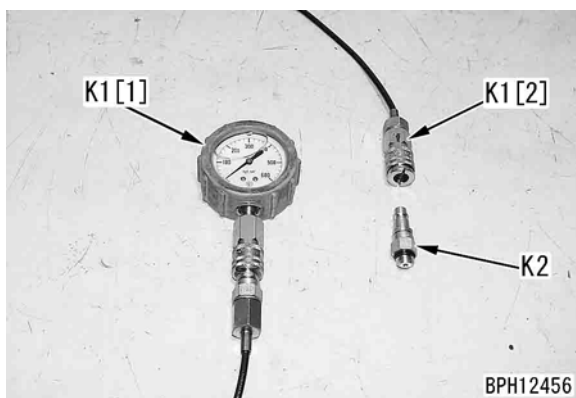
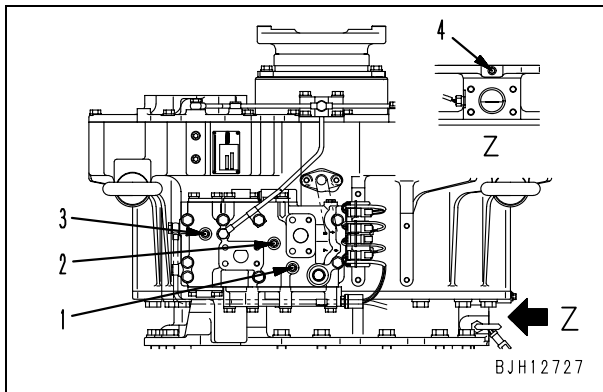
★ The transmission lubrication pressure is represented by the torque converter outlet port pressure, so there is no need to test it.

- ⚠ Stop the machine on a flat place, turn the parking brake switch to the "PARK" position and lock the tires with chocks.
- ⚠ When the body is raised, fix it with the lock pin securely.
- ⚠ When removing and installing a plug or an oil pressure gauge, stop the engine.
- ⚠ When removing and installing a plug or a testing instrument, stop the engine and wait until the oil temperature lowers thoroughly.
- ⚠ When testing the oil pressure during travel, secure a wide travel area and take extreme care of the safety around the machine.

Items related to whole power train

1. Testing of main relief pressure

- 1) Raise the body and fix it with the lock pin.
- 2) Heighten the transmission oil temperature.
 - ★ Oil leak tester for testing: 60 – 80 °C
- 3) Remove plug (1), install nipple K2 and connect oil pressure gauge [1] (5.9 MPa {60 kg/cm²}) of hydraulic tester K1 by hose [2].

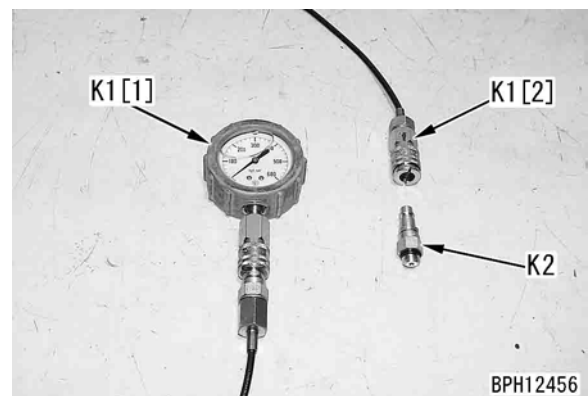
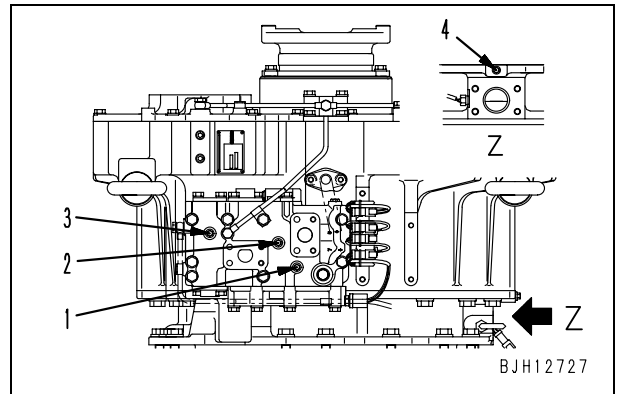


- 4) Start the engine, set the gearshift lever in the "N" position and test the oil pressure at rated speed (1,900 rpm), low idle and high idle.

- 5) After finishing testing, remove the testing instruments and return the removed parts.

2. Testing of flow selector valve inlet pressure

- 1) Raise the body and fix it with the lock pin.
- 2) Heighten the transmission oil temperature.
 - ★ Oil leak tester for testing: 60 – 80 °C
- 3) Remove plug (2), install nipple K2 and connect oil pressure gauge [1] (5.9 MPa {60 kg/cm²}) of hydraulic tester K1 by hose [2].

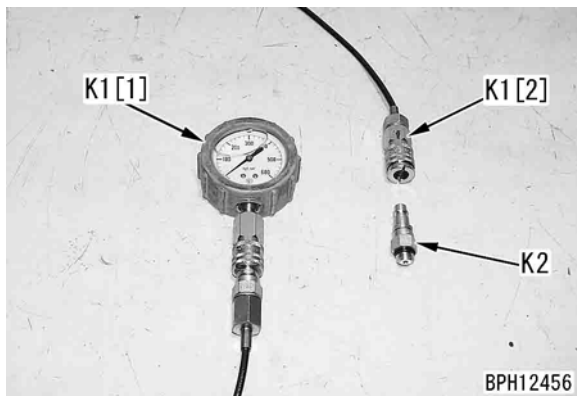
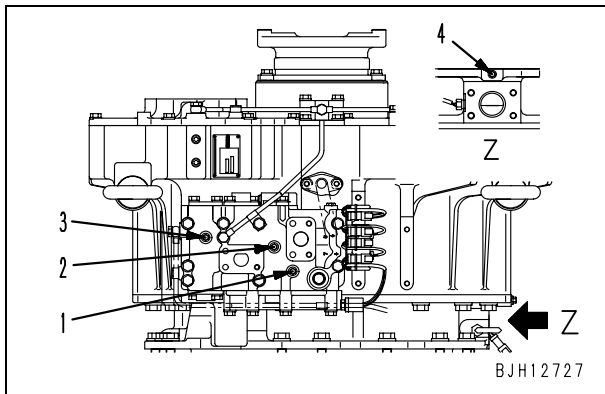


- 4) Start the engine, set the gearshift lever in the "N" position and test the oil pressure at rated speed (1,900 rpm), low idle and high idle.
- 5) After finishing testing, remove the testing instruments and return the removed parts.

Items related to torque converter

3. Testing of torque converter inlet pressure

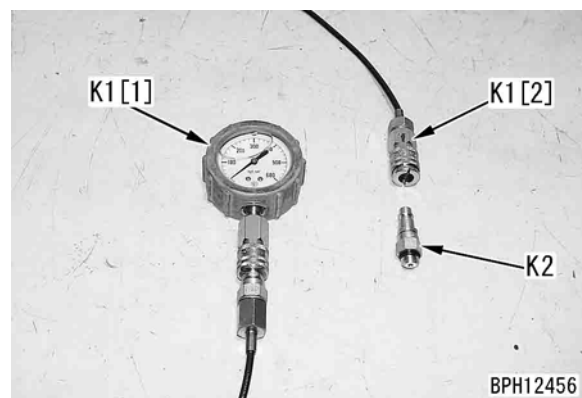
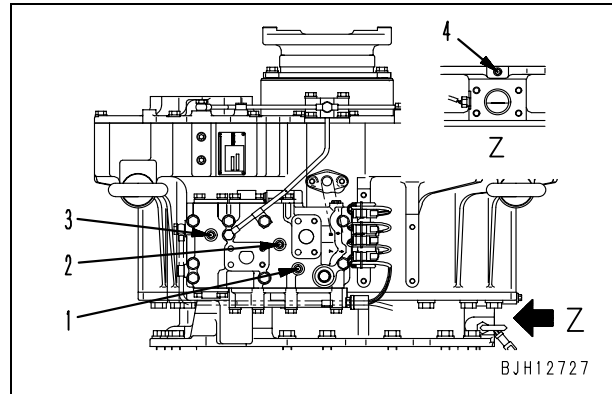
- 1) Raise the body and fix it with the lock pin.
- 2) Referring to "Testing of main relief pressure", check that there is no abnormality.
- 3) Remove plug (3), install nipple **K2** and connect oil pressure gauge [1] (2.45 MPa {25 kg/cm²}) of hydraulic tester **K1** by hose [2].



- 4) Start the engine and test the oil pressure at rated speed (1,900 rpm) and high idle.
- 5) After finishing testing, remove the testing instruments and return the removed parts.

4. Testing of torque converter outlet pressure

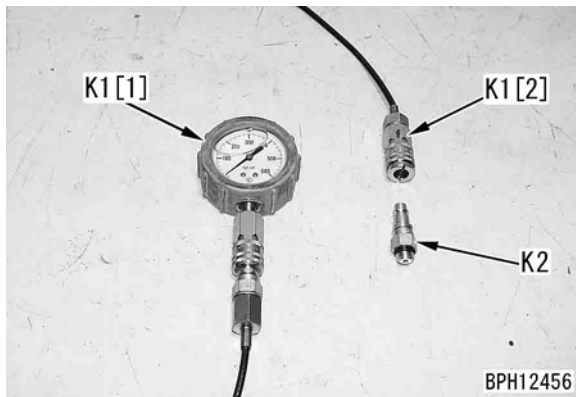
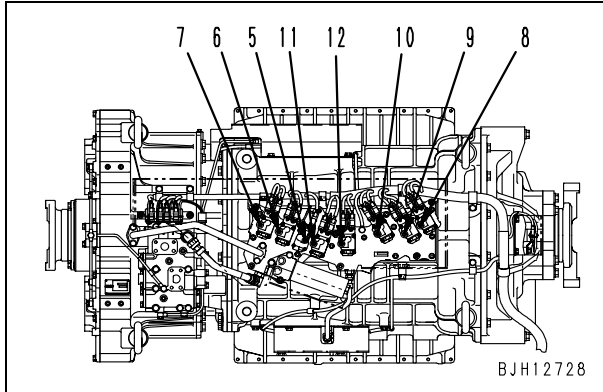
- 1) Raise the body and fix it with the lock pin.
- 2) Referring to "Testing of main relief pressure", check that there is no abnormality.
- 3) Remove plug (4), install nipple **K2** and connect oil pressure gauge [1] (2.45 MPa {25 kg/cm²}) of hydraulic tester **K1** by hose [2].



- 4) Start the engine and test the oil pressure at rated speed (1,900 rpm) and high idle.
- 5) After finishing testing, remove the testing instruments and return the removed parts.

5. Testing of torque converter lockup clutch pressure

- 1) Raise the body and fix it with the lock pin.
- 2) Remove plug (5), install nipple **K2** and connect oil pressure gauge [1] (5.9 MPa {60 kg/cm²}) of hydraulic tester **K1** by hose [2].



- 3) Lower the body to the normal position.
- 4) Run the engine and heighten the torque converter oil temperature to the operating range.
- 5) Turn the parking brake switch to the "OFF" position. While pressing the brake pedal, set the gearshift lever in the "L" position.
- 6) Release the brake, drive the machine at rated speed (1,900 rpm) and high idle and test the oil pressure when the lockup pilot lamp lights up.

⚠ Since the F1 speed reaches about 10.9 km/h, take extreme care of the safety around the machine.

- 7) After finishing testing, remove the testing instruments and return the removed parts.

Transmission related

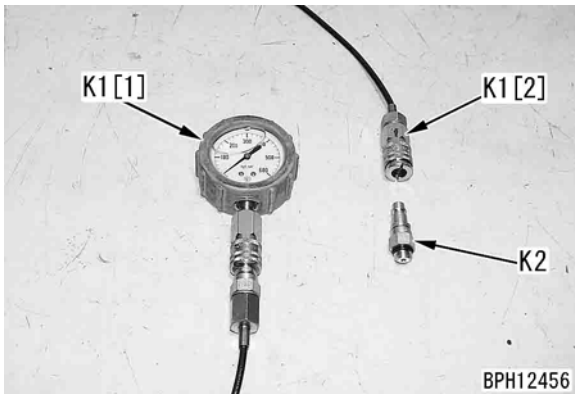
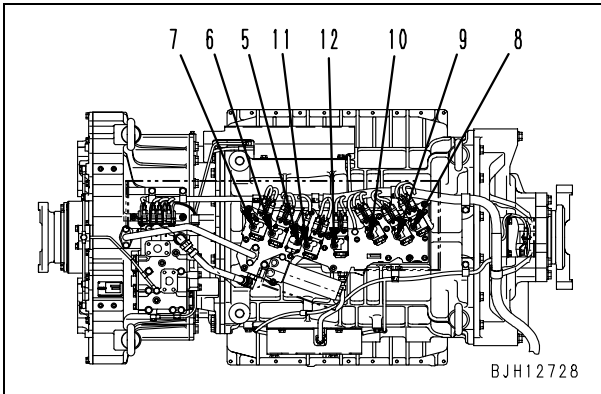
★ Table of gearshift lever positions, speed ranges, and clutches actuated

Gearshift lever										Speed engine	Clutches						
R	N	D	6	5	4	3	2	L			Lo	Hi	1st	2nd	3rd	4th	R
			○	○	○	○	○	○	F1	○		●					
		○	○	○	○	○	○		F2	●			●				
		○	○	○	○	○			F3		●		○				
		○	○	○	○				F4	○					●		
		○	○	○					F5		○				○		
		○	○						F6	○						●	
		○							F7		○					○	
	○								N								
○									RH		○						●
○									RL	○							○

- ★ The ○ mark indicates the speed ranges that are actuated for each position of the gearshift lever.
- ★ The ○ mark and ● mark indicate the clutches that are actuated for each travel speed.
- ★ The ● mark indicates the speed range when testing the oil pressure for each clutch.

6. Testing of transmission low clutch pressure

- 1) Raise the body and fix it with the lock pin.
- 2) Remove plug (6), install nipple **K2** and connect oil pressure gauge [1] (5.9 MPa {60 kg/cm²}) of hydraulic tester **K1** by hose [2].



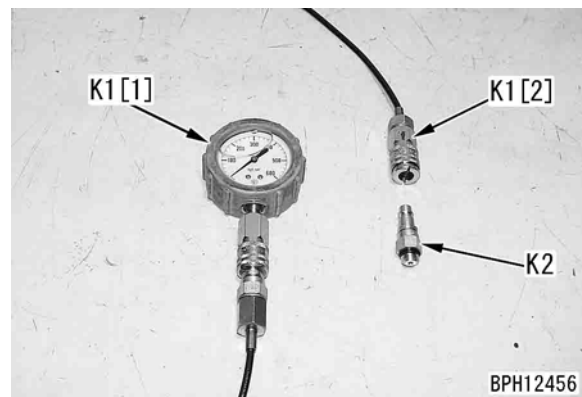
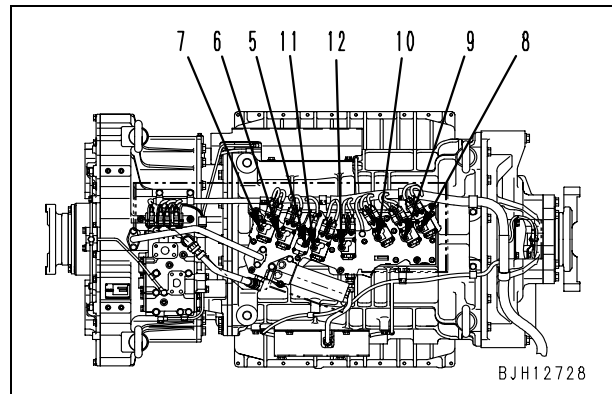
- 3) Lower the dump body and set to the original condition.
- 4) Start the engine and raise the temperature of the torque converter oil to the operating range.
- 5) Turn the parking brake switch TRAVEL, depress the parking brake pedal, then set the gearshift lever to position "L".
- 6) Release the brake and measure the oil pressure when traveling at rated speed (1,900 rpm) and high idle.

⚠ In F2, a maximum travel speed of approx. 15.2 km/h is reached, so check carefully that the surrounding area is safe.

- 7) After completing the testing, remove the testing equipment and set to the original condition.

7. Testing transmission Hi clutch

- 1) Raise the body and fix it with the lock pin.
- 2) Remove plug (7), install nipple **K2** and connect oil pressure gauge [1] (5.9 MPa {60 kg/cm²}) of hydraulic tester **K1** by hose [2].



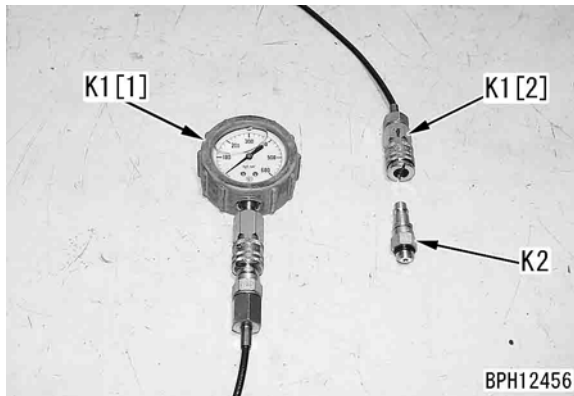
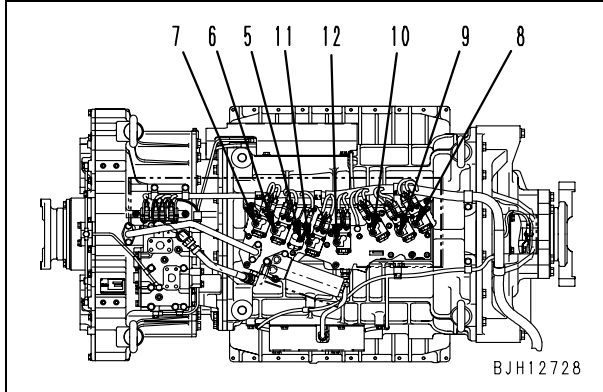
- 3) Lower the dump body and set to the original condition.
- 4) Start the engine and raise the temperature of the torque converter oil to the operating range.
- 5) Turn the parking brake switch OFF, depress the parking brake pedal, then set the gearshift lever to position "3".
- 6) Release the brake, travel at rated speed (1,900 rpm) and high idle, and test the oil pressure when the shift indicator shows "F3".

⚠ In F3, a maximum travel speed of approx. 20.4 km/h is reached, so check carefully that the surrounding area is safe.

- 7) After completing the measurement, remove the testing equipment and set to the original condition.

8. Testing transmission 1st clutch

- 1) Raise the body and fix it with the lock pin.
- 2) Remove plug (8), install nipple **K2** and connect oil pressure gauge [1] (5.9 MPa {60 kg/cm²}) of hydraulic tester **K1** by hose [2].



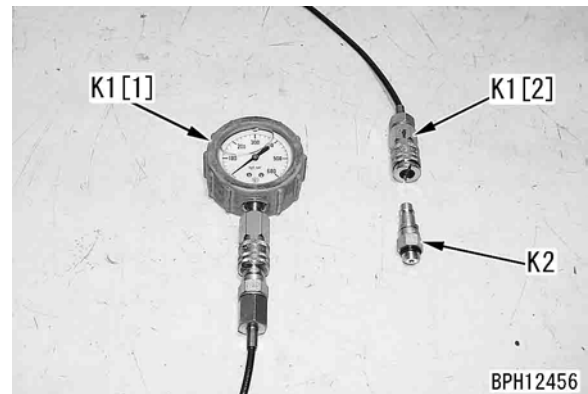
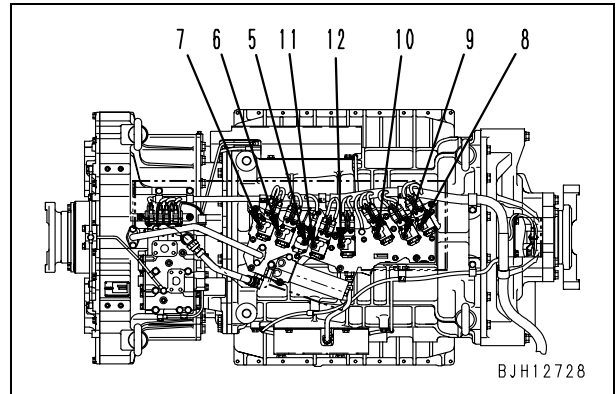
- 3) Lower the dump body and set to the original condition.
- 4) Start the engine and raise the temperature of the torque converter oil to the operating range.
- 5) Turn the parking brake switch OFF, depress the parking brake pedal, then set the gearshift lever to position "L".
- 6) Release the brake and test the oil pressure when traveling at rated speed (1,900 rpm) and high idle.

⚠ In F1, a maximum travel speed of approx. 10.9 km/h is reached, so check carefully that the surrounding area is safe.

- 7) After completing the testing, remove the testing equipment and set to the original condition.

9. Testing transmission 2nd clutch and pilot pressure

- 1) Raise the body and fix it with the lock pin.
- 2) Remove plug (9), install nipple **K2** and connect oil pressure gauge [1] (5.9 MPa {60 kg/cm²}) of hydraulic tester **K1** by hose [2].



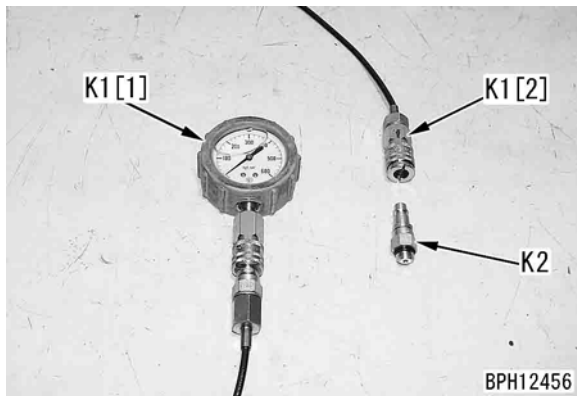
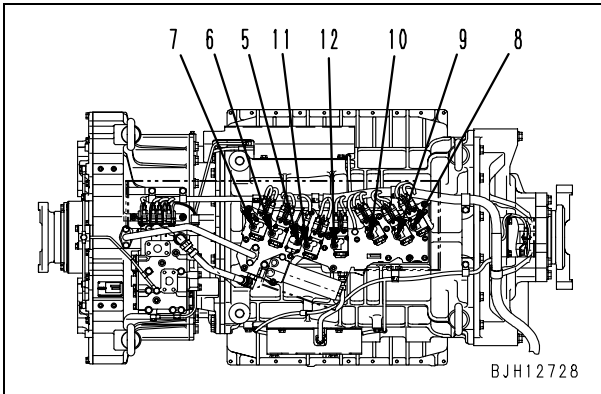
- 3) Lower the dump body and set to the original condition.
- 4) Start the engine and raise the temperature of the torque converter oil to the operating range.
- 5) Turn the parking brake switch OFF depress the parking brake pedal, then set the gearshift lever to position 2.
- 6) Release the brake, travel at rated speed (1,900 rpm) and high idle, and test the oil pressure when the shift indicator shows "F2".

⚠ In F2, a maximum travel speed of approx. 15.2 km/h is reached, so check carefully that the surrounding area is safe.

- 7) After completing the testing, remove the testing equipment and set to the original condition.

10. Testing transmission 3rd clutch and pilot pressure

- 1) Raise the body and fix it with the lock pin.
- 2) Remove plug (10), install nipple **K2** and connect oil pressure gauge [1] (5.9 MPa {60 kg/cm²}) of hydraulic tester **K1** by hose [2].



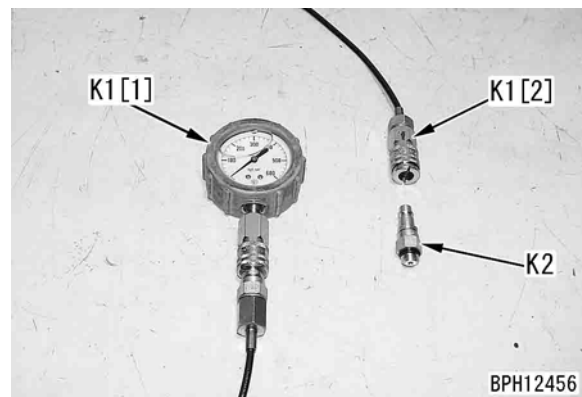
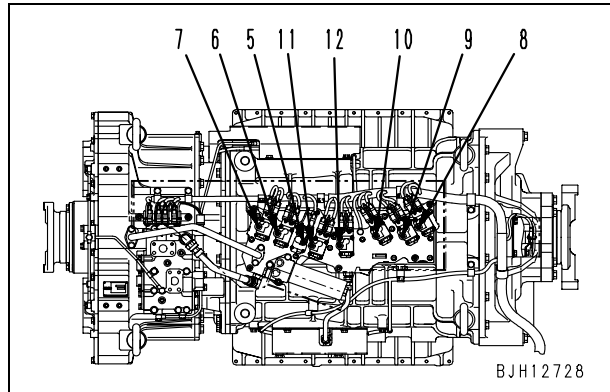
- 3) Lower the dump body and set to the original condition.
- 4) Start the engine and raise the temperature of the torque converter oil to the operating range.
- 5) Turn the parking brake switch OFF, depress the parking brake pedal, then set the gearshift lever to position "4".
- 6) Release the brake, travel at rated speed (1,900 rpm) and high idle, and test the oil pressure when the shift indicator shows "F4".

⚠ In F4, a maximum travel speed of approx. 27.2 km/h is reached, so check carefully that the surrounding area is safe.

- 7) After completing the testing, remove the testing equipment and set to the original condition.

11. Testing transmission 4th clutch

- 1) Raise the body and fix it with the lock pin.
- 2) Remove plug (11), install nipple **K2** and connect oil pressure gauge [1] (5.9 MPa {60 kg/cm²}) of hydraulic tester **K1** by hose [2].



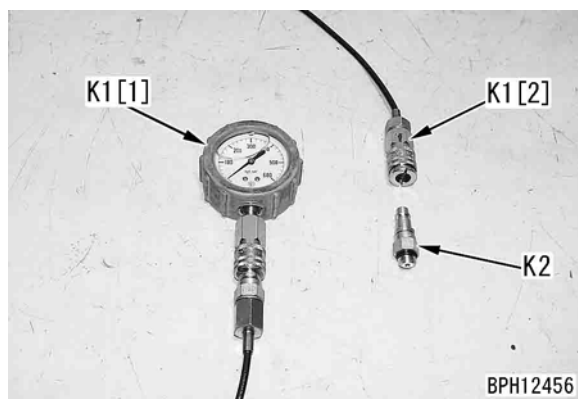
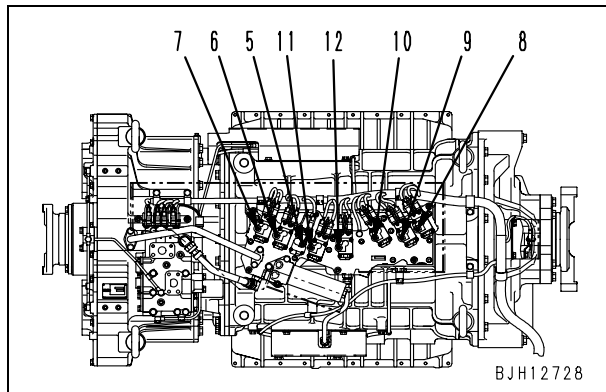
- 3) Lower the dump body and set to the original condition.
- 4) Start the engine and raise the temperature of the torque converter oil to the operating range.
- 5) Turn the parking brake switch OFF, depress the parking brake pedal, then set the gearshift lever to position "6".
- 6) Release the brake, travel at rated speed (1,900 rpm) and high idle, and test the oil pressure when the shift indicator shows "F6".

⚠ In F6, a maximum travel speed of approx. 48.7 km/h is reached, so check carefully that the surrounding area is safe.

- 7) After completing the testing, remove the testing equipment and set to the original condition.

12. Testing transmission R clutch

- 1) Raise the body and fix it with the lock pin.
- 2) Remove plug (12), install nipple **K2** and connect oil pressure gauge [1] (5.9 MPa {60 kg/cm²}) of hydraulic tester **K1** by hose [2].

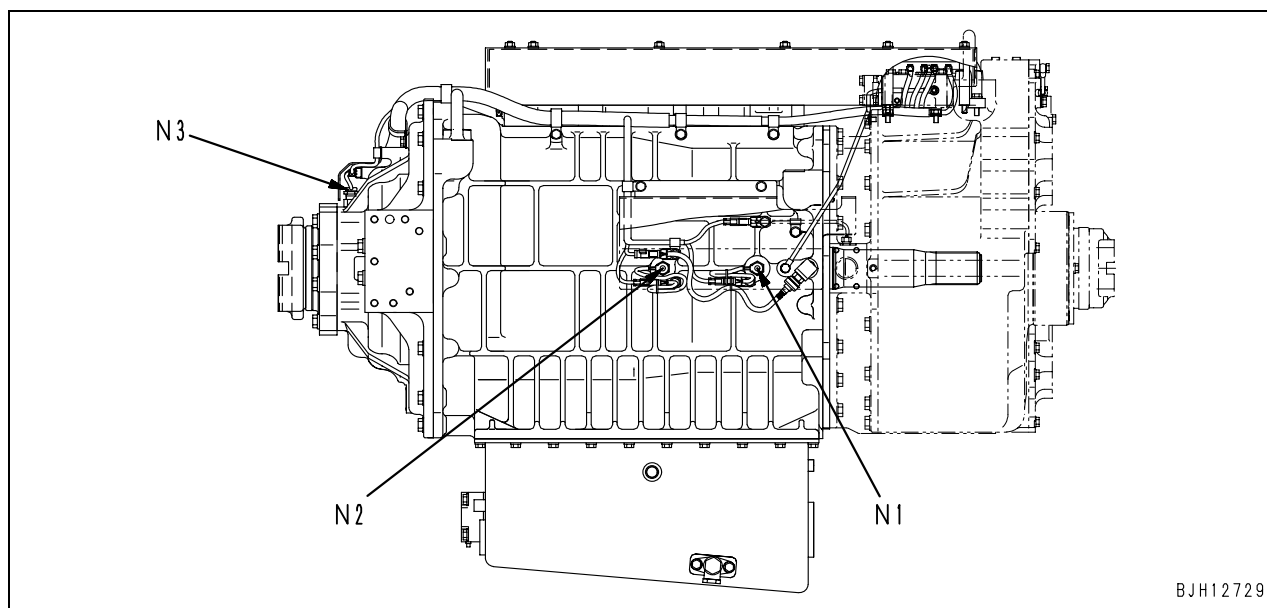


- 3) Lower the dump body and set to the original condition.
- 4) Start the engine and raise the temperature of the torque converter oil to the operating range.
- 5) Turn the parking brake switch OFF, depress the parking brake pedal, then set the gearshift lever to position "R".
- 6) Release the brake and test the oil pressure when traveling at rated speed (1,900 rpm) and high idle.

⚠ In R, a maximum travel speed of approx. 9.7 km/h is reached, so check carefully that the surrounding area is safe.

- 7) After completing the testing, remove the testing equipment and set to the original condition.

Adjusting transmission speed sensor



- ★ Adjust the 3 speed sensors installed to the transmission according to the following procedure.
- ★ Adjust all of the 3 speed sensors similarly.
 - (N1): Input shaft speed sensor
 - (N2): Intermediate shaft speed sensor
 - (N3): Output shaft speed sensor

1. Screw in sensor (1) until its tip lightly touches tooth tip or tooth end face of gear (2).

- ★ Check that the sensor tip is free from iron dust and flaws before installing.

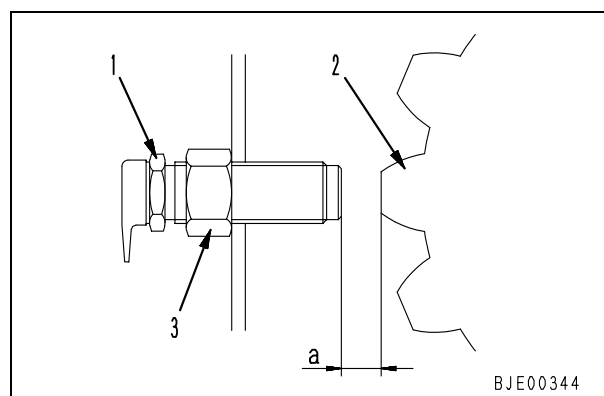
🔧 Threaded part: **Gasket sealant (LG-5)**

2. Return sensor (1) by 1/2 – 1 turn.

- ★ At this time, clearance (a) between the sensor tip and tooth tip or tooth end face of the gear is 0.75 – 1.0 mm.

3. Secure lock nut (3) with sensor (1).

🔧 Lock nut: **49.0 – 68.6 Nm {5 – 7 kgm}**



4. After finishing adjustment, check with the monitoring function of the machine monitor that each transmission shaft speed is displayed normally.

- ★ For details of the method of operation, see "Special functions of machine monitor (EMMS)".

Testing and adjusting brake oil pressure

★ Testing instrument

Symbol	Part No.	Part name
K1	799-101-5002	Analog hydraulic meter
	790-261-1204	Digital hydraulic meter
K3	566-35-43561	Nipple

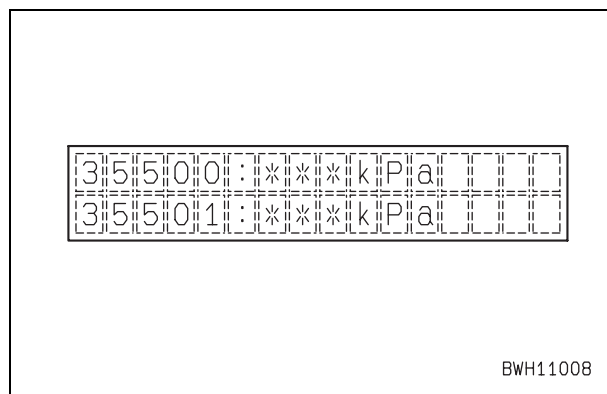
⚠ **Stop the machine on the level ground, turn the parking brake switch **PARKING**, and set chocks to the tires.**

1. Testing ACC (accumulator) charge oil pressure

(Method using monitoring)

1) Set the machine monitor in service mode and display the following 2 items simultaneously with the monitoring function.

- Monitoring system: **2 ITEMS**
- Monitoring code: **35500 (ACC OIL PRESS F)**
- Monitoring code: **35501 (ACC OIL PRESS R)**
- ★ For the operating method, see "Special functions of machine monitor (EMMS)".

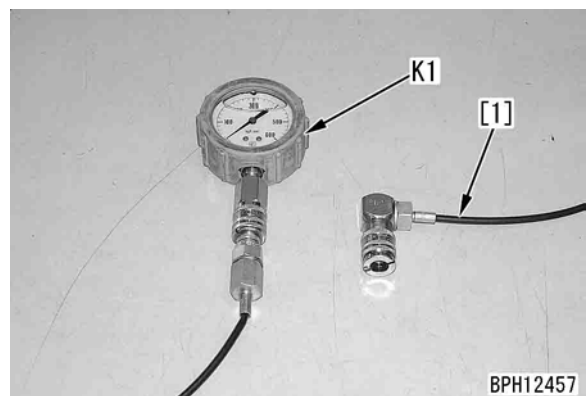


- 2) Start the engine.
- 3) Test the cut-in pressure at high idle.
 - 1) Press and release the brake pedal repeatedly to lower the oil pressure in the accumulator.
 - 2) Read the lower one of the ACC oil pressures (front or rear) when it starts rising after it reaches the bottom.

- 4) Test the cut-out pressure at high idle.
 - Read the ACC oil pressure (front or rear) when it stops rising at the highest point after the cut-in pressure.

(Testing with diagnosing devices)

- 1) Remove the cover
- 2) Stop the engine and remove plug (1) (18, P: 1.5). Connect nipple **K3** and hose [1] and install oil pressure gauge **K1** (Oil pressure gauge: 39.2 MPa {400 kg/cm²}).



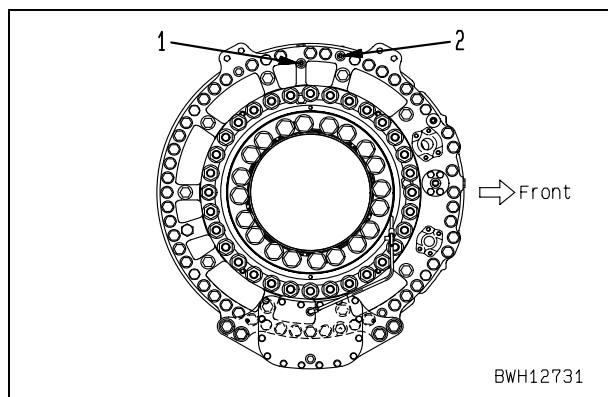
- ★ For the method of testing, see "Method using monitoring, 2) – 4)". (Read the pointer of the oil pressure gauge, however.)

2. Testing rear brake operating pressure

- 1) Remove air bleeder (1) and install oil pressure gauge **K1** [39.2 MPa {400 kg/cm²}).
 - ★ The figure shows the left side.
- 2) Operate the brake pedal and retarder control lever and measure the oil pressure.
 - ★ After finishing testing, bleed air, referring to "Bleeding air from brake circuit" to see page 19.

3. Testing parking brake on rear brake side releasing pressure

- 1) Remove air bleeder (2) and install Oil pressure gauge **K1** [39.2 MPa {400 kg/cm²}].
★ The figure shows the left side.
- 2) Turn OFF the parking brake switch (Release the parking brake) and measure the oil pressure.
★ After finishing testing, bleed air, referring to "Bleeding air from brake circuit".

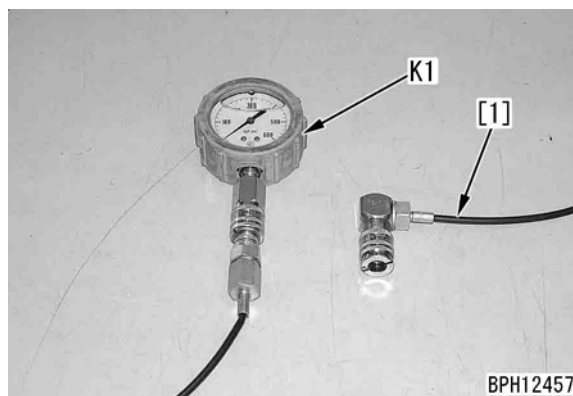
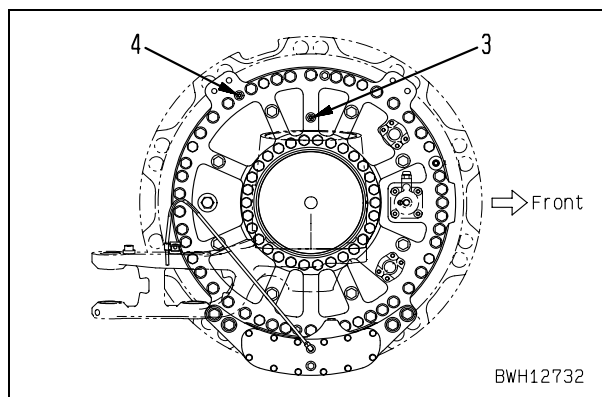


4. Testing parking brake on front brake side releasing pressure

- 1) Remove air bleeder (4) and install Oil pressure gauge **K1** [39.2 MPa {400 kg/cm²}].
★ The figure shows the left side.
- 2) Turn OFF the parking brake switch (Release the parking brake) and measure the oil pressure.
★ After finishing testing, bleed air, referring to "Bleeding air from brake circuit".

5. Testing front brake operating pressure

- 1) Remove air bleeder (3) and install Oil pressure gauge (C1) [39.2 MPa {400 kg/cm²}].
★ The figure shows the left side.
- 2) Operate the brake pedal and retarder control lever and measure the oil pressure.
★ After finishing testing, bleed air, referring to "Bleeding air from brake circuit".



Adjusting

Adjusting charge valve cut-in pressure and cut-out pressure

- ★ If the charge valve cut-in pressure or cut-out pressure is not normal, adjust the R1 relief valve of charge valve (1) according to the following procedures.
- ★ Both cut-in pressure and cut-out pressure change by adjusting the R1 relief valve.

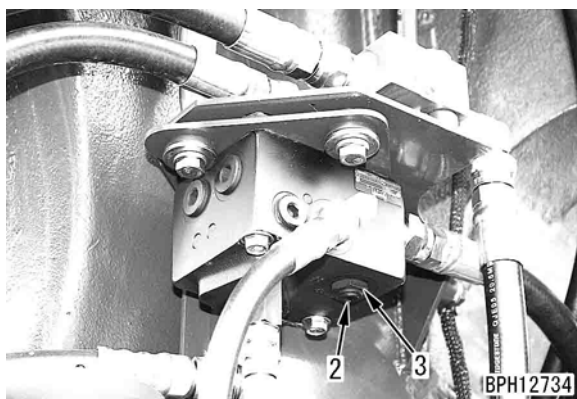
1. Remove the cover.



2. While holding adjustment screw (2), loosen locknut (3).
3. Turn adjustment screw (2) to adjust the oil pressure.
 - ★ Adjustment screw:
 - When turned clockwise, the oil pressure is heightened.
 - When turned counterclockwise, the oil pressure is lowered.
4. While holding adjustment screw (2), tighten locknut (3).

🔧 Locknut: **10.2 Nm {1 kgm}**

- ★ After completing the adjustment, check the oil pressure again following the procedure for the above test.



Testing of accumulator nitrogen gas pressure and procedure for charging accumulator with nitrogen gas

★ Testing instrument

Symbol	Part No.	Part name	Remarks
P1	792-610-1700	Gas charge tool	—
P2	792-610-1310	Nipple (For Russia)	GOST
	792-610-1320	Nipple (For USA)	CGA No. 351
	792-610-1330	Nipple (For USA)	ASA B-571-1965
	792-610-1350	Nipple (For Germany)	DIN 477-1963 NEN 3268-1966 SIS-SMS 2235/2238
	792-610-1360	Nipple (For UK)	BS 341 Part 1-1962

⚠ **Put on proper protection gear (goggles, leather gloves and protective clothes) so that the leaking nitrogen gas will not touch your skin or clothes and work on the windward side as long as possible.**

⚠ **When handling nitrogen gas in a room or another place which is not ventilated well, ventilate the work place forcibly and observe the Oxygen Deficiency Prevention Rules of the Labor Safety and Sanitation Law.**

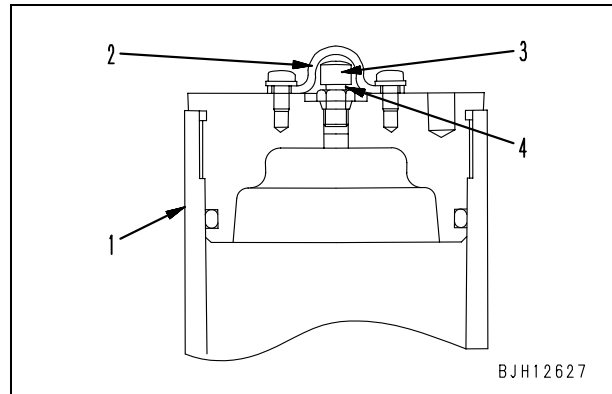
⚠ **Since the accumulator is charged with high-pressure nitrogen gas, wrong handling of it can cause an explosion and injury or death. When handling the accumulator, observe the following strictly.**

- Do not bring fire near the accumulator or put the accumulator in fire.
- Do not drill, weld or gas-cut the accumulator.
- Do not give impacts to the accumulator by hitting or rolling.
- When discarding accumulator, discharge it of the nitrogen gas.

Testing of accumulator nitrogen gas pressure

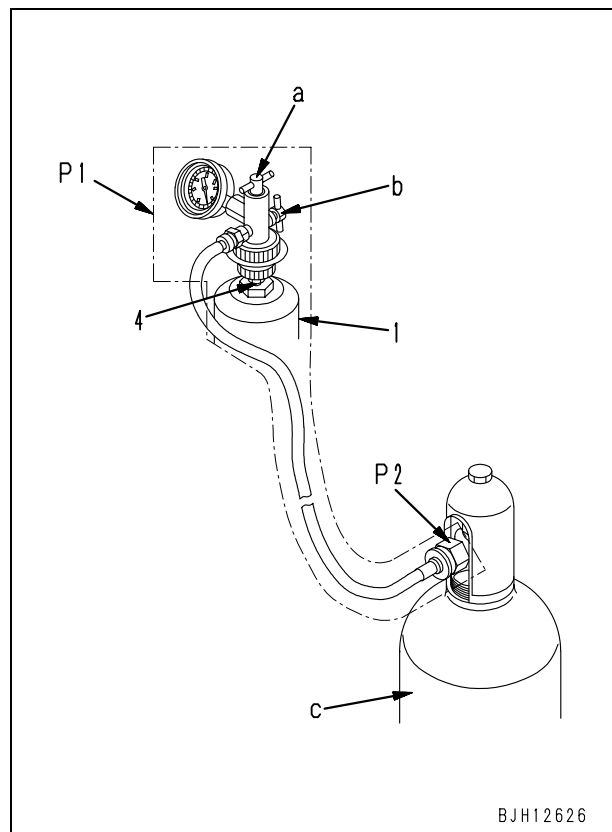
★ The nitrogen gas pressure in the accumulator disconnected from the machine can be measured according to the following procedure, too.

1. Stop the engine and press the brake pedal repeatedly to lower the oil pressure in the brake circuit to zero.
 - ★ Generally, if the brake pedal is pressed 30 times, the reaction force to the brake pedal is lost and the oil pressure is lowered to zero.
2. Remove valve guard (2) and cap (3) from accumulator (1).



3. Connect gas charge tool **P1** to valve (4) of accumulator (1) according to the following procedure.

- 1) Turn handle (a) of gas charge tool **P1** to the left until it stops.
 - Nitrogen gas cylinder (c) must be connected even when you measure only the gas pressure.
 - Close the valve of nitrogen gas cylinder (c) and handle (b).
 - For connection of nitrogen gas cylinder (c) and gas charge tool **P1**, see "Procedure for charging accumulator with nitrogen gas".
- 2) Connect gas charge tool **P1** to valve (4) of accumulator (1).



4. Turn handle (a) of gas charge tool **P1** to the left and read the gauge.

★ Since the indicated value varies with the ambient temperature, correct it by the following formula. (The unit of each value in the formula is °C.)

Indicated gas pressure =

$$\text{Standard gas pressure} \times \frac{(273 + t)}{(273 + 20)}$$

Standard gas pressure =

$$\frac{\text{Indicated gas pressure}}{\frac{(273 + t)}{(273 + 20)}}$$

t = Gas temperature at time of charge (°C)

Reference: t may be assumed to be ambient temperature.

5. If the gas pressure is too high or too low, adjust it referring to "Procedure for charging accumulator with nitrogen gas".

★ Each time the pressure is measured, some nitrogen gas is discharged and the pressure lowers. Add nitrogen gas by the loss.

6. Remove gas charge tool **P1** from accumulator (1) and return the removed parts. See "Procedure for charging accumulator with nitrogen gas".

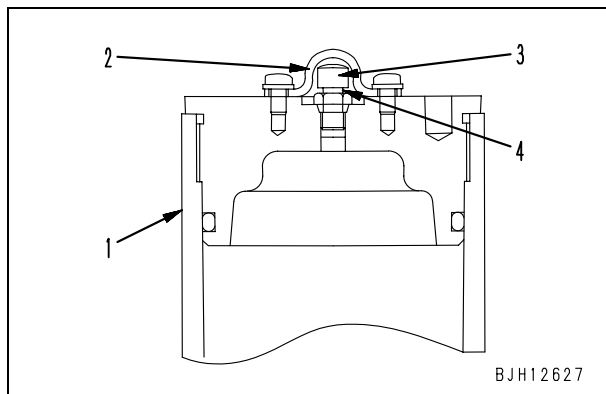
Procedure for charging accumulator with nitrogen gas

★ The disconnected from the machine can be charged with nitrogen gas according to the following procedure, too.

1. Stop the engine and press the brake pedal repeatedly to lower the oil pressure in the brake circuit to zero.

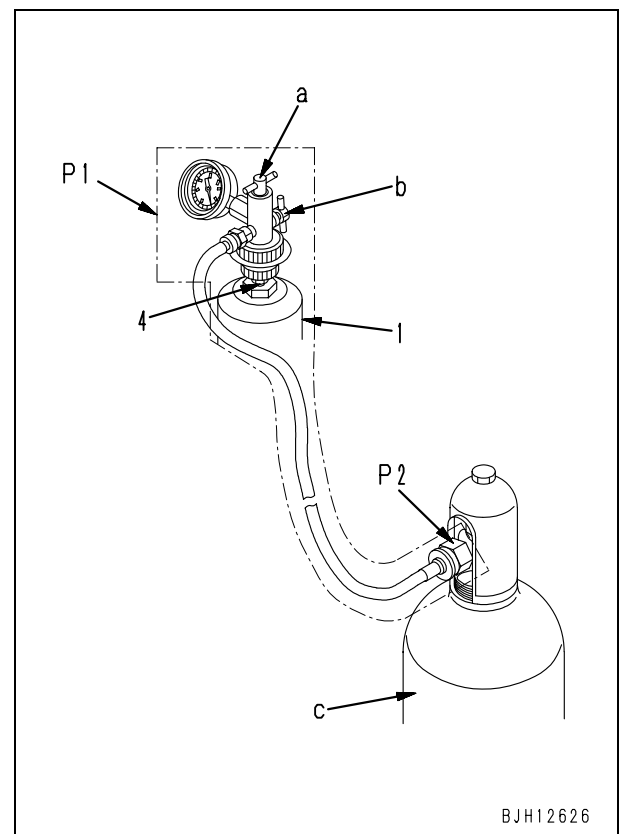
★ Generally, if the brake pedal is pressed 30 times, the reaction force to the brake pedal is lost and the oil pressure is lowered to zero.

2. Remove valve guard (2) and cap (3) from accumulator (1).



3. Connect gas charge tool **P1** and nitrogen gas cylinder (c) to valve (4) of accumulator (1) according to the following procedure.

- 1) Turn handle (a) of gas charge tool **P1** to the left until it stops.
- 2) Turn handle (b) to the left to open.
- 3) Connect gas charge tool **P1** to valve (4) of accumulator (1).
- 4) Connect gas charge tool **P1** and nitrogen gas cylinder (c).
 - There are 2 types of threads of nitrogen gas cylinders, W22-14 thread (male screw, type A) and W23-14 thread (female screw, type B). When using a gas cylinder of W23-14 thread (female screw, type B), connect the hose by using the adapter. (The adapter is attached to gas charge tool **P1**.) [For Japan]
 - Use nipple **P2** to connect the hose, depending on the specification of the nitrogen gas cylinder. [For overseas]



4. Open nitrogen gas cylinder (c) slightly to discharge nitrogen gas at pressure of 0.19 – 0.29 MPa {2 – 3 kg/cm²}.

5. After nitrogen gas starts flowing out of handle (b), close handle (b).

6. Turn handle (a) slowly to the right to open valve (4) of accumulator (1) gradually.
- ★ If handle (a) is turned too much, the valve core of the accumulator will be damaged and gas will leak. Accordingly, operate handle (a) carefully.

7. Open the valve of nitrogen gas cylinder (c) further to charge the accumulator with nitrogen gas.

8. During the work, close the valve of nitrogen gas cylinder (c) and check the nitrogen gas pressure in the accumulator.

- ★ Since the indicated value varies with the ambient temperature, correct it by the following formula. (The unit of each value in the formula is °C.)

Indicated gas pressure =

$$\text{Standard gas pressure} \times \frac{(273 + t)}{(273 + 20)}$$

Standard gas pressure =

$$\frac{\text{Indicated gas pressure}}{(273 + 20)} \times (273 + t)$$

t = Gas temperature at time of charge (°C)

Reference: t may be assumed to be ambient temperature.

9. After the accumulator is charged to the standard pressure, close the valve of nitrogen gas cylinder (c).

- If the accumulator is charged too much, turn handle (b) to the left slowly with the valve of nitrogen gas cylinder (c) closed to release the nitrogen gas gradually to adjust.

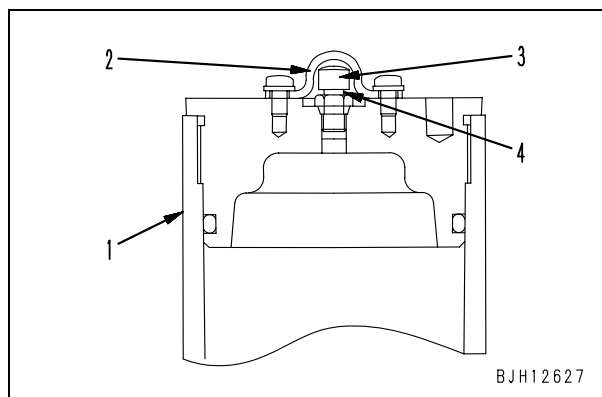
10. Remove gas charge tool **P1** from valve (4) of accumulator (1) according to the following procedure.

- 1) Turn handle (a) to the left to close the valve of the accumulator.
- 2) Turn handle (b) to the left to open and discharge nitrogen gas remaining in gas charge tool **P1** and hoses.
- 3) Remove gas charge tool **P1** from valve (4) of the accumulator.

11. Apply soap water to valve (4) of the accumulator to check that nitrogen gas is not leaking.

12. Install cap (3) and valve guard (2) to accumulator (1).

Cap: **9.8 – 12.7 Nm {1.0 – 1.3 kgm}**



13. In a week after charging the accumulator with nitrogen gas, check that the nitrogen gas pressure has not lowered.

- ★ Check the functions in 5 minutes after stopping the engine. (If the engine is stopped for more than 5 minutes, the brake circuit pressure lowers and the functions cannot be checked accurately.)

- 1) Stop the machine on a level place and set the parking brake switch in the "PARK" position.

- 2) Start the engine and run it at medium speed for 1 minute and then stop it.

- 3) Turn the starting switch to the ON position and press the brake pedal repeatedly. Count the number of presses until the brake oil pressure caution lamp lights up.

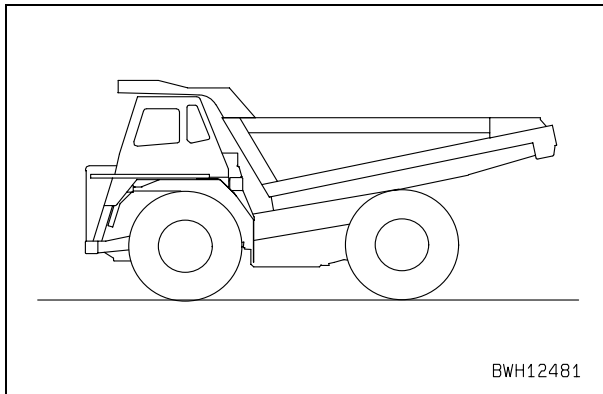
- If number of presses is less than 5: Accumulator gas pressure may have lowered.
- If number of presses is 5 or more: Accumulator gas pressure is normal.

Testing brake performance

- ⚠ Stop the machine on the level ground and turn the parking brake switch **PARKING**.
- ⚠ If the machine starts to move, it can cause a serious personal injury. Should the machine start moving during the performance test, reduce the engine speed immediately, move the gear shift lever to the **N** position and depress the foot brake.

1. Testing braking performance of foot brake (service brake)

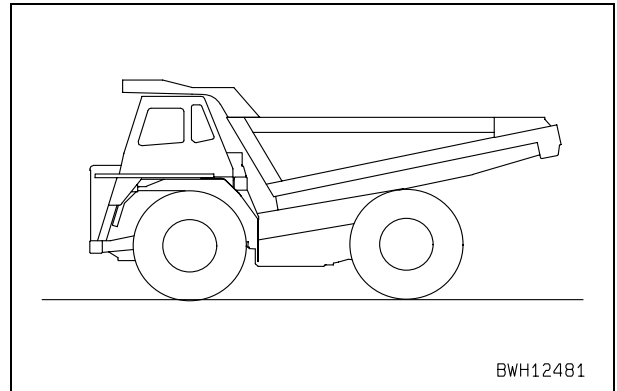
- 1) Start the engine and turn the parking brake switch **OFF**.
- 2) Depress the brake pedal fully, then set the gear shift lever to the **D** position.
 - ⚠ If the torque converter is stalled while the gearshift indicator is indicating "F1", the inside of the transmission may be broken. Accordingly, when stalling the torque converter, seat the body securely and check that the body pilot lamp is turned **OFF**, and then set the gearshift lever in the **D** position and check that the gearshift indicator is indicating "F2".
- 3) Depress the accelerator pedal gradually and check that the machine does not move when the torque converter is stalled at the specified speed.



- 4) After completing the test, run the engine at low idle and set the gear shift lever to the "N" position.

2. Testing braking performance of retarder brake

- 1) Start the engine and turn the parking brake switch **OFF**.
- 2) Pull the retarder lever fully, then set the gear shift lever to the **D** position.
 - ⚠ If the torque converter is stalled while the gearshift indicator is indicating "F1", the inside of the transmission may be broken. Accordingly, when stalling the torque converter, seat the body securely and check that the body pilot lamp is turned **OFF**, and then set the gearshift lever in the **D** position and check that the gearshift indicator is indicating "F2".
- 3) Depress the accelerator pedal gradually and check that the machine does not move when the torque converter is stalled at the specified speed.

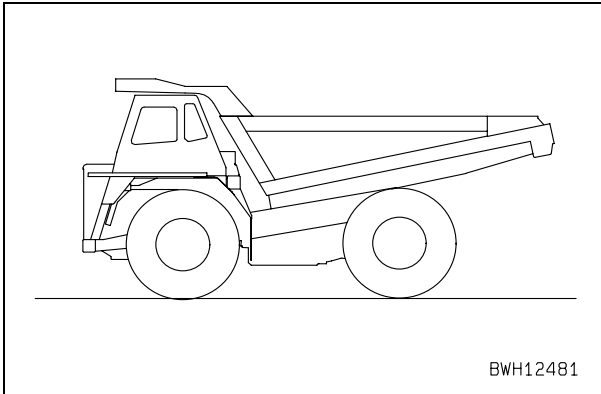


- 4) After completing the testing, run the engine at low idle and set the gear shift lever to the "N" position.

3. Testing braking performance of parking brake

- 1) Turn the parking brake switch **PARKING** and start the engine.
- 2) Set the gear shift lever to the **D** position.
 - ⚠ If the torque converter is stalled while the gearshift indicator is indicating "F1", the inside of the transmission may be broken. Accordingly, when stalling the torque converter, seat the body securely and check that the body pilot lamp is turned **OFF**, and then set the gearshift lever in the **D** position and check that the gearshift indicator is indicating "F2".

- 3) Depress the accelerator pedal gradually and check that the machine does not move when the torque converter is stalled at the specified speed.
 - ★ If the machine moves while the engine speed is below the specified speed, perform "Check of wear of rear brake disc" described later.



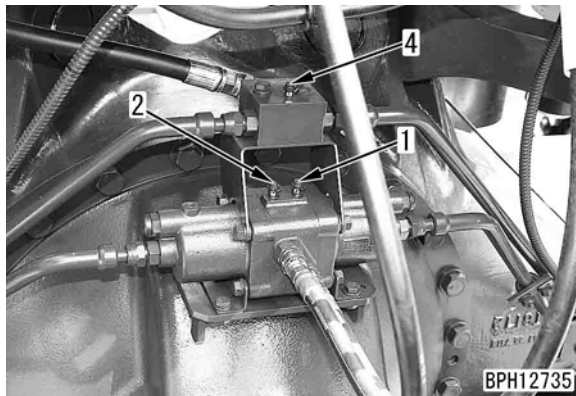
- 4) After completing the testing, run the engine at low idle and set the gear shift lever to the "N" position.

Bleeding air from brake circuit

- ★ If any brake circuit device was removed and installed or if the transmission and brake cooling oil was replaced, bleed air from the brake circuit according to the following procedure.
- ★ If the machine is equipped with ASR, see "Bleeding air from ASR circuit", too.
- ★ Brake oil temperature during work: Min. 40 °C
- ⚠ **Stop the machine on a flat place, turn the parking brake switch to the "PARKING" position and lock the tires with chocks.**

1. Rear brake

- ★ Bleed air from the slack adjuster side first and then bleed from the wheel brake side.
- 1) Using a vinyl tube for bleeding air, depress the brake pedal and loosen air bleeder screw (1) or (2) by 3/4 turns. Keep depressing the brake pedal until bubbles do not come out of the bleeder any more. When bubbles do not come out any more, tighten (close) the bleeder and release the pedal.
- 2) Pull the retarder control lever and loosen air bleeder screw (1) or (2) by 3/4 turns. Keep pulling the retarder control lever until bubbles do not come out of the bleeder any more. When bubbles do not come out any more, tighten (close) the bleeder and release the retarder control lever.



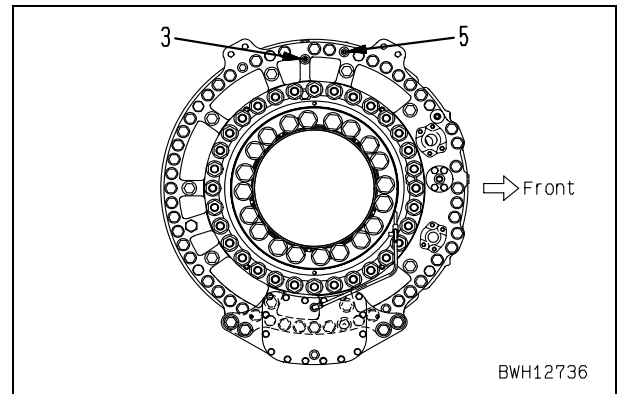
- 3) Bleed air from bleeder (3) on the wheel side similarly to step 1) above.

- ★ The figure shows the left side.

⇐ Bleeder:

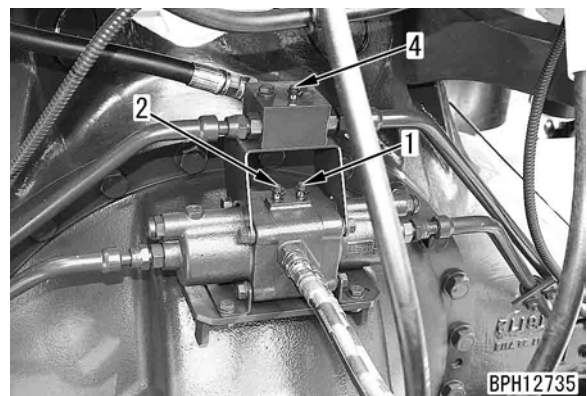
7 – 9 Nm {0.7 – 0.9 kgm}

- ★ After finishing bleeding air, tighten (close) the bleeder and put the cap.

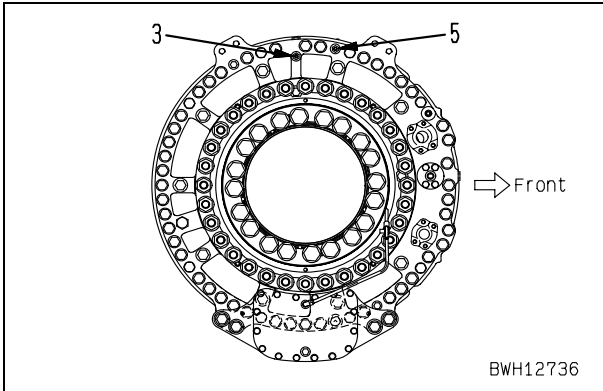


2. Parking brake on rear brake side

- ★ Bleed air from the differential top block side first, then bleed air from the wheel brake side.
- 1) Using a vinyl tube for bleeding air, turn OFF the parking brake switch (release the parking brake) and loosen air bleeder screw (4) by 3/4 turns.
- 2) When bubbles do not come out of the bleeder (4) any more, tighten (close) the bleeder and turn PARKING the parking brake switch.



- 3) Bleed air through bleeder (5) for the parking brake on the wheel side according to step 1).



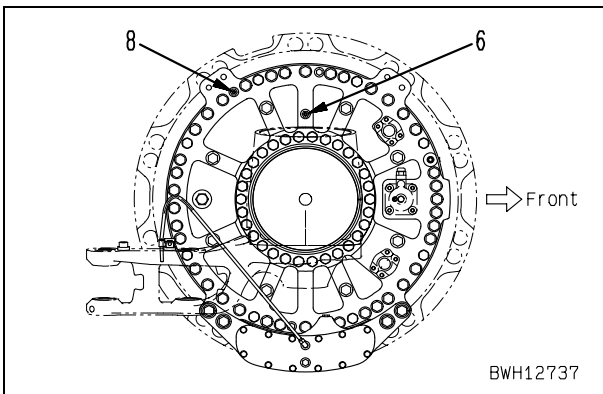
★ After finishing bleeding air, tighten (close) the bleeder and put the cap.

🔧 Bleeder:

7 – 9 Nm {0.7 – 0.9 kgm}

3. Front brake

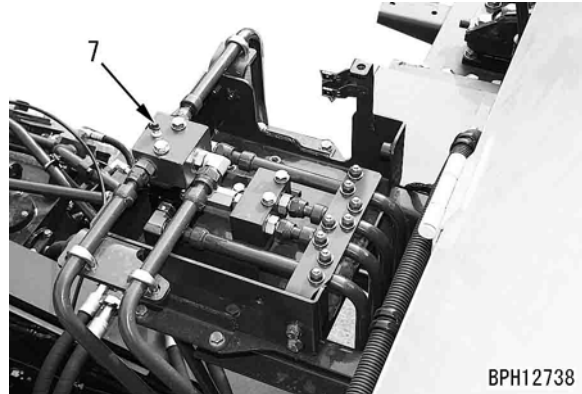
- 1) Loosen air bleeder (6) by 3/4 turns and bleed air similarly to step 1) for the rear brake.



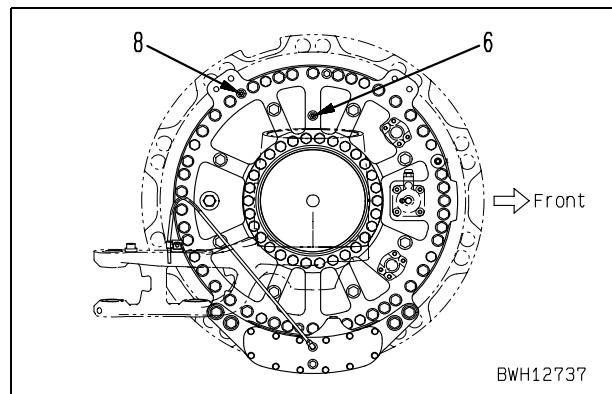
4. Parking brake on front brake side

★ Bleed air from the cab rear block side first, then bleed air from the wheel brake side.

- 1) Using a vinyl tube for bleeding air, turn OFF the parking brake switch (release the parking brake) and loosen air bleeder screw (7) by 3/4 turns.
- 2) When bubbles do not come out of the bleeder (7) any more, tighten (close) the bleeder and turn PARKING the parking brake switch.



- 3) Bleed air through bleeder (5) for the parking brake on the wheel side according to step 1).



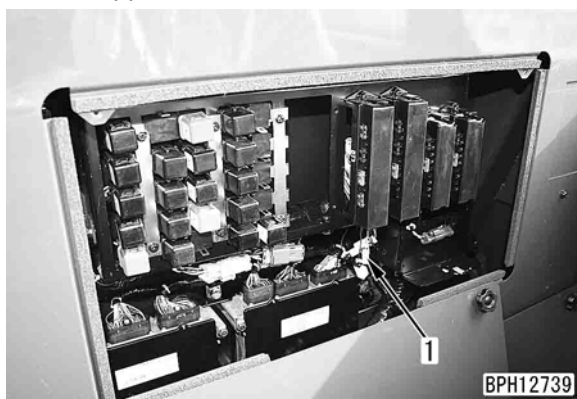
★ After finishing bleeding air, tighten (close) the bleeder and put the cap.

🔧 Bleeder:

7 – 9 Nm {0.7 – 0.9 kgm}

Bleeding air from ASR circuit (if equipped)

- ★ ASR: Automatic Spin Regulator
 - ★ Brake oil temperature during work: Min. 40 °C
 - ⚠ **Stop the machine on a level ground, turn the parking brake switch in the "Park" position, and lock the tires with chocks.**
1. Start the engine and check that the brake sub tank is filled with oil and the brake oil pressure caution lamp is turned OFF.
 2. Turn the ASR switch ON.
 3. Remove the cover at the rear of the operator's seat and connect "TEST" connector (1).
 - ★ The valve opens and oil pressure is applied to the ASR circuit.

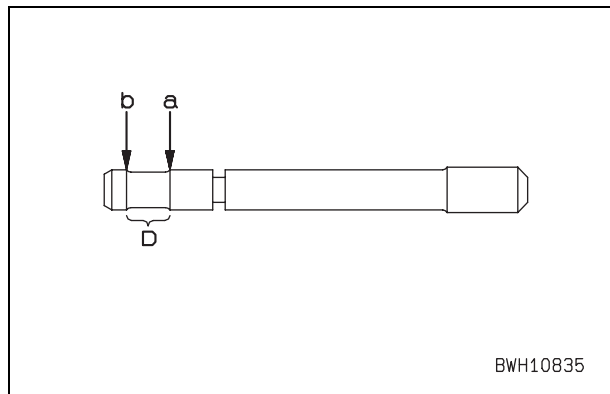
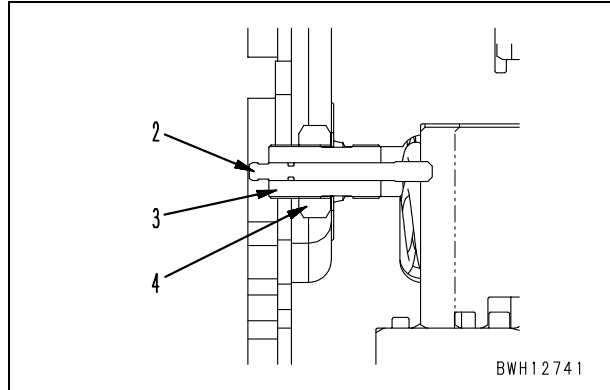
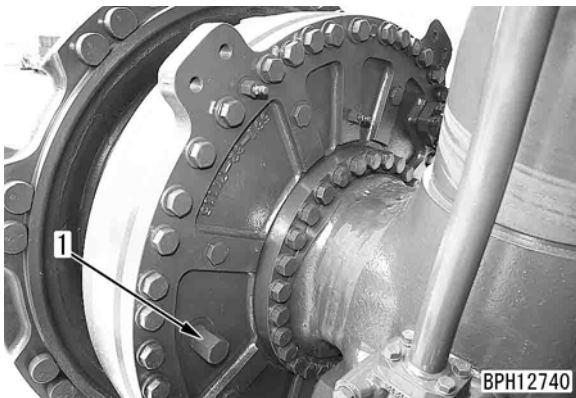


4. Referring to "Bleeding air from brake circuit", bleed air from the wheel brake and parking brake.
 - ★ Bleed air from the ASR circuit, too.
5. After bleeding air from the wheel brake and parking brake, disconnect "TEST" connector (1) and install the cover.

Testing wear of front brake disc

- ⚠ Stop the machine on level ground, turn the parking brake switch **PARKING**, and put chocks under the tires.
- ⚠ Carry out the inspection when the brake oil temperature is less than 60 °C.
- ⚠ When the disk comes close to the wear limit, carry out the inspection more frequently. Be sure to carry out inspection of the retarder braking performance at the same time.

1. Check that the brakes other than parking brake are not being actuated.
2. Stop the engine.
3. Remove cap nut (1) of the gauge.
 - ★ The figure shows the left side as an example.



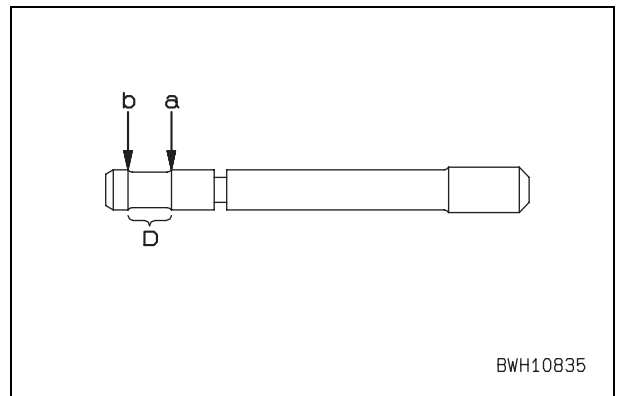
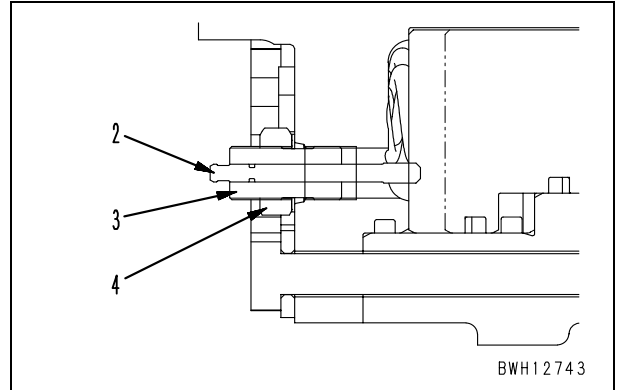
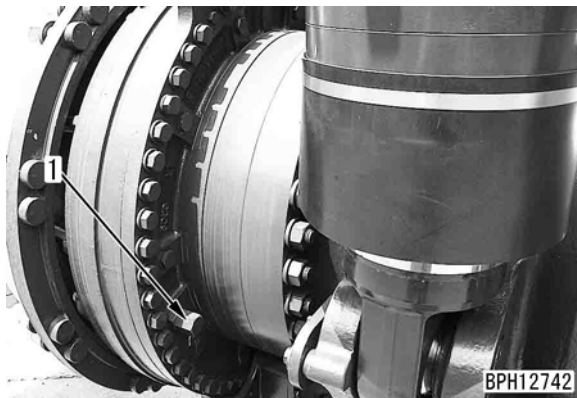
4. Push in the rod (2) of the gauge until it contacts the piston and judge the amount of wear.
 - ★ With a new machine, adjust so that inner (deeper) end (a) of groove (D) on the rod (2) is aligned with the end face of guide (3).
The adjustment position will move out of alignment, so do not loosen locknut (4) of guide (3) except when replacing the disc.
 - ★ Outer end (b) of groove (D) is the wear limit of the disc. If it is fully on the inside of guide (3) (it reaches the end face), the disc is worn to the limit. Replace the disc in this case.

5. Install cap nut (1) of the gauge.
 - ⚙ Cap nut: 128 – 186 Nm {13 – 19 kgm}

Testing wear of rear brake disc

- ⚠ Stop the machine on level ground, turn the parking brake switch **PARKING**, and put chocks under the tires.
- ⚠ Carry out the inspection when the brake oil temperature is less than 60 °C.
- ⚠ When the disk comes close to the wear limit, carry out the inspection more frequently. Be sure to carry out inspection of the retarder braking performance at the same time.

1. Check that the brakes other than parking brake are not being actuated.
2. Stop the engine.
3. Remove cap nut (1) of the gauge.
 - ★ The figure shows the left side as an example.



5. Install cap nut (1) of the gauge.
 - ⚙ Cap nut: **128 – 186 Nm {13 – 19 kgm}**

4. Push in the rod (2) of the gauge until it contacts the piston and judge the amount of wear.
 - ★ With a new machine, adjust so that inner (deeper) end (a) of groove (D) on the rod (2) is aligned with the end face of guide (3).
 - The adjustment position will move out of alignment, so do not loosen locknut (4) of guide (3) except when replacing the disc.
 - ★ Outer end (b) of groove (D) is the wear limit of the disc. If it is fully on the inside of guide (3) (it reaches the end face), the disc is worn to the limit. Replace the disc in this case.

Method of releasing parking brake in an emergency

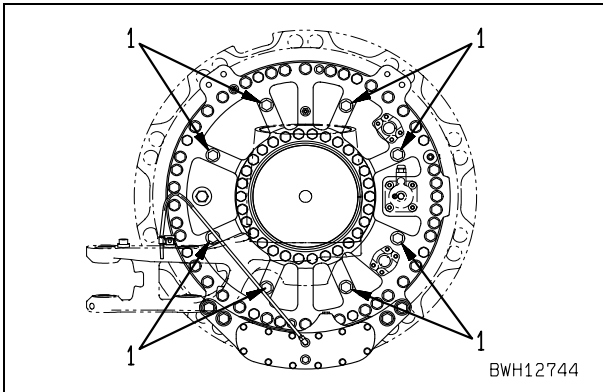
★ If the parking brake cannot be released because of a trouble in its electric or hydraulic system, release it tentatively according to the following procedure.

⚠ If the hydraulic system has a trouble, the wheel brake probably does not work normally. Accordingly, be sure to tow the machine at low speed after releasing the parking brake.

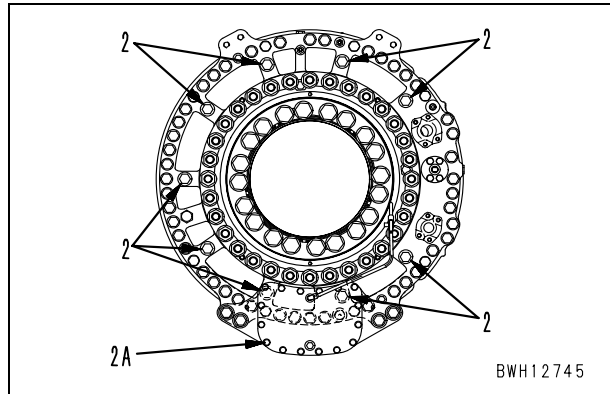
⚠ When releasing the parking brake, stop the machine on a level place and make sure of the safety around it. If it is obliged to release the parking brake on a slope in an emergency, put chocks under the tires securely.

⚠ When releasing the parking brake, stop the engine.

1. Remove front brake plugs (1) (8 places on each side)
 - ★ The figure shows the left side.
 - ★ Prepare a container to receive the oil flowing out of the plug holes.



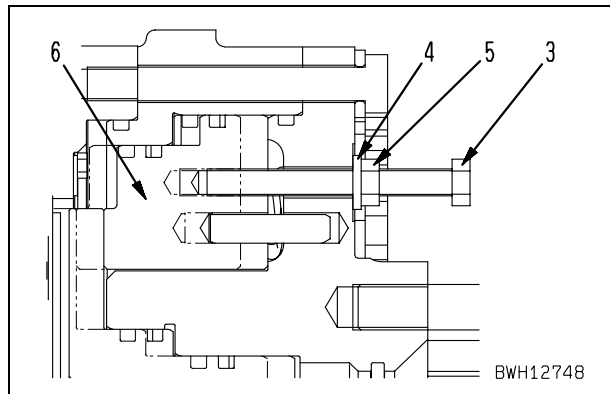
2. Remove rear brake plugs (2) (9 places on each side)
 - ★ The figure shows the left side.
 - ★ Remove the oil catch tank (2A) before hand.
 - ★ Prepare a container to receive the oil flowing out of the plug holes.



3. Prepare bolt (3) (01017-51230), washer (4), and nut (5) for releasing the parking brake manually and tighten the bolts alternately and evenly to release the parking brake.

★ The figure shows the rear side.

★ Tighten nuts (5) to pull piston (6) and release the parking brake.



4. After moving the machine, remove the parking brake manual reset bolts and install plugs (2).
 - ⌘ Tightening torque for plug:
44.1 – 53.9 Nm {4.5 – 5.5 kgm}

Testing and adjusting front suspension cylinder

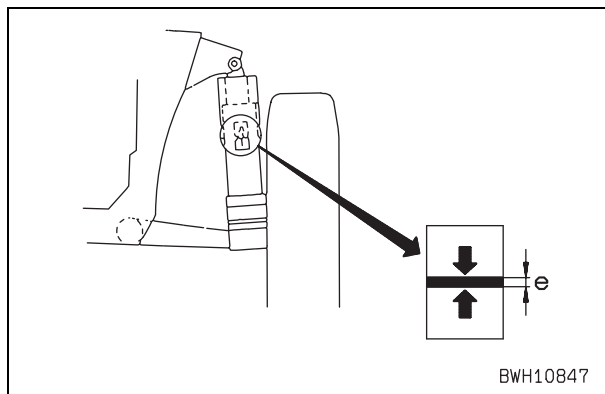
★ Testing instrument

Symbol	Part No.	Part name
L	1	792-610-1000 Suspension tool
	2	792-610-1130 Pump assembly
	3	792-610-1110 Hose
	4	792-610-1120 Joint
	5	07020-21732 Fitting
	6	792-610-1140 Joint
	7	792-610-1250 Valve assembly
	8	792-610-1260 Nipple
	9	792-610-1480 Stem
	10	792-610-1640 Joint
	11	792-610-1400 Regulator assembly
	12	792-610-1430 Gauge
	13	792-610-1440 Gauge

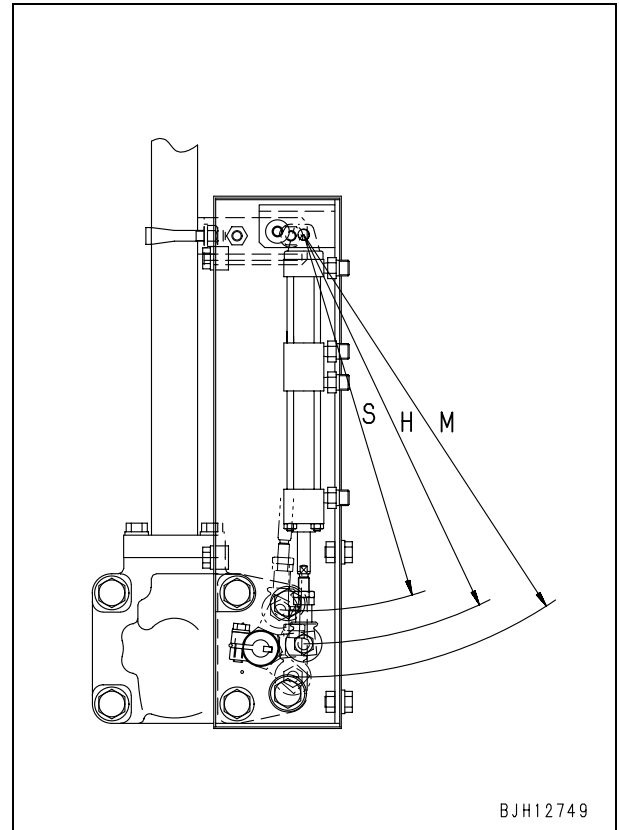
⚠ **Stop the machine on level ground, turn the parking brake switch PARKING, and put chocks under the tires.**

1. Testing length of cylinder

- 1) Check that the bottom of the cylinder cover is within the range (e) marked by arrows for the cylinder level.



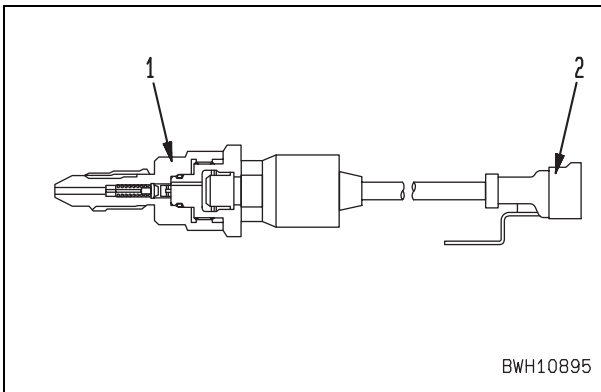
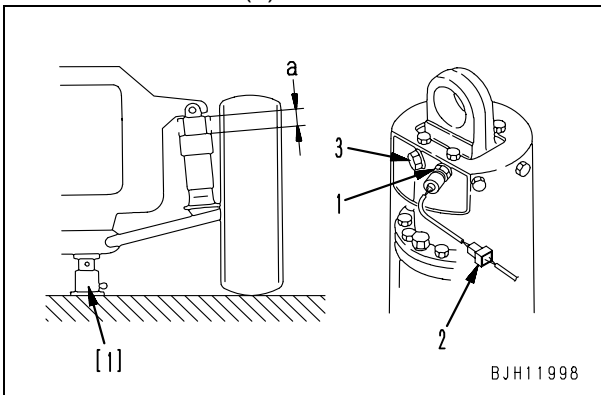
- 2) Before adjusting the oil level, check the condition of the variable damper valve.
(For only automatic suspension specification)
(S) position: soft mode
(H) position: hard mode
(M) position: medium mode



- ★ With the truck empty, starting switch ON, parking brake OFF, and hoist control lever at the FLOAT position, check that the cylinder of the variable damper valve is in the soft mode.
 - ★ If the cylinder of the variable damper valve is not in the soft mode when checking, operate as follows to switch to the soft mode.
 - 1] Use the retarder brake (Note 1) and drive the machine several times repeatedly forward and in reverse to set to the soft mode.
- (*1) If the foot brake pedal is used, the automatic suspension is automatically set to the medium mode, and the resistance of the cylinder increases, so it takes time to adjust.

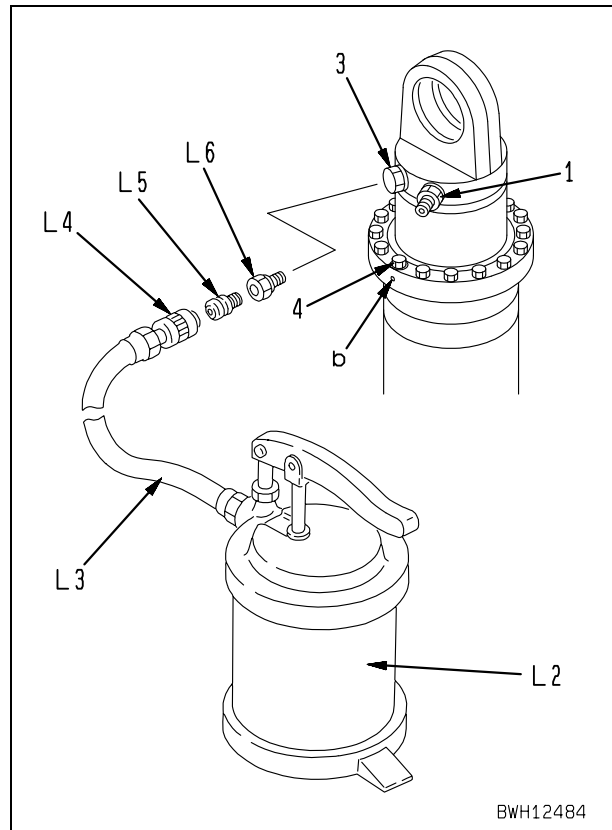
2. Bleeding nitrogen gas

- 1) Set hydraulic jack [1] (490 kN {50 t}) under the main frame.
- 2) Remove the cover from the suspension cylinder.
- 3) Disconnect pressure sensor connector (2) of oil level valve (1) and loosen oil level valve (1) by 2 – 3 turns.
 - ★ The machine equipped with the pressure sensor is shown in the figure. If your machine is not equipped with the pressure sensor, ignore the description on the pressure sensor.
 - ★ If the nitrogen gas is bled through intake valve (3), the valve core may be damaged. Accordingly, bleed through oil level valve (1).
 - ★ Loosen only the oil level valve. Do not loosen the pressure sensor and nipple.
 - ★ When the oil level valve is loosened, if both of the oil and gas spout out, close the valve a little to bleed the gas slowly.
- 4) Operate the hydraulic jack so that dimension (a) of the cylinder is the specified dimension for the oil level.
Dimension (a): **82 ± 3 mm**



3. Adjusting of oil level

- ★ Release the nitrogen gas before adjusting the oil level.
- 1) Remove feed valve (3), and install joint **L6**.
 - 2) Install fitting **L5** to joint **L4**, then connect hose **L3** and volume pump **L2**.
 - 3) Loosen air bleeding valve (4), then operate volume pump **L2** until no more bubbles come out with the oil from air bleed side hole (b).
 - 4) When no more bubbles come out with the oil, tighten air bleeding valve (4).
 - ⌘ Tightening torque of air bleeding valve: **39.2 – 49.0 Nm {4 – 5 kgm}**
 - 5) Remove valve (1), then operate volume pump **L2** until no more bubbles come out with the oil from the valve (1) mount.
 - 6) When no more bubbles come out with the oil, tighten the valve (1).
 - ⌘ Tightening torque of oil level valve: **39.2 – 49.0 Nm {4 – 5 kgm}**
 - 7) After completion of supplying the oil, remove the volume pump, then install feed valve (3).
 - ⌘ Tightening torque of feed valve: **39.2 – 49.0 Nm {4 – 5 kgm}**

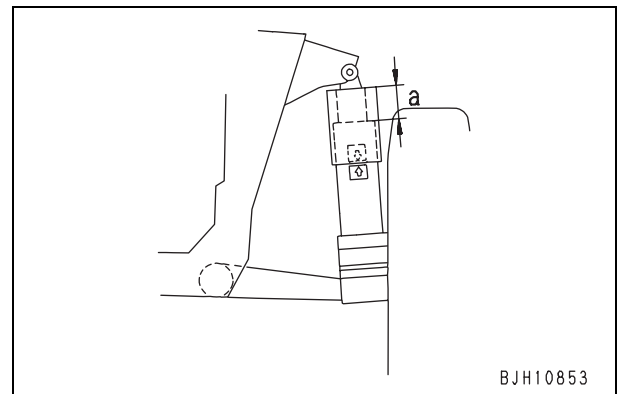
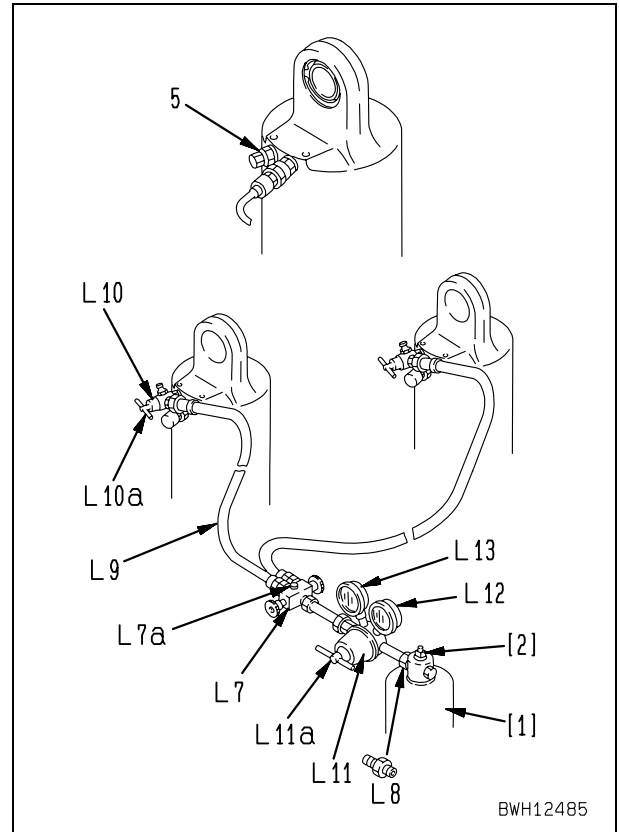


4. Filling suspension cylinder with gas

⚠ Put on proper protection gear (goggles, leather gloves and protective clothes) so that the leaking nitrogen gas will not touch your skin or clothes and work on the windward side as long as possible.

⚠ When handling nitrogen gas in a room or another place which is not ventilated well, ventilate the work place forcibly and observe the Oxygen Deficiency Prevention Rules of the Labor Safety and Sanitation Law.

- 1) Remove cap (5) from feed valve (3).
- 2) Set tool L as shown in the diagram.
 - ★ Before installing regulator L11, blow the connector filter with nitrogen gas at 0.98 MPa {10 kg/cm²} or more to blow out all dirt or dust. (Dirt or dust in the system causes failures.)
- 3) Open valve [2] of the gas cylinder [1], and check the pressure reading of gauge L12 (internal pressure of gas cylinder).
 - ★ The pressure indicated must be at least 0.98 MPa {10 kg/cm²} higher than the pressure inside the suspension cylinder (max. pressure inside suspension cylinder: 3.9 MPa {40 kg/cm²}).
- 4) Turn handle L11a of regulator L11 slowly clockwise, set the pressure reading of gauge L13 to 0.98 MPa {10 kg/cm²} above the internal pressure of the suspension cylinder, then operate valves L7 and L10 to fill the suspension cylinder with nitrogen gas.
 - ★ Fill the left and right cylinders in the same way.
- 5) When dimension (a) of the left and right cylinders reaches the standard value, turn handle L11a of regulator L11 counterclockwise to stop the flow of nitrogen gas.
 - ★ Standard dimension (a): 247 – 10 mm
- 6) Turn handle L10a of L10 fully back counterclockwise, loosen air bleeding plug L7a of valve L7, release the gas inside the hose, then remove tool L.
 - ★ Be careful not lose the O-ring of the feed valve.



5. Adjusting installed length of cylinder

- ★ Carry out adjustment of the installed length of the cylinder with the machine-empty and on level ground.

- 1) Drive the machine forward about 15 m and stop it sharply and then drive it in reverse and stop it sharply at the former position. Repeat this cycle 3 - 4 times and then stop the machine slowly without pressing the brake pedal to eliminate the sliding resistance of the cylinder (hitch of the packing and bushing). Under this condition, measure the installed length.

- ★ Do not use the foot brake but use the retarder control lever to stop the machine. After the machine stops, check that the suspension is in the soft mode.

- 2) If the result of the check shows that the installed length is too long, release nitrogen gas to adjust the length.

- ★ Loosen the valve (1) slightly to release the nitrogen gas. When doing this, release only a small amount of gas; do not make the cylinder move.

- ★ If the nitrogen gas is bled so much that the cylinder will move, the installed length may be less than the specified length.

- ★ Do not press the tip of the valve core. If the tip of the valve core is pressed, the valve core may be damaged.

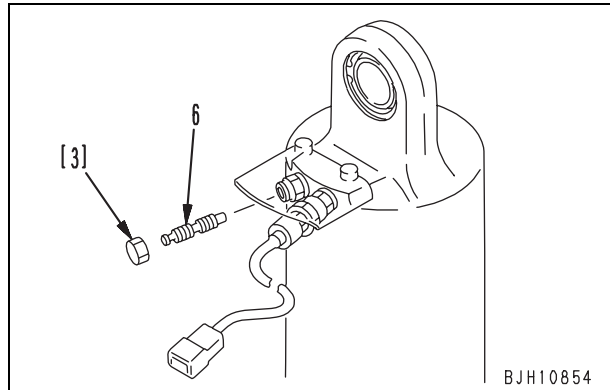
- 3) After releasing nitrogen gas and adjusting the installed length, repeat Step 1) to check the installed length again.

- 4) Repeat the above Steps 1) – 3) to adjust the cylinder to the specified length.

- 5) Finally, check that there is no leakage of gas from the valve core (6), valve (1), and piston rod gland.

- ★ Use soapy water to check for leakage of gas.

- ★ If there is any leakage of gas from the valve core, use tool [3] and replace the valve core.

**Note: 1. Check after replacement of oil or gas**

When the machine operates after the oil or gas is replaced, gas is dissolved in the new oil in the replaced cylinder until the oil is saturated. As a result, the gas volume is reduced and the installed length of the suspension may be reduced to below the limit. Accordingly, measure the installed length of the suspension again 48 hours after the oil or gas is replaced. If it is less than the specification value, adjust the gas.

2. Checking for changes in installed length caused by variation in ambient temperature.

Depending on the ambient temperature when the machine is working, the gas in the suspension may expand or contract, so the installed length will also change. In territories where there are big differences in temperature throughout the year, inspect daily and adjust to keep the installed length within the specified range.

Testing and adjusting rear suspension cylinder

★ Testing instrument

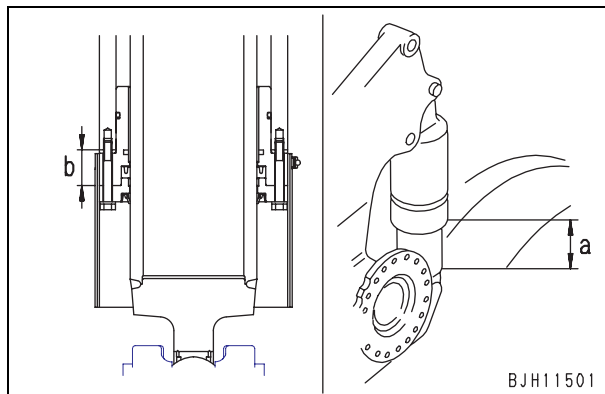
Symbol	Part No.	Part name
L	1	792-610-1000 Suspension tool
	2	792-610-1130 Pump assembly
	3	792-610-1110 Hose
	4	792-610-1120 Joint
	5	07020-21732 Fitting
	6	792-610-1140 Joint
	7	792-610-1250 Valve assembly
	8	792-610-1260 Nipple
	9	792-610-1480 Stem
	10	792-610-1640 Joint
	11	792-610-1400 Regulator assembly
	12	792-610-1430 Gauge
	13	792-610-1440 Gauge

⚠ **Stop the machine on level ground, turn the parking brake switch PARKING, and put chocks under the tires.**

★ When checking, stop the empty machine on a flat place.

1. Testing length of cylinder

- 1) Remove dust cover.
- 2) Check that dimension (a) of the rear suspension cylinder is within the specified value.
Specified value for dimension (a) :
199 ± 10 mm

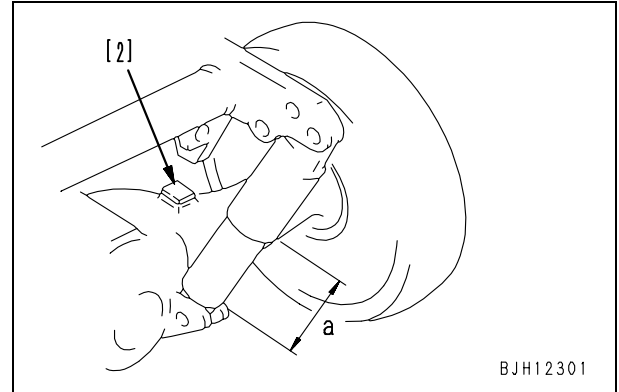


★ The standard dimension is described on the decal stuck on the cylinder, too.

2. Releasing nitrogen gas

- 1) Set block [2] between the stopper and axle housing.

★ Thickness of block: **19 mm**
Dimension (a) : **124 ± 3 mm**



- 2) Disconnect pressure sensor connector (2) of valve (1), then loosen the valve 2 – 3 turns.

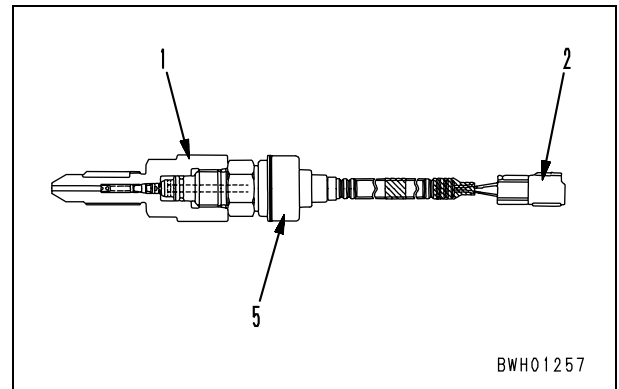
★ When releasing the nitrogen gas, there is danger that releasing the gas from the valve core of feed valve (3) will damage the valve core, so remove the gas at the valve (1).

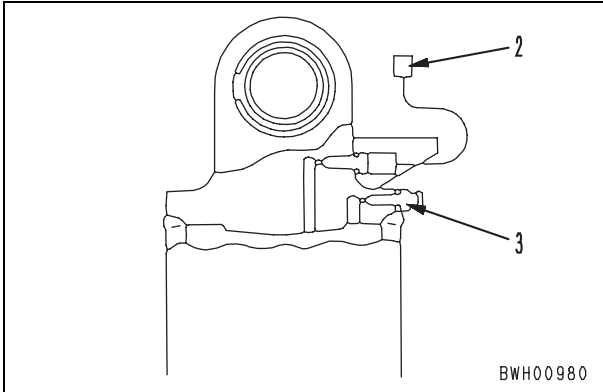
★ When loosening the valve (1), loosen only the valve itself. Do not loosen the pressure sensor or nipple.

⚠ **When loosening the valve (1), gradually loosen only valve (1) itself, and do not remove the valve until all the nitrogen gas has been released from the slit.**

⚠ **If the nitrogen gas has not all been released, pressure sensor (5) are still under high pressure, so do not loosen them under any circumstances.**

★ When the valve (1) is loosened, and oil and gas spurt out together, tighten the valve slightly, and allow time for the gas to escape slowly.

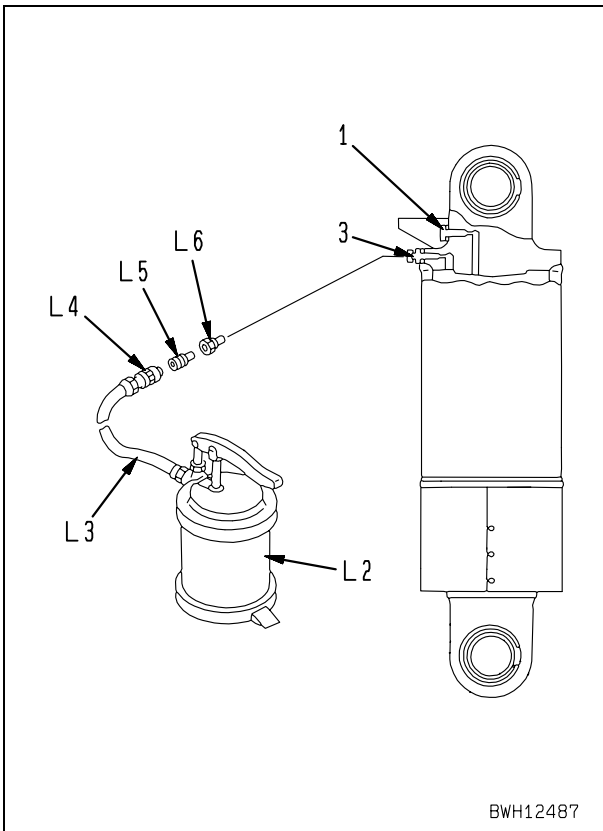




3. Adjusting oil level

★ Release the nitrogen gas before adjusting the oil level.

- 1) Remove feed valve (3), and install joint **L6**.
- 2) Install fitting **L5** to joint **L4**, then connect hose **L3** and volume pump **L2**.
- 3) Loosen air bleeding valve (1), then operate volume pump **L2** until no more bubbles come out with the oil from air bleeding valve (1).
- 4) When no more bubbles come out with the oil, tighten air bleeding valve (1).
- 5) After adding oil, remove the volume pump, then install feed valve (3).



4. Filling suspension cylinder with gas

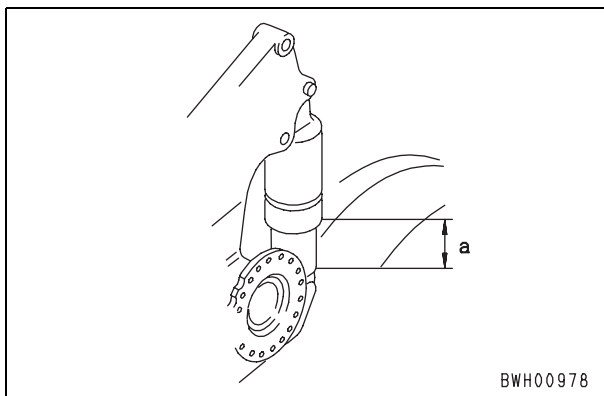
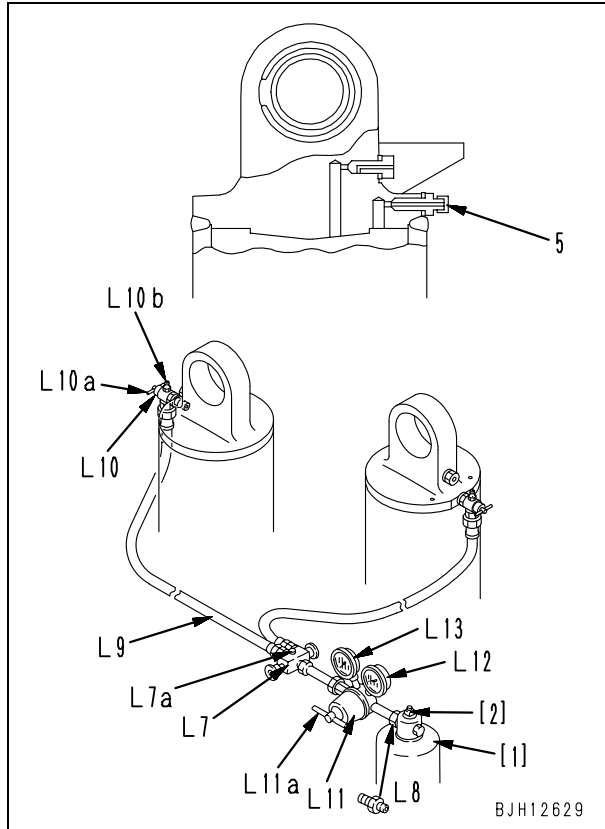
⚠ Put on proper protection gear (goggles, leather gloves and protective clothes) so that the leaking nitrogen gas will not touch your skin or clothes and work on the windward side as long as possible.

⚠ When handling nitrogen gas in a room or another place which is not ventilated well, ventilate the work place forcibly and observe the Oxygen Deficiency Prevention Rules of the Labor Safety and Sanitation Law.

- 1) Remove cap (5) from feed valve (3).
- 2) Set tool **L** to the feed valve supply as shown in the diagram.
 - ★ Before installing regulator **L11**, blow the filter in the connector with nitrogen gas at 0.98 MPa {10 kg/cm²} or more to blow out all dirt or dust. (Dirt or dust in the system causes failures.)
- 3) Open valve [2] of the gas cylinder [1], and check the pressure reading of gauge **L12** (internal pressure of gas cylinder).
 - ★ The pressure indicated must be at least 0.98 MPa {10kg/cm²} higher than the pressure inside the cylinder (max. pressure inside cylinder: 3.9 MPa {40 kg/cm²}).
- 4) Turn handle **L11a** of regulator **H11** slowly clockwise, set the pressure reading of gauge **L13** to 0.98 MPa {10kg/cm²} above the internal pressure of the cylinder, then operate valves **L7** and **L10** to fill the cylinder with nitrogen gas.
 - ★ Fill the left and right cylinders in the same way.
- 5) When dimension (a) of the left and right cylinders reaches the standard value, turn handle **L11a** of regulator **L11** counter-clockwise to stop the flow of nitrogen gas.
 - ★ Standard dimension (a) :

199 ± 10 mm

- 6) Turn handle **L10a** of **L10** fully back counterclockwise, loosen air bleeding plug **L7a** of valve **L7**, release the gas inside the hose, then remove tool **L**.
- ★ Be careful not to lose the O-ring of the feed valve.



5. Adjusting installed length of cylinder

- ★ Carry out adjustment of the installed length of the cylinder with the machine empty and on level ground.
- 1) Drive the machine forward about 15 m and stop it sharply and then drive it in reverse and stop it sharply at the former position. Repeat this cycle 3 – 4 times and then stop the machine slowly without pressing the brake pedal to eliminate the sliding resistance of the cylinder (hitch of

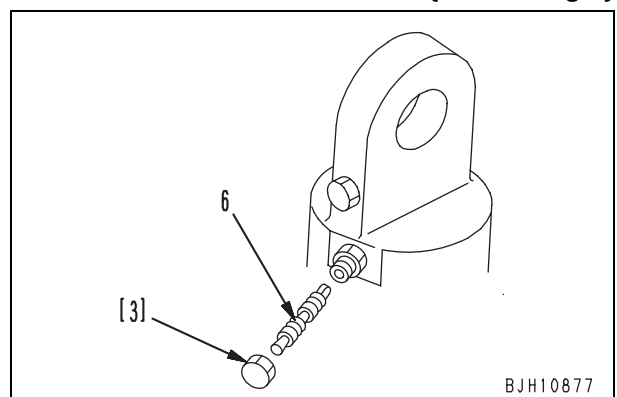
the packing and bushing). Under this condition, measure the installed length.

- ★ Do not use the foot brake when braking the machine. Use the retarder control lever to brake the machine, then check that the suspension is in the soft mode.
- 2) If the result of the check shows that the installed length is too long, release nitrogen gas to adjust the length.
 - ★ Loosen the valve slightly to release the nitrogen gas. When doing this, release only a small amount of gas; do not make the cylinder move.
 - ★ If the nitrogen gas is bled so much that the cylinder will move, the installed length may be less than the specified length.
 - ★ Do not press the tip of the valve core. If the tip of the valve core is pressed, the valve core may be damaged.
 - 3) After releasing nitrogen gas and adjusting the installed length, repeat Step 1) to check the installed length again.
 - 4) Repeat the above Steps 1) – 3) to adjust the cylinder to the specified length.
 - 5) Finally, check that there is no leakage of gas from the valve core (6), valve, and piston rod gland.
 - ★ Use soapy water to check for leakage of gas.
 - ★ If the gas leaks through the valve core, replace the valve core with tool [3].

Valve core: **Adhesive**

Valve core:

16.7 – 34.3 Nm {1.7 – 3.5 kgm}

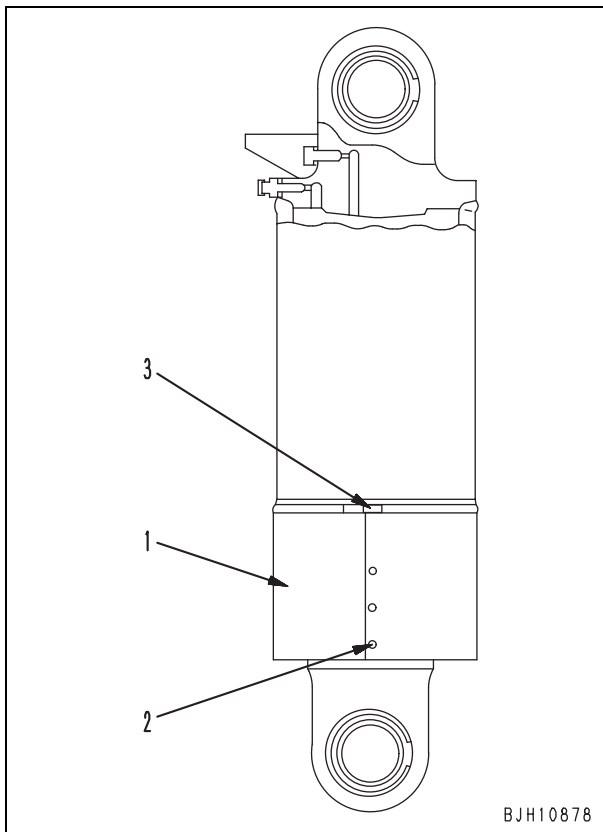


6. Testing and adjusting dust cover

- ★ Check the cover for damage caused by stones etc. scattered by the tires during travel and repair or replace it, if necessary.
- 1) Check visually that there are no cracks or breaks in cover (1).
 - ★ If the cover is damaged, replace it with a new part.
- 2) Check that hooks (2) are not missing.
 - ★ If any hooks are missing, remove all mud and dirt, then install hooks.
- 3) Check that band (3) is not loose or missing.
 - ★ If the band is loose or missing, tighten to the following torque.

 Band:

$6.8 \pm 0.49 \text{ Nm } \{0.7 \pm 0.05 \text{ kgm}\}$



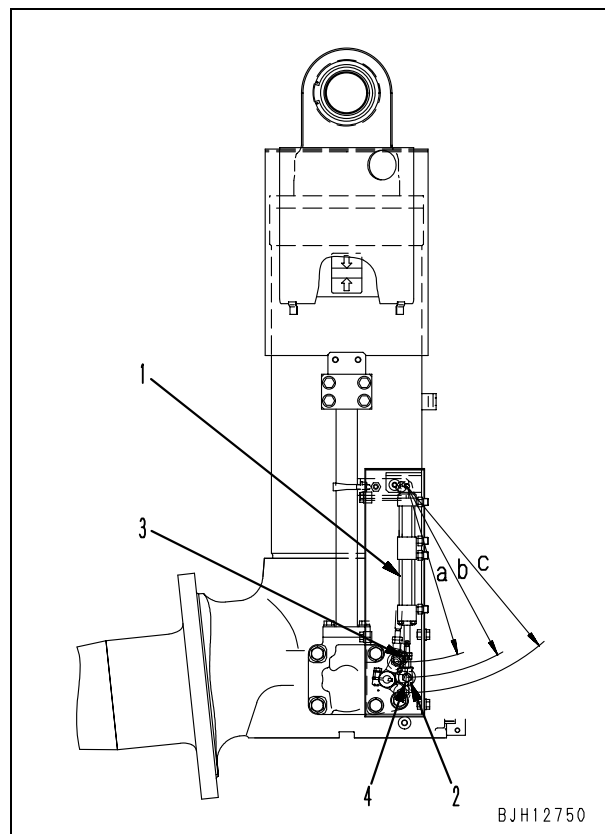
Testing and adjusting front suspension cylinder (Automatic suspension specification)

1. Testing

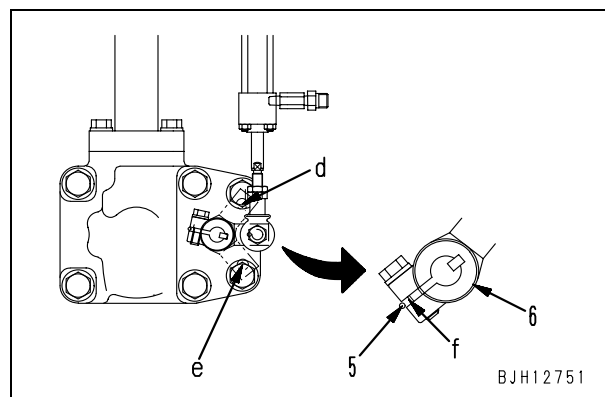
- 1) Check that length (a) of hydraulic cylinder (1) is as specified under the following condition.
 - ★ Condition (Mode Soft)
 - 1] Machine is empty.
 - 2] Starting switch is ON.
 - 3] Parking brake switch is PARKING.
 - 4] Work equipment control lever is at FLOAT.
 - ★ Specified length (a): 351.8 mm
- 2) Shift the hoist lever from the FLOAT position to another position and check that hydraulic cylinder length (a) is not (is longer minimum) 351.8 mm.

2. Adjusting

- 1) Remove mounting bolt (2) of hydraulic cylinder (1) and disconnect hydraulic cylinder (1).
- 2) Loosen locknut (3) and adjust mounting length (a) with rod end.
 - ★ Specified length (a): 352 ± 1 mm
- 3) Install (Return) hydraulic cylinder (1) with mounting bolt (2).
- 4) Turn the starting switch to the ON position and shift the hoist lever from the FLOAT position to another position and check that length (a) of hydraulic cylinder (1) is not (is longer minimum) 352 ± 1 mm.
(Reference)
 - (b) in hard mode: 382.8 mm
 - (c) in medium mode: 413.8 mm



- 5) Check that the hole (5) of bracket is in the slit (part (f)) in modes Soft (position (d)) and Medium (position (c)).



Testing and adjusting hydraulic pressure in steering, hoist circuit

★ Testing instrument

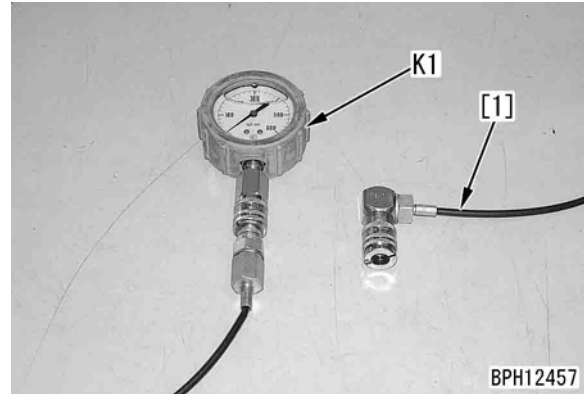
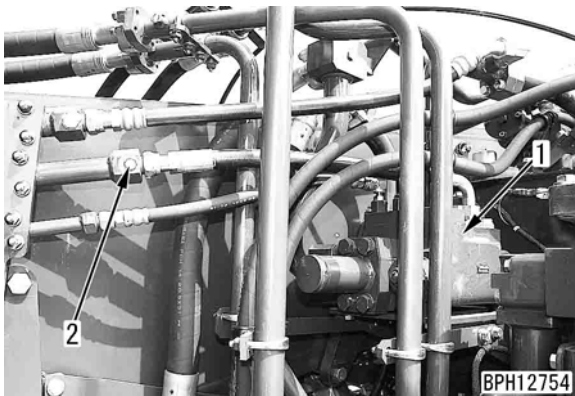
Symbol	Part No.	Part name
K1	799-101-5002	Analog hydraulic meter
	799-261-1204	Digital hydraulic meter

- ⚠ Stop the machine on a flat place, turn the parking brake switch to the "PARKING" position and lock the tires with chocks.
- ⚠ When testing and adjusting, lower and seat the body to the frame, stop the engine and remove the hydraulic tank cap to release the residual pressure in the cylinder circuit.
- ⚠ When operating the steering wheel, check that there is nobody around the front tires.

Steering circuit

1. Measuring hydraulic pressure in steering circuit

- 1) Raise the hydraulic oil temperature.
 - ★ Oil temperature when measuring : 45 – 55 °C
- 2) Remove plug (2) of the outlet piping of steering demand valve (1) and install tool K1 (39.2 MPa {400 kg/cm²}).
- 3) Start the engine, turn the steering wheel fully to the right or left to relieve the oil and measure the oil pressure at this time.



2. Adjusting hydraulic pressure in steering circuit

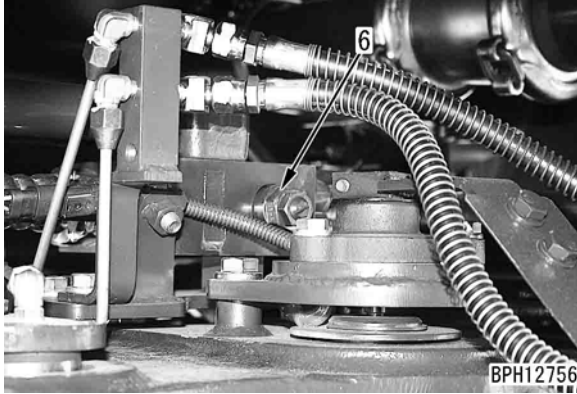
If the hydraulic pressure is not within the standard value, adjust as follows.

- Steering pressure (adjust with demand valve)
 - 1) Loosen locknut (4) of relief valve (5) and turn adjustment screw (5) to adjust.
 - ★ To INCREASE pressure, turn CLOCKWISE
 - To DECREASE pressure, turn COUNTERCLOCKWISE
 - ★ One turn of the adjustment screw adjusts by 12.55 MPa {128 kg/cm²}.



- 2) After adjusting, tighten locknut (4), holding adjustment screw (5) with a screwdriver.

- 3) Check again so that the hydraulic pressure is within the specified value.
For details, see "Measuring hydraulic pressure in steering circuit".
 - ★ The pressure of crossover relief valve (6) cannot be adjusted when it is installed on the machine, so do not adjust the pressure.

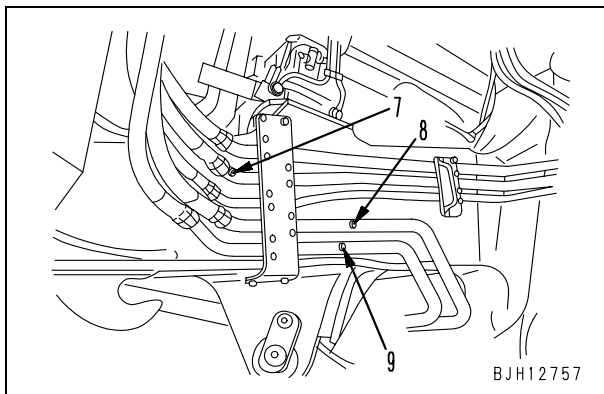


3. Testing steering valve charge pressure

- 1) Remove plug (7) and install tool **K1** (39.2 MPa {400 kg/cm²}).
- 2) Test in the same way as when measuring the hydraulic pressure in the steering circuit.

4. Testing hydraulic pressure in steering cylinder

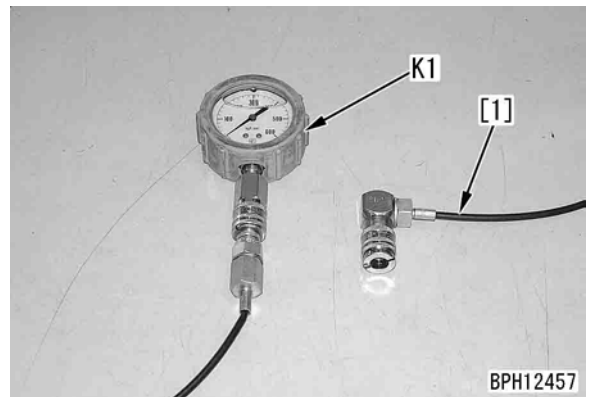
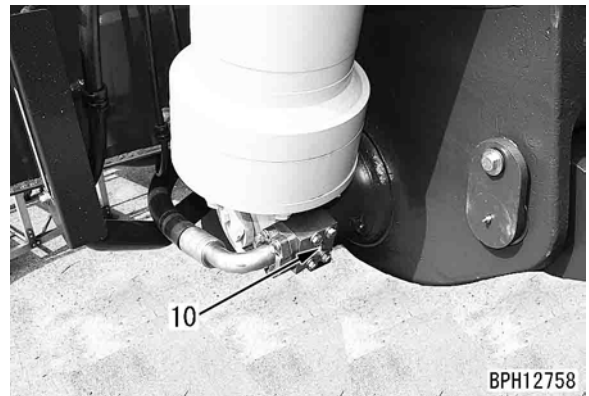
- 1) Remove pressure testing plug (8) (when turning the steering to the left) or pressure testing plug (9) (when turning the steering to the right), and install tool **K1** (39.2 MPa {400 kg/cm²}).
- 2) Test in the same way as when measuring the hydraulic pressure in the steering circuit.



Hoist circuit

1. Testing hydraulic pressure in hoist circuit

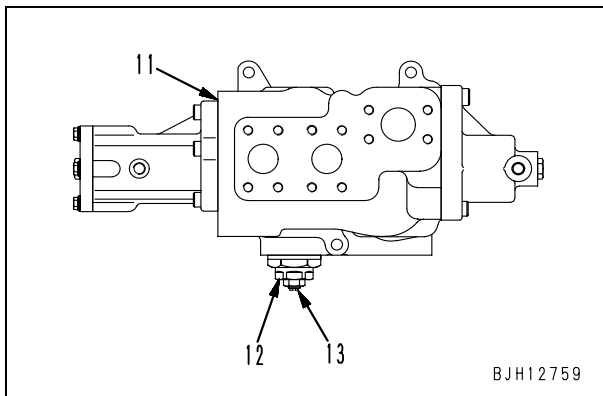
- 1) Raise the hydraulic oil temperature.
 - ★ Oil temperature when measuring :
45 – 55 °C
- 2) Remove oil pressure pickup plug (10) at the hoist cylinder bottom and install tool **K1** (39.2 MPa {400 kg/cm²}).
- 3) Operate the hoist control lever, and move the dump body to the maximum dump position to relieve the circuit, then measure the hydraulic pressure with the engine at full throttle.



2. Adjusting hydraulic pressure in hoist circuit

If the hydraulic pressure is not within the standard value, adjust as follows.

- 1) Loosen locknut (12) of the relief valve of hoist valve (11) and turn adjustment screw (13) to adjust.
 - ★ To INCREASE pressure, turn CLOCKWISE
 - To DECREASE pressure, turn COUNTERCLOCKWISE
 - ★ One turn of the adjustment screw adjusts by 19.6 MPa 200 kg/cm²).
- 2) After adjusting, hold the adjustment screw (13) with a screwdriver to prevent it from turning, then tighten the locknut (12).
 - 🔧 Tightening torque of lock nut:
29.4 – 39.2 Nm {3 – 4 kgm}
- 3) Check again so that the hydraulic pressure is within the specified value.
For details, see "Testing hydraulic pressure in hoist circuit".



Testing and adjusting oil pressure in dump EPC circuit

★ Testing instrument

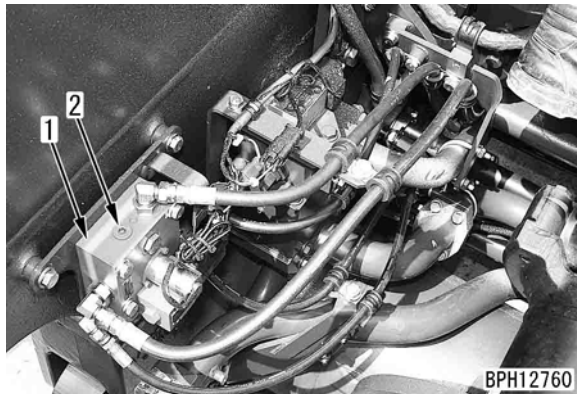
Symbol	Part No.	Part name
K	1	799-101-5002 Analog hydraulic meter
		790-261-1204 Digital hydraulic meter
	4	799-101-5230 Nipple
	5	799-401-3100 Adapter
		02896-11008 O-ring

⚠ Loosen the oil filler cap of the hydraulic tank slowly to release the residual pressure from the tank.

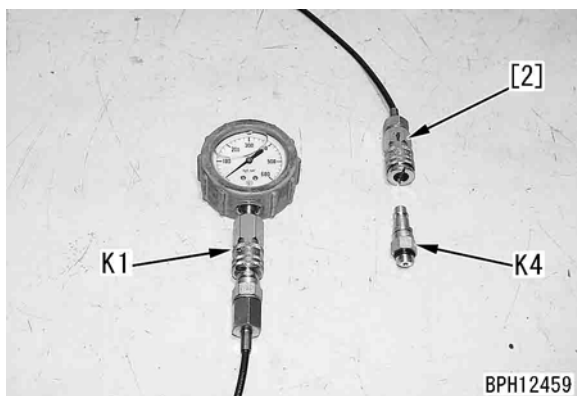
Testing

1. Testing dump EPC valve main pressure

- 1) Remove oil pressure testing plug (2) (M14 × 1.5) from dump EPC valve (1) inside the hydraulic tank (inside the machine).

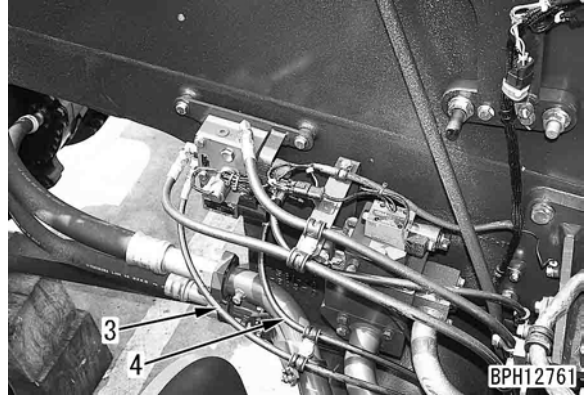


- 2) Install nipple **K4** and hose [2] and connect oil pressure gauge **K1** [5.9 MPa {60 kg/cm²}].
- 3) Start the engine and test the oil pressure when the dump lever is in neutral.

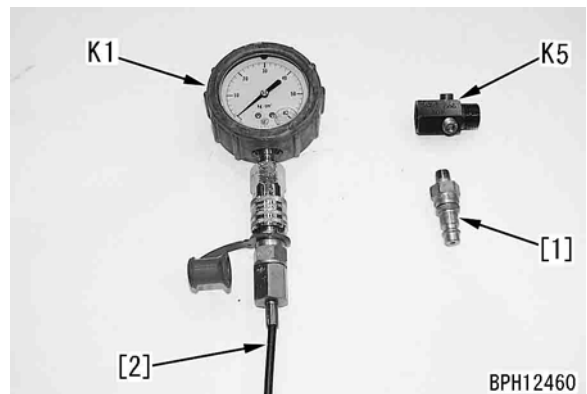


2. Testing dump EPC valve output pressure

- 1) Disconnect EPC hose (3) or (4) to be measured.
(3): Dump raise side (Port PB)
(4): Dump lower side (Port PA)



- 2) Install adapter (K5) to hoist valve and connect the hose.
- 3) Install nipple [1] and hose [2] and connect oil pressure gauge **K1** [5.9 MPa {60 kg/cm²}].
- 4) Start the engine, set the dump lever to the RAISE, FLOAT or lower position and test the circuit oil pressure at this time.



Air bleeding from steering cylinder

- ⚠ **Stop the machine on a flat place, turn the parking brake switch to the "PARKING" position and lock the tires with chocks.**
- ⚠ **Before operating the steering wheel, be sure to check that there is no one around the front tires.**
- ★ If the hydraulic cylinder was removed and installed or its hydraulic piping was removed, bleed air from the hydraulic cylinder according to the following procedure.
 - 1) Start engine, run engine at low idle for 5 minutes.
 - 2) Turn the steering wheel at 30 rpm (2 seconds for one turn) to the left and right to a point approx. 50 mm from the end of the steering cylinder stroke.
Repeat this action ten times.
(This action is to prevent damage to the piston seal caused in the steering cylinder.)
 - 3) Turn the steering wheel at a speed of about 30 rpm to the right and left steering cylinder stroke ends repeatedly.
 - 4) Turn the steering wheel as quickly as possible to the left and right to the end of the steering cylinder stroke.
When reaching the end of the stroke at the left and right, turn the steering wheel immediately in the opposite direction, and carry out this action continuously.
Repeat this action ten times in both direction.

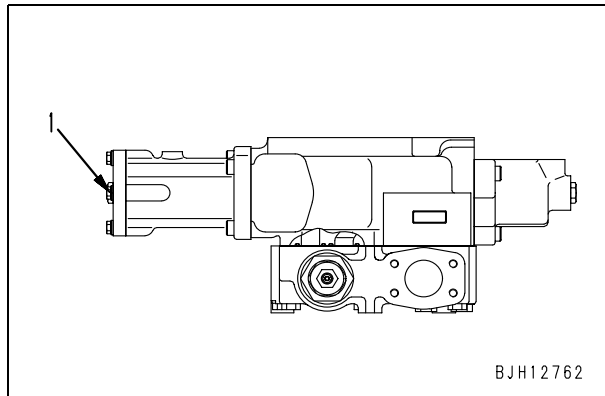
Procedure for raising dump body in emergency

★ Testing instrument

Symbol	Part No.	Part name
M	792T-632-1110	Plug

★ If the dump body cannot be raised because of a failure in the controller or electric system, raise it to dump the load according to the following procedure.

1. Stop the engine and remove the hydraulic tank cap to release the residual pressure from the hoist circuit.
2. Remove plug (1) and tighten tool **M** fully.
★ If tool **M** is tightened in fully, the spool is moved to the rising stroke end.

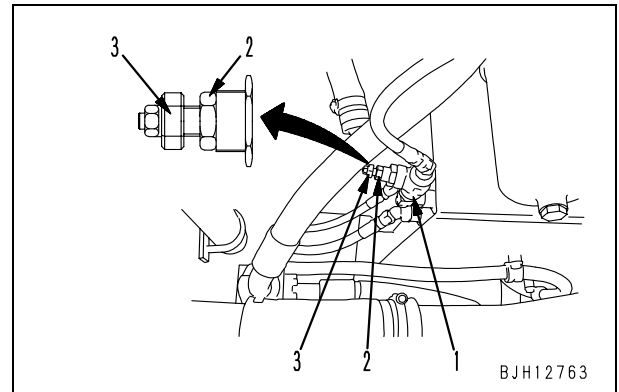


3. Start the engine under this condition, and the dump body rises.
4. Stop the engine and remove tool **M** and install plug (1).
⌘ Tightening torque of plug:
44.1 – 53.9 Nm {4.5 – 5.5 kgm}

5. When lowering the body, operate the manual lowering valve according to the following procedure.

⚠ **Be sure to work from the ground and do not put your body under the body.**

- 1) Remove the hydraulic tank cap and release the residual pressure in the hoist circuit.
- 2) Loosen locknut (2) of manual lowering valve (1).
- 3) Turn grip (3) of manual lowering valve (1) counterclockwise to open the valve.
 - The hydraulic oil in the hoist cylinder is drained and the body lowers.
- ★ The body lowers by itself. Adjust its lowering speed to a safe level with the valve.
- 4) After the body lowers to a desired position, turn grip (3) clockwise to close the valve and tighten locknut (2).



Adjusting body positioner sensor

⚠ **Stop the machine on the level ground, turn the parking brake switch PARKING, and set chocks to the tires.**

- ★ If the body positioner rod has been disconnected and connected again or the body positioner sensor has been removed and installed again, inspect and adjust the body positioner sensor as follows.

1. Checking sensor input voltage

- 1) Switch the machine monitor display to the monitoring function of service mode and display the body positioner sensor input voltage.
 - ★ Monitoring system: **BRAKE**
 - ★ Monitoring code: **34602 (BODY POSITION)**
- ★ For the operating method, see "Special functions of machine monitor (EMMS)".

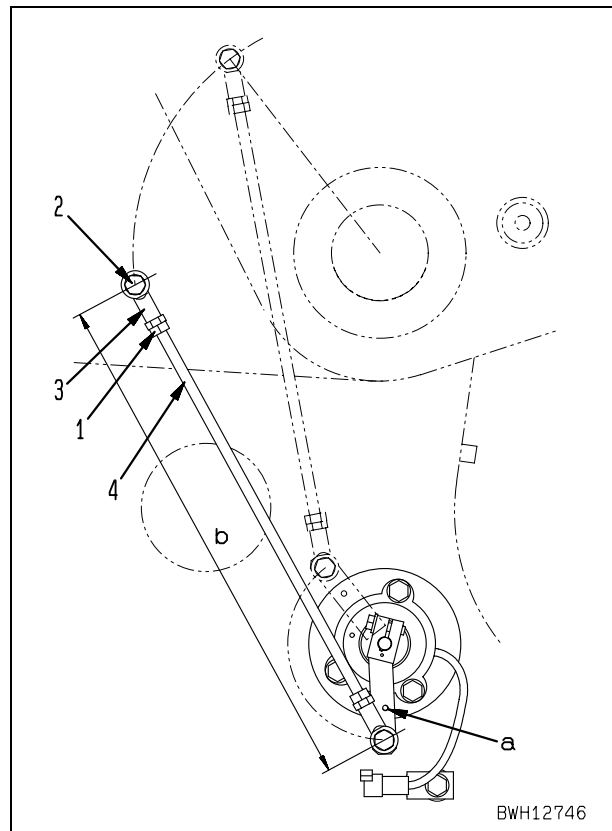


BJH12384

- 2) Start the engine.
- 3) Operate the dump lever and check the monitoring voltage when the dump lever is operated fully to the LOWER position and RAISE position.
 - ★ When operated fully to LOWER:
0.46 – 0.54 V
 - ★ When operated fully to RAISE:
4.26 – 4.59 V

2. Adjusting link length

- ★ If the monitoring voltage is not within the normal range, adjust the length of the link as follows.
 - 1) Check that lever hole (a) is not shifted more than 1 mm from the positioning hole on the sensor side.
 - 2) Loosen locknut (1).
 - 3) Remove mounting bolt (2).
 - 4) Turn rod end (3) to adjust the length of the link (4).
 - ★ Standard installed length (a) of link: 484 mm
 - ★ Do not reduce length (b) to below 480 mm.
 - ★ Adjust the input voltage as follows.
 - INCREASE link length to DECREASE voltage
 - DECREASE link length to INCREASE voltage
 - 5) Install mounting bolt (2).
 - 6) Tighten locknut (1).
 - 7) Check that the sensor input voltage is normal.



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3. Caribrating system

⚠ Stop the machine on the level ground, turn the parking brake switch PARKING, and set chocks to the tires.

- ★ Hydraulic oil temperature: 80 – 90 °C
- 1) Run the engine and raise the hydraulic oil temperature to 80 – 90 °C.
- 2) Lower the dump body to the stroke end and keep the control lever in the "Float" position for 5 seconds.
 - ★ Check that body pilot lamp is turned OFF.
- 3) Raise the dump body to the stroke end and keep the control lever in the "Raise" position for 5 seconds while running the engine at low idle.
- 4) Lower the body. Raise the body while running the engine at high idle and then lower and seat it with the lever in the "Float" position while running the engine at low idle. Repeat this operation 5 – 10 times.
 - ★ Move the control lever to the raise stroke end and float stroke end.
- 5) Raise the body while running the engine at high idle and then lower and seat it with the control lever in the "Float" position while keeping the engine speed at high idle. Repeat this operation 5 – 10 times.
 - ★ Move the control lever to the raise stroke end and float stroke end.

Handling of voltage circuit of engine controller

1. Disconnecting or connecting operation of the connector between the engine controller and the engine shall be performed only when the starting switch is in the OFF position.
2. Do not start the engine while the T adapter is inserted or connected to the connector between the engine controller and the engine for diagnosis.
 - ★ You may turn the starting switch to the OFF or ON position but must not turn it to the START position.

Adjusting transmission controller

- ★ After any of the following operations, adjust the transmission in order to tune the feeling of transmission and its controller.
- The transmission has been overhauled or replaced.
- The transmission control valve has been repaired or replaced.
- If the transmission controller is replaced.
- Power train speed sensor has been repaired or replaced.
- The transmission oil temperature sensor has been repaired or replaced.
- The transmission oil filter has been clogged abnormally and repaired.
- ★ For the adjusting operation of the transmission, use the service function of the machine monitor.
- ★ For the details of the operation method, see "Special functions of machine monitor (EMMS)".

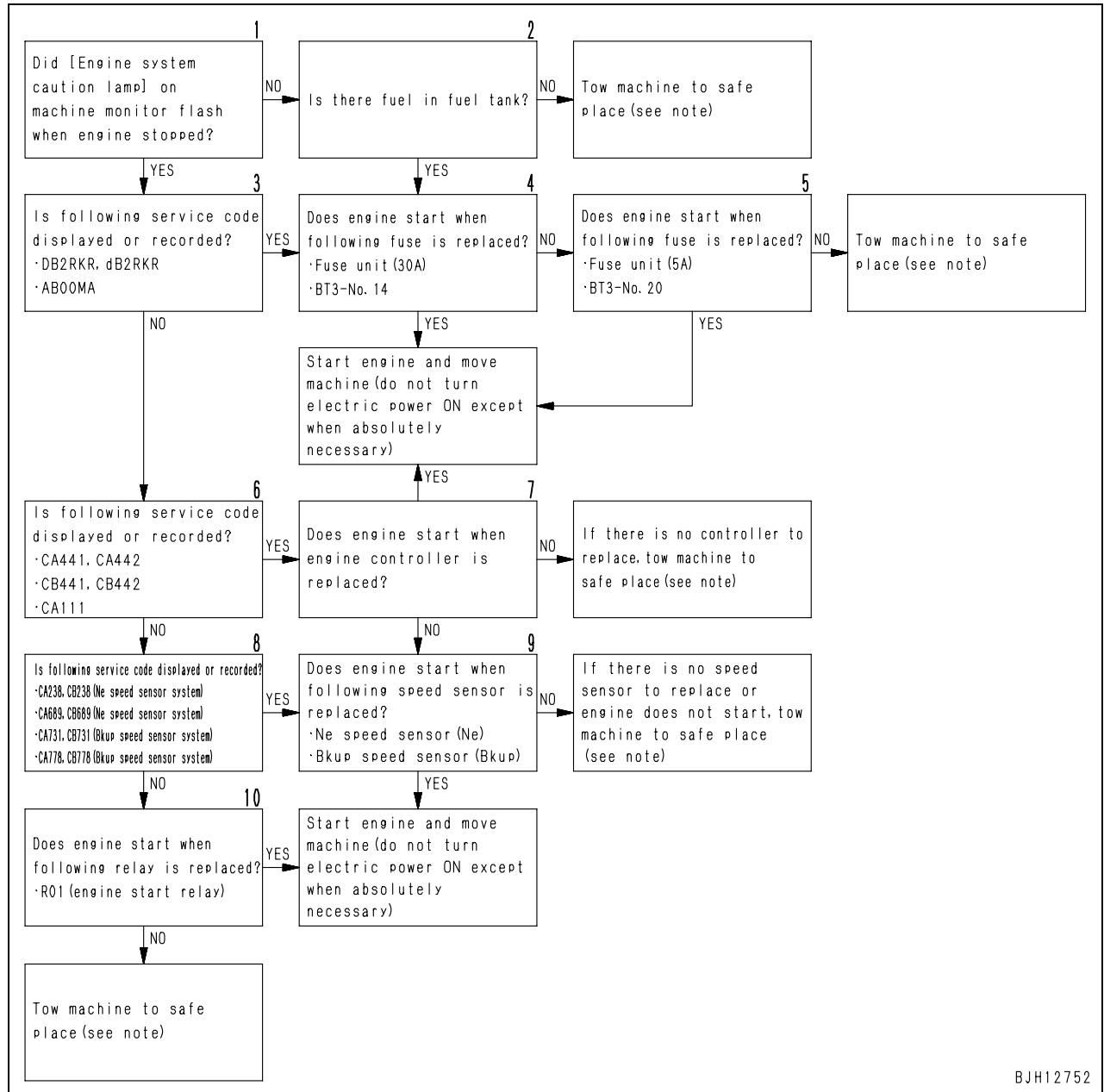
Method for emergency escape at electrical system failure

If any problem occurs in the electrical system of the engine or transmission control system, it may disable the engine to start or the machine to move off.

If such a problem occurs, temporarily restore the engine or transmission electrical system to move the machine to a safe place, then carry out regular troubleshooting.

1. When any problem occurs in the engine control system and the engine cannot be started

- ★ Decide the escape method according to the following flowchart.
- ★ Refer to "Special functions of machine monitor (EMMS)" for the method of checking the failure code.



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Note: If the engine cannot be started and the machine is towed, release the parking brake temporarily referring to "Method for emergency release of parking brake", since it cannot be released by operating the switch.

2. When transmission control system has a trouble and machine cannot start

- ★ Check the failure code and select a proper escape procedure from the following table.
- ★ For the method of checking the failure code, see "Special functions of machine monitor".

Failure code	Condition when trouble occurred	Escape method	Starting gear speed set with lever position after escape operation	Remarks
1500L0	Occurrence condition 2	Escape procedure 2	—	Occurrence condition 1 Gear speed is kept fixed and gear is not shifted from fixed gear after machine restarts. If lever is set to N position, gear is set in neutral.
15G0MW	Occurrence condition 2	Escape procedure 3	D – L: F2	
15H0MW	Occurrence condition 7	Escape procedure 1	D – L: F2, R: RL	
15J0MW	Occurrence condition 7	Escape procedure 1	D – L: F2, R: RH	Occurrence condition 2 Gear is set in neutral suddenly during travel. Once machine stops travel, gear is kept in neutral and machine does start when lever is operated.
15K0MW	Occurrence condition 7	Escape procedure 3	D – L: F2, R: RH	
15L0MW	Occurrence condition 7	Escape procedure 3	D – L: F1, R: RH	
15M0MW	Occurrence condition 7	Escape procedure 3	D – L: F2, R: RH	Occurrence condition 3 Gear is set in neutral suddenly during travel.
15N0MW	Occurrence condition 7	Escape procedure 3	D – L: F2, R: RH	
15SBL1	Occurrence condition 7	Escape procedure 1	R: RH	
15SBMA	Occurrence condition 2	Escape procedure 1	D – L: F2	Occurrence condition 4 After engine is started, gear is kept in neutral and machine does not start when lever is operated.
15SCL1	Occurrence condition 7	Escape procedure 1	D – L: F2, R: RH	
15SCMA	Occurrence condition 7	Escape procedure 1	D – L: F2, R: RL	
15SDL1	Occurrence condition 7	Escape procedure 1	D – L: F2, R: RL	Occurrence condition 5 Lever responds abnormally and does not work. If lever is operated, gear is set in neutral.
15SDMA	Occurrence condition 7	Escape procedure 1	D – L: F2, R: RH	
15SEL1	Occurrence condition 7	Escape procedure 1	D – L: F1	
15SEMA	Occurrence condition 7	Escape procedure 1	D – L: F2, R: RH	Occurrence condition 6 Gear speed is kept fixed and gear is not shifted from fixed gear after machine restarts. If lever is set to N position, gear is set in neutral but cannot be shifted any more.
15SFL1	Occurrence condition 7	Escape procedure 1	D – L: F2	
15SFMA	Occurrence condition 7	Escape procedure 1	D – L: F1, R: RH	
15SGL1	Occurrence condition 7	Escape procedure 1	D – L: F4	Occurrence condition 7 Proper clutch for travel is used and gear speed is fixed. If there is not proper clutch, gear is set in neutral. If lever is set to N position, gear is set in neutral.
15SGMA	Occurrence condition 7	Escape procedure 1	D – L: F2, R: RH	
15SHL1	Occurrence condition 7	Escape procedure 1	D – L: F6	
15SHMA	Occurrence condition 7	Escape procedure 1	D – L: F2, R: RH	Note 1 Even if trouble disappears, gear is kept in neutral until lever is set to N position once.
15SJMA	Occurrence condition 1	Escape procedure 1	D – L: F2, R: RH	
DAQ0KK	Occurrence condition 1	Escape procedure 5	If display becomes normal, machine can travel normally (Note 1).	
DAQ2KK	Occurrence condition 1	Escape procedure 4	If display becomes normal, machine can travel normally (Note 1).	
DAQ9KQ	Occurrence condition 4	Escape procedure 6	—	
DAQRKR	Occurrence condition 2	Escape procedure 5	If display becomes normal, machine can travel normally (Note 1).	
DAQRMA	Occurrence condition 4	Escape procedure 1	D – L: F2, R: RH	
DB2RKR	Occurrence condition 1	Escape procedure 1	D – L: F2, R: RH	
DDTHKA	Occurrence condition 1	Escape procedure 1	D – L: F2, R: RH	
DDTJKA	Occurrence condition 1	Escape procedure 1	D – L: F2, R: RL	
DDTKKA	Occurrence condition 1	Escape procedure 1	D – L: F1	

30 Testing and adjusting

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Failure code	Condition when trouble occurred	Escape method	Starting gear speed set with lever position after escape operation	Remarks
DDTLKA	Occurrence condition1	Escape procedure1	D – L: F2	See the "Remarks" of a front page
DDTMKA	Occurrence condition1	Escape procedure1	D – L: F4	
DDTNKA	Occurrence condition1	Escape procedure1	R: RH	
DDTPKA	Occurrence condition1	Escape procedure1	D – L: F6	
DF10KA	Occurrence condition5	Escape procedure7	If display becomes normal, machine can travel normally (Note 1).	
DF10KB	Occurrence condition5	Escape procedure7	If display becomes normal, machine can travel normally (Note 1).	
DLF1KA	Occurrence condition1	Escape procedure1	D – L: F2, R: RH	
DLF1LC	Occurrence condition1	Escape procedure1	D – L: F2, R: RH	
DLF2KA	Occurrence condition1	Escape procedure1	D – L: F2, R: RH	
DLF2LC	Occurrence condition1	Escape procedure1	D – L: F2, R: RH	
DLT3KA	Occurrence condition6	Escape procedure3	D – L: F2, R: RH	
DXH1KA	Occurrence condition1	Escape procedure1	D – L: F2, R: RH	
DXH1KB	Occurrence condition1	Escape procedure1	D – L: F2, R: RH	
DXH1KY	Occurrence condition1	Escape procedure1	D – L: F2, R: RH	
DXH2KA	Occurrence condition7	Escape procedure1	D – L: F2, R: RL	
DXH2KB	Occurrence condition7	Escape procedure1	D – L: F2, R: RL	
DXH2KY	Occurrence condition7	Escape procedure1	D – L: F2, R: RH	
DXH3KA	Occurrence condition7	Escape procedure1	D – L: F2, R: RH	
DXH3KB	Occurrence condition7	Escape procedure1	D – L: F2, R: RH	
DXH3KY	Occurrence condition7	Escape procedure1	D – L: F2, R: RL	
DXH4KA	Occurrence condition7	Escape procedure1	D – L: F2, R: RH	
DXH4KB	Occurrence condition7	Escape procedure1	D – L: F2, R: RH	
DXH4KY	Occurrence condition7	Escape procedure1	D – L: F1	
DXH5KA	Occurrence condition7	Escape procedure1	D – L: F1, R: RH	
DXH5KB	Occurrence condition7	Escape procedure1	D – L: F1, R: RH	
DXH5KY	Occurrence condition7	Escape procedure1	D – L: F2	
DXH6KA	Occurrence condition7	Escape procedure1	D – L: F2, R: RH	
DXH6KB	Occurrence condition7	Escape procedure1	D – L: F2, R: RH	
DXH6KY	Occurrence condition7	Escape procedure1	D – L: F4	
DXH7KA	Occurrence condition7	Escape procedure1	D – L: F2	
DXH7KB	Occurrence condition7	Escape procedure1	D – L: F2	
DXH7KY	Occurrence condition7	Escape procedure1	R: RH	
DXHHKA	Occurrence condition7	Escape procedure1	D – L: F2, R: RH	
DXHHKB	Occurrence condition7	Escape procedure1	D – L: F2, R: RH	
DXHHKY	Occurrence condition7	Escape procedure1	D – L: F6	

Escape procedure 1:

1. Stop traveling and return the gearshift lever to the "N" position.
2. Operate the gearshift lever again and move the machine OFF.
 - ★ When operating the gearshift lever, release the accelerator pedal.
 - ★ **N → D – L or N → R**

Escape procedure 2:

Tow the machine.

- ★ If the engine cannot be started and the machine is towed, the parking brake cannot be released by operating the switch, so carry out the operation to release it temporarily. For details, see "Method for emergency release of parking brake".

Escape procedure 3:

1. Stop traveling and return the gearshift lever to the "N" position.
2. Connect and disconnect emergency escape connectors **A1** (female) and **A2** (male), and switch to the emergency escape mode.
 - ★ Connectors **A1** and **A2** are installed to near the fuse box.
 - ★ Connect and disconnect the connectors with the starting switch at ON or with the engine started.
3. Operate the gearshift lever again and move the machine OFF.
 - ★ When operating the gearshift lever, release the accelerator pedal.
 - ★ **N → D – L or N → R**
 - ★ The emergency escape mode is maintained until the starting switch is turned OFF.

Escape procedure 4:

Check the circuit breaker and fuse. If they are normal, replace the transmission controller.

- Circuit breaker: No. 64 "FUB2" No. 65 (80 A)
- Fuse: BT3-No. 14 (10 A)

Escape procedure 5:

Check the circuit breaker and fuse. If they are normal, replace the transmission controller.

- Circuit breaker: "FUA2" (30 A)
- Fuse: BT2-No. 18 (10 A)

Escape procedure 6:

Check the model selection setting. If it is normal, see adjustment of transmission controller.

Escape procedure 7:

Check the fuse. If it is normal, replace the gearshift lever.

- Fuse: BT3-No. 14 (10 A)

HD785-7 Dump truck

Form No. SEN01771-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7

7001 and up

30 Testing and adjusting

Testing and adjusting, Part 3

Setting and adjusting of devices	2
Special functions of machine monitor (EMMS)	14

Setting and adjusting of devices

Items to be set or adjusted after replacement, disassembly, assembly or additional installation of controllers or sensors

- ★ If any of the following devices or parts is replaced, disassembled, assembled or installed additionally, carry out the necessary setting and adjusting.

Device/Option replaced, disassembled, assembled or installed additionally	Necessary setting/adjusting
Machine monitor	Setting of model selection (See 1-1 of this section) Setting of option selection (See 1-2 of this section) Setting of machine monitor (corrosion resistor) in OFF (See 1-3 of this section) Deletion of information of electrical equipment system fault history (See *2-1) Setting of service meter (See *3-1) Setting of reverse odometer (See *3-2)
Transmission	Adjusting of transmission ECMV current (See *2-2) Resetting and execution of transmission initial learning (See *2-2)
Transmission controller	Setting of model selection (See 1-1 of this section) Setting of option selection (See 1-2 of this section) Adjusting of transmission ECMV current (See *2-2) Resetting and execution of transmission initial learning (See *2-2) Deletion of information of electrical equipment system fault history (See *2-1)
Transmission ECMV solenoid	Adjusting of transmission ECMV current (See *2-2) Resetting and execution of transmission initial learning (See *2-2)
Retarder controller	Setting of model selection (See 1-1 of this section) Setting of option selection (See 1-2 of this section) Deletion of information of electrical equipment system fault history (See *2-1)
Body positioner sensor Body positioner rod	Adjusting of body positioner sensor (See *2-3)
VHMS	Initialization procedure for VHMS controller
ORBCOMM controller	Setting of ORBCOMM
Payload meter in VHMS	Setting of option selection (See 1-2 of this section) Initialization procedure for VHMS controller
Optional device	Setting of option selection

*2-1: For the setting and adjusting procedure, see "Special functions of machine monitor (EMMS)" ([10] Electrical equipment system fault history display function).

*2-2: For the setting and adjusting procedure, see "Special functions of machine monitor (EMMS)" ([15] Adjusting function).

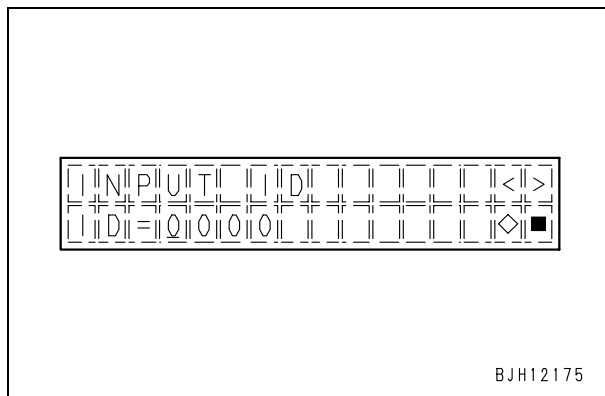
*2-3: For the setting and adjusting procedure, see "Adjusting of body positioner".

*3-1: For the setting and adjusting procedure, see Service News.

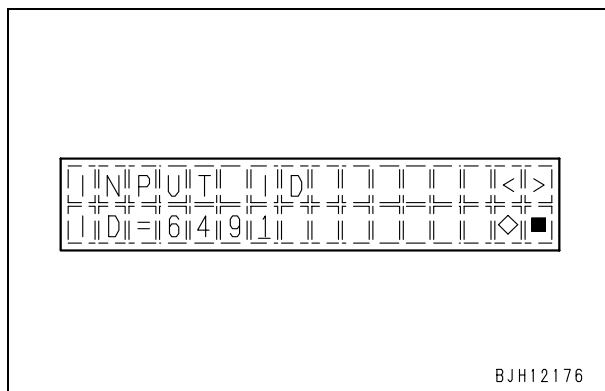
*3-2: For the setting and adjusting procedure, see Service News.

1-1. Setting of model selection**1. Switching to service mode**

- 1) Confirming the screen display
Check that the machine monitor is in operator mode and the screen is displaying either the "service meter and integrated odometer", "action code" or "failure code".
- 2) Displaying ID input screen
Press the following 2 switches at the same time for longer than 5 seconds to display the ID input screen.
 - [■] switch and [<] switch
 - ★ If the switch is pressed for longer than 5 seconds, the character display section becomes blank. After confirming this condition, release the switch.

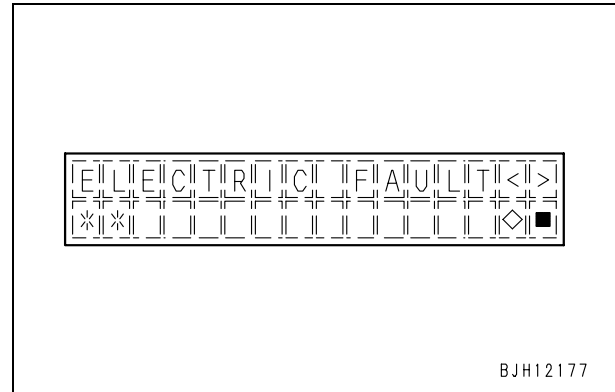


- 3) Input and determination of ID
After displaying ID input screen, operate [>], [<], [◇], and [■] switch to input 4 digits ID.
 - ★ ID: **6491**
 - [>]: Number at the cursor increases.
 - [<]: Number at the cursor decreases
 - [◇]: Number at the cursor is determined
 - [■]: Cursor moves to left end or the display returns to operator mode screen.
 - ★ If the ID input screen is left without switch operation for longer than 60 seconds, it automatically returns to the operator mode screen.



- 4) Displaying service menu selection screen
After confirming all ID's of 4 digits, display the service menu selection screen in the service mode.

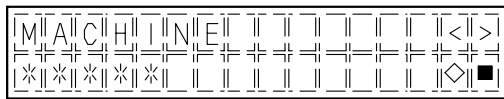
- ★ By inputting and determining the ID once, it will be effective until the starting switch is turned OFF.

**2. Selecting and determining service menu**

- 1) When pressing the [>] switch or [<] switch in the service menu selection screen, the service menu is displayed endlessly in the order shown in the below table, so select the model selection function (MACHINE).
 - [>]: To proceed to next service menu.
 - [<]: To return to previous service menu.
 - ★ Displayed service menu:

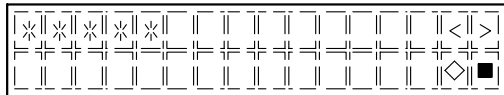
Display	Function
ELECTRIC FAULT	Electrical system failure history display function
MACHINE FAULT	Mechanical system failure history display function
REAL-TIME MONITOR	Real-time monitoring function
CYLINDER CUT-OUT	Reduced cylinder mode function
NO INJECTION	No injection cranking function
TUNING	Adjusting function
MAINTENANCE MONITOR	Filter and oil replacement time setting function
OPERATION INFO	Operation information display function
FIX POWER MODE	Engine mode fixing function
SNAPSHOT	Manual snap shot function
PLM	PLM (Payload meter) setting function
OPTIONAL SELECT	Option selection function
MACHINE	Model selection function
INITIALIZE	Initialize function (exclusive function for factory)

- ★ As for the use of the service menu, besides model selection function, option selection function, and filter and oil replacement time setting function (part of function), refer to the section of "Special function of machine monitor".
- ★ In the "*" part, the model presently set is displayed.
- ★ Even if the model presently set is correct, be sure to carry out the setting newly.



BJH12243

- 2) After selecting the model selection function, press [◇] switch for longer than 5 seconds and display the model selection setting screen.
- [◇]: Conduct the service menu.
 - ★ Press [◇] switch for longer than 5 seconds, otherwise it will not change to model selection setting screen.
 - ★ In the model selection setting screen, display only the model to be set at the [*] part.



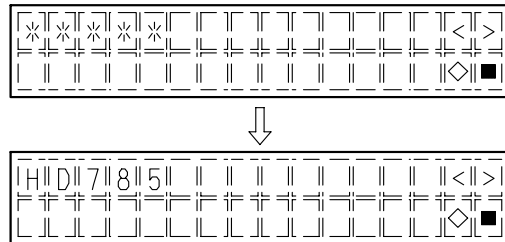
BJH12244

3. Selecting and setting of model

- 1) When pressing the [>] switch or [<] switch in the model selection setting screen, the model which can be set is displayed endlessly in the order shown in the below table, so select the applied model.
- [>] switch: To proceed to next model
 - [<] switch: To return to previous model
 - ★ Displayed model:

Display	Model
HD785	HD785-7
HD605	HD605-7E0
HD465	HD465-7E0
HD405	HD405-7
HD325	HD325-7

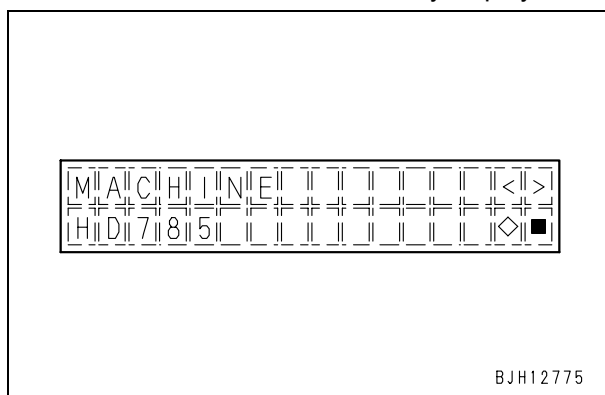
- 2) After selecting the model in the model selecting screen, determine the model by pressing the [◇] switch.
- [◇]: Determine the setting.
 - [■]: To cancel the setting
 - ★ The below figure shows the example that HD785-7 has been selected.



BJH12774

4. Storing data in controller

- 1) After determining the model selection setting, check that the display automatically returned to the service menu screen and the selected model is surely displayed.



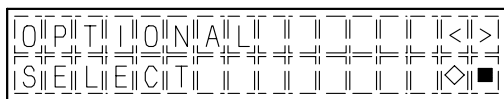
- 2) Turn the starting switch OFF and keep that condition for longer than 15 seconds.
 - ★ Unless the starting switch is turned off for longer than 15 seconds, the new data is not memorized in the controller.
 - 3) Turn the starting switch ON again.
 - ★ After this operation the model setting becomes effective.
5. Carrying out option setting
- If once carrying out the model selection setting, all setting of option selection is reset, so continue to carry out the setting of option selection.
- ★ Refer to section "1-2. Setting of option selection".

1-2. Setting of option selection

★ Item list of option selection function

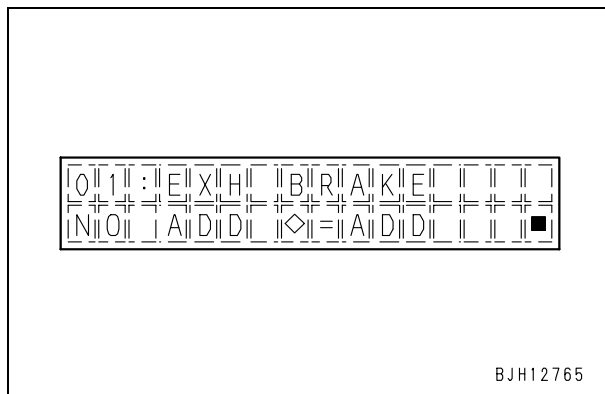
Item	Display	Code	Default setting	Contents of selection
Exhaust brake	EXH BRAKE	01	Not added (NO ADD)	If exhaust brake is installed, select ADD.
ARSC	ARSC	02	Added (ADD)	If ARSC is installed, select ADD.
ASR	ASR	03	Not added (NO ADD)	If ASR is installed, select ADD.
ABS	ABS	04	Not added (NO ADD)	If ABS is installed, select ADD.
Auto-suspension	AURTO SUS	05	Added (ADD)	If auto-suspension is installed, select ADD.
VHMS/PLM	VHMS/PLM	07	VHMS+PLM	Select from following. • VHMS is not installed: [NON] • Only VHMS: [VHMS] • VHMS + Built-in PLM: [+PLM]
—	—	09	E1	Selecting operation is prohibited (Fixed to E1).
—	—	10	Not added (NO ADD)	Selecting operation is prohibited (Fixed to NO ADD).
—	—	11	Not added (NO ADD)	Selecting operation is prohibited (Fixed to NO ADD).
Tire size correction	TIER SIZE	12	0 %	Set speed correction quantity for tire size. HD785-7 (27.00R49★ ★) : 0 % HD785-7 (31/90R49-E4) : -1 % • If speedometer reading is not correct, adjust it with this item. • If setting is increased by 1%, reading is increased by 1% at 0%.
Inclinometer	INCLINOMET	13	Added (ADD)	If inclinometer (machine lateral inclination sensor) is installed, select ADD.
Unit selection (MPH / km/h)	SPEED (UNIT)	15	MPH	Set unit of speed as follows. • When MPH is used: MPH • When km/h is used: km/h ★ This item is not displayed for SI specification. ★ Do not change this setting, basically.
—	—	16	Not added (NO ADD)	Selecting operation is prohibited (Fixed to NO ADD).
Maintenance sensor	SENSOR	19	Not added (NO ADD)	If maintenance sensor is installed, select ADD.

1. Switching to service mode
Switch to the service mode by referring to "1-1. Setting of model selection".
2. Selecting and carrying out service menu
 - 1) Select the optional selection function (OPTIONAL SELECTION) in the service menu selection screen by referring to "1-1. Setting of model selection".



BJH12403

- 2) After selecting the optional selection function, press [$\diamond$] switch for longer than 5 seconds and display the setting screen for the optional item selection.
 - [$\diamond$]: Conduct the service menu.
 - ★ Press [$\diamond$] switch for longer than 5 seconds, otherwise it will not change to optional item selection screen.
 - ★ The setting status of that optional item is displayed at the left of the lower row.
 - ADD: Option is set.
 - NO ADD: Option is not set.



- 3) When pressing the [$\triangleright$] switch or [$\triangleleft$] switch in the option item selection screen, the optional item is displayed endlessly in the order shown in the below table, so select the necessary item.

★ Be sure to start setting of optional functions from code No. 01.

- [$\triangleright$]: To proceed to next option item.
- [$\triangleleft$]: To return to previous option item.

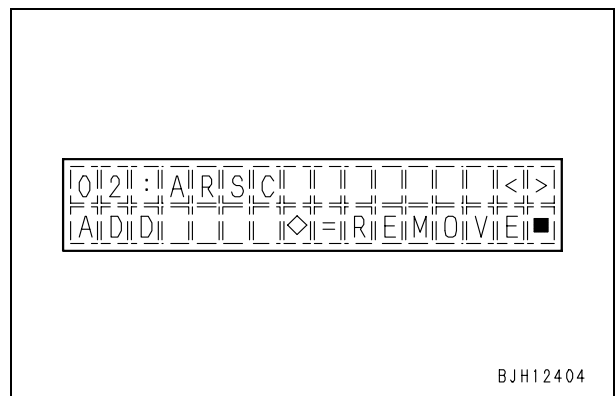
★ Displayed option items:

Display	Check item
01: EXH BRAKE	Exhaust brake
02: ARSC	ARSC
03: ASR	ASR
04: ABS	ABS
05: AUTO SUS	Auto-suspension
07: VHMS/PLM	VHMS/PLM
09: —	—
10: —	—
11: —	—
12: TIRE SIZE	Tire size correction
13: INCLINOMET.	Inclinometer
15: SPEED (UNIT)	Speed unit selection (Do not change, basically)
16: —	—
19: SENSOR	Maintenance sensor

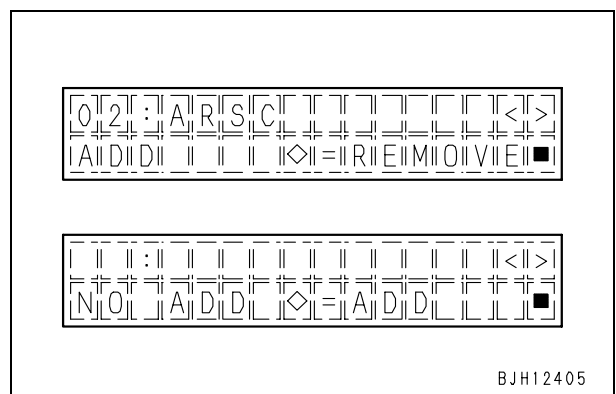
- ★ Perform after checking that the model has been set.
- ★ Always check all the items.
- ★ Settle the first item by pressing the [$\diamond$] switch twice, even if the current setting is correct (to transmit the information to the other controllers).
- ★ After setting, be sure to turn the starting switch OFF and wait for 15 seconds to settle the memory of each controller.

3. Setting of ARSC (02: ARSC)

- 1) While the optional item selection screen is displayed, select ARSC (02: ARSC).
 - ★ The current setting condition is displayed on the left side of the lower line.
 - ADD: ARSC is set.
 - NO ADD: ARSC is not set.

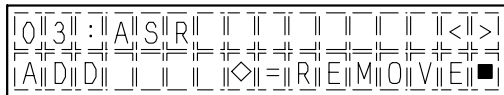


- 2) Check the installation condition of ARSC and setting condition on the screen and press the [$\diamond$] switch to settle the setting.
 - [$\diamond$]: Change setting (Display changes).
 - [$\blacksquare$]: Return to optional item selection screen.
 - ADD: Set option.
 - NO ADD: Set no option.
 - ★ If the setting is settled with the [$\diamond$] switch, it is effective even after this screen is turned OFF.



4. Setting of ASR (03: ASR)

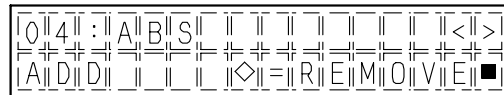
- 1) While the optional item selection screen is displayed, select ASR (03: ASR).
 - ★ The current setting condition is displayed on the left side of the lower line.
 - ADD: ASR is set.
 - NO ADD: ASR is not set.



BJH12406

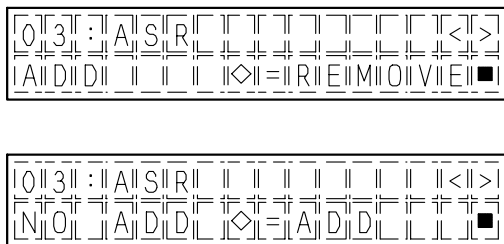
5. Setting of ABS (04: ABS)

- 1) While the optional item selection screen is displayed, select ABS (04: ABS).
 - ★ The current setting condition is displayed on the left side of the lower line.
 - ADD: ABS is set.
 - NO ADD: ABS is not set.



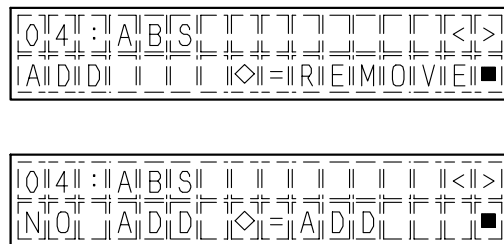
BJH12408

- 2) Check the installation condition of ASR and setting condition on the screen and press the [◇] switch to settle the setting.
 - [◇]: Change setting (Display changes).
 - [■]: Return to optional item selection screen.
 - ADD: Set option.
 - NO ADD: Set no option.
 - ★ If the setting is settled with the [◇] switch, it is effective even after this screen is turned OFF.



BJH12407

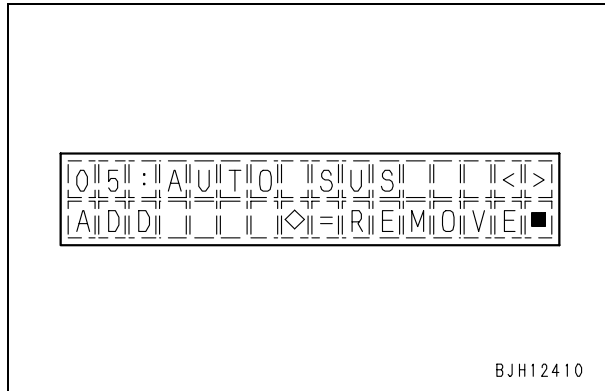
- 2) Check the installation condition of ABS and setting condition on the screen and press the [◇] switch to settle the setting.
 - [◇]: Change setting (Display changes).
 - [■]: Return to optional item selection screen.
 - ADD: Set option.
 - NO ADD: Set no option.
 - ★ If the setting is settled with the [◇] switch, it is effective even after this screen is turned OFF.



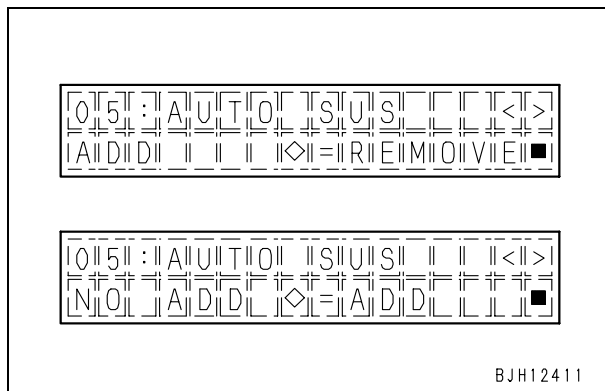
BJH12409

6. Setting of auto-suspension (05: AUTO SUS)

- 1) While the optional item selection screen is displayed, select the auto-suspension (05: AUTO SUS).
 - ★ The current setting condition is displayed on the left side of the lower line.
 - ADD: Auto-suspension is set.
 - NO ADD: Auto-suspension is not set.

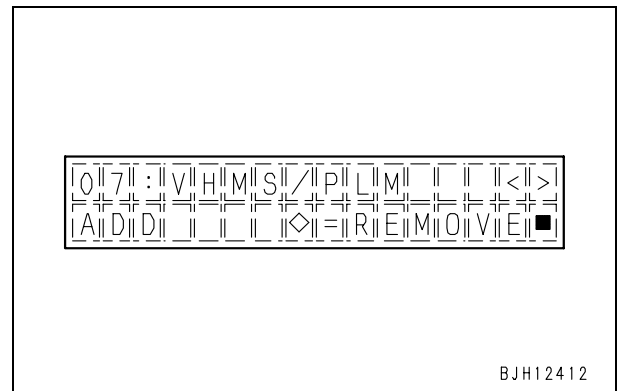


- 2) Check the installation condition of the auto-suspension and setting condition on the screen and press the [◇] switch to settle the setting.
 - [◇]: Change setting (Display changes).
 - [■]: Return to optional item selection screen.
 - ADD: Set option.
 - NO ADD: Set no option.
 - ★ If the setting is settled with the [◇] switch, it is effective even after this screen is turned OFF.

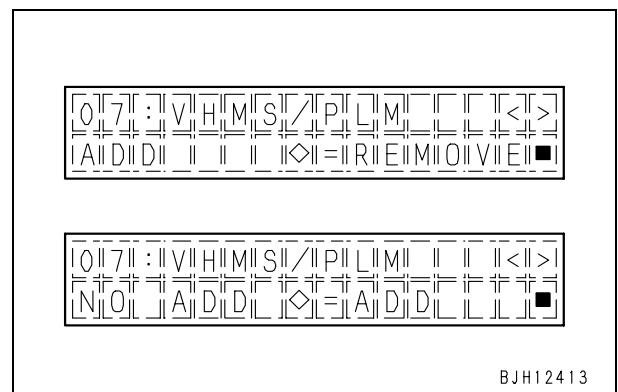


7. Setting of VHMS/PLM (07: VHMS/PLM)

- 1) While the optional item selection screen is displayed, select VHMS/PLM (07: VHMS/PLM).
 - ★ The current setting condition is displayed on the left side of the lower line.
 - NON: VHMS/PLM is not set.
 - VHMS: Only VHMS is set.
 - +PLM: VHMS + PLM are set.



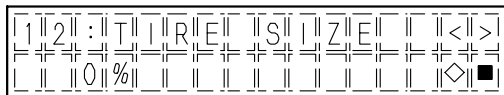
- 2) Check the installation condition of VHMS/PLM and setting condition on the screen and press the [◇] switch to settle the setting.
 - [◇]: Change setting (Display changes).
 - [■]: Return to optional item selection screen.
 - NON: Set no option.
 - VHMS: Set VHMS.
 - +PLM: Set VHMS + PLM.
 - ★ If the setting is settled with the [◇] switch, it is effective even after this screen is turned OFF.



8. Setting of tire size compensation (12: TIRE SIZE)

- 1) Select the tire size compensation (12: TIRE SIZE) in the option item selection screen.

- ★ The present compensation value is displayed at the left of the lower row.
***%: Rate of change from standard tire



BJH12420

- 2) For changing the compensation value, press the [◇] switch to display the compensation value input screen.

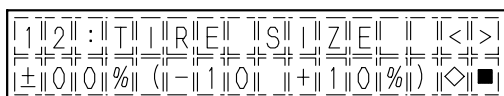
- [◇]: To change compensation value.

- 3) After displaying the compensation value input screen, operate each of the switches [>], [<], [◇] and [■] to input the compensation value directly.

- [>]: To switch the cursor symbol (+/-); To increase number.
- [<]: To switch the cursor symbol (+/-); To decrease number.
- [◇]: To determine compensation value.
- [■]: Cursor moves to left end / To return to optional item selection screen.

- ★ The compensation value at the plant before shipment is [+/- 00%] (In case of inputting 00, +/- does not matter.)

- ★ The compensation value can be input within the range of [-10 % - +10 %].



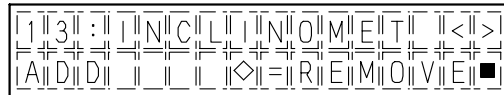
BJH12421

9. Setting of inclinometer (13: INCLINOMET.)

- 1) While the optional item selection screen is displayed, select the inclinometer (13: INCLINOMET.).

- ★ The current setting condition is displayed on the left side of the lower line.

- ADD: Inclinometer is set.
- NO ADD: Inclinometer is not set.



BJH12422

- 2) Check the installation condition of the inclinometer and setting condition on the screen and press the [◇] switch to settle the setting.

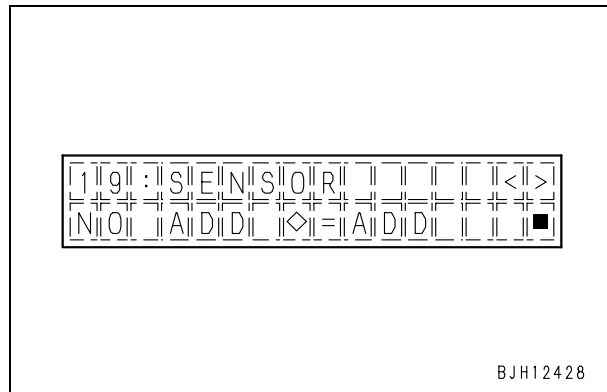
- [◇]: Change setting (Display changes).
- [■]: Return to optional item selection screen.
- ADD: Set option.
- NO ADD: Set no option.
- ★ If the setting is settled with the [◇] switch, it is effective even after this screen is turned OFF.



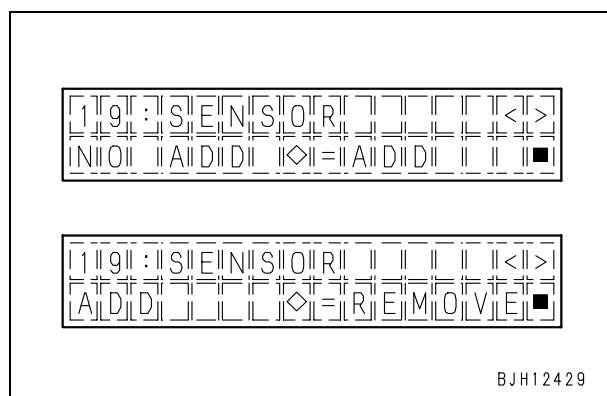
BJH12423

10. Setting of maintenance sensor (19: SENSOR.)

- 1) While the optional item selection screen is displayed, select the maintenance sensor (19: SENSOR.).
 - ★ The current setting condition is displayed on the left side of the lower line.
 - ADD: Maintenance sensor is set.
 - NO ADD: Maintenance sensor is not set.



- 2) Check the installation condition of the maintenance sensor function and setting condition on the screen and press the [◇] switch to settle the setting.
 - [◇]: Change setting (Display changes).
 - [■]: Return to optional item selection screen.
 - ADD: Set option.
 - NO ADD: Set no option.
 - ★ If the setting is settled with the [◇] switch, it is effective even after this screen is turned OFF.

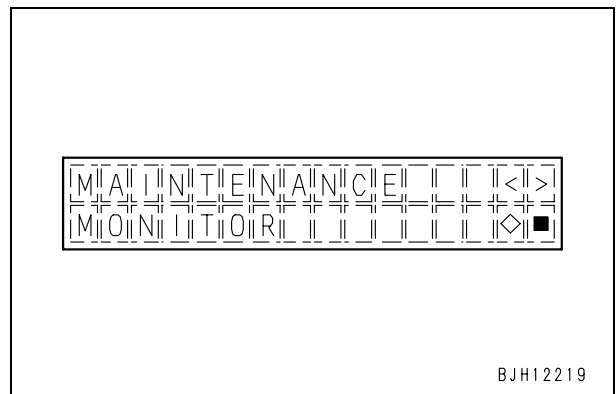


11. Storing data in controller

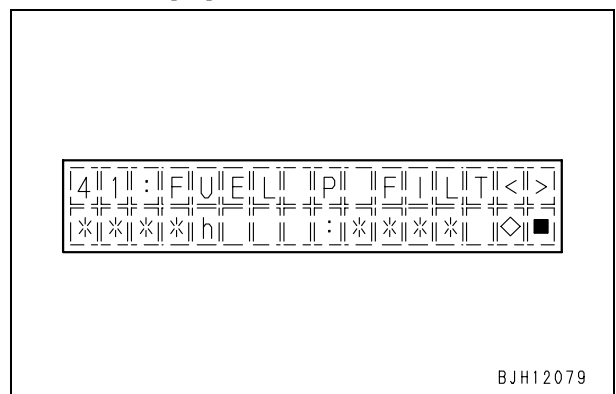
- 1) Check that the setting for all items has been completed in the sub menu screen for the optional item selection function.
- 2) Turn the starting switch OFF and keep that condition for longer than 15 seconds.
 - ★ Unless the starting switch is turned off for longer than 15 seconds, the new data is not memorized in the controller.
- 3) Turn the starting switch ON again.
 - ★ After this operation the option setting becomes effective.

1-3. OFF setting of maintenance monitor (corrosion resistor)

1. Switching to service mode
Switch to the service mode by referring to "1-1. Setting of model selection".
2. Selecting and carrying out service menu
 - 1) Select the filter and oil replacement time setting function (MAINTENANCE MONITOR) in the service menu selection screen referring to "1-1. Setting of model selection".



3. Displaying and selecting of maintenance item
 - 1) While the filter and oil replacement time setting function is selected, display the maintenance item selection screen by pressing the [◇] switch.
 - [◇]: Conduct the service menu.



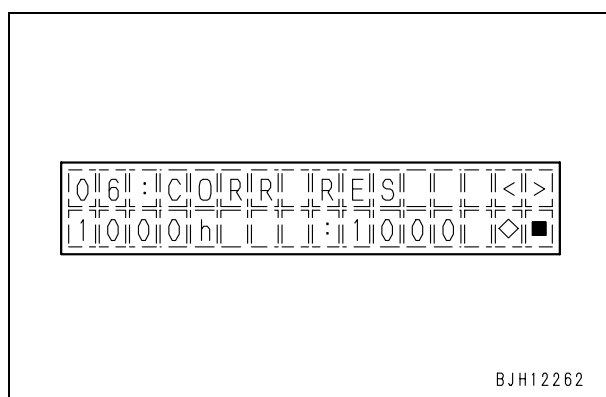
- 2) When pressing the [>] switch or [<] switch in the maintenance item selection screen, the maintenance item is displayed endlessly in the order shown in the below table, so select the corrosion register (06: CORR RES).

- [>]: To proceed to next maintenance item.
- [<]: To return to previous maintenance item.

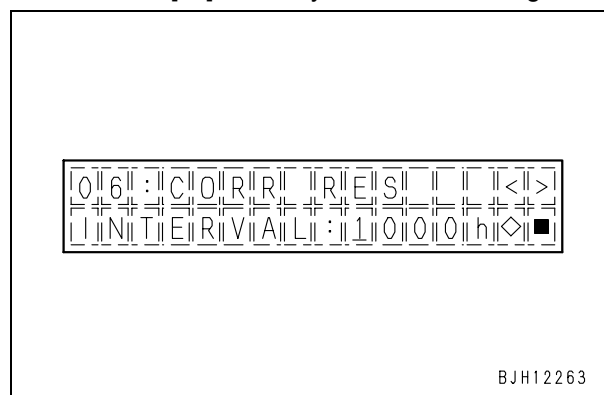
★ Displayed maintenance items:

Display	Maintenance items and functions
41:FUEL P FILT	Fuel pre filter
01:ENG OIL	Engine oil
02:ENG FILT	Engine oil filter
13:TM FILT	Transmission oil filter
03:FUEL FILT	Fuel main filter
06:CORR RES	Corrosion resistor
24: TC/TM/BK OIL	Torque convertor/Transmission/ Brake oil
14:BK OIL FILT	Brake oil filter
16:BK C FILT	Brake cooling oil filter
04:HYD FILT	Hydraulic oil filter
11:DIFF OIL	Differential oil
08:FNL OIL	Final drive oil
10:HYD OIL	Hydraulic oil
INITIALIZE	Setting default value for all items
ALL ITEMS	Setting validity or invalidity for all items

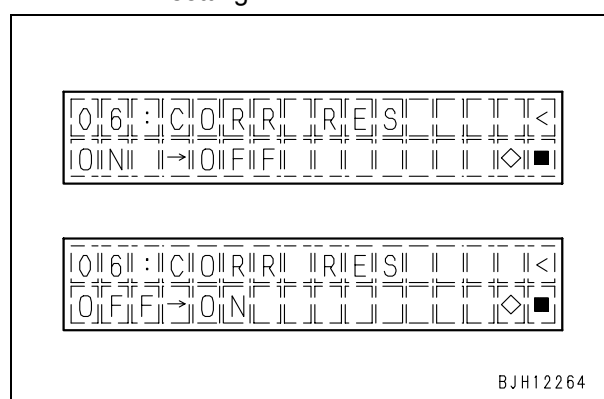
- ★ As for the use of maintenance items besides the corrosion register, refer to the section "Special function of machine monitor".



4. OFF setting of corrosion register item
- 1) With the corrosion register selected, press the [◇] switch and display the interval change screen.
 - [◇]: To carry out interval change.



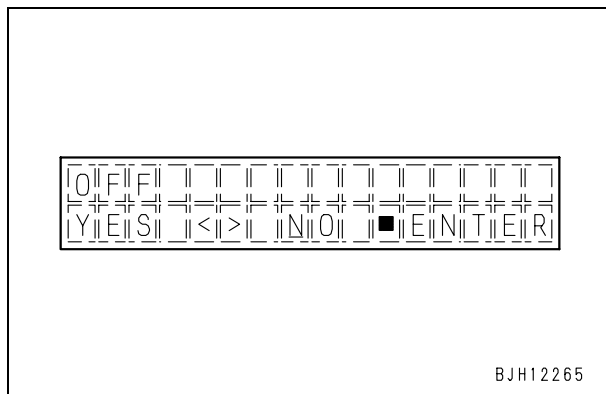
- 2) After displaying the interval change screen, press the [>] or [<] switch further and display the setting screen for validity or invalidity.
- [>]: Change the displayed screen
 - [<]: Change the displayed screen
- ★ If the present setting is ON, the screen displays as above, and if the present setting is OFF, it displays as below.
- ★ The default setting of the machine monitor is ON (above).
- ★ If the present setting is ON (above), carry out the further operation to change the setting to OFF.
- ★ If the present setting is OFF (below), press the [■] switch to complete the setting.



- 3) In order to change the present setting from ON to OFF, press the [◇] switch to display the setting change screen.
- [◇]: Change setting.

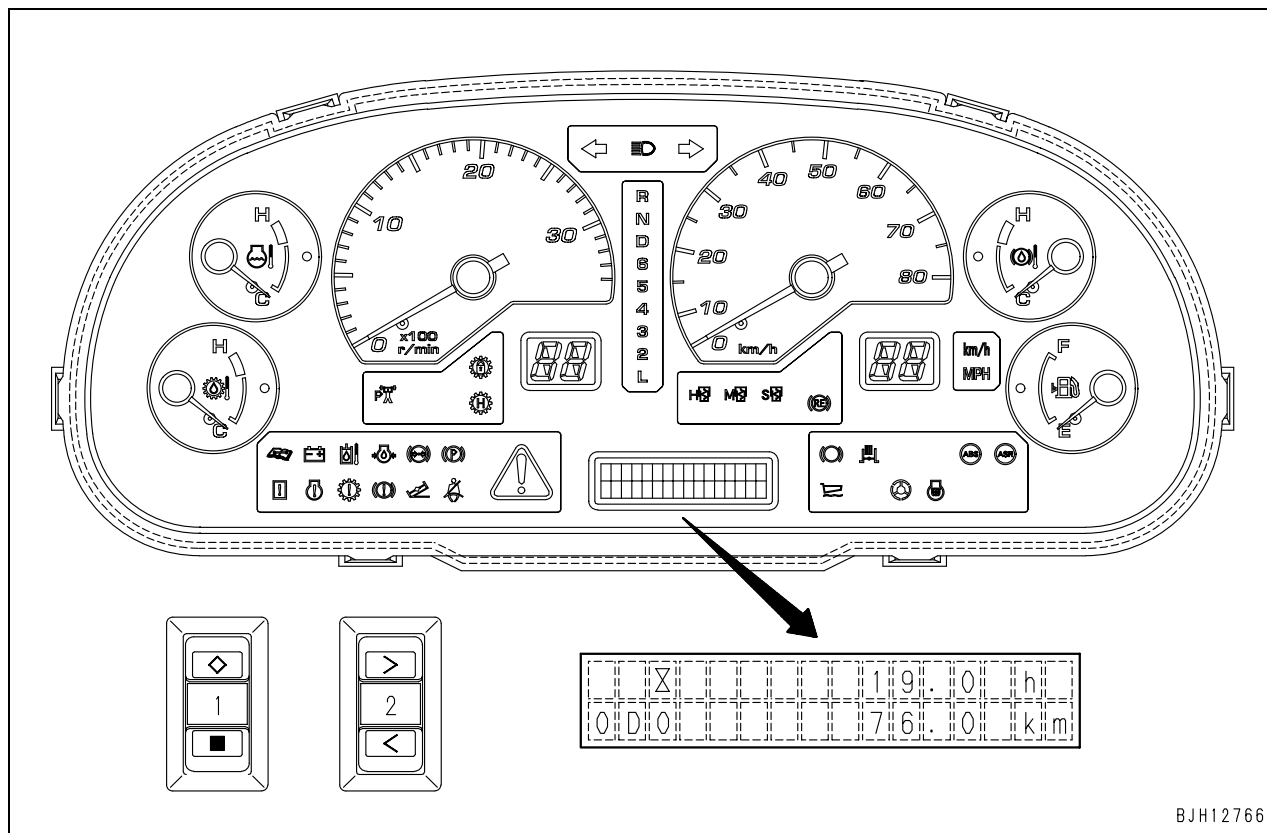
4) After displaying the setting change screen, operate [>], [<], and [■] switch to determine OFF setting.

- [<]: Select YES (move cursor)
- [>]: Select NO (move cursor)
- [■]: To determine selection.



Special functions of machine monitor (EMMS)

★ EMMS: Equipment Management Monitoring System



BJH12766

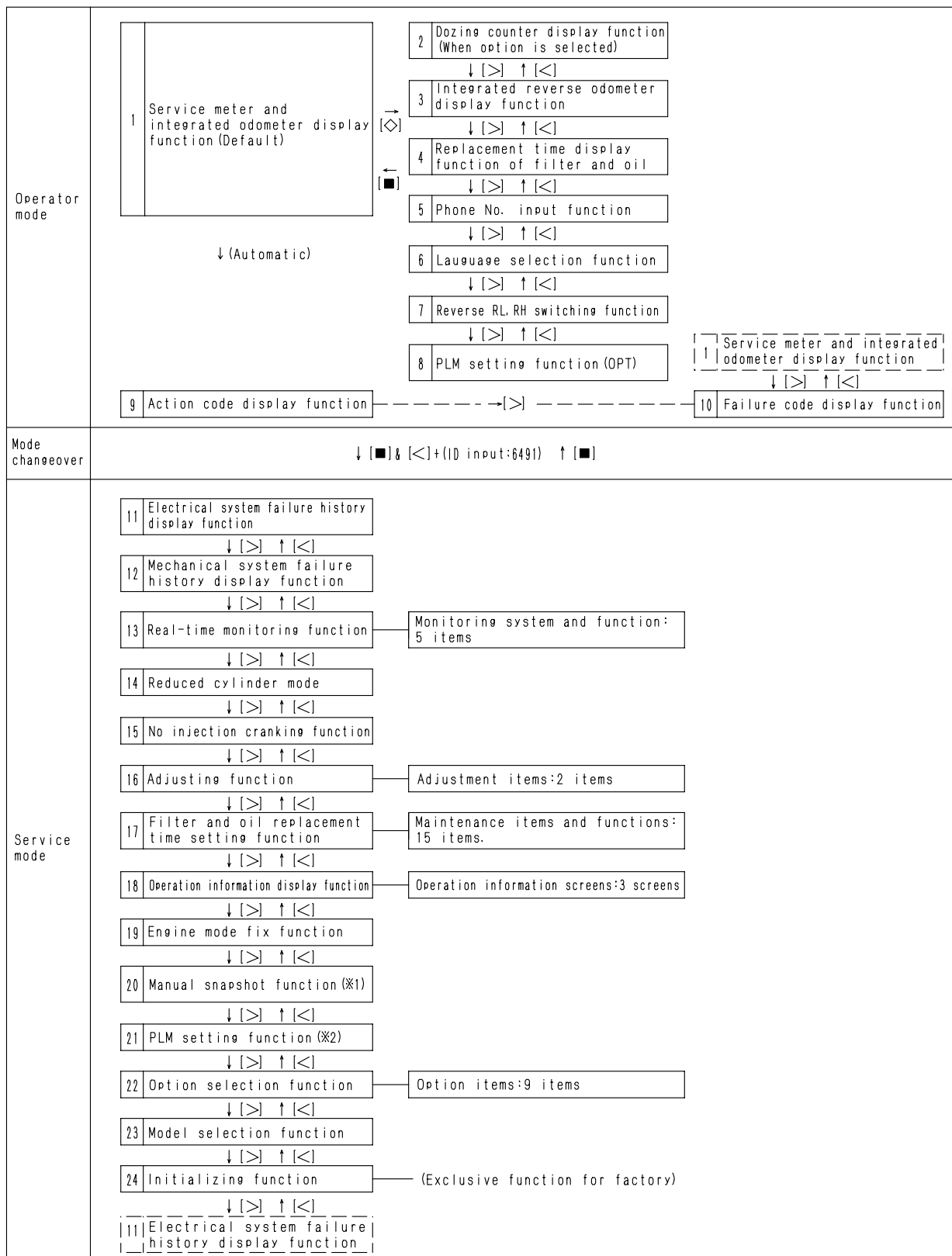
Normal functions and the special functions of machine monitor (EMMS)

The machine monitor is equipped with normal functions and special functions. Various items of data are displayed on the character display in the middle of the machine monitor. The display items are divided by the internal setting of the machine monitor (EMMS), into automatic display items and items displayed when the machine monitor switches are operated.

- 1) Normal functions: Operator mode
Functions for which the content is normally displayed or which can be displayed and operated by the operator operating the switches.
- 2) Special functions: Service mode
Functions which the serviceman can display and operate with the special switches to carry out inspection, maintenance, and troubleshooting.

Operator mode		↔	Service mode	
1	Service meter, odometer display function (default) (*1)		11	Electric system fault history display function
2	Dump counter display function (when option is selected)		12	Mechanical system fault history display function
3	Reverse travel distance display function		13	Real-time monitoring function
4	Filter replacement, oil change interval display function		14	Reduced cylinder mode
5	Telephone number input function		15	No-injection cranking function
6	Language selection function		16	Adjustment function
7	Reverse RL, RH switching function		17	Filter replacement, oil change interval display function
8	PLM setup function		18	Operation information display function
9	Action code display function		19	Engine mode fixing function
10	Failure code display function		20	Manual snapshot function
*1: PLM (payload meter) display function when receiving VHMS data			21	PLM setting function (when option is selected)
			22	Option selection function
			23	Model selection function
			24	Initialize function (factory use only)

Function and flow of each mode



BJH12768

*1: Applicable only when VHMS is installed.

*2: Applicable only when PLM built in VHMS is installed.

Operator mode

- ★ No. 2 – No. 8 is displayed endlessly by following the switch operation.
- ★ When a failure occurs, the screen changes automatically to No. 9 regardless of the displayed screen.
- ★ If the switch is not operated for over 30 seconds regardless of the display screen, the screen automatically;
 - Changes to No. 1.
(If malfunction has not occurred.)
 - Changes to No. 9.
(If malfunction has occurred.)
- ★ After moving from No. 10 to No. 1 by the switch operation, if no switch operation is performed for longer than 10 seconds, then it automatically moves to No. 9.

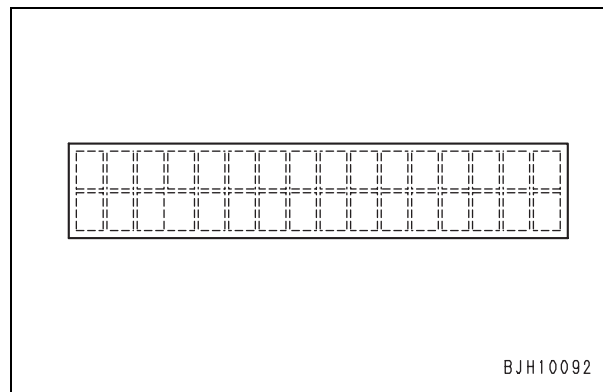
Service mode

- ★ No. 11 – No. 14 is displayed endlessly by following the switch operation.
- ★ By inputting and determining the ID once, it will be effective until the starting switch is turned off.

Character display portion

16 characters can be displayed on each upper and lower row of the character display section, and depending on the contents displays the combination of the next figures, letters, and symbols.

- 1) Arabic numbers: 1, 2, 3, . . .
- 2) Small letters: a, b, c, . . .
- 3) Capital letters: A, B, C, . . .
- 4) Katakana: A, I, U, . . . (Only for Japanese display)
- 5) Symbols: @, ?, \$, . . .
- 6) Special letters:

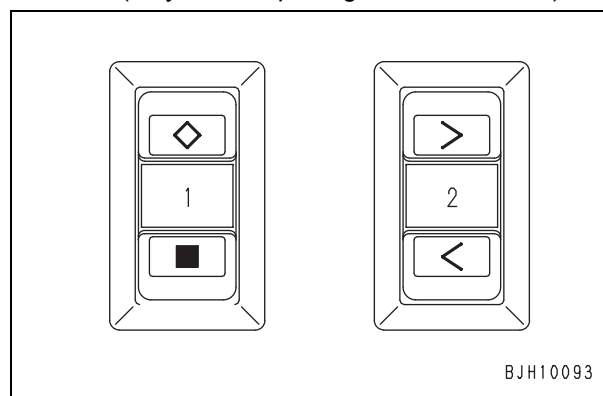


Control switch section

All the display operation of the machine monitor is operated by the machine monitor mode selector switches (1) and (2).

Each switch of [◇], [■], [>], [<] is assigned to the following function.

- 1) ◇ : Determine and execute
- 2) ■ : To cancel, release, and determine (only YES and NO screen)
- 3) > : To right, to next, to proceed, to increase (only when inputting Arabic numbers)
- 4) < : To left, to previous, to return, to decrease (only when inputting Arabic numbers)

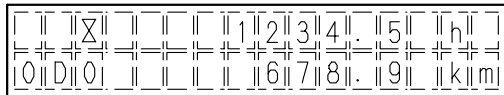


■ Operator mode (Outline)

[1] Service meter and integrated odometer display function

When turning the starting switch ON, the speed meter and integrated odometer are displayed in the upper and lower row respectively.

★ For details, see operation manual.



BJH12165

[2] Dozing counter display function (When option is selected)

Display the dozing counter by operating the machine monitor switch.

★ Dozing counter is displayed only when the option selection is set to be effective in the service mode.

★ For details, see operation manual.



BJH12166

[3] Integrated reverse odometer display function

Machine monitor displays the integrated reverse odometer by operating the switch.

★ For details, see operation manual.

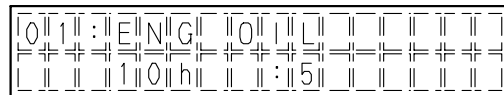


BJH12272

[4] Filter and oil replacement time display function

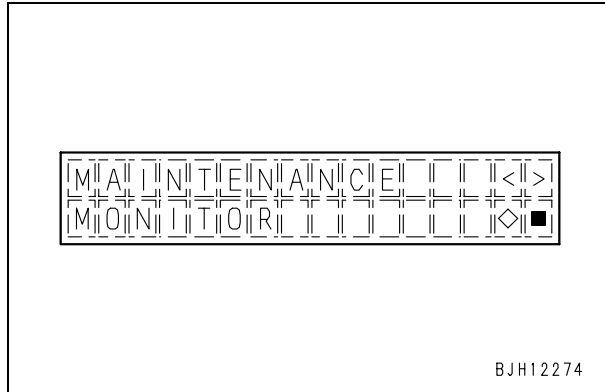
1. Replacement time display of filter and oil (displayed automatically)

When the replacement interval for the various filters or oils approaches, the machine monitor automatically displays the information to remind an operator of maintenance.



BJH12273

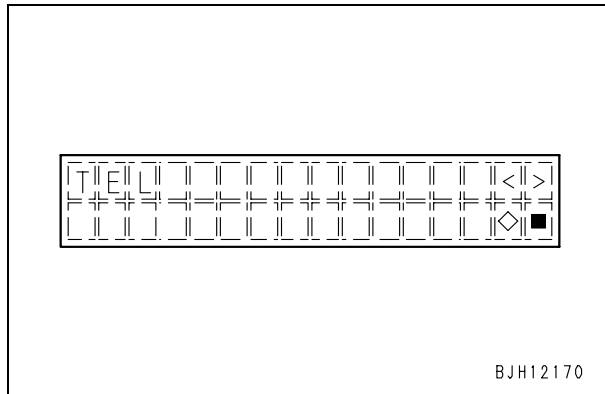
2. Reset of replacement time (selection menu)
The machine monitor can reset the interval time by operating the switch, if various filters and oils maintenances are finished.
- ★ For details, see operation manual.
 - ★ Replacement interval time setting can be operated by the filter and oil replacement time setting function in the service mode.



[5] Phone No. input function

Phone No. set in the machine monitor can be inputted, corrected, and released by the switch operation.

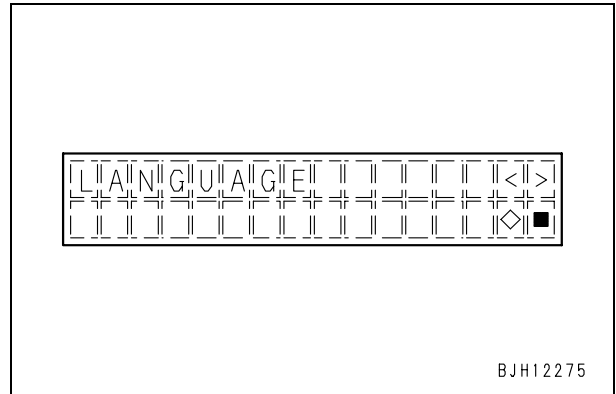
- ★ Phone No. is displayed together with "CALL" when action code "E03" is displayed.
- ★ For details, see operation manual.



[6] Language selection function

Display language of the machine monitor can be selected with the switch operation.

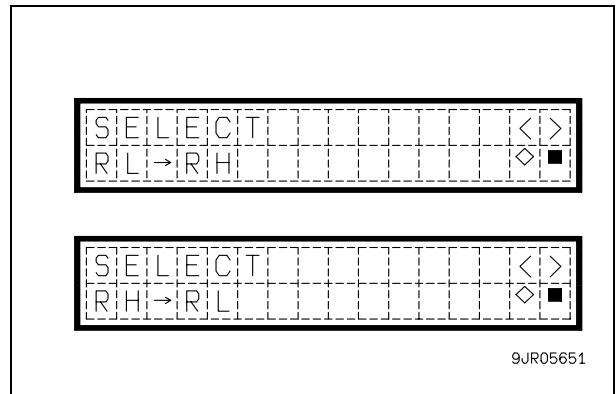
- ★ The Service mode function is not included in the display selection function, therefore always displayed in English.
- ★ For details, see operation manual.



[7] Reverse RL, RH switching function

Reverse RL or RH can be switched with the switch operation.

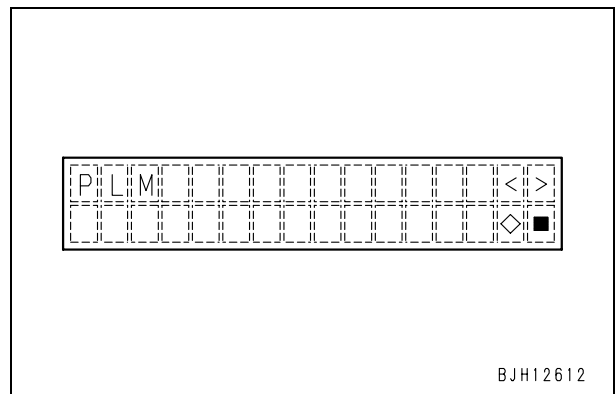
- ★ For details, see operation manual.



[8] PLM setting function (when option is selected)

This function sets and displays the payload meter.

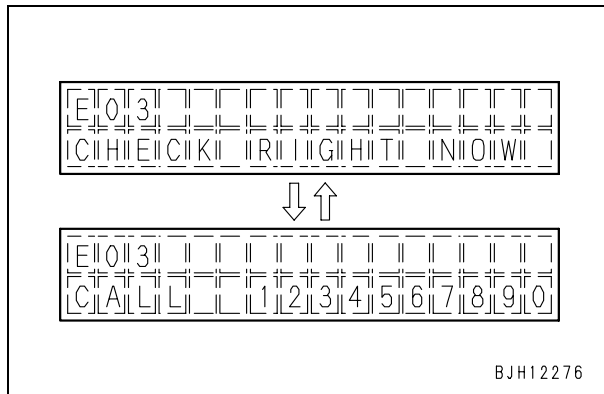
- ★ For details, see Operation and Maintenance Manual.



[9] Action code display function

When abnormal situations occur, the machine monitor automatically displays the action code depending on the extent of the abnormality in order to remind the operator of proper remedy.

- ★ Below figure shows the example of displaying action code "E03" and "CALL + phone No." alternately.
- ★ "CALL + phone No." is not displayed if the action code "E01" or "E02" is displayed.



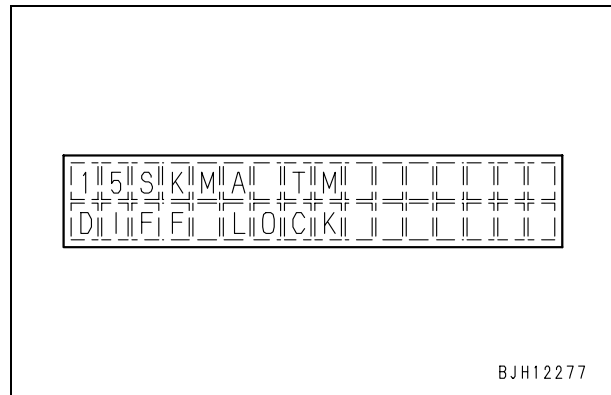
- ★ Action code and remedy requested for an operator

Action code	CALL + phone No.	Remedy requested for operator
E01	None	• Carry out test and maintenance when operation is finished or operator is changed.
E02	None	• If related to an over run is displayed: Travel keeping the engine speed and machine speed down. • If related to an overheat is displayed: Stop machine and keep engine with no-load medium speed running.
E03	Yes	• Stop the engine and machine immediately and contact the service personnel.

[10] Failure code display function

By pressing the [>] switch once while the action code is displayed on the machine monitor, the present failure code is displayed.

- [>]: To display failure code.



- ★ The failure codes which have been detected in the past are separated into electrical and mechanical systems and recorded as failure history (refer to service mode for a detail).
- ★ If there are several failures, other failure codes are displayed by pressing the [>] switch.
- ★ After displaying all the failure codes by pressing the [>] switch, press [>] switch further to return to the service meter and integrated odometer display screen. Press the [>] switch again, and the failure code is displayed from the beginning.
- ★ If there is no switch operation for longer than 10 seconds in the service meter and integrated odometer display screen, it automatically switches to the action code display screen.
- ★ The following information is displayed in the service code display function.
 - A: Failure code (4-digits device code + 2-digits symptom code)
 - B: Controller code
 - MON: Machine monitor
 - ENG: Engine controller
 - TM: Transmission controller
 - BK: Retarder controller
 - PLM: PLM function system of VHMS controller (when option is selected)
 - ABS: ABS controller (when option is selected)
 - C: Trouble occurring system

- ★ Refer to "Failure code table" for details of displayed failure codes.
- ★ Be careful of the partial difference in the displayed information for the failure code display function and the failure history display function (service mode).



BJH12174

Failure code table

Failure codes	Failure contents	Applicable equipment	Action code	History classification
1500L0	Detection of double engagement	TM	E03	Mechanical system
15B0NX	Clogging of transmission oil filter	TM	E01	Mechanical system
15F0KM	Abuse 1 of gear shifting from reverse to forward	TM	—	Mechanical system
15F0MB	Abuse 2 of gear shifting from reverse to forward	TM	—	Mechanical system
15F7KM	Abuse of transmission forward clutch disk	TM	—	Mechanical system
15G0MW	Trouble in reverse clutch system (command holding pressure, fill ON, detection of slip)	TM	E03	Electrical system
15G7KM	Abuse of transmission reverse clutch disk	TM	—	Mechanical system
15H0MW	Trouble in high clutch system (command holding pressure, fill ON, detection of slip)	TM	E03	Electrical system
15J0MW	Trouble in low clutch system (command holding pressure, fill ON, detection of slip)	TM	E03	Electrical system
15K0MW	Trouble in 1st clutch system (command holding pressure, fill ON, detection of slip)	TM	E03	Electrical system
15L0MW	Trouble in 2nd clutch system (command holding pressure, fill ON, detection of slip)	TM	E03	Electrical system
15M0MW	Trouble in 3rd clutch system (command holding pressure, fill ON, detection of slip)	TM	E03	Electrical system
15N0MW	Trouble in 4th clutch system (command holding pressure, fill ON, detection of slip)	TM	E03	Electrical system
15SBL1	Trouble I in reverse clutch pressure control valve (command OFF, fill ON)	TM	E03	Electrical system
15SBMA	Trouble II in reverse clutch pressure control valve (command holding pressure, fill OFF, detection of slip)	TM	E03	Electrical system
15SCL1	Trouble I in high clutch pressure control valve (command OFF, fill ON)	TM	E03	Electrical system
15SCMA	Trouble II in high clutch pressure control valve (command holding pressure, fill OFF, detection of slip)	TM	E03	Electrical system
15SDL1	Trouble I in low clutch pressure control valve (command OFF, fill ON)	TM	E03	Electrical system
15SDMA	Trouble II in low clutch pressure control valve (command holding pressure, fill OFF, detection of slip)	TM	E03	Electrical system
15SEL1	Trouble I in 1st clutch pressure control valve (command OFF, fill ON)	TM	E03	Electrical system
15SEMA	Trouble II in 1st clutch pressure control valve (command holding pressure, fill OFF, detection of slip)	TM	E03	Electrical system
15SFL1	Trouble I in 2nd clutch pressure control valve (command OFF, fill ON)	TM	E03	Electrical system
15SFMA	Trouble II in 2nd clutch pressure control valve (command holding pressure, fill OFF, detection of slip)	TM	E03	Electrical system
15SGL1	Trouble I in 3rd clutch pressure control valve (command OFF, fill ON)	TM	E03	Electrical system
15SGMA	Trouble II in 3rd clutch pressure control valve (command holding pressure, fill OFF, detection of slip)	TM	E03	Electrical system
15SHL1	Trouble I in 4th clutch pressure control valve (command OFF, fill ON)	TM	E03	Electrical system
15SHMA	Trouble II in 4th clutch pressure control valve (command holding pressure, fill OFF, detection of slip)	TM	E03	Electrical system
15SJMA	Trouble II in lockup clutch pressure control valve (command holding pressure, detection of slip)	TM	E03	Electrical system

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Failure codes	Failure contents	Applicable equipment	Action code	History classification
2C4MNX	Clogging of retarder cooling oil filter	BK	E01	Electrical system
2D01CA	Wear of brake (Front right)	BK	E01	Mechanical system
2D02CA	Wear of brake (Front left)	BK	E01	Mechanical system
2D05CA	Wear of brake (rear right)	BK	E01	Mechanical system
2D06CA	Wear of brake (rear left)	BK	E01	Mechanical system
2F00KM	Dragging of parking brake	TM	—	Mechanical system
2G42ZG	Lowering of accumulator oil pressure (front)	TM	E03	Mechanical system
2G43ZG	Lowering of accumulator oil pressure (rear)	TM	E03	Mechanical system
6014NX	Clogging of hydraulic oil filter	BK	E01	Mechanical system
989A00	Operation of engine overrun prevention device (Note: Information is obtained from transmission controller and failure code is displayed on monitor panel)	MON	E02	Mechanical system
989D00	Inclination alarm (Raising body while machine is inclined) (Note: Information is obtained from transmission controller and failure code is displayed on monitor panel)	MON	—	Mechanical system
A570NX	Clogging of engine oil filter	BK	E01	Mechanical system
AA10NX	Clogging of air cleaner	TM	E01	Mechanical system
AB00MA	Trouble in battery charge circuit (No R-terminal signal)	TM	E03	Electrical system
B@BAZG	Lowering of engine oil pressure	ENG	E03	Mechanical system
B@BAZK	Lowering of engine oil level	BK	E01	Mechanical system
B@BCNS	Overheating of engine	ENG	E02	Mechanical system
B@BCZK	Low coolant level alarm	TM	E01	Mechanical system
B@C6NS	Brake cooling oil overheat (Front)	MON	E02	Mechanical system
B@C7NS	Overheating of brake cooling oil (rear)	MON	E02	Mechanical system
B@CENS	Overheating of torque converter oil	MON	E02	Mechanical system
B@GAZK	Lowering of battery electrolyte level	BK	E01	Mechanical system
B@HAZK	Lowering hydraulic oil level	BK	E01	Mechanical system
B@JANS	Overheating of steering oil	TM	E02	Mechanical system
CA111	Abnormality in engine controller	ENG	E03	Electrical system
CA115	Abnormality in engine Ne/Bkup speed sensor	ENG	E03	Electrical system
CA122	Abnormally high level of charge pressure sensor	ENG	E03	Electrical system
CA123	Abnormally low level of charge pressure sensor	ENG	E03	Electrical system
CA131	Abnormally high level of throttle sensor	ENG	E03	Electrical system
CA132	Abnormally low level of throttle sensor	ENG	E03	Electrical system
CA135	Abnormally high level of oil pressure sensor	ENG	E01	Electrical system
CA141	Abnormally low level of oil pressure sensor	ENG	E01	Electrical system
CA144	Abnormally high level of coolant temperature sensor	ENG	E01	Electrical system
CA145	Abnormally low level of coolant temperature sensor	ENG	E01	Electrical system
CA153	Abnormally high level of charge temperature sensor	ENG	E01	Electrical system
CA154	Abnormally low level of charge temperature sensor	ENG	E01	Electrical system
CA187	Abnormally low level of sensor power supply 2	ENG	E03	Electrical system
CA212	Abnormally high level of engine oil temperature sensor (for VHMS)	ENG	E01	Electrical system
CA213	Abnormally low level of engine oil temperature sensor (for VHMS)	ENG	E01	Electrical system

Failure codes	Failure contents	Applicable equipment	Action code	History classification
CA221	Abnormally high level of ambient temperature sensor	ENG	E01	Electrical system
CA222	Abnormally low level of ambient temperature sensor	ENG	E01	Electrical system
CA227	Abnormally high level of sensor power supply 2	ENG	E03	Electrical system
CA234	Overspeed of engine	ENG	E02	Mechanical system
CA238	Abnormality in Ne speed sensor power supply	ENG	E03	Electrical system
CA263	Abnormally high level of fuel temperature sensor	ENG	E01	Electrical system
CA265	Abnormally low level of fuel temperature sensor	ENG	E01	Electrical system
CA271	Short circuit in PCV1	ENG	E03	Electrical system
CA272	Disconnection in PCV1	ENG	E03	Electrical system
CA273	Short circuit in PCV2	ENG	E03	Electrical system
CA274	Disconnection in PCV2	ENG	E03	Electrical system
CA322	Disconnection or short circuit in injector #1 (left bank #1) system	ENG	E03	Electrical system
CA323	Disconnection or short circuit in injector #5 (left bank #5) system	ENG	E03	Electrical system
CA324	Disconnection or short circuit in injector #3 (left bank #3) system	ENG	E03	Electrical system
CA325	Disconnection or short circuit in injector #6 (left bank #6) system	ENG	E03	Electrical system
CA331	Disconnection or short circuit in injector #2 (left bank #2) system	ENG	E03	Electrical system
CA332	Disconnection or short circuit in injector #4 (left bank #4) system	ENG	E03	Electrical system
CA342	Abnormality in matching of engine controller data	ENG	E03	Electrical system
CA351	Abnormality in injector drive circuit	ENG	E03	Electrical system
CA352	Abnormally low level of sensor power supply 1	ENG	E03	Electrical system
CA386	Abnormally high level of sensor power supply 1	ENG	E03	Electrical system
CA431	Abnormality in idle validation switch	ENG	E01	Electrical system
CA432	Abnormality in idle validation setting	ENG	E03	Electrical system
CA441	Abnormally low level of source voltage	ENG	E03	Electrical system
CA442	Abnormally high level of source voltage	ENG	E03	Electrical system
CA449	Abnormality 2 in common rail high pressure	ENG	E03	Electrical system
CA451	Abnormally high level of common rail pressure sensor	ENG	E03	Electrical system
CA452	Abnormally low level of common rail pressure sensor	ENG	E03	Electrical system
CA553	Abnormality 1 in common rail high pressure	ENG	E03	Electrical system
CA554	In-range trouble of common rail pressure sensor	ENG	E03	Electrical system
CA559	Lowering 1 of supply pump pressure	ENG	E03	Electrical system
CA689	Abnormality in engine Ne speed sensor	ENG	E03	Electrical system
CA691	Intake air temperature sensor abnormally high level	ENG	E01	Electrical system
CA692	Intake air temperature sensor abnormally low level	ENG	E01	Electrical system
CA731	Abnormality in engine Bkup speed sensor phase	ENG	E03	Electrical system
CA757	Loss of all engine controller data	ENG	E03	Electrical system
CA778	Abnormality in engine Bkup speed sensor	ENG	E03	Electrical system
CA781	Inter-multicontroller communication error	ENG	E03	Electrical system
CA1257	Multicontroller distinction wiring harness key error	ENG	E03	Electrical system

Failure codes	Failure contents	Applicable equipment	Action code	History classification
CA1633	Abnormality in KOMNET	ENG	E03	Electrical system
CA2185	Abnormally high level of throttle sensor power supply	ENG	E03	Electrical system
CA2186	Abnormally low level of throttle sensor power supply	ENG	E03	Electrical system
CA2249	Lowering 2 of supply pump pressure	ENG	E03	Electrical system
CA2555	Abnormally low level of intake air heater relay voltage	ENG	E01	Electrical system
CA2556	Abnormally high level of intake air heater relay voltage	ENG	E01	Electrical system
CB111	Engine controller internal abnormality (Right bank)	ENG	E03	Electrical system
CB115	Engine Ne/Bkup speed sensor abnormality (Right bank)	ENG	E03	Electrical system
CB187	Sensor power supply (2) abnormally low level (Right bank)	ENG	E03	Electrical system
CB227	Sensor power supply (2) abnormally high level (Right bank)	ENG	E03	Electrical system
CB238	Ne speed sensor power supply abnormality (Right bank)	ENG	E03	Electrical system
CB263	Fuel temperature sensor abnormally high level (Right bank)	ENG	E01	Electrical system
CB265	Fuel temperature sensor abnormally low level (Right bank)	ENG	E01	Electrical system
CB271	PCV1 short circuit (Right bank)	ENG	E03	Electrical system
CB272	PCV1 disconnection (Right bank)	ENG	E03	Electrical system
CB273	PCV2 short circuit (Right bank)	ENG	E03	Electrical system
CB274	PCV2 disconnection (Right bank)	ENG	E03	Electrical system
CB342	Engine controller data mismatch (Right bank)	ENG	E03	Electrical system
CB351	Injector drive circuit abnormality (Right bank)	ENG	E03	Electrical system
CB352	Sensor power supply 1 abnormally low level (Right bank)	ENG	E03	Electrical system
CB386	Sensor power supply 1 abnormally low high (Right bank)	ENG	E03	Electrical system
CB441	Power supply voltage abnormally low level (Right bank)	ENG	E03	Electrical system
CB442	Power supply voltage abnormally high level (Right bank)	ENG	E03	Electrical system
CB449	Common rail abnormally high pressure 2 (Right bank)	ENG	E03	Electrical system
CB451	Common rail pressure sensor abnormally high level (Right bank)	ENG	E03	Electrical system
CB452	Common rail pressure sensor abnormally low level (Right bank)	ENG	E03	Electrical system
CB553	Common rail abnormally high pressure 1 (Right bank)	ENG	E03	Electrical system
CB554	Common rail pressure sensor in-range error (Right bank)	ENG	E03	Electrical system
CB559	Supply pump low pressure 1 (Right bank)	ENG	E03	Electrical system
CB689	Engine Ne speed sensor abnormality (Right bank)	ENG	E03	Electrical system
CB731	Engine Bkup speed sensor abnormal phase (Right bank)	ENG	E03	Electrical system
CB757	Engine controller all data loss (Right bank)	ENG	E03	Electrical system
CB778	Engine Bkup speed sensor abnormality (Right bank)	ENG	E03	Electrical system
CB781	Inter-multicontroller communication error (Right bank)	ENG	E03	Electrical system
CB1257	Multicontroller distinction wiring harness key error (Right bank)	ENG	E03	Electrical system
CB1548	Injector #7 (Right bank #1) system disconnection/short circuit	ENG	E03	Electrical system
CB1549	Injector #8 (Right bank #2) system disconnection/short circuit	ENG	E03	Electrical system
CB1551	Injector #10 (Right bank #4) system disconnection/short circuit	ENG	E03	Electrical system
CB1552	Injector #11 (Right bank #5) system disconnection/short circuit	ENG	E03	Electrical system

Failure codes	Failure contents	Applicable equipment	Action code	History classification
CB1553	Injector #12 (Right bank #6) system disconnection/short circuit	ENG	E03	Electrical system
CB1622	Injector #9 (Right bank #3) system disconnection/short circuit	ENG	E03	Electrical system
CB2249	Supply pump low pressure 2 (Right bank)	ENG	E03	Electrical system
D19HKB	Trouble in stop lamp relay output system	BK	E01	Electrical system
DAF9KM	Wrong connection of connector	MON	E03	Electrical system
(DAFRKR)	Abnormality in CAN communication (monitor panel)	TM	—	—
DAQ0KK	Lowering of source voltage	TM	E03	Electrical system
DAQ0KT	Abnormality in non-volatile memory	TM	E01	Electrical system
DAQ2KK	Trouble in solenoid power supply system	TM	E03	Electrical system
(DAQ9KQ)	Disagreement of model selection signals (transmission controller)	MON	E03	—
DAQRKR	Abnormality in CAN communication (transmission controller)	MON	E03	Electrical system
(DAQRMA)	Disagreement of option setting (transmission)	MON	E03	—
DB10KT	Abnormality in non-volatile memory	BK	E01	Electrical system
DB12KK	Trouble in solenoid power supply	BK	E03	Electrical system
DB13KK	Lowering of battery direct power supply voltage	BK	E03	Electrical system
(DB19KQ)	Disagreement of model selection signals (brake)	MON	E03	—
DB1RKR	Abnormality in CAN communication (retarder controller)	TM	E03	Electrical system
(DB1RMA)	Disagreement of option setting (brake)	MON	E03	—
DB2RKR	Abnormality in CAN communication (engine controller)	TM	E03	Electrical system
dB2RKR	CAN communication error (Right bank engine controller)	TM	E03	Electrical system
DBBRKR	Abnormality in CAN communication (VHMS)	MON	E01	Electrical system
DBC2KK	Trouble in solenoid power supply system	ABS	E03	Electrical system
DBC3KK	Lowering of battery direct power supply voltage	ABS	E03	Electrical system
(DBC9KQ)	Disagreement of model selection signals (ABS)	MON	E03	—
DBCRKR	Abnormality in CAN communication (ABS)	TM	E03	Electrical system
(DBCRMA)	Disagreement of option setting (ABS)	MON	E03	—
DDD7KX	Trouble in travel speed setting switch system	BK	E03	Electrical system
DDD8KA	Disconnection in ARSC system switch	BK	E03	Electrical system
DDD8KB	Short circuit in ARSC system switch	BK	E03	Electrical system
DDD9KA	Disconnection in ABS system switch	ABS	E03	Electrical system
DDD9KB	Short circuit in ABS system switch	ABS	E03	Electrical system
DDDAKA	Disconnection in ASR system switch	BK	E01	Electrical system
DDDAKB	Short circuit in ASR system switch	BK	E01	Electrical system
DDP6L4	Trouble in service brake pressure switch	ABS	E03	Electrical system
DDTHKA	Trouble in high clutch flow sensor valve (command holding pressure, fill OFF, no slip)	TM	E03	Electrical system
DDTJKA	Trouble in low clutch flow sensor valve (command holding pressure, fill OFF, no slip)	TM	E03	Electrical system
DDTKKA	Trouble in 1st clutch flow sensor valve (command holding pressure, fill OFF, no slip)	TM	E03	Electrical system
DDTLKA	Trouble in 2nd clutch flow sensor valve (command holding pressure, fill OFF, no slip)	TM	E03	Electrical system

Failure codes	Failure contents	Applicable equipment	Action code	History classification
DDTMKA	Trouble in 3rd clutch flow sensor valve (command holding pressure, fill OFF, no slip)	TM	E03	Electrical system
DDTNKA	Trouble in reverse clutch flow sensor valve (command holding pressure, fill OFF, no slip)	TM	E03	Electrical system
DDTPKA	Trouble in 4th clutch flow sensor valve (command holding pressure, fill OFF, no slip)	TM	E03	Electrical system
DF10KA	Input of no lever signal	TM	E03	Electrical system
DF10KB	Input of multiple lever signal	TM	E03	Electrical system
DGF1KX	Transmission oil temperature sensor input signal out of range	TM	E03	Electrical system
DGR2KB	Retarder oil temperature sensor (Rear wheel) system trouble (Disconnection/Short circuit)	BK	E01	Electrical system
DGR2KZ	Trouble in retarder oil temperature sensor (rear wheel) system (ground fault)	BK	E01	Electrical system
DGR4KB	Retarder oil temperature sensor (Front wheel) system trouble (Disconnection/Short circuit)	BK	E01	Electrical system
DGR4KZ	Retarder oil temperature sensor (Front wheel) system trouble (Ground fault)	BK	E01	Electrical system
DGR6KX	Steering oil temperature signal out of range	TM	E01	Electrical system
DGT1KX	Torque converter oil temperature sensor input signal out of range	TM	E01	Electrical system
DHP4KY	Short circuit in suspension pressure sensor system (front right)	VHMS (indication: PLM)	E01	Electrical system
DHP4KZ	Disconnection or ground fault in suspension pressure sensor system (front right)	VHMS (indication: PLM)	E01	Electrical system
DHP5KY	Short circuit in suspension pressure sensor system (front left)	VHMS (indication: PLM)	E01	Electrical system
DHP5KZ	Disconnection or ground fault in suspension pressure sensor system (front left)	VHMS (indication: PLM)	E01	Electrical system
DHP6KA	Trouble in suspension pressure sensor system (rear right)	BK	E01	Electrical system
DHP6KX	Trouble in suspension pressure sensor system (rear right)	BK	E03	Electrical system
DHP6KY	Short circuit in suspension pressure sensor system (rear right)	VHMS (indication: PLM)	E01	Electrical system
DHP6KZ	Disconnection or ground fault in suspension pressure sensor system (rear right)	VHMS (indication: PLM)	E01	Electrical system
DHP7KA	Trouble in suspension pressure sensor system (rear left)	BK	E01	Electrical system
DHP7KX	Trouble in suspension pressure sensor system (rear left)	BK	E03	Electrical system
DHP7KY	Short circuit in suspension pressure sensor system (rear left)	VHMS (indication: PLM)	E01	Electrical system
DHP7KZ	Disconnection or ground fault in suspension pressure sensor system (rear left)	VHMS (indication: PLM)	E01	Electrical system
DHT5KX	Disconnection, ground fault or hot short in torque converter inlet oil pressure sensor	TM	E01	Electrical system
DHT5L6	Trouble in torque converter inlet oil pressure sensor	TM	E01	Electrical system
DHU2KX	Trouble in accumulator oil pressure sensor (front)	TM	E01	Electrical system
DHU3KX	Trouble in accumulator oil pressure sensor (rear)	TM	E01	Electrical system
DHU6KX	Trouble in ABS control valve pressure sensor (front right)	ABS	E03	Electrical system
DHU7KX	Trouble in ABS control valve pressure sensor (front left)	ABS	E03	Electrical system
DHU8KX	Trouble in ABS control valve pressure sensor (rear right)	ABS	E03	Electrical system
DHU9KX	Trouble in ABS control valve pressure sensor (rear left)	ABS	E03	Electrical system

Failure codes	Failure contents	Applicable equipment	Action code	History classification
DJF1KA	Disconnection in fuel level sensor system	TM	E01	Electrical system
DK30KX	Trouble in steering angle potentiometer	BK	E01	Electrical system
DK51L5	Trouble in manual retarder potentiometer and RVS	BK	E03	Electrical system
DK52KX	Trouble 1 in hoist lever potentiometer sensor	BK	E03	Electrical system
DK53L8	Trouble 2 in hoist lever potentiometer sensor	BK	E03	Electrical system
DK54KX	Trouble in boom positioner sensor	BK	E03	Electrical system
DKD0L6	Trouble in steering speed sensor	BK	E01	Electrical system
DKH0KX	Inclinometer sensor signal out of range	TM	E01	Electrical system
DKH1KX	Abnormality in inclinometer	VHMS (indication: PLM)	E01	Electrical system
DLF1KA	Disconnection in transmission input shaft speed sensor system	TM	E03	Electrical system
DLF1LC	Trouble in transmission input shaft speed sensor	TM	E03	Electrical system
DLF2KA	Disconnection in transmission intermediate shaft speed sensor system	TM	E03	Electrical system
DLF2LC	Trouble in transmission intermediate shaft speed sensor	TM	E03	Electrical system
DLF6KA	Disconnection in wheel speed sensor (front right)	ABS	E03	Electrical system
DLF6L3	Trouble in wheel speed sensor (front right)	ABS	E03	Electrical system
DLF7KA	Disconnection in wheel speed sensor (front left)	ABS	E03	Electrical system
DLF7L3	Trouble in wheel speed sensor (front left)	ABS	E03	Electrical system
DLF8KA	Disconnection in wheel speed sensor (rear right)	BK	E01	Electrical system
DLF8L3	Trouble in wheel speed sensor (rear right)	ABS	E03	Electrical system
DLF8LC	Trouble in wheel speed sensor system (rear right)	BK	E01	Electrical system
DLF8MA	Disconnection in wheel speed sensor (rear right)	ABS	E03	Electrical system
DLF9KA	Disconnection in wheel speed sensor (rear left)	BK	E01	Electrical system
DLF9L3	Trouble in wheel speed sensor (rear left)	ABS	E03	Electrical system
DLF9LC	Trouble in wheel speed sensor system (rear left)	BK	E01	Electrical system
DLF9MA	Disconnection in wheel speed sensor (rear left)	ABS	E03	Electrical system
DLT3KA	Disconnection in transmission output shaft speed sensor system	TM	E03	Electrical system
DLT3LC	Trouble in transmission output shaft sensor	BK	E01	Electrical system
DLT4KA	Disconnection in transmission output shaft speed sensor	BK	E01	Electrical system
DLT4MA	Disconnection in transmission output shaft speed sensor	BK	E03	Electrical system
DV00KB	Short circuit in buzzer output	MON	E01	Electrical system
DW2AKA	Disconnection in main pressure variable valve output	TM	E01	Electrical system
DW2AKB	Ground fault in main pressure variable valve output circuit	TM	E01	Electrical system
DW2AKY	Hot short in main pressure variable valve output circuit	TM	E01	Electrical system
DW2AL1	Defective reset of main pressure variable valve	TM	E01	Electrical system
DW2ALH	Malfunction of main pressure variable valve	TM	E01	Electrical system
DW2BKA	Main oil level selector valve output disconnection	TM	E01	Electrical system
DW2BKB	Main oil level selector valve output circuit GND short circuit	TM	E01	Electrical system
DW2BKY	Main oil level selector valve output circuit GND hot short	TM	E01	Electrical system
DW2BL1	Main oil level selector valve reset trouble	TM	E01	Electrical system
DW2BLH	Main oil level selector valve malfunction	TM	E01	Electrical system

Failure codes	Failure contents	Applicable equipment	Action code	History classification
DW2CKA	Transmission lubrication variable valve output disconnection	TM	E01	Electrical system
DW2CKB	Transmission lubrication variable valve output circuit GND short circuit	TM	E01	Electrical system
DW2CKY	Transmission lubrication variable valve output circuit hot short	TM	E03	Electrical system
DW2CL1	Transmission lubrication variable valve reset trouble	TM	E03	Electrical system
DW2CLH	Transmission lubrication variable valve malfunction	TM	E01	Electrical system
DW35KZ	Trouble in auto-suspension solenoid 1 output system (disconnection or ground fault)	BK	E01	Electrical system
DW36KZ	Trouble in auto-suspension solenoid 2 output system (disconnection or ground fault)	BK	E01	Electrical system
DW71KZ	Exhaust brake output system trouble (Disconnection/ Ground fault)	BK	E01	Electrical system
DW72KZ	Trouble in kick-out solenoid output system (disconnection or ground fault)	BK	E01	Electrical system
DW73KZ	Trouble (disconnection or ground fault) in hoist selector valve output system (disconnection or ground fault)	BK	E03	Electrical system
DW78KZ	Trouble in BCV output system	BK	E01	Electrical system
DWNBK4	Trouble in ASR shut-off valve (valve keeps operating)	BK	E01	Electrical system
DWNBKA	Disconnection in ASR shut-off valve output circuit	BK	E01	Electrical system
DWNBKB	Ground fault in ASR shut-off valve output circuit	BK	E01	Electrical system
DWNBKY	Short circuit in ASR shut-off valve output circuit	BK	E01	Electrical system
DWNBMA	Trouble in ASR shut-off valve (valve does not operate)	BK	E01	Electrical system
DWNDKZ	Trouble in ABS cut valve (front) system	ABS	E03	Electrical system
DWNDMA	Defective ABS cut valve (front)	ABS	E03	Electrical system
DWNEKZ	Trouble in ABS cut valve (rear) system	ABS	E03	Electrical system
DWNEMA	Defective ABS cut valve (rear)	ABS	E03	Electrical system
DX11K4	Trouble in rear wheel proportional pressure reducing solenoid valve (valve keeps operating)	BK	E03	Electrical system
DX11KA	Disconnection in rear wheel proportional pressure reducing solenoid valve output circuit	BK	E03	Electrical system
DX11KB	Ground fault in rear wheel proportional pressure reducing solenoid valve output circuit	BK	E03	Electrical system
DX11KY	Short circuit in rear wheel proportional pressure reducing solenoid valve output circuit	BK	E03	Electrical system
DX11MA	Trouble in rear wheel proportional pressure reducing solenoid valve (valve does not operate)	BK	E03	Electrical system
DX12K4	Front wheel proportional solenoid pressure reducing valve trouble (Valve keeps operating)	BK	E03	Electrical system
DX12KA	Front wheel proportional solenoid pressure reducing valve output circuit disconnection	BK	E03	Electrical system
DX12KB	Front wheel proportional solenoid pressure reducing valve output circuit ground fault	BK	E03	Electrical system
DX12KY	Front wheel proportional solenoid pressure reducing valve output circuit short circuit	BK	E03	Electrical system
DX12MA	Front wheel proportional solenoid pressure reducing valve trouble (Valve does not operate)	BK	E03	Electrical system
DX13KA	Disconnection in hoist EPC valve output circuit	BK	E03	Electrical system
DX13KB	Ground fault in hoist EPC valve output circuit	BK	E03	Electrical system

Failure codes	Failure contents	Applicable equipment	Action code	History classification
DX13KY	Short circuit in hoist EPC valve output circuit	BK	E03	Electrical system
DX17K4	Trouble in ASR proportional pressure reducing solenoid valve (right) (valve keeps operating)	BK	E01	Electrical system
DX17KA	Disconnection in ASR proportional pressure reducing solenoid valve (right) output circuit	BK	E01	Electrical system
DX17KB	Ground fault in ASR proportional pressure reducing solenoid valve (right) output circuit	BK	E01	Electrical system
DX17KY	Short circuit in ASR proportional pressure reducing solenoid valve (right) output circuit	BK	E01	Electrical system
DX17MA	Trouble in ASR proportional pressure reducing solenoid valve (right) (valve does not operate)	BK	E01	Electrical system
DX18K4	Trouble in ASR proportional pressure reducing solenoid valve (left) (valve keeps operating)	BK	E01	Electrical system
DX18KA	Disconnection in ASR proportional pressure reducing solenoid valve (left) output circuit	BK	E01	Electrical system
DX18KB	Ground fault in ASR proportional pressure reducing solenoid valve (left) output circuit	BK	E01	Electrical system
DX18KY	Short circuit in ASR proportional pressure reducing solenoid valve (left) output circuit	BK	E01	Electrical system
DX18MA	Trouble in ASR proportional pressure reducing solenoid valve (left) (valve does not operate)	BK	E01	Electrical system
DX21KA	Disconnection in ABS control valve (front right) output circuit	ABS	E03	Electrical system
DX21KB	Ground fault in ABS control valve (front right) output circuit	ABS	E03	Electrical system
DX21KY	Short circuit in ABS control valve (front right) output circuit	ABS	E03	Electrical system
DX21MA	Defective ABS control valve (front right)	ABS	E03	Electrical system
DX22KA	Disconnection in ABS control valve (front left) output circuit	ABS	E03	Electrical system
DX22KB	Ground fault in ABS control valve (front left) output circuit	ABS	E03	Electrical system
DX22KY	Short circuit in ABS control valve (front left) output circuit	ABS	E03	Electrical system
DX22MA	Defective ABS control valve (front left)	ABS	E03	Electrical system
DX23KA	Disconnection in ABS control valve (rear right) output circuit	ABS	E03	Electrical system
DX23KB	Ground fault in ABS control valve (rear right) output circuit	ABS	E03	Electrical system
DX23KY	Short circuit in ABS control valve (rear right) output circuit	ABS	E03	Electrical system
DX23MA	Defective ABS control valve (rear right)	ABS	E03	Electrical system
DX24KA	Disconnection in ABS control valve (rear left) output circuit	ABS	E03	Electrical system
DX24KB	Ground fault in ABS control valve (rear left) output circuit	ABS	E03	Electrical system
DX24KY	Short circuit in ABS control valve (rear left) output circuit	ABS	E03	Electrical system
DX24MA	Defective ABS control valve (rear left)	ABS	E03	Electrical system
DX25MA	Defective ABS front wheel system control valve	ABS	E03	Electrical system
DX26MA	Defective ABS rear wheel system control valve	ABS	E03	Electrical system
DXH1KA	Disconnection in lockup clutch solenoid output circuit	TM	E03	Electrical system
DXH1KB	Ground fault in lockup solenoid output circuit	TM	E03	Electrical system
DXH1KY	Hot short in lockup clutch solenoid output circuit	TM	E03	Electrical system
DXH2KA	Disconnection in high clutch solenoid output circuit	TM	E03	Electrical system
DXH2KB	Ground fault in high clutch solenoid output circuit	TM	E03	Electrical system
DXH2KY	Hot short in high clutch solenoid output circuit	TM	E03	Electrical system
DXH3KA	Disconnection in low clutch solenoid output circuit	TM	E03	Electrical system

Failure codes	Failure contents	Applicable equipment	Action code	History classification
DXH3KB	Ground fault in low clutch solenoid output circuit	TM	E03	Electrical system
DXH3KY	Hot short in low clutch solenoid output circuit	TM	E03	Electrical system
DXH4KA	Disconnection in 1st clutch solenoid output circuit	TM	E03	Electrical system
DXH4KB	Ground fault in 1st clutch solenoid output circuit	TM	E03	Electrical system
DXH4KY	Hot short in 1st clutch solenoid output circuit	TM	E03	Electrical system
DXH5KA	Disconnection in 2nd clutch solenoid output circuit	TM	E03	Electrical system
DXH5KB	Ground fault in 2nd clutch solenoid output circuit	TM	E03	Electrical system
DXH5KY	Hot short in 2nd clutch solenoid output circuit	TM	E03	Electrical system
DXH6KA	Disconnection in 3rd clutch solenoid output circuit	TM	E03	Electrical system
DXH6KB	Ground fault in 3rd clutch solenoid output circuit	TM	E03	Electrical system
DXH6KY	Hot short in 3rd clutch solenoid output circuit	TM	E03	Electrical system
DXH7KA	Disconnection in reverse clutch solenoid output circuit	TM	E03	Electrical system
DXH7KB	Ground fault in reverse clutch solenoid output circuit	TM	E03	Electrical system
DXH7KY	Hot short in reverse clutch solenoid output circuit	TM	E03	Electrical system
DXHHKA	Disconnection in 4th clutch solenoid output circuit	TM	E03	Electrical system
DXHHKB	Ground fault in 4th clutch solenoid output circuit	TM	E03	Electrical system
DXHHKY	Hot short in 4th clutch solenoid output circuit	TM	E03	Electrical system

★ Failure codes:

The failure code table is written in alphabetical order and also starting from small number.

The failure code in parentheses is not recorded in the failure history for both electrical system and mechanical system.

★ Applicable equipment:

Applicable equipment indicates in which controller system the failure has occurred.

MON : Machine monitor system

ENG : Engine controller system

TM : Transmission controller system

BK : Retarder controller system

ABS : ABS controller system

VHMS : PLM function system of VHMS controller (Note: Displayed as "PLM" on machine monitor)

★ Action codes:

Action codes indicate what is displayed in the operator mode when a failure is detected.

★ History classification:

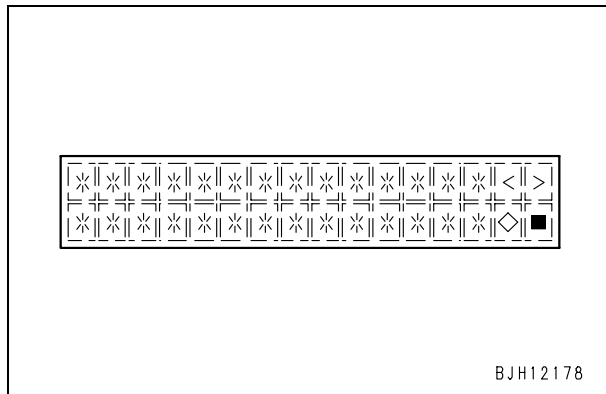
History classification indicates in which system, either electrical system or mechanical system in the failure history display function, a failure has been recorded.

★ Note : Optional equipment is also included in this table.

★ Displayed service menu:

No.	Display	Function
1	ELECTRIC FAULT	Electrical system failure history display function
2	MACHINE FAULT	Mechanical system failure history display function
3	REAL-TIME MONITOR	Real-time monitoring function
4	CYLINDER CUT-OUT	Reduced cylinder mode function
5	NO INJECTION	No injection cranking function
6	TUNING	Adjusting function
7	MAINTENANCE MONITOR	Filter and oil replacement time setting function
8	OPERATION INFO	Operation information display function
9	FIX POWER MODE	Engine mode fixing function
10	SNAPSHOT	Manual snap shot function
11	PLM	PLM (Payload meter) setting function
12	OPTIONAL SELECT	Option selection function
13	MACHINE	Model selection function
14	INITIALIZE	Initialize function (exclusive function for factory)

★ The service menu is displayed in the places marked with [*].



6. Finishing mode and function

The current mode and function can be finished by either of the following method, regardless of the current function and hierarchy.

- When continuing operations in another mode or function:
Press the [■] switch and return to the mode screen to be used or menu screen to be used.
- ★ Note that if the [■] switch is pressed on the YES/NO screen, the function will be executed.

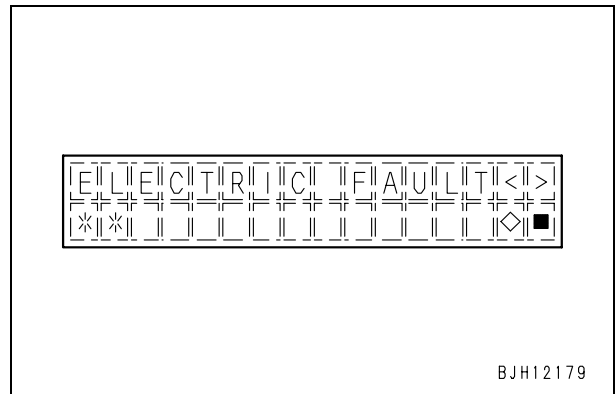
★ If you return to the operator mode screen by mistake, repeat the procedure from step 1 above (however there is no need to input the ID again).

- When completing all operations:
Turn the starting switch OFF.

[11] Electrical system failure history display function (ELECTRIC FAULT)

The machine monitor retains the data for problems that occurred in the electrical system in the past as failure history. They can be displayed as follows.

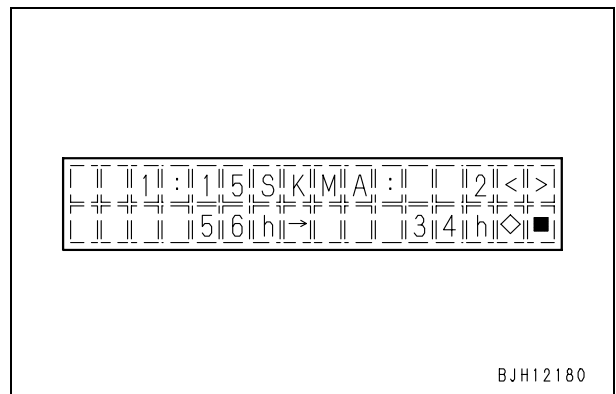
- Selection of the service menu
Select electrical system failure history display function (ELECTRIC FAULT) in the service menu selection screen.
- ★ The total number of failure history data items recorded in memory is displayed in the [* *] portion.



2. Failure history data display

With the service menu selected, press the [◇] switch and display the failure history data recorded in memory.

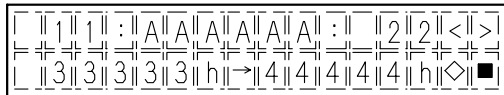
- [◇]: Conduct the service menu.



3. Displayed failure history data

With the electrical system failure history display function, the following data can be displayed.

- 1: Record number (recorded up to a maximum of 20 items)
- A: Failure code (4-digits device code + 2-digits symptom code)
- 2: Number of occurrences (number of occurrences of same code in the past)
- 3: Elapsed time 1 (time elapsed on service meter since first occurrence)
- 4: Elapsed time 2 (time elapsed on service meter since last occurrence)
- ★ Failure codes for problems that are still existing are shown on a flashing display.
- ★ Refer to failure code table of operator mode for details of displayed failure codes.
- ★ Note that with the failure history display function and failure code display function (operator mode) for the electrical system, the displayed data are partially different.
- ★ If the fault history is not recorded, "-" is displayed on the display section of 1/A/2/3/4.



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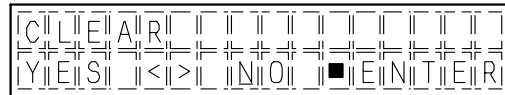
4. Switching failure history display

If the [>] switch or [<] switch is pressed during the display of failure history, the display switches to another failure history data recorded.

- [>]: To proceed to data for next record number
- [<]: Go back to data for previous record number

5. Deleting individual failure history data

- 1) With the failure history data to be deleted displayed, press the [◇] switch and display the individual deletion screen.
 - [◇]: Display the deletion screen
- 2) When the individual deletion screen is displayed, operate each switch of [<], [>] and [■].
 - [<]: Select YES (move cursor)
 - [>]: Select NO (move cursor)
 - [■]: Execute YES or NO
 - ★ An information which is active currently (display is flashing) cannot be deleted.



BJH12182

6. Deletion of all the failure history information

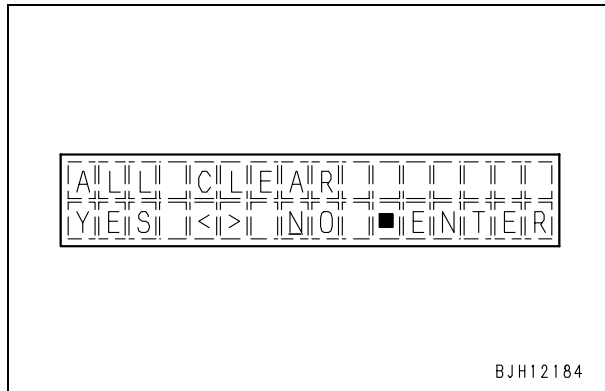
- 1) With the failure history data displayed, press the [>] switch or [<] switch and display ALL CLEAR menu screen.
 - ★ The ALL CLEAR menu is displayed at the end of failure history data.



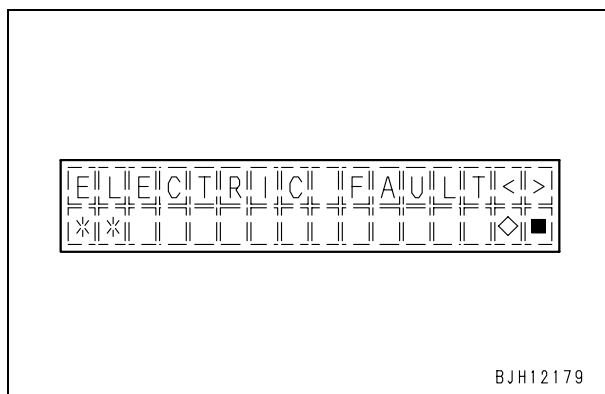
BJH12183

- 2) When the ALL CLEAR menu is displayed, press the [◇] switch and display the ALL CLEAR execution screen.
 - [◇]: Execute ALL CLEAR menu

- 3) When the ALL CLEAR execution screen is displayed, operate each switch of [←], [→] and [■].
- [←]: Select YES (move cursor)
 - [→]: Select NO (move cursor)
 - [■]: Execute YES or NO
- ★ An information which is active currently (display is flashing) cannot be deleted.



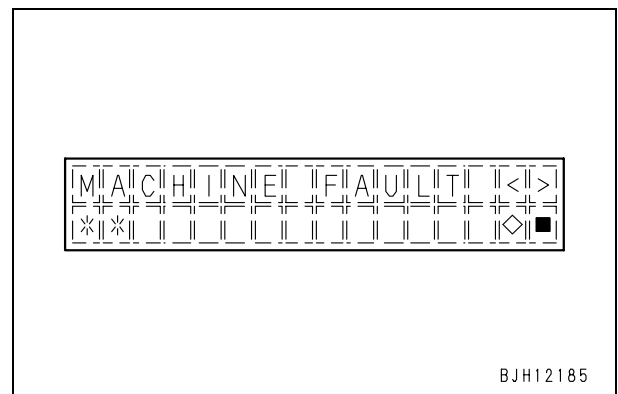
- 4) The screen changes to the fault history screen. Check that the number of records in ** is "0".



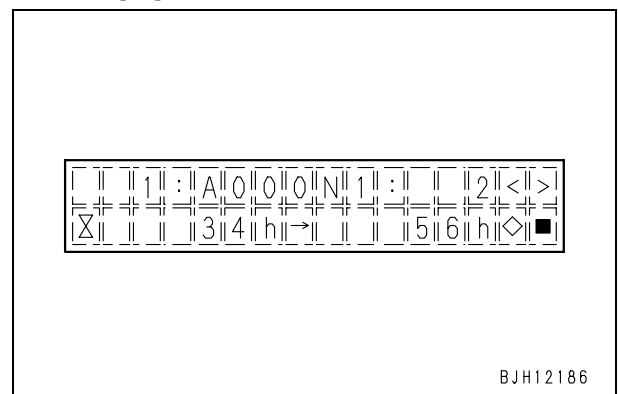
[12] Mechanical system failure history display function (MACHINE FAULT)

The machine monitor retains the data for problems that occurred in the mechanical system in the past as failure history. They can be displayed as follows.

1. Selection of the service menu
Select mechanical system failure history display function (MACHINE FAULT) in the service menu selection screen.
- ★ The total number of failure history data items recorded in memory is displayed in the [* *] portion.



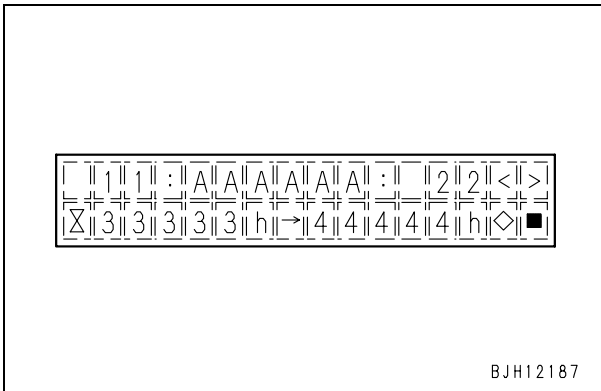
2. Failure history data display
With the service menu selected, press the [◇] switch and display the failure history data recorded in memory.
- [◇]: Conduct the service menu.



3. Displayed failure history data

With the mechanical system failure history display function, the following data can be displayed.

- 1: Record number
- A: Failure code (4-digits device code + 2-digits symptom code)
- 2: Number of occurrences (number of occurrences of same code in the past)
- 3: Elapsed time 1 (time elapsed on service meter since first occurrence)
- 4: Elapsed time 2 (time elapsed on service meter since last occurrence)
- ★ Failure codes for problems that are still existing are shown on a flashing display.
- ★ Refer to failure code table of operator mode for details of displayed failure codes.
- ★ Note that with the failure history display function and failure code display function (operator mode) for the mechanical system, the displayed data are partially different.
- ★ If the fault history is not recorded, "-" is displayed on the display section of 1/A/2/3/4.



4. Switching failure history display

If the [>] switch or [<] switch is pressed during the display of failure history, the display switches to another failure history data recorded.

- [>]: To proceed to data for next record number
- [<]: Go back to data for previous record number

5. Deleting failure history data (not permitted)

- ★ The failure history data for the mechanical system cannot be deleted.

HD785-7 Dump truck

Form No. SEN01772-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

30 Testing and adjusting

Testing and adjusting, Part 4

Special functions of machine monitor (EMMS) 2

Special functions of machine monitor (EMMS)

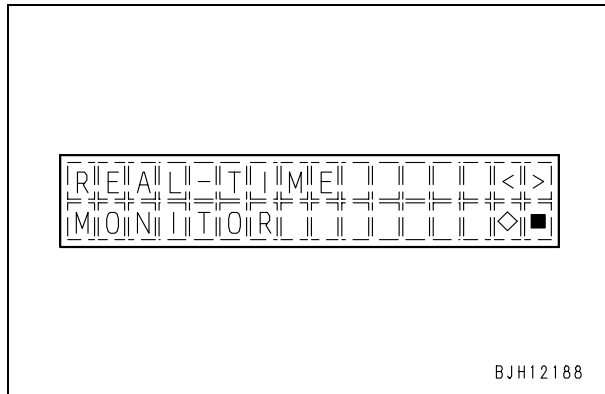
[13] Real time monitoring function (REAL-TIME MONITOR)

The machine monitor can monitor the condition of the machine in real time through the signals from the sensors installed to various parts of the machine.

In the real time monitoring function, the following 2 types of display can be shown.

- 1 item independent display (for each controller)
- 2 items simultaneous display (code input)

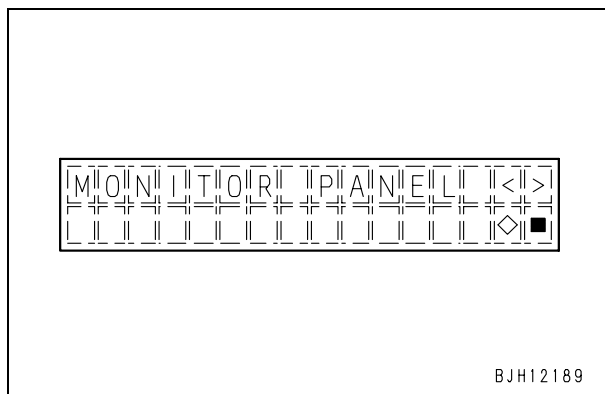
1. Selection of the service menu
Select real time monitoring function (REAL-TIME MONITOR) in the service menu selection screen.



2. Display and selection of monitoring system and function

- 1) With the service menu selected, press the [◇] switch to display the monitoring system and function selection screen.

- [◇]: Conduct the service menu.

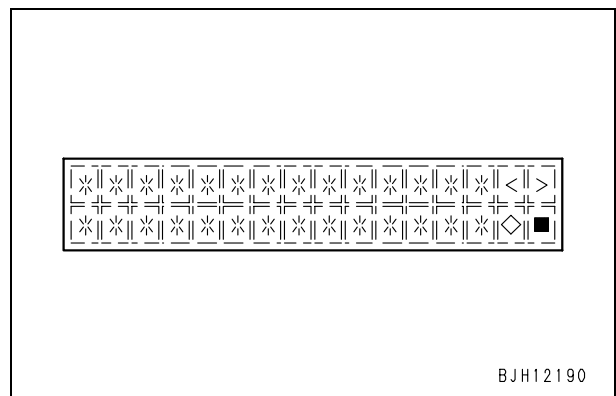


- 2) If the [>] switch or [<] switch is pressed on the monitoring system and function selection screen, the monitoring system and device is displayed endlessly in the following order, then select the system or function that is used.

- [>]: To proceed to next monitoring system and function
- [<]: Go back to data for previous monitoring system and function
- ★ Monitoring system and function to be displayed:

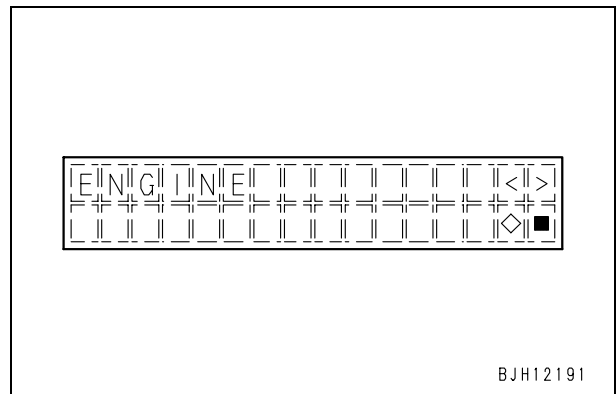
No.	Display	System and function
1	MONITOR PANEL	Machine monitor system
2	TRANSMISSION	Transmission controller system
3	ENGINE	Engine controller system
4	ENGINE SUB	Engine sub controller system
5	BRAKE	Retarder controller system
6	VHMS	VHMS controller system (if equipped is installed)
7	ABS	ABS controller (if equipped is installed)
8	2 ITEMS	2 items simultaneous monitoring

- ★ Display monitoring system and function in the "*" section.



3. Setting 1 item individual monitoring

- 1) In the monitoring system and function selection screen, select the monitoring system (example: ENGINE) to be used.



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- 2 THE MS

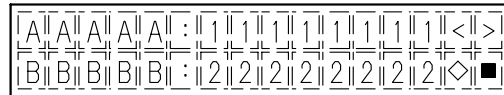
- 3

- 3) In the monitoring code input screen, operate each of the switches [>], [<], [◇] and [■], and directly input 2-digit monitoring codes.
- [>]: Number at the cursor increases.
 - [<]: Number at the cursor decreases
 - [◇]: Number at the cursor is determined
 - [■]: Cursor moves to the left end / To return to the monitoring system and function selection screen.



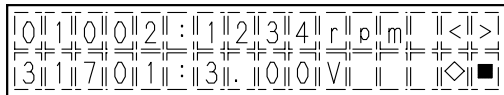
BJH12195

6. Display data for 2 items simultaneous monitoring
On the 2 item simultaneous monitoring display screen, the following data are displayed.
- A** : Monitoring code 1
1 : Monitoring data 1 (including unit)
B : Monitoring code 2
2 : Monitoring data 2 (including unit)
★ For details, see "Monitoring code table".



BJH12197

- 4) When both of the monitoring codes have been confirmed, the screen switches to the 2 items simultaneous monitoring display screen.



BJH12490

- 5) To hold or cancel monitoring data:
If the [◇] switch is pressed during monitoring, the monitor data is held and the [◇] mark flashes.
If the [◇] switch is pressed again, hold is canceled and it becomes active again.
- [◇]: Hold and release of data

Monitoring code table

Monitor panel [machine monitor system]					
No.	Monitoring item	Display of item	Monitoring code	Display range of data	Unit
1	Part No. of software	VERSION	20200	***** (8 digits/symbols)	—
2	Version No. of application	VERSION (APP)	20221	***** (8 digits/symbols)	—
3	Version No. of data	VERSION (DATA)	20222	***** (8 digits/symbols)	—
4	Rheostat (Night decrease light)	RHEOSTAT	30300	0.0 – 51.0	V
5	Rotary switch (SW1 - 3)	SW1, SW2, SW3	30800	0 – F, 0 – F, 0 – F, (SW1, SW2, SW3 from left)	Display of condition
6	DIP switch (SW5-1, 2)	SW5-1, SW5-2	30900	ON/OFF, ON/OFF (SW5-1, SW5-2 from left)	Display of condition
7	DIP switch (SW5-3, 4)	SW5-3, SW5-4	30901	ON/OFF, ON/OFF (SW5-3, SW5-4 from left)	Display of condition
8	DIP switch (SW6-1, 2)	SW6-1, SW6-2	30902	ON/OFF, ON/OFF (SW6-1, SW6-2 from left)	Display of condition
9	DIP switch (SW6-3, 4)	SW6-3, SW6-4	30903	ON/OFF, ON/OFF (SW6-3, SW6-4 from left)	Display of condition
10	Input signal (0 - 7)	D-IN--0-----7	40900	01010101 (8 digits of 0/1. See detail.)	0:OFF/1:ON
11	Input signal (8 - 15)	D-IN--8-----15	40901	01010101 (8 digits of 0/1. See detail.)	0:OFF/1:ON
12	Input signal (16 - 23)	D-IN-16-----23	40902	01010101 (8 digits of 0/1. See detail.)	0:OFF/1:ON
13	Input signal (24 - 31)	D-IN-24-----31	40903	01010101 (8 digits of 0/1. See detail.)	0:OFF/1:ON
14	Input signal (32 - 39)	D-IN-32-----39	40904	01010101 (8 digits of 0/1. See detail.)	0:OFF/1:ON
15	Output signal (0 - 3)	D-OUT-0--3	40925	0101 (4 digits of 0/1. See detail.)	0:OFF/1:ON

Detailed information of 40900 (D-IN--0-----7)

- [0] : Dimmer switch (High beam: 1)
- [1] : Machine monitor check switch (ON: 1)
- [2] : AISS switch (ON: 1)
- [3] : Exhaust brake switch (Upper)
- [4] : Exhaust brake switch (Lower)
- [5] : ABS system switch [If equipped]
(Installed: 1)
- [6] : Dimmer switch (Passing: 1)
- [7] : Power mode switch (Economy: 1)

Detailed information of 40925 (D-OUT-0--3)

- [0] : Headlamp selection (ON: 1)
- [1] : Buzzer (Operated: 1)
- [2] : (Unused)
- [3] : (Unused)

Detailed information of 40901 (D-IN--8-----15)

- [8] : Connector check (Always: 1)
- [9] : Machine monitor mode switch
([■] is pressed: 1)
- [10] : Machine monitor mode switch
([>] is pressed: 1)
- [11] : Machine monitor mode switch
([<] is pressed: 1)
- [12] : Turn signal lever (Operated to right: 1)
- [13] : Turn signal lever (Operated to left: 1)
- [14] : Machine monitor mode switch
([◇] is pressed: 1)
- [15] : (Unused)

Detailed information of 40902 (D-IN--16----23)

- [16] : ARSC switch (Upper position: 1)
- [17] : ARSC switch (Lower position: 1)
- [18] : ABS switch (Upper position: 1)
- [19] : ABS switch (Lower position: 1)
- [20] : ASR switch (Upper position: 1)
- [21] : ASR switch (Lower position: 1)
- [22] : (Unused)
- [23] : (Unused)

Detailed information of 40903 (D-IN--24----31)

- [24] : Headlamp switch (ON: 1)
- [25] : Seat belt switch (Belt is fastened: 1)
- [26] : (Unused)
- [27] : (Unused)
- [28] : (Unused)
- [29] : (Unused)
- [30] : (Unused)
- [31] : (Unused)

Detailed information of 40904 (D-IN--32----39)

- [32] : (Unused)
- [33] : (Unused)
- [34] : Connector check (Always: 1)
- [35] : (Unused)
- [36] : (Unused)
- [37] : (Unused)
- [38] : (Unused)
- [39] : (Spare for service)

Transmission [Transmission controller system]					
No.	Monitoring item	Display of item	Monitoring code	Display range of data	Unit
1	Part No. of software	VERSION	20201	***** (8 digits/symbols)	—
2	Version No. of application	VERSION (APP)	20223	***** (8 digits/symbols)	—
3	Version No. of data	VERSION (DATA)	20224	***** (8 digits/symbols)	—
4	Transmission input shaft speed	T/M SPEED:IN	31200	0 – 32767 ---- [Other than above]	rpm
5	Transmission intermediate shaft speed	T/M SPEED:MID	31300	0 – 32767 ---- [Other than above]	rpm
6	Transmission output shaft speed	T/M SPEED:OUT	31400	0 – 32767 ---- [Other than above]	rpm
7	Fuel level	FUEL SENSOR	04201	0 – 250 ---- [Other than above]	Ω
8	Fuel level	FUEL SENSOR	04200	0.00 – 5.00 ---- [Other than above]	V
9	Alternator R	ALTERNATOR R	04301	OFF/ON	0:OFF/1:ON
10	Torque converter oil temperature	T/C OIL TEMP	30100	0 – 160 ---- [Other than above]	°C
11	Torque converter oil temperature	T/C OIL TEMP	30101	0.00 – 5.00 ---- [Other than above]	V
12	Transmission oil temperature	T/C OIL TEMP	32500	0 – 160 ---- [Other than above]	°C
13	Transmission oil temperature	T/C OIL TEMP	32501	0.00 – 5.00 ---- [Other than above]	V
14	Steering oil temperature	STRG OIL TEMP	32701	0 – 160 ---- [Other than above]	°C
15	Steering oil temperature	STRG OIL TEMP	32702	0.00 – 5.00 ---- [Other than above]	V
16	Torque converter oil pressure	T/C OIL PRESS	32600	0.00 – 5.00 ---- [Other than above]	MPa
17	Torque converter oil pressure	T/C OIL PRESS	32605	0.00 – 5.00 ---- [Other than above]	V
18	Accumulator oil pressure (front)	ACC OIL PRE F	35500	0.00 – 99.99 ---- [Other than above]	MPa
19	Accumulator oil pressure (rear)	ACC OIL PRE R	35501	0.00 – 99.99 ---- [Other than above]	MPa
20	Accumulator oil pressure (front)	ACC OIL PRE F	35504	0.00 – 5.00 ---- [Other than above]	V
21	Accumulator oil pressure (rear)	ACC OIL PRE R	35505	0.00 – 5.00 ---- [Other than above]	V
22	Solenoid output (high)	ECMV H DIR	31600	0 – 1000 ---- [Other than above]	mA

Transmission [Transmission controller system]					
No.	Monitoring item	Display of item	Monitoring code	Display range of data	Unit
23	Solenoid output (low)	ECMV L DIR	31601	0 – 1000 ---- [Other than above]	mA
24	Solenoid output (1st)	ECMV 1 DIR	31602	0 – 1000 ---- [Other than above]	mA
25	Solenoid output (2nd)	ECMV 2 DIR	31603	0 – 1000 ---- [Other than above]	mA
26	Solenoid output (3rd)	ECMV 3 DIR	31604	0 – 1000 ---- [Other than above]	mA
27	Solenoid output (4th)	ECMV 4 DIR	31605	0 – 1000 ---- [Other than above]	mA
28	Solenoid output (R)	ECMV R DIR	31606	0 – 1000 ---- [Other than above]	mA
29	Solenoid output (lockup)	ECMV LU DIR	31609	0 – 1000 ---- [Other than above]	mA
30	Transmission main oil pressure variable solenoid output	ECMV MAIN P	31643	0 – 1000 ---- [Other than above]	mA
31	Main flow selector valve output	ECMV MAIN V	31644	0 – 1000 ---- [Other than above]	mA
32	Pitch angle sensor	ANGLE SENSOR	32900	-180.0 – +180.0 ---- [Other than above]	° [degree]
33	Pitch angle sensor	ANGLE SENSOR	32903	0.00 – 5.00 ---- [Other than above]	V
34	Brake output (front wheel)	BK OUTP DIR F	33807	0 – 100 ---- [Other than above]	%
35	Brake output (rear wheel)	BK OUTP DIR R	33806	0 – 100 ---- [Other than above]	%
36	Throttle correction value	THROTTLE MOD	36000	-100 – 100 ---- [Other than above]	%
37	Transmission lubricating oil level variable solenoid output	ECMV LUB V	38001	0 – 1000 ---- [Other than above]	mA
38	Low clutch trigger correction quantity	TRIGGER MOD L	38900	00000000 – FFFFFFFF (8 digits of 0 – F)	Display of condition
39	High clutch trigger correction quantity	TRIGGER MOD H	38901	00000000 – FFFFFFFF (8 digits of 0 – F)	Display of condition
40	1st clutch trigger correction quantity	TRIGGER MOD 1	38902	00000000 – FFFFFFFF (8 digits of 0 – F)	Display of condition
41	2nd clutch trigger correction quantity	TRIGGER MOD 2	38903	00000000 – FFFFFFFF (8 digits of 0 – F)	Display of condition
42	3rd clutch trigger correction quantity	TRIGGER MOD 3	38904	00000000 – FFFFFFFF (8 digits of 0 – F)	Display of condition
43	4th clutch trigger correction quantity	TRIGGER MOD 4	38905	00000000 – FFFFFFFF (8 digits of 0 – F)	Display of condition
44	R clutch trigger correction quantity	TRIGGER MOD R	38906	00000000 – FFFFFFFF (8 digits of 0 – F)	Display of condition

Transmission [Transmission controller system]					
No.	Monitoring item	Display of item	Monitoring code	Display range of data	Unit
45	Clutch fill switch	FILL HL1234R	38919	0101010 (Data is displayed under HL1234R)	Recognition of fill switch 0:OFF/1:ON
46	Trigger initial learning flag	TRIG HL1234R	38920	0101010 (Data is displayed under HL1234R)	Learning flag of clutch 0:OFF/1:ON
47	Fill time (low)	FILL TIME L	41800	0 – 2550 ---- [Other than above]	ms
48	Fill time (high)	FILL TIME H	41801	0 – 2550 ---- [Other than above]	ms
49	Fill time (1st)	FILL TIME 1	41802	0 – 2550 ---- [Other than above]	ms
50	Fill time (2nd)	FILL TIME 2	41803	0 – 2550 ---- [Other than above]	ms
51	Fill time (3rd)	FILL TIME 3	41804	0 – 2550 ---- [Other than above]	ms
52	Fill time (4th)	FILL TIME 4	41805	0 – 2550 ---- [Other than above]	ms
53	Fill time (R)	FILL TIME R	41806	0 – 2550 ---- [Other than above]	ms
54	Throttle quantity lower limit value output	THROT LIMIT LO	44201	0.0 – 100.0 ---- [Other than above]	%
55	Throttle quantity upper limit value output	THROT LIMIT HI	44200	0.0 – 100.0 ---- [Other than above]	%
56	Input signal (0 – 7)	D-IN--0-----7	40905	01010101 (8 digits of 0/1. See detail.)	0:OFF/1:ON
57	Input signal (8 – 15)	D-IN--8-----15	40906	01010101 (8 digits of 0/1. See detail.)	0:OFF/1:ON
58	Input signal (16 – 23)	D-IN-16-----23	40907	01010101 (8 digits of 0/1. See detail.)	0:OFF/1:ON
59	Input signal (24 – 31)	D-IN-24-----31	40908	01010101 (8 digits of 0/1. See detail.)	0:OFF/1:ON
60	Input signal (32 – 39)	D-IN-32-----39	40942	0 (1 digits of 0/1. See detail.)	0:OFF/1:ON
61	Output signal (0 – 7)	D-OUT-0-----7	40949	01010101 (8 digits of 0/1. See detail.)	0:OFF/1:ON
62	Output signal (8 – 15)	D-OUT-8-----15	40950	01010101 (8 digits of 0/1. See detail.)	0:OFF/1:ON
63	Output signal (16 – 23)	D-OUT-16-----23	40951	01010101 (8 digits of 0/1. See detail.)	0:OFF/1:ON

Detailed information of 40905 (D-IN--0-----7)

- [0] : (Unused)
- [1] : Transmission filter switch 1
- [2] : Transmission filter switch 2
- [3] : Emergency escape switch (ON: 1)
- [4] : Starting switch C terminal signal (Start of engine: 1)
- [5] : (Unused)
- [6] : Emergency steering relay 1 (Driving: 1)
- [7] : Gearshift lever (N position: 1)

Detailed information of 40906 (D-IN--8-----15)

- [8] : Low clutch fill switch (ON: 1)
- [9] : 4th clutch fill switch (ON: 1)
- [10] : High clutch fill switch (ON: 1)
- [11] : 1st clutch fill switch (ON: 1)
- [12] : 2nd clutch fill switch (ON: 1)
- [13] : 3rd clutch fill switch (ON: 1)
- [14] : Reverse clutch fill switch (ON: 1)
- [15] : (Unused)

Detailed information of 40907 (D-IN--16-----23)

- [16] : Gearshift lever (R position: 1)
- [17] : Gearshift lever (D position: 1)
- [18] : Gearshift lever (6 position: 1)
- [19] : Gearshift lever (5 position: 1)
- [20] : Gearshift lever (4 position: 1)
- [21] : Gearshift lever (3 position: 1)
- [22] : Gearshift lever (2 position: 1)
- [23] : Gearshift lever (L position: 1)

Detailed information of 40908 (D-IN--24-----31)

- [24] : (Unused)
- [25] : Coolant level
- [26] : Air cleaner switch
- [27] : Main pressure variable valve pressure switch
- [28] : Main flow rate selector valve pressure switch
- [29] : Lubricating oil quantity variable valve pressure switch
- [30] : (Unused)
- [31] : (Unused)

Detailed information of 40942 (D-IN--32-----39)

- [32] : (Unused)

Detailed information of 40949 (D-OUT--0-----7)

- [0] : (Unused)
- [1] : (Unused)
- [2] : (Unused)
- [3] : (Unused)
- [4] : (Unused)
- [5] : (Unused)
- [6] : (Unused)
- [7] : (Unused)

Detailed information of 40950 (D-OUT--8-----15)

- [8] : (Unused)
- [9] : (Unused)
- [10] : (Unused)
- [11] : (Unused)
- [12] : (Unused)
- [13] : (Unused)
- [14] : (Unused)
- [15] : (Unused)

Detailed information of 40951 (D-OUT--16-----23)

- [16] : (Unused)
- [17] : (Unused)
- [18] : (Unused)
- [19] : (Unused)
- [20] : (Unused)
- [21] : (Unused)
- [22] : (Unused)
- [23] : (Unused)

Engine [Engine controller system] (Main side (Left bank side))					
No.	Monitoring item	Display of item	Monitoring code	Display range of data	Unit
1	Serial No. of hardware (left bank)	ECM S/N	20400	0 – 49999999	—
2	Battery voltage (left bank)	POWER SUPPLY	03200	0.0 – 480.0 ---- [Other than above]	V
3	Engine speed	ENG SPEED	01002	0 – 4000 ---- [Other than above]	rpm
4	Engine coolant temperature	COOLANT TEMP	04104	-40 – 210 ---- [Other than above]	°C
5	Engine coolant temperature sensor voltage	COOLANT TEMP	04105	0.00 – 5.00 ---- [Other than above]	V
6	Oil pressure sensor	ENG OIL PRESS	37200	-99.9 – 999.9 ---- [Other than above]	kPa
7	Oil pressure sensor voltage	ENG OIL PRESS	37201	0.00 – 5.00 ---- [Other than above]	V
8	Engine oil temperature	ENG OIL TEMP	42700	-40 – 210 ---- [Other than above]	°C
9	Engine oil temperature sensor voltage	ENG OIL TEMP	42702	0.00 – 5.00 ---- [Other than above]	V
10	Common rail pressure (left bank)	RAIL PRESS	36400	0 – 400 ---- [Other than above]	MPa
11	Common rail pressure sensor voltage (left bank)	RAIL PRESS	36402	0.00 – 5.00 ---- [Other than above]	V
12	Atmospheric pressure	AMBIENT PRESS	37400	-99.9 – 999.9 ---- [Other than above]	kPa
13	Atmospheric pressure sensor voltage	AMBIENT PRESS	37402	0.00 – 5.00 ---- [Other than above]	V
14	Intake air temperature	INTAKE TEMP	18400	-50 – 200 ---- [Other than above]	°C
15	Intake air temperature sensor voltage	INTAKE TEMP	18401	0.00 – 5.00 ---- [Other than above]	V
16	Fuel temperature (left bank)	FUEL TEMP	04204	-40 – 210 ---- [Other than above]	°C
17	Fuel temperature sensor voltage (left bank)	FUEL TEMP	04201	0.00 – 5.00 ---- [Other than above]	V
18	Boost temperature	CHG TEMP	18500	-50 – 200 ---- [Other than above]	°C
19	Boost temperature sensor voltage	CHG TEMP	18501	0.00 – 5.00 ---- [Other than above]	V
20	Boost pressure	CHG PRESS-A	36500	-99.9 – 999.9 ---- [Other than above]	kPa
21	Boost pressure sensor voltage	CHG PRESS-A	36502	0.00 – 5.00 ---- [Other than above]	V
22	Engine output torque	OUTPUT TORQUE	18700	-24000 – 24000 ---- [Other than above]	Nm
23	Converted torque	TORQUE RATIO	36700	0 – 100 ---- [Other than above]	%
24	Final accelerator position	FINAL THROTTLE	31706	0 – 100 ---- [Other than above]	%

Engine [Engine controller system] (Main side (Left bank side))					
No.	Monitoring item	Display of item	Monitoring code	Display range of data	Unit
25	Momentary fuel consumption	FUEL RATE	37300	0.0 – 999.9 ---- [Other than above]	L/h
26	Final injection rate command (by weight)	INJECT COMMAND	18600	0 – 1000 ---- [Other than above]	mg
27	Final injection timing command	INJECT TIMING	36300	-180.0 – 180.0 ---- [Other than above]	CA
28	Accelerator pedal position	THROTTLE POS	31701	0 – 100 ---- [Other than above]	%
29	Accelerator pedal sensor voltage	THROTTLE POS	31707	0.00 – 5.00 ---- [Other than above]	V
30	Idle validation signal	IVS 1	18300	ON or OFF	—
31	Idle validation signal	IVS 2	18301	ON or OFF	—
32	Controller inside temperature (left bank)	ECM IN TEMP	18900	-40 – 210 ---- [Other than above]	°C
33	Final common rail pressure command	PRESS COMMAND	36200	0 – 400 ---- [Other than above]	MPa
34	PCV valve closing timing (based on BTDC) (left bank)	PCV TIMING	17201	-180 – 180 ---- [Other than above]	CA
35	Engine mode selection	POWER MODE	17500	0 – 4	—
36	Selected model (left 8 digits)	MACHINE ID (H)	00400	Transmitted value is displayed (Left 8 of 16 letters)	—
37	Selected model (right 8 digits)	MACHINE ID (L)	00401	Transmitted value is displayed (Left 8 of 16 letters)	—
38	Build version No.	BUILD VER	20216	Transmitted value is displayed (8 letters)	—
39	Calibration data version No. (left bank)	CAL VER	20217	Transmitted value is displayed (8 letters)	—

★ "CA" in the unit column is an abbreviation for the Crankshaft Angle.

Engine sub [Engine sub controller system] (Sub side (Right bank side))					
No.	Monitoring item	Display of item	Monitoring code	Display range of data	Unit
1	Serial No. of hardware (right bank)	R-ECM S/N	20401	0 – 49999999	—
2	Battery voltage (right bank)	R-POWER SUPPLY	03205	0.0 – 480.0 ---- [Other than above]	V
3	Common rail pressure (right bank)	R-RAIL PRESS	36403	0 – 400 ---- [Other than above]	MPa
4	Common rail pressure sensor voltage (right bank)	R-RAIL PRESS	36404	0.00 – 5.00 ---- [Other than above]	V
5	Fuel temperature (right bank)	R-FUEL TEMP	04205	-40 – 210 ---- [Other than above]	°C
6	Fuel temperature sensor voltage (right bank)	R-FUEL TEMP	04202	0.00 – 5.00 ---- [Other than above]	V
7	Controller inside temperature (right bank)	R-ECM IN TEMP	18901	-40 – 210 ---- [Other than above]	°C
8	PCV valve closing timing (based on BTDC) (right bank)	R-PCV TIMING	17202	-180 – 180 ---- [Other than above]	CA
9	Calibration data version No. (right bank)	R-CAL VER	20218	Transmitted value is displayed (8 letters)	—

★ "CA" in the unit column is an abbreviation for the Crankshaft Angle.

Brake [Retarder controller system]					
No.	Monitoring item	Display of item	Monitoring code	Display range of data	Unit
1	Version of software	VERSION	20214	***** (8 digits/symbols)	—
2	Version No. of application	VERSION (APP)	20231	***** (8 digits/symbols)	—
3	Version No. of data	VERSION (DATA)	20232	***** (8 digits/symbols)	—
4	ARSC set switch	ARSC SET SP SW	37701	0.00 – 5.00 ---- [Other than above]	V
5	Transmission output shaft speed	T/M SPEED:OUT	31403	0 – 32767 ---- [Other than above]	rpm
6	Wheel speed (left)	WHEEL SPEED L	39705	0 – 32767 ---- [Other than above]	rpm
7	Wheel speed (right)	WHEEL SPEED R	39704	0 – 32767 ---- [Other than above]	rpm
8	Retarder cooling oil temperature (front)	BRAKE OIL T F	30201	0 – 160 ---- [Other than above]	°C
9	Retarder cooling oil temperature (front)	BRAKE OIL T F	30204	0.00 – 5.00 ---- [Other than above]	V
10	Retarder cooling oil temperature (rear)	BRAKE OIL T R	30211	0 – 160 ---- [Other than above]	°C
11	Retarder cooling oil temperature (rear)	BRAKE OIL T R	30212	0.00 – 5.00 ---- [Other than above]	V
12	Brake output (front wheel)	BK OUTP DIR F	33700	0 – 1000 ---- [Other than above]	mA
13	Brake output (rear wheel)	BK OUTP DIR R	33806	0 – 1000 ---- [Other than above]	mA
14	Retarder lever	RETARD LEVER	33900	0.00 – 5.00 ---- [Other than above]	V
15	Body positioner	BODY POSITION	34602	0.00 – 5.00 ---- [Other than above]	V
16	Dump lever (Hoist lever) potentiometer 1	DUMP LEVER 1	34304	0.00 – 5.00 ---- [Other than above]	V
17	Dump lever (Hoist lever) potentiometer 2	DUMP LEVER 2	34305	0.00 – 5.00 ---- [Other than above]	V
18	Hoist EPC output	HOIST EPC DIR	45600	0 – 1000 ---- [Other than above]	mA
19	Seating control command γ (high)	S CNT DIR H	45102	0 – 1000 ---- [Other than above]	mA
20	Seating control command γ (low)	S CNT DIR L	45103	0 – 1000 ---- [Other than above]	mA
21	Seating condition calibration value (α)	S CAL A	45201	0.00 – 5.00 ---- [Other than above]	V
22	Cylinder stopper calibration value (β)	S CAL B	45301	0.00 – 5.00 ---- [Other than above]	V
23	Seating control time (high)	S CNT TIME H	45402	0.0 – 10.00 ---- [Other than above]	second
24	Seating control time (low)	S CNT TIME L	45403	0.0 – 10.00 ---- [Other than above]	second

Brake [Retarder controller system]					
No.	Monitoring item	Display of item	Monitoring code	Display range of data	Unit
25	Shut-off valve output	SHUT OFF VALVE	45700	0/1 (1 digit of 0/1)	0:OFF/1:ON
26	Steering angle sensor	STRG ANGLE	35402	-180.0 – +180.0 ---- [Other than above]	° (degree)
27	Steering angle sensor	STRG ANGLE	35400	0.00 – 5.00 ---- [Other than above]	V
28	Steering speed	STRG ANG SPEED	35403	0.0 – 99.99 ---- [Other than above]	rad/second
29	Suspension pressure (left)	SUS PRESS (L)	32814	0.00 – 20.10 ---- [Other than above]	MPa
30	Suspension pressure (left)	SUS PRESS (L)	32815	0.00 – 5.00 ---- [Other than above]	V
31	Suspension pressure (right)	SUS PRESS (R)	32816	0.00 – 20.10 ---- [Other than above]	MPa
32	Suspension pressure (right)	SUS PRESS (R)	32817	0.00 – 5.00 ---- [Other than above]	V
33	Judgment of empty/load	EMPTY OR LOAD	39400	0/1 (1 digit of 0/1) --- [Other than above]	0:EMPTY/1:LOAD
34	ASR output (left) command	ASR OUTP DIR L	39601	0 – 1020 ---- [Other than above]	mA
35	ASR output (right) command	ASR OUTP DIR R	39603	0 – 1020 ---- [Other than above]	mA
36	Input signal (0 – 7)	D-IN--0-----7	40932	01010101 (8 digits of 0/1. See detail.)	0:OFF/1:ON
37	Input signal (8 – 15)	D-IN--8-----15	40933	01010101 (8 digits of 0/1. See detail.)	0:OFF/1:ON
38	Input signal (16 – 23)	D-IN-16-----23	40934	01010101 (8 digits of 0/1. See detail.)	0:OFF/1:ON
39	Input signal (24 – 31)	D-IN-24-----31	40935	01010101 (8 digits of 0/1. See detail.)	0:OFF/1:ON
40	Input signal (32 – 39)	D-IN-32-----39	40943	0 (1 digits of 0/1. See detail.)	0:OFF/1:ON
41	Output signal (0 – 7)	D-OUT-0-----7	40955	01010101 (8 digits of 0/1. See detail.)	0:OFF/1:ON
42	Output signal (8 – 15)	D-OUT-8-----15	40956	01010101 (8 digits of 0/1. See detail.)	0:OFF/1:ON
43	Output signal (16 – 23)	D-OUT-16-----23	40957	01010101 (8 digits of 0/1. See detail.)	0:OFF/1:ON

Detailed information of 40932 (D-IN--0-----7)

- [0] : Exhaust brake switch
- [1] : Service brake switch
- [2] : Retarder switch (Front)
- [3] : Retarder switch (Rear)
- [4] : Validation switch 1
- [5] : Validation switch 2
- [6] : Memory clear switch
- [7] : Brake oil filter

Detailed information of 40933 (D-IN--8-----15)

- [8] : ASR pressure switch (Rear left)
- [9] : ASR pressure switch (Rear right)
- [10] : Shut-off valve switch
- [11] : ASR check switch
- [12] : Parking brake pressure switch
- [13] : (Unused)
- [14] : (Unused)
- [15] : (Unused)

Detailed information of 40934 (D-IN--16-----23)

- [16] : Starting switch C terminal signal
- [17] : (Unused)
- [18] : (Unused)
- [19] : Brake wear switch (Rear left)
- [20] : Brake wear switch (Rear right)
- [21] : Parking brake solenoid
- [22] : (Unused)
- [23] : (Unused)

Detailed information of 40935 (D-IN--24-----31)

- [24] : Steering wheel speed
- [25] : (Unused)
- [26] : Retarder cooling filter
- [27] : Engine oil level switch
- [28] : Engine oil filter
- [29] : Steering hoist level switch
- [30] : Steering hoist filter switch
- [31] : Battery electrolyte level switch

Detailed information of 40943 (D-IN--32-----39)

- [32] : Transmission/Brake oil level switch

Detailed information of 40955 (D-OUT--0-----7)

- [0] : Auto-suspension solenoid 1
- [1] : Hoist selector valve
- [2] : Lever kick-out solenoid
- [3] : Auto-suspension solenoid 2
- [4] : (Unused)
- [5] : Exhaust brake solenoid
- [6] : (Unused)
- [7] : (Unused)

Detailed information of 40956 (D-OUT--8-----15)

- [8] : (Unused)
- [9] : (Unused)
- [10] : (Unused)
- [11] : ASR shut-off valve
- [12] : (Unused)
- [13] : (Unused)
- [14] : (Unused)
- [15] : Body "Float" signal

Detailed information of 40957 (D-OUT--16-----23)

- [16] : Stop lamp relay
- [17] : (Unused)
- [18] : Sensor power supply (24 V)
- [19] : BCV relay
- [20] : (Unused)
- [21] : (Unused)
- [22] : (Unused)
- [23] : (Unused)

VHMS [VHMS controller system]					
No.	Monitoring item	Display of item	Monitoring code	Display range of data	Unit
1	Suspension pressure (front right)	SUS PRESS (FR)	32804 (*)	0.00 – 20.10 ---- [Other than above]	MPa
2	Suspension pressure (front left)	SUS PRESS (FL)	32805 (*)	0.00 – 20.10 ---- [Other than above]	MPa
3	Suspension pressure (rear right)	SUS PRESS (RR)	32806 (*)	0.00 – 20.10 ---- [Other than above]	MPa
4	Suspension pressure (rear left)	SUS PRESS (RL)	32807 (*)	0.00 – 20.10 ---- [Other than above]	MPa
5	Suspension pressure (front right)	SUS PRESS (FR)	32810 (*)	0.00 – 5.00 ---- [Other than above]	V
6	Suspension pressure (front left)	SUS PRESS (FL)	32811 (*)	0.00 – 5.00 ---- [Other than above]	V
7	Suspension pressure (rear right)	SUS PRESS (RR)	32812 (*)	0.00 – 5.00 ---- [Other than above]	V
8	Suspension pressure (rear left)	SUS PRESS (RL)	32813	0.00 – 5.00 ---- [Other than above]	V
9	Inclinometer (pitch angle)	INCLINOMETER	32901 (*)	-15.0 – +15.0 ---- [Other than above]	° (degree)
10	Inclinometer (pitch angle)	INCLINOMETER	32902 (*)	0.00 – 5.10 ---- [Other than above]	V
11	Ambient temperature	AIR TEMP	37501	-30 – +100 ---- [Other than above]	°C
12	Ambient temperature	AIR TEMP	37504	0.00 – 5.00 ---- [Other than above]	V
13	Input signal (0 – 7)	D-IN--0-----7	40944	01010101 (8 digits of 1/0. See detail.)	0:OFF/1:ON
14	Input signal (8 – 15)	D-IN--8-----15	40945	01010101 (8 digits of 1/0. See detail.)	0:OFF/1:ON
15	Output signal (0 – 7)	D-OUT-0--3	40946	0101 (4 digits of 0/1. See detail.)	0:OFF/1:ON
16	SEL signal (0 – 3)	D-SEL--0--3	40947	0101 (4 digits of 0/1. See detail.)	0:OFF/1:ON
17	Payload	PAYLOAD	42200 (*)	0.0 – 655.4 ---- [Other than above]	t
18	Rated load weight	RATE WEIGHT	42201 (*)	0.0 – 655.4 ---- [Other than above]	t
19	Status of truck	TRUCK STATUS	42400 (*)	0 – 8	—
20	Gearshift lever N signal	SHIFT LEVER N	42500 (*)	0/1 (1 digit of 0/1)	0:OFF/1:ON
21	Exhaust temperature (left bank front)	EXHAUST TMP FL	42690	200 – 950 ---- [Other than above]	°C
22	Exhaust temperature (right bank rear)	EXHAUST TMP RR	42601	200 – 950 ---- [Other than above]	°C

VHMS [VHMS controller system]					
No.	Monitoring item	Display of item	Monitoring code	Display range of data	Unit
23	Exhaust temperature (right bank front)	EXHAUST TMP FR	42602	200 – 950 ---- [Other than above]	°C
24	Exhaust temperature (right bank front)	EXHAUST TMP FR	42603	0.00 – 5.00 ---- [Other than above]	V
25	Exhaust temperature (left bank front)	EXHAUST TMP FL	42604	0.00 – 5.00 ---- [Other than above]	V
26	Exhaust temperature (right bank rear)	EXHAUST TMP RR	42605	0.00 – 5.00 ---- [Other than above]	V
27	Exhaust temperature (left bank rear)	EXHAUST TMP RL	42606	2.00 – 950 ---- [Other than above]	°C
28	Exhaust temperature (left bank rear)	EXHAUST TMP RL	42607	0.00 – 5.00 ---- [Other than above]	V
29	Blow-by pressure	BLOWBY PRESS	42801	0.0 – 20.0 ---- [Other than above]	kPa
30	Blow-by pressure	BLOWBY PRESS	42802	0.00 – 5.00 ---- [Other than above]	V
31	Stop and run flags	STOP RUN FLAG	45000 (*)	0/1 (1 digit of 0/1)	0:OFF/1:ON

*: When PLM in VHMS is set.

Detailed information of 40944 (D-IN--0-----7)

- [0] : (Unused)
- [1] : Connection of ORBCOM (Connected: 1)
- [2] : (Unused)
- [3] : (Unused)
- [4] : (Unused)
- [5] : (Unused)
- [6] : Download switch under cab (ON: 1)
- [7] : Body float state (ON: 1)

Detailed information of 40945 (D-IN--8-----15)

- [8] : Protocol selector connector (Automatic transmission: 1)
- [9] : Protocol selector connector (MMS communication: 1)
- [10] : (Unused)
- [11] : (Unused)
- [12] : (Unused)
- [13] : (Unused)
- [14] : (Unused)
- [15] : (Unused)

Detailed information of 40946 (D-OUT-0--3)

- [0] : External indicator lamp (Lighting of green lamp: 0)
- [1] : External indicator lamp (Lighting of orange lamp: 0)
- [2] : External indicator lamp (Lighting of red lamp: 0)
- [3] : Operation of VHMS (Operating: 1)

Detailed information of 40947 (D-SEL-0--3)

- [0] : SEL-0 (Always: 0)
- [1] : SEL-1 (Always: 1)
- [2] : SEL-2 (Always: 1)
- [3] : SEL-3 (Always: 0)

Detailed information of 42400

- [1] : Empty truck is stopped
- [2] : Empty truck is traveling
- [3] : Truck is being loaded
- [4] : Loaded truck is traveling
- [5] : Loaded truck is stopped
- [6] : Truck is dumping

ABS [ABS controller system] (If equipped)					
No.	Monitoring item	Display of item	Monitoring code	Display range of data	Unit
1	Part No. of software	VERSION	20210	***** (8 digits/symbols)	—
2	Version No. of application	VERSION (APP)	20233	***** (8 digits/symbols)	—
3	Version No. of data	VERSION (DATA)	20234	***** (8 digits/symbols)	—
4	Wheel speed (front left)	WHEEL SPEED FL	39706	0 – 3000 ---- [Other than above]	rpm
5	Wheel speed (front right)	WHEEL SPEED FR	39707	0 – 3000 ---- [Other than above]	rpm
6	Wheel speed (rear left)	WHEEL SPEED RL	39708	0 – 3000 ---- [Other than above]	rpm
7	Wheel speed (rear right)	WHEEL SPEED RR	39709	0 – 3000 ---- [Other than above]	rpm
8	Input signal (0 - 7)	D-IN--0-----7	40937	01010101 (8 digits of 1/0. See detail.)	0:OFF/1:ON
9	Input signal (8 - 15)	D-IN--8-----15	40938	01010101 (8 digits of 1/0. See detail.)	0:OFF/1:ON
10	Input signal (16 - 23)	D-IN-16-----23	40939	01010101 (8 digits of 1/0. See detail.)	0:OFF/1:ON
11	Input signal (24 - 31)	D-IN-24-----31	40940	01010101 (8 digits of 1/0. See detail.)	0:OFF/1:ON
12	Output signal (0 - 7)	D-OUT-0-----7	40958	01010101 (8 digits of 1/0. See detail.)	0:OFF/1:ON
13	Output signal (8 - 15)	D-OUT-8-----15	40959	01010101 (8 digits of 1/0. See detail.)	0:OFF/1:ON
14	Output signal (16 - 23)	D-OUT-16-----23	40960	01010101 (8 digits of 1/0. See detail.)	0:OFF/1:ON
15	ABS control valve output (front left)	ABS CNT VAL FL	43308	0 – 1000 ---- [Other than above]	mA
16	ABS control valve output (front right)	ABS CNT VAL FR	43309	0 – 1000 ---- [Other than above]	mA
17	ABS control valve output (rear left)	ABS CNT VAL RL	43310	0 – 1000 ---- [Other than above]	mA
18	ABS control valve output (rear right)	ABS CNT VAL RR	43311	0 – 1000 ---- [Other than above]	mA
19	ABS control oil pressure (front left)	CONT PRESS FL	43312	0.00 – 99.99 ---- [Other than above]	MPa
20	ABS control oil pressure (front left)	CONT PRESS FL	43313	0.00 – 5.00 ---- [Other than above]	V
21	ABS control oil pressure (front right)	CONT PRESS FR	43314	0.00 – 99.99 ---- [Other than above]	MPa
22	ABS control oil pressure (front right)	CONT PRESS FR	43315	0.00 – 5.00 ---- [Other than above]	V

ABS [ABS controller system] (If equipped)					
No.	Monitoring item	Display of item	Monitoring code	Display range of data	Unit
23	ABS control oil pressure (rear left)	CONT PRESS RL	43316	0.00 – 99.99 ---- [Other than above]	MPa
24	ABS control oil pressure (rear left)	CONT PRESS RL	43317	0.00 – 5.00 ---- [Other than above]	V
25	ABS control oil pressure (rear right)	CONT PRESS RR	43318	0.00 – 99.99 ---- [Other than above]	MPa
26	ABS control oil pressure (rear right)	CONT PRESS RR	43319	0.00 – 5.00 ---- [Other than above]	V

Detailed information of 40937 (D-IN--0-----7)

- [0] : ABS cut pressure switch (Front)
- [1] : ABS cut pressure switch (Rear)
- [2] : (Unused)
- [3] : (Unused)
- [4] : (Unused)
- [5] : (Unused)
- [6] : (Unused)
- [7] : (Unused)

Detailed information of 40959 (D-OUT--8-----15)

- [8] : (Unused)
- [9] : (Unused)
- [10] : (Unused)
- [11] : (Unused)
- [12] : (Unused)
- [13] : (Unused)
- [14] : (Unused)
- [15] : (Unused)

Detailed information of 40938 (D-IN--8-----15)

- [8] : (Unused)
- [9] : (Unused)
- [10] : (Unused)
- [11] : (Unused)
- [12] : (Unused)
- [13] : (Unused)
- [14] : (Unused)
- [15] : (Unused)

Detailed information of 40960 (D-OUT--16-----23)

- [16] : (Unused)
- [17] : (Unused)
- [18] : ABS cut valve (Front) (* Through relay)
- [19] : ABS cut valve (Rear) (* Through relay)
- [20] : (Unused)
- [21] : (Unused)
- [22] : (Unused)
- [23] : (Unused)

Detailed information of 40939 (D-IN--16----23)

- [16] : Starting switch C terminal signal
- [17] : (Unused)
- [18] : (Unused)
- [19] : (Unused)
- [20] : (Unused)
- [21] : (Unused)
- [22] : (Unused)
- [23] : (Unused)

Detailed information of 40940 (D-IN--24----31)

- [24] : (Unused)
- [25] : (Unused)
- [26] : (Unused)
- [27] : (Unused)
- [28] : (Unused)
- [29] : (Unused)
- [30] : (Unused)
- [31] : (Unused)

Detailed information of 40958 (D-OUT--0-----7)

- [0] : (Unused)
- [1] : (Unused)
- [2] : (Unused)
- [3] : (Unused)
- [4] : (Unused)
- [5] : (Unused)
- [6] : (Unused)
- [7] : (Unused)

[14] Reduced cylinder mode (CYLINDER CUT-OUT)

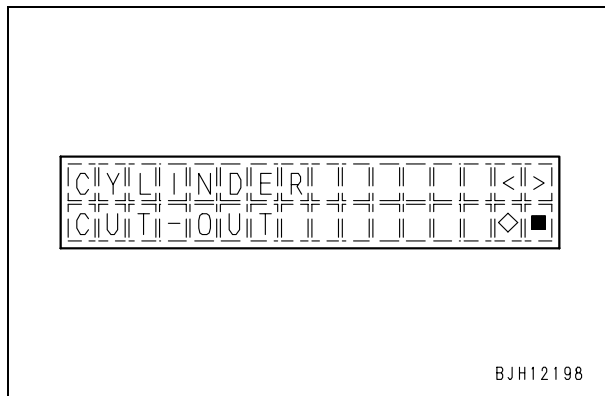
As one method of troubleshooting for the engine, the machine monitor has a reduced cylinder mode that can set the desired cylinder to the no injection condition.

1. Starting engine

Use this function while the engine is running, because a defective cylinder is determined depending on the engine speed in the reduced cylinder mode.

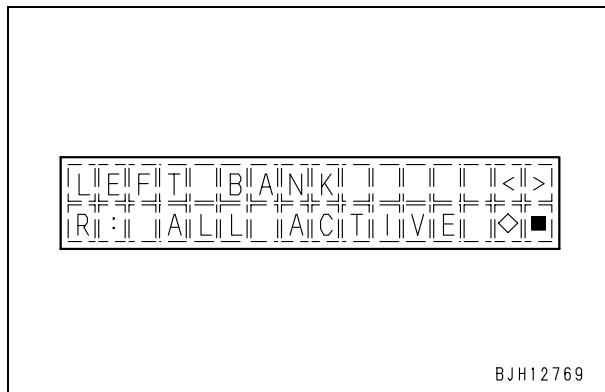
2. Selection of the service menu

- 1) Select the reduced cylinder mode (CYLINDER CUT-OUT) in the service menu selection screen.



- 2) While the service menu is selected, press the [◇] switch to display reduced cylinder mode bank unit selection screen.

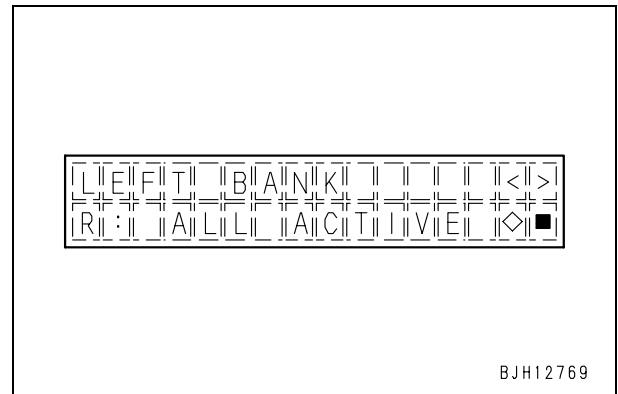
- [◇]: Conduct the service menu.
- ★ The screen in the figure is displayed.



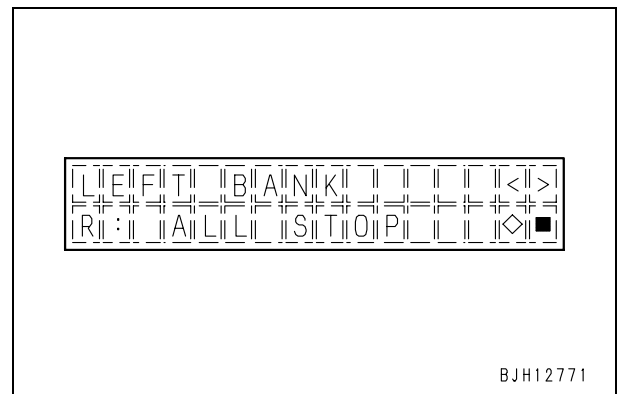
- 3) Selection of operation/non-operation by bank

On the operation/non-operation screen, operate the [>], [<] and [■] switches to select operation/non-operation of the left bank or right bank.

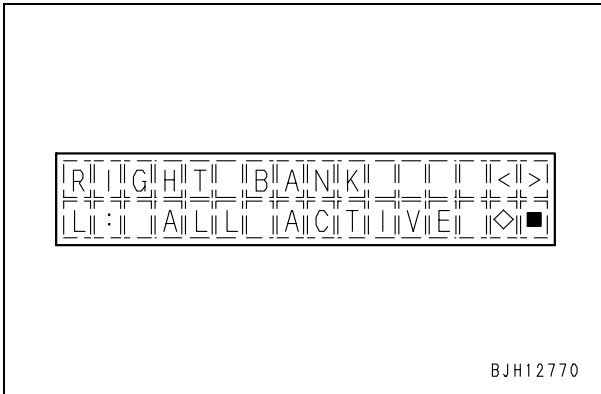
- [>]: Change selection screen
- [<]: Change selection screen
- [■]: Return to reduced cylinder mode screen
- [◇]: Go to reduced cylinder mode operation screen
- ★ Since it takes some time to stop all the cylinders of each bank, wait for at least 8 seconds before changing the screen.
- When checking left bank and operating all cylinders of right bank



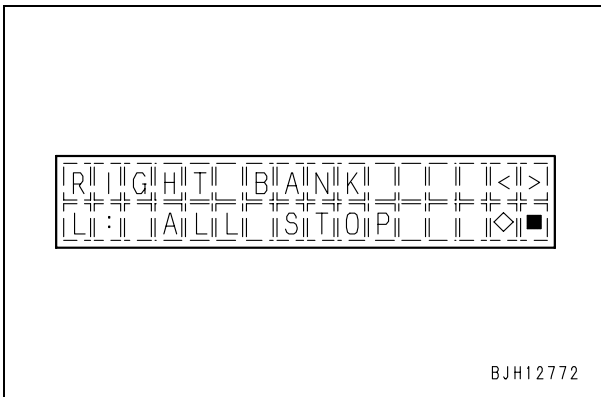
- When checking left bank and stopping all cylinders of right bank



- When checking right bank and operating all cylinders of left bank



- When checking right bank and stopping all cylinders of left bank



3. Setting cut-out cylinder

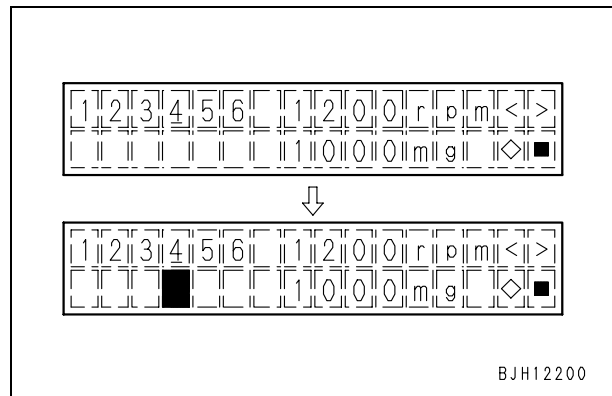
In the reduced cylinder mode execution screen, operate each of the switches [>], [<], [◇] and [■] to select the cut-out cylinder.

- [>]: Selector cursor moves to the right.
- [<]: Selector cursor moves to the left.
- [◇]: Determine the cylinder.
- [■]: To return to the service menu selection screen.

★ When the [◇] switch is used to confirm the cut-out cylinder, communication is carried out between the machine monitor and engine controller. During this time, the cylinder No. flashes.

After completion of the communication, the segment under the cylinder No. becomes black to show that the cylinder has been cut out.

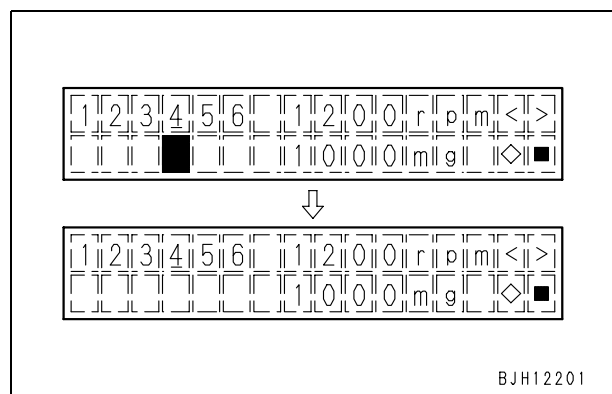
★ A single cylinder or multiple cylinders can be cut out.



4. Canceling cylinder cut-out

Cancellation of cylinder cut-out is done by the same procedure as setting cut-out cylinder.

- ★ When the [◇] switch is used to confirm the cancellation of the cut-out cylinder, communication is carried out between the machine monitor and engine controller. During this time, the cylinder No. flashes. After completion of the communication, the segment under the cylinder No. becomes white to show that the cylinder cut-out has been canceled.



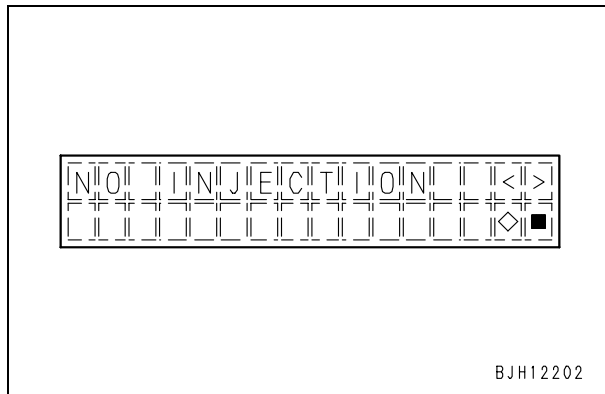
[15] No injection cranking function (NO INJECTION)

The machine monitor has the function of none injection cranking, which carries out cranking after long-term storage, stopping fuel injection of all the cylinders without starting the engine.

- ★ The function of none injection cranking must be operated under the condition that the engine is stopped.

1. Selection of the service menu

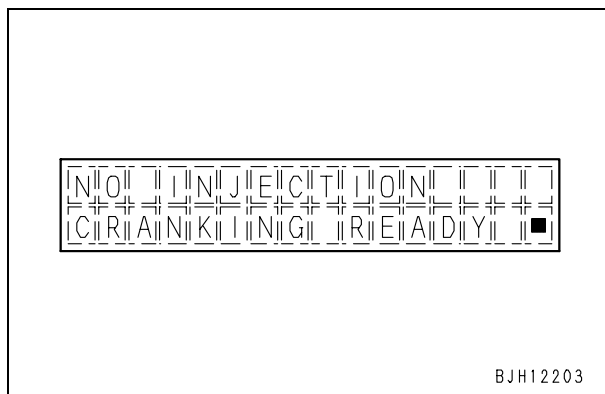
In the service menu selection screen, select none injection cranking function (NO INJECTION).



2. Establishment of no injection cranking

With the service menu selected, press the [◇] switch to display none injection cranking execution screen.

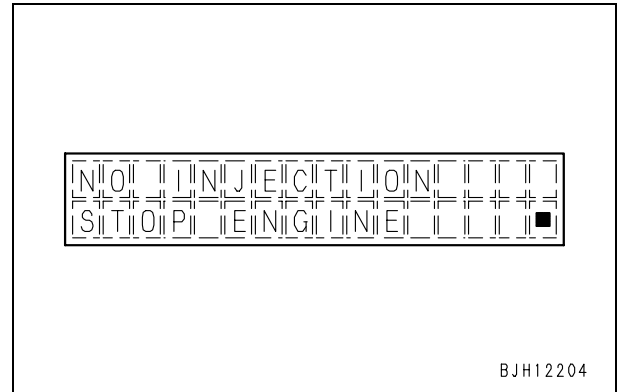
- [◇]: Conduct the service menu.
- ★ If "CRANKING READY" is displayed on the lower line, the none injection cranking is set.
- ★ If the starting switch is operated to the START position under this condition, the engine cranks but will not start.



3. Setting is denied during engine running

During engine running, if the setting of none injection cranking is attempted, "STOP ENGINE" is displayed in the lower line, and setting is rejected.

- ★ None injection cranking function cannot be used during engine running.



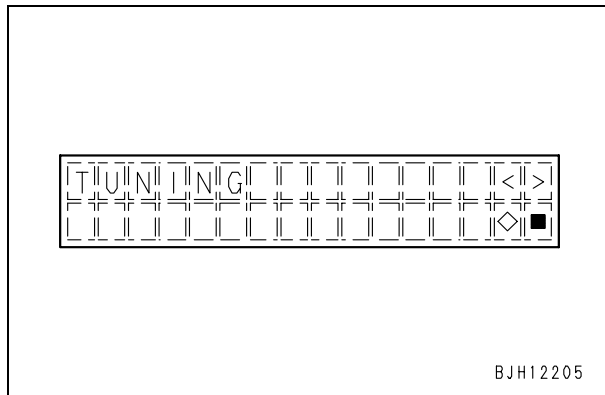
4. Canceling no injection cranking

If the [■] switch is pressed on the no injection cranking execution screen, the screen returns to the service menu selection screen and the no injection cranking is cancelled.

- [■]: To return to the service menu selection screen.

[16] Adjustment function (TUNING)

Machine monitor can run "Adjusting transmission ECMV electric current" and "Reset the transmission initial learning and implement learning " through the transmission controller.



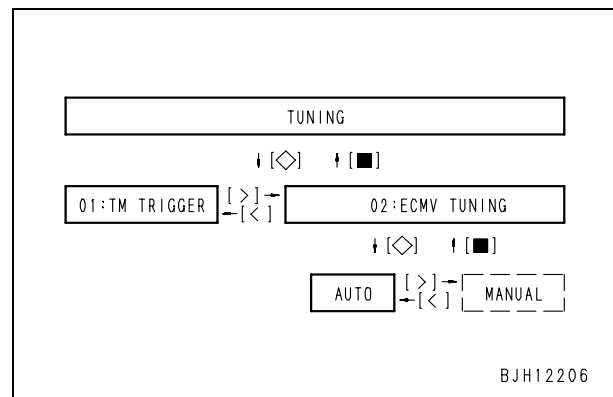
If power train related operation such as the following is carried out, execute the adjustment operation.

- If transmission is overhauled or changed
- If transmission valve is replaced
- Transmission controller has been replaced.
- When an abnormality occurred in the power train speed sensor and has been repaired (refer to the right table for failure code)
- If the transmission oil temperature sensor is troubled and repaired (refer to the below table for failure code)
- If the transmission oil filter is clogged and repaired (refer to the below table for failure code)

Failure code	Device name
DLF1KA	Transmission input shaft speed sensor
DLF1LC	
DLF2KA	Transmission intermediate shaft speed sensor
DLF2LC	
DLF3KA	Transmission output shaft R speed sensor
DGF1KX	Transmission valve oil temperature sensor
15BONX	Transmission oil filter

The adjustment is implemented by operating the machine monitor and machine body following the below procedure.

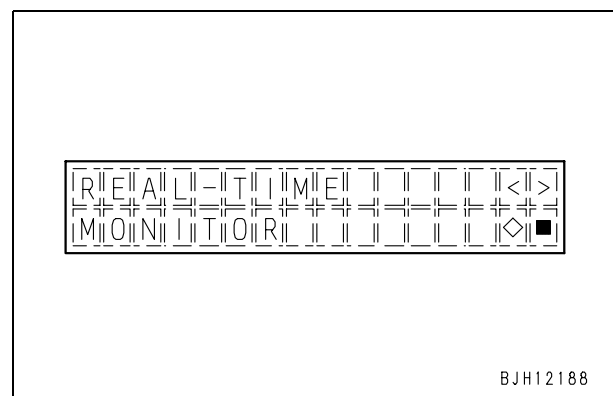
1. Preparing operations for "Adjusting transmission ECMV electric current" (Real time monitoring function)
 2. Adjusting transmission ECMV electric current (02: AUTO of ECMV TUNING)
 3. Reset the transmission initial learning and implement learning (TUNED/Real-time monitoring function for 01: TM TRIGGER)
- ★ () indicates service menu or adjustment function used for the adjustment.
- ★ [MANUAL] menu of [02: ECMV TUNING] is the function only used by plants and not used by services.
- ★ For details concerning the operation method of real time monitoring function, refer to "[11] real time monitoring function".



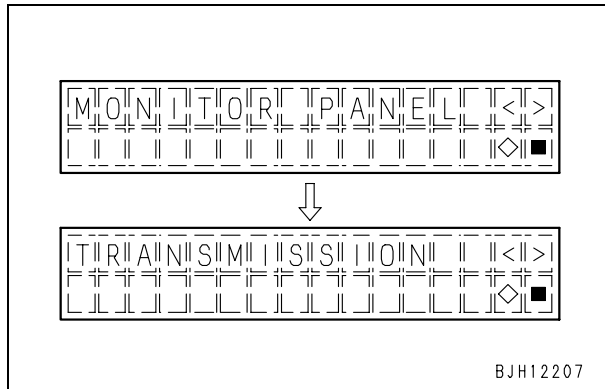
1. Preparing operations for "Adjusting transmission ECMV electric current"

- ★ The adjusting operation should be carried out with the specified oil temperature. Confirm the machine is not displaying abnormality and adjust the transmission oil temperature following the next procedure.

- 1) Select real time monitoring function (REAL-TIME MONITOR) in the service menu selection screen.

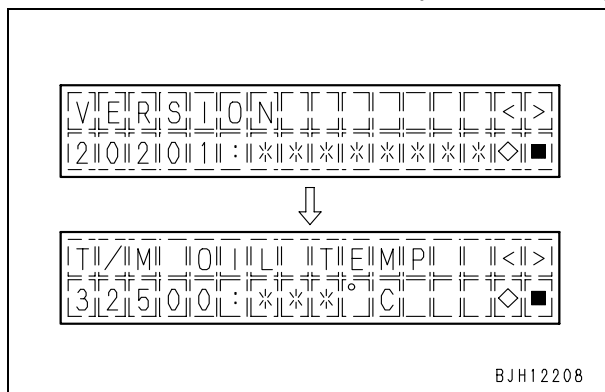


- 2) With the service menu selected, press the [$\diamond$] switch to display the monitoring system and function selection screen.
 - [$\diamond$]: Runs service menu
- 3) In the monitoring system and function selection screen, press [>] switch or [<] switch to select transmission system (TRANSMISSION).
 - [>]: To proceed to next monitoring system and function
 - [<]: To go back to data for previous monitoring system and function



- 4) With the transmission system selected, press the [$\diamond$] switch and display the monitoring display and item selection screen.
 - [$\diamond$]: Implement 1 system individual monitoring
 - The program version No. is displayed on *****.
- 5) In the monitoring display and item selection screen, press [>] switch or [<] switch and select monitoring code of transmission oil temperature.
 - [>]: Goes on to the next monitoring item
 - [<]: Goes back to the previous monitoring item
 - Monitoring code:

32500 (T/M OIL TEMP)



- 6) Confirm that the parking brake switch is PARKING, and start the engine.

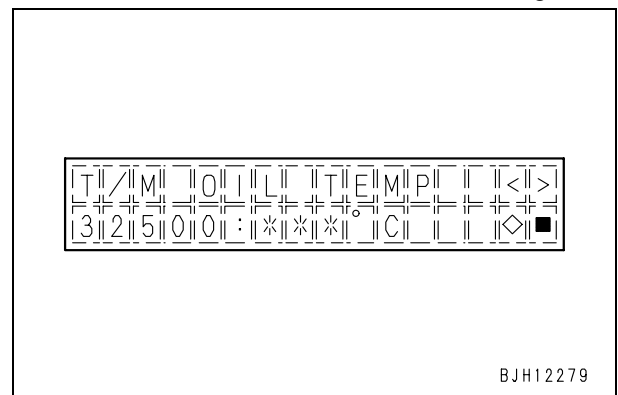
- 7) Depress the brake pedal, and set the gear shift lever to **D** position.
 - ★ Confirm that the shift indicator displays "F2".
- 8) Stall the torque converter and raise the transmission oil temperature up to 70 – 80 °C.
 - ★ Be careful not to overheat the oil while stalling the torque converter.
- 9) Return the gear shift lever to "N" position, keep it for 3 minutes, and confirm that the transmission oil temperature is stable between 70 – 80 °C.
 - ★ In addition to the above, check that the machine has not detected a trouble.

2. Adjusting transmission ECMV electric current

- ★ Adjustment is carried out four times automatically against the Hi, Lo, R, 1st, 2nd and 3rd, 4th valves respectively.
- 1) Refer to "1. Preparation of operations for adjusting transmission ECMV electric current", and select the monitoring code of transmission oil temperature.
 - Monitoring code:

32500 (T/M OIL TEMP)

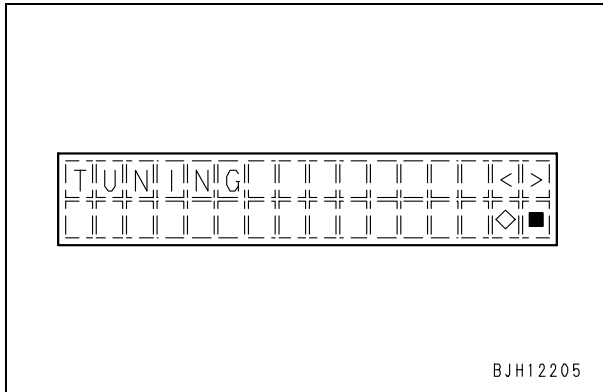
- ★ At this time, do not start the engine.



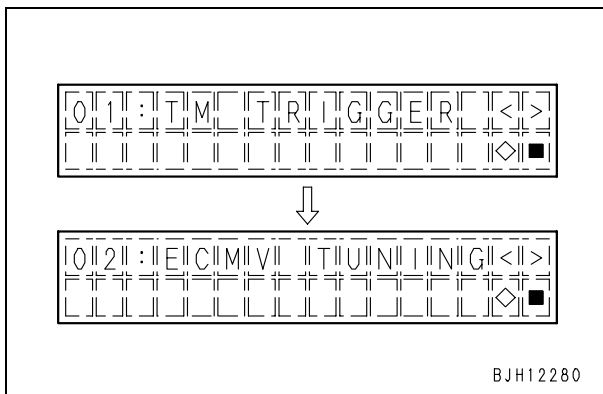
- 2) Run the engine, set the machine to the next condition, and confirm that the transmission oil temperature is between 70 – 80 °C.
 - Parking break switch: PARKING
 - AISS LOW switch: LOW (low speed)
 - Gear shift lever: N position
 - Engine: Low idling
 - Accelerator pedal: OFF (Release)

- 3) Return to the service menu selection screen, and select the adjustment function (TUNING).

- ★ Press [■] switch several times to return to the service menu selection screen.

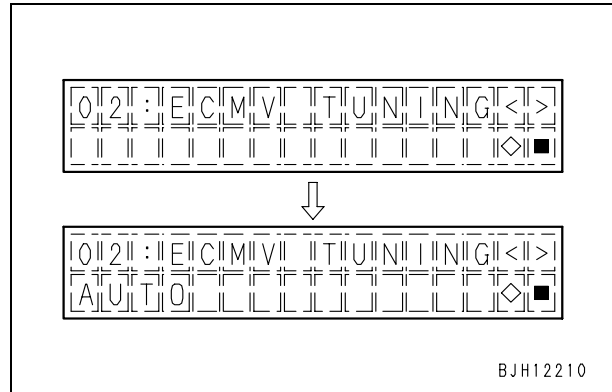


- 4) While the service menu is selected, hold down the [◇] switch for a minimum of 5 seconds to display the adjustment menu selection screen.
- [◇]: Runs service menu
- 5) On the adjustment menu selection screen, press [>] switch or [<] switch, and select ECMV current adjustment item (02: ECMV TUNING).
- [>]: To proceed to the next adjustment menu
 - [<]: To go back to the previous adjustment menu

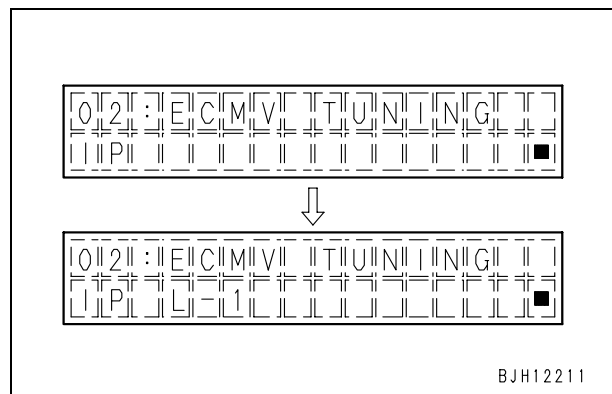


- 6) With the adjustment menu selected, press [◇] switch and display the automatic compensation (AUTO) or manual compensation (MANUAL) selection screen. Press [<] switch or [>] switch to select the automatic compensation (AUTO).
- [◇]: To execute the adjustment menu
 - [>]: To switch to the next compensation screen.
 - [<]: To switch to the next compensation screen.
 - Compensation menu: AUTO

- ★ The figure shows the state in which the automatic compensation is selected, therefore, [AUTO] is indicated in the lower line. \ In the state in which the manual compensation is selected, [MANUAL] is indicated in the lower line.



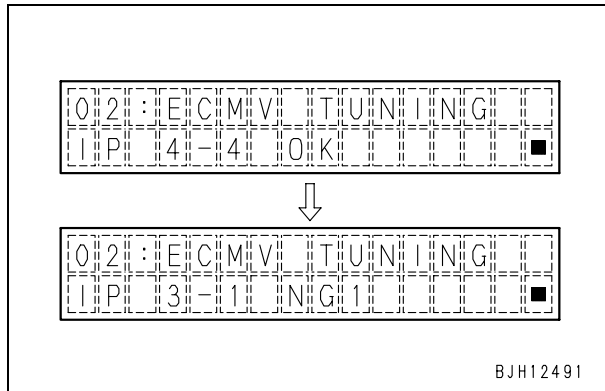
- 7) Confirm the machine condition again and press the [◇] switch to start adjustment.
- [◇] switch: To start the adjustment
 - ★ The lower line display changes from "IP" to "IP ***".



- ★ Adjustments are carried out 4 times continuously for each objective clutch, and the below table is displayed.

No.	Valve	1st time	2nd time	3rd time	4th time
1	LOW	IP L-1	IP L-2	IP L-3	IP L-4
2	HIGH	IP H-1	IP H-2	IP H-3	IP H-4
3	1ST	IP 1-1	IP 1-2	IP 1-3	IP 1-4
4	2ND	IP 2-1	IP 2-2	IP 2-3	IP 2-4
5	3RD	IP 3-1	IP 3-2	IP 3-3	IP 3-4
6	REV	IP R-1	IP R-2	IP R-3	IP R-4
7	4TH	IP 4-1	IP 4-2	IP 4-3	IP 4-4

- 8) Normal and abnormal results are displayed for each adjustment, therefore take action depending on the display.



- Indicated code for the normal or abnormal result

Code	Condition	
OK	Normal result	
NG1	Abnormal result	Out of compensation conditions
NG2		No fill
NG3		Over the compensation values

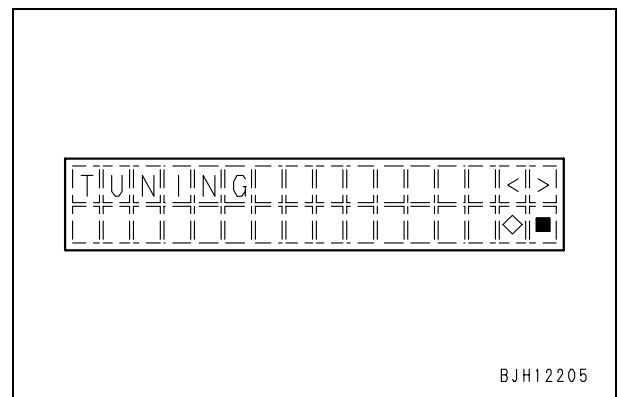
- If "OK" (normal result) is displayed: Adjustment is done without error.
 - If "NG1" is displayed (out of compensation condition): Adjust the transmission oil temperature exactly, and confirm the machine setting conditions again, then carry out the adjustment from procedure 1).
 - If "NG2" (no fill) is displayed: Carry out troubleshooting of failure code [15S*MA][DDT*KA], and if the condition is confirmed to be normal, then start again from procedure 1) (The symbol with * mark varies by objective clutches).
 - If "NG3" is displayed (compensation value over): Carry out troubleshooting of failure code [15S*L1], and if the condition is confirmed to be normal, then start again from procedure 1) (The symbol with * mark varies by objective clutches).
- 9) If the adjustments has been completed normally, the adjustment values are recorded in the transmission controller about 3 seconds after the starting switch has been turned off.
- ★ If the starting switch needs to be turned ON soon after the adjustment, keep the starting switch in the OFF position for more than 10 seconds as a precautionary measure then turn it ON.

3. Reset the transmission initial learning and implementation of learning

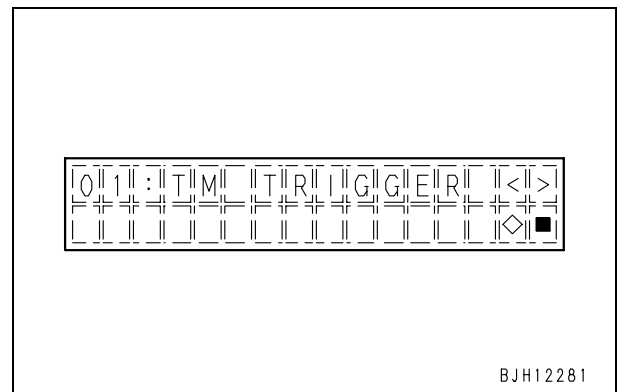
- ★ Before carrying out this adjustment item, be sure to implement "2. Transmission ECMV current adjustment".
- ★ Before proceeding to the learning, confirm that the transmission oil temperature is at the specified temperature referring to "1. Preparing operations for "Adjusting transmission ECMV electric current". (If adjustments are made at temperatures other than specified temperature, time lag or gear shift shock may occur.)

⚠ The learning should be carried out in an area with a sufficient traveling distance, paying attention to the surroundings for safety.

- Select (TUNING) in the service menu selection screen.



- While the service menu is selected, hold down the [◇] switch for a minimum of 5 seconds to display the adjustment menu selection screen.
 - [◇]: To conduct the service menu.
- With the adjustment menu selection screen, confirm that the transmission trigger adjustment item (01: TM TRIGGER) is displayed.



- 4) With the adjustment menu selected, press the [◇] switch to display the initial learning resetting screen.
- [◇]: To execute the adjustment menu
 - ★ The current initialization state is displayed in the lower line.
 - Initialization is done: INITIAL STATUS
 - Initialization is not yet done: TUNED
 - ★ If [TUNED] is indicated, proceed to the next procedure to initialize the learning data.
 - ★ If the resetting operation is to be aborted, press [■] switch to return to the former screen.
 - [■]: To return to the previous screen

INITIAL STATUS
TUNED

BJH12213

- 5) With the initial learning resetting screen displayed, press the [◇] switch to display the initializing operation screen.

- [◇] switch:
To execute the initial learning reset

INITIALIZING OPERATION

BJH12214

- 6) With the initialization operation screen displayed, operate each of the switches [<], [>] and [■] to execute initialization.
- [<]: Select YES (move cursor)
 - [>]: Select NO (move cursor).
 - [■]: Execute YES or NO
 - ★ After initializing, confirm that the display on the lower line indicates that initialization is completed.
 - Initialization is done: INITIAL STATUS

INITIAL STATUS
TUNED

BJH12215

- 7) Return to service menu selection screen and select real time monitoring function (REAL-TIME MONITOR).

- ★ Press [■] switch several times to return to the service menu selection screen.

REAL-TIME MONITOR

BJH12188

- 8) With the service menu selected, press the [◇] switch to display the monitoring system and function selection screen.

- [◇]: To conduct the service menu.

- 9) In the monitoring system and function selection screen, press [>] switch or [<] switch to select 2 items simultaneous monitoring (2 ITEMS).

- [>]: To proceed to next monitoring system and function
- [<]: Go back to data for previous monitoring system and function

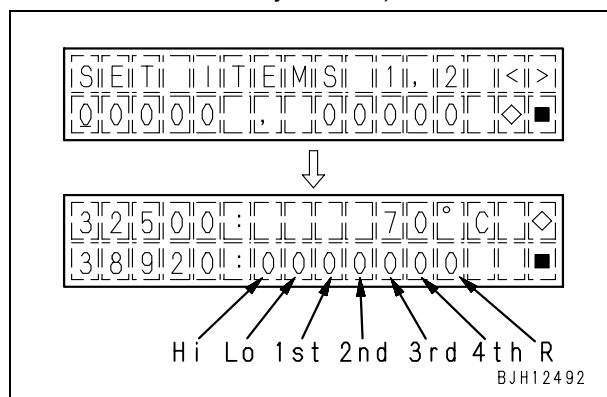
MONITORING PANEL



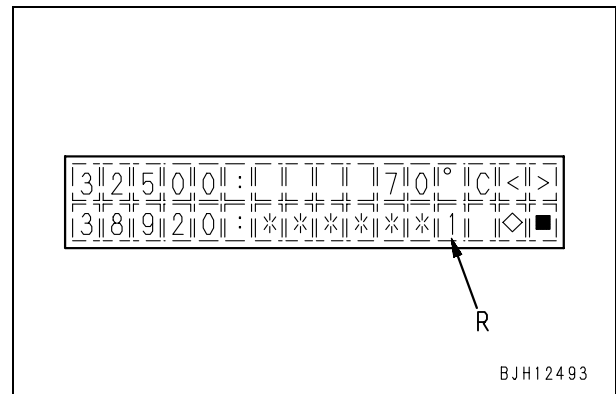
2 ITEMS

BJH12216

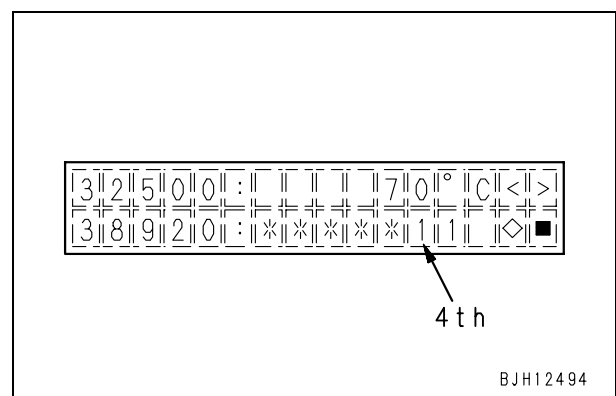
- 10) With 2 items simultaneous monitoring selected, press the [◇] switch and display the monitoring code input screen.
 - [◇]: Execute monitoring system and function.
- 11) In the monitoring code input screen, operate each of the switches [>], [<], [◇] and [■], and directly input 2-digit monitoring codes.
 - [>]: Number at the cursor increases.
 - [<]: Number at the cursor decreases
 - [◇]: Number at the cursor is determined
 - [■]: Cursor moves to the left end / To return to the monitoring system and function selection screen.
 - Monitoring code: **32500** and **38920**
 - ★ Indicate the transmission oil temperature in the upper row (**32500**) and study condition of clutch trigger in the lower row (**38920**) (0: not learned yet, 1: already learned).



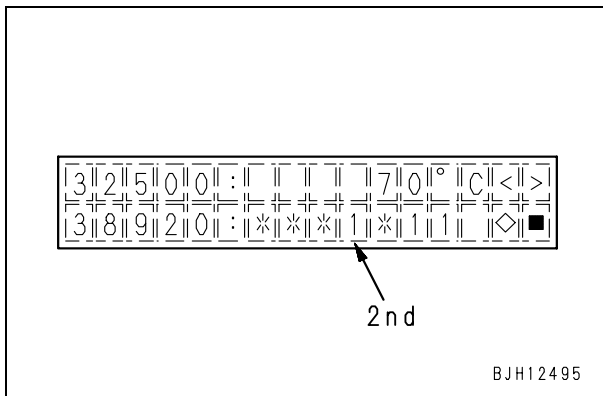
- 12) Set AISS LOW switch to LOW.
- 13) Start the engine, keep the gear shift lever at N position for 10 seconds at the low idle, then operate the gear shift lever as follows.
 - ★ Gear shift lever operation:
N → R → N
- 14) Confirm the trigger learning display of R clutch in the monitoring display.
 - ★ Proceed to the next step if the display is "1".
 - ★ If the display is "0", repeat procedure 13) until it becomes "1".
 - ★ If "1" is not displayed after repeating the steps 4 times, the ECMV may be defective. In this case, replace the ECMV.
 - ★ The * marked clutch display can be either "0" or "1".



- 15) Set the gearshift lever in the 6 position and press the accelerator pedal fully to run the truck and shift up the gear to F6.
 - ★ Shifting up: F1 → F2 → F3 → F4 → F5 → F6
- 16) After the gear is shifted up to F6, release the accelerator pedal and shift down the gear to F1 by coasting run.
 - ★ Shift down: F6 → F5 → F4 → F3 → F2 → F1
 - ★ Do not apply the brake during coasting run.
- 17) Check that the trigger learning of the 4th clutch is displayed on the monitor.
 - ★ If "1" is displayed, go to the next step.
 - ★ If the display is "0", repeat procedure 15) – 16) until it becomes "1".
 - ★ If "1" is not displayed after repeating the steps 4 times, the ECMV may be defective. In this case, replace the ECMV.
 - ★ The * marked clutch display can be either "0" or "1".

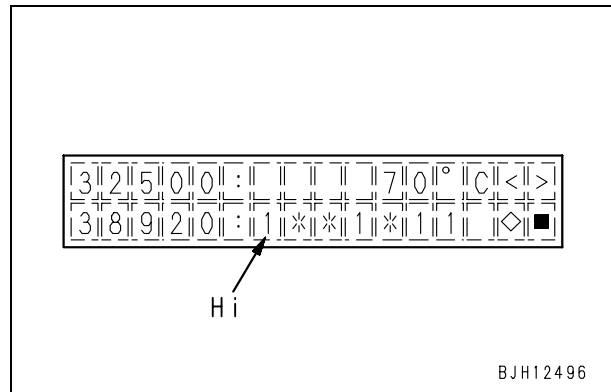


- 18) Set the gearshift lever in the 4 position and press the accelerator pedal fully to run the truck and shift up the gear to F4.
 - ★ Shifting up: F1 → F2 → F3 → F4
- 19) After running the machine at F4 for 10 seconds, release the accelerator pedal and shift down the gear to F1 by coasting run.
 - ★ Shifting down: F4 → F3 → F2 → F1
 - ★ Do not apply the brake during coasting run.
- 20) Check that the trigger learning of the 2nd clutch is displayed on the monitor.
 - ★ If "1" is displayed, go to the next step.
 - ★ If "0" is displayed, repeat steps 18) – 20) until "1" is displayed.
 - ★ If "1" is not displayed after repeating the steps 4 times, the ECMV may be defective. In this case, replace the ECMV.
 - ★ The * marked clutch display can be either "0" or "1".

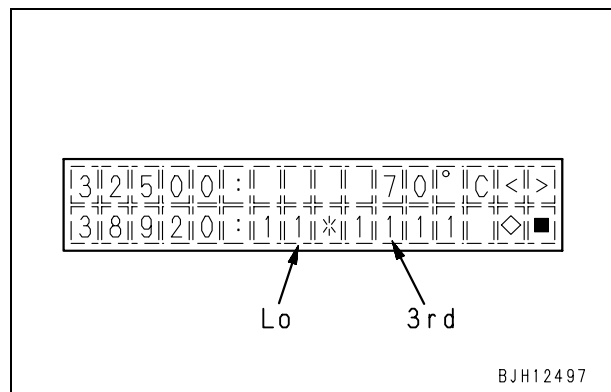


- 21) Set the gearshift lever in the 3 position and press the accelerator pedal fully to run the truck and shift up the gear to F3.
 - ★ Shifting up: F1 → F2 → F3
- 22) After running the machine at F3 for 10 seconds, release the accelerator pedal and shift down the gear to F1 by coasting run.
 - ★ Shifting down: F3 → F2 → F1
 - ★ Do not apply the brake during coasting run.

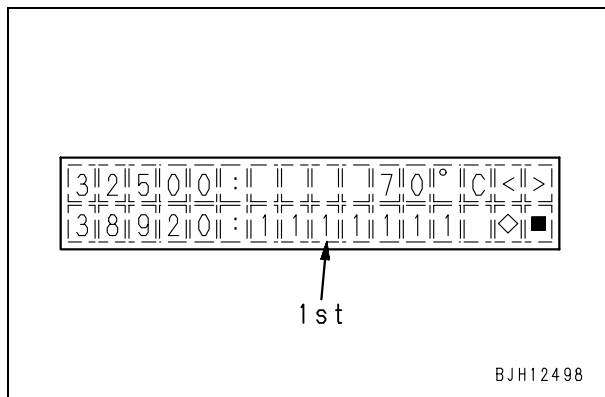
- 23) Check that the trigger learning of the Hi clutch is displayed on the monitor.
 - ★ If "1" is displayed, go to the next step.
 - ★ If "0" is displayed, repeat steps 21) – 23) until "1" is displayed.
 - ★ If "1" is not displayed after repeating the steps 4 times, the ECMV may be defective. In this case, replace the ECMV.
 - ★ The * marked clutch display can be either "0" or "1".



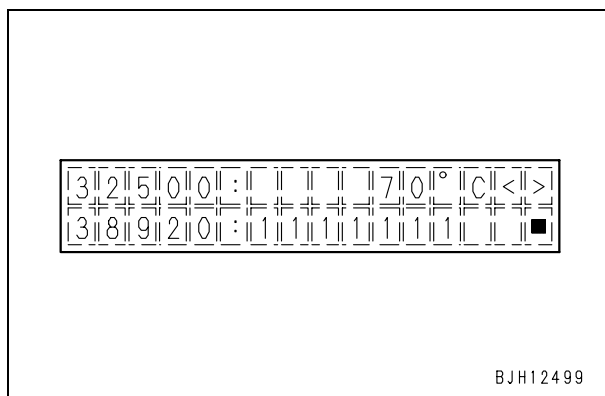
- 24) Set the gearshift lever in position 4 and press the accelerator pedal fully to shift up the gear to F3 and then continue travel at F3, adjusting the accelerator pedal.
 - ★ Shifting up: F1 → F2 → F3
- 25) After running the machine at F3 for 10 seconds, press the accelerator pedal fully to shift up the gear to F4.
 - ★ Shifting up: F3 → F4
- 26) Stop the machine and check that the trigger learning of the low clutch and 3rd clutch is displayed on the monitor.
 - ★ If "1" is displayed, go to the next step.
 - ★ If "0" is displayed, repeat steps 24) – 26) until "1" is displayed.
 - ★ If "1" is not displayed after repeating the steps 4 times, the ECMV may be defective. In this case, replace the ECMV.
 - ★ The * marked clutch display can be either "0" or "1".



- 27) Set the gearshift lever in the 2 position and press the accelerator pedal fully to run the truck and shift up the gear to F2.
★ Shifting up: F1 → F2
- 28) After running the machine at F2 for 10 seconds, release the accelerator pedal and shift down the gear to F1 by coasting run.
★ Shifting down: F2 → F1
- 29) Check that the trigger learning of the 1st clutch is displayed on the monitor.
★ If "1" is displayed the initial learning has completed finally.
★ If "0" is displayed, repeat steps 27) – 29) until "1" is displayed.
★ If "1" is not displayed after repeating the steps 4 times, the ECMV may be defective. In this case, replace the ECMV.



- 30) In the monitoring display, confirm finally the trigger learning display of lower line.
★ If displayed as drawing, the initial learning has completed normally.

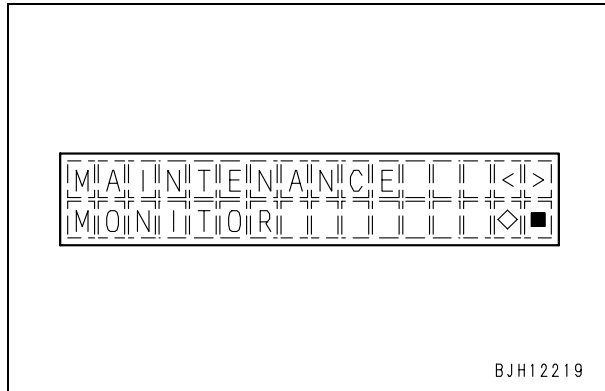


- 31) Press [■] switch several times and complete service menu.
● [■]: To return to the previous screen.

[17] Filter and oil replacement time setting function (MAINTENANCE MONITOR)

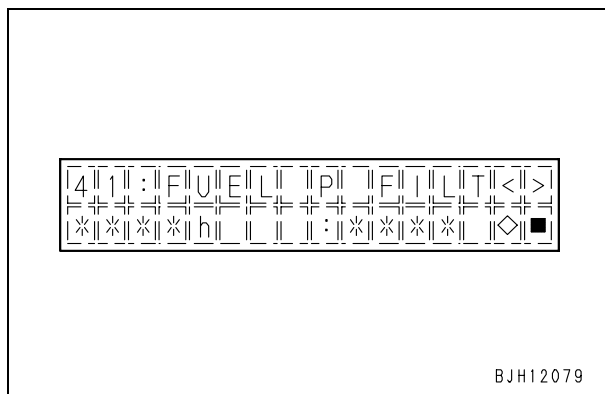
Machine monitor can set the maintenance intervals for various filters and oil which become the base of replacement time display for filter and oil. Also the machine monitor can activate or deactivate the display function.

1. Selection of the service menu
Select the filter and oil replacement time setting function (MAINTENANCE MONITOR) in the service menu selection screen.



2. Displaying and selecting the maintenance item and function

- 1) With the service menu selected, press the [◇] switch to display the maintenance item and function selection screen.
 - [◇]: Conduct the service menu.

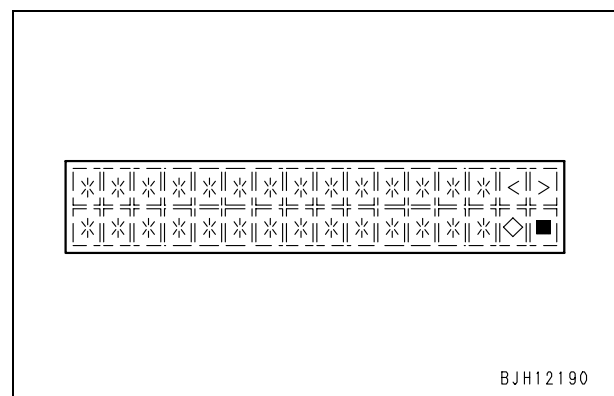


- 2) If [>] switch or [<] switch is pushed while the maintenance item and function selection screen is displayed, the maintenance item and function will be displayed endlessly in the order shown by the below table. Select the item or the function which will be used.
 - [>]: To proceed to next maintenance item and function.
 - [<]: To return to the previous maintenance item and function.

- ★ Displayed maintenance item and function:

No.	Display	Maintenance items and functions
1	41:FUEL P FILT	Fuel pre filter
2	01:ENG OIL	Engine oil
3	02:ENG FILT	Engine oil filter
4	13:TM FILT	Transmission oil filter
5	03:FUEL FILT	Fuel main filter
6	06:CORR RES	Corrosion resistor
7	17:TC/TM/ BK OIL	Torque convertory/ Transmission/Brake oil
8	14:BK OIL FILT	Brake oil filter
9	16:BK C FILT	Brake cooling oil filter
10	04:HYD FILT	Hydraulic oil filter
11	11:DIFF OIL	Differential oil
12	08:FNL OIL	Final drive oil
13	10:HYD OIL	Hydraulic oil
14	INITIALIZE	Setting default value for all items
15	ALL ITEMS	Setting validity or invalidity for all items

- ★ No.1 – 14 are the maintenance items where the setting is changed by item, and No.15 – 16 are the functions which allows to change the setting of all items simultaneously.
- ★ Display the item and function in the [*] section.



3. Display contents of the maintenance item (Items No.1 – 14)

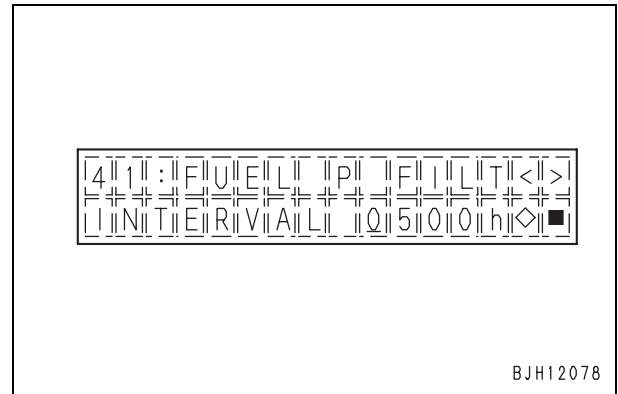
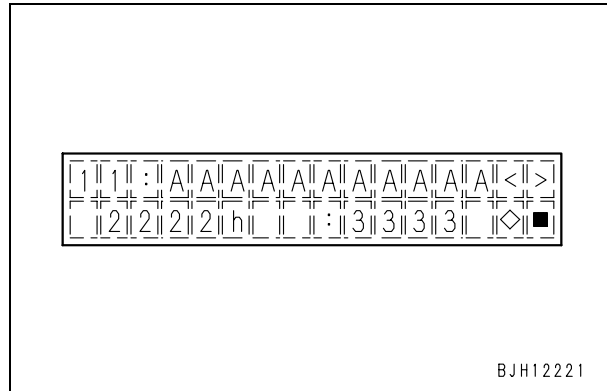
If the maintenance item for filter or oil is selected, the following contents are displayed.

1: Code (2 digits)

A: Filter and oil replacement time set items

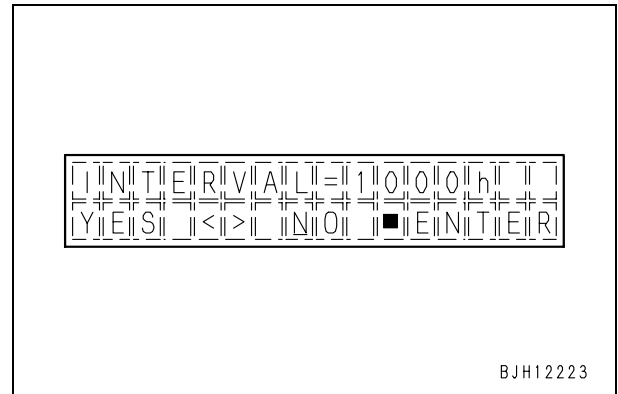
2: Remaining time to set replacement time

3: Number of times of replacement up to present



- 3) When the interval time is completely determined, the screen to confirm the changes is displayed. Then, operate each of the switches [<], [>] and [■].

- [<]: Select YES (move cursor)
- [>]: Select NO (move cursor)
- [■]: Execute YES or NO



4. Changing the interval time by maintenance item (Items No.1 – 14)

- 1) With the item selected on the maintenance item and the function selection screen to change the interval time (ex: P FUEL FILT), press the [◇] switch to display the interval change screen.

- [◇]: Implement the function to change maintenance item.

★ The currently set interval is displayed on the screen.

★ With this screen displayed, if the [>] switch or the [<] switch is operated, the screen switches to the setting screen for activating or deactivating the maintenance item.

- 2) On the interval change screen, operate each of the switches [>], [<], [◇] and [■] to input the interval time.

- [>]: Number at the cursor increases.
- [<]: Number at the cursor decreases.
- [◇]: Number at the cursor is determined.

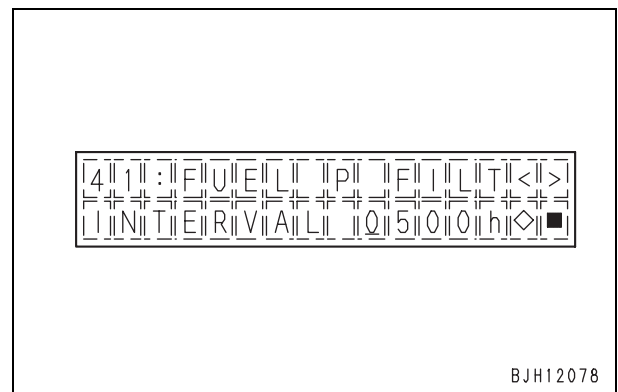
• [■]: To return to the service menu selection screen.

★ The time must always be input with 4 digits. For the time with less than 4 digits, input 0s in place of the vacant number.

5. Set the function activation or deactivation by maintenance item (items No.1 – 14).

- 1) With the item selected on the maintenance item and function selection screen (ex: FUEL P FILT) to change the activation or deactivation of the function, press the [◇] switch to display the interval input screen.

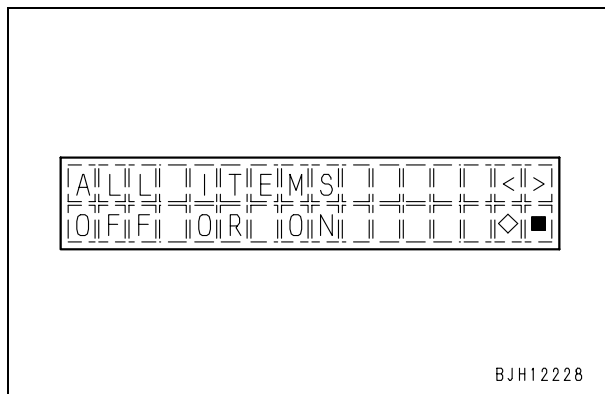
- [◇]: Implement the function to change maintenance item.



- ★ The number of resetting times is kept at the value before the default was set.
- ★ Each item is set turned ON.

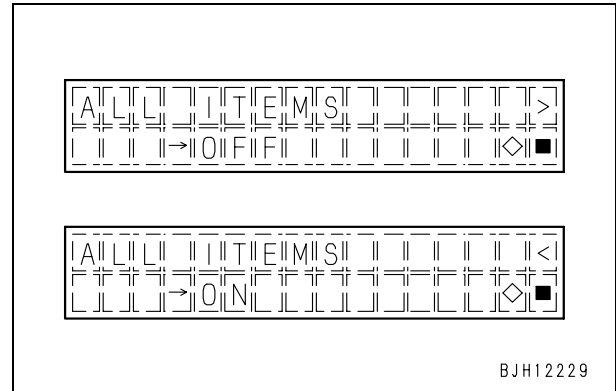
7. Setting the function activation or deactivation for all the items (function No.16)

- 1) With the activation or deactivation setting for all items selected (ALL ITEMS) on the maintenance item and function selection screen, press the [◇] switch to display the all items activation or deactivation setting screen.
 - [◇]: Implement the function to set activation or deactivation of all the items.



- 2) After the all items activation or deactivation setting screen is displayed, press the [>] switch or the [<] switch to display the activation setting or deactivation setting screen.
 - [>]: Switch the setting screen.
 - [<]: Switch the setting screen
 - ★ To deactivate all the items, display the upper line setting screen (OFF), and to activate all the items, display the lower line setting screen (OFF).
- 3) Confirm the setting screen, press the [◇] switch or the [■] switch to display the change confirmation screen.
 - [◇]: To switch to the change confirmation screen.
 - [■]: To return to the maintenance item and function selection screen.
 - ★ If deactivation of all the items (OFF) is set, it will stop the maintenance function of all the items, regardless of the setting by the maintenance item.

- ★ If activation of all the items (ON) is set, the maintenance function of all the items starts to work regardless of setting by the maintenance item and the interval is set to the previous time before the interval has been deactivated.
- ★ The timer is reset simultaneously and it restarts to count from 0 h. The number of resetting times is set to the value before it was turned OFF.



- 4) When the change confirmation screen is displayed, operate each [<], [>] and [■] switches.
 - [<]: Select YES (move cursor)
 - [>]: Select NO (move cursor)
 - [■]: Execute YES or NO

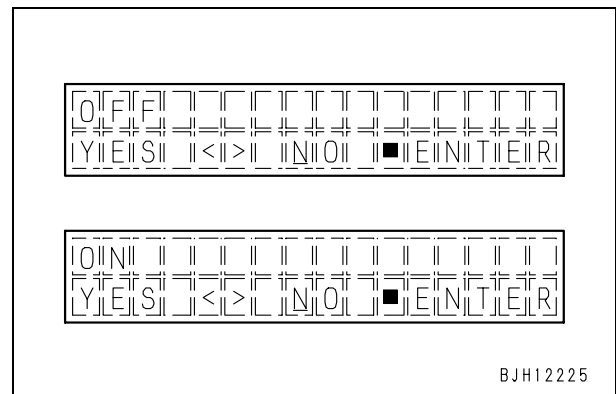


Table of filter and oil replacement time set items

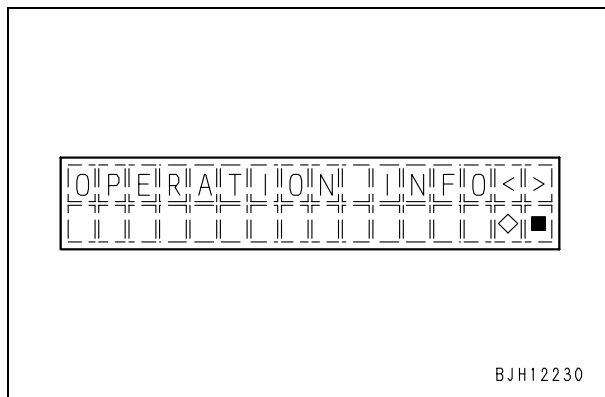
No.	System and function	Code	Display	Replacement frequency (Default value)	Remarks
1	Fuel pre filter	41	FUEL P FILT	0500	
2	Engine oil	01	ENG OIL	0500	
3	Engine oil filter	02	ENG FILT	0500	
4	Transmission oil filter	13	TM FILT	1000	
5	Fuel main filter	03	FUEL FILT	1000	
6	Corrosion resistor	06	CORR RES	1000	
7	Torque converter/Transmission/ Brake oil	24	TC/TM/ BK OIL	1000	
8	Brake oil filter	14	BK OIL FILT	1000	
9	Brake cooling oil filter	16	BK C FILT	1000	
10	Hydraulic oil filter	04	HYD FILT	2000	
11	Differential oil	11	DIFF OIL	2000	
12	Final drive oil	08	FNL OIL	2000	
13	Hydraulic oil	10	HYD OIL	4000	
14	Setting default value for all items	(None)	INITIALIZE	—	All item simultaneous setting function
15	Setting validity or invalidity for all items	(None)	ALL ITEMS	—	All item simultaneous setting function

[18] Operation information display function (OPERATION INFO)

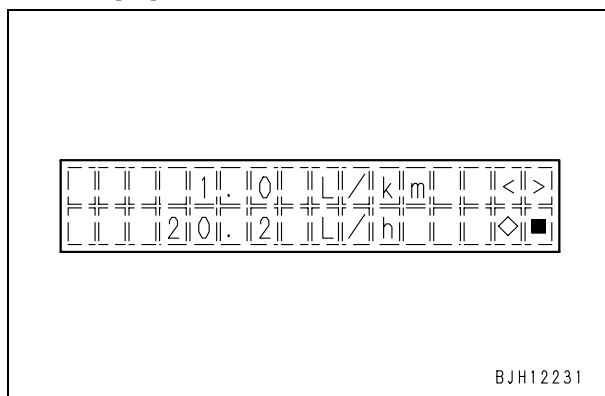
Machine monitor can display the fuel consumption per mile and per time, the fuel consumption per any accumulated time and the travel distance, and the fuel consumption during any accumulated time and its accumulated time.

- ★ Fuel consumption value is the integration of the targeted injection rate signal which is sent from the engine controller. It is not the measurement of the actual fuel consumption. Therefore the displayed fuel consumption is used as a guide value.

1. Selection of the service menu
Select the operation information display function (OPERATION INFO) on the service menu selection screen.



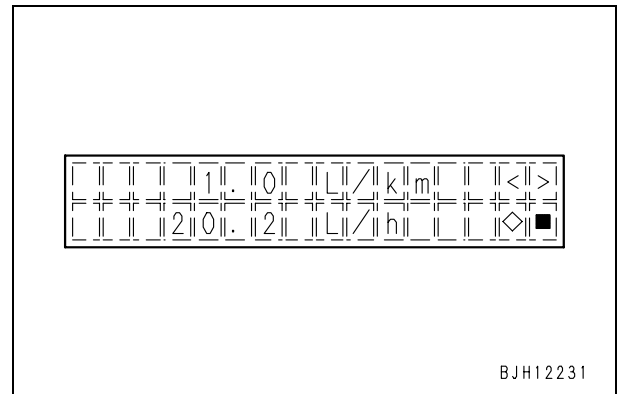
2. Displaying the operation information
With the service menu selected, press the [◇] switch and display the operation information and item selection screen.
 - [◇]: Conduct the service menu.



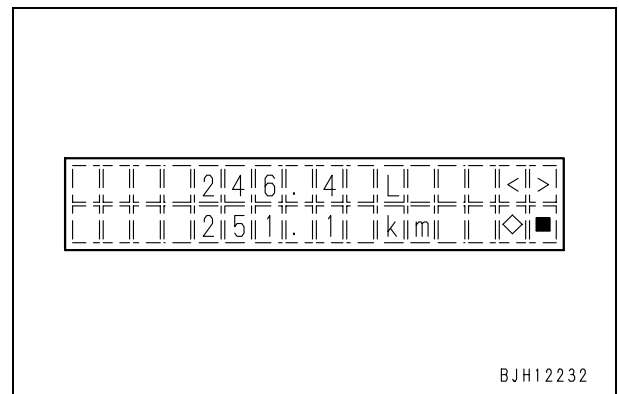
3. Selecting displayed information
With the operation information and item selection screen displayed, operate the [>] switch or the [<] switch to select the information screen to display.
 - [>]: To display the next information screen.
 - [<]: To display the previous information screen.

- ★ There are four types of information screen.

4. Information to be displayed (screen 1 – 4)
Above: Fuel consumption per km or mile from the last reset point (distance unit is km or mile and it depends on the setting of the integrated odometer in the operator mode).
Maximum display value: 99999.9 L/km (L/mile)
Below: Fuel consumption per time started from the last reset point
Maximum display value: 99999.9 L/h



- Above: Integrated fuel consumption started from the last reset point
Maximum display value: 999999.9 L
Below: Accumulated travel distance from the last reset point (travel distance unit is km or mile and it depends on the setting of the integrated odometer in the operator mode).
Maximum display value: 999999.9 km (mile)



Above: Integrated fuel consumption started from the last reset point

Maximum display value: 9999999.9 L

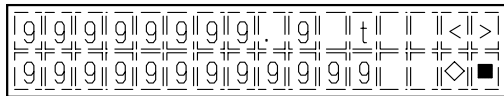
Below: Elapsed time from the last reset point

Maximum display value: 9999999.9 h



BJH12223

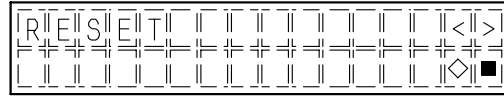
- ★ In case of "PLM function in VHMS" equipped.
- Above: Loading weight started from the last reset point. [ton]
- Below: Loading the number of time from the last reset point. [times]



BJH12786

5. Resetting displayed information

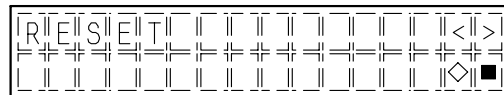
- 1) With any information screen displayed, press the [◇] switch to display the reset screen.
 - [◇]: Switch to the reset screen.
 - 2) After the reset screen is displayed, press the [◇] switch or the [■] switch and execute or cancel the reset.
 - [◇]: Implement resetting.
 - [■]: Cancel resetting
- ★ When the resetting is carried out, all the information goes to "0", and the monitoring starts newly from that point of time (Monitoring is only conducted while engine is running.)
 - ★ If the [>] switch or the [<] switch is operated with this screen displayed, the screen is switched to the fuel consumption correction screen.



BJH12234

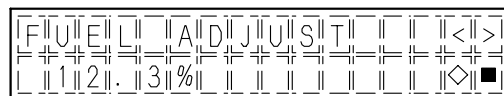
6. Correction of integrated fuel consumption

- ★ When there is the difference between the integrated fuel consumption (L) in display and the actually measured fuel consumption, correct it in the following way.
- 1) With the reset screen displayed, press the [>] switch or the [<] switch to display the fuel consumption correction screen.
 - [>]: Switch the displayed screen
 - [<]: Change the displayed screen



BJH12234

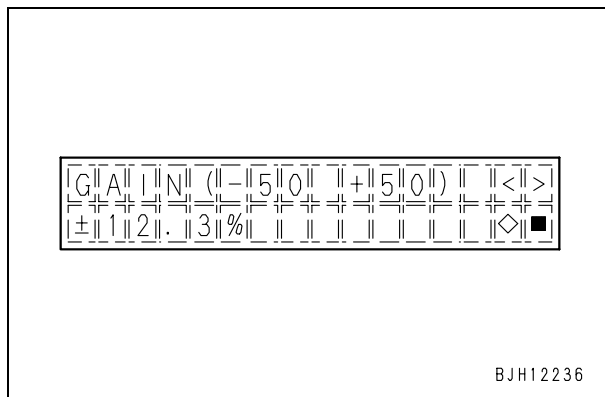
- 2) After the fuel consumption correction screen is displayed, press the [◇] switch or the [■] switch to switch to the correction value input screen.
 - [◇]: Switch to the correction value input screen
 - [■]: To return to the service menu screen



BJH12235

- 3) After displaying the compensation value input screen, operate each of the switches [>], [<], [◇] and [■] to input the compensation value directly.

- [>]: To switch the cursor symbol (+/-) / Number increases.
- [<]: To switch the cursor symbol (+/-) / Number decreases.
- [◇]: Sign/number at the cursor is determined.
- [■]: Return to the fuel correction screen
- ★ The correction value at the plant before shipment is [+/-00.0%] (In case of inputting 00.0, +/- does not matter.)
- ★ The compensation value can be input within the range of [-50.0% – +50.0%].



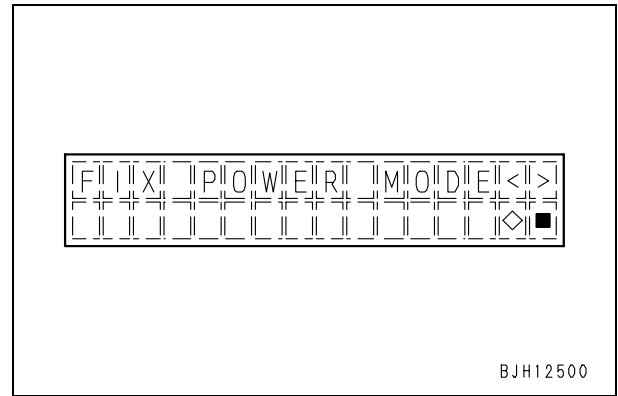
[19] Engine mode fixing function (FIX POWER MODE)

While the screen is displayed, the operator can measure the high idle speed and torque converter stall speed to check the engine performance.

- Engine high idle speed
- Torque converter stall speed

If a mode is selected by the following operation, it is sent to the transmission controller, which sends it to the engine controller.

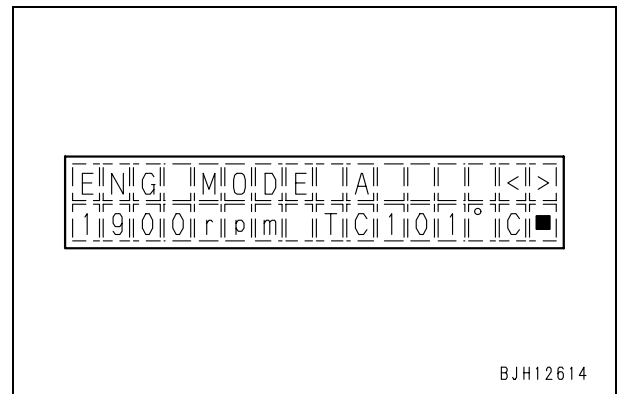
1. Advance check
Before the operation, check the following items.
 - Parking brake: ON (Parking)
 - Failure code: Not displayed
 - ★ Refer to "Standard valve table" about mode and spec.
2. Selection of service menu
While the service menu selection screen is displayed, select the engine mode fixing function (FIX POWER MODE).



3. Selection of mode

While the service menu is selected, press the [◇] switch to display the engine mode fixing screen.

- [◇]: Execute service menu



4. Selection of displayed information

While the engine mode fixing screen is displayed, select the information screen to be displayed with the [>] or [<] switch.

- [>] switch: Select setting screen
- [<] switch: Select setting screen
- [■] switch: Engine mode fixing function
- ★ The mode is four kind of A – D.

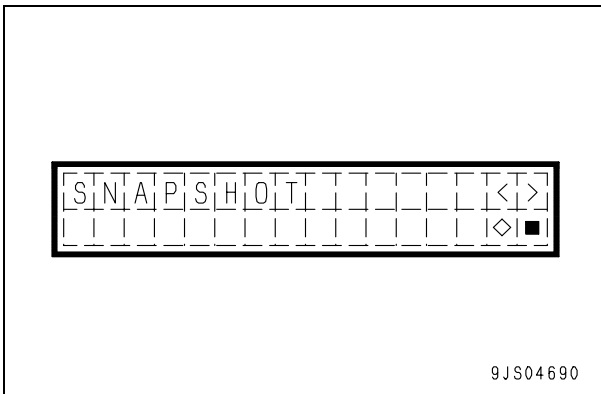
5. Finishing of display

Press the [■] switch to return to the engine mode fixing function screen.

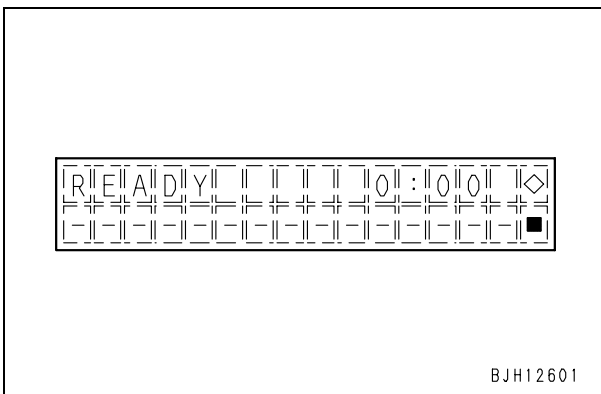
- Fixing of the engine mode is reset.

[20] Manual snapshot function (Snapshot)

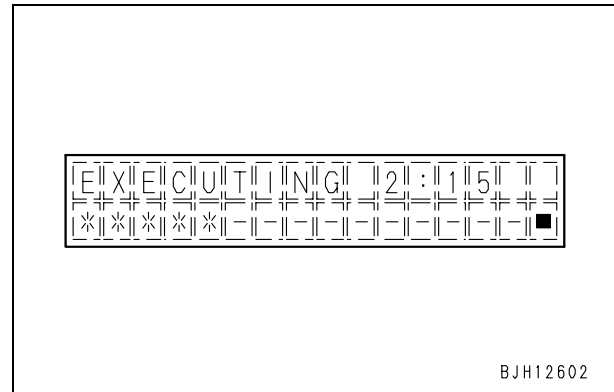
- This function is applicable to only machines equipped with VHMS.
 - The manual snapshot function stores 7 minutes and 30 seconds worth data to be used for Pm clinic or testing/adjustment to VHMS controller.
 - When collecting data at a regular interval for Pm clinic, it is required to observe the machine operating procedure specified for the quick Pm. As for the data collection for the testing or adjustment purpose, however, no specified machine operating procedure is stipulated.
 - When using the data being stored with the manual snapshot function, a PC must be connected. For the connecting as well as operating procedure, refer to VHMS controller initial setting procedure. (Connection of a PC may be done before or after the snapshot.)
- ★ For detail of operation of the snapshot function, see the Quick Pm implementation procedure.
1. Display the SNAPSHOT screen from the menu screen of Service mode.



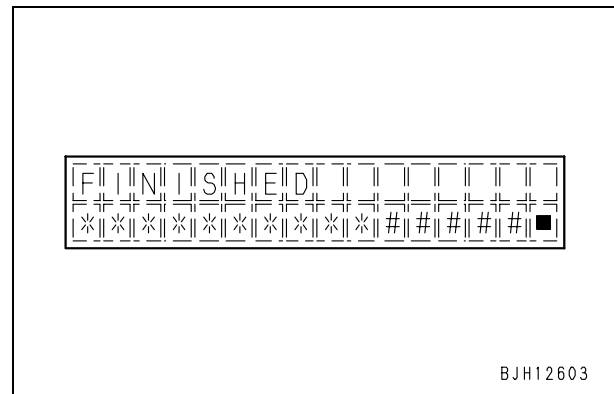
2. Pressing [◇] switch to turn on the ready (READY) screen.
 - ★ The lower column displays 15 pieces of [-] sign.



3. Press [◇] switch to start the snapshot.
 - ★ The upper column displays the elapsed time.
 - ★ [-] sign in the leftmost position of the lower column is replaced with [*] and it starts flashing.
 - ★ For every 30 seconds, [-] is replaced with [*] starting with the leftmost one. When two or more [*] signs are displayed, the rightmost one flashes.
 - ★ Pressing [■] switch while the snapshot is taking place stops the snapshot.



4. Refer to the Pm clinic implementation procedure for the machine operation.
 - ★ After 10th [*] is displayed (5 minutes elapsed from the start), [#] will be displayed for 11th through 15th positions.
 - *: Indicates the data sampling interval is once every 10 seconds.
 - #: Data sampling interval is once every 1 second.
5. As 7 minutes and 30 seconds elapsed from start of the snapshot, following screen appears and then the initial screen is restored in 5 seconds later. (End of snapshot)

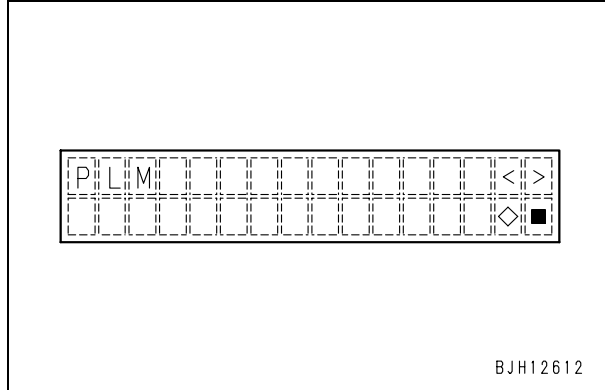


[21] PLM setting function (PLM)

- This function is applicable when the PLM in VHMS is installed.

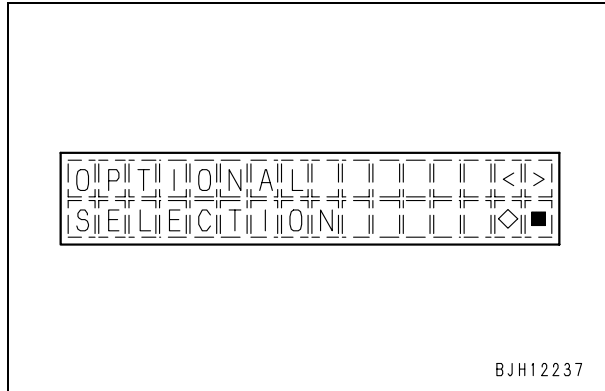
Set various items of the payload meter (PLM) with the machine monitor.

The details refer to "Setting of payload meter built in VHMS".

**[22] Option selection function (OPTIONAL SELECTION)**

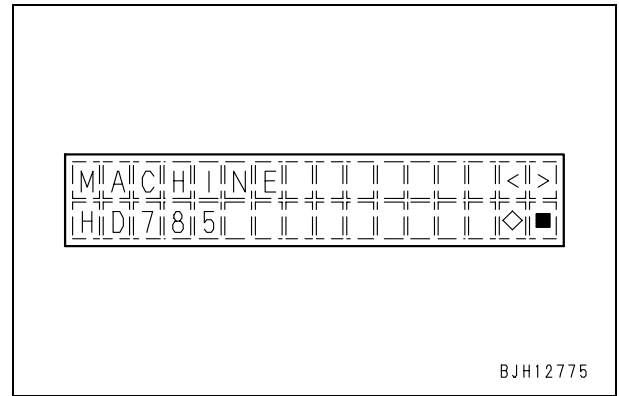
Machine monitor can set and adjust various optional devices which have been installed or removed.

- ★ The operating method of this function refers to the item of "Setting and adjusting various equipment".

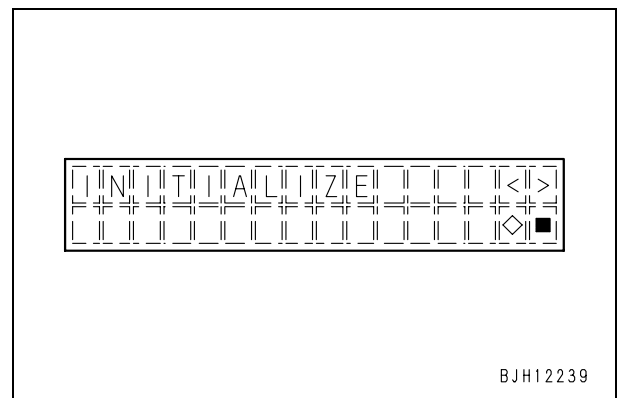
**[23] Model selection function (MACHINE)**

Machine monitor is common among many models, and if the machine monitor is replaced, select the same model as the one currently installed.

- ★ The operating method of this function refers to the item of "Setting and adjusting various equipment".

**[24] Initializing function (INITIALIZE)**

- ★ This function is exclusive for the plant, and is not used for service.



HD785-7 Dump truck

Form No. SEN01773-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7

7001 and up

30 Testing and adjusting

Testing and adjusting, Part 5

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Pm Clinic check sheet.....	29
Initial setting of payload meter	33
Setting of payload meter built in VHMS	34

VHMS controller initial setting procedure

★ Testing instrument

Symbol	Part No.	Part name
N	1	799-608-3211 Diskette
	2	799-608-3220 Wiring harness
	3	Commercially available Note type PC (Windows 98/2000/Me/XP and terminal "RS232C" is with it)

- ★ Initial setting of VHMS controller shall be done according to the following procedure. This operation is needed prior to a full-scale operation of a machine being delivered and assembled in the field, or prior to resumption of its operation after a long time of storage.
- ★ Machine data collected with VHMS controller are stored and managed on WebCARE database. In order to endure smooth data processing on WebCARE, consistency must be provided among the settings done on VHMS controller. Inconsistencies in the settings obstruct loading of data to WebCARE, hampering appropriate use of VHMS data. The initial setting, therefore, is a must.
- ★ For the method of installing the VHMS Initialization Program to the personal computer, refer to the Operation and Maintenance Manual contained in the package of diskette **N1**.
- ★ In the procedure, service menus of the monitor panel are used. Thus, it is advisable to reference the information contained in the "Special functions of monitor panel" to understand their procedure beforehand.
- ★ The initial setting procedure is described in the ORBCOM installation specification and the ORBCOM-less specification. When using the ORBCOM installation specification, implement the procedures needed for VHMS alone, bypassing those prepared only for ORBCOM installation specification.
- ★ Check each step of the setting work referencing the VHMS initial setting work check sheet.
- ★ Information such as models shown in the figures may not be identical with actual ones.

1. Confirmation of machine information, engine information, transmission controller information and controller information

- ★ This confirmation procedure is targeted at the entire machine.
Confirm and record the machine information, engine information, VHMS controller information and ORBCOM terminal information.

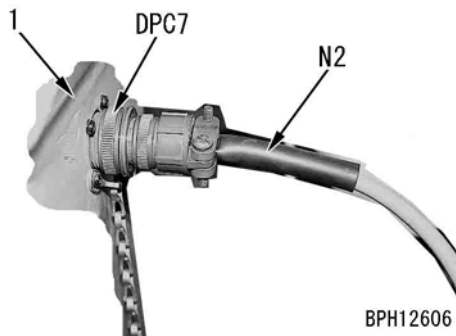
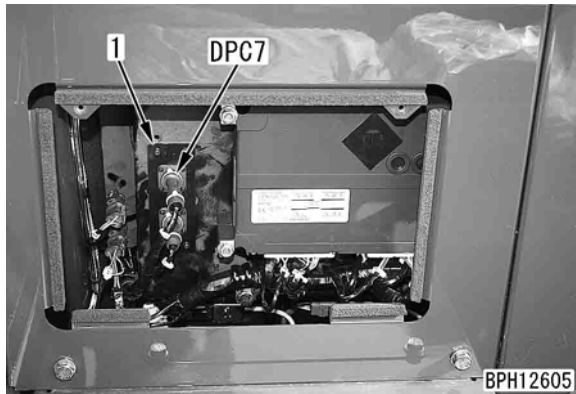
No.	Information to be confirmed
1	Model name
2	Machine serial No.
3	Current service meter hour
4	Engine serial No.
5	Transmission serial No.
6	VHMS controller serial No.
7	ORBCOM terminal serial No. [Only for machines equipped with ORBCOM]

2. Connecting a PC

- ★ This work is done inside the cab.
- 1) Make sure the starting switch is at OFF position.
 ⚠ **Before connecting or disconnecting a PC, be sure to turn off the starting switch.**
- 2) Using harness **N2**, connect the PC **N3** and download connector **DPC7**.
 ★ Then connect the PC to RS232C terminal.

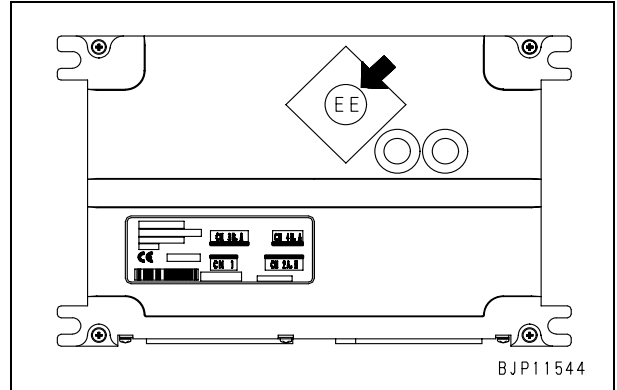


- ★ Download connector **DPC7** is installed to box (1) in the cover at the rear of the operator's seat.

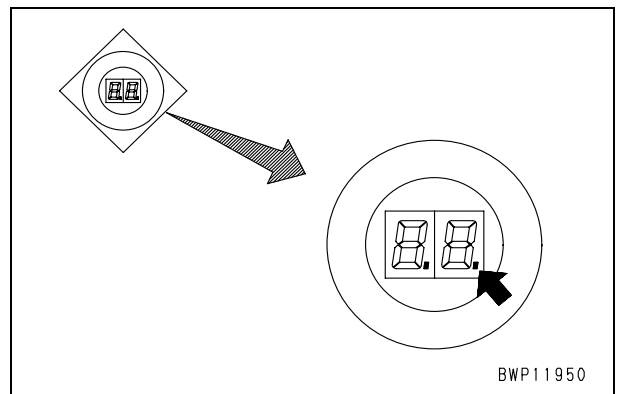


3. Confirming VHMS controller operation and confirming satellite capturing state

- ★ This work is done inside the cab.
 - ★ Confirmation of capturing of the satellite is done for [ORBCOM installation specification].
- 1) Turn the starting switch ON.
 - 2) Check the controller for normal operation referencing 7-segment LED of VHMS controller.
 - ★ The VHMS controller is powered with the accessory power supply. Accordingly, when the starting switch is turned ON, the 7-segment LED must blink to display rotation and then count up in hexadecimal notation. If the LED operates in this way, the VHMS controller is operating normally.



- 3) Among the 7-segment LED situated in the right side of VHMS controller, refer to the one that represents the decimal point to check whether or not ORBCOM controller has captured the communication satellite. [ORBCOM installation specification]
 - ★ Check whether or not ORBCOM controller is capturing the communication satellite from VHMS controller.
 - ★ Perform this check within 3 minutes after the VHMS starts.
 - ★ If the decimal point LED of the right-hand 7-segment LED blinks slowly, the ORBCOM controller is operating normally.
 - Communication between the terminals is normal. The terminals have transmission data and have captured the satellite.



– Other states –

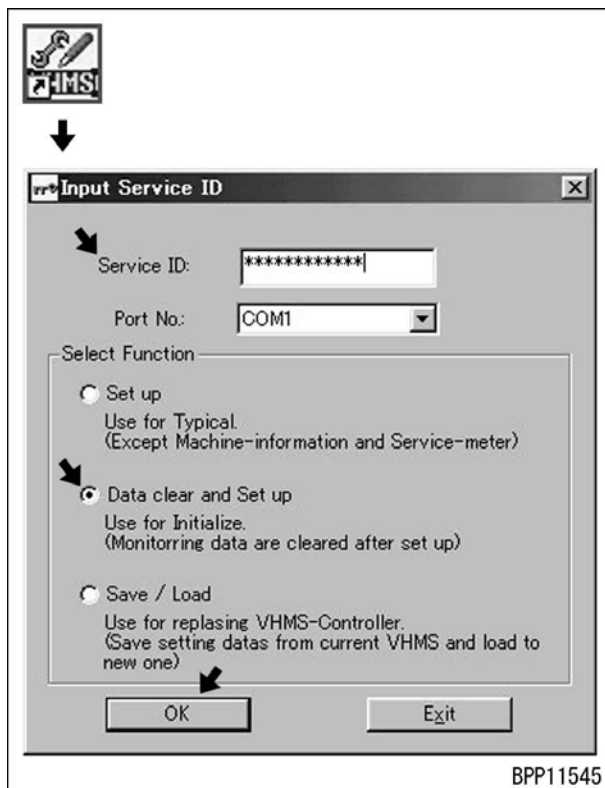
- OFF: The terminals cannot communicate with the ORBCOM terminal.
- ON: Communication between the terminals is normal. The terminals have not captured the satellite.
- Quick blink: Communication between the terminals is normal. The terminals do not have transmission data but have captured satellite.

4. Starting the VHMS initial setting tool

- ★ This work is done inside the cab (from PC).
- 1) Turn on the PC power and start the OS.
- 2) Operating [VHMS initial setting tool] icon on the PC, start up the VHMS initial setting tool.

Important

- ★ Appearance of the setup screen of the VHMS setting tool depends its tool.
 - ★ When using Ver.3.5.2.1 or older version (CD-ROM), the setting procedure shall conform to that described in Section 5.
 - ★ When using an update version (Ver.3.5.2.1 or after), the procedure in Section 6 shall be used.
 - ★ It is recommended to download the latest VHMS version from WebCARE to update the currently used version. (Related material: SERVICE MATE SMP-623)
- 3) Enter the 10-digit service ID to [Service ID].
 - ★ Service ID: **7826138000**
 - 4) Select [Data clear and Set up] from [Select Function] item.
 - 5) Click [OK] button to proceed to the setup screen.

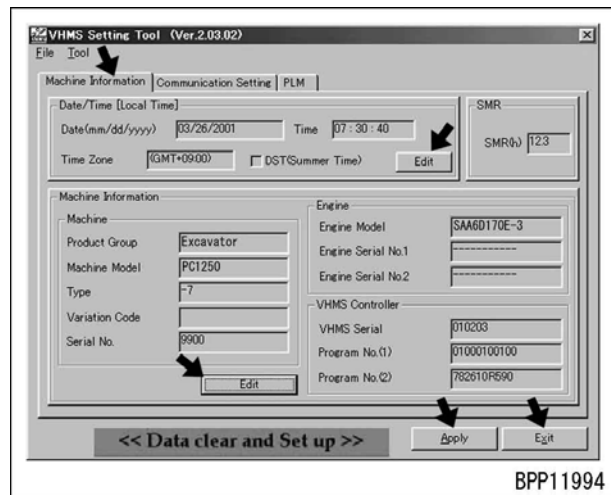


5. Initial setting of VHMS controller (Ver. 3. 5. 2. 1 or older version)

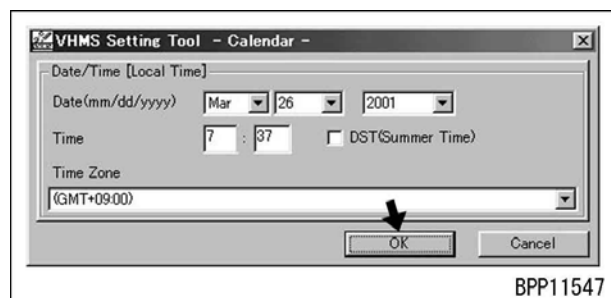
- ★ This work is done inside the cab (from PC).
- ★ It is prohibited in the initial setting to modify the data of service meter [SMR].

[Machine Information]

- 1) Open [Machine Information] tab.
 - ★ [Data clear and Set up] menu displays [Machine Information] tab first.
- 2) Check every data for correctness.
 - ★ The figure shows the display of another model as an example.



- ★ Select a [Variation Code] from the following table.
- 3) When [Date/Time] information is not appropriate, correct it in the following manner.
 - 1) Press [Edit] button in the lower right side of [Date/Time] box to display the correction screen.
 - 2) After correcting it to the correct information, press [OK] button.

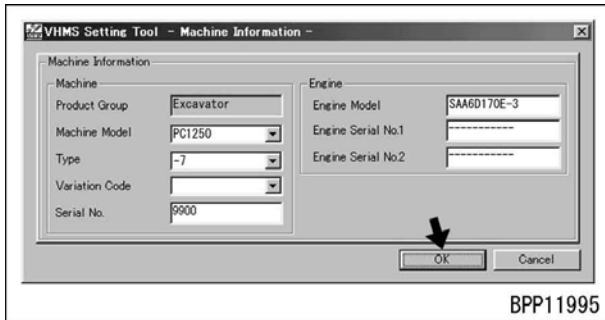


VHMS controller	PLM function in VHMS controller	Payload meter (PLM) function	Setting with VHMS initial setting manual (tool) (*1)			
			Model	Type	Variation code	Date Time Time difference (GMT) Summer time
Installed	Not installed	Not installed	HD785	- 7	ST	Set properly
Installed	Installed	Installed			PV	

(*1) For setting of the model, type, variation code, etc., see the VHMS initial setting manual (Tool)

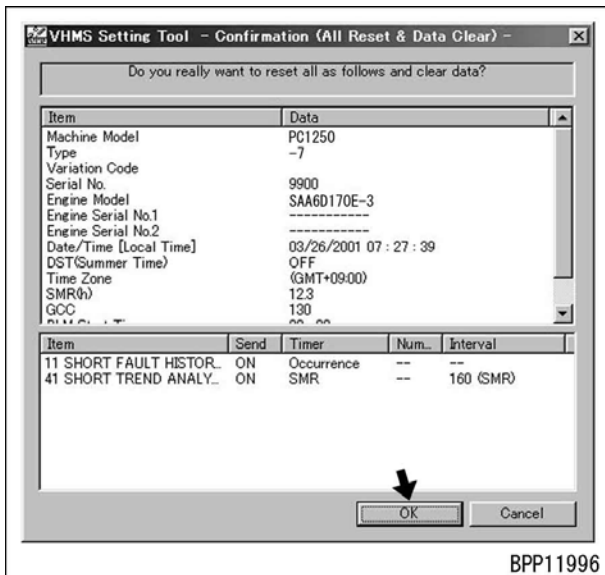
- ★ A variation code is an item among the model, date, etc. that are set with the personal computer software when the VHMS is initialized. It is used to notify the VHMS "whether the PLM in the VHMS is effective (Code: PV), and whether the machine has the payload meter (PLM) function (Code: ST)".
- ★ Since A and B of the short connector to be connected to connector No. HM-50 are not used, connect them normally.

- 4) When [Machine Information] information is not appropriate, correct it in the following manner.
 - 1) Press [Edit] button in the lower right side of [Machine Information] dialog box to display the correction screen.
 - 2) After correcting it to the correct information, press [OK] button.



BPP11995

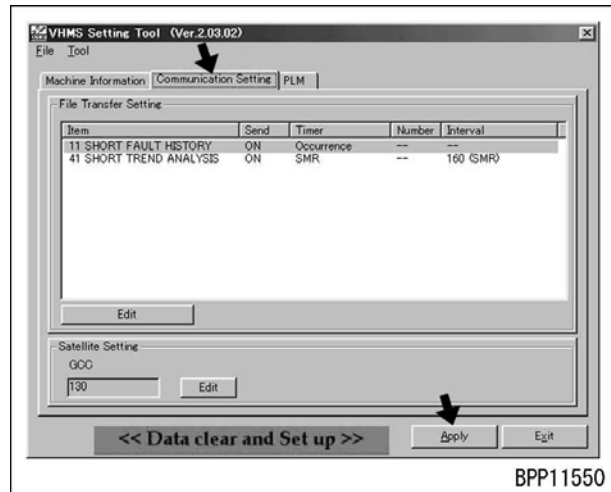
- 5) As every data in [Machine Information] has been checked and corrected, press [Apply] button to settle the setting.
 - ★ As [Apply] button is pressed, a message confirming above setting will appear on the screen. Check the setting again and, if the setting is correct, press [OK] button.
 - ★ ORBCOM installation specification requires the settlement operation after [Communication Setting] is completed.



BPP11996

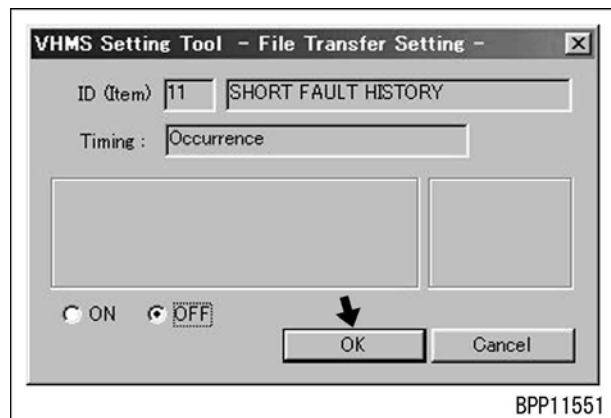
[Communication Setting] [ORBCOM installation specification only]

- ★ This setting shall be implemented after the request for station opening has been made and station of ORBCOM has been opened.
- 6) Open [Communication Setting] tab.
 - 7) Check every data for correctness.



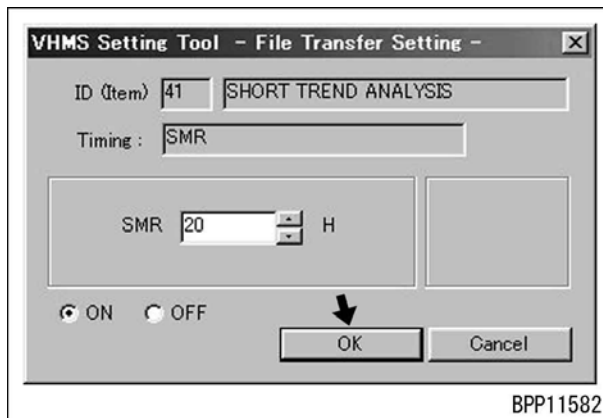
BPP11550

- 8) When modifying the setting of [SHORT FAULT HISTORY], employ the following procedure.
 - 1) Select [SHORT FAULT HISTORY] from the screen and then press [Edit] button in the lower left side of [File Transfer Setting] block to display the setup screen.
 - 2) Correct the setting and, as it is completed, press [OK] button.
 - ★ In the initial setting, select [Occurrence] from [Timing] item and then set the function to ON.

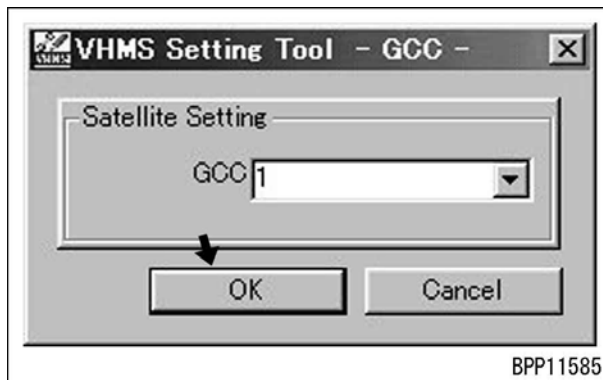


BPP11551

- 9) When modifying the setting of [SHORT TREND ANALYSIS], employ the following procedure.
- 1) Select [SHORT TREND ANALYSIS] from the screen and then press [Edit] button in the lower left side of [File Transfer Setting] block to display the setup screen.
 - 2) Correct the setting and, as it is completed, press [OK] button.
 - ★ In the initial setting, enter [20] to [SMR] and then set the function to ON.

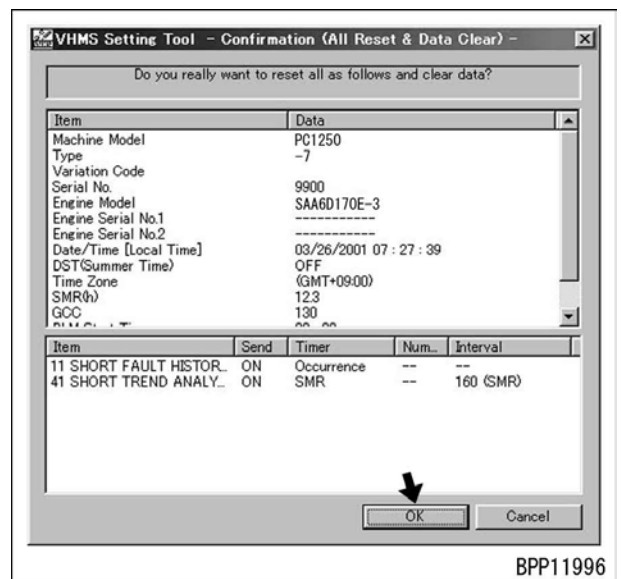


- 10) When modifying the setting of [Satellite Setting], employ the following procedure.
- 1) Press [Edit] button in the [Satellite Setting] block to display the correction screen.
 - 2) Set the GCC code to the region applied and, as setting is completed, press [OK] button.

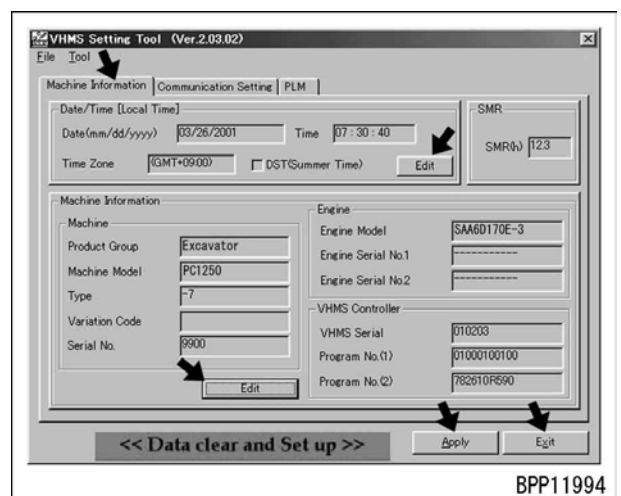


GCC codes and applicable regions			
Code	Applicable region	Code	Applicable region
1	America	122	Korea
120	Italy	123	Brazil
121	Malaysia	130	Japan

- 11) As every data in [Communication Setting] has been checked and corrected, press [Apply] button to settle the setting.
- ★ As [Apply] button is pressed, a message confirming above setting will appear on the screen. Check the setting again and, if the setting is correct, press [OK] button.



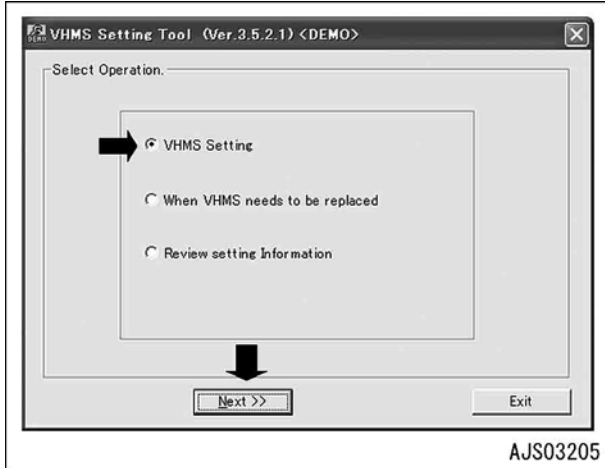
- 12) As every data in [Machine Information] and [Communication Setting] has been checked and corrected, press [Exit] button to end [VHMS initial setting tool].



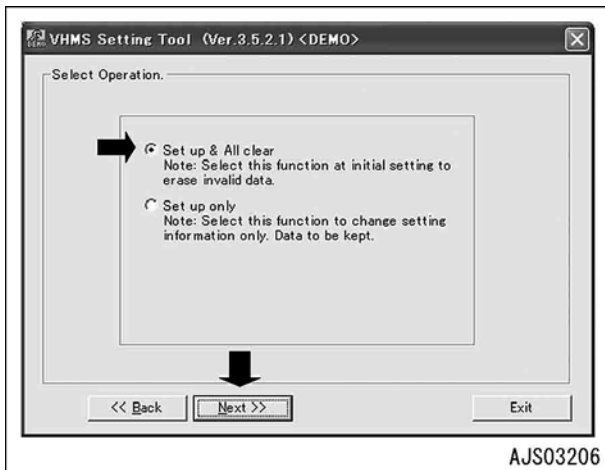
6. Initial setting of VHMS controller (Ver. 3. 5. 2. 1 or later version)

- ★ This work is done inside the cab (from PC).
- ★ It is prohibited in the initial setting to modify the data of service meter [SMR].

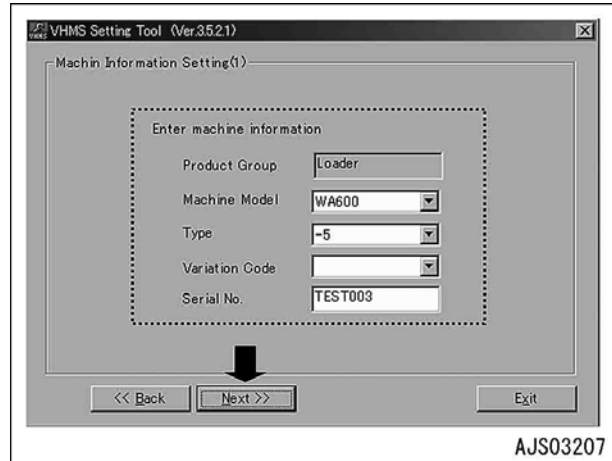
- 1) Select [VHMS Setting] and then press [Next] button.



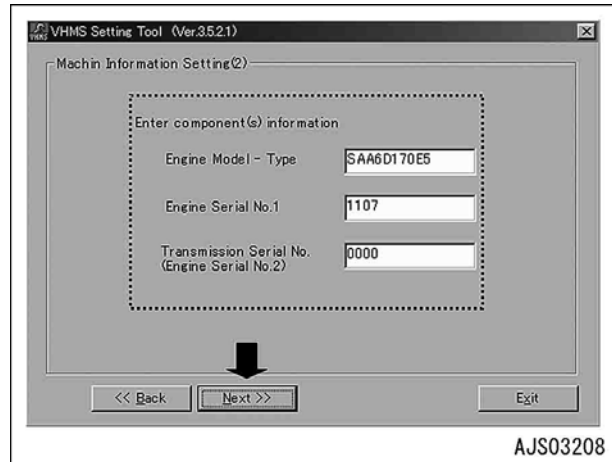
- 2) Select [Set up & All clear] and press [Next] button.



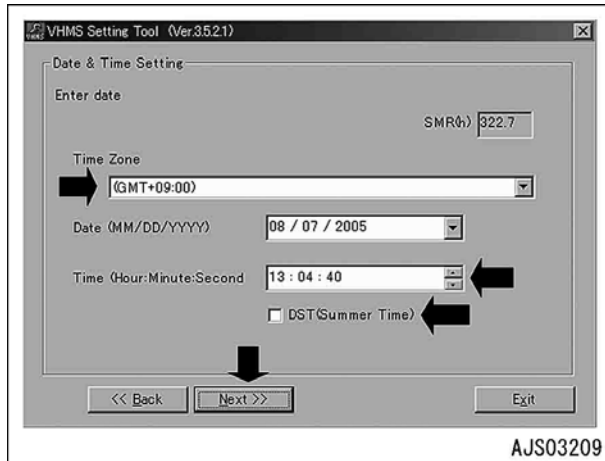
- 3) Confirm the machine information and, if they are correct, press [Next] button.



- ★ When VHMS has been installed later, it is required to enter the information such as [Serial No.].

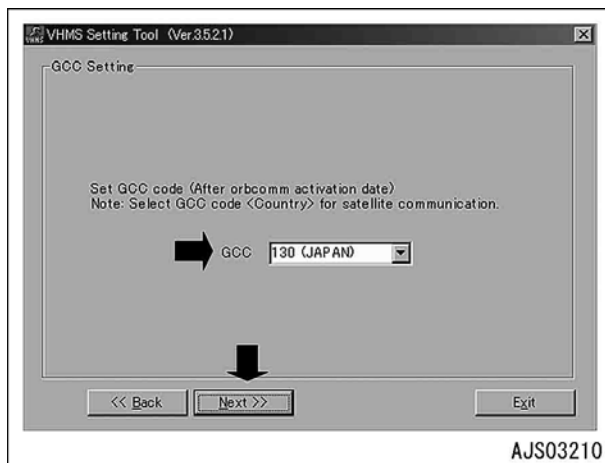


- 4) Select the time zone.
- 5) Enter the local time.
- 6) When DST (Daylight Saving Time) (or summer time) is currently used, press [Next] button.
 - ★ Selecting DST advances the clock by an hour. Thus, correction of the time is needed again.

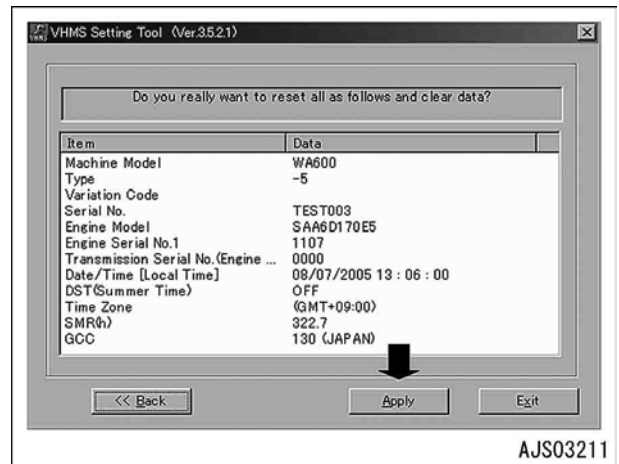


- 7) Set the GCC code to the target region of application and, as setting is completed, press [Next] button.

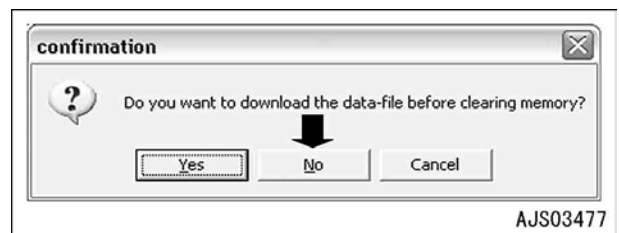
GCC codes and applicable regions			
Code	Applicable region	Code	Applicable region
1	America	122	Korea
120	Italy	123	Brazil
121	Malaysia	130	Japan



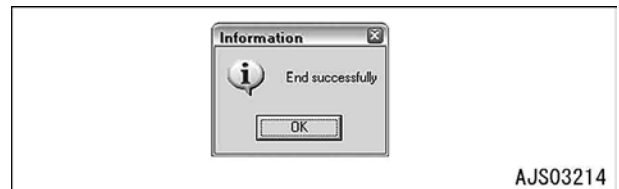
- 8) If there is no problem in the setting displayed last, press [Apply] button.



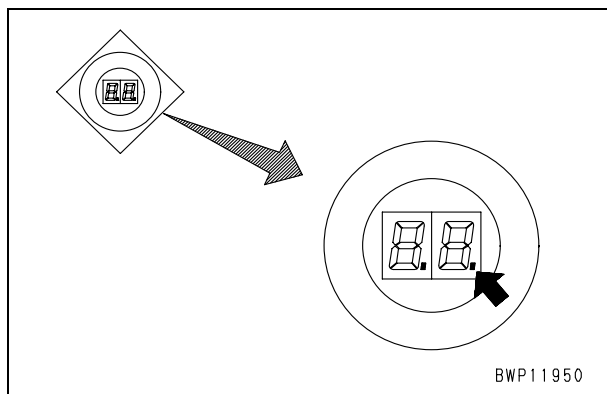
- 9) A screen message will confirm whether or not the data before the setting is to be saved. If the data is not necessary, select [NO].



- 10) As correction of the first setting is completed, press [OK] button to end the program.



- 11) Turn the starting switch OFF.
Check that the 7-segment LED of the VHMS controller keeps displaying for several seconds and then goes off securely.



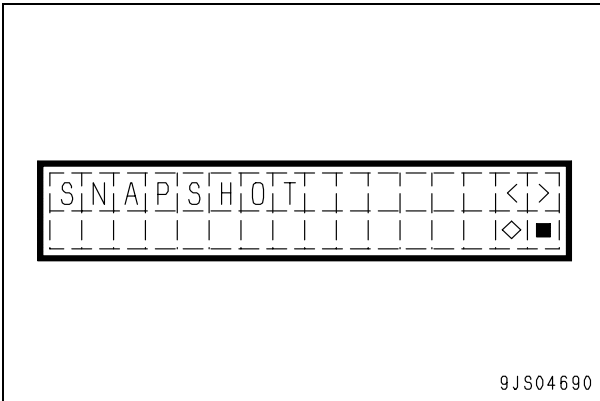
- 12) Opening station request of ORBCOMM terminal
Fill in the necessary matters in the paper of "opening request of ORBCOMM terminal" and send Customer Support Gr. Solution Div. komatsu Ltd by fax or mail.

7. Executing quick Pm

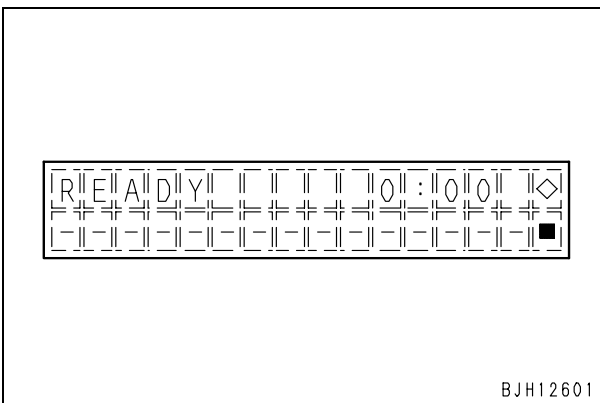
- ★ Quick Pm denotes the Pm click done by use of the manual snapshot function of the machine monitor.
- ★ It stores 7 minutes and 30 seconds worth of data to VHMS controller.

⚠ Park the machine in a flat place.

- 1) Start the engine.
- 2) Switch the machine monitor to Service menu.
 - ★ For the procedure of opening Service menu, see "Special functions of machine monitor".
- 3) Display the manual snapshot function screen from the menu screen of Service mode.

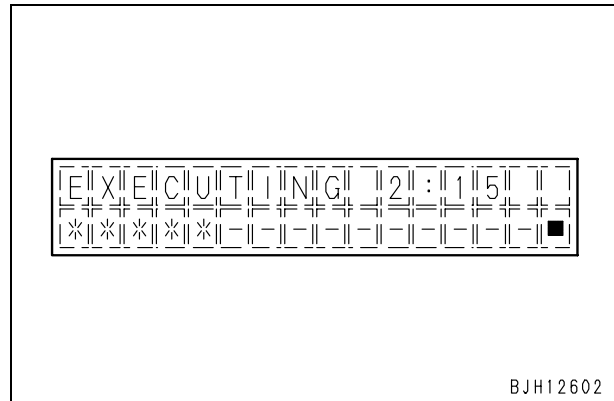


- 4) Press the buzzer cancel switch [◇].
- 5) [READY] will be displayed on the screen, turning on the standby mode.
 - ★ The lower column displays 15 pieces of [-] sign.



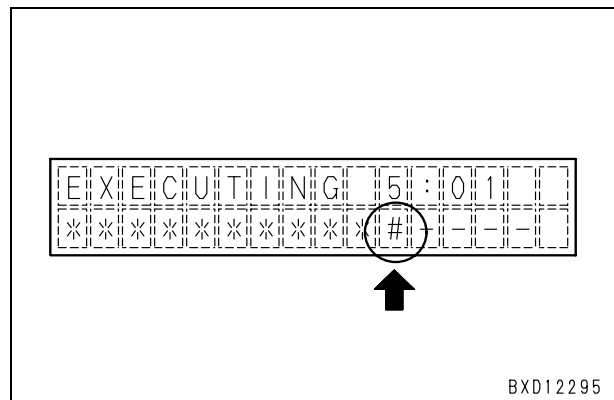
- 6) Press the buzzer cancel switch [◇] to start the snapshot.

- ★ As the snapshot is started, the upper column starts displaying the elapsed time.
- ★ [-] in the leftmost position of the lower column is replaced with [*] for every 30 seconds. When two or more [*] signs are displayed, the rightmost one flashes.
- ★ When stopping the snapshot currently taking place, press the buzzer cancel switch [■].



- 7) After the snapshot is started, operate the machine according to the following table.

- ★ Make sure the engine coolant temperature and torque converter oil temperature are within the operating range.
- ★ After 10th [*] is displayed (5 minutes elapsed from the start), [#] will be displayed for 11th through 15th positions.
 - *: Indicates the data sampling interval is once every 10 seconds.
 - #: Indicates the data sampling interval is once every 1 second.



★ Machine operation for snapshot

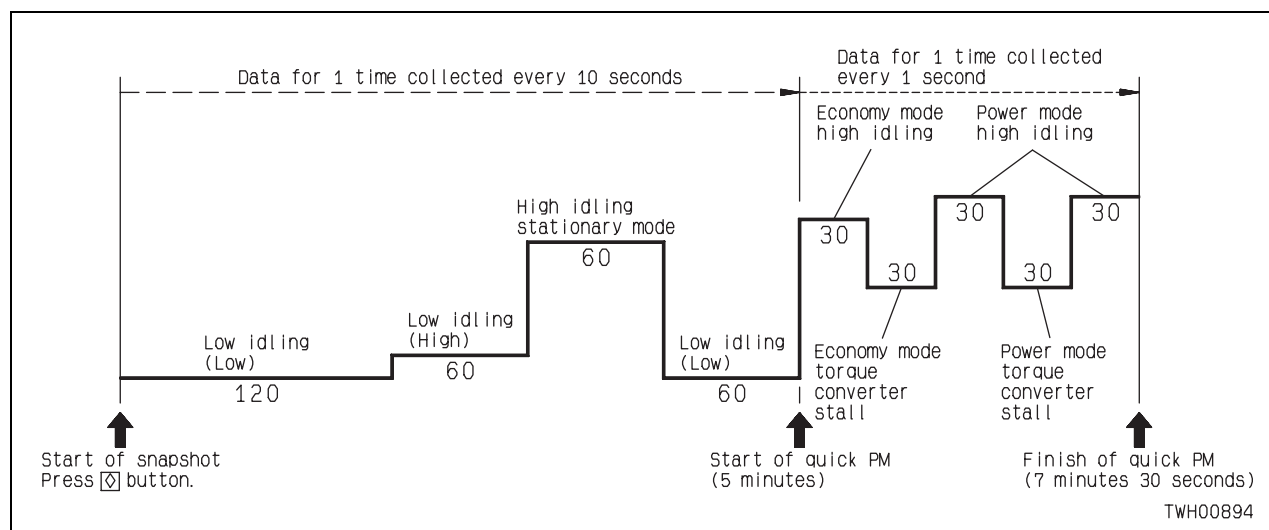
	Start	Finish	Time	Operation of machine	Measurement conditions						Remarks
					AISS switch	Power mode setting	Shift lever	Parking brake	Retarder	Dump lever	
1	0:00	2:00	120 sec	Low idle (Low)	Auto	Economy	N	ON	ON	Hold	
2	2:00	3:00	60 sec	Low idle (Hi)	Auto	Economy	N	OFF	OFF	Hold	(*1)
3	3:00	4:00	60 sec	High idle (Stationary mode)	Auto	Economy	N	ON	ON	Float	
4	4:00	5:00	60 sec	Low idle (Hi)	Auto	Economy	N	ON	ON	Hold	
5	5:00	5:30	30 sec	High idle (Economy mode)	Auto	Economy	N	ON	ON	Hold	
6	5:30	6:00	30 sec	Torque converter stall (Economy mode)	Auto	Economy	D	OFF	ON	Hold	(*2, *3)
7	6:00	6:30	30 sec	High idle (Power mode)	Auto	Power	N	ON	ON	Hold	
8	6:30	7:00	30 sec	Torque converter stall (Power mode)	Auto	Power	D	OFF	ON	Hold	(*2, *3)
9	7:00	7:30	30 sec	High idle (Power mode) + 20 pumping operations of foot brake	Auto	Power	N	ON	ON	Hold	

(*1) Press the foot brake.

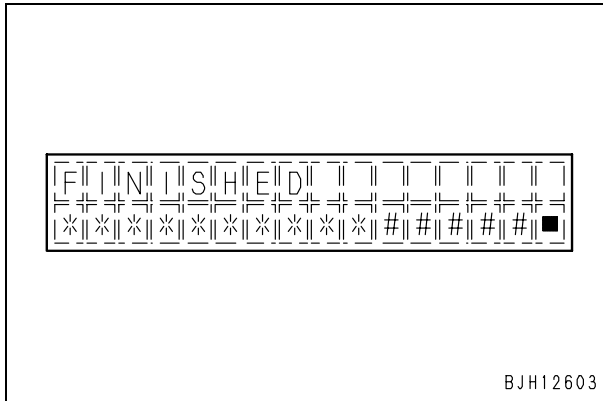
(*2) When stalling the torque converter [Portion marked with (*)], do not overheat it.

[Stall of torque converter for 30 seconds is only a reference. When the oil temperature gauge reaches the top of the white range while the torque converter is stalled, return the transmission (gearshift) lever to the N position.]

(*3) When setting the gearshift lever in the D position, return the engine speed to low idle temporarily (to prevent the machine from running out).



- 8) As 7 minutes and 30 seconds elapsed from start of the snapshot, following screen appears and then the initial screen is restored in 5 seconds. (End of snapshot)

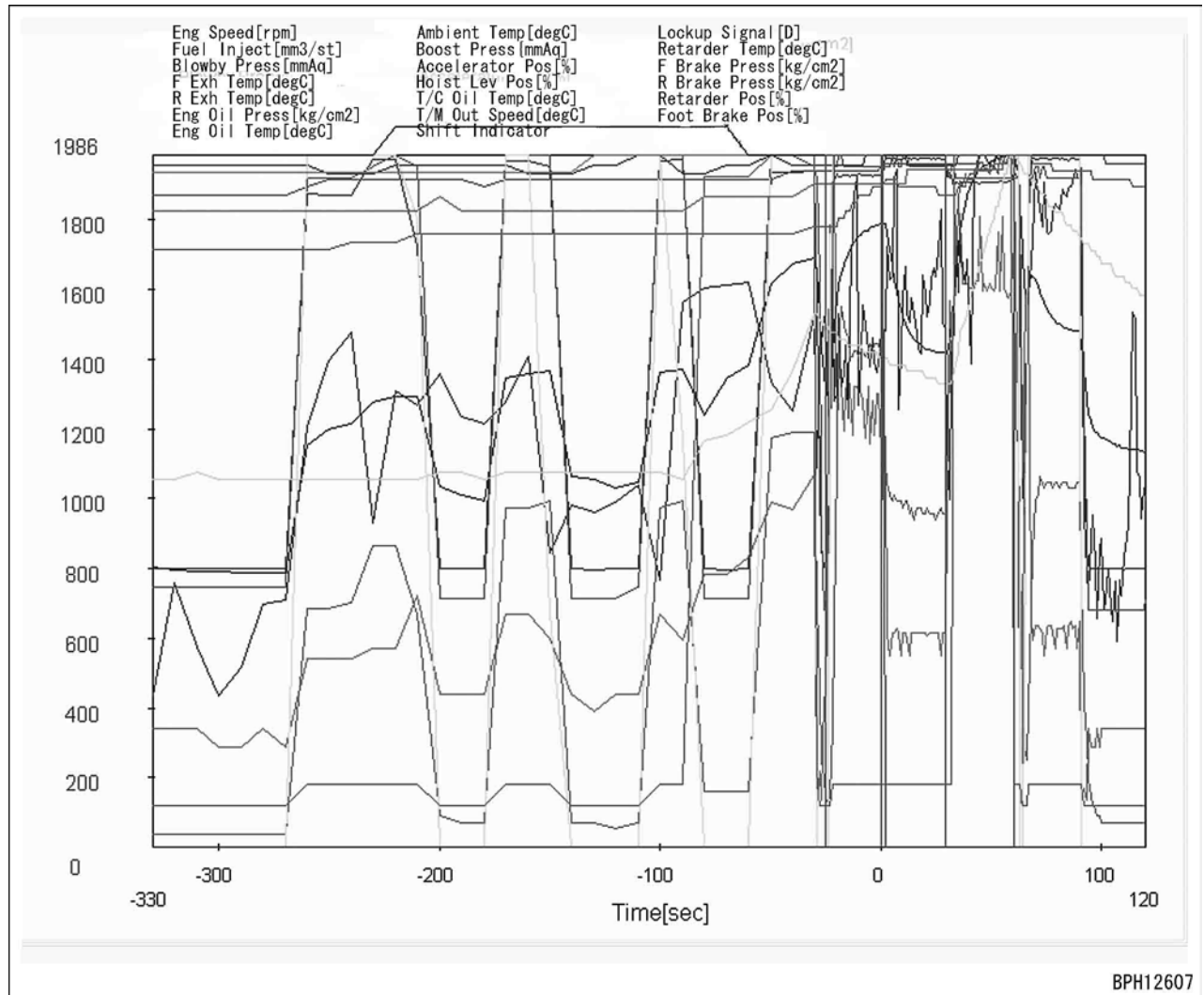


Important

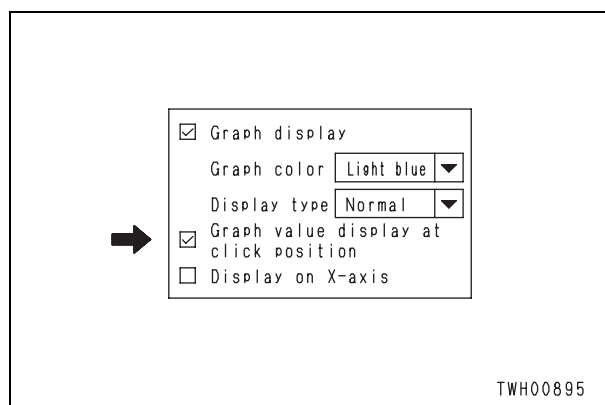
Data of quick Pm are recorded only once. Thus, if another quick PM is repeated, the current data will be overwritten with the last one. In order to avoid above trouble, be sure to download data of every completed quick Pm shall to PC. For the procedure, see 8. Download of setting data.

- 9) Read the quick PM data by use of the analysis tool.
- ★ For detailed usage of the analysis tool, see the operation and maintenance manual.

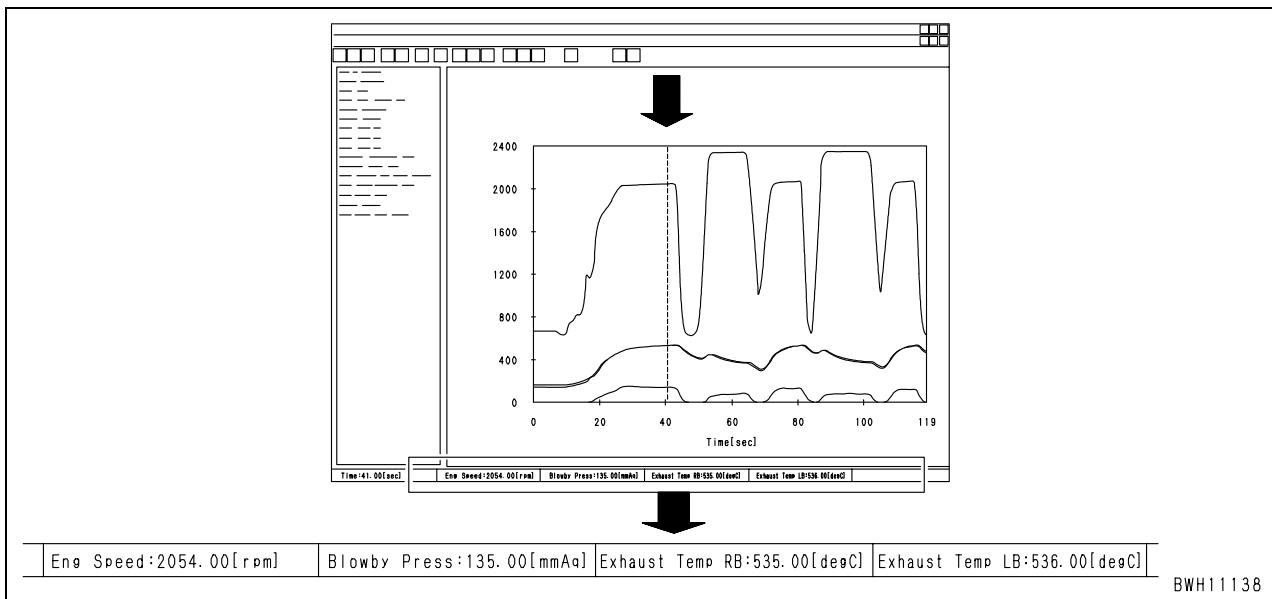
- 10) Open the quick Pm data to draw a graph.
- ★ Set the Time to the X-axis and set the following to the Y-axis.
 - Engine Speed (Engine speed)
 - Fuel Inject (Fuel injection rate)
 - Blowby Press (Blow-by pressure)
 - FL Exhaust Temp (Exhaust temperature of left bank of No. 1, 2, 3 cylinders)
 - RL Exhaust Temp (Exhaust temperature of left bank of No. 4, 5, 6 cylinders)
 - FR Exhaust Temp (Exhaust temperature of right bank of No. 1, 2, 3 cylinders)
 - RR Exhaust Temp (Exhaust temperature of right bank of No. 4, 5, 6 cylinders)
 - Engine Oil Press (Engine oil pressure)
 - Engine Oil Temp (Engine oil temperature)
 - Coolant Temp (Engine coolant temperature)
 - Ambient Temp (Ambient temperature)
 - Boost Press (Boost pressure)
 - Accelerator Pos (Accelerator position)
 - Hoist Lev Pos (Dump lever position)
 - T/C Oil Temp (Torque converter oil temperature)
 - T/M Out speed (Transmission output speed)
 - Shift Indicator (Gearshift position)
 - Lock Up Signal (Lockup signal)
 - Retarder Temp (Retarder oil temperature)
 - F Brake Press (Front brake oil pressure)
 - R Brake Press (Rear brake oil pressure)
 - Retarder Position (Retarder position)
 - Foot Brake Position (Foot brake position)



- 11) Apply a check mark to the Display graph value at clicked position.



- 12) Clicking the graph shows, below the graph, the X-axis value of respective measurement items. (An example of a graph displayed – Not an actual one)

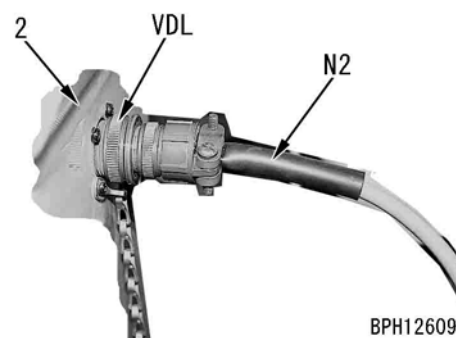
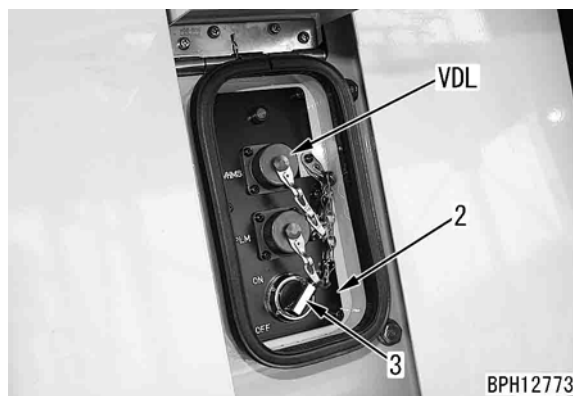


8. Download of setting data

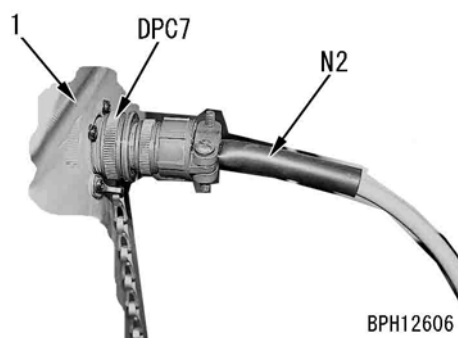
- 1) Using harness **N2**, connect PC **N3** to download connector **DPC7** in the cab or download connector **VDL** on the ground.



- ★ Download connector **DPC7** in the cab is installed to box (1) in the cover at the rear of the operator's seat.

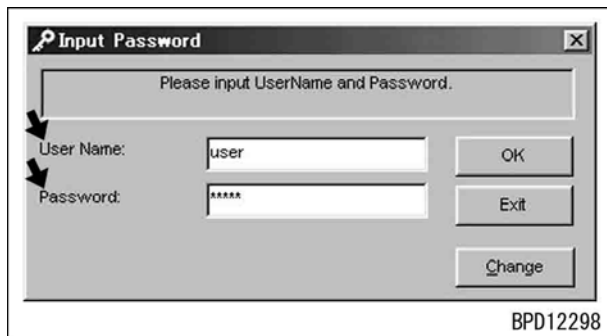


- 2) When using download connector **DPC7** in the cab, set the starting switch to ON position.
- 3) When using download connector **VDL** on the ground, set switch (3) to ON position.
★ The green LED will come on.
- 4) Operating [VHMS analysis tool] on PC, start up the VHMS analysis tool.

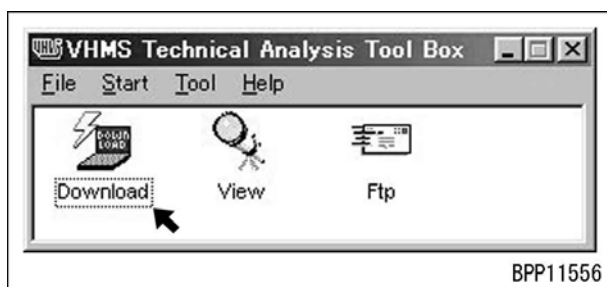


- ★ Ground download connector **VDL** is installed to box (2) in the cover at the rear of the ladder on the front right side of the machine.

- ★ Enter [User Name] and [Password].
- ★ For the operating procedure, see the VHMS analysis tool operation and maintenance manual.

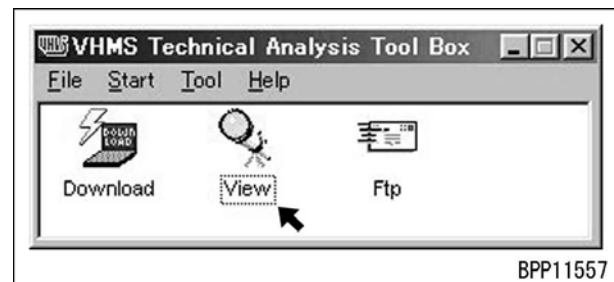


- 5) Using [Download] function, download the data currently recorded on VHMS to PC.
 - ★ For the operating procedure, see the VHMS analysis tool operation and maintenance manual.
 - ★ After making sure the download is complete, proceed to the next step.



9. Confirmation of download data

- 1) Check the setting data using [View] function.
 - ★ For the operating procedure, see the VHMS analysis tool operation and maintenance manual.
 - ★ Make sure that [MFA0] code, which was used in the quick snapshot, is indicated in [Fault History].
 - ★ Make sure the snap shot data are recorded.



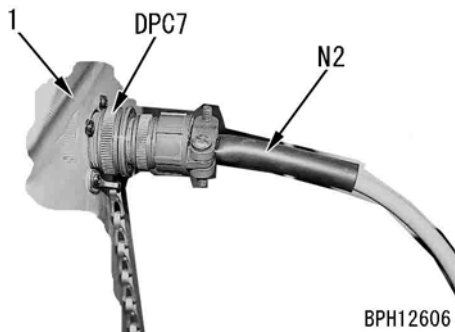
- 2) As check of the setting data is finished, end [VHMS analysis tool].

10. Disconnecting the PC

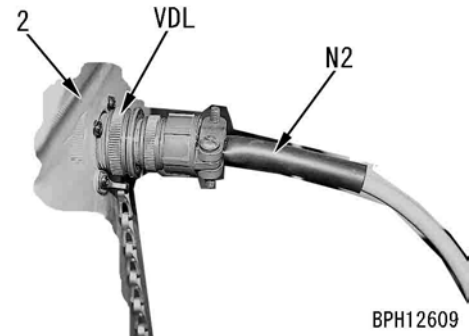
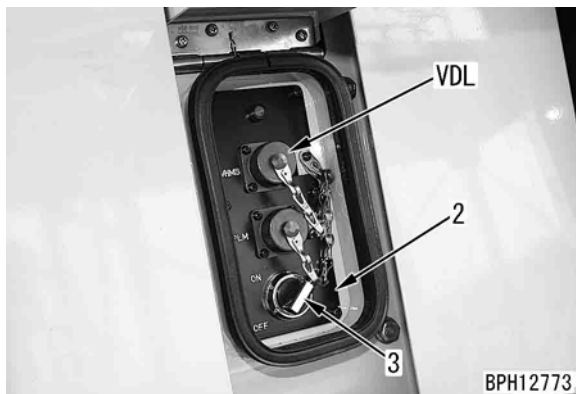
- 1) Make sure the starting switch is at OFF position.
⚠ Before connecting or disconnecting a PC, be sure to turn off the starting switch.
- 2) End the OS of PC **N3** and then turn off the PC power.



- 3) When the data was download into the cab, disconnect harness **N2** from download connector **DPC7**.



- 4) When the data was download to the ground, disconnect **N2** from download connector **VDL**.

**11. Report to Komatsu**

As steps 1 – 10 are completed, send VHMS/ WebCARE setting report to VHMS/WebCARE Support Center in Komatsu Headquarters.

- ★ This report is a must since setting on the receiving end in the satellite communication must be done by Komatsu.
- ★ In this case, send VHMS data via Notes (LAN) or E-mail (WAN).

Komatsu VHMS/WebCARE Support Center

2-3-6, Akasaka Minato-Ku Tokyo, Japan

FAX: 81-3-5561-4766 (from outside of Japan)
 FAX: 03-5561-4766 (Domestic user)

E-mail: webcare@komatsu.co.jp

[For storage]

VHMS Initial Setting Work Check Sheet

Date of setting:	
DB/branch office name	
Data entered by:	

Setup step		Check item	Result	
1	Confirmation of machine body and component nameplates	Model name		
		Serial No.		
		Engine serial No.		
		Transmission controller serial No.		
		VHMS controller serial No.		
2	Connection between PC and VHMS controller	Is the connection secure?	yes	no
3	VHMS controller check for normal operation	Is it operating normally? (Displays counting in ascending-order succeeding to rotation)	yes	no
4	Starting of VHMS initial setting tool	Is "Data Clear and Set up" selected for the setting tool mode?	yes	no
5	Initial setting of VHMS controller (Setting of machine body information) In this step, basic machine body information are set on VHMS controller	Is model name identical with machine body?	yes	no
		Is machine body serial No. correctly entered?	yes	no
		Is engine serial No. correctly entered?	yes	no
		Is today's date entered?	yes	no
		Is current time entered?	yes	no
		Is SMR correctly entered?	yes	no
6	Saving of settings	Is LED (7-segment) turned off?	yes	no
7	Confirmation of VHMS function	Is LED operation normal?	yes	no
8	Execution of quick Pm	Is service mode "SNAPSHOT" turned on and is the switch hit?	yes	no
9	Data storing operation on VHMS	Is LED (7-segment) turned off?	yes	no
10	Download	Is LED operation normal?	yes	no
11	Confirmation of download data	Are all files downloaded?	yes	no
		The time downloaded (Reference wrist watch)	Hour, minute:	
		[Confirmation of data]		
		Is [MFA0] error present in Fault History?	yes	no
		Are SMR and time in Fault History consistent with settings?	yes	no
12	Data storing operation on VHMS	Is any data missing in Snap Shot?	yes	no
		Is LED (7-segment) turned off?	yes	no

[For storage]
ORBCOM Station Opening Work
Check Sheet

Date of setting:	
DB/branch office name	
Data entered by:	

Setup step		Check item	Result	
1	Confirmation of machine body and component nameplates	Model name		
		Serial No.		
		Engine serial No.		
		Transmission serial No.		
		VHMS controller serial No.		
		ORBCOM terminal serial No.		
2	Connection between PC and VHMS controller	Is the connection secure?	yes	no
3	VHMS controller check for normal operation	Is it operating normally? (Displays counting in ascending-order succeeding to rotation)	yes	no
4	Starting of VHMS initial setting tool	Is "Set up" selected for the setting tool mode?	yes	no
5	Initial setting of VHMS controller 1. Setting of communication (Setting of machine body information and PLM are completed) 2. Setting for start of communication	Entry of setting to S.Fault History Presence/absence of communication Number of cases (Default is 8 cases)	On	Off
		Entry of setting of S.Trend Analysis setting Presence/absence of communication Interval (Default is 20H)	On	Off
		Entry of setting of S.Payload data Presence/absence of communication Tabulation start time Interval of tabulation (in days)	On	Off
			day	
		Is GCC code set? (130 for Japan)	yes	no
6	Saving of settings	Is LED (7-segment) turned off after data was stored?	yes	no
7	ORBCOM controller performance check	How is decimal point display in VHMS monitor (7-segment)? (OFF, ON, long/short flashing)	yes	no

To: VHMS / WebCARE Support Center
FAX : 81-3-5561-4766

SEKN5051-1
Attached Sheet

VHMS / WebCARE Basis Information Sheet

<i>For Machine Registration into WebCARE</i>	<i>Please describe clearly.</i>
<<DB information>>	
Distributor name / Branch	/
Person in charge	
e-mail address	
DB code(GCPS code)	
<<Customer information>>	
Customer name / Site name	/
<<Machine information>>	
Model - type	
Serial No.	
Engine Serial No. (Enter both of two engines if mounted.)	/
Transmission Serial No.	
Unit No.	
Date of Orbcomm activation	

<i>For initial download data check</i>	<i>Result</i>
Reason for VHMS setting *Check the reason on the right. *For replacement, enter the serial No. of the replaced component below each column (Note).	☐ (Note 1) The new machine delivery or Retro - Fit
	☐ (Note 1) Replace the VHMS controller.
	☐ (Note 2 or 3) Replace the component. (engine or transmission)
Setting date	(mm:dd:yyyy) (: :)
Setting time (Checked by watch)	(HH :MM: SS) (: :)
Person in charge of setting	
Service Meter Reading	
(Note1) New VHMS controller serial number.	
(Note2) New engine serial number.	No.1 Engine ()
Enter both of two engines if mounted.	No.2 Engine ()
(Note3) New transmission serial number.	
GCC code(If Orbcomm is equipped)	
Time difference (GMT)	(Time Zone offset : 00)
Summer time (Daylight Savings Time)	ON / OFF
Did you initialize VHMS as described in the shop manual ?	YES

Important

WebCARE

*After entering the VHMS/WebCARE Basis Information Form, fax or email it to the following location with the initial download data.

VHMS / WebCARE support center (Product Support Div. Komatsu LTD.)

TEL : 81-3-5561-2765 *** FAX : 81-3-5561-4766 *** EMAIL : webcare@komatsu.co.jp

Precautions for replacing VHMS controller

★ Testing instrument

Symbol	Part No.	Part name
N	1	799-608-3211 Diskette
	2	799-608-3220 Wiring harness
	3	Commercially available Note type PC (Windows 98/2000/Me/XP and terminal "RS232C" is with it)

- ★ When it is required to replace a VHMS controller, setup of the replacing VHMS controller shall be conducted before and after the replacement according to the following procedure.
- ★ Machine data collected with VHMS controller are stored and managed on WebCARE database. In order to endure smooth data processing on WebCARE, consistency must be provided among the settings done on VHMS controller. Inconsistencies in the settings obstruct loading of data to WebCARE, hampering appropriate use of VHMS data. Setting work after replacement, therefore, is a must.
- ★ Check each step of the setting work referencing the "VHMS initial setting work check sheet".
- ★ Information such as models shown in the figures may not be identical with actual ones.

[Operations needed prior to replacement of VHMS controller]

1. Download of the remaining data

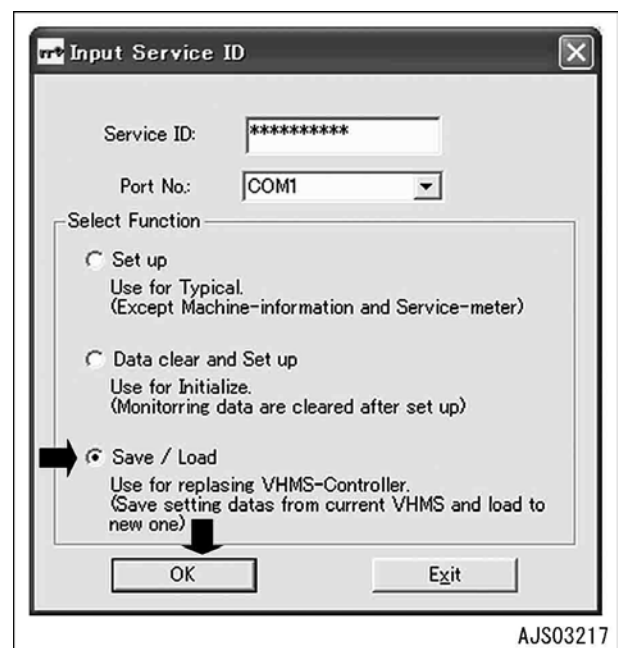
- ★ This work is done inside the cab (from PC).
- ★ Using [Download] function, download the currently recorded and remained data on VHMS to PC.
- ★ For the operating procedure, refer to "8. Download of setting data" in "VHMS controller initial setting procedure".

2. Confirmation, saving and loading of VHMS controller setting information (Ver. 3. 5. 2. 1 or older version)

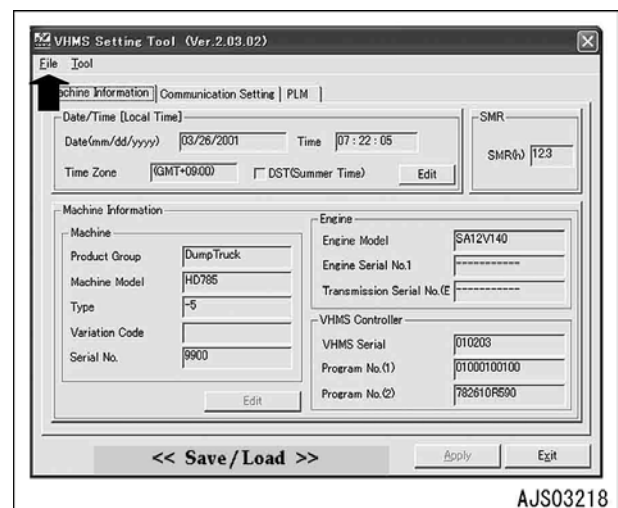
- ★ This work is done inside the cab (from PC).
- ★ Setting information is saved from the VHMS controller to be replaced to the PC and the saved information is loaded to the new VHMS controller after the replacement.

2-1. Confirmation and saving of VHMS controller setting information prior to replacement

- 1) Connect the PC and start the VHMS initial setting tool.
 - ★ See the "VHMS controller initial setting procedure" for this operation.
- 2) Select [Save/Load] and press [OK] button.

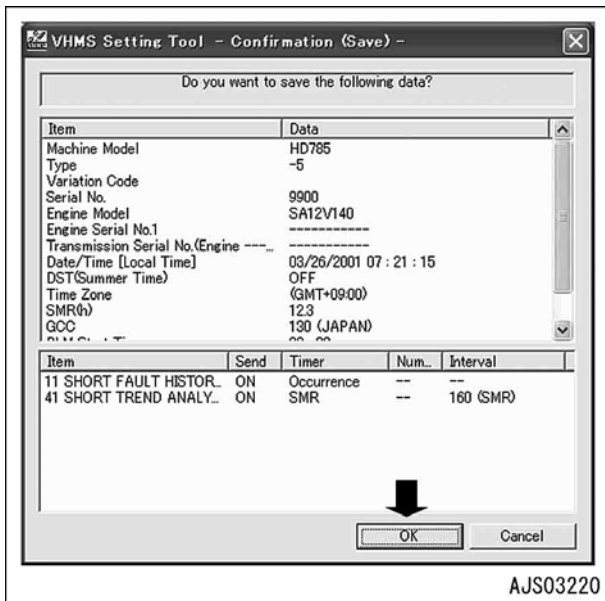


- 3) Confirm every information before the replacement.
- 4) Select [Save] from [File] of the menu.





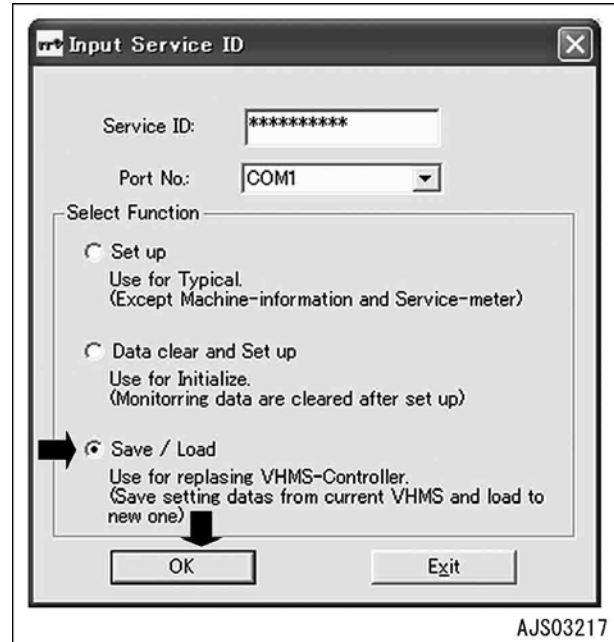
- 5) Reconfirm the information and then press [OK] button to save the information.



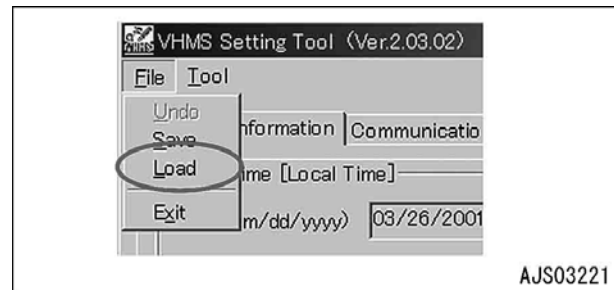
- 6) Select [Exit] from [File] of the menu to end the VHMS setting tool.
 7) Disconnect the PC.
 ★ Refer to "10. Disconnecting the PC" in "VHMS controller initial setting procedure".
 8) Turns the PC power off.
 9) Proceed to replacement of VHMS controllers.

2-2. Loading the setting information to the replacing VHMS controller

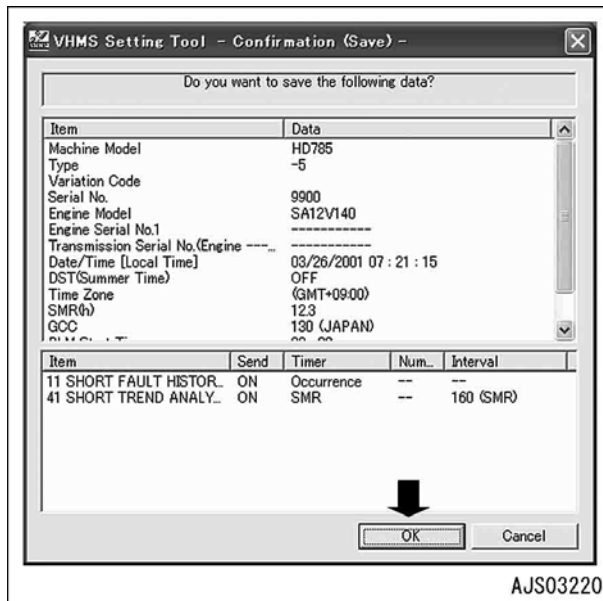
- 1) Connect the PC again and start the VHMS initial setting tool.
 ★ See the "VHMS controller initial setting procedure" for this operation.
- 2) Select [Save/Load] and press [OK] button.



- 3) Select [Load] from [File] of the menu.

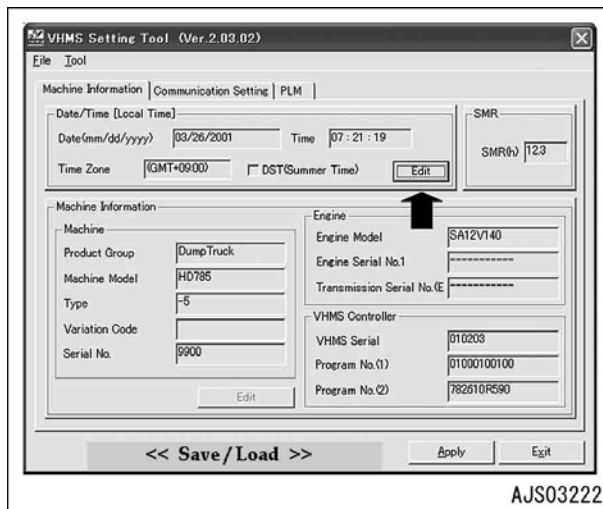


- 4) Currently saved information will be displayed. Press [OK] button.



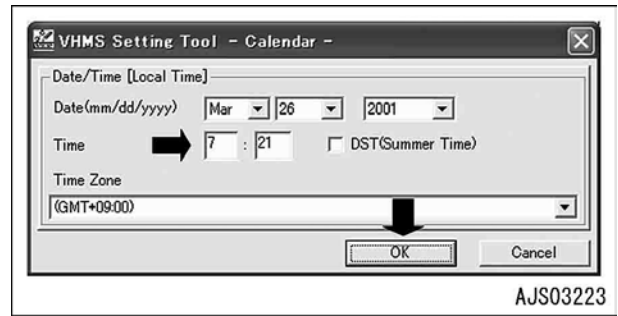
AJS03220

- 5) Display the saved information on another screen.
6) Press [Edit] button and adjust the time.



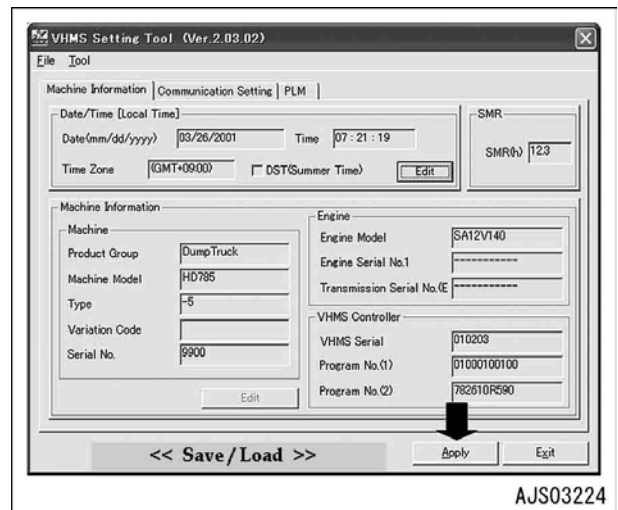
AJS03222

- 7) After adjusting time, press [OK] button.

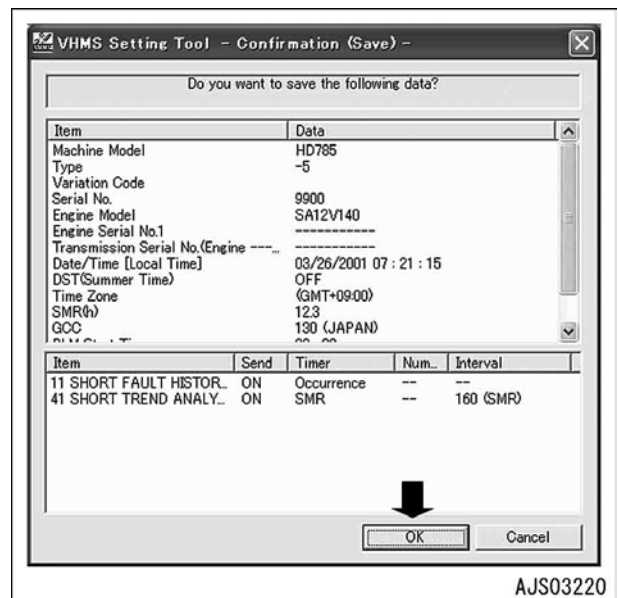


AJS03223

- 8) Press [Apply] button to display contents of the setting. Check the setting again and, if it is acceptable, press [OK] button.

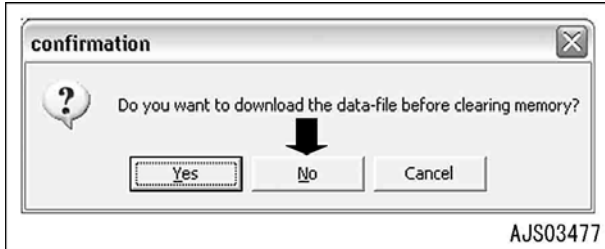


AJS03224

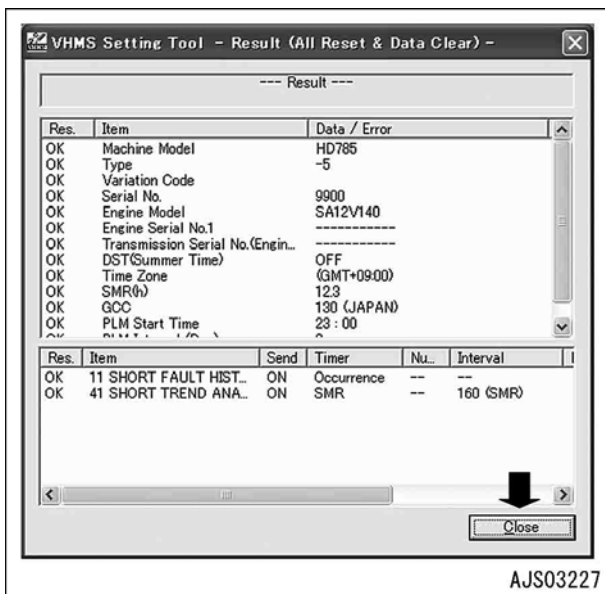


AJS03220

- 9) The confirmation screen will ask whether or not the data before the above setup is to be saved. Press [NO] button.
- ★ It is not necessary to save the data before the setting.



- 10) The setup result is displayed. Confirm the contents and press [Close] button.



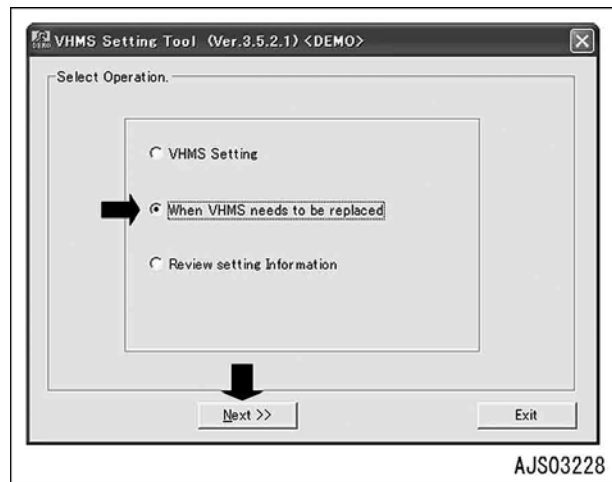
- 11) Select [Exit] from [File] of the menu to end the VHMS initial setting tool.

3. Confirmation, saving and loading of VHMS controller setting information (Ver. 3. 5. 2. 1 or later version)

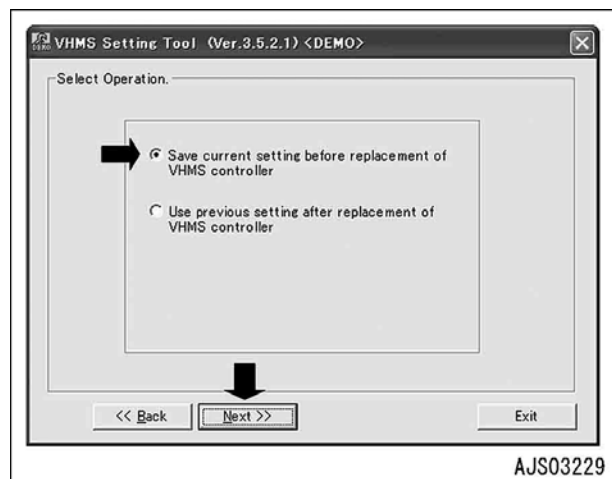
- ★ This work is done inside the cab (from PC).
- ★ Setting information is saved from the VHMS controller to be replaced to the PC and the saved information is loaded to the new VHMS controller after the replacement.

3-1. Confirmation of VHMS controller setting information prior to replacement

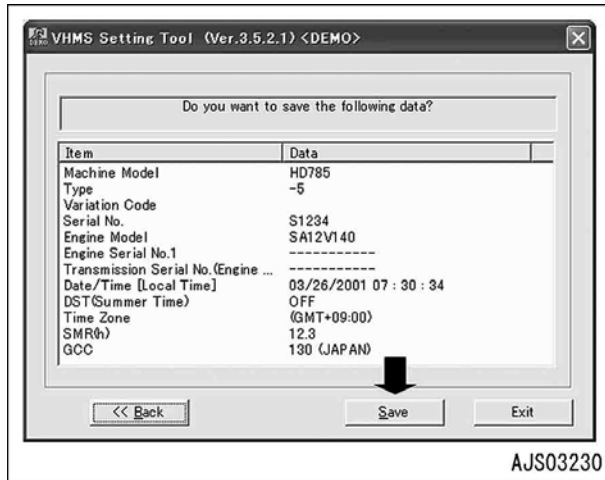
- 1) Connect the PC and start the VHMS initial setting tool.
 - ★ See the "VHMS controller initial setting procedure" for this operation.
- 2) Select [When VHMS needs to be replaced] and then press [Next] button.



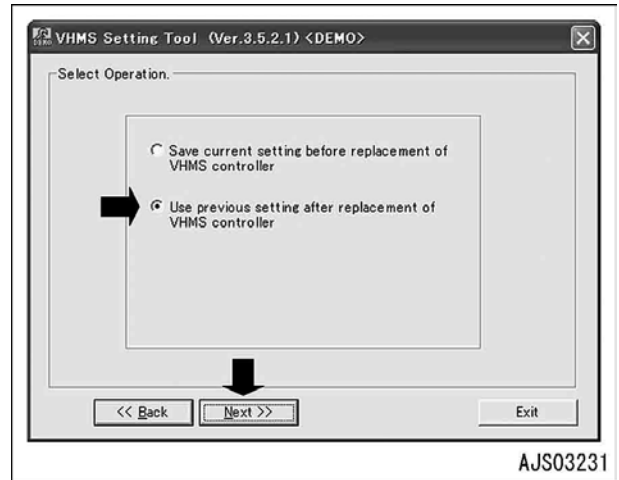
- 3) Select [Save current setting before replacement of VHMS controller] and press [Next] button.



- 4) Confirm every information before the replacement and then press [Save] button.



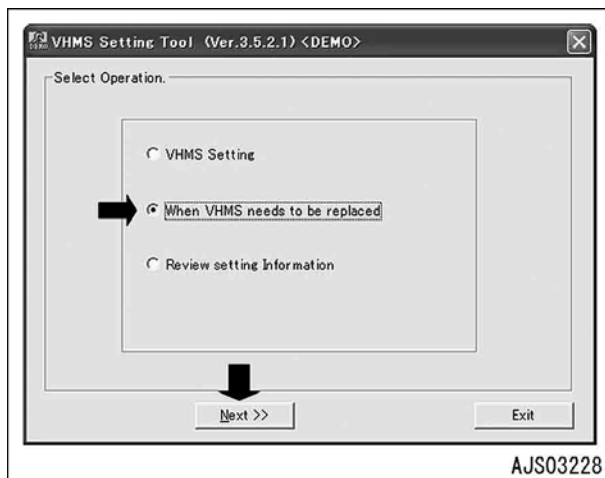
- 3) Select [Use previous setting after replacement of VHMS controller] and press [Next] button.



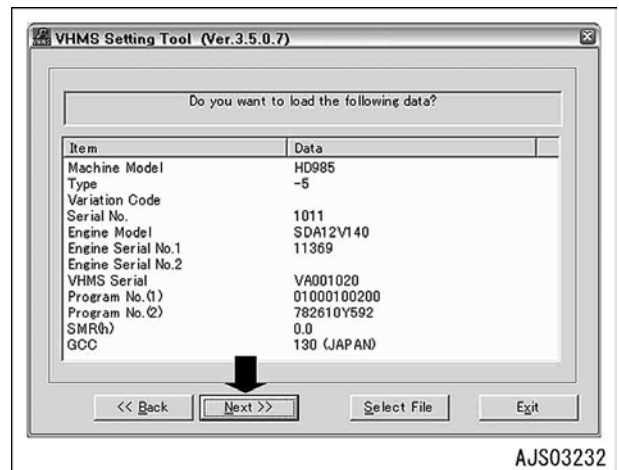
- 5) Select [Exit] from [File] of the menu to end the VHMS initial setting tool.
 6) Disconnect the PC.
 ★ Refer to "10. Disconnecting the PC" in "VHMS controller initial setting procedure".
 7) Turns the PC power off.
 8) Proceed to replacement of VHMS controllers.

3-2. Loading the setting information to the replacing VHMS controller

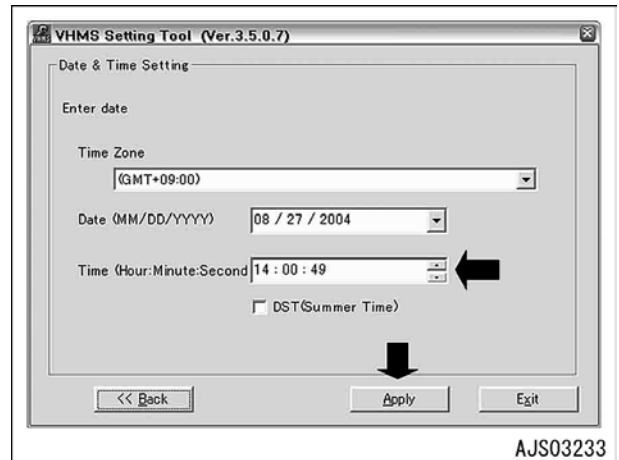
- 1) Connect the PC again and start the VHMS initial setting tool.
 ★ See the "VHMS controller initial setting procedure" for this operation.
 2) Select [When VHMS needs to be replaced] and then press [Next] button.



- 4) Currently saved information will be displayed. Press [Next] button.

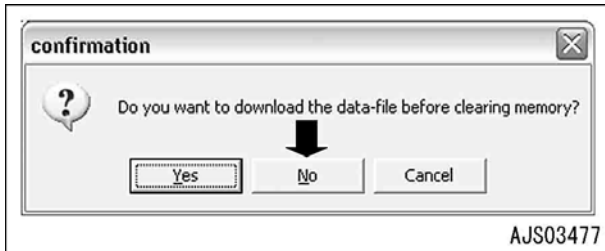


- 5) Adjust the time and press [Apply] button.

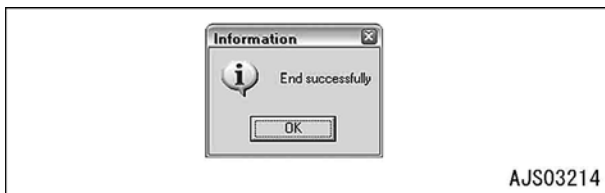


- 6) The confirmation screen will ask whether or not the data before the above setup is to be saved. Press [NO] button.

★ It is not necessary to save the data before the setting.



- 7) The above completes modification of the setting. Press [OK] button to end the VHMS initial setting tool.



[Operations needed after replacement of VHMS controller]

- ★ Execute the quick Pm referring "7. Executing quick Pm" in "VHMS controller initial setting procedure".
- ★ Download the data referring "8. Download of setting data" in "VHMS controller initial setting procedure".
- ★ After the replacement, send VHMS/WebCARE setting report sheet to VHMS/WebCARE Support Center in Komatsu Headquarters.
- ★ Also send two sets of data, the downloaded before and after the VHMS replacement, via Notes (LAN) or E-mail (WAN).

Komatsu VHMS/WebCARE Support Center

2-3-6, Akasaka Minato-Ku Tokyo, Japan

FAX: 81-3-5561-4766 (from outside of Japan)

FAX: 03-5561-4766 (Domestic user)

E-mail: webcare@komatsu.co.jp

Pm Clinic check sheet

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Hour inspection

HD785-7

Machine Serial No.

Engine Serial No.

Work No.	Date	Service meter	Name of inspector
	Year Month Day	hrs	

Questions to operator and inspection around the machine

Was there any abnormality before start of inspection ? _____ _____			Ambient Temperature Max. °C(°F) Min. °C(°F) Altitude m
Is maximum coolant temperature level normal ? (During operation)	Is maximum torque converter oil temperature level normal ? (During operation)	Is maximum retarder oil temperature level normal ? (During operation)	

★ After starting engine!

Measurement items	Measurement conditions	Unit	Standard value for new machine	Service limit value	Measurement result	Accepted	Rejected
Engine	Engine speed	rpm					

Measurement items		Measurement conditions		Unit	Standard value for new machine	Service limit value	Measurement result	Accepted	Rejected
Engine	Blow-by pressure	Engine speed: 1,900 rpm (Rated speed)		kPa {mmH ₂ O}	Max. 2.94 {Max. 300}	5.88 {600}			
	Lubricating oil pressure	SAE0W30E0S SAE5W40E0S SAE10W30DH SAE15W40DH SAE30DH	Engine speed: 1,900 rpm (Rated speed)	MPa {kg/cm ² }	0.29 – 0.44 {3.0 – 4.5}	0.2 {2.0}			
			Low idle		Min. 0.08 {Min. 0.8}	0.07 {0.7}			
	Boost pressure	Engine speed: 1,900 rpm (Rated speed)		kPa {mmHg}	Min. 165.4 {Min. 1,250}	Min. 165.4 {Min. 1,250}			
	Exhaust temperature	Ambient temperature		°C	20	—			
		All speed range			Max. 700	750			

Measurement items		Measurement conditions		Unit	Standard value for new machine	Service limit value	Measurement result	Accepted	Rejected
Torque converter		Torque converter oil temperature: 75 – 85 °C		—	—	—			
	Inlet oil pressure		Engine speed: 1,900 rpm (Rated speed)	MPa {kg/cm²}	Max. 0.85 {Max. 8.67}	Max. 0.85 {Max. 8.67}			
	Outlet oil pressure	When brake is ON			0.45 – 0.53 {4.59 – 5.41}	0.45 – 0.53 {4.59 – 5.41}			
		When brake is OFF			0.45 – 0.59 {4.59 – 6.01}	0.45 – 0.59 {4.59 – 6.01}			
	Lockup operating pressure				1.32 – 1.72 {13.5 – 17.5}	1.32 – 1.72 {13.5 – 17.5}			
	Main relief pressure	N, F1 – F3			3.33 – 3.73 {34.0 – 28.0}	3.33 – 3.73 {34.0 – 28.0}			
		F4 – F7			1.96 – 2.36 {20.0 – 24.0}	1.96 – 2.36 {20.0 – 24.0}			
	Transmission lubricating oil pressure				0.12 – 0.22 {1.2 – 2.2}	0.12 – 0.22 {1.2 – 2.2}			

★ Replace oil and clean inside of transmission case and strainer every 1,000 hours!

T/M	Visual inspection of transmission strainer	—	There is not excessive metal powder or black powder.
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Steering	Steering time	Lock → Lock	sec.	Max. 4	Max. 5			
	Relief pressure	Rated speed (1,900 rpm)	MPa {kg/cm ² }	20.2 – 21.1 {206 – 215}	20.2 – 21.1 {206 – 215}			
		Low idle (650 rpm) [Reference value]		18.1 – 19.1 {185 – 195}	18.1 – 19.1 {185 – 195}			

Brake	Brake oil pressure	Service brake	1st operation after charging accumulator	MPa {kg/cm ² }	9.11 – 10.49 {93 – 107}	9.11 – 10.49 {93 – 107}			
		Retarder			5.81 – 7.09 {59 – 72}	5.81 – 7.09 {59 – 72}			
	Charge valve set pressure	Cut-in	Engine: Full throttle		11.8 – 12.78 {120 – 130}	11.8 – 12.78 {120 – 130}			
		Cut-out			20.6 – 21.58 {210– 220}	20.6 – 21.58 {210– 220}			
	Service brake	When brake is applied and engine speed is increased gradually in gear speed F2, machine must not start at speed shown in table.	1,760		1,570				
	Retarder brake		1,345		1,200				
	Parking brake		1,610		1,440				
	Emergency brake		Torque converter stall speed		Torque converter stall speed				

30 Testing and adjusting

SEN01774-00

Measurement items		Measurement conditions	Unit	Standard value for new machine	Service limit value	Measurement result	Accepted	Rejected
Hydraulic system		Hydraulic oil temperature: 50 – 80 °C	—	—	—			
	Hoist valve relief pressure	Rated speed (1,900 rpm)	MPa {kg/cm ² }	20.2 – 21.1 {206 – 215}	20.2 – 21.1 {206 – 215}			
		Low idle (650 rpm) [Reference value]		18.1 – 19.1 {185 – 195}	18.1 – 19.1 {185 – 195}			
	Dump EPC valve basic pressure	High idle (2,250 rpm)		2.91 – 3.89 {30 – 40}	2.91 – 3.89 {30 – 40}			
		Low idle (650 rpm) [Reference value]		2.11 – 3.09 {22 – 32}	2.11 – 3.09 {22 – 32}			
	Dump body raising time	Rated speed (1,900 rpm)	sec.	11.5 – 14.5	11.5 – 14.5			
	Dump body lowering time	Low idle (650 rpm) Dump lever: "Float" position		12.5 – 15.5	12.5 – 15.5			

★ Set dump body and stop engine!

Hydraulic drift		Hydraulic oil temperature: 50 – 80 °C	—	—	—			
	Hydraulic drift of hoist cylinder	Set dump body to 20 mm extraction position of No. 2 cylinder.	mm/5 min	Max. 85	Max. 170			

★ Replace drain plug with spare plug!

Axle	Visual check of differential drain plug	Engine: Stopped	—	There is not excessive metal powder.				
	Visual check of final drive drain plug	Left side	—	There is not excessive metal powder.				
		Right side						

★ Every 1000 hours service

Brake	Front brake (Disc wear gauge)	Left side	—	Within wear gauge range.			
		Right side		Within wear gauge range.			
	Rear brake (Disc wear gauge)	Left side		Within wear gauge range.			
		Right side		Within wear gauge range.			

Suspension	Left front suspension	Suspension cylinder length	mm	237 – 257	227 – 267			
		Oil/Gas leakage	—	No leakage				
	Right front suspension	Suspension cylinder length	mm	237 – 257	227 – 267			
		Oil/Gas leakage	—	No leakage				
	Left rear suspension	Suspension cylinder length	mm	189 – 209	179 – 219			
		Oil/Gas leakage	—	No leakage				
	Right rear suspension	Suspension cylinder length	mm	189 – 209	179 – 219			
		Oil/Gas leakage	—	No leakage				
	Contact of rear suspension stopper	Left side	—	No contact				
		Right side	—	No contact				

Failure code record			
h ▶ h Time Contents:	h ▶ h Time Contents:	h ▶ h Time Contents:	h ▶ h Time Contents:
h ▶ h Time Contents:	h ▶ h Time Contents:	h ▶ h Time Contents:	h ▶ h Time Contents:

MEMO : Write any data or phenomena that you noticed during today's check.

Initial setting of payload meter

In the following cases, perform "setting of option selection of machine monitor" and "setting with VHMS initialization manual (tool)" according to Table 1.

1. When the payload meter in the VHMS is installed for the first time
2. When the payload meter in the VHMS is removed
3. When the VHMS controller or transmission controller is replaced
4. When setting of VHMS controller is changed

Table 1

VHMS controller	PLM function in VHMS controller	Payload meter (PLM) function	Setting with VHMS initial setting manual (tool) (*1)			
			Model	Type	Variation code	Date Time Time difference (GMT) Summer time
Installed	Not installed	Not installed	HD785	- 7	ST	Set properly
Installed	Installed	Installed			PV	

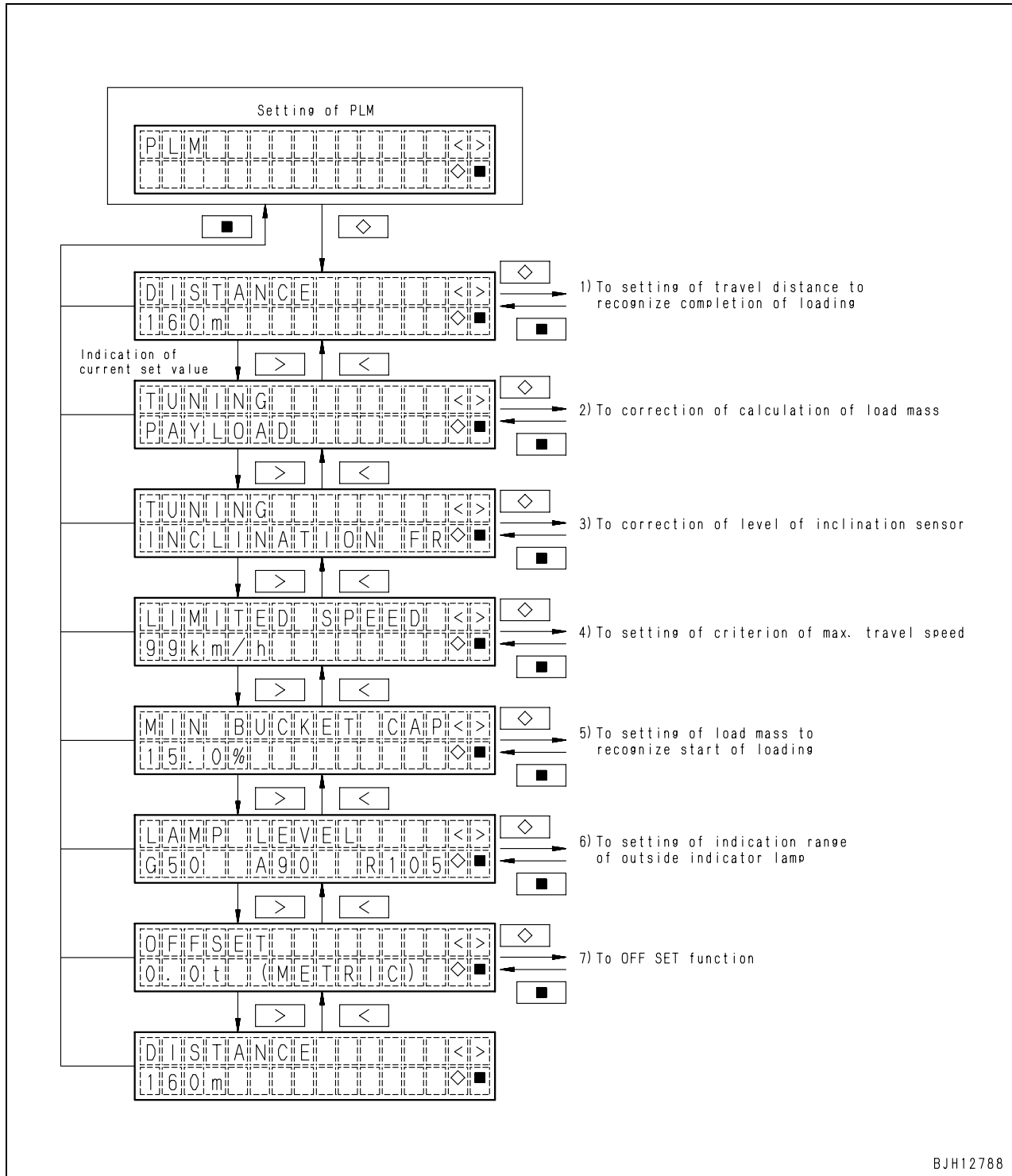
(*1) For setting of the model, type, variation code, etc., see the VHMS initial setting manual (Tool)

When there is not a problem in installation and wiring of the payload meter but there are the following problems, check the above setting again.

1. Items related to the payload meter are not displayed on the machine monitor.
"The payload is not displayed when the machine is loaded and stopped", "There are not the manus related to the payload meter on the match marks", etc.
★ In the following cases, perform "setting of option selection of machine monitor" and "setting with VHMS initialization manual (tool)" according to Table 1.
2. While the payload meter in the VHMS is not set, there are the menus related to the payload meter on the machine monitor.
★ In the following cases, perform "setting of option selection of machine monitor" and "setting with VHMS initialization manual (tool)" according to Table 1.
3. While the payload meter in the VHMS is set, the payload does not match to the lighting condition of the red lamp of the outside indicator lamps.
★ Wrong setting of the model and serial No. with the VHMS initial setting tool.
4. The storage place of the data file made by the download software is not found.
★ Wrong setting of the model and serial No. with the VHMS initial setting tool.
5. Data cannot be downloaded.
★ Wrong setting of the model, serial No., and variation code with the VHMS initial setting tool.
6. Date and time of the downloaded data are wrong.
★ Wrong setting of the date and time with the VHMS initial setting tool.

Setting of payload meter built in VHMS

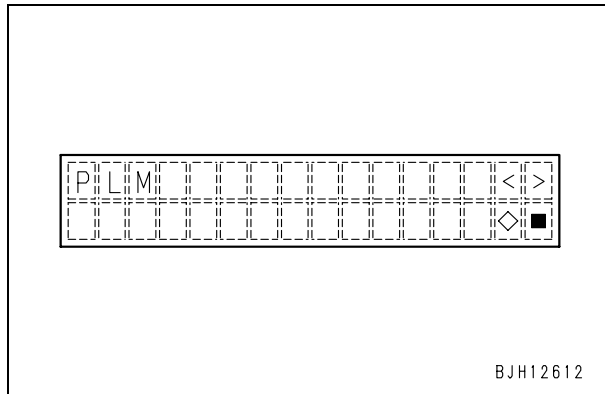
Outline of procedure



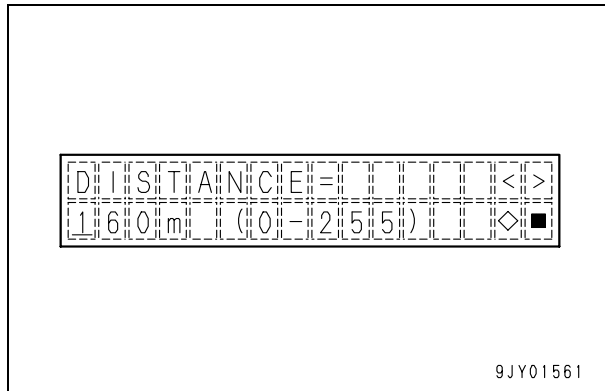
Set various items of the payload meter (PLM) with the machine monitor.

1. Selection of service menu

While the service menu selection screen is displayed, select the PLM setting function (PLM).



2. Setting of travel distance to recognize completion of loading



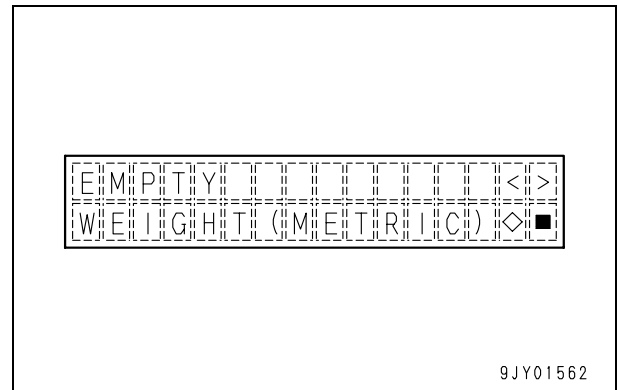
Input a travel distance to recognize completion of loading by pressing the following buttons. The setting range is 0 – 255 m (0.0 – 0.158 miles).

- [$\rightarrow$] button: Number at cursor moves forward
- [$\leftarrow$] button: Number at cursor moves backward
- [$\diamond$] button: Enter number at cursor
- [$\blacksquare$] button: Stop inputting number
- ★ If the set value is too small, the system may recognize that loading is completed while the machine is still being loaded.

3. Correction of calculation of load weight

- ★ Since this function affects the accuracy directly, execute the following procedure securely.
 - ★ Be sure to measure the weight of the empty machine and that of the fully loaded machine as a set in order according to the following procedure.
 - ★ The machine must travel for about 3 minutes each after its empty weight and its fully loaded weight are measured. Accordingly, secure a road for this purpose.
 - ★ The relationship between the suspension pressure and load weight corrected with this function cannot be returned to the condition at the time of shipment. Accordingly, perform the following procedure very carefully.
- 1) Measure the weight of the empty machine with the load meter and record it (Write it on a sheet of paper, etc.)
 - 2) Input the measured weight of the empty machine and drive the machine for about 3 minutes.

1) Select "EMPTY WEIGHT".



- [$\rightarrow$], [$\leftarrow$] buttons: Select "EMPTY WEIGHT" or "LOADED WEIGHT"
- [$\diamond$] button: Enter the selection
- [$\blacksquare$] button: Return to the previous screen

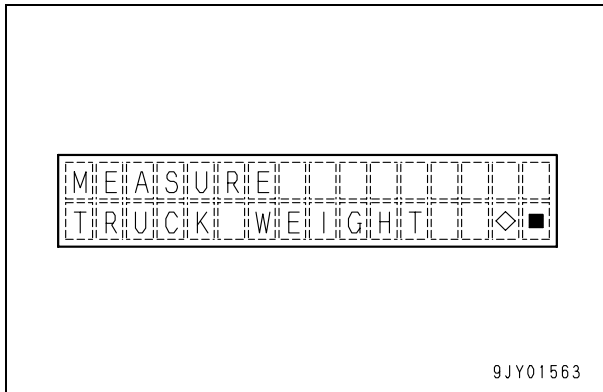
If the weight of the empty machine has been input and the machine has been driven for about 3 minutes, "LOADED WEIGHT" is displayed when the menu is selected.

Check the unit of the input value. The unit is indicated in the () on the right side of WEIGHT.

(METRIC): metric ton

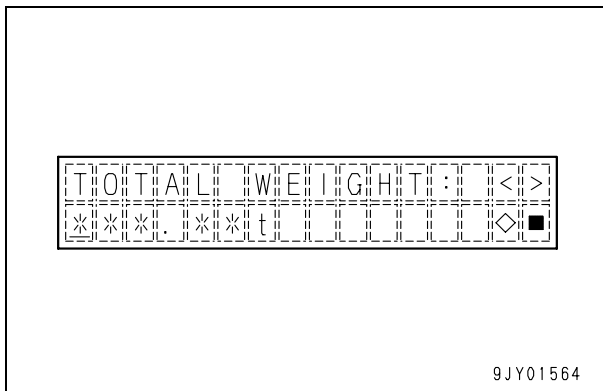
(SHORT): short ton

- 2] Check that measurement of the weight of the empty machine has been completed.



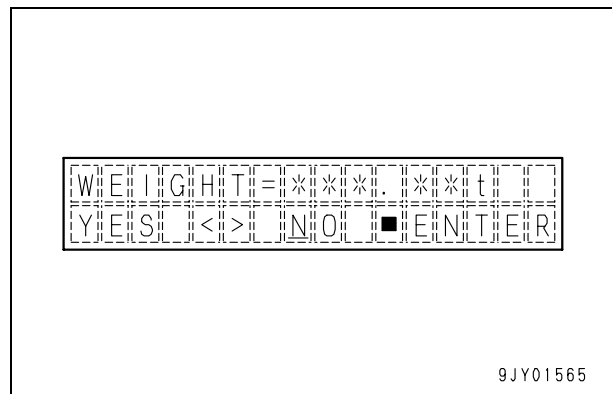
- [◇] button: Check that measurement has been completed and go to the next step
- [■] button: Return to the previous screen

- 3] Input the measured weight of the empty machine.



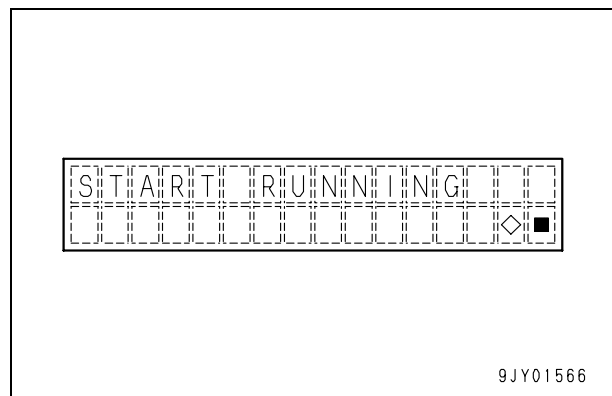
- [>] button: Number at cursor moves forward
- [<] button: Number at cursor moves backward
- [◇] button: Enter number at cursor
- [■] button: Return to the largest position of the number to input the value again. If this button is pressed again, inputting of the value is stopped and the previous screen appears.
- Inputtable range
HD785-7:
72.3 [t] (Operating weight $\pm 13\%$)
(metric ton)

- 4] Check the input value.



- [>] button: Select "YES"
- [<] button: Select "NO"
- [■] button: Enter

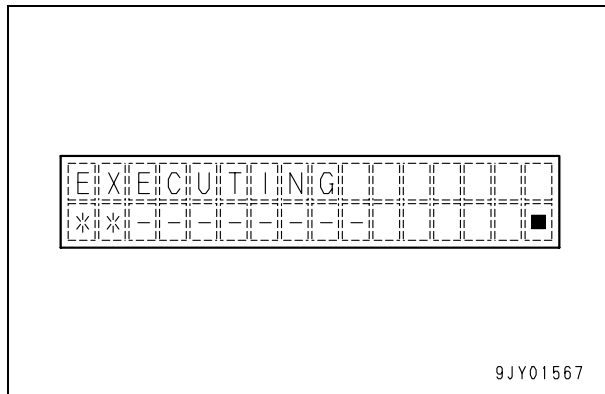
- 5] Move the machine to a place where you can drive it for about 3 minutes.



- [◇] button: After getting ready for drive, press this button and start driving the machine
- [■] button: Return to the value inputting screen

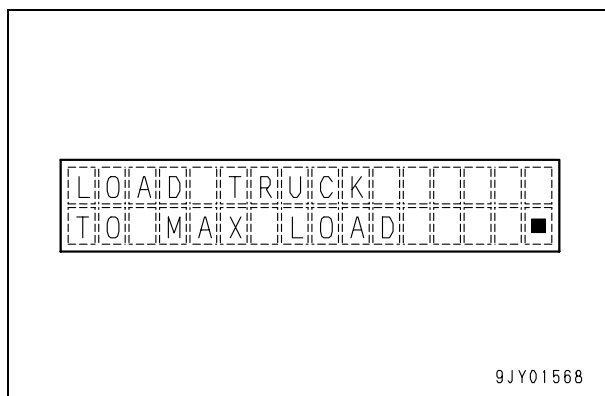
Drive the machine for about 3 minutes (at a speed higher than 8 km/h) to settle the relationship between the weight of the machine and the suspension pressure under that weight.

- 6] Display the progress of measurement.



- [■] button: Stop measurement and return to the previous screen. As measurement is executed, the number of "*" increases. When measurement is finished, the next screen appears automatically.

- 3) Load the machine to measure its fully loaded weight.

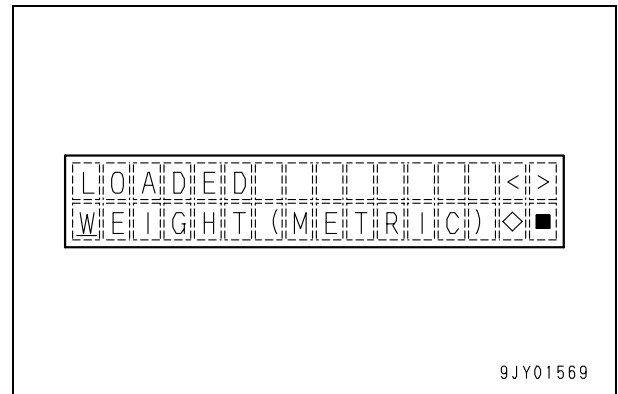


- [■] button: Return to the menu screen. When loading is started, the menu screen appears automatically. When indicating the current load for reference while the machine is being loaded, go out of "Service mode 1" temporarily and return to "Display of load weight/integrated odometer". On this screen, you can check the current load.
- 4) Measure the weight of the fully loaded machine with the load meter and record it (Write it on a sheet of paper, etc.)

- 5) Input the measured weight of the fully loaded machine and drive the machine for about 3 minutes.

- 1] Select "LOADED WEIGHT".

For the method of displaying the following screen, see the steps up to the above step.



- [>], [<] buttons: Select "EMPTY WEIGHT" or "LOADED WEIGHT"
- [◇] button: Enter the selection
- [■] button: Return to the previous screen

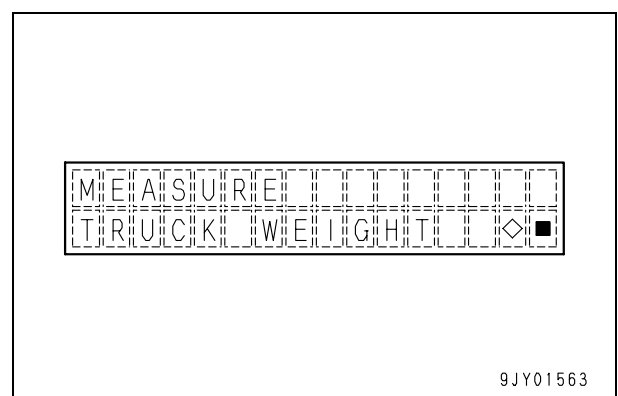
If the weight of the empty machine has been input and the machine has been driven for about 3 minutes, "LOADED WEIGHT" is displayed when the menu is selected.

Check the unit of the input value. The unit is indicated in the () on the right side of WEIGHT.

(METRIC): metric ton

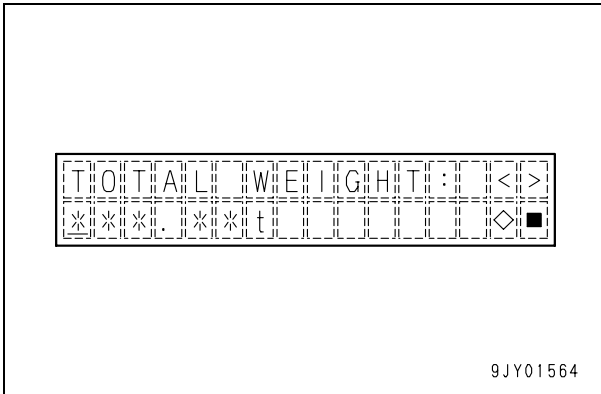
(SHORT): short ton

- 2] Check that measurement of the weight of the fully loaded machine has been completed.



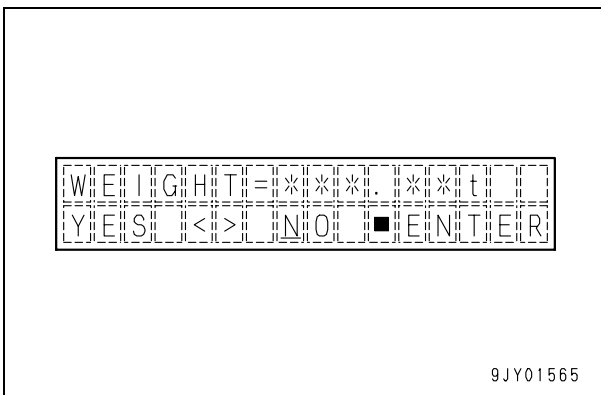
- [◇] button: Check that measurement has been completed and go to the next step
- [■] button: Return to the previous screen

- 3] Input the measured weight of the fully loaded machine.



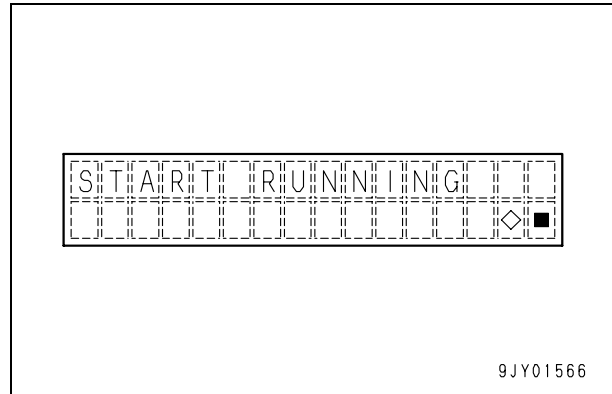
- [$>$] button: Number at cursor moves forward
 - [$<$] button: Number at cursor moves backward
 - [$\diamond$] button: Enter number at cursor
 - [$\blacksquare$] button: Return to the largest position of the number to input the value again. If this button is pressed again, inputting of the value is stopped and the previous screen appears.
- ★ Inputtable range
 HD465-7E0:
 $A1 \pm (A1 \times 0.25)$ (metric ton)
 However,
 $A1 = \{43.6 \text{ [t] (Operating weight)} + 46 \text{ [t] (Load capacity)}\}$
 HD605-7E0:
 $A2 \pm (A2 \times 0.25)$ (metric ton)
 However,
 $A2 = \{46.8 \text{ [t] (Operating weight)} + 63 \text{ [t] (Load capacity)}\}$

- 4] Check the input value.



- [$<$] button: Select "YES"
- [$>$] button: Select "NO"
- [$\blacksquare$] button: Enter

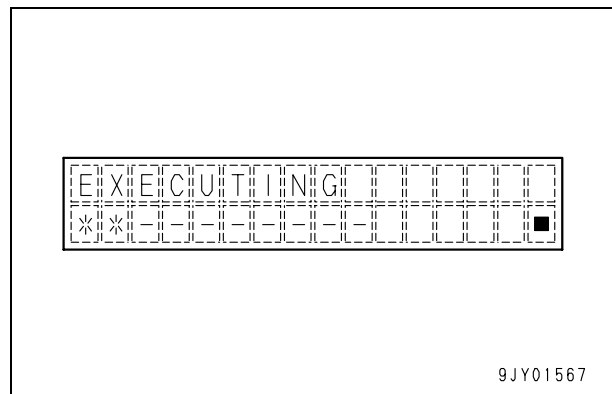
- 5] Move the machine to a place where you can drive it for about 3 minutes.



- [$\diamond$] button: After getting ready for drive, press this button and start driving the machine
- [$\blacksquare$] button: Return to the screen for inputting values

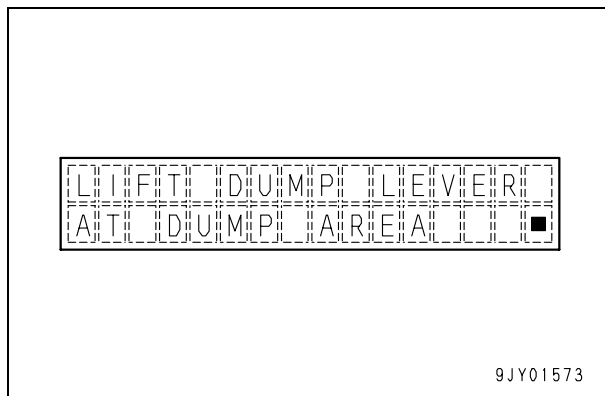
Drive the machine for about 3 minutes (at a speed higher than 8 km/h) to settle the relationship between the weight of the machine and the suspension pressure under that weight.

- 6] Display the progress of measurement.



- [$\blacksquare$] button: Stop measurement and return to the previous screen
 As measurement is executed, the number of "*" increases. When measurement is finished, the next screen appears automatically.

- 7] Dump the load in the dump area.



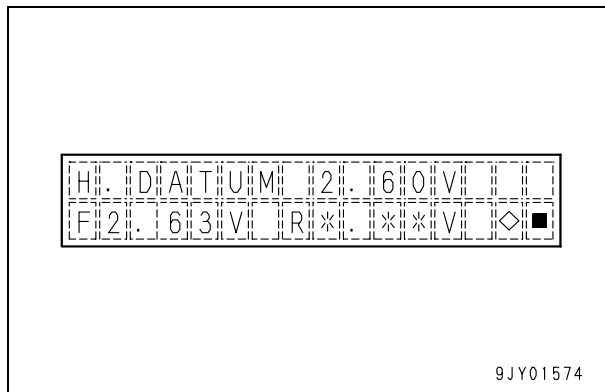
- [■] button: Return to the menu screen

If the load is dumped with the dump lever, the menu screen appears automatically.

If the load is dumped normally, correction is finished.

4. Correction of level of inclinometer

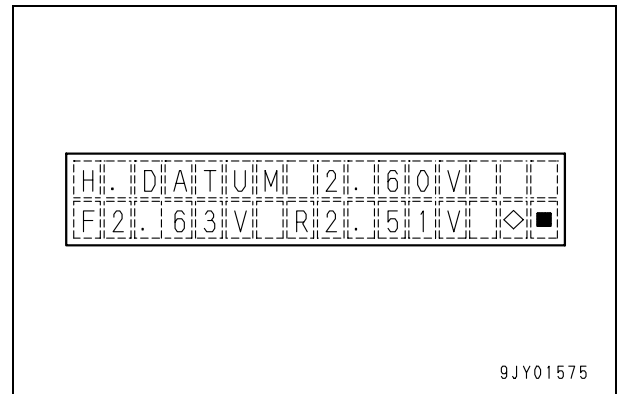
- 1) Move the machine to a level place.
- 2) Input the inclinometer reading (F) at the current position and that (R) after turning the machine 180 degrees (stopping it in the opposite direction) on the same position and use the average value as the standard level.
 - 1] Enter value of (F).



- [◇] button: Enter the blinking value
- [■] button: Return to the menu screen

The current standard level value is displayed on the upper line. The inclinometer value (F) at the current position blinks. Enter it when it is stabilized.

- 2] Turn the machine 180 degrees (Stop it in the opposite direction).
- 3] Enter value of (R).



Input a travel distance to recognize completion of loading by pressing the following buttons.

the setting range is 0 – 255 m (0.0 – 0.158 mile).

- [>] button: Number at cursor moves forward
- [<] button: Number at cursor moves backward
- [◇] button: Enter the blinking value
- [■] button: Return to the menu screen
- [◇] button: Enter the blinking value
- [■] button: Return to the menu screen

The current standard level value is displayed on the upper line. The inclinometer value at the current position blinks. Enter it when it is stabilized.

4] Enter the standard level value.

2	.	6	0	-	>	2	.	5	7	V										
Y	E	S			<					N	O				■	E	N	T	E	R

9JY01576

- [**<**] button: Select "YES"
- [**>**] button: Select "NO"
- [**■**] button: Enter

5. Setting of criterion of maximum travel speed

L	I	M	I	T	E	D		S	P	E	E	D								
9	9	k	m	/	h															

9JY01577

Input a criterion of the maximum travel speed by pressing the following buttons.

- [**>**] button: Number at cursor moves forward
- [**<**] button: Number at cursor moves backward
- [**◇**] button: Enter number at cursor
- [**■**] button: Stop inputting number

The setting range is 0 – 99 km/h (0 – 62 MPH).
(Default: 99 km/h)

6. Setting of load weight to recognize start of loading

M	I	N		B	U	C	K	E	T		C	A	P							
1	5	.	0	%																

9JY01578

Input a load weight to recognize start of loading by pressing the following buttons.

- [**>**] button: Number at cursor moves forward
- [**<**] button: Number at cursor moves backward
- [**◇**] button: Enter number at cursor
- [**■**] button: Stop inputting number

The setting range is 6 – 25.5% of the rated load weight.

(Default: 15%)

★ This function does not assure the operation because of the contrary phenomena shown below.

- If the value is reduced, start of loading may be recognized wrongly.
- If the value is increased and a loader having a small-capacity bucket is used, the forecast function of the outside indicator lamps and the MMS communication may not operate normally.

7. Setting of indication range of outside indicator lamps

L	A	M	P		L	E	V	E	L		%									
G	0	5	0		A	0	9	0		R	1	0	5							

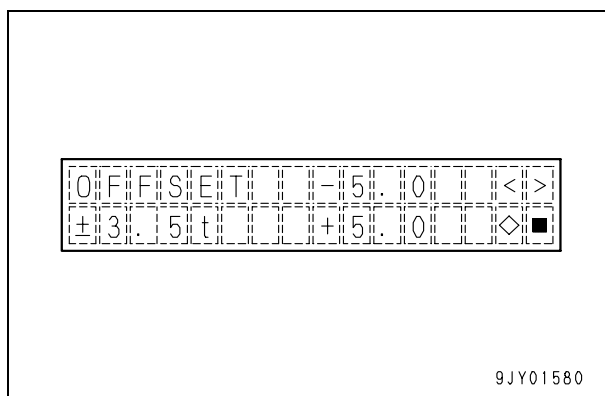
9JY01579

Input an indication range of the outside indicator lamps by pressing the following buttons.

- [**>**] button: Number at cursor moves forward

- [$\leftarrow$] button: Number at cursor moves backward
- [$\diamond$] button: Enter number at cursor
- [$\blacksquare$] button: Stop inputting number
- ★ % The setting range is 0 - 130% of the rated load weight.
Set A (Yellow lamp) higher than G (Green lamp) and set R (Red lamp) higher than A (Yellow lamp), however.

8. Setting of OFFSET range



Input an offset range by pressing the following buttons.

- [$\rightarrow$] button: Number at cursor moves forward
- [$\leftarrow$] button: Number at cursor moves backward
- [$\diamond$] button: Enter number at cursor
- [$\blacksquare$] button: Stop inputting number
- ★ The setting range is -5.0 – +5.0 [t].
Check the unit of the input value by the previous menu screen.
- ★ The unit is indicated in the () on the right side of the input value [t].
(METRIC): metric ton
(SHORT): short ton

HD785-7 Dump truck

Form No. SEN01774-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

40 Troubleshooting

Failure code table and fuse locations

Failure codes table.....	2
Fuse locations	16

Failure codes table

Failure codes	Failure contents	Applicable equipment	Action code	History classification	Reference manual
1500L0	Detection of double engagement	TM	E03	Mechanical system	Troubleshooting by failure code, Part 1 SEN01938-00
15B0NX	Clogging of transmission oil filter	TM	E01	Mechanical system	
15F0KM	Abuse 1 of gear shifting from reverse to forward	TM	—	Mechanical system	
15F0MB	Abuse 2 of gear shifting from reverse to forward	TM	—	Mechanical system	
15F7KM	Abuse of transmission forward clutch disk	TM	—	Mechanical system	
15G0MW	Trouble in reverse clutch system (command holding pressure, fill ON, detection of slip)	TM	E03	Electrical system	
15G7KM	Abuse of transmission reverse clutch disk	TM	—	Mechanical system	
15H0MW	Trouble in high clutch system (command holding pressure, fill ON, detection of slip)	TM	E03	Electrical system	
15J0MW	Trouble in low clutch system (command holding pressure, fill ON, detection of slip)	TM	E03	Electrical system	
15K0MW	Trouble in 1st clutch system (command holding pressure, fill ON, detection of slip)	TM	E03	Electrical system	
15L0MW	Trouble in 2nd clutch system (command holding pressure, fill ON, detection of slip)	TM	E03	Electrical system	
15M0MW	Trouble in 3rd clutch system (command holding pressure, fill ON, detection of slip)	TM	E03	Electrical system	
15N0MW	Trouble in 4th clutch system (command holding pressure, fill ON, detection of slip)	TM	E03	Electrical system	
15SBL1	Trouble I in reverse clutch pressure control valve (command OFF, fill ON)	TM	E03	Electrical system	
15SBMA	Trouble II in reverse clutch pressure control valve (command holding pressure, fill OFF, detection of slip)	TM	E03	Electrical system	
15SCL1	Trouble I in high clutch pressure control valve (command OFF, fill ON)	TM	E03	Electrical system	
15SCMA	Trouble II in high clutch pressure control valve (command holding pressure, fill OFF, detection of slip)	TM	E03	Electrical system	
15SDL1	Trouble I in low clutch pressure control valve (command OFF, fill ON)	TM	E03	Electrical system	
15SDMA	Trouble II in low clutch pressure control valve (command holding pressure, fill OFF, detection of slip)	TM	E03	Electrical system	
15SEL1	Trouble I in 1st clutch pressure control valve (command OFF, fill ON)	TM	E03	Electrical system	
15SEMA	Trouble II in 1st clutch pressure control valve (command holding pressure, fill OFF, detection of slip)	TM	E03	Electrical system	
15SFL1	Trouble I in 2nd clutch pressure control valve (command OFF, fill ON)	TM	E03	Electrical system	Troubleshooting by failure code, Part 2 SEN01939-00
15SFMA	Trouble II in 2nd clutch pressure control valve (command holding pressure, fill OFF, detection of slip)	TM	E03	Electrical system	
15SGL1	Trouble I in 3rd clutch pressure control valve (command OFF, fill ON)	TM	E03	Electrical system	
15SGMA	Trouble II in 3rd clutch pressure control valve (command holding pressure, fill OFF, detection of slip)	TM	E03	Electrical system	

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Failure codes	Failure contents	Applicable equipment	Action code	History classification	Reference manual
15SHL1	Trouble I in 4th clutch pressure control valve (command OFF, fill ON)	TM	E03	Electrical system	Troubleshooting by failure code, Part 2 SEN01939-00
15SHMA	Trouble II in 4th clutch pressure control valve (command holding pressure, fill OFF, detection of slip)	TM	E03	Electrical system	
15SJMA	Trouble II in lockup clutch pressure control valve (command holding pressure, detection of slip)	TM	E03	Electrical system	
2C4MNX	Clogging of retarder cooling oil filter	BK	E01	Electrical system	—
2D01CA	Wear of brake (Front right)	BK	E01	Mechanical system	
2D02CA	Wear of brake (Front left)	BK	E01	Mechanical system	
2D05CA	Wear of brake (rear right)	BK	E01	Mechanical system	
2D06CA	Wear of brake (rear left)	BK	E01	Mechanical system	
2F00KM	Dragging of parking brake	TM	—	Mechanical system	Troubleshooting by failure code, Part 2 SEN01939-00
2G42ZG	Lowering of accumulator oil pressure (front)	TM	E03	Mechanical system	
2G43ZG	Lowering of accumulator oil pressure (rear)	TM	E03	Mechanical system	
6014NX	Clogging of hydraulic oil filter	BK	E01	Mechanical system	—
989A00	Operation of engine overrun prevention device (Note: Information is obtained from transmission controller and failure code is displayed on monitor panel)	MON	E02	Mechanical system	Troubleshooting by failure code, Part 2 SEN01939-00
989D00	Inclination alarm (Raising body while machine is inclined) (Note: Information is obtained from transmission controller and failure code is displayed on monitor panel)	MON	—	Mechanical system	
A570NX	Clogging of engine oil filter	BK	E01	Mechanical system	
AA10NX	Clogging of air cleaner	TM	E01	Mechanical system	
AB00MA	Trouble in battery charge circuit (No R-terminal signal)	TM	E03	Electrical system	
B@BAZG	Lowering of engine oil pressure	ENG	E03	Mechanical system	
B@BAZK	Lowering of engine oil level	BK	E01	Mechanical system	
B@BCNS	Overheating of engine	ENG	E02	Mechanical system	
B@BCZK	Low coolant level alarm	TM	E01	Mechanical system	
B@BFZK	Lowering of fuel level	MON	—	Mechanical system	
B@C6NS	Brake cooling oil overheat (Front)	MON	E02	Mechanical system	
B@C7NS	Overheating of brake cooling oil (rear)	MON	E02	Mechanical system	

Failure codes	Failure contents	Applicable equipment	Action code	History classification	Reference manual
B@CENS	Overheating of torque converter oil	MON	E02	Mechanical system	Troubleshooting by failure code, Part 2 SEN01939-00
B@GAZK	Lowering of battery electrolyte level	BK	E01	Mechanical system	
B@HAZK	Lowering hydraulic oil level	BK	E01	Mechanical system	
B@JANS	Overheating of steering oil	TM	E02	Mechanical system	
CA111	Abnormality in engine controller	ENG	E03	Electrical system	Troubleshooting by failure code, Part 3 SEN01940-00
CB111	Engine controller internal abnormality (Right bank)	ENG	E03	Electrical system	
CA115	Abnormality in engine Ne/Bkup speed sensor	ENG	E03	Electrical system	
CB115	Engine Ne/Bkup speed sensor abnormality (Right bank)	ENG	E03	Electrical system	
CA122	Abnormally high level of charge pressure sensor	ENG	E03	Electrical system	
CA123	Abnormally low level of charge pressure sensor	ENG	E03	Electrical system	
CA131	Abnormally high level of throttle sensor	ENG	E03	Electrical system	
CA132	Abnormally low level of throttle sensor	ENG	E03	Electrical system	
CA135	Abnormally high level of oil pressure sensor	ENG	E01	Electrical system	
CA141	Abnormally low level of oil pressure sensor	ENG	E01	Electrical system	
CA144	Abnormally high level of coolant temperature sensor	ENG	E01	Electrical system	
CA145	Abnormally low level of coolant temperature sensor	ENG	E01	Electrical system	
CA153	Abnormally high level of charge temperature sensor	ENG	E01	Electrical system	
CA154	Abnormally low level of charge temperature sensor	ENG	E01	Electrical system	
CA187	Abnormally low level of sensor power supply 2	ENG	E03	Electrical system	
CB187	Sensor power supply (2) abnormally low level (Right bank)	ENG	E03	Electrical system	
CA212	Abnormally high level of engine oil temperature sensor (for VHMS)	ENG	E01	Electrical system	
CA213	Abnormally low level of engine oil temperature sensor (for VHMS)	ENG	E01	Electrical system	
CA221	Abnormally high level of ambient temperature sensor	ENG	E01	Electrical system	
CA222	Abnormally low level of ambient temperature sensor	ENG	E01	Electrical system	
CA227	Abnormally high level of sensor power supply 2	ENG	E03	Electrical system	
CB227	Sensor power supply (2) abnormally high level (Right bank)	ENG	E03	Electrical system	

Failure codes	Failure contents	Applicable equipment	Action code	History classification	Reference manual
CA234	Overspeed of engine	ENG	E02	Mechanical system	Troubleshooting by failure code, Part 3 SEN01940-00
CA238	Abnormality in Ne speed sensor power supply	ENG	E03	Electrical system	
CB238	Ne speed sensor power supply abnormality (Right bank)	ENG	E03	Electrical system	
CA263	Abnormally high level of fuel temperature sensor	ENG	E01	Electrical system	
CB263	Fuel temperature sensor abnormally high level (Right bank)	ENG	E01	Electrical system	
CA265	Abnormally low level of fuel temperature sensor	ENG	E01	Electrical system	
CB265	Fuel temperature sensor abnormally low level (Right bank)	ENG	E01	Electrical system	
CA271	Short circuit in PCV1	ENG	E03	Electrical system	
CB271	PCV1 short circuit (Right bank)	ENG	E03	Electrical system	
CA272	Disconnection in PCV1	ENG	E03	Electrical system	
CB272	PCV1 disconnection (Right bank)	ENG	E03	Electrical system	
CA273	Short circuit in PCV2	ENG	E03	Electrical system	
CB273	PCV2 short circuit (Right bank)	ENG	E03	Electrical system	
CA274	Disconnection in PCV2	ENG	E03	Electrical system	
CB274	PCV2 disconnection (Right bank)	ENG	E03	Electrical system	
CA322	Disconnection or short circuit in injector #1 (left bank #1) system	ENG	E03	Electrical system	Troubleshooting by failure code, Part 4 SEN01941-00
CA323	Disconnection or short circuit in injector #5 (left bank #5) system	ENG	E03	Electrical system	
CA324	Disconnection or short circuit in injector #3 (left bank #3) system	ENG	E03	Electrical system	
CA325	Disconnection or short circuit in injector #6 (left bank #6) system	ENG	E03	Electrical system	
CA331	Disconnection or short circuit in injector #2 (left bank #2) system	ENG	E03	Electrical system	
CA332	Disconnection or short circuit in injector #4 (left bank #4) system	ENG	E03	Electrical system	
CA342	Abnormality in matching of engine controller data	ENG	E03	Electrical system	
CB342	Engine controller data mismatch (Right bank)	ENG	E03	Electrical system	
CA351	Abnormality in injector drive circuit	ENG	E03	Electrical system	
CB351	Injector drive circuit abnormality (Right bank)	ENG	E03	Electrical system	
CA352	Abnormally low level of sensor power supply 1	ENG	E03	Electrical system	

Failure codes	Failure contents	Applicable equipment	Action code	History classification	Reference manual
CB352	Sensor power supply 1 abnormally low level (Right bank)	ENG	E03	Electrical system	Troubleshooting by failure code, Part 4 SEN01941-00
CA386	Abnormally high level of sensor power supply 1	ENG	E03	Electrical system	
CB386	Sensor power supply 1 abnormally low high (Right bank)	ENG	E03	Electrical system	
CA431	Abnormality in idle validation switch	ENG	E01	Electrical system	
CA432	Abnormality in idle validation setting	ENG	E03	Electrical system	
CA441	Abnormally low level of source voltage	ENG	E03	Electrical system	
CB441	Power supply voltage abnormally low level (Right bank)	ENG	E03	Electrical system	
CA442	Abnormally high level of source voltage	ENG	E03	Electrical system	
CB442	Power supply voltage abnormally high level (Right bank)	ENG	E03	Electrical system	
CA449	Abnormality 2 in common rail high pressure	ENG	E03	Electrical system	
CB449	Common rail abnormally high pressure 2 (Right bank)	ENG	E03	Electrical system	
CA451	Abnormally high level of common rail pressure sensor	ENG	E03	Electrical system	
CB451	Common rail pressure sensor abnormally high level (Right bank)	ENG	E03	Electrical system	
CA452	Abnormally low level of common rail pressure sensor	ENG	E03	Electrical system	
CB452	Common rail pressure sensor abnormally low level (Right bank)	ENG	E03	Electrical system	
CA553	Abnormality 1 in common rail high pressure	ENG	E03	Electrical system	
CB553	Common rail abnormally high pressure 1 (Right bank)	ENG	E03	Electrical system	
CA554	In-range trouble of common rail pressure sensor	ENG	E03	Electrical system	
CB554	Common rail pressure sensor in-range error (Right bank)	ENG	E03	Electrical system	
CA559	Lowering 1 of supply pump pressure	ENG	E03	Electrical system	
CB559	Supply pump low pressure 1 (Right bank)	ENG	E03	Electrical system	
CA689	Abnormality in engine Ne speed sensor	ENG	E03	Electrical system	
CB689	Engine Ne speed sensor abnormality (Right bank)	ENG	E03	Electrical system	
CA691	Intake air temperature sensor abnormally high level	ENG	E01	Electrical system	
CA692	Intake air temperature sensor abnormally low level	ENG	E01	Electrical system	

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Failure codes	Failure contents	Applicable equipment	Action code	History classification	Reference manual
CA731	Abnormality in engine Bkup speed sensor phase	ENG	E03	Electrical system	Troubleshooting by failure code, Part 4 SEN01941-00
CB731	Engine Bkup speed sensor abnormal phase (Right bank)	ENG	E03	Electrical system	
CA757	Loss of all engine controller data	ENG	E03	Electrical system	Troubleshooting by failure code, Part 5 SEN01942-00
CB757	Engine controller all data loss (Right bank)	ENG	E03	Electrical system	
CA778	Abnormality in engine Bkup speed sensor	ENG	E03	Electrical system	
CB778	Engine Bkup speed sensor abnormality (Right bank)	ENG	E03	Electrical system	
CA781	Inter-multicontroller communication error	ENG	E03	Electrical system	
CB781	Inter-multicontroller communication error (Right bank)	ENG	E03	Electrical system	
CA1257	Multicontroller distinction wiring harness key error	ENG	E03	Electrical system	
CB1257	Multicontroller distinction wiring harness key error (Right bank)	ENG	E03	Electrical system	
CB1548	Injector #7 (Right bank #1) system disconnection/short circuit	ENG	E03	Electrical system	
CB1549	Injector #8 (Right bank #2) system disconnection/short circuit	ENG	E03	Electrical system	
CB1551	Injector #10 (Right bank #4) system disconnection/short circuit	ENG	E03	Electrical system	
CB1552	Injector #11 (Right bank #5) system disconnection/short circuit	ENG	E03	Electrical system	
CB1553	Injector #12 (Right bank #6) system disconnection/short circuit	ENG	E03	Electrical system	
CB1622	Injector #9 (Right bank #3) system disconnection/short circuit	ENG	E03	Electrical system	
CA1633	Abnormality in KOMNET	ENG	E03	Electrical system	
CA2185	Abnormally high level of throttle sensor power supply	ENG	E03	Electrical system	
CA2186	Abnormally low level of throttle sensor power supply	ENG	E03	Electrical system	
CA2249	Lowering 2 of supply pump pressure	ENG	E03	Electrical system	
CB2249	Supply pump low pressure 2 (Right bank)	ENG	E03	Electrical system	
CA2555	Abnormally low level of intake air heater relay voltage	ENG	E01	Electrical system	
CA2556	Abnormally high level of intake air heater relay voltage	ENG	E01	Electrical system	
D19HKB	Trouble in stop lamp relay output system	BK	E01	Electrical system	Troubleshooting by failure code, Part 6 SEN01943-00
DAF9KM	Wrong connection of connector	MON	E03	Electrical system	
(DAFRKR)	Abnormality in CAN communication (monitor panel)	TM	—	—	

Failure codes	Failure contents	Applicable equipment	Action code	History classification	Reference manual
DAQ0KK	Lowering of source voltage	TM	E03	Electrical system	Troubleshooting by failure code, Part 6 SEN01943-00
DAQ0KT	Abnormality in non-volatile memory	TM	E01	Electrical system	
DAQ2KK	Trouble in solenoid power supply system	TM	E03	Electrical system	
(DAQ9KQ)	Disagreement of model selection signals (transmission controller)	MON	E03	—	
DAQRKR	Abnormality in CAN communication (transmission controller)	MON	E03	Electrical system	
(DAQRMA)	Disagreement of option setting (transmission)	MON	E03	—	
DB10KT	Abnormality in non-volatile memory	BK	E01	Electrical system	
DB12KK	Trouble in solenoid power supply	BK	E03	Electrical system	
DB13KK	Lowering of battery direct power supply voltage	BK	E03	Electrical system	
(DB19KQ)	Disagreement of model selection signals (brake)	MON	E03	—	
DB1RKR	Abnormality in CAN communication (retarder controller)	TM	E03	Electrical system	
(DB1RMA)	Disagreement of option setting (brake)	MON	E03	—	
DB2RKR	Abnormality in CAN communication (engine controller)	TM	E03	Electrical system	
dB2RKR	CAN communication error (Right bank engine controller)	TM	E03	Electrical system	
DBBRKR	Abnormality in CAN communication (VHMS)	MON	E01	Electrical system	
DBC2KK	Trouble in solenoid power supply system	ABS	E03	Electrical system	
DBC3KK	Lowering of battery direct power supply voltage	ABS	E03	Electrical system	
(DBC9KQ)	Disagreement of model selection signals (ABS)	MON	E03	—	
DBCRKR	Abnormality in CAN communication (ABS)	TM	E03	Electrical system	
(DBCRMA)	Disagreement of option setting (ABS)	MON	E03	—	
DDD7KX	Trouble in travel speed setting switch system	BK	E03	Electrical system	
DDD8KA	Disconnection in ARSC system switch	BK	E03	Electrical system	
DDD8KB	Short circuit in ARSC system switch	BK	E03	Electrical system	
DDD9KA	Disconnection in ABS system switch	ABS	E03	Electrical system	
DDD9KB	Short circuit in ABS system switch	ABS	E03	Electrical system	
DDDAKA	Disconnection in ASR system switch	BK	E01	Electrical system	
DDDAKB	Short circuit in ASR system switch	BK	E01	Electrical system	
DDP6L4	Trouble in service brake pressure switch	ABS	E03	Electrical system	

Failure codes	Failure contents	Applicable equipment	Action code	History classification	Reference manual
DDTHKA	Trouble in high clutch flow sensor valve (command holding pressure, fill OFF, no slip)	TM	E03	Electrical system	Troubleshooting by failure code, Part 6 SEN01943-00
DDTJKA	Trouble in low clutch flow sensor valve (command holding pressure, fill OFF, no slip)	TM	E03	Electrical system	
DDTKKA	Trouble in 1st clutch flow sensor valve (command holding pressure, fill OFF, no slip)	TM	E03	Electrical system	
DDTLKA	Trouble in 2nd clutch flow sensor valve (command holding pressure, fill OFF, no slip)	TM	E03	Electrical system	
DDTMKA	Trouble in 3rd clutch flow sensor valve (command holding pressure, fill OFF, no slip)	TM	E03	Electrical system	
DDTNKA	Trouble in reverse clutch flow sensor valve (command holding pressure, fill OFF, no slip)	TM	E03	Electrical system	
DDTPKA	Trouble in 4th clutch flow sensor valve (command holding pressure, fill OFF, no slip)	TM	E03	Electrical system	
DF10KA	Input of no lever signal	TM	E03	Electrical system	
DF10KB	Input of multiple lever signal	TM	E03	Electrical system	
DGF1KX	Transmission oil temperature sensor input signal out of range	TM	E03	Electrical system	
DGR2KB	Retarder oil temperature sensor (Rear wheel) system trouble (Disconnection/Short circuit)	BK	E01	Electrical system	
DGR2KZ	Trouble in retarder oil temperature sensor (rear wheel) system (ground fault)	BK	E01	Electrical system	
DGR4KB	Retarder oil temperature sensor (Front wheel) system trouble (Disconnection/Short circuit)	BK	E01	Electrical system	
DGR4KZ	Retarder oil temperature sensor (Front wheel) system trouble (Ground fault)	BK	E01	Electrical system	
DGR6KX	Steering oil temperature signal out of range	TM	E01	Electrical system	
DGT1KX	Torque converter oil temperature sensor input signal out of range	TM	E01	Electrical system	
DHP4KY	Short circuit in suspension pressure sensor system (front right)	VHMS (indication: PLM)	E01	Electrical system	Troubleshooting by failure code, Part 7 SEN01944-00
DHP4KZ	Disconnection or ground fault in suspension pressure sensor system (front right)	VHMS (indication: PLM)	E01	Electrical system	
DHP5KY	Short circuit in suspension pressure sensor system (front left)	VHMS (indication: PLM)	E01	Electrical system	
DHP5KZ	Disconnection or ground fault in suspension pressure sensor system (front left)	VHMS (indication: PLM)	E01	Electrical system	
DHP6KA	Trouble in suspension pressure sensor system (rear right)	BK	E01	Electrical system	
DHP6KX	Trouble in suspension pressure sensor system (rear right)	BK	E03	Electrical system	
DHP6KY	Short circuit in suspension pressure sensor system (rear right)	VHMS (indication: PLM)	E01	Electrical system	
DHP6KZ	Disconnection or ground fault in suspension pressure sensor system (rear right)	VHMS (indication: PLM)	E01	Electrical system	

Failure codes	Failure contents	Applicable equipment	Action code	History classification	Reference manual
DHP7KA	Trouble in suspension pressure sensor system (rear left)	BK	E01	Electrical system	Troubleshooting by failure code, Part 7 SEN01944-00
DHP7KX	Trouble in suspension pressure sensor system (rear left)	BK	E03	Electrical system	
DHP7KY	Short circuit in suspension pressure sensor system (rear left)	VHMS (indication: PLM)	E01	Electrical system	
DHP7KZ	Disconnection or ground fault in suspension pressure sensor system (rear left)	VHMS (indication: PLM)	E01	Electrical system	
DHT5KX	Disconnection, ground fault or hot short in torque converter inlet oil pressure sensor	TM	E01	Electrical system	
DHT5L6	Trouble in torque converter inlet oil pressure sensor	TM	E01	Electrical system	
DHU2KX	Trouble in accumulator oil pressure sensor (front)	TM	E01	Electrical system	
DHU3KX	Trouble in accumulator oil pressure sensor (rear)	TM	E01	Electrical system	
DHU6KX	Trouble in ABS control valve pressure sensor (front right)	ABS	E03	Electrical system	—
DHU7KX	Trouble in ABS control valve pressure sensor (front left)	ABS	E03	Electrical system	
DHU8KX	Trouble in ABS control valve pressure sensor (rear right)	ABS	E03	Electrical system	
DHU9KX	Trouble in ABS control valve pressure sensor (rear left)	ABS	E03	Electrical system	
DJF1KA	Disconnection in fuel level sensor system	TM	E01	Electrical system	Troubleshooting by failure code, Part 7 SEN01944-00
DK30KX	Trouble in steering angle potentiometer	BK	E01	Electrical system	
DK51L5	Trouble in manual retarder potentiometer and RVS	BK	E03	Electrical system	
DK52KX	Trouble 1 in hoist lever potentiometer sensor	BK	E03	Electrical system	
DK53L8	Trouble 2 in hoist lever potentiometer sensor	BK	E03	Electrical system	
DK54KX	Trouble in boom positioner sensor	BK	E03	Electrical system	
DKD0L6	Trouble in steering speed sensor	BK	E01	Electrical system	
DKH0KX	Inclinometer sensor signal out of range	TM	E01	Electrical system	
DKH1KX	Abnormality in inclinometer	VHMS (indication: PLM)	E01	Electrical system	
DLF1KA	Disconnection in transmission input shaft speed sensor system	TM	E03	Electrical system	
DLF1LC	Trouble in transmission input shaft speed sensor	TM	E03	Electrical system	
DLF2KA	Disconnection in transmission intermediate shaft speed sensor system	TM	E03	Electrical system	
DLF2LC	Trouble in transmission intermediate shaft speed sensor	TM	E03	Electrical system	

Failure codes	Failure contents	Applicable equipment	Action code	History classification	Reference manual
DLF6KA	Disconnection in wheel speed sensor (front right)	ABS	E03	Electrical system	—
DLF6L3	Trouble in wheel speed sensor (front right)	ABS	E03	Electrical system	
DLF7KA	Disconnection in wheel speed sensor (front left)	ABS	E03	Electrical system	
DLF7L3	Trouble in wheel speed sensor (front left)	ABS	E03	Electrical system	
DLF8KA	Disconnection in wheel speed sensor (rear right)	BK	E01	Electrical system	Troubleshooting by failure code, Part 8 SEN01945-00
DLF8L3	Trouble in wheel speed sensor (rear right)	ABS	E03	Electrical system	
DLF8LC	Trouble in wheel speed sensor system (rear right)	BK	E01	Electrical system	
DLF8MA	Disconnection in wheel speed sensor (rear right)	ABS	E03	Electrical system	
DLF9KA	Disconnection in wheel speed sensor (rear left)	BK	E01	Electrical system	
DLF9L3	Trouble in wheel speed sensor (rear left)	ABS	E03	Electrical system	
DLF9LC	Trouble in wheel speed sensor system (rear left)	BK	E01	Electrical system	
DLF9MA	Disconnection in wheel speed sensor (rear left)	ABS	E03	Electrical system	
DLT3KA	Disconnection in transmission output shaft speed sensor system	TM	E03	Electrical system	
DLT3LC	Trouble in transmission output shaft sensor	BK	E01	Electrical system	
DLT4KA	Disconnection in transmission output shaft speed sensor	BK	E01	Electrical system	
DLT4MA	Disconnection in transmission output shaft speed sensor	BK	E03	Electrical system	
DV00KB	Short circuit in buzzer output	MON	E01	Electrical system	
DW2AKA	Disconnection in main pressure variable valve output	TM	E01	Electrical system	
DW2AKB	Ground fault in main pressure variable valve output circuit	TM	E01	Electrical system	
DW2AKY	Hot short in main pressure variable valve output circuit	TM	E01	Electrical system	
DW2AL1	Defective reset of main pressure variable valve	TM	E01	Electrical system	
DW2ALH	Malfunction of main pressure variable valve	TM	E01	Electrical system	
DW2BKA	Main oil level selector valve output disconnection	TM	E01	Electrical system	
DW2BKB	Main oil level selector valve output circuit GND short circuit	TM	E01	Electrical system	
DW2BKY	Main oil level selector valve output circuit GND hot short	TM	E01	Electrical system	
DW2BL1	Main oil level selector valve reset trouble	TM	E01	Electrical system	

Failure codes	Failure contents	Applicable equipment	Action code	History classification	Reference manual
DW2BLH	Main oil level selector valve malfunction	TM	E01	Electrical system	Troubleshooting by failure code, Part 8 SEN01945-00
DW2CKA	Transmission lubrication variable valve output disconnection	TM	E01	Electrical system	
DW2CKB	Transmission lubrication variable valve output circuit GND short circuit	TM	E01	Electrical system	
DW2CKY	Transmission lubrication variable valve output circuit hot short	TM	E03	Electrical system	
DW2CL1	Transmission lubrication variable valve reset trouble	TM	E03	Electrical system	
DW2CLH	Transmission lubrication variable valve malfunction	TM	E01	Electrical system	
DW35KZ	Trouble in auto-suspension solenoid 1 output system (disconnection or ground fault)	BK	E01	Electrical system	
DW36KZ	Trouble in auto-suspension solenoid 2 output system (disconnection or ground fault)	BK	E01	Electrical system	
DW71KZ	Exhaust brake output system trouble (Disconnection/ Ground fault)	BK	E01	Electrical system	
DW72KZ	Trouble in kick-out solenoid output system (disconnection or ground fault)	BK	E01	Electrical system	
DW73KZ	Trouble (disconnection or ground fault) in hoist selector valve output system (disconnection or ground fault)	BK	E03	Electrical system	
DW78KZ	Trouble in BCV output system	BK	E01	Electrical system	
DWNBK4	Trouble in ASR shut-off valve (valve keeps operating)	BK	E01	Electrical system	
DWNBKA	Disconnection in ASR shut-off valve output circuit	BK	E01	Electrical system	
DWNBKB	Ground fault in ASR shut-off valve output circuit	BK	E01	Electrical system	
DWNBKY	Short circuit in ASR shut-off valve output circuit	BK	E01	Electrical system	
DWNBMA	Trouble in ASR shut-off valve (valve does not operate)	BK	E01	Electrical system	
DWNDKZ	Trouble in ABS cut valve (front) system	ABS	E03	Electrical system	—
DWNDMA	Defective ABS cut valve (front)	ABS	E03	Electrical system	
DWNEKZ	Trouble in ABS cut valve (rear) system	ABS	E03	Electrical system	
DWNEMA	Defective ABS cut valve (rear)	ABS	E03	Electrical system	
DX11K4	Trouble in rear wheel proportional pressure reducing solenoid valve (valve keeps operating)	BK	E03	Electrical system	Troubleshooting by failure code, Part 9 SEN01946-00
DX11KA	Disconnection in rear wheel proportional pressure reducing solenoid valve output circuit	BK	E03	Electrical system	
DX11KB	Ground fault in rear wheel proportional pressure reducing solenoid valve output circuit	BK	E03	Electrical system	
DX11KY	Short circuit in rear wheel proportional pressure reducing solenoid valve output circuit	BK	E03	Electrical system	
DX11MA	Trouble in rear wheel proportional pressure reducing solenoid valve (valve does not operate)	BK	E03	Electrical system	

Failure codes	Failure contents	Applicable equipment	Action code	History classification	Reference manual
DX12K4	Front wheel proportional solenoid pressure reducing valve trouble (Valve keeps operating)	BK	E03	Electrical system	Troubleshooting by failure code, Part 9 SEN01946-00
DX12KA	Front wheel proportional solenoid pressure reducing valve output circuit disconnection	BK	E03	Electrical system	
DX12KB	Front wheel proportional solenoid pressure reducing valve output circuit ground fault	BK	E03	Electrical system	
DX12KY	Front wheel proportional solenoid pressure reducing valve output circuit short circuit	BK	E03	Electrical system	
DX12MA	Front wheel proportional solenoid pressure reducing valve trouble (Valve does not operate)	BK	E03	Electrical system	
DX13KA	Disconnection in hoist EPC valve output circuit	BK	E03	Electrical system	
DX13KB	Ground fault in hoist EPC valve output circuit	BK	E03	Electrical system	
DX13KY	Short circuit in hoist EPC valve output circuit	BK	E03	Electrical system	
DX17K4	Trouble in ASR proportional pressure reducing solenoid valve (right) (valve keeps operating)	BK	E01	Electrical system	
DX17KA	Disconnection in ASR proportional pressure reducing solenoid valve (right) output circuit	BK	E01	Electrical system	
DX17KB	Ground fault in ASR proportional pressure reducing solenoid valve (right) output circuit	BK	E01	Electrical system	
DX17KY	Short circuit in ASR proportional pressure reducing solenoid valve (right) output circuit	BK	E01	Electrical system	
DX17MA	Trouble in ASR proportional pressure reducing solenoid valve (right) (valve does not operate)	BK	E01	Electrical system	
DX18K4	Trouble in ASR proportional pressure reducing solenoid valve (left) (valve keeps operating)	BK	E01	Electrical system	
DX18KA	Disconnection in ASR proportional pressure reducing solenoid valve (left) output circuit	BK	E01	Electrical system	
DX18KB	Ground fault in ASR proportional pressure reducing solenoid valve (left) output circuit	BK	E01	Electrical system	
DX18KY	Short circuit in ASR proportional pressure reducing solenoid valve (left) output circuit	BK	E01	Electrical system	
DX18MA	Trouble in ASR proportional pressure reducing solenoid valve (left) (valve does not operate)	BK	E01	Electrical system	
DX21KA	Disconnection in ABS control valve (front right) output circuit	ABS	E03	Electrical system	—
DX21KB	Ground fault in ABS control valve (front right) output circuit	ABS	E03	Electrical system	
DX21KY	Short circuit in ABS control valve (front right) output circuit	ABS	E03	Electrical system	
DX21MA	Defective ABS control valve (front right)	ABS	E03	Electrical system	
DX22KA	Disconnection in ABS control valve (front left) output circuit	ABS	E03	Electrical system	
DX22KB	Ground fault in ABS control valve (front left) output circuit	ABS	E03	Electrical system	
DX22KY	Short circuit in ABS control valve (front left) output circuit	ABS	E03	Electrical system	
DX22MA	Defective ABS control valve (front left)	ABS	E03	Electrical system	

Failure codes	Failure contents	Applicable equipment	Action code	History classification	Reference manual
DX23KA	Disconnection in ABS control valve (rear right) output circuit	ABS	E03	Electrical system	—
DX23KB	Ground fault in ABS control valve (rear right) output circuit	ABS	E03	Electrical system	
DX23KY	Short circuit in ABS control valve (rear right) output circuit	ABS	E03	Electrical system	
DX23MA	Defective ABS control valve (rear right)	ABS	E03	Electrical system	
DX24KA	Disconnection in ABS control valve (rear left) output circuit	ABS	E03	Electrical system	
DX24KB	Ground fault in ABS control valve (rear left) output circuit	ABS	E03	Electrical system	
DX24KY	Short circuit in ABS control valve (rear left) output circuit	ABS	E03	Electrical system	
DX24MA	Defective ABS control valve (rear left)	ABS	E03	Electrical system	
DX25MA	Defective ABS front wheel system control valve	ABS	E03	Electrical system	
DX26MA	Defective ABS rear wheel system control valve	ABS	E03	Electrical system	
DXH1KA	Disconnection in lockup clutch solenoid output circuit	TM	E03	Electrical system	Troubleshooting by failure code, Part 10 SEN01947-00
DXH1KB	Ground fault in lockup solenoid output circuit	TM	E03	Electrical system	
DXH1KY	Hot short in lockup clutch solenoid output circuit	TM	E03	Electrical system	
DXH2KA	Disconnection in high clutch solenoid output circuit	TM	E03	Electrical system	
DXH2KB	Ground fault in high clutch solenoid output circuit	TM	E03	Electrical system	
DXH2KY	Hot short in high clutch solenoid output circuit	TM	E03	Electrical system	
DXH3KA	Disconnection in low clutch solenoid output circuit	TM	E03	Electrical system	
DXH3KB	Ground fault in low clutch solenoid output circuit	TM	E03	Electrical system	
DXH3KY	Hot short in low clutch solenoid output circuit	TM	E03	Electrical system	
DXH4KA	Disconnection in 1st clutch solenoid output circuit	TM	E03	Electrical system	
DXH4KB	Ground fault in 1st clutch solenoid output circuit	TM	E03	Electrical system	
DXH4KY	Hot short in 1st clutch solenoid output circuit	TM	E03	Electrical system	
DXH5KA	Disconnection in 2nd clutch solenoid output circuit	TM	E03	Electrical system	
DXH5KB	Ground fault in 2nd clutch solenoid output circuit	TM	E03	Electrical system	
DXH5KY	Hot short in 2nd clutch solenoid output circuit	TM	E03	Electrical system	
DXH6KA	Disconnection in 3rd clutch solenoid output circuit	TM	E03	Electrical system	

Failure codes	Failure contents	Applicable equipment	Action code	History classification	Reference manual
DXH6KB	Ground fault in 3rd clutch solenoid output circuit	TM	E03	Electrical system	Troubleshooting by failure code, Part 10 SEN01947-00
DXH6KY	Hot short in 3rd clutch solenoid output circuit	TM	E03	Electrical system	
DXH7KA	Disconnection in reverse clutch solenoid output circuit	TM	E03	Electrical system	
DXH7KB	Ground fault in reverse clutch solenoid output circuit	TM	E03	Electrical system	
DXH7KY	Hot short in reverse clutch solenoid output circuit	TM	E03	Electrical system	
DXHHKA	Disconnection in 4th clutch solenoid output circuit	TM	E03	Electrical system	
DXHHKB	Ground fault in 4th clutch solenoid output circuit	TM	E03	Electrical system	
DXHHKY	Hot short in 4th clutch solenoid output circuit	TM	E03	Electrical system	

★ Failure codes:

The failure code table is written in alphabetical order and also starting from small number.

The failure code in parentheses is not recorded in the failure history for both electrical system and mechanical system.

★ Applicable equipment:

Applicable equipment indicates in which controller system the failure has occurred.

MON : Machine monitor system

ENG : Engine controller system

TM : Transmission controller system

BK : Retarder controller system

ABS : ABS controller system

VHMS : PLM function system of VHMS controller (Note: Displayed as "PLM" on machine monitor)

★ Action codes:

Action codes indicate what is displayed in the operator mode when a failure is detected.

★ History classification:

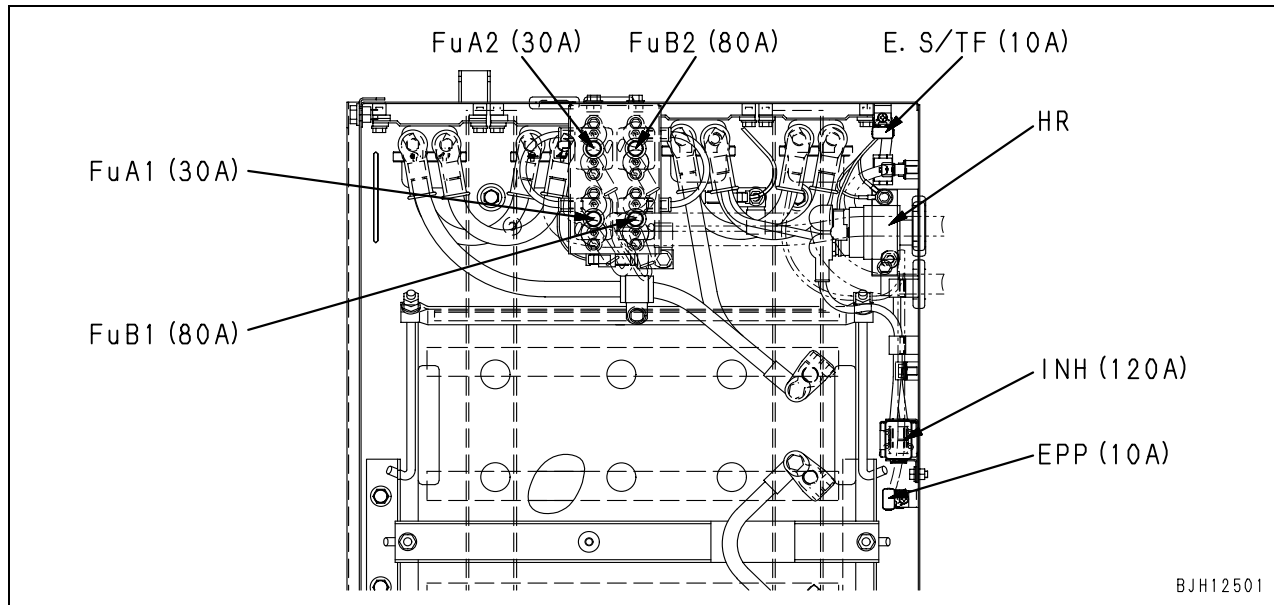
History classification indicates in which system, either electrical system or mechanical system in the failure history display function, a failure has been recorded.

★ Note : Optional equipment is also included in this table.

Fuse locations

- ★ When carrying out troubleshooting related to the electrical system, you should check the circuit breakers and fuses to see if the power is supplied normally.

Circuit breaker (30A/80A) and fuse locations in battery box and connection table



- ★ This connection table shows the devices to which each power supply of the circuit breakers and fuse box supplies power (An accessory power supply is a device which supplies power while the starting switch is in the ON position and an unswitched power supply is a device which supplies power while the starting switch is in the OFF and ON positions).

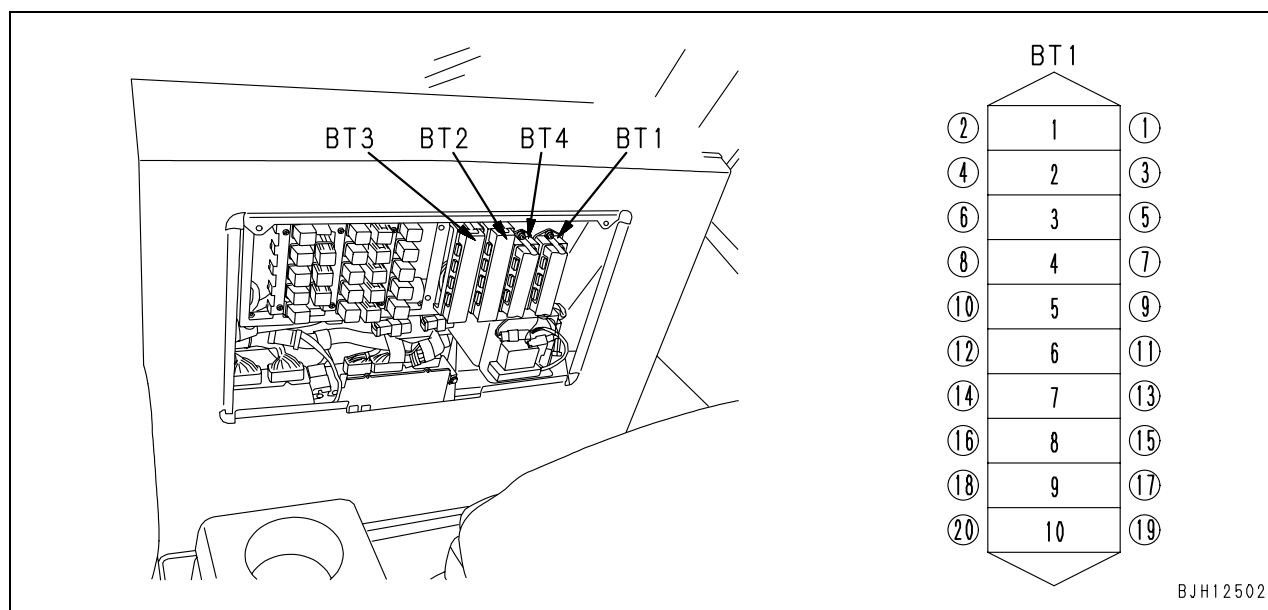
Type of power supply	Circuit breaker No.	Circuit breaker capacity	Destination of power
Unswitched power supply (Battery output)	FuA1	30A	Fuse box (BT2) *1
			Fuse box (BT3) *1
	FuA2	30A	Fuse box (BT3) *1
Accessory power supply (Battery relay output)	FuB1	80A	Fuse box (BT1) *1
			Fuse box (BT2) *1
			Fuse box (BT4) *1
	FuB2	80A	Fuse box (BT3) *1
			Fuse box (BT4) *1

Type of power supply	Fuse No.	Fuse capacity	Destination of power
Unswitched power supply (Battery output)	E.S/TF	10A	Emergency steering switch connected through fuse box (BT2)
	EPP	10A	Electric priming pump *2
Accessory power supply (Battery relay output)	INH	120A	Intake air heater (engine) connected through heater relay (HR)

*1: For fuse boxes (BT1) – (BT4), see the following pages.

*2: For "Extra low-grade fuel specification" only.

Fuse box (BT1) location and connection table



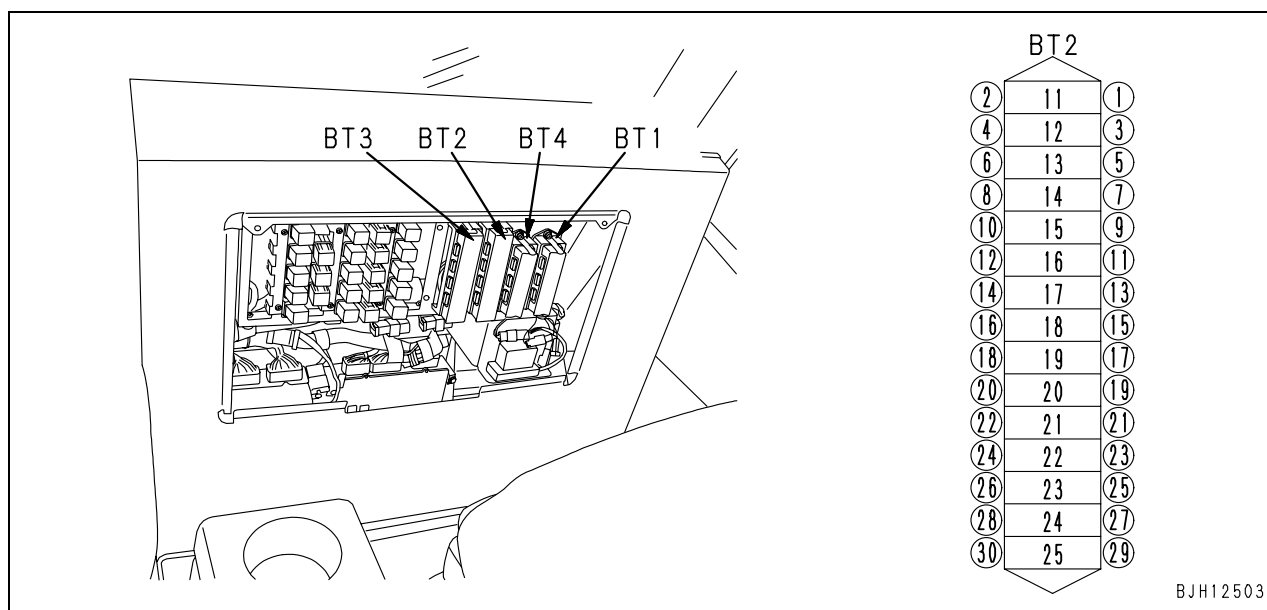
★ The circled numbers are the terminal numbers shown in the circuit diagram of each failure code.

● Fuse box BT1

Type of power supply	Circuit breaker output	Fuse No.	Fuse capacity	Destination of power
Accessory power supply	FuB1 (80A)	(1)	10A	Main lamp and small lamp
		(2)	10A	Turn signal lamp
		(3)	20A	Headlamp (Low)
		(4)	20A	Headlamp (High)
		(5)	20A	Headlamp (Low) *1
		(6)	20A	Headlamp (High) *1
		(7)	10A	Brake lamp
		(8)	20A	Backup lamp
		(9)	10A	Small lamp *1
		(10)	20A	VHMS controller

*1: These are connected to the corresponding fuses (1), (3) and (4) and lighting switch and then connected to the fuses again. See troubleshooting of electrical system (E mode), "E-12".

Fuse box (BT2) location and connection table

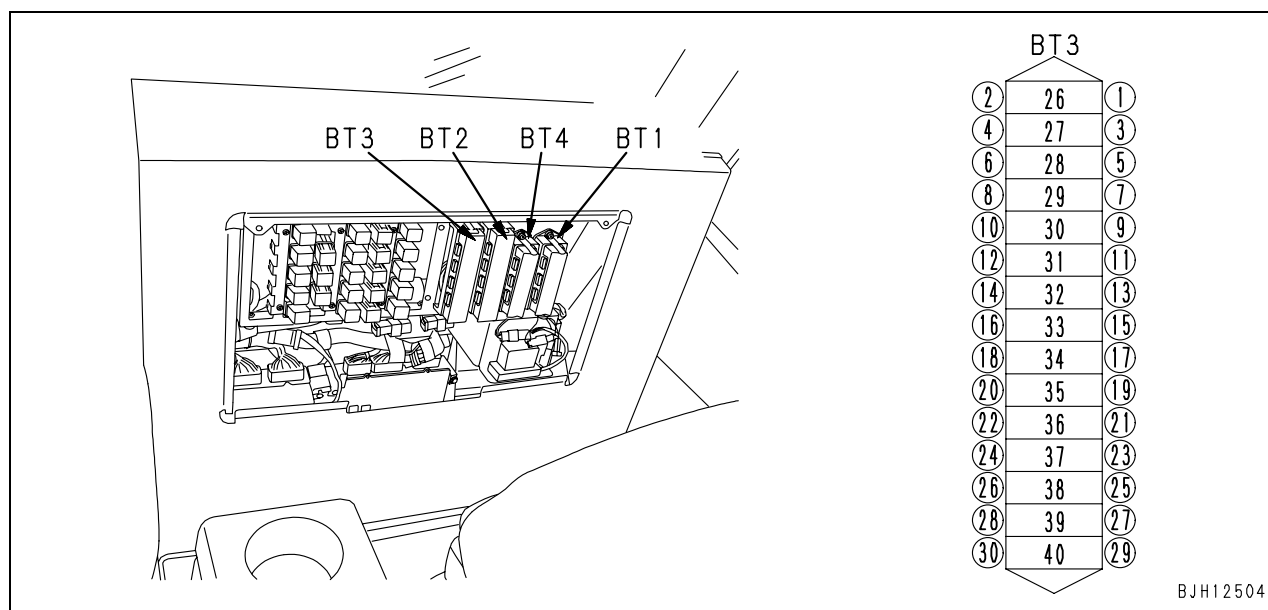


★ The circled numbers are the terminal numbers shown in the circuit diagram of each failure code.

● Fuse box BT2

Type of power supply	Circuit breaker output	Fuse No.	Fuse capacity	Destination of power
Key switch (ACC)		(11)	10A	Machine monitor
Key switch (BR)		(12)	10A	Rear view range monitor (if equipped), VHMS download
Accessory power supply	FuB1 (80A)	(13)	10A	Parking brake circuit
		(14)	20A	Power window (Left)
		(15)	20A	Power window (Right)
Unswitched power supply	FuA2 (30A)	(16)	10A	—
Accessory power supply	FuB1 (80A)	(17)	10A	Horn
Unswitched power supply	FuA2 (30A)	(18)	10A	Machine monitor
		(19)	10A	Transmission controller
		(20)	20A	Terminal B
		(21)	10A	Retarder controller, ABS controller
		(22)	20A	Hazard lamp
		(23)	10A	Emergency steering
		(24)	10A	Room lamp, radio
		(25)	10A	Machine monitor, VHMS controller

Fuse box (BT3) location and connection table

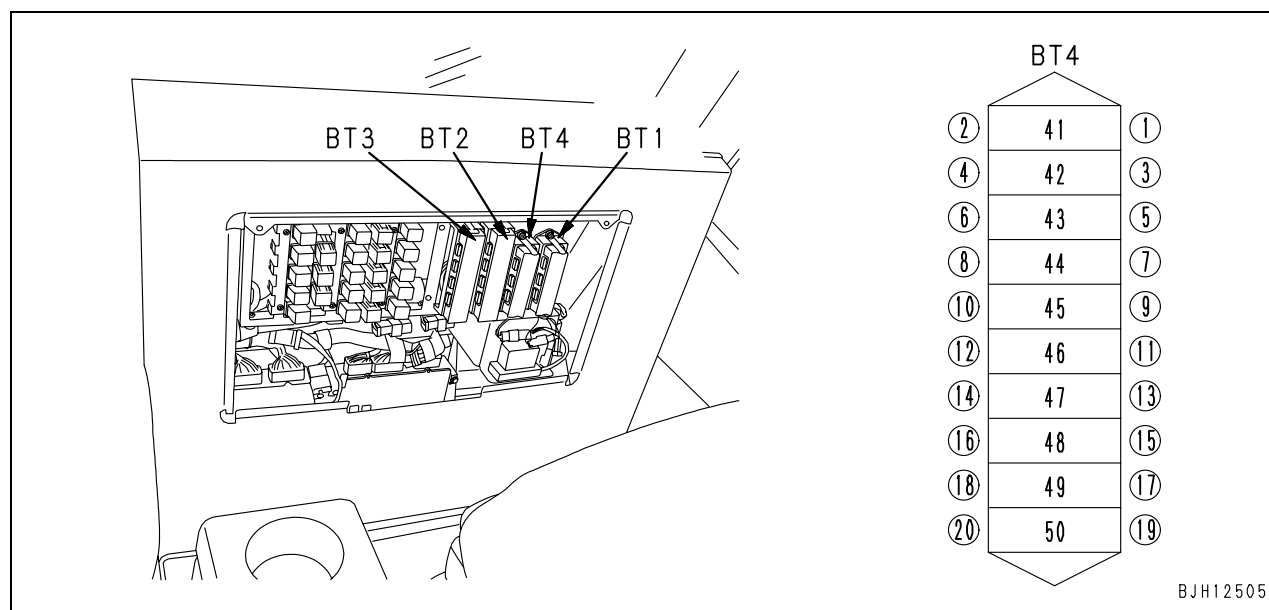


★ The circled numbers are the terminal numbers shown in the circuit diagram of each failure code.

● Fuse box BT3

Type of power supply	Circuit breaker output	Fuse No.	Fuse capacity	Destination of power
Accessory power supply	FuB1 (80A)	(26)	20A	Fog lamp (if equipped)
Accessory power supply	FuB2 (80A)	(27)	20A	Air conditioner controller
		(28)	20A	Heater (if equipped)
		(29)	20A	Heater (if equipped)
		(30)	20A	ABS controller
		(31)	20A	Retarder controller
		(32)	10A	Transmission controller, gearshift lever power supply
		(33)	10A	Emergency steering, parking brake relay
		(34)	10A	Radio
Key switch (ACC)		(35)	5A	Engine controller
Unswitched power supply	FuA1 (80A)	(36)	30A	Engine controller
		(37)		
Unswitched power supply	FuA1 (80A)	(38)	30A	Engine controller
		(39)		
		(40)	2A	Spare

Fuse box (BT4) location and connection table



★ The circled numbers are the terminal numbers shown in the circuit diagram of each failure code.

● Fuse box BT4

Type of power supply	Circuit breaker output	Fuse No.	Fuse capacity	Destination of power
Accessory power supply	FuB2 (80A)	(41)	10A	Room lamp
		(42)	10A	Engine preheater power supply
		(43)	20A	Yellow rotary lamp (if equipped)
		(44)	20A	Side lamp (if equipped)
Accessory power supply	FuB1 (80A)	(45)	20A	Electrical operator's seat heater (if equipped), air suspension seat (if equipped)
		(46)	10A	External indicator lamp of payload meter
		(47)	10A	Tachograph (if equipped), cigarette lighter
		(48)	20A	Air conditioner
		(49)	20A	Spare
		(50)	20A	Front windshield wiper

HD785-7 Dump truck

Form No. SEN01936-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

40 Troubleshooting

General information on troubleshooting

Points to remember when troubleshooting	2
Sequence of events in troubleshooting.....	3
Check before troubleshooting	4
Classification and procedures for troubleshooting	5
Contents of troubleshooting table	6
Connection table for connector pin numbers	8
T-adapter box and T-adapter table.....	37

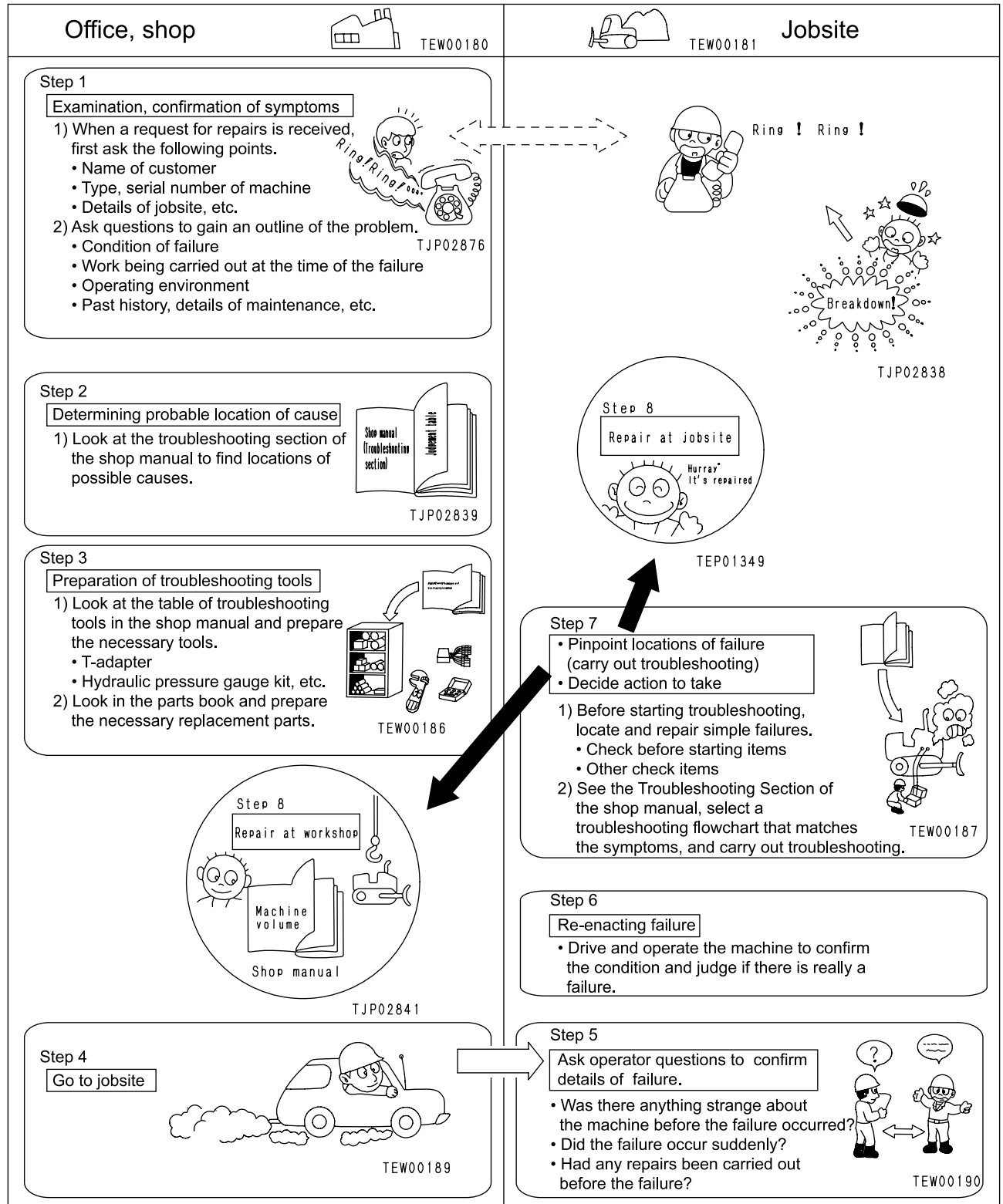
Points to remember when troubleshooting

- ⚠ Stop the machine in a level place, and check that the lock pin, blocks, and parking brake are securely fitted.
- ⚠ When carrying out the operation with 2 or more workers, keep strictly to the agreed signals, and do not allow any unauthorized person to come near.
- ⚠ If the radiator cap is removed when the engine is hot, hot coolant may spurt out and cause burns, so wait for the engine to cool down before starting troubleshooting.
- ⚠ Be extremely careful not to touch any hot parts or to get caught in any rotating parts.
- ⚠ When disconnecting wiring, always disconnect the negative (–) terminal of the battery first.
- ⚠ When removing the plug or cap from a location which is under pressure from oil, water, or air, always release the internal pressure first. When installing testing equipment, be sure to connect it properly.

The aim of troubleshooting is to pinpoint the basic cause of the failure, to carry out repairs swiftly, and to prevent reoccurrence of the failure. When carrying out troubleshooting, an important point is of course to understand the structure and function. However, a short cut to effective troubleshooting is to ask the operator various questions to form some idea of possible causes of the failure that would produce the reported symptoms.

1. When carrying out troubleshooting, do not hurry to disassemble the components.
If components are disassembled immediately any failure occurs:
 - Parts that have no connection with the failure or other unnecessary parts will be disassembled.
 - It will become impossible to find the cause of the failure.
 It will also cause a waste of manhours, parts, or oil or grease, and at the same time, will also lose the confidence of the user or operator. For this reason, when carrying out troubleshooting, it is necessary to carry out thorough prior investigation and to carry out troubleshooting in accordance with the fixed procedure.
2. Points to ask user or operator
 - 1) Have any other problems occurred apart from the problem that has been reported?
 - 2) Was there anything strange about the machine before the failure occurred?
 - 3) Did the failure occur suddenly, or were there problems with the machine condition before this?
 - 4) Under what conditions did the failure occur?
 - 5) Had any repairs been carried out before the failure? When were these repairs carried out?
 - 6) Has the same kind of failure occurred before?
3. Check before troubleshooting
 - 1) Is there any sign of irregularities of the machine?
 - 2) Make checks before starting day's work.
 - 3) Make checks of other items.
- 4) Other maintenance items can be checked externally, so check any item that is considered to be necessary.
4. Confirming failure
Confirm the extent of the failure yourself, and judge whether to handle it as a real failure or as a problem with the method of operation, etc.
 - ★ When operating the machine to reenact the troubleshooting symptoms, do not carry out any investigation or measurement that may make the problem worse.
5. Troubleshooting
Use the results of the investigation and inspection in Items 2 – 4 to narrow down the causes of failure, then use the troubleshooting table or troubleshooting flowchart to locate the position of the failure exactly.
 - ★ The basic procedure for troubleshooting is as follows.
 - 1] Start from the simple points.
 - 2] Start from the most likely points.
 - 3] Investigate other related parts or information.
6. Measures to remove root cause of failure
Even if the failure is repaired, if the root cause of the failure is not repaired, the same failure will occur again. To prevent this, always investigate why the problem occurred. Then, remove the root cause.

Sequence of events in troubleshooting



Check before troubleshooting

	Item	Criterion	Remedy
Lubricating oil/Coolant	1. Check of level and type of fuel	—	Add fuel
	2. Check for foreign matter in fuel	—	Clean and drain
	3. Check of fuel filter	—	Replace
	4. Check of level and type of hydraulic oil	—	Add oil
	5. Check of hydraulic oil strainer	—	Clean and drain
	6. Check of hydraulic oil filter	—	Replace
	7. Check of level and type of oil in engine oil pan	—	Add oil
	8. Check of engine oil filter	—	Replace
	9. Check of coolant level	—	Add coolant
	10. Check of dust indicator for clogging	—	Clean and replacce
	11. Check of power train oil filter	—	Replace
	12. Check of powertrain oil level	—	Add oil
	13. Check of final draive oil level	—	Add oil
	14. Check of differential oil level	—	Add oil
Electrical parts	1. Check of battery terminal cables for looseness and corrosion	—	Retighten or replace
	2. Check of alternator terminal cables for looseness and corrosion	—	Retighten or replace
	3. Check of starting motor terminal cables for looseness and corrosion	—	Retighten or replace
	4. Check of operation of instruments	—	Repair or replace
Hydraulic/Mechanical equipment	1. Check for abnormal noise and smell	—	Repair
	2. Check for oil leakage	—	Repair
	3. Bleeding air	—	Bleed air
Electrical equipment	1. Check of battery voltage (with engine stopped)	20 – 26 V	Replace
	2. Check of battery electrolyte level	—	Retighten or replace
	3. Check wires for discoloration, burn, and removal of cover	—	Replace
	4. Check for removed wire clamp and drooping wire	—	Repair
	5. Check wiring for wetting with water (Check connectors and terminals for wetting with water, in particular)	—	Disconnect and dry connectors
	6. Check of slow-blow fuses and fuses for disconnection and corrosion	—	Replace
	7. Check of alternator voltage (with engine at medium speed or higher)	After several-minute operation: 27.5 – 29.5 V	Replace
	8. Check of operating sound of battery relay (Starting switch OFF ⇄ ON)	—	Replace

Classification and procedures for troubleshooting

Classification for troubleshooting

Type	Contents
Display of code	Troubleshooting by failure code
E mode	Troubleshooting for electrical system
H mode	Troubleshooting for hydraulic and mechanical system
S mode	Troubleshooting for engine

Procedure for troubleshooting

If a phenomenon looking like a trouble occurs in the machine, select a proper troubleshooting No. according to the following procedure, and then go to the corresponding troubleshooting section.

1. Procedure for troubleshooting to be taken when action code and failure code are displayed on machine monitor:

If a action code and a failure code are displayed on the machine monitor, carry out the troubleshooting for the corresponding "**Display of code**" according to the displayed failure code.

2. When electrical system failure code or mechanical system failure code is recorded in fault history:

If a action code and a failure code are not displayed on the machine monitor, check for a mechanical system failure code and an electrical system failure code with the fault history function of the machine monitor.

If a failure code is recorded, carry out troubleshooting for the corresponding "**Display of code**" according to that code.

- ★ If an electrical system failure code is recorded, delete all the codes and reproduce them, and then see if the trouble is still detected.
- ★ A failure code of the mechanical system cannot be deleted.
- ★ If a trouble is displayed in the air conditioner fault history or heater fault history by the fault history function, carry out the corresponding troubleshooting in "**E mode**".

3. When action code or failure code is not displayed and no failure code is recorded in fault history:

If a action code or a failure code is not displayed on the machine monitor and no failure code is recorded in the fault history, a trouble that the machine cannot find out by itself may have occurred in the electrical system or hydraulic and mechanical system.

In this case, check the phenomenon looking like a trouble again and select the same phenomenon from the table of "Phenomena looking like troubles and troubleshooting Nos.", and then carry out troubleshooting corresponding to that phenomenon in the "**E mode**", "**H mode**", or "**S mode**".

Contents of troubleshooting table

★ The following information is summarized in the troubleshooting table and the related electrical circuit diagram. Before carrying out troubleshooting, understand that information fully.

Action code	Failure code	Trouble	Names of the failure symptoms displayed in the failure history on the machine monitor
Machine monitor display	Machine monitor display		
Contents of trouble	State where the machine monitor or controller detects the trouble		
Action of machine monitor or controller	Action to be taken to protect the system and equipment when the machine monitor or controller detects a trouble		
Problem that appears on machine	Problem that appears as an abnormality in the machine by the action (above) taken by monitor or controller		
Related information	Information related to troubles occurred or troubleshooting		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Cause by which a trouble is assumed to be detected (The order number indicates a serial number, not a priority sequence.)	<Described contents> - Standard value when normal required to judge the possible cause - Remarks required to judge whether any cause is right or not
	2		<Symptoms of defective harness> Disconnection in wiring The connector connection is defective or the wiring harness is disconnected. Defective grounding A harness not connected to GND (ground) circuit comes into contact with the GND (ground) circuit. Hot short defect A harness not connected to the electric power supply (24V) circuit comes into contact with the electric power supply (24V) circuit. Short circuit A harness abnormally comes into contact with a harness of separate circuit.
	3		<Points to remember when troubleshooting> (1) Method of indicating connector numbers and handling T-adapter For troubleshooting, insert or connect the T- adapter as described below unless especially specified. - When “male” or “female” is not indicated for a connector number, disconnect the connector, and insert the T-adapter in both the male and female. - When “male” or “female” is indicated for a connector number, disconnect the connector, and insert the T-adapter in only either the male or female.
	4		(2) Pin number description sequence and tester lead handling For troubleshooting, connect the plus (+) and minus (-) leads of the tester as described below unless especially specified. - Connect the plus (+) lead to a pin number or harness indicated in the front. - Connect the minus (-) lead to a pin number or harness indicated in the rear.

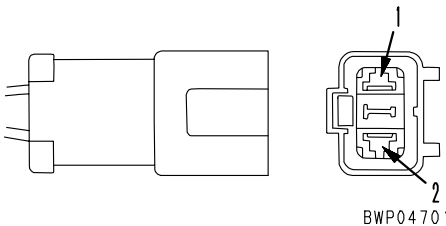
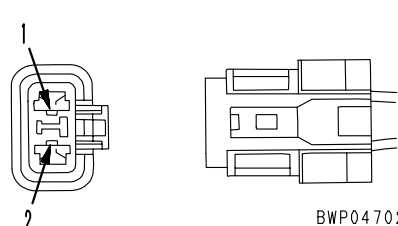
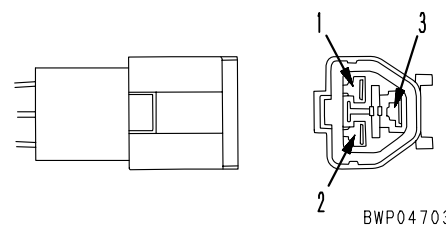
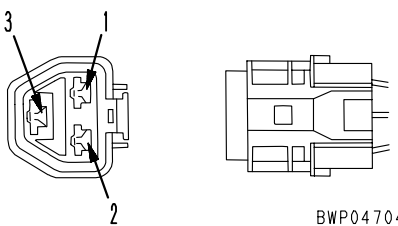
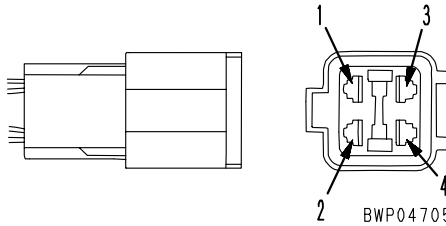
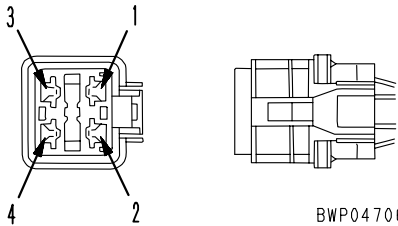
Circuit diagram related

This drawing is a part of the electric circuit diagram related to trouble-shooting.

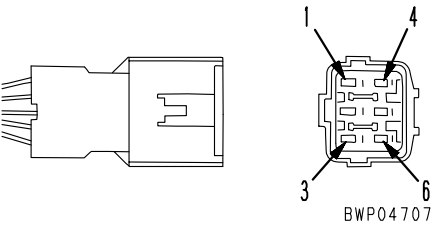
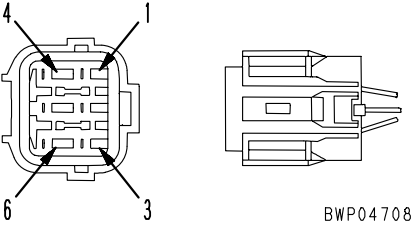
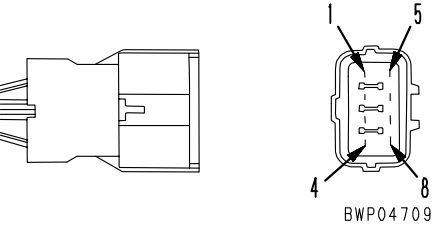
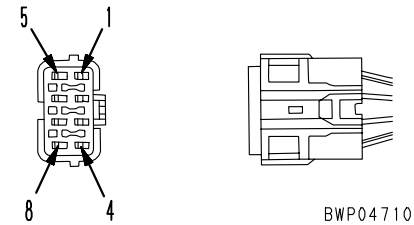
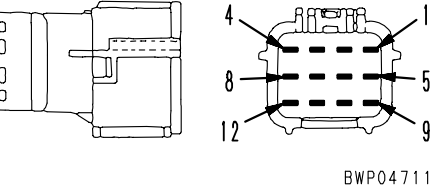
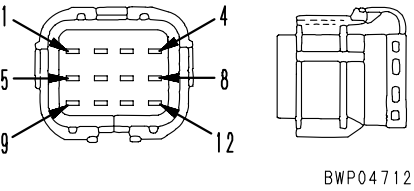
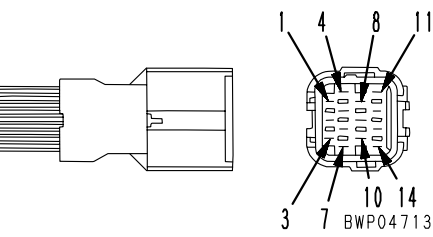
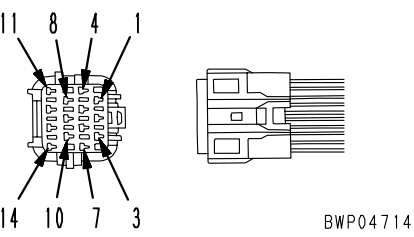
- Connector No.: Indicates (Model - Number of pins) and (Color).
- "Connector No. and pin No." from each branching/merging point:
Shows the ends of branch or source of merging within the parts of the same wiring harness.
- Arrow (↔): Roughly shows the location on the machine.

Connection table for connector pin numbers

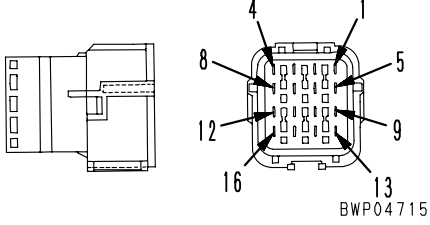
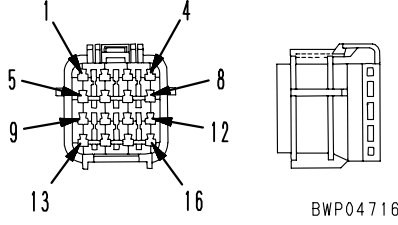
- ★ The terms male and female refer to the pins, while the terms male housing and female housing refer to the mating portion of the housing.

No. of pins	X type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
1	Part No. : 08055-00181	Part No. : 08055-00191	799-601-7010
2	 BWP04701	 BWP04702	799-601-7020
	Part No. : 08055-00282	Part No. : 08055-00292	
3	 BWP04703	 BWP04704	799-601-7030
	Part No. : 08055-00381	Part No. : 08055-00391	
4	 BWP04705	 BWP04706	799-601-7040
	Part No. : 08055-00481	Part No. : 08055-00491	
—	Terminal part No. : 79A-222-3370 ·Electric wire size: 0.85 ·Grommet:Black ·Q'ty: 20	Terminal part No. : 79A-222-3390 ·Electric wire size: 0.85 ·Grommet:Black ·Q'ty: 20	—
—	Terminal part No. : 79A-222-3380 ·Electric wire size: 2.0 ·Grommet:Red ·Q'ty: 20	Terminal part No. : 79A-222-3410 ·Electric wire size: 2.0 ·Grommet:Red ·Q'ty: 20	—

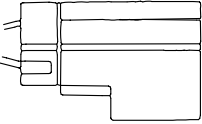
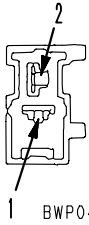
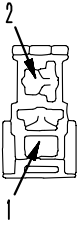
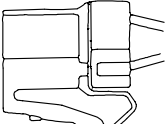
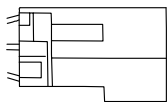
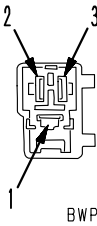
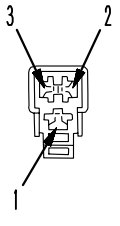
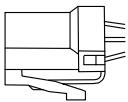
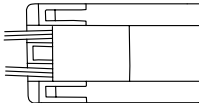
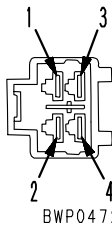
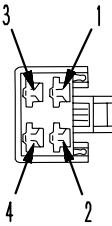
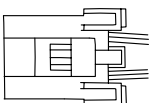
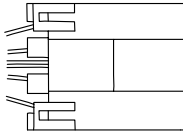
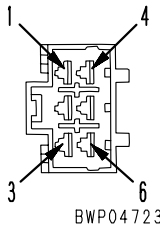
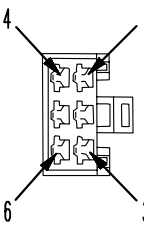
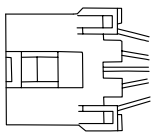
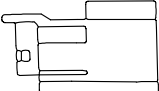
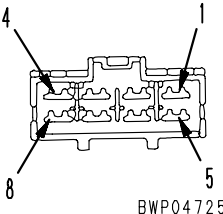
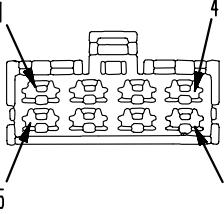
9JS04890

No. of pins	SWP type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
6	 BWP04707	 BWP04708	799-601-7050
	Part No. : 08055-10681	Part No. : 08055-10691	
8	 BWP04709	 BWP04710	799-601-7060
	Part No. : 08055-10881	Part No. : 08055-10891	
12	 BWP04711	 BWP04712	799-601-7310
	Part No. : 08055-11281	Part No. : 08055-11291	
14	 BWP04713	 BWP04714	799-601-7070
	Part No. : 08055-11481	Part No. : 08055-11491	

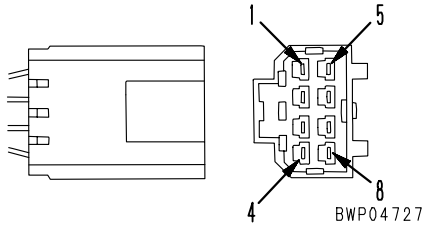
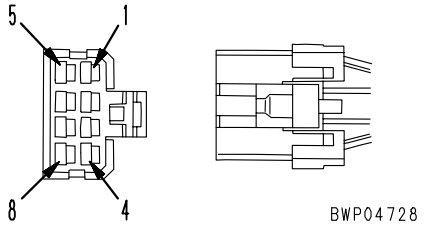
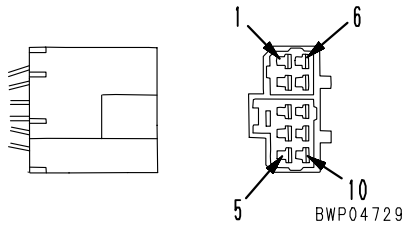
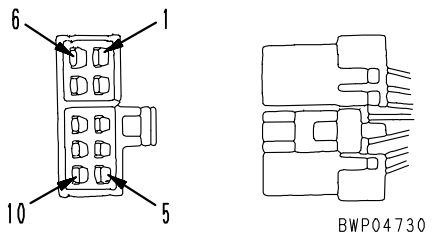
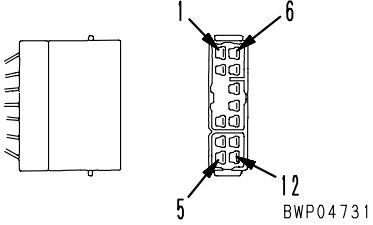
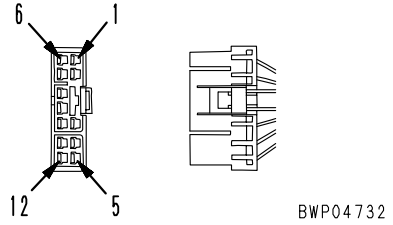
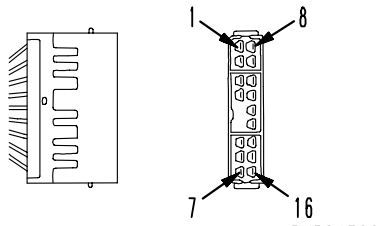
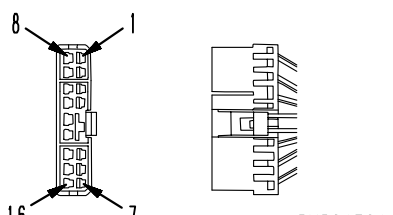
9JS04891

No. of pins	SWP type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
16	 BWP04715	 BWP04716	799-601-7320
	Part No. : 08055-11681	Part No. : 08055-11691	
—	Terminal part No. : ·Electric wire size: 0.85 ·Grommet:Black ·Q'ty: 20	Terminal part No. : ·Electric wire size: 0.85 ·Grommet:Black ·Q'ty: 20	—
—	Terminal part No. : ·Electric wire size: 1.25 ·Grommet:Red ·Q'ty: 20	Terminal part No. : ·Electric wire size: 1.25 ·Grommet:Red ·Q'ty: 20	—

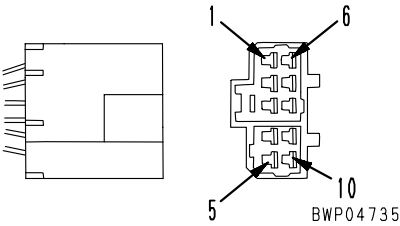
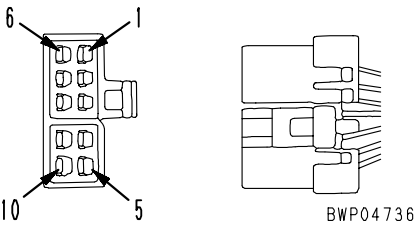
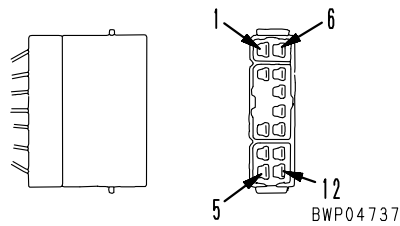
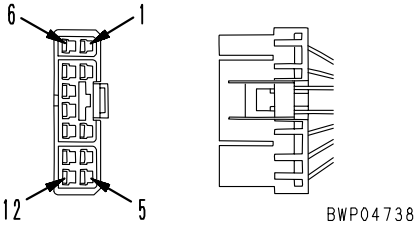
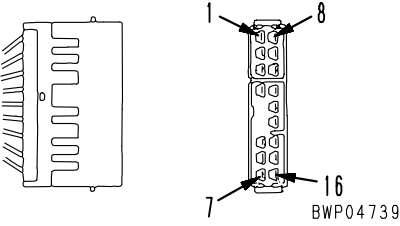
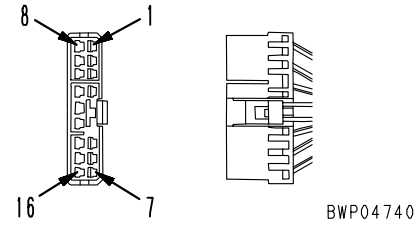
9JS04892

No. of pins	M type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
1	Part No. : 08056-00171	Part No. : 08056-00181	799-601-7080
2	  BWP04717	  BWP04718	799-601-7090
	Part No. : 08056-00271	Part No. : 08056-00281	
3	  BWP04719	  BWP04720	799-601-7110
	Part No. : 08056-00371	Part No. : 08056-00381	
4	  BWP04721	  BWP04722	799-601-7120
	Part No. : 08056-00471	Part No. : 08056-00481	
6	  BWP04723	  BWP04724	799-601-7130
	Part No. : 08056-00671	Part No. : 08056-00681	
8	  BWP04725	  BWP04726	799-601-7340
	Part No. : 08056-00871	Part No. : 08056-00881	

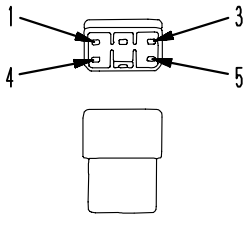
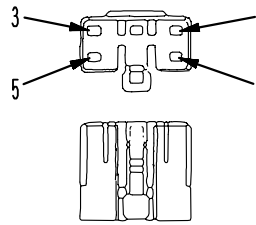
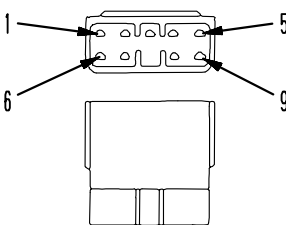
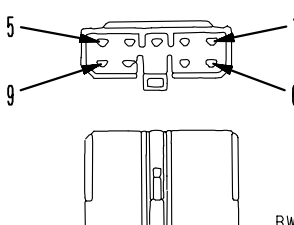
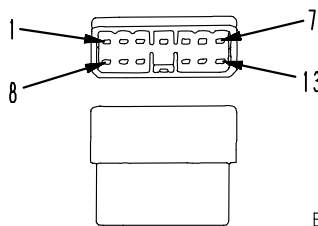
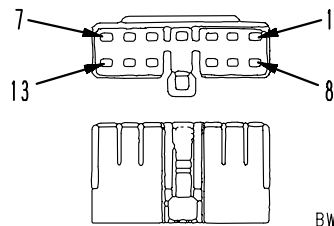
9JS04893

No. of pins	S type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
8	 BWP04727	 BWP04728	799-601-7140
	Part No. : 08056-10871	Part No. : 08056-10881	
10 (White)	 BWP04729	 BWP04730	799-601-7150
	Part No. : 08056-11071	Part No. : 08056-11081	
12 (White)	 BWP04731	 BWP04732	799-601-7350
	Part No. : 08056-11271	Part No. : 08056-11281	
16 (White)	 BWP04733	 BWP04734	799-601-7330
	Part No. : 08056-11671	Part No. : 08056-11681	

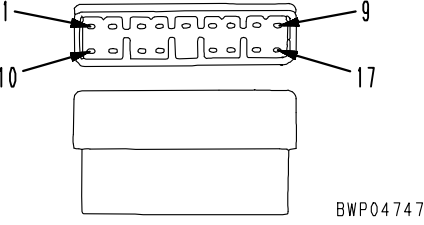
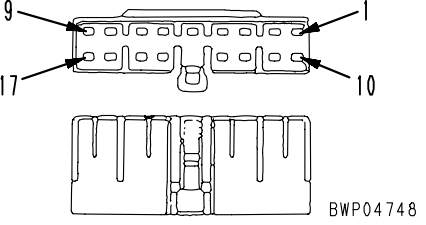
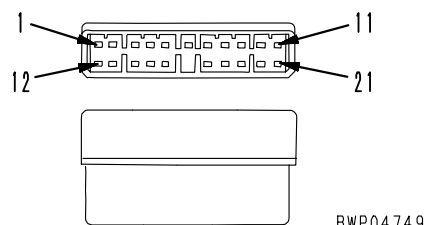
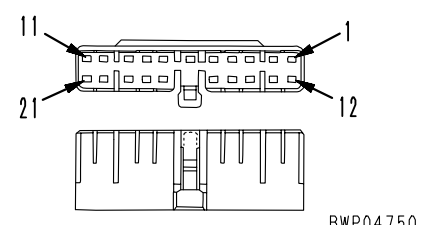
9JS04894

No. of pins	S type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
10 (Blue)			—
	—	—	
12 (Blue)			799-601-7160
	Part No. : 08056-11272	Part No. : 08056-11282	
16 (Blue)			799-601-7170
	Part No. : 08056-11672	Part No. : 08056-11682	

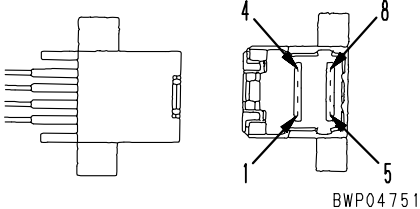
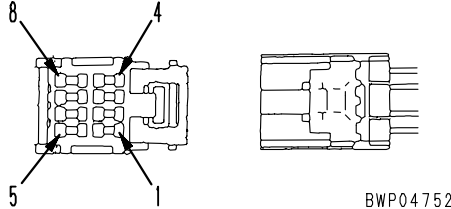
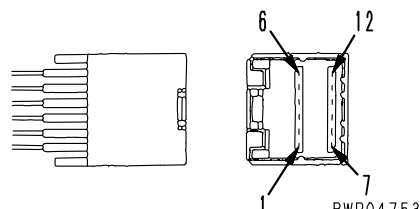
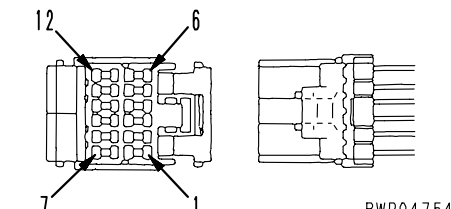
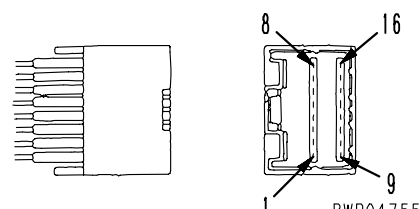
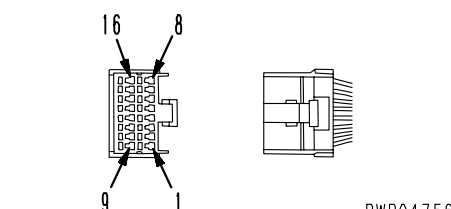
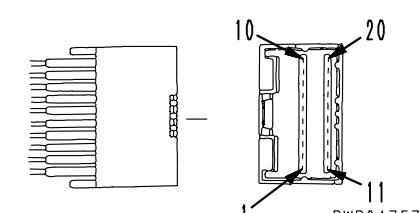
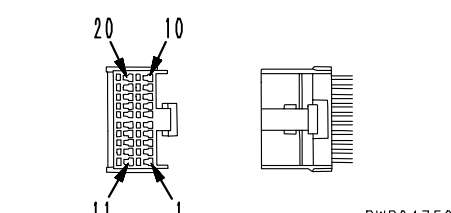
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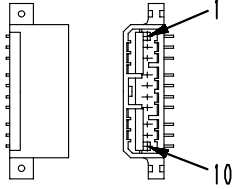
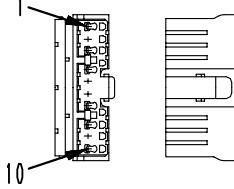
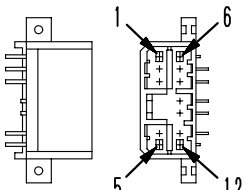
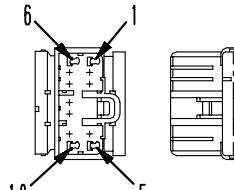
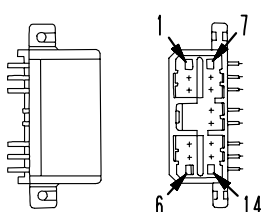
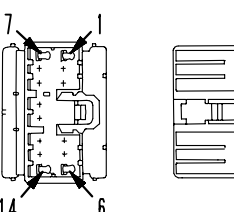
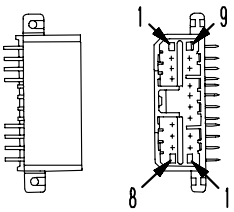
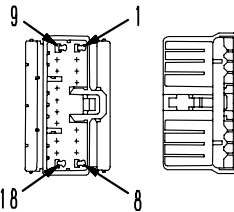
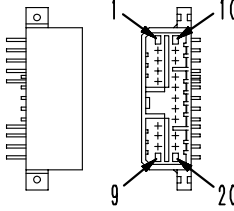
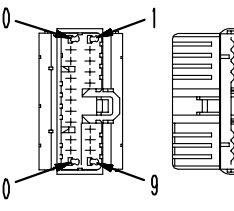
No. of pins	MIC type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
7	Body part No. : 79A-222-2640 (Q' ty:5)	Body part No. : 79A-222-2630 (Q' ty:5)	—
11	Body part No. : 79A-222-2680 (Q' ty:5)	Body part No. : 79A-222-2670 (Q' ty:5)	—
5	 BWP04741	 BWP04742	799-601-2710
	Body part No. : 79A-222-2620 (Q' ty:5)	Body part No. : 79A-222-2610 (Q' ty:5)	
9	 BWP04743	 BWP04744	799-601-2950
	Body part No. : 79A-222-2660 (Q' ty:5)	Body part No. : 79A-222-2650 (Q' ty:5)	
13	 BWP04745	 BWP04746	799-601-2720
	Body part No. : 79A-222-2710 (Q' ty:2)	Body part No. : 79A-222-2690 (Q' ty:2)	

9JS04896

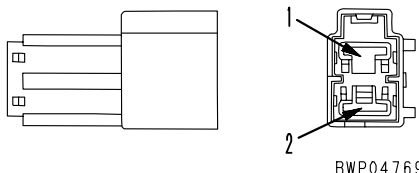
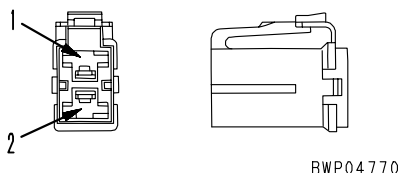
No. of pins	MIC type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
17	 BWP04747	 BWP04748	799-601-2730
	Body part No. : 79A-222-2730 (Q' ty:2)	Body part No. : 79A-222-2720 (Q' ty:2)	
21	 BWP04749	 BWP04750	799-601-2740
	Body part No. : 79A-222-2750 (Q' ty:2)	Body part No. : 79A-222-2740 (Q' ty:2)	
	Terminal part No. : 79A-222-2770 (Q' ty:50)	Terminal part No. : 79A-222-2760 (Q' ty:50)	

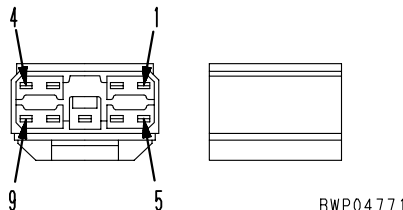
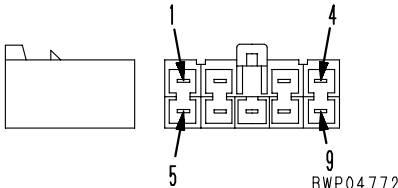
9JS04897

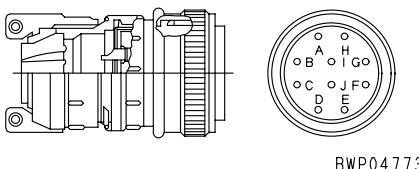
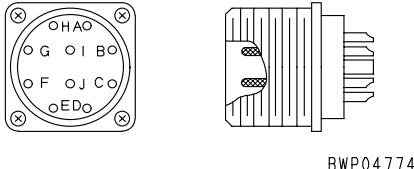
No. of pins	AMP040 type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
8	 BWP04751	 BWP04752	799-601-7180
	—	Housing part No. : 79A-222-3430 (Q' ty:5)	
12	 BWP04753	 BWP04754	799-601-7190
	—	Housing part No. : 79A-222-3440 (Q' ty:5)	
16	 BWP04755	 BWP04756	799-601-7210
	—	Housing part No. : 79A-222-3450 (Q' ty:5)	
20	 BWP04757	 BWP04758	799-601-7220
	—	Housing part No. : 79A-222-3460 (Q' ty:5)	
★ Terminal part No. : 79A-222-3470 (No relation with number of pins)			
9JS04898			

No. of pins	AMP070 type connector		
	Male (female housing)	Female (male housing)	T-adaptor Part No.
10	 BWP04759	 BWP04760	799-601-7510
	—	Part No. : 7821-92-7330	
12	 BWP04761	 BWP04762	799-601-7520
	—	Part No. : 7821-92-7340	
14	 BWP04763	 BWP04764	799-601-7530
	—	Part No. : 7821-92-7350	
18	 BWP04765	 BWP04766	799-601-7540
	—	Part No. : 7821-92-7360	
20	 BWP04767	 BWP04768	799-601-7550
	—	Part No. : 7821-92-7370	

9JS04899

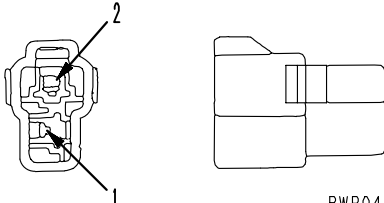
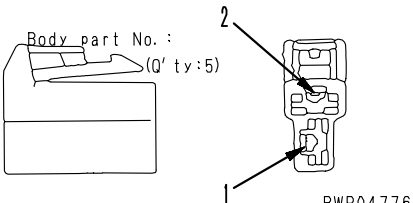
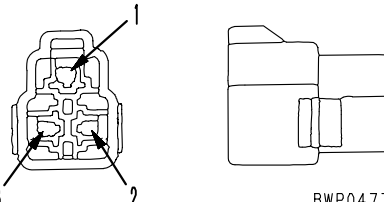
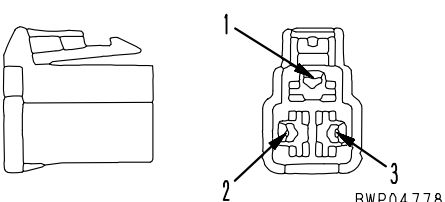
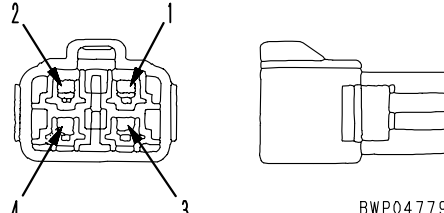
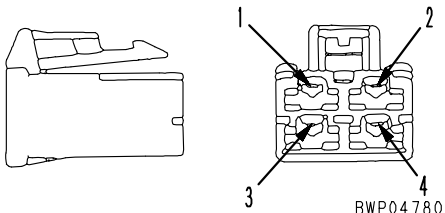
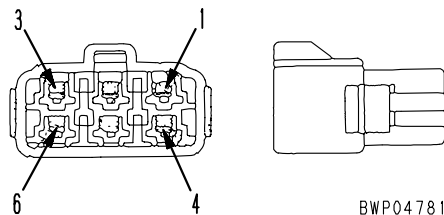
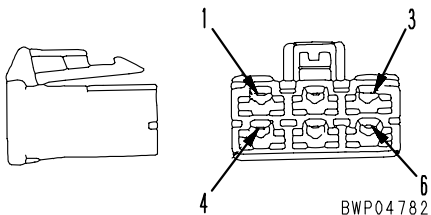
No. of pins	L type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
2	 BWP04769	 BWP04770	—
	—	—	

No. of pins	Connector for PA		
	Male (female housing)	Female (male housing)	T-adapter Part No.
9	 BWP04771	 BWP04772	—
	—	—	

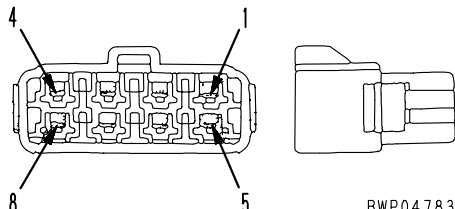
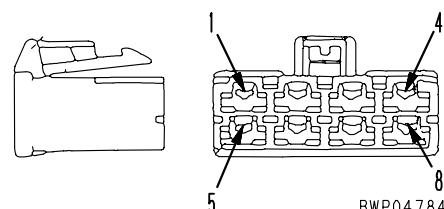
No. of pins	Bendix MS connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
10	 BWP04773	 BWP04774	799-601-3460
	—	—	

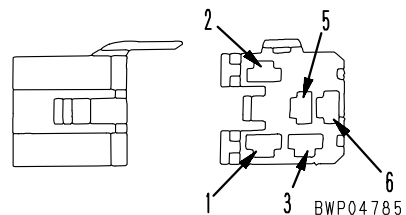
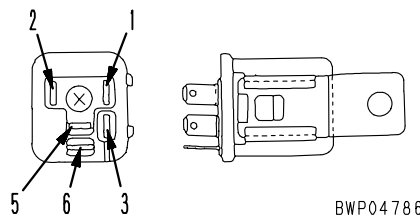
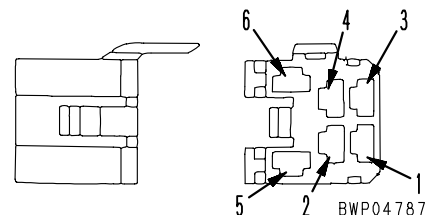
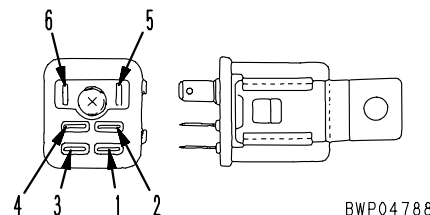
9JS04900

9JS04900

No. of pins	KES 1 (Automobile) connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
2	 BWP04775	 Body part No. : (Q'ty:5) BWP04776	—
	Part No. : 08027-10210 (Natural color) 08027-10220 (Black)	Part No. : 08027-10260 (Natural color) 08027-10270 (Black)	
3	 BWP04777	 BWP04778	—
	Part No. : 08027-10310	Part No. : 08027-10360	
4	 BWP04779	 BWP04780	—
	Part No. : 08027-10410 (Natural color) 08027-10420 (Black)	Part No. : 08027-10460 (Natural color) 08027-10470 (Black)	
6	 BWP04781	 BWP04782	—
	Part No. : 08027-10610 (Natural color) 08027-10620 (Black)	Part No. : 08027-10660 (Natural color) 08027-10670 (Black)	

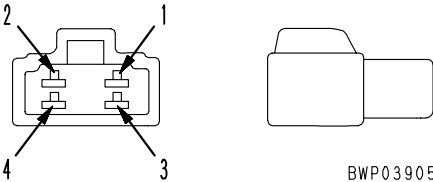
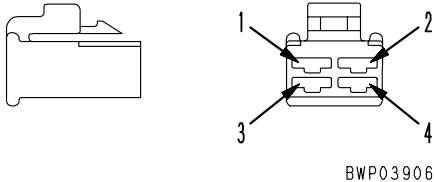
9JS04901

No. of pins	KES1 (Automobile) connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
8	 BWP04783	 BWP04784	—
	Part No. :08027-10810 (Natural color) 08027-10820 (Black)	Part No. :08027-10860 (Natural color) 08027-10870 (Black)	

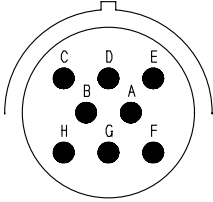
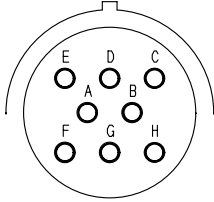
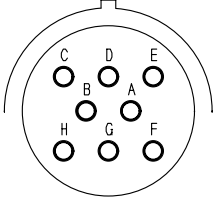
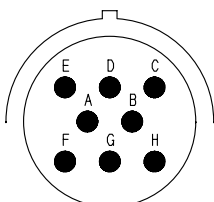
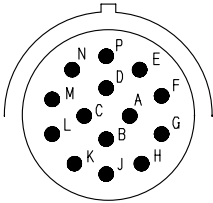
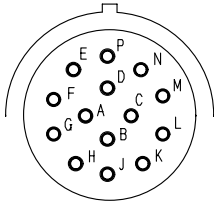
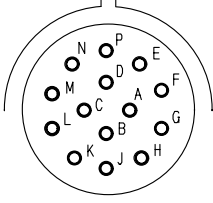
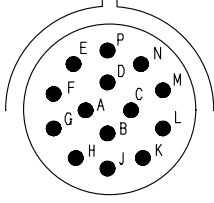
No. of pins	Connector for relay (Socket type)		
	Male (female housing)	Female (male housing)	T-adapter Part No.
5	 BWP04785	 BWP04786	799-601-7360
	—	—	
6	 BWP04787	 BWP04788	799-601-7370
	—	—	

9JS04902

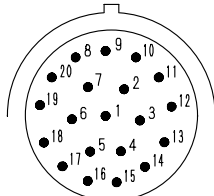
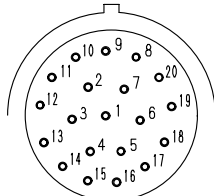
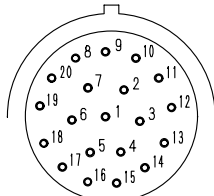
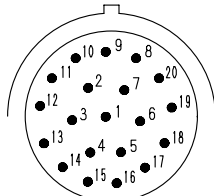
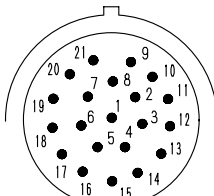
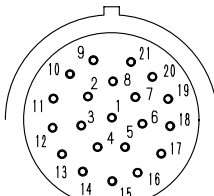
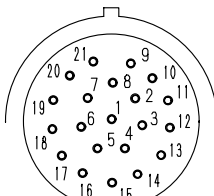
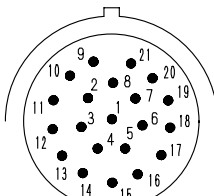
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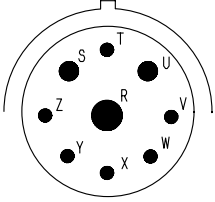
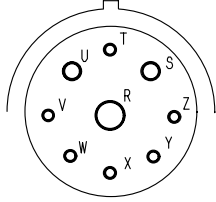
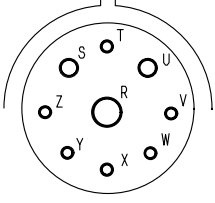
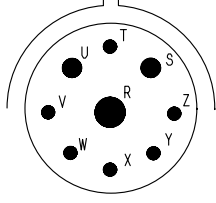
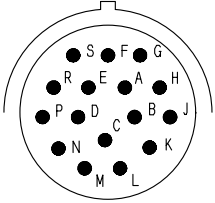
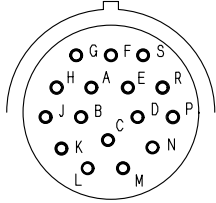
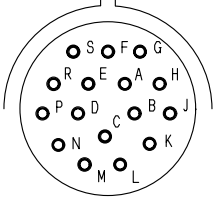
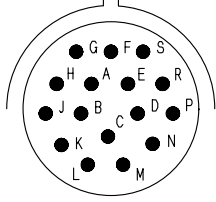
No. of pins	F type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
4	 BWP03905	 BWP03906	—
	—	—	

9JS04903

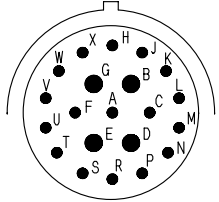
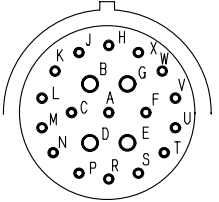
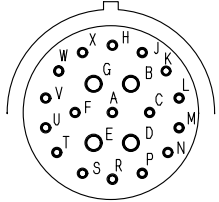
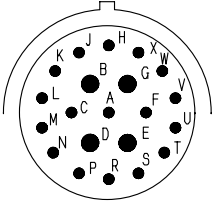
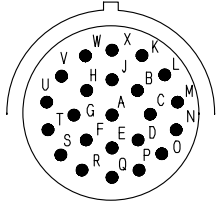
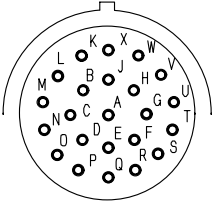
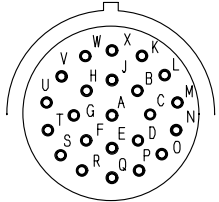
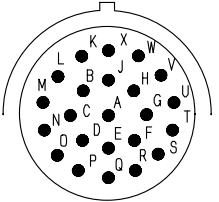
[The pin No. is also marked on the connector (electric wire insertion end)]			
Type (shell size code)	HD30 Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
18-8 (1)	Pin (male terminal)	Socket (female terminal)	799-601-9210
	 BWP05001	 BWP05002	
	Part No. : 08191-11201, 08191-11202, 08191-11205, 08191-11206	Part No. : 08191-14101, 08191-14102, 08191-14105, 08191-14106	799-601-9210
	Socket (female terminal)	Pin (male terminal)	
18-14 (2)	 BWP05003	 BWP05004	799-601-9220
	Part No. : 08191-12201, 08191-12202, 08191-12205, 08191-12206	Part No. : 08191-13101, 08191-13102, 08191-13105, 08191-13106	
	Pin (male terminal)	Socket (female terminal)	799-601-9220
	 BWP05005	 BWP05006	
18-14 (2)	Part No. : 08191-21201, 08191-21202, 08191-21205, 08191-21206	Part No. : 08191-24101, 08191-24102, 08191-24105, 08191-24106	799-601-9220
	Socket (female terminal)	Pin (male terminal)	
	 BWP05007	 BWP05008	799-601-9220
	Part No. : 08191-22201, 08191-22202, 08191-22205, 08191-22206	Part No. : 08191-23101, 08191-23102, 08191-23105, 08191-23106	

9JS04904

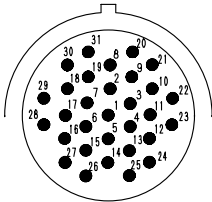
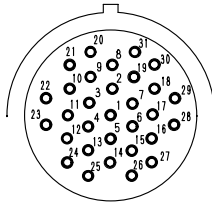
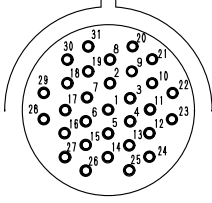
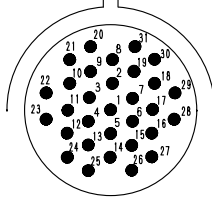
[The pin No. is also marked on the connector (electric wire insertion end)]			
Type (shell size code)	HD30 Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
18-20 (3)	Pin (male terminal)	Socket (female terminal)	799-601-9230
	 BWP05009	 BWP05010	
	Part No. : 08191-31201, 08191-31202		Part No. : 08191-34101, 08191-34102
	Socket (female terminal)	Pin (male terminal)	799-601-9230
 BWP05011	 BWP05012		
Part No. : 08191-32201, 08191-32202		Part No. : 08191-33101, 08191-33102	
18-21 (4)	Pin (male terminal)	Socket (female terminal)	799-601-9240
	 BWP05013	 BWP05014	
	Part No. : 08191-41201, 08191-42202		Part No. : 08191-44101, 08191-44102
	Socket (female terminal)	Pin (male terminal)	799-601-9240
 BWP05015	 BWP05016		
Part No. : 08191-42201, 08191-42202		Part No. : 08191-43101, 08191-43102	
9JS04905			

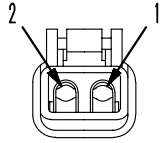
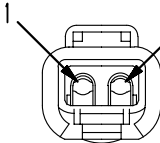
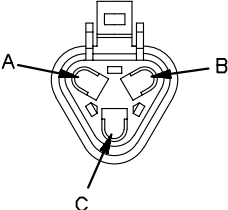
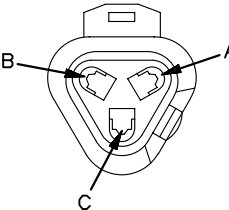
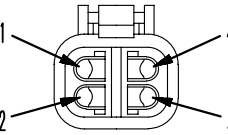
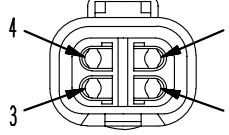
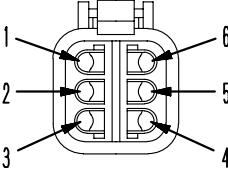
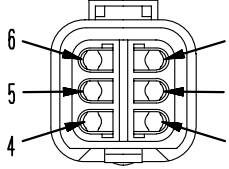
[The pin No. is also marked on the connector (electric wire insertion end)]			
Type (shell size code)	HD30 Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
24-9 (5)	Pin (male terminal)	Socket (female terminal)	799-601-9250
	 BWP05017	 BWP05018	
	Part No. :08191-51201, 08191-51202	Part No. :08191-54101, 08191-54102	799-601-9250
	Socket (female terminal)	Pin (male terminal)	
24-16 (6)	 BWP05019	 BWP05020	799-601-9260
	Part No. :08191-52201, 08191-52202	Part No. :08191-53101, 08191-53102	
	Pin (male terminal)	Socket (female terminal)	799-601-9260
	 BWP05021	 BWP05022	
24-16 (6)	Part No. :08191-61201, 08191-62202, 08191-61205, 08191-62206	Part No. :08191-64101, 08191-64102, 08191-64105, 08191-64106	799-601-9260
	Socket (female terminal)	Pin (male terminal)	
	 BWP05023	 BWP05024	799-601-9260
	Part No. :08191-62201, 08191-62202, 08191-62205, 08191-62206	Part No. :08191-63101, 08191-63102, 08191-63105, 08191-63106	

9JS04906

[The pin No. is also marked on the connector (electric wire insertion end)]			
Type (shell size code)	HD30 Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
24-21 (7)	Pin (male terminal)	Socket (female terminal)	799-601-9270
	 BWP05025	 BWP05026	
	Part No. :08191-71201, 08191-71202, 08191-71205, 08191-71206	Part No. :08191-74101, 08191-74102, 08191-74105, 08191-74106	799-601-9270
	Socket (female terminal)	Pin (male terminal)	
	 BWP05027	 BWP05028	
	Part No. :08191-72201, 08191-72202, 08191-72205, 08191-72206	Part No. :08191-73101, 08191-73102, 08191-73105, 08191-73106	
24-23 (8)	Pin (male terminal)	Socket (female terminal)	799-601-9280
	 BWP05029	 BWP05030	
	Part No. :08191-81201, 08191-81202, 08191-81203, 08191-81204, 08191-81205, 08191-80206	Part No. :08191-84101, 08191-84102, 08191-84103, 08191-84104, 08191-84105, 08191-84106	799-601-9280
	Socket (female terminal)	Pin (male terminal)	
	 BWP05031	 BWP05032	
	Part No. :08191-82201, 08191-82202, 08191-82203, 08191-82204, 08191-82205, 08191-82206	Part No. :08191-83101, 08191-83102, 08191-83103, 08191-83104, 08191-83105, 08191-83106	

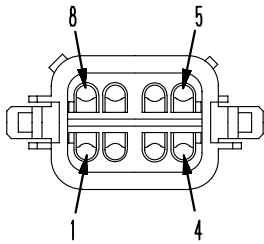
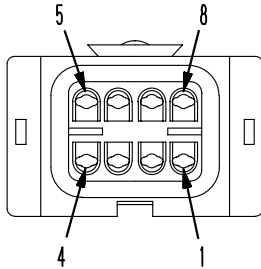
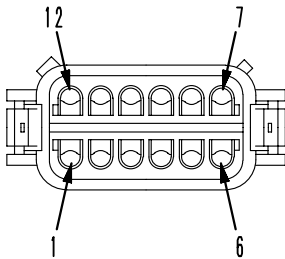
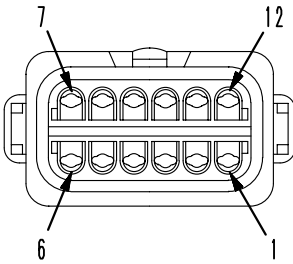
9JS04907

[The pin No. is also marked on the connector (electric wire insertion end)]			
Type (shell size code)	HD30 Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
24-31 (9)	Pin (male terminal)	Socket (female terminal)	799-601-9290
	 BWP05033	 BWP05034	
	Part No. : 08191-91203, 08191-91204, 08191-91205, 08191-91206	Part No. : 08191-94103, 08191-94104, 08191-94105, 08191-94106	799-601-9290
	Socket (female terminal)	Pin (male terminal)	
	 BWP05035	 BWP05036	
	Part No. : 08191-92203, 08191-92204, 08191-92205, 08191-92206	Part No. : 08191-93103, 08191-93104, 08191-93105, 08191-93106	
9JS04908			

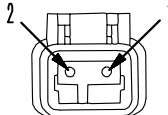
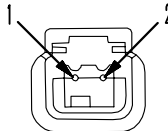
[The pin No. is also marked on the connector (electric wire insertion end)]			
No. of pins	DT Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
2	 BWP05037	 BWP05038	799-601-9020
	Part No. :08192-12200 (normal type) 08192-22200 (fine wire type)	Part No. :08192-12100 (normal type) 08192-22100 (fine wire type)	
3	 BWP05039	 BWP05040	799-601-9030
	Part No. :08192-1A200 (normal type) 08192-2A200 (fine wire type)	Part No. :08192-1A100 (normal type) 08192-2A100 (fine wire type)	
4	 BWP05041	 BWP05042	799-601-9040
	Part No. :08192-14200 (normal type) 08192-24200 (fine wire type)	Part No. :08192-14100 (normal type) 08192-24100 (fine wire type)	
6	 BWP05043	 BWP05044	799-601-9050
	Part No. :08192-16200 (normal type) 08192-26200 (fine wire type)	Part No. :08192-16100 (normal type) 08192-26100 (fine wire type)	

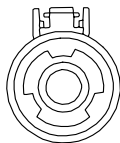
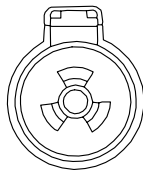
BJD14069

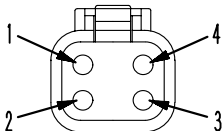
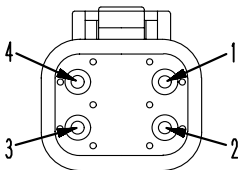
[The pin No. is also marked on the connector (electric wire insertion end)]

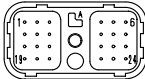
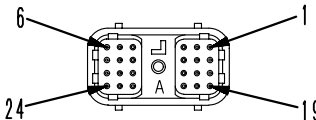
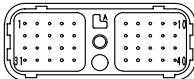
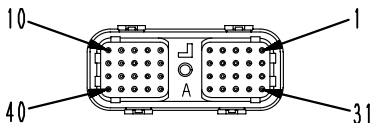
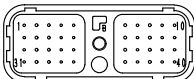
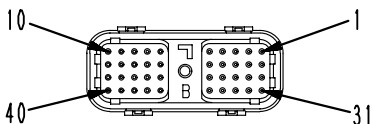
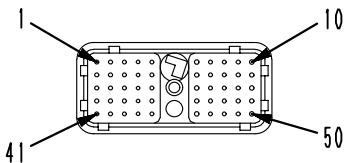
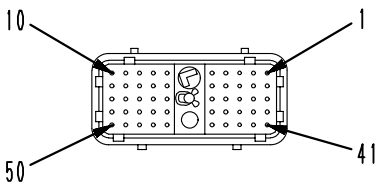
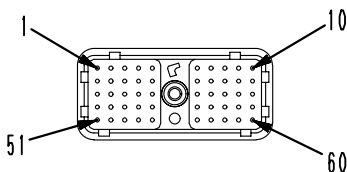
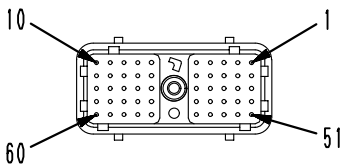
No. of pins	DT Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
8	 BWP05045	 BWP05046	8GR: 799-601-9060 8B: 799-601-9070 8G: 799-601-9080 8BR: 799-601-9090
	Part No. : 08192-1820□ (normal type) 08192-2820□ (fine wire type)	Part No. : 08192-1810□ (normal type) 08192-2810□ (fine wire type)	
12	 BWP05047	 BWP05048	12GR: 799-601-9110 12B: 799-601-9120 12G: 799-601-9130 12BR: 799-601-9140
	Part No. : 08192-1920□ (normal type) 08192-2920□ (fine wire type)	Part No. : 08192-1910□ (normal type) 08192-2910□ (fine wire type)	

9JS04910

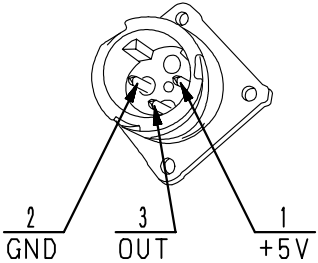
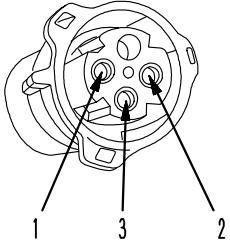
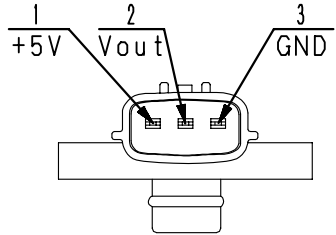
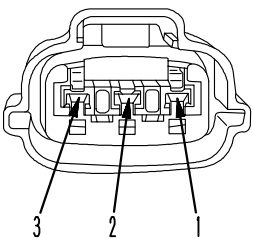
[The pin No. is also marked on the connector (electric wire insertion end)]			
No. of pins	DTM Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
2	 BWP05049	 BWP05050	799-601-9010
	Part No. :08192-02200	Part No. :08192-02100	
9JS04911			

[The pin No. is also marked on the connector (electric wire insertion end)]			
No. of pins	DTHD Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
2	 BWP05051	 BWP05052	—
	Part No. :08192-31200 (Contact size #12) 08192-41200 (Contact size #8) 08192-51200 (Contact size #4)	Part No. :08192-31100 (Contact size #12) 08192-41100 (Contact size #8) 08192-51100 (Contact size #4)	
9JS04912			

[The pin No. is also marked on the connector (electric wire insertion end)]			
No. of pins	DTP4 Series connector		
	Pin (male terminal)	Socket (female terminal)	T-adapter Part No.
4	 BJD14066	 BJD14067	799-601-4260
	—	Part No. :6261-81-2810	
BJD14071			

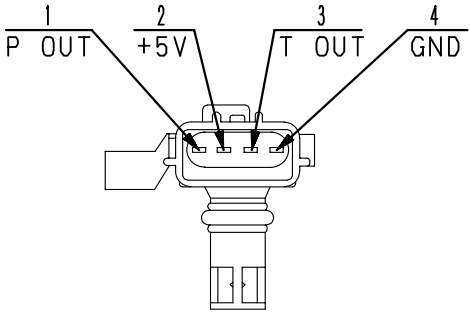
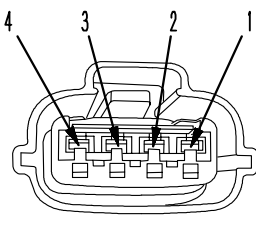
[The pin No. is also marked on the connector (electric wire insertion end)]			
No. of pins	DRC26 Series connector		
	Body (plug)	Body (receptacle)	T-adaptor Part No.
24	 BJD12722	 BJD12723	799-601-9360
	—	Part No. :08194-01101	
40 (A)	 BJD12724	 BJD12725	799-601-9350
	—	Part No. :08194-02101	
40 (B)	 BJD12726	 BJD12727	799-601-9350
	—	Part No. :08194-02102	
50	 9JS02951	 9JS02952	799-601-4210
	—	Part No. :08194-03103	
60	 BJD14063	 BJD14064	799-601-4220
	—	Part No. :08194-04104	

BJD14070

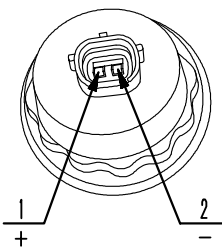
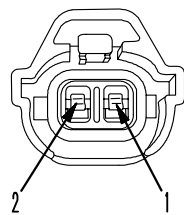
Tier III Engine			
No. of pins	Boost (air intake) pressure (140)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
4	 2 GND 3 OUT 1 +5V	 1 3 2	799-601-4110
	☆ Without pin (4)	☆ Without pin (4)	
No. of pins	Boost (air intake) pressure (125, 170, 12V140)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
3	 1 +5V 2 Vout 3 GND	 3 2 1	799-601-4250 (Kit : 799-601-4100)
	—	—	

BJH12940

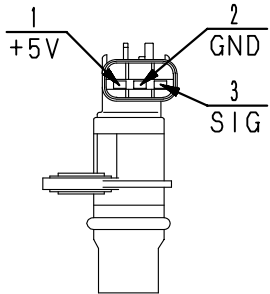
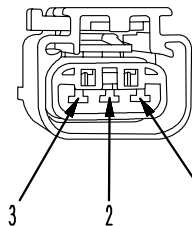
BJH12940

Tier III Engine (107, 114)			
No. of pins	Boost (air intake) pressure, temperature sensor		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
4			799-601-4230 (Kit: 799-601-4100)
	—	—	

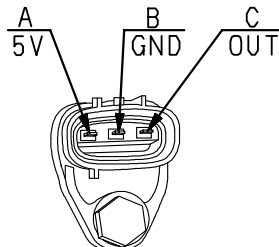
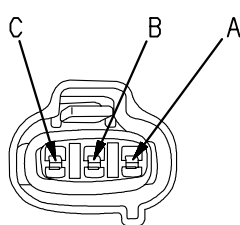
BJH12941

Tier III Engine (125, 140, 170, 12V140)			
No. of pins	PCV		
	Valve side (plug)	Harness side (receptacle)	T-adapter Part No.
2			799-601-9430 (Kit: 799-601-4100)
	—	—	

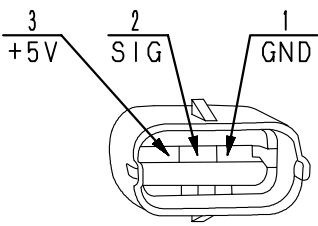
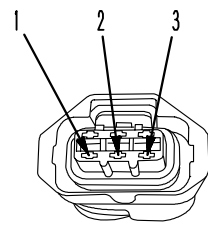
BJH12942

Tier III Engine			
No. of pins	NE speed sensor (107, 114, 125, 140, 170, 12V140), CAM sensor (107, 114)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
3			799-601-4130 (Kit: 799-601-4100)
	—	—	

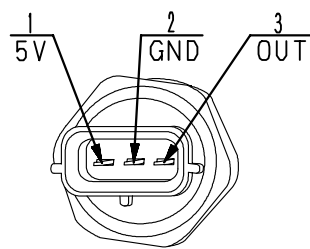
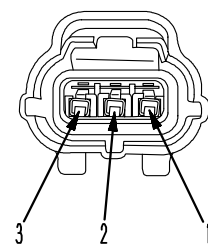
BJH12943

Tier III Engine (125, 140, 170, 12V140)			
No. of pins	G sensor (fuel supply pump speed sensor)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
3			799-601-4330 (Kit: 799-601-4100)
	—	—	

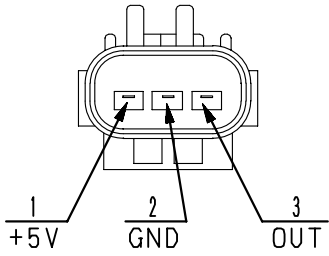
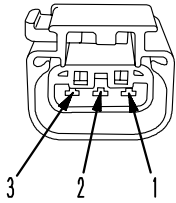
BJH12944

Tier III Engine (107, 114)			
No. of pins	Common rail (fuel) pressure		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
3			799-601-4190 (Kit: 799-601-4100)
	—	—	

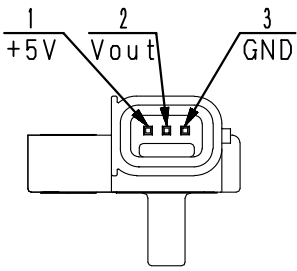
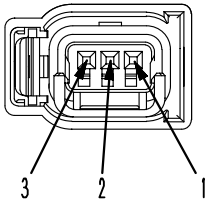
BJH12945

Tier III Engine (125, 140, 170, 12V140)			
No. of pins	Common rail (fuel) pressure		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
3			799-601-9420 (Kit: 799-601-4100)
	—	—	

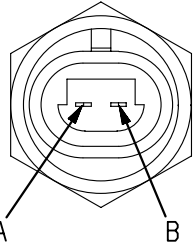
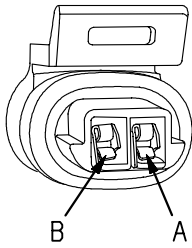
BJH12946

Tier III Engine			
No. of pins	Ambient pressure sensor (107, 114)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
3			799-601-4140 (Kit: 799-601-4100)
	—	—	

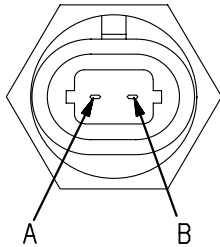
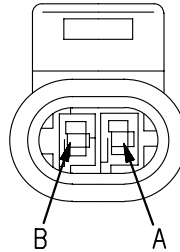
BJH12947

Tier III Engine			
No. of pins	Ambient pressure sensor (125, 140, 170, 12V140)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
3			799-601-4240 (Kit: 799-601-4100)
	—	—	

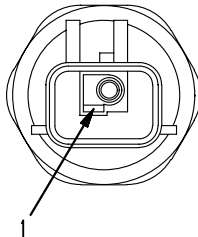
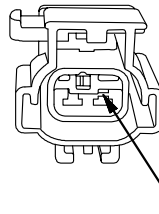
BJH12948

Tier III Engine			
No. of pins	Temperature sensor of coolant, fuel and lubricating oil (107, 114, 125, 140, 170, 12V140)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
2			795-799-5530 (Kit: 799-601-4100)
	☆ Non-polarity	—	

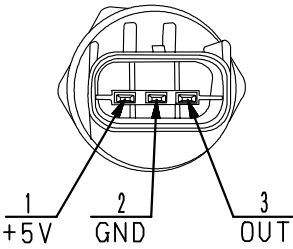
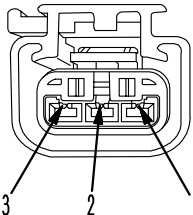
BJH12949

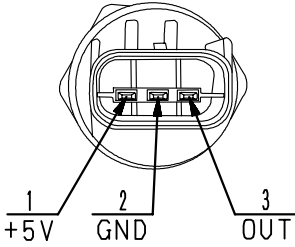
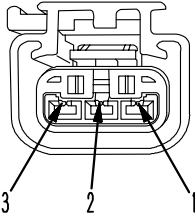
Tier III Engine			
No. of pins	Boost (air intake) temperature sensor (125, 140, 170, 12V140)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
2			795-799-5540 (Kit: 799-601-4100)
	☆ Non-polarity	—	

BJH12950

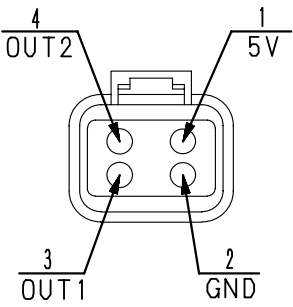
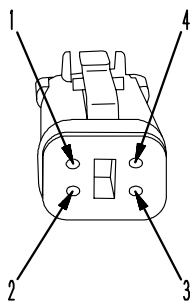
Tier III Engine (107,114)			
No. of pins	Hydraulic switch		
	Switch side (plug)	Harness side (receptacle)	T-adapter Part No.
2			799-601-4160 (Kit: 799-601-4100)
	☆ Without pin (2)	☆ Without pin (2)	

BJH12951

Tier III Engine (125, 140, 170, 12V140)			
No. of pins	Lubricating oil pressure		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
			799-601-4150 (Kit: 799-601-4100)
	—	—	
BJH12952			

Tier III Engine (125, 140)			
No. of pins	EGR gas pressure sensor		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
			799-601-4180 (Kit: 799-601-4100)
	—	—	

BJH12953

Tier III Engine (125, 140, 170, 12V140)			
No. of pins	EGR (by pass) valve stroke sensor		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
4			799-601-9040 (Kit: 799-601-4100)
	—	—	

BJH12954

T-adapter box and T-adapter table

- ★ The vertical column indicates a part number of T-branch box or T-branch adapter while the horizontal column indicates a part number of harness checker assembly.

Part No.	Part name	Number of pins	Identifica- tion symbol	T-adapter kit												Out of kit		
				799-601-2500	799-601-2700	799-601-2800	799-601-7000	799-601-7100	799-601-7400	799-601-7500	799-601-8000	799-601-9000	799-601-9100	799-601-9200	799-601-9300		799-601-4100	799-601-4200
799-601-2600	T-box (for ECONO)	21		●	●		●	●	●									
799-601-3100	T-box (for MS)	37																
799-601-3200	T-box (for MS)	37																
799-601-3380	• Plate for MS (14-pin)																	●
799-601-3410	Adapter for BENDIX (MS)	24	MS-24P															●
799-601-3420	Adapter for BENDIX (MS)	24	MS-24P															●
799-601-3430	Adapter for BENDIX (MS)	17	MS-17P															●
799-601-3440	Adapter for BENDIX (MS)	17	MS-17P															●
799-601-3450	Adapter for BENDIX (MS)	5	MS-5P															●
799-601-3460	Adapter for BENDIX (MS)	10	MS-10P															●
799-601-3510	Adapter for BENDIX (MS)	5	MS-5S															●
799-601-3520	Adapter for BENDIX (MS)	17	MS-17P															●
799-601-3530	Adapter for BENDIX (MS)	19	MS-19P															●
799-601-2910	Adapter for BENDIX (MS)	14	MS-14P															●
799-601-3470	Case																	●
799-601-2710	Adapter for MIC	5	MIC-5P	●	●				●									
799-601-2720	Adapter for MIC	13	MIC-13P	●	●				●									
799-601-2730	Adapter for MIC	17	MIC-17P	●	●	●		●	●		●							
799-601-2740	Adapter for MIC	21	MIC-21P	●	●	●		●	●		●							
799-601-2950	Adapter for MIC	9	MIC-9P				●	●	●		●							
799-601-2750	Adapter for ECONO	2	ECONO2P	●	●													
799-601-2760	Adapter for ECONO	3	ECONO3P	●	●													
799-601-2770	Adapter for ECONO	4	ECONO4P	●	●													
799-601-2780	Adapter for ECONO	8	ECONO8P	●	●													
799-601-2790	Adapter for ECONO	12	ECONO12P	●	●													
799-601-2810	Adapter for DLI	8	DLI-8P	●	●													
799-601-2820	Adapter for DLI	12	DLI-12P	●	●													
799-601-2830	Adapter for DLI	16	DLI-16P	●	●													
799-601-2840	Extension cable (ECONO type)	12	ECONO12P	●	●				●									
799-601-2850	Case			●														
799-601-4210	Adapter for DRC	50	DRC50															●
799-601-7010	Adapter for X (T-adapter)	1							●		●							
799-601-7020	Adapter for X	2	X2P				●	●	●		●							
799-601-7030	Adapter for X	3	X3P				●	●	●		●							
799-601-7040	Adapter for X	4	X4P				●	●	●		●							
799-601-7050	Adapter for SWP	6	SW6P				●	●	●									
799-601-7060	Adapter for SWP	8	SW8P				●	●	●									
799-601-7310	Adapter for SWP	12	SW12P															●
799-601-7070	Adapter for SWP	14	SW14P						●		●							
799-601-7320	Adapter for SWP	16	SW16P															●
799-601-7080	Adapter for M (T-adapter)	1							●		●							
799-601-7090	Adapter for M	2	M2P				●	●	●		●							

Part No.	Part name	Number of pins	Identifica- tion symbol	T-adapter kit														Out of kit
				799-601-2500	799-601-2700	799-601-2800	799-601-7000	799-601-7100	799-601-7400	799-601-7500	799-601-8000	799-601-9000	799-601-9100	799-601-9200	799-601-9300	799-601-4100	799-601-4200	
799-601-7110	Adapter for M	3	M3P				●	●	●		●							
799-601-7120	Adapter for M	4	M4P				●	●	●		●							
799-601-7130	Adapter for M	6	M6P				●	●	●		●							
799-601-7340	Adapter for M	8	M8P															●
799-601-7140	Adapter for S	8	S8P				●	●	●		●							
799-601-7150	Adapter for S (White)	10	S10P				●	●	●		●							
799-601-7160	Adapter for S (Blue)	12	S12P				●	●	●									
799-601-7170	Adapter for S (Blue)	16	S16P				●	●	●		●							
799-601-7330	Adapter for S (White)	16	S16PW								●							
799-601-7350	Adapter for S (White)	12	S12PW															●
799-601-7180	Adapter for AMP040	8	A8P						●									
799-601-7190	Adapter for AMP040	12	A12P						●		●							
799-601-7210	Adapter for AMP040	16	A16P				●	●	●		●							
799-601-7220	Adapter for AMP040	20	A20P				●	●	●		●							
799-601-7230	Short connector for X	2					●	●	●		●							
799-601-7240	Case						●	●										
799-601-7270	Case								●									
799-601-7510	Adapter for 070	10	07-10							●								
799-601-7520	Adapter for 070	12	07-12							●								
799-601-7530	Adapter for 070	14	07-14							●								
799-601-7540	Adapter for 070	18	07-18							●								
799-601-7550	Adapter for 070	20	07-20							●								
799-601-7360	Adapter for relay	5	REL-5P															●
799-601-7370	Adapter for relay	6	REL-6P															●
799-601-7380	Adapter for JFC	2																●
799-601-9010	Adapter for DTM	2	DTM2									●		●				
799-601-9020	Adapter for DT	2	DT2									●		●				
799-601-9030	Adapter for DT	3	DT3									●		●				
799-601-9040	Adapter for DT	4	DT4									●		●				
799-601-9050	Adapter for DT	6	DT6									●		●				
799-601-9060	Adapter for DT (Gray)	8	DT8GR									●		●				
799-601-9070	Adapter for DT (Black)	8	DT8B									●		●				
799-601-9080	Adapter for DT (Green)	8	DT8G									●		●				
799-601-9090	Adapter for DT (Brown)	8	DT8BR									●		●				
799-601-9110	Adapter for DT (Gray)	12	DT12GR									●		●				
799-601-9120	Adapter for DT (Black)	12	DT12B									●		●				
799-601-9130	Adapter for DT (Green)	12	DT12G									●		●				
799-601-9140	Adapter for DT	12	DT12BR									●		●				
799-601-9210	Adapter for HD30-18	8	D18-8									●	●					
799-601-9220	Adapter for HD30-18	14	D18-14									●	●					
799-601-9230	Adapter for HD30-18	20	D18-20									●	●					
799-601-9240	Adapter for HD30-18	21	D18-21									●	●					
799-601-9250	Adapter for HD30-24	9	D24-9									●	●					
799-601-9260	Adapter for HD30-24	16	D24-16									●	●					
799-601-9270	Adapter for HD30-24	21	D24-21									●	●					
799-601-9280	Adapter for HD30-24	23	D24-23									●	●					

Part No.	Part name	Number of pins	Identifica- tion symbol	T-adapter kit														Out of kit
				799-601-2500	799-601-2700	799-601-2800	799-601-7000	799-601-7100	799-601-7400	799-601-7500	799-601-8000	799-601-9000	799-601-9100	799-601-9200	799-601-9300	799-601-4100	799-601-4200	
799-601-9290	Adapter for HD30-24	31	D24-31										●	●				
799-601-9310	Plate for HD30 (24-pin)												●	●		●		
799-601-9320	T-box (for DT/HD)	12											●	●		●		
799-601-9330	Case												●					
799-601-9340	Case													●				
799-601-9350	Adapter for DRC	40	DRC-40													●		
799-601-9360	Adapter for DRC	24	DRC-24													●		
799-601-9410	Adapter for engine (CRI-T2)	2	G															●
799-601-9420	Adapter for engine (CRI-T2) Adapter for engine (CRI-T3) PFUEL	3	A3														●	●
799-601-9430	Adapter for engine (CRI-T2) Adapter for engine (CRI-T3) PCV	2	P														●	●
799-601-9440	Adapter for engine (CRI-T2)	3	1,2,3															●
795-799-5520	Adapter for engine (HPI-T2)	2	S															●
795-799-5530	Adapter for engine (HPI-T2) Adapter for engine (CRI-T3) Temperature sensor	2	C														●	●
795-799-5540	Adapter for engine (HPI-T2) Adapter for engine (CRI-T3) TIM	2	A														●	●
795-799-5460	Cable for engine (HPI-T2)	3																●
795-799-5470	Cable for engine (HPI-T2)	3																●
795-799-5480	Cable for engine (HPI-T2)	3																●
799-601-4110	Adapter for engine (140-T3) PIM	4	ITT3N															●
799-601-4130	Adapter for engine (CRI-T3) NE, CAM	3	FCIN														●	●
799-601-4140	Adapter for engine (CRI-T3) Atomosphere pressure	3	FCIG														●	●
799-601-4150	Adapter for engine (CRI-T3) POIL	3	FCIB														●	●
799-601-4160	Adapter for engine (CRI-T3) Oil pressure switch	2	4160														●	●
799-601-4180	Adapter for engine (CRI-T3) PEVA	3	4180														●	●
799-601-4190	Adapter for engine (CRI-T3) Commonrail pressure	3	1,2,3L														●	●
799-601-4230	Adapter for engine (CRI-T3) Air intake pressure/temperature	4	1,2,3,4C														●	●
799-601-4240	Adapter for engine (CRI-T3) PAMB	3	1,2,3A														●	●
799-601-4250	Adapter for engine (CRI-T3) PIM	3	1,2,3B														●	●
799-601-4330	Adapter for engine (CRI-T3) G	3	1,2,3,G														●	●
799-601-4340	Adapter for engine (CRI-T3) Pump actuator	2	2,PA														●	●
799-601-9020	Adapter for engine (CRI-T3) Injector	2	DT2														●	●
799-601-9040	Adapter for engine (CRI-T3) SEGR, SBP	4	DT4														●	●
799-601-4260	Adapter for controller (ENG)	4	DTP4														●	●
799-601-4211	Adapter for controller (ENG)	50	DRC50														●	
799-601-4220	Adapter for controller (ENG)	60	DRC60														●	
799-601-4280	Box for controller (PUMP)	121																●
799-601-9720	Adapter for controller (HST)	16	HST16A															●
799-601-9710	Adapter for controller (HST)	16	HST16B															●
799-601-9370	Adapter for controller (HST)	26	HST26A															●

HD785-7 Dump truck

Form No. SEN01937-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7

7001 and up

40 Troubleshooting

Troubleshooting by failure code, Part 1

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Failure code [1500L0] Dual engagement

Action code	Failure code	Trouble	Dual engagement (Transmission controller system)
E03	1500L0		
Contents of trouble	• Fill switch signals have been inputted from 2 clutches that do not form a normal combination.		
Action of controller	• Suddenly shifts to Neutral while traveling, and cannot move off again. • Even after the repair, does not resume to normal unless starting switch is once turned OFF.		
Problem that appears on machine	• The gear speed is shifted to Neutral.		
Related information	• Other problem (clutch pressure control valve system failure code [15S*L1]) occurs at same time.		

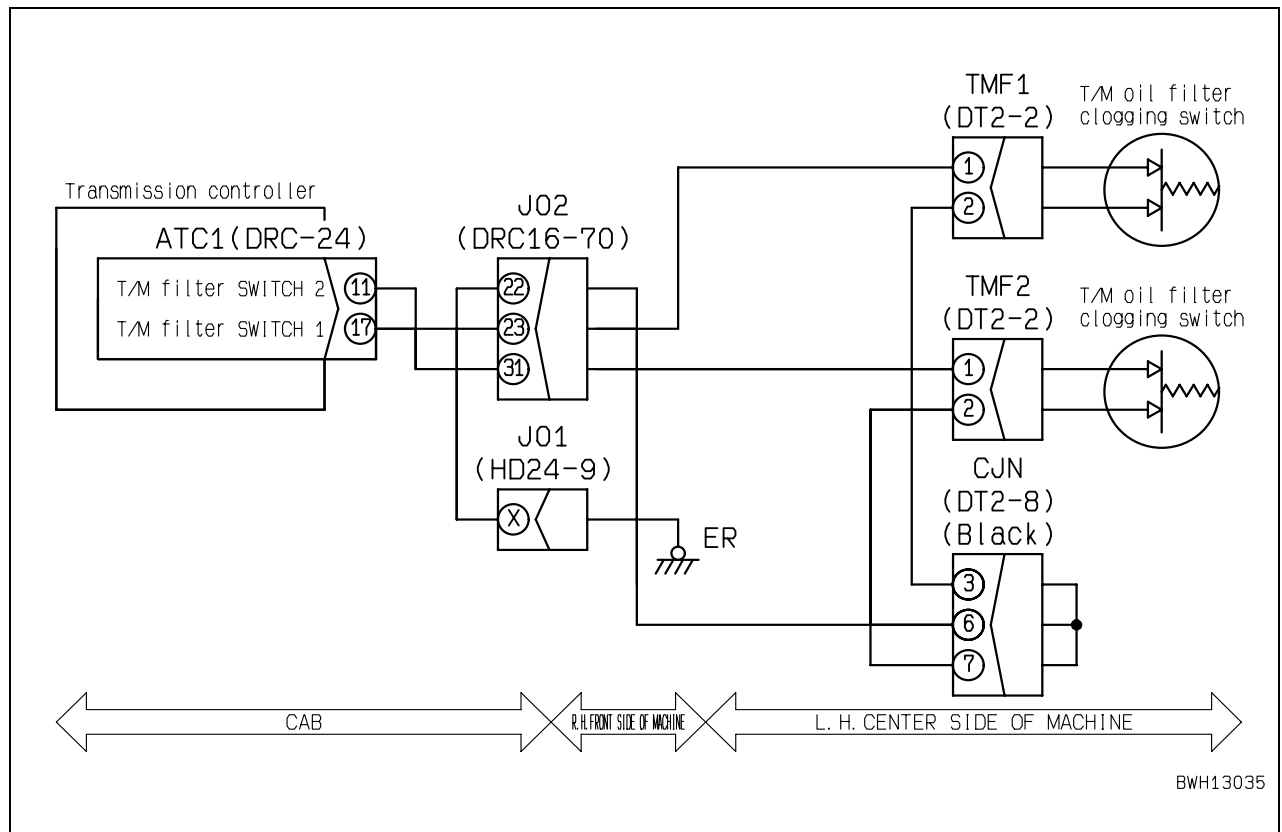
Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Clutch pressure control valve system failure code (15S*L1) has occurred	Troubleshooting by the active failure code.
	2	Defective hydraulic or mechanical system of clutch ECMV	Clutch ECMV may be malfunctioning. Carry out troubleshooting of hydraulic and mechanical systems.
	3	Defective transmission controller	Troubleshooting by the active failure code.

Failure code [15B0NX] Transmission oil filter: Clogging

Action code	Failure code	Trouble	Transmission oil filter: Clogging (Transmission controller system)
E01	15B0NX		
Contents of trouble	When the torque converter oil temperature is above 50°C, the signal circuit of the transmission clogging sensor is opened (disconnected from GND).		
Action of controller	None in particular.		
Problem that appears on machine	If the machine is used without repairing, dust may enter the transmission circuit.		
Related information	- This failure can be checked in the monitoring function (Code: 40905). (Bit [1] [2], normal: 0, clogging: 1) - After repairing the failure and confirming resetting of the machine, perform the initial learning of the transmission controller, referring to Testing and adjusting, "Inspection of machine monitor".		

	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Clogging of transmission filter	Clean or replace.			
Possible causes and standard value in normal state	2	Defective transmission filter clogging sensor	1) Turn the starting switch OFF. 2) Disconnect connector TMF1 and TMF2. 3) Connect T-adapter.			
			Between TMF1 (male) (1) – (2)	Filter is normal	Resistance	Max. 1 Ω
				Filter is clogged	Resistance	Min. 1 MΩ
			Between TMF2 (male) (1) – (2)	Filter is normal	Resistance	Max. 1 Ω
				Filter is clogged	Resistance	Min. 1 MΩ
	3	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC1, TMF1 and TMF2. 3) Connect T-adapter.			
			Wiring harness between ATC1 (female) (11) – TMF2 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between ATC1 (female) (17) – TMF1 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between TMF1 (female) (2) – ground		Resistance	Max. 1 Ω
			Wiring harness between TMF2 (female) (2) – ground		Resistance	Max. 1 Ω
	4	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connectors ATC1. 3) Insert T-adapter. 4) Connect connector. 5) Turn the starting switch ON.			
			Between ATC1 (female) (11) – ground	Filter is normal	Voltage	Max. 1V
				Filter is clogged	Voltage	20 – 30 V
			Between ATC1 (female) (17) – ground	Filter is normal	Voltage	Max. 1V
				Filter is clogged	Voltage	20 – 30 V

Circuit diagram related



Failure code [15F0KM] R → F shifting abuse 1: Mistake in operation

Action code	Failure code	Trouble	R → F shifting abuse 1: Mistake in operation (Transmission controller system)
—	15F0KM		
Contents of trouble	• When output shaft speed is 200 – 300 rpm (about 5 – 7 km/h), gear shifting from reverse to forward has been detected.		
Action of controller	• Non in particular.		
Problem that appears on machine	• If the machine is operated in as-is condition, the machine may be damaged. • Only recorded in failure history.		
Related information	• Output shaft speed can be checked by monitoring function (code: 31400 (rpm)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Abuse	A forward-reverse shifting should be performed when the machine is stationary. (Teach the proper operating method.)

Failure code [15F0MB] R → F shifting abuse 2: Mistake in operation

Action code	Failure code	Trouble	R → F shifting abuse 2: Mistake in operation (Transmission controller system)
—	15F0MB		
Contents of trouble	• When output shaft speed is above 300 rpm (about 7 km/h), gear shifting from reverse to forward has been detected.		
Action of controller	• Non in particular.		
Problem that appears on machine	• If the machine is operated in as-is condition, the machine may be damaged. • Only recorded in failure history.		
Related information	• Output shaft speed can be checked by monitoring function (code: 31400 (rpm)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Abuse	A forward-reverse shifting should be performed when the machine is stationary. (Teach the proper operating method.)

Failure code [15F7KM] Forward clutch disk abuse: Mistake in operation or setting

Action code	Failure code	Trouble	Forward clutch disc abuse: Mistake in operation or setting (Transmission controller system)
—	15F7KM		
Contents of trouble	• When the engine speed is above 1,800 rpm, gear shifting from neutral or reverse to forward has been detected.		
Action of controller	• Non in particular.		
Problem that appears on machine	• Repeated abnormal operations may cause machine damage. • Only recorded in failure history.		
Related information			

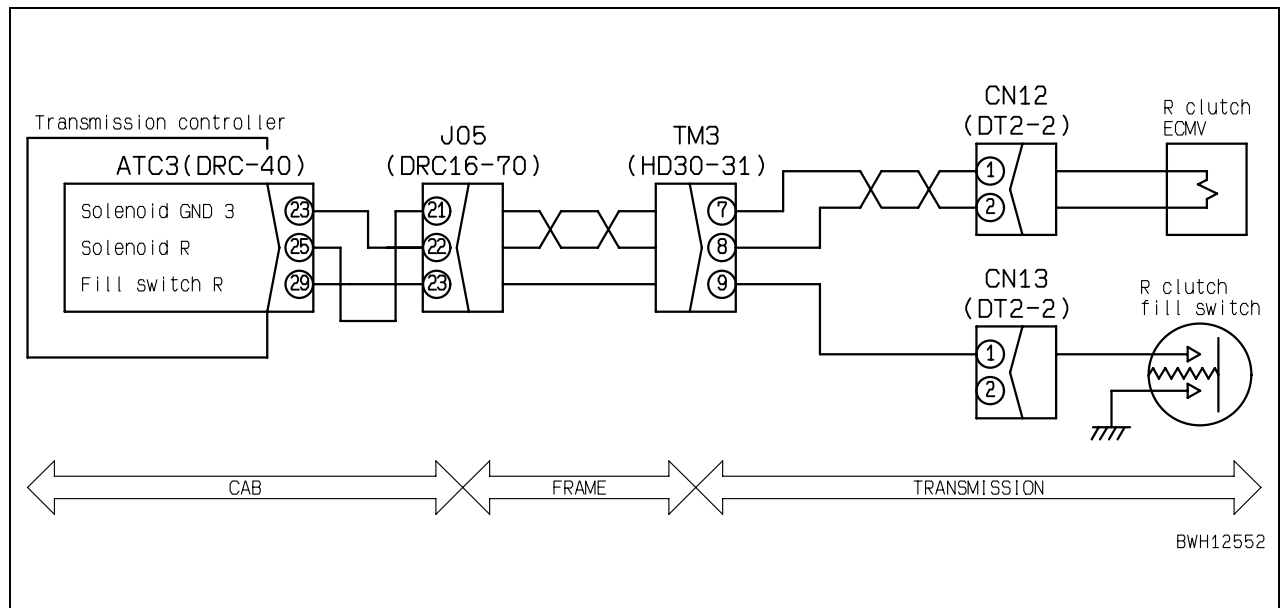
Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Abuse	
			A forward-reverse shifting should be performed when the machine is stationary. (Teach the proper operating method.)

Failure code [15G0MW] R clutch: Slipping

Action code	Failure code	Trouble	R clutch: Slipping (R command is holding pressure, R clutch, fill switch is ON, and slipping detected) (Transmission controller system)
E03	15G0MW		
Contents of trouble	When a signal is output to the R clutch ECMV, the value calculated from the signals of the transmission input shaft speed sensor, transmission intermediate shaft speed sensor, and transmission output shaft speed sensor is abnormal.		
Action of controller	- Sets gear in neutral. - Turns lockup system OFF.		
Problem that appears on machine	- Machine cannot travel in reverse. - If gearshift lever is set in neutral, machine cannot start. - Operator can move machine by following escape procedure. 1) Stop travel and set gearshift lever in N position. 2) Disconnect emergency escape connectors A1 (female) and A2 (male) and connect them to each other to set machine in emergency escape mode. 3) Operate gearshift lever and start machine again. ★ When operating gearshift lever, release accelerator pedal. ★ Operate gearshift lever from N to D – L or from N to R. ★ Machine is kept in emergency escape mode until starting switch is turned OFF.		
Related information	- Electric current of out put to ECMV can be checked with monitoring function (Code: 31606 (mA)). - If electrical system is normal, check reverse clutch and mechanical/hydraulic system of pressure control valve for defect. - When carrying out emergency escape operation, see "Emergency escape method when electrical system has trouble".		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective R clutch ECMV	1) Turn the starting switch OFF. 2) Disconnect connector CN12. 3) Connect T-adaptor.		
			Between CN12 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN12 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC3 and CN12. 3) Connect T-adaptor.		
			Wiring harness between ATC3 (female) (25) – CN12 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (23) – CN12 (female) (2)	Resistance	Max. 1 Ω
	3	Defective sensing by speed sensor	Troubleshooting by the failure codes of DL**KA, and DL**LC.		
	4	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connector ATC3. 3) Connect T-adaptor.		
			Wiring harness between ATC3 (female) (25) – ATC3 (female) (23)	Resistance	5 – 15 Ω

Circuit diagram related



Failure code [15G7KM] Reverse clutch disk abuse: Mistake in operation or setting

Action code	Failure code	Trouble	Reverse clutch disc abuse: Mistake in operation or setting (Transmission controller system)
—	15G7KM		
Contents of trouble	• When the engine speed is above 1,800 rpm, gear shifting from neutral or forward to reverse has been detected.		
Action of controller	• Non in particular.		
Problem that appears on machine	• Repeated abnormal operations may cause machine damage. • Only recorded in failure history.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Abuse	
			A forward-reverse shifting should be performed when the machine is stationary. (Teach the proper operating method.)

Failure code [15H0MW] Hi clutch: Slipping

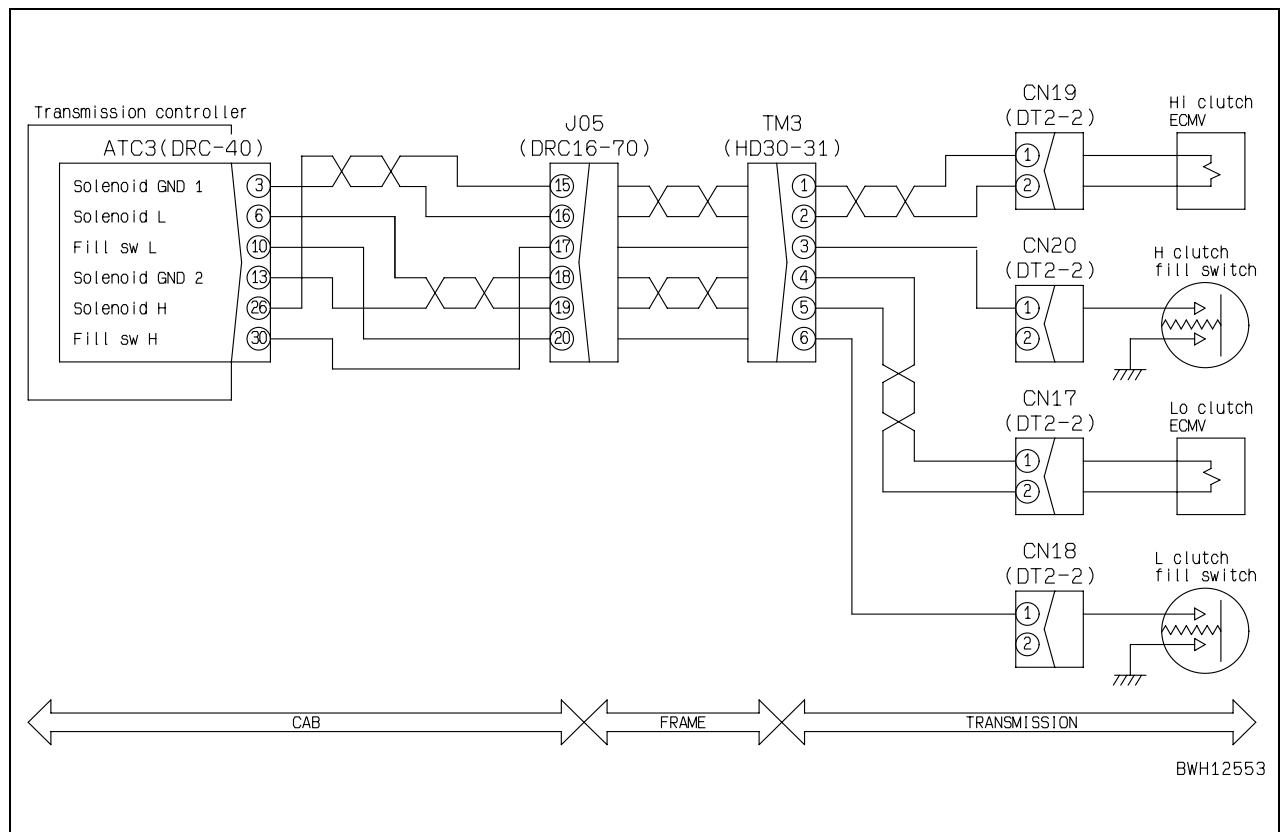
Action code	Failure code	Trouble	Hi clutch: Slipping (Hi command is holding pressure, fill switch is ON, and slipping detected) (Transmission controller system)
E03	15H0MW		
Contents of trouble	When a signal is output to the Hi clutch ECMV, the value calculated from the signals of the transmission input shaft speed sensor, transmission intermediate shaft speed sensor, and transmission output shaft speed sensor is abnormal.		
Action of controller	- Shifts up and keeps gear according to gear speed before trouble and Table 1. - Turns lockup system OFF.		
Problem that appears on machine	If gearshift lever is set in neutral, machine cannot restart until it stops.		
Related information	- Can be checked with monitoring function (Code: 31600 (mA)). - If electrical system is normal, check Hi clutch and mechanical/hydraulic system of pressure control valve for defect. - When carrying out emergency escape operation, see "Emergency escape method when electrical system has trouble".		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective Hi clutch ECMV	1) Turn the starting switch OFF. 2) Disconnect connector CN19. 3) Connect T-adapter.		
			Between CN19 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN19 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC3 and CN19. 3) Connect T-adapter.		
			Wiring harness between ATC3 (female) (26) – CN19 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (3) – CN19 (female) (2)	Resistance	Max. 1 Ω
	3	Defective sensing by speed sensor	Troubleshooting by the failure codes of DL**KA, and DL**LC.		
	4	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connector ATC3. 3) Connect T-adapter.		
			Wiring harness between ATC3 (female) (26) – ATC3 (female) (3)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related



Failure code [15J0MW] Lo clutch: Slipping

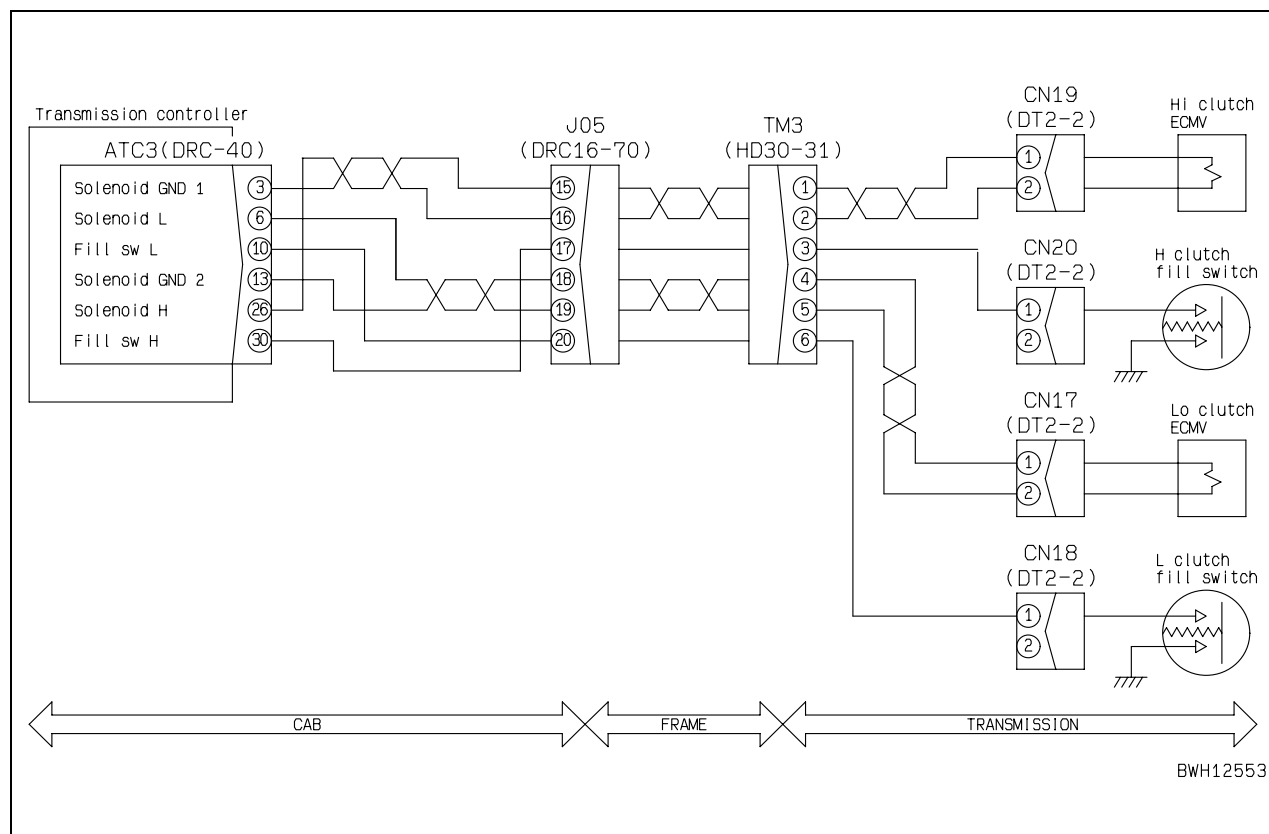
Action code	Failure code	Trouble	Lo clutch: Slipping (Lo command is holding pressure, fill switch is ON, and slipping detected) (Transmission controller system)
E03	15J0MW		
Contents of trouble	When a signal is output to the Lo clutch ECMV, the value calculated from the signals of the transmission input shaft speed sensor, transmission intermediate shaft speed sensor, and transmission output shaft speed sensor is abnormal.		
Action of controller	- Shifts up and keeps gear according to gear speed before trouble and Table 1. - Turns lockup system OFF.		
Problem that appears on machine	If gearshift lever is set in neutral, machine cannot restart until it stops.		
Related information	- Can be checked with monitoring function (Code: 31601 (mA)). - If electrical system is normal, check Lo clutch and mechanical/hydraulic system of pressure control valve for defect. - When carrying out emergency escape operation, see "Emergency escape method when electrical system has trouble".		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective Lo clutch ECMV	1) Turn the starting switch OFF. 2) Disconnect connector CN17. 3) Connect T-adaptor.		
			Between CN17 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN17 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC3 and CN17. 3) Connect T-adaptor.		
			Wiring harness between ATC3 (female) (6) – CN17 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (13) – CN17 (female) (2)	Resistance	Max. 1 Ω
	3	Defective sensing by speed sensor	Troubleshooting by the failure codes of DL**KA, and DL**LC.		
	4	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connector ATC3. 3) Connect T-adaptor.		
			Wiring harness between ATC3 (female) (6) – ATC3 (female) (13)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related



Failure code [15K0MW] 1st clutch: Slipping

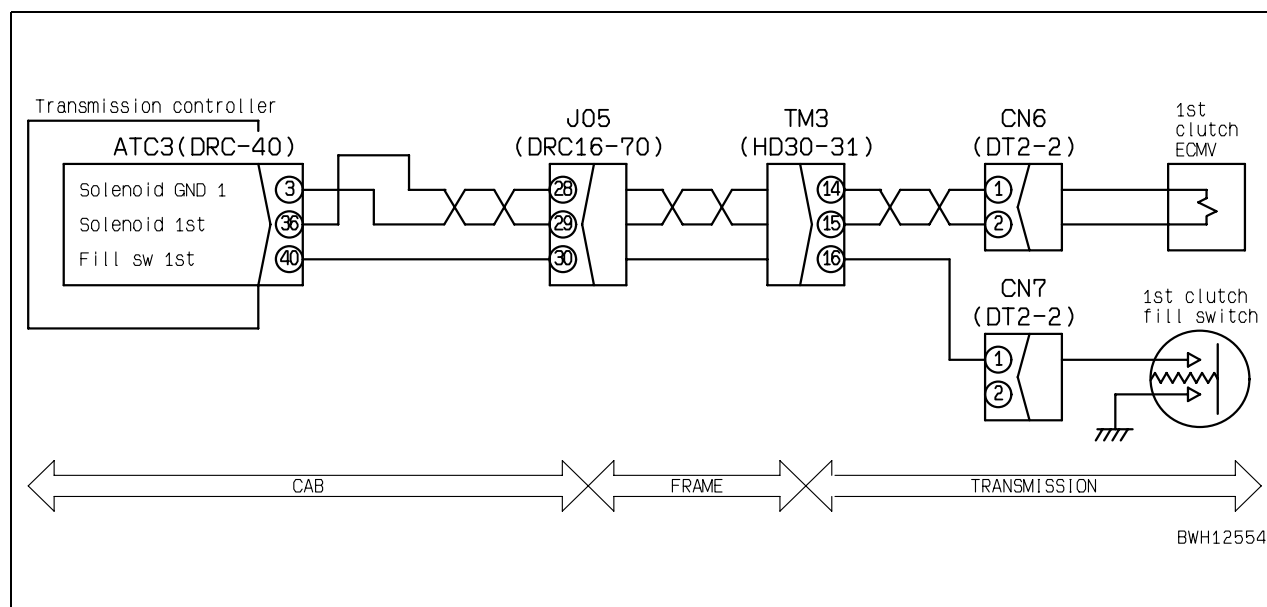
Action code	Failure code	Trouble	1st clutch: Slipping (1st command holding pressure, 1st clutch fill switch ON, slipping detected) (Transmission controller system)
E03	15K0MW		
Contents of trouble	• During an output to the 1st clutch ECMV, an abnormality exists in the value calculated from the signals of transmission input shaft speed sensor, transmission intermediate shaft speed sensor and transmission output shaft speed sensor.		
Action of controller	• Shifts up and holds the gear speed depending on the gear speed before failure as mentioned in Table 1 . • Turns lock up to OFF.		
Problem that appears on machine	• If gearshift lever is set in neutral, machine cannot start. • Operator can move machine by following escape procedure. 1) Stop travel and set gearshift lever in N position. 2) Disconnect emergency escape connectors A1 (female) and A2 (male) and connect them to each other to set machine in emergency escape mode. 3) Operate gearshift lever and start machine again. ★ When operating gearshift lever, release accelerator pedal. ★ Operate gearshift lever from N to D – L or from N to R. ★ Machine is kept in emergency escape mode until starting switch is turned OFF.		
Related information	• Electric current of output to ECMV can be checked by monitoring function (code: 31602 (mA)) • If the electrical system is normal, check for a failure in the hydraulic or mechanical system for 1st clutch or pressure control valve.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective 1st clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adaptor to connector CN6 (male).		
			Between CN6 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN6 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adaptor to connectors ATC3 (female) and CN6 (female).		
			Wiring harness between ATC3 (female) (36) – CN6 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (3) – CN6 (female) (2)	Resistance	Max. 1 Ω
	3	Defective speed sensor detection	• Troubleshooting by failure code DL**KA, DL**LC		
	4	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adaptor to connector ATC3 (female).		
			Wiring harness between ATC3 (female) (36) – (3)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related



Failure code [15L0MW] 2nd clutch: Slipping

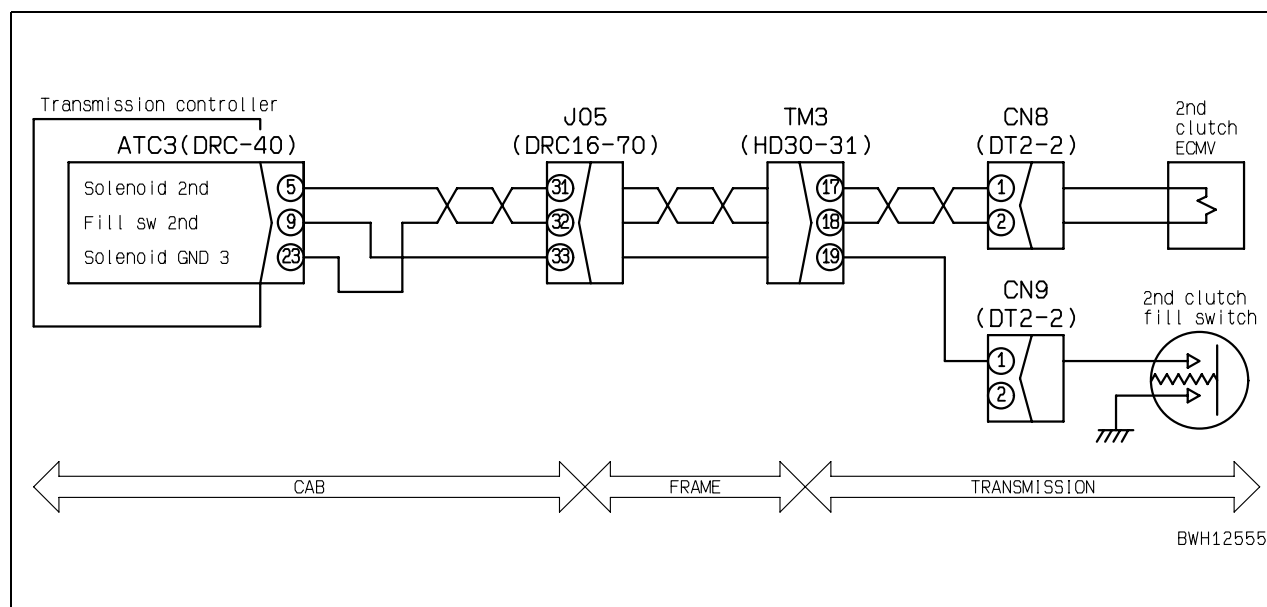
Action code	Failure code	Trouble	2nd clutch: Slipping (2nd command holding pressure, 2nd clutch fill switch ON, slipping detected) (Transmission controller system)
E03	15L0MW		
Contents of trouble	During an output to the 2nd clutch ECMV, an abnormality exists in the value calculated from the signals of transmission input shaft speed sensor, transmission intermediate shaft speed sensor and transmission output shaft speed sensor.		
Action of controller	- Shifts up and holds the gear speed depending on the gear speed before failure as mentioned in Table 1. - Turns lock up to OFF.		
Problem that appears on machine	- If gearshift lever is set in neutral, machine cannot start. - Operator can move machine by following escape procedure. - Stop travel and set gearshift lever in N position. - Disconnect emergency escape connectors A1 (female) and A2 (male) and connect them to each other to set machine in emergency escape mode. - Operate gearshift lever and start machine again. ★ When operating gearshift lever, release accelerator pedal. ★ Operate gearshift lever from N to D – L or from N to R. ★ Machine is kept in emergency escape mode until starting switch is turned OFF.		
Related information	- Electric current of output to ECMV can be checked by monitoring function (code: 31603 (mA)) - If the electrical system is normal, check for a failure in the hydraulic or mechanical system for 2nd clutch or pressure control valve.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective 2nd clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adaptor to connector CN8 (male).		
			Between CN8 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN8 (male) (1), (2) and ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adaptor to connectors ATC3 (female) and CN8 (female).		
			Wiring harness between ATC3 (female) (5) – CN8 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (23) – CN8 (female) (2)	Resistance	Max. 1 Ω
	3	Defective speed sensor detection	• Troubleshooting by failure code DL**KA, DL**LC		
	4	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adaptor to connector ATC3 (female).		
			Wiring harness between ATC3 (female) (5) – (23)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related



Failure code [15M0MW] 3rd clutch: Slipping

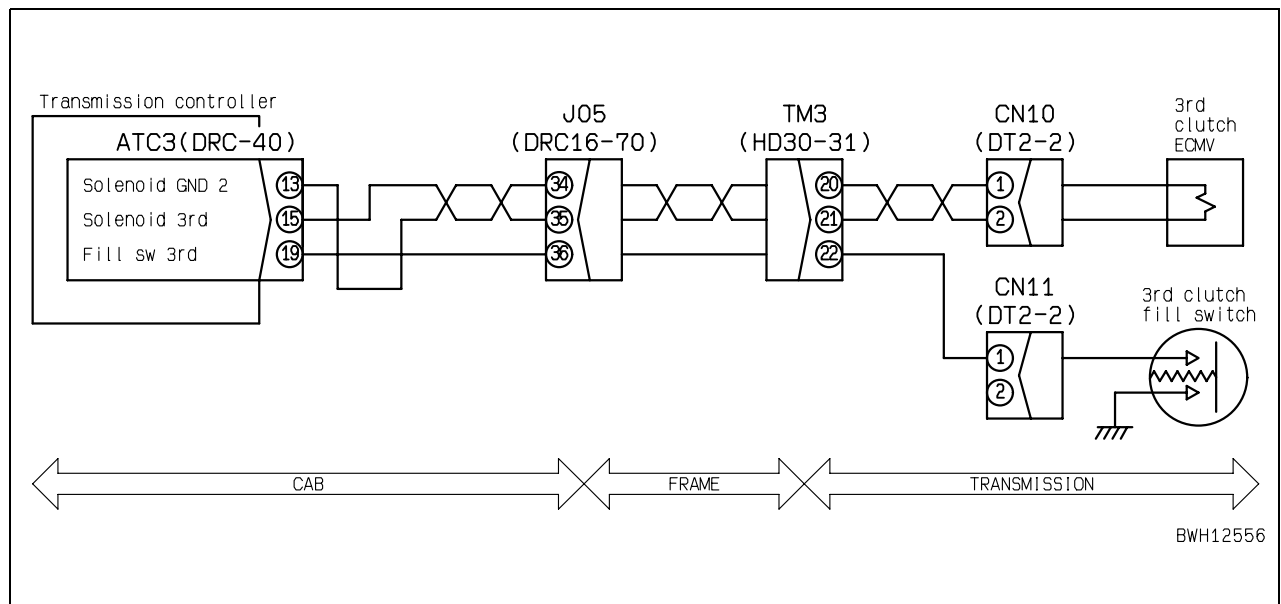
Action code	Failure code	Trouble	3rd clutch: Slipping (3rd command holding pressure, 3rd clutch fill switch ON, slipping detected) (Transmission controller system)
E03	15M0MW		
Contents of trouble	• During an output to the 3rd clutch ECMV, an abnormality exists in the value calculated from the signals of transmission input shaft speed sensor, transmission intermediate shaft speed sensor and transmission output shaft speed sensor.		
Action of controller	• Shifts up and holds the gear speed depending on the gear speed before failure as mentioned in Table 1 .		
Problem that appears on machine	• If gearshift lever is set in neutral, machine cannot start. • Operator can move machine by following escape procedure. 1) Stop travel and set gearshift lever in N position. 2) Disconnect emergency escape connectors A1 (female) and A2 (male) and connect them to each other to set machine in emergency escape mode. 3) Operate gearshift lever and start machine again. ★ When operating gearshift lever, release accelerator pedal. ★ Operate gearshift lever from N to D – L or from N to R. ★ Machine is kept in emergency escape mode until starting switch is turned OFF.		
Related information	• Electric current of output to ECMV can be checked by monitoring function (code: 31604 (mA)) • If the electrical system is normal, check for a failure in the hydraulic or mechanical system for 3rd clutch or pressure control valve.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective 3rd clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adaptor to connector CN10 (male).		
			Between CN10 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN10 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adaptor to connectors ATC3 (female) and CN10 (female).		
			Wiring harness between ATC3 (female) (15) – CN10 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (13) – CN10 (female) (2)	Resistance	Max. 1 Ω
	3	Defective speed sensor detection	Troubleshooting by failure code DL**KA, DL**LC		
	4	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adaptor to connector ATC3 (female).		
			Wiring harness between ATC3 (female) (15) – (3)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related



Failure code [15N0MW] 4th clutch: Slipping

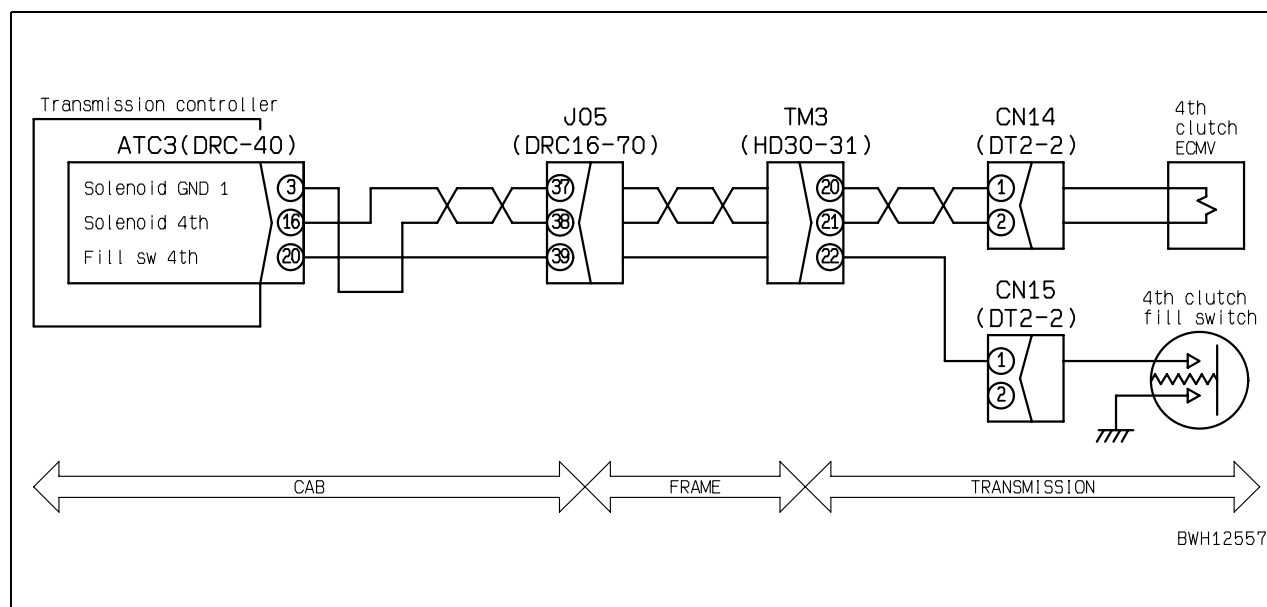
Action code	Failure code	Trouble	4th clutch: Slipping (4th command holding pressure, 4th clutch fill switch ON, slipping detected) (Transmission controller system)
E03	15N0MW		
Contents of trouble	During an output to the 4th clutch ECMV, an abnormality exists in the value calculated from the signals of transmission input shaft speed sensor, transmission intermediate shaft speed sensor and transmission output shaft speed sensor.		
Action of controller	- Shifts up and holds the gear speed depending on the gear speed before failure as mentioned in Table 1. - Turns lock up to OFF.		
Problem that appears on machine	- If gearshift lever is set in neutral, machine cannot start. - Operator can move machine by following escape procedure. - Stop travel and set gearshift lever in N position. - Disconnect emergency escape connectors A1 (female) and A2 (male) and connect them to each other to set machine in emergency escape mode. - Operate gearshift lever and start machine again. ★ When operating gearshift lever, release accelerator pedal. ★ Operate gearshift lever from N to D – L or from N to R. ★ Machine is kept in emergency escape mode until starting switch is turned OFF.		
Related information	- Electric current of output to ECMV can be checked by monitoring function (code: 31605 (mA)) - If the electrical system is normal, check for a failure in the hydraulic or mechanical system for 4th clutch or pressure control valve.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective 4th clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adaptor to connector CN14 (male).		
			Between CN14 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN14 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adaptor to connectors ATC3 (female) and CN14 (female).		
			Wiring harness between ATC3 (female) (16) – CN14 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (3) – CN14 (female) (2)	Resistance	Max. 1 Ω
	3	Defective speed sensor detection	• Troubleshooting by failure code DL**KA, DL**LC		
	4	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adaptor to connector ATC3 (female).		
			Wiring harness between ATC3 (female) (16) – (3)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related

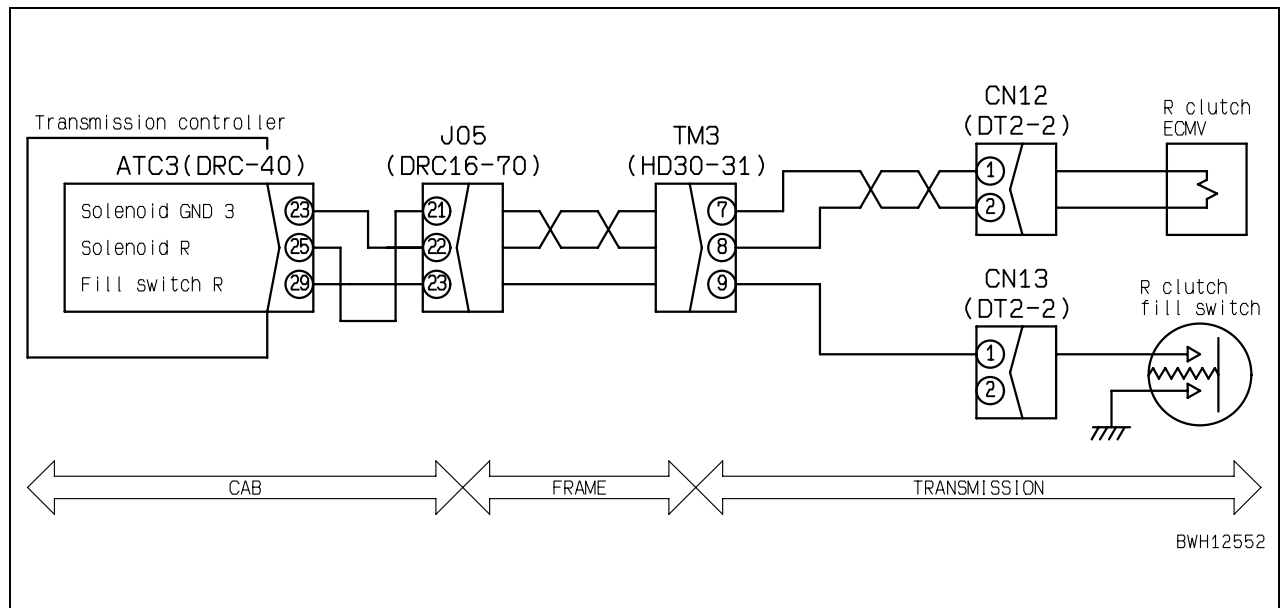


Failure code [15SBL1] R clutch solenoid: Fill signal is ON when command current is OFF

Action code	Failure code	Trouble	R clutch solenoid: Fill signal is ON when command current is OFF (Transmission controller system)
E03	15SBL1		
Contents of trouble	Even when output to the R clutch ECMV is turned "OFF", the signal from the fill switch stays "ON" and the clutch is not released.		
Action of controller	- The controller sets the gear is neutral. - Turns lock up to OFF.		
Problem that appears on machine	Machine cannot restart until it stops.		
Related information	- Electric current of output to ECMV can be checked by monitoring function (code: 31606 (mA)) - Fill switch input signal can be checked with code: 38919 (0: OFF, 1: ON). - If electrical system is normal, check hydraulic and mechanical systems of R clutch or pressure control valve for defect.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective for R clutch fill switch	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN13 (male).			
			Between CN13 (male) (1) – ground	When R is disengaged	Resistance	Min. 1 MΩ
				When R is engaged	Resistance	Max. 1 Ω
	2	Defective harness grounding (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN13. 3) Connect T-adapter to ATC3 (female).			
			Wiring harness between ATC3 (female) (29) – CN13 (female) (1)	Resistance		Min. 1 MΩ
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).			
			Between ATC3 (female) (29) – ground	When R is disengaged	Resistance	Min. 1 MΩ
				When R is engaged	Resistance	Max. 1 Ω

Circuit diagram related

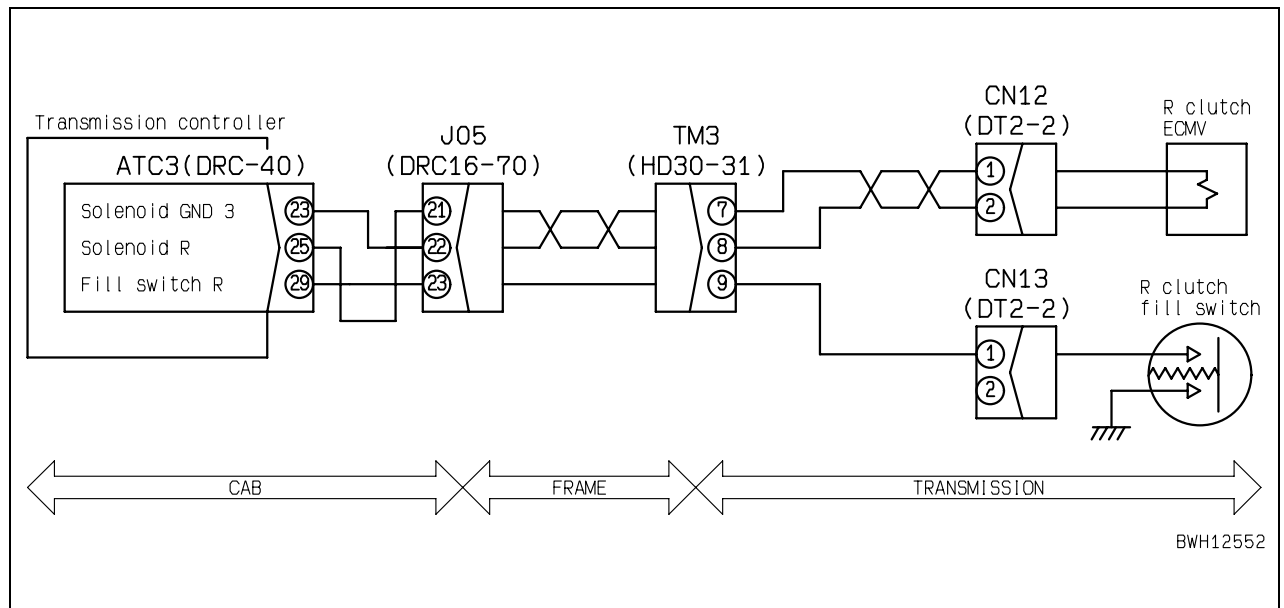


Failure code [15SBMA] R clutch solenoid: Malfunction

Action code	Failure code	Trouble	R clutch solenoid: Malfunction (R command holding pressure, R clutch fill switch OFF, slipping detected) (Transmission controller system)
E03	15SBMA		
Contents of trouble	The signal from the fill switch stays "OFF" during an output to the R clutch ECMV and an abnormality exists in the value calculated from the signals of transmission input shaft speed sensor, transmission intermediate shaft speed sensor and transmission output shaft speed sensor.		
Action of controller	- The controller sets the gear is neutral. - Turns lock up to OFF.		
Problem that appears on machine	Machine cannot restart until it stops.		
Related information	- Electric current of output to ECMV can be checked by monitoring function (code: 31606 (mA)) - If the electrical system is normal, check for a failure in the hydraulic or mechanical system for R clutch or pressure control valve.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective R clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adaptor to connector CN12 (male).		
			Between CN12 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN12 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adaptor to connectors ATC3 (female) and CN12 (female).		
			Wiring harness between ATC3 (female) (25) – CN12 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (23) – CN12 (female) (2)	Resistance	Max. 1 Ω
	3	Defective speed sensor detection	Troubleshooting by failure code DL**KA, DL**LC		
	4	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adaptor to connector ATC3 (female).		
			Wiring harness between ATC3 (female) (25) – (23)	Resistance	5 – 15 Ω

Circuit diagram related



Failure code [15SCL1] Hi clutch solenoid: Fill signal is ON when command current is OFF

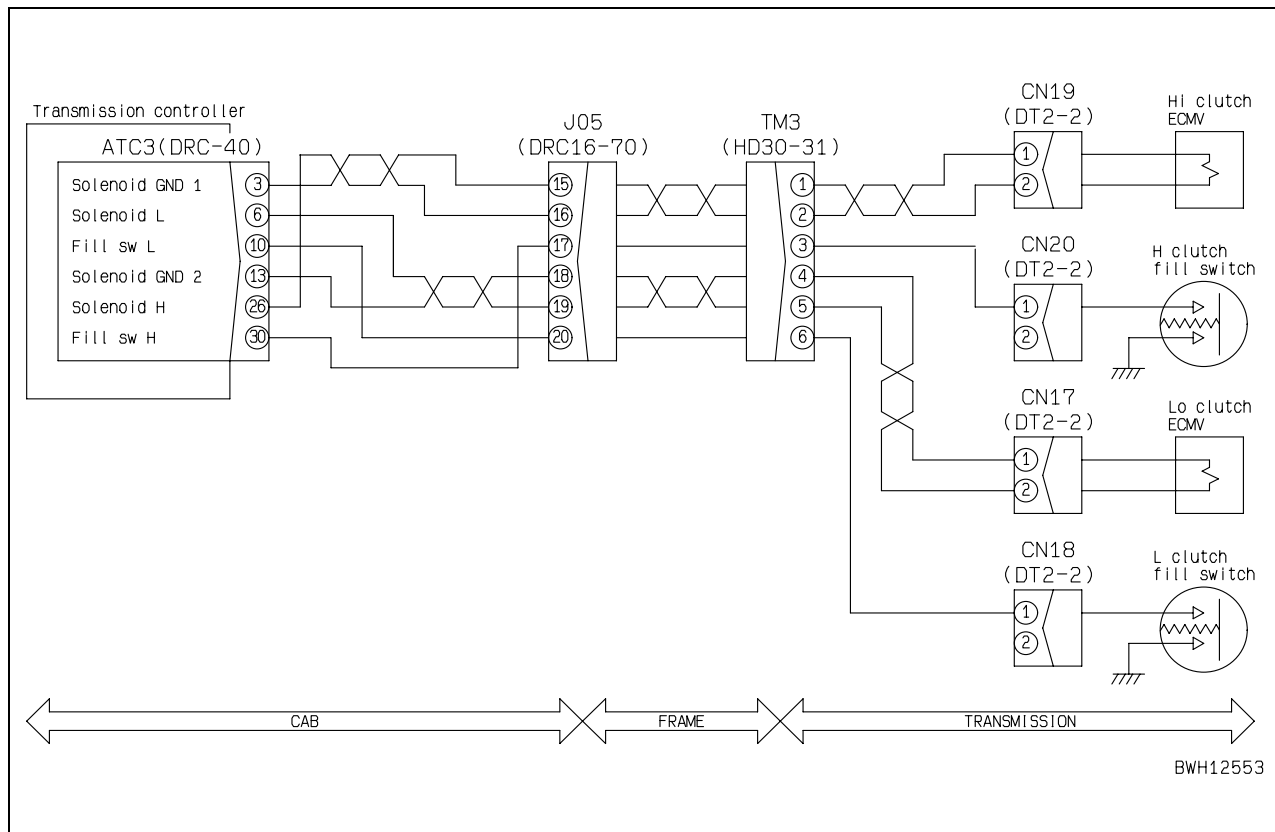
Action code	Failure code	Trouble	Hi clutch solenoid: Fill signal is ON when command signal is OFF (Transmission controller system)
E03	15SCL1		
Contents of trouble	Even when output to the Hi clutch ECMV is turned "OFF", the signal from the fill switch stays "ON" and the clutch is not released.		
Action of controller	- Shifts up and holds the gear speed depending on the gear speed before failure as mentioned in Table 2. - Turns lock up to OFF.		
Problem that appears on machine	- Machine travels at gear speeds which use Hi clutch. - Machine cannot travel in reverse.		
Related information	- Electric current of output to ECMV can be checked by monitoring function (code: 31600 (mA)) - Fill switch input signal can be checked with code: 38919 (0: OFF, 1: ON). - If electrical system is normal, check hydraulic and mechanical systems of high clutch or pressure control valve for defect.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective Hi clutch fill switch	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN20 (male).			
			Between CN20 (male) (1) – ground	When Hi is disengaged	Resistance	Min. 1 MΩ
				When Hi is engaged	Resistance	Max. 1 Ω
	2	Defective harness grounding (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN20. 3) Connect T-adapter to ATC3 (female).			
			Between ground and wiring harness between ATC3 (female) (30) – CN20 (female) (1)		Resistance	Min. 1 MΩ
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).			
			Between ATC3 (female) (30) – ground	When Hi is disengaged	Resistance	Min. 1 MΩ
				When Hi is engaged	Resistance	Max. 1 Ω

Table 2

Speed when trouble was detected		Failed clutch (Fill switch ON)	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
F6	4th Low	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	4H	F7	OFF
F5	3rd High	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	4L	F6	OFF
F4	3rd Low	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	3H	F5	OFF
F3	2nd High	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	3L	F4	OFF
F2	2nd Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
F1	1st Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		2nd	2L	F2	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
RH	Reverse High	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
RL	Reverse Low	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		High	RH	RH	OFF
N		ANY	NONE	No reaction	—

Circuit diagram related



Failure code [15SCMA] Hi clutch solenoid: Malfunction

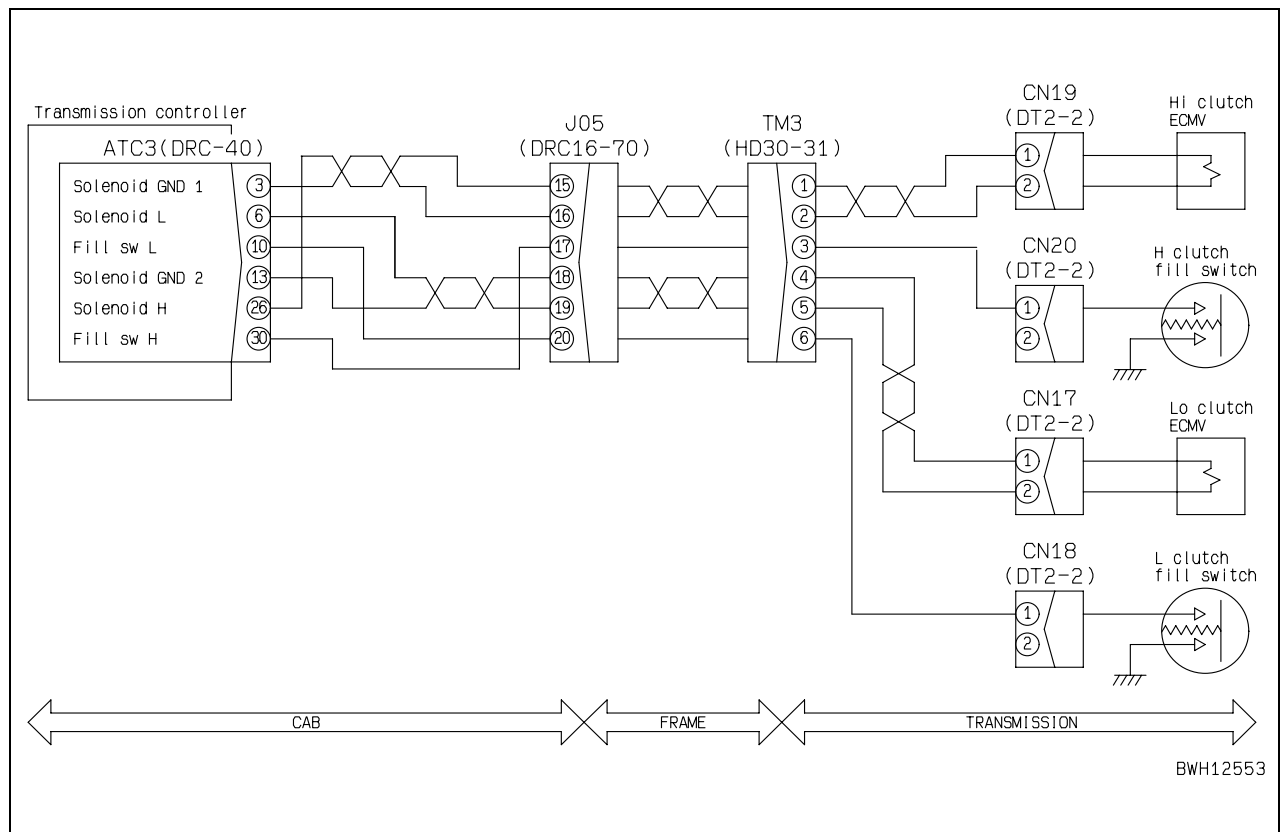
Action code	Failure code	Trouble	Hi clutch solenoid: Malfunction (Hi command holding pressure, Hi clutch fill switch OFF, slipping detected) (Transmission controller system)
E03	15SCMA		
Contents of trouble	The signal from the fill switch stays "OFF" during an output to the Hi clutch ECMV and an abnormality exists in the value calculated from the signals of transmission input shaft speed sensor, transmission intermediate shaft speed sensor and transmission output shaft speed sensor.		
Action of controller	- Shifts up and holds the gear speed depending on the gear speed before failure as mentioned in Table 1. - Turns lock up to OFF.		
Problem that appears on machine	Machine travels at gear speeds which do not use Hi clutch.		
Related information	- Electric current of output to ECMV can be checked by monitoring function (code: 31600 (mA)) - If the electrical system is normal, check for a failure in the hydraulic or mechanical system for Hi clutch or pressure control valve.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective Hi clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN19 (male).		
			Between CN19 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN19 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors ATC3 (female) and CN19 (female).		
			Wiring harness between ATC3 (female) (26) – CN19 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (13) – CN19 (female) (2)	Resistance	Max. 1 Ω
	3	Defective speed sensor detection	Troubleshooting by failure code DL**KA, DL**LC		
	4	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).		
			Wiring harness between ATC3 (female) (26) – (3)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related



Failure code [15SDL1] Lo clutch solenoid: Fill signal is ON when command current is OFF

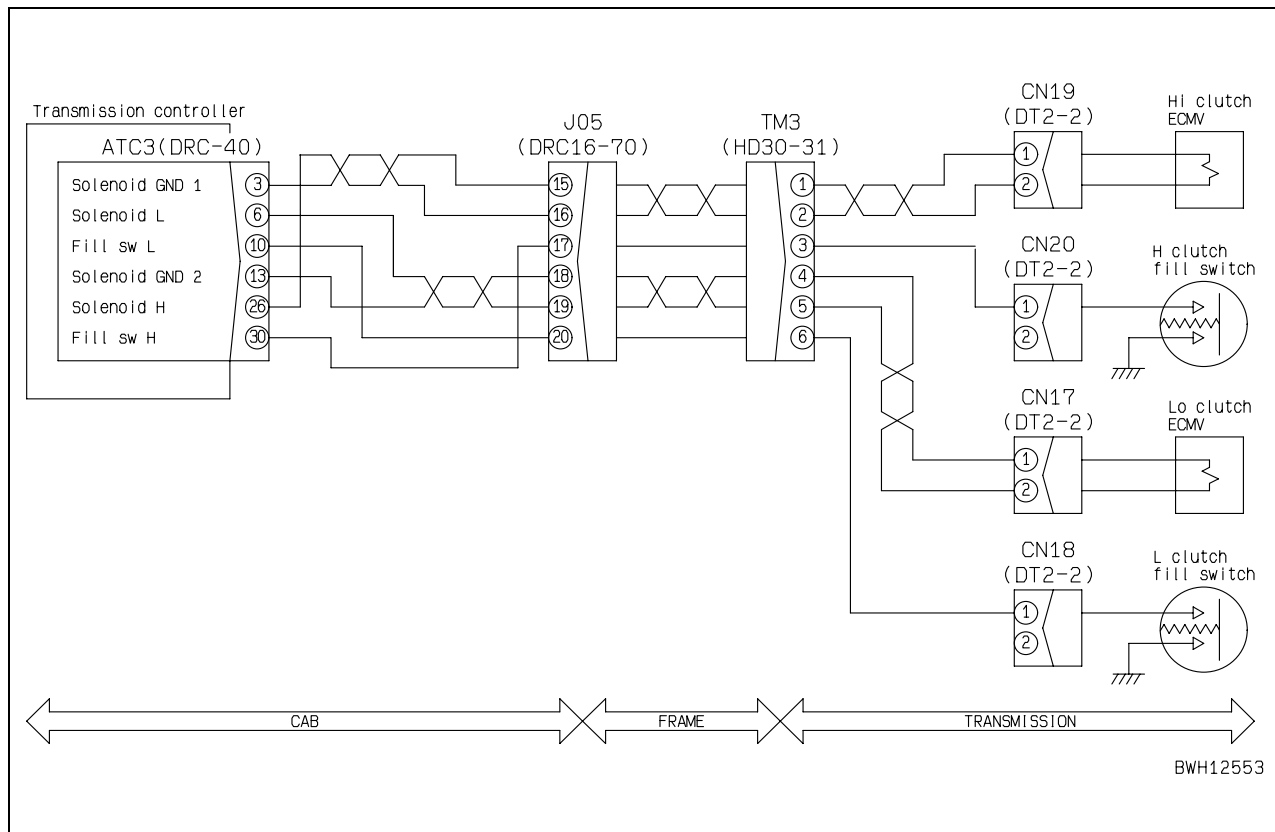
Action code	Failure code	Trouble	Lo clutch solenoid: Fill signal is ON when command current is OFF (Transmission controller system)
E03	15SDL1		
Contents of trouble	Even when output to the Lo clutch ECMV is turned "OFF", the signal from the fill switch stays "ON" and the clutch is not released.		
Action of controller	- Shifts up and holds the gear speed as shown in Table 2 depending on the gear speed before failure. - Turns lock up to OFF.		
Problem that appears on machine	Machine travels at gear speeds which use Lo clutch.		
Related information	- Electric current of output to ECMV can be checked by monitoring function (code: 31601 (mA)) - Fill switch input signal can be checked with code: 38919 (0: OFF, 1: ON). - If electrical system is normal, check hydraulic and mechanical systems of low clutch or pressure control valve for defect.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective Lo clutch fill switch	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN18 (male).			
			Between CN18 (male) (1) – ground	When Lo is released	Resistance	Min. 1 MΩ
				When Lo is engaged	Resistance	Max. 1 Ω
	2	Defective harness grounding (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN18. 3) Connect T-adapter to ATC3 (female).			
			Between ground and wiring harness between ATC3 (female) (10) – CN18 (female) (1)		Resistance	Min. 1 MΩ
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).			
			Between ATC3 (female) (10) – ground	When Lo is released	Resistance	Min. 1 MΩ
				When Lo is engaged	Resistance	Max. 1 Ω

Table 2

Speed when trouble was detected		Failed clutch (Fill switch ON)	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
F6	4th Low	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	4H	F7	OFF
F5	3rd High	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	4L	F6	OFF
F4	3rd Low	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	3H	F5	OFF
F3	2nd High	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	3L	F4	OFF
F2	2nd Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
F1	1st Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		2nd	2L	F2	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
RH	Reverse High	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
RL	Reverse Low	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		High	RH	RH	OFF
N		ANY	NONE	No reaction	—

Circuit diagram related



Failure code [15SDMA] Lo clutch solenoid: Malfunction

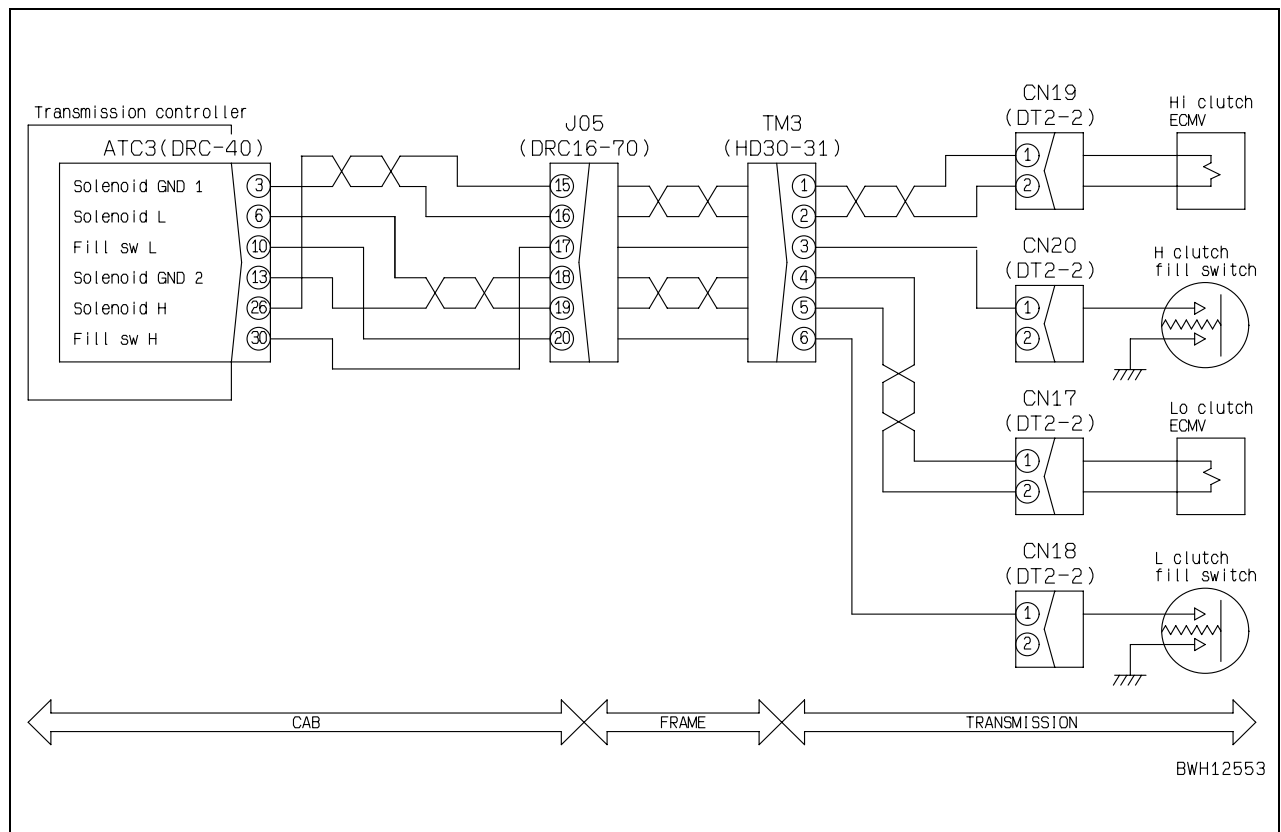
Action code	Failure code	Trouble	Lo clutch solenoid: Malfunction (Lo command holding pressure, Lo clutch fill switch OFF, slipping detected) (Transmission controller system)
E03	15SDMA		
Contents of trouble	• The signal from the fill switch stays "OFF" during an output to the Lo clutch ECMV and an abnormality exists in the value calculated from the signals of transmission input shaft speed sensor, transmission intermediate shaft speed sensor and transmission output shaft speed sensor.		
Action of controller	• Shifts up and holds the gear speed as shown in Table 1 depending on the gear speed before failure. • Turns lock up to OFF.		
Problem that appears on machine	• Machine travels at gear speeds which do not use Lo clutch.		
Related information	• Electric current of output to ECMV can be checked by monitoring function (code: 31601 (mA)) • If the electrical system is normal, check for a failure in the hydraulic or mechanical system for Lo clutch or pressure control valve.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective Lo clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN17 (male).		
			Between CN17 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN17 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors ATC3 (female) and CN17 (female).		
			Wiring harness between ATC3 (female) (6) – CN17 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (13) – CN17 (female) (2)	Resistance	Max. 1 Ω
	3	Defective speed sensor detection	Troubleshooting by failure code DL**KA, DL**LC		
	4	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).		
			Wiring harness between ATC3 (female) (6) – (13)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related



Failure code [15SEL1] 1st clutch solenoid: Fill signal is ON when command current is OFF

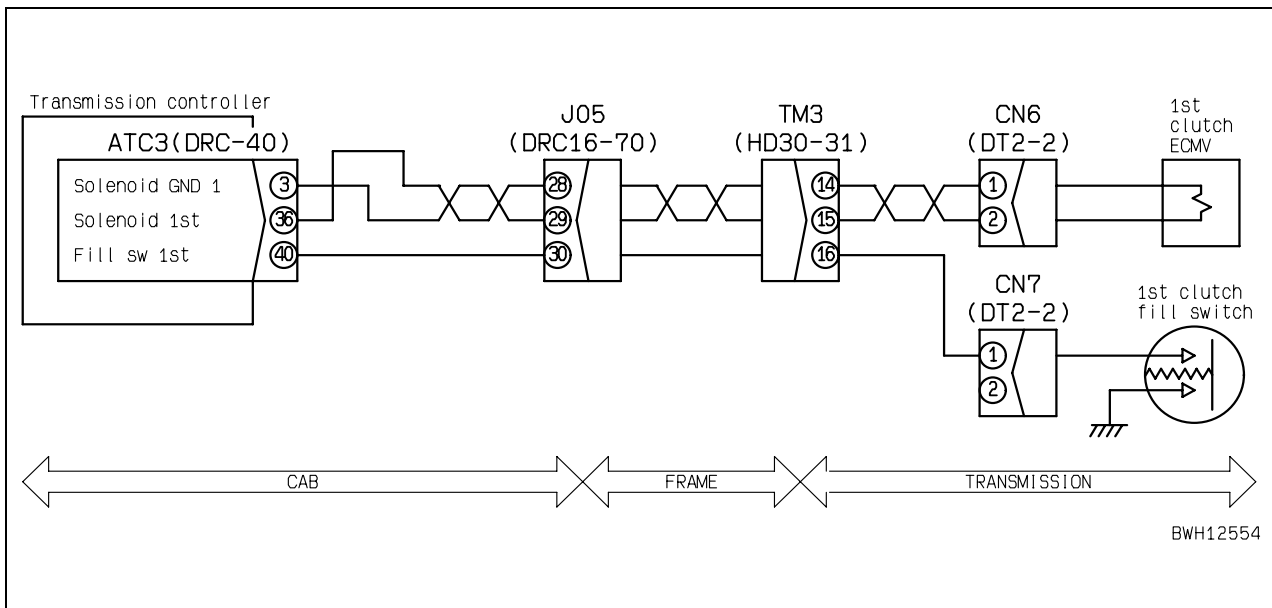
Action code	Failure code	Trouble	1st clutch solenoid: Fill signal is ON when command current is OFF (Transmission controller system)
E03	15SEL1		
Contents of trouble	Even when output to the 1st clutch ECMV is turned "OFF", the signal from the fill switch stays "ON" and the clutch is not released.		
Action of controller	- Shifts up and holds the gear speed as shown in Table 2 depending on the gear speed before failure. - Turns lock up to OFF.		
Problem that appears on machine	- Machine travels at gear speeds which use 1st clutch. - Machine cannot travels in reverse.		
Related information	- Electric current of output to ECMV can be checked by monitoring function (code: 31602 (mA)) - Fill switch input signal can be checked with code: 38919 (0: OFF, 1: ON). - If electrical system is normal, check hydraulic and mechanical systems of 1st clutch or pressure control valve for defect.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective 1st clutch fill switch	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN7 (male).			
			Between CN7 (male) (1) – ground	When 1st is released	Resistance	Min. 1 MΩ
				When 1st is engaged	Resistance	Max. 1 Ω
	2	Defective harness grounding (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN7. 3) Connect T-adapter to ATC3 (female).			
			Between ground and wiring harness between ATC3 (female) (40) – CN7 (female) (1)		Resistance	Min. 1 MΩ
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).			
			Between ATC3 (female) (40) – ground	When 1st is released	Resistance	Min. 1 MΩ
				When 1st is engaged	Resistance	Max. 1 Ω

Table 2

Speed when trouble was detected		Failed clutch (Fill switch ON)	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
F6	4th Low	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	4H	F7	OFF
F5	3rd High	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	4L	F6	OFF
F4	3rd Low	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	3H	F5	OFF
F3	2nd High	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	3L	F4	OFF
F2	2nd Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
F1	1st Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		2nd	2L	F2	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
RH	Reverse High	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
RL	Reverse Low	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		High	RH	RH	OFF
N		ANY	NONE	No reaction	—

Circuit diagram related



Failure code [15SEMA] 1st clutch solenoid: Malfunction

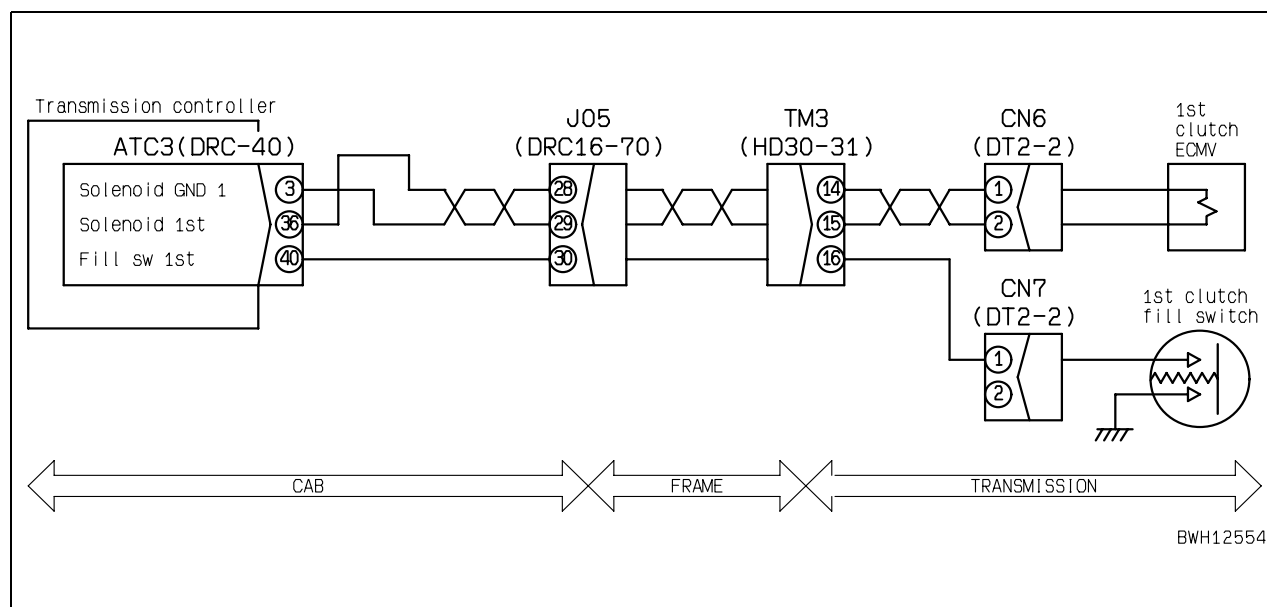
Action code	Failure code	Trouble	1st clutch solenoid: Malfunction (1st command holding pressure, 1st clutch fill switch OFF, slipping detected) (Transmission controller system)
E03	15SEMA		
Contents of trouble	The signal from the fill switch stays "OFF" during an output to the 1st clutch ECMV and an abnormality exists in the value calculated from the signals of transmission input shaft speed sensor, transmission intermediate shaft speed sensor and transmission output shaft speed sensor.		
Action of controller	- Shifts up and holds the gear speed as shown in Table 1 depending on the gear speed before failure. - Turns lock up to OFF.		
Problem that appears on machine	Machine travels at gear speeds which do not use 1st clutch.		
Related information	- Electric current of output to ECMV can be checked by monitoring function (code: 31602 (mA)) - If the electrical system is normal, check for a failure in the hydraulic or mechanical system for 1st clutch or pressure control valve.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective 1st clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN6 (male).		
			Between CN6 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN6 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors ATC3 (female) and CN6 (female).		
			Wiring harness between ATC3 (female) (36) – CN6 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (3) – CN6 (female) (2)	Resistance	Max. 1 Ω
	3	Defective speed sensor detection	Troubleshooting by failure code DL**KA, DL**LC		
	4	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).		
			Wiring harness between ATC3 (female) (36) – (3)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related



HD785-7 Dump truck

Form No. SEN01938-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

40 Troubleshooting

Troubleshooting by failure code, Part 2

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Failure code [15SFL1] 2nd clutch solenoid: Fill signal is ON when command current is OFF

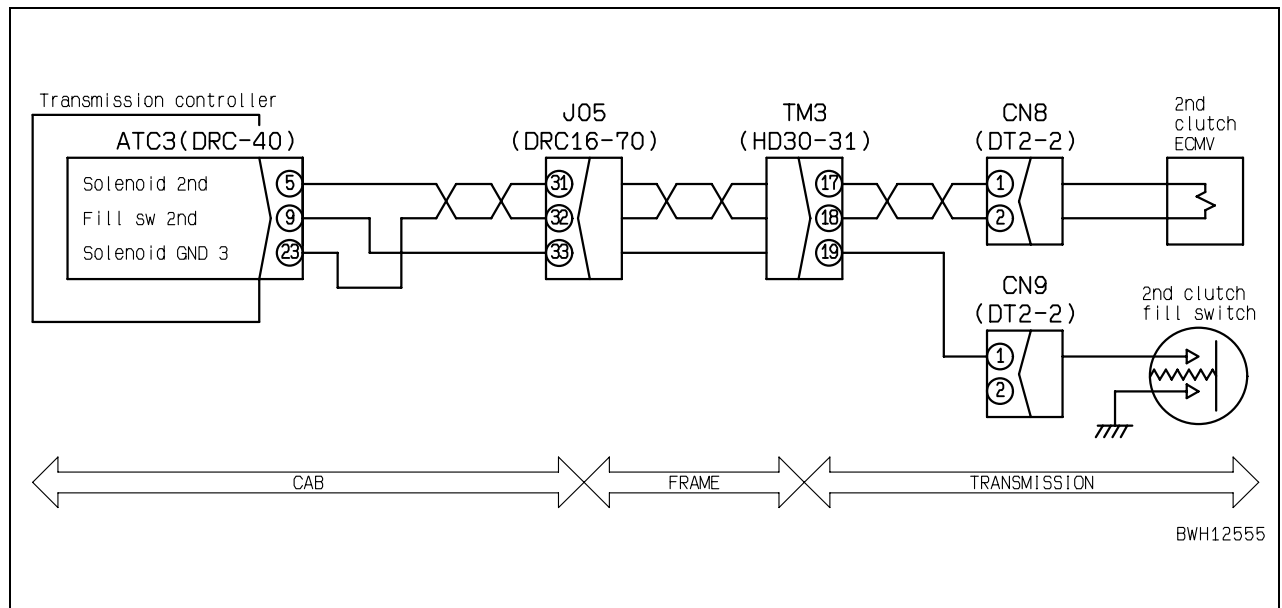
Action code	Failure code	Trouble	2nd clutch solenoid: Fill signal is ON when command current is OFF (Transmission controller system)
E03	15SFL1		
Contents of trouble	Even when output to the 2nd clutch ECMV is turned "OFF", the signal from the fill switch stays "ON" and the clutch is not released.		
Action of controller	- Shifts up and holds the gear speed as shown in Table 2 depending on the gear speed before failure. - Turns lock up to OFF.		
Problem that appears on machine	- Machine travels at gear speeds which use 2nd clutch. - Machine cannot travel in reverse.		
Related information	- Electric current of output to ECMV can be checked by monitoring function (code: 31603 (mA)) - Fill switch input signal can be checked with code: 38919 (0: OFF, 1:ON). - If electrical system is normal, check hydraulic and mechanical systems of 2nd clutch or pressure control valve for defect.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective fill switch for 2nd clutch	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN9 (male).			
			Between CN9 (male) (1) – ground	When 2nd is released	Resistance	Min. 1 MΩ
				When 2nd is engaged	Resistance	Max. 1 Ω
	2	Defective harness grounding (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN9. 3) Connect T-adapter to ATC3 (female).			
			Between ground and wiring harness between ATC3 (female) (9) – CN9 (female) (1)		Resistance	Min. 1 MΩ
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).			
			Between ATC3 (female) (9) – ground	When 2nd is released	Resistance	Min. 1 MΩ
				When 2nd is engaged	Resistance	Max. 1 Ω

Table 2

Speed when trouble was detected		Failed clutch (Fill switch ON)	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
F6	4th Low	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	4H	F7	OFF
F5	3rd High	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	4L	F6	OFF
F4	3rd Low	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	3H	F5	OFF
F3	2nd High	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	3L	F4	OFF
F2	2nd Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
F1	1st Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		2nd	2L	F2	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
RH	Reverse High	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
RL	Reverse Low	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		High	RH	RH	OFF
N		ANY	NONE	No reaction	—

Circuit diagram related



Failure code [15SFMA] 2nd clutch solenoid: Malfunction

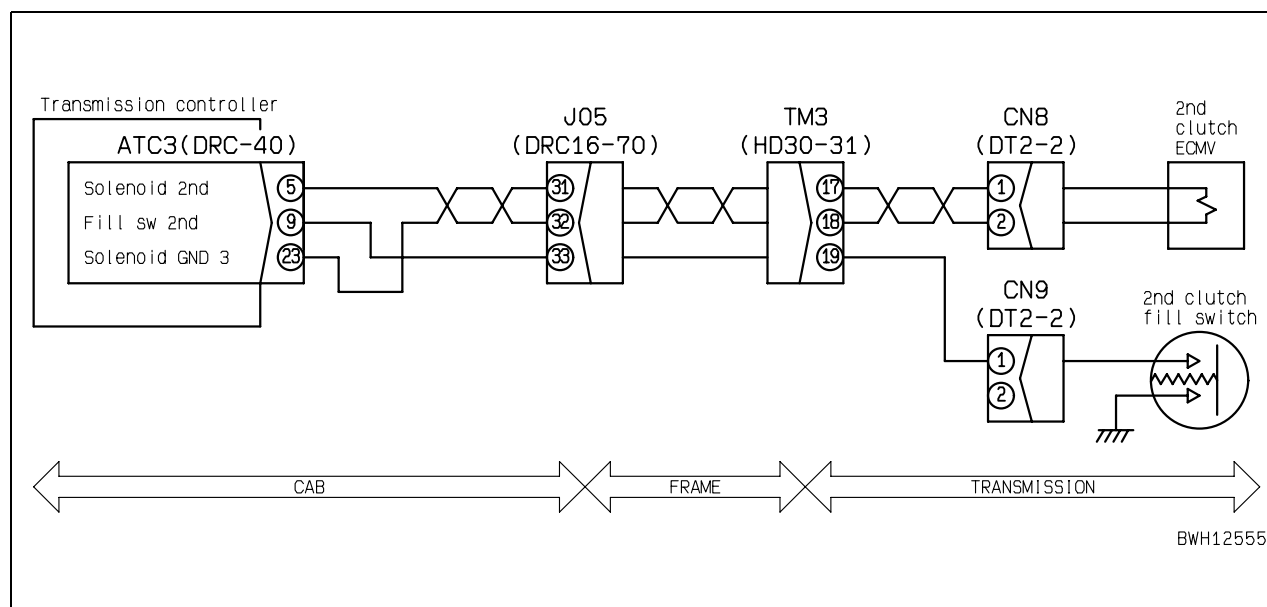
Action code	Failure code	Trouble	2nd clutch solenoid: Malfunction (2nd command holding pressure, 2nd clutch fill switch OFF, slipping detected) (Transmission controller system)
E03	15SFMA		
Contents of trouble	The signal from the fill switch stays "OFF" during an output to the 2nd clutch ECMV and an abnormality exists in the value calculated from the signals of transmission input shaft speed sensor, transmission intermediate shaft speed sensor and transmission output shaft speed sensor.		
Action of controller	- Shifts up and holds the gear speed as shown in Table 1 depending on the gear speed before failure. - Turns lock up to OFF.		
Problem that appears on machine	Machine travels at gear speeds which do not use 2nd clutch.		
Related information	- Electric current of output to ECMV can be checked by monitoring function (code: 31603 (mA)) - If the electrical system is normal, check for a failure in the hydraulic or mechanical system for 2nd clutch or pressure control valve.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective 2nd clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN8 (male).		
			Between CN8 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN8 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors ATC3 (female) and CN8 (female).		
			Wiring harness between ATC3 (female) (5) – CN8 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (23) – CN8 (female) (2)	Resistance	Max. 1 Ω
	3	Defective speed sensor detection	Troubleshooting by failure code DL**KA, DL**LC		
	4	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).		
			Wiring harness between ACT3 (female) (5) – (23)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related



Failure code [15SGL1] 3rd clutch solenoid: Fill signal is ON when command current is OFF

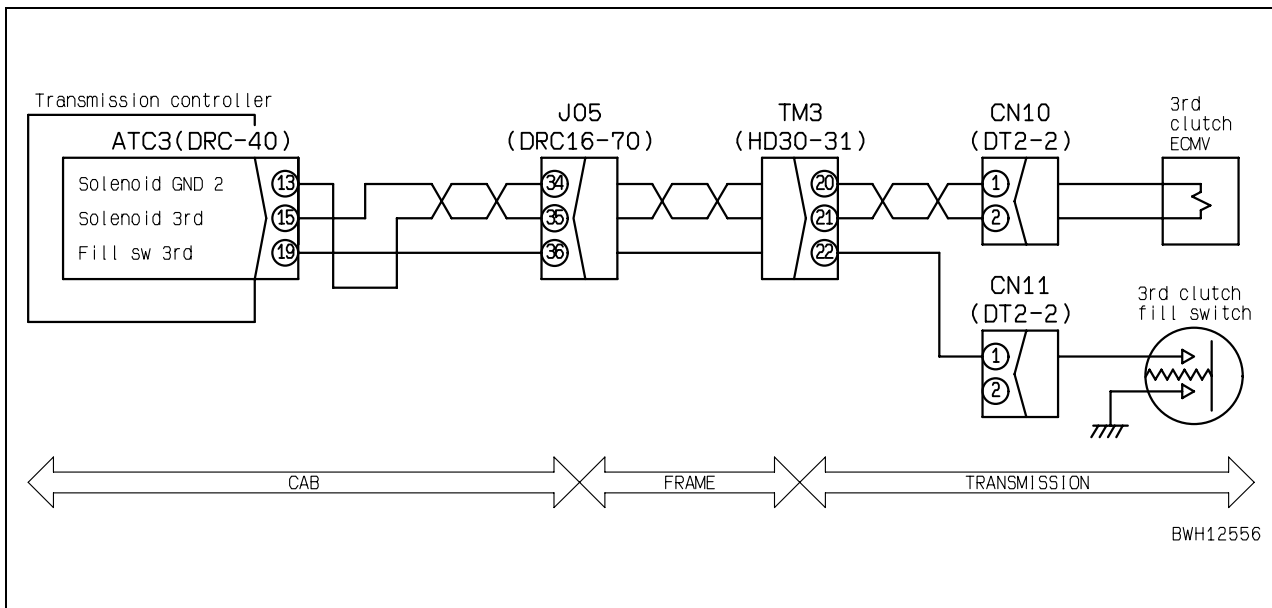
Action code	Failure code	Trouble	3rd clutch solenoid: Fill signal is ON when command current is OFF (Transmission controller system)
E03	15SGL1		
Contents of trouble	Even when output to the 3rd clutch ECMV is turned "OFF", the signal from the fill switch stays "ON" and the clutch is not released.		
Action of controller	- Shifts up and holds the gear speed as shown in Table 2 depending on the gear speed before failure. - Turns lock up to OFF.		
Problem that appears on machine	- Machine travels at gear speeds which use 3rd clutch. - Machine cannot travel in reverse.		
Related information	- Electric current of output to ECMV can be checked by monitoring function (code: 31604 (mA)) - Fill switch input signal can be checked with code: 38919 (0: OFF, 1:ON). - If electrical system is normal, check hydraulic and mechanical systems of 3rd clutch or pressure control valve for defect.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective 3rd clutch fill switch	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN11 (male).			
			Between CN11 (male) (1) – ground	When 3rd is released	Resistance	Min. 1 MΩ
				When 3rd is engaged	Resistance	Max. 1 Ω
	2	Defective harness grounding (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN11. 3) Connect T-adapter to ATC3 (female).			
			Between ground and wiring harness between ATC3 (female) (19) – CN11 (female) (1)		Resistance	Min. 1 MΩ
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).			
			Between ATC3 (female) (19) – ground	When 3rd is released	Resistance	Min. 1 MΩ
				When 3rd is engaged	Resistance	Max. 1 Ω

Table 2

Speed when trouble was detected		Failed clutch (Fill switch ON)	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
F6	4th Low	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	4H	F7	OFF
F5	3rd High	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	4L	F6	OFF
F4	3rd Low	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	3H	F5	OFF
F3	2nd High	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	3L	F4	OFF
F2	2nd Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
F1	1st Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		2nd	2L	F2	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
RH	Reverse High	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
RL	Reverse Low	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		High	RH	RH	OFF
N		ANY	NONE	No reaction	—

Circuit diagram related



Failure code [15SGMA] 3rd clutch solenoid: Malfunction

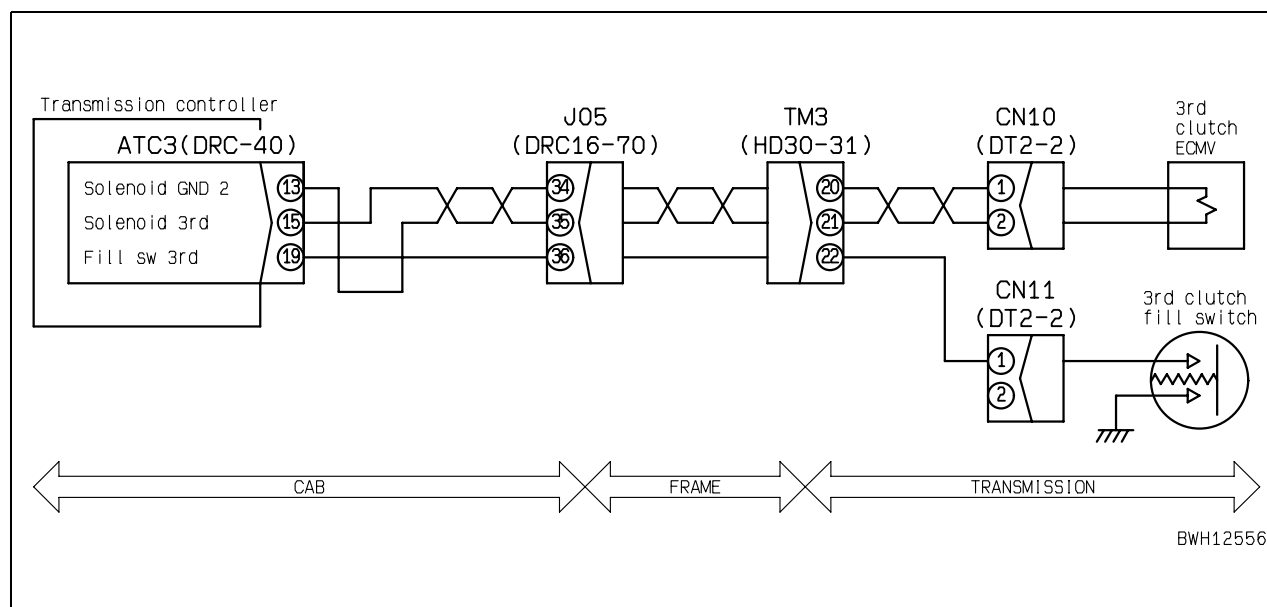
Action code	Failure code	Trouble	3rd clutch solenoid: Malfunction (3rd command holding pressure, 3rd clutch fill switch OFF, slipping detected) (Transmission controller system)
E03	15SGMA		
Contents of trouble	The signal from the fill switch stays "OFF" during an output to the 3rd clutch ECMV and an abnormality exists in the value calculated from the signals of transmission input shaft speed sensor, transmission intermediate shaft speed sensor and transmission output shaft speed sensor.		
Action of controller	- Shifts up and holds the gear speed as shown in Table 1 depending on the gear speed before failure. - Turns lock up to OFF.		
Problem that appears on machine	Machine travels at gear speeds which do not use 3rd clutch.		
Related information	- Electric current of output to ECMV can be checked by monitoring function (code: 31604 (mA)) - If the electrical system is normal, check for a failure in the hydraulic or mechanical system for 3rd clutch or pressure control valve.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective 3rd clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN10 (male).		
			Between CN10 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN10 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors ATC3 (female) and CN10 (female).		
			Wiring harness between ATC3 (female) (15) – CN10 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (13) – CN10 (female) (2)	Resistance	Max. 1 Ω
	3	Defective speed sensor detection	Troubleshooting by failure code DL**KA, DL**LC		
	4	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).		
			Wiring harness between ATC3 (female) (15) – (13)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related



Failure code [15SHL1] 4th clutch solenoid: Fill signal is ON when command current is OFF

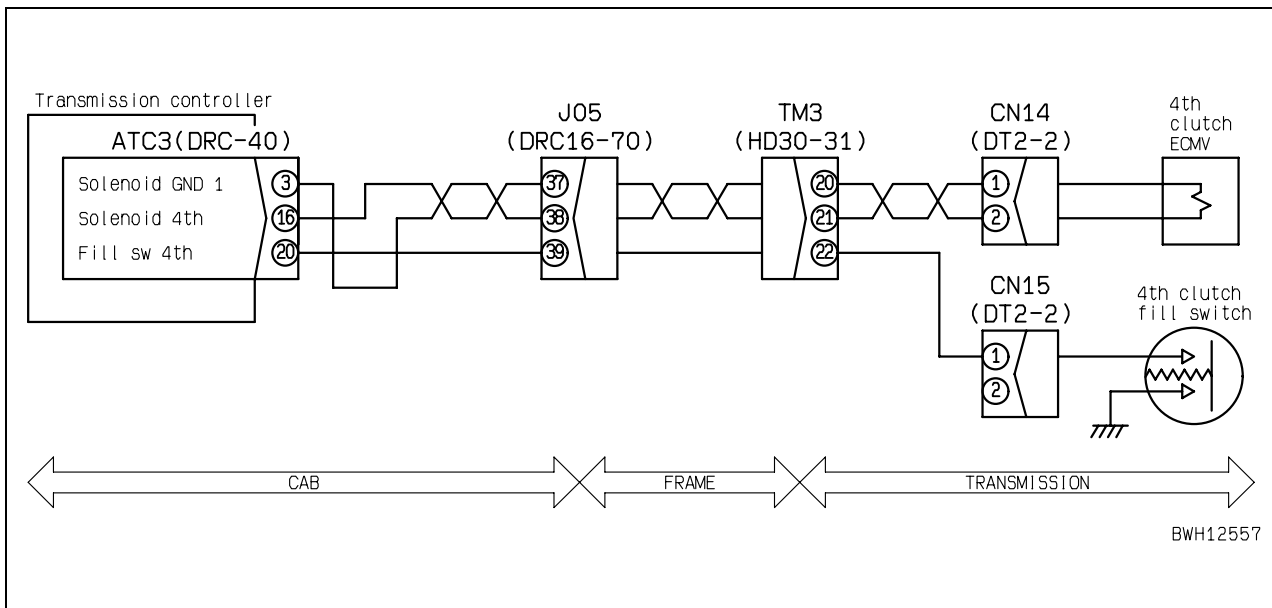
Action code	Failure code	Trouble	4th clutch solenoid: Fill signal is ON when command current is OFF (Transmission controller system)
E03	15SHL1		
Contents of trouble	When output to 4th clutch ECMV is turned "OFF", signal from fill switch is kept "ON" and clutch is not disengaged.		
Action of controller	- Shifts up and holds the gear speed as shown in Table 2 depending on the gear speed before failure. - Turns lockup system OFF.		
Problem that appears on machine	- Machine travels at gear speeds which use 4th clutch. - Machine cannot travel in reverse.		
Related information	- Current output to ECMV can be checked with monitoring function (Code: 31605 (mA)). - Fill switch input signal can be checked with code: 38919 (0: OFF, 1:ON). - If electrical system is normal, check hydraulic and mechanical systems of 4th clutch or pressure control valve for defect.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective 4th clutch fill switch	1) Turn starting switch OFF. 2) Disconnect connector CN15. 3) Connect T-adapter.			
			Between CN15 (male) (1) – ground	When dis-engaged	Resistance	Min. 1 MΩ
				When engaged	Resistance	Max. 1 Ω
	2	Grounding fault in wiring harness	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN15. 3) Connect T-adapter to ATC3 (female).			
			Wiring harness between ATC3 (female) (20) – CN15 (female) (1)		Resistance	Min. 1 MΩ
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Disconnect connector ATC3. 3) Connect T-adapter.			
			Between ATC3 (female) (20) – ground	When dis-engaged	Resistance	Min. 1 MΩ
				When engaged	Resistance	Max. 1 Ω

Table 2

Speed when trouble was detected		Failed clutch (Fill switch ON)	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
F6	4th Low	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	4H	F7	OFF
F5	3rd High	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	4L	F6	OFF
F4	3rd Low	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	3H	F5	OFF
F3	2nd High	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	3L	F4	OFF
F2	2nd Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
F1	1st Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		2nd	2L	F2	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
RH	Reverse High	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
RL	Reverse Low	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		High	RH	RH	OFF
N		ANY	NONE	No reaction	—

Circuit diagram related

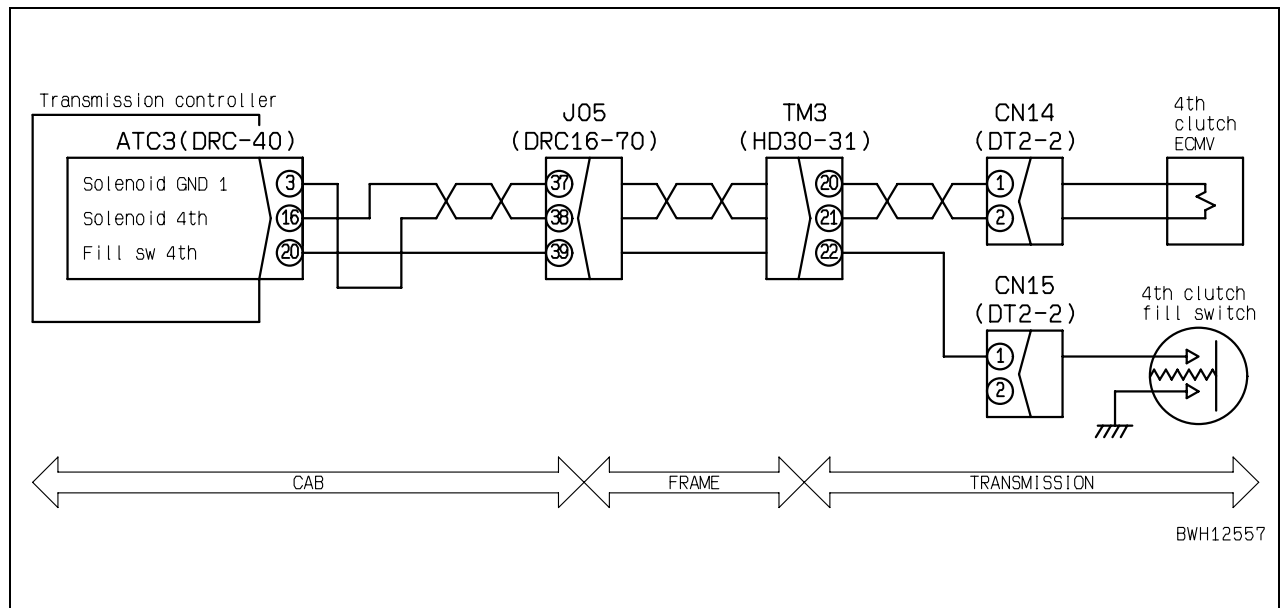


Failure code [15SHMA] 4th clutch solenoid: Malfunction

Action code	Failure code	Trouble	4th clutch solenoid: Malfunction (4th command is holding pressure, 4th clutch fill switch is OFF, and slipping detected) (Transmission controller system)
E03	15SHMA		
Contents of trouble	When a signal is output to the 4th clutch ECMV, the signal from the fill switch is kept "OFF" and the value calculated from the signals of the transmission input shaft speed sensor, transmission intermediate shaft speed sensor, and transmission output shaft speed sensor is abnormal.		
Action of controller	- The controller sets the gear in Neutral. - Turns lock up to OFF.		
Problem that appears on machine	- The gear is set in Neutral suddenly during travel. - Machine travels at gear speeds which do not use 4th clutch.		
Related information	- Electric current of output to ECMV can be checked by monitoring function (code: 31605 (mA)) - If the electric system is normal, check the hydraulic/mechanical system of the 4th clutch and pressure control valve for a defect.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective 4th clutch ECMV	1) Turn the starting switch OFF. 2) Disconnect connector CN14. 3) Connect T-adapter.		
			Between CN14 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN14 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC3 and CN14. 3) Connect T-adapter.		
			Wiring harness between ATC3 (female) (16) – CN14 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (3) – CN14 (female) (2)	Resistance	Max. 1 Ω
	3	Defective detection speed sensor	Troubleshooting by the failure codes of DL**KA, and DL**LC.		
	4	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connector ATC3. 3) Connect T-adapter.		
			Wiring harness between ATC3 (female) (16) – (3)	Resistance	5 – 15 Ω

Circuit diagram related

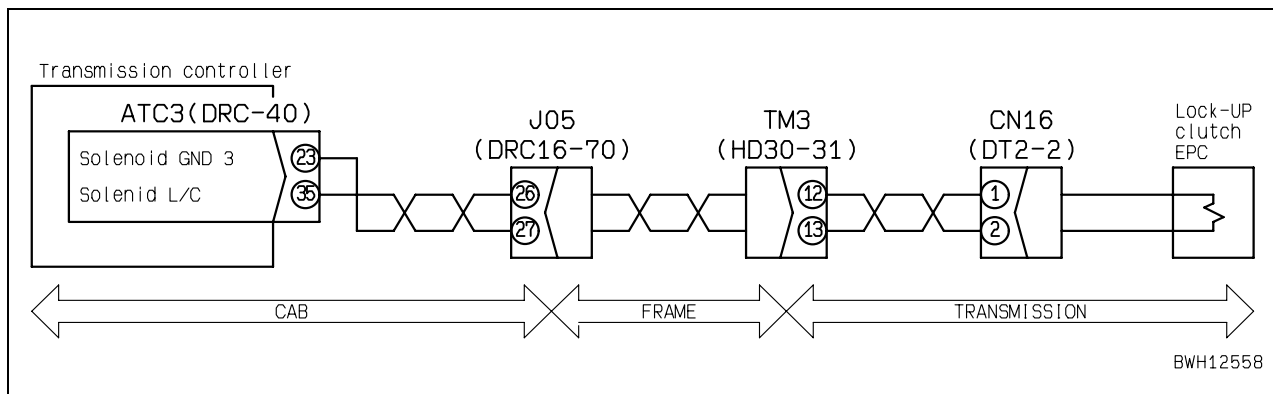


Failure code [15SJMA] Lockup clutch solenoid: Malfunction

Action code	Failure code	Trouble	Lockup clutch solenoid: Malfunction (Lockup command holding pressure is applied and slipping detected) (Transmission controller system)
E03	15SJMA		
Contents of trouble	During an output to the lockup clutch solenoid, an abnormality exists in the value calculated from the signals of engine speed sensor, transmission intermediated shaft speed sensor, and transmission output shaft speed sensor.		
Action of controller	- Holds gear speed during traveling and turns lock up to "OFF". - Holds neutral when gear shift lever is set to "N".		
Problem that appears on machine	- Lockup is released and gear shift is disabled. - If gear shift lever is shifted to "N", machine does not start unless it is stopped.		
Related information	- Electric current of output to ECMV can be checked by monitoring function (code: 31609 (mA)) - If the electrical system is normal, check for a failure in the hydraulic or mechanical system for lockup clutch or pressure control valve.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective lockup clutch solenoid	1) Turn starting switch OFF. 2) Connect T-adaptor to connector CN16 (male).		
			Between CN16 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN16 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adaptor to connectors ATC3 (female) and CN16 (female).		
			Wiring harness between ATC3 (female) (35) – CN16 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (23) – CN16 (female) (2)	Resistance	Max. 1 Ω
	3	Defective speed sensor detection	• Troubleshooting by failure code DL**KA, DL**LC		
	4	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adaptor to connector ATC3 (female).		
			Wiring harness between ATC3 (female) (35) – (23)	Resistance	5 – 15 Ω

Circuit diagram related



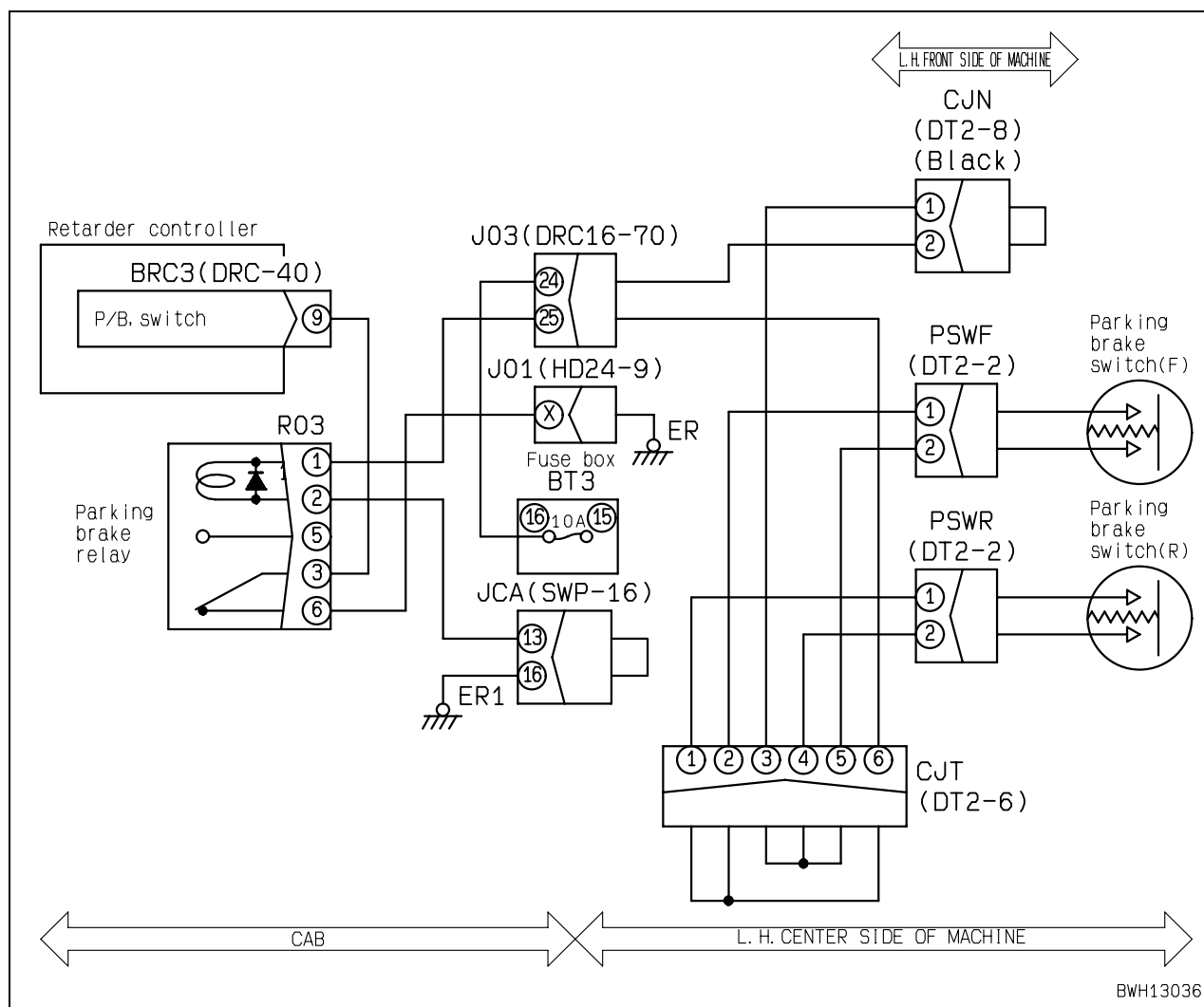
Failure code [2F00KM] Parking brake: Mistake in operation or setting

Action code	Failure code	Trouble	Parking brake: Mistake in operation or setting (Parking brake drags) (Retarder controller system)
—	2F00KM		
Contents of trouble	When the output shaft speed is above 200 rpm (approx. 5 km/h), the parking brake or emergency brake is operated.		
Action of controller	None in particular.		
Problem that appears on machine	If the machine is used without repairing, it may be broken.		
Related information	If error in communication between transmission connector and retarder controller (DB1RKR) is displayed, carry out troubleshooting for it first.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Mistake in operation of parking brake switch	- Set the parking brake switch in the FREE position and then start the machine. - Do not use parking brake while machine is traveling.			
	2	Defective parking brake relay (R03)	1) Turn the starting switch OFF. 2) Replace R03 with normal one.			
			When the parking brake relay (R03) is replaced, is failure repaired?	Yes	Relay (R03) is defective	
				No	Relay (R03) is normal	
			1) Turn the starting switch OFF. 2) Disconnect connector R03. 3) Check the relay.			
			Between R03 (male) (1) – (2)		Resistance	200 – 400 Ω
			1) Turn the starting switch OFF. 2) Disconnect connector R03. 3) Check the relay. 4) Apply voltage between R03 (male) (1) – (2).			
			Between R03 (male) (3) – (6)	Apply 24 V between (1) – (2)	Resistance	Min. 1 MΩ
				Do not apply 24 V between (1) – (2)	Resistance	Max. 1 Ω
	3	Defective parking brake oil pressure switch (front)	1) Turn starting switch OFF. 2) Connect T-adaptor to connector PSWF (male). 3) Start engine.			
			Between PSWF (male) (1) – (2)	Set parking brake switch in FREE position	Resistance	Min. 1 MΩ
				Set parking brake switch in PARK position	Resistance	Max. 1 Ω
	4	Defective parking brake oil pressure switch (rear)	1) Turn starting switch OFF. 2) Connect T-adaptor to connector PSWR (male). 3) Start engine.			
			Between PSWR (male) (1) – (2)	Set parking brake switch in FREE position	Resistance	Min. 1 MΩ
				Set parking brake switch in PARK position	Resistance	Max. 1 Ω

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	5	Mistake in operation of emergency brake (Operation of emergency brake during travel)	Operate the emergency brake only when necessary.		
	6	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adapter to connector R03 (female).		
			Wiring harness between R03 (female) (2), (6) – ground	Resistance	Max. 1 Ω
			1) Turn starting switch OFF. 2) Connect T-adapter to connectors R03, BT3, PSWR (female), and PSWR (female). 3) Check the relay.		
			Wiring harness between fuse BT3 (16) – PSWF (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between fuse BT3 (16) – PSWR (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between R03 (female) (1) – PSWF (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between R03 (female) (1) – PSWR (female) (2)	Resistance	Max. 1 Ω
	7	Grounding fault of wiring harness	1) Turn the starting switch OFF. 2) Disconnect connectors BRC3 and R03. 3) Connect T-adapter.		
			Wiring harness between BRC3 (female) (9), R03 (female) (3) – ground	Resistance	Min. 1 MΩ
	8	Defective retarder controller	1) Turn the starting switch OFF. 2) Disconnect connector BRC3. 3) Connect T-adapter. 4) Connect connector BRC3 5) Start the engine.		
			Between BRC3 (9) – ground	Set parking brake switch in FREE position	Voltage Max. 1 V
				Set parking brake switch in PARK position	Voltage 20 – 30 V

Circuit diagram related



Failure code [2G42ZG] Accumulator: Oil pressure reduction (Front)

Action code	Failure code	Trouble	Accumulator: Oil pressure reduction (Front) (Transmission controller system)
E03	2G42ZG		
Contents of trouble	• Oil pressure reduction (Max. 8.83 MPa {90 kg/cm ² }) was detected by signal from accumulator oil pressure sensor (front).		
Action of controller	• Displays accumulator oil pressure monitor red.		
Problem that appears on machine	• Brake (Retarder) (front) does not work.		
Related information	• Input signal from oil pressure sensor can be checked with monitoring function (Code: 35500 (MPa) , 35504 (V)). • Circuit diagram: See [DHU2KX].		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Trouble in hydraulic system	
	2	Defective accumulator (front) oil pressure sensor system	If cause 1 is not detected, accumulator (front) oil pressure sensor system may be defective. Carry out troubleshooting for failure code [DHU2KX].

Failure code [2G43ZG] Accumulator: Oil pressure reduction (Rear)

Action code	Failure code	Trouble	Accumulator oil pressure reduction (Rear) (Transmission controller system)
E03	2G43ZG		
Contents of trouble	• Oil pressure reduction (Max. 8.83 (MPa) {90 (kg/cm ²)}) was detected by signal from accumulator oil pressure sensor (rear).		
Action of controller	• Displays accumulator oil pressure monitor red.		
Problem that appears on machine	• Brake (Retarder) (rear) does not work.		
Related information	• Input signal from oil pressure sensor can be checked with monitoring function (Code: 35501 (MPa) , 35505 (V)). • Circuit diagram: See [DHU3KX].		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Trouble in hydraulic system	
	2	Defective accumulator (rear) oil pressure sensor system	If cause 1 is not detected, accumulator (rear) oil pressure sensor system may be defective. Carry out troubleshooting for failure code [DHU3KX].

Failure code [989A00] Engine over run prevention command signal: Operating

Action code	Failure code	Trouble	Engine over run prevention command signal: Operating (Machine monitor system)
E02	989A00		
Contents of trouble	• When gear speed is set at the position other than neutral, transmission input shaft speed signal exceeds the input shaft speed which is set for each gear speed to prevent over run.		
Action of controller	• Send out command signal to retarder controller and activate brake.		
Problem that appears on machine	• Brake becomes activated and travel speed lowers.		
Related information	• Input shaft speed can be checked in monitoring function (code: 31200 (rpm)). • Information on operation of engine overrun prevention command is obtained from transmission controller through network.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Engine over run	★ If machine is so traveling that transmission input shaft speed signal exceeds 2,600 rpm (or 2,400 rpm at R2), engine is overrunning.
	2	Defective transmission controller	If machine is not so traveling that transmission input shaft speed signal exceeds 2,600 rpm (or 2,400 rpm at R2), transmission controller is defective.

Failure code [989D00] Rear section tipping over alarm: Alarm is activated

Action code	Failure code	Trouble	Rear section tipping over alarm: Alarm is activated (Lift operation when machine is inclined) (Machine monitor system)
—	989D00		
Contents of trouble	• Body is lifted when machine is inclined.		
Action of machine monitor	• Turns on inclination caution lamp • Sounds alarm buzzer.		
Problem that appears on machine	• If body is lifted in such condition, machine body may tip over.		
Related information	• Input signal from pitch angle sensor can be checked with monitoring function (code: 32900 (°) , 32903 (V)). • Information on operation of inclination alarm activation is obtained from transmission controller through network.		

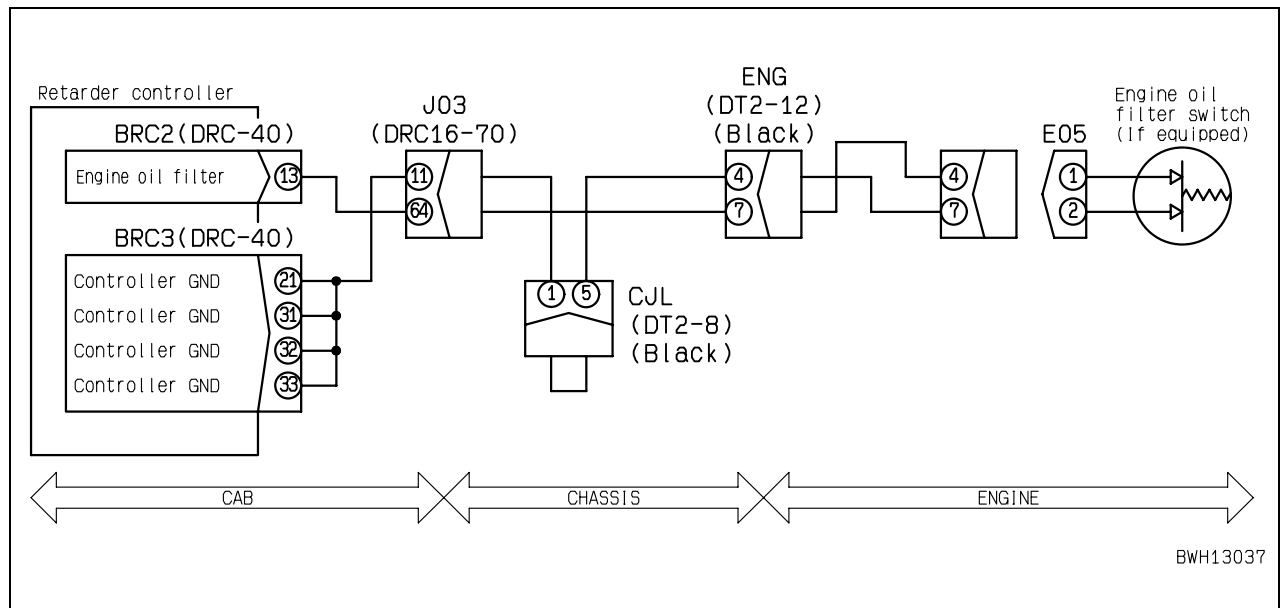
Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Mistake in operation	Do not lift body when machine is inclined for more than 15°. (Teach the proper operating method.)

Failure code [A570NX] Engine oil filter: Clogging

Action code	Failure code	Trouble	Engine oil filter: Clogging (Retarder controller system)
E01	A570NX		
Contents of trouble	When engine speed is above 500 rpm and torque converter oil temperature is above 50°C, and engine coolant temperature is above 67°C, oil filter circuit is opened (disconnected from ground circuit).		
Action of controller	None in particular.		
Problem that appears on machine	If engine is used for long hours, it may be seized.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Clogged engine oil filter	When maintenance caution lamp is lighting	Oil filter is probably clogged		
	2	Defective engine oil filter clogging switch	1) Turn starting switch OFF. 2) Disconnect E05.			
			E05 (male)		Oil filter	Resistance
			Between (1) – (2)		When normal	Max. 1 Ω
					When clogging switch is open	Min. 1 MΩ
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn starting switch OFF. 2) Disconnect connector BRC2 and E05. 3) Connect T-adapter to BRC2 (female).			
			Wiring harness between BRC2 (female) (13) – E05 (1)		Resistance	Max. 1 Ω
	4	Defective retarder controller	1) Turn starting switch OFF. 2) Insert T-adapter in connector BRC2 and BRC3. 3) Turn starting switch ON.			
			BRC2 and BRC3		Oil filter	Voltage
			Between BRC2 (13) – BRC3 (21), (31), (32) and (33)		When normal	Max. 1 V
					When clogging switch is open	20 – 30 V

Circuit diagram related



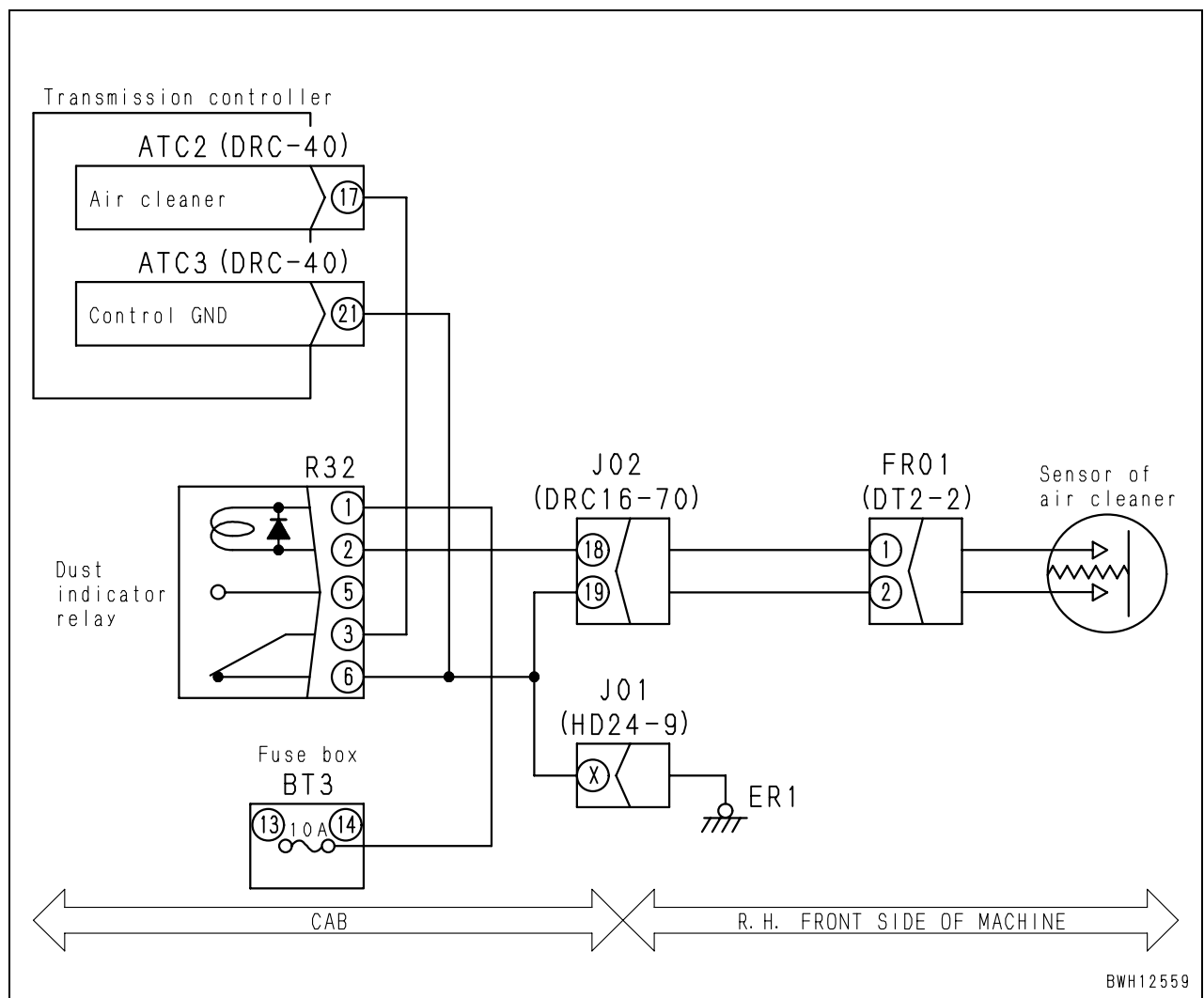
Failure code [AA10NX] Air cleaner element: Clogging

Action code	Failure code	Trouble	Air cleaner element: Clogging (Transmission controller system)
E01	AA10NX		
Contents of trouble	• The air cleaner clogging signal circuit is "opened" (disconnected from GND).		
Action of controller	• None in particular.		
Problem that appears on machine	• If the machine is used without repairing, the suction performance of the engine may be lowered.		
Related information	• ATC2 (17) When normal: GND, When clogged: OPEN		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting					
	1	Clogging of air cleaner	The dust indicator is not red		Air cleaner is normal			
			The dust indicator is red		Air cleaner is clogged			
	2	Dust indicator relay (R32) defective	1) Turn the starting switch OFF. 2) Replace R32 with normal one. 3) Turn the starting switch ON.					
			When the dust indicator relay (R32) is replaced, is failure repaired?		No	Relay (R03) is normal		
					Yes	Relay (R03) is defective		
			1) Turn the starting switch OFF. 2) Disconnect connector R32. 3) Check the relay.					
			Between R32 (male) (1) – (2)		Resistance	200 – 400 Ω		
			1) Turn the starting switch OFF. 2) Disconnect connector R32. 3) Check the relay. 4) Apply voltage between R32 (male) (1) – (2).					
			Between R32 (male) (3) – (6)		Apply 24 V between (1) – (2)	Resistance	Min. 1 MΩ	
					Do not apply 24 V between (1) – (2)	Resistance	Max. 1 Ω	
	3	Defective air cleaner clogging sensor	1) Turn the starting switch OFF. 2) Disconnect connector FR01. 3) Connect T-adaptor. 4) Turn the starting switch ON. ★ Inside of air cleaner sensor is consist of electric circuit, so it is impossible to judge with resistance.					
			Between FR01 (male) (1) – (2)		Air cleaner is normal	Voltage	20 – 30V	
					Air cleaner is clogged	Voltage	Max. 10V	
	4	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC2, ATC3 and R32. 3) Connect T-adaptor.					
			Wiring harness between ATC3 (female) (21) – R32 (female) (6)		Resistance	Max. 1 Ω		
			Wiring harness between ATC2 (female) (17) – R32 (female) (3)		Resistance	Max. 1 Ω		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	5	Grounding fault of wiring harness	1) Turn the starting switch OFF. 2) Disconnect connectors R32 and FR01. 3) Connect T-adapter.		
			Wiring harness between R32 (female) (2) – FR01 (female) (1) – ground	Resistance	Min. 1 MΩ
	6	Defective transmission controller	1) Turn starting switch OFF. 2) Insert T-adapter in connectors ATC3 and ATC2. 3) Turn starting switch ON.		
			Between ATC2 (17) – ATC3 (21)	Air cleaner is normal	Voltage
				Air cleaner is clogged	Voltage
					Max. 1 V
					20 – 30 V

Circuit diagram related

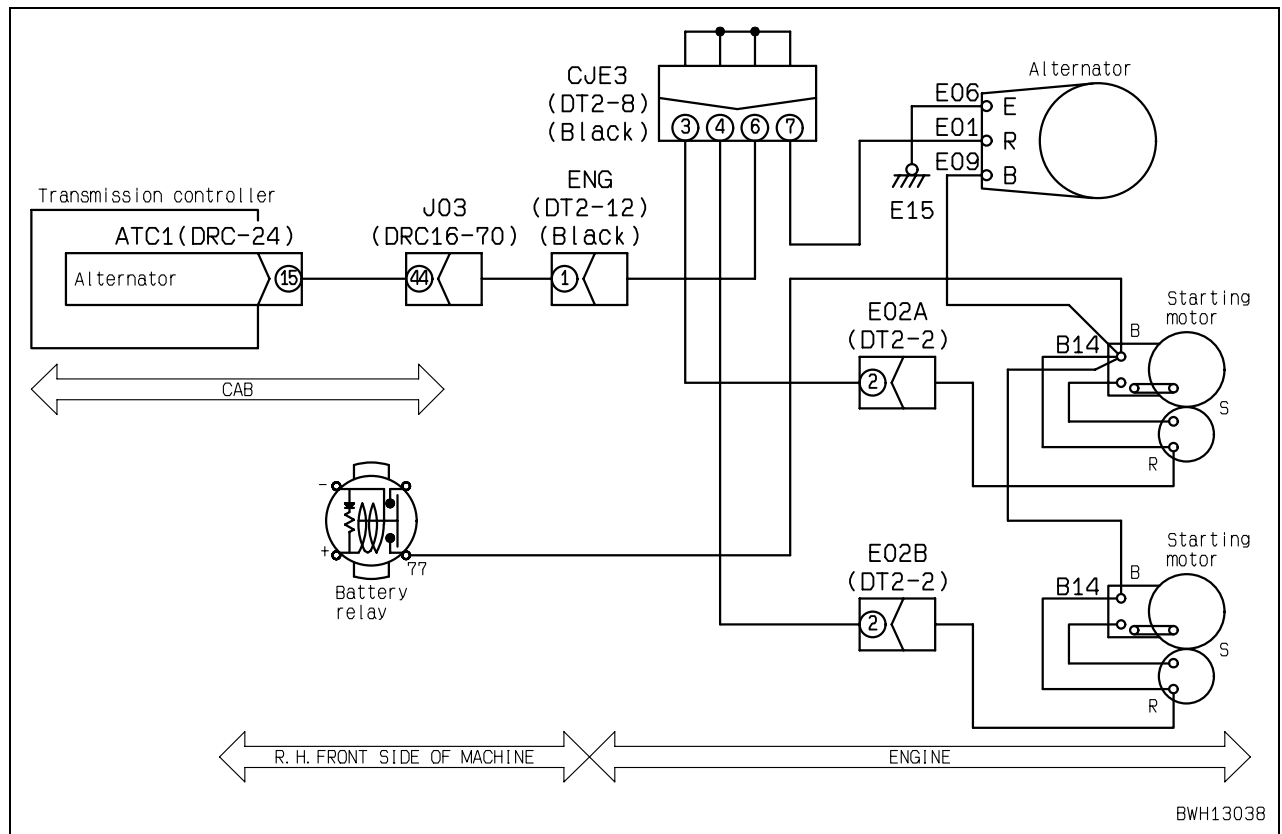


Failure code [AB00MA] Alternator: Malfunction

Action code	Failure code	Trouble	Alternator: Malfunction (Failure in battery charging circuit) (Transmission controller system)
E03	AB00MA		
Contents of trouble	• A generation signal is not input from the alternator while the engine is running.		
Action of controller	• None in particular.		
Problem that appears on machine	• If the machine is used without repairing, the source voltage may lower so much that the machine cannot travel.		
Related information	• This failure can be checked in the monitoring function (Code: 04301 (0: OFF, 1:ON)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective alternator	1) Turn the starting switch OFF. 2) Disconnect connector alternator terminal R. 3) Start the engine.		
			Between alternator R – E	Voltage	27.5 – 29.5 V
			★ If the battery is deteriorated or used in a cold district, the voltage may not rise for a while after the engine is started.		
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connector ATC1. 3) Connect T-adapter. 4) Start the engine.		
			Between ATC1 (female) (5) – ground	Voltage	27.5 – 29.5 V
			★ If the battery is deteriorated or used in a cold district, the voltage may not rise for a while after the engine is started.		
			★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between battery relay terminal M – alternator terminal R	Resistance	Max. 1 Ω
	3	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connector ATC1. 3) Insert T-adapter. 4) Start the engine.		
			Between ATC1 (5) – ground	Voltage	20 – 30 V
			★ If the battery is deteriorated or used in a cold district, the voltage may not rise for a while after the engine is started.		

Circuit diagram related

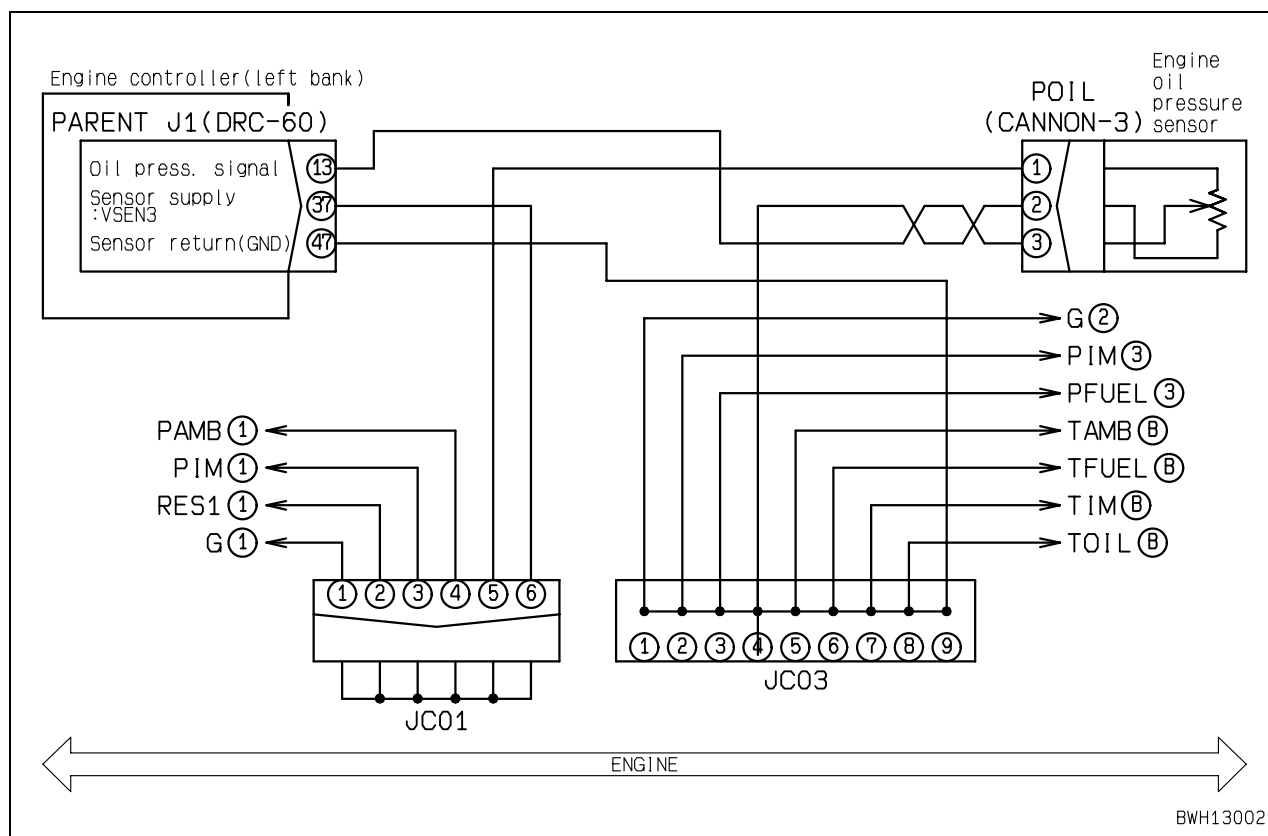


Failure code [B@BAZG] Abnormal lowering of engine oil pressure: Lowering of oil pressure

Action code	Failure code	Trouble	Abnormal lowering of engine oil pressure: Lowering of oil pressure (Engine controller system)
E03	B@BAZG		
Contents of trouble	When engine speed was below 500 rpm for 15 seconds, engine oil pressure became lower than operating range.		
Action of controller	- Limit output for travel (Limit injection rate and engine speed) - Turns the centralized warning lamp and alarm buzzer ON.		
Problem that appears on machine	Engine output drops.		
Related information	- The input state (oil pressure) from the engine oil pressure sensor can be checked with the monitoring function (Code: 37200 (kPa)). - The input state (voltage) from the engine oil pressure sensor can be checked with the monitoring function (Code: 37201 (V)). - Method of reproducing failure code: Start engine.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective sensor power supply system	If failure code [CA187] or [CA227] is also indicated, carry out troubleshooting for it first.			
	2	Defective oil pressure sensor (Internal defect)	★ Prepare with starting switch OFF, then turn starting switch ON or start engine and carry out troubleshooting.			
			POIL		Voltage	
			Between (1) and (2)	Power supply	4.75 – 5.25V	
			Sensor voltage is measured with wiring harness connected. Accordingly, if voltage is abnormal, check wiring harness and controller, too, for another cause of trouble, and then judge.			
	3	Disconnection in wiring harness (Disconnection or defective contact of connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between PARENT J1 (female) (37) – POIL (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (47) – POIL (female) (2)		Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (13) – POIL (female) (3)		Resistance	Max. 1 Ω
	4	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between PARENT J1 (female) (37) – POIL (female) (1)		Resistance	Min. 1 MΩ
			Wiring harness between PARENT J1 (female) (47) – POIL (female) (2)		Resistance	Min. 1 MΩ
			Wiring harness between PARENT J1 (female) (13) – POIL (female) (3)		Resistance	Min. 1 MΩ
	5	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON or start engine and carry out troubleshooting.			
			PARENT J1		Voltage	
			Between (37) and (47)	Power supply	4.75 – 5.25V	
			Between (13) and (47)	Signal	0.3 – 4.7 V	

Circuit diagram related

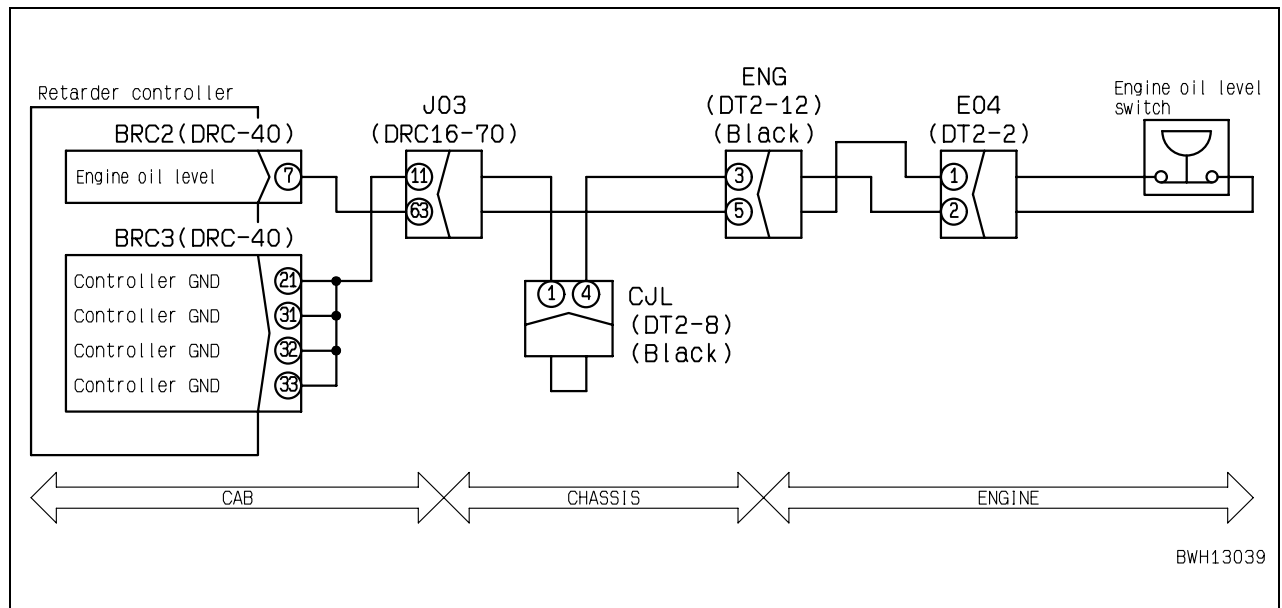


Failure code [B@BAZK] Engine oil: Level too low

Action code	Failure code	Trouble	Engine oil: Level too low (Retarder controller system)
E01	B@BAZK		
Contents of trouble	• Engine oil level switch circuit has become "OPEN" (disconnected with GND).		
Action of controller	• Turn on the maintenance caution lamp.		
Problem that appears on machine	• If machine is operated in such a condition, engine may be seized.		
Related information	• This trouble is not detected while engine coolant temperature is above 60°C. • This failure code is reset when engine is started.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Engine oil level is too low.	Engine oil level is normal.			
			★ If engine oil level is too low, check for an oil leakage around engine before refilling.			
	2	Defective engine oil level switch	★ Prepare with starting switch OFF and troubleshooting with starting switch still OFF.			
			Between E04 (male) (1) and (2)	Engine oil level is normal	Resistance	Max. 1 Ω
				Engine oil level is too low	Resistance	Min. 1 MΩ
	3	Disconnection in wiring harness (Disconnection or defective contact)	★ Prepare with starting switch OFF and troubleshooting with starting switch still OFF.			
			Wiring harness between BRC2 (female) (7) – E04 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between BRC3 (female) (21), (31), (32) and (33) – E04 (female) (2)		Resistance	Max. 1 Ω
	4	Defective retarder controller	★ Prepare with starting switch OFF and troubleshooting with starting switch ON.			
			Between BRC2 (7) – ground	Engine oil level is normal	Voltage	Max. 1V
				Engine oil level is too low	Voltage	20 – 30 V

Circuit diagram related

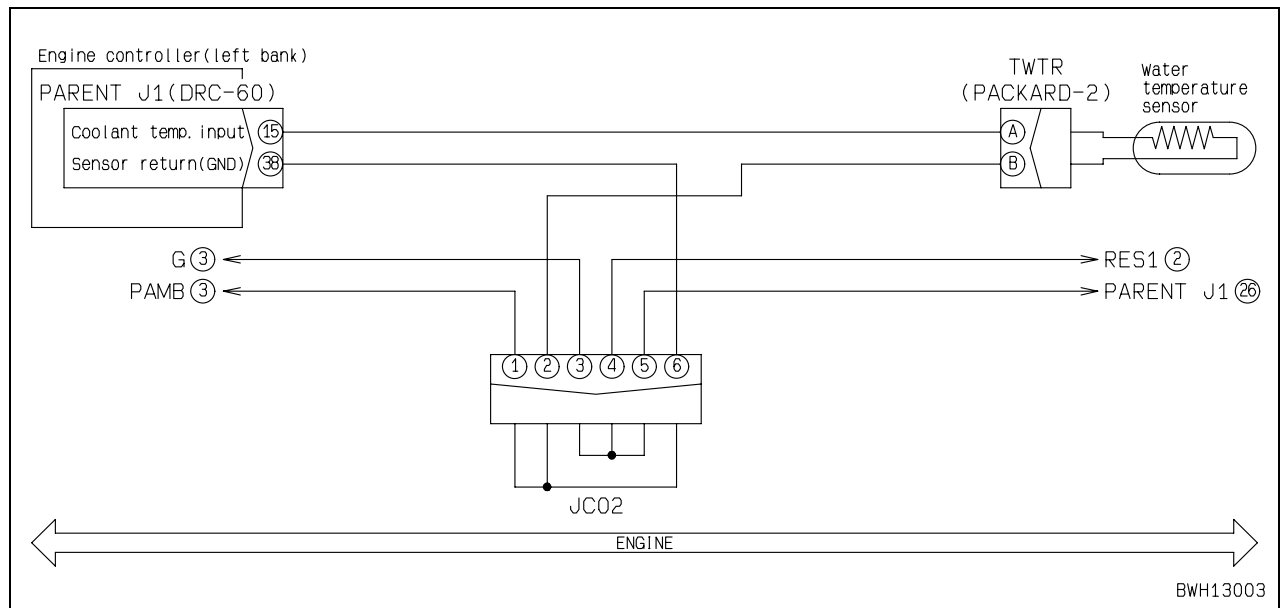


Failure code [B@BCNS] Engine: Overheat

Action code	Failure code	Trouble	Engine overheat (Engine controller system)
E02	B@BCNS		
Contents of trouble	• When engine speed was below 500 rpm for 3 seconds or more, coolant temperature exceeded operating range.		
Action of controller	• Limits output and continues operation. • Turns the centralized warning lamp and alarm buzzer ON.		
Problem that appears on machine	• Engine output drops.		
Related information	• The input state (temperature) from the coolant temperature sensor can be checked with the monitoring function (Code: 04104 (°C)). • The input state (voltage) from the coolant temperature sensor can be checked with the monitoring function (Code: 04105 (V)). • Method of reproducing failure code: Start engine.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective coolant temperature sensor (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			TWTR (male)		Coolant temperature	Resistance
			Between (A) and (B)		10 – 100°C	0.6 – 20 kΩ
	2	Disconnection in wiring harness (Disconnection or defective contact of connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between PARENT J1 (female) (15) – TWTR (female) (A)		Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (38) – TWTR (female) (B)		Resistance	Max. 1 Ω
	3	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			PARENT J1 (female)		Coolant temperature	Resistance
			Between (15) and (38)		10 – 100°C	0.6 – 20 kΩ

Circuit diagram related

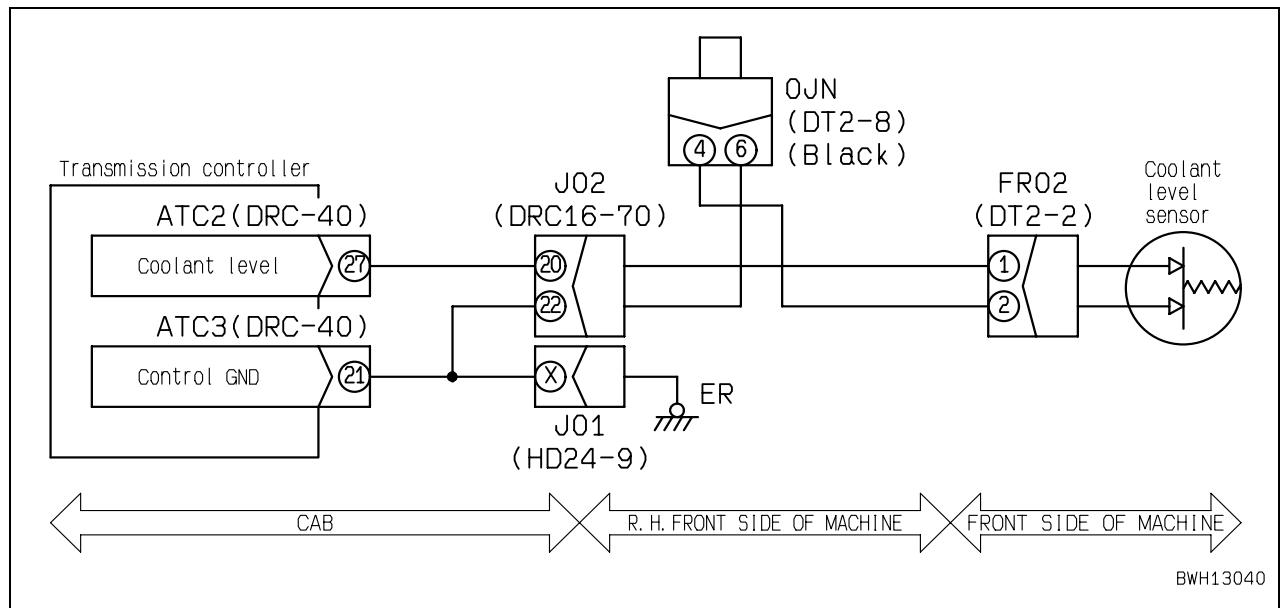


Failure code [B@BCZK] Lowering of radiator coolant: Lowering of level

Action code	Failure code	Trouble	Lowering of radiator coolant: Lowering of level (Transmission controller system)
E01	B@BCZK		
Contents of trouble	The radiator coolant level switch signal circuit is opened (disconnected from GND).		
Action of controller	None in particular.		
Problem that appears on machine	If machine is used while coolant level is low, engine may overheat.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Lowering of radiator coolant level	- The radiator coolant level is normal. ★ If the radiator coolant level is low, check around the engine and radiator for coolant leakage before adding coolant.			
	2	Defective radiator coolant level switch	1) Turn the starting switch OFF. 2) Disconnect connector FR02. 3) Connect T-adaptor.			
			Between FR02 (male) (1) – (2)	Radiator coolant level is normal	Resistance	Max. 1 Ω
				Radiator coolant level is low	Resistance	Min. 1 MΩ
	3	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC2, ATC3 and FR02. 3) Connect T-adaptor.			
			Wiring harness between ATC2 (female) (27) – FR02 (female) (1)	Resistance		Max. 1 Ω
			Wiring harness between FR02 (female) (2) – ATC3 (female) (21)	Resistance		Max. 1 Ω
	4	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connector ATC2. 3) Insert T-adaptor. 4) Turn the starting switch ON.			
			Between ATC2 (female) (27) – ATC3 (female) (21)	Radiator coolant level is normal	Voltage	Max. 1V
				Radiator coolant level is low	Voltage	20 – 30 V

Circuit diagram related



Failure code [B@BFZK] Lowering of fuel level

Action code	Failure code	Trouble	Lowering of fuel level (Machine monitor system)
—	B@BFZK		
Contents of trouble	• Fuel level sensor signal indicates lowering of fuel level (Resistance of 70 Ω or higher is detected).		
Action of machine monitor	• Does not display this failure code, if DJF1KA is detected. • Turns fuel level caution lamp ON.		
Problem that appears on machine	• None in particular.		
Related information	• When fuel level is below LOW and fuel is added, if failure code disappears, fuel was insufficient. • Signal from fuel level sensor can be checked with monitoring function. (Monitoring code: MONITOR PANEL - FUEL SENSOR - 04200 (V) / 04201 (Ω)) • Method of reproducing failure code: Turn starting switch ON.		

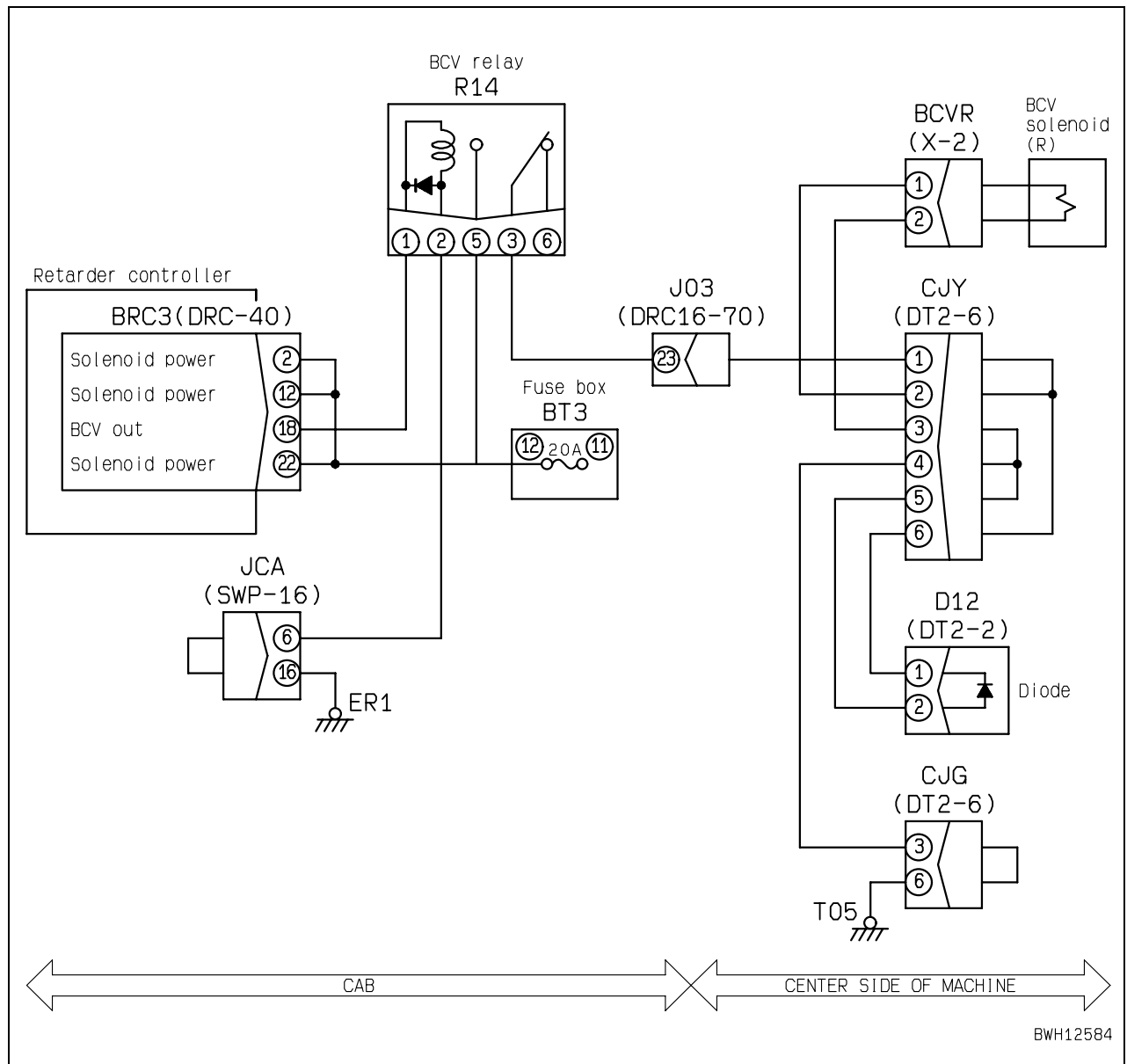
Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Lack of fuel (When system is normal)	
	2	Defective fuel level sensor	When not recover by above 1, then carry out troubleshooting for failure code [DJF1KA].

Failure code [B@C6NS] Brake cooling oil: Overheating (Front)

Action code	Failure code	Trouble	Brake cooling oil: Overheating (Front) (Machine monitor system)
E02	B@C6NS		
Contents of trouble	While engine was running, oil overheat was detected by signal from front brake (retarder) oil temperature sensor.		
Action of machine monitor	Turn on brake oil temperature caution lamp.		
Problem that appears on machine	- Brake (Retarder) (front) comes not to work. - If machine is used as it is, brake (retarder) (front) may be damaged.		
Related information	- Input signal from oil temperature sensor can be checked with monitoring function (Code: 30201 (°C), 30204 (V)). - For troubleshooting for brake (retarder) (front) oil temperature sensor, see failure code [DGR4KZ]. - If R14 (BCV relay) primary side has trouble, error code [DW78KZ] is displayed.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective R14 (BCV relay)	1) Remove relay cover. 2) Turn starting switch ON (Do not start engine). 3) Turn retarder brake ON and OFF and carry out troubleshooting.			
			R14 (BCV relay)	Operating sound of relay is heard.		
	2	Defective diode	★ Turn starting switch OFF and disconnect D12, then carry out troubleshooting without turning starting switch ON (Measure in diode check mode).			
			Between D12 (male) (1) – (2)	Continuity	Forward direction: There is continuity Backward direction: There is not continuity	
	3	Defective BCV solenoid	1) Open operator's cab door. 2) Turn starting switch ON (Do not start engine). 3) Turn retarder brake ON and OFF and carry out troubleshooting.			
			BCV solenoid		Operating sound of BCV solenoid is heard.	
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Turn starting switch OFF and disconnect R14 (BCV relay) and BCVR, then carry out troubleshooting without turning starting switch ON.			
			Between R14 (female) (3) – BCVR (female) (1)		Resistance	Max. 1 Ω
			Between T05 (ground) – BCVR (female) (2)		Resistance	Max. 1 Ω
			Between R14 (female) (5) – BT3 (12)		Resistance	Max. 1 Ω
	5	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect BCVR, then carry out troubleshooting without turning starting switch ON.			
			Between R14 (female) (1) – ground		Resistance	Min. 1 MΩ
	6	Trouble in hydraulic system (when electrical system is normal)	Hydraulic system may have trouble. Remove cause of trouble.			
	7	Defective retarder controller	If causes 1 – 6 are not detected, retarder controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)			

Circuit diagram related

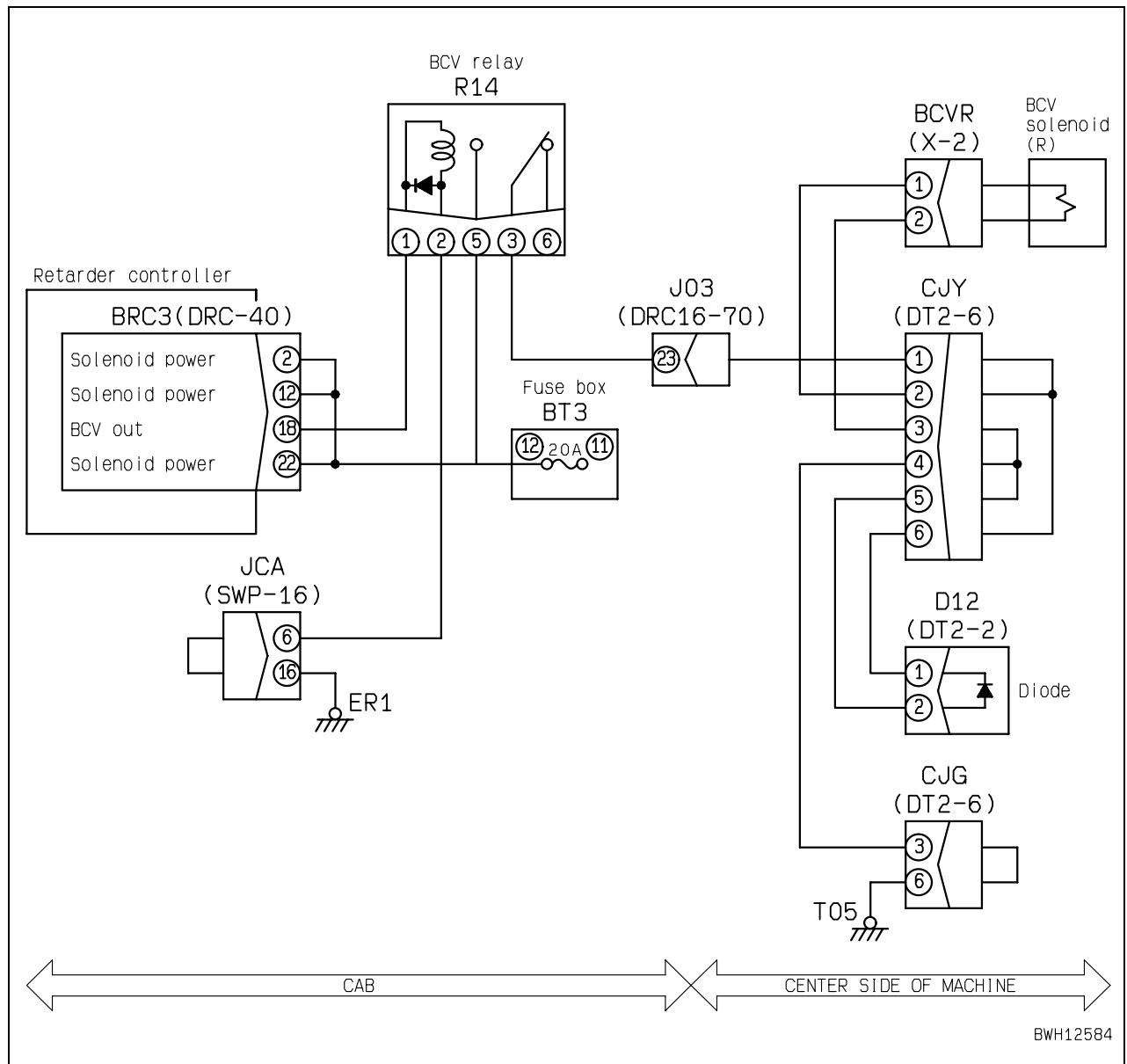


Failure code [B@C7NS] Brake cooling oil: Overheating (Rear)

Action code	Failure code	Trouble	Brake cooling oil: Overheating (Rear) (Machine monitor system)
E02	B@C7NS		
Contents of trouble	While engine was running, oil overheat was detected by signal from rear brake (retarder) oil temperature sensor.		
Action of machine monitor	Turn on brake oil temperature caution lamp.		
Problem that appears on machine	- Brake (Retarder) (Rear) comes not to work. - If machine is used as it is, brake (retarder) (rear) may be damaged.		
Related information	- Input signal from oil temperature sensor can be checked with monitoring function (Code: 30211 (°C), 30212 (V)). - For troubleshooting for brake (retarder) (rear) oil temperature sensor, see failure code [DGR2KZ]. - If R14 (BCV relay) primary side has trouble, error code [DW78KZ] is displayed.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective R14 (BCV relay)	1) Remove relay cover. 2) Turn starting switch ON (Do not start engine). 3) Turn retarder brake ON and OFF and carry out troubleshooting.			
			R14 (BCV relay)	Operating sound of relay is heard.		
	2	Defective diode	★ Turn starting switch OFF and disconnect D12, then carry out troubleshooting without turning starting switch ON (Measure in diode check mode).			
			Between D12 (male) (1) – (2)	Continuity	Forward direction: There is continuity Backward direction: There is not continuity	
	3	Defective BCV solenoid	1) Open operator's cab door. 2) Turn starting switch ON (Do not start engine). 3) Turn retarder brake ON and OFF and carry out troubleshooting.			
			BCV solenoid		Operating sound of BCV solenoid is heard.	
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Turn starting switch OFF and disconnect R14 (BCV relay) and BCVR, then carry out troubleshooting without turning starting switch ON.			
			Between R14 (female) (3) – BCVR (female) (1)		Resistance	Max. 1 Ω
			Between T05 (ground) – BCVR (female) (2)		Resistance	Max. 1 Ω
			Between R14 (female) (5) – BT3 (12)		Resistance	Max. 1 Ω
	5	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect BCVR, then carry out troubleshooting without turning starting switch ON.			
			Between R14 (female) (1) – ground		Resistance	Min. 1 MΩ
	6	Trouble in hydraulic system (when electrical system is normal)	Hydraulic system may have trouble. Remove cause of trouble.			
	7	Defective retarder controller	If causes 1 – 6 are not detected, retarder controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)			

Circuit diagram related



Failure code [B@CENS] Overheating of torque converter oil

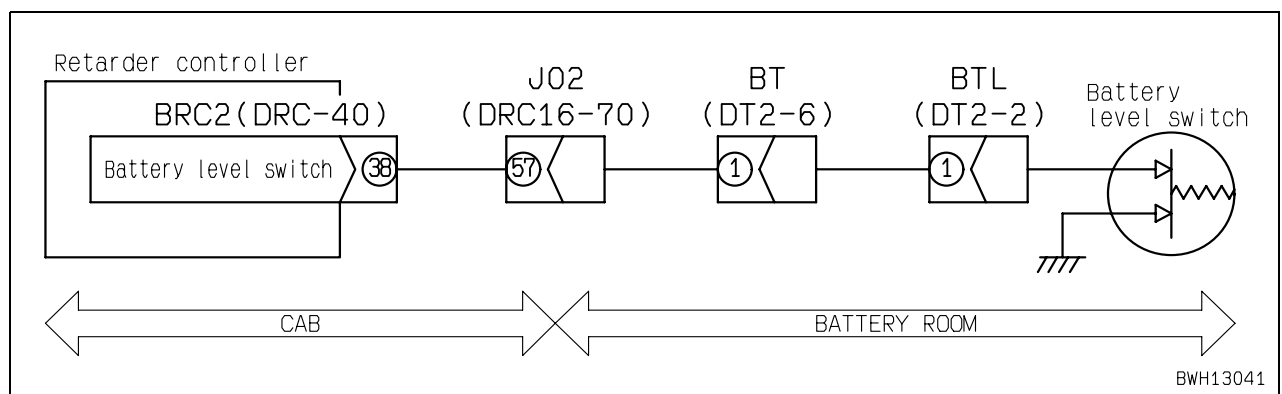
Action code	Failure code	Trouble	Overheating of torque converter oil (Machine monitor system)
E02	B@CENS		
Contents of trouble	• Torque converter oil is overheating.		
Action of machine monitor	• Turns torque converter oil temperature caution lamp ON and sounds alarm buzzer.		
Problem that appears on machine	• If machine is used as it is, torque converter may be broken.		
Related information	• Signal of torque converter oil temperature sensor is input to transmission controller and then its information is transmitted to machine monitor through communication system. • Power train oil temperature can be checked with monitoring function. (Monitoring code: TRANSMISSION - T/C OIL TEMP - 30100 (°C) / 30101 (V))		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Overheating of torque converter oil (When system is normal)	Torque converter oil may be overheating. Check for cause and repair.
	2	Defective torque converter oil temperature sensor system	If cause 1 is not detected, torque converter oil temperature sensor system may be defective. Carry out troubleshooting for failure code [DGT1KX].

Failure code [B@GAZK] Battery electrolyte level: Lowering of level

Action code	Failure code	Trouble	Battery electrolyte level: Lowering of level (Retarder controller system)
E01	B@GAZK		
Contents of trouble	• While engine speed is below 100 rpm, input signal is closed (disconnected from ground circuit).		
Action of controller	• None in particular.		
Problem that appears on machine	• If machine is used as it is, battery is deteriorated.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Low battery electrolyte level	Check battery electrolyte level. If it is low, add new electrolyte. (If this trouble occurs frequently, check for overcharging.)		
	2	Defective battery electrolyte level switch	1) Turn starting switch OFF. 2) Connect T-adaptor to connector BTL (male).		
			BTL (male)	Battery electrolyte level	Resistance
			Between (1) – ground	When normal	Max. 1 Ω
				When low	Min. 1 MΩ
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn starting switch OFF. 2) Connect T-adaptor to connectors BTC2 (female) (38) and BTL (female).		
			Wiring harness between BRC2 (female) (38) – BTL (female) (1)	Resistance	Max. 1 Ω
	4	Defective pump controller	1) Turn starting switch OFF. 2) Connect T-adaptor to connector BTC2 (female). 3) Turn starting switch ON.		
			Between BRC2 (female) (38) – ground	Voltage	20 – 30 V

Circuit diagram related

Failure code [B@JANS] Steering oil: Overheat

Action code	Failure code	Trouble	Steering oil: Overheat (Transmission controller system)
E02	B@JANS		
Contents of trouble	• Voltage of steering temperature sensor circuit has become below 1.61 V (oil temperature is above 120°C).		
Action of controller	• None in particular. • Turn on steering oil temperature caution lamp. • Turns on centralized warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• If machine is operated in such a condition, it may cause an oil leakage.		
Related information	• Steering oil temperature can be checked with monitoring function (code: 32701 (°C) and 32702 (V))		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Steering oil temperature is overheated. (When the system is operating normally)	Since the overheat of the steering oil can be suspected, if there is an overheat, repair the cause of the failure.
	2	Defective steering oil temperature sensor	If cause 1 is not detected, steering oil temperature sensor system may be defective. Carry out troubleshooting for failure code [DGR6KX].

HD785-7 Dump truck

Form No. SEN01939-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

40 Troubleshooting

Troubleshooting by failure code, Part 3

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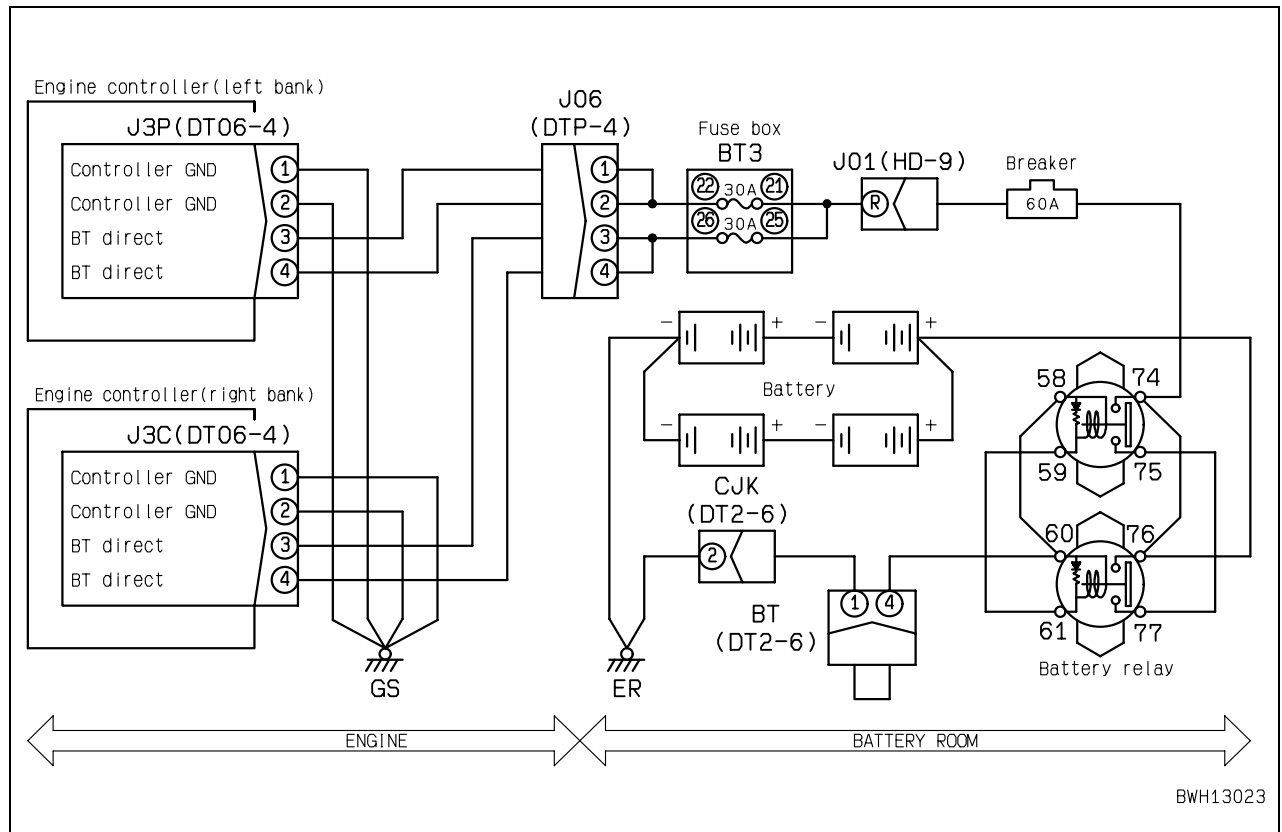
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Failure code [CA111] Engine controller (Left bank): Internal abnormality

Action code	Failure code	Trouble	Engine controller (Left bank): Internal abnormality (Engine controller system)
E03	CA111		
Contents of trouble	• Controller has abnormality in it.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Machine continues operation normally but may stop suddenly or may not able to start again once it stops.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective circuit breaker	Circuit breaker may be defective. Check it directly. (If fuse is broken or circuit breaker is turned OFF, circuit probably has ground fault.)			
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between J3P (female) (3), (4) – battery (+)		Resistance	Max. 1 Ω
			Wiring harness between J3P (female) (1), (2) – ground		Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between J3P (female) (3), (4) – battery (+)		Resistance	Min. 1 MΩ
	4	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			J3P		Voltage	
			Between (3), (4) – (1), (2)		20 – 30 V	

Circuit diagram related

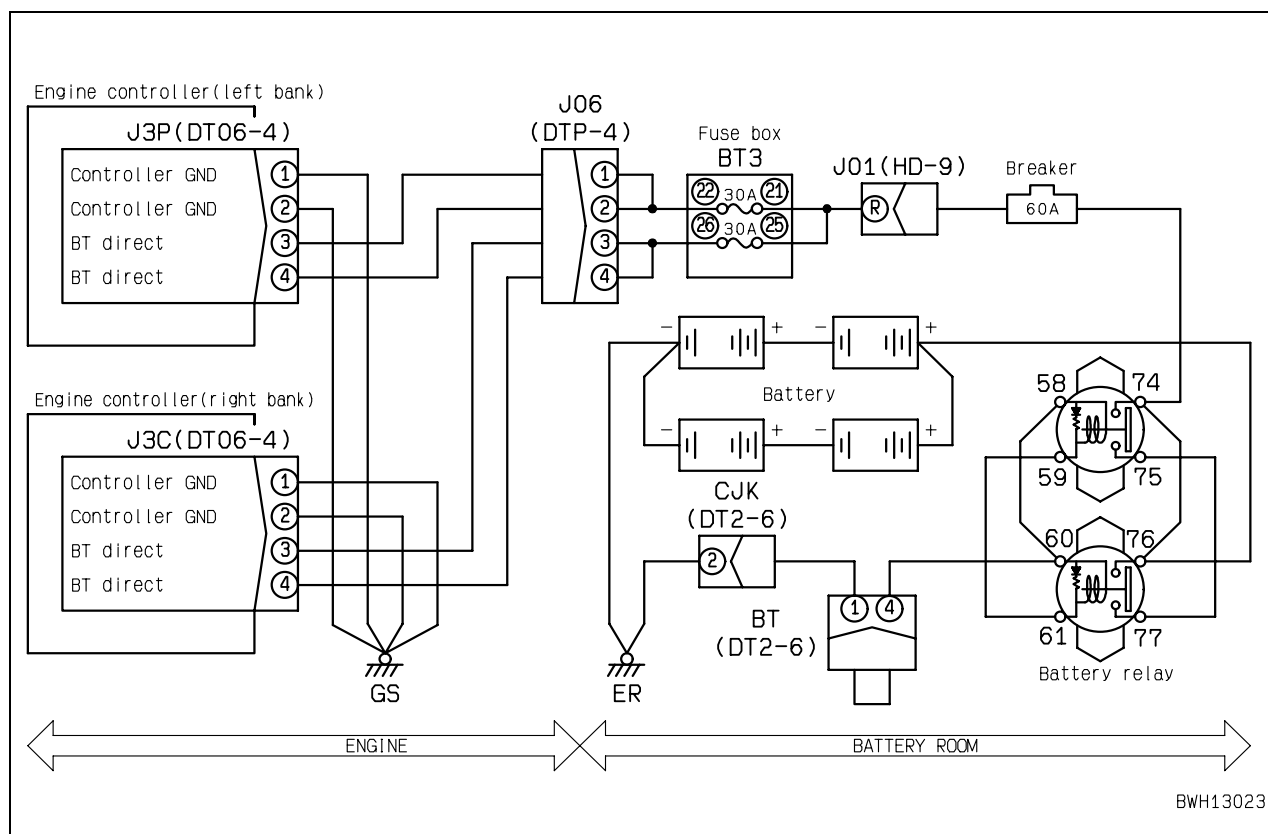


Failure code [CB111] Engine controller (Right bank): Internal abnormality

Action code	Failure code	Trouble	Engine controller (Right bank): Internal abnormality (Engine controller system)
E03	CB111		
Contents of trouble	• Controller has abnormality in it.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Machine continues operation normally but may stop suddenly or may not able to start again once it stops.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective circuit breaker	Circuit breaker may be defective. Check it directly. (If fuse is broken or circuit breaker is turned OFF, circuit probably has ground fault.)		
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between J3J (female) (3), (4) – battery (+)	Resistance	Max. 1 Ω
			Wiring harness between J3J (female) (1), (2) – ground	Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between J3J (female) (3), (4) – battery (+) and ground	Resistance	Min. 1 MΩ
	4	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			J3J	Voltage	
			Between (3), (4) – (1), (2)	20 – 30 V	

Circuit diagram related



Failure code [CA115] Abnormal engine Ne and Bkup speed sensors (At left bank): Abnormal speed sensor signal

Action code	Failure code	Trouble	Abnormal engine Ne and Bkup speed sensors (At left bank): Abnormal speed sensor signal (Engine controller system)
E03	CA115		
Contents of trouble	Abnormality has occurred at the same time in Ne speed sensor circuit and Bkup speed sensor circuit.		
Action of controller	Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	- Engine does not start (during engine stop). - Engine stops (during engine running).		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective Ne speed sensor circuit	Carry out troubleshooting of [CA689].
	2	Defective Bkup speed sensor circuit	Carry out troubleshooting of [CA778].
	3	Defective Ne speed sensor mounting section	Since a mounting section of Ne speed sensor can be suspected to be defective, directly check the mounting section. (Defective installation of sensor itself, internal defect of flywheel, etc.)
	4	Bkup speed sensor mounting section	Since a mounting section of Bkup speed sensor can be suspected to be defective, directly check the mounting section. (Defective installation of sensor itself, internal defect of supply pump, etc.)
	5	Defective connection of sensor (wrong connection)	The defective (wrong) connections of Ne speed sensor and Bkup speed sensor can be suspected. Directly check them.
	6	Defective engine controller	Engine controller can be suspected to be defective if no problem is found in causes 1 – 5 (since this is an internal defect, it cannot be diagnosed).

Failure code [CB115] Abnormal engine Ne and Bkup speed sensors (At right bank): Abnormal speed sensor signal

Action code	Failure code	Trouble	Abnormal engine Ne and Bkup speed sensors (At right bank): Abnormal speed sensor signal (Engine controller system)
E03	CB115		
Contents of trouble	• Abnormality has occurred at the same time in Ne speed sensor circuit and Bkup speed sensor circuit.		
Action of controller	• Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Engine does not start (during engine stop). • Engine stops (during engine running).		
Related information			

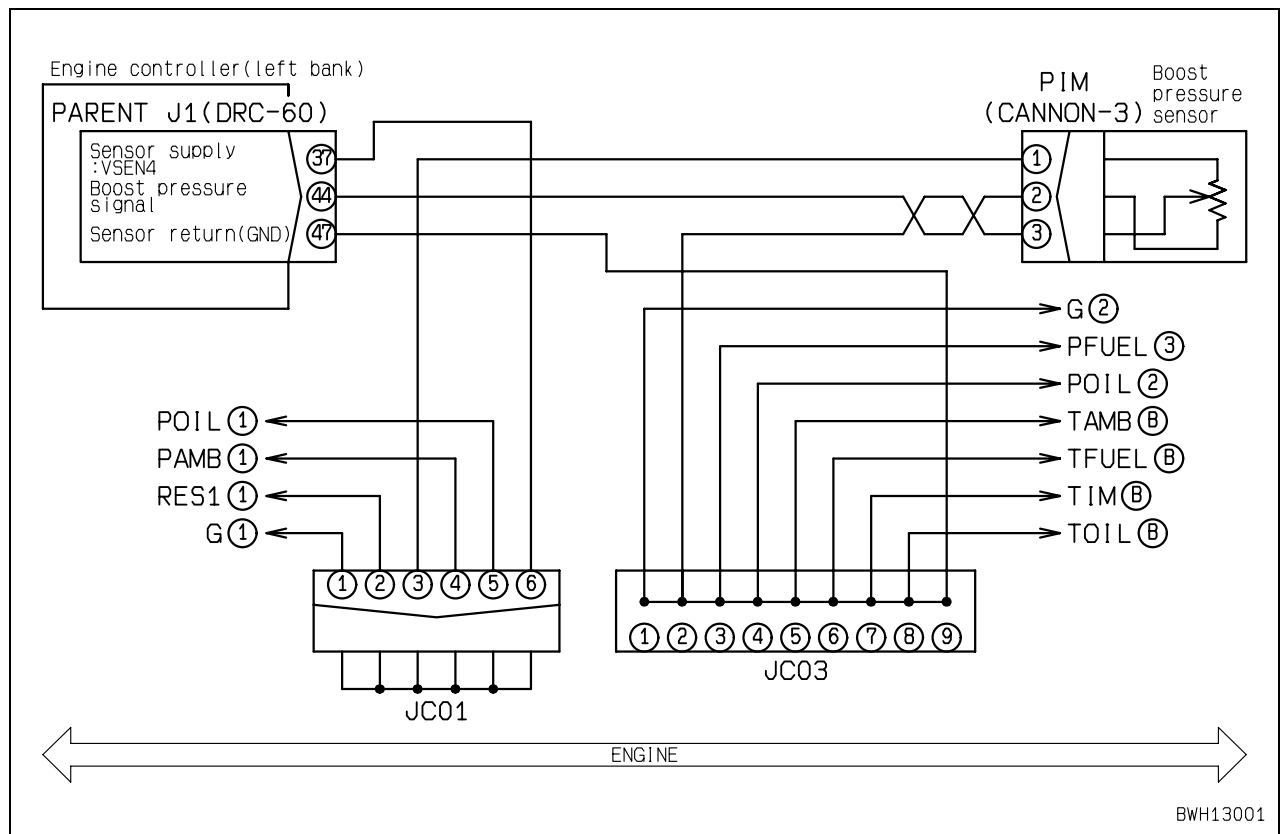
Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective Ne speed sensor circuit	Carry out troubleshooting of [CB689].
	2	Defective Bkup speed sensor circuit	Carry out troubleshooting of [CB778].
	3	Defective Ne speed sensor mounting section	Since a mounting section of Ne speed sensor can be suspected to be defective, directly check the mounting section. (Defective installation of sensor itself, internal defect of flywheel, etc.)
	4	Bkup speed sensor mounting section	Since a mounting section of Bkup speed sensor can be suspected to be defective, directly check the mounting section. (Defective installation of sensor itself, internal defect of supply pump, etc.)
	5	Defective connection of sensor (wrong connection)	The defective (wrong) connections of Ne speed sensor and Bkup speed sensor can be suspected. Directly check them.
	6	Defective engine controller	Engine controller can be suspected to be defective if no problem is found in causes 1 – 5 (since this is an internal defect, it cannot be diagnosed).

Failure code [CA122] Charge pressure sensor too high (At left bank only): Excessively high voltage detected

Action code	Failure code	Trouble	Charge pressure sensor too high (At left bank only): Excessively high voltage detected (Engine controller system)
E03	CA122		
Contents of trouble	• Excessively high voltage is detected at circuit of charge pressure (boost pressure) sensor.		
Action of controller	• Operate with a fixed charge pressure (boost pressure) (400 kPa {4.1 kg/cm²}). • Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Acceleration performance of engine deteriorates.		
Related information	• Input state from charge pressure (boost pressure) sensor can be checked with monitoring function. (Code: 36500 Boost pressure, Code 36502: Boost pressure sensor voltage) • Duplication of failure code: turn ON the starting switch.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective sensor power source circuit	If failure code [CA227] is displayed at the same time, carry out troubleshooting for it first.			
	2	Defective charge pressure (boost pressure) sensor (internal defect)	★ Prepare with starting switch OFF, and diagnose with starting switch ON or with engine started.			
			PIM		Voltage	
			Between (1) – (2)	Power source	4.75 – 5.25 V	
			Since the sensor voltage is measured with the harness being connected, if the voltage is abnormal, first check the harness and the controller to make it sure if there is no other cause of the trouble, and then judge the sensor voltage.			
	3	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Wiring harness between PARENT J1 (female) (37) – PIM (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (44) – PIM (female) (3)		Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (47) – PIM (female) (2)		Resistance	Max. 1 Ω
	4	Defective harness grounding (contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between ground and wiring harness between PARENT J1 (female) (37) – PIM (female) (1)		Resistance	Min. 1 MΩ
			Between ground and wiring harness between PARENT J1 (female) (44) – PIM (female) (3)		Resistance	Min. 1 MΩ
			Between ground and wiring harness between PARENT J1 (female) (47) – PIM (female) (2)		Resistance	Min. 1 MΩ
	5	Harness short (Harness internal short)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between wiring harness from PARENT J1 (female) (37) to PIM (female) (1) and wiring harness from PARENT J1 (female) (44) to PIM (female) (3)		Resistance	Min. 1 MΩ
			Between wiring harness from PARENT J1 (female) (37) to PIM (female) (1) and wiring harness from PARENT J1 (female) (47) to PIM (female) (2)		Resistance	Min. 1 MΩ
			Between wiring harness from PARENT J1 (female) (44) to PIM (female) (3) and wiring harness from PARENT J1 (female) (47) to PIM (female) (2)		Resistance	Min. 1 MΩ
	6	Defective engine controller	★ Prepare with starting switch OFF, and diagnose with starting switch ON or with engine started.			
			PARENT J1		Voltage	
Between (37) – (47)			Power source	4.75 – 5.25 V		

Circuit diagram related



Failure code [CA123] Charge pressure sensor too low (At left bank only): Excessively low voltage detected

Action code	Failure code	Trouble	Charge pressure sensor too low (At left bank only): Excessively low voltage detected (Engine controller system)
E03	CA123		
Contents of trouble	Excessively low voltage is detected at circuit of charge pressure (boost pressure) sensor.		
Action of controller	- Operate with a fixed charge pressure (boost pressure) (400 kPa {4.1 kg/cm²}). - Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	Acceleration performance of engine deteriorates.		
Related information	- Input state from charge pressure (boost pressure) sensor can be checked with monitoring function. (Code: 36500 Boost pressure, Code 36502: Boost pressure sensor voltage) - Duplication of failure code: turn ON the starting switch.		

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
1	Defective sensor power source circuit	If failure code [CA187] is displayed at the same time, carry out troubleshooting for it first.

Failure code [CA131] Throttle sensor high error

Action code	Failure code	Trouble	Throttle sensor high error (Engine controller system)
E03	CA131		
Contents of trouble	• Throttle sensor circuit is abnormally high (Min. 4.5 V)		
Action of controller	• Runs the engine at position of throttle 0% when accelerator pedal is OFF and at 50% when it is ON. • Turns the centralized warning lamp and alarm buzzer ON.		
Problem that appears on machine	• Even if the accelerator pedal is depressed, the engine speed does not increase above medium speed.		
Related information	• The input state (position of accelerator pedal) from the throttle sensor can be checked with the monitoring function (Code: 31701 (%)). • The input state (voltage) from the throttle sensor can be checked with the monitoring function (Code: 31707 (V)). • Method of reproducing failure code: Turn the starting switch ON.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective throttle sensor power supply system	If failure code [CA2185] or [CA2186] is also indicated, carry out troubleshooting for it first.			
	2	Defective accelerator pedal (Internal defect)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting			
			AS1	Accelerator pedal	Voltage	
			Between (1) and (3)	All range (Power supply)	4.75 – 5.25V	
			Between (2) and (3)	When released	(17 ± 2% of power supply)*	
				When pressed	(82 ± 2% of power supply)*	
			Sensor voltage is measured with wiring harness connected. Accordingly, if voltage is abnormal, check wiring harness and controller, too, for another cause of trouble, and then judge.			
	3	Disconnection in wiring harness (Disconnection or defective contact of connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between J2P (female) (22) – AS1 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between J2P (female) (9) – AS1 (female) (2)		Resistance	Max. 1 Ω
			Wiring harness between J2P (female) (23) – AS1 (female) (3)		Resistance	Max. 1 Ω
	4	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between J2P (female) (22) – AS1 (female) (1)		Resistance	Min. 1 MΩ
			Wiring harness between J2P (female) (9) – AS1 (female) (2)		Resistance	Min. 1 MΩ
			Wiring harness between J2P (female) (23) – AS1 (female) (3)		Resistance	Min. 1 MΩ
	5	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting			
			J2P	Accelerator pedal	Voltage	
			Between (22) and (23)	All range (Power supply)	4.75 – 5.25V	
			Between (9) and (23)	When released	(17 ± 2% of power supply)*	
When pressed				(82 ± 2% of power supply)*		

* Refer to Fig. 1

Circuit diagram related

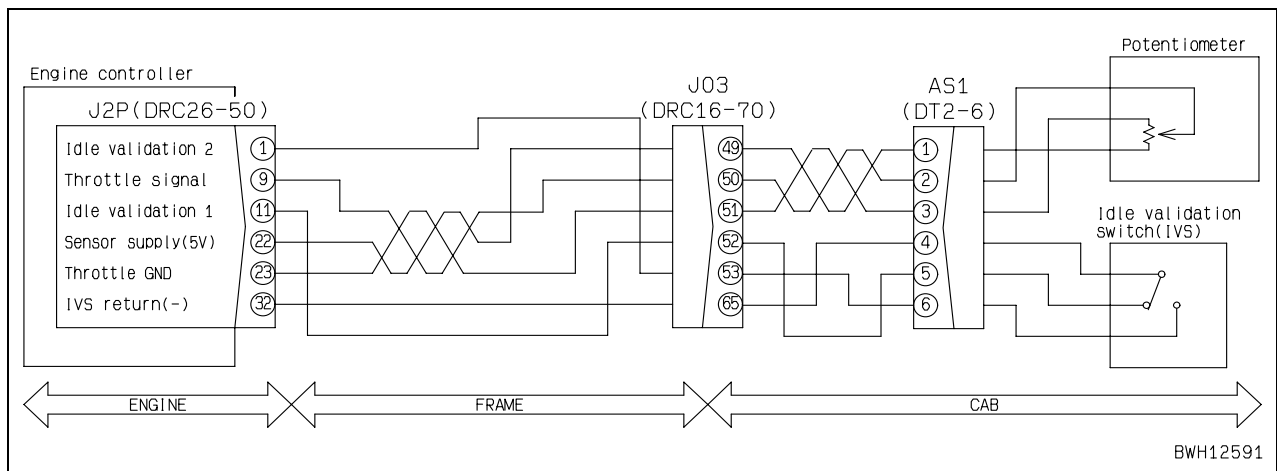
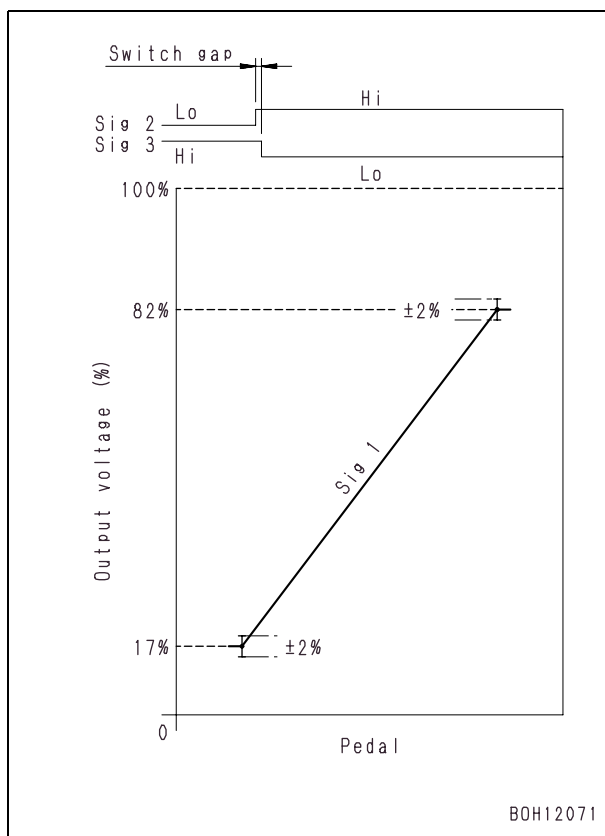


Fig. 1



Pedal: Stroke of accelerator pedal
 Output voltage: Output voltage (%)
 Sig1: Signal voltage of throttle sensor
 Sig2: Signal voltage of idle validation switch 1
 Sig3: Signal voltage of idle validation switch 2
 Lo: Switch circuit is closed
 Hi: Switch circuit is open
 Switch gap: Overlap between signals of switch 1 and switch 2

Failure code [CA132] Throttle sensor low error

Action code	Failure code	Trouble	Throttle sensor low error (Engine controller system)
E03	CA132		
Contents of trouble	• Throttle sensor circuit is abnormally low.		
Action of controller	• Runs the engine at position of throttle 0% when accelerator pedal is OFF and at 50% when it is ON. • Turns the centralized warning lamp and alarm buzzer ON.		
Problem that appears on machine	• Even if the accelerator pedal is depressed, the engine speed does not increase above medium speed.		
Related information	• The input state (position of accelerator pedal) from the throttle sensor can be checked with the monitoring function (Code: 31701 (%) , 31707 (V)). • Method of reproducing failure code: Turn the starting switch ON.		

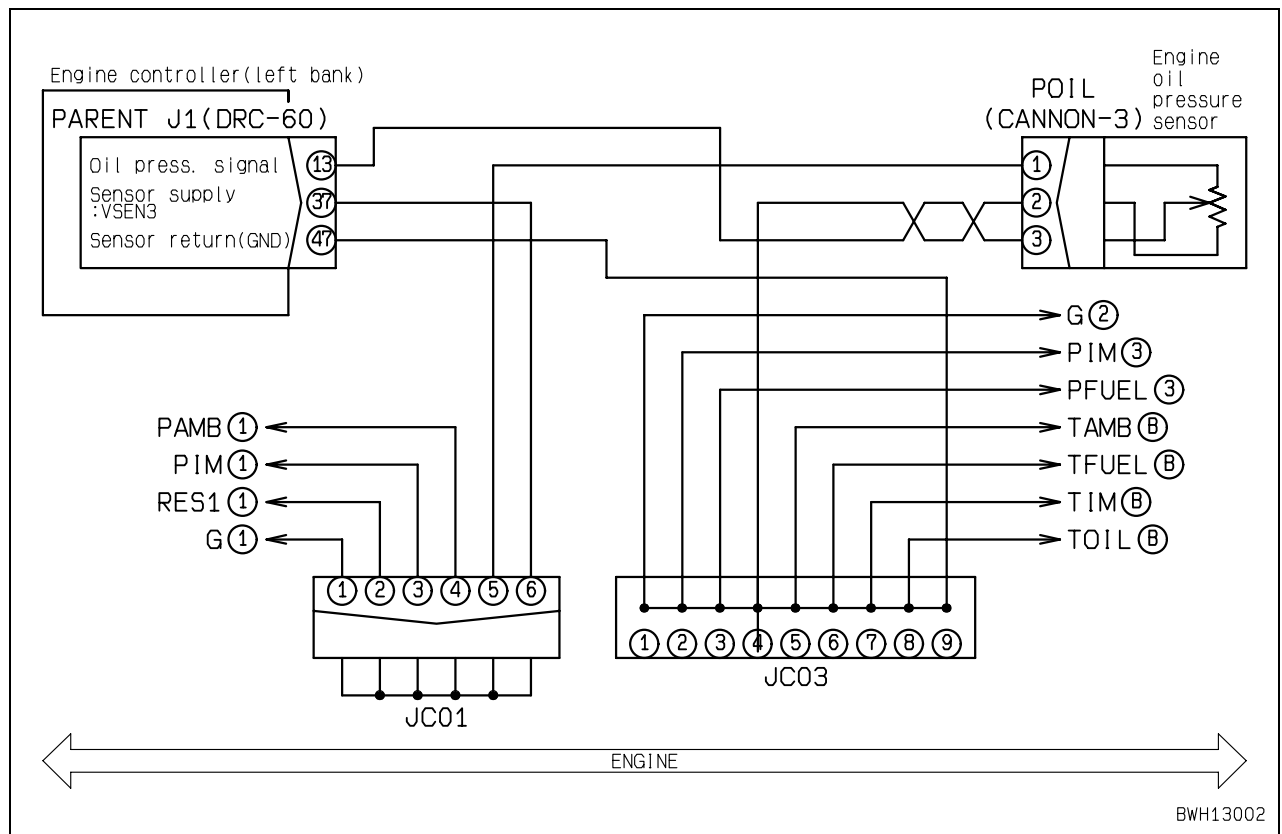
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [CA131].	

Failure code [CA135] Oil pressure sensor too high (At left bank only): Excessively high voltage detected

Action code	Failure code	Trouble	Oil pressure sensor too high (At left bank only): Excessively high voltage detected (Engine controller system)
E01	CA135		
Contents of trouble	• Excessively high voltage is detected at oil pressure sensor circuit.		
Action of controller	• Operates with oil pressure value defaulted to (250 kPa {2.5 kg/cm ² }) • Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine			
Related information	• Input state from engine oil pressure sensor can be checked with monitoring function. (Code: 37200 Engine oil pressure, Code 37201 : Engine oil pressure sensor voltage) • Duplication of failure code: turn ON the starting switch.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective sensor power source circuit	If failure code [CA187] or [CA227] is displayed at the same time, carry out troubleshooting for it first.			
	2	Defective oil pressure sensor (internal defect)	★ Prepare with starting switch OFF, and diagnose with starting switch ON or with engine started.			
			POIL		Voltage	
			Between (1) – (2)	Power source	4.75 – 5.25 V	
			Since the sensor voltage is measured with the harness being connected, if the voltage is abnormal, first check the harness and the controller to make it sure if there is no other cause of the trouble, and then judge the sensor voltage.			
	3	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Wiring harness between PARENT J1 (female) (37) – POIL (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (47) – POIL (female) (2)		Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (13) – POIL (female) (3)		Resistance	Max. 1 Ω
	4	Defective harness grounding (contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between ground and wiring harness between PARENT J1 (female) (37) – POIL (female) (1)		Resistance	Min. 1 MΩ
			Between ground and wiring harness between PARENT J1 (female) (47) – POIL (female) (2)		Resistance	Min. 1 MΩ
			Between ground and wiring harness between PARENT J1 (female) (13) – POIL (female) (3)		Resistance	Min. 1 MΩ
	5	Harness short (Harness internal short)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between wiring harness from PARENT J1 (female) (37) to POIL (female) (1) and wiring harness from PARENT J1 (female) (47) to POIL (female) (2)		Resistance	Min. 1 MΩ
			Between wiring harness from PARENT J1 (female) (37) to POIL (female) (1) and wiring harness from PARENT J1 (female) (13) to POIL (female) (3)		Resistance	Min. 1 MΩ
			Between wiring harness from PARENT J1 (female) (47) to POIL (female) (2) and wiring harness from PARENT J1 (female) (13) to POIL (female) (3)		Resistance	Min. 1 MΩ
	6	Defective engine controller	★ Prepare with starting switch OFF, and diagnose with starting switch ON or with engine started.			
			PARENT J1		Voltage	
Between (37) – (47)			Power source	4.75 – 5.25 V		

Circuit diagram related



Failure code [CA141] Oil pressure sensor too low (At left bank only): Excessively low voltage detected

Action code	Failure code	Trouble	Oil pressure sensor too low (At left bank only): Excessively low voltage detected (At left bank only) (Engine controller system)
E01	CA141		
Contents of trouble	Excessively low voltage is detected at oil pressure sensor circuit.		
Action of controller	- Operates with oil pressure value defaulted to (250 kPa {2.5 kg/cm²}) - Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine			
Related information	- Input state from engine oil pressure sensor can be checked with monitoring function. (Code: 37200 Engine oil pressure, Code 37201: Engine oil pressure sensor voltage) - Duplication of failure code: turn ON the starting switch.		

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
1	Defective sensor power source circuit	If failure code [CA187] is displayed at the same time, carry out troubleshooting for it first.

Failure code [CA144] Coolant temperature sensor too high: Excessively high voltage detected

Action code	Failure code	Trouble	Coolant temperature sensor too high: Excessively high voltage detected (Engine controller system)
E01	CA144		
Contents of trouble	Excessively high voltage is detected at signal circuit of coolant temperature sensor.		
Action of controller	- Operates with a fixed coolant temperature (90°C). - Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	Exhaust gas color becomes white.		
Related information	- Input state from engine coolant temperature sensor can be checked with monitoring function. (Code: 04104 Engine coolant temperature, Code 04105 Engine coolant temperature sensor voltage) - Duplication of failure code: turn ON the starting switch.		

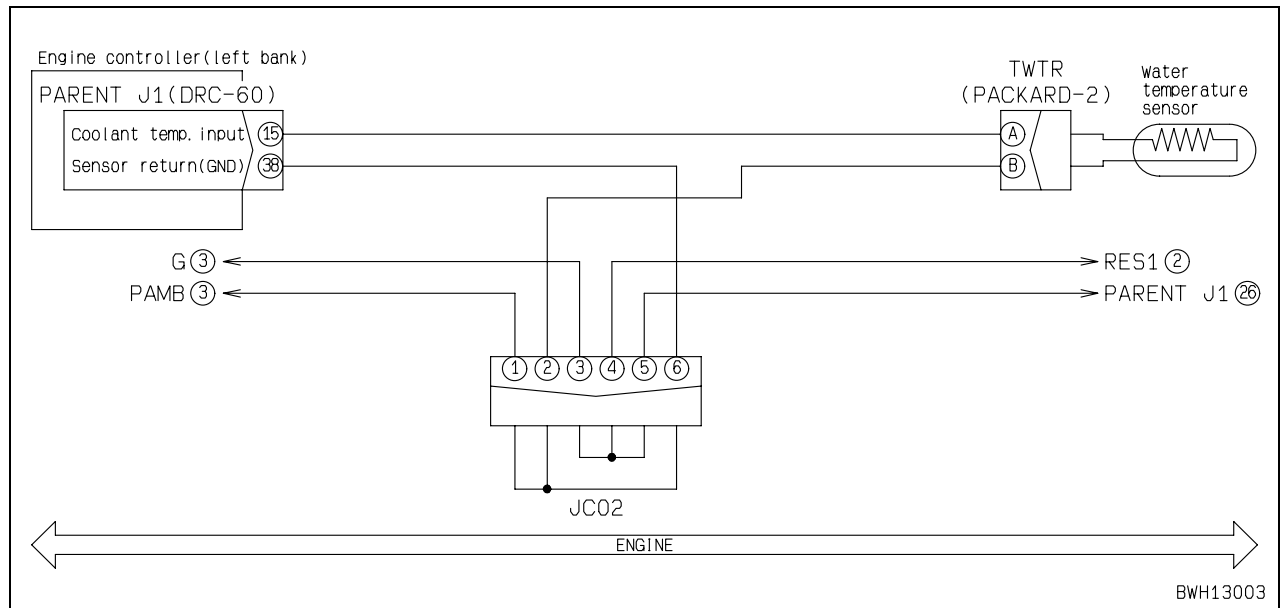
Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective coolant temperature sensor (Internal defect)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			TWTR (male)	Coolant temperature	Resistance
			Between (A) – (B)	10 – 100°C	0.6 – 20 kΩ
	2	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			Wiring harness between PARENT J1 (female) (15) – TWTR (female) (A)	Resistance	Max. 1 Ω
			Wiring harness among PARENT J1 (female) (38) – JB – TWTR (female) (B)	Resistance	Max. 1 Ω
	3	Harness short (Harness internal short)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			Between PARENT J1 (female) (15) – all pins of PARENT J1 (female) (with all connectors in the harness disconnected)	Resistance	Min. 1 MΩ
	4	Defective wiring harness connector	Since the connections among coolant temperature sensor – engine harness – engine controller are suspected to be defective, check for a defective connection. - Connector is loose, lock is broken, seal is broken - Pin is corroded, bent, broken, pushed in, expanded. - Moisture in connector, entry of dirt or sand, etc., and insufficient insulation		
	5	Defect in other locations than engine controller	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			PARENT J1 (female)	Coolant temperature	Resistance
			Between (15) – (38)	10 – 100°C	0.6 – 20 kΩ
	6	Defective engine controller	Engine controller is possibly defective if no problem is found in causes 1 – 5. (Since this is an internal defect, it cannot be diagnosed.)		

Failure code [CA145] Coolant temperature sensor too low (At left bank only): Excessively low voltage detected

Action code	Failure code	Trouble	Coolant temperature sensor too low (At left bank only): Excessively low voltage detected (Engine controller system)
E01	CA145		
Contents of trouble	Excessively low voltage is detected at signal circuit of coolant temperature sensor.		
Action of controller	- Operates with a fixed coolant temperature (90°C). - Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	Exhaust gas color becomes white.		
Related information	Input state from engine coolant temperature sensor can be checked with monitoring function. (Code: 04104 Engine coolant temperature, Code 04105 Engine coolant temperature sensor voltage)		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective coolant temperature sensor (Internal defect)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			TWTR (male)	Coolant temperature	Resistance	
			Between (A) – (B)	10 – 100°C	0.6 – 20 kΩ	
	2	Defective harness grounding (contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between ground and wiring harness between PARENT J1 (female) (15) – TWTR (female) (A)		Resistance	Min. 1 MΩ
	3	Harness short (Harness internal short)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between PARENT J1 (female) (15) – all pins of PARENT J1 (female) (with all connectors in the harness disconnected)		Resistance	Min. 1 MΩ
	4	Defective wiring harness connector	Since the connections among coolant temperature sensor – engine harness – engine controller are suspected to be defective, check for a defective connection. • Connector is loose, lock is broken, seal is broken • Pin is corroded, bent, broken, pushed in, expanded. • Moisture in connector, entry of dirt or sand, etc., and insufficient insulation			
	5	Defect in other locations than engine controller	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			PARENT J1 (female)	Coolant temperature	Resistance	
			Between (15) – (38)	10 – 100°C	0.6 – 20 kΩ	
	6	Defective engine controller	Engine controller is possibly defective if no problem is found in causes 1 – 5. (Since this is an internal defect, it cannot be diagnosed.)			

Circuit diagram related

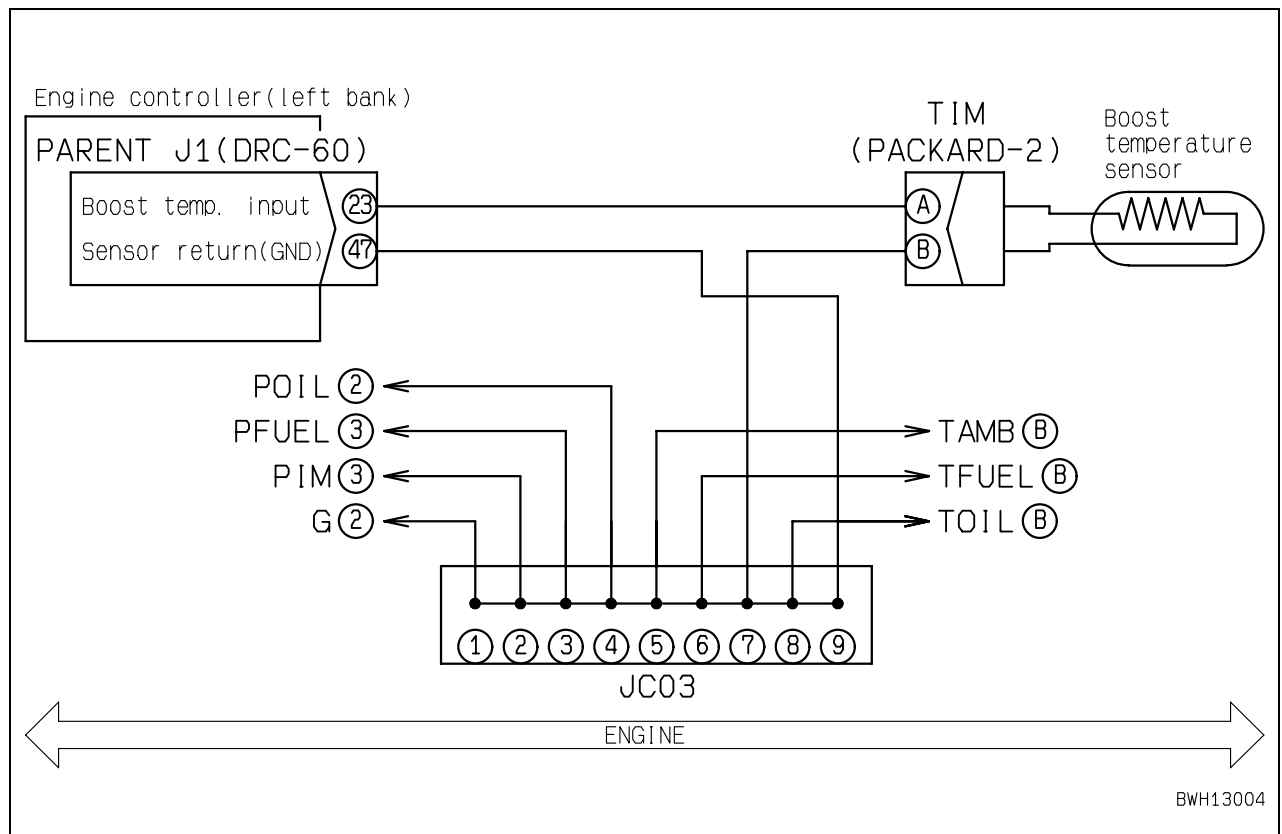


Failure code [CA153] Charge temperature sensor too high (At left bank only): Excessively high voltage detected

Action code	Failure code	Trouble	Charge temperature sensor too high (At left bank only): Excessively high voltage detected. (Engine controller system)
E01	CA153		
Contents of trouble	• Excessively high voltage is detected at signal circuit of charge temperature (boost temperature) sensor.		
Action of controller	• Operates with a fixed charge temperature (boost temperature) (70°C).		
Problem that appears on machine	• Exhaust gas color becomes white.		
Related information	- Input state from charge temperature (boost temperature) sensor can be checked with monitoring function. (Code: 18500 Boost temperature, Code: 18501: Boost temperature sensor voltage) - Duplication of failure code: turn ON the starting switch.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting				
	1	Defective charge temperature (boost temperature) sensor (internal defect)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.				
			TIM (male)		Air boost temperature	Resistance	
			Between (A) – (B)		10 – 100°C	0.5 – 20 kΩ	
			Between (A) – ground		In all range	Min. 1 MΩ	
	2	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.				
			Wiring harness between PARENT J1 (female) (23) – TIM (female) (A)		Resistance	Max. 1 Ω	
			Wiring harness between PARENT J1 (female) (47) – JB – TIM (female) (B)		Resistance	Max. 1 Ω	
	3	Harness short (Harness internal short)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.				
			Between PARENT J1 (female) (23) – all pins of PARENT J1 (female) (with all connectors in the harness disconnected)		Resistance	Min. 1 MΩ	
	4	Defective wiring harness connector	Since the connections among charge temperature (boost temperature) sensor – engine harness – engine controller are suspected to be defective, check for a defective connection. • Connector is loose, lock is broken, seal is broken • Pin is corroded, bent, broken, pushed in, expanded. • Moisture in connector, entry of dirt or sand, etc., and insufficient insulation				
	5	Defect in other locations than engine controller	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.				
			PARENT J1 (female)	Air boost temperature	Resistance		
			Between (23) – (47)		10 – 100°C	0.5 – 20 kΩ	
	6	Defective engine controller	Engine controller is possibly defective if no problem is found in causes 1 – 5. (Since this is an internal defect, it cannot be diagnosed.)				

Circuit diagram related

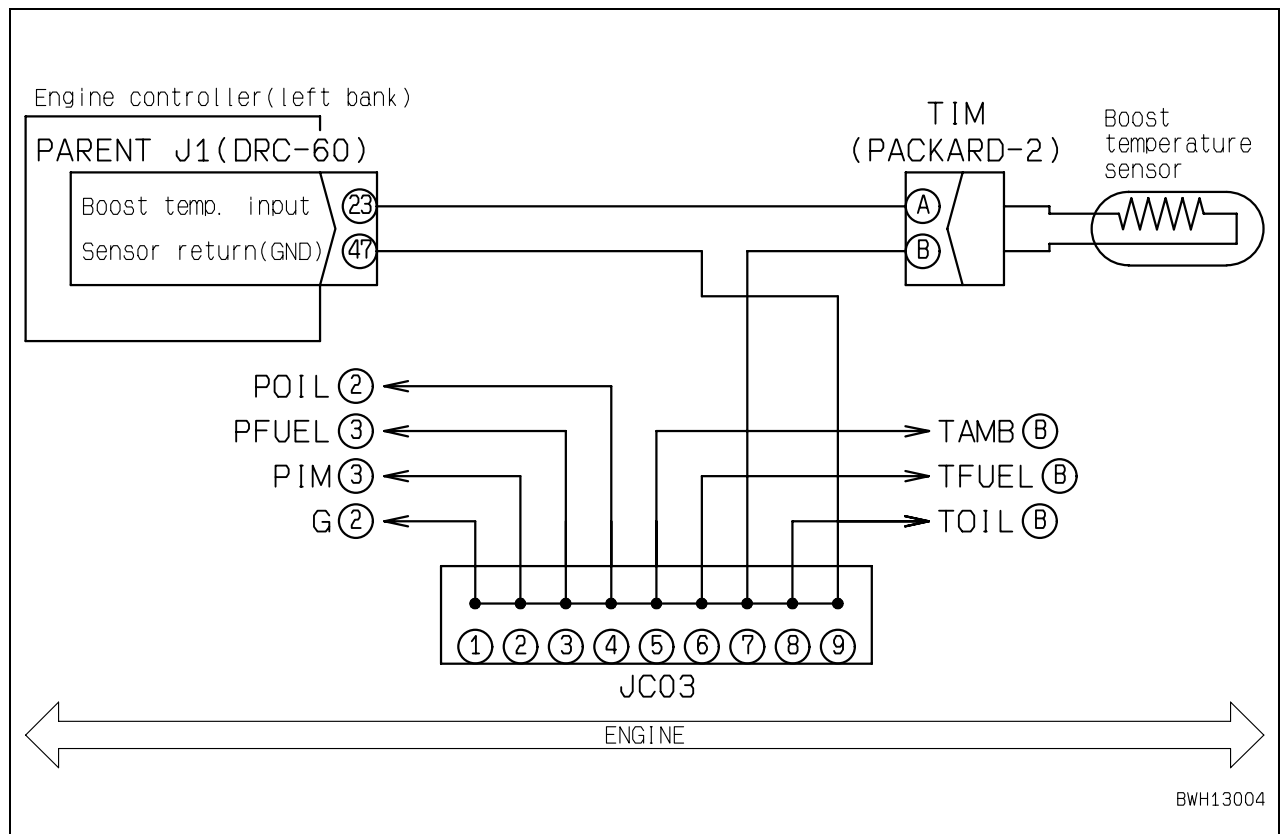


Failure code [CA154] Charge temperature sensor too low (At left bank only): Excessively low voltage detected

Action code	Failure code	Trouble	Charge temperature sensor too low (At left bank only): Excessively low voltage detected (Engine controller system)
E01	CA154		
Contents of trouble	• Excessively low voltage is detected at signal circuit of charge temperature (boost temperature) sensor.		
Action of controller	• Operates with a fixed charge temperature (boost temperature) (70°C).		
Problem that appears on machine	• Exhaust gas color becomes white.		
Related information	- Input state from charge temperature (boost temperature) sensor can be checked with monitoring function. (Code: 18500 Boost temperature, Code: 18501: Boost temperature sensor voltage) - Duplication of failure code: turn ON the starting switch.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting					
	1	Defective charge temperature (boost temperature) sensor (internal defect)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.					
			TIM (male)		Air boost temperature	Resistance		
			Between (A) – (B)		10 – 100°C		0.5 – 20 kΩ	
			Between (A) – ground		In all range		Min. 1 MΩ	
	2	Defective harness grounding (contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.					
			Between ground and wiring harness between PARENT J1 (female) (23) – TIM (female) (A)		Resistance	Min. 1 MΩ		
	3	Harness short (Harness internal short)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.					
			Between PARENT J1 (female) (23) – all pins of PARENT J1 (female) (with all connectors in the harness disconnected)		Resistance	Min. 1 MΩ		
	4	Defective wiring harness connector	Since the connections among charge temperature (boost temperature) sensor – engine harness – engine controller are suspected to be defective, check for a defective connection. • Connector is loose, lock is broken, seal is broken • Pin is corroded, bent, broken, pushed in, expanded. • Moisture in connector, entry of dirt or sand, etc., and insufficient insulation					
	5	Defect in other locations than engine controller	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.					
			PARENT J1 (female)		Air boost temperature	Resistance		
			Between (23) – (47)		10 – 100°C		0.5 – 20 kΩ	
			Between (23) – ground		In all range		Min. 1 MΩ	
			6	Defective engine controller	Engine controller is possibly defective if no problem is found in causes 1 – 5. (Since this is an internal defect, it cannot be diagnosed.)			

Circuit diagram related



Failure code [CA187] Sensor power supply (2) abnormally low level (Left bank): Low voltage detection

Action code	Failure code	Trouble	Sensor power supply (2) abnormally low level (Left bank): Low voltage detection (Engine controller system)
E03	CA187		
Contents of trouble	• Low voltage was detected in sensor power supply (2) (5 V) circuit.		
Action of controller	• Ambient pressure sensor sets ambient temperature to default value (52.44 kPa {0.5 kg/cm ² }) and continues operation. • Oil pressure sensor sets oil pressure to default value (250 kPa {2.5 kg/cm ² }) and continues operation. • Charge pressure sensor fixes charge pressure to (400 kPa {4.1 kg/cm ² }) and continues operation. • Bkup sensor operates with Ne speed sensor signal. • Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Output lowers.		
Related information			
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting	
	Carry out troubleshooting for failure code [CA227].		

Failure code [CB187] Sensor power supply (2) abnormally low level (Right bank): Low voltage detection

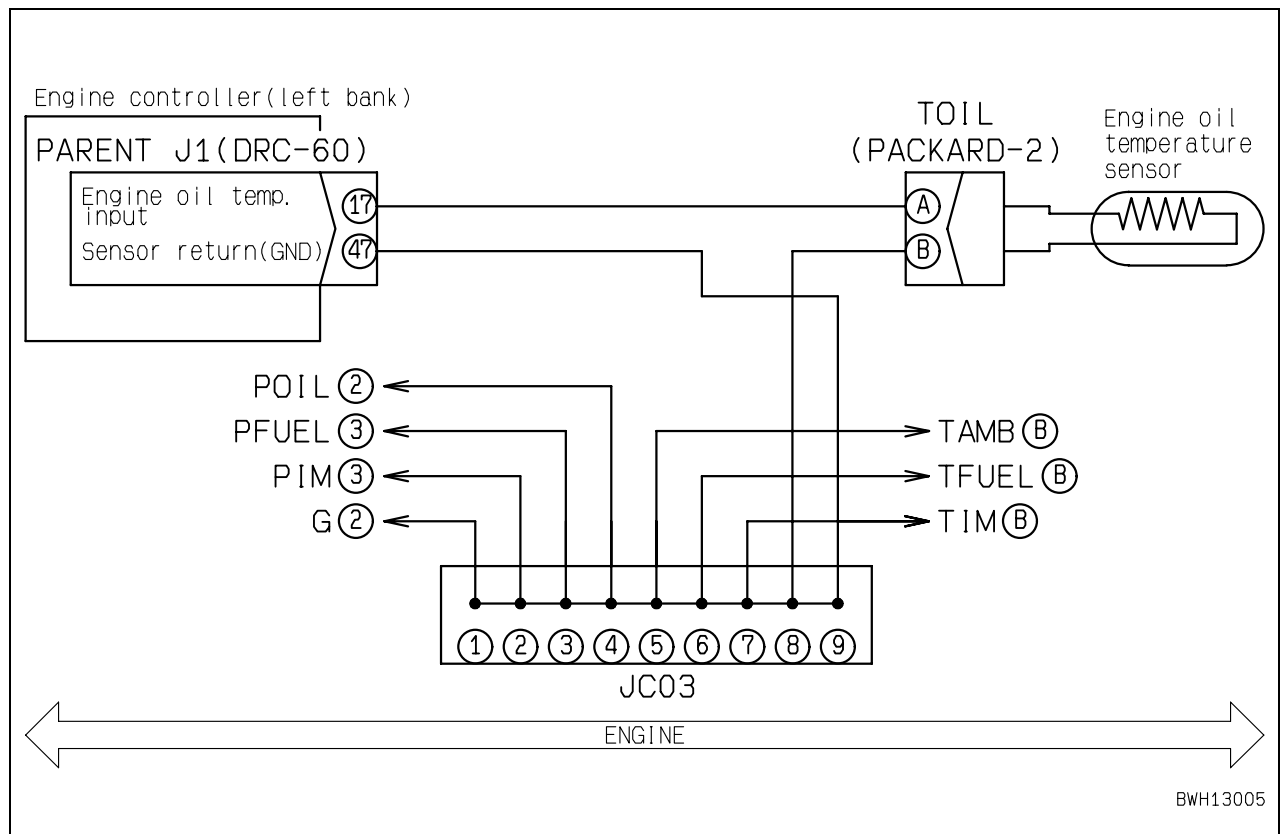
Action code	Failure code	Trouble	Sensor power supply (2) abnormally low level (Right bank): Low voltage detection (Engine controller system)
E03	CA187		
Contents of trouble	• Low voltage was detected in sensor power supply (2) (5 V) circuit.		
Action of controller	• Bkup sensor operates with Ne speed sensor signal. • Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Output lowers.		
Related information			
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting	
	Carry out troubleshooting for failure code [CB227].		

Failure code [CA212] Engine oil temperature sensor abnormally high level (Only left bank): High voltage detection

Action code	Failure code	Trouble	Engine oil temperature sensor abnormally high level (Only left bank): High voltage detection (Engine controller system)
E01	CA212		
Contents of trouble	• High voltage was detected in engine oil temperature sensor circuit.		
Action of controller	• Sets oil temperature to default value (100°C) and continues operation.		
Problem that appears on machine			
Related information	• Input state from engine oil temperature sensor can be checked with monitoring function. (Code: 42700 Engine oil temperature, Code 42702 : Engine oil temperature sensor voltage)		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting				
	1	Defective oil temperature sensor (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.				
			TOIL (male)		Oil temperature	Resistance	
			Between (A) – (B)		0 – 100°C	0.5 – 36 kΩ	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.				
			Wiring harness between PARENT J1 (female) (17) – TOIL (female) (A)		Resistance	Max. 1 Ω	
			Wiring harness between PARENT J1 (female) (47) – TOIL (female) (B)		Resistance	Max. 1 Ω	
	3	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.				
			Wiring harness between PARENT J1 (female) (17) – TOIL (female) (A)		Resistance	Min. 1 MΩ	
	4	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.				
			PARENT J1		Oil temperature	Resistance	
			(17) – (47)		0 – 100°C	0.5 – 36 kΩ	

Circuit diagram related



Failure code [CA213] Engine oil temperature sensor abnormally low level (Only left bank): Low voltage detection

Action code	Failure code	Trouble	Engine oil temperature sensor abnormally low level (Only left bank): Low voltage detection (Engine controller system)
E01	CA213		
Contents of trouble	• Low voltage was detected in engine oil temperature sensor circuit.		
Action of controller	• Sets oil temperature to default value (100°C) and continues operation.		
Problem that appears on machine			
Related information	• Input state from engine oil temperature sensor can be checked with monitoring function. (Code: 42700 Engine oil temperature, Code 42702 : Engine oil temperature sensor voltage)		
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting	
	Carry out troubleshooting for failure code [CA212].		

Failure code [CA221] Atmospheric pressure sensor too high (At left bank only): Excessively high voltage detected

Action code	Failure code	Trouble	Atmospheric pressure sensor too high (At left bank only): Excessively high voltage detected (Engine controller system)
E01	CA221		
Contents of trouble	• Excessively high voltage is detected at signal circuit of atmospheric pressure sensor.		
Action of controller	• Operates with atmospheric pressure value defaulted to (52.44 kPa {0.5 kg/cm ² }). • Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Output decreases.		
Related information	• Input state from ambient pressure sensor can be checked with monitoring function. (Code: 37400 Ambient pressure, Code 37402 Ambient pressure sensor voltage) • Duplication of failure code: turn ON the starting switch.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective sensor power source circuit	If failure code [CA352] or [CA386] is displayed at the same time, carry out troubleshooting for it first.			
	2	Defective atmospheric pressure sensor (internal defect)	★ Prepare with starting switch OFF and diagnose with starting switch ON.			
			PAMB		Voltage	
			Between (1) – (3)	Power source	4.75 – 5.25 V	
			Between (2) – (3)	Signal	0.5 – 4.5 V	
			Since the sensor voltage is measured with the harness being connected, if the voltage is abnormal, first check the harness and the controller to make it sure if there is no other cause of the trouble, and then judge the sensor voltage.			
	3	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Wiring harness between PARENT J1 (female) (37) – PAMB (female) (1)	Resistance	Max. 1 Ω	
			Wiring harness between PARENT J1 (female) (3) – PAMB (female) (2)	Resistance	Max. 1 Ω	
			Wiring harness between PARENT J1 (female) (38) – PAMB (female) (3)	Resistance	Max. 1 Ω	
	4	Defective harness grounding (contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between ground and wiring harness between PARENT J1 (female) (37) – PAMB (female) (1)	Resistance	Min. 1 MΩ	
			Between ground and wiring harness between PARENT J1 (female) (3) – PAMB (female) (2)	Resistance	Min. 1 MΩ	
			Between ground and wiring harness between PARENT J1 (female) (38) – PAMB (female) (3)	Resistance	Min. 1 MΩ	
	5	Harness short (Harness internal short)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between wiring harness from PARENT J1 (female) (37) to PAMB (female) (1) and wiring harness from PARENT J1 (female) (3) to PAMB (female) (2)	Resistance	Min. 1 MΩ	
			Between wiring harness from PARENT J1 (female) (37) to PAMB (female) (1) and wiring harness from PARENT J1 (female) (38) to PAMB (female) (3)	Resistance	Min. 1 MΩ	
			Between wiring harness from PARENT J1 (female) (3) to PAMB (female) (2) and wiring harness from PARENT J1 (female) (38) to PAMB (female) (3)	Resistance	Min. 1 MΩ	

Failure code [CA222] Atmospheric pressure sensor too low (At left bank only): Excessively low voltage detected

Action code	Failure code	Trouble	Atmospheric pressure sensor too low (At left bank only): Excessively low voltage detected (Engine controller system)
E01	CA222		
Contents of trouble	• Excessively low voltage is detected at signal circuit of atmospheric pressure sensor.		
Action of controller	• Operates with atmospheric pressure value defaulted to (52.44 kPa {0.5 kg/cm ² }). • Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Output decreases.		
Related information	• Input state from ambient pressure sensor can be checked with monitoring function. (Code: 37400 Ambient pressure, Code 37402 Ambient pressure sensor voltage) • Duplication of failure code: turn ON the starting switch.		

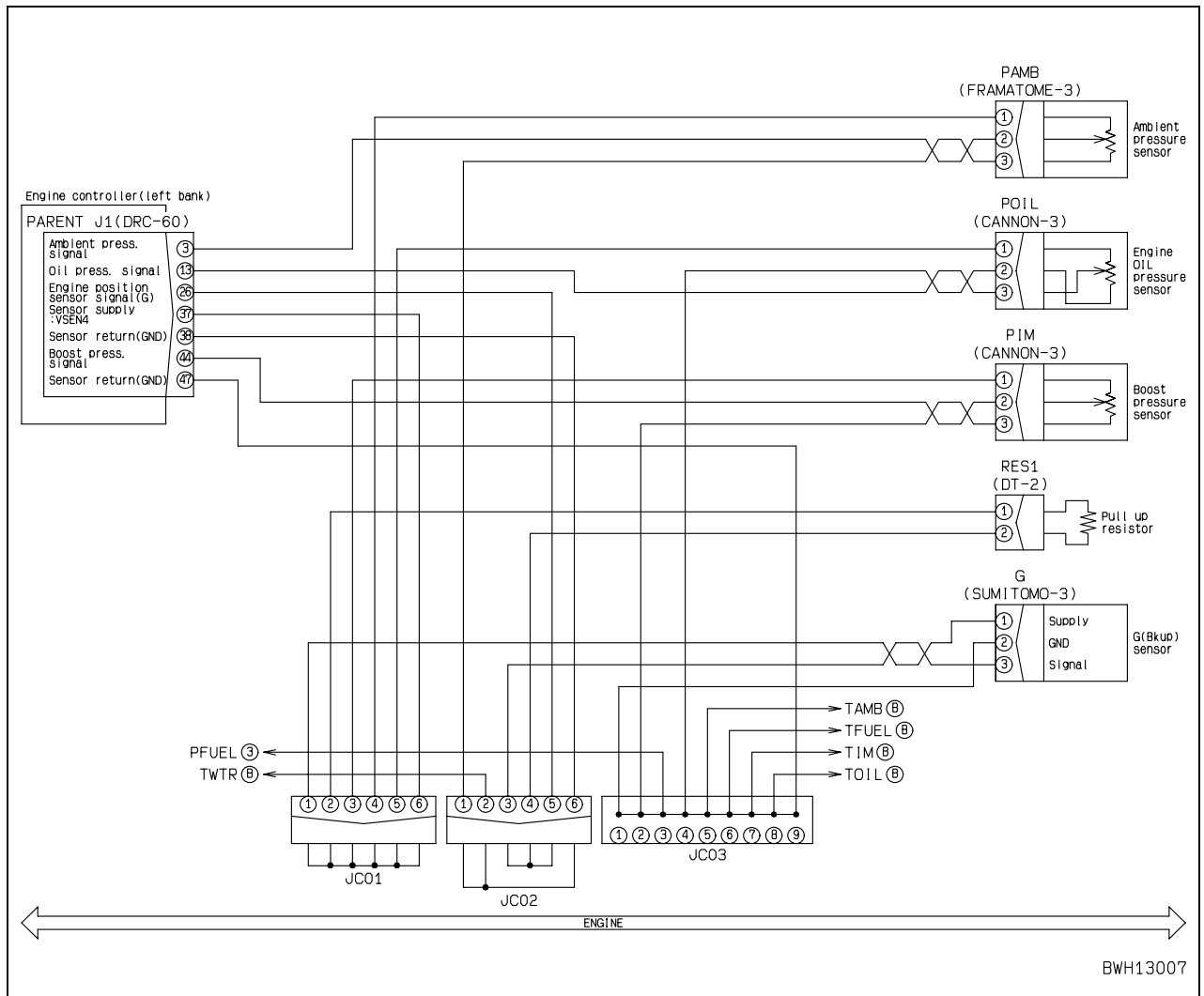
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting of failure code [CA221].	

Failure code [CA227] Sensor power source (2) too high (At left bank): Excessively high voltage detected

Action code	Failure code	Trouble	Sensor power source (2) too high (At left bank): Excessively high voltage detected (Engine controller system)
E03	CA227		
Contents of trouble	• Excessively high voltage is detected in sensor power source (2) (5V) circuit.		
Action of controller	- Operates using Ne speed sensor signal instead of Bkup speed sensor signal. - Operate oil pressure sensor with oil pressure at default value (250 kPa {2.5 kg/cm²}) - Operates with atmospheric pressure sensor value defaulted to (52.44 kPa {0.5 kg/cm²}) - Operates with charge pressure sensor at fixed value (400 kPa {4.1 kg/cm²}). - Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Output decreases.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective related circuits	Check the codes that are displayed at the same time. If any other codes are displayed, carry out troubleshooting for those codes.			
	2	Defective sensor (internal defect)	★ Prepare with starting switch OFF and diagnose with starting switch ON.			
			Disconnect the devices on the right one at a time. If the code disappears, that device is internally defective.	Bkup speed sensor	G connector	
				Engine oil pressure sensor	POIL connector	
				Atmospheric pressure sensor	PAMB connector	
				Charge pressure sensor	PIM connector	
	3	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Wiring harness between PARENT J1 (female) (37) – each sensor (female)		Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (47) – each sensor (female)		Resistance	Max. 1 Ω
	4	Defective harness grounding (contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between ground and wiring harness between PARENT J1 (female) (37) – each sensor (female)		Resistance	Min. 1 MΩ
			Between ground and wiring harness between PARENT J1 (female) (47) – each sensor (female)		Resistance	Min. 1 MΩ
	5	Harness short (Harness internal short)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between wiring harness from PARENT J1 (female) (37) to each sensor (female) and wiring harness from PARENT J1 (female) (47) to each sensor (female)		Resistance	Min. 1 MΩ
	6	Defective engine controller	★ Prepare with starting switch OFF and diagnose with starting switch ON.			
			PARENT J1		Voltage	
Between (37) – (47)			4.75 – 5.25 V			

Circuit diagram related

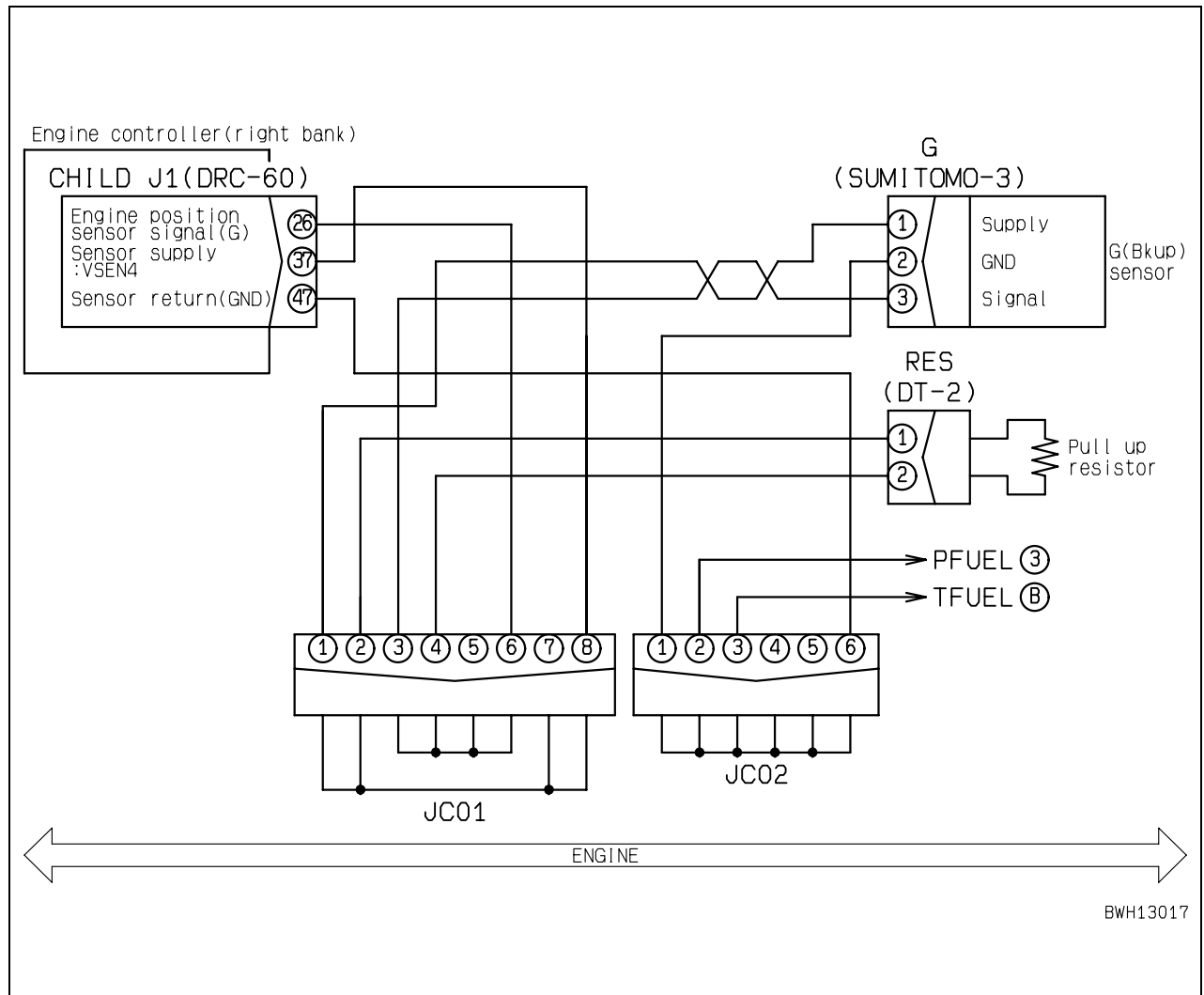


Failure code [CB227] Sensor power supply (2) abnormally high level (Right bank): High voltage detection

Action code	Failure code	Trouble	Sensor power supply (2) abnormally high level (Right bank): High voltage detection (Engine controller system)
E03	CB227		
Contents of trouble	• High voltage was detected in sensor power supply (2) (5 V) circuit.		
Action of controller	• Bkup speed sensor operates with Ne speed sensor signal.		
Problem that appears on machine	• Output lowers.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Related defective system	If another code is also displayed, carry out troubleshooting for it.			
	2	Defective sensor (Internal defect)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			When device at right is disconnected, if error code disappears, that device has defect in it.	Bkup speed sensor	G connector	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (37) – each sensor (female)		Resistance	Max. 1 Ω
			Wiring harness between CHILD J1 (female) (47) – each sensor (female)		Resistance	Max. 1 Ω
	4	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (37) – each sensor (female)		Resistance	Min. 1 MΩ
			Wiring harness between CHILD J1 (female) (47) – each sensor (female)		Resistance	Min. 1 MΩ
	5	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between wiring harness from CHILD J1 (female) (37) to each sensor (female) and wiring harness from CHILD J1 (female) (47) to each sensor (female)		Resistance	Min. 1 MΩ
	6	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			CHILD J1		Voltage	
			Between (37) – (47)		4.75 – 5.25 V	

Circuit diagram related



Failure code [CA234] Engine over speed (At left bank only): Excessively high speed

Action code	Failure code	Trouble	Engine over speed (At left bank only): Excessively high speed (Engine controller system)
E02	CA234		
Contents of trouble	The engine speed exceeds upper control limit speed.		
Action of controller	- Stops operation of injector until the engine speed drops to the normal speed. - Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	Engine speed fluctuates.		
Related information	- The engine speed can be checked in monitoring function. (Code: 01002 Engine speed) - Duplication of failure code: Start engine and operate at high idle.		

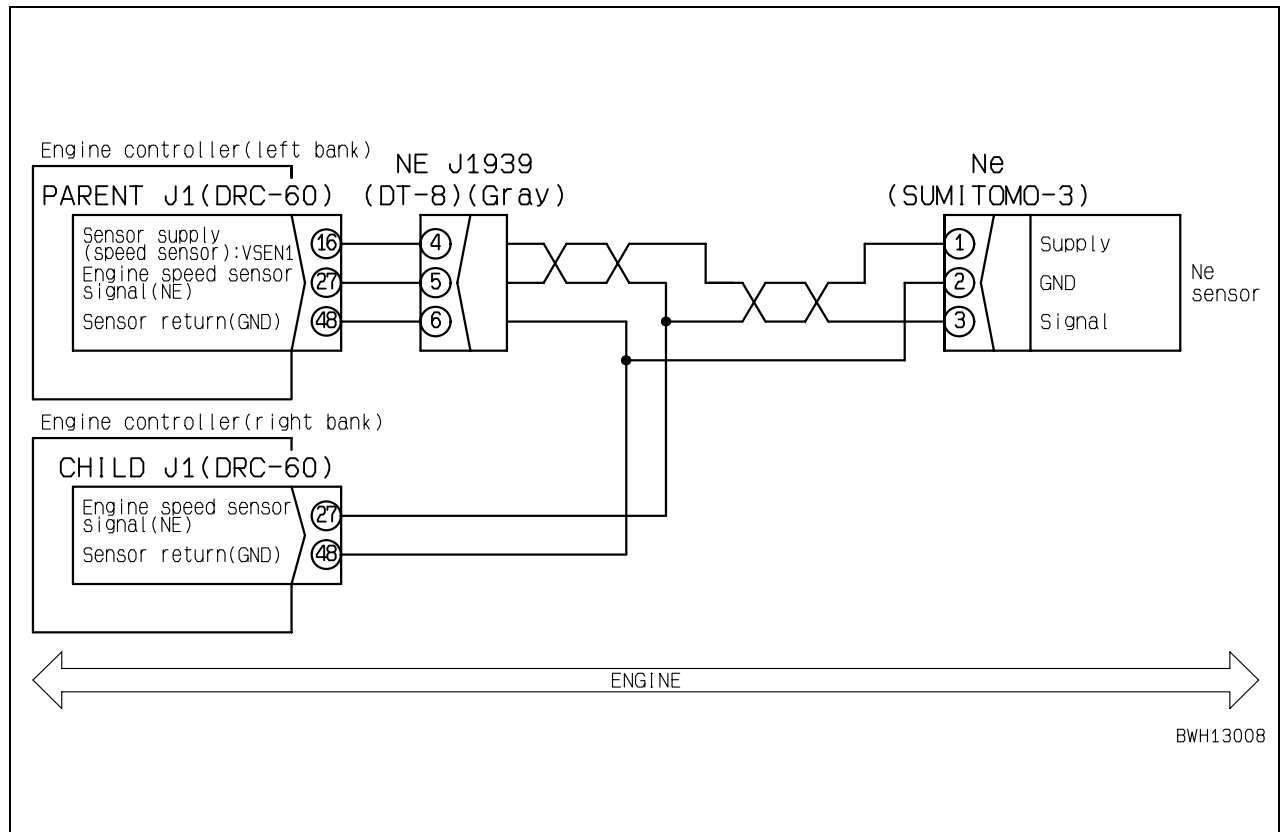
Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective related circuits	Check the codes that are displayed at the same time. If any other codes are displayed, carry out troubleshooting for those codes.
	2	Improper usage	Operation may be improper. Teach proper operation.
	3	Defective engine controller	Engine controller can be suspected to be defective if no problem is found in causes 1 – 2 (since this is an internal defect, it cannot be diagnosed).

Failure code [CA238] Abnormal power source for Ne speed sensor (At left bank only): Excessively low voltage detected

Action code	Failure code	Trouble	Abnormal power source for Ne speed sensor (At left bank only): Excessively low voltage detected (Engine controller system)
E03	CA238		
Contents of trouble	• Excessively low voltage is detected at Ne speed sensor power supply (5V) circuit.		
Action of controller	• Controls using Bkup speed sensor signal. • Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Engine stops during operation (when Bkup speed sensor is defective at the same time). • Engine cannot be started while stopping (when Bkup speed sensor is defective at the same time).		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective Ne speed sensor (internal defect)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Disconnect a device shown on the right. If the failure code disappears, that device is internally defective.	Ne speed sensor	Ne connector	
	2	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Wiring harness between PARENT J1 (female) (16) – Ne (female) (1)	Resistance		Max. 1 Ω
	3	Defective harness grounding (contact with ground circuit)	Wiring harness between PARENT J1 (female) (48) – Ne (female) (2)	Resistance		Max. 1 Ω
			★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
	4	Harness short (Harness internal short)	Between ground and wiring harness between PARENT J1 (female) (16) – Ne (female) (1)	Resistance		Min. 1 MΩ
			Between ground and wiring harness between PARENT J1 (female) (48) – Ne (female) (2)	Resistance		Min. 1 MΩ
	5	Defective engine controller	★ Prepare with starting switch OFF and diagnose with starting switch ON.			
			PARENT J1	Voltage		
			Between (16) – (48)	4.75 – 5.25 V		

Circuit diagram related

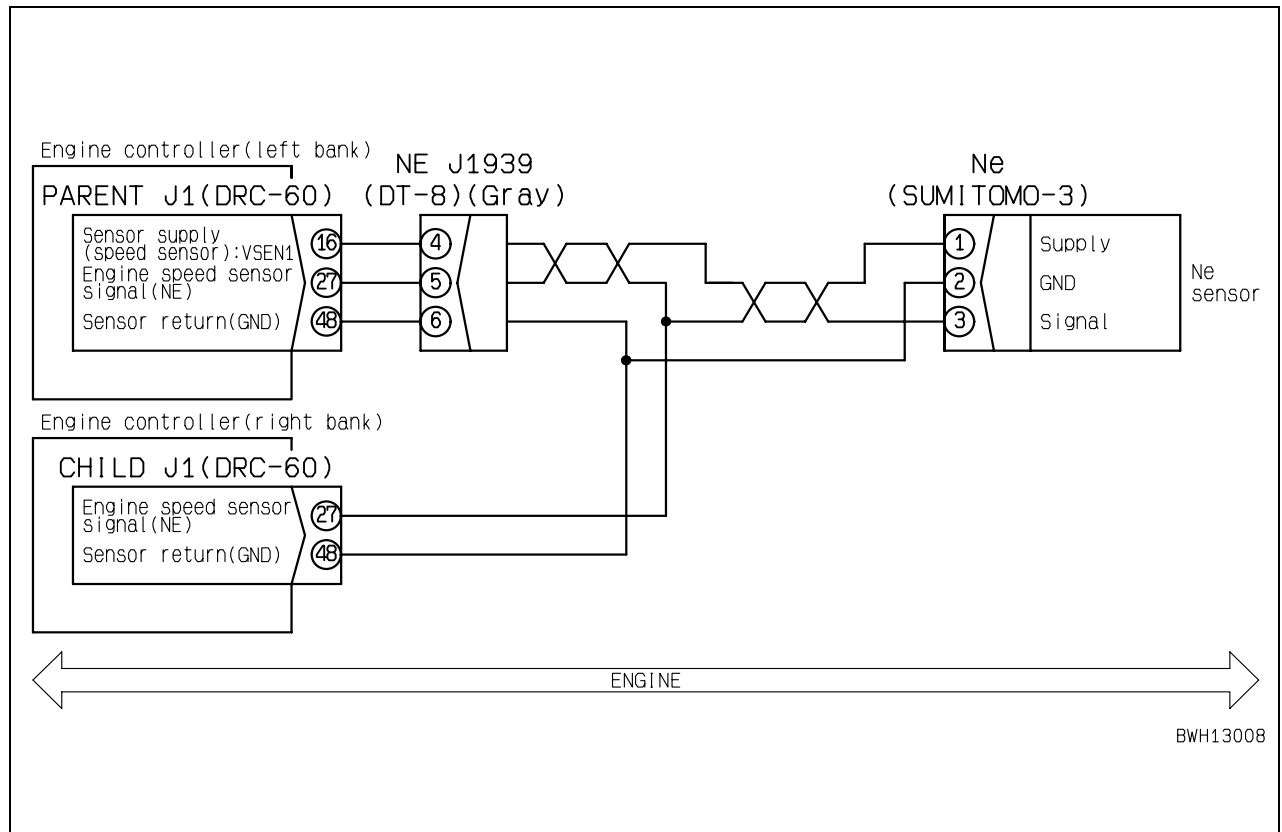


Failure code [CB238] Abnormal power source for Ne speed sensor (At right bank only): Excessively low voltage detected

Action code	Failure code	Trouble	Abnormal power source for Ne speed sensor (At right bank only): Excessively low voltage detected (Engine controller system)
E03	CB238		
Contents of trouble	• Excessively low voltage is detected at Ne speed sensor power supply (5V) circuit.		
Action of controller	• Controls using Bkup speed sensor signal. • Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Engine stops during operation (when Bkup speed sensor is defective at the same time). • Engine cannot be started while stopping (when Bkup speed sensor is defective at the same time).		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective Ne speed sensor (internal defect)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Disconnect a device shown on the right. If the failure code disappears, that device is internally defective.	Ne speed sensor	Ne connector	
	2	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Wiring harness between PARENT J1 (female) (16) – Ne (female) (1)	Resistance		Max. 1 Ω
			Wiring harness between CHILD J1 (female) (48) – Ne (female) (2)	Resistance		Max. 1 Ω
	3	Defective harness grounding (contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between ground and wiring harness between PARENT J1 (female) (16) – Ne (female) (1)	Resistance		Min. 1 MΩ
			Between ground and wiring harness between CHILD J1 (female) (48) – Ne (female) (2)	Resistance		Min. 1 MΩ
	4	Harness short (Harness internal short)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between wiring harness from PARENT J1 (female) (16) to Ne (female) (1) and wiring harness from CHILD J1 (female) (48) to Ne (female) (2)	Resistance		Min. 1 MΩ
	5	Defective engine controller	★ Prepare with starting switch OFF and diagnose with starting switch ON.			
			Between PARENT J1 (16) – CHILD J1 (48)	Voltage		
				4.75 – 5.25 V		

Circuit diagram related

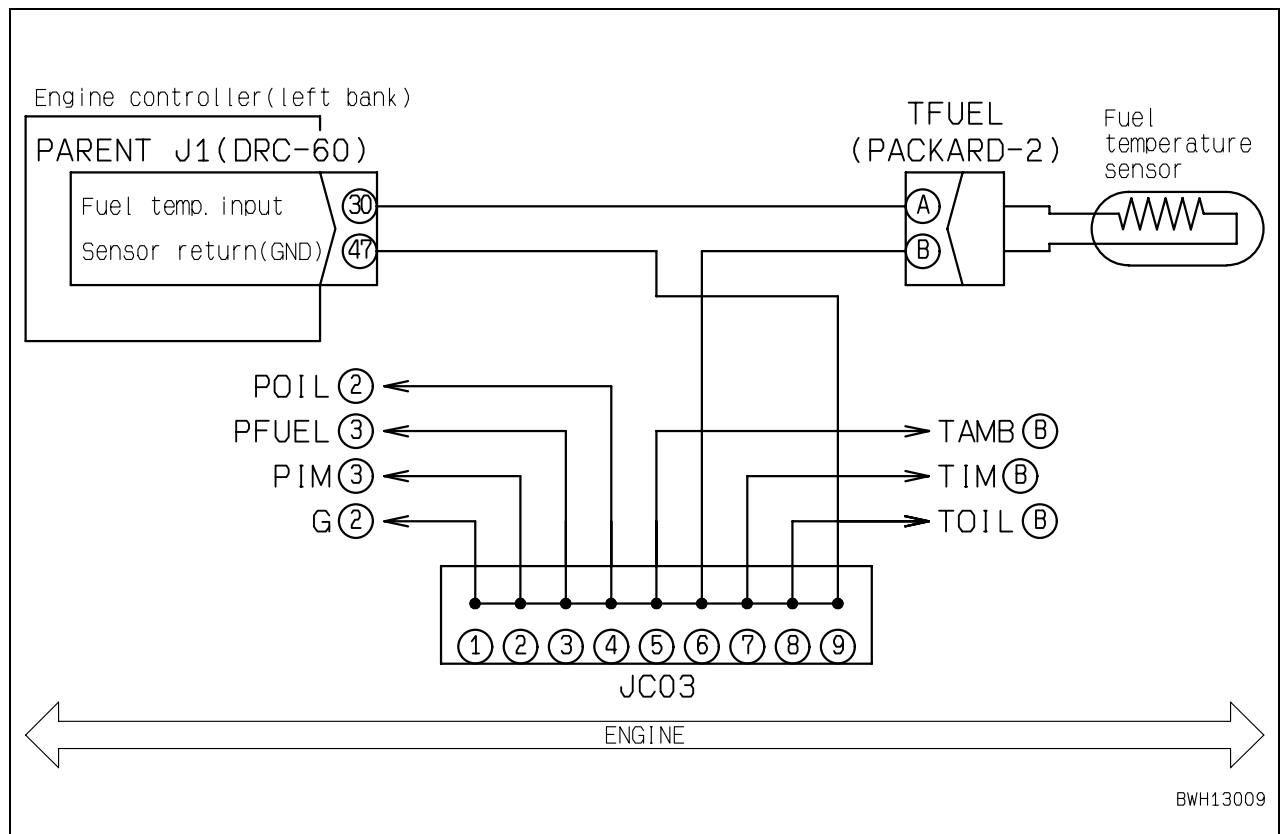


Failure code [CA263] Fuel temperature sensor too high (At left bank): Excessively high voltage detected

Action code	Failure code	Trouble	Fuel temperature sensor too high (At left bank): Excessively high voltage detected (Engine controller system)
E01	CA263		
Contents of trouble	• Excessively high voltage is detected at fuel temperature sensor circuit.		
Action of controller	• Operates with a fixed fuel temperature (95°C).		
Problem that appears on machine			
Related information	• Input state from engine fuel temperature sensor can be checked with monitoring function. (Code: 04204 Fuel temperature (Left bank), Code 14201 Fuel temperature sensor voltage (Left bank))		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective fuel temperature sensor (internal defect)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			TFUEL (male)	Fuel temperature	Resistance
			Between (A) – (B)	10 – 100°C	0.6 – 20 kΩ
	2	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			Wiring harness between PARENT J1 (female) (30) – TFUEL (female) (A)		Resistance
			Wiring harness between PARENT J1 (female) (47) – TFUEL (female) (B)		Resistance
	3	Defective harness grounding (contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			Between ground and wiring harness between PARENT J1 (female) (30) – TFUEL (female) (A)		Resistance
			★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
	4	Defective engine controller	PARENT J1 (female)	Fuel temperature	Resistance
			Between (30) – (47)	10 – 100°C	0.6 – 20 kΩ

Circuit diagram related

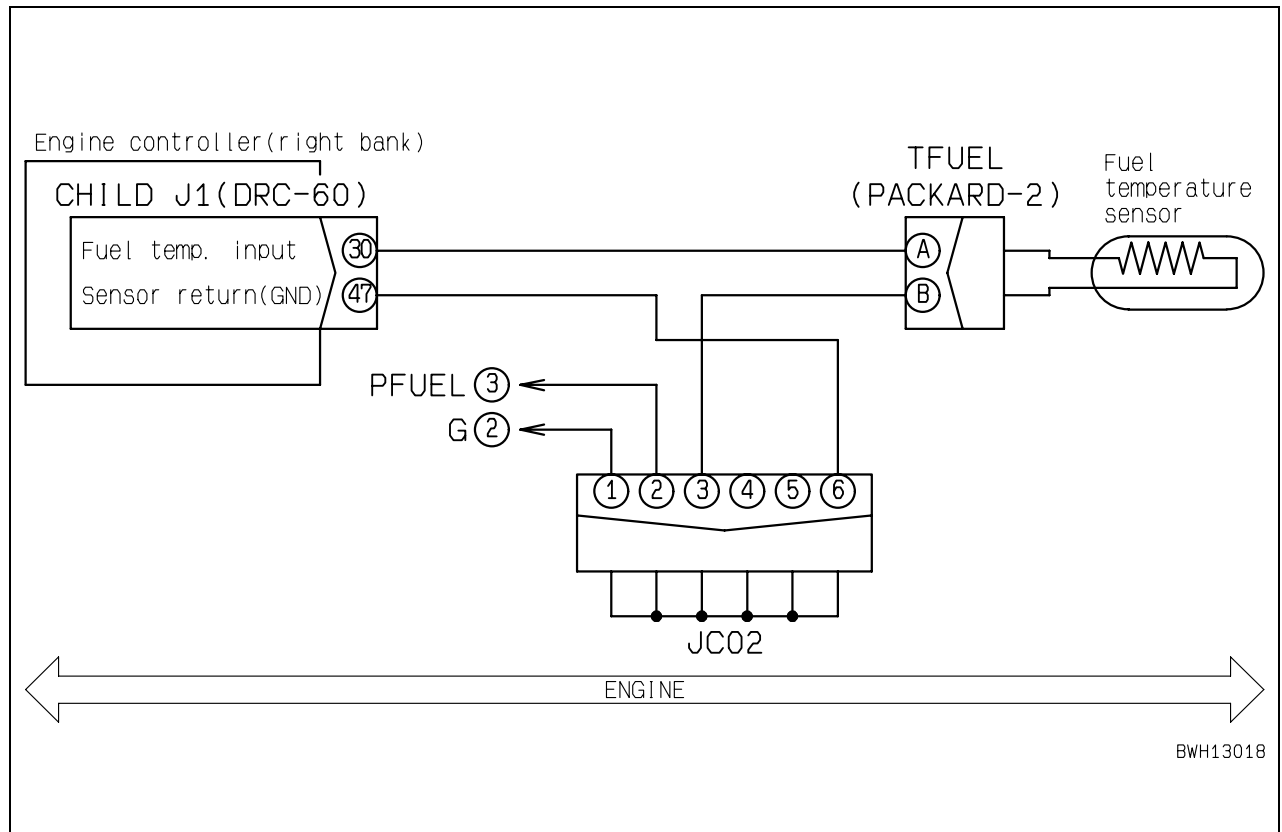


Failure code [CB263] Fuel temperature sensor too high (At right bank): Excessively high voltage detected

Action code	Failure code	Trouble	Fuel temperature sensor too high (At right bank): Excessively high voltage detected (Engine controller system)
E01	CB263		
Contents of trouble	• Excessively high voltage is detected at fuel temperature sensor circuit.		
Action of controller	• Operates with a fixed fuel temperature (95°C).		
Problem that appears on machine			
Related information	• Input state from engine fuel temperature sensor can be checked with monitoring function. (Code: 04205 Fuel temperature (Right bank), Code 14202 Fuel temperature sensor voltage (Right bank))		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective fuel temperature sensor (internal defect)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			TFUEL (male)	Fuel temperature	Resistance	
			Between (A) – (B)	10 – 100°C	0.6 – 20 kΩ	
	2	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Wiring harness between CHILD J1 (female) (30) – TFUEL (female) (A)		Resistance	Max. 1 Ω
			Wiring harness between CHILD J1 (female) (47) – TFUEL (female) (B)		Resistance	Max. 1 Ω
	3	Defective harness grounding (contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between ground and wiring harness between CHILD J1 (female) (30) – TFUEL (female) (A)		Resistance	Min. 1 MΩ
			★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
	4	Defective engine controller	CHILD J1 (female)	Fuel temperature	Resistance	
			Between (30) – (47)	10 – 100°C	0.6 – 20 kΩ	

Circuit diagram related



Failure code [CA265] Fuel temperature sensor abnormally low level (Left bank): Low voltage detection

Action code	Failure code	Trouble	Fuel temperature sensor abnormally low level (Left bank): Low voltage detection (Engine controller system)
E01	CA265		
Contents of trouble	Low voltage was detected in fuel temperature sensor circuit.		
Action of controller	- Substitutes coolant temperature sensor. - If coolant temperature sensor is also abnormal, sets fuel temperature to default value (95°C) and continues operation.		
Problem that appears on machine			
Related information	Input state from engine fuel temperature sensor can be checked with monitoring function. (Code: 04204 Fuel temperature (Left bank), Code 14201 Fuel temperature sensor voltage (Left bank))		
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting	
	Carry out troubleshooting for failure code [CA263].		

Failure code [CB265] Fuel temperature sensor abnormally low level (Right bank): Low voltage detection

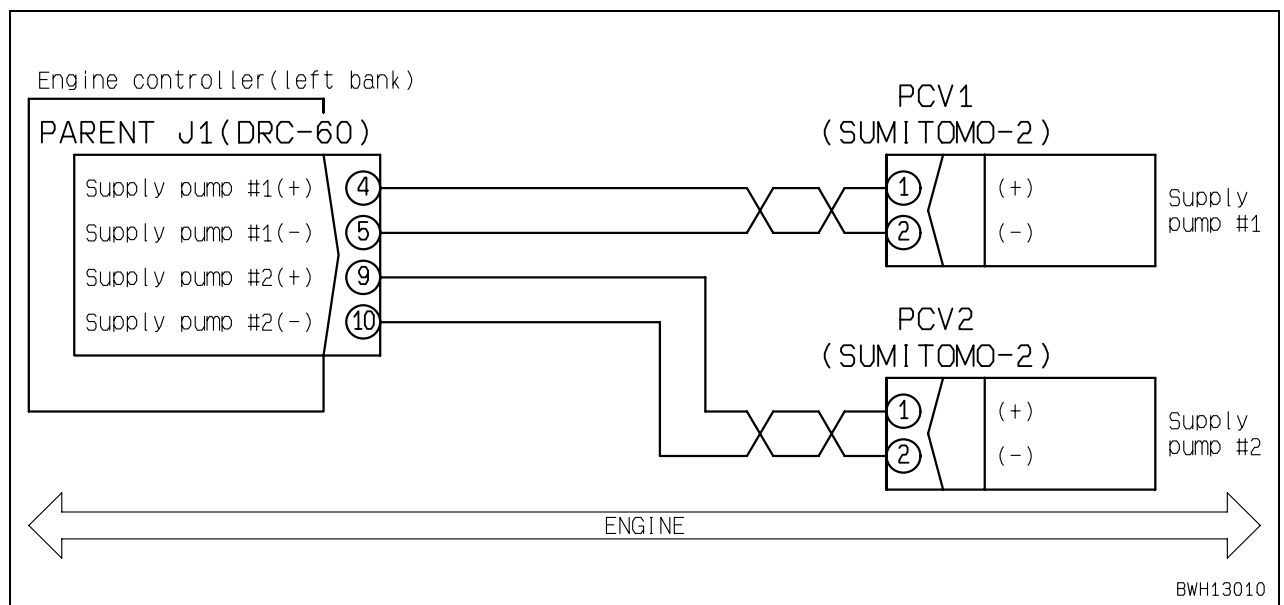
Action code	Failure code	Trouble	Fuel temperature sensor abnormally low level (Right bank): Low voltage detection (Engine controller system)
E01	CB265		
Contents of trouble	• Low voltage was detected in fuel temperature sensor circuit.		
Action of controller	• Substitutes coolant temperature sensor. • If coolant temperature sensor is also abnormal, sets fuel temperature to default value (95°C) and continues operation.		
Problem that appears on machine			
Related information			

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [CB263].	

Failure code [CA271] PCV1 short circuit (Left bank): Short circuit

Action code	Failure code	Trouble	PCV1 short circuit (Left bank): Short circuit (Engine controller system)
E03	CA271		
Contents of trouble	• Short circuit occurred in supply pump PCV1 circuit.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine			
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective supply pump PCV1 (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			PCV1 (male)		Resistance
			Between (1) – (2)		2.3 – 5.3 Ω
			Between (1), (2) – ground		Min. 1 MΩ
	2	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between PARENT J1 (female) (4) – PCV1 (female) (1)		Resistance Min. 1 MΩ
			Wiring harness between PARENT J1 (female) (5) – PCV1 (female) (2)		Resistance Min. 1 MΩ
	3	Hot short (Contact with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between PARENT J1 (female) (4) – PCV1 (female) (1)		Voltage Max. 1 V
			Wiring harness between PARENT J1 (female) (5) – PCV1 (female) (2)		Voltage Max. 1 V
	4	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			PARENT J1 (female)		Resistance
			Between (4) – (5)		2.3 – 5.3 Ω
			Between (4), (5) – ground		Min. 1 MΩ

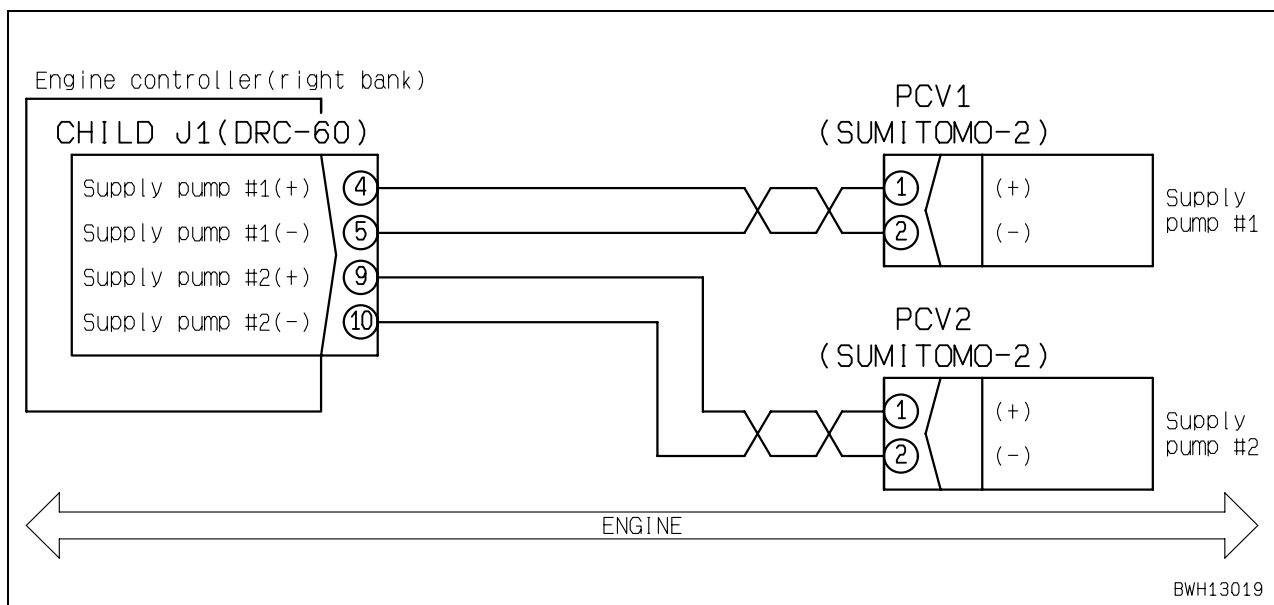
Circuit diagram related

Failure code [CB271] PCV1 short circuit (Right bank): Short circuit

Action code	Failure code	Trouble	PCV1 short circuit (Right bank): Short circuit (Engine controller system)
E03	CB271		
Contents of trouble	• Short circuit occurred in supply pump PCV1 circuit.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine			
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective supply pump PCV1 (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			PCV1 (male)		Resistance	
			Between (1) – (2)		2.3 – 5.3 Ω	
			Between (1), (2) – ground		Min. 1 MΩ	
	2	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (4) – PCV1 (female) (1)		Resistance	Min. 1 MΩ
			Wiring harness between CHILD J1 (female) (5) – PCV1 (female) (2)		Resistance	Min. 1 MΩ
	3	Hot short (Contact with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CHILD J1 (female) (4) – PCV1 (female) (1)		Voltage	Max. 1 V
			Wiring harness between CHILD J1 (female) (5) – PCV1 (female) (2)		Voltage	Max. 1 V
	4	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CHILD J1 (female)		Resistance	
			Between (4) – (5)		2.3 – 5.3 Ω	
			Between (4), (5) – ground		Min. 1 MΩ	

Circuit diagram related

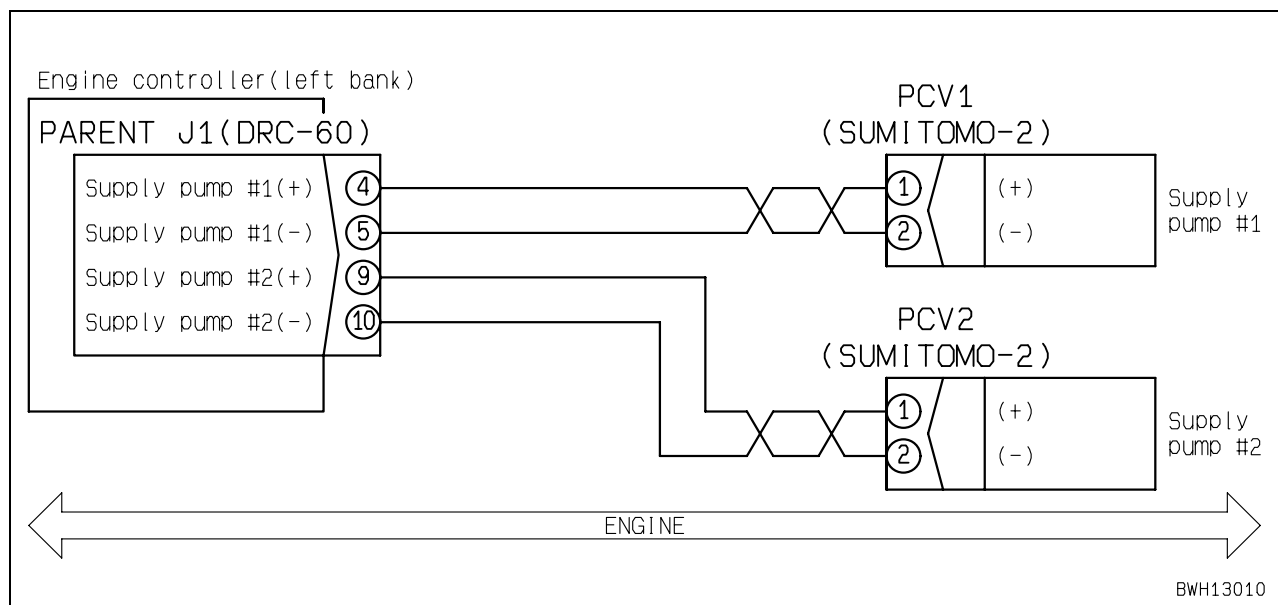


Failure code [CA272] PCV1 disconnection (Left bank): Disconnection

Action code	Failure code	Trouble	PCV1 disconnection (Left bank): Disconnection (Engine controller system)
E03	CA272		
Contents of trouble	• Disconnection occurred in supply pump PCV1 circuit.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine			
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective supply pump PCV1 (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			PCV1 (male)		Resistance	
			Between (1) – (2)		2.3 – 5.3 Ω	
			Between (1), (2) – ground		Min. 1 MΩ	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between PARENT J1 (female) (4) – PCV1 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (5) – PCV1 (female) (2)		Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between PARENT J1 (female) (4) – PCV1 (female) (1)		Resistance	Min. 1 MΩ
			Wiring harness between PARENT J1 (female) (5) – PCV1 (female) (2)		Resistance	Min. 1 MΩ
	4	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			PARENT J1 (female)		Resistance	
			Between (4) – (5)		2.3 – 5.3 Ω	
			Between (4), (5) – ground		Min. 1 MΩ	

Circuit diagram related

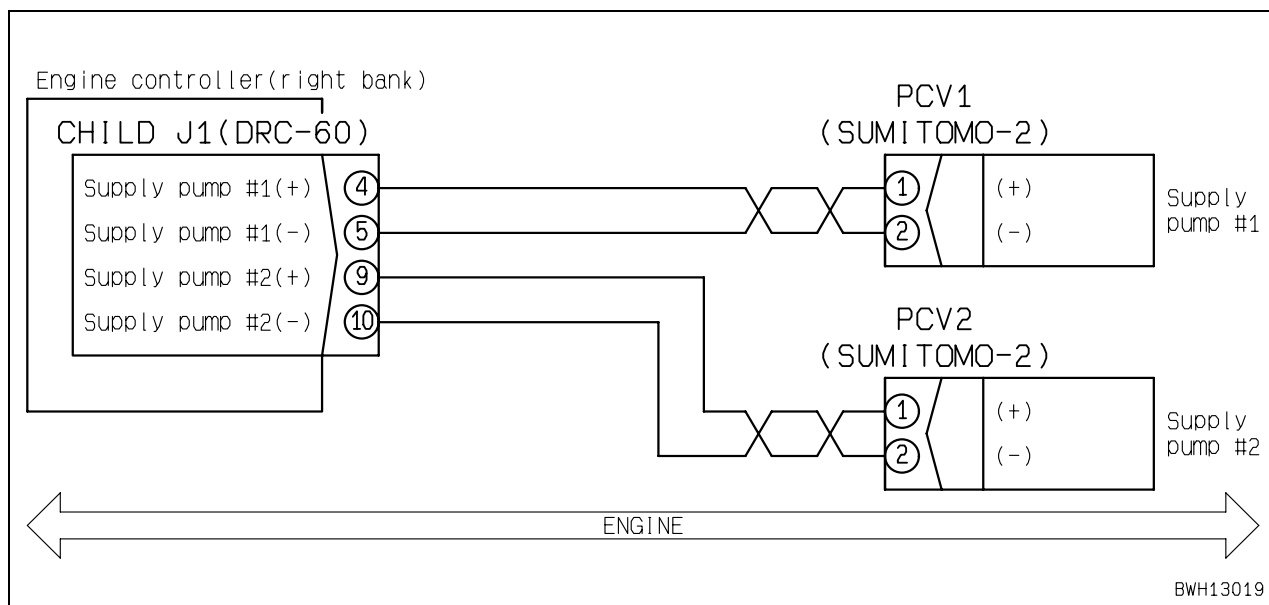


Failure code [CB272] PCV1 disconnection (Right bank): Disconnection

Action code	Failure code	Trouble	PCV1 disconnection (Right bank): Disconnection (Engine controller system)
E03	CB272		
Contents of trouble	• Disconnection occurred in supply pump PCV1 circuit.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine			
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective supply pump PCV1 (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			PCV1 (male)		Resistance	
			Between (1) – (2)		2.3 – 5.3 Ω	
			Between (1), (2) – ground		Min. 1 MΩ	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (4) – PCV1 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between CHILD J1 (female) (5) – PCV1 (female) (2)		Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (4) – PCV1 (female) (1)		Resistance	Min. 1 MΩ
			Wiring harness between CHILD J1 (female) (5) – PCV1 (female) (2)		Resistance	Min. 1 MΩ
	4	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CHILD J1 (female)		Resistance	
			Between (4) – (5)		2.3 – 5.3 Ω	
			Between (4), (5) – ground		Min. 1 MΩ	

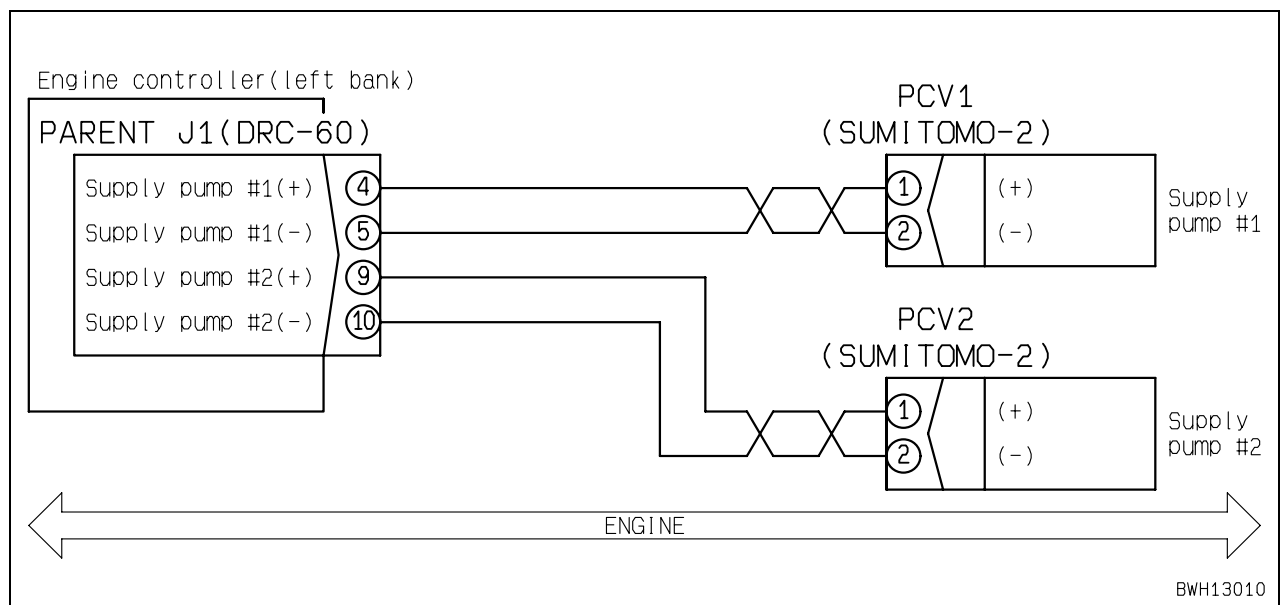
Circuit diagram related



Failure code [CA273] PCV2 short circuit (Left bank): Short circuit

Action code	Failure code	Trouble	PCV2 short circuit (Left bank): Short circuit (Engine controller system)
E03	CA273		
Contents of trouble	• Short circuit occurred in supply pump PCV2 circuit.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine			
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective supply pump PCV2 (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			PCV2 (male)		Resistance	
			Between (1) – (2)		2.3 – 5.3 Ω	
			Between (1), (2) – ground		Min. 1 MΩ	
	2	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between PARENT J1 (female) (9) – PCV2 (female) (1)		Resistance	Min. 1 MΩ
			Wiring harness between PARENT J1 (female) (10) – PCV2 (female) (2)		Resistance	Min. 1 MΩ
	3	Hot short (Contact with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between PARENT J1 (female) (9) – PCV2 (female) (1)		Voltage	Max. 1 V
			Wiring harness between PARENT J1 (female) (10) – PCV2 (female) (2)		Voltage	Max. 1 V
	4	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			PARENT J1 (female)		Resistance	
			Between (9) – (10)		2.3 – 5.3 Ω	
			Between (9), (10) – ground		Min. 1 MΩ	

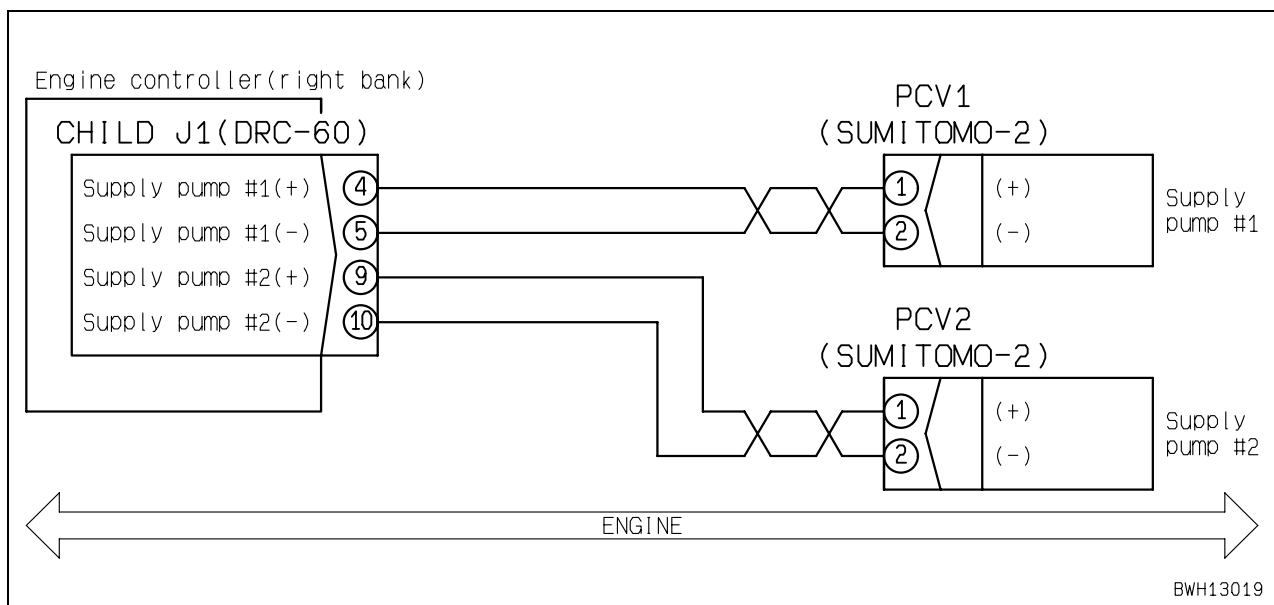
Circuit diagram related

Failure code [CB273] PCV2 short circuit (Right bank): Short circuit

Action code	Failure code	Trouble	PCV2 short circuit (Right bank): Short circuit (Engine controller system)
E03	CB273		
Contents of trouble	• Short circuit occurred in supply pump PCV2 circuit.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine			
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective supply pump PCV2 (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			PCV2 (male)		Resistance	
			Between (1) – (2)		2.3 – 5.3 Ω	
			Between (1), (2) – ground		Min. 1 MΩ	
	2	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (9) – PCV2 (female) (1)		Resistance	Min. 1 MΩ
			Wiring harness between CHILD J1 (female) (10) – PCV2 (female) (2)		Resistance	Min. 1 MΩ
	3	Hot short (Contact with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between CHILD J1 (female) (9) – PCV2 (female) (1)		Voltage	Max. 1 V
			Wiring harness between CHILD J1 (female) (10) – PCV2 (female) (2)		Voltage	Max. 1 V
	4	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CHILD J1 (female)		Resistance	
			Between (9) – (10)		2.3 – 5.3 Ω	
			Between (9), (10) – ground		Min. 1 MΩ	

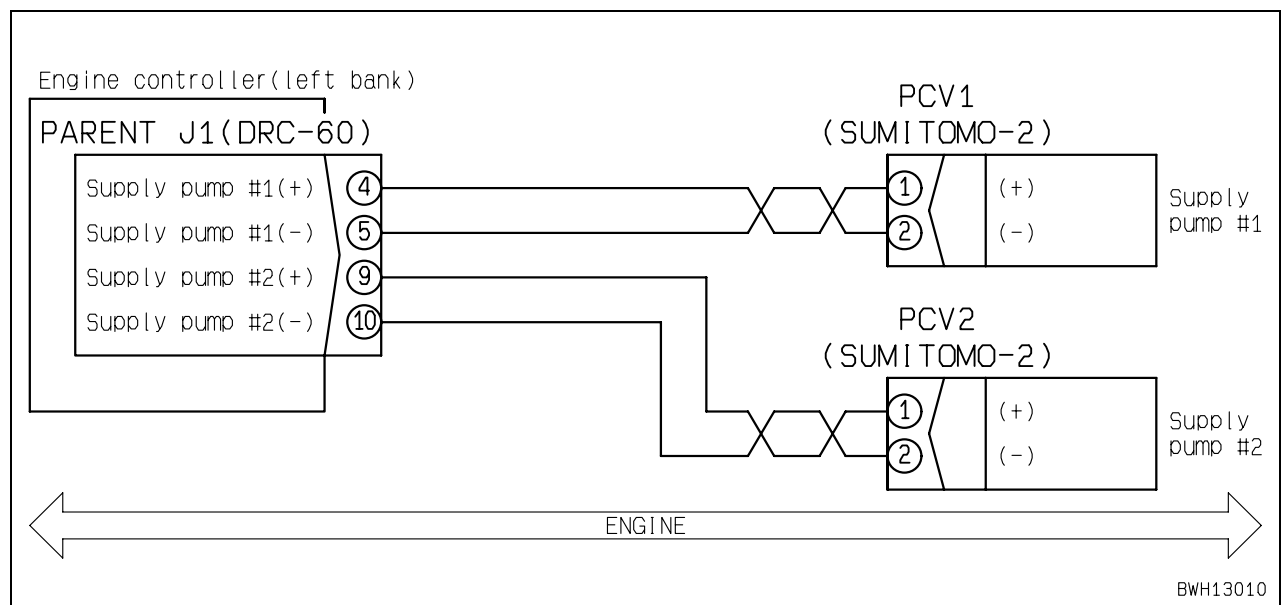
Circuit diagram related



Failure code [CA274] PCV2 disconnection (Left bank): Disconnection

Action code	Failure code	Trouble	PCV2 disconnection (Left bank): Disconnection (Engine controller system)
E03	CA274		
Contents of trouble	• Disconnection occurred in supply pump PCV2 circuit.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine			
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective supply pump PCV2 (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			PCV2 (male)		Resistance	
			Between (1) – (2)		2.3 – 5.3 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between PARENT J1 (female) (9) – PCV2 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (10) – PCV2 (female) (2)		Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between PARENT J1 (female) (9) – PCV2 (female) (1)		Resistance	Min. 1 MΩ
			Wiring harness between PARENT J1 (female) (10) – PCV2 (female) (2)		Resistance	Min. 1 MΩ
	4	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			PARENT J1 (female)		Resistance	
			Between (9) – (10)		2.3 – 5.3 Ω	
Between (9), (10) – ground			Min. 1 MΩ			

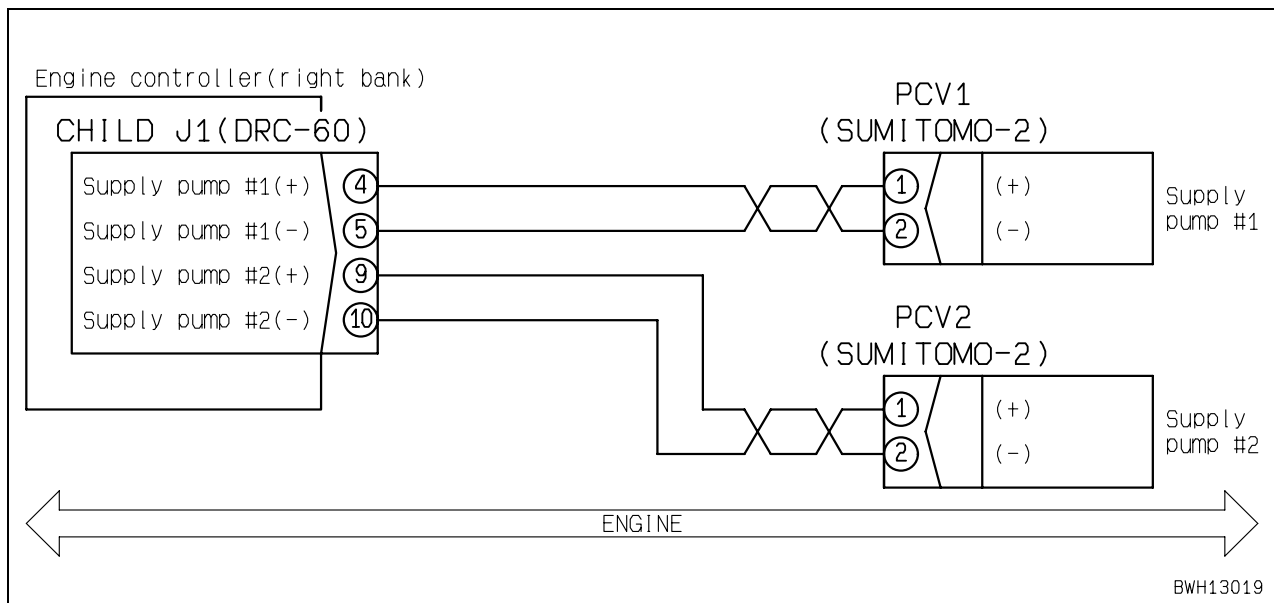
Circuit diagram related

Failure code [CB274] PCV2 disconnection (Right bank): Disconnection

Action code	Failure code	Trouble	PCV2 disconnection (Right bank): Disconnection (Engine controller system)
E03	CB274		
Contents of trouble	• Disconnection occurred in supply pump PCV2 circuit.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine			
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective supply pump PCV2 (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			PCV2 (male)		Resistance	
			Between (1) – (2)		2.3 – 5.3 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (9) – PCV2 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between CHILD J1 (female) (10) – PCV2 (female) (2)		Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (9) – PCV2 (female) (1)		Resistance	Min. 1 MΩ
			Wiring harness between CHILD J1 (female) (10) – PCV2 (female) (2)		Resistance	Min. 1 MΩ
	4	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CHILD J1 (female)		Resistance	
			Between (9) – (10)		2.3 – 5.3 Ω	
			Between (9), (10) – ground		Min. 1 MΩ	

Circuit diagram related



HD785-7 Dump truck

Form No. SEN01940-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

40 Troubleshooting

Troubleshooting by failure code, Part 4

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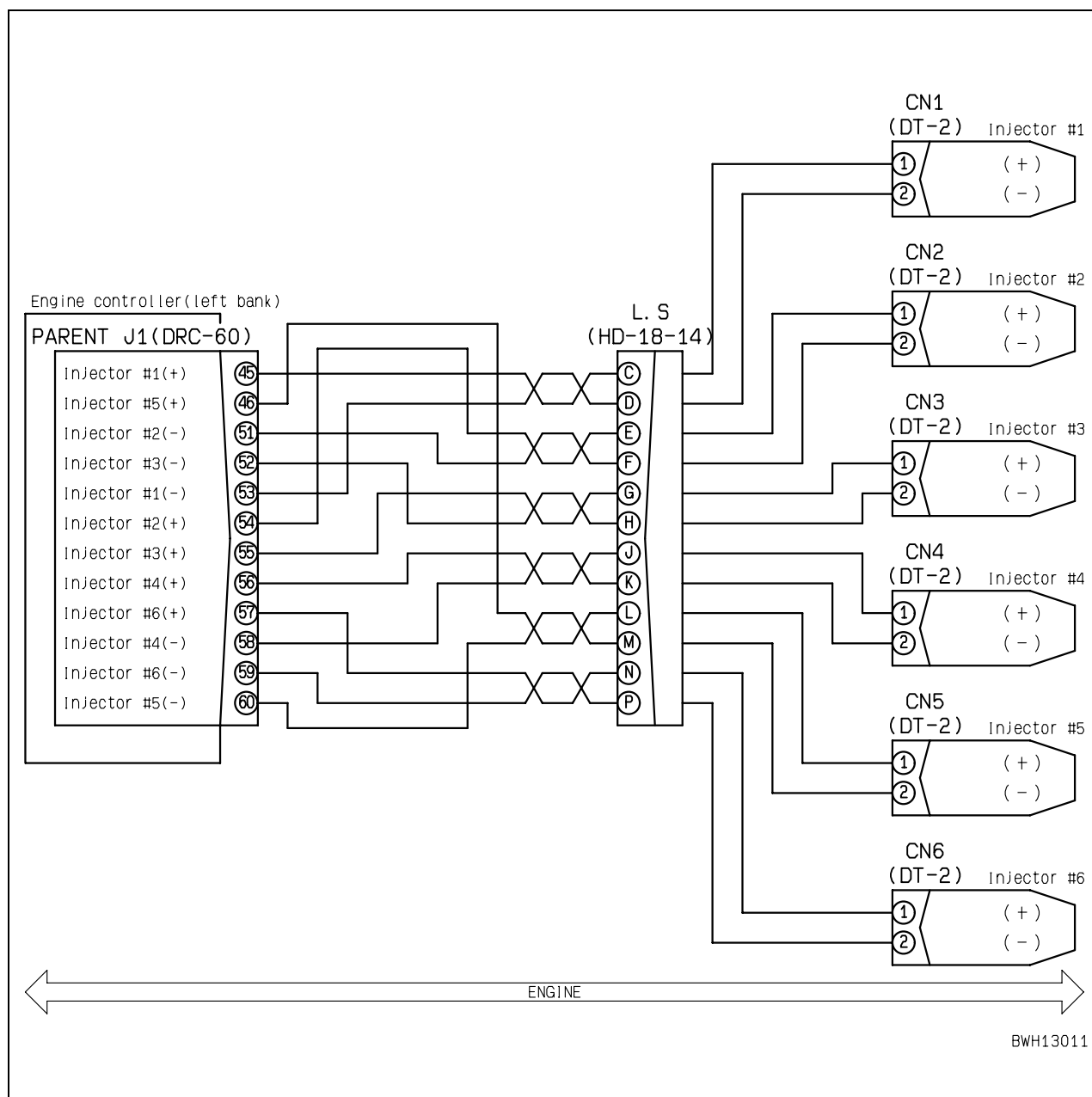
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Failure code [CA322] Injector No. 1 (L/B No.1) system disconnection or short circuit (At left bank): Disconnection, short circuit

Action code	Failure code	Trouble	Injector No. 1 (L/B No.1) system disconnection or short circuit (At left bank): Disconnection, short circuit (Engine controller system)
E03	CA322		
Contents of trouble	• A disconnection or short circuit has occurred in injector No. 1 circuit.		
Action of controller	• Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Output decreases. • Speed is not stable.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective injector No. 1 (internal defect)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			CN1 (male)		Resistance	
			Between (1) – (2)		0.4 – 1.1 Ω	
			Between (1), (2) and ground		Min. 1 MΩ	
	2	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Wiring harness between PARENT J1 (female) (45) – CN1 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (53) – CN1 (female) (2)		Resistance	Max. 1 Ω
	3	Defective harness grounding (contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between ground and wiring harness between PARENT J1 (female) (45) – CN1 (female) (1)		Resistance	Min. 1 MΩ
			Between ground and wiring harness between PARENT J1 (female) (53) – CN1 (female) (2)		Resistance	Min. 1 MΩ
	4	Defective another cylinder injector or wiring harness	If multiple failure codes are displayed for injector malfunction, carry out troubleshooting for them, too.			
	5	Defective engine controller	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			PARENT J1 (female)		Resistance	
			Between (45) – (53)		0.4 – 1.1 Ω	
			Between (45), (53) and ground		Min. 1 MΩ	

Circuit diagram related

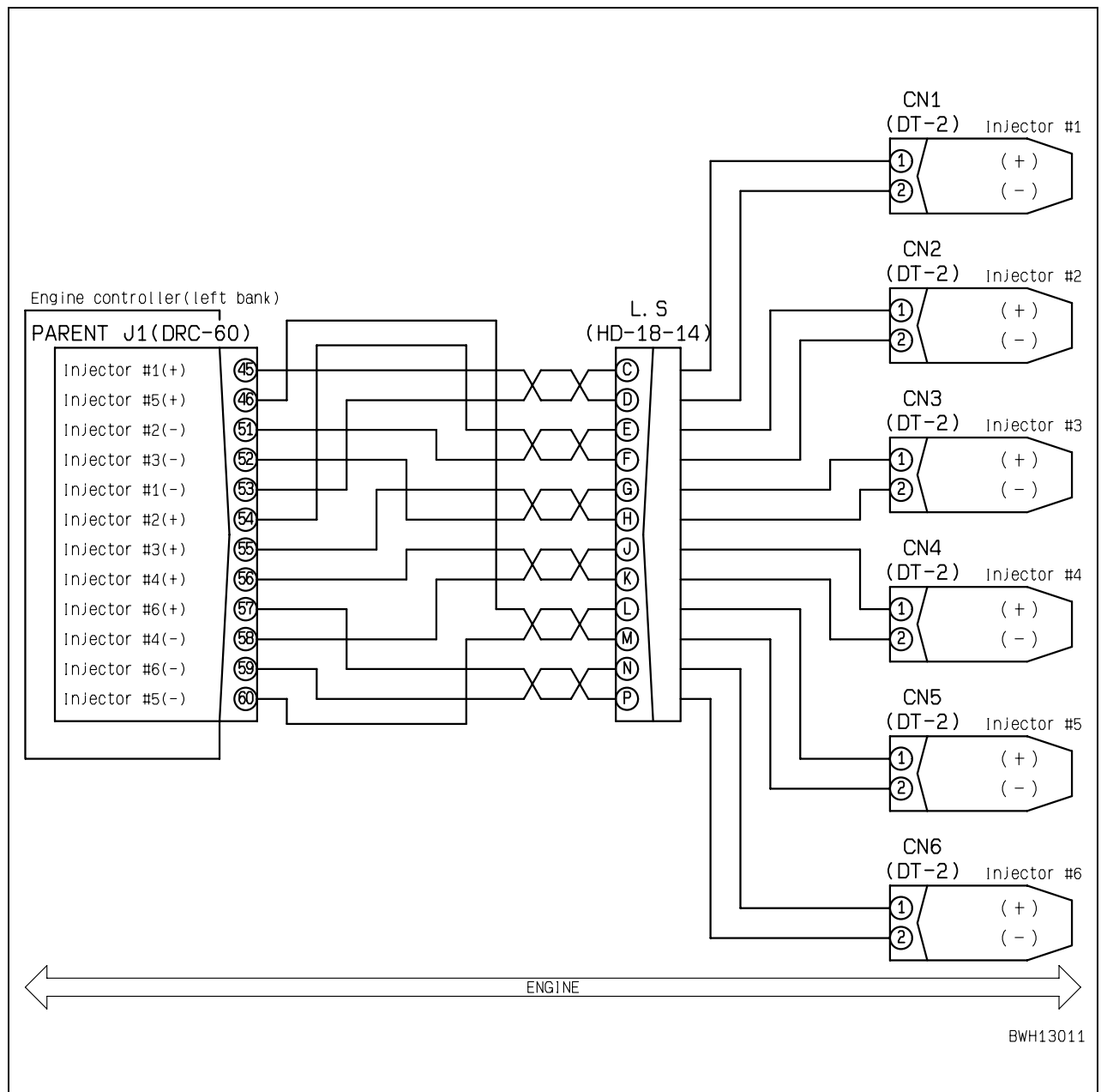


Failure code [CA323] Injector No. 5 (L/B No.5) system disconnection or short circuit (At left bank): Disconnection, short circuit

Action code	Failure code	Trouble	Injector No. 5 (L/B No.5) system disconnection or short circuit (At left bank): Disconnection, short circuit (Engine controller system)
E03	CA323		
Contents of trouble	• A disconnection or short circuit has occurred in injector No. 5 circuit.		
Action of controller	• Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Output decreases. • Speed is not stable.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective injector No. 5 (internal defect)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			CN5 (male)		Resistance	
			Between (1) – (2)		0.4 – 1.1 Ω	
			Between (1), (2) and ground		Min. 1 MΩ	
	2	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Wiring harness between PARENT J1 (female) (46) – CN5 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (60) – CN5 (female) (2)		Resistance	Max. 1 Ω
	3	Defective harness grounding (contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between ground and wiring harness between PARENT J1 (female) (46) – CN5 (female) (1)		Resistance	Min. 1 MΩ
			Between ground and wiring harness between PARENT J1 (female) (60) – CN5 (female) (2)		Resistance	Min. 1 MΩ
	4	Defective another cylinder injector or wiring harness	If multiple failure codes are displayed for injector malfunction, carry out troubleshooting for them, too.			
	5	Defective engine controller	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			PARENT J1 (female)		Resistance	
			Between (46) – (60)		0.4 – 1.1 Ω	
			Between (46), (60) and ground		Min. 1 MΩ	

Circuit diagram related

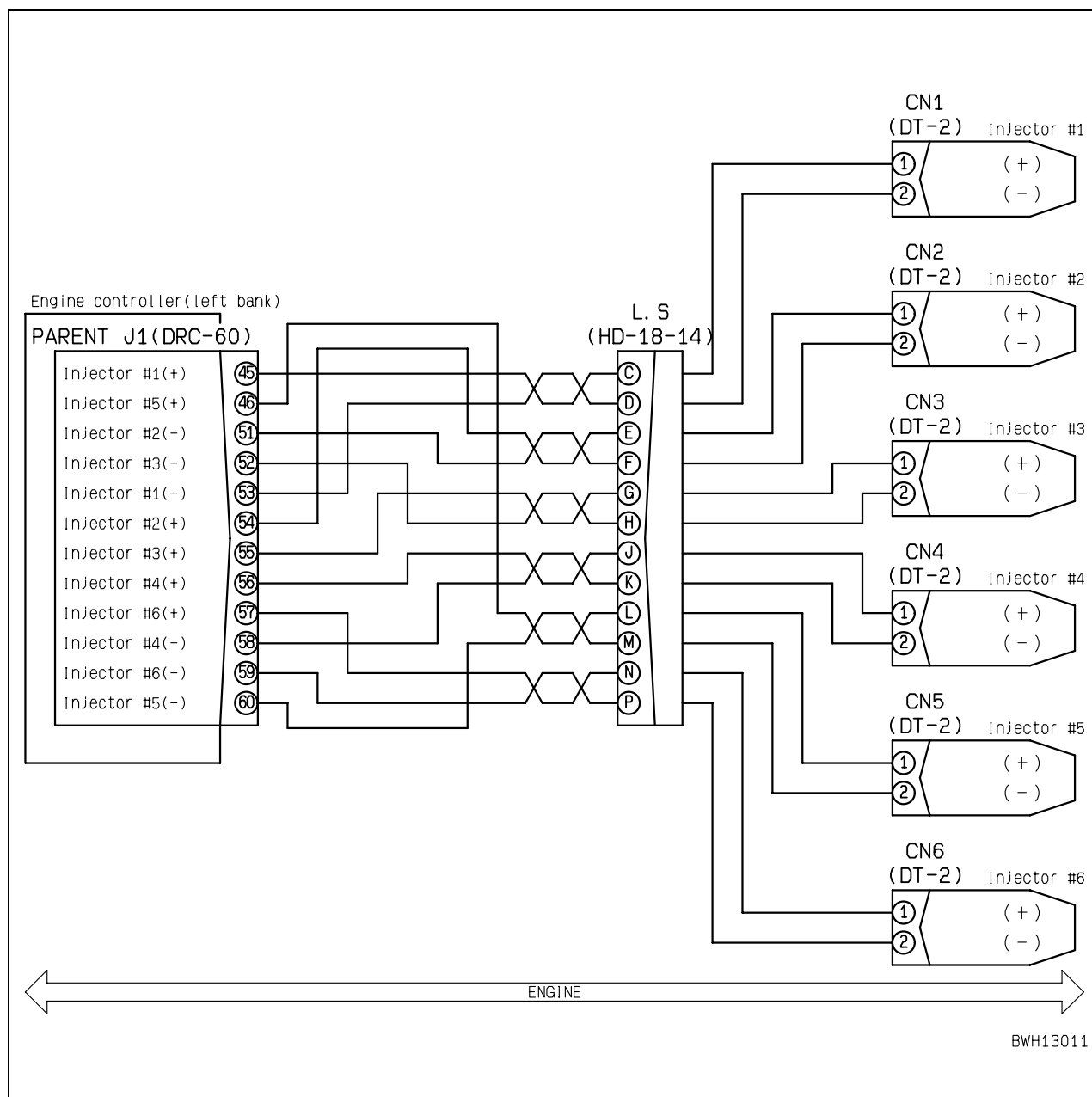


Failure code [CA324] Injector No. 3 (L/B No.3) system disconnection or short circuit (At left bank): Disconnection, short circuit

Action code	Failure code	Trouble	Injector No. 3 (L/B No.3) system disconnection or short circuit (At left bank): Disconnection, short circuit (Engine controller system)
E03	CA324		
Contents of trouble	• A disconnection or short circuit has occurred in injector No. 3 circuit.		
Action of controller	• Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Output decreases. • Speed is not stable.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective injector No. 3 (internal defect)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			CN3 (male)		Resistance	
			Between (1) – (2)		0.4 – 1.1 Ω	
			Between (1), (2) and ground		Min. 1 MΩ	
	2	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Wiring harness between PARENT J1 (female) (55) – CN3 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (52) – CN3 (female) (2)		Resistance	Max. 1 Ω
	3	Defective harness grounding (contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between ground and wiring harness between PARENT J1 (female) (55) – CN3 (female) (1)		Resistance	Min. 1 MΩ
			Between ground and wiring harness between PARENT J1 (female) (52) – CN3 (female) (2)		Resistance	Min. 1 MΩ
	4	Defective another cylinder injector or wiring harness	If multiple failure codes are displayed for injector malfunction, carry out troubleshooting for them, too.			
	5	Defective engine controller	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			PARENT J1 (female)		Resistance	
			Between (55) – (52)		0.4 – 1.1 Ω	
			Between (55), (52) and ground		Min. 1 MΩ	

Circuit diagram related

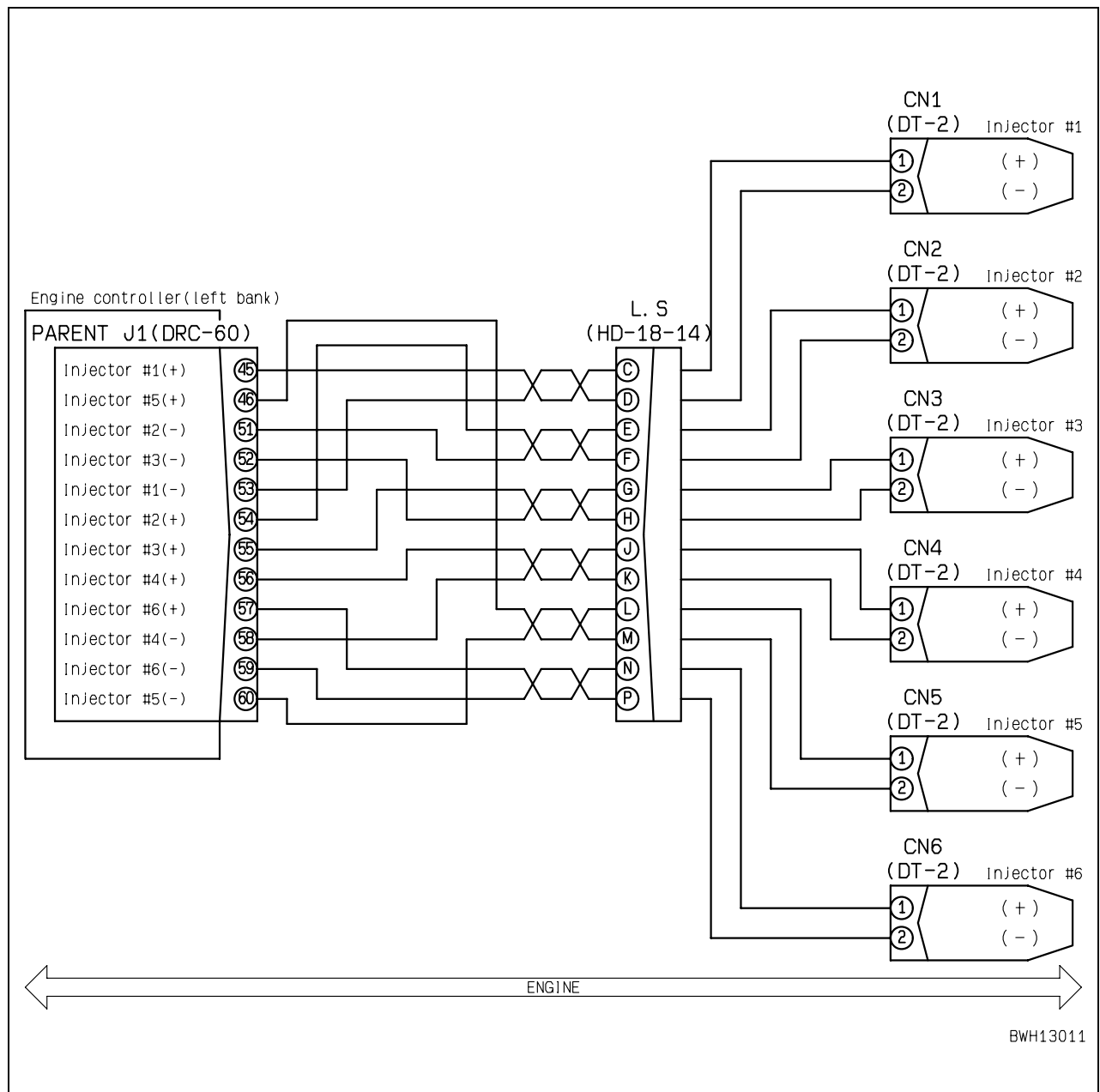


Failure code [CA325] Injector No. 6 (L/B No.6) system disconnection or short circuit (At left bank): Disconnection, short circuit

Action code	Failure code	Trouble	Injector No. 6 (L/B No.6) system disconnection or short circuit (At left bank): Disconnection, short circuit (Engine controller system)
E03	CA325		
Contents of trouble	• A disconnection or short circuit has occurred in injector No. 6 circuit.		
Action of controller	• Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Output decreases. • Speed is not stable.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective injector No. 6 (internal defect)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			CN6 (male)		Resistance	
			Between (1) – (2)		0.4 – 1.1 Ω	
			Between (1), (2) and ground		Min. 1 MΩ	
	2	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Wiring harness between PARENT J1 (female) (57) – CN6 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (59) – CN6 (female) (2)		Resistance	Max. 1 Ω
	3	Defective harness grounding (contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between ground and wiring harness between PARENT J1 (female) (57) – CN6 (female) (1)		Resistance	Min. 1 MΩ
			Between ground and wiring harness between PARENT J1 (female) (59) – CN6 (female) (2)		Resistance	Min. 1 MΩ
	4	Defective another cylinder injector or wiring harness	If multiple failure codes are displayed for injector malfunction, carry out troubleshooting for them, too.			
	5	Defective engine controller	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			PARENT J1 (female)		Resistance	
			Between (57) – (59)		0.4 – 1.1 Ω	
			Between (57), (59) and ground		Min. 1 MΩ	

Circuit diagram related

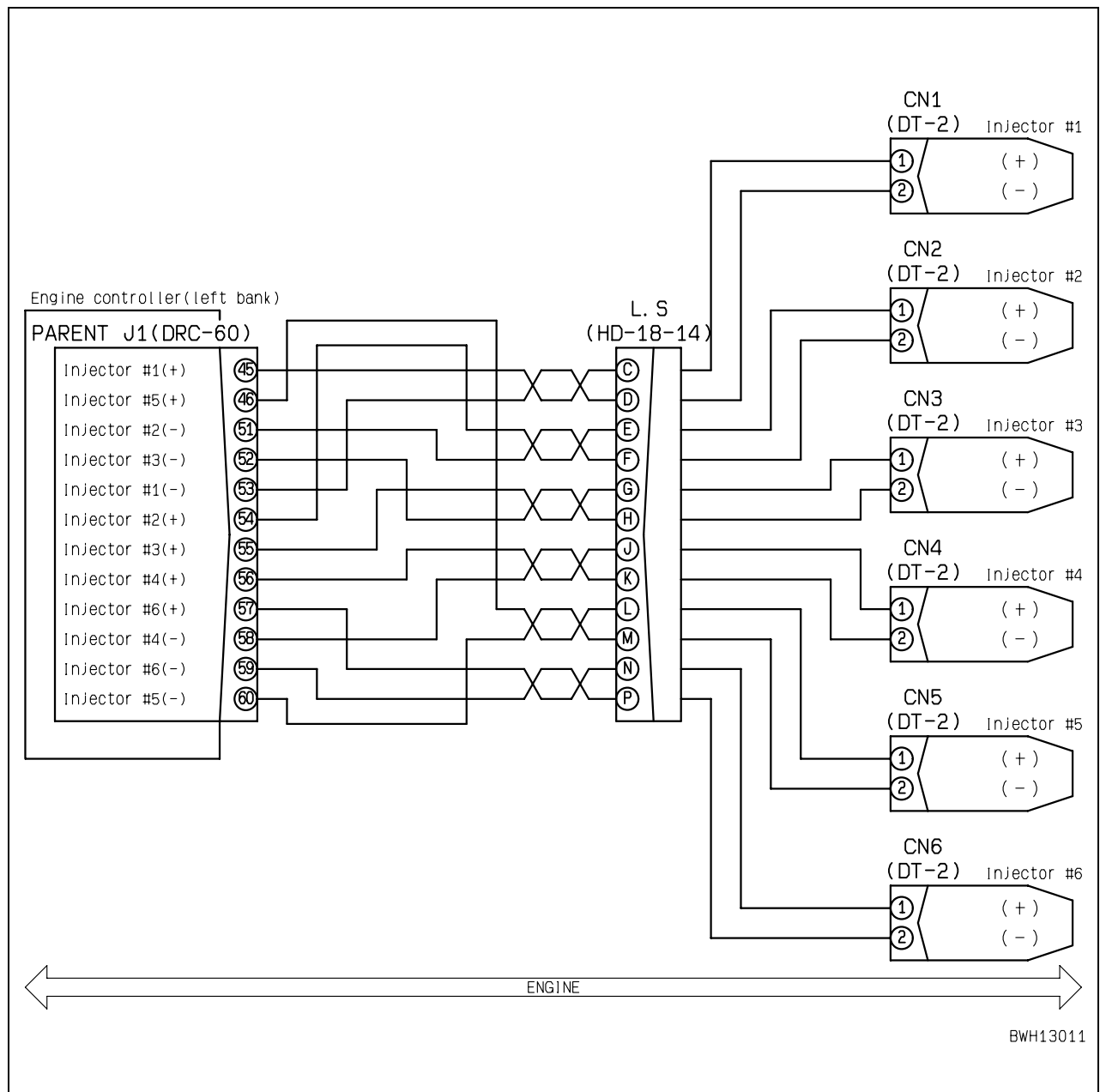


Failure code [CA331] Injector No. 2 (L/B No.2) system disconnection or short circuit (At left bank): Disconnection, short circuit

Action code	Failure code	Trouble	Injector No. 2 (L/B No.2) system disconnection or short circuit (At left bank): Disconnection, short circuit (Engine controller system)
E03	CA331		
Contents of trouble	• A disconnection or short circuit has occurred in injector No. 2 circuit.		
Action of controller	• Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Output decreases. • Speed is not stable.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective injector No. 2 (internal defect)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			CN2 (male)		Resistance	
			Between (1) – (2)		0.4 – 1.1 Ω	
			Between (1), (2) and ground		Min. 1 MΩ	
	2	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Wiring harness between PARENT J1 (female) (54) – CN2 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (51) – CN2 (female) (2)		Resistance	Max. 1 Ω
	3	Defective harness grounding (contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between ground and wiring harness between PARENT J1 (female) (54) – CN2 (female) (1)		Resistance	Min. 1 MΩ
			Between ground and wiring harness between PARENT J1 (female) (51) – CN2 (female) (2)		Resistance	Min. 1 MΩ
	4	Defective another cylinder injector or wiring harness	If multiple failure codes are displayed for injector malfunction, carry out troubleshooting for them, too.			
	5	Defective engine controller	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			PARENT J1 (female)		Resistance	
			Between (54) – (51)		0.4 – 1.1 Ω	
			Between (54), (51) and ground		Min. 1 MΩ	

Circuit diagram related

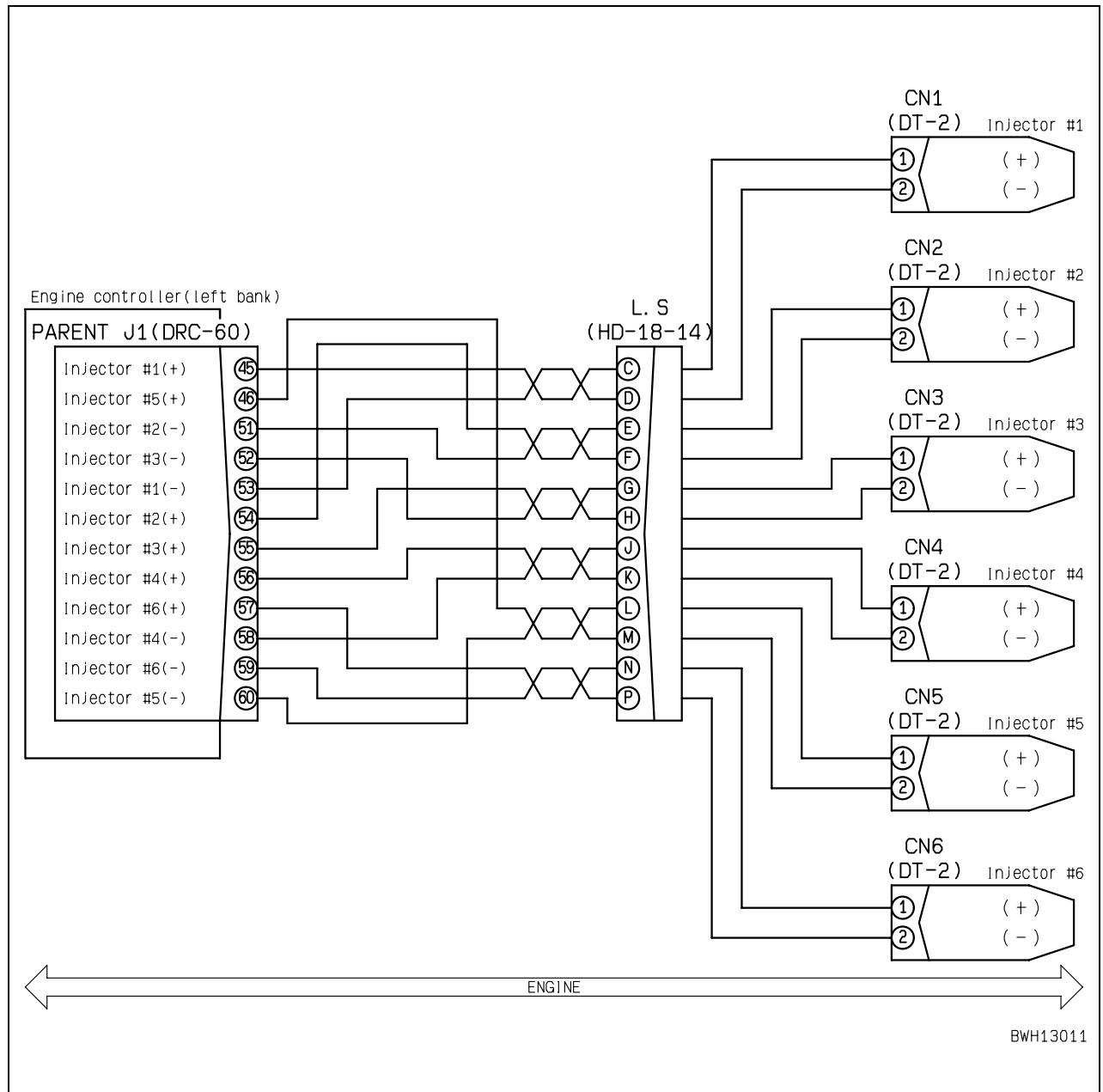


Failure code [CA332] Injector No. 4 (L/B No.4) system disconnection or short circuit (At left bank): Disconnection, short circuit

Action code	Failure code	Trouble	Injector No. 4 (L/B No.4) system disconnection or short circuit (At left bank): Disconnection, short circuit (Engine controller system)
E03	CA332		
Contents of trouble	• A disconnection or short circuit has occurred in injector No. 4 circuit.		
Action of controller	• Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Output decreases. • Speed is not stable.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective injector No. 4 (internal defect)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			CN4 (male)		Resistance	
			Between (1) – (2)		0.4 – 1.1 Ω	
			Between (1), (2) and ground		Min. 1 MΩ	
	2	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Wiring harness between PARENT J1 (female) (56) – CN4 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (58) – CN4 (female) (2)		Resistance	Max. 1 Ω
	3	Defective harness grounding (contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between ground and wiring harness between PARENT J1 (female) (56) – CN4 (female) (1)		Resistance	Min. 1 MΩ
			Between ground and wiring harness between PARENT J1 (female) (58) – CN4 (female) (2)		Resistance	Min. 1 MΩ
	4	Defective another cylinder injector or wiring harness	If multiple failure codes are displayed for injector malfunction, carry out troubleshooting for them, too.			
	5	Defective engine controller	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			PARENT J1 (female)		Resistance	
			Between (56) – (58)		0.4 – 1.1 Ω	
			Between (56), (58) and ground		Min. 1 MΩ	

Circuit diagram related



Failure code [CA342] Engine controller data mismatch (Left bank): Mismatch

Action code	Failure code	Trouble	Engine controller data mismatch (Left bank): Mismatch (Engine controller system)
E03	CA342		
Contents of trouble	• Data mismatch occurred in engine controller.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Engine cannot be started or operated.		
Related information			

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [CA111].	

Failure code [CB342] Engine controller data mismatch (Right bank): Mismatch

Action code	Failure code	Trouble	Engine controller data mismatch (Right bank): Mismatch (Engine controller system)
E03	CB342		
Contents of trouble	• Data mismatch occurred in engine controller.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Engine cannot be started or operated.		
Related information			

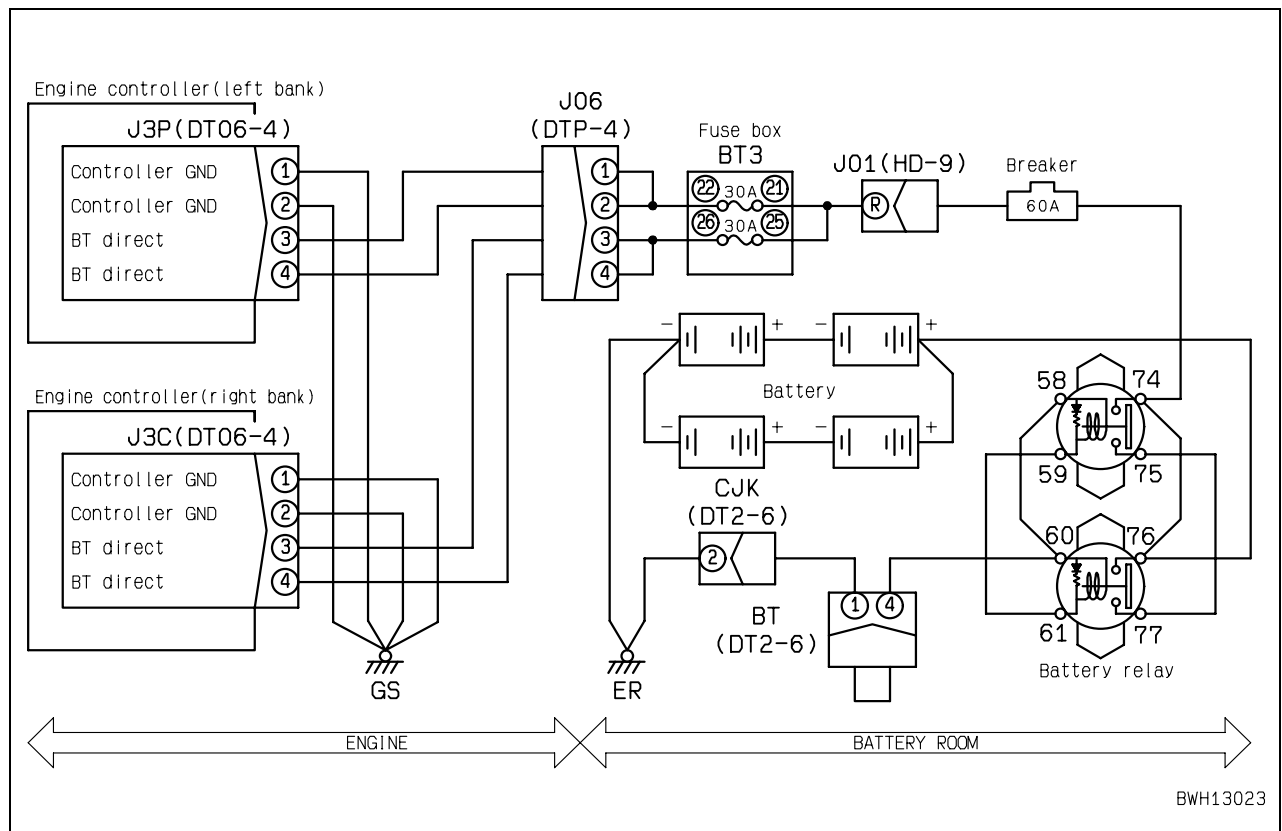
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [CB111].	

Failure code [CA351] Abnormal injector drive circuit (At left bank): Abnormal circuit

Action code	Failure code	Trouble	Abnormal injector drive circuit (At left bank): Abnormal circuit (Engine controller system)
E03	CA351		
Contents of trouble	Abnormality has occurred in injector drive circuit.		
Action of controller	- Operates with limited output. (Limits common rail pressure.) - Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	Output decreases.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective related circuits	Check the failure codes (codes for injector system trouble) that are displayed at the same time. If any other codes are displayed, carry out troubleshooting for those codes.		
	2	Defective breaker	Since a fuse or breaker of equipped machine side can be suspected to be defective, directly check them. (If fuse is blown, or breaker is shut off, it is highly possible that a defective grounding, etc. has occurred in the circuit.)		
	3	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			Wiring harness between J3P (female) (3) (4) – battery (+)	Resistance	Max. 1 Ω
			Wiring harness between J3P (female) (1) (2) and ground	Resistance	Max. 1 Ω
	4	Defective harness grounding (contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			Between ground and wiring harness between J3P (female) (3) (4) – battery (+)Resistance	Resistance	Min. 1 MΩ
	5	Defective engine controller	★ Prepare with starting switch OFF and diagnose with starting switch ON.		
			J3P	Voltage	
			Between (3), (4) – (1), (2)	20 – 30 V	

Circuit diagram related

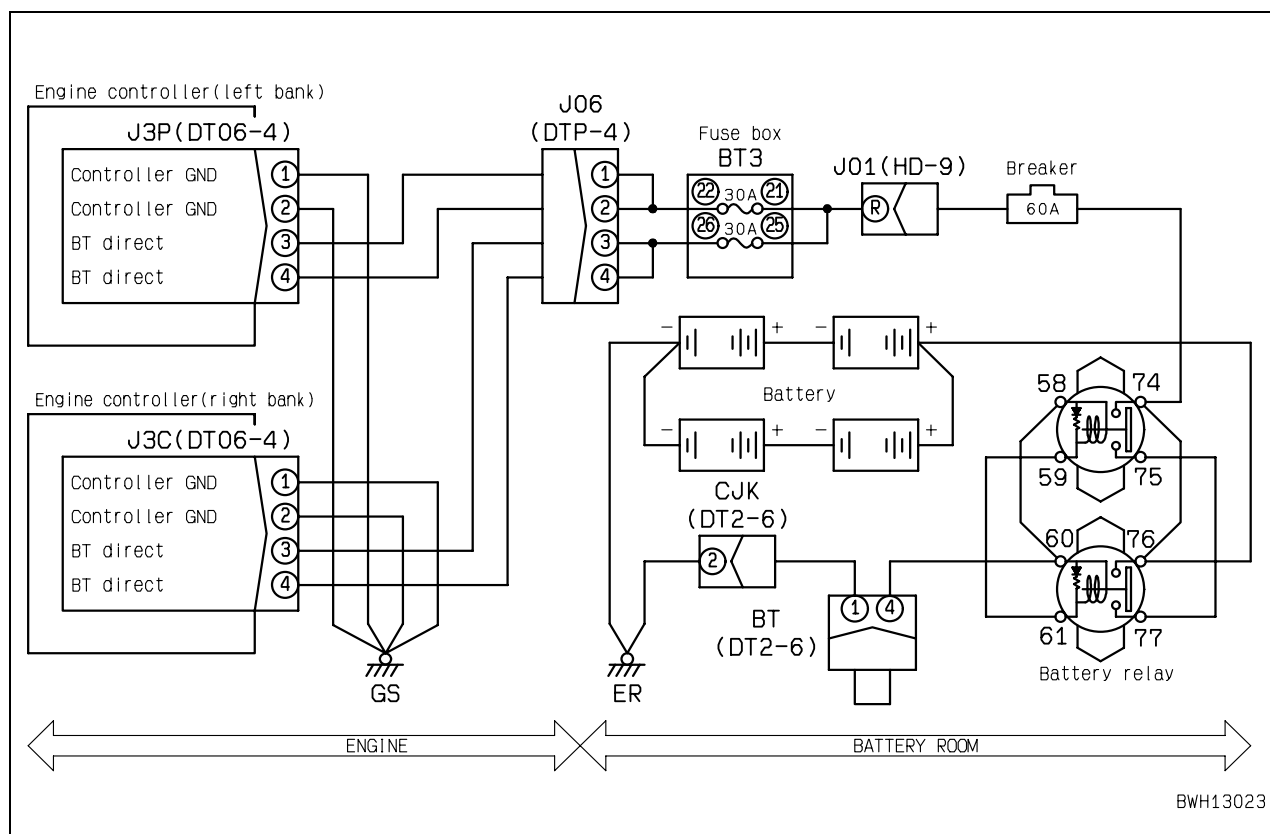


Failure code [CB351] Injector drive circuit abnormality (Right bank): Circuit abnormality

Action code	Failure code	Trouble	Injector drive circuit abnormality (Right bank): Circuit abnormality (Engine controller system)
E03	CB351		
Contents of trouble	Abnormality occurred in injector drive circuit.		
Action of controller	- Limits output and continues operation (Limits common rail pressure). - Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	Output lowers.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Related defective system	If another code (code of injector system abnormality) is also displayed, carry out troubleshooting for it.		
	2	Defective circuit breaker	Fuse or circuit breaker on applicable machine side may be defective. Check them directly. (If fuse is broken or circuit breaker is turned OFF, circuit probably has ground fault.)		
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between J3J (female) (3), (4) – battery (+)	Resistance	Max. 1 Ω
	4	Ground fault in wiring harness (Contact with GND circuit)	Wiring harness between J3J (female) (1), (2) – ground	Resistance	Max. 1 Ω
			★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
	5	Defective engine controller	Wiring harness between J3J (female) (3), (4) – battery (+)	Resistance	Min. 1 MΩ
			★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			J3J	Voltage	
			Between (3), (4) – (1), (2)	20 – 30 V	

Circuit diagram related



Failure code [CA352] Sensor power supply (1) abnormally low level (Left bank): Low voltage detection

Action code	Failure code	Trouble	Sensor power supply (1) abnormally low level (Left bank): Low voltage detection (Engine controller system)
E03	CA352		
Contents of trouble	Low voltage was detected in sensor power supply (1) (5 V) circuit.		
Action of controller	- Common rail pressure sensor limits output and continues operation (Limits common rail pressure). - Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	Output lowers.		
Related information			

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [CA386].	

Failure code [CB352] Sensor power supply (1) abnormally low level (Right bank): Low voltage detection

Action code	Failure code	Trouble	Sensor power supply (1) abnormally low level (Right bank): Low voltage detection (Engine controller system)
E03	CB352		
Contents of trouble	Low voltage was detected in sensor power supply (1) (5 V) circuit.		
Action of controller	- Common rail pressure sensor limits output and continues operation (Limits common rail pressure). - Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	Output lowers.		
Related information			

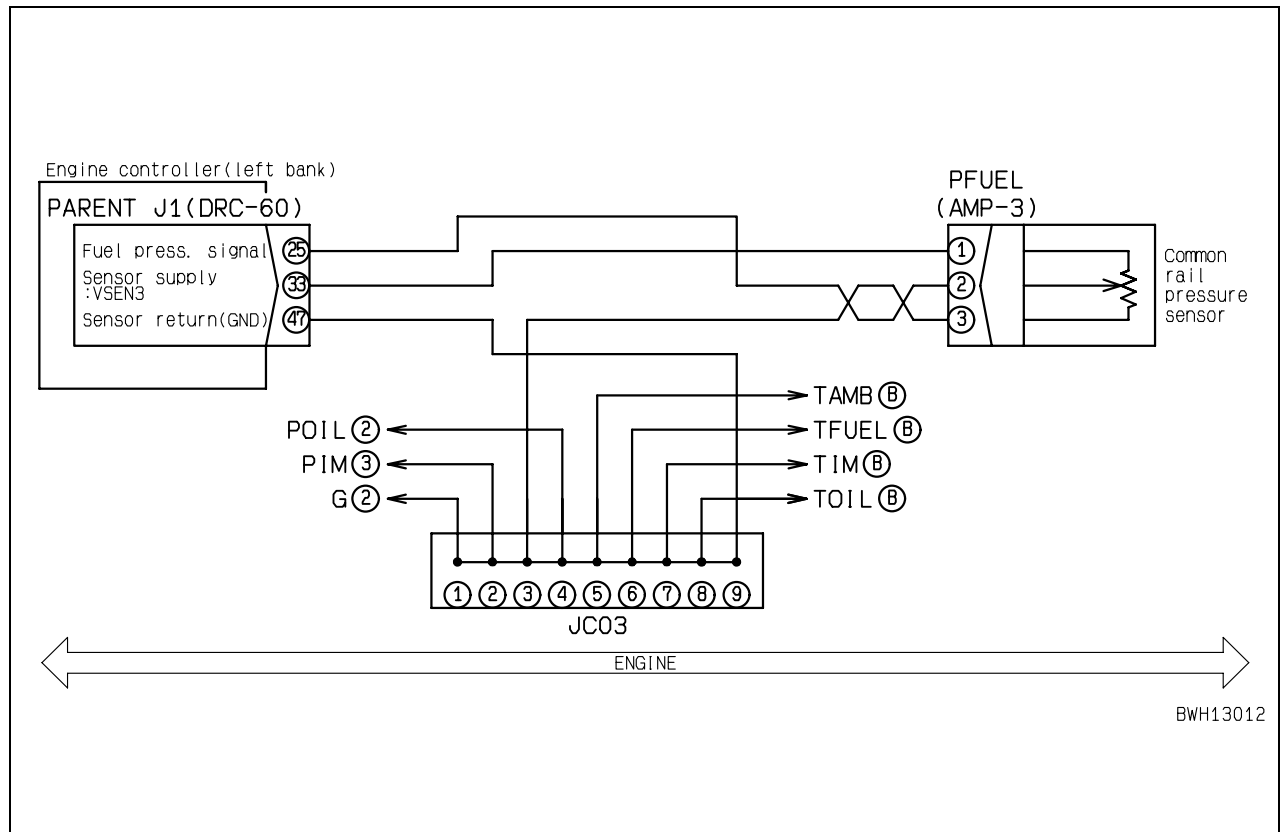
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [CB386].	

Failure code [CA386] Sensor power supply (1) abnormally high level (Left bank): High voltage detection

Action code	Failure code	Trouble	Sensor power supply (1) abnormally high level (Left bank): High voltage detection (Engine controller system)
E03	CA386		
Contents of trouble	High voltage was detected in sensor power supply (1) (5 V) circuit.		
Action of controller	- Common rail pressure sensor limits output and continues operation (Limits common rail pressure). - Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	Output lowers.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Related defective system	If another code is also displayed, carry out troubleshooting for it.			
	2	Defective sensor (Internal defect)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			When device at right is disconnected, if error code disappears, that device has defect in it.	Left common rail pressure sensor	PFUEL connector	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between PARENT J1 (female) (33) – PFUEL (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (25) – PFUEL (female) (2)		Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (47) – PFUEL (female) (3)		Resistance	Max. 1 Ω
	4	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between PARENT J1 (female) (33) – PFUEL (female) (1)		Resistance	Min. 1 MΩ
			Wiring harness between PARENT J1 (female) (25) – PFUEL (female) (2)		Resistance	Min. 1 MΩ
			Wiring harness between PARENT J1 (female) (47) – PFUEL (female) (3)		Resistance	Min. 1 MΩ
	5	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between wiring harness between PARENT J1 (female) (33) – PFUEL (female) (1) and wiring harness between PARENT J1 (female) (25) – PFUEL (female) (2)		Resistance	Min. 1 MΩ
			Between wiring harness between PARENT J1 (female) (33) – PFUEL (female) (1) and wiring harness between PARENT J1 (female) (47) – PFUEL (female) (3)		Resistance	Min. 1 MΩ
			Between wiring harness between PARENT J1 (female) (25) – PFUEL (female) (2) and wiring harness between PARENT J1 (female) (47) – PFUEL (female) (3)		Resistance	Min. 1 MΩ
	6	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
PARENT J1			Voltage			
Between (33) – (47)			4.75 – 5.25 V			

Circuit diagram related

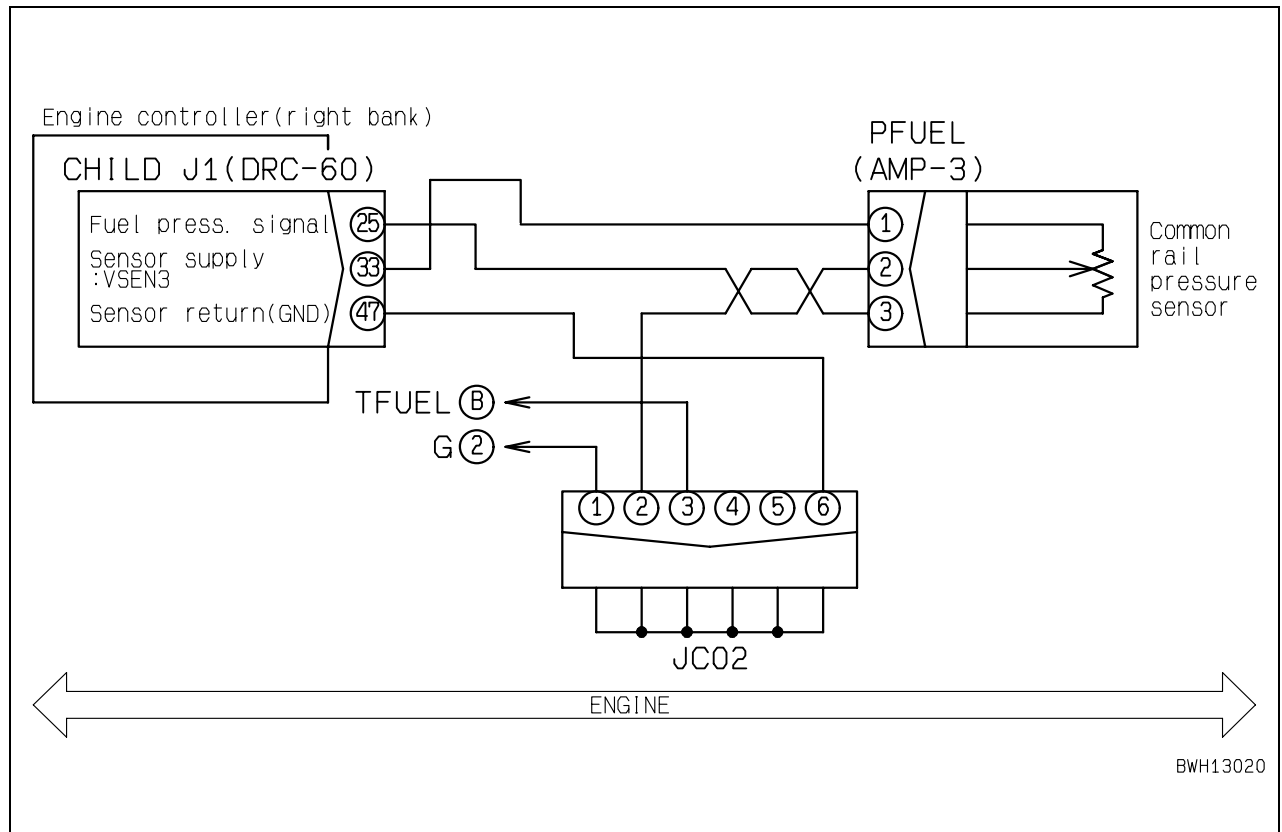


Failure code [CB386] Sensor power supply (1) abnormally high level (Right bank): High voltage detection

Action code	Failure code	Trouble	Sensor power supply (1) abnormally high level (Right bank): High voltage detection (Engine controller system)
E03	CB386		
Contents of trouble	• High voltage was detected in sensor power supply (1) (5 V) circuit.		
Action of controller	• Common rail pressure sensor limits output and continues operation (Limits common rail pressure). • Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Output lowers.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Related defective system	If another code is also displayed, carry out troubleshooting for it.			
	2	Defective sensor (Internal defect)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			When device at right is disconnected, if error code disappears, that device has defect in it.	Right common rail pressure sensor	PFUEL connector	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (33) – PFUEL (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between CHILD J1 (female) (25) – PFUEL (female) (2)		Resistance	Max. 1 Ω
			Wiring harness between CHILD J1 (female) (47) – PFUEL (female) (3)		Resistance	Max. 1 Ω
	4	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (33) – PFUEL (female) (1)		Resistance	Min. 1 MΩ
			Wiring harness between CHILD J1 (female) (25) – PFUEL (female) (2)		Resistance	Min. 1 MΩ
			Wiring harness between CHILD J1 (female) (47) – PFUEL (female) (3)		Resistance	Min. 1 MΩ
	5	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between wiring harness between CHILD J1 (female) (33) – PFUEL (female) (1) and wiring harness between CHILD J1 (female) (25) – PFUEL (female) (2)		Resistance	Min. 1 MΩ
			Between wiring harness between CHILD J1 (female) (33) – PFUEL (female) (1) and wiring harness between CHILD J1 (female) (47) – PFUEL (female) (3)		Resistance	Min. 1 MΩ
			Between wiring harness between CHILD J1 (female) (25) – PFUEL (female) (2) and wiring harness between CHILD J1 (female) (47) – PFUEL (female) (3)		Resistance	Min. 1 MΩ
	6	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			CHILD J1		Voltage	
			Between (33) – (47)		4.75 – 5.25 V	

Circuit diagram related



Failure code [CA431] Trouble in idle validation switch

Action code	Failure code	Trouble	Trouble in idle validation switch (Engine controller system)
E01	CA431		
Contents of trouble	• Both of signals 1 and 2 of idle validation switch are open or there is trouble in ground circuit.		
Action of controller	• Operates normally according to throttle sensor (E01 Testing and maintenance)		
Problem that appears on machine	• None in particular.		
Related information	- The input state (ON/OFF) from the idle validation switch 1 can be checked with the monitoring function (Code: 18300). - The input state (ON/OFF) from the idle validation switch 2 can be checked with the monitoring function (Code: 18301). - Method of reproducing failure code: Turn the starting switch ON.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective accelerator pedal (Internal defect)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			AS1		Signal name	Voltage
			Between (5) – (4)		Signal 1	See Fig. 1
			Between (6) – (4)		Signal 2	
			Sensor voltage is measured with wiring harness connected. Accordingly, if voltage is abnormal, check wiring harness and controller, too, for another cause of trouble, and then judge.			
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between J2P (female) (32) – AS1 (female) (4)		Resistance	Max. 1 Ω
			Wiring harness between J2P (female) (11) – AS1 (female) (5)		Resistance	Max. 1 Ω
			Wiring harness between J2P (female) (1) – AS1 (female) (6)		Resistance	Max. 1 Ω
	3	Grounding fault in wiring harness (Short circuit with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between J2P (female) (32) – AS1 (female) (4)		Resistance	Min. 1 MΩ
			Wiring harness between J2P (female) (11) – AS1 (female) (5)		Resistance	Min. 1 MΩ
			Wiring harness between J2P (female) (1) – AS1 (female) (6)		Resistance	Min. 1 MΩ
	4	Hot short (Short circuit with 24V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between J2P (female) (32) – AS1 (female) (4)		Voltage	Max. 1 V
			Wiring harness between J2P (female) (11) – AS1 (female) (5)		Voltage	Max. 1 V
			Wiring harness between J2P (female) (1) – AS1 (female) (6)		Voltage	Max. 1 V
	5	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			J2P	Signal name	Voltage	
Between (11) – (32)			Signal 1	See Fig. 1		
Between (1) – (32)			Signal 2			

Circuit diagram related

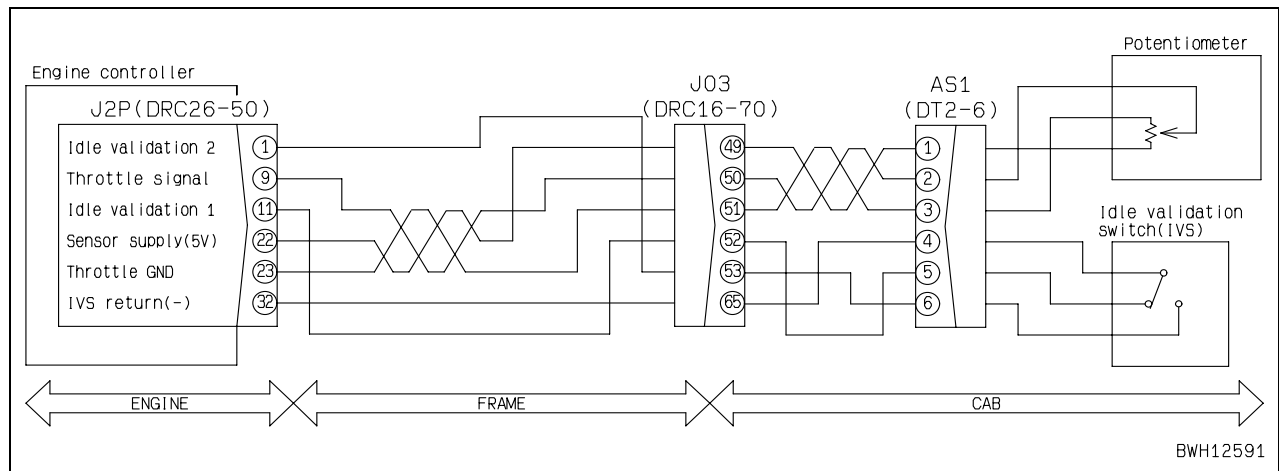
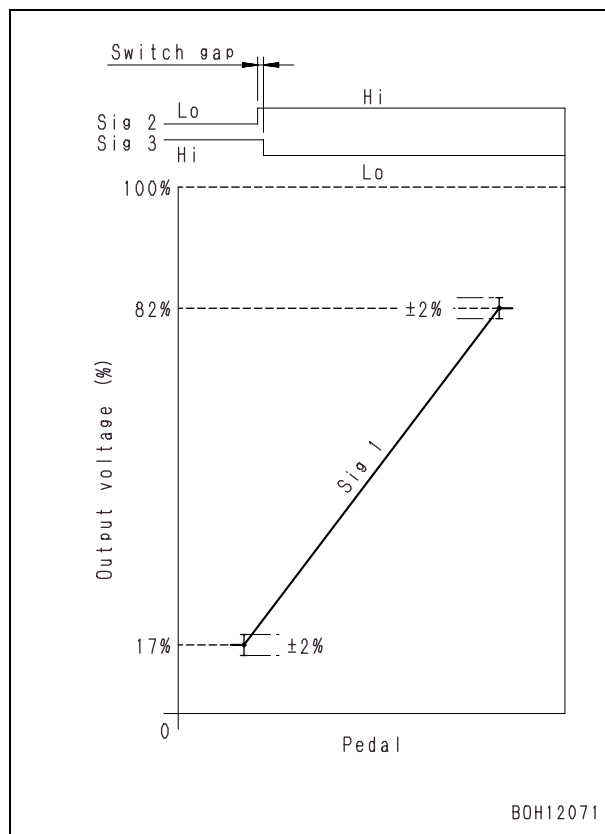


Fig. 1



Pedal: Stroke of accelerator pedal
 Output voltage: Output voltage (%)
 Sig1: Signal voltage of throttle sensor
 Sig2: Signal voltage of idle validation switch 1
 Sig3: Signal voltage of idle validation switch 2
 Lo: Switch circuit is closed
 Hi: Switch circuit is open
 Switch gap: Overlap between signals of switch 1 and switch 2

Failure code [CA432] Idle validation action error

Action code	Failure code	Trouble	Idle validation action error (Engine controller system)
E03	CA432		
Contents of trouble	Action error was detected in idle validation switch circuit.		
Action of controller	- Operates at position of throttle of accelerator pedal (throttle sensor). - Turns the centralized warning lamp and alarm buzzer ON.		
Problem that appears on machine			
Related information	- The input state (ON/OFF) from the idle validation switch 1 can be checked with the monitoring function (Code: 18300). - The input state (ON/OFF) from the idle validation switch 2 can be checked with the monitoring function (Code: 18301). - Method of reproducing failure code: Turn the starting switch ON.		

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [CA431].	

Failure code [CA441] Power supply voltage abnormally low level (Left bank): Low voltage detection

Action code	Failure code	Trouble	Power supply voltage abnormally low level (Left bank): Low voltage detection (Engine controller system)
E03	CA441		
Contents of trouble	• Low voltage was detected in power supply voltage circuit.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Machine continues operation normally but may stop suddenly or may not able to start again once it stops.		
Related information			

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [CA111].	

Failure code [CB441] Power supply voltage abnormally low level (Right bank): Low voltage detection

Action code	Failure code	Trouble	Power supply voltage abnormally low level (Right bank): Low voltage detection (Engine controller system)
E03	CB441		
Contents of trouble	• Low voltage was detected in power supply voltage circuit.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Machine continues operation normally but may stop suddenly or may not able to start again once it stops.		
Related information			

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [CB111].	

Failure code [CA442] Power supply voltage abnormally high level (Left bank): High voltage detection

Action code	Failure code	Trouble	Power supply voltage abnormally high level (Left bank): High voltage detection (Engine controller system)
E03	CA442		
Contents of trouble	• High voltage was detected in power supply voltage circuit.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Machine continues operation normally but may stop suddenly or may not able to start again once it stops.		
Related information			

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [CA111].	

Failure code [CB442] Power supply voltage abnormally high level (Right bank): High voltage detection

Action code	Failure code	Trouble	Power supply voltage abnormally high level (Right bank): High voltage detection (Engine controller system)
E03	CB442		
Contents of trouble	• High voltage was detected in power supply voltage circuit.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Machine continues operation normally but may stop suddenly or may not able to start again once it stops.		
Related information			

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [CB111].	

Failure code [CA449] Common rail abnormally high pressure (2) (Left bank): Abnormally high pressure occurrence

Action code	Failure code	Trouble	Common rail abnormally high pressure (2) (Left bank): Abnormally high pressure occurrence (Engine controller system)
E03	CA449		
Contents of trouble	• Common rail pressure sensor circuit detected abnormally high pressure (Level 2).		
Action of controller	- Limits output and continues operation (Limits common rail pressure). - Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Output lowers.		
Related information			

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [CA2249].	

Failure code [CB449] Common rail abnormally high pressure (2) (Right bank): Abnormally high pressure occurrence

Action code	Failure code	Trouble	Common rail abnormally high pressure (2) (Right bank): Abnormally high pressure occurrence (Engine controller system)
E03	CB449		
Contents of trouble	• Common rail pressure sensor circuit detected abnormally high pressure (Level 2).		
Action of controller	- Limits output and continues operation (Limits common rail pressure). - Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Output lowers.		
Related information			

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [CB2249].	

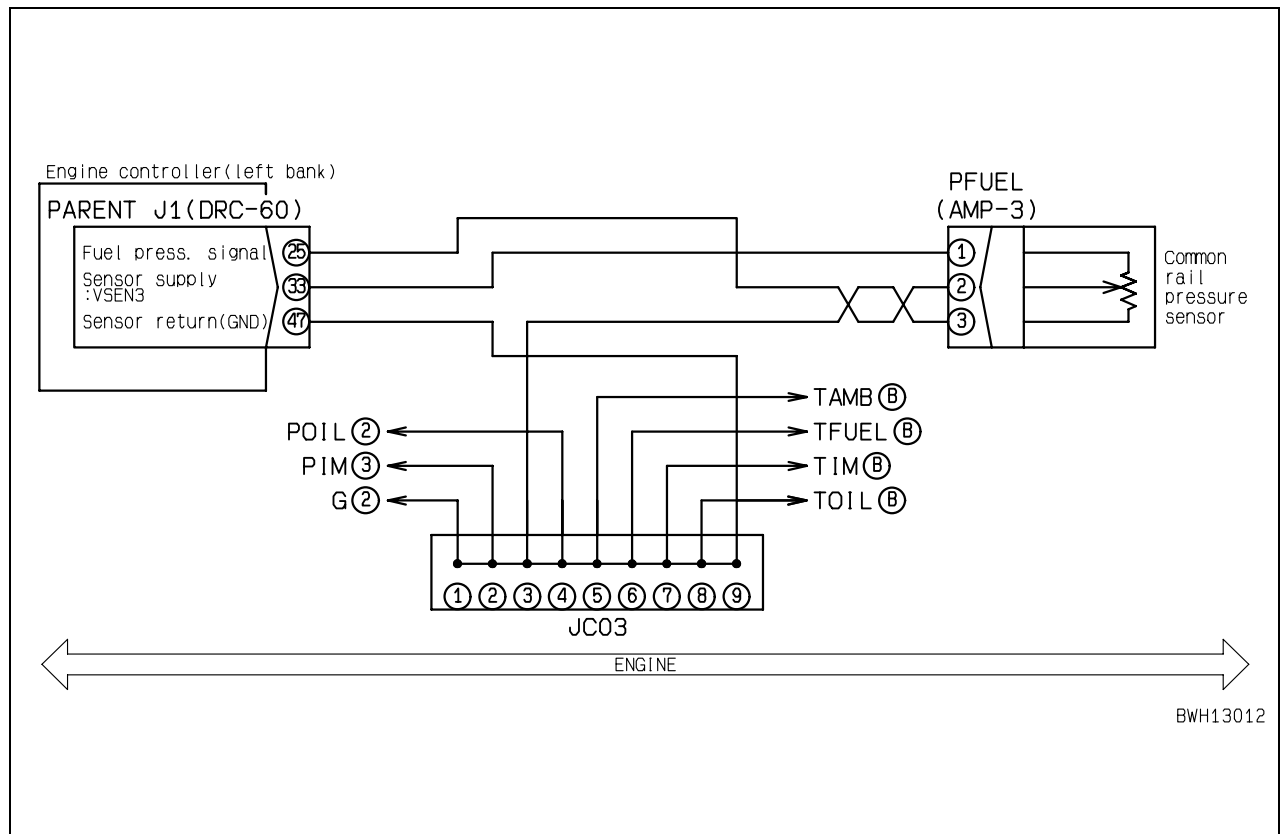
Failure code [CA451] Common rail pressure sensor too high (At left bank): Excessively high voltage detected

Action code	Failure code	Trouble	Common rail pressure sensor too high (At left bank): Excessively high voltage detected (Engine controller system)
E03	CA451		
Contents of trouble	Excessively high voltage has occurred in the common rail pressure sensor circuit.		
Action of controller	- Operates with limited output.(Limits common rail pressure.) - Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	Output decreases.		
Related information	Input state from common rail pressure sensor can be checked with monitoring function. (Code: 36400 Common rail pressure (Left bank), Code 36402 Common rail pressure sensor voltage (Left bank))		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective sensor power source circuit	If failure code [CA352] or [CA386] is displayed, carry out troubleshooting for it first.			
	2	Defective common rail pressure sensor (internal defect)	★ Prepare with starting switch OFF, and diagnose with starting switch ON or with engine started.			
			PFUEL		Voltage	
			Between (1) – (3)	Power source	4.75 – 5.25 V	
			Between (2) – (3)	Signal	0.25 – 4.6 V	
			Since the sensor voltage is measured with the harness being connected, if the voltage is abnormal, first check the harness and the controller to make it sure if there is no other cause of the trouble, and then judge the sensor voltage.			
	3	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Wiring harness between PARENT J1 (female) (33) – PFUEL (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (25) – PFUEL (female) (2)		Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (47) – PFUEL (female) (3)		Resistance	Max. 1 Ω
	4	Defective harness grounding (contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between ground and wiring harness between PARENT J1 (female) (33) – PFUEL (female) (1)		Resistance	Min. 1 MΩ
			Between ground and wiring harness between PARENT J1 (female) (25) – PFUEL (female) (2)		Resistance	Min. 1 MΩ
			Between ground and wiring harness between PARENT J1 (female) (47) – PFUEL (female) (3)		Resistance	Min. 1 MΩ
	5	Harness short (Harness internal short)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.			
			Between wiring harness from PARENT J1 (female) (33) to PFUEL (female) (1) and wiring harness from PARENT J1 (female) (25) to PFUEL (female) (2)		Resistance	Min. 1 MΩ
			Between wiring harness from PARENT J1 (female) (33) to PFUEL (female) (1) and wiring harness from PARENT J1 (female) (47) to PFUEL (female) (3)		Resistance	Min. 1 MΩ
Between wiring harness from PARENT J1 (female) (25) to PFUEL (female) (2) and wiring harness from PARENT J1 (female) (47) to PFUEL (female) (3)			Resistance	Min. 1 MΩ		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	6	Defective engine controller	★ Prepare with starting switch OFF, and diagnose with starting switch ON or with engine started.	
			PARENT J1	Voltage
			Between (33) – (47)	4.75 – 5.25 V
			Between (25) – (47)	0.25 – 4.6 V

Circuit diagram related



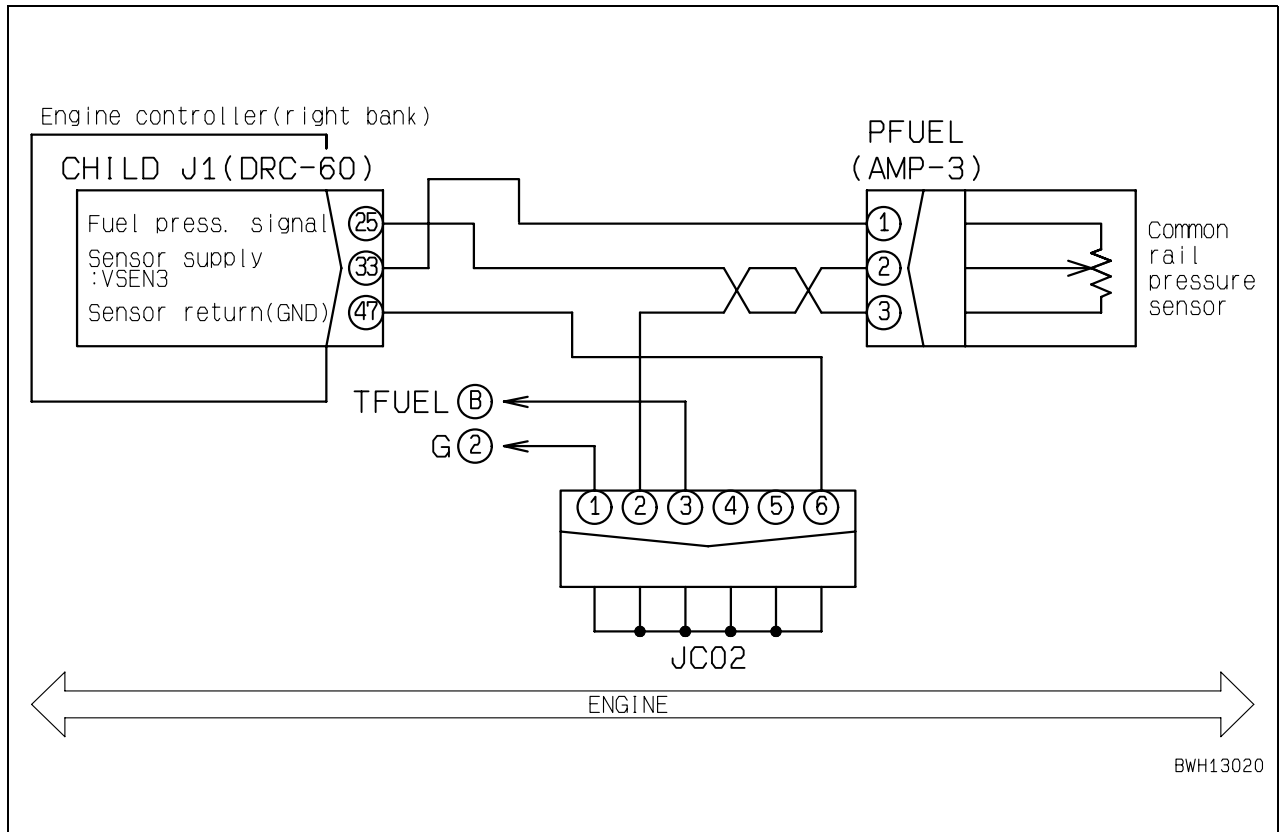
Failure code [CB451] Common rail pressure sensor abnormally high level (Right bank): High voltage detection

Action code	Failure code	Trouble	Common rail pressure sensor abnormally high level (Right bank): High voltage detection (Engine controller system)
E03	CB451		
Contents of trouble	High voltage was detected in common rail pressure sensor circuit.		
Action of controller	- Limits output and continues operation (Limits common rail pressure). - Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	Output lowers.		
Related information	Input state from common rail pressure sensor can be checked with monitoring function. (Code: 36403 Common rail pressure (Right bank), Code 36404 Common rail pressure sensor voltage (Right bank))		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective sensor power supply system	If code [CB352] or [CB386] is displayed, carry out troubleshooting for it first.			
	2	Defective common rail pressure sensor (Internal defect)	★ Prepare with starting switch OFF, then turn starting switch ON or start engine and carry out troubleshooting.			
			PFUEL		Voltage	
			Between (1) – (3)	Power supply	4.75 – 5.25 V	
			Between (2) – (3)	Signal	0.25 – 4.6 V	
			Sensor voltage is measured with wiring harness connected. Accordingly, if voltage is abnormal, check wiring harness and controller, too, for another cause of trouble, and then judge.			
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (33) – PFUEL (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between CHILD J1 (female) (25) – PFUEL (female) (2)		Resistance	Max. 1 Ω
			Wiring harness between CHILD J1 (female) (47) – PFUEL (female) (3)		Resistance	Max. 1 Ω
	4	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (33) – PFUEL (female) (1)		Resistance	Min. 1 MΩ
			Wiring harness between CHILD J1 (female) (25) – PFUEL (female) (2)		Resistance	Min. 1 MΩ
			Wiring harness between CHILD J1 (female) (47) – PFUEL (female) (3)		Resistance	Min. 1 MΩ
	5	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between wiring harness between CHILD J1 (female) (33) – PFUEL (female) (1) and wiring harness between CHILD J1 (female) (25) – PFUEL (female) (2)		Resistance	Min. 1 MΩ
			Between wiring harness between CHILD J1 (female) (33) – PFUEL (female) (1) and wiring harness between CHILD J1 (female) (47) – PFUEL (female) (3)		Resistance	Min. 1 MΩ
			Between wiring harness between CHILD J1 (female) (25) – PFUEL (female) (2) and wiring harness between CHILD J1 (female) (47) – PFUEL (female) (3)		Resistance	Min. 1 MΩ

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	6	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.	
			CHILD J1	Voltage
			Between (33) – (47)	4.75 – 5.25 V
			Between (25) – (47)	0.25 – 4.6 V

Circuit diagram related



Failure code [CA452] Common rail pressure sensor abnormally low level (Left bank): Abnormally low voltage detection

Action code	Failure code	Trouble	Common rail pressure sensor abnormally low level (Left bank): Abnormally low voltage detection (Engine controller system)
E03	CA452		
Contents of trouble	• Low voltage was detected in common rail pressure sensor circuit.		
Action of controller	• Limits output and continues operation (Limits common rail pressure). • Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Output lowers.		
Related information	• Input state from common rail pressure sensor can be checked with monitoring function. (Code: 36400 Common rail pressure (Left bank), Code 36402 Common rail pressure sensor voltage (Left bank))		
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting	
	Carry out troubleshooting for failure code [CA451].		

Failure code [CB452] Common rail pressure sensor abnormally low level (Right bank): Abnormally low voltage detection

Action code	Failure code	Trouble	Common rail pressure sensor abnormally low level (Right bank): Abnormally low voltage detection (Engine controller system)
E03	CB452		
Contents of trouble	• Low voltage was detected in common rail pressure sensor circuit.		
Action of controller	• Limits output and continues operation (Limits common rail pressure). • Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Output lowers.		
Related information	• Input state from common rail pressure sensor can be checked with monitoring function. (Code: 36403 Common rail pressure (Right bank), Code 36404 Common rail pressure sensor voltage (Right bank))		

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [CB451].	

Failure code [CA553] Common rail pressure too high (1) (At left bank): Excessively high pressure detected

Action code	Failure code	Trouble	Common rail pressure high trouble (1) (At left bank): Excessively high pressure trouble occurred (Engine controller system)
E03	CA553		
Contents of trouble	• Excessively high pressure (level 1) has been detected in the common rail pressure sensor circuit.		
Action of controller	• Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Output decreases.		
Related information	• Input state from common rail pressure sensor can be checked with monitoring function. (Code: 36400 Common rail pressure (Left bank), Code 36402 Common rail pressure sensor voltage (Left bank))		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective related circuits	Check the codes that are displayed at the same time. If any other codes are displayed, carry out troubleshooting for those codes.
	2	Improper fuel has been used.	Since the use of improper fuel can be suspected, check the fuel. (Viscosity is too high)
	3	Defective electrical system of common rail pressure sensor	Since an electrical defect of common rail pressure sensor is suspected, carry out troubleshooting for the following code. [CA451]
	4	Defective mechanical system of common rail pressure sensor	Since a mechanical defect of common rail pressure sensor is suspected, directly check the sensor.
	5	Defective overflow valve	Since a damage of spring, wear of seat or sticking of ball is suspected, directly check them.
	6	Clogged overflow piping	Since an overflow piping is suspected to be clogged, directly check it.
	7	Defective pressure limiter	Since a mechanical defect of pressure limiter is suspected, directly check the limiter.

Failure code [CB553] Common rail pressure too high (1) (At right bank): Excessively high pressure detected

Action code	Failure code	Trouble	Common rail pressure high trouble (1) (At right bank): Excessively high pressure trouble occurred (Engine controller system)
E03	CB553		
Contents of trouble	• Excessively high pressure (level 1) has been detected in the common rail pressure sensor circuit.		
Action of controller	• Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Output decreases.		
Related information	• Input state from common rail pressure sensor can be checked with monitoring function. (Code: 36403 Common rail pressure (Right bank), Code 36404 Common rail pressure sensor voltage (Right bank))		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective related circuits	Check the codes that are displayed at the same time. If any other codes are displayed, carry out troubleshooting for those codes.
	2	Improper fuel has been used.	Since the use of improper fuel can be suspected, check the fuel. (Viscosity is too high)
	3	Defective electrical system of common rail pressure sensor	Since an electrical defect of common rail pressure sensor is suspected, carry out troubleshooting for the following code. [CB451]
	4	Defective mechanical system of common rail pressure sensor	Since a mechanical defect of common rail pressure sensor is suspected, directly check the sensor.
	5	Defective overflow valve	Since a damage of spring, wear of seat or sticking of ball is suspected, directly check them.
	6	Clogged overflow piping	Since an overflow piping is suspected to be clogged, directly check it.
	7	Defective pressure limiter	Since a mechanical defect of pressure limiter is suspected, directly check the limiter.

Failure code [CA554] In-range error in common rail pressure sensor (At left bank): In-range error

Action code	Failure code	Trouble	In-range error in common rail pressure sensor (At left bank): In-range error occurred (Engine controller system)
E03	CA554		
Contents of trouble	In-range error has occurred in common rail pressure sensor circuit.		
Action of controller	- Operates with limited output.(Limits common rail pressure.) - Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	Output decreases.		
Related information			

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting of [CA451].	

Failure code [CB554] In-range error in common rail pressure sensor (At right bank): In-range error

Action code	Failure code	Trouble	In-range error in common rail pressure sensor (At right bank): In-range error occurred (Engine controller system)
E03	CB554		
Contents of trouble	In-range error has occurred in common rail pressure sensor circuit.		
Action of controller	- Operates with limited output.(Limits common rail pressure.) - Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	Output decreases.		
Related information			

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting of [CB451].	

Failure code [CA559] Loss of pressure feed from supply pump (1) (At left bank): Loss of pressure feed detected

Action code	Failure code	Trouble	Loss of pressure feed from supply pump (1) (At left bank): Loss of pressure feed detected (Engine controller system)
E03	CA559		
Contents of trouble	• Loss of pressure feed (level 1) from supply pump has occurred.		
Action of controller	- Limits common rail pressure. - Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Output decreases.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	1	Defective related circuits	Check the codes that are displayed at the same time. If any other codes are displayed, carry out troubleshooting for those codes.	
	2	Improper fuel has been used.	Since the use of improper fuel is suspected, directly check the fuel.	
	3	Defective low pressure circuit device	★ See "Note 1" for the contents of diagnosis. See Testing and adjusting "Testing fuel pressure" for the pressure inspection of the fuel low pressure circuit.	
			Pressure in fuel low pressure circuit (At high idle or under the load equivalent to rating (stalling))	Min. 0.15 MPa {Min. 1.5 kg/cm ² }
	4	Clogged filter or strainer	★ See "Note 2" for the contents of diagnosis.	
	5	Defective electrical system of supply pump PCV	Since an electrical defect of supply pump PCV is suspected, carry out troubleshooting for the following codes. [CA271], [CA272], [CA273], and [CA274]	
	6	Defective common rail pressure sensor	Since a defect of common rail pressure sensor is suspected, check for a damage in harnesses.	
	7	Defective pressure limiter	★ As for testing an amount of pressure limiter leak, see testing and adjusting "Testing fuel return and leak amount".	
			Pressure limiter leak amount	Max. 10 cc/min. [Equivalent to rated operation (stalling)]
	8	Defective injector	★ As for the test relating to return (spill) limit amount of injector, see Testing and adjusting "Testing fuel return and leak amount".	
			Speed under the conditions which are equivalent to rated operation (stalling)	Injector return (spill) limit amount
			1,600 rpm	960 cc/min
			1,700 rpm	1,020 cc/min
			1,800 rpm	1,080 cc/min
			1,900 rpm	1,140 cc/min
			2,000 rpm	1,200 cc/min
	9	Defective supply pump	Supply pump can be suspected to be defective if no problem is found in causes 1 – 8.	

<How to use check sheet>

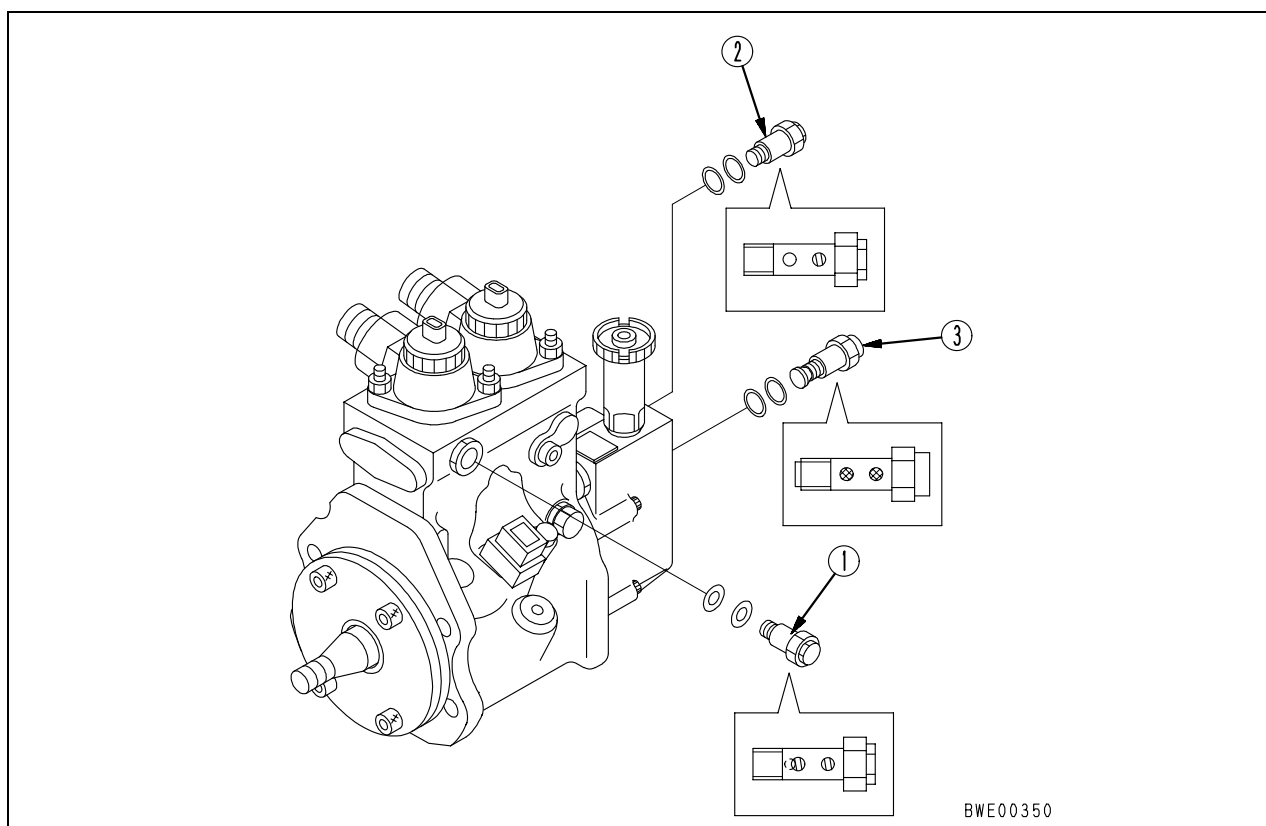
Carry out the above troubleshooting and take a record of the contents of the attached "Check sheet for no-pressure feed".

Note 1: When low-pressure circuit equipment is defective, check the following:

- 1) Fuel level
- 2) Clogged fuel tank breather
- 3) Stuck or worn feed pump, clogged filter
- 4) Leaked or clogged low-pressure fuel pipe
- 5) Bypass valve malfunction, defective assembly of other parts (See Fig.1.)
- 6) Clogged fuel filter
- 7) Fuel in oil pan (fuel leakage in head cover)

Fig. 1: Locations of overflow valve (1), bypass valve (2), and fuel inlet joint (3)

- Overflow valve (1): Spring is seen through both holes.
- Bypass valve (2): Spring is seen through hole on nut side.
- Fuel inlet joint (3): Gauze filter is seen through both holes.



Note 2: Check, clean, and replace the filters and strainers according to the following procedure.

- 1) Gauze filter: Disassemble and check. If clogged, clean.
- 2) Upstream strainer of gauze filter: If the gauze filter is clogged, clean the upstream filter, too.
- 3) Fuel filter: If the trouble is not solved by performing 1) and 2) above, replace the fuel filter.

Check sheet for no-pressure feed

Model	HD785-7	Operation No.	
Model and serial No.	#	Date inspected	/ /
Engine		Service meter	h
Engine serial No.	#	Worker's name	

A. Visual inspections

		Pass	Fail
1	Fuel leakage to outside		
2	Clogged fuel tank breather		

B. Inspections with monitor panel (failure history, monitoring, and reduced cylinder mode operation)

							Pass	Fail
3	Checking failure codes	/	/	/	/			
4	Checking monitoring information							
	Code	Display item	Condition for inspection	Unit	Standard value (reference value)	Measured value	Pass	Fail
	*1	Engine speed	Low idle	rpm	625 – 675			
			High idle	rpm	2,200 – 2,300			
			Equivalent to rating	rpm	1,900			
	*2	Throttle speed	Low idle	%	0			
			High idle	%	100			
	*3	Command for fuel injection rate	Equivalent to rating	mm ³	—		—	—
	*4	Command for common rail pressure	Equivalent to rating	MPa				
	*5	Fuel pressure in common rail	Equivalent to rating	MPa				
	*6	Command for fuel injection timing	Low idle	CA	—		—	—
			High idle	CA	—		—	—
			Equivalent to rating	CA	—		—	—
	*7	Boost pressure	Equivalent to rating	kPa	—		—	—
5	Checking reduced cylinder mode operation (engine speed)							
	Function	Cut-out cylinder	Condition for inspection	Unit	Standard value (reference value)	Measured value	Pass	Fail
	*11	Cylinder No. 1	Low idle	rpm	—		—	—
		Cylinder No. 2	Low idle	rpm	—		—	—
		Cylinder No. 3	Low idle	rpm	—		—	—
		Cylinder No. 4	Low idle	rpm	—		—	—
		Cylinder No. 5	Low idle	rpm	—		—	—
		Cylinder No. 6	Low idle	rpm	—		—	—

C. Inspection of pressure in fuel circuit

		Condition for inspection	Unit	Standard value (reference value)	Measured value	Pass	Fail
6	Pressure in fuel low pressure circuit	At high idle or under the load equivalent to rating (stalling)	MPa {kg/cm ² }	Min. 0.15 {Min. 1.5}			

D. Inspection of strainer and filter

		Pass	Fail
7	Visual inspection of strainer		
8	Visual inspection of gauze filter		
9	Visual inspection of fuel filter		
10	Visual inspection of bypass valve		

E. Inspection of fuel leak and return amount

E. Inspection of fuel leak and return amount		Condition for inspection	Unit	Standard value (reference value)	Measured value	Pass	Fail
11	Pressure limiter leak amount	Under the load equivalent to rating (stalling)	cc/min	Max 10			
12	Injector return amount	Equivalent to rating: 1,600 rpm	cc/min	960	Rotation speed:		
		Equivalent to rating: 1,700 rpm	cc/min	1,020			
		Equivalent to rating: 1,800 rpm	cc/min	1,080	Return amount:		
		Equivalent to rating: 1,900 rpm	cc/min	1,140			
		Equivalent to rating: 2,000 rpm	cc/min	1,200			

Inspection items *1 – *10 of B-4:

When inspecting with the monitoring function, see “Monitoring code table”.

Inspection items *11 of B-5:

When inspecting with the monitoring function, see “Adjustment mode table”.

Equivalent to rating: 1) Engine at full throttle, 2) Relieve pressure in each work equipment cylinder

Failure code [CB559] Loss of pressure feed from supply pump (1) (At right bank): Loss of pressure feed detected

Action code	Failure code	Trouble	Loss of pressure feed from supply pump (1) (At right bank): Loss of pressure feed detected (Engine controller system)
E03	CB559		
Contents of trouble	• Loss of pressure feed (level 1) from supply pump has occurred.		
Action of controller	- Limits common rail pressure. - Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Output decreases.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	1	Defective related circuits	Check the codes that are displayed at the same time. If any other codes are displayed, carry out troubleshooting for those codes.	
	2	Improper fuel has been used.	Since the use of improper fuel is suspected, directly check the fuel.	
	3	Defective low pressure circuit device	★ See "Note 1" for the contents of diagnosis. See Testing and adjusting "Testing fuel pressure" for the pressure inspection of the fuel low pressure circuit.	
			Pressure in fuel low pressure circuit (At high idle or under the load equivalent to rating (stalling))	Min. 0.15 MPa {Min. 1.5 kg/cm ² }
	4	Clogged filter or strainer	★ See "Note 2" for the contents of diagnosis.	
	5	Defective electrical system of supply pump PCV	Since an electrical defect of supply pump PCV is suspected, carry out troubleshooting for the following codes. [CB271], [CB272], [CB273], and [CB274]	
	6	Defective common rail pressure sensor	Since a defect of common rail pressure sensor is suspected, check for a damage in harnesses.	
	7	Defective pressure limiter	★ As for testing an amount of pressure limiter leak, see testing and adjusting "Testing fuel return and leak amount".	
			Pressure limiter leak amount	Max. 10 cc/min. [Equivalent to rated operation (stalling)]
	8	Defective injector	★ As for the test relating to return (spill) limit amount of injector, see Testing and adjusting "Testing fuel return and leak amount".	
			Speed under the conditions which are equivalent to rated operation (stalling)	Injector return (spill) limit amount
			1,600 rpm	960 cc/min
			1,700 rpm	1,020 cc/min
			1,800 rpm	1,080 cc/min
			1,900 rpm	1,140 cc/min
			2,000 rpm	1,200 cc/min
	9	Defective supply pump	Supply pump can be suspected to be defective if no problem is found in causes 1 – 8.	

<How to use check sheet>

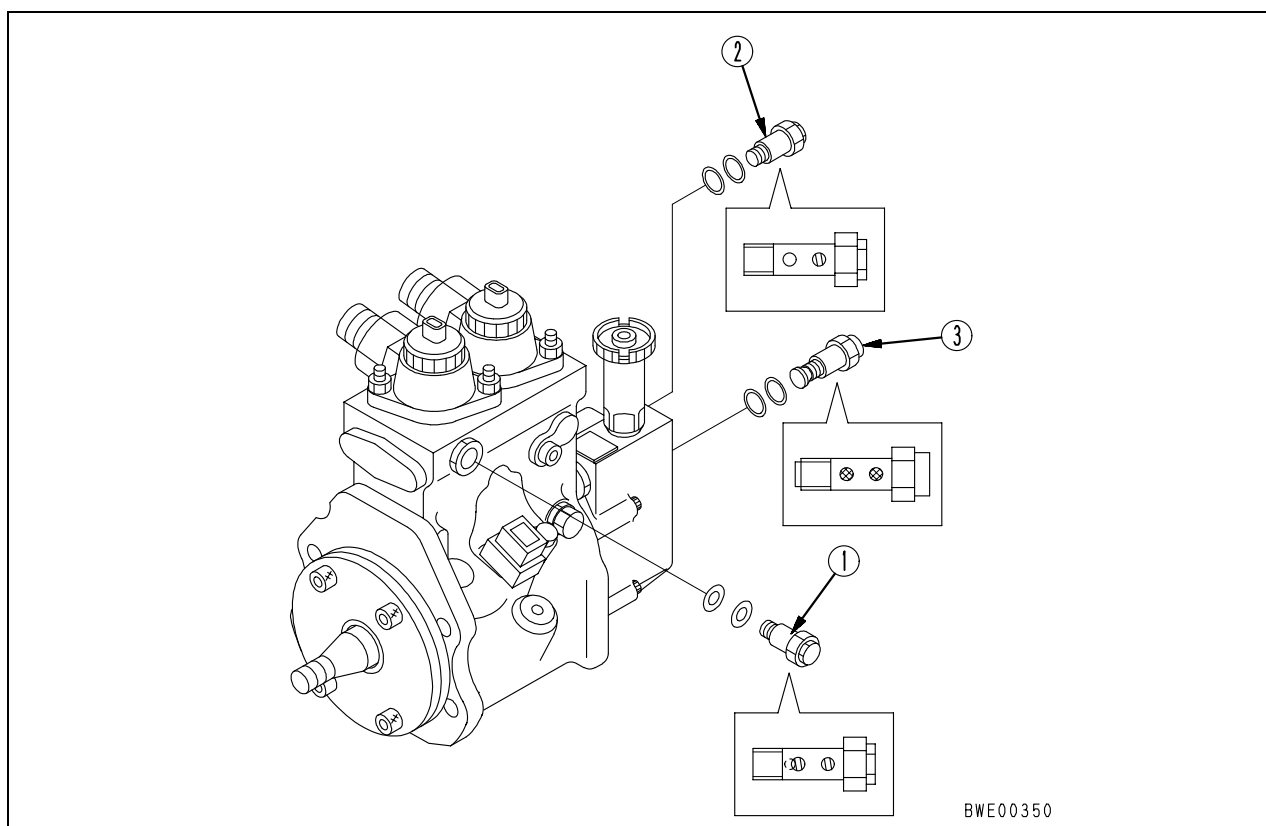
Carry out the above troubleshooting and take a record of the contents of the attached "Check sheet for no-pressure feed".

Note 1: When low-pressure circuit equipment is defective, check the following:

- 1) Fuel level
- 2) Clogged fuel tank breather
- 3) Stuck or worn feed pump, clogged filter
- 4) Leaked or clogged low-pressure fuel pipe
- 5) Bypass valve malfunction, defective assembly of other parts (See Fig.1.)
- 6) Clogged fuel filter
- 7) Fuel in oil pan (fuel leakage in head cover)

Fig. 1: Locations of overflow valve (1), bypass valve (2), and fuel inlet joint (3)

- Overflow valve (1): Spring is seen through both holes.
- Bypass valve (2): Spring is seen through hole on nut side.
- Fuel inlet joint (3): Gauze filter is seen through both holes.



Note 2: Check, clean, and replace the filters and strainers according to the following procedure.

- 1) Gauze filter: Disassemble and check. If clogged, clean.
- 2) Upstream strainer of gauze filter: If the gauze filter is clogged, clean the upstream filter, too.
- 3) Fuel filter: If the trouble is not solved by performing 1) and 2) above, replace the fuel filter.

Check sheet for no-pressure feed

Model	HD785-7	Operation No.	
Model and serial No.	#	Date inspected	/ /
Engine		Service meter	h
Engine serial No.	#	Worker's name	

A. Visual inspections

		Pass	Fail
1	Fuel leakage to outside		
2	Clogged fuel tank breather		

B. Inspections with monitor panel (failure history, monitoring, and reduced cylinder mode operation)

							Pass	Fail
3	Checking failure codes	/	/	/	/			
4	Checking monitoring information							
	Code	Display item	Condition for inspection	Unit	Standard value (reference value)	Measured value	Pass	Fail
	*1	Engine speed	Low idle	rpm	625 – 675			
			High idle	rpm	2,200 – 2,300			
			Equivalent to rating	rpm	1,900			
	*2	Throttle speed	Low idle	%	0			
			High idle	%	100			
	*3	Command for fuel injection rate	Equivalent to rating	mm ³	—		—	—
	*4	Command for common rail pressure	Equivalent to rating	MPa				
	*5	Fuel pressure in common rail	Equivalent to rating	MPa				
	*6	Command for fuel injection timing	Low idle	CA	—		—	—
			High idle	CA	—		—	—
			Equivalent to rating	CA	—		—	—
	*7	Boost pressure	Equivalent to rating	kPa	—		—	—
5	*8	Coolant temperature (high temperature)	Low idle	°C	—		—	—
	*9	Coolant temperature (low temperature)	Low idle	°C	—		—	—
	*10	Fuel temperature	Low idle	°C	—		—	—
	Checking reduced cylinder mode operation (engine speed)							
	Function	Cut-out cylinder	Condition for inspection	Unit	Standard value (reference value)	Measured value	Pass	Fail
	*11	Cylinder No. 1	Low idle	rpm	—		—	—
		Cylinder No. 2	Low idle	rpm	—		—	—
		Cylinder No. 3	Low idle	rpm	—		—	—
		Cylinder No. 4	Low idle	rpm	—		—	—
		Cylinder No. 5	Low idle	rpm	—		—	—
		Cylinder No. 6	Low idle	rpm	—		—	—

C. Inspection of pressure in fuel circuit

		Condition for inspection	Unit	Standard value (reference value)	Measured value	Pass	Fail
6	Pressure in fuel low pressure circuit	At high idle or under the load equivalent to rating (stalling)	MPa {kg/cm ² }	Min. 0.15 {Min. 1.5}			

D. Inspection of strainer and filter

		Pass	Fail
7	Visual inspection of strainer		
8	Visual inspection of gauze filter		
9	Visual inspection of fuel filter		
10	Visual inspection of bypass valve		

E. Inspection of fuel leak and return amount

E. Inspection of fuel leak and return amount		Condition for inspection	Unit	Standard value (reference value)	Measured value	Pass	Fail
11	Pressure limiter leak amount	Under the load equivalent to rating (stalling)	cc/min	Max 10			
12	Injector return amount	Equivalent to rating: 1,600 rpm	cc/min	960	Rotation speed:		
		Equivalent to rating: 1,700 rpm	cc/min	1,020			
		Equivalent to rating: 1,800 rpm	cc/min	1,080	Return amount:		
		Equivalent to rating: 1,900 rpm	cc/min	1,140			
		Equivalent to rating: 2,000 rpm	cc/min	1,200			

Inspection items *1 – *10 of B-4:

When inspecting with the monitoring function, see “Monitoring code table”.

Inspection items *11 of B-5:

When inspecting with the monitoring function, see “Adjustment mode table”.

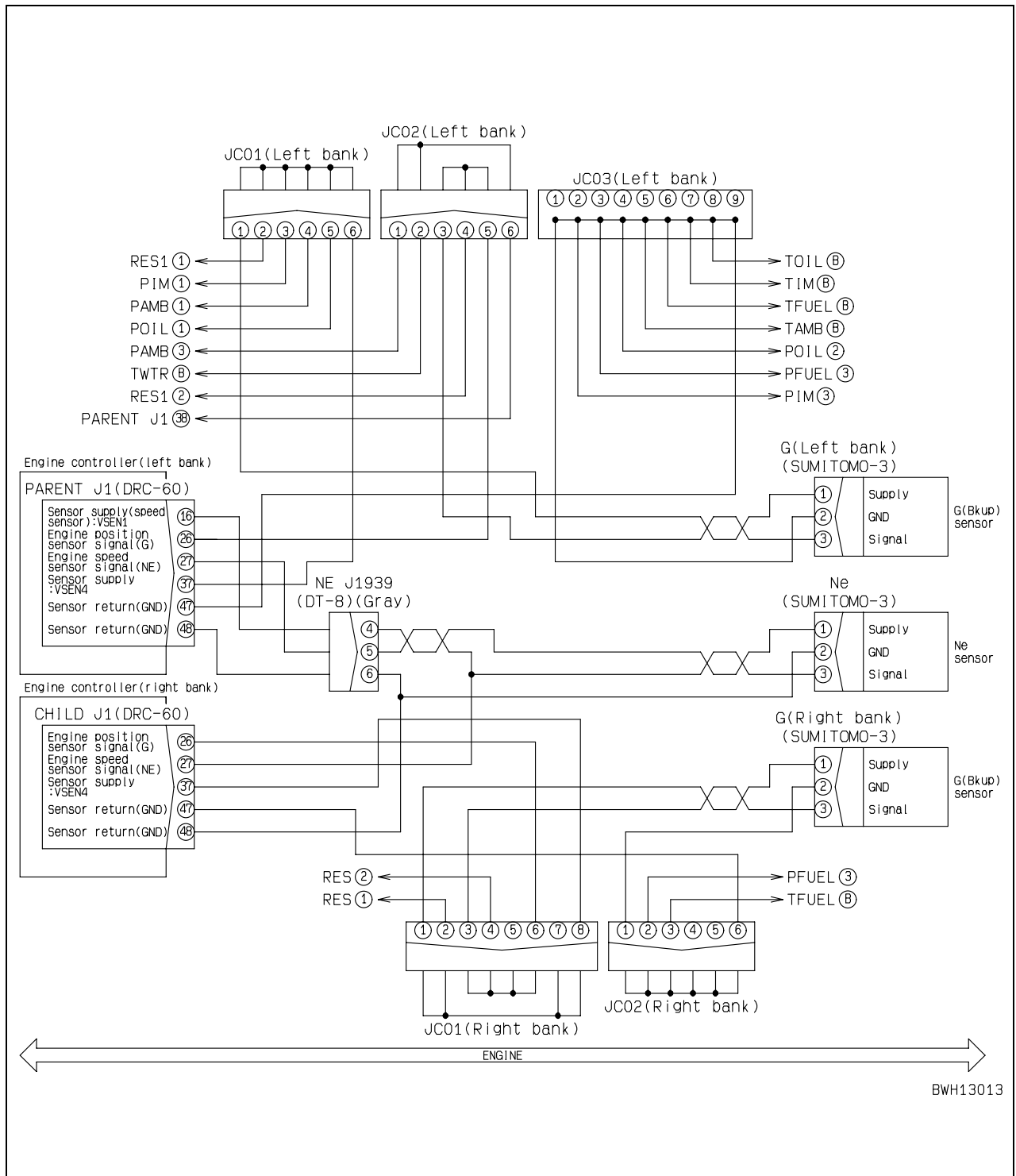
Equivalent to rating: 1) Engine at full throttle, 2) Relieve pressure in each work equipment cylinder

Failure code [CA689] Abnormal engine Ne speed sensor (At left bank): Abnormal signal

Action code	Failure code	Trouble	Abnormal engine Ne speed sensor (At left bank): Abnormal signal (Engine controller system)
E03	CA689		
Contents of trouble	• Abnormal signal of the engine Ne speed sensor has been detected.		
Action of controller	• Operates using Bkup speed sensor signal. • Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Engine stops during operation (when Bkup speed sensor is defective at the same time). • Engine cannot be started while stopping (when Bkup speed sensor is defective at the same time).		
Related information			

Possible causes and standard value in normal state	Causes		Standard value in normal state/Remarks on troubleshooting		
	1	Defective sensor power source circuit	If failure code [CA238] is displayed at the same time, carry out troubleshooting for it first.		
	2	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			Wiring harness between PARENT J1 (female) (16) – NE (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (48) – NE (female) (2)	Resistance	Max. 1 Ω
	3	Defective harness grounding (contact with ground circuit)	Wiring harness between PARENT J1 (female) (27) – NE (female) (3)	Resistance	Max. 1 Ω
			★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			Between ground and wiring harness between PARENT J1 (female) (16) – NE (female) (1)	Resistance	Min. 1 MΩ
	4	Harness short (Harness internal short)	Between ground and wiring harness between PARENT J1 (female) (48) – NE (female) (2)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between PARENT J1 (female) (27) – NE (female) (3)	Resistance	Min. 1 MΩ
			★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
	5	Defective mounting of sensor or defective parts for speed detection	Between wiring harness from PARENT J1 (female) (16) to NE (female) (1) and wiring harness from PARENT J1 (female) (48) to NE (female) (2)	Resistance	Min. 1 MΩ
			Between wiring harness from PARENT J1 (female) (16) to NE (female) (1) and wiring harness from PARENT J1 (female) (27) to NE (female) (3)	Resistance	Min. 1 MΩ
			Between wiring harness from PARENT J1 (female) (48) to NE (female) (2) and wiring harness from PARENT J1 (female) (27) to NE (female) (3)	Resistance	Min. 1 MΩ
	6	Defective engine Ne speed sensor	Since defective mounting of Ne speed sensor (improper gap) or defective parts for speed detection (flywheel) can be suspected, directly check it.		
	7	Defective engine controller	Engine Ne speed sensor can be suspected to be defective if no problem is found in causes 1 – 5 (since this is an internal defect, it cannot be diagnosed).		
			Engine controller can be suspected to be defective if no problem is found in causes 1 – 6 (since this is an internal defect, it cannot be diagnosed).		

Circuit diagram related

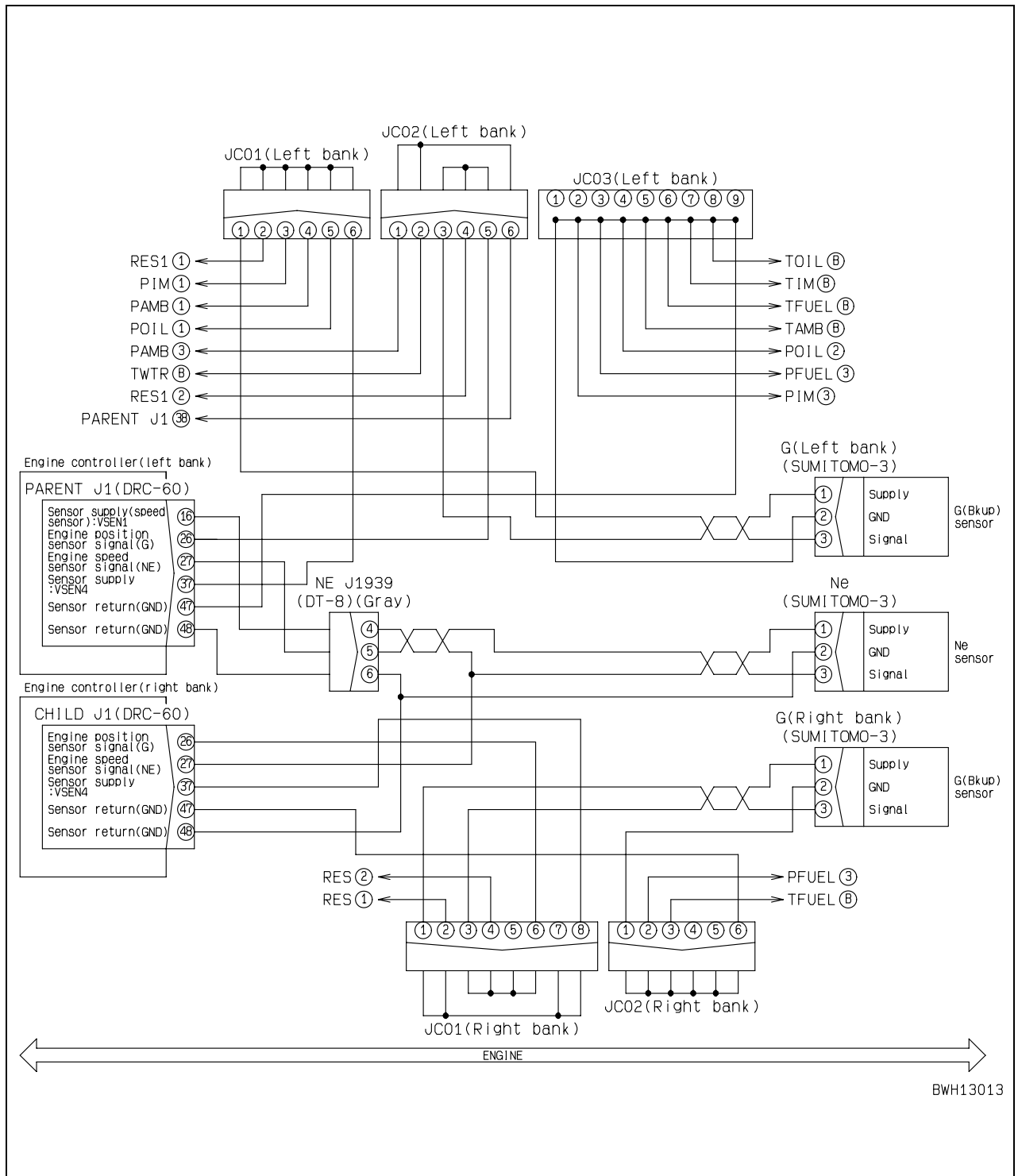


Failure code [CB689] Abnormal engine Ne speed sensor (At right bank): Abnormal signal

Action code	Failure code	Trouble	Abnormal engine Ne speed sensor (At right bank): Abnormal signal (Engine controller system)
E03	CB689		
Contents of trouble	• Abnormal signal of the engine Ne speed sensor has been detected.		
Action of controller	- Operates using Bkup speed sensor signal. - Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	- Engine stops during operation (when Bkup speed sensor is defective at the same time). - Engine cannot be started while stopping (when Bkup speed sensor is defective at the same time).		
Related information			

Possible causes and standard value in normal state	Causes		Standard value in normal state/Remarks on troubleshooting		
	1	Defective sensor power source circuit	If failure code [CB238] is displayed at the same time, carry out troubleshooting for it first.		
	2	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			Wiring harness between PARENT J1 (female) (16) – NE (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between CHILD J1 (female) (48) – NE (female) (2)	Resistance	Max. 1 Ω
	3	Defective harness grounding (contact with ground circuit)	Wiring harness between CHILD J1 (female) (27) – NE (female) (3)	Resistance	Max. 1 Ω
			★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			Between ground and wiring harness between PARENT J1 (female) (16) – NE (female) (1)	Resistance	Min. 1 MΩ
	4	Harness short (Harness internal short)	Between ground and wiring harness between CHILD J1 (female) (48) – NE (female) (2)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between CHILD J1 (female) (27) – NE (female) (3)	Resistance	Min. 1 MΩ
			Between wiring harness from PARENT J1 (female) (16) to NE (female) (1) and wiring harness from CHILD J1 (female) (48) to NE (female) (2)	Resistance	Min. 1 MΩ
	5	Defective mounting of sensor or defective parts for speed detection	Between wiring harness from PARENT J1 (female) (16) to NE (female) (1) and wiring harness from CHILD J1 (female) (27) to NE (female) (3)	Resistance	Min. 1 MΩ
			Between wiring harness from CHILD J1 (female) (48) to NE (female) (2) and wiring harness from CHILD J1 (female) (27) to NE (female) (3)	Resistance	Min. 1 MΩ
			Since defective mounting of Ne speed sensor (improper gap) or defective parts for speed detection (flywheel) can be suspected, directly check it.		
	6	Defective engine Ne speed sensor	Engine Ne speed sensor can be suspected to be defective if no problem is found in causes 1 – 5 (since this is an internal defect, it cannot be diagnosed).		
	7	Defective engine controller	Engine controller can be suspected to be defective if no problem is found in causes 1 – 6 (since this is an internal defect, it cannot be diagnosed).		

Circuit diagram related

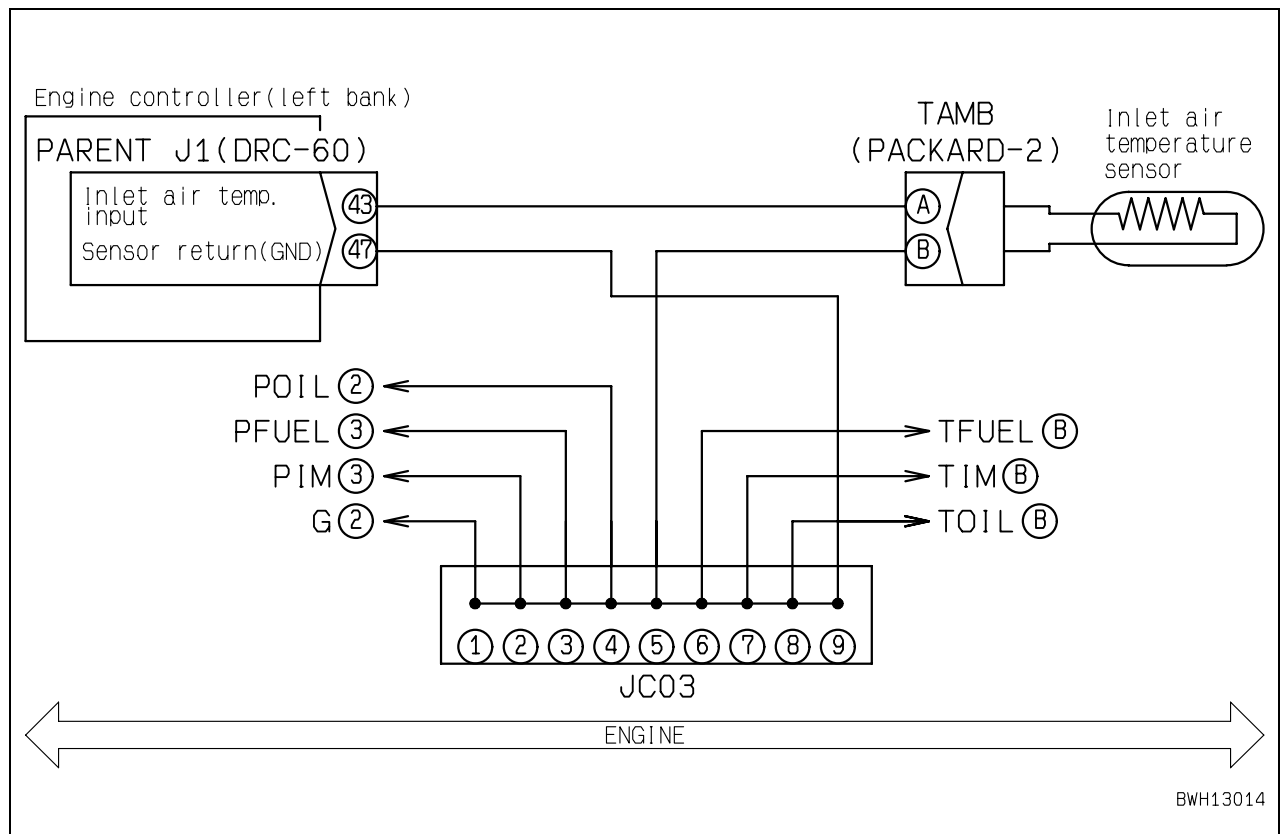


Failure code [CA691] Intake air temperature sensor abnormally high level (Only left bank): High voltage detection

Action code	Failure code	Trouble	Intake air temperature sensor abnormally high level (Only left bank): High voltage detection (Engine controller system)
E01	CA691		
Contents of trouble	• Intake air temperature sensor circuit detected high voltage.		
Action of controller	• Fixes intake air temperature (25°C) and continues operation.		
Problem that appears on machine			
Related information	• Input state from intake air temperature sensor can be checked with monitoring function. (Code: 18400 Intake air temperature, Code: 18401 Intake air temperature sensor voltage)		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective charge temperature sensor (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			TAM1	Intake air temperature	Resistance
			Between (A) – (B)	10 – 100°C	0.5 – 20 kΩ
			Between (A) – ground	All range	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between PARENT J1 (female) (43) – TAM1 (female) (A)	Resistance	Max. 1Ω
			Wiring harness between PARENT J1 (female) (47) – TAM1 (female) (B)	Resistance	Max. 1Ω
	3	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between PARENT J1 (female) (43) – TAM1 (female) (A)	Resistance	Min. 1 MΩ
	4	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			PARENT J1 (female)	Intake air temperature	Resistance
			Between (43) – (47)	10 – 100°C	0.5 – 20 kΩ

Circuit diagram related



Failure code [CA692] Intake air temperature sensor abnormally low level (Only left bank): Low voltage detection

Action code	Failure code	Trouble	Intake air temperature sensor abnormally low level (Only left bank): Low voltage detection (Engine controller system)
E01	CA692		
Contents of trouble	• Intake air temperature sensor circuit detected low voltage.		
Action of controller	• Fixes intake air temperature (25°C) and continues operation.		
Problem that appears on machine			
Related information	• Input state from intake air temperature sensor can be checked with monitoring function. (Code: 18400 Intake air temperature, Code: 18401 Intake air temperature sensor voltage)		
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting	
	Carry out troubleshooting for failure code [CA691].		

Failure code [CA731] Abnormal engine Bkup speed sensor phase (At left bank): Abnormal phase

Action code	Failure code	Trouble	Abnormal engine Bkup speed sensor phase (At left bank): Abnormal phase (Engine controller system)
E03	CA731		
Contents of trouble	Abnormal phase has been detected in the engine Bkup sensor circuit.		
Action of controller	- Operates using engine Ne speed sensor signal. - Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	- Engine stops during operation (when Ne speed sensor is defective at the same time). - Engine cannot be started while stopping (when Ne speed sensor is defective at the same time).		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective engine Ne speed sensor circuit	Since a defect of engine Ne speed sensor can be suspected, carry out troubleshooting for the following code. [CA689]
	2	Defective engine Bkup speed sensor system	Since a defect of engine Bkup speed sensor can be suspected, carry out troubleshooting for the following code. [CA778]

Failure code [CB731] Abnormal engine Bkup speed sensor phase (At right bank): Abnormal phase

Action code	Failure code	Trouble	Abnormal engine Bkup speed sensor phase (At right bank): Abnormal phase (Engine controller system)
E03	CB731		
Contents of trouble	Abnormal phase has been detected in the engine Bkup sensor circuit.		
Action of controller	- Operates using engine Ne speed sensor signal. - Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	- Engine stops during operation (when Ne speed sensor is defective at the same time). - Engine cannot be started while stopping (when Ne speed sensor is defective at the same time).		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective engine Ne speed sensor circuit	Since a defect of engine Ne speed sensor can be suspected, carry out troubleshooting for the following code. [CB689]
	2	Defective engine Bkup speed sensor system	Since a defect of engine Bkup speed sensor can be suspected, carry out troubleshooting for the following code. [CB778]

HD785-7 Dump truck

Form No. SEN01941-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7

7001 and up

40 Troubleshooting

Troubleshooting by failure code, Part 5

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Disconnection/Short circuit	20
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Loss of pressure feed detected.....	31
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Failure code [CA757] Loss of all engine controller data (At left bank): Loss of all data

Action code	Failure code	Trouble	Loss of all engine controller data (At left bank): Loss of all data (Engine controller system)
E03	CA757		
Contents of trouble	• Loss of all data in engine controller has been detected.		
Action of controller	• Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• The engine cannot be started, or cannot be operated.		
Related information			

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting of [CA111].	

Failure code [CB757] Loss of all engine controller data (At right bank): Loss of all data

Action code	Failure code	Trouble	Loss of all engine controller data (At right bank): Loss of all data (Engine controller system)
E03	CB757		
Contents of trouble	• Loss of all data in engine controller has been detected.		
Action of controller	• Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• The engine cannot be started, or cannot be operated.		
Related information			

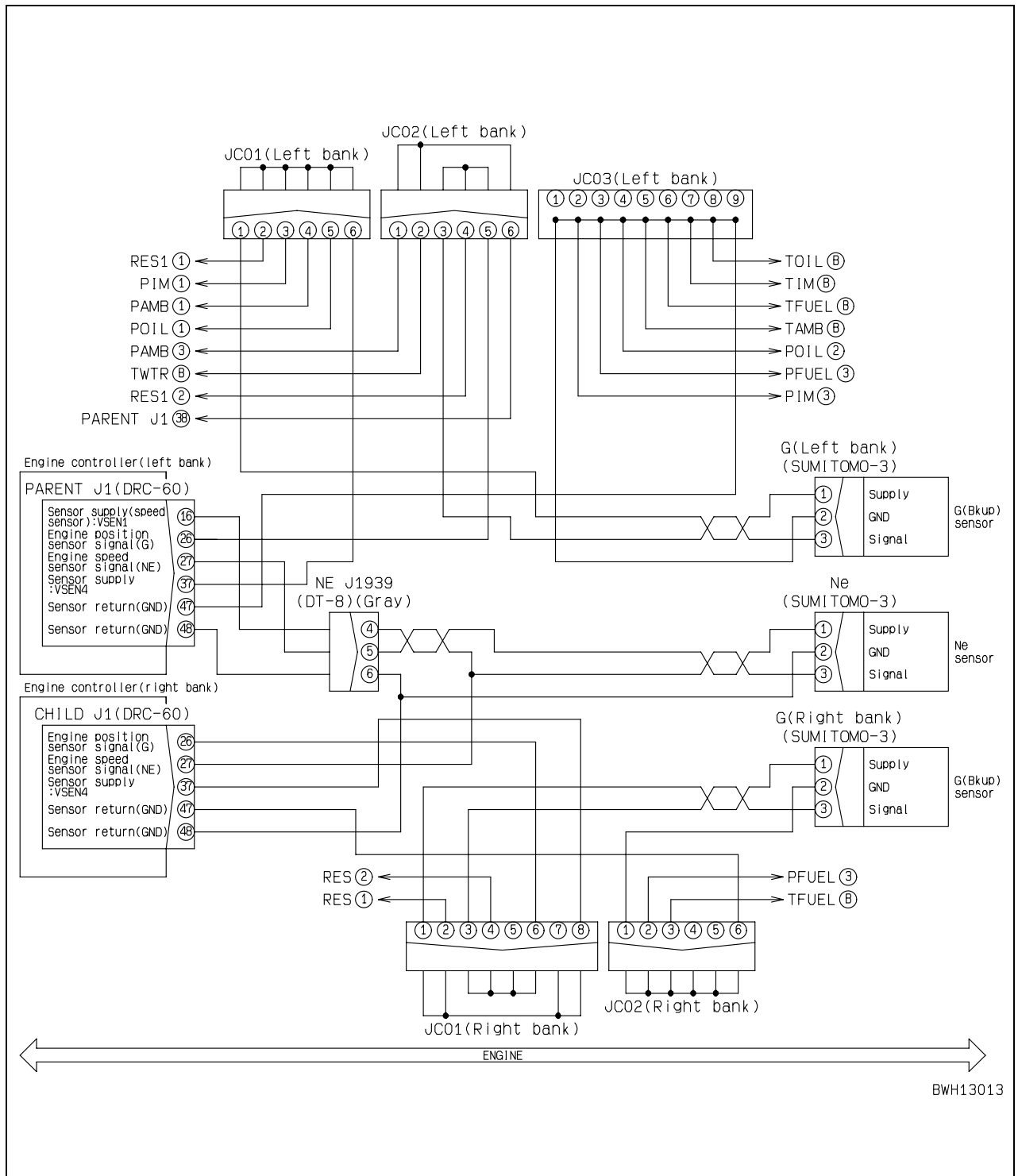
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting of [CB111].	

Failure code [CA778] Abnormal engine Bkup speed sensor (At left bank): Abnormal Bkup signal

Action code	Failure code	Trouble	Abnormal engine Bkup speed sensor (At left bank): Abnormal Bkup signal (Engine controller system)
E03	CA778		
Contents of trouble	• Abnormal engine Bkup speed sensor signal has been detected.		
Action of controller	- Operates using Ne speed sensor signal. - Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	- Engine stops during operation (when Ne speed sensor is defective at the same time). - Engine cannot be started while stopping (when Ne speed sensor is defective at the same time).		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective sensor power source circuit	If failure code [CA187] or [CA227] is displayed, carry out troubleshooting for it first.		
	2	Disconnection in wiring harness (disconnection or defective contact of connectors)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			Wiring harness between PARENT J1 (female) (37) – left G (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (47) – left G (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (26) – left G (female) (3)	Resistance	Max. 1 Ω
	3	Defective harness grounding (contact with ground circuit)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			Between ground and wiring harness between PARENT J1 (female) (37) – left G (female) (1)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between PARENT J1 (female) (47) – left G (female) (2)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between PARENT J1 (female) (26) – left G (female) (3)	Resistance	Min. 1 MΩ
	4	Harness short (Harness internal short)	★ Prepare with starting switch OFF and diagnose with starting switch still OFF.		
			Between wiring harness from PARENT J1 (female) (37) to left G (female) (1) and wiring harness from PARENT J1 (female) (47) to left G (female) (2)	Resistance	Min. 1 MΩ
			Between wiring harness from PARENT J1 (female) (37) to left G (female) (1) and wiring harness from PARENT J1 (female) (26) to left G (female) (3)	Resistance	Min. 1 MΩ
			Between wiring harness from PARENT J1 (female) (47) to left G (female) (2) and wiring harness from PARENT J1 (female) (26) to left G (female) (3)	Resistance	Min. 1 MΩ
	5	Defective mounting of sensor or defective parts for speed detection	Since defective mounting of Bkup speed sensor (improper gap) or defective parts for speed detection (in supply pump) can be suspected, directly check it.		
	6	Defective engine Bkup speed sensor	Engine Bkup speed sensor can be suspected to be defective if no problem is found in causes 1 – 5 (since this is an internal defect, it cannot be diagnosed).		
	7	Defective engine controller	Engine controller can be suspected to be defective if no problem is found in causes 1 – 6 (since this is an internal defect, it cannot be diagnosed).		

Circuit diagram related

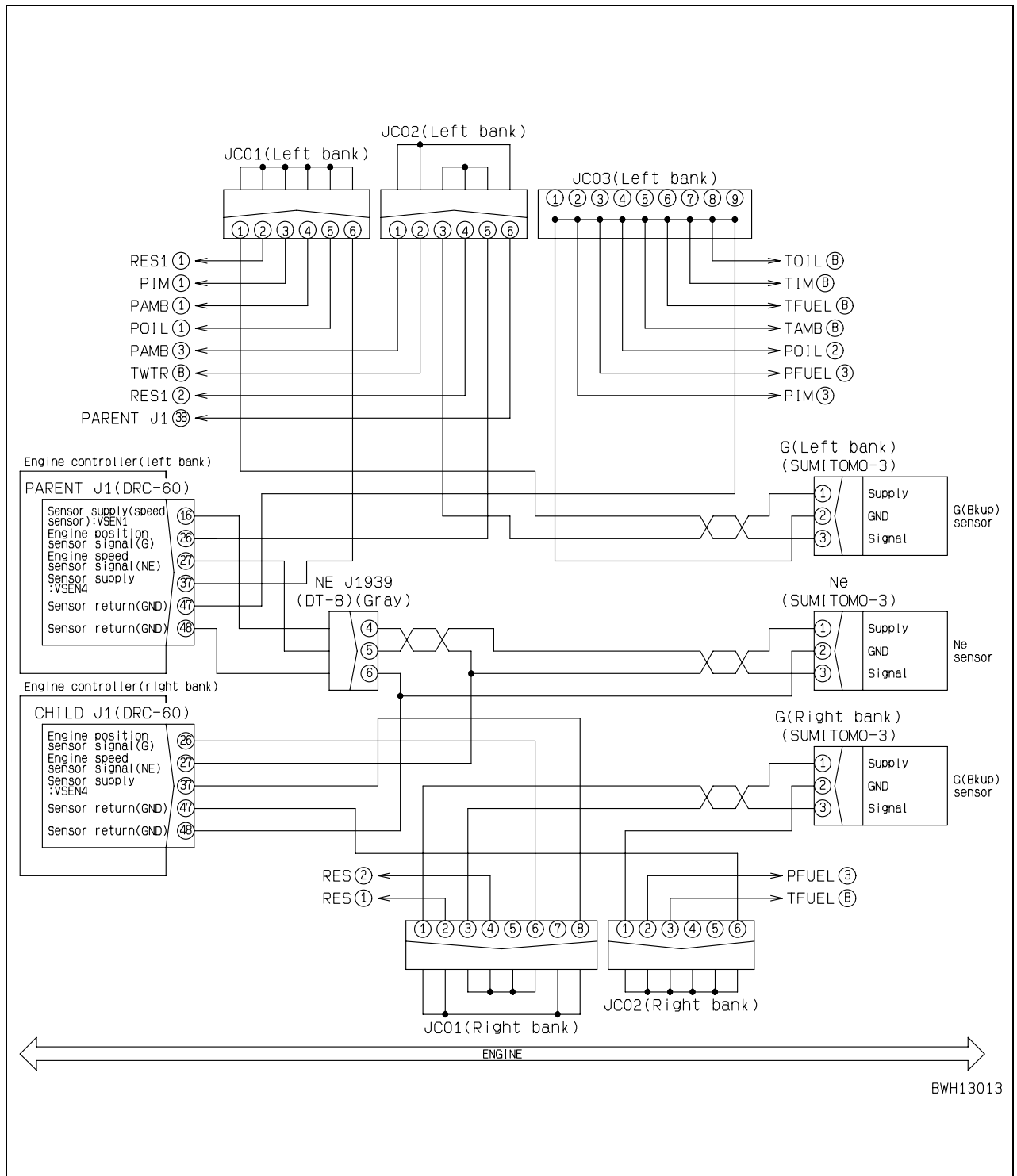


Failure code [CB778] Engine Bkup speed sensor abnormality (Right bank): Bkup signal error

Action code	Failure code	Trouble	Engine Bkup speed sensor abnormality (Right bank): Bkup signal error (Engine controller system)
E03	CB778		
Contents of trouble	• Engine Bkup speed sensor signal detected abnormality.		
Action of controller	• Operates with Ne speed sensor signal • Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• If engine has been running, it stops (when Ne speed sensor is also defective). • If engine has been stopped, it cannot start (when Ne speed sensor is also defective).		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective sensor power supply system	If failure code [CB187] or [CB227] is displayed, carry out troubleshooting for it first.		
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CHILD J1 (female) (37) – right G (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between CHILD J1 (female) (47) – right G (female) (2)	Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Contact with GND circuit)	Wiring harness between CHILD J1 (female) (26) – right G (female) (3)	Resistance	Max. 1 Ω
			★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CHILD J1 (female) (37) – right G (female) (1)	Resistance	Min. 1 MΩ
	4	Short circuit in wiring harness (with another wiring harness)	Wiring harness between CHILD J1 (female) (47) – right G (female) (2)	Resistance	Min. 1 MΩ
			Wiring harness between CHILD J1 (female) (26) – right G (female) (3)	Resistance	Min. 1 MΩ
			Between wiring harness between CHILD J1 (female) (37) – right G (female) (1) and wiring harness between CHILD J1 (female) (47) – right G (female) (2)	Resistance	Min. 1 MΩ
	5	Defective sensor installation or defective speed sensing part	Between wiring harness between CHILD J1 (female) (47) – right G (female) (2) and wiring harness between CHILD J1 (female) (26) – right G (female) (3)	Resistance	Min. 1 MΩ
			Bkup speed sensor may be installed defectively (improper clearance) or speed sensing part (in supply pump) may be defective. Check them directly.		
			If causes 1 – 5 are not detected, engine Bkup speed sensor may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		
	6	Defective engine Bkup speed sensor	If causes 1 – 6 are not detected, engine controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		
	7	Defective engine controller			

Circuit diagram related

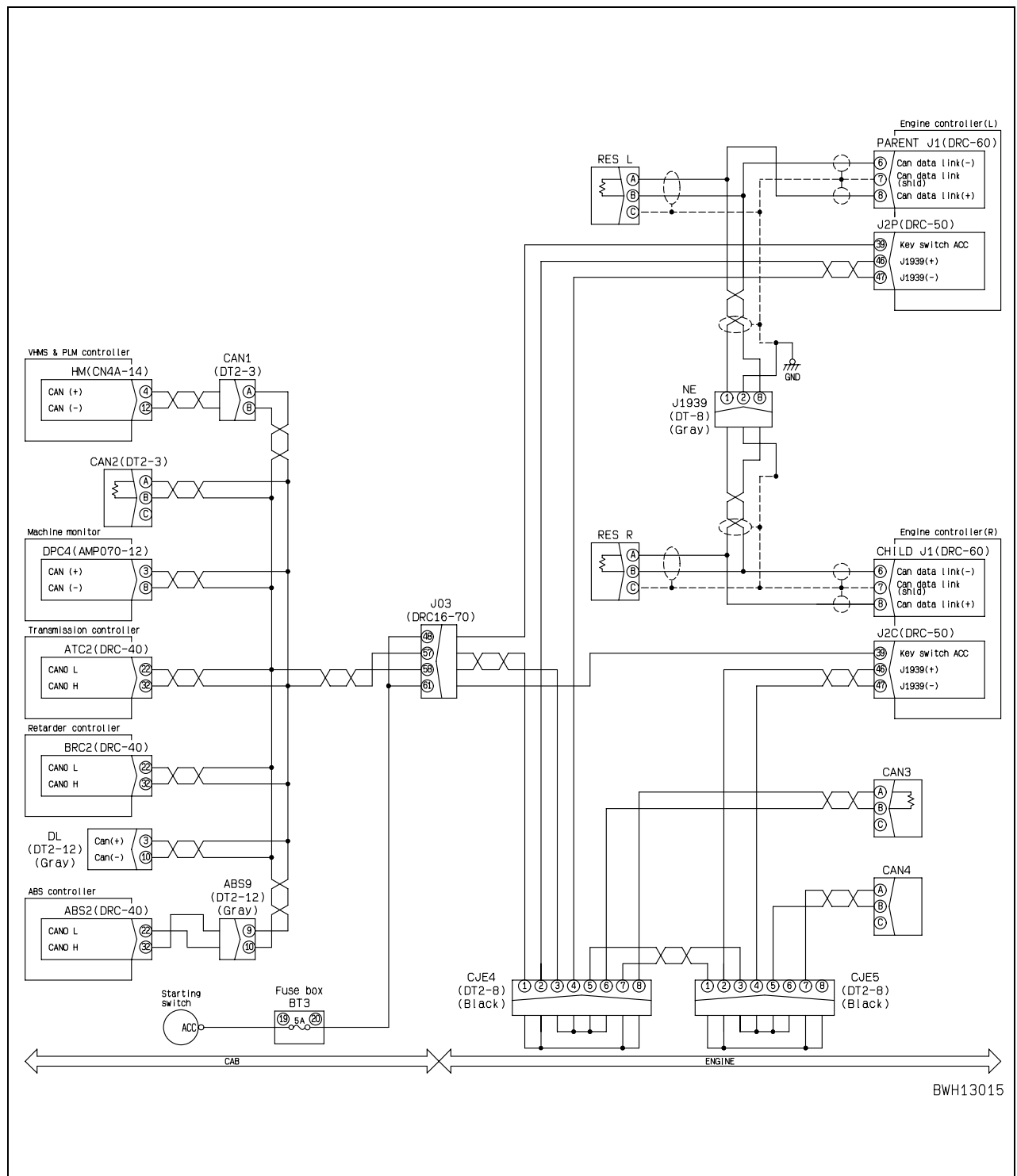


Failure code [CA781] Inter-multicontroller communication error (Left bank): Communication error

Action code	Failure code	Trouble	Inter-multicontroller communication error (Left bank): Communication error (Engine controller system)
E03	CA781		
Contents of trouble	• Communication error occurred between engine controllers (Left bank).		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• During operation: Engine continues operation with 1 bank. • When key is ON: Engine cannot be started.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between PARENT J1 (female) (8) – CHILD J1 (female) (8)	Resistance	Max. 1 Ω
			Wiring harness between PARENT J1 (female) (6) – CHILD J1 (female) (6)	Resistance	Max. 1 Ω
	2	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between PARENT J1 (female) (8) – CHILD J1 (female) (8)	Resistance	Min. 1 MΩ
			Wiring harness between PARENT J1 (female) (6) – CHILD J1 (female) (6)	Resistance	Min. 1 MΩ
	3	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			PARENT J1 (female)	Resistance	
			Between (8) – (6)	108 – 132 Ω	
			Between (8), (6) – ground	Min. 1 MΩ	

Circuit diagram related



Failure code [CB781] Inter-multicontroller communication error (Right bank): Communication error

Action code	Failure code	Trouble	Inter-multicontroller communication error (Right bank): Communication error (Engine controller system)
E03	CB781		
Contents of trouble	Communication error occurred between engine controllers (Right bank).		
Action of controller	Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	- During operation: Engine continues operation with 1 bank. - When key is ON: Engine cannot be started.		
Related information			

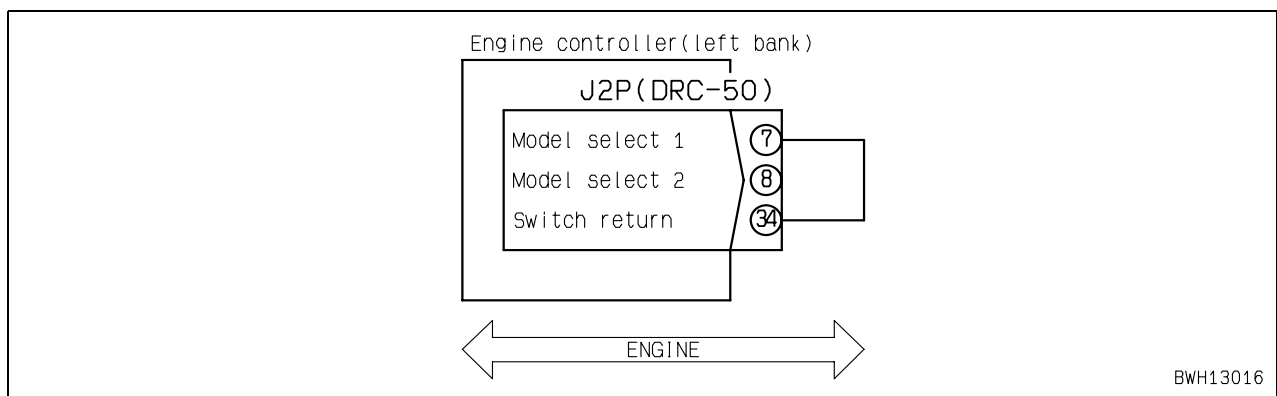
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [CA781].	

Failure code [CA1257] Multicontroller distinction wiring harness key error (Left bank): Distinction error

Action code	Failure code	Trouble	Multicontroller distinction wiring harness key error (Left bank): Distinction error (Engine controller system)
E03	CA1257		
Contents of trouble	• Controller of each bank disagrees with distinction wiring harness (Left bank).		
Action of controller	• Stops operation. • Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• When key is ON: Engine cannot be started.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between J2P (female) (7) – J2P (female) (34)	Resistance	Max. 1 Ω
	2	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between J2P (female) (8) – ground	Resistance	Min. 1 MΩ
	3	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between J2P (female) (7) – ground	Resistance	Min. 1 MΩ
			Between J2P (female) (8) – ground	Resistance	Min. 1 MΩ

Circuit diagram related

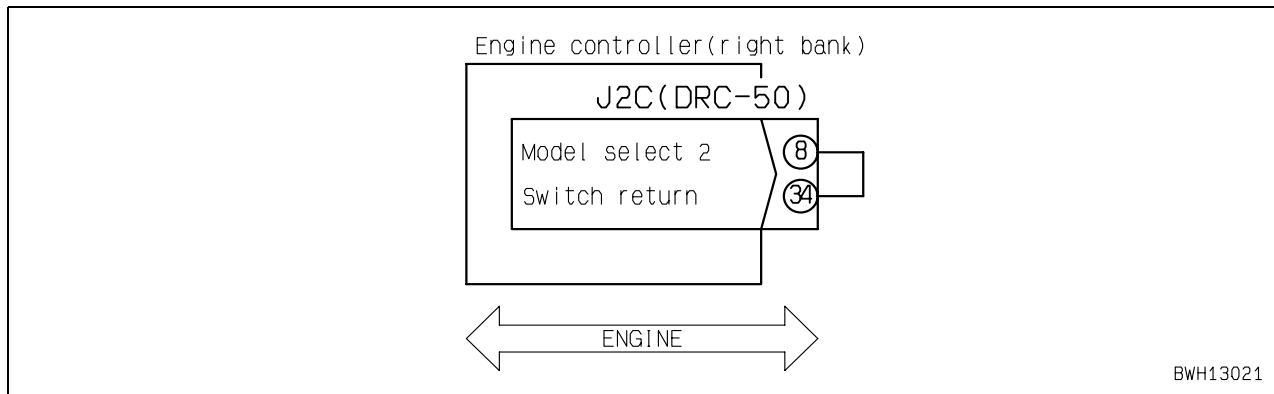


Failure code [CB1257] Multicontroller distinction wiring harness key error (Right bank): Distinction error

Action code	Failure code	Trouble	Multicontroller distinction wiring harness key error (Right bank): Distinction error (Engine controller system)
E03	CB1257		
Contents of trouble	• Controller of each bank disagrees with distinction wiring harness (Right bank).		
Action of controller	• Stops operation. • Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• When key is ON: Engine cannot be started.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between J2C (female) (8) – J2C (female) (34)	Resistance	Min. 1 MΩ
	2	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between J2C (female) (8) – ground	Resistance	Min. 1 MΩ
	3	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between J2C (female) (8) – ground	Resistance	Min. 1 MΩ

Circuit diagram related

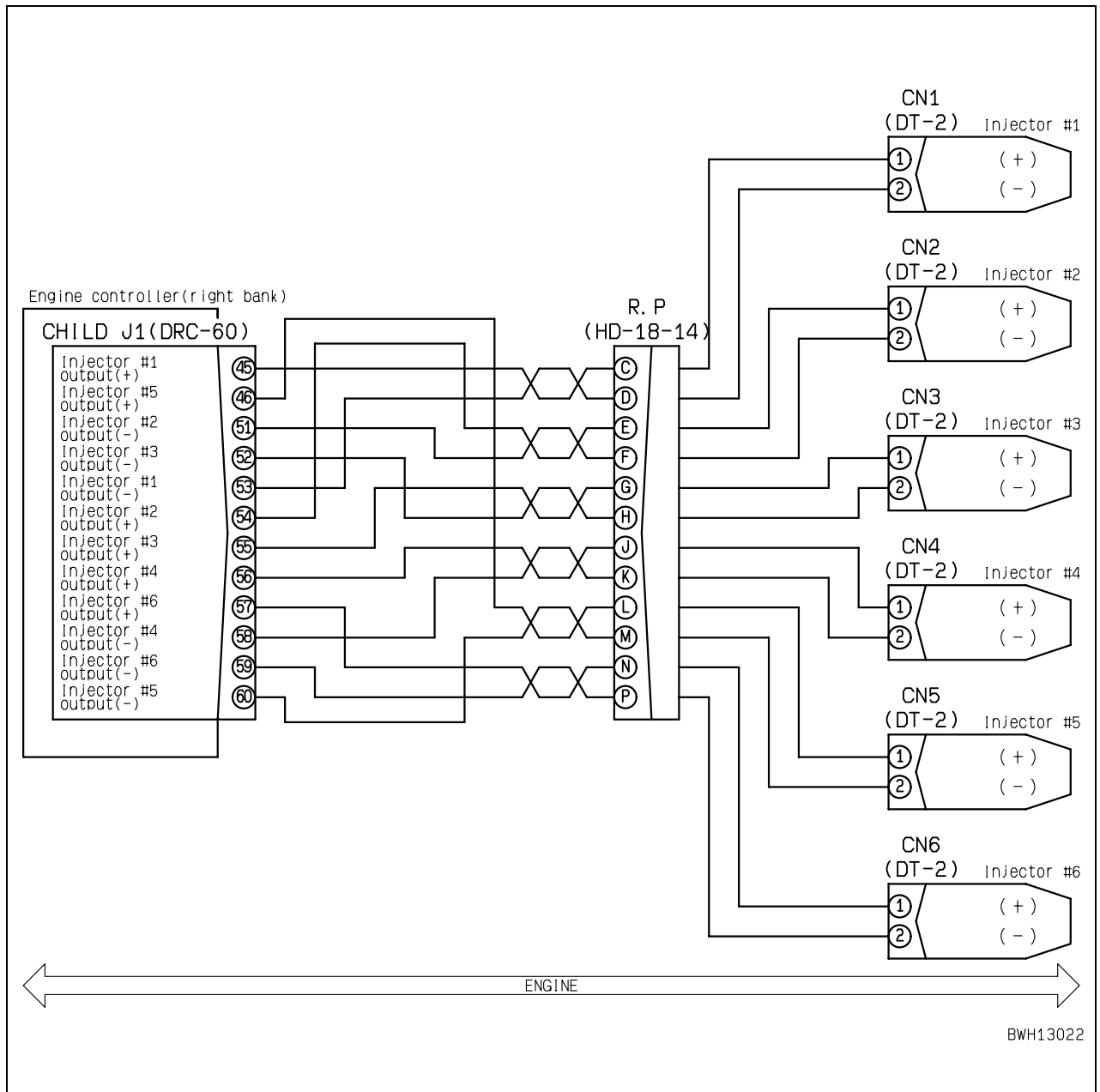


Failure code [CB1548] Injector #7 (R/B #1) system disconnection/short circuit (Right bank): Disconnection/Short circuit

Action code	Failure code	Trouble	Injector #7 (R/B #1) system disconnection/short circuit (Right bank): Disconnection/Short circuit (Engine controller system)
E03	CB1548		
Contents of trouble	• Disconnection or short circuit occurred in injector #7 circuit.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Output lowers. • Engine speed is unstable.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective injector #7 (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CN1 (male)		Resistance	
			Between (1) – (2)		0.4 – 1.1 Ω	
			Between (1), (2) – ground		Min. 1 MΩ	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (45) – CN1 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between CHILD J1 (female) (53) – CN1 (female) (2)		Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (45) – CN1 (female) (1)		Resistance	Min. 1 MΩ
			Wiring harness between CHILD J1 (female) (53) – CN1 (female) (2)		Resistance	Min. 1 MΩ
	4	Defective injector of another cylinder or defective wiring harness	If failure codes of 1 or more injectors are displayed, carry out troubleshooting for them.			
	5	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CHILD J1 (female)		Resistance	
			Between (45) – (53)		0.4 – 1.1 Ω	
			Between (45), (53) – ground		Min. 1 MΩ	

Circuit diagram related

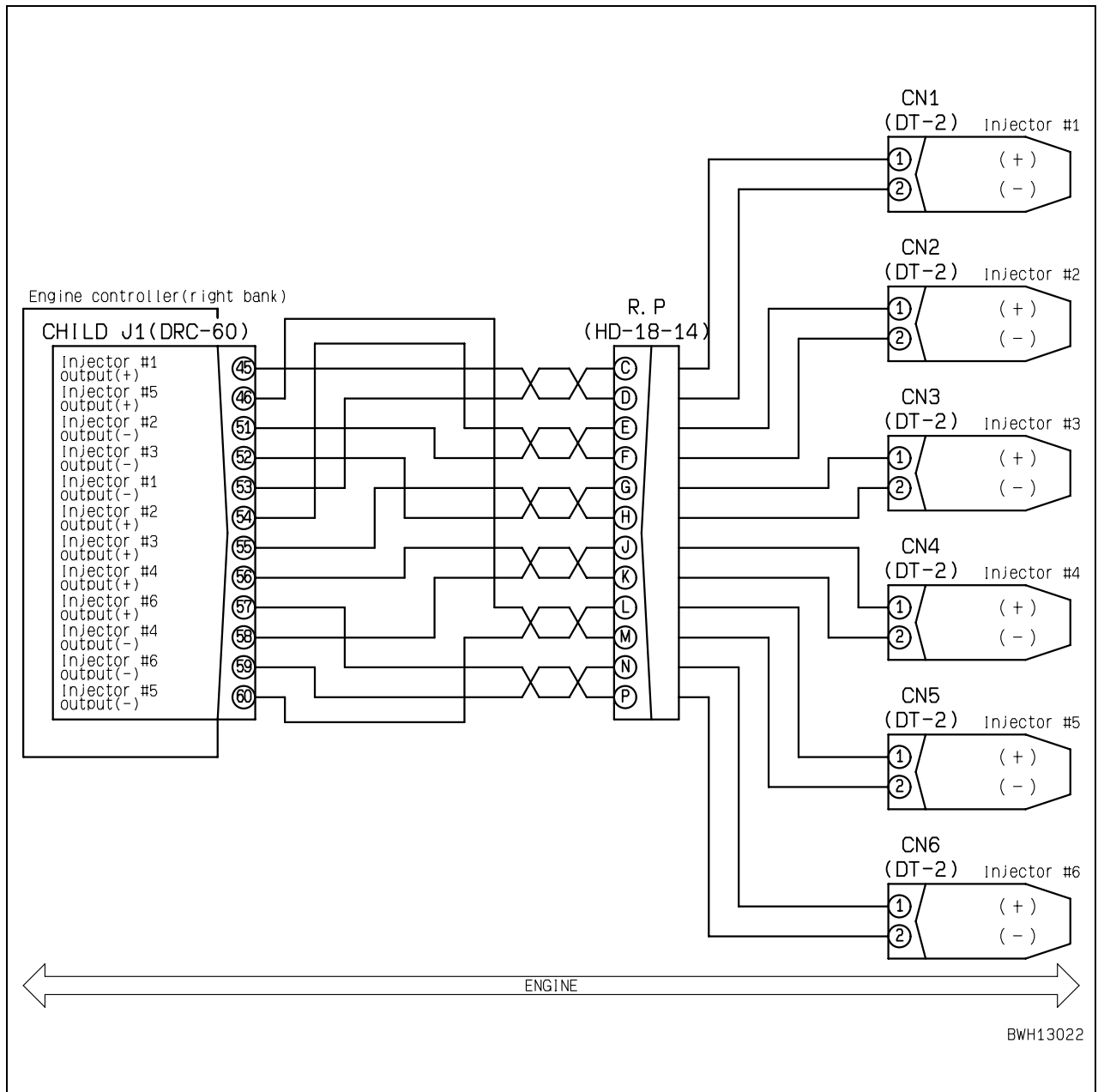


Failure code [CB1549] Injector #8 (R/B #2) system disconnection/short circuit (Right bank): Disconnection/Short circuit

Action code	Failure code	Trouble	Injector #8 (R/B #2) system disconnection/short circuit (Right bank): Disconnection/Short circuit (Engine controller system)
E03	CB1549		
Contents of trouble	• Disconnection or short circuit occurred in injector #8 circuit.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Output lowers. • Engine speed is unstable.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective injector #8 (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CN2 (male)		Resistance	
			Between (1) – (2)		0.4 – 1.1 Ω	
			Between (1), (2) – ground		Min. 1 MΩ	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (54) – CN2 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between CHILD J1 (female) (51) – CN2 (female) (2)		Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (54) – CN2 (female) (1)		Resistance	Min. 1 MΩ
			Wiring harness between CHILD J1 (female) (51) – CN2 (female) (2)		Resistance	Min. 1 MΩ
	4	Defective injector of another cylinder or defective wiring harness	If failure codes of 1 or more injectors are displayed, carry out troubleshooting for them.			
	5	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CHILD J1 (female)		Resistance	
			Between (54) – (51)		0.4 – 1.1 Ω	
			Between (54), (51) – ground		Min. 1 MΩ	

Circuit diagram related

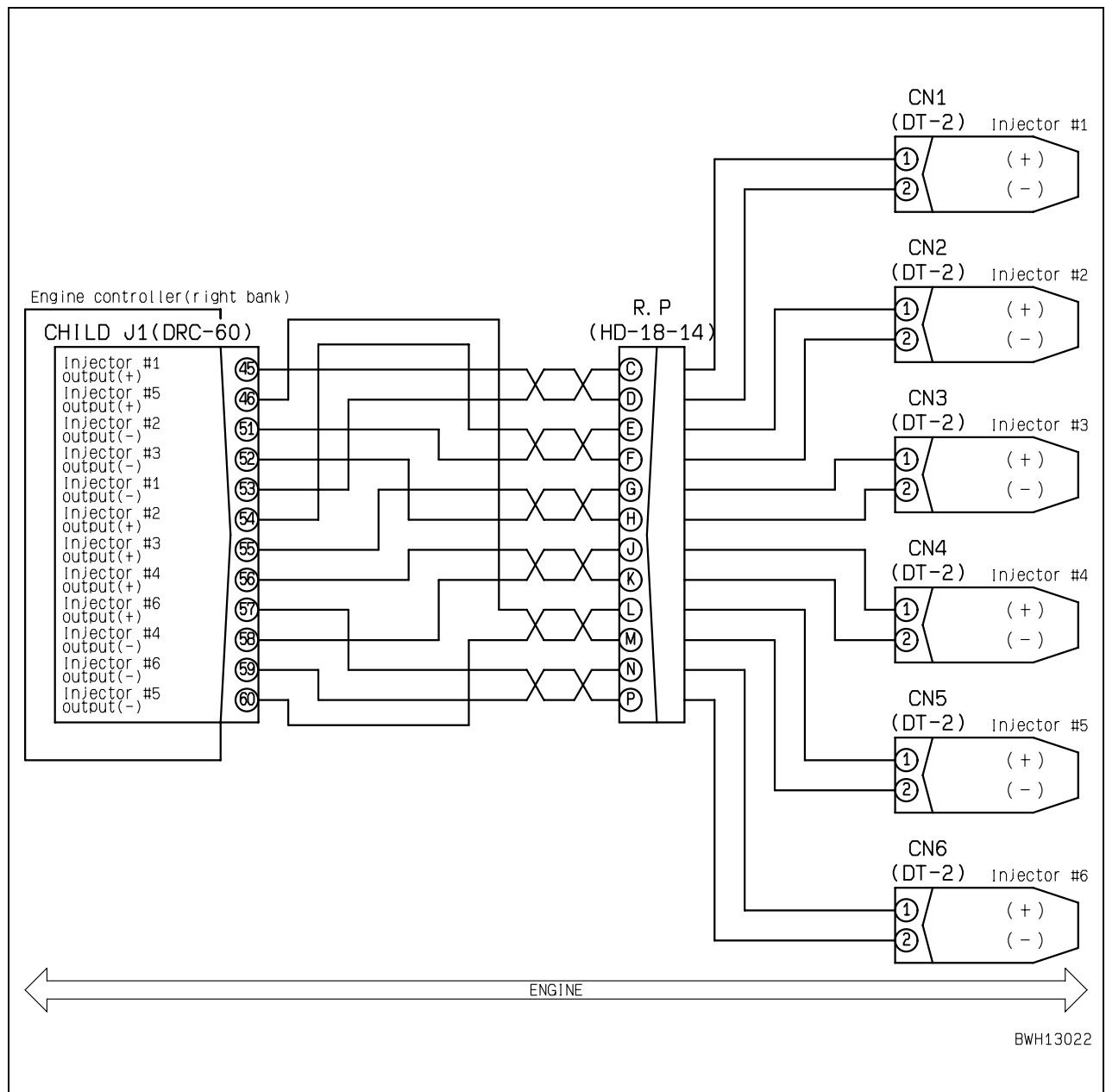


Failure code [CB1551] Injector #10 (R/B #4) system disconnection/short circuit (Right bank): Disconnection/Short circuit

Action code	Failure code	Trouble	Injector #10 (R/B #4) system disconnection/short circuit (Right bank): Disconnection/Short circuit (Engine controller system)
E03	CB1551		
Contents of trouble	• Disconnection or short circuit occurred in injector #10 circuit.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Output lowers. • Engine speed is unstable.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective injector #10 (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CN4 (male)		Resistance	
			Between (1) – (2)		0.4 – 1.1 Ω	
			Between (1), (2) – ground		Min. 1 MΩ	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (56) – CN4 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between CHILD J1 (female) (58) – CN4 (female) (2)		Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (56) – CN4 (female) (1)		Resistance	Min. 1 MΩ
			Wiring harness between CHILD J1 (female) (58) – CN4 (female) (2)		Resistance	Min. 1 MΩ
	4	Defective injector of another cylinder or defective wiring harness	If failure codes of 1 or more injectors are displayed, carry out troubleshooting for them.			
	5	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CHILD J1 (female)		Resistance	
			Between (56) – (58)		0.4 – 1.1 Ω	
			Between (56), (58) – ground		Min. 1 MΩ	

Circuit diagram related

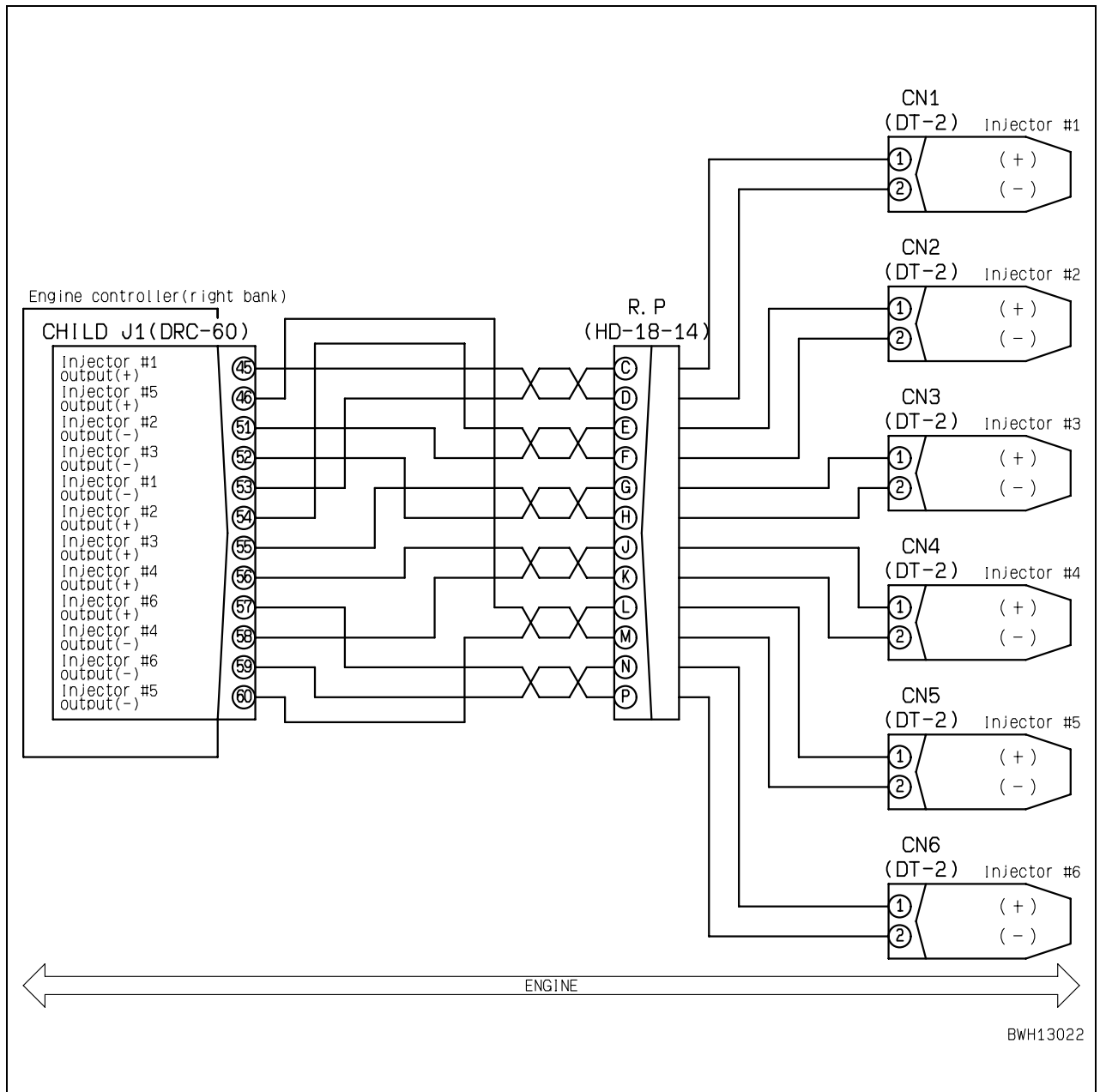


Failure code [CB1552] Injector #11 (R/B #5) system disconnection/short circuit (Right bank): Disconnection/Short circuit

Action code	Failure code	Trouble	Injector #11 (R/B #5) system disconnection/short circuit (Right bank): Disconnection/Short circuit (Engine controller system)
E03	CB1552		
Contents of trouble	• Disconnection or short circuit occurred in injector #11 circuit.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Output lowers. • Engine speed is unstable.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective injector #11 (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CN5 (male)		Resistance	
			Between (1) – (2)		0.4 – 1.1 Ω	
			Between (1), (2) – ground		Min. 1 MΩ	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (46) – CN5 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between CHILD J1 (female) (60) – CN5 (female) (2)		Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (46) – CN5 (female) (1)		Resistance	Min. 1 MΩ
			Wiring harness between CHILD J1 (female) (60) – CN5 (female) (2)		Resistance	Min. 1 MΩ
	4	Defective injector of another cylinder or defective wiring harness	If failure codes of 1 or more injectors are displayed, carry out troubleshooting for them.			
	5	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CHILD J1 (female)		Resistance	
			Between (46) – (60)		0.4 – 1.1 Ω	
			Between (46), (60) – ground		Min. 1 MΩ	

Circuit diagram related

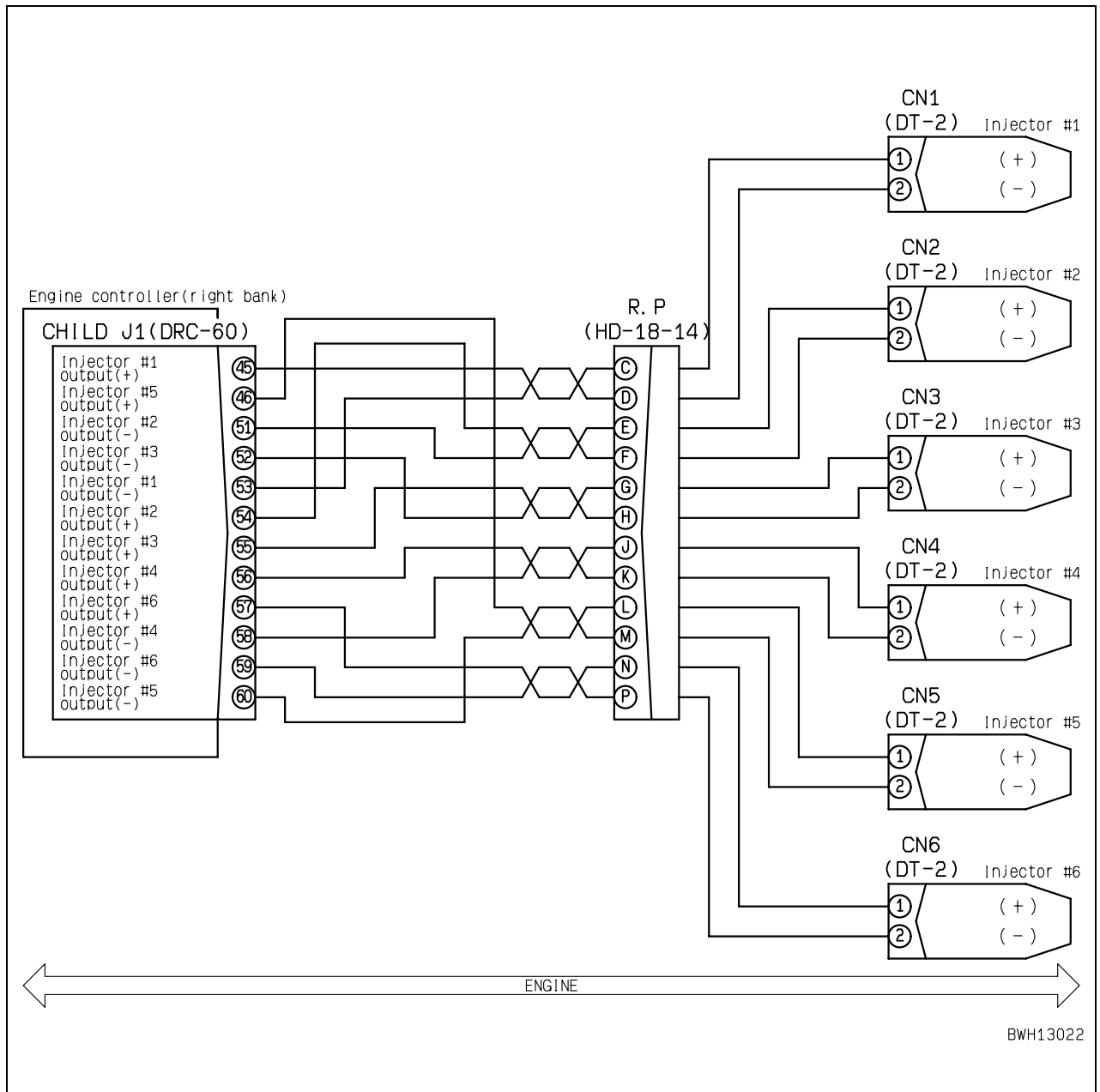


Failure code [CB1553] Injector #12 (R/B #6) system disconnection/short circuit (Right bank): Disconnection/Short circuit

Action code	Failure code	Trouble	Injector #12 (R/B #6) system disconnection/short circuit (Right bank): Disconnection/Short circuit (Engine controller system)
E03	CB1553		
Contents of trouble	• Disconnection or short circuit occurred in injector #12 circuit.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Output lowers. • Engine speed is unstable.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective injector #12 (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CN6 (male)		Resistance	
			Between (1) – (2)		0.4 – 1.1 Ω	
			Between (1), (2) – ground		Min. 1 MΩ	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (57) – CN6 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between CHILD J1 (female) (59) – CN6 (female) (2)		Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (57) – CN6 (female) (1)		Resistance	Min. 1 MΩ
			Wiring harness between CHILD J1 (female) (59) – CN6 (female) (2)		Resistance	Min. 1 MΩ
	4	Defective injector of another cylinder or defective wiring harness	If failure codes of 1 or more injectors are displayed, carry out troubleshooting for them.			
	5	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CHILD J1 (female)		Resistance	
			Between (57) – (59)		0.4 – 1.1 Ω	
			Between (57), (59) – ground		Min. 1 MΩ	

Circuit diagram related

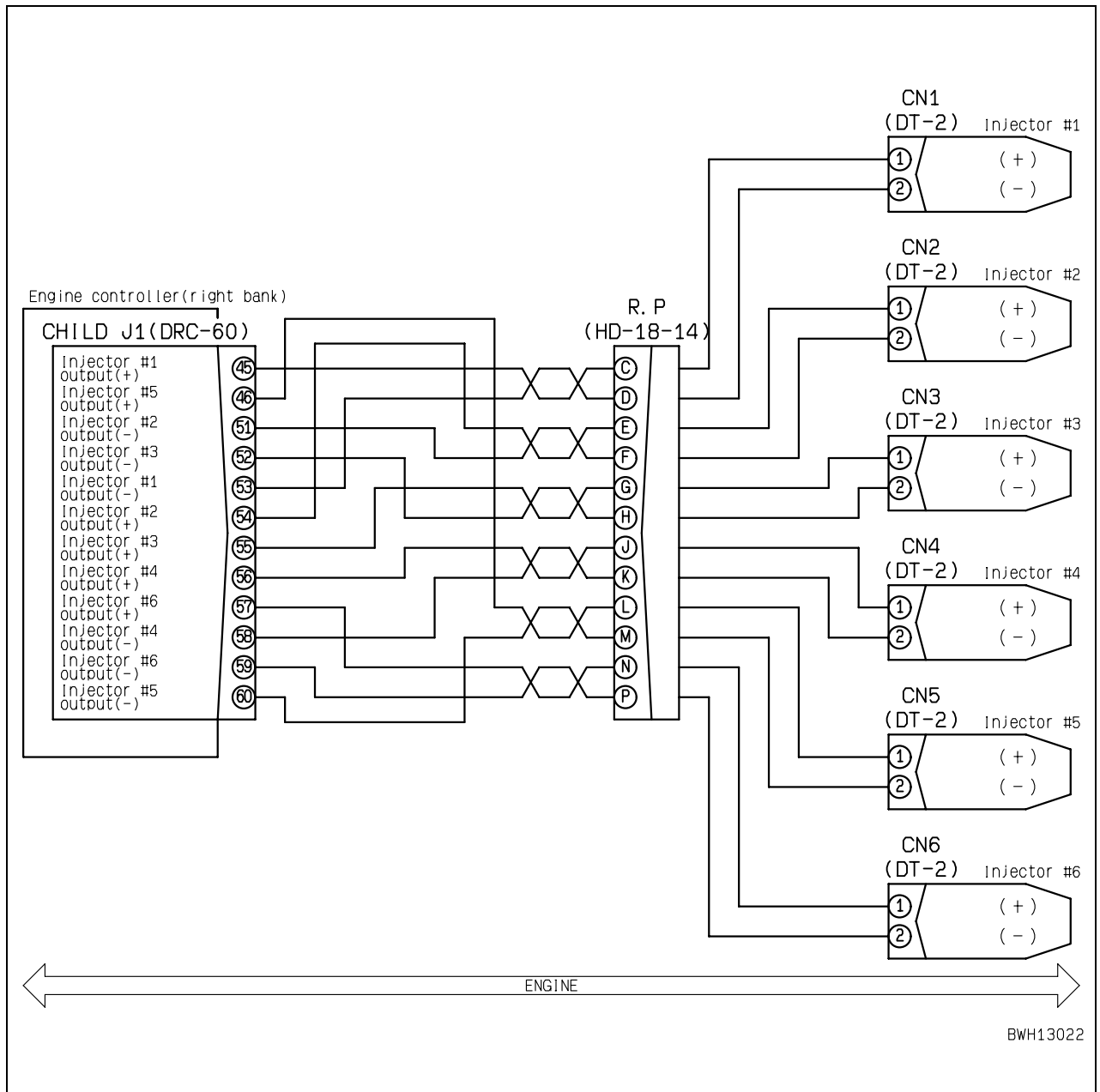


Failure code [CB1622] Injector #9 (R/B #3) system disconnection/short circuit (Right bank): Disconnection/Short circuit

Action code	Failure code	Trouble	Injector #9 (R/B #3) system disconnection/short circuit (Right bank): Disconnection/Short circuit (Engine controller system)
E03	CB1622		
Contents of trouble	• Disconnection or short circuit occurred in injector #9 circuit.		
Action of controller	• Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Output lowers. • Engine speed is unstable.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective injector #9 (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CN3 (male)		Resistance	
			Between (1) – (2)		0.4 – 1.1 Ω	
			Between (1), (2) – ground		Min. 1 MΩ	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (55) – CN3 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between CHILD J1 (female) (52) – CN3 (female) (2)		Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between CHILD J1 (female) (55) – CN3 (female) (1)		Resistance	Min. 1 MΩ
			Wiring harness between CHILD J1 (female) (52) – CN3 (female) (2)		Resistance	Min. 1 MΩ
	4	Defective injector of another cylinder or defective wiring harness	If failure codes of 1 or more injectors are displayed, carry out troubleshooting for them.			
	5	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CHILD J1 (female)		Resistance	
			Between (55) – (52)		0.4 – 1.1 Ω	
			Between (55), (52) – ground		Min. 1 MΩ	

Circuit diagram related

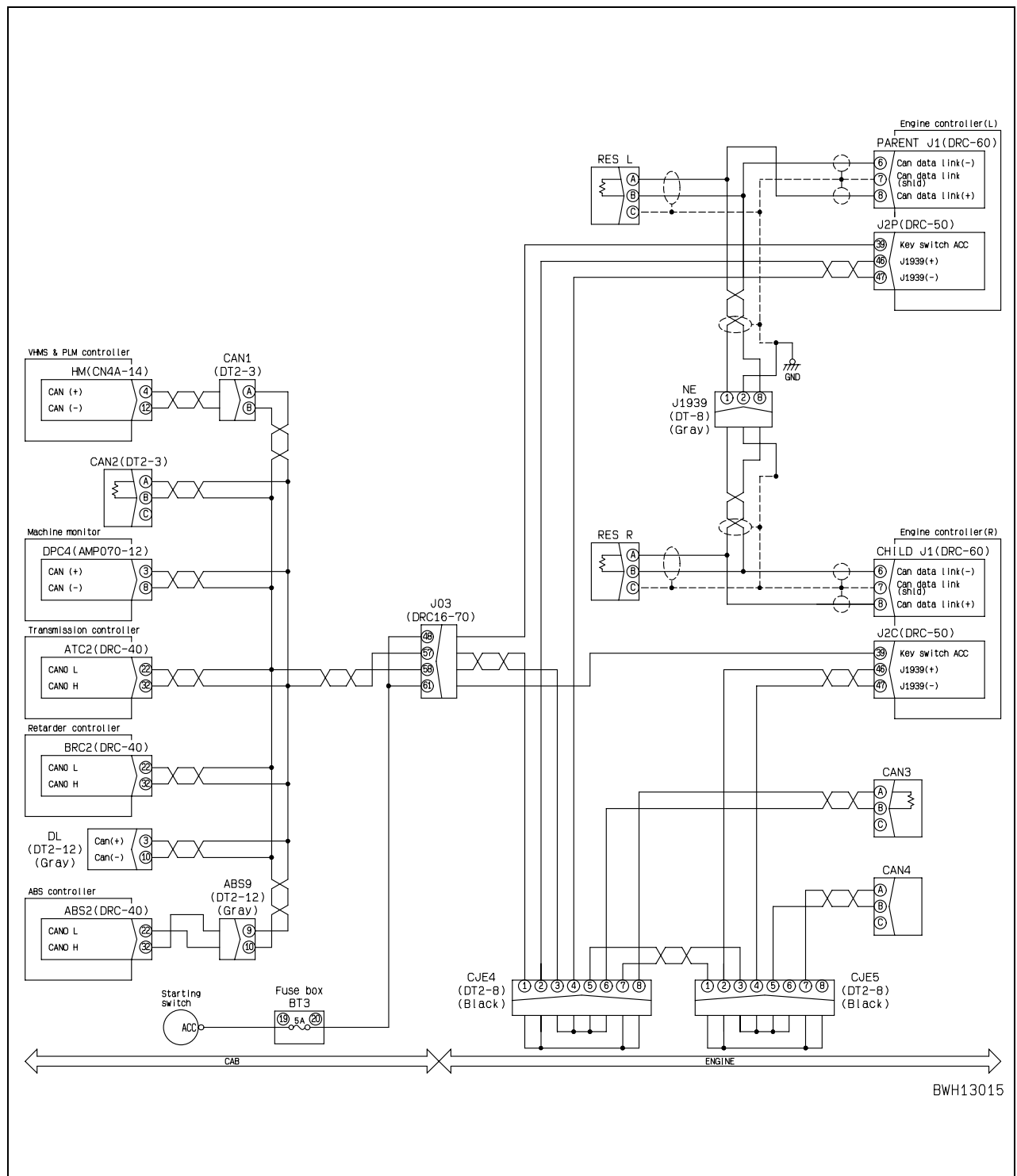


Failure code [CA1633] KOMNET abnormality (Left bank): Communication error

Action code	Failure code	Trouble	KOMNET abnormality (Left bank): Communication error (Engine controller system)
E03	CA1633		
Contents of trouble	• Abnormality occurred in KOMNET communication circuit to engine controller (Left bank).		
Action of controller	• Continues normal control (Communication function cannot be used). • Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Information may not be transmitted or received normally through KOMNET communication system and machine may not operate normally.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between J2P (female) (46) – J2C (female) (46)	Resistance	Max. 1 Ω
			Wiring harness between J2P (female) (47) – J2C (female) (47)	Resistance	Max. 1 Ω
			Wiring harness between J2P (female) (46) – J2P (female) (47)	Resistance	108 – 132 Ω
	2	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between J2P (female) (46) – J2C (female) (46)	Resistance	Min. 1 MΩ
			Wiring harness between J2P (female) (47) – J2C (female) (47)	Resistance	Min. 1 MΩ
	3	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between J2P (female) (46) – J2P (female) (47)	Resistance	108 – 132 Ω
			Wiring harness between J2C (female) (46) – J2C (female) (47)	Resistance	108 – 132 Ω

Circuit diagram related

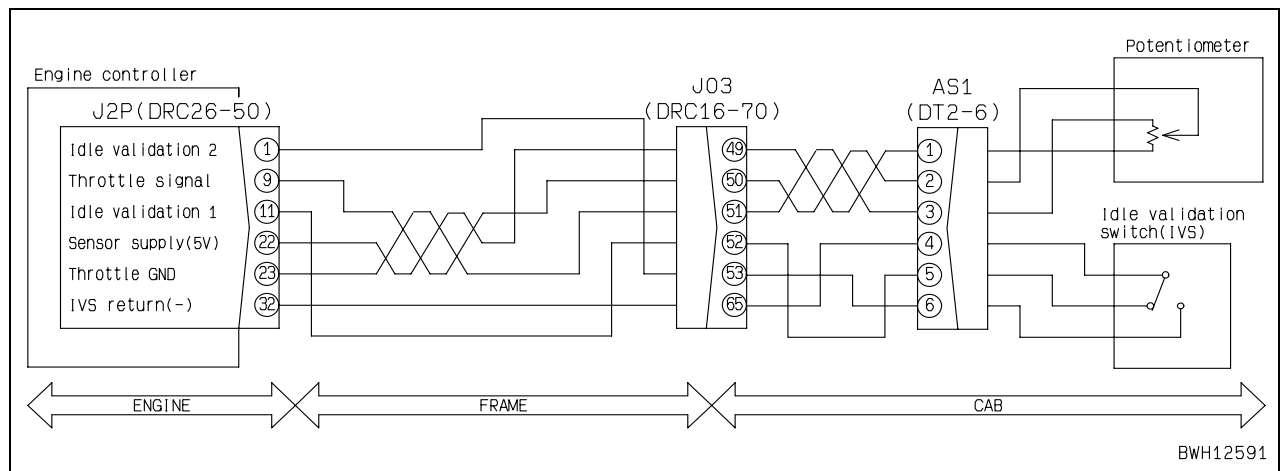


Failure code [CA2185] Throttle sensor supply voltage high error

Action code	Failure code	Trouble	Throttle sensor supply voltage high error (Engine controller system)
E03	CA2185		
Contents of trouble	• Voltage of throttle sensor power supply (5V) circuit is high.		
Action of controller	- Runs the engine at position of throttle 0% when accelerator pedal is OFF and at 50% when it is ON. - Turns the centralized warning lamp and alarm buzzer ON.		
Problem that appears on machine	• When accelerator pedal is pressed fully, engine speed does not rise above medium level.		
Related information	• Method of reproducing failure code: Turn the starting switch ON.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective accelerator pedal (Internal defect)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting			
			Disconnect device suggested on the right. At this time, if failure code is not indicated, the device is defective.	Accelerator pedal	AS1 connector	
	2	Disconnection in wiring harness (Disconnection or defective contact of connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between J2P (female) (22) – AS1 (female) (1)	Resistance		Max. 1 Ω
	3	Grounding fault in wiring harness (Contact with ground circuit)	Wiring harness between J2P (female) (23) – AS1 (female) (3)	Resistance		Max. 1 Ω
			★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
	4	Short circuit in wiring harness (with another wiring harness)	Wiring harness between J2P (female) (22) – AS1 (female) (1)	Resistance		Min. 1 MΩ
			Wiring harness between J2P (female) (23) – AS1 (female) (3)	Resistance		Min. 1 MΩ
	5	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting			
			J2P	Voltage		
			Between (22) and (23)	4.75 – 5.25 V		

Circuit diagram related



Failure code [CA2186] Throttle sensor power supply low error

Action code	Failure code	Trouble	Throttle sensor power supply low error (Engine controller system)
E03	CA2186		
Contents of trouble	Voltage of throttle sensor power supply (5V) circuit is low.		
Action of controller	- Runs the engine at position of throttle 0% when accelerator pedal is OFF and at 50% when it is ON. - Turns the centralized warning lamp and alarm buzzer ON.		
Problem that appears on machine	When accelerator pedal is pressed fully, engine speed does not rise above medium level.		
Related information	Method of reproducing failure code: Turn the starting switch ON.		

Possible causes and the standard values when normal	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [CA2185].	

Failure code [CA2249] Loss of pressure feed from supply pump (2) (At left bank): Loss of pressure feed detected

Action code	Failure code	Trouble	Loss of pressure feed from supply pump (2) (At left bank): Loss of pressure feed detected (Engine controller system)
E03	CA2249		
Contents of trouble	Loss of pressure feed (level 2) occurred in the common rail circuit.		
Action of controller	- Operates with limited output. - Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	- Engine is hard to start. - Exhaust gas color becomes black. - Output decreases.		
Related information	Input state from common rail pressure sensor can be checked with monitoring function. (Code: 36400 Common rail pressure (Left bank), Code: 36402 Common rail pressure sensor voltage (Left bank))		
Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Carry out troubleshooting of [CA559].	

Failure code [CB2249] Loss of pressure feed from supply pump (2) (At right bank): Loss of pressure feed detected

Action code	Failure code	Trouble	Loss of pressure feed from supply pump (2) (At right bank): Loss of pressure feed detected (Engine controller system)
E03	CB2249		
Contents of trouble	Loss of pressure feed (level 2) occurred in the common rail circuit.		
Action of controller	- Operates with limited output. - Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	- Engine is hard to start. - Exhaust gas color becomes black. - Output decreases.		
Related information	Input state from common rail pressure sensor can be checked with monitoring function. (Code: 36403 Common rail pressure (Right bank), Code 36404 Common rail pressure sensor voltage (Right bank))		
Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Carry out troubleshooting of [CB559].	

Failure code [CA2555] Intake heater relay voltage low error (At left bank)

Action code	Failure code	Trouble	Intake heater relay voltage low error (At left bank) (Engine controller system)
E01	CA2555		
Contents of trouble	Disconnection error was detected in intake air heater relay circuit.		
Action of controller	Automatic preheating (to be started when engine coolant temperature is below -5 °C) is not started.		
Problem that appears on machine	Engine does not start easily at low temperature.		
Related information	Method of reproducing failure code: Turn the starting switch ON.		

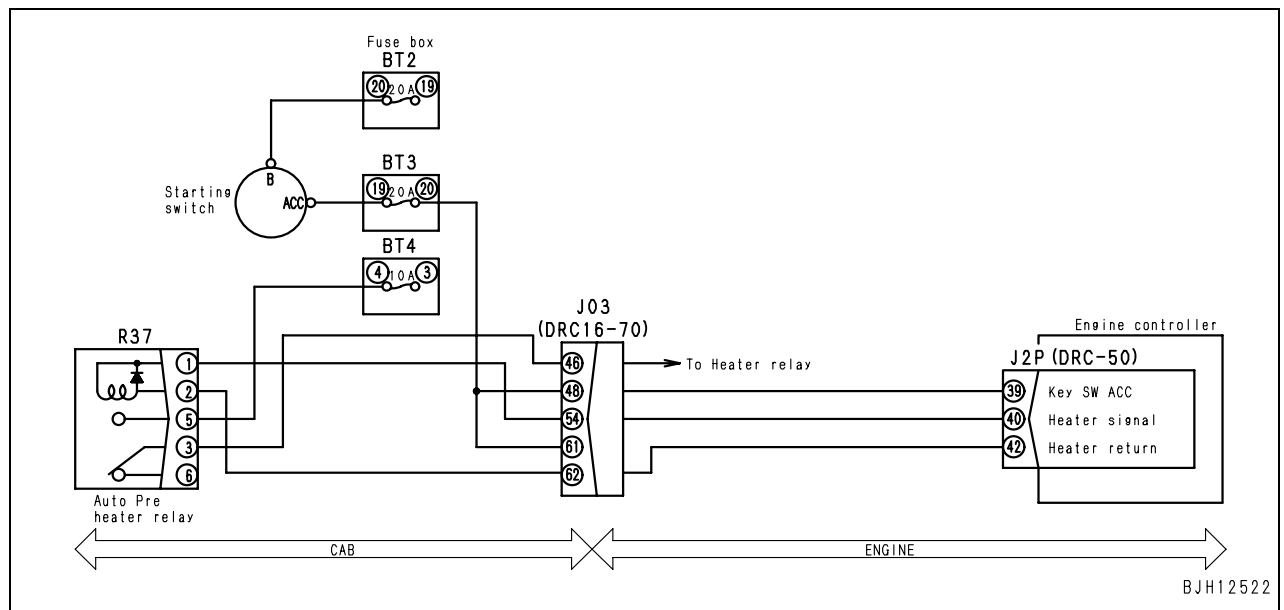
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [CA2556].	

Failure code [CA2556] Intake heater relay voltage high error (At left bank)

Action code	Failure code	Trouble	Intake heater relay voltage high error (At left bank) (Engine controller system)
E01	CA2556		
Contents of trouble	• Short circuit was detected in intake heater relay circuit.		
Action of controller	• Automatic preheating (to be started when engine coolant temperature is below -5 °C) is not started.		
Problem that appears on machine	• Engine does not start easily at low temperature.		
Related information	• Method of reproducing failure code: Turn the starting switch ON.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective intake heater relay (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			R37 (male)		Resistance
			Between (1) and (2)		200 – 400 Ω
	2	Disconnection in wiring harness (Disconnection or defective contact of connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between J2P (female) (40) – R37 (female) (1)		Resistance Max. 1 Ω
			Wiring harness between J2P (female) (42) – R37 (female) (2)		Resistance Max. 1 Ω
	3	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between J2P (female) (40) – R37 (female) (1)		Resistance Min. 1 MΩ
			Wiring harness between J2P (female) (42) – R37 (female) (2)		Resistance Min. 1 MΩ
	4	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting		
			J2P	Heater relay	Voltage
Between (40) and (42)			Operating condition	20 – 30 V	
	Stop condition	Max. 1 V			

Circuit diagram related



HD785-7 Dump truck

Form No. SEN01942-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7

7001 and up

40 Troubleshooting

Troubleshooting by failure code, Part 6

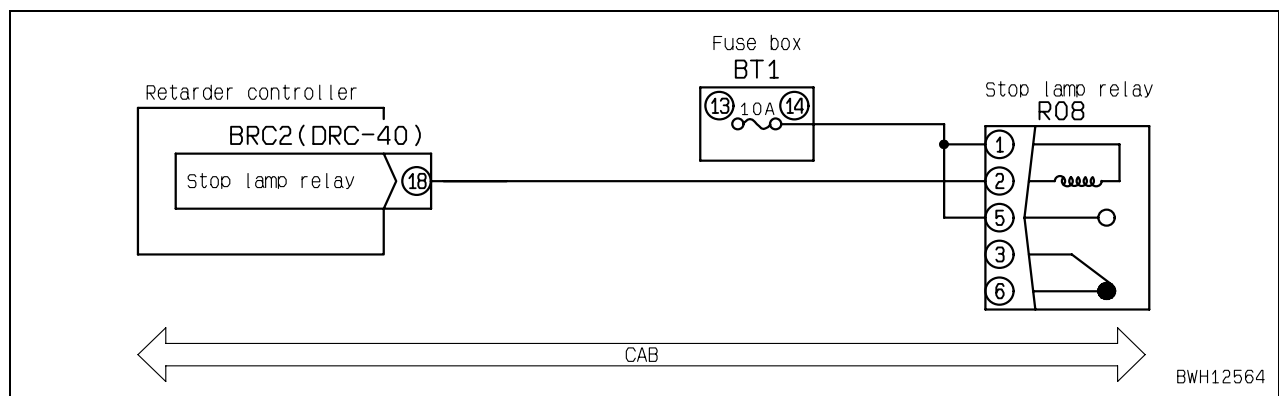
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Failure code [D19HKB] Stop lamp relay output system: Short circuit

Action code	Failure code	Trouble	Stop lamp relay output system: Short circuit (Retarder controller system)
E01	D19HKB		
Contents of trouble	• When signal was output to stop lamp relay, abnormal current flowed.		
Action of controller	• Turns output to stop lamp relay OFF. • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• Stop lamp does not light up.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective stop lamp relay	1) Turn starting switch OFF. 2) Connect T-adaptor to connector R08 (male).			
			R08 (male)		Resistance	
			Between (1) – (2)		250 – 350 Ω	
			Between (1) – ground		Min. 1 MΩ	
			Relay may be checked by exchanging it with another relay (5-pole relay).			
	2	Grounding fault in wiring harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors BRC2 and R08. 3) Connect T-adaptor to BRC2 (female).			
			Wiring harness between BRC2 (female) (18) – R08 (female) (2)		Resistance	Min. 1 MΩ
	3	Defective retarder controller	1) Turn starting switch OFF. 2) Insert T-adaptor in connector BRC2 (female). 3) Turn starting switch ON.			
			BRC2		Brake pedal	Voltage
			Between (18) – ground	When pressed		Max. 1 V
				When in neutral		20 – 30 V

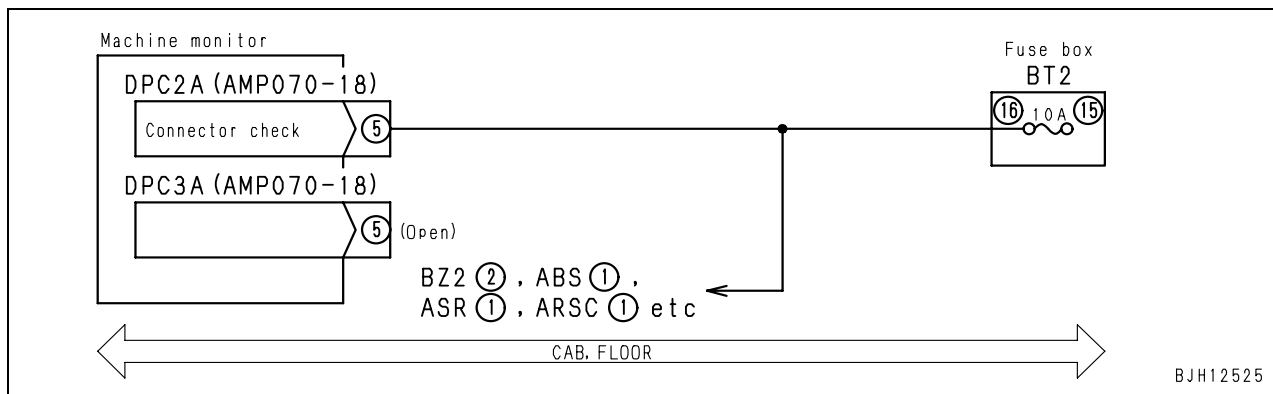
Circuit diagram related

Failure code [DAF9KM] Wrong connection of connector

Action code	Failure code	Trouble	Wrong connection of connector (Machine monitor system)
E03	DAF9KM		
Contents of trouble	Check signal of connector is different from internal setting of machine monitor.		
Action of machine monitor	- Detects only at start. - Keeps trouble condition until starting switch is turned OFF.		
Problem that appears on machine	- Machine monitor mode selector switch cannot be selected. - Headlamp high beam pilot lamp, turn signal pilot lamp, and output mode pilot lamp do not operate.		
Related information	Method of reproducing failure code: Turn starting switch ON.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Wrong connection of connector	Connector DPC2A (female) may be connected to DPC3A (male) by mistake. Check and connect it correctly, if connected wrongly.			
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Starting switch OFF. 2) Connect T-adapter to DPC2A. 3) Turn starting switch ON			
			DPC2A		Voltage	
			Between (5) – ground		20 – 30 V	
	3	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between DPC3A (female) (5) – pin other than DPC3A (5)		Resistance	Min. 1 MΩ
	4	Defective machine monitor	Check by replacing machine monitor.			

Circuit diagram related



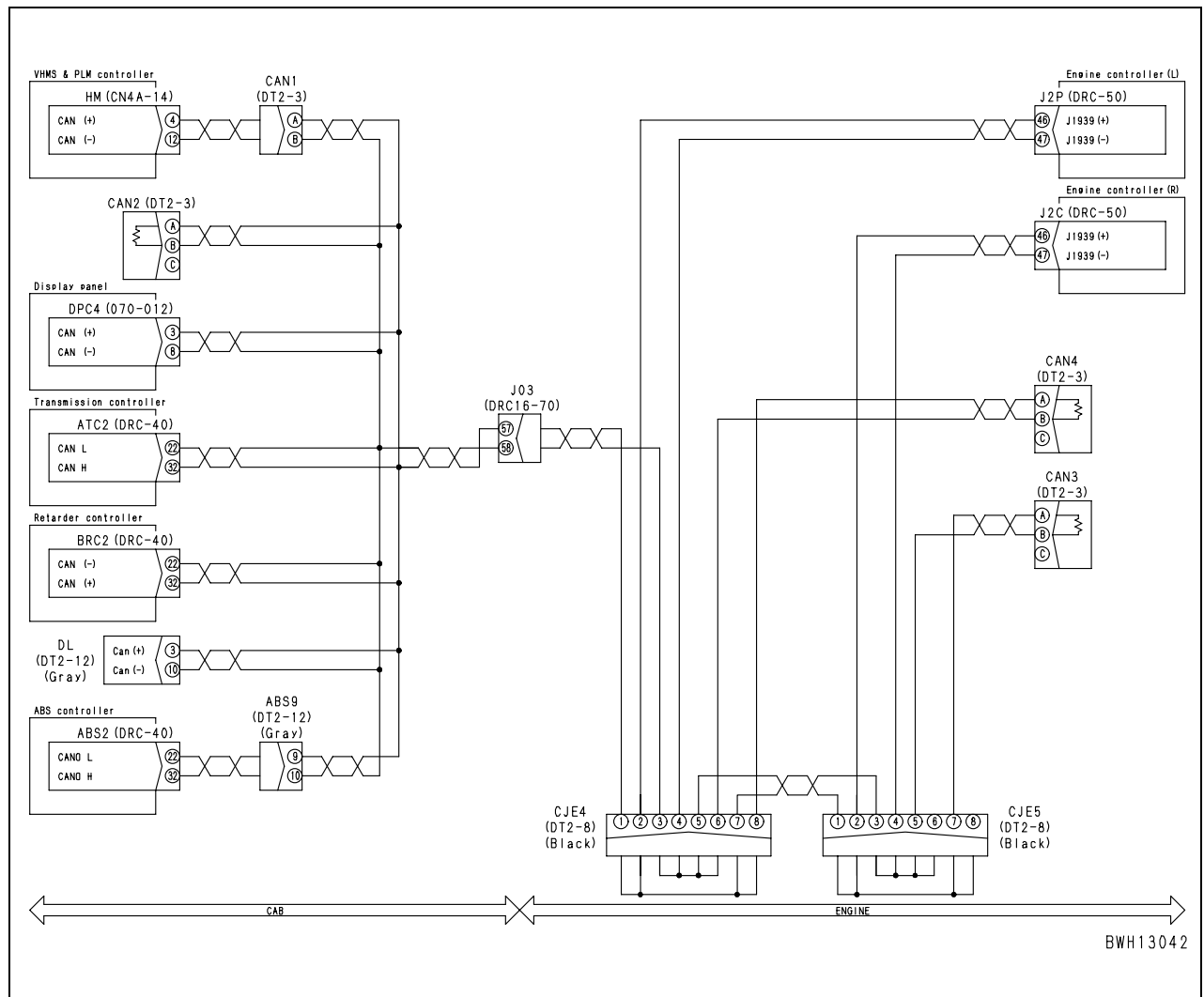
Failure code [DAFRKR] CAN communication error (Machine monitor): Communication error

Action code	Failure code	Trouble	CAN communication error (Machine monitor): Communication error (Machine monitor system)
E03	DAFRKR		
Contents of trouble	Transmission controller stops updating data received from machine monitor.		
Action of controller	- Holds information at time when trouble occurs. - Turns the centralized warning lamp and alarm buzzer ON.		
Problem that appears on machine	If network has error, data sent from each controller to machine monitor cannot be displayed normally.		
Related information	Check that power source circuit of machine monitor is normal.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective CAN terminal resistor (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CAN3 (male)		Resistance	
			Between (A) – (B)		Approx. 120 ± 12 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between J2P (female) (46) – J2C (female) (46), CAN3 (female) (A), CAN4 (female) (A), HM (female) (4), CAN2 (female) (A), DPC4 (female) (3), ATC2 (female) (32), BRC2 (female) (32), DL (female) (3) or ABS2 (female) (32)		Resistance	Max. 1 Ω
			Wiring harness between J2C (female) (46) – J2P (female) (46), CAN3 (female) (A), CAN4 (female) (A), DPC4 (female) (3), HM (female) (4), CAN2 (female) (A), DPC4 (female) (3), ATC2 (female) (32), BRC2 (female) (32), DL (female) (3) or ABS2 (female) (32)		Resistance	Max. 1 Ω
			Wiring harness between J2P (female) (47) – J2C (female) (47), CAN3 (female) (B), CAN4 (female) (B), HM (female) (12), CAN2 (female) (B), DPC4 (female) (8), ATC2 (female) (22), BRC2 (female) (22), DL (female) (10) or ABS2 (female) (22)		Resistance	Max. 1 Ω
			Wiring harness between J2C (female) (47) – J2A (female) (47), CAN3 (female) (B), CAN4 (female) (B), HM (female) (12), CAN2 (female) (B), DPC4 (female) (8), ATC2 (female) (22), BRC2 (female) (22), DL (female) (10) or ABS2 (female) (22)		Resistance	Max. 1 Ω
	3	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between ground and wiring harness between J2P (female) (46) – J2C (female) (46), CAN3 (female) (A), CAN4 (female) (A), HM (female) (4), CAN2 (female) (A), DPC4 (female) (3), ATC2 (female) (32), BRC2 (female) (32), DL (female) (3) or ABS2 (female) (32)		Resistance	Min. 1 MΩ

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	3	Grounding fault in wiring harness (Contact with ground circuit)	Between ground and wiring harness between J2C (female) (46) – J2P (female) (46), CAN3 (female) (A), CAN4 (female) (A), DPC4 (female) (3), HM (female) (4), CAN2 (female) (A), DPC4 (female) (3), ATC2 (female) (32), BRC2 (female) (32), DL (female) (3) or ABS2 (female) (32)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between J2P (female) (47) – J2C (female) (47), CAN3 (female) (B), CAN4 (female) (B), HM (female) (12), CAN2 (female) (B), DPC4 (female) (8), ATC2 (female) (22), BRC2 (female) (22), DL (female) (10) or ABS2 (female) (22)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between J2C (female) (47) – J2A (female) (47), CAN3 (female) (B), CAN4 (female) (B), HM (female) (12), CAN2 (female) (B), DPC4 (female) (8), ATC2 (female) (22), BRC2 (female) (22), DL (female) (10) or ABS2 (female) (22)	Resistance	Min. 1 MΩ
	4	Defective hot short in wiring harness (a contact with 24 V circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between ground and wiring harness between J2P (female) (46) – J2C (female) (46), CAN3 (female) (A), CAN4 (female) (A), HM (female) (4), CAN2 (female) (A), DPC4 (female) (3), ATC2 (female) (32), BRC2 (female) (32), DL (female) (3) or ABS2 (female) (32)	Voltage	Max. 1V
			Between ground and wiring harness between J2C (female) (46) – J2P (female) (46), CAN3 (female) (A), CAN4 (female) (A), DPC4 (female) (3), HM (female) (4), CAN2 (female) (A), DPC4 (female) (3), ATC2 (female) (32), BRC2 (female) (32), DL (female) (3) or ABS2 (female) (32)	Voltage	Max. 1V
			Between ground and wiring harness between J2P (female) (47) – J2C (female) (47), CAN3 (female) (B), CAN4 (female) (B), HM (female) (12), CAN2 (female) (B), DPC4 (female) (8), ATC2 (female) (22), BRC2 (female) (22), DL (female) (10) or ABS2 (female) (22)	Voltage	Max. 1V
			Between ground and wiring harness between J2C (female) (47) – J2A (female) (47), CAN3 (female) (B), CAN4 (female) (B), HM (female) (12), CAN2 (female) (B), DPC4 (female) (8), ATC2 (female) (22), BRC2 (female) (22), DL (female) (10) or ABS2 (female) (22)	Voltage	Max. 1V
	5	Defective machine monitor, engine controller, transmission controller, VHMS & PLM controller, retarder controller or ABS controller	If causes 1 – 4 are not detected, machine monitor, engine controller, transmission controller, VHMS & PLM controller, retarder controller or ABS controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related

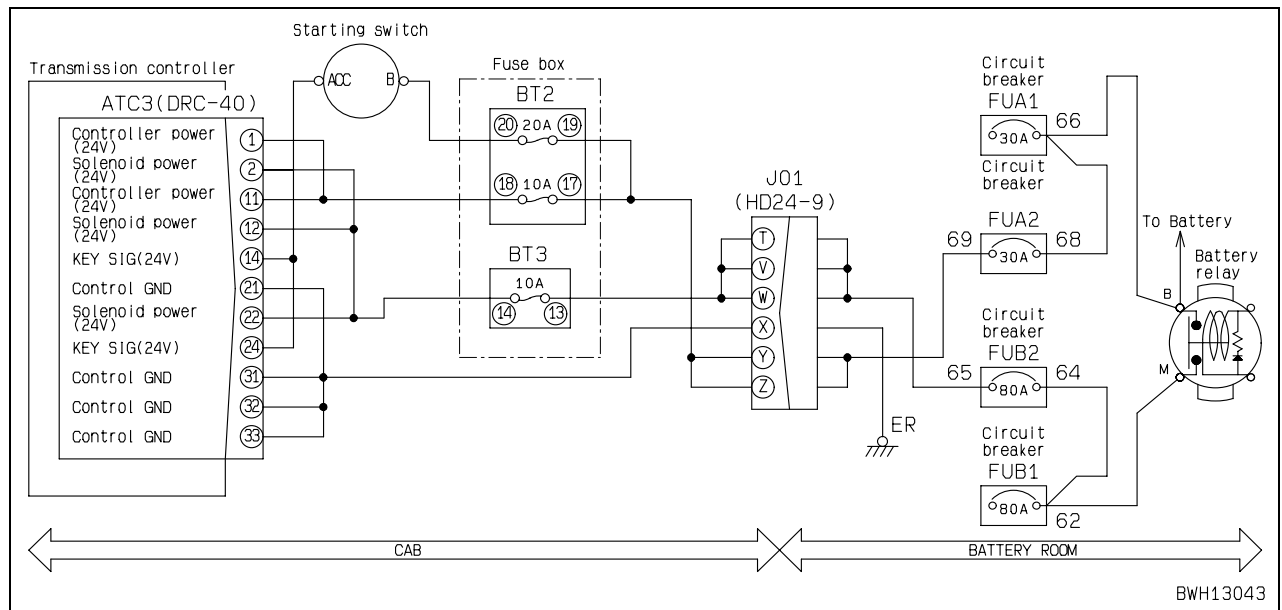


Failure code [DAQ0KK] Transmission controller direct power supply: Lowering of source voltage

Action code	Failure code	Trouble	Transmission controller direct power supply: Lowering of source voltage (Transmission controller system)
E03	DAQ0KK		
Contents of trouble	While engine was running, controller direct power supply circuit voltage lowered below 18 V.		
Action of controller	- Keeps current gear speed. - If gearshift lever is set in N, transmission is set in neutral.		
Problem that appears on machine	- If there is not power supply voltage (there is disconnection), transmission is set in neutral suddenly during travel and machine cannot restart until voltage becomes normal. - The gear is set in Neutral suddenly during travel and the machine cannot start again until the voltage rises to the normal level. - If power supply voltage is low, machine can move but transmission may slip because of load.		
Related information	- If failure code "AB00MA" (Malfunction of alternator) is indicated, perform troubleshooting for it first. - If the fuse is broken, check the line between the fuse and ATC3 (female) (1) and (11) for grounding fault.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective battery	★ Test the battery voltage and specific gravity of the battery fluid.		
			Battery voltage	Voltage	Min. 24 V
			Specific gravity of battery fluid	Specific gravity	Min. 1.26
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect negative (–) terminal of battery and insert T-adapter in ATC3. 3) Connect negative (–) terminal of battery.		
			Between battery relay terminal B – ground	Voltage	20 – 30 V
			Between ATC3 (1), (11) – ground	Voltage	20 – 30 V
			If there is voltage between battery relay terminal B and ground and there is not voltage between ATC3 (1) and (11), wiring harness between them has disconnection.		
			1) Turn starting switch OFF. 2) Disconnect negative (–) terminal of battery and connect T-adapter to ATC3 (female)		
			Wiring harness between ATC3 (female) (21), (31), (32), (33) – ground	Resistance	Max. 1 Ω
			If there is voltage between battery relay terminal B and ground but not between ATC3 (1), (11), (14), (24) and ground, wiring harness or fuse is broken.		
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Disconnect negative (–) terminal of battery and insert T-adapter in ATC3. 3) Connect negative (–) terminal of battery. 4) Turn starting switch ON.		
			Between ATC3 (1), (11) – (21), (31), (32), (33)	Voltage	20 – 30 V

Circuit diagram related



Failure code [DAQ0KT] Transmission controller nonvolatile memory: Abnormality in controller

Action code	Failure code	Trouble	Transmission controller nonvolatile memory: Abnormality in controller (Transmission controller system)
E01	DAQ0KT		
Contents of trouble	• An abnormality has occurred in the nonvolatile memory inside the controller. • Just after starting switch was turned OFF, there was not battery direct power supply and finishing operation was not carried out normally.		
Action of controller	• Control the model selection and option setting with default value. • Even if the cause of the failure has been eliminated automatically, the machine does not return to normal unless once resetting the starting switch OFF.		
Problem that appears on machine	• Machine control parameter may change and transmission gear shift shock may get worse.		
Related information	• Perform initial setting and initial adjustment as when transmission controller is replaced.		

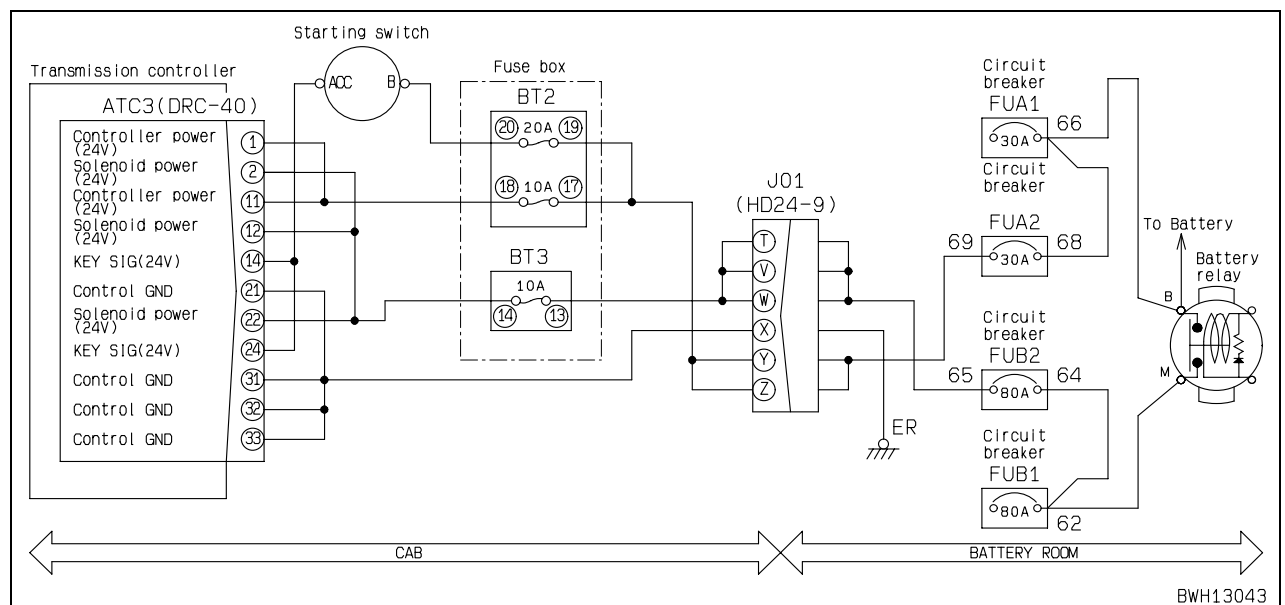
Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective transmission controller	
			Since this is an internal defect, it cannot be diagnosed. (It is no problem to keep using controller unless any visible trouble symptom appears on machine.)

Failure code [DAQ2KK] Transmission controller solenoid power source: Power source voltage too low

Action code	Failure code	Trouble	Transmission controller solenoid power source: Power source voltage too low (Transmission controller system)
E03	DAQ2KK		
Contents of trouble	Battery direct power source voltage of transmission controller has dropped to above 20 V, and solenoid power source voltage has dropped to below 18 V.		
Action of controller	- Holds the gear speed. - Keeps neutral with shift lever neutral.		
Problem that appears on machine	Suddenly shifts to neutral while traveling, and the machine cannot move off again.		
Related information	When the fuse is blown, check for ground fault of line from fuse – ATC3 (female) (2), (12), (22).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect negative (–) terminal of battery and insert T-adaptor in ATC3. 3) Connect negative (–) terminal of battery. 4) Turn starting switch ON.		
			Between battery relay terminal M – ground	Voltage	20 – 30 V
			Between ATC3 (2), (12), (22) – ground	Voltage	20 – 30 V
			If there is voltage between battery relay terminal M and ground and there is not voltage between ATC3 (2), (12), (22) and ground, wiring harness between them has disconnection.		
	2	Defective transmission controller	1) Turn starting switch OFF. 2) Disconnect negative (–) terminal of battery and insert T-adaptor in ATC3. 3) Connect negative (–) terminal of battery. 4) Turn starting switch ON.		
			Between ATC3 (2), (12), (22) – (21), (31), (32), (33)	Voltage	20 – 30 V

Circuit diagram related



Failure code [DAQ9KQ] Transmission controller: Disagreement of model selection

Action code	Failure code	Trouble	Transmission controller: Disagreement of model selection (Machine monitor system)
E03	DAQ9KQ		
Contents of trouble	• Machine model information from machine monitor is different from machine model information saved in transmission controller.		
Action of machine monitor			
Problem that appears on machine	• Machine cannot travel.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Wrong setting of machine model by machine monitor	Failure code [DAQ9KQ] is not displayed (Code is not displayed). ★ When machine monitor or transmission controller is replaced, set them according to Testing and adjusting.
	2	Installation of wrong transmission controller	Controller of correct part No. is mounted. ★ Check part No. If it is wrong, replace transmission controller with correct one.

Failure code [DAQRK R] Abnormality in CAN communication (Transmission)

Action code	Failure code	Trouble	Abnormality in CAN communication (Transmission) (Transmission controller system)
E03	DAQRKR		
Contents of trouble	• Machine monitor cannot obtain information from transmission controller through CAN communication circuit.		
Action of controller	• Keeps information at time of occurrence of abnormality.		
Problem that appears on machine	• System may not operate normally. • Information from transmission controller is not displayed.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DAFRKR]		

Failure code [DAQRMA] Transmission controller option setting: Malfunction

Action code	Failure code	Trouble	Transmission controller option setting: Malfunction (Machine monitor-transmission controller) (Machine monitor system)
E03	DAQRMA		
Contents of trouble	• Option setting signals inputted from machine monitor with the starting switch ON are different from the option settings that controller memorizes.		
Action of machine monitor	• Holds the gear speed in neutral. • Controls with the option setting that the controller memorizes. • It does not return normal unless the starting switch is turned OFF.		
Problem that appears on machine	• The gear speed becomes neutral and the machine cannot move off again.		
Related information	• Perform initial setting and initial adjustment as when transmission controller is replaced.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective machine monitor	
			Defective option setting of machine monitor or internal defect of monitor

Failure code [DB10KT] Retarder controller nonvolatile memory: Abnormality in controller

Action code	Failure code	Trouble	Retarder controller nonvolatile memory: Abnormality in controller (Retarder controller system)
E01	DB10KT		
Contents of trouble	• An abnormality has occurred in the nonvolatile memory inside the controller.		
Action of controller	• Control the model selection and option setting with default value. • Even if the cause of the failure has been eliminated automatically, the machine does not return to normal unless once resetting the starting switch OFF.		
Problem that appears on machine	• Machine parameter may change and power may increase or decrease.		
Related information			

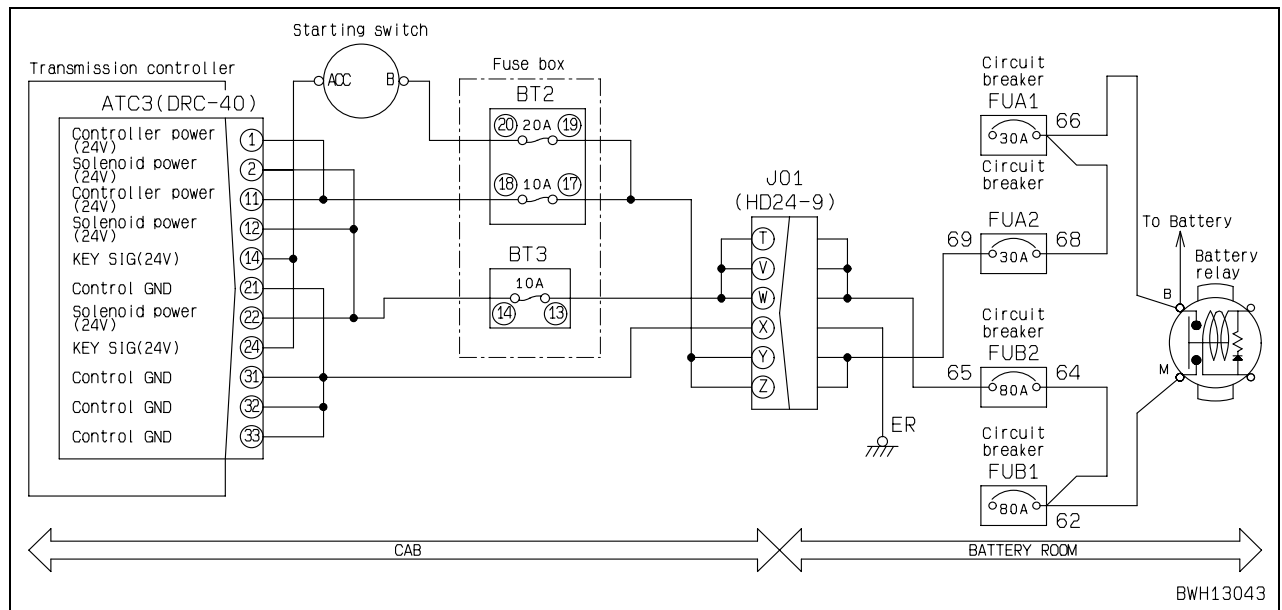
Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective retarder controller	
			Since this is an internal defect, it cannot be diagnosed. Replace to controller.

Failure code [DB12KK] Retarder controller solenoid power source: Power source system trouble

Action code	Failure code	Trouble	Retarder controller solenoid power source: Power source system trouble (Retarder controller system)
E03	DB12KK		
Contents of trouble	While controller direct power source voltage is normal, solenoid power source voltage has become below 18 V.		
Action of controller	- Turn OFF all of output circuits. - Turn OFF sensor 24 V power source.		
Problem that appears on machine	- All systems of retarder controller do not operate. (retarder, dump, automatic suspension, ARSC and ASR) - Failure code (DHU2KX and DHU3KX) are displayed at the same time.		
Related information	- If the fuse is blown, check for ground fault of line from fuse – BRC3 (female) (2), (12), (22). - If failure code "DAQ0KK" or "DAQ2KK" (transmission controller power source) is displayed, carry out troubleshooting for it first.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect negative (–) terminal of battery and insert T-adapter in BRC3. 3) Connect negative (–) terminal of battery. 4) Turn starting switch ON.		
			Between battery terminal M – ground	Voltage	20 – 30 V
			Between BRC3 (2), (12), (22) – ground	Voltage	20 – 30 V
			If voltage at fuse BT3 (12) is normal and voltage at BRC3 (2), (12), (22) is abnormal, wiring harness between fuse (12) – BRC3 (female) (2), (12), (22) has disconnection.		
			1) Turn starting switch OFF. 2) Disconnect negative (–) terminal of battery and connect T-adapter to BRC3 (female). 3) Connect negative (–) terminal of battery. 4) Turn starting switch ON.		
			Wiring harness between BRC3 (female) (21), (31), (32), (33) – ground	Resistance	Max. 1 Ω
	2	Defective retarder controller	1) Turn starting switch OFF. 2) Disconnect negative (–) terminal of battery and insert T-adapter in BRC3. 3) Connect negative (–) terminal of battery. 4) Turn starting switch ON.		
			Between BRC3 (2), (12), (22) – ground	Voltage	20 – 30 V

Circuit diagram related

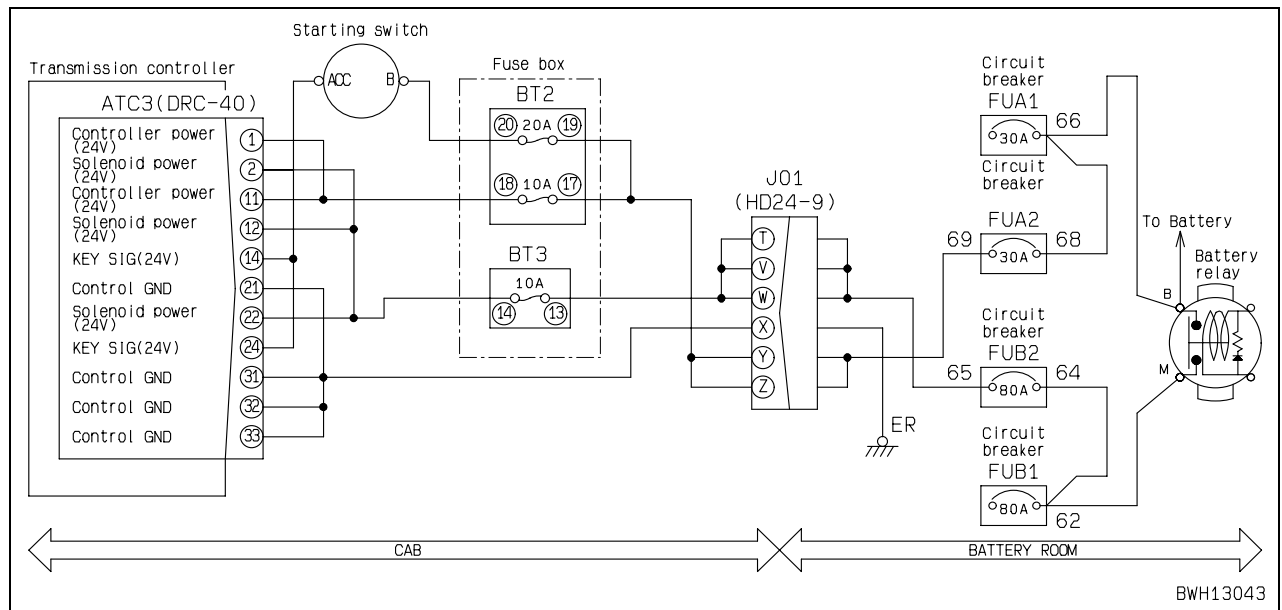


Failure code [DB13KK] Retarder controller battery direct power source: Power source voltage too low

Action code	Failure code	Trouble	Retarder controller battery direct power source: Power source voltage too low (Retarder controller system)
E03	DB13KK		
Contents of trouble	• Controller source voltage is below 18 V.		
Action of controller	• Turns all output OFF.		
Problem that appears on machine	• Retarder does not operate.		
Related information	- When the fuse is blown, check the short circuit of line from fuse – BRC3 (female) (1), (11), (2), (12), (22). - If failure code "DAQ0KK" or "DAQ2KK" (transmission controller power source) is displayed, carry out troubleshooting for it first.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective battery	★ Check battery voltage and electrolyte specific gravity.		
			Battery voltage	Voltage	Min. 24 V
			Battery electrolyte specific gravity	Specific gravity	Min. 1.26
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn starting switch OFF. 2) Disconnect battery (–) terminal and connect T-adapter to BRC3 (female).		
			Wiring harness between BRC3 (female) (21), (31), (32), (33) – ground	Resistance	Max. 1 Ω
			1) Turn starting switch OFF. 2) Disconnect battery (–) terminal and insert T-adapter in BRC3 (female). 3) Connect battery (–) terminal.		
			Between battery relay terminal B – ground	Voltage	20 – 30 V
			Between BRC (1), (11) – ground	Voltage	20 – 30 V
			1) Turn starting switch OFF. 2) Disconnect battery (–) terminal and connect T-adapter to BRC3 (female).		
			If there is voltage between battery relay terminal B and ground but not between ATC3 (1), (11) and ground, wiring harness or fuse is broken.		
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Disconnect battery (–) terminal and insert T-adapter in BRC3 (female). 3) Connect battery (–) terminal.		
			Between BRC3 (1), (11) – ground	Voltage	20 – 30 V

Circuit diagram related



Failure code [DB19KQ] Disagreement of model selection (Retarder controller)

Action code	Failure code	Trouble	Disagreement of model selection (Retarder controller) (Machine monitor system)
E03	DB19KQ		
Contents of trouble	• Information of model selection input from machine monitor when starting switch is turned ON is different from model selection saved in retarder controller.		
Action of machine monitor	• Turns all outputs OFF. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• When operator performs starting operation, machine does not start.		
Related information	• Perform initial setting and adjustment of retarder controller to be performed after replacement. • Method of reproducing failure code: Turn starting switch ON.		

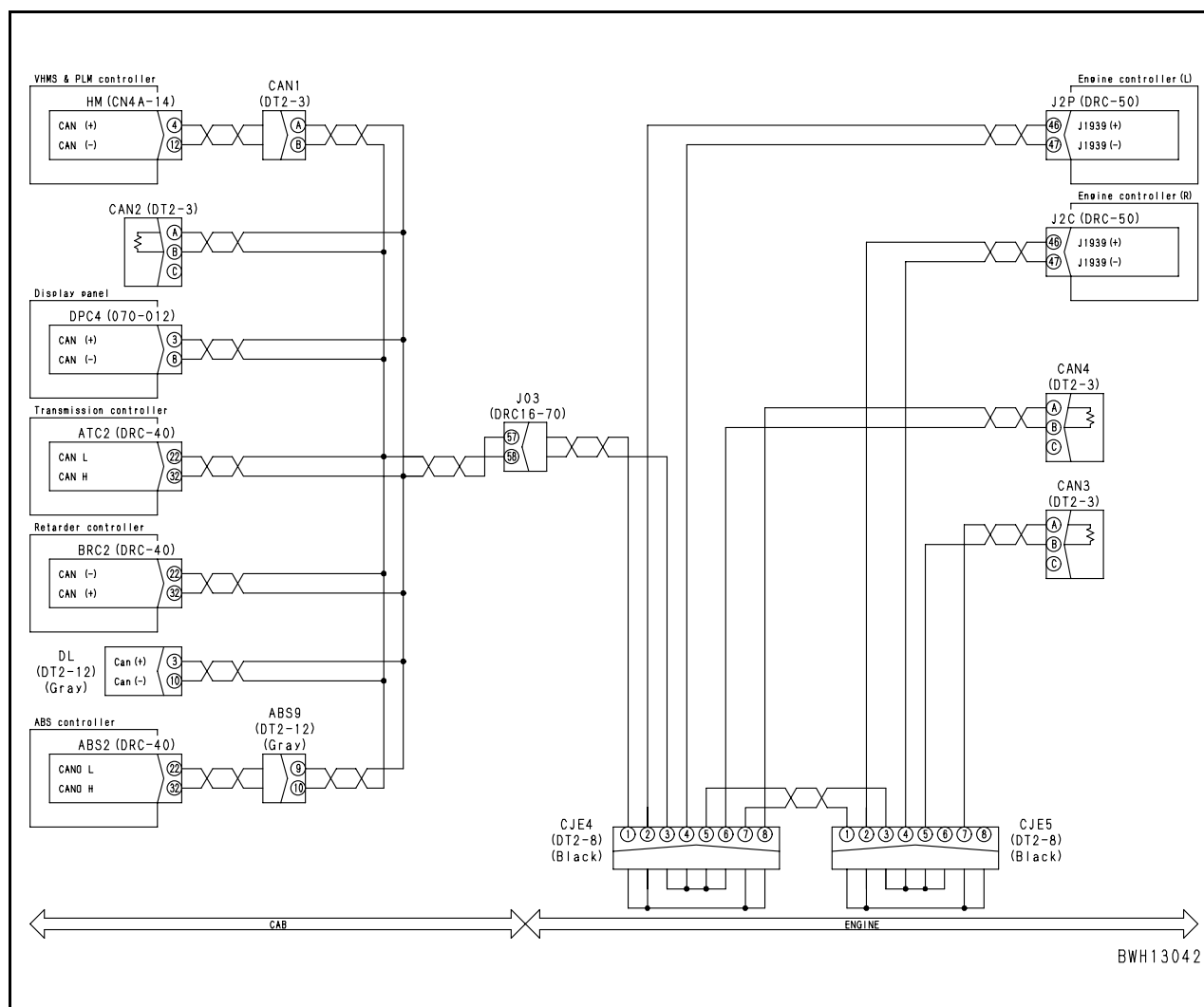
Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Wrong model selection in machine monitor	Failure code [DB19KQ] is not displayed. ★ Machine model may not be set correctly in machine monitor. After replacing machine monitor or retarder controller, set them correctly according to Testing and adjusting volume.
	2	Defective transmission controller	Wrong reterder controller may be installed. Check its part No. and install correct reterder controller.

Failure code [DB1RKR] CAN communication (retarder controller): Communication disabled

Action code	Failure code	Trouble	Abnormal CAN communication (retarder controller): Communication disabled (Between retarder controller – transmission controller) (Transmission controller system)
E03	DB1RKR		
Contents of trouble	• Updating of received data from retarder controller has stopped.		
Action of controller	• AISS is locked in LOW. (until starting switch is turned OFF.) • Keep the information at the time when abnormality occurred. • Turns on centralized warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• The information and special functions which are retrieved from retarder controller do not work or display.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective CAN terminal resistor (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CAN3 (male)		Resistance	
			Between (A) – (B)		Approx. 120 ± 12 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between J2P (female) (46) – J2C (female) (46), CAN3 (female) (A), CAN4 (female) (A), HM (female) (4), CAN2 (female) (A), DPC4 (female) (3), ATC2 (female) (32), BRC2 (female) (32), DL (female) (3) or ABS2 (female) (32)		Resistance	Max. 1 Ω
			Wiring harness between J2C (female) (46) – J2P (female) (46), CAN3 (female) (A), CAN4 (female) (A), DPC4 (female) (3), HM (female) (4), CAN2 (female) (A), DPC4 (female) (3), ATC2 (female) (32), BRC2 (female) (32), DL (female) (3) or ABS2 (female) (32)		Resistance	Max. 1 Ω
			Wiring harness between J2P (female) (47) – J2C (female) (47), CAN3 (female) (B), CAN4 (female) (B), HM (female) (12), CAN2 (female) (B), DPC4 (female) (8), ATC2 (female) (22), BRC2 (female) (22), DL (female) (10) or ABS2 (female) (22)		Resistance	Max. 1 Ω
			Wiring harness between J2C (female) (47) – J2A (female) (47), CAN3 (female) (B), CAN4 (female) (B), HM (female) (12), CAN2 (female) (B), DPC4 (female) (8), ATC2 (female) (22), BRC2 (female) (22), DL (female) (10) or ABS2 (female) (22)		Resistance	Max. 1 Ω
	3	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between ground and wiring harness between J2P (female) (46) – J2C (female) (46), CAN3 (female) (A), CAN4 (female) (A), HM (female) (4), CAN2 (female) (A), DPC4 (female) (3), ATC2 (female) (32), BRC2 (female) (32), DL (female) (3) or ABS2 (female) (32)		Resistance	Min. 1 MΩ

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	3	Grounding fault in wiring harness (Contact with ground circuit)	Between ground and wiring harness between J2C (female) (46) – J2P (female) (46), CAN3 (female) (A), CAN4 (female) (A), DPC4 (female) (3), HM (female) (4), CAN2 (female) (A), DPC4 (female) (3), ATC2 (female) (32), BRC2 (female) (32), DL (female) (3) or ABS2 (female) (32)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between J2P (female) (47) – J2C (female) (47), CAN3 (female) (B), CAN4 (female) (B), HM (female) (12), CAN2 (female) (B), DPC4 (female) (8), ATC2 (female) (22), BRC2 (female) (22), DL (female) (10) or ABS2 (female) (22)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between J2C (female) (47) – J2A (female) (47), CAN3 (female) (B), CAN4 (female) (B), HM (female) (12), CAN2 (female) (B), DPC4 (female) (8), ATC2 (female) (22), BRC2 (female) (22), DL (female) (10) or ABS2 (female) (22)	Resistance	Min. 1 MΩ
	4	Defective machine monitor, engine controller, transmission controller, VHMS & PLM controller, retarder controller or ABS controller	If causes 1 – 3 are not detected, machine monitor, engine controller, transmission controller, VHMS & PLM controller, retarder controller or ABS controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		



Failure code [DB1RMA] Disagreement of option setting (Retarder controller)

Action code	Failure code	Trouble	Disagreement of option setting (Retarder controller) (Machine monitor system)
E03	DB1RMA		
Contents of trouble	• Information of option setting sent from machine monitor when starting switch is turned ON is different from option setting saved in retarder controller.		
Action of machine monitor	• Turns machine monitor and option system caution lamp ON and sounds alarm buzzer. • Controls with option setting saved in controller. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• None in particular.		
Related information	• Perform initial setting and adjustment of retarder controller to be performed after replacement. • Method of reproducing failure code: Turn starting switch ON.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Wrong option setting in machine monitor	Option may be set wrongly in machine monitor. When machine monitor or retarder controller is replaced, set it correctly according to Testing and adjusting.
	2	Defective machine monitor	If cause 1 is not detected, machine monitor may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)

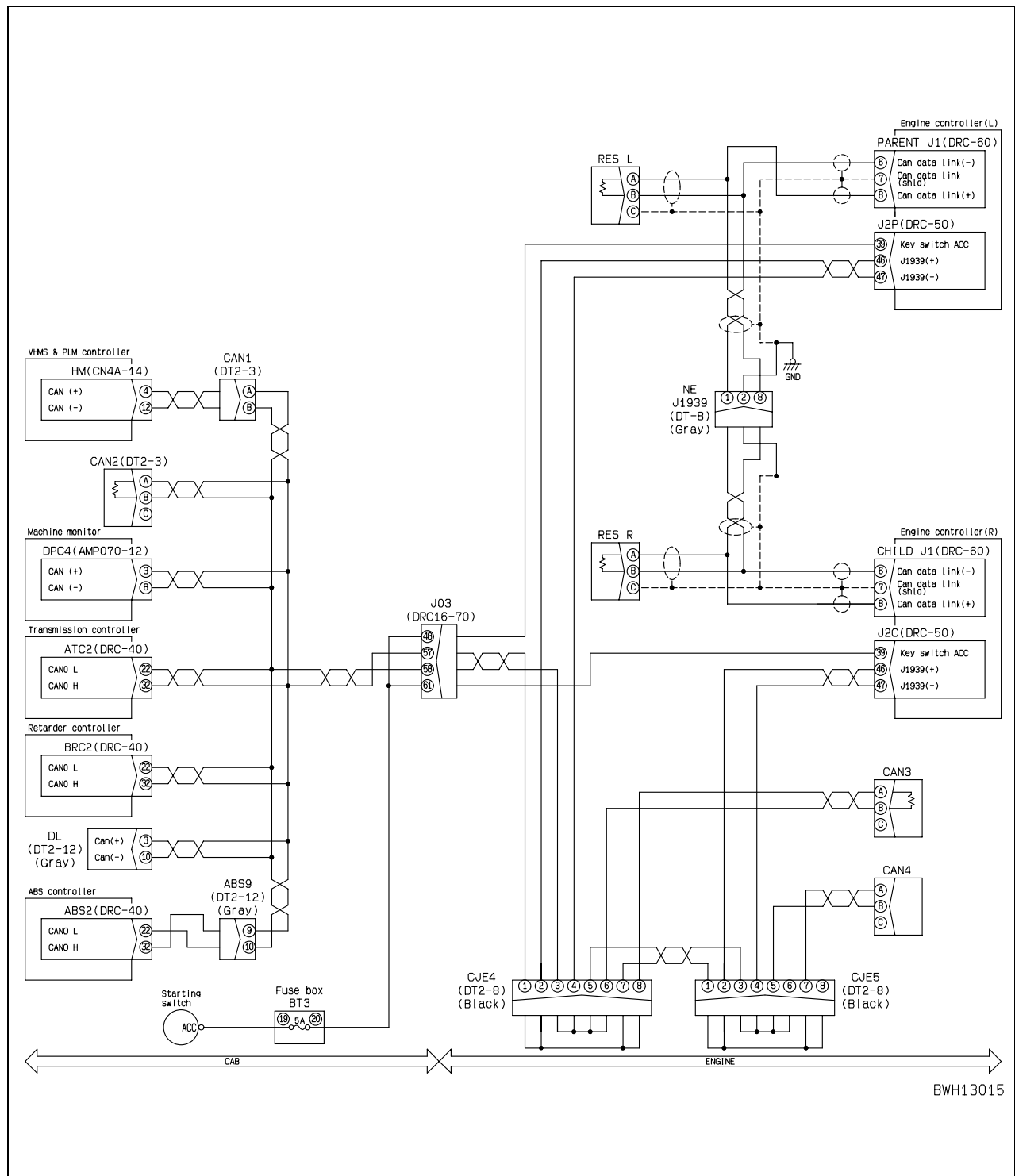
Failure code [DB2RKR] CAN communication (engine controller): Communication disabled

Action code	Failure code	Trouble	CAN communication (engine controller): Communication disabled (Between engine controller – transmission controller) (Transmission controller system)
E03	DB2RKR		
Contents of trouble	• Updating of received data from engine controller has stopped.		
Action of controller	• Keep the current gear speed. • Set the gearshift lever in the "N" position to keep the transmission in neutral. • Keep the information at the time when abnormality occurred. • Turns on centralized warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• The information and special functions which are retrieved from engine controller do not work or display.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective CAN terminal resistor (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CAN3 (male)		Resistance	
			Between (A) – (B)		Approx. 120 ± 12 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between J2P (female) (46) – J2C (female) (46), CAN3 (female) (A), CAN4 (female) (A), HM (female) (4), CAN2 (female) (A), DPC4 (female) (3), ATC2 (female) (32), BRC2 (female) (32), DL (female) (3) or ABS2 (female) (32)		Resistance	Max. 1 Ω
			Wiring harness between J2C (female) (46) – J2P (female) (46), CAN3 (female) (A), CAN4 (female) (A), DPC4 (female) (3), HM (female) (4), CAN2 (female) (A), DPC4 (female) (3), ATC2 (female) (32), BRC2 (female) (32), DL (female) (3) or ABS2 (female) (32)		Resistance	Max. 1 Ω
			Wiring harness between J2P (female) (47) – J2C (female) (47), CAN3 (female) (B), CAN4 (female) (B), HM (female) (12), CAN2 (female) (B), DPC4 (female) (8), ATC2 (female) (22), BRC2 (female) (22), DL (female) (10) or ABS2 (female) (22)		Resistance	Max. 1 Ω
			Wiring harness between J2C (female) (47) – J2A (female) (47), CAN3 (female) (B), CAN4 (female) (B), HM (female) (12), CAN2 (female) (B), DPC4 (female) (8), ATC2 (female) (22), BRC2 (female) (22), DL (female) (10) or ABS2 (female) (22)		Resistance	Max. 1 Ω
	3	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
Between ground and wiring harness between J2P (female) (46) – J2C (female) (46), CAN3 (female) (A), CAN4 (female) (A), HM (female) (4), CAN2 (female) (A), DPC4 (female) (3), ATC2 (female) (32), BRC2 (female) (32), DL (female) (3) or ABS2 (female) (32)			Resistance	Min. 1 MΩ		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	3	Grounding fault in wiring harness (Contact with ground circuit)	Between ground and wiring harness between J2C (female) (46) – J2P (female) (46), CAN3 (female) (A), CAN4 (female) (A), DPC4 (female) (3), HM (female) (4), CAN2 (female) (A), DPC4 (female) (3), ATC2 (female) (32), BRC2 (female) (32), DL (female) (3) or ABS2 (female) (32)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between J2P (female) (47) – J2C (female) (47), CAN3 (female) (B), CAN4 (female) (B), HM (female) (12), CAN2 (female) (B), DPC4 (female) (8), ATC2 (female) (22), BRC2 (female) (22), DL (female) (10) or ABS2 (female) (22)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between J2C (female) (47) – J2A (female) (47), CAN3 (female) (B), CAN4 (female) (B), HM (female) (12), CAN2 (female) (B), DPC4 (female) (8), ATC2 (female) (22), BRC2 (female) (22), DL (female) (10) or ABS2 (female) (22)	Resistance	Min. 1 MΩ
	4	Defective engine controller power supply	If engine cannot be started, engine controller power supply may be defective. Carry out troubleshooting for Failure code [CA111].		
	5	Defective machine monitor, engine controller, transmission controller, VHMS & PLM controller, retarder controller or ABS controller	If causes 1 – 4 are not detected, machine monitor, engine controller, transmission controller, VHMS & PLM controller, retarder controller or ABS controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related



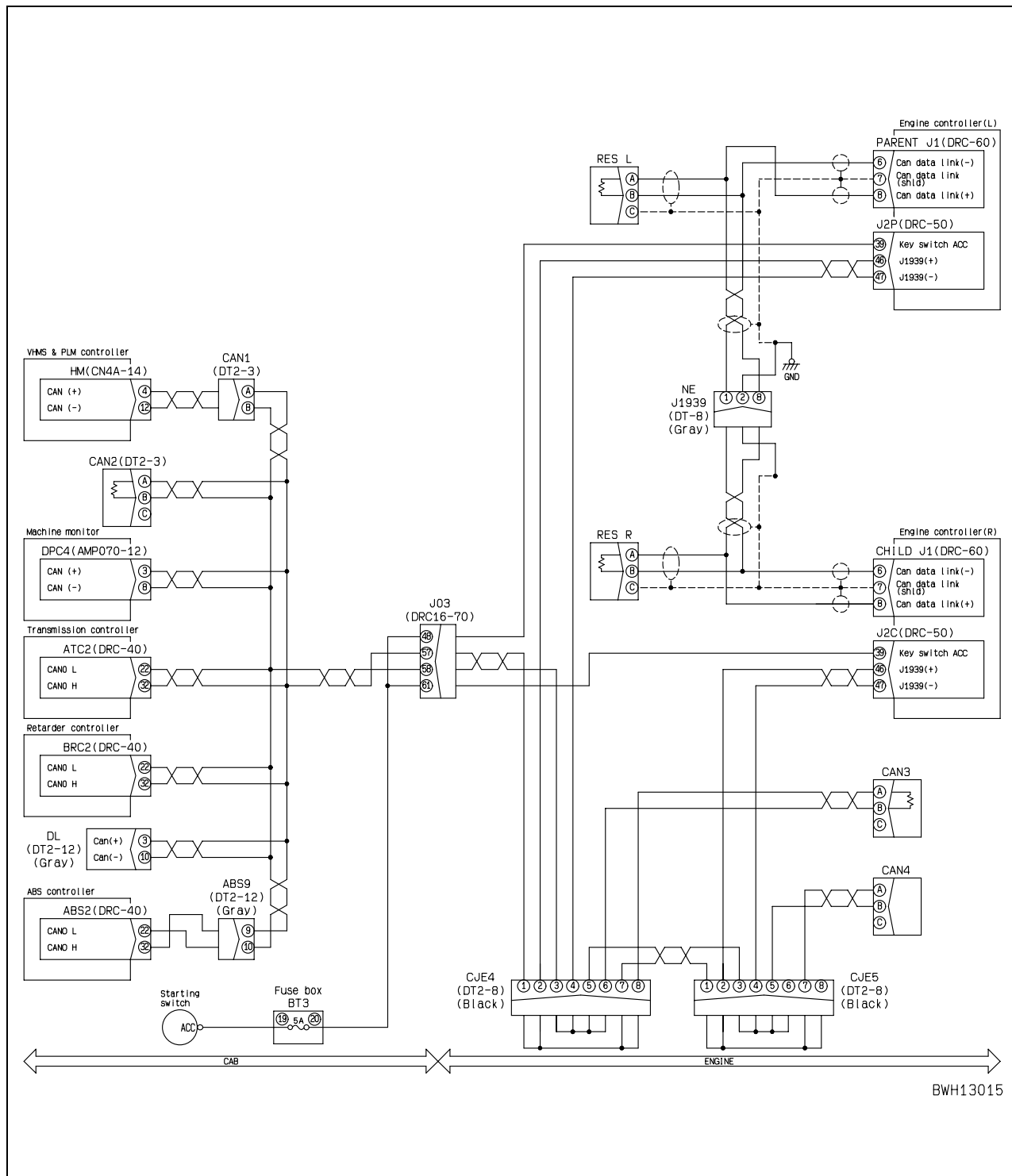
Failure code [dB2RKR] CAN communication (engine controller): Communication disabled

Action code	Failure code	Trouble	CAN communication (engine controller): Communication disabled (Between engine controller – transmission controller) (Transmission controller system)
E03	dB2RKR		
Contents of trouble	Updating of received data from engine controller has stopped.		
Action of controller	- Keep the current gear speed. - Set the gearshift lever in the "N" position to keep the transmission in neutral. - Keep the information at the time when abnormality occurred. - Turns on centralized warning lamp and sounds alarm buzzer.		
Problem that appears on machine	The information and special functions which are retrieved from engine controller do not work or display.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective CAN terminal resistor (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CAN3 (male)		Resistance	
			Between (A) – (B)		Approx. 120 ± 12 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between J2P (female) (46) – J2C (female) (46), CAN3 (female) (A), CAN4 (female) (A), HM (female) (4), CAN2 (female) (A), DPC4 (female) (3), ATC2 (female) (32), BRC2 (female) (32), DL (female) (3) or ABS2 (female) (32)		Resistance	Max. 1 Ω
			Wiring harness between J2C (female) (46) – J2P (female) (46), CAN3 (female) (A), CAN4 (female) (A), DPC4 (female) (3), HM (female) (4), CAN2 (female) (A), DPC4 (female) (3), ATC2 (female) (32), BRC2 (female) (32), DL (female) (3) or ABS2 (female) (32)		Resistance	Max. 1 Ω
			Wiring harness between J2P (female) (47) – J2C (female) (47), CAN3 (female) (B), CAN4 (female) (B), HM (female) (12), CAN2 (female) (B), DPC4 (female) (8), ATC2 (female) (22), BRC2 (female) (22), DL (female) (10) or ABS2 (female) (22)		Resistance	Max. 1 Ω
			Wiring harness between J2C (female) (47) – J2A (female) (47), CAN3 (female) (B), CAN4 (female) (B), HM (female) (12), CAN2 (female) (B), DPC4 (female) (8), ATC2 (female) (22), BRC2 (female) (22), DL (female) (10) or ABS2 (female) (22)		Resistance	Max. 1 Ω
	3	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between ground and wiring harness between J2P (female) (46) – J2C (female) (46), CAN3 (female) (A), CAN4 (female) (A), HM (female) (4), CAN2 (female) (A), DPC4 (female) (3), ATC2 (female) (32), BRC2 (female) (32), DL (female) (3) or ABS2 (female) (32)		Resistance	Min. 1 MΩ

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	3	Grounding fault in wiring harness (Contact with ground circuit)	Between ground and wiring harness between J2C (female) (46) – J2P (female) (46), CAN3 (female) (A), CAN4 (female) (A), DPC4 (female) (3), HM (female) (4), CAN2 (female) (A), DPC4 (female) (3), ATC2 (female) (32), BRC2 (female) (32), DL (female) (3) or ABS2 (female) (32)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between J2P (female) (47) – J2C (female) (47), CAN3 (female) (B), CAN4 (female) (B), HM (female) (12), CAN2 (female) (B), DPC4 (female) (8), ATC2 (female) (22), BRC2 (female) (22), DL (female) (10) or ABS2 (female) (22)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between J2C (female) (47) – J2A (female) (47), CAN3 (female) (B), CAN4 (female) (B), HM (female) (12), CAN2 (female) (B), DPC4 (female) (8), ATC2 (female) (22), BRC2 (female) (22), DL (female) (10) or ABS2 (female) (22)	Resistance	Min. 1 MΩ
	4	Defective engine controller power supply	If engine cannot be started, engine controller power supply may be defective. Carry out troubleshooting for Failure code [CA111].		
	5	Defective machine monitor, engine controller, transmission controller, VHMS & PLM controller, retarder controller or ABS controller	If causes 1 – 4 are not detected, machine monitor, engine controller, transmission controller, VHMS & PLM controller, retarder controller or ABS controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related



Failure code [DBBRKR] Abnormality in CAN communication (VHMS)

Action code	Failure code	Trouble	Abnormality in CAN communication (VHMS) (Machine monitor system)
E03	DBBRKR		
Contents of trouble	• Machine monitor cannot obtain information from VHMS controller through CAN communication circuit.		
Action of machine monitor	• Keeps information at time of occurrence of abnormality.		
Problem that appears on machine	• System may not operate normally. • Information from VHMS controller is not displayed.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

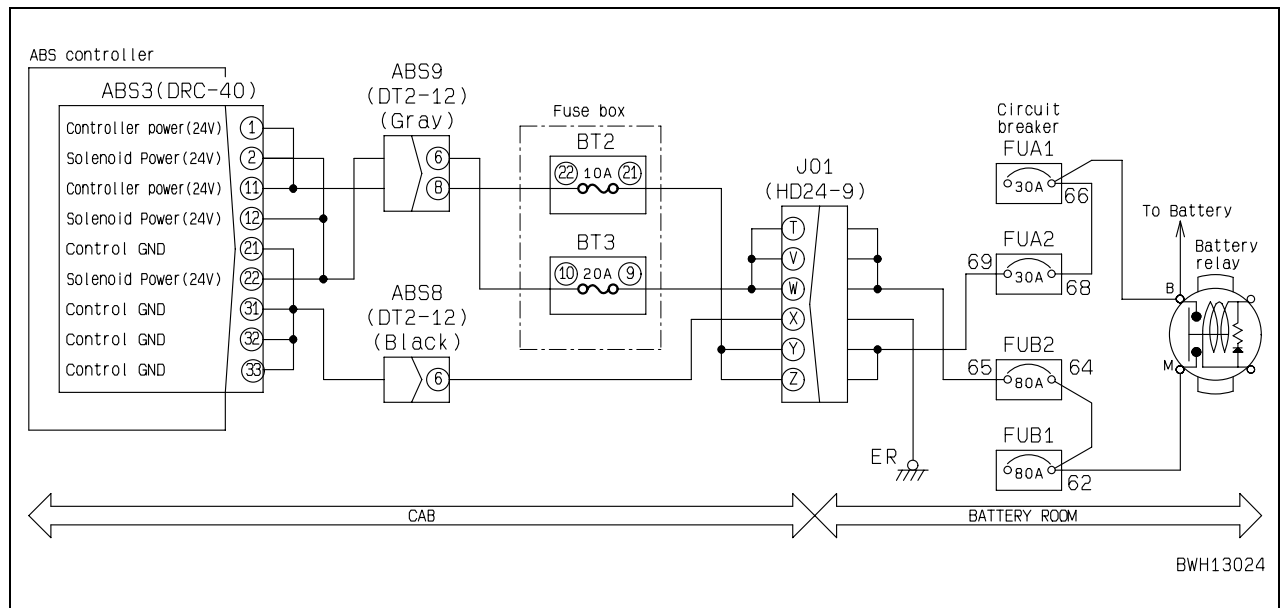
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DAFRKR]	

Failure code [DBC2KK] ABS controller solenoid power source: Power source system trouble

Action code	Failure code	Trouble	ABS controller solenoid power source: Power source system trouble (ABS controller system)
E03	DBC2KK		
Contents of trouble	• While controller direct power source voltage is normal, solenoid power source voltage has become below 18 V.		
Action of controller	• Turn OFF all of output circuits. • Turn OFF sensor 24 V power source.		
Problem that appears on machine	• All systems of ABS controller do not operate.		
Related information	• If the fuse is blown, check for ground fault of line from fuse – ABS3 (female) (2), (12), (22).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect negative (–) terminal of battery and insert T-adaptor in ABS3. 3) Connect negative (–) terminal of battery. 4) Turn starting switch ON.		
			Between battery terminal M – ground	Voltage	20 – 30 V
			Between ABS3 (2), (12), (22) – ground	Voltage	20 – 30 V
			If voltage at fuse BT3 (12) is normal and voltage at ABS3 (2), (12), (22) is abnormal, wiring harness between fuse (10) – ABS3 (female) (2), (12), (22) has disconnection.		
			1) Turn starting switch OFF. 2) Disconnect negative (–) terminal of battery and connect T-adaptor to ABS3 (female). 3) Connect negative (–) terminal of battery. 4) Turn starting switch ON.		
			Wiring harness between ABS3 (female) (21), (31), (32), (33) – ground	Resistance	Max. 1 Ω
	2	Defective retarder controller	1) Turn starting switch OFF. 2) Disconnect negative (–) terminal of battery and insert T-adaptor in ABS3. 3) Connect negative (–) terminal of battery. 4) Turn starting switch ON.		
			Between ABS3 (2), (12), (22) – ground	Voltage	20 – 30 V

Circuit diagram related

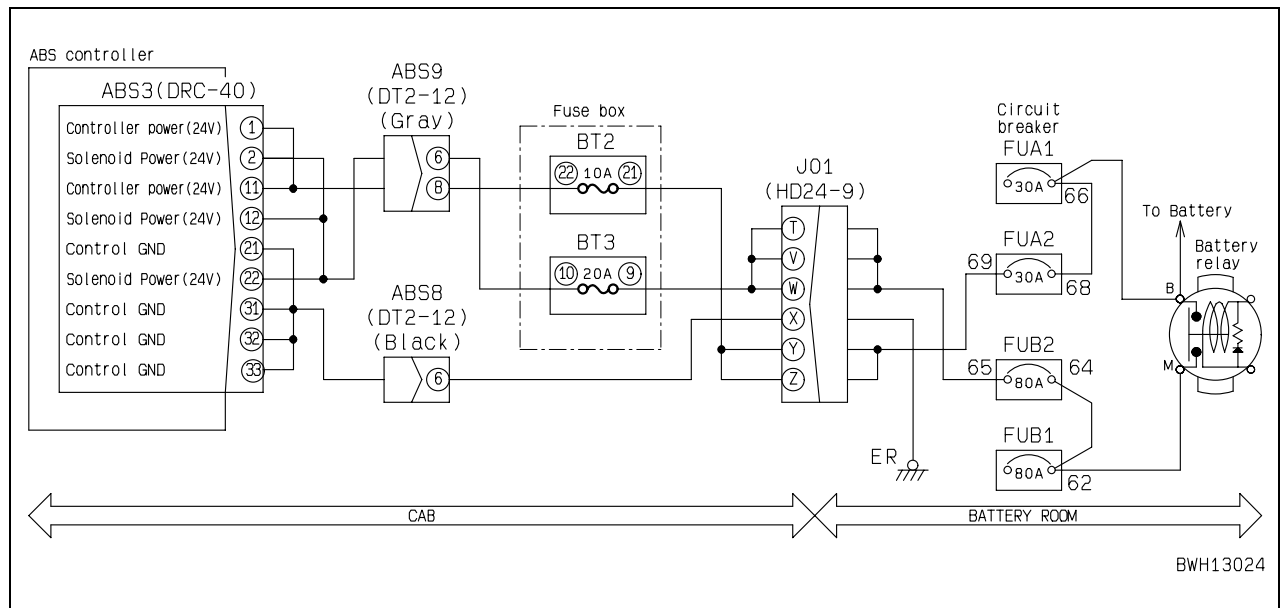


Failure code [DBC3KK] ABS controller battery direct power source: Power source voltage too low

Action code	Failure code	Trouble	ABS controller battery direct power source: Power source voltage too low (ABS controller system)
E03	DBC3KK		
Contents of trouble	• Controller source voltage is below 18 V.		
Action of controller	• Turns all output OFF.		
Problem that appears on machine	• ABS does not operate.		
Related information	• When the fuse is blown, check the short circuit of line from fuse – ABS3 (female) (1), (11), (2), (12), (22).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective battery	★ Check battery voltage and electrolyte specific gravity.		
			Battery voltage	Voltage	Min. 24 V
			Battery electrolyte specific gravity	Specific gravity	Min. 1.26
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn starting switch OFF. 2) Disconnect battery (–) terminal and insert T-adapter in ABS3 (female).		
			Wiring harness between ABS3 (female) (21), (31), (32), (33) – ground	Resistance	Max. 1 Ω
			1) Turn starting switch OFF. 2) Disconnect battery (–) terminal and insert T-adapter in ABS3 (female). 3) Connect battery (–) terminal.		
			Between battery relay terminal B – ground	Voltage	20 – 30 V
			Between ABS3 (1), (11) – ground	Voltage	20 – 30 V
			1) Turn starting switch OFF. 2) Disconnect battery (–) terminal and connect T-adapter to ABS3 (female).		
			If there is voltage between battery relay terminal B and ground but not between ABS3 (1), (11) and ground, wiring harness or fuse is broken.		
	3	Defective transmission controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between ABS3 (1), (11) – ground	Voltage	20 – 30 V

Circuit diagram related



Failure code [DBC9KQ] Disagreement of model selection (ABS controller)

Action code	Failure code	Trouble	Disagreement of model selection (ABS controller) (Machine monitor system)
E03	DBC9KQ		
Contents of trouble	• Information of model selection input from machine monitor when starting switch is turned ON is different from model selection saved in ABS controller.		
Action of machine monitor	• Turns all outputs OFF. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• ABS does not operate. • All ABS output is turned OFF.		
Related information	• Perform initial setting and adjustment of ABS controller to be performed after replacement. • Method of reproducing failure code: Turn starting switch ON.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Wrong model selection in machine monitor	Failure code [DBC9KQ] is not displayed. ★ Machine model may not be set correctly in machine monitor. After replacing machine monitor or retarder controller, set them correctly according to Testing and adjusting volume.
	2	Installation of wrong ABS controller	Wrong ABS controller may be installed. Check part No. of installed ABS controller and install normal ABS controller.

Failure code [DBCRKR] Abnormality in CAN communication (ABS)

Action code	Failure code	Trouble	Abnormality in CAN communication (ABS) (Transmission controller system)
E03	DBCRKR		
Contents of trouble	• Machine monitor cannot obtain information from ABS controller through CAN communication circuit.		
Action of machine monitor	• Keeps information at time of occurrence of abnormality.		
Problem that appears on machine	• System may not operate normally. • Information from ABS controller is not displayed.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DAFRKR]		

Failure code [DBCRMA] Disagreement of option setting (ABS controller)

Action code	Failure code	Trouble	Disagreement of option setting (ABS controller) (Machine monitor system)
E03	DBCRMA		
Contents of trouble	• Information of option setting sent from machine monitor when starting switch is turned ON is different from option setting saved in ABS controller.		
Action of machine monitor	• Turns machine monitor and option system caution lamp ON and sounds alarm buzzer. • Controls with option setting saved in controller. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• Non in particular.		
Related information	• Perform initial setting and adjustment of ABS controller to be performed after replacement. • Method of reproducing failure code: Turn starting switch ON.		

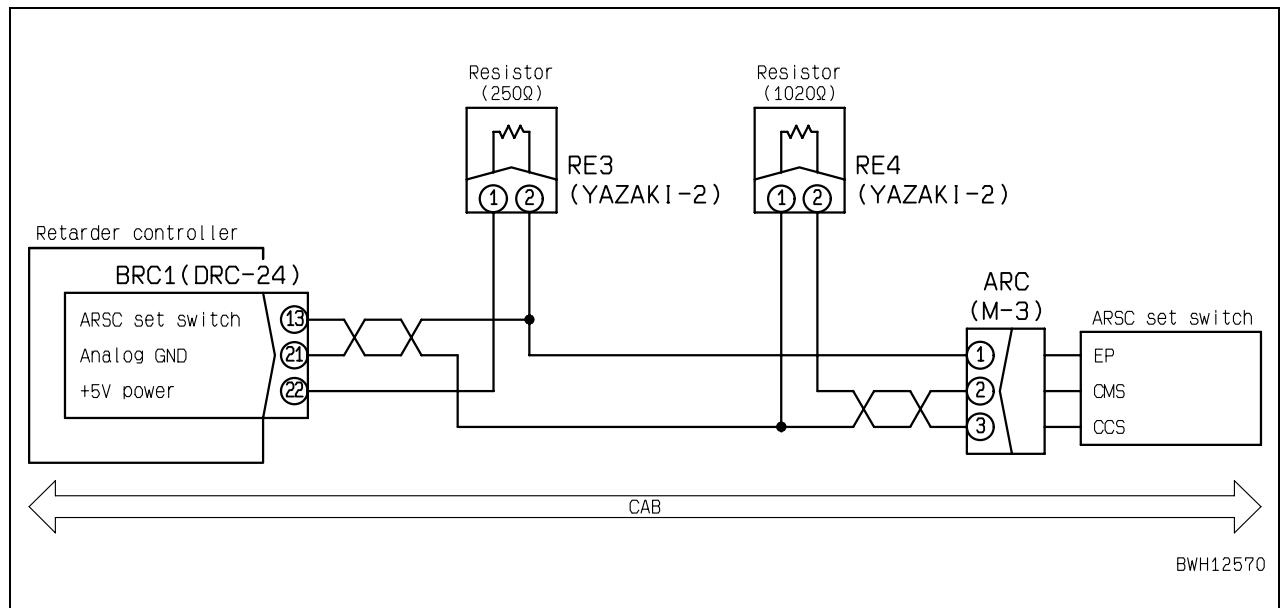
Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Wrong option setting in machine monitor	Failure code [DBCRMA] is not displayed. ★ Machine model may not be set correctly in machine monitor. After replacing machine monitor or retarder controller, set them correctly according to Testing and adjusting volume.
	2	Defective machine monitor	If cause 1 is not detected, machine monitor may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)

Failure code [DDD7KX] Trouble in travel speed setting switch system: Out of input signal range

Action code	Failure code	Trouble	Trouble in travel speed setting switch system: Out of input signal range (When ARSC is set and ARSC system switch is ON) (Retarder controller system)
E03	DDD7KX		
Contents of trouble	• The input signal circuit voltage of the travel speed set switch is below 0.15 V.		
Action of controller	• When ARSC operates, the controller releases the brake gradually.		
Problem that appears on machine	• This failure does not have a serious effect on the machine.		
Related information	• None in particular.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective travel speed set switch (ARSC SET switch)	1) Turn the starting switch OFF. 2) Replace the travel speed set switch (ARSC SET switch).			
			Replace the travel speed set switch (ARSC SET switch).	Failure is not repaired.	Switch is normal	
				Failure is repaired.	Switch is defective	
	2	Defective register (250 Ω)	1) Turn the starting switch OFF. 2) Disconnect connector RE3. 3) Connect T-adapter.			
			Between RE3 (female) (1) – (2)		Resistance	250 ± 25 Ω
	3	Defective resistor (1,020 z)	1) Turn the starting switch OFF. 2) Disconnect connector RE4. 3) Connect T-adapter.			
			Between RE4 (female) (1) – (2)		Resistance	1,020 ± 102 Ω
	4	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC1, ARC, RE3, and RE4. 3) Connect T-adapter.			
			Wiring harness between BRC1 (female) (22) – RE3 (male) (1)		Resistance	Max. 1 Ω
			Wiring harness between BRC1 (female) (13) – RE3 (male) (2) – ARC (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between RE4 (male) (1) – ARC (female) (3)		Resistance	Max. 1 Ω
			Wiring harness between RE4 (male) (2) – ARC (female) (2)		Resistance	Max. 1 Ω
	5	Defective retarder controller	1) Turn the starting switch OFF. 2) Disconnect connector BRC1. 3) Insert T-adapter. 4) Turn the starting switch ON.			
			Between BRC1 (22) – (21)		Voltage	Approx. 5 V
			1) Turn the starting switch OFF. 2) Disconnect connectors BRC1. 3) Insert T-adapter.			
			Between BRC1 (female) (13) – (21)	When set switch is ON	Resistance	1,020 ± 102 Ω
				When set switch is TOUCH UP	Resistance	68 ± 6.8 Ω
				When set switch is TOUCH DOWN	Resistance	198 ± 19.8 Ω
When set switch is CANCEL				Resistance	418 ± 41.8 Ω	

Circuit diagram related

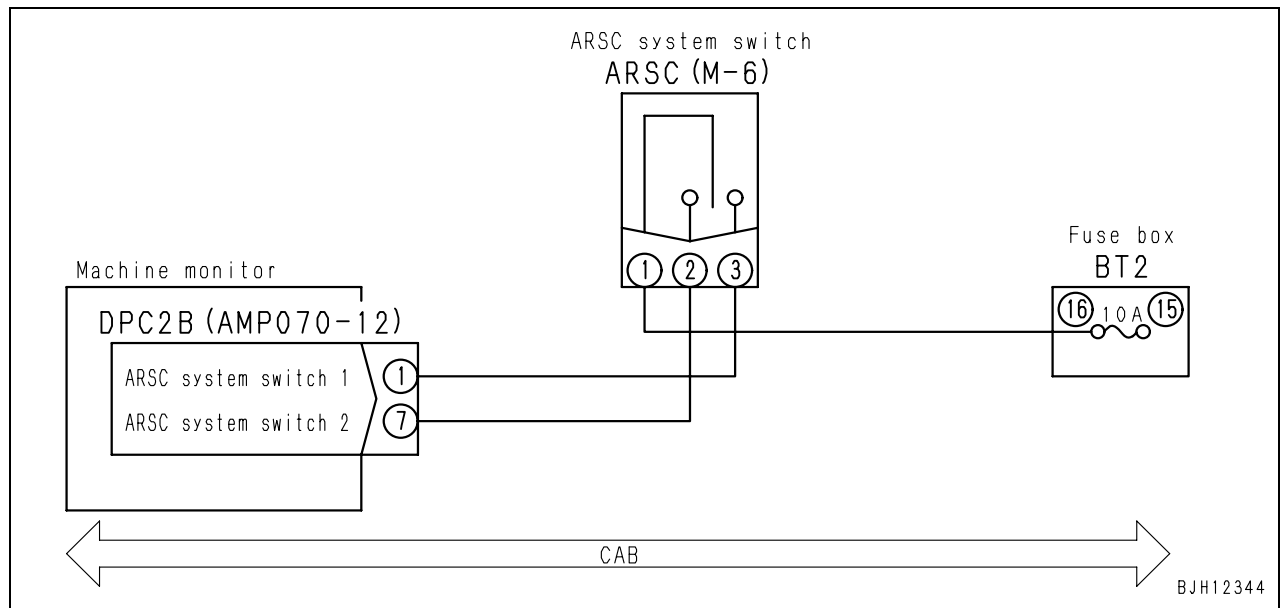


Failure code [DDD8KA] ARSC system switch system: Disconnection

Action code	Failure code	Trouble	ARSC system switch system: Disconnection (When ARSC is set and ARSC system switch is ON) (Retarder controller system)
E03	DDD8KA		
Contents of trouble	The ON input of the ARSC system switch is ON and the OFF input of the system switch is ON.		
Action of controller	When ARSC operates, the controller releases the brake gradually.		
Problem that appears on machine	This failure does not have a serious effect on the machine.		
Related information	Condition of ARSC switch can be checked with monitoring function (Code: 37701 (V)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors ARSC and DPC2B. 3) Connect T-adapter.			
			Wiring harness between DPC2B (female) (1) – ARSC (female) (3)		Resistance	Max. 1 Ω
	2	Defective ARSC system switch	1) Turn the starting switch OFF. 2) Replace the ARSC system switch with normal one. 3) Turn the starting switch ON.			
			When the ARSC system switch is replaced with normal one, is failure repaired?	No	System switch is normal	
				Yes	System switch is defective	
	3	Defective machine monitor	1) Turn the starting switch OFF. 2) Disconnect connector DPC2B. 3) Insert T-adapter. 4) Turn the starting switch ON.			
			Between DPC2B (1) – ground	Turn the ARSC system switch ON (Press it up).	Voltage	20 – 30 V
				Turn the ARSC system switch OFF (Press it down).	Voltage	Max. 1 V

Circuit diagram related

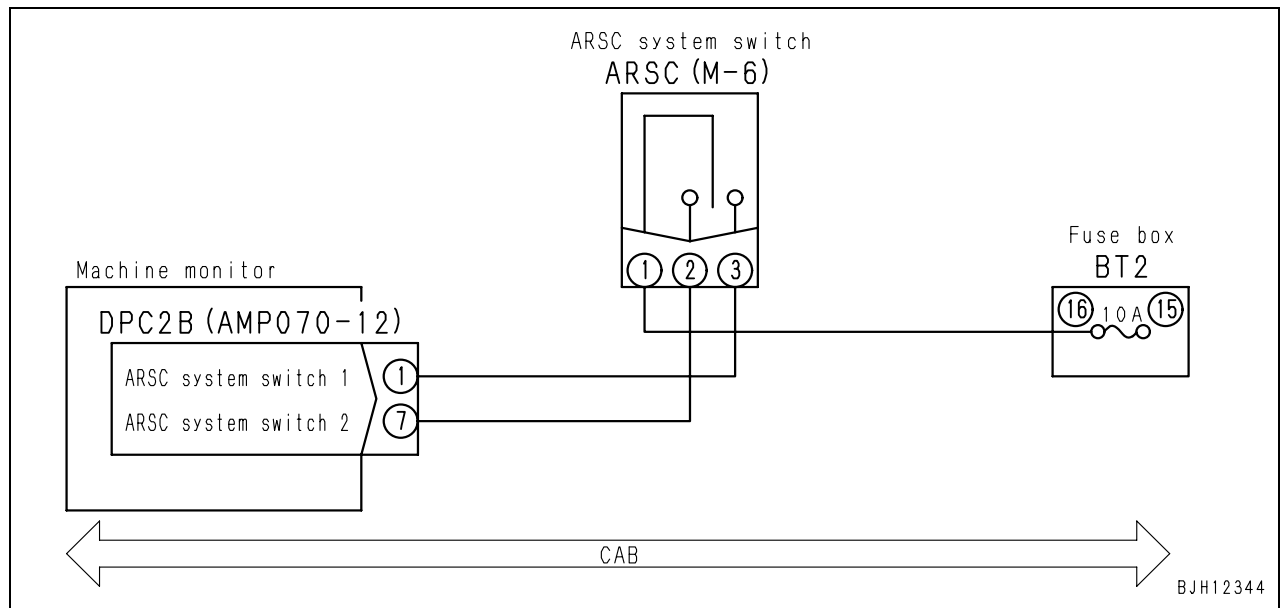


Failure code [DDD8KB] ARSC system switch system: Short circuit

Action code	Failure code	Trouble	ARSC system switch system: Short circuit (When ARSC is set and ARSC system switch is ON) (Retarder controller system)
E03	DDD8KB		
Contents of trouble	• The ON input of the ARSC system switch is ON and the OFF input of the system switch is ON.		
Action of controller	• When ARSC operates, the controller releases the brake gradually.		
Problem that appears on machine	• This failure does not have a serious effect on the machine.		
Related information	• Condition of ARSC switch can be checked with monitoring function (Code: 37701 (V)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Hot short in wiring harness	1) Turn the starting switch OFF. 2) Disconnect connectors ARSC and DPC2B. 3) Connect T-adapter. 4) Turn the starting switch ON.			
			Wiring harness between DPC2B (female) (1) – ARSC (female) (3)		Voltage	Max. 1 V
			Wiring harness between DPC2B (female) (7) – ARSC (female) (2)		Voltage	Max. 1 V
	2	ARSC system switch defective	1) Turn the starting switch OFF. 2) Replace the ARSC system switch with normal one. 3) Turn the starting switch ON.			
			When the ARSC system switch is replaced with normal one, is failure repaired?	No	System switch is normal	
				Yes	System switch is defective	
	3	Machine monitor defective	1) Turn the starting switch OFF. 2) Disconnect connector DPC2B. 3) Insert T-adapter. 4) Turn the starting switch ON.			
			Between DPC2B (1) – ground	Turn the ARSC system switch ON (Press it up).	Voltage	20 – 30 V
				Turn the ARSC system switch OFF (Press it down).	Voltage	Max. 1 V

Circuit diagram related

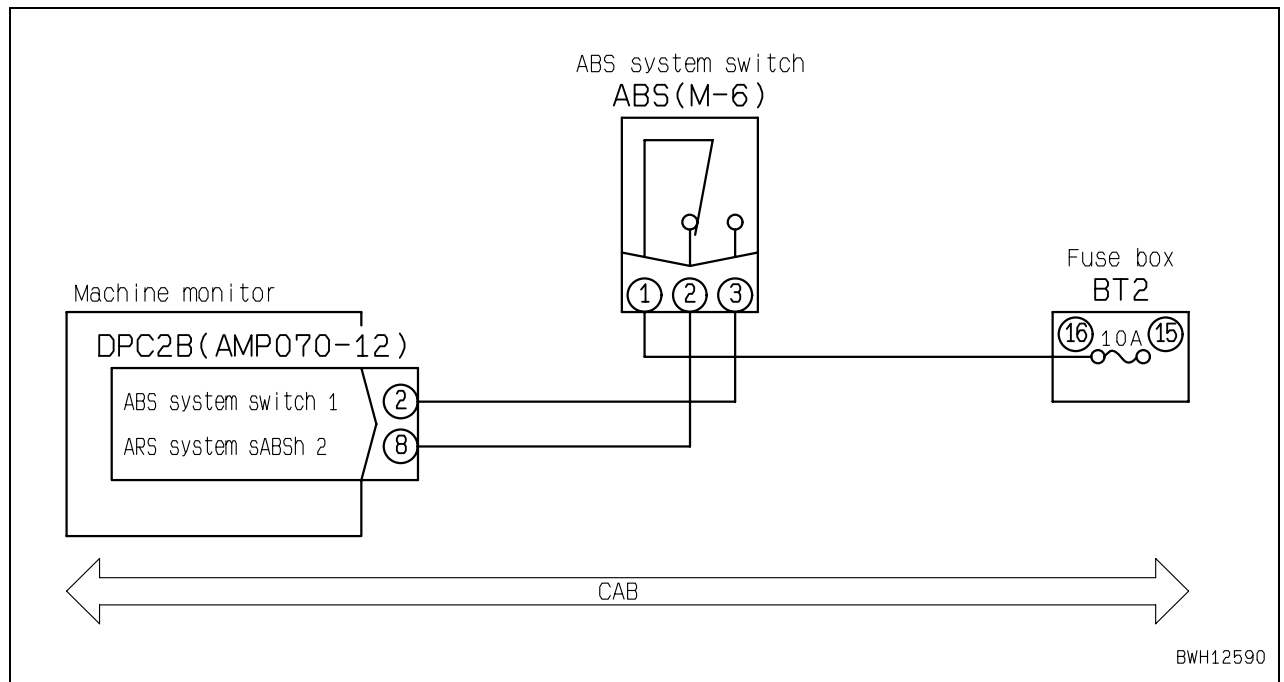


Failure code [DDD9KA] ABS system switch system: Disconnection

Action code	Failure code	Trouble	ABS system switch system: Disconnection (When ABS is set and ABS system switch is ON) (ABS controller system)
E03	DDD9KA		
Contents of trouble	• The ON input of the ABS system switch is ON and the OFF input of the system switch is ON.		
Action of controller	• When ABS operates, the controller releases the brake gradually.		
Problem that appears on machine	• This failure does not have a serious effect on the machine.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors ABS and DPC2B. 3) Connect T-adapter.			
			Wiring harness between DPC2B (female) (2) – ABS (female) (3)		Resistance	Max. 1 Ω
			Wiring harness between DPC2B (female) (8) – ABS (female) (2)		Resistance	Max. 1 Ω
	2	Defective ABS system switch	1) Turn the starting switch OFF. 2) Replace the ABS system switch with normal one. 3) Turn the starting switch ON.			
			When the ABS system switch is replaced with normal one, is failure repaired?	No	System switch is normal	
				Yes	System switch is defective	
	3	Defective machine monitor	1) Turn the starting switch OFF. 2) Disconnect connector DPC2B. 3) Insert T-adapter. 4) Turn the starting switch ON.			
			Between DPC2B (2) – ground	Turn the ABS system switch ON (Press it up).	Voltage	20 – 30 V
				Turn the ABS system switch OFF (Press it down).	Voltage	Max. 1 V

Circuit diagram related

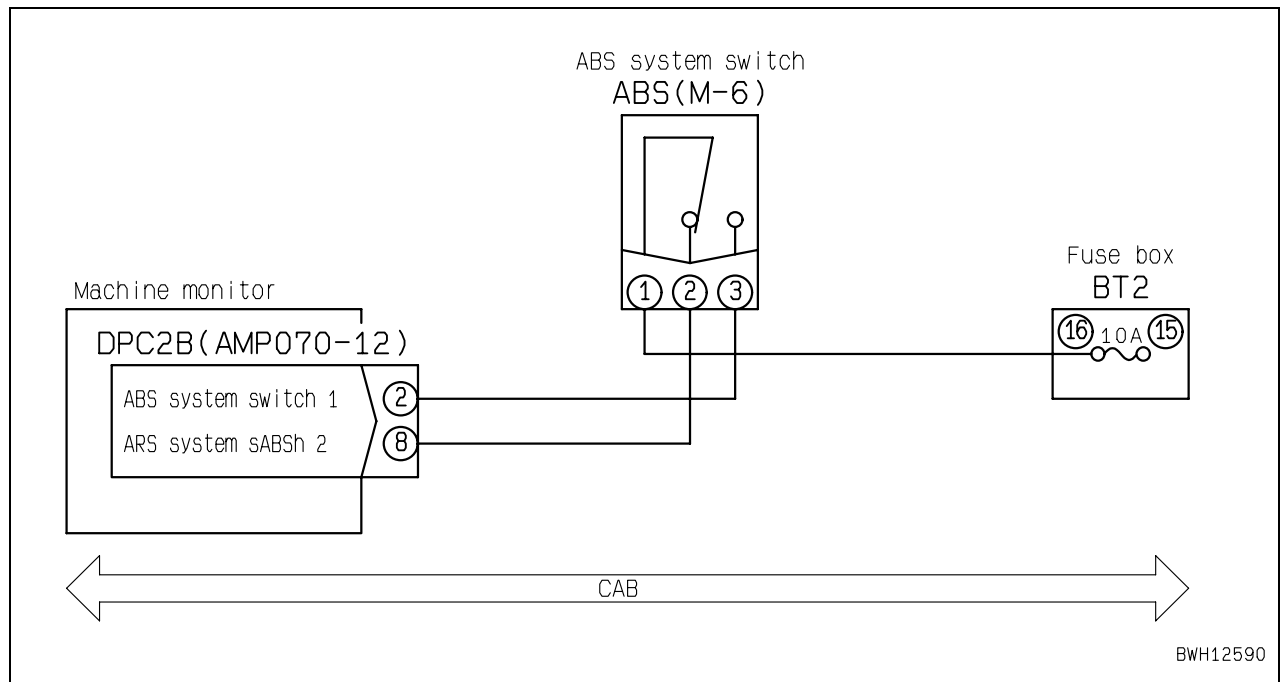


Failure code [DDD9KB] ABS system switch system: Short circuit

Action code	Failure code	Trouble	ABS system switch system: Short circuit (When ABS is set and ABS system switch is ON) (Machine monitor system)
E03	DDD9KB		
Contents of trouble	• The ON input of the ABS system switch is ON and the OFF input of the system switch is ON.		
Action of controller	• When ABS operates, the controller releases the brake gradually.		
Problem that appears on machine	• This failure does not have a serious effect on the machine.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors ABS and DPC2B. 3) Connect T-adapter. 4) Turn the starting switch ON.			
			Between ground and wiring harness between DPC2B (female) (2) – ABS (female) (3)	Voltage	Max. 1 V	
			Between ground and wiring harness between DPC2B (female) (8) – ABS (female) (2)	Voltage	Max. 1 V	
	2	Defective ABS system switch	1) Turn the starting switch OFF. 2) Replace the ABS system switch with normal one. 3) Turn the starting switch ON.			
			When the ABS system switch is replaced with normal one, is failure repaired?	No	System switch is normal	
				Yes	System switch is defective	
	3	Defective machine monitor	1) Turn the starting switch OFF. 2) Disconnect connector DPC2B. 3) Insert T-adapter. 4) Turn the starting switch ON.			
			Between DPC2B (2) – ground	Turn the ABS system switch ON (Press it up).	Voltage	20 – 30 V
				Turn the ABS system switch OFF (Press it down).	Voltage	Max. 1 V

Circuit diagram related

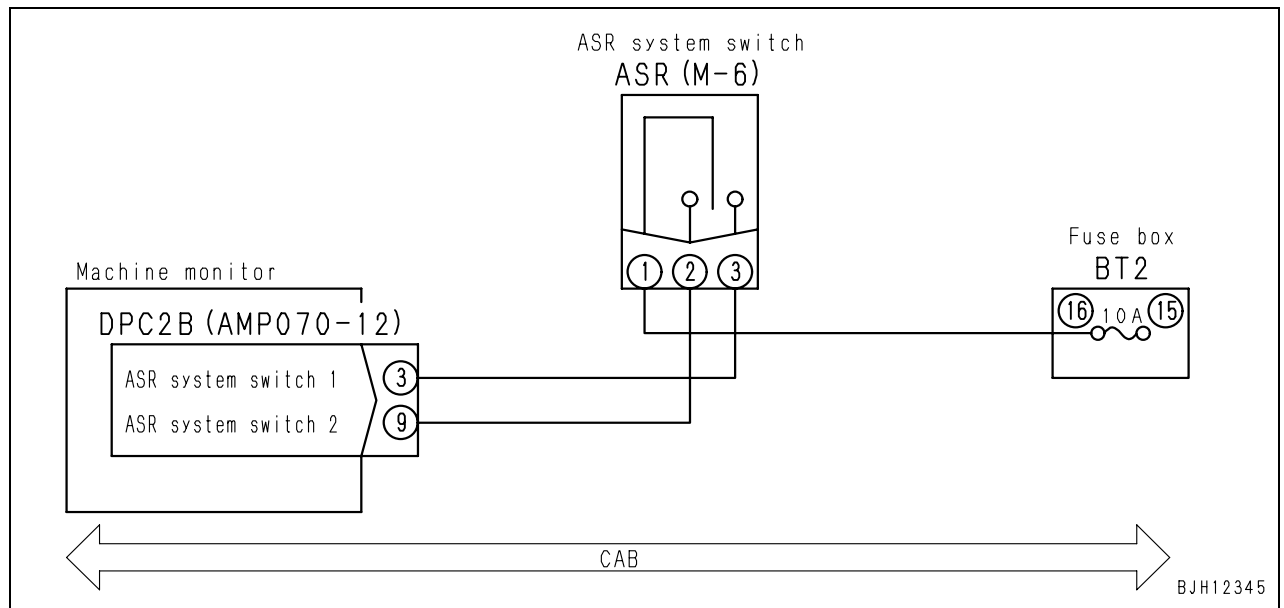


Failure code [DDDAKA] ASR system switch: Disconnection

Action code	Failure code	Trouble	ASR system switch: Disconnection (Machine monitor system)
E01	DDDAKA		
Contents of trouble	• The ON input of the ASR system switch is OFF and the OFF input of the system switch is OFF.		
Action of controller	• Resets ASR control.		
Problem that appears on machine	• Machine is not affected seriously. • ASR control cannot be continued.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn starting switch OFF. 2) Disconnect connectors ASR and DPC2B. 3) Connect T-adapter.			
			Wiring harness between DPC2B (female) (3) – ASR (female) (3)		Resistance	Max. 1 Ω
			1) Turn starting switch OFF. 2) Disconnect connectors ASR and DPC2B. 3) Connect T-adapter.			
			Wiring harness between DPC2B (female) (9) – ASR (female) (2)		Resistance	Max. 1 Ω
	2	Defective ASR system switch	1) Turn starting switch OFF. 2) Replace ASR system switch with normal switch. 3) Turn starting switch ON.			
			When ASR system switch is replaced with normal switch, does condition become normal?	No	System switch is normal	
				Yes	System switch is abnormal	
	3	Defective machine monitor	1) Turn starting switch OFF. 2) Disconnect connector DPC2B. 3) Insert T-adapter. 4) Turn starting switch ON.			
			Between DPC2B (3) – ground	ASR system switch "ON"	Voltage	20 – 30 V
				ASR system switch "OFF"	Voltage	Max. 1 V
			Between DPC2B (9) – ground	ASR system switch "ON"	Voltage	Max. 1 V
				ASR system switch "OFF"	Voltage	20 – 30 V

Circuit diagram related

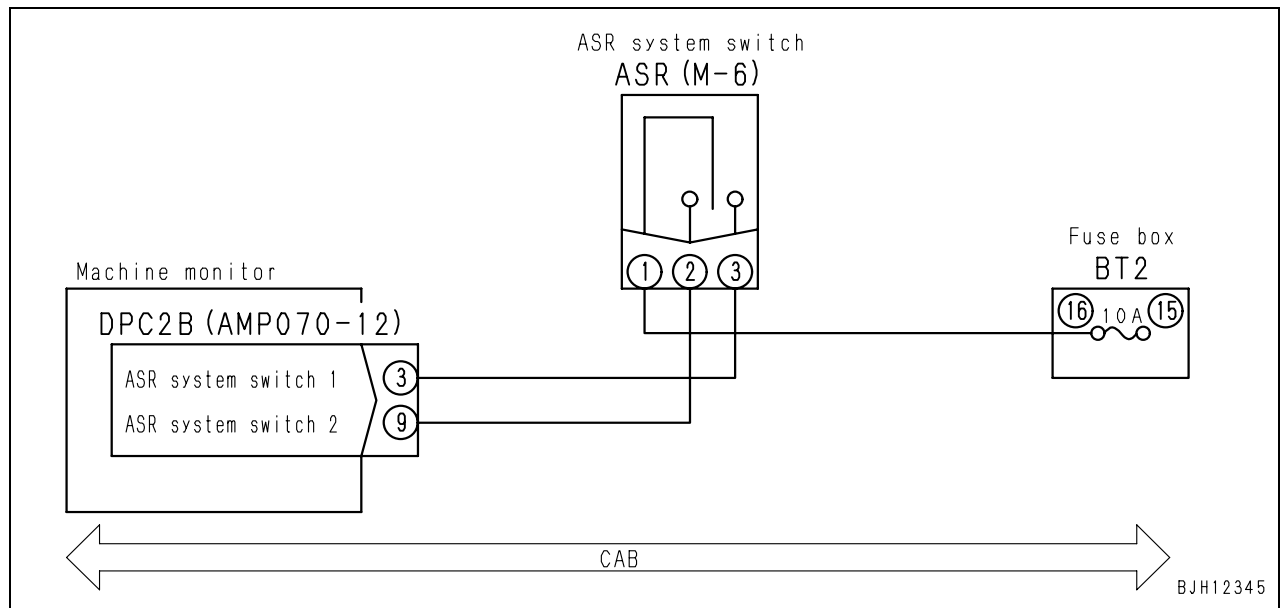


Failure code [DDDAKB] ASR system switch: Short circuit

Action code	Failure code	Trouble	ASR system switch system: Short circuit (Machine monitor system)
E01	DDDAKB		
Contents of trouble	• ASR system switch ON input is turned ON and system switch OFF input is turned ON.		
Action of controller	• Resets ASR control.		
Problem that appears on machine	• Machine is not affected particularly. • ASR control cannot be continued.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Hot short in wiring harness	1) Turn starting switch OFF. 2) Disconnect connectors ASR and DPC2B. 3) Connect T-adapter. 4) Turn starting switch ON.			
			Between ground and wiring harness between DPC2B (female) (3) – ASR (female) (3)	Voltage	Max. 1 V	
			Between ground and wiring harness between DPC2B (female) (9) – ASR (female) (2)	Voltage	Max. 1 V	
	2	Defective ASR system switch	1) Turn starting switch OFF. 2) Replace ASR system switch with normal switch. 3) Turn starting switch ON.			
			When ASR system switch is replaced with normal switch, is condition normal?	No	System switch is normal	
				Yes	System switch is defective	
	3	Defective machine monitor	1) Turn starting switch OFF. 2) Disconnect connector DPC2B. 3) Insert T-adapter. 4) Turn starting switch ON.			
			Between DPC2B (3) – ground	ASR system switch "ON"	Voltage	20 – 30 V
				ASR system switch "OFF"	Voltage	Max. 1 V
			Between DPC2B (9) – ground	ASR system switch "ON"	Voltage	Max. 1 V
				ASR system switch "OFF"	Voltage	20 – 30 V

Circuit diagram related



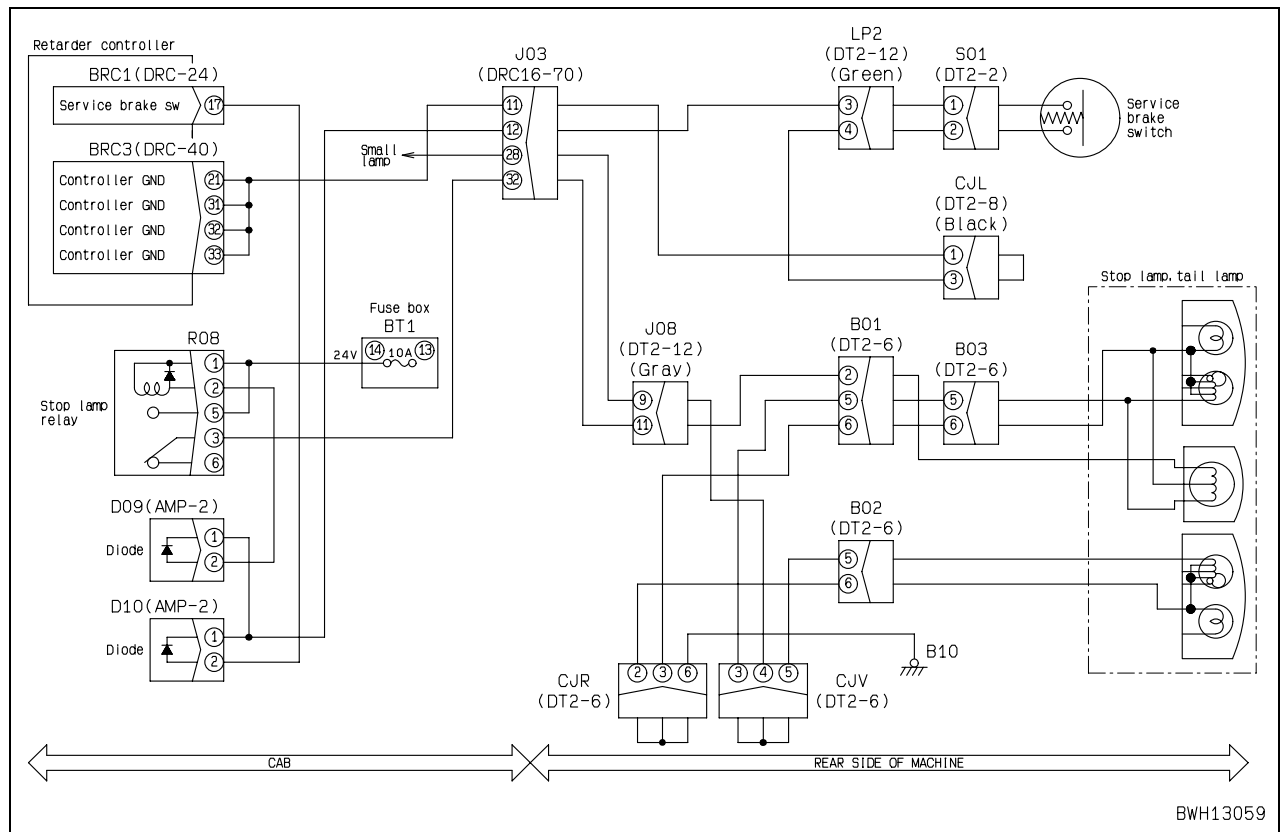
Failure code [DDP6L4] Service brake pressure switch trouble (Rear)

Action code	Failure code	Trouble	Service brake pressure switch trouble (Rear) (Retarder controller system)
E03	DDP6L4		
Contents of trouble	When foot brake is pressed, signal is not input from service brake pressure switch.		
Action of controller			
Problem that appears on machine	When foot brake is pressed, brake lamp (rear center lamp) does not light up.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective R08 (STOP LAMP relay)	1) Remove relay cover. 2) Turn starting switch ON (Do not start engine). 3) Turn foot brake ON and OFF to check relay.			
			R08		Turning ON/OFF sound is heard.	
	2	Defective diode	★ Turn starting switch OFF and disconnect D09, then carry out troubleshooting without turning starting switch ON (Measure in diode check mode).			
			Between D09 (male) (1) – (2)		Continuity	Forward direction: There is continuity Backward direction: There is not continuity
			★ Turn starting switch OFF and disconnect D10, then carry out troubleshooting without turning starting switch ON (Measure in diode check mode).			
			Between D10 (male) (1) – (2)		Continuity	Forward direction: There is continuity Backward direction: There is not continuity
	3	Defective service brake switch	★ Connect wires to T-adapter for DT-T-3. 1) Turn starting switch OFF. 2) Disconnect S01 and connect T-adapter. 3) Turn starting switch ON.			
			Between S01 (male) (1) – (2)		Continuity	When brake pressed: There is continuity When brake is released: There is not continuity
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Turn starting switch OFF and disconnect BRC1, S01 and D10, then carry out troubleshooting without turning starting switch ON.			
			Between S01 (female) (1) – D01 (female) (1)		Resistance	Max. 1 Ω
			Between BRC1 (female) (17) – D01 (female) (2)		Resistance	Max. 1 Ω
			Between S01 (female) (2) – ground		Resistance	Max. 1 Ω

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	5	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect BRC1, S01, D09 and D10, then carry out troubleshooting without turning starting switch ON.		
			Between D10 (female) (1) – ground	Resistance	Min. 1 MΩ
			Between D10 (female) (2) – ground	Resistance	Min. 1 MΩ
	6	Trouble in hydraulic system (when electrical system is normal)	Hydraulic system may have trouble. Remove cause of trouble.		
	7	Defective retarder controller	If causes 1 – 6 are not detected, retarder controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related



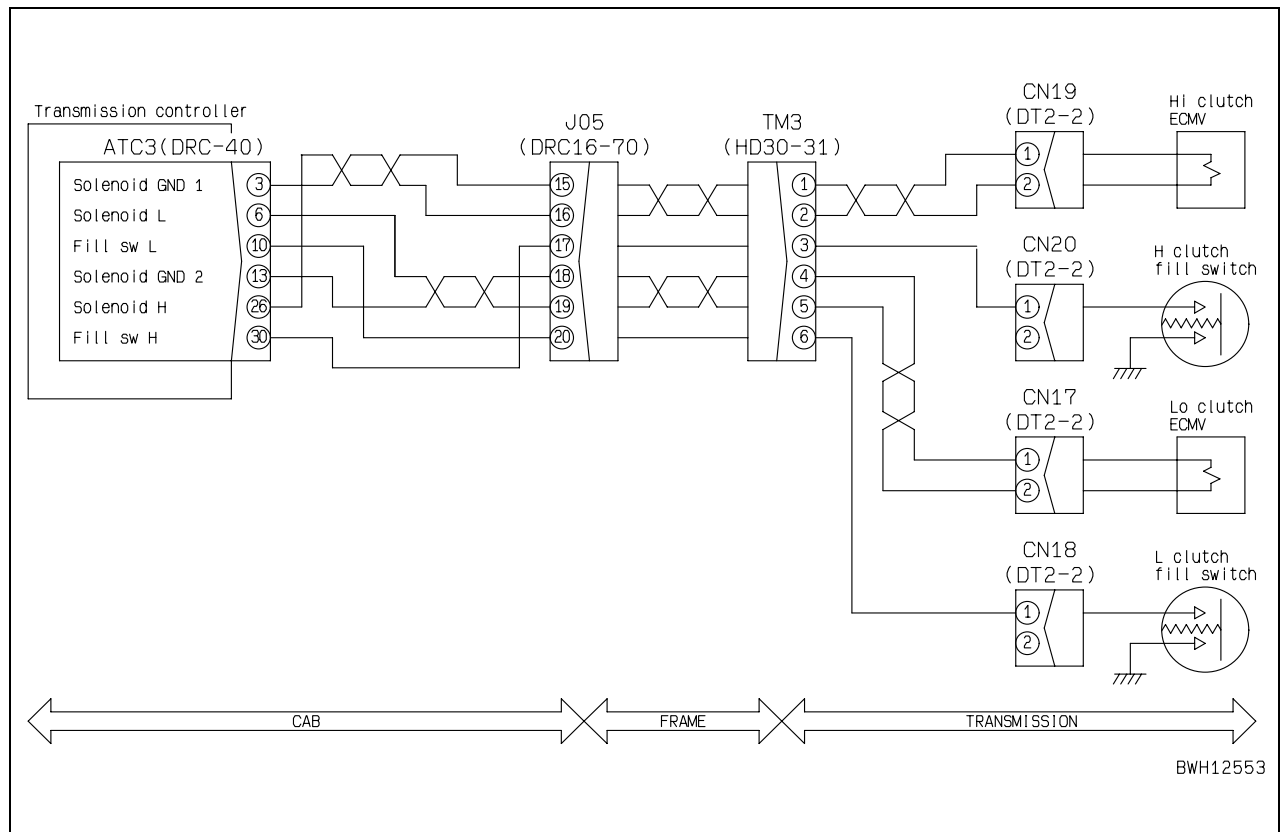
BWH13059

Failure code [DDTHKA] Hi clutch fill switch: Disconnection

Action code	Failure code	Trouble	Hi clutch fill switch: Disconnection (Command is Holding pressure, fill switch is OFF, and slip is not sensed) (Transmission controller system)
E03	DDTHKA		
Contents of trouble	• When the output to the Hi clutch ECMV is turned ON, the clutch is engaged but the signal from the fill switch is not turned ON.		
Action of controller	• The controller keeps the current gear speed. • If the shift lever is set in the "N" position, the controller keeps the gear in Neutral.		
Problem that appears on machine	• The gear cannot be shifted. • If the shift lever is set in the "N" position, the machine cannot start until it is stopped.		
Related information	• This failure can be checked in the monitoring function (Code: 38919).		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective Hi clutch fill switch	1) Turn the starting switch OFF. 2) Disconnect connector CN20. 3) Connect T-adapter.			
			Between CN20 (male) (1) – ground	When dis-engaged	Resistance	Min. 1 MΩ
				When engaged	Resistance	Max. 1 Ω
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC3 and CN20. 3) Connect T-adapter.			
			Wiring harness between ATC3 (female) (30) – CN20 (female) (1)		Resistance	Max. 1 Ω
	3	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connector ATC3. 3) Connect T-adapter.			
			Between ATC3 (female) (30) – ground	When dis-engaged	Resistance	Min. 1 MΩ
				When engaged	Resistance	Max. 1 Ω

Circuit diagram related

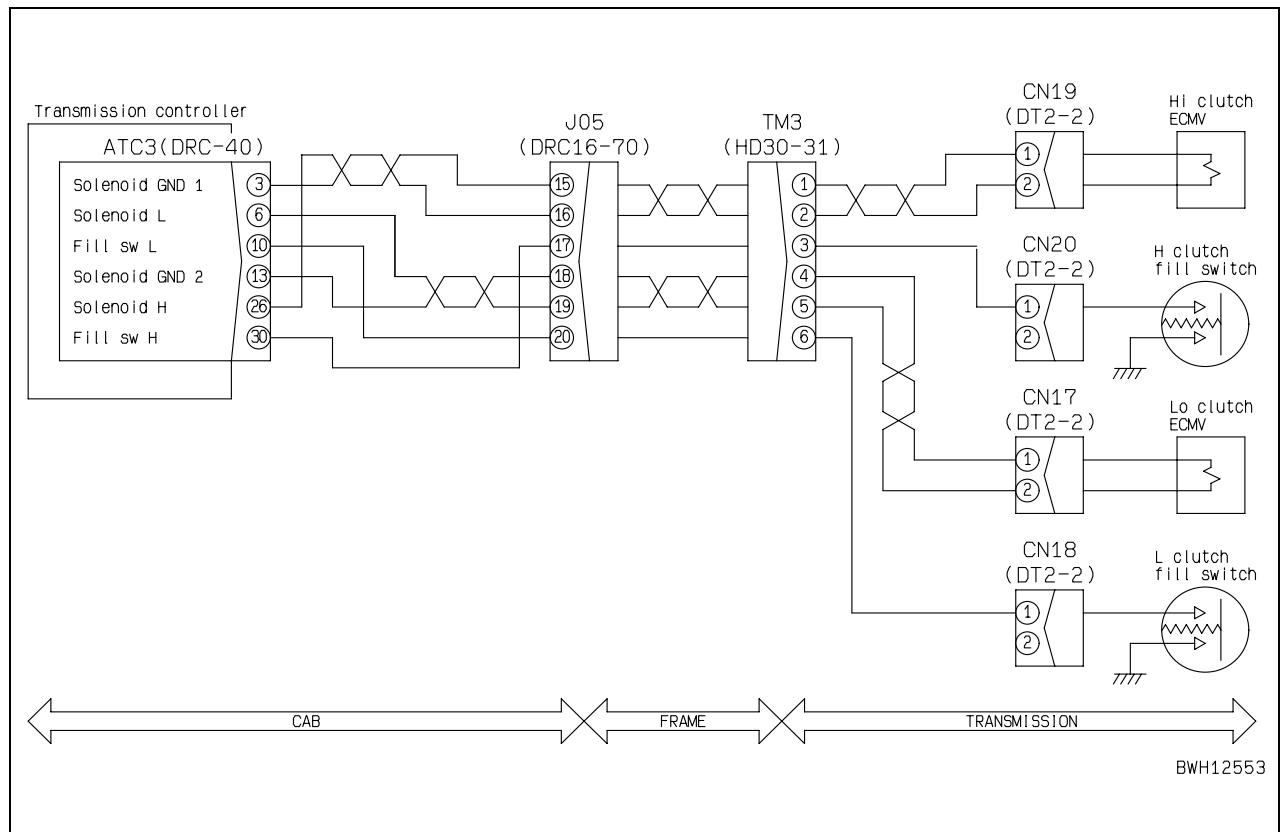


Failure code [DDTJKA] Lo clutch fill switch: Disconnection

Action code	Failure code	Trouble	Lo clutch fill switch: Disconnection (Command is Holding pressure, fill switch is OFF, and slip is not sensed) (Transmission controller system)
E03	DDTJKA		
Contents of trouble	• When the output to the Lo clutch ECMV is turned ON, the clutch is engaged but the signal from the fill switch is not turned ON.		
Action of controller	• The controller keeps the current gear speed. • If the shift lever is set in the "N" position, the controller keeps the gear in Neutral.		
Problem that appears on machine	• The gear cannot be shifted. • If the shift lever is set in the "N" position, the machine cannot start until it is stopped.		
Related information	• This failure can be checked in the monitoring function (Code: 38919).		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective Lo clutch fill switch	1) Turn the starting switch OFF. 2) Disconnect connector CN18. 3) Connect T-adapter.			
			Between CN18 (male) (1) – ground	When dis-engaged	Resistance	Min. 1 MΩ
				When engaged	Resistance	Max. 1 Ω
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC3 and CN18. 3) Connect T-adapter.			
			Wiring harness between ATC3 (female) (10) – CN18 (female) (1)		Resistance	Max. 1 Ω
	3	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connector ATC3. 3) Connect T-adapter.			
			Between ATC3 (female) (10) – ground	When dis-engaged	Resistance	Min. 1 MΩ
				When engaged	Resistance	Max. 1 Ω

Circuit diagram related

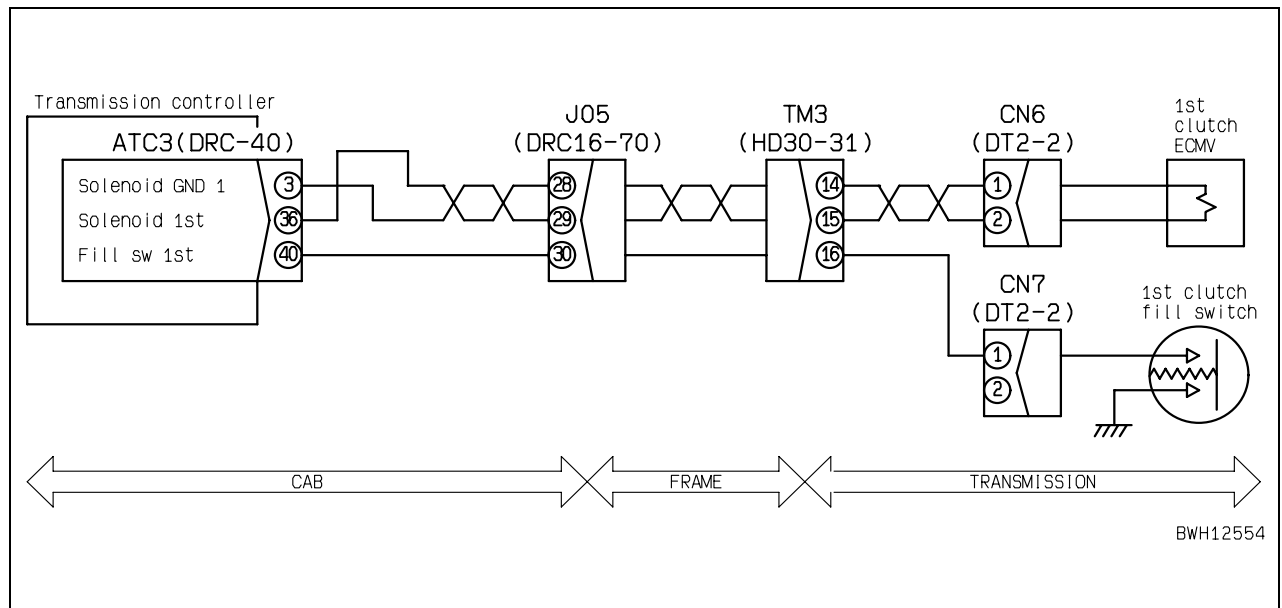


Failure code [DDTKKA] 1st clutch fill switch: Disconnection

Action code	Failure code	Trouble	1st clutch fill switch: Disconnection (Command is Holding pressure, fill switch is OFF, and slip is not sensed) (Transmission controller system)
E03	DDTKKA		
Contents of trouble	• When the output to the 1st clutch ECMV is turned ON, the clutch is engaged but the signal from the fill switch is not turned ON.		
Action of controller	• The controller keeps the current gear speed. • If the shift lever is set in the "N" position, the controller keeps the gear in neutral.		
Problem that appears on machine	• The gear cannot be shifted. • If the shift lever is set in the "N" position, the machine cannot start until it is stopped.		
Related information	• This failure can be checked in the monitoring function (Code: 38919).		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective 1st clutch fill switch	1) Turn the starting switch OFF. 2) Disconnect connector CN7. 3) Connect T-adapter.			
			Between CN7 (male) (1) – ground	When dis-engaged	Resis-tance	Min. 1 MΩ
				When engaged	Resis-tance	Max. 1 Ω
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC3 and CN7. 3) Connect T-adapter.			
			Wiring harness between ATC3 (female) (40) – CN7 (female) (1)		Resis-tance	Max. 1 Ω
	3	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connector ATC3. 3) Connect T-adapter.			
			Between ATC3 (female) (40) – ground	When dis-engaged	Resis-tance	Min. 1 MΩ
				When engaged	Resis-tance	Max. 1 Ω

Circuit diagram related

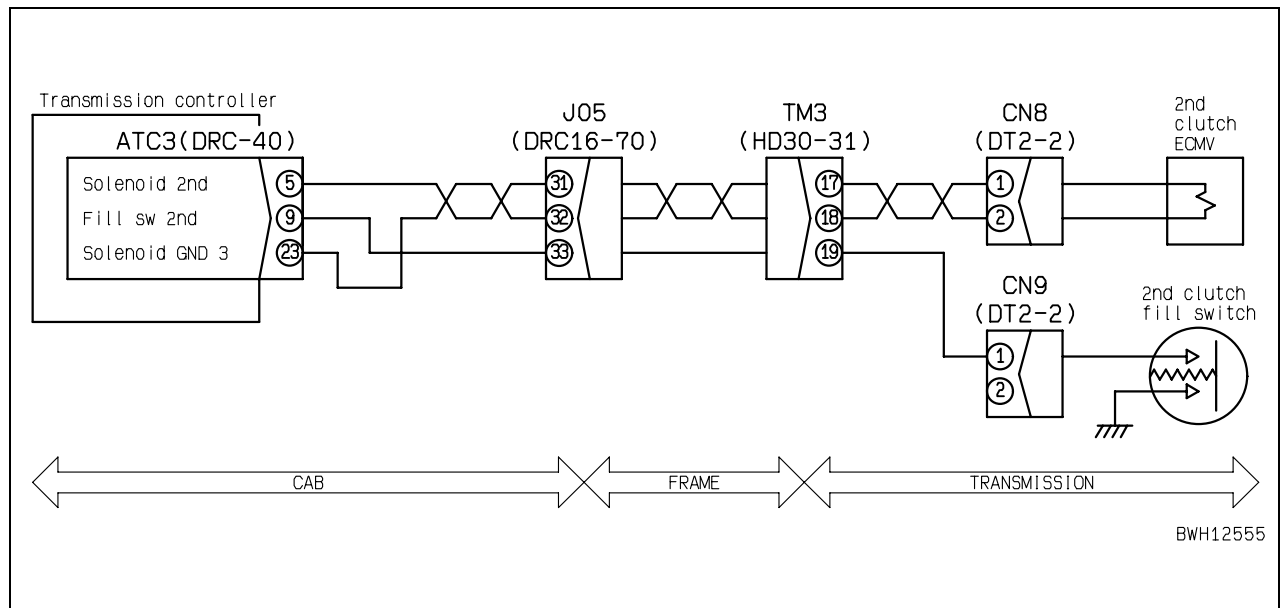


Failure code [DDTLKA] 2nd clutch fill switch: Disconnection

Action code	Failure code	Trouble	2nd clutch fill switch: Disconnection (KA) (Command is Holding pressure, fill switch is OFF, and slip is not sensed) (Transmission controller system)
E03	DDTLKA		
Contents of trouble	• When the output to the 2nd clutch ECMV is turned ON, the clutch is engaged but the signal from the fill switch is not turned ON.		
Action of controller	• The controller keeps the current gear speed. • If the shift lever is set in the "N" position, the controller keeps the gear in neutral.		
Problem that appears on machine	• The gear cannot be shifted. • If the shift lever is set in the "N" position, the machine cannot start until it is stopped.		
Related information	• This failure can be checked in the monitoring function (Code: 38919).		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective 2nd clutch fill switch	1) Turn the starting switch OFF. 2) Disconnect connector CN9. 3) Connect T-adapter.			
			Between CN9 (male) (1) – ground	When dis-engaged	Resis-tance	Min. 1 MΩ
				When engaged	Resis-tance	Max. 1 Ω
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC5 and CN9. 3) Connect T-adapter.			
			Wiring harness between ATC3 (female) (9) – CN9 (female) (1)		Resis-tance	Max. 1 Ω
	3	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connector ATC3. 3) Connect T-adapter.			
			Between ATC3 (female) (9) – ground	When dis-engaged	Resis-tance	Min. 1 MΩ
				When engaged	Resis-tance	Max. 1 Ω

Circuit diagram related

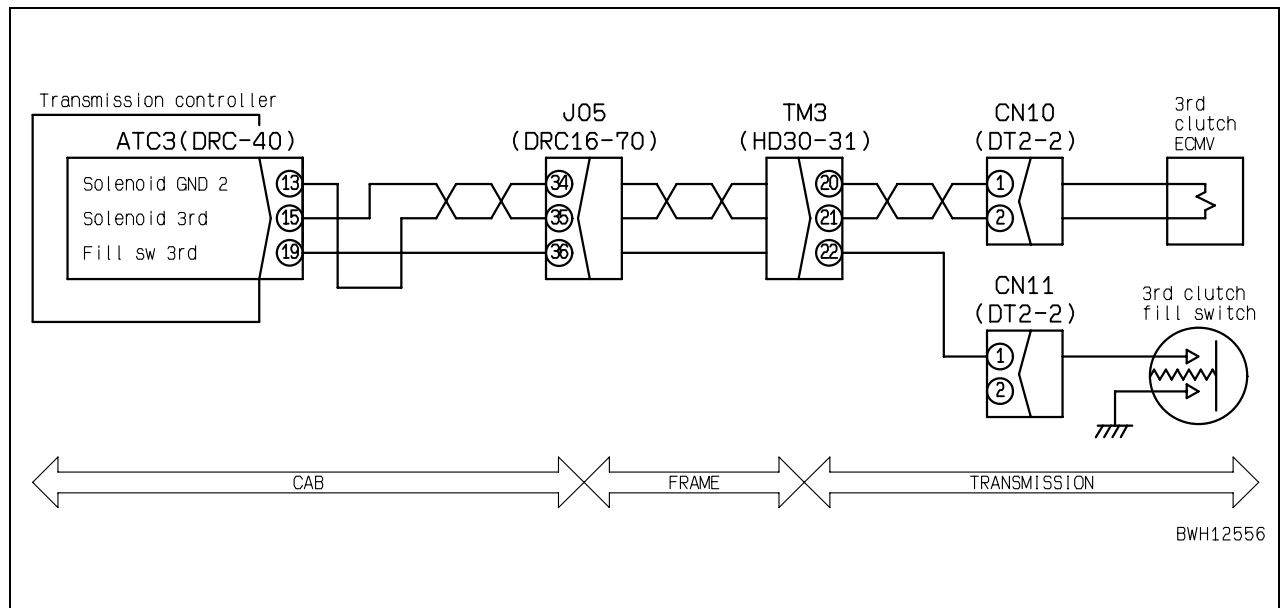


Failure code [DDTMKA] 3rd clutch fill switch: Disconnection

Action code	Failure code	Trouble	3rd clutch fill switch: Disconnection (Command is Holding pressure, fill switch is OFF, and slip is not sensed) (Transmission controller system)
E03	DDTMKA		
Contents of trouble	• When the output to the 3rd clutch ECMV is turned ON, the clutch is engaged but the signal from the fill switch is not turned ON.		
Action of controller	• The controller keeps the current gear speed. • If the shift lever is set in the "N" position, the controller keeps the gear in Neutral.		
Problem that appears on machine	• The gear cannot be shifted. • If the shift lever is set in the "N" position, the machine cannot start until it is stopped.		
Related information	• This failure can be checked in the monitoring function (Code: 38919).		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective 3rd clutch fill switch	1) Turn the starting switch OFF. 2) Disconnect connector CN11. 3) Connect T-adapter.			
			Between CN11 (male) (1) – ground	When dis-engaged	Resis-tance	Min. 1 MΩ
				When engaged	Resis-tance	Max. 1 Ω
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC3 and CN8. 3) Connect T-adapter.			
			Wiring harness between ATC3 (female) (19) – CN11 (female) (1)		Resis-tance	Max. 1 Ω
	3	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connector ATC3. 3) Connect T-adapter.			
			Between ATC3 (female) (19) – ground	When dis-engaged	Resis-tance	Min. 1 MΩ
				When engaged	Resis-tance	Max. 1 Ω

Circuit diagram related

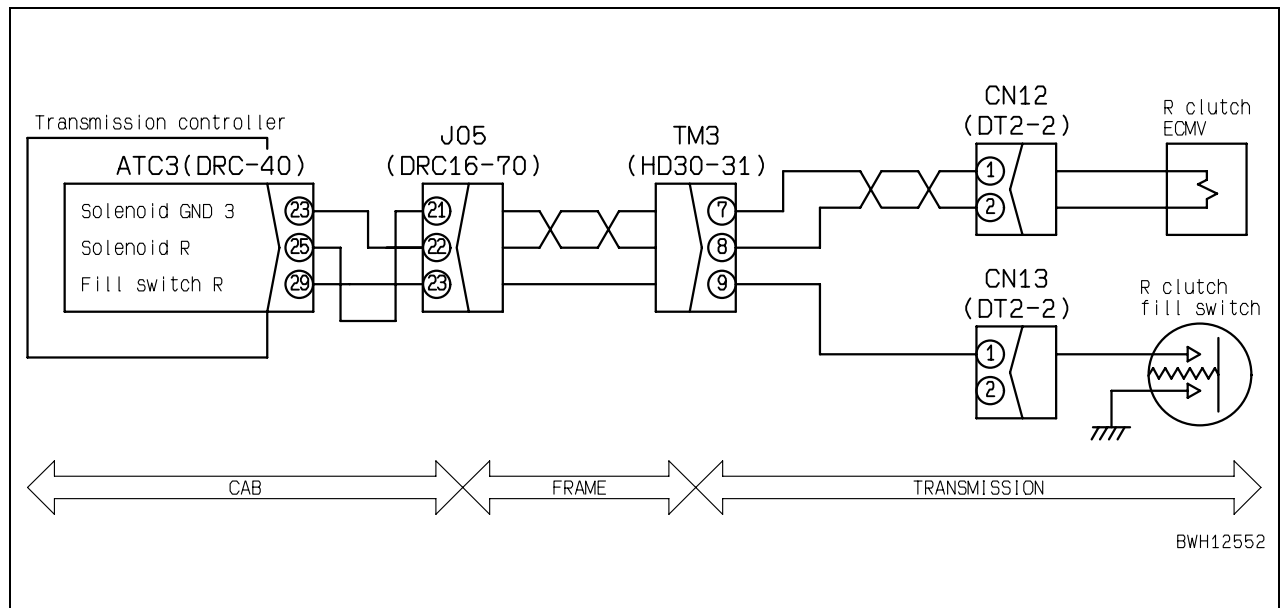


Failure code [DDTNKA] R clutch fill switch: Disconnection

Action code	Failure code	Trouble	R clutch fill switch: Disconnection (Command is Holding pressure, fill switch is OFF, and slip is not sensed) (Transmission controller system)
E03	DDTNKA		
Contents of trouble	• When the output to the R clutch ECMV is turned ON, the clutch is engaged but the signal from the fill switch is not turned ON.		
Action of controller	• The controller keeps the current gear speed. • If the shift lever is set in the "N" position, the controller keeps the gear in Neutral.		
Problem that appears on machine	• The gear cannot be shifted. • If the shift lever is set in the "N" position, the machine cannot start until it is stopped.		
Related information	• This failure can be checked in the monitoring function (Code: 38919).		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective R clutch fill switch	1) Turn the starting switch OFF. 2) Disconnect connector CN13. 3) Connect T-adapter.			
			Between CN13 (male) (1) – ground	When dis-engaged	Resis-tance	Min. 1 MΩ
				When engaged	Resis-tance	Max. 1 Ω
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC3 and CN13. 3) Connect T-adapter.			
			Wiring harness between ATC3 (female) (29) – CN13 (female) (1)		Resis-tance	Max. 1 Ω
	3	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connector ATC3. 3) Connect T-adapter.			
			Between ATC3 (female) (29) – ground	When dis-engaged	Resis-tance	Min. 1 MΩ
				When engaged	Resis-tance	Max. 1 Ω

Circuit diagram related

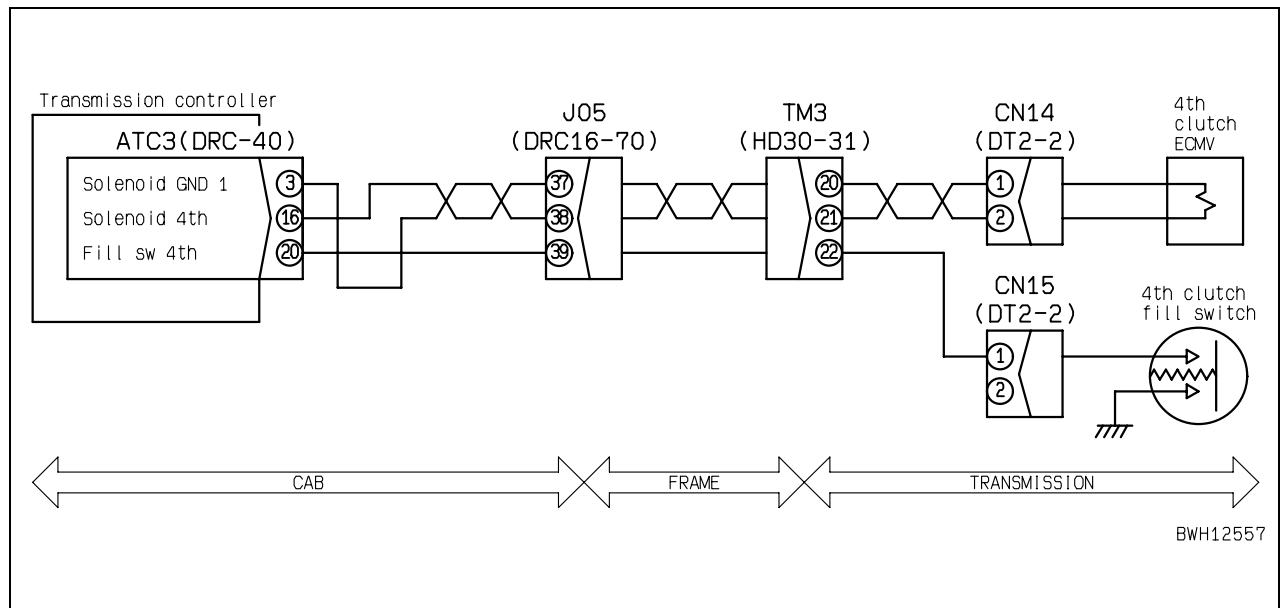


Failure code [DDTPKA] 4th clutch fill switch: Disconnection

Action code	Failure code	Trouble	4th clutch fill switch : Disconnection (Command is Holding pressure, fill switch is OFF, and slip is not sensed) (Transmission controller system)
E03	DDTPKA		
Contents of trouble	• When the output to the 4th clutch ECMV is turned ON, the clutch is engaged but the signal from the fill switch is not turned ON.		
Action of controller	• The controller keeps the current gear speed. • If the shift lever is set in the "N" position, the controller keeps the gear in Neutral.		
Problem that appears on machine	• The gear cannot be shifted. • If the shift lever is set in the "N" position, the machine cannot start until it is stopped.		
Related information	• This failure can be checked in the monitoring function (Code: 38919).		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective 4th clutch fill switch	1) Turn the starting switch OFF. 2) Disconnect connector CN15. 3) Connect T-adapter.			
			Between CN15 (male) (1) – ground	When dis-engaged	Resis-tance	Min. 1 MΩ
				When engaged	Resis-tance	Max. 1 Ω
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC3 and CN15. 3) Connect T-adapter.			
			Wiring harness between ATC3 (female) (20) – CN15 (female) (1)		Resis-tance	Max. 1 Ω
	3	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connector ATC3. 3) Connect T-adapter.			
			Between ATC3 (female) (20) – ground	When dis-engaged	Resis-tance	Min. 1 MΩ
				When engaged	Resis-tance	Max. 1 Ω

Circuit diagram related



Failure code [DF10KA] Gear shift lever: Disconnection

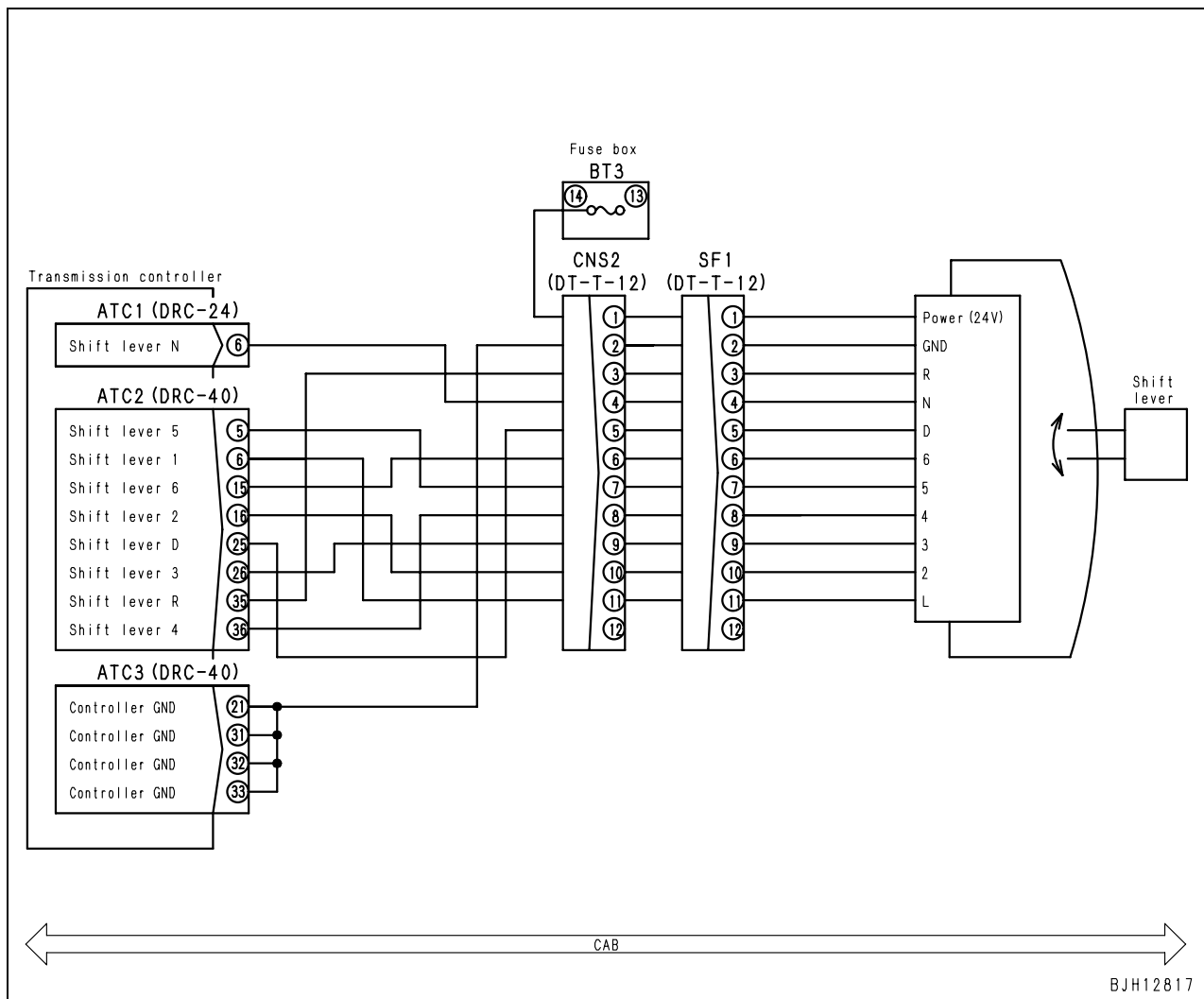
Action code	Failure code	Trouble	Gear shift lever: Disconnection (No lever signal input) (Transmission controller system)
E03	DF10KA		
Contents of trouble	• Gear shift lever signal is not input at all.		
Action of controller	• Controls according to previous gear shift lever information before abnormality occurs.		
Problem that appears on machine	• Gear speed is still in neutral and cannot start vehicle. • Cannot shift between forward and reverse positions. • All gear shift lever position lamps go out.		
Related information	• Non in particular.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Operational error	• Gear shift lever is being pushed even though it is not operated. • Gear shift lever has been stopped at the midway point between each of the gear positions.		
Possible causes and standard value in normal state	2	Disconnection in wiring harness (Disconnection or defective contact of connectors)	1) Turn starting switch OFF. 2) Connect T-adapter to connector SF1 (male).		
			Harness between BT3 (14) – SF1 (male) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC2 (female) (35) – SF1 (male) (3)	Resistance	Max. 1 Ω
			Wiring harness between ATC2 (female) (25) – SF1 (male) (5)	Resistance	Max. 1 Ω
			Wiring harness between ATC1 (female) (6) – SF1 (male) (4)	Resistance	Max. 1 Ω
			Wiring harness between ATC2 (female) (15) – SF1 (male) (6)	Resistance	Max. 1 Ω
			Wiring harness between ATC2 (female) (5) – SF1 (male) (7)	Resistance	Max. 1 Ω
			Wiring harness between ATC2 (female) (36) – SF1 (male) (8)	Resistance	Max. 1 Ω
			Wiring harness between ATC2 (female) (26) – SF1 (male) (9)	Resistance	Max. 1 Ω
			Wiring harness between ATC2 (female) (16) – SF1 (male) (10)	Resistance	Max. 1 Ω
			Wiring harness between ATC2 (female) (6) – SF1 (male) (11)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (21) (31), (32), (33) – SF1 (male) (2)	Resistance	Max. 1 Ω
	3	Defective harness grounding (Contact with ground circuit)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors ATC1 (female), ATC2 (female), and SF1 (male). 3) Turn starting switch ON.		
			Between ground and wiring harness between ATC2 (female) (35) – SF1 (male) (3)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between ATC2 (female) (25) – SF1 (male) (5)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between ATC1 (female) (6) – SF1 (male) (4)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between ATC2 (female) (15) – SF1 (male) (6)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between ATC2 (female) (5) – SF1 (male) (7)	Resistance	Min. 1 MΩ

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	3	Defective harness grounding (Contact with ground circuit)	Between ground and wiring harness between ATC2 (female) (36) – SF1 (male) (8)		Resistance	Min. 1 MΩ
			Between ground and wiring harness between ATC2 (female) (26) – SF1 (male) (9)		Resistance	Min. 1 MΩ
			Between ground and wiring harness between ATC2 (female) (16) – SF1 (male) (10)		Resistance	Min. 1 MΩ
			Between ground and wiring harness between ATC2 (female) (6) – SF1 (male) (11)		Resistance	Min. 1 MΩ
	4	Defective gear shift lever	1) Turn starting switch OFF. 2) Insert T-adaptor in connector SF1. 3) Turn starting switch ON.			
			Between SF1 (3) – ground	In shift range "R"	Voltage	20 – 30 V
				In shift range other than "R"	Voltage	Max. 1 V
			Between SF1 (4) – ground	In shift range "N"	Voltage	20 – 30 V
				In shift range other than "N"	Voltage	Max. 1 V
			Between SF1 (5) – ground	In shift range "D"	Voltage	20 – 30 V
				In shift range other than "D"	Voltage	Max. 1 V
			Between SF1 (6) – ground	In shift range "6"	Voltage	20 – 30 V
				In shift range other than "6"	Voltage	Max. 1 V
			Between SF1 (7) – ground	In shift range "5"	Voltage	20 – 30 V
				In shift range other than "5"	Voltage	Max. 1 V
			Between SF1 (8) – ground	In shift range "4"	Voltage	20 – 30 V
				In shift range other than "4"	Voltage	Max. 1 V
			Between SF1 (9) – ground	In shift range "3"	Voltage	20 – 30 V
				In shift range other than "3"	Voltage	Max. 1 V
			Between SF1 (10) – ground	In shift range "2"	Voltage	20 – 30 V
				In shift range other than "2"	Voltage	Max. 1 V
			Between SF1 (11) – ground	In shift range "L"	Voltage	20 – 30 V
				In shift range other than "L"	Voltage	Max. 1 V
			5	Defective transmission controller	1) Turn starting switch OFF. 2) Insert T-adaptor in connectors ATC1 and ATC2. 3) Turn starting switch ON.	
	Between ATC2 (35) – ground	In shift range "R"			Voltage	20 – 30 V
		In shift range other than "R"			Voltage	Max. 1 V
	Between ATC2 (25) – ground	In shift range "D"			Voltage	20 – 30 V
		In shift range other than "D"			Voltage	Max. 1 V
	Between ATC1 (6) – ground	In shift range "N"			Voltage	20 – 30 V
In shift range other than "N"		Voltage			Max. 1 V	

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	5	Defective transmission controller	Between ATC2 (15) – ground	In shift range "6"	Voltage	20 – 30 V
				In shift range other than "6"	Voltage	Max. 1 V
			Between ATC2 (5) – ground	In shift range "5"	Voltage	20 – 30 V
				In shift range other than "5"	Voltage	Max. 1 V
			Between ATC2 (36) – ground	In shift range "4"	Voltage	20 – 30 V
				In shift range other than "4"	Voltage	Max. 1 V
			Between ATC2 (26) – ground	In shift range "3"	Voltage	20 – 30 V
				In shift range other than "3"	Voltage	Max. 1 V
			Between ATC2 (16) – ground	In shift range "2"	Voltage	20 – 30 V
				In shift range other than "2"	Voltage	Max. 1 V
			Between ATC2 (6) – ground	In shift range "L"	Voltage	20 – 30 V
				In shift range other than "L"	Voltage	Max. 1 V

Circuit diagram related



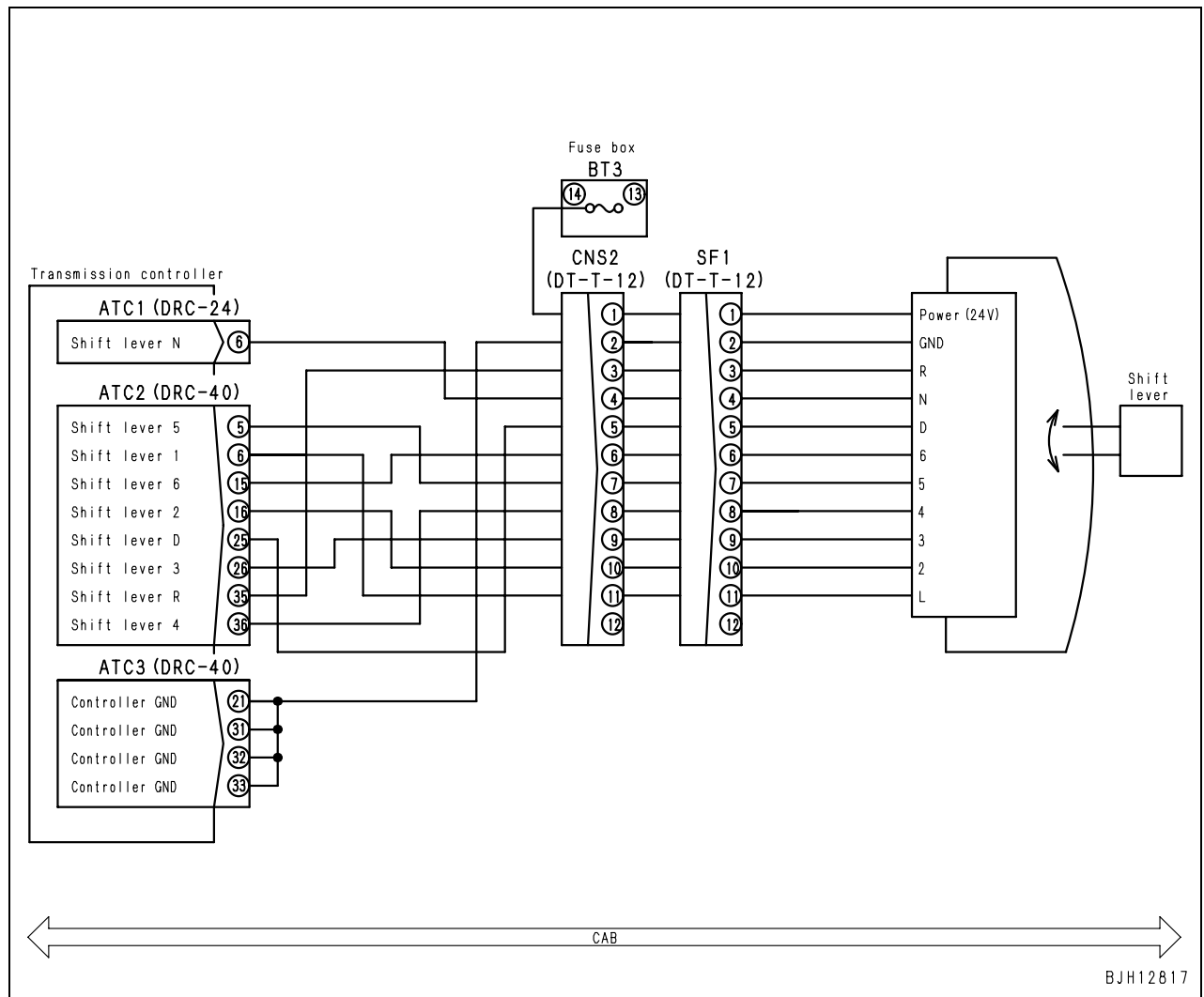
Failure code [DF10KB] Gear shift lever: Short circuit

Action code	Failure code	Trouble	Gear shift lever: Short circuit (Input of multiple lever signach) (Transmission controller system)
E03	DF10KB		
Contents of trouble	Gear shift lever signals have been inputted at the same time from 2 or more systems.		
Action of controller	- Controls according to high priority signal. (1): N > D > 6 > 5 > 4 > 3 > 2 > L (2): N > R - Shifts gear speed to neutral when signals have been inputted from system (1) and system (2) at the same time.		
Problem that appears on machine	- There are cases where the gear speed is shifted to a higher gear speed than that which has been set by the gear shift lever. - Gear speed is still in neutral and cannot start vehicle. - Gear shift lever position lamp does not indicate actual gear shift lever position.		
Related information	None in particular.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective hot short in wiring harness (a contact with 24 V circuit)	1) Turn starting switch OFF. 2) Connect T-adaptor to connectors ATC1 (female), ATC2 (female), and SF1 (male). 3) Turn starting switch ON.			
			Between ground and wiring harness between ATC2 (female) (35) – SF1 (male) (3)	Voltage	When not at R, Max. 1 V	
			Between ground and wiring harness between ATC2 (female) (25) – SF1 (male) (5)	Voltage	When not at D, Max. 1 V	
			Between ground and wiring harness between ATC1 (female) (6) – SF1 (male) (4)	Voltage	When not at N, Max. 1 V	
			Between ground and wiring harness between ATC2 (female) (15) – SF1 (male) (6)	Voltage	When not at 6, Max. 1 V	
			Between ground and wiring harness between ATC2 (female) (5) – SF1 (male) (7)	Voltage	When not at 5, Max. 1 V	
			Between ground and wiring harness between ATC2 (female) (36) – SF1 (male) (8)	Voltage	When not at 4, Max. 1 V	
			Between ground and wiring harness between ATC2 (female) (26) – SF1 (male) (9)	Voltage	When not at 3, Max. 1 V	
			Between ground and wiring harness between ATC2 (female) (16) – SF1 (male) (10)	Voltage	When not at 2, Max. 1 V	
			Between ground and wiring harness between ATC2 (female) (6) – SF1 (male) (11)	Voltage	When not at L, Max. 1 V	
	2	Defective gear shift lever	1) Turn starting switch OFF. 2) Insert T-adaptor in connector SF1 (male). 3) Turn starting switch ON.			
			Between SF1 (3) – ground	In shift range "R"	Voltage	20 – 30 V
				In shift range other than "R"	Voltage	Max. 1 V

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	2	Defective gear shift lever	Between SF1 (4) – ground	In shift range "N"	Voltage	20 – 30 V
				In shift range other than "N"	Voltage	Max. 1 V
			Between SF1 (5) – ground	In shift range "D"	Voltage	20 – 30 V
				In shift range other than "D"	Voltage	Max. 1 V
			Between SF1 (6) – ground	In shift range "6"	Voltage	20 – 30 V
				In shift range other than "6"	Voltage	Max. 1 V
			Between SF1 (7) – ground	In shift range "5"	Voltage	20 – 30 V
				In shift range other than "5"	Voltage	Max. 1 V
			Between SF1 (8) – ground	In shift range "4"	Voltage	20 – 30 V
				In shift range other than "4"	Voltage	Max. 1 V
			Between SF1 (9) – ground	In shift range "3"	Voltage	20 – 30 V
				In shift range other than "3"	Voltage	Max. 1 V
			Between SF1 (10) – ground	In shift range "2"	Voltage	20 – 30 V
				In shift range other than "2"	Voltage	Max. 1 V
			Between SF1 (11) – ground	In shift range "L"	Voltage	20 – 30 V
				In shift range other than "L"	Voltage	Max. 1 V
	3	Defective transmission controller	★ Turn the starting switch OFF.			
			Between ATC2 (35) – ground	In shift range "R"	Voltage	20 – 30 V
				In shift range other than "R"	Voltage	Max. 1 V
			Between ATC2 (25) – ground	In shift range "D"	Voltage	20 – 30 V
				In shift range other than "D"	Voltage	Max. 1 V
			Between ATC1 (6) – ground	In shift range "N"	Voltage	20 – 30 V
				In shift range other than "N"	Voltage	Max. 1 V
			Between ATC2 (15) – ground	In shift range "6"	Voltage	20 – 30 V
				In shift range other than "6"	Voltage	Max. 1 V
			Between ATC2 (5) – ground	In shift range "5"	Voltage	20 – 30 V
				In shift range other than "5"	Voltage	Max. 1 V
			Between ATC2 (36) – ground	In shift range "4"	Voltage	20 – 30 V
				In shift range other than "4"	Voltage	Max. 1 V
			Between ATC2 (26) – ground	In shift range "3"	Voltage	20 – 30 V
				In shift range other than "3"	Voltage	Max. 1 V
			Between ATC2 (16) – ground	In shift range "2"	Voltage	20 – 30 V
				In shift range other than "2"	Voltage	Max. 1 V
			Between ATC2 (6) – ground	In shift range "L"	Voltage	20 – 30 V
				In shift range other than "L"	Voltage	Max. 1 V

Circuit diagram related

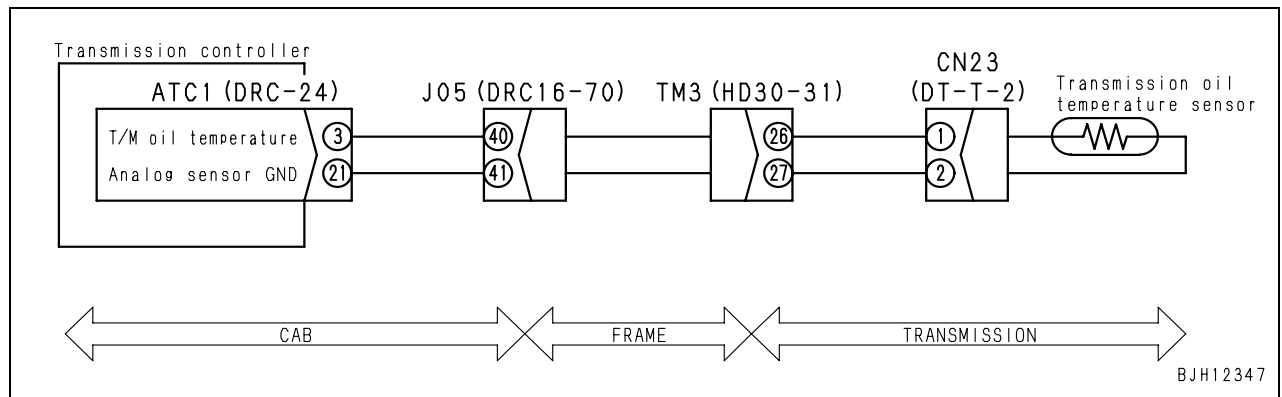


Failure code [DGF1KX] Transmission oil temperature sensor: Out of input signal range

Action code	Failure code	Trouble	Transmission oil temperature sensor: Out of input signal range (Transmission controller system)
E03	DGF1KX		
Contents of trouble	The voltage of the signal circuit of the transmission oil temperature sensor is below 0.97 V (above 150°C) or only transmission oil temperature is low (transmission oil temperature sensor signal circuit voltage is above 4.56 V (below 15 °C) and torque converter and brake oil temperature sensor voltage is below 3.7 V (above 55 °C).		
Action of controller	The controller controls the clutch oil pressure, fixing the sensed oil temperature high.		
Problem that appears on machine	Gear shift shocks become large.		
Related information	- This failure can be checked in the monitoring function (Code: 32500 (°C), 32501 (V)). - After repairing the failure and confirming resetting of the machine, perform the initial learning of the transmission controller, referring to TESTING AND ADJUSTING, "Inspection of machine monitor".		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective transmission oil temperature sensor	1) Turn the starting switch OFF. 2) Disconnect connector CN23. 3) Connect T-adapter.			
			Between CN23 (male) (1) – (2)	Oil temperature: 25°C	Resistance	37 – 50 kΩ
				Oil temperature: 100°C	Resistance	3.5 – 4.0 kΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC1 and CN23. 3) Connect T-adapter.			
			Wiring harness between ATC1 (female) (21) – CN23 (female) (2)		Resistance	Max. 1 Ω
			Wiring harness between ATC1 (female) (3) – CN23 (female) (1)		Resistance	Max. 1 Ω
	3	Grounding fault in wiring harness (Contact with ground)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC1 and CN23. 3) Connect T-adapter.			
			Between ground and wiring harness ATC1 (female) (3) – CN23 (female) (1)		Resistance	Min. 1 MΩ
	4	Hot short in wiring harness (Contact with 24V)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC1 and CN23. 3) Connect T-adapter. 4) Turn the starting switch ON.			
			Between ground and wiring harness ATC1 (female) (3) – CN23 (female) (1)		Voltage	Max. 5 V
	5	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connectors ATC1 and CN23. 3) Connect T-adapter. 4) Turn the starting switch ON.			
			Between ATC1 (female) (3) – (21)	Oil temperature: 25°C	Resistance	37 – 50 kΩ
				Oil temperature: 100°C	Resistance	3.5 – 4.0 kΩ

Circuit diagram related

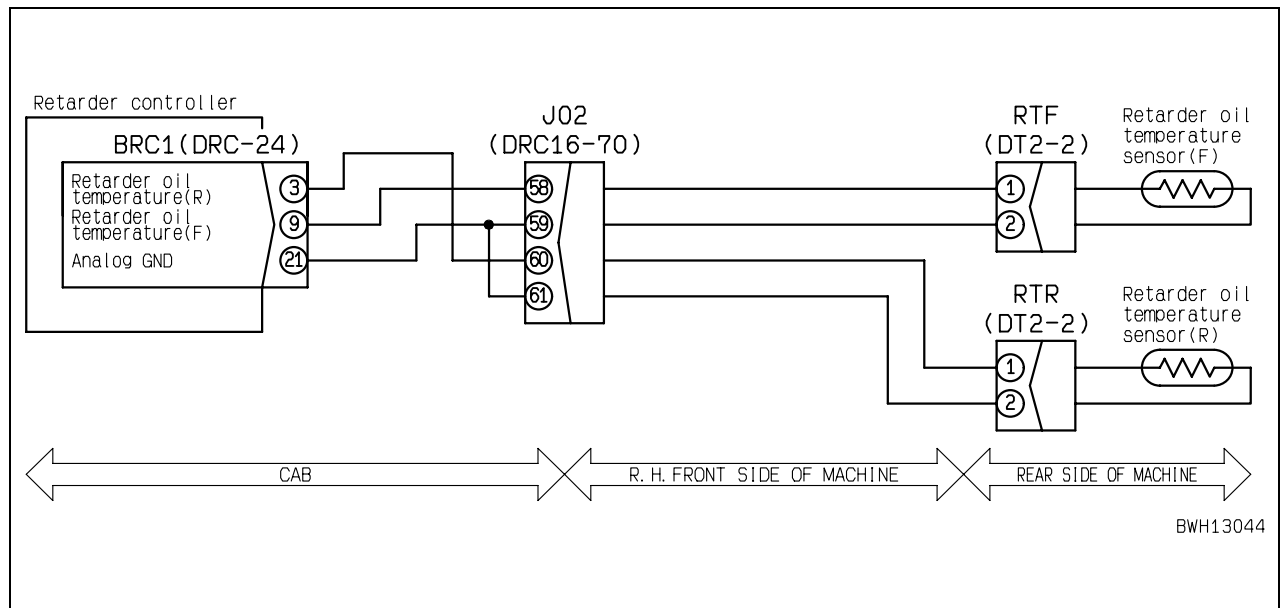


Failure code [DGR2KB] Trouble in retarder oil temperature sensor (rear wheel) system (Disconnection and short circuit)

Action code	Failure code	Trouble	Trouble in retarder oil temperature sensor (rear wheel) system (Disconnection and short circuit) (Retarder controller system)
E01	DGR2KB		
Contents of trouble	• Signal circuit voltage of retarder oil temperature sensor has become below 0.96 V.		
Action of controller	• None in particular.		
Problem that appears on machine	• Oil temperature gauge does not work because of failure mode of sensor.		
Related information	• Input signal from oil temperature sensor can be checked with monitoring function (codes: 30211 (°C) and 30212 (V)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective retarder oil temperature sensor	★ Prepare with starting switch OFF, disconnect connector RTR and troubleshooting with starting switch still OFF.		
			RTR (male)	Retarder oil temperature (°C)	Resistance (kΩ)
			Between (1) – (2)	25	42.7
				30	35.13
				80	6.556
				90	4.925
				100	3.75
	2	Disconnection in wiring harness (Disconnection or defective contact)	★ Prepare with starting switch OFF, disconnect connector BRC1 and troubleshooting with starting switch still OFF.		
			BRC1 (female)	Retarder oil temperature (°C)	Resistance (kΩ)
			Between (3) – (21)	25	42.7
				30	35.13
				80	6.556
				90	4.925
				100	3.75
	3	Short circuit of harness (Contact with ground circuit or contact between harnesses)	★ Prepare with starting switch OFF, disconnect connector BRC1 and troubleshooting with starting switch still OFF.		
			BRC1 (female)	Retarder oil temperature (°C)	Resistance (kΩ)
			Between (3) – (21)	25	42.7
				30	35.13
				80	6.556
				90	4.925
				100	3.75
	4	Defective retarder controller (In normal system)	★ Prepare with starting switch OFF and troubleshooting with starting switch still ON.		
			Check with monitoring function (Code: 30211).	Oil temperature	Actual oil temperature and displayed temperature are same.

Circuit diagram related

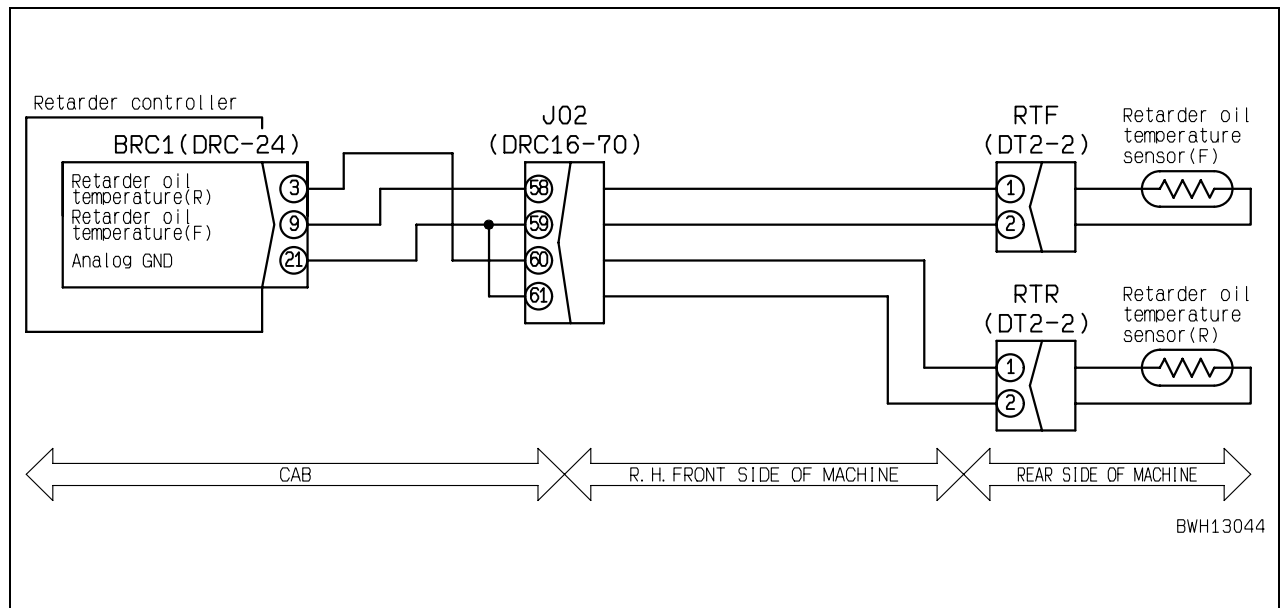


Failure code [DGR2KZ] Trouble in retarder oil temperature sensor (rear wheel) system (Ground fault)

Action code	Failure code	Trouble	Trouble in retarder oil temperature sensor (rear wheel) system (Ground fault) (Retarder controller system)
E01	DGR2KZ		
Contents of trouble	• Signal circuit voltage of retarder oil temperature sensor has become below 0.96 V.		
Action of controller	• None in particular.		
Problem that appears on machine	• Oil temperature gauge does not work because of failure mode of sensor.		
Related information	• Input signal from oil temperature sensor can be checked with monitoring function (codes: 30211 (°C) and 30212 (V)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective retarder oil temperature sensor	★ Prepare with starting switch OFF, disconnect connector RTR and troubleshooting with starting switch still OFF.		
			RTR (male)	Retarder oil temperature (°C)	Resistance (kΩ)
			Between (1) – (2)	25	42.7
				30	35.13
				80	6.556
				90	4.925
				100	3.75
	2	Disconnection in wiring harness (Disconnection or defective contact)	★ Prepare with starting switch OFF, disconnect connector BRC1 and troubleshooting with starting switch still OFF.		
			BRC1 (female)	Retarder oil temperature (°C)	Resistance (kΩ)
			Between (3) – (21)	25	42.7
				30	35.13
				80	6.556
				90	4.925
				100	3.75
	3	Short circuit of harness (Contact with ground circuit or contact between harnesses)	★ Prepare with starting switch OFF, disconnect connector BRC1 and troubleshooting with starting switch still OFF.		
			BRC1 (female)	Retarder oil temperature (°C)	Resistance (kΩ)
			Between (3) – (21)	25	42.7
				30	35.13
				80	6.556
				90	4.925
				100	3.75
	4	Defective retarder controller (In normal system)	★ Prepare with starting switch OFF and troubleshooting with starting switch still ON.		
			Check with monitoring function (Code: 30211).	Oil temperature	Actual oil temperature and displayed temperature are same.

Circuit diagram related

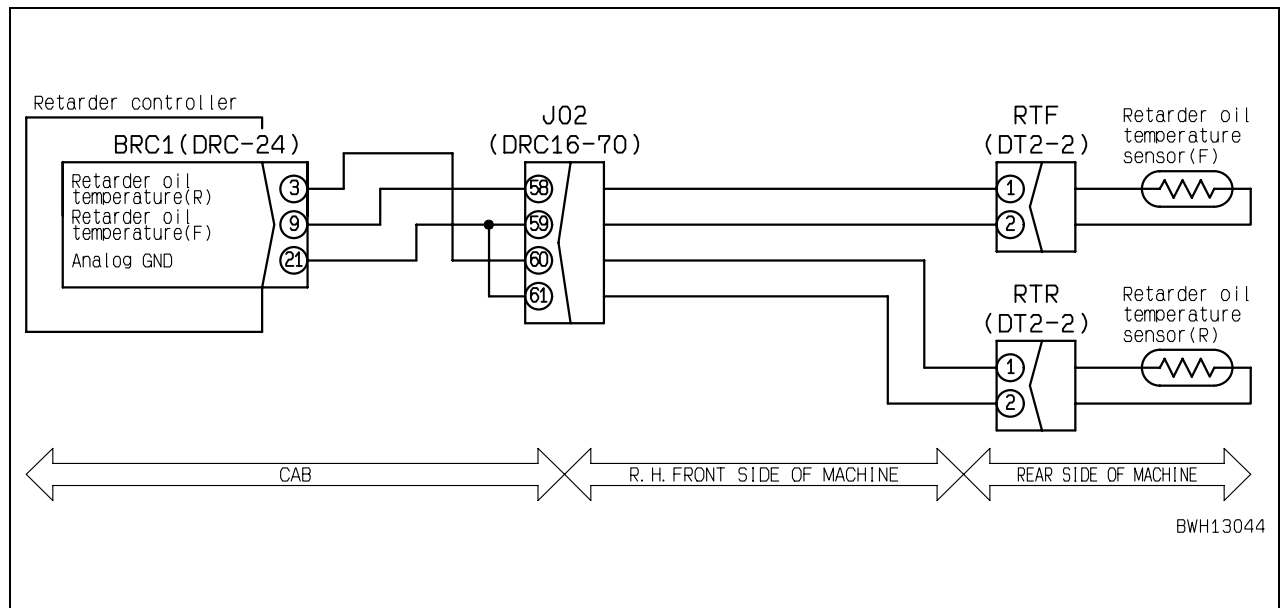


Failure code [DGR4KB] Trouble in retarder oil temperature sensor (front wheel) system (Disconnection and short circuit)

Action code	Failure code	Trouble	Trouble in retarder oil temperature sensor (front wheel) system (Disconnection and short circuit) (Retarder controller system)
E01	DGR4KB		
Contents of trouble	• Signal circuit voltage of retarder oil temperature sensor has become below 0.96 V.		
Action of controller	• None in particular.		
Problem that appears on machine	• Oil temperature gauge does not work because of failure mode of sensor.		
Related information	• Input signal from oil temperature sensor can be checked with monitoring function (codes: 30201 (°C) and 30204 (V)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective retarder oil temperature sensor	★ Prepare with starting switch OFF, disconnect connector RTF and troubleshooting with starting switch still OFF.		
			RTF (male)	Retarder oil temperature (°C)	Resistance (kΩ)
			Between (1) – (2)	25	42.7
				30	35.13
				80	6.556
				90	4.925
				100	3.75
	2	Disconnection in wiring harness (Disconnection or defective contact)	★ Prepare with starting switch OFF, disconnect connector BRC1 and troubleshooting with starting switch still OFF.		
			BRC1 (female)	Retarder oil temperature (°C)	Resistance (kΩ)
			Between (9) – (21)	25	42.7
				30	35.13
				80	6.556
				90	4.925
				100	3.75
	3	Short circuit of harness (Contact with ground circuit or contact between harnesses)	★ Prepare with starting switch OFF, disconnect connector BRC1 and troubleshooting with starting switch still OFF.		
			BRC1 (female)	Retarder oil temperature (°C)	Resistance (kΩ)
			Between (9) – (21)	25	42.7
				30	35.13
				80	6.556
				90	4.925
				100	3.75
	4	Defective retarder controller (In normal system)	★ Prepare with starting switch OFF and troubleshooting with starting switch still ON.		
			Check with monitoring function (Code: 30201).	Oil temperature	Actual oil temperature and displayed temperature are same.

Circuit diagram related

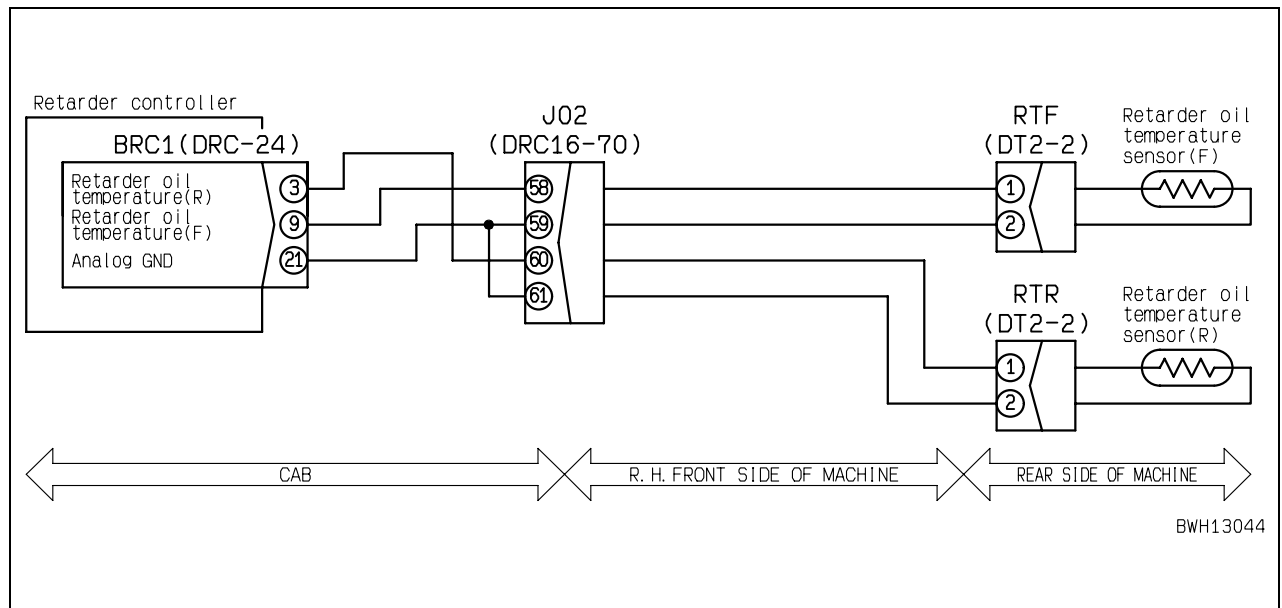


Failure code [DGR4KZ] Trouble in retarder oil temperature sensor (front wheel) system (Ground fault)

Action code	Failure code	Trouble	Trouble in retarder oil temperature sensor (front wheel) system (Ground fault) (Retarder controller system)
E01	DGR4KZ		
Contents of trouble	• Signal circuit voltage of retarder oil temperature sensor has become below 0.96 V.		
Action of controller	• None in particular.		
Problem that appears on machine	• Oil temperature gauge does not work because of failure mode of sensor.		
Related information	• Input signal from oil temperature sensor can be checked with monitoring function (codes: 30201 (°C) and 30204 (V)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective retarder oil temperature sensor	★ Prepare with starting switch OFF, disconnect connector RTF and troubleshooting with starting switch still OFF.		
			RTF (male)	Retarder oil temperature (°C)	Resistance (kΩ)
			Between (1) – (2)	25	42.7
				30	35.13
				80	6.556
				90	4.925
				100	3.75
	2	Disconnection in wiring harness (Disconnection or defective contact)	★ Prepare with starting switch OFF, disconnect connector BRC1 and troubleshooting with starting switch still OFF.		
			BRC1 (female)	Retarder oil temperature (°C)	Resistance (kΩ)
			Between (9) – (21)	25	42.7
				30	35.13
				80	6.556
				90	4.925
				100	3.75
	3	Short circuit of harness (Contact with ground circuit or contact between harnesses)	★ Prepare with starting switch OFF, disconnect connector BRC1 and troubleshooting with starting switch still OFF.		
			BRC1 (female)	Retarder oil temperature (°C)	Resistance (kΩ)
			Between (9) – (21)	25	42.7
				30	35.13
				80	6.556
				90	4.925
				100	3.75
	4	Defective retarder controller (In normal system)	★ Prepare with starting switch OFF and troubleshooting with starting switch still ON.		
			Check with monitoring function (Code: 30201).	Oil temperature	Actual oil temperature and displayed temperature are same.

Circuit diagram related

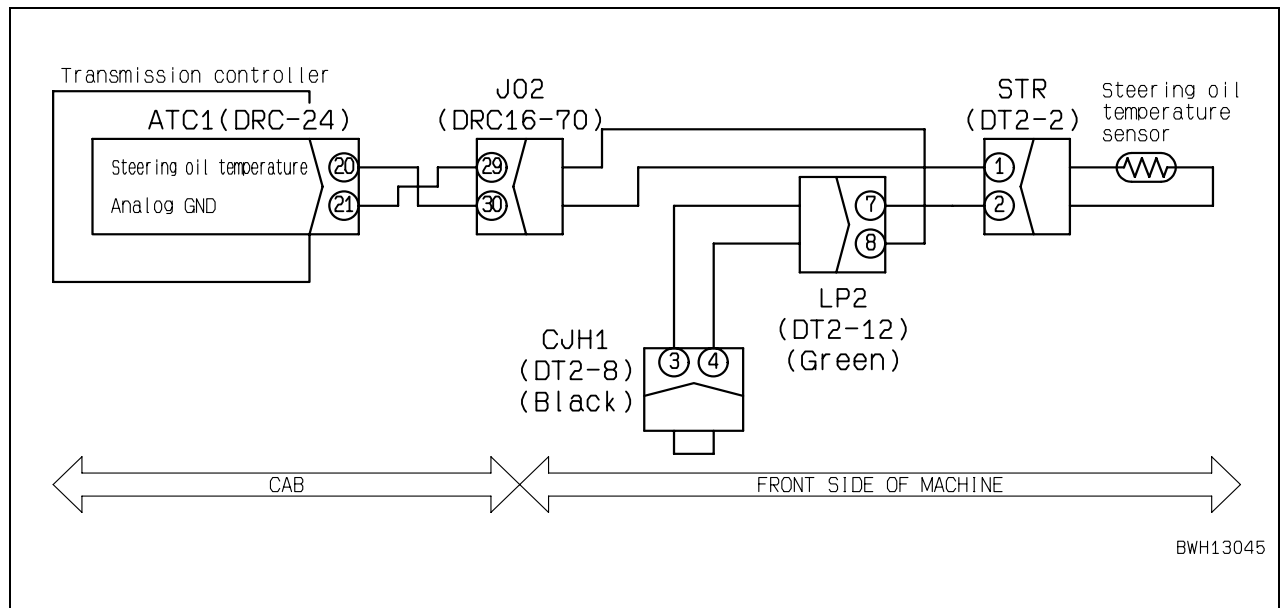


Failure code [DGR6KX] Steering oil temperature sensor: Input signal out of range

Action code	Failure code	Trouble	Steering oil temperature sensor: Input signal out of range (Transmission controller system)
E01	DGR6KX		
Contents of trouble	- Signal circuit voltage of steering oil temperature sensor has reached 0.97 V (more than 150 °C) or only steering oil temperature is low (signal circuit voltage of steering oil temperature sensor is above 4.56 V (less than 15 °C)). - Oil temperature sensor voltages of torque converter and brake are below 3.7 V (more than 55 °C) and normal.		
Action of controller	None in particular.		
Problem that appears on machine	Steering oil temperature gauge does not indicate properly.		
Related information	- Input signal from oil temperature sensor can be checked with monitoring function. 1) Steering oil temperature sensor (codes: 32701 (°C) and 32702 (V)) 2) Torque converter oil temperature sensor (codes: 30100 (°C) and 30101 (V)) 3) Retarder oil temperature sensor (codes: 30211 (°C) and 30212 (V))		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective steering oil temperature sensor	1) Turn starting switch OFF. 2) Connect T-adapter to connector STR (male).			
			Between STR (male) (1)	Oil temperature: 25 °C	Resistance	37 – 50 kΩ
			– (2)	Oil temperature: 100 °C	Resistance	3.5 – 4.0 kΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors ATC1 (female) and STR (female).			
			Wiring harness between ATC1 (female) (20) – STR (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between ATC1 (female) (21) – STR (female) (2)		Resistance	Max. 1 Ω
	3	Defective harness grounding (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors ATC1 and STR. 3) Connect T-adapter to connector ATC1 (female).			
			Between ground and wiring harness between ATC1 (female) (20) – STR (female) (1)		Resistance	Min. 1 MΩ
	4	Hot short in wiring harness (Contact with 24 V circuit)	1) Turn starting switch OFF. 2) Disconnect connectors ATC1 and STR. 3) Connect T-adapter to connector ATC1 (female). 4) Turn starting switch ON.			
			Between ground and wiring harness between ATC1 (female) (21) – STR (female) (2)		Voltage	Max. 5V
	5	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC1 (female).			
			Between ATC1 (female) (20) – (21)	Oil temperature: 25 °C	Resistance	37 – 50 kΩ
				Oil temperature: 100 °C	Resistance	3.5 – 4.0 kΩ

Circuit diagram related

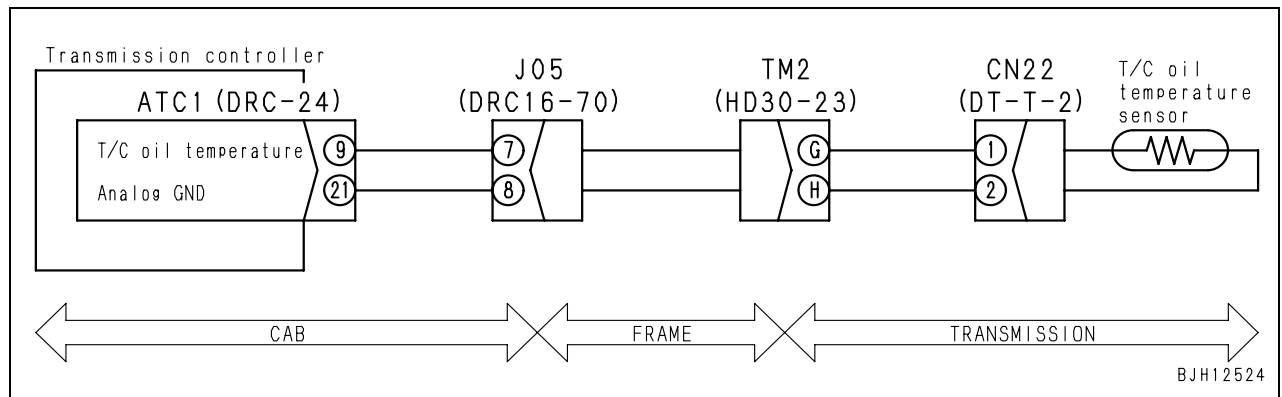


Failure code [DGT1KX] Torque converter oil temperature sensor: Out of input signal range

Action code	Failure code	Trouble	Torque converter oil temperature sensor: Out of input signal range (Transmission controller system)
E01	DGT1KX		
Contents of trouble	The voltage of the signal circuit of the torque converter oil temperature sensor is below 0.97 V (above 150°C) or when transmission valve oil temperature signal voltage is below 0.37 V (above 5°C) and there is no abnormality, torque converter oil temperature sensor signal circuit voltage is above 4.56 V (below 15°C).		
Action of controller	None in particular.		
Problem that appears on machine	The torque converter oil temperature gauge does not indicate normally.		
Related information	This failure can be checked in the monitoring function (Code: 30100 (°C), 30101 (V)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective torque converter oil temperature sensor	1) Turn the starting switch OFF. 2) Disconnect connector CN22. 3) Connect T-adapter.			
			Between CN22 (male) (1) – (2)	Oil temperature: 25°C	Resistance	37 – 50 kΩ
				Oil temperature: 100°C	Resistance	3.5 – 4.0 kΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC1 and CN22. 3) Connect T-adapter.			
			Wiring harness between ATC1 (female) (21) – CN22 (female) (2)		Resistance	Max. 1 Ω
			Wiring harness between ATC1 (female) (9) – CN22 (female) (1)		Resistance	Max. 1 Ω
	3	Grounding fault in wiring harness	1) Turn the starting switch OFF. 2) Disconnect connectors ATC1 and CN22. 3) Connect T-adapter.			
			Between ground and wiring harness ATC1 (female) (9) – CN22 (female) (1)		Resistance	Min. 1 MΩ
	4	Defective hot short in wiring harness	1) Turn the starting switch OFF. 2) Disconnect connectors ATC1 and CN22. 3) Insert T-adapter. 4) Turn the starting switch ON.			
			Between ground and wiring harness ATC1 (female) (21) – CN22 (female) (2)		Voltage	Max. 1 V
	5	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connector ATC1. 3) Insert T-adapter. 4) Turn the starting switch ON.			
			Between AT1 (female) (9) – (21)	Oil temperature: 25°C	Resistance	37 – 50 kΩ
				Oil temperature: 100°C	Resistance	3.5 – 4.0 kΩ

Circuit diagram related



HD785-7 Dump truck

Form No. SEN01943-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

40 Troubleshooting

Troubleshooting by failure code, Part 7

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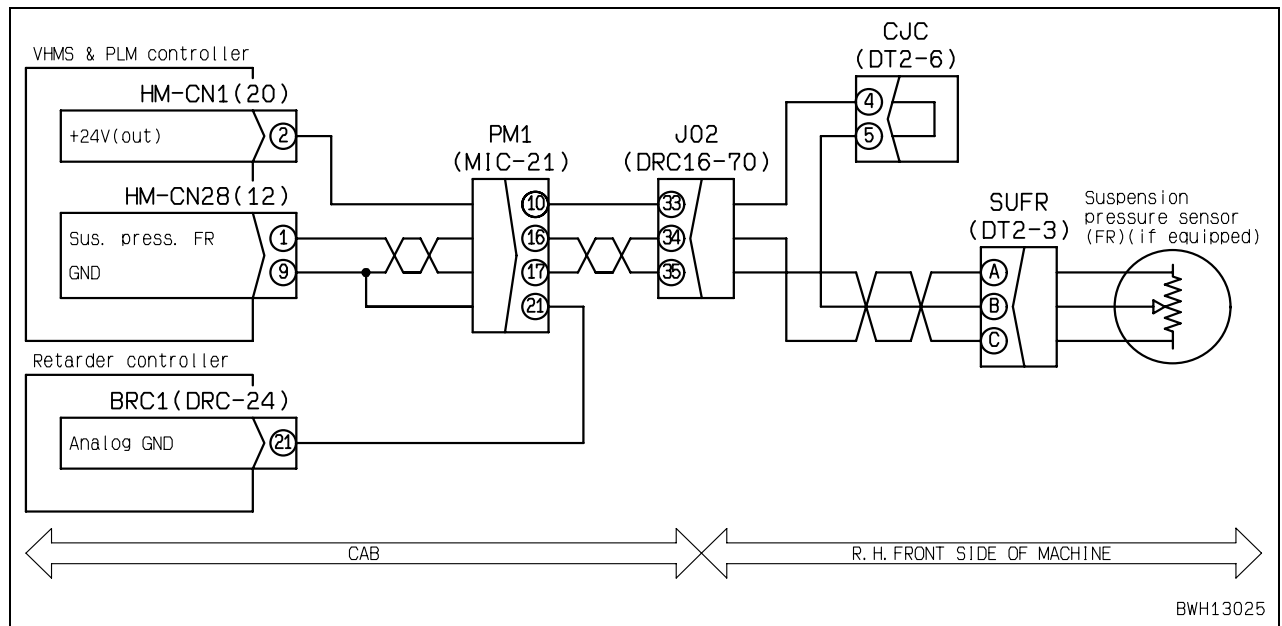
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Failure code [DHP4KY] Suspension pressure sensor system: Short circuit (Right front)

Action code	Failure code	Trouble	Suspension pressure sensor system: Short circuit (Right front) (VHMS controller system) (Display: PLM)
E01	DHP4KY		
Contents of trouble	• Abnormal current is flowing in signal circuit coming from suspension pressure sensor (right front).		
Action of controller	• Stops auto-suspension function.		
Problem that appears on machine	• Auto-suspension function does not operate.		
Related information	• Suspension pressure can be checked with monitoring function (Code: 32816 (MPa) , 32817 (V)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective suspension pressure sensor	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between SUFR (female) (B) – (A)	Voltage	18 ± 3 V
			Between SUFR (female) (C) – (A)	Voltage	1.0 – 4.6 V
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between SUFR (female) (A) – HM-CN2B (9)	Resistance	Max. 1 Ω
			Wiring harness between SUFR (female) (B) – HM-CN1 (2)	Resistance	Max. 1 Ω
			Wiring harness between SUFR (female) (C) – HM-CN2B (1)	Resistance	Max. 1 Ω
	3	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between SUFR (female) (B) – HM-CN1 (2)	Resistance	Min. 1 MΩ
			Wiring harness between SUFR (female) (C) – HM-CN2B (1)	Resistance	Min. 1 MΩ
	4	Defective hot short in wiring harness (a contact with 24 V circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between SUFR (female) (A) – HM-CN2B (9)	Voltage	Max. 1 V
			Wiring harness between SUFR (female) (C) – HM-CN2B (1)	Voltage	Max. 1 V
	5	Defective VHMS & PLM controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between HM-CN2B (1) – (9)	Voltage	1.0 – 4.6 V

Circuit diagram related



Failure code [DHP4KZ] Suspension pressure sensor system: Disconnection or ground fault (Right front)

Action code	Failure code	Trouble	Suspension pressure sensor system: Disconnection or ground fault (Right front) (VHMS controller system) (Display: PLM)
E01	DHP4KZ		
Contents of trouble	Signal is not sent from suspension pressure sensor (right front) or it is grounded (Abnormal).		
Action of controller	Stops auto-suspension function.		
Problem that appears on machine	Auto-suspension function does not operate.		
Related information	Suspension pressure can be checked with monitoring function (Code: 32816 (MPa), 32817 (V)).		

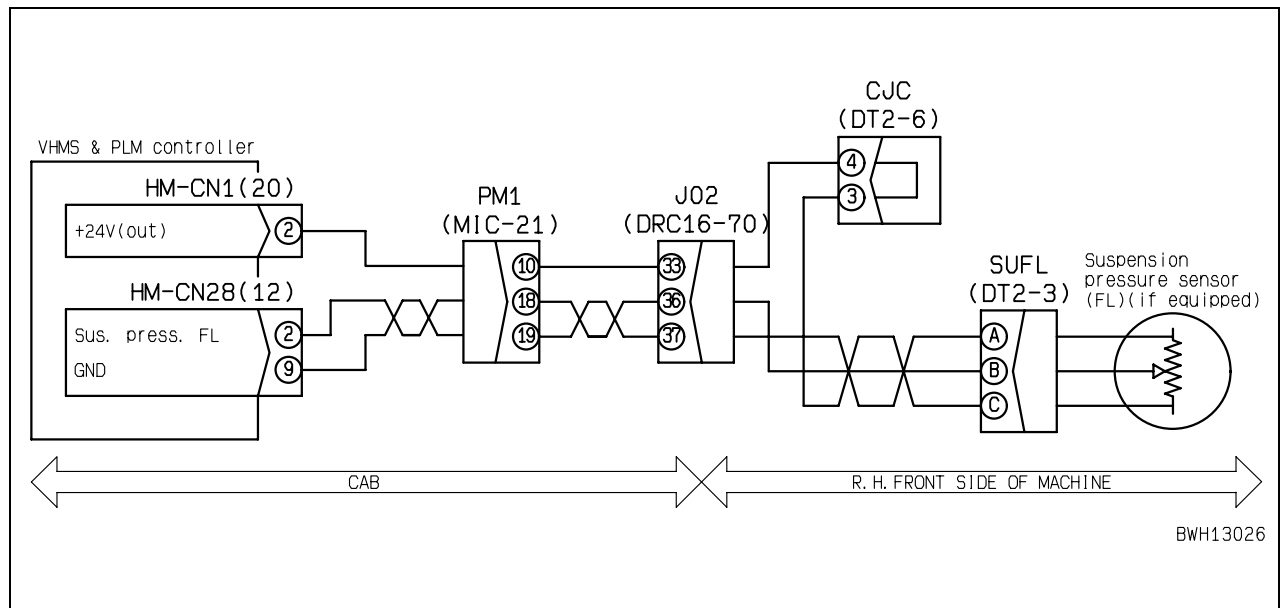
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DHP4KY].	

Failure code [DHP5KY] Suspension pressure sensor system: Short circuit (Left front)

Action code	Failure code	Trouble	Suspension pressure sensor system: Short circuit (Left front) (VHMS controller system) (Display: PLM)
E01	DHP5KY		
Contents of trouble	• Abnormal current is flowing in signal circuit coming from suspension pressure sensor (left front).		
Action of controller	• Stops auto-suspension function.		
Problem that appears on machine	• Auto-suspension function does not operate.		
Related information	• Suspension pressure can be checked with monitoring function (Code: 32814 (MPa) , 32815 (V)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective suspension pressure sensor	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between SUFL (female) (B) – (A)	Voltage	18 ± 3 V
			Between SUFL (female) (C) – (A)	Voltage	1.0 – 4.6 V
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between SUFL (female) (A) – HM-CN2B (9)	Resistance	Max. 1 Ω
			Wiring harness between SUFL (female) (B) – HM-CN1 (2)	Resistance	Max. 1 Ω
			Wiring harness between SUFL (female) (C) – HM-CN2B (2)	Resistance	Max. 1 Ω
	3	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between SUFL (female) (B) – HM-CN1 (female) (2)	Resistance	Min. 1 MΩ
			Wiring harness between SUFL (female) (C) – HM-CN2B (female) (2)	Resistance	Min. 1 MΩ
	4	Defective hot short in wiring harness (a contact with 24 V circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between SUFL (female) (A) – HM-CN2B (9)	Voltage	Max. 1 V
			Wiring harness between SUFL (female) (C) – HM-CN2B (2)	Voltage	Max. 1 V
	5	Defective VHMS & PLM controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between HM-CN2B (2) – (9)	Voltage	1.0 – 4.6 V

Circuit diagram related



Failure code [DHP5KZ] Suspension pressure sensor system: Disconnection or ground fault (Left front)

Action code	Failure code	Trouble	Suspension pressure sensor system: Disconnection or ground fault (Left front) (VHMS controller system) (Display: PLM)
E01	DHP5KZ		
Contents of trouble	Signal is not sent from suspension pressure sensor (left front) or it is grounded (Abnormal).		
Action of controller	Stops auto-suspension function.		
Problem that appears on machine	Auto-suspension function does not operate.		
Related information	Suspension pressure can be checked with monitoring function (Code: 32814 (MPa), 32815 (V)).		

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DHP5KY].	

Failure code [DHP6KA] Suspension pressure sensor system: Disconnection (Right rear)

Action code	Failure code	Trouble	Suspension pressure sensor system: Disconnection (Right rear) (Retarder controller system)
E01	DHP6KA		
Contents of trouble	• The voltage of the signal circuit of the suspension pressure sensor (right rear) is below 1.0 V or above 4.7 V.		
Action of controller	• Does not operate auto suspension. • Dose not operate ARSC.		
Problem that appears on machine	• There is no great influence of machine.		
Related information	• Input state from suspension pressure sensor (right rear) can be checked with monitoring function (Code: 32816 (MPa) , 32817 (V)).		

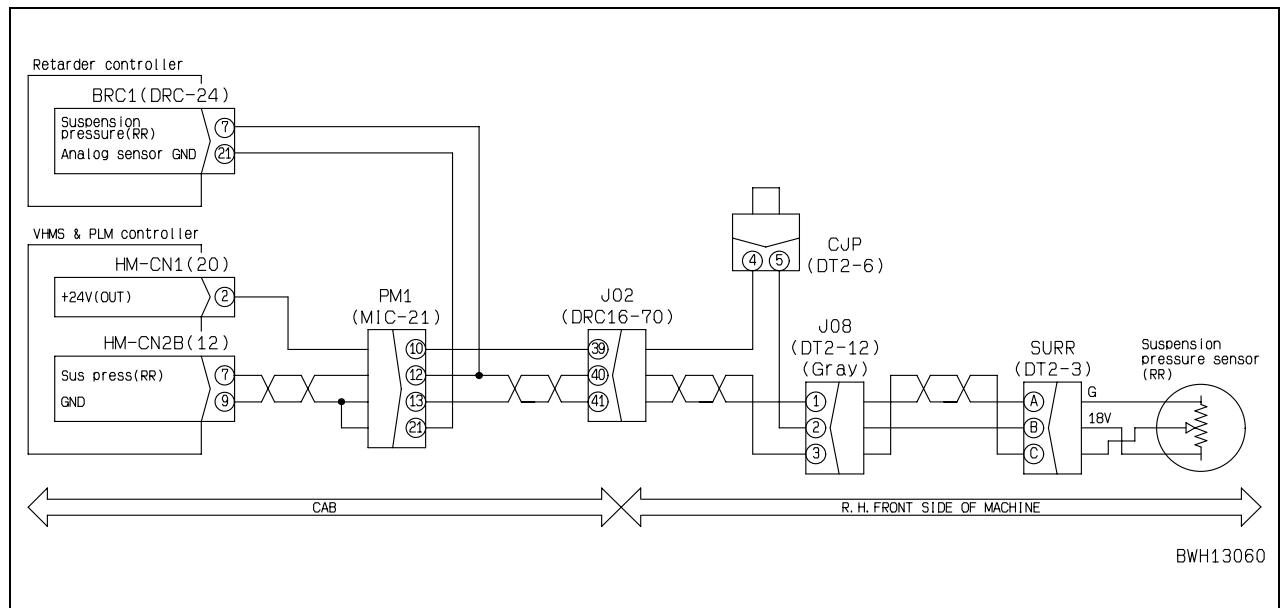
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DHP6KX].	

Failure code [DHP6KX] Failure in suspension pressure sensor system trouble: Out of input signal range (Right rear)

Action code	Failure code	Trouble	Failure in suspension pressure sensor system trouble: Out of input signal range (Right rear) (Retarder controller system)
E03	DHP6KX		
Contents of trouble	The voltage of the signal circuit of the suspension pressure sensor (right rear) is below 1.0 V or above 4.7 V.		
Action of controller	- Does not operate auto suspension. - Dose not operate ARSC.		
Problem that appears on machine	There is no great influence of machine.		
Related information	Input state from suspension pressure sensor (right rear) can be checked with monitoring function (Code: 32816 (MPa), 32817 (V)).		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective suspension pressure sensor	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between SURR (female) (B) – (A)	Voltage	18 ± 3 V
			Between SURR (female) (C) – (A)	Voltage	1.0 – 4.6 V
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between SURR (female) (A) – HM-CN2B (female) (9)	Resistance	Max. 1 Ω
			Wiring harness between SURR (female) (A) – BRC1 (female) (21)	Resistance	Max. 1 Ω
			Wiring harness between SURR (female) (B) – HM-CN1 (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between SURR (female) (C) – BRC1 (female) (7)	Resistance	Max. 1 Ω
			Wiring harness between SURR (female) (C) – HM-CN2B (female) (7)	Resistance	Max. 1 Ω
	3	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between SURR (female) (B) – HM-CN1 (female) (2)	Resistance	Min. 1 MΩ
			Wiring harness between SURR (female) (C) – BRC1 (female) (7)	Resistance	Min. 1 MΩ
			Wiring harness between SURR (female) (C) – HM-CN2B (female) (7)	Resistance	Min. 1 MΩ
	4	Defective hot short in wiring harness (a contact with 24 V circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between SURR (female) (A) – HM-CN2B (female) (9)	Voltage	Max. 1 V
			Wiring harness between SURR (female) (A) – BRC1 (female) (21)	Voltage	Max. 1 V
			Wiring harness between SURR (female) (C) – BRC1 (female) (7)	Voltage	Max. 1 V
			Wiring harness between SURR (female) (C) – HM-CN2B (female) (7)	Voltage	Max. 1 V
	5	Defective retarder controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between BRC1 (7) – (21)	Voltage	1.0 – 4.6 V

Circuit diagram related



Failure code [DHP6KY] Suspension pressure sensor system: Short circuit (Right rear)

Action code	Failure code	Trouble	Suspension pressure sensor system: Short circuit (Right rear) (VHMS controller system) (Display: PLM)
E01	DHP6KY		
Contents of trouble	• Abnormal current is flowing in signal circuit coming from suspension pressure sensor (right rear).		
Action of controller	• Stops auto-suspension function.		
Problem that appears on machine	• Auto-suspension function does not operate.		
Related information	• Input state from suspension pressure sensor (right rear) can be checked with monitoring function (Code: 32816 (MPa) , 32817 (V)).		

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DHP6KX] .	

Failure code [DHP6KZ] Suspension pressure sensor system: Disconnection or ground fault (Right rear)

Action code	Failure code	Trouble	Suspension pressure sensor system: Disconnection or ground fault (Right rear) (VHMS controller system) (Display: PLM)
E01	DHP6KZ		
Contents of trouble	• Signal is not sent from suspension pressure sensor (right rear) or it is grounded.		
Action of controller	• Stops auto-suspension function.		
Problem that appears on machine	• Auto-suspension function does not operate.		
Related information	• Input state from suspension pressure sensor (right rear) can be checked with monitoring function (Code: 32816 (MPa) , 32817 (V)).		

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DHP6KX] .	

Failure code [DHP7KA] Suspension pressure sensor system: Disconnection (Left rear)

Action code	Failure code	Trouble	Suspension pressure sensor system: Disconnection (Left rear) (Retarder controller system)
E01	DHP7KA		
Contents of trouble	• The voltage of the signal circuit of the suspension pressure sensor (left rear) is below 0.3 V or above 4.6V.		
Action of controller	• Does not operate auto suspenshion. • Dose not operate ARSC.		
Problem that appears on machine	• There is no great influence of machine.		
Related information	• Input state from suspension pressure sensor (left rear) can be checked with monitoring function (Code: 32814 (MPa) , 32815 (V)). • This failure occurs only when the built-in PLM function is installed.		

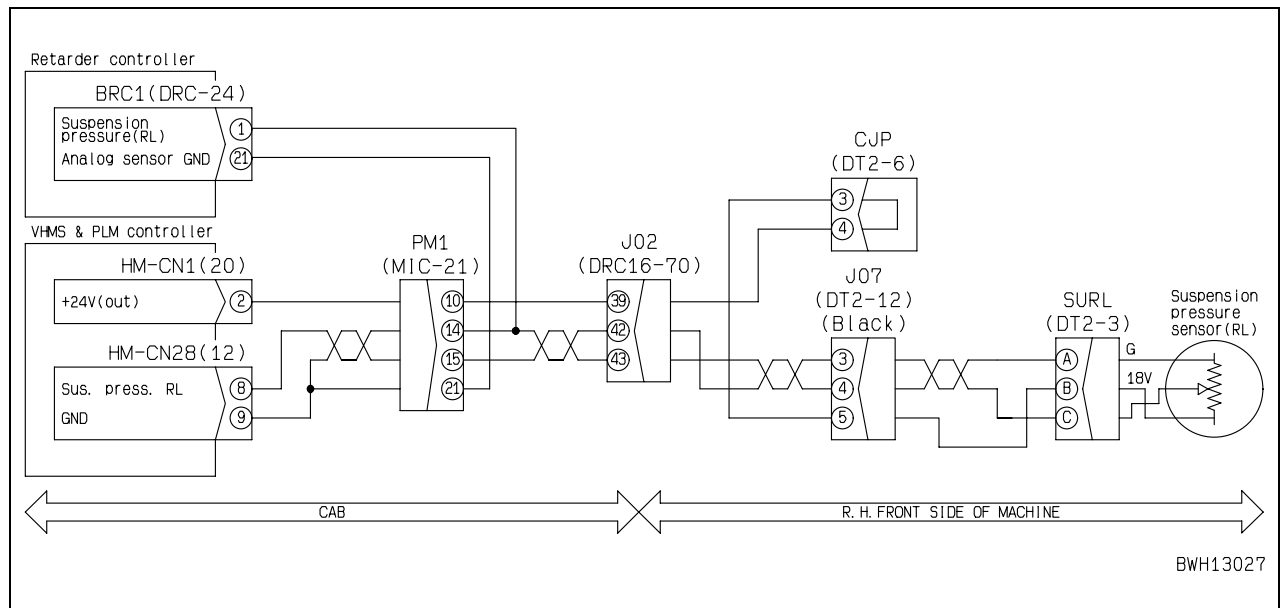
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DHP7KX].	

Failure code [DHP7KX] Failure in suspension pressure sensor system trouble: Out of input signal range (Left rear)

Action code	Failure code	Trouble	Failure in suspension pressure sensor system trouble: Out of input signal range (Left rear) (When ARSC is not set or ARSC system switch is "ON") (Retarder controller system)
E03	DHP7KX		
Contents of trouble	The voltage of the signal circuit of the suspension pressure sensor (left rear) is below 1.0 V or above 4.6 V.		
Action of controller	- Does not operate auto suspension. - Does not operate ARSC.		
Problem that appears on machine	There is no great influence of machine.		
Related information	Input state from suspension pressure sensor (left rear) can be checked with monitoring function (Code: 32814 (MPa), 32815 (V)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective suspension pressure sensor	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between SURL (female) (B) – (A)	Voltage	18 ± 3 V
			Between SURL (female) (C) – (A)	Voltage	1.0 – 4.6 V
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between SURL (female) (A) – HM-CN2B (female) (9)	Resistance	Max. 1 Ω
			Wiring harness between SURL (female) (A) – BRC1 (female) (21)	Resistance	Max. 1 Ω
			Wiring harness between SURL (female) (B) – HM-CN1 (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between SURL (female) (C) – BRC1 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between SURL (female) (C) – HM-CN2B (female) (8)	Resistance	Max. 1 Ω
	3	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between SURL (female) (B) – HM-CN1 (female) (2)	Resistance	Min. 1 MΩ
			Wiring harness between SURL (female) (C) – BRC1 (female) (1)	Resistance	Min. 1 MΩ
			Wiring harness between SURL (female) (C) – HM-CN2B (female) (8)	Resistance	Min. 1 MΩ
	4	Defective hot short in wiring harness (a contact with 24 V circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between SURL (female) (A) – HM-CN2B (female) (9)	Voltage	Max. 1 V
			Wiring harness between SURL (female) (A) – BRC1 (female) (21)	Voltage	Max. 1 V
			Wiring harness between SURL (female) (C) – BRC1 (female) (1)	Voltage	Max. 1 V
			Wiring harness between SURL (female) (C) – HM-CN2B (female) (8)	Voltage	Max. 1 V
	5	Defective retarder controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between BRC1 (1) – (21)	Voltage	1.0 – 4.6 V

Circuit diagram related



Failure code [DHP7KY] Suspension pressure sensor system: Short circuit (Left rear)

Action code	Failure code	Trouble	Suspension pressure sensor system: Short circuit (Left rear) (VHMS controller system) (Display: PLM)
E01	DHP7KY		
Contents of trouble	• Abnormal current is flowing in signal circuit coming from suspension pressure sensor (Left rear).		
Action of controller	• Stops auto-suspension function.		
Problem that appears on machine	• Auto-suspension function does not operate.		
Related information	• Input state from suspension pressure sensor (left rear) can be checked with monitoring function (Code: 32814 (MPa) , 32815 (V)).		

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DHP7KX].	

Failure code [DHP7KZ] Suspension pressure sensor system: Disconnection or ground fault (Left rear)

Action code	Failure code	Trouble	Suspension pressure sensor system: Disconnection or ground fault (Left rear) (VHMS controller system) (Display: PLM)
E01	DHP7KZ		
Contents of trouble	• Signal is not sent from suspension pressure sensor (left rear) or it is grounded.		
Action of controller	• Stops auto-suspension function.		
Problem that appears on machine	• Auto-suspension function does not operate.		
Related information	• Input state from suspension pressure sensor (left rear) can be checked with monitoring function (Code: 32814 (MPa) , 32815 (V)).		

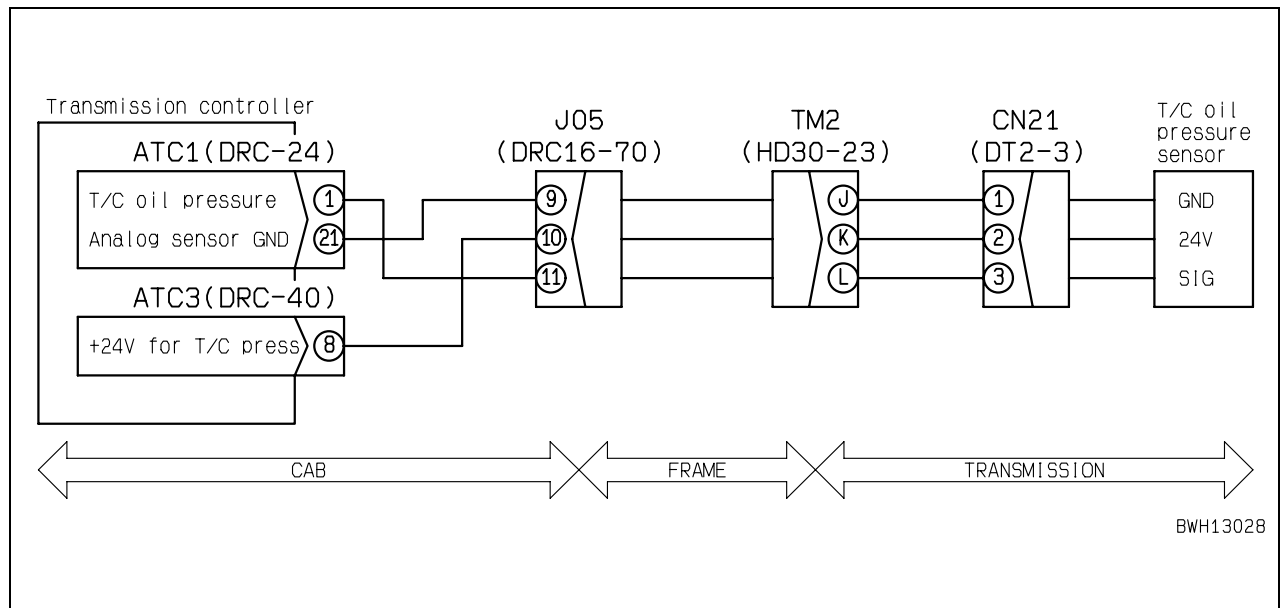
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DHP7KX].	

Failure code [DHT5KX] Torque converter oil pressure sensor: Out of input signal range

Action code	Failure code	Trouble	Torque converter oil pressure sensor: Out of input signal range (Transmission controller system)
E01	DHT5KX		
Contents of trouble	• The voltage of the signal circuit of the torque converter oil pressure sensor is below 0.5 V or above 4.5 V.		
Action of controller	• The controller controls the machine, fixing the torque converter oil pressure to the set pressure in itself.		
Problem that appears on machine	• Large shocks are made when the lockup system is operated.		
Related information	• Input state from torque converter oil pressure sensor can be checked with monitoring function (Code: 32600 (MPa) , 32605 (V)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC1, ATC3, and CN21. 3) Connect T-adapter.		
			Wiring harness between ATC3(female) (8) – CN21 (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between ATC1(female) (21) – CN21 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC1 (female) (1) – CN21 (female) (3)	Resistance	Max. 1 Ω
	2	Grounding fault in wiring harness (Contact with ground circuit)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC3 and CN21. 3) Connect T-adapter.		
			Between ground and wiring harness between ATC3A (female) (8) – CN21 (female) (2)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between ATC1 (female) (1) – CN21 (female) (3)	Resistance	Min. 1 MΩ
	3	Defective hot short in wiring harness (a contact with 24 V circuit)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC3 and CN21. 3) Insert T-adapter. 4) Turn the starting switch ON.		
			Between ground and wiring harness between ATC3 (female) (8) – CN21 (female) (2) – ground	Voltage	0.8 – 2.0 V
	4	Defective torque converter oil pressure sensor	1) Turn the starting switch OFF. 2) Disconnect connector CN21. 3) Insert T-adapter. 4) Turn the starting switch ON.		
			Between CN21 (1) – (2)	Voltage	20 – 30 V
			Between CN21 (1) – (3)	Voltage	0.8 – 2.0 V
	5	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connectors ATC1 and ATC3. 3) Insert T-adapter. 4) Turn the starting switch ON.		
			Between ATC1 (1) – (21)	Voltage	20 – 30 V
			Between ATC3 (8) – ATC1 (21)	Voltage	0.8 – 2.0 V

Circuit diagram related

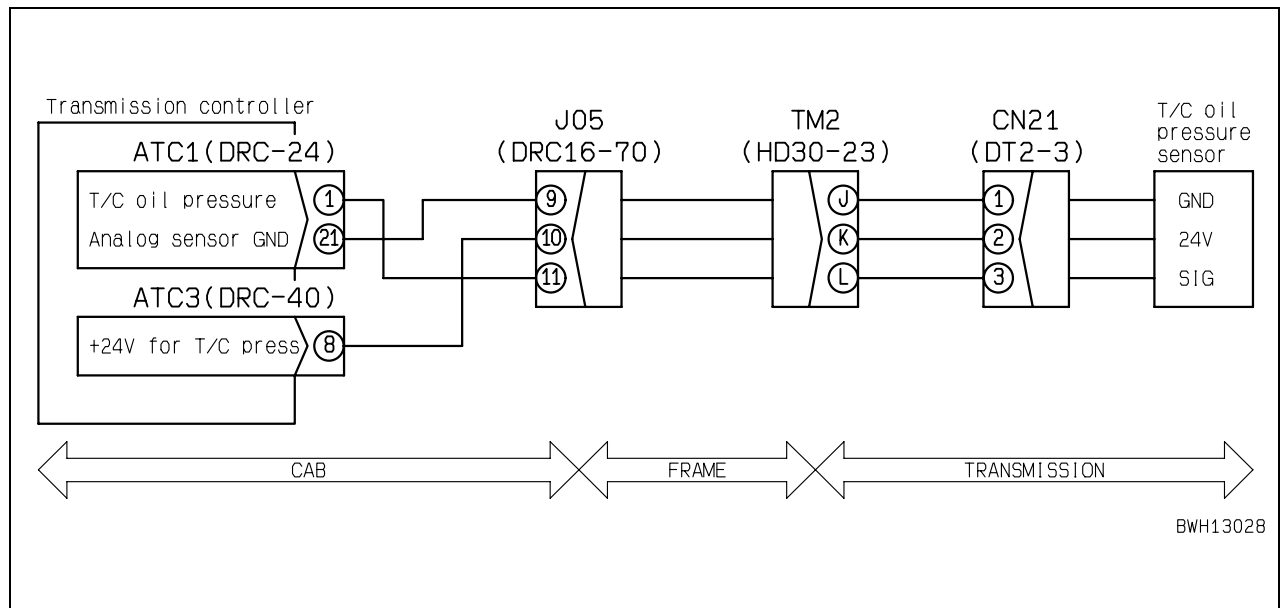


Failure code [DHT5L6] Torque converter oil pressure sensor: Disagreement of run and stop condition with signal

Action code	Failure code	Trouble	Torque converter oil pressure sensor: Disagreement of run and stop condition with signal (Transmission controller system)
E01	DHT5L6		
Contents of trouble	While the engine is stopped, an oil pressure signal is input to the signal circuit of the torque converter oil pressure sensor.		
Action of controller	The controller controls the machine, fixing the torque converter oil pressure to the set pressure itself.		
Problem that appears on machine	Large shocks are made when the lockup system is operated.		
Related information	Input state from torque converter oil pressure sensor can be checked with monitoring function (Code: 32600 (MPa), 32605 (V)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective hot short in wiring harness (a contact with 24 V circuit)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC3 and CN21. 3) Insert T-adapter. 4) Turn the starting switch ON.		
			Wiring harness between ATC1 (female) (1) – CN21 (female) (3)	Voltage	Max. 1.2 V
	2	Defective torque converter oil pressure sensor	1) Turn the starting switch OFF. 2) Disconnect connector CN21. 3) Insert T-adapter. 4) Turn the starting switch ON.		
			Between CN21 (1) – (2)	Voltage	20 – 30 V
			Between CN21 (1) – (3)	Voltage	0.8 – 2.0 V
	3	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connectors ATC1 and ATC3. 3) Insert T-adapter. 4) Turn the starting switch ON.		
			Between ATC3 (8) – ATC1 (21)	Voltage	20 – 30 V
			Between ATC1 (1) – (21)	Voltage	0.8 – 2.0 V

Circuit diagram related

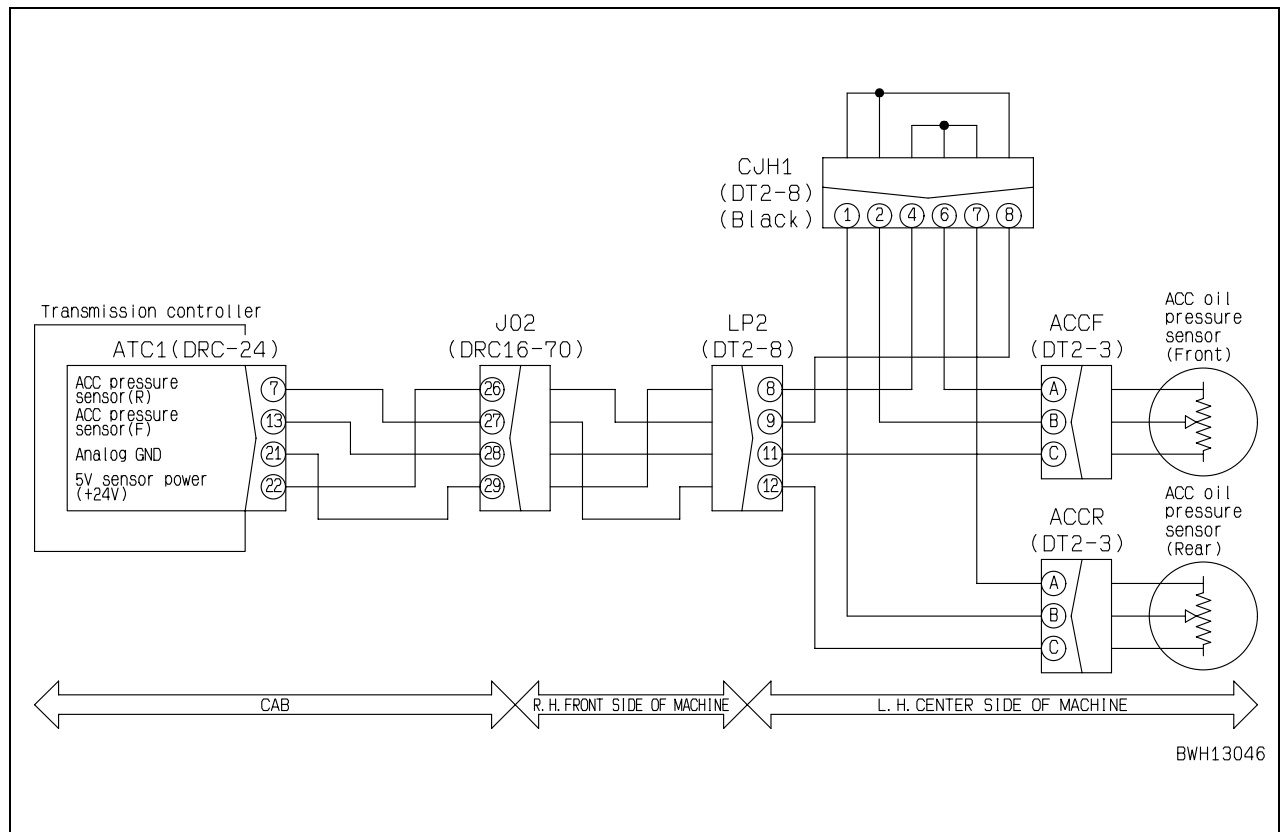


Failure code [DHU2KX] Front accumulator oil pressure sensor: Out of input signal range

Action code	Failure code	Trouble	Front accumulator oil pressure sensor: Out of input signal range (Transmission controller system)
E01	DHU2KX		
Contents of trouble	• Signal circuit voltage of front accumulator oil pressure sensor has become below 0.5 V or above 4.5 V.		
Action of controller	• None in particular.		
Problem that appears on machine	• There is no great influence on the machine.		
Related information	• Input state from front accumulator pressure sensor can be checked with monitoring function (Code: 35500 (MPa) , 35504 (V)). • When only rear accumulator oil pressure sensor is has trouble, this error code may be displayed, too.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors ATC1 (female) and ACCF (female).			
			Wiring harness between ATC1 (female) (13) – ACCF (female) (C)	Resistance		Max. 1 Ω
			Wiring harness between ATC1 (female) (21) – ACCF (female) (A)	Resistance		Max. 1 Ω
			Wiring harness between ATC1 (female) (22) – ACCF (female) (B)	Resistance		Max. 1 Ω
	2	Defective harness grounding (Contact with ground circuit)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors ATC1 (female) and ACCF (female).			
			Between ground and wiring harness between ATC1 (female) (13) – ACCF (female) (C)	Resistance		Min. 1 MΩ
			Between ground and wiring harness between ATC1 (female) (22) – ACCF (female) (B)	Resistance		Min. 1 MΩ
	3	Hot short in wiring harness (a contact with 24 V circuit)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors ACCF and ATC1 3) Turn starting switch ON.			
			Between ground and wiring harness between ATC1 (13) – ACCF (C)	Voltage		Max. 1 V
	4	Defective front accumulator oil pressure sensor	1) Turn starting switch OFF. 2) Connect T-adapter to connector ACCF. 3) Carry out troubleshooting while starting switch is ON.			
			Between ACCF (B) – (A)	Voltage		4.6 – 5.4 V
			Between ACCF (C) – (A)	Voltage		0.3 – 4.7 V
	5	Defective transmission controller	1) Turn starting switch OFF. 2) Insert T-adapter in connector ATC1. 3) Turn starting switch ON.			
			Between ATC1 (22) – (21)	Voltage		4.6 – 5.4 V
			Between ATC1 (13) – (21)	Voltage		0.3 – 4.7 V

Circuit diagram related

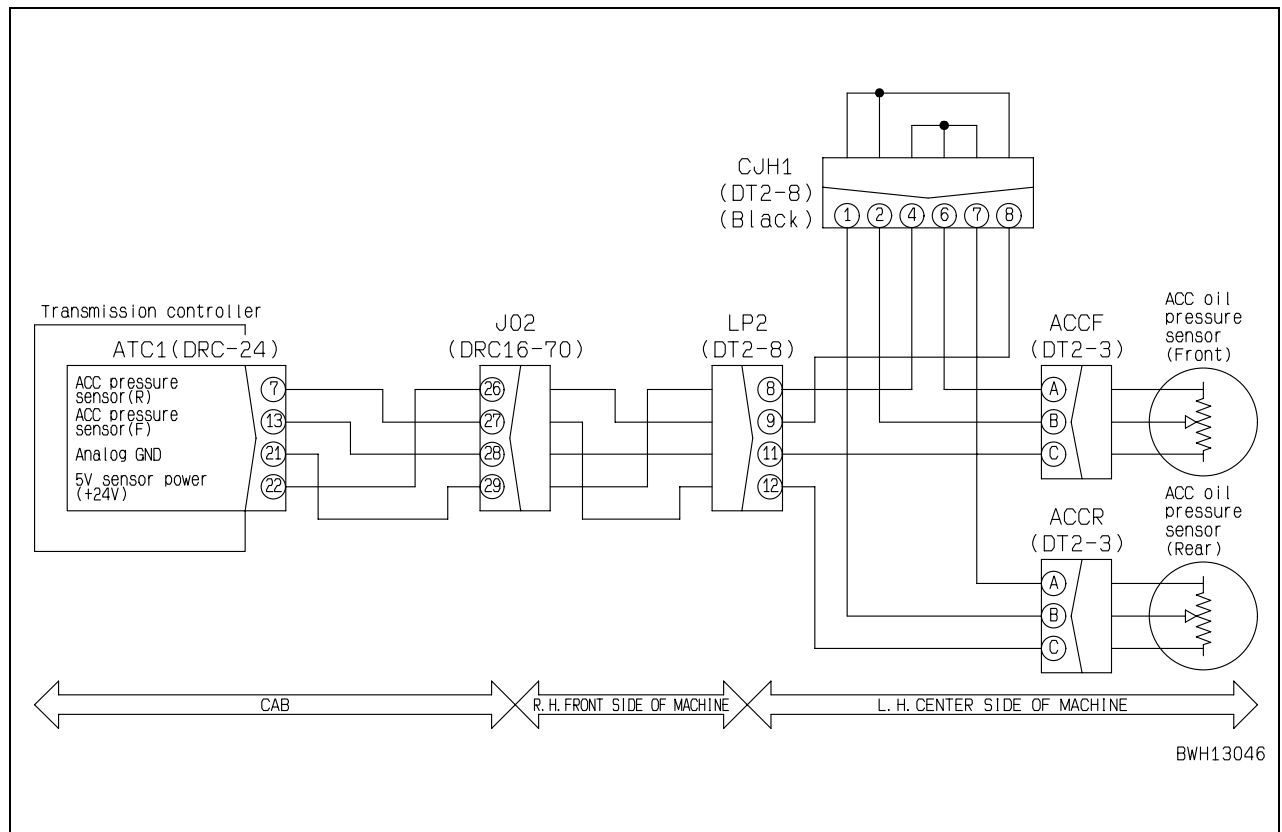


Failure code [DHU3KX] Rear accumulator oil pressure sensor: Out of input signal range

Action code	Failure code	Trouble	Rear accumulator oil pressure sensor: Out of input signal range (Transmission controller system)
E01	DHU3KX		
Contents of trouble	• Signal circuit voltage of front accumulator oil pressure sensor has become below 0.5 V or above 4.5 V.		
Action of controller	• None in particular.		
Problem that appears on machine	• There is no great influence on the machine.		
Related information	• Input state from front accumulator pressure sensor can be checked with monitoring function (Code: 35501 (MPa) , 35505 (V)). • When only front accumulator oil pressure sensor is has trouble, this error code may be displayed, too.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors ATC1 (female) and ACCR (female).			
			Wiring harness between ATC1 (female) (7) – ACCR (female) (C)	Resistance		Max. 1 Ω
			Wiring harness between ATC1 (female) (21) – ACCR (female) (A)	Resistance		Max. 1 Ω
			Wiring harness between ATC1 (female) (22) – ACCR (female) (B)	Resistance		Max. 1 Ω
	2	Defective harness grounding (Contact with ground circuit)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors ATC1 (female) and ACCR (female).			
			Between ground and wiring harness between ATC1 (female) (7) – ACCR (female) (C)	Resistance		Min. 1 MΩ
			Between ground and wiring harness between ATC1 (female) (22) – ACCR (female) (B)	Resistance		Min. 1 MΩ
	3	Hot short in wiring harness (a contact with 24V circuit)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors ATC1 and ACCR. 3) Turn starting switch ON.			
			Between ground and wiring harness between ATC1 (female) (7) – ACCR (C)	Voltage		Max. 1 V
	4	Defective rear accumulator oil pressure sensor	1) Turn starting switch OFF. 2) Connect T-adapter to connector ACCR. 3) Carry out troubleshooting while starting switch is ON.			
			Between ACCR (B) – (A)	Voltage		4.6 – 5.4 V
			Between ACCR (C) – (A)	Voltage		0.3 – 4.7 V
	5	Defective transmission controller	1) Turn starting switch OFF. 2) Insert T-adapter in connector ATC1. 3) Turn starting switch ON.			
			Between ATC1 (22) – (21)	Voltage		4.6 – 5.4 V
			Between ATC1 (7) – (21)	Voltage		0.3 – 4.7 V

Circuit diagram related

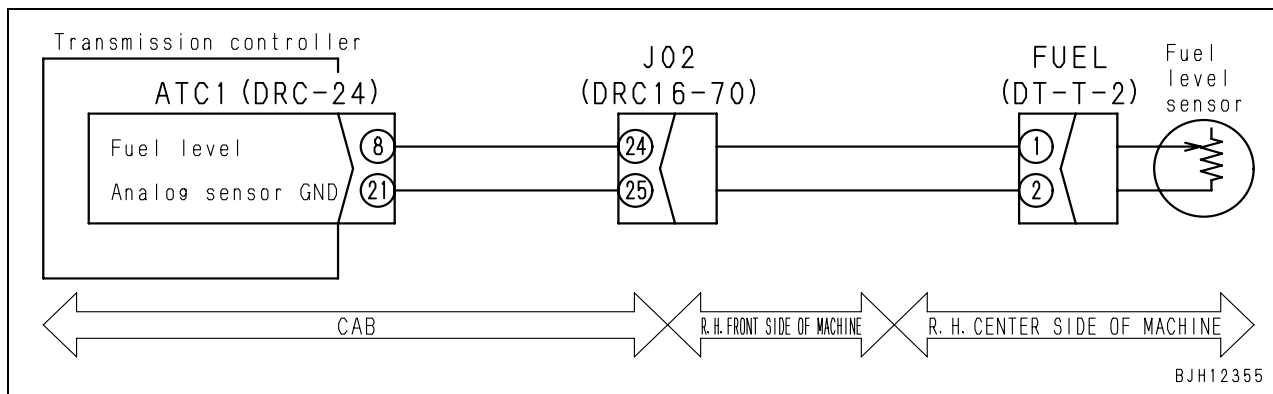


Failure code [DJF1KA] Fuel level sensor: Disconnection

Action code	Failure code	Trouble	Fuel level sensor: Disconnection (Transmission controller system)
E01	DJF1KA		
Contents of trouble	• The voltage of the signal circuit of the fuel level sensor is higher than 4.0 V.		
Action of controller	• None in particular.		
Problem that appears on machine	• The fuel level gauge does not indicate normally.		
Related information	• This failure can be checked in the monitoring function (Code: 04200 (V) , 04201 (Ω)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective fuel level sensor	1) Turn the starting switch OFF. 2) Disconnect connector FUEL. 3) Connect T-adapter.			
			Between FUEL (male) (1) – (2)	Fuel level: When FULL	Resistance	Max. 12 Ω
				Fuel level: When EMPTY	Resistance	74 – 100 Ω
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC1 and FUEL. 3) Connect T-adapter.			
			Wiring harness between ATC1 (female) (8) – FUEL (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between ATC1 (female) (21) – FUEL (female) (2)		Resistance	Max. 1 Ω
	3	Defective hot short in wiring harness (a contact with 24 V circuit)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC1 and FUEL. 3) Connect T-adapter. 4) Turn the starting switch ON.			
			Between ground and wiring harness between ATC1 (female) (8) – FUEL (female) (1)		Voltage	Max. 1 V
	4	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connector ATC1. 3) Insert T-adapter. 4) Turn the starting switch ON.			
			Between ATC1 (female) (8) – (21)	Fuel level: When FULL	Resistance	Max. 12 Ω
				Fuel level: When EMPTY	Resistance	74 – 100 Ω

Circuit diagram related

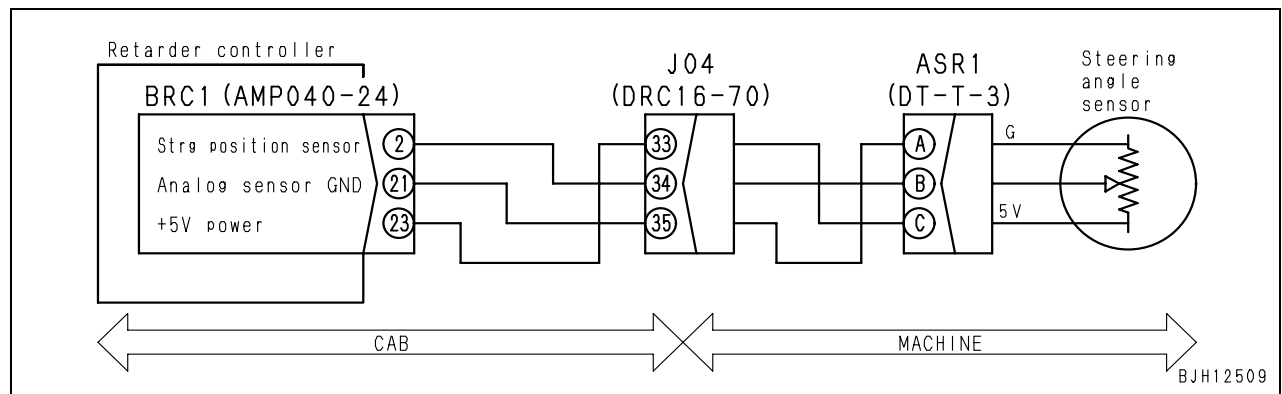


Failure code [DK30KX] Steering angle potentiometer: Trouble (Disconnection)

Action code	Failure code	Trouble	Steering angle potentiometer: Trouble (Disconnection) (Retarder controller system)
E01	DK30KX		
Contents of trouble	• There is no voltage in signal coming from steering angle potentiometer.		
Action of controller	• None in particular.		
Problem that appears on machine	• Since steering angle signal is not input to retarder controller, ASR may not operate normally and tires may slip consequently.		
Related information	• Input state from steering angle sensor can be checked with monitoring function (Code: 35400 (V) , 35402 (°)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective sensor	Turn starting switch OFF and disconnect ASR1, then carry out troubleshooting without turning starting switch ON.		
			ASR1 (Male: Sensor side)		Resistance
			Between (A) – (C)		5 kΩ ± 20%
			Between (A) – (B)		0 – 5 kΩ *1
			Between (B) – (C)		0 – 5 kΩ *1
			*1 Between (A) – (B) + between (B) – (C) = 5 kΩ ± 20%		
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Turn starting switch OFF and disconnect ASR1, then carry out troubleshooting without turning starting switch ON.		
			Between ASR1 (female) (B) – BRC1 (female) (2)	Resistance	Max. 1 Ω
			1) Turn starting switch OFF and disconnect ASR1. 2) Turn starting switch ON and carry out troubleshooting.		
			ASR1 (Female)		Voltage
			Between (C) – (A)		5 V
	3	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect R14 (BCV relay), then carry out troubleshooting without turning starting switch ON.		
			Between ASR1 (female) (B) – ground	Resistance	Min. 1 MΩ
	4	Defective retarder controller	If causes 1 – 3 are not detected, retarder controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related



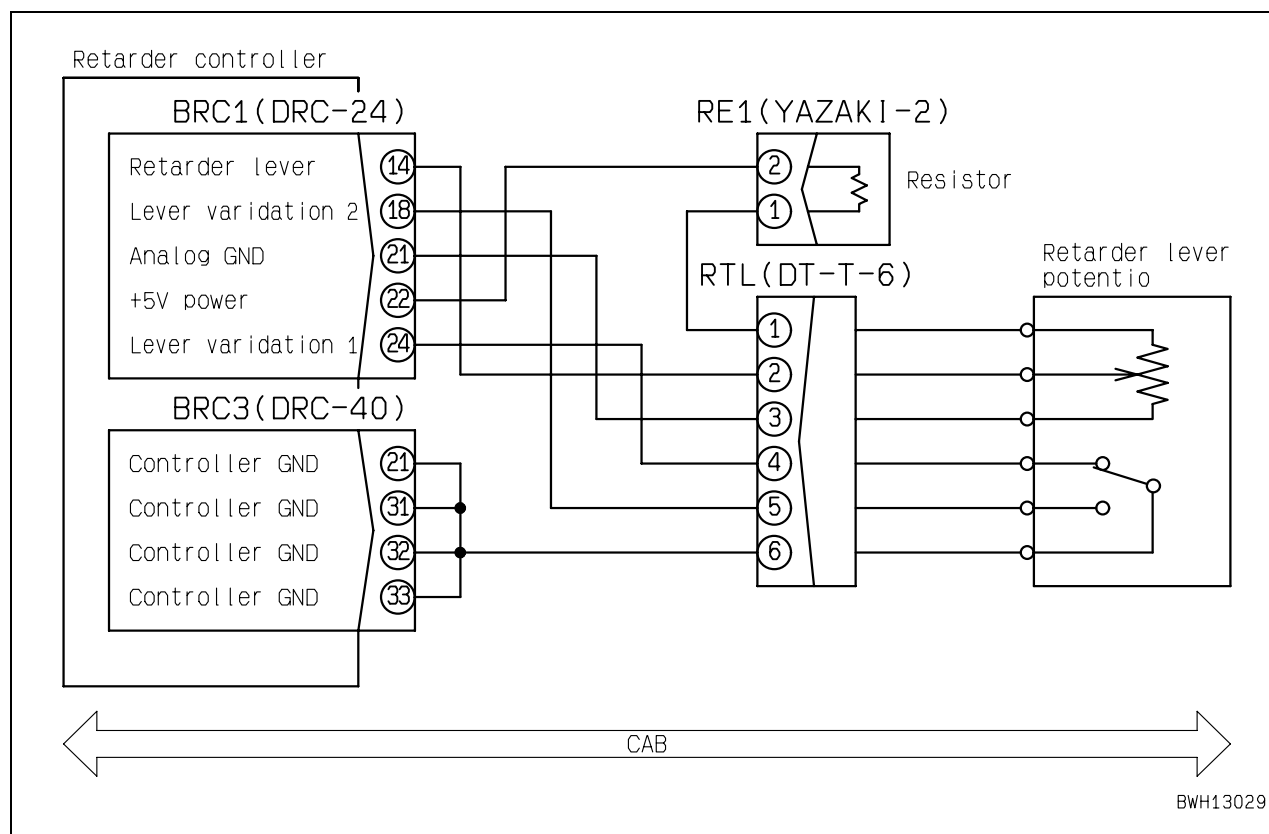
Failure code [DK51L5] Trouble in retarder lever potentiometer and RVS

Action code	Failure code	Trouble	Trouble in retarder lever potentiometer and RVS (Retarder controller system)
E03	DK51L5		
Contents of trouble	The signal voltage of the potentiometer of the retarder lever circuit is below 0.3 V or above 4.7 V. Or, the potentiometer signal does not agree with the switch signal.		
Action of controller	The controller acts as follows, depending on the condition of the failure. - Controls with the potentiometer signal. - Limits the output for the solenoid to 70%. - Turns the output for the solenoid OFF.		
Problem that appears on machine	The following appear, depending on the action of the controller. - This failure does not have a serious effect on the machine. - The retarder cannot control finely. - The retarder does not operate (The foot brake operates, however).		
Related information	This failure can be checked in the monitoring function (Code: 33900 (V)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC1, BRC3, RE1, and RTL. 3) Connect T-adaptor.		
			Wiring harness between BRC1 (female) (22) – RE1 (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between RE1 (female) (1) – RTL (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between BRC1 (female) (21) – RTL (female) (3)	Resistance	Max. 1 Ω
			Wiring harness between BRC1 (female) (14) – RTL (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between BRC1 (female) (24) – RTL (female) (4)	Resistance	Max. 1 Ω
			Wiring harness between BRC1 (female) (18) – RTL (female) (5)	Resistance	Max. 1 Ω
			Wiring harness between RTL (female) (6) – BRC3 (female) (21), (31), (32), (33)	Resistance	Max. 1 Ω
	2	Grounding fault in wiring harness (Contact with ground circuit)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC1, RE1, and RTL. 3) Connect T-adaptor to BRC1 (female).		
			Between ground and wiring harness between BRC1 (female) (22) – RE1 (female) (2)	Resistance	Min. 1 M Ω
			Between ground and wiring harness between RE1 (female) (1) – RTL (female) (1)	Resistance	Min. 1 M Ω
			Between ground and wiring harness between BRC1 (female) (14) – RTL (female) (2)	Resistance	Min. 1 M Ω

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	3	Defective hot short in wiring harness (a contact with 24 V circuit)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC1 and RTL. 3) Connect T-adapter to BRC1 (female). 4) Turn the starting switch ON.			
			Between ground and wiring harness between BR1 (female) (22) – RE1 (female) (2)	Voltage		Max. 1 V
			Between ground and wiring harness between RE1 (female) (1) – RTL (female) (1)	Voltage		Max. 1 V
			Between ground and wiring harness between BRC1 (female) (14) – RTL (female) (2)	Voltage		Max. 1 V
	4	Defective resistor (RE1)	1) Turn the starting switch OFF. 2) Disconnect connector RE1. 3) Connect T-adapter.			
			Between RE1 (male) (1) – (2)	Resistance		250 ± 5 Ω
	5	Defective retarder lever	1) Turn the starting switch OFF. 2) Disconnect connector RTL 3) Insert T-adapter. 4) Turn the starting switch ON. 5) Check the potentiometer.			
			Between RTL (1) – (3)	Voltage		4.1 – 4.8 V
			Between RTL (2) – (3)	Voltage		0.3 – 4.7 V
			1) Turn the starting switch OFF. 2) Disconnect connector RTL 3) Connect T-adapter. 4) Check the switch.			
			Between RTL (male) (4) – (6)	Lever at OFF position	Resistance	Max. 1 Ω
				Lever at ON position	Resistance	Min. 1 MΩ
			Between RTL (male) (5) – (6)	Lever at OFF position	Resistance	Min. 1 MΩ
				Lever at ON position	Resistance	Max. 1 Ω
	6	Defective retarder controller	1) Turn the starting switch OFF. 2) Disconnect connectors BRC1, and BRC3. 3) Insert T-adapter. 4) Turn the starting switch ON.			
			Between BRC1 (22) – BRC3, (21), (31), (32), (33)	Voltage		4.1 – 4.8 V
			Between BRC1 (14) – BRC3, (21), (31), (32), (33)	Voltage		0.3 – 4.7 V
			1) Turn the starting switch OFF. 2) Disconnect connector RTL. 3) Connect T-adapter. 4) Check the switch.			
			Between BRC1 (female) (24) – ground	Lever at OFF position	Resistance	Max. 1 Ω
				Lever at ON position	Resistance	Min. 1 MΩ
			Between BRC1 (female) (18) – ground	Lever at OFF position	Resistance	Min. 1 MΩ
				Lever at ON position	Resistance	Max. 1 Ω

Circuit diagram related



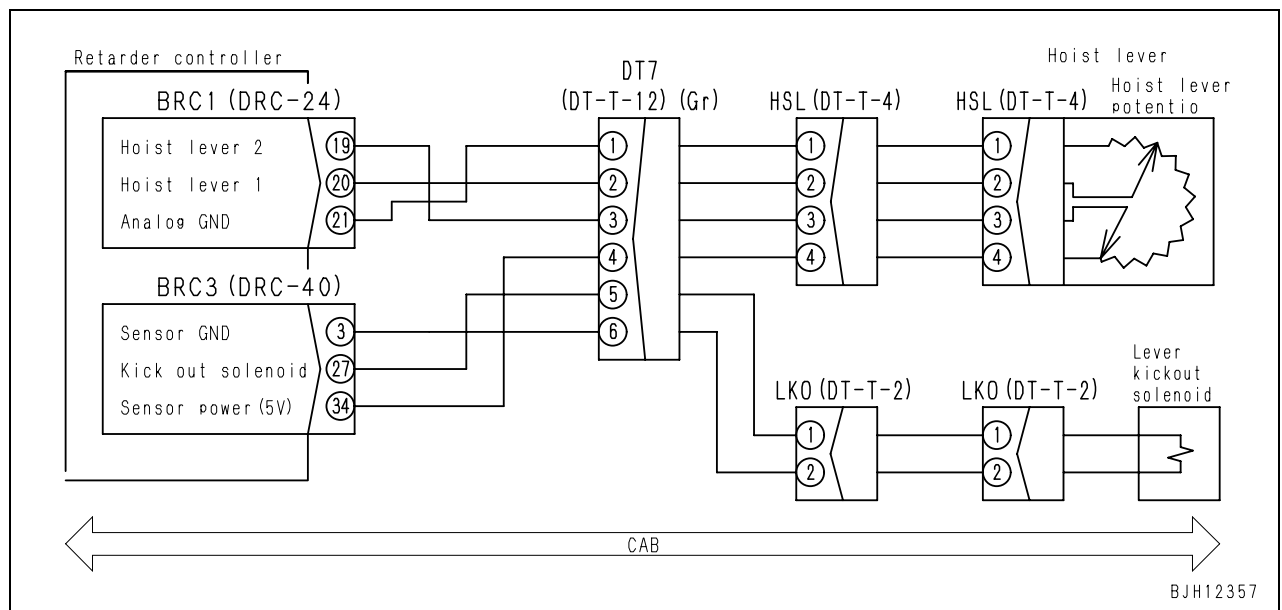
Failure code [DK52KX] Failure in hoist lever potentiometer 1: Out of input signal range

Action code	Failure code	Trouble	Failure in hoist lever potentiometer 1: Out of input signal range (Out of input signal range of lever potentiometer 1 or 2) (Retarder controller system)
E03	DK52KX		
Contents of trouble	The signal voltage of the signal circuit of hoist lever potentiometer 1 or 2 is below 0.3 V or above 4.7 V.		
Action of controller	Operates body by using normal one of 2 potentiometers.		
Problem that appears on machine	Machine is not affected in particular.		
Related information	This failure can be checked in the monitoring function (Code: 34304 (V)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC1, BRC3, and HSL. 3) Connect T-adapter.		
			Wiring harness between BRC3 (female) (34) – HSL (female) (4)	Resistance	Max. 1 Ω
			Wiring harness between BRC1 (female) (20) – HSL (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between BRC1 (female) (19) – HSL (female) (3)	Resistance	Max. 1 Ω
			Wiring harness between BRC1 (female) (21) – HSL (female) (1)	Resistance	Max. 1 Ω
	2	Grounding fault in wiring harness (Contact with ground circuit)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC1, BRC3, and HSL. 3) Connect T-adapter.		
			Between ground and wiring harness between BRC3 (female) (34) – HSL (female) (4)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between BRC1 (female) (20) – HSL (female) (2)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between BRC1 (female) (19) – HSL (female) (3)	Resistance	Min. 1 MΩ
	3	Defective hot short in wiring harness (a contact with 24 V circuit)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC1, BRC3, and HSL. 3) Connect T-adapter. 4) Turn the starting switch ON.		
			Between ground and wiring harness between BRC3 (female) (34) – HSL (female) (4)	Voltage	Max. 1 V
			Between ground and wiring harness between BRC1 (female) (20) – HSL (female) (2)	Voltage	Max. 1 V
			Between ground and wiring harness between BRC1 (female) (19) – HSL (female) (3)	Voltage	Max. 1 V

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	4	Defective hoist lever	1) Turn the starting switch OFF. 2) Disconnect connector HSL. 3) Insert T-adapter. 4) Turn the starting switch ON.		
			Between HSL (4) – (1)	Voltage	4.6 – 5.4 V
			Between HSL (2) – (1)	Voltage	0.3 – 4.7 V
			Between HSL (3) – (1)	Voltage	0.3 – 4.7 V
	5	Defective retarder controller	1) Turn the starting switch OFF. 2) Disconnect connectors BRC1, BRC3, and HSL. 3) Insert T-adapter. 4) Turn the starting switch ON.		
			Between BRC3 (34) – BRC1 (21)	Voltage	4.1 – 4.8 V
			Between BRC1 (20) – (21)	Voltage	0.3 – 4.7 V
			Between BRC1 (19) – (21)	Voltage	0.3 – 4.7 V

Circuit diagram related

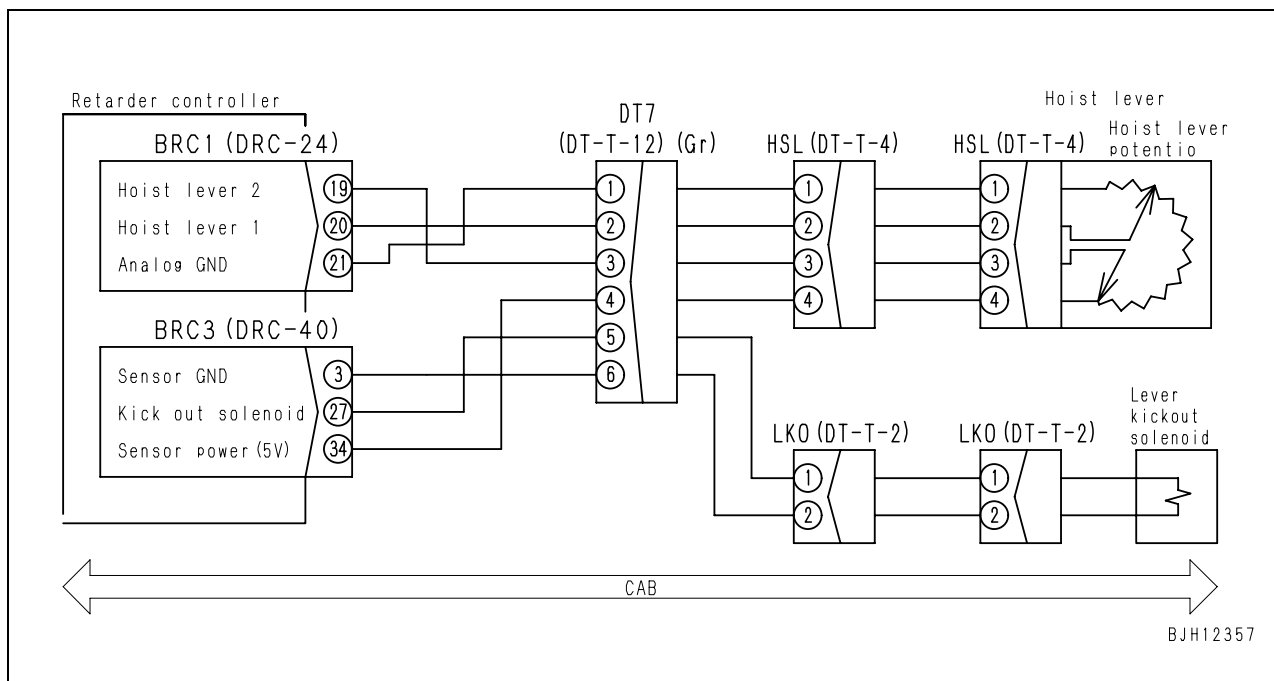


Failure code [DK53L8] Failure in hoist lever potentiometer 2: Disagreement of analog signal

Action code	Failure code	Trouble	Failure in hoist lever potentiometer 2: Disagreement of analog signal (Out of total range of input signal voltage of lever potentiometer 1 or 2) (Retarder controller system)
E03	DK53L8		
Contents of trouble	The total voltage of the signal circuit of hoist lever potentiometer 1 or 2 is below 4.4 V or above 5.6 V.		
Action of controller	The controller recognizes the hoist lever position as "NEUTRAL".		
Problem that appears on machine	Body does not operate.		
Related information	- This failure can be checked in the monitoring function (Code: 34305 (V)). - If the failure code "DK52KX" is displayed, perform troubleshooting for it.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective hoist leverx	1) Turn the starting switch OFF. 2) Disconnect connector HSL. 3) Insert T-adapter. 4) Turn the starting switch ON.		
			Between HSL (4) – (1)	Voltage	4.6 – 5.4 V
			Between HSL (2) – (1)	Voltage	0.3 – 4.7 V
			Between HSL (3) – (1)	Voltage	0.3 – 4.7 V
	2	Defective retarder controller	If the failure is not repaired by performing the troubleshooting in 1 above, the retarder controller is defective.		

Circuit diagram related



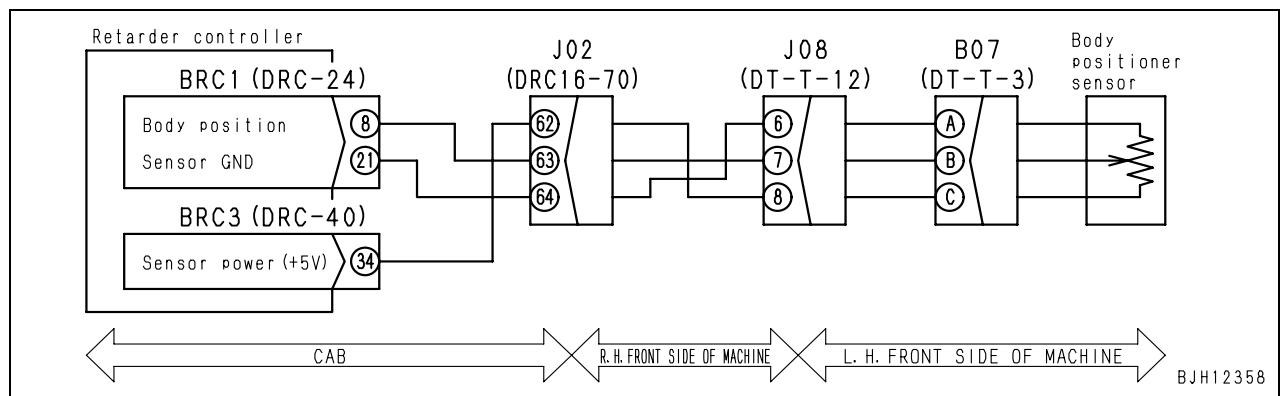
Failure code [DK54KX] Body positioner sensor: Out of input signal range

Action code	Failure code	Trouble	Body positioner sensor: Out of input signal range (Retarder controller system)
E03	DK54KX		
Contents of trouble	The signal circuit voltage of the body positioner is below 0.3 V or above 4.7 V.		
Action of controller	- The controller controls dumping according to the hoist lever signal. - The controller controls, assuming that the body is not seated.		
Problem that appears on machine	- Body seating shocks become large. - The hoist lever positioner does not function. - The maximum gear speed is limited. - The machine cannot travel in reverse if the hoist lever is not at "FLOAT".		
Related information	Input state from body positioner sensor can be checked with monitoring function (Code: 34602 (V)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC1, BRC3, and B07. 3) Connect T-adapter.		
			Wiring harness between BRC1 (female) (8) – B07 (female) (B)	Resistance	Max. 1 Ω
			Wiring harness between BRC3 (female) (34) – B07 (female) (C)	Resistance	Max. 1 Ω
			Wiring harness between BRC1 (female) (21) – B07 (female) (A)	Resistance	Max. 1 Ω
	2	Grounding fault in wiring harness (Contact with ground circuit)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC1, BRC3, and B07. 3) Connect T-adapter.		
			Wiring harness between BRC1 (female) (8) – B07 (female) (B)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between BRC3 (female) (34) – B07 (female) (C)	Resistance	Min. 1 MΩ
	3	Defective hot short in wiring harness (a contact with 24 V circuit)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC1, BRC3B, and B07. 3) Connect T-adapter. 4) Turn the starting switch ON.		
			Between ground and wiring harness between BRC1 (female) (8) – B07 (female) (B)	Voltage	Max. 1 V
			Between ground and wiring harness between BRC3 (female) (34) – B07 (female) (C)	Voltage	Max. 1 V
	4	Defective body positioner	1) Turn the starting switch OFF. 2) Disconnect connector B07. 3) Insert T-adapter. 4) Turn the starting switch ON.		
			Between B07 (C) – (A)	Voltage	4.6 – 5.4 V
			Between B07 (B) – (A)	Voltage	0.3 – 4.7 V

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	5	Defective retarder controller	1) Turn the starting switch OFF. 2) Disconnect connectors BRC1, BRC3, and B07. 3) Insert T-adapter. 4) Turn the starting switch ON.		
			Between BRC1 (8) – (21)	Voltage	4.1 – 4.8 V
			Between BRC3 (34) – BRC1 (21)	Voltage	0.3 – 4.7 V

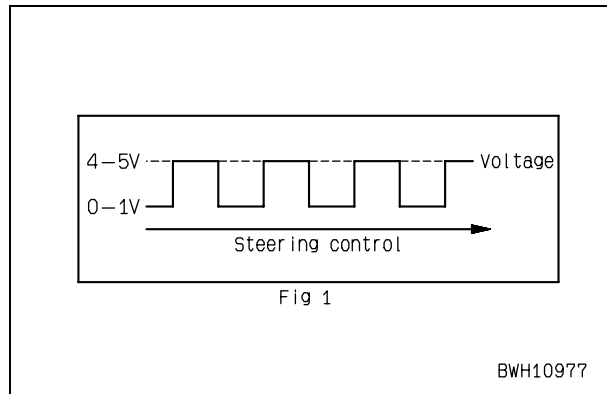
Circuit diagram related



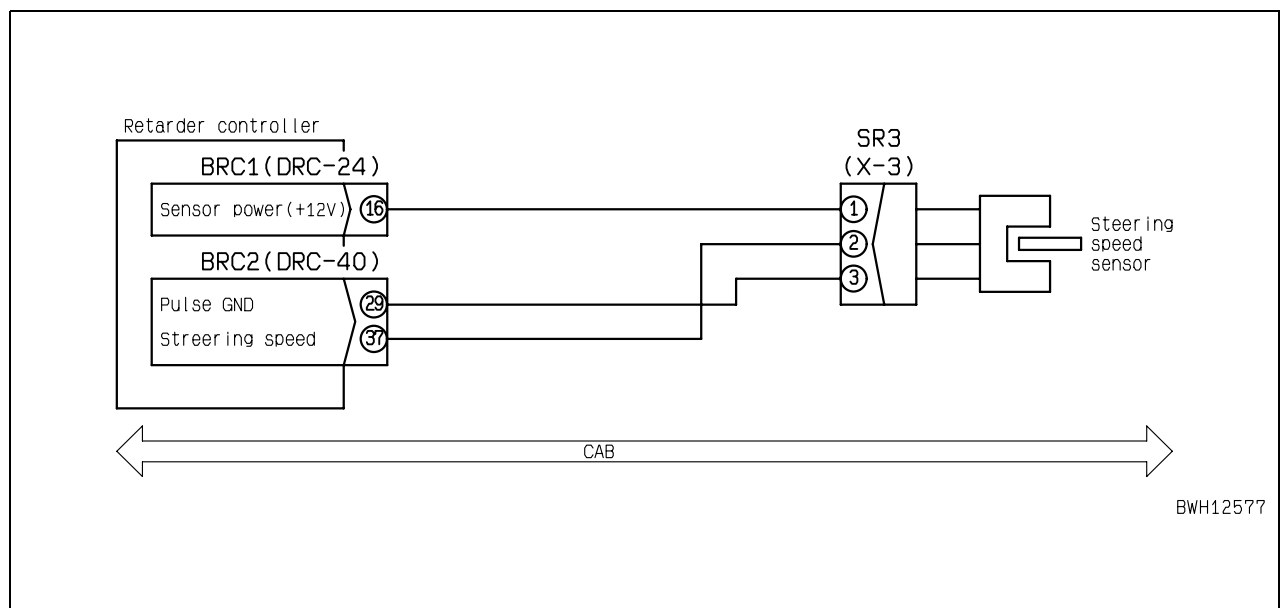
Failure code [DKD0L6] Failure in steering angle speed sensor

Action code	Failure code	Trouble	Failure in steering angle speed sensor (Retarder controller system)
E01	DKD0L6		
Contents of trouble	Disconnection, grounding fault, or short circuit occurs in the signal circuit of the steering speed sensor and no signals are input.		
Action of controller	Fix the auto-suspension in the M mode.		
Problem that appears on machine	This failure does not have a serious effect on the machine.		
Related information	This failure can be checked in the monitoring function (Code: 35403 (rad/s)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC1, BRC2, and SR3. 3) Connect T-adapter.		
			Wiring harness between BRC2 (female) (29) – SR3 (female) (3)	Resistance	Max. 1 Ω
			Wiring harness between BRC2 (female) (37) – SR3 (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between BRC1 (female) (16) – SR3 (female) (1)	Resistance	Max. 1 Ω
	2	Grounding fault in wiring harness (Contact with ground circuit)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC1, BRC2, and SR3. 3) Connect T-adapter.		
			Between ground and wiring harness between BRC2 (female) (37) – SR3 (female) (2)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between BRC1 (female) (16) – SR3 (female) (1)	Resistance	Min. 1 MΩ
	3	Steering speed sensor defective	1) Turn the starting switch OFF. 2) Disconnect connector SR3. 3) Insert T-adapter. 4) Turn the starting switch ON. 5) Turn the steering wheel slowly.		
			Between SR3 (1) – (3)	Voltage	10 – 13 V
			1) Turn the starting switch OFF. 2) Disconnect connector SR3. 3) Insert T-adapter. 4) Turn the starting switch ON.		
			Between SR3 (2) – (3)	Voltage	See Fig-1.
	4	Retarder controller defective	1) Turn the starting switch OFF. 2) Disconnect connectors BRC1, BRC2. 3) Insert T-adapter. 4) Turn the starting switch ON.		
			Between BRC1 (16) – BRC2 (29)	Voltage	10 – 13 V
			1) Turn the starting switch OFF. 2) Disconnect connector BRC2. 3) Insert T-adapter. 4) Turn the starting switch ON. 5) Turn the steering wheel slowly.		
			Between BRC2 (37) – (29)	Voltage	See Fig-1.



Circuit diagram related

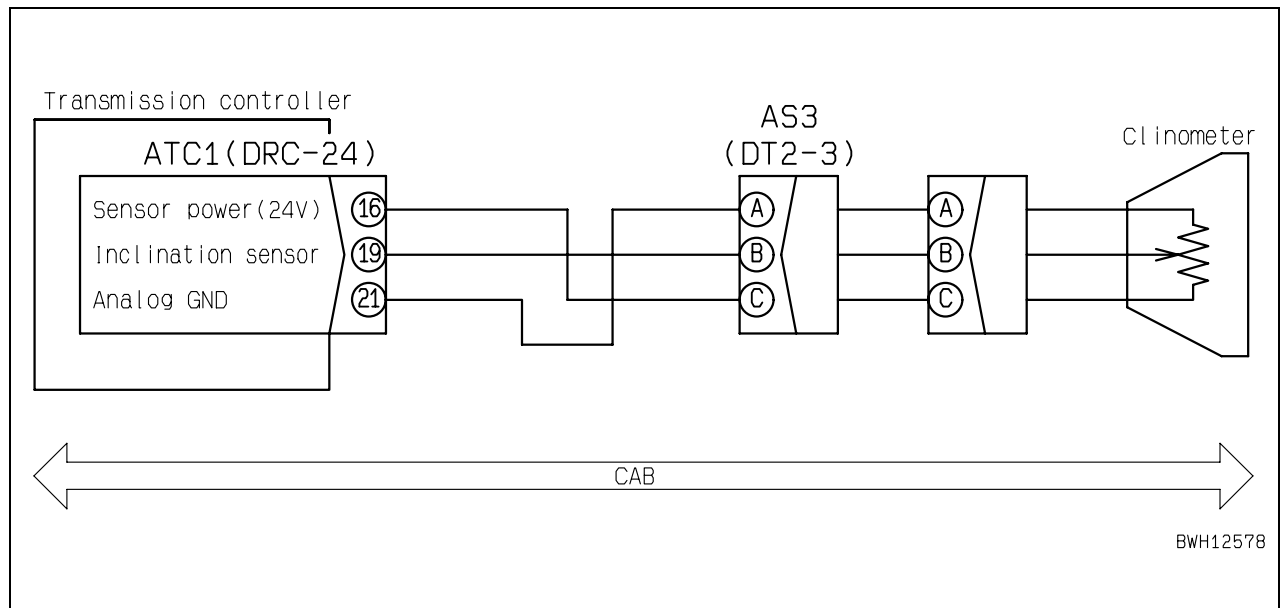


Failure code [DKH0KX] Pitch angle sensor: Out of input signal range

Action code	Failure code	Trouble	Pitch angle sensor: Out of input signal range (Transmission controller system)
E01	DKH0KX		
Contents of trouble	• Voltage in signal circuit of Inclination sensor has become below 0.5 V or above 4.5 V.		
Action of controller	• None in particular.		
Problem that appears on machine	• Machine pitch angle abnormality [989D00] cannot be detected.		
Related information	• Signal from Inclination sensor can be checked with monitoring function (Code: 32900 (°) and 32903 (V)). • Cannot detect tipping over.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective pitch angle sensor	1) Turn starting switch OFF. 2) Connect T-adapter to connector AS3 (male). 3) Turn starting switch ON.			
			Between AS3 (C) – (A)	Voltage	20 – 30 V	
			Between AS3 (B) – (A)	Voltage	0.5 – 4.5 V	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors ATC1 (female) and AS3 (female).			
			Wiring harness between ATC1 (female) (19) – AS3 (female) (B)	Resistance	Max. 1 Ω	
			Wiring harness between ATC1 (female) (16) – AS3 (female) (C)	Resistance	Max. 1 Ω	
			Wiring harness between ATC1 (female) (21) – AS3 (female) (A)	Resistance	Max. 1 Ω	
	3	Defective harness grounding (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors ATC1 and AS3. 3) Connect T-adapter to ATC1 (female).			
			Between ground and wiring harness between ATC1 (female) (19) – AS3 (female) (B)	Resistance	Min. 1 MΩ	
			Between ground and wiring harness between ATC1 (female) (16) – AS3 (female) (C)	Resistance	Min. 1 MΩ	
	4	Defective hot short in wiring harness (Contact with 24 V circuit)	1) Turn starting switch OFF. 2) Disconnect connectors ATC1 and AS3. 3) Connect T-adapter to ATC1 (female). 4) Turn starting switch ON.			
			Between ground and wiring harness between ATC1 (female) (19) – AS3 (female) (B)	Voltage	Max. 4.6 V	
	5	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter in connector ATC1. 3) Turn starting switch ON.			
			Between ATC1 (female) (16) – (21)	Voltage	20 – 30 V	
			Between ATC1 (female) (19) – (21)	Voltage	0.5 – 4.5 V	

Circuit diagram related



Failure code [DKH1KX] Pitch angle sensor: Abnormality

Action code	Failure code	Trouble	Pitch angle sensor: Abnormality (VHMS & PML controller system)
E01	DKH1KX		
Contents of trouble	• Abnormality (Disconnection or short circuit) was detected in signal from pitch angle sensor.		
Action of controller	• None in particular. • Cannot detect tipping over.		
Problem that appears on machine	• Load weight is not displayed or recorded correctly.		
Related information	• Input signal from pitch angle sensor can be checked with monitoring function (Code: 32900 (°) , 32902 (V)).		

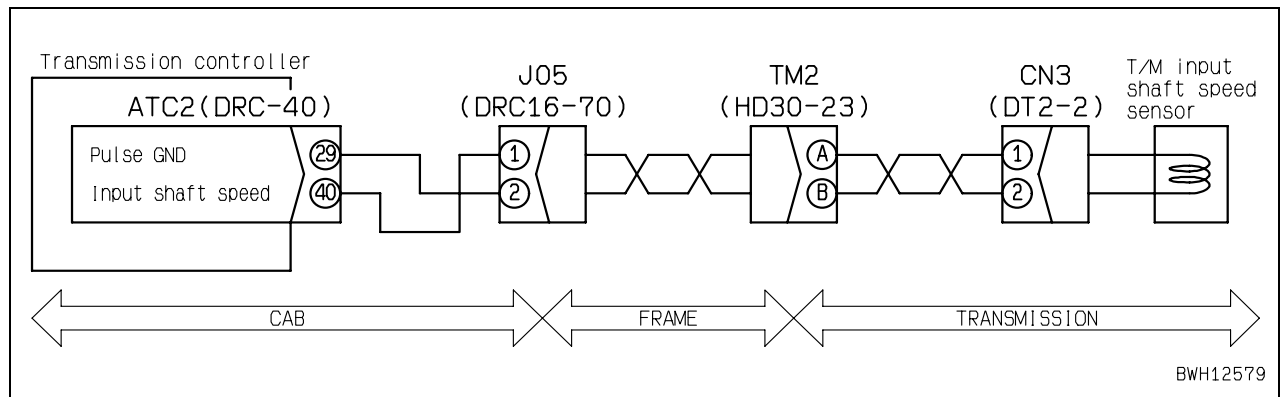
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DKH0KX].	

Failure code [DLF1KA] Transmission input shaft speed sensor: Disconnection

Action code	Failure code	Trouble	Transmission input shaft speed sensor: Disconnection (Transmission controller system)
E03	DLF1KA		
Contents of trouble	The signal circuit of the transmission input shaft speed sensor is disconnected and signals are not input.		
Action of controller	- The controller keeps the current gear speed and turns the lockup operation OFF. - If the shift lever is set in the "N" position, the controller keeps the gear in neutral.		
Problem that appears on machine	- The lockup system is reset and the gear cannot be shifted. - If the shift lever is set in the "N" position, the machine cannot start until it is stopped.		
Related information	This failure can be checked in the monitoring function (Code: 31200 (rpm)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Wrong adjustment of transmission input shaft speed sensor	Press the sensor lightly against the revolution pickup gear, and then return it by 1/2 – 1 turn. ★ For details, see Testing and adjusting, "Adjustment of transmission speed sensor".		
	2	Defective transmission input shaft speed sensor	1) Turn the starting switch OFF. 2) Disconnect connector CN3. 3) Connect T-adapter.		
			Between CN3 (male) (1) – (2)	Resistance	500 – 1,000 Ω
			Between CN3 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC2 and CN3. 3) Connect T-adapter.		
			Wiring harness between ATC2 (female) (40) – CN3 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC2 (female) (29) – CN3 (female) (2)	Resistance	Max. 1 Ω
	4	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connector ATC2. 3) Connect T-adapter.		
			Between ATC2 (female) (40) – (29)	Resistance	500 – 1,000 Ω

Circuit diagram related

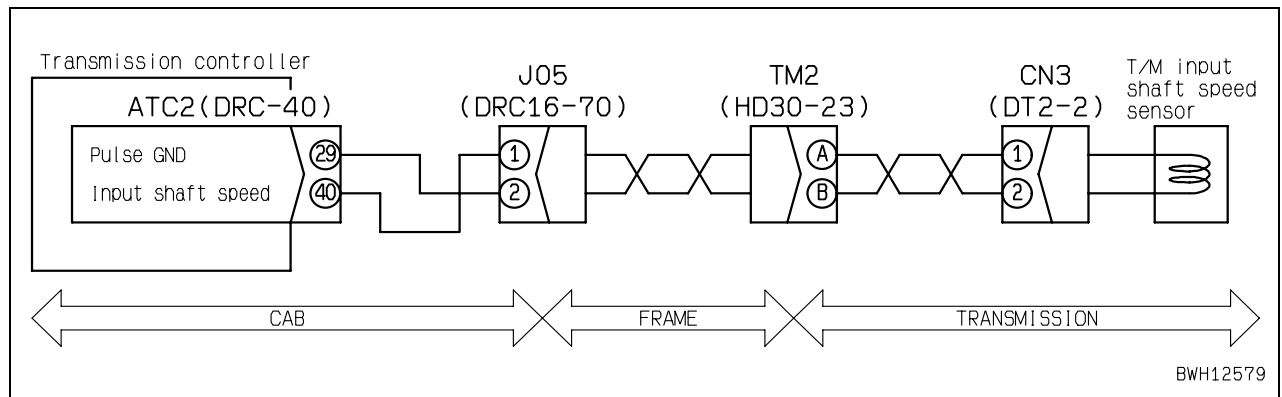


Failure code [DLF1LC] Transmission input shaft speed sensor: Disagreement of revolution speed signal

Action code	Failure code	Trouble	Transmission input shaft speed sensor: Disagreement of revolution speed signal (Transmission controller system)
E03	DLF1LC		
Contents of trouble	The speed calculated from the engine speed sensor signal, transmission intermediate shaft speed sensor signal, and transmission output shaft speed sensor signal is different from the signal speed of the transmission input shaft speed sensor.		
Action of controller	- The controller keeps the current gear speed and turns the lockup operation OFF. - If the shift lever is set in the "N" position, the controller keeps the gear in Neutral.		
Problem that appears on machine	- The lockup system is reset and the gear cannot be shifted. - If the shift lever is set in the "N" position, the machine cannot start until it is stopped.		
Related information	This failure can be checked in the monitoring function (Code: 31200 (rpm)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective transmission input shaft speed sensor	1) Turn the starting switch OFF. 2) Disconnect connector CN3. 3) Connect T-adapter.		
			Between CN3 (male) (1) – (2)	Resistance	500 – 1,000 Ω
			Between CN3 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Grounding fault in wiring harness (Contact with ground circuit)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC2 and CN3. 3) Connect T-adapter.		
			Between ground and wiring harness between ATC2 (female) (40) – CN3 (female) (1)	Resistance	Min. 1 MΩ
	3	Defective hot short in wiring harness (a contact with 24 V circuit)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC2 and CN3. 3) Connect T-adapter. 4) Turn the starting switch ON.		
			Between ground and wiring harness between ATC2 (female) (40) – CN3 (female) (1)	Voltage	Max. 1 V
	4	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connector ATC2. 3) Connect T-adapter.		
			Between ATC2 (female) (40) – (29)	Resistance	500 – 1,000 Ω

Circuit diagram related

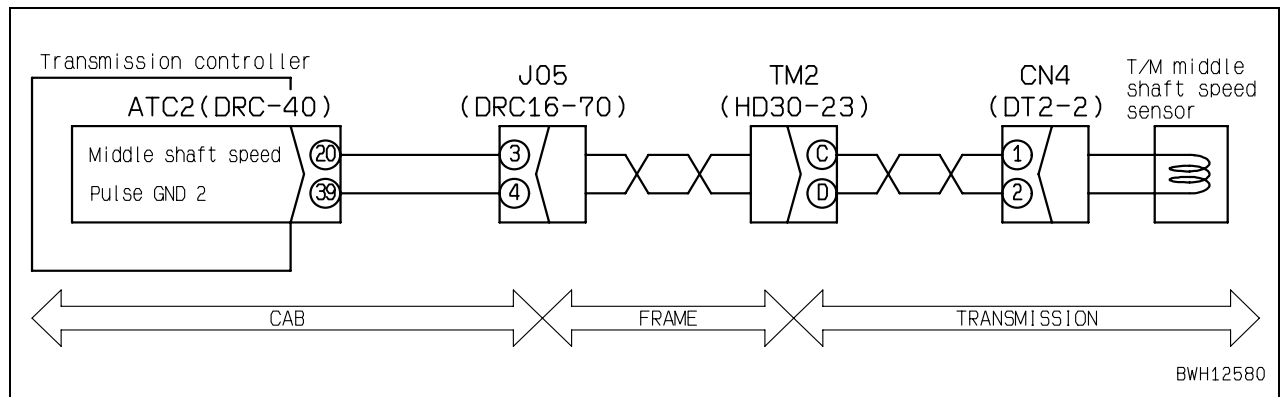


Failure code [DLF2KA] Transmission intermediate shaft speed sensor: Disconnection

Action code	Failure code	Trouble	Transmission intermediate shaft speed sensor: Disconnection (Transmission controller system)
E03	DLF2KA		
Contents of trouble	The signal circuit of the transmission intermediate shaft speed sensor is disconnected and signals are not input.		
Action of controller	- The controller keeps the current gear speed. - If the shift lever is set in the "N" position, the controller keeps the gear in neutral.		
Problem that appears on machine	- The lockup system is reset and the gear cannot be shifted. - If the shift lever is set in the "N" position, the machine cannot start until it is stopped.		
Related information	This failure can be checked in the monitoring function (Code: 31300 (rpm)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Wrong adjustment of transmission intermediate shaft speed sensor	Press the sensor lightly against the revolution pickup gear, and then return it by 1/2 – 1 turn. ★ For details, see Testing and adjusting, "Adjustment of transmission speed sensor".		
	2	Defective transmission intermediate shaft speed sensor	1) Turn the starting switch OFF. 2) Disconnect connector CN4. 3) Connect T-adapter.		
			Between CN4 (male) (1) – (2)	Resistance	500 – 1,000 Ω
			Between CN4 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC2, CN4. 3) Connect T-adapter.		
			Wiring harness between ATC2 (female) (20) – CN4 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC2 (female) (39) – CN4 (female) (2)	Resistance	Max. 1 Ω
	4	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connector ATC2. 3) Connect T-adapter.		
			Between ATC2 (female) (20) – (39)	Resistance	500 – 1,000 Ω

Circuit diagram related

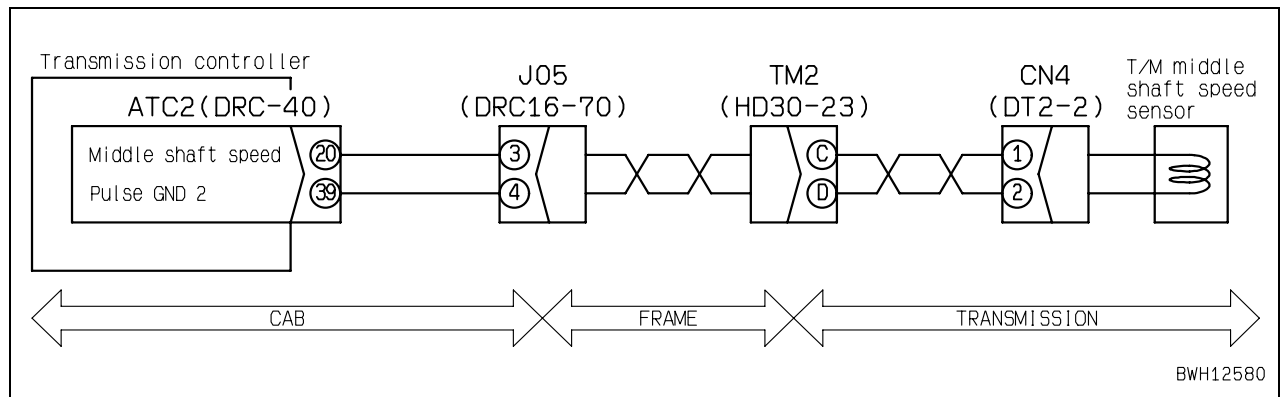


Failure code [DLF2LC] Transmission intermediate shaft speed sensor: Disagreement of revolution speed signal

Action code	Failure code	Trouble	Transmission intermediate shaft speed sensor: Disagreement of revolution speed signal (Transmission controller system)
E03	DLF2LC		
Contents of trouble	The speed calculated from the engine speed sensor signal, transmission input shaft speed sensor signal, and transmission output shaft speed sensor signal is different from the signal speed of the transmission intermediate shaft speed sensor.		
Action of controller	- The controller keeps the current gear speed. - If the shift lever is set in the "N" position, the controller keeps the gear in Neutral.		
Problem that appears on machine	- The gear cannot be shifted. - If the shift lever is set in the "N" position, the machine cannot start until it is stopped.		
Related information	This failure can be checked in the monitoring function (Code: 31300 (rpm)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Transmission intermediate shaft speed sensor defective	1) Turn the starting switch OFF. 2) Disconnect connector CN4. 3) Connect T-adaptor.		
			Between CN4 (male) (1) – (2)	Resistance	500 – 1,000 Ω
			Between CN4 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Grounding fault in wiring harness (Contact with ground circuit)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC2 – CN4. 3) Connect T-adaptor.		
			Between ground and wiring harness between ATC2 (female) (20) – CN4 (female) (1)	Resistance	Min. 1 MΩ
	3	Defective hot short in wiring harness (a contact with 24 V circuit)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC2 and CN4. 3) Connect T-adaptor. 4) Turn the starting switch ON.		
			Between ground and wiring harness between ATC2 (female) (20) – CN4 (female) (1)	Voltage	Max. 1 V
	4	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connector ATC2. 3) Connect T-adaptor.		
			Between ATC2 (female) (20) – (39)	Resistance	500 – 1,000 Ω

Circuit diagram related



HD785-7 Dump truck

Form No. SEN01944-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7

7001 and up

40 Troubleshooting

Troubleshooting by failure code, Part 8

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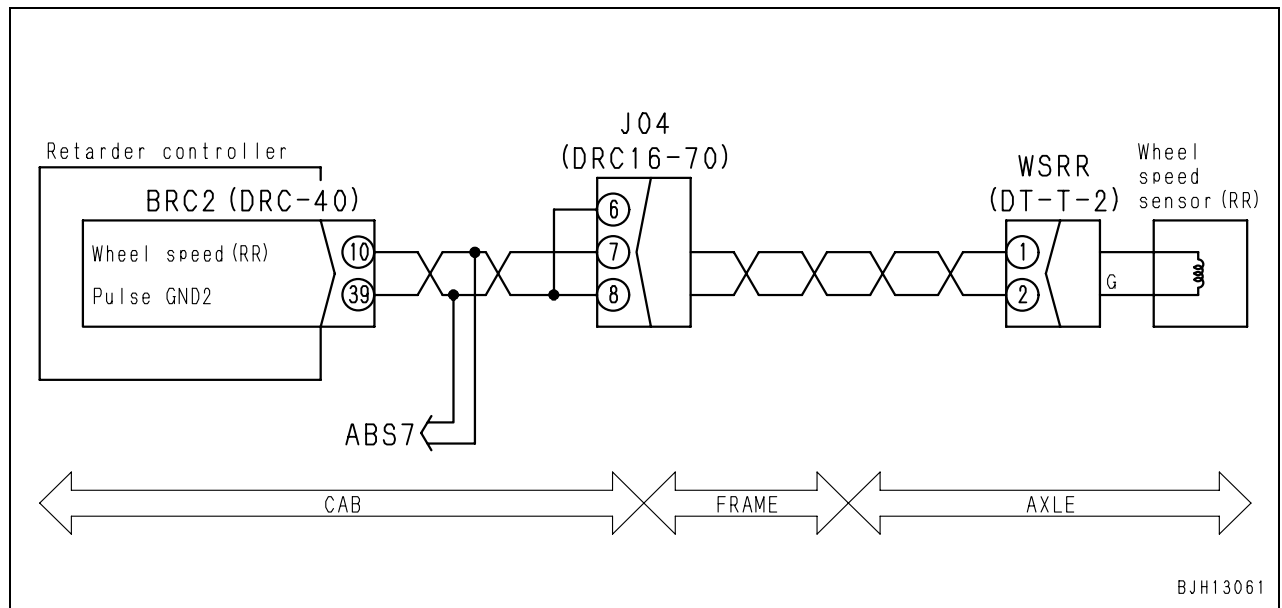
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Failure code [DLF8KA] Wheel speed sensor: Disconnection (Right rear)

Action code	Failure code	Trouble	Wheel speed sensor: Disconnection (Right rear) (Retarder controller system)
E01	DLF8KA		
Contents of trouble	• Wheel speed signal (pulse) is not input to retarder controller.		
Action of controller	• Does not control ASR.		
Problem that appears on machine	• ASR is not controlled normally.		
Related information	- ABS controller inspects same trouble by failure code [DLF8MA]. ★ If ABS is installed and [DLF8MA] is not displayed, sensor and wiring harness out of cab are judged normal. ★ If ABS is installed and [DLF8MA] is displayed, perform following operations. 1) Turn starting switch OFF. 2) Disconnect ABS7 connector. 3) Turn starting switch ON. Check that failure code [DLF8KA] is displayed again (factors of ABS controller are eliminated) and then carry out following troubleshooting. - Input state from wheel speed sensor (right rear) can be checked with monitoring function (Code: 39709 (rpm)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective wheel speed sensor	★ Turn starting switch OFF and disconnect WSRR, then carry out troubleshooting without turning starting switch ON.		
			WSRR (Male: Sensor side)		Resistance
			Between (1) – (2)		1,750 Ω ± 10 %
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Turn starting switch OFF and disconnect WSRR, then carry out troubleshooting without turning starting switch ON.		
			Between WSRR (female) (1) – BRC2 (female) (10)	Resistance	Max. 1 Ω
			Between WSRR (female) (2) – BRC2 (female) (39)	Resistance	Max. 1 Ω
	3	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect WSRR, then carry out troubleshooting without turning starting switch ON.		
			Between WSRR (female) (1) – ground	Resistance	Min. 1 MΩ
	4	Defective retarder controller	If causes 1 – 3 are not detected, retarder controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related

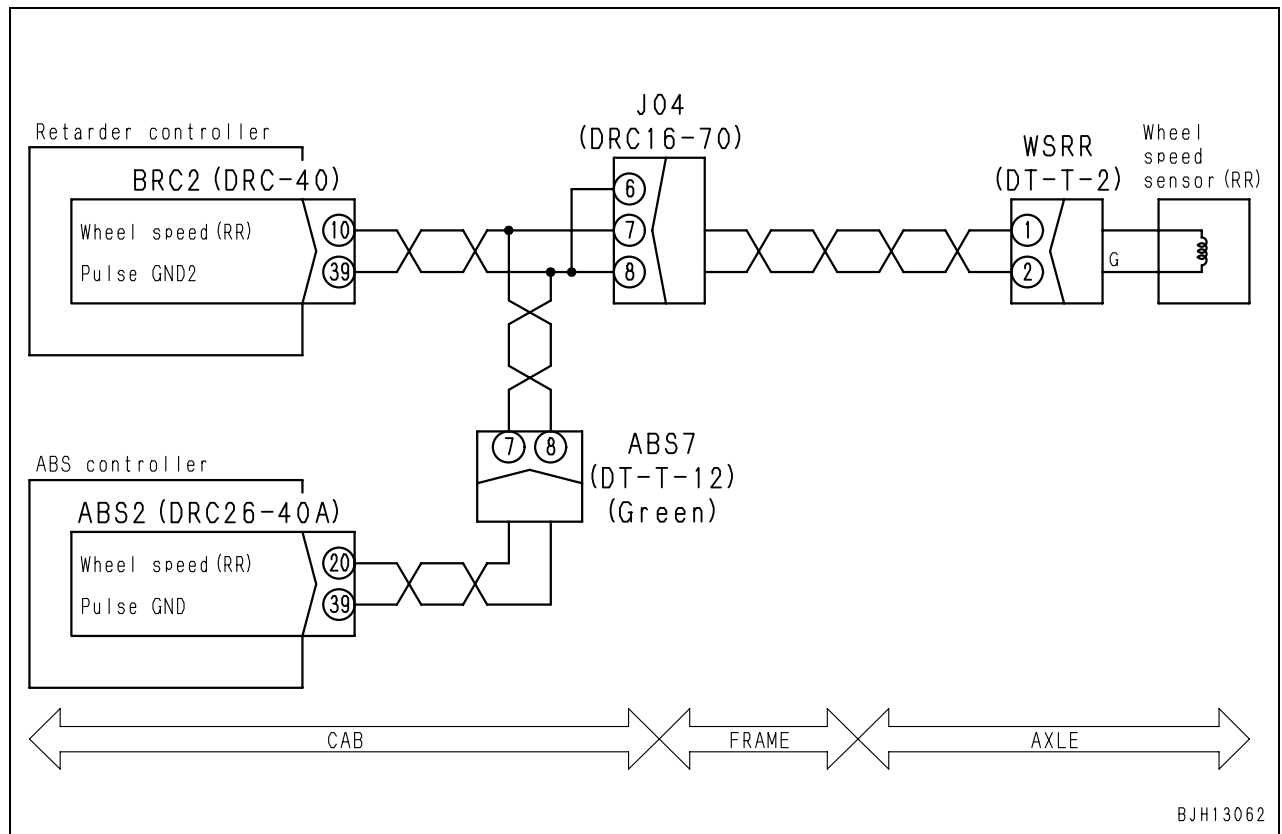


Failure code [DLF8L3] Wheel speed sensor: Disconnection (Right rear)

Action code	Failure code	Trouble	Wheel speed sensor: Disconnection (Right rear) (ABS controller system)
E03	DLF8L3		
Contents of trouble	• Wheel speed signal (pulse) input to ABS controller is abnormal.		
Action of controller	• Does not control ABS.		
Problem that appears on machine	• ABS is not controlled normally.		
Related information	- Retarder controller inspects same trouble by failure code [DLF8LC]. ★ If [DLF8L3] is not displayed, sensor and wiring harness out of cab are judged normal. ★ If [DLF8LC] is displayed, disconnect BRC2 connector and check that [DLF8L3] is displayed again and then carry out following troubleshooting. - Input state from wheel speed sensor (right rear) can be checked with monitoring function (Code: 39709 (rpm)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective wheel speed sensor	★ Turn starting switch OFF and disconnect WSRR, then carry out troubleshooting without turning starting switch ON.		
			WSRR (Male: Sensor side)		Resistance
			Between (1) – (2)		1,750 Ω ± 10 %
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Turn starting switch OFF and disconnect BRC2, WSRR, ABS2 conector, then carry out troubleshooting without turning starting switch ON.		
			Between WSRR (female) (1) – ABS2 (female) (20)	Resistance	Max. 1 Ω
			Between WSRR (female) (2) – ABS2 (female) (39)	Resistance	Max. 1 Ω
	3	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect WSRR, then carry out troubleshooting without turning starting switch ON.		
			Between WSRR (female) (1) – ground	Resistance	Min. 1 MΩ
	4	Defective retarder controller	If causes 1 – 3 are not detected, retarder controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related



Failure code [DLF8LC] Wheel speed sensor: Trouble (Right rear)

Action code	Failure code	Trouble	Wheel speed sensor: Trouble (Right rear) (Retarder controller system)
E01	DLF8LC		
Contents of trouble	• Wheel speed signal (pulse) input to retarder controller is abnormal.		
Action of controller	• Does not control retarder.		
Problem that appears on machine	• ASR is not controlled normally.		
Related information	• ABS controller inspects same trouble by failure code [DLF8L3]. ★ If ABS is installed and [DLF8L3] is not displayed, sensor and wiring harness out of cab are judged normal. ★ If ABS is installed and [DLF8L3] is displayed, turn starting switch OFF and disconnect ABS7 connector. Check that failure code [DLF8LC] is displayed again. • Input state from wheel speed sensor (right rear) can be checked with monitoring function (Code: 39709 (rpm)).		

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DLF8KA] .	

Failure code [DLF8MA] Wheel speed sensor: Disconnection (Right rear)

Action code	Failure code	Trouble	Wheel speed sensor: Disconnection (Right rear) (ABS controller system)
E03	DLF8MA		
Contents of trouble	• Wheel speed signal (pulse) is not input to ABS controller.		
Action of controller	• Does not control ABS.		
Problem that appears on machine	• ABS is not controlled normally.		
Related information	• Retarder controller inspects same trouble by failure code [DLF8KA]. ★ If [DLF8KA] is not displayed, sensor and wiring harness out of cab are judged normal. ★ If [DLF8KA] is displayed, turn starting switch OFF and disconnect retarder controller connector BRC2 connector. Check that failure code [DLF8MA] is displayed again. • Input state from wheel speed sensor (right rear) can be checked with monitoring function (Code: 39709 (rpm)).		

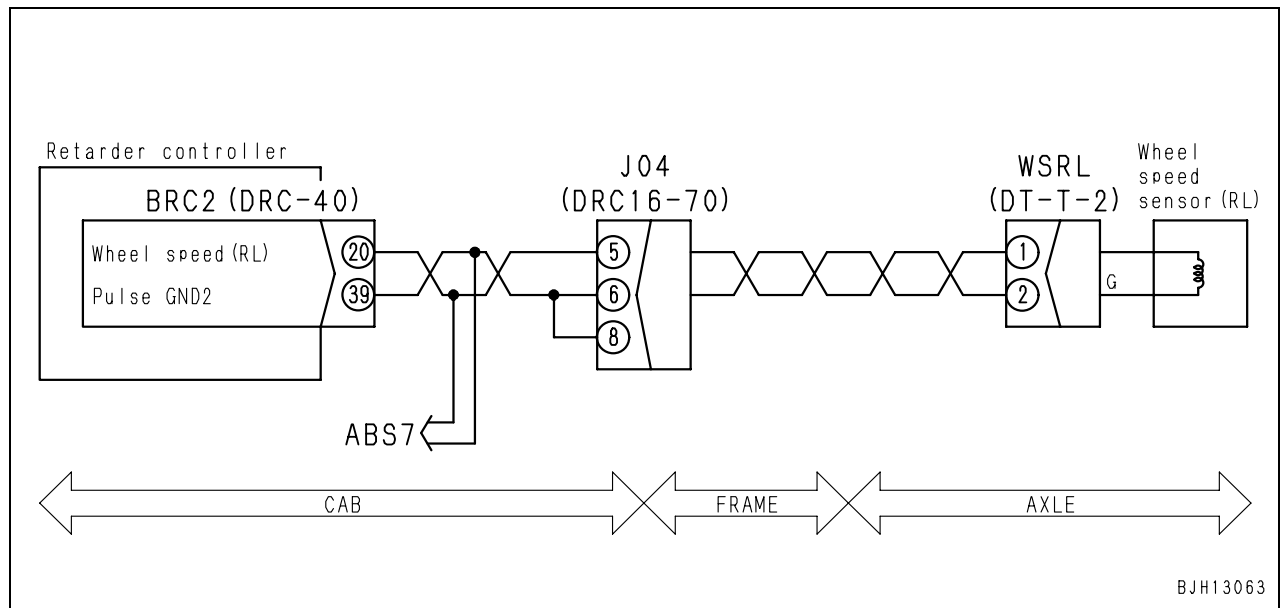
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DLF8L3] .	

Failure code [DLF9KA] Wheel speed sensor: Disconnection (Left rear)

Action code	Failure code	Trouble	Wheel speed sensor: Disconnection (Left rear) (Retarder controller system)
E01	DLF9KA		
Contents of trouble	• Wheel speed signal (pulse) is not input to retarder controller.		
Action of controller	• Does not control ASR.		
Problem that appears on machine	• ASR is not controlled normally. • (ABS is not controlled normally.)		
Related information	• ABS controller inspects same trouble by failure code [DLF9MA]. ★ If ABS is installed and [DLF9MA] is not displayed, sensor and wiring harness out of cab are judged normal. ★ If ABS is installed and [DLF9MA] is displayed, perform following operations. 1) Turn starting switch OFF. 2) Disconnect ABS7 connector. 3) Turn starting switch ON. Check that failure code [DLF9KA] is displayed again (factors of ABS controller are eliminated) and then carry out following troubleshooting. • Input state from wheel speed sensor (left rear) can be checked with monitoring function (Code: 39708 (rpm)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective wheel speed sensor	★ Turn starting switch OFF and disconnect WSRL, then carry out troubleshooting without turning starting switch ON.		
			WSRL (Male: Sensor side)		Resistance
			Between (1) – (2)		1,750 Ω ± 10 %
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Turn starting switch OFF and disconnect WSRL, then carry out troubleshooting without turning starting switch ON.		
			Between WSRL (female) (1) – BRC2 (female) (20)	Resistance	Max. 1 Ω
			Between WSRL (female) (2) – BRC2 (female) (39)	Resistance	Max. 1 Ω
	3	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect WSRL, then carry out troubleshooting without turning starting switch ON.		
			Between WSRL (female) (1) – ground	Resistance	Min. 1 MΩ
	4	Defective retarder controller	If causes 1 – 3 are not detected, retarder controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related

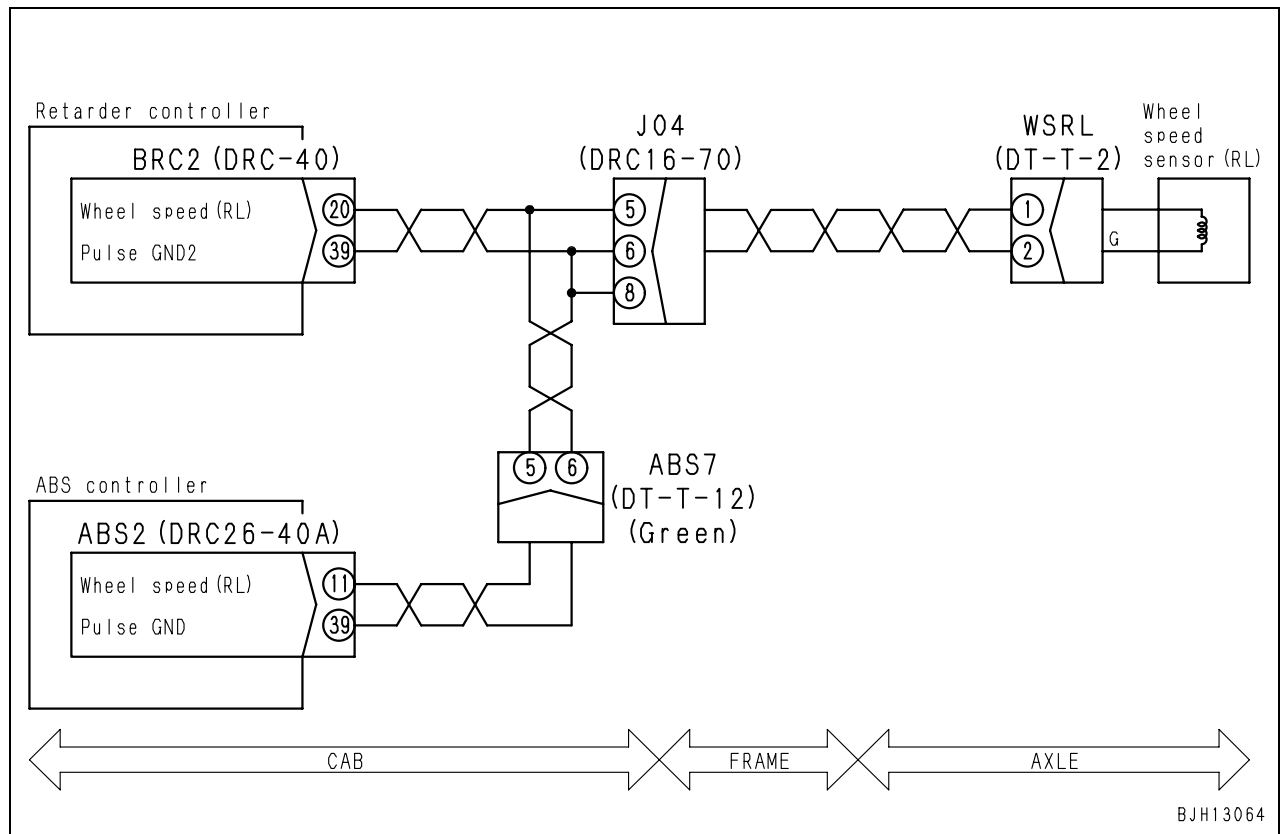


Failure code [DLF9L3] Wheel speed sensor: Trouble (Left rear)

Action code	Failure code	Trouble	Wheel speed sensor: Trouble (Left rear) (ABS controller system)
E03	DLF9L3		
Contents of trouble	• Wheel speed signal (pulse) input to retarder controller is abnormal.		
Action of controller	• Does not control ABS.		
Problem that appears on machine	• ABS is not controlled normally.		
Related information	• Retarder controller inspects same trouble by failure code [DLF9LC]. ★ If [DLF9LC] is not displayed, sensor and wiring harness out of cab are judged normal. ★ If [DLF9LC] is displayed, disconnect BRC2 connector and check that [DLF9L3] is displayed again and then carry out following troubleshooting. • Input state from wheel speed sensor (left rear) can be checked with monitoring function (Code: 39708 (rpm)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective wheel speed sensor	★ Turn starting switch OFF and disconnect WSRL, then carry out troubleshooting without turning starting switch ON.		
			WSRL (Male: Sensor side)		Resistance
			Between (1) – (2)		1,750 Ω ± 10 %
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Turn starting switch OFF and disconnect BRC2, WSRL and ABS2 connectors, then carry out troubleshooting without turning starting switch ON.		
			Between WSRL (female) (1) – ABS2 (female) (11)		Resistance Max. 1 Ω
			Between WSRL (female) (2) – ABS2 (female) (39)		Resistance Max. 1 Ω
	3	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect WSRL, then carry out troubleshooting without turning starting switch ON.		
			Between WSRL (female) (1) – ground		Resistance Min. 1 MΩ
	4	Defective retarder controller	If causes 1 – 3 are not detected, retarder controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related



Failure code [DLF9LC] Wheel speed sensor: Trouble (Left rear)

Action code	Failure code	Trouble	Wheel speed sensor: Trouble (Left rear) (Retarder controller system)
E01	DLF9LC		
Contents of trouble	• Wheel speed signal (pulse) input to retarder controller is abnormal.		
Action of controller	• Does not control ASR.		
Problem that appears on machine	• ASR is not controlled normally.		
Related information	• ABS controller inspects same trouble by failure code [DLF9L3]. ★ If ABS is installed and [DLF9L3] is not displayed, sensor and wiring harness out of cab are judged normal. ★ If ABS is installed and [DLF9L3] is displayed, turn starting switch OFF and disconnect ABS7 connector. Check that failure code [DLF9LC] is displayed again. • Input state from wheel speed sensor (left rear) can be checked with monitoring function (Code: 39708 (rpm)).		

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DLF9KA].	

Failure code [DLF9MA] Wheel speed sensor: Disconnection (Left rear)

Action code	Failure code	Trouble	Wheel speed sensor: Disconnection (Left rear) (ABS controller system)
E03	DLF9MA		
Contents of trouble	• Wheel speed signal (pulse) is not input to ABS controller.		
Action of controller	• Does not control ABS.		
Problem that appears on machine	• ABS is not controlled normally. • (Retarder is not controlled normally.)		
Related information	• Retarder controller inspects same trouble by failure code [DLF9KA]. ★ If [DLF9KA] is not displayed, sensor and wiring harness out of cab are judged normal. ★ If [DLF9KA] is displayed, turn starting switch OFF and disconnect retarder controller connector BRC2 connector. Check that failure code [DLF9MA] is displayed again. • Input state from wheel speed sensor (left rear) can be checked with monitoring function (Code: 39708 (rpm)).		

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DLF9L3].	

Failure code [DLT3KA] Transmission output shaft speed sensor: Disconnection

Action code	Failure code	Trouble	Transmission output shaft speed sensor: Disconnection (Transmission controller system)
E03	DLT3KA		
Contents of trouble	The signal circuit of the transmission output shaft speed sensor is disconnected and signals are not input.		
Action of controller	- Keeps gear speed when trouble occurs. - If gearshift lever is set in "N", gear is kept in neutral. - Turns lockup system OFF.		
Problem that appears on machine	- Operator can move machine by following escape procedure. - Stop travel and set gearshift lever in "N" position. - Disconnect emergency escape connectors A1 (female) and A2 (male) and connect them to each other to set machine in emergency escape mode. - Operate gearshift lever and start machine again. ★ When operating gearshift lever, release accelerator pedal. ★ Operate gearshift lever from N to D – L or from N to R. ★ Machine is kept in emergency escape mode until starting switch is turned OFF.		
Related information	This failure can be checked in the monitoring function (Code: 31400 (rpm)).		

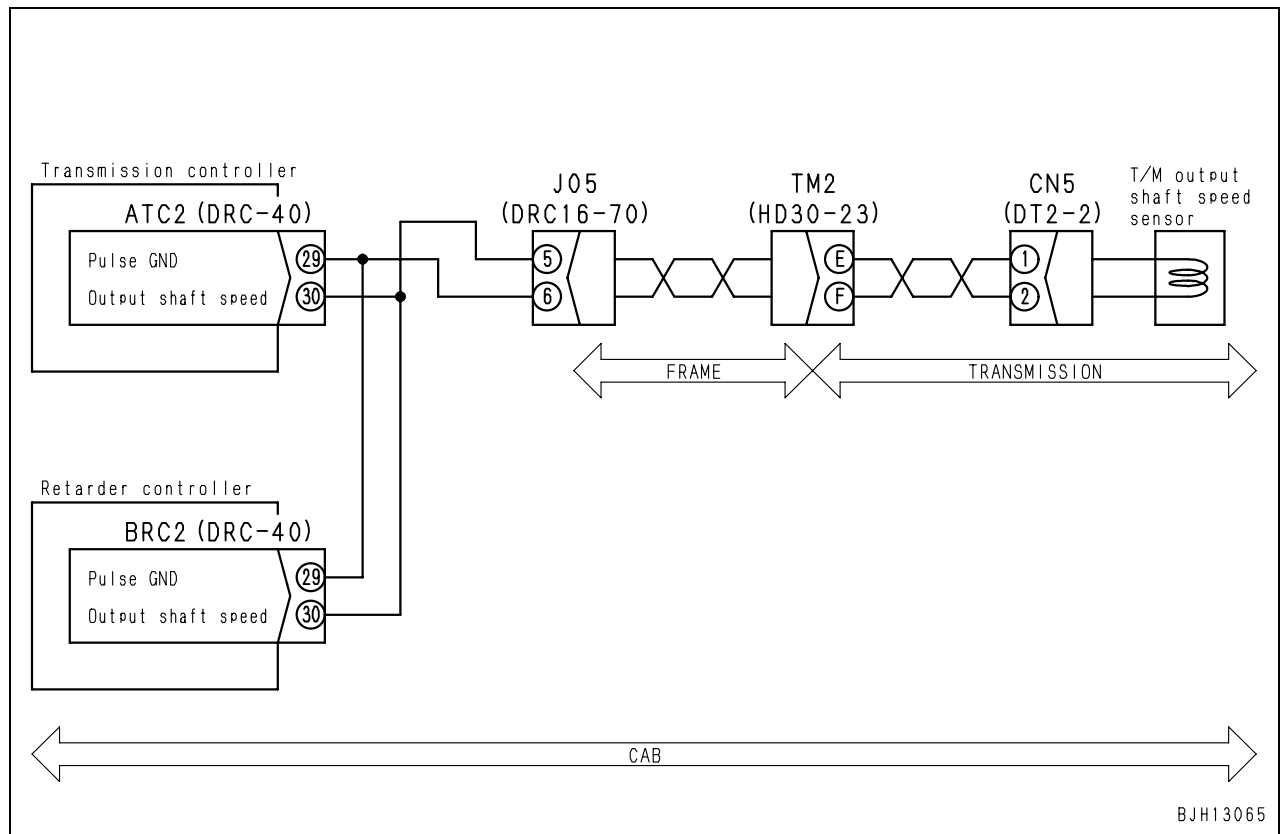
Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Wrong adjustment of transmission output shaft speed sensor	Press the sensor lightly against the revolution pickup gear, and then return it by 1/2 – 1 turn. ★ For details, see Testing and adjusting, "Adjustment of transmission speed sensor".		
	2	Defective transmission output shaft speed sensor	1) Turn the starting switch OFF. 2) Disconnect connector CN5. 3) Connect T-adapter.		
			Between CN5 (male) (1) – (2)	Resistance	500 – 1,000 Ω
			Between CN5 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC2, ATC2, CN5. 3) Connect T-adapter to ATC2 (female) and CN5 (female).		
			Wiring harness between ATC2 (female) (30) – CN5 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC2 (female) (29) – CN5 (female) (2)	Resistance	Max. 1 Ω
	4	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connectors BRC2, ATC2. 3) Connect T-adapter to ATC2 (female).		
			Between ATC2 (female) (30) – (29)	Resistance	500 – 1,000 Ω

Failure code [DLT3LC] Transmission output shaft speed sensor: Disagreement of revolution speed signal

Action code	Failure code	Trouble	Transmission output shaft speed sensor: Disagreement of revolution speed signal (Retarder controller system)
E01	DLT3LC		
Contents of trouble	The speed calculated from the engine speed sensor signal, transmission input shaft speed sensor signal, and transmission intermediate shaft speed sensor signal is different from the signal speed of the transmission output shaft speed sensor.		
Action of controller	- The controller keeps the current gear speed and turns the lockup operation OFF. - If the shift lever is set in the "N" position, the controller keeps the gear in neutral.		
Problem that appears on machine	- The gear cannot be shifted. - If the shift lever is set in the "N" position, the gear is set in neutral.		
Related information	This failure can be checked in the monitoring function (Code: 31400 (rpm)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective transmission output shaft speed sensor	1) Turn the starting switch OFF. 2) Disconnect connector CN5. 3) Connect T-adapter.		
			Between CN5 (male) (1) – (2)	Resistance	500 – 1,000 Ω
			Between CN5 (male) (1), (2) – chassis ground	Resistance	Min. 1 MΩ
	2	Grounding fault in wiring harness (Contact with ground circuit)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC2, BRC2, and CN5. 3) Connect T-adapter.		
			Between ground and wiring harness between ATC2 (female) (30) – BRC2 (female) (30) – CN5 (female) (1)	Resistance	Min. 1 MΩ
	3	Defective hot short in wiring harness (a contact with 24 V circuit)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC2, BRC2, CN5. 3) Connect T-adapter. 4) Turn the starting switch ON.		
			Wiring harness between ATC2 (female) (30) – BRC2 (female) (30) – CN5 (female) (1)	Voltage	Max. 1 V
	4	Defective transmission controller	1) Turn the starting switch OFF. 2) Disconnect connector ATC2. 3) Connect T-adapter.		
			Between ATC2 (female) (30) – (29)	Resistance	500 – 1,000 Ω

Circuit diagram related

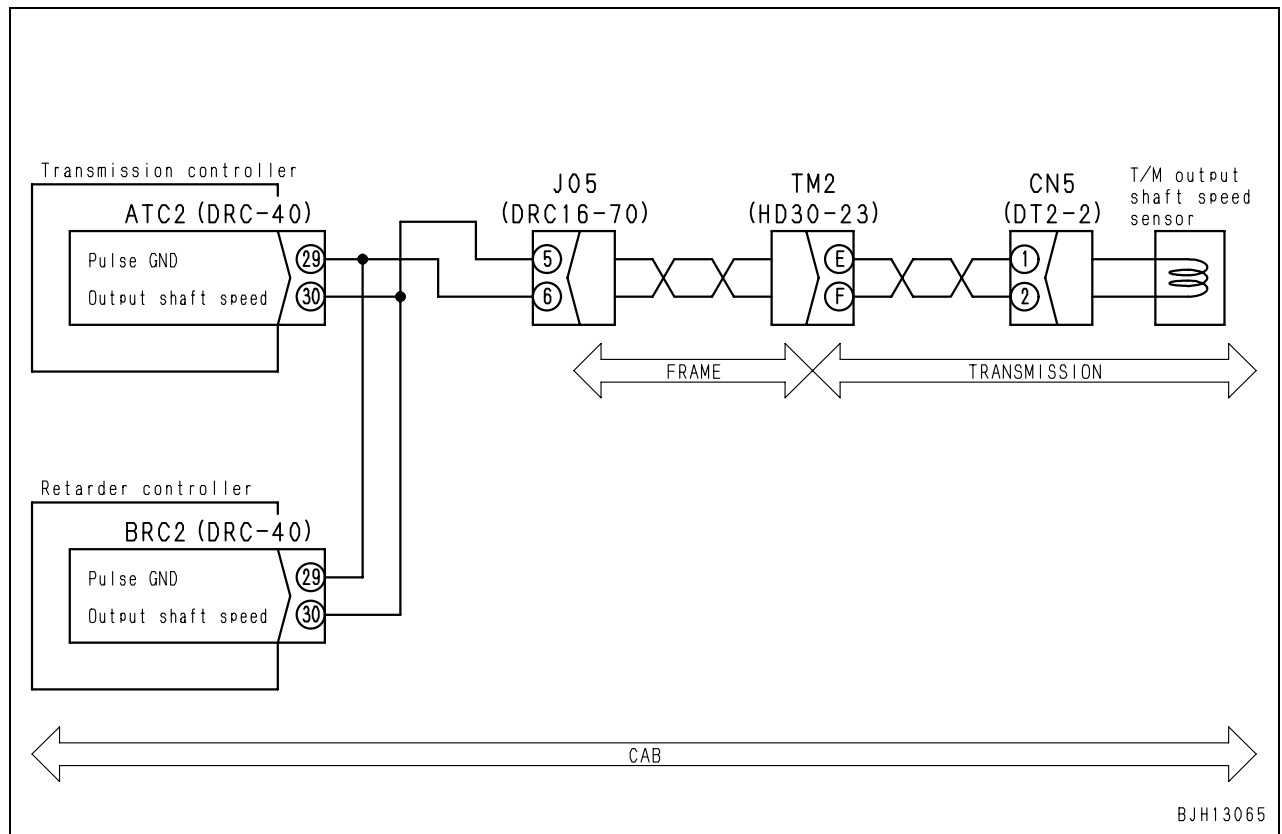


Failure code [DLT4KA] Transmission output shaft speed sensor: Disconnection

Action code	Failure code	Trouble	Transmission output shaft speed sensor: Disconnection (Retarder controller system)
E01	DLT4KA		
Contents of trouble	When ARSC, ASR, and auto-suspension are set, signal circuit of transmission output shaft speed sensor has disconnection and no signals are input.		
Action of controller	- Turns output to ASR proportional solenoid OFF. - Turns output to auto-suspension solenoid OFF. - When ARSC operates, brake is released gradually, then control is stopped until power is turned OFF.		
Problem that appears on machine	- ARSC control cannot be continued. (Even if ARSC switch ON with ARSC selection.) - ASR control cannot be continued. - Operator can move machine by following escape procedure. - Stop travel and set gearshift lever in "N" position. - Disconnect emergency escape connectors A1 (female) and A2 (male) and connect them to each other to set machine in emergency escape mode. - Operate gearshift lever and start machine again. ★ When operating gearshift lever, release accelerator pedal. ★ Operate gearshift lever from N to D – L or from N to R. ★ Machine is kept in emergency escape mode until starting switch is turned OFF.		
Related information	- Transmission output shaft speed can be checked with monitoring function (Code: 31400 (rpm)). Wheel speed can be also checked with monitoring function (Code: 39704 (rpm), 39705 (rpm)). - Controller does not defect ground fault and hot short.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Wrong adjustment of transmission output shaft speed sensor	Press the sensor lightly against the revolution pickup gear, and then return it by 1/2 - 1 turn. ★ For details, see Testing and adjusting, "Adjustment of transmission speed sensor".		
	2	Defective transmission output shaft speed sensor	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN5 (male).		
			Between CN5 (male) (1) – (2)	Resistance	500 – 1,000 Ω
			Between CN5 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn starting switch OFF. 2) Disconnect connectors ATC2, BRC2, and CN5. 3) Connect T-adapter to BRC2 (female) and CN5 (female).		
			Wiring harness between BRC2 (female) (30) – CN5 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between BRC2 (female) (29) – CN5 (female) (2)	Resistance	Max. 1 Ω
	4	Defective retarder controller	1) Turn starting switch OFF. 2) Disconnect connectors BRC2 and ATC2. 3) Connect T-adapter to BRC2 (female).		
			Between BRC2 (female) (30) – (29)	Resistance	500 – 1,000 Ω

Circuit diagram related



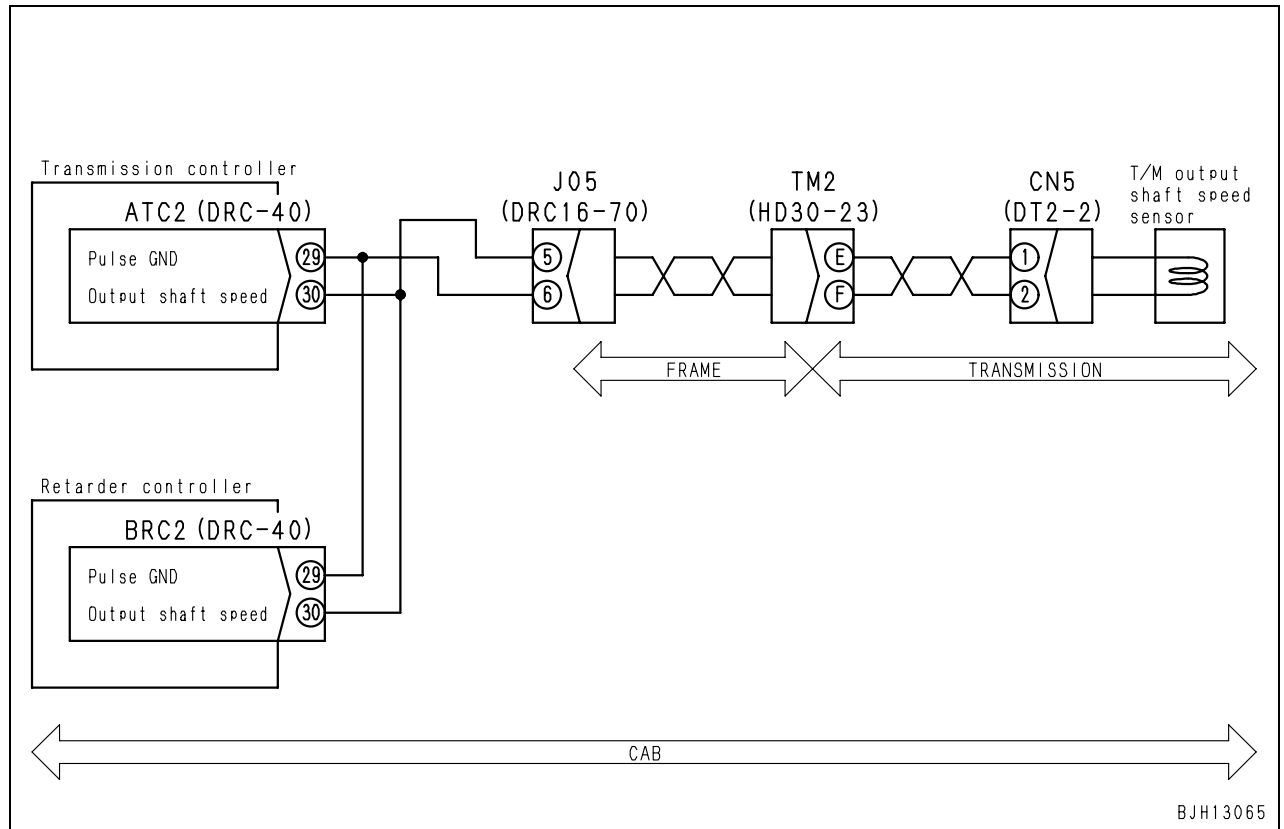
Failure code [DLT4MA] Transmission output shaft speed sensor: Disconnection

Action code	Failure code	Trouble	Transmission output shaft speed sensor: Disconnection (Reterder controller system)
E03	DLT4MA		
Contents of trouble	When ARSC, ASR, and auto-suspension are set, signal circuit of transmission output shaft speed sensor has disconnection and no signals are input.		
Action of controller	- ASR control released. - Turns output to ASR proportional solenoid OFF. - Turns output to auto-suspension solenoid OFF. - When ARSC operates, brake is released gradually, then control is stopped until power is turned OFF.		
Problem that appears on machine	- ARSC control cannot be continued. - ASR control cannot be continued.		
Related information	- Transmission output shaft speed can be checked with monitoring function (Code: 31400 (rpm), 31403 (rpm)). Wheel speed can be also checked with monitoring function (Code: 39704 (rpm), 39705 (rpm)). - Controller does not defect ground fault and hot short. "Method for emergency escape procedure" refers to [DLT4KA]		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC2, BRC2, CN5. 3) Connect T-adapter to connectors BRC2 (female) and CN5 (female).		
			Wiring harness between BRC2 (female) (30) – CN5 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between BRC2 (female) (29) – CN5 (female) (2)	Resistance	Max. 1 Ω
	2	Defective transmission output shaft speed sensor	1) Turn the starting switch OFF. 2) Disconnect connector CN5. 3) Connect T-adapter.		
			Between CN5 (male) (1) – (2)	Resistance	500 – 1,000 Ω
			Between CN5 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	3	Wrong adjustment of transmission output shaft speed sensor	Press the sensor lightly against the revolution pickup gear, and then return it by 1/2 – 1 turn. ★ For details, see Testing and adjusting, "Adjustment of transmission speed sensor".		
	4	Grounding fault in wiring harness (Contact with ground circuit) (Reference)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC2, BRC2, PM5, and CN5. 3) Connect T-adapter to connector BRC2 (female).		
			Between ground and wiring harness between BRC2 (female) (30) – ATC2 (female) (30) – PM5 (female) (7) – CN5 (female) (1)	Resistance	Min. 1 MΩ
	5	Defective hot short in wiring harness (a contact with 24 V circuit) (Reference)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC2, ATC2, PM5, and CN5. 3) Connect T-adapter to BRC2 (female). 4) Turn the starting switch ON.		
			Between ground and wiring harness between ATC2 (female) (30) – BRC2 (female) (30) – PM5 (female) (7) – CN5 (female) (1)	Voltage	Max. 1 V

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	6	Defective reterder controller	1) Turn the starting switch OFF. 2) Disconnect connector BRC2 and ATC2. 3) Connect T-adapter.		
			Between BRC2 (female) (30) – (29)	Resistance	500 – 1,000 Ω

Circuit diagram related

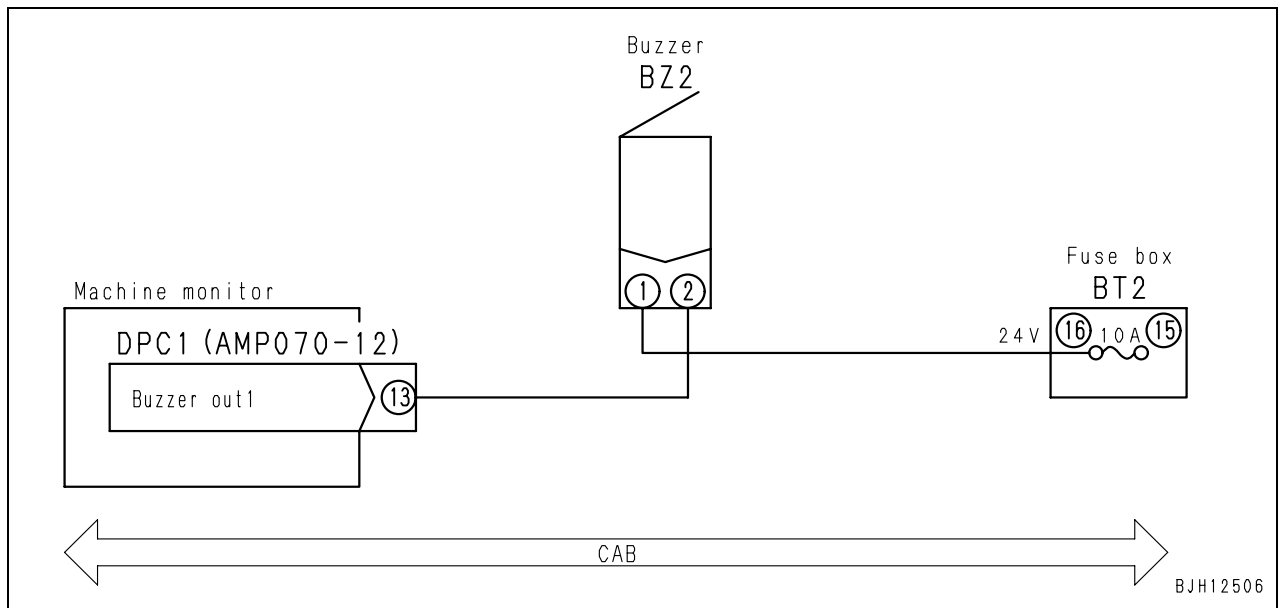


Failure code [DV00KB] Buzzer output: Short circuit

Action code	Failure code	Trouble	Buzzer output: Short circuit (Machine monitor system)
E01	DV00KB		
Contents of trouble	• When signal is output to buzzer circuit, abnormal current flows.		
Action of machine monitor	• Keeps abnormality until starting switch is turned OFF. • Turns alarm buzzer output OFF.		
Problem that appears on machine	• Alarm buzzer does not sound.		
Related information	• If buzzer sounds, BZ2 (2) is Sink output (Normal). • Controller cannot detect disconnection and ground fault of wiring harness.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective buzzer	1) Turn starting switch OFF, disconnect connector BZ2, and remove buzzer. 2) Connect +24 V to BZ2 (male) (1) and connect GND to BZ2 (male) (2). ★ If buzzer does not sound, buzzer is defective. (Replace)		
	2	Grounding fault in wiring harness (Contact with ground circuit) (Reference)	★ Turn starting switch OFF and disconnect BZ2, then carry out troubleshooting without turning starting switch ON. Between DPC1 (male) (13) – ground		
			Resistance	Min. 1 MΩ	
	3	Hot short (Contact with 24V circuit) in wiring harness	1) Turn starting switch OFF, disconnect DPC1 and BZ2, and insert T-adapter in DPC1 (female). 2) Turn starting switch ON and carry out troubleshooting. Between DPC1 (male) (13) – ground		
			Voltage	Max. 1 V	
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector) (Reference)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON. (When voltage in Cause 1 is abnormal) Between DPC1 (female) (13) – BZ2 (2)		
			Resistance	Max. 1 Ω	
			Between BT2 (16) – BZ2 (1)	Resistance	Max. 1 Ω
	5	Defective machine monitor	If causes 1 – 4 are not detected, machine monitor may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related

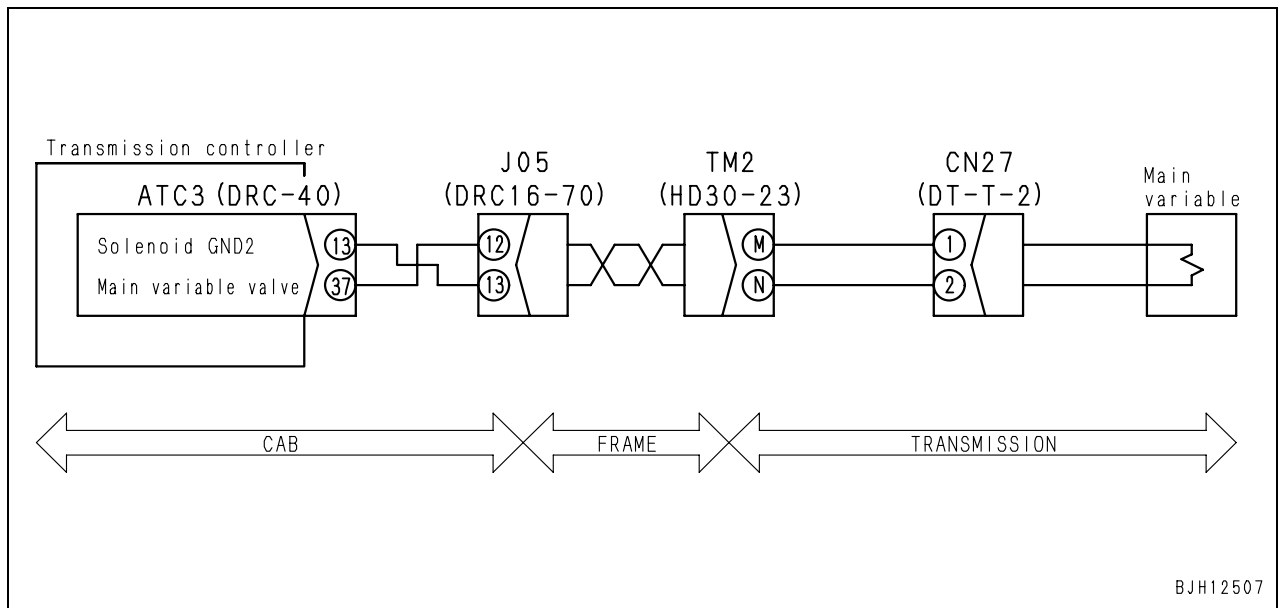


Failure code [DW2AKA] Main pressure variable valve output: Disconnection

Action code	Failure code	Trouble	Main pressure variable valve output: Disconnection (Transmission controller system)
E01	DW2AKA		
Contents of trouble	When signal is output to main pressure variable valve solenoid circuit, no current flows.		
Action of controller	Stops outputting signal to main pressure variable valve solenoid circuit.		
Problem that appears on machine	If the machine keeps traveling as it is, fuel consumption increases.		
Related information	- Output state to main pressure variable valve solenoid can be checked with monitoring function (Code: 31643 (mA)). - Signal is not output to main pressure variable valve solenoid circuit until starting switch is turned OFF once.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective main pressure variable valve solenoid (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CN27 (male)		Resistance
			Between (1) – (2)		5 – 15 Ω
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON. (When check result of Cause 1 is normal)		
			Between J05 (male) (12) – (13)		Resistance 5 – 15 Ω
			Between ATC3 (female) (13) – (37)		Resistance 5 – 15 Ω
	3	Defective transmission controller	If causes 1 and 2 are not detected, transmission controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related

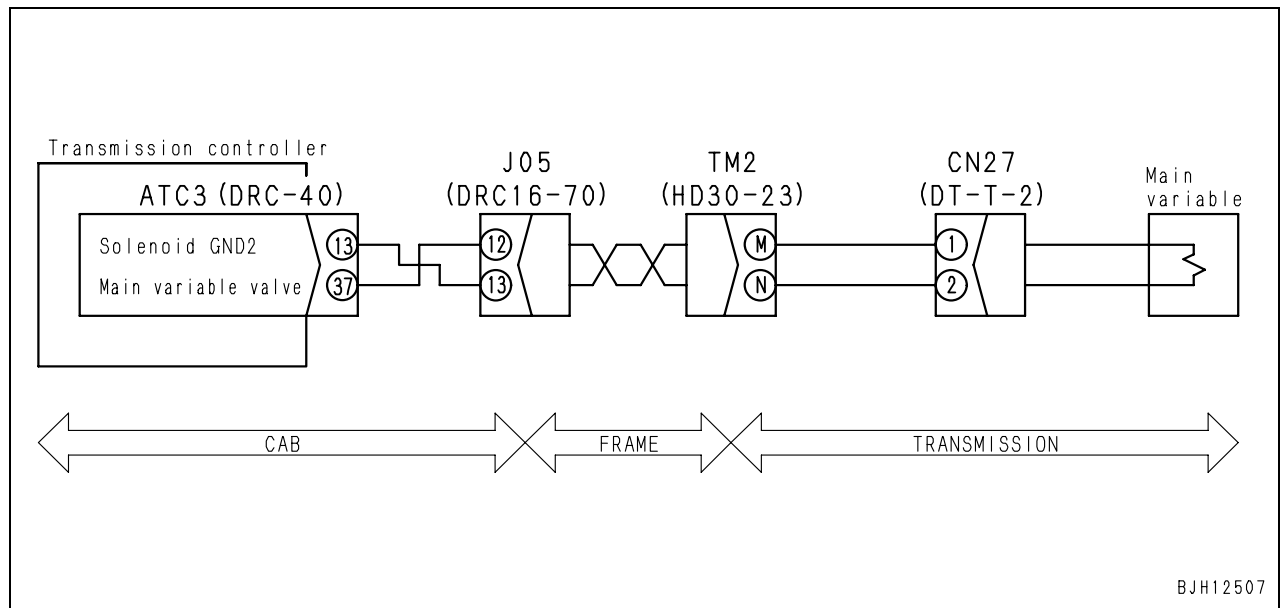


Failure code [DW2AKB] Main pressure variable valve output circuit: Ground fault

Action code	Failure code	Trouble	Main pressure variable valve output circuit: Ground fault (Transmission controller system)
E01	DW2AKB		
Contents of trouble	When signal is output to main pressure variable valve solenoid circuit, abnormal current flows.		
Action of controller	Stops outputting signal to main pressure variable valve solenoid circuit.		
Problem that appears on machine	If the machine keeps traveling as it is, fuel consumption increases.		
Related information	- Output state to main pressure variable valve solenoid can be checked with monitoring function (Code: 31643 (mA)). - Signal is not output to main pressure variable valve solenoid circuit until starting switch is turned OFF once.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective main pressure variable valve solenoid (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CN27 (male)		Resistance
			Between (1) – (2)		5 – 15 Ω
	2	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect CN27, then carry out troubleshooting without turning starting switch ON.		
			Between ATC3 (female) (37) – ground		Resistance Min. 1 MΩ
	3	Short circuit in wiring harness (with another wiring harness)	★ Turn starting switch OFF and disconnect CN27, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between ATC3 (female) (37) – ATC3 (female) (pin other than 37)		Resistance Min. 1 MΩ
	4	Hot short (Contact with 24 V circuit) in wiring harness	★ Turn starting switch OFF and insert T-adaptor in ATC3, then turn starting switch ON and carry out troubleshooting.		
			Between ATC3 (female) (37) – ground		Voltage Max. 1 V
	5	Defective transmission controller	If causes 1 – 4 are not detected, transmission controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related



Failure code [DW2AKY] Main pressure variable valve output circuit: Hot short

Action code	Failure code	Trouble	Main pressure variable valve output circuit: Hot short (Transmission controller system)
E01	DW2AKY		
Contents of trouble	While signal is not output to main pressure variable valve solenoid circuit, abnormal current flows.		
Action of controller	Stops outputting signal to main pressure variable valve solenoid circuit.		
Problem that appears on machine	- Error [15*OMW] may be detected because of oil pressure reduction. - The transmission clutch may be damaged during travel in F1, F2 or F3.		
Related information	- Output state to main pressure variable valve solenoid can be checked with monitoring function (Code: 31643 (mA)). - Signal is not output to main pressure variable valve solenoid circuit until starting switch is turned OFF once.		

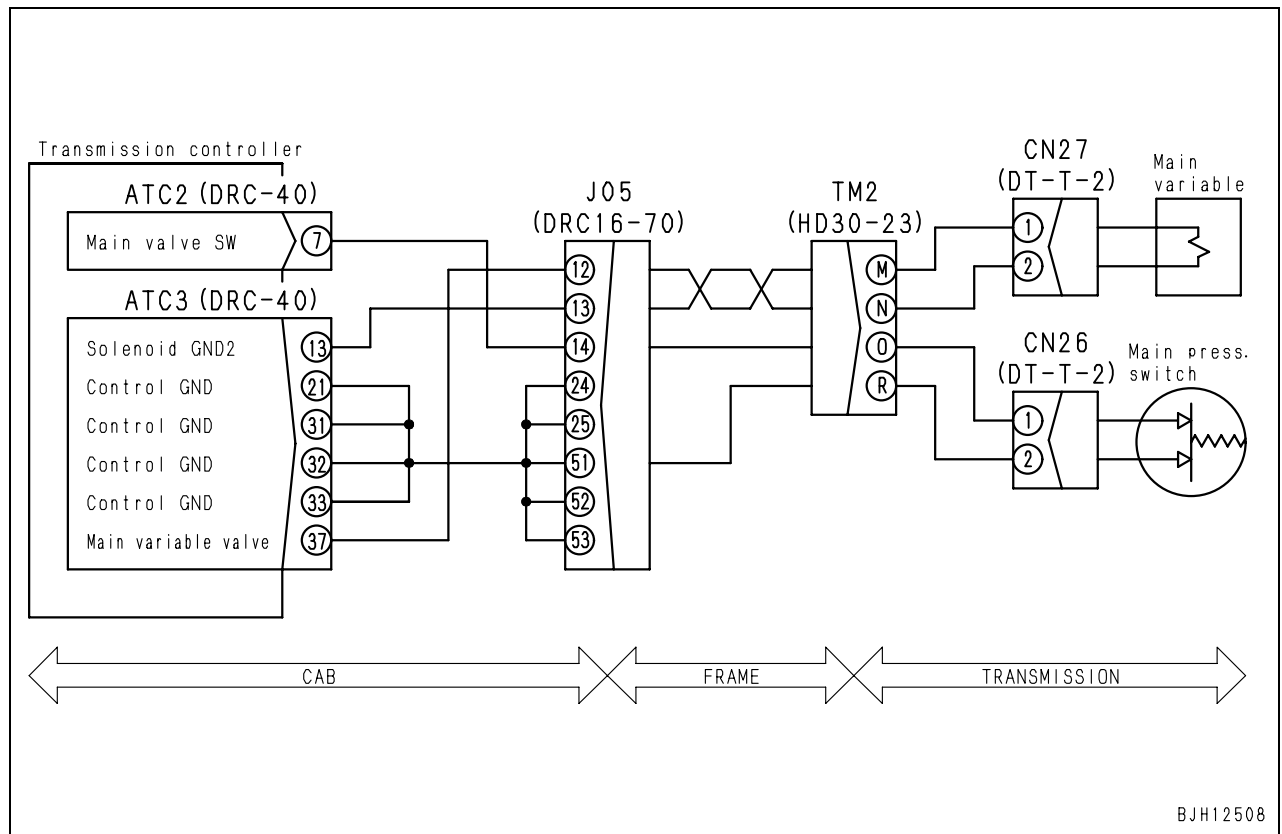
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DW2AKB].	

Failure code [DW2AL1] Main pressure variable valve: Defective reset

Action code	Failure code	Trouble	Main pressure variable valve: Defective reset (Transmission controller system)
E01	DW2AL1		
Contents of trouble	When outputting signal to main pressure variable valve solenoid circuit is stopped, response of main pressure switch is abnormal.		
Action of controller	Stops outputting signal to main pressure variable valve solenoid circuit.		
Problem that appears on machine	- Error [15*OMW] may be detected because of oil pressure reduction. - The transmission clutch may be damaged during travel in F1, F2 or F3.		
Related information	- Output state to main pressure variable valve solenoid can be checked with monitoring function (Code: 31643 (mA)). - Signal is not output to main pressure variable valve solenoid circuit until starting switch is turned OFF once.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective main pressure switch (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CN26 (male)		Resistance
			Between (1) – (2)		Max. 10 Ω
	2	Defective main pressure variable valve	Main pressure variable valve may have mechanical trouble. Check it directly.		
	3	Defective hydraulic piping	Hydraulic piping may be defective. Check it directly.		
	4	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect CN26, then carry out troubleshooting without turning starting switch ON.		
			Between ATC2 (female) (7) – ground		Resistance Min. 1 MΩ
	5	Short circuit in wiring harness (with another wiring harness)	★ Turn starting switch OFF and disconnect CN26, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between ATC2 (female) (7) – ATC (female) (pin other than 7)		Resistance Min. 1 MΩ
	6	Hot short (Contact with 24 V circuit) in wiring harness	★ Turn starting switch OFF and insert T-adapter in ATC2, then turn starting switch ON and carry out troubleshooting.		
			Between ATC2 (female) (7) – ground		Voltage Max. 1 V
	7	Defective transmission controller	If causes 1 – 6 are not detected, transmission controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related



Failure code [DW2ALH] Main pressure variable valve: Malfunction

Action code	Failure code	Trouble	Main pressure variable valve: Malfunction (Transmission controller system)
E01	DW2ALH		
Contents of trouble	• When signal is output to main pressure variable valve solenoid circuit, main pressure switch does not respond.		
Action of controller	• Stops outputting signal to main pressure variable valve solenoid circuit.		
Problem that appears on machine	• If the machine keeps traveling as it is, fuel consumption increases.		
Related information	• Output state to main pressure variable valve solenoid can be checked with monitoring function (Code: 31643 (mA)). • Signal is not output to main pressure variable valve solenoid circuit until starting switch is turned OFF once.		

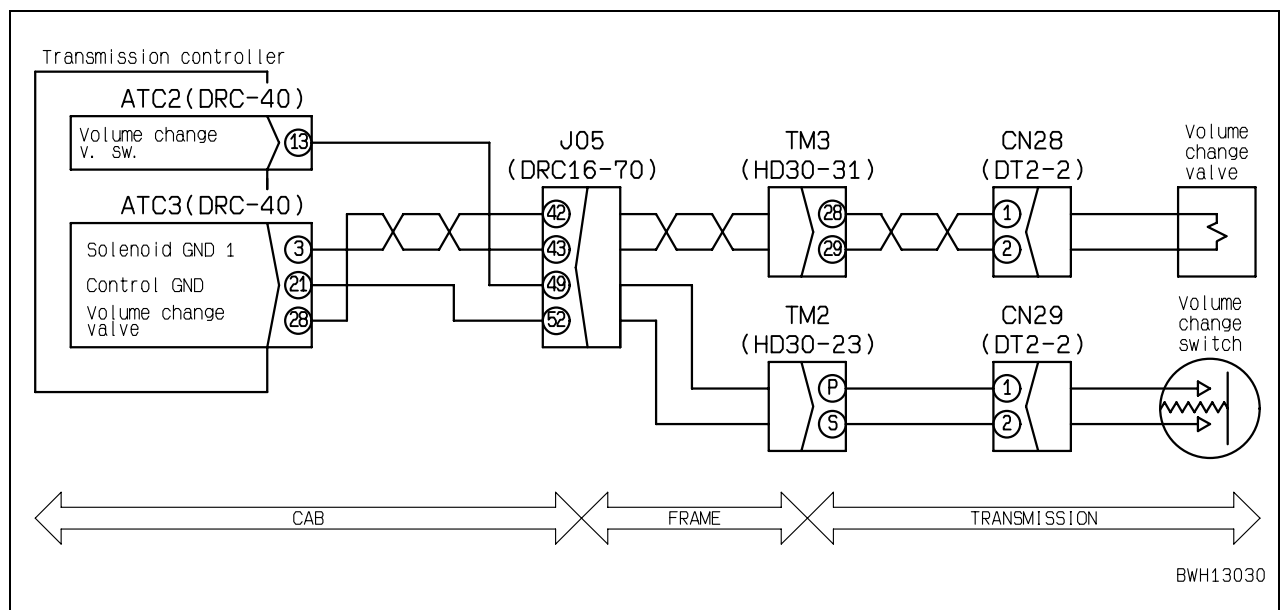
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DW2AL1] .	

Failure code [DW2BKA] Main oil level selector valve output: Disconnection

Action code	Failure code	Trouble	Main oil level selector valve output: Disconnection (Transmission controller system)
E01	DW2BKA		
Contents of trouble	When signal is output to main oil level selector valve solenoid circuit, no current flows.		
Action of controller	Stops outputting signal to main oil level selector valve solenoid circuit.		
Problem that appears on machine	If the machine keeps traveling as it is, fuel consumption increases.		
Related information	- Output state to main oil level selector valve solenoid can be checked with monitoring function (Code: 31644 (mA)). - Signal is not output to main oil level selector valve solenoid circuit until starting switch is turned OFF once.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective main oil level selector valve solenoid (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CN28 (male)		Resistance
			Between (1) – (2)		5 – 15 Ω
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between ATC3 (female) (21) – (28)		Resistance
	3	Defective transmission controller	If causes 1 and 2 are not detected, transmission controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related

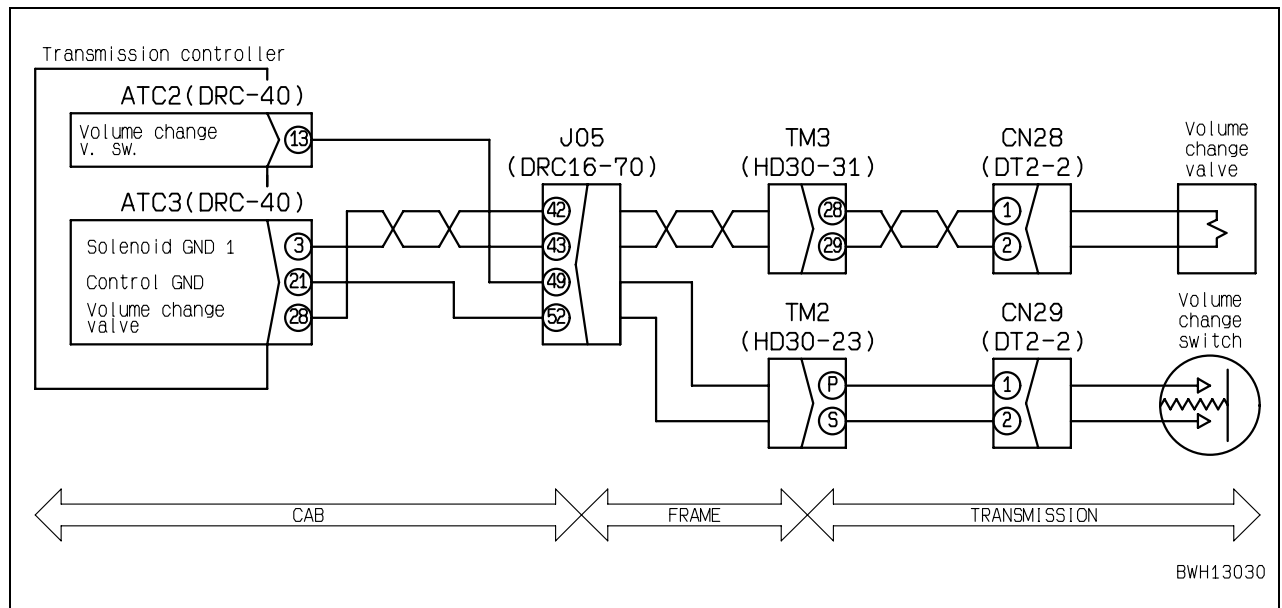


Failure code [DW2BKB] Main oil level selector valve output circuit: Ground fault

Action code	Failure code	Trouble	Main oil level selector valve output circuit: Ground fault (Transmission controller system)
E01	DW2BKB		
Contents of trouble	When signal is output to main oil level selector valve solenoid circuit, abnormal current flows.		
Action of controller	Stops outputting signal to main oil level selector valve solenoid circuit.		
Problem that appears on machine	If the machine keeps traveling as it is, fuel consumption increases.		
Related information	- Output state to main oil level selector valve solenoid can be checked with monitoring function (Code: 31644 (mA)). - Signal is not output to main oil level selector valve solenoid circuit until starting switch is turned OFF once.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective main oil level selector valve solenoid (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CN28 (male)		Resistance
			Between (1) – (2)		5 – 15 Ω
	2	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect CN28, then carry out troubleshooting without turning starting switch ON.		
			Between ATC3 (female) (28) – ground		Resistance Min. 1 MΩ
	3	Short circuit in wiring harness (with another wiring harness)	★ Turn starting switch OFF and disconnect CN28, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between ATC3 (female) (28) – ATC3 (female) (pin other than 28)		Resistance Min. 1 MΩ
	4	Hot short (Contact with 24 V circuit) in wiring harness	★ Turn starting switch OFF and insert T-adapter in ATC3, then turn starting switch ON and carry out troubleshooting.		
			Between ATC3 (female) (28) – ground		Voltage Max. 1 V
	5	Defective transmission controller	If causes 1 – 4 are not detected, transmission controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related



Failure code [DW2BKY] Main oil level selector valve output circuit: Hot short

Action code	Failure code	Trouble	Main oil level selector valve output circuit: Hot short (Transmission controller system)
E01	DW2BKY		
Contents of trouble	While signal is not output to main oil level selector valve solenoid circuit, abnormal current flows.		
Action of controller	Stops outputting signal to main oil level selector valve solenoid circuit.		
Problem that appears on machine	- Error [15*OMW] may be detected because of oil pressure reduction. - The transmission clutch may be damaged during travel in F1, F2 or F3.		
Related information	- Output state to main oil level selector valve solenoid can be checked with monitoring function (Code: 31644 (mA)). - Signal is not output to main oil level selector valve solenoid circuit until starting switch is turned OFF once.		

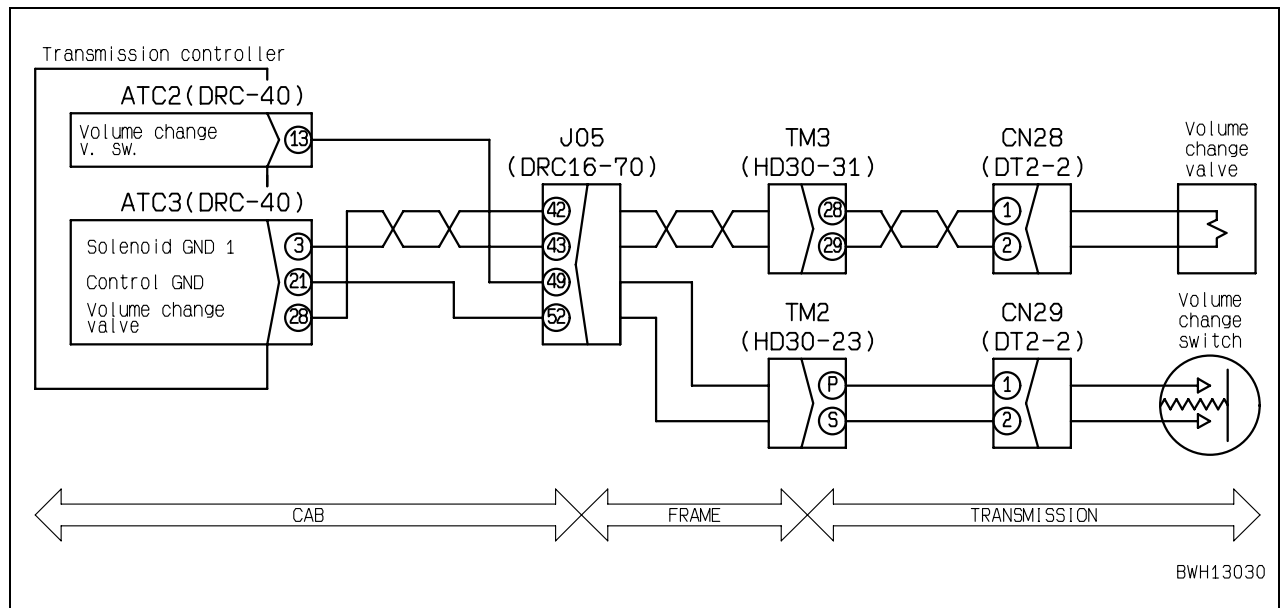
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DW2BKB].	

Failure code [DW2BL1] Main oil level selector valve: Defective reset

Action code	Failure code	Trouble	Main oil level selector valve: Defective reset (Transmission controller system)
E01	DW2BL1		
Contents of trouble	• When outputting signal to main oil level selector valve solenoid circuit is stopped, response of main oil level selector switch is abnormal.		
Action of controller	• Stops outputting signal to main oil level selector valve solenoid circuit.		
Problem that appears on machine	• Error [15*OMW] may be detected because of oil pressure reduction. • The transmission clutch may be damaged during travel in F1, F2 or F3.		
Related information	• Output state to main oil level selector valve solenoid can be checked with monitoring function (Code: 31644 (mA)). • Signal is not output to main oil level selector valve solenoid circuit until starting switch is turned OFF once.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective main oil level selector switch (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CN29 (male)		Resistance
			Between (1) – (2)		Max. 10 Ω
	2	Defective main oil level selector valve	Main oil level selector valve may have mechanical trouble. Check it directly.		
	3	Defective hydraulic piping	Hydraulic piping may be defective. Check it directly.		
	4	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect CN29, then carry out troubleshooting without turning starting switch ON.		
			Between ATC2 (female) (13) – ground		Resistance Min. 1 MΩ
	5	Short circuit in wiring harness (with another wiring harness)	★ Turn starting switch OFF and disconnect CN29, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between ATC2 (female) (13) – ATC (female) (pin other than 13)		Resistance Min. 1 MΩ
	6	Hot short (Contact with 24 V circuit) in wiring harness	★ Turn starting switch OFF and insert T-adaptor in ATC2, then turn starting switch ON and carry out troubleshooting.		
			Between ATC2 (female) (13) – ground		Voltage Max. 1 V
7	Defective transmission controller	If causes 1 – 6 are not detected, transmission controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)			

Circuit diagram related



Failure code [DW2BLH] Main oil level selector valve: Malfunction

Action code	Failure code	Trouble	Main oil level selector valve: Malfunction (Transmission controller system)
E01	DW2BLH		
Contents of trouble	• When signal is output to main oil level selector valve solenoid circuit, main oil level selector switch does not respond.		
Action of controller	• Stops outputting signal to main oil level selector valve solenoid circuit.		
Problem that appears on machine	• If the machine keeps traveling as it is, fuel consumption increases.		
Related information	• Output state to main oil level selector valve solenoid can be checked with monitoring function (Code: 31644 (mA)). • Signal is not output to main oil level selector valve solenoid circuit until starting switch is turned OFF once.		

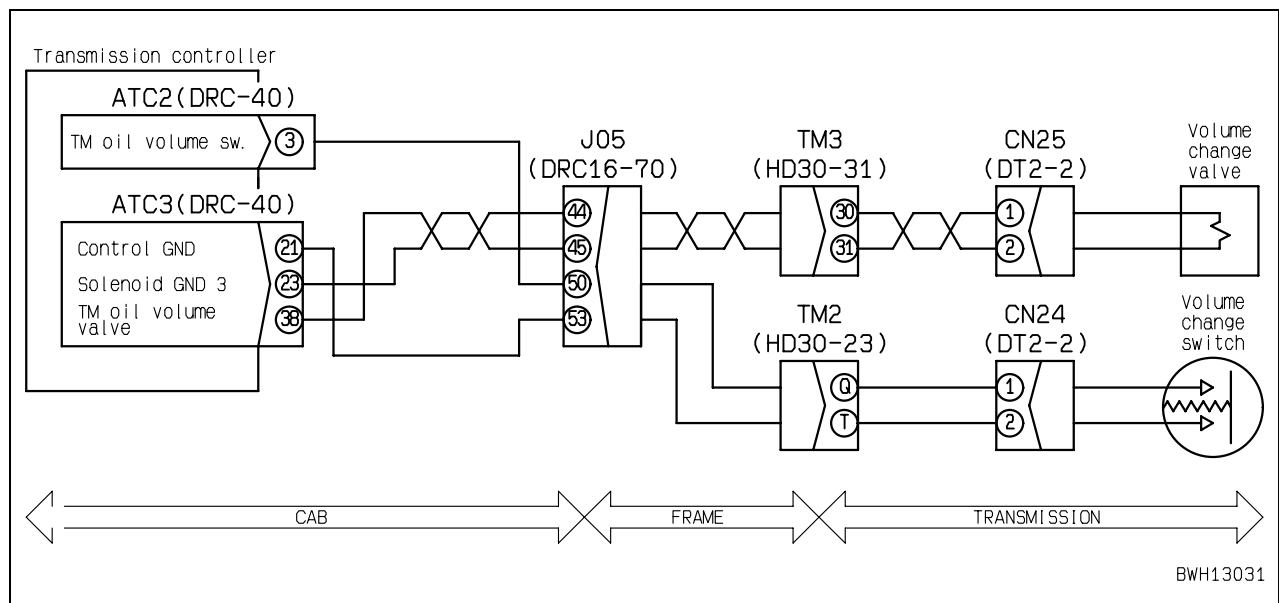
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DW2BL1] .	

Failure code [DW2CKA] Transmission lubrication variable valve output: Disconnection

Action code	Failure code	Trouble	Transmission lubrication variable valve output: Disconnection (Transmission controller system)
E01	DW2CKA		
Contents of trouble	When signal is output to transmission lubrication variable valve solenoid circuit, no current flows.		
Action of controller	Stops outputting signal to transmission lubrication variable valve solenoid circuit.		
Problem that appears on machine	If the machine keeps traveling as it is, fuel consumption increases.		
Related information	- Output state to transmission lubrication variable valve solenoid can be checked with monitoring function (Code: 38001 (mA)). - Signal is not output to transmission lubrication variable valve solenoid circuit until starting switch is turned OFF once.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective transmission lubrication variable valve solenoid (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CN25 (male)		Resistance	
			Between (1) – (2)		5 – 15 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON. (When check result of Cause 1 is normal)			
			Between J05 (male) (44) – (45)		Resistance	5 – 15 Ω
			Between ATC3 (female) (23) – (38)		Resistance	5 – 15 Ω
	3	Defective transmission controller	If causes 1 and 2 are not detected, transmission controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)			

Circuit diagram related

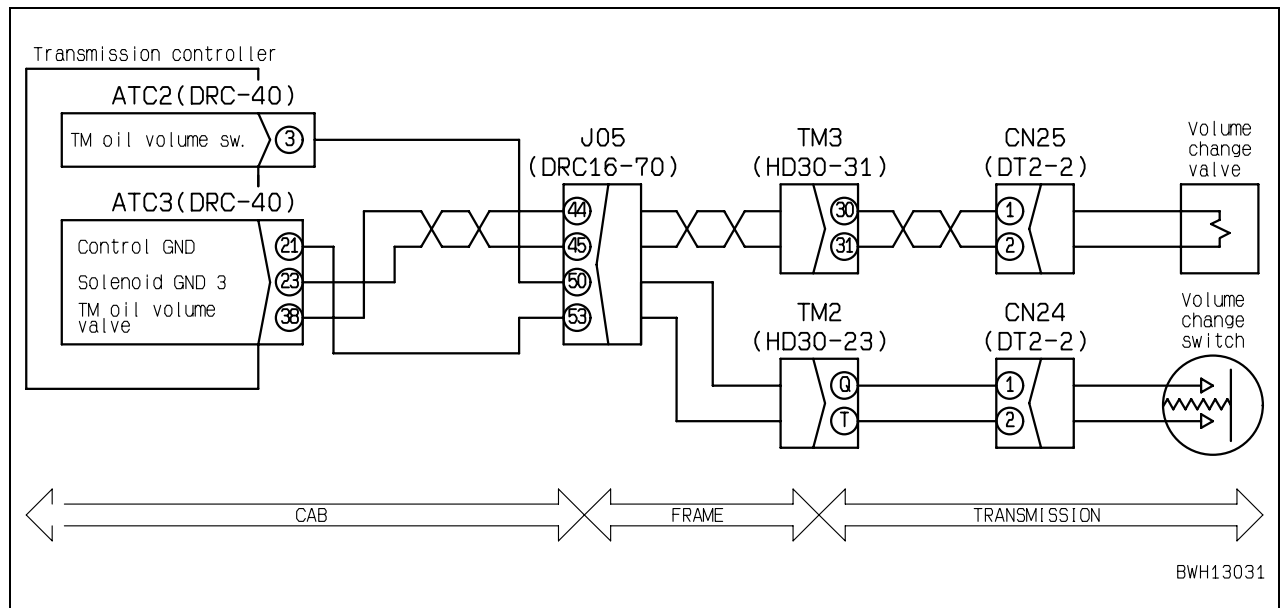


Failure code [DW2CKB] Transmission lubrication variable valve output circuit: Ground fault

Action code	Failure code	Trouble	Transmission lubrication variable valve output circuit: Ground fault (Transmission controller system)
E01	DW2CKB		
Contents of trouble	When signal is output to transmission lubrication variable valve solenoid circuit, abnormal current flows.		
Action of controller	Stops outputting signal to transmission lubrication variable valve solenoid circuit.		
Problem that appears on machine	If the machine keeps traveling as it is, fuel consumption increases.		
Related information	- Output state to transmission lubrication variable valve solenoid can be checked with monitoring function (Code: 38001 (mA)). - Signal is not output to transmission lubrication variable valve solenoid circuit until starting switch is turned OFF once.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective transmission lubrication variable valve solenoid (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CN25 (male)		Resistance
			Between (1) – (2)		5 – 15 Ω
	2	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect CN25, then carry out troubleshooting without turning starting switch ON.		
			Between ATC3 (female) (38) – ground		Resistance Min. 1 MΩ
	3	Short circuit in wiring harness (with another wiring harness)	★ Turn starting switch OFF and disconnect CN25, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between ATC3 (female) (38) – ATC3 (female) (pin other than 38)		Resistance Min. 1 MΩ
	4	Hot short (Contact with 24 V circuit) in wiring harness	★ Turn starting switch OFF and insert T-adaptor in ATC3, then turn starting switch ON and carry out troubleshooting.		
			Between ATC3 (female) (38) – ground		Voltage Max. 1 V
	5	Defective transmission controller	If causes 1 – 4 are not detected, transmission controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related



Failure code [DW2CKY] Transmission lubrication variable valve output circuit: Hot short

Action code	Failure code	Trouble	Transmission lubrication variable valve output circuit: Hot short (Transmission controller system)
E01	DW2CKY		
Contents of trouble	While signal is not output to transmission lubrication variable valve solenoid circuit, abnormal current flows.		
Action of controller	Stops outputting signal to transmission lubrication variable valve solenoid circuit.		
Problem that appears on machine	- Error [15*OMW] may be detected because of oil pressure reduction. - The transmission clutch may be damaged during travel in F1, F2 or F3.		
Related information	- Output state to transmission lubrication variable valve solenoid can be checked with monitoring function (Code: 38001 (mA)). - Signal is not output to transmission lubrication variable valve solenoid circuit until starting switch is turned OFF once.		

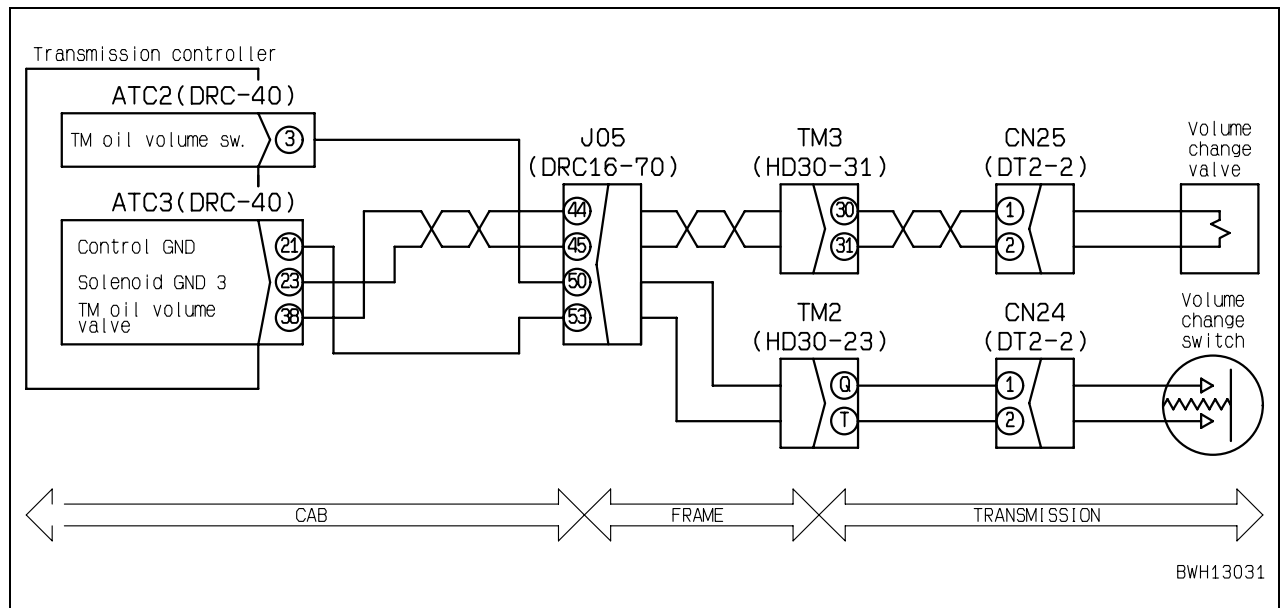
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DW2CKB].	

Failure code [DW2CL1] Transmission lubrication variable valve: Defective reset

Action code	Failure code	Trouble	Transmission lubrication variable valve: Defective reset (Transmission controller system)
E01	DW2CL1		
Contents of trouble	When outputting signal to transmission lubrication variable valve solenoid circuit is stopped, response of transmission lubrication variable valve pressure switch is abnormal.		
Action of controller	Stops outputting signal to transmission lubrication variable valve solenoid circuit.		
Problem that appears on machine	- Error [15*OMW] may be detected because of oil pressure reduction. - The transmission clutch may be damaged during travel in F1, F2 or F3.		
Related information	- Output state to transmission lubrication variable valve solenoid can be checked with monitoring function (Code: 38001 (mA)). - Signal is not output to transmission lubrication variable valve solenoid circuit until starting switch is turned OFF once.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective transmission lubrication variable valve pressure switch (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			CN24 (male)		Resistance
			Between (1) – (2)		Max. 10 Ω
	2	Defective transmission lubrication variable valve	Transmission lubrication variable valve may have mechanical trouble. Check it directly.		
	3	Defective hydraulic piping	Hydraulic piping may be defective. Check it directly.		
	4	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect CN26, then carry out troubleshooting without turning starting switch ON.		
			Between ATC2 (female) (3) – ground		Resistance Min. 1 MΩ
	5	Short circuit in wiring harness (with another wiring harness)	★ Turn starting switch OFF and disconnect CN26, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between ATC2 (female) (3) – ATC (female) (pin other than 3)		Resistance Min. 1 MΩ
	6	Hot short (Contact with 24 V circuit) in wiring harness	★ Turn starting switch OFF and insert T-adaptor in ATC2, then turn starting switch ON and carry out troubleshooting.		
			Between ATC2 (female) (3) – ground		Voltage Max. 1 V
	7	Defective transmission controller	If causes 1 – 6 are not detected, transmission controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related



Failure code [DW2CLH] Transmission lubrication variable valve: Malfunction

Action code	Failure code	Trouble	Transmission lubrication variable valve: Malfunction (Transmission controller system)
E01	DW2CLH		
Contents of trouble	When signal is output to transmission lubrication variable valve solenoid circuit, transmission lubrication variable valve pressure switch does not respond.		
Action of controller	Stops outputting signal to transmission lubrication variable valve solenoid circuit.		
Problem that appears on machine	If the machine keeps traveling as it is, fuel consumption increases.		
Related information	- Output state to transmission lubrication variable valve solenoid can be checked with monitoring function (Code: 38001 (mA)). - Signal is not output to transmission lubrication variable valve solenoid circuit until starting switch is turned OFF once.		

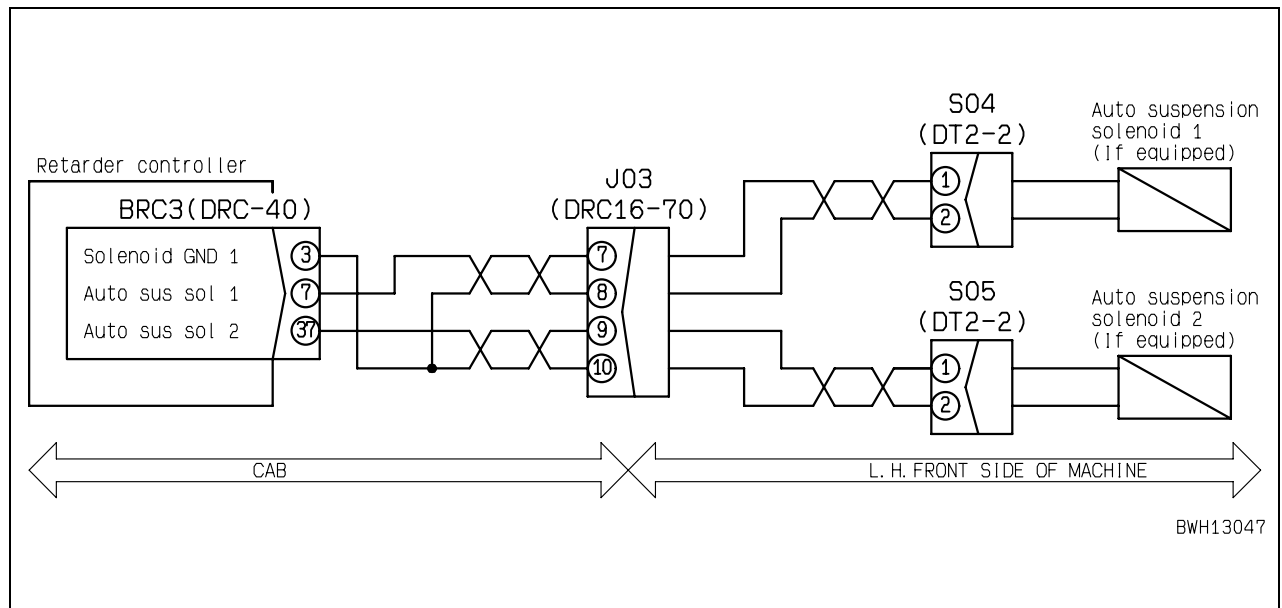
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DW2CL1].	

Failure code [DW35KZ] Failure in output system of auto suspension solenoid 1: Disconnection or short circuit

Action code	Failure code	Trouble	Failure in output system of auto suspension solenoid 1: Disconnection or short circuit (Retarder controller system)
E01	DW35KZ		
Contents of trouble	When the output to the auto suspension solenoid 1 circuit is ON, a too large current flows or any current does not flow. Or, some current is flowing while the output is OFF.		
Action of controller	The controller turns the output to auto suspension solenoid 1 and 2 OFF.		
Problem that appears on machine	The auto suspension system does not operate.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective auto suspension solenoid 1	1) Turn the starting switch OFF. 2) Disconnect connector S04. 3) Insert T-adapter.		
			Between S04 (female) (1) – (2)	Resistance	15 – 35 Ω
			Between S04 (female) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC3 and S04. 3) Connect T-adapter.		
			Wiring harness between BRC3 (female) (7) – S04 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between BRC3 (female) (3) – S04 (female) (2)	Resistance	Max. 1 Ω
	3	Hot short in wiring harness (Contact with power supply circuit)	1) Turn starting switch OFF. 2) Disconnect BRC3 and S04. 3) Connect T-adapter to BRC3 (female). 4) Turn starting switch ON.		
			Wiring harness between BRC3 (female) (7) – S04 (female) (1)	Voltage	Max. 1 V
	4	Defective retarder controller	1) Turn the starting switch OFF. 2) Disconnect connector BRC3. 3) Insert T-adapter.		
			Between BRC3 (female) (7) – ground	Resistance	15 – 35 Ω

Circuit diagram related

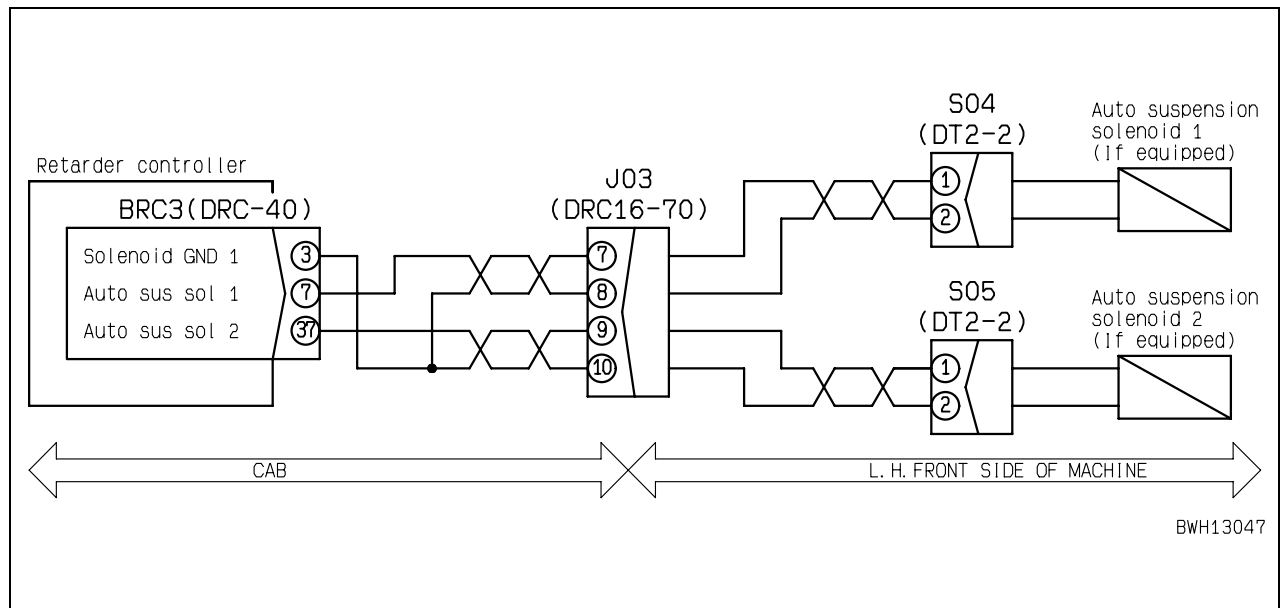


Failure code [DW36KZ] Failure in output system of auto suspension solenoid 2: Disconnection or short circuit

Action code	Failure code	Trouble	Failure in output system of auto suspension solenoid 2: Disconnection or short circuit (Retarder controller system)
E01	DW36KZ		
Contents of trouble	When the output to the auto suspension solenoid 2 circuit is ON, a too large current flows or any current does not flow. Or, some current is flowing while the output is OFF.		
Action of controller	The controller turns the output to auto suspension solenoid 1 and 2 OFF.		
Problem that appears on machine	The auto suspension system does not operate.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective auto suspension solenoid 2	1) Turn the starting switch OFF. 2) Disconnect connector S05. 3) Insert T-adapter.		
			Between S05 (female) (1) – (2)	Resistance	15 – 35 Ω
			Between S05 (female) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC3 and S05. 3) Connect T-adapter.		
			Wiring harness between BRC3 (female) (37) – S05 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between BRC3 (female) (3) – S05 (female) (2)	Resistance	Max. 1 Ω
	3	Hot short in wiring harness (Contact with power supply circuit)	1) Turn starting switch OFF. 2) Disconnect BRC3 and S05. 3) Connect T-adapter to BRC3 (female). 4) Turn starting switch ON.		
			Wiring harness between BRC3 (female) (37) – S05 (female) (1)	Voltage	Max. 1 V
	4	Defective retarder controller	1) Turn the starting switch OFF. 2) Disconnect connector BRC3. 3) Insert T-adapter.		
			Between BRC3 (female) (37) – ground	Resistance	15 – 20 Ω

Circuit diagram related

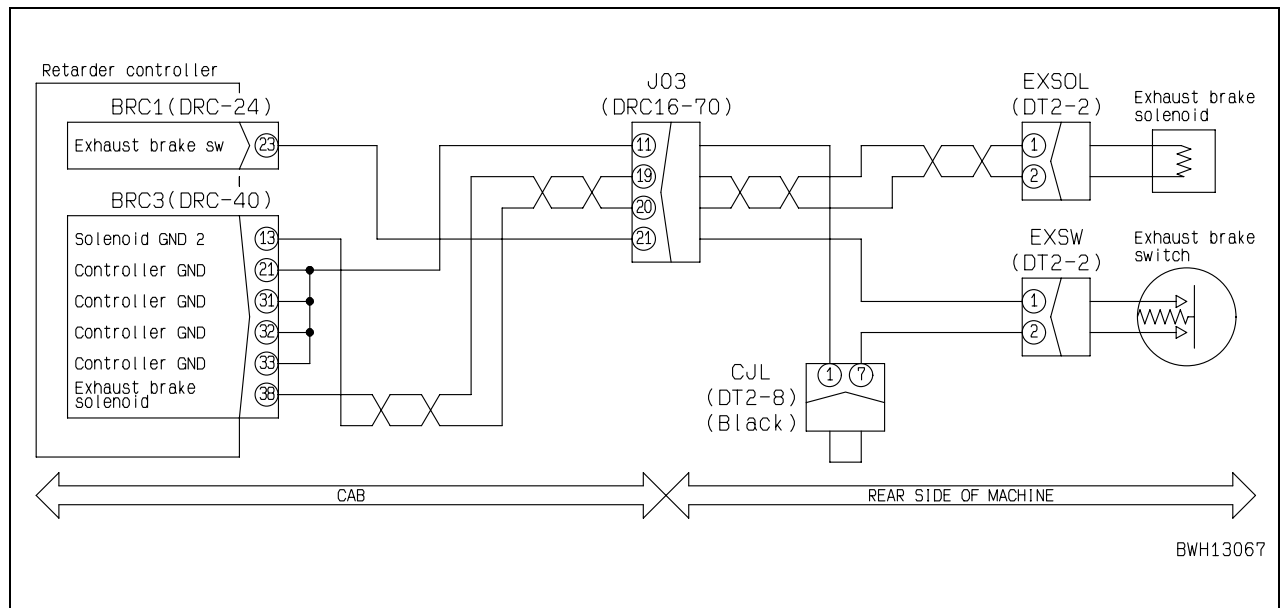


Failure code [DW71KZ] Exhaust brake output system trouble (Disconnection/Ground fault/Hot short)

Action code	Failure code	Trouble	Exhaust brake output system trouble (Disconnection/Ground fault/Hot short) (Retarder controller system)
E01	DW71KZ		
Contents of trouble	• Disconnection/Ground fault/Hot short of Exhaust brake solenoid.		
Action of controller	• Ground fault at the time of the detection, turn off exhaust brake and do not return normally unless turn off a start switch once. • Disconnection/Hot short fault at the time of the detection, continue control of exhaust brake.		
Problem that appears on machine	• Exhaust brake do not operate normally.		
Related information	• Condition of exhaust brake can be checked with monitoring function. (Code: 3 5900 exhaust brake OFF[0], ON[1])"		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective exhaust brake solenoid	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			EXSOL(male)		Resistance
			Between (1) – (2)		15 – 30 Ω
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between wiring harness BRC3 (female) (13) – EXSOL(female) (1)	Resistance	Max. 1 Ω
			Between wiring harness BRC3 (female) (38) – EXSOL(female) (2)	Resistance	Max. 1 Ω
	3	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between ground and wiring harness between BRC3 (female) (38) – EXSOL (female) (2)	Resistance	Min. 1 MΩ
	4	Hot short in wiring harness (Contact with power source wiring harness)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC3 and EXSOL. 3) Connect T-adaptor to BRC3 (female). 4) Turn the starting switch ON.		
			Between ground and wiring harness between BRC3 (female) (38) – EXSOL (female) (2)	Voltage	Max. 1 V
	5	Defective retarder controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between BRC3 (38) – (13)		Voltage
			Exhaust brake not operating		Max. 1 V
			Exhaust brake operating		20 – 30 V

Circuit diagram related

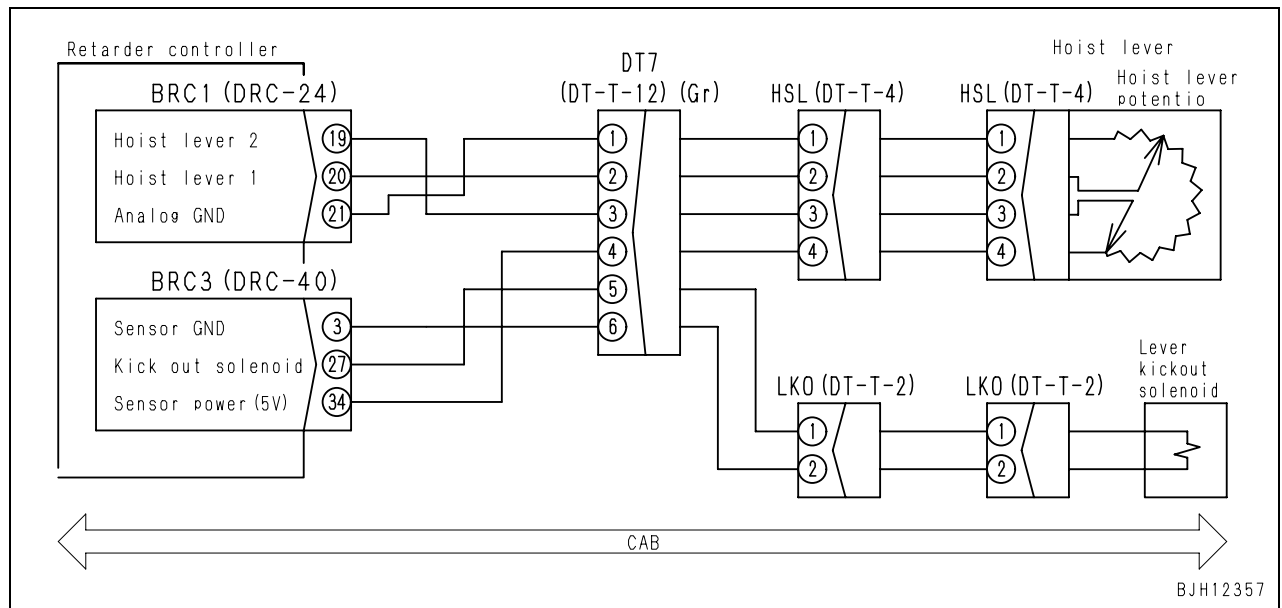


Failure code [DW72KZ] Kick-out solenoid output system trouble: Disconnection or short circuit

Action code	Failure code	Trouble	Kick-out solenoid output system trouble: Disconnection or short circuit (Retarder controller system)
E01	DW72KZ		
Contents of trouble	When signal is output to hoist lever kick-out solenoid circuit, large current flows or no current flows or when signal is not output, some current flows.		
Action of controller	Turns output to hoist lever kick-out solenoid OFF.		
Problem that appears on machine	Hoist lever is not locked by detent.		
Related information	- This phenomenon also occurs when signals from body potentiometer and sensor are abnormal. (See failure code DK54KX.) - When kick-out solenoid needs to be replaced, hoist lever must be replaced.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn the starting switch OFF. 2) Disconnect connector BRC3 and LK0. 3) Connect T-adapter.		
			Wiring harness between LK0 (female) (2) – ground	Resistance	Max. 1 Ω
			Wiring harness between BRC3 (female) (27) – LK0 (female) (1)	Resistance	Max. 1 Ω
	2	Defective hot short in wiring harness (a contact with 24 V circuit)	1) Turn the starting switch OFF. 2) Disconnect connector BRC3 and LK0. 3) Connect T-adapter to BRC3 (female). 4) Turn starting switch ON.		
			Wiring harness between BRC3 (female) (27) – LK0 (female) (1)	Voltage	Max. 1 V
	3	Defective hoist lever kick-out solenoid	1) Turn the starting switch OFF. 2) Disconnect connector LK0. 3) Connect T-adapter.		
			Between LK0 (male) (1) – (2)	Resistance	39 Ω ± 5 %
			Between LK0 (male) (1) and (2) – ground	Resistance	Min. 1 MΩ
	4	Defective retarder controller	1) Turn the starting switch OFF. 2) Disconnect connector BRC3. 3) Connect T-adapter.		
			Between BRC3 (female) (27) – ground	Resistance	39 Ω ± 5 %

Circuit diagram related

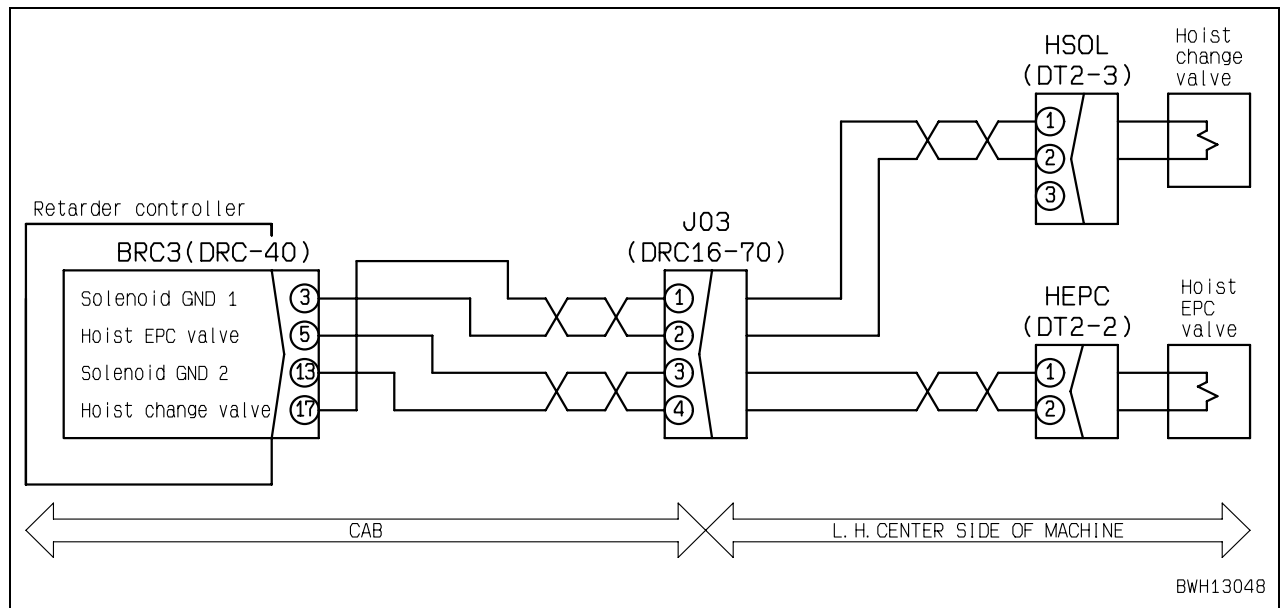


Failure code [DW73KZ] Failure in hoist select valve output system: Disconnection or short circuit

Action code	Failure code	Trouble	Failure in hoist select valve output system: Disconnection or short circuit (Retarder controller system)
E03	DW73KZ		
Contents of trouble	When the output to the hoist lever select valve solenoid circuit is ON, a too large current flows or any current does not flow. Or, some current is flowing while the output is OFF.		
Action of controller	- The controller turns the output to the hoist lever select valve solenoid OFF. - The controller turns the output to the hoist lever EPC valve solenoid OFF.		
Problem that appears on machine	Body does not operate.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC3 and HSOL. 3) Connect T-adapter.		
			Wiring harness between BRC3 (female) (3) – HSOL (female) (B)	Resistance	Max. 1 Ω
			Wiring harness between BRC3 (female) (17) – HSOL (female) (A)	Resistance	Max. 1 Ω
	2	Defective hot short in wiring harness (a contact with 24 V circuit)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC3 and HSOL. 3) Connect T-adapter to BRC3 (female). 4) Turn the starting switch ON.		
			Between ground and wiring harness between BRC3 (female) (17) – HSOL (female) (A)	Voltage	Max. 1 V
	3	Defective hoist lever select valve solenoid	1) Turn the starting switch OFF. 2) Disconnect connector HSOL. 3) Connect T-adapter.		
			Between HSOL (male) (A) – (B)	Resistance	15 – 35 Ω
			Between HSOL (male) (A), (B) – ground	Resistance	Min. 1 M Ω
	4	Defective retarder controller	1) Turn the starting switch OFF. 2) Disconnect connector HSOL. 3) Connect T-adapter.		
			Between BRC3 (female) (17) – (13)	Resistance	15 – 35 Ω

Circuit diagram related

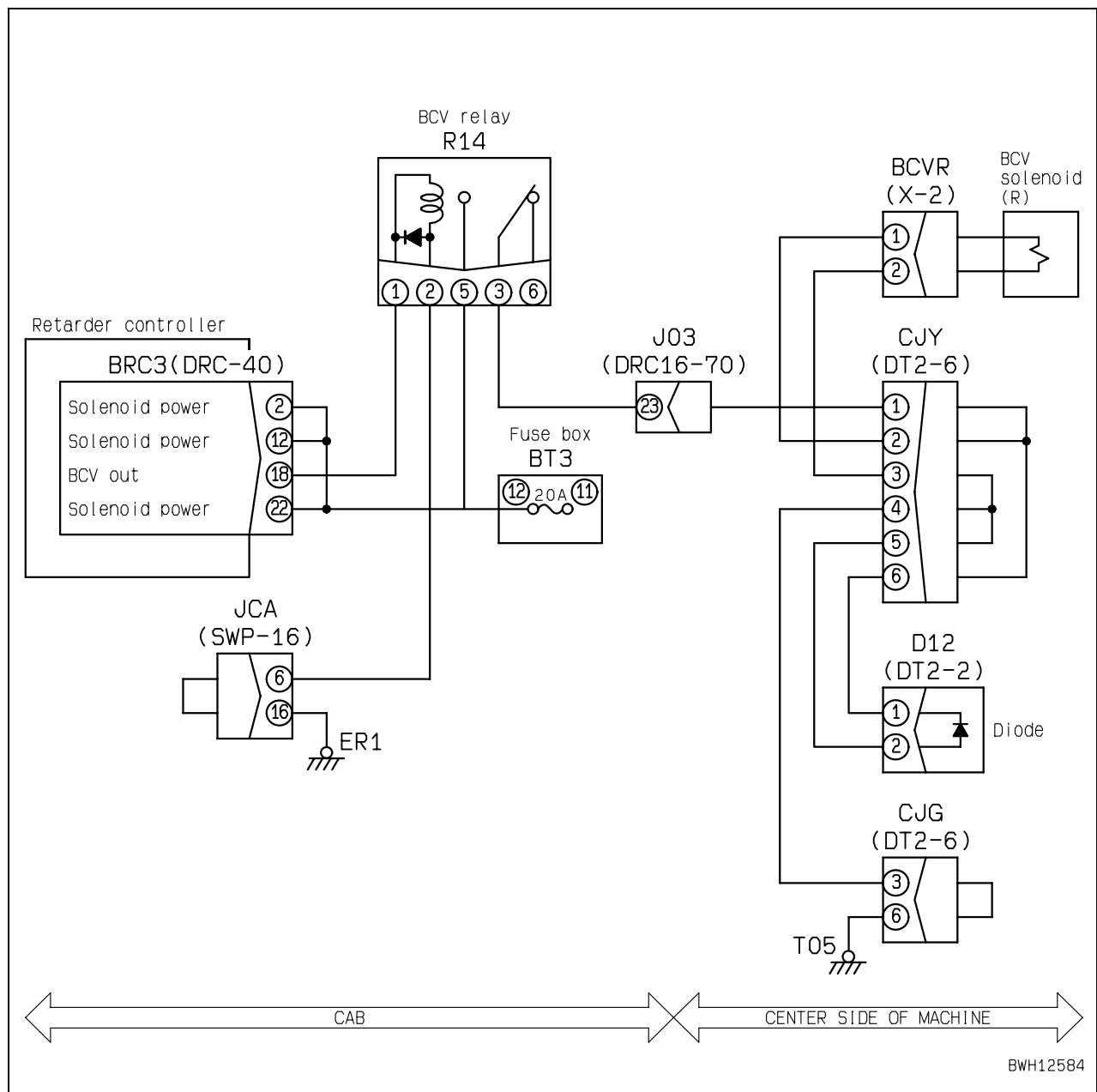


Failure code [DW78KZ] Brake cooling valve (BCV) (rear wheel) output system trouble: Disconnection or short circuit

Action code	Failure code	Trouble	Brake cooling valve (BCV) (rear wheel) output system trouble: Disconnection or short circuit (Retarder controller system)
E01	DW78KZ		
Contents of trouble	Since no current flows or overcurrent flows in BCV relay primary side, BCV relay cannot be turned ON/OFF. Accordingly, BCV solenoid cannot be driven.		
Action of controller	- Stops supplying current when BCV circuit is disconnected. - Turns output to BCV relay (R14) primary side OFF.		
Problem that appears on machine	Since retarder is not cooled, it may overheat.		
Related information	For troubleshooting for BCV relay (R14) secondary side, see [B@C7NS].		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective R14 (BCV relay)	★ Turn starting switch OFF and disconnect R14 (BCV relay), then carry out troubleshooting without turning starting switch ON.		
			R14 (female: Wiring harness side)	Resistance	
			Between (1) – (2)	100 – 500 Ω	
	2	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect R14 (BCV relay), then carry out troubleshooting without turning starting switch ON.		
			Between R14 (female) (1) – ground	Resistance	Min. 1 MΩ
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Turn starting switch OFF and disconnect R14 (BCV relay) and BRC3, then carry out troubleshooting without turning starting switch ON.		
			Between BRC3 (female) (18) – R14 (female) (1)	Resistance	Max. 1 Ω
			Between ER1 (ground) – R14 (female) (2)	Resistance	Max. 1 Ω
	4	Defective retarder controller	If causes 1 – 4 are not detected, retarder controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related

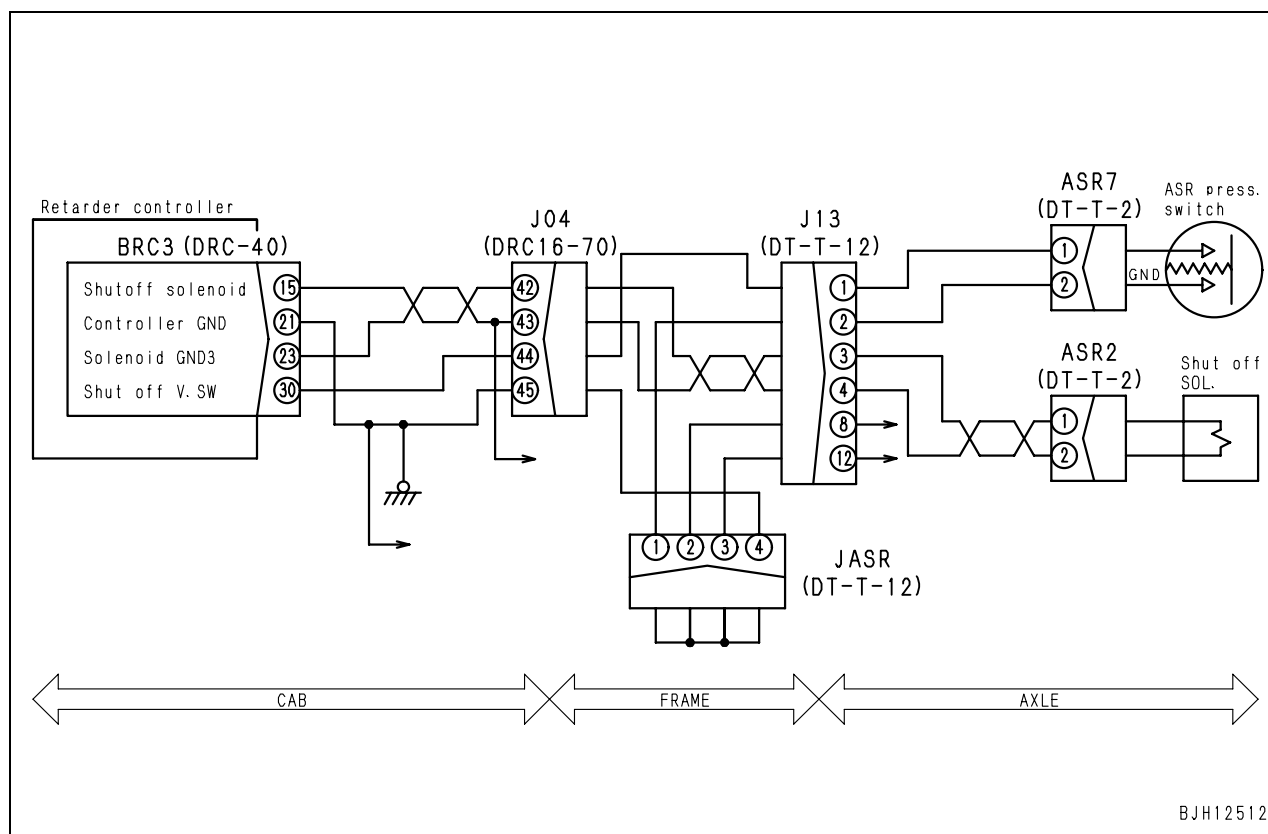


Failure code [DWNBK4] ASR shut-off valve: Trouble (Valve keeps operating)

Action code	Failure code	Trouble	ASR shut-off valve: Trouble (Valve keeps operating) (Retarder controller system)
E01	DWNBK4		
Contents of trouble	• ASR pressure sensor does not respond to shut-off valve OFF command of retarder controller.		
Action of controller	• Stops controlling ASR.		
Problem that appears on machine	• ASR is not controlled normally.		
Related information	• Sensor is turned OFF when pressure is 0.3 MPa {3 kg/cm²} or less. (In range of 0.3 MPa {3 kg/cm²} – 0.7 MPa {7 kg/cm²} , operation of sensor is unstable because of hysteresis.) • If ASR shut-off valve has electrical trouble, code [DWNBKA], [DWNBKB] or [DWNBKY] is output.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective ASR shut-off valve	★ ASR shut-off valve may have mechanical trouble. Check it directly. 1) Turn starting switch ON. 2) Turn ASR switch ON/OFF.		
			Operating sound of ASR shut-off valve solenoid is heard.		
	2	Defective ASR pressure sensor	1) Turn starting switch OFF. 2) Disconnect ASR7. 3) Prepare and turn starting switch ON. 4) Turn ASR switch ON and OFF and carry out troubleshooting.		
			ASR7 (male) (1) – (2)	Resistance	
			Turn ASR switch OFF	Min. 1 MΩ	
			Turn ASR switch ON	Max. 1 Ω	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Turn starting switch OFF and disconnect ASR7 and BRC3, then carry out troubleshooting without turning starting switch ON.		
			Between ASR7 (female) (1) – BRC3 (female) (30)	Resistance	Max. 1 Ω
			Between ASR7 (female) (2) – BRC3 (female) (21)	Resistance	Max. 1 Ω
	4	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect ASR7, then carry out troubleshooting without turning starting switch ON.		
			Between ASR7 (female) (1) – ground	Resistance	Min. 1 MΩ
	5	Defective retarder controller	If causes 1 – 4 are not detected, retarder controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related

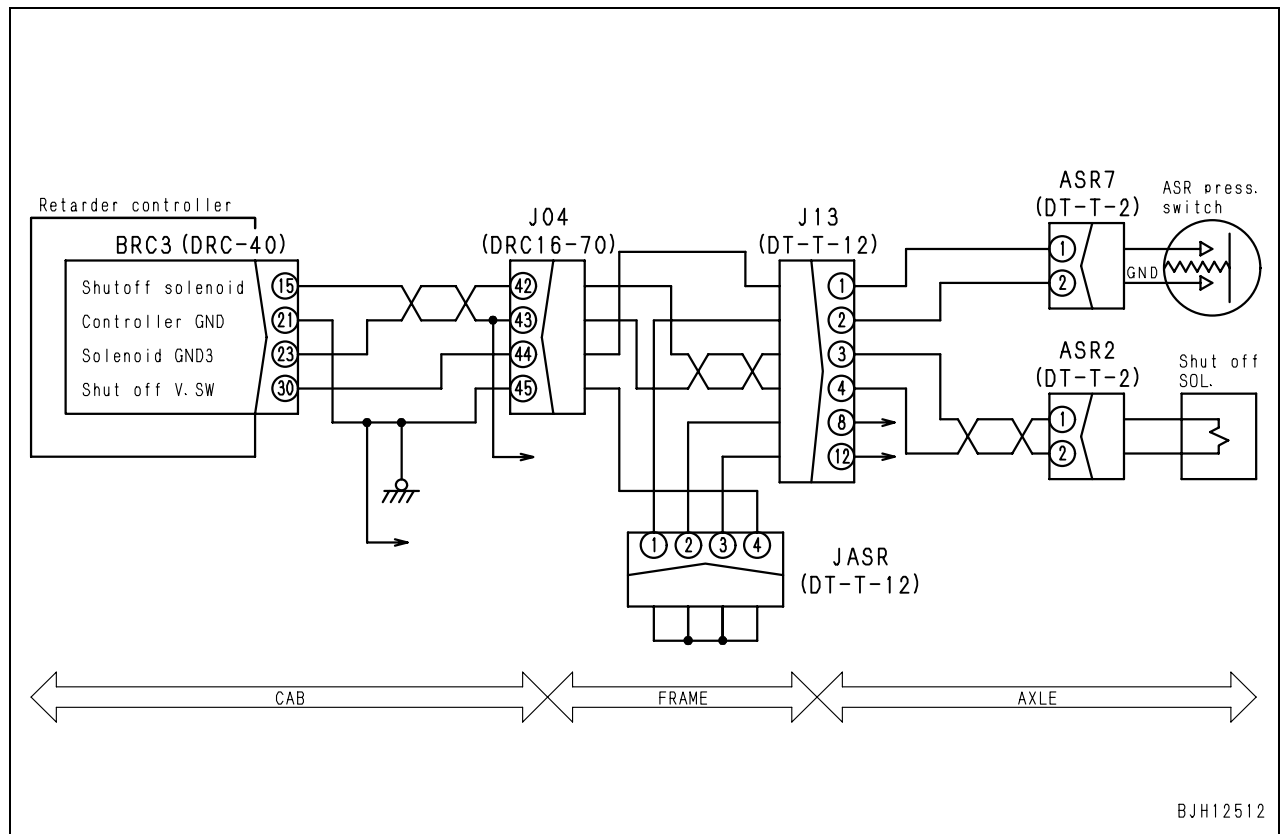


Failure code [DWNBKA] ASR shut-off valve output circuit: Disconnection

Action code	Failure code	Trouble	ASR shut-off valve output circuit: Disconnection (Retarder controller system)
E01	DWNBKA		
Contents of trouble	When signal is output to ASR shut-off valve solenoid circuit, no current flows.		
Action of controller	Stops controlling ASR.		
Problem that appears on machine	ASR is not controlled normally.		
Related information	Signal is not output to ASR shut-off valve solenoid circuit until starting switch is turned OFF once.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective ASR shut-off valve solenoid (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			ASR2 (male)		Resistance
			Between (1) – (2)		5 – 15 Ω
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON. (When check result of Cause 1 is normal)		
			Between J04 (male) (42) – (43)		Resistance 5 – 15 Ω
			Between BRC3 (female) (15) – (23)		Resistance 5 – 15 Ω
	3	Defective retarder controller	If causes 1 and 2 are not detected, retarder controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related

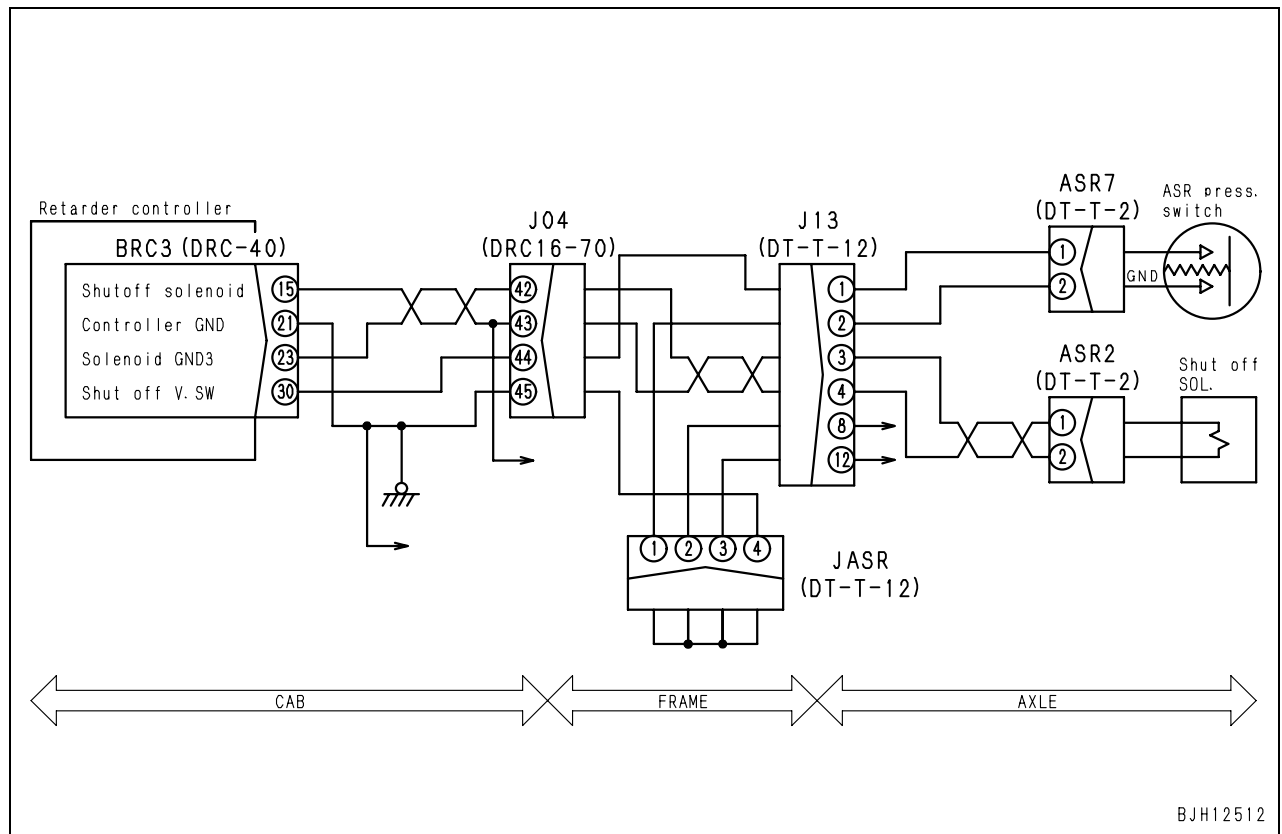


Failure code [DWNBKB] ASR shut-off valve output circuit: Ground fault

Action code	Failure code	Trouble	ASR shut-off valve output circuit: Ground fault (Retarder controller system)
E01	DWNBKB		
Contents of trouble	When signal is output to ASR shut-off valve solenoid circuit, abnormal current flows.		
Action of controller	Stops controlling ASR.		
Problem that appears on machine	ASR is not controlled normally.		
Related information	Signal is not output to ASR shut-off valve solenoid circuit until starting switch is turned OFF once.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective ASR shut-off valve solenoid (Internal short circuit)	★ Turn starting switch OFF and disconnect ASR2, then carry out troubleshooting without turning starting switch ON.		
			ASR2 (male)		Resistance
			Between (1) – (2)		5 – 15 Ω
	2	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect BRC3 and ASR2, then carry out troubleshooting without turning starting switch ON.		
			Between BRC3 (female) (15) – ground		Resistance Min. 1 MΩ
	3	Short circuit in wiring harness (with another wiring harness)	★ Turn starting switch OFF and disconnect BRC3 and ASR2, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between BRC3 (female) (15) – BRC3 (female) (pin other than (15))		Resistance Min. 1 MΩ
	4	Hot short (Contact with 24 V circuit) in wiring harness	★ Turn starting switch OFF and insert T-adapter in BRC3, then turn starting switch ON and carry out troubleshooting.		
			Between BRC3 (female) (37) – ground		Voltage Max. 1 V
	5	Defective retarder controller	If causes 1 – 4 are not detected, retarder controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related



Failure code [DWNBKY] ASR shut-off valve output circuit: Short circuit

Action code	Failure code	Trouble	ASR shut-off valve output circuit: Short circuit (Retarder controller system)
E01	DWNBKY		
Contents of trouble	• When signal is output to ASR shut-off valve solenoid circuit, abnormal current flows.		
Action of controller	• Stops controlling ASR.		
Problem that appears on machine	• ASR is not controlled normally.		
Related information	• Signal is not output to ASR shut-off valve solenoid circuit until starting switch is turned OFF once.		

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DWNBKB].	

Failure code [DWNBMA] ASR shut-off valve: Trouble (Valve does not operate)

Action code	Failure code	Trouble	ASR shut-off valve: Trouble (Valve does not operate) (Retarder controller system)
E01	DWNBMA		
Contents of trouble	• Sensor does not respond to shut-off valve ON command of retarder controller.		
Action of controller	• Stops controlling ASR.		
Problem that appears on machine	• Retarder is not controlled normally. • ASR is not controlled normally.		
Related information	• Sensor is turned ON when pressure is 0.7 MPa {7 kg/cm²} or above. (In range of 0.3 MPa {3 kg/cm²} – 0.7 MPa {7 kg/cm²} , operation of sensor is unstable because of hysteresis.) • If ASR shut-off valve has electrical trouble, code [DWNBKA], [DWNBKB] or [DWNBKY] is output.		

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DWNBK4].	

HD785-7 Dump truck

Form No. SEN01945-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

40 Troubleshooting

Troubleshooting by failure code, Part 9

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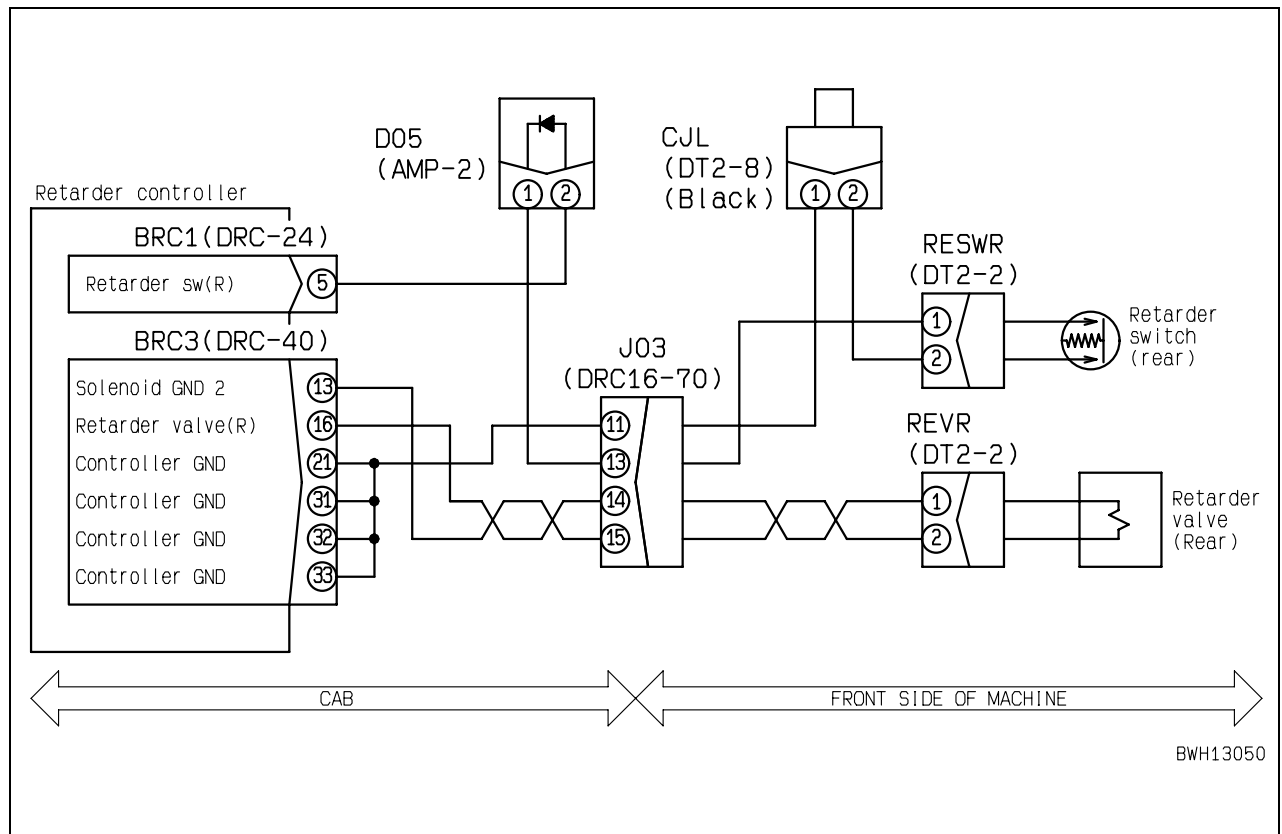
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Failure code [DX11K4] Rear brake proportional pressure reducing solenoid valve: Out of control

Action code	Failure code	Trouble	Rear brake proportional pressure reducing solenoid valve: Out of control (Valve is stuck in operated condition) (Retarder controller system)
E03	DX11K4		
Contents of trouble	• Rear brake proportional pressure reducing solenoid valve and solenoid keep operating and do not return or their condition cannot be judged normally because of defect in sensor switch after they return.		
Action of controller	• Continues control.		
Problem that appears on machine	• If solenoid is defective, rear brake drags. • If switch is defective or switch input circuit has ground fault, gear shift-up operation becomes difficult and gear shift-down operation becomes easy.		
Related information	• Retarder oil pressure switch state can be checked with monitoring function (Code: 40932) (bit [3], 0:OFF, 1:ON).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective rear brake proportional pressure reducing solenoid valve	• Check rear brake proportional pressure reducing solenoid valve. If there is an abnormality (mechanical failure), repair or replace it.			
	2	Defective rear brake proportional pressure reducing solenoid	1) Turn starting switch OFF. 2) Connect T-adapter to connector REVR (male).			
			Between REVR (male) (1) – (2)	Oil pressure is ON.	Resistance	Max. 1 Ω
				Oil pressure is OFF.	Resistance	Min. 1 MΩ
	3	Defective retarder pressure switch	1) Turn starting switch OFF. 2) Connect T-adapter to connector RESWR. 3) Start engine.			
			RESWR	Retarder	Voltage	
			Between (1) – (2)	When not operated	20 – 30 V	
				When operated	Max. 1 V	
	4	Defective harness grounding (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors BRC1 and RESWR. 3) Connect T-adapter to BRC1 (female).			
			Between ground and wiring harness between BRC1 (female) (5) – RESWR (female) (1)		Resistance	Min. 1 MΩ
	5	Defective retarder controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector BRC3 (female).			
			Between BRC3 (16) – (13)	Oil pressure is ON.	Voltage	Max. 1 V
Oil pressure is OFF.				Voltage	20 – 30 V	

Circuit diagram related

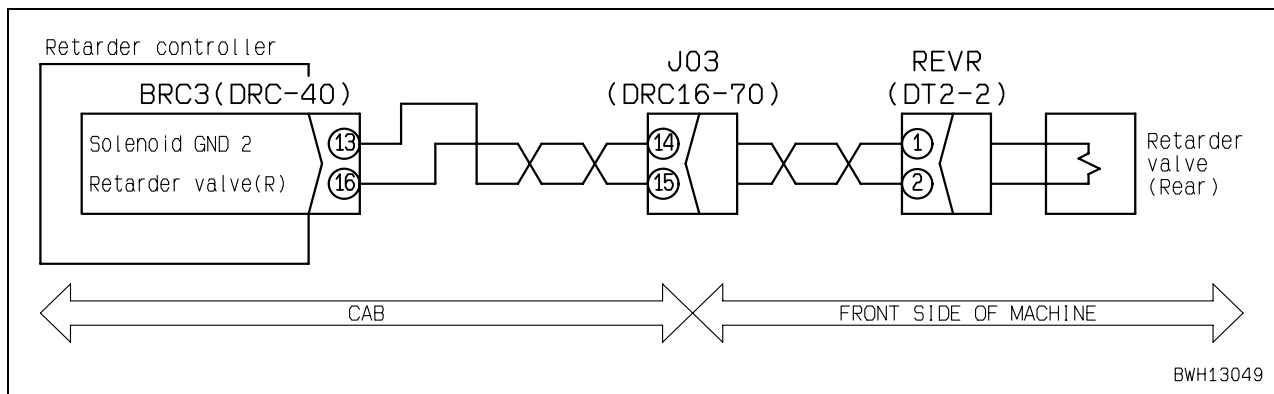


Failure code [DX11KA] Rear brake proportional pressure reducing solenoid valve output circuit: Disconnection

Action code	Failure code	Trouble	Rear brake proportional pressure reducing solenoid valve output circuit: Disconnection (Retarder controller system)
E03	DX11KA		
Contents of trouble	• When output to rear brake proportional pressure reducing valve solenoid circuit is ON, current does not flow.		
Action of controller	• Turn output to rear brake proportional pressure reducing valve solenoid OFF.		
Problem that appears on machine	• Retarder (rear brake) does not operate.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective rear brake proportional pressure reducing solenoid valve	1) Turn starting switch OFF. 2) Connect T-adaptor to connector REVR (male).		
			Between REVR (male) (1) – (2)	Resistance	10 – 30 Ω
			Between REVR (female) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adaptor to connectors BRC3 (female) and REVR (female).		
			Wiring harness between BRC3 (female) (16) – REVR (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between BRC3 (female) (13) – REVR (female) (2)	Resistance	Max. 1 Ω
	3	Defective retarder controller	1) Turn starting switch OFF. 2) Connect T-adaptor to connector BRC3 (female).		
			Between BRC3 (female) (16) – (13)	Resistance	10 – 30 Ω

Circuit diagram related

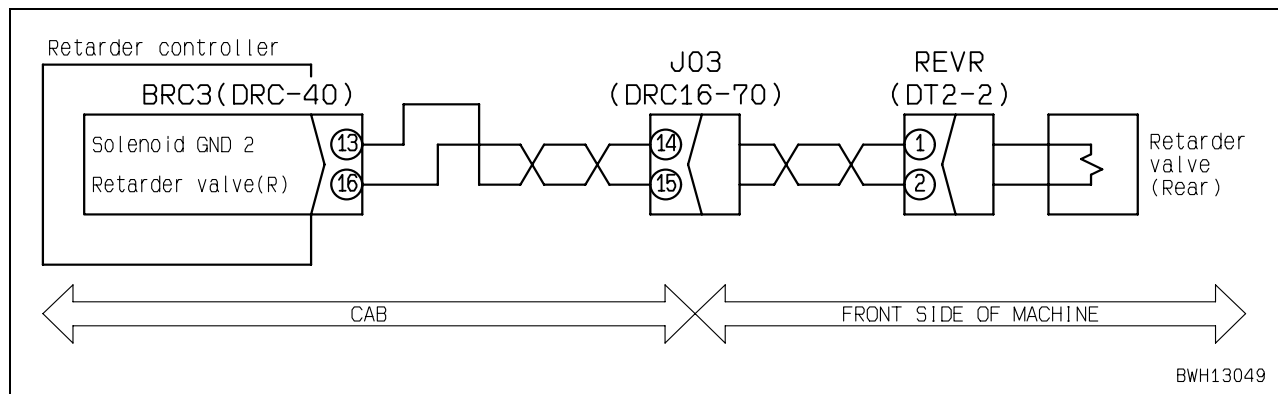


Failure code [DX11KB] Rear brake proportional pressure reducing solenoid valve: Short circuit

Action code	Failure code	Trouble	Rear brake proportional pressure reducing solenoid valve: Short circuit (Retarder controller system)
E03	DX11KB		
Contents of trouble	• When output to solenoid circuit of rear brake proportional pressure reducing valve is turned ON, much current flows.		
Action of controller	• Turns output to solenoid circuit of rear brake proportional pressure reducing valve OFF.		
Problem that appears on machine	• Retarder (rear brake) does not operate.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective rear brake proportional pressure reducing solenoid valve	1) Turn starting switch OFF. 2) Connect T-adaptor to connector REVR (male).		
			Between REVR (male) (1) – (2)	Resistance	10 – 30 Ω
			Between REVR (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Short circuit of harness (Contact with ground circuit or contact between harnesses)	1) Turn starting switch OFF. 2) Disconnect connectors BRC3 and REVR. 3) Connect T-adaptor to BRC3 (female).		
			Between ground and wiring harness between BRC3 (female) (16) – REVR (female) (1)	Resistance	Min. 1 MΩ
			Between wiring harness from BRC3 (female) (16) – REVR (female) (1) and wiring harness from BRC3 (female) (13) – REVR (female) (2)	Resistance	Min. 1 MΩ
	3	Defective retarder controller	1) Turn starting switch OFF. 2) Connect T-adaptor to BRC3 (female).		
			Between BRC3 (female) (16) – (13)	Resistance	10 – 30 Ω

Circuit diagram related

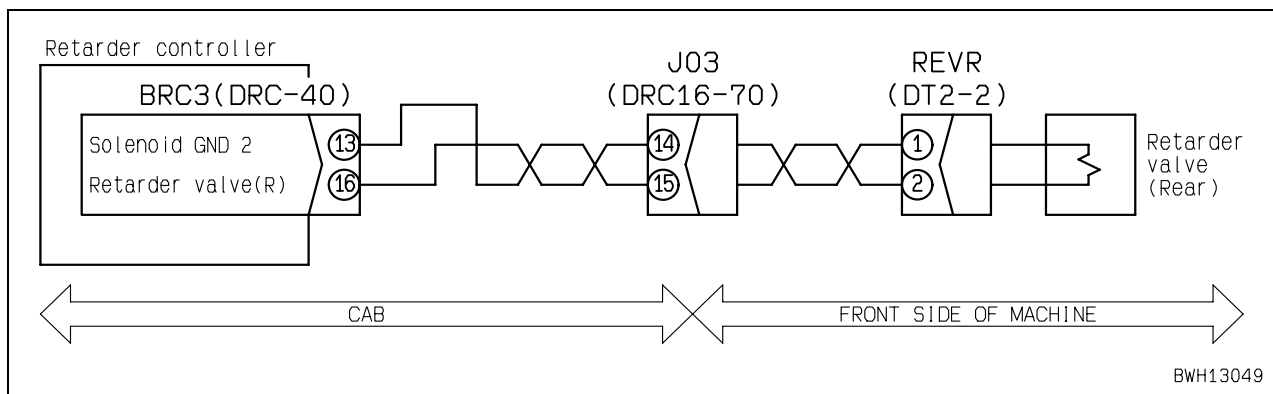


Failure code [DX11KY] Rear brake proportional pressure reducing solenoid valve: Short circuit to power source line

Action code	Failure code	Trouble	Rear brake proportional pressure reducing solenoid valve: Short circuit to power source line (Retarder controller system)
E03	DX11KY		
Contents of trouble	When output to rear brake proportional pressure reducing valve solenoid circuit is OFF, electric current flows.		
Action of controller	Turn output to rear brake proportional pressure reducing valve solenoid OFF.		
Problem that appears on machine	Retarder (rear brake) does not operate.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective rear brake proportional pressure reducing solenoid valve	1) Turn starting switch OFF. 2) Connect T-adaptor to connector REVR (male).		
			Between REVR (male) (1) – (2)	Resistance	10 – 30 Ω
			Between REVR (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Hot short in wiring harness (a contact with 24 V circuit)	1) Turn starting switch OFF. 2) Disconnect connectors BRC3 and REVR. 3) Connect T-adaptor to BRC3 (female). 4) Turn starting switch ON.		
			Between ground and wiring harness between BRC3 (female) (16) – REVR (female) (1)	Voltage	Max. 1 V
	3	Defective retarder controller	1) Turn starting switch OFF. 2) Connect T-adaptor to BRC3 (female).		
			Between BRC3 (female) (16) – (13)	Resistance	10 – 30 Ω

Circuit diagram related

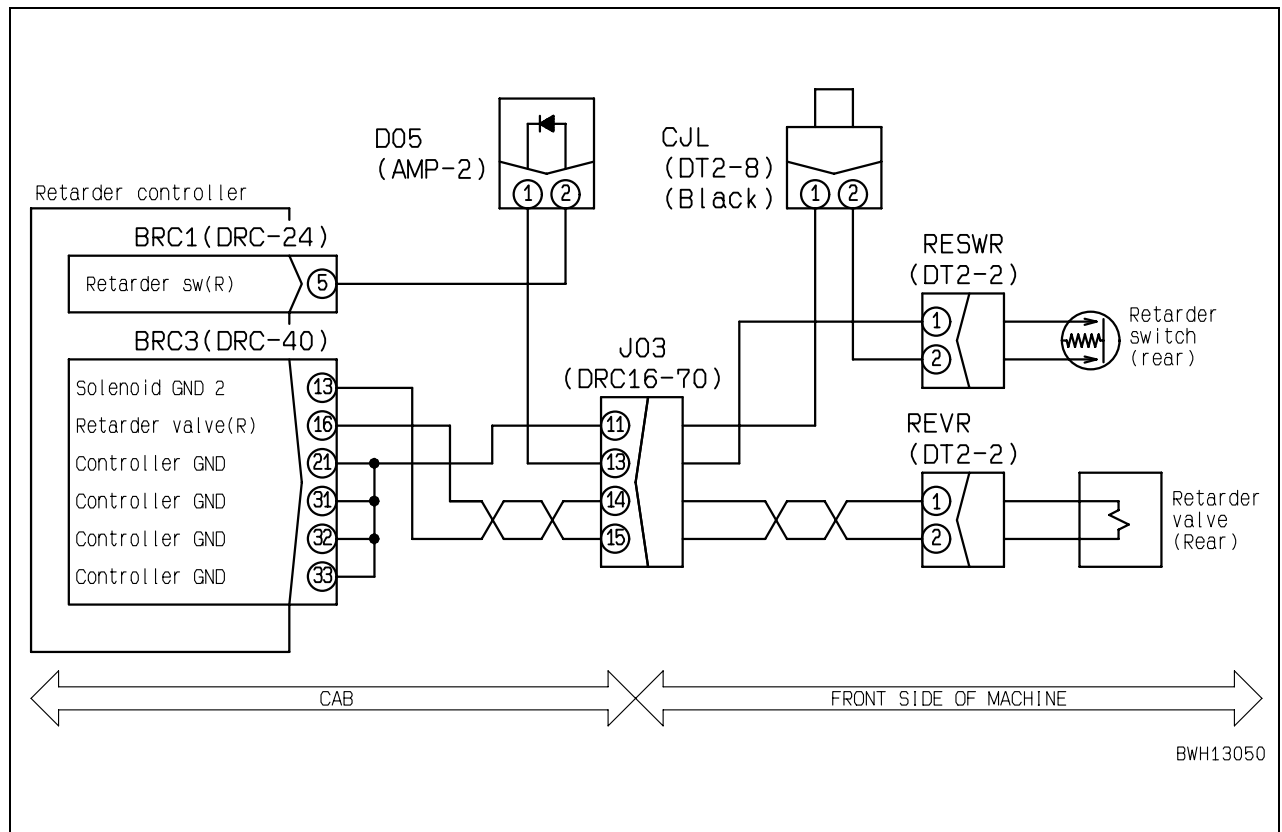


Failure code [DX11MA] Rear brake proportional pressure reducing solenoid valve: Malfunction

Action code	Failure code	Trouble	Rear brake proportional pressure reducing solenoid valve: Malfunction (Retarder controller system)
E03	DX11MA		
Contents of trouble	Rear brake proportional pressure reducing solenoid valve and solenoid keep operating and do not return or their condition cannot be judged normally because of defect in sensor switch after they return.		
Action of controller	Continues control.		
Problem that appears on machine	- If solenoid is defective, rear brake drags. - If switch is defective or switch input circuit has disconnection, condition does not change.		
Related information	Condition of retarder oil pressure switch can be checked with monitoring function (Code: 40932) (bit [3], 0:OFF, 1:ON).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective rear brake proportional pressure reducing solenoid valve	• Check rear brake proportional pressure reducing solenoid valve. If there is an abnormality (mechanical failure), repair or replace it.			
	2	Defective rear brake proportional pressure reducing solenoid	1) Turn starting switch OFF. 2) Connect T-adapter to connector REVR.			
			Between REVR (male) (1) – (2)	Oil pressure is ON.	Resistance	Max. 1 Ω
				Oil pressure is OFF.	Resistance	Min. 1 MΩ
	3	Defective retarder pressure switch	1) Turn starting switch OFF. 2) Insert T-adapter in connector RESWR. 3) Start engine.			
			RESWR	Retarder	Voltage	
			Between (1) – (2)	When not operated	20 – 30 V	
				When operated	Max. 1 V	
	4	Defective harness grounding (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors BRC1 and RESWR. 3) Connect T-adapter to BRC1.			
			Between ground and wiring harness between BRC1 (female) (5) – RESWR (female) (1)		Resistance	Min. 1 MΩ
	5	Defective retarder controller	1) Turn starting switch OFF. 2) Insert T-adapter in connector BRC3. 3) Turn starting switch ON.			
			Between BRC3 (16) – (13)	Oil pressure is ON.	Voltage	Max. 1 V
Oil pressure is OFF.				Voltage	20 – 30 V	

Circuit diagram related

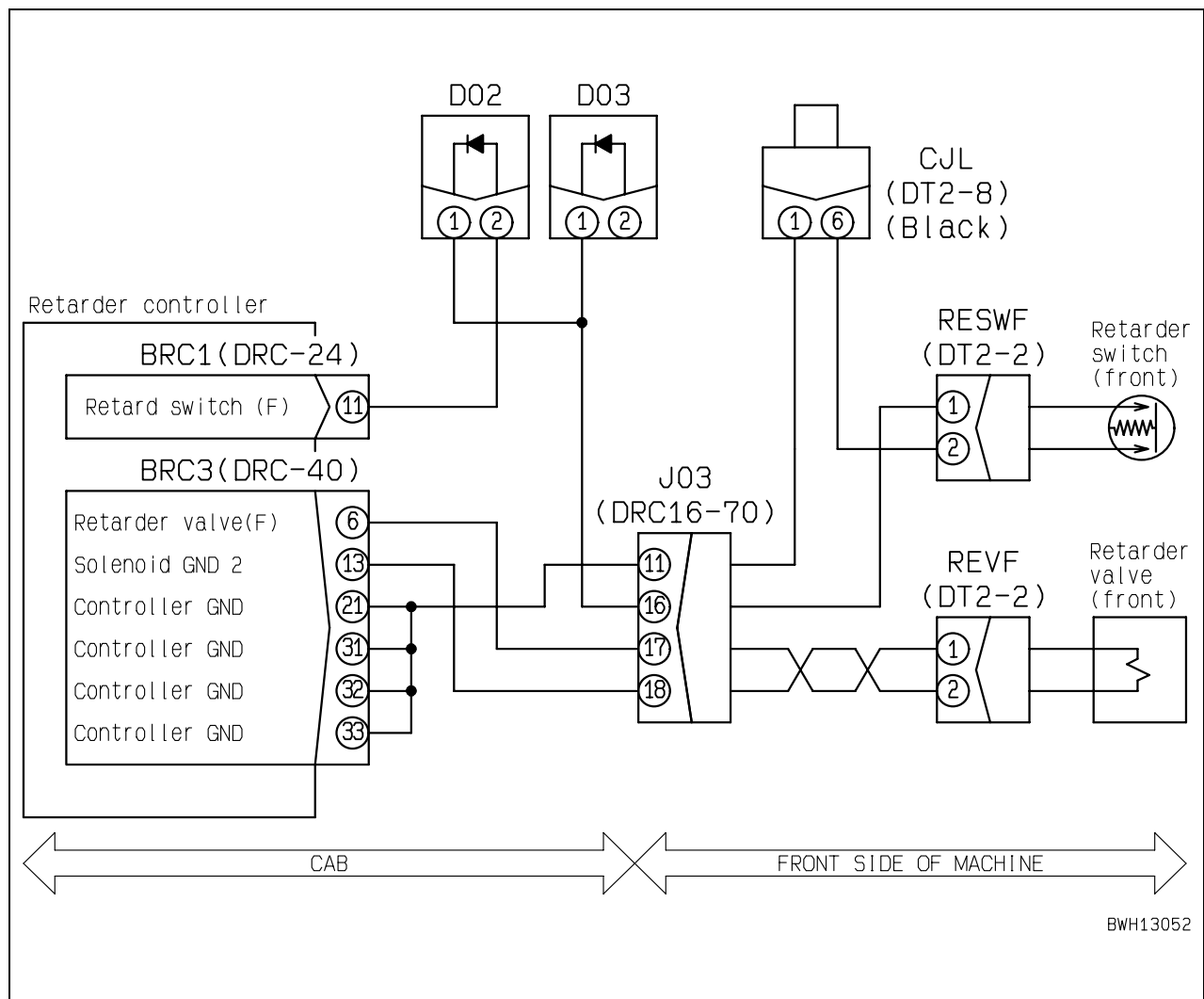


Failure code [DX12K4] Front brake proportional pressure reducing solenoid valve: Out of control

Action code	Failure code	Trouble	Front brake proportional pressure reducing solenoid valve: Out of control (Valve is stuck in operated condition) (Retarder controller system)
E03	DX12K4		
Contents of trouble	Front brake proportional pressure reducing solenoid valve and solenoid keep operating and do not return or their condition cannot be judged normally because of defect in sensor switch after they return.		
Action of controller	Continues control.		
Problem that appears on machine	- If solenoid is defective, front brake drags. - If switch is defective or switch input circuit has ground fault, gear shift-up operation becomes difficult and gear shift-down operation becomes easy.		
Related information	Retarder oil pressure switch state can be checked with monitoring function (Code: 40932) (bit [2], 0:OFF, 1:ON).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective front brake proportional pressure reducing solenoid valve	• Check front brake proportional pressure reducing solenoid valve. If there is an abnormality (mechanical failure), repair or replace it.			
	2	Defective front brake proportional pressure reducing solenoid	1) Turn starting switch OFF. 2) Connect T-adapter to connector REVF (male).			
			Between REVF (male) (1) – (2)	Oil pressure is ON.	Resistance	Max. 1 Ω
				Oil pressure is OFF.	Resistance	Min. 1 MΩ
	3	Defective retarder pressure switch	1) Turn starting switch OFF. 2) Connect T-adapter to connector RESWF. 3) Start engine.			
			RESWF	Retarder	Voltage	
			Between (1) – (2)	When not operated	20 – 30 V	
				When operated	Max. 1 V	
	4	Defective harness grounding (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors BRC1 and RESWF. 3) Connect T-adapter to BRC1 (female).			
			Between ground and wiring harness between BRC1 (female) (11) – RESWF (female) (1)		Resistance	Min. 1 MΩ
	5	Defective retarder controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector BRC3 (female).			
			Between BRC3 (6) – (13)	Oil pressure is ON.	Voltage	Max. 1 V
				Oil pressure is OFF.	Voltage	20 – 30 V

Circuit diagram related

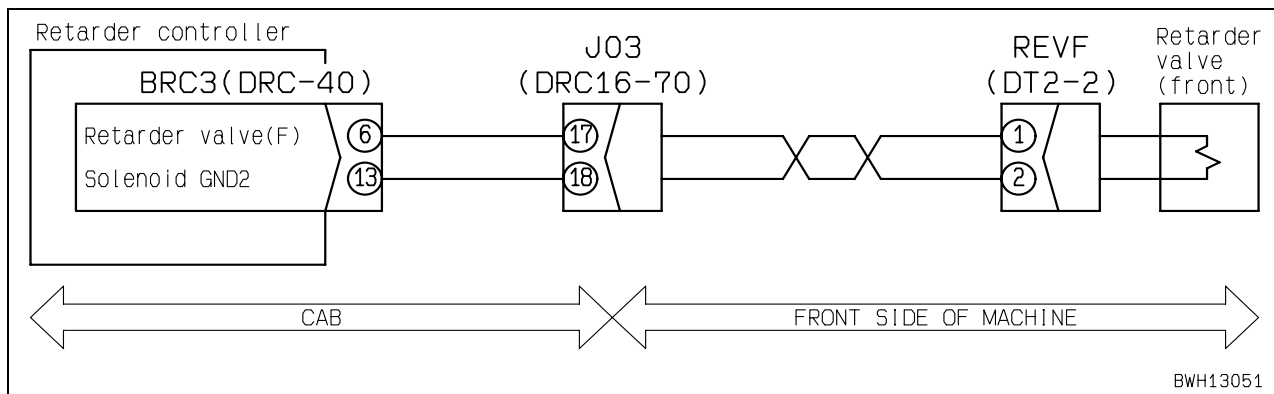


Failure code [DX12KA] Front brake proportional pressure reducing solenoid valve output circuit: Disconnection

Action code	Failure code	Trouble	Front brake proportional pressure reducing solenoid valve output circuit: Disconnection (Retarder controller system)
E03	DX12KA		
Contents of trouble	When output to front brake proportional pressure reducing valve solenoid circuit is ON, current does not flow.		
Action of controller	Turn output to front brake proportional pressure reducing valve solenoid OFF.		
Problem that appears on machine	Retarder (front brake) does not operate.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective front brake proportional pressure reducing solenoid valve	1) Turn starting switch OFF. 2) Connect T-adaptor to connector REVF (male).		
			Between REVF (male) (1) – (2)	Resistance	10 – 30 Ω
			Between REVF (female) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adaptor to connectors BRC3 (female) and REVF (female).		
			Wiring harness between BRC3 (female) (6) – REVF (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between BRC3 (female) (13) – REVF (female) (2)	Resistance	Max. 1 Ω
	3	Defective retarder controller	1) Turn starting switch OFF. 2) Connect T-adaptor to connector BRC3 (female).		
			Between BRC3 (female) (6) – (13)	Resistance	10 – 30 Ω

Circuit diagram related

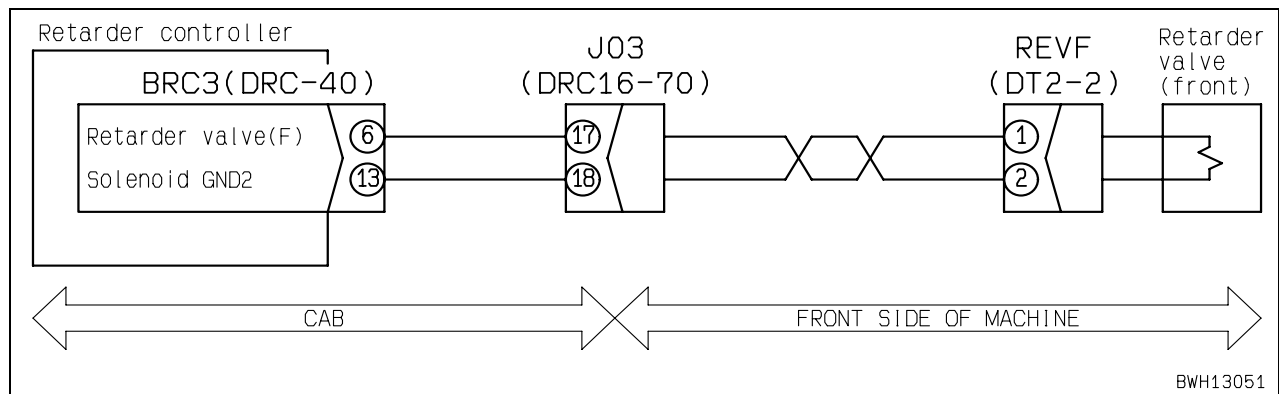


Failure code [DX12KB] Front brake proportional pressure reducing solenoid valve: Short circuit

Action code	Failure code	Trouble	Front brake proportional pressure reducing solenoid valve: Short circuit (Retarder controller system)
E03	DX12KB		
Contents of trouble	When output to solenoid circuit of front brake proportional pressure reducing valve is turned ON, much current flows.		
Action of controller	Turns output to solenoid circuit of front brake proportional pressure reducing valve OFF.		
Problem that appears on machine	Retarder (front brake) does not operate.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective front brake proportional pressure reducing solenoid valve	1) Turn starting switch OFF. 2) Connect T-adapter to connector REVF (male).		
			Between REVF (male) (1) – (2)	Resistance	10 – 30 Ω
			Between REVF (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Short circuit of harness (Contact with ground circuit or contact between harnesses)	1) Turn starting switch OFF. 2) Disconnect connectors BRC3 and REVF. 3) Connect T-adapter to BRC3 (female).		
			Between ground and wiring harness between BRC3 (female) (6) – REVF (female) (1)	Resistance	Min. 1 MΩ
			Between wiring harness from BRC3 (female) (6) – REVF (female) (1) and wiring harness from BRC3 (female) (13) – REVF (female) (2)	Resistance	Min. 1 MΩ
	3	Defective retarder controller	1) Turn starting switch OFF. 2) Connect T-adapter to BRC3 (female).		
			Between BRC3 (female) (16) – (13)	Resistance	10 – 30 Ω

Circuit diagram related

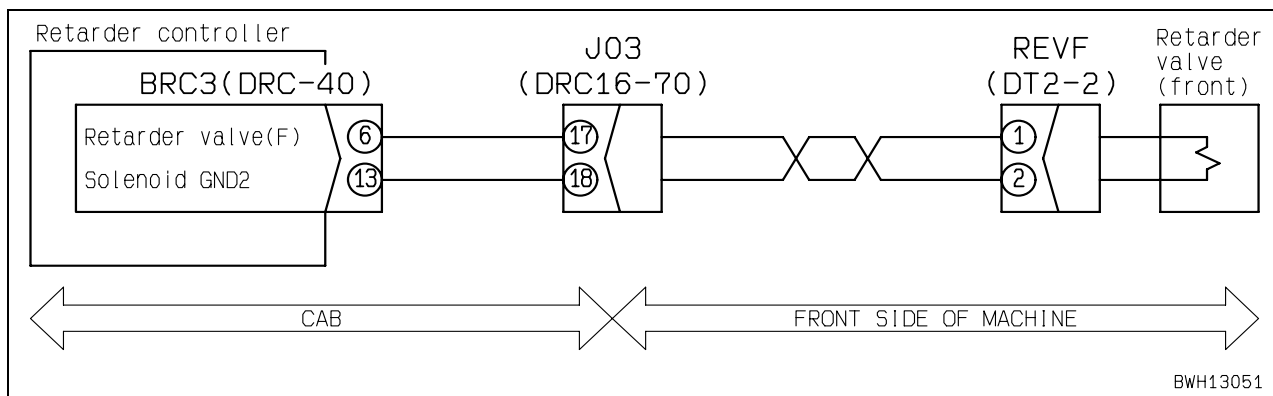


Failure code [DX12KY] Front brake proportional pressure reducing solenoid valve: Short circuit to power source line

Action code	Failure code	Trouble	Front brake proportional pressure reducing solenoid valve: Short circuit to power source line (Retarder controller system)
E03	DX12KY		
Contents of trouble	When output to front brake proportional pressure reducing valve solenoid circuit is OFF, electric current flows.		
Action of controller	Turn output to front brake proportional pressure reducing valve solenoid OFF.		
Problem that appears on machine	Retarder (front brake) does not operate.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective front brake proportional pressure reducing solenoid valve	1) Turn starting switch OFF. 2) Connect T-adapter to connector REVF (male).		
			Between REVF (male) (1) – (2)	Resistance	10 – 30 Ω
			Between REVF (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Hot short in wiring harness (a contact with 24 V circuit)	1) Turn starting switch OFF. 2) Disconnect connectors BRC3 and REVF. 3) Connect T-adapter to BRC3 (female). 4) Turn starting switch ON.		
			Between ground and wiring harness between BRC3 (female) (6) – REVF (female) (1)	Voltage	Max. 1 V
	3	Defective retarder controller	1) Turn starting switch OFF. 2) Connect T-adapter to BRC3 (female).		
			Between BRC3 (female) (6) – (13)	Resistance	10 – 30 Ω

Circuit diagram related

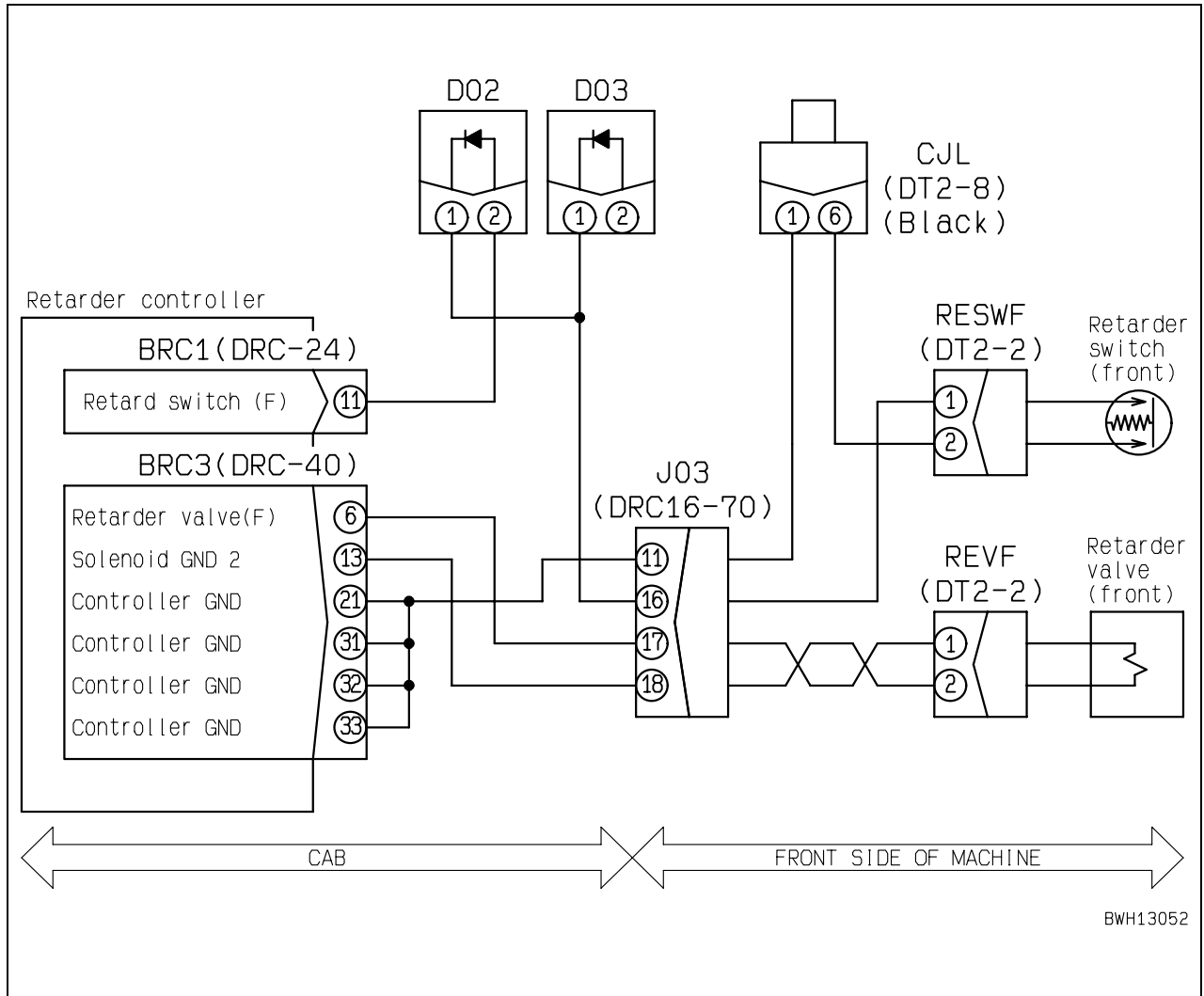


Failure code [DX12MA] Front brake proportional pressure reducing solenoid valve: Malfunction

Action code	Failure code	Trouble	Front brake proportional pressure reducing solenoid valve: Malfunction (Retarder controller system)
E03	DX12MA		
Contents of trouble	Front brake proportional pressure reducing solenoid valve and solenoid keep operating and do not return or their condition cannot be judged normally because of defect in sensor switch after they return.		
Action of controller	Continues control.		
Problem that appears on machine	- If solenoid is defective, front brake drags. - If switch is defective or switch input circuit has disconnection, condition does not change.		
Related information	Condition of retarder oil pressure switch can be checked with monitoring function (Code: 40932) (bit [2], 0:OFF, 1:ON).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective front brake proportional pressure reducing solenoid valve	• Check front brake proportional pressure reducing solenoid valve. If there is an abnormality (mechanical failure), repair or replace it.			
	2	Defective front brake proportional pressure reducing solenoid	1) Turn starting switch OFF. 2) Connect T-adapter to connector REVF.			
			Between REVF (male) (1) – (2)	Oil pressure is ON.	Resistance	Max. 1 Ω
				Oil pressure is OFF.	Resistance	Min. 1 MΩ
	3	Defective retarder pressure switch	1) Turn starting switch OFF. 2) Insert T-adapter in connector RESWF. 3) Start engine.			
			RESWF	Retarder	Voltage	
			Between (1) – (2)	When not operated	20 – 30 V	
				When operated	Max. 1 V	
	4	Defective harness grounding (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors BRC1 and RESWF. 3) Connect T-adapter to BRC1.			
			Between ground and wiring harness between BRC1 (female) (11) – RESWF (female) (1)		Resistance	Min. 1 MΩ
	5	Defective retarder controller	1) Turn starting switch OFF. 2) Insert T-adapter in connector BRC3. 3) Turn starting switch ON.			
Between BRC3 (6) – (13)			Oil pressure is ON.	Voltage	Max. 1 V	
			Oil pressure is OFF.	Voltage	20 – 30 V	

Circuit diagram related

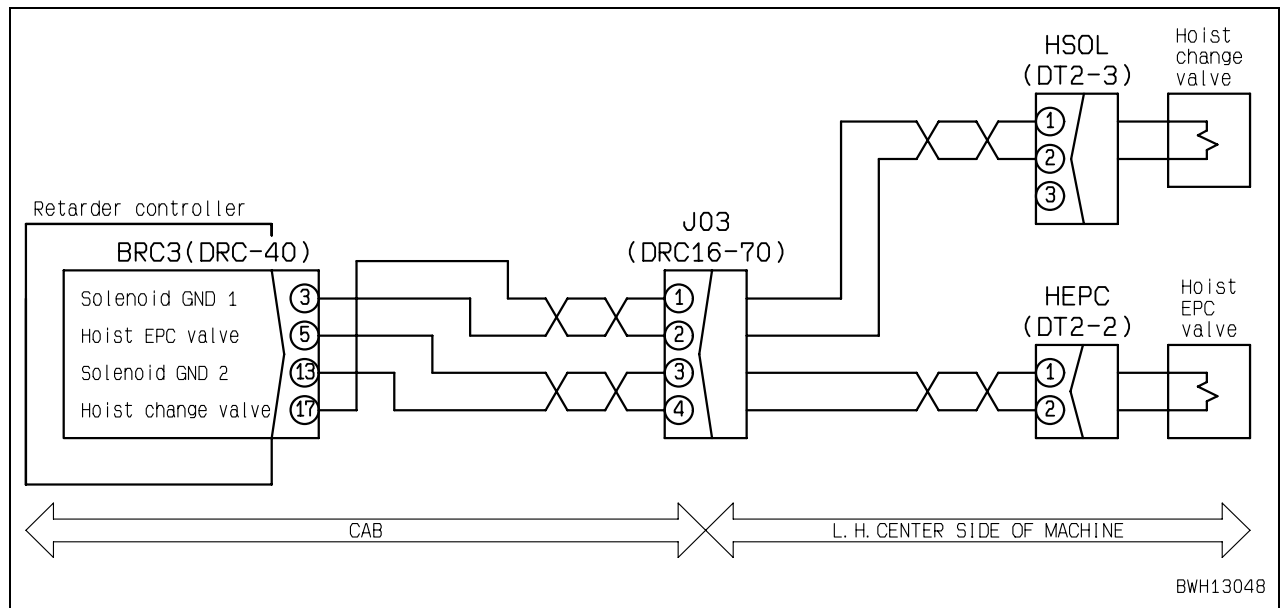


Failure code [DX13KA] Output circuit of hoist EPC valve: Disconnection

Action code	Failure code	Trouble	Output circuit of hoist EPC valve: Disconnection (Retarder controller system)
E03	DX13KA		
Contents of trouble	When the output to the hoist EPC solenoid circuit is ON, any current does not flow.		
Action of controller	- The controller turns the output to the hoist select valve solenoid OFF. - The controller turns the output to the hoist EPC valve solenoid OFF.		
Problem that appears on machine	Body does not operate.		
Related information	This failure can be checked in the monitoring function (Code: 45600 (mA)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective hoist EPC valve solenoid	1) Turn the starting switch OFF. 2) Disconnect connector HEPC. 3) Connect T-adapter.		
			Between HEPC (male) (1) – (2)	Resistance	15 – 20 Ω
			Between HEPC (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC3 and HEPC. 3) Connect T-adapter.		
			Wiring harness between BRC3 (female) (5) – HEPC (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between BRC3 (female) (13) – HEPC (female) (2)	Resistance	Max. 1 Ω
	3	Defective retarder controller	1) Turn the starting switch OFF. 2) Disconnect connector BRC3. 3) Insert T-adapter.		
			Between BRC3 (female) (5) – (13)	Resistance	15 – 20 Ω

Circuit diagram related

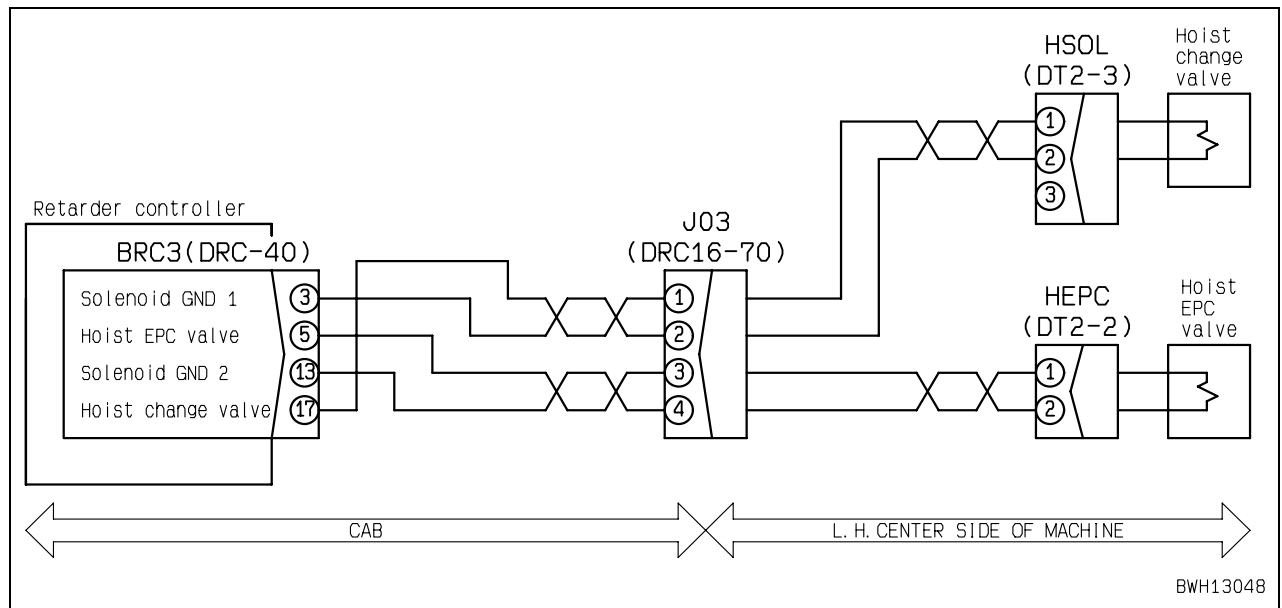


Failure code [DX13KB] Output circuit of hoist EPC valve: Short circuit

Action code	Failure code	Trouble	Output circuit of hoist EPC valve: Short circuit (Retarder controller system)
E03	DX13KB		
Contents of trouble	• When the output to the hoist EPC valve solenoid circuit is ON, a too large current flows.		
Action of controller	• The controller turns the output to the hoist select valve solenoid OFF. • The controller turns the output to the hoist EPC valve solenoid OFF.		
Problem that appears on machine	• Body does not operate.		
Related information	• This failure can be checked in the monitoring function (Code: 45600 (mA)).		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective hoist EPC valve solenoid	1) Turn the starting switch OFF. 2) Disconnect connector HEPC. 3) Connect T-adaptor.		
			Between HEPC (male) (1) – (2)	Resistance	15 – 20 Ω
			Between HEPC (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Grounding fault or short circuit in wiring harness (Contact with ground circuit or another wiring harness)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC3 and HEPC. 3) Connect T-adaptor to BRC3 (female).		
			Between ground and wiring harness between BRC3 (female) (5) – HEPC (female) (1)	Resistance	Min. 1 MΩ
			Wiring harness between BRC3 (female) (5) – HEPC (female) (1) and between BRC3 (female) (13) – HEPC (female) (2)	Resistance	Min. 1 MΩ
	3	Defective retarder controller	1) Turn the starting switch OFF. 2) Disconnect connector BRC3. 3) Connect T-adaptor.		
			Between BRC3 (female) (5) – (13)	Resistance	15 – 20 Ω

Circuit diagram related

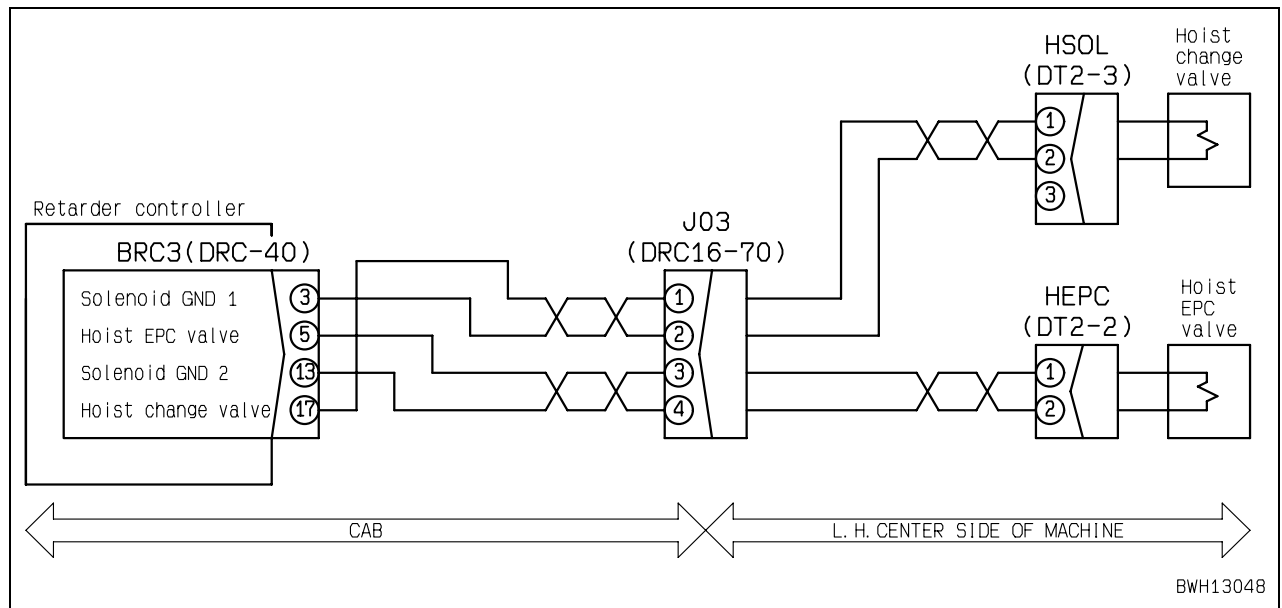


Failure code [DX13KY] Output circuit of hoist EPC valve: Short circuit with power source line

Action code	Failure code	Trouble	Output circuit of hoist EPC valve: Short circuit with power source line (Retarder controller system)
E03	DX13KY		
Contents of trouble	While the output to the hoist EPC valve solenoid circuit is OFF, some large current is flowing.		
Action of controller	- The controller turns the output to the hoist select valve solenoid OFF. - The controller turns the output to the hoist EPC valve solenoid OFF.		
Problem that appears on machine	Body does not operate.		
Related information	This failure can be checked in the monitoring function (Code: 45600 (mA)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective hoist EPC valve solenoid	1) Turn the starting switch OFF. 2) Disconnect connector HEPC. 3) Insert T-adapter.		
			Between HEPC (female) (1) – (2)	Resistance	15 – 20 Ω
			Between HEPC (female) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Hot short in wiring harness (Contact with power source wiring harness)	1) Turn the starting switch OFF. 2) Disconnect connectors BRC3 and HEPC. 3) Connect T-adapter to BRC3 (female). 4) Turn the starting switch ON.		
			Between ground and wiring harness between BRC3 (female) (5) – HEPC (female) (1)	Voltage	Max. 1 V
			Between ground and wiring harness between BRC3 (female) (13) – HEPC (female) (2)	Voltage	Max. 1 V
	3	Defective retarder controller	1) Turn the starting switch OFF. 2) Disconnect connector BRC3. 3) Insert T-adapter.		
			Between BRC3 (female) (5) – (13)	Resistance	15 – 20 Ω

Circuit diagram related

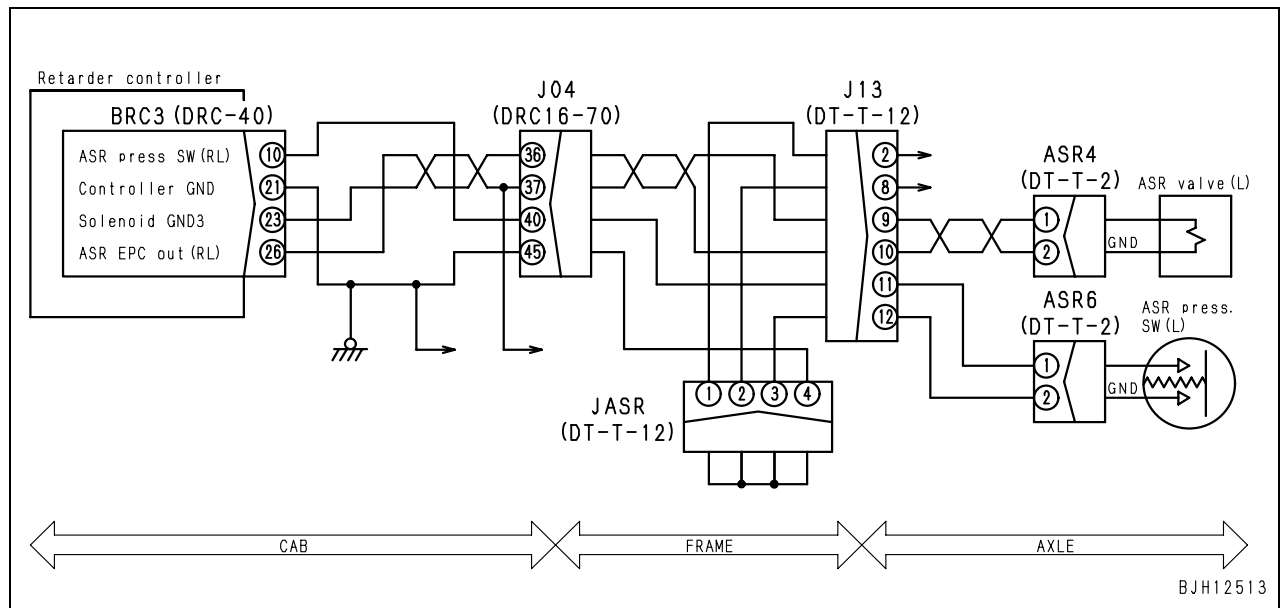


Failure code [DX17K4] ASR proportional pressure reducing solenoid valve (right): Trouble (Valve keeps operating)

Action code	Failure code	Trouble	ASR proportional pressure reducing solenoid valve (right): Trouble (Valve keeps operating) (Retarder controller system)
E01	DX17K4		
Contents of trouble	Sensor does not respond normally to ASR proportional pressure reducing solenoid valve (right) OFF command of retarder controller.		
Action of controller	Stops controlling ASR.		
Problem that appears on machine	ASR is not controlled normally.		
Related information	- ASR pressure sensor is turned OFF when pressure is 0.3 MPa {3 kg/cm²} or less. (In range of 0.3 MPa {3 kg/cm²} – 0.7 MPa {7 kg/cm²}, operation of sensor is unstable because of hysteresis.) - If ASR proportional pressure reducing solenoid valve (right) has electrical trouble, code [DX17KA], [DX17KB] or [DX17KY] is output.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective ASR proportional pressure reducing solenoid valve (right)	★ ASR proportional pressure reducing solenoid valve (right) may have mechanical trouble. Check it directly. If the failure is repaired by replacing the ASR valve (right), the ASR valve (right) is defective.		
	2	Defective ASR pressure sensor	1) Turn starting switch OFF. 2) Disconnect ASR6 and insert jig in ASR6 (male) (Keep ASR6 (female) disconnected). 3) Turn starting switch OFF and ON (Keep ASR switch OFF). Between ASR6 (male) (1) – ASR6 (male) (2)		
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	Resistance	Min. 1 MΩ	
			Between ASR6 (female) (1) – BRC3 (female) (10)	Resistance	Max. 1 Ω
			Between ASR6 (female) (2) – BRC3 (female) (21)	Resistance	Max. 1 Ω
	4	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect ASR6, then carry out troubleshooting without turning starting switch ON. Between ASR6 (female) (1) – ground		
	5	Defective retarder controller	Resistance	Min. 1 MΩ	
			If causes 1 – 5 are not detected, retarder controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related

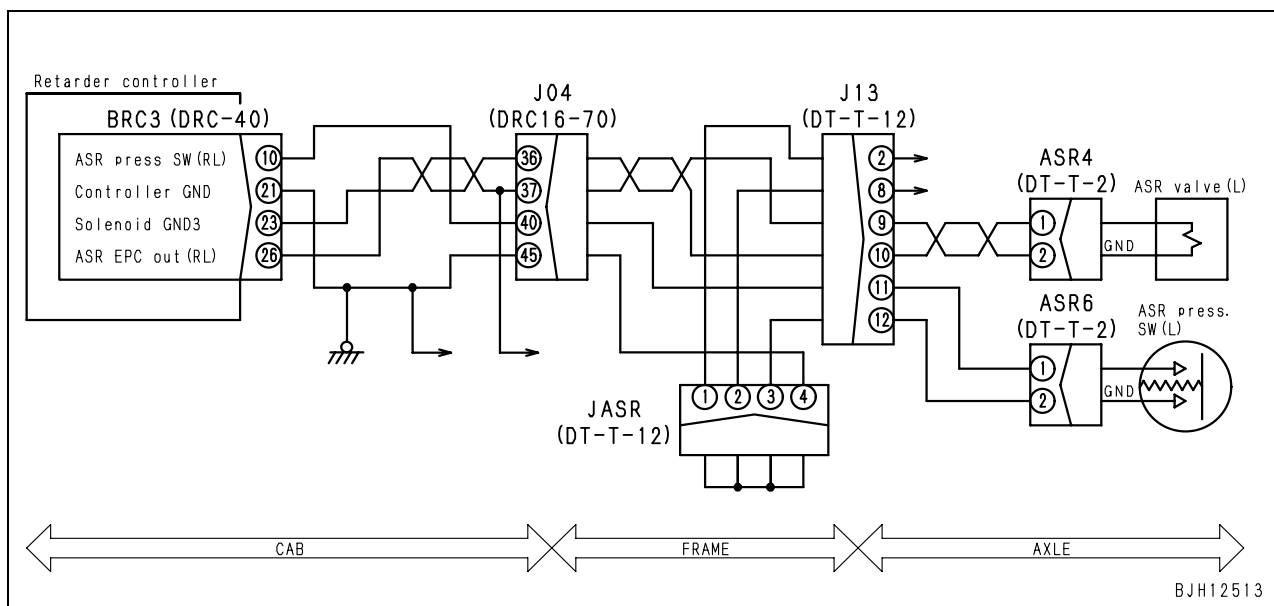


Failure code [DX17KA] ASR proportional pressure reducing solenoid valve (right) output circuit: Disconnection

Action code	Failure code	Trouble	ASR proportional pressure reducing solenoid valve (right) output circuit: Disconnection (Retarder controller system)
E01	DX17K4		
Contents of trouble	• When signal is output to ASR proportional pressure reducing solenoid valve (right) solenoid circuit, no current flows.		
Action of controller	• Stops controlling ASR.		
Problem that appears on machine	• ASR is not controlled normally.		
Related information	• Signal is not output to ASR proportional pressure reducing solenoid valve (right) solenoid circuit until starting switch is turned OFF once.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective ASR proportional pressure reducing solenoid valve (right) solenoid (Internal disconnection)	★ Turn starting switch OFF and disconnect ASR4, then carry out troubleshooting without turning starting switch ON.		
			ASR4 (male)		Resistance
			Between (1) – (2)		20 Ω
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON. (When check result of Cause 1 is normal)		
			Between J04 (male) (36) – (37)		Resistance 20 Ω
			Between BRC3 (female) (26) – (23)		Resistance 20 Ω
	3	Defective retarder controller	If causes 1 and 2 are not detected, retarder controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related



Failure code [DX17KB] ASR proportional pressure reducing solenoid valve (right) output circuit: Ground fault

Action code	Failure code	Trouble	ASR proportional pressure reducing solenoid valve (right) output circuit: Ground fault (Retarder controller system)
E01	DX17KB		
Contents of trouble	When signal is output to ASR proportional pressure reducing solenoid valve (right) solenoid circuit, abnormal current flows.		
Action of controller	Stops controlling ASR.		
Problem that appears on machine	ASR is not controlled normally.		
Related information	Signal is not output to ASR proportional pressure reducing solenoid valve (right) solenoid circuit until starting switch is turned OFF once.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective ASR proportional pressure reducing solenoid valve (right) solenoid (Internal short circuit)	★ Turn starting switch OFF and disconnect ASR4, then carry out troubleshooting without turning starting switch ON.		
			ASR4 (male)		Resistance
			Between (1) – (2)		20 Ω
	2	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect BRC3 and ASR4, then carry out troubleshooting without turning starting switch ON.		
			Between BRC3 (female) (26) – ground	Resistance	Min. 1 MΩ
	3	Short circuit in wiring harness (with another wiring harness)	★ Turn starting switch OFF and disconnect BRC3 and ASR4, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between BRC3 (female) (26) – BRC3 (female) (pin other than (26))	Resistance	Min. 1 MΩ
	4	Hot short (Contact with 24 V circuit) in wiring harness	★ Turn starting switch OFF and insert T-adaptor in BRC3, then turn starting switch ON and carry out troubleshooting.		
			Between BRC3 (female) (26) – ground	Voltage	Max. 1 V
	5	Defective retarder controller	If causes 1 – 4 are not detected, retarder controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Failure code [DX17KY] ASR proportional pressure reducing solenoid valve (right) output circuit: Short circuit

Action code	Failure code	Trouble	ASR proportional pressure reducing solenoid valve (right) output circuit: Short circuit (Retarder controller system)
E01	DX17KY		
Contents of trouble	When signal is output to ASR proportional pressure reducing solenoid valve (right) solenoid circuit, abnormal current flows.		
Action of controller	Stops controlling ASR.		
Problem that appears on machine	ASR is not controlled normally.		
Related information	Signal is not output to ASR proportional pressure reducing solenoid valve (right) solenoid circuit until starting switch is turned OFF once.		

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DX17KB].	

Failure code [DX17MA] ASR proportional pressure reducing solenoid valve (right): Trouble (Valve does not operate)

Action code	Failure code	Trouble	ASR proportional pressure reducing solenoid valve (right): Trouble (Valve does not operate) (Retarder controller system)
E01	DX17MA		
Contents of trouble	Sensor does not respond to ASR proportional pressure reducing solenoid valve (right) ON command of retarder controller.		
Action of controller	Stops controlling ASR.		
Problem that appears on machine	ASR is not controlled normally.		
Related information	- ASR pressure sensor is turned ON when pressure is 0.7 MPa {7 kg/cm²} or above. (In range of 0.3 MPa {3 kg/cm²} – 0.7 MPa {7 kg/cm²}, operation of sensor is unstable because of hysteresis.) - If ASR proportional pressure reducing solenoid valve (right) has electrical trouble, code [DX17KA], [DX17KB] or [DX17KY] is output.		

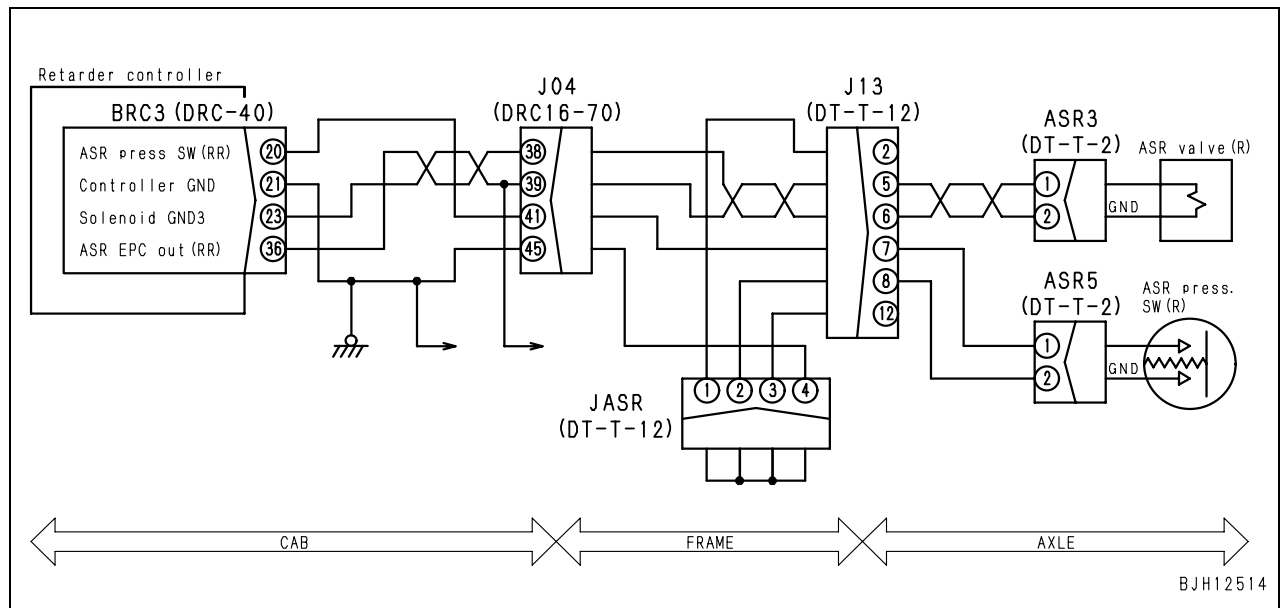
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DX17K4].	

Failure code [DX18K4] ASR proportional pressure reducing solenoid valve (left): Trouble (Valve keeps operating)

Action code	Failure code	Trouble	ASR proportional pressure reducing solenoid valve (left): Trouble (Valve keeps operating) (Retarder controller system)
E01	DX18K4		
Contents of trouble	Sensor does not respond normally to ASR proportional pressure reducing solenoid valve (left) OFF command of retarder controller.		
Action of controller	Stops controlling ASR.		
Problem that appears on machine	ASR is not controlled normally.		
Related information	- ASR pressure sensor is turned OFF when pressure is 0.3 MPa {3 kg/cm²} or less. (In range of 0.3 MPa {3 kg/cm²} – 0.7 MPa {7 kg/cm²}, operation of sensor is unstable because of hysteresis.) - If ASR proportional pressure reducing solenoid valve (left) has electrical trouble, code [DX18KA], [DX18KB] or [DX18KY] is output.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective ASR proportional pressure reducing solenoid valve (left)	★ ASR proportional pressure reducing solenoid valve (left) may have mechanical trouble. Check it directly. If the failure is repaired by replacing the ASR valve (left), the ASR valve (left) is defective.		
	2	Defective ASR pressure sensor	1) Turn starting switch OFF. 2) Disconnect ASR5 and insert jig in ASR5 (male) (Keep ASR5 (female) disconnected). 3) Turn starting switch OFF and ON (Keep ASR switch OFF).		
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	Between ASR5 (male) (1) – ASR5 (male) (2)	Resistance	Min. 1 MΩ
			Between ASR5 (female) (1) – BRC3 (female) (20)	Resistance	Max. 1 Ω
			Between ASR5 (female) (2) – BRC3 (female) (21)	Resistance	Max. 1 Ω
	4	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect ASR5, then carry out troubleshooting without turning starting switch ON.		
	5	Defective retarder controller	Between ASR5 (female) (1) – ground	Resistance	Min. 1 MΩ
			If causes 1 – 5 are not detected, retarder controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related

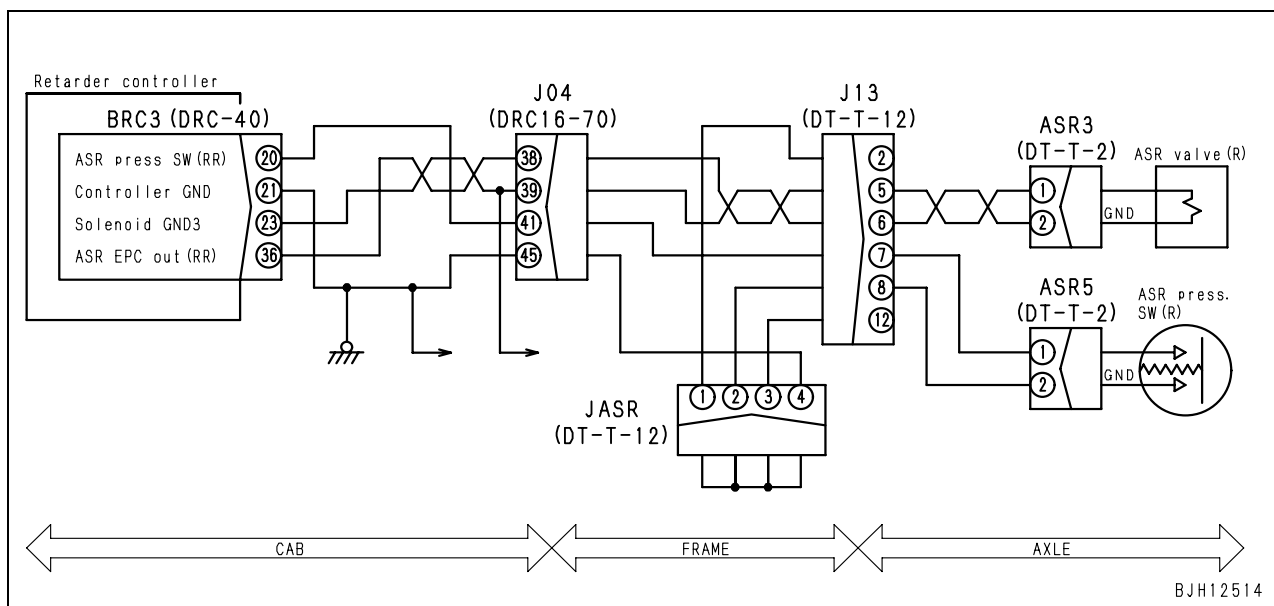


Failure code [DX18KA] ASR proportional pressure reducing solenoid valve (left) output circuit: Disconnection

Action code	Failure code	Trouble	ASR proportional pressure reducing solenoid valve (left) output circuit: Disconnection (Retarder controller system)
E01	DX18KA		
Contents of trouble	When signal is output to ASR proportional pressure reducing solenoid valve (left) solenoid circuit, no current flows.		
Action of controller	Stops controlling ASR.		
Problem that appears on machine	ASR is not controlled normally.		
Related information	Signal is not output to ASR proportional pressure reducing solenoid valve (left) solenoid circuit until starting switch is turned OFF once.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective ASR proportional pressure reducing solenoid valve (left) solenoid (Internal disconnection)	★ Turn starting switch OFF and disconnect ASR3, then carry out troubleshooting without turning starting switch ON.		
			ASR3 (male)		Resistance
			Between (1) – (2)		20 Ω
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON. (When check result of Cause 1 is normal)		
			Between J04 (male) (38) – (39)		Resistance 20 Ω
			Between BRC3 (female) (36) – (23)		Resistance 20 Ω
	3	Defective retarder controller	If causes 1 and 2 are not detected, retarder controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related



Failure code [DX18KB] ASR proportional pressure reducing solenoid valve (left) output circuit: Ground fault

Action code	Failure code	Trouble	ASR proportional pressure reducing solenoid valve (left) output circuit: Ground fault (Retarder controller system)
E01	DX18KB		
Contents of trouble	When signal is output to ASR proportional pressure reducing solenoid valve (left) solenoid circuit, abnormal current flows.		
Action of controller	Stops controlling ASR.		
Problem that appears on machine	ASR is not controlled normally.		
Related information	Signal is not output to ASR proportional pressure reducing solenoid valve (left) solenoid circuit until starting switch is turned OFF once.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective ASR proportional pressure reducing solenoid valve (left) solenoid (Internal short circuit)	★ Turn starting switch OFF and disconnect ASR3, then carry out troubleshooting without turning starting switch ON.		
			ASR3 (male)		Resistance
			Between (1) – (2)		20 Ω
	2	Grounding fault in wiring harness (Contact with ground circuit)	★ Turn starting switch OFF and disconnect BRC3 and ASR3, then carry out troubleshooting without turning starting switch ON.		
			Between BRC3 (female) (36) – ground		Resistance Min. 1 MΩ
	3	Short circuit in wiring harness (with another wiring harness)	★ Turn starting switch OFF and disconnect BRC3 and ASR3, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between BRC3 (female) (36) – BRC3 (female) (pin other than (36))		Resistance Min. 1 MΩ
	4	Hot short (Contact with 24 V circuit) in wiring harness	★ Turn starting switch OFF and insert T-adapter in BRC3, then turn starting switch ON and carry out troubleshooting.		
			Between BRC3 (female) (36) – ground		Voltage Max. 1 V
	5	Defective retarder controller	If causes 1 – 4 are not detected, retarder controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Failure code [DX18KY] ASR proportional pressure reducing solenoid valve (left) output circuit: Short circuit

Action code	Failure code	Trouble	ASR proportional pressure reducing solenoid valve (left) output circuit: Short circuit (Retarder controller system)
E01	DX18KY		
Contents of trouble	When signal is output to ASR proportional pressure reducing solenoid valve (left) solenoid circuit, abnormal current flows.		
Action of controller	Stops controlling ASR.		
Problem that appears on machine	ASR is not controlled normally.		
Related information	Signal is not output to ASR proportional pressure reducing solenoid valve (left) solenoid circuit until starting switch is turned OFF once.		

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DX18KB].	

Failure code [DX18MA] ASR proportional pressure reducing solenoid valve (left): Trouble (Valve does not operate)

Action code	Failure code	Trouble	ASR proportional pressure reducing solenoid valve (left): Trouble (Valve does not operate) (Retarder controller system)
E01	DX18MA		
Contents of trouble	Sensor does not respond to ASR proportional pressure reducing solenoid valve (left) ON command of retarder controller.		
Action of controller	Stops controlling ASR.		
Problem that appears on machine	ASR is not controlled normally.		
Related information	- Sensor is turned ON when pressure is 0.7 MPa {7 kg/cm²} or above. (In range of 0.3 MPa {3 kg/cm²} – 0.7 MPa {7 kg/cm²}, operation of sensor is unstable because of hysteresis.) - If ASR proportional pressure reducing solenoid valve (left) has electrical trouble, code [DX18KA], [DX18KB] or [DX18KY] is output.		

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [DX18K4].	

HD785-7 Dump truck

Form No. SEN01946-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

40 Troubleshooting

Troubleshooting by failure code, Part 10

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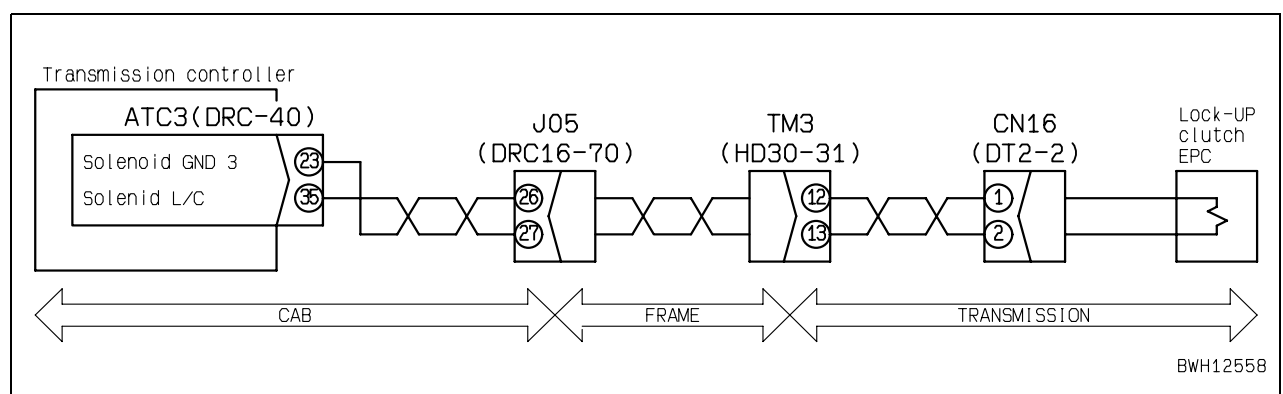
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Failure code [DXH1KA] Lockup clutch solenoid output circuit: Disconnection

Action code	Failure code	Trouble	Lockup clutch solenoid output circuit: Disconnection (Transmission controller system)
E03	DXH1KA		
Contents of trouble	When signal is output to lockup clutch solenoid, no current flows.		
Action of controller	- Keeps gear speed used for travel. - Turns lockup operation OFF. - Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	- Lockup system does not operate. - If gearshift lever is set in N, machine cannot restart until it stops.		
Related information	- As solenoid detects disconnection while output is ON, be sure to turn output ON to check operation after repair. - Output current to lockup solenoid can be checked with monitoring function (Code: 31609 (mA)). - Since output is turned ON and self-check is performed for 5 seconds after starting switch is turned ON, wait for 5 seconds without starting the engine. - If trouble has not been repaired, error is detected again.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective lockup clutch solenoid	1) Turn starting switch OFF. 2) Connect T-adaptor to connector CN16 (male).		
			Between CN16 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN16 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or improper contact)	1) Turn starting switch OFF. 2) Connect T-adaptor to connectors ATC3 (female) and CN16 (female).		
			Wiring harness between ATC3 (female) (35) – CN16 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (23) – CN16 (female) (2)	Resistance	Max. 1 Ω
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adaptor to connector ATC3 (female).		
			Between ATC3 (female) (35) – (23)	Resistance	5 – 15 Ω

Circuit diagram related

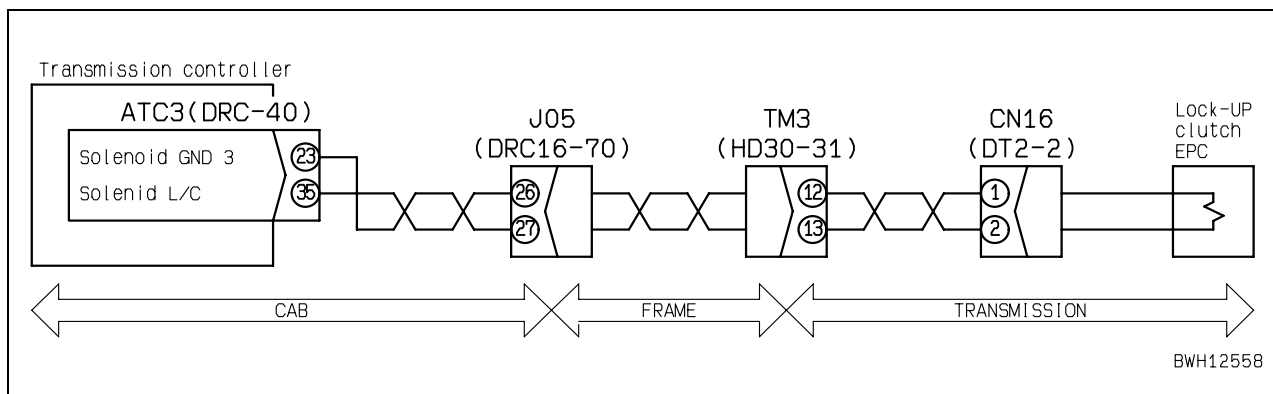


Failure code [DXH1KB] Lock-up clutch solenoid output circuit: Short circuit

Action code	Failure code	Trouble	Lockup clutch solenoid output circuit: Short circuit (Transmission controller system)
E03	DXH1KB		
Contents of trouble	When signal is output to lockup clutch solenoid, much current flows, or while signal is OFF, some current flows.		
Action of controller	- Keeps gear speed used for travel and turns lockup operation OFF. - Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	- Lockup system is kept OFF. - If gearshift lever is set in N, machine cannot restart until it stops.		
Related information	Output current to lockup solenoid can be checked with monitoring function (Code: 31609 (mA)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective lockup clutch solenoid	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN16 (male).		
			Between CN16 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN16 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Short circuit of harness (Contact with ground circuit or contact between harnesses)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN16. 3) Connect T-adapter to ATC3 (female).		
			Between ground and wiring harness between ATC3 (female) (35) – CN16 (female) (1)	Resistance	Min. 1 MΩ
			Between wiring harness from ATC3 (female) (35) – CN16 (female) (1) and wiring harness from ATC3 (female) (23) – CN16 (female) (2)	Resistance	Min. 1 MΩ
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).		
			Between ATC3 (female) (35) – (23)	Resistance	5 – 15 Ω

Circuit diagram related

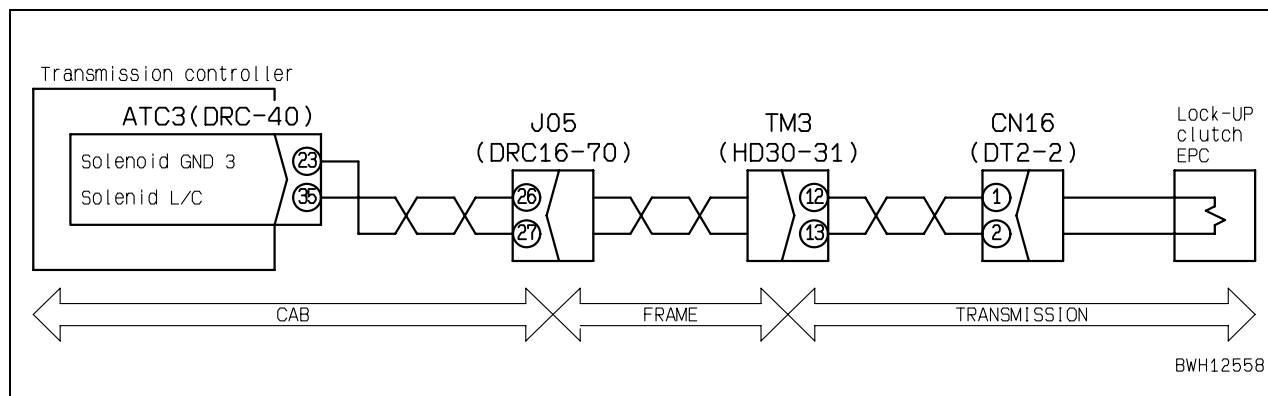


Failure code [DXH1KY] Lockup clutch solenoid output circuit: Short circuit to power source line

Action code	Failure code	Trouble	Lockup clutch solenoid output circuit: Short circuit to power source line (Transmission controller system)
E03	DXH1KY		
Contents of trouble	• While output to lock-up clutch solenoid is OFF, electric current flows.		
Action of controller	• Keeps gear speed used for travel and turns lockup operation OFF. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• Cannot change gear speed. • Keeps lockup OFF • When gear shift lever is operated to N, machine cannot move off.		
Related information	• Output current to lockup solenoid can be checked with monitoring function (Code: 31609 (mA))		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective lockup clutch solenoid	1) Turn starting switch OFF. 2) Connect T-adaptor to connector CN16 (male).		
			Between CN16 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN16 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Hot short in wiring harness (a contact with 24 V circuit)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN16. 3) Connect T-adaptor to ATC3 (female). 4) Turn starting switch ON.		
			Between ground and wiring harness between ATC3 (female) (35) – CN16 (female) (1)	Voltage	Max. 1 V
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adaptor to connector ATC3 (female).		
			Between ATC3 (female) (35) – (23)	Resistance	5 – 15 Ω

Circuit diagram related



Failure code [DXH2KA] Hi clutch solenoid output circuit: Disconnection

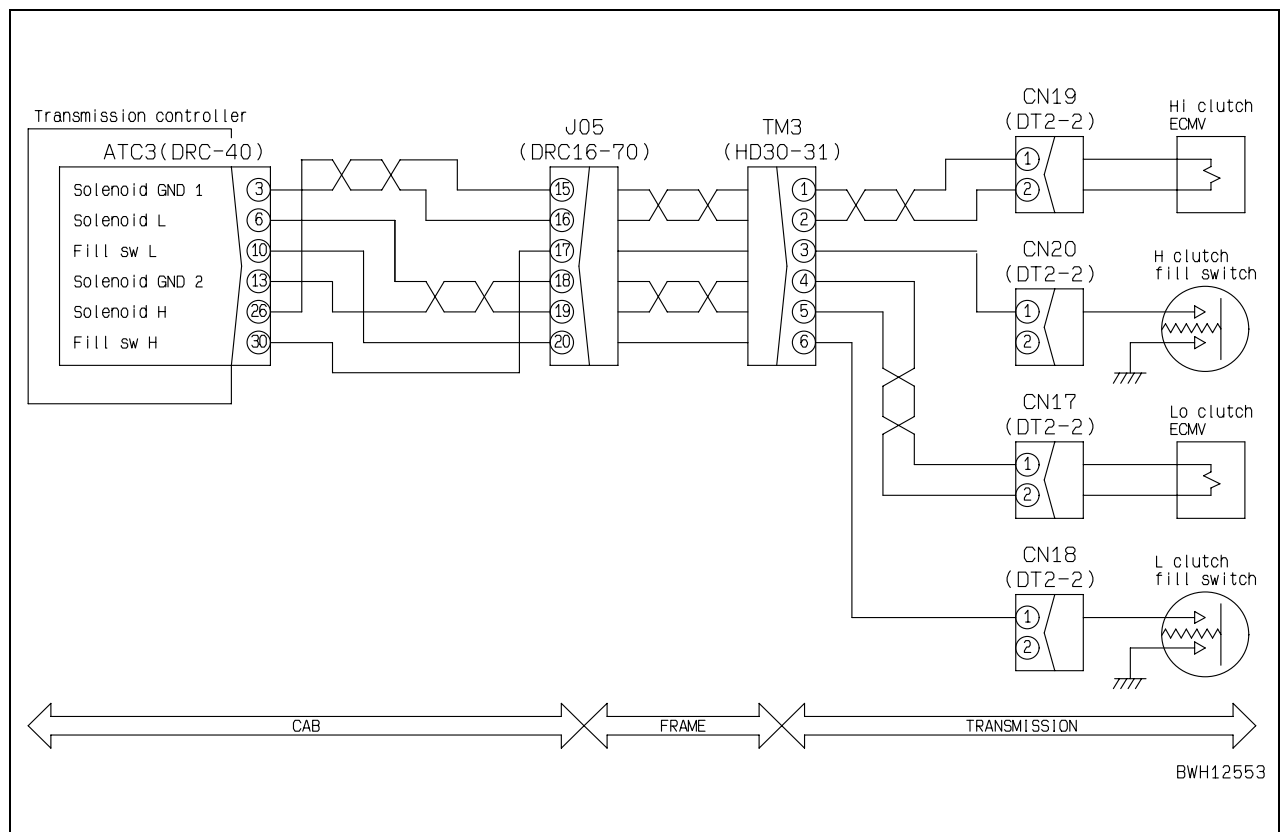
Action code	Failure code	Trouble	Hi clutch solenoid output circuit: Disconnection (Transmission controller system)
E03	DXH2KA		
Contents of trouble	• No electric current flows when the output to Hi clutch ECMV is ON.		
Action of controller	• Shifts up and holds the gear speed as shown in Table 1 depending on the gear speed before failure. • Turns lock up to OFF.		
Problem that appears on machine	• Once the gear shift lever is set to neutral, the machine can not move off in any gear speeds.		
Related information	• As solenoid detects disconnection while output is ON, be sure to turn output ON to check operation after repair. • Electric current of output to ECMV can be checked with monitoring function (code: 31600 (mA)). • Since output is turned ON and self-check is performed for 5 seconds after starting switch is turned ON, wait for 5 seconds without starting the engine. • If trouble has not been repaired, error is detected again.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective Hi clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adaptor to connector CN19 (male).		
			Between CN19 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN19 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adaptor to connectors ATC3 (female) and CN19 (female).		
			Wiring harness between ATC3 (female) (26) – CN19 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (3) – CN19 (female) (2)	Resistance	Max. 1 Ω
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adaptor to connector ATC3 (female).		
			Between ATC3 (female) (26) – (3)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related



Failure code [DXH2KB] Hi clutch solenoid output circuit: Short circuit

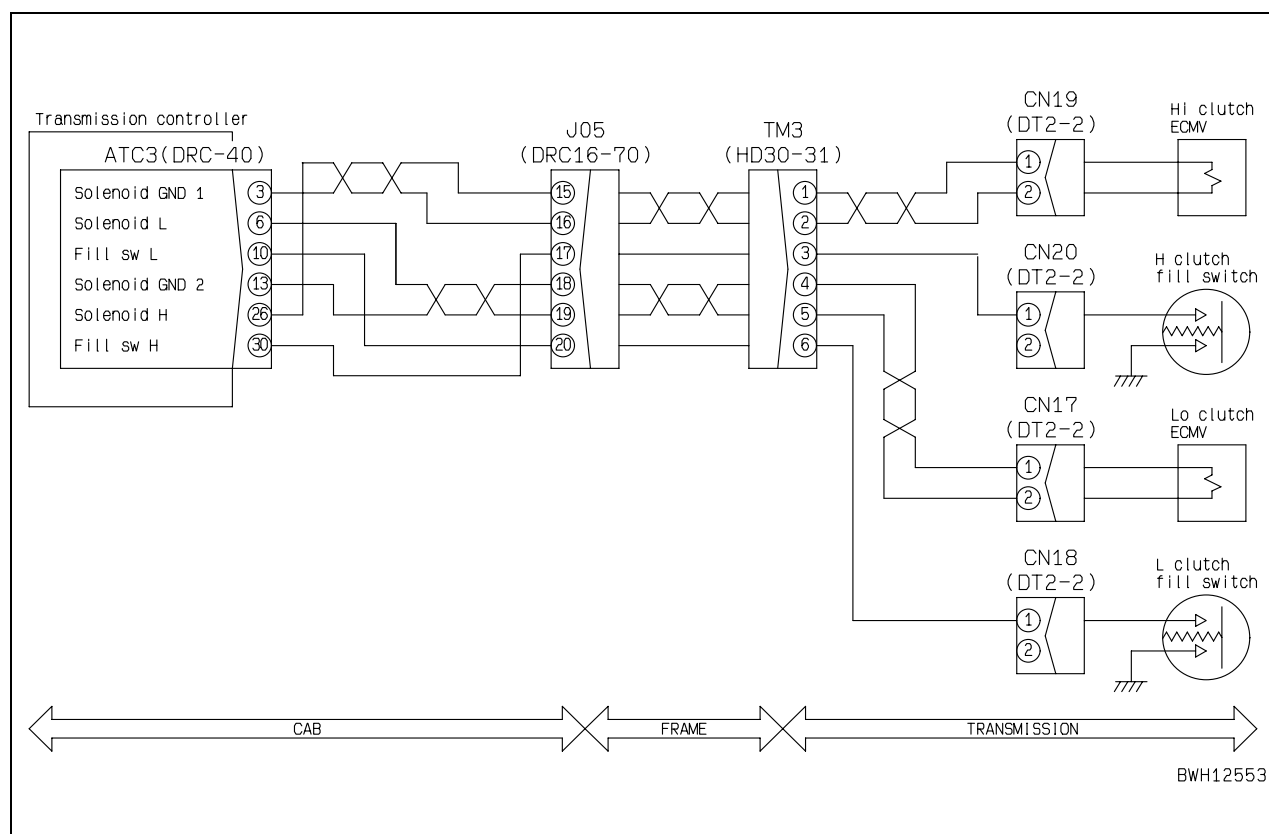
Action code	Failure code	Trouble	Hi clutch solenoid output circuit: Short circuit (Transmission controller system)
E03	DXH2KB		
Contents of trouble	• Abnormally excessive current flows while output to Hi clutch ECMV is ON.		
Action of controller	• Shifts up and holds the gear speed as shown in Table 1 depending on the gear speed before failure. • Turns lock up to OFF.		
Problem that appears on machine	• Once the gear shift lever is set to neutral, the machine can not move off in any gear speeds.		
Related information	• Electric current of output to ECMV can be checked by monitoring function (code: 31600 (mA)).		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective Hi clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN19 (male).		
			Between CN19 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN19 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Short circuit of harness (Contact with ground circuit or contact between harnesses)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN19. 3) Connect T-adapter to ATC3 (female).		
			Between ground and wiring harness between ATC3 (female) (26) – CN19 (female) (1)	Resistance	Min. 1 MΩ
			Between wiring harness from ATC3 (female) (26) – CN19 (female) (1) and wiring harness from ATC3 (female) (13) – CN19 (female) (2)	Resistance	Min. 1 MΩ
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).		
			Between ATC3 (female) (26) – (3)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related



Failure code [DXH2KY] Hi clutch solenoid output circuit: Short circuit to power source line

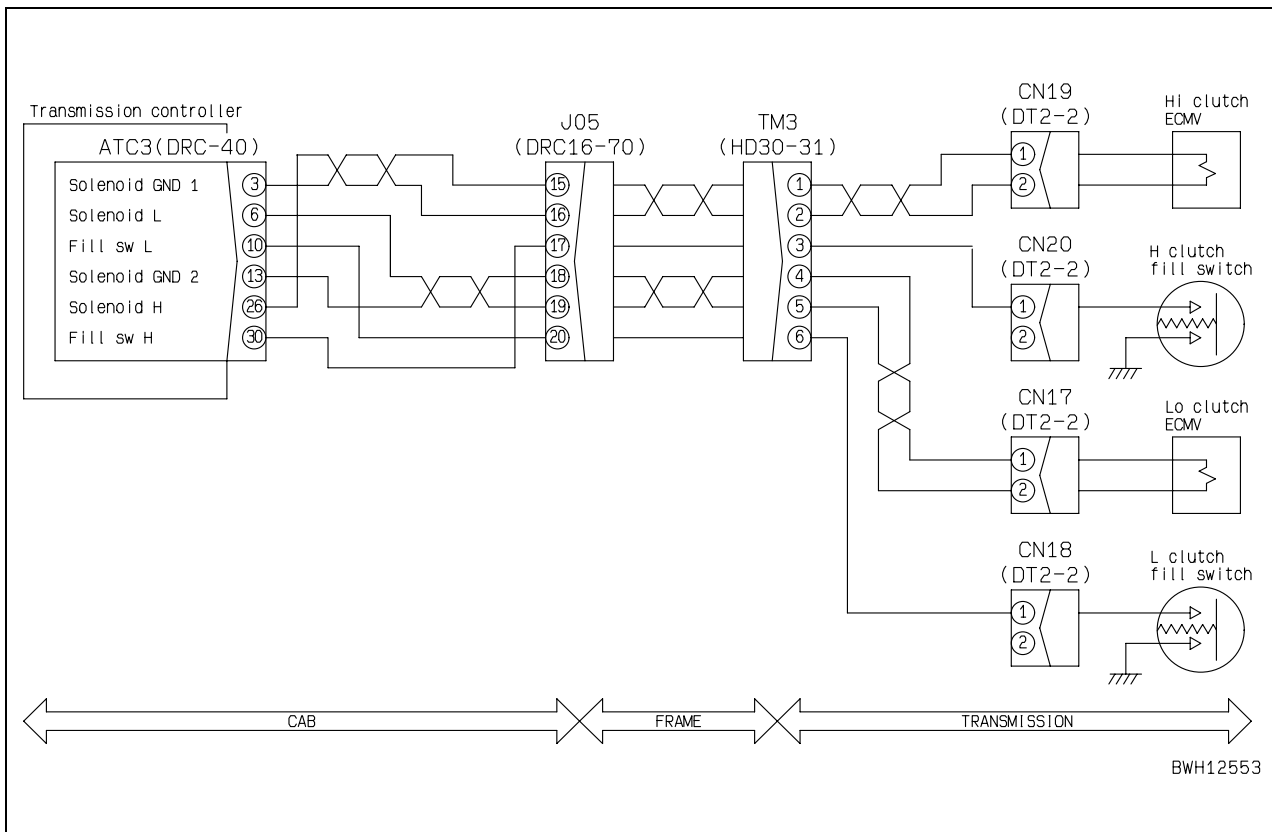
Action code	Failure code	Trouble	Hi clutch solenoid output circuit: Short circuit to power source line (Transmission controller system)
E03	DXH2KY		
Contents of trouble	When output to Hi clutch ECMV is OFF, electric current flows.		
Action of controller	- Shifts up and holds the gear speed as shown in Table 2 depending on the gear speed before failure. - Turns lock up to OFF.		
Problem that appears on machine	Once the gear shift lever is set to neutral, the machine can not move off in any gear speeds.		
Related information	Electric current of output to ECMV can be checked by monitoring function (code: 31600 (mA)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective Hi clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN19 (male).		
			Between CN19 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN19 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Hot short in wiring harness (a contact with 24 V circuit)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN19. 3) Connect T-adapter to ATC3 (female). 4) Turn starting switch ON.		
			Between ground and wiring harness between ATC3 (female) (26) – CN19 (female) (1)	Voltage	Max. 1V
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).		
			Between ATC3 (female) (26) – (3)	Resistance	5 – 15 Ω

Table 2

Speed when trouble was detected		Failed clutch (Fill switch ON)	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
F6	4th Low	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	4H	F7	OFF
F5	3rd High	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	4L	F6	OFF
F4	3rd Low	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	3H	F5	OFF
F3	2nd High	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	3L	F4	OFF
F2	2nd Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
F1	1st Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		2nd	2L	F2	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
RH	Reverse High	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
RL	Reverse Low	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		High	RH	RH	OFF
N		ANY	NONE	No reaction	—

Circuit diagram related



Failure code [DXH3KA] Lo clutch solenoid output circuit: Disconnection

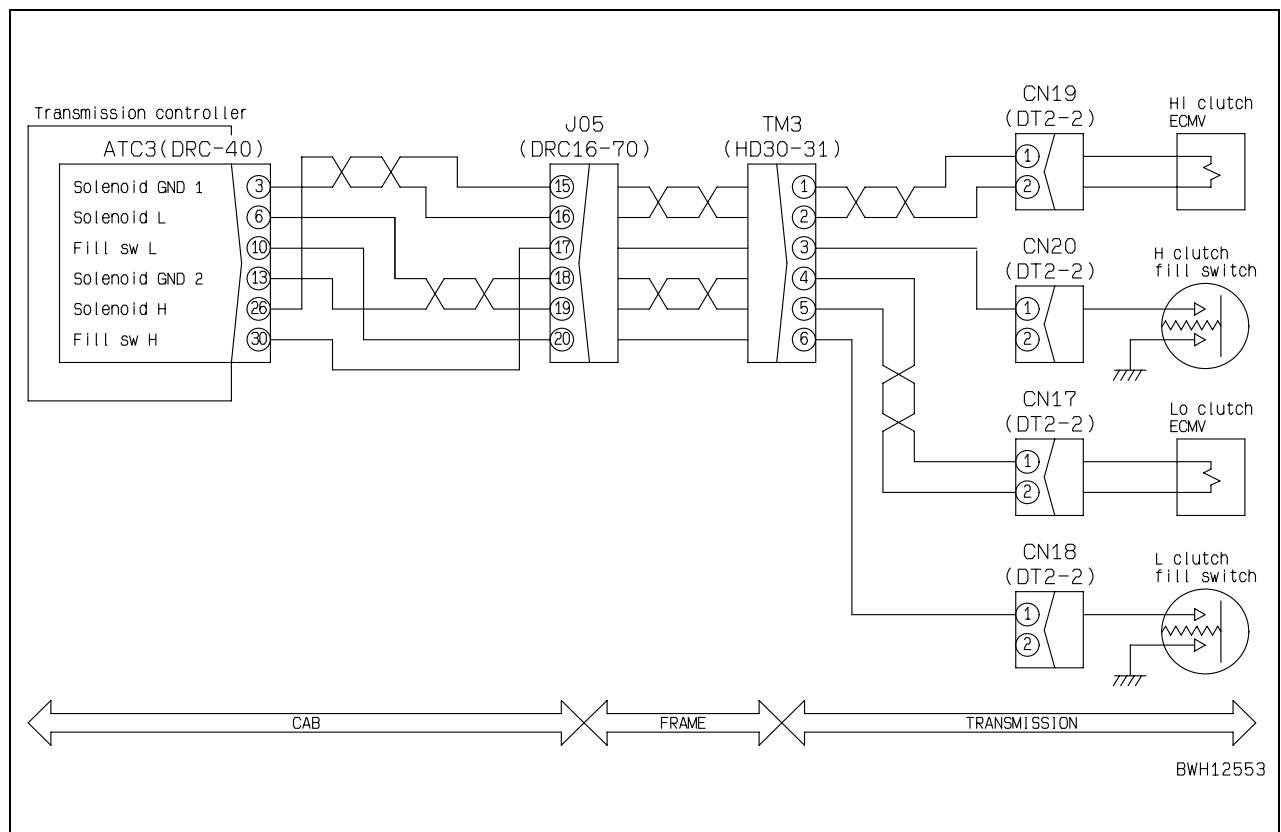
Action code	Failure code	Trouble	Lo clutch solenoid output circuit: Disconnection (Transmission controller system)
E03	DXH3KA		
Contents of trouble	Current does not flow when output to Lo clutch ECMV is ON.		
Action of controller	- Shifts up and holds the gear speed as shown in Table 1 depending on the gear speed before failure. - Turns lock up to OFF.		
Problem that appears on machine	Once the gear shift lever is set to neutral, the machine can not move off in any gear speeds.		
Related information	- As solenoid detects disconnection while output is ON, be sure to turn output ON to check operation after repair. - Electric current of output to ECMV can be checked with monitoring function (code: 31601 (mA)). - Since output is turned ON and self-check is performed for 5 seconds after starting switch is turned ON, wait for 5 seconds without starting the engine. - If trouble has not been repaired, error is detected again.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective Lo clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adaptor to connector ATC3 (male).		
			Between CN17 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN17 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adaptor to connectors ATC3 (female) and CN17 (female).		
			Wiring harness between ATC3 (female) (6) – CN17 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (13) – CN17 (female) (2)	Resistance	Max. 1 Ω
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adaptor to connector ATC3 (female).		
			Wiring harness between ATC3 (female) (6) – (13)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related



Failure code [DXH3KB] Lo clutch solenoid output circuit: Short circuit

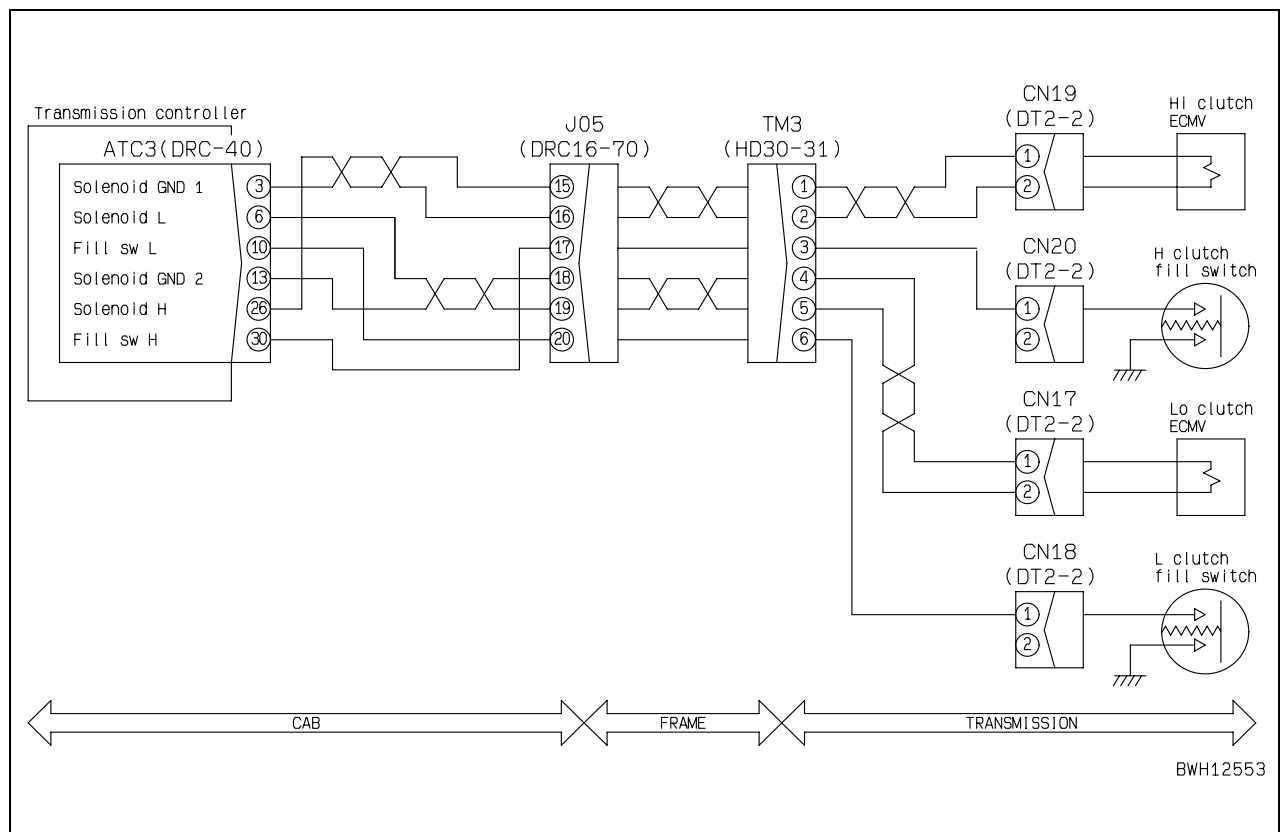
Action code	Failure code	Trouble	Lo clutch solenoid output circuit: Short circuit (Transmission controller system)
E03	DXH3KB		
Contents of trouble	• Excessive current flows while output to Lo clutch ECMV is ON.		
Action of controller	• Shifts up and holds the gear speed as shown in Table 1 depending on the gear speed before failure. • Turns lock up to OFF.		
Problem that appears on machine	• Once the gear shift lever is set to neutral, the machine can not move off in any gear speeds.		
Related information	• Electric current of output to ECMV can be checked by monitoring function (code: 31601 (mA)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective Lo clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN17 (male).		
			Between CN17 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN17 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Short circuit of harness (Contact with ground circuit or contact between harnesses)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN17. 3) Connect T-adapter to ATC3 (female).		
			Between ground and wiring harness between ATC3 (female) (6) – CN17 (female) (1)	Resistance	Min. 1 MΩ
			Between wiring harness from ATC3 (female) (6) – CN17 (female) (1) and wiring harness from ATC3 (female) (13) – CN17 (female) (2)	Resistance	Min. 1 MΩ
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).		
			Between ATC3 (female) (6) – (13)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related



Failure code [DXH3KY] Lo clutch solenoid output circuit: Short circuit in power source line

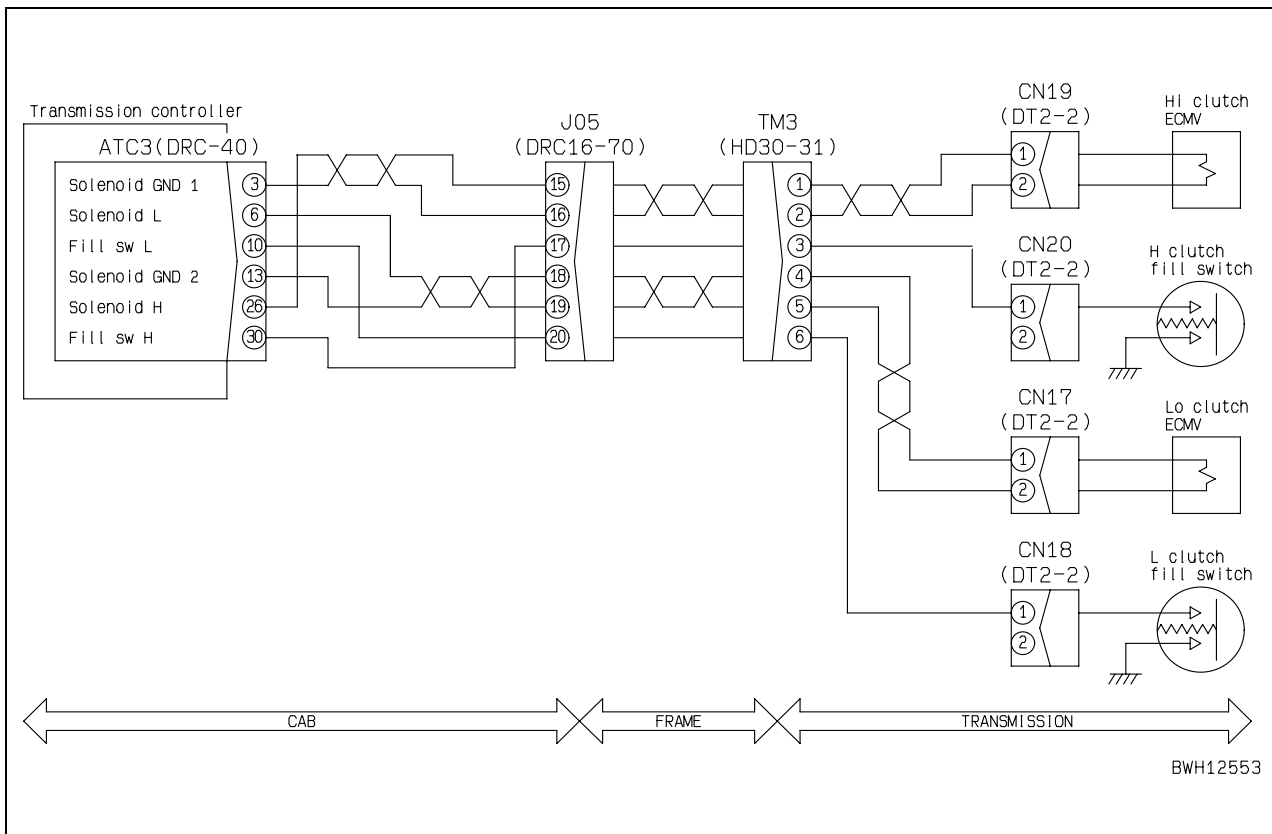
Action code	Failure code	Trouble	Lo clutch solenoid output circuit: Short circuit to power source line (Transmission controller system)
E03	DXH3KY		
Contents of trouble	When output to Lo clutch ECMV is turned "OFF", current flows to circuit.		
Action of controller	- Shifts up and holds the gear speed as shown in Table 2 depending on the gear speed before failure. - Turns lock up to OFF.		
Problem that appears on machine	Once the gear shift lever is set to neutral, the machine can not move off in any gear speeds.		
Related information	Electric current of output to ECMV can be checked by monitoring function (code: 31601 (mA)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective Lo clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN17 (male).		
			Between CN17 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN17 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Hot short in wiring harness (a contact with 24 V circuit)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN17. 3) Connect T-adapter to ATC3 (female). 4) Turn starting switch ON.		
			Between ground and wiring harness between ATC3 (female) (6) – CN17 (female) (1)	Voltage	Max. 1 V
	3	Defective transmission controller	Turn starting switch OFF.		
			Between ATC3 (female) (6) – (13)	Resistance	5 – 15 Ω

Table 2

Speed when trouble was detected		Failed clutch (Fill switch ON)	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
F6	4th Low	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	4H	F7	OFF
F5	3rd High	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	4L	F6	OFF
F4	3rd Low	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	3H	F5	OFF
F3	2nd High	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	3L	F4	OFF
F2	2nd Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
F1	1st Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		2nd	2L	F2	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
RH	Reverse High	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
RL	Reverse Low	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		High	RH	RH	OFF
N		ANY	NONE	No reaction	—

Circuit diagram related



Failure code [DXH4KA] 1st clutch solenoid output circuit: Disconnection

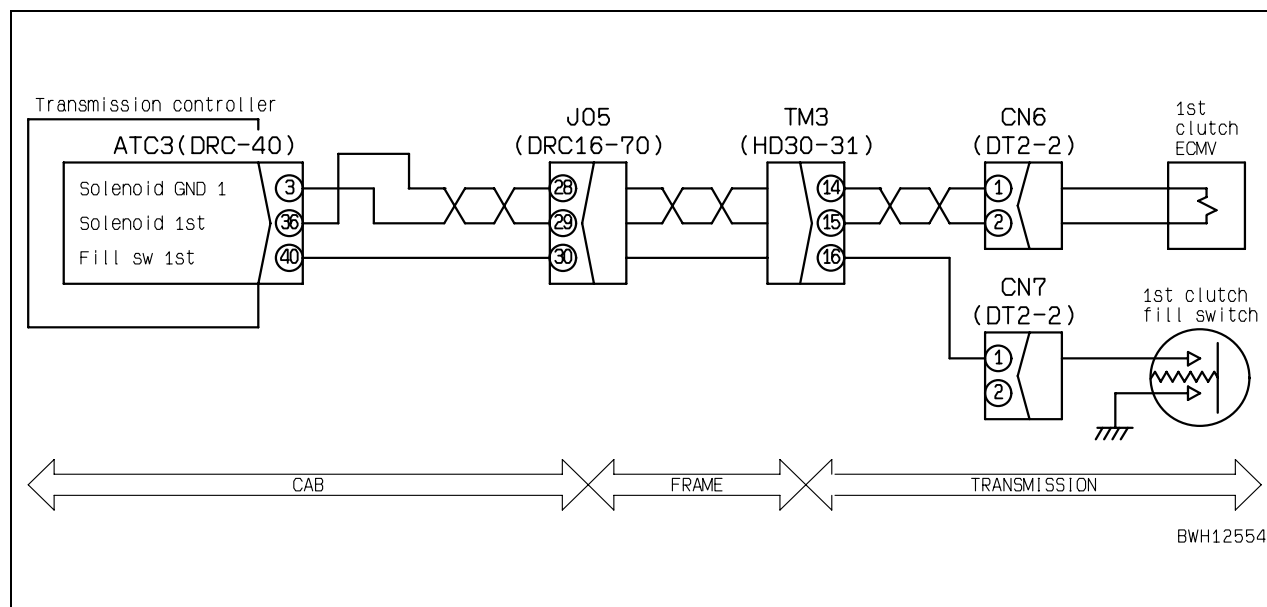
Action code	Failure code	Trouble	1st clutch solenoid output circuit: Disconnection (Transmission controller system)
E03	DXH4KA		
Contents of trouble	Current does not flow when output to 1st clutch ECMV is ON.		
Action of controller	- Shifts up and holds the gear speed as shown in Table 1 depending on the gear speed before failure. - Turns lock up to OFF.		
Problem that appears on machine	Once the gear shift lever is set to neutral, the machine can not move off in any gear speeds.		
Related information	- As solenoid detects disconnection while output is ON, be sure to turn output ON to check operation after repair. - Electric current of output to ECMV can be checked with monitoring function (code: 31602 (mA)). - Since output is turned ON and self-check is performed for 5 seconds after starting switch is turned ON, wait for 5 seconds without starting the engine. - If trouble has not been repaired, error is detected again.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective 1st clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN6 (male).		
			Between CN6 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN6 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or improper contact)	1) Turn starting switch OFF. 2) Connect T-adapter to ATC3 (female) and CN6 (female).		
			Wiring harness between ATC3 (female) (36) – CN6 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (3) – CN6 (female) (2)	Resistance	Max. 1 Ω
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to ATC3 (female).		
			Between ATC3 (female) (36) – (3)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related



Failure code [DXH4KB] 1st clutch solenoid output circuit: Short circuit

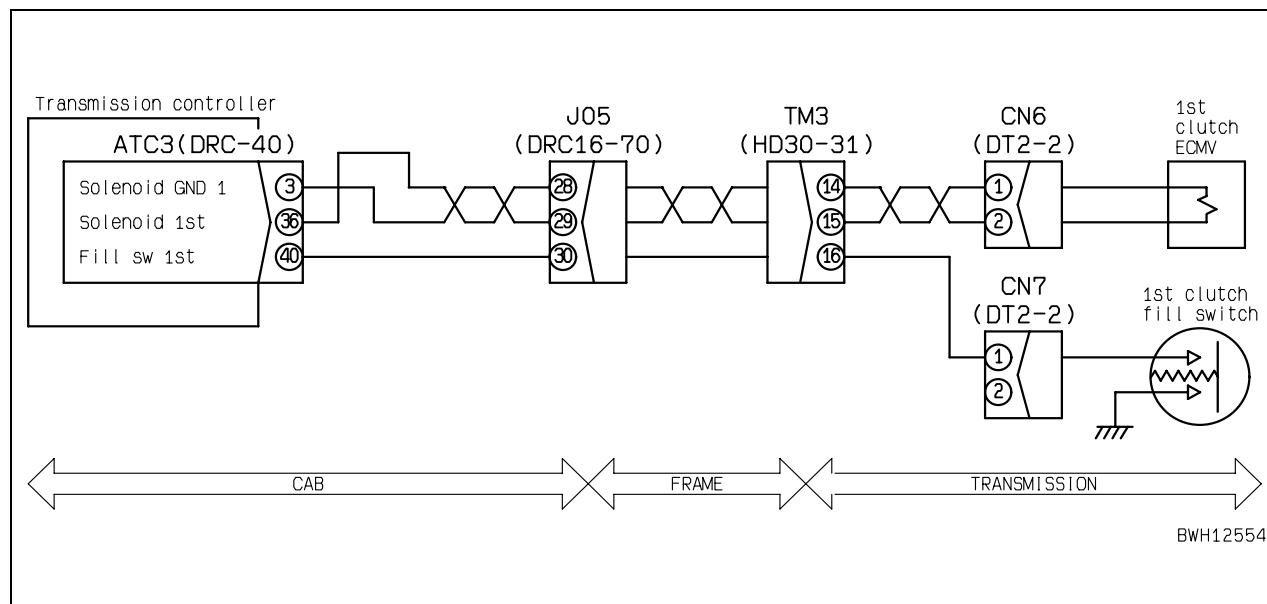
Action code	Failure code	Trouble	1st clutch solenoid output circuit: Short circuit (Transmission controller system)
E03	DXH4KB		
Contents of trouble	• Abnormally excessive current flows when output to 1st clutch ECMV is ON.		
Action of controller	• Shifts up and holds the gear speed as shown in Table 1 depending on the gear speed before failure. • Turns lock up to OFF.		
Problem that appears on machine	• Once the gear shift lever is set to neutral, the machine can not move off in any gear speeds.		
Related information	• Electric current of output to ECMV can be checked by monitoring function (code: 31602 (mA)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective 1st clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN6 (male).		
			Between CN6 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN6 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Short circuit of harness (Contact with ground circuit or contact between harnesses)	1) Turn starting switch OFF. 2) Disconnect connectors to ATC3 and CN6. 3) Connect T-adapter to connector ATC3 (female).		
			Between ground and wiring harness between ATC3 (female) (36) – CN6 (female) (1)	Resistance	Min. 1 MΩ
			Between wiring harness from ATC3 (female) (36) – CN6 (female) (1) and wiring harness from ATC3 (female) (3) – CN6 (female) (2)	Resistance	Min. 1 MΩ
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to ATC3 (female).		
			Between ATC3 (female) (36) – (3)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related



Failure code [DXH4KY] 1st clutch solenoid output circuit: Short circuit to power source line

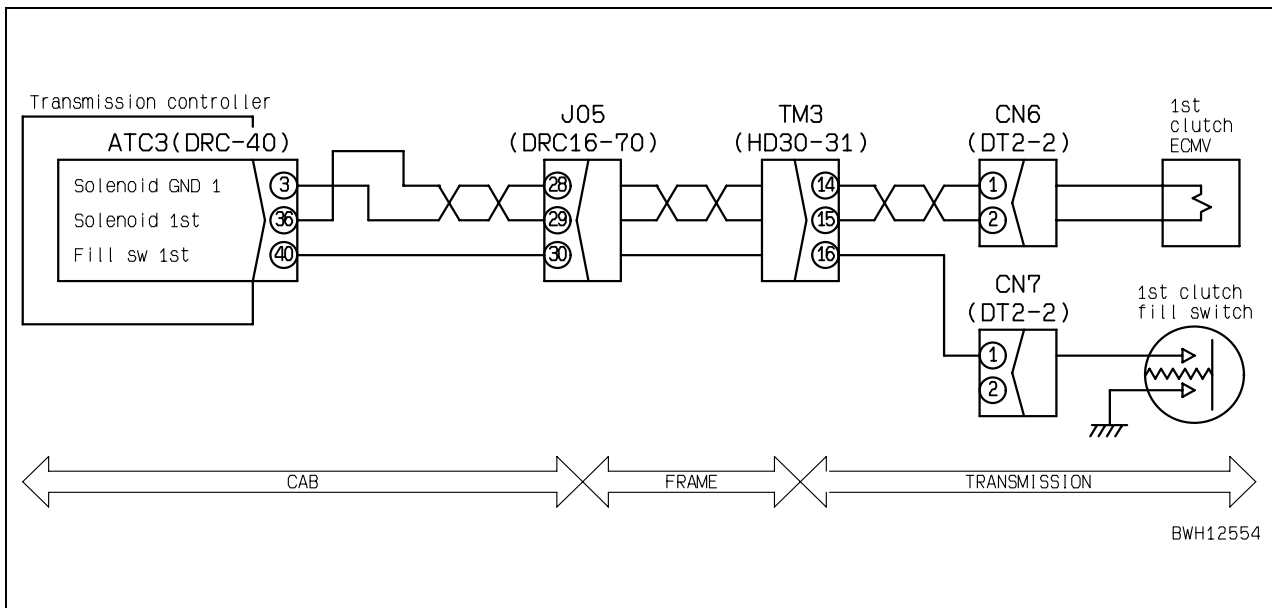
Action code	Failure code	Trouble	1st clutch solenoid output circuit: Short circuit to power source line (Transmission controller system)
E03	DXH4KY		
Contents of trouble	When output to 1st clutch ECMV is "OFF", current flows to circuit.		
Action of controller	- Shifts up and holds the gear speed as shown in Table 2 depending on the gear speed before failure. - Turns lock up to OFF.		
Problem that appears on machine	Once the gear shift lever is set to neutral, the machine can not move off in any gear speeds.		
Related information	Electric current of output to ECMV can be checked by monitoring function (code: 31602 (mA)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective 1st clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN6 (male).		
			Between CN6 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN6 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Hot short in wiring harness (a contact with 24 V circuit)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN6. 3) Connect T-adapter to ATC3 (female). 4) Turn starting switch ON.		
			Between ground and wiring harness between ATC3 (female) (36) – CN6 (female) (1)	Voltage	Max. 1 V
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to ATC3 (female).		
			Between ATC3 (female) (36) – (3)	Resistance	5 – 15 Ω

Table 2

Speed when trouble was detected		Failed clutch (Fill switch ON)	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
F6	4th Low	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	4H	F7	OFF
F5	3rd High	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	4L	F6	OFF
F4	3rd Low	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	3H	F5	OFF
F3	2nd High	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	3L	F4	OFF
F2	2nd Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
F1	1st Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		2nd	2L	F2	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
RH	Reverse High	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
RL	Reverse Low	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		High	RH	RH	OFF
N		ANY	NONE	No reaction	—

Circuit diagram related



Failure code [DXH5KA] 2nd clutch solenoid output circuit: Disconnection

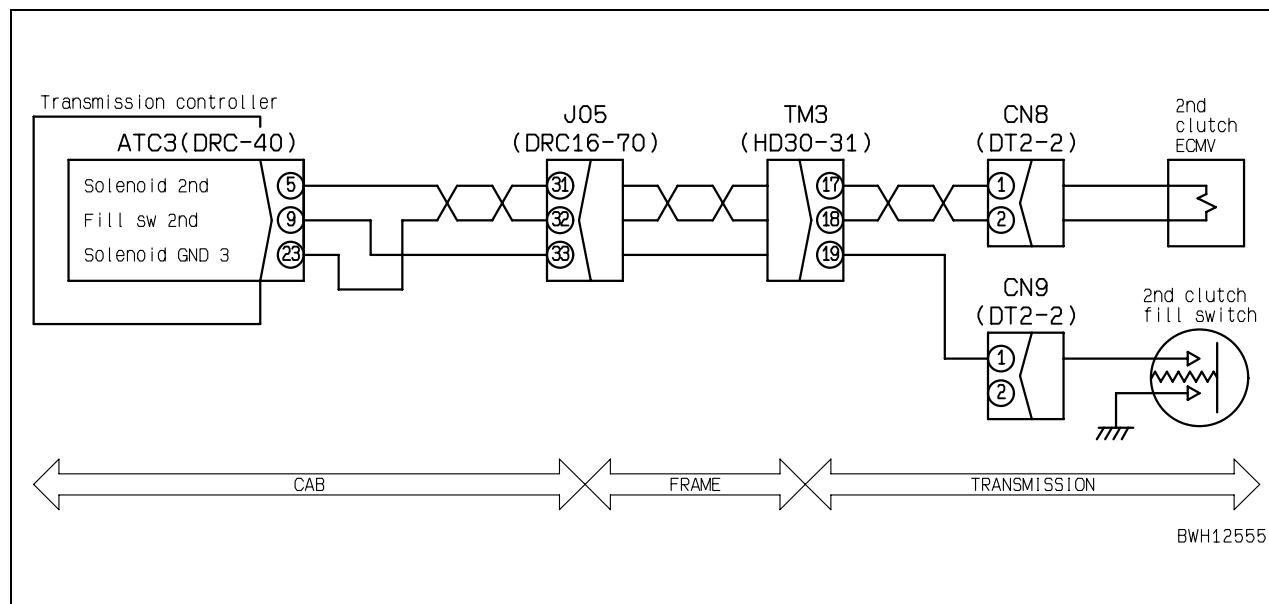
Action code	Failure code	Trouble	2nd clutch solenoid output circuit: Disconnection (Transmission controller system)
E03	DXH5KA		
Contents of trouble	Current does not flow when output to 2nd clutch ECMV is ON.		
Action of controller	- Shifts up and holds the gear speed as shown in Table 1 depending on the gear speed before failure. - Turns lock up to OFF.		
Problem that appears on machine	Once the gear shift lever is set to neutral, the machine can not move off in any gear speeds.		
Related information	- As solenoid detects disconnection while output is ON, be sure to turn output ON to check operation after repair. - Electric current of output to ECMV can be checked with monitoring function (code: 31603 (mA)). - Since output is turned ON and self-check is performed for 5 seconds after starting switch is turned ON, wait for 5 seconds without starting the engine. - If trouble has not been repaired, error is detected again.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective 2nd clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN8 (male).		
			Between CN8 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN8 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors ATC3 (female) and CN8 (female).		
			Wiring harness between ATC3 (female) (5) – CN8 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (23) – CN8 (female) (2)	Resistance	Max. 1 Ω
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to ATC3 (female).		
			Between ATC3 (female) (5) – (23)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related



Failure code [DXH5KB] 2nd clutch solenoid output circuit: Short circuit

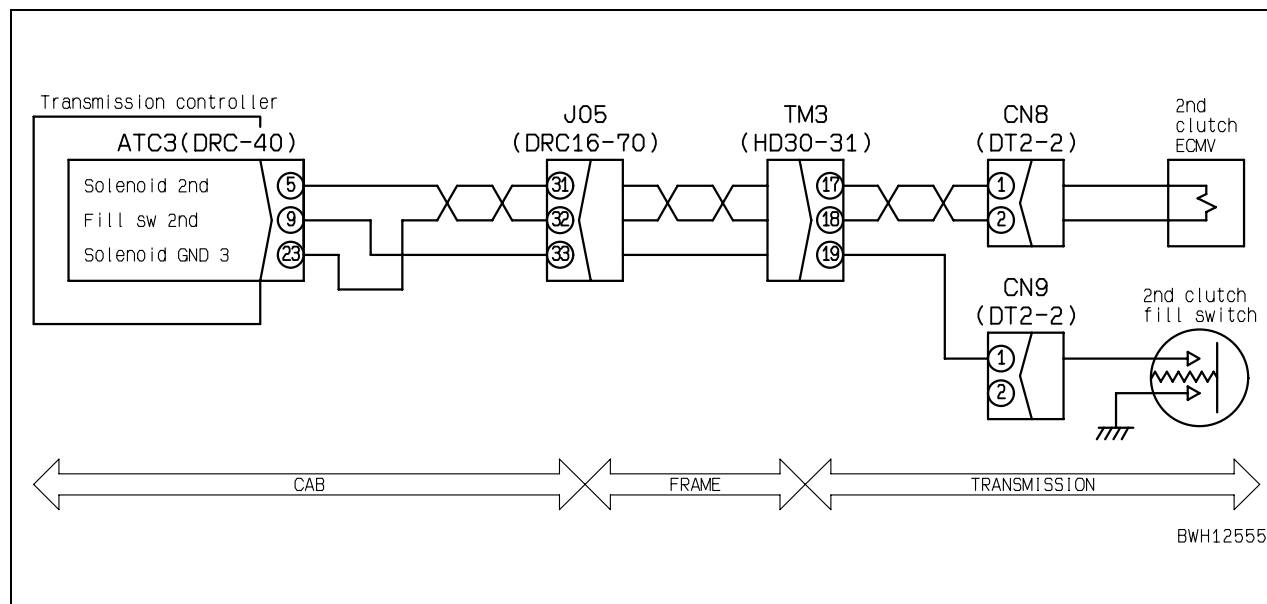
Action code	Failure code	Trouble	2nd clutch solenoid output circuit: Short circuit (Transmission controller system)
E03	DXH5KB		
Contents of trouble	• Abnormally excessive current flows while output to 2nd clutch ECMV is ON.		
Action of controller	• Shifts up and holds the gear speed as shown in Table 1 depending on the gear speed before failure. • Turns lock up to OFF.		
Problem that appears on machine	• Once the gear shift lever is set to neutral, the machine can not move off in any gear speeds.		
Related information	• Electric current of output to ECMV can be checked by monitoring function (code: 31603 (mA)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective 2nd clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN8 (male).		
			Between CN8 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN8 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Short circuit of harness (Contact with ground circuit or contact between harnesses)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN8. 3) Connect T-adapter to ATC3 (female).		
			Between ground and wiring harness between ATC3 (female) (5) – CN8 (female) (1)	Resistance	Min. 1 MΩ
			Between wiring harness from ATC3 (female) (5) – CN8 (female) (1) and wiring harness from ATC3 (female) (23) – CN8 (female) (2)	Resistance	Min. 1 MΩ
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).		
			Between ATC3 (female) (5) – (23)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related



Failure code [DXH5KY] 2nd clutch solenoid output circuit: Short circuit in power source line

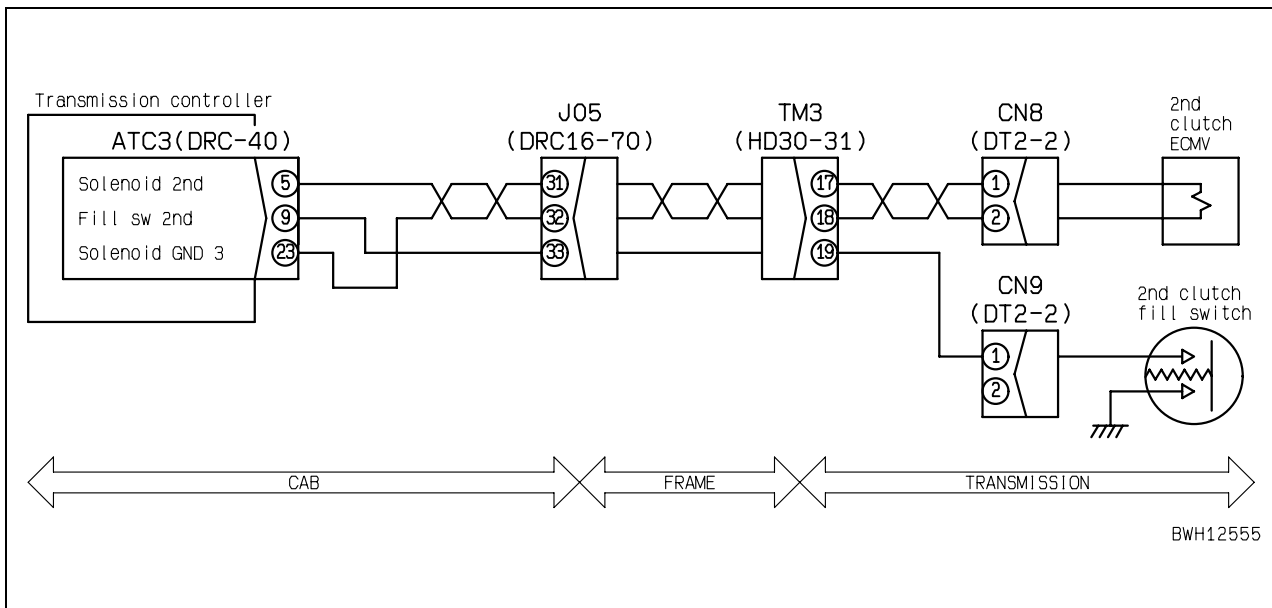
Action code	Failure code	Trouble	2nd clutch solenoid output circuit: Short circuit in power source line (Transmission controller system)
E03	DXH5KY		
Contents of trouble	When output to 2nd clutch ECMV is "OFF", current flows to circuit.		
Action of controller	- Shifts up and holds the gear speed as shown in Table 2 depending on the gear speed before failure. - Turns lock up to OFF.		
Problem that appears on machine	Once the gear shift lever is set to neutral, the machine can not move off in any gear speeds.		
Related information	Electric current of output to ECMV can be checked by monitoring function (code: 31603 (mA)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective 2nd clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adaptor to connector CN8 (male).		
			Between CN8 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN8 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Hot short in wiring harness (a contact with 24V circuit)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN8. 3) Connect T-adaptor to ATC3 (female). 4) Turn starting switch ON.		
			Between ground and wiring harness between ATC3 (female) (5) – CN8 (female) (1)	Voltage	Max. 1 V
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adaptor to connector ATC3 (female).		
			Between ATC3 (female) (5) – (23)	Resistance	5 – 15 Ω

Table 2

Speed when trouble was detected		Failed clutch (Fill switch ON)	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
F6	4th Low	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	4H	F7	OFF
F5	3rd High	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	4L	F6	OFF
F4	3rd Low	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	3H	F5	OFF
F3	2nd High	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	3L	F4	OFF
F2	2nd Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
F1	1st Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		2nd	2L	F2	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
RH	Reverse High	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
RL	Reverse Low	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		High	RH	RH	OFF
N		ANY	NONE	No reaction	—

Circuit diagram related



Failure code [DXH6KA] 3rd clutch solenoid output circuit: Disconnection

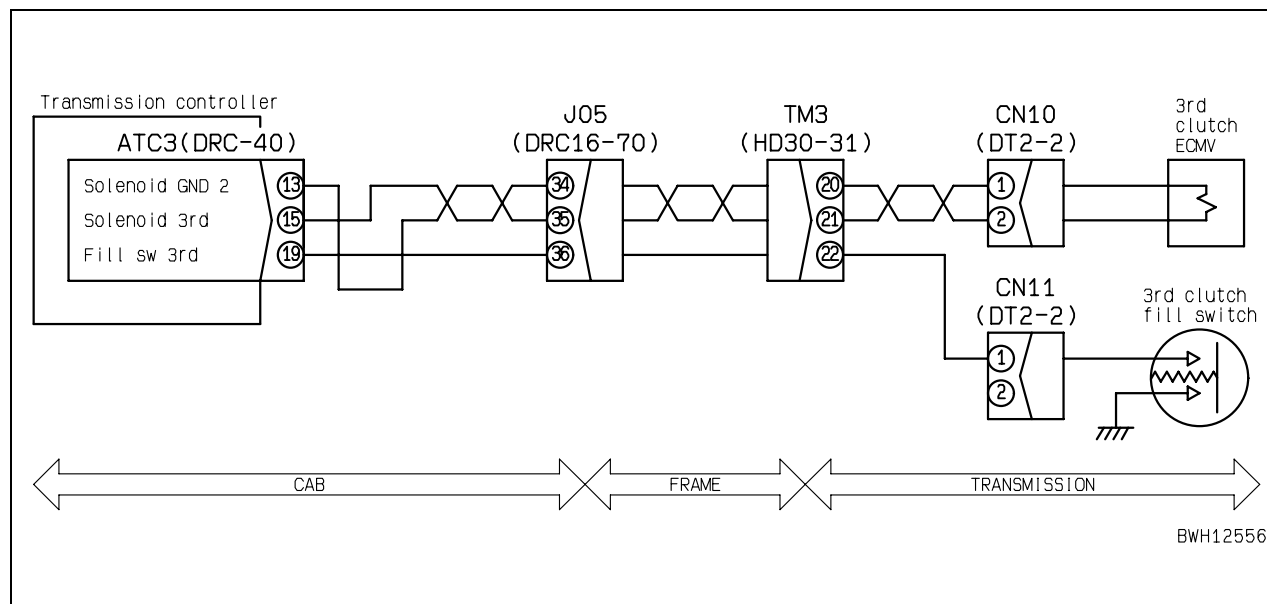
Action code	Failure code	Trouble	3rd clutch solenoid output circuit: Disconnection (Transmission controller system)
E03	DXH6KA		
Contents of trouble	Current does not flow when output to 3rd clutch ECMV is ON.		
Action of controller	- Shifts up and holds the gear speed as shown in Table 1 depending on the gear speed before failure. - Turns lock up to OFF.		
Problem that appears on machine	Once the gear shift lever is set to neutral, the machine can not move off in any gear speeds.		
Related information	- As solenoid detects disconnection while output is ON, be sure to turn output ON to check operation after repair. - Electric current of output to ECMV can be checked with monitoring function (code: 31604 (mA)). - Since output is turned ON and self-check is performed for 5 seconds after starting switch is turned ON, wait for 5 seconds without starting the engine. - If trouble has not been repaired, error is detected again.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective 3rd clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN10 (male).		
			Between CN10 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN10 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect T-adapter connectors to ATC3 (female) and CN10 (male).		
			Wiring harness between ATC3 (female) (15) – CN10 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (13) – CN10 (female) (2)	Resistance	Max. 1 Ω
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).		
			Between ATC3 (female) (15) – (13)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related



Failure code [DXH6KB] 3rd clutch solenoid output circuit: Short circuit

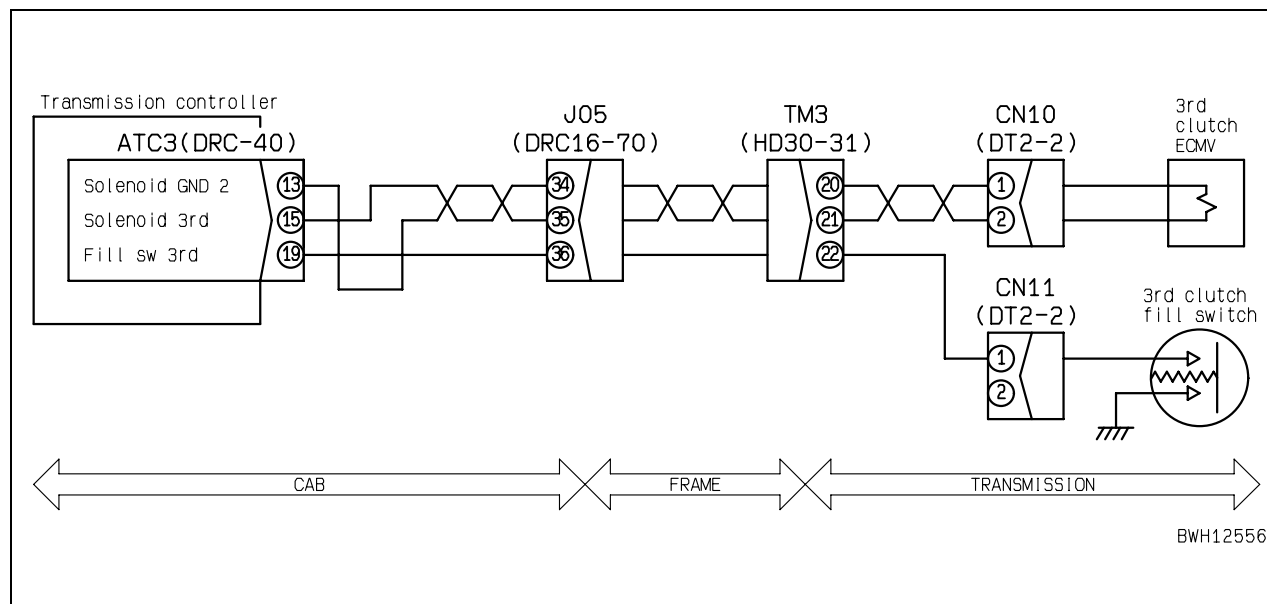
Action code	Failure code	Trouble	3rd clutch solenoid output circuit: Short circuit (Transmission controller system)
E03	DXH6KB		
Contents of trouble	• Abnormally excessive current flows while output to 3rd clutch ECMV is ON.		
Action of controller	• Shifts up and holds the gear speed as shown in Table 1 depending on the gear speed before failure. • Turns lock up to OFF.		
Problem that appears on machine	• Once the gear shift lever is set to neutral, the machine can not move off in any gear speeds.		
Related information	• Electric current of output to ECMV can be checked by monitoring function (code: 31604 (mA)).		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective 3rd clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN10 (male).		
			Between CN10(male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN10 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Short circuit of harness (Contact with ground circuit or contact between harnesses)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN10. 3) Connect T-adapter to ATC3 (female).		
			Between ground and wiring harness between ATC3 (female) (15) – CN10 (female) (1)	Resistance	Min. 1 MΩ
			Between wiring harness from ATC3 (female) (15) – CN10 (female) (1) and wiring harness from ATC3 (female) (13) – CN10 (female) (2)	Resistance	Min. 1 MΩ
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).		
			Between ATC3 (female) (15) – (13)	Resistance	5 – 15 Ω

Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related



Failure code [DXH6KY] 3rd clutch solenoid output circuit: Short circuit to power source line

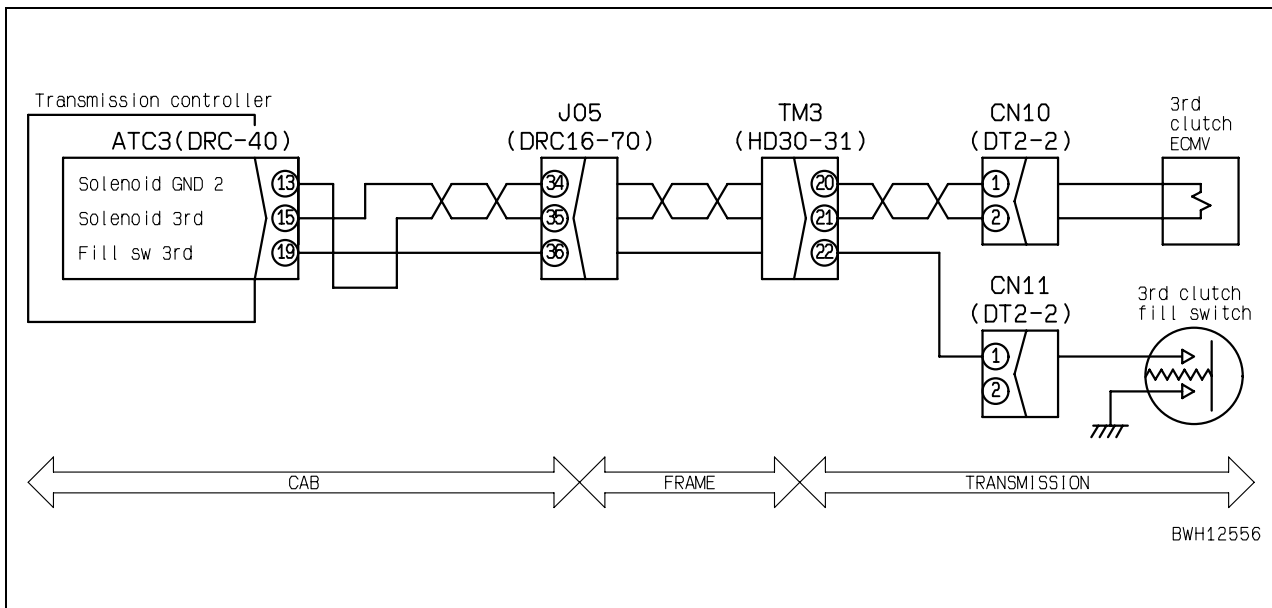
Action code	Failure code	Trouble	3rd clutch solenoid output circuit: Short circuit to power source line (Transmission controller system)
E03	DXH6KY		
Contents of trouble	When output to 3rd clutch ECMV is OFF, current flows to circuit.		
Action of controller	- Shifts up and holds the gear speed as shown in Table 2 depending on the gear speed before failure. - Turns lock up to OFF.		
Problem that appears on machine	Once the gear shift lever is set to neutral, the machine can not move off in any gear speeds.		
Related information	Electric current of output to ECMV can be checked by monitoring function (code: 31604 (mA)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective 3rd clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN10 (male).		
			Between CN10 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN10 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Hot short in wiring harness (a contact with 24 V circuit)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN10. 3) Connect T-adapter to ATC3 (female). 4) Turn starting switch ON.		
			Between ground and wiring harness between ATC3 (female) (15) – CN10 (female) (1)	Voltage	Max. 1 V
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).		
			Between ATC3 (female) (15) – (13)	Resistance	5 – 15 Ω

Table 2

Speed when trouble was detected		Failed clutch (Fill switch ON)	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
F6	4th Low	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	4H	F7	OFF
F5	3rd High	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	4L	F6	OFF
F4	3rd Low	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	3H	F5	OFF
F3	2nd High	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	3L	F4	OFF
F2	2nd Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
F1	1st Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		2nd	2L	F2	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
RH	Reverse High	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
RL	Reverse Low	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		High	RH	RH	OFF
N		ANY	NONE	No reaction	—

Circuit diagram related

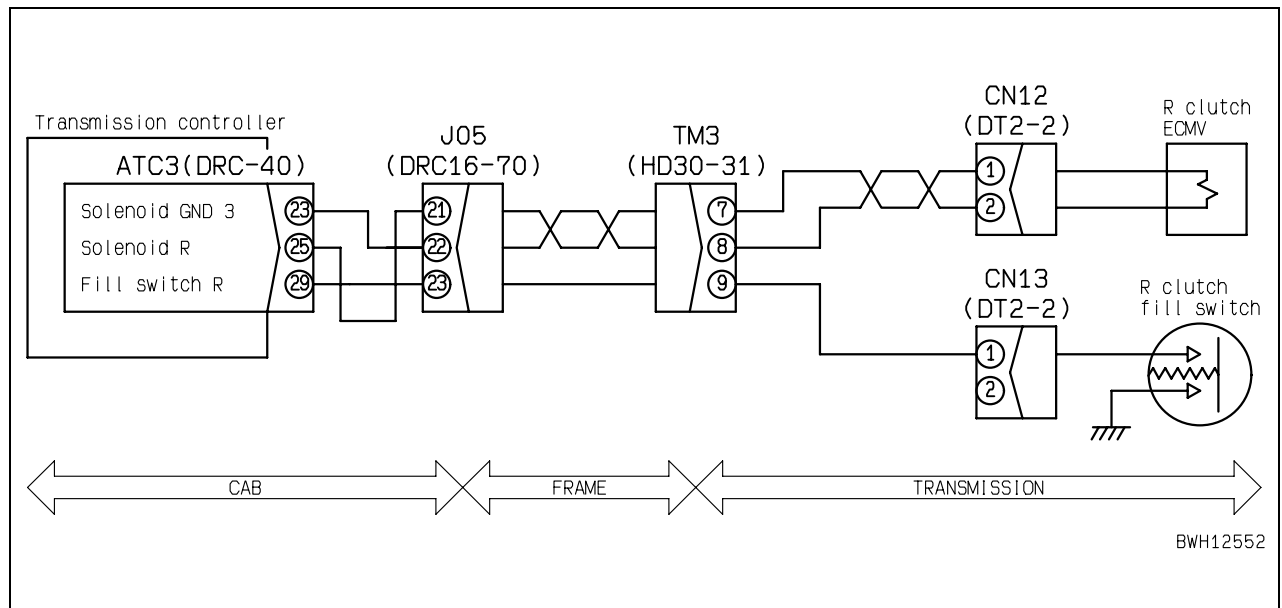


Failure code [DXH7KA] R clutch solenoid output circuit: Disconnection

Action code	Failure code	Trouble	R clutch solenoid output circuit: Disconnection (Transmission controller system)
E03	DXH7KA		
Contents of trouble	Current does not flow when output to R clutch ECMV is ON.		
Action of controller	- The controller sets the gear in neutral. - Turns lock up to OFF.		
Problem that appears on machine	Machine can not move off in any gear speeds.		
Related information	- As solenoid detects disconnection while output is ON, be sure to turn output ON to check operation after repair. - Electric current of output to ECMV can be checked with monitoring function (code: 31606 (mA)). - Since output is turned ON and self-check is performed for 5 seconds after starting switch is turned ON, wait for 5 seconds without starting the engine. - If trouble has not been repaired, error is detected again.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective R clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN12 (male).		
			Between CN12 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN12 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors ATC3 (female) and CN12 (female).		
			Wiring harness between ATC3 (female) (25) – CN12 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (23) – CN12 (female) (2)	Resistance	Max. 1 Ω
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).		
			Between ATC3 (female) (25) – (23)	Resistance	5 – 15 Ω

Circuit diagram related

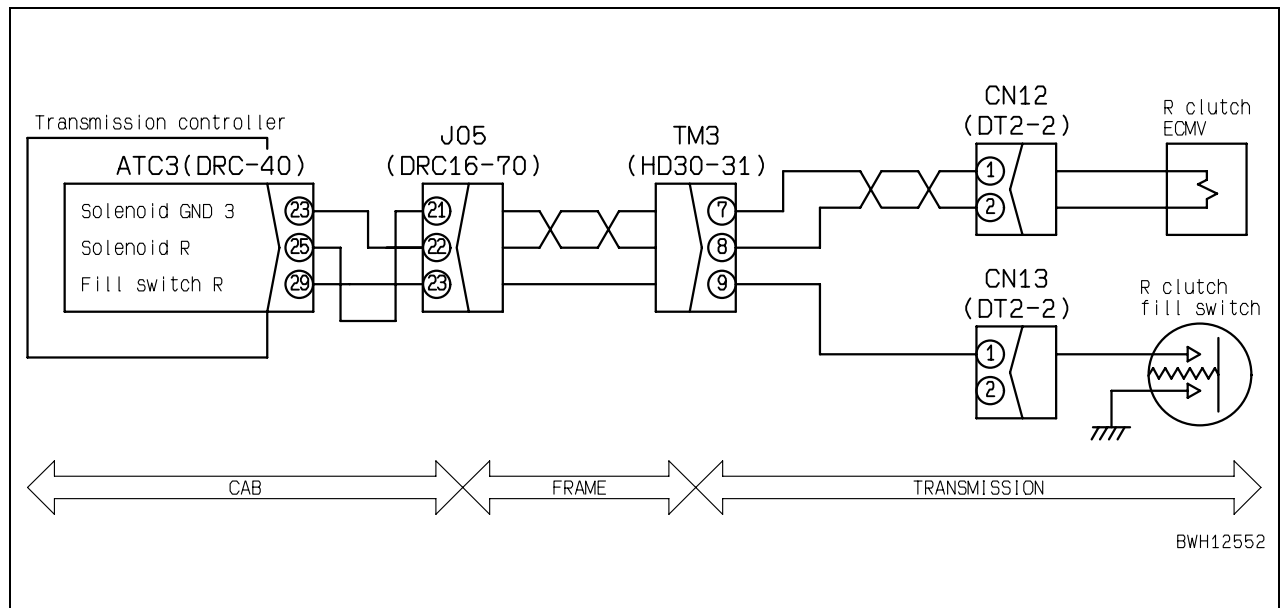


Failure code [DXH7KB] R clutch solenoid output circuit: Short circuit

Action code	Failure code	Trouble	R clutch solenoid output circuit: Short circuit (Transmission controller system)
E03	DXH7KB		
Contents of trouble	Abnormally excessive current flows while output to R clutch ECMV is ON.		
Action of controller	- The controller sets the gear in neutral. - Turns lock up to OFF.		
Problem that appears on machine	Machine can not move off in any gear speeds.		
Related information	Electric current of output to ECMV can be checked by monitoring function (code: 31606 (mA)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective R clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adaptor to connector CN12 (male).		
			Between CN12 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN12 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Short circuit of harness (Contact with ground circuit or contact between harnesses)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN12. 3) Connect T-adaptor to ATC3 (female).		
			Between ground and wiring harness between ATC3 (female) (25) – CN12 (female) (1)	Resistance	Min. 1 MΩ
			Between wiring harness from ATC3 (female) (25) – CN12 (female) (1) and wiring harness from ATC3 (female) (23) – CN12 (female) (2)	Resistance	Min. 1 MΩ
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adaptor to connector ATC3 (female).		
			Between ATC3 (female) (25) – (23)	Resistance	5 – 15 Ω

Circuit diagram related

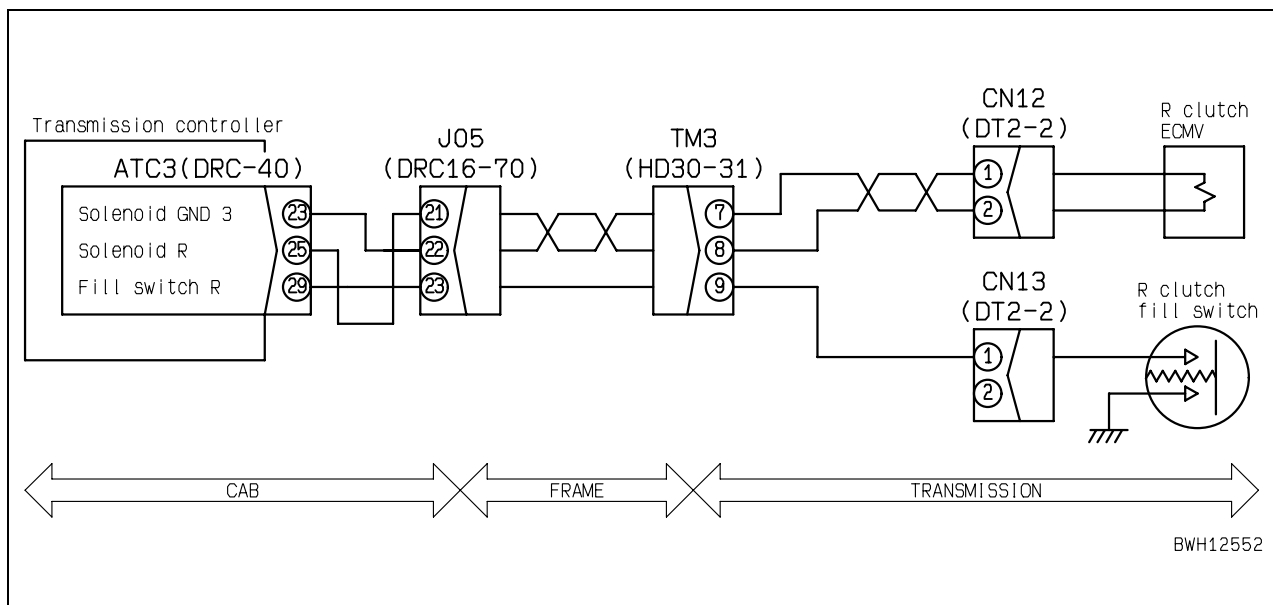


Failure code [DXH7KY] R clutch solenoid output circuit: Short circuit to power source line

Action code	Failure code	Trouble	R clutch solenoid output circuit: Short circuit to power source line (Transmission controller system)
E03	DXH7KY		
Contents of trouble	When output to R clutch ECMV is OFF, current flows to circuit.		
Action of controller	- The controller sets the gear in neutral. - Turns lock up to OFF.		
Problem that appears on machine	Machine can not move off in any gear speeds.		
Related information	Electric current of output to ECMV can be checked by monitoring function (code: 31606 (mA)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective R clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN12 (male).		
			Between CN12 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN12 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Hot short in wiring harness (a contact with 24 V circuit)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN12. 3) Connect T-adapter to ATC3 (female). 4) Turn starting switch ON.		
			Between ground and wiring harness between ATC3 (female) (25) – CN12 (female) (1)	Voltage	Max. 1 V
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).		
			Between ATC3 (female) (25) – (23)	Resistance	5 – 15 Ω

Circuit diagram related

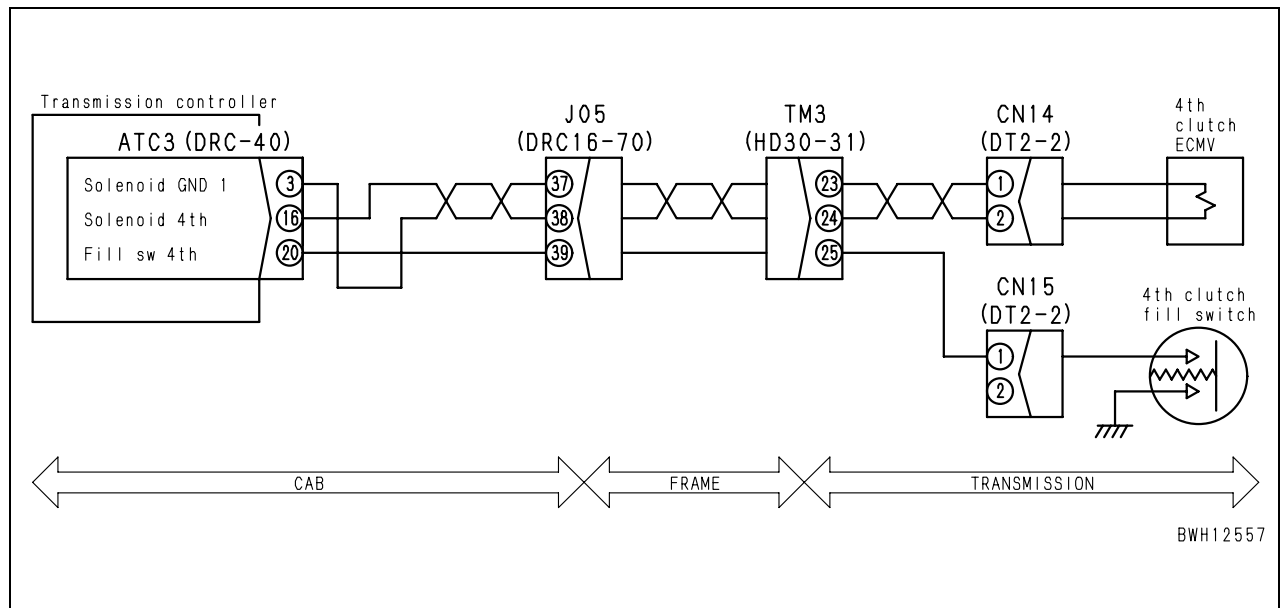


Failure code [DXHHKA] 4th clutch solenoid output circuit: Disconnection

Action code	Failure code	Trouble	4th clutch solenoid output circuit: Disconnection (Transmission controller system)
E03	DXHHKA		
Contents of trouble	Current does not flow when output to 4th clutch ECMV is ON.		
Action of controller	- The controller sets the gear in neutral. - Turns lock up to OFF.		
Problem that appears on machine	Machine can not move off in any gear speeds.		
Related information	- As solenoid detects disconnection while output is ON, be sure to turn output ON to check operation after repair. - Electric current of output to ECMV can be checked with monitoring function (code: 31605 (mA)). - Since output is turned ON and self-check is performed for 5 seconds after starting switch is turned ON, wait for 5 seconds without starting the engine. - If trouble has not been repaired, error is detected again.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective 4th clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN14 (male).		
			Between CN14 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN14 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adapter to ATC3 (female) and CN14 (female).		
			Wiring harness between ATC3 (female) (16) – CN14 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between ATC3 (female) (3) – CN14 (female) (2)	Resistance	Max. 1 Ω
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).		
			Wiring harness between ATC3 (female) (16) – (3)	Resistance	5 – 15 Ω

Circuit diagram related

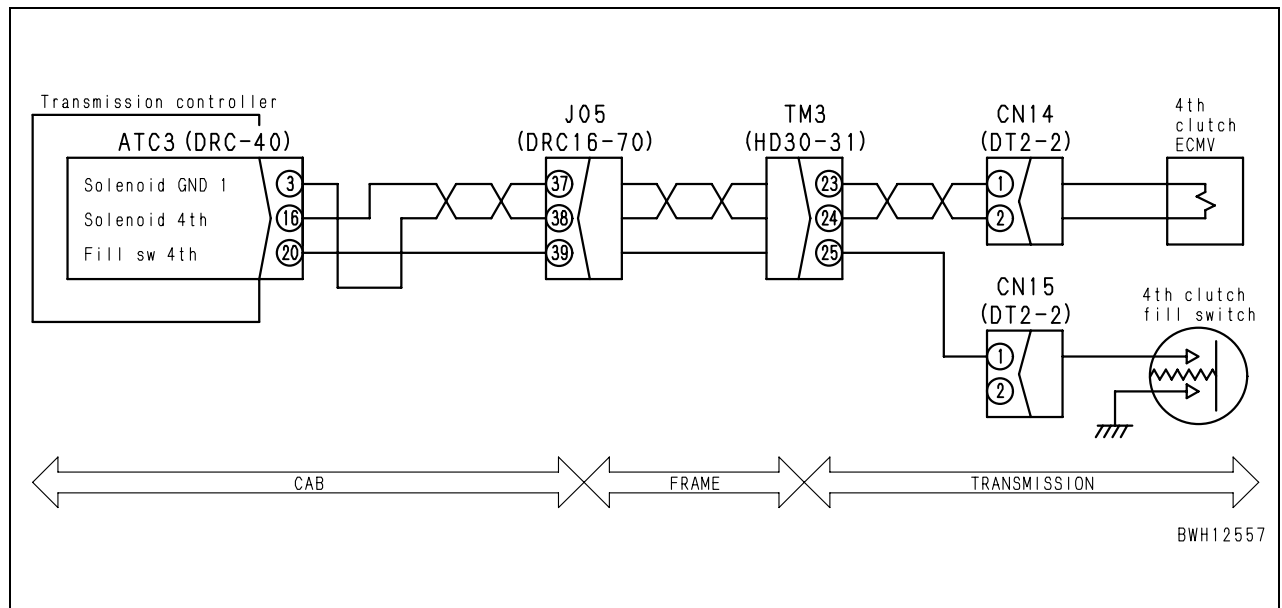


Failure code [DXHHKB] 4th clutch solenoid output circuit: Short circuit

Action code	Failure code	Trouble	4th clutch solenoid output circuit: Short circuit (Transmission controller system)
E03	DXHHKB		
Contents of trouble	Abnormally excessive current flows while output to 4th clutch ECMV is ON.		
Action of controller	- The controller sets the gear in neutral. - Turns lock up to OFF.		
Problem that appears on machine	Once the gear shift lever is set to neutral, the machine can not move off in any gear speeds.		
Related information	Electric current of output to ECMV can be checked by monitoring function (code: 31605 (mA)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective 4th clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN14 (male).		
			Between CN14 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN14 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Short circuit of harness (Contact with ground circuit or contact between harnesses)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN14. 3) Connect T-adapter to ATC3 (female).		
			Between ground and wiring harness between ATC3 (female) (16) – CN14 (female) (1)	Resistance	Min. 1 MΩ
			Between wiring harness from ATC3 (female) (16) – CN14 (female) (1) and wiring harness from ATC3 (female) (3) – CN14 (female) (2)	Resistance	Min. 1 MΩ
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).		
			Between ATC3 (female) (16) – (3)	Resistance	5 – 15 Ω

Circuit diagram related



Failure code [DXHHKY] 4th clutch solenoid output circuit: Short circuit to power source line

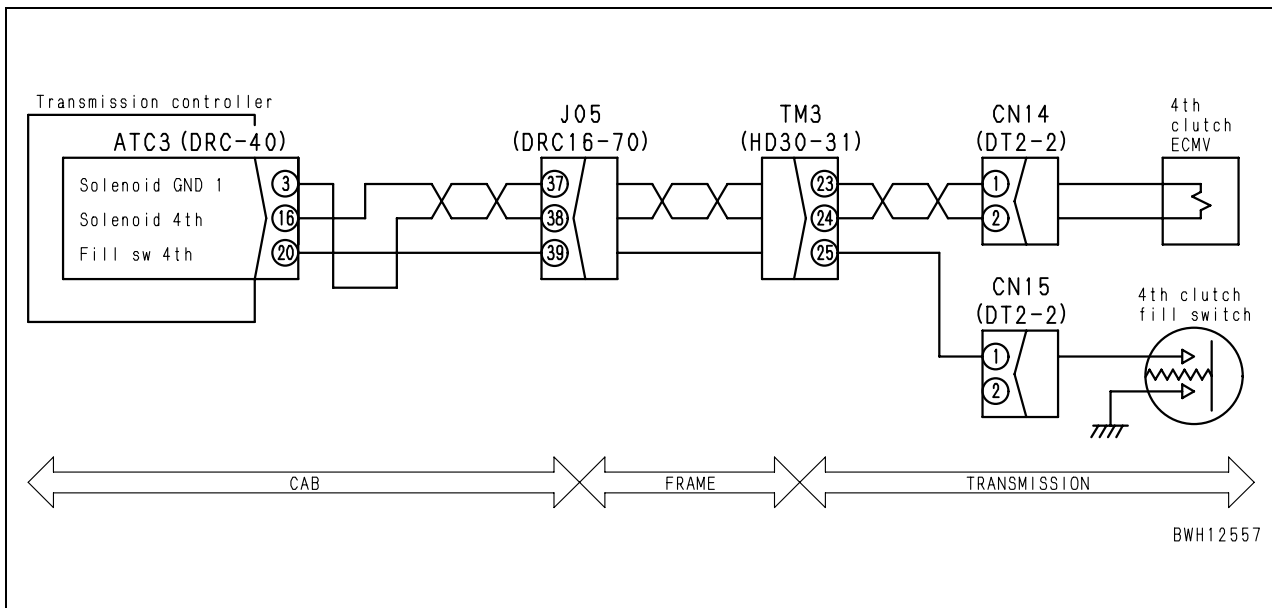
Action code	Failure code	Trouble	4th clutch solenoid output circuit: Short circuit to power source line (Transmission controller system)
E03	DXHHKY		
Contents of trouble	When output to 4th clutch ECMV is OFF, current flows to circuit.		
Action of controller	- Shifts up and holds the gear speed as shown in Table 2 depending on the gear speed before failure. - Turns lock up to OFF.		
Problem that appears on machine	Once the gear shift lever is set to neutral, the machine can not move off in any gear speeds.		
Related information	Electric current of output to ECMV can be checked by monitoring function (code: 31605 (mA)).		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective 4th clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN14 (male).		
			Between CN14 (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN14 (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Hot short in wiring harness (a contact with 24 V circuit)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN14. 3) Connect T-adapter to ATC3 (female). 4) Turn starting switch ON.		
			Between ground and wiring harness between ATC3 (female) (16) – CN14 (female) (1)	Voltage	Max. 1 V
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).		
			Between ATC3 (female) (16) – (3)	Resistance	5 – 15 Ω

Table 2

Speed when trouble was detected		Failed clutch (Fill switch ON)	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
F6	4th Low	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	4H	F7	OFF
F5	3rd High	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	4L	F6	OFF
F4	3rd Low	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	3H	F5	OFF
F3	2nd High	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	3L	F4	OFF
F2	2nd Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
F1	1st Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		2nd	2L	F2	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
RH	Reverse High	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
RL	Reverse Low	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		High	RH	RH	OFF
N		ANY	NONE	No reaction	—

Circuit diagram related



HD785-7 Dump truck

Form No. SEN01947-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

40 Troubleshooting

Troubleshooting of electrical system (E-mode)

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Before troubleshooting of electric system

- ★ When carrying out troubleshooting related to the electrical system, you should check the circuit breakers and slow-blow fuses to see if the power is supplied normally.
- ★ When checking, see "Troubleshooting by failure code (General)", "Before carrying out troubleshooting when failure code is displayed".

Contents of troubleshooting table

- ★ Troubleshooting Table and Circuit Diagram Related collectively carry the following information. Carry out troubleshooting work after fully grasping their contents.

Trouble	Phenomenon occurring on machine
Related information	Information on the failure occurred as well as the troubleshooting

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Cause for presumed failure (The attached No. is for filing and reference purpose only. It does not stand for any priority.)	<Contents> - The standard values in normalcy by which to judge "Good" or "No Good" about presumed causes. - References for making judgement of "Good" or "No Good".
	2		<Phenomena of wiring harness fault> - Failure due to disconnection Defective contact with connector or disconnection of wiring harness has occurred. - Grounding fault A wiring harness that is not originally connected with a grounding circuit is in contact with it. - Failure due to short-circuiting A wiring harness that is not originally connected with a power source circuit (24 V) is in contact with it.
	3		<Points to remember in troubleshooting> - Connector denotation method and handling of T-adapters Insert or connect T-adapters in the following manner, unless specifically otherwise instructed. - If there is no indication of "male" or "female" in the connector No., pull off a connector and insert a T-adapter into both sides of male and female - If there is an indication of "male" and "female" in the connector No., pull off a connector and insert a T-adapter into only one side of "male" or "female". - Description sequence of pin No. and handling of circuit tester leads Connect the positive lead (+) and negative lead (-) for troubleshooting in the following manner unless specifically otherwise instructed. - Connect the positive lead (+) to a pin No. marked at the front or wiring harness. - Connect the negative lead (-) to a pin No. marked at the rear of wiring harness.
	4		
	5		

Circuit diagram related

This is part of the electrical circuit diagram which shows the portion where the failure occurred.

- Connector No.: Indicates (Type - numbers of a pin) (color)
- Arrow (↔) : Roughly indicates the location in the machine where it is installed.

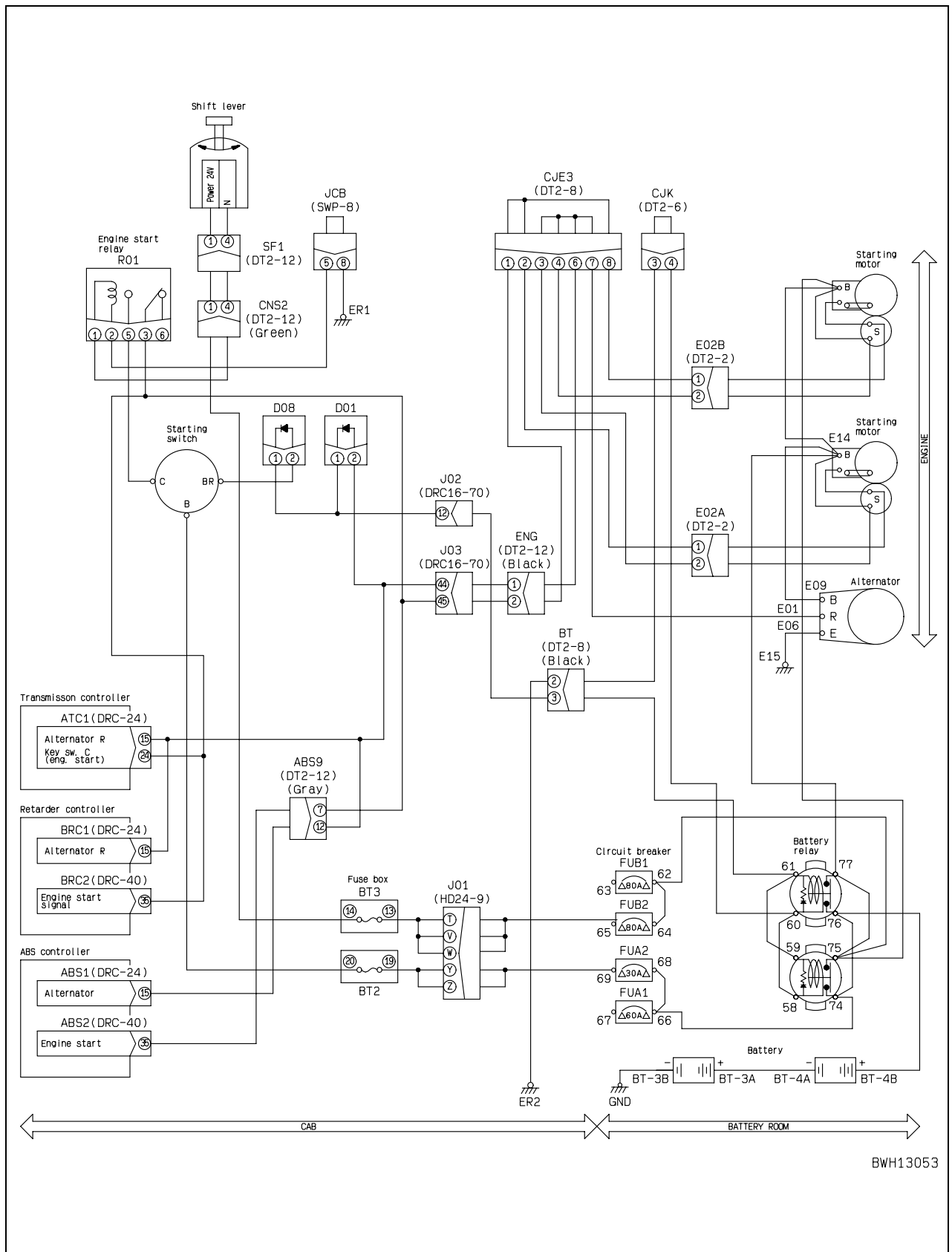
E-1 Engine does not start

Trouble	Engine does not start.
Related information	When failure code related to engine controller or transmission is present, troubleshooting the corresponding failure code first.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective battery	Gravity		Min. 1.26	
			Voltage		Min. 25 V	
	2	Defective circuit breaker FUA2 and FUB2 or defective fuse BT2 (19) – (20), BT3 (13) – (14) and BT3 (21) – (22)	When circuit breaker FUA2, FUB2 is shut off, or fuse BT2 (19) – (20), BT3 (13) – (14) and BT3 (21) – (22) is blown, it is highly possible that a defective grounding has occurred in the circuit.			
	3	Defective engine starter relay (R01)	1) Turn starting switch OFF. 2) Start engine and carry out troubleshooting. ★ Gearshift lever: Neutral			
			Replace relay (R01) with other relay (5 terminals)	The problem is resolved.	Defective relay	
				The problem is not resolved.	Relay is normal	
	4	Defective engine starting relay (R01) coil, gearshift lever or wiring	1) Turn starting switch OFF. 2) Set gearshift lever in neutral and carry out troubleshooting.			
			Between starting motor terminal B – ground	Resistance (Coil of R01)	230 – 350 Ω	
	5	Defective diode (D01), (D08)	1) Turn starting switch OFF. 2) Disconnect connector D01 (female) and D08 (male).			
			D01, D08 (male)	Between (1) – (2)	Continuity	None
				Between (2) – (1)	Continuity	Yes
			• Troubleshooting in a diode range.			
	6	Defective alternator (regulator)	1) Turn starting switch OFF and carry out troubleshooting.			
			Between alternator terminal R (E01) – ground	Voltage	Max. 12V	
	7	Defective battery relay	1) Prepare with starting switch OFF. 2) Turn starting switch ON and carry out troubleshooting.			
			Between starting motor terminal B – ground	Voltage	20 – 30 V	
	8	Disconnection in wiring harness (Disconnection or defective contact in connector) (Power supply circuits)	1) Turn starting switch OFF. 2) Disconnect battery ground cable, connector SF1, battery relay and starting switch terminals.			
			Wiring harness between BT2 (19) – battery relay (76) terminal B	Resistance	Max. 1 Ω	
			Wiring harness between BT3 (13) – battery relay (77) terminal M	Resistance	Max. 1 Ω	
			Harness between battery (+) terminal – battery relay (76) terminal B	Resistance	Max. 1 Ω	
			Harness between BT2 (20) – starting switch (terminal B)	Resistance	Max. 1 Ω	
Harness between BT3 (14) – SF1 (male) (1)			Resistance	Max. 1 Ω		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	8	Disconnection in wiring harness (Disconnection or defective contact in connector) (Power supply circuits)	Harness between starting switch (terminal BR) – battery relay (61) terminal BR (Troubleshooting in the diode range from starting switch (terminal BR) side)	Continuity	Continue
			Harness between battery relay (60) terminal (-) – frame ground (ER2)	Resistance	Max. 1 Ω
			Harness between battery relay (77) terminal M – starting motor (terminal B)	Resistance	Max. 1 Ω
	9	Disconnection in wiring harness (Disconnection or defective contact in connector) (Related circuit after starting switch terminal C)	1) Turn starting switch OFF. 2) Disconnect connectors R01, R38, E02A, and starting switch terminals. 3) Connect T-adapter to connector of circuit to be measured.		
			Harness between starting switch (terminal C) – R38 (female) (3)	Resistance	Max. 1 Ω
			Harness between R01 (female) (3) – E02B (female) (1)	Resistance	Max. 1 Ω
			Harness between R01 (female) (3) – E02A (female) (1)	Resistance	Max. 1 Ω
			Harness between R01 (female) (1) – SF1 (male) (4)	Resistance	Max. 1 Ω
			Between R01 (female) (2) – ground (ER1)	Resistance	Max. 1 Ω
	10	Hot short of wiring harness (a contact with 24 V circuit)	1) Turn starting switch OFF. 2) Disconnect connectors R01, R38, E02A, and starting switch terminals. 3) Connect T-adapter to connector of circuit to be measured.		
			Between ground and wiring harness between alternator (terminal R) – E02A (male) (2)	Voltage	Max. 1V
			Between ground and wiring harnesses between CJE3 (female) (1) – ATC1 (female) (15), BRC1 (female) (15) – D01 (female) (2)	Voltage	Max. 1V
	11	Defective starting switch (Between terminals B – C or BR)	1) Disconnect battery ground cable. 2) Disconnect starting switch terminals.		
			Starting switch unit (between B – C), (between B – BR)	Resistance	Max. 1 Ω
	12	Defective starting motor	1) Turn starting switch ON and carry out troubleshooting.		
			Between starting motor (B terminal) – ground	Voltage	20 – 30 V
			1) Turn starting switch OFF. 2) Insert T-adapter in connector E02A. 3) Turn starting switch ON.		
			Between E02A (1) – ground	Voltage	20 – 30 V
			Between E02B (1) – ground	Voltage	20 – 30 V

Circuit diagram related



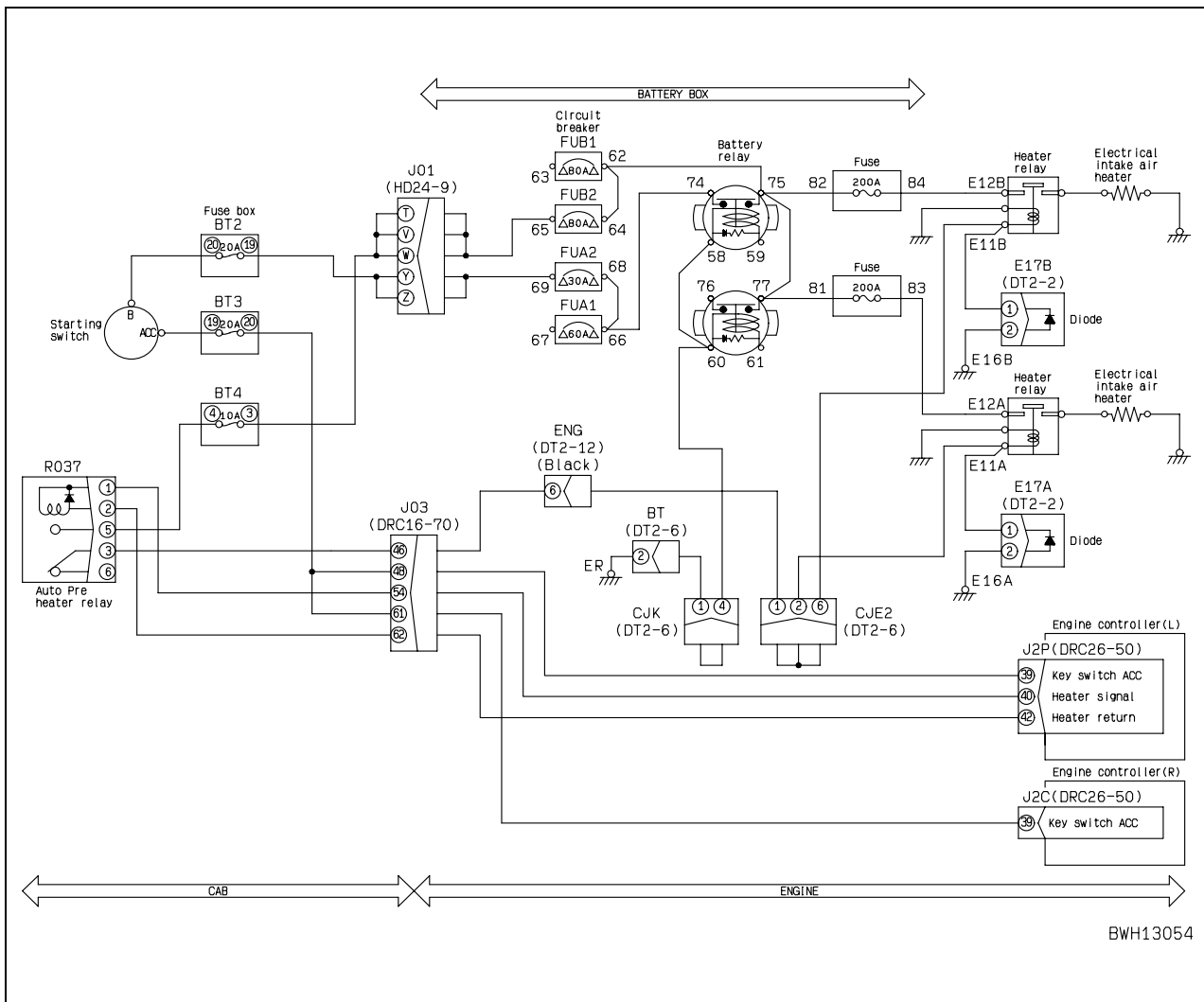
E-2 Automatic preheating does not operate

Trouble	Auto-preheater does not operate when starting switch is turned ON while engine coolant temperature is below -5 °C.
Related information	- Carry out following troubleshooting when failure neither of codes [CA2555] and [CA2556] are displayed. (If either of these failure codes is displayed, carry out troubleshooting for it first.) - While engine coolant temperature is above -5 °C, auto-preheater does not operate. - Engine coolant temperature can be checked with monitoring function (Code: 04104 (°C))

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective circuit breaker FUA2, FUB2 and defective fuse BT2 (20), BT4 (4)	When the circuit breaker is shut off or the fuse is blown, it is highly possible that a defective grounding has occurred in the circuit (troubleshooting cause 8).			
	2	Defective high current fuse (200A) (fuse is blown)	Fuse is normal if continuity exists between inlet and outlet of high current fuse (disconnect the inlet and outlet terminals).			
	3	Defect intake air heater (internal disconnection) (internal resistance: Max.0.2 Ω)	1) Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between heater inlet terminal – ground	Resistance	Max. 1 Ω	
			Between heater (-) terminal – ground	Resistance	Max. 1 Ω	
	4	Defective heater relay (Internal disconnection or defective contact)	1) Turn starting switch OFF and carry out troubleshooting.			
			Between heater relay coil side (-) terminal – ground	Resistance	10 – 20 Ω	
			1) Disconnect battery ground cable. 2) Disconnect connector BT (input on heater relay primary side). 3) Prepare wire and connect battery relay terminal 75 to heater relay terminal E11B. 4) Connect battery ground cable. 5) Turn starting switch ON and carry out troubleshooting. (★ It does not turn ON 5 minutes or more)			
			Between heater relay terminal (E12B) – ground	Voltage	15 – 28 V	
			Between heater relay terminal (RLY) – ground	Voltage	15 – 28 V	
			Between heater relay terminal (E11B) – ground	Voltage	15 – 28 V	
	5	Defective auto preheater relay (R37)	1) Turn starting switch OFF. 2) Replace R37 with horn relay (R11). 3) Turn starting switch ON.			
			Turn horn ON.	Horn sounds.		
	6	Defective diode (E17B)	1) Turn starting switch OFF. 2) Disconnect connector E17B.			
			E17B (male)	Between (1) + – (2) -	Continuity	There is not continuity
				Between (1) - – (2) +	Continuity	There is continuity
			• Check in diode check mode.			
	7	Defective starting switch (Defective contact between contact points B and ACC)	1) Turn starting switch ON and carry out troubleshooting.			
			Between starting switch terminal B – ground	Voltage	15 – 28 V	
			Between starting switch terminal ACC – ground	Voltage	15 – 28 V	
			• If no problem is found by above diagnoses, starting switch is defective.			

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	8	Disconnection in wiring harness (Disconnection or defective contact in connector)	1) Turn starting switch OFF. 2) Disconnect terminals of circuit breaker, starting switch, slow-blow fuse, and heater relay.		
			Wiring harness between heater relay terminal (RLY) – air heater inlet terminal	Resistance	Max. 1 Ω
			Wiring harness between heater relay terminal (E12B) – high current fuse outlet terminal	Resistance	Max. 1 Ω
			Wiring harness between slow-blow fuse inlet – battery relay terminal M (75).	Resistance	Max. 1 Ω
			Wiring harness between battery relay terminal M (75) – circuit breaker FUB2 terminal	Resistance	Max. 1 Ω
			Wiring harness between circuit breaker FUB2 terminal – fuse BT4 (3), (4) – R37 (female) (5)	Resistance	Max. 1 Ω
			Wiring harness between battery relay terminal B (74) – circuit breaker FUA2 terminal	Resistance	Max. 1 Ω
			Wiring harness between circuit breaker FUA2 terminal – fuse BT2 (19), (20) – starting switch terminal B	Resistance	Max. 1 Ω
			Wiring harness between starting switch terminal ACC-fuse BT3 (19), (20) – J2P (female) (39)	Resistance	Max. 1 Ω
	9	Short circuit of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect terminals of circuit breaker, slow-blow fuse, heater relay, heater terminal, and starting switch.		
			Between ground and wiring harness between heater relay terminal (RLY) – air heater inlet terminal	Resistance	Min. 1 MΩ
			Between ground and wiring harness between heater relay terminal (E12B) – high current fuse outlet terminal	Resistance	Min. 1 MΩ
			Between ground and wiring harness between slow-blow fuse inlet – battery relay terminal M (75).	Resistance	Min. 1 MΩ
			Between ground and wiring harness between battery relay terminal M (75) – circuit breaker FUB2 terminal (64)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between circuit breaker FUB2 terminal – fuse BT4 (3), (4) – R37 (female) (5)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between battery relay terminal B (74) – circuit breaker FUA2 terminal	Resistance	Min. 1 MΩ
			Between ground and wiring harness between circuit breaker FUA2 terminal – fuse BT2 (19), (20) – starting switch terminal B	Resistance	Min. 1 MΩ
			Between ground and wiring harness between starting switch terminal ACC – fuse BT3 (19), (20) – J2P (female) (39)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between starting switch terminal ACC – fuse BT3 (19), (20) – J2C (female) (39)	Resistance	Min. 1 MΩ

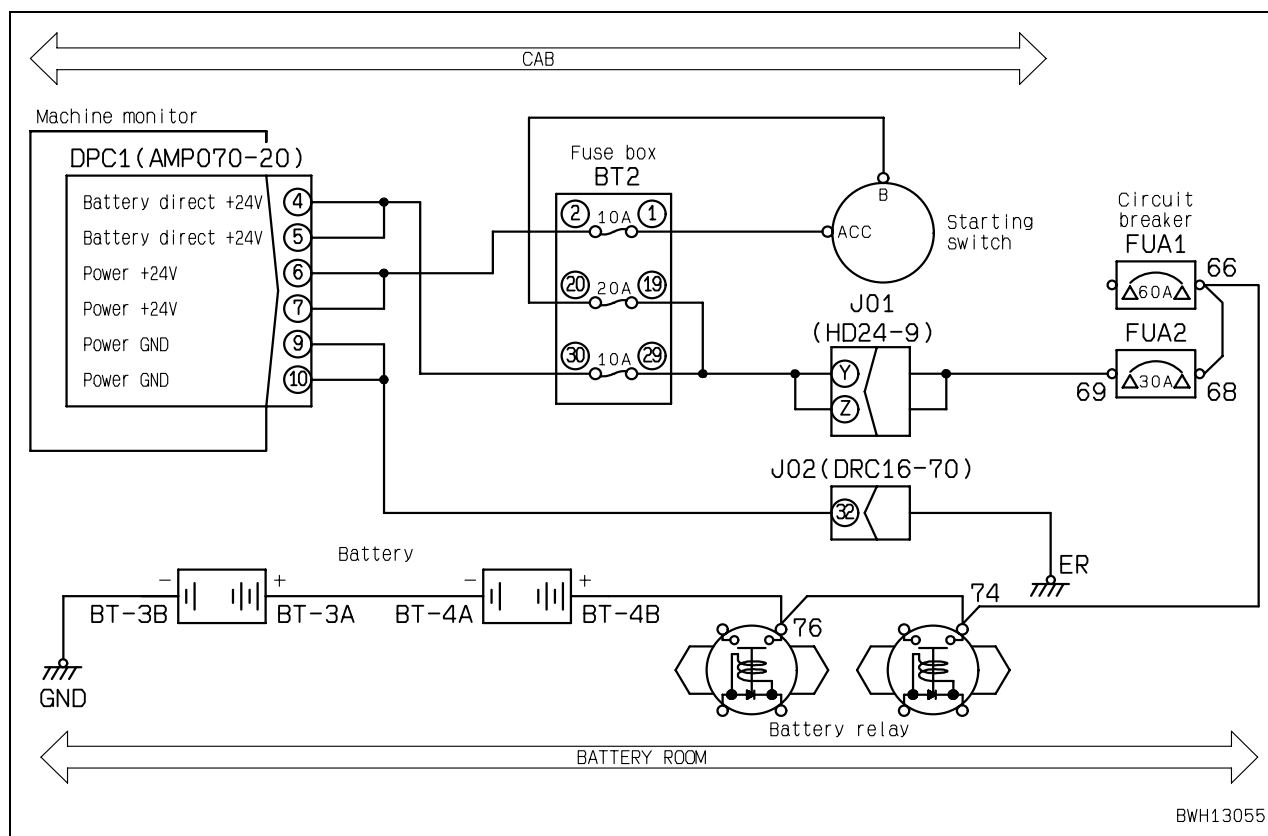
Circuit diagram related



E-3 Machine monitor does not display all, when starting switch is turned ON

Trouble	Lamps and gauges of machine monitor do not display all, when starting switch is turned ON.
Related information	When the machine related failure code is not displayed (if displayed, troubleshooting the code first.)

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective fuse BT2 (2), (20) or (30) or defective circuit breaker FUA2	When the fuse BT2 (2), (20) or (30) is blown or the circuit breaker FUA2 is shut off, it is highly possible that a defective grounding has occurred in the circuit (troubleshooting cause 3).		
	2	Disconnection in wiring harness (Disconnection or defective contact in connector)	1) Turn starting switch OFF. 2) Connect T-adapter to connector DPC1 (female). 3) Disconnect fuse terminal of starting switch.		
			Wiring harness between DPC1 (female) (6), (7) – fuse BT2 (2)	Resistance	Max. 1 Ω
			Wiring harness between BT2 (1) – starting switch terminal ACC	Resistance	Max. 1 Ω
			Wiring harness between BT2 (20) – starting switch terminal B	Resistance	Max. 1 Ω
			Wiring harness between circuit breaker FUA2 – fuse BT2 (19)	Resistance	Max. 1 Ω
			Between DPC1 (female) (9), (10) – ground ER	Resistance	Max. 1 Ω
	3	Short circuit of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connector DPC1 and terminals of fuse and starting switch.		
			Between ground and wiring harness between DPC1 (female) (6), (7) – fuse BT2 (2)	Resistance	Min. 1 M Ω
			Between ground and wiring harness between BT2 (1) – starting switch terminal ACC	Resistance	Min. 1 M Ω
			Between ground and wiring harness between fuse BT2 (20) – starting switch terminal B	Resistance	Min. 1 M Ω
			Between ground and wiring harness between circuit breaker FUA2 – fuse BT2 (19)	Resistance	Min. 1 M Ω
	4	Defective machine monitor	1) Turn starting switch OFF. 2) Insert T-adapter in connector DPC1. 3) Turn starting switch ON.		
			Between DPC1 (6), (7) – (9), (10)	Voltage	20 – 30 V

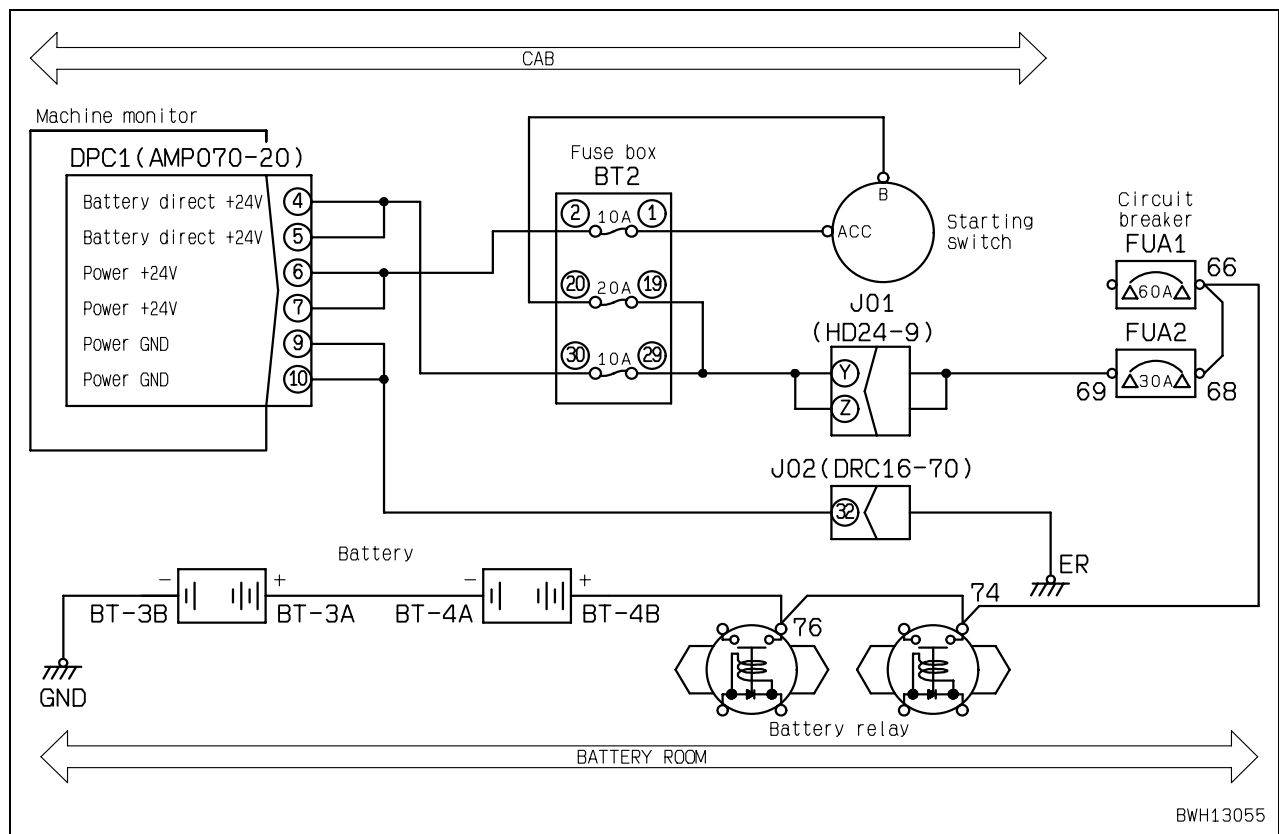


E-4 Machine monitor does not operate when starting switch is OFF

Trouble	Service meter and travel distance integrating meter, turn signal pilot lamp, and high beam pilot lamp do not flash, if the switches are operated with starting switch OFF.
Related information	When the machine related failure code is not displayed (if displayed, troubleshooting the code first.)

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective fuse BT2 (30) or defective circuit breaker FUA2	When the fuse BT2 (30) is blown or the circuit breaker FUA2 is shut off, it is highly possible that a defective grounding has occurred in the circuit (troubleshooting cause 3).		
	2	Disconnection in wiring harness (Disconnection or defective contact in connector)	1) Disconnect battery ground cable. 2) Connect T-adapter to connector DPC1 (female). 3) Disconnect terminals of BT2 (30) and FUA2.		
			Wiring harness between DPC1 (female) (4), (5) – fuse BT2 (30)	Resistance	Max. 1 Ω
			Wiring harness between circuit breaker FUA2 – fuse BT2 (29)	Resistance	Max. 1 Ω
			Between DPC1 (female) (9), (10) – ground ER2	Resistance	Max. 1 Ω
	3	Short circuit of harness (Contact with ground circuit)	1) Disconnect battery ground cable. 2) Connect T-adapter to connector DPC1 (female). 3) Disconnect terminals of BT2 (30) and FUA2.		
			Between ground and wiring harness between DPC1 (female) (4), (5) – fuse BT2 (30)	Resistance	Min. 1 M Ω
			Between ground and wiring harness between circuit breaker FUA2 – fuse BT2 (29)	Resistance	Min. 1 M Ω
	4	Defective machine monitor	1) Turn starting switch OFF. 2) Insert T-adapter in connector DPC1. 3) Turn starting switch ON.		
			Between DPC1 (4), (5) – (9), (10)	Voltage	20 – 30 V

Circuit diagram related

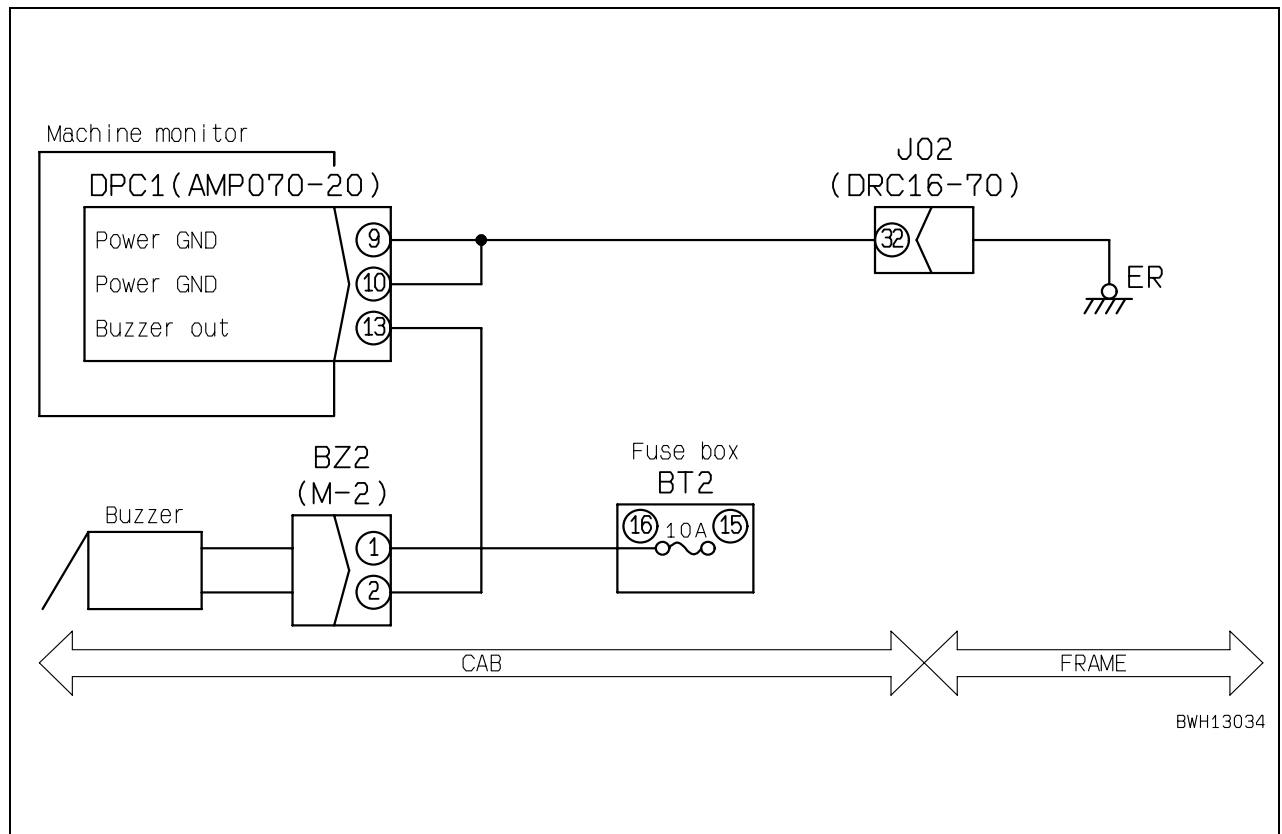


E-5 Alarm buzzer does not sound

Trouble	The alarm buzzer does not sound when the starting switch is ON, emergency stop item lamps are ON, and centralized warning lamp is ON.
Related information	When the machine related failure code is not displayed (if displayed, troubleshooting the code first.)

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective fuse BT2 (16)	When the fuse BT2 (16) is blown, it is highly possible that a defective grounding has occurred in the circuit (troubleshooting cause 3).		
	2	Disconnection in wiring harness (Disconnection or defective contact in connector)	1) Turn starting switch OFF. 2) Connect T-adapter to connector DPC1 (female) and BZ2 (female).		
			Wiring harness between DPC1 (female) (13) – BZ2 (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between BZ2 (female) (1) – fuse BT2 (16)	Resistance	Max. 1 Ω
			Between DPC1 (female) (9), (10) – ground ER	Resistance	Max. 1 Ω
	3	Short circuit of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connector DPC1 and BZ2. 3) Connect T-adapter to DPC1 (female).		
			Between ground and wiring harness between DPC1 (female) (13) – BZ2 (female) (2)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between BZ2 (female) (1) – fuse BT2 (16)	Resistance	Min. 1 MΩ
	4	Defective machine monitor	1) Turn starting switch OFF. 2) Insert T-adapter in connector DPC1. 3) Turn starting switch ON.		
			DPC1	Measurement conditions	Voltage
			Between (13) – (9), (10)	When the buzzer does not sound	20 – 30 V
				When the buzzer sounds	Max. 1V
			* Set up the conditions to actuate the buzzer for the measurement.		

Circuit diagram related



E-6 Gauges of machine monitor, caution lamps or character display section do not display properly

Trouble	Gauges, lamps or character display section are malfunctioning
Related information	When the machine related failure code is not displayed (if displayed, troubleshooting the code first.)

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective sensors or switches	Troubleshooting corresponding sensors or switches by the failure code.
	2	Defective CAN communication circuit	Troubleshooting by the communication related failure code
	3	Defective machine monitor	If no problem is found in above 1 and 2, machine monitor is defective (since this is an internal defect, it cannot be diagnosed).

E-7 A selection of the display in character display section cannot be changed

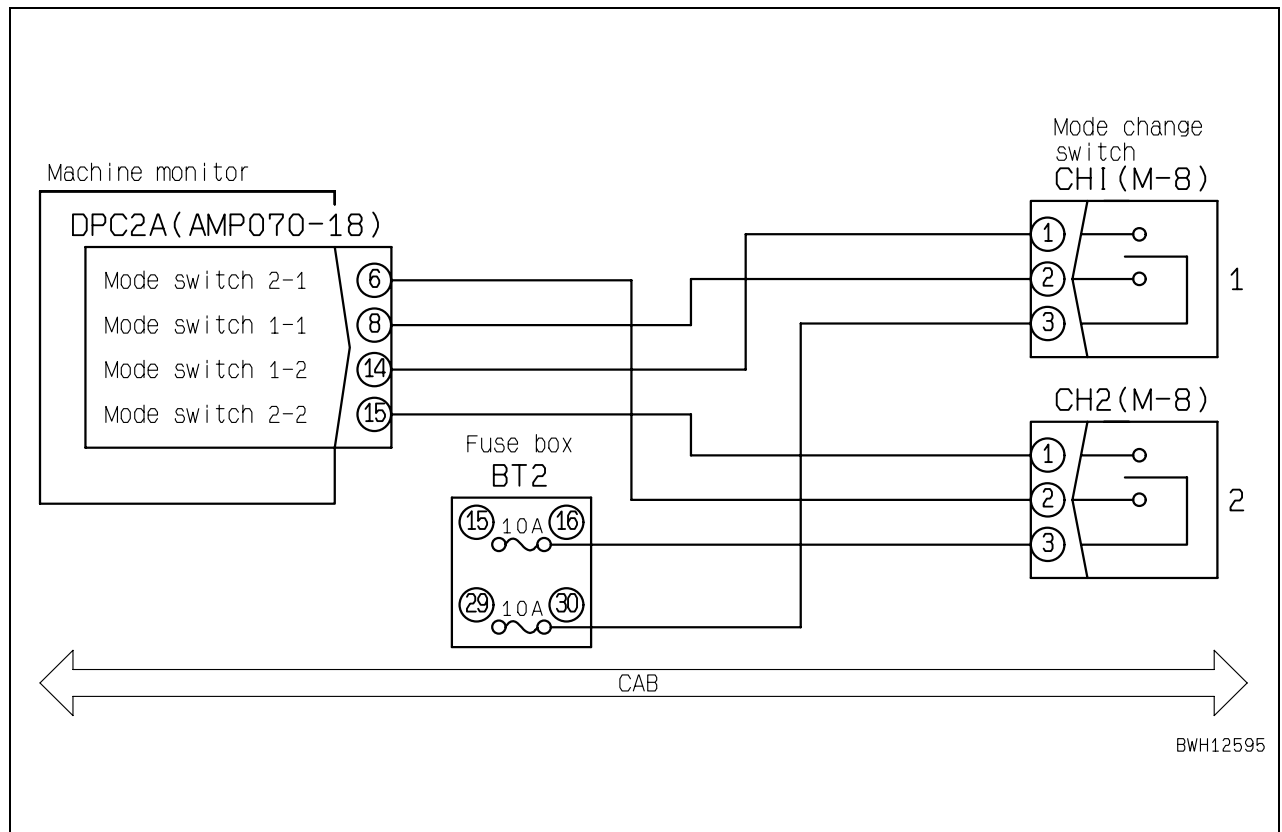
Trouble (1)	When the mode selector switch 1 circuit for machine monitor is defective			
Related information				

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective fuse BT2 (30)	When the fuse BT2 (30) is blown, it is highly possible that a defective grounding has occurred in the circuit (troubleshooting cause 4).		
	2	Defective monitor mode selector switch 1 (CH1)	1) Turn starting switch OFF. 2) Connect T-adapter to connector CH1 (male).		
			CH1 (male)	Operation of switch (switch unit)	Resistance
			Between (3) – (2)	Press the switch [◇].	Max. 1 Ω
				Switch is in the neutral.	Min. 1 MΩ
			Between (3) – (1)	Press the switch [■].	Max. 1 Ω
				Switch is in the neutral.	Min. 1 MΩ
	3	Disconnection in wiring harness (Disconnection or defective contact in connector)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors DPC2A (female) and CH1 (female).		
			Wiring harness between CH1 (female) (1) – DPC2A (female) (14)	Resistance	Max. 1 Ω
			Wiring harness between CH1 (female) (2) – DPC2A (female) (8)	Resistance	Max. 1 Ω
			Wiring harness between CH1 (female) (3) – fuse BT2 (30)	Resistance	Max. 1 Ω
	4	Short circuit of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors DPC2A and CH1. 3) Connect T-adapter to DPC2A.		
			Between ground and wiring harness between CH1 (female) (1) – DPC2A (female) (14)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between CH1 (female) (2) – DPC2A (female) (8)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between CH1 (female) (3) – fuse BT2 (30)	Resistance	Min. 1 MΩ
	5	Defective machine monitor	1) Turn starting switch OFF. 2) Insert T-adapter in connector DPC2A. 3) Turn starting switch ON.		
			DPC2A	Operation of switch	Voltage
			Between (8) – ground	Press the switch [◇].	20 – 30 V
				Switch is in the neutral.	Max. 1V
			Between (14) – ground	Press the switch [■].	20 – 30 V
				Switch is in the neutral.	Max. 1V

Trouble (2)	When the mode selector switch 2 circuit for machine monitor is defective
Related information	

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective fuse BT2 (16)	When the fuse BT2 (16) is blown, it is highly possible that a defective grounding has occurred in the circuit (troubleshooting cause 4).			
	2	Defective monitor mode selector switch 2 (CH2)	1) Turn starting switch OFF. 2) Connect T-adapter to connector CH2 (male).			
			CH2 (male)	Operation of switch (switch unit)	Resistance	
			Between (3) – (2)	Press the switch [>].	Max. 1 Ω	
				Switch is in the neutral.	Min. 1 MΩ	
			Between (3) – (1)	Press the switch [<].	Max. 1 Ω	
				Switch is in the neutral.	Min. 1 MΩ	
	3	Disconnection in wiring harness (Disconnection or defective contact in connector)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors DPC2A (female) and CH2 (female).			
			Wiring harness between CH2 (female) (1) – DPC2A (female) (15)	Resistance	Max. 1 Ω	
			Harness between CH2 (female) (2) – DPC2A (female) (6)	Resistance	Max. 1 Ω	
			Wiring harness between CH2 (female) (3) – fuse BT2 (16)	Resistance	Max. 1 Ω	
	4	Short circuit of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors DPC2A and CH2. 3) Connect T-adapter to DPC2A.			
			Between ground and wiring harness between CH2 (female) (1) – DPC2A (female) (15)	Resistance	Min. 1 MΩ	
			Between ground and wiring harness between CH2 (female) (2) – DPC2A (female) (6)	Resistance	Min. 1 MΩ	
			Between ground and wiring harness between CH2 (female) (3) – fuse BT2 (16)	Resistance	Min. 1 MΩ	
	5	Defective machine monitor	1) Turn starting switch OFF. 2) Insert T-adapter in connector DPC2A. 3) Turn starting switch ON.			
			DPC2A	Operation of switch	Voltage	
			Between (6) – ground	Press the switch [>].	20 – 30 V	
				Switch is in the neutral.	Max. 1V	
			Between (15) – ground	Press the switch [<].	20 – 30 V	
				Switch is in the neutral.	Max. 1V	

Circuit diagram related

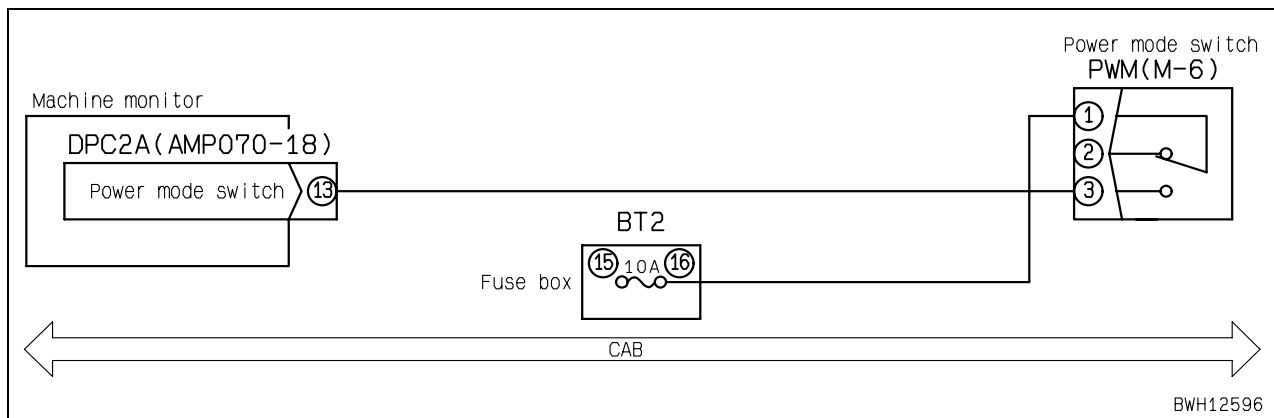


E-8 Power mode selecting function does not operate properly

Trouble	When power mode selector function does not operate properly, even if the power mode selector switch is operated.
Related information	When the machine related failure code is not displayed (if displayed, troubleshooting the code first.)

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective fuse BT2 (16)	When the fuse BT2 (16) is blown, it is highly possible that a defective grounding has occurred in the circuit (troubleshooting cause 4).		
	2	Defective power mode selector switch	1) Turn starting switch OFF. 2) Connect T-adapter to connector PWM (male).		
			PWM (male)	Operation of switch (switch unit)	Resistance
			Between (1) – (3)	Switch: down	Max. 1 Ω
				Switch: up	Min. 1 M Ω
	3	Disconnection in wiring harness (Disconnection or defective contact in connector)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors DPC2A (female) and PWM (female).		
			Wiring harness between DPC2A (female) (13) – PWM (female) (3)	Resistance	Max. 1 Ω
			Wiring harness between PWM (female) (1) – fuse BT2 (16)	Resistance	Max. 1 Ω
	4	Short circuit of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors DPC2A and PWM. 3) Connect T-adapter to DPC2A.		
			Between ground and wiring harness between DPC2A (female) (13) – PWM (female) (3)	Resistance	Min. 1 M Ω
			Between ground and wiring harness between PWM (female) (1) – fuse BT2 (16)	Resistance	Min. 1 M Ω
	5	Defective machine monitor	1) Turn starting switch OFF. 2) Insert T-adapter in connector DPC2A. 3) Turn starting switch ON.		
			DPC2A	Operation of switch	Voltage
			Between (13) – ground	Switch: down	20 – 30 V
				Switch: up	Max. 1V

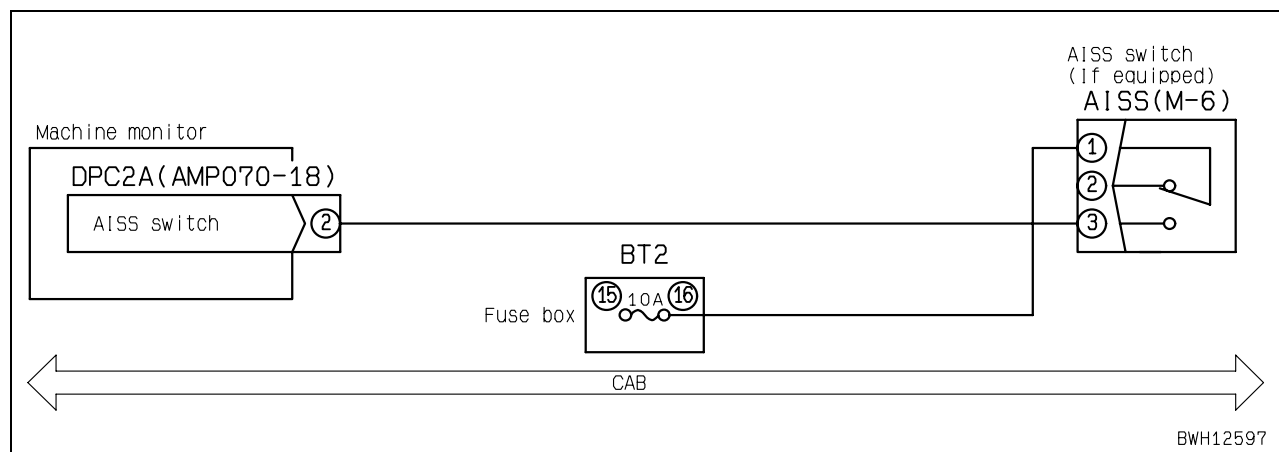
Circuit diagram related



E-9 AISS function does not operate properly

Trouble	When AISS function does not operate properly, even if the AISS LOW switch is operated.
Related information	- When the machine related failure code is not displayed (if displayed, troubleshooting the code first.) - If the brake pilot lamp is not normally turned ON or OFF, carry out troubleshooting and repair first.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective fuse BT2 (16)	When the fuse BT2 (16) is blown, it is highly possible that a defective grounding has occurred in the circuit (troubleshooting cause 4).		
	2	Defective AISS switch	1) Turn starting switch OFF. 2) Connect T-adapter to connector AISS (male).		
			AISS (male)	Operation of switch (switch unit)	Resistance
			Between (1) – (3)	Switch: up	Min. 1 MΩ
	3	Disconnection in wiring harness (Disconnection or defective contact in connector)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors DPC2A (female) and AISS (female).		
			Wiring harness between DPC2A (female) (2) – AISS (female) (3)	Resistance	Max. 1 Ω
			Wiring harness between AISS (female) (1) – fuse BT2 (16)	Resistance	Max. 1 Ω
	4	Short circuit of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors DPC2A and AISS. 3) Connect T-adapter to DPC2A.		
			Between ground and wiring harness between DPC2A (female) (2) – AISS (female) (3)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between AISS (female) (1) – fuse BT2 (16)	Resistance	Min. 1 MΩ
	5	Defective machine monitor	1) Turn starting switch OFF. 2) Insert T-adapter in connector DPC2A. 3) Turn starting switch ON.		
			DPC2A	Operation of switch	Voltage
			Between (2) – ground	Switch: down	20 – 30 V
				Switch: up	Max. 1V

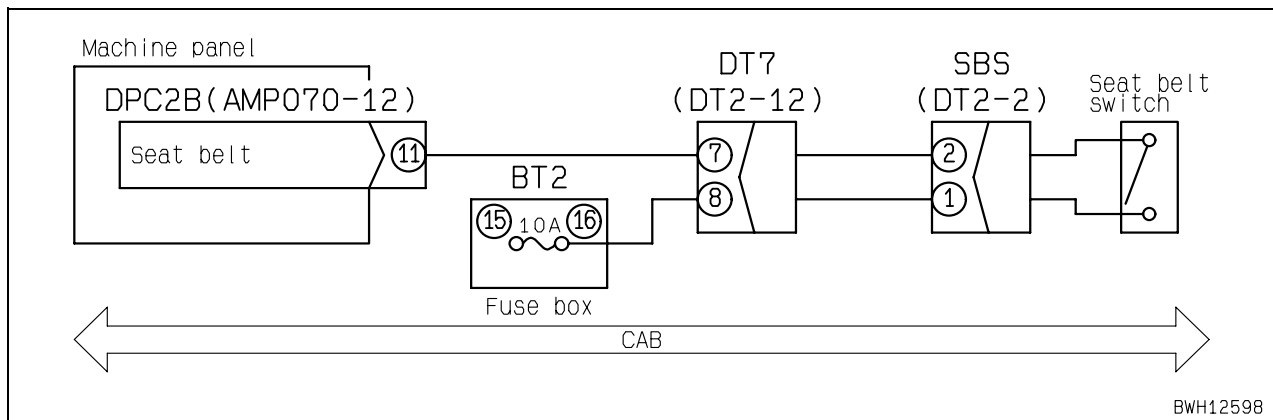
Circuit diagram related

E-10 Seat belt caution lamp does not display properly

Trouble	The lamp lights up even if the seat belt is fastened, or the lamp does not light up even if the seat belt is not fastened.
Related information	When the machine related failure code is not displayed (if displayed, troubleshooting the code first.)

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective fuse BT2 (16)	When the fuse BT2 (16) is blown, it is highly possible that a defective grounding has occurred in the circuit (troubleshooting cause 4).			
	2	Defective seat belt switch	1) Turn starting switch OFF. 2) Connect T-adapter to connector SBS (male). 3) Check switch unit.			
			SBS	Seat belt	Resistance	
			Between (1) – (2)	Fastened	Max. 1 Ω	
				Unfastened	Min. 1 MΩ	
	3	Disconnection in wiring harness (Disconnection or defective contact in connector)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors DPC2B (female) and SBS (female).			
			Wiring harness between DPC2B (female) (11) – SBS (female) (2)		Resistance	Max. 1 Ω
			Wiring harness between SBS (female) (2) – fuse BT2 (16)		Resistance	Max. 1 Ω
	4	Short circuit of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors DPC2B and SBS. 3) Connect T-adapter to DPC2A.			
			Between ground and wiring harness between DPC2B (female) (11) – SBS (female) (2)		Resistance	Min. 1 MΩ
			Between ground and wiring harness between SBS (female) (2) – fuse BT2 (16)		Resistance	Min. 1 MΩ
	5	Defective machine monitor	1) Turn starting switch OFF. 2) Insert T-adapter in connector DPC2B. 3) Turn starting switch ON.			
			DPC2B	Seat belt	Voltage	
			Between (11) – ground	Fastened	20 – 30 V	
				Unfastened	Max. 1V	

Circuit diagram related



E-11 Turn signal lamp or turning lamp (hazard lamp) do not work properly

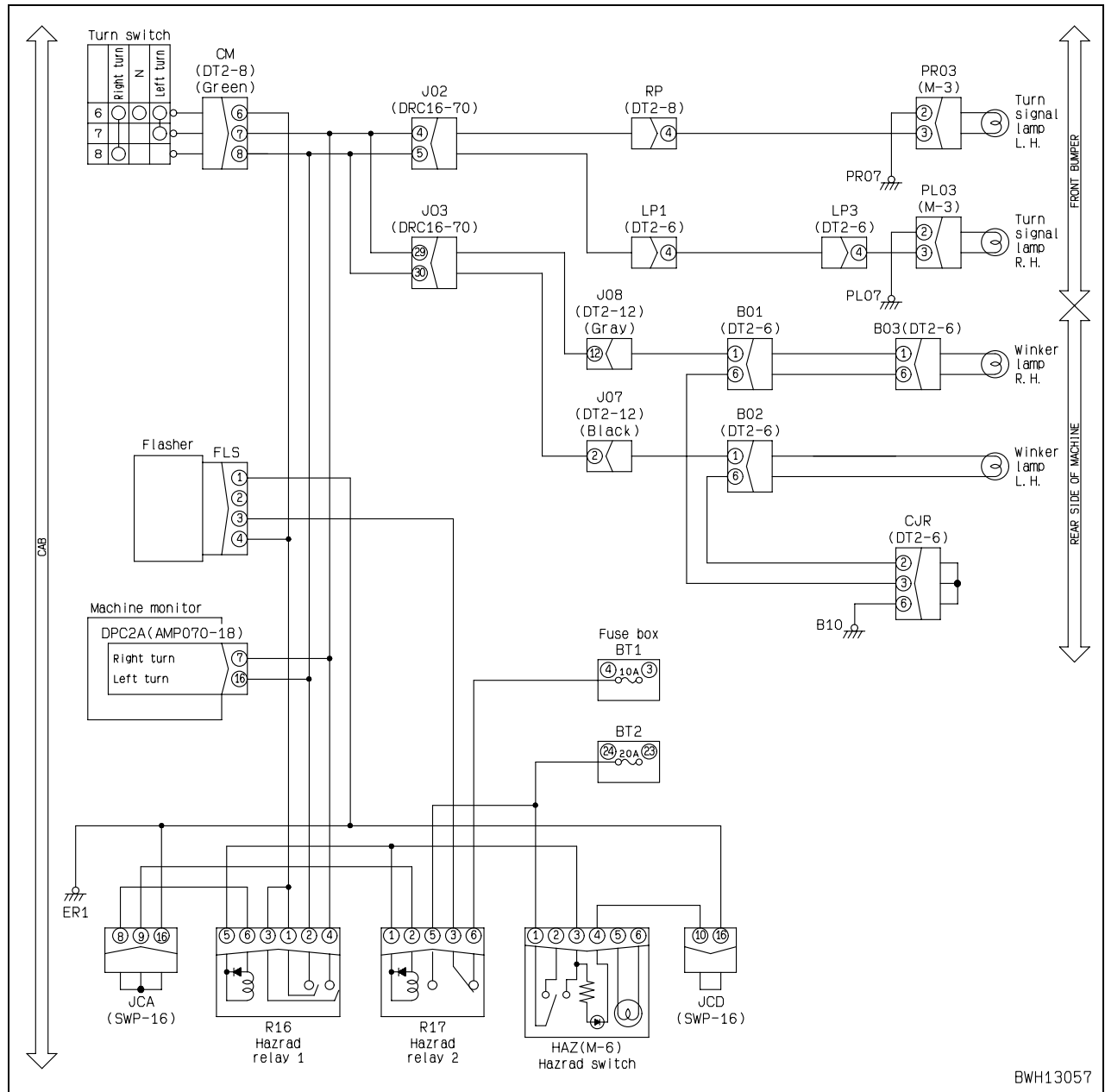
Trouble	Turn signal lamp or turning lamp (hazard lamp) do not flash.
Related information	Explanation of circuit 1) If 24 V is input to pin (3), the flasher keeps outputting signals of 24 V and 0 V from pin (4) repeatedly. 2) The input of 24 V to flasher pin (3) is changed by relay (R17). It is supplied through BT1 for turn signal lamp and through BT2 for hazard lamp. 3) The flasher output is supplied constantly (regardless of the position of the switch) through connector (CM) to pin (6) of the turn switch and to pins (1) and (3) of hazard relay (R16). 4) When the turn switch is turned ON, the flashing signal is input to pin (6) of connector (CM) and the turn switch sends that signal to the left side (pin (7)) or right side (pin (8)). 5) If the hazard switch is pressed, pins (1) and (3) of relay (HAZ) are connected and hazard relays 1 (R16) and 2 (R17) are turned ON. Hazard relay 2 (R17) changes the power supply from BT1 to BT2 and hazard relay 1 (R16) connects the flashing signal from the flasher to both of the right side and left side.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting				
	1	Defective fuse BT1 (4) or BT2 (24)	When the fuse BT1 (4) or BT2 (24) is blown, it is highly possible that a defective grounding has occurred in the circuit (troubleshooting cause 7).				
	2	Defective lamp	Since the lamp can be suspected to be defective, visually check it or replace it with known good lamp to make a judgement.				
	3	Defective turn signal lamp	1) Turn starting switch OFF. 2) Insert T-adaptor in connector FLS. 3) Turn starting switch ON and carry out troubleshooting.				
			FLS		Voltage		
			Between (3) – ground		20 – 30 V		
			Between (4) – ground		20 – 30 V and 0 V repeatedly		
	4	Defective turn switch	1) Turn starting switch OFF. 2) Connect T-adaptor to connector FLS (male). 3) Check switch unit.				
			CM (male)		Turn switch (lever)		Resistance
			Between (6) – (7)		Turned to the left		Max. 1 Ω
					Turned to the right		Min. 1 MΩ
			Between (6) – (8)		Turned to the right		Max. 1 Ω
					Turned to the left		Min. 1 MΩ
	5	Defective relay	When the relay can be suspected to be defective, replace it with another relay to make a judgement. • As for the relay R16 (6 terminals): Replace with the relay R21, R40 or R05, etc. • Relay R17 (5-pole): Replace with relay R11, R30, R31, etc.				
	6	Disconnection in wiring harness (Disconnection or defective contact in connector)	1) Turn starting switch OFF. 2) Disconnect connectors HAZ, R17, R16, FLS, CM, DPC2A, PR03, PL03, CJR, B02, and B03. 3) Connect T-adaptor to connector of circuit to be checked.				
			Wiring harness between BT1 (4) – R17 (female) (6)		Resistance	Max. 1 Ω	
			Wiring harness between BT2 (24) – R17 (female) (5) – HAZ (female) (1)		Resistance	Max. 1 Ω	
			Wiring harness between HAZ (male) (3) – R17 (female) (1) – R16 (female) (5)		Resistance	Max. 1 Ω	
			Wiring harness between R17 (female) (3) – FLS (female) (3)		Resistance	Max. 1 Ω	
			Wiring harness between R16 (female) (4) – CM (female) (7) – DPC2A (female) (7)		Resistance	Max. 1 Ω	
			Wiring harness between R16 (female) (2) – CM (female) (8) – DPC2A (female) (16)		Resistance	Max. 1 Ω	

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	6	Disconnection in wiring harness (Disconnection or defective contact in connector)	Wiring harness between R16 (female) (1), (3) – FLS (female) (4) – CM (female) (6)	Resistance	Max. 1 Ω
			Wiring harness between CM (female) (7) – PR03 (female) (3) (left front)	Resistance	Max. 1 Ω
			Wiring harness between CM (female) (7) – B03 (female) (1) (left rear)	Resistance	Max. 1 Ω
			Wiring harness between CM (female) (8) – PL03 (female) (3) (right front)	Resistance	Max. 1 Ω
			Wiring harness between CM (female) (8) – B02 (female) (1) (right rear)	Resistance	Max. 1 Ω
			Between PR03 (female) (2) – ground (left front)	Resistance	Max. 1 Ω
			Between PL03 (female) (2) – ground (right front)	Resistance	Max. 1 Ω
			Between B03 (female) (6) – CJR (3), (6) – ground (B10) (right rear)	Resistance	Max. 1 Ω
			Between B02 (female) (6) – CJR (2), (6) – ground (B10) (left rear)	Resistance	Max. 1 Ω
			Between HAZ (male) (4) – ground (ER1)	Resistance	Max. 1 Ω
			Between R17 (female) (2) – ground (ER1)	Resistance	Max. 1 Ω
			Between R16 (female) (6) – ground (ER1)	Resistance	Max. 1 Ω
			Between FLS (female) (1) – ground (ER1)	Resistance	Max. 1 Ω
	7	Short circuit of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors HAZ, R17, R16, FLS, CM, DPC2A, PR03, PL03, CJR, B02, and B03. 3) Connect T-adaptor to connector of circuit to be checked.		
			Between ground and wiring harness between BT1 (4) – R17 (female) (6)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between BT2 (24) – R17 (female) (5) – HAZ (male) (1)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between HAZ (male) (3) – R17 (female) (1) – R16 (female) (5)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between R17 (female) (3) – FLS (female) (3)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between R16 (female) (4) – CM (female) (7) – DPC2A (female) (7)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between R16 (female) (2) – CM (female) (8) – DPC2A (female) (16)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between R16 (female) (1), (3) – FLS (female) (4) – CM (female) (6)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between CM (female) (7) – PR03 (female) (3) (right front)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between CM (female) (7) – B03 (female) (1) (left front)	Resistance	Min. 1 MΩ

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	7	Short circuit of harness (Contact with ground circuit)	Between ground and wiring harness between CM (female) (8) – PL03 (female) (3) (right front)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between CM (female) (8) – B02 (female) (1) (right rear)	Resistance	Min. 1 MΩ

Circuit diagram related

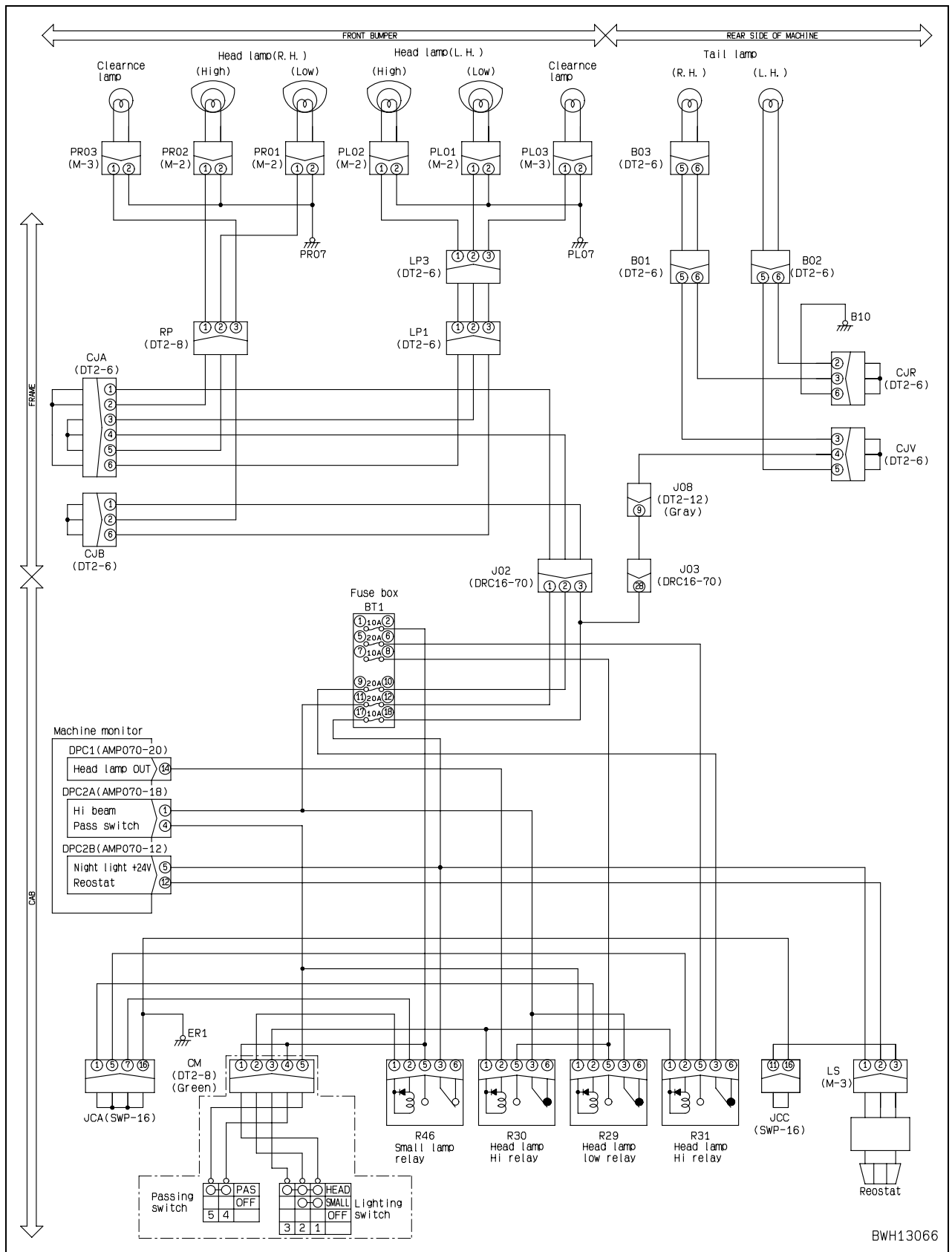


E-12 Night illumination (lighting) does not work properly

Trouble (1)	Small lamps (clearance lamp, tail lamp), night illumination and head lamp do not light up at all.
Related information	Explanation of relay circuit 1) The 24V power source from fuse BT1 pin (2) is supplied to light switch pin (4), passing switch pin (1), and small lamp relay (R46) pin (5). 2) If the light switch is set in the small position, small lamp relay (R46) is turned ON. The 24V power supplied to R46 pin (5) is output through R46 pin (3). Then, the 24V power is supplied again through fuse BT1 pin (17) to each small lamp. 3) If the light switch is set in the head (low) position, head lamp low relay (R31) is turned ON and 24V power supplied through fuse BT1 pin (6) is output through R31 pin (3). Then, the 24V power is supplied again through fuse BT1 pin (9) to each low lamp. 4) If the light switch is set in the head (low) and high beam position, DPC1 pin (14) is grounded and headlamp high relay (R30) is turned ON. The 24V power supplied through fuse BT1 pin (8) is output through R30 pin (3). Then, the 24V power is supplied again through fuse BT1 pin (11) to each high lamp. 5) If passing switch is turned ON, headlamp high pass relay (R29) is turned ON. The 24V power supplied through fuse BT1 pin (8) is output through R29 pin (3) and connected to R30 pin (3) and then supplied through the high beam circuit. (The 24V power is supplied again through fuse BT1 pin (11) to each high lamp.)

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective circuit breaker FUB1 or fuse BT1 (2) or (17)	If fuse BT1 (2) or (17) is broken, circuit probably has ground fault. (Check by Cause 4.)			
	2	Defective lamp switch	1) Turn starting switch OFF. 2) Connect T-adapter to connector CM (male).			
			CM (male)		Lamp switch	Resistance
			Between (1) – (2)		1st detent	Max. 1 Ω
			Between (1) – (3)			Min. 1 MΩ
			Between (1) – (2)		2nd detent	Max. 1 Ω
			Between (1) – (3)			Max. 1 Ω
	3	Defective small lamp relay (R46)	1) Turn starting switch OFF. 2) Replace R46 with horn relay (R11). 3) Turn starting switch ON.			
			Turn horn ON.		Horn sounds.	
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn starting switch OFF. 2) Connect T-adapter to connector CM (female) 3) Disconnect R46, J02 and J03.			
			Wiring harness between circuit breaker FUB1 (63) – CM (female) (1), (4) or R46 (5)		Resistance	Max. 1 Ω
			Between CM (female) (2) – R46 (female) (1)		Resistance	Max. 1 Ω
			Between R46 (female) (2) – ground ER1		Resistance	Max. 1 Ω
			Between R46 (female) (3), J03 (28) – J02 (2)		Resistance	Max. 1 Ω
	5	Ground fault in wiring harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors CM, R46, DPC2B, LS, RP, LP1, B01 and B02. 3) Prepare and carry out troubleshooting with starting switch kept OFF.			
			Wiring harness between BT1 (2) – R46 (female) (5)		Resistance	Min. 1 MΩ
			Wiring harness between CM (female) (2) – R46 (female) (1)		Resistance	Min. 1 MΩ
			Wiring harness between CM (female) (3) – BT1 (17) – each lamp		Resistance	Min. 1 MΩ

Circuit diagram related



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Trouble (2)	Small lamps (clearance lamp and tail lamp) or night illumination do not light up at the "first detent" position of the lamp switch.
Related information	- When the head lamps light up. ★ See circuit diagram (1).

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective lamp switch	1) Turn starting switch OFF. 2) Connect T-adapter to connector CM (female).			
			CM (male)	Lamp switch	Resistance	
			Between (1) – (2)	1st detent	Max. 1 Ω	
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect connectors CM, R46, and J02 and terminals of fuse. 3) Connect T-adapter to connector of circuit to be measured.			
			Wiring harness between CM (female) (2) – R46 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between CM (female) (1), (4) – R46 (female) (5) (branch point)		Resistance	Max. 1 Ω
			Wiring harness between R46 (female) (3) – BT1 (17) – (18) – J02 (female) (3) (to branch point)		Resistance	Max. 1 Ω
			Between R46 (female) (2) – ground (ER1)		Resistance	Max. 1 Ω
	3	Defective small lamp relay (R46)	1) Turn starting switch OFF. 2) Replace R46 with horn relay (R11). 3) Turn starting switch ON.			
			Turn horn ON.		Horn sounds.	

Trouble (3)	Left small lamp (clearance lamp and tail lamp) does not "left" light up.
Related information	- Carry out following troubleshooting when right small lamp and headlamps (right and left) light up. ★ See circuit diagram (1).

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective lamp (bulb)	When the lamp (bulb) can be suspected to be defective, judge by visual check or replacing the lamp bulb.			
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect connectors J02, CJB, and PL03. 3) Connect T-adaptor to J02, CJB, and PL03.			
			Wiring harness between J02 (male) (3) – CJB (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between CJB (female) (6) – PL03 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between PL03 (female) (2) – ground (PL07)		Resistance	Max. 1 Ω
	3	Short circuit of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors J02, CJB, and PL03. 3) Connect T-adaptor to J02 (male).			
			Between ground and wiring harness between J02 (male) (3) – CJB (female) (1)		Resistance	Min. 1 MΩ
			Between ground and wiring harness between CJB (female) (6) – PL03 (female) (1)		Resistance	Min. 1 MΩ

Trouble (4)	Right small lamp (clearance lamp) does not "right" light up.
Related information	- Carry out following troubleshooting when left small lamp and headlamps (right and left) light up. ★ See circuit diagram (1).

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective lamp (bulb)	When the lamp (bulb) can be suspected to be defective, judge by visual check or replacing the lamp bulb.		
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect connectors J02, CJB, and PR03.		
			Wiring harness between J02 (male) (3) – CJB (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between CJB (female) (2) – PR03 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between PR03 (female) (2) – ground (PR07)	Resistance	Max. 1 Ω
	3	Short circuit of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors J02, CJB, and PR03. 3) Connect T-adaptor to J02 (male).		
			Between ground and wiring harness between J02 (male) (3) – CJB (female) (1)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between CJB (female) (2) – PR03 (female) (1)	Resistance	Min. 1 MΩ

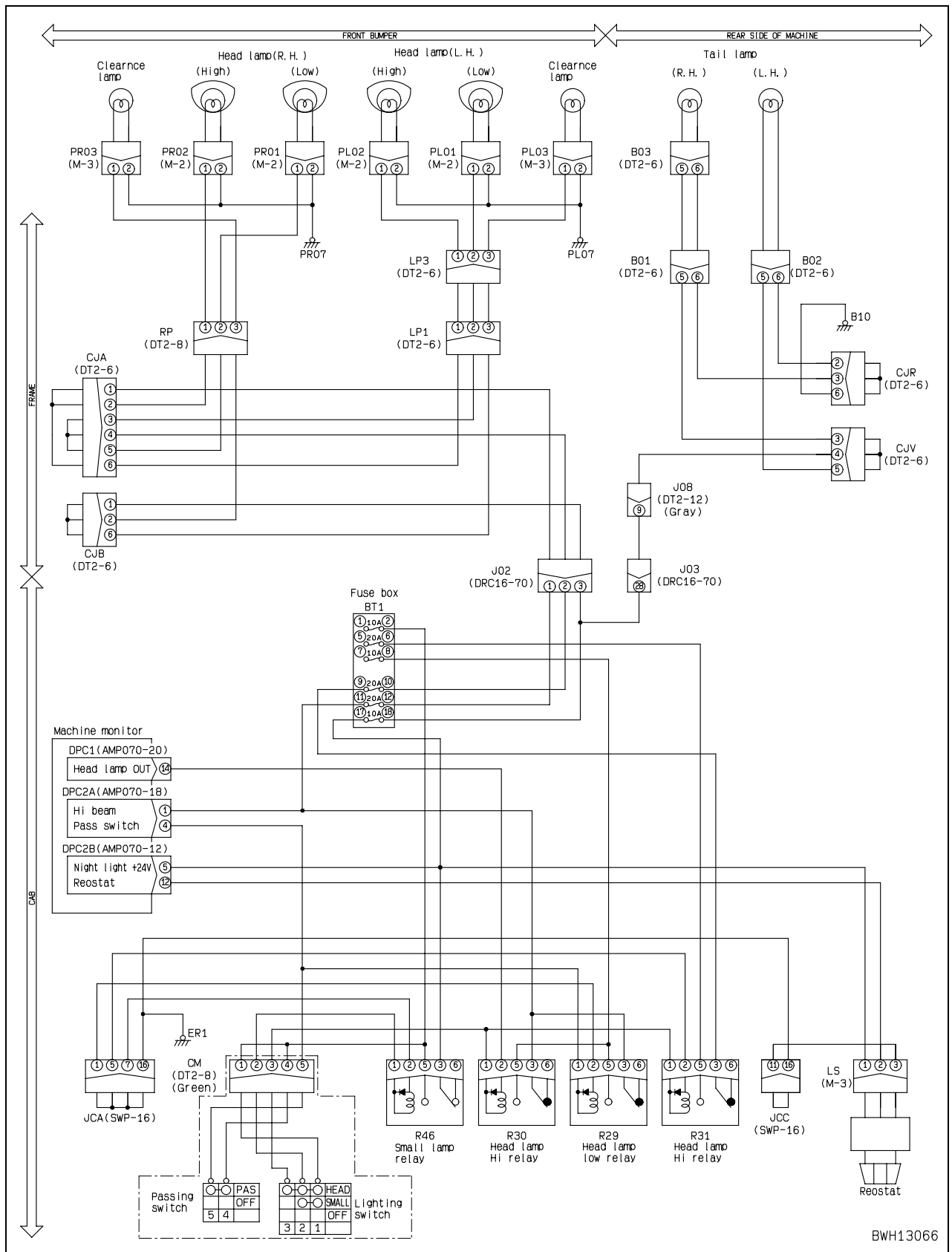
Trouble (5)	Left small lamp (tail lamp) does not "left" light up.
Related information	- Carry out following troubleshooting when right tail lamp and headlamps light up. ★ See circuit diagram (1).

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective lamp (bulb)	When the lamp (bulb) can be suspected to be defective, judge by visual check or replacing the lamp bulb.		
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect connectors J02, CJV, and B02. 3) Connect T-adaptor to J02, CJV, and B02.		
			Wiring harness between J02 (branched point) (female) (3) – CJV (female) (4)	Resistance	Max. 1 Ω
			Wiring harness between CJV (female) (5) – B02 (female) (5)	Resistance	Max. 1 Ω
			Wiring harness between B02 (female) (6) – ground (B10)	Resistance	Max. 1 Ω
	3	Short circuit of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors J02, CJV, and B02. 3) Connect T-adaptor to J02 (female).		
			Between ground and wiring harness between J02 (male) (branch point) (3) – CJV (female) (4)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between CJV (female) (5) – B02 (female) (5)	Resistance	Min. 1 MΩ

Trouble (6)	Right small lamp (clearance lamp) does not "right" light up.
Related information	Carry out following troubleshooting when left tail lamp and headlamps light up.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective lamp (bulb)	When the lamp (bulb) can be suspected to be defective, judge by visual check or replacing the lamp bulb.		
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect connectors J02, CJV, and B03. 3) Connect T-adapter to J02, CJV, and B03.		
			Wiring harness between J02 (female) (branch point) (3) – CJV (female) (4)	Resistance	Max. 1 Ω
			Wiring harness between CJV (female) (3) – B03 (female) (5)	Resistance	Max. 1 Ω
			Wiring harness between B03(female) (6) – ground (B10)	Resistance	Max. 1 Ω
	3	Short circuit of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors J02, CJV, and B03. 3) Connect T-adapter to J02 (female).		
			Between ground and wiring harness between J02 (male) (branched point) (3) – CJV (female) (4)	Resistance	Min. 1 M Ω
			Between ground and wiring harness between CJV (female) (3) – B03 (female) (5)	Resistance	Min. 1 M Ω

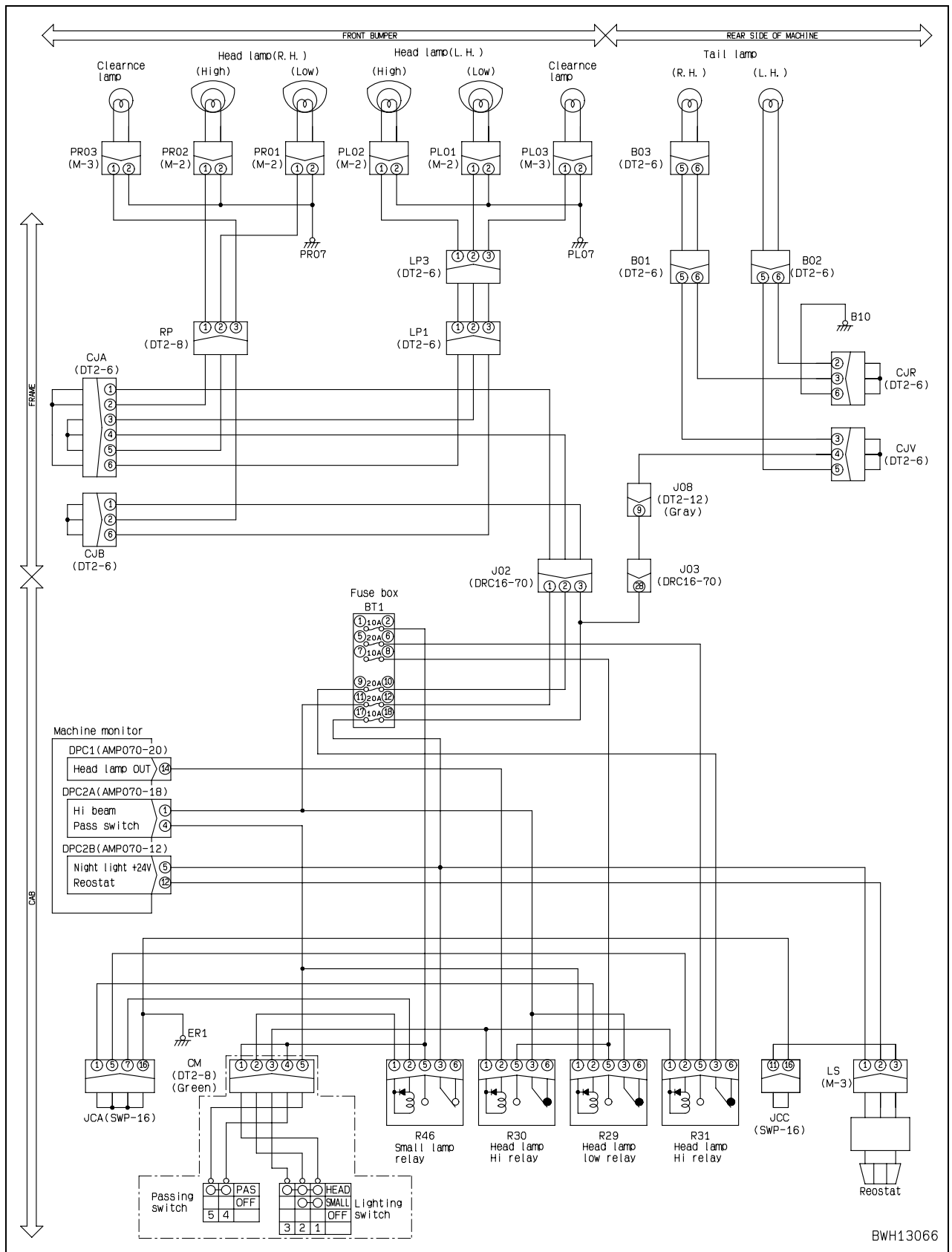
Circuit diagram related



Trouble (7)	Head lamps "Lo beam" do not light up.
Related information	When the lamps light up in the Hi beam side.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective fuse BT1(6), (9) – (10)	When the fuse BT1 (6), (9) – (10) is blown, it is highly possible that a defective grounding has occurred in the circuit (troubleshooting cause 5).		
	2	Defective lamp (bulb)	When the lamp (bulb) can be suspected to be defective, judge by visual check or replacing the lamp bulb.		
	3	Defective headlamp low relay (R31)	1) Turn starting switch OFF. 2) Replace R31 with horn relay (R11). 3) Turn starting switch ON.		
			Turn horn ON.	Horn sounds.	
	4	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect connectors PR01, PL01, CJA, R31. 3) Connect T-adapter to connector of circuit to be measured.		
			Wiring harness between PR01 (female) (1) – CJA (female) (5) (right side)	Resistance	Max. 1 Ω
			Wiring harness between PL01 (female) (1) – CJA (female) (3) (left side)	Resistance	Max. 1 Ω
			Wiring harness between CJA (female) (4) – fuse BT1 (10)	Resistance	Max. 1 Ω
			Wiring harness between fuse BT1 (9) – R31 (female) (3)	Resistance	Max. 1 Ω
			Wiring harness between CM (female) (3) – R31 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between R31 (female) (5) – BT1(6)	Resistance	Max. 1 Ω
			Between R31 (female) (2) – JCA(5), (16) – ground (ER1)	Resistance	Max. 1 Ω
	5	Short circuit of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors PR01, PL01, CJA, R31, and CM and terminals of fuse. 3) Connect T-adapter to connector of circuit to be measured.		
			Between ground and wiring harness between PR01 (female) (1) – CJA (female) (5) (right side)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between PL01 (female) (1) – CJA (female) (3) (left side)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between CJA (female) (4) – fuse BT1 (10)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between fuse BT1 (9) – R31 (female) (3)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between CM (female) (3) – R31 (female) (1)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between R31 (female) (5) – BT1 (6)	Resistance	Min. 1 MΩ

Circuit diagram related



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Trouble (8)	Head lamps "Hi beam" do not light up.
Related information	When the lamps light up in the Lo beam side. ★ See circuit diagram (7).

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective fuse BT1 (8), (11) – (12)	When the fuse BT1 (8), (11) – (12) is blown, it is highly possible that a defective grounding has occurred in the circuit (troubleshooting cause 4).		
	2	Defective lamp (bulb)	When the lamp (bulb) can be suspected to be defective, judge by visual check or replacing the lamp bulb.		
	3	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect connectors PR02, PL02, DPC1, and CM and terminals of fuse. 3) Connect T-adapter to connector of circuit to be measured.		
			Wiring harness between PR02 (female) (1) – CJA (female) (2) (right side)	Resistance	Max. 1 Ω
			Wiring harness between PL02 (female) (1) – CJA (female) (6) (left side)	Resistance	Max. 1 Ω
			Wiring harness between CJA (female) (1) – fuse BT1 (12)	Resistance	Max. 1 Ω
			Wiring harness between fuse BT1 (11) – R30 (female) (3)	Resistance	Max. 1 Ω
			Between ground and wiring harness between R30 (female) (1) – CM (female) (3)	Resistance	Max. 1 Ω
			Wiring harness between DPC1 (female) (14) – R30 (female) (2) *1	Resistance	Max. 1 Ω
			Wiring harness between BT1 (8) (female) (1) – R30 (female) (5)	Resistance	Max. 1 Ω
	4	Short circuit of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors PR02, PL02, DPC1, and CM and terminals of fuse. 3) Connect T-adapter to connector of circuit to be measured.		
			Between ground and wiring harness between PR02 (female) (1) – CJA (female) (2) (right side)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between PL02 (female) (1) – CJA (female) (6) (left side)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between CJA (female) (1) – fuse BT1 (12)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between fuse BT1 (11) – R30 (female) (3)	Resistance	Min. 1 MΩ
			Wiring harness between R30 (female) (1) – CM (female) (3)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between DPC1 (female) (14) – R30 (female) (2) *1	Resistance	Min. 1 MΩ
			Between ground and wiring harness between BT1 (8) (female) (1) – R30 (female) (5)	Resistance	Min. 1 MΩ
	5	Defective headlamp high relay (R30) *1	1) Turn starting switch OFF. 2) Replace R30 with horn relay (R11). 3) Turn starting switch ON.		
			Turn horn ON.	Horn sounds.	

*1: Passing lamp lights up, even if head lamp "Hi beam" do not light up.

Trouble (9)	Headlamp "low beam" and "high beam" do not light up.
Related information	Carry out following troubleshooting when small lamps light up. ★ See circuit diagram (7).

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective lamp switch	1) Turn starting switch OFF. 2) Connect T-adaptor to connector CM (male).			
			CM (male)	Lamp switch	Resistance	
			Between (1) – (3)	Turn to 2nd detent.	Max. 1 Ω	
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect connectors R31, and CM and terminals. 3) Connect T-adaptor to connector of circuit to be measured.			
			Wiring harness between CM (female) (3) – R31 (female) (1)		Resistance	Max. 1 Ω
	3	Short circuit of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors R31, and CM and terminals. 3) Connect T-adaptor to connector of circuit to be measured.			
			Between ground and wiring harness between CM (female) (3) – R31 (female) (1)		Resistance	Min. 1 MΩ

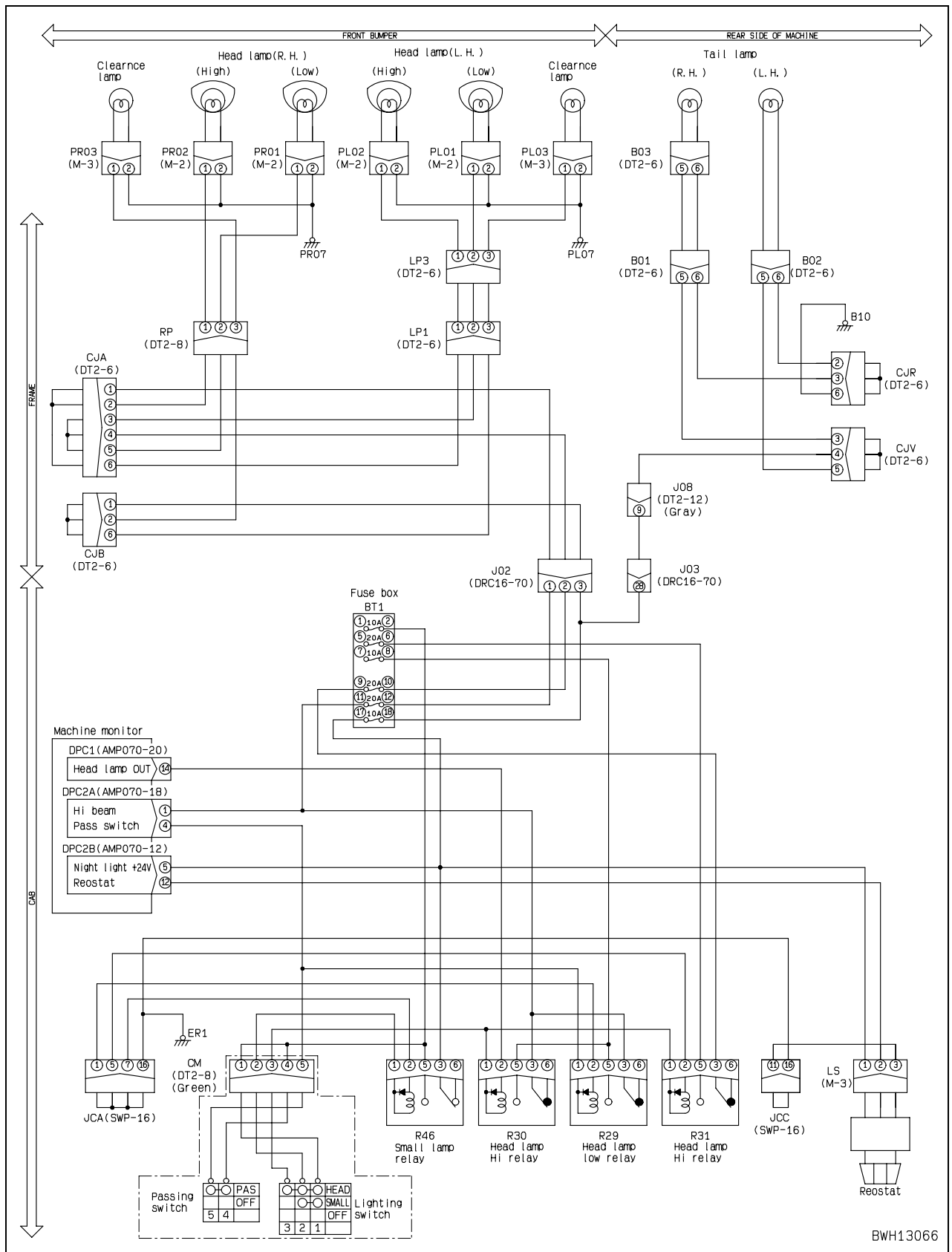
Trouble (10)	Passing lamp does not light up.
Related information	When head lamps light up properly. (High beam lights up) ★ See circuit diagram (7).

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective passing switch	1) Turn starting switch OFF. 2) Connect T-adaptor to connector CM (male).			
			CM (male)	Passing switch	Resistance	
			Between (4) – (5)	Operated	Max. 1 Ω	
				Not operated	Min. 1 MΩ	
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect connectors CM, R29, and DPC2A (female). 3) Connect T-adaptor to CM, R29, and DPC2A (female).			
			Wiring harness between CM (female) (5) – R29 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between R29 (female) (5) – R30 (female) (5) (up to branch point)		Resistance	Max. 1 Ω
			Wiring harness between DPC2A (female) (4) – CM (female) (5) (up to branch point)		Resistance	Max. 1 Ω
			Between R29 (female) (2) – ground (ER11)		Resistance	Max. 1 Ω
	3	Defective headlamp high (pass) relay (R29)	1) Turn starting switch OFF. 2) Replace R29 with horn relay (R11). 3) Turn starting switch ON.			
			Turn horn ON.		Horn sounds.	

Trouble (11)	The brightness of the night illumination does not change, even if the rheostat is operated.
Related information	

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective rheostat	1) Turn starting switch OFF. 2) Connect T-adapter to connector LS (male).			
			LS	Rheostat	Voltage	
			Between (1) – ground	Neutral	20 – 30 V	
			Between (2) – ground	Left end	6 – 12 V	
				Right end	18 – 27 V	
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Connect T-adapter to connectors LS (female) and DPC2B (female).			
			Wiring harness between LS (female) (2) – DPC2B (female) (12)		Resistance	Max. 1 Ω
			Between LS (female) (3) – ground (ER1)		Resistance	Max. 1 Ω
	3	Short circuit of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors LS and DPC2B. 3) Connect T-adapter to LS (female).			
			Between ground and wiring harness between LS (female) (2) – DPC2B (female) (12)		Resistance	Min. 1 MΩ

Circuit diagram related



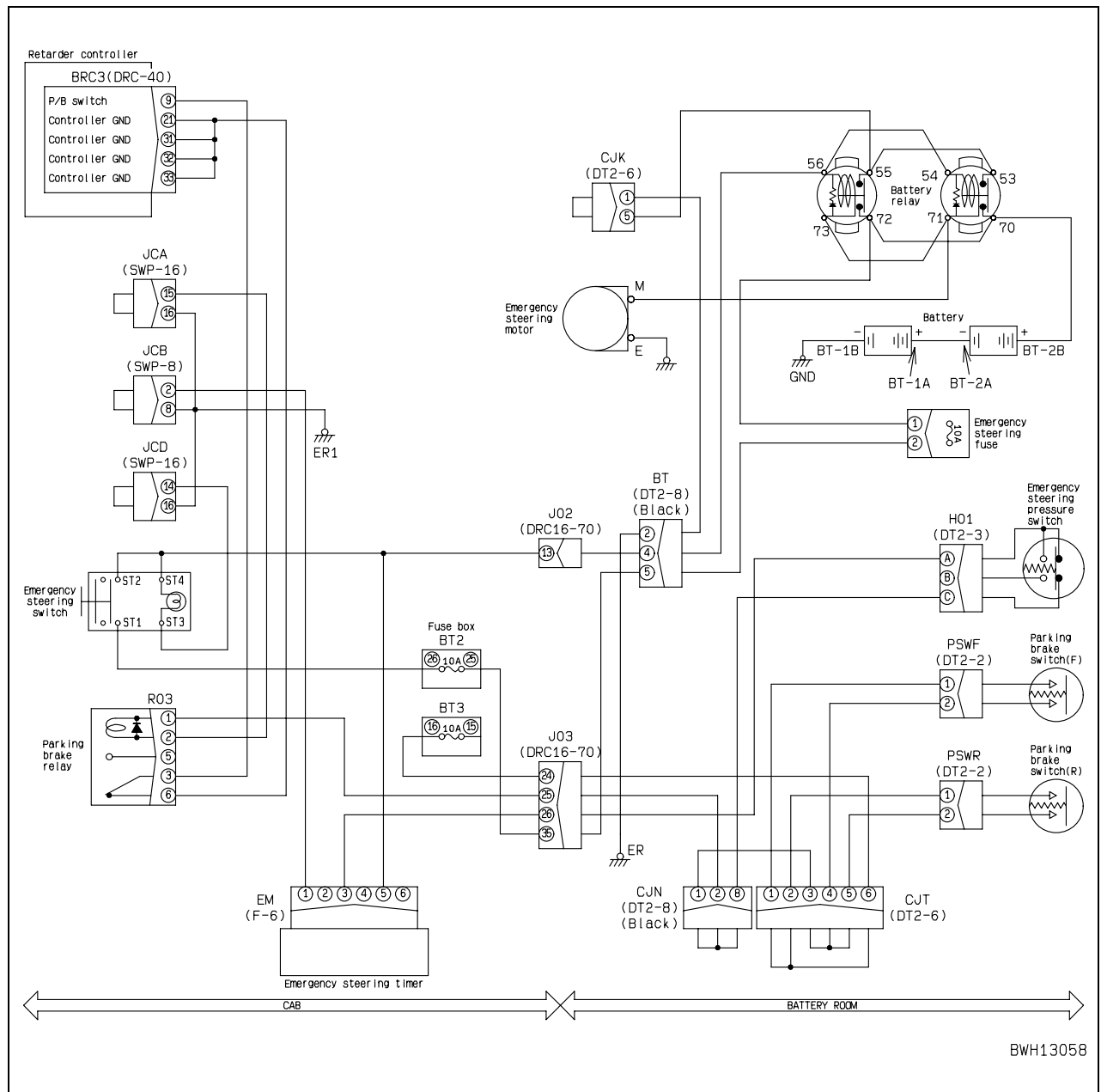
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E-13 Emergency steering does not operate

Trouble (1)	When steering pump stops, machine cannot be steered manually (emergency steering switch does not work).
Related information	★ See Operation and Maintenance Manual, Operation volume, "Operating procedure", Testing and adjusting before starting engine", "Testing emergency steering" and "Testing automatic emergency steering".

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective fuse EMPR, BT2 (26)	If fuse EMPR, BT2 (26) is blown, it is highly possible that a defective harness grounding has occurred in the circuit.			
	2	Defective manual switch (internal defective contact)	1) Turn starting switch OFF. 2) Disconnect switch terminal and check switch unit.			
			Manual switch terminal	Manual switch operation	Resistance	
			Between ST1 – ST2 (Switch unit)	Switch (pressed)	Max. 1 Ω	
				Switch (not pressed)	Min. 1 MΩ	
	3	Defective emergency steering relay	1) Turn starting switch OFF.			
			Between relay terminal (55) – ground		Resistance	Max. 1 Ω
			1) Start engine. 2) Turn parking brake ON. 3) Turn emergency steering switch ON.			
			1) Between relay terminal (72) – ground		Voltage	20 – 30 V
			2) Between relay terminal (54) – ground		Voltage	20 – 30 V
			3) Between relay terminal (73) – ground		Voltage	20 – 30 V
	4	Defective emergency steering motor	1) Start engine. 2) Turn parking brake ON. 3) Turn emergency steering switch ON.			
			Between motor terminal M and ground		Voltage	20 – 30 V
			1) Turn starting switch OFF.			
			Between motor terminal E and ground		Resistance	Max. 1 Ω
			• If no problem is found in above diagnoses, the steering motor is defective.			
	5	Disconnection in wiring harness (Disconnection or defective contact)	1) Disconnect battery ground cable. 2) Turn emergency steering switch ON.			
			Wiring harness between battery (+) (BT-2B) – emergency steering relay (54)		Resistance	Max. 1 Ω
			Wiring harness between relay terminal (71) – motor terminal M		Resistance	Max. 1 Ω
			Wiring harness between motor terminal E – ground		Resistance	Max. 1 Ω
			Wiring harness between relay terminal (53) – ground		Resistance	Max. 1 Ω
			Wiring harness between relay terminal (70) – battery (+)		Resistance	Max. 1 Ω
	6	Short circuit (ground fault) of harness (Contact with ground circuit)	1) Disconnect battery ground cable and battery (+) cable. 2) Turn emergency steering switch ON. 3) Connect T-adaptor to connector of circuit to be measured.			
Wiring harness between battery (+) (BT-2B) – emergency steering relay (54)			Resistance	Min. 1 MΩ		
Between ground and wiring harness between relay terminal (71) – motor terminal M			Resistance	Min. 1 MΩ		

Circuit diagram related



Trouble (2)	Automatic emergency steering does not operate.
Related information	★ See Operation and Maintenance Manual, Operation volume, "Operating procedure", Testing and adjusting before starting engine", "Testing emergency steering" and "Testing automatic emergency steering". - Explanation of auto emergency steering circuit - When the parking brake is released, the parking brake switch is turned ON and a voltage (about 24 V) is generated at pin PSWR (2) (The power is supplied through fuse BT3 (16).) - If the oil flow in the steering unit is lost and the steering pressure switch is turned ON, a voltage is generated at pin H01 (A). - The emergency steering timer operates and a voltage is generated at emergency steering timer output pin (5). ★ After the above operation, the steering circuit operates as in the manual operation (emergency steering switch). - The emergency steering relay is turned ON and the emergency steering motor operates. ★ For defects of the emergency steering relay and emergency steering motor, see Trouble (1).

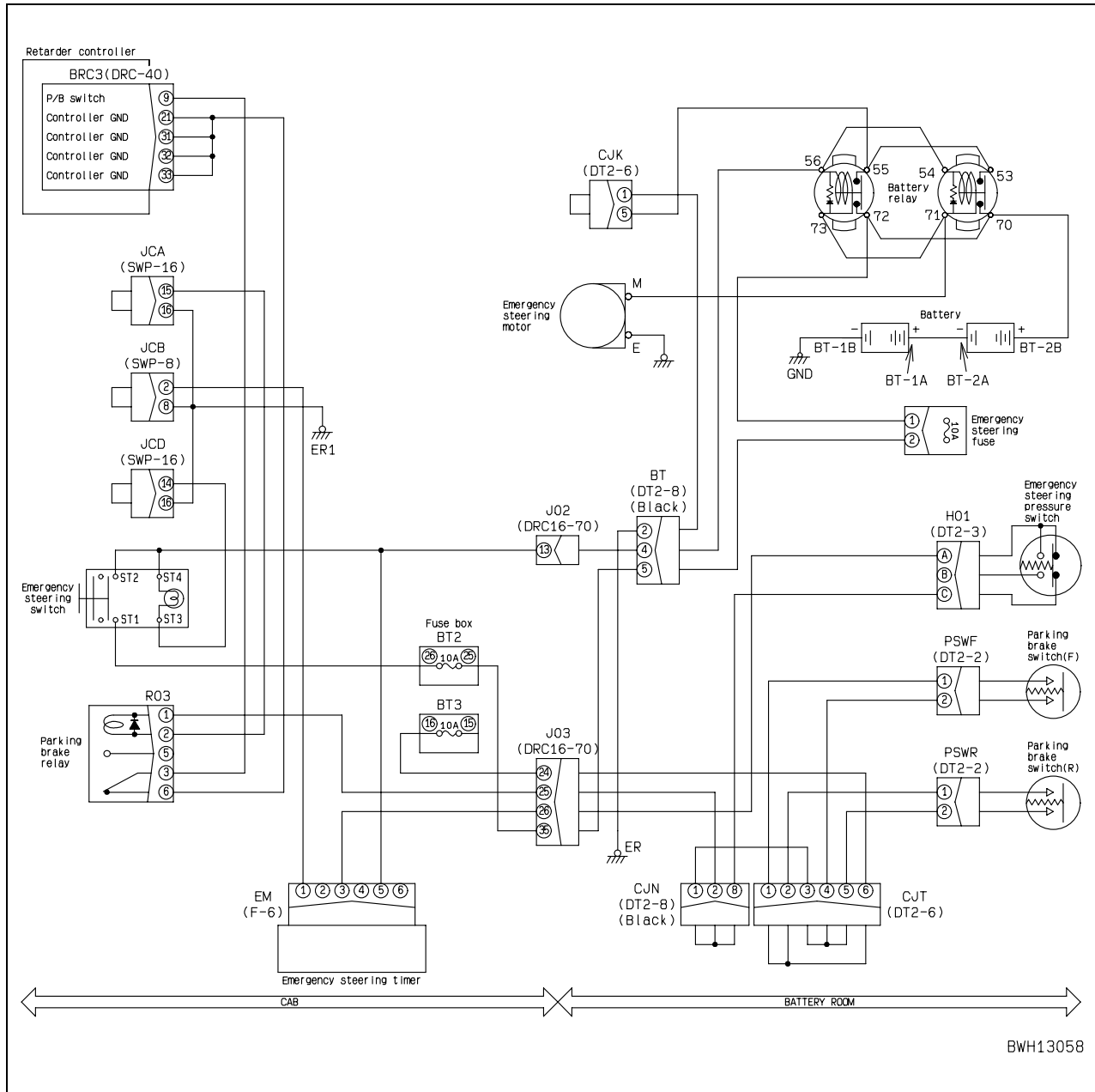
	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective fuse BT3 (16)	When the fuse BT3 (16) is blown, it is highly possible that a defective grounding has occurred in the circuit (troubleshooting cause 6).			
	2	Defective parking brake switch (rear) (Internal defective contact)	1) Turn starting switch OFF. 2) Connect T-adapter to PSWF (male) 3) Start engine and carry out troubleshooting.			
			PSWF (male)	Parking brake operations	Resistance	
			Between (1) – (2)	Released (CLOSE)	Max. 1 Ω	
				Operated (OPEN)	Min. 1 MΩ	
	3	Defective parking brake switch (front) (Internal defective contact)	1) Turn starting switch OFF. 2) Connect T-adapter to PSWR (male) 3) Start engine and carry out troubleshooting.			
			PSWR (male)	Parking brake operations	Resistance	
			Between (1) – (2)	Released (CLOSE)	Max. 1 Ω	
				Operated (OPEN)	Min. 1 MΩ	
	4	Defective emergency steering oil pressure switch (Internal contact)	1) Turn starting switch OFF. 2) Connect T-adapter to H01 (male) 3) Start engine and carry out troubleshooting.			
			H01 (male)	Steering pump	Resistance	
			Between (A) – (C)	Operated (OPEN)	Min. 1 MΩ	
				Stopped (CLOSE)	Max. 1 Ω	
	5	Defective emergency steering timer	1) Turn starting switch OFF.			
			Between EM (female) (1) – ground		Resistance	Max. 1 Ω
			1) Turn starting switch OFF. 2) Insert T-adapter in connector EM. 3) Turn parking brake ON. (Turn line to EM (3) OFF) 4) Check by supplying 24 V to EM (3). ★ Check within 90 seconds.			
			Between EM (female) (5) – ground		Voltage	20 – 30 V
	6	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect connectors PSWR, CJN, EM, and BT3 (16). 3) Connect T-adapter to connector of circuit to be measured.			

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	6	Disconnection in wiring harness (Disconnection or defective contact)	Wiring harness between fuse BT-3 (16) – PSWR (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between PSWR (female) (2) – CJN (female) (4)	Resistance	Max. 1 Ω
			Wiring harness between CJN (female) (3) – H01 (female) (C)	Resistance	Max. 1 Ω
			Wiring harness between H01 (female) (A) – EM (female) (3)	Resistance	Max. 1 Ω
			Wiring harness between EM (female) (5) – relay terminal (54)	Resistance	Max. 1 Ω
	7	Short circuit (ground fault) of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors PSWR, CJN, EM, and BT3 (16). 3) Connect T-adaptor to connector of circuit to be measured.		
			Between ground and wiring harness between fuse BT-3 (16) – PSWR (female) (1)	Resistance	Min. 1 M Ω
			Between ground and wiring harness between PSWR (female) (2) – CJN (female) (4)	Resistance	Min. 1 M Ω
			Between ground and wiring harness between CJN (female) (3) – H01 (female) (C)	Resistance	Min. 1 M Ω
			Between ground and wiring harness between H01 (female) (A) – EM (female) (3)	Resistance	Min. 1 M Ω
			Between ground and wiring harness between EM (female) (5) – relay terminal (54)	Resistance	Min. 1 M Ω

- ★ The 5 factors in causing the trouble that "the emergency steering operates by itself (while the switch is turned OFF)" are as follows. (Factors 4) and 5) can cause this trouble only when they occur simultaneously.)

- 1) The emergency steering relay is kept turned ON for some vibration. (Replace the emergency steering relay.)
- 2) The voltage at the (+) terminal of the emergency steering relay is 20 – 30 V. (This terminal should be grounded normally.)
- 3) The wiring of the emergency steering relay on the M side comes in contact with that on the B side. (Open the battery box and check the wiring.)
- 4) Parking brake oil pressure switch is stuck. (Replace the parking brake oil pressure switch.)
- 5) Steering flow switch is stuck. (Replace steering flow switch.)

Circuit diagram related

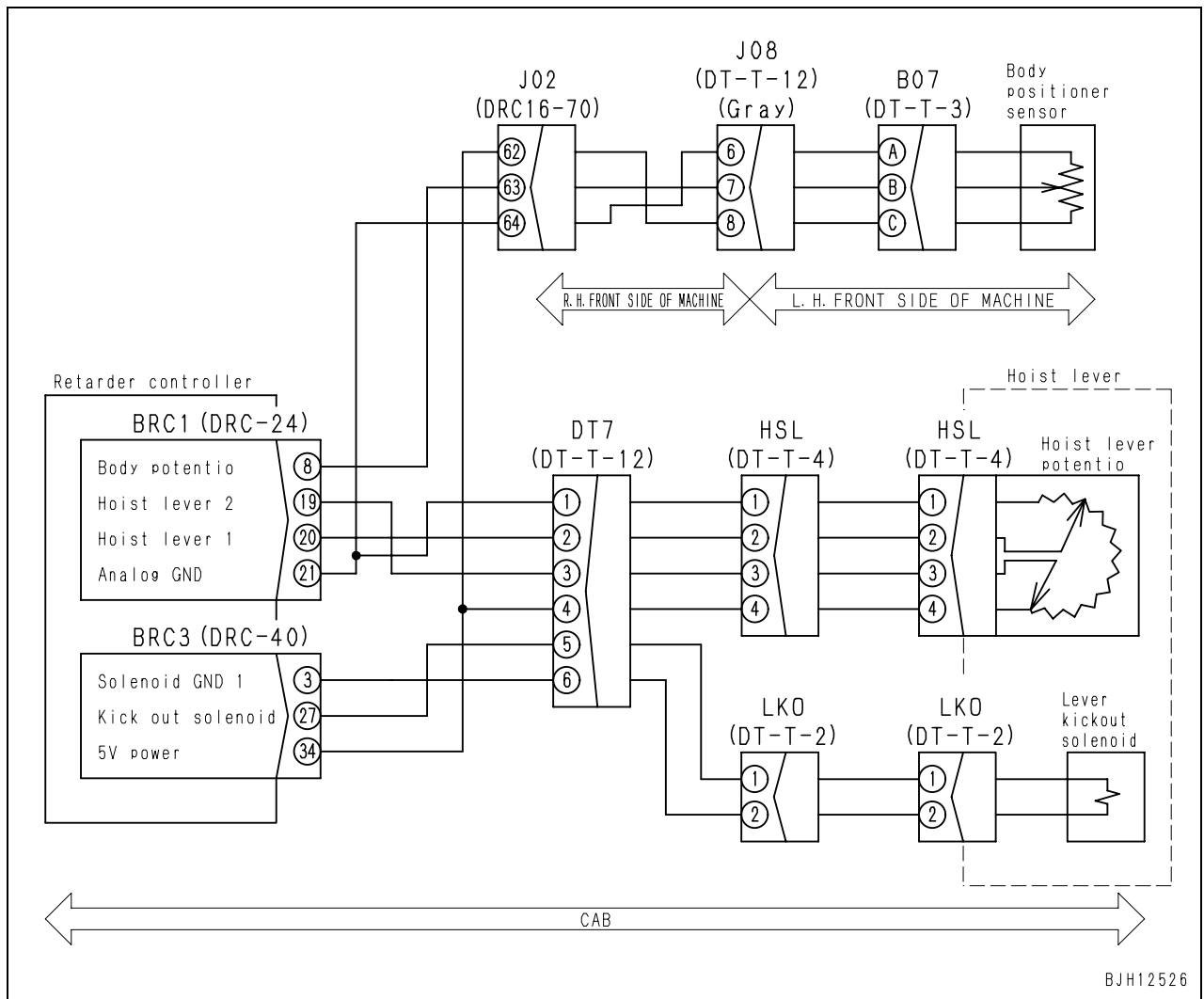


E-14 Hoist lever does not operate normally

Trouble	Hoist lever does not operate normally. (1) Hoist lever is not fixed at RAISE position. (2) Hoist lever raise fixing device (detent) is not reset before body raising position.
Related information	- Failure code [DW72KZ] checks kick-out solenoid and [DK54KX] checks body positioner sensor. Accordingly, if these codes are not displayed, it is judged that there is not breakage in solenoid coil or disconnection/short circuit in sensor and wiring is normal. - If detent is not reset, hoist lever kick-out is judge to be normal (solenoid is turned ON and OFF normally). It should be judged that signal from body positioner sensor is not sent to controller normally. If body is not hoisted at all, see failure codes [DK52KX] and [DK53LX] (Troubleshooting for hoist lever potentiometer sensor). - If kick-out solenoid is defective, replace hoist lever.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Defective hoist lever kick-out	1) Turn starting switch OFF and insert T-adapter in LK0. 2) Start engine. 3) Set hoist lever in RAISE position and check.		
			LK0		Voltage
			Between (1) – (2)		20 – 30 V
	2	Defective body positioner sensor	1) Turn starting switch OFF and insert T-adapter in BRC1 (or in connector on route to body positioner sensor). 2) Start engine. 3) Set hoist lever in RAISE position and check until body is raised.		
			Between BRC1 (8) – (21)		Voltage
	3	Defective retarder controller	If causes 1 – 2 are not detected, retarder controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related



HD785-7 Dump truck

Form No. SEN01948-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

40 Troubleshooting

Troubleshooting of hydraulic and mechanical system (H-mode)

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Contents of troubleshooting table

- ★ Troubleshooting Table and Related Circuit Diagram collectively carry the following information. Carry out troubleshooting work after fully grasping their contents.

Trouble	Phenomenon occurring on machine
Related information	Information on the failure occurred as well as the troubleshooting

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Cause for presumed failure (The attached No. is for filing and reference purpose only. It does not stand for any priority.)	<Contents> • The standard values in normalcy by which to judge “Good” or “No Good” about presumed causes. • References for making judgement of “Good” or “No Good”
	2		
	3		
	4		
	5		

<Contents>

- The standard values in normalcy by which to judge “Good” or “No Good” about presumed causes.
- References for making judgement of “Good” or “No Good”

H-1 Machine does not start

Trouble	Machine does not start at any gear speed.
Related information	- Before carrying out troubleshooting, check that transmission oil level is normal. - If failure code related to input shaft speed sensor system or mechanical system is displayed, carry out troubleshooting for it first. - Check that drive shaft etc. is free from abnormality. - Check that parking brake is reset securely.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	1	Defective power train pump strainer	Power train pump strainer may be clogged. Check it directly.	
	2	Air in suction side of power train pump	Suction piping of power train pump may have sucked air. Check it directly.	
	3	Defective power train pump main relief valve	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. - Oil temperature: 80 °C - Engine speed: 1,900 rpm (Rated speed)	
			Relief oil pressure	N, F1 – F3, RL, RH $3.53 \pm 0.2 \text{ MPa}$ $\{36.0 \pm 2.0 \text{ kg/cm}^2\}$
				F4 – F7 $2.16 \pm 0.2 \text{ MPa}$ $\{22.0 \pm 2.0 \text{ kg/cm}^2\}$
	4	Defective torque converter oil pressure (relief valve)	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. - Oil temperature: 85 °C - Engine speed: 1,900 rpm (Rated speed) ★ For details, refer to "Standard value table".	
			Torque converter inlet pressure	Max. 0.85 MPa $\{\text{Max. } 8.67 \text{ kg/cm}^2\}$
			Torque converter outlet pressure	$0.49 \pm 0.04 \text{ MPa}$ $\{5.0 \pm 0.41 \text{ kg/cm}^2\}$
	5	Defective torque converter	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. - Oil temperature: 80 °C - Engine speed: 1,900 rpm (Rated speed)	
			Stall speed (Power mode, high load)	$1,845 \pm 100 \text{ rpm}$
	6	Defective gear speed clutch ECMV	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. - Oil temperature: 80 °C - Engine speed: 1,900 rpm (Rated speed)	
			Lo, Hi, 4th clutch	$1.61 \pm 0.2 \text{ MPa}$ $\{16.5 \pm 2.0 \text{ kg/cm}^2\}$
			3rd clutch	$2.01 \pm 0.2 \text{ MPa}$ $\{20.5 \pm 2.0 \text{ kg/cm}^2\}$
			2nd clutch	$3.29 \pm 0.25 \text{ MPa}$ $\{33.5 \pm 2.5 \text{ kg/cm}^2\}$
			1st clutch	$3.43 \pm 0.2 \text{ MPa}$ $\{35.0 \pm 2.0 \text{ kg/cm}^2\}$
			* Since gear speed clutches are combined and operated 2 sets by 2, see combinations in Table 1.	

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	7	Defective gear speed clutch	- If oil pressure checked in Cause 6 is low, oil may be leaking through clutch seal ring. - If oil pressure checked in Cause 6 is normal, clutch may be slipping.
	8	Defective power train pump	- If check result of Cause 3 is abnormal, disconnect power train pump outlet hose and crank engine to see if oil flows out. - Check line filter for foreign matter to judge.
	9	Internal defect in transmission	Transmission may have defect in it. Check it directly.

Table 1

		Operated clutches						
		Lo	Hi	1st	2nd	3rd	4th	R
Gear speed	F1	●		●				
	F2	●			●			
	F3		●		●			
	F4	●				●		
	F5		●			●		
	F6	●					●	
	F7		●				●	
	N							
	RH		●					●
	RL	●						●

H-2 Machine does not travel smoothly (hunting)

Trouble	Machine does not travel smoothly (hunting).
Related information	- Check that the transmission oil level is correct. - If a failure code related to the machine is displayed, firstly troubleshooting the displayed code.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	1	Defective power train pump strainer	Since the power train pump strainer can be suspected to be clogged, check it directly.	
	2	Air sucked in at the suction side of the power train pump	Since the air is potentially sucked in from the suction piping of the power train pump; visually check it.	
	3	Defective power train pump main relief valve	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. - Oil temperature: 80 °C - Engine speed: 1,900 rpm (Rated speed)	
			Relief oil pressure	N, F1 – F3, RL, RH 3.53 ± 0.2 MPa {36.0 ± 2.0 kg/cm ² }
				F4 – F7 2.16 ± 0.2 MPa {22.0 ± 2.0 kg/cm ² }
	4	Defective gear speed clutch	- If the oil pressure is low in the item 3, wear of the gear speed clutch piston seal ring or wear of the ring groove can be suspected. - If the oil pressures are within the ranges in the item 3, a slip of the clutch can be suspected.	

H-3 Lockup cannot be cancelled

Trouble	Torque converter lockup cannot be cancelled.
Related information	- Check that the transmission oil level is correct. - If a failure code related to the machine is displayed, firstly troubleshooting the displayed code.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	1	Defective lockup solenoid valve	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. - Oil temperature: 80 °C - Engine speed: 1,900 rpm (Rated speed)	
			Lockup solenoid valve output pressure	1.52 ± 0.2 MPa {15.5 ± 2.0 kg/cm ² }
	2	Defective lockup clutch	If the oil pressure is within the range in the item 1, a seizure of the lockup clutch can be suspected.	

H-4 Excessive shock when starting or shifting excessive

Trouble	Shock when starting or shifting is excessive.
Related information	If a failure code related to the machine is displayed, firstly troubleshooting the displayed code.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective gear speed clutch ECMV	* There is some shock, but it is difficult to judge if the shock is excessive or not, so judge that it is excessive in the following cases. - When it is apparent that the shock suddenly became severer than before. - The shock is severer compared with other machines of the same class. Since the operation of the gear speed clutch ECMV can be suspected to be defective, check it directly.

H-5 Transmission does not shift up

Trouble	Transmission does not shift up.
Related information	- If a failure code related to the machine is displayed, firstly troubleshooting the displayed code. - If the brake lamp lights up while the foot brake (service brake), retarder brake or secondary brake is not operated, carry out repair first.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	1	Defective power train pump main relief valve	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. - Oil temperature: 80 °C - Engine speed: 2,000 rpm (Rated speed)	
			Relief oil pressure	N, F1 – F3, RL, RH 3.53 ± 0.2 MPa {36.0 ± 2.0 kg/cm ² }
				F4 – F7 2.16 ± 0.2 MPa {22.0 ± 2.0 kg/cm ² }
	2	Defective lockup solenoid valve	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. - Oil temperature: 80 °C - Engine speed: 1,900 rpm (Rated speed)	
			Lockup solenoid valve output pressure	1.52 ± 0.2 MPa {15.5 ± 2.0 kg/cm ² }
	3	Defective lockup clutch	If the shift up operations take place when traveling down a slope, a slip of the lockup clutch can be suspected.	
	4	Defective gear speed clutch ECMV	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. - Oil temperature: 80 °C - Engine speed: 1,900 rpm (Rated speed)	
			Lo, Hi, 4th clutch	1.61 ± 0.2 MPa {16.5 ± 2.0 kg/cm ² }
			3rd clutch	2.01 ± 0.2 MPa {20.5 ± 2.0 kg/cm ² }
			2nd clutch	3.29 ± 0.25 MPa {33.5 ± 2.5 kg/cm ² }
			1st clutch	3.43 ± 0.2 MPa {35.0 ± 2.0 kg/cm ² }
			* Since gear speed clutches are combined and operated 2 sets by 2, see combinations in Table 1.	
	5	Defective gear speed clutch piston	- If the oil pressure is low in the item 4, wear of the gear speed clutch piston seal ring or wear of the ring groove can be suspected. - If the oil pressure is within the range in the item 4, a slip of the gear speed clutch piston can be suspected.	

Table 1

		Operated clutches						
		Lo	Hi	1st	2nd	3rd	4th	R
Gear speed	F1	●		●				
	F2	●			●			
	F3		●		●			
	F4	●				●		
	F5		●			●		
	F6	●					●	
	F7		●				●	
	N							
	RH		●					●
	RL	●						●

H-6 Machine lacks power or speed when traveling

Trouble (1)	When abnormality is present at all gear speeds (when traveling in lockup range).
Related information	- Check that the transmission oil level is correct. - If a failure code related to the machine is displayed, firstly troubleshooting the displayed code. - Check that the parking brake is completely released and also check for dragging of the retarder brake. - Check that the tire inflation pressure is proper.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	1	Defective power train pump strainer	The power train pump strainer is suspected to be clogged, check it directly.	
	2	Air sucked in at the suction side of the power train pump	Since the air can be suspected to be sucked in from the suction piping of the power train pump, check it directly.	
	3	Defective power train pump main relief valve	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. - Oil temperature: 80 °C - Engine speed: 1,900 rpm (Rated speed)	
			Relief oil pressure	N, F1 – F3, RL, RH $3.53 \pm 0.2 \text{ MPa}$ $\{36.0 \pm 2.0 \text{ kg/cm}^2\}$
			F4 – F7	$2.16 \pm 0.2 \text{ MPa}$ $\{22.0 \pm 2.0 \text{ kg/cm}^2\}$
	4	Defective lockup solenoid valve	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. - Oil temperature: 80 °C - Engine speed: 1,900 rpm (Rated speed)	
			Lockup solenoid valve output pressure	$1.52 \pm 0.2 \text{ MPa}$ $\{15.5 \pm 2.0 \text{ kg/cm}^2\}$
	5	Slip of lockup clutch	- If the oil pressure is low in the item 4, wear of the lockup clutch piston seal ring or wear of the ring groove can be suspected. - If the oil pressures are within the ranges in the item 4, a slip of the lockup clutch piston can be suspected.	
	6	Defective power train pump	If a defect is found in the item 3, the power train pump can be suspected to be defective. Check for aluminum worn powder etc. residing on the line filter.	
	7	Decrease of engine output	If no problem is found in item 1 through 6, measure the torque converter stall speed (in the power mode: $1,910 \pm 100 \text{ rpm}$). If it is below the standard value, the deterioration of the engine unit performance can be suspected.	

Trouble (2)	When machine lacks power or speed while traveling in torque converter range.
Related information	• Check that the transmission oil level is correct. • If a failure code related to the machine is displayed, firstly troubleshooting the displayed code. • Check for oil leaking from the piping to the outside. • Check that the parking brake is completely released and also check for dragging of the retarder brake.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	1	Defective power train pump main relief valve	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. • Oil temperature: 80 °C • Engine speed: 1,900 rpm (Rated speed)	
			Relief oil pressure	N, F1 – F3, RL, RH 3.53 ± 0.2 MPa {36.0 ± 2.0 kg/cm ² }
				F4 – F7 2.16 ± 0.2 MPa {22.0 ± 2.0 kg/cm ² }
	2	Defective torque converter oil pressure (relief valve)	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. • Oil temperature: 85 °C • Engine speed: 1,900 rpm (Rated speed) ★ For details, refer to "Standard value table".	
			Torque converter inlet pressure	
			Torque converter outlet pressure	
	3	Defective torque converter	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. • Oil temperature: 80 °C • Engine speed: 1,900 rpm (Rated speed)	
			Stall speed (Power mode, high load)	

Trouble (3)	Machine lacks speed or power when traveling in certain gear speeds.
Related information	- Check that the transmission oil level is correct. - If a failure code related to the machine is displayed, firstly troubleshooting the displayed code.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	1	Defective gear speed clutch ECMV	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. - Oil leak tester: 80 °C - Engine speed: 1,900 rpm (Rated speed)	
			Lo, Hi, 4th clutch	1.61 ± 0.2 MPa {16.5 ± 2.0 kg/cm ² }
			3rd clutch	2.01 ± 0.2 MPa {20.5 ± 2.0 kg/cm ² }
			2nd clutch	3.29 ± 0.25 MPa {33.5 ± 2.5 kg/cm ² }
			1st clutch	3.43 ± 0.2 MPa {35.0 ± 2.0 kg/cm ² }
			It can be also diagnosed by replacing the ECMV.	
			* Since gear speed clutches are combined and operated 2 sets by 2, see combinations in Table 1.	
	2	Defective gear speed clutch	- If the oil pressure is low in the item 1, wear of the gear speed clutch piston seal ring or wear of the ring groove can be suspected. - If the oil pressure is within the range in the item 1, a slip of the gear speed clutch can be suspected.	

Table 1

		Operated clutches						
		Lo	Hi	1st	2nd	3rd	4th	R
Gear speed	F1	●		●				
	F2	●			●			
	F3		●		●			
	F4	●				●		
	F5		●			●		
	F6	●					●	
	F7		●				●	
	N							
	RH		●					●
	RL	●						●

H-7 Time lag is excessive when starting or shifting gear

Trouble	Time lag is excessive when starting or shifting gear.
Related information	- Check that the transmission oil level is correct. - If a failure code related to the machine is displayed, firstly troubleshooting the displayed code. - Check for oil leaking from the piping to the outside.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	1	Defective power train pump strainer	Since the power train pump strainer can be suspected to be clogged, check it directly.	
	2	Air sucked in at the suction side of the power train pump	Since the air is potentially sucked in from the suction piping of the power train pump; visually check it.	
	3	Defective power train pump main relief valve	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. - Oil temperature: 80 °C - Engine speed: 1,900 rpm (Rated speed)	
			Relief oil pressure	N, F1 – F3, RL, RH 3.53 ± 0.2 MPa {36.0 ± 2.0 kg/cm ² }
				F4 – F7 2.16 ± 0.2 MPa {22.0 ± 2.0 kg/cm ² }
	4	Defective gear speed clutch ECMV	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. - Oil temperature: 80 °C - Engine speed: 1,900 rpm (Rated speed)	
			Lo, Hi, 4th clutch	1.61 ± 0.2 MPa {16.5 ± 2.0 kg/cm ² }
			3rd clutch	2.01 ± 0.2 MPa {20.5 ± 2.0 kg/cm ² }
			2nd clutch	3.29 ± 0.25 MPa {33.5 ± 2.5 kg/cm ² }
			1st clutch	3.43 ± 0.2 MPa {35.0 ± 2.0 kg/cm ² }
			• It can be also diagnosed by replacing the ECMV. * Since gear speed clutches are combined and operated 2 sets by 2, see combinations in Table 1.	
	5	Defective gear speed clutch	- If the oil pressure is low in the item 4, wear of the gear speed clutch piston seal ring or wear of the ring groove can be suspected. - If the oil pressure is within the range in the item 4, a slip of the gear speed clutch can be suspected.	
	6	Defective power train pump	If a defect is found in the item 3, the power train pump can be suspected to be defective. Check for aluminum worn powder etc. residing on the line filter.	

Table 1

		Operated clutches						
		Lo	Hi	1st	2nd	3rd	4th	R
Gear speed	F1	●		●				
	F2	●			●			
	F3		●		●			
	F4	●				●		
	F5		●			●		
	F6	●					●	
	F7		●				●	
	N							
	RH		●					●
	RL	●						●

H-8 Torque converter oil temperature is high

Trouble	Torque converter oil temperature is high.
Related information	- Check that the transmission oil level is correct. - If a failure code related to the machine is displayed, firstly troubleshooting the displayed code. - If the oil temperature goes up when the torque converter is stalled and goes down when the transmission is returned to the neutral position, the machine is normal and overload operation is a cause of the problem.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	1	Defective power train pump strainer	The power train pump strainer is suspected to be clogged, check it directly.	
	2	Air sucked in at the suction side of the power train pump	Since the air can be suspected to be sucked in from the suction piping of the power train pump, check it directly.	
	3	Defective power train pump line filter	The filter can be suspected to be clogged; visually check it.	
	4	Defective power train pump main relief valve	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. - Oil temperature: 80 °C - Engine speed: 1,900 rpm (Rated speed)	
			Relief oil pressure	N, F1 – F3, RL, RH 3.53 ± 0.2 MPa {36.0 ± 2.0 kg/cm ² }
			F4 – F7	2.16 ± 0.2 MPa {22.0 ± 2.0 kg/cm ² }
	5	Defective power train pump	- If a defect is found in the item 4, the power train pump can be suspected to be defective. - Check for aluminum worn powder etc. residing on the line filter.	
	6	Defective torque converter relief valve	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. - Oil temperature: 80 °C - Engine speed: 1,900 rpm (Rated speed)	
			Torque converter inlet pressure	Max. 0.85 MPa {Max. 8.67 kg/cm ² }
	7	Defective torque converter	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. - Oil temperature: 80 °C - Engine speed: 1,900 rpm (Rated speed)	
			Torque converter inlet pressure	Max. 0.85 MPa {Max. 8.67 kg/cm ² }
			Torque converter outlet pressure	0.49 ± 0.04 MPa {5.0 ± 0.41 kg/cm ² }

H-9 Torque converter oil pressure is low

Trouble	Torque converter oil pressure is low.
Related information	- Check that the transmission oil level is correct. - If a failure code related to the machine is displayed, firstly troubleshooting the displayed code. - Check for oil leaking from the piping to the outside.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	1	Defective power train pump strainer	The power train pump strainer is suspected to be clogged, check it directly.	
	2	Air sucked in at the suction side of the power train pump	Since the air can be suspected to be sucked in from the suction piping of the power train pump, check it directly.	
	3	Defective power train pump main relief valve	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. - Oil temperature: 80 °C - Engine speed: 1,900 rpm (Rated speed)	
			Relief oil pressure	N, F1 – F3, RL, RH 3.53 ± 0.2 MPa {36.0 ± 2.0 kg/cm ² }
				F4 – F7 2.16 ± 0.2 MPa {22.0 ± 2.0 kg/cm ² }
	4	Defective power train pump	• If a defect is found in the item 3, the power train pump can be suspected to be defective. Check for aluminum worn powder etc. residing on the line filter.	
	5	Defective torque converter relief valve	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. - Oil temperature: 80 °C - Engine speed: 1,900 rpm (Rated speed)	
			Torque converter inlet pressure	Max. 0.85 MPa {Max. 8.67 kg/cm ² }
	6	Defective torque converter	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle. - Oil temperature: 80 °C - Engine speed: 1,900 rpm (Rated speed)	
			Torque converter inlet pressure	Max. 0.85 MPa {Max. 8.67 kg/cm ² }
			Torque converter outlet pressure	0.49 ± 0.04 MPa {5.0 ± 0.41 kg/cm ² }

H-10 Front brake is ineffective

Trouble	Front brake is ineffective.
Related information	- Check that the transmission oil level is correct. - If a failure code related to the machine is displayed, firstly troubleshooting the displayed code. - Check that the tire inflation pressure is proper.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Air sucked in at the suction side of the brake control pump	Since the air can be suspected to be sucked in from the suction piping of the brake control pump, check it directly.		
	2	Defective accumulator charge valve	★ Prepare with the engine stopped and measure with the engine running at high idle.		
			Charge valve cut-in pressure		11.8 (+0.98/0) MPa {120 (+10/0) kg/cm ² }
			Charge valve cut-out pressure		20.6 (+0.98/0) MPa {210 (+10/0) kg/cm ² }
	3	Defective accumulator for front brake	• If the brake becomes ineffective as soon as the engine is stopped, the gas charged in the accumulator is insufficient. * [Reference] Charged gas pressure: 6.2 ± 0.2 MPa {63 ± 2 kg/cm ² }		
	4	Defective front brake valve	★ Prepare with the engine stopped and measure with the engine running at high idle.		
			Brake actuating pressure	Brake pedal operated	9.8 ± 0.69 MPa {100 ± 7 kg/cm ² }
	5	Defective front brake retarder pressure reducing valve	★ Prepare with the engine stopped and measure with the engine running at high idle.		
			Brake actuating pressure	Retarder lever operated	6.4 (+0.69/-0.59) MPa {65 (+7/-6) kg/cm ² }
	6	Defective front brake slack adjuster	When the initial response time of brake system is excessively long or excess pedal effort is required to obtain the specific braking force, the slack adjuster can be suspected to be defective.		
	7	Defective front disc brake	• If the oil pressure is low in the item 4 or 5, a seal ring or ring groove can be suspected to be defective. • If the oil pressures are within the range in the item 4 or 5, a slip of the brake disc is suspected.		

H-11 Rear brake is ineffective

Trouble	Rear brake is ineffective.
Related information	- Check that the transmission oil level is correct. - If a failure code related to the machine is displayed, firstly troubleshooting the displayed code. - Check that the tire inflation pressure is proper.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	1	Air sucked in at the suction side of the brake control pump	Since the air can be suspected to be sucked in from the suction piping of the brake control pump, check it directly.		
	2	Defective accumulator charge valve	★ Prepare with the engine stopped and measure with the engine running at high idle.		
			Charge valve cut-in pressure		11.8 (+0.98/0) MPa {120 (+10/0) kg/cm ² }
			Charge valve cut-out pressure		20.6 (+0.98/0) MPa {210 (+10/0) kg/cm ² }
	3	Defective accumulator for rear brake	• If the brake becomes ineffective as soon as the engine is stopped, the gas charged in the accumulator is insufficient. * [Reference] Charged gas pressure: 6.2 ± 0.2 MPa {63 ± 2 kg/cm ² }		
	4	Defective rear brake valve	★ Prepare with the engine stopped and measure with the engine running at high idle.		
			Brake actuating pressure	Brake pedal operated	9.8 ± 0.69 MPa {100 ± 7 kg/cm ² }
	5	Defective rear brake retarder pressure reducing valve	★ Prepare with the engine stopped and measure with the engine running at high idle.		
			Brake actuating pressure	Retarder lever operated	6.4 (+0.69/-0.59) MPa {65 (+7/-6) kg/cm ² }
	6	Defective rear brake slack adjuster	When the initial response time of brake system is excessively long or excess pedal effort is required to obtain the specific braking force, the slack adjuster can be suspected to be defective.		
	7	Defective rear wheel brake	• If the oil pressure is low in the item 4 or 5, a seal ring or ring groove can be suspected to be defective. • If the oil pressures are within the range in the item 4 and 5, a slip of the brake disc is suspected.		

H-12 Steering wheel is heavy

Trouble	Steering wheel is heavy.
Related information	- Check that oil level in hydraulic tank is proper. - If failure code related to mechanical system is displayed, carry out troubleshooting for it first. - Check that play of steering wheel is normal (max. 150 mm). - Check that hinge pins etc. are greased thoroughly. - Before starting carry out troubleshooting, adjust tire inflation pressure to proper level. "Standard tire" 27.00-R49 (Front and rear wheels) (0.69 ± 0.01 MPa {7.0 ± 0.1 kg/cm²}) "Option tire" 31/90-R49 (Front and rear wheels) (0.69 ± 0.01 MPa {7.0 ± 0.1 kg/cm²})

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	1	Air in suction side of steering and work equipment pump	Suction piping of steering and work equipment pump may have sucked air. Check it directly.	
	2	Defective steering and work equipment pump strainer	Steering and work equipment pump strainer may be clogged. Check it directly.	
	3	Defective relief valve of demand valve	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle.	
			Relief pressure (Cylinder stroke end)	20.6 (+0.98/0) MPa {210 (+10/0) kg/cm ² }
	4	Defective steering valve	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle.	
			Relief pressure (Cylinder stroke end)	20.2 – 21.1 MPa {206 – 215 kg/cm ² }
	5	Malfunction of demand valve spool	If oil pressure is normal, demand valve spool may be malfunctioning. Check it directly.	
	6	Defective steering cylinder	★ Prepare with engine stopped, then start engine and carry out troubleshooting at high idle.	
			Relief pressure (Cylinder stroke end)	20.6 (+0.98/0) MPa {210 (+10/0) kg/cm ² }
			If oil pressure is low, disconnect hydraulic hose on steering cylinder head side and relieve at stroke end. If oil flows from cylinder side, piston ring of cylinder is defective.	
	7	Defective steering and work equipment pump	If oil pressure check in Causes 3 and (4) is low, steering and work equipment pump may be defective. Check line filter for aluminum chips.	

H-13 Steering wheel does not work

Trouble	Steering wheel does not work.
Related information	• Check that the oil level in the hydraulic tank is correct. • If a failure code related to the machine is displayed, firstly troubleshooting the displayed code. • Check that the steering wheel play is correct (less than 150 mm). • Check that the hinge pin, etc. are greased sufficiently.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	1	Defective PTO	If the dump body also does not work, the PTO can be suspected to be defective.	
	2	Air sucked in at the suction side of the steering and work equipment pump	Since the air can be suspected to be sucked in from the suction side of the steering and work equipment pump, check it directly.	
	3	Defective steering and work equipment pump strainer	Since the steering and work equipment pump strainer is potentially clogged, visually check it.	
	4	Defective relief valve of demand valve	★ Prepare with the engine stopped and troubleshooting with the engine running at high idle.	
			Relief oil pressure (cylinder stroke end)	20.6 (+0.98/0) MPa {210 (+10/0) kg/cm ² }
	5	Defective steering valve	★ Prepare with the engine stopped and troubleshooting with the engine running at high idle.	
			Relief oil pressure (cylinder stroke end)	22.5 ± 0.98 MPa {230 ± 10 kg/cm ² }
	6	Defective operation of demand valve spool	If the oil pressure is within the range, the operation of the demand valve spool can be suspected to be defective: check it directly.	
	7	Defective steering cylinder	★ Prepare with the engine stopped and troubleshooting with the engine running at high idle.	
			Relief oil pressure (cylinder stroke end)	20.6 (+0.98/0) MPa {210 (+10/0) kg/cm ² }
			When the oil pressure is low, disconnect the hydraulic hose in the steering cylinder head side and relieve the pressure at the stroke end. If the oil comes out from the cylinder side, the cylinder piston ring is defective.	
8	Defective steering and work equipment pump	If the oil pressure is low in the item 4 or 5, the steering and work equipment pump can be suspected to be defective. Check for aluminum worn powder etc. residing on the line filter.		

H-14 Steering wheel vibrates

Trouble	Steering wheel vibrates.
Related information	- Check that the oil level in the hydraulic tank is correct. - If a failure code related to the machine is displayed, firstly troubleshooting the displayed code.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	1	Defective oil	Check for deterioration of oil.	
	2	Defective steering cylinder	★ Prepare with the engine stopped and troubleshooting with the engine running at high idle.	
			Relief oil pressure (cylinder stroke end)	20.6 (+0.98/0) MPa {210 (+10/0) kg/cm ² }
			When the oil pressure is low, disconnect the hydraulic hose in the steering cylinder head side and relieve the pressure at the stroke end. If the oil comes out from the cylinder side, the cylinder piston ring is defective.	
	3	Defective crossover relief valve	If relief pressure (demand valve relief pressure) of steering circuit is normal and piston rings of hydraulic cylinder checked in Cause 2 is also normal, "crossover relief valve" may be defective. (Replace valve.)	

H-15 Dump body lifting speed is slow

Trouble	When lifting dump body, the speed is slow and the power is insufficient.
Related information	- Check that the oil level in the hydraulic tank is correct. - If a failure code related to the machine is displayed, firstly troubleshooting the displayed code. - Check that the dump lever moves smoothly.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	1	Air sucked in at the suction side of the work equipment and steering pump	Since the air can be suspected to be sucked in from the suction side of the steering and work equipment pump, check it directly.	
	2	Defective work equipment and steering pump strainer	The work equipment and steering pump strainer is potentially clogged, visually check it.	
	3	Defective relief valve of demand valve	★ Prepare with the engine stopped and troubleshooting with the engine running at high idle.	
			Relief oil pressure (steering cylinder stroke end)	20.6 (+0.98/0) MPa {210 (+10/0) kg/cm ² }
	4	Defective dump EPC valve relief valve (dump pilot pressure)	★ Prepare with the engine stopped and troubleshooting with the engine running at high idle.	
			Operate dump lever to "raise" or "lower" position.	3.4 ± 0.49 MPa {35 ± 5 kg/cm ² }
				(Reference: low idle) 2.6 ± 0.49 MPa {27 ± 5 kg/cm ² }
	5	Defective operation of dump EPC valve	If the oil pressure is low in the item 4, the operation of the dump EPC valve can be suspected to be defective; visually check the valve.	
	6	Defective pilot pump for dump EPC valve	If the oil pressure is low in the item 4, the pilot pump for the dump EPC valve circuit can be suspected to be defective; check it directly.	
	7	Defective hoist valve relief valve	★ Prepare with the engine stopped and troubleshooting with the engine running at high idle.	
			Relief oil pressure (dump cylinder raise stroke end)	20.6 (+0.98/0) MPa {210 (+10/0) kg/cm ² }
	8	Defective operation of the hoist valve main spool	If the oil pressure does not reach the standard value in the item 7, the operation of the hoist valve main spool can be suspected to be defective. (Visually check the spool.)	
	9	Defective dump cylinder	★ Prepare with the engine stopped and troubleshooting with the engine running at high idle.	
			Relief oil pressure (cylinder stroke end)	20.6 (+0.98/0) MPa {210 (+10/0) kg/cm ² }
			When the oil pressure is low, disconnect the hydraulic hose in the dump cylinder head side and relieve the pressure at the raise stroke end. If the oil comes out from the cylinder side, the cylinder piston ring is defective.	

H-16 Dump body does not work

Trouble	Dump body does not work.
Related information	- Check that the oil level in the hydraulic tank is correct. - If a failure code related to the machine is displayed, firstly troubleshooting the displayed code. - Check that the dump lever moves smoothly.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	1	Defective PTO	If the steering also does not work, the PTO can be suspected to be defective.	
	2	Air sucked in at the suction side of the work equipment and steering pump	Since the air can be suspected to be sucked in from the suction side of the steering and work equipment pump, check it directly.	
	3	Defective work equipment and steering pump strainer	The work equipment and steering pump strainer is potentially clogged, visually check it.	
	4	Defective relief valve of demand valve	★ Prepare with the engine stopped and troubleshooting with the engine running at high idle.	
			Relief oil pressure (steering cylinder stroke end)	20.6 (+0.98/0) MPa {210 (+10/0) kg/cm ² }
	5	Defective dump EPC valve relief valve (dump pilot pressure)	★ Prepare with the engine stopped and troubleshooting with the engine running at high idle.	
			Operate dump lever to "raise" or "lower" position.	3.4 ± 0.49 MPa {35 ± 5 kg/cm ² } (Reference: low idle) 2.6 ± 0.49 MPa {27 ± 5 kg/cm ² }
	6	Defective operation of dump EPC valve	If the oil pressure is low in the item 5, the operation of the dump EPC valve can be suspected to be defective; visually check the valve.	
	7	Defective pilot pump for dump EPC valve	If the oil pressure is low in the item 5, the pilot pump for the dump EPC valve circuit can be suspected to be defective; check it directly.	
	8	Defective hoist valve relief valve	★ Prepare with the engine stopped and troubleshooting with the engine running at high idle.	
			Relief oil pressure (dump cylinder raise stroke end)	20.6 (+0.98/0) MPa {210 (+10/0) kg/cm ² }
	9	Defective operation of the hoist valve main spool	If the oil pressure does not reach the standard value in the item 8, the operation of the hoist valve main spool can be suspected to be defective. (Visually check the spool.)	
	10	Defective dump cylinder	★ Prepare with the engine stopped and troubleshooting with the engine running at high idle.	
			Relief oil pressure (cylinder stroke end)	20.6 (+0.98/0) MPa {210 (+10/0) kg/cm ² }
			When the oil pressure is low, disconnect the hydraulic hose in the dump cylinder head side. If the oil comes out from the cylinder side at the raise stroke end, the cylinder piston ring is defective.	

H-17 Excessive hydraulic drift of dump body

Trouble	Hydraulic drift of dump body is excessive.
Related information	If a failure code related to the machine is displayed, firstly troubleshooting the displayed code.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective oil tightness of hoist valve main spool	★ Raise the dump body and troubleshooting with the engine stopped. Raise the dump body and disconnect the hydraulic hose in the dump cylinder head side. If the oil flows out from the cylinder side, the oil tightness of the spool is defective.
	2	Defective dump cylinder	Raise the dump body and disconnect the hydraulic hose in the dump cylinder head side. If the oil does not flow out from the cylinder side, the cylinder piston ring is defective.

HD785-7 Dump truck

Form No. SEN01949-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

40 Troubleshooting

Troubleshooting of engine (S-mode)

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Method of using troubleshooting charts

The troubleshooting chart consists of the "questions", "check items", "causes", and "troubleshooting" blocks.

The questions and check items are used to pinpoint high probability causes by simple inspection or from phenomena without using troubleshooting tools.

Next, troubleshooting tools or direct inspection are applied to check the narrowed causes in order from the most probable one to make final confirmation according to the troubleshooting procedure.

[Questions]:

Items to be drawn from the user or operator.

They correspond to **A** and **B** in the chart on the right.

The items in **A** are basic ones.

The items in **B** can be drawn from the user or operator, depending on their level.

[Check items]:

Simple check items used by the serviceman to narrow down the causes.

They corresponds to **C** in the chart on the right.

[Causes]:

Items to be narrowed from the questions and check items.

The serviceman narrows down the probable causes from **A**, **B**, and **C**.

[Troubleshooting]:

Items to finally verify whether the narrowed down causes are undoubtedly the real causes using the troubleshooting tools and direct inspections.

Items listed in the [Questions] and [Check items] and related to the [Causes] are marked with $\triangle$, $\circ$, or $\odot$.

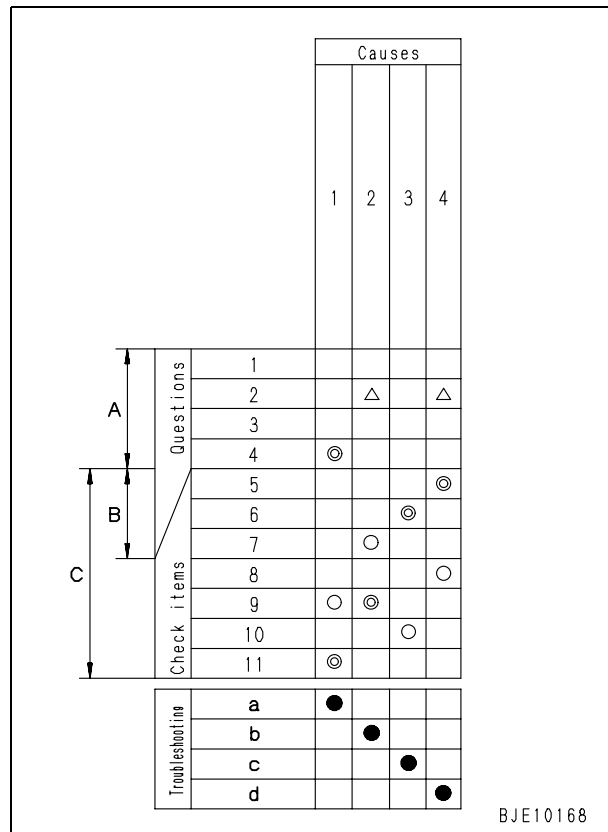
$\triangle$: Causes to be referred to for questions and check items

$\circ$: Causes related to questions and check items

$\odot$: Causes highly probable among ones marked with $\circ$

★ When narrowing the "auses", apply the items marked with $\odot$ before those marked with $\circ$.

When narrowing the causes, do not apply the items marked with $\triangle$. (If no items have other marks and the causes cannot be narrowed, however, you may apply them.)



<Example of troubleshooting> Exhaust smoke is black

Let us assume that [Clogged air cleaner element] is taken to be the cause of black exhaust gas. Three symptoms have causal relationship with this problem: [Color of exhaust gas gradually became black], [Power was lost gradually], and [Air cleaner clogging caution lamp is flashing].

S-7 Exhaust smoke is black(incomplete combustion)

General causes why exhaust smoke is black

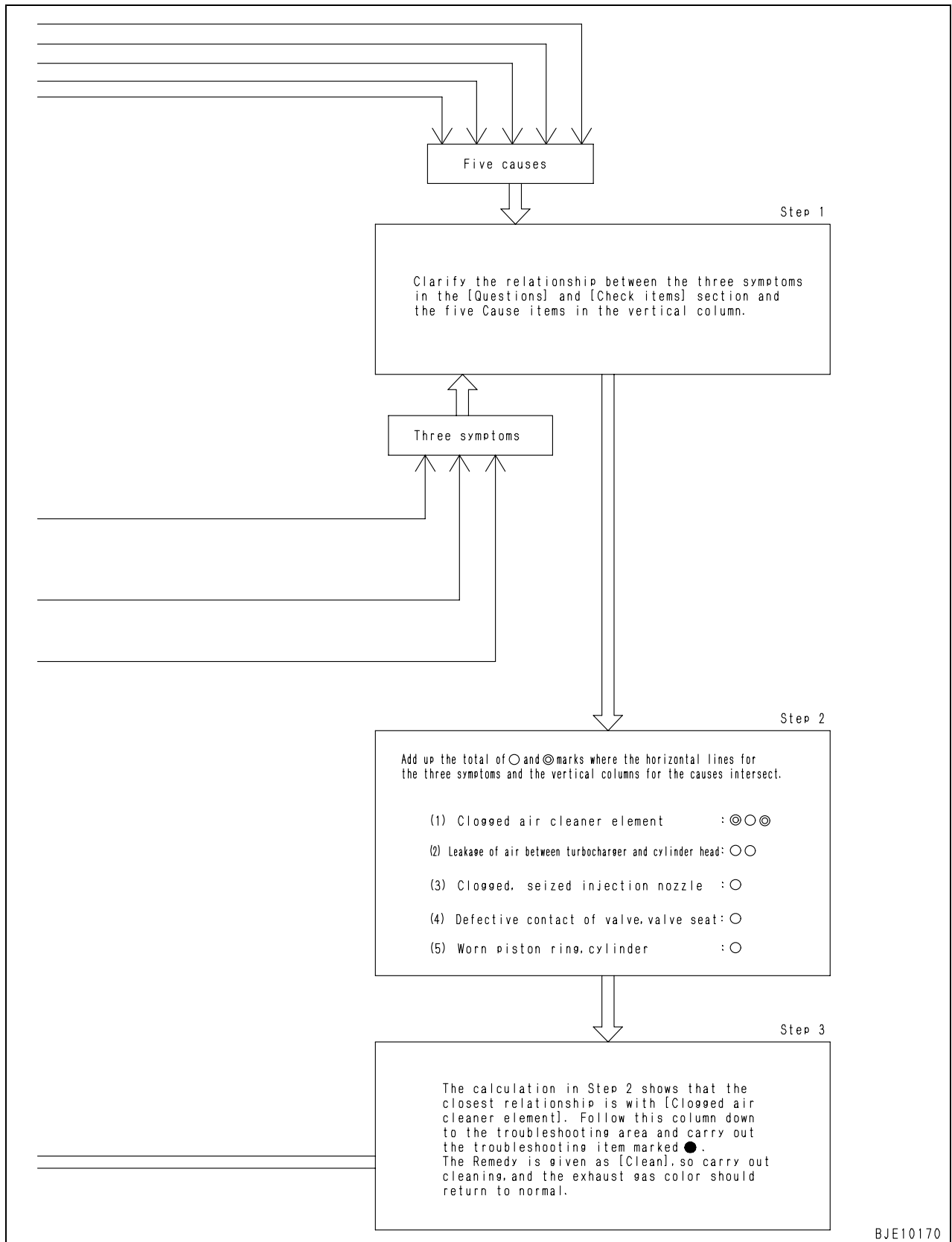
- Insufficient intake of air
- Defective condition of fuel injection
- Excessive injection of fuel

		Causes									
		Seized turbocharger, interference	Clogged air cleaner element	Worn piston ring, cylinder	Clogged, seized fuel injection nozzle	Defective fuel injection timing	Defective fuel injection pump (Excessive injection)	Improper valve clearance	Crushed, clogged muffler	Leakage of air between turbocharger and cylinder head	Defective contact of valve and valve seat
Questions	Confirm recent repair history										
	Degree of use of machine	Operated for long period	△	△	△						△
Color of exhaust gas	Suddenly became black	◎			○						○
	Gradually became black		◎		○					○	
	Blue under light load			◎							
Engine oil must be added more frequently				◎							
	Power was lost		◎		○				○		○
Non-specified fuel has been used	Suddenly				○					○	○
	Gradually									○	○
Noise of interference is heard from around turbocharger		◎			○						○
	Air cleaner clogging caution lamp is flashing		◎								
Check items	Blow-by gas is excessive			◎							
	Engine pickup is poor and combustion is irregular	○			◎			○	○	○	○
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low				◎						○
	Mating mark of fuel injection pump is not in position					◎					
	Seal of fuel injection pump has come off						◎				
	Clanging sound is heard from around cylinder head							◎			
	Exhaust noise is abnormal	○		○					◎		
	Muffler is crushed								◎		
	Air leaks between turbocharger and cylinder head, clamp is loosened									◎	
Troubleshooting	When turbocharger is rotated by hand, it is found to be heavy	●									
	When air cleaner is inspected directly, it is found to be clogged		●								
	When compression pressure is measured, it is found to be low			●						●	
	When a cylinder is cut out for reduced cylinder mode operation, engine speed does not change				●						
	When fuel injection timing is checked by delivery method, it is out of order					●					
	When fuel pump is tested, fuel injection rate is improper						●				
	When valve clearance is checked directly, it is improper							●			
	When muffler is removed, exhaust gas color improves								●		
	When control rack is pressed, it is heavy, does not return										●
	Remedy	Replace	Clean	Replace	Replace	Adjust	Adjust	Adjust	Replace	Correct	Replace

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If we look for the linkage of these three phenomena to possible causes, we find that they have causal relationship with five causes.

Let us explain here the method of using this causal relationship to pinpoint the most probable cause.



S-1 Starting performance is poor

General causes for poor starting performance are

- Defective electrical system
- Insufficient supply of fuel
- Insufficient intake of air
- Improper selection of fuel (particularly during winter)
- Coolant in exhaust pipe
- ★ The common rail fuel injection system (CRI) recognizes the fuel injection timing electrically. Accordingly, even if the starting operation is carried out, the engine may not start until the crankshaft revolves 2 turns at maximum. This phenomenon does not indicate a trouble, however.

General causes for poor starting performance are		Causes												
		Clogged air cleaner element	Defective contact of valve and valve seat	Worn piston ring and cylinder	Clogged air breather hole of fuel tank cap	Leaking or clogged fuel piping, entry of air	Clogged fuel filter element	Clogged feed pump gauze filter	Stuck or seized supply pump plunger	Defective injector	Defective intake air heater system	Defective alternator (regulator section)	Defective alternator (generator section)	Defective or deteriorated battery
- Defective electrical system - Insufficient supply of fuel - Insufficient intake of air - Improper selection of fuel (particularly during winter) - Coolant in exhaust pipe ★ The common rail fuel injection system (CRI) recognizes the fuel injection timing electrically. Accordingly, even if the starting operation is carried out, the engine may not start until the crankshaft revolves 2 turns at maximum. This phenomenon does not indicate a trouble, however.														
Questions	Confirm recent repair history													
	Degree of machine operation	Operated for long period	△					△	△					△
	Starting performance	Became worse gradually	○	◎	◎			○	○					
		Engine starts easily when warm										◎		
	Non-specified fuel is being used							○	○	○	○			
	Replacement of filters not carried out according to Operation and Maintenance Manual		◎					◎	◎	○	○			
	Engine oil replenished more frequently				◎									
	When engine is preheated or when temperature is low, preheating monitor does not indicate normally (if monitor is installed)										◎			
	During operation, charge level monitor indicates abnormal charge (if monitor is installed)											◎	◎	
	Dust indicator is red (if indicator is installed)		◎											
Check items	Air breather hole of fuel tank cap is clogged				◎									
	Fuel is leaking from fuel piping					◎								
	When priming pump is operated, it makes no reaction or it is heavy					△	◎	○	○					
	Starting motor cranks engine slowly													◎
	While engine is cranked with starting motor,	Fuel does not flow out if air bleeding plug of fuel filter is removed						◎	◎					
		If spill hose from injector is disconnected, little fuel spills					○		◎					
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low									◎				
	Engine does not pick up smoothly and combustion is irregular		○	○	○	○		○			◎			
	There is hunting from engine (rotation is irregular)					○		○	○					
	Blow-by gas is excessive				◎									

Troubleshooting	Inspect air cleaner directly		●												
	When compression pressure is measured, it is found to be low			●	●										
	When air is bled from fuel system, air comes out						●								
	Inspect fuel filter and strainer directly							●							
	Inspect feed pump gauze filter directly								●						
	Carry out troubleshooting for "Supply pump pressure is low pressure (*1)" indicated by failure code									●					
	When a cylinder is cut out for reduced cylinder mode operation, engine speed does not change on some cylinders										●				
	When starting switch is turned to HEAT, intake air heater mount does not become warm											●			
	Check if there is voltage (20 – 30 V) between alternator B terminal and E terminal during low idle operation	Yes											●		
		None												●	
When specific gravity of electrolyte and voltage of battery are measured, they are low														●	
		Remedy	Clean	Correct	Replace	Clean	Correct	Clean	Clean	Replace	Replace	Replace	Replace	Replace	Replace

*1: Code [CA559], [CB559] and code [CA2249], [CB2249]

S-2 Engine does not start

a) Engine does not turn

General causes why engine does not turn

- Engine seized inside
→ See "S-4 Engine stops during operations".
- Water hammer caused by coolant which entered cylinder
- Defective electrical system
- Problem in drive devices on applicable machine side
→ Troubleshoot the applicable machine side

a) Engine does not turn			Causes							
General causes why engine does not turn			Broken flywheel ring gear	Defective or deteriorated battery	Defective connection of battery terminal	Defective battery relay	Defective starting switch	Defective starting motor (safety relay section)	Defective starting motor (motor section)	Defective steering circuit wiring
- Engine seized inside → See "S-4 Engine stops during operations". - Water hammer caused by coolant which entered cylinder - Defective electrical system - Problem in drive devices on applicable machine side → Troubleshoot the applicable machine side										
Questions	Confirm recent repair history									
	Degree of machine operation	Operated for long period	△	△						
	Condition of horn when starting switch is turned ON	Horn does not sound			○		○			
		Horn volume is low		◎						
Check items	Battery electrolyte is low			◎						
	Battery terminal is loose				◎					
	When starting switch is turned ON, there is no operating sound from battery relay			○		◎				
	When starting switch is turned to START, starting pinion does not move out			○			○			
	When starting switch is turned to START, starting pinion moves out, but	Speed of rotation is low		◎						
		Makes grating noise		◎				◎		
		Soon disengages						◎		
		Makes rattling noise and does not turn		○				○		
Troubleshooting	Inspect flywheel ring gear directly		●							Carry out troubleshooting on installed machine
	When specific gravity of electrolyte and voltage of battery are measured, they are low			●						
	Turn starting switch OFF, connect cord, turn the switch ON and carry out troubleshooting	There is not voltage (20 - 30 V) between battery relay terminal B and terminal E				●				
		When terminal B and terminal C of starting switch are connected, engine starts					●			
		When terminal B and terminal C at safety relay outlet are connected, engine starts						●		
		When terminal B and terminal C at safety relay outlet are connected, engine does not start							●	
Remedy		Replace	Replace	Correct	Replace	Replace	Replace	Replace	—	

b) Engine turns but no exhaust smoke comes out

General causes why engine turns but no exhaust smoke comes out

- Fuel is not being supplied
- Supply of fuel is extremely small
- Improper selection of fuel (particularly in winter)

b) Engine turns but no exhaust smoke comes out			Causes													
			Use of improper fuel	Insufficient fuel in tank	Clogged air breather hole of fuel tank cap	Leaking, clogging and entry of air to fuel piping	Clogged fuel filter element	Clogged feed pump gauze filter	Seized, abnormally worn feed pump	Broken supply pump shaft spline	Stuck or seized supply pump plunger	Defective supply pump PCV	Wrong connection of supply pump PCV	Defective operation of overflow valve (Does not close)	Defective operation of flow damper	Defective injector
General causes why engine turns but no exhaust smoke comes out																
● Fuel is not being supplied																
● Supply of fuel is extremely small																
● Improper selection of fuel (particularly in winter)																
Questions	Confirm recent repair history															
	Degree of machine operation	Operated for long period				△	△	△								
Check items	Exhaust smoke suddenly stopped coming out (when starting again)								○	○	○	○	○		△	△
	Non-specified fuel is being used							○								
	Replacement of filters not carried out according to Operation and Maintenance Manual							○	○	△		△				○
	When fuel tank is inspected, it is found to be empty			○												
	Air breather hole of fuel tank cap is clogged			○	○											
	Rust and water are found when fuel tank is drained						○	○	○		○	○				
	When fuel filter is removed, there is no fuel in it		○	○		○										
	Fuel is leaking from fuel piping					○										
	When priming pump is operated, it makes no reaction or it is heavy					○	○	○								
	While engine is cranked with starting motor,	If air bleeding plug of fuel filter is removed, fuel does not flow out	○	○		○			○	○						
		If spill hose from injector is disconnected, little fuel spills				○				○	○	○	○			○
	Troubleshooting	When air is bled from fuel system, air comes out					●									
Inspect fuel filter directly						●										
Inspect feed pump gauze filter directly							●									
Inspect feed pump directly								●								
Carry out troubleshooting for "Supply pump pressure is low pressure (*1)" indicated by failure code									●	●		●				
Carry out troubleshooting for "PCV1 error (*2) or PCV2 error (*3)" indicated by failure code											●					
Inspect overflow valve directly													●			
Engine can be started in reduced cylinder mode														●	●	
Remedy		Replace	Add	Correct	Correct	Replace	Clean	Replace	Replace	Replace	Replace	Correct	Replace	Replace	Replace	

*1: Code [CA559], [CB559] and code [CA2249], [CB2249]

*2: Code [CA271], [CB271] and code [CA272], [CB272]

*3: Code [CA273], [CB273] and code [CA274], [CB274]

**c) Exhaust smoke comes out but engine does not start
(fuel is being injected)**

General causes why exhaust smoke comes out but engine does not start

- Lack of rotating force due to defective electrical system
- Insufficient supply of fuel
- Insufficient intake of air
- Improper selection of fuel

c) Exhaust smoke comes out but engine does not start (fuel is being injected)		Causes												
		Clogged air cleaner element	Worn dynamic valve system (Valve, rocker lever, etc.)	Worn piston ring and/or cylinder liner	Use of improper fuel	Clogged air breather hole of fuel tank cap	Leaking, clogging of fuel system, and entry of air	Clogged fuel filter and/or strainer	Clogged feed pump gauze filter	Stuck and/or seized supply pump plunger	Clogged injector and/or defective spray	Defective or deteriorated battery	Defective coolant temperature sensor and/or wiring harness	Defective intake air heater system
General causes why exhaust smoke comes out but engine does not start														
● Lack of rotating force due to defective electrical system														
● Insufficient supply of fuel														
● Insufficient intake of air														
● Improper selection of fuel														
Questions	Confirm recent repair history													
	Degree of machine operation	Operated for long period			△				△	△		△		
	Suddenly failed to start			○							○		○	
	Non-specified fuel is being used					○			○		○			
	Replacement of filters not carried out according to Operation and Maintenance Manual		○						○	○				
	Engine oil replenished more frequently				○									
	When engine is preheated or when temperature is low, preheating monitor does not indicate normally (if monitor is installed)													○
	Dust indicator is red (if indicator is installed)		○											
	Air breather hole of fuel tank cap is clogged						○							
	Rust and water are found when fuel tank is drained								○	○				
	When fuel filter is removed, there is no fuel in it					○								
	Fuel is leaking from fuel piping								○					
	When priming pump is operated, it makes no reaction or it is heavy								○	○	○			
	Starting motor cranks engine slowly												○	
Check items	When engine is cranked, abnormal sound is generated around cylinder head			○										
	While engine is cranked with start- ing motor,	Fuel does not flow out if air bleeding plug of fuel filter is removed				○		○	○	○				
		If spill hose from injector is disconnected, little fuel spills						○	○		○			
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low											○		
Troubleshooting	Inspect air cleaner directly		●											
	Inspect dynamic valve system directly			●										
	When compression pressure is measured, it is found to be low				●									
	When air is bled from fuel system, air comes out							●						
	Inspect fuel filter, strainer directly								●					
	Inspect feed pump gauze filter directly									●				
	Carry out troubleshooting for "Supply pump pressure is low pressure (*1)" indicated by failure code										●			
	When injector unit is tested, spray condition is bad											●		
	When specific gravity of electrolyte and voltage of battery are measured, they are low												●	
	Coolant temperature gauge does not indicate normally (if coolant temperature gauge is installed)													●
	When starting switch is turned to HEAT, intake air heater mount does not become warm													●
Remedy		Clean	Replace	Replace	Replace	Clean	Correct	Clean	Clean	Replace	Clean	Replace	Replace	Replace

*1: Code [CA559], [CB559] and code [CA2249], [CB2249]

S-3 Engine does not pick up smoothly

General causes why engine does not pick up smoothly

- Insufficient intake of air
- Insufficient supply of fuel
- Defective spray condition of fuel
- Improper selection of fuel
- Controller is controlling in derate mode (limiting injection rate (output) because of an error in electrical system)

		Causes											
		Clogged air cleaner element	Defective contact of valve and valve seat	Improper valve clearance	Seized turbocharger or interference of turbocharger	Worn piston ring and/or cylinder liner	Clogged air breather hole of fuel tank cap	Leaking, clogging of or entry of air to fuel piping	Clogged fuel filter and/or strainer	Clogged feed pump gauze filter	Stuck or seized supply pump plunger	Defective operation of flow damper (Maximum leakage from injector)	Clogged injector and/or defective spray
Questions	Confirm recent repair history												
	Degree of machine operation	Operated for long period	△	△		△			△	△			
	Engine pick-up suddenly became worse				○		○	○					○
	Non-specified fuel is being used								○	○	○		○
	Replacement of filters not carried out according to Operation and Maintenance Manual	○							○	○			
	Engine oil replenished more frequently					○							
	Dust indicator is red (if indicator is installed)	○											
	Air breather hole of fuel tank cap is clogged						○						
	Rust and water are found when fuel tank is drained								○	○			
	Fuel is leaking from fuel piping							○					
Check items	When priming pump is operated, it makes no reaction or it is heavy							○	○	○			
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low										○		○
	Color of exhaust gas is					○							
	Blue under light load					○							
	Black	○	○		○								○
	When engine is cranked, abnormal sound is generated around cylinder head			○									
	When engine is cranked, interference sound is emitted from around turbocharger				○								
	High idle speed under no load is normal, but speed suddenly drops when load is applied						○		○	○			
	There is hunting from engine (rotation is irregular)						○		○	○			○
	Blow-by gas is excessive					○							
Troubleshooting	Inspect air cleaner directly	●											
	When compression pressure is measured, it is found to be low		●			●							
	Inspect valve clearance directly			●									
	When turbocharger is rotated by hand, it is found to be heavy				●								
	When air is bled from fuel system, air comes out							●					
	Inspect fuel filter and strainer directly								●				
	Inspect feed pump gauze filter directly												
	Carry out troubleshooting for "Supply pump pressure is low pressure (*1)" indicated by failure code										●		
	When a cylinder is cut out for reduced cylinder mode operation, engine speed does not change on some cylinders											●	●
Remedy		Clean	Replace	Adjusting	Replace	Replace	Clean	Correct	Clean	Clean	Replace	Replace	Correct

*1: Code [CA559], [CB559] and code [CA2249], [CB2249]

S-4 Engine stops during operations

General causes why engine stops during operations

- Seized parts inside engine
- Insufficient supply of fuel
- There is overheating
- Problem in drive devices on applicable machine side
→ Troubleshoot the applicable machine side

General causes why engine stops during operations		Causes													
		Broken dynamic valve system (valve, rocker arm, etc.)	Broken or seized piston and/or connecting rod	Broken or seized crankshaft bearing	Broken or seized gear train	Insufficient fuel in tank	Clogged air breather hole of fuel tank cap	Leaking and/or clogged fuel piping	Clogged fuel filter and/or strainer	Clogged feed pump gauze filter	Broken or seized feed pump	Broken supply pump shaft spline	Stuck or seized supply pump plunger	Broken auxiliary equipment (pump, compressor, etc.)	Problem in drive devices on installed machine side
Questions	Confirm recent repair history														
	Degree of machine operation	Operated for long period						△	△						
	Condition when engine stopped	Abnormal noise was heard and engine stopped suddenly	○	○	○	○					○	○	○	○	○
		Engine overheated and stopped		○	○									○	
		Engine stopped slowly				○			○	○					
		Engine stopped after hunting				○	○		○	○	○				
	Non-specified fuel is being used								○	○	○		○		
	Replacement of filters not carried out according to Operation and Maintenance Manual								○	○					
	Fuel level monitor indicates low level (if monitor is installed)						○								
	When fuel tank is inspected, it is found to be empty						○								
Air breather hole of fuel tank cap is clogged							○								
Check items	Fuel is leaking from fuel piping							○							
	When priming pump is operated, it makes no reaction or it is heavy							○	○	○					
	Rust and water are found when fuel tank is drained								○	○					
	Metal particles are found when oil pan is drained			○	○					○	○				
	When engine is cranked by hand	Does not turn at all		○	○										
		Turns in opposite direction	○												
		Moves by amount of gear backlash				○								○	
		Supply pump shaft does not turn										○			
	Engine turns, but stops when load is applied to machine														○

Troubleshooting	Inspect dynamic valve system directly	●													
	Inspect piston and connecting rod directly		●												
	Inspect crankshaft bearing directly			●											
	Inspect gear train directly				●										
	Inspect fuel filter and strainer directly							●							
	Inspect feed pump gauze filter directly								●						
	Inspect feed pump directly									●					
	Carry out troubleshooting for "Supply pump pressure is low pressure (*1)" indicated by failure code											●	●		
	Engine rotates when pump auxiliary equipment (pump, compressor, etc.) is removed													●	
	Remedy	Replace	Replace	Replace	Replace	Add	Clean	Correct	Clean	Clean	Replace	Replace	Replace	Replace	—

Carry out troubleshooting on installed machine

*1: Code [CA559], [CB559] and code [CA2249], [CB2249]

S-5 Engine does not rotate smoothly

General causes why engine does not rotate smoothly

- Air in fuel system
- Defective speed sensor (Error at degree that it is not indicated)

		Causes									
		Low setting of low idle speed	Insufficient fuel in tank	Clogged air breather hole of fuel tank cap	Leaking or clogging or entry of air to fuel piping	Clogged feed pump gauze filter	Clogged fuel filter or strainer	Defective operation of flow damper (Maximum leakage from injector)	Clogged injector and/or defective spray (dirt in injector)	Defective Ne speed sensor and/or wiring harness	Defective G (Bkup) speed sensor or wiring harness
Questions	Confirm recent repair history										
	Degree of machine operation	Operated for long period				△	△				
	Condition of hunting	Occurs at a certain speed range	○							○	○
		Occurs at low idle	◎		○	○	○	○	○	○	○
		Occurs even when speed is raised		○						○	○
		Occurs on slopes		◎						○	○
	Replacement of filters not carried out according to Operation and Maintenance Manual										
	When fuel tank is inspected, it is found to be empty										
	Air breather hole of fuel tank cap is clogged										
	Rust and water are found when fuel tank is drained										
	Fuel is leaking from fuel piping										
Check items	When priming pump is operated, it makes no reaction or it is heavy										
Troubleshooting	When air is bled from fuel system, air comes out										
	Inspect feed pump gauze filter directly										
	Inspect fuel filter and strainer directly										
	When a cylinder is cut out for reduced cylinder mode operation, engine speed does not change on some cylinders										
	Carry out troubleshooting for "Abnormality in engine Ne speed sensor (*1)" indicated by failure code										
	Carry out troubleshooting for "Abnormality in engine Bkup speed sensor (*2)" indicated by failure code										
Remedy		Correct	Add	Clean	Replace	Replace	Replace	Replace	Correct	Correct	Correct

*1: Code [CA689] and [CB689]

*2: Code [CA778] and [CB778]

S-6 Engine lacks output (or lacks power)

General causes why engine lacks output

- Insufficient intake of air
- Insufficient supply of fuel
- Defective spray condition of fuel
- Improper selection of fuel
- Overheat
 - See "S-14 Coolant temperature becomes too high (Overheating)"
- Controller is controlling in derate mode (limiting injection rate (output) because of an error in electrical system)

General causes why engine lacks output			Causes														
			Clogged air cleaner element	Air leakage from air intake piping	Seized turbocharger or interference of turbocharger	Defective contact of valve and valve seat	Improper valve clearance	Worn piston ring and/or cylinder liner	Clogged air breather hole of fuel tank cap	Leaking or clogged fuel piping	Clogged fuel filter and/or strainer	Clogged feed pump gauze filter	Stuck or seized supply pump plunger	Clogged injector or defective spray (dirt in injector)	Defective drive of injector (signal and/or solenoid)	Defective installation of boost pressure sensor (air leakage)	Defective boost pressure sensor and/or wiring harness
Questions	Confirm recent repair history																
	Degree of machine operation	Operated for long period	△			△		△		△	△						
	Power was lost	Suddenly		○										○	○	○	
		Gradually	○			○				○	○		○		○		
	Non-specified fuel is being used									○	○						
	Replacement of filters not carried out according to Operation and Maintenance Manual		○							○							
	Engine oil replenished more frequently					○	○	○									
	Dust indicator is red (if indicator is installed)		○														
	Air breather hole of fuel tank cap is clogged								○								
	Fuel is leaking from fuel piping									○							
Check items	Output becomes insufficient after short stop of operation																○
	Color of exhaust gas	Black	○	○													
		Blue under light load			○												
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low												○				
	When engine is cranked, interference sound is emitted from around turbocharger			○													
	When engine is cranked, abnormal sound is generated around cylinder head						○										
	High idle speed is too high														○		
	High idle speed under no load is normal, but speed suddenly drops when load is applied										○	○	○				
	Engine does not pick up smoothly and combustion is irregular			○					○	○				○	○		
	There is hunting from engine (rotation is irregular)								○	○	○	○					
Blow-by gas is excessive				○			○										

Troubleshooting	Inspect air cleaner directly	●															
	Inspect air intake piping directly		●														
	When boost pressure is measured, it is found to be low	●	●	●													
	When compression pressure is measured, it is found to be low				●		●										
	Inspect valve clearance directly					●											
	Inspect fuel filter and strainer directly									●							
	Inspect feed pump gauze filter directly										●						
	Carry out troubleshooting for "Supply pump pressure is low pressure (*1)" indicated by failure code											●					
	When a cylinder is cut out for reduced cylinder mode operation, engine speed does not change on some cylinders												●	●			
	Inspect boost pressure sensor mount directly														●		
	Carry out troubleshooting for "Charge pressure sensor error (*2)" indicated by failure code															●	
	Carry out troubleshooting for "Fuel temperature sensor error (*3)" indicated by failure code																●
Remedy		Clean	Correct	Replace	Replace	Adjusting	Replace	Clean	Correct	Replace	Clean	Replace	Replace	Replace	Correct	Replace	Replace

*1: Code **[CA559]**, **[CB559]** and code **[CA2249]**, **[CB2249]**

*2: Code **[CA122]** and code **[CA123]**

*3: Code **[CA263]**, **[CB263]** and code **[CA265]**, **[CB265]**

S-7 Exhaust smoke is black (incomplete combustion)

General causes why exhaust smoke is black

- Insufficient intake of air
- Excessive injection of fuel
- Defective spray condition of fuel
- Improper selection of fuel
- Overheat
→ See "S-14 Coolant temperature becomes too high (Overheating)"
- Controller is controlling in derate mode
(limiting injection rate (output) because of an error in electrical system)

		Causes														
		Clogged air cleaner element	Seized turbocharger or interference of turbocharger	Defective contact of valve and valve seat	Improper valve clearance	Leakage of air between turbocharger and cylinder head	Crushed or clogged muffler	Worn piston ring and/or cylinder liner	Stuck or seized supply pump plunger	Clogged or seized injector	Abnormally worn injector	Clogged fuel spill piping (on cylinder head side)	Improper injection timing	Improper fuel injection pressure	Defective coolant temperature sensor or wiring harness	
General causes why exhaust smoke is black																
● Insufficient intake of air																
● Excessive injection of fuel																
● Defective spray condition of fuel																
● Improper selection of fuel																
● Overheat																
→ See "S-14 Coolant temperature becomes too high (Overheating)"																
● Controller is controlling in derate mode (limiting injection rate (output) because of an error in electrical system)																
Questions	Confirm recent repair history															
	Degree of machine operation	Operated for long period	△		△				△		△					
	Color of exhaust gas	Suddenly became black		○						○	○	○				
		Gradually became black	○				○				○					
		Blue under light load							○							
	Non-specified fuel is being used									○	○					
	Oil replenished more frequently								○							
	Power was lost	Suddenly		○				○		○	○					
		Gradually	○		○		○		○							
	Dust indicator is red (if indicator is installed)		○													
Check items	Muffler is crushed							○								
	Air leaks between turbocharger and cylinder head, and clamp is loosened						○									
	Engine is operated in low-temperature mode at normal temperature												○	○	○	
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low									○	○					
	When engine is cranked, interference sound is emitted from around turbocharger			○												
	When engine is cranked, abnormal sound is generated around cylinder head					○										
	Torque converter stall speed or pump relief speed is high (Fuel is injected excessively)										○	○				
	Exhaust noise is abnormal			○				○		○						
	Engine does not pick up smoothly and combustion is irregular			○		○	○	○		○	○					
	Blow-by gas is excessive								○							
	If spill hose from injector is disconnected, abnormally much fuel spills										○					
	Troubleshooting	Inspect air cleaner directly		●												
		When turbocharger is rotated by hand, it is found to be heavy			●											
When compression pressure is measured, it is found to be low				●			●									
Inspect valve clearance directly					●											
When muffler is removed, exhaust sound improves						●										
Carry out troubleshooting for "Supply pump pressure is low pressure (*1)" indicated by failure code								●		●						
When a cylinder is cut out for reduced cylinder mode operation, engine speed does not change on some cylinder									●							
Inspect fuel spill piping (on cylinder head side) directly											●			●		
Carry out troubleshooting for "Coolant temperature sensor error (*2)" indicated by failure code																
		Remedy	Clean	Replace	Replace	Adjusting	Correct	Replace	Replace	Replace	Replace	Correct	Adjusting	Adjusting	Replace	

*1: Code [CA559], [CB559] and code [CA2249], [CB2249]

*2: Code [CA144] and code [CA145]

S-8 Oil consumption is excessive (or exhaust smoke is blue)

General causes why oil consumption is excessive

- Abnormal combustion of oil
- Long-time operation of engine at low idle or high idle (Do not run engine continuously at idle without load for more than 20 minutes)
- External leakage of oil
- Wear of parts in lubrication system

General causes why oil consumption is excessive			Causes															
			Dust sucked in from intake system	Worn or damaged valve (stem, guide, seal)	Turbocharger 1		Clogged breather or breather hose	Broken piston ring	Worn piston ring and/or cylinder liner	Worn or damaged rear oil seal	Broken oil cooler	Oil leakage from oil cooler	Oil leakage from oil filter	Oil leakage from oil piping	Oil leakage from oil drain plug	Oil leakage from oil pan, cylinder head, etc.		
					Worn seal at turbocharger end	Worn seal at blower end												
● Abnormal combustion of oil ● Long-time operation of engine at low idle or high idle (Do not run engine continuously at idle without load for more than 20 minutes) ● External leakage of oil ● Wear of parts in lubrication system	Confirm recent repair history																	
	Degree of machine operation	Operated for long period		△	△	△			△									
	Oil consumption suddenly increased							○			○							
	Oil replenished more frequently								○		○							
	Oil becomes contaminated quickly							○	○	○								
	Outside of engine is contaminated with oil											○						
		There are loose piping clamps in intake system		○										○	○	○	○	○
		Inside of turbocharger intake outlet pipe is contaminated with oil					○											
		Inside of turbocharger exhaust outlet pipe is contaminated with oil			○	○												
		There is oil in coolant										○						
		Oil level in damper chamber is high									○							
		Exhaust smoke is blue under light load							○	○								
		Amount of blow-by gas	Excessive		○		○			○	○							
None							○											
Troubleshooting		When intake manifold is removed, dust is found inside		●														
	When intake manifold is removed, inside is found contaminated abnormally			●														
	Excessive play of turbocharger shaft				●	●												
	Check breather and breather hose directly						●											
	When compression pressure is measured, it is found to be low							●	●									
	Inspect rear oil seal directly									●								
	Pressure-tightness test of oil cooler shows there is leakage										●	●						
	There is external leakage of oil from engine												●	●	●	●		
		Remedy	Correct	Replace	Replace	Replace	Clean	Replace	Replace	Correct	Replace	Replace	Correct	Correct	Correct	Correct		

S-9 Oil becomes contaminated quickly

General causes why oil becomes contaminated

- Entry of exhaust gas into oil due to internal wear
- Clogging of lubrication passage
- Use of improper fuel
- Use of improper oil
- Operation under excessive load

		Causes								
		Defective seal at turbocharger turbine end	Worn valve and/or valve guide	Worn piston ring and/or cylinder liner	Clogged breather and/or breather hose	Clogged oil cooler	Clogged oil filter	Defective oil filter safety valve	Clogged turbocharger lubrication drain tube	Exhaust smoke is bad
Questions	Confirm recent repair history									
	Degree of machine operation	Operated for long period	△	△	△					
	Non-specified fuel is being used						○			
	Engine oil replenished more frequently			◎						
	Even when engine oil temperature rises, oil filter clogging monitor indicates clogging (if monitor is installed)						◎	○		
	Metal particles are found when oil filter is drained		○	○			◎			
	Inside of exhaust pipe is contaminated with oil		◎							
	Engine oil temperature rises quickly					◎				
	Color of exhaust gas	Blue under light load		◎						
		Black								◎
Check items	Amount of blow-by gas	Excessive	○	○	◎				○	
		None			◎					
Troubleshooting	Excessive play of turbocharger shaft	●								
	When compression pressure is measured, it is found to be low		●	●						
	Inspect breather and breather hose directly				●					
	Inspect oil cooler directly					●				
	Inspect oil filter directly						●			
	Spring of oil filter safety valve is hitched or broken							●		
	Inspect turbocharger lubrication drain tube directly								●	
Remedy		Replace	Replace	Replace	Clean	Clean	Replace	Replace	Clean	—

S-10 Fuel consumption is excessive

General causes why fuel consumption is excessive

- Leakage of fuel
- Defective condition of fuel injection (fuel pressure, injection timing)
- Excessive injection of fuel

		Causes							
		Fuel leakage inside head cover	Fuel leakage from fuel filter, piping, etc.	Defective feed pump oil seal	Defective supply pump plunger	Defective common rail fuel pressure	Defective spray by injector	Defective operation of injector	Improper injection timing
Questions	Confirm recent repair history								
	Degree of machine operation	Operated for long period		△	△		△		
	Condition of fuel consumption	More than other machines of same model			○		○	○	○
		Gradually increased			○		○		
Check items		Suddenly increased	○	○					
	There is external leakage of fuel from engine		○						
	Combustion is irregular						○		
	Engine oil level rises and oil smells of diesel fuel	○		○					
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low						○		
	Low idle speed is high							○	
	Torque converter stall speed or hydraulic pump relief speed is high							○	
	Color of exhaust gas	Black				○	○		○
		White	○						
Troubleshooting	Remove and inspect head cover directly	●							
	Inspect feed pump oil seal directly			●					
	Carry out troubleshooting for "Supply pump pressure is low pressure (*1)" indicated by failure code				●				
	When a cylinder is cut out for reduced cylinder mode operation, engine speed does not change change on some cylinders						●		
	If spill hose from injector is disconnected and measured, much fuel spills							●	
	Carry out troubleshooting for "Coolant temperature sensor error (*2)" indicated by failure code								●
	Check with monitoring function					●		●	
Remedy		Correct	Correct	Replace	Replace	Correct	Replace	Replace	Correct
		Correct							Correct

*1: Code [CA559], [CB559] and code [CA2249], [CB2249]

*2: Code [CA144] and code[CA145]

S-11 Oil is in coolant (or coolant spurts back or coolant level goes down)

General causes why oil is mixed in coolant

- Internal leakage in lubrication system
- Internal leakage in cooling system

		Causes					
		Broken cylinder head and/or head gasket	Cracks inside cylinder block	Damaged cylinder liner O-ring and/or hole caused by pitting	Insufficient protrusion of cylinder liner	Broken oil cooler core and/or O-ring	Broken hydraulic oil cooler or power train oil cooler
Questions	Confirm recent repair history						
	Degree of machine operation	Operated for long period		△		△	
	Oil level	Suddenly increased	○			○	○
		Gradually increased		○	○		
	Hard water is being used as coolant			○		○	
Check items	Oil level has risen and oil is milky		○	○		◎	
	There are excessive air bubbles in radiator, coolant spurts back	◎			◎		
	Hydraulic oil or power train oil on installed machine side is milky						◎
	When hydraulic oil or power train oil is drained, water is found						◎
Troubleshooting	Pressure-tightness test of cylinder head shows there is leakage	●					Carry out troubleshooting on installed machine
	Inspect cylinder block and liner directly		●	●			
	Inspect cylinder liner directly				●		
	Pressure-tightness test of oil cooler shows there is leakage					●	
Remedy		Replace	Replace	Replace	Replace	Replace	—

S-13 Oil level rises (Entry of coolant or fuel)

General causes why oil level rises

- Coolant in oil (milky)
- Fuel in oil (smells diluted diesel fuel)
- ★ If oil is in coolant, carry out troubleshooting for "S-11 Oil is in coolant".

		Causes									
Questions		Broken cylinder head and/or head gasket	Fuel leakage inside head cover	Cracks inside cylinder block	Damaged cylinder liner O-ring and/or hole caused by pitting	Worn or damaged rear oil seal	Broken oil cooler core and/or O-ring	Clogged water pump drain hole (breather hole) and/or defective seal	Defective thermostat seat	Defects in supply pump	Defective seal of auxiliary equipment (pump, compressor)
Check items	Confirm recent repair history										
	Degree of machine operation				△	△		△			△
	Fuel consumption increasing		○							○	
	Coolant replenished more frequently	○						○			
	There is oil mixed in coolant	○	○	○		○					
	Oil smells of diesel fuel		○							○	
	Oil is milky	○						○			
	When engine is started, drops of water come from muffler	○									
	When radiator cap is removed and engine is run at low idle, an abnormal number of bubbles appears, or coolant spurts back	○			○						
	Exhaust smoke is white		○						○		
	Water pump drain hole (breather hole) is clogged							○			
	When water pump drain hole (breather hole) is cleaned, coolant comes out							○			
	Oil level in damper chamber is low					○					
	Oil level in hydraulic tank is low										○
Troubleshooting	When compression pressure is measured, it is found to be low	●									
	Remove and inspect head cover directly		●								
	Inspect cylinder block and/or liner directly			●	●						
	Inspect rear oil seal directly					●					
	Pressure-tightness test of oil cooler shows there is leakage						●				
	Remove and inspect water pump directly							●			
	Remove and inspect thermostat cover directly								●		
	Remove and inspect supply pump directly									●	
	Inspect seal of auxiliary equipment directly										●
Remedy		Replace	Correct	Replace	Replace	Correct	Replace	Replace	Correct	Replace	Replace

S-14 Coolant temperature becomes too high (overheating)

General causes why coolant temperature becomes too high

- Lack of cooling air (deformation, and/or damages of fan)
- Drop in heat dissipation efficiency
- Problem in coolant circulation system
- Rise in oil temperature in power train

		Causes											
		Broken cylinder head and/or head gasket	Damaged cylinder liner O-ring and/or hole caused by pitting	Clogged or broken oil cooler	Lack of coolant	Broken water pump	Defective operation of thermostat	Clogged or crushed radiator fins	Clogged radiator core	Defective radiator cap (pressure valve)	Slipping fan belt and/or worn fan pulley	Defective coolant temperature gauge	Rise in power train oil temperature
Questions	Confirm recent repair history												
	Degree of machine operation	Operated for long period	△	△				△	△				
	Condition for	Sudden overheated			○	○					○		
		Persistent overheating					○	○	○		○		
	Coolant temperature gauge (if installed)	Rises quickly			○	○							
		Does not go down from red range										○	
	Radiator coolant level monitor indicates drop of coolant level				○								
	Engine oil level has risen and oil is milky		○	○									
	Fan belt tension is low										○		
	Milky oil is floating on coolant			○									
Check items	There are excessive air bubbles in radiator and coolant spurts back		○										
	When light bulb is held behind radiator core, no light passes through						○						
	Radiator shroud or undercover is filled with dirt and sand						○				○		
	Coolant is leaking because of cracks in hose or loose clamps				○								
	Coolant flows out from radiator overflow hose								○				
	Fan belt whines under sudden acceleration										○		
	Power train oil temperature gauge reaches red range earlier than engine coolant temperature gauge (if oil temperature gauge and coolant temperature gauge are installed)												○
Troubleshooting	When compression pressure is measured, it is found to be low		●										
	Inspect cylinder liner directly			●									
	Inspect oil cooler directly				●								
	Temperature difference between upper and lower tanks of radiator is large					●							
	When operation of thermostat is tested, it does not open at cracking temperature						●						
	Temperature difference between upper and lower tanks of radiator is slight							●					
	Inspect radiator core directly								●				
	When operation of radiator cap is carried out, its cracking pressure is low									●			
	Inspect fan belt and pulley directly										●		
	When coolant temperature is measured, it is found to be normal											●	
		Remedy	Replace	Replace	Replace	Add	Replace	Replace	Correct	Correct	Replace	Correct	Replace
													—
													Carry out troubleshooting on installed machine

S-15 Abnormal noise is made

General causes why abnormal noise is emitted

- Abnormality due to defective parts
- Abnormal combustion
- Air leakage from air intake system
- ★ Judge if the noise is an internal noise or an external noise before starting troubleshooting.
- ★ While the engine is not sufficiently warmed up, it is operated in the low-temperature mode. Accordingly, the engine sound rises slightly higher. This is no abnormality, however.
- ★ When the engine is accelerated, the engine sound rises slightly for approx. 3 seconds maximum. This is no abnormality, however.

		Causes											
Questions													
		Leakage of air between turbocharger and cylinder head	Interference or seizure of turbocharger	Broken dynamic valve system (valve and/or rocker lever)	Defective inside of muffler (dividing board out of position)	Improper valve clearance	Excessive wear of piston ring and/or cylinder liner	Improper gear train backlash	Removed or seized gear train bushing	Deformed cooling fan and/or looseness or interference of fan belt	Clogged or seized injector	Dirt caught in injector	Improper fuel injection timing (abnormality in coolant temperature sensor)
Check items	Confirm recent repair history												
	Degree of machine operation	Operated for long period					△						
	Condition of abnormal noise	Gradually increased					○			○			
		Suddenly increased		○	○				○				
	Non-specified fuel is being used										○		
	Oil replenished more frequently						○						
	Metal particles are found when oil filter is drained						○		○				
	Air leaks between turbocharger and cylinder head	○											
	When engine is cranked, interference sound is emitted from around turbocharger		○										
	When engine is cranked, abnormal sound is generated around EGR gas piping												
	When engine is cranked, abnormal sound is generated around cylinder head			○		○							
	When engine is cranked, beat noise is emitted around muffler				○								
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low										○	○	
	Color of exhaust gas	Blue under light load					○						
		Black	○	○			○						
Troubleshooting	Engine does not pick up smoothly and combustion is irregular										○		
	Abnormal noise is loud when engine is accelerated					○		○		○	○		
	Blow-by gas is excessive						○						
	When turbocharger is rotated by hand, it is found to be heavy		●										
	Inspect dynamic valve system directly			●									
	When muffler is removed, abnormal noise disappears				●								
	Inspect valve clearance directly					●							
	When compression pressure is measured, it is found to be low						●						
	Inspect gear train directly							●	●				
	Inspect fan and fan belt directly									●			
Remedy	When a cylinder is cut out for reduced cylinder mode operation, engine speed does not change on some cylinders										●	●	
	Abnormal noise is heard only when engine is started											●	
	Check with monitoring function												●
		Replace	Replace	Correct	Replace	Replace	Replace	Replace	Correct	Replace	Correct	Correct	

S-16 Vibration is excessive

General causes why vibration occurs

- Defective parts (abnormal wear, breakage, etc.)
- Misalignment between installed machine
- Abnormal combustion
- ★ If abnormal noise vibration occur, carry out troubleshooting for "S-15 Abnormal noise is emitted", too.

General causes why vibration occurs - Defective parts (abnormal wear, breakage, etc.) - Misalignment between installed machine - Abnormal combustion ★ If abnormal noise vibration occur, carry out troubleshooting for "S-15 Abnormal noise is emitted", too.			Causes									
Questions	Confirm recent repair history											
	Degree of machine operation	Operated for long period		△		△		△		△		
	Condition of vibration	Suddenly increased	○									
		Gradually increased		○		○		○			○	
	Non-specified oil is being used			○		○						
Check items	Metal particles are found when oil filter is drained			⊙		⊙						
	Metal particles are found when oil pan is drained			⊙		⊙						
	Oil pressure is low at low idle			○		○						
	Vibration occurs at mid-range speed							○			○	
	Vibration follows engine speed				○			○	○	○	○	
	Exhaust smoke is black		⊙				○					
Troubleshooting	Inspect dynamic valve system directly		●									
	Inspect main bearing and connecting rod bearing directly			●								
	Inspect gear train directly				●							
	Inspect camshaft bushing directly					●						
	Check with monitoring function						●					
	Inspect engine mounting bolts and cushions directly							●				
	When alignment is checked, radial runout or facial runout is detected								●			
	Inspect front support spigot joint portion directly									●		
	Inspect output shaft or inside of damper directly										●	
		Remedy	Replace	Replace	Replace	Replace	Adjusting	Replace	Adjusting	Replace	Replace	

HD785-7 Dump truck

Form No. SEN01950-00

DUMP TRUCK

HD785-7

Machine model	Serial number
HD785-7	7001 and up

50 Disassembly and assembly

General information on disassembly and assembly

How to read this manual	2
List of adhesives	4
Special tool list	7
Sketches of special tools	8

How to read this manual

1. Removal and installation of assemblies

Special tools

- Special tools which are deemed necessary for removal or installation of parts are described as **A1, ...X1** etc. and their part names, part numbers and quantities are described in the special tool list.
- Also the following information is described in the special tool list.
 - 1) Necessity
 - : Special tools that cannot be substituted and should always be used (installed).
 - : Special tools that will be useful if available and are substitutable with commercially available tools.
 - 2) Distinction of new and existing special tools
 - N: Tools newly developed for this model. They respectively have a new part number.
 - R: Tools with upgraded part numbers. They are remodeled from already available tools for other models.
 - Blank: Tools already available for other models. They can be used without any modification.
 - 3) Circle mark ○ in sketch column:
 - The sketch of the special tool is presented in the section of "Sketches of special tools".
 - Part No. of special tools starting with 79*T-***-****: means that they can not be supplied from Komatsu in Japan (i.e. locally made parts).
- ★ General tools that are necessary for removal or installation are described as [1], [2]...etc. and their part names, part numbers and quantities are not described.

Removal

- The "Removal" section contains procedures and precautions for implementing the work, know how and the amount of oil or coolant to be drained.
- Various symbols used in the "Removal" section are explained and listed below.
 - ⚠ : **Precautions related to safety in execution of work.**
 - ★ : This mark gives guidance or precautions when doing the procedure.
 - [*1] : This mark shows that there are instructions or precautions for installing parts.
 -  : This mark shows the amount of oil or coolant to be drained.
 -  : Weight of part or component

Installation

- Except where otherwise instructed, installation of parts is done in the reverse order of removal.
- Instructions and precautions for installing parts are shown with [*1] mark in the "Removal" section, identifying which step the instructions are intended for.
- Marks shown in the "Installation" section stand for the following.
 - ⚠ : **Precautions related to safety in execution of work.**
 - ★ : This mark gives guidance or precautions when doing the procedure.
 -  : Type of coating material
 -  : Tightening torque
 -  : Quantity of oil or coolant to be added

Sketches of special tools

- Various special tools are illustrated for the convenience of local manufacture.

2. Disassembly and assembly of assemblies

Special tools

- Special tools which are deemed necessary for disassembly and assembly of parts are described as **A1, ... X1** etc. and their part names, part numbers and quantities are described in the special tool list.
- Also the following information is described in the special tool list.
 - 1) Necessity
 - : Special tools that cannot be substituted and should always be used (installed).
 - : Special tools that will be useful if available and are substitutable with commercially available tools.
 - 2) Distinction of new and existing special tools
 - N : Tools newly developed for this model. They respectively have a new part number.
 - R : Tools with upgraded part numbers. They are remodeled from already available tools for other models.
 - Blank: Tools already available for other models. They can be used without any modification.
 - 3) Circle mark ○ in sketch column:
 - The sketch of the special tool is presented in the section of "Sketches of special tools".
 - Part No. of special tools starting with 79*T-***-****: means that they can not be supplied from Komatsu in Japan (i.e. locally made parts).
- ★ General tools that are necessary for disassembly and assembly are described as [1], [2]...etc. and their part names, part numbers and quantities are not described.

Disassembly

- In "Disassembly" section, the work procedures, precautions and know-how for carrying out those procedures, and quantity of the oil and coolant drained are described.
- The meanings of the symbols used in "Disassembly" section are as follows.
 - ▲ : **Precautions related to safety in execution of work.**
 - ★: This mark gives guidance or precautions when doing the procedure.
 - : Quantity of oil or coolant drained

Assembly

- In "Assembly" section, the work procedures, precautions and know-how for carrying out those procedures, and quantity of the oil and coolant added are described.
- The meanings of the symbols used in "Assembly" section are as follows.
 - ▲ : **Precautions related to safety in execution of work**
 - ★: This mark gives guidance or precautions when doing the procedure.
 -  : Type of coating material
 -  : Tightening torque
 -  : Quantity of oil or coolant to be added

Sketches of special tools

- Various special tools are illustrated for the convenience of local manufacture.

List of adhesives

- ★ The recommended coating materials such as adhesives, gasket sealants, and greases used for disassembly and assembly are listed below.
- ★ For coating materials not listed below, use the equivalent of products shown in this list.

Cate- gory	Komatsu code	Part No.	Q'ty	Container	Main features and applications
Adhesive	LT-1A	790-129-9030	150 g	Tube	Used to prevent rubber gaskets, rubber cushions, and cork plugs from coming out.
	LT-1B	790-129-9050	20 g (2 pcs.)	Polyethylene container	Used for plastic (except polyethylene, polypropylene, tetrafluoroethylene and vinyl chloride), rubber, metal, and non-metal parts which require immediate and strong adhesion.
	LT-2	09940-00030	50 g	Polyethylene container	- Features: Resistance to heat and chemicals. - Used to fix and seal bolts and plugs.
	LT-3	790-129-9060 (Set of adhesive and hardener)	Adhesive: 1 kg Hardener: 500 g	Can	Used to stick and seal metal, glass, and plastics.
	LT-4	790-129-9040	250 g	Polyethylene container	Used to seal plugs.
	Holtz MH 705	790-129-9120	75 g	Tube	Heat-resistant seal used to repair engines.
	ThreeBond 1735	790-129-9140	50 g	Polyethylene container	- Quick-setting adhesive. - Setting time: Within 5 sec. to 3 min. - Used mainly to stick metals, rubbers, plastics, and woods.
	Aron-alpha 201	790-129-9130	2 g	Polyethylene container	- Quick-setting adhesive. - Quick-setting type. (max. strength is obtained after 30 minutes) - Used mainly to stick rubbers, plastics, and metals.
	Loctite 648-50	79A-129-9110	50 cc	Polyethylene container	- Features: Resistance to heat and chemicals. - Used for fitted portions used at high temperatures.
Gasket sealant	LG-1	790-129-9010	200 g	Tube	Used to stick or seal gaskets and packings of power train case, etc.
	LG-5	790-129-9080	1 kg	Polyethylene container	- Used to seal various threaded portions, pipe joints, and flanges. - Used to seal tapered plugs, elbows, and nipples of hydraulic piping.
	LG-6	790-129-9020	200 g	Tube	- Features: Silicon-based heat and cold-resistant sealant. - Used to seal flange surfaces and threaded portions. - Used to seal oil pan, final drive case, etc.
	LG-7	790-129-9070	1 kg	Tube	- Features: Silicon-based quick-setting sealant. - Used to seal flywheel housing, intake manifold, oil pan, thermostat housing, etc.
	ThreeBond 1211	790-129-9090	100 g	Tube	Gasket sealant used to repair engine.
	ThreeBond 1207B	419-15-18131	100 g	Tube	- Features: Silicon-based, heat and cold-resistant, vibration-resistant, impact-resistant sealant. - Used to seal transfer case, etc.

Category	Komatsu code	Part No.	Q'ty	Container	Main features and applications	
Lubricant with molybdenum disulfide	LM-G	09940-00051	60 g	Can	To be used as lubricant (anti squeaking) for sliding part.	
	LM-P	09940-00040	200 g	Tube	- To be used for press fit, shrink fit and preventing scratching or seizure of thread. - To be used as lubricant for linkage and bearing etc..	
Grease	G2-LI	SYG2-400LI SYG2-350LI SYG2-400LI-A SYG2-160LI SYGA-160CNLI	Various kinds	Various kinds	Versatile type	
	G2-CA	SYG2-400CA SYG2-350CA SYG2-400CA-A SYG2-160CA SYGA-160CNCA	Various kinds	Various kinds	To be used for the place where the bearing designed for normal temperature and low load condition is used and contacts water and • Usteam.	
	Grease with molybdenum disulphide LM-G(G2-M)	SYG2-400M SYG2-400M-A SYGA-16CNM	400 g x 10 400 g x 20 16 kg	Bellows type Can	- Used for parts under heavy load. Caution: - Do not apply grease to ball bearings like swing circle bearings, etc. - The grease should be applied for greasing afterwards.	
	Hyper white grease G2-T GO-T(*) *: For cold region	SYG2-400T-A SYG2-16CNT SYG0-400T-A (*) SYG0-16CNT (*)	400 g 16 kg	Bellows type Can	- Higher anti seizure and heat resistance than grease with molybdenum disulphide - Body dirt is not distinctive due to white color.	
	Biological grease G2-B G2-BT(*) *: For heat resistance and heavy load	SYG2-400B SYGA-16CNB SYG2-400BT (*) SYGA-16CNBT (*)	400 g 16 kg	Bellows type Can	To be shortly dissolved by a bacteria in nature so that the influence to microorganism and animals and plants is suppressed to the minimum.	
Primer	Sunstar primer for painting plane 580 super	417-926-3910	20 ml	Glass container	For adhesion of cab glass	To be used as primer for cab side. (Term of validity: 4 months after manufacturing)
	Sunstar primer for glass 580 super		20 ml	Glass container		To be used as primer for glass side. (Term of validity: 4 months after manufacturing)
	Sunstar primer for painting plane 435-95	22M-54-27230	20 ml	Glass container		To be used as primer for painting plane of cab side. (Term of validity: 4 months after manufacturing)

Category	Komatsu code	Part No.	Q'ty	Container	Main features and applications	
Primer	Sunstar primer for glass 435-41	22M-54-27240	150 ml	Steel can	For adhesion of cab glass	To be used as primer for black ceramic coated plane of glass side and polycarbonate hard coat plane. (Term of validity: 4 months after manufacturing)
	Sunstar primer for sash GP-402	22M-54-27250	20 ml	Glass container		To be used as primer for sash (Alumite surface treatment) (Term of validity: 4 months after manufacturing)
Adhesive compound	Sunstar penguin seal 580 super "S" or "W"	417-926-3910	320 ml	Polyethylene container	For adhesion of cab glass	"S" and "W" are used as glass adhesive compound in high temperature (April - October) and in low temperature (October -April) respectively. (Term of validity: 4 months after manufacturing)
	Sika Ltd, Japan Sika Flex 256HV	20Y-54-39850	310 ml	Polyethylene container		To be used as glass adhesive compound. (Term of validity: 6 months after manufacturing)
	Sunstar pengiun super 560	22M-54-27210	320 ml	ECOCART (special container)		To be used as glass adhesive compound. (Term of validity: 6 months after manufacturing)
Coaking compound	Sunstar pengiun seal No. 2505	417-926-3920	320 ml	Polyethylene container	For adhesion of cab glass	To be used as seal for joints of glass. (Term of validity: 4 months after manufacturing)
	Sekisui silicone sealant	20Y-54-55130	333 ml	Polyethylene container		To be used for seal of front window. (Term of validity: 6 months after manufacturing)
	GE Toshiba Silicones Tosseal 381	22M-54-27220	333 ml	Cartridge		To be used as seal for joints of glass. semi-transparent white seal (Term of validity: 12 months after manufacturing)

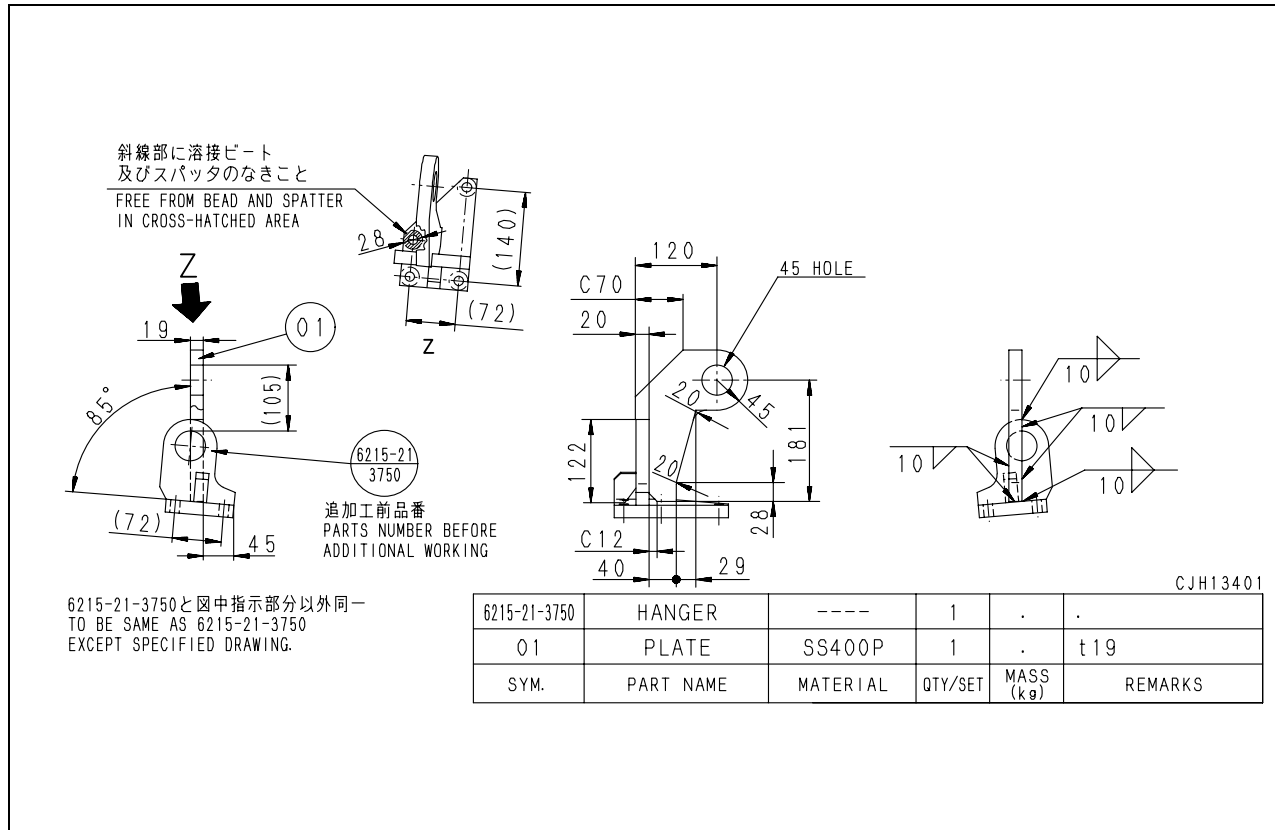
Special tool list

- ★ Tools with part number 79○T-○○○-○○○○ cannot be supplied (they must be locally manufactured).
- ★ Necessity : ■ Cannot be substituted, should always be installed (used)
: ● Extremely useful if available, can be substituted with commercially available part
- ★ New/Remodel: N Tools newly developed for this model and given new part Nos.
: R Tools remodeled from tools already available for other models and given upgraded part Nos.
: Blank . . Tools already available for other models, usable without any modification
- ★ Tools marked with ○ in the sketch column are tools introduced in the sketches of the special tools (See Sketches of special tools).

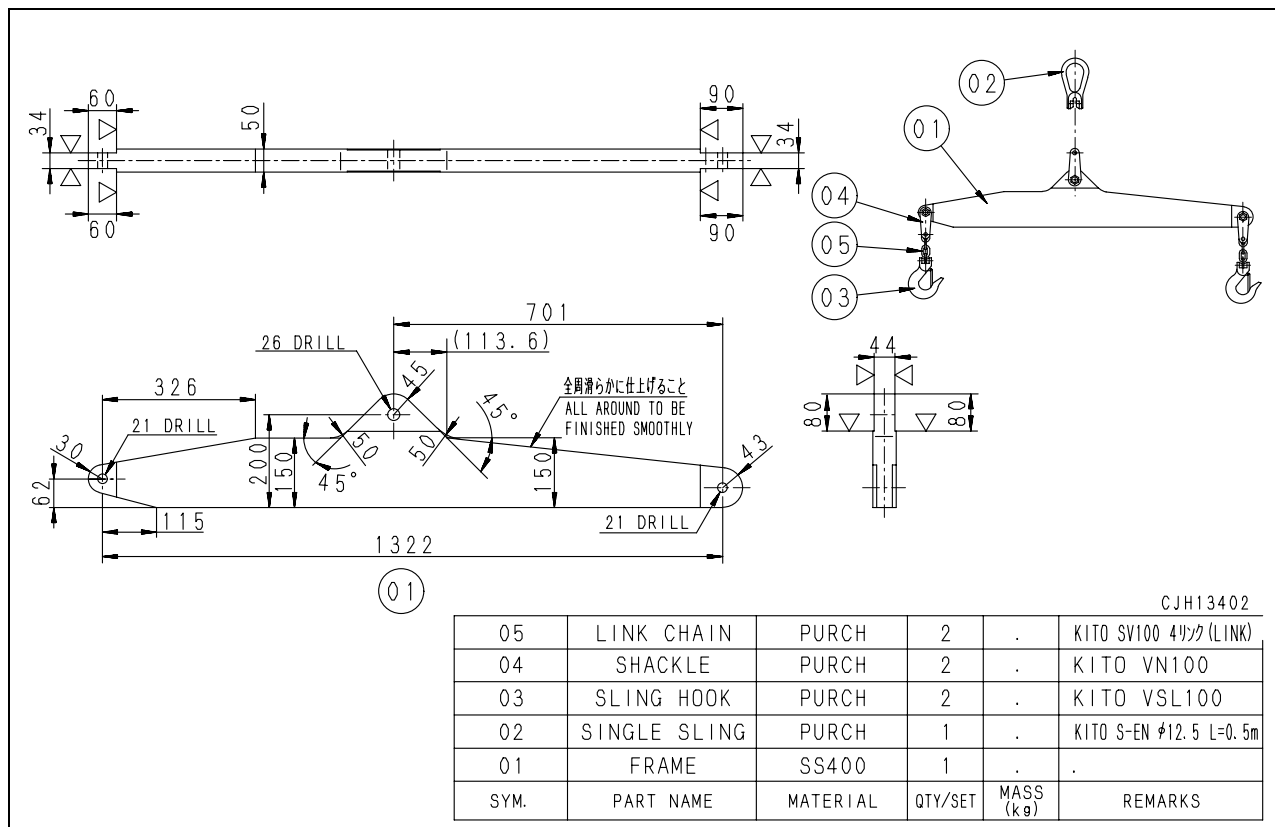
Component	Sym- bol	Part No.	Part Name	Necessity	Q'ty	New/remodel	Sketch	Nature of work, remarks	
Removal and installation of cylinder head assembly	A	3	795-102-2102	Spring pusher	■	1		Disassembly, assembly of cylinder head	
		4	790-331-1110	Wrench	●	1		Installation of cylinder head	
5		792T-600-1120	Hanger	■	1	N	○	Removal and installation of engine assembly	
6		792T-600-1110	Engine assembly lifting tool	■	1	N	○		
Disassembly, assembly of torque converter, PTO assembly	C	1	792-620-1400	Centering tool	■	1	N	Centering engine and torque converter	
		2	790-413-1131	Nut wrench	■	1		Removal and installation of round nut of stator shaft bearing	
		3	791-346-1400	Wrench	■	1		Removal and installation of PTO pump shaft	
		4	792-413-1131	Installer	■	1	N	Installation of bushing to stator outer race	
Disassembly, assembly of transmission	D	1	799-301-1600	Oil leak tester kit (A)	■	1		Operation check of disk and plate	
Disassembly, assembly of differential assembly	H	3	790-501-2001	Repair stand	■	1		Disassembly, assembly of differential assembly	
			792-622-1110	Bracket	■	1	N		
		4	790-425-1660	Wrench	■	1		Removal and installation of preload adjustment nut	
			5	792-201-7010	Wrench	■	1		Removal and installation of pinion gear nut
Disassembly, assembly of front brake assembly, rear brake assembly	J	1	01011-61610	Bolt	■	3	N	Lock of floating seal	
			01643-31645	Washer	■	3	N		
		2	01017-51620	Bolt	■	9	N	Parking brake manual releasing	
			01580-31613	Nut	■	9	N		
			01643-31645	Washer	■	9	N		

Sketches of special tools

A5. Hanger (792T-600-1120)



A6. Engine assembly lifting tool



HD785-7 Dump truck

Form No. SEN01951-00

DUMP TRUCK

HD785-7

Machine model	Serial number
HD785-7	7001 and up

50 Disassembly and assembly

Engine and cooling system

Removal and installation of fuel supply pump.....	2
Removal and installation of cylinder head assembly	4
Removal and installation of radiator assembly	12
Removal and installation of engine assembly	19

Removal and installation of fuel supply pump

Removal

⚠ **Disconnect the cable from the negative (–) terminal of the battery.**

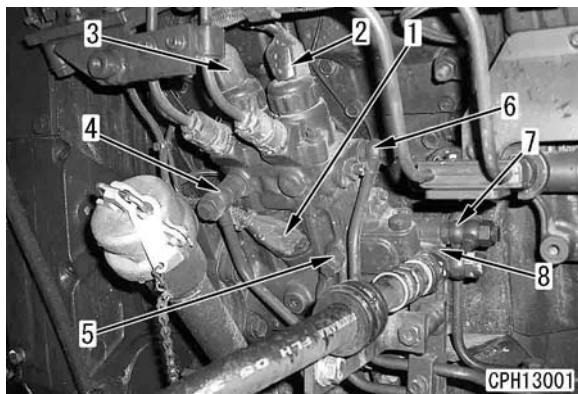
⚠ **Close the fuel filler valve of the fuel tank.**

★ The figure shows the left bank as an example. Work on the right and left banks similarly, unless otherwise specified.

1. Disconnect engine wiring harnesses (1), (2) and (3).

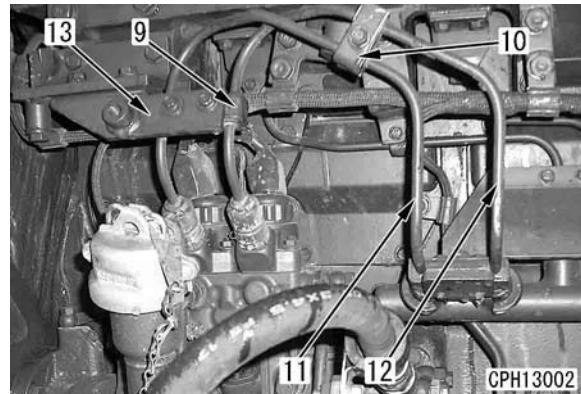
2. **Remove the tubes and hoses from the supply pump**

- 1) Remove fuel return tube (4) [*1]
- 2) Remove oil tube (5) between the pump and cylinder block. [*2]
- 3) Remove fuel tube (6) between the priming pump and pump. [*3]
- 4) Remove fuel tube (7) between the pump and controller cooler. [*3]
- 5) Remove fuel hose (3) between the main fuel filter and pump. [*3]



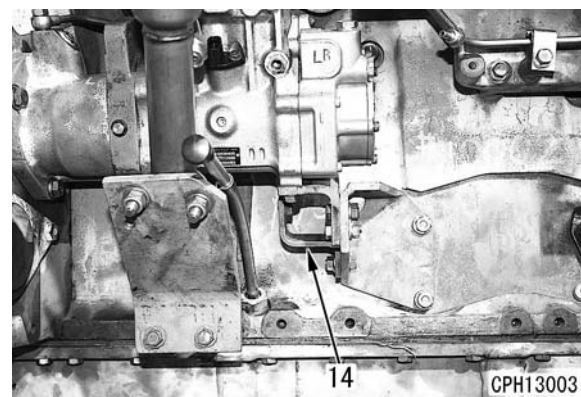
3. **Remove the high-pressure pipes (between the supply pump and common rail)**

- 1) Make mounting position marks of clamps (9) – (10) with paint.
- 2) Remove bracket (13).
- 3) Remove clamps (9) – (10). [*4]
- 4) Remove high-pressure pipes (11) and (12). [*5]



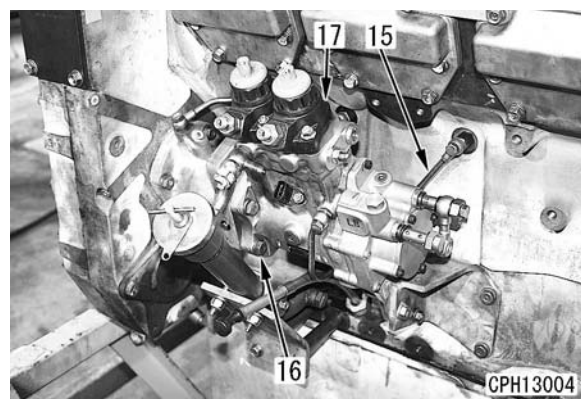
4. **Remove the supply pump**

- 1) Remove pump mounting bracket (14). [*6]



- 2) Remove oil tube (15).
- 3) Remove supply pump assembly mounting bolts (16). [*7]
- 4) Remove supply pump assembly (17).

 Supply pump assembly: **20 kg**



Installation

Carry out installation in the reverse order to removal.

[*1]

- Joint bolt of fuel return tube (4):
14.9 – 19.6 Nm {1.5 – 2.0 kgm}

[*2]

- Joint bolt of fuel return tube (5):
7.9 – 12.7 Nm {0.8 – 1.3 kgm}

[*3]

- Joint bolt of fuel tubes (6), (7) and (8):
24.5 – 34.3 Nm {2.5 – 3.5 kgm}

[*4]

- Mounting bolt of high-pressure pipe clamps (9) and (10): **9.8 ± 1 Nm {1.0 ± 0.1 kgm}**

[*5]

- Sleeve nut of high-pressure pipes (11) and (12)
Supply pump side:
39.2 – 49 Nm {4 – 5 kgm}
Common rail side:
39.2 – 58.8 Nm {4 – 6 kgm}

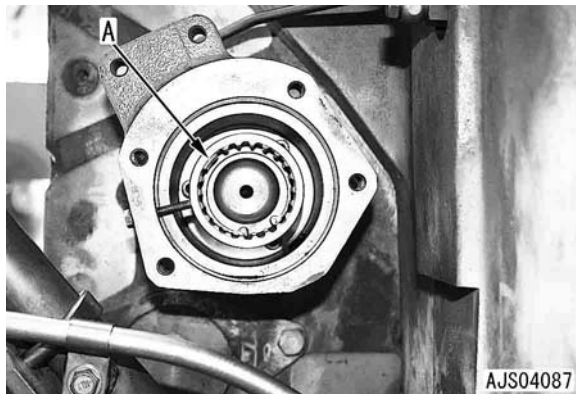
[*6]

- Supply pump mounting bolt (pump bottom side): **19.6 – 29.4 Nm {2.0 – 3.0 kgm}**

[*7] [*4]

Position and install the supply pump and high-pressure pipes according to the following procedure.

- 1) Install supply pump assembly (17) temporarily.
 - ★ Insert the supply pump shaft in the supply pump drive case, setting the positioning sector of the former to positioning sector (A) of the latter.
 - ★ If the supply pump cannot be inserted, rotate the crankshaft to change the position of positioning sector (A).



AJS04087

- ★ Tighten mounting bolts (16) to the specified torque after tightening the sleeve nuts of the high-pressure pipe (between the supply pump and common rail).

Supply pump assembly mounting bolt: **Adhesive (LT-2)**

- 2) Install the high-pressure pipe temporarily to the supply pump and common rail and then tighten the sleeve nut to the specified torque.

- ★ Tighten the nut to the specified torque with a spanner-type torque wrench (commercially available).

High-pressure pipe sleeve nut (Supply pump side):

39.2 – 49 Nm {4 – 5 kgm}

High-pressure pipe sleeve nut Common rail side:

39.2 – 58.8 Nm {4 – 6 kgm}

- 3) Install the high-pressure pipe clamps according to the following procedure.

- 1) Tighten all the stays and upper and lower clamps of the high-pressure pipe with the fingers.

- 2) Tighten the upper and lower clamps permanently.

- ★ When tightening, avoid applying excessive force to the mounting part of the supply pump as long as possible.

Upper and lower clamps:

9.8 ± 1 Nm {1 ± 0.1 kgm}

- 3) Tighten each stay permanently.

- 4) Install the rubber cover to the high-pressure pipe sleeve nut.

- ★ When installing the cover, set the slits in the following directions.

- Supply pump side: Down
- Common rail side:

In (Opposite directions)

Removal and installation of cylinder head assembly

Special tools

Symbol	Part No.	Part name	Necessity	Q'ty	New/Remodel	Sketch
A3	795-102-2102	Spring pusher	■	1		
A4	790-331-1110	Wrench		1		

Removal

- ⚠ **Stop the machine on a level ground, set the parking brake switch in the "PARK" position, and lock the tires with chocks.**
- ⚠ **Raise the body and lock it with the safety pin.**
- ⚠ **Disconnect the cable from the negative (-) terminal of the battery.**

1. Drain the engine coolant.

 Radiator lower tank: **283 ℓ**

2. Remove the engine hood

★ For details, see "Removal of radiator assembly".

- 1) Remove the reservoir tank from the top of the engine hood.

 Reservoir tank: **15 kg**

- 2) Remove the engine hood.

 Engine hood: **110 kg**

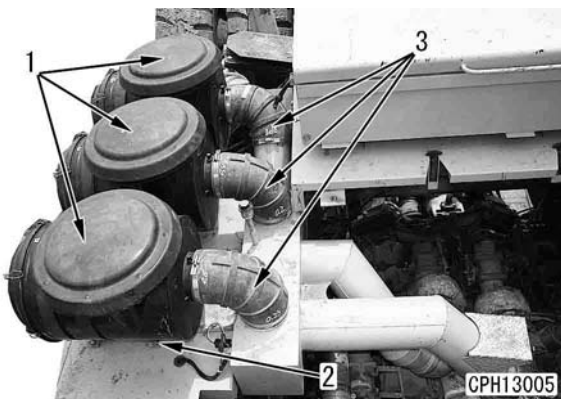
3. Remove the air cleaner assemblies

- 1) Remove mounting bolts (2) of each air cleaner assembly (1).

- 2) Loosen rubber elbow mounting clamp (3). [***1**]

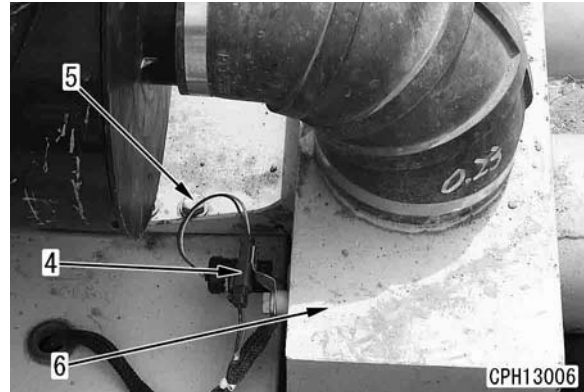
- 3) Remove 3 air cleaner assemblies (1).

 Air cleaner assembly: **15 kg**



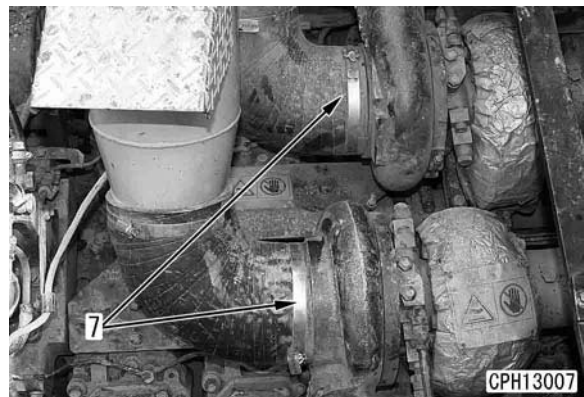
4. Remove air duct assembly

- 1) Disconnect the air cleaner clogging sensor switch connector (4) and remove mounting bolts (5) of air cleaner duct assembly (6).



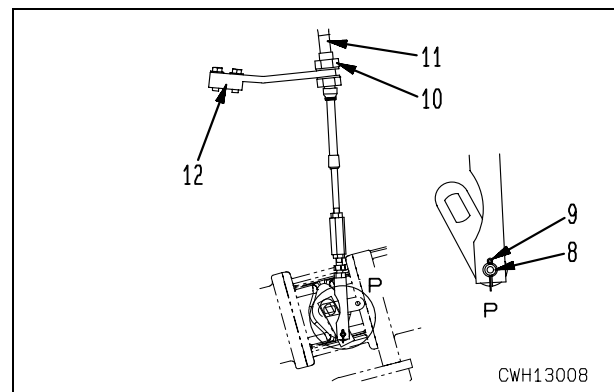
- 2) Sling air cleaner duct assembly (6) temporarily and loosen rubber elbow mounting clamp (7) on the turbocharger side of the duct. [***2**]
- 3) Sling and remove the air duct assembly.

 Air duct assembly: **45 kg**

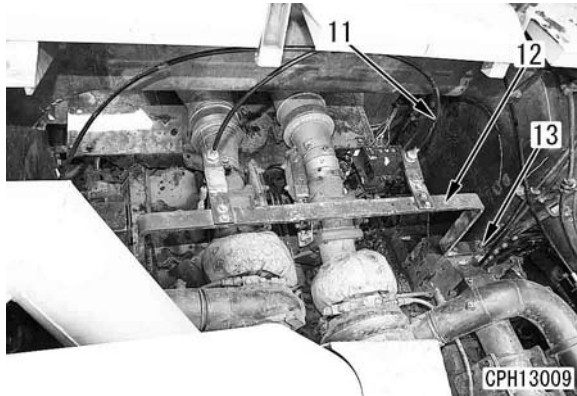


- 4) Remove the exhaust brake control bracket (If equipped).

- 1) Loosen mounting nut (10) of exhaust brake cable (11), remove pin (8) and cotter pin (9) from the lever yoke, and disconnect cable (11). [***3**]

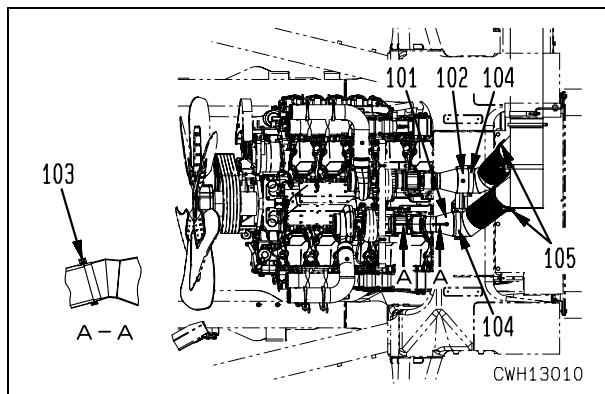


- 2) Remove mounting bolt (13) of cable mounting bracket (12).

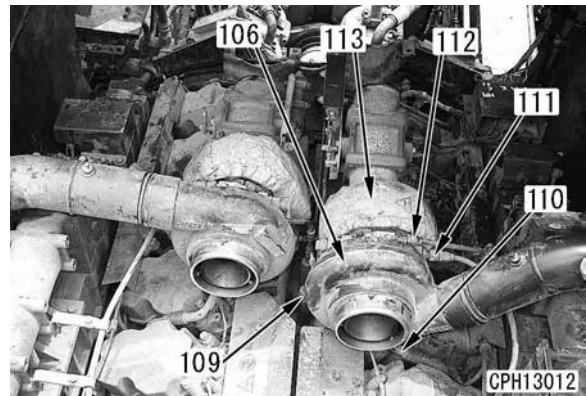


5. Remove the exhaust connectors between the turbocharger and muffler.

- 1) Remove coupling band (103) of exhaust connectors (101) and (102). [*4]
- 2) Loosen clamp (105) on the rubber hose side of the exhaust connector. [*5]
- 3) Remove U-bolt (104) fixing the exhaust connector.
- 4) Pull and pry out the rubber tube of the connector.

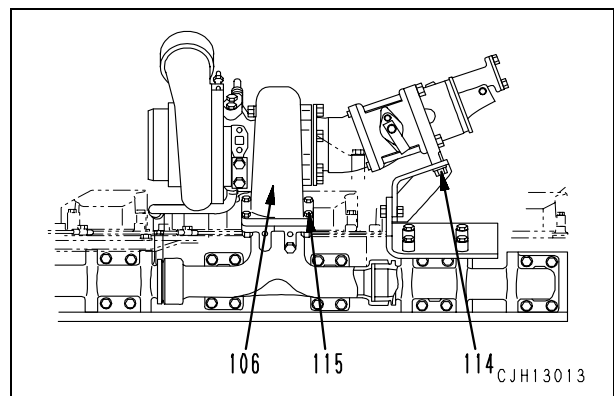


- 2) Remove cooling tubes (109) and (111) and lubrication hoses (110) and (112) from turbocharger assembly (106). [*7]
- 3) Remove heat insulation cover (113).



- 4) Sling turbocharger assembly (106) temporarily and remove mounting bolts (114) and (115). [*8]

 Turbocharger: **35 kg**



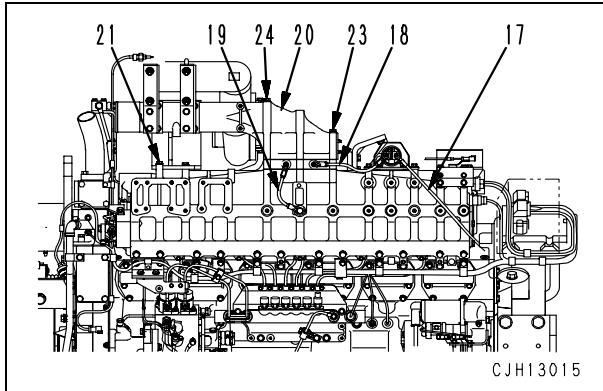
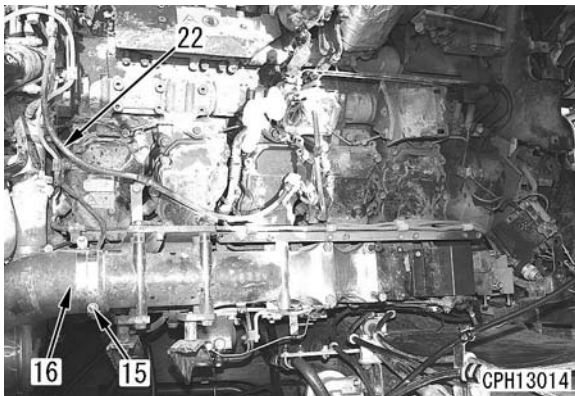
6. Remove the turbocharger assembly

- 1) Loosen air piping rubber hose coupling band (107) of turbocharger assembly (106) and remove U-bolt (108) fixing the piping. [*6]

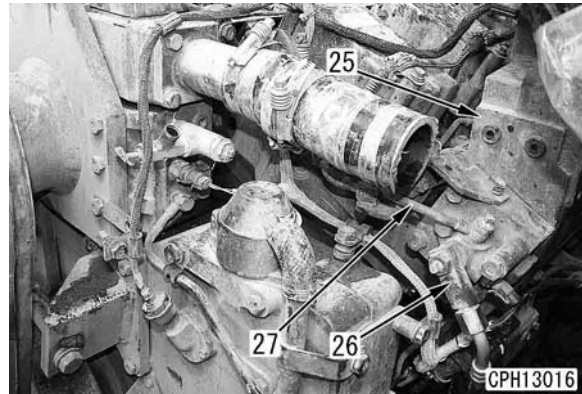


7. Remove the air intake manifold (left bank)

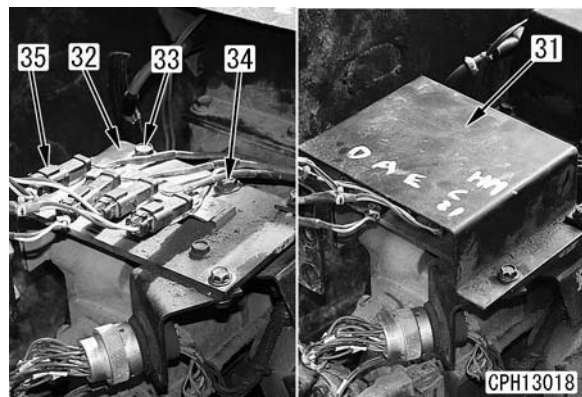
- 1) Loosen clamp (15) of the tube coming from the aftercooler and remove elbow tube (16). [*9]
- 2) Disconnect electrical intake air heater switch wire (17) and remove electrical intake air heater wires (18) and (19).
- 3) Sling air intake connector (20) temporarily and remove bracket mounting bolts (21). Remove water hose clamp (22) and connector mounting bolts (23) and (24).
 - ★ Install a guide bar to the lower air intake manifold mounting bolt hole to prevent the electrical intake air heater from falling.



- 4) Sling air intake manifold (25) temporarily.
 - 1) Remove fuel tubes (26) and (27) installed from the air intake manifold. [*10]

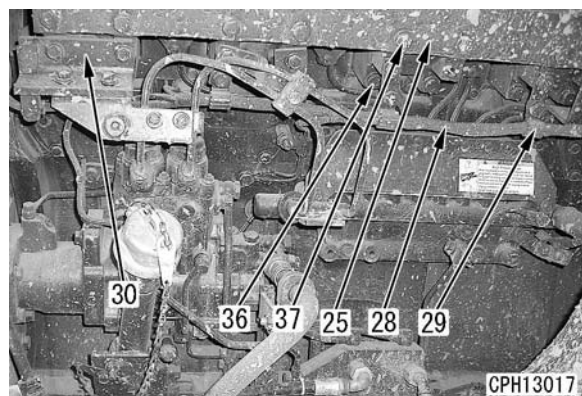


- 2) Remove clamp (29) of engine wiring (28).
- 3) Remove wiring cover (31) and mounting bolts (33) and (34) of inside wiring bracket (32). Disconnect wiring connector (35) and remove it from the air intake manifold.

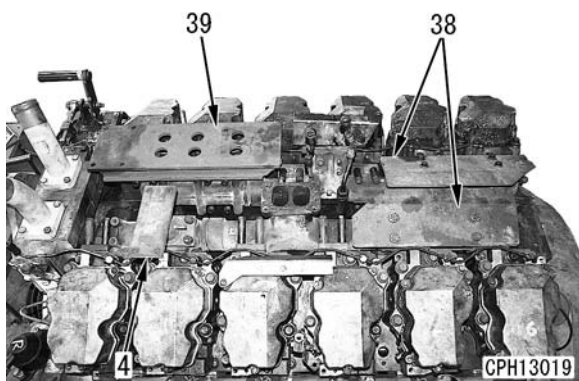


- 4) Remove high-pressure pipe bracket (30).
- 5) While slinging the air intake manifold, remove manifold mounting bolts (26) and (27) and move the manifold to the right to remove. [*11]

 Air intake manifold: **35 kg**

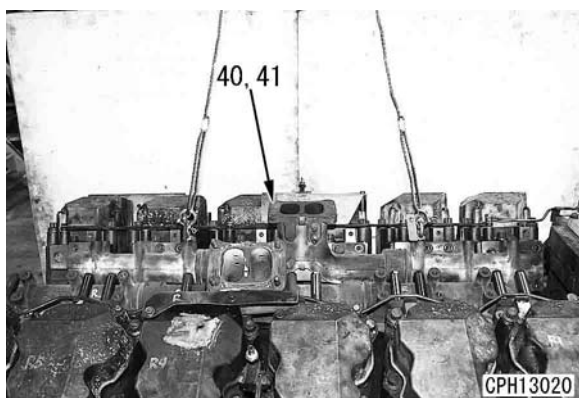


8. Remove heat shields (38) and (39).



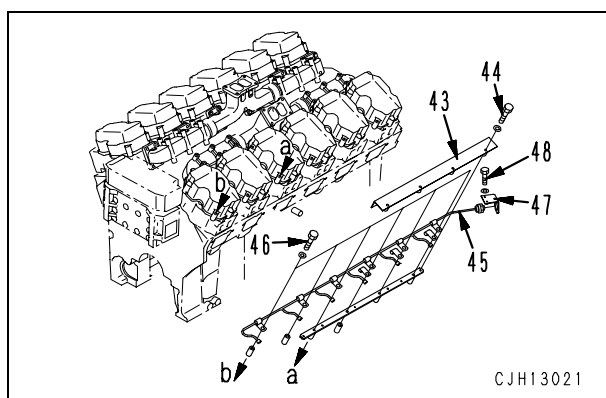
9. Remove mounting bolts of exhaust manifolds (40) and (41). [*12]

 Exhaust manifold assembly: **22 kg**



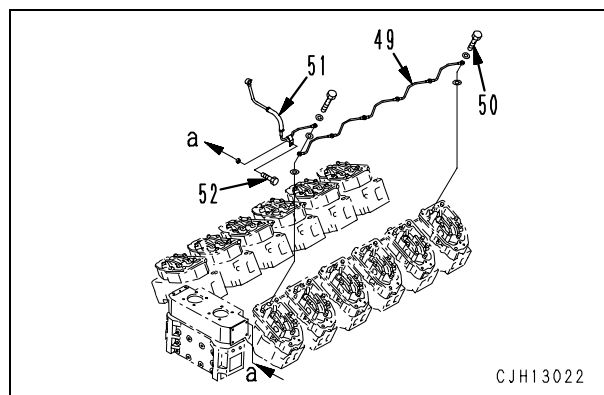
10. Remove the injector external wiring

- 1) Remove mounting bolts (44) of cover plate (43).
- 2) Remove clamp bolt (46) of wiring (45).
- 3) Remove mounting bolts (48) of connector mounting bracket (47).

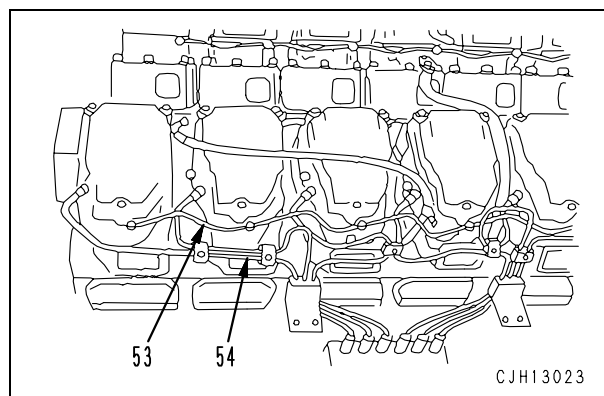


11. Remove the air vent tube

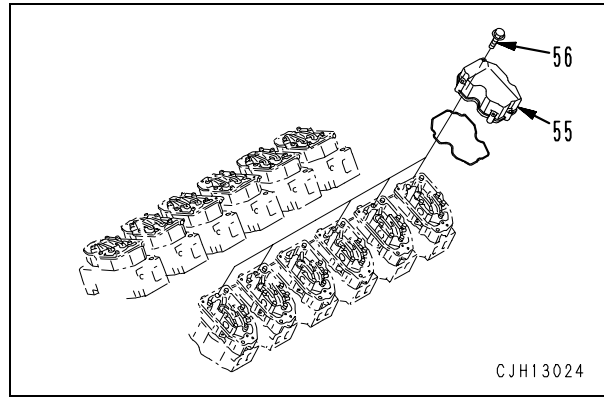
- 1) Remove mounting bolts (50) of tube (49). [*13]
- 2) Remove mounting bolts (52) of tube assembly (51).



12. Remove the clamp, then fuel high-pressure injection tube (53) and spill tube (54). [*14] [*15]

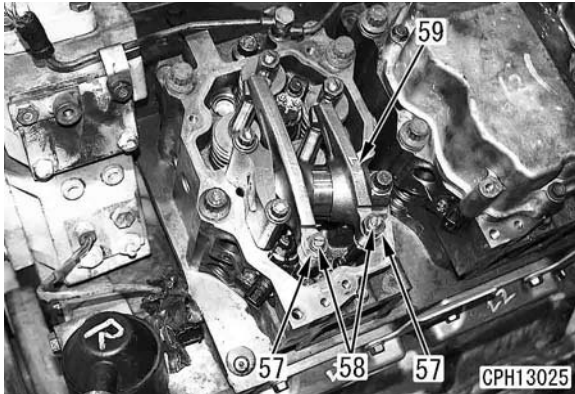


13. Remove mounting bolts (56) of head cover (55). [*16]

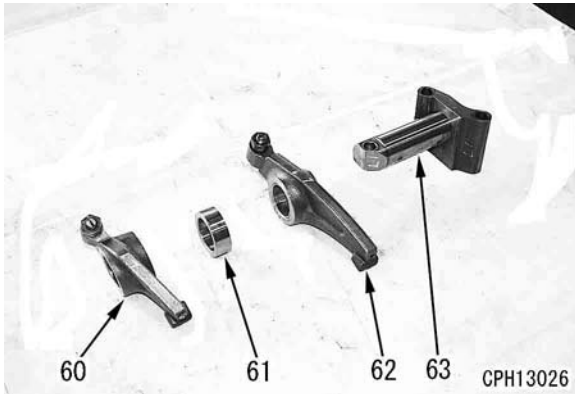


14. Remove the rocker arm assembly

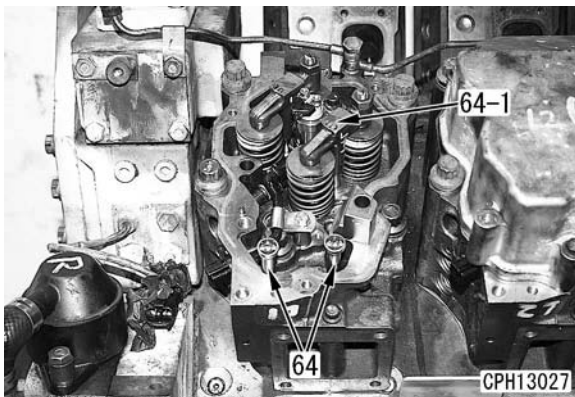
- 1) Loosen locknut (57) and then loosen adjustment screw (57) fully. [*17]
 - ★ Check that the rocker arm is not affected by the valve tension and is free.
- 2) Remove rocker arm assembly (59).
 - ★ Put tags to record the mounting positions to prevent a mistake in installation.



- 3) Remove intake rocker arm (60), spacer (61) and exhaust rocker arm (62) from rocker shaft (63).

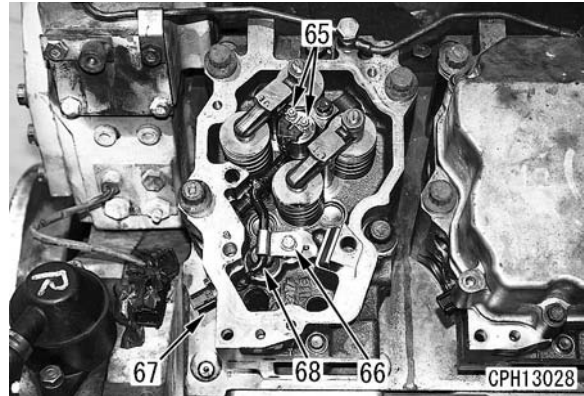


15. Remove push rod (64), then remove cross-head (64-1). [*18]



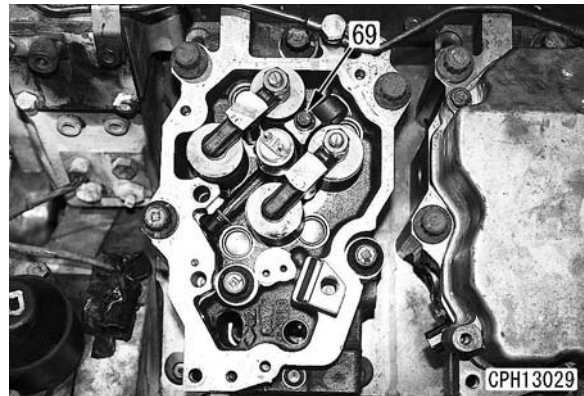
16. Remove the injector wiring harness

- 1) Remove injector terminal mounting nuts (65) and clamp mounting bolts (66). [*19]
- 2) Push connector (67) into the cylinder head and remove injector wiring harness (68).

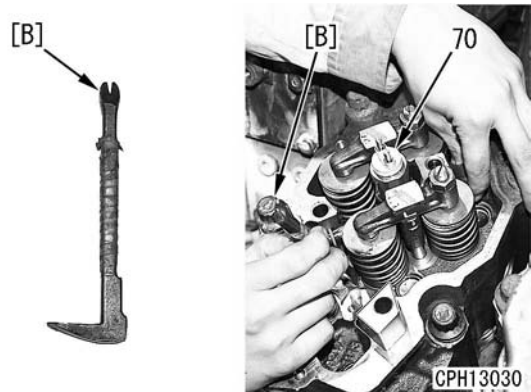


17. Remove the fuel injector

- 1) Remove holder mounting bolts (69).



- 2) Put small L-bar [B] under the fuel connector and pry out fuel injector (70) slowly.
 - ★ Do not hold the solenoid valve at the injector top with pliers, etc. to pull out the injector.



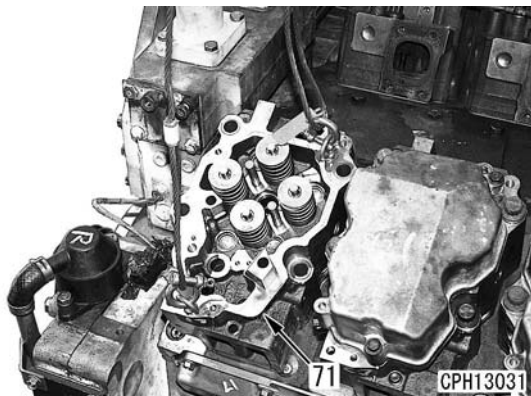
18. Remove the cylinder head assembly

- 1) Remove the water tube.
- 2) Lift off cylinder head assembly (71). [*20]

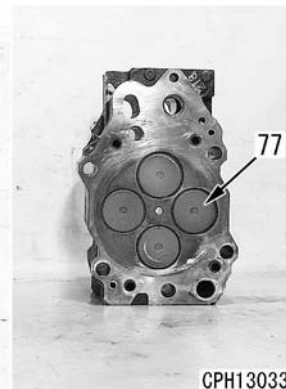
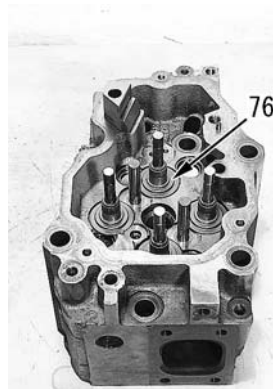


Cylinder head assembly: **25 kg**

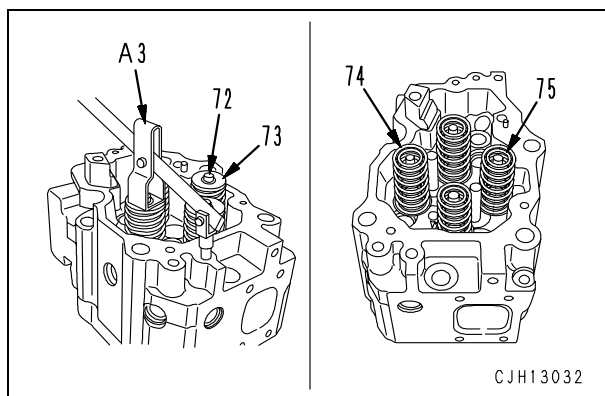
- ★ If the cylinder head assembly is removed without removing the fuel injector, the injector tip projects from the bottom of the cylinder head. Accordingly, use a block, etc. to prevent the injector from interfering with the floor.



- 3] Remove lower seat (76).
- 4] Raise the cylinder head and remove valve (77).



- 3) Remove the cylinder head gasket.
- 4) Disassemble the cylinder head assembly according to the following procedure.
 - 1] Using tool **A3**, compress the valve spring and remove cotter (72).
 - 2] Remove upper seat (73), outer spring (74) and inner spring (75).



Installation

Carry out installation in the reverse order to removal.

[*1] [*2]

- ⌋ Air duct rubber hose (elbow) mounting clamp on air cleaner side and turbocharger side: **0.88 Nm {90 kgcm}**

[*3]

- ⌋ Exhaust brake cable mounting bolt: **109 – 173 Nm {11.1 – 17.6 kgm}**

[*4]

- ⌋ Exhaust connector coupling band: **14.7 – 16.95 Nm {1.5 – 1.73 kgm}**

[*5]

- ⌋ Clamp on exhaust connector rubber hose side: **6.9 – 8.3 Nm {0.7 – 0.85 kgm}**

[*6]

- ⌋ Turbocharger air piping coupling band: **10.5 ± 0.5 Nm {107 ± 5 kgm}**
- ⌋ Turbocharger piping fixing U-bolt: **29.4 – 44.1 Nm {3.0 – 4.5 kgm}**

[*7]

- ⌋ Turbocharger coolant tube: **24.5 – 34.3 Nm {2.3 – 2.5 kgm}**
- ⌋ Turbocharger lubrication tube: **29.4 – 39.2 Nm {3.0 – 4.0 kgm}**

[*8]

- ⌋ Turbocharger mounting bolt: **44.1 – 53.9 Nm {4.5 – 5.5 kgm}**
- ⌋ Threads and seat of bolt: **LM-P**

[*9]

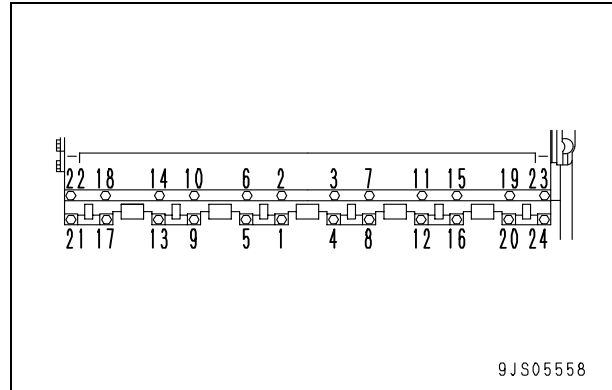
- ⌋ Exhaust manifold mounting bolt: **10.5 ± 0.5 Nm {107 ± 5 kgm}**

[*10]

- ⌋ Fuel tube of air intake manifold
 - Head side: **7.9 – 12.7 Nm {1.0 – 1.3 kgm}**
 - Manifold side: **19.6 – 29.4 Nm {2.0 – 3.0 kgm}, 24.5 – 34.7 Nm {2.5 – 3.5 kgm}**

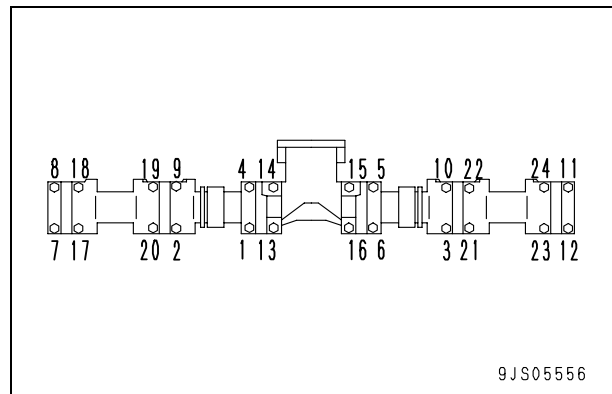
[*11]

- ⌋ Exhaust manifold mounting bolt: **58.8 – 73.5 Nm {6.0 – 7.5 kgm}**
- ⌋ Threads and seat of bolt: **LM-P**
- ★ Tighten the mounting bolts according to the procedure in the figure.



[*12]

- ⌋ Exhaust manifold mounting bolt: **44.1 – 53.9 Nm {4.5 – 5.5 kgm}**
- ⌋ Threads and seat of bolt: **LM-P**
- ★ Tighten the mounting bolts according to the procedure in the figure. Tighten bolts 1 – 3 in order, and then tighten other bolts 4 – 24 in order. After tightening all the bolts, tighten them again.



[*13]

- ⌋ Air vent tube mounting bolt: **9.8 – 11.7 Nm {1.0 – 1.3 kgm}**

[*14] [*15]

- ⌋ Fuel high-pressure injection tube head and clamp
 - Head: **39.2 – 49 Nm {4.0 – 4.5 kgm}**
 - Clamp: **9.8 ± 1 Nm {1.0 ± 0.1 kgm}**

[*16]

- ⌋ Head cover mounting bolt: **14.7 – 34.3 Nm {1.5 – 3.5 kgm}**

[*17]

- ★ Check that the adjustment screw ball is fitted to the push rod socket securely.
- ★ For adjustment of the valve clearance, see Testing and adjusting, "Adjusting valve clearance".

Adjustment screw locknut:

$58.8 \pm 5.9 \text{ Nm}$ { $6.0 \pm 0.6 \text{ kgm}$ }

[*18]

- ★ Check that push rod is inserted in the cam follower securely.
- ★ Adjust the crosshead according to the following procedure.

- 1) Loosen the locknut and return the adjustment screw.
- 2) Hold the crosshead top lightly and tighten the adjustment screw.
- 3) After the adjustment screw touches the valve stem, tighten it 20 degrees further.
- 4) Tighten the locknut.

Locknut:

$58.8 \pm 5.9 \text{ Nm}$ { $6.0 \pm 0.6 \text{ kgm}$ }

[*19]

Injector wiring harness terminal mounting nut: **$2 \pm 0.2 \text{ Nm}$ { $0.2 \pm 0.02 \text{ kgm}$ }**

[*20]

Threads and seat of cylinder head mounting bolt: **Lubricant (LM-P)**

Tighten each mounting bolt 2 – 3 turns with the fingers first, and then tighten them further according to the following procedure.

- ★ Mounting bolts tightens it in order of 1 to 6 in figure.

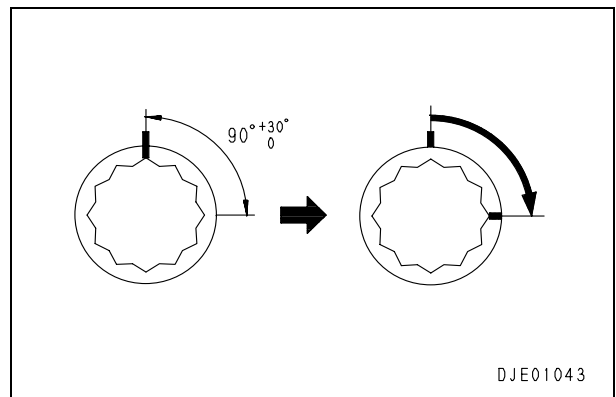
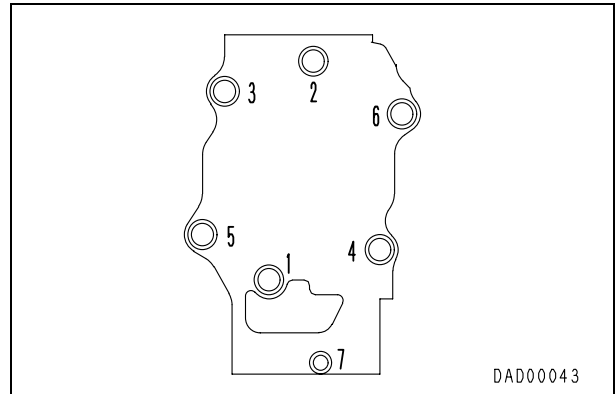
1st time: **$137.2 - 156.8 \text{ Nm}$ { $14 - 16 \text{ kgm}$ }**

2nd time: **$210.7 - 220.5 \text{ Nm}$ { $21.5 - 22.5 \text{ kgm}$ }**

3rd time: **Using wrench A4, tighten 90 degrees (+30 degrees/0).**

- When not using wrench A4, tighten the bolts according to the following procedure.

Step	Procedure
1st time	$137.2 - 156.8 \text{ Nm}$ { $14 - 16 \text{ kgm}$ }
2nd time	$210.7 - 220.5 \text{ Nm}$ { $21.5 - 22.5 \text{ kgm}$ }
3rd time	Make mark on bolt head with paint and tighten bolt 90 degrees (+30 degrees/0).



- ★ Tighten bolt (7) to **$66.15 \pm 7.35 \text{ Nm}$ { $6.75 \pm 0.75 \text{ kgm}$ }**.
- ★ After tightening each bolt, make a punch mark on its head to show the number of tightening times.
- ★ If there are 5 punch marks on the head of a bolt, do not reuse that bolts but replace it.

● Refilling with coolant

Add coolant through the coolant filler to the specified level. Run the engine to circulate the coolant through the system. Then, check the coolant level again.

Removal and installation of radiator assembly

Removal

- ⚠ Stop the machine on a level ground and lock the wheels with chocks.
- ⚠ Raise the body and lock it with the safety pin.
- ⚠ Disconnect the cable from the negative (-) terminal of the battery.

- ★ Drain the coolant from the radiator.

🔧 Coolant: **283 ℓ**

- ★ Drain the oil from the torque converter and transmission assembly.

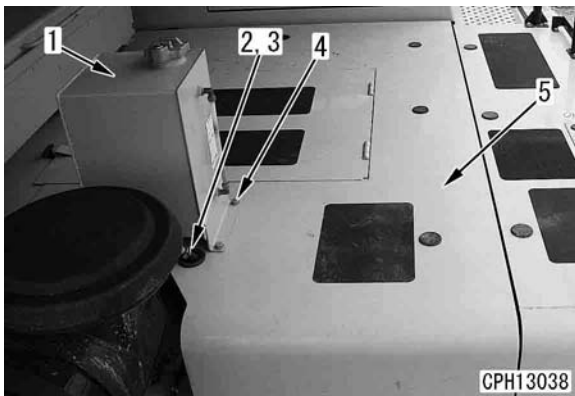
🔧 Torque converter and transmission assembly: **368 ℓ**

- ★ Collect the air conditioner refrigerant.

1. Removal of radiator coolant reservoir tank on engine hood

- 1) Loosen reservoir tank hose clamps (2) and (3) and disconnect the hose. [*1]
- 2) Remove reservoir tank mounting bolt (4) and reservoir tank (1).

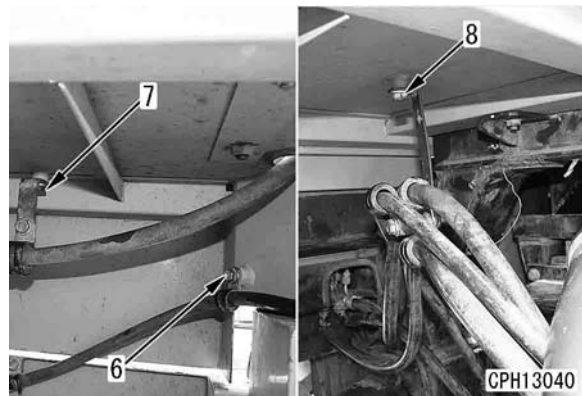
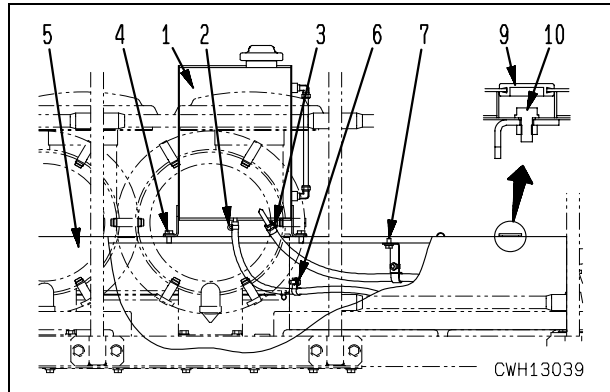
🔧 Reservoir tank (1): **15 kg**



2. Removal of engine hood

- 1) Remove reservoir tank hose clamp (6) and bracket (7) installed to the back side of the engine hood.
- 2) Remove air conditioner hose clamp bracket (8).
- 3) Remove caps (9) of the engine hood mounting bolt holes and mounting bolts (10) in the hole.
- 4) Install sling hooks to the bolt holes of engine hood (5) and remove the engine hood.

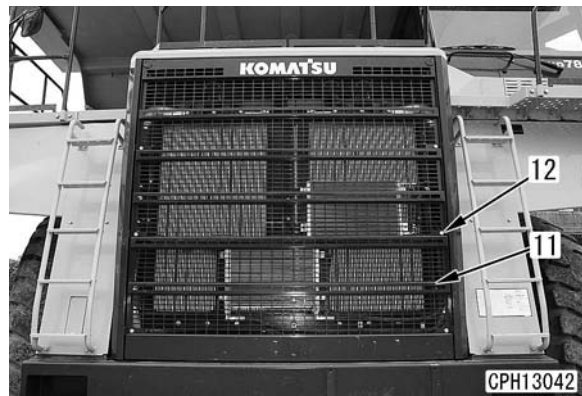
🔧 Engine hood (5): **110 kg**



3. Removal of radiator grille

- 1) Sling or fix grille (11) so that it will not fall and then remove mounting bolt (12).

🔧 Grille: **45 kg**



4. Removal of radiator guard top handrail and radiator guard

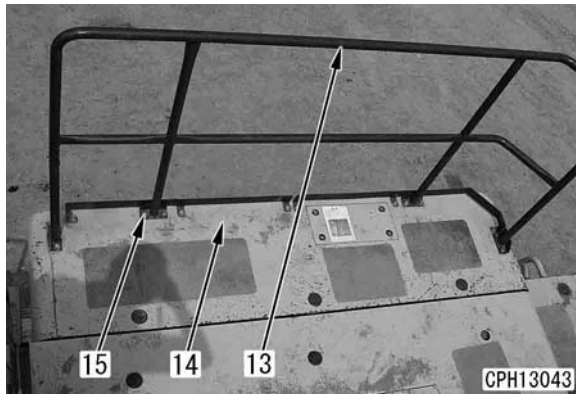
- 1) While slinging handrail (13) with belts, remove mounting bolts.

 Handrail: **20 kg**

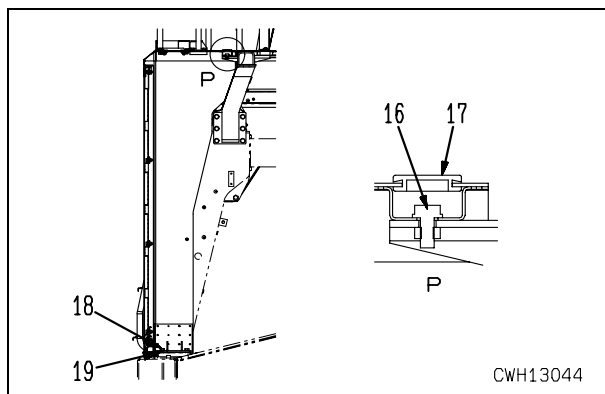
- 2) Remove caps (17) and bolts (16) on the radiator guard top.

- 3) Install sling hooks to the bolt holes of radiator guard (14). While slinging the guard lightly, remove lower mounting bolts (18).

 Radiator guard (14): **120 kg**



- ★ Tighten mounting bolt (B) (18) temporarily so that shim (19) of the lower mounting seat will not be lost.



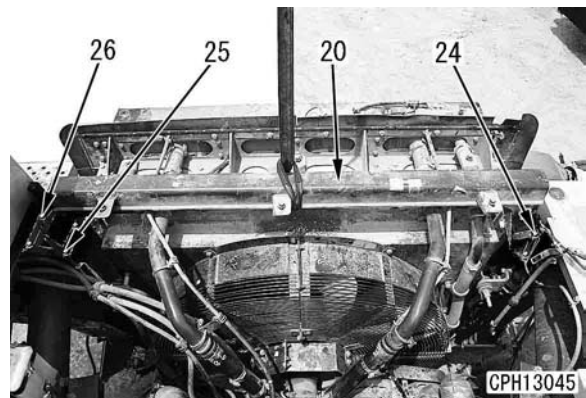
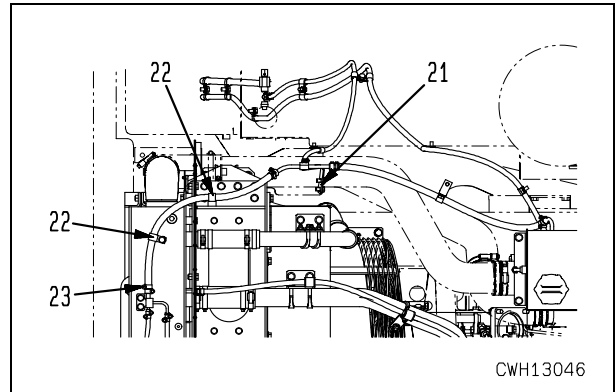
5. Removal of stay connecting right and left fenders

- 1) Remove hose clamp bracket bolts (21), clamp (22) and hose clip (23) between the reservoir tank and radiator upper tank mounted on the frame.

- 2) While slinging stay (20) with belts, remove right and left mounting bolts (24) and (25).

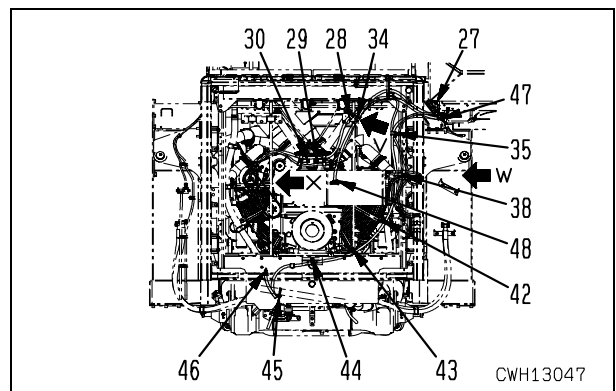
★ Use an extension to remove mounting bolt (26).

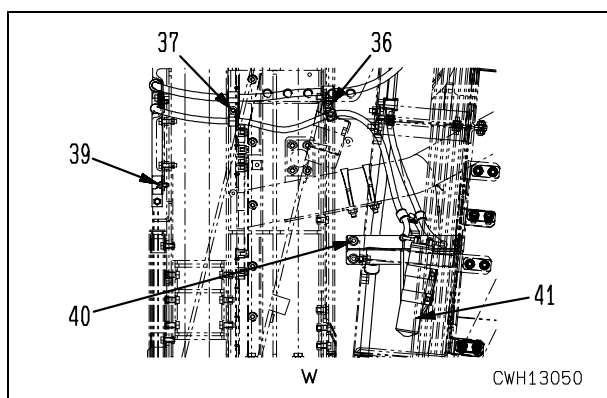
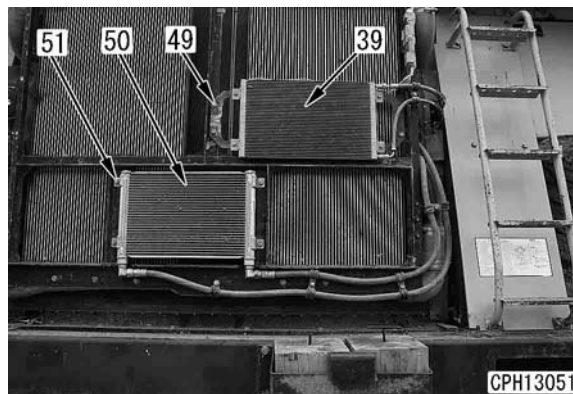
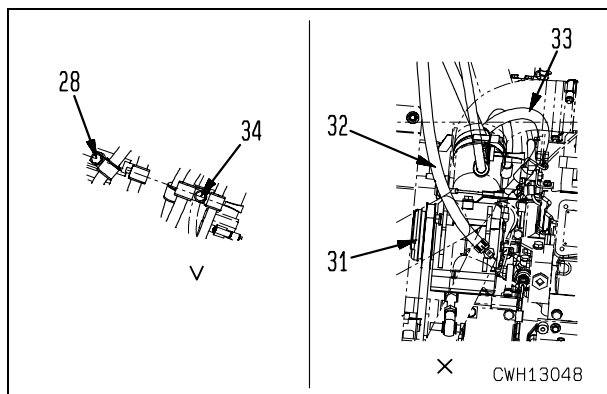
 Stay: **100 kg**



6. Removal of air conditioner hose mounted on radiator assembly

- 1) Remove hose clamps (27), (28), (29) and (30) between the air conditioner unit and compressor, and then remove the hose on the suction side of compressor (31).
- 2) Remove delivery hose (33) of compressor (31) and then remove hose clamp bolts (34), (35), (36) and (37) between condenser (39), receiver kit (41) and air conditioner unit. [*2]
- 3) Remove mounting bracket bolts (40) of receiver (41).
- 4) Remove hose clamp mounting bolts (42), (43), (44) and (45) of the hot water circuit and then remove hose clamps (46), (47) and (48).





★ Cover the openings of the removed air conditioner refrigerant circuit and hot water circuit with caps or vinyl tapes to prevent dirt from entering them.

7. Removal of air conditioner condenser and steering oil cooler

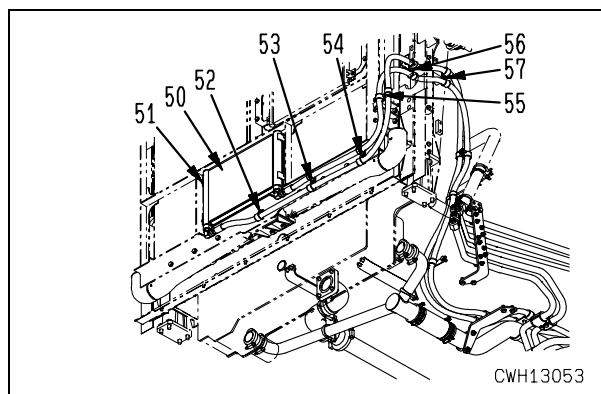
- 1) Remove mounting bolts (49) of air conditioner condenser (39).

 Air conditioner condenser (39): **3 kg**

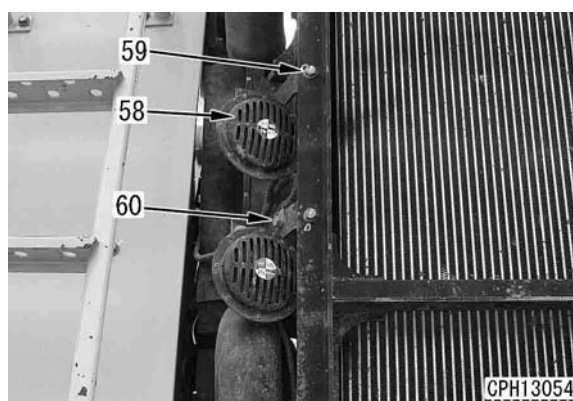
- 2) Remove mounting bolts (51) of steering oil cooler (50).

 Oil cooler (50): **4 kg**

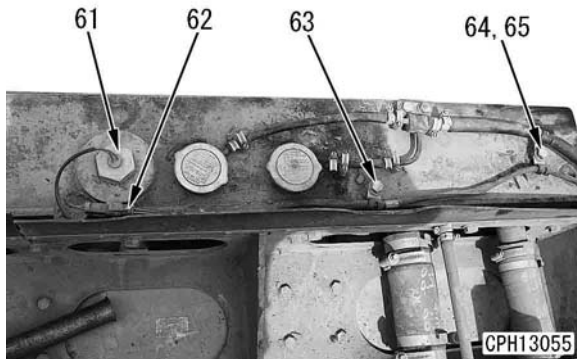
- 3) Remove oil cooler hose clamp mounting bolts (52), (53), (54), (55), (56) and (57).
- 4) Fix condenser (39) and oil cooler (50) and their hoses to the middle of the cab ladder with strings so that they will not be obstacles to slinging of the radiator assembly.



8. Remove mounting bolts (59) of horn and bracket assembly (58). Disconnect wiring connector (60).

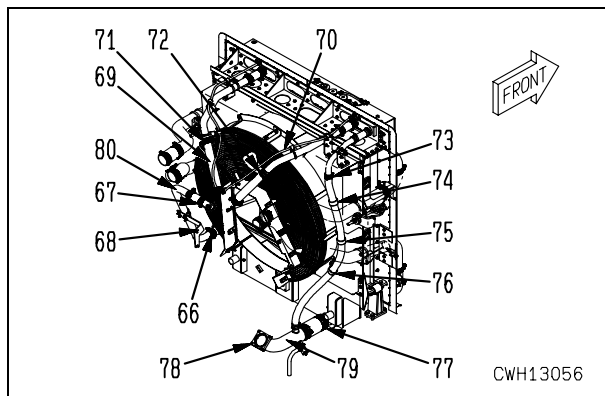


9. Disconnect connector (62) of radiator coolant level sensor (61) and remove wiring clamp mounting bolts (63), (64) and (65).



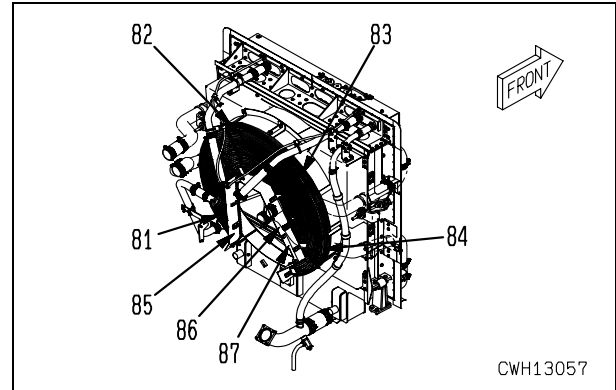
10. Removal of radiator coolant piping

- 1) Remove lower tank hose clamp (66), coolant pump hose clamp (67) and bracket mounting bolts (68) to remove hose assembly (80) between the radiator left lower tank and engine coolant pump.
- 2) Remove hose clamps (69), (70), (71) and (72) between the coolant pump and radiator right and left upper tanks.
- 3) Remove upper tank hose clamp (73) and hose clamp mounting bolts (74), (75) and (76) to remove bypass hose assembly (79) between the radiator upper tank and lower tank. Then, remove radiator right lower tank hose clamp (77) and engine-side piping mounting bolts (78) to disconnect the hose assembly. [*3]



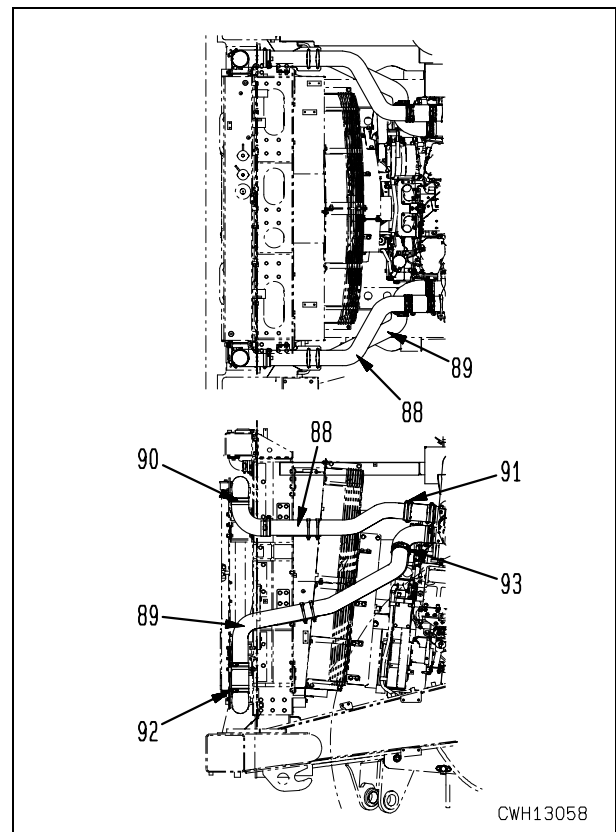
11. Removal of engine fan shroud

- 1) Remove left belt guard (85) and then remove right belt guards (86) and (87).
- 2) Remove upper left shroud (82) and upper right shroud (83). Then, remove lower left shroud (81) and lower right shroud (84).



12. Removal of engine aftercooler air piping

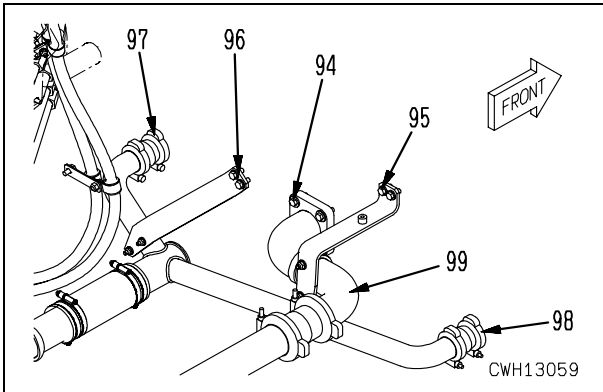
- 1) Remove engine-side clamps (91) and (93) and then remove cooler-side clamps (90) and (92) to remove aftercooler pipings (88) and (89). [*4]
- ★ After removing the aftercooler air pipings, cover the openings on the engine side and cooler side with vinyl sheet and fix them with adhesive tapes.



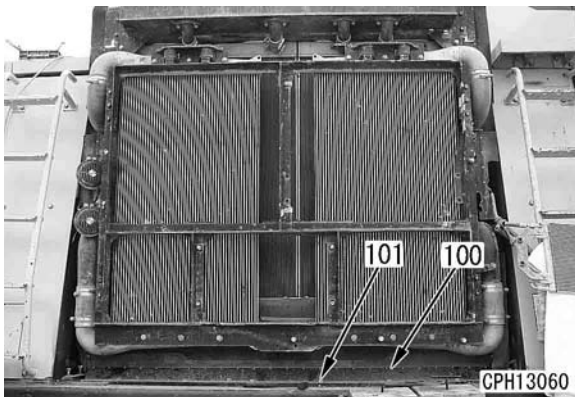
13. Removal of brake oil cooler piping of radiator lower tank

Remove return filter piping joints (97) and (98) and then remove brake oil cooler inlet piping (99).

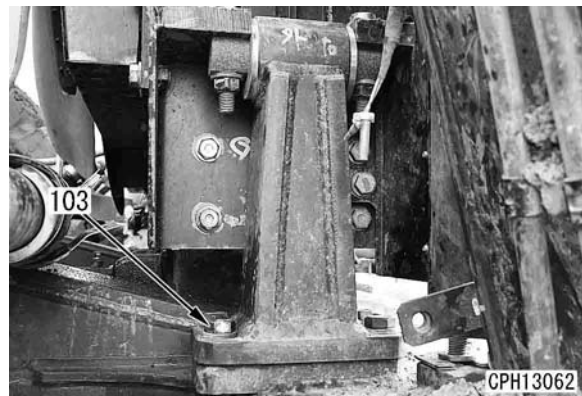
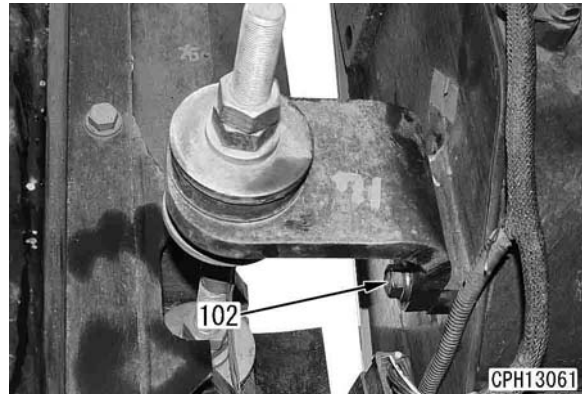
- ★ Since there is oil left in the lower tank oil cooler, place a pan under the piping to be disconnected.
- ★ After all the oil is drained from the piping, remove piping bracket mounting bolts (95) and (96).



14. Remove mounting bolts (101) of windshield plate (100) under the radiator.

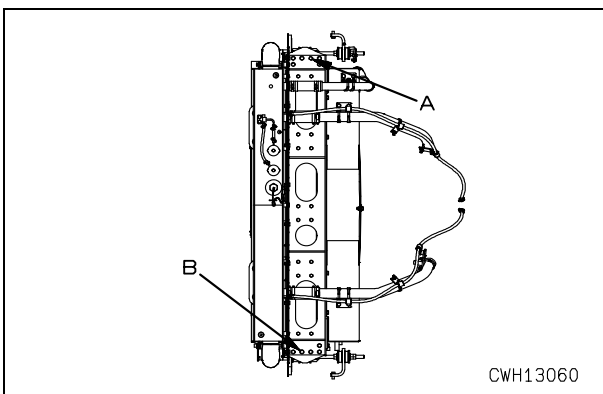


- 2) Remove radiator assembly right and left upper mounting bolts (102).
- 3) Remove radiator assembly right and left lower mounting bolts (103). [*5]



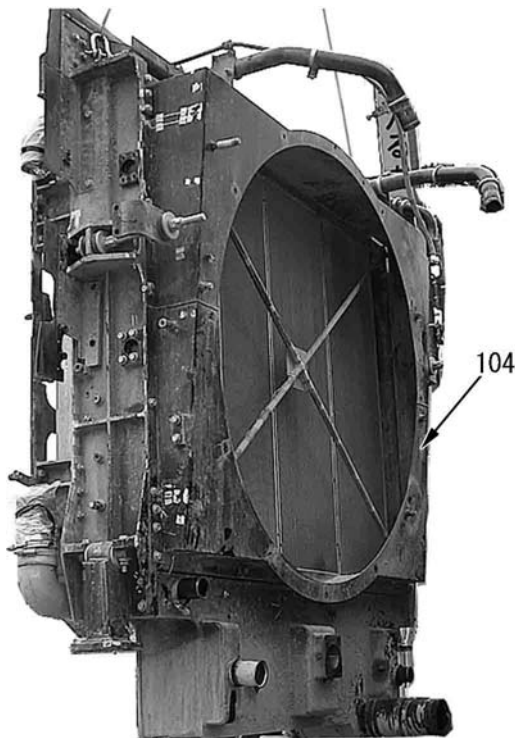
15. Removal of radiator assembly

- 1) Replace radiator upper tank right and left mounting bolts (A) and (B) with hanging bolts and sling the radiator assembly temporarily.



- 4) Sling radiator (104), and remove it.

 Radiator assembly: **950 kg**



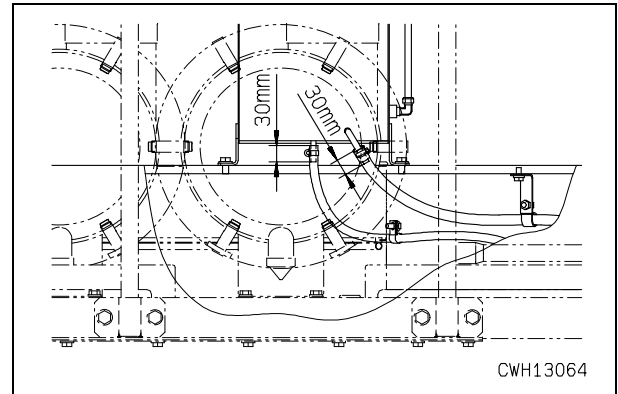
CPH13063

Installation

Carry out installation in the reverse order to removal.

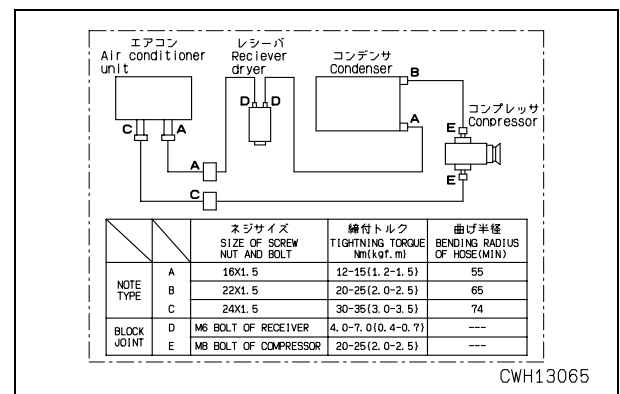
[*1] Installation of reservoir tank hose

- 1) Set hose insertion length A of reservoir tank (19) to 30 mm.



[*2] Installation of air conditioner hose

- 1) When connecting each refrigerant hose, apply compressor oil to the threads and tighten with 2 spanners.

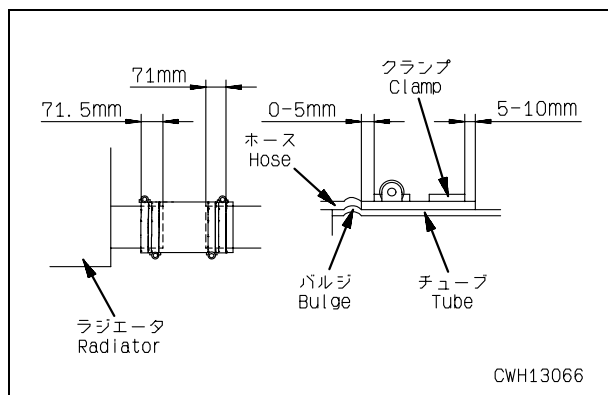


CWH13065

- 2) Install each hose so that it will not be twisted, bent forcibly or slackened excessively.
- 3) After connecting the hoses, charge the system with refrigerant and check that the refrigerant is not leaking.

[*3] Installation of refrigerant piping

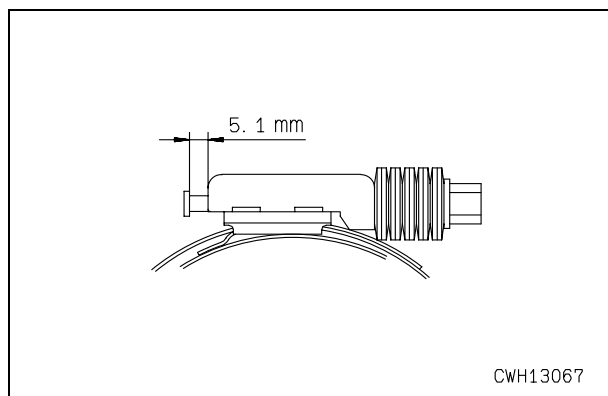
- 1) Tighten clamp to 13.7 ± 0.5 Nm { 140 ± 5 kgcm}.
- 2) When using 2 clamps, install them in opposite directions.



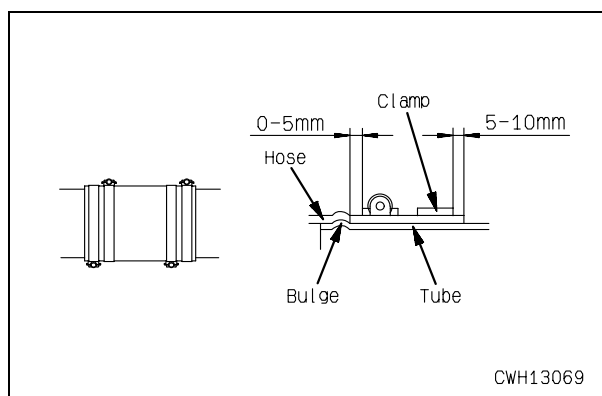
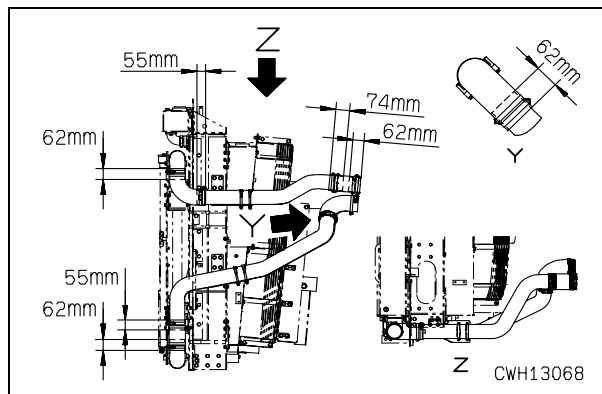
- 3) Do not apply adhesive to the hose insertion parts. If the hose cannot be inserted, apply neutral detergent.
- 4) After starting operation, retighten the clamps.

[*4] Installation of engine aftercooler piping

- 1) Tighten clamp to 10.5 ± 0.5 Nm { 107 ± 5 kgcm}. When the tightening torque is 9.8 Nm {1.0 kgm}, the projection of the screw must be as shown in the following figure.



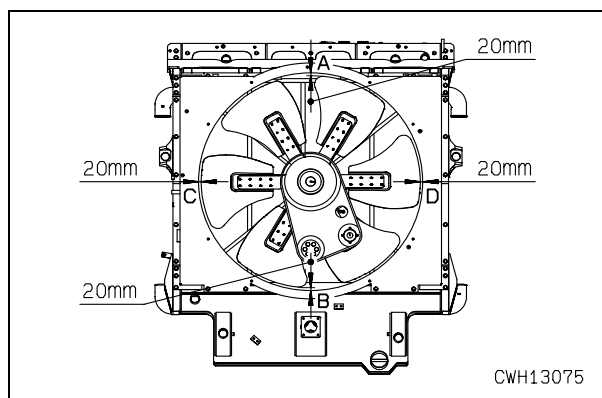
- 2) The hose insertion length must be as shown in the following figure.



[*5] Installation of radiator assembly mount bracket

Lower mount bracket mounting bolt:

235 – 285 Nm {23.5 – 29.5 kgm}



Removal and installation of engine assembly

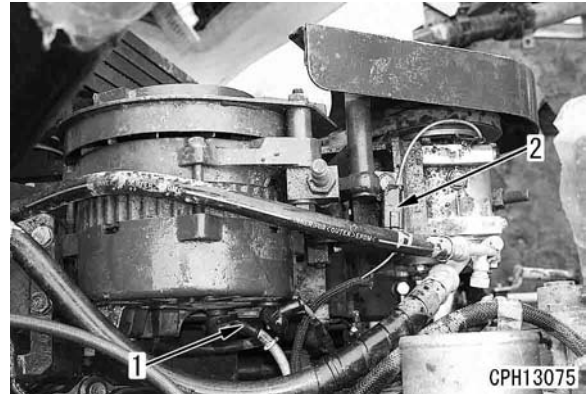
Special tools

Symbol	Part No.	Part name	Necessity	Q'ty	New/Remodel	Sketch
A5	792T-600-1120	Hanger	■	1	N	○
A6	792T-600-1110	Engine assembly lifting tool	■	1	N	○
C1	792-620-1400	Centering tool	■	1	N	○

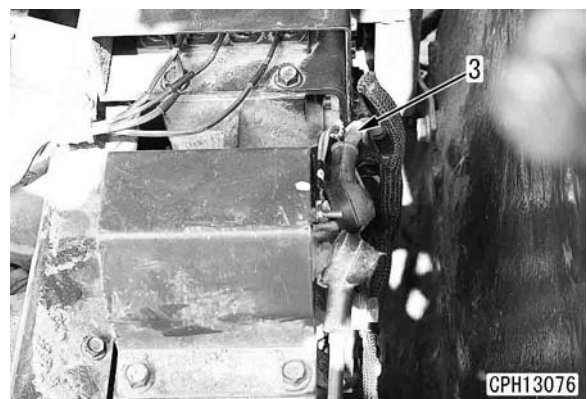
Removal

- ⚠ **Stop the machine on a level ground, set the parking brake switch in the "Park" position, and lock the tires with chocks.**
- ⚠ **Raise the body and fix it with the lock pin.**
- ⚠ **Disconnect the cable from the negative (-) terminal of the battery.**
- ★ Close the fuel supply valve.
- ★ Collect the air conditioner refrigerant.
- ★ Drain the coolant from the radiator.
 - 🔧 Coolant: **283 ℓ**
- ★ Drain the hydraulic oil from the hydraulic tank.
 - 🔧 Hydraulic oil: **270 ℓ**
- ★ Drain the oil from the torque converter and transmission case.
 - 🔧 Torque converter and transmission oil: **368 ℓ**

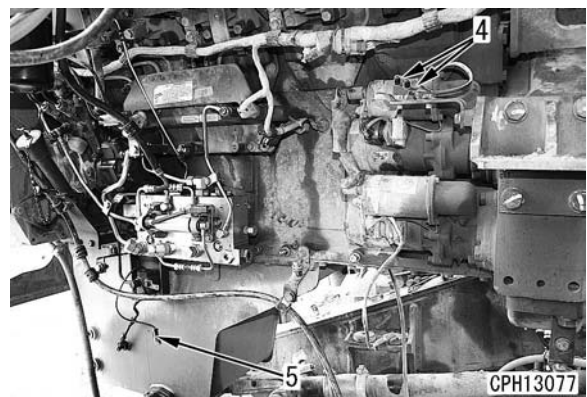
1. Removal of radiator assembly.
 - 1) Remove the radiator assembly. For details, see "Removal of radiator assembly".
2. Removal of front drive shaft.
 - 1) Remove the front drive shaft assembly. For details, see "Removal of front drive shaft assembly".
3. Removal of engine auxiliary equipment wiring.
 - 1) Disconnect alternator power supply wiring (1).
 - 2) Disconnect air conditioner compressor wiring connector (2).



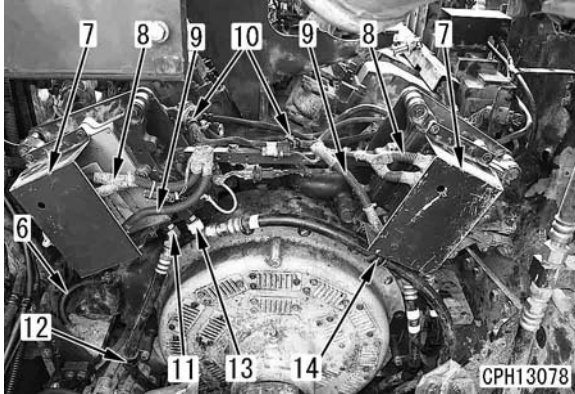
- 3) Remove wiring (3) between the electrical intake air heater and battery.



- 4) Disconnect 2 starting motor wiring connectors (4).
- 5) Disconnect engine oil level sensor connector (5).

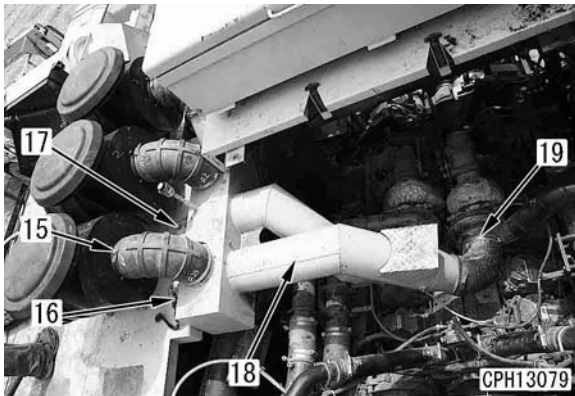


- 6) Remove engine ground wiring (6).
- 7) Remove engine controller cover (7).
- 8) Disconnect the connectors of wirings (8) and (9) on the controller side and remove clamp (10) on the machine side.
- 9) Disconnect tubes (11) and (13) connected into the engine controller and remove clamps (12) and (14) to remove those tubes.

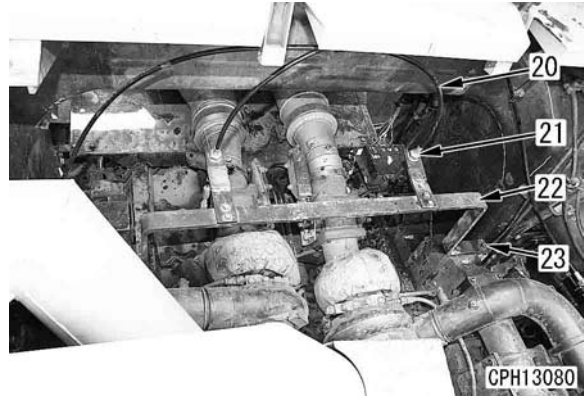


4. Removal of intake air duct.
 - 1) Remove air cleaner clogging sensor switch connector (16).
 - 2) Loosen air cleaner rubber elbow clamp (15). [*1]
 - 3) While slinging air duct (18), remove mounting bolts (17).
 - 4) Remove rubber elbow clamp (19) on the turbocharger side of the air duct. [*2] While swinging the air duct, pull out the rubber elbow.

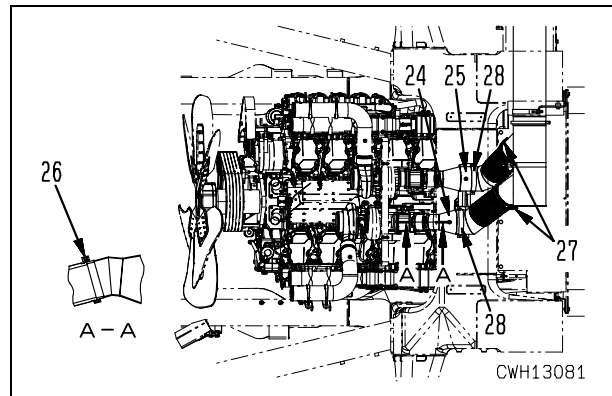
 Air duct: **45 kg**



5. Removal of exhaust brake control bracket (Machine with exhaust brake).
 - 1) Loosen mounting nut (22) of exhaust brake cable (20) and remove the yoke pin and cotter pin of the lever.
 - 2) Remove cable (20).
 - 3) Remove mounting bolt (23) and cable bracket (22).



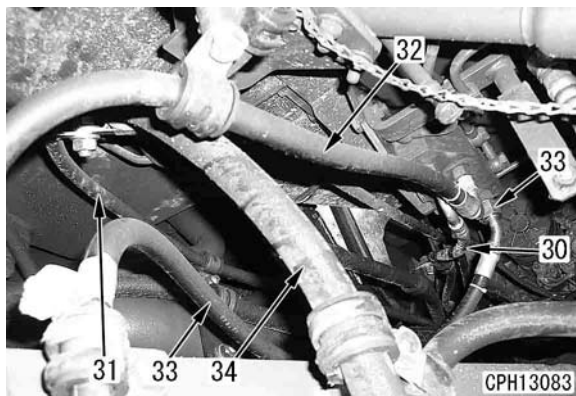
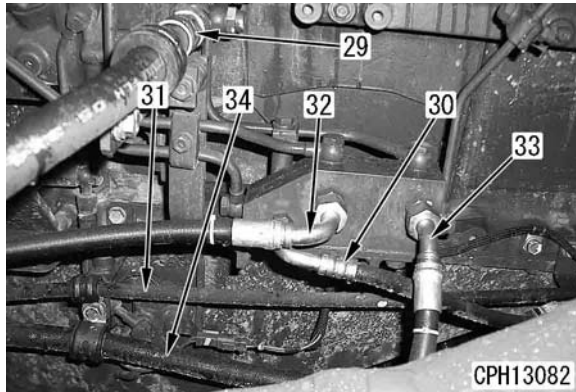
6. Removal of exhaust connector between turbo-charger and muffler.
 - 1) Remove connecting band (26) of exhaust connectors (24) and (25). [*4]
 - 2) Loosen clamp (27) on the rubber tube side of the exhaust connector. [*5]
 - 3) Remove U-bolt (28) which is fixing the exhaust connector.



- 4) Pry out the rubber tube side of the connector.

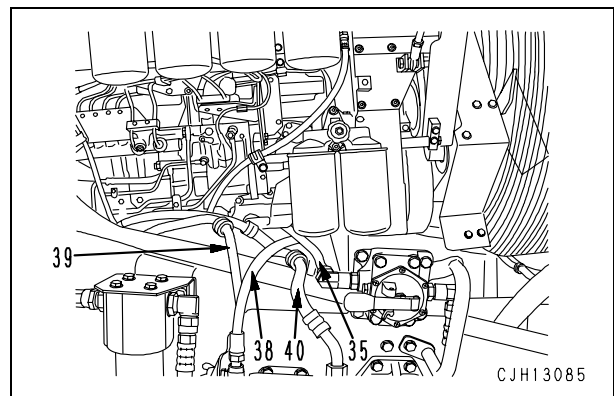
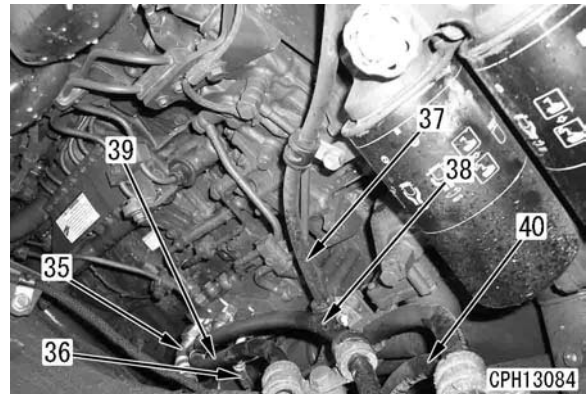
7. Removal of left bank fuel hose.

- 1) Remove hose (29) between the priming pump and feed pump.
- 2) Remove overflow hose (30) connected to the supply pump. Remove return hose (31) connected to the injector.
- 3) Remove hose (32) between the feed pump and fuel filter.
- 4) Remove hose (33) between the fuel filter and supply pump.
- 5) Remove hose (34) between the fuel tank and water separator.



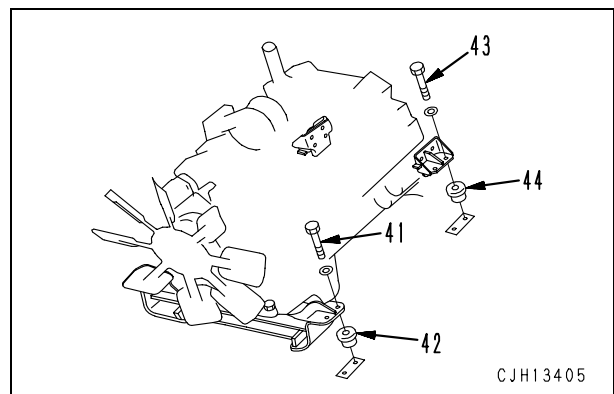
8. Removal of right bank fuel hose.

- 1) Remove hose (35) between the priming pump and feed pump.
- 2) Remove overflow hose (36) connected to the supply pump. Remove return hose (37) connected to the injector.
- 3) Remove hose (38) between the feed pump and fuel filter.
- 4) Remove hose (39) between the fuel filter and supply pump.
- 5) Remove hose (40) between the fuel tank and water separator.



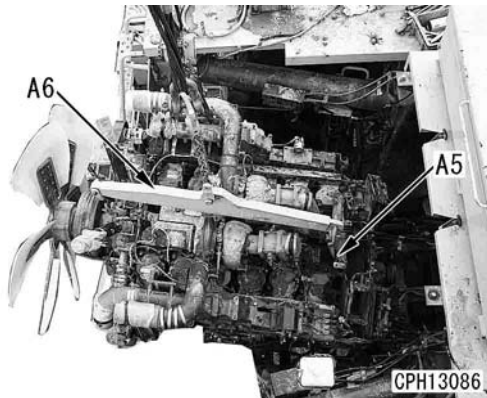
9. Removal of engine assembly.

- 1) Remove engine rear hanger, then install special tool **A5**.
- 2) Remove engine mounting bolt (front) (41) and mount rubber (42).
- 3) Remove engine mounting bolt (rear) (43) and mount rubber (44). [*3]



- 4) Sling engine assembly (45) with special tool **A6** and remove it forward.

 Engine assembly: **3,400 kg**



Installation

- Carry out installation in the reverse order to removal.
- Install the drive shaft. For details, see "Installation of front drive shaft".
- Install the radiator assembly. For details, see "Installation of radiator assembly".

[*1] [*2]

-  Air cleaner rubber elbow clamp and elbow clamp on turbocharger side of air duct:

8.8 Nm {90 kgm}

[*3]

-  Engine mounting bolt:

343 – 427 Nm {35 – 43.5 kgm}

[*4]

- ★ When installing the engine assembly, set cushions (42) and (44).
- ★ Referring to the "Installation of front drive shaft" for aligning the engine assembly and torque converter and transmission assembly, align them.

- **Refilling with coolant**

Add coolant to the brim of the coolant filler. Run the engine to circulate the coolant and then check the coolant level in the reservoir tank.

- **Refilling with oil**

Add oil to the specified level. Run the engine to circulate the oil and then check the oil level.

HD785-7 Dump truck

Form No. SEN01952-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

50 Disassembly and assembly

Power train, Part 1

Removal and installation of front drive shaft	2
Removal and installation of torque converter and transmission assembly	4
Disconnection and connection of torque converter and transmission assembly	7
Disassembly and assembly of torque converter and PTO assemblies	14
Disassembly and assembly of transmission assembly	26

Removal and installation of front drive shaft

Special tools

Symbol	Part No.	Part name	Necessity	Q'ty	New/Remodel	Sketch
C1	792-620-1400	Centering tool	■	1	N	

Removal

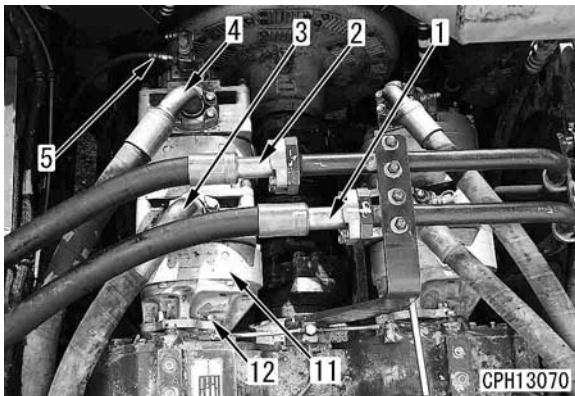
⚠ Stop the machine in a level place. Set the parking brake switch to "PARK" and put chocks under the tires.

⚠ Raise the body and apply lock pin to fix.

★ Drain the oil from the hydraulic tank.

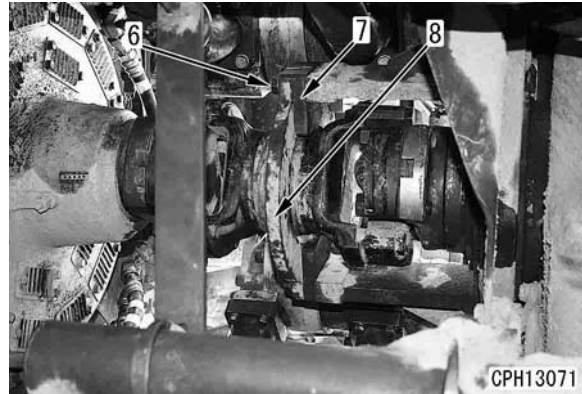
🛢 Quantity of oil in hydraulic tank: 270 ℓ

1. Remove the steering hoist pump assembly.
 - 1) Disconnect hoses (1) and (2) from the torque converter and transmission pumps.
 - ★ Install a plug to split flange to prevent foreign matters from entering.
 - 2) Disconnect hoses (3) and (4) from the steering hoist pumps.
 - ★ Install a plug to split flange to prevent foreign matters from entering.
 - 3) Disconnect hose (5) from SAR006 pump.
 - ★ Put the cap to taper seal to prevent foreign matters from entering.

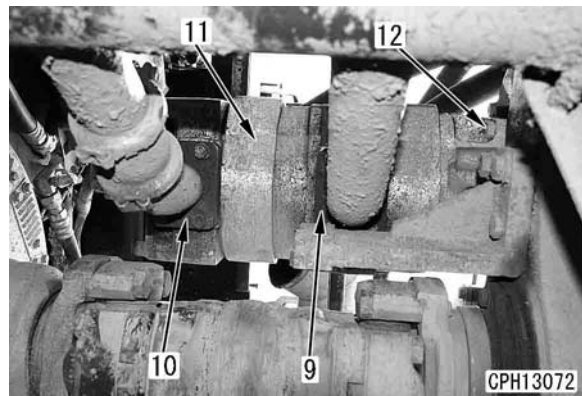


- 4) Loosen the mounting bolt (6) of drive shaft guard. Support the guards (7) and (8) with a sling belt to prevent falling. Remove the mounting bolt (6). Remove the guards by lowering the belt.

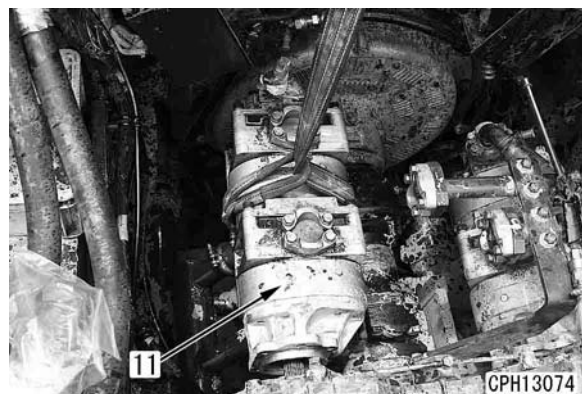
🛢 Drive shaft guard: 5 kg



- 5) Remove suction tubes (9) and (10) of the steering hoist pump assembly.



- 6) Sling the steering hoist pump assembly with a belt to remove the mounting bolt (12) and remove pump assembly (11).



2. Removal of front drive shaft

- 1) Sling front drive shaft (15) and remove cross joint bolt (14). Disconnect the cross joint key portion (13) by prying with a bar.

[*1][*2]

 Drive shaft assembly: **45 kg**



Installation

Carry out installation in reverse order of removal.

[*1] [*2]

- ★ Before tightening the mounting bolts, check that the key way of the spider cap is fitted securely to the key way of the mating yoke.

[*1]

 Mounting bolt:

Liquid adhesive (Loctite -2)

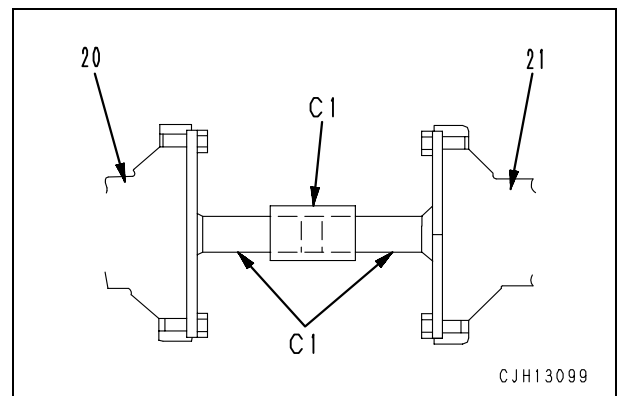
 Mounting bolt: **490 – 608 Nm {50 – 62 kgm}**

- ★ Align the engine assembly and the torque converter and transmission assembly as instructed below:

1. Install the flange and collar of tool **C1** to between the coupling (20) on the engine side and the coupling (21) on the torque converter side.

2. Align both flanges by adjusting the torque converter and transmission assembly to ensure that the collar move between the two flanges smoothly while the coupling (21) on the side of torque converter makes one rotation.

Reference: Allowable range of dislocation between the two flanges shall be 3 mm maximum vertically and laterally.



Removal and installation of torque converter and transmission assembly

Special tools

Sym-bol	Part No.	Part name	Necessity	Q'ty	New/Remodel	Sketch
C1	792-620-1400	Centering tool	■	1	N	

Removal

⚠ Stop the machine in a level place. Set the parking brake switch to "PARK" and put chocks under the tires.

⚠ Raise the body and apply lock pin to fix.

⚠ Disconnect the cable from the negative (-) terminal of the battery.

★ Drain the transmission oil and hydraulic oil.

🛢 Transmission case: **368 ℓ**

🛢 Quantity of oil in hydraulic tank: **270 ℓ**

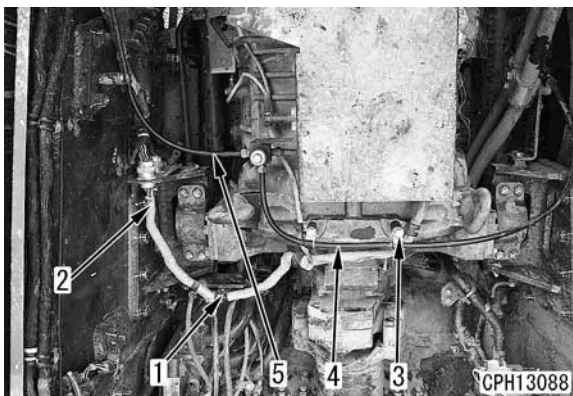
1. Remove transmission underguard.

🛢 Underguard: **120 kg**

2. Remove front drive shaft by referring to the "Removal of front drive shaft."

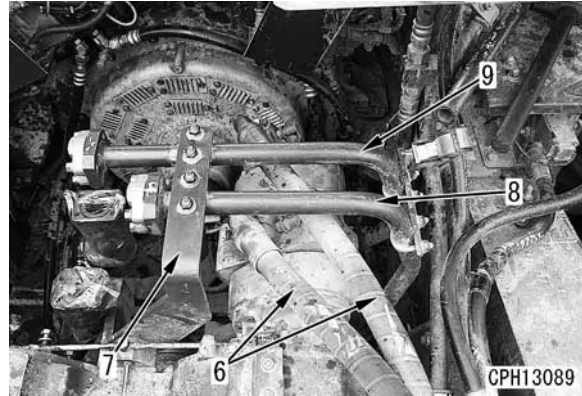
3. Remove wiring clamp (1) and disconnect wiring connectors (2) (TM2 and TM3).

4. Remove breather hose clamp (3) and disconnect hoses (4) and (5).

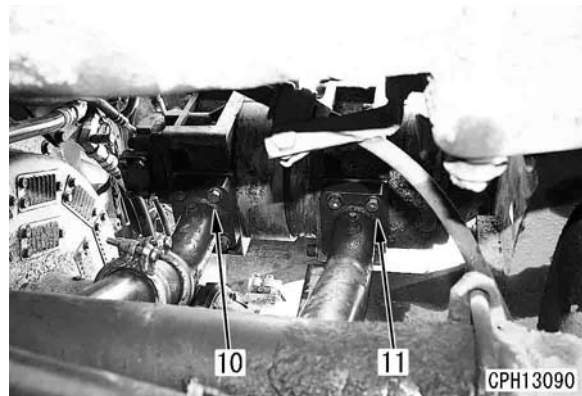


5. Disconnect the brake cooling pump high-pressure hose (6).

6. Remove the high-pressure hose mounting bracket (7) of the torque converter and transmission brake control pump. Remove high-pressure hoses (8) and (9) from the pump.

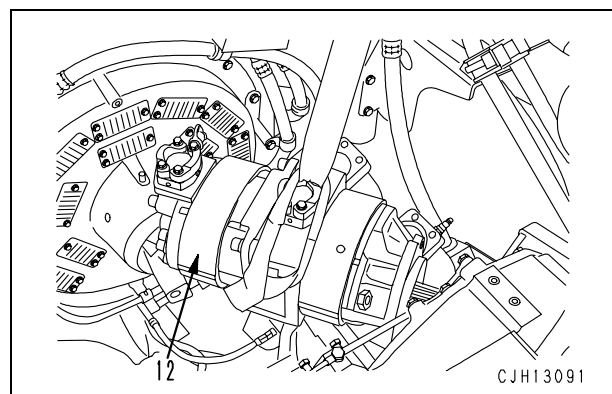


7. Disconnect brake cooling pump suction piping (10) and (11).



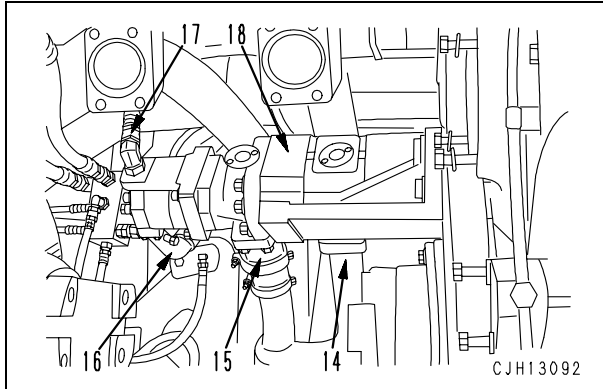
8. Sling the brake cooling pump. Remove the mounting bolt and remove pump (12).

🛢 Brake cooling pump: **45 kg**



9. Removal of torque converter and transmission brake control pump piping and hoses

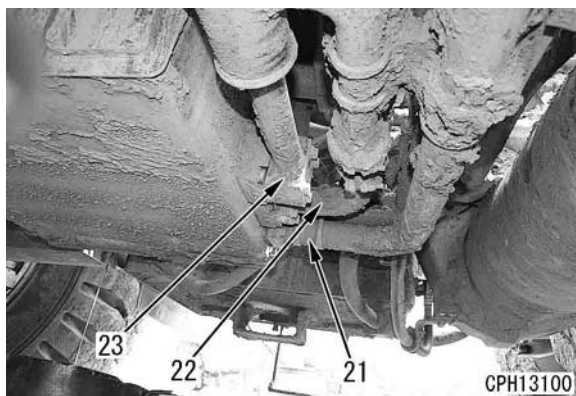
- 1) Remove tubes (14) and (15) on the pump suction side.
- 2) Remove the brake control suction tube (16) and remove the hose (17) on the high-pressure side.
- 3) Remove the torque converter and transmission brake control pump (18).



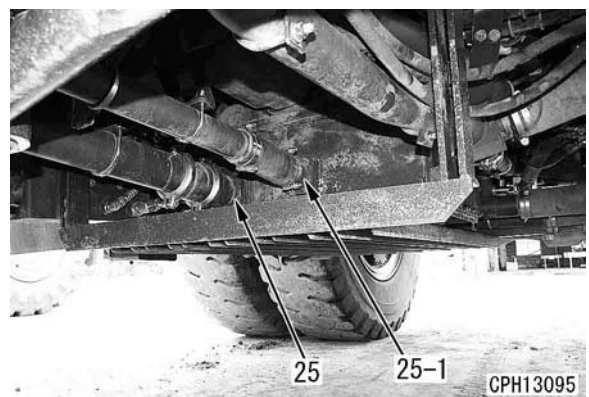
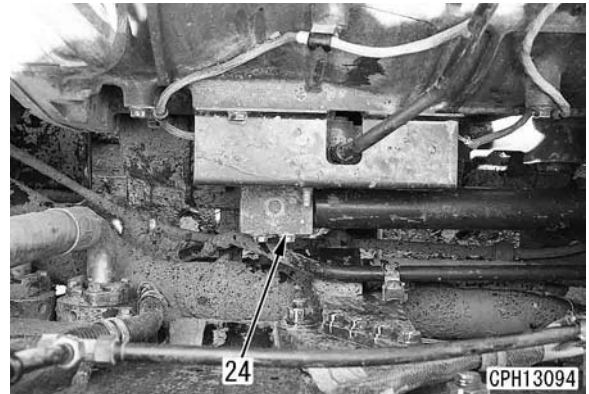
10. Disconnect split flanges at the joint section to the piping of torque converter valve hoses (19) and (20).



11. Disconnect tubes (21) and (22) connecting to the transmission oil pan. Disconnect tube (23) connecting to the transmission case.



12. Remove tubes (24), (25) and (25-1) connecting to the front of transmission oil pan.



13. Disconnection of rear drive shaft

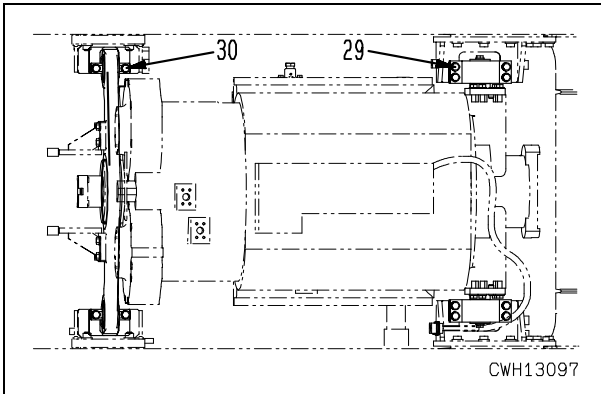
- 1) Temporarily sling rear drive shaft (26) and remove the mounting bolts (27). [*1]
- 2) Pry the cross joint key (28) with a bar to contract and disconnect the drive shaft.



14. Remove the rear mount bracket mounting bolts (29). [*2]

★ Temporarily retain the shim with a mount bolt to prevent missing.

15. Temporarily sling the torque converter and transmission assembly and remove the front mount bracket bolts (30). [*3]



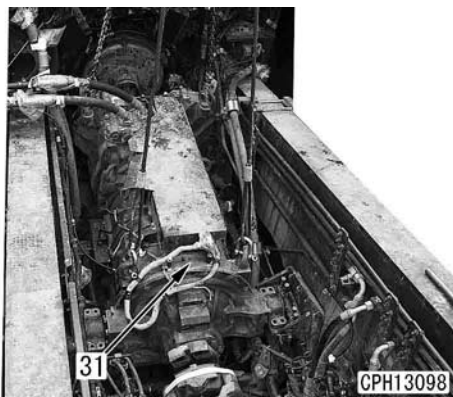
16. Sling and remove the torque converter and transmission assembly (31).

★ When removing the engine assembly, check that no wires and pipes are connected to the chassis and remove the assembly carefully avoiding interference with the chassis.

★ Check the number and thickness of shims installed to the rear mount.

- Standard shim thickness: 2 mm
- Shim thickness and type: 0.5 mm (one type only)

 Torque converter and transmission assembly: **2,500 kg**



Installation

- Carry out installation in reverse order of removal.

[*1]

- ★ Degrease and dry bolts. Apply LT-2 and tighten the coupling.
- ★ Before tightening the mounting bolts, check that the key way of the spider cap is fitted securely to the key way of the mating yoke.

 Mounting bolt: **Liquid adhesive (LT -2)**

 Mounting bolt:

343 – 427 Nm {35 – 43.5 kgm}

[*2] [*3]

- ★ Degrease and dry bolts. Apply LT-2.

 Mounting bolt: **Liquid adhesive (LT -2)**

 Mounting bolt:

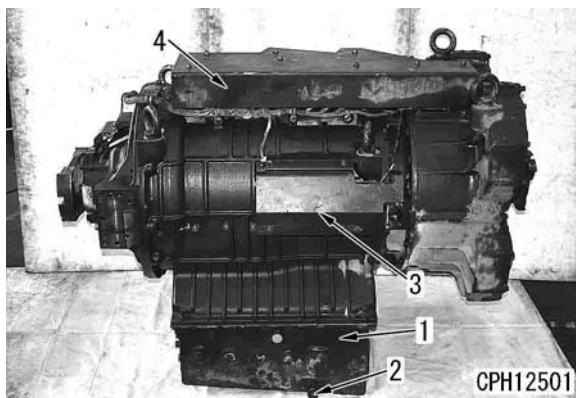
147 – 309 Nm {15 – 31.5 kgm}

Disconnection and connection of torque converter and transmission assembly

Disconnection

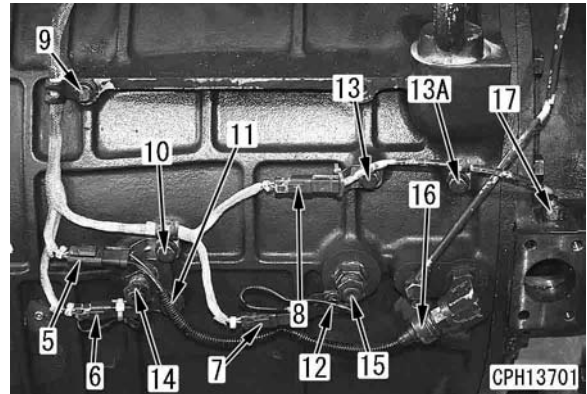
- ★ Remove the oil pump assembly in advance.
- ★ Take note of connector numbers and connecting positions for the wire harness connectors.

1. Sling the torque converter and transmission assembly horizontally.
2. Loosen drain plug (2) of oil pan (1) to drain oil.
3. Remove covers (3) and (4).



4. Disconnect wiring harness connectors (5) to (8).
 - (5) T/C. P
 - (6) N2
 - (7) N1
 - (8) T/C. T
5. Remove clamps (9) to (13A).
6. Remove intermediate shaft rotation sensor (14) and input shaft rotation sensor (15).
7. Remove torque converter oil pressure sensor (16).

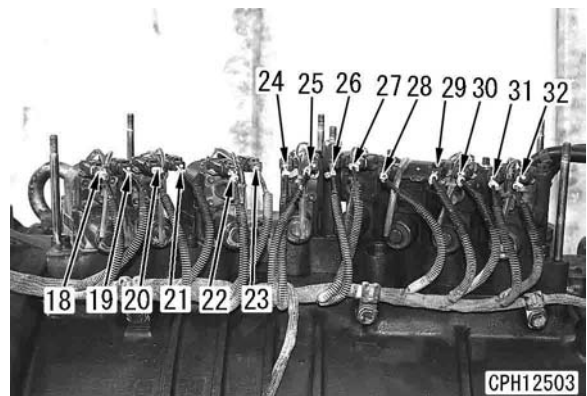
8. Remove torque converter oil pressure sensor (17).



9. Disconnect ECMV wiring harness connectors (18) to (32).

* Connector No. (from the left)

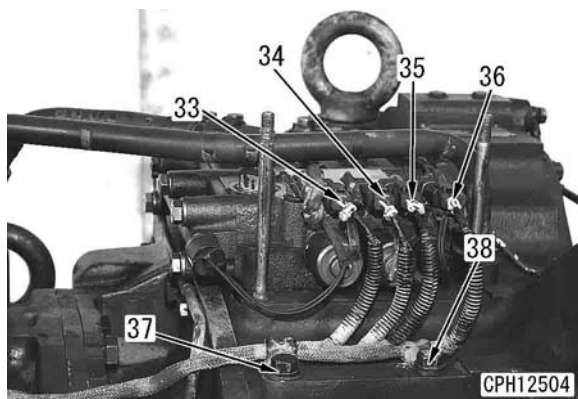
(18) 1. PS	(26) 4. PS
(19) 1. SW	(27) 4. SW
(20) 2. PS	(28) L/U. PS
(21) 2. SW	(29) L. PS
(22) 3. PS	(30) L. SW
(23) 3. SW	(31) H. PS
(24) R. PS	(32) H. SW
(25) R. SW	



10. Disconnect torque converter relief valve wiring harness connectors (33) to (36).

(33) M/P. SW
(34) M/P. PS
(35) VOL. PS
(36) VOL. SW

11. Disconnect clamps (37) and (38).



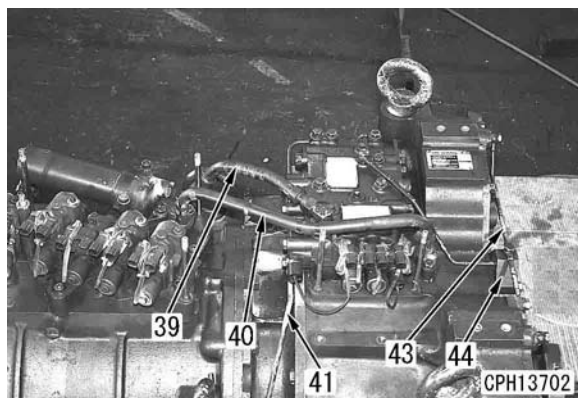
12. Remove tube (39).

13. Remove tube (40).

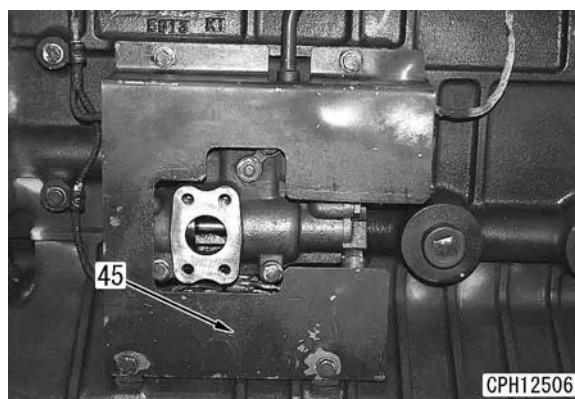
14. Remove tube (41).

15. Remove tube (43).

16. Remove lubrication tube block (44).



17. Remove cover (45).



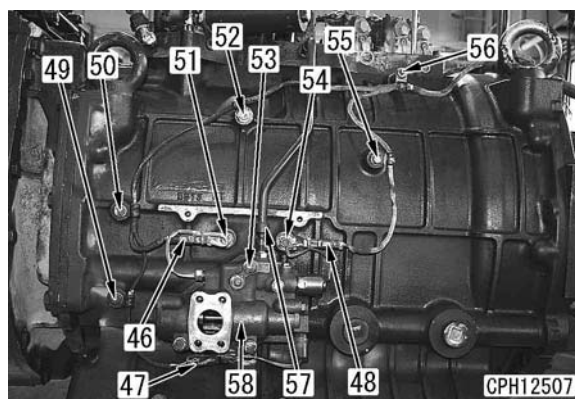
18. Disconnect wiring harness connectors (46), (47), and (48).

(46) T/M. T
(47) LUB. PS
(48) LUB. SW

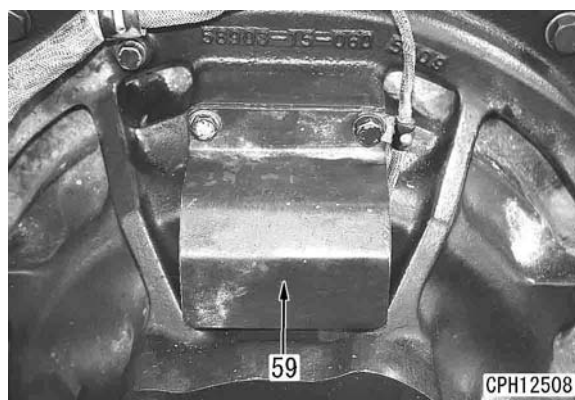
19. Disconnect clamps (49) to (56).

20. Remove tube (57).

21. Remove lubrication valve assembly (58).



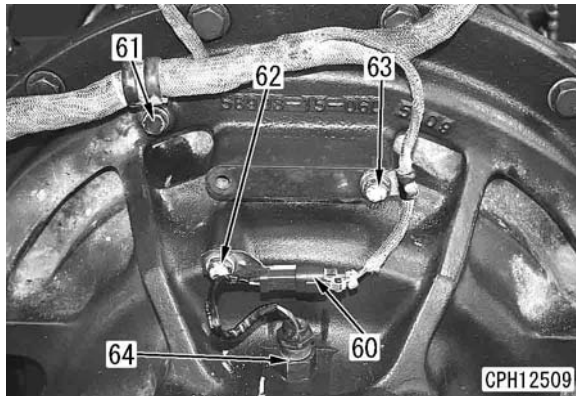
22. Remove cover (59).



23. Disconnect wiring harness connector (60).

24. Remove clamps (61) to (63).

25. Remove output shaft rotation sensor (64).

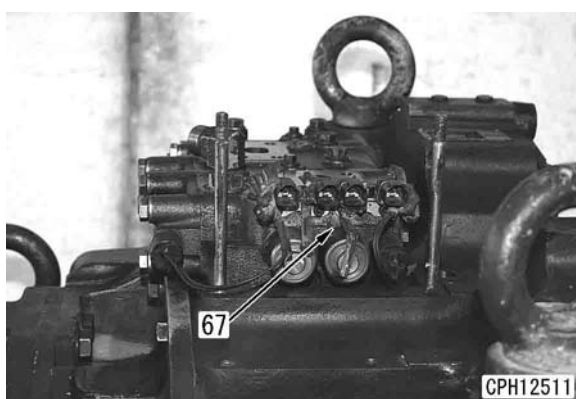


26. Remove oil filter (65).

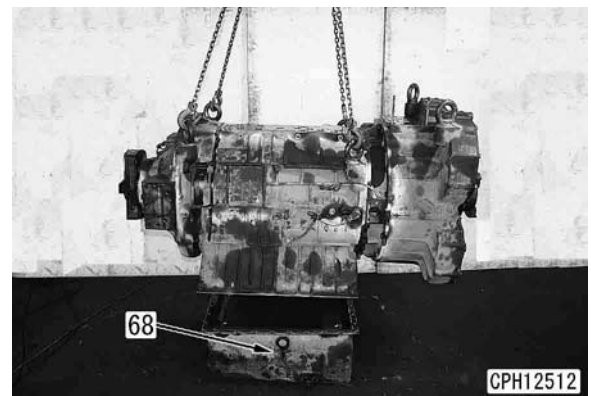
27. Remove ECMV assembly (66).



28. Remove torque converter relief valve (67).

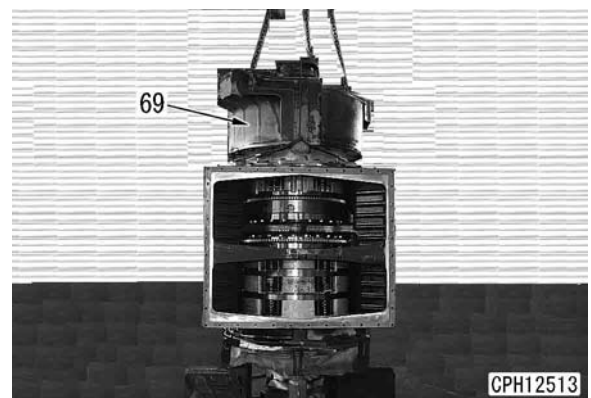


29. Remove oil pan (68).

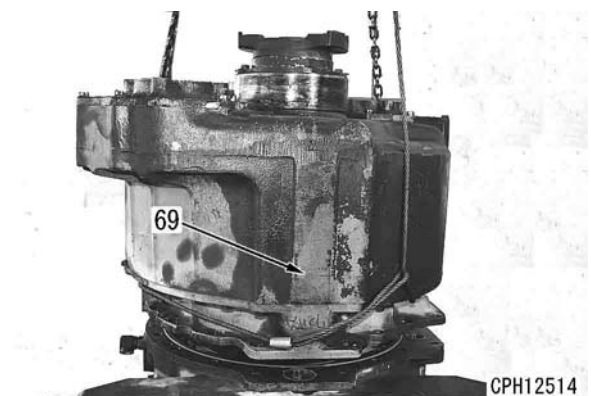


30. Set the assembly with torque converter and PTO assembly (69) upward.

- ★ Blocks placed to the left and right may not fully stabilize the assembly. Place a hydraulic jack to the front and rear of the assembly. Adjust height with the hydraulic jacks to make whole the assembly stable.

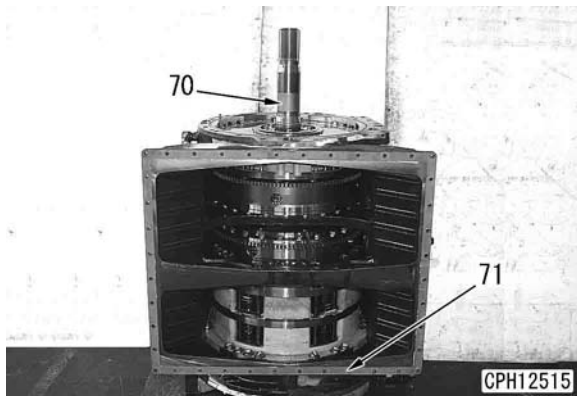


31. With the torque converter and PTO assembly (69) slung temporarily, remove the mounting bolts, sling and remove the torque converter and PTO assembly.

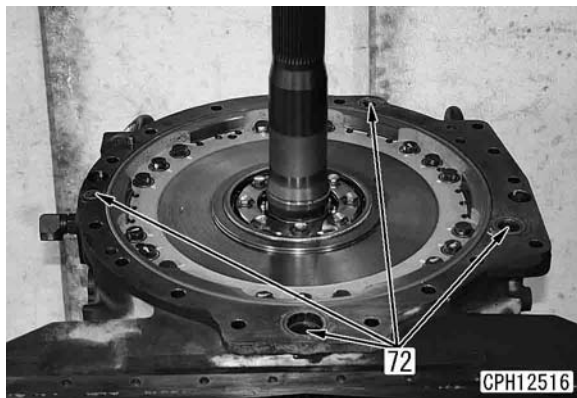


Connection

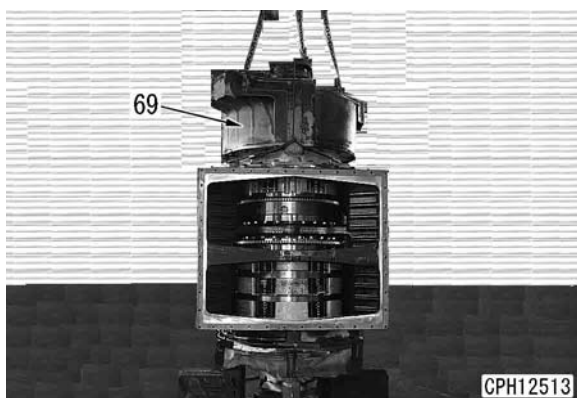
1. With transmission input shaft (70) pointing upward, set the transmission assembly (71) in stable condition.



2. Install O-rings (72) to the connecting face with the torque converter assembly.



3. With the torque converter and PTO assembly (69) slung temporarily, install mounting bolts (73).



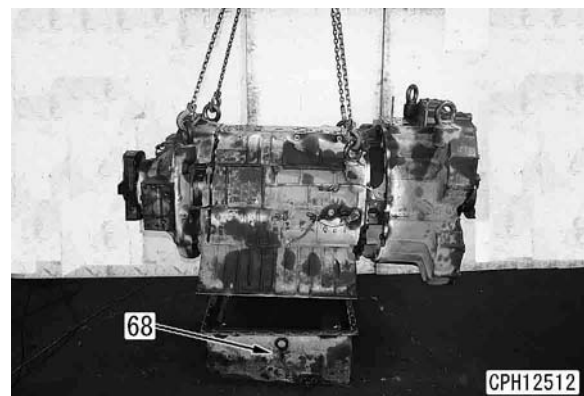
4. Place oil pan assembly (68) level and install gasket (74).

Adhesive: **LG-1**



5. Lay down the torque converter and transmission assembly and install oil pan (68).

★ With the torque converter and transmission assembly temporarily slung, temporarily install bolts (40 bolts), then lower the assembly to the floor and tighten the bolts with a specified torque.

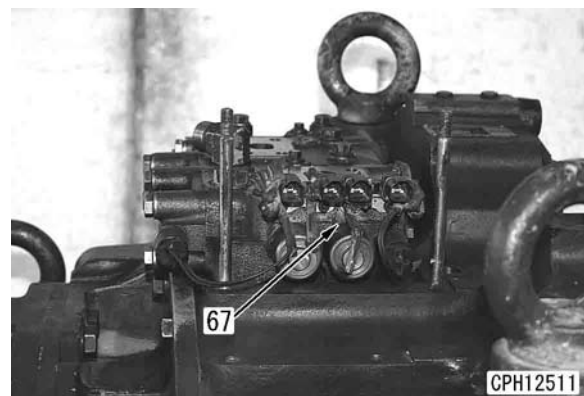


6. Install torque converter relief valve assembly (67).

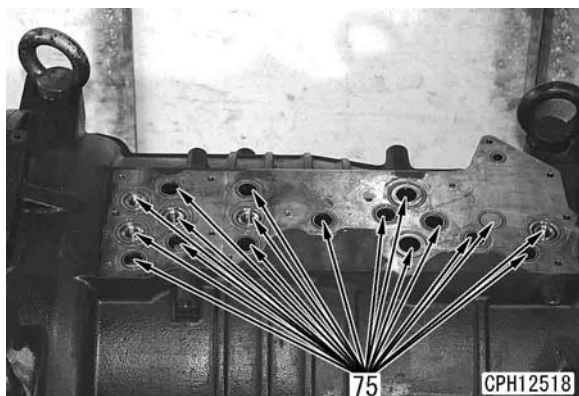
★ Replace the gasket with new one.
★ When tightening the bolt, take care not to damage the lead wire.

Mounting bolt:

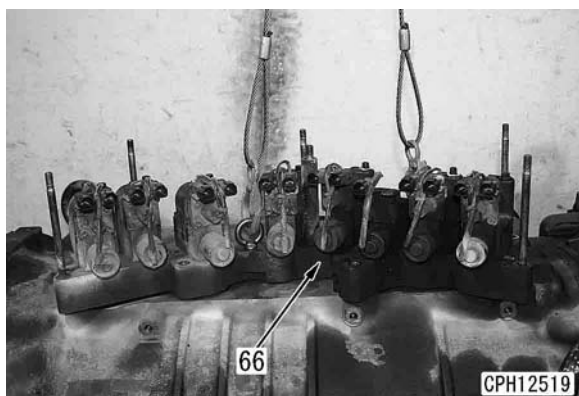
44.1 – 53.9 Nm {4.5 – 5.5 kgm}



7. Install O-ring (75) to the mounting face of ECMV assembly (66) on the transmission side.



8. Sling and install ECMV assembly (66).
 ☞ Mounting bolts: **Gasket sealant (LG-5)**



9. Install oil filter (65).



10. Install output shaft rotation sensor (64).
 ★ Clearance adjustment method between gear and rotation sensors
 Allow the sensor to make light contact with the gear. Reverse by 1/2 to 1 rotation from this position. Tighten with lock nuts.

☞ Sensor threaded portion:

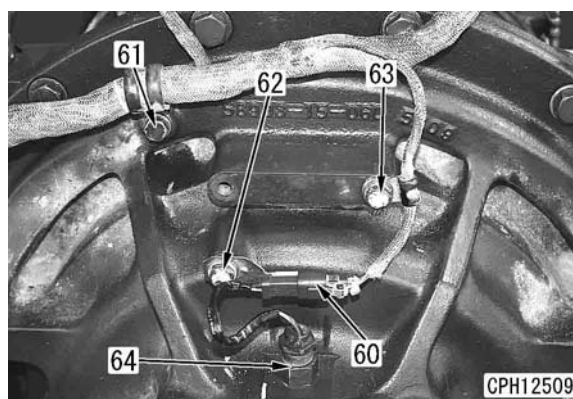
Gasket sealant (LG-5)

☞ Mounting bolt:

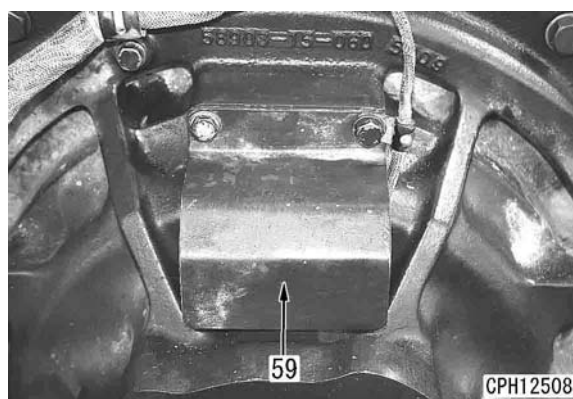
49.0 – 68.6 Nm {5.0 – 7.0 kgm}

11. Install wiring harness connector (60).

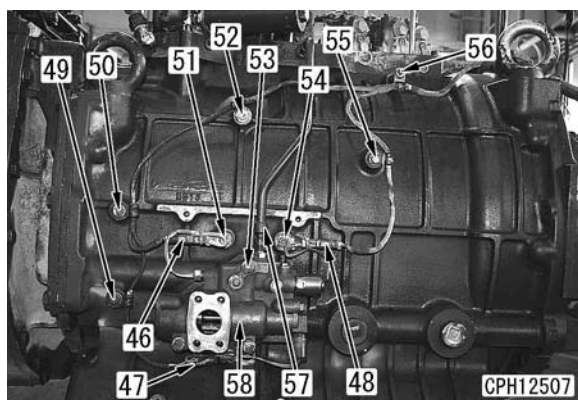
12. Install clamps (61) to (63).



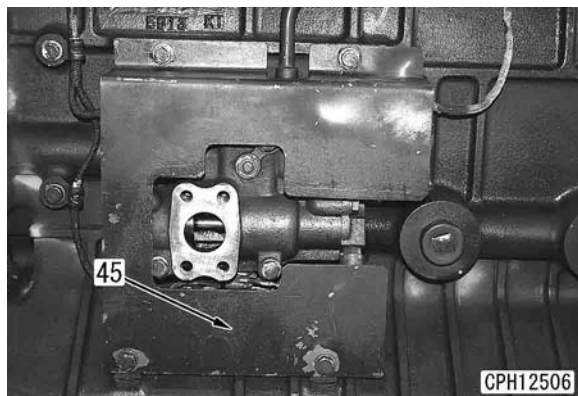
13. Install cover (59).



14. Install lubrication valve assembly (58).
 Mounting bolt:
44.1 – 53.9 Nm {4.5 – 5.5 kgm}
15. Install tube (57).
 Mounting nut:
54.0 – 78.0 Nm {5.5 – 8.0 kgm}
16. Install clamps (49) to (56).
 ★ Clamp (56) has a spacer and uses bolts of different lengths. Take care.
17. Install wire harness connectors (46), (47), and (48).
 (46) T/M. T
 (47) LUB. PS
 (48) LUB. SW



18. Install cover (45).

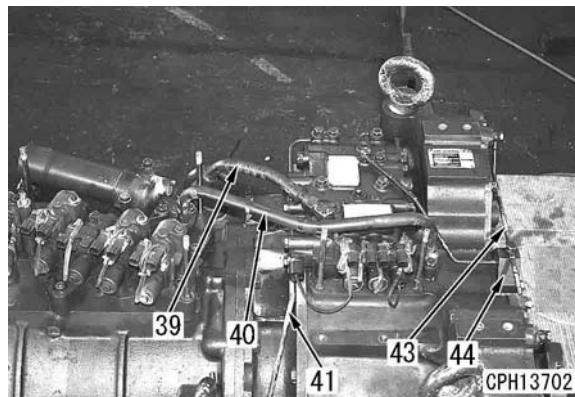


19. Install lubrication tube block (44).
 Mounting bolt:
19.6 – 29.4 Nm {2.0 – 3.0 kgm}
20. Install tube (43).
 Mounting bolt:
19.6 – 29.4 Nm {2.0 – 3.0 kgm}

21. Install lubrication tube (41).
 Mounting bolt:
19.6 – 29.4 Nm {2.0 – 3.0 kgm}

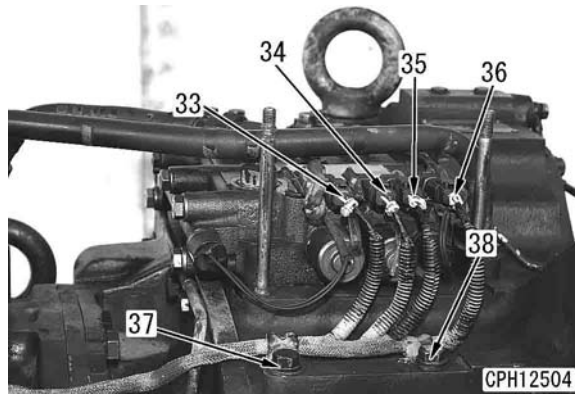
22. Install tube (40).

23. Install tube (39).



24. Install wiring harness connectors (33) to (36) of the torque converter relief valve .
 (33) M/P. SW
 (34) M/P. PS
 (35) VOL. PS
 (36) VOL. SW

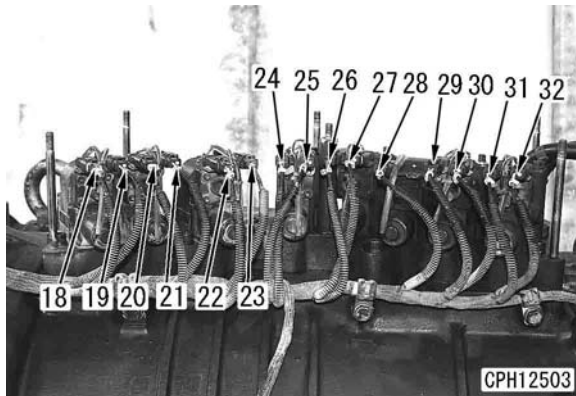
25. Install clamps (37) to (38).



26. Install ECMV wiring harness connectors (18) to (32).

* Connector No. (from the left)

(18) 1. PS	(26) 4. PS
(19) 1. SW	(27) 4. SW
(20) 2. PS	(28) L/U. PS
(21) 2. SW	(29) L. PS
(22) 3. PS	(30) L. SW
(23) 3. SW	(31) H. PS
(24) R. PS	(32) H. SW
(25) R. SW	



27. Install torque converter oil pressure sensor (17).

 Sensor threaded portion:

Gasket sealant (LG-5)

 Mounting nut:

29.4 – 49.0 Nm {3.0 – 5.0 kgm}

28. Install torque converter oil pressure sensor (16).

Elbow: **84 – 132.0 Nm {8.5 – 13.5 kgm}**

Sensor: **29.4 – 34.3 Nm {3.0 – 3.5 kgm}**

29. Remove intermediate shaft rotation sensor (14) and input shaft rotation sensor (15).

★ Clearance adjustment method between the gear and rotation sensors

Allow the sensor to make light contact with the gear. Reverse by 1/2 to 1 rotation from this position. Tighten with lock nuts.

 Sensor threaded portion:

Gasket sealant (LG-5)

 Mounting bolt:

49.0 – 68.6 Nm {5.0 – 7.0 kgm}

30. Install clamps (9) to (13A).

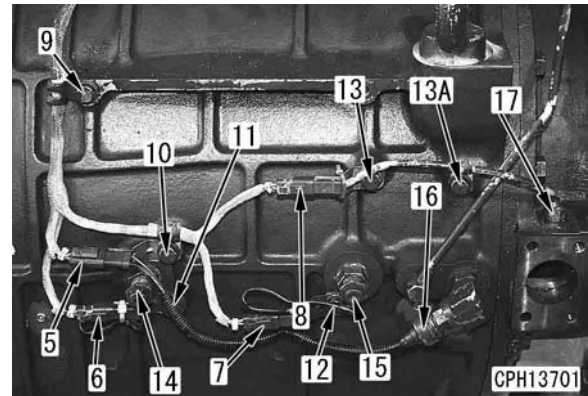
31. Install wiring harness connectors (5) to (8).

(5) T/C. P

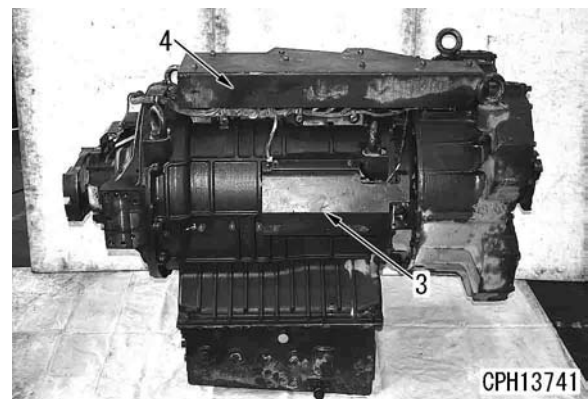
(6) N2

(7) N1

(8) T/C. T



32. Install covers (3) and (4).



Disassembly and assembly of torque converter and PTO assemblies

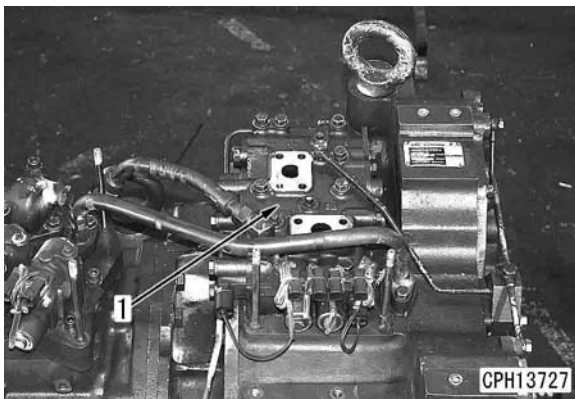
Special tools

Sym-bol	Part No.	Part name	Necessity	Q'ty	New/Remodel	Sketch
C	2	790-413-1131	Nut wrench	■	1	
	3	791-346-1400	Wrench	■	1	
	4	792-413-1131	Installer	■	1	N

Disassembly

1. Relief valve assembly

Remove the attached parts and relief valve assembly (1) by referring to the "Disconnection and connection of torque converter and transmission assembly."



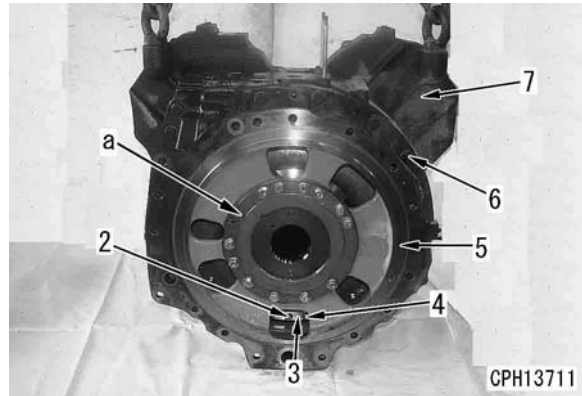
2. Remove drain plug (2) to drain oil.

3. Remove the mounting bolts (4) of the pump assembly (3).

- ★ Remove the pump assembly mounting bolts at this point, or it will be difficult to do so since the torque converter housing assembly (6) will face downward when removing PTO assembly (5).

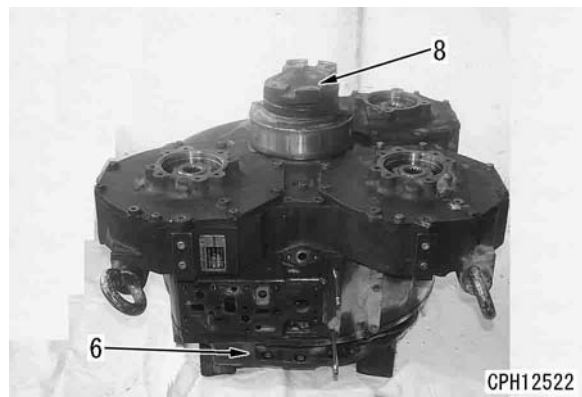
4. Remove the PTO assembly mounting bolts (7) by leaving 4 bolts evenly spaced.

- ★ Because loosening bolts becomes difficult when the assembly is placed with the PTO assembly on the top.
- ★ Remove orifice plug (a) so that it will not be broken.

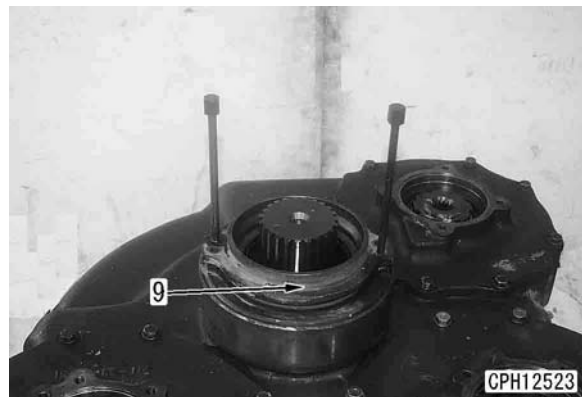


5. PTO assembly

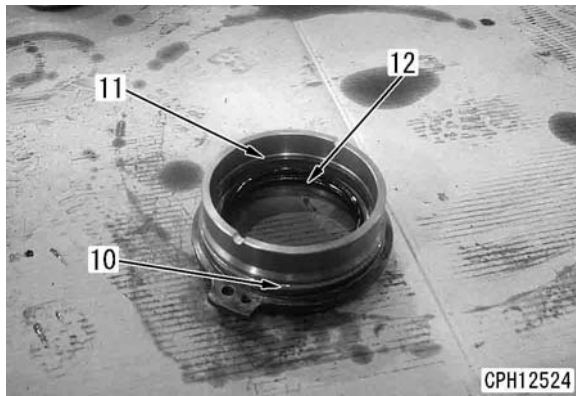
- 1) Set the assembly with torque converter housing assembly (6) facing downward.
- 2) Remove input coupling (8).



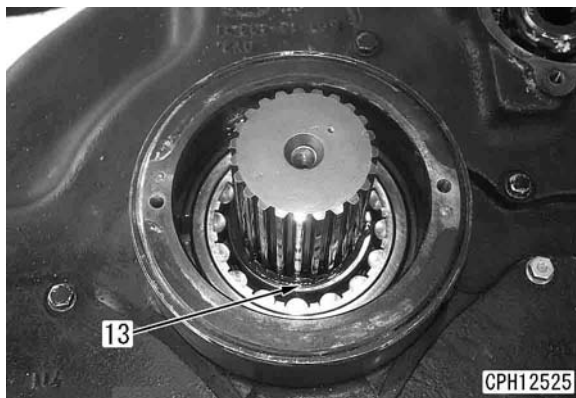
- 3) Pull out cage assembly (9) by using forcing screws.



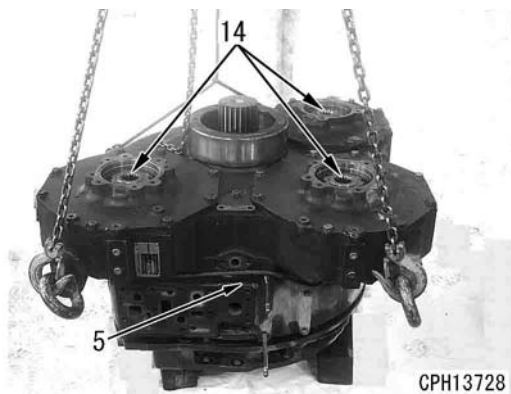
- 4) Disassembly of cage assembly
 - 1] Remove O-ring (10).
 - 2] Remove oil seal (11).
 - 3] Remove dust seal (12).



- 5) Remove snap ring (13).

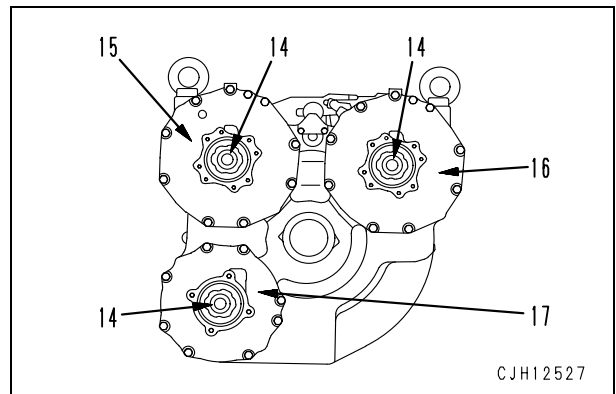


- 6) Nut
Lock the pump drive gear. Loosen nuts (14) using tool C3.
★ Loosen the nut at this point as it will be difficult to do so after removing the pump drive gear assembly.
- 7) Remove the remaining 4 bolts of PTO assembly mounting bolts.
- 8) Disconnect the PTO assembly (5) from the rear cover assembly using forcing screw.
- 9) Sling and remove the PTO assembly.



6. Disassembly of PTO assembly

- 1) Remove the pump drive gear cage assemblies (15), (16) and (17) using the forcing screw.

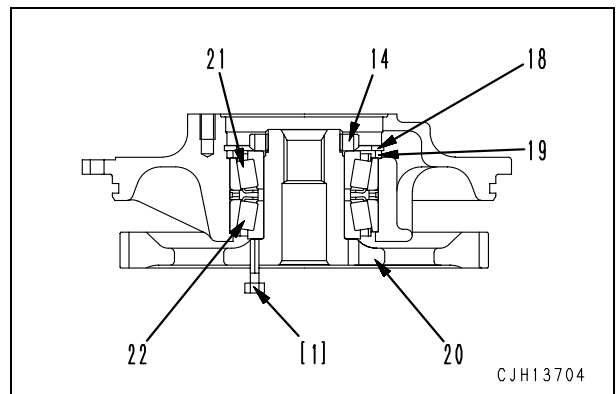


- 2) Disassembly of pump drive gear cage assembly

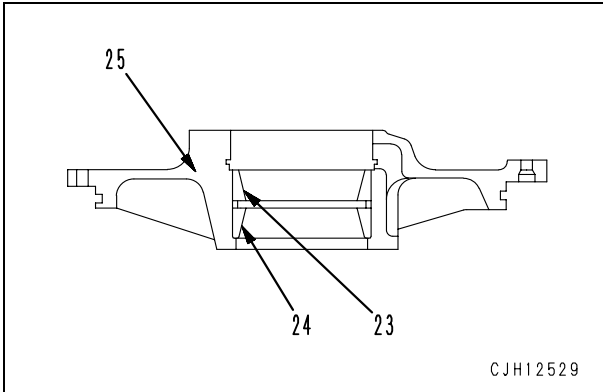
★ Disassembly procedure is given on pump drive gear cage (15). Follow the same procedure for (16) and (17).

★ When reusing the bearing, check the bearing position and match mark.

- 1] Remove nut (14).
- 2] Remove snap ring (18) and remove plate (19).
- 3] Use a forcing screw [1] to remove gear (20).
- 4] Remove bearings (21) and (22).

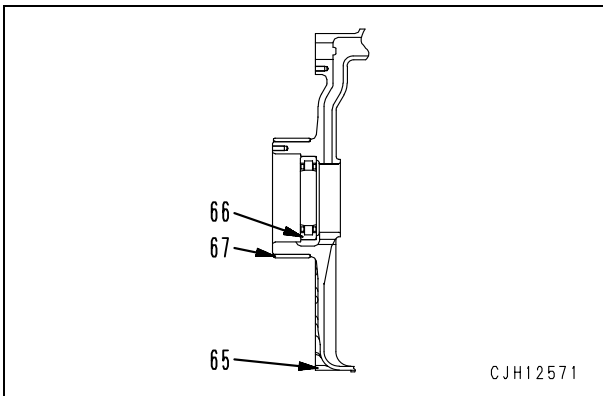


- 5] Use push tool to remove outer races (23) and (24) from cover (25).



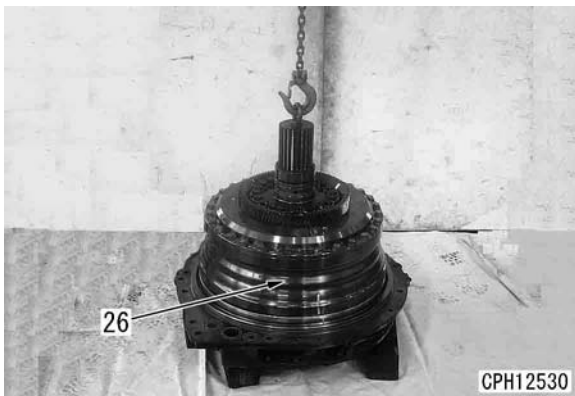
7. Disassembly of PTO case

Remove bushing (67) and outer race (66) from PTO case (65).



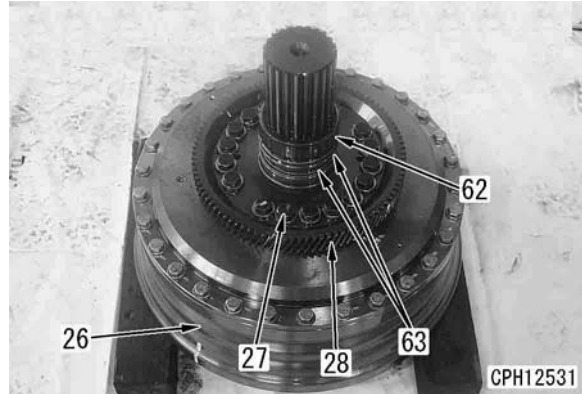
8. Turbine clutch assembly

Remove turbine clutch assembly (26).



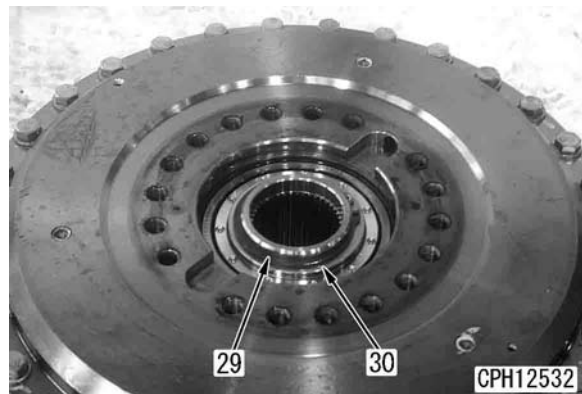
9. Disassembly of turbine clutch assembly

- 1) Drive gear assembly
 - 1] Remove gear mounting bolts (27).
 - 2] Remove the drive gear assembly (28) using the forcing screw.
 - 3] Remove seal ring (63).
 - 4] Remove inner race (62).



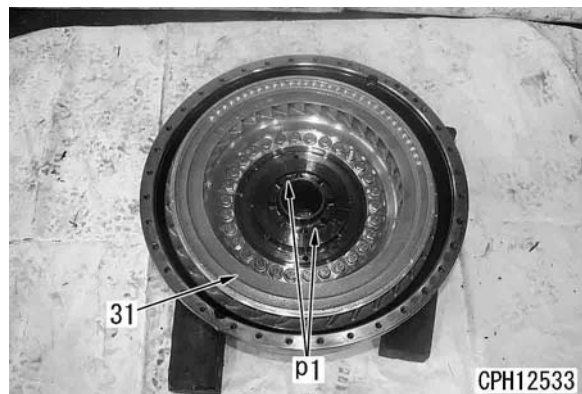
2) Turbine assembly

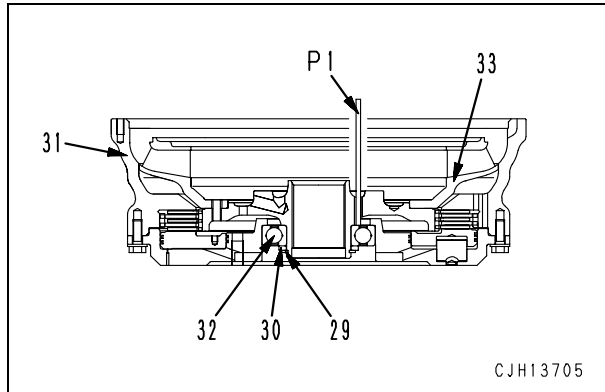
- 1] Remove snap ring (29) and remove spacer (30).



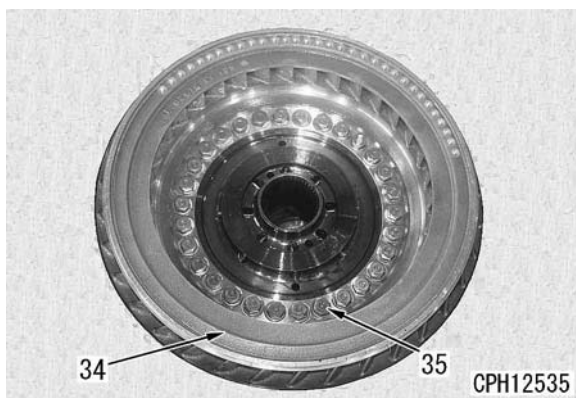
- 2] Reverse turbine clutch assembly (31). Hammer out the bearing inner race (32) from the holes (p1) on the boss to remove turbine assembly (33).

★ Place blocks of about 50 mm high under the turbine boss section.



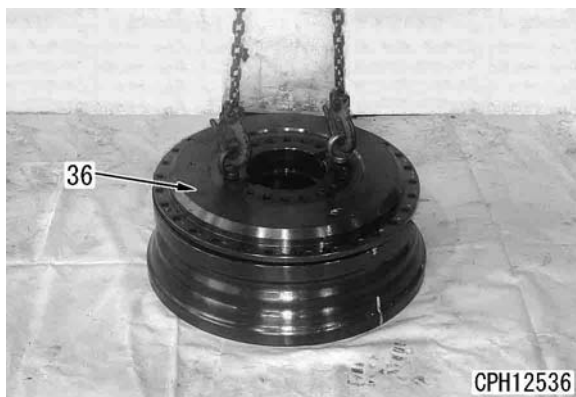


- 3] Remove inner gear mounting bolts (35) from the turbine (34).

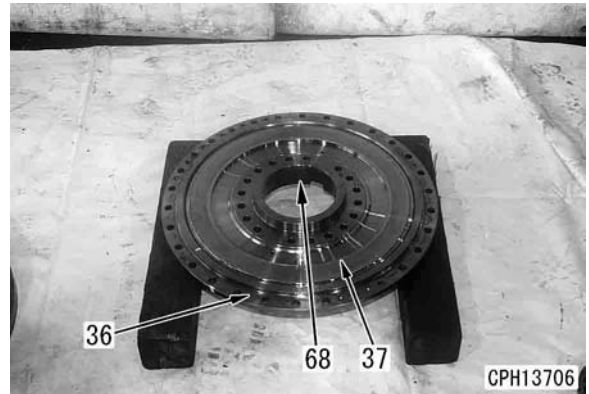


3) Housing

- 1] Remove the housing assembly (36) with the housing facing upward.

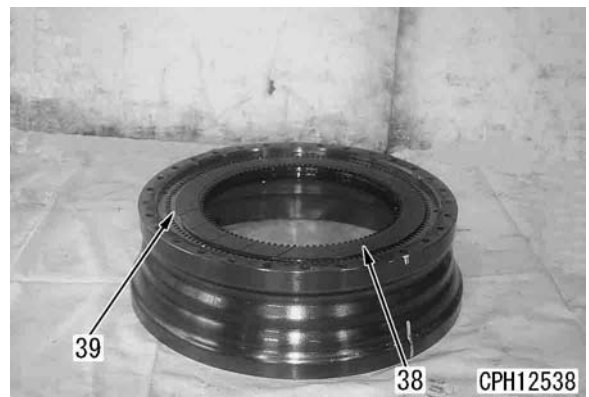


- 2] Remove piston (37) and bearing (68) from the housing (36).



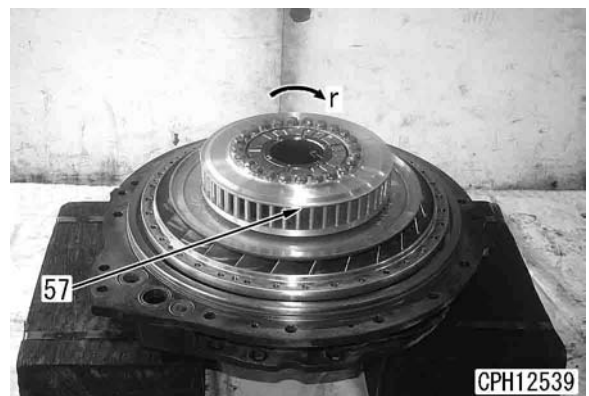
4) Disc and plate

- Remove disc (38) and plate (39).



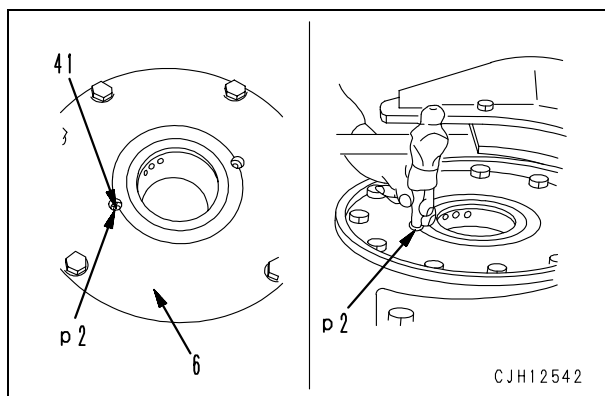
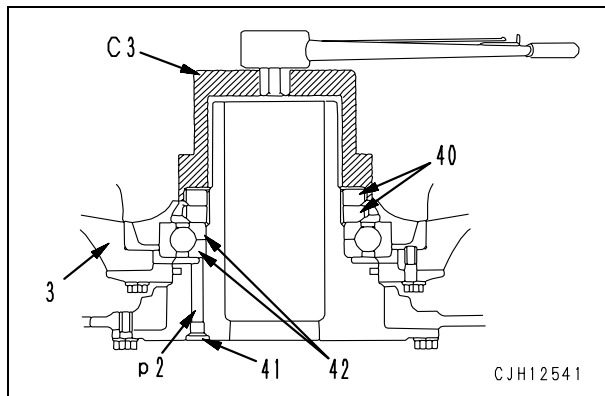
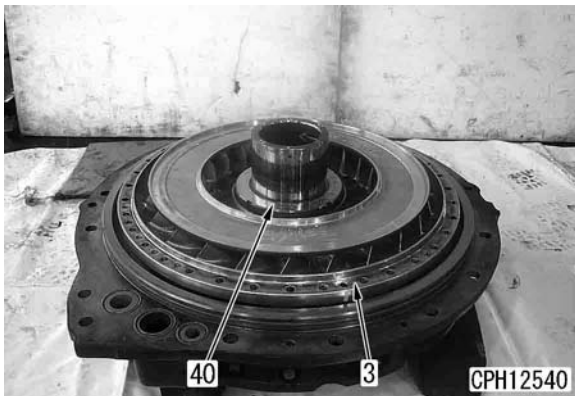
10. Stator

- Turn stator assembly (57) clockwise, pull up and remove.



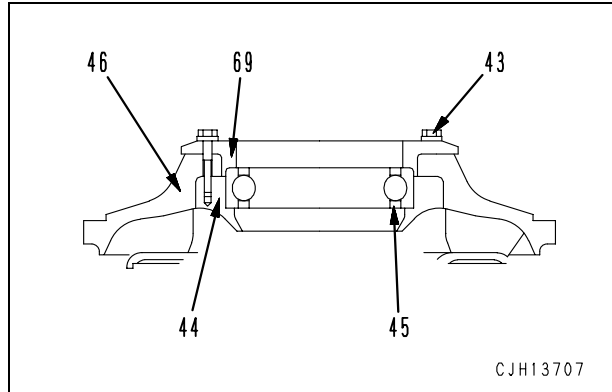
11. Pump assembly

- 1) Use tool **C3** to remove nut (40).
- 2) Reverse the pump and torque converter housing assembly and place the assembly down.
 - ★ Place blocks of about 200 mm high under the torque converter housing.
 - ★ Since the pump assembly falls down, place some soft stuff to cover the area of falling.
- 3) Remove plug (41). Hammer inner race (42) through this hole (p2) to let pump assembly (3) fall.
- 4) Sling torque converter housing (6) to remove pump assembly (3).



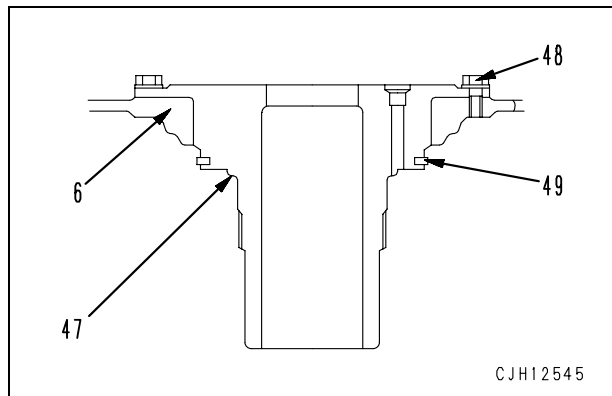
5) Disassembly of pump assembly

- 1] Remove retainer (69) mounting bolts (43).
- 2] Remove retainer (69).
- 3] Remove guide (44).
- 4] Remove bearing (45) from pump (46).



12. Shaft

- 1) Remove shaft (47) and mounting bolts (48).
- 2) Reverse and install the torque converter housing assembly (6).
- 3) Hammer and remove shaft (47).
- 4) Remove seal ring (49).
 - ★ This procedure is not required if the shaft is not to be replaced.

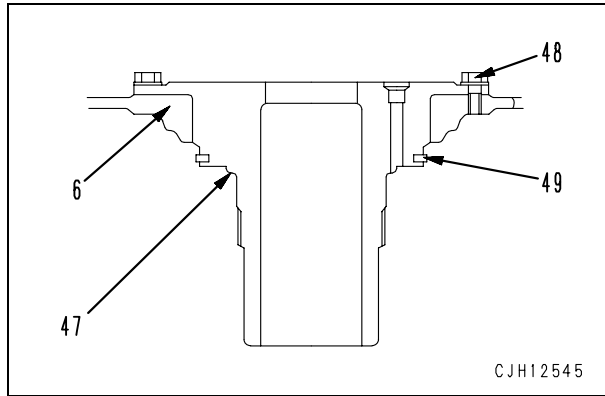


Assembly

1. Shaft

- 1) Install torque converter housing (6).
 - ★ Height of the block is about 200 mm.
- 2) Install seal ring (49).
- 3) Install shaft (47).
 - 🔧 Mounting bolt:

98 – 123 Nm {10.0 – 12.5 kgm}

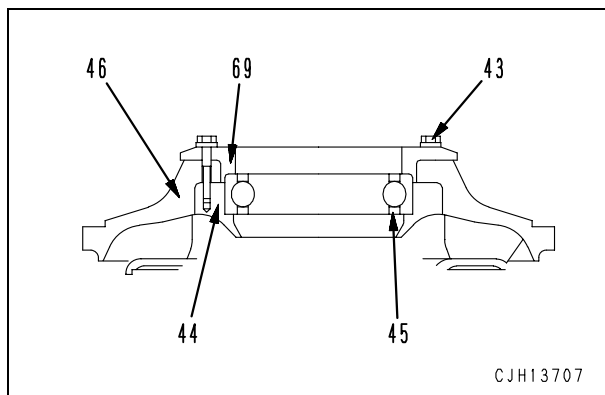


- 4) Reverse and install the shaft and torque converter housing assembly.

2. Pump assembly

- ★ Install the assembly by carefully checking the serial number and the direction of the match mark provided on the end face of the bearing and inner race.
- 1) Assemble the pump assembly in the following procedure:
 - 1] Install bearing (45) to guide (44).
 - ★ Install by holding the face indicating the serial number in front.
 - 2] Install pump (46).
 - 3] Install retainer (69) and tighten bolt (43).
 - 🔧 Mounting bolt:

59 – 74 Nm {6.0 – 7.5 kgm}



- 2) Install inner race (42) to shaft (47).
 - ★ Install by matching surface (b) having match mark "A" indicated on the end face of inner race (42) to match mark "A" indicated on surface (a) of bearing (45) installed to guide (44).
- 3) Install pump assembly (3).
 - ★ Grease and fix seal ring (49) so that they protrude from the shaft evenly
- 4) Install remaining inner race (42).
- 5) Install nuts (40).
 - 🔧 Nut threaded portion:

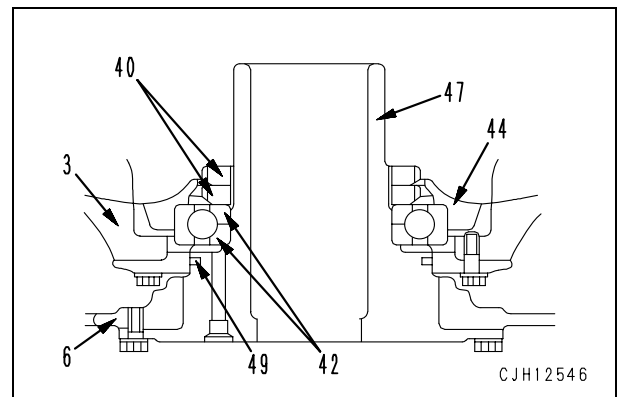
Adhesive (LT -2)

- 🔧 Nut on the bearing side (first nut to install):

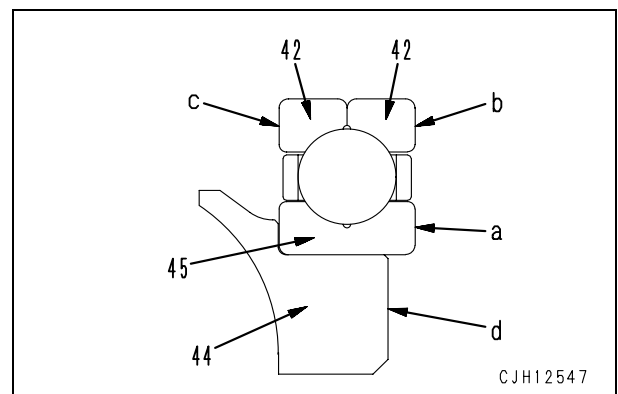
196 – 245 Nm {20.0 – 25.0 kgm}

- 🔧 Nut on the stator side (nut to install next):

441 – 490 Nm {45.0 – 50.0 kgm}

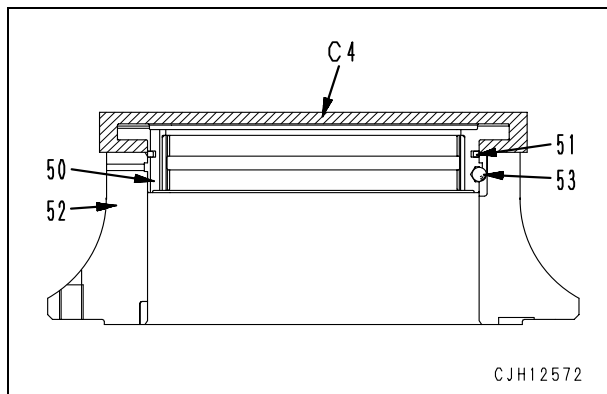


- ★ Symbol "A" is indicated on surface (a) of bearing (45).
- ★ Symbol "A" is indicated on surface (b) of inner race (42).
- ★ Same serial number is indicated on surfaces (a), (b) and (c) of the inner race bearing.

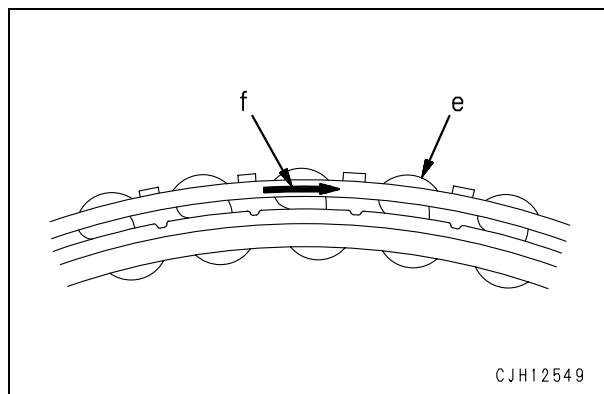
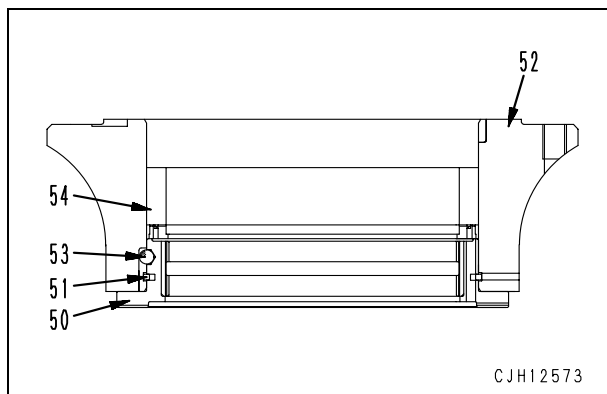


3. Assembly of stator assembly

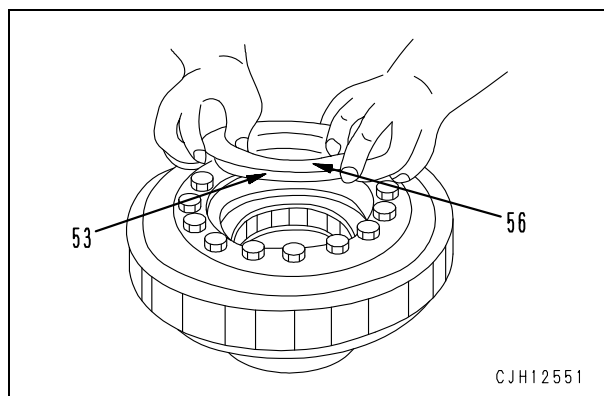
- 1) Chill bushing (50) in dry ice etc.
- 2) Install ball (53) and snap ring (51) to bushing (50).
- 3) Using the tool **C4**, insert bushing (50) in outer race (52) until snap ring (51) catches outer race (52), while holding snap ring (51) to prevent it from expanding.



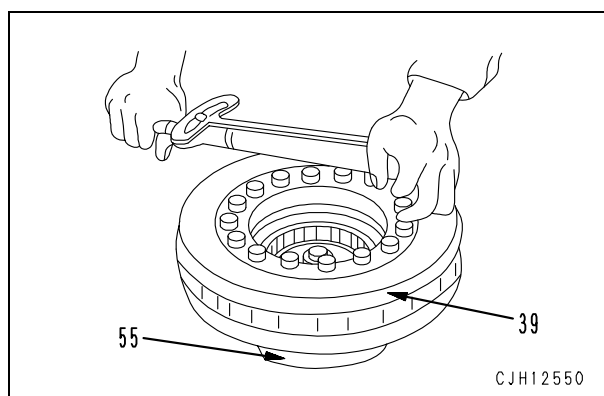
- 4) Remove the tool and insert bushing (50) in outer race (52) completely.
- 5) Reverse outer race (52).
- 6) Install one-way clutch (54) to outer race (52).
 - ★ Install one-way clutch (54) so that the "→" on its retainer will be directed clockwise.
 - ★ Take care not to damage sprag (e).
 - ★ Install the one-way clutch so that the arrow mark indicating the direction of racing will be clockwise (f) when seen from the direction of flange. Never remove the sprag.



- 7) Install ball (53) to bushing (56).
 - ⚙ Mounting bolt: **Adhesive (LT-2)**
 - 🔧 Mounting bolt: **$66.19 \pm 7.35 \text{ Nm}$ { $6.75 \pm 0.75 \text{ kgm}$ }**



- 8) Chill bushing (56) in dry ice etc.
 - ★ Fix ball (53) with grease, match the position and install.
 - ★ Be careful not to damage the bushing contact surface.



4. Installation of stator assembly

Install stator assembly (57) while turning it clockwise.

- ★ Before installing the stator assembly, apply oil ("TO30" or "TO10") to the sliding surface of one-way clutch (54) of the shaft.

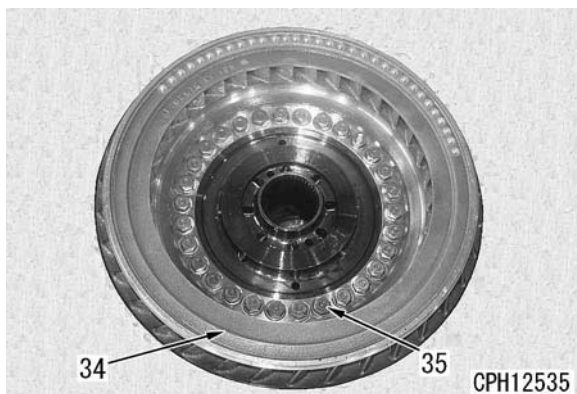
**5. Assembly of turbine assembly**

Install inner gear to turbine and tighten bolts (35).

 Mounting bolt: **Adhesive (LT-2)**

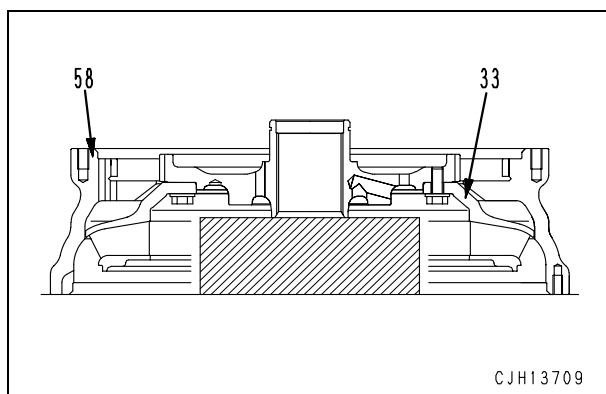
 Mounting bolt:

98 – 123 Nm {10 – 12.5 kgm}

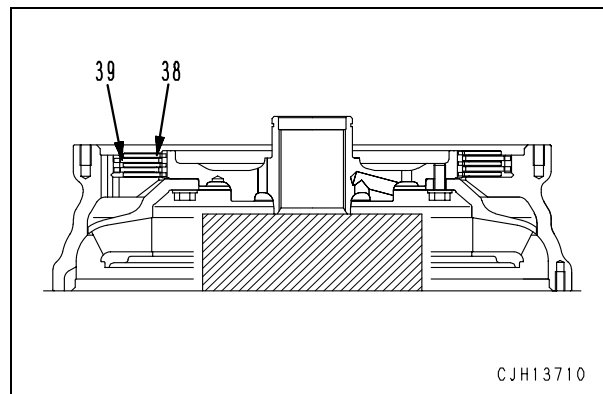
**6. Assembly of turbine clutch assembly****1) Turbine**

Set case (58) and turbine assembly (33).

- ★ Place blocks under the turbine to align the disc installation surfaces.

**2) Disc and plate**

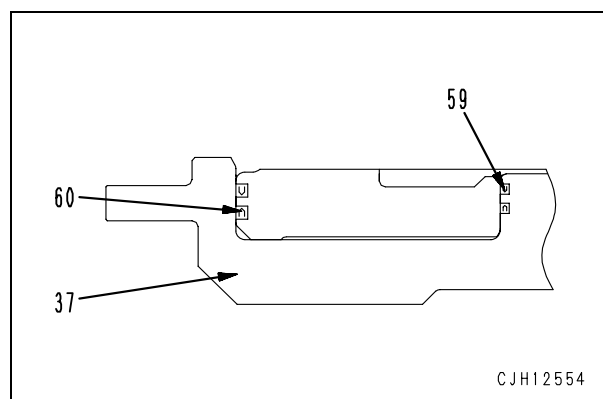
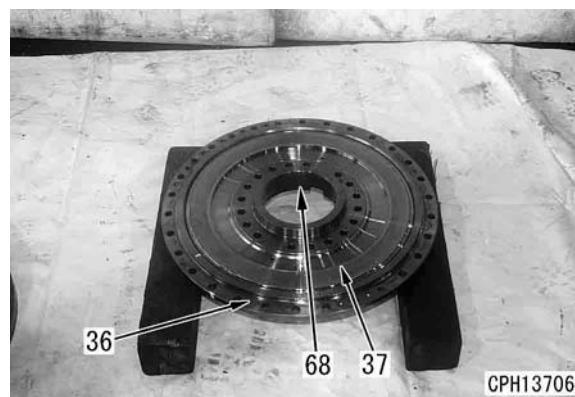
Install disc (38) and plate (39).

**3) Piston**

1] Install bearing (68) to housing.

2] Install seal rings (59) and (60) to piston (37).

3] Install piston (37) to housing (36).



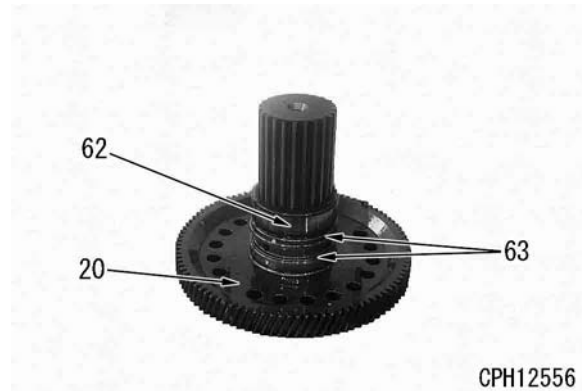
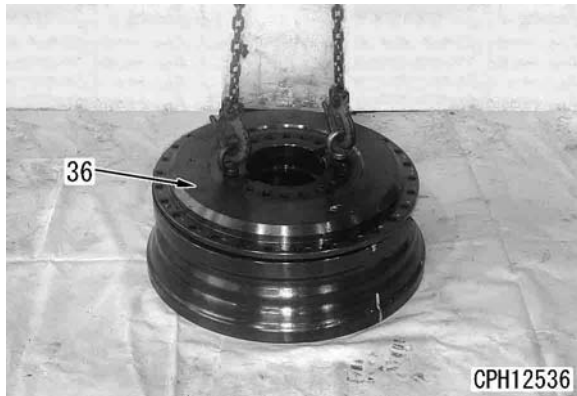
4) Housing

Install housing (36).

 Mounting bolt: **Adhesive (LT-2)**

 Mounting bolt:

98 – 123 Nm {10 – 12.5 kgm}

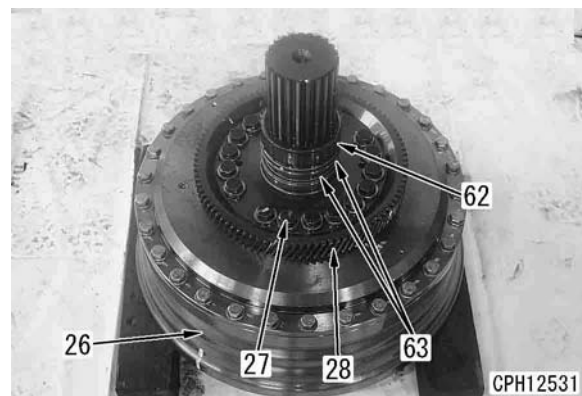
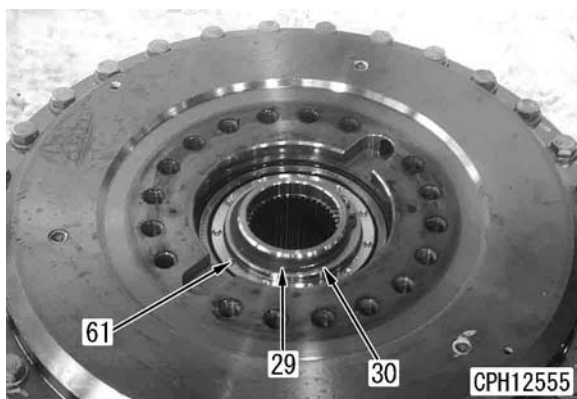


5) Bearing

1] Press-fit bearing (61).

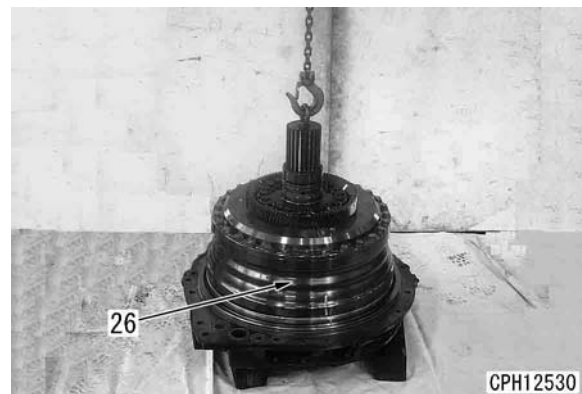
★ Press-fit the inner race and outer race at the same time.

2] Install spacer (30) and install snap ring (29).



7. Installation of turbine and clutch assembly

1) Sling the assembly by the shaft end. Match the pump drain plug and the drain groove. Install turbine and clutch assembly (26).



6) Drive gear assembly

1] Use the press-fitting tool to press-fit inner race (62) to shaft (20).

2] Install seal ring (63).

3] Install drive gear assembly (27) to turbine clutch assembly (26) and tighten the bolts.

★ Tighten the mounting bolts evenly.

 Mounting bolt:

Adhesive (LT-2)

 Mounting bolt:

245 – 309 Nm {25 – 31.5 kgm}

- 2) Tighten pump mounting bolt (4) and drain plug (2).

Mounting bolt: **Adhesive (LT-2)**

Mounting bolt:

$53.9 \pm 4.9 \text{ Nm}$ { $5.5 \pm 0.5 \text{ kgm}$ }

Plug:

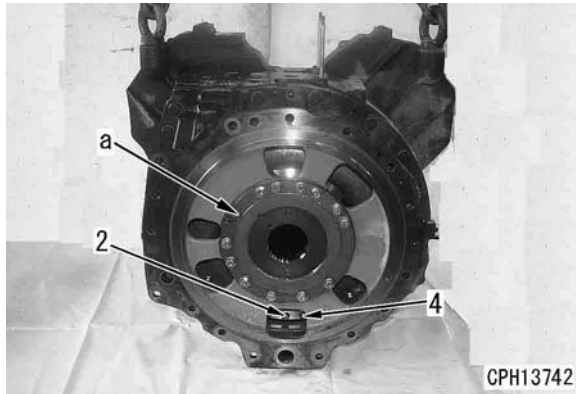
$11.28 \pm 1.47 \text{ Nm}$ { $1.15 \pm 0.15 \text{ kgm}$ }

- 3) Install orifice plug (a).

Mounting bolt: **Adhesive (LT-2)**

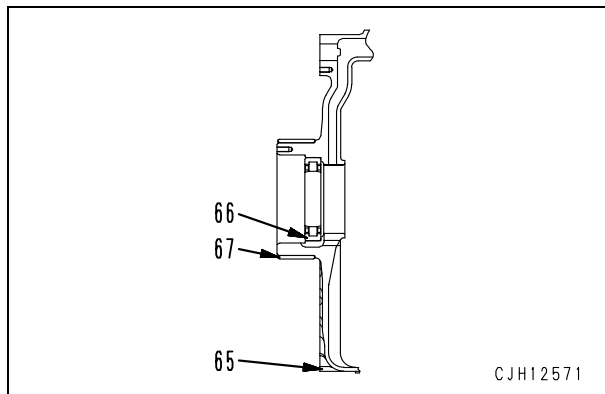
Plug:

$4.9 - 9.8 \text{ Nm}$ { $0.5 - 1.0 \text{ kgm}$ }



8. Assembly of PTO case assembly

Install bushing (67) and outer race (66) to PTO case (65).

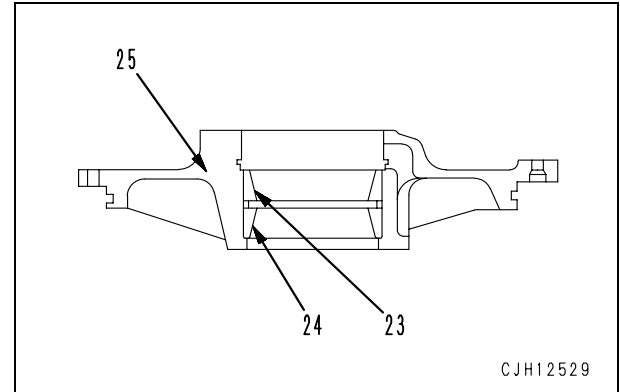


9. Assembly of PTO assembly

Assembly of pump drive gear cage assembly

★ Drip about 6 cc of engine oil to the bearing after assembly and turn the bearing several rounds.

- 1) Using the pushing tool, press-fit outer races (23) and (24) to cover (25).

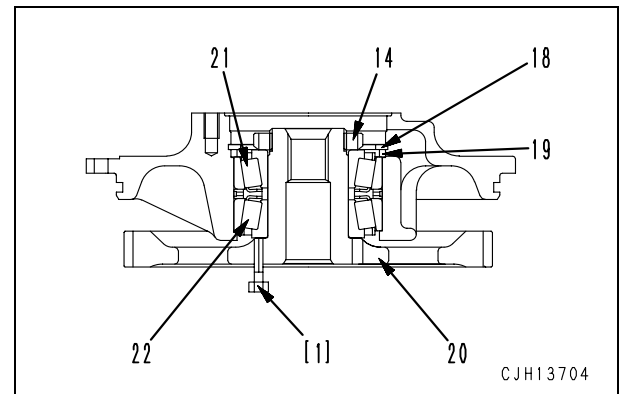


- 2) Using the pushing tool, press-fit bearing (22) and gear (20) and install to cover (25).

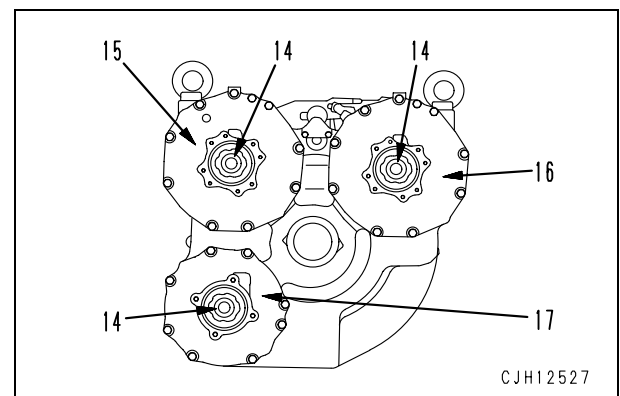
- 3) Install bearing (21) and tighten nut (14) temporarily.

Mounting bolt: **Adhesive (LT-2)**

- 4) Install plate (19) and install snap ring (18).



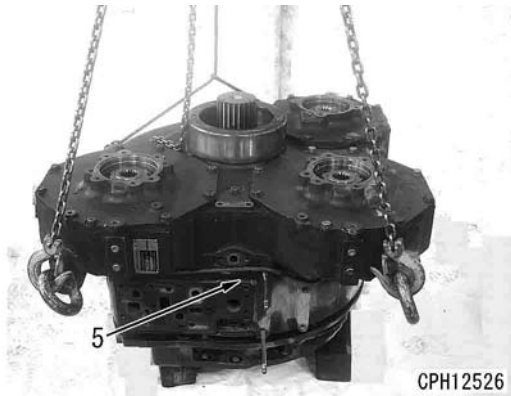
- 5) Install pump drive gear cage assemblies (17), (16) and (15) to the case.



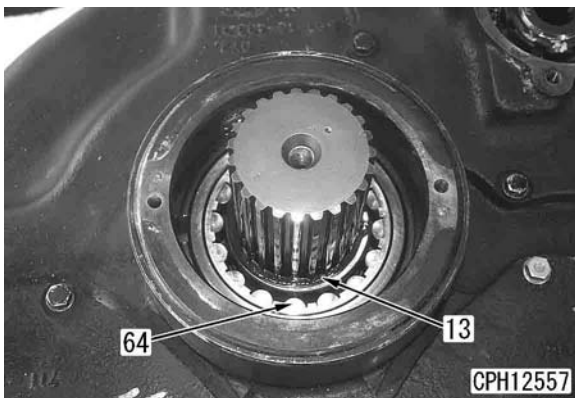
10. Installation of PTO assembly

- 1) Install O-ring, and install PTO assembly (5) while having the PTO gear engaged.

 O-ring: **Grease (G2-LI)**

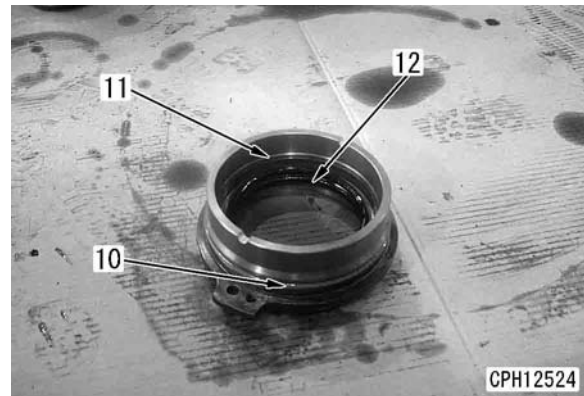
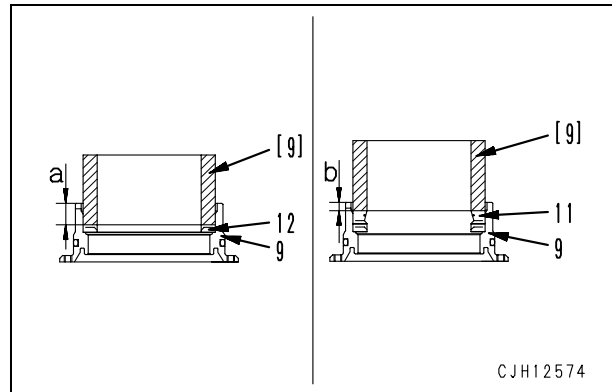


- 2) Use tool **C3** to tighten nut.
 Nut: **313 – 392 Nm {32 – 40 kgm}**
- 3) Install bearing (64) and fix it with snap ring (13).

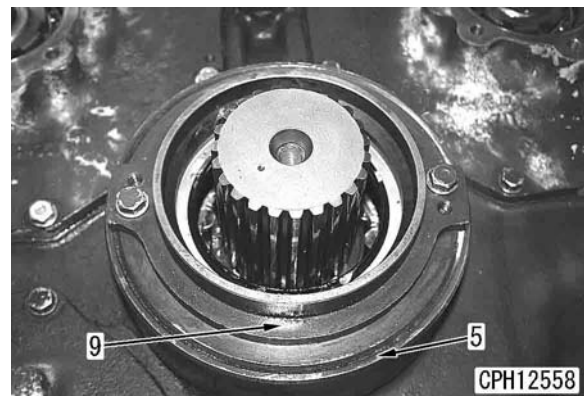


- 4) Assembly of cage assembly
 Using push tool [9], install oil seal (11) and dust seal (12) to cage (10) according to the following procedure.
 - 1] Thinly apply gasket sealant (LG-5) to the seal fitting surface in the cage.
 - 2] Install the oil seal and dust seal so that the distance between the cage top and each seal top will be as follows.
 - Distance (a): 46.5 ± 0.25 mm
 - Distance (b): 31.5 ± 0.25 mm
 - ★ After installing, wipe off the projected gasket sealant.
 - 3] Apply grease (G2-LI) or silicone grease (Threebond 1855) to the clearance between the oil seal and dust seal and to the oil seal lip surface.
 - ★ Supply the grease up to 40 – 60% of the space between the lips so that it will not project from the lip surfaces.

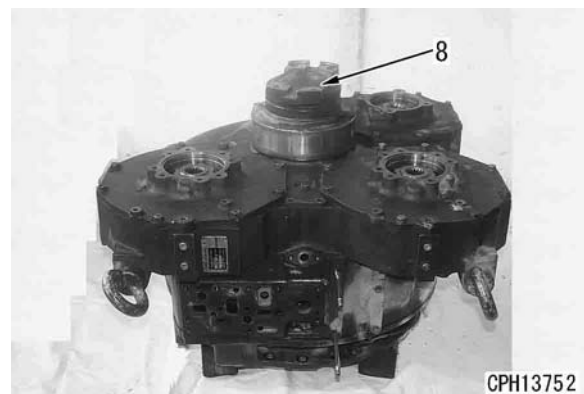
- 4] Install O-ring (10).



- 5) Installation of cage assembly
 Install cage assembly (9) to PTO case (5) and tighten the bolts.

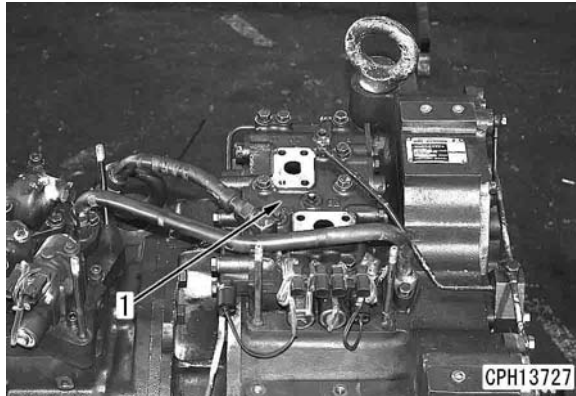


- 6) Install coupling (8).



11. Relief valve assembly

Install the attached parts and relief valve assembly (1) by referring to the "Disconnection and connection of torque converter and transmission assembly."



Disassembly and assembly of transmission assembly

Special tools

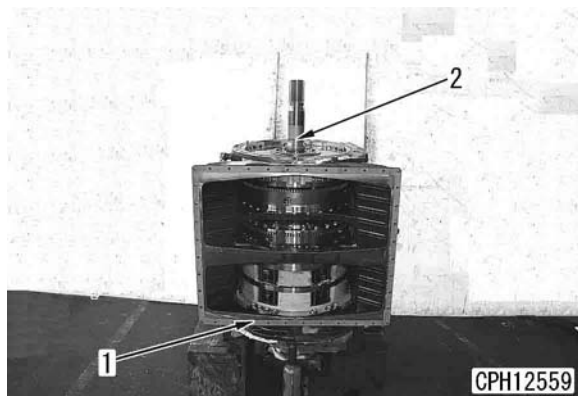
Sym- bol	Part No.	Part name	Necessity	Q'ty	New/Remodel	Sketch
D1	799-301-1600	Oil leak tester kit (A)	■	1		

Disassembly

- Remove the attached parts and disconnect torque converter assembly by referring to the "Disconnection of Torque Converter and Transmission Assembly."
- When disassembling the clutch disc and plate, group the parts by each No. and put tags to identify them.
- Place the clutch discs and plates in level pile (warping may be caused if placed on a slant)

- Install transmission assembly (1) with the input shaft (2) side on the top.

- ★ Install the assembly on the left- and right-hand blocks of 250 to 300 mm high. Adjust the front and rear levels using the hydraulic jacks to vertically stabilize transmission assembly.



2. Piston operation check

Use tool D1 to check the operating state of clutch piston Nos. 1, 2 and 3.

(Since operations of the pistons of the No. 2 and No. 3 clutches cannot be checked directly, however, check them by the movement of the discs or plates.)

- ★ Air pressure:

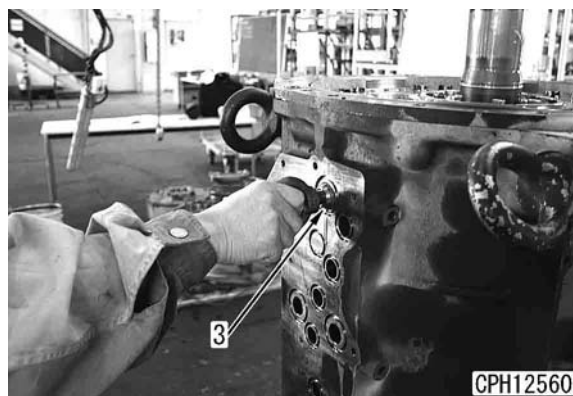
0.29 – 0.59 MPa {3 – 6 kg/cm²}



Standard piston stroke of No. 1 clutch: 6.3 mm

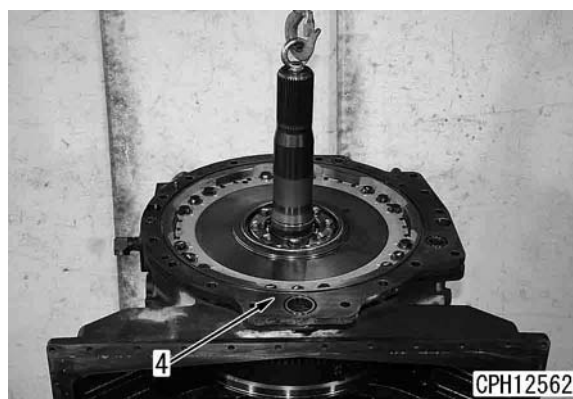
3. Sleeve

Remove 5 sleeves (3) using the forcing screw.



4. Clutch No. 1 assembly

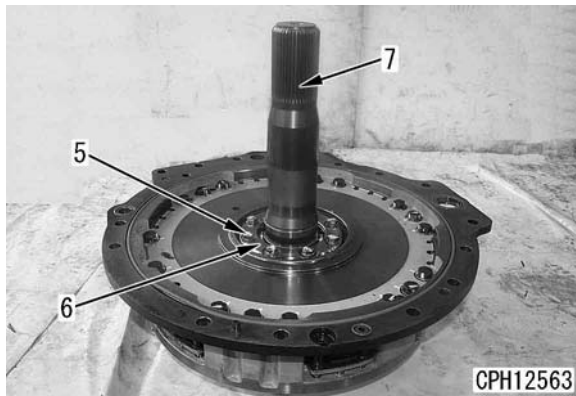
Remove clutch No. 1 assembly (4) using the forcing screw.



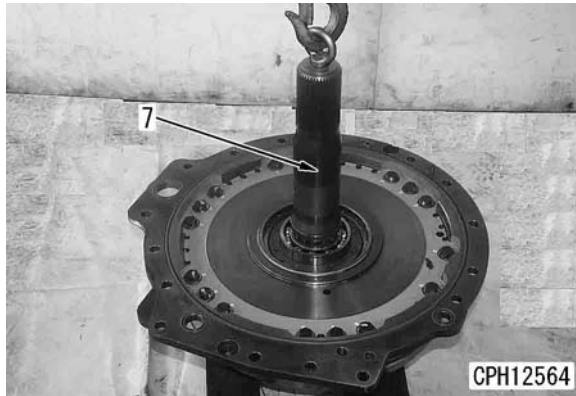
5. Disassembly of clutch No. 1 assembly

1) Input shaft

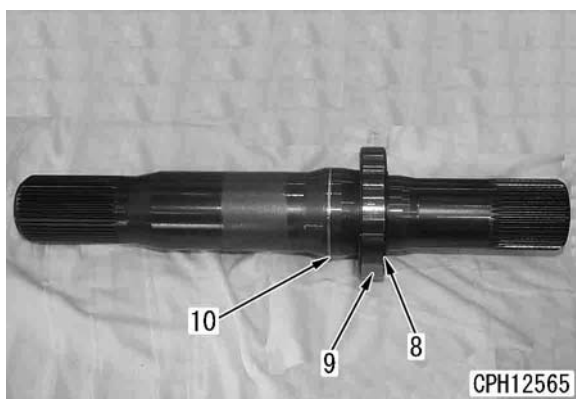
- 1] Remove bolts (5) and plate (6) from shaft assembly (7).



- 2] Sling and remove input shaft assembly (7).

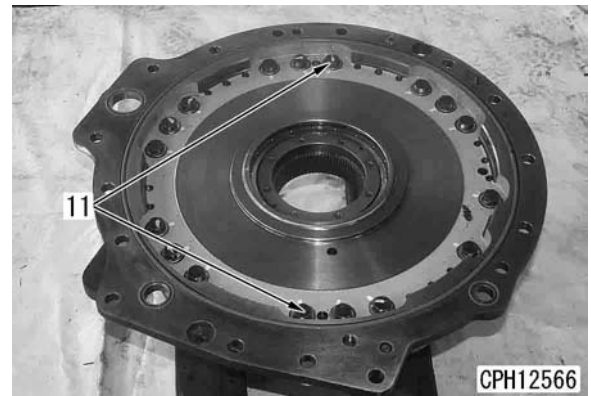


- 3] Remove snap ring (8) from the input shaft and remove bearing (9).
- 4] Remove seal ring (10).



2) Housing and piston

- 1] Leave 2 mounting bolts (11) on the diagonal line and remove all other 15 bolts.



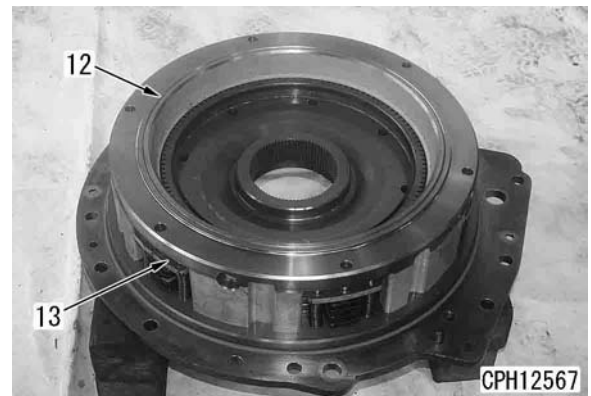
- 2] Reverse and install the clutch assembly.

★ To enable to remove the remaining 2 bolts, place the assembly on the blocks of about 100 mm high.

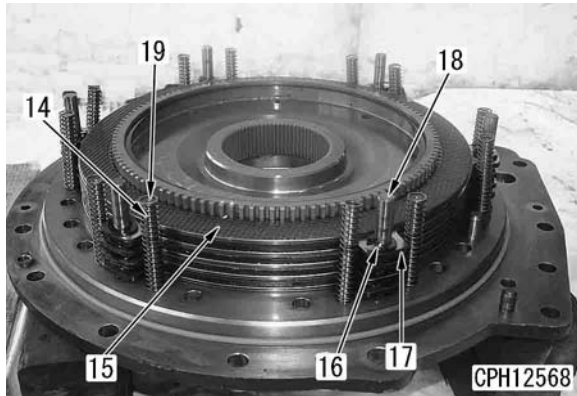
- 3] Remove the remaining 2 bolts and remove housing and piston assembly (12).

★ When installing the housing piston assembly, take care that the spacer of the spring guide pin will not come off and will not be lost.

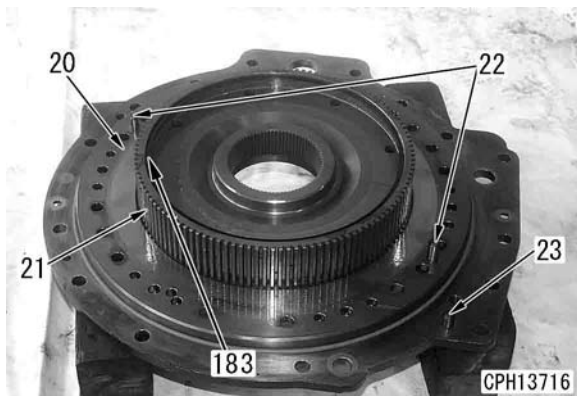
- 4] Remove piston (13) and seal ring from the housing.



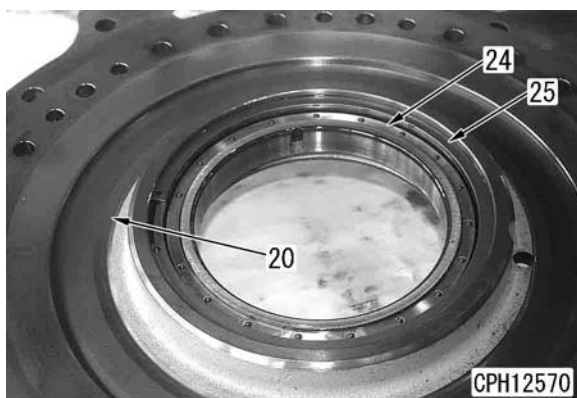
- 3) Guide spring, disc, spring, plate and guide pin
 - 1] Remove spring (14) and spring guide pin (19).
 - 2] Remove disc (15), spring (16), and plate (17).
 - 3] Remove guide pin (18).



- 4) No. 1 clutch and ring gear
 - Remove ring gear (21) and dowel pins (22) and (23) from cage (20).
 - ★ Remove the snap ring (183) from ring gear (21).

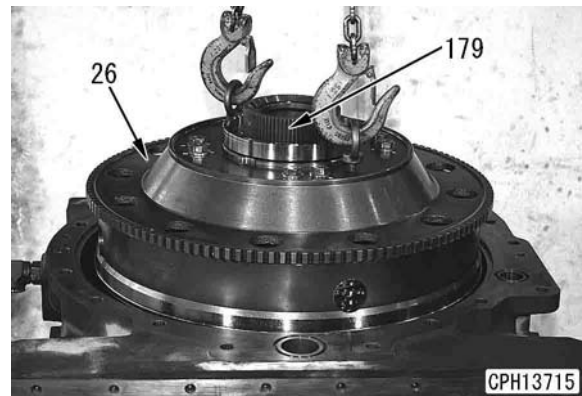


- 5) Bearing
 - Remove snap ring (24) and then remove bearing (25) from cage (20).



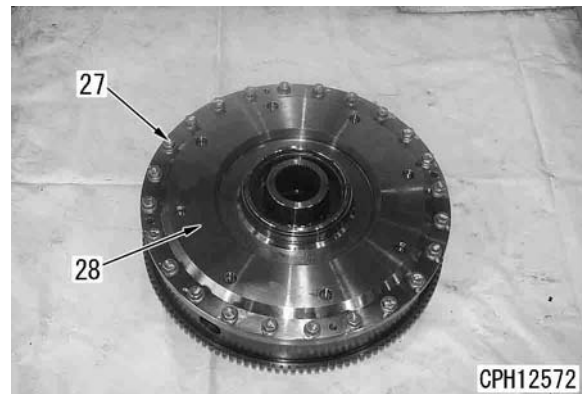
6. Clutch No. 2 assembly

Remove clutch No. 2 assembly (26) with sun gear (179) using the eyebolts.

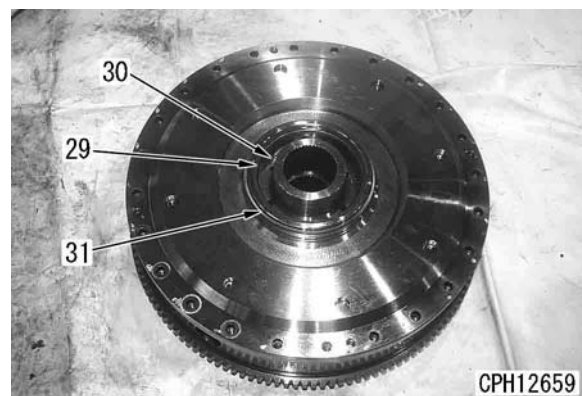


7. Disassembly of clutch No. 2 assembly

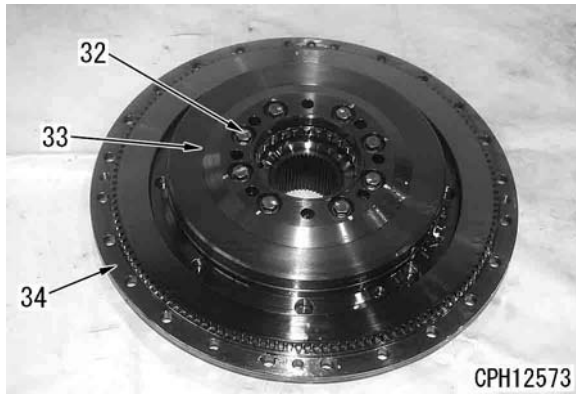
- 1) Housing assembly
 - 1] Remove mounting bolts (27) to remove housing assembly (28).



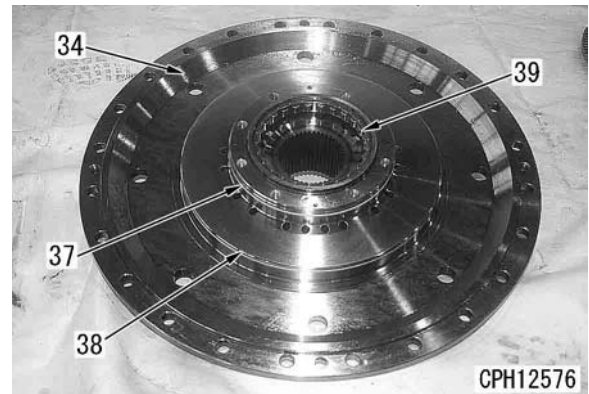
- 2] Remove snap ring (29) and remove bushing (30).
- ★ When removing the bushing, take care not to lose the lock ball.
- 3] Remove inner race (31).



- 4] Remove mounting bolts (32) to remove cylinder (33) from housing assembly (34).



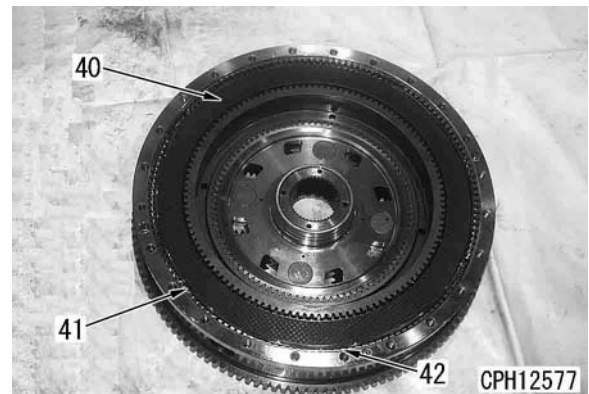
- 7] Remove seal rings (37) and (38) from the housing (34).
8] Remove bearing (39) from the housing (34).



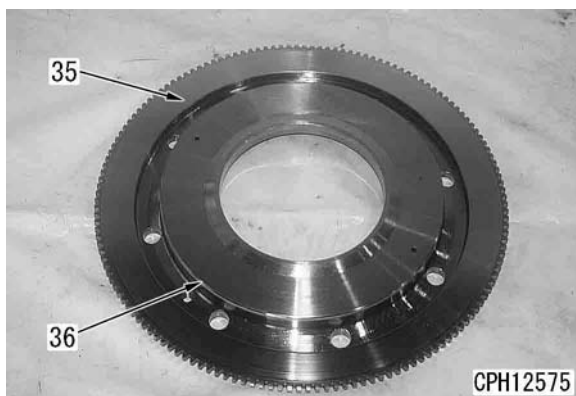
- 5] Remove piston (35) from housing (34).



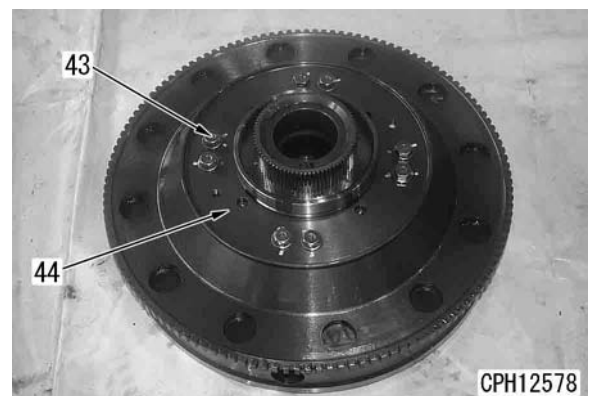
- 2) Disc, plate and spring
Remove disc (40), plate (41), and spring (42).



- 6] Remove seal ring (36) from piston (35).

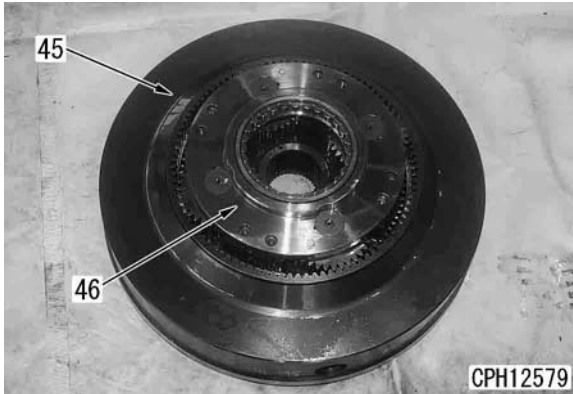


- 3) Transmission input shaft rotation detecting plate
1] Reverse and install the clutch assembly.
2] Remove mounting bolts (43) to remove plate (44).

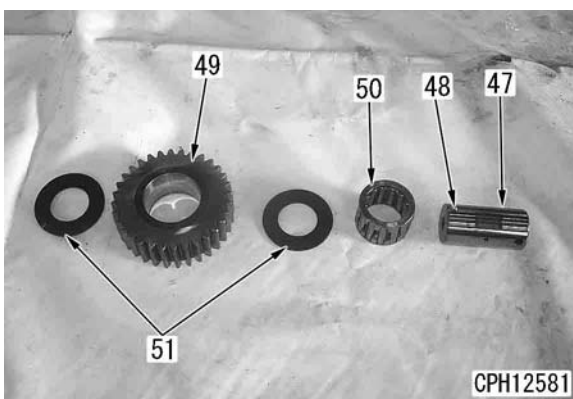
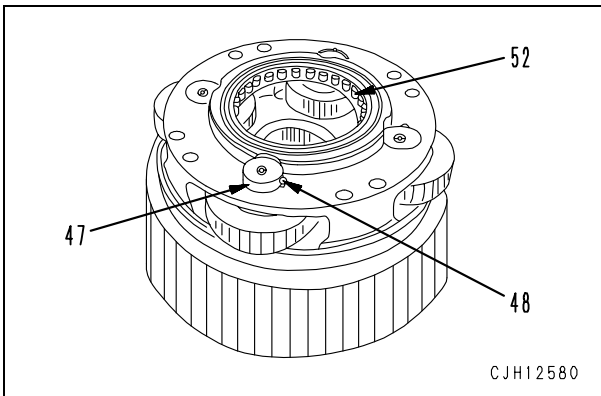


4) Planetary gear

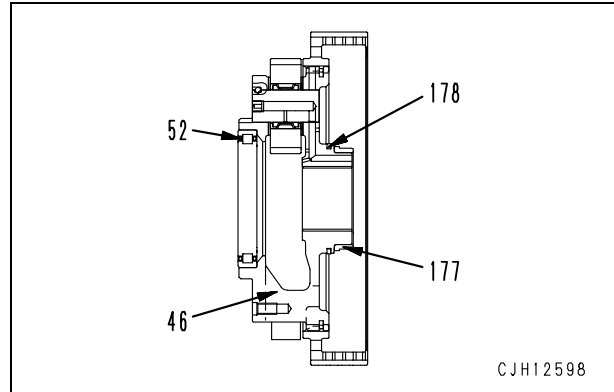
- 1] Remove carrier assembly (46) from drum (45).



- 2] Remove shaft (47).
★ Care should be taken not to lose ball (48).
- 3] Remove gear (49), bearing (50) and thrust washer (51).
- 4] Remove bearing (52).

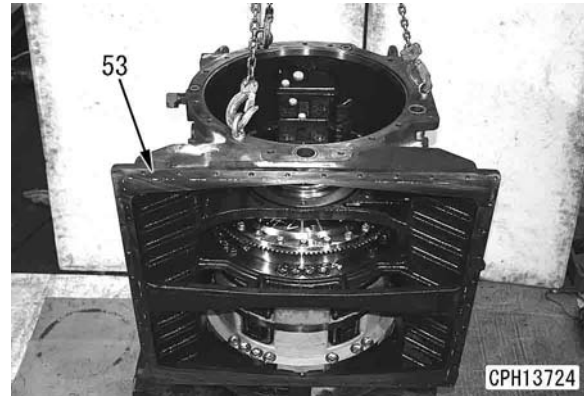


- 5] Remove inner race (177) and seal ring (178) from carrier assembly (46).

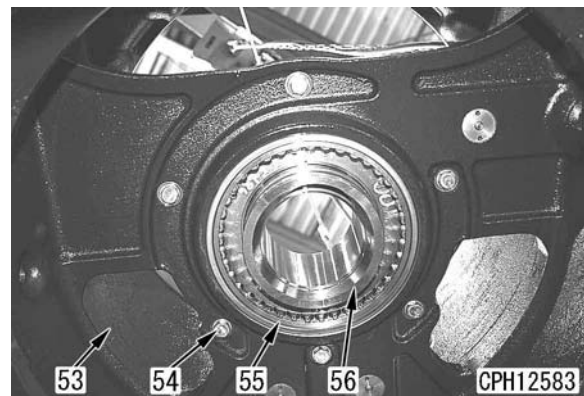


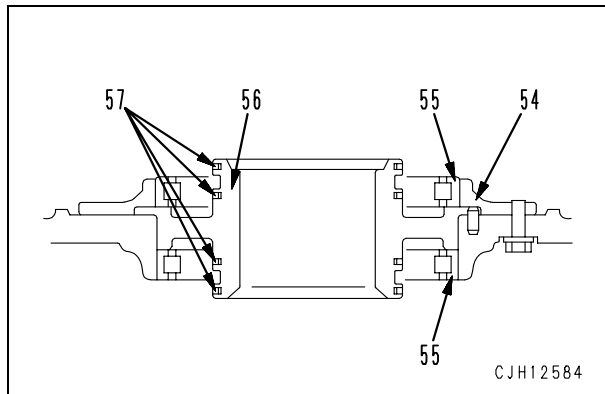
8. Transmission case

- 1] Sling the case by fixing the eyebolts with nuts and remove transmission case (53).
★ Sling it vertically.



- 2) Remove the following parts from transmission case (53).
 - 1] Cage (54)
 - 2] Bearing (55)
 - 3] Collar (56)
- 3) Remove seal ring (57) from collar (56).





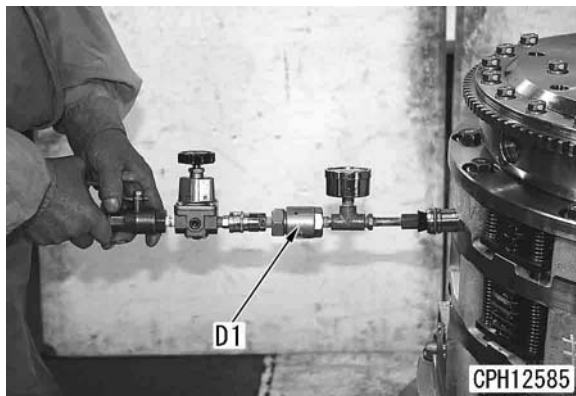
9. Piston operation check

Use tool **D1** to check the operating state of clutch piston Nos. 4, 5, 6 and 7.

★ Air pressure:

0.29 – 0.59 MPa {3 – 6 kg/cm²}

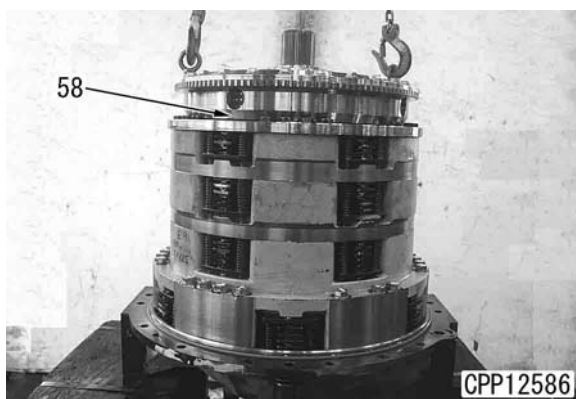
Standard piston stroke: 6.3 mm



10. Clutch housing No. 3 assembly

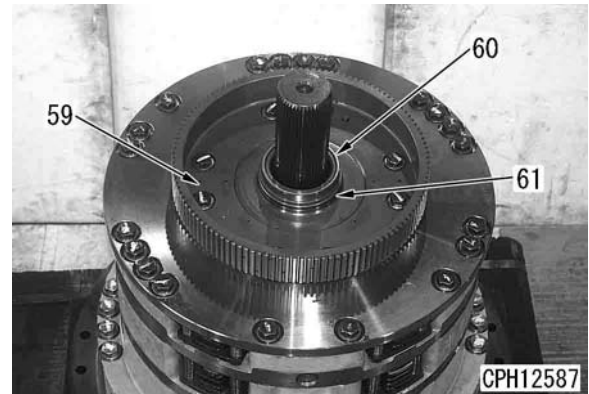
Remove clutch housing No. 3 assembly (58) using the forcing screw.

★ For disassembly of the housing assembly, refer to the "Disassembly of clutch No. 2 assembly."



11. Ring gear No. 3

- 1) Remove ring gear No. 3 (59).
- 2) Remove inner race (60) from ring gear (59).
- 3) Remove seal ring (61) from ring gear (59).

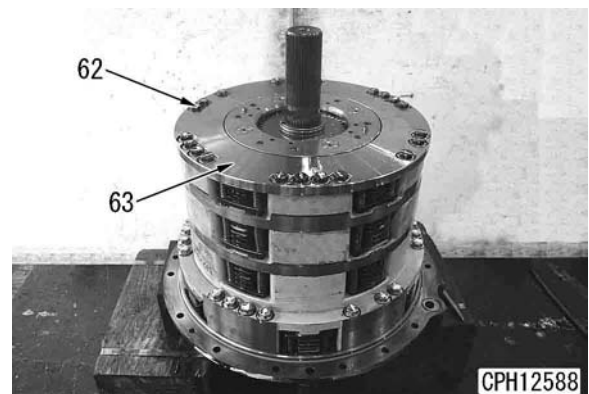


12. Tie bolt

Remove tie bolts (62).

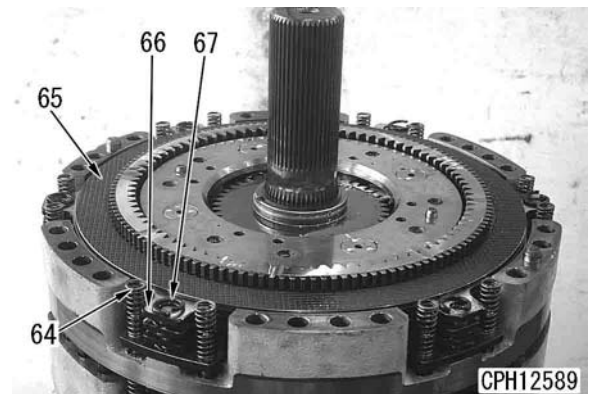
13. Clutch plate No. 4

Use a forcing screw to remove plate (63).



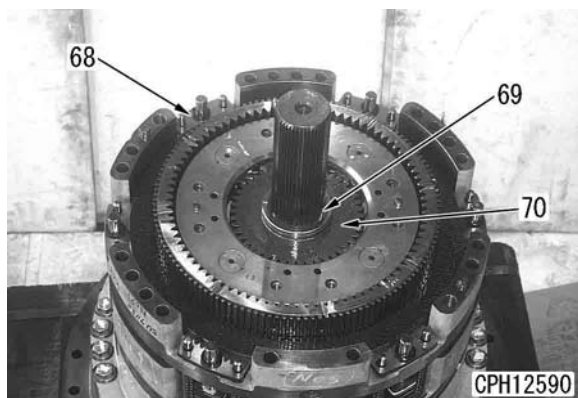
14. Clutch No. 4 disc, plate and spring

- 1) Remove spring (64).
- 2) Remove discs (65), plates (66) and springs (67).



15. Sun gear No. 4 and plate

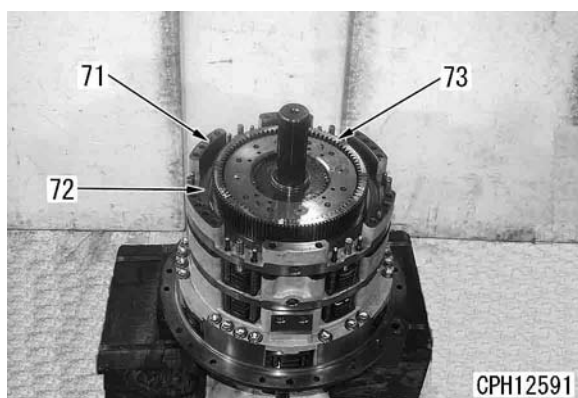
- 1) Remove plate (68).
- 2) Remove snap ring (69).
- 3) Remove sun gear (70).



16. Housing No. 4, piston and ring gear

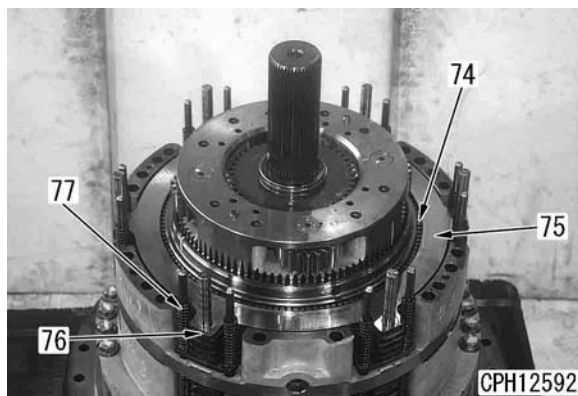
Use the forcing screw to remove housing No. 4 (71), piston (72) and ring gear (73) in one assembly.

- ★ Care should be taken not to damage the housing when prying it to loosen tight dowel pins.

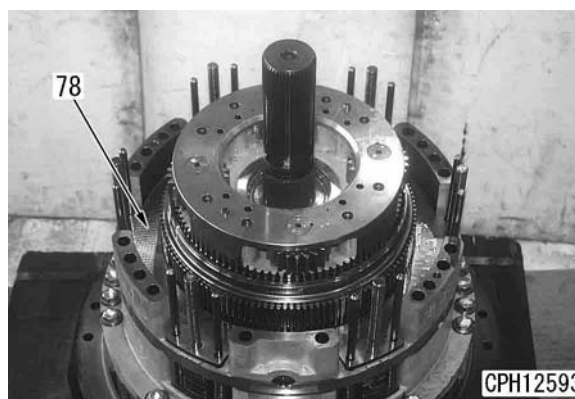


17. Clutch No. 5 disc, plate and spring

- 1) Remove disc (74), plate (75) and springs (76) and (77).

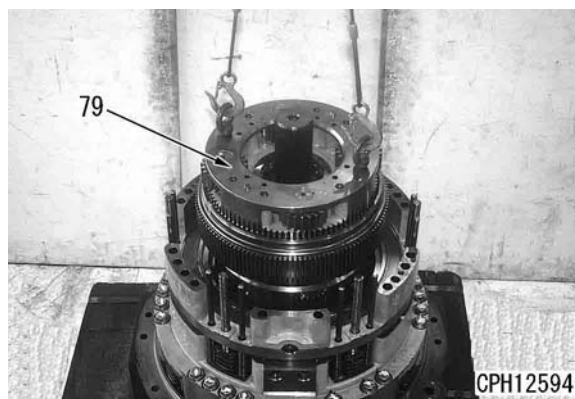


- 2) Remove plate (78).



18. Carrier No. 4 and ring gear No. 5

Remove carrier No. 4, ring gear No. 5 assembly (79) using the forcing screw.



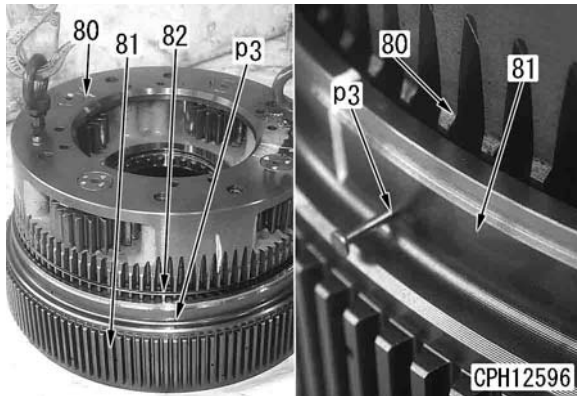
19. Disassembly of carrier No. 4 and ring gear No. 5 assembly

- 1) Carrier No. 4 assembly
Disconnect carrier No. 4 assembly (80) and ring gear No. 5 (81).



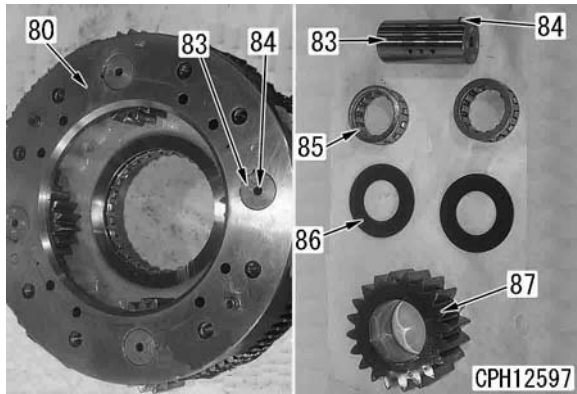
- ★ Disconnect the carrier assembly and the ring gear as follows:

- 1] Sling carrier No. 4 assembly (80) temporarily.
- 2] Push snap ring (82) inside using three (3) holes (p3) on the circumference of ring gear No. 5 (81).
- 3] While pushing the snap ring evenly through the three holes, sling and remove carrier No. 4.

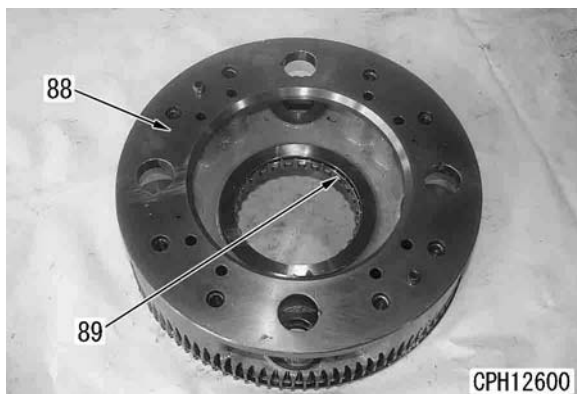


- 2) Planetary gear No. 4

- 1] Pull out shaft (83) toward the side of the ball from carrier (80).
- 2] Remove ball (84) from carrier (80).
- 3] Remove gear (85), bearing (86) and thrust washer (87) from carrier (80).

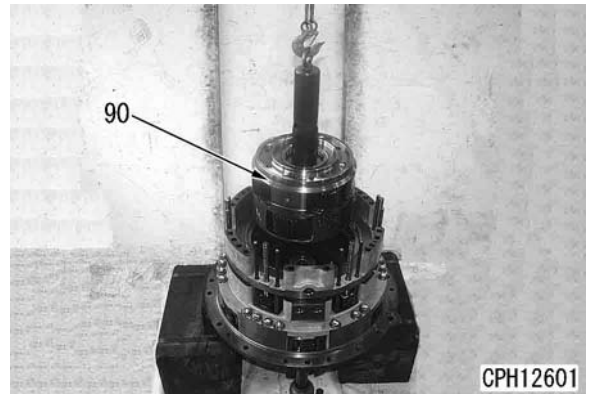


- 4] Remove bearing (89) from carrier (88).



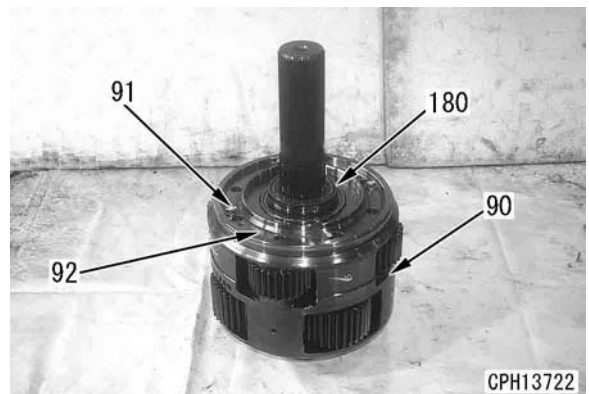
20. Carrier No. 5 and No. 6 assembly

Sling and remove carrier No. 5 and No. 6 assembly (90).

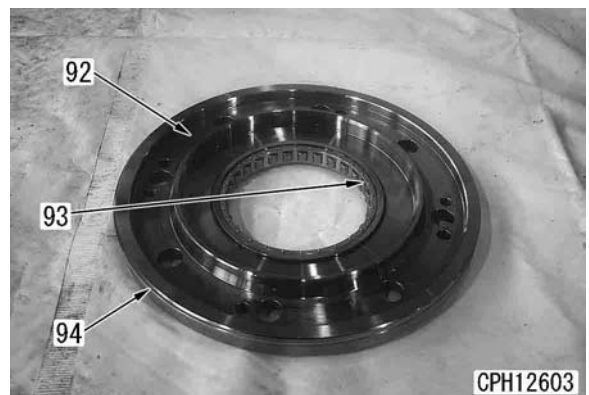


21. Disassembly of carrier No. 5 and No. 6 assembly

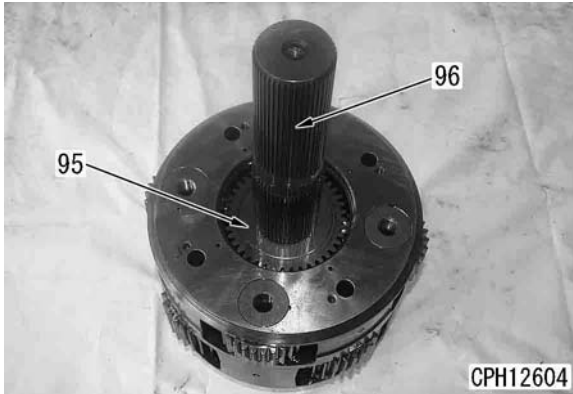
- 1) Remove collar (180) and then remove the snap ring and inner race from it.
★ Check the installed direction (top and bottom) of the collar.
- 2) Remove bolts (91) from carrier assembly (90) and remove cover (92).



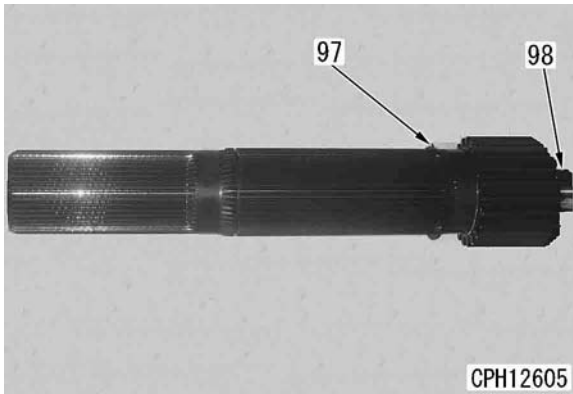
- 3) Remove bearing (93) and seal ring (94) from cover (92).



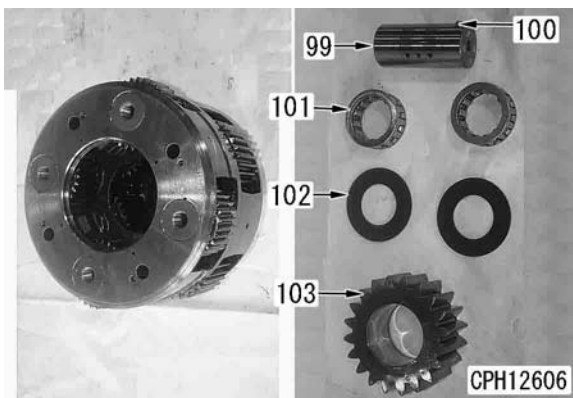
- 4) Sling and remove the shaft and sun gear assembly.
- 5) Pull out sun gear (95) from shaft (96).



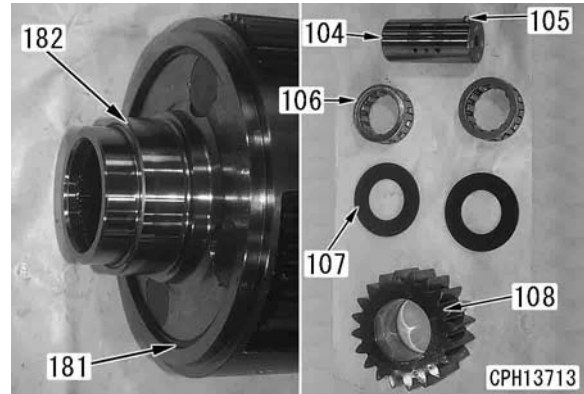
- 6) Shaft
 - 1] Remove snap ring (97) from the shaft.
 - 2] Remove inner race (98) from the shaft.



- 7) Disassembly of carrier No. 5 assembly
To disassemble carrier No. 5 assembly, refer to the "Disassembly of planetary gear No. 4." Remove shaft (99), ball (100), bearing (101), thrust washer (102) and gear (103) accordingly.

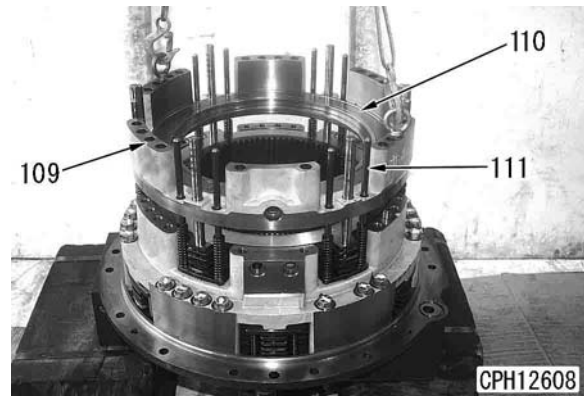


- 8) Disassembly of carrier No. 6 assembly
 - 1] Remove snap ring (181) from the No. 6 carrier assembly.
 - 2] To disassemble carrier No. 6 assembly, refer to the "Disassembly of planetary gear No. 4." Remove shaft (104), ball (105), bearing (106), thrust washer (107) and gear (108) accordingly.
 - 3] Remove inner race (182) from the No. 6 carrier assembly.



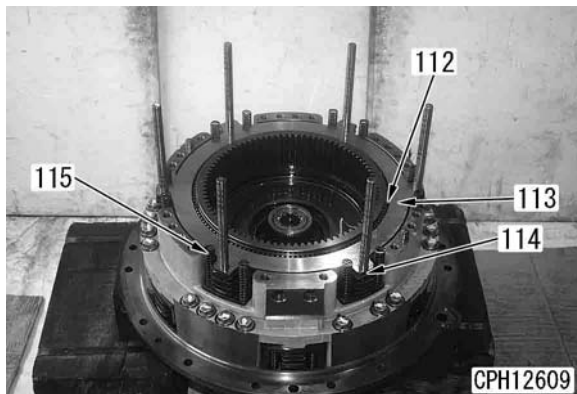
22. Housing No. 5, piston, and spring guide pin

- 1) Remove spring guide pin (111).
- 2) Use the forcing screw to remove housing No. 5 (109) and piston (110) in one assembly.
 - ★ Care should be taken not to damage the housing when prying it to loosen tight dowel pins.

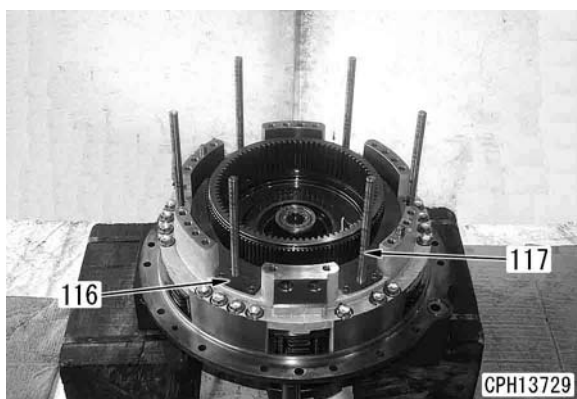


23. Clutch disc No. 6, plate and spring

- 1) Remove disc (112), plate (113) and springs (114) and (115).



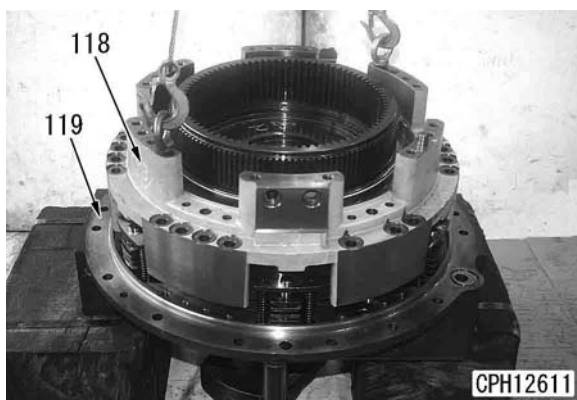
- 2) Remove plate (116).
- 3) Remove guide pin (117).



24. Housing Nos. 6, 7 and piston

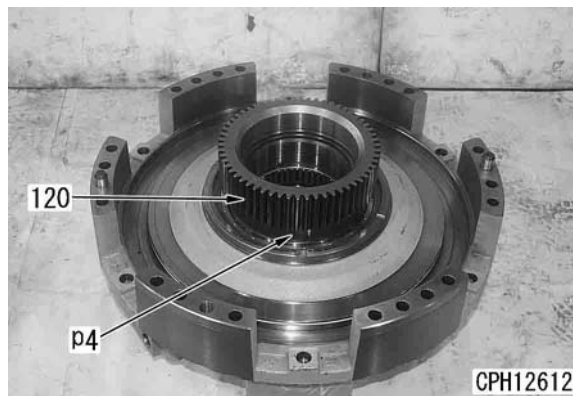
Remove housing Nos. 6, 7 assembly (118) using the eyebolts.

- ★ Care should be taken not to damage the housing when prying it to loosen tight dowel pins.
- ★ Mark housing assembly (118) and cover assembly (119).

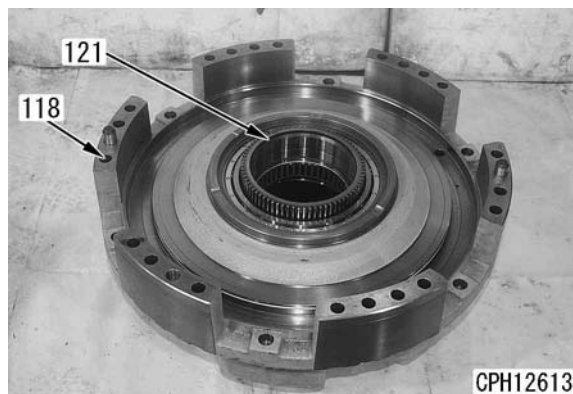


25. Disassembly of ring gear No. 6 and housing

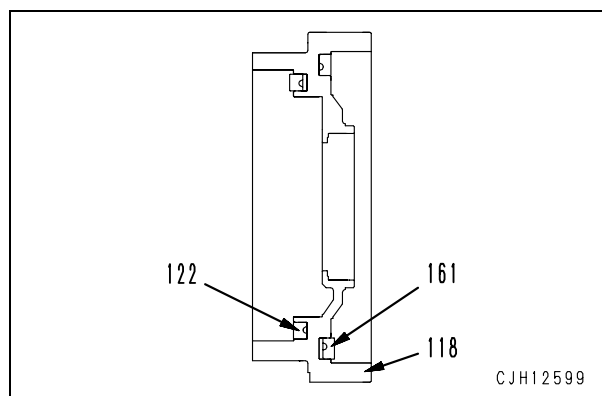
- 1) Housing
 - 1] Raise and remove the sun gear by pushing the snap ring inside through three holes (p4) on the circumference of sun gear (120).
- ★ For the removal procedure, refer to the "Disassembly of carrier No. 4 assembly."



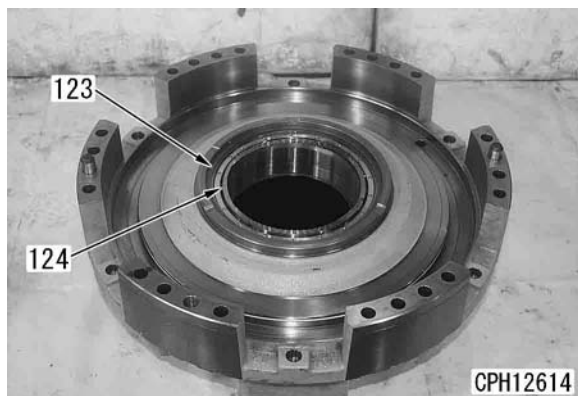
- 2] Hammer and let gear No. 7 (121) fall down to disconnect.
- 3] Sling and remove housing assembly (118).



- 4] Remove piston No. 6 (122) and No. 7 (161) from housing (118).



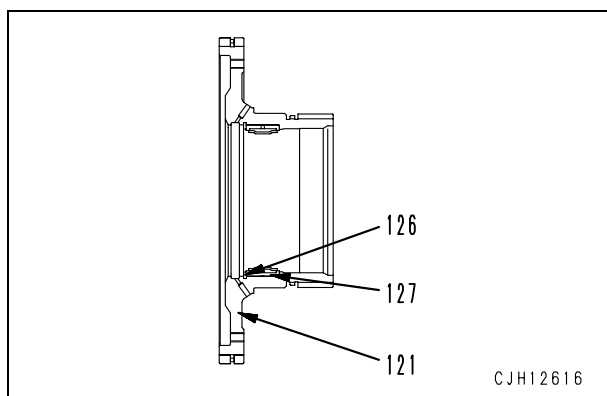
- 5] Remove snap ring (123).
- 6] Remove bearing (124).



- 2) Gear No. 7
 - 1] Disconnect ring gear No. 6 (125) and gear No. 7 (121).
 - ★ Refer to the "Disassembly of carrier No. 4 assembly."



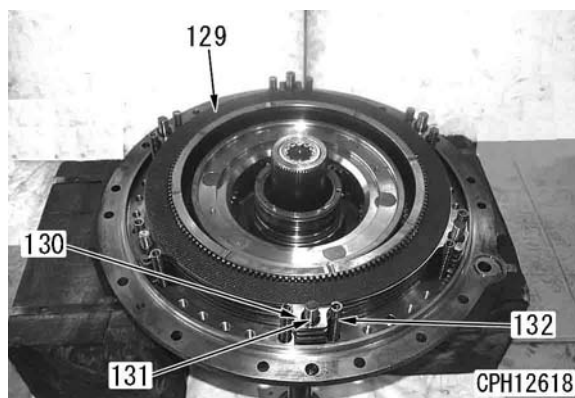
- 2] Remove snap ring (126).
- 3] Remove bearing (127).



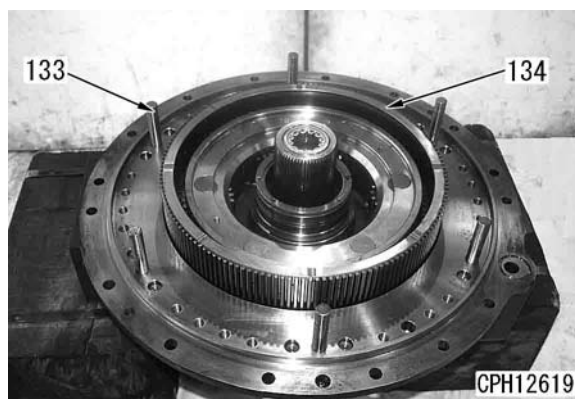
26. Plate No. 7
 - Remove plate (128).



27. Clutch No. 7 disc, plate and spring
 - 1) Remove discs (129), plates (130) and springs (131) alternately.
 - 2) Remove guide springs (132).



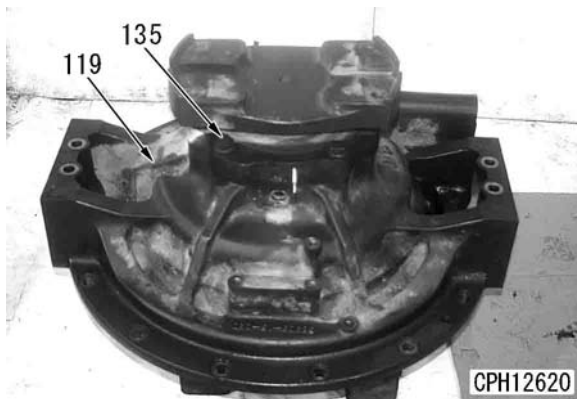
28. Guide pin No. 7 and clutch ring gear No. 7
 - 1) Remove guide pin (133).
 - 2) Remove clutch ring gear No. 7 (134).



29. Output shaft assembly

In the case of oil leakage from oil seal, the output shaft assembly only may be removed.

- 1) Reverse and install cover assembly (119).
 - ★ To secure a space for pulling out carrier No. 7 assembly downward, place blocks of about 100 mm high under the cover assembly.
- 2) Remove cage mounting bolts (135).

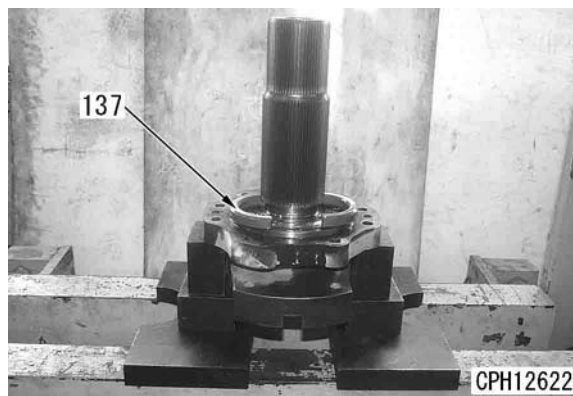


- 3) Remove output shaft and cage assembly (136) from cover assembly (119).

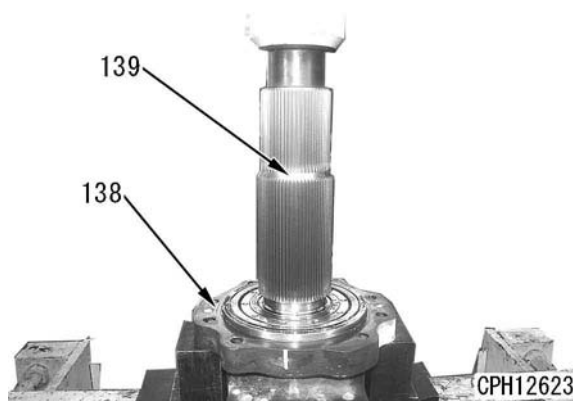
★ In the case of oil leakage from the oil seal, implement Step 29 only.

**30. Disassembly of output shaft assembly**

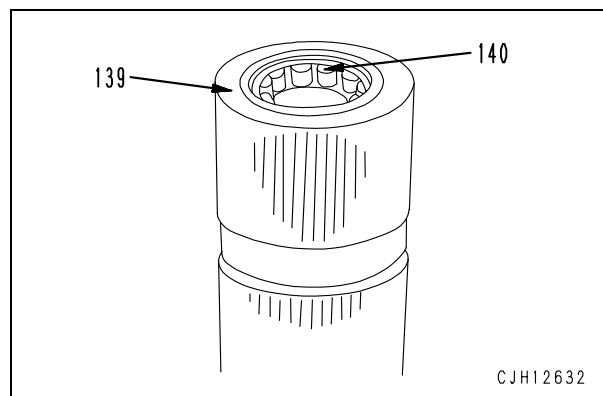
- 1) Remove collar (137) from the output shaft.



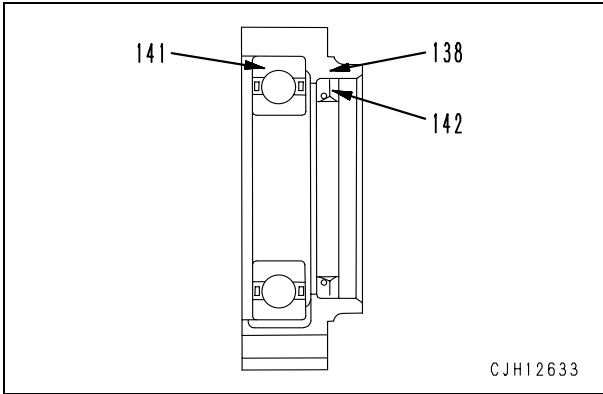
- 2) Receive cage (138), push output shaft (139) with a press to pull it out from the bearing.



- 3) Remove bearing (140) from output shaft (139).

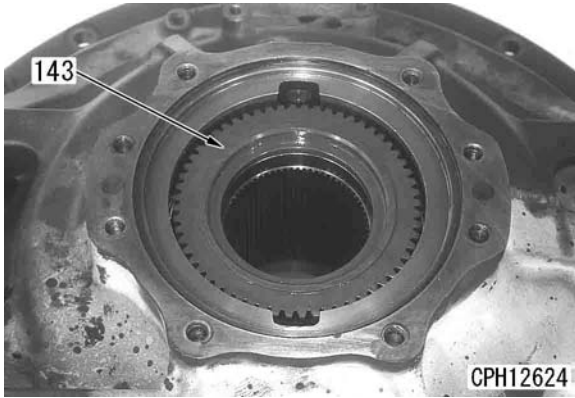


- 4) Remove bearing (141) from cage (138).
- 5) Remove oil seal (142) from cage (138).

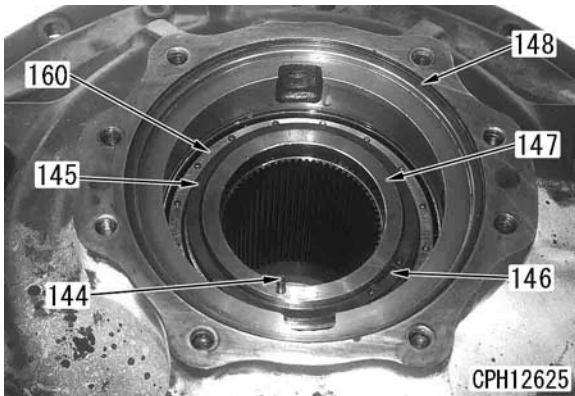


31. Output sensor gear and carrier No. 7 assembly

- 1) Remove output shaft rotation sensor gear (143).

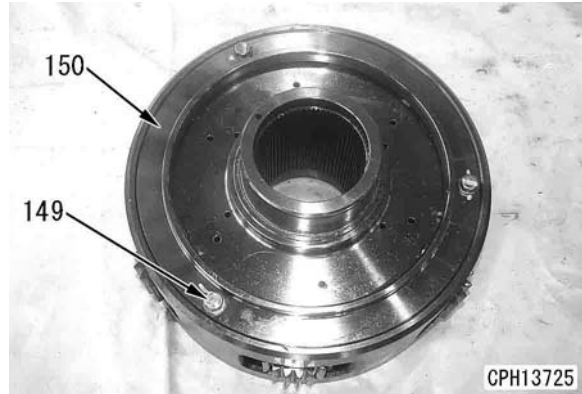


- 2) Remove O-ring (148).
- 3) Remove dowel pin (144).
- 4) Remove snap ring (145) and spacer (146).
- 5) Hammer carrier assembly (147) to let it fall to remove.
 - ★ Place a piece of soft cloth and so forth under the carrier assembly.
- 6) Remove bearing (160).

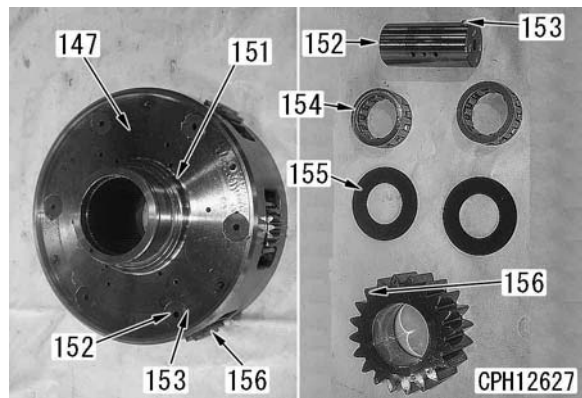


32. Disassembly of carrier No. 7 assembly

- 1) Remove mounting bolts (149) to remove plate (150).

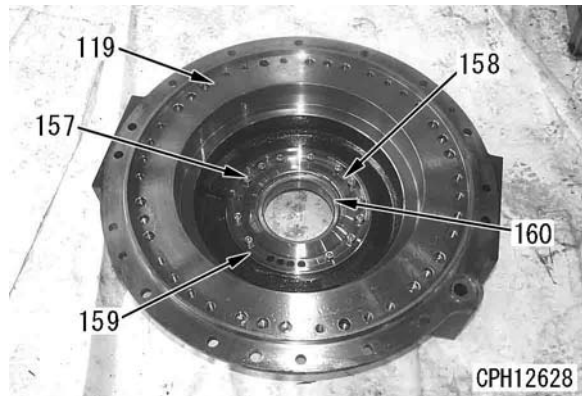


- 2) Remove seal ring (151) from carrier (147).
- 3) Remove shaft (152), ball (153), bearing (154), thrust washer (155) and gear (156) from carrier (147) by referring to the "Disassembly of Planetary Gear No. 4".



33. Bearing

- 1) Reverse cover assembly (119).
- 2) Remove cage mounting bolts (157) to remove cage (158).
- 3) Remove seal ring (159).
- 4) Remove bearing (160) from cover (119).



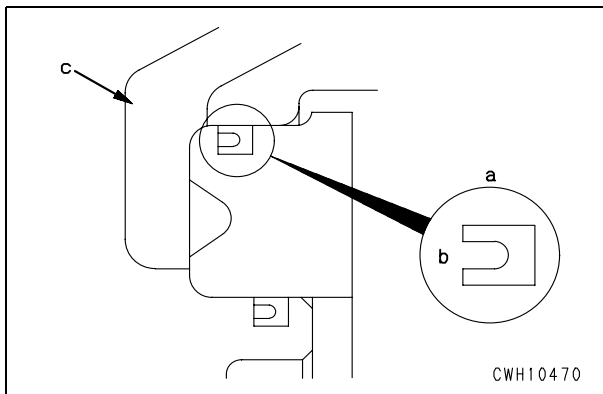
Assembly

Preparations for work

Wash each part carefully. Correct burrs and other irregularities.

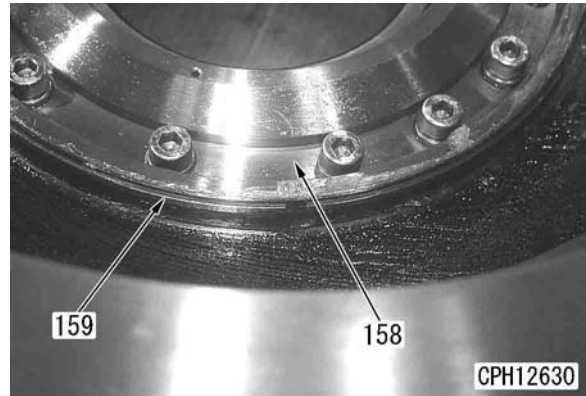
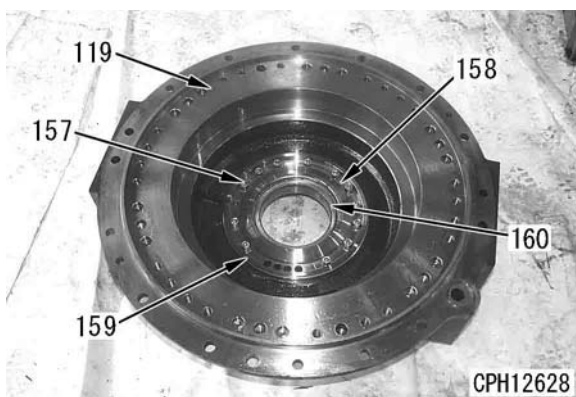
Cautions for assembly

- 1) Apply grease (G2-LI) to oil seal, O-rings and seal rings for which no specific cautions are given in respective procedures.
- 2) Apply Adhesive (LT-2) to the mounting bolts having the torque indication.
- 3) Apply engine oil to respective rotating and sliding parts before assembly.
 - ★ Before installing the discs, soak them in clean engine oil (EO10-CD) for at least 2 minutes.
 - ★ When installing each seal ring (a) for the clutch assembly piston, direct its pressure receiving side (side (b)) toward housing (c).
 - ★ Before chilling each bearing for expansion fit, drop engine oil (EO10-CD or EO30-CD) onto it and rotate it 10 turns.



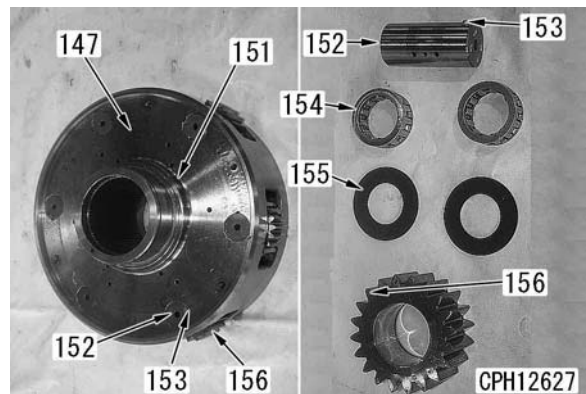
1. Cover assembly

- 1) Install bearing (160) to cover assembly (119).
- 2) Install cage (158).
- 3) Install cage mounting bolts (157).
 - ⚙ Mounting bolt: **Adhesive (LT-2)**
 - ⚙ Mounting bolt: **59 – 74 Nm {6 – 7.5 kgm}**
- 4) Install seal ring (159) to cage (158).



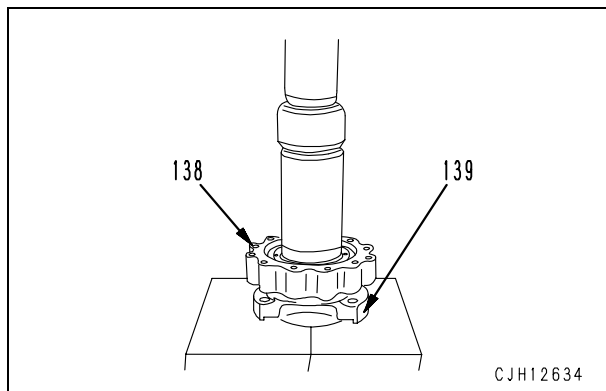
2. Disassembly of carrier No. 7 assembly

- 1) Planetary gear No. 7
 - 1] Install to carrier assembly (147) the set of gear (156), bearing (154) and thrust washer (155) by referring to the "Assembly of Planetary Gear No. 4."
 - 2] Fix ball (153) to shaft (152) with grease and insert to carrier assembly (147).
 - ★ Refer to Step (1) in the "Assembly of carrier No. 4 and ring gear No. 5 assembly."
 - ★ Check that the ball installation hole of the shaft is aligned to the hole position of the carrier. Install the shaft carefully avoiding damages to the bearing and thrust washer.
 - ★ Check that the gear rotates smoothly.
 - 3] Install seal ring (151).

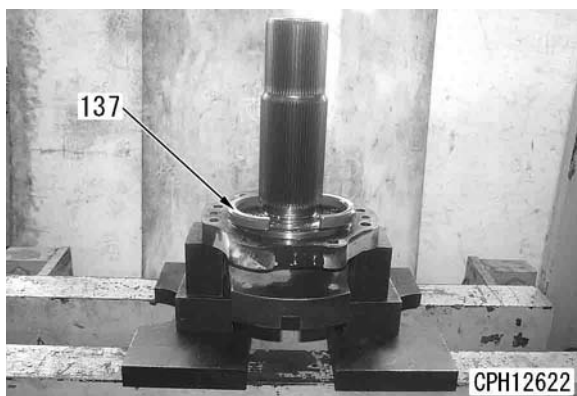


-
- Technical drawing of a vertical component, likely a part of a machine. The drawing shows a side view of a vertical assembly. Callout 141 points to a circular feature on the left side. Callout 138 points to a small rectangular feature on the right side. Callout 142 points to a small rectangular feature on the right side, located below 138. The component has a complex, multi-faceted shape with various internal and external features.

- 4) Set output shaft (139) on the press bench. Press the bearing by the inner race side to install cage (138).



- 5) Install collar (137) to the output shaft.



5. Installation of output shaft assembly

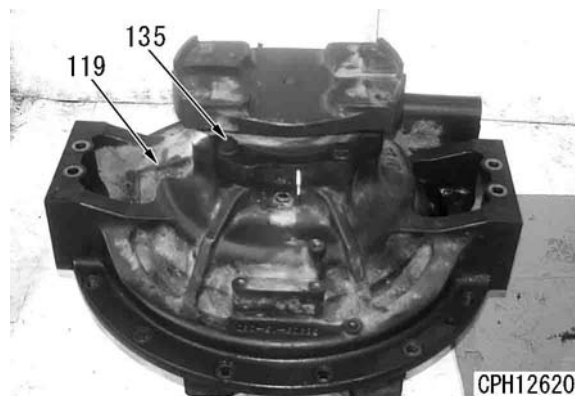
- 1) Sling and install output shaft assembly (136) to cover assembly (119).
★ Apply molybdenum disulfide lubricant (LMG) to the spline of the output shaft.



- 2) Install cage mounting bolts (135).

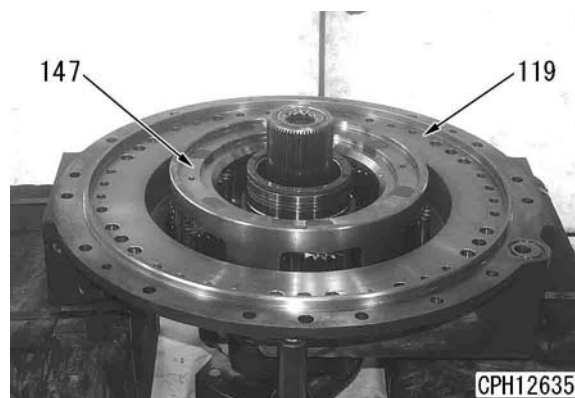
Mounting bolt: **Adhesive (LT-2)**
Mounting bolt:

245.2 – 309 Nm {25 – 31.5 kgm}



6. Clutch ring gear No. 7

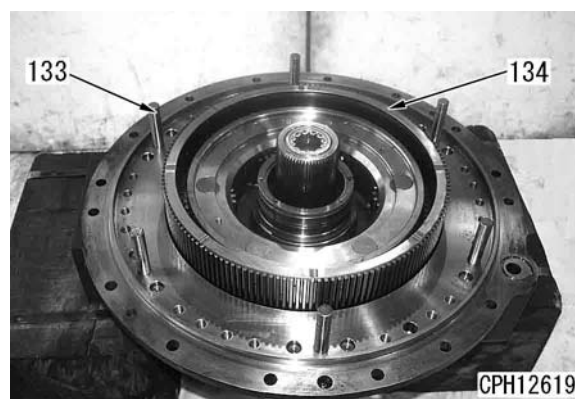
- 1) Reverse and install cover assembly (119).
★ Use the block and hydraulic jacks to stabilize cover assembly in level condition.
2) Install the dowel pin to the carrier and then install collar (147).



- 3) Install ring gear (134) to the cover assembly.

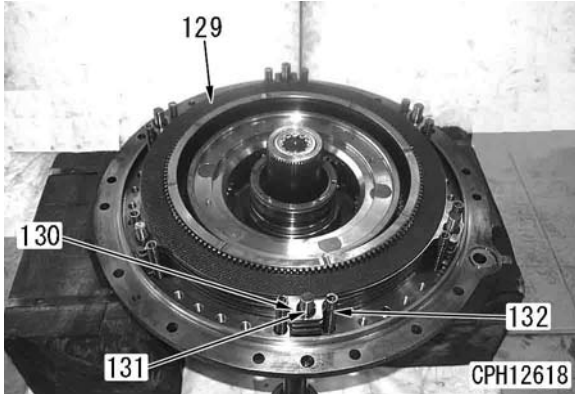
7. Guide pin

Install guide pins (133).



8. Clutch No. 7 disc, plate and spring

- 1) Install discs (129), plates (130) and springs (131) alternately.
- 2) Install the guide spring (132).
★ Don't overlook to install springs between the plates and discs.



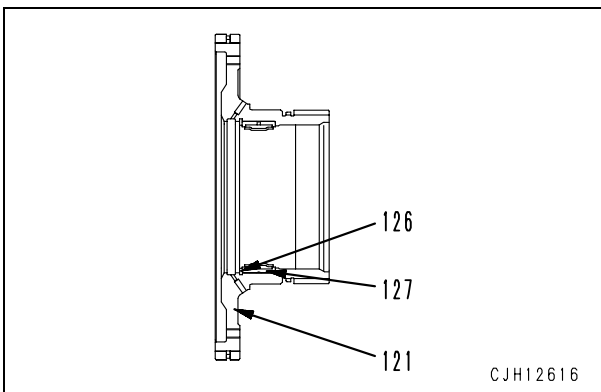
9. Spring and piston plate

- Install piston plate (128).
- ★ Check that the spring is inserted to the spring hole of the piston plate.



10. Assembly of ring gear No. 6 and sun gear No. 7 assembly

- 1) Gear No. 7
 - 1] Install bearing (127) to No. 7 sun gear (121).
 - 2] Install snap ring (126) to No. 7 sun gear (121).

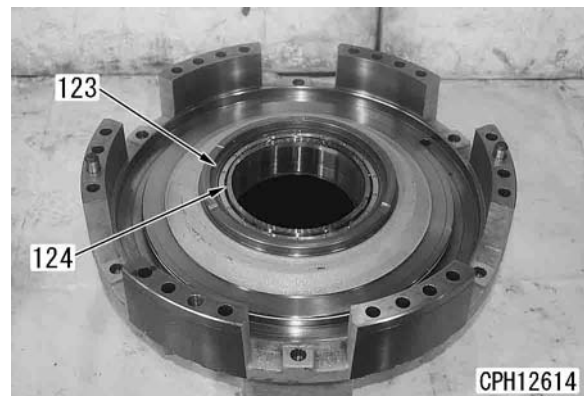


- 2) Install gear No. 7 (121) to ring gear No. 6 (125).
★ For the installation procedure, refer to the "Assembly of carrier No. 4 assembly."

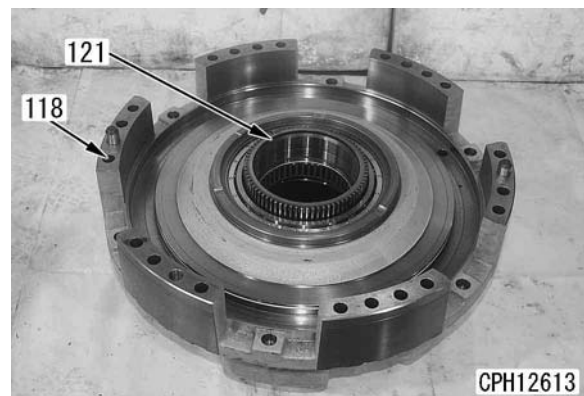


3) Housing

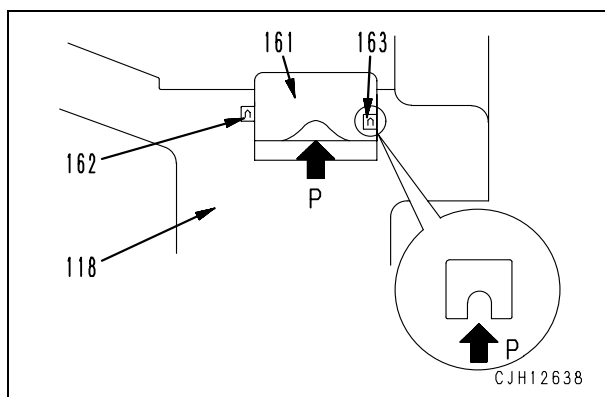
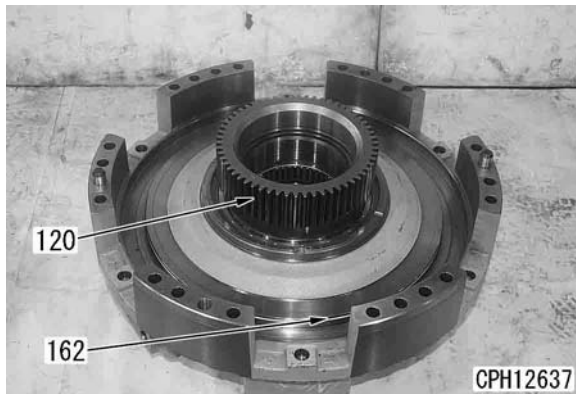
- 1] Install bearing (124) to housing (118).
- 2] Install snap ring (123).



- 3] Sling and install to ring gear No. 6 and gear No. 7 assembly (121).

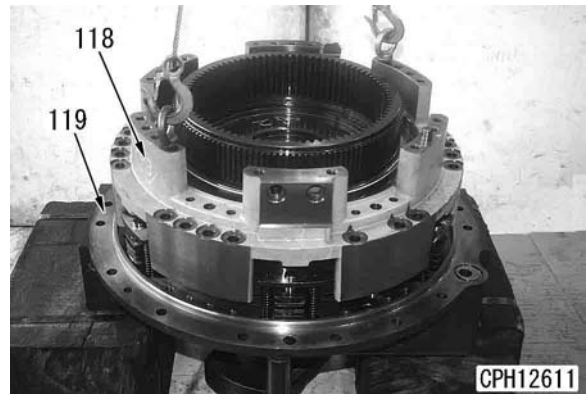


- 4) Sun gear No. 7 and piston
 - 1) Install sun gear (120).
 - ★ For the installation procedure, refer to the "Assembly of carrier No. 4 assembly."
 - ★ Apply molybdenum disulfide lubricant (LMG) to the spline.
 - 2) Install seal rings (162) and (163) to housing (118) and piston (161) and install the piston to the housing.
 - ★ Set the seal ring groove portion to the pressure receiving side.



11. Installation of housing Nos. 6 and 7 assembly

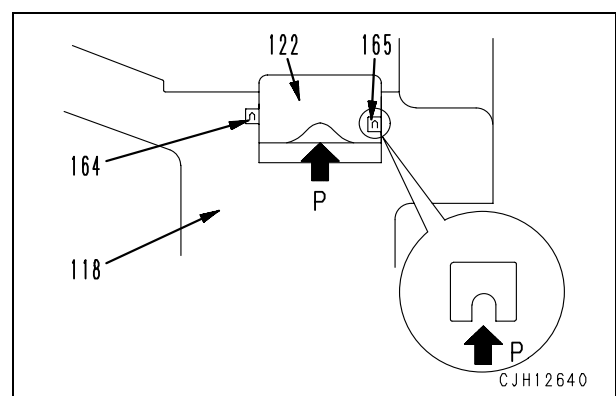
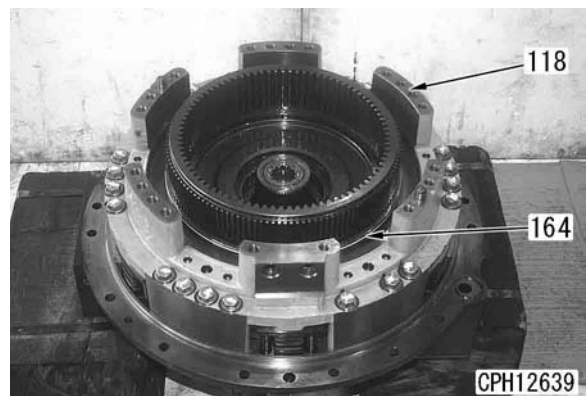
- 1) Install housing Nos. 6 and 7 assembly (118) using the eyebolts.
 - ★ When removing housing assembly (118), check the mark provided between cover assembly (119).
 - ★ Reverse and sling housing assembly (118). Care should be taken not to allow piston No. 7 to fall until the assembly is installed.
 - ★ If the dowel pin is hardened, use a plastic hammer to strike it in.



- 2) Install seal rings (164) and (165) to the housing (118) and piston No. 6 (122).
 - ★ Set the seal ring groove portion to the pressure receiving side.

⌘ Mounting bolt:

245.2 – 274.6 Nm {25 – 28 kgm}

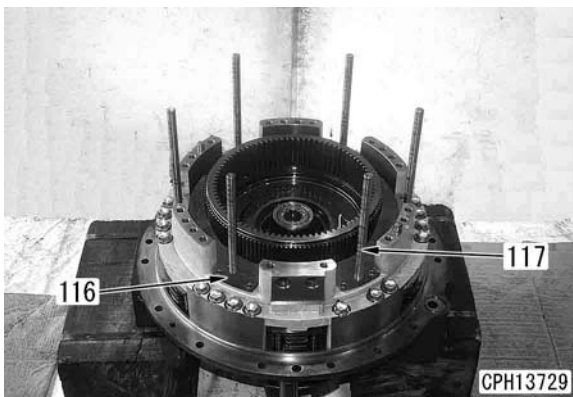


- 3) Install piston No. 6 (122).



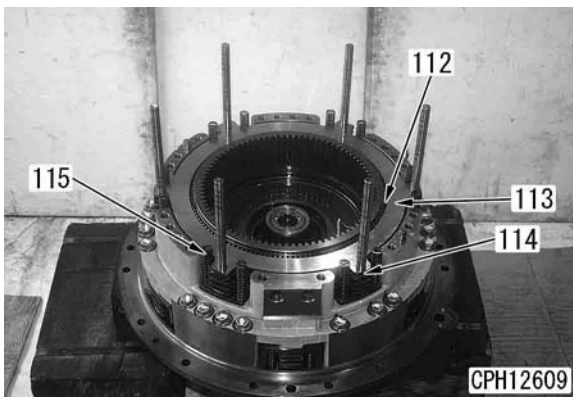
12. Guide pin and piston plate

- 1) Install guide pins (117).
- 2) Install plate (116).



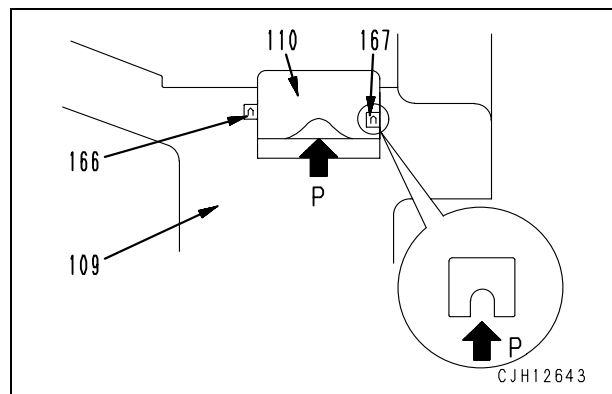
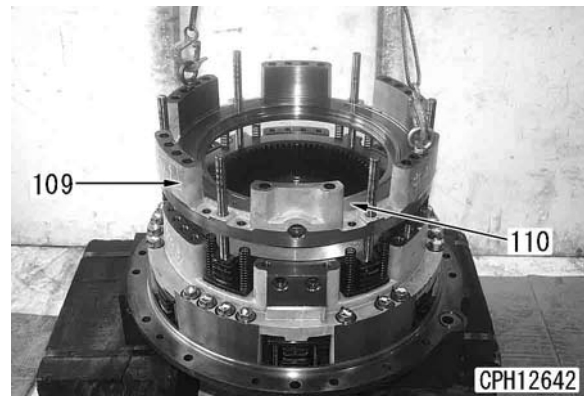
13. Clutch No. 6 disc, plate and spring

- 1) Install discs (112), springs (114) and plates (113) alternately.
- 2) Install spring (115).

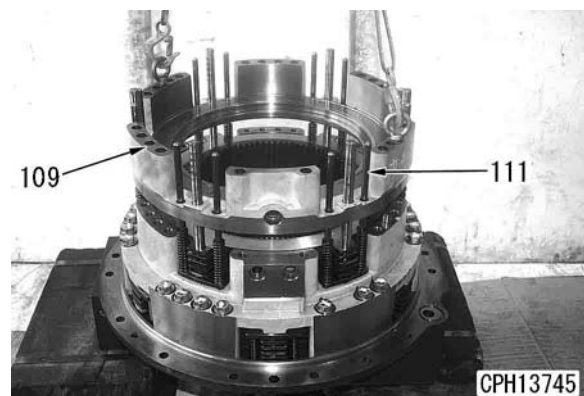


14. Housing No. 5 and piston

- 1) Install seal rings (166) and (167) to housing (109) and piston (110). Install the piston to the housing.
 - ★ Set the seal ring groove portion to the pressure receiving side.
- 2) Install housing (109) using the eyebolts and aligning to the spring.
 - ★ If the dowel pin is hardened, use a plastic hammer to strike it in.

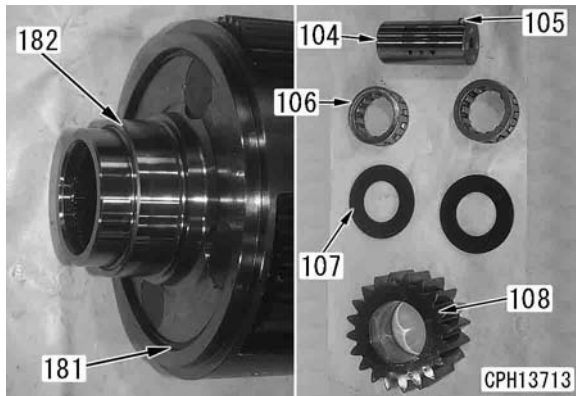


- 3) Install spring guide pins (111) to housing (109).

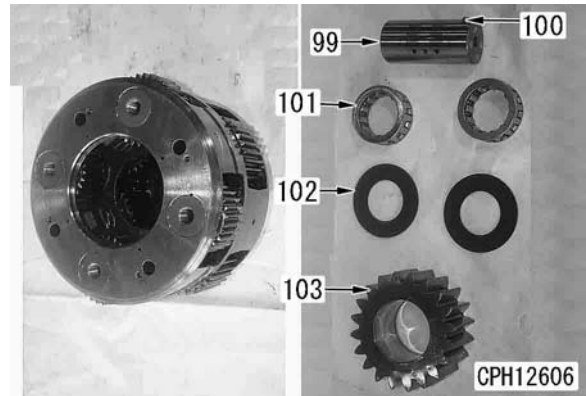


15. Assembly of carrier No. 5 and No. 6 assembly**1) Planetary gear No. 6**

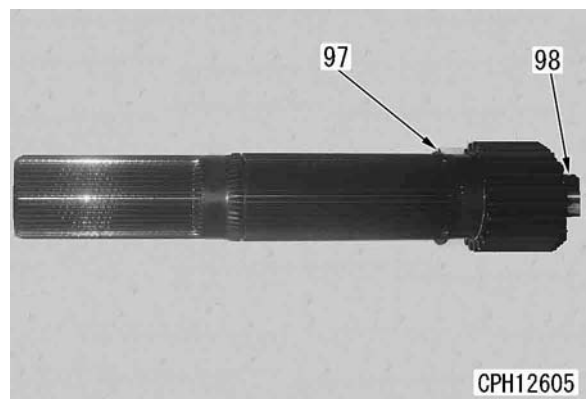
- 1] Install bearing (106) to planetary gear No. 6 (108) and set them to the carrier by placing thrust washer (107) to both sides of installation.
- 2] Install shaft (104) to the carrier.
 - ★ Refer to Step (1) in the "Assembly of carrier No. 4 and ring gear No. 5 assembly."
 - ★ Check that the ball (105) installation hole of the shaft is aligned to the hole position of the carrier. Install the shaft carefully avoiding damages to the bearing and thrust washer.
 - ★ Check that the gear rotates smoothly.
- 3] Install snap ring (181) to the carrier.
- 4] Install inner race (182) to the carrier.

**2) Planetary gear No. 5**

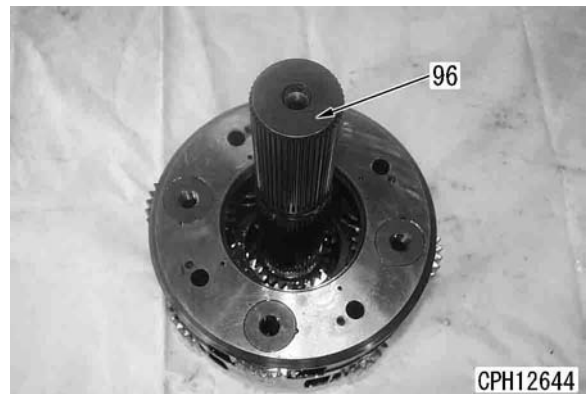
- 1] Reverse and install the carrier assembly.
- 2] Install bearing (101) to planetary gear No. 5 (103) and set them to the carrier by placing thrust washer (102) to both sides of installation.
- 3] Install shaft (99) with ball (100) to the carrier.
 - ★ Refer to Step (1) in the "Assembly of carrier No. 4 and ring gear No. 5 assembly."
 - ★ Check that the ball installation hole of the shaft is aligned to the hole position of the carrier. Install the shaft carefully avoiding damages to the bearing and thrust washer.
 - ★ Check that the gear rotates smoothly.

**3) Shaft**

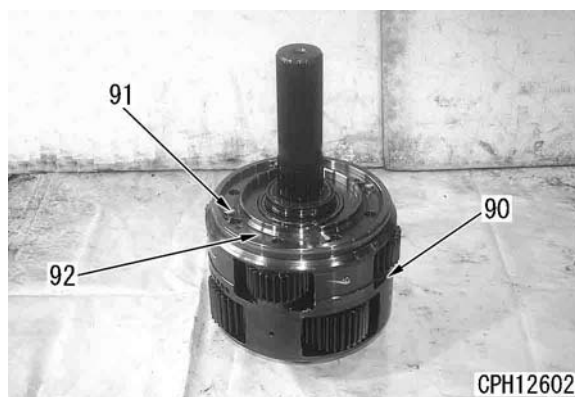
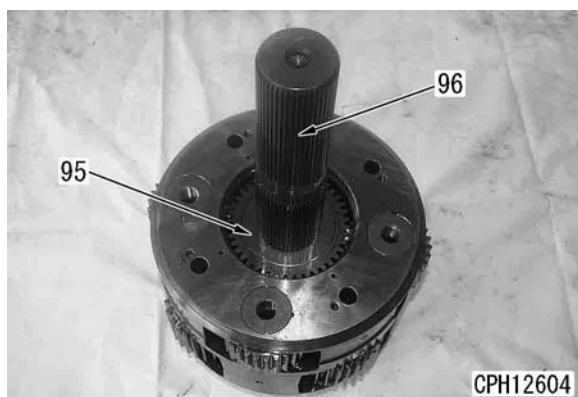
- 1] Install inner race (98) to the shaft.
- 2] Install snap ring (97) to the shaft.



- 3] Sling shaft assembly (96) and install to carrier assembly.

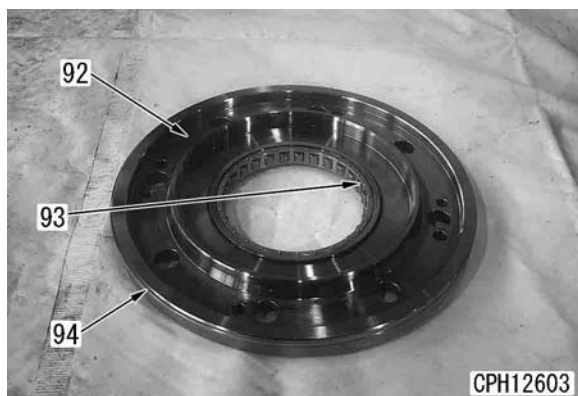


- 4) Install sun gear (95) to shaft assembly (96).



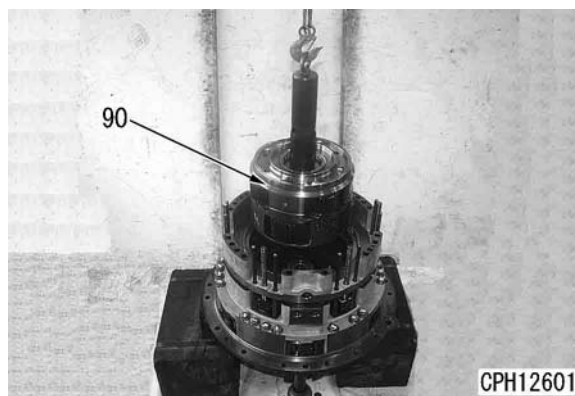
- 5) Cover

- 1] Install bearing (93) to cover (92).
- 2] Install seal ring (94) to cover (92).



16. Sun gears No. 5, No. 6 and carrier gear

Sling and install sun gears No. 5, No. 6 and carrier gear assembly (90).



- 3] Install cover assembly (92) to carrier assembly (90).

⚙ Mounting bolt (91):

Adhesive (LT-2)

⚙ Mounting bolt (91):

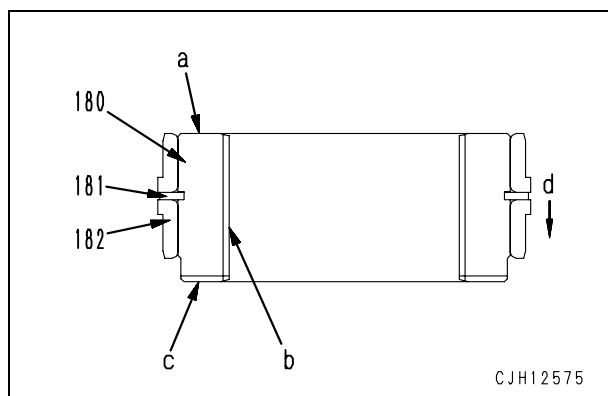
58.3 – 73.5 Nm {6 – 7.5 kgm}

- 4] Press fit inner race (182), after assembling snap ring (181) to collar (180).

- 5] Install the collar (180) to shaft.

★ Apply molybdenum disulfide lubricant to [a], [b], [c], before installing the collar (180).

★ Confirm the direction (d) of the collar (180).



17. Assembly of carrier No. 4 and ring gear No. 5 assembly

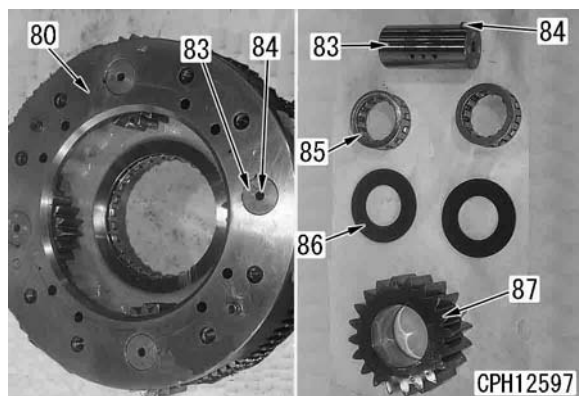
- 1) Carrier No. 4 assembly

- 1] Install bearing (88) to the carrier.

- 2] Install seal ring (168) to the carrier.

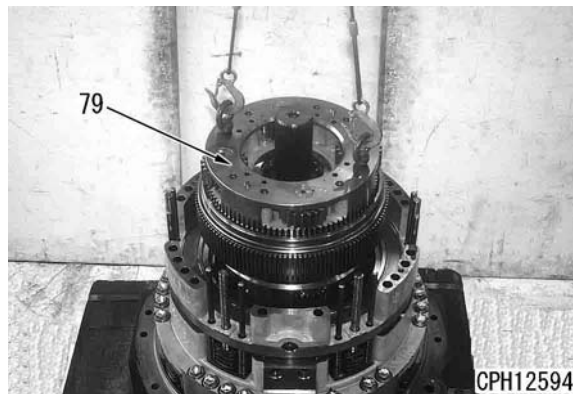


- 3] Install bearing (85) to planetary gear No. 4 (87) and set them to the carrier (80) by placing thrust washer (86) to both sides of installation.
 - 4] Attach ball (84) to shaft (83) and install to the carrier.
- ★ Check that the ball installation hole of the shaft is aligned to the hole position of the carrier. Install the shaft carefully avoiding damages to the bearing and thrust washer.
 - ★ Check that the gear rotates smoothly.



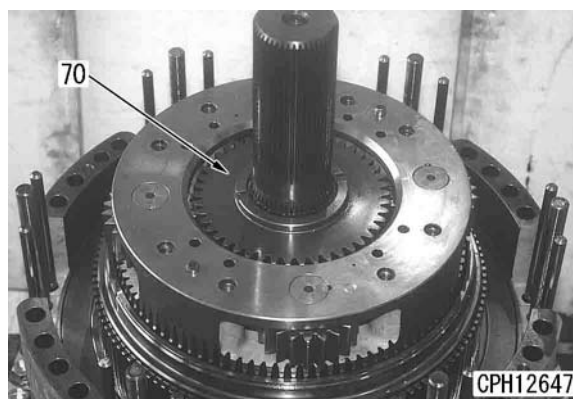
18. Carrier gear No. 4

Sling and install carrier gear No. 4 assembly (79).



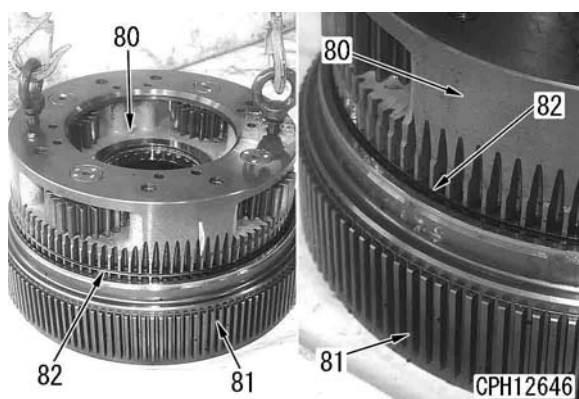
19. Sun gear No. 4

1) Install sun gear No. 4 assembly (70).



2) Ring gear

- 1] Install snap ring (82) to carrier assembly (80).
- ★ Apply grease to the snap ring installation groove. Install snap rings evenly.
- 2] Sling carrier No. 4 assembly (80) and install to ring gear (81).
- ★ Insert by pressing snap ring (82) evenly inside.

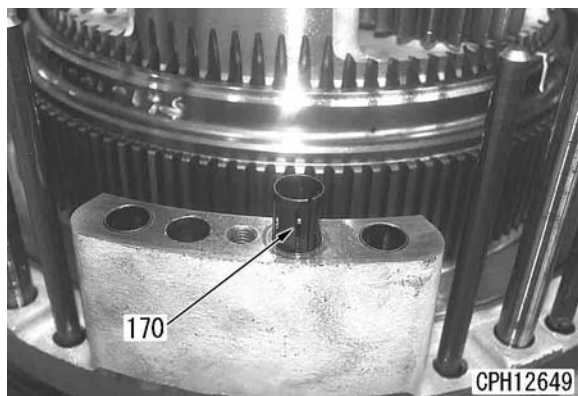


- 2) Install snap ring (69) to gear (70).
- 3) Install seal ring (169) to gear (70).



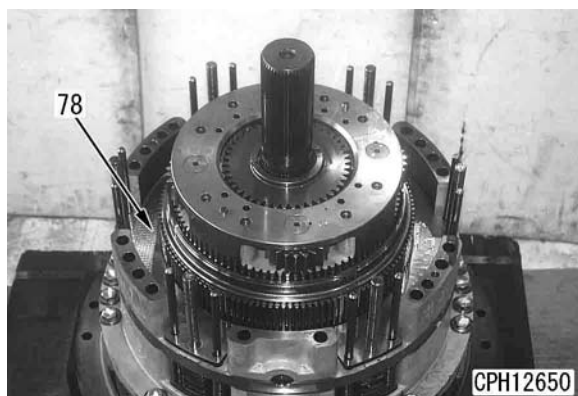
20. Sleeve for tie bolt

Install sleeve (170) for tie bolt.



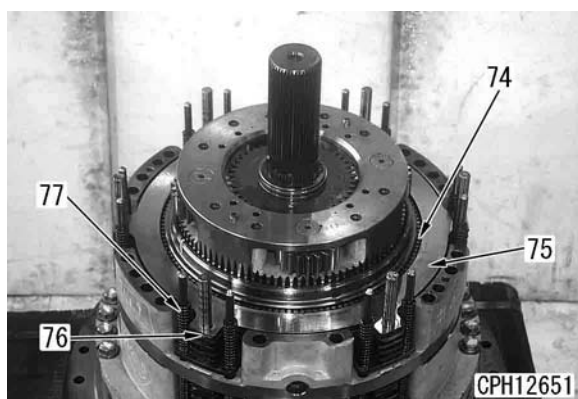
21. Clutch No. 5, disc, plate and spring

1) Install piston plate (78).



2) Install discs (74), plates (75) and springs (76).

3) Install guide springs (77).



22. Housing No. 4 and piston

1) Install seal rings to housing (71) and piston (72). Install the piston to the housing.

★ For the installation direction of seal ring, refer to the "Assembly Section 5."

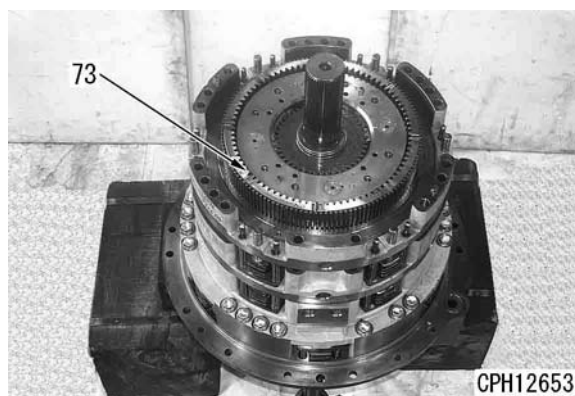
2) Install housing (71) using the eyebolts and aligning to the spring.

★ If the dowel pin is hardened, use a plastic hammer to strike it in.



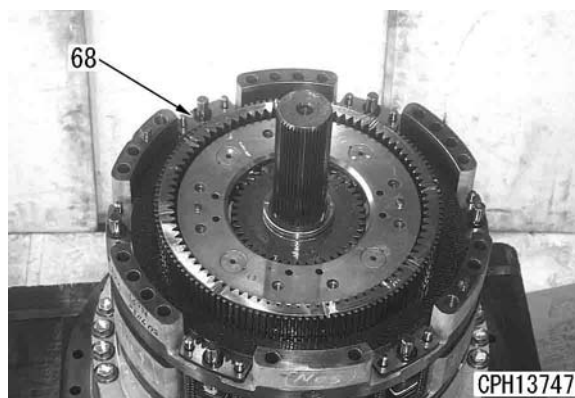
3) Set clutch ring gear No. 4 (73).

★ Direct the cut side of the inner circumference downward.

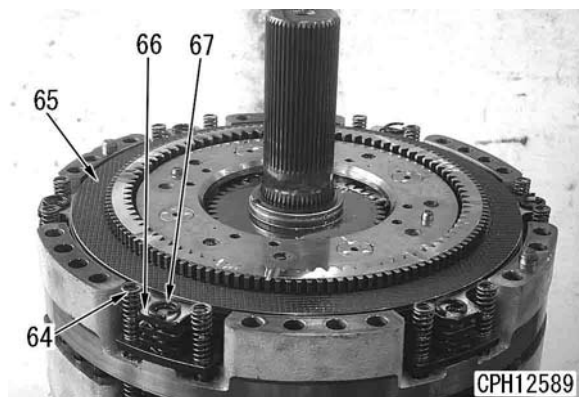


23. Clutch No. 4, disc, plate and spring

1) Install piston plate (68).



- 2) Install discs (65), springs (67) and plates (66) alternately.
- 3) Install springs (64).



24. Clutch No. 4, plate and tie bolt

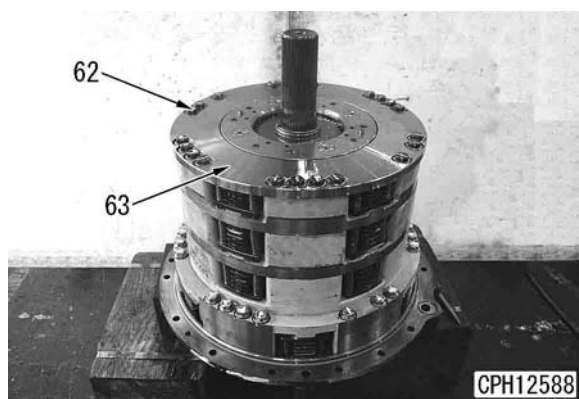
- 1) Install plate (63).

25. Install tie bolts (62).

☞ Tie bolt:

245.2 – 274.6 Nm {25 – 28 kgm}

- ★ Manually press the tie bolts in to the end face of the tapped hole.
- ★ Don't use an impact wrench to the extent the bolt makes contact with the screw thread.



26. Clutch ring gear No. 3

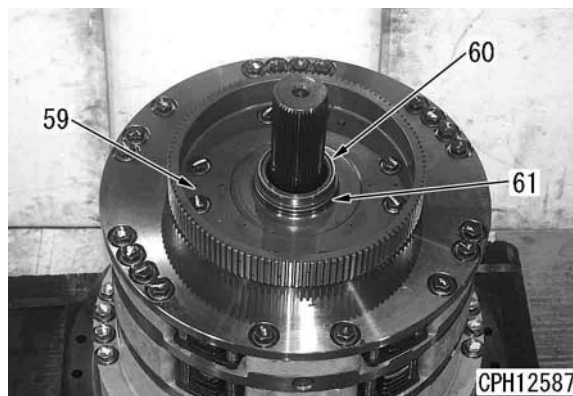
- 1) Install ring gear (59).

☞ Mounting bolt: **Adhesive (LT-2)**

☞ Mounting bolt:

156.1 – 196.1 Nm {16.0 – 20.0 kgm}

- 2) Install inner race (60).
- 3) Install seal ring (61).



27. Clutch drum No. 3

- Install drum (171).



28. Clutch No. 3, disc, plate and spring

- 1) Install disc (172) and spring (173).

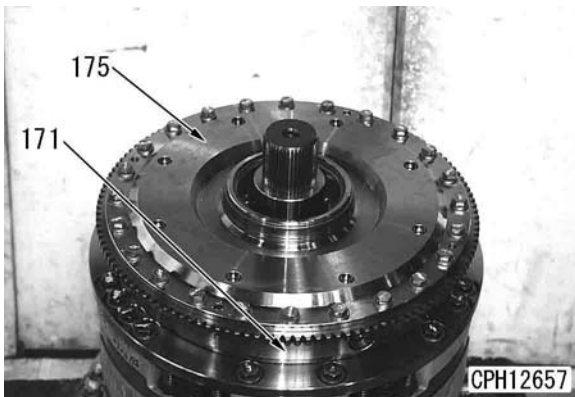


- 2) Install plate (174).
- ★ Then install the disc, spring and plate.



29. Clutch housing No. 3 assembly

- 1) For assembly of the piston, refer to Section (5), "Assembly of clutch No. 2 assembly."
- 2) Align the external teeth of balance piston to the internal teeth of drum (171), then install housing assembly (175).
 -  Mounting bolt: **Adhesive (LT-2)**
 -  Mounting bolt: **98.1 – 122.6 Nm {10.0 – 12.5 kgm}**



30. Piston operation check

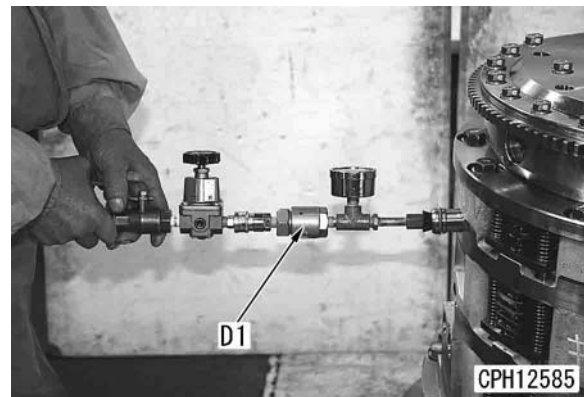
Use tool **D1** to check the operating state of clutch piston Nos. 4, 5, 6 and 7.

★ Air pressure: 3 - 6 kg/cm²

Standard piston stroke:

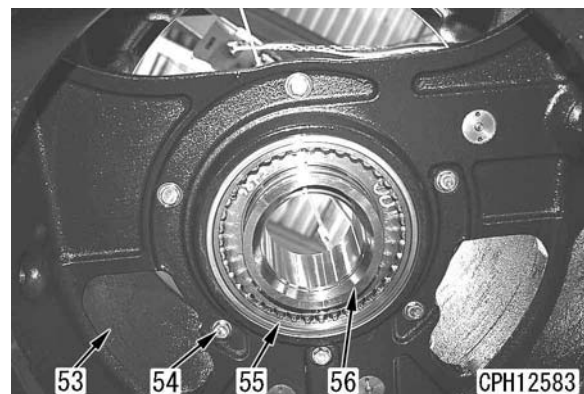
Piston No.	Stroke m/m
No. 4	4.0
No. 5	6.3
No. 6	6.8
No. 7	6.0

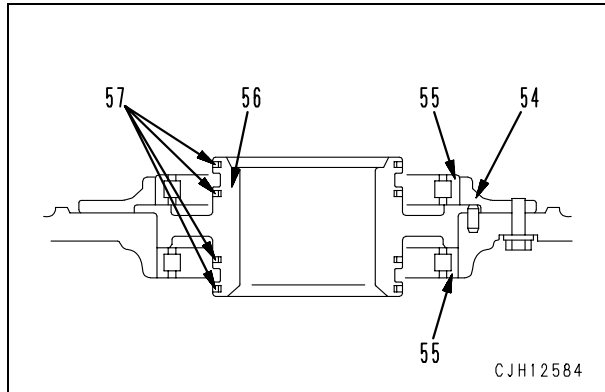
★ If operation is irregular, apply engine oil.



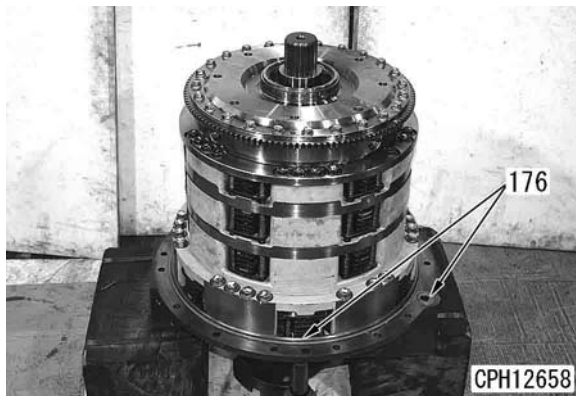
31. Transmission case

- 1) Install the following parts to the transmission case:
 - 1] Attach seal ring (57) to the outer groove of collar (56), align to the dowel pin of the transmission case and install.
 -  Seal ring: **Grease (G2-LI)**
 - 2] Install cage (54) to case (53).
 - 3] Install bearing (55) on both surfaces.
 - ★ Press fit until the collar is contacted. (Check that there is no clearance between the collar and the bearing.)

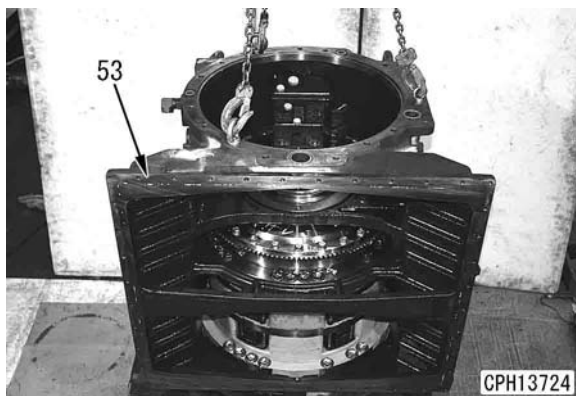




2) Install O-ring (176) to the cover assembly.



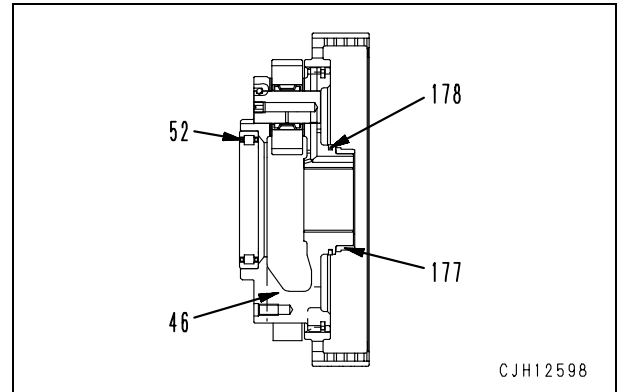
3) Fix the forcing screws with nuts and then sling and install transmission case (53).



32. Assembly of clutch No. 2 assembly

1) Carrier assembly

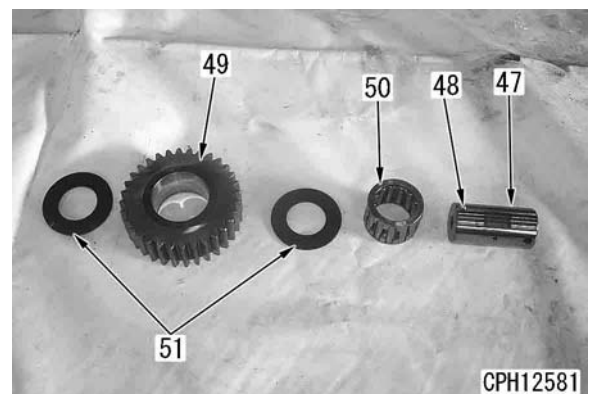
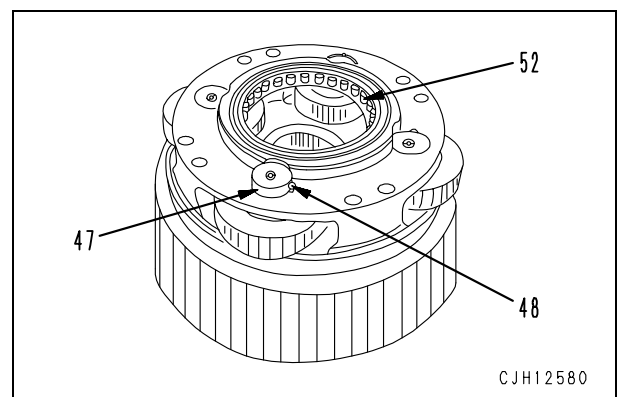
1] Install inner race (177), bearing (52) and seal ring (178) to carrier assembly (46).



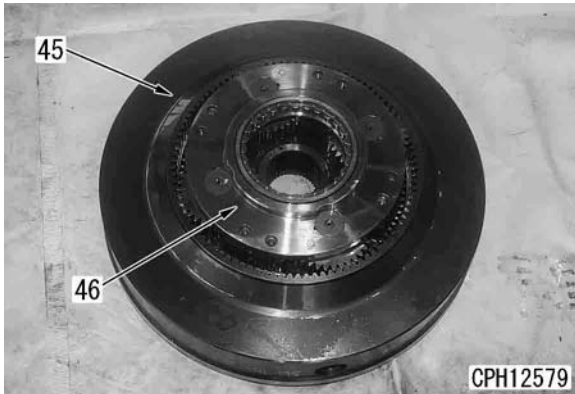
2] Install bearing (50) to gear (49) and set it to carrier assembly (46) by placing thrust washer (51) to both sides.
3] Push in shaft (47) by aligning to the bearing and thrust washer.
4] Assemble ball (48) and install completely.

★ If the shaft tends to run out, hammer in the punch from the carrier side.

★ Check that the gear rotates smoothly.



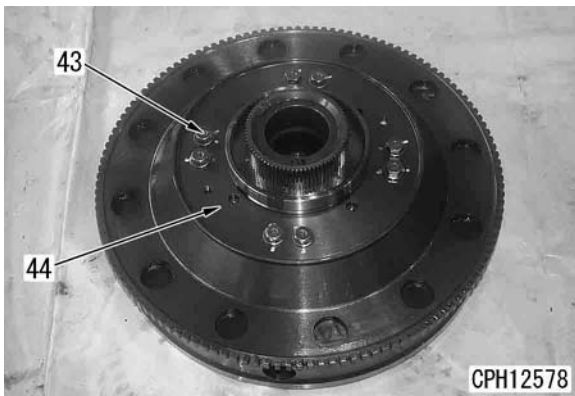
- 2) Drum
Install carrier assembly (46) to drum (45).



- 3) Transmission input shaft rotation detecting plate
Install plate (44) to carrier assembly.
🔧 Mounting bolt (43):

Adhesive (LT-2)

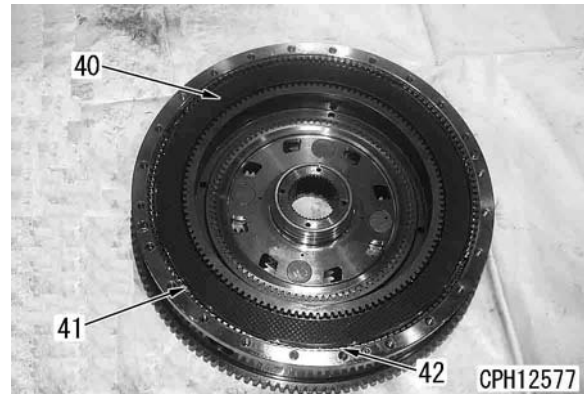
🔧 Mounting bolt (43):
98.1 – 122.6 Nm {10.0 – 12.5 kgm}



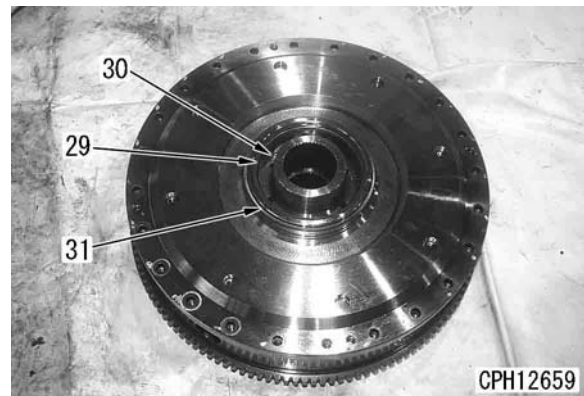
- 4) Disc, plate and spring
1] Reverse and install the clutch assembly.



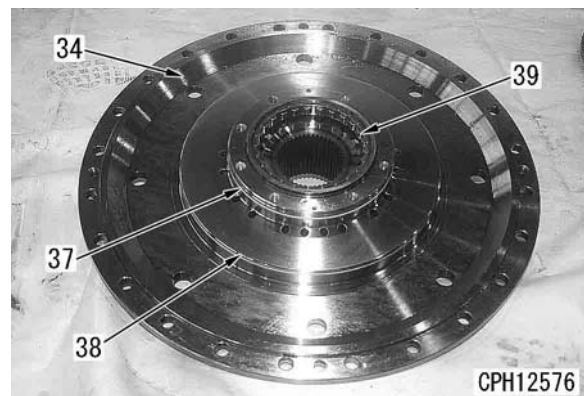
- 2] Install disc (40), plate (41) and spring (42).
★ 5 discs, 4 plates, and 5 springs



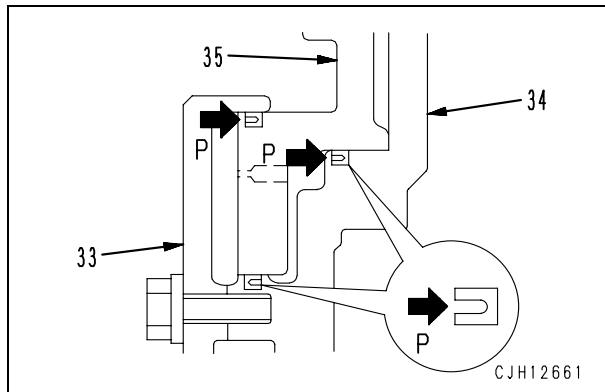
- 5) Housing assembly
1] Install bushing (30) and fix it with snap ring (29).
2] Install inner race (31).



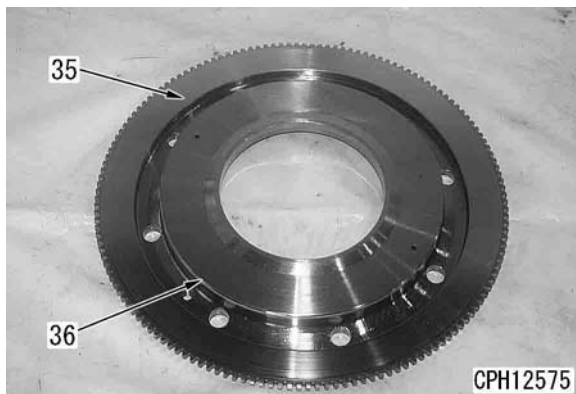
- 3] Reverse housing (34) and install to bearing (39).
4] Install seal rings (37) and (38).



- ★ Set the seal ring groove portion to the pressure (P) receiving side.



- 5] Install seal ring (36) to piston (35).



- 6] Install piston (35) to housing (34).



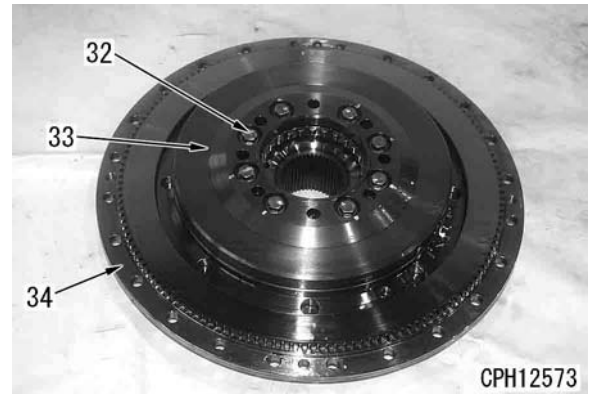
- 7] Install cylinder (33) to housing (34).

Mounting bolt:

Adhesive (LT-2)

Mounting bolt (32):

58.8 – 73.5 Nm {6.0 – 7.5 kgm}



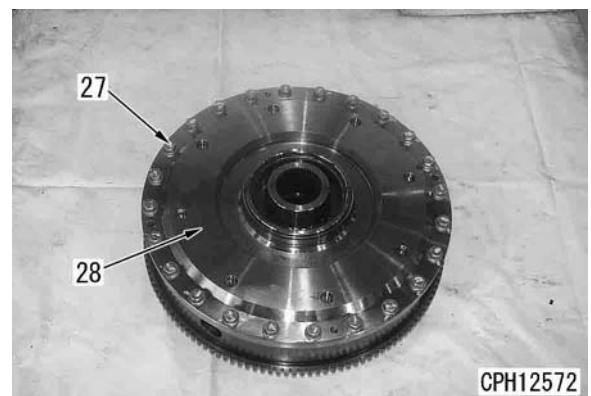
- 6) Install housing assembly (28) to the clutch assembly.

Mounting bolt (27):

Adhesive (LT-2)

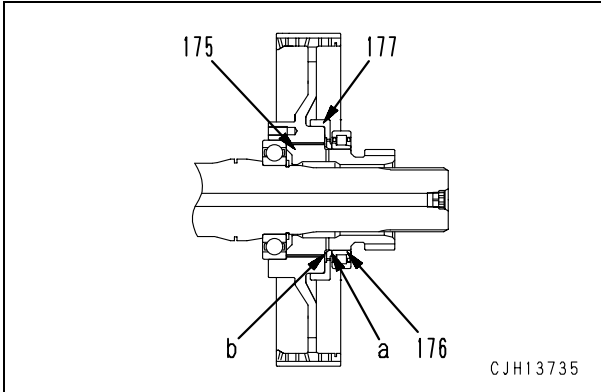
Mounting bolt:

98.1 – 122.6 Nm {10.0 – 12.5 kgm}

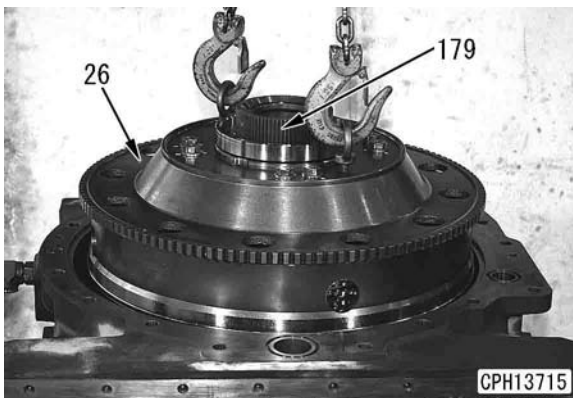


33. Installation of clutch No. 2 assembly

- 1) Install inner race (176) and spacer (177) to gear (175).
 - ★ Check that there is no clearance between parts (a) and (b).

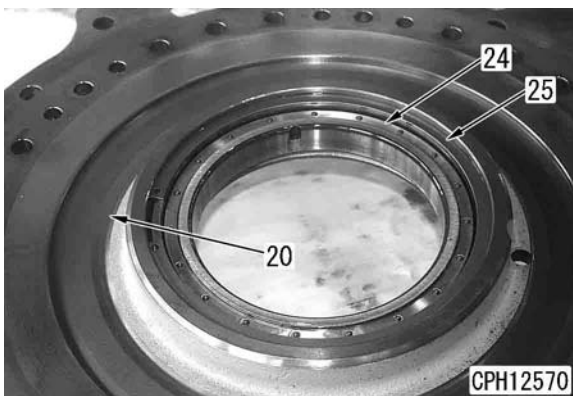


- 2) Install clutch No. 2 assembly (26) using the eyebolts.
- 3) Install sun gear (179).

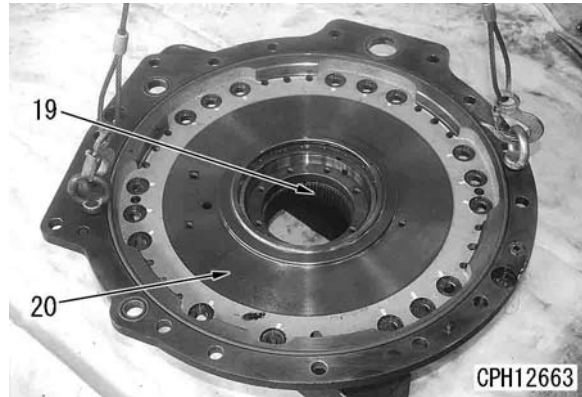


34. Assembly of clutch No. 1 assembly

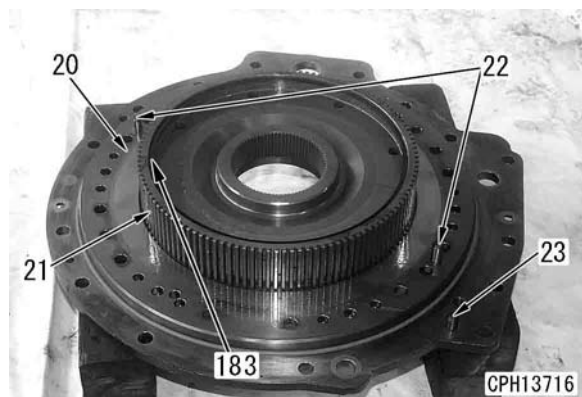
- 1) Bearing
 - Press-fit bearing (24) to cage (20) and fix with snap ring (25).
 - ★ Before installing bearing (24), check that "NTN6934L1CS65PX3" is stamped on the end of its outer race.



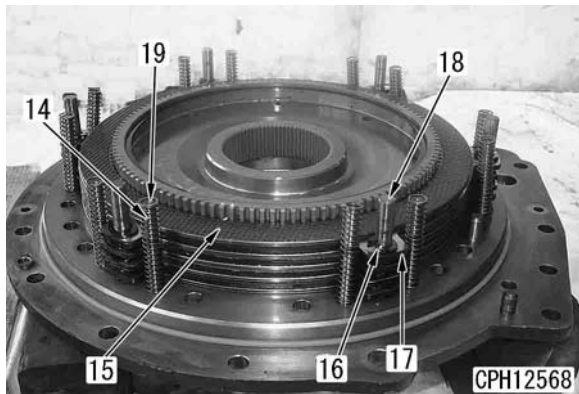
- 2) Sling and install cage assembly (20) to inner gear (19).
 - ★ When press fitting the bearing, press its inner race.



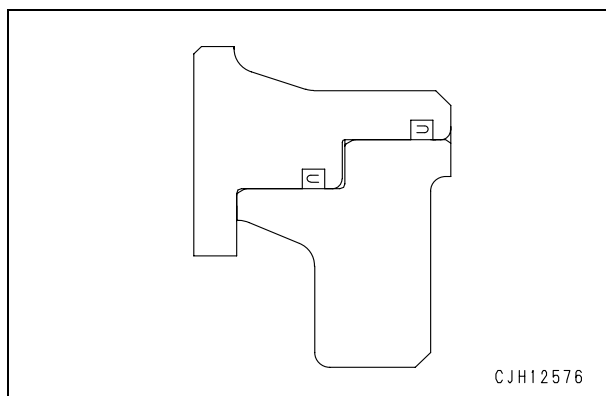
- 3) Clutch No. 1 and ring gear
 - 1] Reverse and install cage assembly (20) and install the ring gear.
 - ★ Install snap ring (183) to ring gear (21).
 - 2] Install dowel pins (22) and (23).
 - ⚙ Mounting bolt (23):
Adhesive (LT-2)
 - ⚙ Mounting bolt:
156.9 – 196.1 Nm {16.0 – 20.0 kgm}



- 4) Clutch No. 1, plate, disc and guide pin
- 1] Install guide pins (18), and install discs (15), springs (16) and plates (17) alternately.
 - 2] Install guide pins (19) and springs (14).



- 5) Clutch No. 1, housing, piston and spring
- 1] Install seal rings (180) and (181) to piston (13).
- ★ Set the seal ring groove portion to the pressure receiving side.



- 2] Install the piston by aligning it to the guide pins.



- 3] Install housing (12).
- ★ Temporarily tighten 2 mounting bolts diagonally from under. (Bolt (11) of 4])

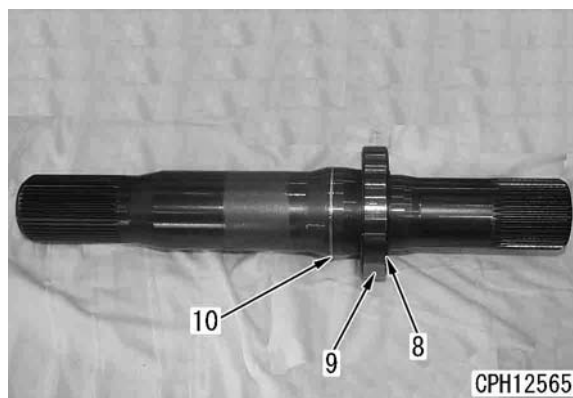


- 4] Reverse and install clutch No. 1 assembly and install the remaining mounting bolts.

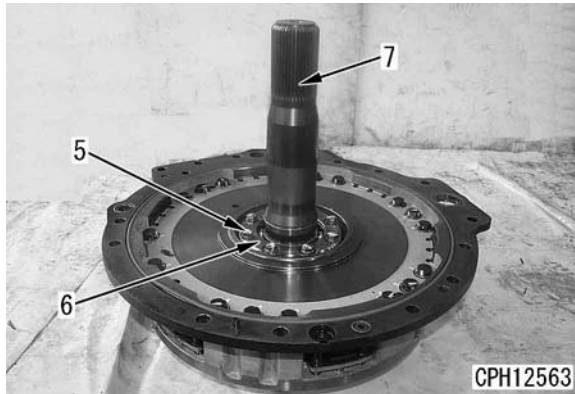
□ Mounting bolt:
156.9 – 196.1 Nm {16.0 – 20.0 kgm}



- 6) Input shaft
- 1] Press-fit bearing (9) to the input shaft and fix with snap ring (8).
 - 2] Install seal ring (10).



- 3] Install input shaft assembly (7) to clutch assembly and fix with plate (6).



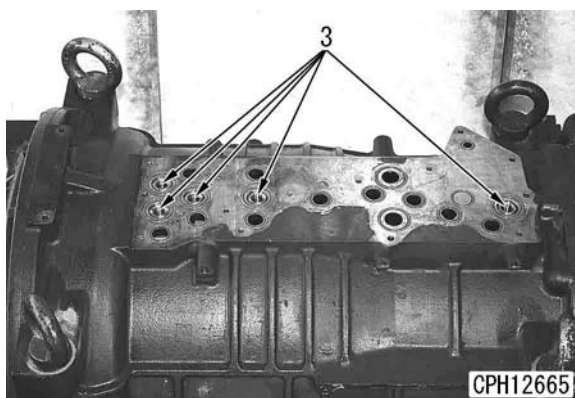
35. Installation of clutch No. 1 assembly

Install O-ring to the side of transmission case and install clutch No. 1 assembly (4) using the forcing screw.



36. Sleeve

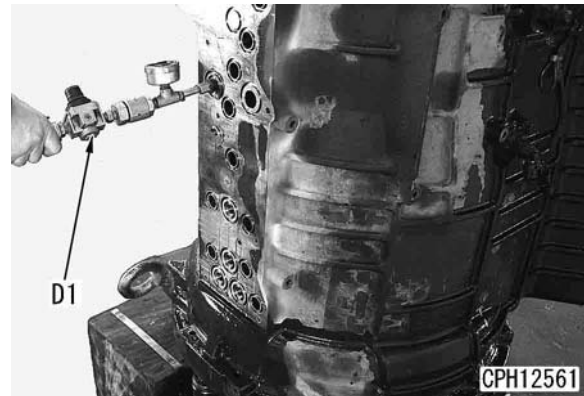
Install sleeves (3).



37. Piston operation check

Use tool D1 to check the operating state of clutch piston Nos. 1, 2 and 3. (Because that piston operation of clutches No. 2 and 3 cannot be directly checked, check it with the movement of disc or plate.)

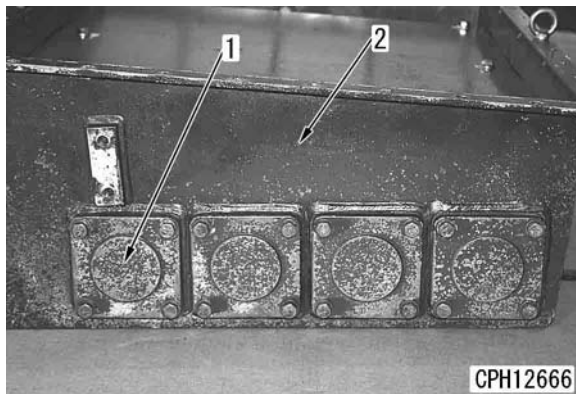
- ★ Standard piston stroke: 6.3 mm for clutch No. 1



Disassembly of oil pan

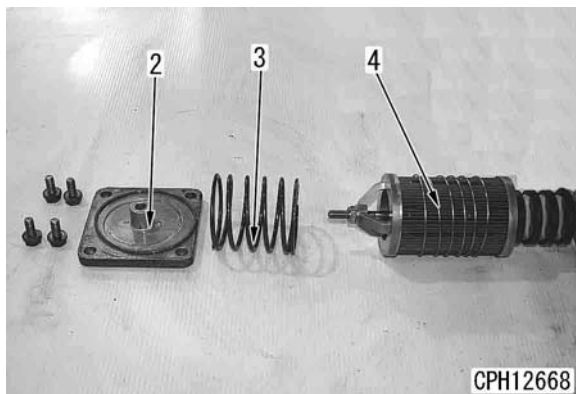
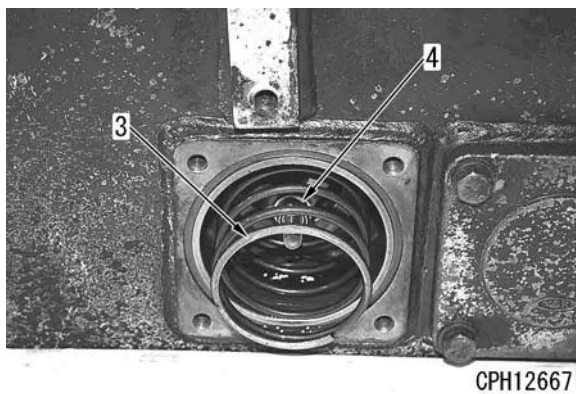
1. Cover

Remove oil pan (1) and cover (2).



2. Spring and magnet screen

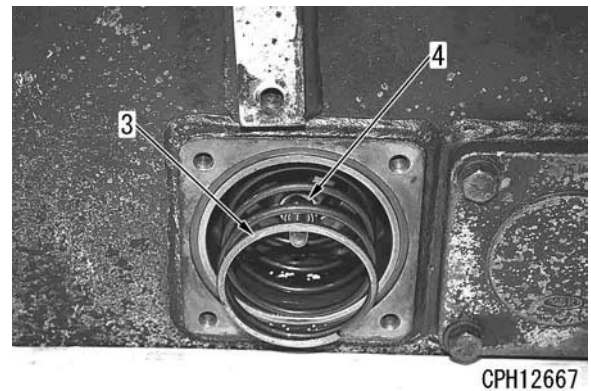
Pull out spring (3) and magnet screen (4).



Assembly of oil pan

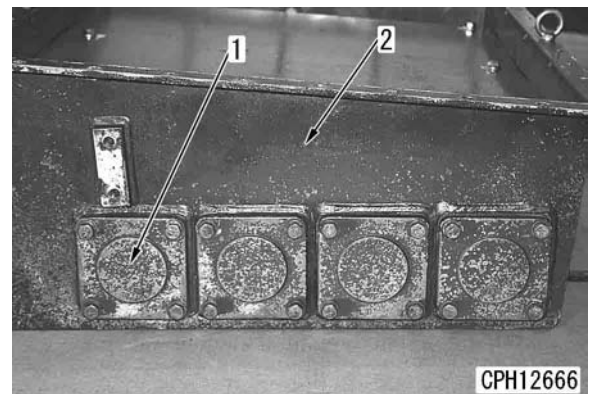
1. Magnet screen and spring

1) Assemble magnet screen (4) and spring (3) to oil pan.



2) Cover

Install O-ring to the cover (1) and assemble.



HD785-7 Dump truck

Form No. SEN01953-00

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

50 Disassembly and assembly

Power train, Part 2

Disassembly and assembly of differential assembly	2
Disassembly and assembly of front brake assembly	15
Disassembly and assembly of rear brake assembly	22

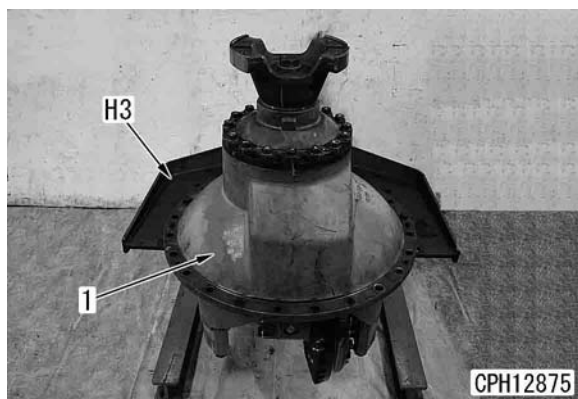
Disassembly and assembly of differential assembly (Standard differential)

Special tools

Sym-bol	Part No.	Part name	Necessity	Q'ty	New/Remodel	Sketch
H	3	790-501-2001 Repair stand	■	1		
		792-622-1110 Bracket	■	1		
	4	790-425-1660 Wrench	■	1		
	5	792-201-7010 Wrench	■	1		

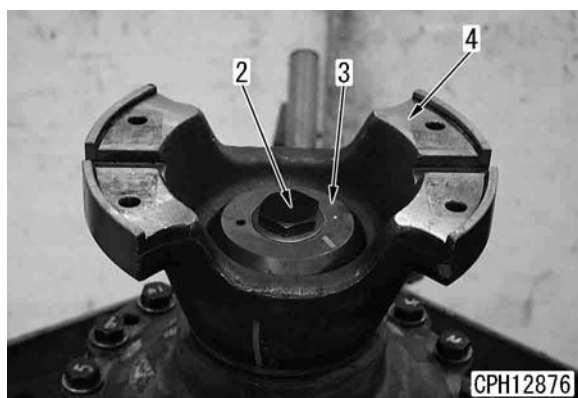
Disassembly

1. Place differential assembly (1) on tool H3.



2. **Coupling**

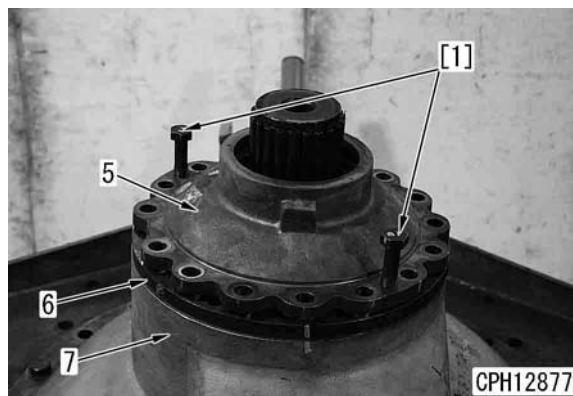
Remove mounting bolt (2), and remove coupling (4) together with retainer (3) and O-ring.



(Coupling face up.)

3. **Cage assembly**

- 1) Screw in forcing screws [1], and remove cover (5).
 - ★ Put counter marks on cover (5), cage (6) and case (7).
 - ★ Check the number and thickness of shims.

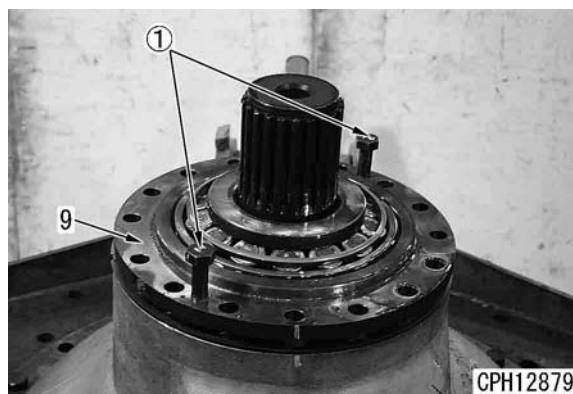


- 2) Remove dust seal (8) from cover (5).

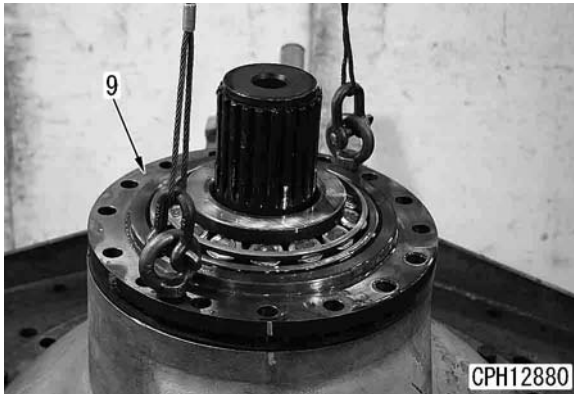


4. **Pinion and cage assembly**

- 1) Screw in forcing screws [1], and lift pinion and cage assembly (9).



- 2) Lift and remove pinion and cage assembly (9).

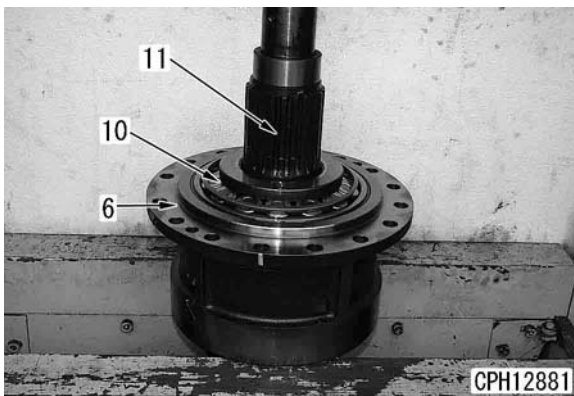


- 3) Remove bearing (13) from cage (6).



- **Disassembly of pinion and cage assembly**

- 1) Remove cage (6) from pinion gear (11) together with bearing inner (10).

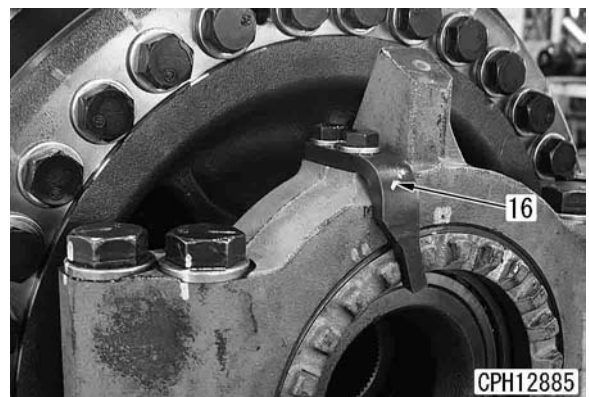


- 4) Remove outer races (14) and (15).

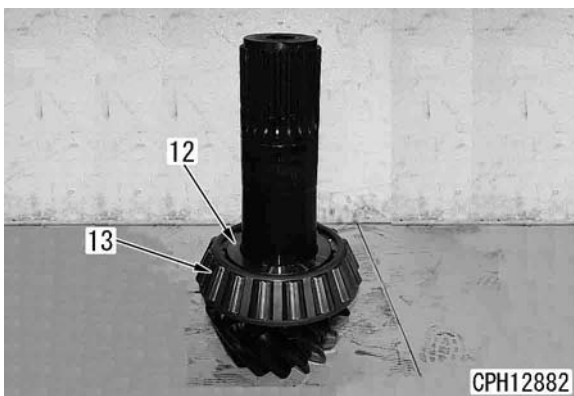


5. **Differential gear assembly**

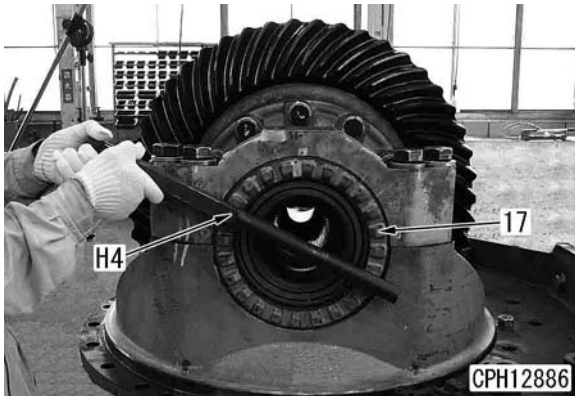
- 1) Remove lock (16).



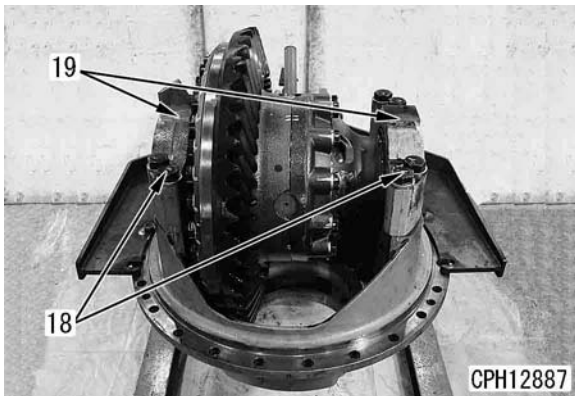
- 2) Remove spacer (12) and remove bearing inner (13).



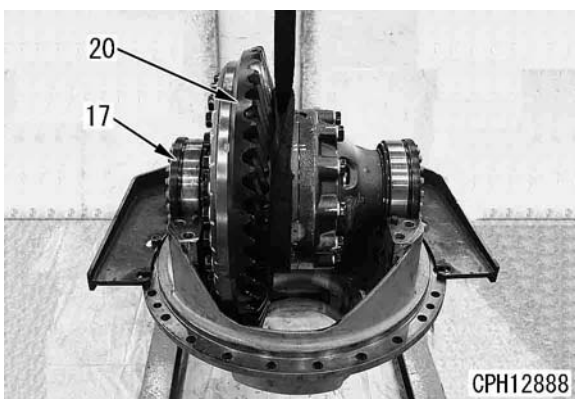
- 2) Loosen side bearing adjustment nuts (17) on both sides until it can be loosened by hand using tool H4.



- 3) Loosen mounting bolts (18) and remove caps (19).



- 4) Lift and remove differential gear assembly (20).
- 5) Remove side bearing adjustment nuts (17) on both sides.

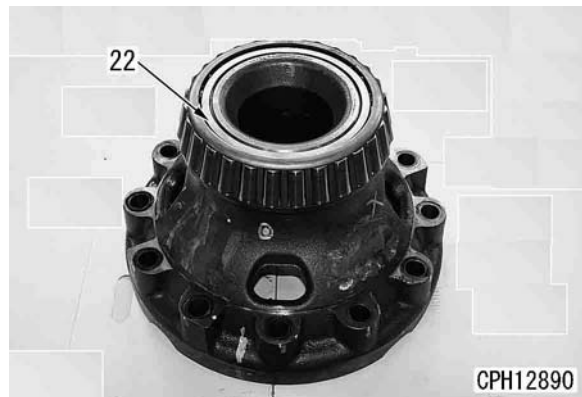


● **Disassembly of differential gear assembly**

- 1) Remove mounting bolt and remove case (21).
 - ★ Put counter marks on the bevel gear and case.



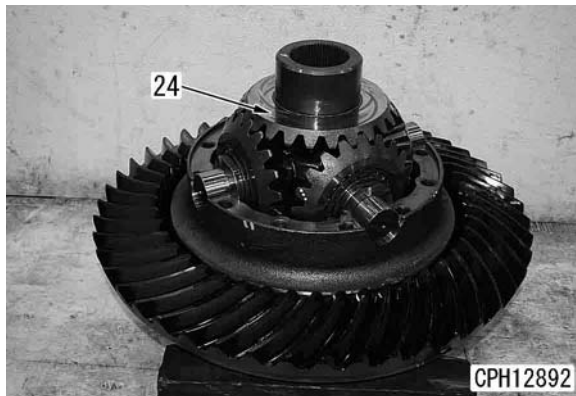
- 2) Remove bearing (22).



- 3) Remove thrust washer (23).

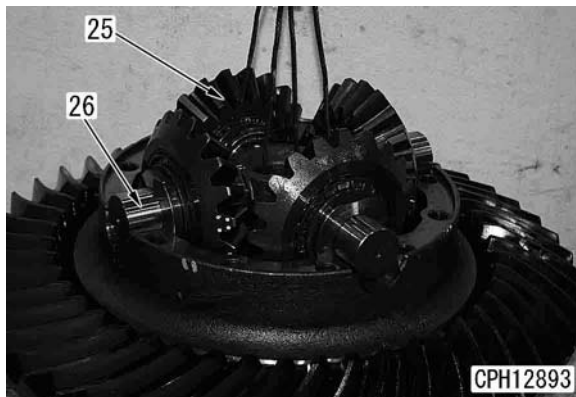


- 4) Remove side gear (24).

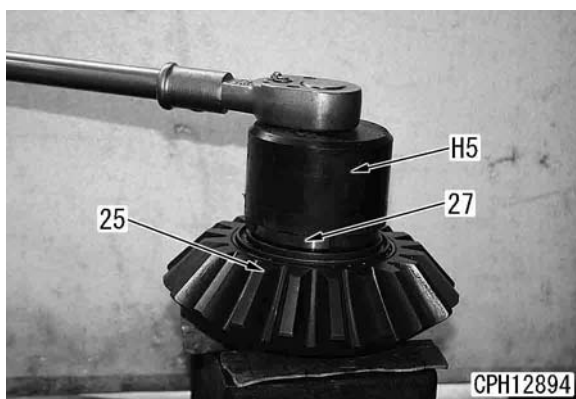


- 5) Remove pinion gear assembly (25) and cross shaft (26) together.

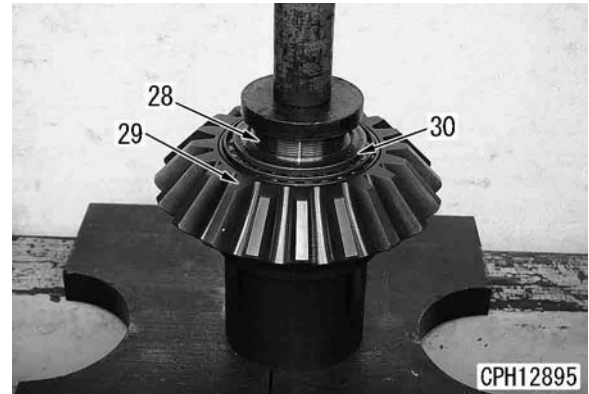
★ Be careful, that the pinion gear assembly can easily come off from the cross shaft during removal.



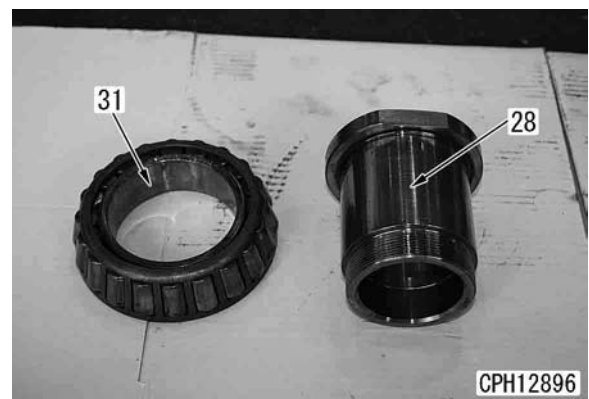
- 6) Fix pinion gear assembly (25) with a press, and remove ring nut (27) using tool H5.



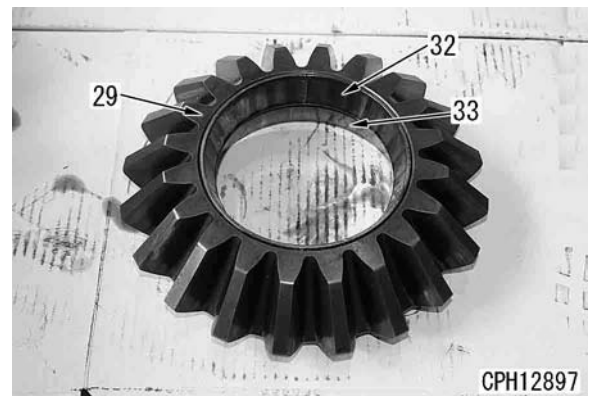
- 7) Pull out shaft (28) with a press, and remove bearing (30) from pinion gear (29).



- 8) Remove bearing (31) from shaft (28).

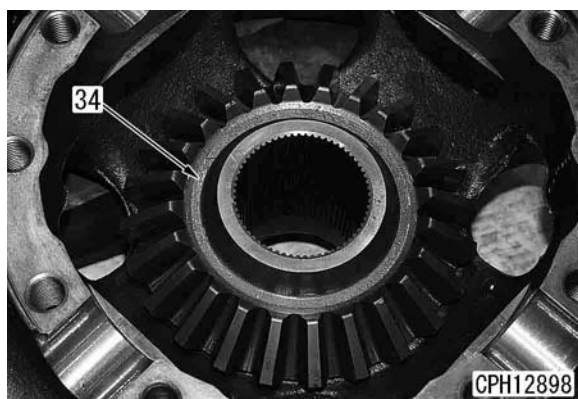


- 9) Remove bearing outer races (32) and (33) from pinion gear (29).



★ Nonadjustable bearing is used. Store them as a set by checking the mating numbers on the bearing and outer races.

10) Remove side gear (34).

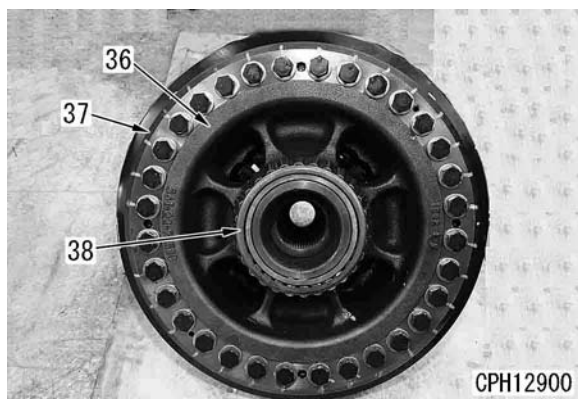


11) Remove thrust washer (35).



12) Remove bevel gear (37) from case (36).

13) Remove bearing (38) from the case.



Assembly

1. Assembly of differential gear assembly

- 1) Install bevel gear (37) to differential gear case (36).

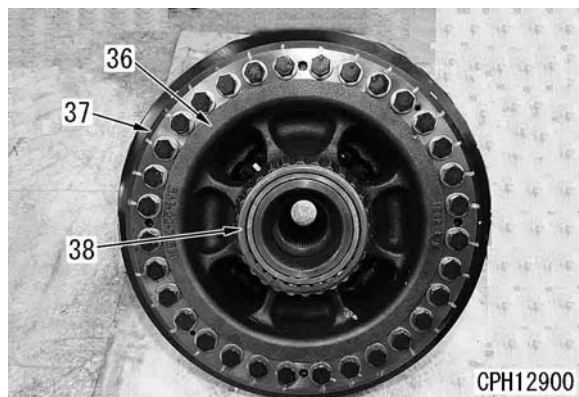
 Mounting bolt: **Adhesive (LT-2)**

 Mounting bolt: **921.9 – 1,029.7 Nm**
{94.0 – 105.0 kgm}

- 2) Install side bearing (38).

★ Shrink fit, warm up to 100°C

★ Make sure there is no clearance in the bearing-to-case end surface.

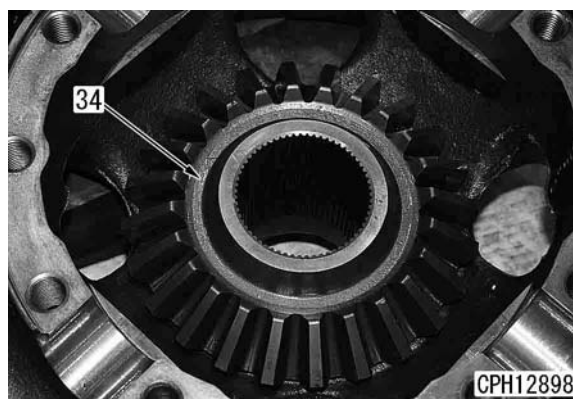


- 3) Reverse the case, and install thrust washer (35) by aligning with the dowel pin.

★ Make sure the head of the dowel pin is lower than the washer surface for 0.5 (+0.2/-0) mm.



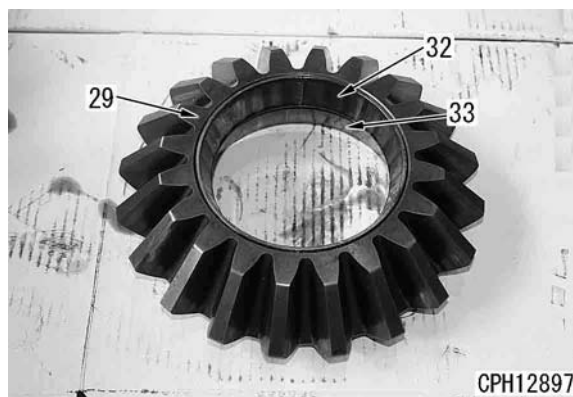
- 4) Install side gear (34).



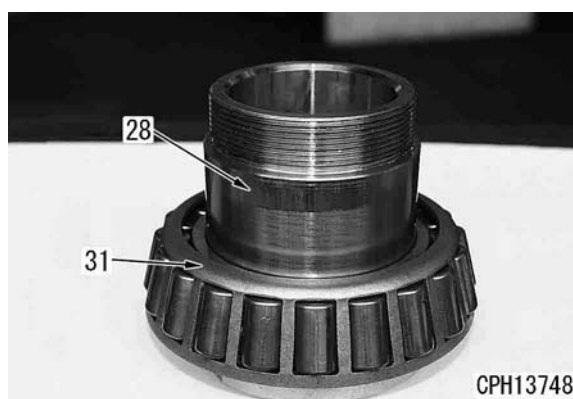
- 5) Pinion gear

★ Nonadjustable bearing is used. Assemble by checking the mating numbers on the bearing and outer races.

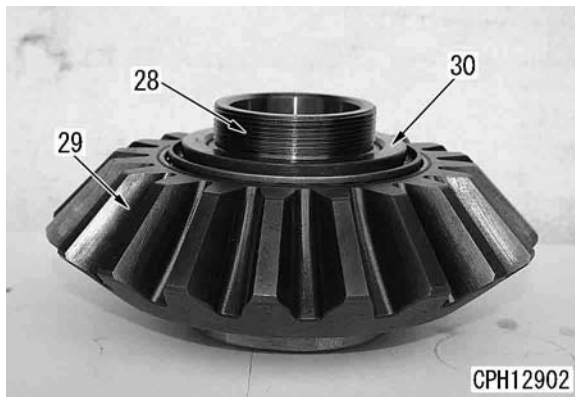
- 1] Press fit outer races (32) and (33) to pinion gear (29).



- 2] Using push tool, press fit bearing (31) to shaft (28).

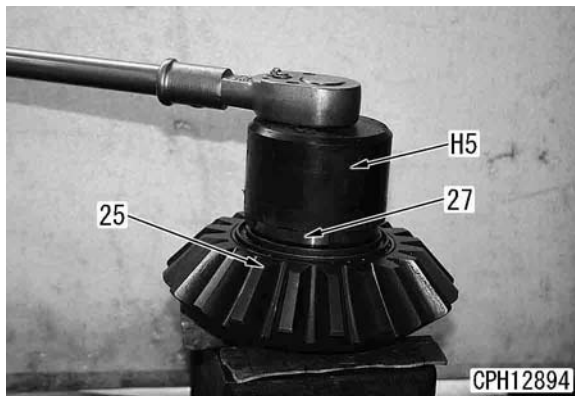


- 3] Place pinion gear (29) to shaft (28), and install bearing (30).



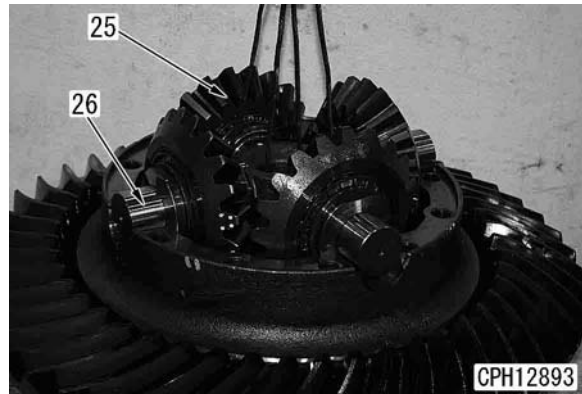
- 4] Fix pinion gear assembly (25) with a press, and tighten ring nut (27) using tool H5.

⌚ Ring nut: **578.6 – 745.3 Nm**
{59.0 – 76.0 kgm}

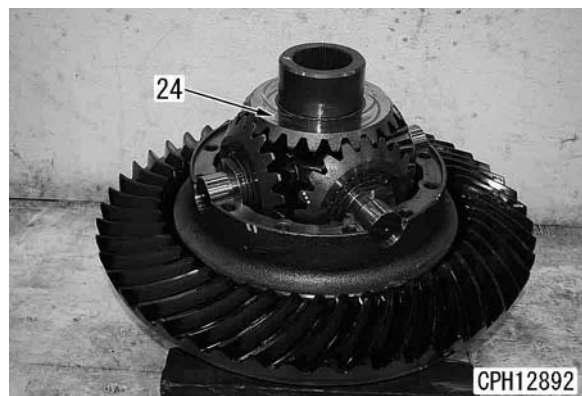


- 6) Assemble pinion gear assembly (25) to cross shaft (26), and lift and install to the case.

- ★ Install by aligning the dowel pin of the case with the cut-out portion of the pinion gear shaft.
- ★ Move the pinion gear to make sure the pinion gear assembly rotates smoothly.



- 7) Install side gear (24).

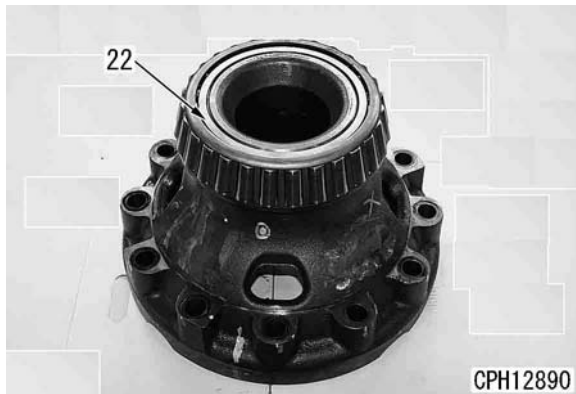


- 8) Install thrust washer (23) by aligning with the dowel pin.

- ★ Make sure the head of the dowel pin is lower than the washer surface for 0.5 (+0.2/-0) mm.



- 9) Install side bearing (22).
 - ★ Shrink fit, warm up to 100°C
 - ★ Make sure there is no clearance in the bearing-to-case end surface.

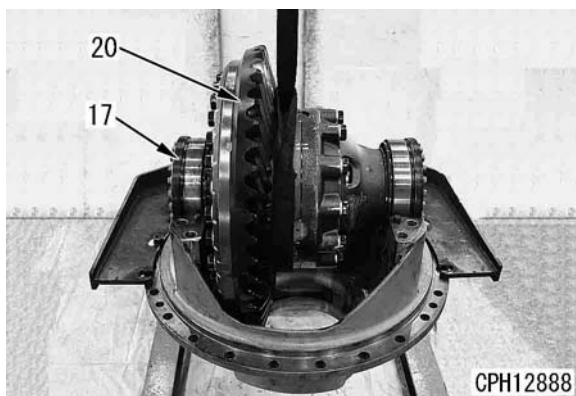


- 10) Install case (21).
 - ⚙ Mounting bolt: **Adhesive (LT-2)**
 - ⚙ Mounting bolt: **823.8 – 1,029.7 Nm**
{84.0 – 105.0 kgm}



2. Installation of differential assembly

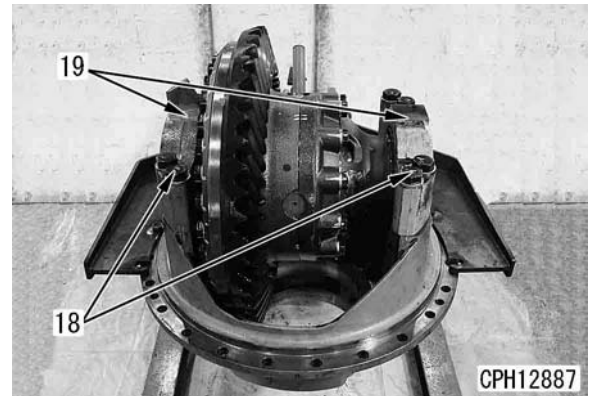
- 1) Temporarily tighten side bearing adjustment nuts (17), and temporarily place differential gear case assembly (20).



- 2) Install caps (19) and tighten mounting bolts (18).

⚙ Mounting bolt: **Adhesive (LT-2)**
 ⚙ Mounting bolt: **1,520.0 – 1,912.3 Nm**
{155.0 – 195.0 kgm}

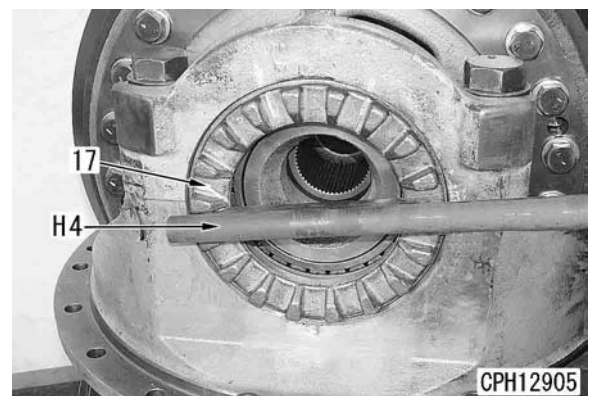
- ★ Align with the cap's counter marks.
- ★ Rotate the bevel gear 20 to 30 turns to fit the bearing before tightening.



- 3) Bearing preload adjustment

- 1) Using tool **H4**, tighten adjustment nuts (17) on both sides, taking care the locking groove.

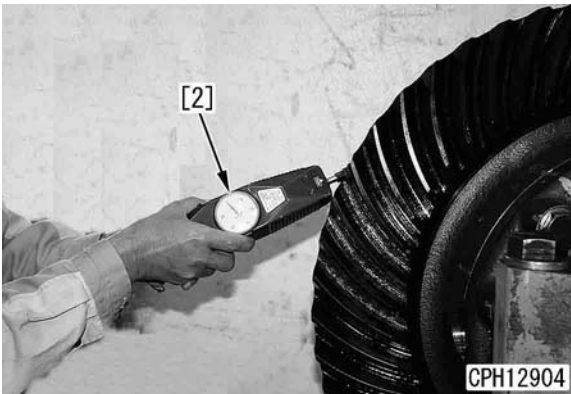
- ★ To fit the bearing, tap on the bearing cap and bevel gear using a copper hammer or the like, as rotating the bevel gear.



- 2] Press push pull gauge [2] on the outside perimeter of the bevel gear and measure the starting tangential force in the tangential direction.

Standard value of starting tangential force: **23.5 – 47 N {2.4 – 4.8 kg}**

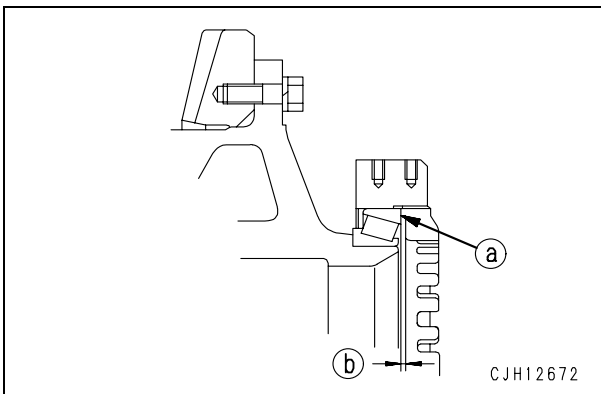
- ★ If the starting tangential force is less than the standard value, tighten the adjustment nuts on both sides using tool **H4**. If it exceeds the standard value, loosen the adjustment nuts on both sides.



- ★ Precautions for preload adjustment

If the incremental amount of deflection exceeds the standard value due to overtightening of the adjustment nut, loosen the adjustment nut to its original position.

Before readjustment, make sure there is no clearance in (a) and (b) by tapping on the bearing cap and bevel gear using a plastic hammer or the like, as rotating the bevel gear.



- 4) Backlash adjustment

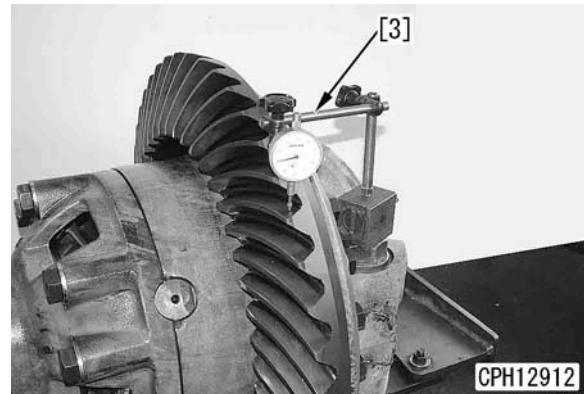
- 1] Apply the probe of dial gauge [3] perpendicular to the addendum (tip of the gear teeth) in the bevel gear tip.

- 2] With the bevel pinion fixed, read the graduations when the bevel gear is moved backward and forward (rotation direction).

- Backlash standard value:

0.41 – 0.56 mm

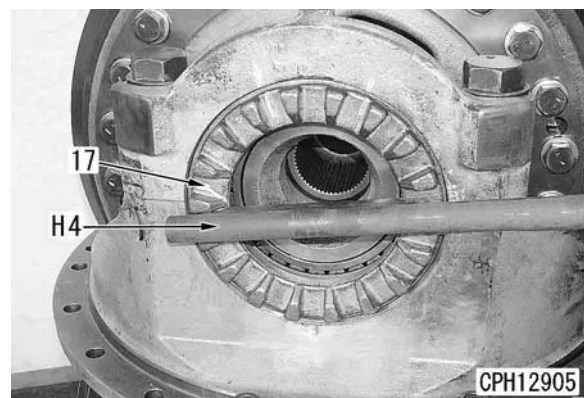
- ★ Measure the backlash at 3 to 4 points, and make sure the variations are within 0.1 mm.

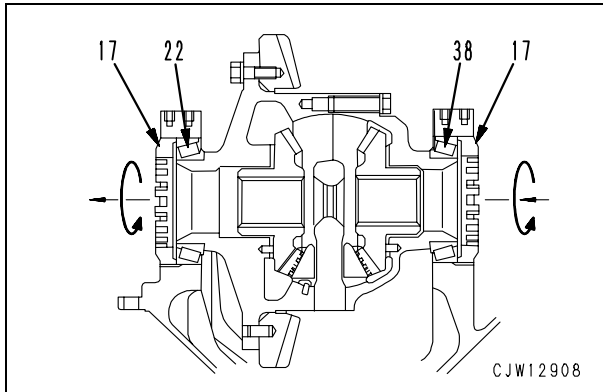


- 3] If the backlash does not conform to the standard value, adjust it by moving the bevel gear.

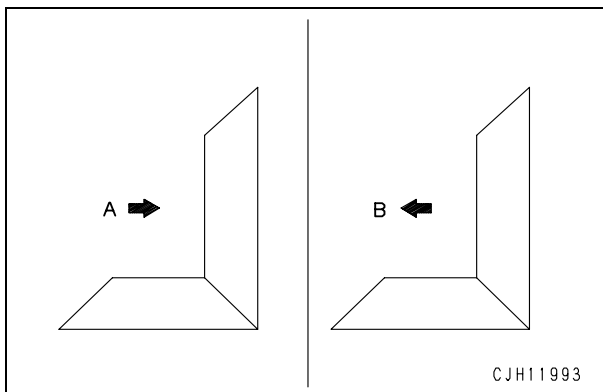
- ★ Move the bevel gear using tool **H4** and with adjustment nuts (17).

- ★ To keep the preload applied to bearings (22) and (38) (done at Step 3), when you tighten the adjustment nut on one side, loosen the nut on other side for the same amount, and vice versa.





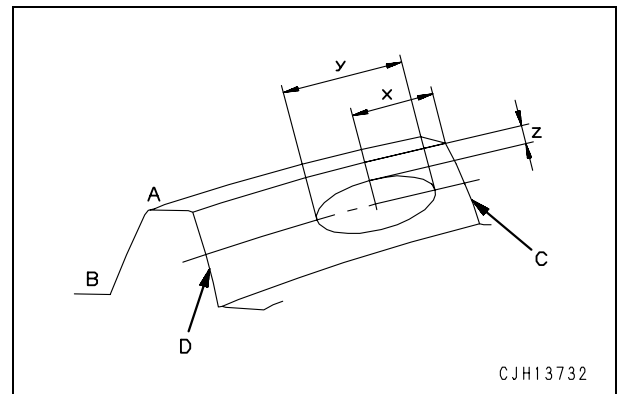
- **Backlash is less than the standard value.**
Loosen adjustment nut (17) on the bevel gear side. And tighten adjustment nut (17) on the right side for the same amount.
(Move the bevel gear to (A) direction.)
- **Backlash exceeds the standard value.**
Loosen adjustment nut (17) on the right side. And tighten adjustment nut (17) on the bevel gear side for the same amount.
(Move the bevel gear to (B) direction.)



5) Tooth contact inspection

Apply a thin coat of red lead to 7 to 8 tooth surfaces of the bevel gear, and turn the bevel gear to both directions (backward and forward). Then, check the tooth contact pattern on the bevel gear.

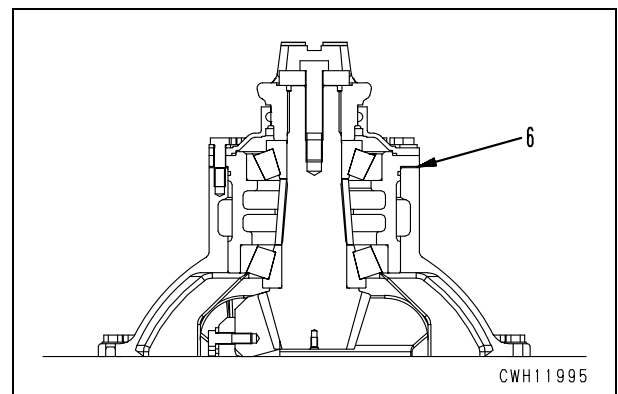
- ★ Center of the tooth contact must be as follows.
 - Center of teeth height
 - Tooth length is at (x) position from the small end (C) ($(x) = 46 \pm 6$ mm).
- ★ Tooth contact width (y) is 41 – 82 mm.
- ★ Make sure there is no hard contact in any of the addendum (tip of the gear teeth) (A), dedendum (root of the gear teeth) (B), small end (C) or big end (D).
- ★ Distance (z) between the addendum and the tooth contact part at the (x) position must be 1 – 3 mm.



6) Tooth contact adjustment

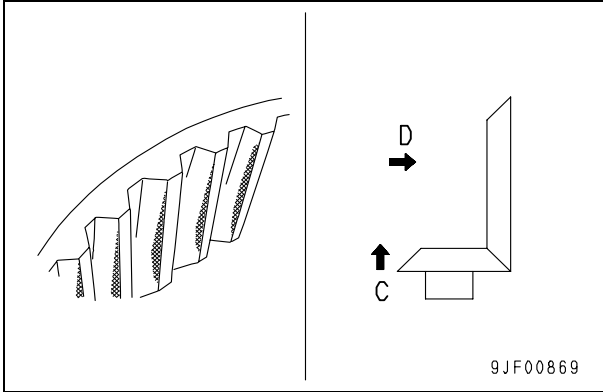
If the tooth contact pattern is faulty, adjust by following the next page.

- ★ Adjust by changing the number of shims (6) (moving bevel pinion) and using adjustment nuts (moving bevel gear, see Backlash adjustment).
- ★ After tooth contact adjustment, check the backlash again.



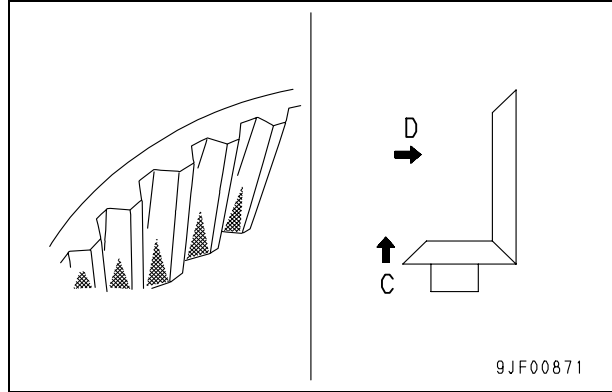
The bevel pinion is too far from the bevel gear.

- ★ Tooth contact pattern is as shown below.
- 1) Decrease the number of shims, to make the bevel pinion closer to the bevel gear.
- 2) Make the bevel gear farther from the bevel pinion.



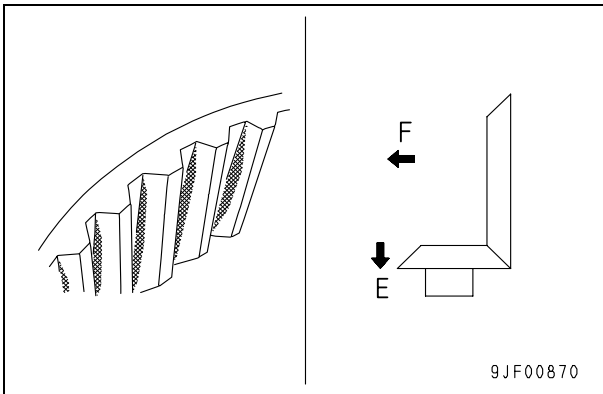
The bevel gear is too close to the bevel pinion.

- ★ Tooth contact pattern is as shown below.
- 1) Decrease the number of shims, to make the bevel pinion closer to the bevel gear.
- 2) Make the bevel gear farther from the bevel pinion.



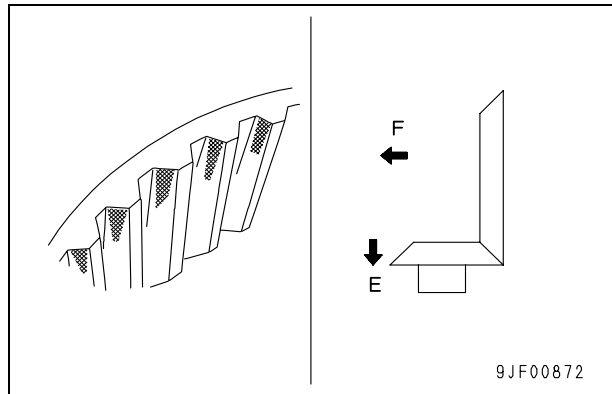
The bevel pinion is too close to the bevel gear.

- ★ Tooth contact pattern is as shown below.
- 1) Increase the number of shims, to make the bevel pinion farther from the bevel gear.
- 2) Make the bevel gear closer to the bevel pinion.



The bevel gear is too far from the bevel pinion.

- ★ Tooth contact pattern is as shown below.
- 1) Increase the number of shims, to make the bevel pinion farther from the bevel gear.
- 2) Make the bevel gear closer to the bevel pinion.

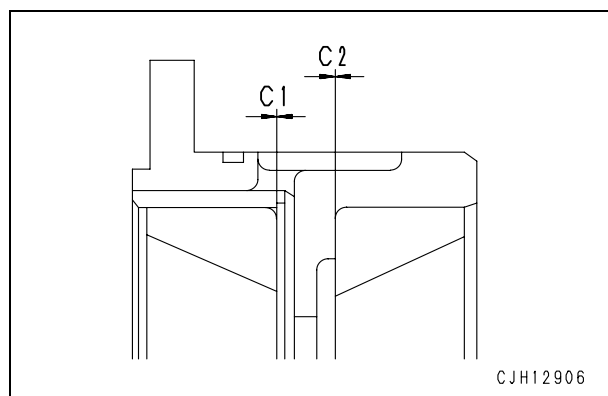


- 7) Lock
Install locks (16) to adjustment nuts on both sides.

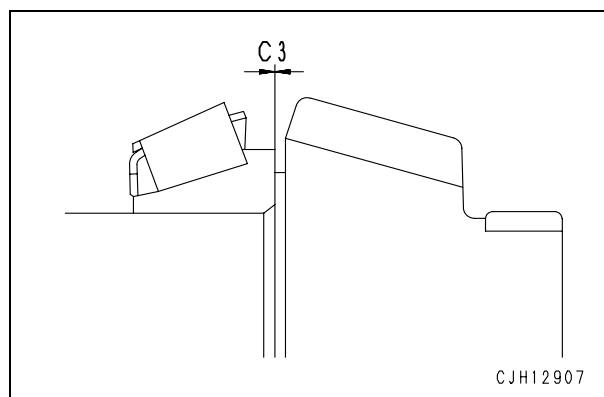
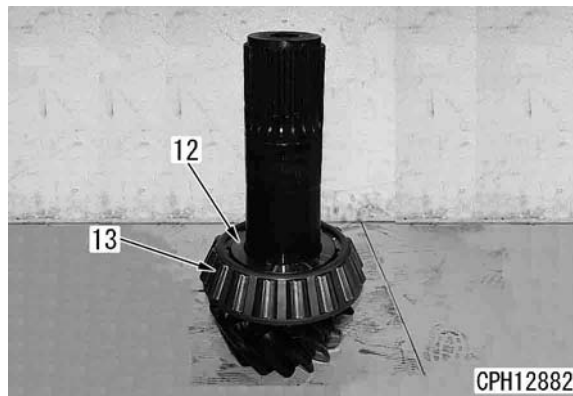


3. Assembly of pinion and cage assembly

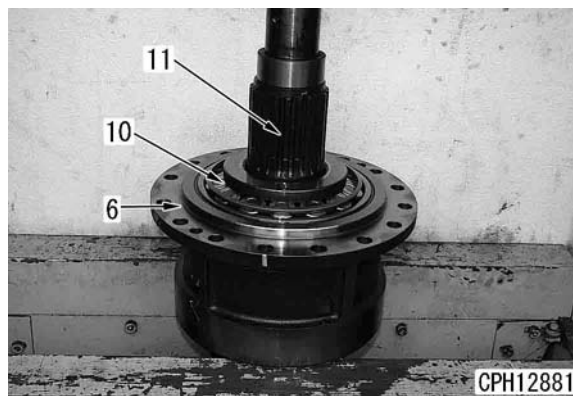
- 1) Using push tool, press fit outer races (14) and (15) to cage.
★ Make sure there is no clearance between the outer races and cage (C1), (C2).



- 2) Press fit bearing inner (13) and install spacer (12).
★ Shrink fit, 100°C
★ Nonadjustable bearing is used. Check the mating numbers.
★ Make sure there is no clearance between the pinion gear and bearing inner end surface (C3).



- 3) Place cage (6) to pinion gear (11) and install bearing (10).
- 4) Apply sufficient amount of engine oil (EO30CD) to the roller of the bearing and transfer surface of the inner and outer races.

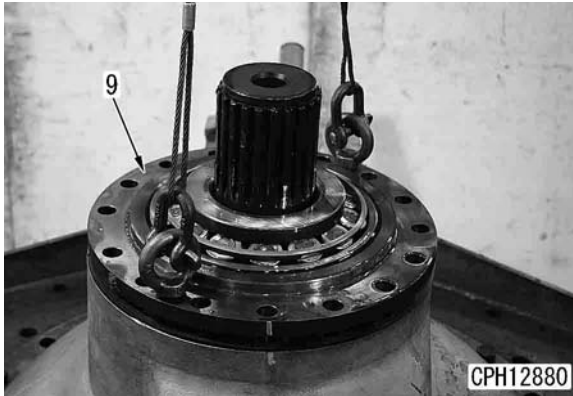


4. Installation of pinion and cage assembly

- 1) Attach O-ring, assemble shim to the pinion and cage assembly (9), and install to the differential case.

★ Use shims with same numbers and thickness removed at disassembly.

⌋ Mounting bolt: **490.4 – 608.0 Nm**
{50.0 – 62.0 kgm}



- 2) Install dust seal (8) on cover (5).



- 3) Install cover (5).

⌋ Mounting bolt:

**5. Coupling**

- 1) Install coupling (4), O-ring and retainer (3), and tighten mounting bolt (2).

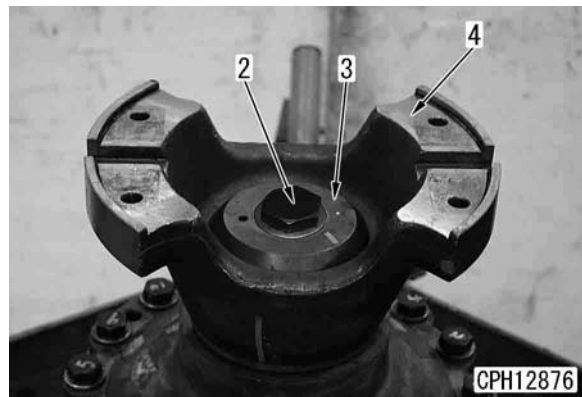
★ Tighten bolt (2) gradually as rotating the bearing 20 to 30 turns.

★ The bearing can be damaged if you tighten bolt (2) without rotating bearing.

⌋ Mounting bolt: **Adhesive (LT-2)**

⌋ Mounting bolt: **1,961.4 – 2,451.8 Nm**
{200.0 – 250.0 kgm}

★ After tightening, rotate the bearing another 20 to 30 turns to make sure it rotates smoothly. Also, make sure bolt (2) is tightened to the specified torque.

**6. Bearing preload adjustment**

Make sure the bearing is set properly, the following procedure.

Insert a bolt to the screw hole of the coupling, attach push pull gauge [2] or spring gauge on it, and measure the starting torque in the tangential direction. (Perform this before the bevel gear side is installed.)

Starting torque: 5.1 kgm or less



Disassembly and assembly of front brake assembly

Special tools

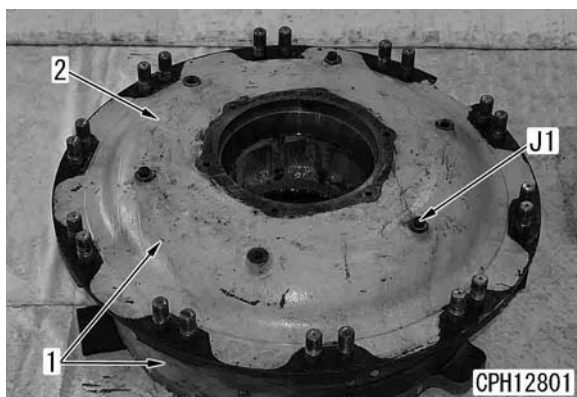
Sym-bol	Part No.	Part name	Necessity	Q'ty	New/Remodel	Sketch
J	1	01011-61610 Bolt	■	3	N	
		01643-31645 Washer	■	3	N	
	2	01017-51620 Bolt	■	8	N	
		01580-31613 Nut	■	8	N	
		01643-31645 Washer	■	8	N	

Disassembly

- Place brake assembly (1) with the inner gear assembly (2) face up.

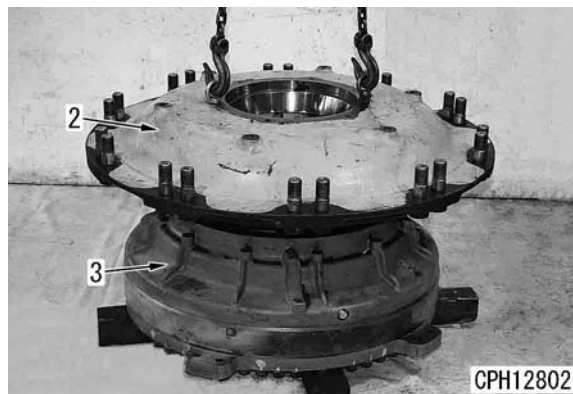
 Brake assembly: **760 kg**

- Remove floating seal lock bolt (J1).
★ Floating seal lock bolt (J1) is installed to protect the floating seal when removing the front brake assembly (1) from the body.



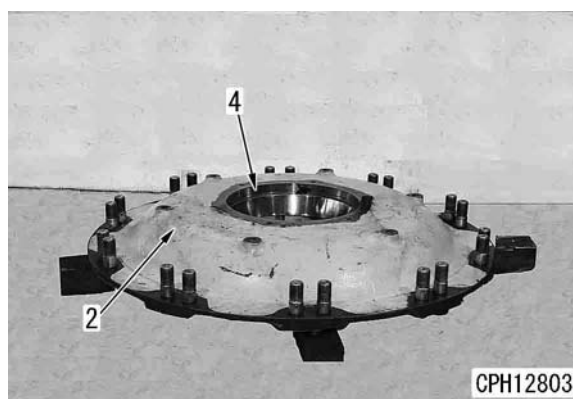
- Remove inner gear assembly (2).
★ Put counter marks on the inner gear assembly (2) and parking brake and service brake assembly (3).

 Inner gear assembly: **160 kg**

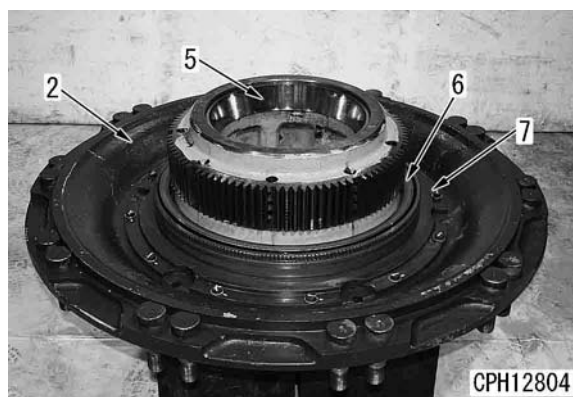


4. Disassembly of inner gear assembly

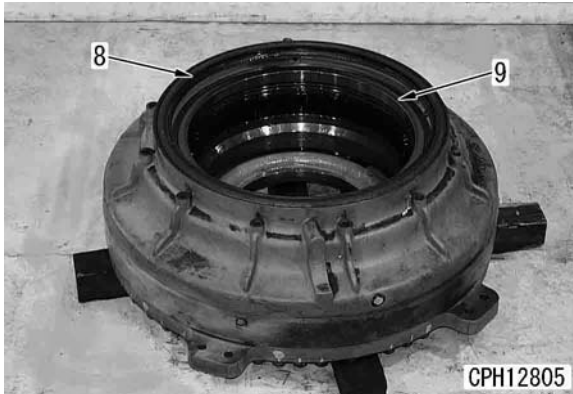
- Remove outer race (4) from inner gear assembly (2).



- Reverse and place inner gear assembly (2).
- Remove outer race (5).
- Remove floating seal (6).
- Remove retainer (7).



5. Remove oil seal (8).
6. Remove floating seal (9).



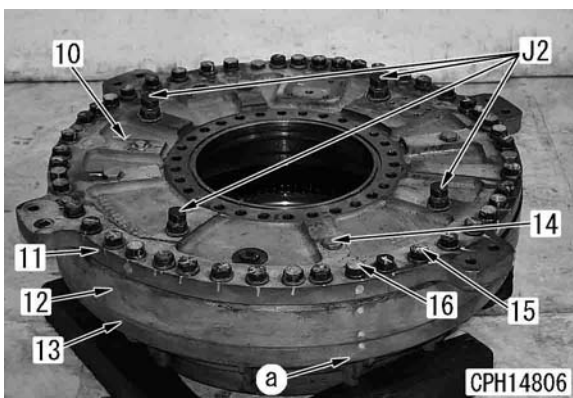
7. Parking brake assembly

- 1) Reverse and place parking brake and service brake assembly (10).
 - ★ Put counter marks (a) on the parking brake cover (11), parking brake assembly (12) and service brake assembly (13).

 Parking brake and service brake assembly: **560 kg**

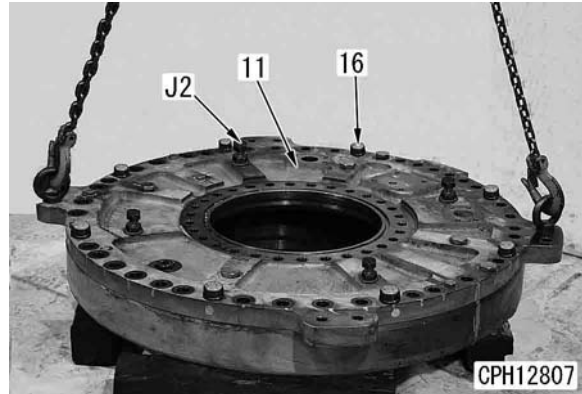
- 2) Remove plug (14), and install 8 parking brake manual releasing bolts (J2) at least 4 locations diagonally.
- 3) Tighten nuts evenly to retract parking brake spring.
 - ★ Tightening length: Approx. 10 mm
 - ⚠ **Do not skip the step 2) and 3).**
- 4) Remove 38 parking brake mounting bolts (15).
 - ★ Do not remove parking brake cover mounting bolts (16). (The diameter is smaller than the washer of the parking brake mounting bolts.)
- 5) Remove parking brake assembly (12) from service brake assembly (13).

 Parking brake assembly: **400 kg**

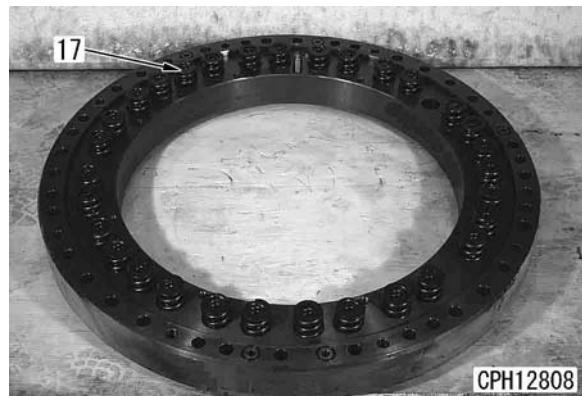


- 6) Remove 8 parking brake cover mounting bolts (16).
- 7) Loosen nuts of parking brake manual releasing bolts (J2) evenly, and remove bolts.
- 8) Remove parking brake cover (11).

 Parking brake cover: **190 kg**



- 9) Remove parking brake spring (17).

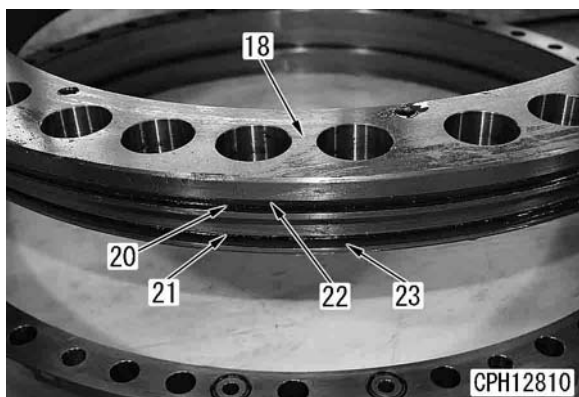


- 10) Remove parking brake piston (18) from parking brake housing (19).

 Parking brake piston: **70 kg**

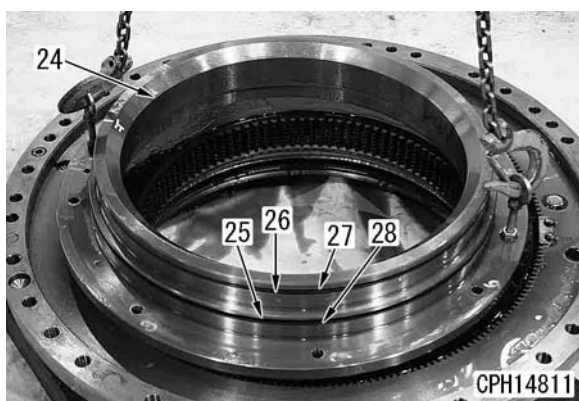


- 11) Remove seal rings (20) and (21), and backup rings (22) and (23) from parking brake piston (18).



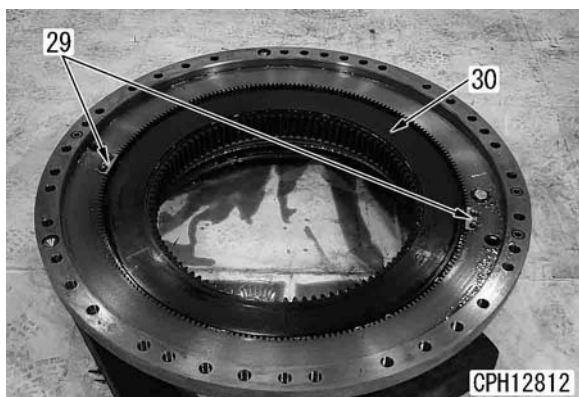
8. Service brake assembly

- 1) Remove service brake piston (24).
 Service brake piston: **55 kg**
- 2) Remove seal rings (25) and (26), and backup rings (27) and (28) from the service brake piston.



9. Plate and disc

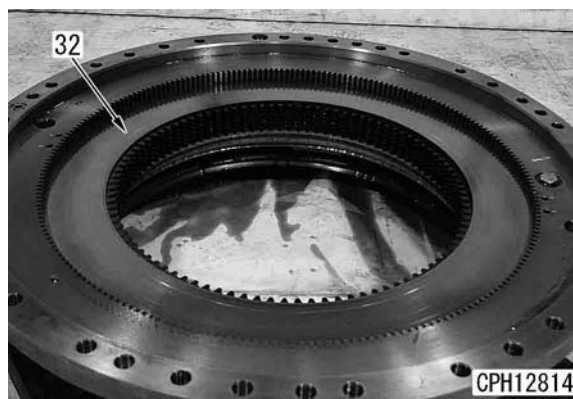
- 1) Remove 2 stopper plates (29).
- 2) Remove cork-attached plate (30).
 ★ Cork is adhered to one side of the plate.



- 3) Remove disc (31).



- 4) Remove plate (32).
 ★ Discs and plates are assembled 7 pieces respectively.



- 5) Remove plate having facing (33).
 ★ Facing is affixed to both sides of the plate.



Assembly

1. Service brake

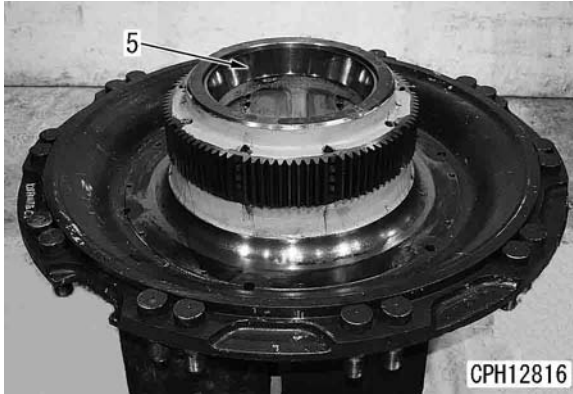
1) Inner gear

- 1] Place inner gear.



Inner gear: **160 kg**

- 2] Install outer race (5).

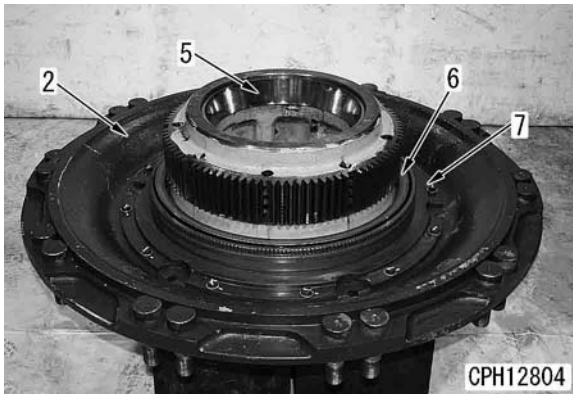


- 3] Install retainer (7) to inner gear assembly (2).

Mounting bolt:

98 – 123 Nm {10 – 12.5 kgm}

- 4] Install floating seal (6).



2) Outer gear assembly

- 1] Place outer gear.



Outer gear: **160 kg**

- 2] Install floating seal (9) to the outer gear.

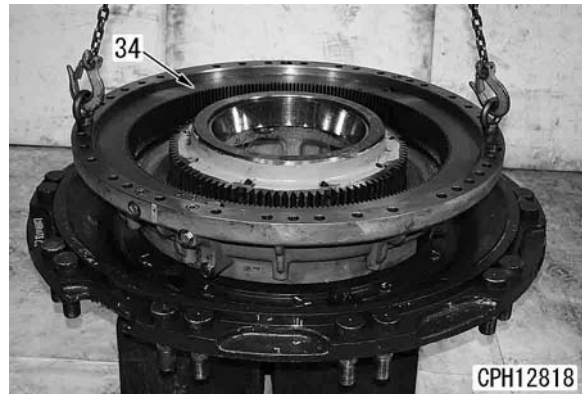
- ★ Wipe off oil completely from the installation position. (If oil is attached on the installation portion, the floating seal can easily come off when reversing the outer gear assembly.)

- 3] Install oil seal (8).



- 4] Reverse outer gear assembly (34) and install to inner gear assembly.

- ★ Take care not to let the floating seal come off.

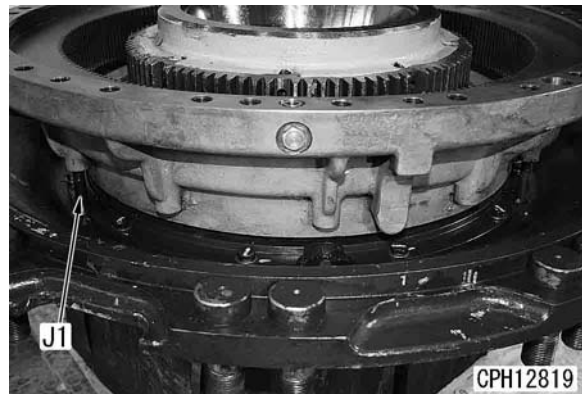


- 5] Install 3 floating seal lock bolts (J1) from the lower side.

- ★ Tighten until the inner gear assembly contacts to the outer gear assembly tightly.

Tightening amount: Approx. 3 mm

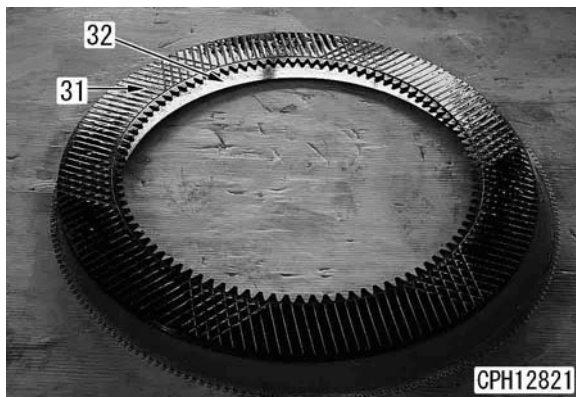
- ★ After installing the front brake assembly to the machine, remove the bolt (J1).



- 3) Disc and plate
1) Install plate having the facing on both sides (33).



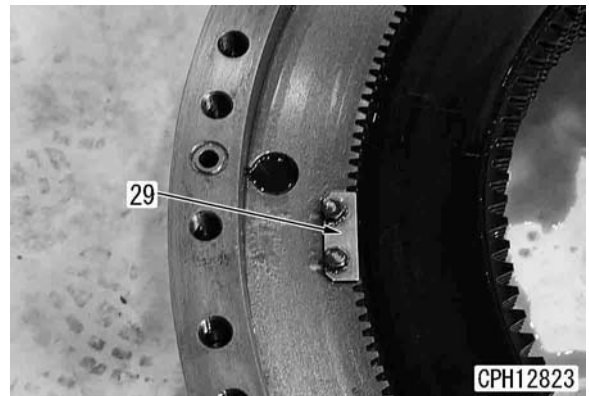
- 2) Install disc (31) and plate (32).



- 3) Install cork-attached plate (30).
★ Cork-side face up.

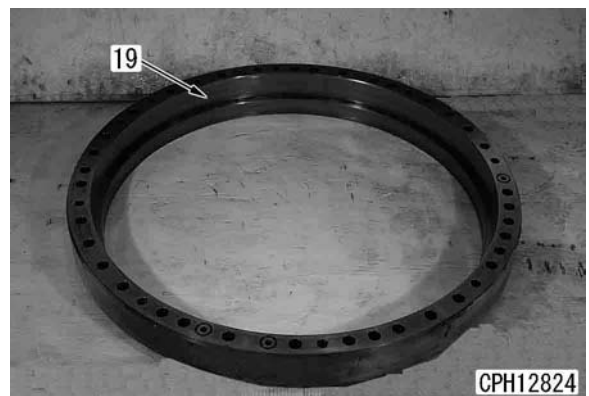


- 4) Install 2 stopper plates (29).

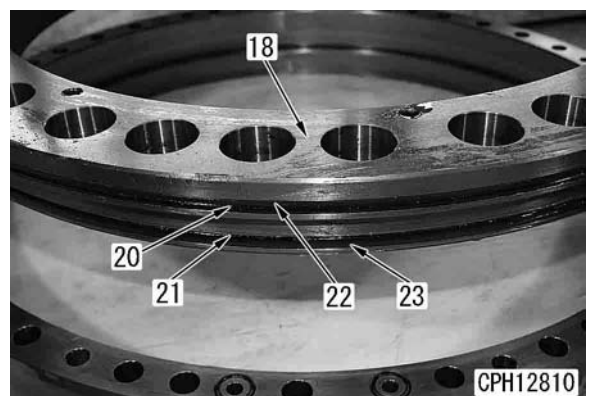


2. Parking brake

- 1) Place housing (19).
Housing: 80 kg



- 2) Install seal rings (20) and (21), and backup rings (22) and (23) to piston (18).
★ Install seal rings on the pressure-receiving side.

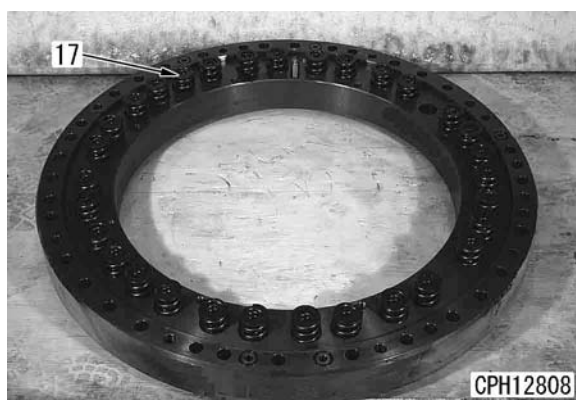


- 3) Install piston (18) to housing (19).

 Piston: **70 kg**



- 4) Install spring (17).



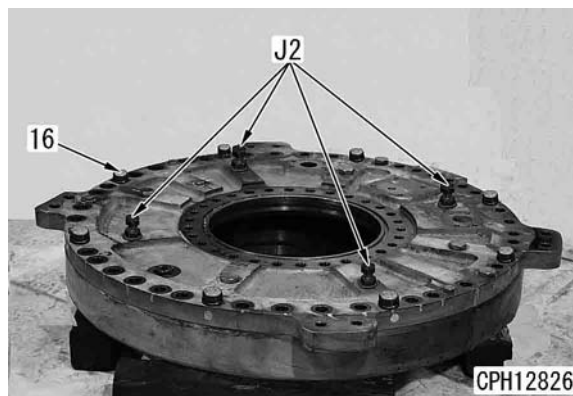
- 5) Install O-ring to parking brake cover (11), and install to the piston and housing assembly.

 Cover: **190 kg**



- 6) Install parking brake manual releasing bolts (J2) evenly.
 7) Tighten nuts evenly to retract parking brake spring.
 ★ Tightening length: Approx. 10 mm
 ⚠ **Do not skip step 6) and 7).**
 8) Install parking brake cover mounting bolts (16).

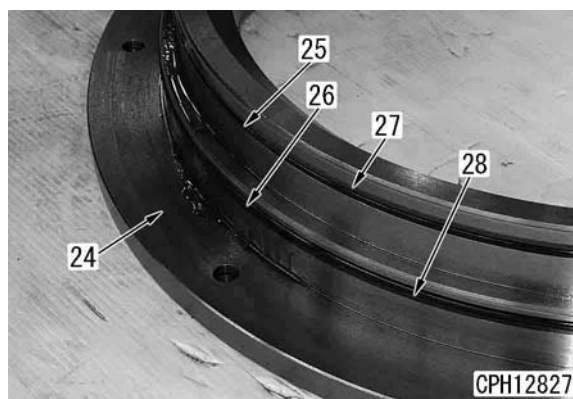
 Mounting bolt:
490 – 608 Nm {50 – 62 kgm}



3. Service brake piston

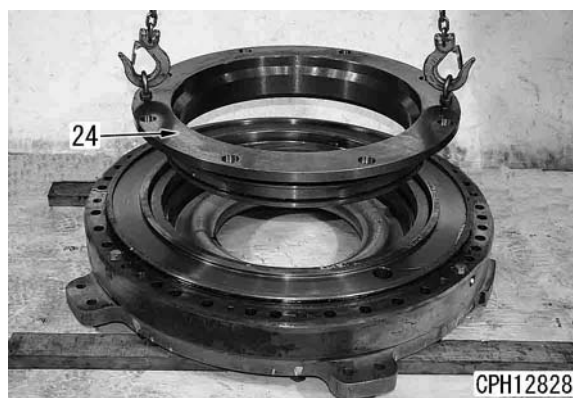
- 1) Install seal rings (25) and (26), and backup rings (27) and (28) to service brake piston (24).

★ Install seal rings on the pressure-receiving side.



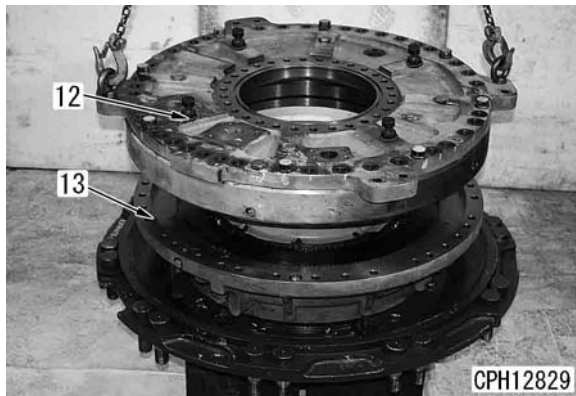
- 2) Reverse and place parking brake assembly, and install service brake piston (24).

 Service brake piston: **55 kg**



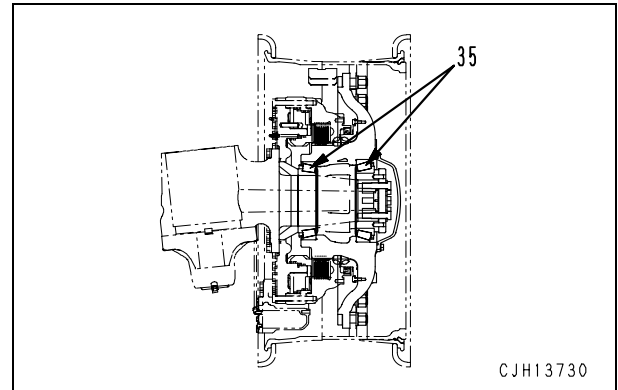
4. Lift parking brake assembly (12) and install to service brake assembly (13).

 Parking brake assembly: **400 kg**



8. **Adjusting pre-load on bearing**

Adjust pre-load on bearings (35) after assembling the front brake assembly to the machine.



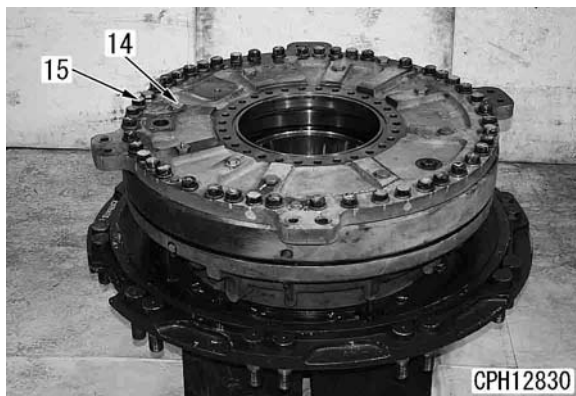
5. Install parking brake mounting bolts (15).

 Mounting bolt:
490 – 608 Nm {50 – 62 kgm}

6. Loosen tightening nuts of the parking brake manual releasing bolts, and remove parking brake manual releasing bolts.

7. Install plug (14) to the releasing bolt mounting hole.

 Mounting bolt:
44.1 – 53.9 Nm {4.5 – 5.5 kgm}



Disassembly and assembly of rear brake assembly

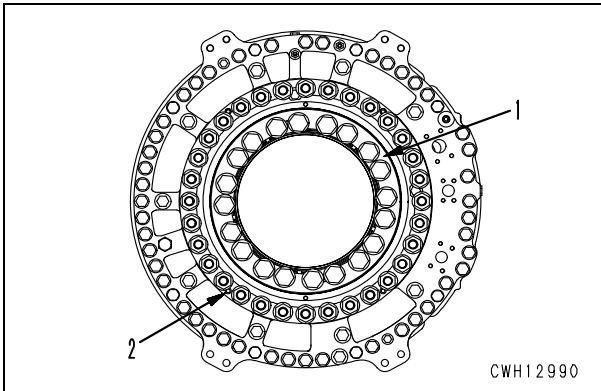
Special tools

Sym- bol	Part No.	Part name	Necessity	Q'ty	New/Remodel	Sketch
J	1	01011-61610 Bolt	■	3	N	
		01643-31645 Washer	■	3	N	
	2	01017-51620 Bolt	■	9	N	
		01580-31613 Nut	■	9	N	
		01643-31645 Washer	■	9	N	

Disassembly

1. Setting of rear axle

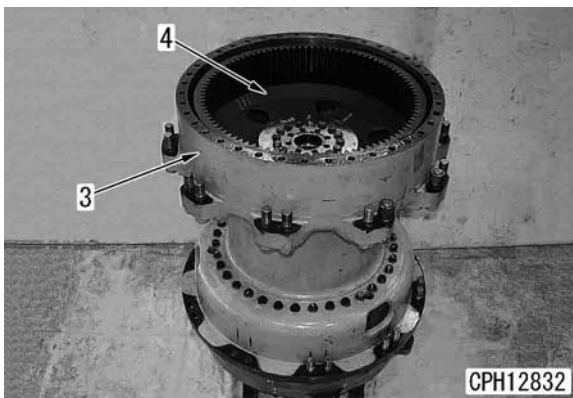
- 1) Remove 4 mounting bolts (2) of shaft (1).



- 2) Set rear axle assembly (3) with planetary carrier (4) up.

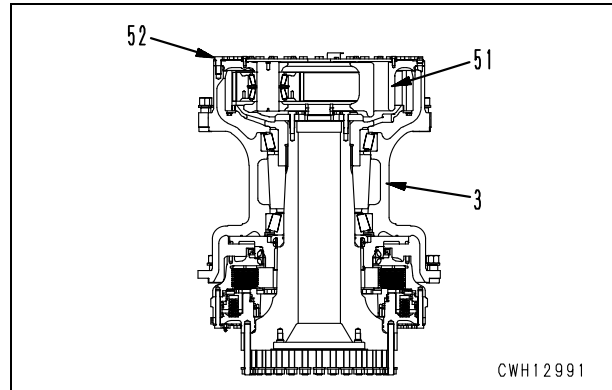
⚠ Set the rear axle assembly vertically and stably so that it will not overturn.

 Rear axle assembly: 3,250 kg

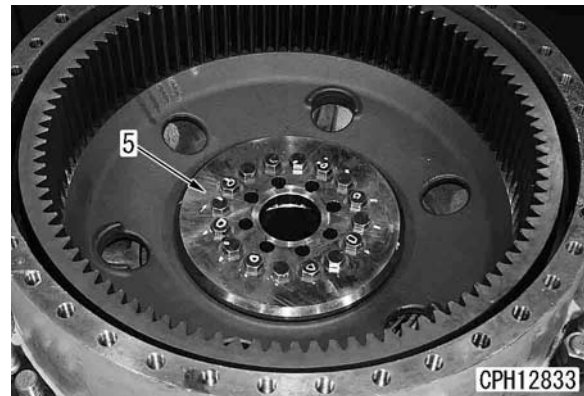


2. Planetary carrier assembly and ring gear

- 1) Remove 39 bolts (52).
- 2) Remove planetary carrier assembly (51).



- 3) Sling ring gear temporarily and remove retainer (5).

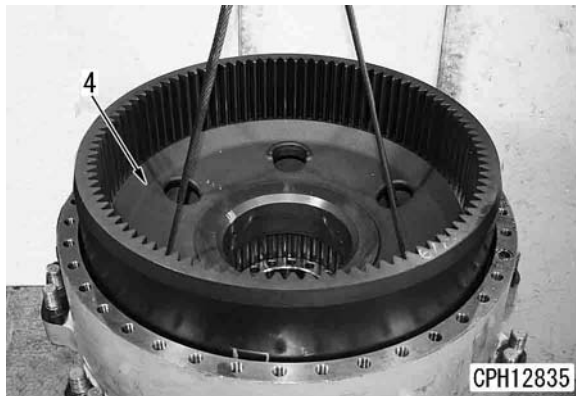


- 4) Remove shims (6).

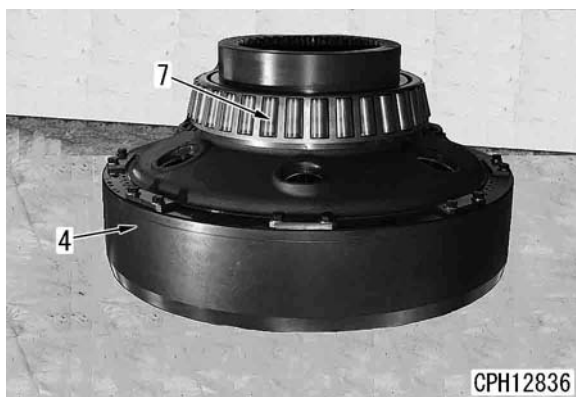
★ Check the quantity and thickness of the shims.



- 5) Lift off ring gear (4).



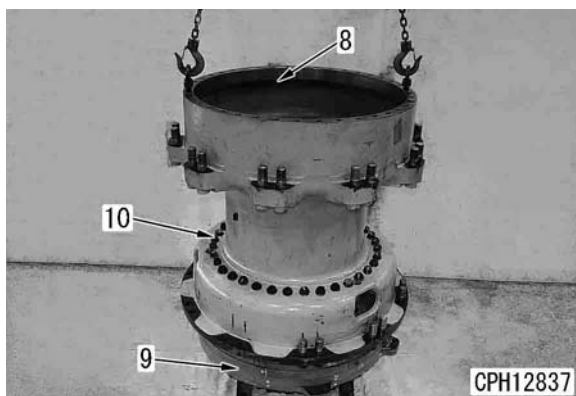
- 6) Remove bearing (7) from ring gear (4).



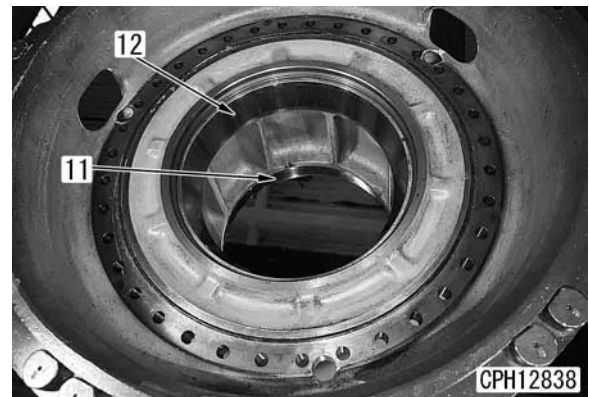
3. Rear axle case

- 1) Sling rear axle case (8).
 - ★ Make a match mark on rear axle case (8) and brake assembly (9).
- 2) Remove rear axle case mounting bolts (10).
- 3) Sling rear axle and brake assembly (8) and disconnect it from the shaft.

⚠ Sling the assembly so carefully that the shaft will not overturn.



- 4) Remove the outer races (11), (12) from the rear axle.



4. Shaft

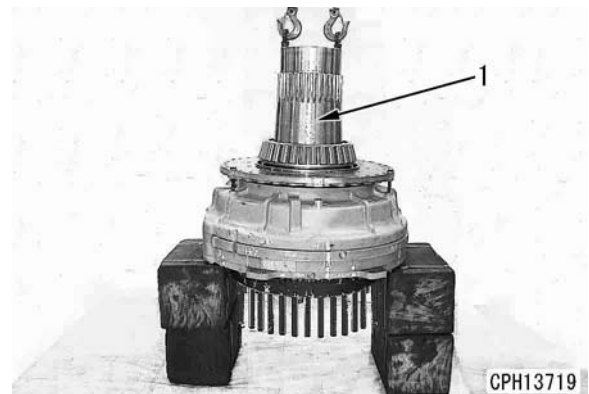
- 1) Lift rear brake and shaft assembly (13), and reposition it at a height of approx. 400 mm.

★ Shaft (1)

⏏ Rear brake and shaft assembly: **1,900 kg**

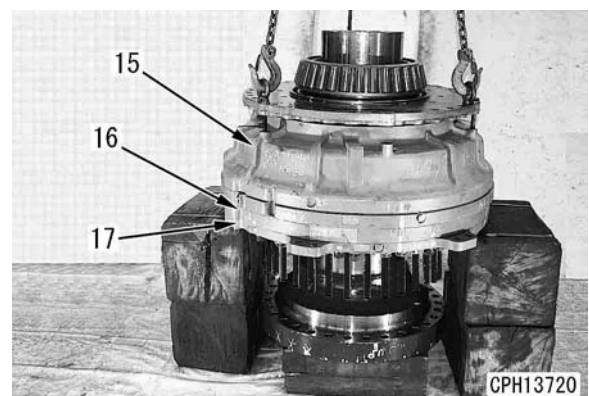
- 2) Lift down shaft (1) to disconnect.

⏏ Shaft: **750 kg**



- 3) Remove brake assembly.
 - ★ Put counter marks on service brake assembly (15), parking brake cylinder (16) and parking brake cover (17).

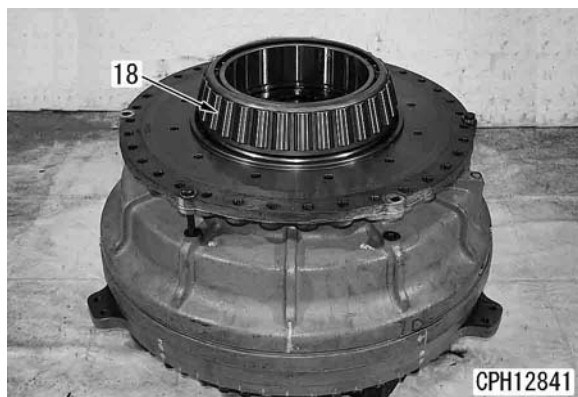
⏏ Rear brake assembly: **1,150 kg**



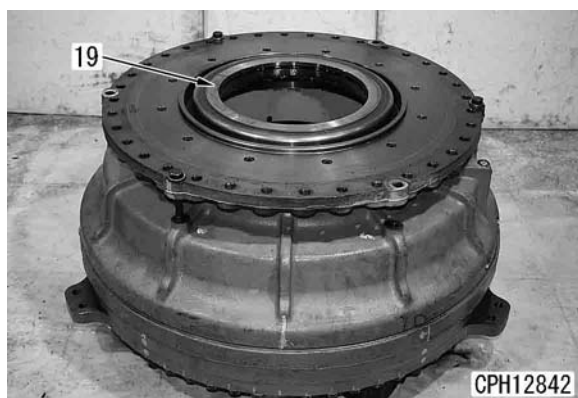
5. Parking brake

- 1) Remove bearing (18).

 Bearing: **50 kg**



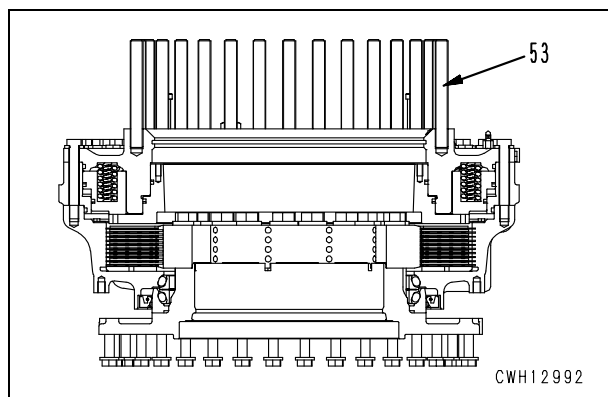
- 2) Remove floating seal (19).



- 3) Reverse and place brake assembly (9).

 Brake assembly: **1,100 kg**

- 4) Remove stud bolt (53).



- 5) Remove plug (20).



- 6) Install parking brake manual releasing bolts (J2) at least 4 locations in even distribution.

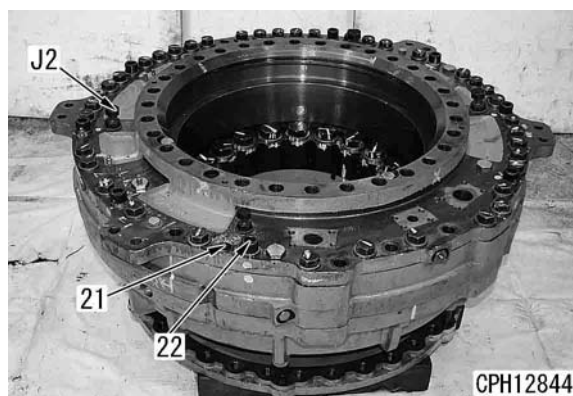
- 7) Tighten nuts evenly to retract parking brake spring.

★ Tightening length: Approx. 10 mm

⚠ **Do not skip the step 6) and 7).**

- 8) Remove 45 parking brake mounting bolts (21).

★ Do not remove parking brake cover mounting bolts (22) having smaller washer diameter.



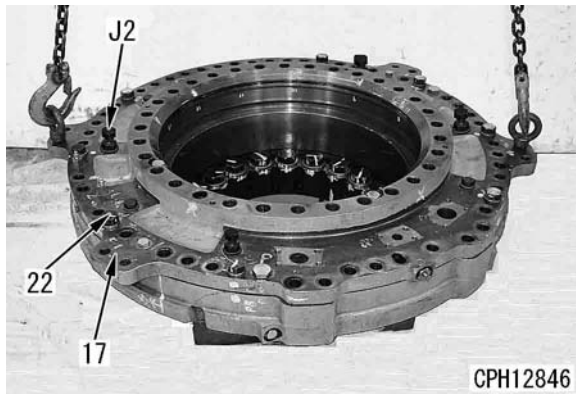
- 9) Lift and remove parking brake assembly (23).

 Parking brake assembly: **495 kg**



- 10) Remove parking brake cover mounting bolts (22).
- 11) Loosen nuts of parking brake manual releasing bolts (J2) evenly, and remove bolts.
★ The piston and cylinder may be scratched, if they are not loosened evenly.
- 12) Remove parking brake cover (17).

 Cover: **210 kg**



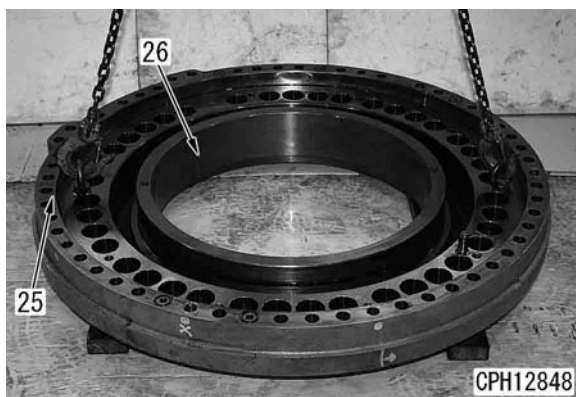
- 13) Remove parking brake spring (24).



- 14) Remove parking brake piston and parking brake cylinder assembly (25) from service brake piston (26).

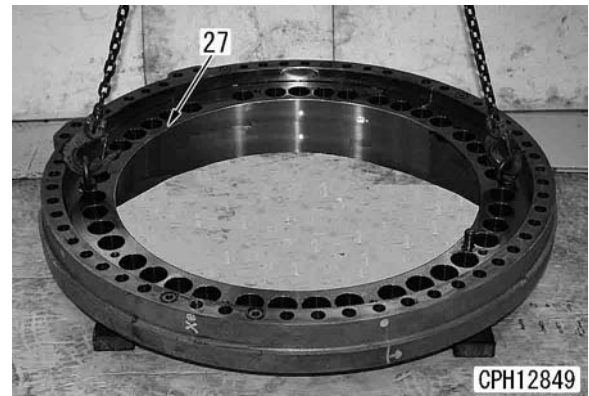
 Parking brake piston and parking brake cylinder assembly: **310 kg**

 Service brake piston: **80 kg**

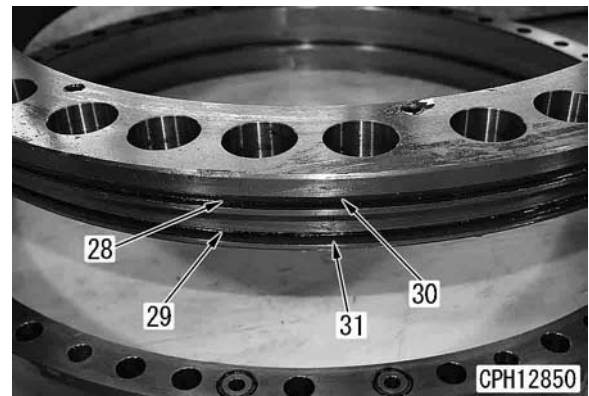


- 15) Remove parking brake piston (27).

 Parking brake piston: **95 kg**

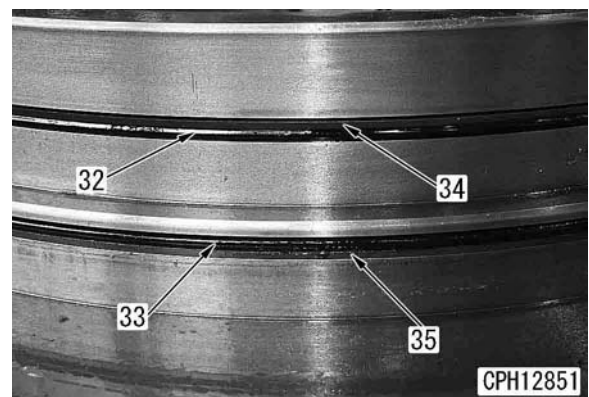


- 16) Remove seal rings (28) and (29), and backup rings (30) and (31) from parking brake piston.

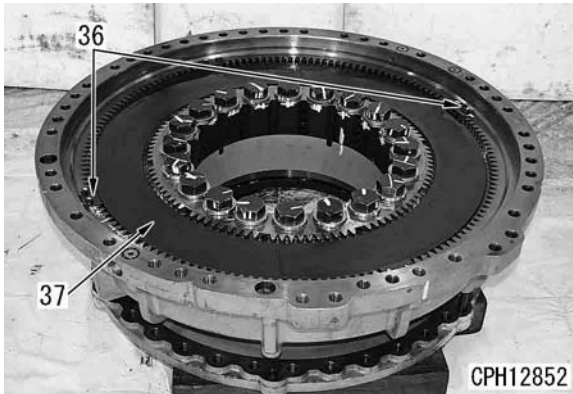


6. Service brake

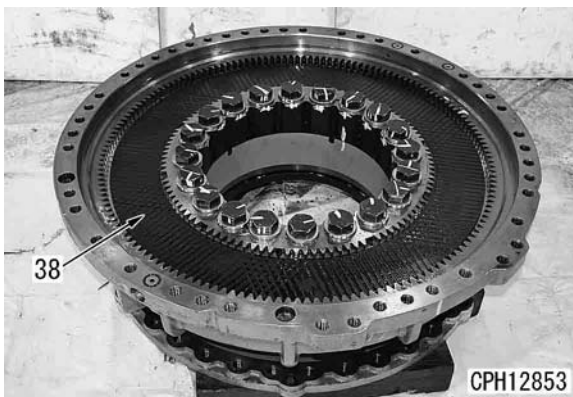
- 1) Remove seal rings (32) and (33), and backup rings (34) and (35) from service brake piston.



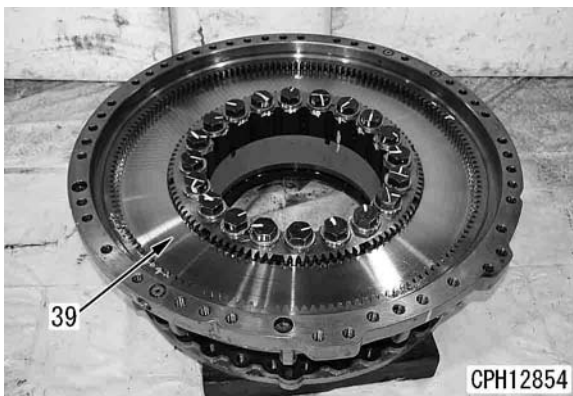
- 2) Remove lock plates (36).
- 3) Remove cork-attached plate (37).



- 4) Remove disc (38).



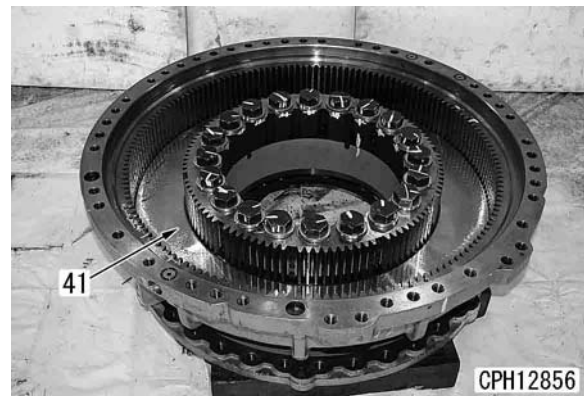
- 5) Remove plate (39).
- ★ 9 discs and 8 plates are assembled.



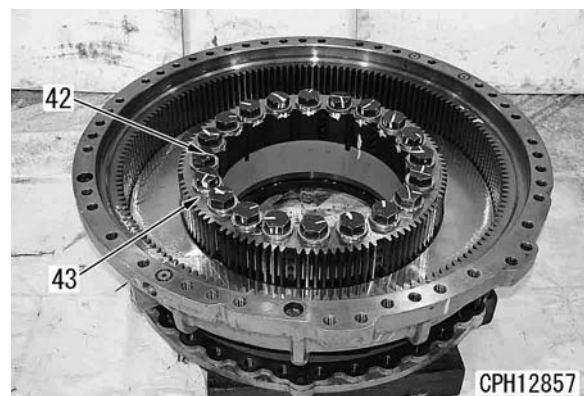
- 6) Remove plate having facing (40).
- ★ The facing is affixed to the space side.



- 7) Remove spacer (41).
-  Spacer: 20 kg

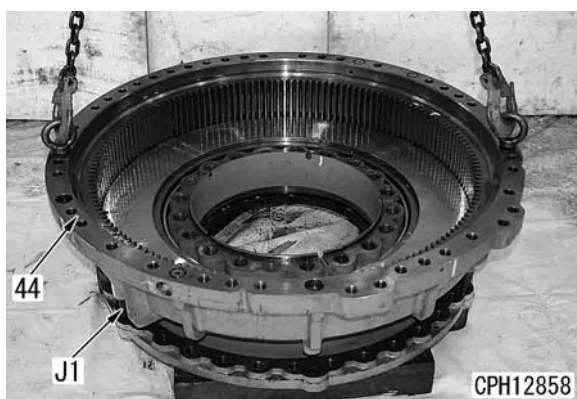


- 8) Remove mounting bolts (42) and remove inner gear (43).
-  Inner gear: 60 kg

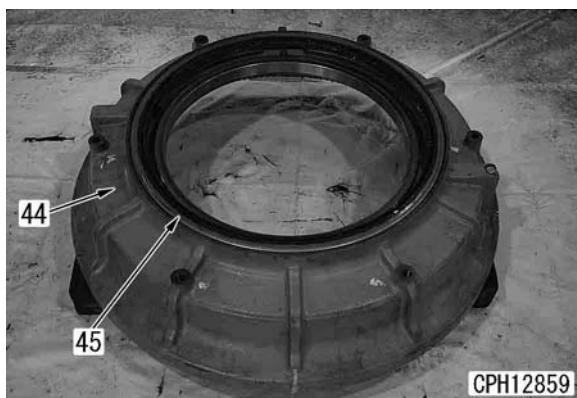


- 9) Lift outer gear (44) temporarily, and remove floating seal lock bolt (J1).
- 10) Remove outer gear (44).

 Outer gear: **200 kg**



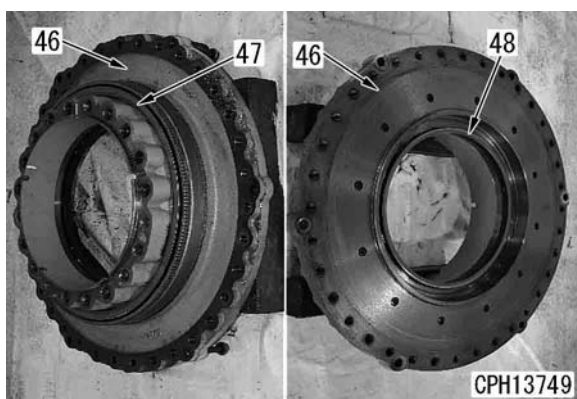
- 11) Reverse outer gear (44) and remove floating seal (45).



- 12) Remove floating seal (47) from cage (46).
- 13) Reverse cage.

 Cage: **130 kg**

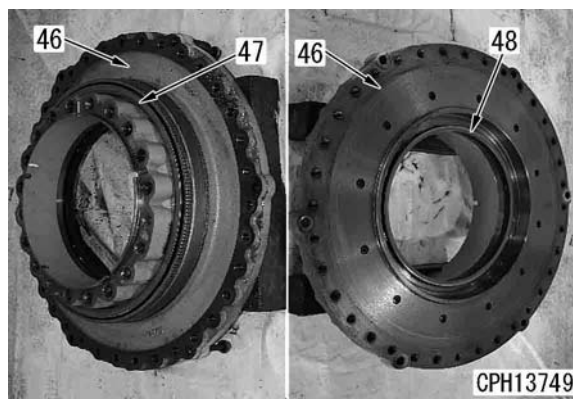
- 14) Remove floating seal (48) from cage (46).



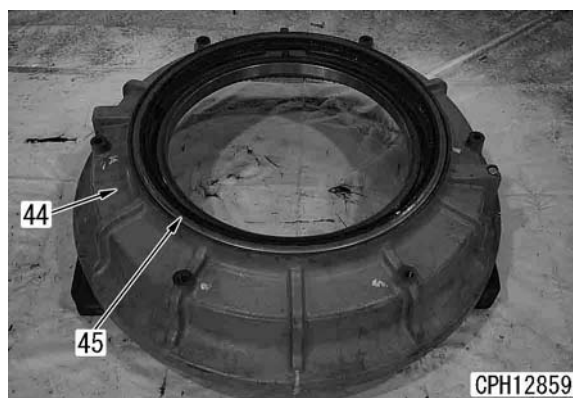
Assembly

1. Service brake

- 1) Install floating seals (47) and (48) to cage (46).



- 2) Install floating seal (45) to outer gear (44).



- 3) Install outer gear (44) to cage.

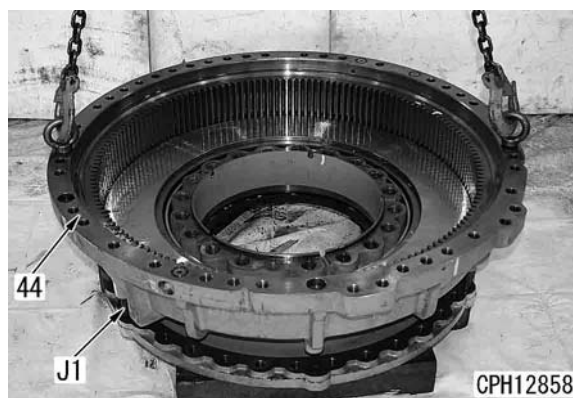
 Outer gear: **200 kg**

- 4) Fix outer gear and cage with floating seal lock bolt (J1).

★ Tighten until the inner gear assembly contacts to the outer gear assembly tightly.

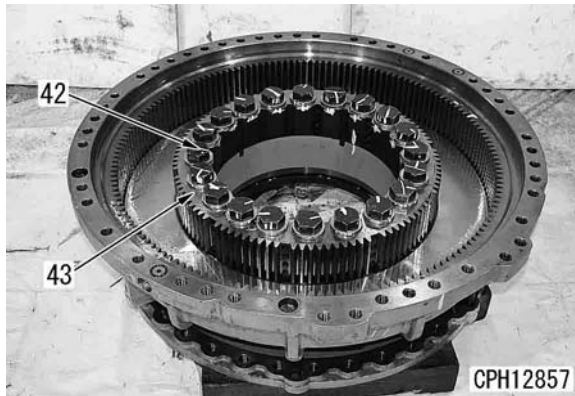
Tightening amount: Approx. 3 mm

★ After assembling the rear brake assembly to the machine, remove bolt (J1).



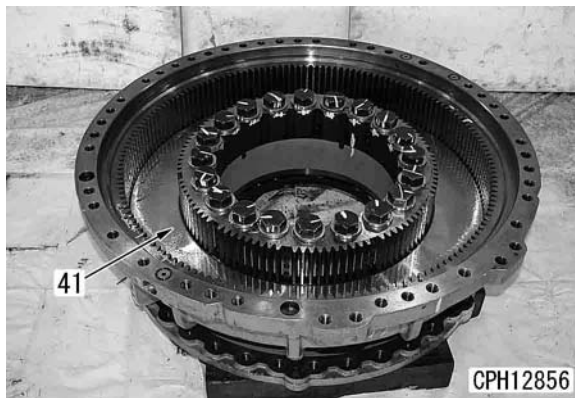
- 5) Install inner gear (43).

 Inner gear: **60 kg**
 Mounting bolt (42):
1,529 – 1,910 Nm {155 – 195 kgm}



- 6) Install spacer (41).

 Spacer: **20 kg**



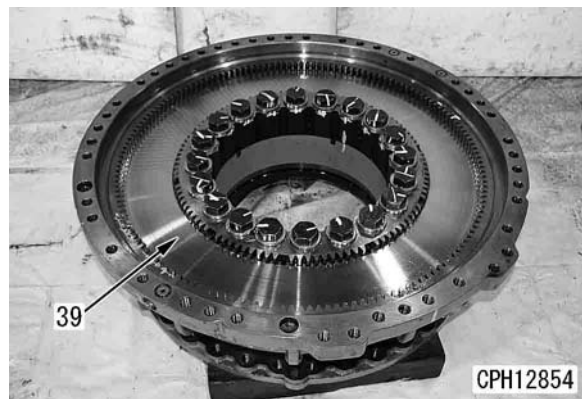
- 7) Install plate having facing (40).
 ★ Facing-side toward the spacer.



- 8) Install disc (38).

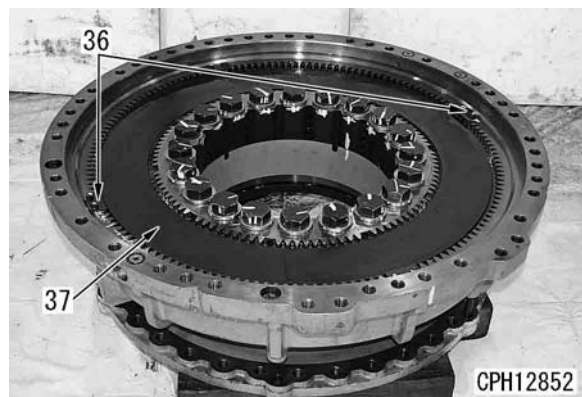


- 9) Install plate (39).
 ★ Install 9 discs and 8 plates alternately.



- 10) Install cork-attached plate (37).
 ★ Cork-side toward the piston.

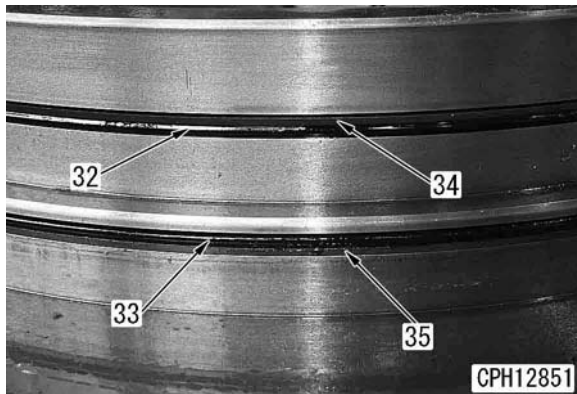
- 11) Install lock plate (36).



- 12) Install seal rings (32) and (33), and backup rings (34) and (35) to service brake piston (26).

★ Install seal ring to the pressure-receiving side (inside).

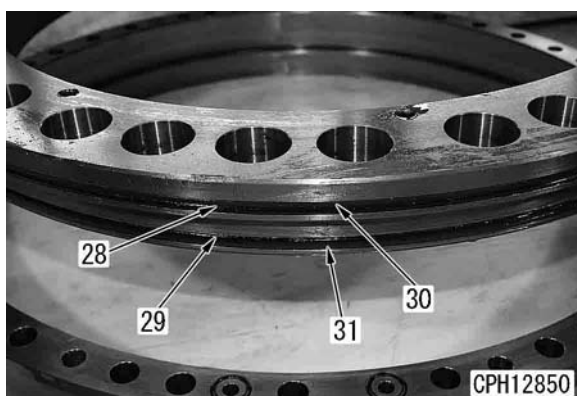
- 13) Install service brake piston (26).



2. Parking brake

- 1) Install seal rings (28) and (29), and backup rings (30) and (31) to piston.

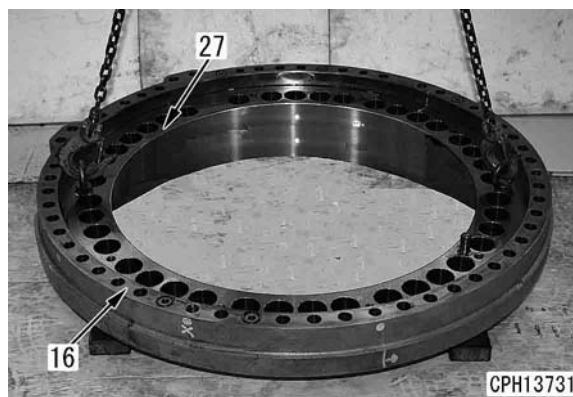
★ Install seal ring to the pressure-receiving side (inside).



- 2) Install piston (27) to parking brake cylinder (16).

★ If the cylinder and piston are not aligned, their sliding surfaces may be scratched. Take care.

 Piston: **95 kg**

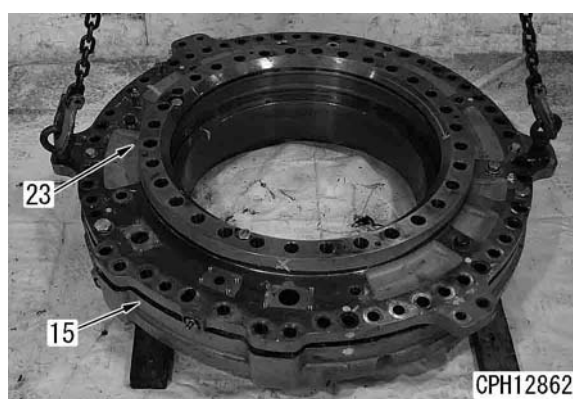


- 3) Install the set of large and small springs (24).



- 4) Install parking brake cover (23).

 Cover: **210 kg**



- 5) Install parking brake manual releasing bolts (J2), nuts and washers at least 4 locations in even distribution.

- 6) Tighten nuts evenly to retract parking brake spring.

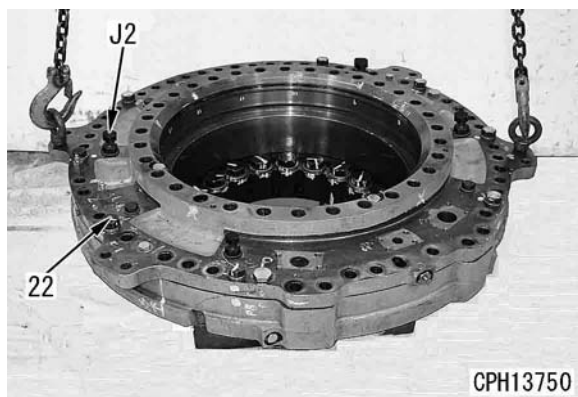
★ Tightening length: Approx. 10 mm

- 7) Install cover mounting bolts (22).

☞ Mounting bolt:

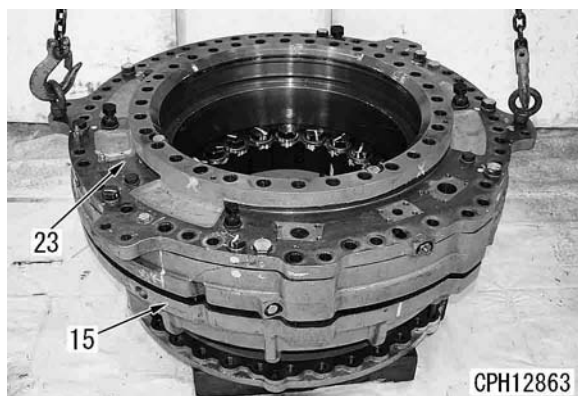
490 – 608 Nm {50 – 62 kgm}

⚠ Do not skip the step 6) and 7).



- 8) Install parking brake assembly (23) to service brake assembly (15).

☞ Parking brake assembly: **495 kg**

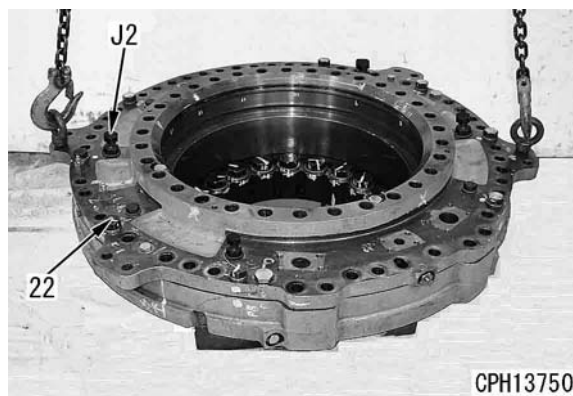


- 9) Install 45 parking brake mounting bolts.

☞ Mounting bolt:

490 – 608 Nm {50 – 62 kgm}

- 10) Remove release bolt (J2).



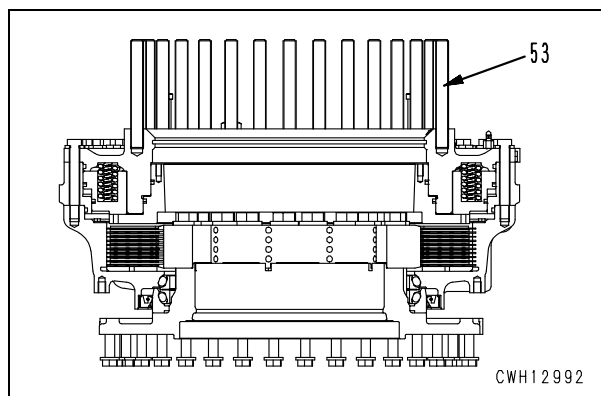
- 11) Install plug (20).

☞ Mounting bolt:

44.1 – 53.9 Nm {4.5 – 5.5 kgm}



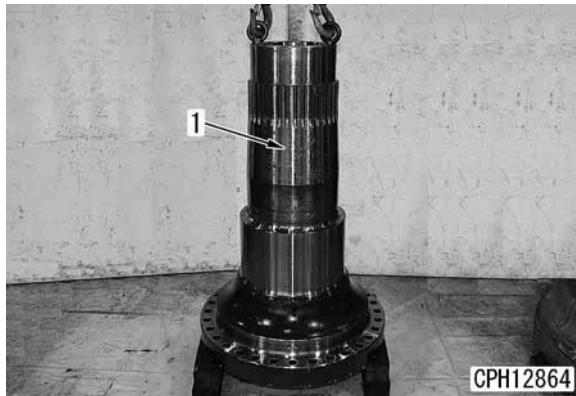
- 12) Install stud bolt (53).



3. Shaft

- 1) Place shaft
Place shaft (1) with the flange face down.

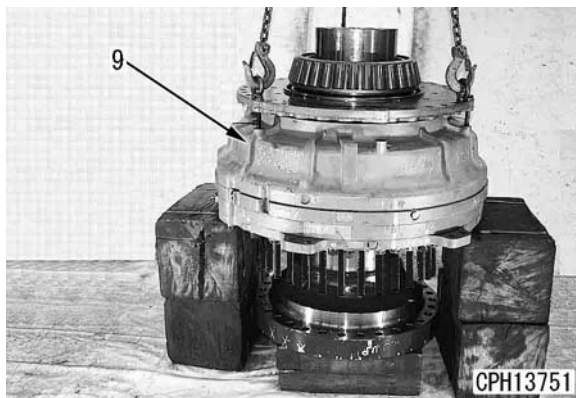
 Shaft: **750 kg**



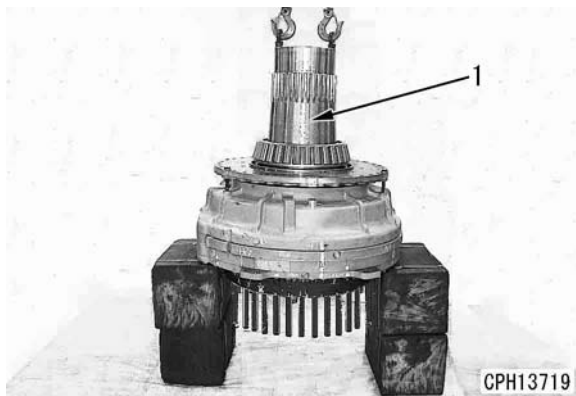
- 2) Sling the brake assembly (9) down.

 Brake assembly: **1,100 kg**

- ★ Set blocks with a height of approx. 400 mm.



- 3) Sling the shaft (1) and install 4 shaft mounting bolts (2).
(Refer to the figure "CWH12990" of disassembly step 1 for the shaft mounting bolt (2).)



- 4) Install floating seal (19).

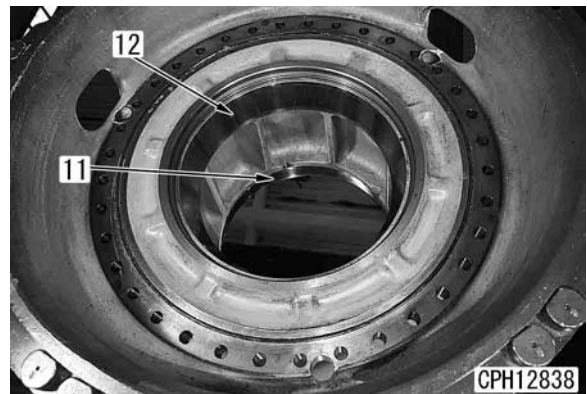


- 5) Install bearing (18).

 Bearing: **18 kg**

**4. Rear axle case**

- 1) Install outer race (12).



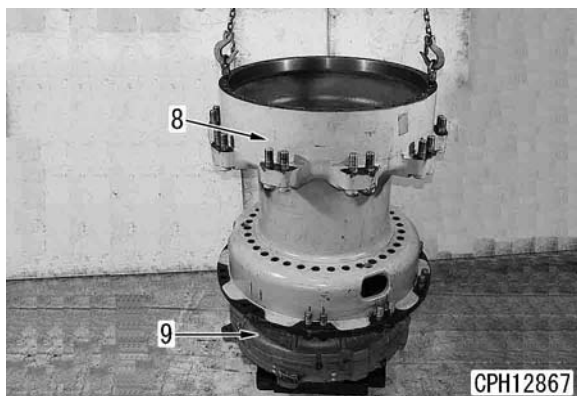
- 2) Reverse rear axle case (8) and install to brake assembly (9).



Rear axle case: **1,000 kg**



Rear axle case mounting bolt:



- 2) Install ring gear assembly (4) to rear axle case (8).

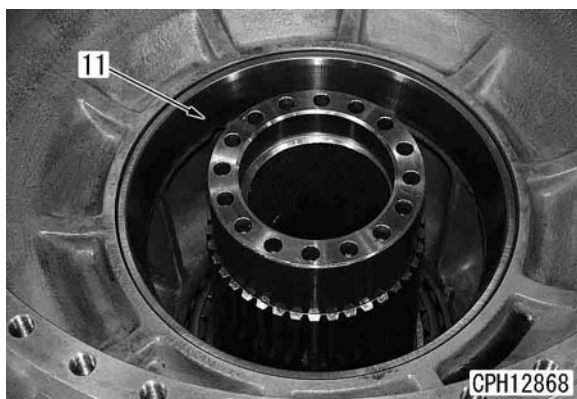


Ring gear and bearing assembly:

350 kg



- 3) Install outer race (11).

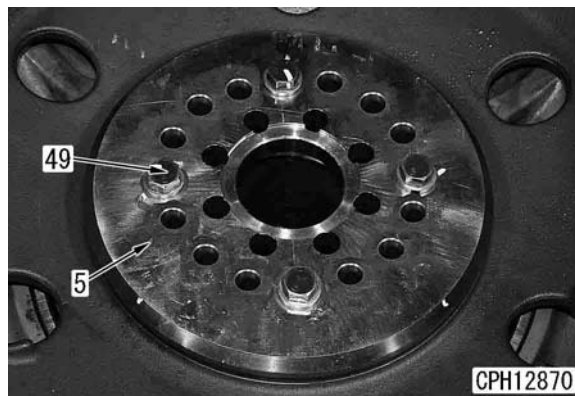


6. Bearing preload adjustment

- 1) Measure thickness (Pt) of retainer (5).
 - 2) Install retainer (5) without shim, and use 4 bolts (49) to tighten the retainer to 58 – 68 Nm {5.9 – 6.9 kgm}.
- ★ Rotate ring gear 20 to 30 turns and retighten 4 bolts evenly. Repeat this until the specified torque is obtained for 4 bolts.

Mounting bolt:

490 – 608 Nm {50 – 62 kgm}

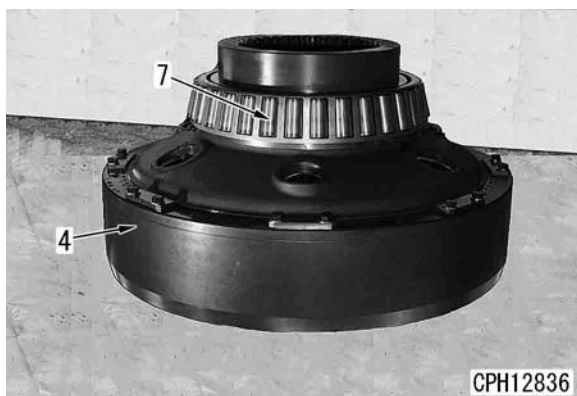


5. Ring gear

- 1) Install bearing (7) to ring gear (4).



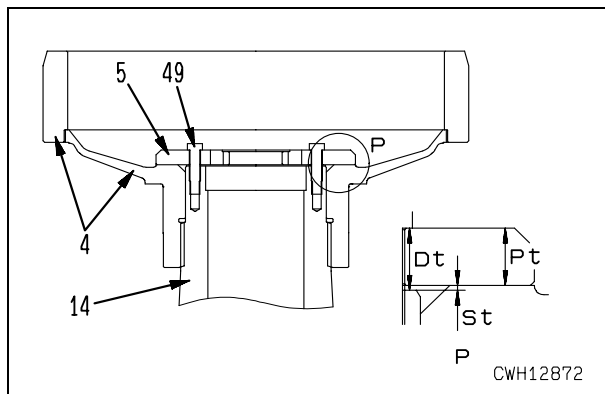
Bearing: **50 kg**



- 3) Measure distance (depth Dt) from spacer end surface to shaft end surface.



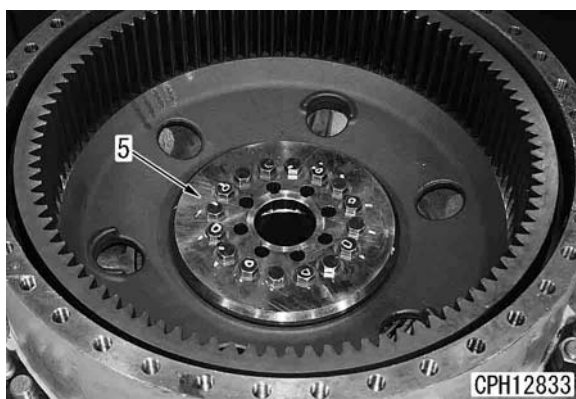
- 4) Remove 4 mounting bolts and retainer.
- 5) Measure thickness of the retainer by 3 positions, and obtain the average (Pt).
- 6) Adjust the number of shims so that it conforms the equation below, then install shims (6). Shim thickness (St) = (Dt) – (Pt) + 0.3



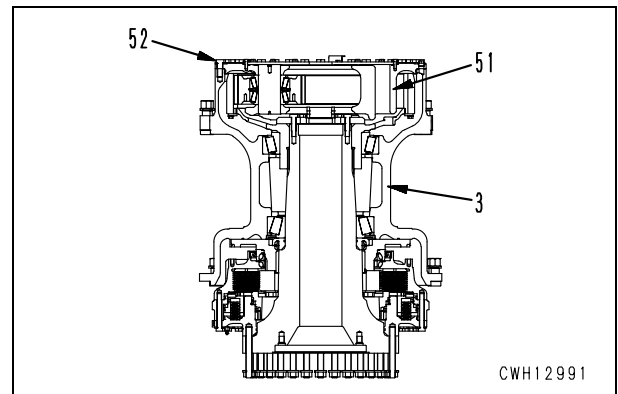
- 7) Install retainer (5), and tighten mounting bolts to the specified torque.

⚙ Mounting bolt:

490 – 608 Nm {50 – 62 kgm}



7. Assemble planetary carrier Assembly (51).



DUMP TRUCK

HD785-7

Machine model	Serial number
HD785-7	7001 and up

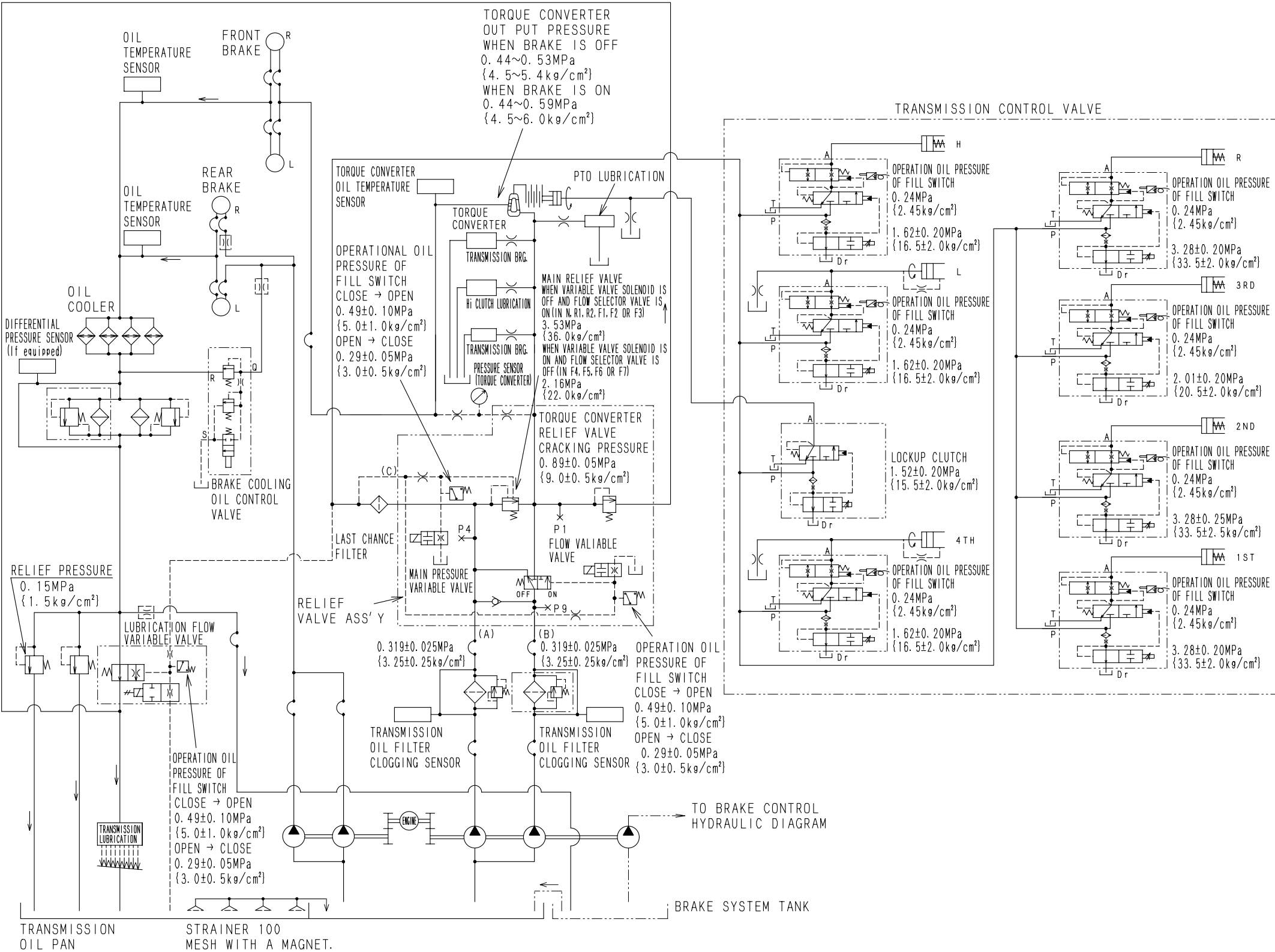
90 Diagrams and drawings

Hydraulic diagrams and drawings

Power train hydraulic circuit diagram	3
Steering and hoist hydraulic circuit diagram	5
Brake hydraulic circuit diagram	7
Brake hydraulic circuit diagram (ASR specification)	9
Brake hydraulic circuit diagram (ABS specification)	11
Brake hydraulic circuit diagram (ASR and ABS specification)	13

Power train hydraulic circuit diagram

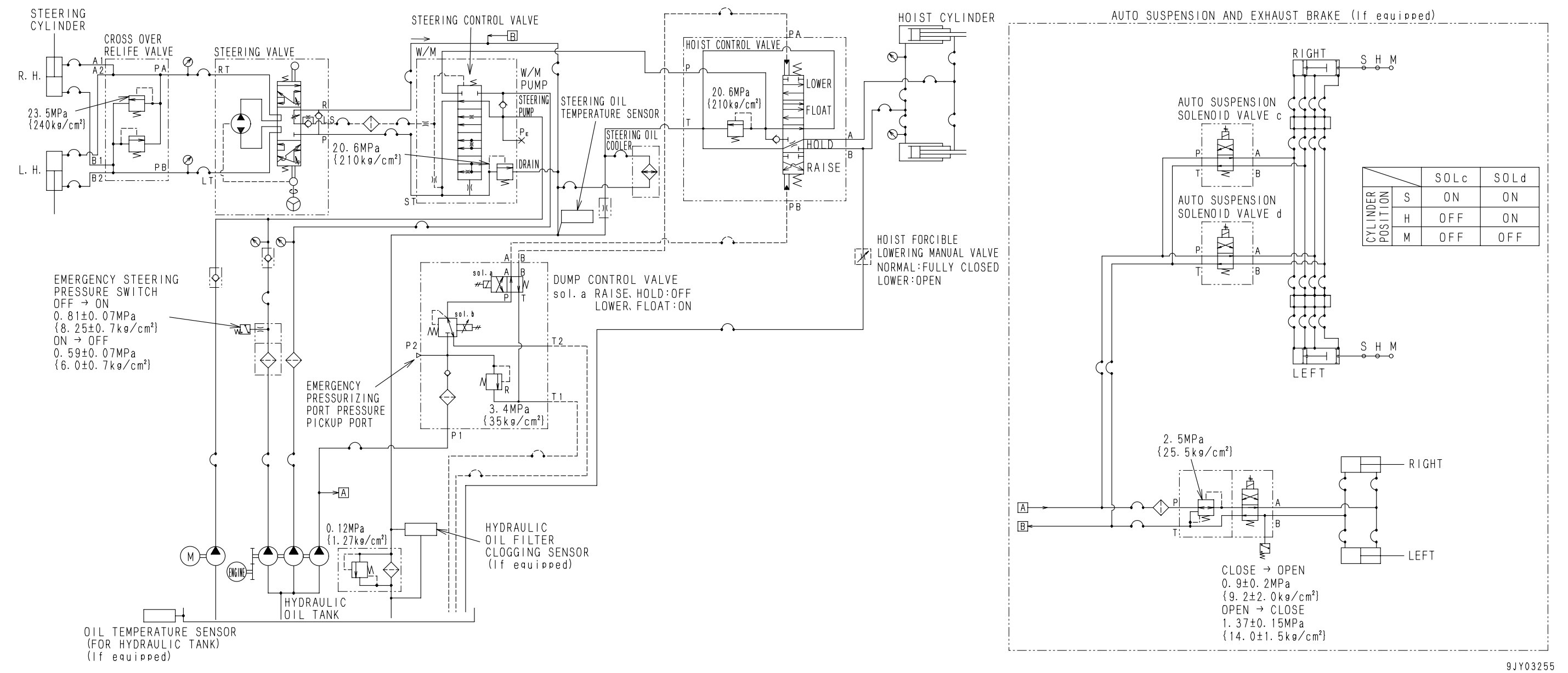
Power train hydraulic circuit diagram
HD785-7



9JY03254

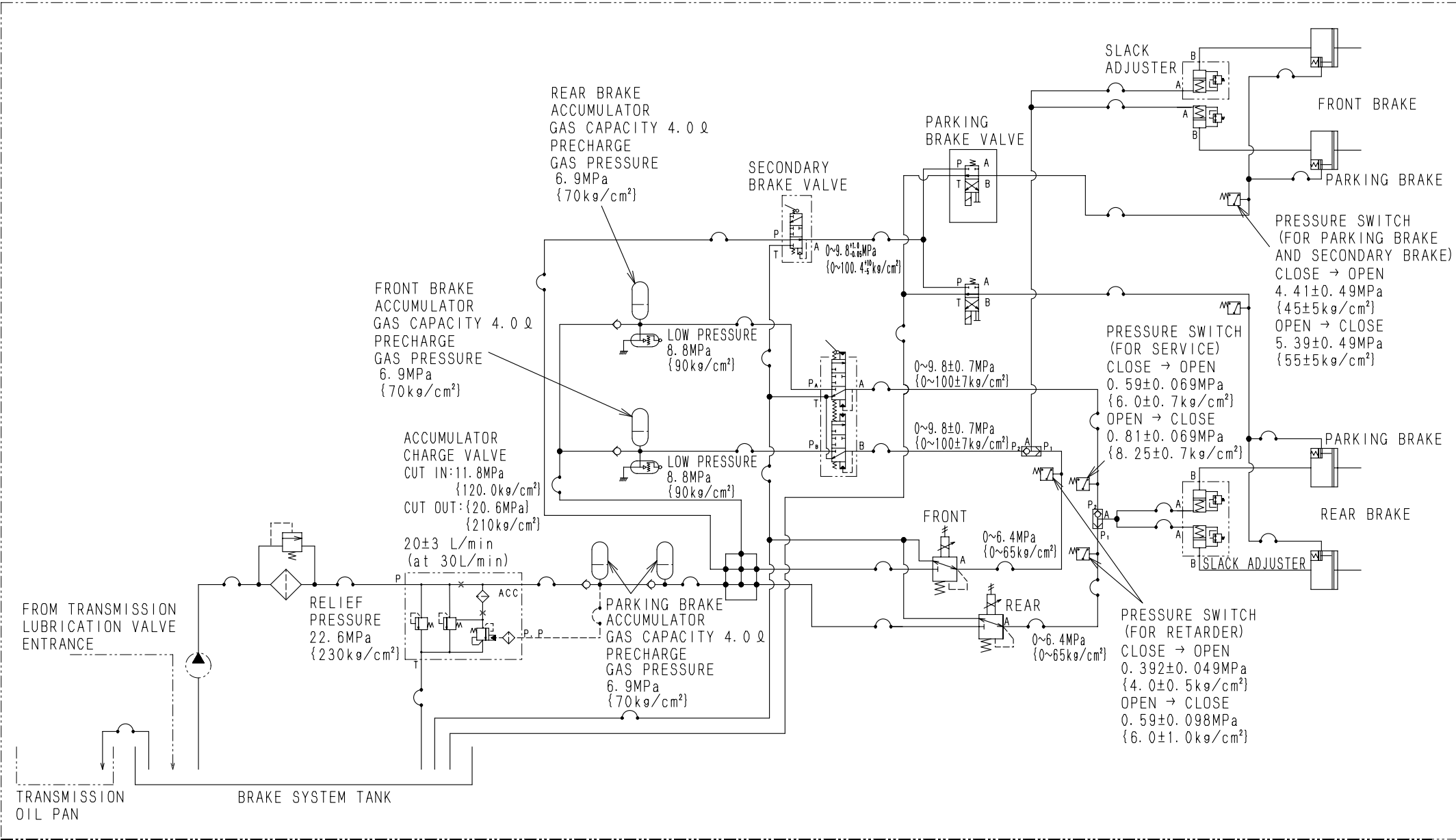
Steering and hoist hydraulic circuit diagram
(Auto-suspension and exhaust brake are optional)

Steering and hoist hydraulic circuit diagram
HD785-7



Brake hydraulic circuit diagram

Brake hydraulic circuit diagram
HD785-7

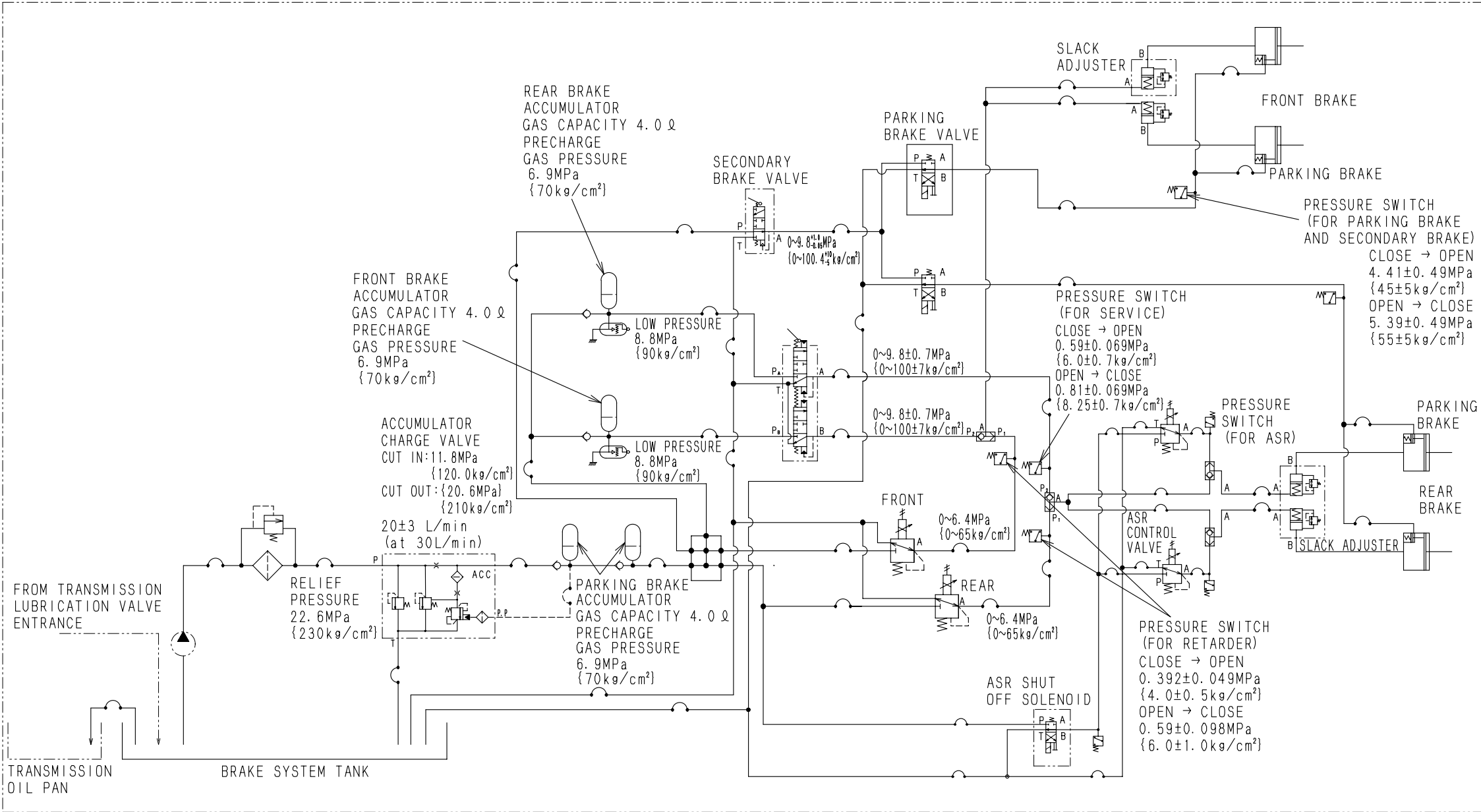


9JY03256

Brake hydraulic circuit diagram

(ASR specification)
(If equipped)

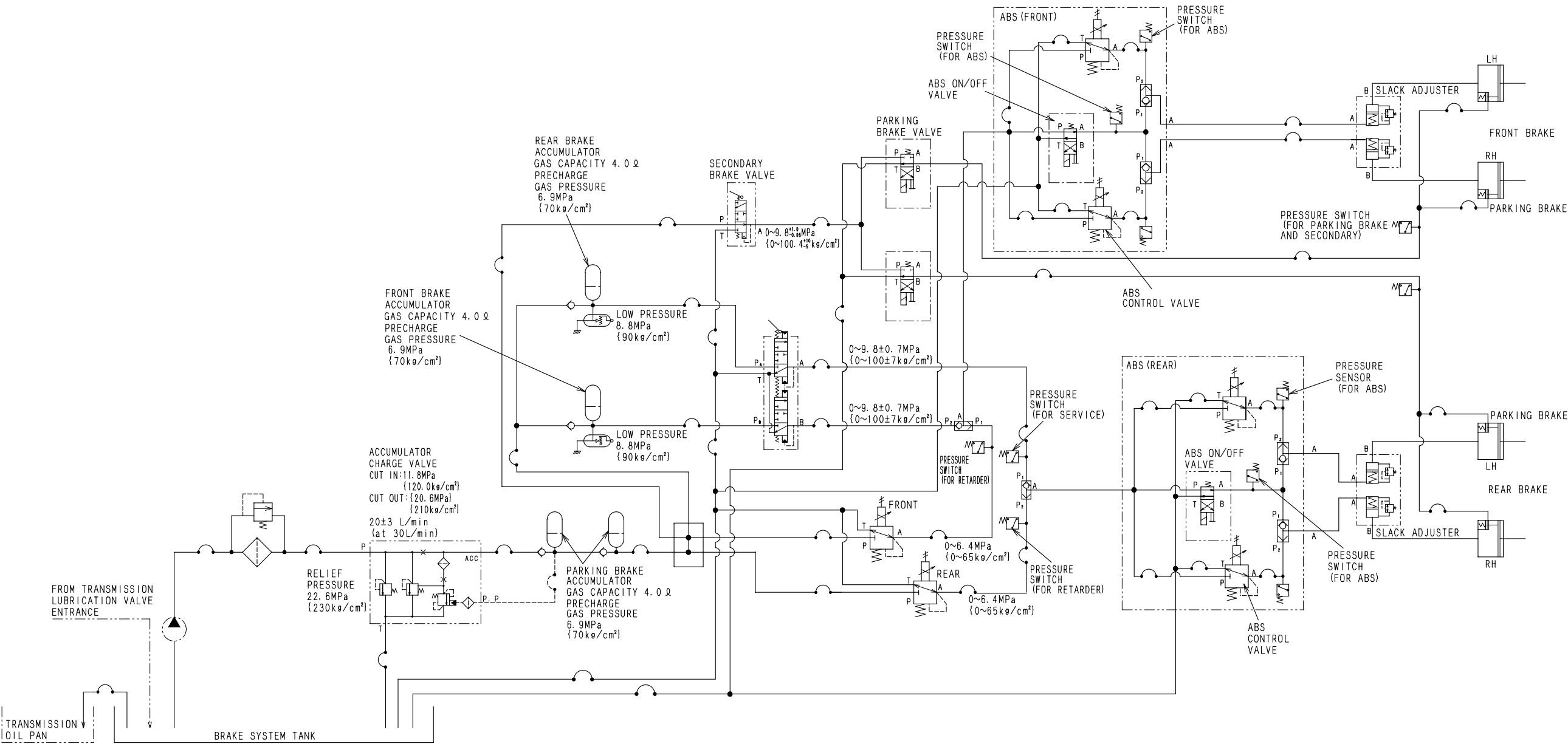
Brake hydraulic circuit diagram
HD785-7



Brake hydraulic circuit diagram

(ABS specification)
(If equipped)

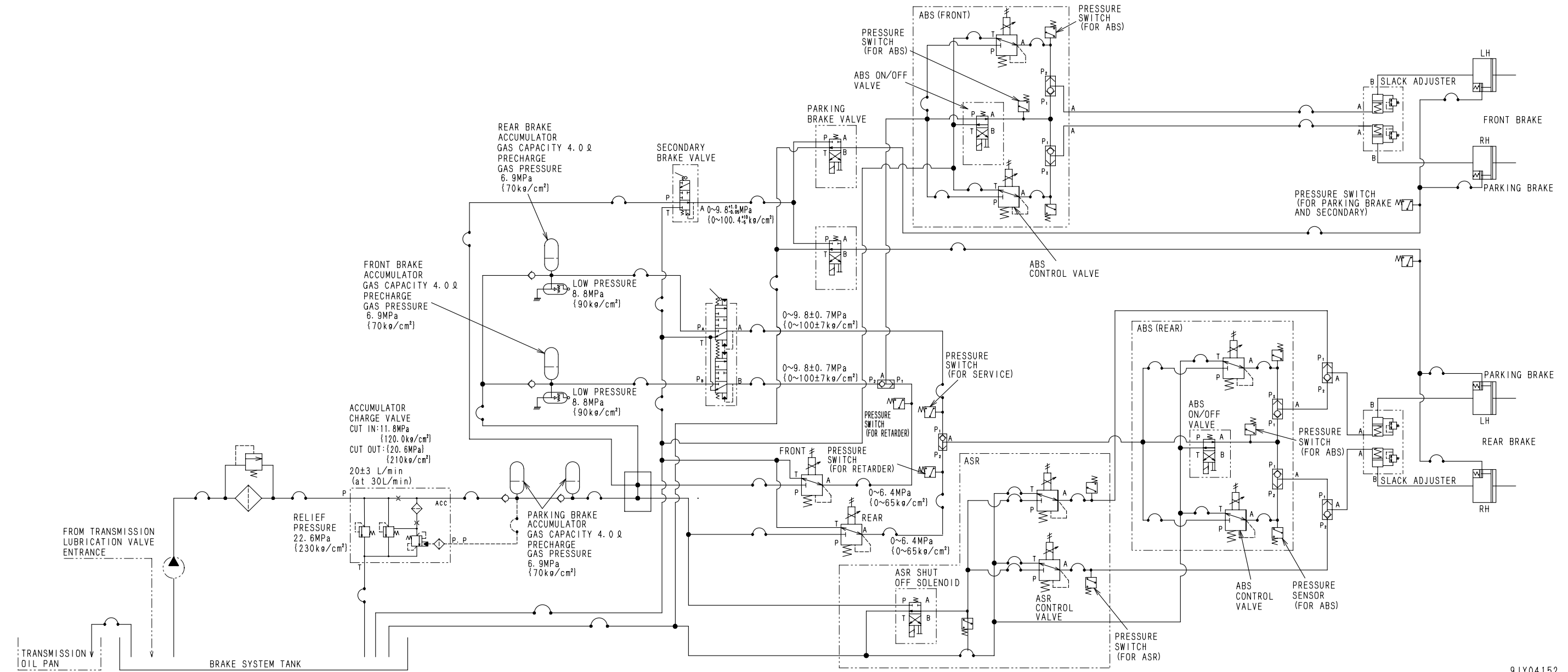
Brake hydraulic circuit diagram
HD785-7



9JY04151

Brake hydraulic circuit diagram
(ASR and ABS specification)
(If equipped)

Brake hydraulic circuit diagram
HD785-7



9JY04152

HD785-7 Dump truck

Form No. SEN01298-01

DUMP TRUCK

HD785-7

Machine model Serial number

HD785-7 7001 and up

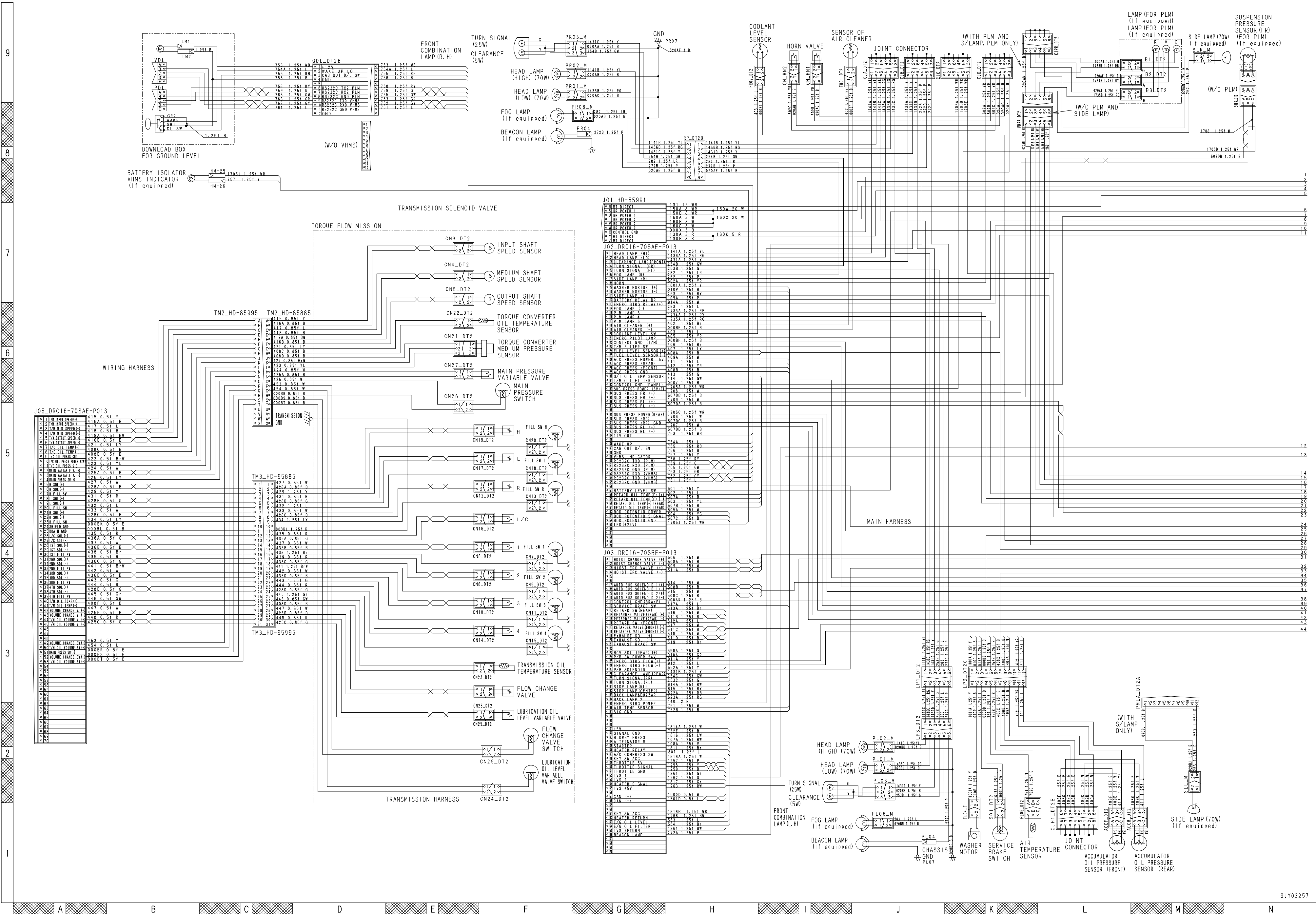
90 Diagrams and drawings

Electrical diagrams and drawings

Electrical circuit diagram for outside cab (1/3)	3
Electrical circuit diagram for outside cab (2/3)	5
Electrical circuit diagram for outside cab (3/3)	7
Electrical circuit diagram for inside cab (1/3)	9
Electrical circuit diagram for inside cab (2/3)	11
Electrical circuit diagram for inside cab (3/3)	13
Electrical circuit diagram for VHMS	15
Electrical circuit diagram for ABS (Outside cab)	17
Electrical circuit diagram for ABS (Inside cab)	19
Electrical circuit diagram for ASR	21
Connectors table and arrangement drawing	23

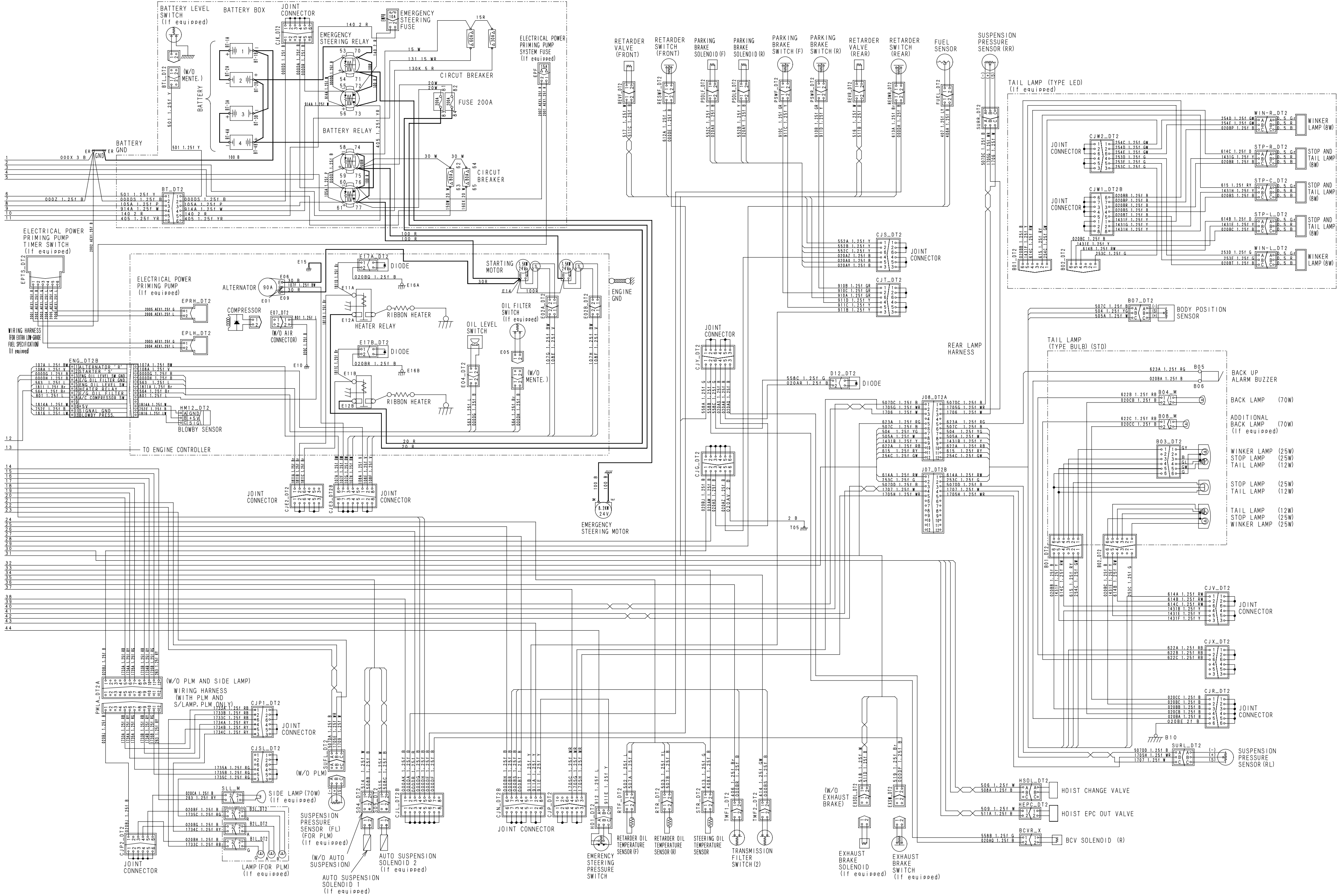
Electrical circuit diagram for outside cab (1/3)

Electrical circuit diagram for outside cab (1/3)
HD785-7



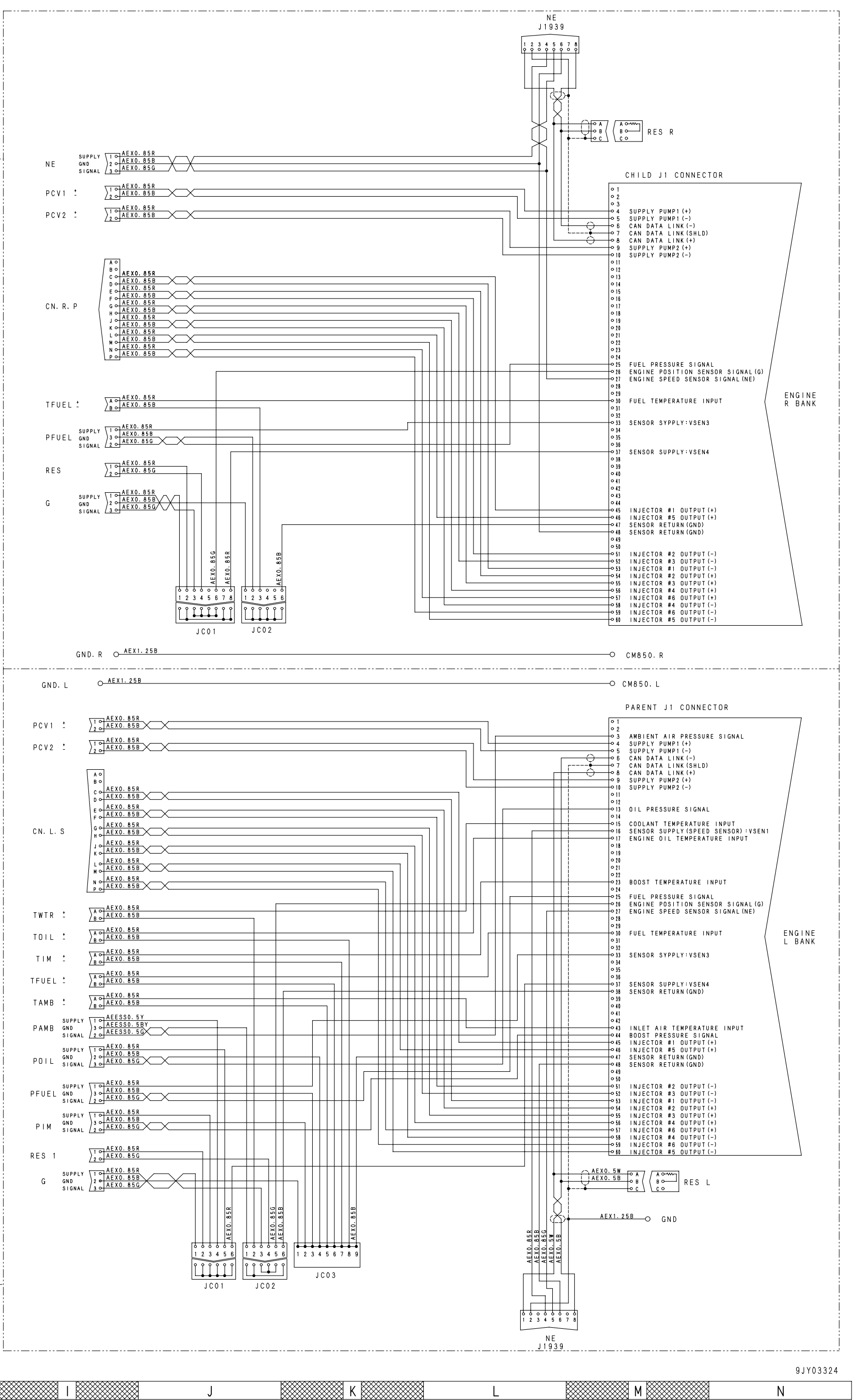
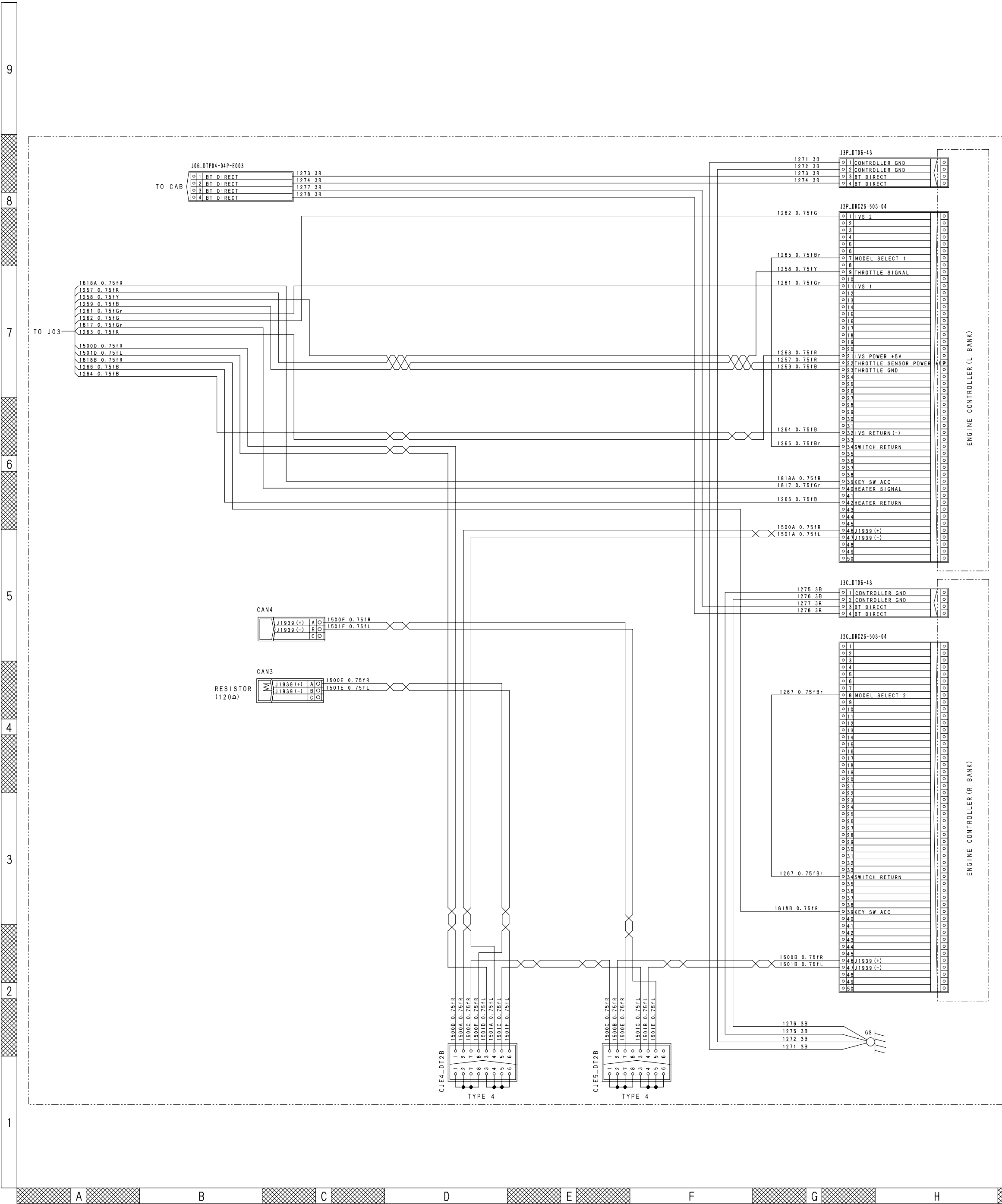
Electrical circuit diagram for outside cab (2/3)

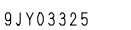
Electrical circuit diagram for outside cab (2/3)
HD785-7



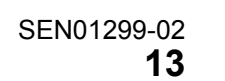
Electrical circuit diagram for outside cab (3/3)

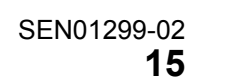
Electrical circuit diagram for outside cab (3/3)
HD785-7





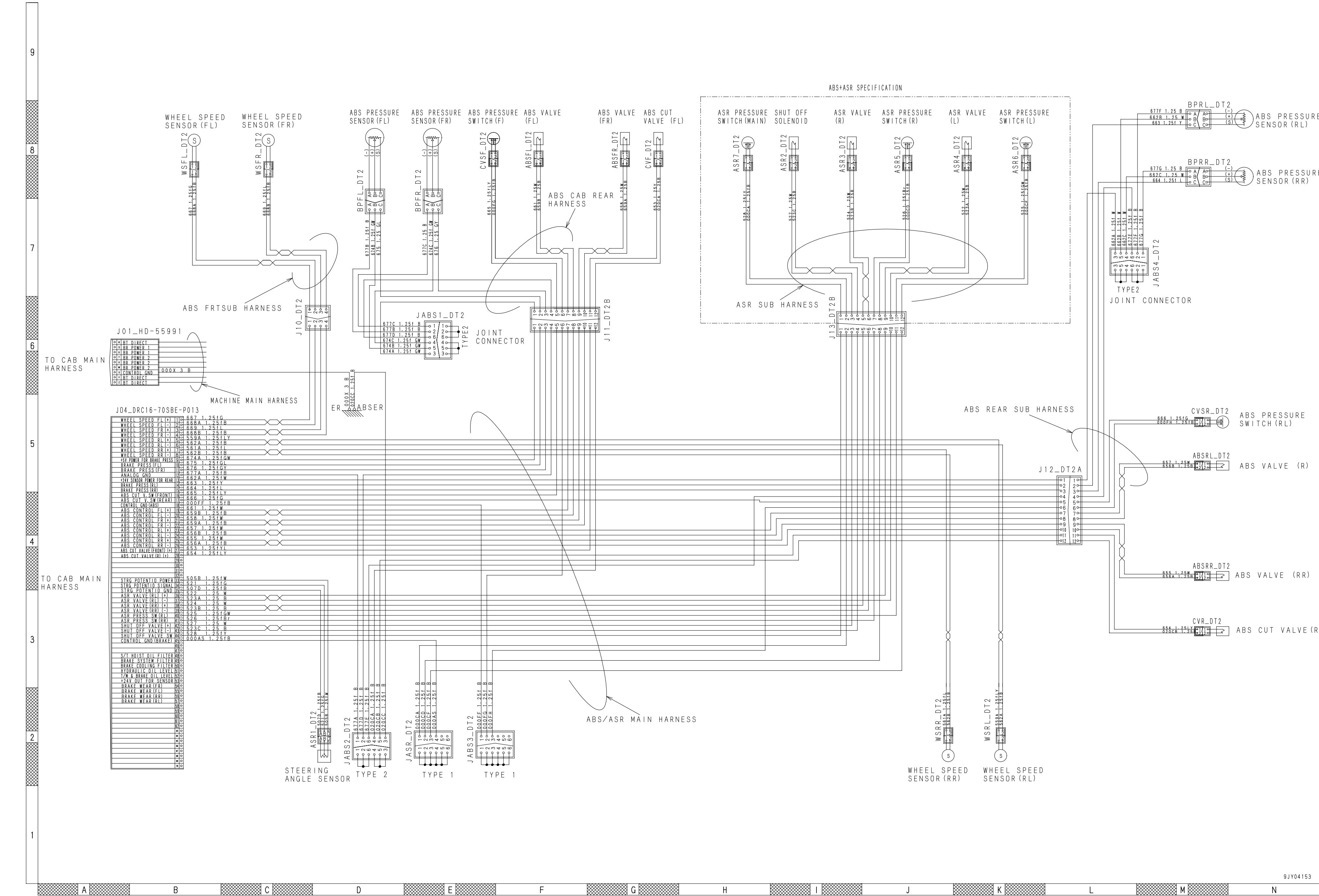




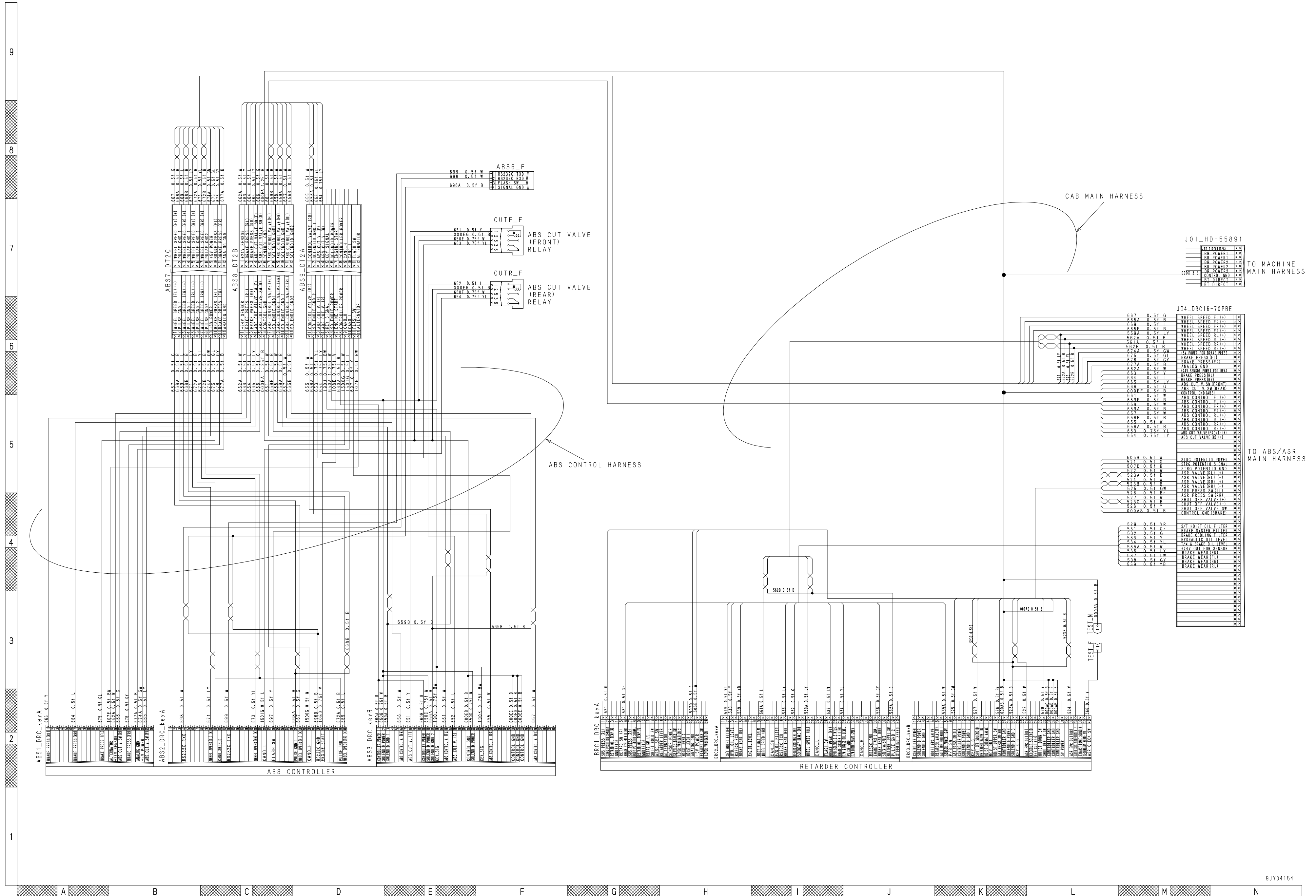


Electrical circuit diagram for ABS

(Outside cab)
(If equipped)

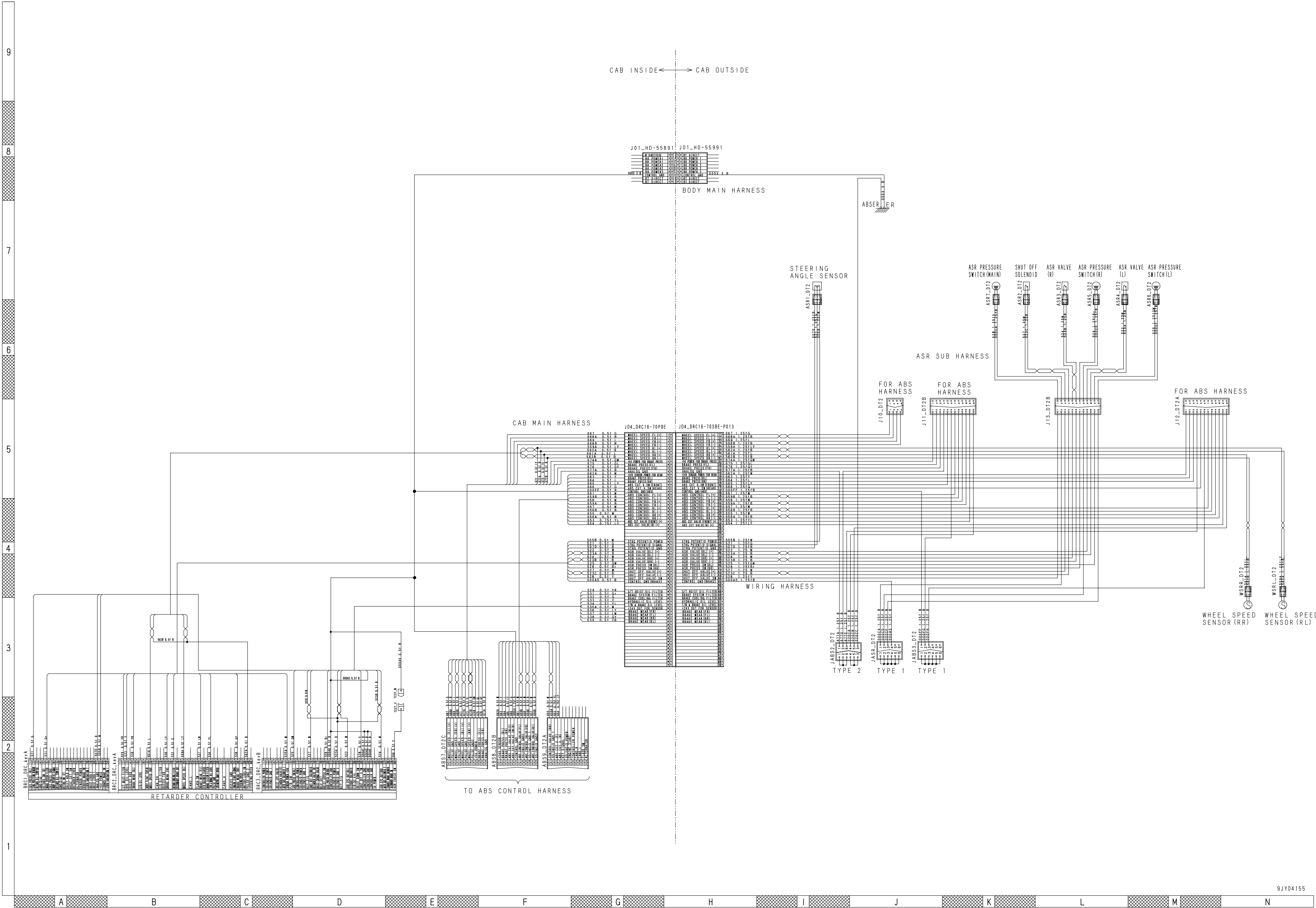


Electrical circuit diagram for ABS
HD785-7



Electrical circuit diagram for ASR
(If equipped)

Electrical circuit diagram for ASR
HD785-7



The address column in the following table shows the addresses in the connector arrangement drawing (3D drawing).

Connector No.	Connector type	Number of pins	Location	Address in 3D drawing
Z50	2	Resistor (male)	U-1	
1020	2	Resistor (male)	S-1	
A1_F	1	Emergency escape switch	AE-3	
A1_M	1	Emergency escape switch	AE-3	
ABS	M	6 ABS system switch	Q-7	
ABS1	DRC	24 ABS controller		
ABS2	DRC	40 ABS controller		
ABS3	DRC	40 ABS controller		
ABS6	4	Intermediate connector		
ABS7	DT2C	12 Intermediate connector	AC-2	
ABS8	DT2B	12 Intermediate connector	AC-2	
ABS9	DT2A	12 Intermediate connector	AC-2	
ACC	M	6 Intermediate connector	Q-2	
ACC	Terminal	1 Starting switch ACC terminal	O-8	
AISS	M	6 AISS switch (if equipped)	P-9	
ARC	M	3 ARSC set switch	R-2	
ARSC	M	6 ARSC system switch	P-7	
AS1	DT2	6 Acceleration sensor	Q-4	
AS2	DT2	3 Pitch angle sensor	AG-2	
AS3	DT2	3 Pitch angle sensor	AG-2	
ASR	M	6 ASR system switch	Q-8	
ASS	DT2	2 Pneumatic suspension seat	X-2	
ATC1	DRC	24 Transmission controller	AF-2	
ATC2	DRC	40 Transmission controller	AF-2	
ATC3	DRC	40 Transmission controller	AF-2	
ATC6	X	4 Intermediate connector	AF-1	
B	Terminal	1 Starting switch B terminal	P-7	
BLS	M	6 Rotary lamp switch	AA-1	
BR	Terminal	1 Starting switch BR terminal	Q-7	
BRC1	DRC	24 Retarder controller	AD-3	
BRC2	DRC	40 Retarder controller	AD-3	
BRC3	DRC	40 Retarder controller	AD-3	
BRC6	X	4 Intermediate connector	AF-1	
BT1		Fuse box	AH-3	
BT3		Fuse box	AH-3	
BT3		Fuse box	AG-3	
BT4		Fuse box	AH-3	
BZ2	M	2 Buzzer	V-1	
C	Terminal	1 Starting switch C terminal	P-7	
CAB1	DT2A	8 Intermediate connector	U-9	
CAB2	DT2B	8 Intermediate connector	V-9	
CAN1	DT2	3 Intermediate connector		
CAN2	DT2	3 Resistor	U-1	
CG1		2 Cigarette lighter	Q-6	
CH1	M	8 Mode selector switch 1	Z-2	
CH2	M	8 Mode selector switch 2	Z-2	
CHECK	M	6 ABS check switch	AA-3	
CK1	M	6 Bulb breakage check switch	AA-3	
CM	DT2C	8 Lighting switch, passing switch, turn switch	U-1	
CNS1	DT2D	12 Intermediate connector	U-8	
CNS2	DT2C	12 Intermediate connector	U-8	
CNS3	DT2B	12 Intermediate connector	U-8	
CUTF	5	ABS cut valve relay (front)		
CUTR	5	ABS cut valve relay (rear)		
D01	AMP	2 Diode	AC-3	
D02	AMP	2 Diode		
D03	AMP	2 Diode		
D04	AMP	2 Diode	AC-1	
D05	AMP	2 Diode	AC-1	
D06	AMP	2 Diode	AC-3	
D07	AMP	2 Diode	T-1	
D08	AMP	2 Diode	AC-3	
D09	AMP	2 Diode	AC-3	
D10	AMP	2 Diode	AC-2	
D11	AMP	2 Diode	AC-1	
DL	DT2A	12 Intermediate connector	AF-2	
DPC1	AMP070	20 Monitor panel	S-8	
DPC2A	AMP070	18 Monitor panel	S-7	
DPC2B	AMP070	18 Monitor panel	S-7	
DPC3A	AMP070	18 Monitor panel	R-7	
DPC4	AMP070	12 Monitor panel	S-7	
DPC6	AMP070	8 Monitor panel	R-7	
DPC7	X	4 Monitor panel	S-1	
DSL	1	Door switch (left)	D-7	
DSR	1	Door switch (right)	D-7	
DT7	DT2	12 Intermediate connector	X-2	
DT8	DT2	4 Intermediate connector	W-2	
EG4	DT2D	12 Intermediate connector		
EM	Terminal	6 Emergency steering timer	AH-2	
ER	1	Ground		
ER1	Terminal	1 Ground	X-9	
ER3	Terminal	1 Ground		
EXH	M	6 Exhaust brake switch		
FLS	4	Flusher	W-2	
FOG	M	6 Fog lamp switch (if equipped)	Z-1	
HM2	M	6 Hazard switch	Q-9	
HM2130	2	Connector		
HM2140	2	Connector		
HM-22A	2	Exhaust temperature sensor amplifier		
HM-22B	2	Exhaust temperature sensor amplifier		
HM-23A	2	Exhaust temperature sensor amplifier		
HM-23B	2	Exhaust temperature sensor amplifier		
HM-50	3	Connector		
HM-55	3	Intermediate connector		
HM-81	8	Intermediate connector		
HM-CN1	20	VHMS and payload meter controller		
HM-CN2A	18	VHMS and payload meter controller		
HM-CN2B	12	VHMS and payload meter controller		
HM-CN3A	18	VHMS and payload meter controller		
HM-CN3B	12	VHMS and payload meter controller		
HM-CN4A	14	VHMS and payload meter controller		
HM-CN4B	10	VHMS and payload meter controller		
HN	1	Horn switch	Q-6	
HSL	DT2	4 Host lever potentiometer	Y-3	
HSL	DT2	4 Intermediate connector	X-2	
J01	HD	9 Intermediate connector	AA-4	
J02	DRC	70 Intermediate connector	AA-4	
J03	DRC	70 Intermediate connector	Z-3	
J04	DRC	70 Intermediate connector	AA-4	
J05	DRC	70 Intermediate connector	Z-3	
J06	DT06	4 Intermediate connector	Z-4	
JCA	SWP	16 Joint connector	AF-1	
JCB	SWP	8 Joint connector	AF-1	

Connector No.	Connector type	Number of pins	Location	Address in 3D drawing
JCC	SWP	16	Joint connector	U-1
JCD	SWP	16	Joint connector	V-1
JCE	SWP	8	Joint connector	
JCF	SWP	16	Joint connector	
JRE	DT2	8	Joint connector	
LKO	DT2	2	Lever kick-off solenoid	Y-3
LKS	DT2	2	Intermediate connector	X-2
LS	3	Rheostat	W-1	
MON	AMP	4	Intermediate connector	P-9
OP7		1	Connector	V-1
OPS	DT2	2	Operator's seat heater	
ORB-A	14	ORBCOMM controller (if equipped)		
ORB-B	10	ORBCOMM controller (if equipped)		
PLM		21	Intermediate connector	V-9
PM1	MIC	20	Intermediate connector	
PM11	MIC	20	Intermediate connector	
PM3	DT2	3	Pitch angle sensor	AH-1
PM4	S	16	Intermediate connector	V-9
PM5	S	13	Payload meter controller (if equipped)	
PM6	S	12	Payload meter controller (if equipped)	
PM7	S	6	Payload meter controller (if equipped)	
PM8	S	6	Intermediate connector	
PWL_F	1	Power window motor (left)	I-1	
PWL_M	1	Power window motor (right)	I-1	
PWM	M	6	Power mode switch	P-9
PWR_F	1	Power window motor (right)	I-1	
PWR_M	1	Power window motor (right)	H-1	
R01	Relay	5	Engine starting relay	AF-4
R02	Relay	5	Transmission neutral relay	AF-4
R03	Relay	5	Parking brake relay	AF-4
R04	Relay	5	Stop lamp relay	AF-3
R05	Relay	5	Backup lamp/buzzer relay	AF-3
R06	Relay	5	Fog lamp relay	AF-4
R08	Relay	5	Stop lamp relay	AF-4
R11	Relay	5	Horn relay	AF-3
R14	Relay	5	BCV relay	AF-4
R16	Relay	5	Hazard relay 1	AF-4
R17	Relay	5	Hazard relay 2	AF-4
R19	Relay	5	Parking brake safety relay	AF-3
R21	Relay	5	Side lamp relay	AF-2
R22	Relay	5	Rotary lamp relay	AF-2
R25	11	Power window relay	X-9	
R29	Relay	5	Headlamp relay (H) (PASS)	AF-4
R30	Relay	5	Headlamp relay (H)	AF-4
R31	Relay	5	Headlamp relay (Lo)	AG-4
R32	Relay	5	Dust indicator relay	AF-2
R33	Relay	5	Parking brake manual switch	U-9
R34	M	7	Power window switch (right)	AF-2
R35	M	7	Power window switch (left)	AF-2
R37	Relay	5	Auto pre-heater relay	AF-2
R40	Relay	5	Payload meter relay (if equipped)	AG-4
R43	Relay	5	Payload meter external indicator lamp blue relay	AG-4
R44	Relay	5	Payload meter external indicator lamp yellow relay	AG-4
R45	Relay	5	Payload meter external indicator lamp red relay	AG-2
R46	5	Small lamp relay	AG-2	
RAD		9	Cassette stereo AM/FM radio	O-8
RE1		2	Resistor	AF-2
RE3		2	Resistor (female)	C-6
RE4		2	Resistor (female)	S-1
RL	M	2	Room lamp	E-8
RL2		2	Room lamp 2	G-9
RTL	DT2	6	Retarder lever potentiometer	S-1
SBS	DT2	2	Seat belt switch	Y-3
SDE	M	6	Side lamp switch (if equipped)	AB-2
SF1	DT2	12	Gearshift lever	T-8
SF2	DT2	2	Gearshift lever	T-8
SPARE	X	4	Intermediate connector	AD-3
SPL		2	Speaker (left)	G-9
SPR		2	Speaker (right)	G-9
SR3	X	3	Steering speed sensor	T-1
ST1	Terminal	1	Emergency steering switch	R-9
ST2	Terminal	1	Emergency steering switch	R-8
ST3	Terminal	1	Emergency steering switch	R-8
ST4	Terminal	1	Emergency steering switch	S-8
TOHET	X	4	Intermediate connector	D-7
TEST_F	1	ASR test switch	AE-3	
TEST_M	1	ASR test switch	AE-2	
VHMS	5	Intermediate connector		
WFM	6	Wiper motor (front)	T-1	
WFR	6	Wiper relay (front)	V-1	
WFS	DT2B	12	Wiper switch	S-1
CN10	DT2	2	3rd clutch ECMV	AF-9
CN11	DT2	2	3rd fill switch	AF-9
CN12	DT2	2	R clutch ECMV	AE-9
CN13	DT2	2	R fill switch	AE-9
CN14	DT2	2	4th clutch ECMV	AE-9
CN15	DT2	2	4th fill switch	AE-9
CN16	DT2	2	Torque converter lockup solenoid	AE-9
CN17	DT2	2	Low clutch ECMV	AD-9
CN18	DT2	2	Low fill switch	AD-9
CN19	DT2	2	High clutch ECMV	AD-8
CN20	DT2	2	High fill switch	AD-8
CN21	DT2	2	Torque converter intermediate pressure sensor	AE-6
CN22	DT2	2	Torque converter oil temperature sensor	AE-6
CN23	DT2	2	Transmission oil temperature sensor	AH-6
CN24	DT2	2	Lubricating oil flow variable valve switch	AG-5
CN25	DT2	2	Lubricating oil flow variable valve	AF-6
CN26	DT2	2	Main pressure switch	AC-8
CN27	DT2	2	Main pressure variable valve	AC-8
CN28	DT2	2	Flow selector valve	AC-8
CN29	DT2	2	Flow variable valve switch	AC-7
CN3	DT2	2	Input shaft speed sensor	D-5
CN4	DT2	2	Intermediate shaft speed sensor	D-5
CN5	DT2	2	Output shaft speed sensor	AH-6
CN6	DT2	2	1st clutch ECMV	AF-9
CN7	DT2	2	1st fill switch	AF-9
CN8	DT2	2	2nd clutch ECMV	AG-9
CN9	DT2	2	2nd fill switch	AG-9
T1	Terminal	1	Ground	AA-6
TM2	HD	23	Intermediate connector	AH-7
TM3	HD	31	Intermediate connector	AE-6
53	Terminal	1	Emergency steering relay	D-8
54	Terminal	1	Steering pressure switch	D-8

Connector No.	Connector type	Number of pins	Location	Address in 3D drawing
55	Terminal	1	Emergency steering relay	C-6
56	Terminal	1	Emergency steering relay	C-6
58	Terminal	1	Battery relay	B-8
59	Terminal	1	Battery relay	B-8
60	Terminal	1	Battery relay	B-7
61	Terminal	1	Battery relay	B-7
62	Terminal	1	Circuit breaker (80 A)	A-7
63	Terminal	1	Circuit breaker (80 A)	A-7
64	Terminal	1	Circuit breaker (80 A)	B-6
65	Terminal	1	Circuit breaker (80 A)	A-6
66	Terminal	1	Circuit breaker (80 A)	B-7
67	Terminal	1	Circuit breaker (80 A)	B-7
68	Terminal	1	Circuit breaker (80 A)	B-7
69	Terminal	1	Circuit breaker (30 A)	F-1
70	Terminal	1	Emergency steering relay	C-9
71	Terminal	1	Emergency steering relay	C-9
72	Terminal	1	Emergency steering relay	B-9
73	Terminal	1	Emergency steering relay	B-9
74	Terminal	1	Battery relay	B-8
75	Terminal	1	Battery relay	B-8
76	Terminal	1	Battery relay	B-9
77	Terminal	1	Battery relay	B-9
ACCF	DT2	3	ACC oil pressure sensor (front)	
ACGR	DT2	3	ACC oil pressure sensor (rear)	
B01	DT2	6	Intermediate connector	K-9
B02	DT2	6	Intermediate connector	J-9
B03	DT2	6	Winker tail stop lamp	L-8
B04	M	2	Backup alarm buzzer	L-8
B05	Terminal	1	Backup alarm buzzer	K-9
B07	DT2	3	Body position sensor	K-9
B08	M	2	ADD backup lamp (if equipped)	H-9
B1	DT2	2	Lamp G (right) (for payload meter) (if equipped)	D-7
B1	Terminal	1	Fuse	M-9
B10	DT2	2	Retarder switch (front)	M-7
B1L	DT2	2	Lamp G (left) (for payload meter) (if equipped)	D-9
B2	DT2	2	Lamp A (right) (for payload meter) (if equipped)	C-7
B2	Terminal	1	Fuse	D-9
B2L	DT2	2	Lamp A (left) (for payload meter) (if equipped)	N-4
B3	DT2	2	Lamp R (right) (for payload meter) (if equipped)	C-7
B3L	DT2	2	Lamp R (left) (for payload meter) (if equipped)	C-9
B3L	DT2	2	Lamp R (left) (for payload meter) (if equipped)	N-5
B4	Terminal	1	Fuse	D-9
BCVR	X	2	BCV solenoid (right)	N-6
BT	DT2B	8	Intermediate connector	C-8
BT-1A	Terminal	1	Battery 1 (-)	E-8
BT-1B	Terminal	1	Battery 1 (-)	E-8
BT-2A	Terminal	1	Battery 2 (-)	E-8
BT-2B	Terminal	1	Battery 2 (+)	F-8
BT-3A	Terminal	1	Battery 1 (+)	F-8
BT-3B	Terminal	1	Battery 1 (-)	F-9
BT-4A	Terminal	1	Battery 2 (+)	F-9
BT-4B	Terminal	1	Battery 2 (+)	F-9
BTL	DT2	2	Battery electrolyte level switch (if equipped)	B-7
CJA	DT2	6	Joint connector	C-7
CJB	DT2	6	Joint connector	C-6
CJC	DT2	6	Joint connector	C-6
CJE4	DT2	8	Joint connector	C-6
CJE2	DT2	8	Joint connector	AI-2
CJE3	DT2B	8	Joint connector	AM-7
CJE	DT2	6	Joint connector	M-4
CJH1	DT2B	8	Joint connector	C-7
CJK	DT2	6	Joint connector	C-7
CL	DT2	6	Joint connector	N-6
CJN	DT2	6	Joint connector	N-6
CJP	DT2	6	Joint connector	N-7
CJP1	DT2	6	Joint connector	L-3
CJP2	DT2	6	Joint connector	M-4
CJP3	DT2	6	Joint connector	M-4
CJR	DT2	6	Joint connector	K-9
CJS	DT2	6	Joint connector	H-9
CJSL	DT2	6	Joint connector	H-9
CJT	DT2	6	Joint connector	H-9
CJV	DT2	6	Joint connector	L-8
CJW	DT2	6	Joint connector	L-8
CJY	DT2	6	Joint connector	M-3
D12	DT2	2	Diode	I-9
E	Terminal	1	Emergency steering motor	K-2
E01	Terminal	1	Alternator R terminal	AN-5
E02A	DT2	2	Intermediate connector	AM-8
E02B	DT2	2	Intermediate connector	AL-7
E04	DT2	2	Engine oil level switch	AK-5
E05	Terminal	1	Oil filter switch	AN-4
E06	Terminal	1	Alternator E terminal	AN-5
E07	X	2	Air compressor	AN-4
E08	Terminal	1	Alternator B terminal	AN-5
E10	Terminal	1	Ground	AN-4
E11A	Terminal	1	Heater relay	AL-9

HD785-7 Dump truck

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