

SHOP MANUAL

CX50 Series

KOMATSU

SHOP MANUAL

FORKLIFT TRUCK

CX50 Series

FOR GENERAL

FG40Z-10
FG35/40/45/50A-10
FD40Z-10
FD35/40/45/50A-10
FD40ZY-10
FD35Y/40Y/45Y/50AY-10

M251-133001 and up
M253-133001 and up
M250-133001 and up
M252-133001 and up
M250-133001 and up
M252-133001 and up

FOR USA

FG40ZU-10
FG40U/45U/50AU-10
FD40ZU-10
FD40U/45U/50AU-10

M251-133001 and up
M253-133001 and up
M250-133001 and up
M252-133001 and up

Komatsu Utility Co.,Ltd.
Product Support Div.

KOMATSU FORKLIFT

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For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

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Composition of shop manual

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Safety notice

(Rev. 2008/07)

Important safety notice

Proper service and repair are extremely important for safe lift truck operation. The service and repair techniques recommended by KOMATSU UTILITY and described in this manual are both effective and safe. Some of these techniques require the use of tools specially designed by KOMATSU UTILITY 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 lift truck. In addition, read this manual carefully before starting work.**

- 1) Before carrying out any greasing or repairs, read all the safety labels stuck to the lift truck. For the locations of the safety labels 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, lift truck, 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.
- 9) Avoid working continuously for long hours and take rests at proper intervals to keep the good condition. Take rests in a fixed safe place.

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. Preparation for work

- 1) Before adding oil or making any repairs, park the lift truck on hard and level ground, and apply the parking brake and block the wheels or tracks to prevent the lift truck from moving.
- 2) Before starting work, lower the work equipment (mast) to the ground. If this is not possible, insert the lock pin or use blocks to prevent the work equipment from falling and hang warning signs on them.
- 3) When disassembling or assembling, support the lift truck 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 lift truck. Always use the handrails and steps when getting on or off the lift truck. Never jump on or off the lift truck.

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 lift truck 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) 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. Safety items on maintenance (for safe work)**⚠ Inspection and maintenance shall be carried out by persons having maintenance skill and experience.**

- 1) Inspection and repair work of the lift trucks shall be carried out by persons having sufficient knowledge and experience in maintenance and repair work.
- 2) When inspecting or servicing a new model or a new component, fully understand its structure, performance and mechanism.

⚠ Precautions for inspection and maintenance work (preparation)

- 1) Perform inspection and maintenance on a flat, dry, and dustless place.
- 2) When working in a warehouse, ventilate well.
- 3) Keep the inside of the maintenance shop arranged well and work safely.
- 4) Prepare a fire extinguisher against a fire and learn how to use it.
- 5) Before starting inspection work, lower the fork to the ground.
- 6) Before starting inspection work, turn the starting switch OFF and pull out the key.
- 7) Turn the starting switch OFF and keep the key pulled out unless necessary.
- 8) Pull the parking brake lever and put chocks in front and rear of the front and rear tyres.

⚠ Precautions for inspection and maintenance work (safety)

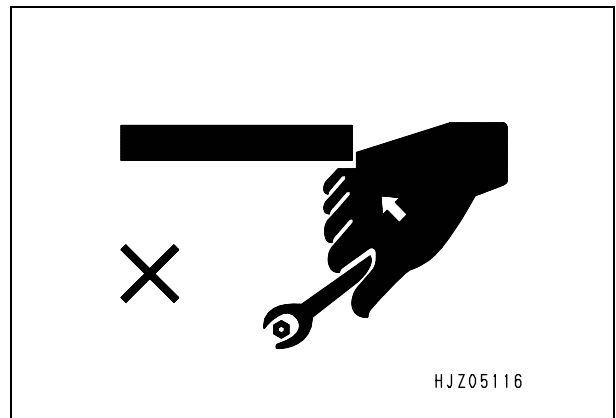
- 1) If oil or grease is sticking, wipe it off. If oil leaks, wipe it off immediately. Dirtiness hides faults such as a crack. Keep clean.
- 2) No fire. Cloths impregnated with fuel or oil can catch fire.
- 3) Wear adequate working clothes.
- 4) Use safety goods and protective items (helmet, safety shoes, goggles and gloves) suitable for work.
- 5) When working on the lift truck, take care not to fall.
- 6) Do not put your foot under the fork.
- 7) When opening and closing the floor plate or engine hood, take care not to have your hand caught.
- 8) When inspecting with the fork raised, pat a stand under the inner mast so that the fork and mast will not fall.
- 9) When working with other personnel, appoint a leader and follow his/her instructions.

⚠ Periodic inspection of safety-critical parts

- 1) Replace the safety-critical parts periodically, even if they are normal. They are deteriorated as the time passes on and can cause a fire and a trouble in the work equipment system.
- 2) Replace safety-critical parts even before their periodic replacement periods, if they are abnormal.

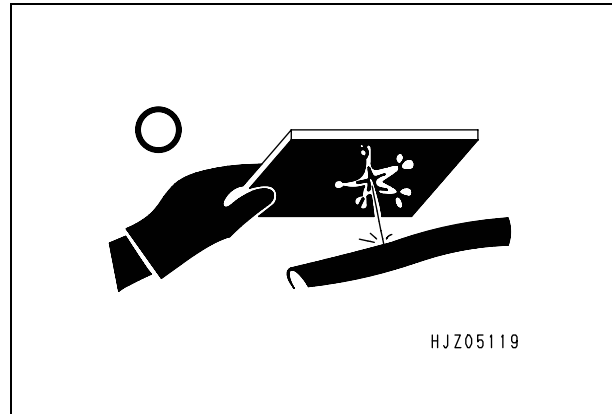
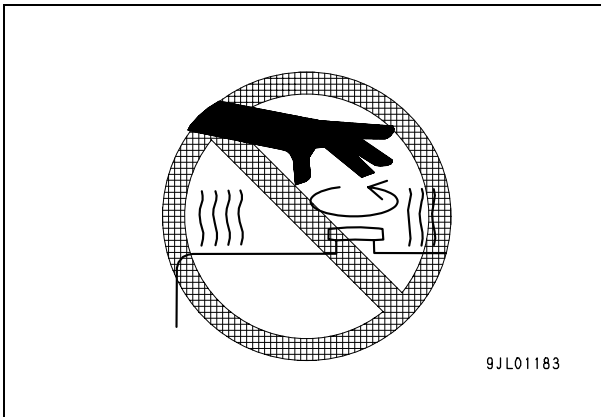
⚠ Use of right tools and equipment

Use right tools for inspection and maintenance work. Use of a broken tool or use a tool for a purpose other than its true purpose is very dangerous.



⚠ Be careful of boiling coolant

- 1) The engine coolant is high in temperature and pressure just after the lift truck is used. Do not remove the radiator cap under this condition. Hot coolant will spout and can scald you.
- 2) When removing the radiator cap, loosen it slowly to release the internal pressure.
- 3) When checking the coolant level, stop the engine and wait for it and radiator to cool. If a reservoir tank is installed, check it.
- 4) If a reservoir tank is installed, add coolant in it.

**⚠ Prohibition of welding fuel tank**

Never weld the fuel tank since it may explode.

⚠ Take care of high-pressure and high-temperature oil

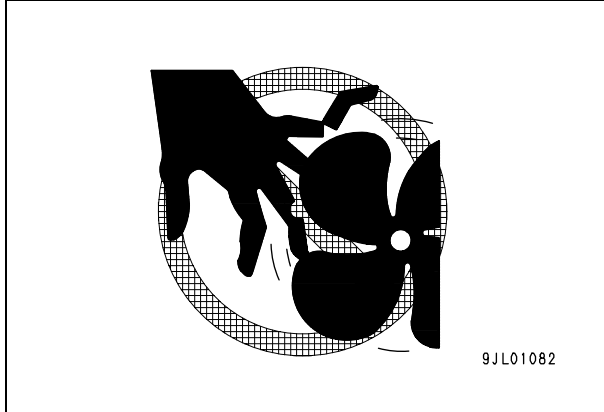
- 1) The oil is high in temperature just after the lift truck is used. Do not drain the oil or replace the oil filter under this condition. Hot oil will spout and can scald you.
- 2) Wait until the oil temperature decreases and then carry out inspection or maintenance according to the procedure described in this manual.
- 3) There is residual pressure in the hydraulic circuit. Do not start inspection or maintenance before the residual pressure decreases to zero.
- 4) High-pressure oil leaking through a small hole is dangerous to the skin or eye. Do not check the hydraulic system for oil leakage with naked eye but put on safety glasses and thick gloves and put a piece of thick paper or plywood to the inspection point.

- 5) When inspecting the accumulator piping, release the pressure inside it in advance.
- 6) If you are injured with high-pressure oil, see a doctor immediately.
- 7) When removing the mast or lift cylinder, be sure to release the pressure from the hydraulic piping.
 - Stop the lift truck and lower the fork to the ground.
 - Stop the engine.
 - Turn the starting switch to the ACC position.
 - Sit on the operator seat and tilt the lift lever and tilt lever forward and in reverse 4 – 5 times each to release the pressure in the hydraulic piping.

⚠ The pressure is not released unless you operate the levers while sitting on the seat.

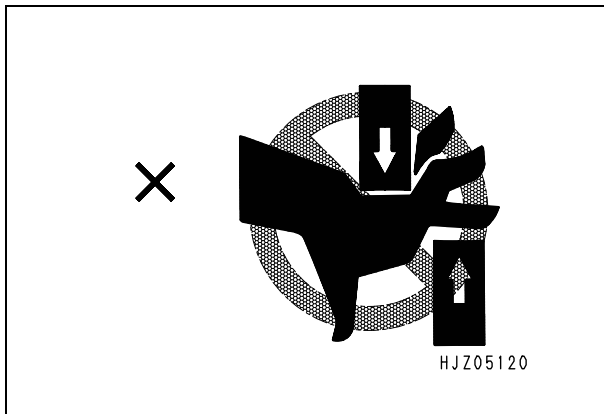
⚠ Beware of rotating cooling fan and belt

- 1) Keep hand off the rotating fan or fan belt.
- 2) When inspecting the rotating parts, stop the engine.
- 3) Do not bring a thing near the rotating parts which can be caught easily.

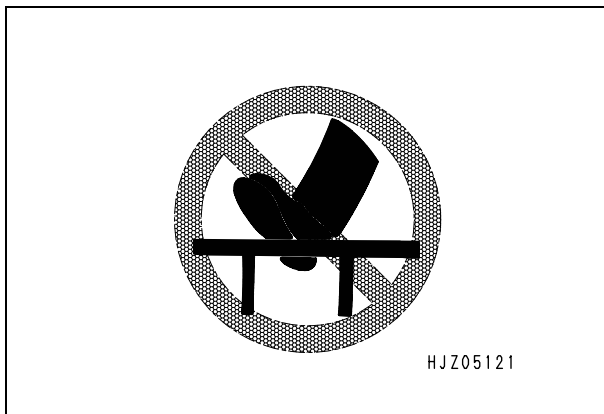


⚠ Danger of being caught and falling

- 1) Never put your hand, foot or body in the mast. You may be caught and injured in the moving parts.

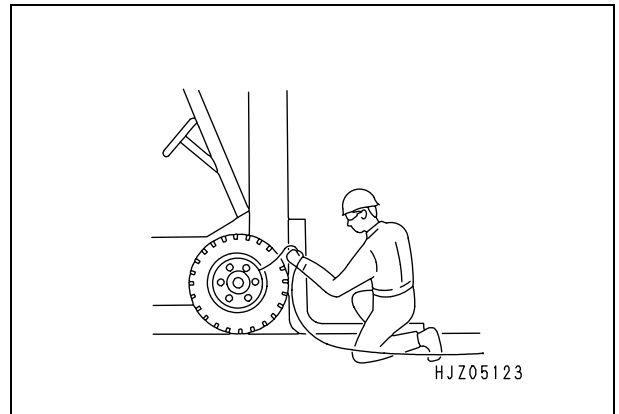


- 2) Do not use the mast as a ladder. You may slip off the mast and fall.



⚠ Tyre inspection and inflation procedures

- 1) If the tyre inflation pressure is low, the lift truck stability is lowered. Do not inflate the tyre immediately, however. The inflation pressure may have decreased because of a damage of the rim. If the tyre is inflated to high pressure while the rim is damaged or cracked, the tyre will burst and cause an injury or a death.
- 2) When checking the tyre inflation pressure, place your body in front of the tread face of the tyre. Do not work from the side of the tyre.

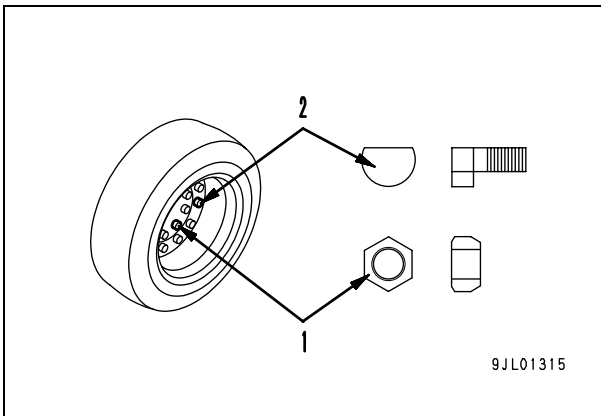


- 3) When inflating the tyre, you have to have taken the special education.
- 4) The air pressure for the lift truck tyre is as several times high as that for car tyre, thus there is possibility of danger in inflating.
- 5) When pumping air into the tyre, dirt may be blown with compressed air and may enter your eye. Put of safety glasses.

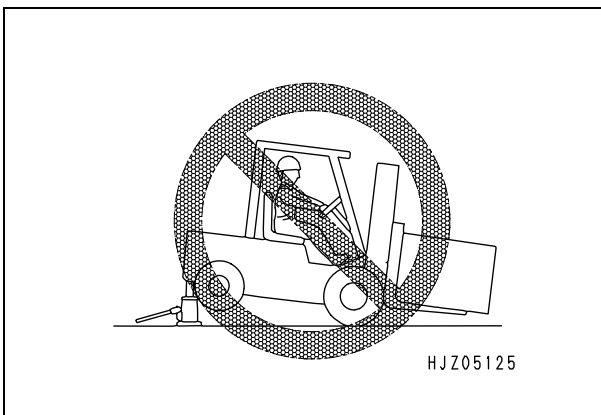
⚠ Handling of tyres

Have the tyre disassembled and assembled by a specialist. Since the tyre inflation pressure is very high, the tyres must be handled carefully.

- 1) When removing the tyre, release all air from it. When removing the tyre, loosen hub nut (1).
- 2) Never touch rim nut (2). Doing so is dangerous.
- 3) After replacing the tyre, travel the lift truck on trial and then check the mounting nuts for looseness. If the tightening torque has decreased, tighten to the specified torque.
- 4) Tightening torque: See "Standard value table".

**⚠ Jack-up work (for checking or replacing tyre)**

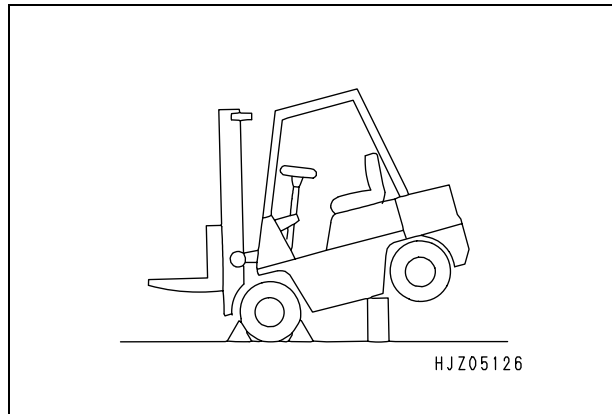
- 1) Do not go under the fork during jack-up work.
- 2) Check the following items before starting jack-up work.
 - No person is on the lift truck.
 - No load is on the lift truck.



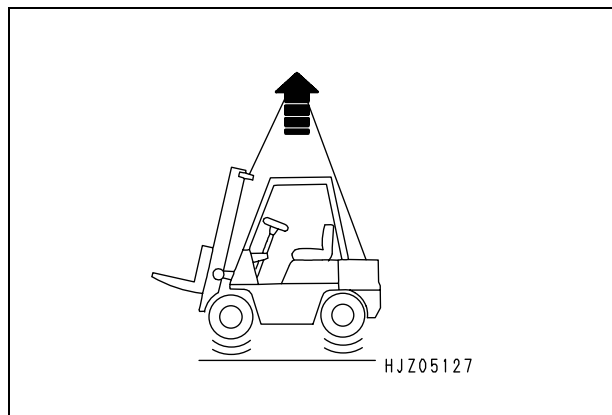
- 3) Stop jacking up when the tyres are floated above the ground a little and put blocks under both sides of the frame to prevent the lift truck from falling.
- 4) Lock the tyres with chocks.

⚠ Slings lift truck (for checking or replacing tyre)

- 1) Never sling the the lift truck by the over-head guard. When slinging the lift truck frequently, use special slings.
- 2) The lift truck shall be slung by a person who has finished the sling skill course.
- 3) Install wires to the specified slinging points.
- 4) When slinging the lift truck, use wires having sufficient strength and no damage.
- 5) Lock the tyres with chocks.
- 6) Put blocks under both sides of the slung lift truck to prevent fall.

**⚠ Slings lift truck (for loading on trailer etc.)**

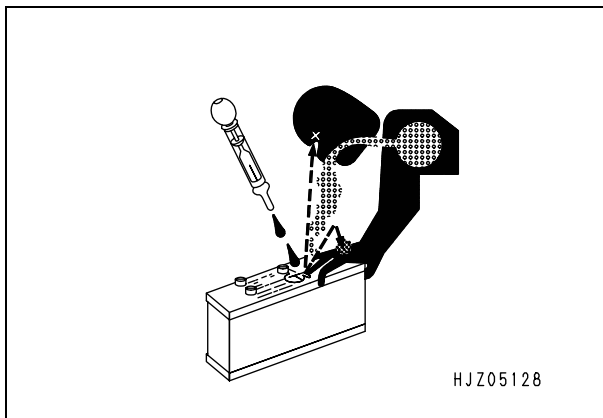
- 1) Never sling the the lift truck by the over-head guard. When slinging the lift truck frequently, use special slings.
- 2) The lift truck shall be slung by a person who has finished the sling skill course.
- 3) Install wires to the specified slinging points.



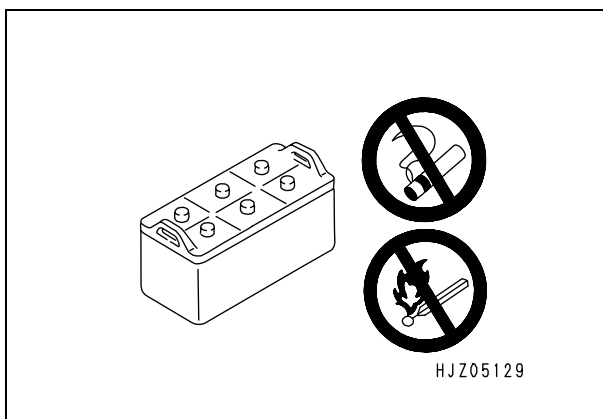
- 4) When slinging the lift truck, use wires having sufficient strength and no damage.

⚠ Handling of batteries

- 1) Battery electrolyte contains dilute sulphuric acid, which attacks clothes and skins. If it sticks to the clothes or skins, take off the clothes immediately and wash the skins which the electrolyte stuck with tap water and then consult a doctor.
- 2) If battery electrolyte gets into your eyes, flush them immediately with fresh tap water for 10 – 15 minutes continually and then consult a doctor.
- 3) If you have drunk battery electrolyte by accident, either drink a large quantity of water or milk mixed with beaten egg white or salad oil, and then consult a doctor at once.



- 4) When handling the battery, always wear safety glasses.
- 5) The battery generates hydrogen gas, which is highly explosive. Do not bring fire of a lighter or a cigarette or make a spark near the battery.



- 6) When inspecting or handling the battery, turn the starting switch OFF.
- 7) When removing the battery, be sure to disconnect the cable from the negative terminal first.
- 8) When installing the battery, be sure to connect the cable to the positive terminal first.

- 9) Do not short the battery terminals by a metallic thing.
- 10) If the terminals are loosened, sparks are made because of a defective contact and they can cause explosion. Tighten the terminals securely.
- 11) When removing the battery, check its positive and negative terminals and take care not to reconnect the cables with reverse polarities.
- 12) Tighten the battery caps securely.
- 13) When cleaning, keep the battery caps tightened.

⚠ Do not put a metallic piece on the battery.

Do not put a metallic piece on the battery, since it can cause a fire from a short circuit.

⚠ Precautions for charging

Nitrogen gas is produced while the battery is being charge and the battery heats itself because of the chemical reaction. To prevent gas explosion, observe the following.

- 1) Charge the battery in a place ventilated well.
- 2) No fire.
- 3) Start to charge the battery when its electrolyte temperature is 35°C or below. (If the electrolyte temperature increases above 50°C, wait until it decreases to below 35°C and then start charging again.)
- 4) When charging the battery with a charging device, keep the battery caps removed.

⚠ Starting engine with booster cables

- 1) When starting the engine with booster cables, put on safety glasses.
- 2) When starting the engine with the battery of another vehicle, do not bring the lift truck body in contact with that vehicle.
- 3) Stop the engine before connecting the cables.
- 4) Take extreme care that that the cables will not be caught in the cooling fan or the fan belt.
- 5) Do not make a mistake in connection of the booster cable. Never bring the positive and negative terminals in contact with each other.

⚠ Prohibition of engine push-start

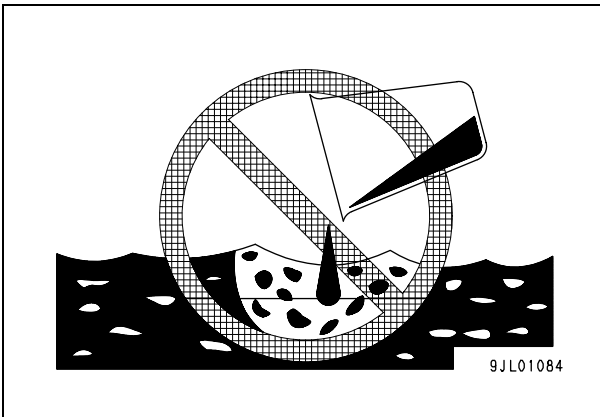
Do not start the engine by pushing the lift truck. The lift truck starts suddenly and you may make a mistake in operation.

⚠ Handling of antifreeze

- 1) Antifreeze contains flammable material. When handling it, do not bring fire near it.
- 2) Since antifreeze is toxic, do not drink it. If you have swallowed by mistake, drink much water and vomit and then consult a doctor immediately.

⚠ Wastes

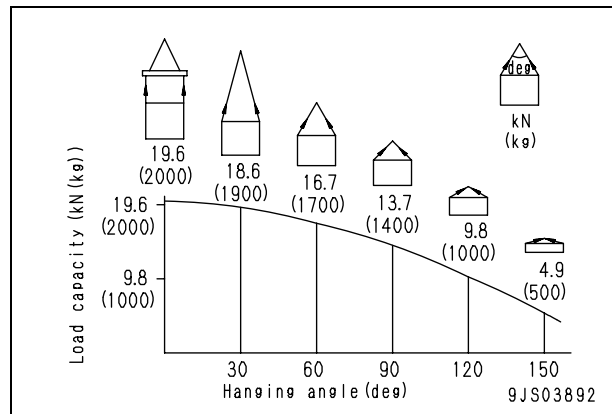
When disposing of oil, fuel, coolant, solvent, filter, battery, Freon (air conditioner refrigerant), etc., observe the applicable regulations and rules.

**5. Precautions for sling work and making signs**

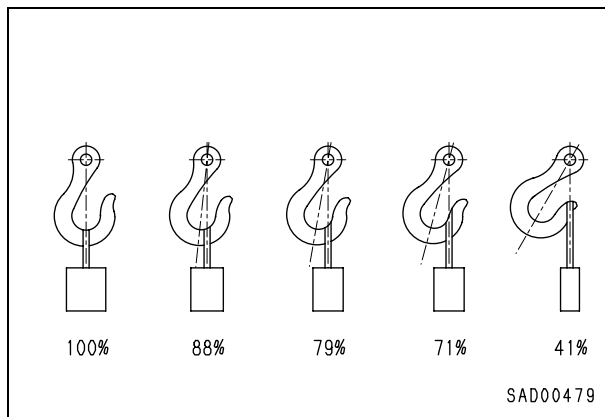
- 1) Only one appointed worker must make signs and co-workers must communicate with each other frequently. The appointed sign maker must make specified signs clearly at a place where he is seen well from the operator's seat and where he can see the working condition easily. The sign maker must always 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.

⚠ Slinging 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.

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	Allowable load	
mm	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**

- ⚠ **The air conditioner mounted on this lift truck uses refrigerant (R134a), which must not be discharged into the atmosphere as it is, although it has less ozone layer breaking factors for preservation of the environment. When disconnecting the air conditioner gas circuit, be sure to collect the refrigerant to reuse it.**

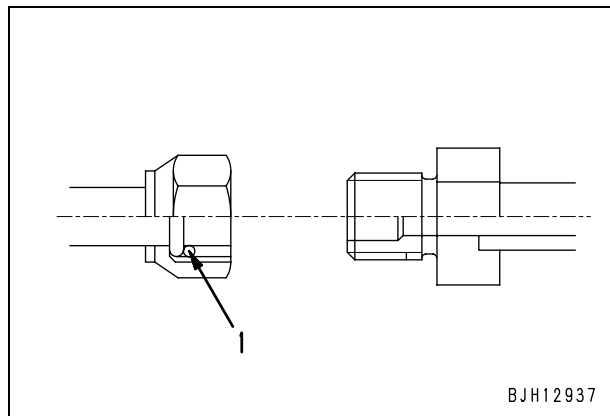
- ★ Ask professional traders for collecting and filling operation of refrigerant (R134a).
- ★ Never release the refrigerant (R134a) to the atmosphere.

- ⚠ **If the refrigerant gas (R134a) gets in your eyes, you may lose your sight. When collecting or filling the it, be sure to put on protective goggles, gloves and protective clothes. In addition, you must be qualified for handling the refrigerant.**

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, VALEO THERMAL SYSTEMS: 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 FORKLIFT 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 lift truck.

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. For troubleshooting "S mode" related to the engine, see Engine.

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.

80. Yearly inspection criteria

This section explains the items, contents and criteria of the specific self-imposed inspection.

90. Diagrams and drawings (Chassis)

This section gives hydraulic circuit diagrams and electrical circuit diagrams.

2. Symbols

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

Symbol	Item	Remarks
	Security	Special precautions are necessary for lift truck security during assembly work.
	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.

3. Unit

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 chapter of maintenance standard explains the criteria for replacing or reusing each product or part in the disassembly maintenance. The criteria 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.

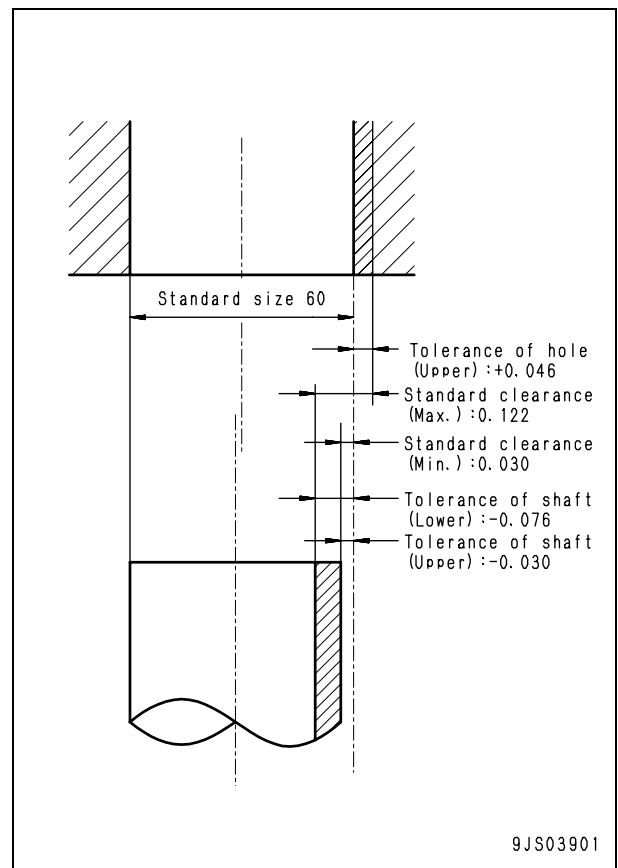
Example:

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	+0.046
	–0.076	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 or allowable dimension

- 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" or "allowable dimension".
- 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 of electric equipment and hydraulic component

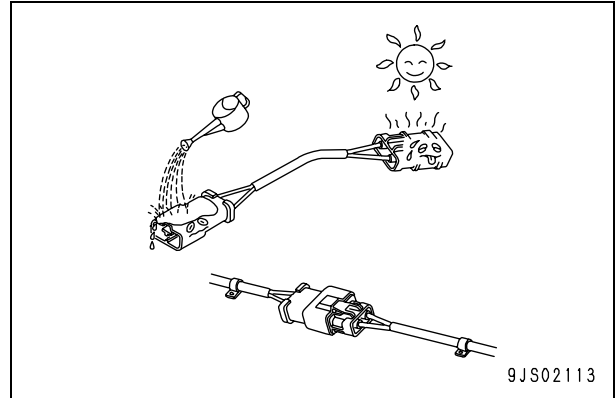
To maintain the performance of the machine over a long period, and to prevent failures or other troubles before they occur, correct "operation", "maintenance and inspection", "troubleshooting", and "repairs" must be carried out. This section deals particularly with correct repair procedures for mechatronics 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.

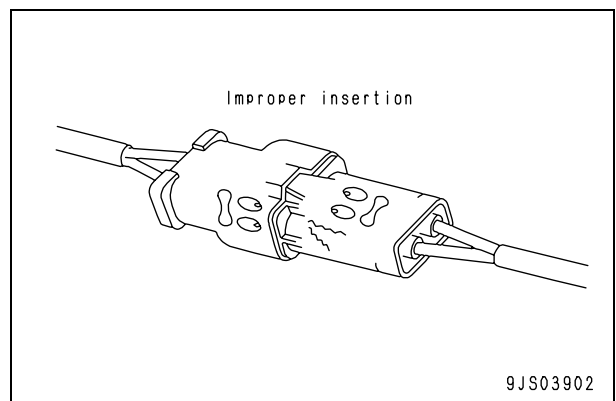
Compared with other electrical components fitted in boxes or cases, wiring harnesses are more likely to be affected by the direct effects of rain, water, heat, or vibration. Furthermore, during inspection and repair operations, they are frequently removed and installed again, so they are likely to suffer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



2. Main failures occurring in wiring harness

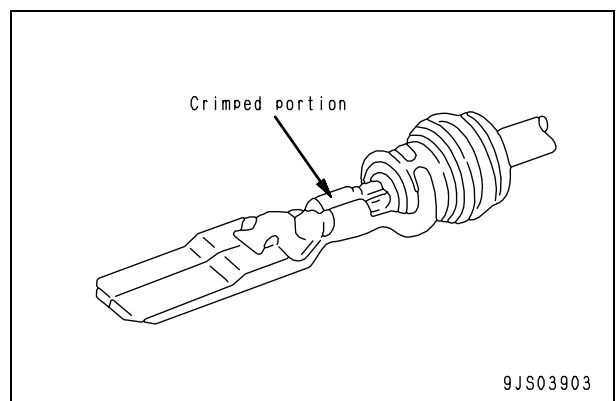
1) Defective contact of connectors (defective contact between male and female)

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.



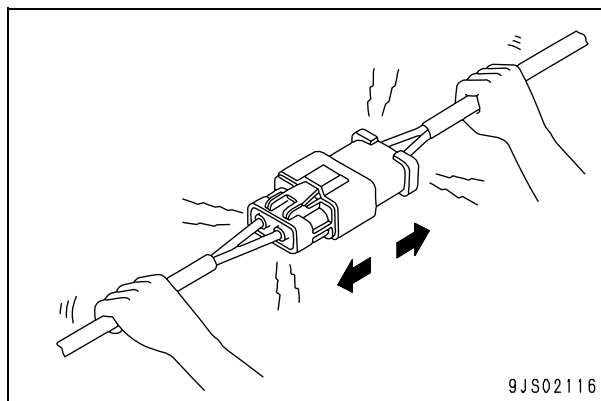
2) Defective crimping or soldering of connectors

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.

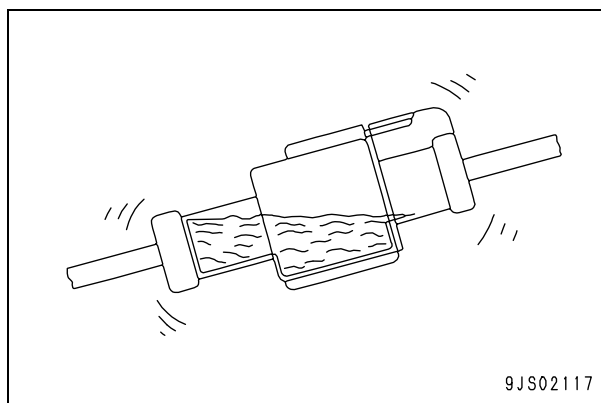


4) High-pressure water entering connector

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.

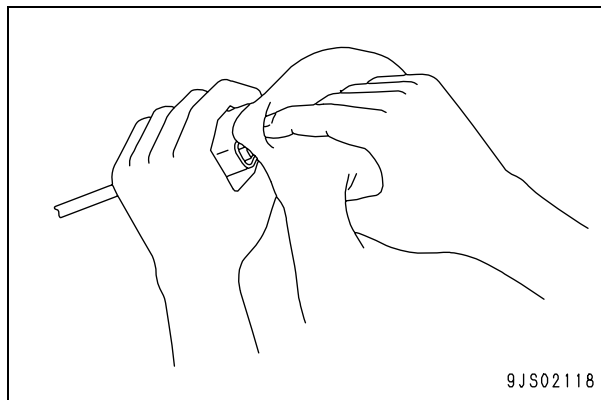
The connector is designed to prevent water from entering, but at the same time, if water does enter, it is difficult for it to be drained. Therefore, if water should get into the connector, the pins will be short-circuited by the water, so if any water gets in, immediately dry the connector or take other 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.

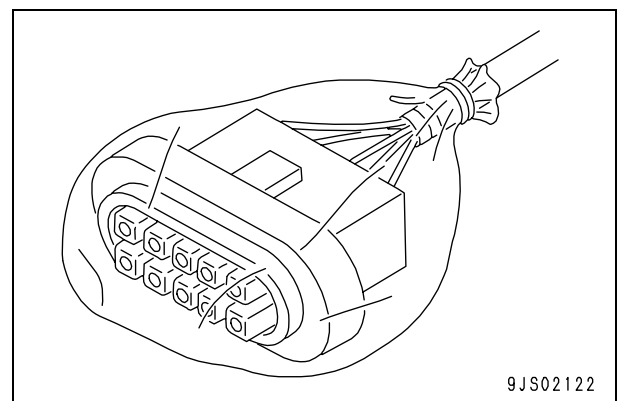
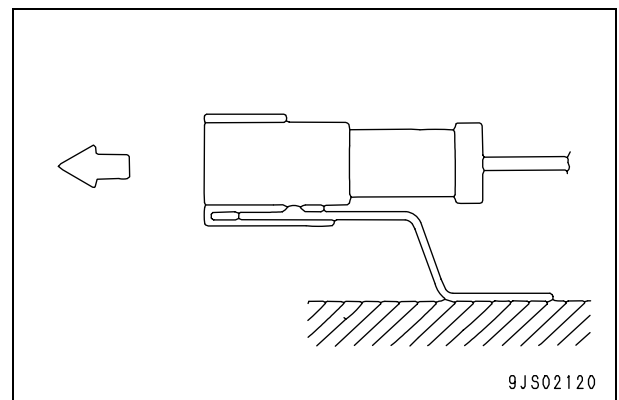
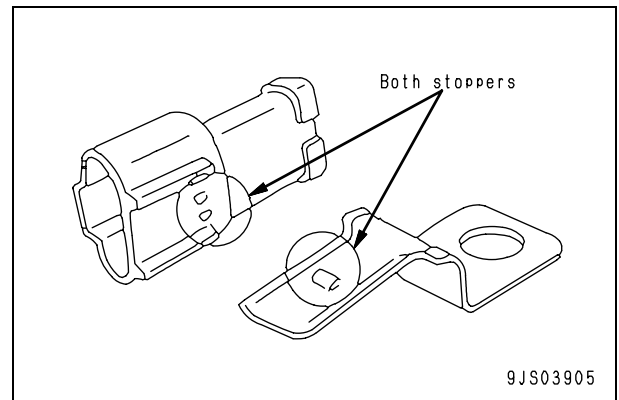
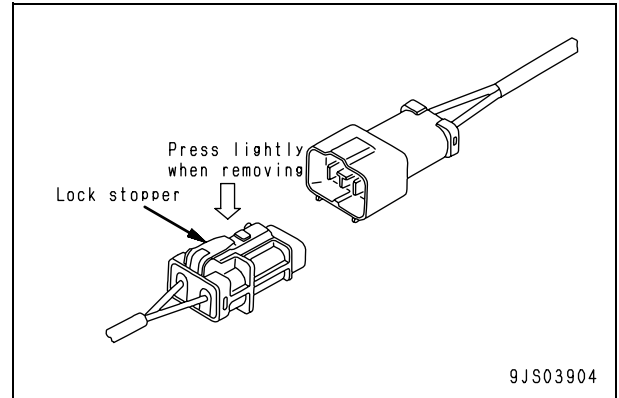
- When removing a connector from a clip, pull the connector in a parallel direction to the clip for removing stoppers.

★ 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.

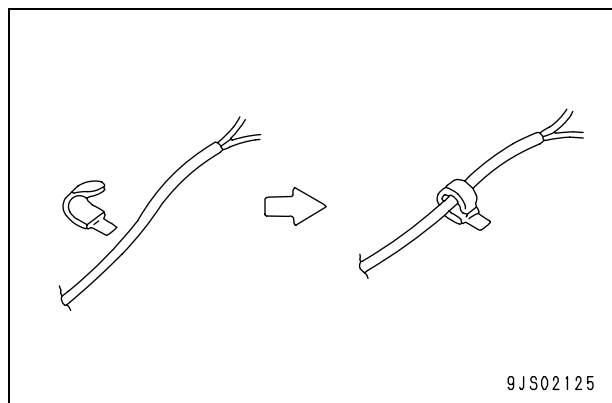
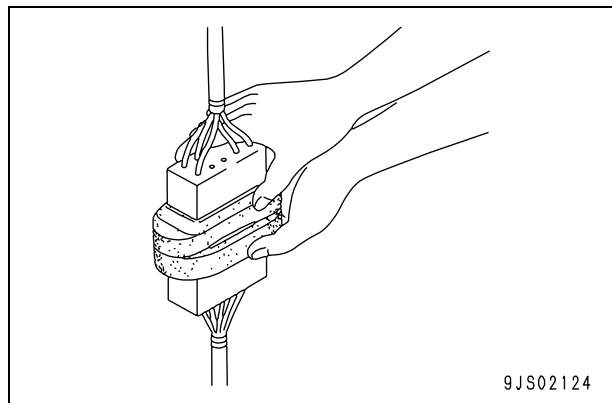
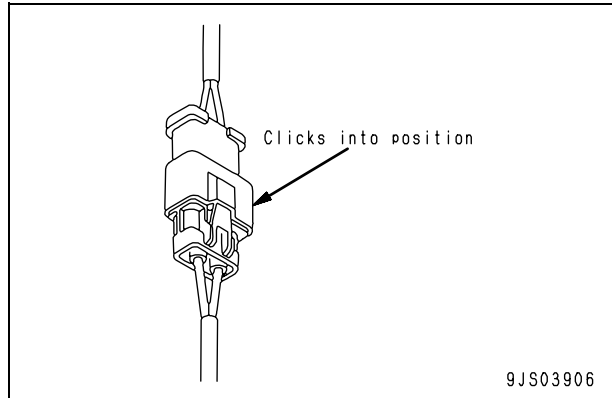
Align the position of the connector correctly, and then insert it securely. For connectors with the lock stopper, push in the connector until the stopper clicks into position.

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.

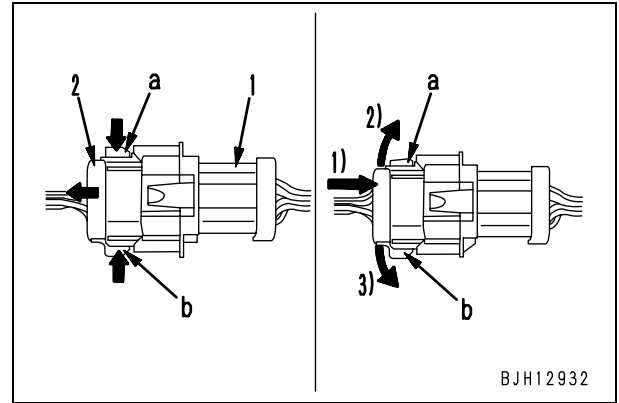
(1): Male connector

(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.

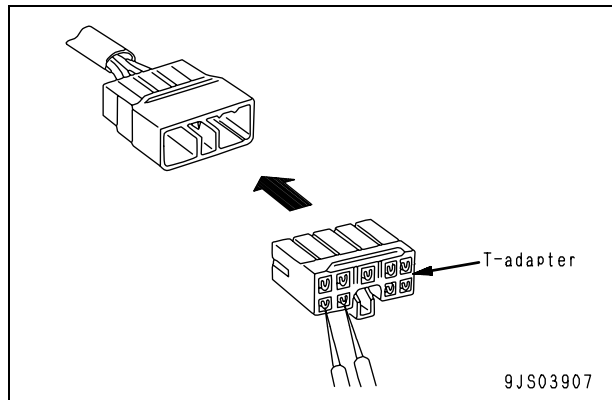
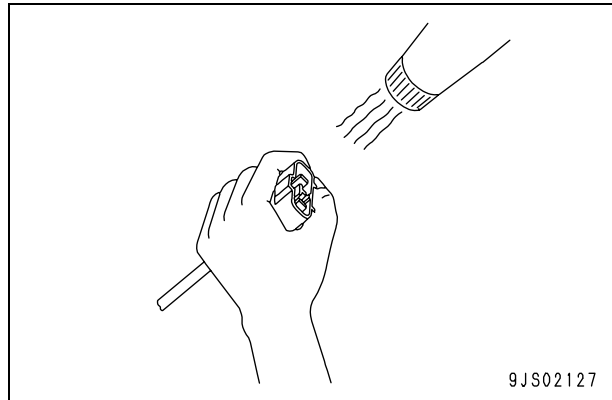
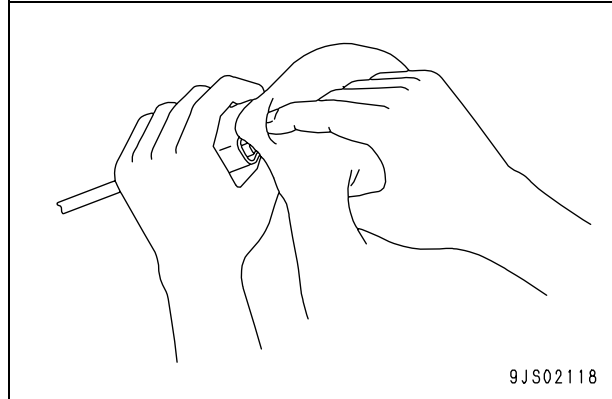
If water gets inside the connector, use a dryer to dry the connector.

★ 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.

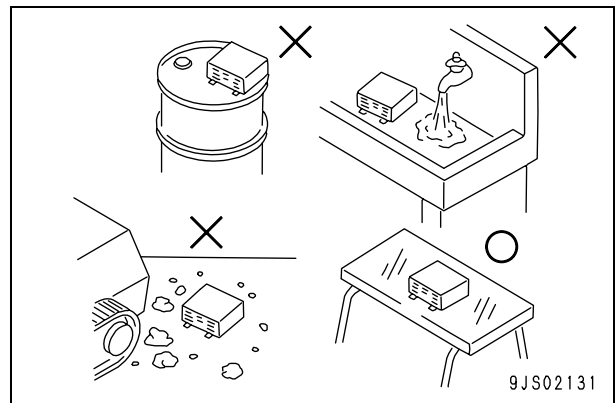
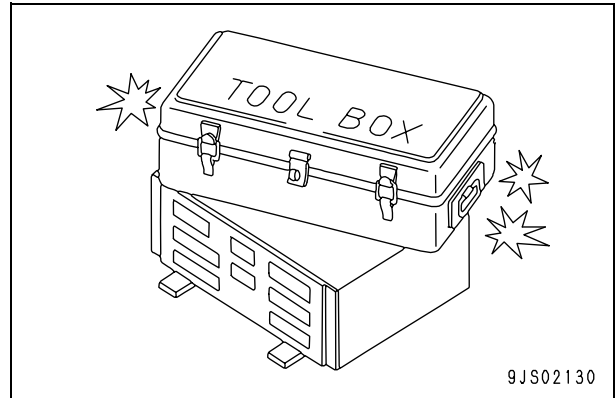
After drying, leave the wiring harness disconnected and carry out a continuity test to check for any short circuits between pins caused by water.

★ 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. 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

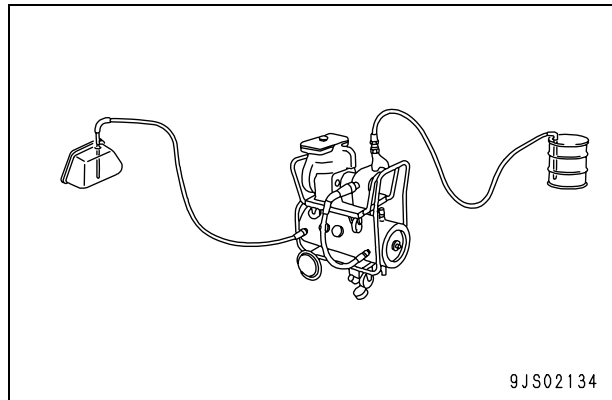
If disassembly or maintenance work is carried out on hydraulic equipment in the field, there is danger of dust entering the equipment. It is also difficult to check the performance after repairs, so it is desirable to use unit exchange. Disassembly and maintenance of hydraulic equipment should be carried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

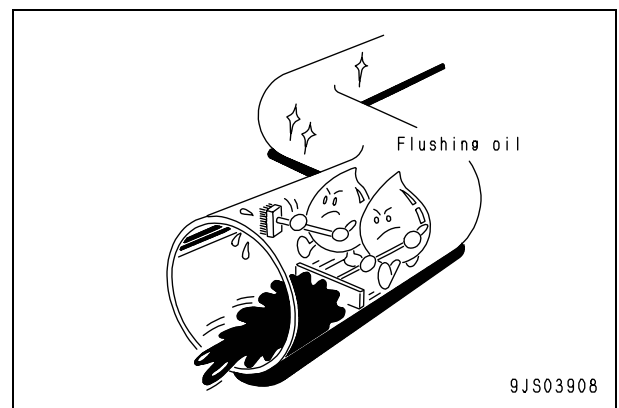


5. Change hydraulic oil when the temperature is high

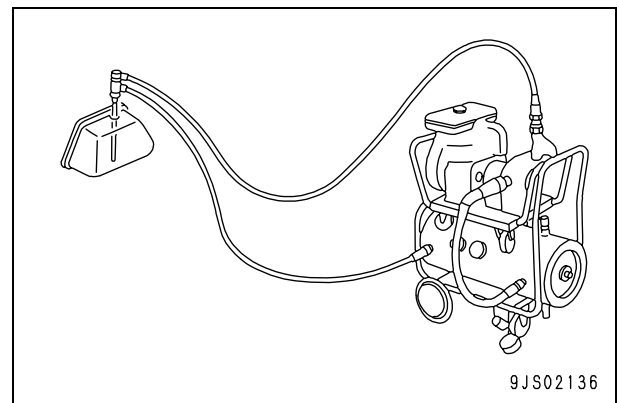
When hydraulic oil or other oil is warm, it flows easily. In addition, the sludge can also be drained out easily from the circuit together with the oil, so it is best to change the oil when it is still warm. When changing the oil, as much as possible of the old hydraulic oil must be drained out. (Drain 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.



Handling of connectors newly used for engines

- ★ Mainly, following engines are object for following connectors.

- 95E-5
- 107E-1

1. Slide lock type (FRAMATOME-3, FRAMATOME-2)

- 95E-5 engine, 107E-1 engine
 - Various pressure sensors and NE speed sensor

Example)

Oil pressure switch

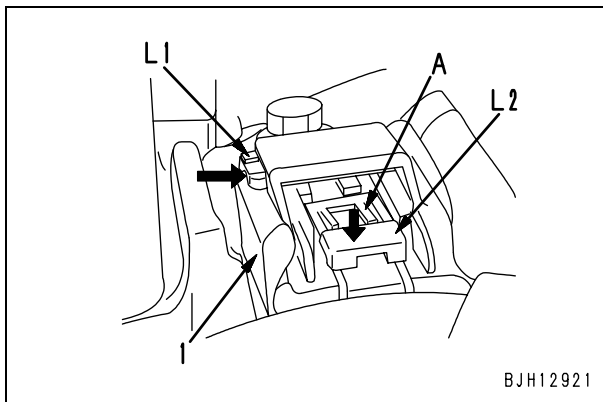
Ne speed sensor of flywheel housing

: NE

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 pressing lock L2, and then pull out connector (1) toward you.



2. Pull lock type (PACKARD-2)

- 95E-5 engine, 107E-1 engine
 - Various temperature sensors

Example)

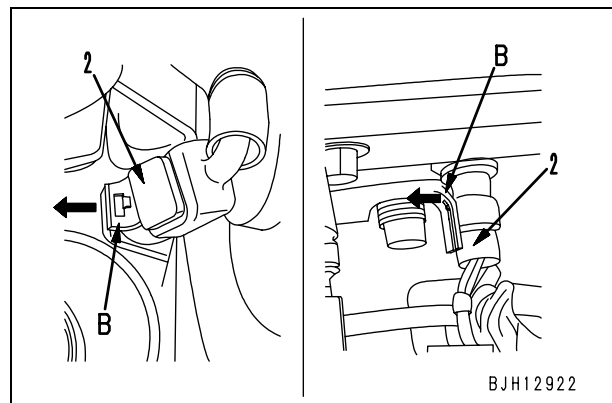
Intake air temperature sensor in intake manifold: TIM

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

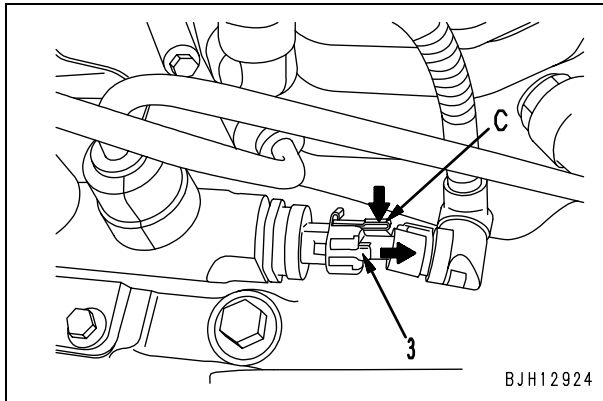
Example)

Fuel pressure sensor in common rail
(**BOSCH-03**)

Disconnect connector (3) according to the following procedure.

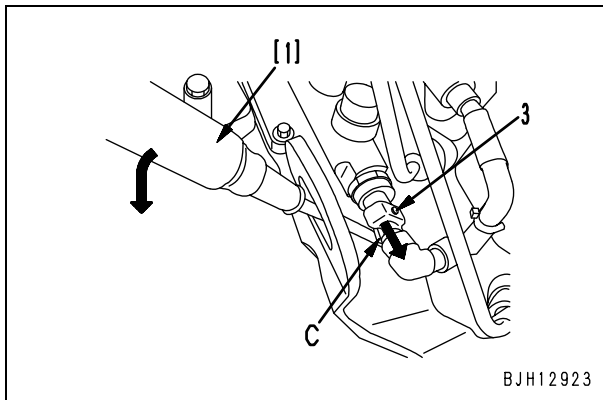
- 1) While pressing lock (C), pull out connector (3) in the direction of the arrow.

- 95E-5 engine, 107E-1 engine



- ★ 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.

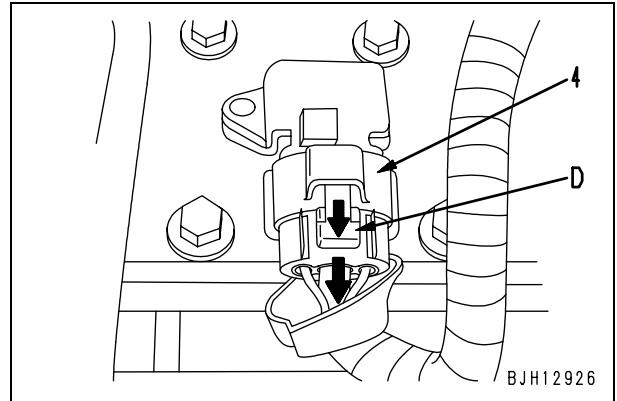


- 107E-1 engine

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.

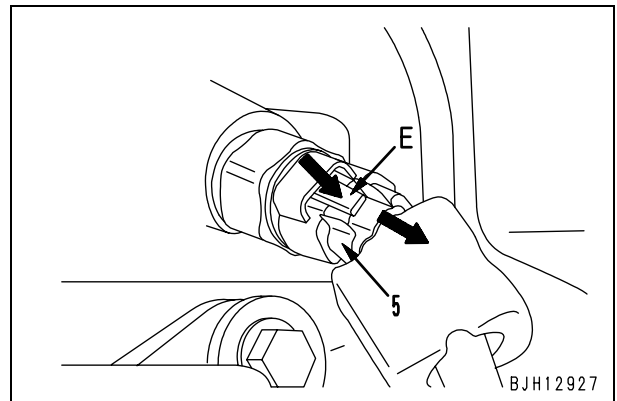


- 95E-5 engine

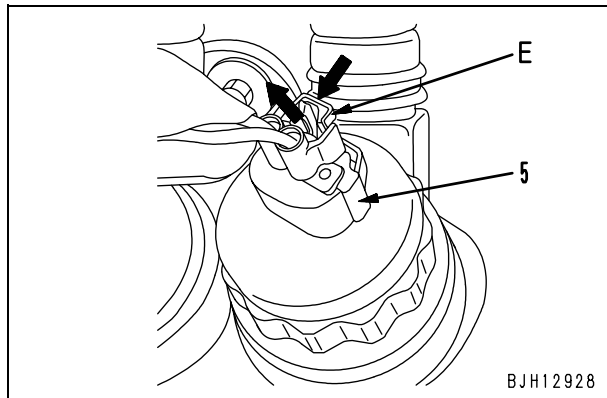
- 4) While pressing lock (E), pull out connector (5) in the direction of the arrow.

Example)

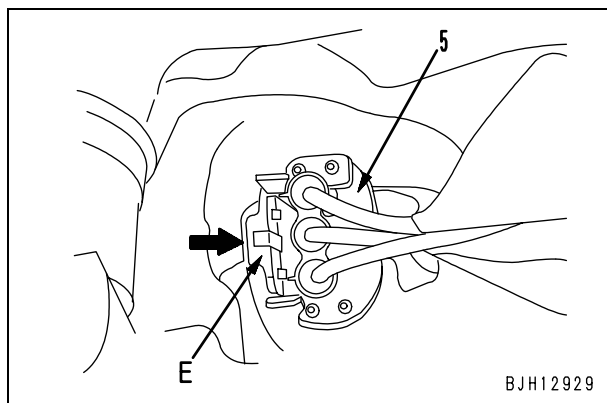
Fuel pressure in common rail: PFUEL etc.
(**AMP-3**)



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.



How to read electric wire code

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.

Example: 0.85 L - - - Indicates blue, heat-resistant, low-voltage wire for automobile, having nominal No. of 0.85.

Indicates color of wire by color code.
Color codes are shown in Table 3.

Indicates size of wire by nominal No.
Size (Nominal No.) is shown in Table 2.

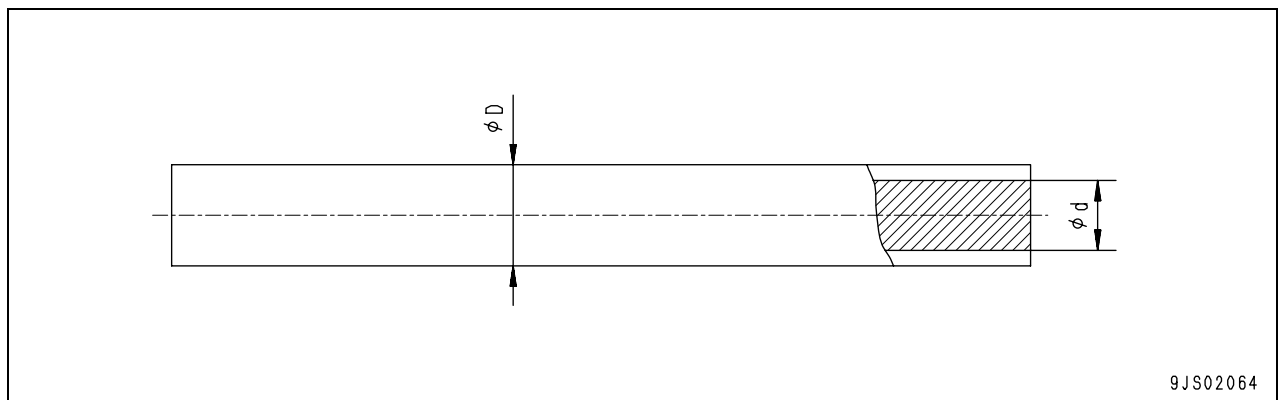
1. Dimensions

(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
	CAVS Standard	—	1.6	—	1.8	—	2.1	—	—	—	—	—
	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
	CAVS Standard	—	—	—	—	—	—	—	—	—
	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".



2. 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	Symbol	Material		Using temperature range (°C)	Example of use
Low-voltage wire for automobile	AV	Conductor	Annealed copper for electric appliance	-30 to +60	Wiring conducting large current (Nominal No. 5 and above)
		Insulator	Soft polyvinyl chloride		
Thin-cover low-voltage wire for automobile, type 1	AVS	Conductor	Annealed copper for electric appliance		General wiring (Nominal No. 0.5 – 3)
		Insulator	Soft polyvinyl chloride		
Thin-cover low-voltage wire for automobile, type 2	CAVS	Conductor	Annealed copper for electric appliance		General wiring (Nominal No. 0.5 – 1.25)
		Insulator	Soft polyvinyl chloride		
Heat-resistant low-voltage wire for automobile	AEX	Conductor	Annealed copper for electric appliance	-50 to +110	General wiring in extremely cold district, wiring at high-temperature place
		Insulator	Heat-resistant crosslinked polyethylene		

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, installation, disassembly or assembly of units, be sure to follow the general precautions given below.

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.
- 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

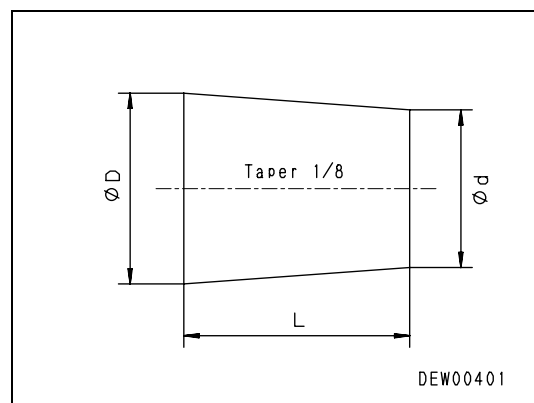
Nominal No.	Plug (nut end)	Nut (elbow end)
02	07376-70210	02789-00210
03	07376-70315	02789-00315
04	07376-70422	02789-00422
05	07376-70522	02789-00522
06	07376-70628	02789-00628

2) Split flange type hoses and tubes

Nominal No.	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 No.	Part Number	Dimensions (mm)		
		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	22.5	22.5	34



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.
- ★ When using the lift truck for the first time after repair or long storage, follow the same procedure.

3. Precautions when completing 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 hydraulic equipment has been removed, always bleed the air from the system after reassembling the parts, referring to Testing and adjusting.
 - 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 part 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".

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.

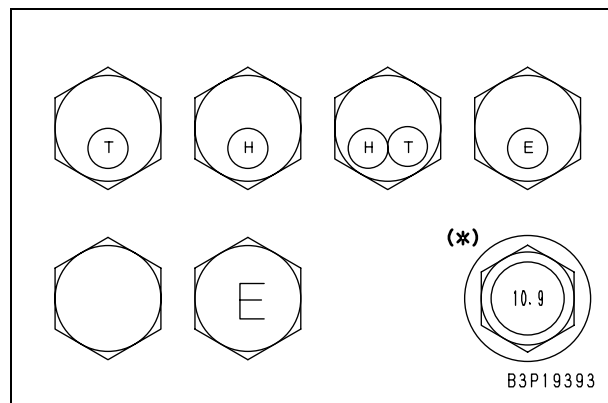
★ The following table corresponds to the bolts in Fig. A.

Thread diameter of bolt	Width across flats	Tightening torque	
		Nm	kgfm
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	157 – 196	16 – 20
16	24	245 – 309	25 – 31.5
18	27	343 – 427	35 – 43.5
20	30	490 – 608	50 – 62
22	32	662 – 829	67.5 – 84.5
24	36	824 – 1,030	84 – 105
27	41	1,180 – 1,470	120 – 150
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

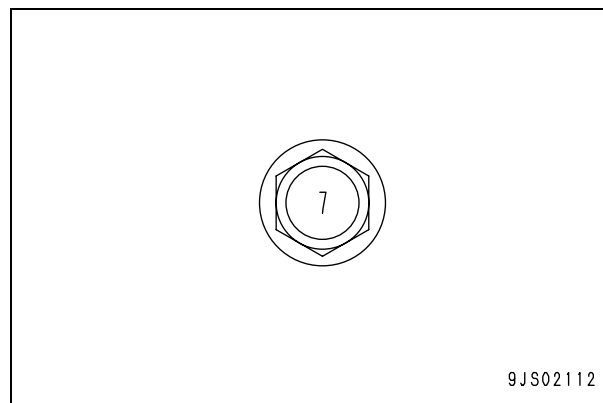
★ The following table corresponds to the bolts in Fig. B.

Thread diameter of bolt	Width across flats	Tightening torque	
		Nm	kgfm
6	10	5.9 – 9.8	0.6 – 1.0
8	12	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



Remarks: The widths across flats against the thread diameters of flanged bolts (marks with "**") in Fig. A are the ones indicated in the table for bolts shown in Fig. B.
(Values of tightening torques shown in the table for Fig. A are applied.)

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	kgfm
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 of bolt	Width across flats	Tightening torque Nm {kgfm}	
	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 of bolt	Width across flats	Tightening torque Nm {kgfm}	
	mm	mm	Range	Target
08	8	14	5.88 – 8.82 { 0.6 – 0.9 }	7.35 { 0.75 }
10	10	17	9.8 – 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 (mm)	Tightening torque Nm {kgfm}		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 }	–	9/16-18UNF	14.3
		34 – 63 { 3.5 – 6.5 }	44 { 4.5 }	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 face seal joint

- ★ Tighten the face joint seals (sleeve nut type) of steel pipes for plated low-pressure piping in engines etc. to the torque below.
- ★ Apply the following torque when the threads are coated (wet) with engine oil.

Suitable pipe outside diameter (mm)	Width across flats (mm)	Tightening torque Nm {kgfm}		Face seal	
		Range	Target	Nominal No. - Number of threads, type of thread	Thread diameter (mm) (Reference)
8	19	14 – 16 { 1.4 – 1.6 }	15 { 1.5 }	9/16-18UN	14.3
10	22	24 – 27 { 2.4 – 2.7 }	25.5 { 2.6 }	11/16-16UN	17.5
12	24 (27)	43 – 47 { 4.4 – 4.8 }	45 { 4.6 }	13/16-16UN	20.6
15 (16)	30 (32)	60 – 68 { 6.1 – 6.8 }	64 { 6.5 }	1-14UN	25.4
22 (20)	36	90 – 95 { 9.2 – 9.7 }	92.5 { 9.4 }	1-3/16-12UN	30.2

7. Table of tightening torques for 107 engine series (mounted on EX50 Series) (Bolts and nuts)

- ★ Unless there are special instructions, tighten the metric bolts and nuts of the 107 engine series to the torque below.
- ★ For tightening torques for 95 engine series, see "Standard tightening torque table".

Thread size	Tightening torque	
	Bolts and nuts	
mm	Nm	kgfm
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	—	—

8. Table of tightening torques for 107 engine series (mounted on EX50 Series) (Eye joints)

- ★ Unless there are special instructions, tighten the metric eye joints of the 107 engine series to the torque below.
- ★ For tightening torques for 95 engine series, see "Standard tightening torque table".

Thread size	Tightening torque	
	Bolts and nuts	
mm	Nm	kgfm
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

9. Table of tightening torques for 107 engine series (mounted on EX50 Series) (Taper screws)

- ★ Unless there are special instructions, tighten the taper screws (unit: inch) of the 107 engine series to the torque below.
- ★ For tightening torques for 95 engine series, see "Standard tightening torque table".

Material	Tightening torque			
	Cast iron or steel		Aluminium	
	Nm	kgfm	Nm	kgfm
Thread size (inch)				
1/16	15 ± 2	1.53 ± 0.20	5 ± 1	0.51 ± 0.10
1/8	20 ± 2	2.04 ± 0.20	15 ± 2	1.53 ± 0.20
1/4	25 ± 3	2.55 ± 0.20	20 ± 2	2.04 ± 0.20
3/8	35 ± 4	3.57 ± 0.41	25 ± 3	2.55 ± 0.20
1/2	55 ± 6	5.61 ± 0.61	35 ± 4	3.57 ± 0.41
3/4	75 ± 8	7.65 ± 0.82	45 ± 5	4.59 ± 0.51

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/in²1 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

FORKLIFT TRUCK

CX50 Series

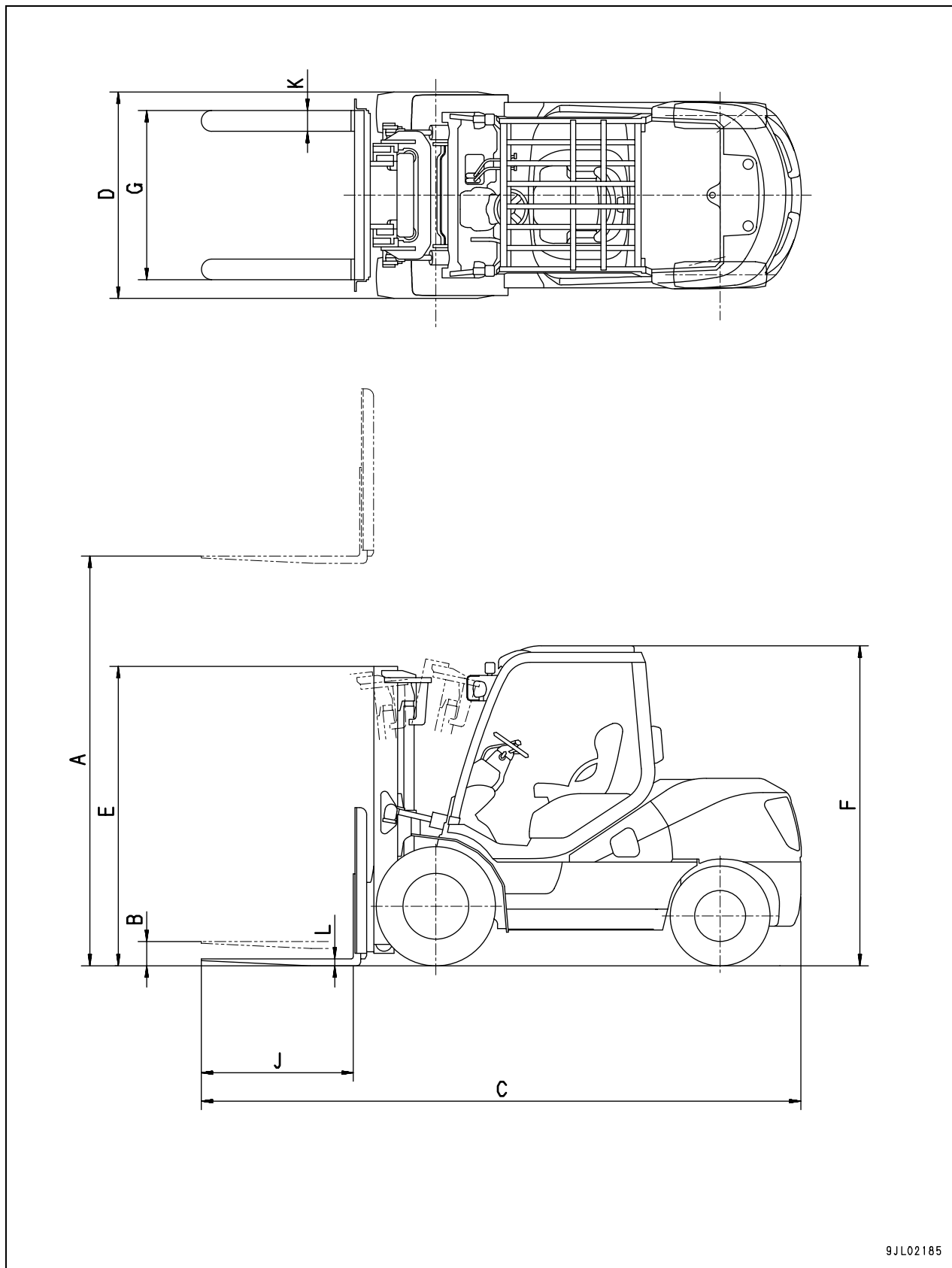
Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

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Specification dimension drawing



Diesel engine lift truck (For general)

(Applicable model: Lift truck with SAA4D95LE-5-A engine)

Item			Unit	FD40Z-10	FD35-10
Performance	Rated Capacity		kg	4,000	3,500
	Load center		mm	500	600
	Max. lifting height	A	mm	3,000	3,000
	Std. Free Lift	B	mm	155	155
	Fork lifting speed (loaded)		mm/s	540	540
	Max. travel speed (unloaded)	1st (Forward)	km/h	19.0	19.5
		2nd (Forward)	km/h	—	—
	Gradeability (loaded) (Max.)		%	30	28
Dimensions and Weight	Overall length	C	mm	4,025	4,155
	Overall width	D	mm	1,350	1,350
	Overall height	Mast	E	mm	2,100
		Overhead guard	F	mm	2,210
	Fork length x width x thickness J x K x L		mm	1,070 x 150 x 50	1,070 x 150 x 50
	Fork opening width (Min./Max.)	G	mm	300/1,190	300/1,190
Engine	Unladen mass		kg	5,735	5,790
	Type		—	SAA4D95LE-5-A	SAA4D95LE-5-A
	Total piston displacement		cc	3,260	3,260
Tyres	Rated output		kW{PS} /rpm	59.7{81.2}/2,400	59.7{81.2}/2,400
	Front		—	250-15-16PR (I)	8.25-15-12PR (I)
	Rear		—	7.00-12-12PR (I)	7.00-12-12PR (I)

Item			Unit	FD40-10	FD45-10	FD50A-10
Performance	Rated Capacity		kg	4,000	4,500	5,000
	Load center		mm	600	600	600
	Max. lifting height	A	mm	3,000	3,000	3,000
	Std. Free Lift	B	mm	160	145	145
	Fork lifting speed (loaded)		mm/s	540	470	470
	Max. travel speed (unloaded)	1st (Forward)	km/h	19.0	15.5	15.5
		2nd (Forward)	km/h	–	25	25
	Gradeability (loaded) (Max.)		%	28	29	28
Dimensions and Weight	Overall length		C	mm	4,220	4,270
	Overall width		D	mm	1,450	1,450
	Overall height	Mast	E	mm	2,105	2,205
		Overhead guard	F	mm	2,250	2,250
	Fork length x width x thickness J x K x L		mm	1,070 x 150 x 55	1,220 x 150 x 55	1,220 x 150 x 55
	Fork opening width (Min./Max.)		G	mm	300/1,190	300/1,270
Engine	Unladen mass		kg	6,270	6,855	7,295
	Type		–	SAA4D95LE-5-A	SAA4D95LE-5-A	SAA4D95LE-5-A
	Total piston displacement		cc	3,260	3,260	3,260
Tyres	Rated output		kW{PS} /rpm	59.7{81.2}/2,400	59.7{81.2}/2,400	59.7{81.2}/2,400
	Front		–	300-15-18PR (I)	300-15-18PR (I)	300-15-18PR (I)
	Rear		–	7.00-12-12PR (I)	7.00-12-12PR (I)	7.00-12-14PR (I)

Diesel engine lift truck (For general) (Applicable model: Lift truck with S4D95LE-3 engine)

Item			Unit	FD40ZY-10	FD35Y-10
Performance	Rated Capacity		kg	4,000	3,500
	Load center		mm	500	600
	Max. lifting height	A	mm	3,000	3,000
	Std. Free Lift	B	mm	155	155
	Fork lifting speed (loaded)		mm/s	460	460
	Max. travel speed (unloaded)	1st (Forward)	km/h	19.0	18.5
		2nd (Forward)	km/h	—	—
	Gradeability (loaded) (Max.)		%	29	29
Dimensions and Weight	Overall length	C	mm	4,025	4,155
	Overall width	D	mm	1,350	1,350
	Overall height	Mast	E	mm	2,100
		Overhead guard	F	mm	2,210
	Fork length x width x thickness J x K x L		mm	1,070 x 150 x 50	1,070 x 150 x 50
	Fork opening width (Min./Max.)	G	mm	300/1,190	300/1,190
Engine	Unladen mass		kg	5,700	5,755
	Type		—	S4D95LE-3	S4D95LE-3
	Total piston displacement		cc	3,260	3,260
Tyres	Rated output		kW{PS} /rpm	58.8{80}/2,350	58.8{80}/2,350
	Front		—	250-15-16PR (I)	8.25-15-12PR (I)
	Rear		—	7.00-12-12PR (I)	7.00-12-12PR (I)

Item			Unit	FD40Y-10	FD45Y-10	FD50AY-10
Performance	Rated Capacity		kg	4,000	4,500	5,000
	Load center		mm	600	600	600
	Max. lifting height	A	mm	3,000	3,000	3,000
	Std. Free Lift	B	mm	160	145	145
	Fork lifting speed (loaded)		mm/s	460	455	455
	Max. travel speed (unloaded)	1st (Forward)	km/h	18.5	15.0	15.0
		2nd (Forward)	km/h	–	24.0	24.0
	Gradeability (loaded) (Max.)		%	26	29	28
Dimensions and Weight	Overall length		C	mm	4,220	4,270
	Overall width		D	mm	1,450	1,450
	Overall height	Mast	E	mm	2,105	2,205
		Overhead guard	F	mm	2,250	2,250
	Fork length x width x thickness J x K x L		mm	1,070 x 150 x 55	1,220 x 150 x 55	1,220 x 150 x 55
	Fork opening width (Min./Max.)		G	mm	300/1,190	300/1,270
Engine	Unladen mass		kg	6,235	6,820	7,260
	Type		–	S4D95LE-3	S4D95LE-3	S4D95LE-3
	Total piston displacement		cc	3,260	3,260	3,260
Tyres	Rated output		kW{PS} /rpm	58.8{80}/2,350	58.8{80}/2,350	58.8{80}/2,350
	Front		–	300-15-18PR (I)	300-15-18PR (I)	300-15-18PR (I)
	Rear		–	7.00-12-12PR (I)	7.00-12-12PR (I)	7.00-12-14PR (I)

Diesel engine lift truck (For USA)

(Applicable model: Lift truck with SAA4D95LE-5-A engine)

Item			Unit	FD40ZU-10	FD40U-10
Performance	Rated Capacity		kg	3,500	4,000
	Load center		mm	600	600
	Max. lifting height	A	mm	3,300	3,300
	Std. Free Lift	B	mm	155	160
	Fork lifting speed (loaded)		mm/s	540	540
	Max. travel speed (unloaded)	1st (Forward)	km/h	18.0	19.0
		2nd (Forward)	km/h	—	—
Dimensions and Weight	Gradeability (loaded) (Max.)		%	30	28
	Overall length	C	mm	4,025	4,220
	Overall width	D	mm	1,350	1,450
	Overall height	Mast	E	mm	2,250
		Overhead guard	F	mm	2,250
	Fork length x width x thickness J x K x L		mm	1,070 x 150 x 50	1,070 x 150 x 50
	Fork opening width (Min./Max.)	G	mm	300/1,190	300/1,190
Engine	Unladen mass		kg	5,765	6,295
	Type		—	SAA4D95LE-5-A	SAA4D95LE-5-A
	Total piston displacement		cc	3,260	3,260
Tyres	Rated output		kW{PS} /rpm	59.7{81.2}/2,400	59.7{81.2}/2,400
	Front		—	250-15-16PR (I)	300-15-18PR (I)
	Rear		—	7.00-12-12PR (I)	7.00-12-12PR (I)

Item			Unit	FD45U-10	FD50AU-10
Performance	Rated Capacity		kg	4,500	5,000
	Load center		mm	600	600
	Max. lifting height	A	mm	3,300	3,300
	Std. Free Lift	B	mm	145	145
	Fork lifting speed (loaded)		mm/s	470	470
	Max. travel speed (unloaded)	1st (Forward)	km/h	15.5	15.5
		2nd (Forward)	km/h	25.0	25.0
Dimensions and Weight	Gradeability (loaded) (Max.)		%	29	28
	Overall length	C	mm	4,270	4,405
	Overall width	D	mm	1,450	1,450
	Overall height	Mast	E	mm	2,355
		Overhead guard	F	mm	2,290
	Fork length x width x thickness J x K x L		mm	1,070 x 150 x 55	1,220 x 150 x 55
	Fork opening width (Min./Max.)	G	mm	300/1,190	300/1,270
Engine	Unladen mass		kg	6,895	7,335
	Type		–	SAA4D95LE-5-A	SAA4D95LE-5-A
	Total piston displacement		cc	3,260	3,260
Tyres	Rated output		kW{PS} /rpm	59.7{81.2}/2,400	59.7{81.2}/2,400
	Front		–	300-15-18PR (I)	300-15-18PR (I)
	Rear		–	7.00-12-12PR (I)	7.00-12-14PR (I)

Gasoline engine lift truck (For general)**(Applicable model: Lift truck with EBT-TB45-1A/2A/3A engine)**

Item				Unit	FG40Z-10	FG35-10
Performance	Rated Capacity			kg	4,000	3,500
	Load center			mm	500	600
	Max. lifting height		A	mm	3,000	3,000
	Std. Free Lift		B	mm	155	155
	Fork lifting speed (loaded)			mm/s	510	510
	Max. travel speed (unloaded)	1st (Forward)		km/h	19.0	19.0
		2nd (Forward)		km/h	—	—
	Gradeability (loaded) (Max.)			%	28	25
Dimensions and Weight	Overall length		C	mm	4,025	4,155
	Overall width		D	mm	1,350	1,350
	Overall height	Mast	E	mm	2,210	2,250
		Overhead guard	F	mm	2,210	2,250
	Fork length x width x thickness J x K x L			mm	1,070 x 150 x 50	1,070 x 150 x 50
	Fork opening width (Min./Max.)		G	mm	300/1,190	300/1,190
	Unladen mass			kg	5,685	5,740
Engine	Type			—	EBT-TB45-1A	EBT-TB45-1A
					EBT-TB45-2A (*1)	EBT-TB45-2A (*1)
					EBT-TB45-3A (*2)	EBT-TB45-3A (*2)
	Total piston displacement			cc	4,478	4,478
Rated output			kW{PS} /rpm	62.5{85}/2,400	62.5{85}/2,400	
Tyres	Front			—	250-15-16PR (I)	8.25-15-12PR (I)
	Rear			—	7.00-12-12PR (I)	7.00-12-12PR (I)

*1. Gasoline/LPG (dual fuel) engine

*2. LPG specification engine

Item			Unit	FG40-10	FG45-10	FG50A-10
Performance	Rated Capacity		kg	4,000	4,500	5,000
	Load center		mm	600	600	600
	Max. lifting height	A	mm	3,000	3,000	3,000
	Std. Free Lift	B	mm	160	145	145
	Fork lifting speed (loaded)		mm/s	510	440	440
	Max. travel speed (unloaded)	1st (Forward)	km/h	19.0	16.5	15.5
		2nd (Forward)	km/h	–	24.0	24.5
	Gradeability (loaded) (Max.)		%	25	26	25
Dimensions and Weight	Overall length		C	mm	4,220	4,270
	Overall width		D	mm	1,450	1,450
	Overall height	Mast	E	mm	2,105	2,205
		Overhead guard	F	mm	2,250	2,250
	Fork length x width x thickness J x K x L		mm	1,070 x 150 x 55	1,070 x 150 x 55	1,220 x 150 x 55
	Fork opening width (Min./Max.)		G	mm	300/1,190	300/1,270
	Unladen mass		kg	6,215	6,800	7,240
Engine	Type		–	EBT-TB45-1A	EBT-TB45-1A	EBT-TB45-1A
				EBT-TB45-2A (*1)	EBT-TB45-2A (*1)	EBT-TB45-2A (*1)
				EBT-TB45-3A (*2)	EBT-TB45-3A (*2)	EBT-TB45-3A (*2)
	Total piston displacement		cc	4,478	4,478	4,478
	Rated output		kW{PS}/rpm	62.5{85}/2,400	62.5{85}/2,400	62.5{85}/2,400
Tyres	Front		–	300-15-18PR (I)	300-15-18PR (I)	300-15-18PR (I)
	Rear		–	7.00-12-12PR (I)	7.00-12-12PR (I)	7.00-12-14PR (I)

*1. Gasoline/LPG (dual fuel) engine

*2. LPG specification engine

Gasoline engine lift truck (For USA)**(Applicable model: Lift truck with EBT-TB45-2A/3A engine)**

Item			Unit	FG40ZU-10	FG40U-10
Performance	Rated Capacity		kg	3,500	4,000
	Load center		mm	600	600
	Max. lifting height	A	mm	3,300	3,300
	Std. Free Lift	B	mm	155	160
	Fork lifting speed (loaded)		mm/s	510	510
	Max. travel speed (unloaded)	1st (Forward)	km/h	19.0	19.0
		2nd (Forward)	km/h	—	—
Dimensions and Weight	Gradeability (loaded) (Max.)		%	28	25
	Overall length	C	mm	4,025	4,220
	Overall width	D	mm	1,350	1,450
	Overall height	Mast	E	mm	2,250
		Overhead guard	F	mm	2,250
	Fork length x width x thickness J x K x L		mm	1,070 x 150 x 50	1,070 x 150 x 55
	Fork opening width (Min./Max.)	G	mm	300/1,190	300/1,190
Engine	Unladen mass		kg	5,730	6,260
	Type		—	EBT-TB45-2A (*1)	EBT-TB45-2A (*1)
				EBT-TB45-3A (*2)	EBT-TB45-3A (*2)
	Total piston displacement		cc	4,478	4,478
Tyres	Rated output		kW{PS} /rpm	62.5{85}/2,400	62.5{85}/2,400
	Front		—	250-15-16PR (I)	300-15-18PR (I)
	Rear		—	7.00-12-12PR (I)	7.00-12-12PR (I)

*1. Gasoline/LPG (dual fuel) engine

*2. LPG specification engine

Item				Unit	FG45U-10	FG50AU-10
Performance	Rated Capacity			kg	4,500	5,000
	Load center			mm	600	600
	Max. lifting height		A	mm	3,300	3,300
	Std. Free Lift		B	mm	145	145
	Fork lifting speed (loaded)			mm/s	440	440
	Max. travel speed (unloaded)	1st (Forward)		km/h	16.5	15.5
		2nd (Forward)		km/h	24.0	24.5
	Gradeability (loaded) (Max.)			%	26	25
Dimensions and Weight	Overall length		C	mm	4,270	4,405
	Overall width		D	mm	1,450	1,450
	Overall height	Mast	E	mm	2,355	2,355
		Overhead guard	F	mm	2,290	2,290
	Fork length x width x thickness J x K x L			mm	1,070 x 150 x 55	1,220 x 150 x 55
	Fork opening width (Min./Max.)		G	mm	300/1,190	300/1,270
	Unladen mass			kg	6,860	7,300
Engine	Type			—	EBT-TB45-2A (*1)	EBT-TB45-2A (*1)
				—	EBT-TB45-3A (*2)	EBT-TB45-3A (*2)
	Total piston displacement			cc	4,478	4,478
Tyres	Rated output			kW{PS}/rpm	62.5{85}/2,400	62.5{85}/2,400
	Front			—	300-15-18PR (I)	300-15-18PR (I)
	Rear			—	7.00-12-12PR (I)	7.00-12-14PR (I)

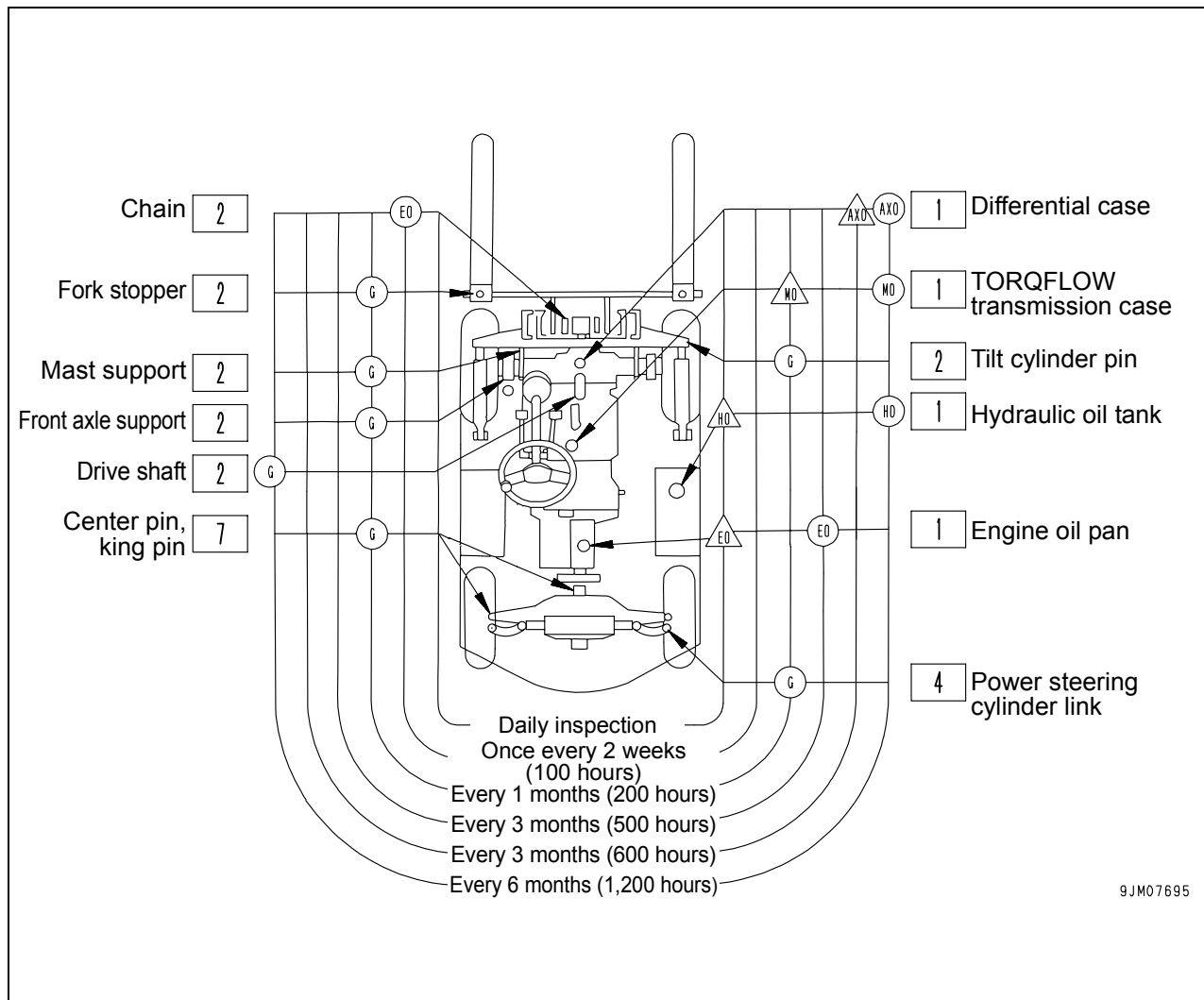
*1. Gasoline/LPG (dual fuel) engine

*2. LPG specification engine

Weight table

Unit: kg (Dry weight)

Model			FG (D) 40Z-10	FG (D) 35-10	FG (D) 40-10	FG (D) 45-10	FG (D) 50A-10	Remarks
Device								
Engine assembly	Gasoline	EBT-TB45	295	295	295	295	295	
	Diesel	SAA4D95L E-5-A	300	300	300	300	300	
Torque con- verter/Transmis- sion assembly	Torque converter		247	247	247	260	260	Torque converter + Transmission assembly
Axle	Front		285	285	285	285	285	Including differential and brake disc
	Rear		160	160	160	160	160	With PS cylinder and hub
Wheel	Front		62	62	90	90	90	Single tyre + Rim
	Rear		35	35	35	35	35	Tyre + Rim
Overhead guard			120	120	120	120	120	Overhead guard + Stay + Dashboard
Counterbalance-weight			2,590	2,160	2,555	2,890	3,200	
Lift cylinder assembly (1 piece)			40	40	40	45	45	Lifting height: 3 m
Tilt cylinder assembly (1 piece)			20	20	20	20	20	
Power steering cylinder assembly			17	17	17	17	17	
Hydraulic pump			18	18	18	18	18	Hydraulic main pump
Control valve			12	12	12	12	12	2CV
Steering valve			8	8	8	8	8	
Mast assembly			690	690	690	905	905	FV, lifting height: 3m, excluding fork carriage and overhead guard
Fork carriage assembly			190	190	190	210	290	
Overhead guard			35	35	35	35	45	
Fork assembly (1 pieces)			100	90	100	100	115	FG (D) 35Z-45: L = 1,070 FG (D) 50A: L = 1,220

Lubricant list**Applicable model: Lift truck with SAA4D95LE-5-A engine****Oil and greasing chart**

△ : Check and add fluid if necessary

○ : Total oil change or greasing and application

□ : Figure inside the box shows the number of places to add oil or grease to.

Symbol	Type of fluid
EO	Diesel engine oil
MO	Engine oil
AXO	Axle oil
HO	Hydraulic oil
G	Lithium grease

★ Be sure to use the recommended genuine oil for diesel engine oil.

Lubricant list

Lubrication point	Type of oil	Ambient Temperature							
		−30	−20	−10	0	10	20	30	40℃
Engine oil pan	Diesel engine oil			SAE15W40 (*1)					
TORQFLOW transmission case	Engine oil			SAE J300 10W (*2)					
Differential case	Axle oil			SAE J306 80W					
Hydraulic oil tank	Hydraulic oil			SAE10WCD					
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					
Greasing points	Lithium grease			G2-LI					
Cooling system	Supercoolant			AF-NAC					

*1 Use API CF-4 or higher grade oil.

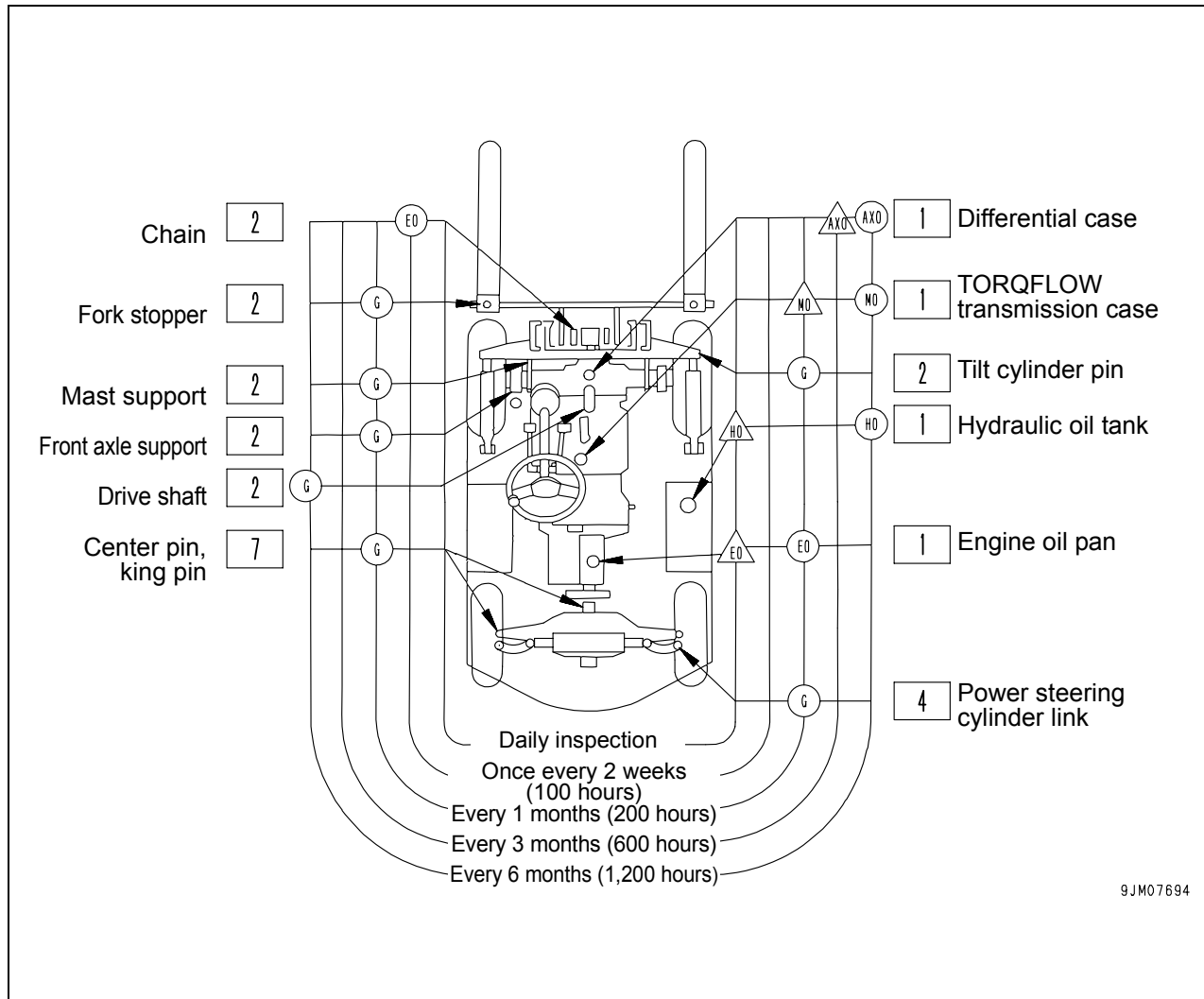
*2 Use API CD or higher grade oil.

Capacity(ℓ)	Engine oil pan	TORQFLOW transmission case	Differential case	Hydraulic oil tank	Fuel tank	Cooling system
Model	SAA4D95LE-5-A					
4 ton (Compact model lift truck)	11	12 (Replacement)	10 (Replacement)	57	76	9
3.5 to 5 ton (Standard model lift truck)		17 (Disassembly)	12 (Disassembly)	74	98	

- ★ Always use diesel oil for the fuel. To ensure good fuel consumption characteristics and exhaust gas characteristics, the engine mounted on this lift truck use an electronically controlled high-pressure fuel injection device. This device requires high precision parts and lubrication, so if low viscosity fuel with low lubricating ability is used, the durability may drop markedly.
- ★ Always use Komatsu Utility genuine parts for oils and greases.

Applicable model: Lift truck with S4D95LE-3 engine

Oil and greasing chart



- △ : Check and add fluid if necessary
 ○ : Total oil change or greasing and application
 □ : Figure inside the box shows the number of places to add oil or grease to.

Symbol	Type of fluid
EO	Diesel engine oil
MO	Engine oil
AXO	Axle oil
HO	Hydraulic oil
G	Lithium grease

★ Be sure to use the recommended genuine oil for diesel engine oil.

Lubricant list

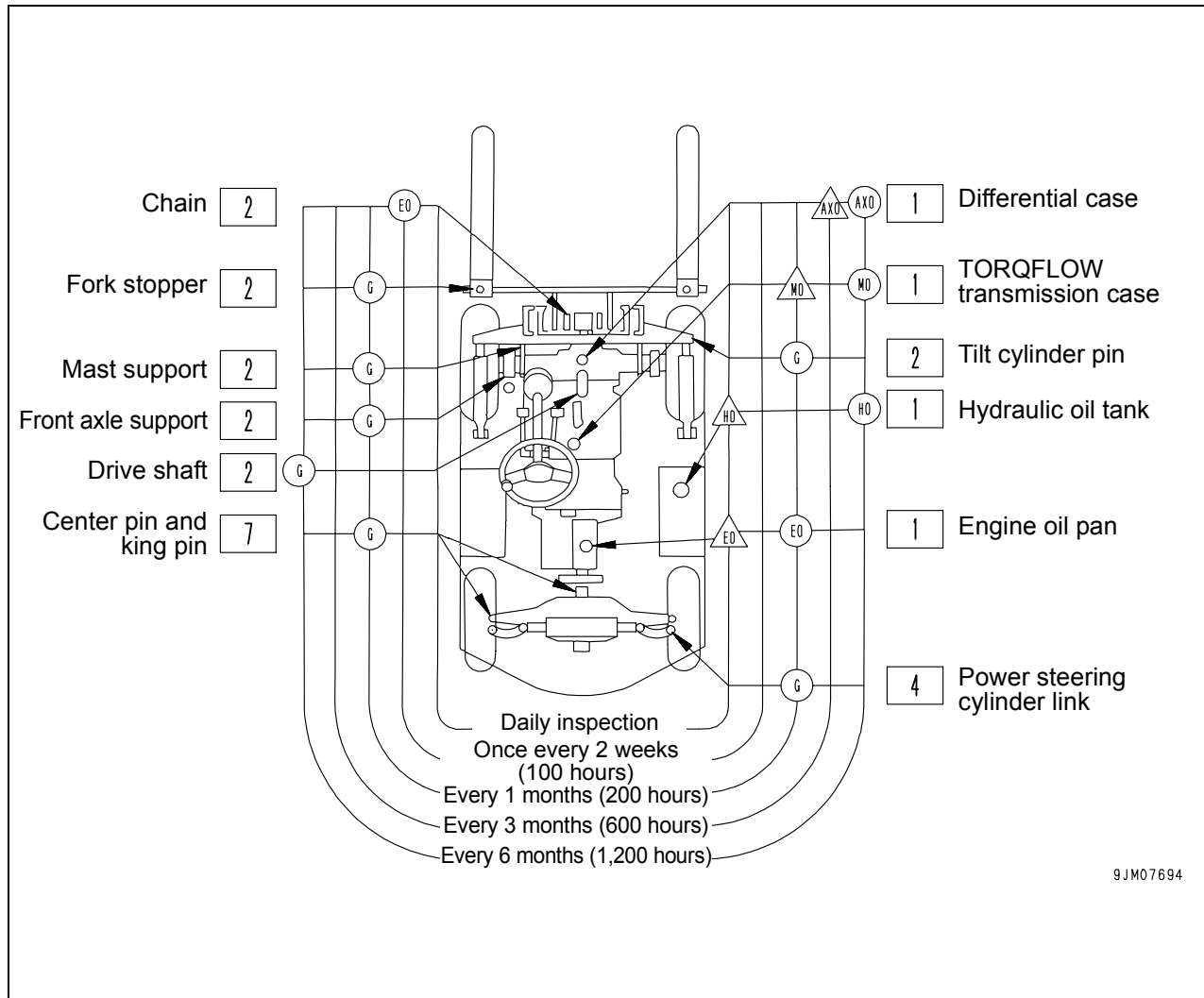
Lubrication point	Type of oil	Ambient Temperature							
		-30	-20	-10	0	10	20	30	40°C
Engine oil pan	Diesel engine oil								SAE15W40 (*)
TORQFLOW transmission case	Engine oil								SAE J300 10W (*)
Differential case	Axle oil								SAE J306 80W
Hydraulic oil tank	Hydraulic oil								SAE10WCD
Fuel 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
Greasing points	Lithium grease								G2-LI
Cooling system	Supercoolant								AF-NAC

* Use API CD or higher grade oil.

Capacity(ℓ) Model	Engine oil pan	TORQFLOW transmission case	Differential case	Hydraulic oil tank	Fuel tank	Cooling system
	S4D95LE-3					
4 ton (Compact model lift truck)	11	12 (Replacement)	10 (Replacement)	57	76	9
3.5 to 5 ton (Standard model lift truck)		17 (Disassembly)	12 (Disassembly)	74	98	

- ★ Always use diesel oil for the fuel. To ensure good fuel consumption characteristics and exhaust gas characteristics, the engine mounted on this lift truck use an electronically controlled high-pressure fuel injection device. This device requires high precision parts and lubrication, so if low viscosity fuel with low lubricating ability is used, the durability may drop markedly.
- ★ Always use Komatsu Utility genuine parts for oils and greases.

Applicable model: Lift truck with EBT-TB45-1A/2A/3A engine **Oil and greasing chart**



- △ : Check and add fluid if necessary
 ○ : Total oil change or greasing and application
 □ : Figure inside the box shows the number of places to add oil or grease to.

Symbol	Type of fluid
EO	Gasoline engine oil
MO	Engine oil
AXO	Axle oil
HO	Hydraulic oil
G	Lithium grease

★ Be sure to use the recommended genuine oil for gasoline engine oil.

FORKLIFT TRUCK

CX50 Series

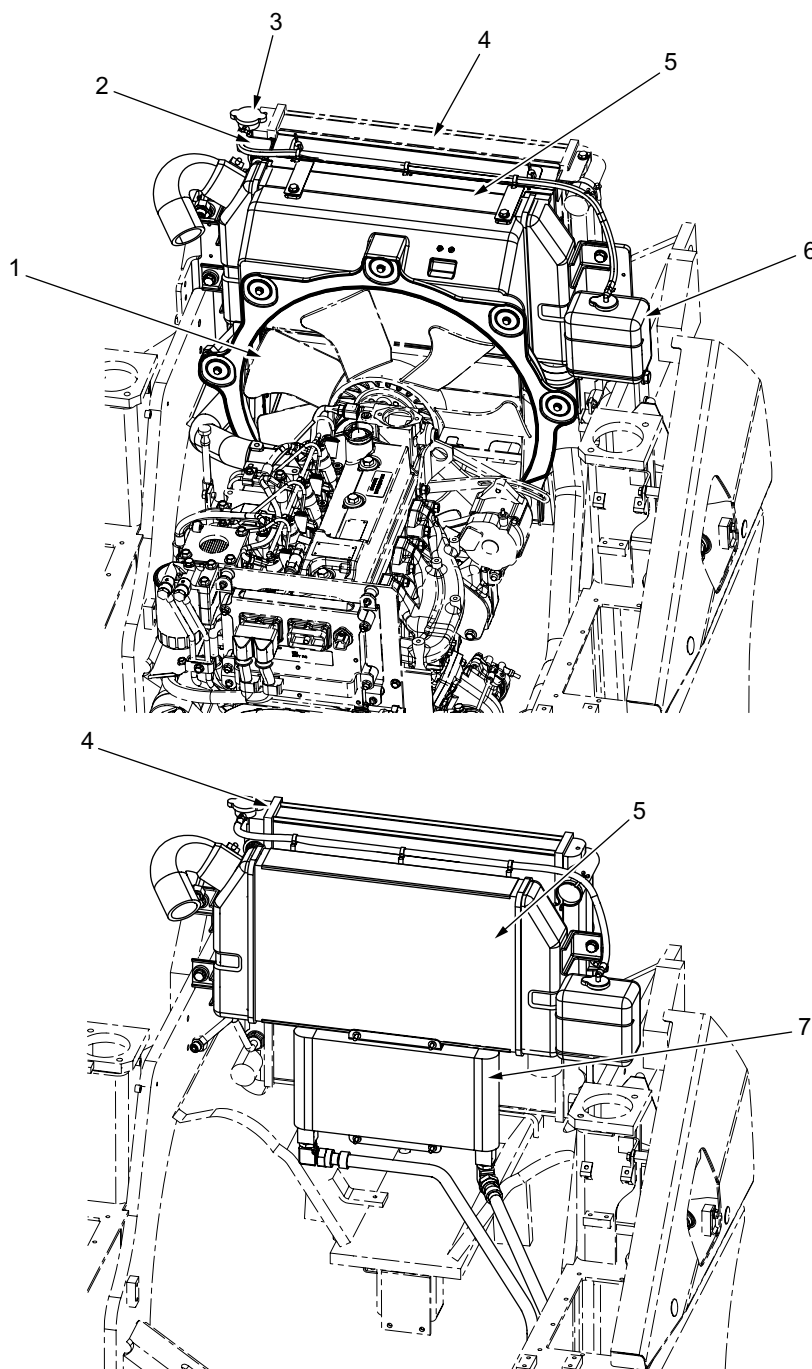
Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

10 Structure, function and maintenance standard

100 Engine and cooling system

Cooling system (Lift truck with SAA4D95LE-5-A/S4D95LE-3 engine).....	2
Cooling system (Lift truck with EBT-TB45-1A/2A/3A engine)	4
Brake cooling system hydraulic piping diagram.....	6

Cooling system (Lift truck with SAA4D95LE-5-A/S4D95LE-3 engine)



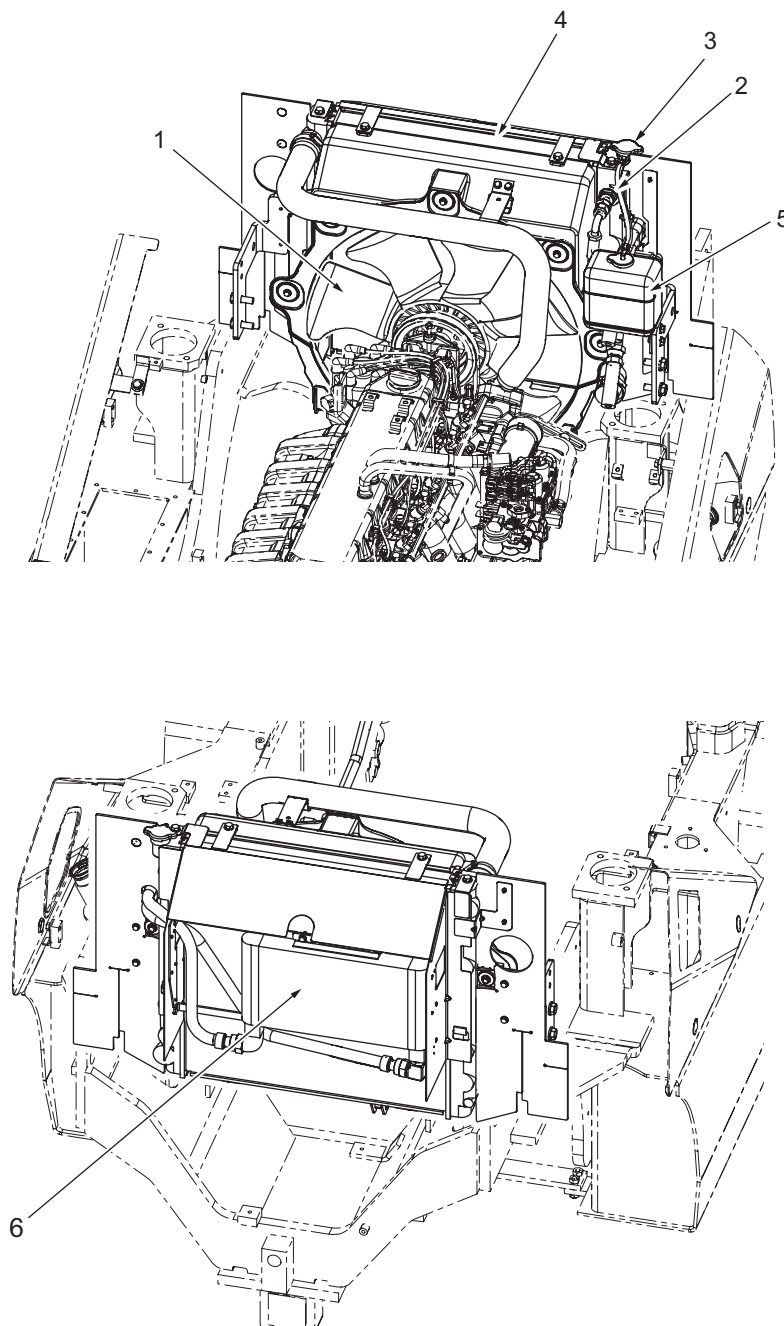
9JL02189

1. Fan
2. Brake oil cooler (built in radiator)
3. Radiator cap
4. Radiator
5. Aftercooler
6. Coolant reservoir tank
7. Torque converter oil cooler

Specifications

		Radiator	Brake oil cooler	Torque con- verter oil cooler	Aftercooler	
					Cooling air side	Intake air side
Core type		CF59-3 (Rectangular wave fin)	Aluminium PTO (Multi-plate oil cooler)	Drawn cup	Wave fin	Offset fin
Fin pitch (mm)		4.0/2	—	4.0/2	3.5/2	2.75/2
Total heat dissipation area (m ²)		16.83	—	2.287	9.19	
Cracking pressure (kPa {kgf/cm ² })	Pressure valve	88 ± 14.7	—	—	—	—
	Vacuum valve	4.9	—	—	—	—

Cooling system (Lift truck with EBT-TB45-1A/2A/3A engine)



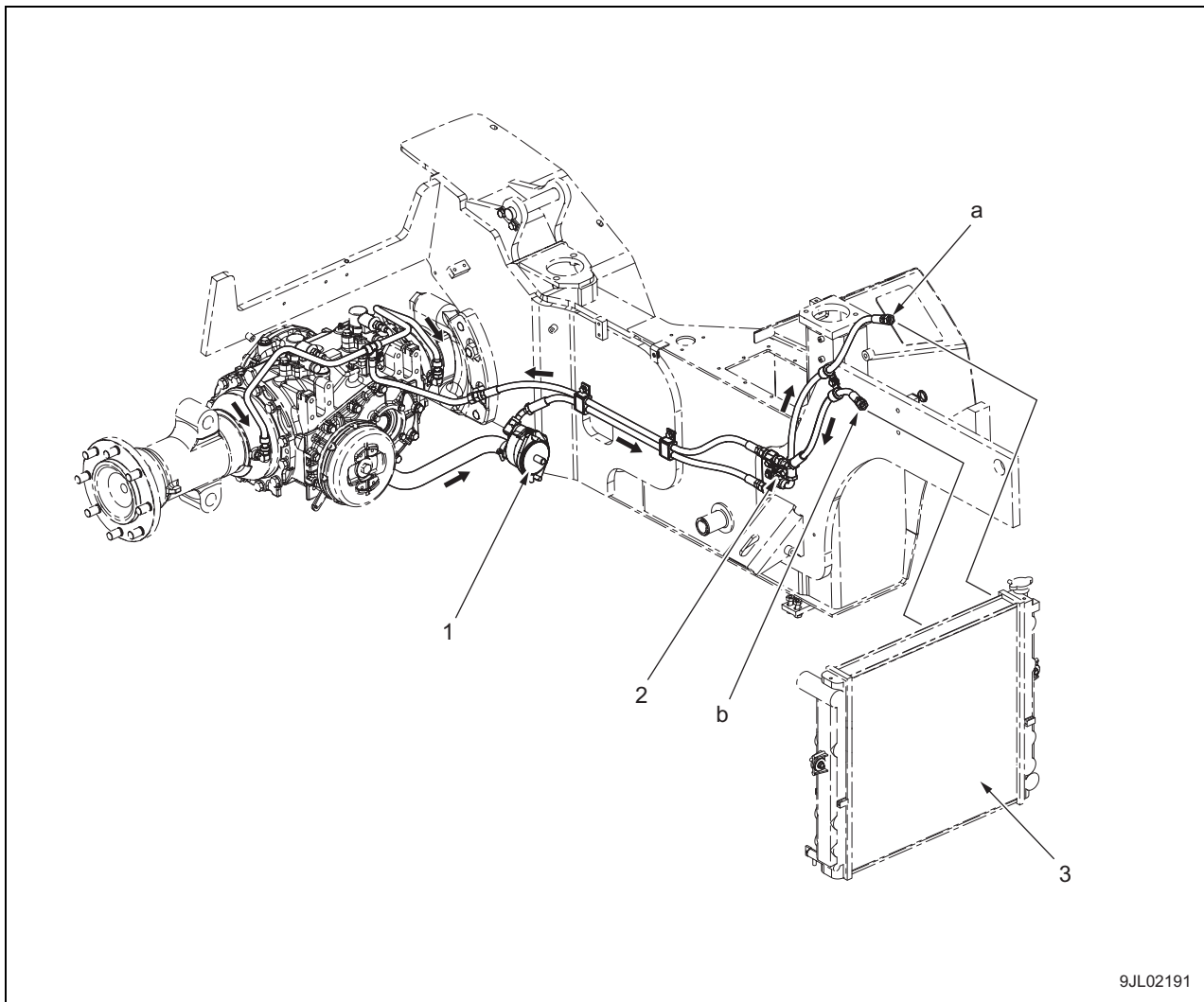
9JM07760

1. Fan
2. Brake oil cooler (built-in radiator)
3. Radiator cap
4. Radiator
5. Coolant reservoir tank
6. Torque converter oil cooler

Specifications

		Radiator	Brake oil cooler	Torque converter oil cooler
Core type		CF59-3 (Rectangular wave fin)	Aluminium PTO (Multi-plate oil cooler)	Drawn cup
Fin pitch (mm)		4.0/2	—	4.0/2
Total heat dissipation area (m ²)		16.83	—	2.287
Cracking pressure (kPa {kgf/cm ² })	Pressure valve	88 ± 14.7	—	—
	Vacuum valve	4.9	—	—

Brake cooling system hydraulic piping diagram



* The figure shows the diesel engine lift truck.

1. Brake cooling pump
2. Cold relief valve
3. Brake oil cooler (built in radiator)

- a: Brake oil cooler inlet
b: Brake oil cooler outlet

FORKLIFT TRUCK

CX50 Series

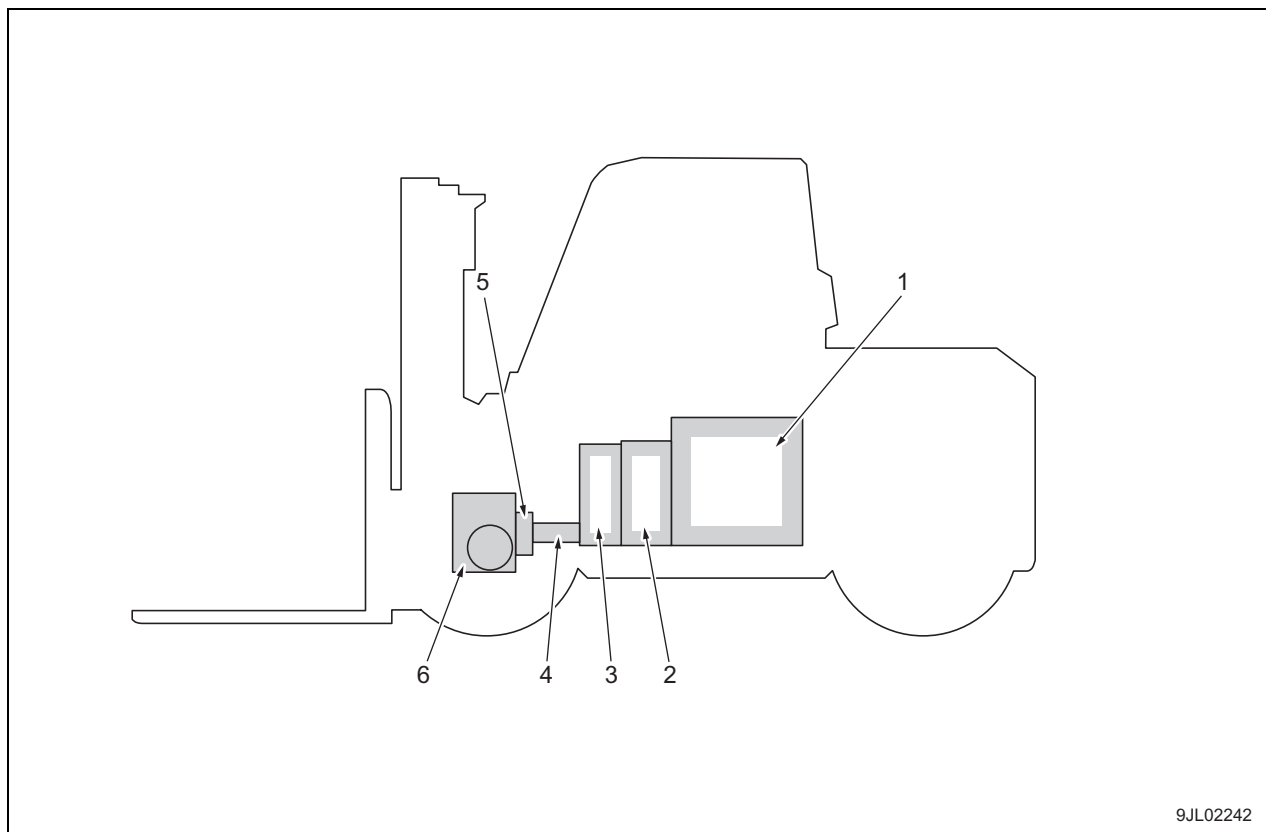
Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

10 Structure, function and maintenance standard

200 Power train

Power train	2
Power train system diagram	3
Torque converter	5
Transmission	13
Transmission control valve	27
Relief valve	31
Drive shaft	32
Front axle	34
Differential	35
Final drive	40

Power train

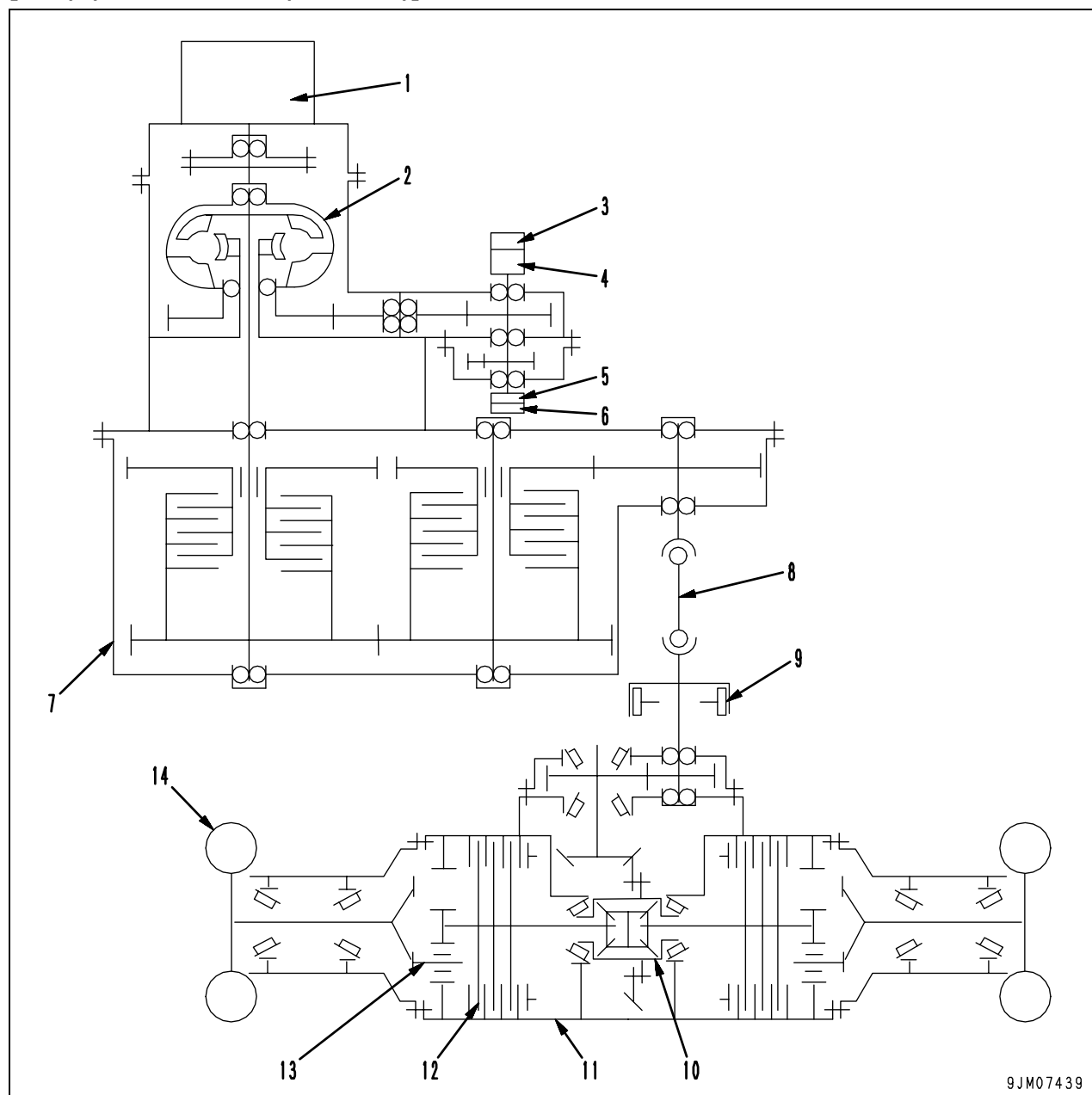


1. Engine
2. Torque converter
3. Transmission
4. Drive shaft
5. Parking Brake
6. Front axle

Power train system diagram

[FG (D) 40Z/40ZY/35/35Y/40/40Y-10 (For general)]

[FG (D) 40ZU/40U-10 (For USA)]

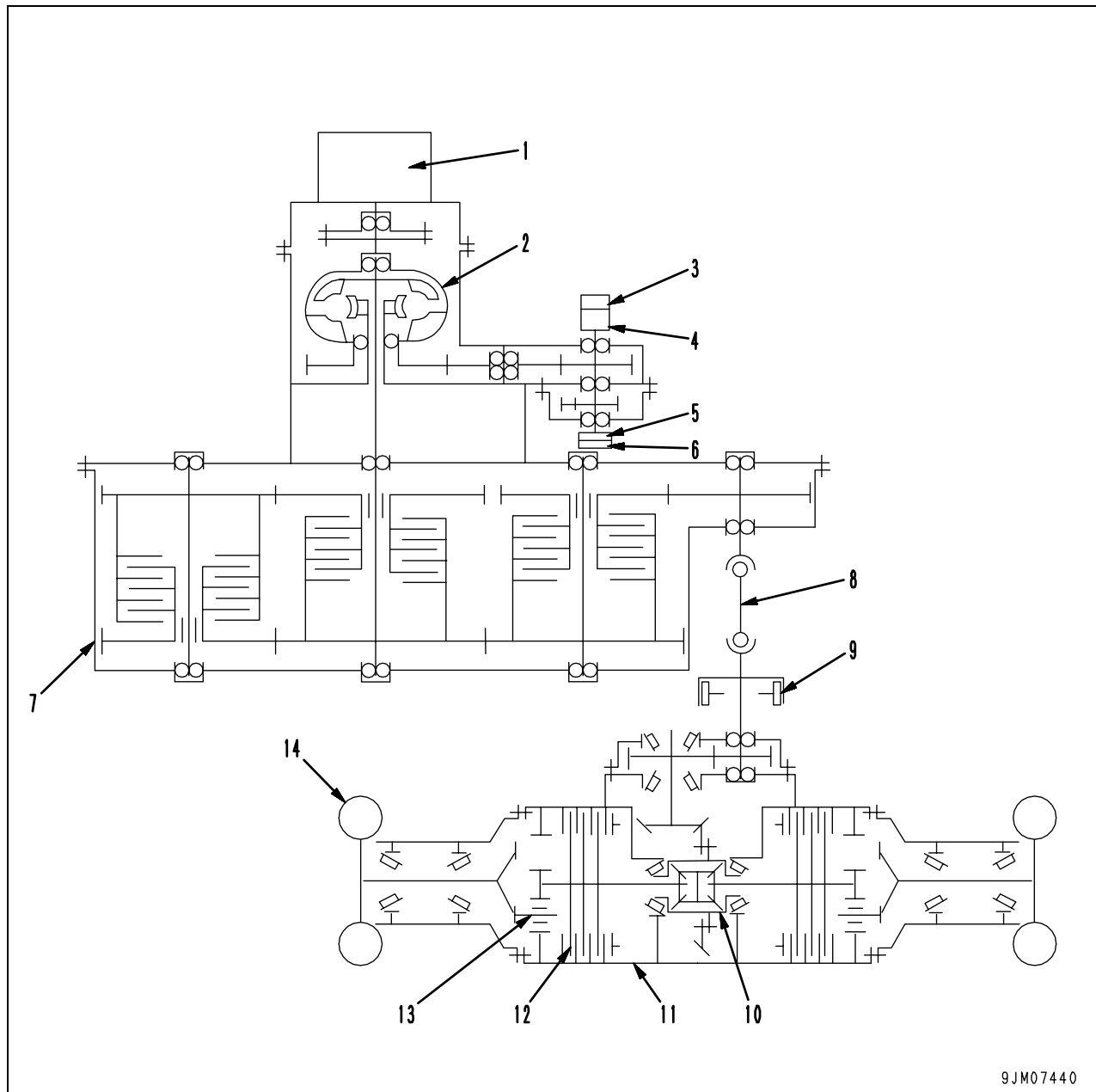


9JM07439

- | | |
|---------------------------------|----------------------------------|
| 1. Engine | 11. Front axle |
| 2. Torque converter | 12. Wet multiple disc type brake |
| 3. Brake pump | 13. Final drive |
| 4. Work equipment pump | 14. Front tyre |
| 5. Torque converter charge pump | |
| 6. Brake cooling pump | |
| 7. Transmission | |
| 8. Drive shaft | |
| 9. Parking Brake | |
| 10. Differential | |

[FG (D) 45/45Y/50A/50AY-10 (For general)]

[FG (D) 45U/50AU-10 (For USA)]

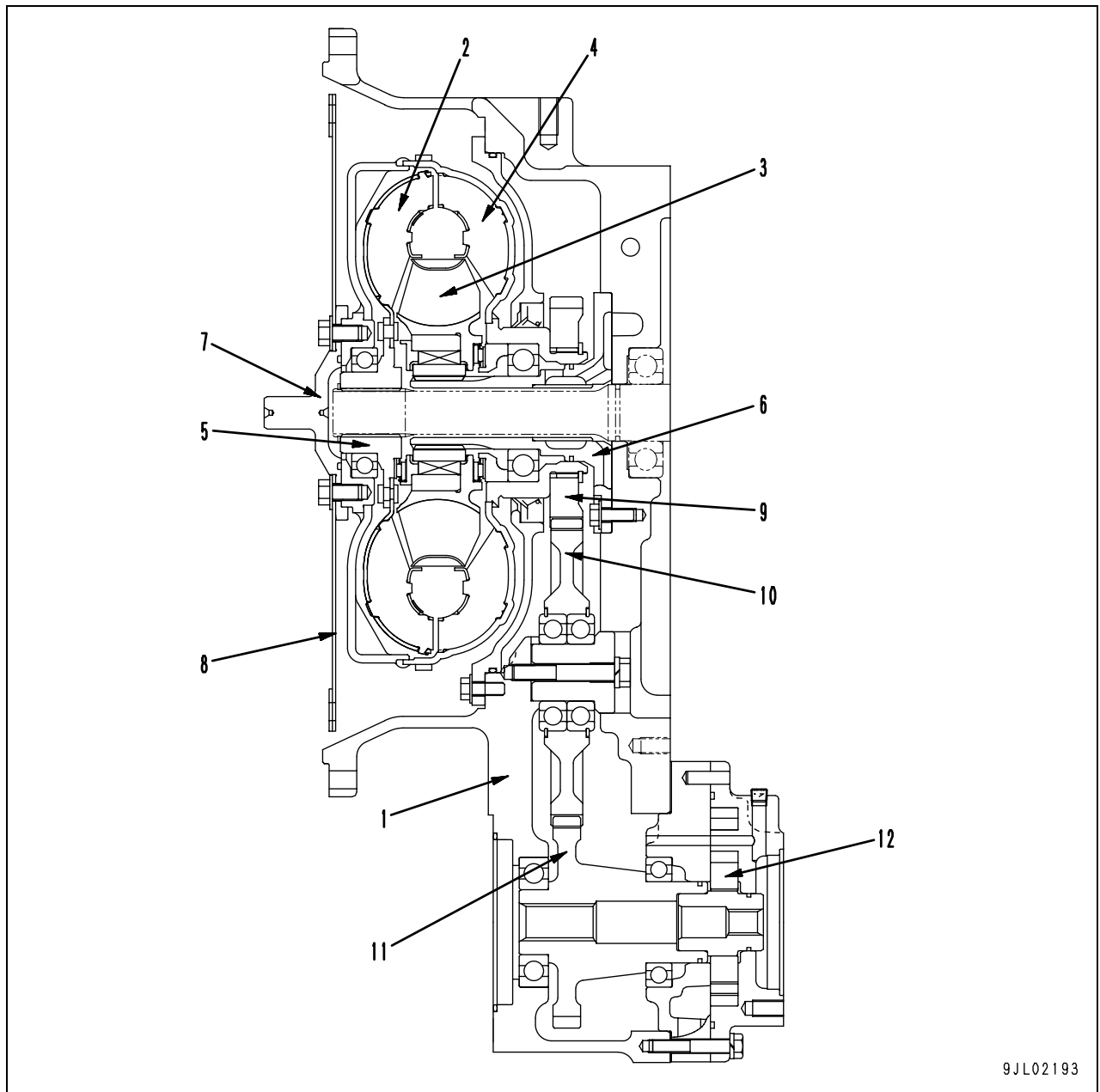


1. Engine
2. Torque converter
3. Brake pump
4. Work equipment pump
5. Torque converter charge pump
6. Brake cooling pump
7. Transmission
8. Drive shaft
9. Parking Brake
10. Differential
11. Front axle
12. Wet multiple disc type brake
13. Final drive

14. Front tyre

9JM07440

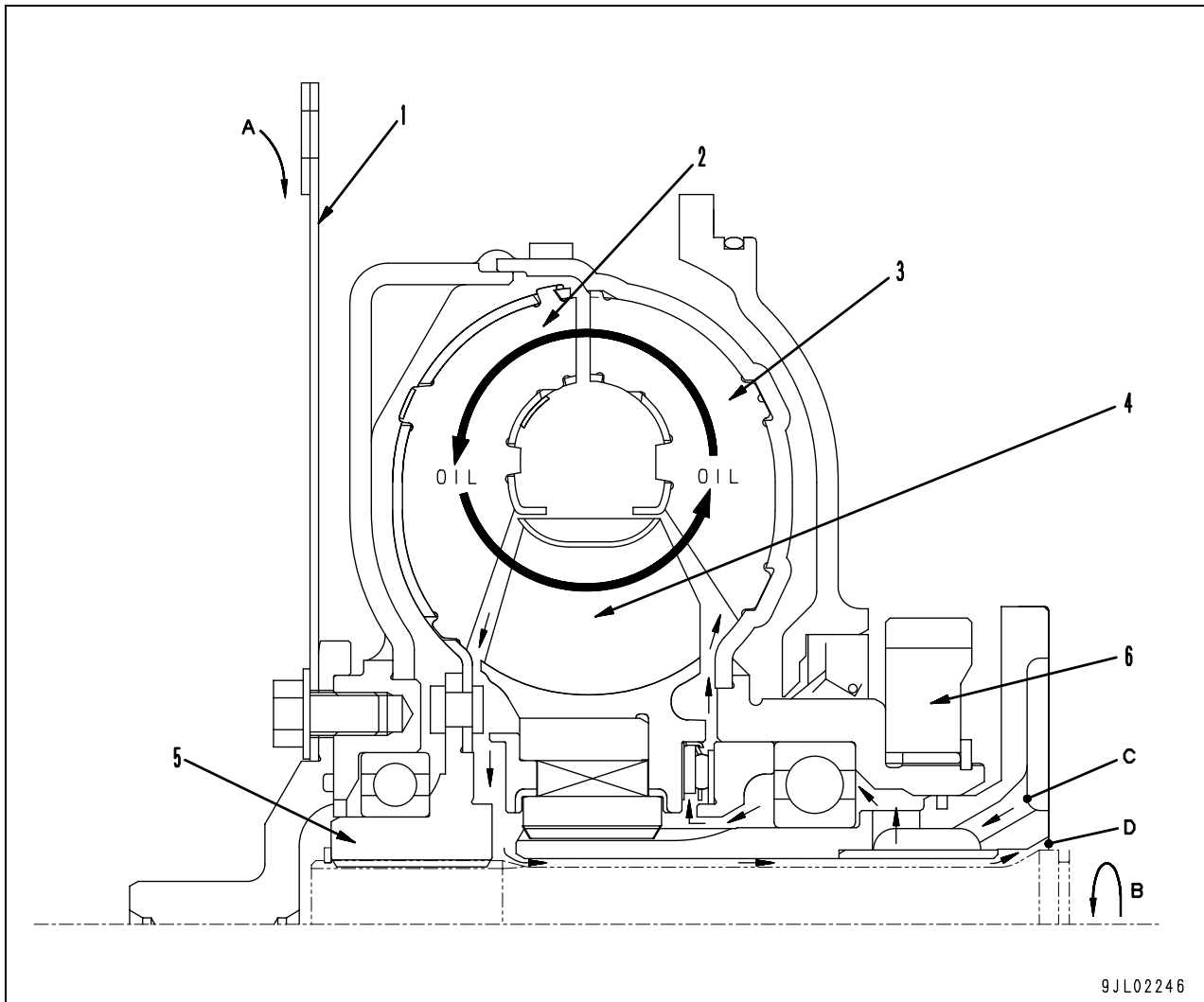
Torque converter



9JL02193

1. Torque converter housing
2. Turbine (*)
3. Stator (*)
4. Pump (Impeller) (*)
5. Turbine hub
6. Stator support
7. Input guide
8. Input plate
9. Impeller gear
10. Idler gear
11. Pump (PTO) drive gear
12. Gear pump

* Service parts are replaced by assembly. Do not disassemble them.



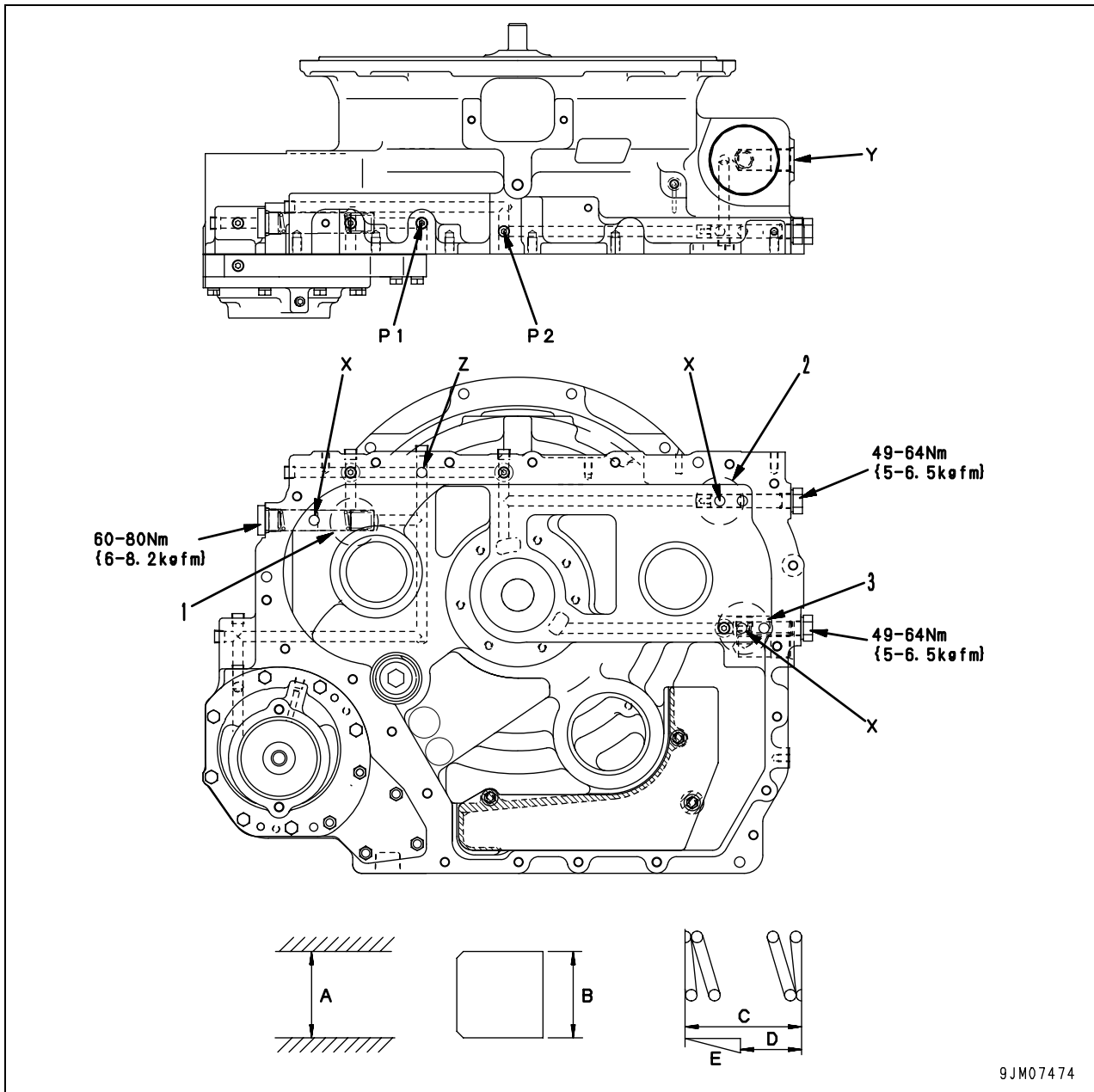
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1. Input plate
2. Turbine
3. Pump
4. Stator
5. Turbine hub
6. Pump (PTO) drive gear

- A. Input
- B. Output
- C. Oil inlet
- D. Oil outlet

- The rotation of the engine is transmitted through input plate (1) to pump (3). The oil in the pump is pushed out along the pump vanes by the centrifugal force.
- The oil pushed out of the pump flows against the vanes of turbine (2). The force generated at this time is output through turbine shaft (5).
- After the oil flows out of the turbine, its direction is so changed by stator (4) that it will flow in again at a proper angle to the pump vanes.
- The engine power is transmitted to the transmission by repeating the above. The gear pump is driven by pump (PTO) drive gear (6).

Hydraulic port locations



1. Main relief valve
2. Torque converter inlet relief valve
3. Lubricating oil relief valve

P1. Main hydraulic port

P2. Torque converter inlet pressure pickup port

X: Drain hole

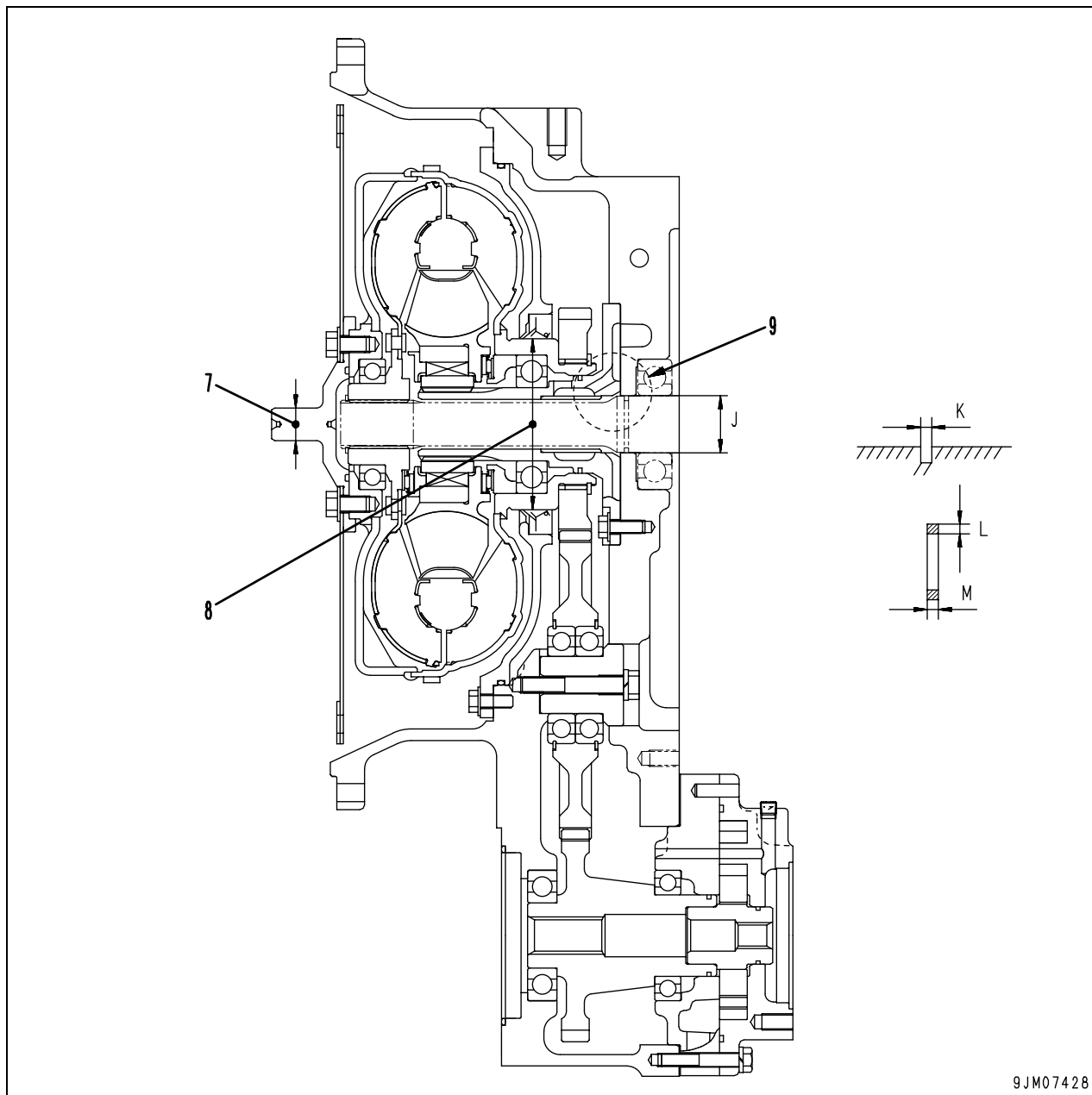
Y: To oil cooler

Z: To control valve

Unit: mm

No.	Check item	Criteria			Remedy
1	Main relief valve piston (shaft)	Standard size		Tolerance	Repair limit
		A	21 $\begin{smallmatrix} +0.985 \\ +0.972 \end{smallmatrix}$	0.015 – 0.049	0.080
	Main relief valve housing hole	B	22 $\begin{smallmatrix} +0.021 \\ 0 \end{smallmatrix}$	—	—
	Main relief valve spring free length	C	91.8	—	—
	Main relief valve spring installed length	D	74.1	—	—
2	Main relief valve spring installed load	E	185.4 ± 0.3 N {18.9 ± 0.03 kgf}	—	166.9 N {17 kgf}
	Torque converter inlet relief valve piston (shaft)	A	13 $\begin{smallmatrix} +0.970 \\ +0.960 \end{smallmatrix}$	0.030 – 0.058	0.080
	Torque converter inlet relief valve housing hole	B	14 $\begin{smallmatrix} +0.018 \\ 0 \end{smallmatrix}$		
	Torque converter inlet relief valve spring free length	C	103.4	—	—
	Torque converter inlet relief valve spring installed length	D	77.6	—	—
3	Torque converter inlet relief valve spring installed load	E	47.8 ± 2.4 N {47.8 ± 0.25 kgf}	—	43.0 N {4.4 kgf}
	Lubricating oil relief valve piston (shaft)	A	13 $\begin{smallmatrix} +0.970 \\ +0.960 \end{smallmatrix}$	0.030 – 0.058	0.080
	Lubricating oil relief valve housing hole	B	14 $\begin{smallmatrix} +0.018 \\ 0 \end{smallmatrix}$		
	Lubricating oil relief valve spring free length	C	60.5	—	—
	Lubricating oil relief valve spring installed length	D	48.2	—	—
	Lubricating oil relief valve spring installed load	E	58.8 ± 2.9 N {6 ± 0.3 kgf}	—	52.9 N {54 kgf}

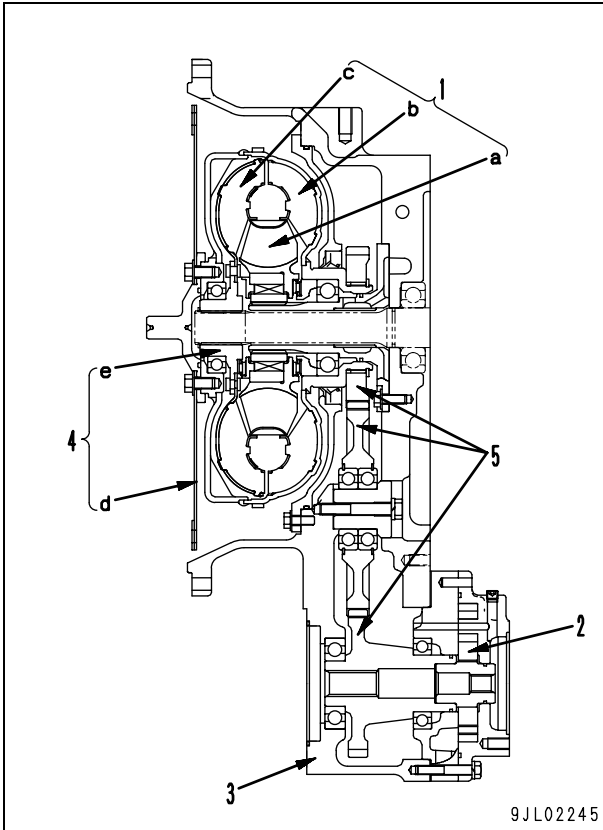
Replace



9JM07428

Unit: mm

No.	Check item	Criteria		Remedy
7	Pilot shaft	Standard size		Replace
		20 ^{-0.020 -0.041}	19.95	
8	Impeller hub	105 ^{0 -0.054}		
9	Turbine shaft housing hole	J	35 ^{+0.025 0}	
	Turbine shaft seal ring groove width	K	2.46 – 2.55	
	Seal ring thickness	L	2.32 – 2.37	
	Seal ring width	M	2.60 – 2.80	

BEC10E1-01CB

The structure is shown above. The main component parts are as follows.

1. Torque converter
2. Gear pump
3. Housing
4. Power coupling section
5. Pump (PTO) drive gear

Torque converter

The pump, stator and turbine of the torque converter are coupled as follows.

- a) Pump
Coupled with input plate
- b) Stator
Coupled with stator support by spline through one-way clutch
- c) Turbine
Coupled with turbine hub

Gear pump

The gear pump is an internal gear pump, which is driven by the pump (PTO) drive gear to supply the transmission oil and torque converter oil.

Housing

The main relief valve to adjust the clutch pressure, torque converter inlet relief valve to limit the pressure rise in the torque converter and lubricating oil relief valve are installed in the housing.

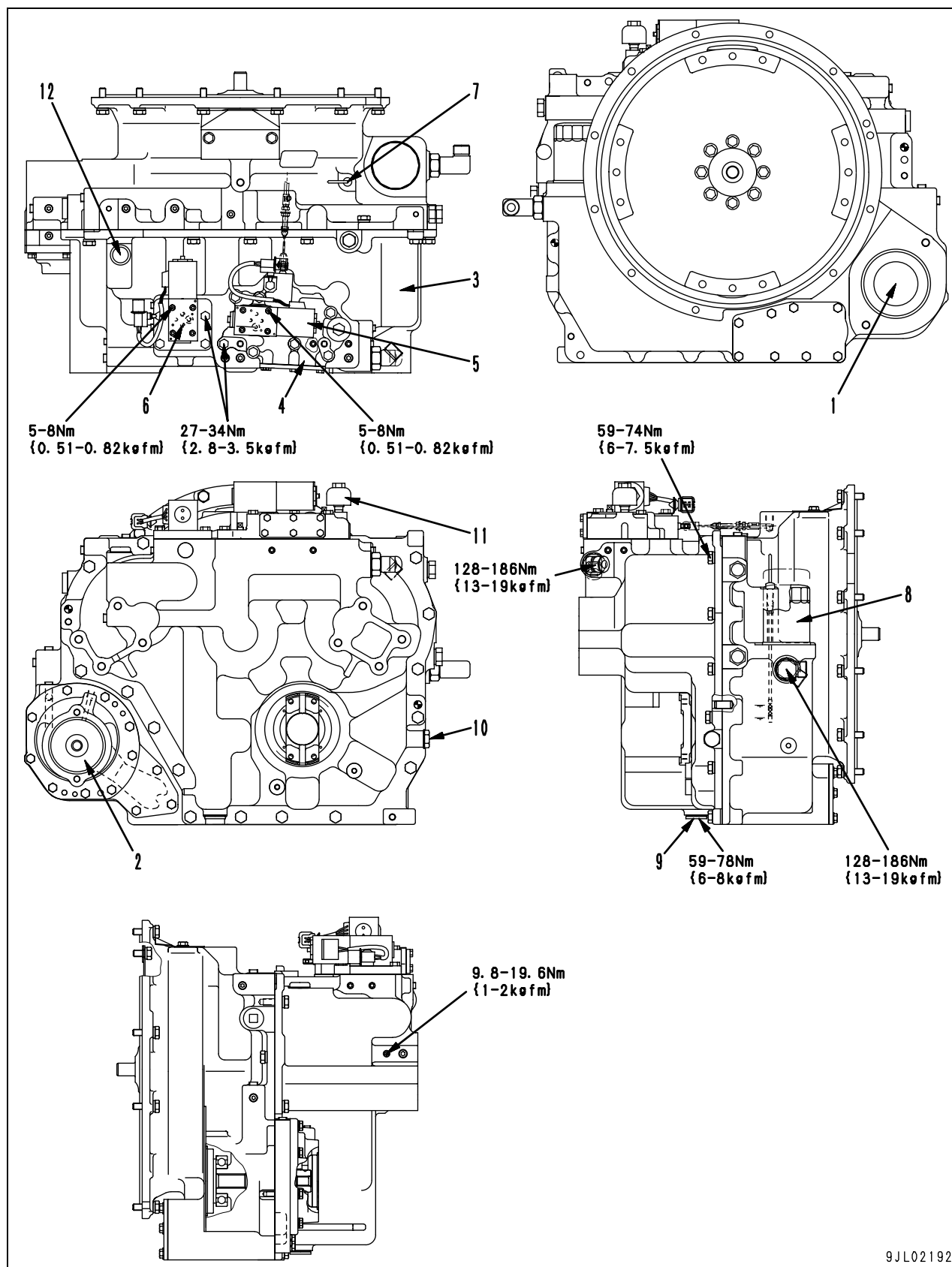
Power coupling section

- d) Input plate
The outside of the input plate is coupled with the engine flywheel and the inside is coupled with the torque converter impeller to transmit the engine torque to the torque converter.
- e) Turbine hub
The turbine hub is connected to the turbine shaft on the transmission side by spline to transmit the torque converter output to the transmission.

Pump (PTO) drive gear

The pump (PTO) drive gear is driven by the torque converter pump to transmit the engine rotation to the gear pump and PTO.

Transmission



BEC10E1-01CB

1. Work equipment pump and brake pump mounting port
2. Torque converter charge pump and brake cooling pump mounting port
3. Transmission case
4. F/R valve assembly
5. F/R solenoid valve
6. F2 solenoid valve
7. Oil level gauge
8. Oil filter
9. Drain plug
10. Oil temperature sensor (Option)
11. Breather
12. Oil filler

Outline

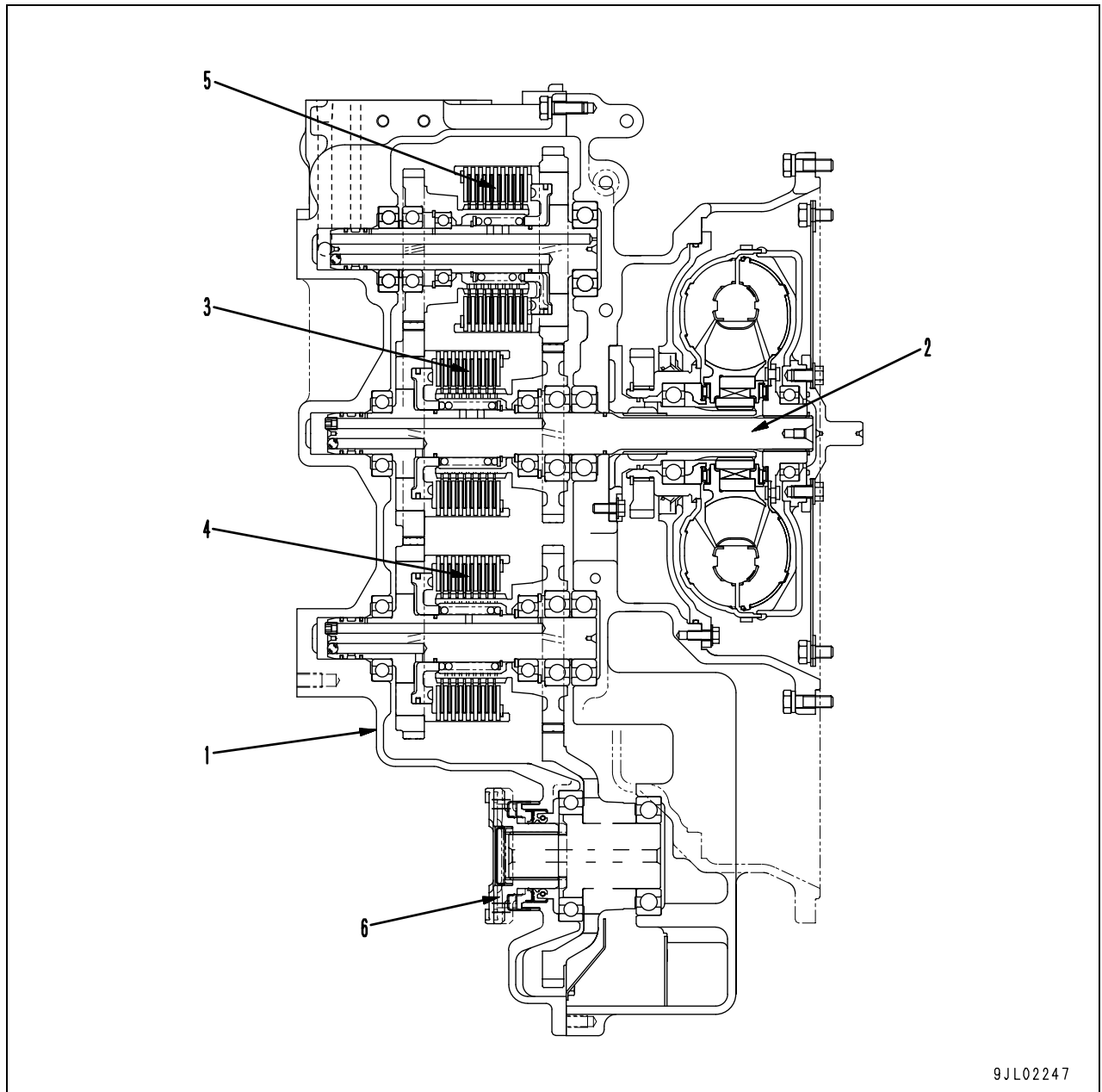
- The transmission consists of a counter-shaft constant-mesh gear mechanism and disc clutches and has 2 forward gear speeds and 1 reverse gear speed (for 4.5 – 5.0 ton) or 1 forward gear speed and 1 reverse gear speed (for 3.5 – 4.0 ton).
- The rotation direction and gear speed of the transmission are selected by fixing 1 clutch hydraulically with the control valve.

Number of plates and discs

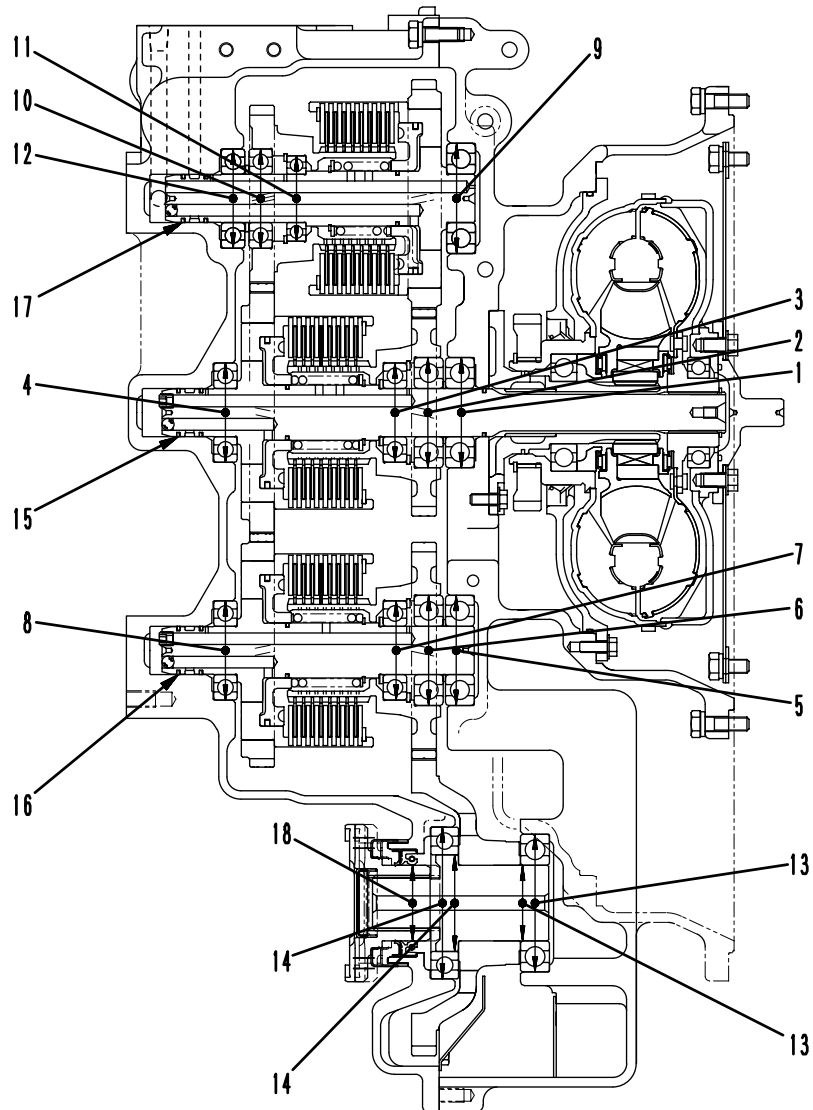
Clutch type	Number plates	Number of discs
F1 clutch	9	8
F2 clutch	9	8
R clutch	9	8

Reduction ratio

For 3.5 – 4.0 ton	F	1.388
	R	1.432
For 4.5 – 5.0 ton	F1	1.489
	F2	0.923
	R	1.283



1. Transmission case
2. Input shaft
3. F clutch
4. R1 clutch
5. F2 clutch (For 4.5 – 5.0 ton)
6. Coupling



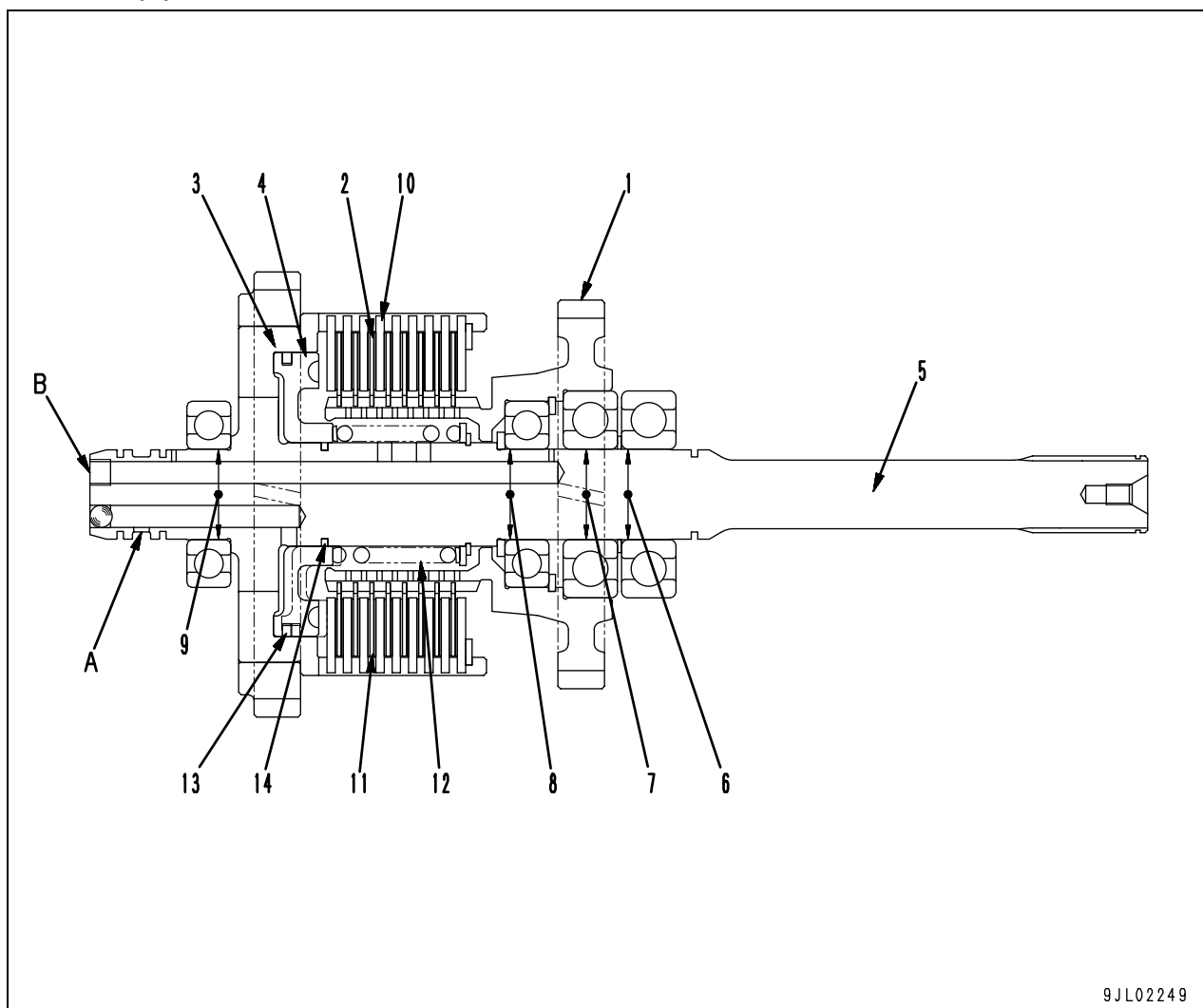
9JL02248

Unit: mm

No.	Check item	Criteria				Remedy
1	Clearance between input shaft bearing and torque converter case	Standard size	Tolerance		Standard clearance	Allowable clearance
			Shaft	Hole		
		80	0 -0.013	+0.030 0	0 – 0.043	—
2	Clearance between input shaft bearing and F gear	80	0 -0.013	+0.030 0	0 – 0.043	—
3	Clearance between input shaft bearing and F gear	72	0 -0.013	+0.030 0	0 – 0.043	—
4	Clearance between input shaft bearing and transmission case	72	0 -0.013	+0.030 0	0 – 0.043	—
5	Clearance between R shaft bearing and torque converter case	80	0 -0.013	+0.030 0	0 – 0.043	—
6	Clearance between R shaft bearing and R gear	80	0 -0.013	+0.030 0	0 – 0.043	—
7	Clearance between R shaft bearing and R gear	72	0 -0.013	+0.030 0	0 – 0.043	—
8	Clearance between R shaft bearing and transmission case	72	0 -0.013	+0.030 0	0 – 0.043	—
9	Clearance between F2 shaft bearing and torque converter case	80	0 -0.013	+0.030 0	0 – 0.043	—
10	Clearance between F2 shaft bearing and F2 gear	72	0 -0.013	+0.030 0	0 – 0.043	—
11	Clearance between F2 shaft bearing and F2 gear	62	0 -0.013	+0.030 0	0 – 0.043	—
12	Clearance between F2 shaft bearing and transmission case	72	0 -0.013	+0.030 0	0 – 0.043	—
13	Clearance between output shaft bearing and torque converter case	100	0 -0.015	+0.035 0	0 – 0.050	—
	Clearance between output shaft bearing and output shaft	55	0.012 0	0 -0.015	-0.027 – 0	—
14	Clearance between output shaft bearing and transmission case	110	0 -0.015	+0.035 0	0 – 0.050	—
	Clearance between output shaft bearing and output shaft	70	+0.012 -0.007	0 -0.015	-0.027 – 0.007	—
15	Input shaft seal ring contact surface inside diameter	Standard size	Tolerance		Repair limit	
		35	+0.025 0		35.1	
	Input shaft seal ring groove width	2.5	+0.15 +0.10		2.75	
16	R shaft seal ring contact surface inside diameter	35	+0.025 0		35.1	
	R shaft seal ring groove width	2.5	+0.15 +0.10		2.75	
17	F2 shaft seal ring contact surface inside diameter	35	+0.025 0		35.1	
	F2 shaft seal ring groove width	2.5	+0.15 +0.10		2.75	
18	Coupling oil seal contact surface outside diameter	55	0 -0.016		54.8	

Replace

Forward (F) clutch

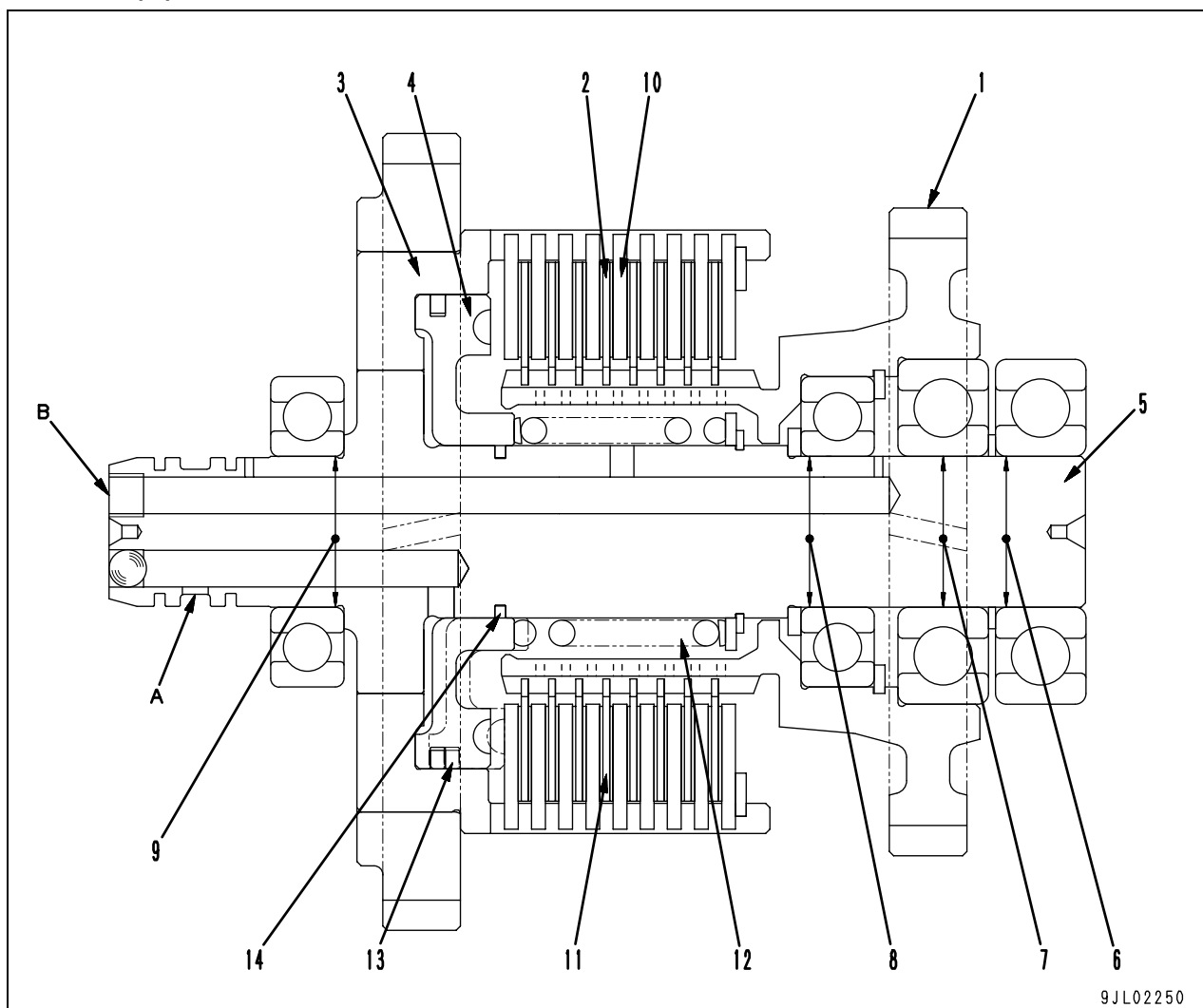


- 1. F gear
- 2. F clutch
- 3. Cylinder
- 4. Piston
- 5. Input shaft
- A. F clutch oil port
- B. Lubricating oil port

Unit: mm

No.	Check item	Criteria					Remedy
6	Clearance between input shaft and bearing	Standard size	Tolerance		Standard clearance	Allowable clearance	Replace
			Shaft	Hole			
		35	+0.011 -0.005	0 -0.012	-0.023 – 0.005	—	
7	Clearance between input shaft and bearing	35	+0.011 -0.005	0 -0.012	-0.023 – 0.005	—	
8	Clearance between input shaft and bearing	35	+0.011 -0.005	0 -0.012	-0.023 – 0.005	—	
9	Clearance between input shaft and bearing	35	+0.011 -0.005	0 -0.012	-0.023 – 0.005	—	
10	Clutch plate thickness	Standard size	Tolerance		Repair limit		
		3.2	±0.07		2.9		
11	Clutch disc thickness	3.1	±0.1		2.4		
12	Spring	Standard size			Repair limit		
		Installed height	Installed load		Installed load		
		49	539 N {55 kgf}		485 N {50 kgf}		
13	Piston seal ring contact surface inside diameter	110	+0.054 0		110.15		
	Piston seal ring groove width	3.5	+0.2 +0.1		3.8		
14	Piston inside diameter	40	+0.050 +0.025		40.15		
	Input shaft seal ring groove width	2.5	+0.15 +0.10		2.75		

Reverse (R) clutch



- 1. R gear
- 2. R clutch
- 3. Cylinder
- 4. Piston
- 5. Input shaft
- A. R clutch oil port
- B. Lubricating oil support

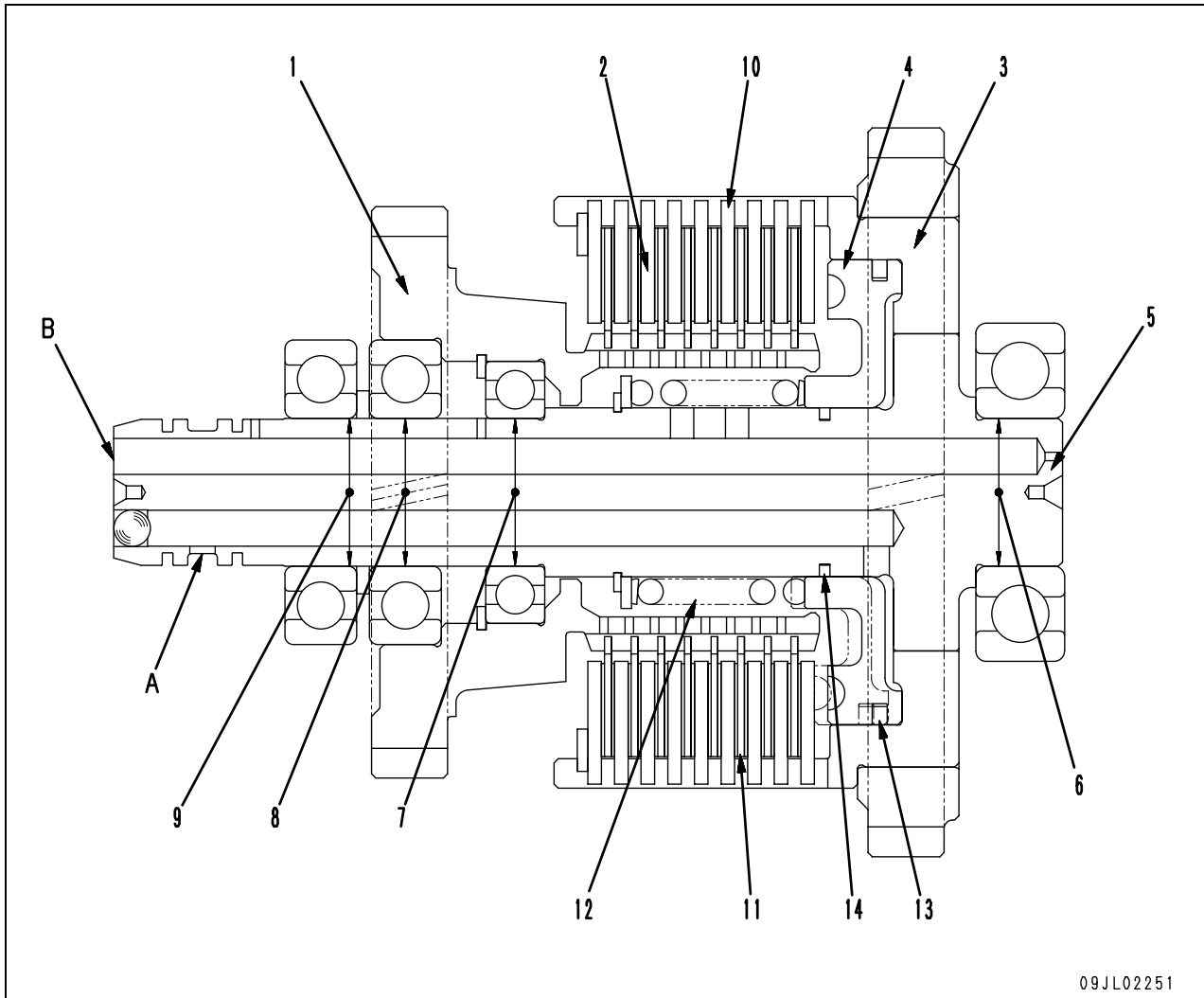
Unit: mm

No.	Check item	Criteria					Remedy
6	Clearance between input shaft and bearing	Standard size	Tolerance		Standard clearance	Allowable clearance	Replace
			Shaft	Hole			
		35	+0.011 -0.005	0 -0.012	-0.023 – 0.005	—	
7	Clearance between input shaft and bearing	35	+0.011 -0.005	0 -0.012	-0.023 – 0.005	—	
8	Clearance between input shaft and bearing	35	+0.011 -0.005	0 -0.012	-0.023 – 0.005	—	
9	Clearance between input shaft and bearing	35	+0.011 -0.005	0 -0.012	-0.023 – 0.005	—	
10	Clutch plate thickness	Standard size	Tolerance		Repair limit		
		3.2	±0.07		2.9		
11	Clutch disc thickness	3.1	±0.1		2.4		
12	Spring	Standard size			Repair limit		
		Installed height	Installed load		Installed load		
		49	539 N {55 kgf}		485 N {50 kgf}		
13	Piston seal ring contact surface inside diameter	110	+0.054 0		10.15		
	Piston seal ring groove width	3.5	+0.2 +0.1		3.8		
14	Piston inside diameter	40	+0.050 +0.025		40.15		
	R shaft seal ring groove width	2.5	+0.15 +0.10		2.75		

Forward 2nd (F2) clutch

[FG (D) 45/45Y/50A/50AY-10 (For general)]

[FG (D) 45U/50AU-10 (For USA)]



1. F2 gear
2. F2 clutch
3. Cylinder
4. Piston
5. F2 shaft

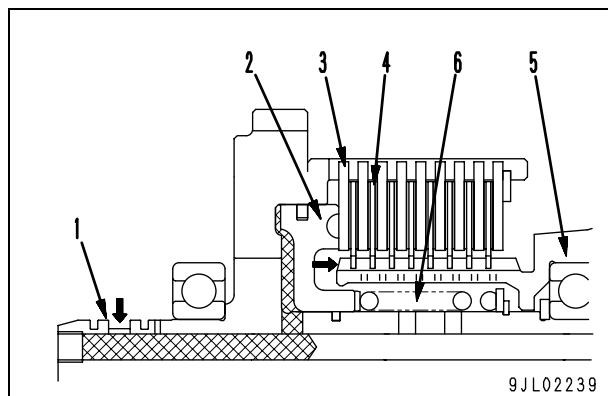
- A. F2 clutch oil port
- B. Lubricating oil port

Unit: mm

No.	Check item	Criteria					Remedy
6	Clearance between input shaft and bearing	Standard size	Tolerance		Standard clearance	Allowable clearance	Replace
			Shaft	Hole			
		35	+0.011 -0.005	0 -0.012	-0.023 – 0.005	—	
7	Clearance between input shaft and bearing	35	+0.011 -0.005	0 -0.012	-0.023 – 0.005	—	
8	Clearance between input shaft and bearing	35	+0.011 -0.005	0 -0.012	-0.023 – 0.005	—	
9	Clearance between input shaft and bearing	35	+0.011 -0.005	0 -0.012	-0.023 – 0.005	—	
10	Clutch plate thickness	Standard size	Tolerance		Repair limit		
		3.2	±0.07		2.9		
11	Clutch disc thickness	3.1	±0.1		2.4		
12	Spring	Standard size			Repair limit		
		Installed height	Installed load		Installed load		
		41	863 N {88 kgf}		777 N {79 kgf}		
13	Piston seal ring contact surface inside diameter	110	+0.054 0		110.15		
	Piston seal ring groove width	3.5	+0.2 +0.1		3.8		
14	Piston inside diameter	40	+0.050 +0.025		40.15		
	F2 shaft seal ring groove width	2.5	+0.15 +0.10		2.75		

Operation

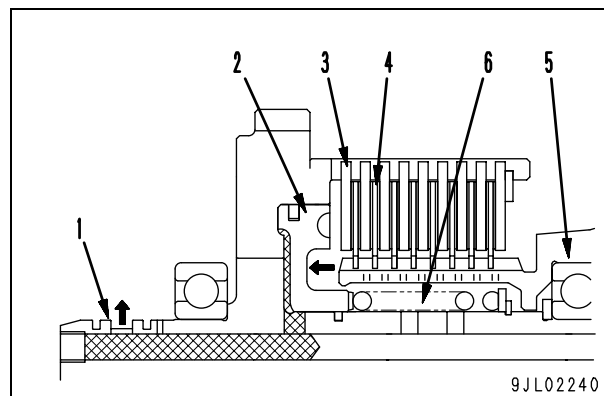
When clutch is "engaged" (fixed)



1. Shaft
2. Piston
3. Plate
4. Disc
5. Clutch gear
6. Spring

- The oil from the control valve is sent through the oil passage of shaft (1) to the back of piston (2) to push piston (2) the right.
- Piston (2) presses plates (3) and discs (4) against each other to stop the rotation of discs (4) with the friction force.
- Since the internal teeth of discs (4) are meshed with clutch gear (5), and shaft (1) and clutch gear (5) transmit the power together.

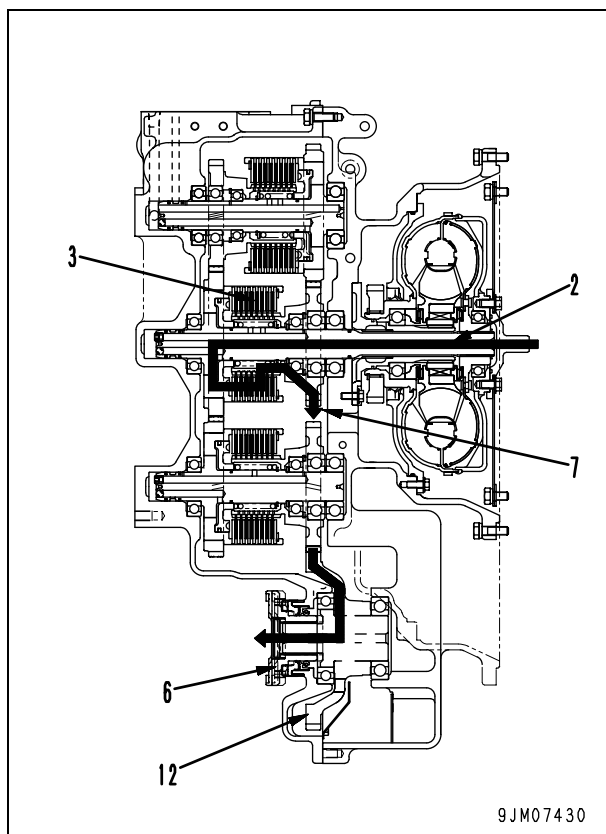
When clutch is "disengaged" (released)



- If the oil from the control valve is stopped, the pressure applied to piston (2) decreases.
- Piston (2) is pushed back to the left by the reaction force of spring (6).
- Plates (3) and discs (4) are relieved of the friction force and shaft (1) is released.

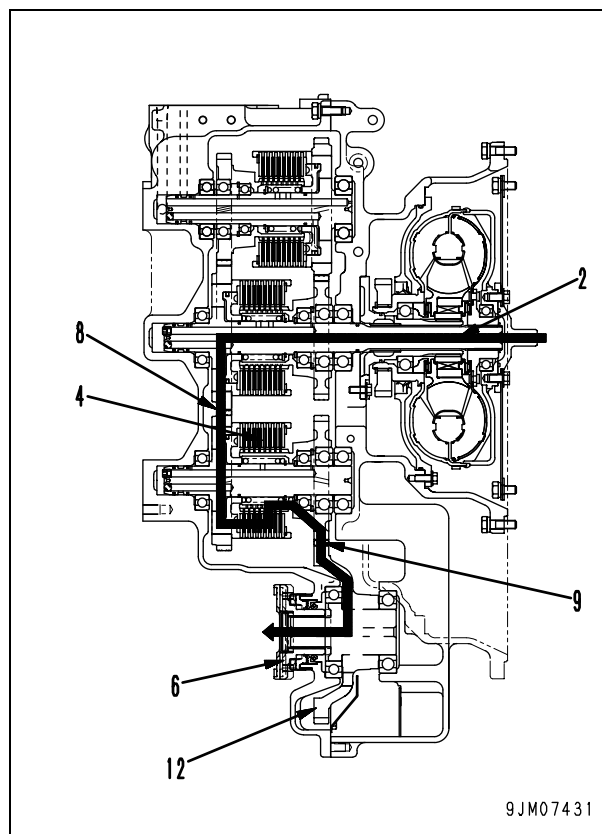
Power transmission route

In forward 1st gear speed

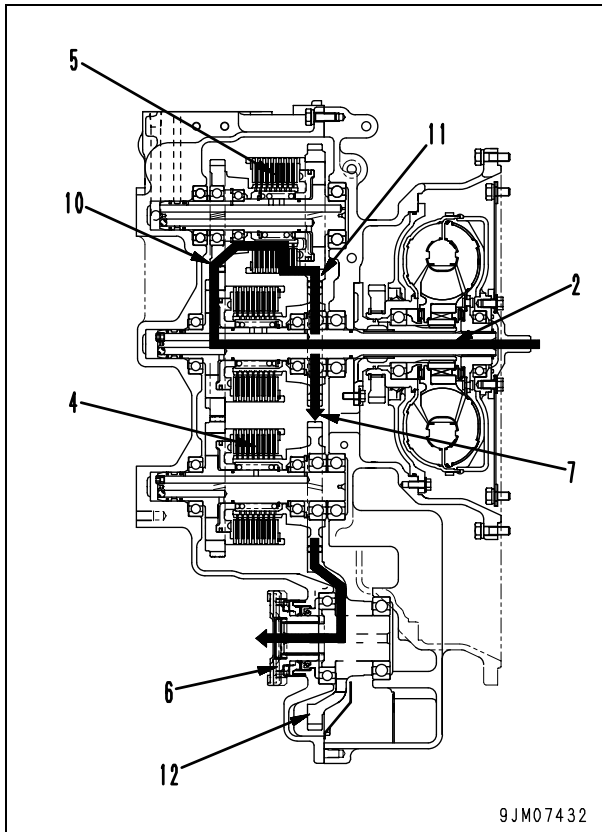


- In the forward 1st gear speed, F clutch (3) is engaged.
- F clutch (3) fixes the clutch discs with the oil pressure applied to the piston.
- Since F clutch (3) is engaged, the power transmitted from the torque converter to input shaft (2) is transmitted through F clutch (3), F gear (7) and output gear (12) to coupling (6).

In reverse

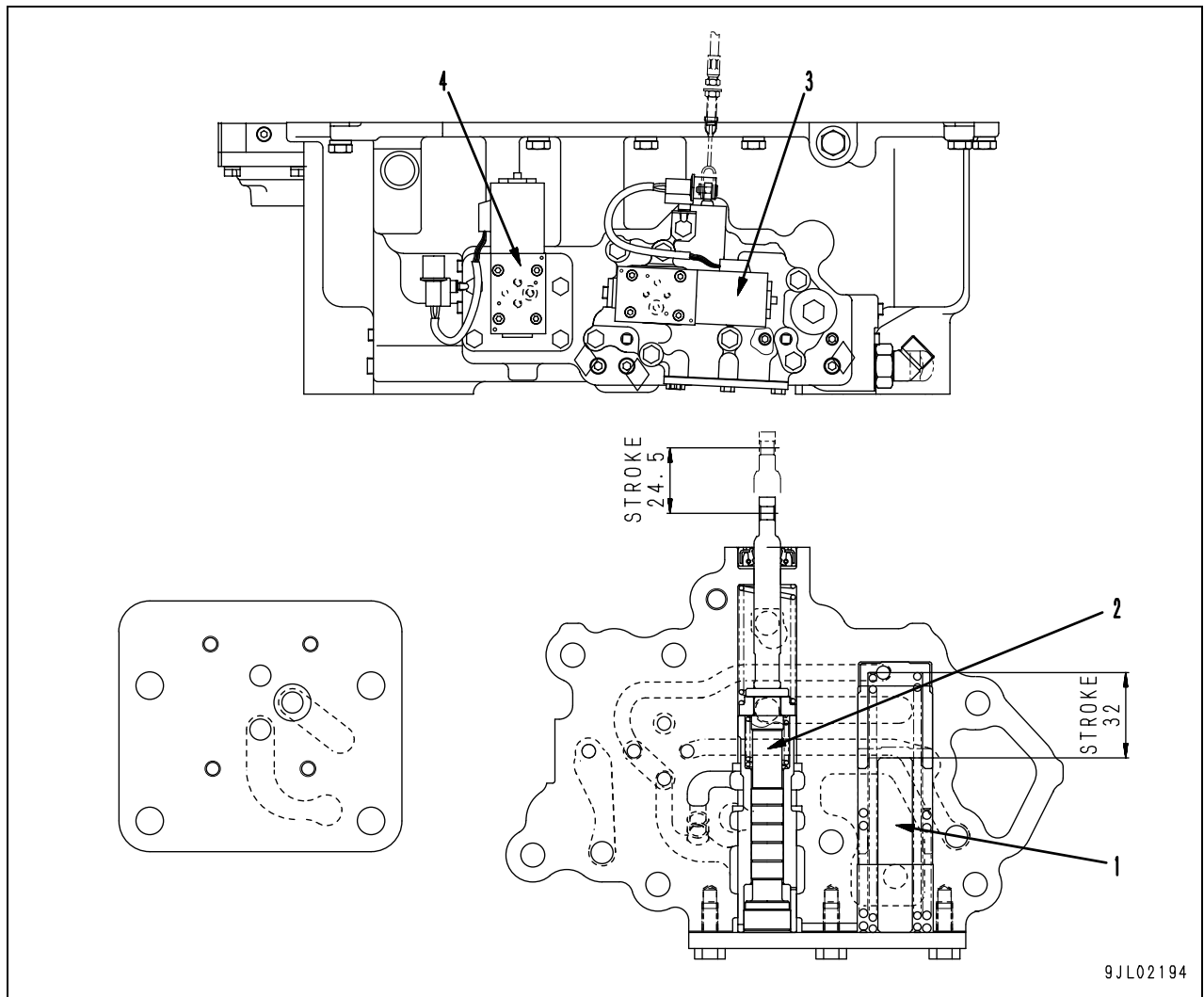


- In the reverse travel, R clutch (4) is engaged.
- R clutch (4) fixes the clutch discs with the oil pressure applied to the piston.
- Since R clutch (4) is engaged, the power transmitted from the torque converter to input shaft (2) is transmitted through counter gear (9), R gear (8) and output gear (12) to coupling (6).

BEC10E1-01CB**In forward 2nd gear speed****[FG (D) 45/45Y/50A/50AY-10 (For general)]****[FG (D) 45U/50AU-10 (For USA)]**

- In the forward 2nd gear speed, F2 clutch (5) is engaged.
- F2 clutch (5) fixes the clutch discs with the oil pressure applied to the piston.
- Since F2 clutch (5) is engaged, the power transmitted from the torque converter to input shaft (2) is transmitted through counter gear (10) and F2 gear (11) and then transmitted through counter gear (7) to output gear (12) and coupling (6).

Transmission control valve



1. Accumulator valve (Modulating valve)
2. Inching valve
3. F/R solenoid valve
4. F2 solenoid valve (For 4.5 – 5.0 ton)

Outline

- The gear shift has 1 forward gear speed and 1 reverse gear speed (For 4.5 – 5.0 ton: 2 forward gear speeds and 1 reverse gear speed), which are selected with the solenoid valve.
- The control valve has the inching mechanism to control the hydraulic clutch pressure and the modulating mechanism to decrease the impacts generated when the lift truck is started and the gear speed is shifted.

Hydraulic equipment lubrication route

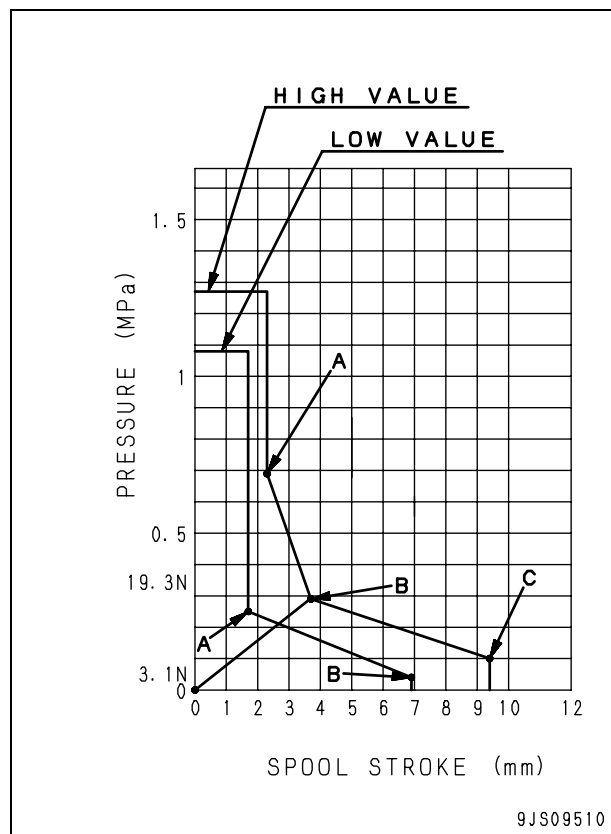
- If the engine is started, the gear pump is driven with the pump (PTO) drive gear of the torque converter assembly and the oil in the transmission is sent through the strainer to the gear pump and delivered.
- The oil discharged from the gear pump is adjusted in pressure to the clutch pressure (1.01 – 1.25 MPa {10.3 – 12.7 kgf/cm²}) by the regulator valve in the torque converter housing and supplied to the solenoid valve of the hydraulic clutch circuit.
- If the circuit is changed to the forward travel or reverse travel by the solenoid valve, the accumulator is opened and the oil in it is supplied to the circuit to the hydraulic clutch.
- After the clutch operates, the oil flows to the clutch side while charging the accumulator on the hydraulic circuit side, thus the pressure in the clutch increases gradually and the power is transmitted smoothly.
- On the other hand, the oil discharged from the regulator valve is supplied to the torque converter.
- The relief valve installed to the torque converter inlet limits the pressure rise in the torque converter to 0.75 MPa {7.1 kgf/cm²}.
- One part of the oil discharged from the torque converter is sent to the oil cooler, while the lubricating oil relief valve in the torque converter housing sets the flow load for cooling and lubrication so that the pressure in the lubrication circuit will not exceed 0.58 MPa {6.0 kgf/cm²} normally.
- The oil cooled in the oil cooler lubricates and cools each part, and then returns to the transmission case.

Inching valve hydraulic characteristics

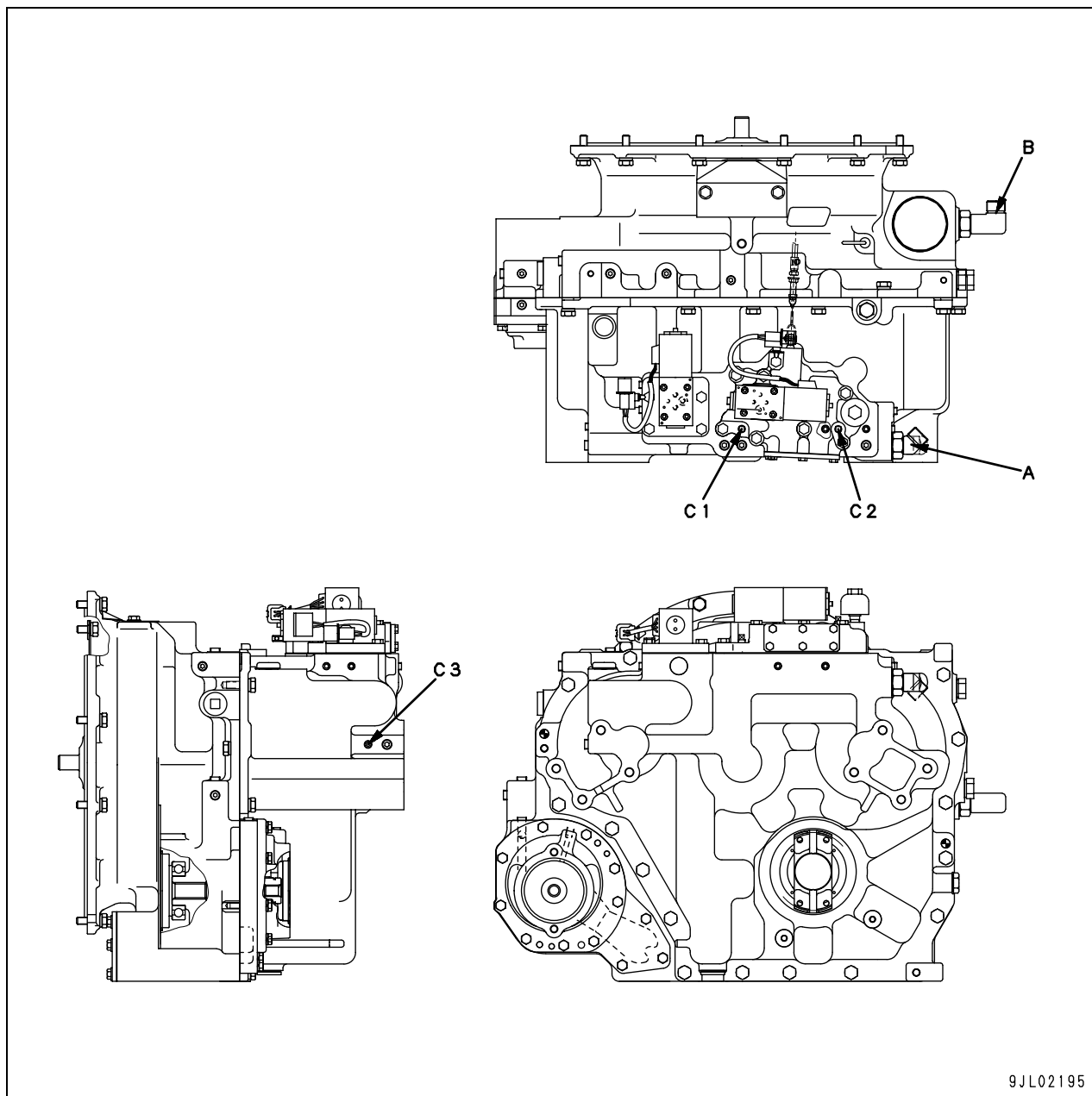
- Measurement condition of port P1 pressure:
1.13 MPa {11.5 kgf/cm²}

Unit: kgf/cm²

Point		Lower limit	Upper limit
A	Oil pressure	0.25 {2.6}	0.69 {7.0}
	Stroke (mm)	1.7	2.3
B	Oil pressure	0.04 {0.4}	0.29 {3.0}
	Stroke (mm)	6.9	3.7
C	Oil pressure	–	0.10 {1.0}
	Stroke (mm)	–	9.4

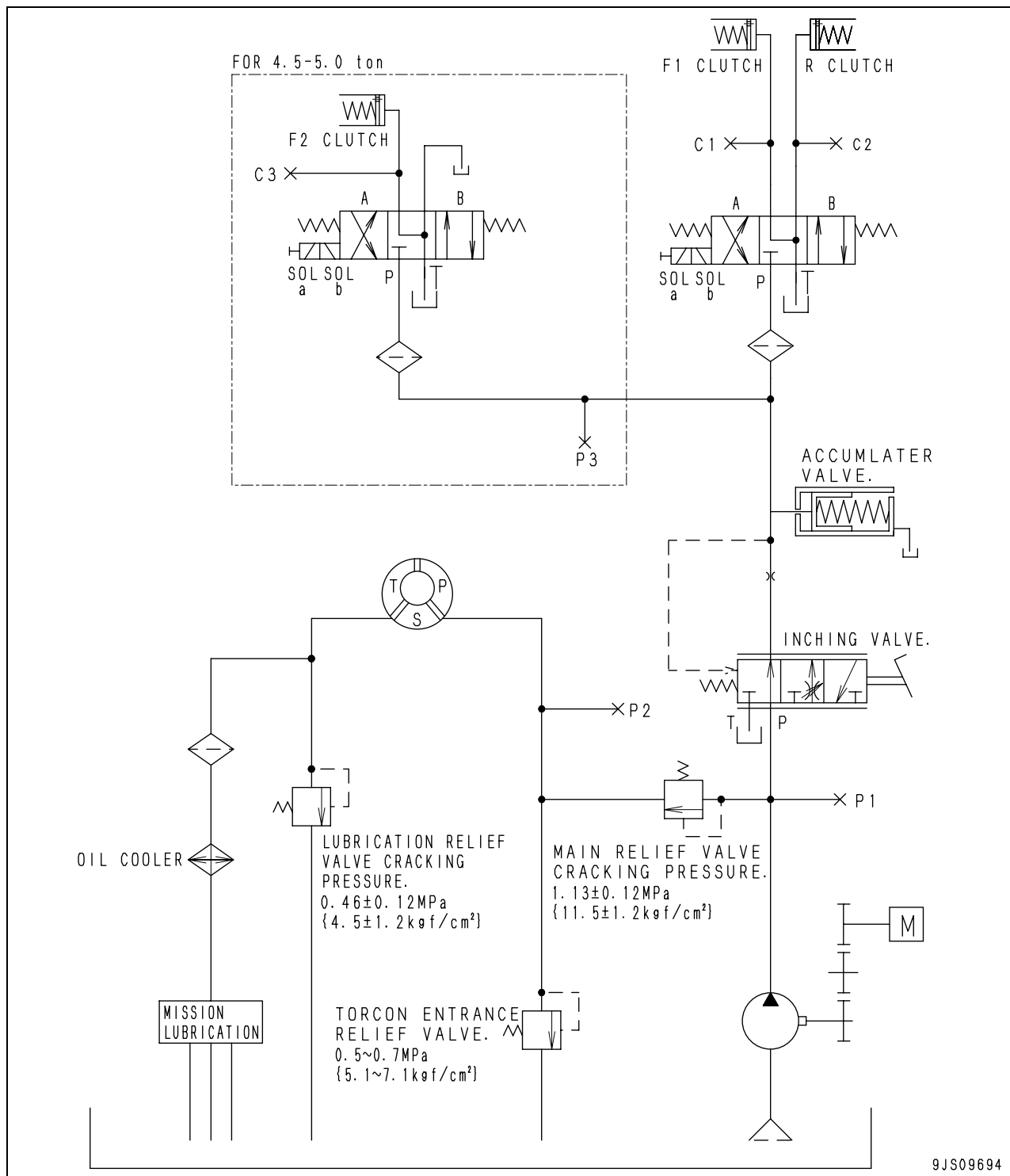


Hydraulic port locations

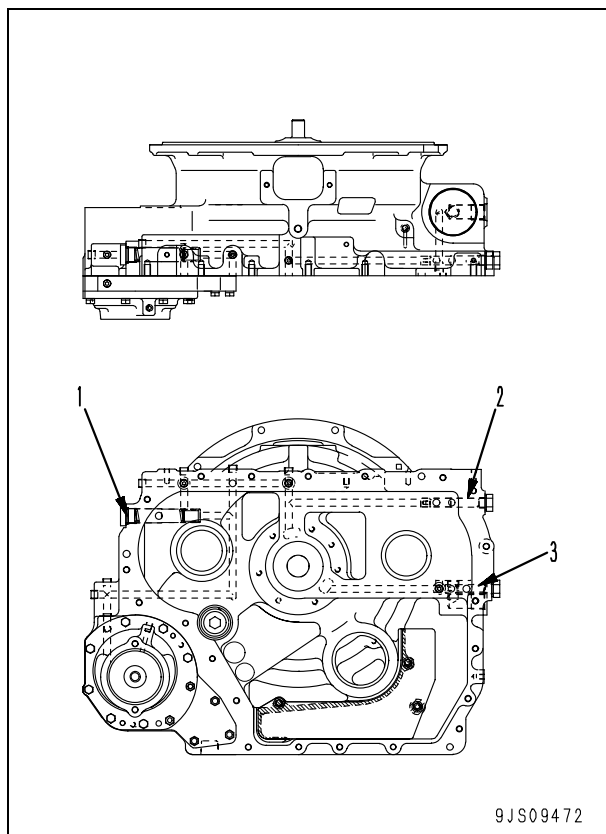


- C1: F clutch pressure pickup port (RC 1/8)
C2: R clutch pressure pickup port (RC 1/8)
C3: F2 clutch pressure pickup port (RC 1/8) (For
4.5 – 5.0 ton)

Hydraulic system diagram



Relief valve



1. Main relief valve
2. Torque converter inlet relief valve
3. Lubricating oil relief valve

Main relief valve

The main relief valve is built in the housing and regulates the oil discharged from the pump and supplies it to the transmission control valve. The oil relieved here is supplied to the torque converter.

Torque converter inlet relief valve

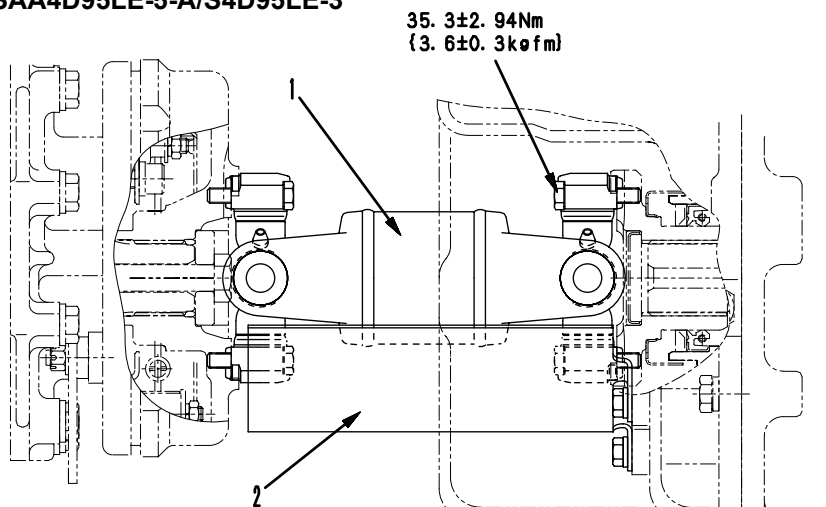
The torque converter inlet relief valve is built in the housing and relieves (drains) the oil to limit the pressure rise in the torque converter so that the pressure in the torque converter will not exceed the specified pressure.

Lubricating oil relief valve

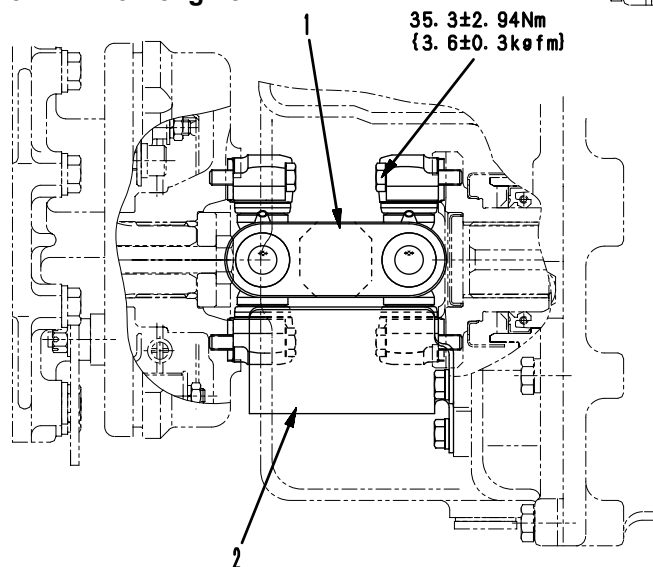
The lubricating oil relief valve is built in the housing and relieves (drains) the oil to limit the pressure rise in the lubrication circuit so that the pressure in the lubrication circuit (cooler, piping, etc.) on the lift truck side will not exceed the specified pressure.

Drive shaft

Lift truck with SAA4D95LE-5-A/S4D95LE-3 engine



Lift truck with EBT-TB45-1A/2A/3A engine



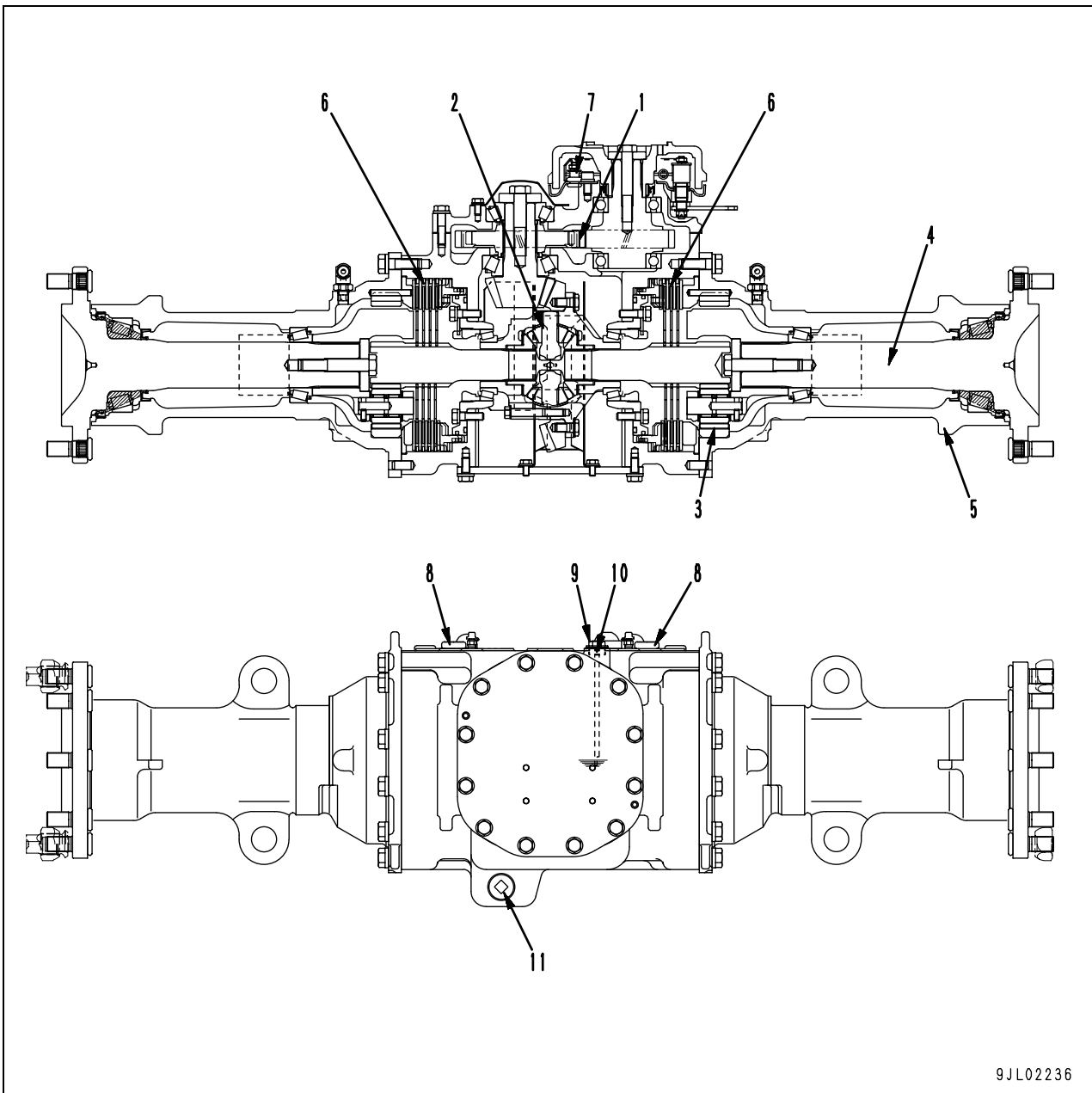
9JL02257

1. Drive shaft
2. Cover

Outline

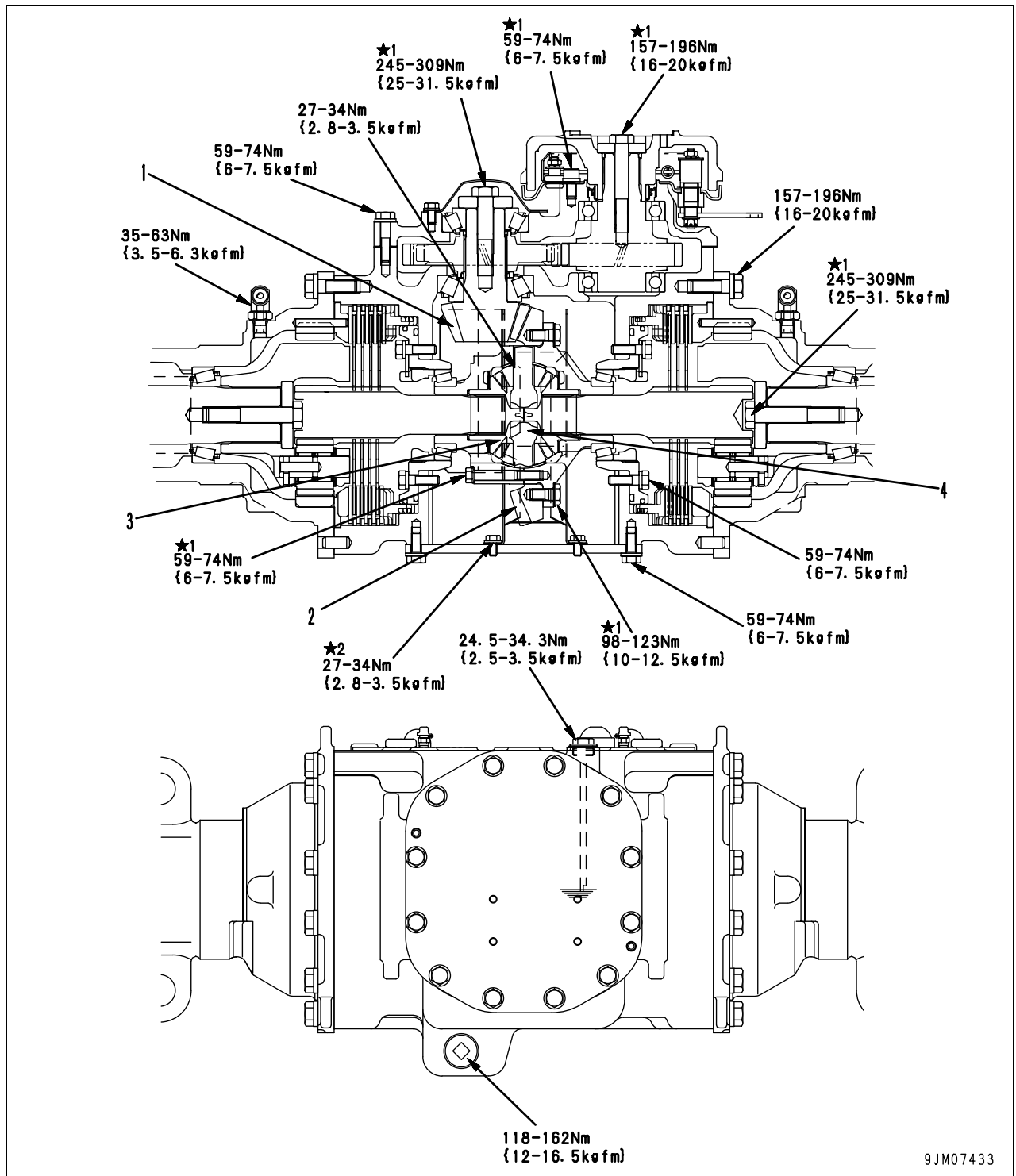
- The power from the transmission output shaft is transmitted through the drive shaft to the front axle.
- When the lift truck receives impacts from the road during travel or impacts during work, the distance between the transmission and the front axle changes. The drive shaft absorbs the fluctuation of the angle and length so that the power will be transmitted without damaging the parts under the above condition.
- Service parts are replaced by assembly. Do not disassemble them.

Front axle



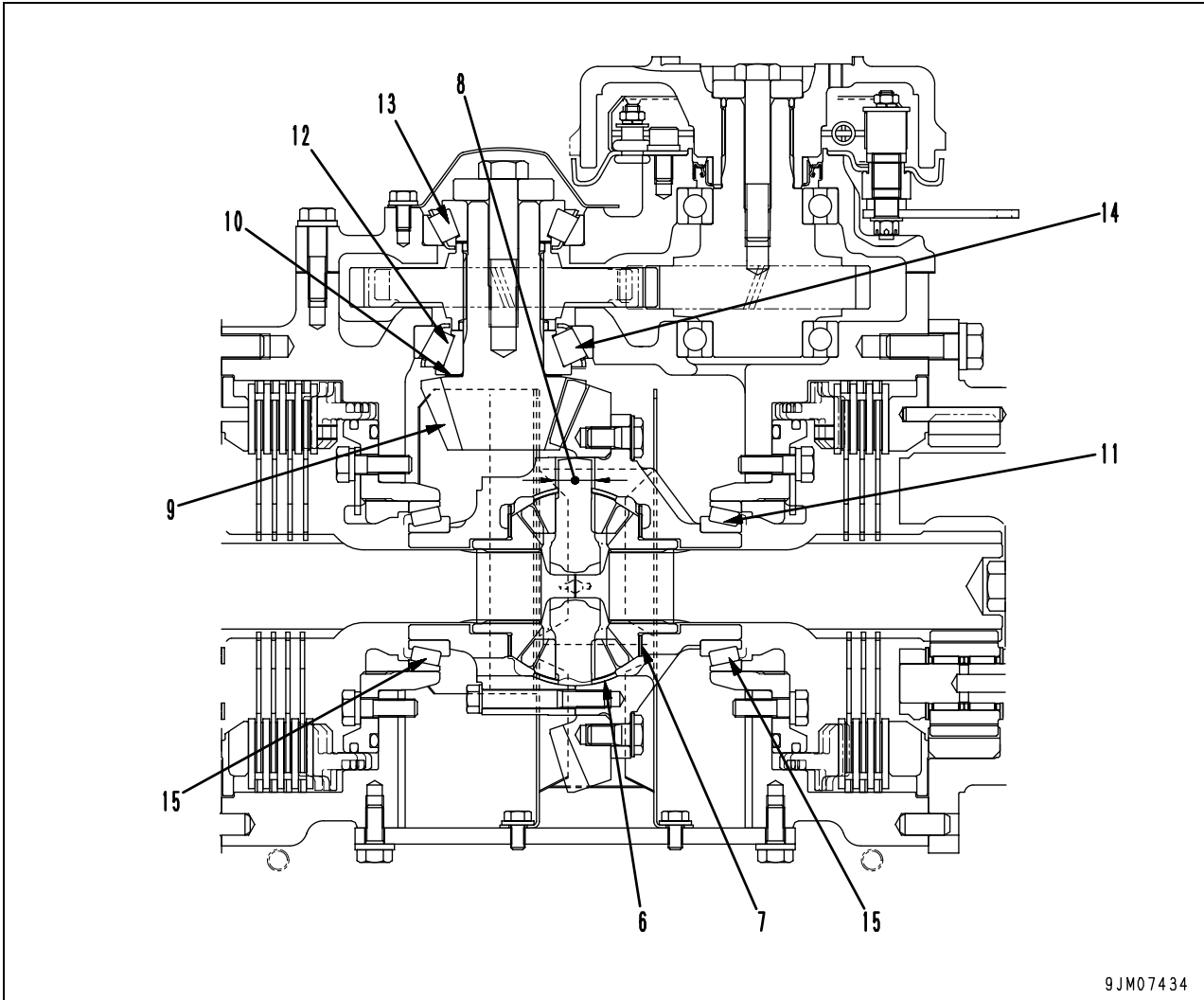
1. Reduction gear
2. Differential
3. Final drive
4. Axle shaft
5. Axle housing
6. Wet multiple disc type brake
(For 4.5 – 5.0 ton: 4 discs, For 3.5 – 4.0 ton: 3 discs)
7. Parking brake
8. Brake oil filler/Brake disc check port (2 places)
9. Oil level gauge/Brake disc wear check gauge
10. Differential oil filler
11. Drain plug

Differential



- ★1 Apply LT-2.
- ★2 Apply LG-5.

1. Bevel pinion
2. Bevel gear
3. Side gear
4. Shaft



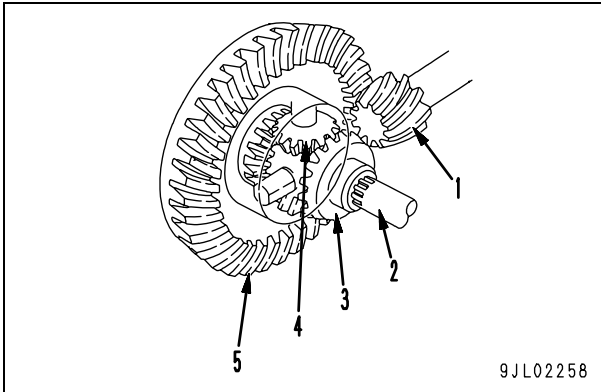
Unit: mm

No.	Check item		Criteria					Remedy
6	Pinion washer thickness		Standard size	Tolerance		Repair limit		Replace
			2.5	±0.08		2.3		
7	Side gear washer thickness		1.6	±0.06		1.4		
8	Clearance between spider and bevel pinion		Standard size	Shaft	Hole	Standard clearance	Allowable clearance	
			22	-0.020 -0.041	+0.12 +0.08	-0.010 – 0.161	0.25	
9	Bevel gear backlash		0.15 – 0.23					Adjust
10	Shim thickness between bevel pinion and bearing		1.06 ± 0.4					
			Standard size	Tolerance		Standard clearance	Allowable clearance	Replace
				Shaft	Hole			
11	Clearance to differential side bearing	Outer race	95	0 -0.018	+0.016 -0.006	-0.006 – 0.034	—	
		Inner race	60	+0.051 +0.032	0 -0.015	-0.006 – 0.034	—	
12	Bearing clearance on bevel pinion gear side	Outer race	100	0 -0.018	+0.010 -0.045	-0.045 – 0.008	—	
		Inner race	45	+0.033 +0.017	0 -0.012	-0.045 – 0.008	—	
13	Bevel pinion transmission side bearing clearance	Outer race	90	0 -0.018	-0.010 -0.045	-0.045 – 0.008	—	
		Inner race	40	+0.018 +0.002	0 -0.012	-0.030 – -0.002	—	
14	Differential input bearing rotation starting torque		When gasket is new: 5.8 – 11.1 Nm {0.59 – 1.13 kgfm} When gasket is reused: 2.8 – 8.1 Nm {0.28 – 0.81 kgfm}					Adjust
15	Differential side bearing rotation starting torque		No. 14 + 0.5 – 1.9 Nm {0.05 – 0.19 kgfm} (Measured at bevel pinion)					

BEC10E1-01CB

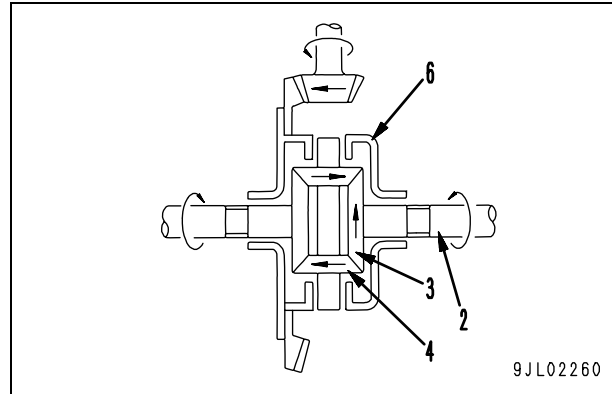
Outline

- The power from the engine is transmitted through the torque converter, transmission, and drive shafts to the front axle.
- In the axle, the power is changed in direction by 90 degrees and reduced in speed by bevel pinion (1) and bevel gear (5) and then transmitted through pinion gears (4) to sun gear shafts (2).
- The power of the sun gear is further reduced in speed by the planetary gear type final drive and then transmitted to the axle shafts and wheels.



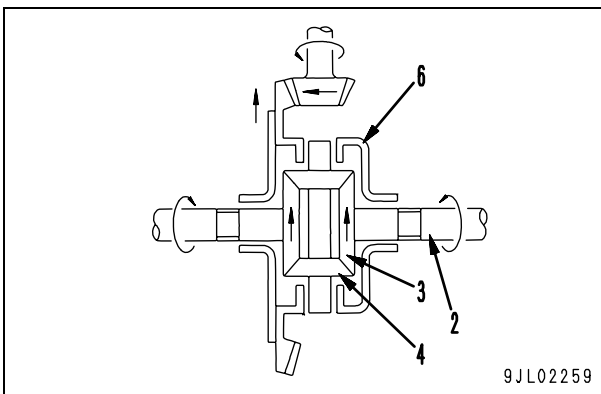
During turn

- While the lift truck is turning, the right and left wheels rotate at different speeds. Accordingly, pinion gears (4) and side gears (3) in the differential rotate and transmit the power of carrier (6) to sun gear shafts (2), depending on the difference in rotation speed between the right and left wheels.

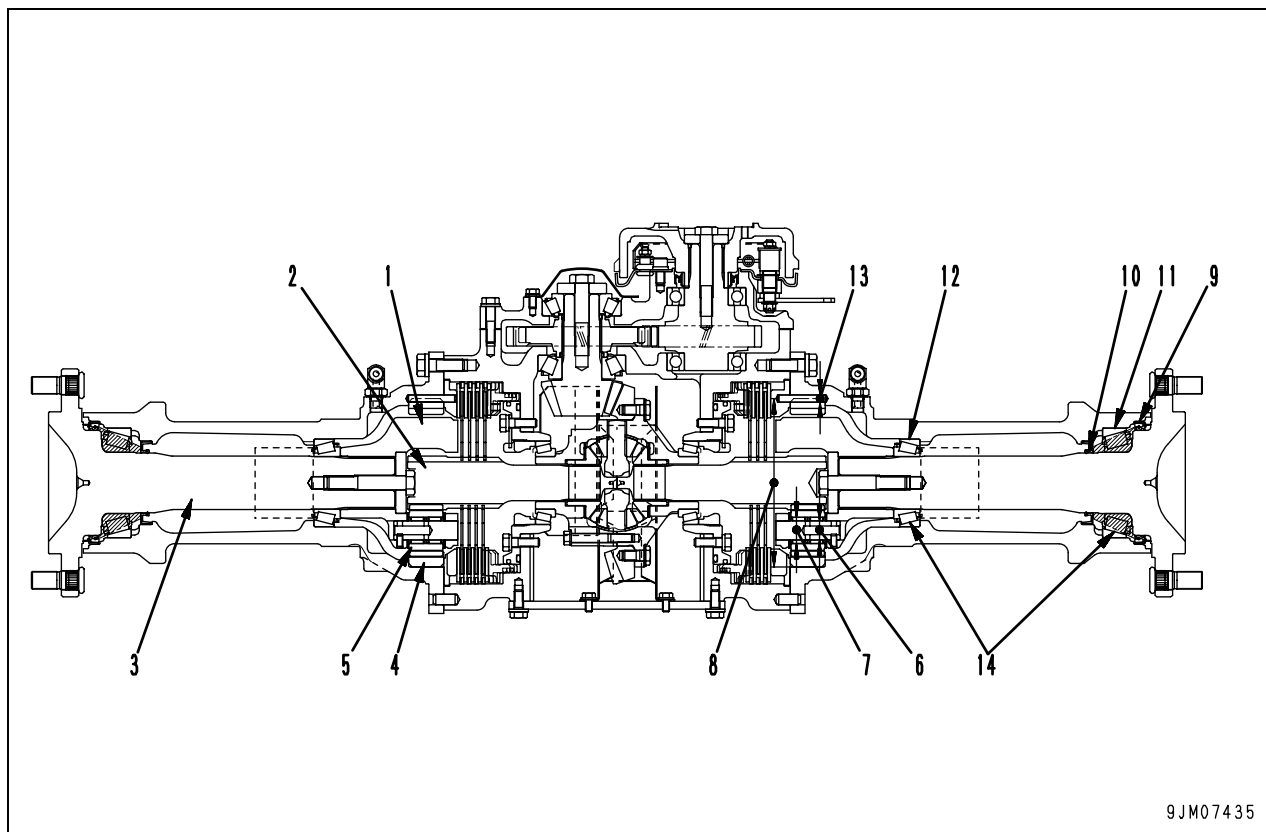


During straight travel

- While the lift truck is traveling straight, the right and left wheels rotate at the same speed. Accordingly, the pinion gears (4) in the differential assembly do not rotate and the power of carrier (6) is transmitted through pinion gears (4) and side gears (3) to right and left sun gear shafts (2) evenly.



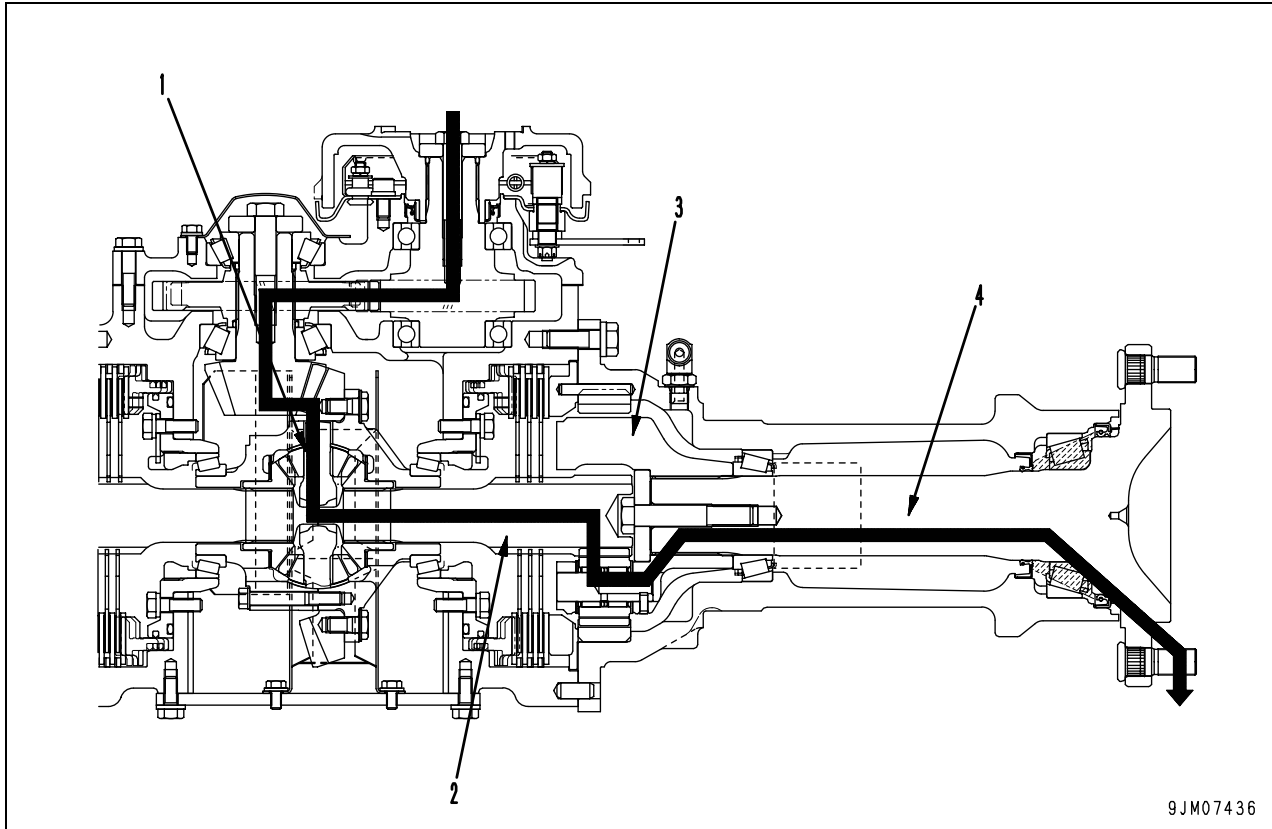
Final drive



1. Planetary carrier
2. Sun gear shaft
3. Axle shaft
4. Ring gear
5. Planetary gear

Unit: mm

No.	Check item		Criteria				Remedy
6	Planetary shaft outside diameter		Standard size	Tolerance		Standard clearance	Allowable clearance
				Shaft	Hole		
			22	-0.007 -0.020	—	—	—
7	Planetary gear hole diameter		30	—	+0.025 +0.009	—	—
8	Clearance between axle housing and ring gear		192	+0.06 +0.03	+0.10 +0.06	0 - 0.07	—
9	Axle shaft seal press fitted part	Housing	140	+0.21 +0.10	+0.063 0	-0.21 – -0.037	—
		Shaft	120	0 -0.087	—	—	—
10	Axle shaft seal press fitted part	Housing	95	+0.17 +0.08	+0.054 0	-0.17 – -0.026	—
		Shaft	68	0 -0.074	—	—	—
11	Axle housing bearing press fitted part clearance	Outer race	125	0 -0.020	-0.012 -0.052	-0.052 – 0.008	—
		Inner race	70	+0.039 +0.020	0 -0.015	-0.054 – -0.020	—
12	Axle housing bearing press fitted part clearance	Outer race	100	0 -0.018	-0.010 -0.045	-0.045 – 0.008	—
		Inner race	60	+0.021 +0.002	0 -0.015	-0.036 – -0.002	—
13	Clearance of guide pin		8	-0.080 -0.116	+0.058 0	0.08 – 0.174	—
14	Wheel bearing rotation starting torque		0.8 – 4.6 Nm {0.08 – 0.47 kgfm}				Adjust



1. Differential
2. Sun gear shaft
3. Planetary carrier
4. Axle shaft

Outline

- The final drive finally reduces the rotation speed of the engine and increases the drive force.
- The power transmitted from differential (1) through sun gear shaft (2) is reduced in speed by the planetary gear unit to increase the drive force.
- The increased drive force is transmitted through planetary carrier (3) and axle shaft (4) to the tyres.

FORKLIFT TRUCK

CX50 Series

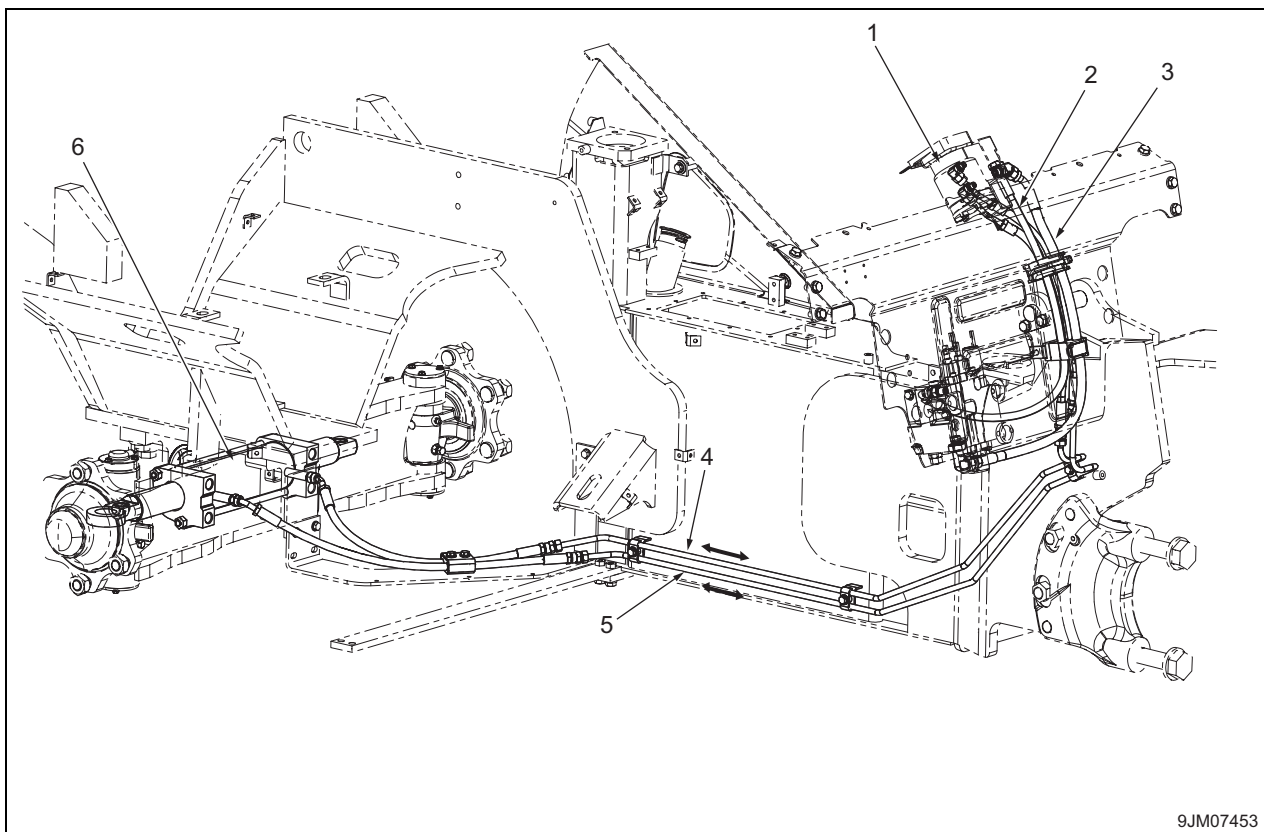
Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

10 Structure, function and maintenance standard

300 Steering system

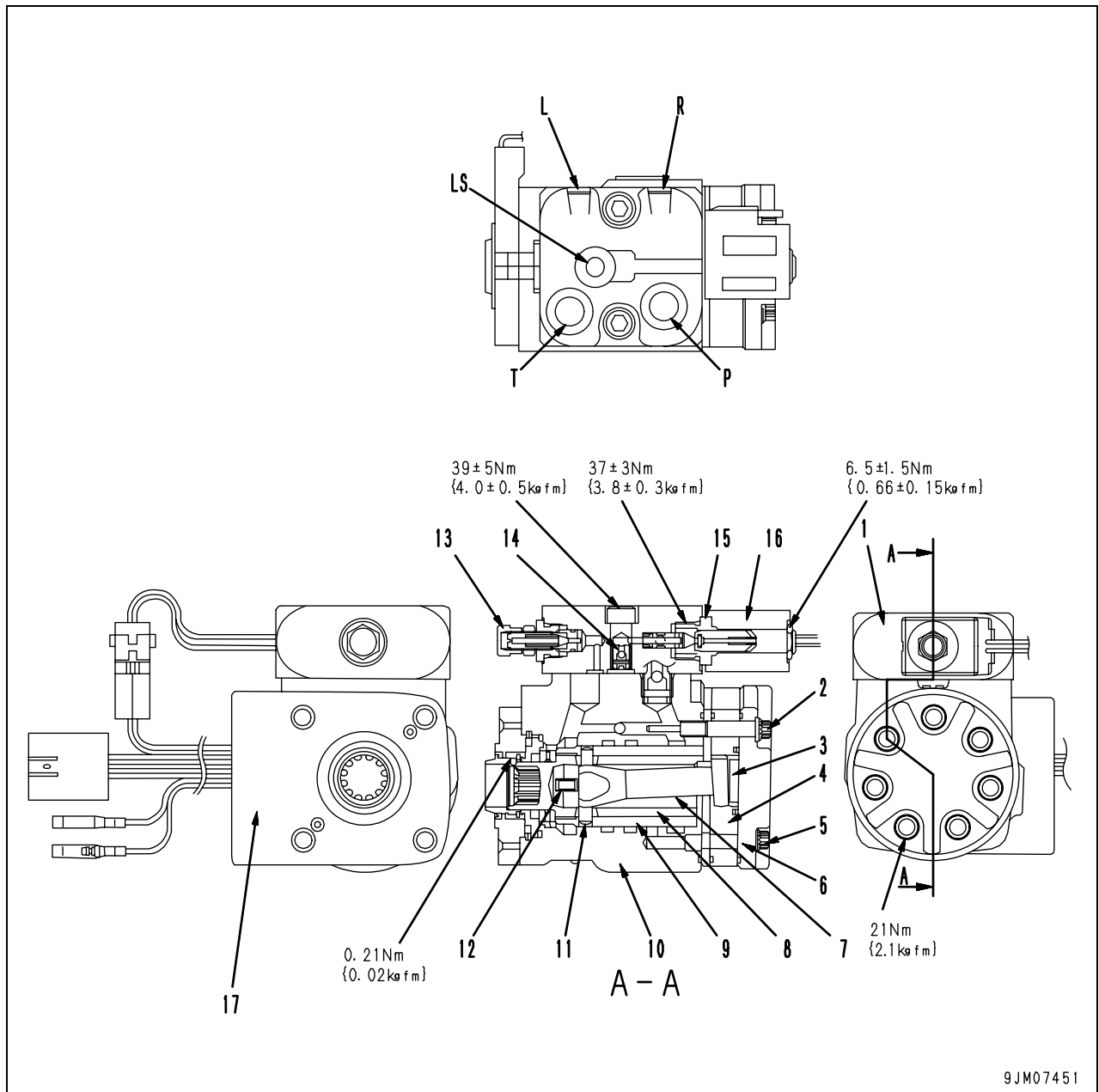
Steering piping diagram (control valve – power steering cylinder).....	2
Orbit-roll valve.....	3
Power steering cylinder.....	5

Steering piping diagram (control valve – power steering cylinder)



1. Orbit-roll valve
2. Hose (steering LS line)
3. Hose (steering P line)
4. Hose (for power steering)
5. Hose (for power steering)
6. Power steering cylinder

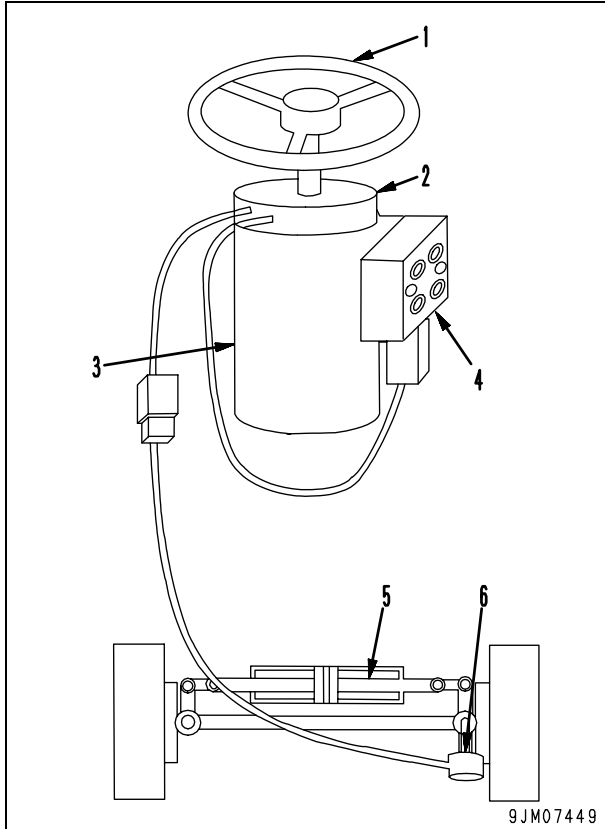
Orbit-roll valve



- | | |
|---|---|
| 1. EPACS (Electronic Proportional Active Control Steering System) valve | 14. Check valve assembly |
| 2. Retainer screw assembly | 15. Tube assembly |
| 3. Spacer | 16. Coil with connector |
| 4. Gerotor | 17. Electronic Proportional Active Control Steering System (EPACS) controller (*) |
| 5. Screw | |
| 6. End cap | |
| 7. Driver | |
| 8. Spool | |
| 9. Sleeve | |
| 10. Housing | |
| 11. Pin | |
| 12. Centering spring | |
| 13. Relief valve cartridge | |
- *: Related to only lift truck with EPACS
 L: Port L
 P: Port P
 R: Port R
 T: Port T
 LS: Port LS

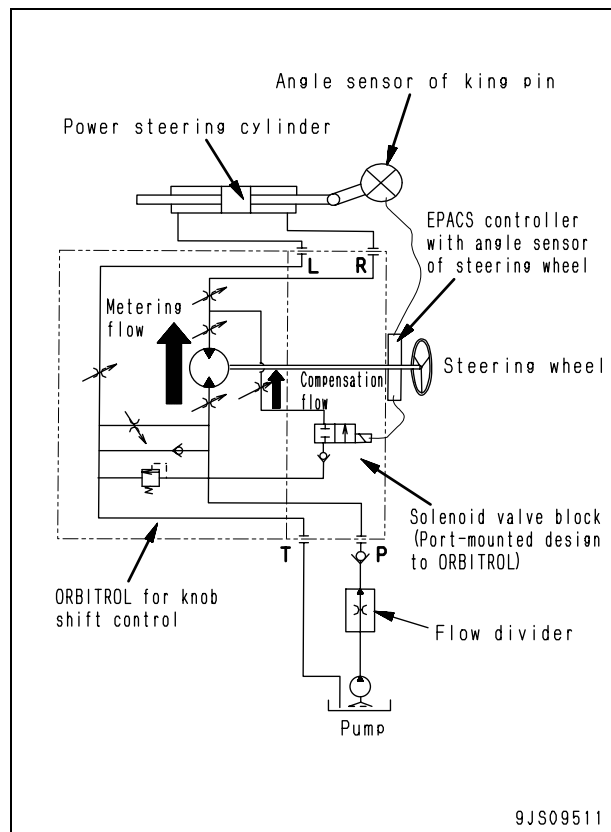
Outline

The Electronic Proportional Active Control Steering System (EPACS) electronically corrects the deviation between the steering wheel position and tyre position caused by leakage inside the orbit-roll valve that is inevitable to the full hydraulic power steering system.



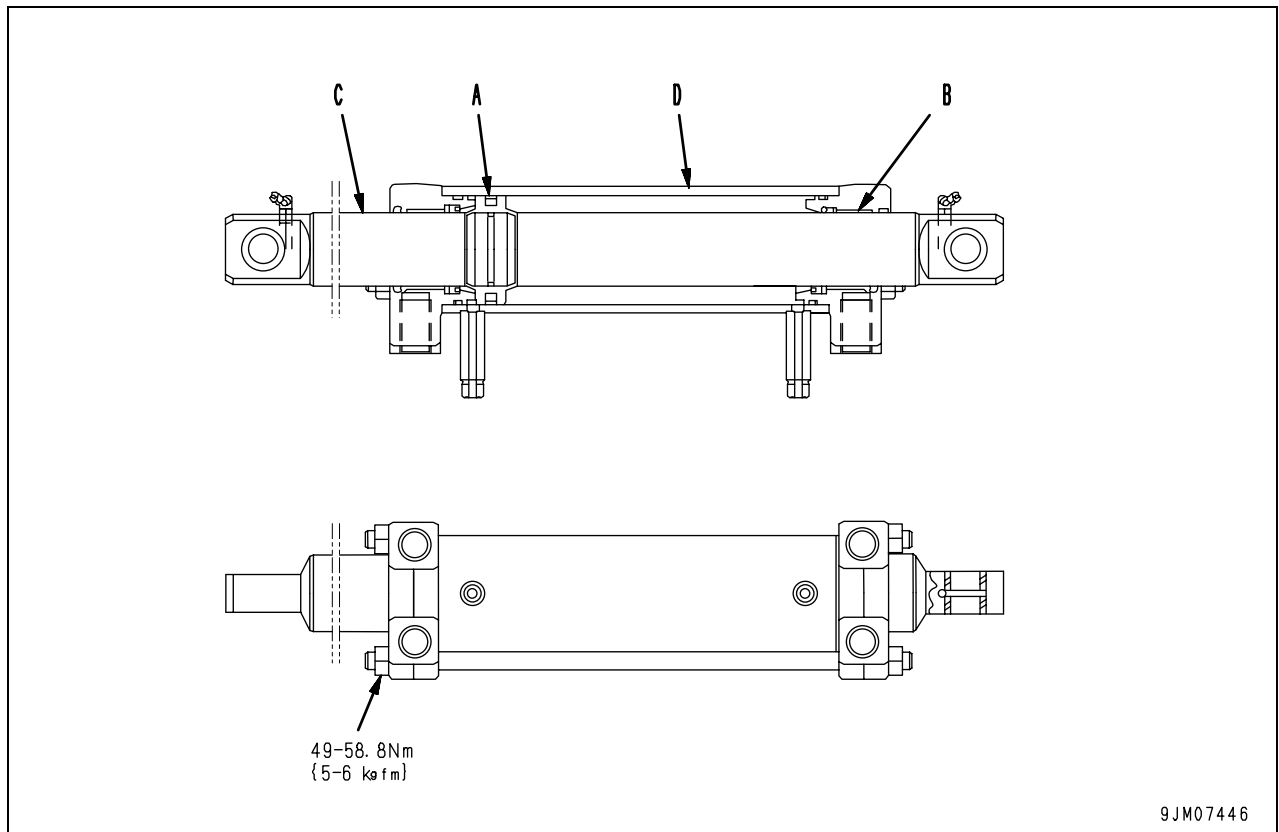
1. Steering wheel
2. Electronic Proportional Active Control Steering System (EPACS) controller (containing steering wheel angle sensor)
3. Orbit-roll valve
4. EPACS (Electronic Proportional Active Control Steering System) valve (*)
5. Power steering cylinder
6. Tyre angle sensor

*: Related to only lift truck with EPACS

Hydraulic circuit diagram

- The oil discharged from the pump flows through the EPACS valve port P into the orbit-roll and the oil of an amount in proportion to the steering wheel rotation number is discharged through the cylinder port (port R) into the cylinder to steer the wheels.
- The oil from the cylinder flows through the cylinder port (port L) into the orbit-roll and returns to the tank through port T.
- The EPACS reads the steering wheel angle and tyre angle from the steering wheel angle sensor and tyre angle sensor respectively. If there is deviation between them, the EPACS operates the EPACS valve solenoid to supply a correction oil flow to the cylinder to correct the deviation.
- As explained above, the leakage inside the orbit-roll is compensated by the correction oil flow to correct the deviation of the steering wheel position from the tyre angle.

Power steering cylinder



Unit: mm

No.	Check item	Criteria				Remedy
A	Clearance between cylinder and piston	Standard size		Tolerance	Repair limit	Replace
		Cylinder bore	Piston outside diameter	0.3 – 0.448	0.65	
		75 ^{+0.074} ₀	74.7 ⁰ _{-0.074}			
B	Clearance between piston rod and bushing	Bushing inside diameter	Rod outside diameter	0.032 – 0.228	0.492	
		50 ^{+0.164} _{+0.007}	50 ^{-0.025} _{-0.064}			
C	Piston rod	Flaw, bruise, streak, dent felt with stopper				
D	Cylinder	Flaw, bruise, streak, dent felt with stopper				

FORKLIFT TRUCK

CX50 Series

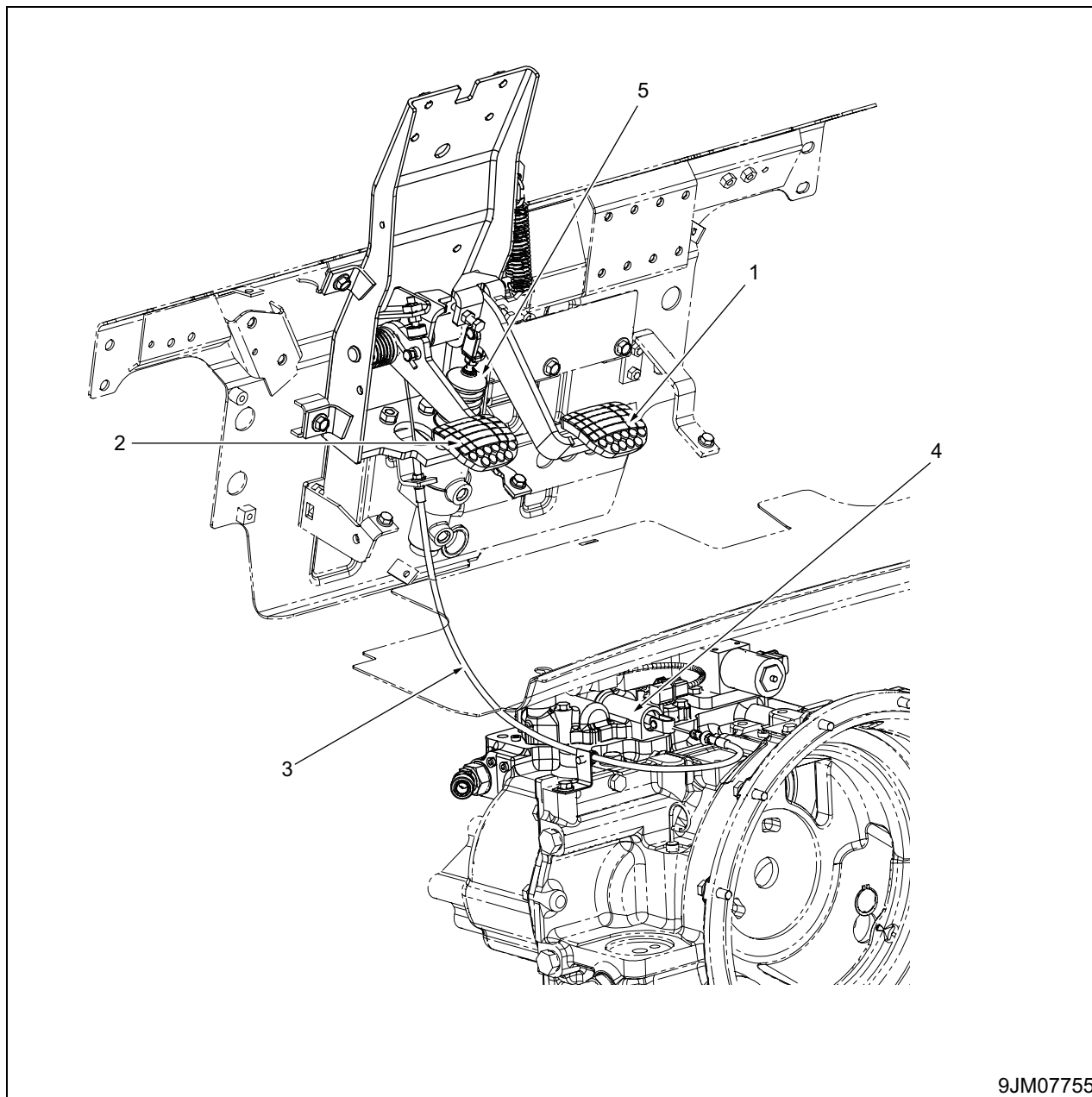
Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

10 Structure, function and maintenance standard

400 Brake system

Brake control	2
Brake piping diagram (control valve – accumulator)	3
Service brake	4
Accumulator charge valve	6
Brake valve	12
Slack adjuster	16
Accumulator (for brake)	20
Parking brake	21

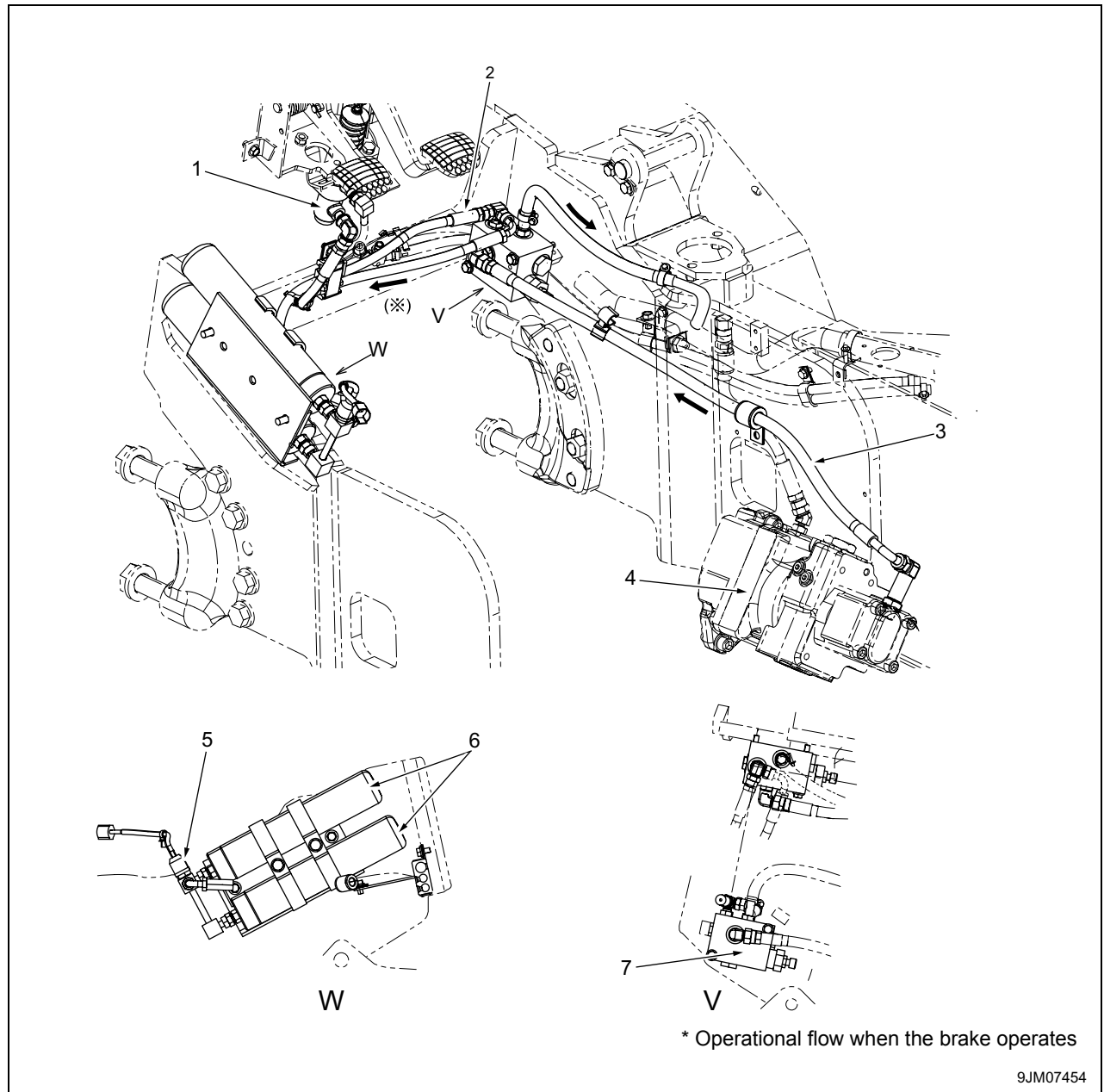
Brake control



9JM07755

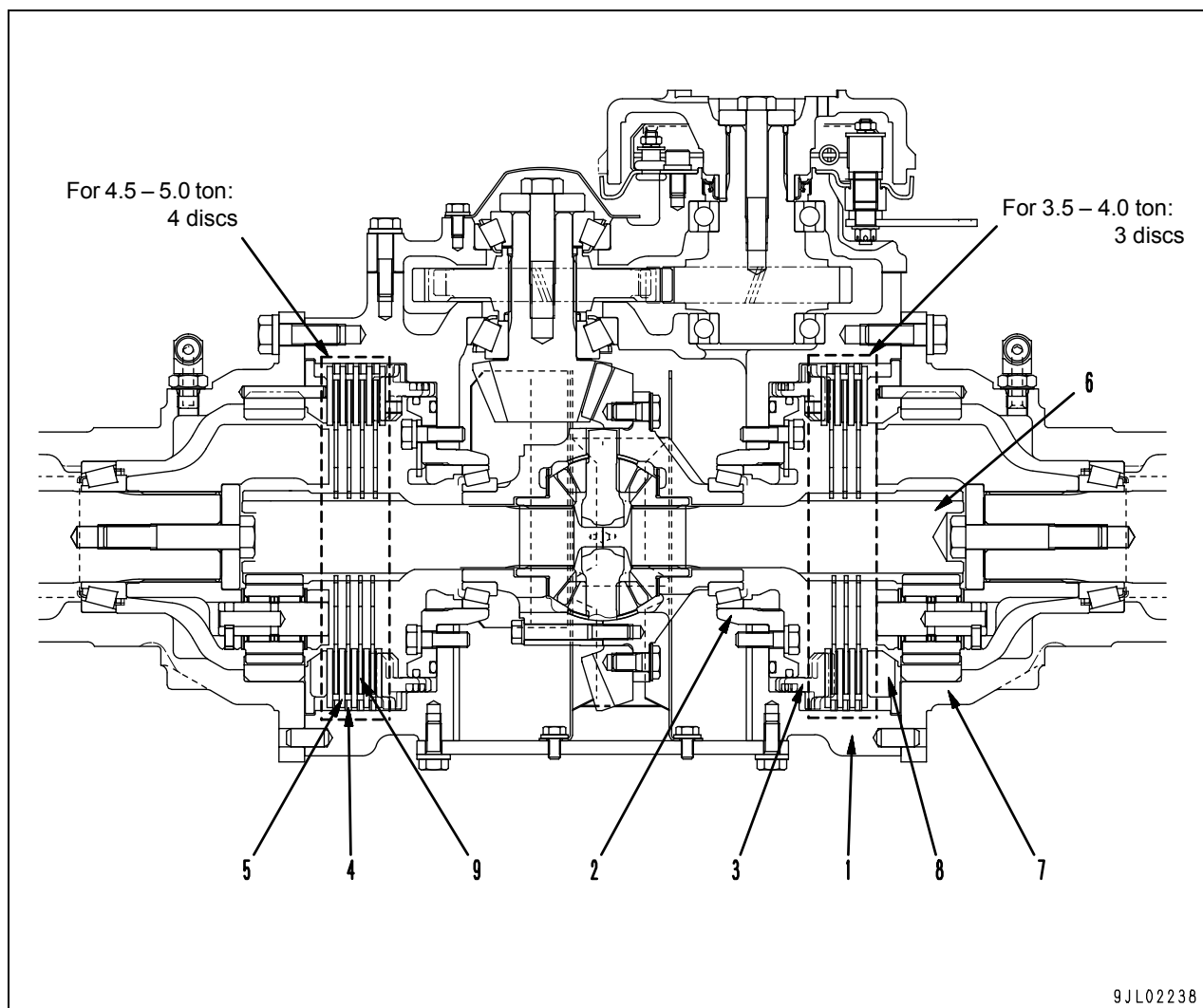
1. Brake pedal
2. Inching pedal
3. Inching cable
4. Inching valve
5. Brake valve

Brake piping diagram (control valve – accumulator)



1. Brake valve
2. Hose (for charging accumulator)
3. Hose (for charging brake)
4. Brake pump
5. Oil pressure switch (for accumulator oil pressure warning)
6. Accumulator
7. Accumulator charge valve

Service brake



1. Differential housing
2. Bearing carrier
3. Piston
4. Spring
5. Plate
6. Sun gear shaft
7. Axle housing
8. Outer plate
9. Disc

Function

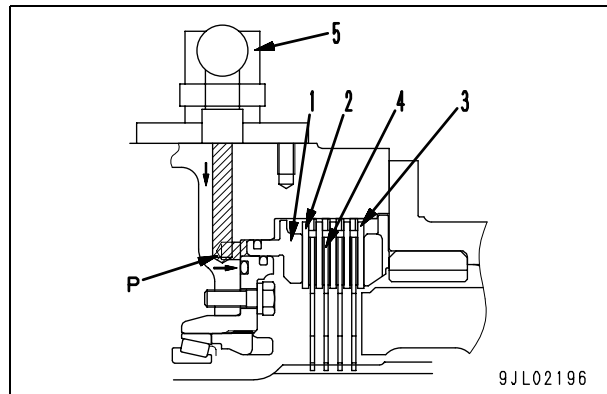
- The service brake is a wet multiple disc type brake consisting of piston (3), plate (5), disc (9), outer plate (8) and spring (4).
- The brake cylinder consists of differential housing (1) and bearing carrier (2) and has piston (3) in it.
- Plate (5) and outer plate (8) are fixed to the groove of differential housing (1) by lug.
- The linings are stuck to both sides of disc (9) and installed between plate (5) and outer plate (8) and these parts are connected by the spline of sun gear shaft (6).

Unit: mm

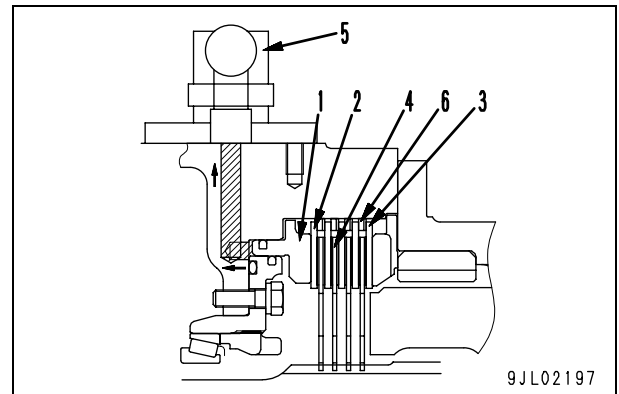
No.	Check item	Criteria			Remedy
4	Spring load	Standard size		Repair limit	Replace
		Installed height	Installed load	Installed load	
		5.1	904 N {92 kg}	768 N {78 kg}	
5	Plate thickness	Standard size	Tolerance	Repair limit	
		3.7	±0.1	3.5	
9	Brake disc thickness	4.4	±0.15	3.6	
	Lining groove depth	0.6 (Min.)	—	0.4	
	Lining thickness	1.0	0.8 (Min.)	—	

Operation**When operated**

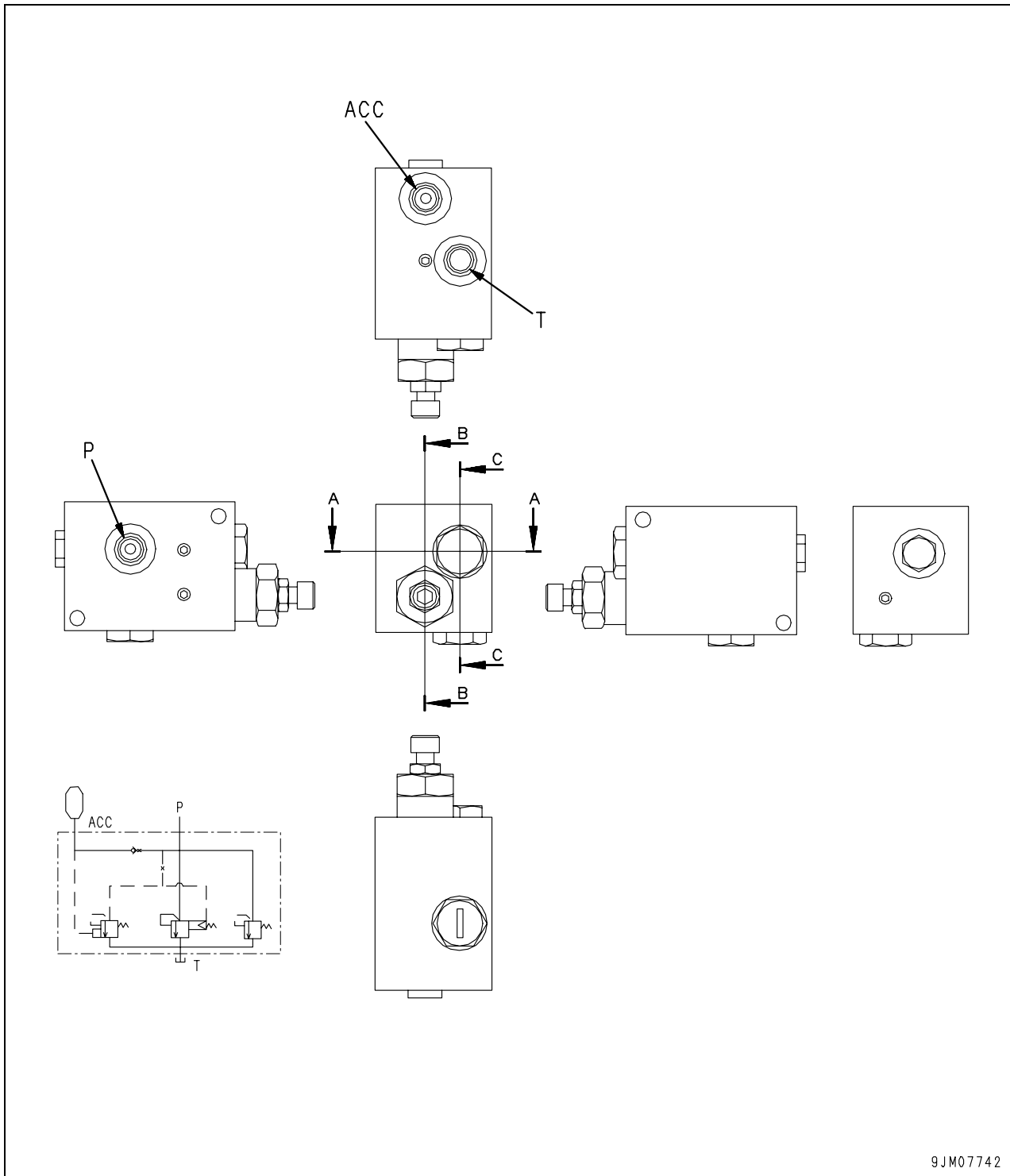
- If the brake pedal is depressed, hydraulic pressure (P) flows from the hydraulic tank through the pump, accumulator charge valve and slack adjuster and pushes piston (1) in the brake cylinder to slide.

**When released**

- If the hydraulic pressure is relieved, piston (1) is returned to the original position by the reaction force of spring (6) and clearance is made between plate (2) and outer plate (3) and then disc (4) is set free.



Accumulator charge valve



9JM07742

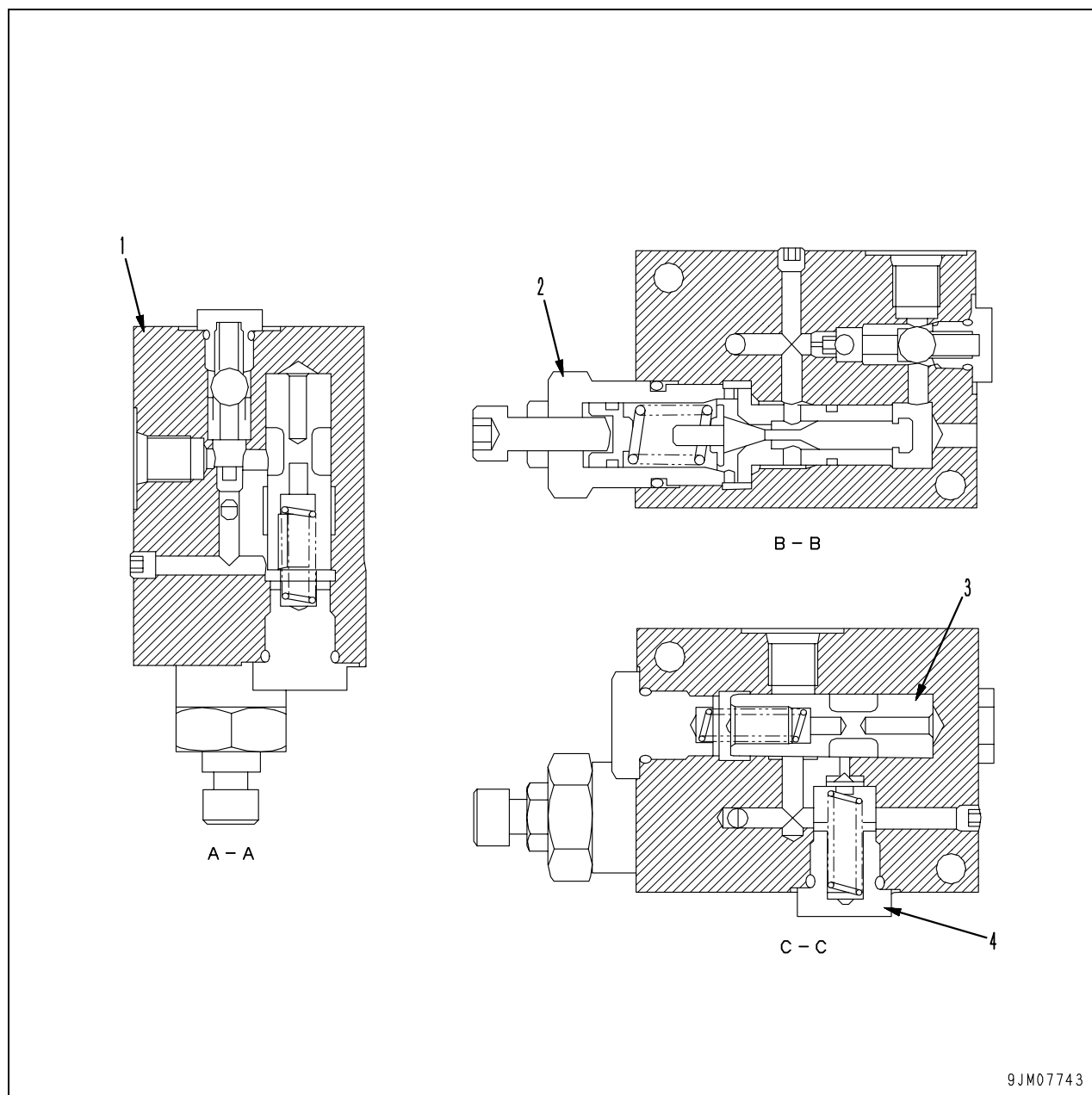
ACC: To brake valve/accumulator

P: From brake valve

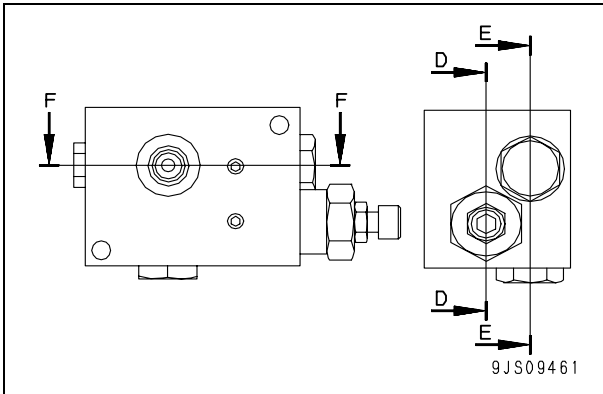
T: To hydraulic tank

Function

- The accumulator charge valve operates to keep the oil pressure from the pump at the specified level and charges the accumulator with pressure.
- If the oil pressure increases above the specified level, the oil from the pump flows to the drain circuit to reduce the pump load.



1. Valve body
2. Main relief valve
3. Unload spool
4. Safety valve

Operation**1. When oil is supplied to accumulator (Cut-in)**

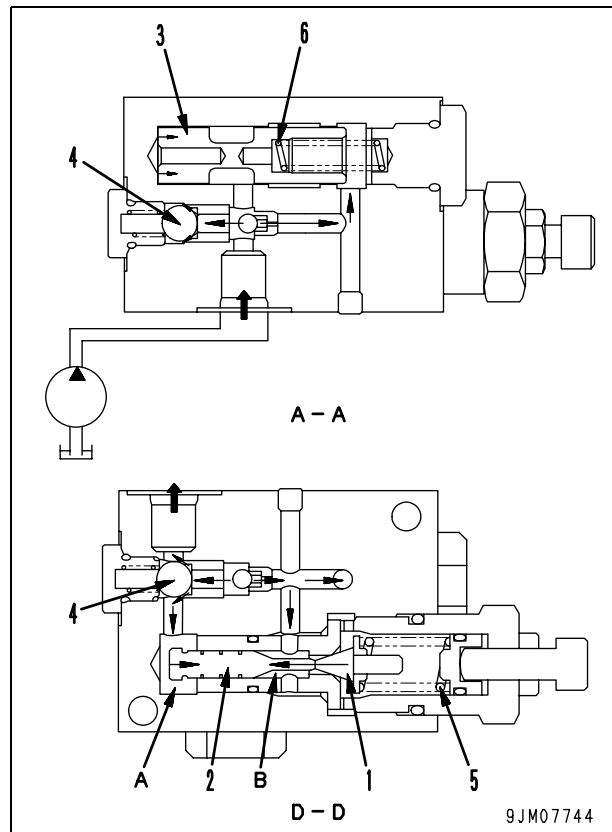
- The hydraulic oil sent from the pump pushes up check valve (4) and flows to the accumulator.

(Fig. 1/Fig. 2) Since the accumulator is connected to the pilot spool chamber (A), the accumulator pressure acts on the pilot spool (2).

- Since the hydraulic oil from the pump flows into relief chamber (B) at the same pressure as the accumulator pressure, the pressure in pilot spool chamber (A) and that in relief chamber (B) are the same, thus pilot spool (2) does not move.

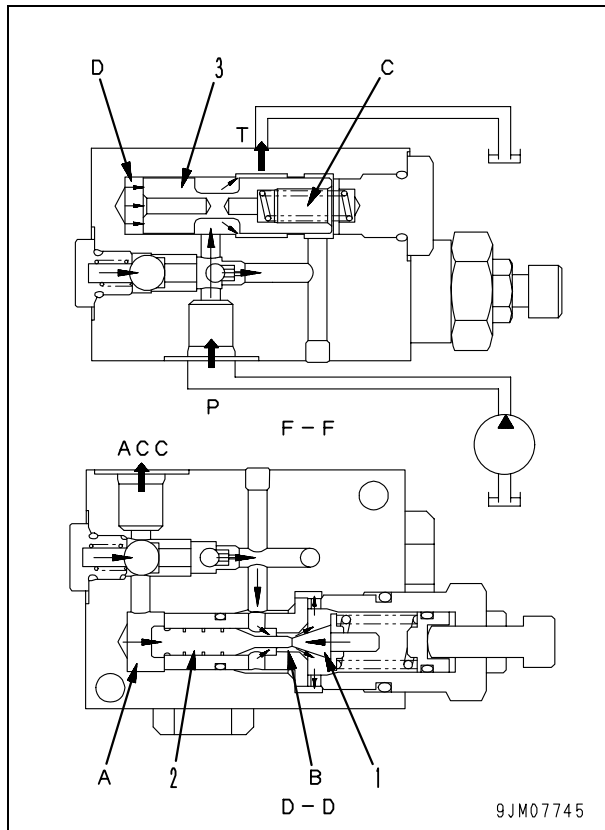
Main relief valve (1) is pressed by control spring (5) and does not move until the specified pressure is applied, similarly to pilot spool (2). (Fig.2)

- The pressures on both sides of unload spool (3) are the same and the unload spool is moved to the left by the load of spool return spring (6), thus the pump is disconnected from the drain circuit.



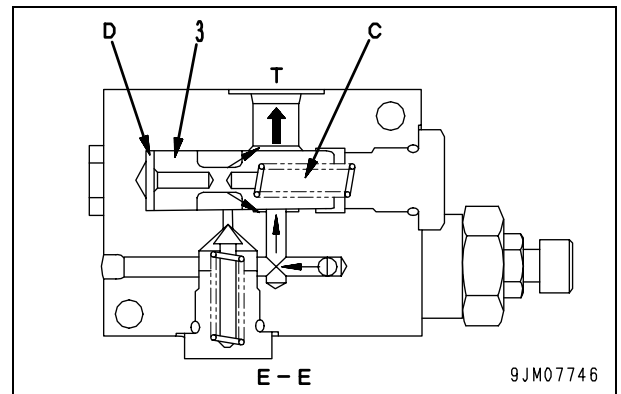
2. When accumulator pressure reaches cut-pressure

- If the hydraulic pressure sent from the pump is stored in the accumulator to the specified pressure (cut-out), it pushes main relief valve (1) open and connects to port T (the relief chamber pressure decreases).
- Accordingly, a pressure difference is made between pilot spool chamber (A) and relief chamber (B) and then contacting pilot spool (2) pushes main relief valve (1) open further.



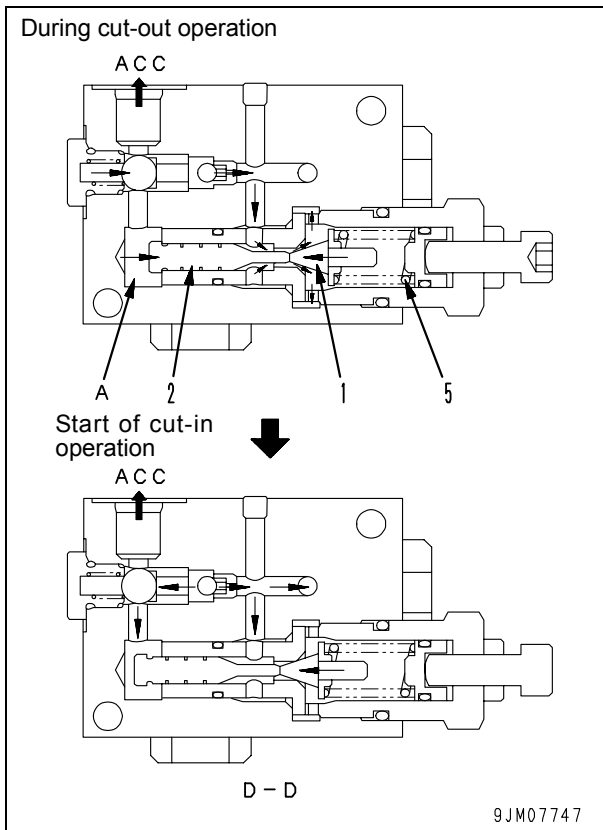
- Since the pressure in spring chamber (C) decreases, a pressure difference is made between connected unload spool (3) and spool pressure chamber (D) and then unload spool (3) moves to the right and lets the hydraulic oil from the pump flow to the hydraulic tank.

The unloading state is continued until the accumulator pressure decreases to the specified pressure (cut-in).

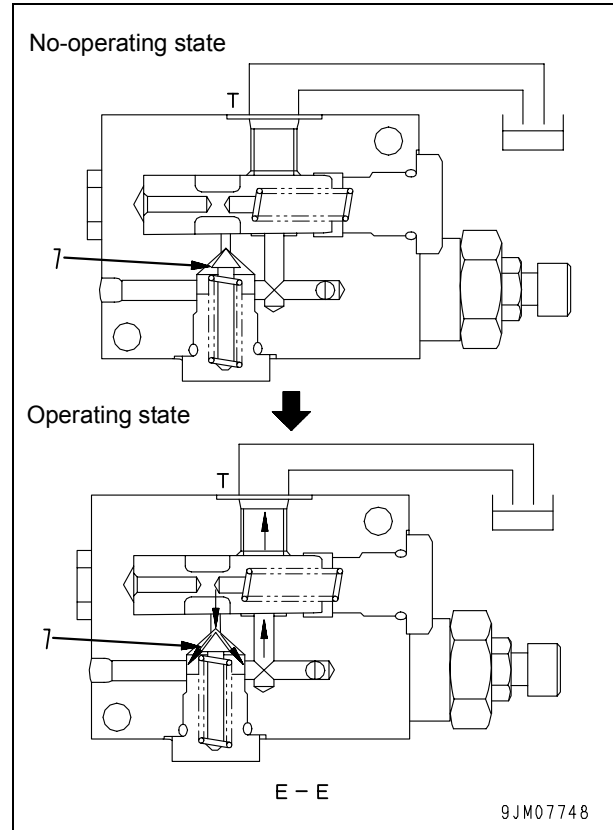


3. Cut-in operation

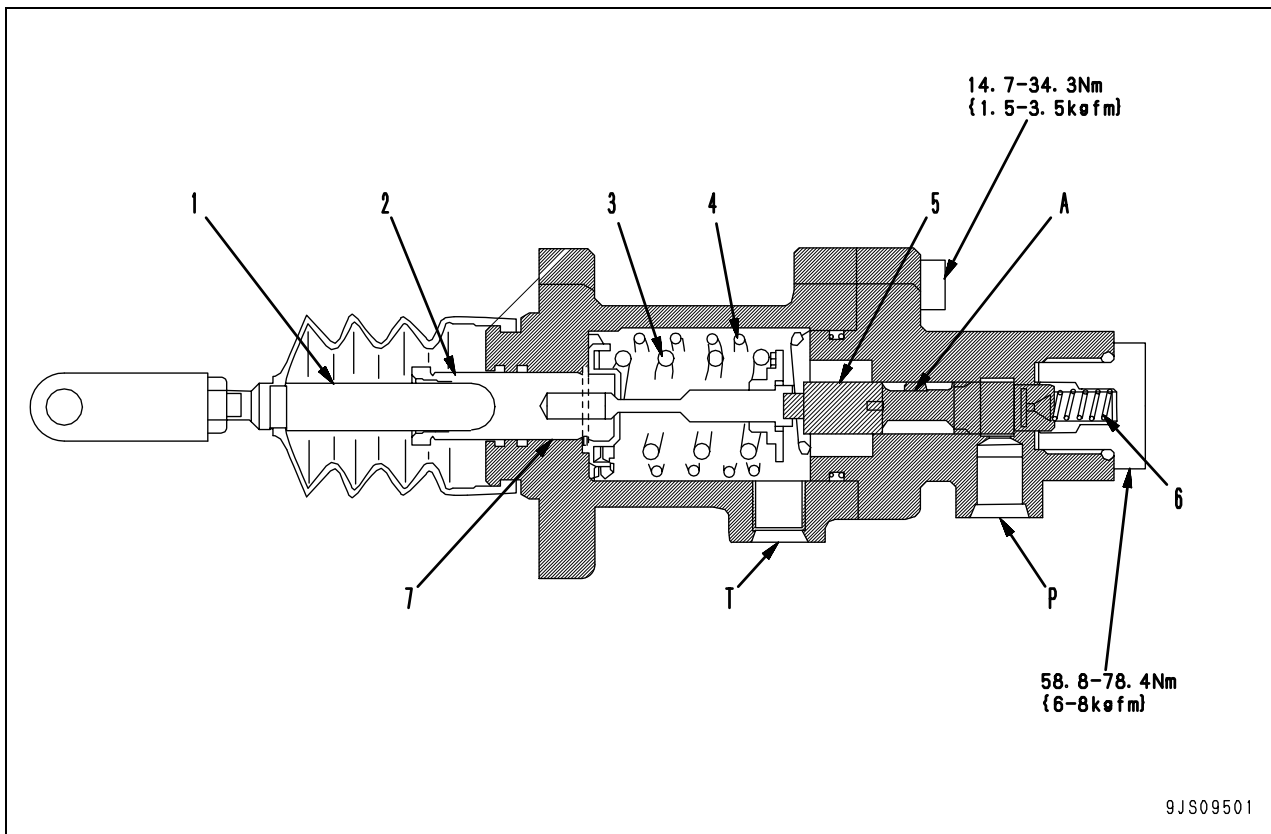
- Since the pressure in the pilot spool chamber (A) decreases as the accumulator pressure decreases, the load of pressure control spring (5) pushes back pilot spool (2) to the left and closes main relief valve (1). At this time, the accumulator pressure is set as the cut-in pressure and the system is set in the charging state explained in 1.

**4. Safety valve**

- If the pressure supplied from the pump increases above the safety valve set pressure because of loss of the functions of the component parts, the hydraulic oil from the pump pushes safety valve (7) down to let the oil flow to the tank circuit. As a result, the maximum pressure in the brake circuit is limited and the circuit is protected.



Brake valve



1. Push rod
2. Piston
3. Control spring
4. Pedal return spring
5. Spool
6. Spool return spring

A: Out port (to slack adjuster)
 P: IN port (from accumulator)
 T: Drain port

Function

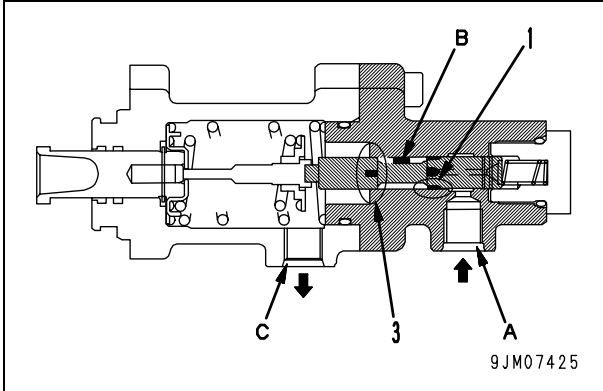
- The brake valve controls the hydraulic pressure supplied from the brake pump and supplies it to the wet brake chamber according to the pedal depressing force (pedal stroke).
- To avoid constant high-load pump operation, accumulator charge valve and accumulator are installed so that the brake can be operated by the specified numbers even while the engine (pump) is stopped.

Unit: mm

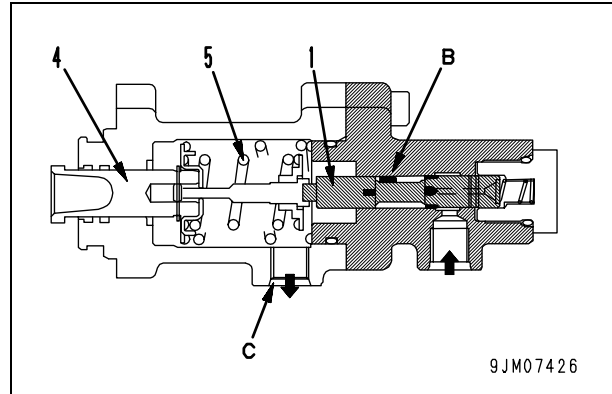
No.	Check item	Criteria						Remedy
3	Control spring	Standard size				Repair limit		Replace
		Outside diameter	Free length	Installed length	Installed load	Free length	Installed load	
		29.0	(52)	49.7	64.2 N {6.6 kgf}	46.8	57.8 N {5.9 kgf}	
4	Pedal return spring	39.0	(71.7)	58.6	97.8 N {10.0 kgf}	64.5	88.0 N {9.0 kgf}	
6	Spool return spring	9.0	52	49.7	64.4 N {6.6 kgf}	46.1	57.1 N {5.8 kgf}	
7	Clearance between flange and piston	Standard size				Standard clearance	Allowable clearance	
		Base diameter		Flange diameter	Piston diameter			
		18.0		+0.043 0	-0.016 -0.043		0.016 – 0.086	

Operation**When not operated**

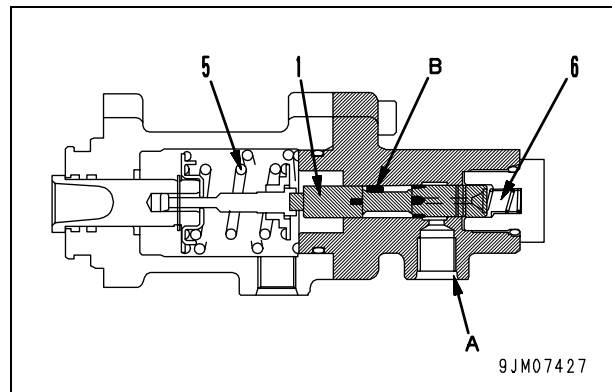
- The hydraulic oil is led from the pump through accumulator to IN port (A) but the oil passage is stopped by spool (1).
- The hydraulic oil in the brake chamber flows from OUT port (B) through the valve, spool notch (3) and drain port (C) to the tank to relieve the brake pressure into the atmosphere.

**When operated (Piston is moved halfway)**

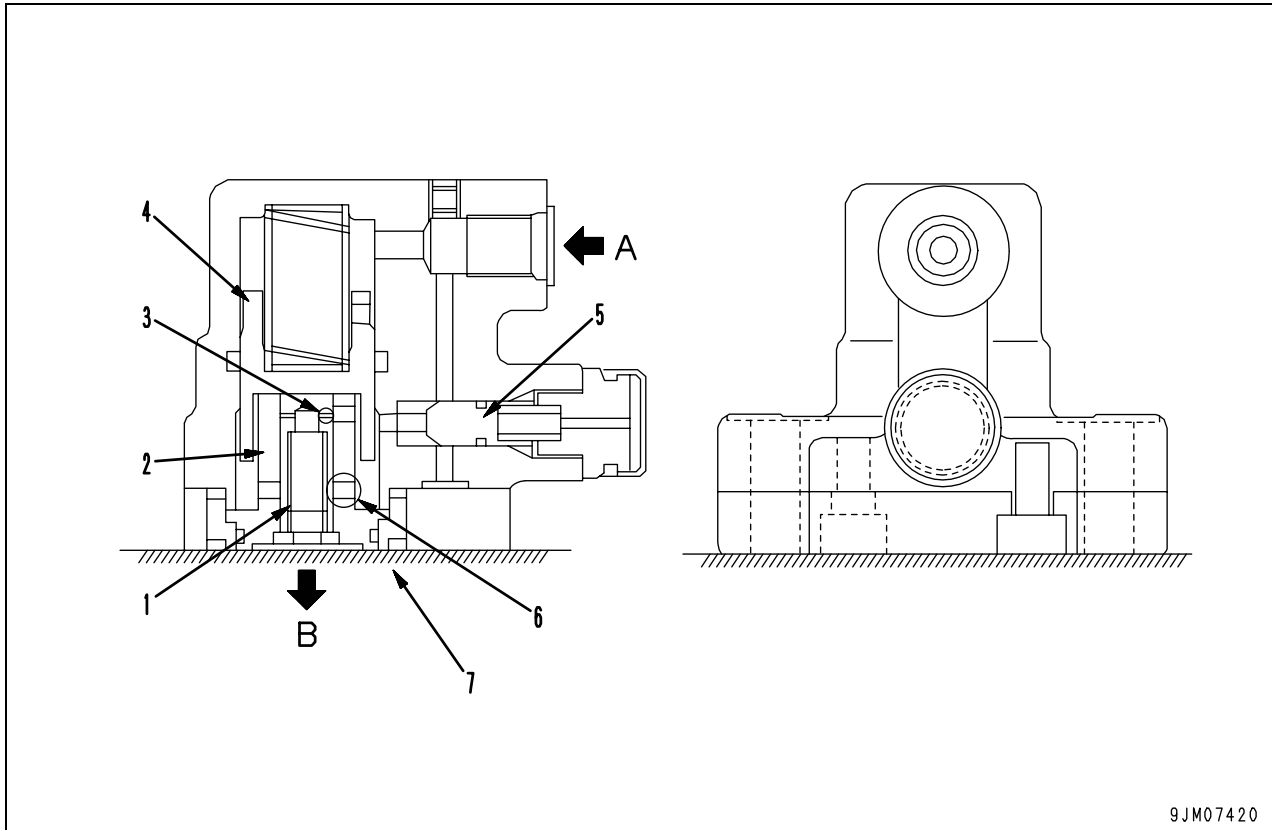
- If piston (4) is pushed in, spool (1) moves through control spring (5) and OUT port (B) is disconnected from drain port (C).



- If spool (1) moves further, IN port (A) is connected to OUT port (B) and the pressurized oil flows from the accumulator through the valve to the brake chamber.
- Since the pressure in the brake chamber (output pressure) is also led to reaction force chamber (6), it returns spool (1) toward control spring (5). As a result, spool (1) disconnects IN and OUT ports at a position where the spring load is balanced, and oil pressure is kept.
- From the above operation, output pressure in proportion to the pedal depressing force (control spring + pedal return spring) is obtained.



Slack adjuster



9JM07420

1. Cushion valve mechanism spool
2. Cushion valve mechanism cylinder
3. 2-ø0.7 orifice
4. Slack adjuster mechanism piston
5. Check valve
6. 4-ø4 main oil passage
7. Axle

- A. Inlet port
B. Outlet port

Function

- The slack adjuster is installed to the brake oil line between the brake valve and brake piston. It evens the brake operation time lag and suppresses the "stepped braking" and "backlash sound".

Specifications

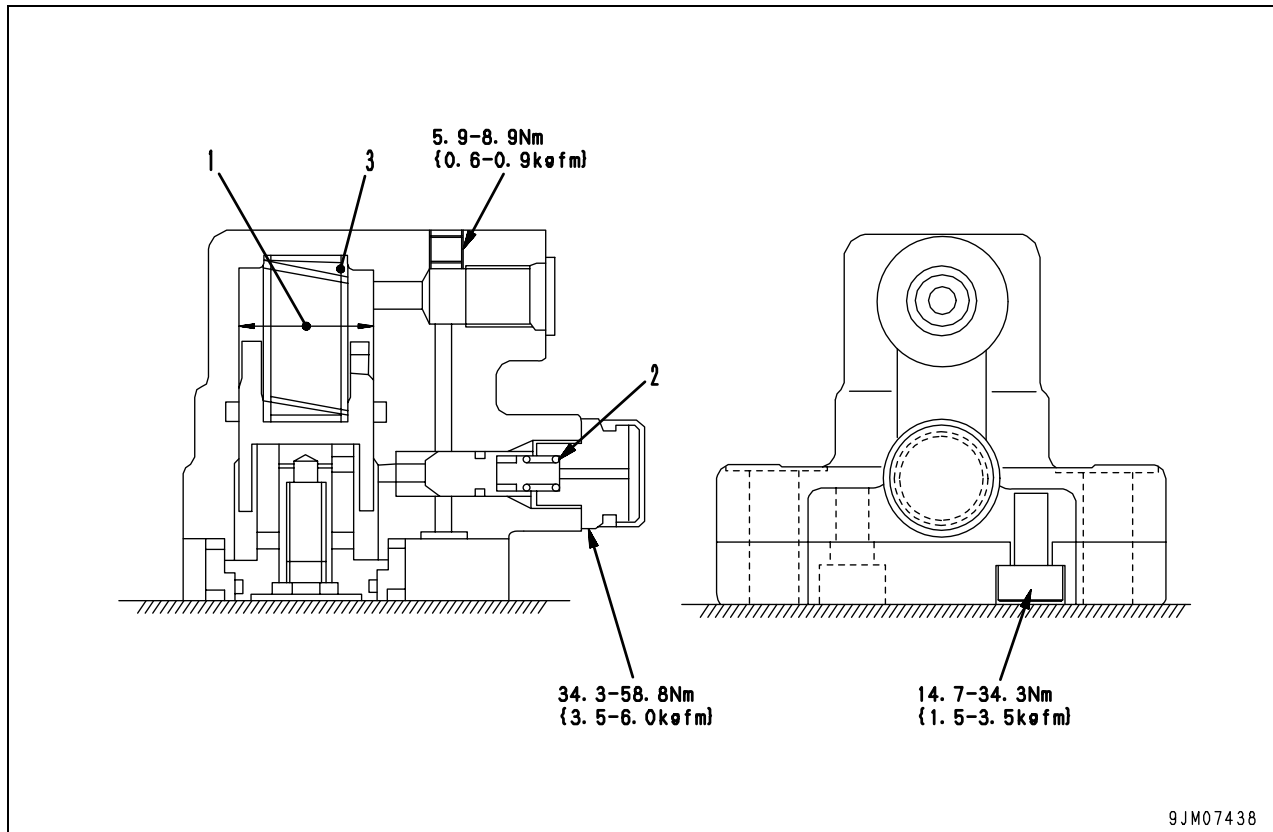
Unit: MPa {kgf/cm ² }	
Piston drive pressure	0.01 – 0.02 {0.1 – 0.2}
Check valve cracking pressure	0.88±0.098
Check valve checking pressure	0.57±0.098

Cushion mechanism

- If the brake pedal is depressed sharply, the generated peak pressure causes "stepped braking", "backlash sound", etc. Generally, the peak pressure is restricted by installing an orifice or damping part (ACC etc.) in the hydraulic piping after the brake valve so that hydraulic oil will be supplied to the brake chamber gently. If this method is applied, the response is lowered more or less, however.

Accordingly, the throttling rate is decided from the balance between the response required by the lift truck and the peak pressure restriction effect. However, it is difficult to attain both peak pressure restriction and high response for medium and small-sized lift trucks, since high brake response is required.

To solve this problem, the response reduction is minimized and the peak pressure (backlash sound) is restricted by starting oil flow control just before the brake discs contact each other while maintaining the slack adjuster mechanism.

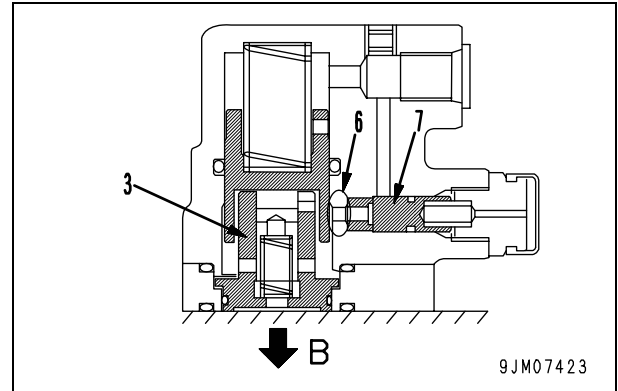
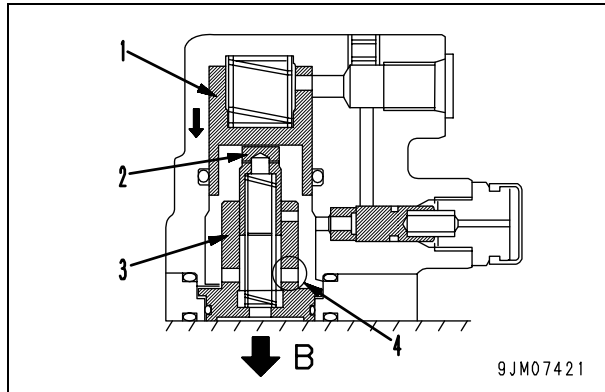


Unit: mm

No.	Check item	Criteria						Remedy	
1	Clearance between cylinder body and piston	Standard size				Standard clearance	Allowable clearance	Replace	
		Base diameter	Cylinder diameter	Piston diameter					
		30.0	+0.052 0	-0.020 -0.053	0.020 – 0.105	0.205			
2	Check valve spring	Standard size				Repair limit			
		Outside diameter	Free length	Installed length	Installed load	Free length	Installed load		
		7.2	(17.7)	14.0	43.5 N {4.4 kgf}	15.9	39.2 N {4.0 kgf}		
3	Slack adjuster spring	18.6	(76.2)	37.6	26.9 N {2.7 kgf}	68.6	24.2 N {2.5 kgf}		

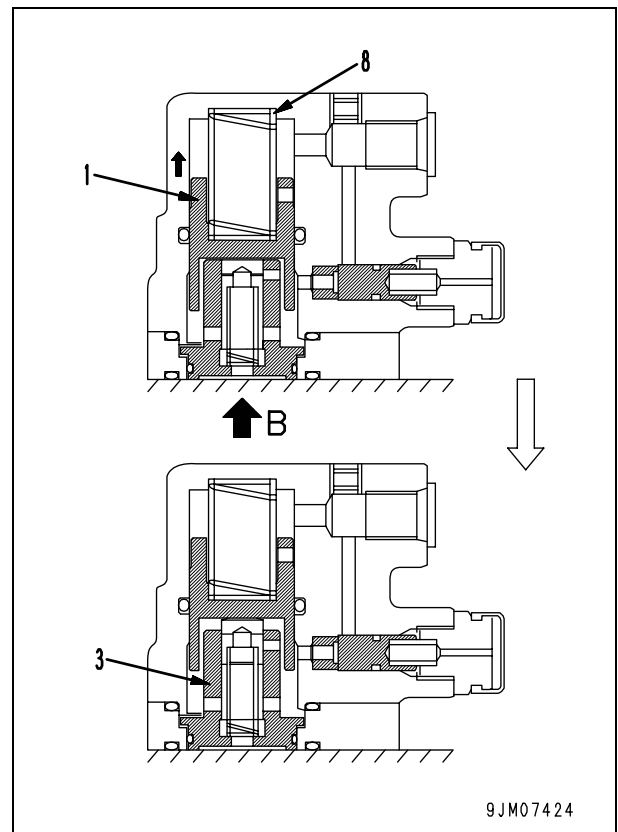
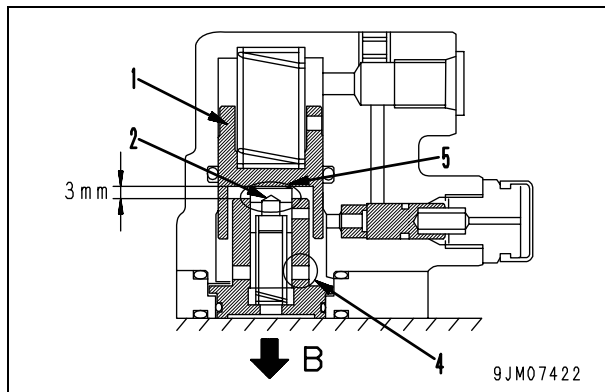
Operation

- The hydraulic oil sent from the brake valve pushes slack adjuster mechanism piston (1) toward OUT port (B), and the cushion valve mechanism spool (2) moves inside the cushion valve mechanism cylinder (3), following the slack adjuster mechanism piston (1). This hydraulic oil is sent through 4- ϕ 4 main oil passages (4) to OUT port (B).



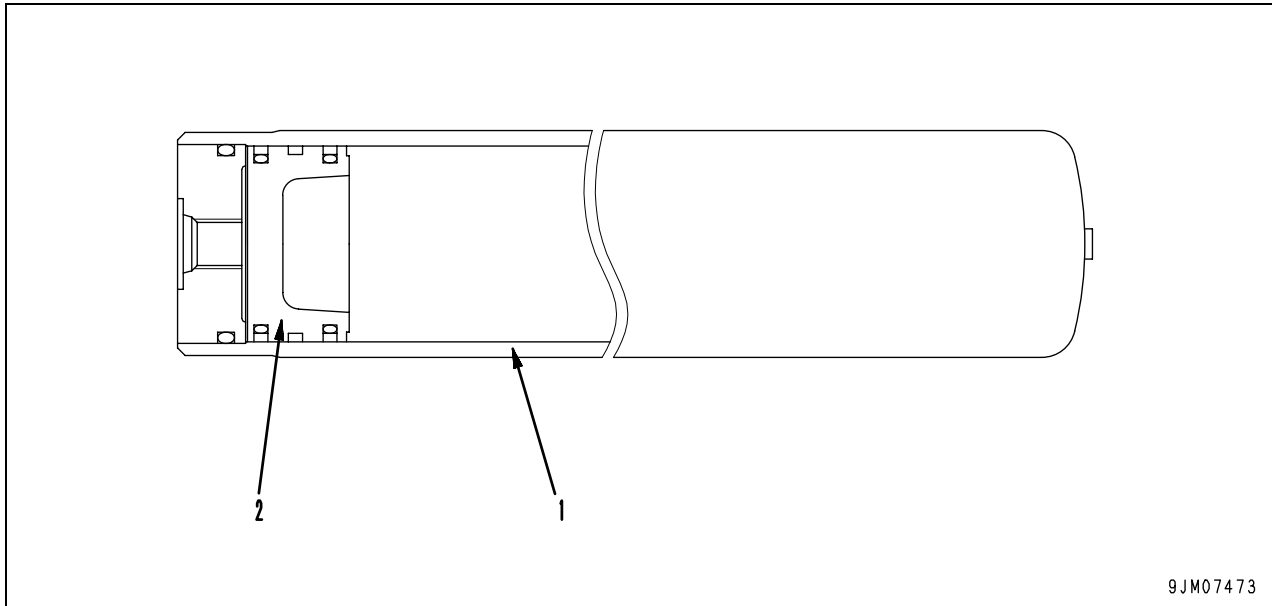
- If the brake is released and the check valve closes, slack adjuster mechanism piston (1) is returned by the force of return spring (8) in the axle and the residual pressure on the OUT port (B) side, while compressing spring (8), thus oil necessary for brake operation (refill capacity) is stored in cushion valve mechanism cylinder (3). (Slack adjuster mechanism)

- The 4- ϕ 4 main oil passages are shut off by cushion valve mechanism spool (2) at 3 mm before the stroke end of slack adjuster mechanism piston (1), and then the oil is sent through only ϕ 0.7 orifice (5) to OUT port (B) to operate the brake. (Cushion mechanism)



- If the pressure in cushion valve mechanism cylinder (3) increases to the cracking pressure of check valve (7), the pressure in the line between the IN and OUT ports becomes constant. At this time, if the oil quantity is insufficient for brake operation because of wear of the discs, the hydraulic oil is supplied from check valve oil passage (6) to the OUT port (B) side. (Slack adjuster mechanism)

Accumulator (for brake)



9JM07473

1. Cylinder
2. Free piston

Function

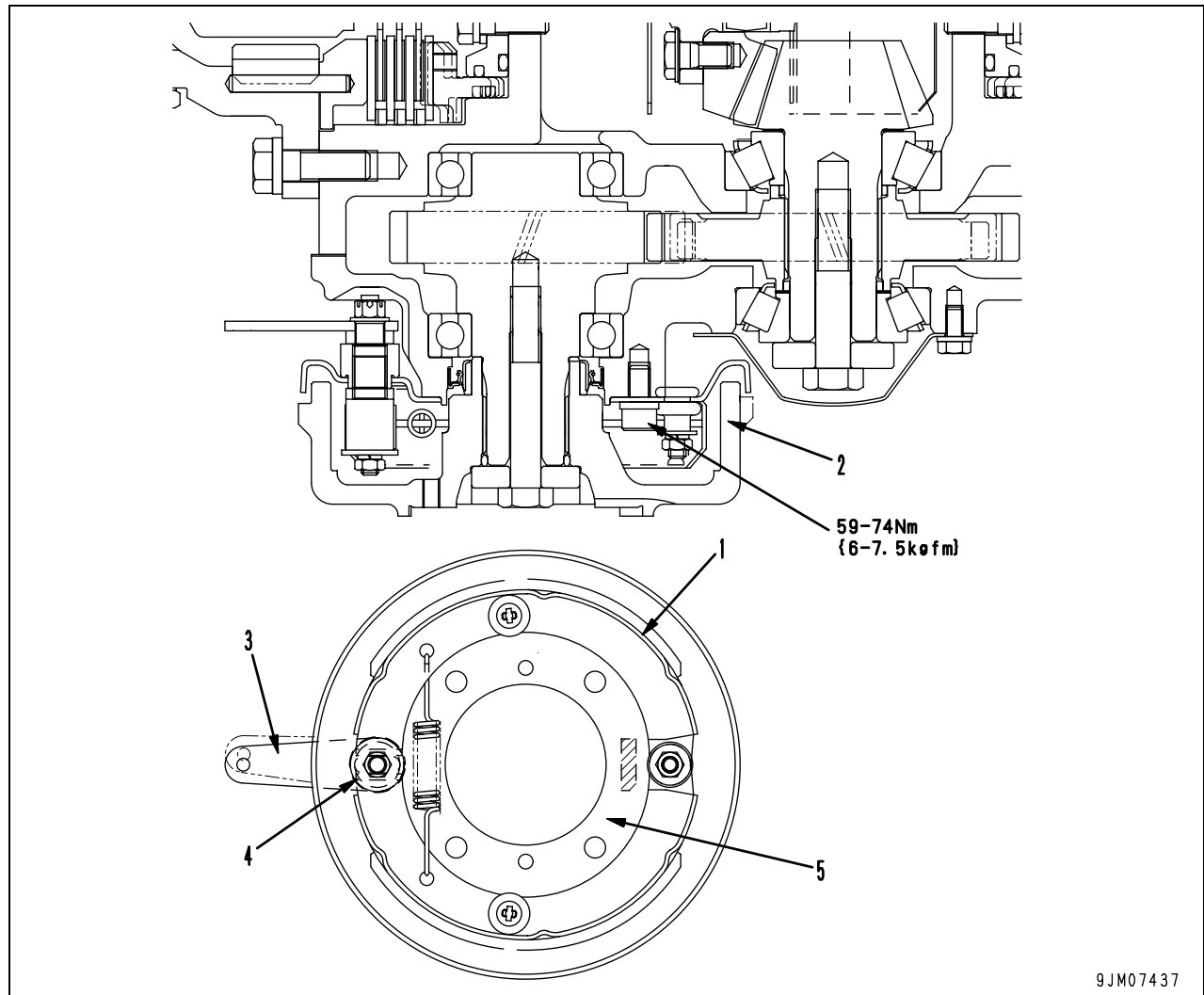
- This accumulator is installed between the accumulator charge valve and brake valve. The space between cylinder (1) and free piston (2) is charged with nitrogen gas.
- The brake hydraulic oil pressure is accumulated by utilizing compressibility of nitrogen gas and used as a pressure source of braking force for the lift truck.

⚠ Since the nitrogen gas pressure in the accumulator is very high, take extreme care in handling the accumulator. Never disassemble the accumulator.

Specifications

Gas used		Nitrogen gas
Charge quantity	cc	500
Charge pressure (at 20°C)	MPa {kgf/cm ² }	3.43±0.1 {35±1.0}

Parking brake



1. Shoe and lining
2. Drum
3. Lever
4. Camshaft
5. Back plate

Structure

- The parking brake is internal expanding type and consists of back plate (5), lever (3), camshaft (4), shoe and lining (1) and other parts.

Function

- If lever (3) is pulled, camshaft (4) rotates to press shoe and lining (1) against drum (2), thus the lift truck is braked.

Unit: mm

No.	Check item	Criteria			Remedy
		Standard size	Tolerance	Repair limit	
1	Lining thickness	5	—	3.5	Replace
2	Wear/Damage of drum	180	0 ± 0.1	181	

FORKLIFT TRUCK

CX50 Series

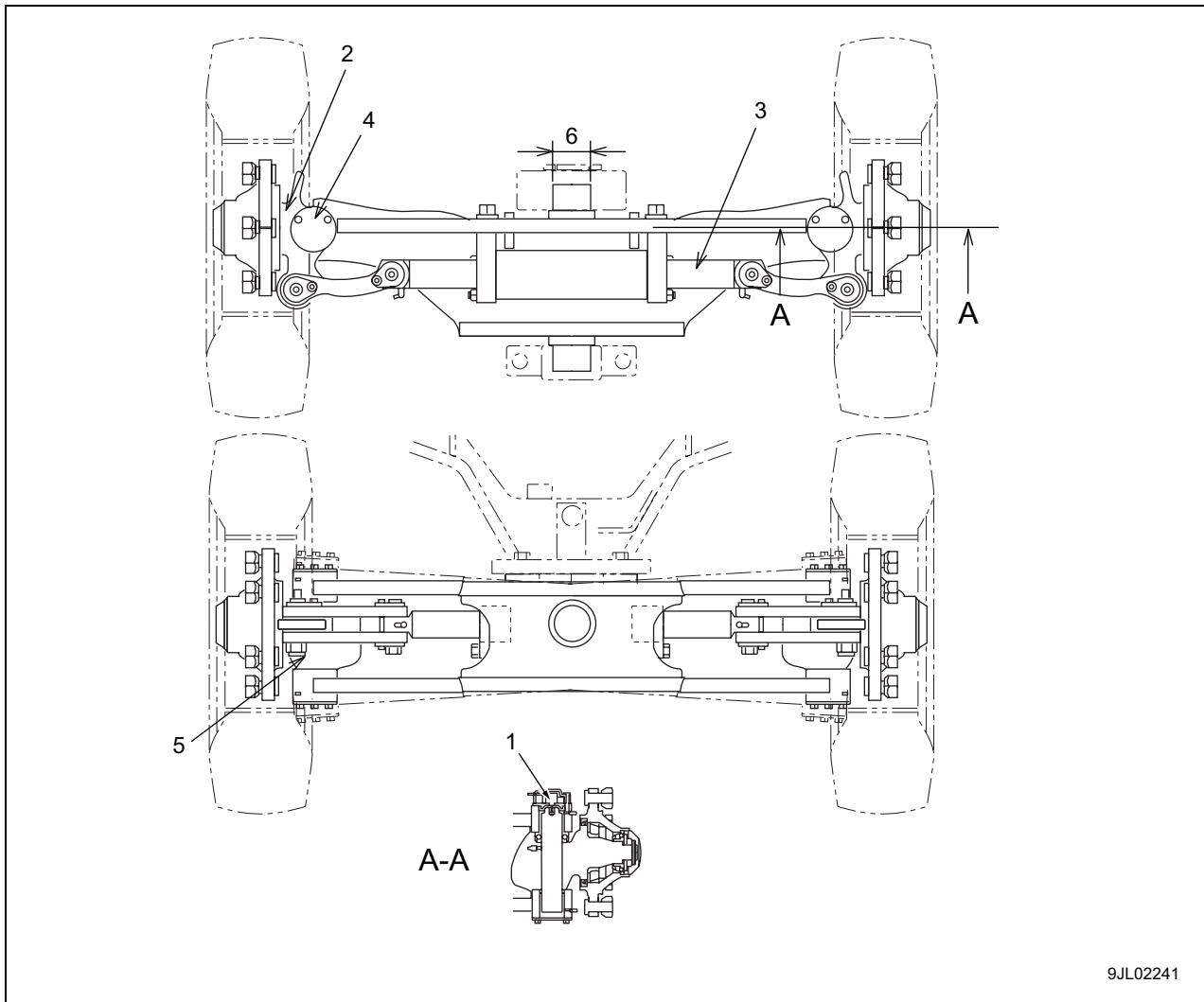
Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

10 Structure, function and maintenance standard

500 Undercarriage and frame

Rear axle.....	2
Hydraulic tank piping diagram.....	3

Rear axle



9JL02241

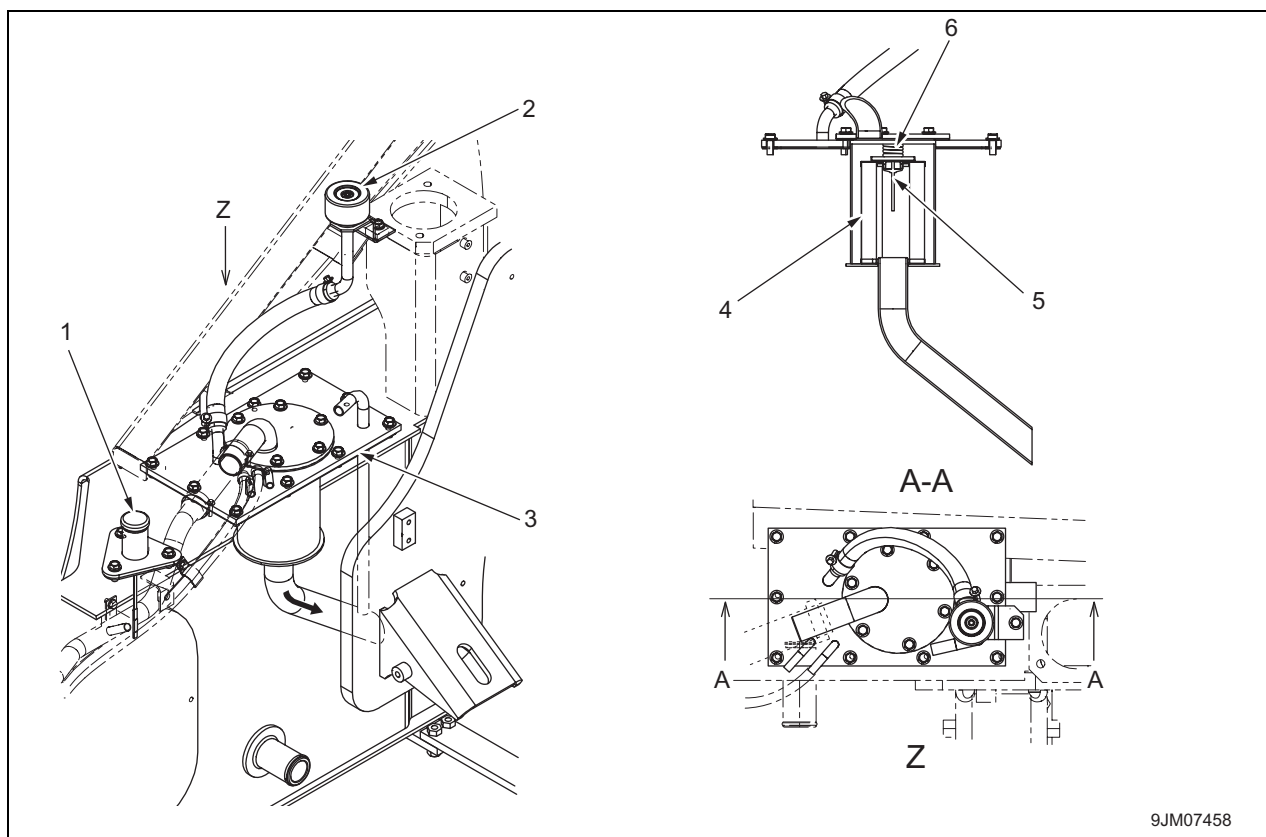
1. Tyre angle sensor (*)
2. Knuckle
3. Power steering cylinder

*: Related to only lift truck with EPACS.

Unit: mm

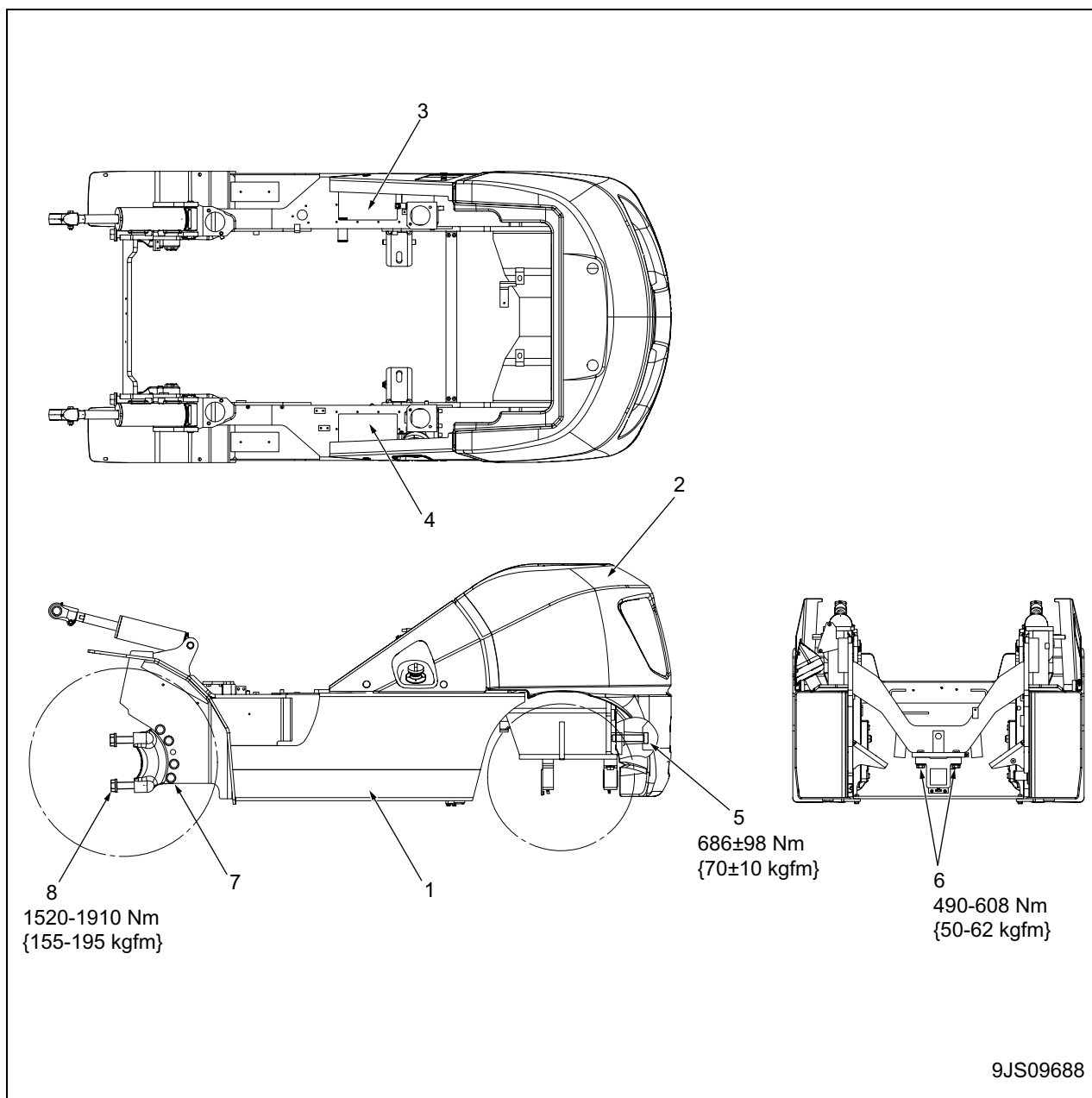
No.	Check item	Criteria		Remedy
4	King pin diameter	Standard size	Repair limit	Replace
		40	39.8	
5	Knuckle top and bottom play	—	0.2	Adjust shim
6	Center pin diameter	65	64.5	Replace
—	Rear axle, hub, knuckle and bearing	Cracks, damage and flaking Seizure, abnormal rotation, abnormal noise		

Hydraulic tank piping diagram



1. Cap/Gauge
2. Breather
3. Tank cover
4. Filter element
5. Valve
6. Spring

Frame



1. Frame
2. Counterbalance-weight
3. Hydraulic tank
4. Fuel tank
5. Counterbalance-weight mounting bolt
6. Rear axle mounting bolt
7. Front axle support mounting bolt
8. Front axle mounting bolt

FORKLIFT TRUCK

CX50 Series

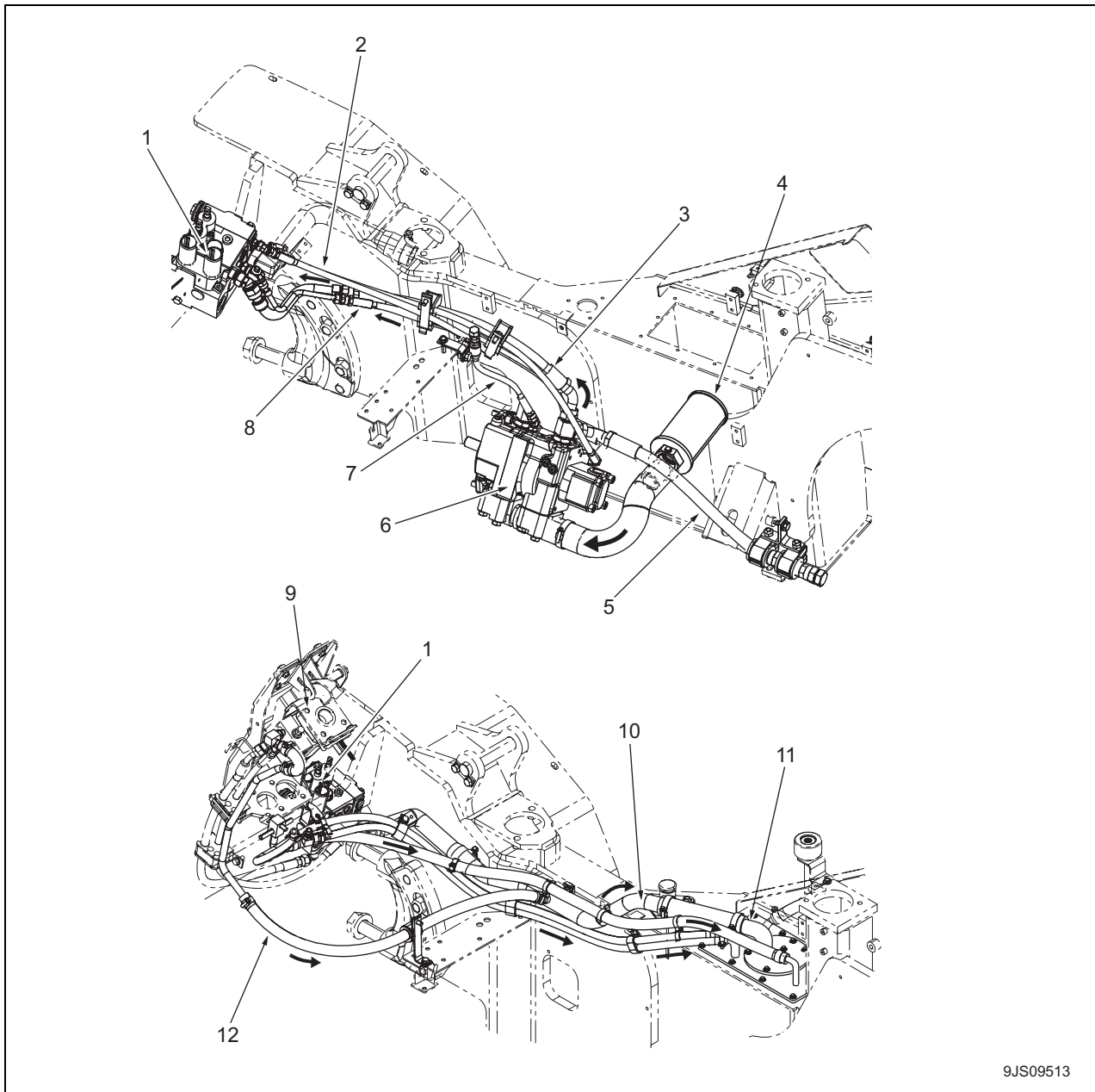
Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

10 Structure, function and maintenance standard

600 Hydraulic system

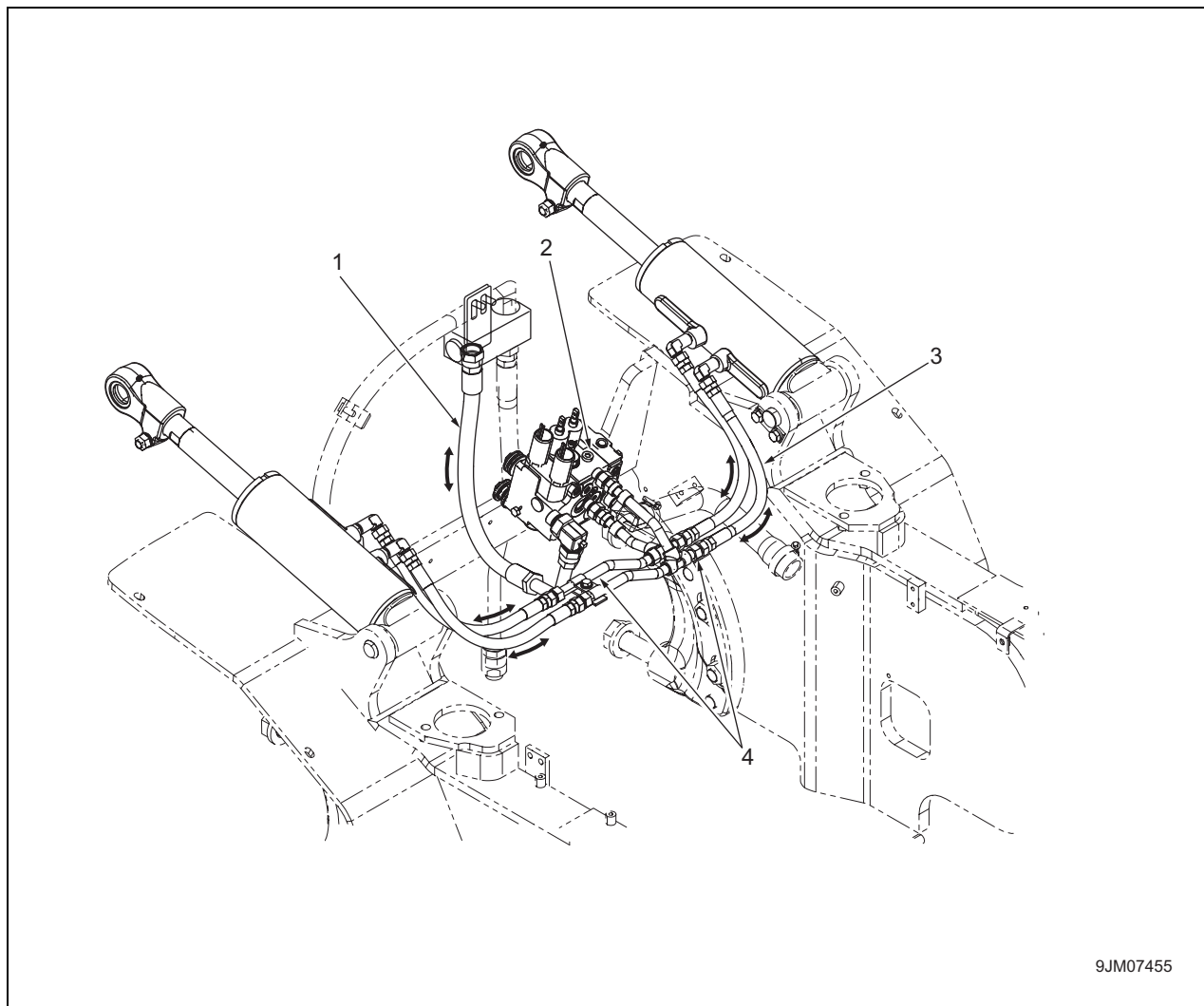
Control valve piping diagram (tank – control valve)	2
Work equipment piping diagram (control valve – tilt cylinder/lift cylinder)	3
Attachment piping diagram	4
Work equipment and steering pump	6
Control valve	14
CLSS	20
Each function and operation of each valve	22

Control valve piping diagram (tank – control valve)



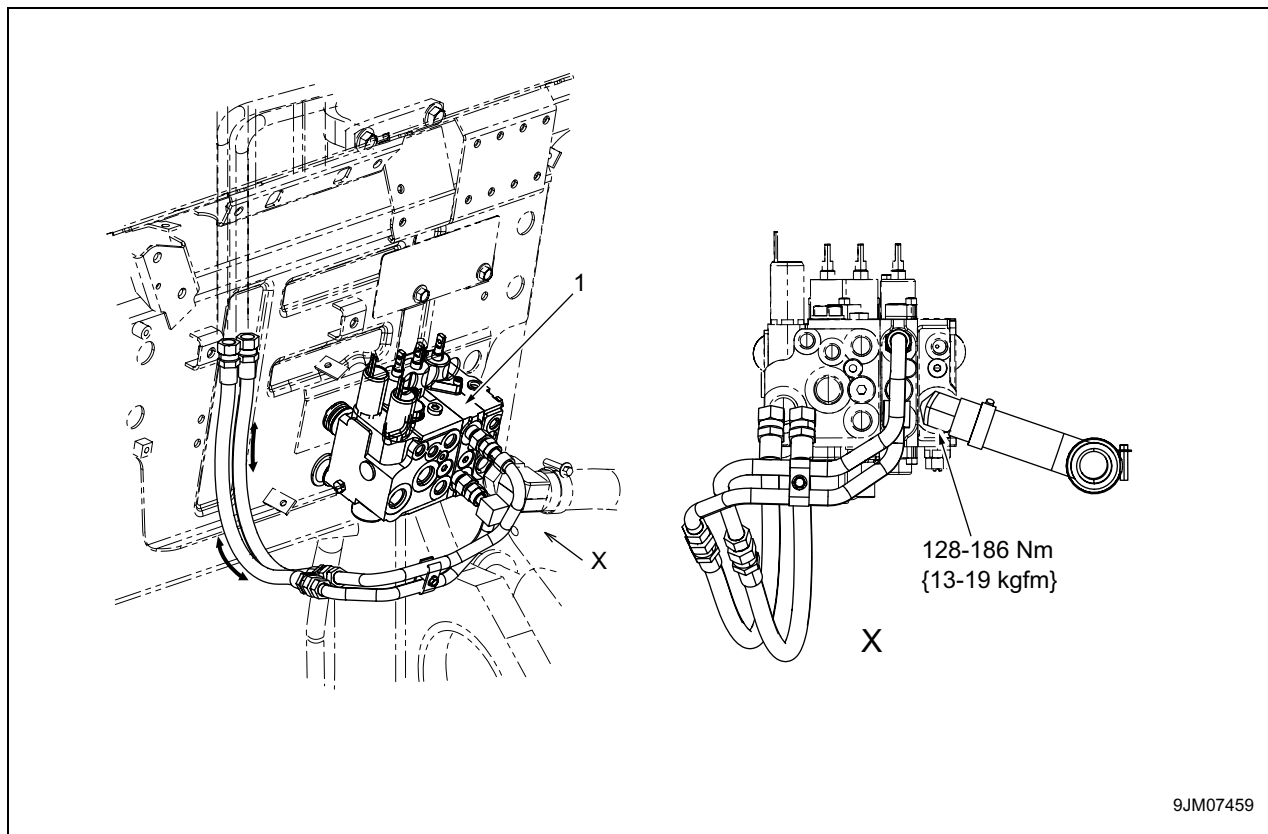
1. Control valve
2. Hose (LS line)
3. Hose (Main pump)
4. Suction strainer
5. Branch hose
6. Work equipment pump
7. Hose (for bleeding air)
8. Hose (PP line)
9. Orbit-roll valve
10. Pipe (return from control valve)
11. Hydraulic oil tank cover
12. Hose (return from orbit-roll valve)

Work equipment piping diagram (control valve – tilt cylinder/lift cylinder)



1. Hose (for lift)
2. Control valve
3. Hose (for tilt)
4. Pipe (for tilt)

Attachment piping diagram

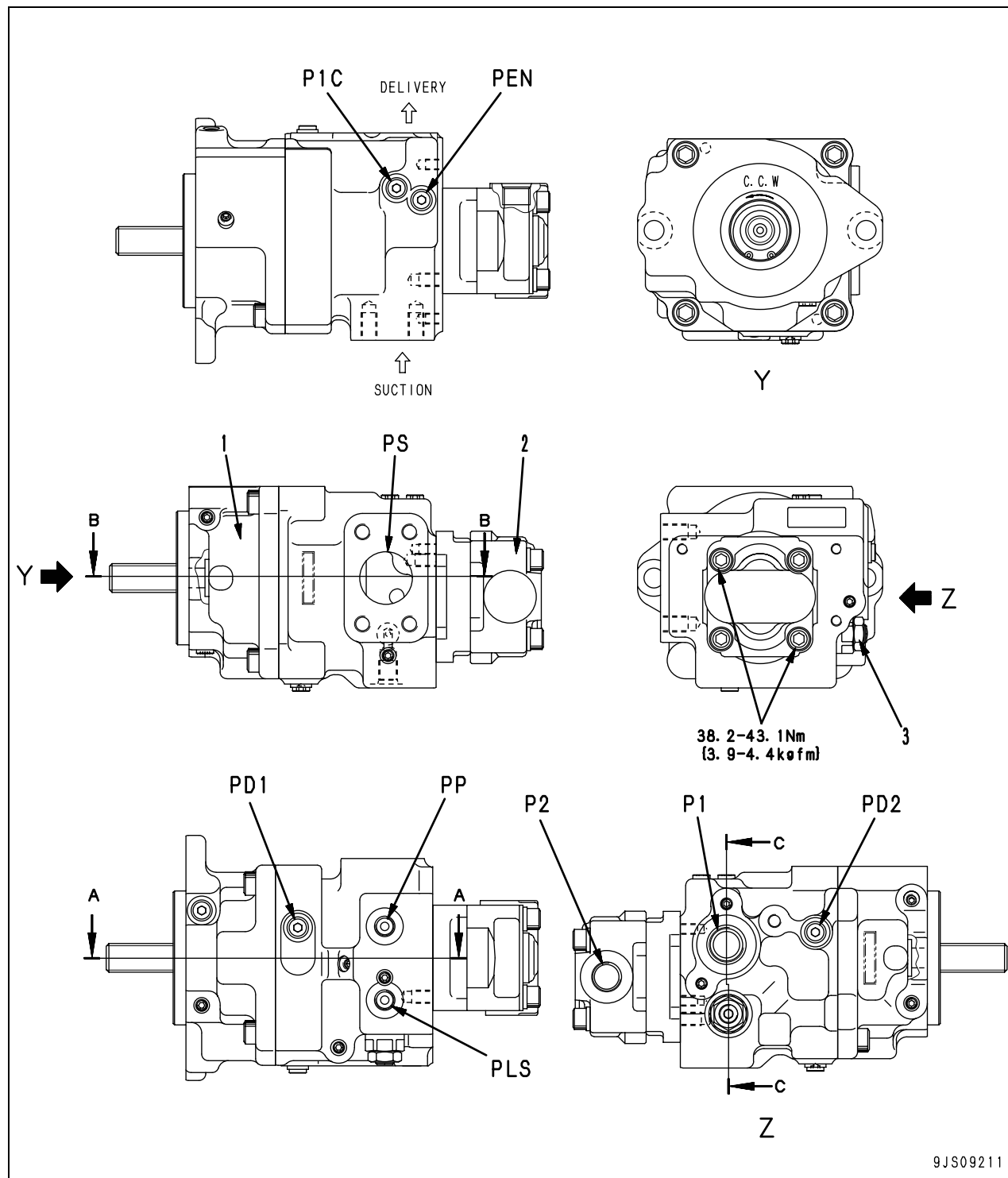


1. Control valve

Work equipment and steering pump

Model: LPV45

General view

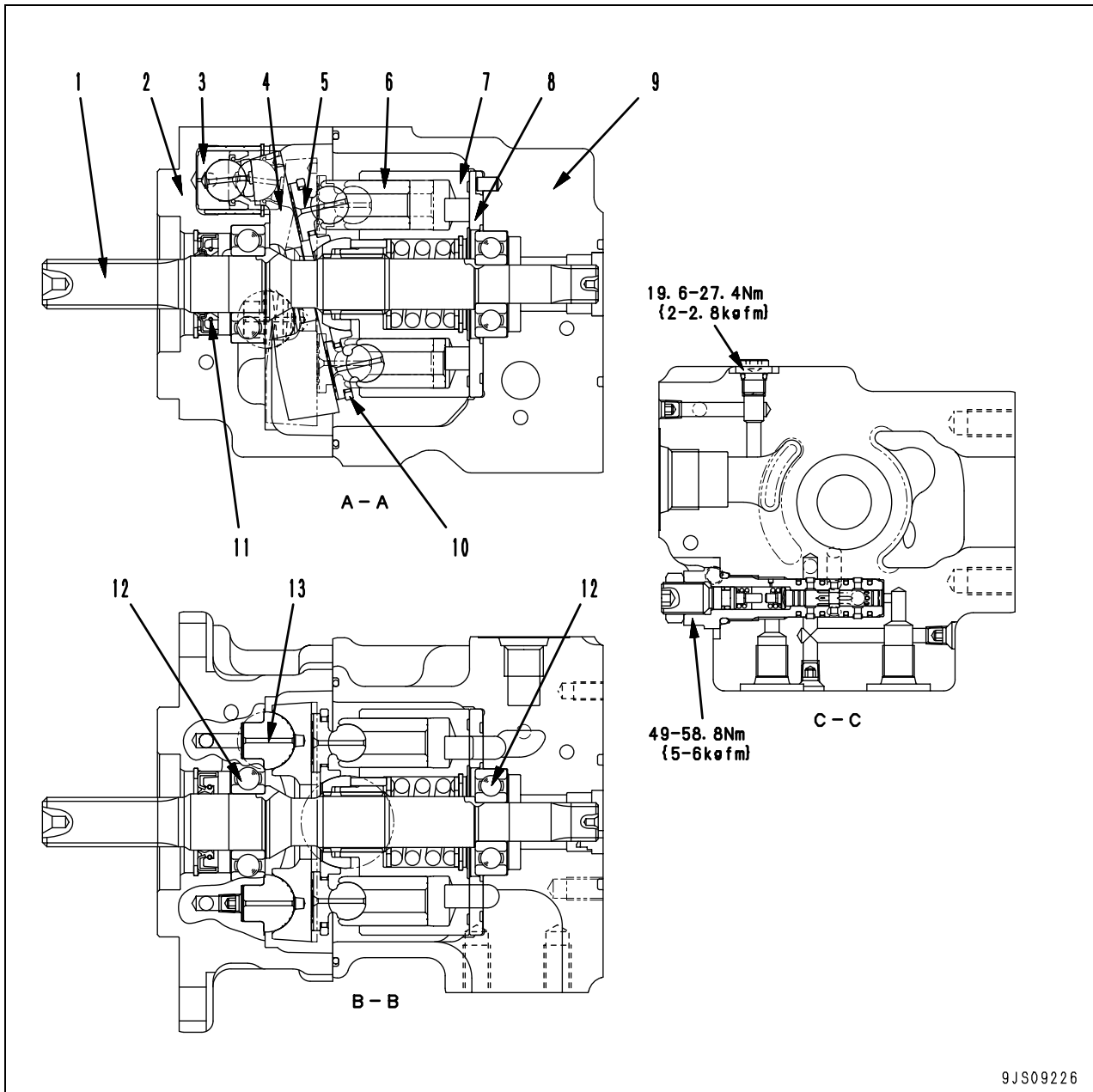


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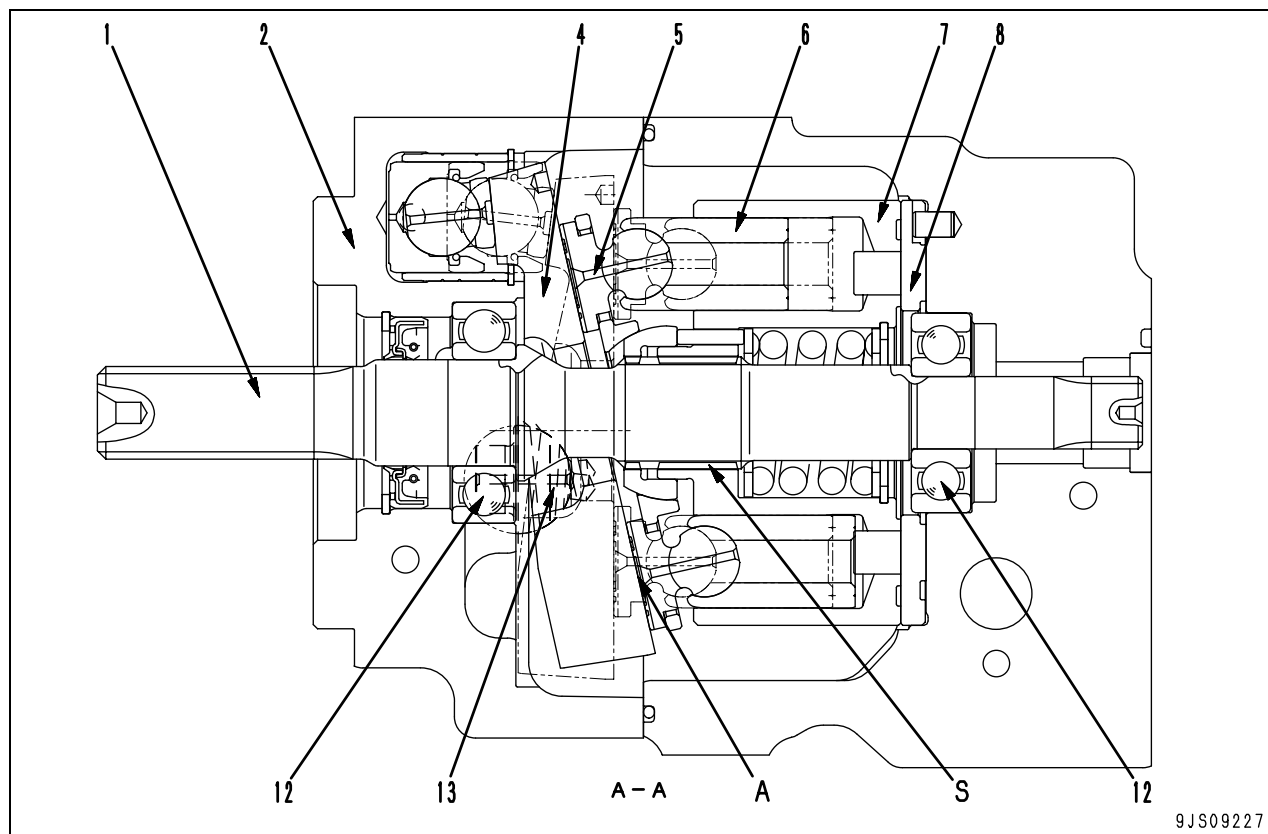
P1: Pump discharge port
P1C: Pump pressure pickup plug
P2: Gear pump discharge port
PD1: Drain plug
PD2: Drain plug
PEN: Control pressure pickup plug
PLS: LS pressure input port
PP: Pump pressure input port
PS: Pump suction port

1. Pump unit
2. Gear pump
3. LS valve

Sectional view



- | | |
|-------------------|-------------------|
| 1. Shaft | 8. Valve plate |
| 2. Case | 9. End cap |
| 3. Servo piston | 10. Shoe retainer |
| 4. Rocker cam | 11. Oil seal |
| 5. Shoe | 12. Bearing |
| 6. Piston | 13. Retainer |
| 7. Cylinder block | |



Function

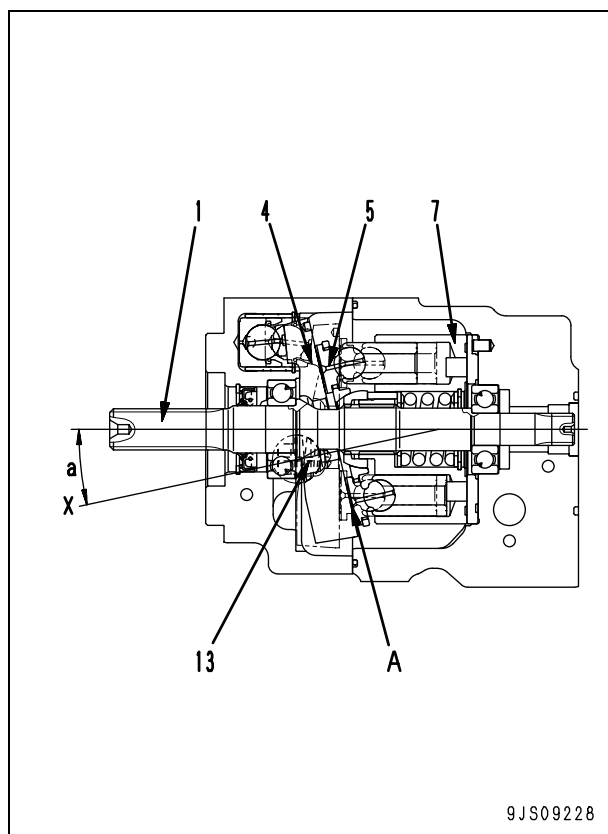
- This pump receives the rotation and torque from the engine with its shaft (1) and converts them into hydraulic pressure and discharges hydraulic oil according to the load.
- The delivery of this pump can be changed by changing its swash plate angle.

Structure

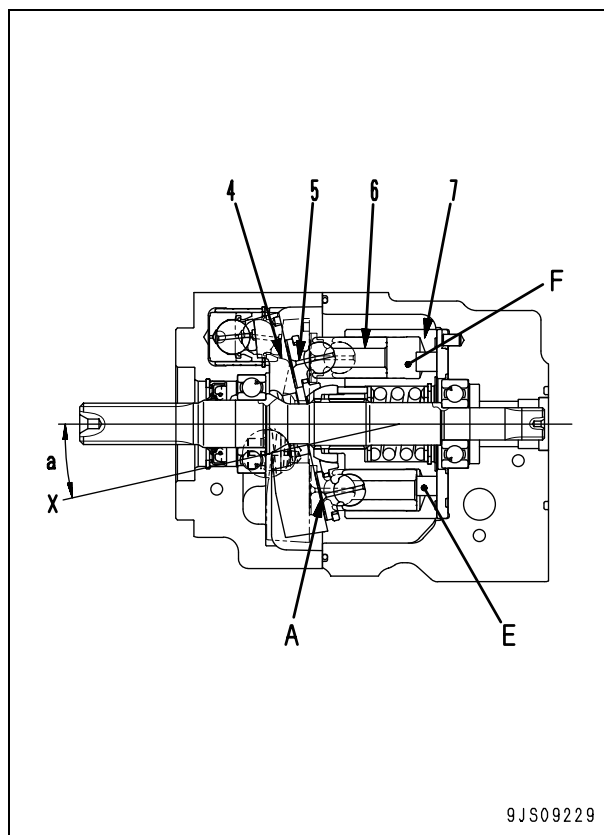
- Cylinder block (7) is supported on shaft (1) through spline (S), and shaft (1) is supported on front and rear bearings (12).
- The end of piston (6) has a spherical hollow and is combined with caulked shoe (5). Piston (6) and shoe (5) form a spherical bearing.
- Rocker cam (3) is supported on case (2) and retainer (13), and has plane (A). Shoe (5) is kept pressed against this plane and slid circularly. Shoe (5) leads high-pressure oil to form a static pressure bearing and slides on it.
- Piston (6) in each cylinder chamber of cylinder block (7) moves relatively in the axial direction.
- Cylinder block (7) rotates relatively against valve plate (8), sealing the hydraulic oil. The hydraulic balance on the valve plate is maintained properly.
- The oil in each cylinder chamber of cylinder block (7) can be sucked and discharged through valve plate (8).

Operation**Pump operation**

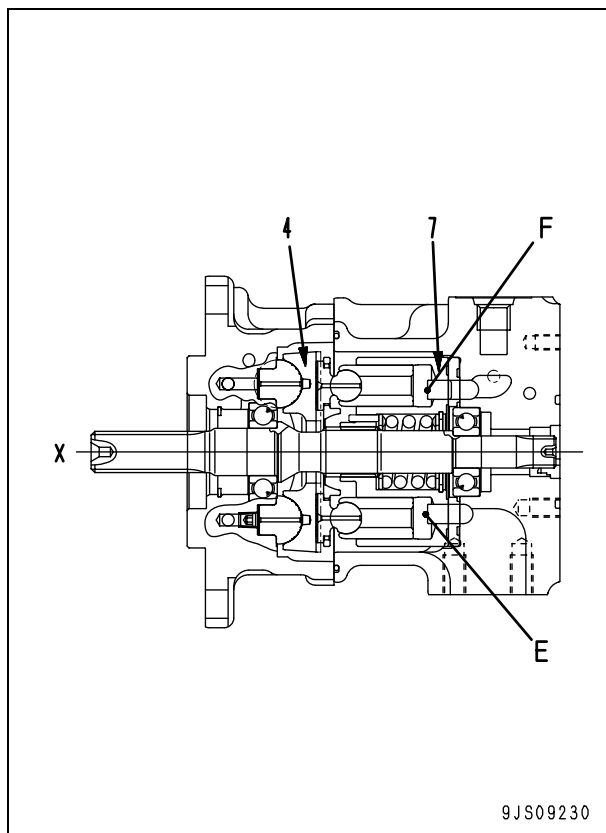
- Cylinder block (7) rotates together with shaft (1) and shoe (5) slides on plane (A). At this time, rocker cam (4) slants around retainer (13), and consequently angle (a) between center line (X) of rocker cam (4) and the axis of cylinder block (7) changes. Angle (a) is called the swash plate angle.



- If angle (a) is made between center line (X) of rocker cam (4) and the axis of cylinder block (7), plane (A) works as a cam for shoe (5).
- Piston (6) slides inside cylinder block (7) and a difference is made between volumes (E) and (F) in cylinder block (7). And the piston sucks and discharges oil by (F) – (E).
- If cylinder block (7) rotates and the volume of chamber (E) is decreased, the oil is discharged during this stroke. On the other hand, the volume of chamber (F) is increased and the oil is sucked in during this stroke. [In the figure, chamber (F) is at the end of the suction stroke and chamber (E) is at the end of the discharge stroke.]



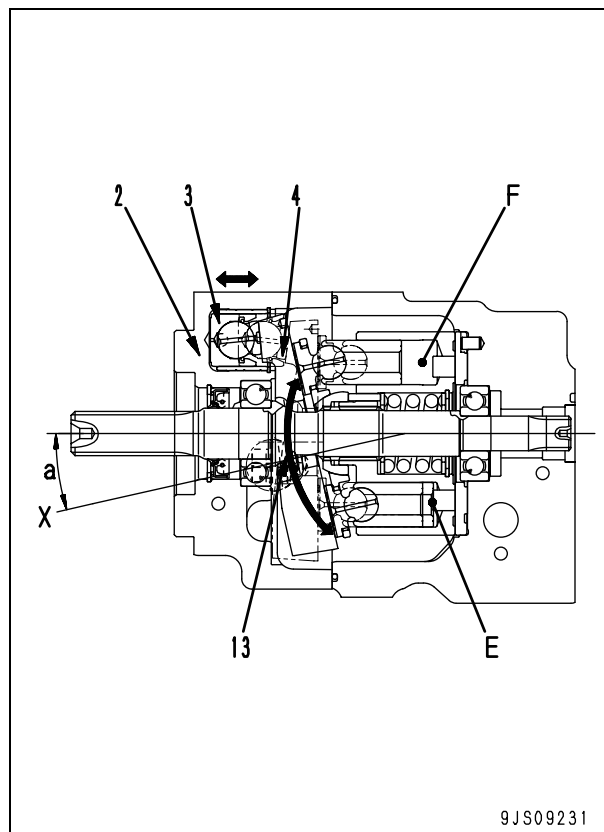
- If center line (X) of rocker cam (4) is equal to the axial direction of cylinder block (7) (the swash plate angle is 0), there is not a difference between volumes (E) and (F) in cylinder block (7) and the oil is not sucked or discharged.



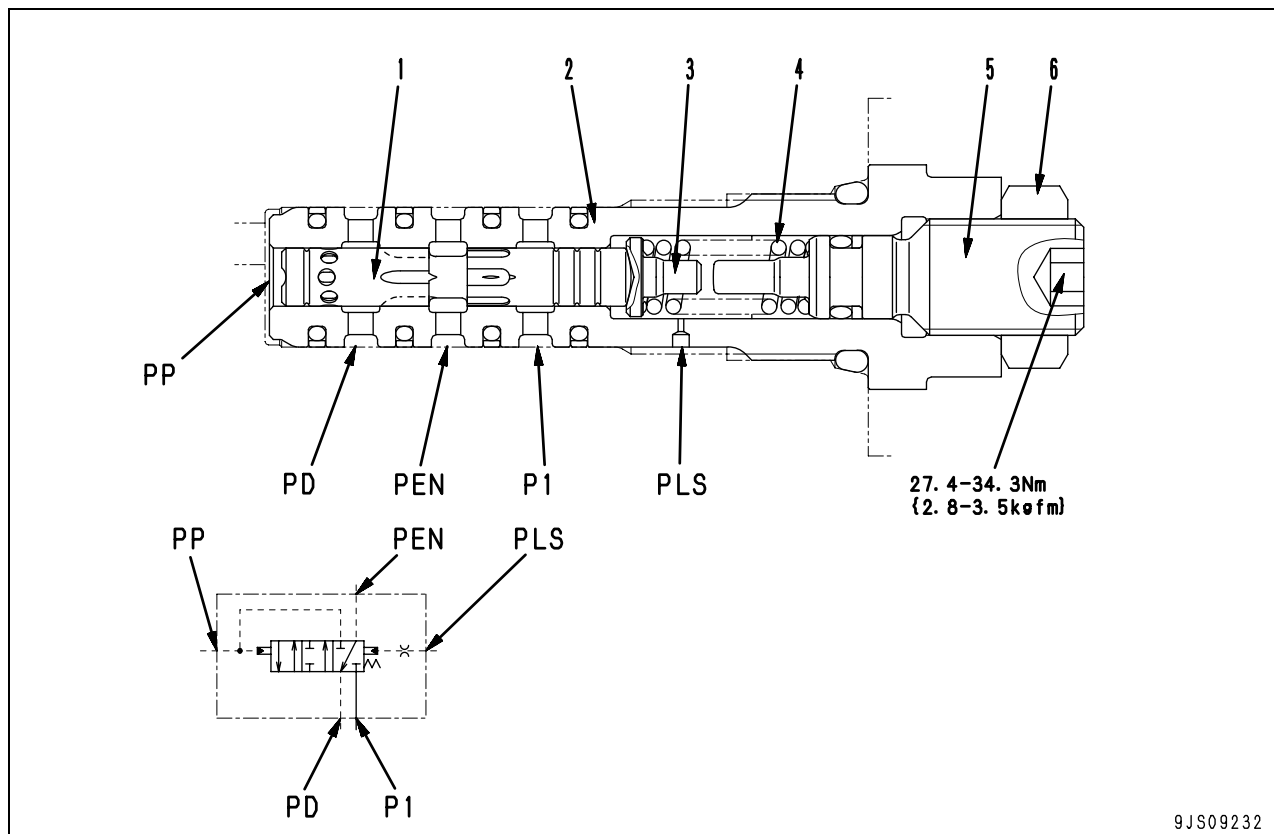
- Swash plate angle (a) is in proportion to the pump delivery.

Delivery control

- If swash plate angle (a) is increased, the difference between volumes (E) and (F) is increased, or delivery (Q) is increased. Swash plate angle (a) is changed with servo piston (3).
- Servo piston (3) reciprocates straight according to the signal pressure of the LS valve. This straight motion is transmitted to rocker cam (4). Then, rocker cam (4) supported on case (2) with retainer (13) slides in rotational directions.



LS valve



P1: Pump discharge pressure port
 PD: Drain port
 PEN: Control piston pressure port
 PLS: LS pressure input port
 PP: Pump discharge pressure input port

1. Spool
2. Sleeve
3. Retainer
4. Spring
5. Screw
6. Nut

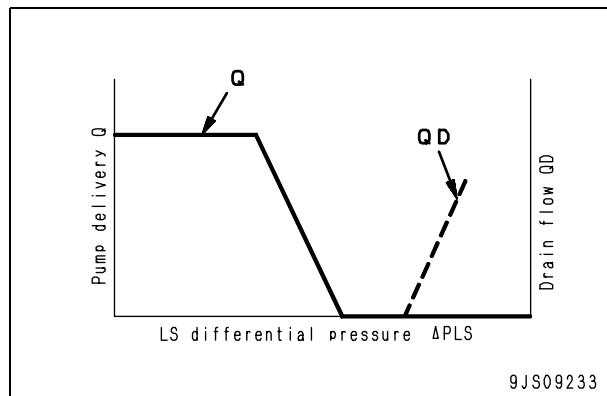
Function

- The LS valve controls the pump delivery according to the stroke of the control lever, or the demand flow for the actuator.
- The LS valve detects the demand flow for the actuator from differential pressure (ΔPLS) between control valve inlet pressure (P1) and control valve outlet pressure (PLS), and controls main pump delivery (Q). [(P1) is called the LS pump pressure, (PLS) the LS pressure, and (ΔPLS) the LS differential pressure.]
- In other words, the pressure loss caused by flow of oil through the opening of the control valve spool [= LS differential pressure (ΔPLS)] is detected, and then main pump delivery (Q) is supplied according to the demand flow for the actuator by controlling it so that the pressure loss will be constant.
- Main pump discharge pressure (PP), LS pump pressure (P1) and LS pressure (PLS) are led to the LS valve. The relationship between LS differential pressure (ΔPLS) and main pump delivery (Q) changes as shown below.

Unload valve

Function

- The unload valve is built in the LS valve and relieves the pressurized oil in the main pump discharge pressure circuit to the tank circuit when the LS differential pressure (ΔPLS) exceeds the unload set differential pressure.
- The unload set differential pressure is set higher than the LS set differential pressure controlled by the LS valve.
- The unload valve does not operate while the LS valve is controlling the pump delivery according to the demand of the actuator.
- When the actuator is stopped suddenly by the operation of the control valve spool and the pump circuit pressure increases, the unload valve relieves the pressurized oil in the pump circuit to the tank circuit to prevent abnormally high pressure generation.



Control valve

Outline

The control valves of the following types are set.

- 2-spool valve for 3.5 – 4.0 ton
- 3-spool valve for 3.5 – 4.0 ton
- 4-spool valve for 3.5 – 4.0 ton
- 4-spool valve (3 or 4 port) for 3.5 – 4.0 ton
- 5-spool valve for 3.5 – 4.0 ton
- 5-spool valve (4 or 5 port) for 3.5 – 4.0 ton
- 2-spool valve for 4.5 – 5.0 ton
- 3-spool valve for 4.5 – 5.0 ton
- 4-spool valve for 4.5 – 5.0 ton
- 4-spool valve (3 or 4 port) for 4.5 – 5.0 ton
- 5-spool valve for 4.5 – 5.0 ton
- 5-spool valve (4 or 5 port) for 4.5 – 5.0 ton

A1: To lift cylinder

A2: To tilt cylinder

A3: To attachment actuator

B2: To tilt cylinder

B3: To attachment actuator

C1: From lift truck wiring

C2: From lift truck wiring

LS: To work equipment and steering pump

P: From work equipment and steering pump

PP: To work equipment and steering pump

STLS: From orbit-roll valve

STP: To orbit-roll valve

T: To tank

TS: To tank

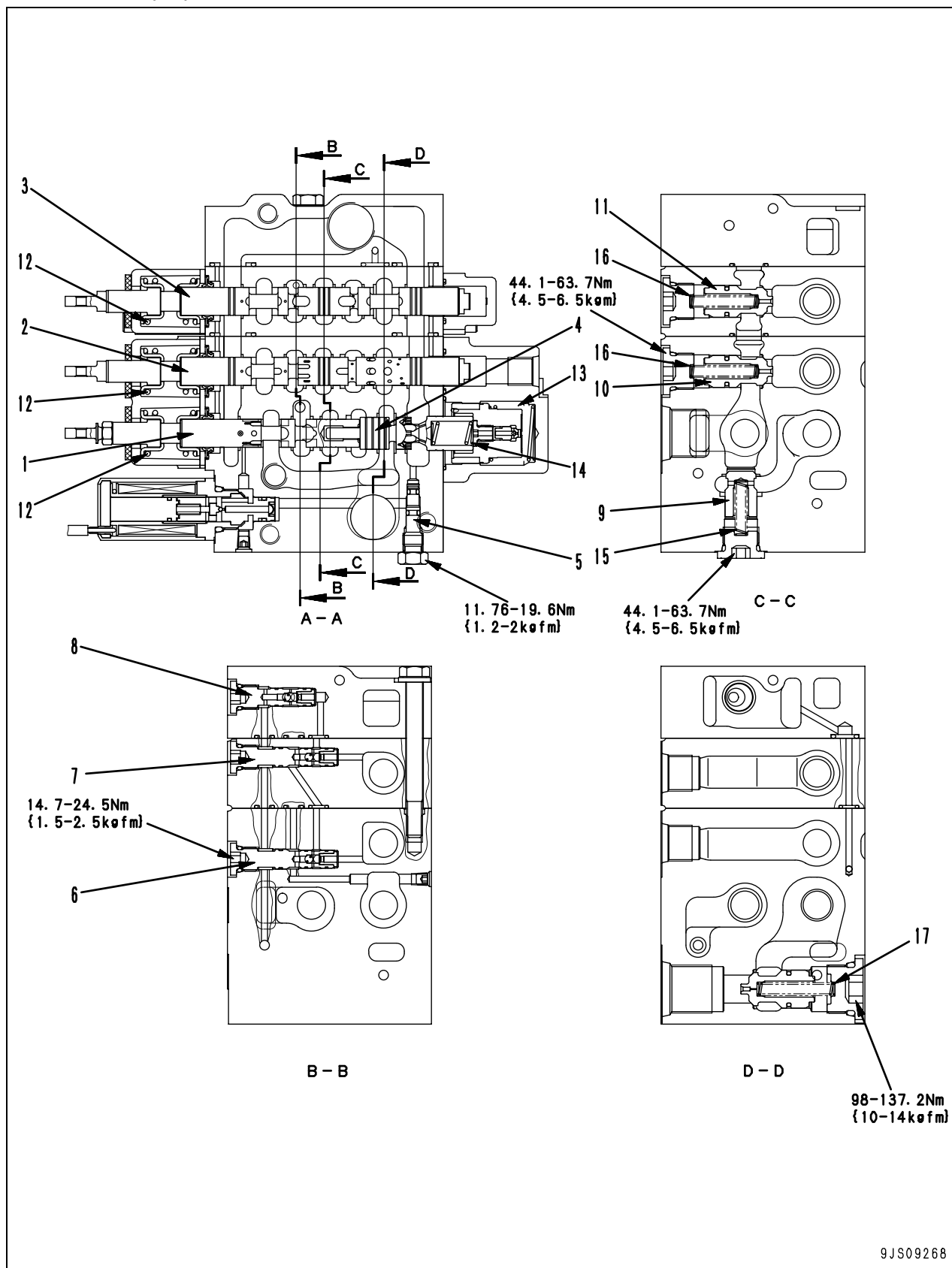
Outside view of each control valve

- A general view and sectional view of the 3-spool valve for 3.5 – 4.5 ton are shown below.
- If the service valve under the cover of the 3-spool valve is removed, the appearance of the remaining portion is the same as the 2-spool valve.
- All the service valves have the same general view.

1. Valve block
2. Service valve
3. Cover

Since each service valve is add-on type, they can be added or removed after the lift truck is delivered.

Sectional view (1/2)

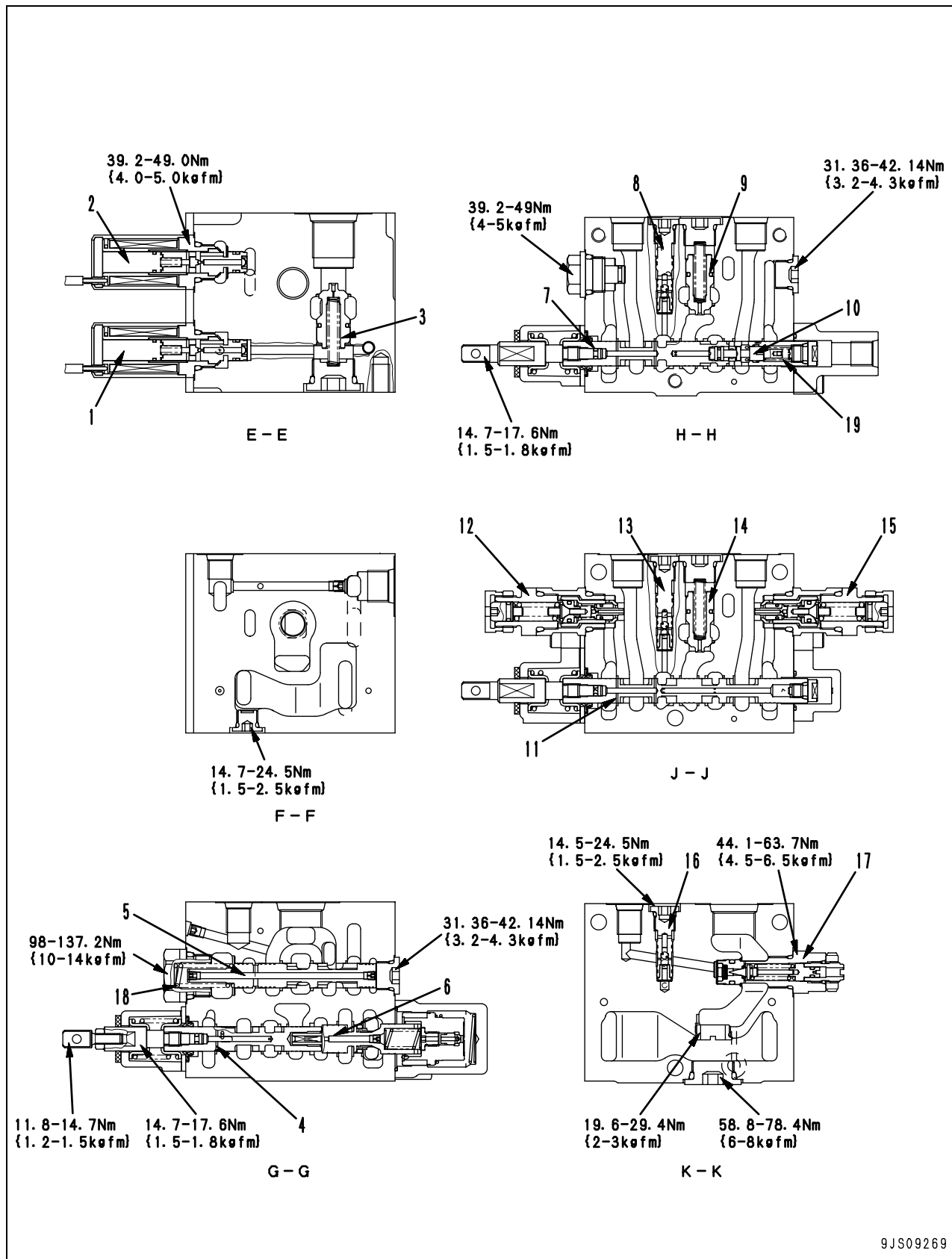


1. Spool (lift)
2. Spool (tilt)
3. Spool (attachment)
4. Down control valve
5. Emergency lowering valve
6. LS shuttle valve (lift/tilt)
7. LS shuttle valve (attachment)
8. LS shuttle valve (steering)
9. Load check valve (lift)
10. Load check valve (tilt)
11. Load check valve (attachment)

Unit: mm

No.	Check item	Criteria					Remedy
12	Spool return spring	Standard size			Repair limit		Replace spring when damaged or deformed
		Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	
		45.58 x 23.1	26.5	152 N {15.50 kgf}	—	12.2 N {12.4 kgf}	
13	Down control valve spring (for 3.5 – 4.0 ton)	84.27 x 27.9	27.3	16.5 N {1.68 kgf}	—	13.1 N {1.34 kgf}	
	Down control valve spring (for 4.5 – 5.0 ton)	110.38 x 27.9	27.3	24.0 N {2.45 kgf}	—	19.2 N {1.96 kgf}	
14	Down control valve spring (for 3.5 – 4.0 ton)	24.49 x 11.4	22.5	16.3 N {1.66 kgf}	—	13.0 N {1.33 kgf}	
	Down control valve spring (for 4.5 – 5.0 ton)	24.81 x 11.4	22.5	21.5 N {2.19 kgf}	—	17.2 N {1.75 kgf}	
15	Load check valve spring	29.44 x 6	25.5	8.83 N {0.9 kgf}	—	7.06 N {0.72 kgf}	
16	Load check valve spring	43.92 x 6	34	9.81 N {1 kgf}	—	7.85 N {0.8 kgf}	
17	Lift lock valve spring	48.75 x 6.4	40	15.2 N {1.55 kgf}	—	12.2 N {1.24 kgf}	

(2/2)



Valve block

1. ON-OFF solenoid (lift lock)
2. ON-OFF solenoid (work equipment lock)
3. Lift lock valve
4. Spool (lift)
5. Priority valve
6. Down control valve
7. Spool (tilt)
8. LS shuttle valve (lift/tilt)
9. Load check valve (tilt)
10. Tilt lock valve

Service valve

11. Spool (attachment)
12. Suction safety valve (attachment)
13. LS shuttle valve (attachment)
14. Load check valve (attachment)
15. Suction safety valve (attachment)

Cover

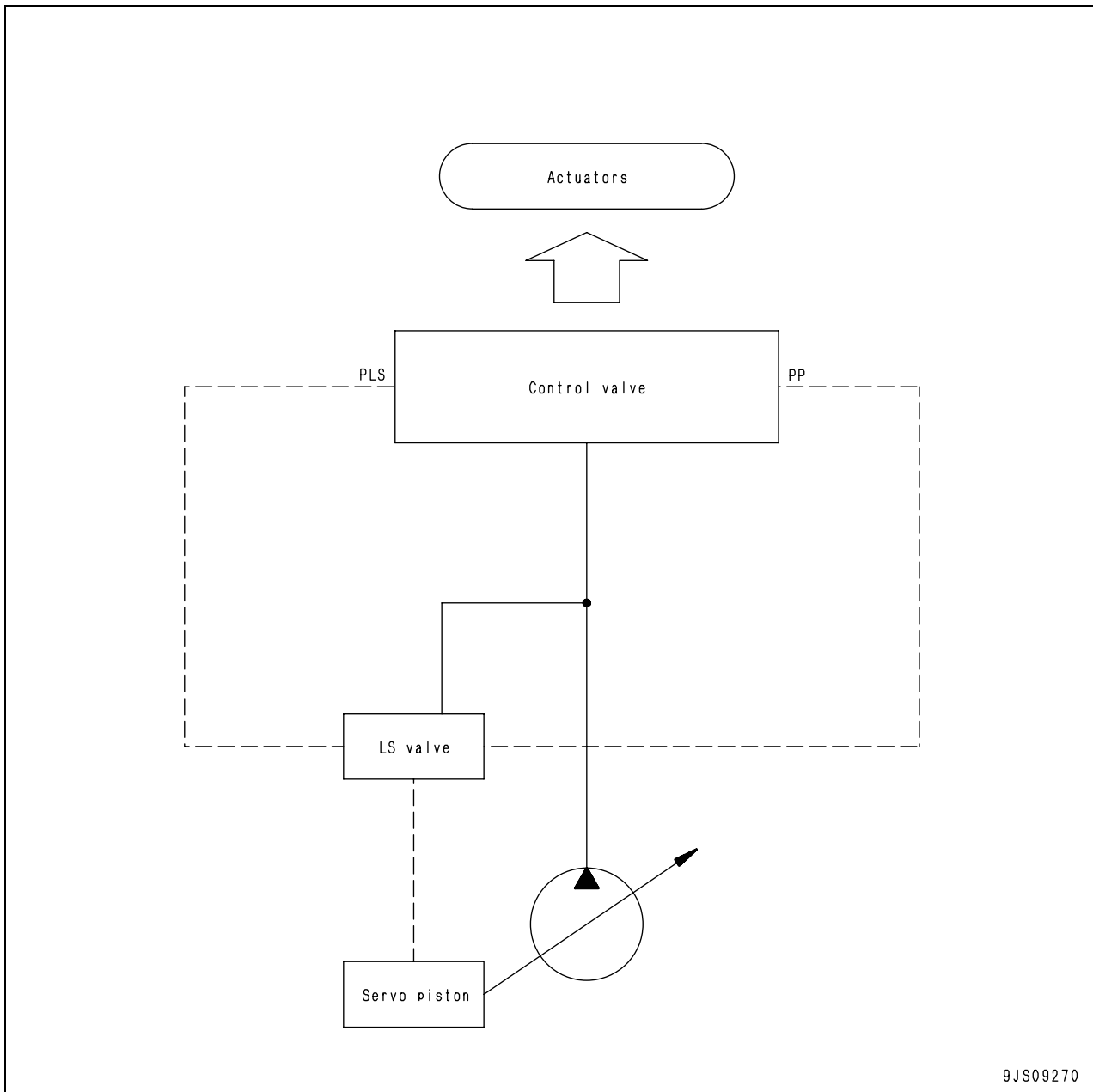
16. LS shuttle valve (steering)
17. LS relief valve

Unit: mm

No.	Check item	Criteria					Remedy
18	Priority valve spring	Standard size			Repair limit		Replace spring when damaged or deformed
		Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	
		41.19 x 13.5	34.0	120 N {12.28 kgf}	—	96.3 N {9.82 kgf}	
19	Tilt lock valve spring	26.98 x 7	16	14.8 N {1.51 kgf}	—	11.9 N {1.21 kgf}	

CLSS

Outline of CLSS



Features

The CLSS is the abbreviation for Closed center Load Sensing System, which has the following features.

- Fine control performance which is not affected by load
- Energy saving performance by variable pump control

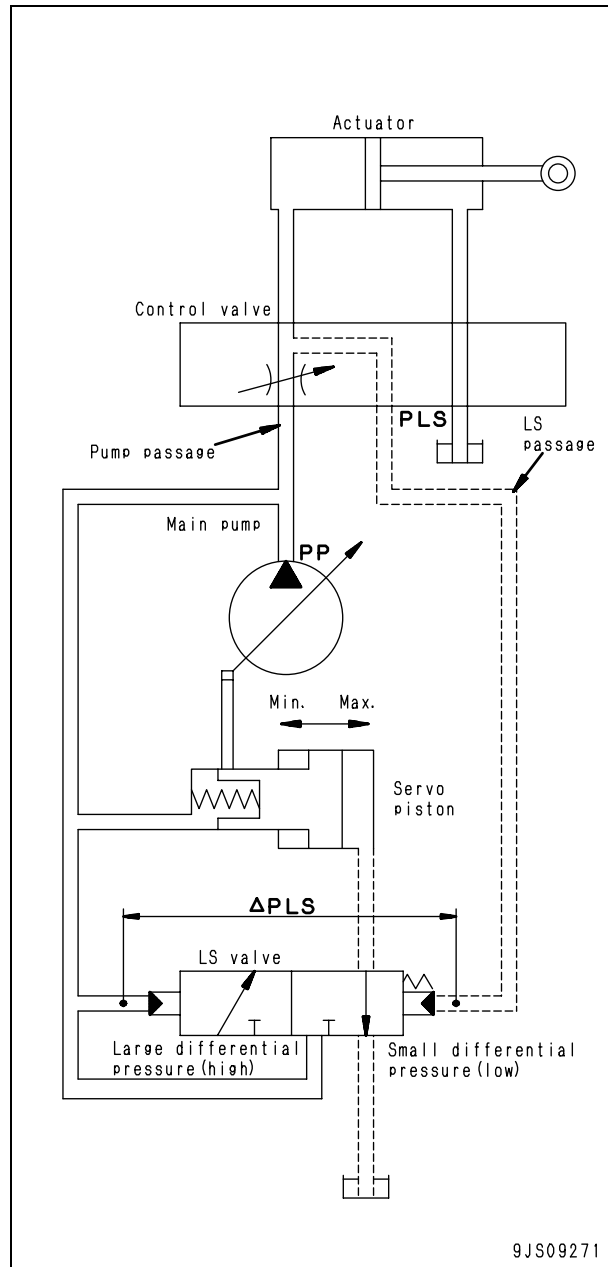
Composition

- The CLSS is composed of the variable-capacity piston pump, control valve and actuators.
- The hydraulic pump is composed of the pump unit and LS valve.

Basic principle

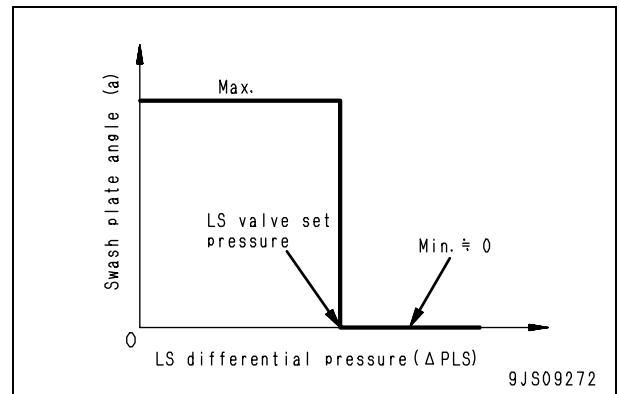
Pump swash plate angle control

- The pump swash plate angle (pump delivery) is so controlled that the LS differential pressure (ΔPLS) will be constant. The LS differential pressure is the differential pressure between the pump discharge pressure (PP) and LS pressure (PLS) (actuator load pressure) at the control valve outlet.
- [LS differential pressure (ΔPLS) = Pump discharge pressure (PP) – LS pressure (PLS)]



- If the LS differential pressure (ΔPLS) lowers below the LS valve set pressure (the actuator load pressure is high), the pump swash plate angle is increased.
- If the LS differential pressure rises above the set pressure (the actuator load pressure is low), the pump swash plate angle is decreased.

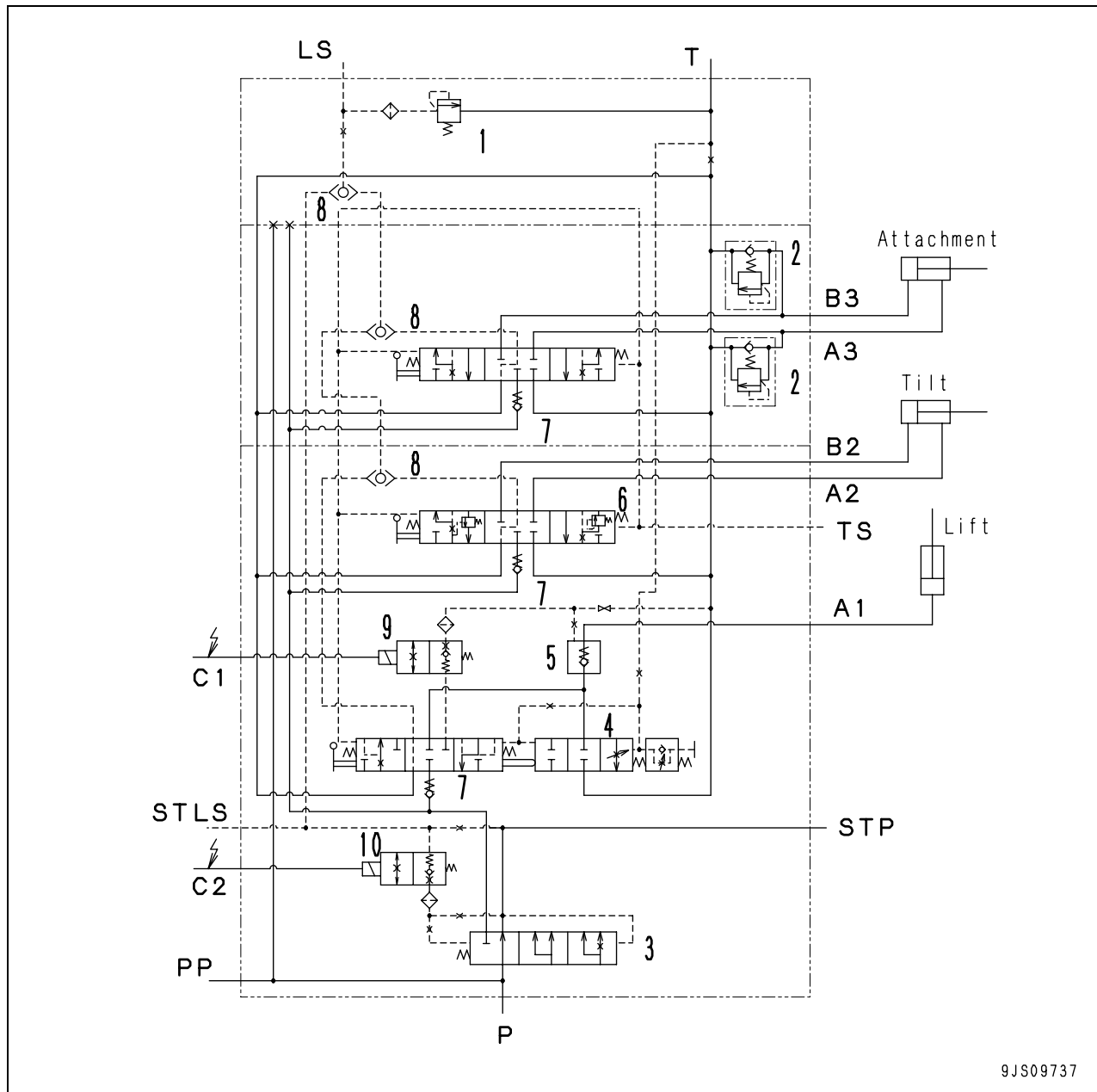
LS differential pressure (ΔPLS) and pump swash plate angle



★ For details of operation, see "Hydraulic pump".

Each function and operation of each valve

Hydraulic circuit diagram and valve names



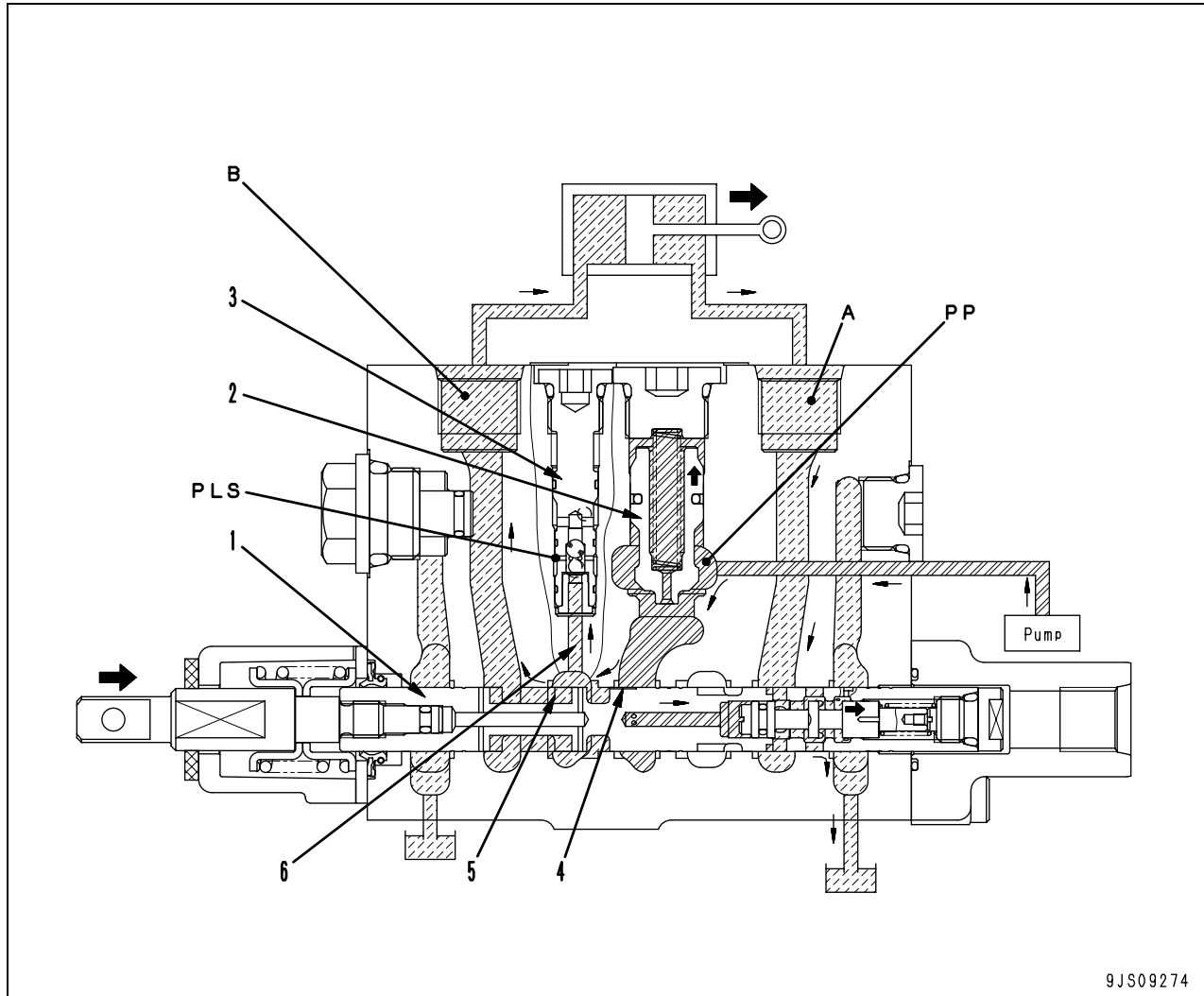
- ★ The hydraulic circuit diagram shows the 3-spool valve for 3.5 – 4.0 ton.

1. LS relief valve set pressure:
17.15 MPa {175 kgf/cm²}
2. Suction safety valve set pressure:
17.64 MPa {180 kgf/cm²}
3. Priority valve
4. Down control valve
5. Lift lock valve
6. Tilt lock valve
7. Load check valve
8. LS shuttle valve
9. ON-OFF solenoid (lift lock)
10. ON-OFF solenoid (work equipment lock)

Supply of LS pressure

Function

- The LS pressure means the actuator load pressure on the outlet side of the control valve.
- The downstream pressure of control notch (4) of spool (1) is supplied as LS pressure (PLS) to LS shuttle valve (3).
- The highest LS pressure of supplied LS pressures (PLS) is selected by the LS shuttle valve and supplied to the pump LS valve.



★ The figure shows the state when the fork is tilted forward.

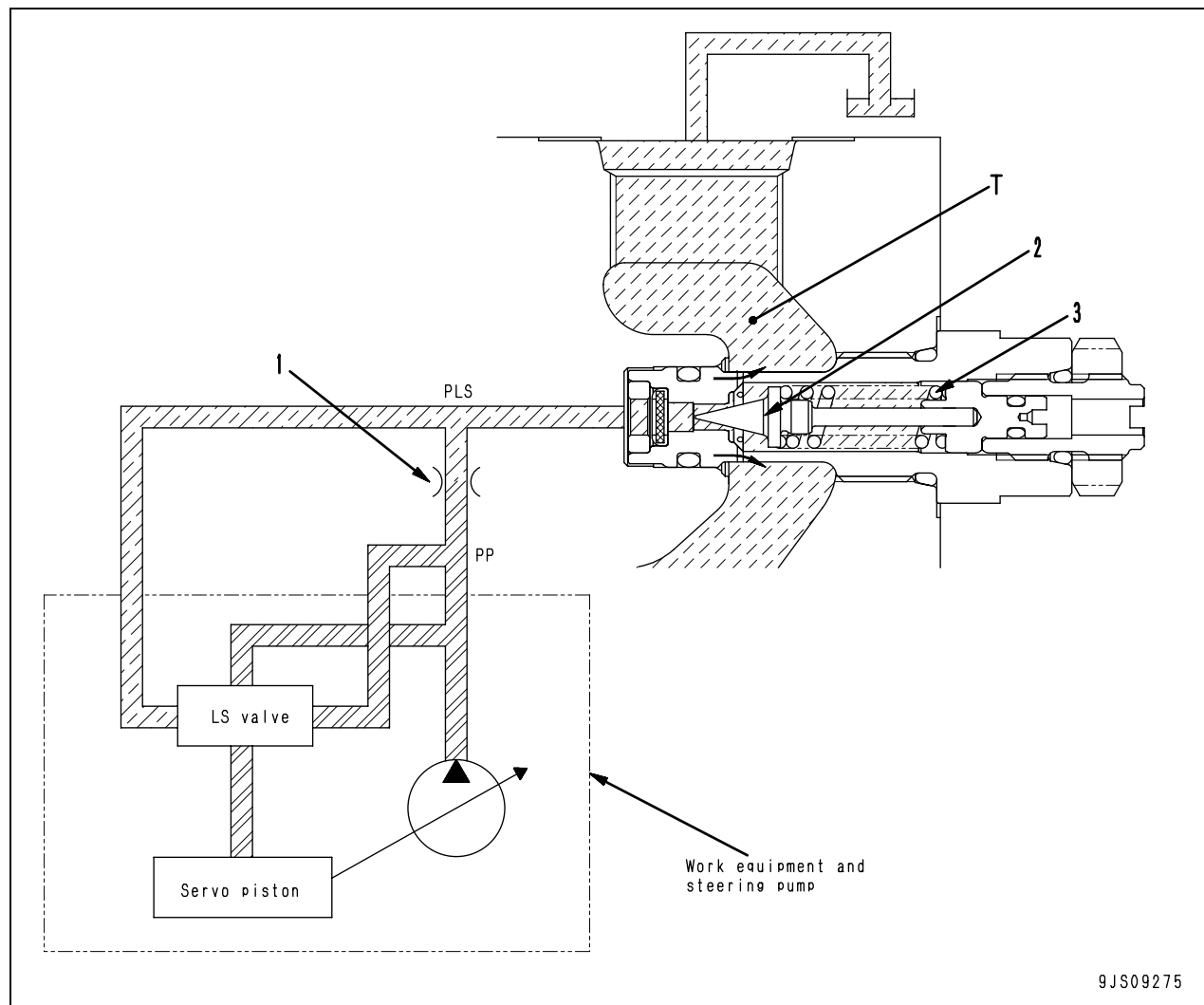
Operation

- If spool (1) is operated, pump pressure (PP) flows through load check valve (2), spool notches (4) and (5) to actuator circuit (B).
- The pressure decreased by spool notch (4) is supplied as LS pressure (PLS) through passage (6) to LS shuttle valve (3).
- Since the opening area of spool notch (5) is wide and less pressure loss is made, LS pressure approximates the actuator load pressure.

LS relief valve

Function

- The LS valve sets the maximum LS pressure.
- When the oil is relieved, differential pressure is generated between pump pressure (PP) and LS pressure (PLS) by LS shuttle valve orifice (1).
- The maximum pump pressure is set by controlling the LS valve with that differential pressure so that the pump swash plate angle will be the minimum (≈ 0 degrees).



Operation

- If the work equipment control lever is operated to move the work equipment cylinder to the stroke end, pump pressure (PP) increases.
- Since no pressurized oil flows to the actuator circuit, LS pressure (PLS) is the same as pump pressure (PP).
- LS pressure (PLS) which is the same as increased pump pressure (PP) acts on LS relief valve poppet (2). If it reaches the set load of spring (3), LS pressure (PLS) is relieved into tank circuit (T).
- Since there is orifice (1) on the upstream side of the LS relief valve, pump pressure (PP) increases further and generates differential pressure between pump pressure (PP) and LS pressure (PLS).
- If the differential pressure acts on the pump LS valve and increases to a certain pressure, pump pressure (PP) is balanced when the swash plate angle is minimum (≈ 0 degrees).

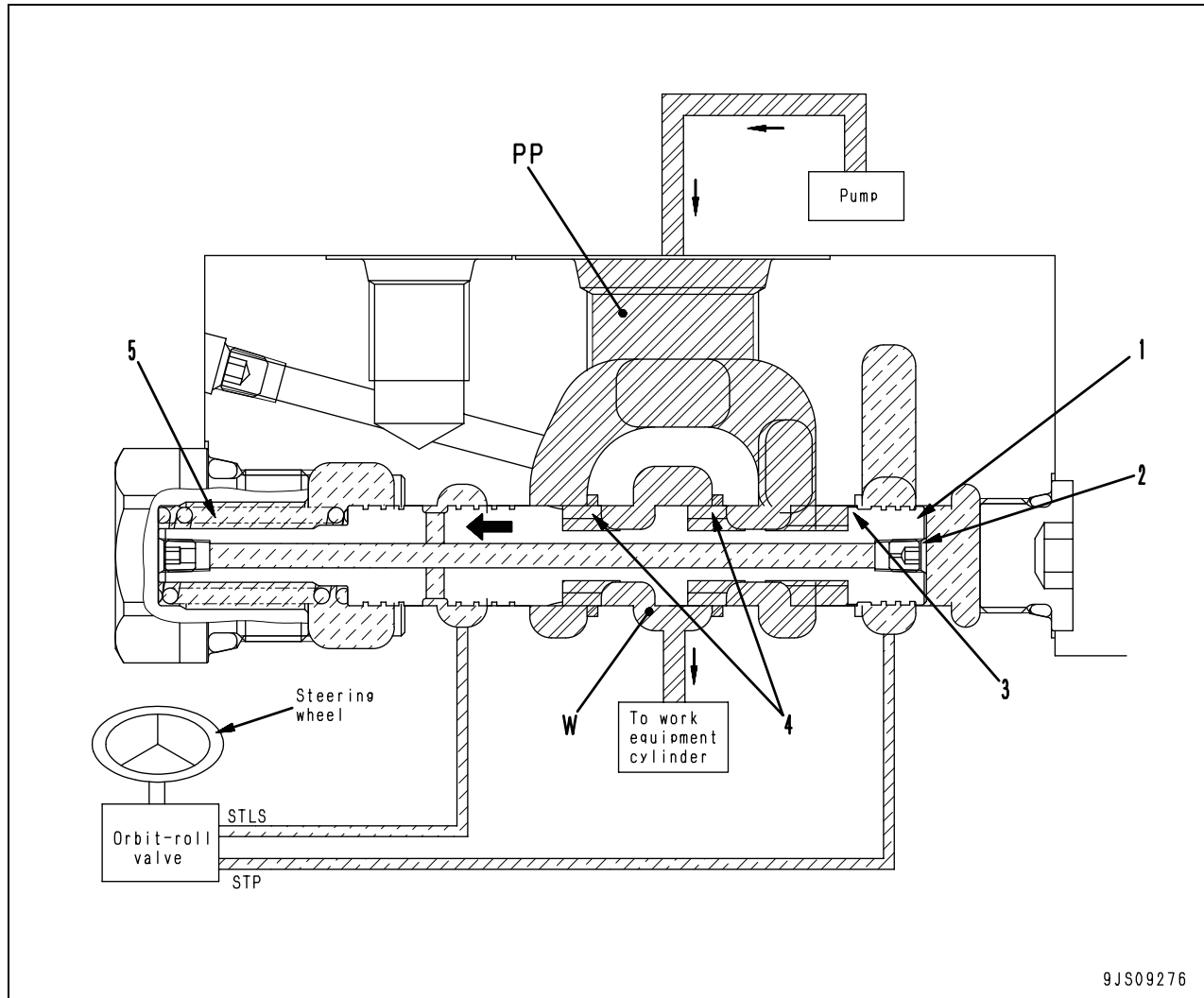
Priority valve

Function

The priority valve distributes the pump delivery to the steering circuit first.

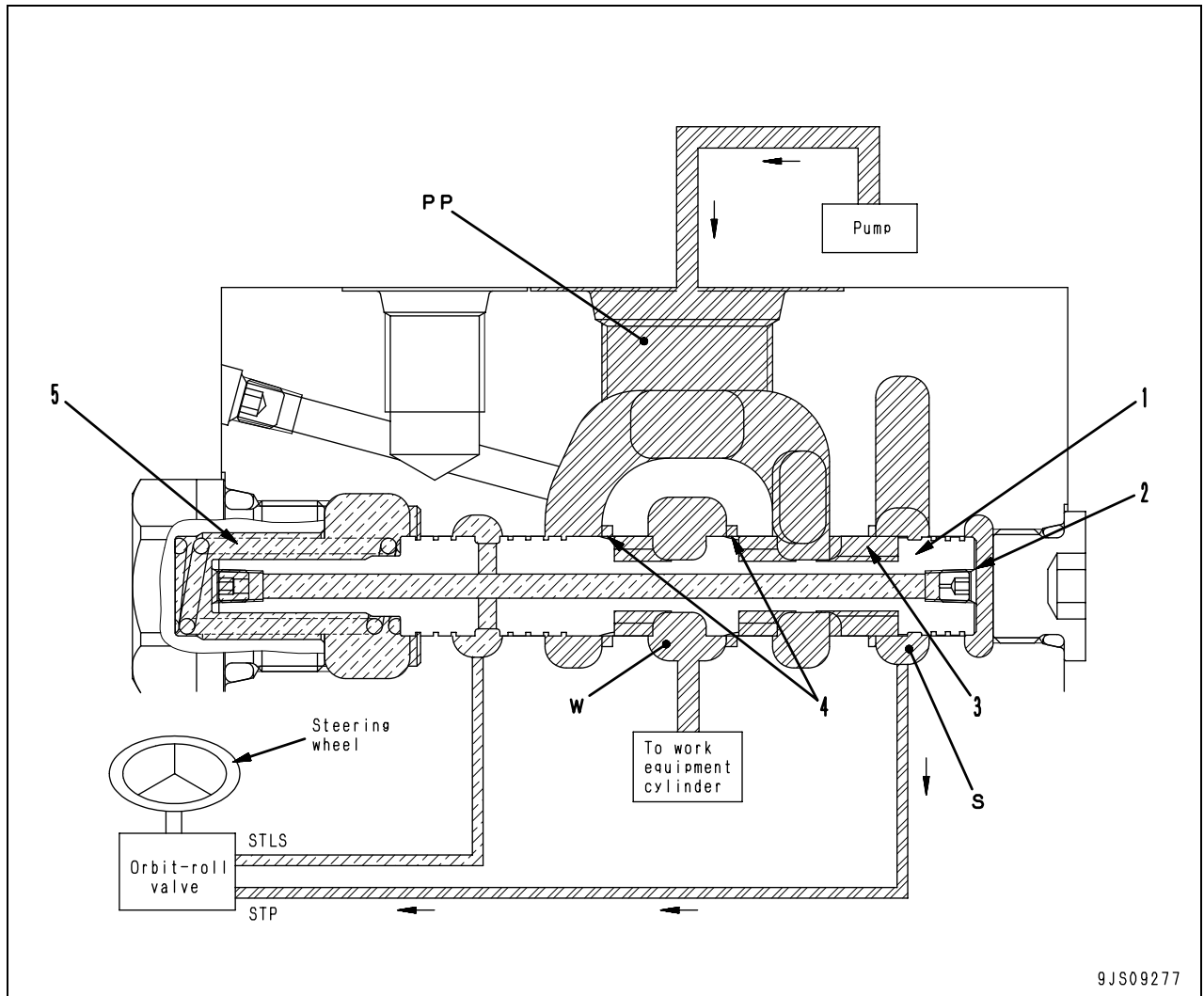
Operation

When work equipment is operated singly

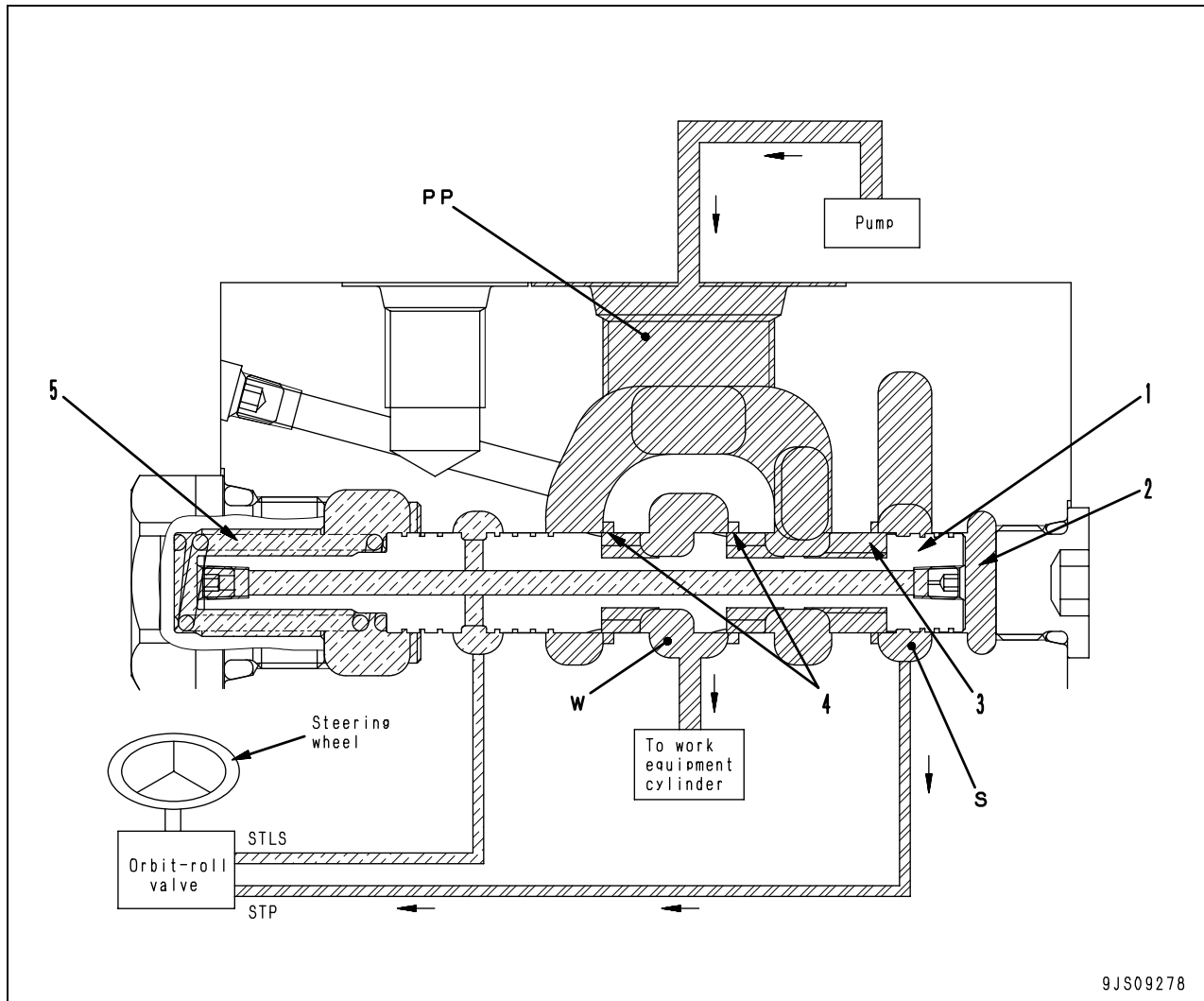


- Pump pressure (PP) is applied to the right end of spool (1) and steering LS pressure (STLS) is applied to the left end [spring (5) chamber].
- Since the steering is not operated, steering LS pressure (STLS) approximates 0 MPa {0 kg/cm²}.
- Spool (1) is move to the left stroke end by pump pressure (PP) applied to its right end.
- If the work equipment control lever is operated, pump circuit (PP) is connected to work equipment circuit (W) by spool notch (4) and pump pressure (PP) flows to the work equipment cylinder.

When steering is operated singly



- Pump pressure (PP) is applied to the right end of spool (1) and steering LS pressure (STLS) is applied to the left end [spring (5) chamber].
- Since the steering is operated, steering LS pressure (STLS) is the steering cylinder load pressure.
- Spool (1) is balanced at an opening area necessary for supplying steering demand flow by spool notch (4) according to the differential pressure applied to both ends of spool (1) and the set load of spring (5).
- If the steering wheel is operated, pump circuit (PP) is connected to steering circuit (S) by spool notch (4) and pump pressure (PP) flows to the orbit-roll valve.

When steering and work equipment are operated simultaneously

9JS09278

- Pump pressure (PP) is applied to the right end of spool (1) and steering LS pressure (STLS) is applied to the left end [spring (5) chamber].
- Since the steering is operated, steering LS pressure (STLS) is the steering cylinder load pressure.
- Spool (1) is balanced at an opening area necessary for supplying steering demand flow and work equipment demand flow according to the differential pressure applied to both ends of spool (1) and the set load of spring (5).
- If the steering wheel and work equipment are operated simultaneously, pump circuit (PP) and steering circuit (S) are connected by spool notch (4) and pump pressure (PP) flows to the orbit-roll valve and also flows to the work equipment cylinder since pump circuit (PP) and work equipment circuit (W) are connected, too.

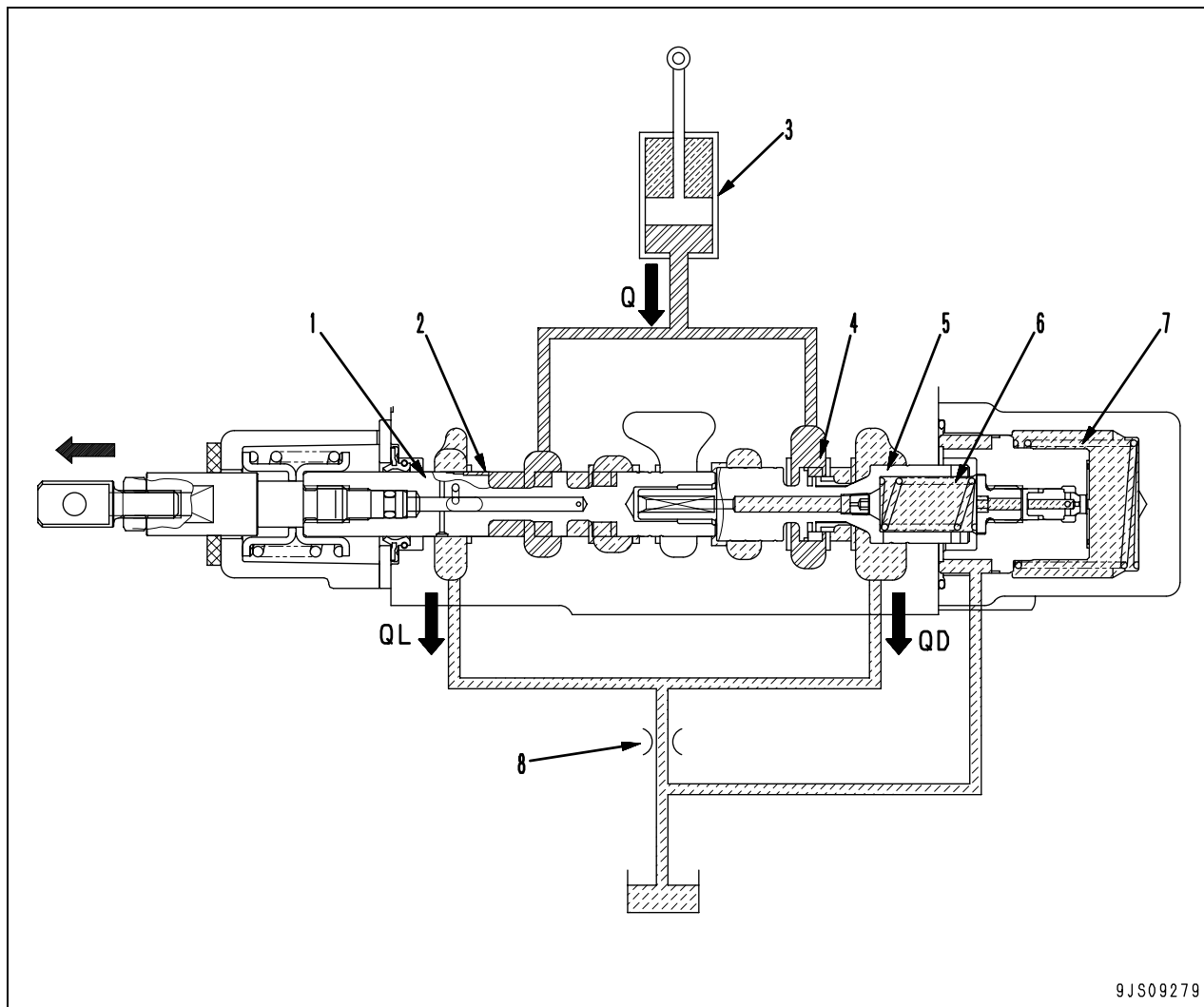
Down control valve

Function

The down control valve controls the cylinder circuit return flow according to the load pressure when the fork is lowered.

Operation

When lift spool (1) is operated for lowering



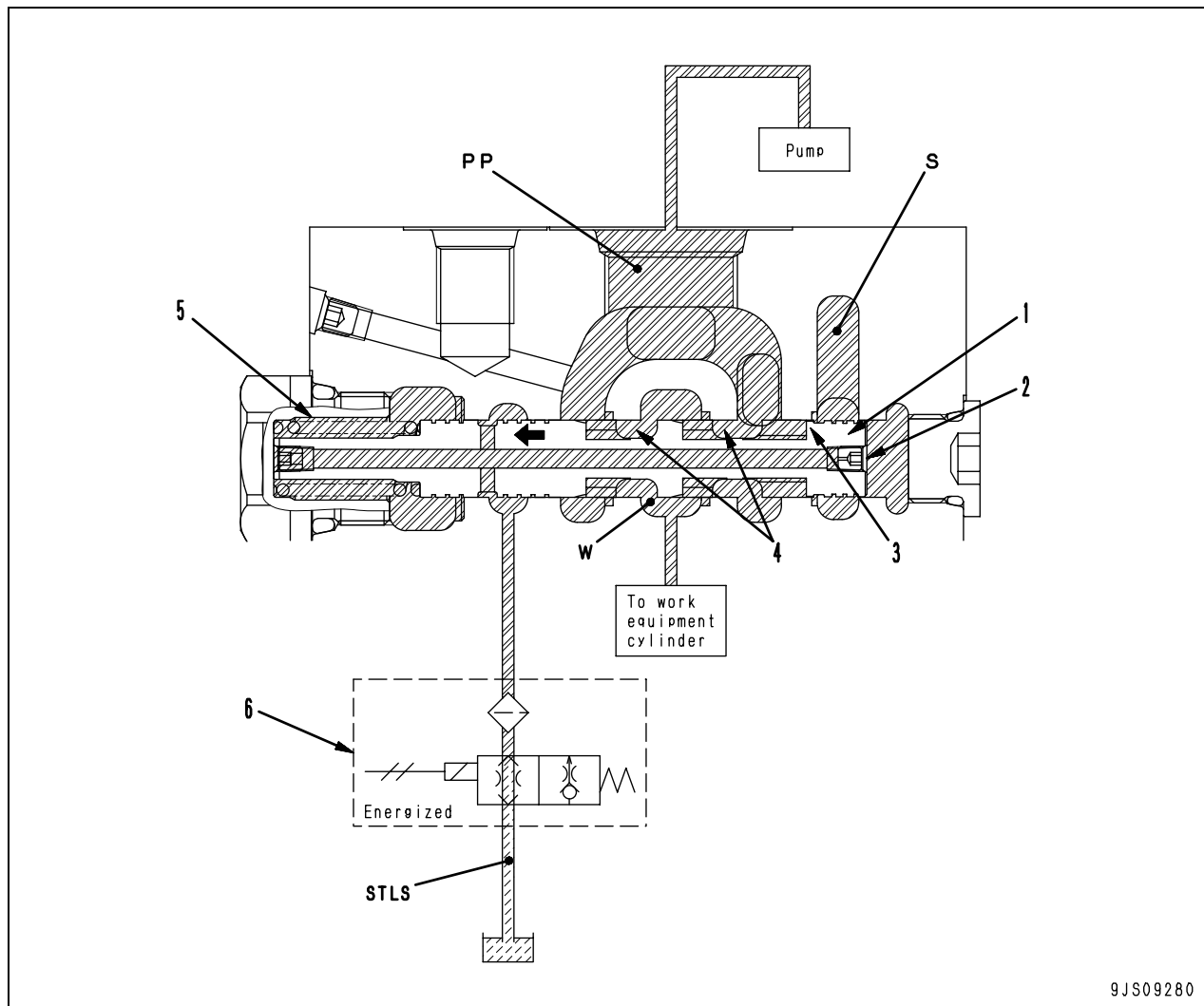
- If lift spool (1) is operated, down control spool (5) is moved by springs (6) and (7) in the same direction with lift spool (1).
- The stroke of down control spool (5) is controlled by the differential pressure between the front and rear of orifice (8) and the balance of springs (6) and (7).
- Return flow (Q) from lift cylinder (3) is the total of flow (QL) through lift spool notch (2) and flow (QD) through down control spool notch (4).

Work equipment lock function (priority valve)**Function**

This function prevents the pump delivery from flowing to the work equipment circuit (W) when solenoid (6) is turned OFF.

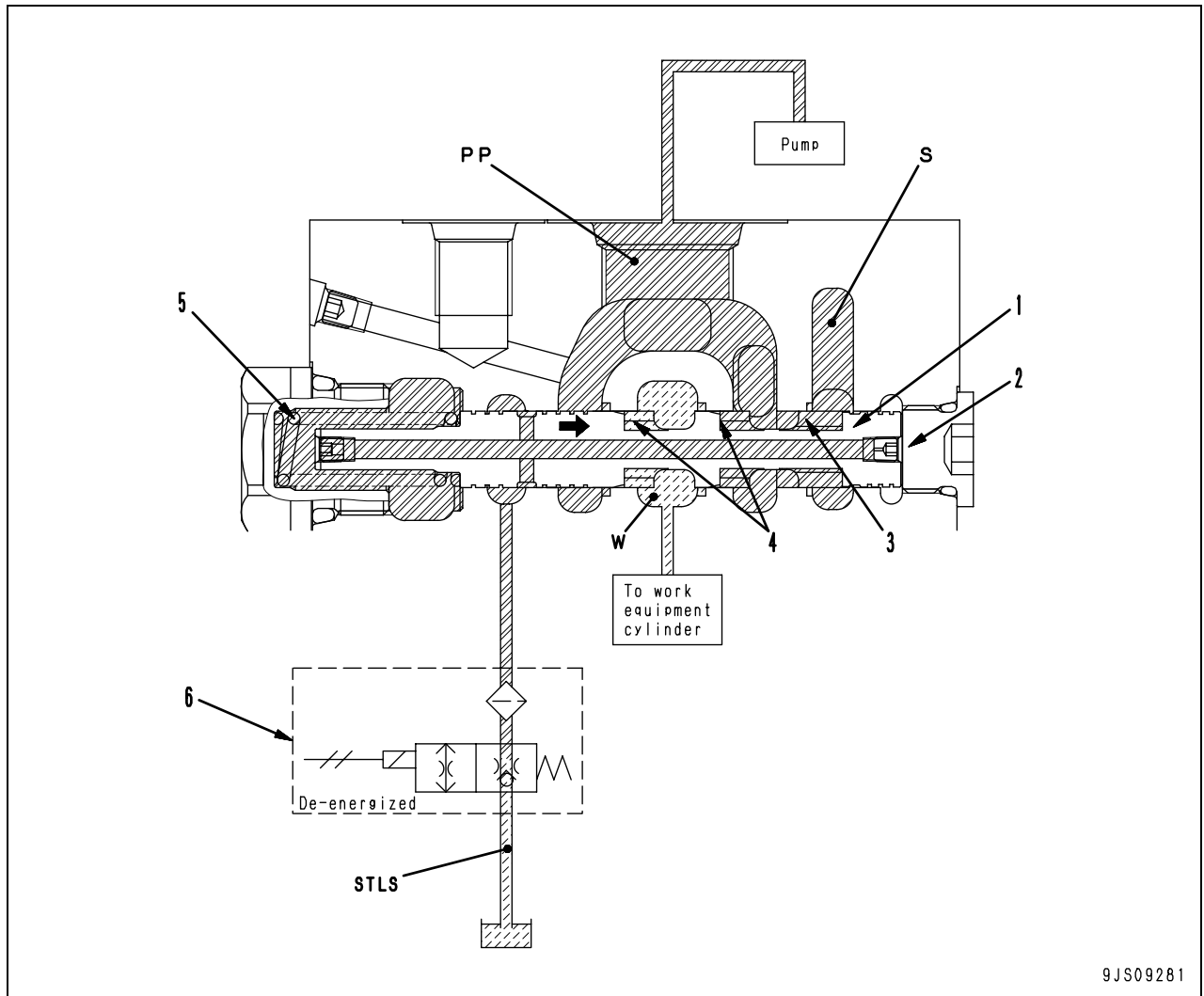
Operation

When solenoid (6) is turned ON



- If the signal to solenoid valve (6) is turned ON, pump pressure (PP) is applied to the right end of spool (1) and steering LS pressure (STLS) is applied to the left end [spring (5) chamber].
- Since the steering is not operated, steering LS pressure (STLS) is 0 MPa {0 kg/cm²}.
- Spool (1) is move to the left stroke end by pump pressure (PP) applied to its right end.
- If the work equipment control lever is operated, pump circuit (PP) is connected to work equipment circuit (W) by spool notch (4) and pump pressure (PP) flows to the work equipment cylinder.

When solenoid (6) is turned OFF



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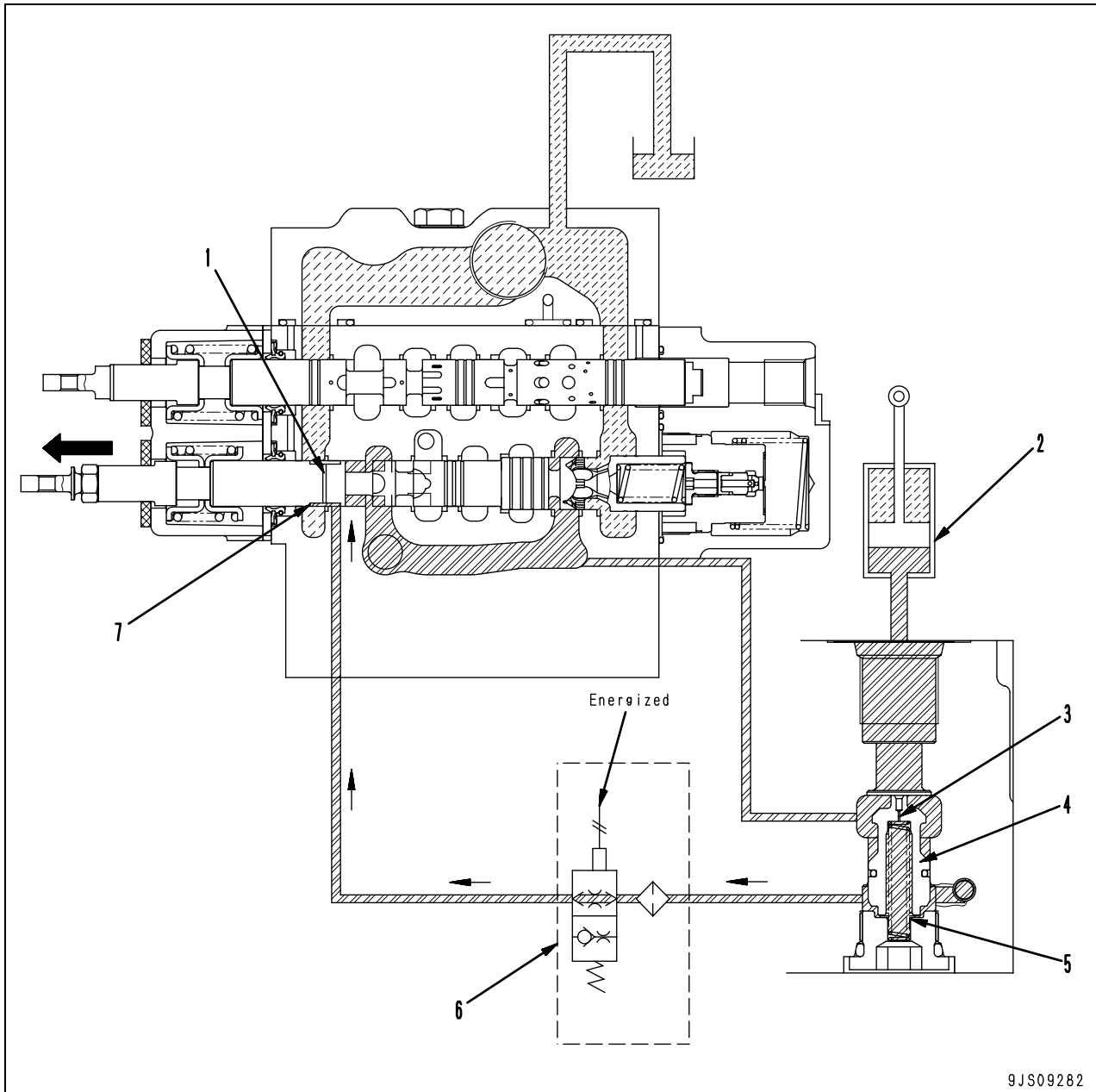
- If the signal to solenoid valve (6) is turned OFF, pump pressure (PP) is applied to the left end [spring (5) chamber] of spool (1) as well as to the right end.
- Spool (1) is moved to the right stroke end by spring (5).
- Since spool notch (4) is closed, pump pressure PP does not flow to work equipment circuit (W) even if the work equipment control lever is operated.

Lift lock function (lift lock valve)**Function**

This function prevents lift cylinder (2) from operating when solenoid valve (6) is de-energized.

Operation

When lift spool (1) operated for lowering and solenoid valve (6) is energized



- If lift spool (1) is operated while solenoid valve (6) is energized, the cylinder pressure is drained into the tank through check valve orifice (3), solenoid valve (6) and lift spool notch (7).
- Differential pressure is generated between front and rear of check valve (4) by the above flow.
- If the differential pressure reaches the set load of spring (5), check valve (4) opens and lift cylinder (2) operates.

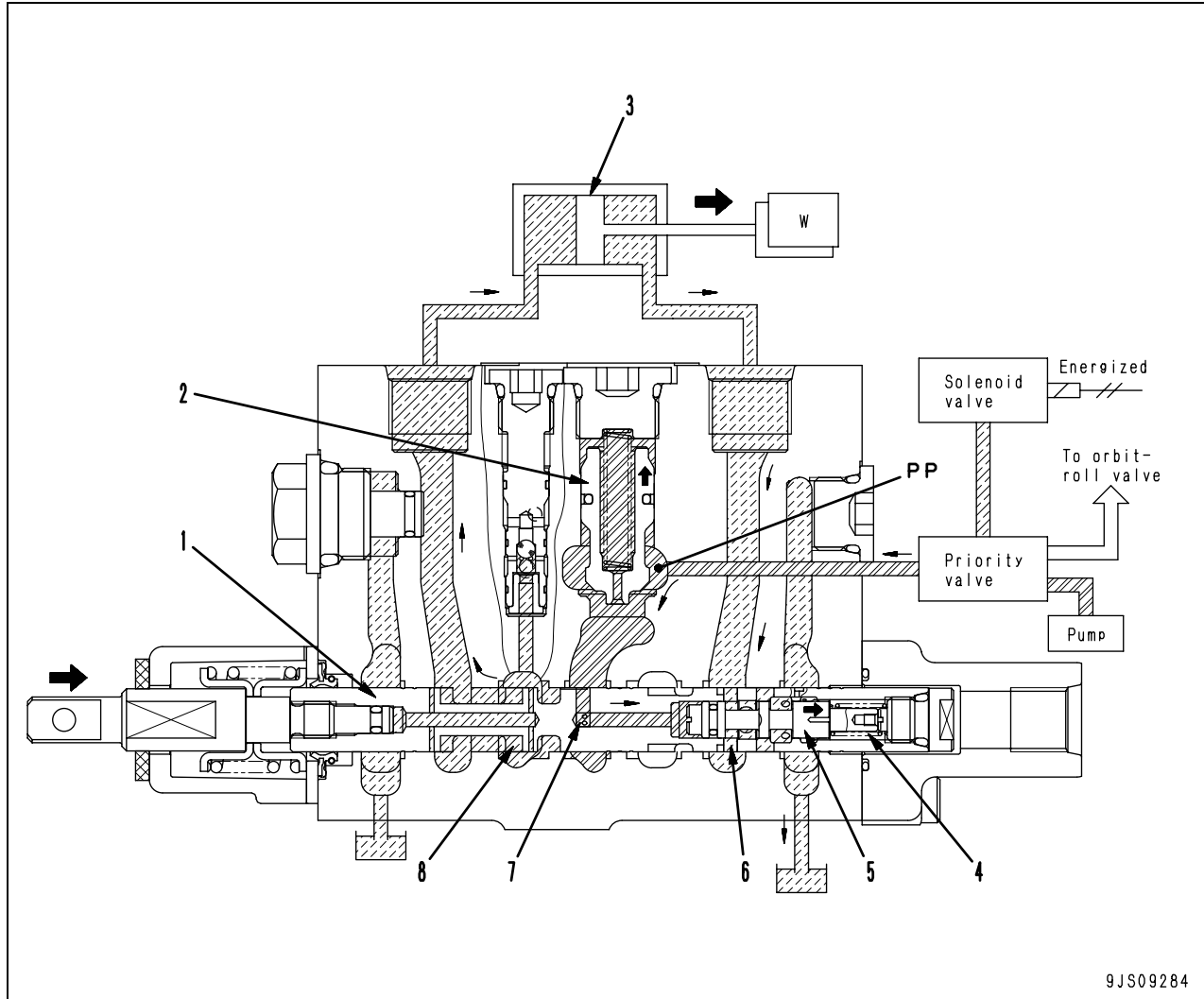
- If solenoid valve (6) is de-energized, the check valve spring chamber is filled with the cylinder pressure and check valve (4) is seated.
- Since check valve (4) does not open even if lift spool (1) is operated, lift cylinder (7) does not operate.

Tilt lock function (tilt lock valve)**Function**

This function prevents the tilt cylinder from operating when the solenoid valve is de-energized.

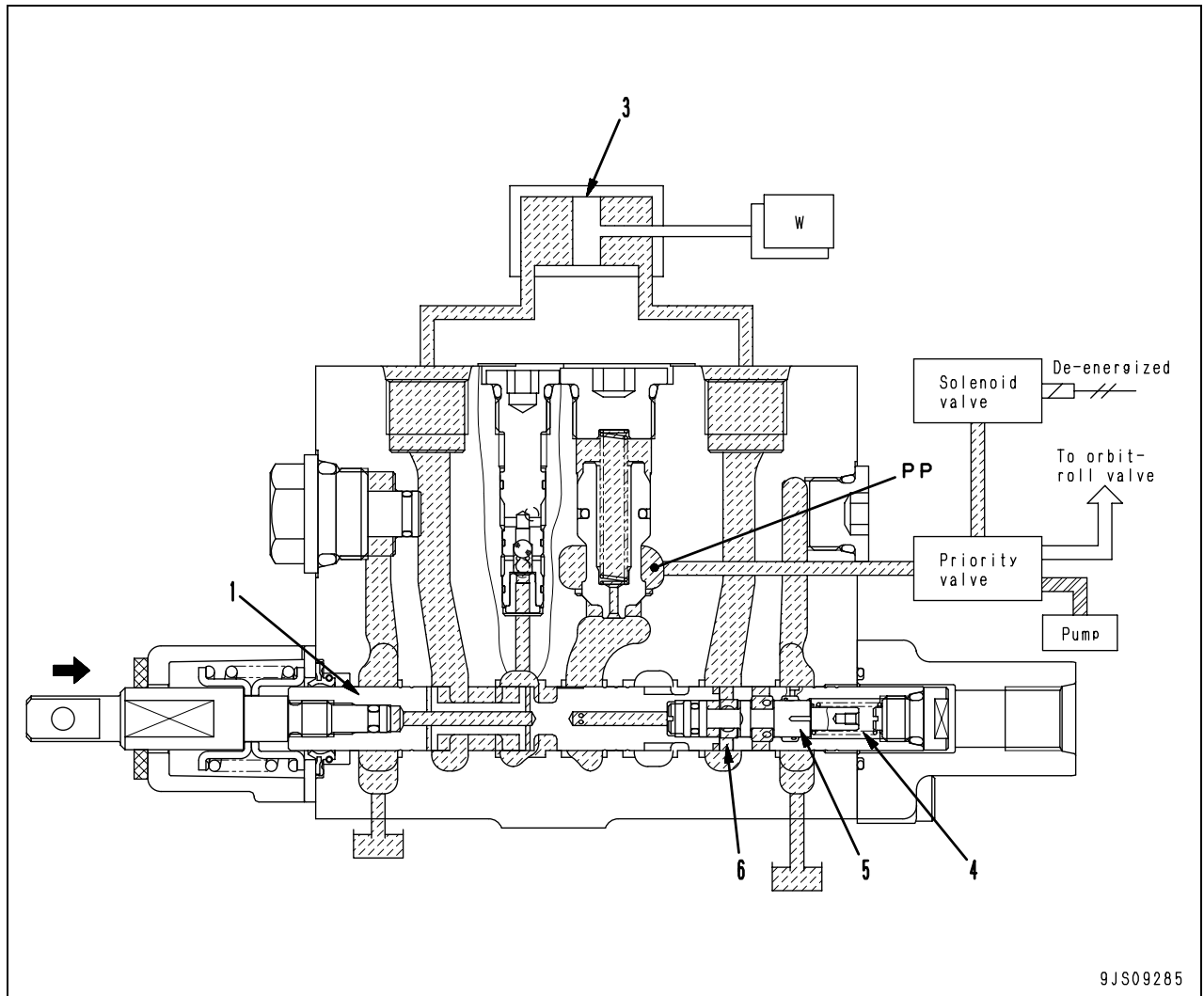
Operation

When tilt spool is operated for tilting forward and solenoid valve is energized



- If tilt spool (1) is operated for tilting forward, pump pressure (PP) acts on tilt spool notch (6) through load check valve (2), tilt spool notch (8) and tilt cylinder (3).
- Since pump pressure (PP) is applied to the left end of tilt lock valve (5) through tilt spool hole (7), tilt lock valve (5) moves and pushes spring (4).
- If tilt lock valve (5) moves, tilt spool notch (6) is connected to the tank and tilt cylinder (3) moves for tilting forward.

When tilt spool is operated for tilting forward and solenoid valve is de-energized



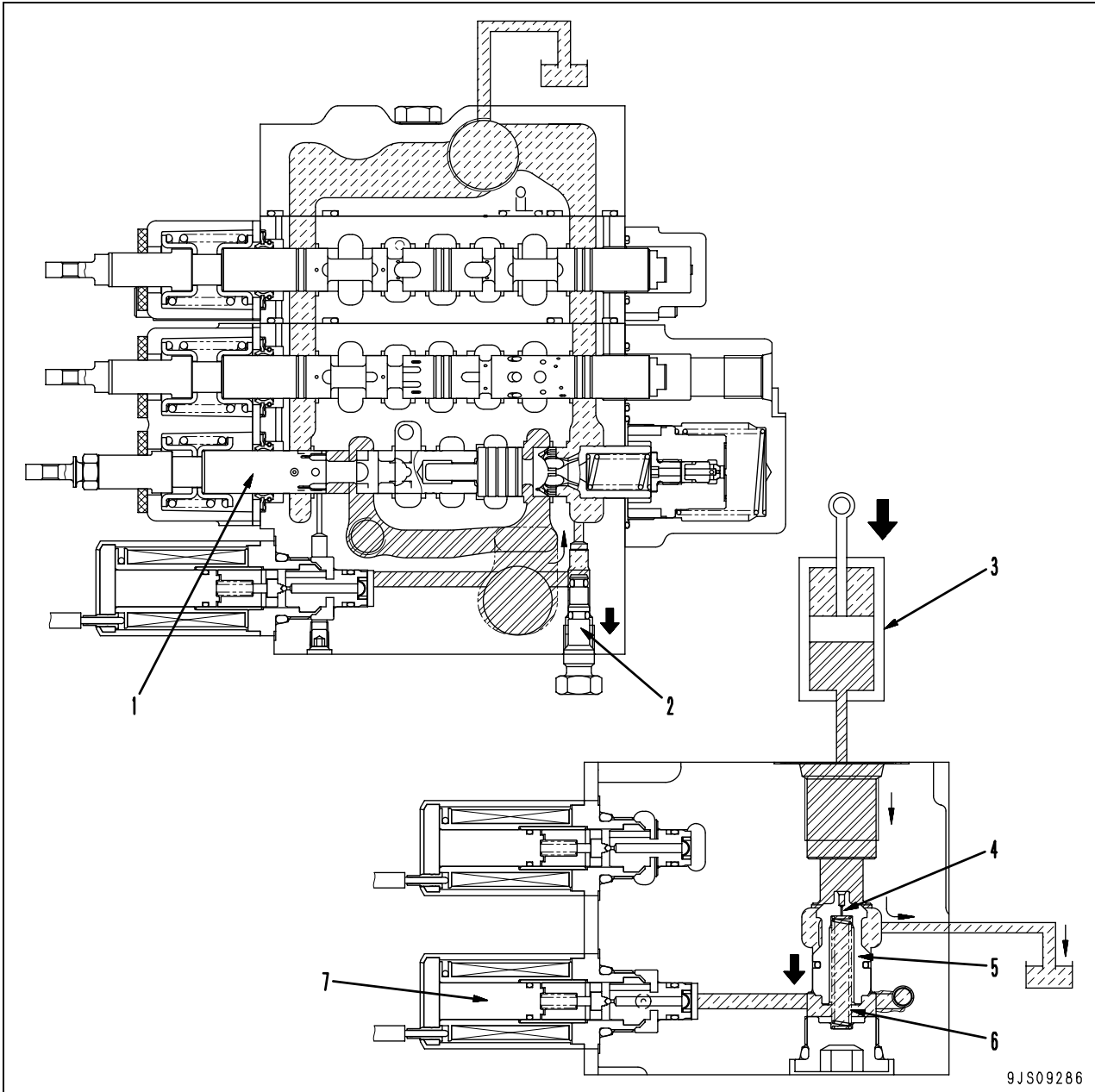
- If the solenoid valve is de-energized, pump pressure (PP) is stopped by the priority valve and is not applied to the left end of tilt lock valve (5).
- Since tilt lock valve (5) is pressed by spring (4), tilt spool notch (6) is not connected to the tank, thus tilt cylinder (3) does not operate even if tilt spool (1) is operated for tilting forward.

Emergency lowering valve

Function

When solenoid valve (7) breaks down or the electric circuit has a trouble, lift cylinder (3) can be lowered manually with the emergency lowering valve.

Operation



- While solenoid valve (7) is de-energized, check valve (5) does not open even if lift spool (1) is lowered, thus lift cylinder (3) does not operate. [See Lift lock function (lift lock valve)]
- If emergency lowering valve (2) is opened slowly under this condition, the pressurized oil in the spring chamber of check valve (5) is drained into the tank and differential pressure is generated between front and rear of check valve orifice (4).
- If the differential pressure reaches the set load of spring (6), check valve (5) opens and lift cylinder (3) lowers.

FORKLIFT TRUCK

CX50 Series

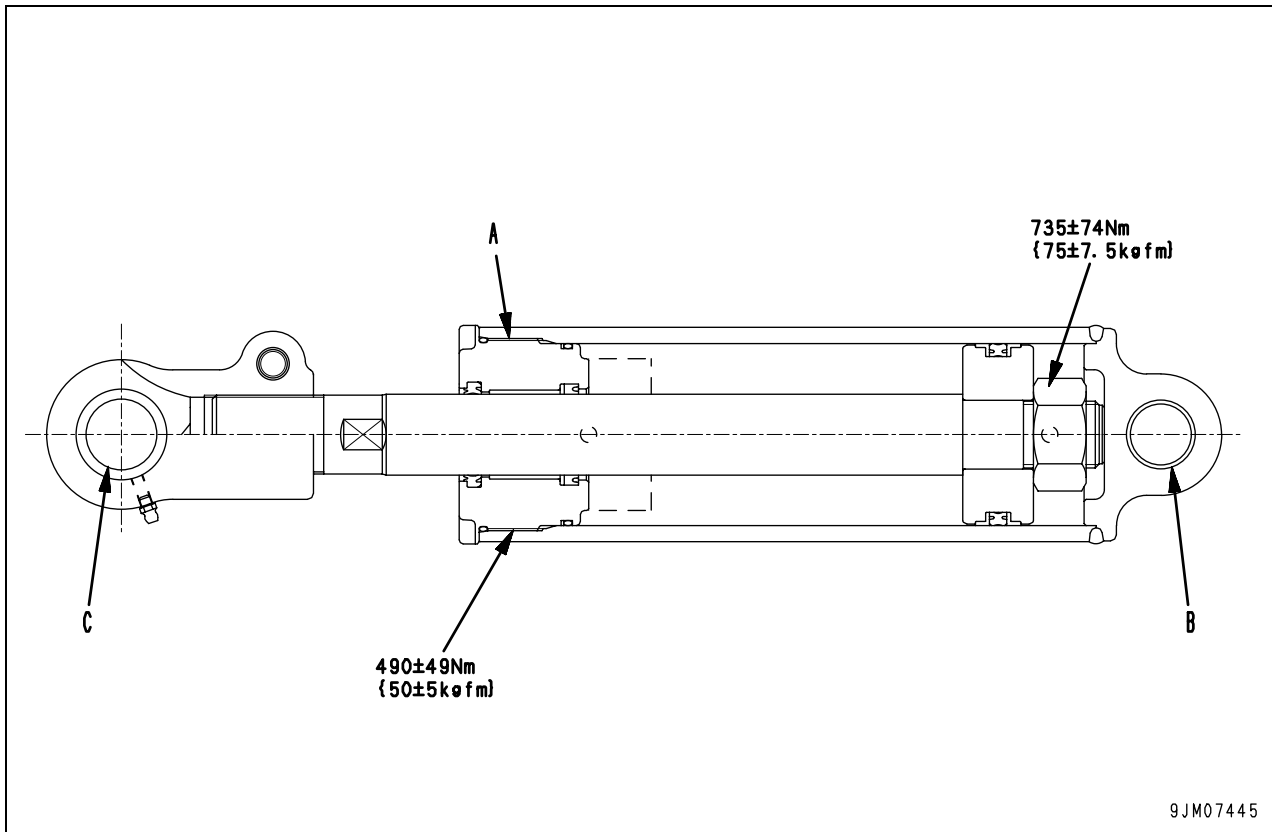
Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

10 Structure, function and maintenance standard

700 Work equipment

Tilt cylinder	2
Lift cylinder	3
Mast	4
Fork carriage	11
Fork	12

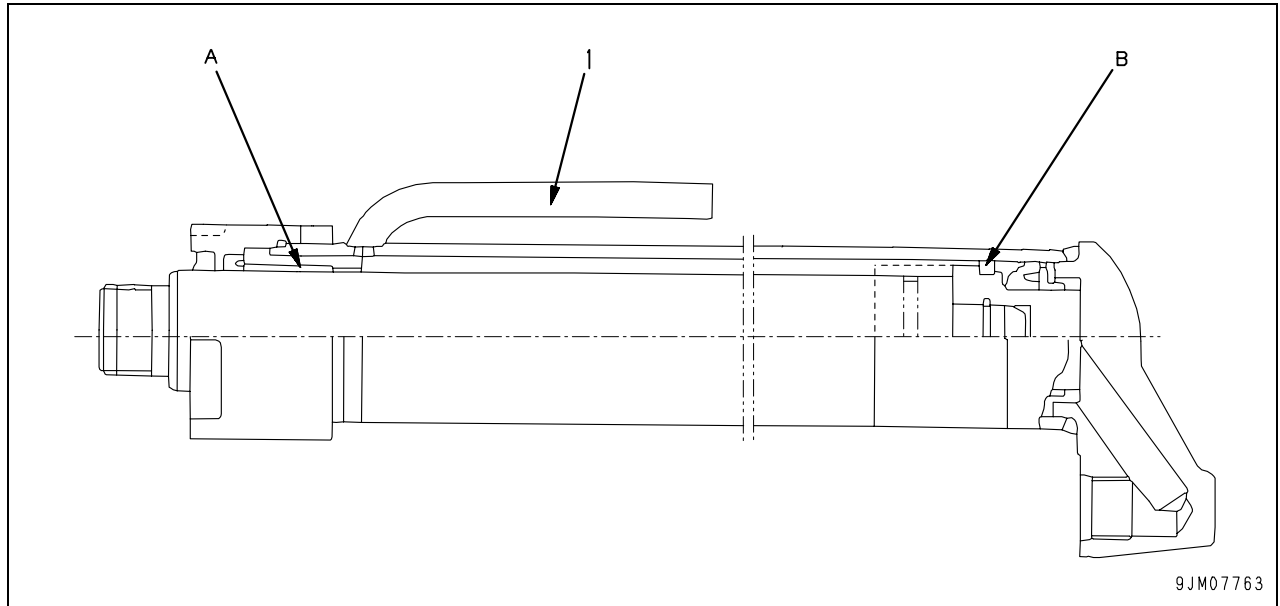
Tilt cylinder



Unit: mm

No.	Check item	Criteria				Remedy
A	Clearance between piston rod and cylinder head bushing	Standard size		Tolerance	Repair limit	Replace
		Bushing inside diameter	Piston outside diameter	0.032 – 0.239	0.545	
		40	40			
B	Clearance between cylinder mounting pin and bushing (bottom side)	Bushing inside diameter	Pin diameter	0.1 – 0.35	0.6	
		30	30			
C	Clearance between rod head pin and head pin hole	Bushing inside diameter	Pin diameter	0.04 – 0.14	2.5	
		35	35			

Lift cylinder

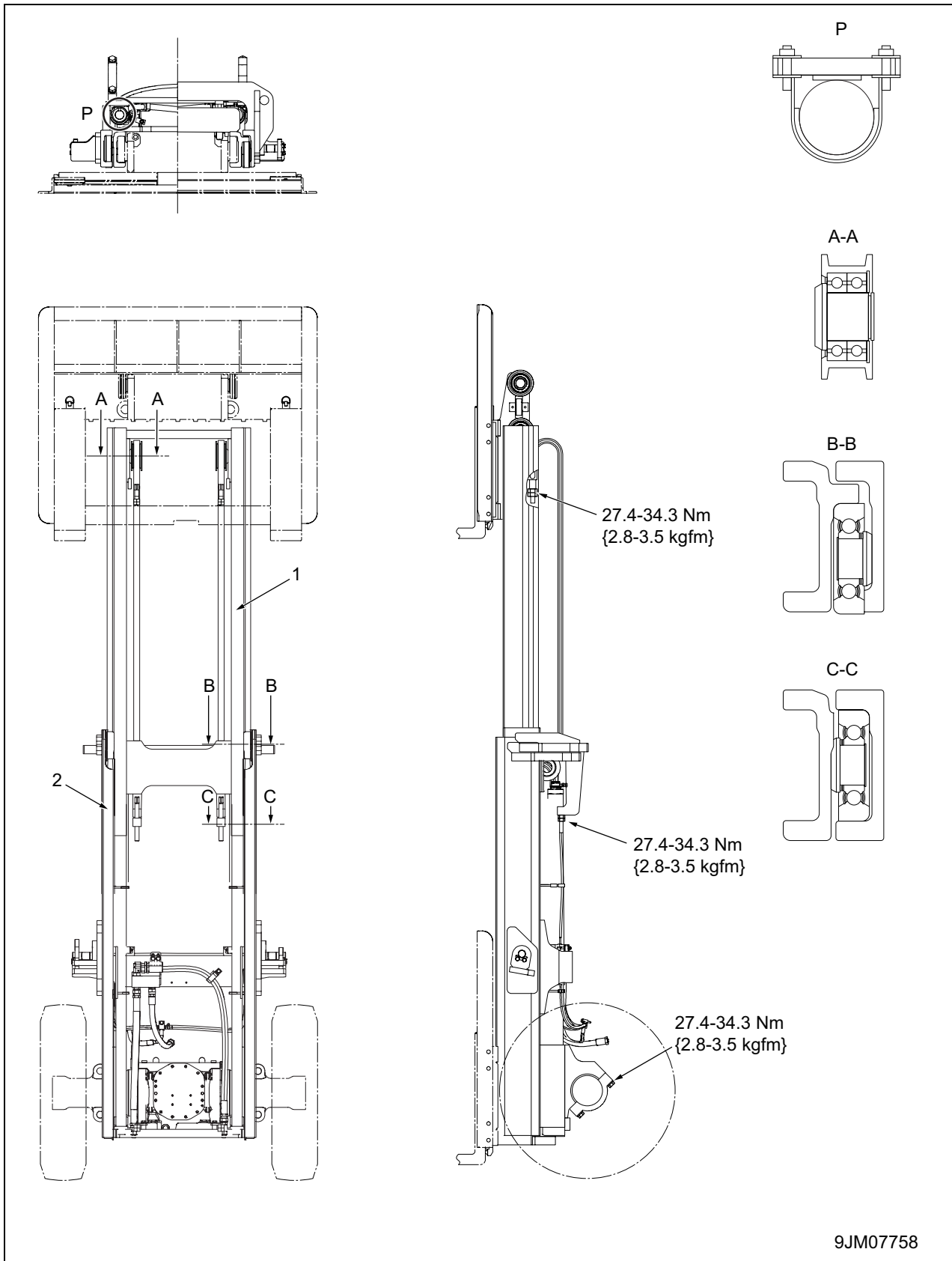


1. Drain pipe

Unit: mm

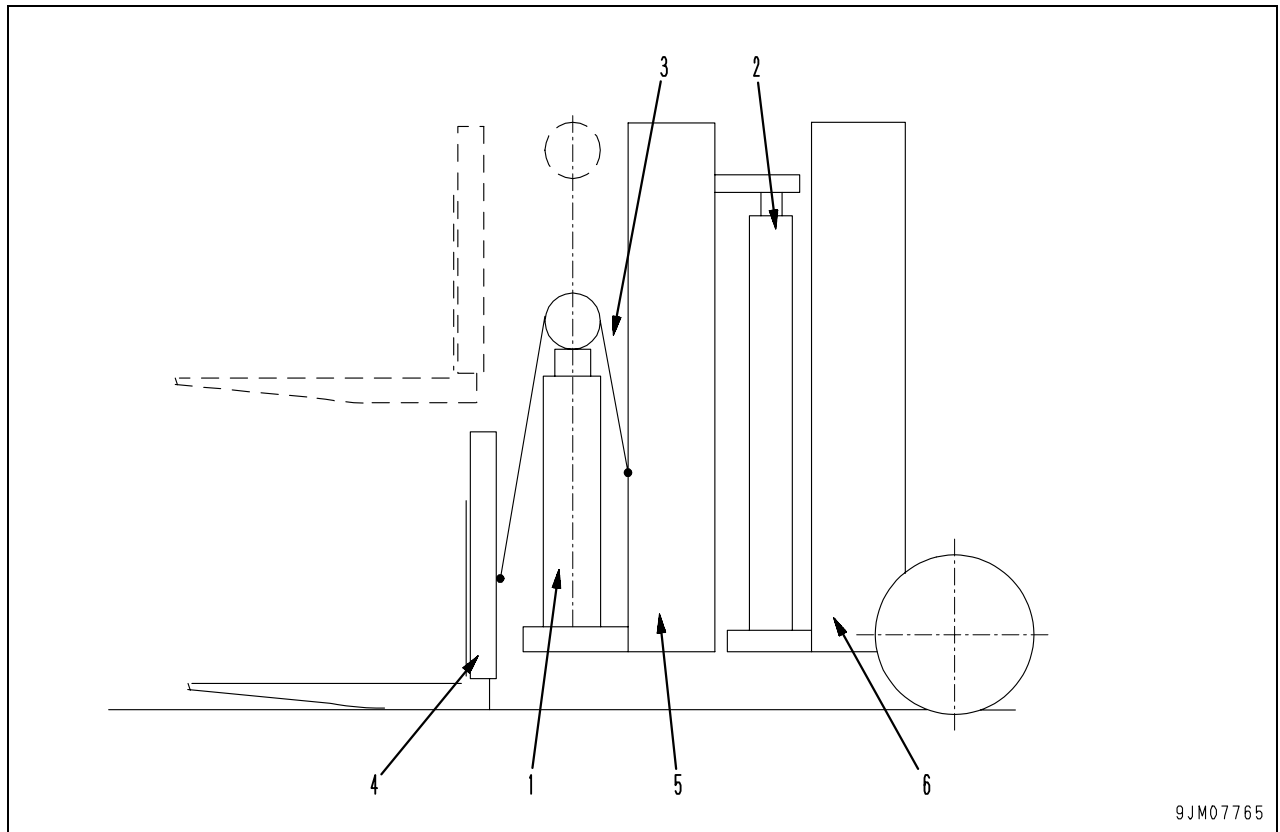
No.	Check item	Criteria		Remedy
		Standard size	Repair limit	
A	Clearance between cylinder rod and bushing	0.072 – 0.288	0.5	Replace bushing
B	Clearance between piston ring and tube	0.05 – 0.30	0.5	Replace piston ring

Mast



1. Inner mast
2. Outer mast

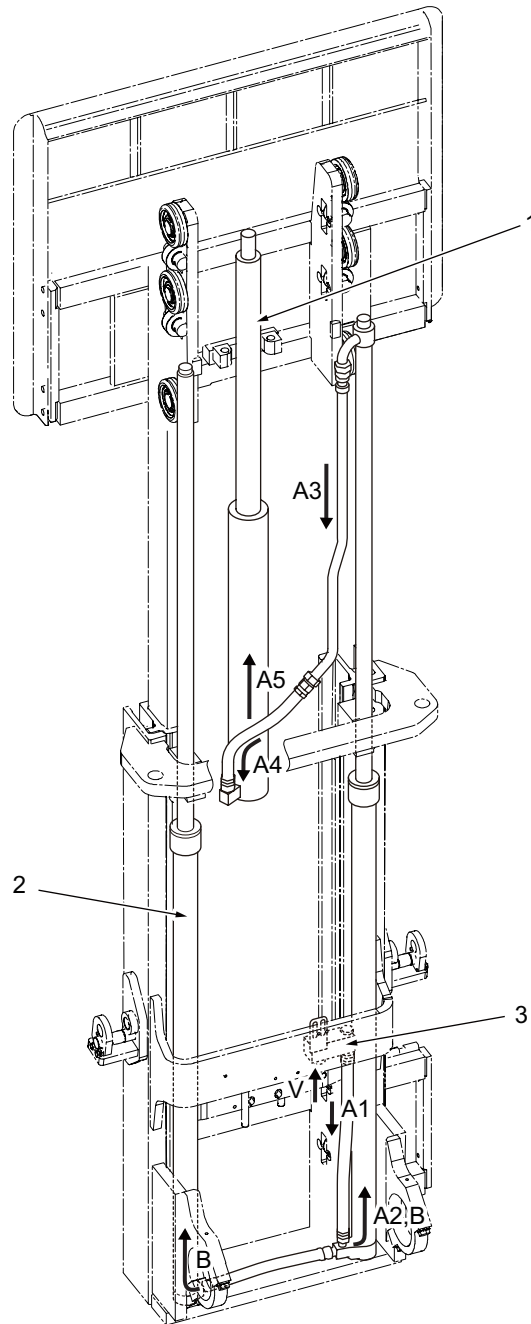
Full free view mast



1. Front cylinder
2. Rear cylinder
3. Chain
4. Finger board
5. Inner mast
6. Outer mast

Outline

- Finger board (4) is raised by front cylinder (1) installed to inner mast (5). At this time, finger board (4) is raised twice the cylinder stroke because of the chain structure.
- If front cylinder (1) reaches the stroke end, inner mast (5) is raised by rear cylinder (2) installed to outer mast (6). At this time, inner mast (5) is raised the height of cylinder stroke.



9JM07761

- 1. Front cylinder
 - 2. Rear cylinder
 - 3. Block
- V: From control valve

Operation

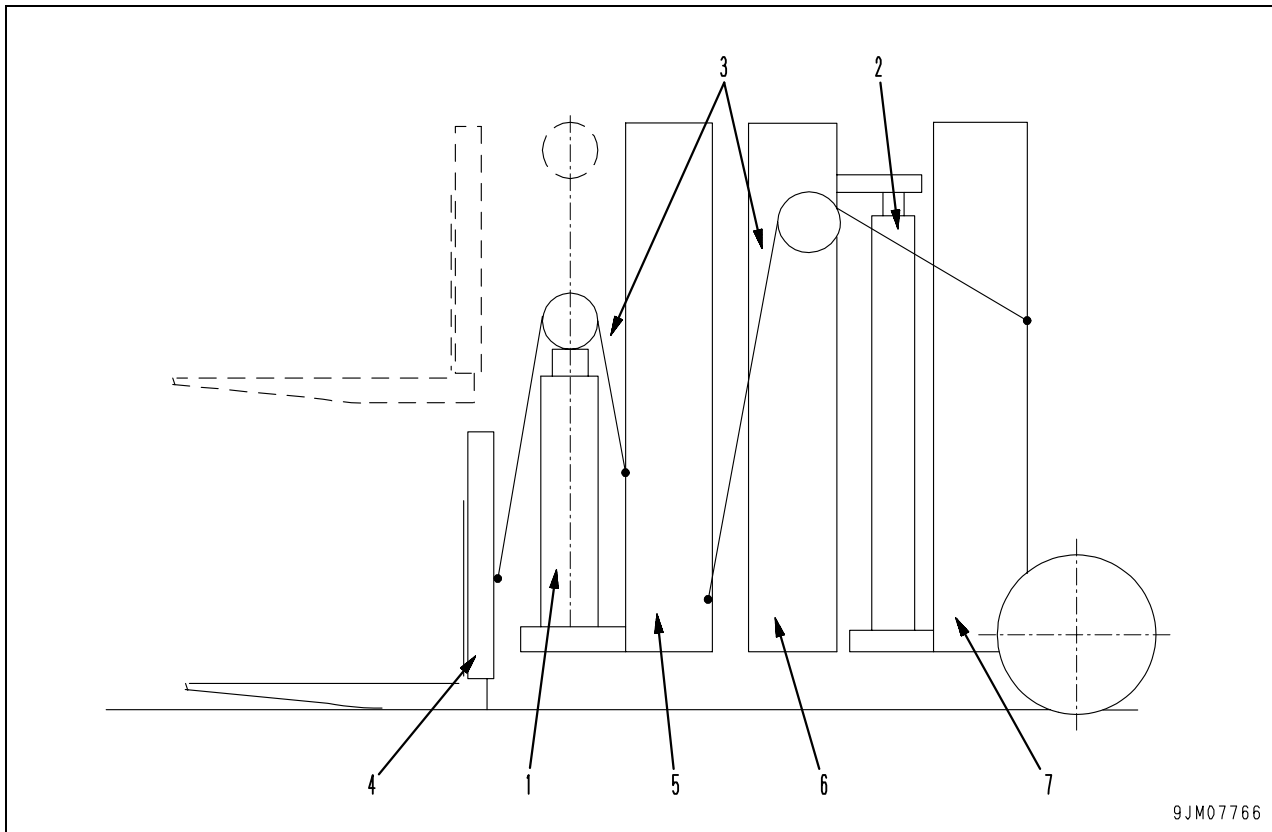
Raising lift

- Since the operating pressures of front cylinder (1) and rear cylinder (2) are different because of their difference in size, the oil discharged from the control valve flows through block (3), passage (A1) to (A5), and rear cylinder hollow rod, and front cylinder (1) is extracted first.
- If the front cylinder (1) is extracted to the stroke end, the oil flows through each passage of (B), and rear cylinder (2) is extracted.

Lowering lift

- When the lift is lowered, the oil flows in reverse and the devices operate in the reverse order.

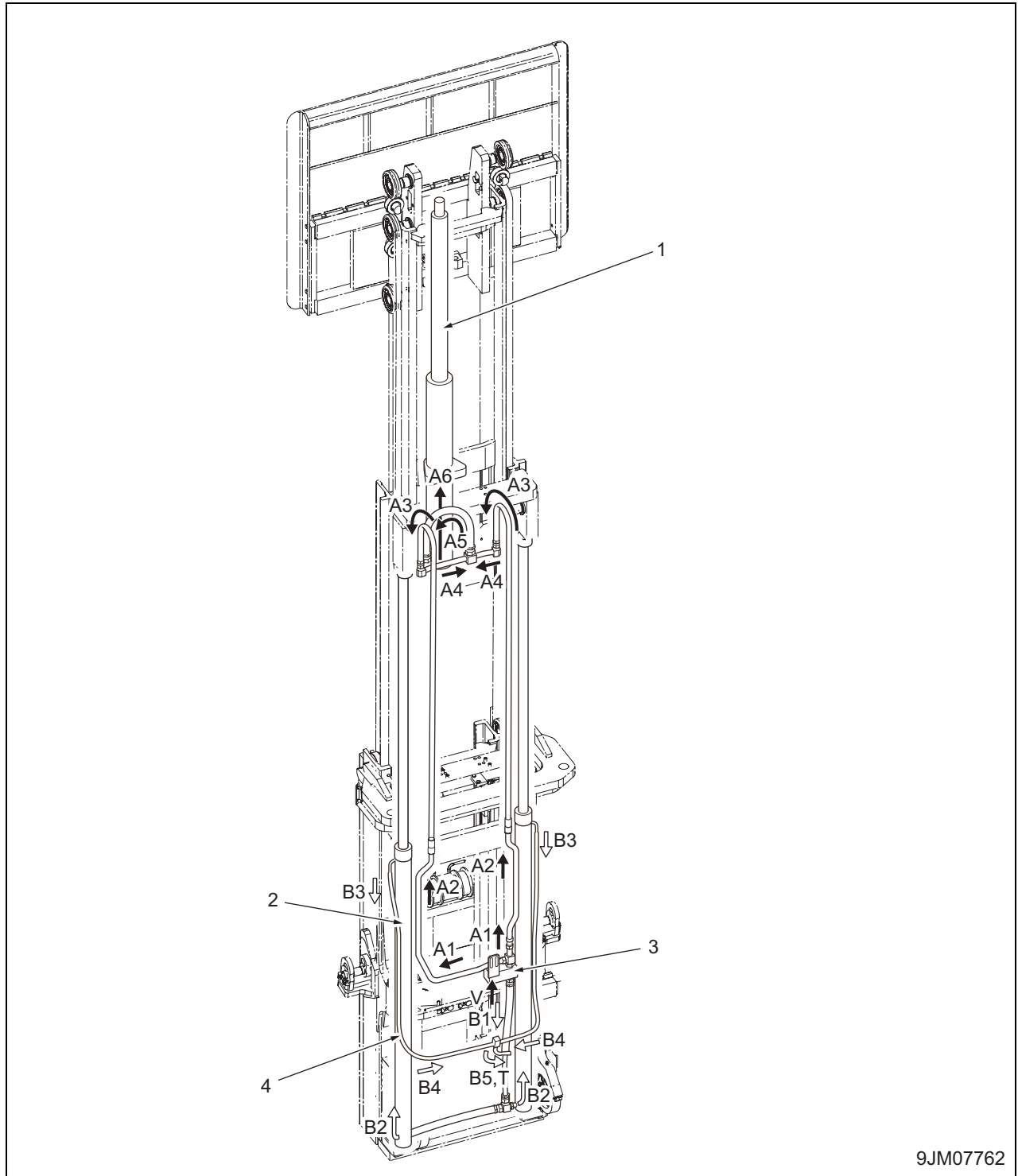
3-stage free view mast



1. Front cylinder
2. Rear cylinder
3. Chain
4. Finger board
5. Inner mast
6. Middle mast
7. Outer mast

Outline

- Finger board (4) is raised by front cylinder (1) installed to inner mast (5). At this time, finger board (4) is raised twice the cylinder stroke because of the chain structure.
- If front cylinder (1) reaches the stroke end, middle mast (6) and inner mast (5) are raised by rear cylinder (2) installed to outer mast (7). At this time, middle mast (6) is raised the height of cylinder stroke and inner mast (5) is raised twice the cylinder stroke because of the chain structure.



1. Front cylinder
2. Rear cylinder
3. Block
4. Return hose

V: From control valve
T: To tank

Operation

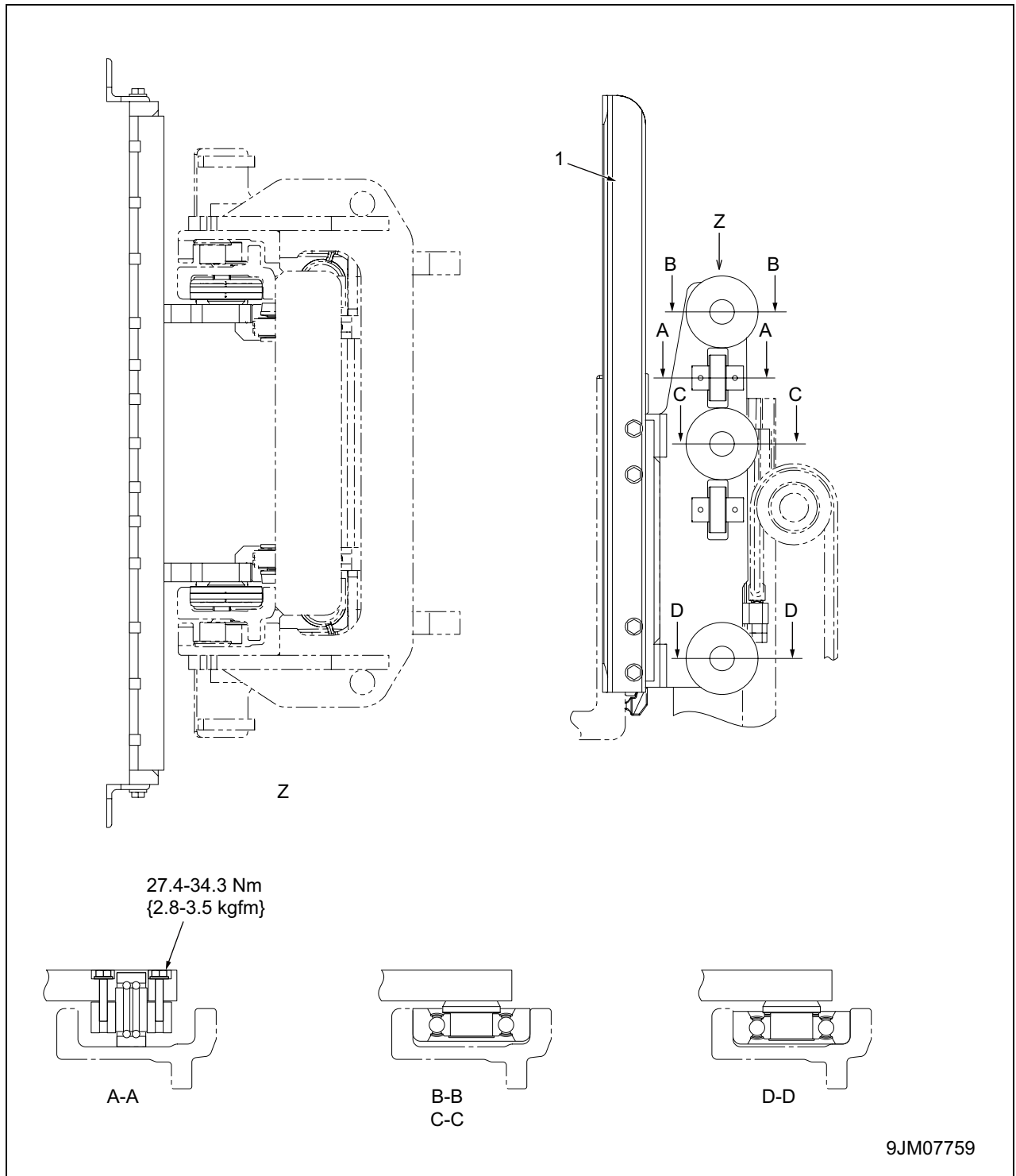
Raising lift

- Since the operating pressures of front cylinder (1) and rear cylinder (2) are different because of their difference in size, the oil discharged from the control valve flows through block (3) and passage (A1) to (A6), and the front cylinder is extracted first.
- If the front cylinder (1) is extracted to the stroke end, the oil flows through passage (B1) to (B2), and rear cylinder (2) is extracted. At this time, the oil on the upper side of rear cylinder (2) is discharged through passage (B3) to (B5) and return hose (4) into the tank.

Lowering lift

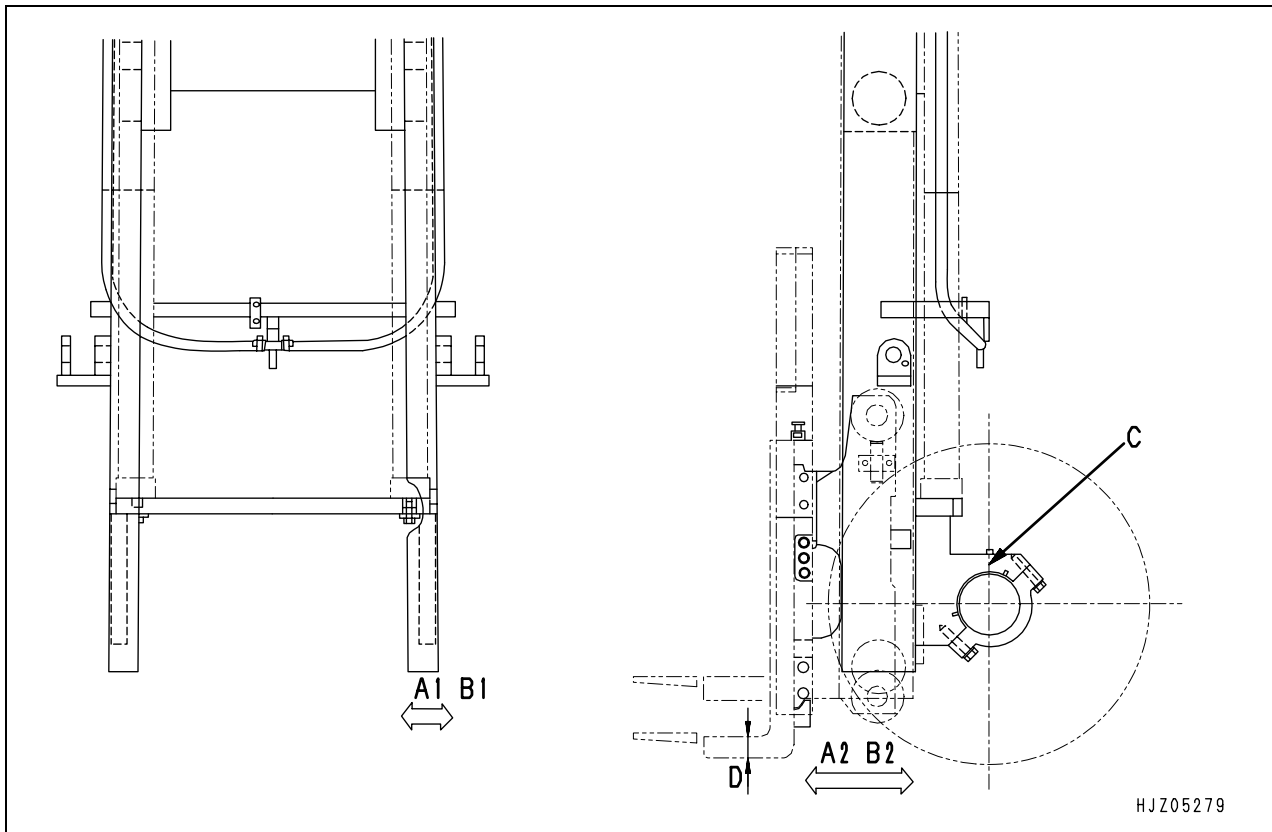
- When the lift is lowered, the oil flows in reverse and the devices operate in the reverse order.

Fork carriage



1. Fork carriage

Fork



Unit: mm

No.	Check item		Criteria		Remedy
			Standard size	Repair limit	
A	Clearance between outer mast and inner mast	A1 Lateral	0.5 – 1.0	Max. 2.5	Adjust shim
		A2 Longitudinal	0.4 – 1.6	Max. 2.0	Replace
B	Clearance between outer mast and finger cover	B1 Lateral	0.5 – 1.0	Max. 2.5	Adjust shim
		B2 Longitudinal	0.4 – 1.6	Max. 2.0	Replace
C	Oil groove of mast support bushing		There is oil groove	Is there oil groove	
D	Fork thickness (base)	3.5t model	50	Min. 48	
		4.0t model	55	Min. 50	
		4.5t model	55	Min. 50	
		5t model	55	Min. 50	

FORKLIFT TRUCK

CX50 Series

Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

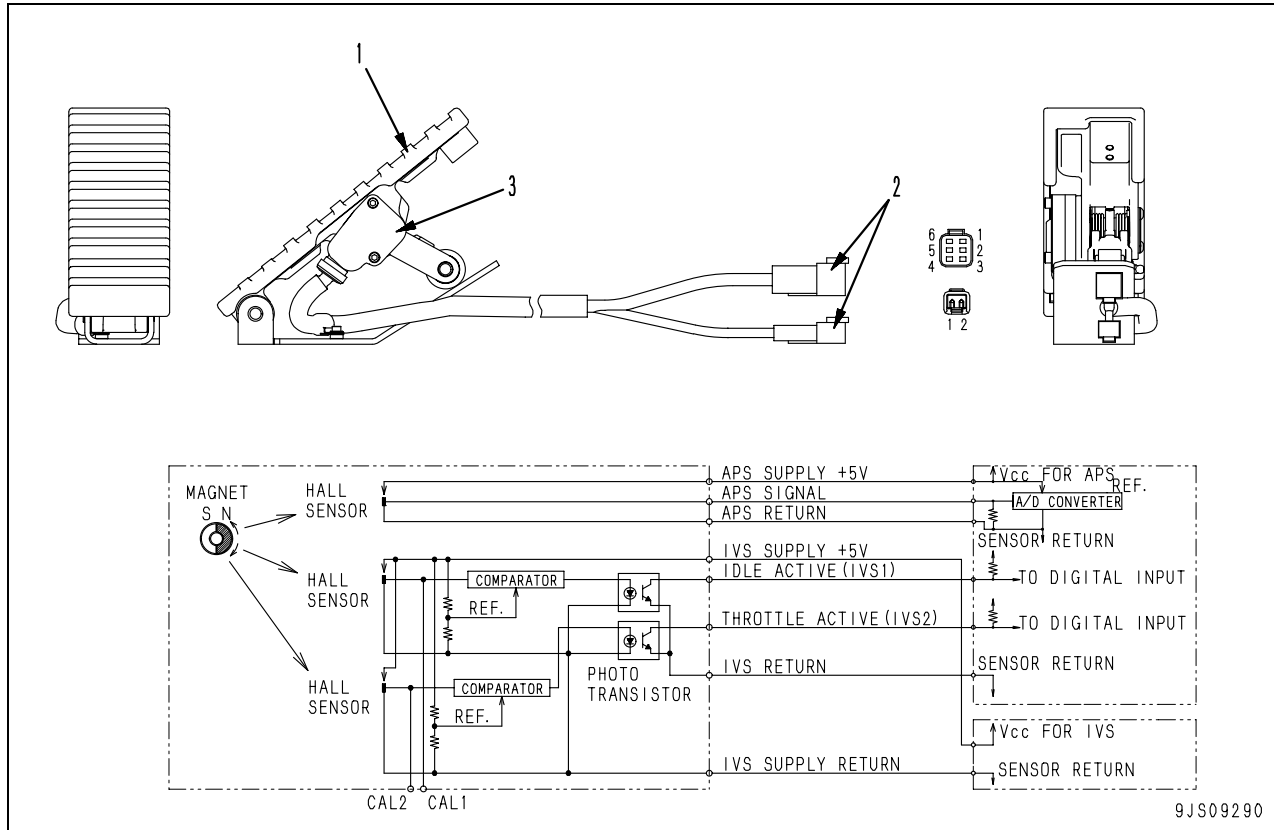
10 Structure, function and maintenance standard

801 Electric devices (Part 1)

Accelerator pedal sensor	2
ISO controller (Operator Presence Sensing (OPS) system)	4
EPACS controller	11
Instrument panel	13
Engine starting circuit	15
Engine stopping circuit	17
Electrical system wiring diagram	18

Accelerator pedal sensor

(Applicable model: Lift truck with SAA4D95LE-5-A engine)



1. Pedal
2. Connector
3. Sensor

Function

- The accelerator pedal sensor is installed on the floor panel top and outputs acceleration signal and idle validation signal according to the accelerator pedal depressing angle.

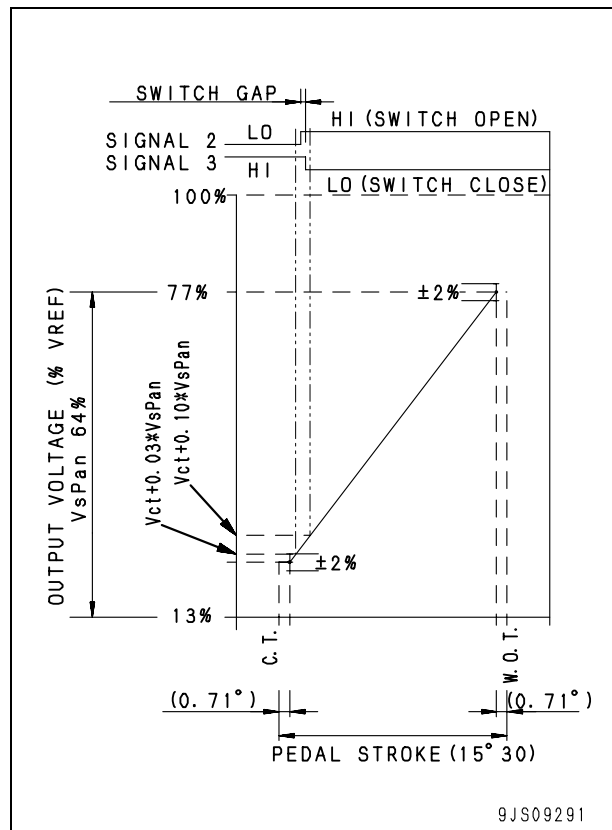
Acceleration signal

- The sensor senses the displacement of the accelerator pedal and outputs a variable voltage through pin No. 2.

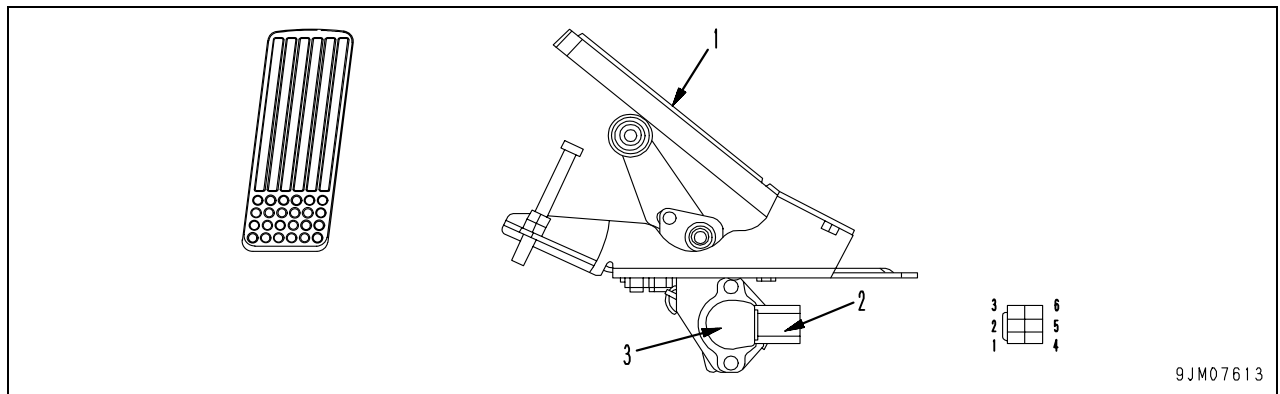
Idle validation signal

- The sensor senses the operating condition of the accelerator pedal. If the accelerator pedal is released, the sensor outputs the signal input to pin No. 5 through pin No. 4. If the former is depressed, the latter outputs the signal input to pin No. 6 through pin No. 4.

Output characteristics



(Applicable model: Lift truck with EBT-TB45-1A/2A/3A engine)



1. Pedal
2. Connector
3. Sensor

Acceleration signal

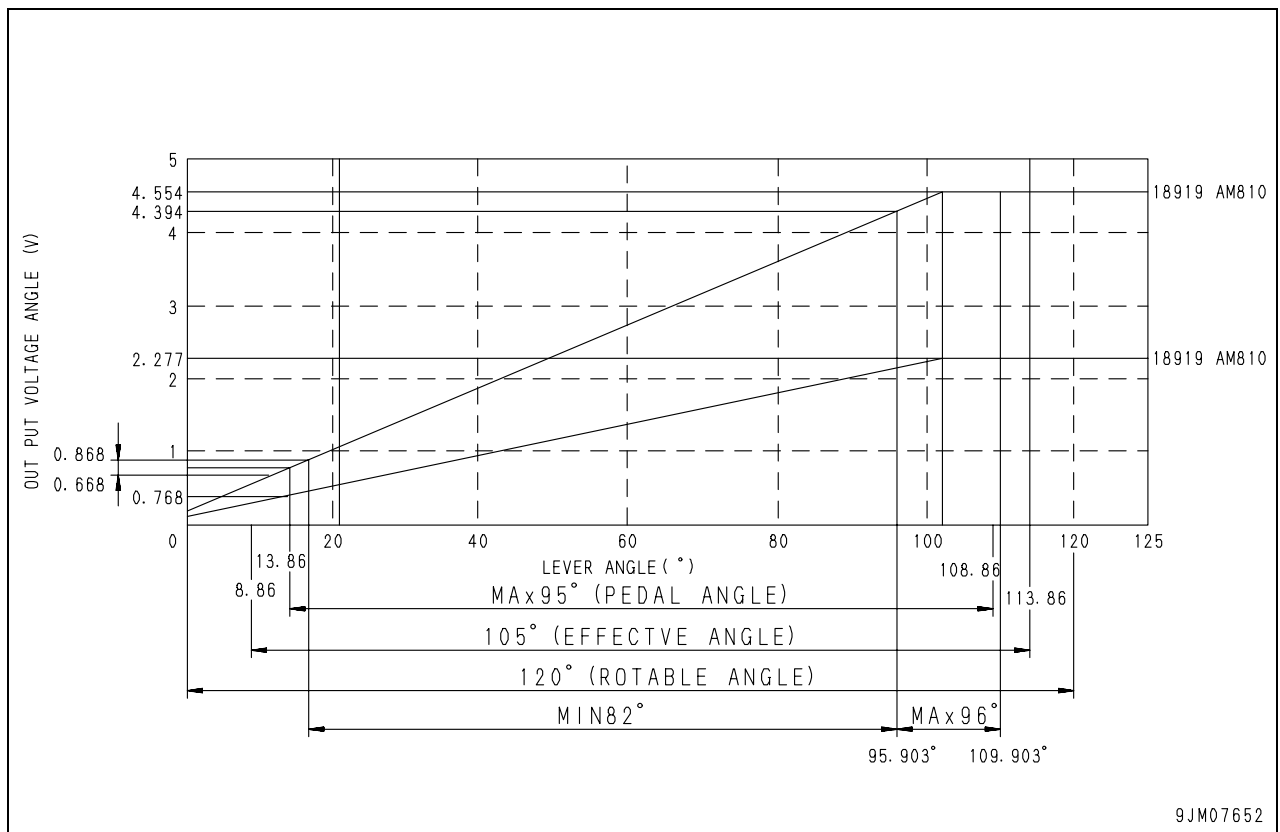
- The sensor senses the displacement of the accelerator pedal and outputs a variable voltage through pins No. 5 and 2.

Function

- The accelerator pedal sensor is installed on the floor top and outputs acceleration signal according to the accelerator pedal depressing angle.

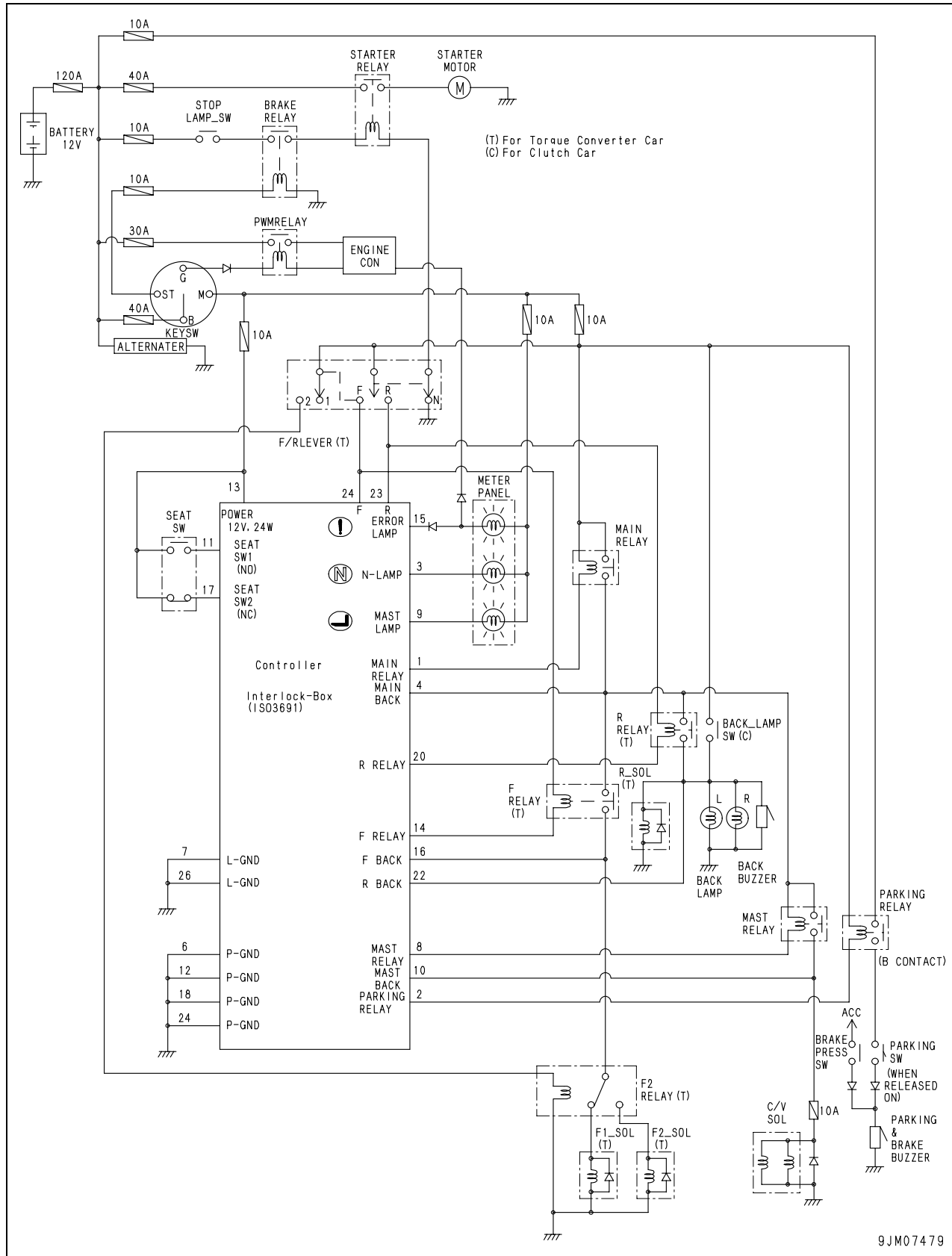
Accelerator pedal sensor output characteristics (PAS1, PAS2)

Input voltage: 5.12 V

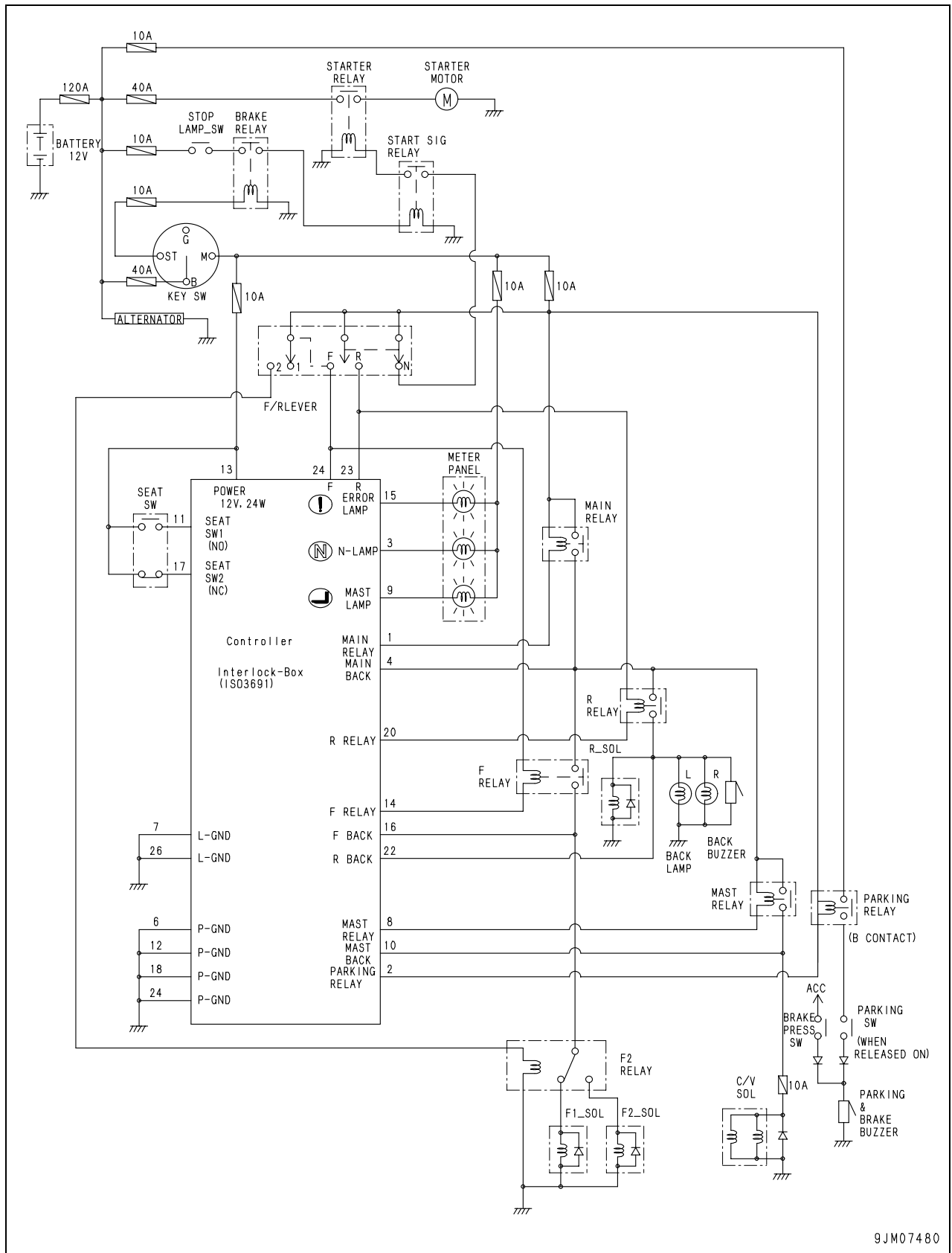


ISO controller (Operator Presence Sensing (OPS) system)

ISO control system configuration (Applicable model: Lift truck with SAA4D95LE-5-A engine)



(Applicable model: Lift truck with EBT-TB45-1A engine)



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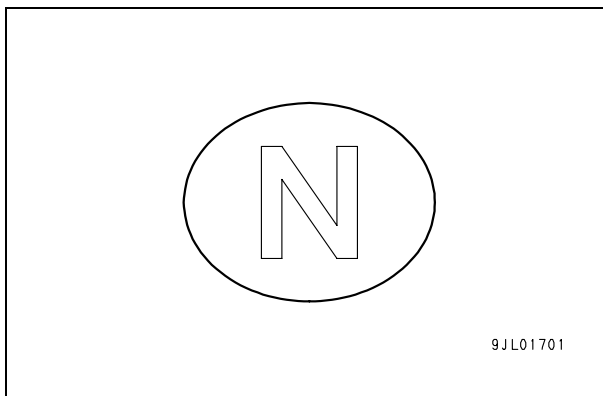
Functions of ISO controller

CX Series model is equipped with the ISO controller near the battery. The ISO controller conforms to ISO3691 Standard and has functions of increasing the safety of the lift truck.

Travel interlock function

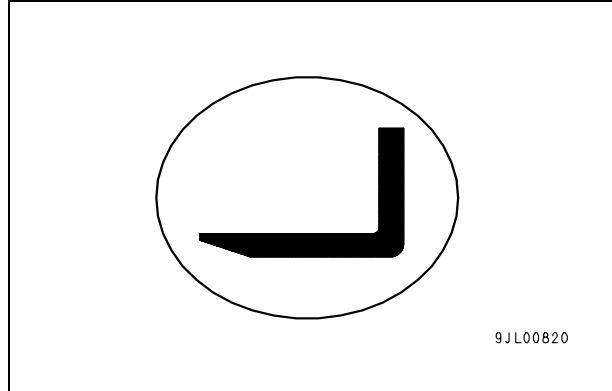
If the operator leaves the operator seat, the seat switch installed to the seat operates to disable the travel operation of the lift truck. To start the travel operation again, the forward-reverse lever must be reset. With this function, misoperation of the lift truck is prevented. The operator can check the operating condition of the travel interlock by the travel interlock warning lamp on the instrument panel.

If the operator leaves the seat with the forward-reverse lever in the F or R position, the travel interlock warning lamp blinks to notify the operator that the lift truck cannot travel. If the operator sits in the seat correctly and returns the forward-reverse lever to the N position (resets the lever), the blinking travel interlock warning lamp lights and the lift truck can travel.



Lift interlock function

If the operator leaves the operator seat, the seat switch installed to the seat operates to disable the lifting operation of the lift truck. The operator can check the operating condition of the lift interlock by the lift interlock warning lamp on the instrument panel. If the operator sits in the seat correctly, the lift interlock warning lamp goes off and the lift truck can start lifting operation.



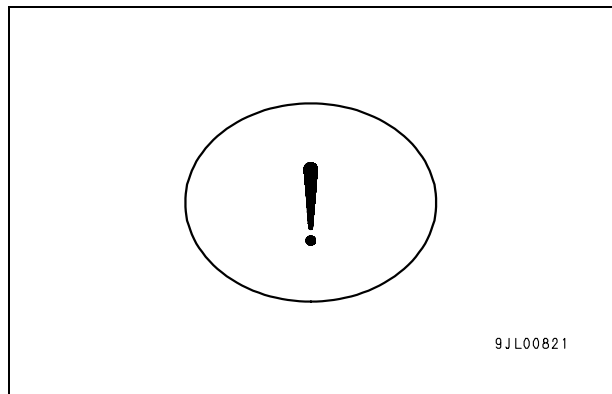
Parking brake remainder warning

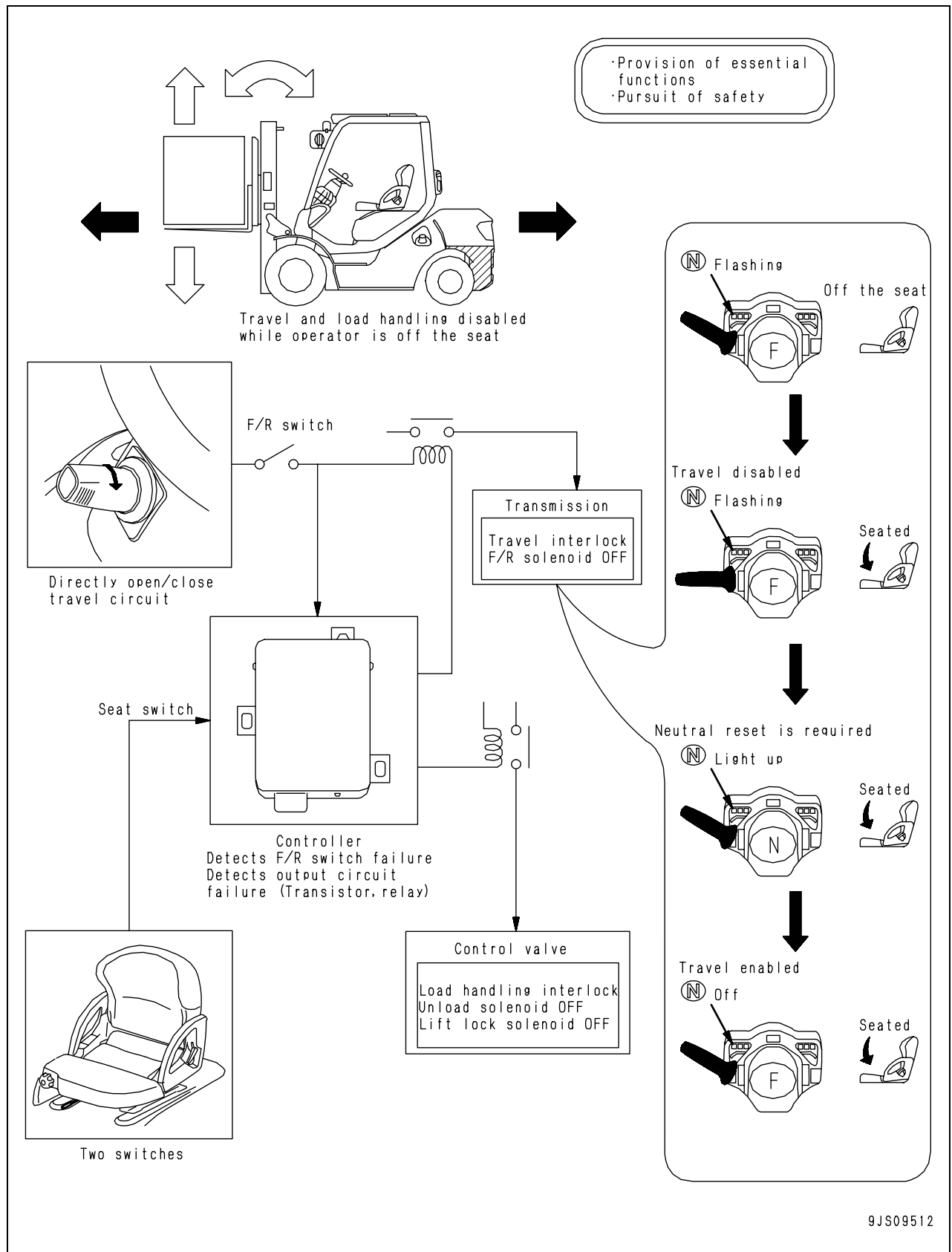
If the operator leaves the operator seat without pulling the parking brake lever, the buzzer sounds to remind the operator to apply the parking brake.

Trouble detection

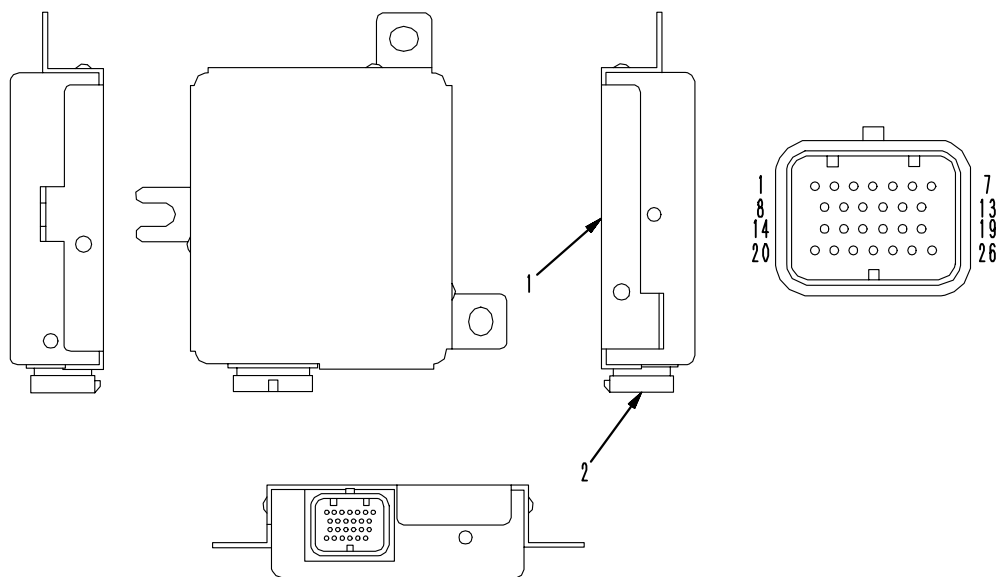
- 1) Seat switch trouble detection
- 2) Relay output and transistor trouble detection
- 3) Forward-reverse lever trouble detection
- 4) CPU abnormality

If any of these troubles is detected, the abnormality warning lamp of the instrument panel blinks to notify the abnormality.





ISO controller



PIN ARRANGEMENT

PIN No.	SYMBOL	PIN NAME	TYPE	REMARKS
1	MAIN RELAY	MAIN RELAY OUTPUT	OUTPUT	MAIN RELAY
2	PARKING RELAY	PARKING RELAY OUTPUT	OUTPUT	PARKING RELAY
3	N LAMP	NUTRAL LAMP OUTPUT	OUTPUT	NUTRAL LAMP
4	MAIN BACK	MAIN RELAY SWITCH DETECT	INPUT	MAIN RELAY SWITCH
5				
6	P GND	GND (Power)	--	
7	L GND	GND (Logic)	--	
8	MAST RELAY	MAST RELAY OUTPUT	OUTPUT	MAST RELAY
9	MAST LAMP	MAST INTERLOCK LAMP OUTPUT	OUTPUT	MAST INTERLOCK LAMP
10	MAST BACK	MAST RELAY SWITCH DETECT	INPUT	MAST RELAY SWITCH
11	SEAT SW 1	SEAT SW 1	INPUT	SEAT SW 1
12	P GND	GND (Power)	--	
13	POWER	POWER (12V)	--	POWER SUPPLY (12V)
14	F RELAY	F RELAY OUTPUT	OUTPUT	F RELAY
15	ERROR LAMP	ERROR LAMP OUTPUT	OUTPUT	ERROR LAMP
16	F BACK	F RELAY SWITCH DETECT	INPUT	F RELAY SWITCH
17	SEAT SW 2	SEAT SW 2	INPUT	SEAT SW 2
18	P GND	GND (Power)	--	
19				
20	R RELAY	R RELAY OUTPUT	OUTPUT	R RELAY
21				
22	R BACK	R RELAY SWITCH DETECT	INPUT	R RELAY SWITCH
23	R SW	R-SW	INPUT	
24	F SW	F-SW	INPUT	
25	P GND	GND (Power)	--	
26	L GND	GND (Logic)	--	

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1. Body
2. Connector

Maintenance standard

1. See the separate troubleshooting table.
2. Visual check
 - Check of outside for deformation and rust
 - Check of connectors and terminals for corrosion

3. Outline of failure indication

No.	Trouble	Failure indicator [I] No translation Number of flashings	Condition of neutral lamp [N] No translation	Condition of lift interlock warning lamp [L] No translation	Contents of trouble	Repair method	Reset method	Remarks
1	Travel system and work equipment do not operate.	1	Flashing *1	Flashing	Seat switch trouble (Disconnection or short circuit)	1) Check and repair seat switch circuit	Restoration to normal	See remark table 1
2	Lift truck cannot travel.	2	Flashing *1	OFF	F/R lever trouble (Short circuit)	1) Check and repair F/R lever circuit	Restoration to normal	See remark table 2
3	1) Parking brake reminder buzzer 1-1) When parking brake lever is pulled, buzzer does not stop sounding. 1-2) When operator leaves lift truck with parking brake released, buzzer does not sound. 2) Neutral lamp and lift interlock warning lamp 2-1) When F/R lever is set in neutral, neutral lamp does not light. 2-2) When F/R lever is not set in neutral, neutral lamp does not go off. 2-3) When key is turned to ON position, lift interlock warning lamp does not light for certain period. 2-4) After key is turned to ON position, lift interlock warning lamp does not go off.	3	OFF	OFF	1) Parking brake reminder buzzer output abnormality (Disconnection or short circuit) 2) "Neutral lamp" or "Lift interlock warning lamp" output abnormality (Disconnection or short circuit)	1) Check and repair PARKING relay of parking brake remainder buzzer and buzzer circuit 2) Neutral lamp Check and repair circuits of neutral lamp and lift interlock warning lamp.	1) Parking brake reminder buzzer: Restoration to normal 2) Neutral lamp: Turn key to OFF position.	
4	1) Only work equipment does not operate. 2) Travel system and work equipment do not operate.	4	1) OFF 2) Flashing *1	Flashing	Lift interlock relay output abnormality (Disconnection or short circuit) 1) Opening of controller output transistor or disconnection in relay 2) Short circuit in controller output transistor or short circuit in MAST, F or R relay	1) Only work equipment Check and repair MAST relay and relay circuit 2) Travel system and work equipment Check and repair MAST relay, F relay, R relay and relay circuit.	1) Restoration to normal or turn key to OFF position. 2) Turn key to OFF position.	
5	1) Only travel system does not operate. 2) Travel system and work equipment do not operate.	5	Flashing *1	1) OFF 2) Flashing	Travel interlock relay output abnormality (Disconnection or short circuit) 1) Opening of controller output transistor or disconnection in relay 2) Short circuit in controller output transistor or short circuit in MAST, F or R relay	1) Only travel system Check and repair F and R relays and relay circuit 2) Travel system and work equipment Check and repair F relay, R relay, MAST relay and relay circuit.	1) Restoration to normal or turn key to OFF position. 2) Turn key to OFF position.	
6	Travel system and work equipment do not operate.	6	Flashing *1	Flashing	Main relay output abnormality (Disconnection or short circuit)	Check and repair MAIN relay and relay circuit	Turn key to OFF position.	
7	Travel system and work equipment do not operate.	7	Flashing *1	Flashing	Controller abnormality	1) Check and repair power supply circuit. 2) Replace controller.	Turn key to OFF position.	Return controller, then check.

*1: When the F/R lever is in neutral, the neutral lamp lights.

*2: The neutral lamp is also used as the travel interlock warning lamp.

Remark table 1

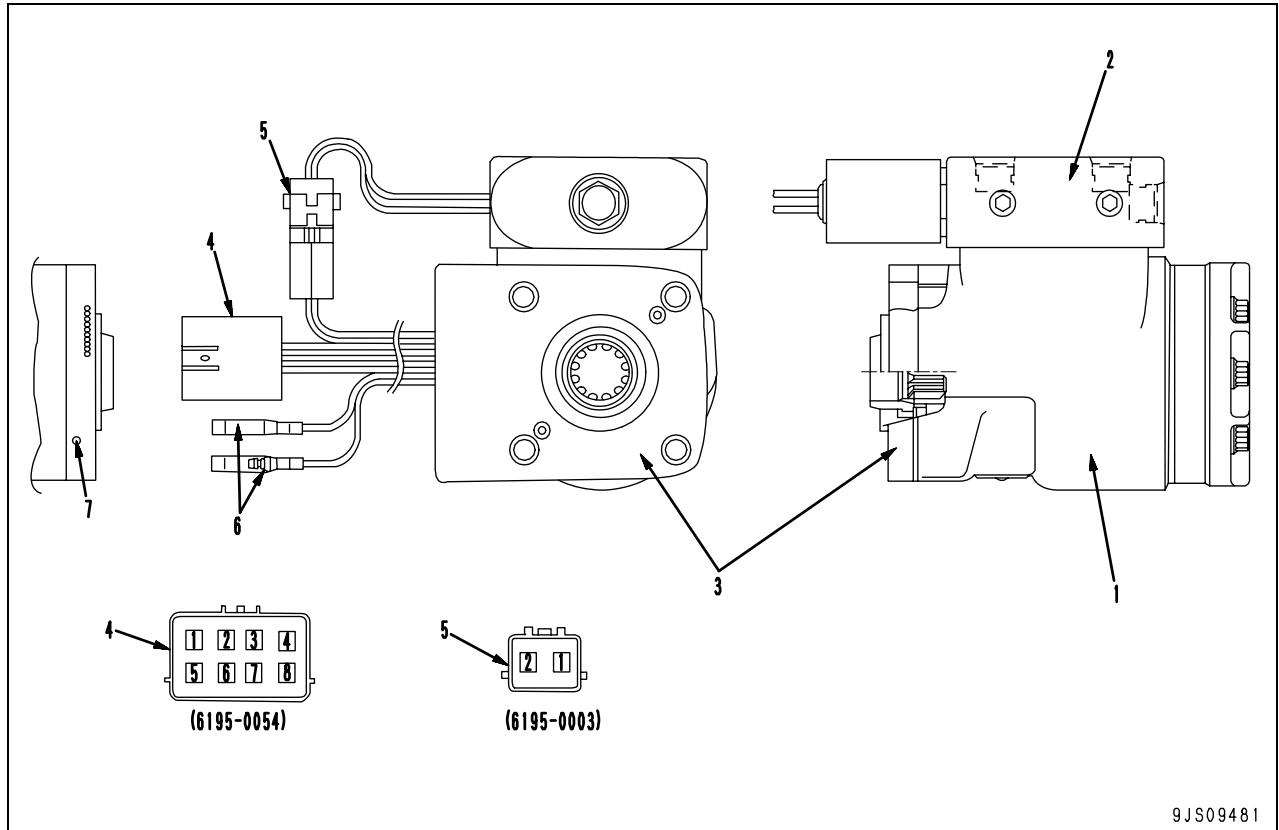
Input		Output	Remarks
SEAT_SW1	SEAT_SW2	Failure indicator	
OFF	OFF	Error No. 1 (1 flashing)	Open
OFF	ON	OFF	Normal
ON	OFF	OFF	Normal
ON	ON	Error No. 1 (1 flashing)	Short circuit

Remark table 2

Input		Output	Remarks
F_SW1	R_SW2	Failure indicator	
OFF	OFF	OFF	Normal (neutral)
ON	OFF	OFF	Normal (F)
OFF	ON	OFF	Normal (R)
ON	ON	Error No. 2 (1 flashing)	Failure indicator

EPACS controller

(Related to only lift truck with EPACS)



- | | |
|--------------------------------|-----------------------------|
| 1. Orbit roll valve | 5. Solenoid valve connector |
| 2. Solenoid valve block | 6. Initialization plug |
| 3. EPACS controller | 7. Condition indicator LED |
| 4. Tyre angle sensor connector | |

1. Wire and connector list

No.	Wire color	Pin No.	Function	Connector type
1	Red	1	Power input (Rated voltage)	Connector manufactured by SUMITOMO DENSO (Model No: 6195-0054)
	Black	2	Power input (0 V)	
	—	3	—	
	—	4	—	
	Pink	5	Power output for tyre angle sensor	
	Yellow	6	Tyre angle sensor input	
	Purple	7	Tyre angle sensor GND	
	—	8	—	
2	Light green	1	Solenoid valve drive output (+)	Connector manufactured by SUMITOMO DENSO (Model No: 6195-0003)
	Brown	2	Solenoid valve drive output (-)	
3	White	Plug	Initial setting input (+)	Plug terminal (male)
	Red	Plug	Initial setting input (GND)	Plug terminal (female)

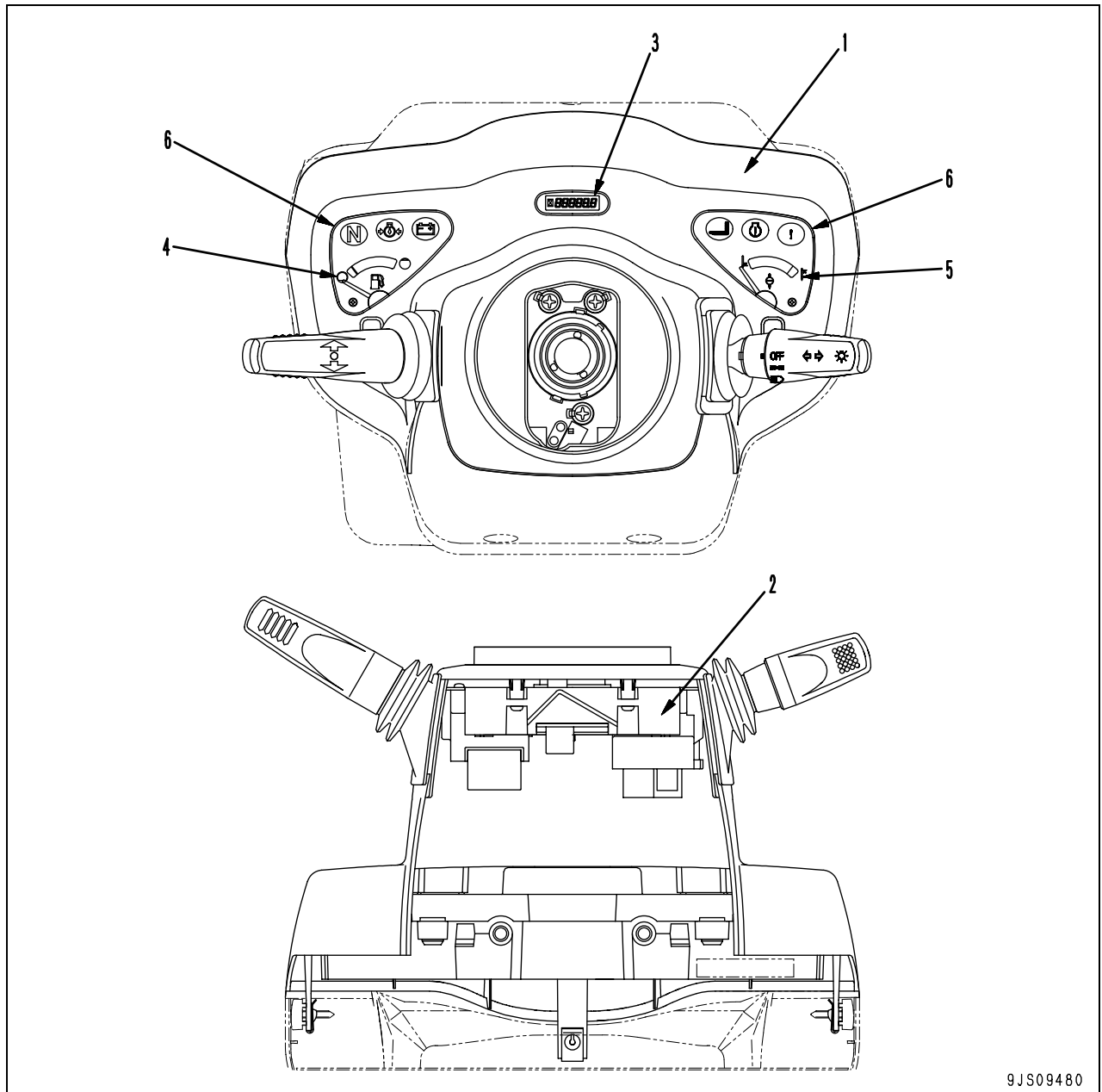
2. Outline of failure indication

No.	Trouble	Condition of LED on controller	Contents of trouble	Repair method	Remarks
1	Knob deviates	OFF	Controller abnormality	1) Check and repair controller power supply circuit 2) Replace controller	(*1)
2	Knob deviates	Repeats 1 flashings	Initialization is not completed	1) Check that controller plug is open (It is normally open: disconnected) 2) Initialize	
3	Knob deviates	Repeats 2 flashings	Controller is being initialized (May be normal)	1) Perform initialization from first 2) Check and correct tyre angle sensor installation 3) Check orbit roll rotor for loose installation and repair and fix it (tighten set screw and lock).	
4	Knob deviates	Repeats 3 flashings	Steering wheel angle sensor abnormality	Replace controller.	
5	Knob deviates	Repeats 4 flashings	Tyre angle sensor abnormality • Disconnection or short circuit of signal line with GND • Tyre angle sensor installation abnormality (direction)	1) Check and repair tyre angle sensor (including installation) 2) Check and repair tyre angle sensor circuit	
6	Knob deviates	ON	(1) Short circuit of tyre angle sensor power supply with signal line	1) Check and repair tyre angle sensor (including installation) 2) Check and repair tyre angle sensor circuit	(*2)
			(2) Correction solenoid valve trouble	1) Check if solenoid valve is turned ON/OFF during steering operation 2) Check and repair solenoid valve wiring harness	
			(3) Idle rotation of orbit roll rotor	1) Check rotor for loose installation and repair and fix it (tighten set screw and lock).	
			(4) Controller solenoid valve drive circuit trouble	1) Perform (2) 2) Replace controller.	
			(5) Short circuit in steering wheel angle sensor	1) Check if system can be initialized 2) (1) Perform 3) Replace controller	

*1. When the controller is detecting trouble (abnormality). For troubleshooting, see "Troubleshooting by failure code (EPACS controller system)".

*2. When the controller is not detecting trouble (abnormality). For troubleshooting, see "Troubleshooting of electrical system (E-mode)".

Instrument panel



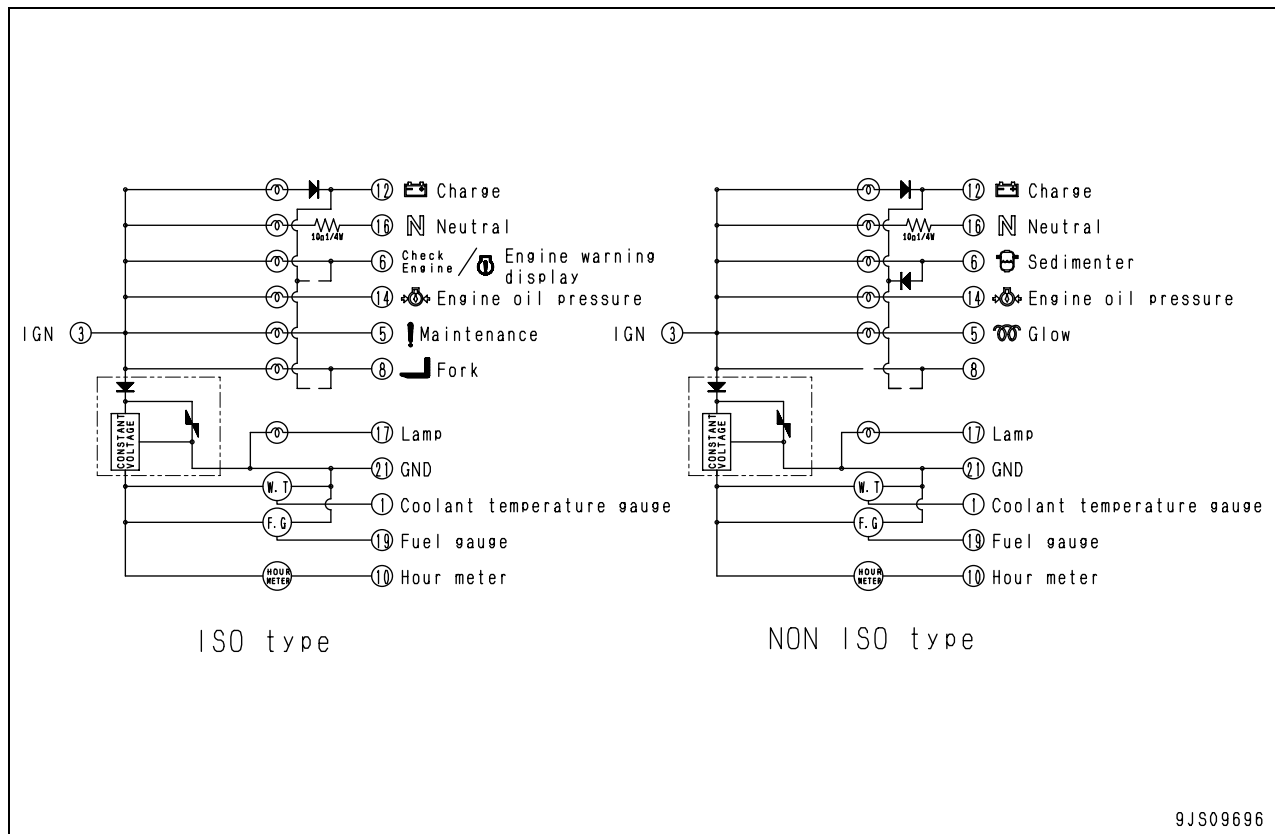
9JS09480

1. Body
2. Combination switch
3. Hour meter
4. Fuel level gauge
5. Coolant temperature gauge
6. Pilot lamp

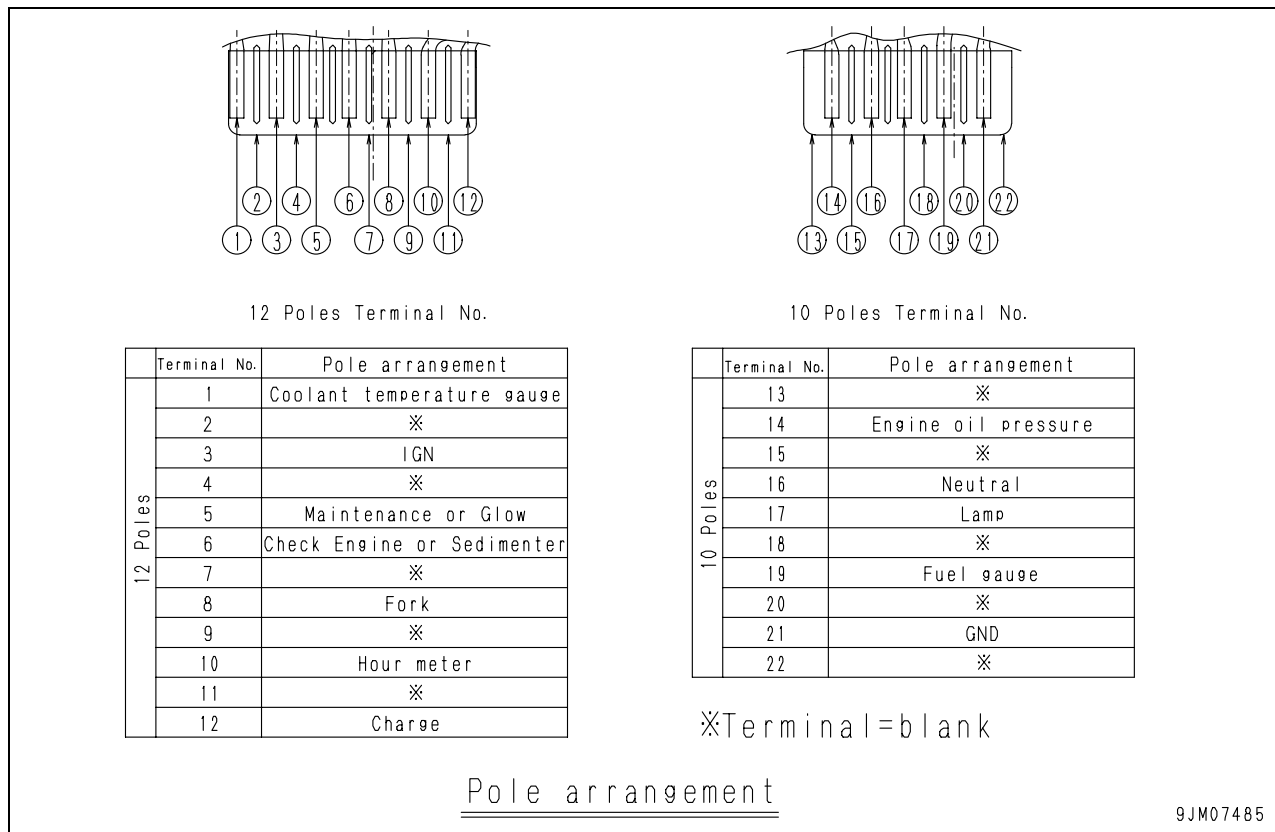
Function

The instrument panel is installed near the steering wheel and indicates the fuel level, engine coolant temperature, warning lamp and operating time.

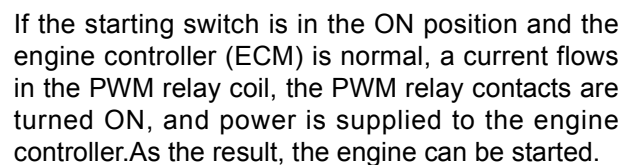
Circuit diagram



Pole arrangement



(Applicable model: Lift truck with SAA4D95LE-5-A engine)



1. If the starting switch is turned to the START (ST) position, a current flows from the battery through the slow blow fuse (120 A), fuse (40 A), starting switch terminal B, starting switch terminal ST, fuse (10 A) and brake relay coil to the ground, and the brake relay contacts are turned ON.
2. If the brake pedal is kept depressed, the stop lamp switch is turned ON, a current flows in the starting motor relay coil, and the starting motor relay contacts are turned ON.

[illegible]

When the starting switch is set in the ON position, power is supplied to the engine controller (ECM) and the engine can be started..

Engine stopping circuit

Lift truck with SAA4D95LE-5-A engine

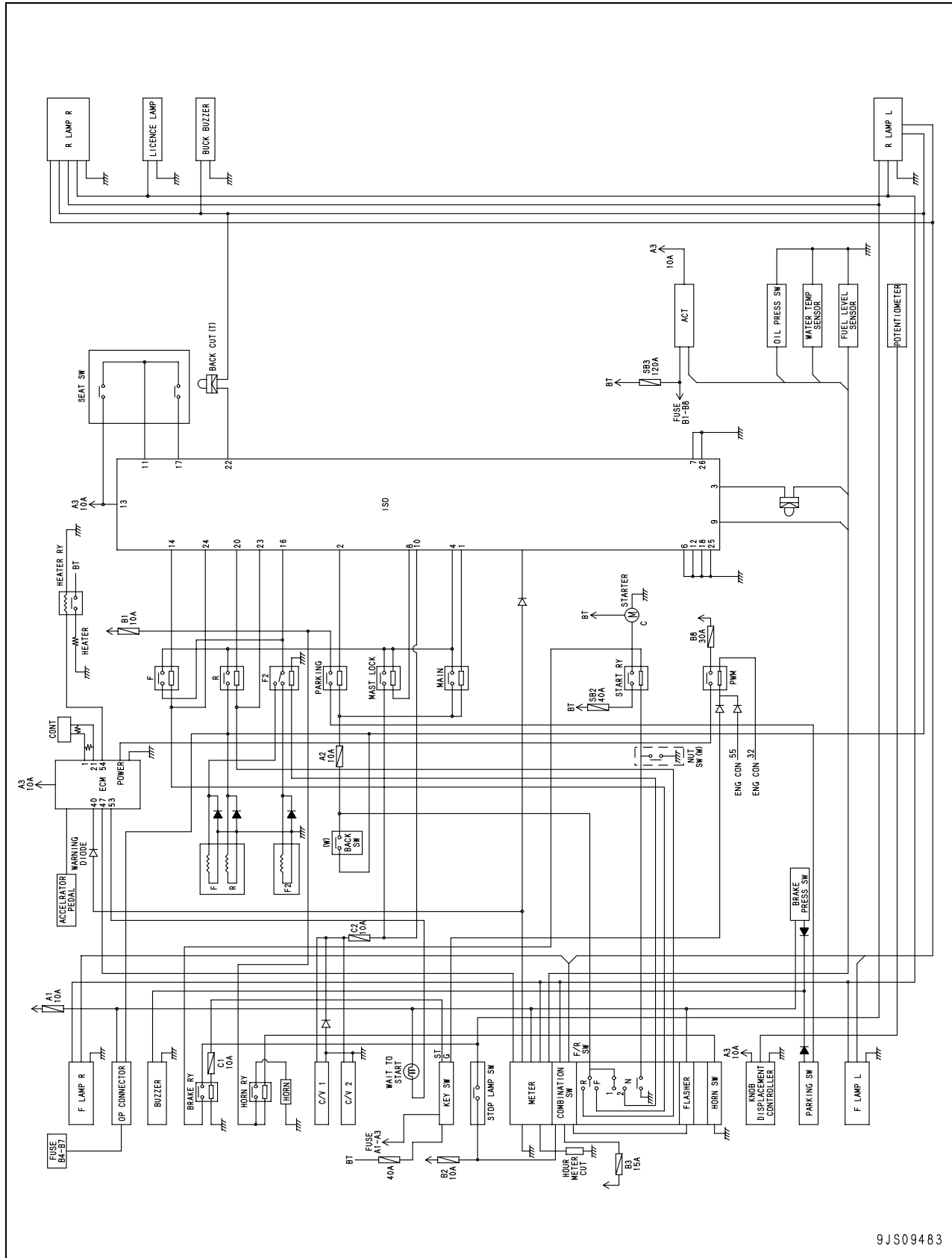
- If the starting switch is turned to the OFF position, no current flows in the PWM relay coil.
- The engine controller (ECM) turns the PWM OFF to turn the power for itself OFF.
- The engine controller performs the control related to stopping of the engine. For details, see the electrical system wiring diagram.

Lift truck with EBT-TB45-1A engine

If the starting switch is turned to the OFF position, no power is supplied to the engine controller (ECM). If no current flows into the engine controller which controls ignition of the ignition plug and operation of the fuel pump, fuel cannot be supplied and ignited and the engine stops consequently. For details, see the electrical system wiring diagram.

Electrical system wiring diagram

(Applicable model: Lift truck with SAA4D95LE-5-A engine)



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[illegible]

FORKLIFT TRUCK

CX50 Series

Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

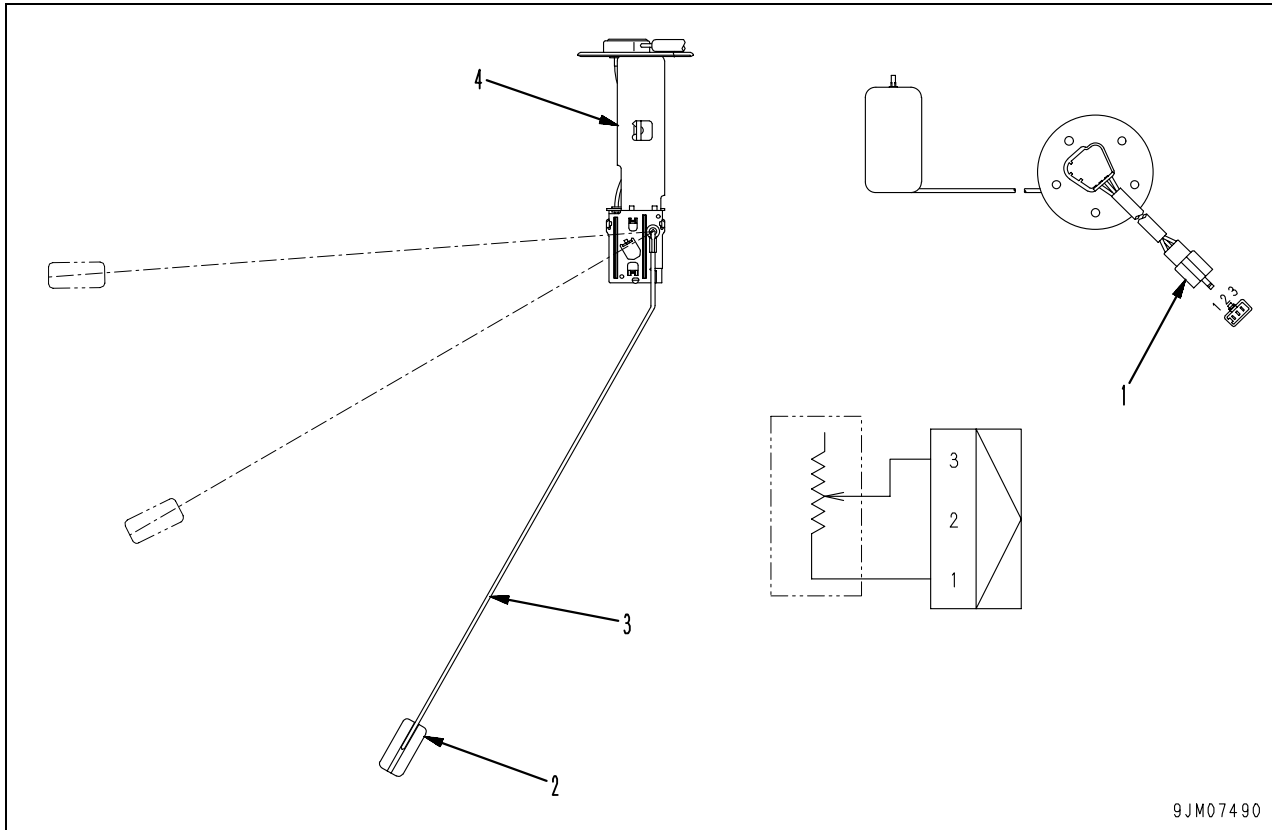
10 Structure, function and maintenance standard

802 Electric devices (Part 2)

Sensors	2
Switches.....	6
Lamps	13
Horn and buzzer	16
Flasher	19
F/R solenoid valve and F2 solenoid valve	20
Relay box	21
Resistor	27
Diode.....	28
Fuse	40
Battery.....	42

Sensors

Fuel level sensor



1. Connector
2. Float
3. Arm
4. Body

Function

- The fuel level sensor is installed to the top of the fuel tank and its float moves up and down as the fuel level changes.
- The movement of the float operates the variable resistor through the arm and the resistance of the resistor changes according to the arm angle and is displayed as the fuel level on the instrument panel.

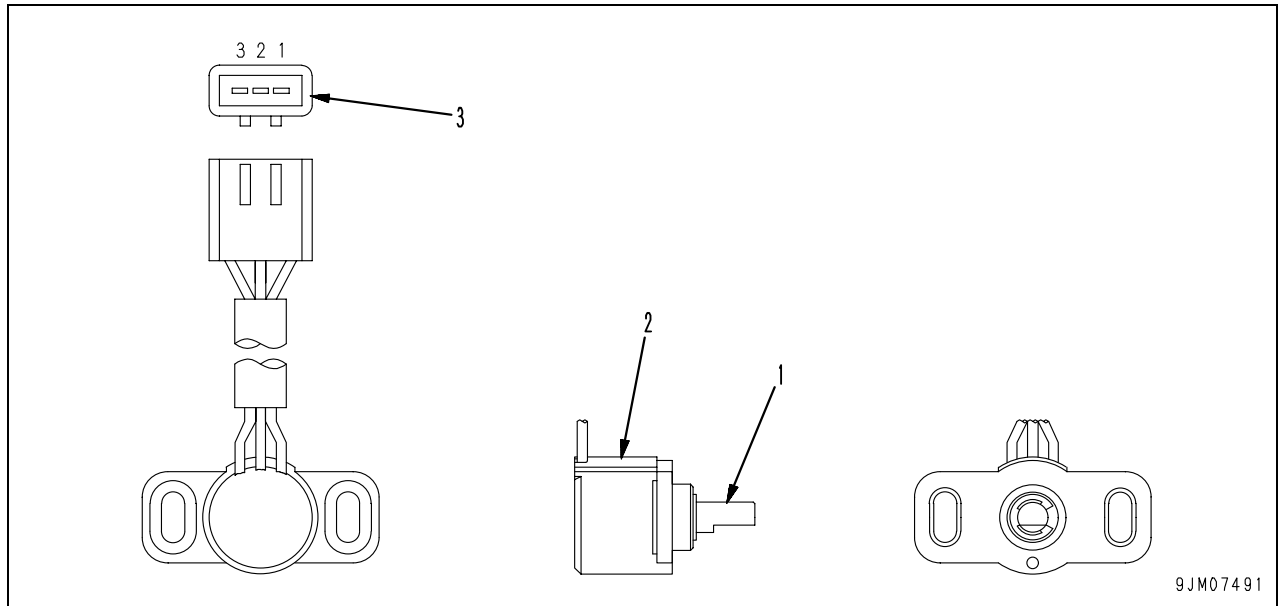
Maintenance standard

1. The resistance changes continuously.
2. The resistor has the specified resistances when the float is at the following points.

Fuel level	Resistance
Full	$0_{-0}^{+2} \Omega$
1/2	$50 \pm 3 \Omega$
Empty	$150 \pm 10 \Omega$

Tyre angle sensor

(Related to only lift truck with EPACS)



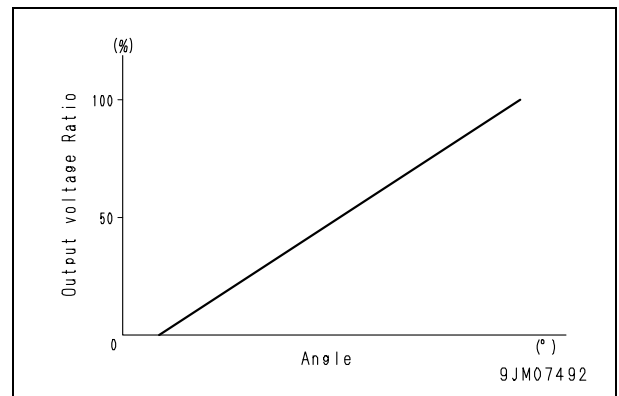
1. Shaft
2. Housing
3. Connector

Function

The tyre angle sensor is installed to the right steering axle. The sensor senses the axle angle and outputs voltage signals according to the resistance of the variable resistor. The sensed angle is the steering angle of the steering wheel.

Specifications

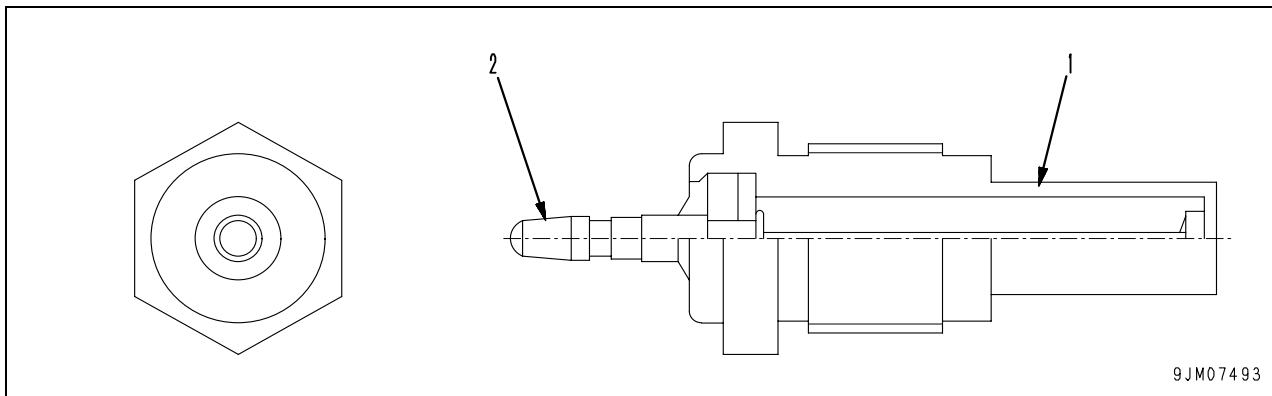
Resistance: $2\text{ k}\Omega \pm 20\%$



Maintenance standard

The resistance changes continuously.

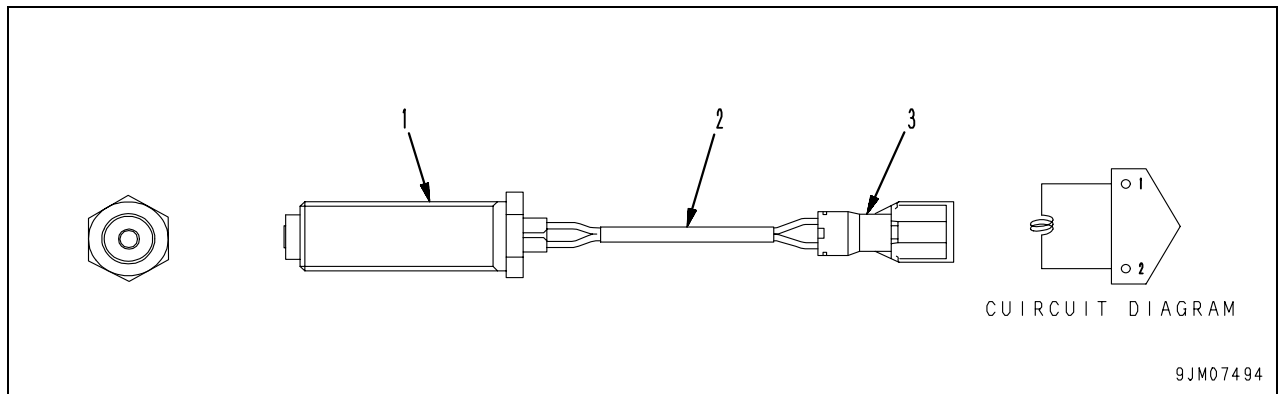
Coolant temperature sensor (Applicable model: Lift truck with SAA4D95LE-5-A engine)



- 1. Body
- 2. Terminal

Function

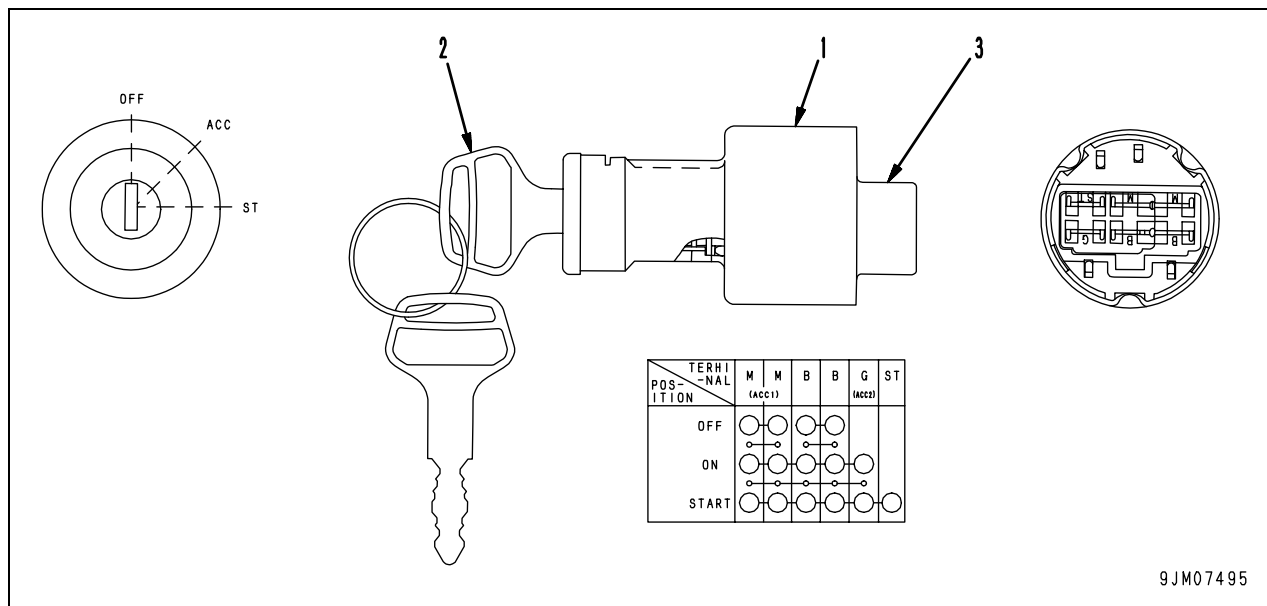
The coolant temperature sensor is installed to the coolant outlet connector of the radiator near the diesel engine fan. The sensor is thermistor type and outputs resistance according to the engine coolant temperature.

Travel speed sensor (Applicable model: Lift truck with EBT-TB45-1A engine)**Function**

The travel speed sensor is installed to the top of the transmission, senses the rotation of a gear in the transmission, and outputs pulse waves. The output pulse waves are input to the engine controller (ECM) through the travel speed conversion unit and used as travel speed signals.

Switches

Starting switch



1. Body
2. Key
3. Connector

Specifications

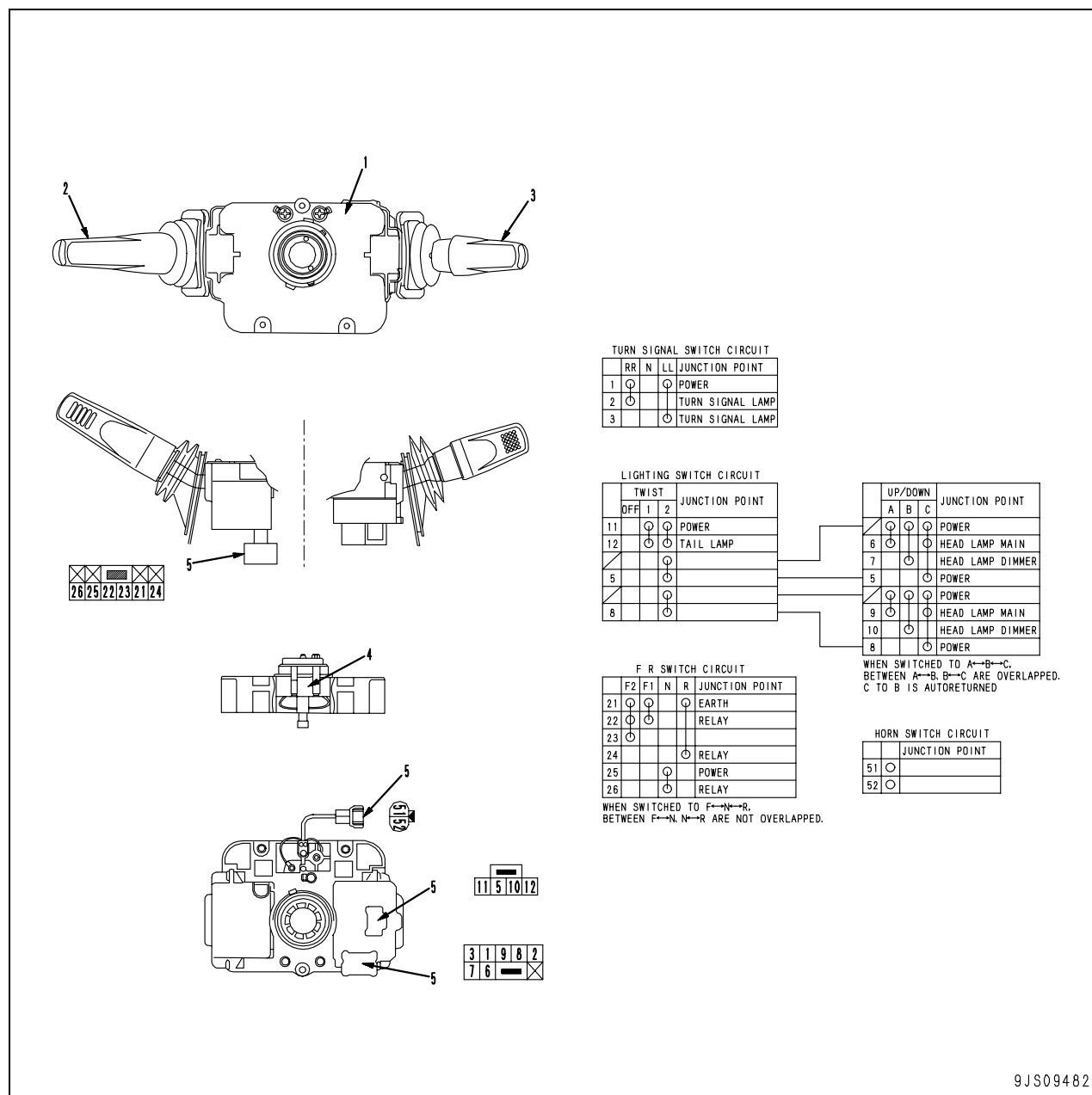
Rated load B-M: 35A
 B-G: 2A
 B-ST: 3A

Function

The starting switch is installed to the dashboard and used to stop the engine (OFF position), supply electric power (ON position), and start the engine (START position).

The key can be inserted and pulled out at the OFF position.

Combination switch



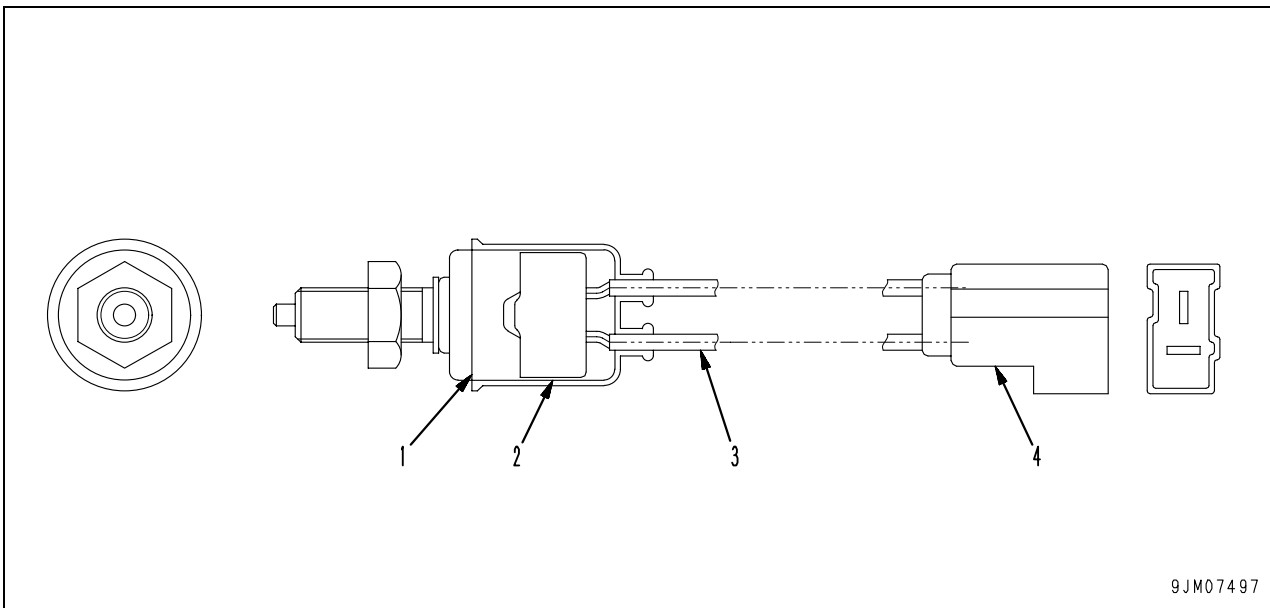
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1. Body
2. Forward-reverse lever switch
3. Lamp and turn signal lever switch
4. Horn switch
5. Connector

Function

The combination switch is installed between the steering wheel and instrument panel and used to change the forward-reverse lever switch, turn the lamp ON and OFF, change the turn signal lever switch, and turn the horn switch ON and OFF.

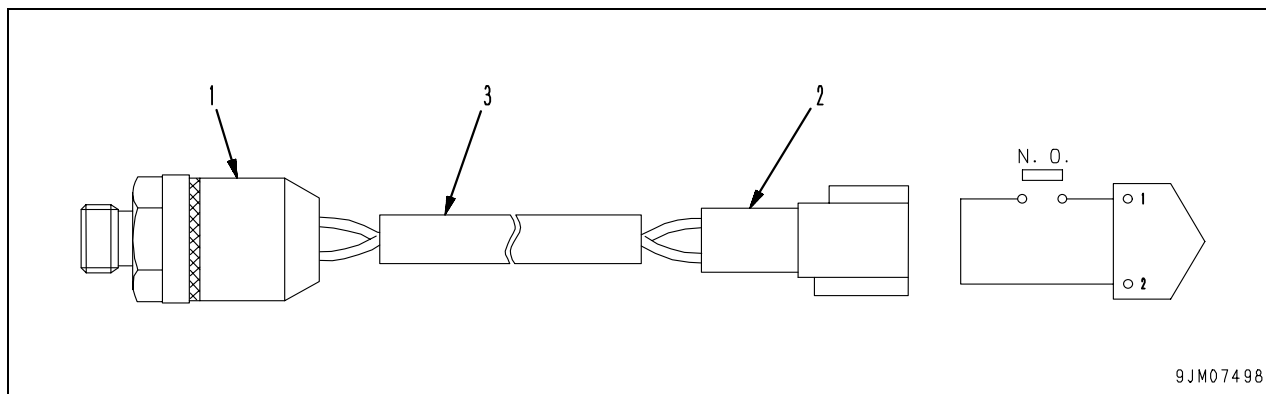
Stop lamp switch



1. Switch
2. Cover
3. Wire
4. Connector

Function

- The stop lamp switch is installed near the brake pedal base and connected to the brake electric circuit.
- If the brake pedal is depressed, the switch is turned ON and the brake lamp lights.
- This switch is connected to the brake relay wiring so that the engine cannot be started unless the brake pedal is depressed.

Brake pressure switch

1. Switch
2. Connector
3. Wire

Specifications

Composition of contacts: Normally open contacts

Operating (ON) pressure:

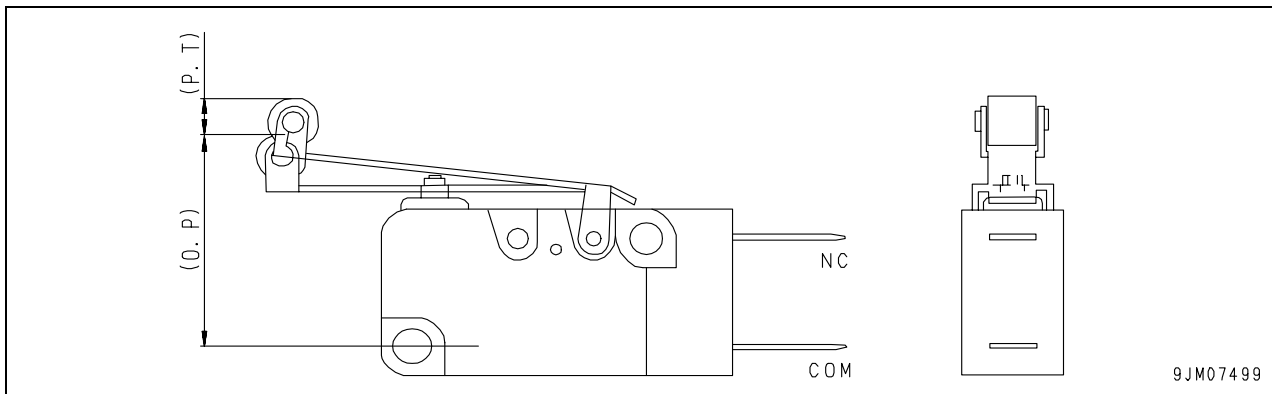
4.41 ± 0.49 MPa (45 ± 5 kg/cm²)
(Operating (ON) pressure when
brake pedal is released and brake
pressure is decreased)

Operating (OFF) pressure:

5.39 ± 0.49 MPa (55 ± 5 kg/cm²)
(Operating (OFF) pressure when
brake pedal is depressed and
brake pressure is increased.
Switch is turned ON at atmospheric
pressure.)

Function

The brake pressure switch is installed near the accumulator outlet on front left side frame. The brake pressure switch senses the brake circuit oil pressure and turns ON itself when the sensed pressure is below the specified level.

Parking brake switch**Specifications**

Contact: 1b

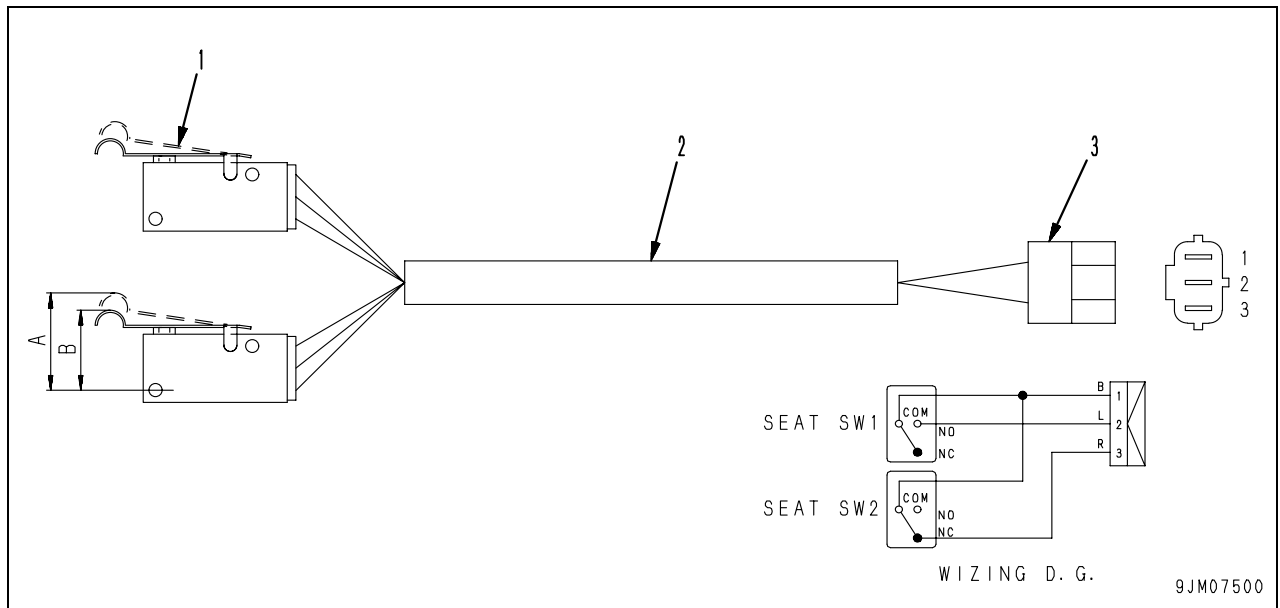
Function

The parking brake switch is installed to the parking brake lever. While the lift truck is parked (the lever is pulled toward the near side), the switch roller is pushed in and the switch is turned OFF. The switch is connected to the ISO controller and used as a parking brake reminder.

Maintenance standard

Movement to operation P.T. Max.	3.2 mm
Hysteresis M.D. Max.	1.2 mm
Movement after operation O.T. Min.	1.2 mm
Operating point O.P.	20.7 ± 1.2 mm

Seat switch



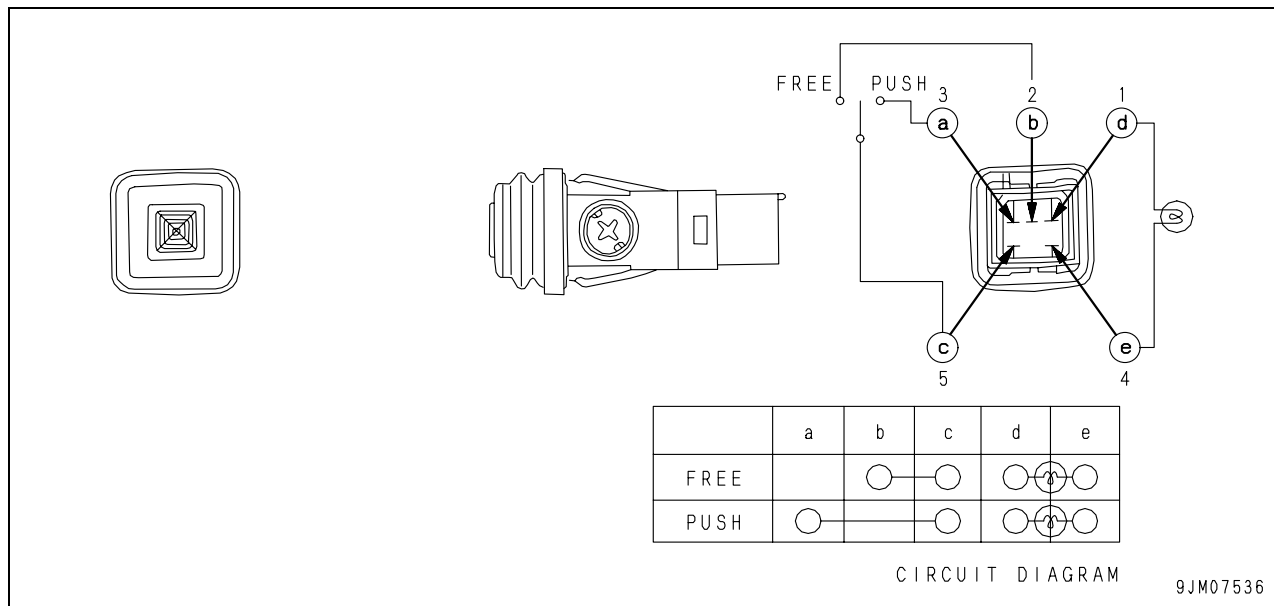
1. Switch
2. Wire
3. Connector

Function

The seat switch is installed under the operator seat and used to check if the operator is seated or not. The switch is connected to the ISO controller and operates the functions of the travel interlock and lift interlock.

Maintenance standard

- A. When free: 22.7 mm
- B. When switch is ON: 18.7 mm

Fuel selector switch (Applicable model: Lift truck with EBT-TB45-2A engine)**WAIT TO START lamp (Applicable model: Lift truck with SAA4D95LE-5-A engine)****Engine preheater switch (Applicable model: Lift truck with S4D95LE-3 engine)****Fuel selector switch****Function**

This switch is installed to the dashboard. Select gasoline or LPG as the fuel to be used with this switch. Then, the engine is controlled for the selected fuel.

LPG: If the switch is pressed and the lamp lights (red), the LPG specification is selected.

Gasoline: If the switch is pressed and the lamp goes off, the gasoline specification is selected.

WAIT TO START lamp**Function**

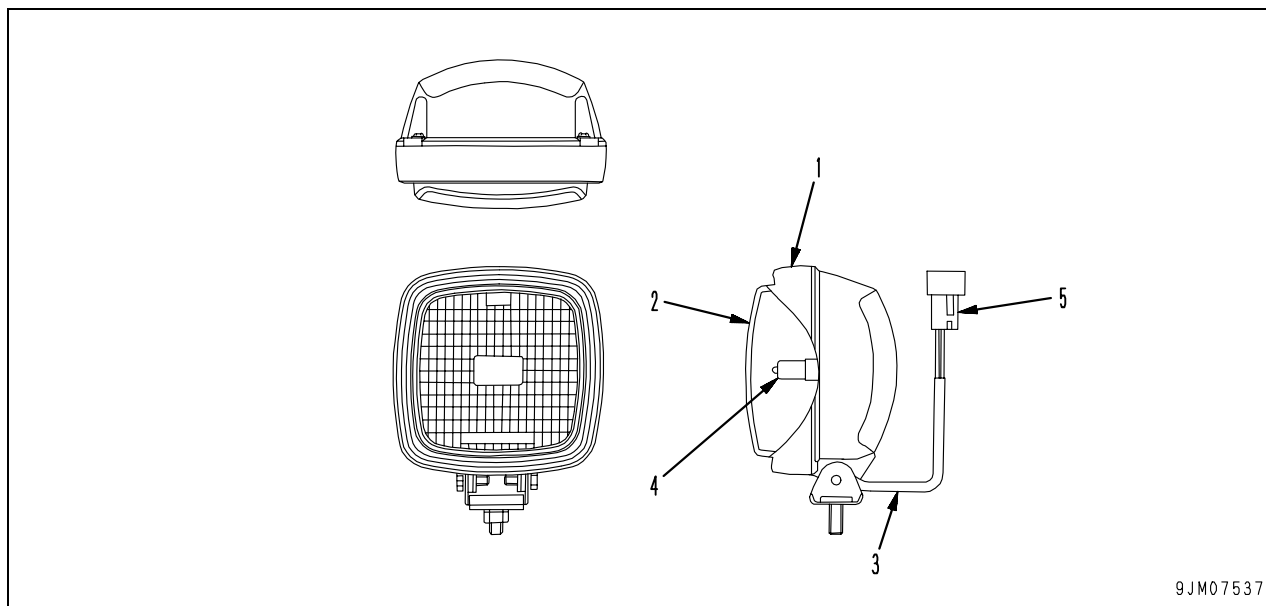
This switch is installed to the dashboard. While this lamp is lighting (red), the engine cannot be started even if the starting switch is turned to the ST position. While this lamp is turned OFF, the engine can be started.

Heater switch**Function**

While this switch is depressed, it is kept ON. This switch is connected to the heater relay and the preheater lamp of meter panel. If this switch is depressed, the engine preheater heats up and the engine preheater lamp lights up. If this switch is released, the engine preheater is turned OFF and the engine preheater lamp goes off.

Lamps

Headlamp

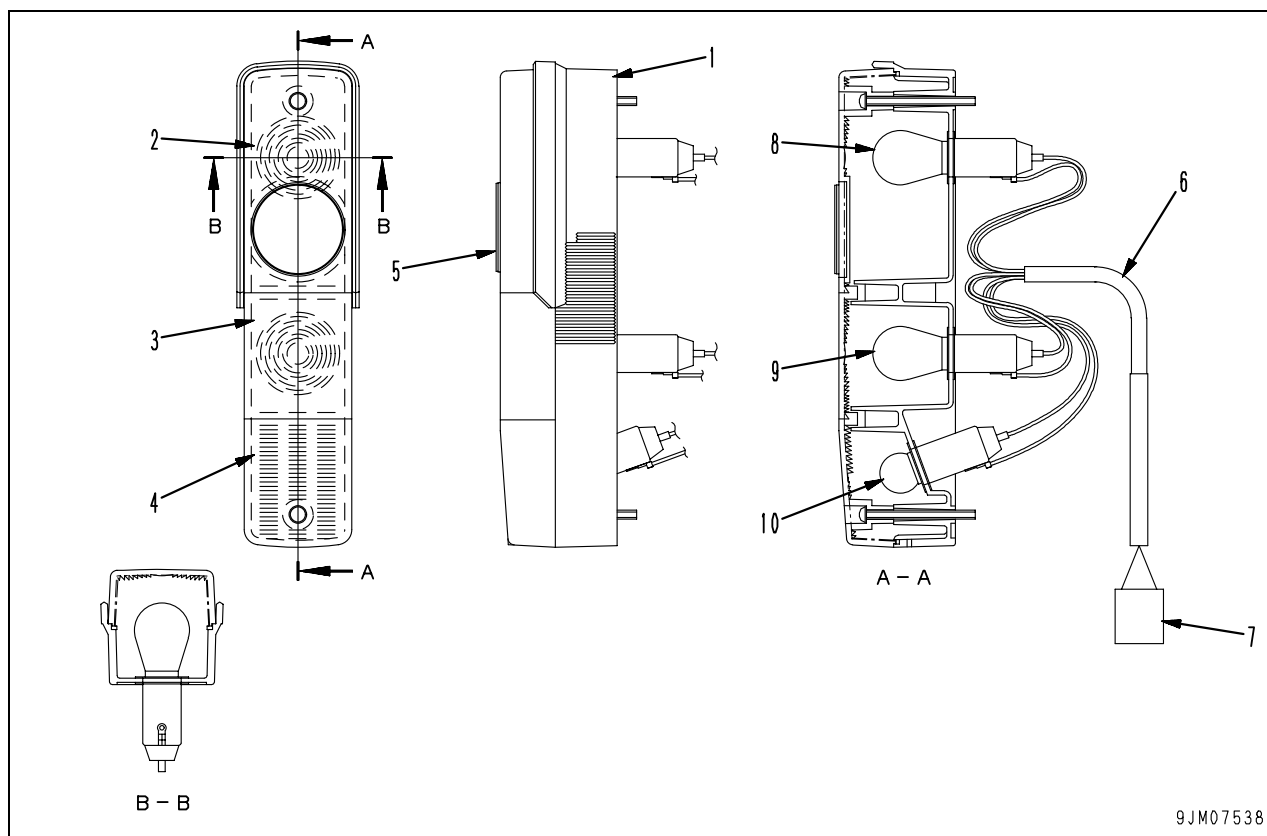


1. Body
2. Lens
3. Wire
4. Bulb 12V-55W Halogen lamp
5. Connector

Function

This lamp is installed to the front side of the overhead guard stay and used as the headlamp.

Rear combination lamp (For general)



1. Body
2. Stop/Tail lamp lens
3. Turn signal lamp lens
4. Backup lamp lens
5. Reflector (red)
6. Wire
7. Connector
8. Stop/Tail lamp bulb (12V, 21/5W)
9. Turn signal lamp bulb (12V, 23W)
10. Turn signal lamp bulb (12V, 23W)

Function

This lamp is installed to the rear of the lift truck.

Stop lamp

If the brake pedal is pressed, the brake switch operates and the stop lamp lights.

Tail lamp

If the headlamp is turned ON, the tail lamp lights.

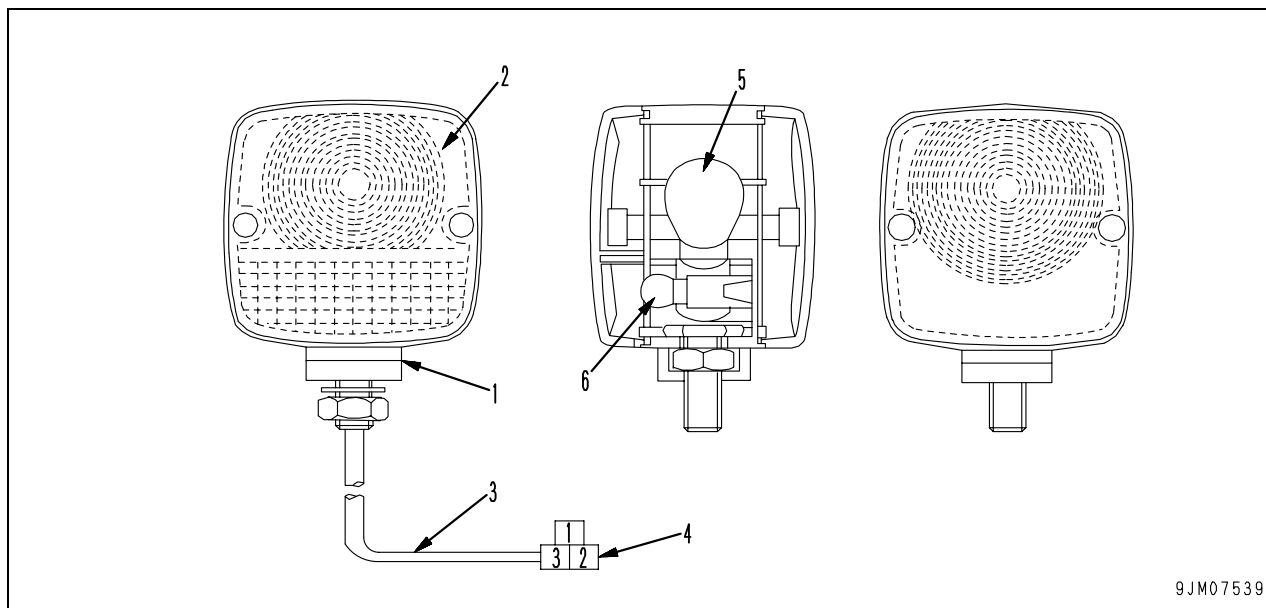
Turn signal lamp

If the turn signal lamp switch of the combination switch is operated, the turn signal lamp blinks.

Backup lamp

If the forward-reverse lever is set in the reverse position, the backup lamp lights.

Turn signal lamp



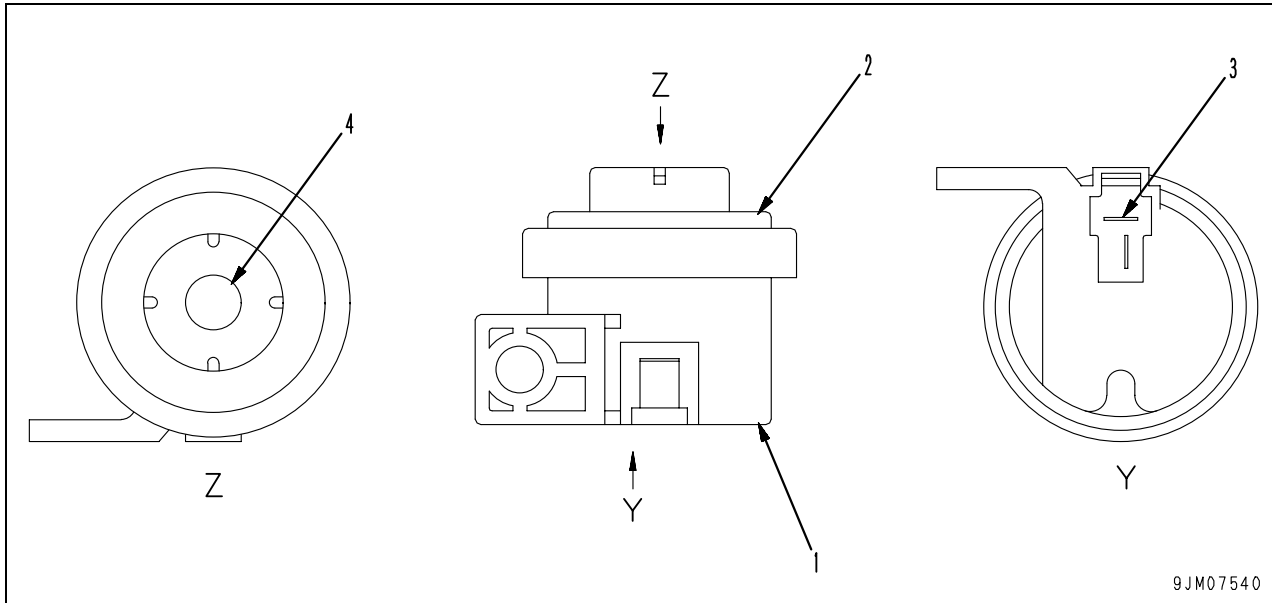
1. Body
2. Lens
3. Wire
4. Connector
5. Bulb, 12V, 23W
6. Bulb, 12V, 8W

Function

This lamp is installed to the front side of the overhead guard stay and used as a turn signal lamp and clearance lamp.

Horn and buzzer

Parking and brake buzzer



1. Case
2. Cover
3. Connector
4. Sound generator

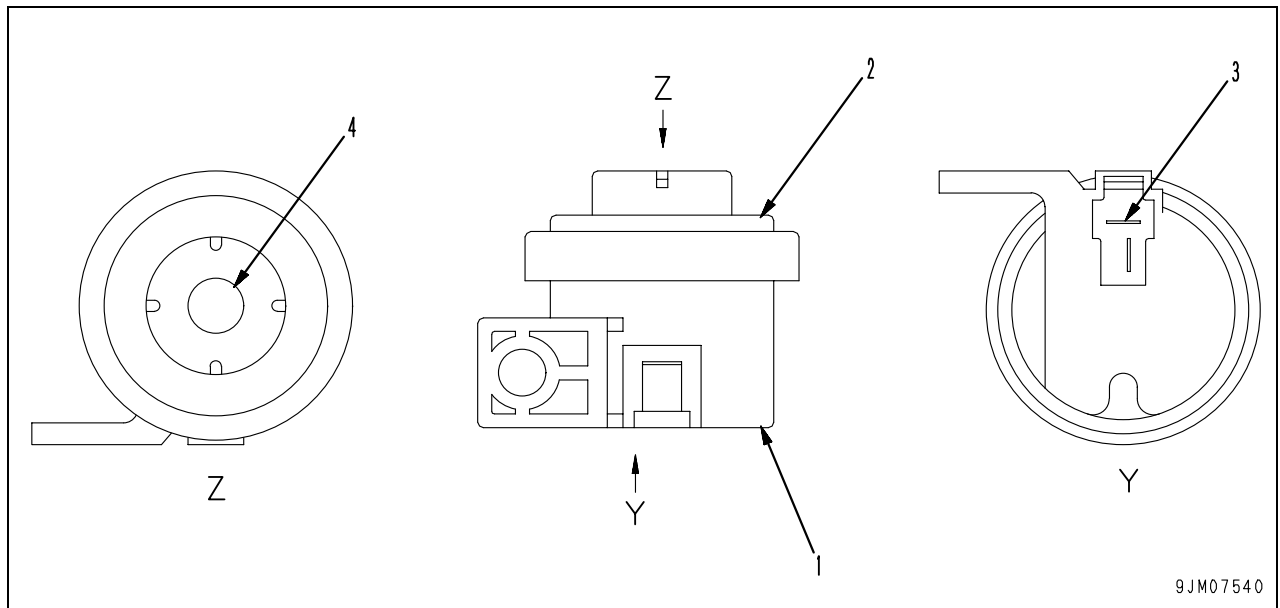
Specifications

130 ± 30 times/min (Intermittent sound)

Function

This buzzer is installed inside the dashboard and makes a sound when the operator forgets to apply the parking brake or when the brake oil pressure decreases.

Backup buzzer



1. Case
2. Cover
3. Connector
4. Sound generator

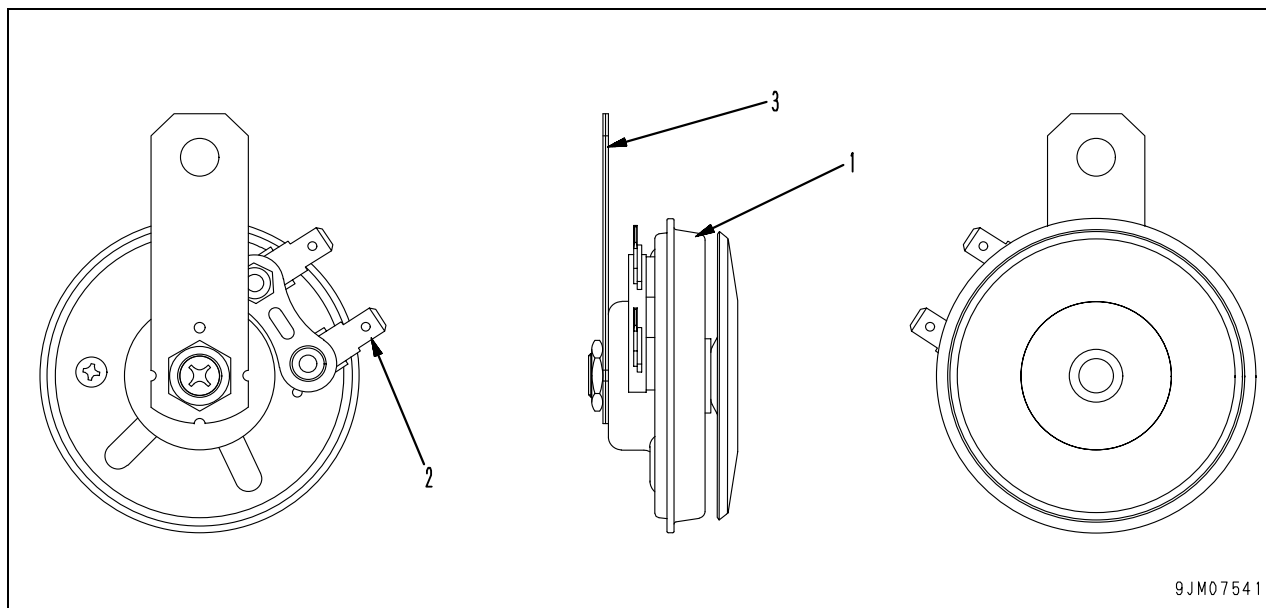
Specifications

85 ± 10 times/min (Intermittent sound)

Function

This buzzer is installed to the right rear of the engine compartment in the hood and makes a sound when the forward-reverse lever is set in the reverse position.

Horn

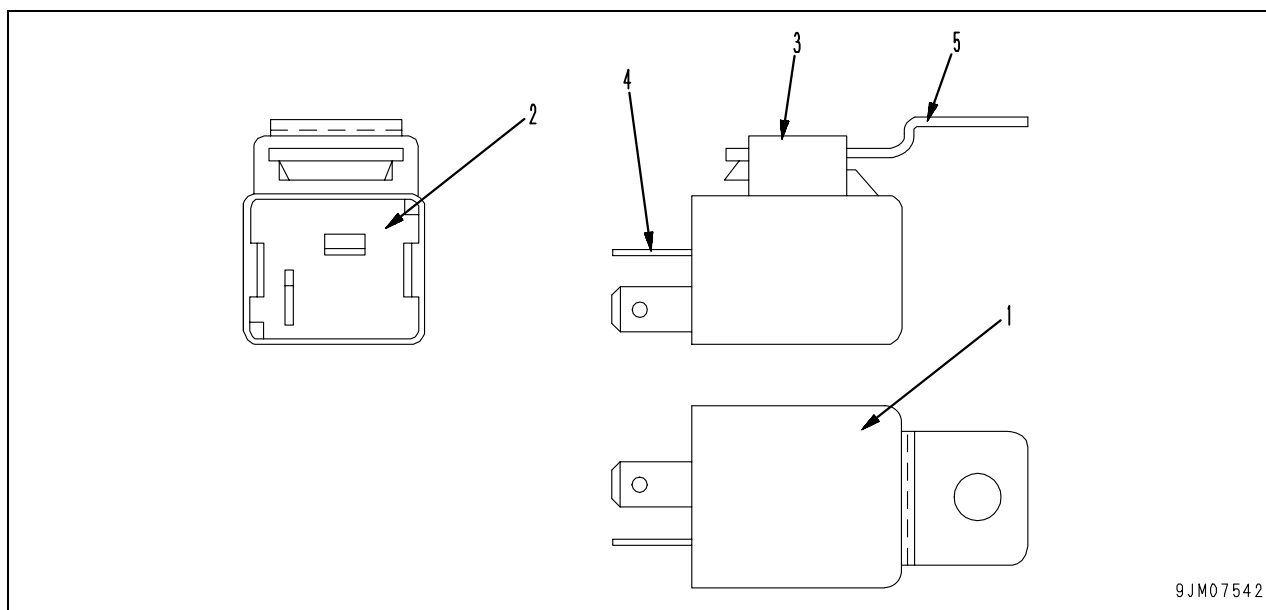


1. Body
2. Terminal
3. Mounting plate

Function

The horn is installed to the front left side of the frame and makes a warning sound when the horn switch of the steering wheel is pressed.

Flasher



1. Case
2. Cover
3. Rubber damper
4. Terminal
5. Plate

Specifications

Number of flashings

When voltage is 11 V – 15 V:

60 times/min – 120 times/min

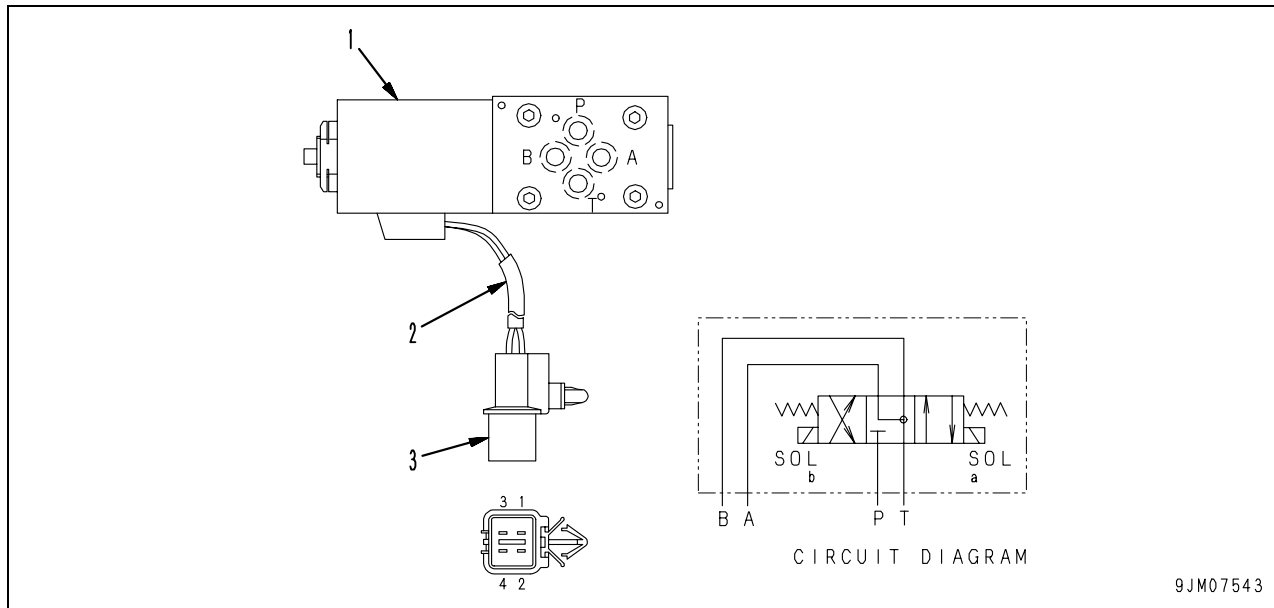
When lamp is broken:

140 times/min – 250 times/min

Function

The flasher is installed inside the cover on the operator seat side of the instrument panel. It controls flashing of the turn signal lamp. If either of the right and left turn signal lamps is broken, the current flowing in the flasher changes and the flashing speed increases.

F/R solenoid valve and F2 solenoid valve



1. Body
2. Wire
3. Connector

Specifications

Rated voltage: DC 12 V

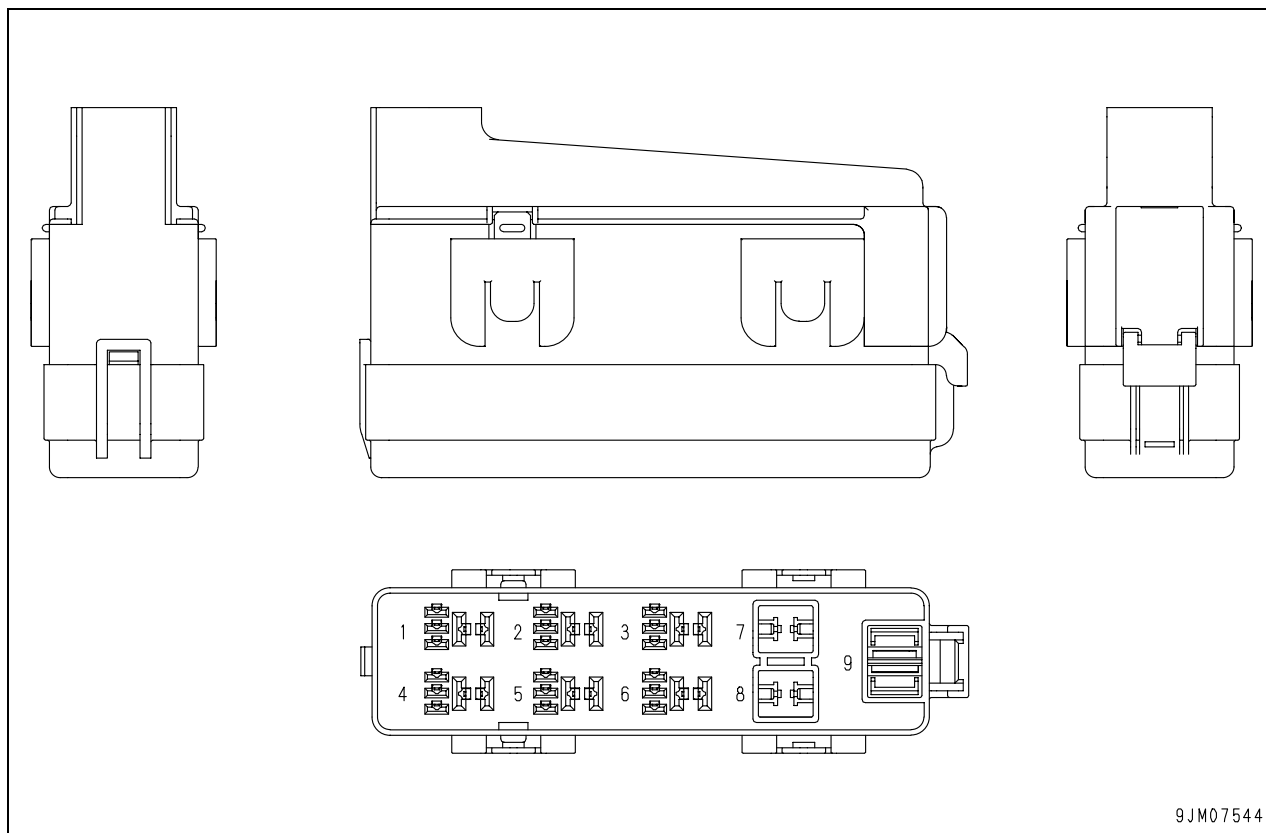
Current: 2.0 A

Function

These solenoid valves are installed to the top of the transmission and set the travel direction to forward or reverse and set the forward gear speed to the 1st or 2nd.

Relay box

(Applicable model: Lift truck with SAA4D95LE-5-A engine)



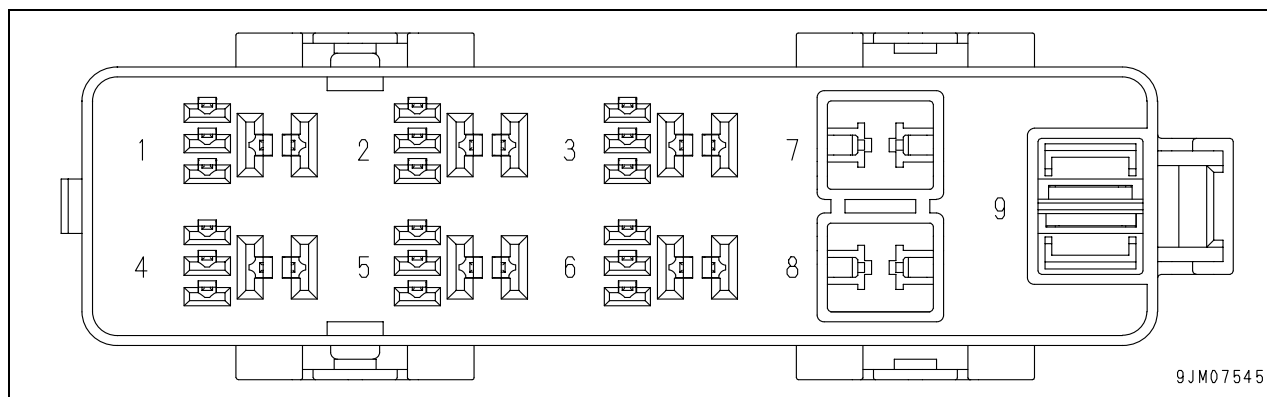
1. F relay
2. R relay
3. F2 relay
4. PARKING relay
5. MAST LOCK relay
6. MAIN relay
7. ACC 40A (Slow blow fuse)
8. STR 40A (Slow blow fuse)
9. ALT 120A (Slow blow fuse)

Function

This relay box is installed to the left side in the engine compartment. It contains the control relays and slow blow fuses.

(Applicable model: Lift truck with EBT-TB45-1A engine)

Relay box 1

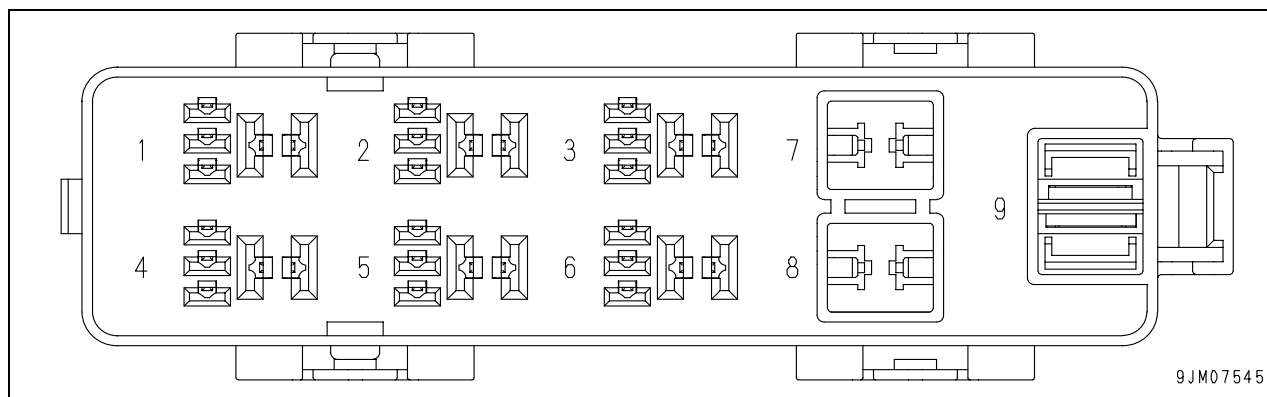


1. F relay
2. R relay
3. F2 relay
4. PARKING relay
5. MAST LOCK relay
6. MAIN relay
7. ACC 40A (Slow blow fuse)
8. STR 40A (Slow blow fuse)
9. ALT 120A (Slow blow fuse)

Function

This relay box is installed to the left side in the engine compartment. It contains the control relays and slow blow fuses.

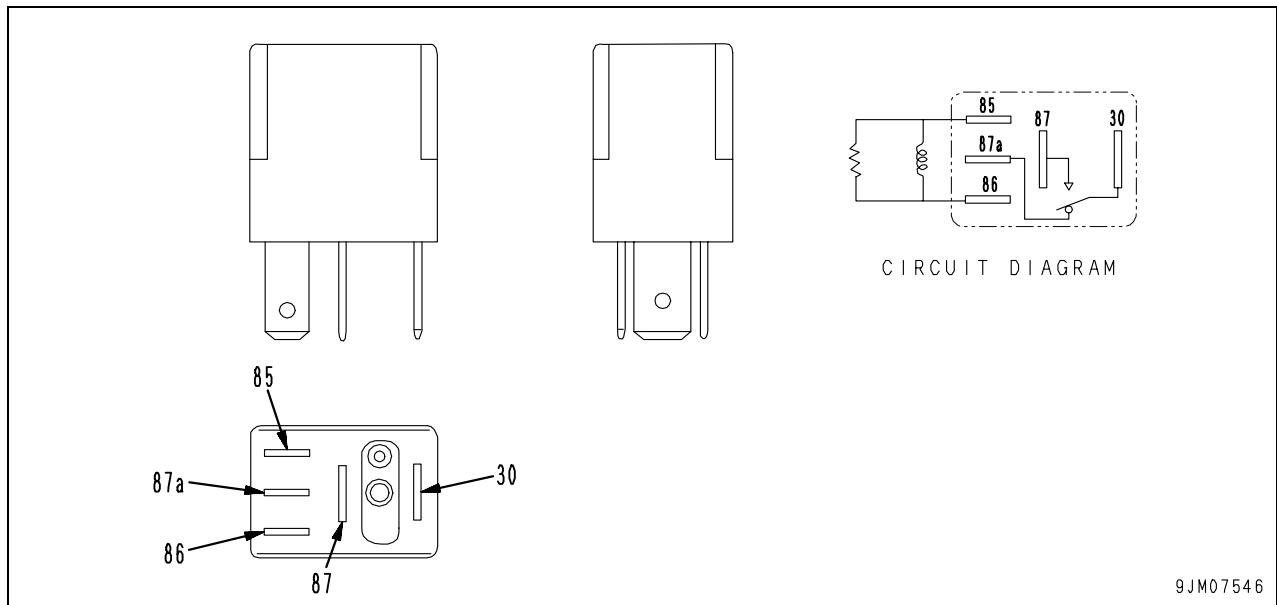
Relay box 2



1. EGI 1 relay
2. EGI 2 relay
3. ETC relay
4. FUEL PUMP relay
5. NEUT relay
6. START S/G relay

PARKING relay

F2 relay



Specifications

Coil voltage: 12 V

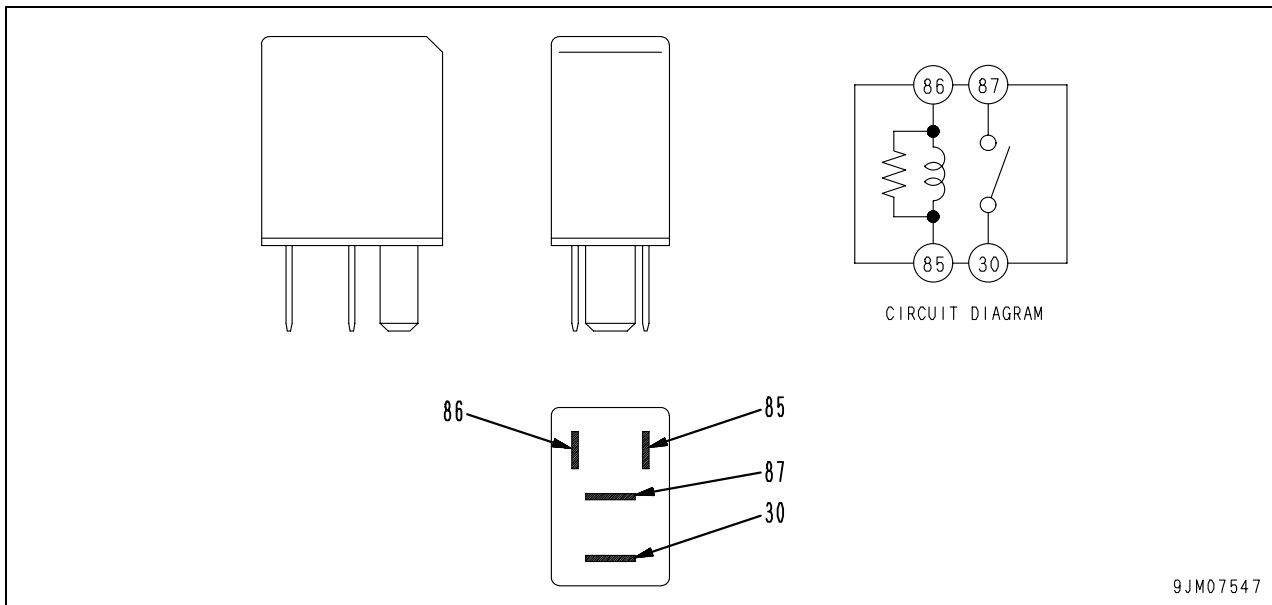
Composition of contacts: 1C

Rating of contact: N. O.: 35 A

N. C.: 20 A

Function

This relay is used as the PARKING relay and F2 relay inside the relay box.

F relay**R relay****MAST LOCK relay****MAIN relay****HEATER relay****EGI 1 relay****EGI 2 relay****ETC relay****FUEL PUMP relay****NEUT relay****START SIG relay****Specifications**

Coil voltage: 12 V

Composition of contacts: 1a

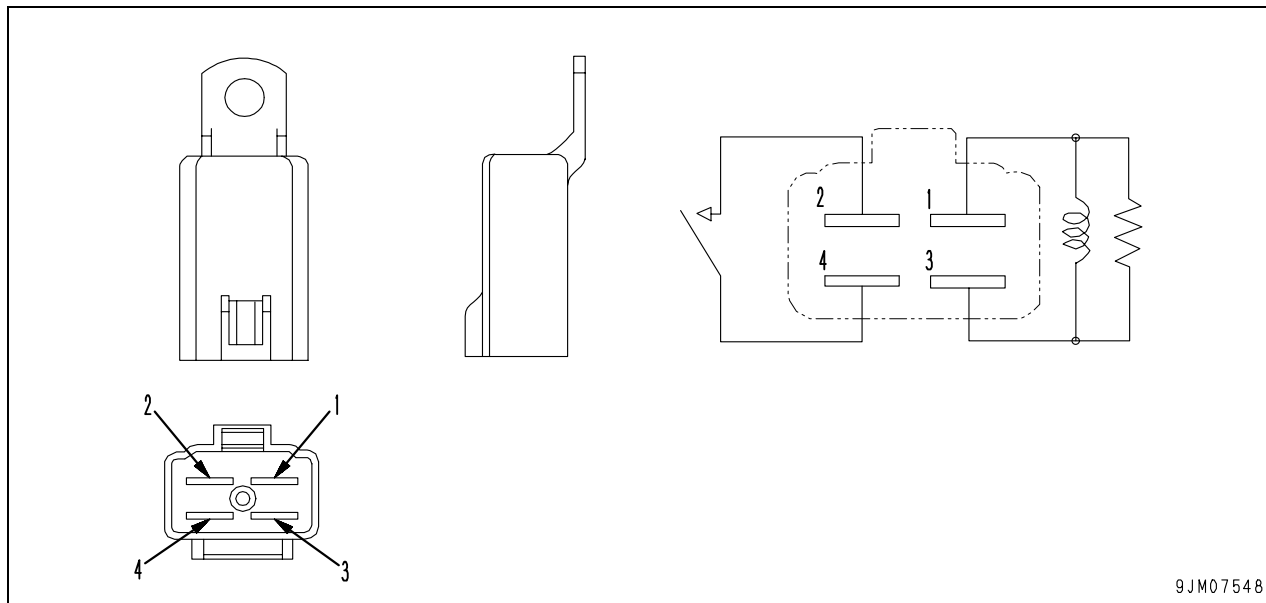
Rating of contacts: 20 A

Function

This relay is used as the F relay, R relay, MAST LOCK relay, MAIN relay, HEATER relay, EGI 1 relay, EGI 2 relay, ETC relay, FUEL PUMP relay, NEUT relay and START SIG relay on the relay box.

Horn relay

Brake relay



9JM07548

Specifications

Coil rated operating voltage: DC 12 V
 Coil resistance (at 20°C): $100 \Omega \pm 10\%$
 Built-in resistor: $1,100 \Omega \pm 5\%$
 Combined resistance: $91.7 \Omega \pm 10\%$
 Rated exciting current (at 20 °C): $130.9 \text{ mA} \pm 10\%$
 Rated power consumption: 1.57 W
 Composition of contacts: 1a
 Rated control capacity: 20 A, 12 VDC

Function

This relay is installed to the work equipment control lever bracket inside the dashboard.

Horn relay

If the horn switch inside the steering wheel is pressed, the horn relay is energized and its contact is turned ON. As the result, the horn makes the warning sound.

Brake relay

When the starting switch is at the START (ST) position, the brake relay is energized and its contact is turned ON. If the brake pedal is depressed, the starting motor relay is energized and the starting motor rotates.

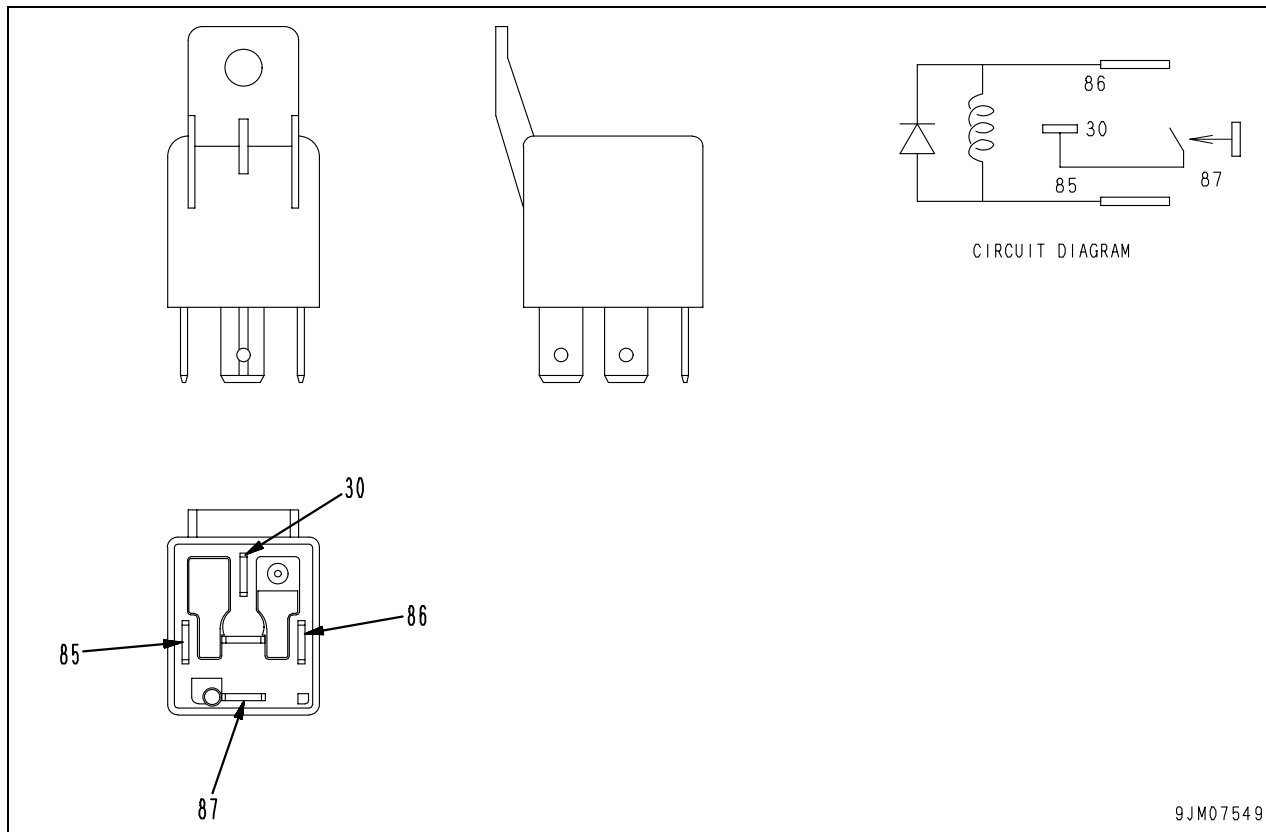
START relay

PWM relay

PTC relay

LPG relay

LPG SOL relay



Specifications

Composition of contacts: 1a

Rated control capacity (resistance load):
35 A, 12 VDC

Coil rated voltage: 12 V

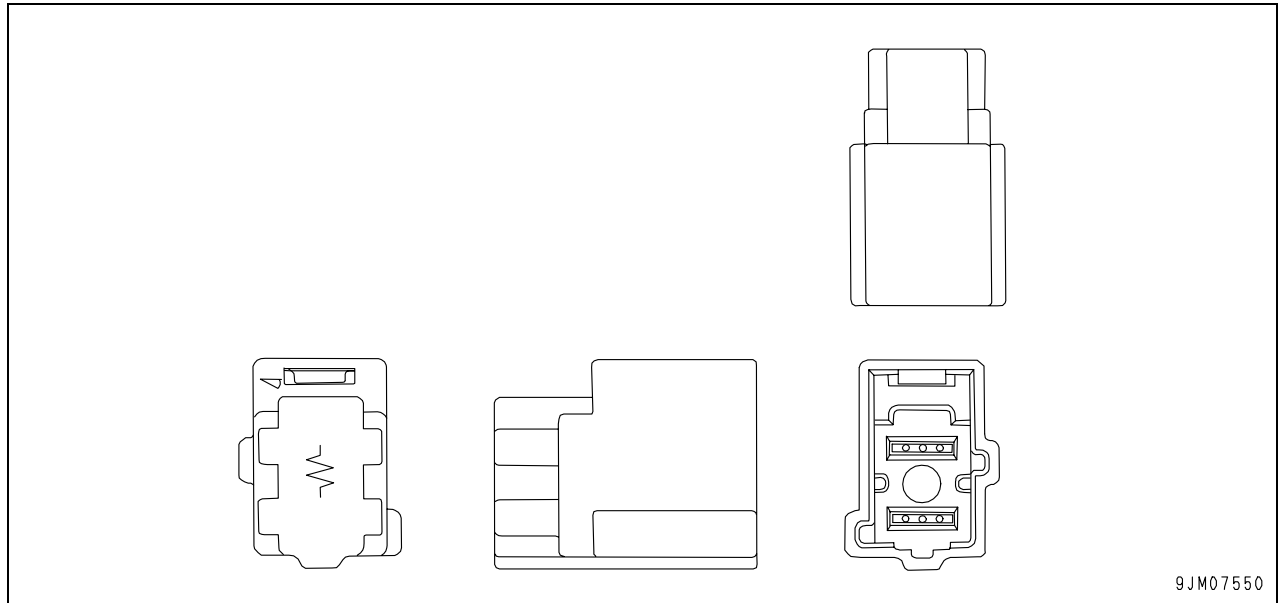
Rated exciting current: 117 mA

Coil resistance: 103 Ω

Rated power consumption: 1.4 W

Resistor

(Applicable model: Lift truck with SAA4D95LE-5-A engine)



Specifications

Resistance: $120 \pm 10 \Omega$

Rated electric power: 0.5 W

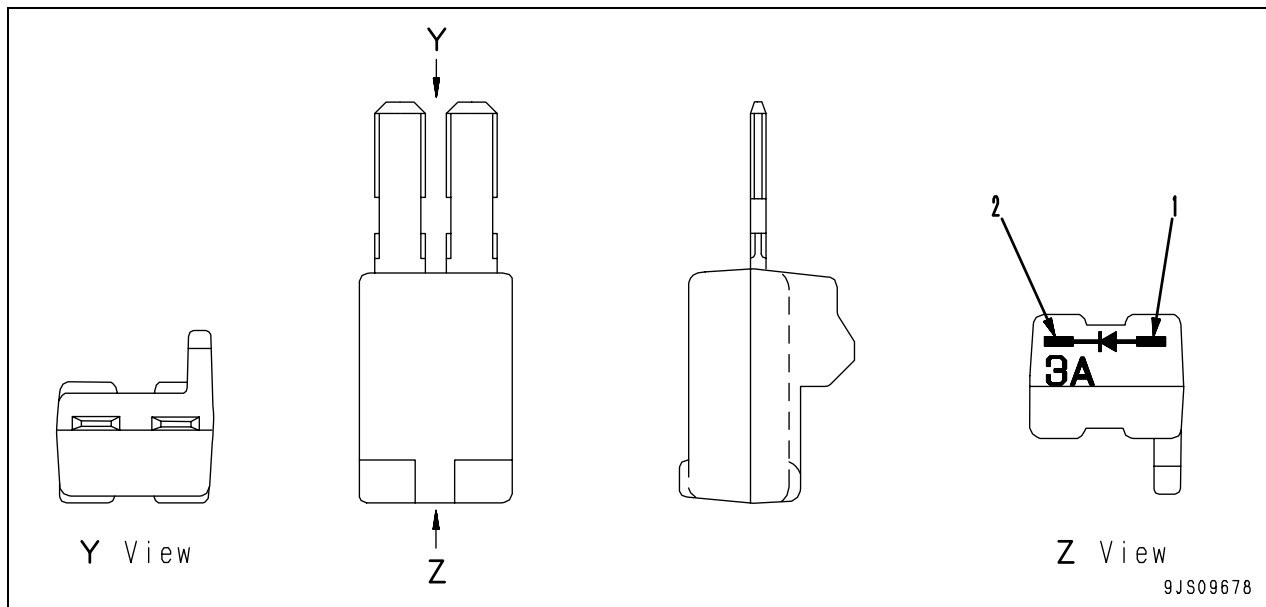
Function

This resistor is taped to the main wiring harness near the fuel level sensor. It is used as a terminal resistor for CAN communication with the engine controller.

Maintenance standard

The resistance is within the specification range.

Diode



1. Anode
2. Cathode

Specifications

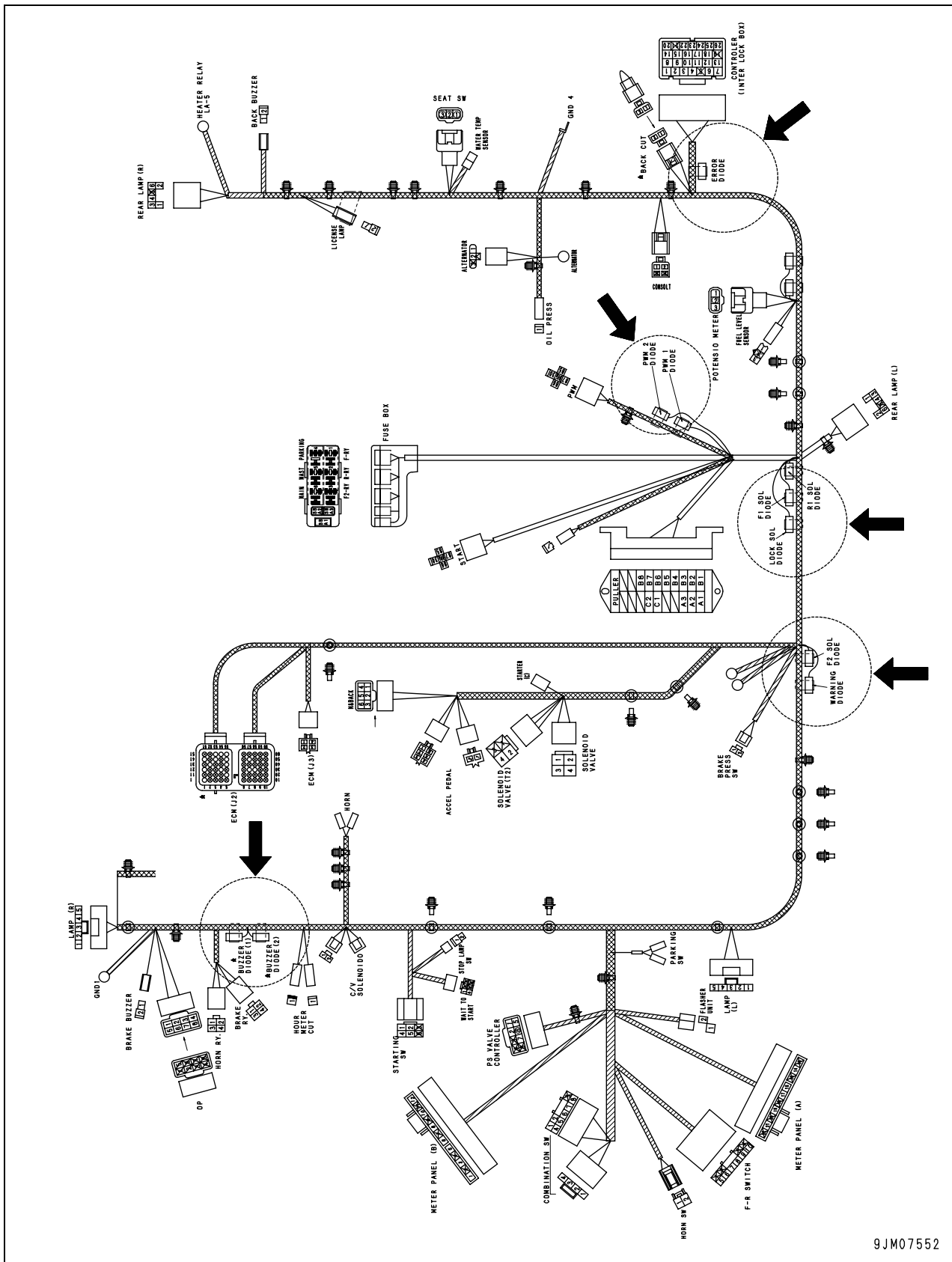
Peak reverse voltage: 400 V

Average output current: 3 A

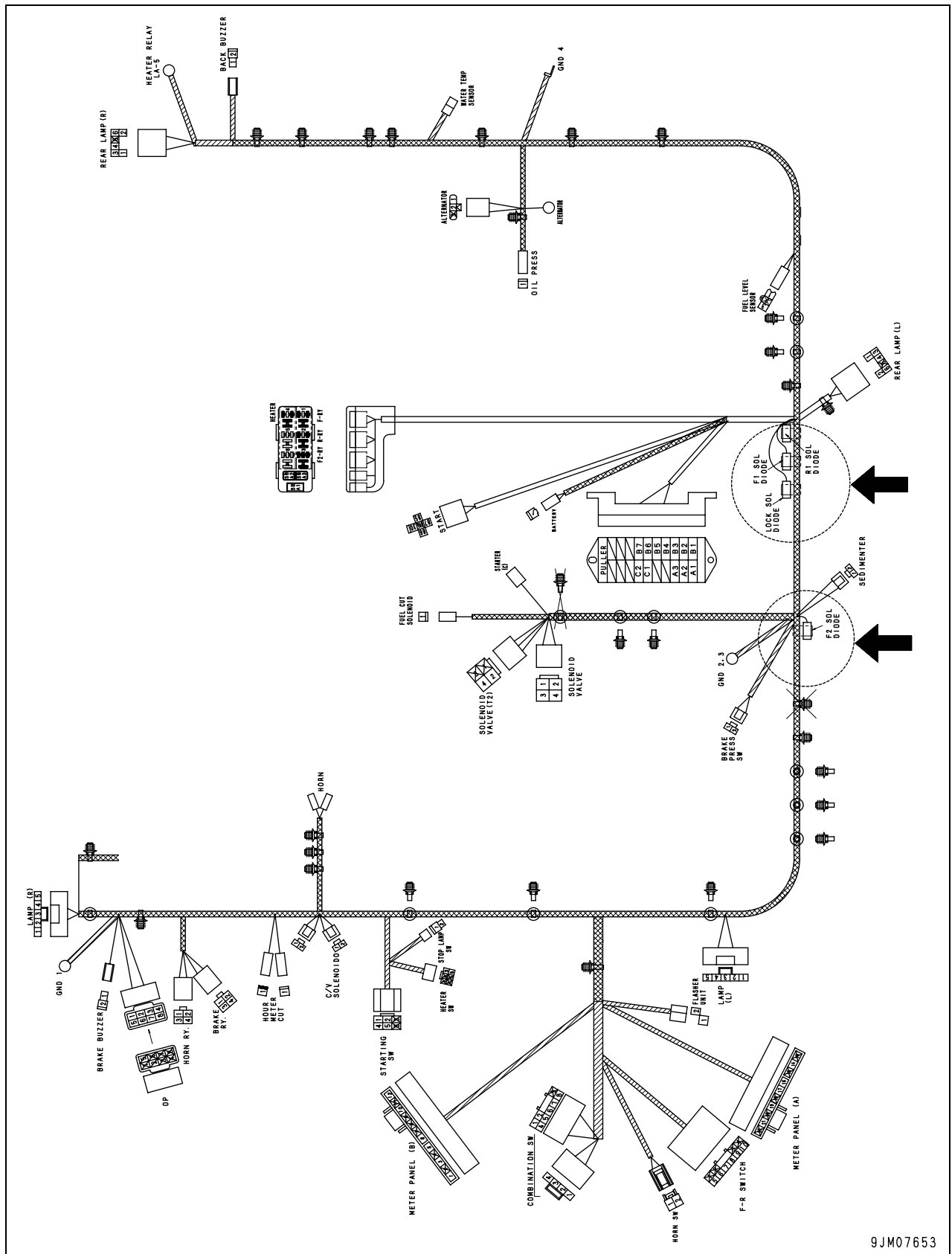
Function

This diode is taped to the main wiring harness. It is used to prevent rush currents and absorb surges.

(Applicable model: Lift truck with SAA4D95LE-5-A engine) (For general)

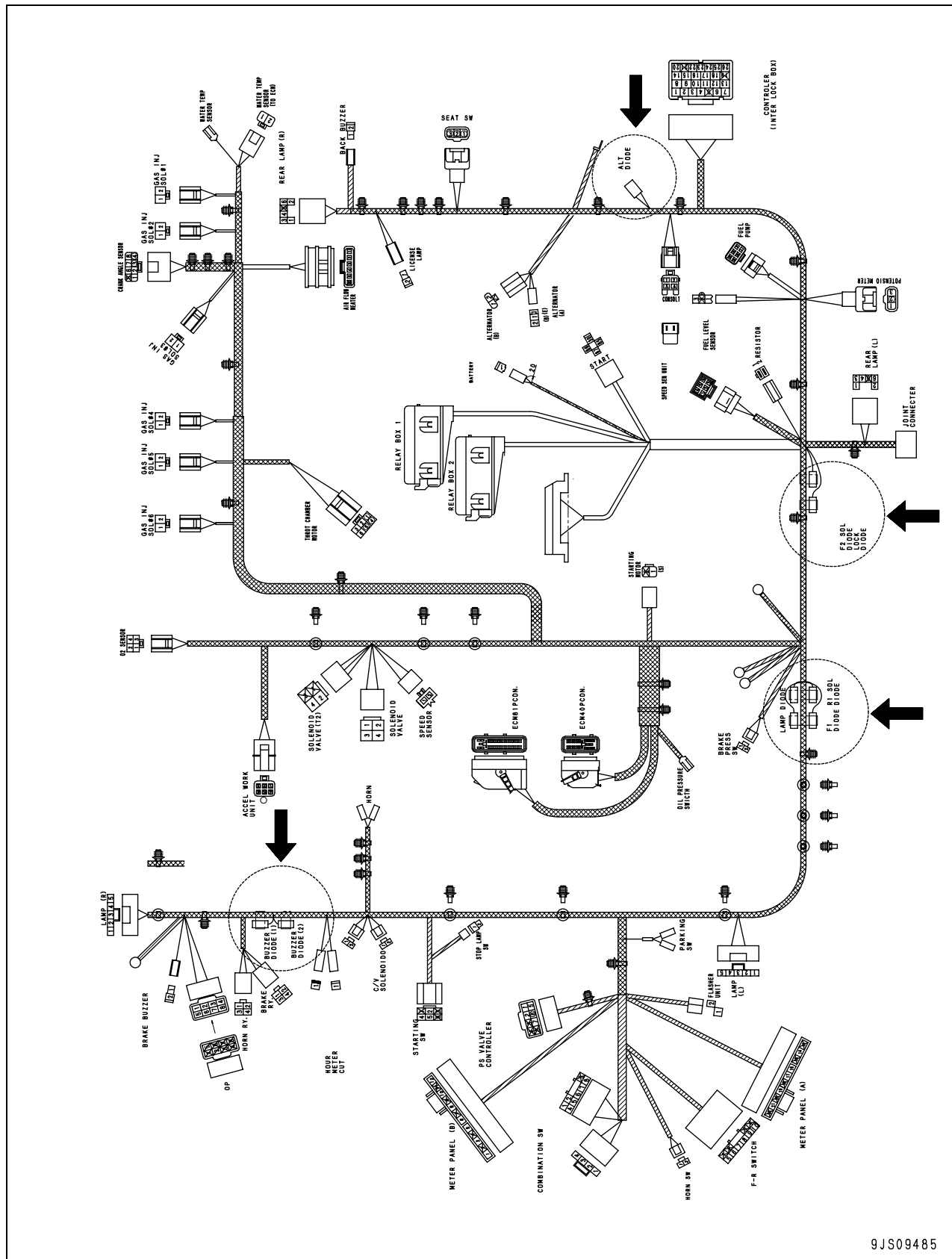


(Applicable model: Lift truck with S4D95LE-3 engine) (For general)



9JM07653

(Applicable model: Lift truck with EBT-TB45-1A engine) (For general)

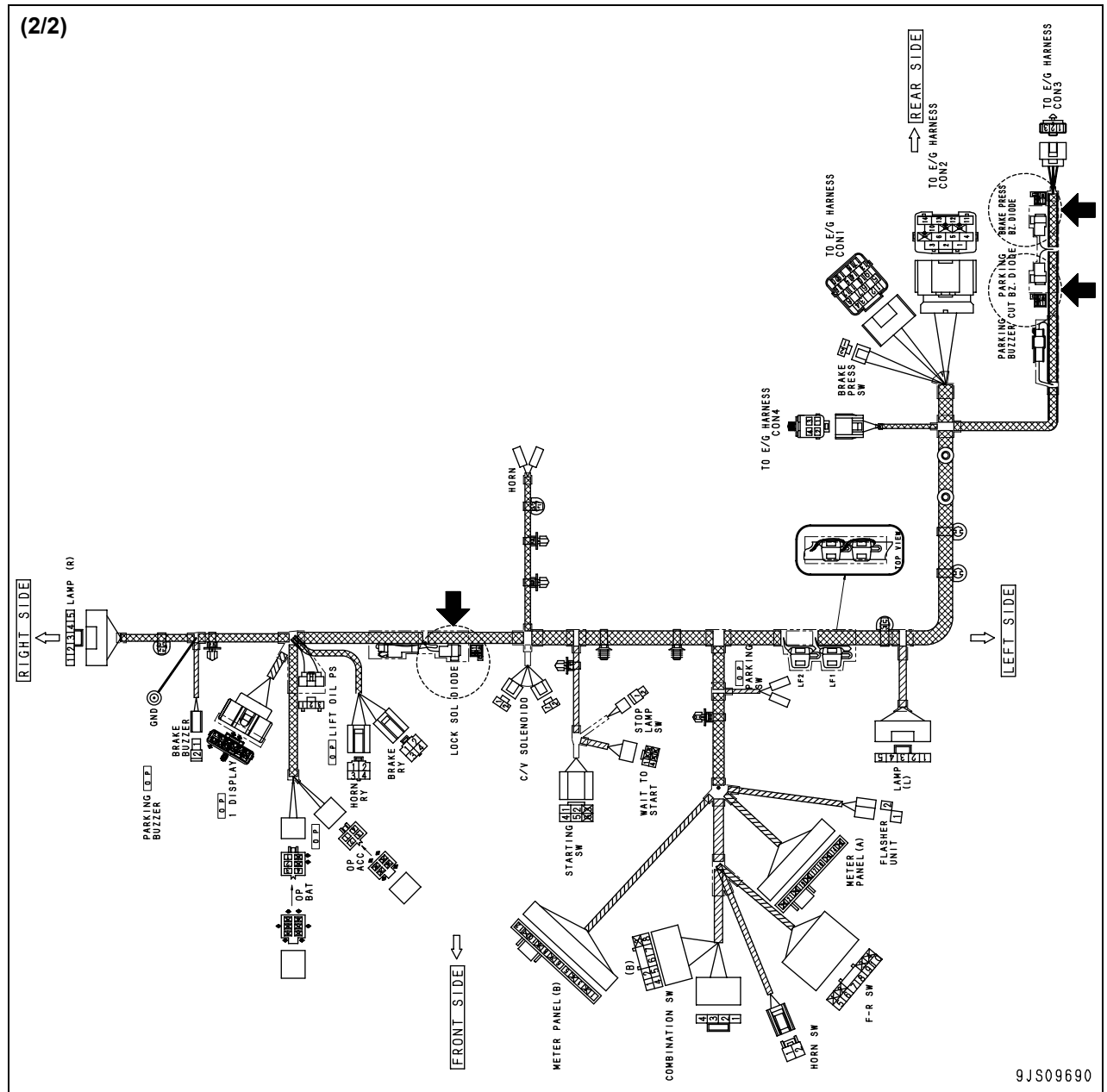


9JS09485

[illegible]

9JS09689

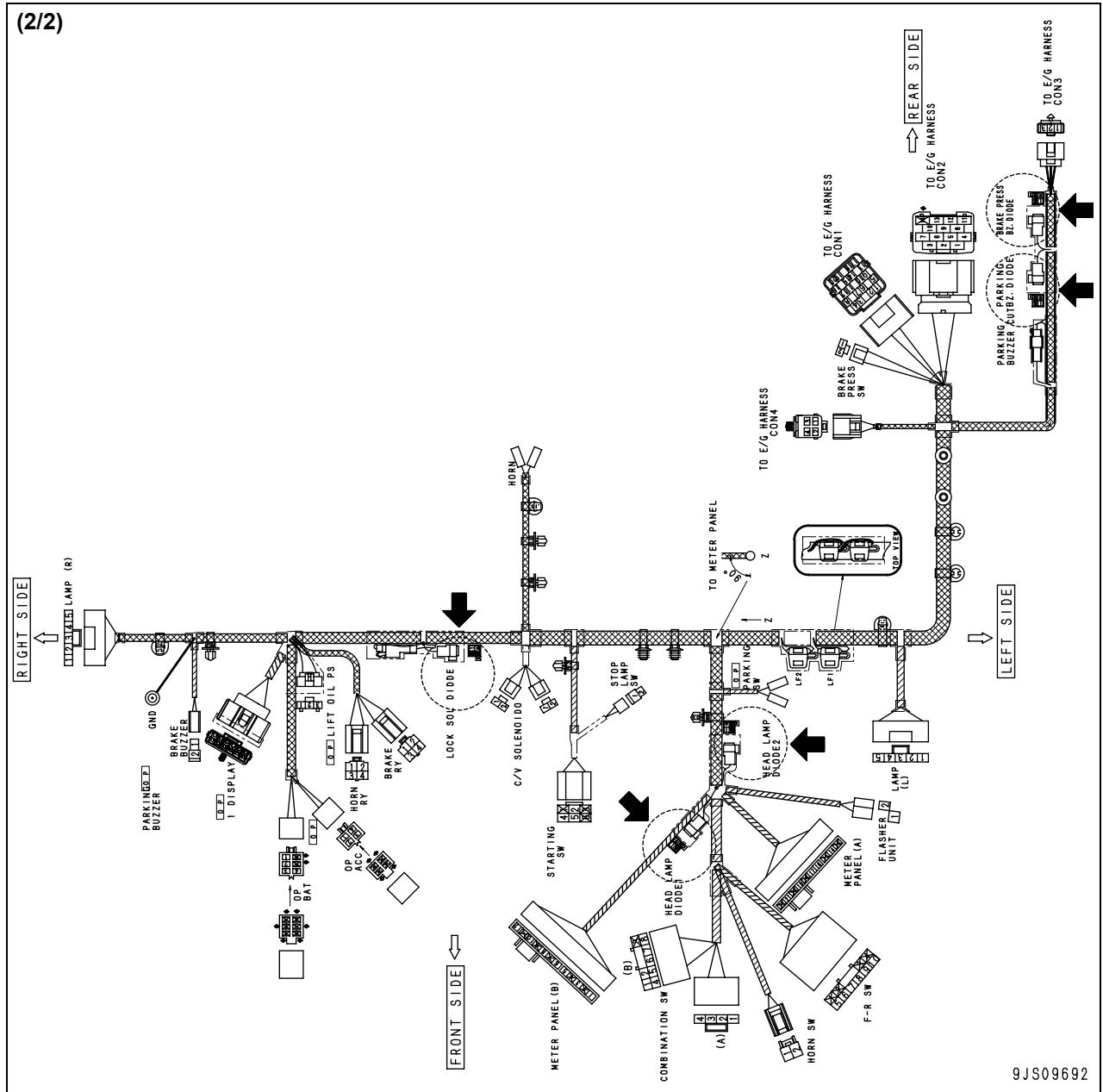
10-802 35



(1/2)

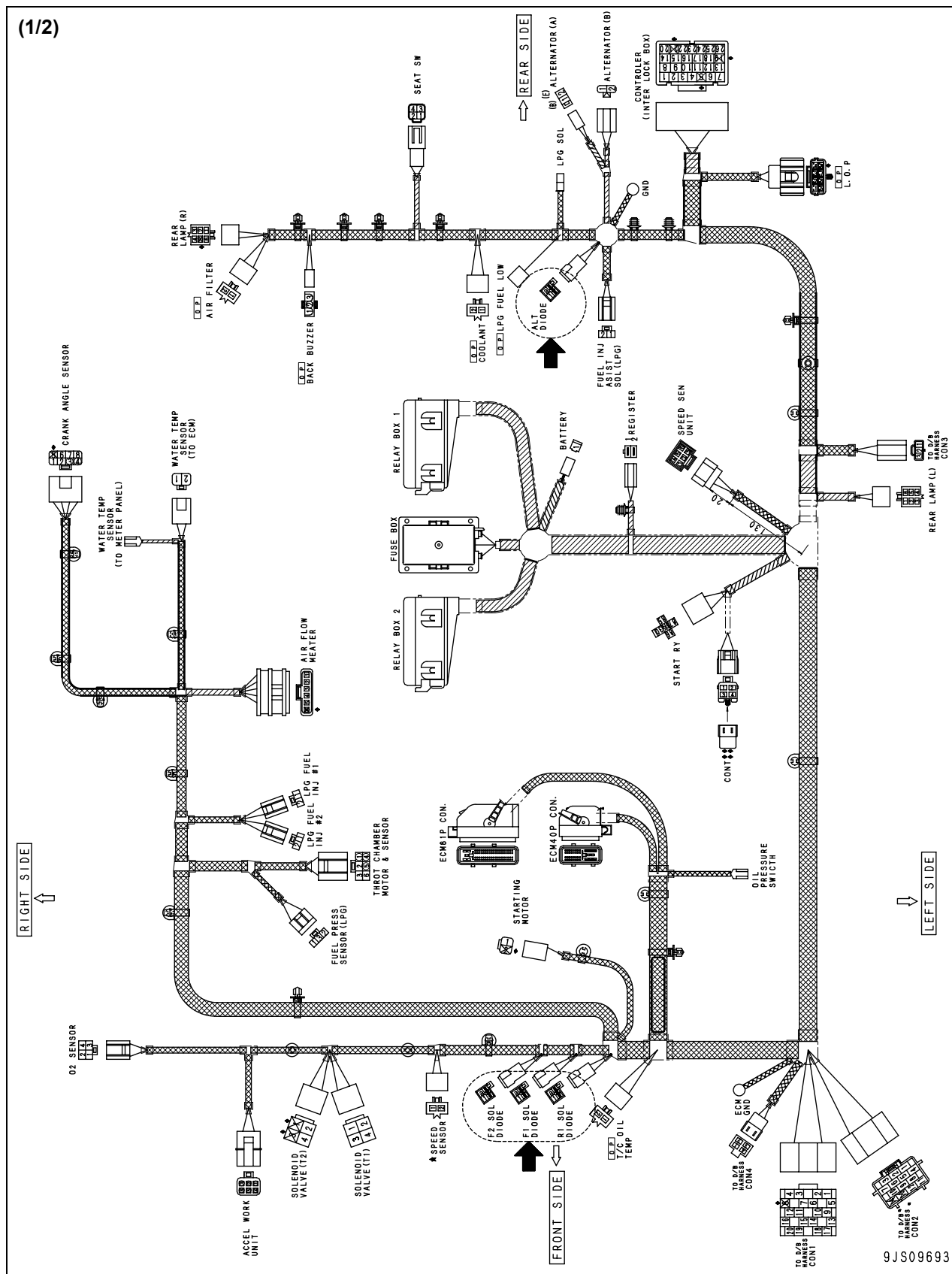


(2/2)

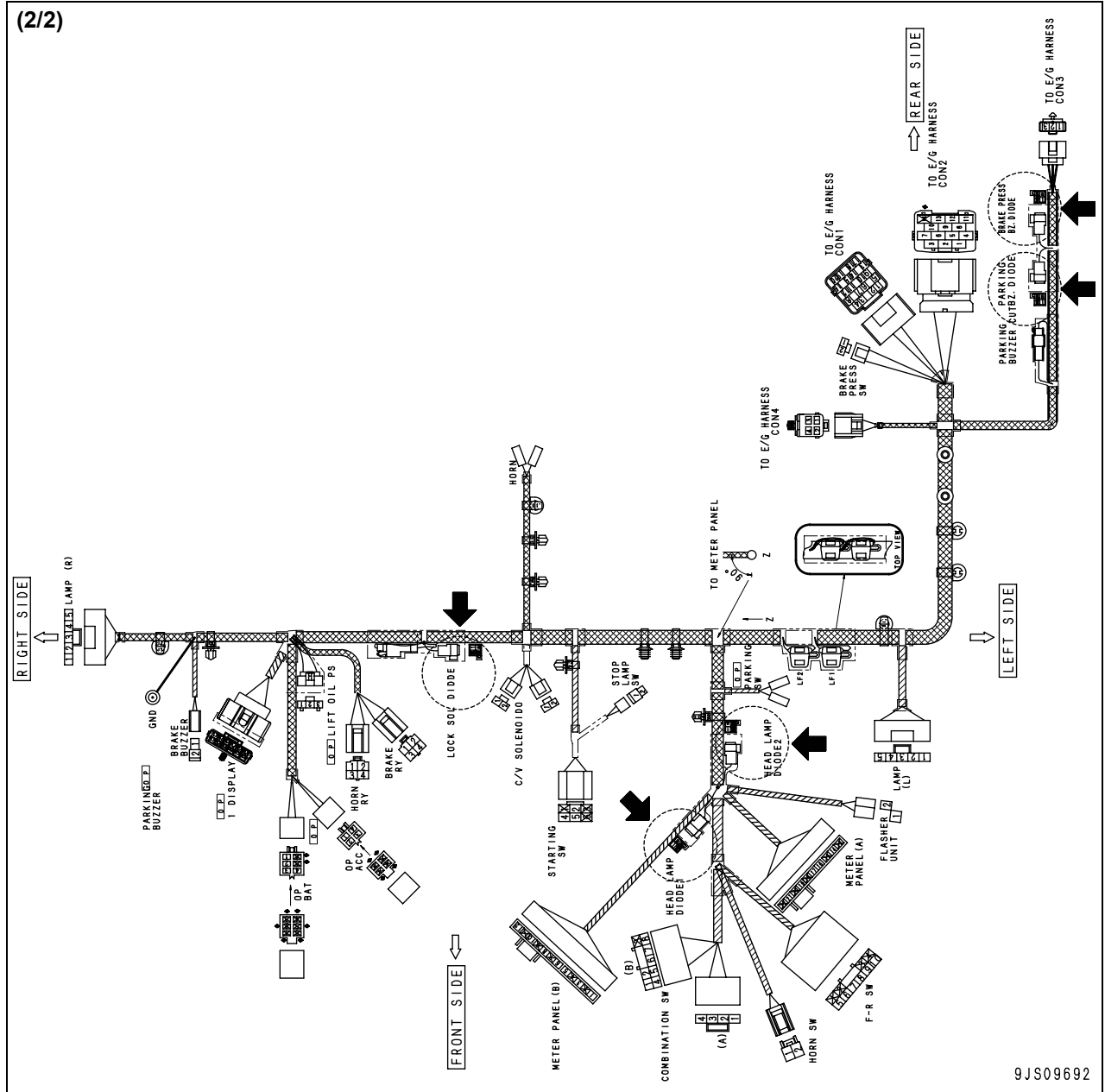


9JS09692

(Applicable model: Lift truck with EBT-TB45-3A engine) (For USA)

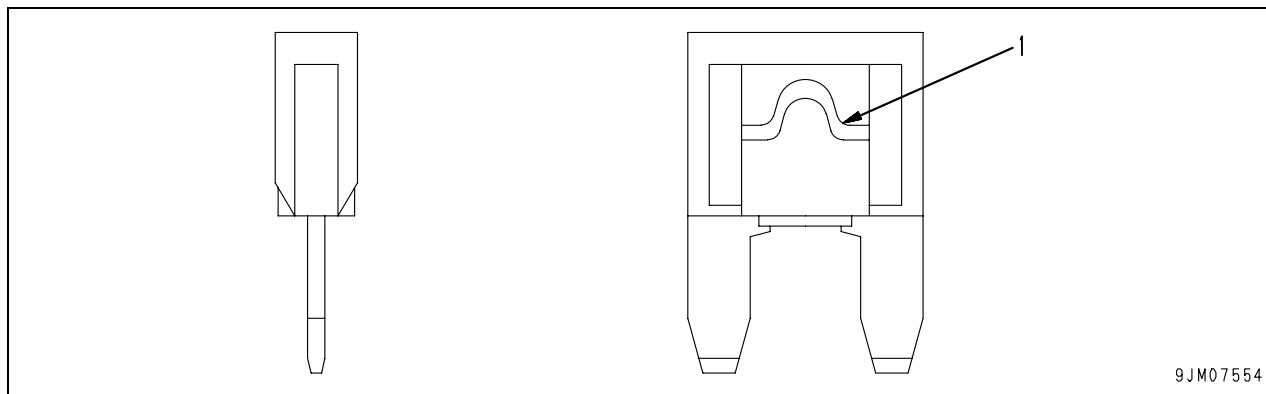


(2/2)



9JS09692

Fuse



1. Fuse blade

Function

- If an excessive current flows in the fuse, its blade melts to protect the circuit.
- When replacing the fuse, turn the starting switch OFF.
- Be sure to replace the fuse with one of the same capacity.
- When replacing the fuse, use the puller inside the fuse box.
- Fuse capacities and colors
 - 10A: Red
 - 15A: Blue
 - 30A: Green

Maintenance standard

1. Measure the resistance of the fuse with a circuit tester. If the fuse does not have continuity, replace it.
2. Even if the fuse has continuity, if it has resistance of several Ω , replace it.
3. Visually check the fuse and its blade for discoloration and deformation. If it is discolored or deformed, replace it.
4. When the fuse is installed in the fuse box, its terminals must not have play.
5. If the replaced fuse is broken soon, repair the load circuit and then replace the fuse again. (If the load circuit is not repaired, the other circuits may be damaged.)

Fuse location**Applicable model: Lift truck with
SAA4D95LE-5-A engine****Applicable model: Lift truck with
EBT-TB45-1A/2A/3A engine**FUSE BOX ARENGEMENT
FOR DIESEL ENGINE

PULLER			
		BA	
		B9	
C3	FUEL* 15A	B8	ENG 30A
C2	OPS SOL 10A	B7	OP
C1	START 10A	B6	OP
A5		B5	OP
A4		B4	OP
A3	CONT* 10A	B3	HEAD LAMP 15A
A2	MAIN 10A	B2	STOP LAMP 15A
A1	METER 10A	B1	HORN 10A

*TIER 2 (S4D95LE-3) ENGINE ONLY

FUSE BOX ARENGEMENT
FOR GASOLINE ENGINE

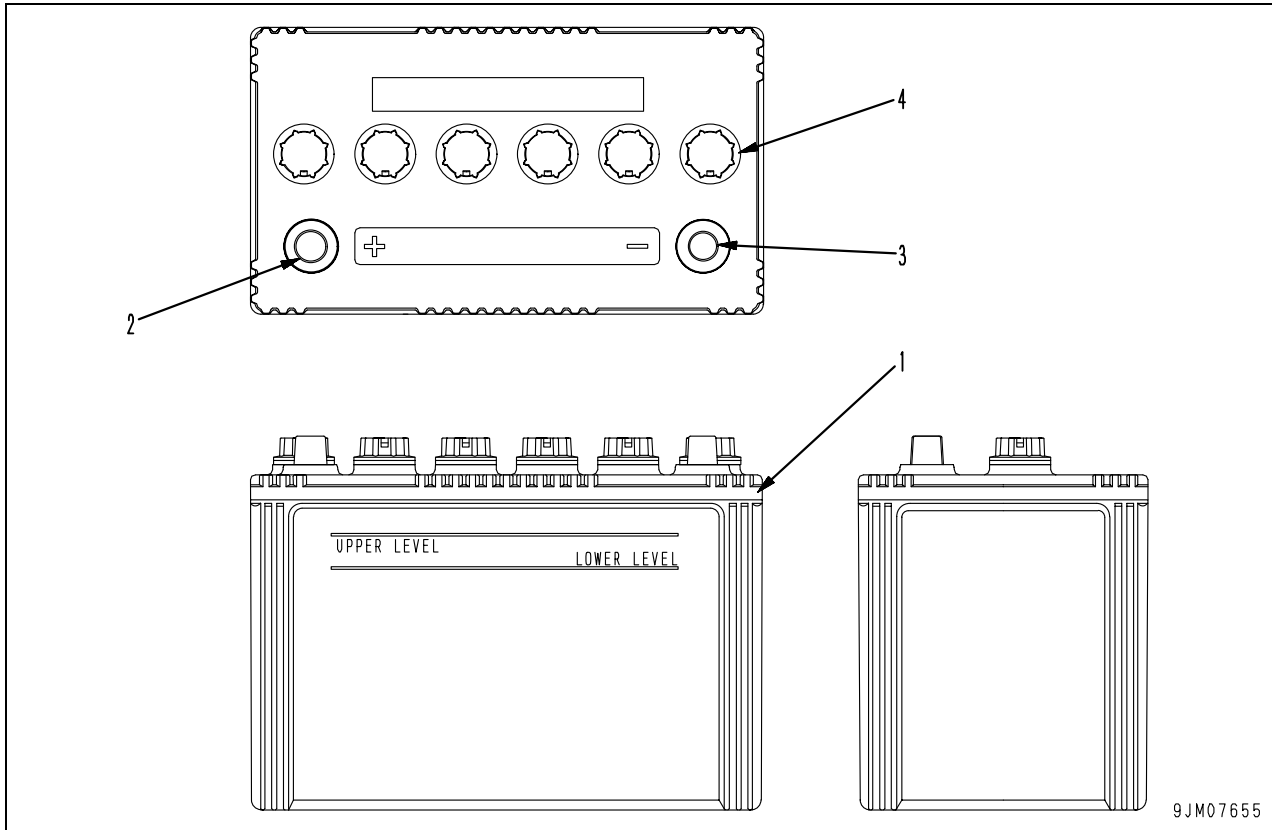
PULLER			
		BA	OP
		B9	OP
C3	LPG** 10A	B8	OP
C2	OPS SOL 10A	B7	OP
C1	START 10A	B6	EGI 1 15A
A5	FUEL PUMP 10A	B5	EGI 2 10A
A4	FUEL INJECTION 10A	B4	ETC 15A
A3	CONTROLLER 10A	B3	HEAD LAMP 15A
A2	MAIN 10A	B2	STOP LAMP 10A
A1	METER 10A	B1	HORN 10A

**FOR DUAL FUEL ENGINE ONLY

9JM07555

Battery

(Applicable model: Lift truck with SAA4D95LE-5-A/S4D95LE-3 engine)



1. Body
2. (+) terminal
3. (-) terminal
4. Water filler

Specifications

Type: 95D31R

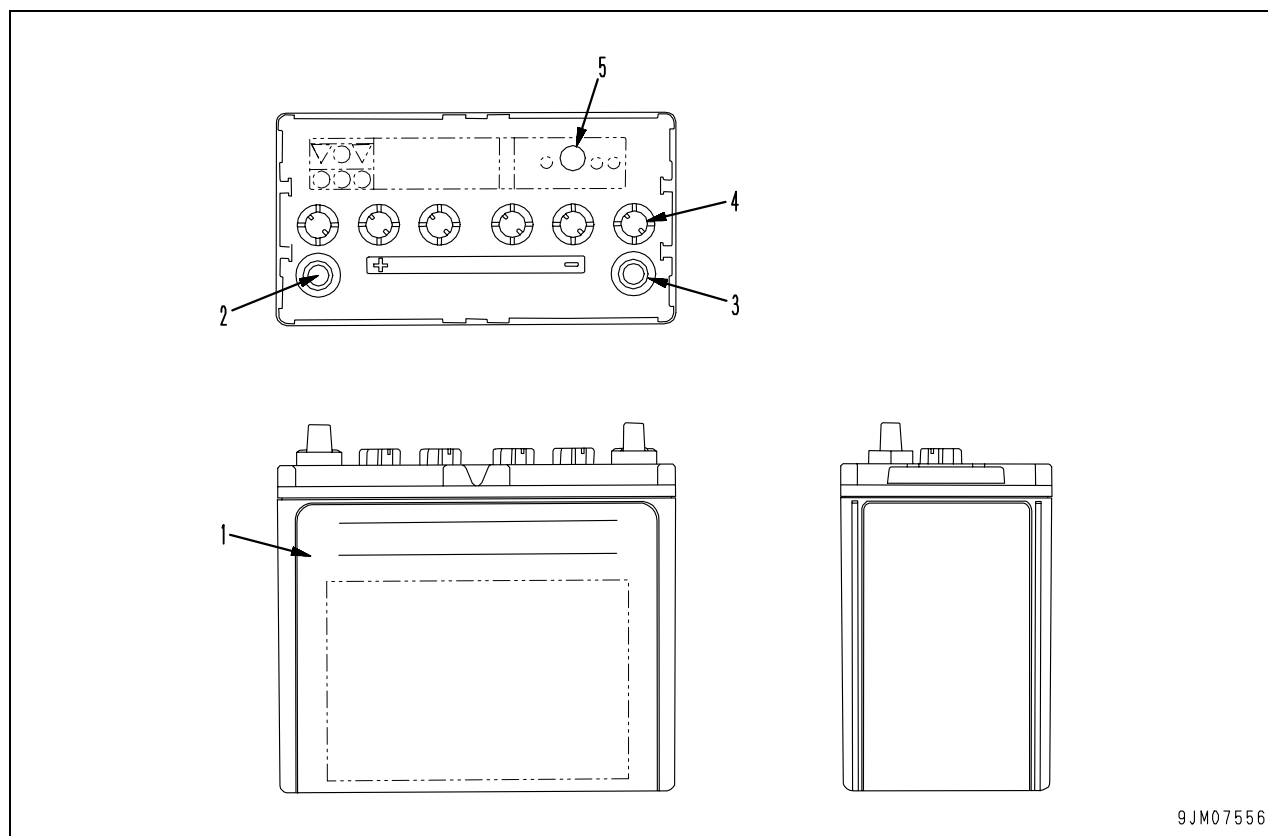
Voltage: 12 V

Capacity: 64 Ah/5HR

Function

The battery is installed to the left side in the hood and used to start the engine (with the starting motor).

(Applicable model: Lift truck with EBT-TB45-1A/2A/3A engine)



9JM07556

1. Body
2. (+) terminal
3. (-) terminal
4. Water filler
5. Electrolyte check window

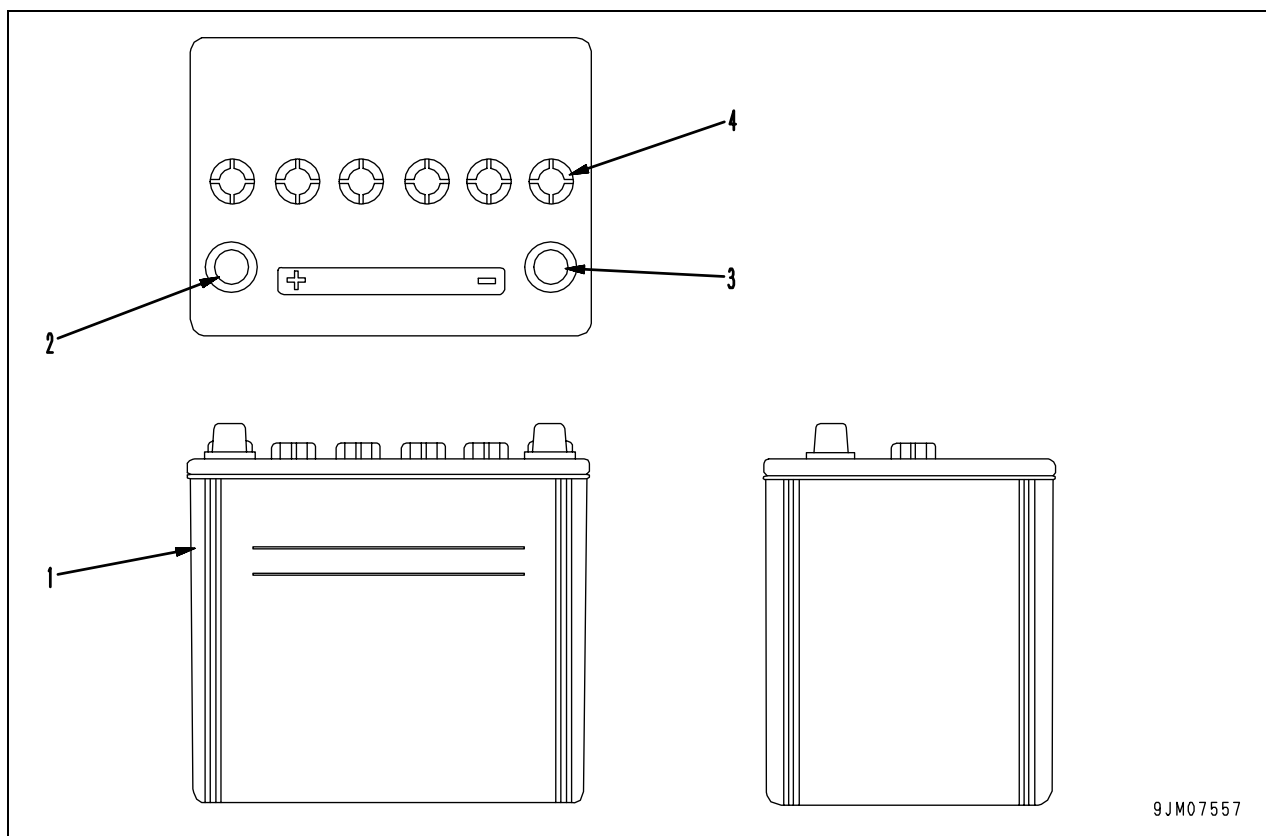
Specifications

Type: 60B24R

Voltage: 12 V

Capacity: 38 Ah/5HR

For EU large-capacity specification and USA



1. Body
2. (+) terminal
3. (-) terminal
4. Water filler

Specifications

Type: 75D23R

Voltage: 12 V

Capacity: 52 Ah/5HR

FORKLIFT TRUCK

CX50 Series

Applicable model Serial number

For general

FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up

For USA

FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

20 Standard value table

100 Standard value table

Standard value table	2
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Standard value table (For general)**(Applicable model: Lift truck with SAA4D95LE-5-A engine)**

Device		Item		Unit	FD40Z-10	FD35-10
Engine	Body	Engine model		—	SAA4D95LE-5-A	
		Idling speed		rpm	800 ± 25	
		Max. speed		rpm	2,550 ± 25	
		Torque converter stall speed		rpm	2,000 ± 50	
		Compression		MPa {kgf/cm ² }/rpm	Min. 2.9 {Min. 30}/150 – 250	
	Lubricating and cooling systems	Engine oil amount		ℓ	11	
		Coolant amount		ℓ	9	
		Fan belt tension (58.8 N {approx. 6 kgf} finger pressure)		mm	7 – 10	
	Fuel system	Injection timing		deg-BTDC	Electronic control system	
		Injection order		—	1-2-4-3	
		Injection pressure		MPa {kgf/cm ² }	25.4 – 108 {250 – 1,100}	
		Fuel tank capacity		ℓ	76	98
	Intake and exhaust systems	Valve clearance	Intake	mm	0.35 (Cold)	
			Exhaust	mm	0.50 (Cold)	
	Electric system	Battery electrolyte specific gravity		—	1.28 (20 °C)	
Power train	Torque converter	Inlet oil pressure		MPa {kgf/cm ² }	0.5 – 0.7 {5 – 7}	
		Outlet oil pressure		MPa {kgf/cm ² }	0.46 ± 0.12 {4.5 ± 1.2}	
	TORQFLOW transmission	Main relief pressure		MPa {kgf/cm ² }	1.13 ± 0.12 {11.5 ± 1.2}	
		Clutch operating pressure		MPa {kgf/cm ² }	1.12 – 1.25 {11.4 – 12.7}	
		Lubricating oil pressure		MPa {kgf/cm ² }	0.46 ± 0.12 {4.5 ± 1.2}	
		Oil amount		ℓ	12 (Replacement)/17 (Disassembly)	
	Differential	Oil amount		ℓ	10 (Replacement)/12 (Disassembly)	
Traveling equipment	Tyres	Tire inflation pressure	Front wheel	kPa {kgf/cm ² }	835 {8.5}	685 {7.0}
			Rear wheel	kPa {kgf/cm ² }	835 {8.5}	
	Hub nut	Tightening torque	Front wheel	Nm {kgfm}	294 – 490 {30 – 50}	
			Rear wheel	Nm {kgfm}	294 – 490 {30 – 50}	

Device		Item		Unit	FD40Z-10	FD35-10
Steering and braking systems	Steering wheel	Play		mm	10 – 30	
	Rear axle	Min. turning radius		mm	2,640	2,730
	Inching pedal	Play		mm	0 – 4	
		Interconnected stroke		mm	53 – 57	
	Brake pedal	Play		mm	0 – 4	
		Pedal height when depressed		mm	82 – 86	
	Brake	Parking brake operating effort		N {kgf}	59 – 64 {6.0 – 6.5}	
		Back plate mounting bolt tightening torque		Nm {kgfm}	59 – 74 {6.0 – 7.5}	
Loading equipment	Fork	Fork thickness (at base)		mm	Min. 48	
		Height difference		mm	Max. 15	
		Tip opening		mm	Max. 35	
	Chain	Length over 17 links	Lifting height: 3 m	mm	Max. 440	
	Cylinder	Hydraulic drift		mm/15 min	Max. 50	
		Hydraulic forward drift		mm/15 min	Max. 45	
	Hydraulic system	Relief pressure		MPa {kgf/cm ² }	20.6 {210}	
		Oil amount		ℓ	42	63

Device		Item		Unit	FD40-10	FD45-10	FD50A-10
Engine	Body	Engine model		—	SAA4D95LE-5-A		
		Idling speed		rpm	800 ± 25		
		Max. speed		rpm	2,550 ± 25		
		Torque converter stall speed		rpm	2,000 ± 50		
		Compression		MPa {kgf/cm ² }/rpm	Min. 2.9 {Min. 30}/150 – 250		
	Lubricating and cooling systems	Engine oil amount		ℓ	11		
		Coolant amount		ℓ	9		
		Fan belt tension (58.8 N {approx. 6 kgf} finger pressure)		mm	7 – 10		
	Fuel system	Injection timing		deg-BTDC	Electronic control system		
		Injection order		—	1-2-4-3		
		Injection pressure		MPa {kgf/cm ² }	25.4 – 108 {250 – 1,100}		
		Fuel tank capacity		ℓ	98		
	Intake and exhaust systems	Valve clearance	Intake	mm	0.35 (Cold)		
			Exhaust	mm	0.50 (Cold)		
	Electric system	Battery electrolyte specific gravity		—	1.28 (20 °C)		
Power train	Torque converter	Inlet oil pressure		MPa {kgf/cm ² }	0.5 – 0.7 {5 – 7}		
		Outlet oil pressure		MPa {kgf/cm ² }	0.46 ± 0.12 {4.5 ± 1.2}		
	TORQFLOW transmission	Main relief pressure		MPa {kgf/cm ² }	1.13 ± 0.12 {11.5 ± 1.2}		
		Clutch operating pressure		MPa {kgf/cm ² }	1.12 – 1.25 {11.4 – 12.7}		
		Lubricating oil pressure		MPa {kgf/cm ² }	0.46 ± 0.12 {4.5 ± 1.2}		
		Oil amount		ℓ	12 (Replacement)/17 (Disassembly)		
	Differential	Oil amount		ℓ	10 (Replacement)/12 (Disassembly)		
Traveling equipment	Tyres	Tire inflation pressure	Front wheel	kPa {kgf/cm ² }	785 {8.0}		
			Rear wheel	kPa {kgf/cm ² }	835 {8.5}		980 {10.0}
	Hub nut	Tightening torque	Front wheel	Nm {kgfm}	294 – 490 {30 – 50}		
			Rear wheel	Nm {kgfm}	294 – 490 {30 – 50}		

Device		Item		Unit	FD40-10	FD45-10	FD50A-10
Steering and braking systems	Steering wheel	Play		mm	10 – 30		
	Rear axle	Min. turning radius		mm	2,770	2,820	2,850
	Inching pedal	Play		mm	0 – 4		
		Interconnected stroke		mm	53 – 57		
	Brake pedal	Play		mm	0 – 4		
		Pedal height when depressed		mm	82 – 86		
	Brake	Parking brake operating effort		N {kgf}	59 – 64 {6.0 – 6.5}		
		Back plate mounting bolt tightening torque		Nm {kgfm}	59 – 74 {6.0 – 7.5}		
Loading equipment	Fork	Fork thickness (at base)		mm	Min. 50		
		Height difference		mm	Max. 15		
		Tip opening		mm	Max. 35		
	Chain	Length over 17 links	Lifting height: 3 m	mm	Max. 440		
	Cylinder	Hydraulic drift		mm/15 min	Max. 50		
		Hydraulic forward drift		mm/15 min	Max. 45		
	Hydraulic system	Relief pressure		MPa {kgf/cm ² }	20.6 {210}		
		Oil amount		ℓ	63		

(For general)**(Applicable model: Lift truck with S4D95LE-3 engine)**

Device		Item		Unit	FD40ZY-10	FD35Y-10
Engine	Body	Engine model		—	S4D95LE-3	
		Idling speed		rpm	800 ⁺⁵⁰ ₀	
		Max. speed		rpm	2,650 ± 50	
		Torque converter stall speed		rpm	1,960 ± 50	
		Compression		MPa {kgf/cm ² }/rpm	Min. 2.9 {Min. 30}/150 – 250	
	Lubricating and cooling systems	Engine oil amount		ℓ	11	
		Coolant amount		ℓ	9	
		Fan belt tension (58.8 N {approx. 6 kgf} finger pressure)		mm	7 – 10	
	Fuel system	Injection timing		deg-BTDC	5 ± 0.45 °	
		Injection order		—	1-2-4-3	
		Injection pressure		MPa {kgf/cm ² }	20.1 – 21.1 {205 – 215}	
		Fuel tank capacity		ℓ	76	98
	Intake and exhaust systems	Valve clearance	Intake	mm	0.35 (Cold)	
			Exhaust	mm	0.50 (Cold)	
	Electric system	Battery electrolyte specific gravity		—	1.28 (20 °C)	
Power train	Torque converter	Inlet oil pressure		MPa {kgf/cm ² }	0.5 – 0.7 {5 – 7}	
		Outlet oil pressure		MPa {kgf/cm ² }	0.46 ± 0.12 {4.5 ± 1.2}	
	TORQFLOW transmission	Main relief pressure		MPa {kgf/cm ² }	1.13 ± 0.12 {11.5 ± 1.2}	
		Clutch operating pressure		MPa {kgf/cm ² }	1.12 – 1.25 {11.4 – 12.7}	
		Lubricating oil pressure		MPa {kgf/cm ² }	0.46 ± 0.12 {4.5 ± 1.2}	
		Oil amount		ℓ	12 (Replacement)/17 (Disassembly)	
	Differential	Oil amount		ℓ	10 (Replacement)/12 (Disassembly)	
Traveling equipment	Tyres	Tire inflation pressure	Front wheel	kPa {kgf/cm ² }	835 {8.5}	685 {7.0}
			Rear wheel	kPa {kgf/cm ² }	835 {8.5}	
	Hub nut	Tightening torque	Front wheel	Nm {kgfm}	294 – 490 {30 – 50}	
			Rear wheel	Nm {kgfm}	294 – 490 {30 – 50}	

Device		Item		Unit	FD40ZY-10	FD35Y-10
Steering and braking systems	Steering wheel	Play		mm	10 – 30	
	Rear axle	Min. turning radius		mm	2,640	2,730
	Inching pedal	Play		mm	0 – 4	
		Interconnected stroke		mm	53 – 57	
	Brake pedal	Play		mm	0 – 4	
		Pedal height when depressed		mm	82 – 86	
	Brake	Parking brake operating effort		N {kgf}	59 – 64 {6.0 – 6.5}	
		Back plate mounting bolt tightening torque		Nm {kgfm}	59 – 74 {6.0 – 7.5}	
Loading equipment	Fork	Fork thickness (at base)		mm	Min. 48	
		Height difference		mm	Max. 15	
		Tip opening		mm	Max. 35	
	Chain	Length over 17 links	Lifting height: 3 m	mm	Max. 440	
	Cylinder	Hydraulic drift		mm/15 min	Max. 50	
		Hydraulic forward drift		mm/15 min	Max. 45	
	Hydraulic system	Relief pressure		MPa {kgf/cm ² }	20.6 {210}	
		Oil amount		ℓ	42	63

Device		Item		Unit	FD40Y-10	FD45Y-10	FD50AY-10
Engine	Body	Engine model		—	S4D95LE-3		
		Idling speed		rpm	800 ⁺⁵⁰ ₀		
		Max. speed		rpm	2,650 ± 50		
		Torque converter stall speed		rpm	1,960 ± 50		
		Compression		MPa {kgf/cm ² }/rpm	Min. 2.9 {Min. 30}/150 – 250		
	Lubricating and cooling systems	Engine oil amount		ℓ	11		
		Coolant amount		ℓ	9		
		Fan belt tension (58.8 N {approx. 6 kgf} finger pressure)		mm	7 – 10		
	Fuel system	Injection timing		deg-BTDC	5 ± 0.45 °		
		Injection order		—	1-2-4-3		
		Injection pressure		MPa {kgf/cm ² }	20.1 – 21.1 {205 – 215}		
		Fuel tank capacity		ℓ	98		
	Intake and exhaust systems	Valve clearance	Intake	mm	0.35 (Cold)		
			Exhaust	mm	0.50 (Cold)		
	Electric system	Battery electrolyte specific gravity		—	1.28 (20 °C)		
Power train	Torque converter	Inlet oil pressure		MPa {kgf/cm ² }	0.5 – 0.7 {5 – 7}		
		Outlet oil pressure		MPa {kgf/cm ² }	0.46 ± 0.12 {4.5 ± 1.2}		
	TORQFLOW transmission	Main relief pressure		MPa {kgf/cm ² }	1.13 ± 0.12 {11.5 ± 1.2}		
		Clutch operating pressure		MPa {kgf/cm ² }	1.12 – 1.25 {11.4 – 12.7}		
		Lubricating oil pressure		MPa {kgf/cm ² }	0.46 ± 0.12 {4.5 ± 1.2}		
		Oil amount		ℓ	12 (Replacement)/17 (Disassembly)		
	Differential	Oil amount		ℓ	10 (Replacement)/12 (Disassembly)		
Traveling equipment	Tyres	Tire inflation pressure	Front wheel	kPa {kgf/cm ² }	785 {8.0}		
			Rear wheel	kPa {kgf/cm ² }	835 {8.5}		985 {10.0}
	Hub nut	Tightening torque	Front wheel	Nm {kgfm}	294 – 490 {30 – 50}		
			Rear wheel	Nm {kgfm}	294 – 490 {30 – 50}		

Device		Item		Unit	FD40Y-10	FD45Y-10	FD50AY-10
Steering and braking systems	Steering wheel	Play		mm	10 – 30		
	Rear axle	Min. turning radius		mm	2,770	2,820	2,850
	Inching pedal	Play		mm	0 – 4		
		Interconnected stroke		mm	53 – 57		
	Brake pedal	Play		mm	0 – 4		
		Pedal height when depressed		mm	82 – 86		
	Brake	Parking brake operating effort		N {kgf}	59 – 64 {6.0 – 6.5}		
		Back plate mounting bolt tightening torque		Nm {kgfm}	59 – 74 {6.0 – 7.5}		
Loading equipment	Fork	Fork thickness (at base)		mm	Min. 50		
		Height difference		mm	Max. 15		
		Tip opening		mm	Max. 35		
	Chain	Length over 17 links	Lifting height: 3 m	mm	Max. 440		
	Cylinder	Hydraulic drift		mm/15 min	Max. 50		
		Hydraulic forward drift		mm/15 min	Max. 45		
	Hydraulic system	Relief pressure		MPa {kgf/cm ² }	20.6 {210}		
		Oil amount		ℓ	63		

(For USA)**(Applicable model: Lift truck with SAA4D95LE-5-A engine)**

Device		Item		Unit	FD40ZU-10	FD40U-10
Engine	Body	Engine model		—	SAA4D95LE-5-A	
		Idling speed		rpm	800 ± 25	
		Max. speed		rpm	2,550 ± 25	
		Torque converter stall speed		rpm	2,000 ± 50	
		Compression		MPa {kgf/cm ² }/rpm	Min. 2.9 {Min. 30}/150 – 250	
	Lubricating and cooling systems	Engine oil amount		ℓ	11	
		Coolant amount		ℓ	9	
		Fan belt tension (58.8 N {approx. 6 kgf} finger pressure)		mm	7 – 10	
	Fuel system	Injection timing		deg-BTDC	Electronic control system	
		Injection order		—	1-2-4-3	
		Injection pressure		MPa {kgf/cm ² }	25.4 – 108 {250 – 1,100}	
		Fuel tank capacity		ℓ	76	98
	Intake and exhaust systems	Valve clearance	Intake	mm	0.35 (Cold)	
			Exhaust	mm	0.50 (Cold)	
	Electric system	Battery electrolyte specific gravity		—	1.28 (20 °C)	
Power train	Torque converter	Inlet oil pressure		MPa {kgf/cm ² }	0.5 – 0.7 {5 – 7}	
		Outlet oil pressure		MPa {kgf/cm ² }	0.46 ± 0.12 {4.5 ± 1.2}	
	TORQFLOW transmission	Main relief pressure		MPa {kgf/cm ² }	1.13 ± 0.12 {11.5 ± 1.2}	
		Clutch operating pressure		MPa {kgf/cm ² }	1.12 – 1.25 {11.4 – 12.7}	
		Lubricating oil pressure		MPa {kgf/cm ² }	0.46 ± 0.12 {4.5 ± 1.2}	
		Oil amount		ℓ	12 (Replacement)/17 (Disassembly)	
	Differential	Oil amount		ℓ	10 (Replacement)/12 (Disassembly)	
Traveling equipment	Tyres	Tire inflation pressure	Front wheel	kPa {kgf/cm ² }	685 {7.0}	785 {8.0}
			Rear wheel	kPa {kgf/cm ² }	835 {8.5}	
	Hub nut	Tightening torque	Front wheel	Nm {kgfm}	294 – 490 {30 – 50}	
			Rear wheel	Nm {kgfm}	294 – 490 {30 – 50}	

Device		Item		Unit	FD40ZU-10	FD40U-10
Steering and braking systems	Steering wheel	Play		mm	10 – 30	
	Rear axle	Min. turning radius		mm	2,590	2,770
	Inching pedal	Play		mm	0 – 4	
		Interconnected stroke		mm	53 – 57	
	Brake pedal	Play		mm	0 – 4	
		Pedal height when depressed		mm	82 – 86	
	Brake	Parking brake operating effort		N {kgf}	59 – 64 {6.0 – 6.5}	
		Back plate mounting bolt tightening torque		Nm {kgfm}	59 – 74 {6.0 – 7.5}	
Loading equipment	Fork	Fork thickness (at base)		mm	Min. 50	
		Height difference		mm	Max. 15	
		Tip opening		mm	Max. 35	
	Chain	Length over 17 links	Lifting height: 3 m	mm	Max. 440	
	Cylinder	Hydraulic drift		mm/15 min	Max. 50	
		Hydraulic forward drift		mm/15 min	Max. 45	
	Hydraulic system	Relief pressure		MPa {kgf/cm ² }	20.6 {210}	
		Oil amount		ℓ	42	63

Device		Item		Unit	FD45U-10	FD50AU-10
Engine	Body	Engine model		—	SAA4D95LE-5-A	
		Idling speed		rpm	800 ± 25	
		Max. speed		rpm	2,550 ± 50	
		Torque converter stall speed		rpm	2,000 ± 50	
		Compression		MPa {kgf/cm ² }/rpm	Min. 2.9 {Min. 30}/150 – 250	
	Lubricating and cooling systems	Engine oil amount		ℓ	11	
		Coolant amount		ℓ	9	
		Fan belt tension (58.8 N {approx. 6 kgf} finger pressure)		mm	7 – 10	
	Fuel system	Injection timing		deg-BTDC	Electronic control system	
		Injection order		—	1-2-4-3	
		Injection pressure		MPa {kgf/cm ² }	25.4 – 108 {250 – 1,100}	
		Fuel tank capacity		ℓ	98	
	Intake and exhaust systems	Valve clearance	Intake	mm	0.35 (Cold)	
			Exhaust	mm	0.50 (Cold)	
	Electric system	Battery electrolyte specific gravity		—	1.28 (20 °C)	
Power train	Torque converter	Inlet oil pressure		MPa {kgf/cm ² }	0.5 – 0.7 {5 – 7}	
		Outlet oil pressure		MPa {kgf/cm ² }	0.46 ± 0.12 {4.5 ± 1.2}	
	TORQFLOW transmission	Main relief pressure		MPa {kgf/cm ² }	1.13 ± 0.12 {11.5 ± 1.2}	
		Clutch operating pressure		MPa {kgf/cm ² }	1.12 – 1.25 {11.4 – 12.7}	
		Lubricating oil pressure		MPa {kgf/cm ² }	0.46 ± 0.12 {4.5 ± 1.2}	
		Oil amount		ℓ	12 (Replacement)/17 (Disassembly)	
	Differential	Oil amount		ℓ	10 (Replacement)/12 (Disassembly)	
Traveling equipment	Tyres	Tire inflation pressure	Front wheel	kPa {kgf/cm ² }	785 {8.0}	
			Rear wheel	kPa {kgf/cm ² }	835 {8.5}	985 {10.0}
	Hub nut	Tightening torque	Front wheel	Nm {kgfm}	294 – 490 {30 – 50}	
			Rear wheel	Nm {kgfm}	294 – 490 {30 – 50}	

Device		Item		Unit	FD45U-10	FD50AU-10
Steering and braking systems	Steering wheel	Play		mm	10 – 30	
	Rear axle	Min. turning radius		mm	2,820	2,850
	Inching pedal	Play		mm	0 – 4	
		Interconnected stroke		mm	53 – 57	
	Brake pedal	Play		mm	0 – 4	
		Pedal height when depressed		mm	82 – 86	
	Brake	Parking brake operating effort		N {kgf}	59 – 64 {6.0 – 6.5}	
		Back plate mounting bolt tightening torque		Nm {kgfm}	59 – 74 {6.0 – 7.5}	
Loading equipment	Fork	Fork thickness (at base)		mm	Min. 50	
		Height difference		mm	Max. 15	
		Tip opening		mm	Max. 35	
	Chain	Length over 17 links	Lifting height: 3 m	mm	Max. 440	
	Cylinder	Hydraulic drift		mm/15 min	Max. 50	
		Hydraulic forward drift		mm/15 min	Max. 45	
	Hydraulic system	Relief pressure		MPa {kgf/cm ² }	20.6 {210}	
		Oil amount		ℓ	63	

(For general)**(Applicable model: Lift truck with EBT-TB45-1A/2A/3A engine)**

Device		Item		Unit	FG40Z-10	FG35-10
Engine	Body	Engine model		—	EBT-TB45-1A/2A/3A	
		Idling speed		rpm	700 – 800	
		Max. speed		rpm	2,350 – 2,450	
		Torque converter stall speed		rpm	1,930 ± 50	
		Compression		MPa {kgf/cm ² }/rpm	Min. 1.19 {Min. 12.1}/200	
	Lubricating and cooling systems	Engine oil amount		ℓ	8.4	
		Coolant amount		ℓ	16	
		Fan belt tension (58.8 N {approx. 6 kgf} finger pressure)		mm	15 – 17	
	Fuel system	Injection timing		deg-BTDC	—	
		Injection order		—	—	
		Injection pressure		MPa {kgf/cm ² }	—	
		Fuel tank capacity		ℓ	76	98
	Intake and exhaust systems	Valve clearance	Intake	mm	0.35 (Warm)	
			Exhaust	mm	0.35 (Warm)	
	Electric system	Battery electrolyte specific gravity		—	1.28 (20 °C)	
Power train	Torque converter	Inlet oil pressure		MPa {kgf/cm ² }	0.5 – 0.7 {5 – 7}	
		Outlet oil pressure		MPa {kgf/cm ² }	0.46 ± 0.12 {4.5 ± 1.2}	
	TORQFLOW transmission	Main relief pressure		MPa {kgf/cm ² }	1.13 ± 0.12 {11.5 ± 1.2}	
		Clutch operating pressure		MPa {kgf/cm ² }	1.12 – 1.25 {11.4 – 12.7}	
		Lubricating oil pressure		MPa {kgf/cm ² }	0.46 ± 0.12 {4.5 ± 1.2}	
		Oil amount		ℓ	12 (Replacement)/17 (Disassembly)	
	Differential	Oil amount		ℓ	10 (Replacement)/12 (Disassembly)	
Traveling equipment	Tyres	Tire inflation pressure	Front wheel	kPa {kgf/cm ² }	835 {8.5}	685 {7.0}
			Rear wheel	kPa {kgf/cm ² }	835 {8.5}	
	Hub nut	Tightening torque	Front wheel	Nm {kgfm}	294 – 490 {30 – 50}	
			Rear wheel	Nm {kgfm}	294 – 490 {30 – 50}	

Device		Item		Unit	FG40Z-10	FG35-10
Steering and braking systems	Steering wheel	Play		mm	10 – 30	
	Rear axle	Min. turning radius		mm	2,640	2,730
	Inching pedal	Play		mm	0 – 4	
		Interconnected stroke		mm	53 – 57	
	Brake pedal	Play		mm	0 – 4	
		Pedal height when depressed		mm	82 – 86	
	Brake	Parking brake operating effort		N {kgf}	59 – 64 {6.0 – 6.5}	
		Back plate mounting bolt tightening torque		Nm {kgfm}	59 – 74 {6.0 – 7.5}	
Loading equipment	Fork	Fork thickness (at base)		mm	Min. 48	
		Height difference		mm	Max. 15	
		Tip opening		mm	Max. 35	
	Chain	Length over 17 links	Lifting height: 3 m	mm	Max. 440	
	Cylinder	Hydraulic drift		mm/15 min	Max. 50	
		Hydraulic forward drift		mm/15 min	Max. 45	
	Hydraulic system	Relief pressure		MPa {kgf/cm ² }	20.6 {210}	
		Oil amount		ℓ	42	63

Device		Item		Unit	FG40-10	FG45-10	FG50A-10
Engine	Body	Engine model		—	EBT-TB45-1A/2A/3A		
		Idling speed		rpm	700 – 800		
		Max. speed		rpm	2,350 – 2,450		
		Torque converter stall speed		rpm	1,930 ± 50		
		Compression		MPa {kgf/cm ² }/rpm	Min. 1.19 {Min. 12.1}/200		
	Lubricating and cooling systems	Engine oil amount		ℓ	8.4		
		Coolant amount		ℓ	16		
		Fan belt tension (58.8 N {approx. 6 kgf} finger pressure)		mm	15 – 17		
	Fuel system	Injection timing		deg-BTDC	—		
		Injection order		—	—		
		Injection pressure		MPa {kgf/cm ² }	—		
		Fuel tank capacity		ℓ	98		
	Intake and exhaust systems	Valve clearance	Intake	mm	0.35 (Warm)		
			Exhaust	mm	0.35 (Warm)		
	Electric system	Battery electrolyte specific gravity		—	1.28 (20 °C)		
Power train	Torque converter	Inlet oil pressure		MPa {kgf/cm ² }	0.5 – 0.7 {5 – 7}		
		Outlet oil pressure		MPa {kgf/cm ² }	0.46 ± 0.12 {4.5 ± 1.2}		
	TORQFLOW transmission	Main relief pressure		MPa {kgf/cm ² }	1.13 ± 0.12 {11.5 ± 1.2}		
		Clutch operating pressure		MPa {kgf/cm ² }	1.12 – 1.25 {11.4 – 12.7}		
		Lubricating oil pressure		MPa {kgf/cm ² }	0.46 ± 0.12 {4.5 ± 1.2}		
		Oil amount		ℓ	12 (Replacement)/17 (Disassembly)		
	Differential	Oil amount		ℓ	10 (Replacement)/12 (Disassembly)		
Traveling equipment	Tyres	Tire inflation pressure	Front wheel	kPa {kgf/cm ² }	785 {8.0}		
			Rear wheel	kPa {kgf/cm ² }	835 {8.5}		985 {10.0}
	Hub nut	Tightening torque	Front wheel	Nm {kgfm}	294 – 490 {30 – 50}		
			Rear wheel	Nm {kgfm}	294 – 490 {30 – 50}		

Device		Item		Unit	FG40-10	FG45-10	FG50A-10
Steering and braking systems	Steering wheel	Play		mm	10 – 30		
	Rear axle	Min. turning radius		mm	2,770	2,820	2,850
	Inching pedal	Play		mm	0 – 4		
		Interconnected stroke		mm	53 – 57		
	Brake pedal	Play		mm	0 – 4		
		Pedal height when depressed		mm	82 – 86		
	Brake	Parking brake operating effort		N {kgf}	59 – 64 {6.0 – 6.5}		
		Back plate mounting bolt tightening torque		Nm {kgfm}	59 – 74 {6.0 – 7.5}		
Loading equipment	Fork	Fork thickness (at base)		mm	Min. 50		
		Height difference		mm	Max. 15		
		Tip opening		mm	Max. 35		
	Chain	Length over 17 links	Lifting height: 3 m	mm	Max. 440		
	Cylinder	Hydraulic drift		mm/15 min	Max. 50		
		Hydraulic forward drift		mm/15 min	Max. 45		
	Hydraulic system	Relief pressure		MPa {kgf/cm ² }	20.6 {210}		
		Oil amount		ℓ	63		

(For USA)**(Applicable model: Lift truck with EBT-TB45-2A/3A engine)**

Device		Item		Unit	FG40ZU-10	FG40U-10
Engine	Body	Engine model		—	EBT-TB45-2A/3A	
		Idling speed		rpm	700 – 800	
		Max. speed		rpm	2,350 – 2,450	
		Torque converter stall speed		rpm	1,930 ± 50	
		Compression		MPa {kgf/cm ² }/rpm	Min. 1.19 {Min. 12.1}/200	
	Lubricating and cooling systems	Engine oil amount		ℓ	8.4	
		Coolant amount		ℓ	16	
		Fan belt tension (58.8 N {approx. 6 kgf} finger pressure)		mm	15 – 17	
	Fuel system	Injection timing		deg-BTDC	—	
		Injection order		—	—	
		Injection pressure		MPa {kgf/cm ² }	—	
		Fuel tank capacity		ℓ	76	98
	Intake and exhaust systems	Valve clearance	Intake	mm	0.35 (Warm)	
			Exhaust	mm	0.35 (Warm)	
	Electric system	Battery electrolyte specific gravity		—	1.28 (20 °C)	
Power train	Torque converter	Inlet oil pressure		MPa {kgf/cm ² }	0.5 – 0.7 {5 – 7}	
		Outlet oil pressure		MPa {kgf/cm ² }	0.46 ± 0.12 {4.5 ± 1.2}	
	TORQFLOW transmission	Main relief pressure		MPa {kgf/cm ² }	1.13 ± 0.12 {11.5 ± 1.2}	
		Clutch operating pressure		MPa {kgf/cm ² }	1.12 – 1.25 {11.4 – 12.7}	
		Lubricating oil pressure		MPa {kgf/cm ² }	0.46 ± 0.12 {4.5 ± 1.2}	
		Oil amount		ℓ	12 (Replacement)/17 (Disassembly)	
	Differential	Oil amount		ℓ	10 (Replacement)/12 (Disassembly)	
Traveling equipment	Tyres	Tire inflation pressure	Front wheel	kPa {kgf/cm ² }	685 {7.0}	785 {8.0}
			Rear wheel	kPa {kgf/cm ² }	835 {8.5}	
	Hub nut	Tightening torque	Front wheel	Nm {kgfm}	294 – 490 {30 – 50}	
			Rear wheel	Nm {kgfm}	294 – 490 {30 – 50}	

Device		Item		Unit	FG40ZU-10	FG40U-10
Steering and braking systems	Steering wheel	Play		mm	10 – 30	
	Rear axle	Min. turning radius		mm	2,640	2,730
	Inching pedal	Play		mm	0 – 4	
		Interconnected stroke		mm	53 – 57	
	Brake pedal	Play		mm	0 – 4	
		Pedal height when depressed		mm	82 – 86	
	Brake	Parking brake operating effort		N {kgf}	59 – 64 {6.0 – 6.5}	
		Back plate mounting bolt tightening torque		Nm {kgfm}	59 – 74 {6.0 – 7.5}	
Loading equipment	Fork	Fork thickness (at base)		mm	Min. 48	
		Height difference		mm	Max. 15	
		Tip opening		mm	Max. 35	
	Chain	Length over 17 links	Lifting height: 3 m	mm	Max. 440	
	Cylinder	Hydraulic drift		mm/15 min	Max. 50	
		Hydraulic forward drift		mm/15 min	Max. 45	
	Hydraulic system	Relief pressure		MPa {kgf/cm ² }	20.6 {210}	
		Oil amount		ℓ	42	63

Device		Item		Unit	FG45U-10	FG50AU-10
Engine	Body	Engine model		—	EBT-TB45-2A/3A	
		Idling speed		rpm	700 – 800	
		Max. speed		rpm	2,350 – 2,450	
		Torque converter stall speed		rpm	1,930 ± 50	
		Compression		MPa {kgf/cm ² }/rpm	Min. 1.19 {Min. 12.1}/200	
	Lubricating and cooling systems	Engine oil amount		ℓ	8.4	
		Coolant amount		ℓ	16	
		Fan belt tension (58.8 N {approx. 6 kgf} finger pressure)		mm	15 – 17	
	Fuel system	Injection timing		deg-BTDC	—	
		Injection order		—	—	
		Injection pressure		MPa {kgf/cm ² }	—	
		Fuel tank capacity		ℓ	98	
	Intake and exhaust systems	Valve clearance	Intake	mm	0.35 (Warm)	
			Exhaust	mm	0.35 (Warm)	
	Electric system	Battery electrolyte specific gravity		—	1.28 (20 °C)	
Power train	Torque converter	Inlet oil pressure		MPa {kgf/cm ² }	0.5 – 0.7 {5 – 7}	
		Outlet oil pressure		MPa {kgf/cm ² }	0.46 ± 0.12 {4.5 ± 1.2}	
	TORQFLOW transmission	Main relief pressure		MPa {kgf/cm ² }	1.13 ± 0.12 {11.5 ± 1.2}	
		Clutch operating pressure		MPa {kgf/cm ² }	1.12 – 1.25 {11.4 – 12.7}	
		Lubricating oil pressure		MPa {kgf/cm ² }	0.46 ± 0.12 {4.5 ± 1.2}	
		Oil amount		ℓ	12 (Replacement)/17 (Disassembly)	
	Differential	Oil amount		ℓ	10 (Replacement)/12 (Disassembly)	
Traveling equipment	Tyres	Tire inflation pressure	Front wheel	kPa {kgf/cm ² }	785 {8.0}	
			Rear wheel	kPa {kgf/cm ² }	835 {8.5}	985 {10.0}
	Hub nut	Tightening torque	Front wheel	Nm {kgfm}	294 – 490 {30 – 50}	
			Rear wheel	Nm {kgfm}	294 – 490 {30 – 50}	

Device		Item		Unit	FG45U-10	FG50AU-10
Steering and braking systems	Steering wheel	Play		mm	10 – 30	
	Rear axle	Min. turning radius		mm	2,820	2,850
	Inching pedal	Play		mm	0 – 4	
		Interconnected stroke		mm	53 – 57	
	Brake pedal	Play		mm	0 – 4	
		Pedal height when depressed		mm	82 – 86	
	Brake	Parking brake operating effort		N {kgf}	59 – 64 {6.0 – 6.5}	
		Back plate mounting bolt tightening torque		Nm {kgfm}	59 – 74 {6.0 – 7.5}	
Loading equipment	Fork	Fork thickness (at base)		mm	Min. 50	
		Height difference		mm	Max. 15	
		Tip opening		mm	Max. 35	
	Chain	Length over 17 links	Lifting height: 3 m	mm	Max. 440	
	Cylinder	Hydraulic drift		mm/15 min	Max. 50	
		Hydraulic forward drift		mm/15 min	Max. 45	
	Hydraulic system	Relief pressure		MPa {kgf/cm ² }	20.6 {210}	
		Oil amount		ℓ	63	

FORKLIFT TRUCK

CX50 Series

Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

30 Testing and adjusting

100 Testing and adjusting

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Check of troubleshooting software functions and failure codes (Applicable model: Lift truck with SAA4D95LE-5-A engine, EBT-TB45-1A/2A/3A engine)

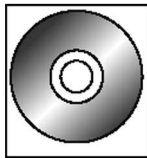
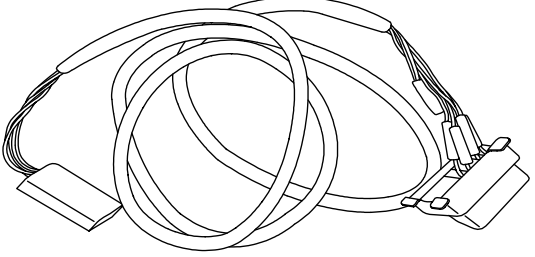
Troubleshooting software functions

The electronic engine controller of this lift truck displays a failure code when a trouble occurs.

The failure code can be checked by the following 2 methods.

- Check of failure code with troubleshooting software
- The troubleshooting software has the following functions
 - 1) Display failure codes
 - 2) Delete failure codes
 - 3) Display repair procedure

★ Prepare the tools necessary for troubleshooting in advance.

Sym bol	Part name (Part No.)	Remarks	
A	Troubleshooting software CD-ROM (3EB-97-50030)	• Common to diesel and gasoline types • Applicable to Windows 2000, Windows XP, Windows Vista	 Troubleshooting software (CD-ROM)  Personal computer (To be prepared by KOMATSU FORKLIFT distributor)
B	Intermediate cable (3EA-55-38880)	Special to diesel type	 9JL01760
C	Communication cable (3BA-97-71220)	CANBUS manufactured by Kvaser (Common to FB-12/FBR-14)	

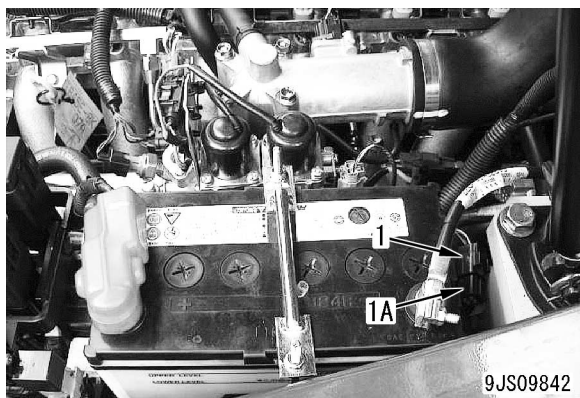
Display method of failure code with troubleshooting software

Install troubleshooting software (A) from the CD-ROM to a personal computer (PC) in advance.

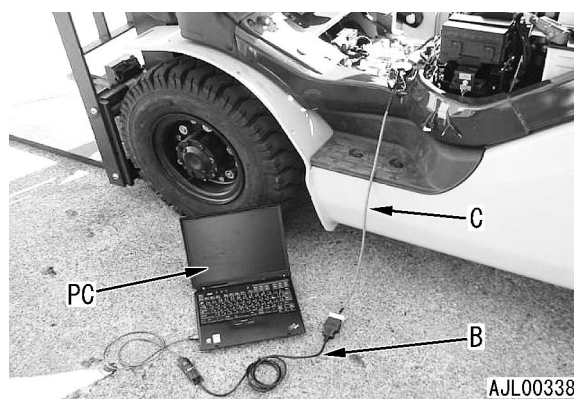
1. Turn the key switch OFF.
2. Open the engine hood.
3. Disconnect cap (1A) (with short-circuit wiring harness) from wiring harness connector (1) on the left side of the lift truck and connect communication cable (C) and intermediate cable (B) of the troubleshooting software.
 - Lift truck with SAA4D95LE-5-A engine



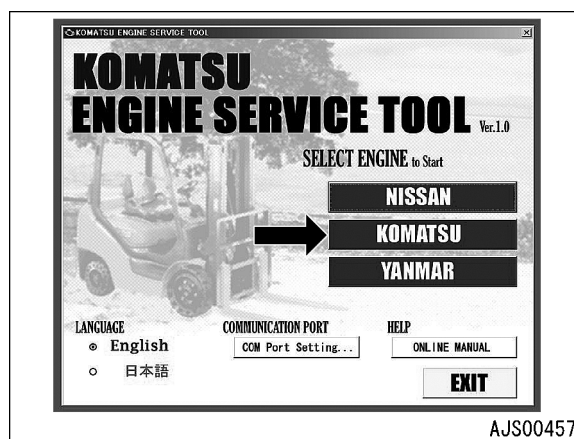
- Lift truck with EBT-TB45-1A/2A/3A engine



<Lift truck in photo is different from actual one>



4. Start the installed software and check the failure codes.
 - ★ The using method of the software is described in the CD-ROM.



Example of displayed failure codes

KOMATSU ENGINE SERVICE TOOL

KOMATSU

DATA MONITOR

READ

CLEAR

HELP

DT Codes: **81**

Red-Letter : Active Error
Black-Letter : Previous Error

☒ SIMULATION

FAULT CODE	TROUBLE (Click to display details on troubleshooting.)	Engine		Lamp	Disconnection Error	Action Derate	
		4D95	6D107			Torque	Rev
1228	EGR Valve Servo Error 1	-	-	Warning(Solid)			
2271	Abnormally high level in EGR valve lift position sensor	-	-	Warning(Solid)		0	
2272	Abnormally low level in EGR valve lift position sensor	-	-	Warning(Solid)		0	
1625	EGR Valve Servo Error 2	-	-	Warning(Solid)		0	
131	Abnormally high level in throttle sensor power supply	0	0	Stop(Solid)			
132	Abnormally low level in throttle sensor power supply	0	0	Stop(Solid)	0		
428	Abnormally high level in water sensor	-	0	Warning(Solid)	0		
429	Abnormally low level in water sensor	-	0	Warning(Solid)			
418	Water in fuel error	-	0	Warning(Blinking)			
415	Derating of torque by engine oil pressure reduction	0	0	Stop(Solid)			0
435	Abnormality in engine oil pressure switch	0	0	Warning(Solid)			
135	Abnormally high level in engine oil pressure sensor	-	-	Warning(Solid)			
141	Abnormally low level in engine oil pressure sensor	-	-	Warning(Solid)			
143	Derating of speed by engine oil pressure reduction	0	0	Warning(Solid)		0	

ECU TERMINAL SAA4D95LE(1)

ECU TERMINAL SAA6D107E(2)

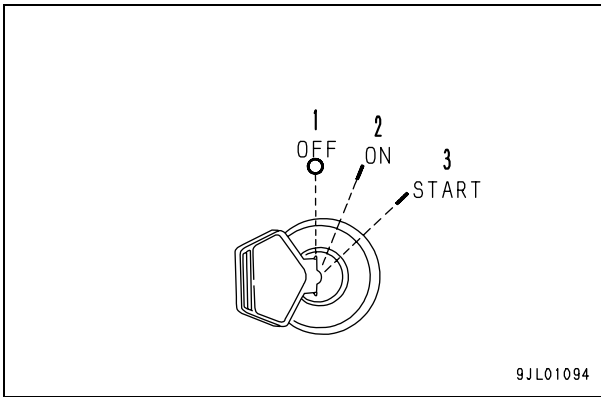
MAIN MENU

AJS00462

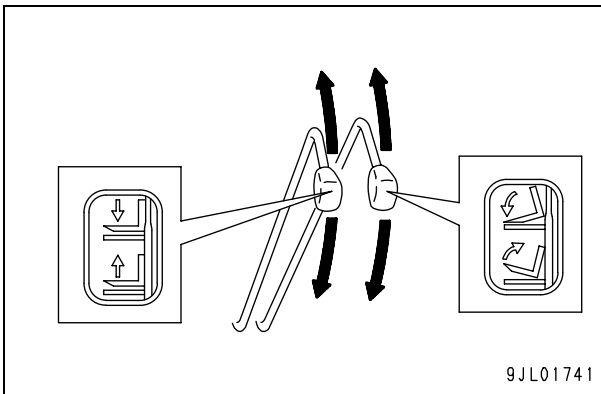
Hydraulic piping pressure release procedure

⚠ When releasing the pressure inside the hydraulic piping, be sure to sit in the operator seat and operate the levers. If you operate the levers without sitting in the operator seat, the shut valve of the hydraulic piping is closed and the pressure is not released.

1. Stop the lift truck and lower the fork to the ground.
2. Stop the engine.
3. Turn the starting switch to ON position (2).



4. While sitting in the operator seat, operate the lift lever and tilt lever in each direction 4 – 5 times to release the pressure inside the hydraulic circuit.

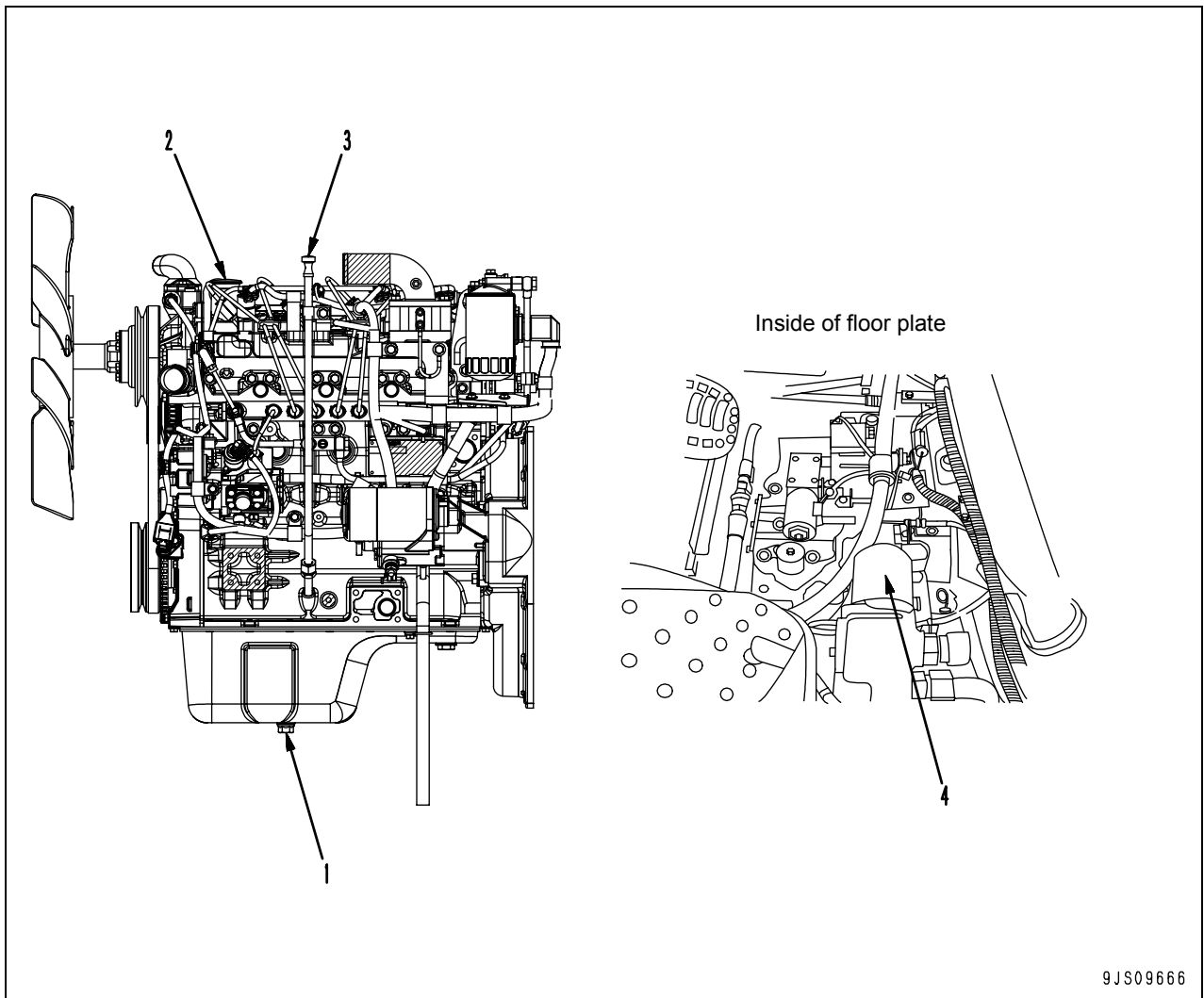


Replacement of engine oil and engine oil filter

⚠ **Service the engine while it is stopped and cooled sufficiently.**

Engine oil

1. Remove drain plug (1) to drain the oil.
2. After draining the oil, tighten drain plug (1).
 - Lift truck with SAA4D95LE-5-A/S4D95LE-3 engine
 - 🔧 Drain plug (1):
44.1 – 58.8 Nm {4.5 – 6.0 kgfm}
 - Lift truck with EBT-TB45-1A/2A/3A engine
 - 🔧 Drain plug (1):
54 – 59 Nm {5.5 – 6.0 kgfm}
3. Add engine oil through oil filler (2) to the specified level.
4. Check the oil level with oil level gauge (3).
 - Lift truck with SAA4D95LE-5-A/S4D95LE-3 engine
Refill capacity: **11 ℓ**
 - Lift truck with EBT-TB45-1A/2A/3A engine
Refill capacity: **8.4 ℓ**



★ The figure shows the lift truck with SAA4D95LE-5-A engine.

Engine oil filter

1. Using a filter wrench, remove cartridge (4).
2. Clean the filter holder, apply engine oil to the seal and threaded portion of new cartridge (4), and install.
 - ★ After installing cartridge (4), start the engine and check the filter mounting face for oil leakage.

Replacement of fuel filter (Applicable model: Lift truck with SAA4D95LE-5-A engine)

The fuel filter of this lift truck has the pre-filter cartridge and main filter cartridge.

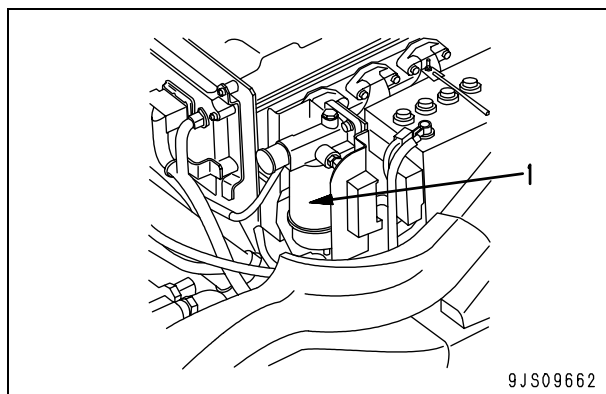
- ⚠ Do not replace the filter just after stopping the engine since each part is hot. Wait until each part cools down.
- ⚠ When replacing the filter, wait until the internal pressure lowers. Wait for at least 30 seconds after stopping the engine, then replace the filter.
- ⚠ Do not bring fire near the lift truck.

- ★ Special filter of high-efficiency filtration property is adopted for the genuine Komatsu Utility fuel filter cartridges. Always use genuine Komatsu Utility parts for replacement.
- ★ The common rail fuel injection system adopted for this lift truck is configured with components of higher accuracy compared with conventional injection pumps and nozzles. Using other fuel filter cartridges than genuine Komatsu Utility parts may cause mixing of foreign matters, leading to a failure of injection system. Never use substitute parts.
- ★ For inspection and maintenance of the fuel system, more care should be given for the mixing of foreign matters than before. Attached dirt, if any, must be fully washed off using engine oil.

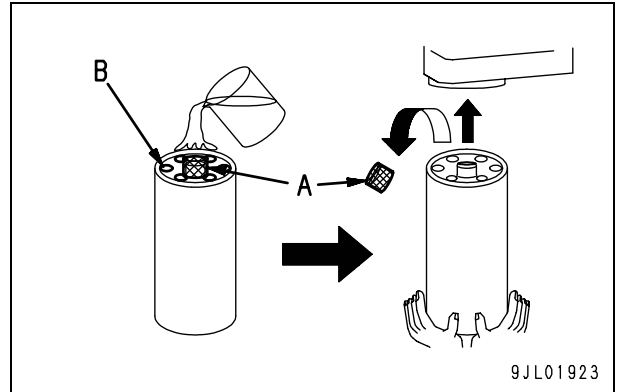
Replacement of fuel pre-filter cartridge

Prepare a filter wrench.

1. Open the engine hood.
2. Using the filter wrench, rotate filter cartridge (1) to remove.



3. Clean the filter holder.
 - ★ When filling the filter cartridge with fuel, keep cap (A) installed.
 - ★ Cap (A) is installed to prevent dirt from entering the filter cartridge.

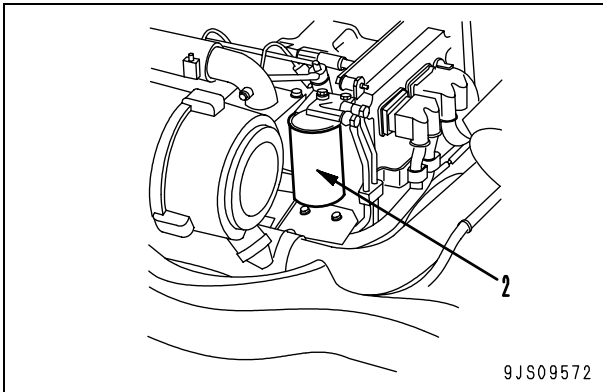


4. Fill the new filter cartridge with clean fuel through 8 small holes (B) of the filter cartridge.
5. Apply oil to the filter cartridge packing surface.
6. Remove filter cartridge cap (A) and install it to the filter holder.
7. When installing, tighten the filter cartridge 3/4 turns after its packing surface contacts the seal surface.
 - ★ If the filter cartridge is tightened too strongly, the packing is damaged and the fuel may leak. If the former is not tightened sufficiently, the fuel leaks through the gap on the packing. Accordingly, be sure to observe the tightening angle.
 - ★ When using the filter wrench, take care extremely that the filter will not be scratched or dented.
8. After the fuel main filter cartridge is replaced (every 1,000 hours), bleed air.
(See Bleeding air from fuel filter)
9. Start the engine, check the filter seal surface for fuel leakage, and run the engine at low idle for about 10 minutes.

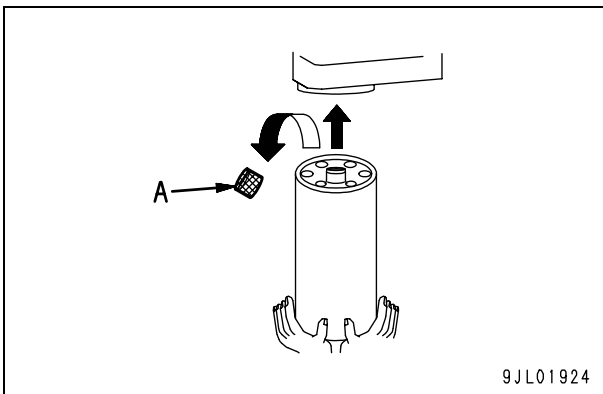
Replacement of fuel main filter cartridge

Prepare a filter wrench.

1. Open the engine hood.
2. Using the filter wrench, rotate main filter cartridge (2) to remove.



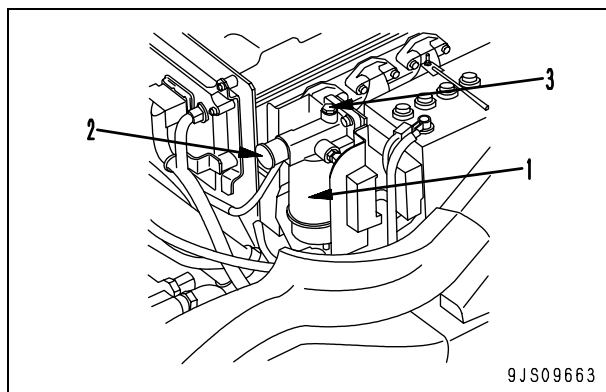
3. Clean the filter holder.
 - ★ Do not add fuel to the filter cartridge.
 - ★ Cap (A) is installed to prevent dirt from entering the filter cartridge.



4. Apply oil to the filter cartridge packing surface.
5. Remove filter cartridge cap (A) and install it to the filter holder.
6. When installing, tighten the filter cartridge 3/4 turns after its packing surface contacts the seal surface.
 - ★ If the filter cartridge is tightened too strongly, the packing is damaged and the fuel may leak. If the former is not tightened sufficiently, the fuel leaks through the gap on the packing. Accordingly, be sure to observe the tightening angle.
 - ★ When using the filter wrench, take care extremely that the filter will not be scratched or dented.
7. After replacing the fuel main filter cartridge, bleed air.
(See Bleeding air from fuel filter)
8. After bleeding air, start the engine and check the filter seal surface for fuel leakage. If oil is leaking, check the filter cartridge tightening condition. If oil still leaks, remove filter cartridge according to steps 1. through 2. If there is damage or foreign matter on the packing surface, replace the cartridge with new one and repeat steps 3. through 7.

Bleeding air from fuel filter

1. Loosen air bleeding plug (3) of the bracket of fuel pre-filter (1).

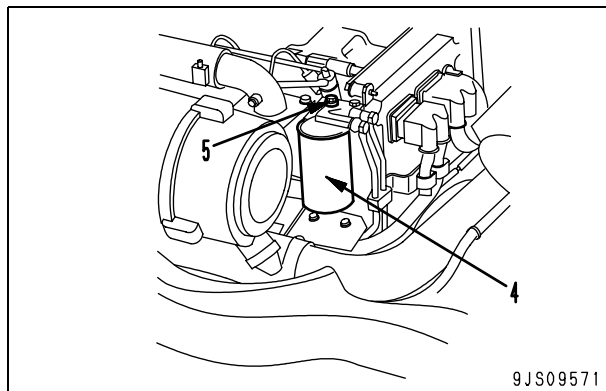


2. Loosen and pull out the knob (2) of the priming pump. Operate it forward and backward.
3. Check that fuel flows out of air bleeding plug (3) and tighten plug (2).

⌘ Air bleeding plug (3):

7.8 – 9.8 Nm {0.8 – 1.0 kgfm}

4. Loosen air bleeding plug (5) of fuel main filter (4).



5. Loosen and pull out the knob (2) of the priming pump. Operate it forward and backward.
6. Check that fuel flows out of air bleeding plug (5) and tighten plug (5).

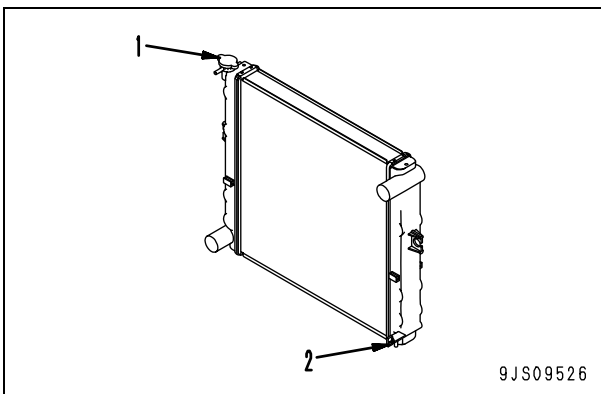
⌘ Air bleeding plug (5):

7.8 – 9.8 Nm {0.8 – 1.0 kgfm}

Cleaning of radiator

- ⚠ If the coolant is drained immediately after the engine is stopped, it is still hot and can scald you. Wait until the engine cools down.
- ⚠ It is very dangerous to enter under the lift truck for cleaning while the engine is running since the lift truck may move suddenly. Never enter under the lift truck while the engine is running.
- ⚠ Do not remove the radiator cap when the coolant in the radiator is hot. The hot coolant may spout out. When removing the cap after the coolant cools down, rotate it slowly to release the internal pressure and then remove it.
- ⚠ If air is not bled thoroughly after the coolant or radiator is replaced, the engine may overheat. Accordingly, bleed air from the cooling system securely.

1. Open radiator cap (1).
 - ★ The radiator cap of the lift truck with EBT-TB45-1A/2A/3A is on the opposite side to the figure (on the left side of the lift truck body).
2. Open drain valve (2) at the radiator bottom to drain the coolant.
 - ★ The drain valve of the lift truck with EBT-TB45-1A/2A/3A is on the opposite side to the figure (on the right side of the lift truck body).



3. Close drain valve (2) at the radiator bottom, pour radiator detergent liquid and clean water (city water) through the coolant filler of the radiator, and run the engine at idling speed for about 15 minutes.
4. Stop the engine and open drain valve (2) at the radiator bottom to drain the radiator detergent liquid and clean water (city water).
5. While pouring clean water (city water) through the coolant filler of the radiator, run the engine at idling speed until clean water flows out of drain valve (2) at the radiator bottom. (5 – 10 minutes)
6. Stop the engine and drain the clean water (city water).
7. Close drain valve (2) at the radiator bottom and fill the radiator with Supercoolant and clean water (city water) through the coolant filler of the radiator.
 - Coolant amount of lift truck with SAA4D95LE-5-A/S4D95LE-3 engine: **9 ℓ**
 - Coolant amount of lift truck with EBT-TB45-1A/2A/3A engine: **16 ℓ**
8. Close radiator cap (1).
 - ★ Set the Supercoolant concentration according to the minimum temperature of the using environment.

Relationship between minimum temperature and coolant concentration

Minimum temperature (°C)	Min. -10	-15	-20	-25	-30	-35	-40
Coolant concentration (%)	30	36	41	46	50	54	58

- ★ When not using the Supercoolant, add rust-preventive solution to the radiator to protect the engine from being corroded.
- ★ Clean the radiator on a level place.
- ★ Use Komatsu Utility genuine detergent liquid, rust-prevent solution and Supercoolant (AF-NAC).

Check of air cleaner and replacement of cleaner element

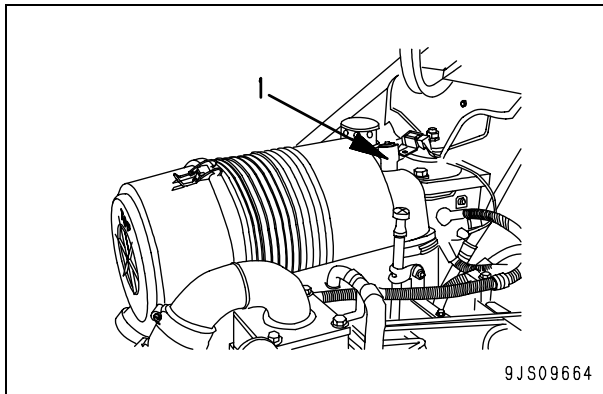
⚠ Do not clean or replace the air cleaner while the engine is running.

⚠ When using compressed air to clean the cleaner element, be sure to wear safety glasses to protect your eyes from flying dirt.

- ★ If the cleaner element is stained with oil, grease or carbon, clean it with the special element cleaner according to the instruction manual of the cleaner.
- ★ When the working environment or condition is bad, clean or replace the air cleaner element a little earlier than the specified period.

Check of air cleaner

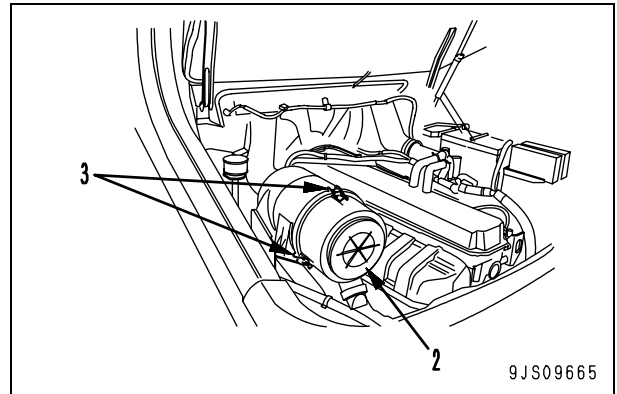
1. Check the display of dust indicator (1).



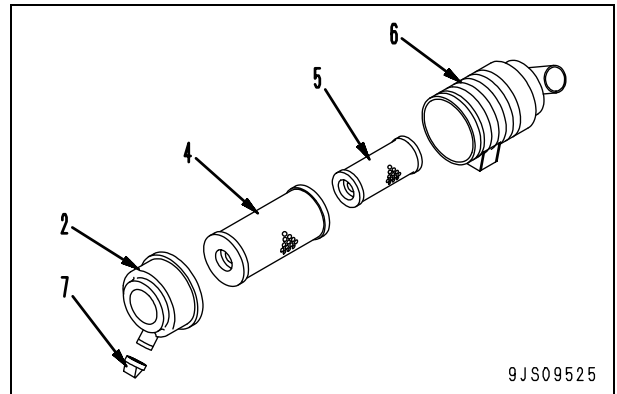
2. If the red piston is projected into the transparent portion of dust indicator (1), clean or replace the air cleaner element.
 - Condition for red display of dust indicator
SAA4D95LE-5-A/S4D95LE-3 engine:
 $7.47 \pm 0.57 \text{ kPa} \{762 \pm 58 \text{ mmH}_2\text{O}\}$
EBT-TB45-1A/2A/3A engine:
 $6.23 \pm 0.57 \text{ kPa} \{635 \pm 58 \text{ mmH}_2\text{O}\}$

Replacement of cleaner element

1. Remove 3 latches (3) of cover (2) and remove cover (2).



2. Remove outer element (4) first and remove inner element (5).



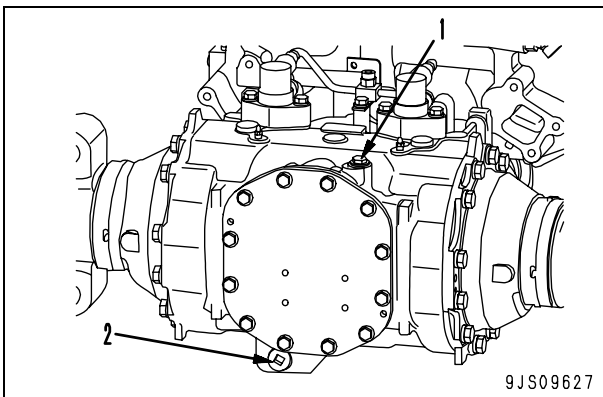
3. Block the air connector inside body (6) with a clean cloth or a tape to prevent dirt from entering.
4. Clean the inside of body (6).
5. Remove the cloth or tape which has been blocking the air connector.
6. Clean the inside of cover (2). If dirt discharged from evacuator valve (7) is accumulated inside the engine hood, remove it.
7. If the lip of evacuator valve (7) is cracked, replace it.
8. Fit new inner element (5) and outer element (4) to body (6) and install cover (2).

Oil level check and oil replacement of differential case

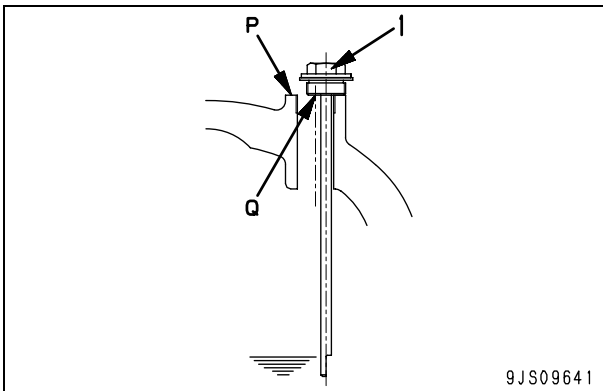
- ⚠ The oil is hot just after the lift truck is stopped. Start the following work after the oil has cooled down.
- ⚠ Stop the lift truck on a level place and lock the tyres with chocks. If the lift truck starts moving during the work, it can cause a serious accident.

Oil level check

1. Stop the engine.
2. Pull out oil level gauge (1).



3. Wipe the gauge portion of oil level gauge (1) with cloth and insert it in the oil filler again.
4. Pull out oil level gauge (1) and check the oil level.
 - ★ When inserting oil level gauge (1) to check the oil level, keep pressing face (Q) of the gauge portion against face (P).



5. If the oil level is low, add gear oil through the oil filler.
6. After adding oil, check the oil level.

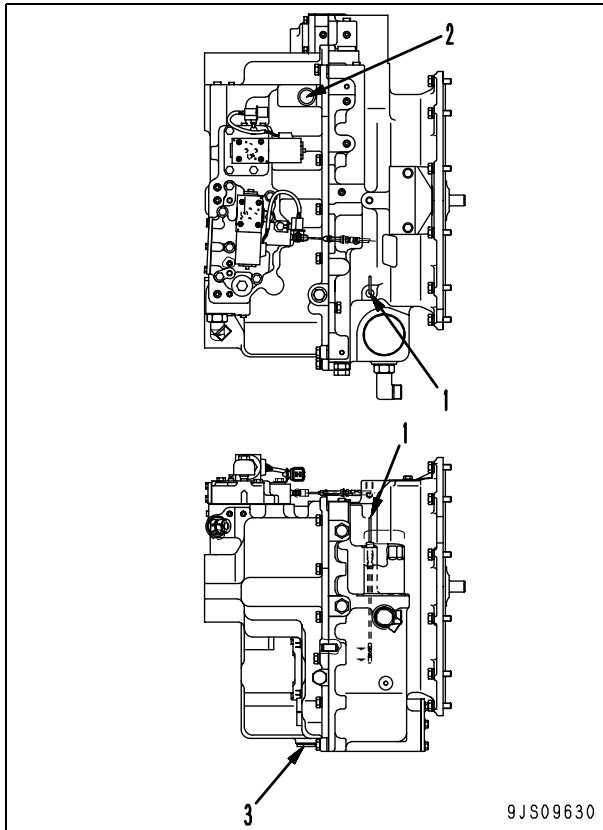
Oil replacement

1. Prepare a container to receive the waste oil under drain plug (2).
2. Remove drain plug (2) to drain the oil into the container.
3. Tighten drain plug (2).
 - 🔧 Drain plug (2):
118 – 162 Nm {12 – 16.5 kgfm}
4. Add oil through oil filler (3) to the specified level.
 - ★ Refill capacity: **10 ℓ**
5. After adding oil, check the oil level.

Oil replacement and strainer cleaning of TORQFLOW transmission

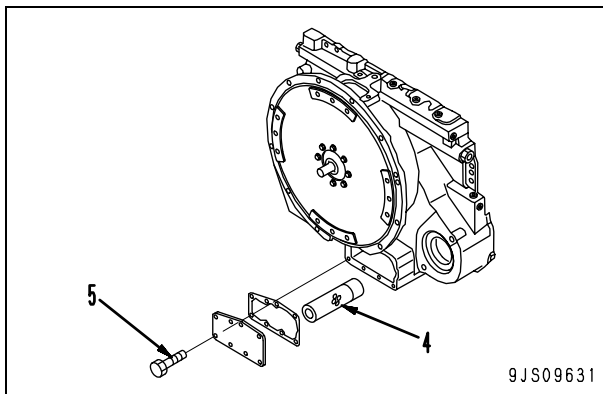
⚠ The oil is hot just after the lift truck is stopped. Start the following work after the oil has cooled down.

1. Prepare a container to receive the waste oil under TORQFLOW transmission drain plug (3).



2. Remove drain plug (3) to drain the oil into the container.

3. Tighten drain plug (3).
 Drain plug (3): **59 – 78 Nm {6 – 8 kgfm}**



4. Remove mounting bolts (5) of strainer (4) and remove strainer (4).
5. Clean strainer (4) in cleaning oil.
6. Blow compressed air from inside of cleaned strainer (4) to remove the cleaning oil and dry the strainer well.
7. Install strainer (4).
8. Add oil through the oil filler to the specified level.
 - Refill capacity: **12 ℓ**
9. After adding oil, check the oil level with oil level gauge (1).
10. If the oil level is low, add oil through oil filler (2).

Testing power train oil pressure

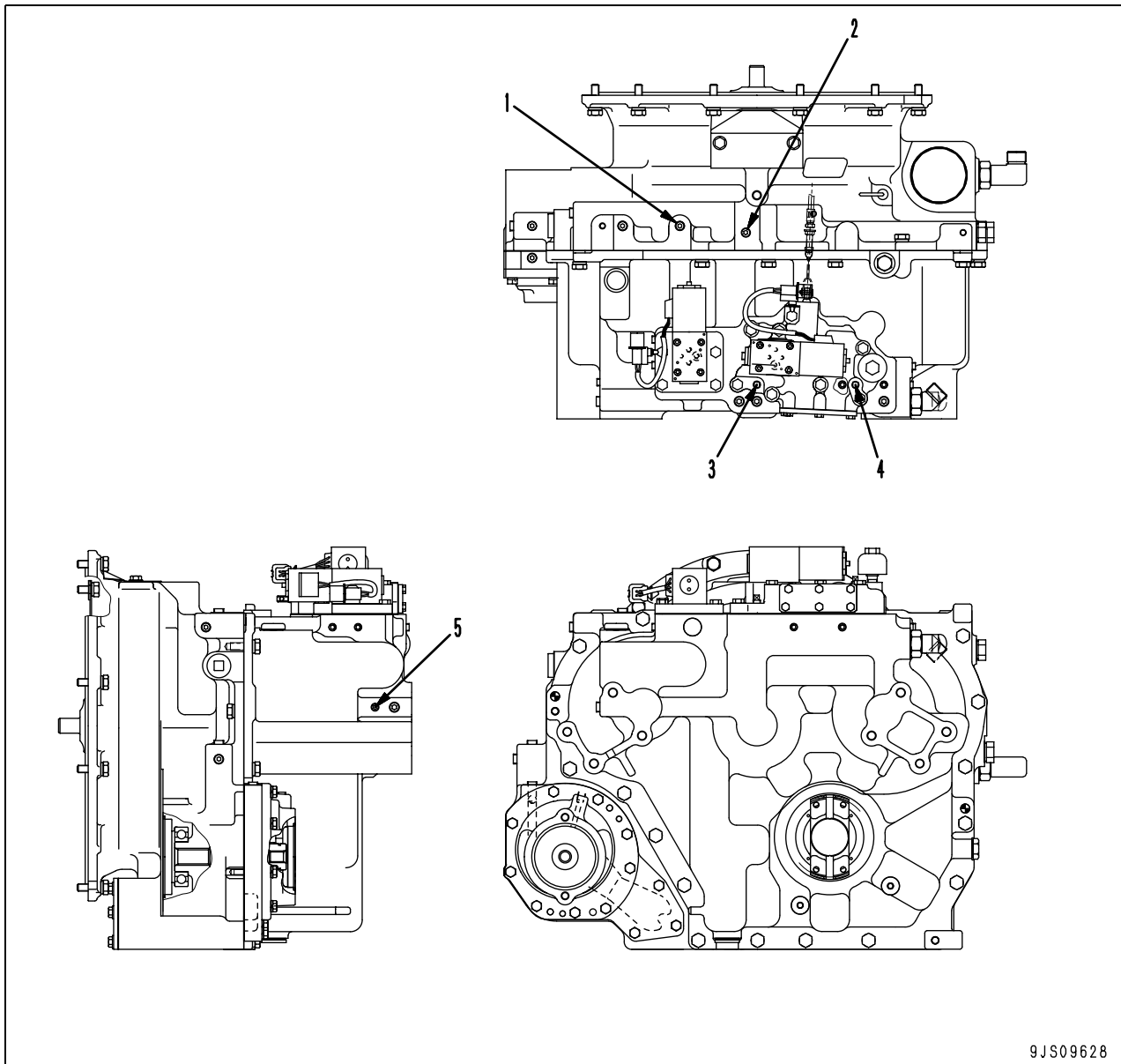
▲ Stop the lift truck on a level place and lock the tyres with chocks.

★ Measure the power train oil pressure under the following condition.

- Coolant temperature: Within operating range
- Transmission oil temperature:
Within operating range

1. Transmission main relief pressure pickup port
2. Torque converter relief pressure pickup port
3. Transmission F clutch pressure pickup port
4. Transmission R clutch pressure pickup port
5. Transmission F2 clutch pressure pickup port
(For 4.5 – 5.0 ton)

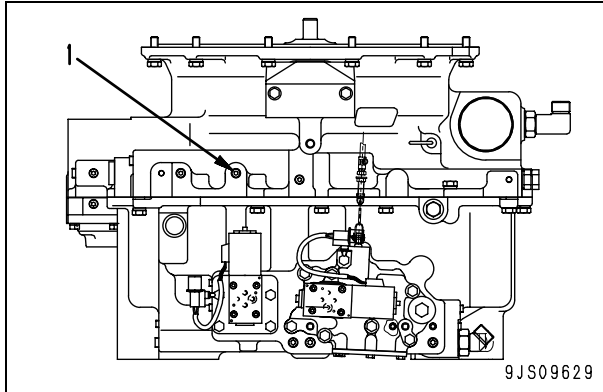
No.	Oil pressure to be measured	Measurement gauge MPa {kgf/cm ² }
1	Main relief pressure	2.5 MPa {25 kgf/cm ² }
2	Torque converter relief pressure	2.5 MPa {25 kgf/cm ² }
3	Transmission F clutch pressure	2.5 MPa {25 kgf/cm ² }
4	Transmission R clutch pressure	2.5 MPa {25 kgf/cm ² }
5	Transmission F2 clutch pressure	2.5 MPa {25 kgf/cm ² }
6	Lubricating oil pressure	2.5 MPa {25 kgf/cm ² }



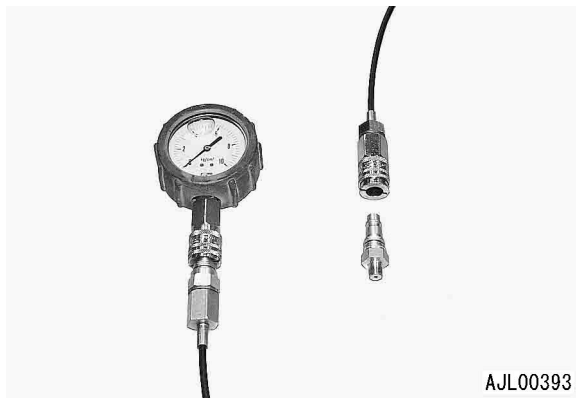
9JS09628

Measurement of transmission main relief pressure

1. Remove transmission main relief pressure pickup port plug (1) (R1/8).



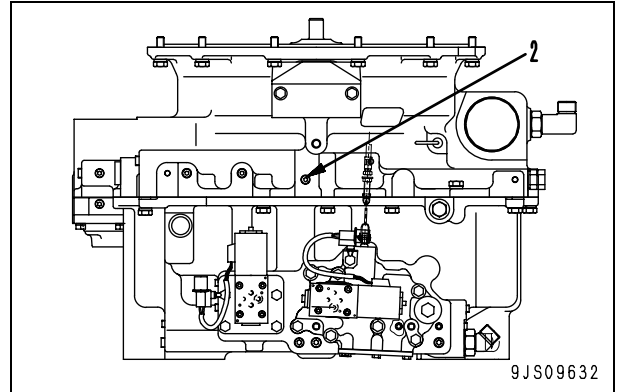
2. Install the hydraulic tester to the transmission main relief pressure pickup port.
★ Use the oil pressure gauge of 2.5 MPa {25 kgf/cm²}.



3. Start the engine and set the forward/reverse lever in "N (Neutral)" position.
4. Measure the main relief pressure while running the engine at low idle and high idle.
5. After finishing measurement, remove the measuring tools and install plug (1) to the main relief pressure pickup port.

Measurement of torque converter relief pressure (inlet pressure)

1. Remove torque converter relief pressure (inlet pressure) pickup port plug (2) (R1/8).



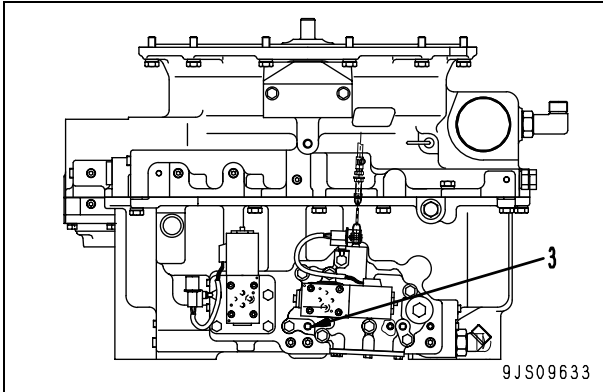
2. Install the hydraulic tester to the torque converter relief pressure (inlet pressure) pickup port.
★ Use the oil pressure gauge of 2.5 MPa {25 kgf/cm²}.



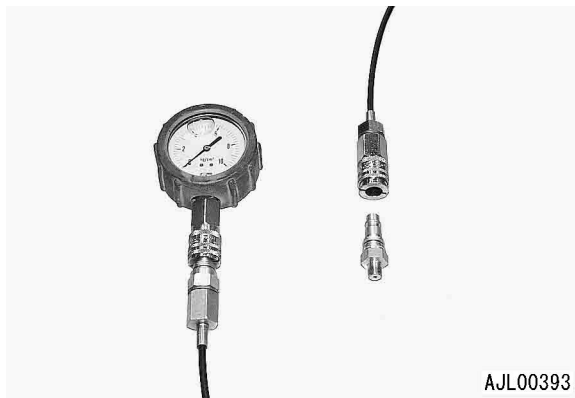
3. Start the engine and set the forward/reverse lever in "N (Neutral)" position.
4. Measure the torque converter relief pressure (inlet pressure) while running the engine at high idle.
5. After finishing measurement, remove the measuring tools and install plug (2) to the torque converter relief pressure (inlet pressure) pickup port.

Measurement of transmission F (forward) clutch pressure

1. Remove transmission F (forward) clutch pressure pickup port plug (3) (R1/8).



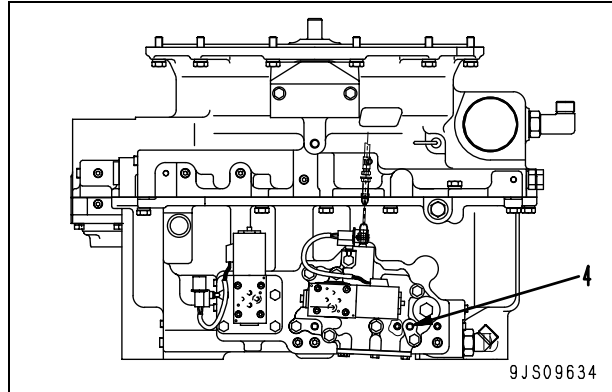
2. Install the hydraulic tester to the transmission F (forward) clutch pressure pickup port.
★ Use the oil pressure gauge of 2.5 MPa {25 kgf/cm²}.



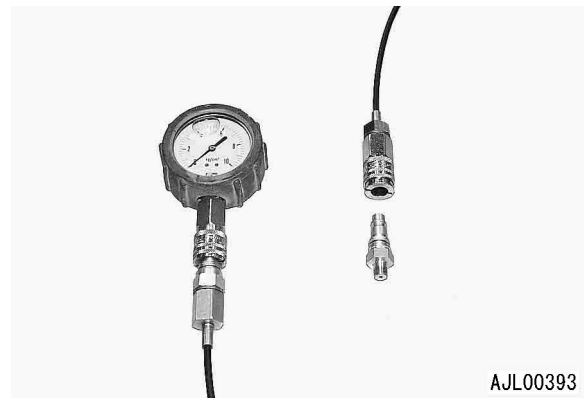
3. Start the engine and apply the parking brake.
4. Depress the service brake.
5. While running the engine at low idle and depressing the brake, set the forward/reverse lever in F (forward) and measure the transmission F (forward) clutch pressure.
⚠ Keep depressing the brake pedal securely. Since the lift truck may start moving suddenly, work in a wide place and keep other persons away from the lift truck.
6. After finishing measurement, remove the measuring tools and install plug (3) (R1/8) to the transmission F (forward) clutch pressure pickup port.

Measurement of transmission R (reverse) clutch pressure

1. Remove transmission R (reverse) clutch pressure pickup port plug (4) (R1/8).



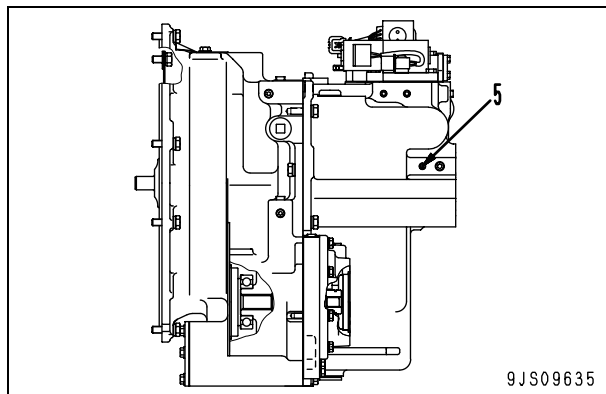
2. Install the hydraulic tester to the transmission R (reverse) clutch pressure pickup port.
★ Use the oil pressure gauge of 2.5 MPa {25 kgf/cm²}.



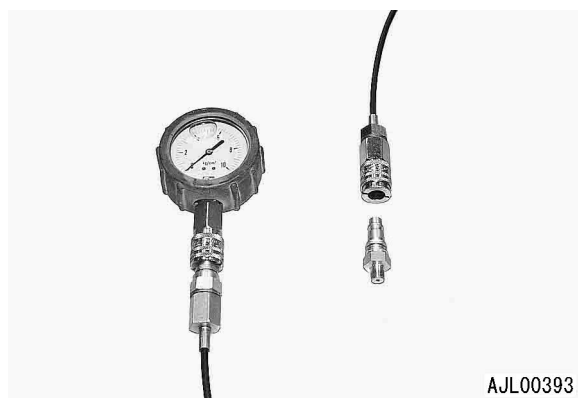
3. Start the engine and apply the parking brake.
4. Depress the service brake.
5. While running the engine at low idle and depressing the brake, set the forward/reverse lever in R (reverse) and measure the transmission R (reverse) clutch pressure.
⚠ Keep depressing the brake pedal securely. Since the lift truck may start moving suddenly, work in a wide place and keep other persons away from the lift truck.
6. After finishing measurement, remove the measuring tools and install plug (4) (R1/8) to the transmission R (reverse) clutch pressure pickup port.

Measurement of transmission F2 clutch pressure (For 4.5 – 5.0 ton)

1. Remove transmission F2 clutch pressure pickup port plug (5) (R1/8).



2. Install the hydraulic tester to the transmission F2 clutch pressure pickup port.
 - ★ Use the oil pressure gauge of 2.5 MPa {25 kgf/cm²}.



3. Start the engine and apply the parking brake.
4. Depress the service brake.
5. While running the engine at low idle and depressing the brake, set the forward/reverse lever in F2 and measure the transmission F2 clutch pressure.
 - ⚠ Keep depressing the brake pedal securely. Since the lift truck may start moving suddenly, work in a wide place and keep other persons away from the lift truck.**
6. After finishing measurement, remove the measuring tools and install plug (5) (R1/8) to the transmission F2 clutch pressure pickup port.

Check of hydraulic tank

Replacement of oil in hydraulic tank

Replacement of line filter

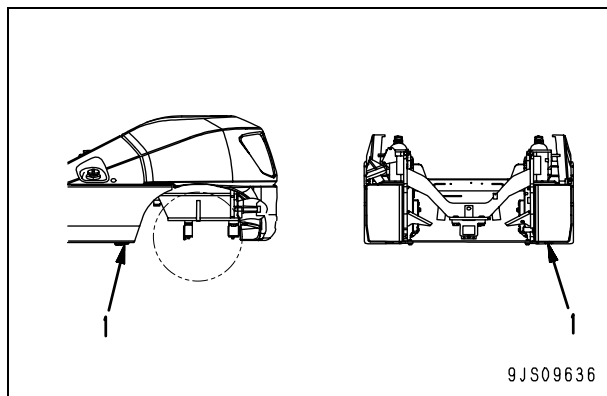
Cleaning of hydraulic tank strainer

Cleaning of inside of hydraulic tank

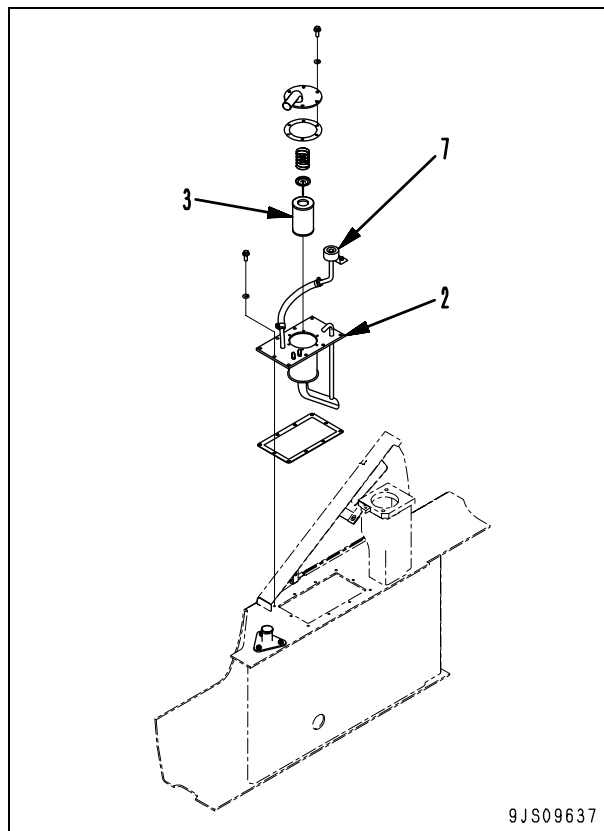
Cleaning of hydraulic tank breather

⚠ The oil is hot just after the lift truck is stopped. Start the following work after the oil has cooled down.

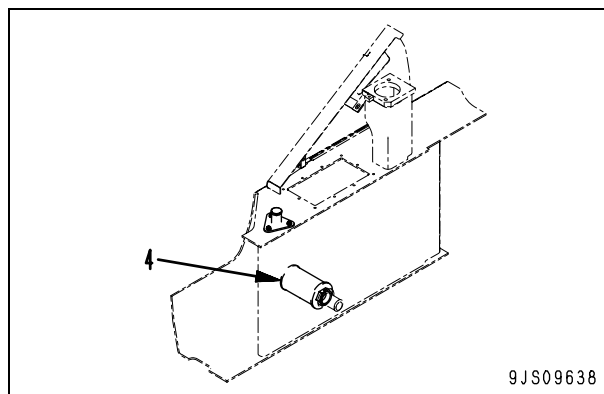
1. Stop the engine.
2. Prepare a container to receive the waste oil under the hydraulic tank drain plug (1).
3. Remove drain plug (1) to drain the oil into the container.



4. Disconnect each hose, remove cover (2) and line filter (3).

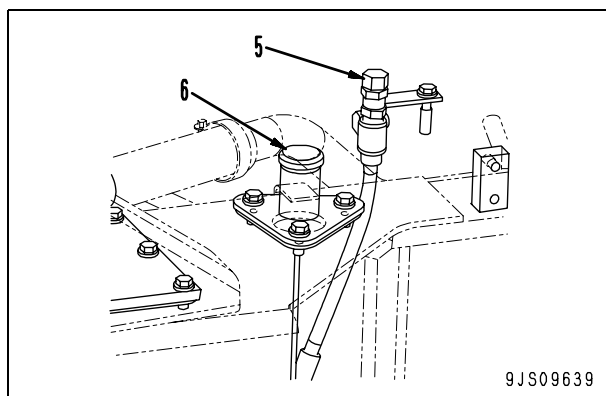


5. Remove strainer (4).



6. Clean strainer (4) in cleaning oil.
7. Blow compressed air from inside of cleaned strainer (4) to remove the cleaning oil and dry the strainer well.

8. Clean the inside of the hydraulic tank.
9. Install drain plug (1).
🔧 Drain plug (1): **59 – 78 Nm {6 – 8 kgfm}**
10. Install strainer (4).
11. Replace line filter (3) with new one and install cover (2).
12. Remove air bleeding plug (5) of the work equipment pump.

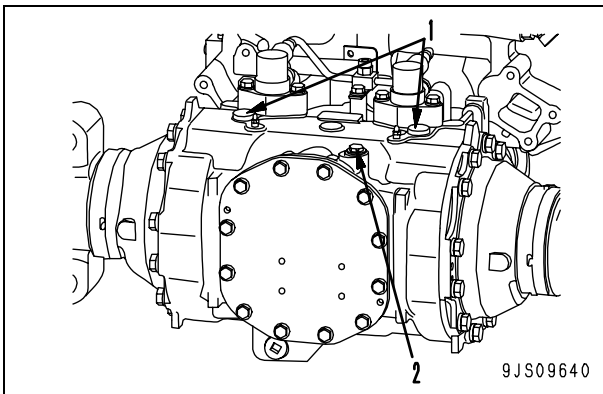


13. Remove oil level gauge cap (6) of the hydraulic oil filler.
14. Add oil through the hydraulic oil filler.
 - Refill capacity (Tank capacity): **42 ℓ**
(For compact model)
 - Refill capacity (Tank capacity): **63 ℓ**
(For standard model)
15. Check the oil level with oil level gauge (6).
16. Install air bleeding plug (5).
17. Check the vent hole of breather (7). If the breather is dirty extremely, replace it.
18. Start the engine and operate the hydraulic cylinders (lift and tilt) to the stroke ends 5 – 6 times to bleed air.
 - ★ Always use Komatsu Utility genuine hydraulic oil.

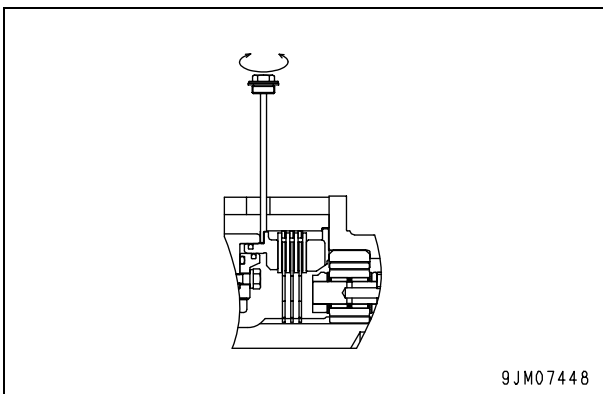
Measurement of wear amount of service brake disc

- ⚠ **Stop the lift truck on a level place and lock the tyres with chocks. If the lift truck starts moving during the work, it can cause a serious accident.**
- ⚠ **Work by 2 workers. One worker shall depress the brake pedal and the other shall measure the wear amount of the disc.**

1. Stop the engine.
2. Remove the caps of right and left brake disc wear check ports (1).



3. Remove brake disc wear check gauges (2).
 - ★ Brake disc wear check gauges (2) are used as the oil level gauges, too.
4. Keep depressing the brake pedal to the stroke end.
5. Insert brake disc wear check gauge (2) in brake disc wear check port (1) and rotate it.
 - ★ If brake disc wear check gauge (2) rotates full 1 turn, the disc has been worn to the limit. Replace the disc with new one in this case.



6. After checking, return the caps of brake disc wear check ports and brake disc wear check gauges (2).

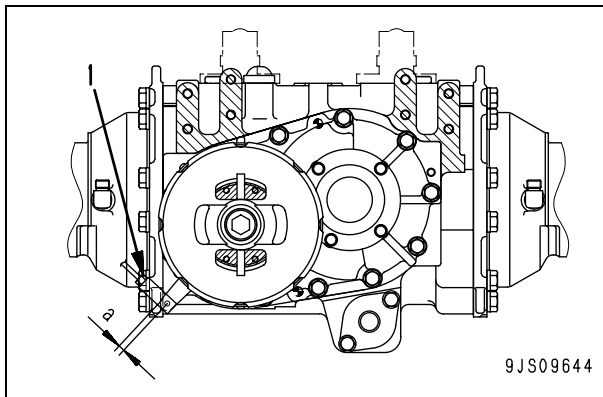
🔧 Brake disc wear check gauge (2):
24.5 – 34.3 Nm {2.5 – 3.5 kgfm}

Check of parking brake

Check of shoe clearance

⚠ Stop the lift truck on a level place and lock the tyres with chocks. If the lift truck starts moving during the work, it can cause a serious accident.

1. Stop the engine.
2. Release the parking brake.
3. Pull the parking brake lever with a force of 30 – 50 N {3 – 5 kgf}.
4. Measure cable mounting position stroke (a) when the parking brake lever is pulled.
 - If stroke (a) is 2.5 mm or more, it is normal.

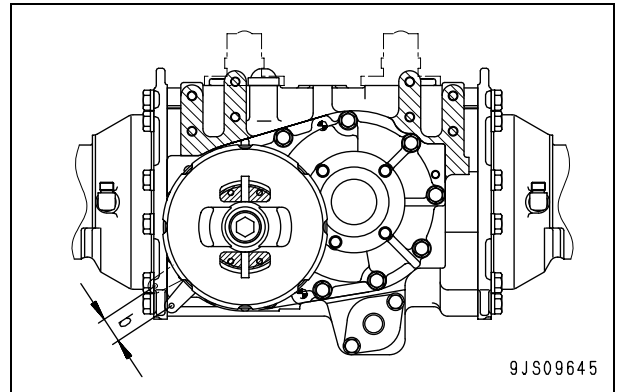


5. When stroke (a) is less than 2.5 mm, increase it to above 2.5 mm with parking brake cable adjustment screw (1).

Check of wear amount of brake lining and brake drum

⚠ Stop the lift truck on a level place and lock the tyres with chocks. If the lift truck starts moving during the work, it can cause a serious accident.

1. Stop the engine.
2. Release the parking brake.
3. Remove the parking brake cable.
4. Pull the parking brake cable mounting position with a force of 30 – 50 N {3 – 5 kgf}.
5. Measure parking brake cable mounting position stroke (b) when it is pulled.
 - If stroke (a) is 36 mm or more, it is normal.



6. If stroke (b) is more than 36 mm, replace the parking brake shoe or brake drum.
7. After checking or replacing, check the operating effort of the parking brake lever.
 - Parking brake operating effort:
59 – 64 N {6.0 – 6.5 kgf}

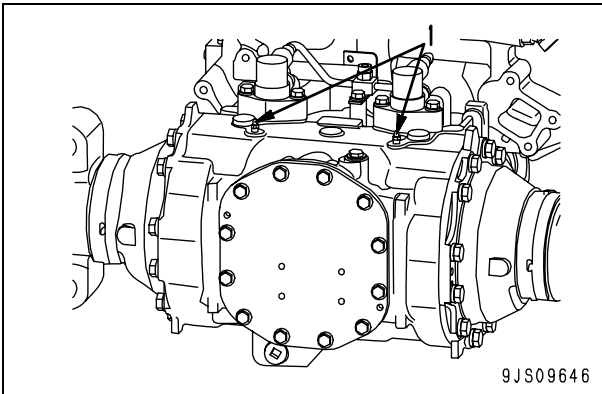
Air bleeding procedure

Brake piping

- ⚠ **Stop the lift truck on a level place and lock the tyres with chocks. If the lift truck starts moving during the work, it can cause a serious accident.**
- ⚠ **Work by 2 workers. One worker shall depress the brake pedal and the other shall bleed air through the air bleeding plug.**

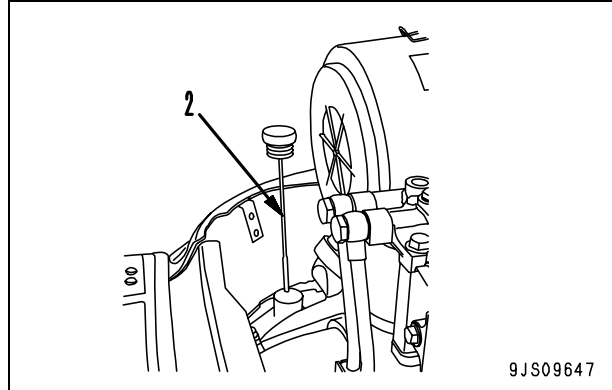
★ Bleed air from the right and left separately.

1. Remove the bleeder cap on the front axle top.
2. Connect one end of a vinyl hose to brake air bleeding plug (1) and put the other end in a container.



3. Depress the brake pedal.
4. Loosen air bleeding plug (1) slowly. When no bubble comes out of the hose, depress the brake pedal fully and tighten air bleeding plug (1) while oil is flowing out.
5. Bleed air from the other brake similarly.

6. After bleeding air, tighten the air bleeding plug and install the cap.
7. Check the hydraulic tank oil level with oil level gauge (2) and add hydraulic oil by the lost amount.



Lift cylinder

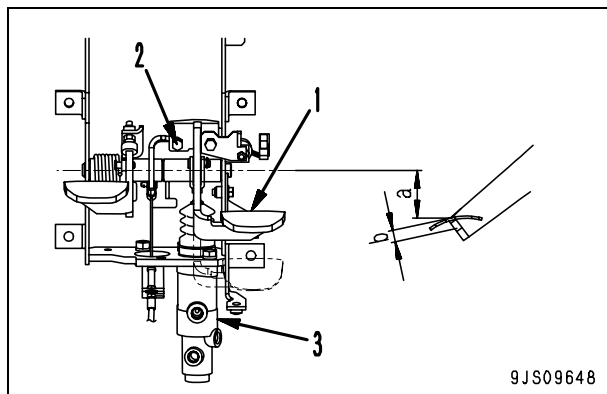
⚠ Stop the lift truck on a level place and lock the tyres with chocks. If the lift truck starts moving during the work, it can cause a serious accident.

1. Start the engine and run it at low idle.
2. Raise and lower the mast to 100 mm before the maximum and minimum lifting heights.
3. Repeat the operation of **step 2.** by 4 – 5 times.
4. Raise and lower the mast to the maximum and minimum lifting heights.
5. Repeat the operation of **step 4.** by 4 – 5 times.

Adjustment of brake pedal

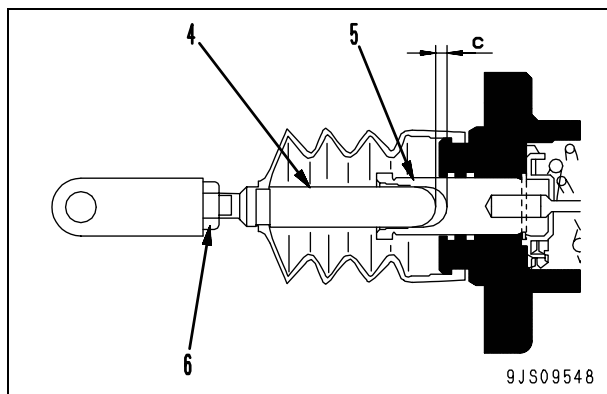
1. Adjust height (a) of brake pedal (1) with stopper bolt (2).

- Height (a): 62 ± 2 mm
- ★ Remove the brake pedal cover before measuring the height.



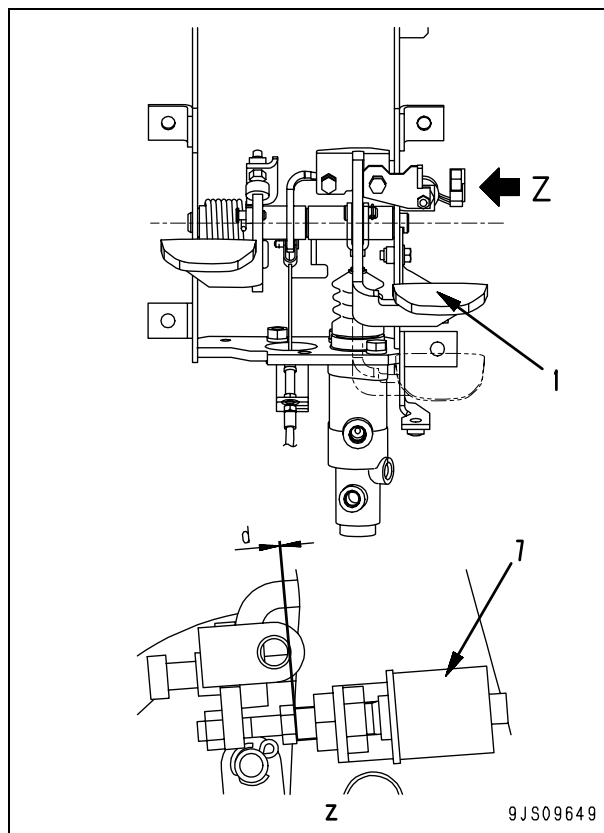
2. Adjust clearance (c) between rod (4) and piston (5) of brake valve (3) with nut (6) so that brake pedal play (b) will be 2.5 ± 2 mm.

- Play (b): 2.5 ± 2 mm
- Clearance (c): $0 - 4$ mm
- ★ Loose nut (6) and rotate rod (4) to adjust.



3. After adjusting brake pedal (1), adjust clearance (d) in the threaded portion of stop lamp switch (7).

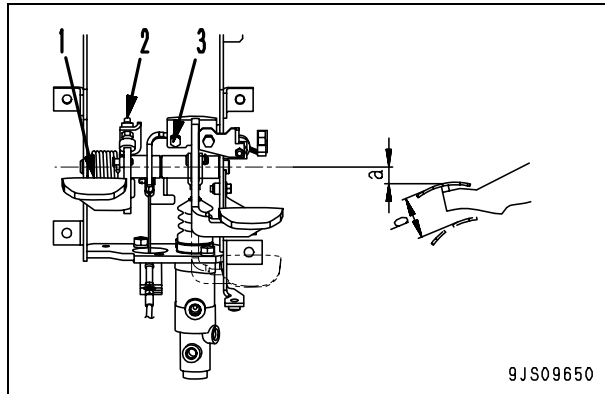
- Clearance (d): $0 - 0.4$ mm



4. After adjusting the brake pedal, install the cover.

Adjustment of inching pedal

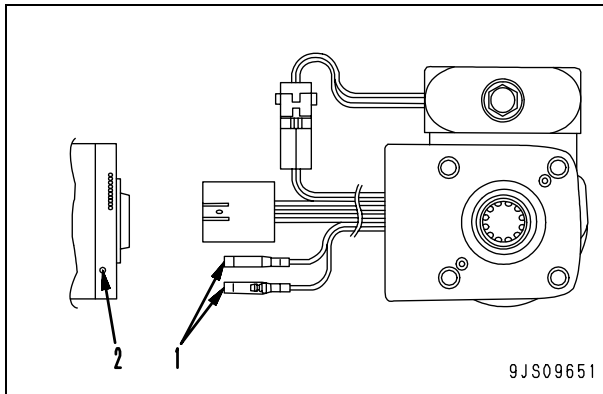
1. Adjust height (a) of inching pedal (1) with stopper bolt (2).
 - Height (a): **23 ± 2 mm**
 - ★ Remove the inching pedal cover before measuring the height.



2. Adjust brake pedal interlocked stroke (b) with bolt (3).
 - Interlocked stroke (b): **55 mm**
3. After adjusting the inching pedal, install the cover.

Initialization of orbit-roll valve (Related to only lift truck with EPACS)

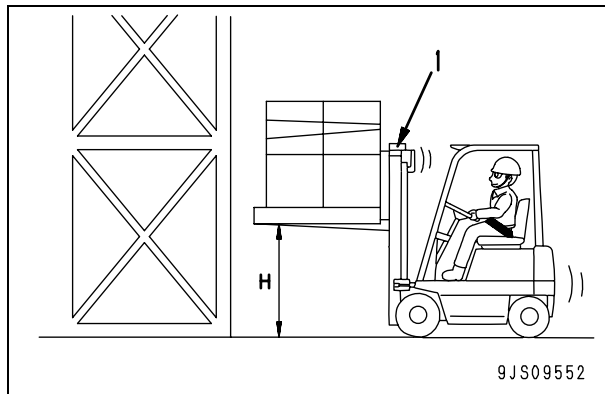
- ★ Initialization means the work of saving the standard condition (center position, right and left end positions) in the EPACS controller.
1. With the starting switch of the lift truck in the OFF position, connect initialization plug terminal (1).



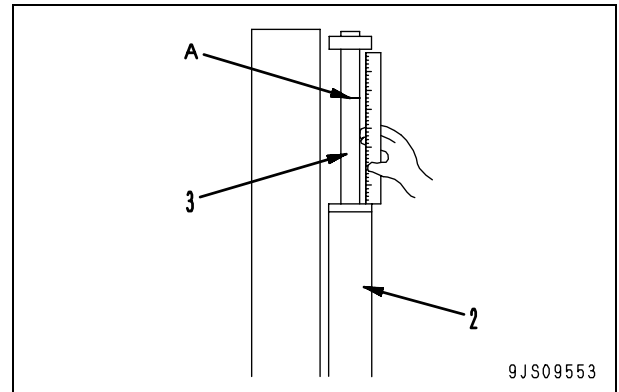
2. Turn the starting switch to the ON (ACC) position and check that condition indicator LED (2) flashes.
3. Check that condition indicator LED (2) flashes 1 time.
 - ★ If condition indicator LED (2) is kept OFF for a long period or flashes 3 times or 4 times, the steering wheel angle sensor is abnormal. In this case, check the steering wheel angle sensor for disconnection and short circuit and repair it.
4. Start the engine and turn the steering wheel to set the tyres in the straight travel direction.
5. With the starting switch kept in the ON (ACC) position, disconnect initialization plug terminal (1).
6. Check that condition indicator LED (2) flashes 2 times.
7. Turn the steering wheel from the center to the right stroke end, then turn it to the left stroke end, and return it to the center.
 - ★ Take care that the steering wheel will not slip at each stroke end.
8. Check that condition indicator LED (2) lights.
 - ★ If condition indicator LED (2) does not light but flashes 2 times, repeat the work from **step 1**.

Measurement of cylinder hydraulic drift and hydraulic forward drift

- ⚠ Keep persons off under the load during measurement. If the lift falls, it can cause serious injury.
 - ⚠ Use a stand having sufficient height, strength and stability for measurement. Do not put your hand or foot on the mast stay or dashboard. If you measure under such condition, your hand or foot may be caught and you may fall.
 - ⚠ Measure on a level and flat place. If the ground is not flat, the lift truck may tip over.
 - ⚠ Measure in front of a stand which can hold the lift truck even if the latter tilts forward.
 - ★ Before measuring, check that the hydraulic oil is clean and free from mixing of a different oil and its level is proper.
1. Repeat lifting and tilting operations until the hydraulic oil temperature is about 50 °C.
 2. Put a rated load on the fork and fix it to the fork carriage with wires.
 3. Stop the lift truck at 500 mm before the stand.
 4. Raise the load to height (H) of 1,500 mm and set mast (1) vertically.



5. After 3 minutes, make mark (A) on piston rod (3) of lift cylinder (2) and measure its position with a scale.

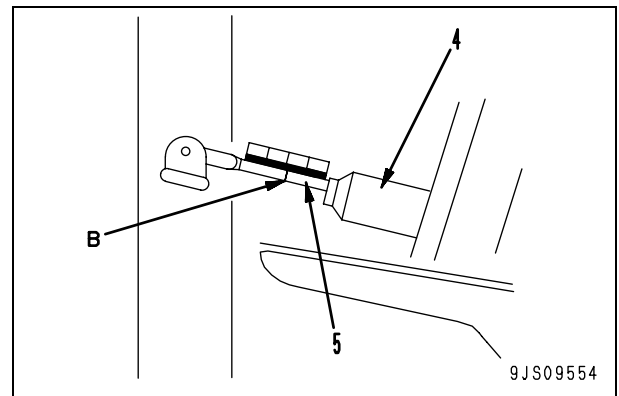


6. Leave for 15 minutes, then measure the position of mark (A) on piston rod (3) and obtain the hydraulic drift in the past 15 minutes.

- Hydraulic forward drift in 15 minutes:
Max. 50 mm

7. Raise the load to height (H) of 1,500 mm and set mast (1) vertically.

8. After 3 minutes, make mark (B) on piston rod (5) of tilt cylinder (4) and measure its position with a scale.

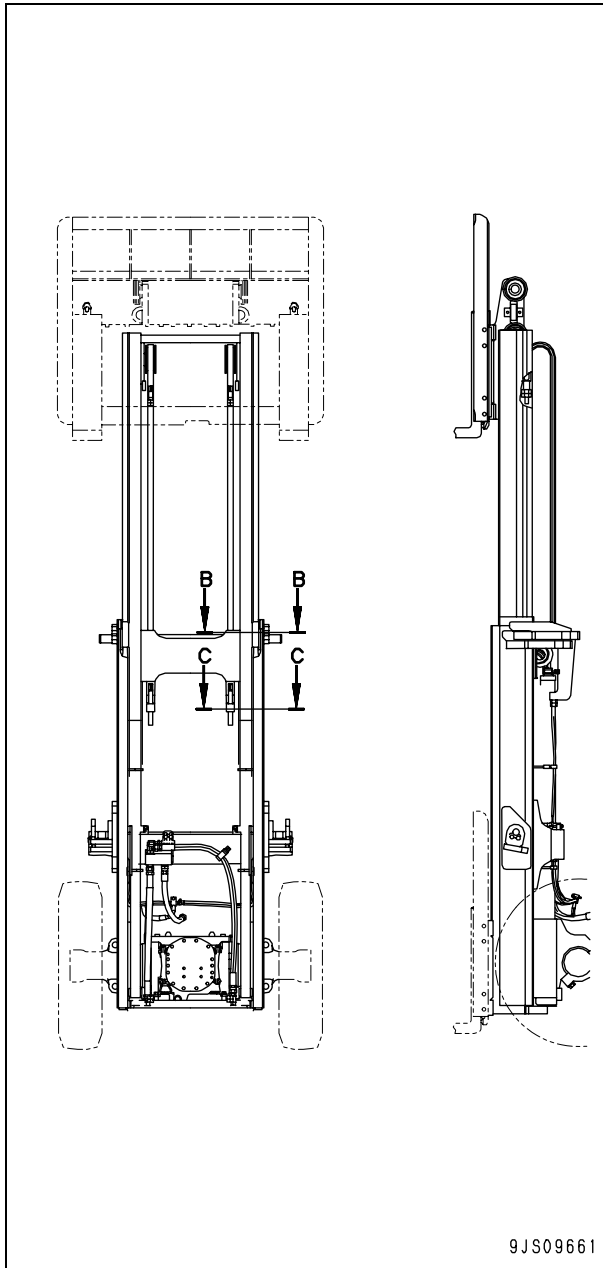


9. Leave for 15 minutes, then measure the position of mark (B) on piston rod (5) and obtain the hydraulic forward drift in the past 15 minutes.

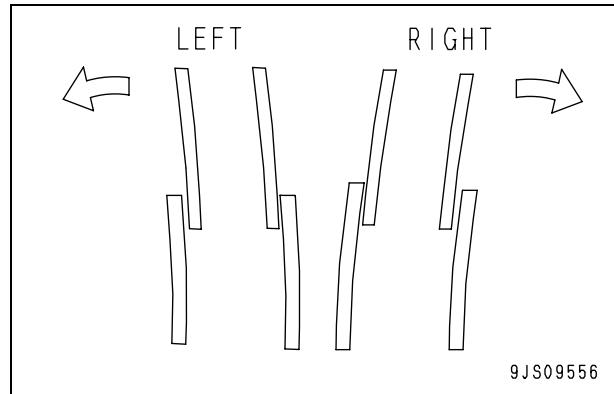
- Hydraulic forward drift in 15 minutes:
Max. 45 mm

Adjustment of mast

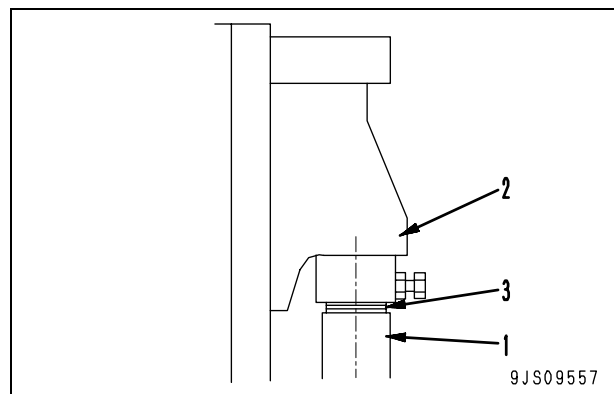
Adjustment of mast runout



1. Stop the lift truck on a level and flat place.
2. Raise the mast to the maximum lifting height.
3. Check the mast for lateral runout.

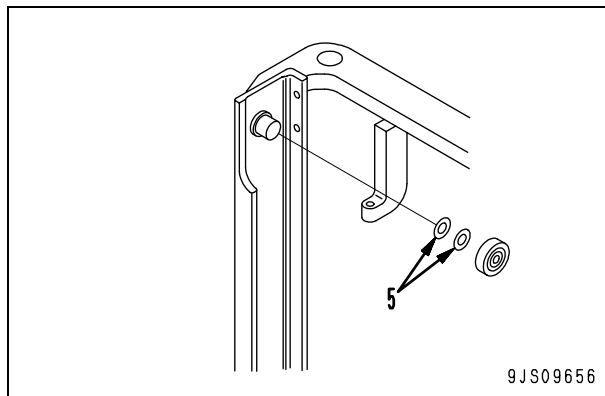
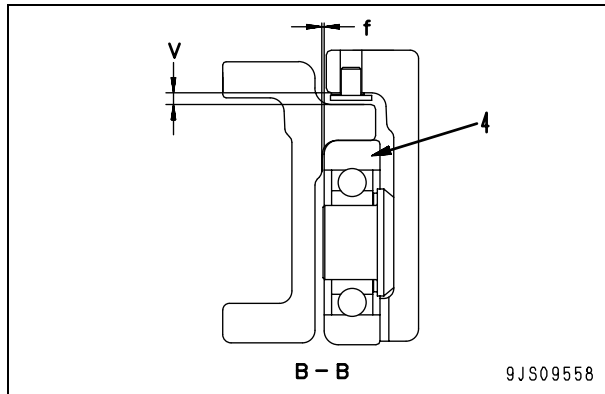


4. If the mast runs out laterally, add shim (3) between lift cylinder (1) and mast stay (2) on the runout side.
 - Shim thickness (t) = 0.1 mm



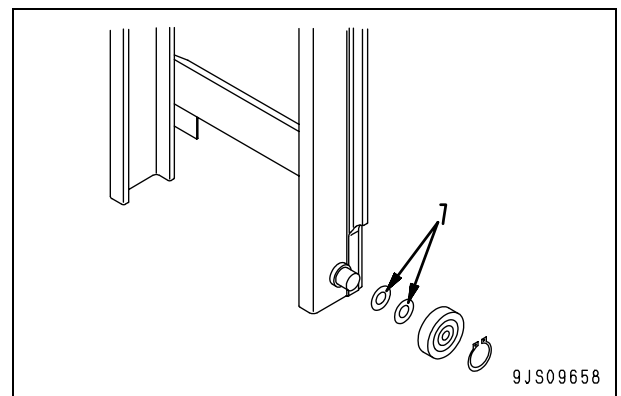
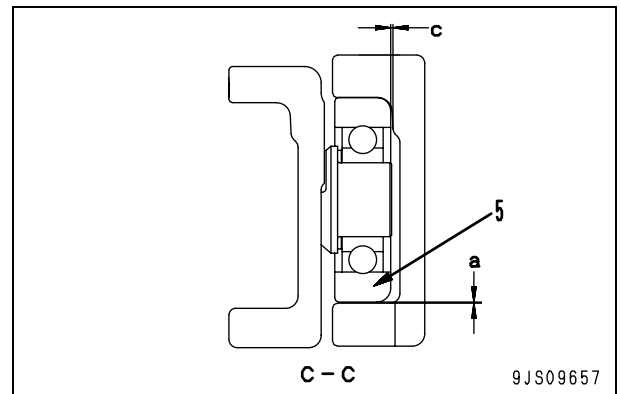
Selection of outer roller and adjustment of shim

1. Select roller (4) so that dimension (V) of the strip portion of the inner mast and outer mast will be the same on the right and left sides.
2. Raise the mast to the maximum lifting height.
3. Insert shims (5) of the same thickness to the right and left sides so that clearance (f) between the corners of the inner mast rail and roller (4) will be in the following range.
 - Clearance (f):
0 – 0.5 mm (For 3.5 – 4.0 ton)
 - Clearance (f):
0.5 – 1.0 mm (For 4.5 – 5.0 ton)



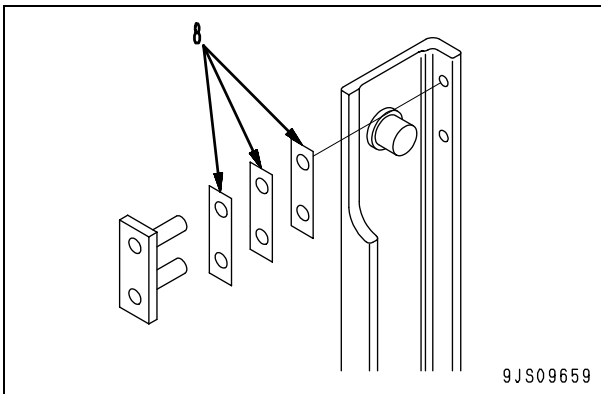
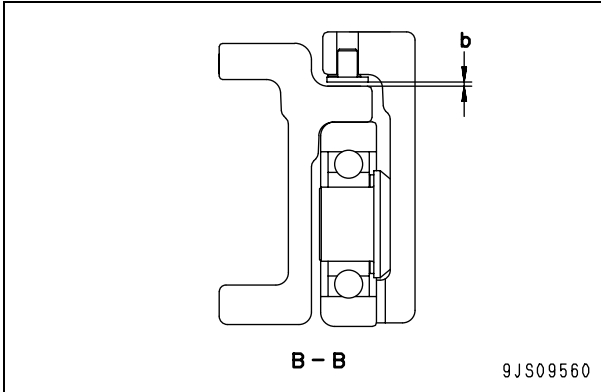
Selection of inner roller and adjustment of shim

1. Select roller (6) so that clearance (a) between the outer mast rail and roller (6) will be in the following range.
 - Clearance (a): **0.2 – 0.9 mm (For 3.5 – 4.0 ton)**
 - Clearance (a): **0.4 – 1.6 mm (For 4.5 – 5.0 ton)**
 - ★ Only 1 type of roller is set for FG (D) 45/50A.
2. Raise the mast to the maximum lifting height.
3. Insert shims (7) of the same thickness to the right and left sides so that clearance (c) between the corners of the outer mast rail and roller (6) will be in the following range.
 - Clearance (c):
0 – 0.5 mm (For 3.5 – 4.0 ton)
 - Clearance (c):
0.5 – 1.0 mm (For 4.5 – 5.0 ton)

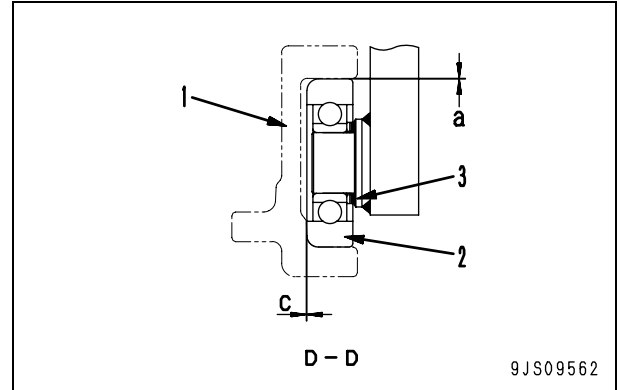
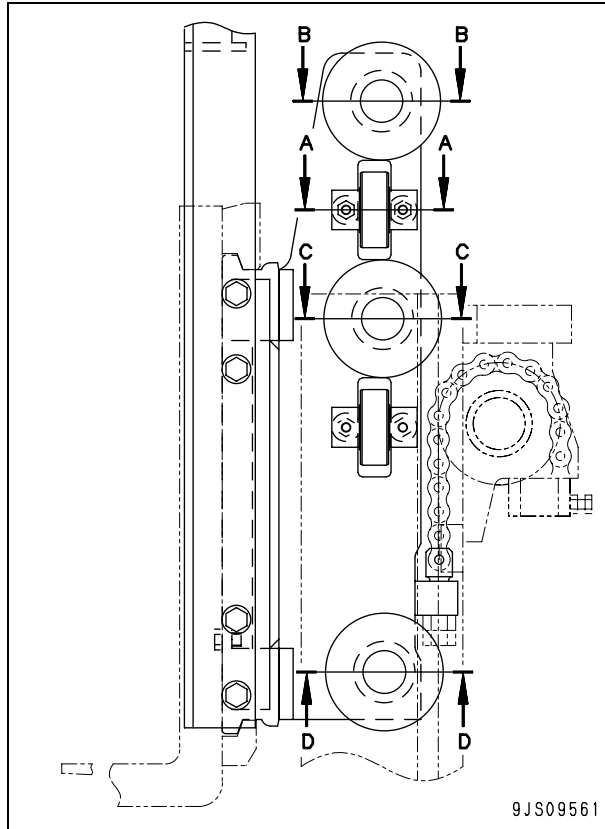


Adjustment of shim at strip portion

1. Insert shims (6) so that clearance (b) between the strip and rail will be even through the inner rail when the main roller is pressed against the rail.
 - Clearance (b): **0.1 – 0.4 mm**
 - Standard clearance (b): **0.3 mm**



Adjustment of fork carriage

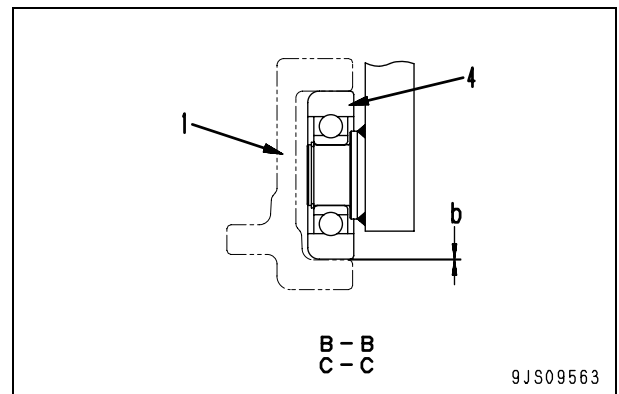


Selection of upper main roller and intermediate main roller and adjustment of shim

- Select roller (4) so that clearance (b) between the rail of inner mast (1) and upper main roller and intermediate main roller (4) will be in the following range.
 - Clearance (b): **0.2 – 0.9 mm**
(For 3.5 – 4.0 ton)
 - Clearance (b): **0.4 – 1.6 mm**
(For 4.5 – 5.0 ton)
 - ★ Only 1 type of roller is set for FG (D) 45/50A.
 - Standard shim thickness: **1 mm**

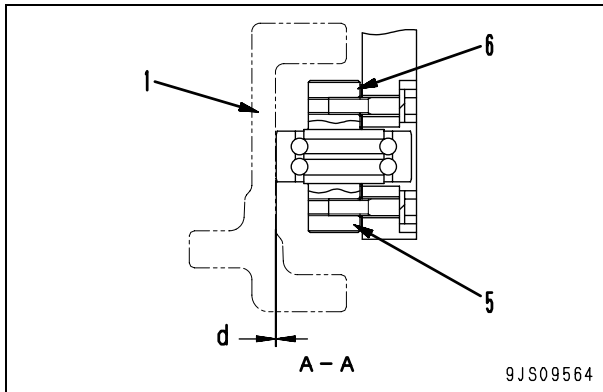
Selection of lower roller and adjustment of shim

- Select roller (2) so that clearance (a) between the rail of inner mast (1) and lower main roller (2) will be in the following range.
 - Clearance (a): **0.2 – 0.9 mm**
(For 3.5 – 4.0 ton)
 - Clearance (a): **0.4 – 1.6 mm**
(For 4.5 – 5.0 ton)
 - ★ Only 1 type of roller is set for FG (D) 45/50A.
- Raise the fork carriage to the maximum lifting height.
- Insert shims (3) of the same thickness to the right and left side so that clearance (c) between the rail and roller (2) will be in the following range.
 - Clearance (c): **0 – 0.1 mm**
(For 3.5 – 4.0 ton)
 - Clearance (c): **0.5 – 1.0 mm**
(For 4.5 – 5.0 ton)

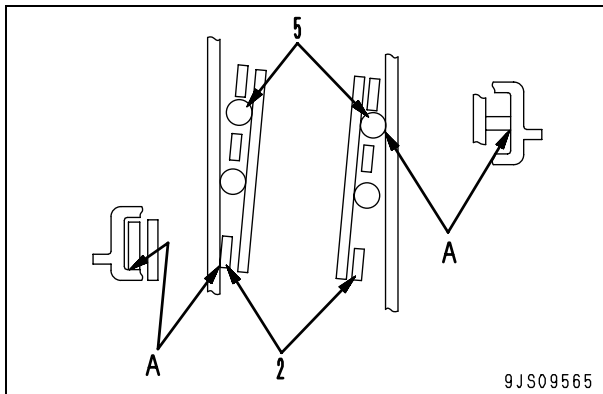


Adjustment of side roller shim

1. Raise the fork carriage to the maximum lifting height.
2. Adjust shim (6) so that clearance (d) between the rail of inner mast (1) and upper side roller (5) will be 0.01 – 0.3 mm.
 - Clearance (d): **0 – 0.3 mm**
(For 3.5 – 4.0 ton)
 - Clearance (d): **0 – 0.5 mm**
(For 4.5 – 5.0 ton)

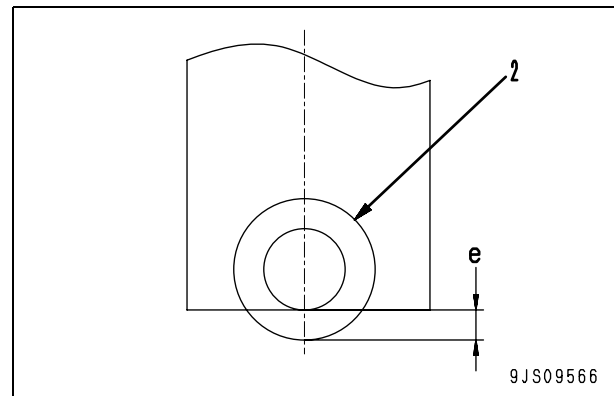


3. Insert shims 0.3 mm thinner than those of the upper side roller in the lower side roller.
4. Slant the fork carriage and check contact faces (A) of upper side roller (5) and lower main roller (2) through the rail.

**Adjustment of chains**

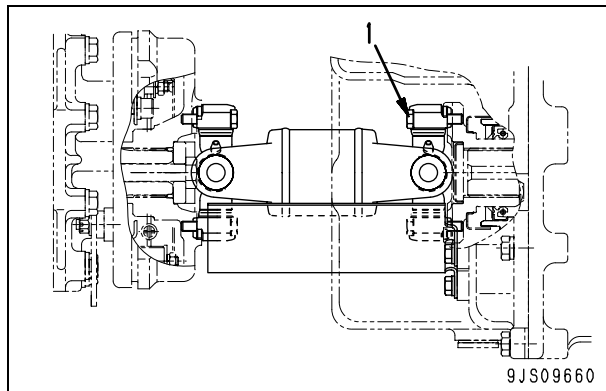
1. Check the mounting condition of the lift chains on the outer mast and adjust the right and left chain tensions evenly.
2. Lower the mast to the minimum lifting height.
3. Adjust the chain stopper locknut so that projection (e) of lower main roller (2) from the inner mast bottom will be as follows.

Model	Projection (e)
4.0 ton compact model	7.5 mm
3.5 – 4.0 ton standard model	12.5 mm
4.5 – 5.0 ton standard model	39.5 mm



Check of drive shaft for looseness, play and damage

1. Check the drive shaft for damage, abnormal play and looseness of connecting bolts (1).
2. Move the cross member of the universal joint up, down, laterally, and in both rotation directions to check for abnormal play.



★ The figure shows the lift truck with SAA4D95LE-5-A engine.

3. If drive shaft connecting bolts (1) are loosened, retighten them.

 Connecting bolt (1):

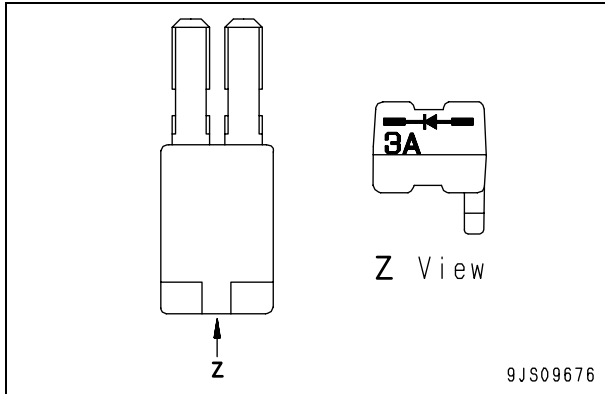
$35.3 \pm 2.94 \text{ Nm}$ { $3.6 \pm 0.3 \text{ kgfm}$ }

4. If the drive shaft is damaged or abnormal, repair or replace it.

Check of diode

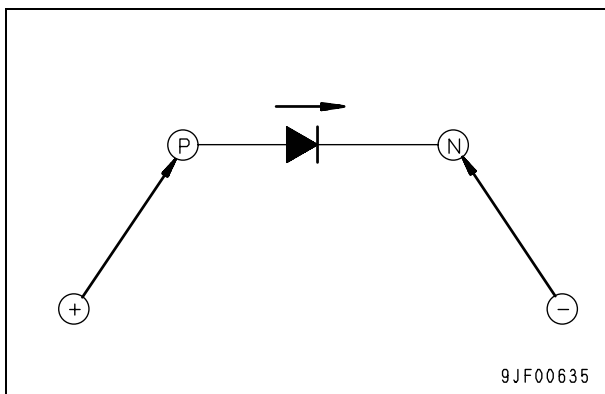
Check the diode (2-pin) according to the following procedure.

- ★ The current flow direction of the diode is shown on the diode surface.



When using digital circuit tester

1. Set the circuit tester in the diode range and check the displayed value.
 - ★ A common circuit tester indicates the internal battery voltage.
2. Apply the red test lead pin (+) to the anode (P) side of the diode and apply the black pin (–) to cathode (N) side, and check the displayed value.
3. Judge the condition of the diode by the displayed value.
 - Displayed value does not change:
Continuity is broken (defective)
 - Displayed value changes:
Continuity is secured (normal)



When using analog circuit tester

1. Set the circuit tester in the resistance range.
2. Perform the following operation and check the tester pointer for movement.
 - 1) Apply the red test lead pin (+) to the anode (P) side of the diode and apply the black pin (–) to cathode (N) side.
 - 2) Apply the red test lead pin (+) to the cathode (N) side of the diode and apply the black pin (–) to anode (P) side.
3. Judge the condition of the diode by the pointer movement.
 - Pointer does not move in 1) but moves in 2):
Normal
 - ★ The degree of the tester point movement depends on the type and measurement range of the tester.
 - Pointer moves in both 1) and 2):
Defective (internal short circuit)
 - Pointer does not move in either of 1) and 2):
Defective (internal disconnection)
 - ★ Replace the diode, if it is defective.

FORKLIFT TRUCK

CX50 Series

Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

40 Troubleshooting

100 General information on troubleshooting

Points to remember when troubleshooting	2
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Testing before troubleshooting	4
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Phenomena looking like troubles and troubleshooting No.	6
Information contained in troubleshooting table	16
Locations of fuses	18

Points to remember when troubleshooting

- ⚠ **Stop the lift truck on a level place and check the lock pin, chocks, parking brake, etc. are applied normally.**
- ⚠ **When carrying out the operation with two 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 measuring equipment, be sure to connect it properly.**

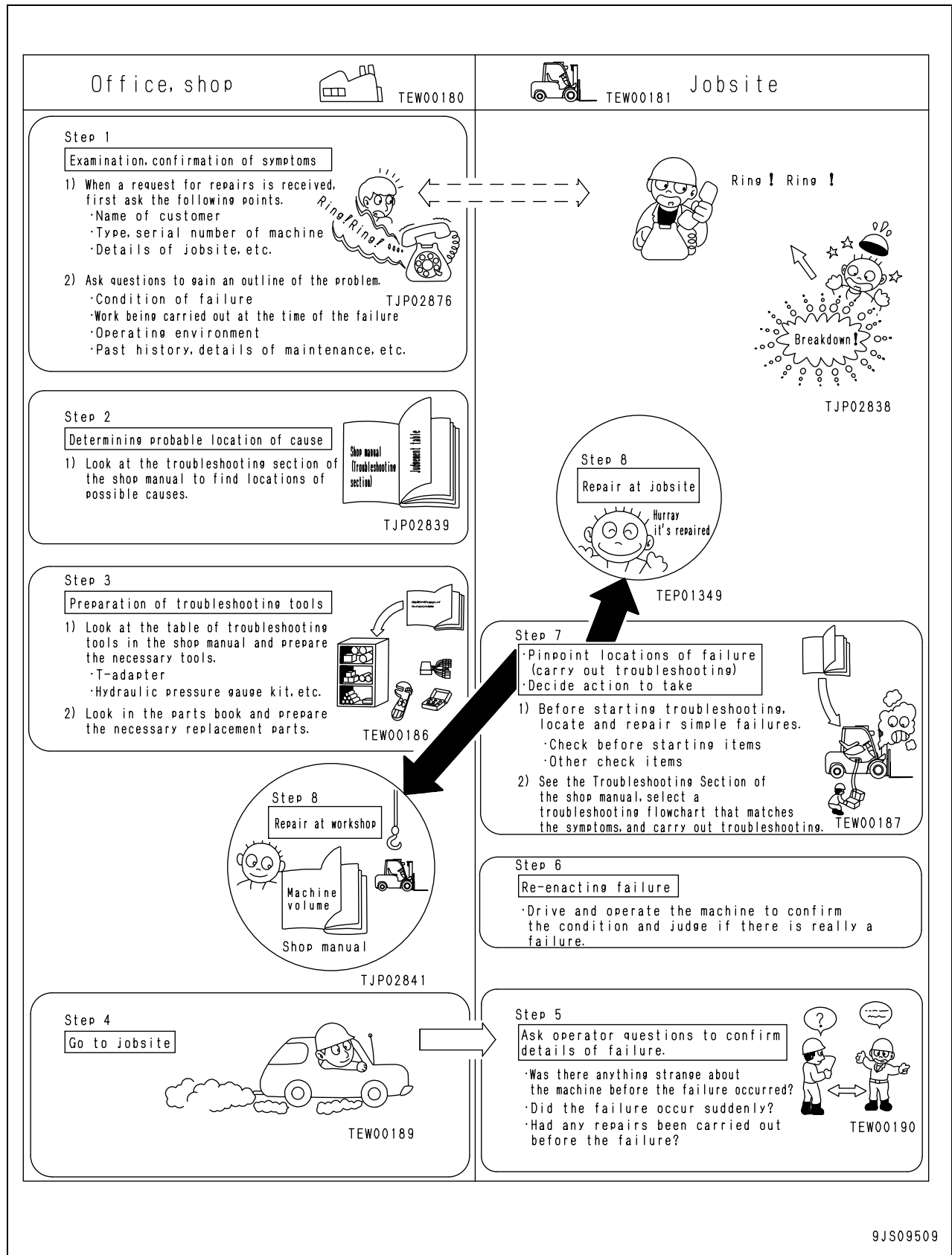
The aim of troubleshooting is to pinpoint the basic cause of the failure, to carry out repairs swiftly, and to prevent reoccurrence of the failure. When carrying out troubleshooting, an important point is of course to understand the structure and function. However, a short cut to effective troubleshooting 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 lift truck before the failure occurred?
 - 3) Did the failure occur suddenly, or were there problems with the lift truck 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 abnormal symptoms in lift truck?
 - 2) Check the check-before-starting items.
 - 3) Check the other check 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 lift truck 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 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



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Testing before troubleshooting

	Item	Criterion	Remedy
Fuel, lubricating oil and coolant	1. Check of level and type of fuel	–	Add fuel
	2. Check of fuel for foreign matter	–	Clean and drain
	3. Check of level and type of engine oil	Between H and L	Add oil
	4. Check of coolant level	Between FULL and LOW	Add coolant
	5. Check of air cleaner for clogging	–	Clean or replace
	6. Check of level and type of hydraulic oil	Between H and L	Add oil
	7. Check of level and type of transmission oil	Within oil gauge	Add oil
	8. Check of fuel filter for clogging	–	Replace
	9. Check of engine oil filter for clogging	–	Replace
	10. Check of hydraulic oil filter for clogging	–	Replace
	11. Check of transmission oil filter for clogging	–	Replace
Electrical equipment	12. Check of battery terminals and wiring for loose and corrosion	–	Retighten or replace
	13. Check of alternator terminals and wiring for loose and corrosion	–	Retighten or replace
	14. Check of starting motor terminals and wiring for loose and corrosion	–	Retighten or replace
	15. Check of operations of instruments	–	Repair or replace
Hydraulic, mechanical equipment	16. Check for abnormal noise or smell	–	Repair
	17. Check for oil leakage	–	Repair
	18. Bleeding air	–	Bleed air
	19. Check of brake performance	–	Repair or adjust
Electric, electrical equipment	20. Check of battery voltage (with engine stopped)	10 – 14 V	Charge or replace
	21. Check of electrolyte level	Upper level and Low level	Add electrolyte or replace battery
	22. Check of wires for discoloration, burn, and removal of cover	–	Replace
	23. Check for released wire clamp and drooping wire	–	Repair
	24. Check of wires for wetness (Check connectors and terminals for wetness, in particular)	–	Disconnect and dry connector
	25. Check of slow blow fuse and fuse for disconnection and corrosion	–	Replace
	26. Check of alternator voltage (while engine speed is at middle or higher)	After operating for several minutes 13.5 – 14.5 V	Repair or replace

Classification and procedures of troubleshooting

Classification of troubleshooting

Mode	Contents
Failure code	Troubleshooting when failure code is displayed
E-mode	Troubleshooting of electrical system
H-mode	Troubleshooting of hydraulic and mechanical system

Procedure for troubleshooting

If a phenomenon looking like a trouble occurs in the lift truck, 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 failure code is displayed on instrument panel:

If a failure code is displayed on the instrument panel, perform the troubleshooting for the corresponding [Failure code] according to the displayed failure code.

★ If a failure code related to the engine is displayed, see "Engine shop manual".

2. Procedure for troubleshooting when failure code is not displayed:

If a failure code is not displayed on the instrument panel, a trouble that the lift truck cannot find out by itself may have occurred in the electrical system or hydraulic and mechanical system.

In this case, check the Phenomena looking like 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" or "H-mode".

★ For troubleshooting of the engine unit, see "Engine shop manual".

Phenomena looking like troubles and troubleshooting No.**Applicable model: Lift truck with SAA4D95LE-5-A engine (For general)**

No.	Phenomena looking like trouble	Troubleshooting			
		Code display	E-mode	H-mode	Remarks
Phenomena related to failure code					
1	Failure code of ISO controller is displayed on instrument panel (*1)	●			
2	Electronic Proportional Active Control Steering System (EPACS) controller displays failure code (*2)	●			
<Reference> *1: Indicated by flashing/lighting of failure indicator, neutral lamp and lift interlock warning lamp of instrument panel. *2: Indicated by flashing/turning off LED section of EPACS.					
Phenomena related to engine					
3	Engine does not start.		E-1		
4	Engine does not stop		E-2		
5	When work equipment is operated, engine speed lowers remarkably or engine stalls			H-34	
6	When work equipment and steering are operated, engine speed lowers remarkably or engine stalls			H-38	
Phenomena related to power train					
7	Lift truck cannot travel		E-3		
8	Lift truck does not start			H-1	
9	Travel speed is low, rush force is low, gradeability is low and/or gear is not shifted			H-2	
10	Large shocks are made when lift truck starts and gear is shifted			H-3	
11	Long time lag is made when lift truck starts and gear is shifted			H-4	
12	Torque converter oil temperature is high			H-5	
Phenomena related to brake					
13	Parking brake reminder alarm does not sound or does not stop sounding		E-4		
14	Service brake does not work or its performance is low			H-17	
15	Service brake is not released or it drags			H-18	
16	Parking brake does not work or its performance is low			H-19	
17	Parking brake is not released or it drags			H-20	
Phenomena related to steering					
18	EPACS is abnormal		E-8		
19	Lift truck does not turn			H-6	
20	Response is low during turning			H-7	
21	Steering is heavy			H-8	
22	Lift truck is unstable or large shock is made when it turns			H-9	
23	Right and left turning radii are different			H-10	
24	When steering wheel is released it does not return to neutral or it rotates by itself			H-11	
25	Steering wheel is turned in reverse or it kicks			H-12	
26	EPACS does not work			H-13	
27	Steering wheel vibrates			H-14	
28	Steering system makes abnormal sound			H-15	
29	Oil leaks from steering circuit			H-16	
30	Work equipment and steering system do not move			H-39	
31	Steering is heavy			H-52	
32	Large shock is made when steering wheel is returned			H-53	
33	Steering is heavy when work equipment and steering are operated simultaneously			H-55	

No.	Phenomena looking like trouble	Troubleshooting			
		Code display	E-mode	H-mode	Remarks
Phenomena related to work equipment					
34	Work equipment does not move		E-6		
35	Work equipment cannot be locked		E-7		
36	Lift cylinder and fork do not lift			H-21	
37	Fork lifting speed is low			H-22	
38	Fork lifting speed lowers at specific height			H-23	
39	Lift cylinder cannot lift load			H-24	
40	Lift cylinder natural drift is large			H-25	
41	Fork lowering speed is too high			H-26	
42	Mast does not tilt forward or backward			H-27	
43	Forward/backward tilting speed or force of mast is insufficient			H-28	
44	Tilting speed lowers halfway			H-29	
45	Tilt cylinder cannot lift load			H-30	
46	Tilt cylinder natural forward drift is large			H-31	
47	Mast is unstable during travel with load			H-32	
48	Lift and tilt levers do not move smoothly and they are heavy			H-33	
49	Engine speed lowers remarkably or engine stalls when work equipment is operated.			H-34	
50	Large shocks are made when work equipment is started and stopped			H-35	
51	Another part of work equipment moves when work equipment is relieved singly			H-36	
52	Work equipment speed or force is low			H-37	
53	Work equipment and steering system do not move			H-39	
54	Abnormal sound is heard from around work equipment and steering pump			H-40	
55	Work equipment fine control performance is low or response is low			H-41	
56	Work equipment is not locked (it operates while operator is not in operator seat) or only work equipment does not move			H-42	
57	Work equipment (lift-up) does not move, moves but slow or moves but force is low			H-43	
58	Lift cylinder drift is large (while operator is not in operator seat)			H-44	
59	Lift cylinder drift is large (while operator is in operator seat)			H-45	
60	Work equipment (lift-down) lowering speed is low or high or fine control performance is low or response is low			H-46	
61	Fork does not lower			H-47	
62	Fork does not tilt, tilts but slow or tilts but force is low			H-48	
63	Tilt cylinder natural forward drift is large			H-49	
64	Attachment does not move, moves but slow or moves but force is low			H-50	
65	Attachment cylinder natural drift is large			H-51	
66	Work equipment is heavy when work equipment and steering are operated simultaneously			H-54	
Other phenomena					
67	Travel direction is not changed normally		E-5		
68	Headlamp, clearance lamp, tail lamp and license plate lamp do not light or go off		E-9		License plate lamp is related to only lift truck with it
69	Turn signal lamps do not light or go off		E-10		
70	Brake lamps do not light or go off		E-11		
71	Backup lamps do not light or go off		E-12		
72	Backup buzzer does not sound or does not stop sounding		E-13		
73	Horn does not sound or does not stop sounding		E-14		
74	Fuel level is not displayed normally		E-15		

Applicable model: Lift truck with S4D95LE-3 engine (For general)

No.	Phenomena looking like trouble	Troubleshooting			
		Code display	E-mode	H-mode	Remarks
Phenomena related to failure code					
1	Failure code of ISO controller is displayed on instrument panel (*1)	●			Related to only lift truck with ISO controller
2	Electronic Proportional Active Control Steering System (EPACS) controller displays failure code (*2)	●			Related to only lift truck with EPACS
<Reference> *1: Indicated by flashing/lighting of failure indicator, neutral lamp and lift interlock warning lamp of instrument panel. *2: Indicated by flashing/turning off LED section of EPACS.					
Phenomena related to engine					
3	Engine does not start.		E-1		
4	Engine does not stop		E-2		
5	Engine preheater does not operate normally		E-3		
6	Engine speed lowers remarkably or engine stalls when work equipment is operated.			H-34	
7	When work equipment and steering are operated, engine speed lowers remarkably or engine stalls			H-38	
Phenomena related to power train					
8	Lift truck cannot travel		E-4		
9	Lift truck does not start			H-1	
10	Travel speed is low, rush force is low, gradeability is low and/or gear is not shifted			H-2	
11	Large shocks are made when lift truck starts and gear is shifted			H-3	
12	Long time lag is made when lift truck starts and gear is shifted			H-4	
13	Torque converter oil temperature is high			H-5	
Phenomena related to brake					
14	Parking brake reminder alarm does not sound or does not stop sounding		E-5		Related to only lift truck with ISO controller
15	Service brake does not work or its performance is low			H-17	
16	Service brake is not released or it drags			H-18	
17	Parking brake does not work or its performance is low			H-19	
18	Parking brake is not released or it drags			H-20	
Phenomena related to steering					
19	EPACS is abnormal		E-9		Related to only lift truck with EPACS
20	Lift truck does not turn			H-6	
21	Response is low during turning			H-7	
22	Steering is heavy			H-8	
23	Lift truck is unstable or large shock is made when it turns			H-9	
24	Right and left turning radii are different			H-10	
25	When steering wheel is released it does not return to neutral or it rotates by itself			H-11	
26	Steering wheel is turned in reverse or it kicks			H-12	
27	EPACS does not work			H-13	Related to only lift truck with EPACS
28	Steering wheel vibrates			H-14	
29	Steering system makes abnormal sound			H-15	
30	Oil leaks from steering circuit			H-16	
31	Work equipment and steering system do not move			H-39	
32	Steering is heavy			H-52	
33	Large shock is made when steering wheel is returned			H-53	

No.	Phenomena looking like trouble	Troubleshooting			
		Code display	E-mode	H-mode	Remarks
34	Steering is heavy when work equipment and steering are operated simultaneously			H-55	
Phenomena related to work equipment					
35	Work equipment does not move		E-7		
36	Work equipment cannot be locked		E-8		
37	Lift cylinder and fork do not lift			H-21	
38	Fork lifting speed is low			H-22	
39	Fork lifting speed lowers at specific height			H-23	
40	Lift cylinder cannot lift load			H-24	
41	Lift cylinder natural drift is large			H-25	
42	Fork lowering speed is too high			H-26	
43	Mast does not tilt forward or backward			H-27	
44	Forward/backward tilting speed or force of mast is insufficient			H-28	
45	Tilting speed lowers halfway			H-29	
46	Tilt cylinder cannot lift load			H-30	
47	Tilt cylinder natural forward drift is large			H-31	
48	Mast is unstable during travel with load			H-32	
49	Lift and tilt levers do not move smoothly and they are heavy			H-33	
50	Engine speed lowers remarkably or engine stalls when work equipment is operated.			H-34	
51	Large shocks are made when work equipment is started and stopped			H-35	
52	Another part of work equipment moves when work equipment is relieved singly			H-36	
53	Work equipment speed or force is low			H-37	
54	Work equipment and steering system do not move			H-39	
55	Abnormal sound is heard from around work equipment and steering pump			H-40	
56	Work equipment fine control performance is low or response is low			H-41	
57	Work equipment is not locked (it operates while operator is not in operator seat) or only work equipment does not move			H-42	
58	Work equipment (lift-up) does not move, moves but slow or moves but force is low			H-43	
59	Lift cylinder drift is large (while operator is not in operator seat)			H-44	
60	Lift cylinder drift is large (while operator is in operator seat)			H-45	
61	Work equipment (lift-down) lowering speed is low or high or fine control performance is low or response is low			H-46	
62	Fork does not lower			H-47	
63	Fork does not tilt, tilts but slow or tilts but force is low			H-48	
64	Tilt cylinder natural forward drift is large			H-49	
65	Attachment does not move, moves but slow or moves but force is low			H-50	
66	Attachment cylinder natural drift is large			H-51	
67	Work equipment is heavy when work equipment and steering are operated simultaneously			H-54	
Other phenomena					
68	Travel direction is not changed normally		E-6		
69	Headlamp, clearance lamp and tail lamp do not light or go off		E-10		
70	Turn signal lamps do not light or go off		E-11		
71	Brake lamps do not light or go off		E-12		
72	Backup lamps do not light or go off		E-13		
73	Backup buzzer does not sound or does not stop sounding		E-14		
74	Horn does not sound or does not stop sounding		E-15		
75	Fuel level is not displayed normally		E-16		

Applicable model: Lift truck with EBT-TB45-1A/2A/3A engine (For general)

No.	Phenomena looking like trouble	Troubleshooting			
		Code display	E-mode	H-mode	Remarks
Phenomena related to failure code					
1	Failure code of ISO controller is displayed on instrument panel (*1)	●			
2	Electronic Proportional Active Control Steering System (EPACS) controller displays failure code (*2)	●			
<Reference>					
*1: Indicated by flashing/lighting of failure indicator, neutral lamp and lift interlock warning lamp of instrument panel.					
*2: Indicated by flashing/turning off LED section of EPACS.					
Phenomena related to engine					
3	Engine does not start.		E-1		
4	Engine does not stop		E-2		
5	Engine speed lowers remarkably or engine stalls when work equipment is operated.			H-34	
6	When work equipment and steering are operated, engine speed lowers remarkably or engine stalls			H-38	
Phenomena related to power train					
7	Lift truck cannot travel		E-3		
8	Lift truck does not start			H-1	
9	Travel speed is low, rush force is low, gradeability is low and/or gear is not shifted			H-2	
10	Large shocks are made when lift truck starts and gear is shifted			H-3	
11	Long time lag is made when lift truck starts and gear is shifted			H-4	
12	Torque converter oil temperature is high			H-5	
Phenomena related to brake					
13	Parking brake reminder alarm does not sound or does not stop sounding		E-4		
14	Service brake does not work or its performance is low			H-17	
15	Service brake is not released or it drags			H-18	
16	Parking brake does not work or its performance is low			H-19	
17	Parking brake is not released or it drags			H-20	
Phenomena related to steering					
18	EPACS is abnormal		E-8		
19	Lift truck does not turn			H-6	
20	Response is low during turning			H-7	
21	Steering is heavy			H-8	
22	Lift truck is unstable or large shock is made when it turns			H-9	
23	Right and left turning radii are different			H-10	
24	When steering wheel is released it does not return to neutral or it rotates by itself			H-11	
25	Steering wheel is turned in reverse or it kicks			H-12	
26	EPACS does not work			H-13	
27	Steering wheel vibrates			H-14	
28	Steering system makes abnormal sound			H-15	
29	Oil leaks from steering circuit			H-16	
30	Work equipment and steering system do not move			H-39	
31	Steering is heavy			H-52	
32	Large shock is made when steering wheel is returned			H-53	
33	Steering is heavy when work equipment and steering are operated simultaneously			H-55	
Phenomena related to work equipment					
34	Work equipment does not move		E-6		
35	Work equipment cannot be locked		E-7		

No.	Phenomena looking like trouble	Troubleshooting			
		Code display	E-mode	H-mode	Remarks
36	Lift cylinder and fork do not lift			H-21	
37	Fork lifting speed is low			H-22	
38	Fork lifting speed lowers at specific height			H-23	
39	Lift cylinder cannot lift load			H-24	
40	Lift cylinder natural drift is large			H-25	
41	Fork lowering speed is too high			H-26	
42	Mast does not tilt forward or backward			H-27	
43	Forward/backward tilting speed or force of mast is insufficient			H-28	
44	Tilting speed lowers halfway			H-29	
45	Tilt cylinder cannot lift load			H-30	
46	Tilt cylinder natural forward drift is large			H-31	
47	Mast is unstable during travel with load			H-32	
48	Lift and tilt levers do not move smoothly and they are heavy			H-33	
49	Engine speed lowers remarkably or engine stalls when work equipment is operated.			H-34	
50	Large shocks are made when work equipment is started and stopped			H-35	
51	Another part of work equipment moves when work equipment is relieved singly			H-36	
52	Work equipment speed or force is low			H-37	
53	Work equipment and steering system do not move			H-39	
54	Abnormal sound is heard from around work equipment and steering pump			H-40	
55	Work equipment fine control performance is low or response is low			H-41	
56	Work equipment is not locked (it operates while operator is not in operator seat) or only work equipment does not move			H-42	
57	Work equipment (lift-up) does not move, moves but slow or moves but force is low			H-43	
58	Lift cylinder drift is large (while operator is not in operator seat)			H-44	
59	Lift cylinder drift is large (while operator is in operator seat)			H-45	
60	Work equipment (lift-down) lowering speed is low or high or fine control performance is low or response is low			H-46	
61	Fork does not lower			H-47	
62	Fork does not tilt, tilts but slow or tilts but force is low			H-48	
63	Tilt cylinder natural forward drift is large			H-49	
64	Attachment does not move, moves but slow or moves but force is low			H-50	
65	Attachment cylinder natural drift is large			H-51	
66	Work equipment is heavy when work equipment and steering are operated simultaneously			H-54	
Other phenomena					
67	Travel direction is not changed normally		E-5		
68	Headlamp, clearance lamp, tail lamp and license plate lamp do not light or go off		E-9		License plate lamp is related to only lift truck with it
69	Turn signal lamps do not light or go off		E-10		
70	Brake lamps do not light or go off		E-11		
71	Backup lamps do not light or go off		E-12		
72	Backup buzzer does not sound or does not stop sounding		E-13		
73	Horn does not sound or does not stop sounding		E-14		
74	Fuel (Gasoline) level is not displayed normally		E-15		Related to only gasoline lift truck

Applicable model: Lift truck with SAA4D95LE-5-A engine (For USA)

No.	Phenomena looking like trouble	Troubleshooting			
		Code display	E-mode	H-mode	Remarks
Phenomena related to failure code					
1	Failure code of ISO controller is displayed on instrument panel (*1)	●			
<Reference> *1: Indicated by flashing/lighting of failure indicator, neutral lamp and lift interlock warning lamp of instrument panel.					
Phenomena related to engine					
2	Engine does not start.		E-1		
3	Engine does not stop		E-2		
4	When work equipment is operated, engine speed lowers remarkably or engine stalls			H-34	
5	When work equipment and steering are operated, engine speed lowers remarkably or engine stalls			H-38	
Phenomena related to power train					
6	Lift truck cannot travel		E-3		
7	Lift truck does not start			H-1	
8	Travel speed is low, rush force is low, gradeability is low and/or gear is not shifted			H-2	
9	Large shocks are made when lift truck starts and gear is shifted			H-3	
10	Long time lag is made when lift truck starts and gear is shifted			H-4	
11	Torque converter oil temperature is high			H-5	
Phenomena related to brake					
12	Parking brake reminder alarm does not sound or does not stop sounding		E-4		
13	Service brake does not work or its performance is low			H-17	
14	Service brake is not released or it drags			H-18	
15	Parking brake does not work or its performance is low			H-19	
16	Parking brake is not released or it drags			H-20	
Phenomena related to steering					
17	Lift truck does not turn			H-6	
18	Response is low during turning			H-7	
19	Steering is heavy			H-8	
20	Lift truck is unstable or large shock is made when it turns			H-9	
21	Right and left turning radii are different			H-10	
22	When steering wheel is released it does not return to neutral or it rotates by itself			H-11	
23	Steering wheel is turned in reverse or it kicks			H-12	
24	EPACS does not work			H-13	
25	Steering wheel vibrates			H-14	
26	Steering system makes abnormal sound			H-15	
27	Oil leaks from steering circuit			H-16	
28	Work equipment and steering system do not move			H-39	
29	Steering is heavy			H-52	
30	Large shock is made when steering wheel is returned			H-53	
31	Steering is heavy when work equipment and steering are operated simultaneously			H-55	
Phenomena related to work equipment					
32	Work equipment does not move		E-6		
33	Work equipment cannot be locked		E-7		
34	Lift cylinder and fork do not lift			H-21	

No.	Phenomena looking like trouble	Troubleshooting			
		Code display	E-mode	H-mode	Remarks
35	Fork lifting speed is low			H-22	
36	Fork lifting speed lowers at specific height			H-23	
37	Lift cylinder cannot lift load			H-24	
38	Lift cylinder natural drift is large			H-25	
39	Fork lowering speed is too high			H-26	
40	Mast does not tilt forward or backward			H-27	
41	Forward/backward tilting speed or force of mast is insufficient			H-28	
42	Tilting speed lowers halfway			H-29	
43	Tilt cylinder cannot lift load			H-30	
44	Tilt cylinder natural forward drift is large			H-31	
45	Mast is unstable during travel with load			H-32	
46	Lift and tilt levers do not move smoothly and they are heavy			H-33	
47	Engine speed lowers remarkably or engine stalls when work equipment is operated.			H-34	
48	Large shocks are made when work equipment is started and stopped			H-35	
49	Another part of work equipment moves when work equipment is relieved singly			H-36	
50	Work equipment speed or force is low			H-37	
51	Work equipment and steering system do not move			H-39	
52	Abnormal sound is heard from around work equipment and steering pump			H-40	
53	Work equipment fine control performance is low or response is low			H-41	
54	Work equipment is not locked (it operates while operator is not in operator seat) or only work equipment does not move			H-42	
55	Work equipment (lift-up) does not move, moves but slow or moves but force is low			H-43	
56	Lift cylinder drift is large (while operator is not in operator seat)			H-44	
57	Lift cylinder drift is large (while operator is in operator seat)			H-45	
58	Work equipment (lift-down) lowering speed is low or high or fine control performance is low or response is low			H-46	
59	Fork does not lower			H-47	
60	Fork does not tilt, tilts but slow or tilts but force is low			H-48	
61	Tilt cylinder natural forward drift is large			H-49	
62	Attachment does not move, moves but slow or moves but force is low			H-50	
63	Attachment cylinder natural drift is large			H-51	
64	Work equipment is heavy when work equipment and steering are operated simultaneously			H-54	
Other phenomena					
65	Travel direction is not changed normally		E-5		
66	Headlamp, clearance lamp and tail lamp do not light or go off		E-8		
67	Turn signal lamps do not light or go off		E-9		
68	Brake lamps do not light or go off		E-10		
69	Backup lamps do not light or go off		E-11		
70	Backup buzzer does not sound or does not stop sounding (Option)		E-12		Related to only lift truck with backup buzzer
71	Horn does not sound or does not stop sounding		E-13		
72	Fuel level is not displayed normally		E-14		

Applicable model: Lift truck with EBT-TB45-2A/3A engine (For USA)

No.	Phenomena looking like trouble	Troubleshooting			
		Code display	E-mode	H-mode	Remarks
Phenomena related to failure code					
1	Failure code of ISO controller is displayed on instrument panel (*1)	●			
<Reference> *1: Indicated by flashing/lighting of failure indicator, neutral lamp and lift interlock warning lamp of instrument panel.					
Phenomena related to engine					
2	Engine does not start.		E-1		
3	Engine does not stop		E-2		
4	Engine speed lowers remarkably or engine stalls when work equipment is operated.			H-34	
5	When work equipment and steering are operated, engine speed lowers remarkably or engine stalls			H-38	
Phenomena related to power train					
6	Lift truck cannot travel		E-3		
7	Lift truck does not start			H-1	
8	Travel speed is low, rush force is low, gradeability is low and/or gear is not shifted			H-2	
9	Large shocks are made when lift truck starts and gear is shifted			H-3	
10	Long time lag is made when lift truck starts and gear is shifted			H-4	
11	Torque converter oil temperature is high			H-5	
Phenomena related to brake					
12	Parking brake reminder alarm does not sound or does not stop sounding		E-4		
13	Service brake does not work or its performance is low			H-17	
14	Service brake is not released or it drags			H-18	
15	Parking brake does not work or its performance is low			H-19	
16	Parking brake is not released or it drags			H-20	
Phenomena related to steering					
17	Lift truck does not turn			H-6	
18	Response is low during turning			H-7	
19	Steering is heavy			H-8	
20	Lift truck is unstable or large shock is made when it turns			H-9	
21	Right and left turning radii are different			H-10	
22	When steering wheel is released it does not return to neutral or it rotates by itself			H-11	
23	Steering wheel is turned in reverse or it kicks			H-12	
24	EPACS does not work			H-13	
25	Steering wheel vibrates			H-14	
26	Steering system makes abnormal sound			H-15	
27	Oil leaks from steering circuit			H-16	
28	Work equipment and steering system do not move			H-39	
29	Steering is heavy			H-52	
30	Large shock is made when steering wheel is returned			H-53	
31	Steering is heavy when work equipment and steering are operated simultaneously			H-55	
Phenomena related to work equipment					
32	Work equipment does not move		E-6		
33	Work equipment cannot be locked		E-7		
34	Lift cylinder and fork do not lift			H-21	

No.	Phenomena looking like trouble	Troubleshooting			
		Code display	E-mode	H-mode	Remarks
35	Fork lifting speed is low			H-22	
36	Fork lifting speed lowers at specific height			H-23	
37	Lift cylinder cannot lift load			H-24	
38	Lift cylinder natural drift is large			H-25	
39	Fork lowering speed is too high			H-26	
40	Mast does not tilt forward or backward			H-27	
41	Forward/backward tilting speed or force of mast is insufficient			H-28	
42	Tilting speed lowers halfway			H-29	
43	Tilt cylinder cannot lift load			H-30	
44	Tilt cylinder natural forward drift is large			H-31	
45	Mast is unstable during travel with load			H-32	
46	Lift and tilt levers do not move smoothly and they are heavy			H-33	
47	Engine speed lowers remarkably or engine stalls when work equipment is operated.			H-34	
48	Large shocks are made when work equipment is started and stopped			H-35	
49	Another part of work equipment moves when work equipment is relieved singly			H-36	
50	Work equipment speed or force is low			H-37	
51	Work equipment and steering system do not move			H-39	
52	Abnormal sound is heard from around work equipment and steering pump			H-40	
53	Work equipment fine control performance is low or response is low			H-41	
54	Work equipment is not locked (it operates while operator is not in operator seat) or only work equipment does not move			H-42	
55	Work equipment (lift-up) does not move, moves but slow or moves but force is low			H-43	
56	Lift cylinder drift is large (while operator is not in operator seat)			H-44	
57	Lift cylinder drift is large (while operator is in operator seat)			H-45	
58	Work equipment (lift-down) lowering speed is low or high or fine control performance is low or response is low			H-46	
59	Fork does not lower			H-47	
60	Fork does not tilt, tilts but slow or tilts but force is low			H-48	
61	Tilt cylinder natural forward drift is large			H-49	
62	Attachment does not move, moves but slow or moves but force is low			H-50	
63	Attachment cylinder natural drift is large			H-51	
64	Work equipment is heavy when work equipment and steering are operated simultaneously			H-54	
Other phenomena					
65	Travel direction is not changed normally		E-5		
66	Headlamp, clearance lamp and tail lamp do not light or go off		E-8		
67	Turn signal lamps do not light or go off		E-9		
68	Brake lamps do not light or go off		E-10		
69	Backup lamps do not light or go off		E-11		
70	Backup buzzer does not sound or does not stop sounding (Option)		E-12		Related to only lift truck with backup buzzer
71	Horn does not sound or does not stop sounding		E-13		
72	Fuel (Gasoline) level is not displayed normally		E-14		Related to only gasoline use lift truck

Information contained in troubleshooting table

- ★ The troubleshooting table and the related circuit diagrams contain the following information. Understand their contents well to advance troubleshooting.

Failure code		Trouble	Trouble that appeared on lift truck
Monitor display			
Contents of trouble	State where the controller detects the trouble		
Action of controller	Action taken to protect the system and equipment when the controller detects a trouble		
Problem that appears on lift truck	Problem that appears as an abnormality on lift truck by the action taken by controller (shown above)		
Related information	Information related to a detected trouble or troubleshooting		

Possible causes and standard value in normal state	Cause		Standard value in normal condition/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 in normal state required to judge assumed causes • Remarks required to judge whether the cause is good
	2		<Phenomenon of defective harness> • Disconnection in wiring The connector connection is defective or the wiring harness is disconnected. • Grounding fault A harness not connected to the ground (earth) circuit comes into contact with the ground (earth) circuit. • Hot short circuit A harness not connected to power source (12 V) circuit comes into contact with power (12 V) circuit. • Short circuit A harness of an independent circuit abnormally comes into contact with one of another circuit.
	3		
	4		<Notes on troubleshooting> • Pin number description sequence and tester lead handling For troubleshooting, connect the positive (+) and negative (–) leads as shown below unless especially specified. • Connect positive (+) lead to a pin or harness indicated in the front. • Connect negative (–) to a pin or harness indicated in the rear.

Related circuit diagram

This is the excerpted circuit diagram related to trouble

- **Symbols of devices and connector names (numbers of pins) are shown.**

Locations of fuses

Applicable model: Lift truck with SAA4D95LE-5-A engine (For general)

Connection table of fuse box

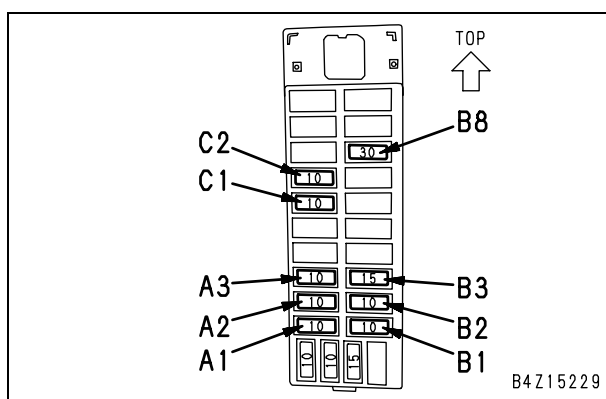
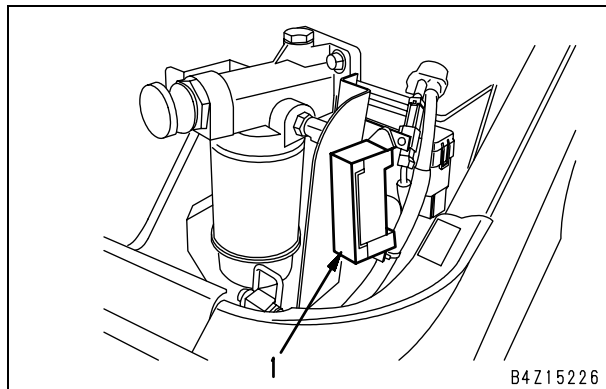
- ★ This connection table shows the devices to which each power supply of the fuse box supplies power (A switch power supply is a device which supplies power while the starting switch is in the ON position and a constant power supply is a device which supplies power while the starting switch is in the OFF and ON positions).
- ★ When carrying out troubleshooting related to the electrical system, you should check the fuse box to see if the power is supplied normally.

Fuse box

Type of power supply (Source)	Fuse name	Capacity of fuse	Destination of power
Switch power supply (Starting switch terminal M)	A1	10A	Meters Turn signal lamps
	A2	10A	F-R switch OPS main relay Parking relay
	A3	10A	ISO controller Seat switch
Constant power supply (Slow blow fuse: SB1)	B1	10A	Horn
	B2	10A	Combination switch Stop lamp switch
	B3	15A	Combination switch
	B4	–	(Unused)
	B5	–	(Unused)
	B6	–	(Unused)
	B7	–	(Unused)
	B8	30A	PWM relay
Switch power supply (Starting switch terminal ST)	C1	10A	Brake relay
Drive signal (ISO controller)	C2	10A	C/V solenoid

Locations of fuses and fuse No.

- The fuses are installed in fuse box (1) at the front of the battery on the left side of the engine compartment.

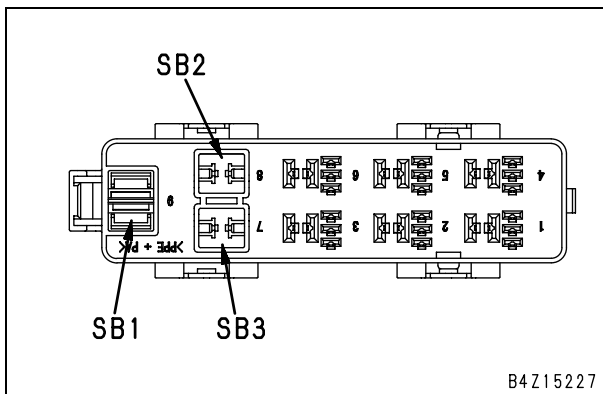
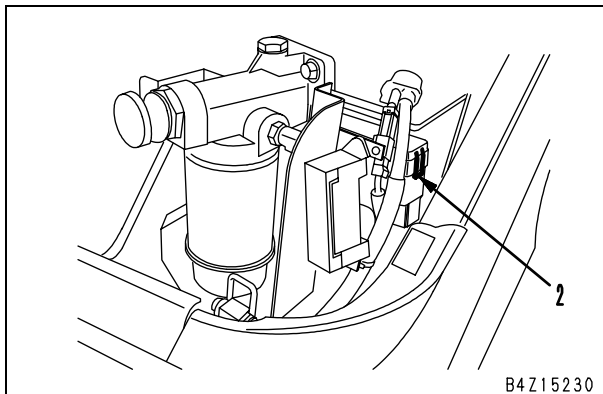


Slow blow fuse

Type of power supply (Source)	Fuse name	Capacity of fuse	Destination of power
Constant power supply (Battery)	SB1	120A	Fuses B1 – B8 Alternator
	SB2	40A	Starting motor relay
	SB3	40A	Starting switch terminal B

Locations of slow blow fuses and fuse No.

- The slow blow fuses are installed in relay case (2) at the front of the battery on the left side of the engine compartment.



Applicable model: Lift truck with S4D95LE-3 engine (For general, standard specification)

Connection table of fuse box

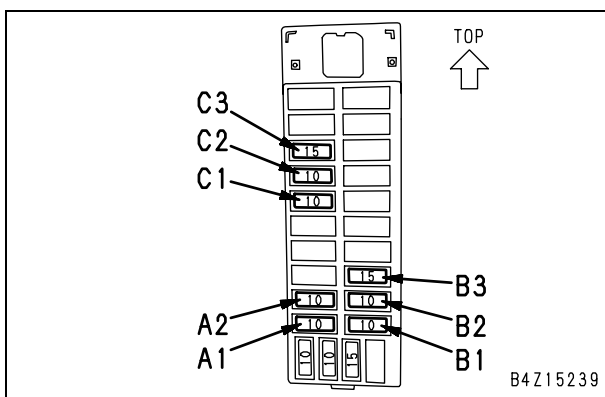
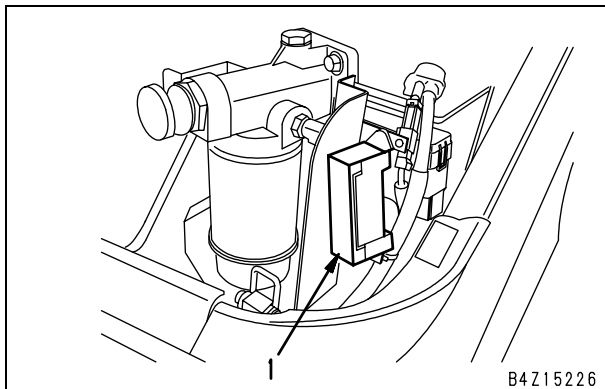
- ★ This connection table shows the devices to which each power supply of the fuse box supplies power (A switch power supply is a device which supplies power while the starting switch is in the ON position and a constant power supply is a device which supplies power while the starting switch is in the OFF and ON positions).
- ★ When carrying out troubleshooting related to the electrical system, you should check the fuse box to see if the power is supplied normally.

Fuse box

Type of power supply (Source)	Fuse name	Capacity of fuse	Destination of power
Switch power supply (Starting switch terminal M)	A1	10A	Meters Turn signal lamps
	A2	10A	F-R switch Heater relay F relay R relay
Constant power supply (Slow blow fuse: SB3)	B1	10A	Horn
	B2	10A	Combination switch Stop lamp switch
	B3	15A	Combination switch
	B4	–	(Unused)
	B5	–	(Unused)
	B6	–	(Unused)
	B7	–	(Unused)
Switch power supply (Starting switch terminal ST)	C1	10A	Brake relay
Switch power supply (Starting switch terminal M)	C2	10A	C/V solenoid
Switch power supply (Starting switch terminal G)	C3	15A	Fuel cut solenoid

Locations of fuses and fuse No.

- The fuses are installed in fuse box (1) at the front of the battery on the left side of the engine compartment.

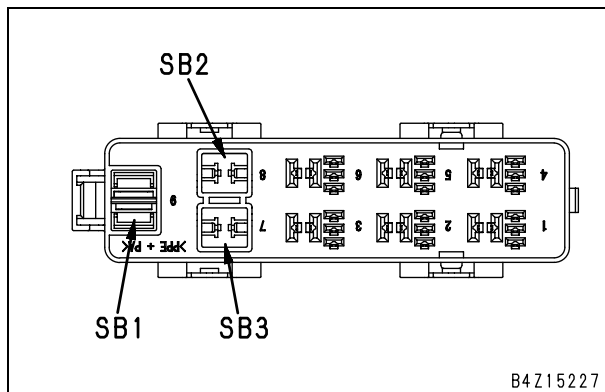
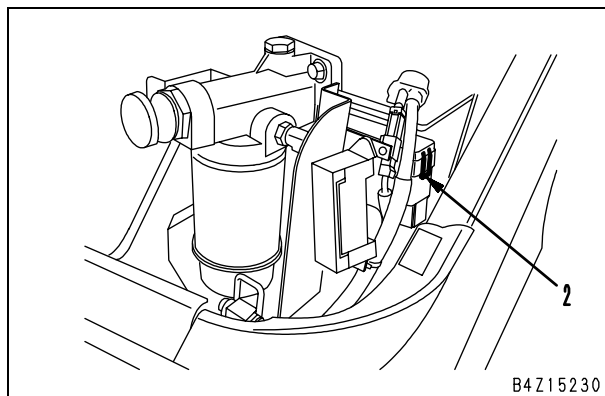


Slow blow fuse

Type of power supply (Source)	Fuse name	Capacity of fuse	Destination of power
Constant power supply (Battery)	SB1	120A	Fuses B1 – B8 Alternator
	SB2	40A	Starting motor relay
	SB3	40A	Starting switch terminal B

Locations of slow blow fuses and fuse No.

- The slow blow fuses are installed in relay case (2) at the front of the battery on the left side of the engine compartment.



Applicable model: Lift truck with S4D95LE-3 engine (For general, ISO controller installation specification)

Connection table of fuse box

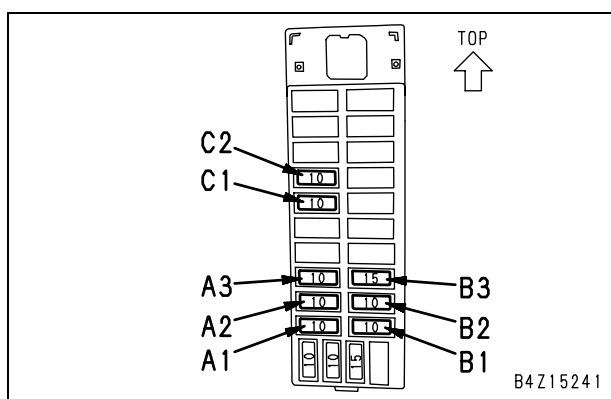
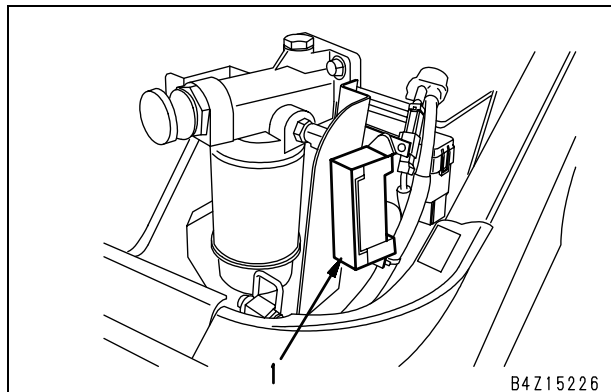
- ★ This connection table shows the devices to which each power supply of the fuse box supplies power (A switch power supply is a device which supplies power while the starting switch is in the ON position and a constant power supply is a device which supplies power while the starting switch is in the OFF and ON positions).
- ★ When carrying out troubleshooting related to the electrical system, you should check the fuse box to see if the power is supplied normally.

Fuse box

Type of power supply (Source)	Fuse name	Capacity of fuse	Destination of power
Switch power supply (Starting switch terminal M)	A1	10A	Meters Turn signal lamps
	A2	10A	F-R switch CPS main relay Parking relay
	A3	10A	ISO controller Seat switch
Constant power supply (Slow blow fuse: SB3)	B1	10A	Horn
	B2	10A	Combination switch Stop lamp switch
	B3	15A	Combination switch
	B4	–	(Unused)
	B5	–	(Unused)
	B6	–	(Unused)
	B7	–	(Unused)
Switch power supply (Starting switch terminal ST)	C1	10A	Brake relay
Drive signal (ISO controller)	C2	10A	C/V solenoid

Locations of fuses and fuse No.

- The fuses are installed in fuse box (1) at the front of the battery on the left side of the engine compartment.

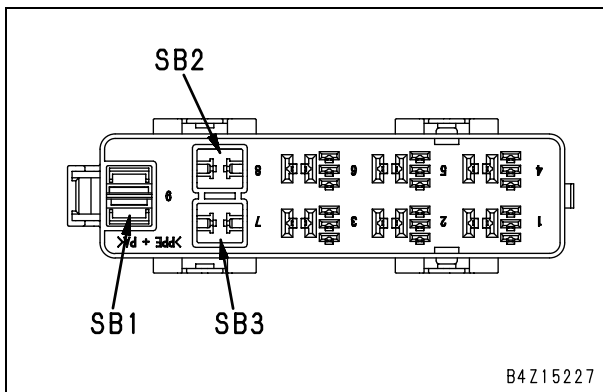
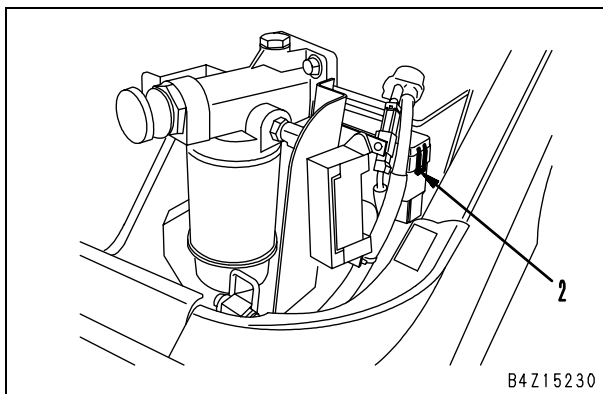


Slow blow fuse

Type of power supply (Source)	Fuse name	Capacity of fuse	Destination of power
Constant power supply (Battery)	SB1	120A	Fuses B1 – B7 Alternator
	SB2	40A	Starting motor relay
	SB3	40A	Starting switch terminal B

Locations of slow blow fuses and fuse No.

- The slow blow fuses are installed in relay case (2) at the front of the battery on the left side of the engine compartment.



Applicable model: Lift truck with EBT-TB45-1A/2A/3A engine (For general)**Connection table of fuse box**

- ★ This connection table shows the devices to which each power supply of the fuse box supplies power (A switch power supply is a device which supplies power while the starting switch is in the ON position and a constant power supply is a device which supplies power while the starting switch is in the OFF and ON positions).
- ★ When carrying out troubleshooting related to the electrical system, you should check the fuse box to see if the power is supplied normally.

Fuse box

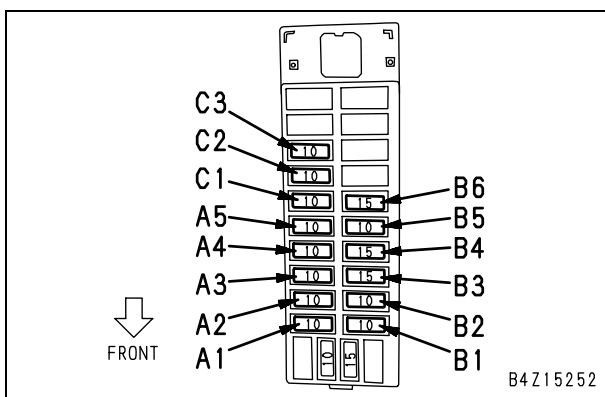
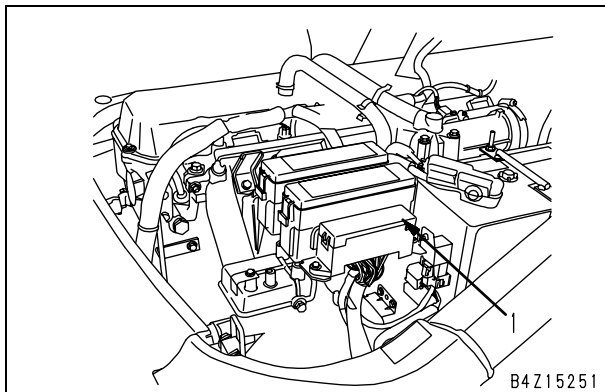
Type of power supply (Source)	Fuse name	Capacity of fuse	Destination of power
Switch power supply (Starting switch terminal M)	A1	10A	Meters Turn signal lamps
	A2	10A	F-R switch CPS main relay Parking relay
	A3	10A	ISO controller Seat switch
	A4 [*1]	10A	Fuel injector
	A5 [*1]	10A	Fuel pump relay
Constant power supply (Slow blow fuse: SB1)	B1	10A	Horn
	B2	10A	Combination switch Stop lamp switch
	B3	15A	Combination switch
	B4	15A	ETC relay
	B5	10A	EGI 2 relay
	B6	15A	EGI 1 relay, engine controller
	B7	–	(Unused)
	B8	–	(Unused)
	B9	–	(Unused)
Switch power supply (Starting switch terminal ST)	C1	10A	Brake relay
Drive signal (ISO controller)	C2	10A	C/V solenoid
Drive signal (Engine controller)	C3 [*2]	10A	LPG relay

*1: Applied to EBT-TB45-1A engine (Gasoline), EBT-TB45-2A engine (Gasoline/LPG)

*2: Applied to EBT-TB45-2A engine (Gasoline/LPG), EBT-TB45-3A (LPG specification)

Locations of fuses and fuse No.

- The fuses are installed in fuse box (1) at the front of the battery on the left side of the engine compartment.

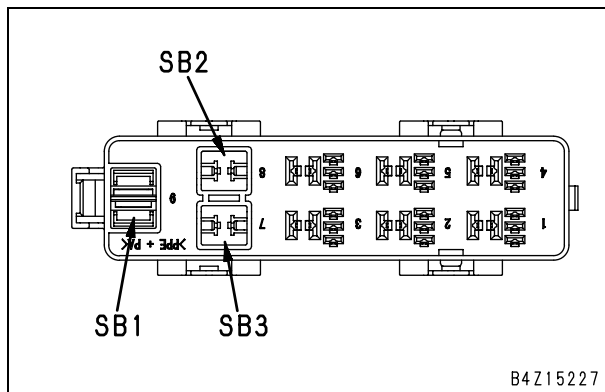
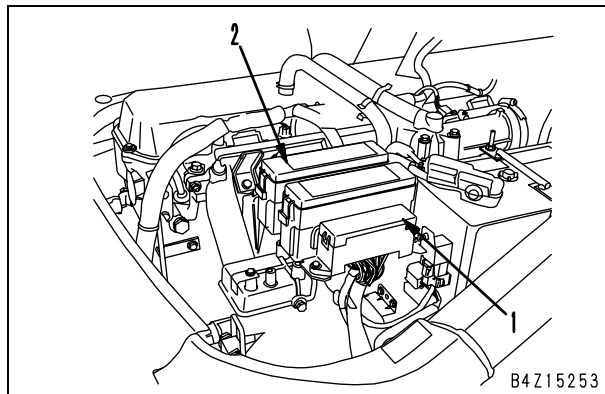


Slow blow fuse

Type of power supply (Source)	Fuse name	Capacity of fuse	Destination of power
Constant power supply (Battery)	SB1	120A	Fuses B1 – B9 Alternator
	SB2	40A	Starting motor relay
	SB3	40A	Starting switch terminal B

Locations of slow blow fuses and fuse No.

- The slow blow fuses are installed in relay case (2) at the front of the battery on the left side of the engine compartment.



Applicable model: Lift truck with SAA4D95LE-5-A engine (For USA)**Connection table of fuse box**

- ★ This connection table shows the devices to which each power supply of the fuse box supplies power (A switch power supply is a device which supplies power while the starting switch is in the ON position and a constant power supply is a device which supplies power while the starting switch is in the OFF and ON positions).
- ★ When carrying out troubleshooting related to the electrical system, you should check the fuse box to see if the power is supplied normally.

Fuse box 1

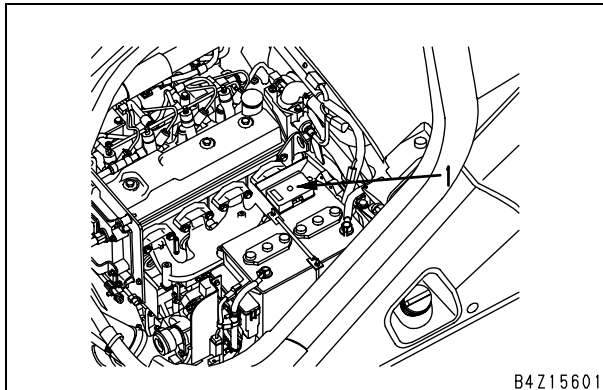
Type of power supply (Source)	Fuse name	Capacity of fuse	Destination of power
Constant power supply (Slow blow fuse: SB3)	F1	10A	Horn relay
	F2	10A	Combination switch (Tail lamp) Stop lamp switch Parking relay
	F3	15A	Combination switch (Head lamp)
	F4	30A	PWM relay
Switch power supply (Starting switch terminal M)	F11	10A	Meters Flasher unit
	F12	10A	F-R switch
	F13	10A	ISO controller Seat switch
	F16	10A	Backup lamp
	F17	10A	L.O.P (Option)

Fuse box 2

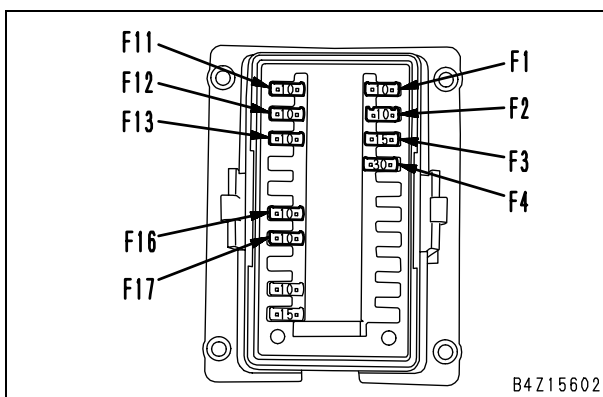
Type of power supply (Source)	Fuse name	Capacity of fuse	Destination of power
Switch power supply (Starting switch terminal ST)	LF1	10A	Brake relay
Switch power supply (ISO controller)	LF2	10A	C/V solenoid

Locations of fuses and fuse No.

- The fuses F1 – F17 are installed in fuse box 1 (1) at the front of the battery on the left side of the engine compartment.

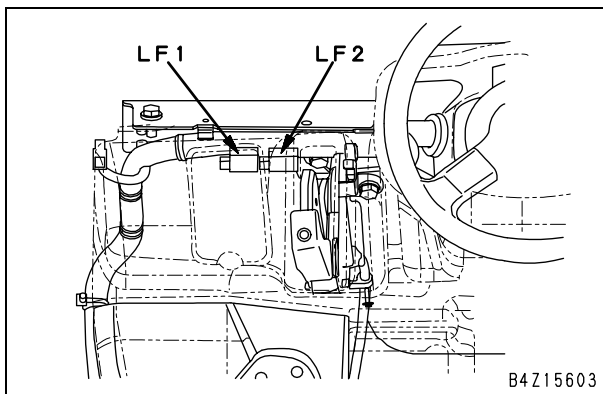


B4Z15601



B4Z15602

- Line fuses LF1 and LF2 are taped to the main wiring harness on the left side in the dashboard.
 - ★ When replacing the line fuses, replace the dashboard.



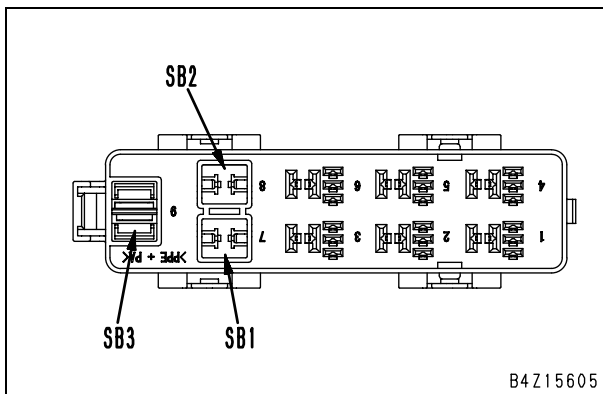
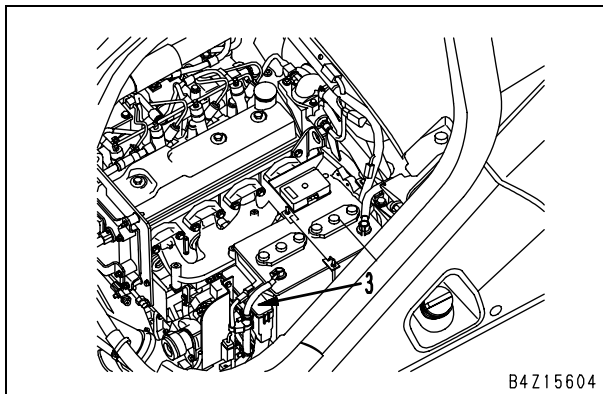
B4Z15603

Slow blow fuse

Type of power supply (Source)	Fuse name	Capacity of fuse	Destination of power
Constant power supply (Battery)	SB1	40A	Starting switch terminal B
	SB2	40A	Starting motor relay
	SB3	120A	Fuses F1 – F4 Alternator

Locations of slow blow fuses and fuse No.

- The slow blow fuses are installed in relay case (3) at the front of the battery on the left side of the engine compartment.



Applicable model: Lift truck with EBT-TB45-2A/3A engine (For USA)**Connection table of fuse box**

- ★ This connection table shows the devices to which each power supply of the fuse box supplies power (A switch power supply is a device which supplies power while the starting switch is in the ON position and a constant power supply is a device which supplies power while the starting switch is in the OFF and ON positions).
- ★ When carrying out troubleshooting related to the electrical system, you should check the fuse box to see if the power is supplied normally.

Fuse box 1

Type of power supply (Source)	Fuse name	Capacity of fuse	Destination of power
Constant power supply (Slow blow fuse: SB3)	F1	10A	Horn relay
	F2	10A	Combination switch (Tail lamp) Stop lamp switch Parking relay
	F3	15A	Combination switch (Head lamp)
	F4	15A	ETC relay
	F5	10A	EGI relay 1 EGI relay 2
	F6	15A	EGI relay 1 Engine controller
Switch power supply (Starting switch terminal M)	F11	10A	Meters Flasher unit
	F12	10A	Main relay F-R switch
	F13	10A	ISO controller Seat switch
	F14 [*]	10A	Fuel injector
	F15 [*]	10A	Fuel pump relay
	F16	10A	Backup lamp
	F17	10A	L.O.P (Option)

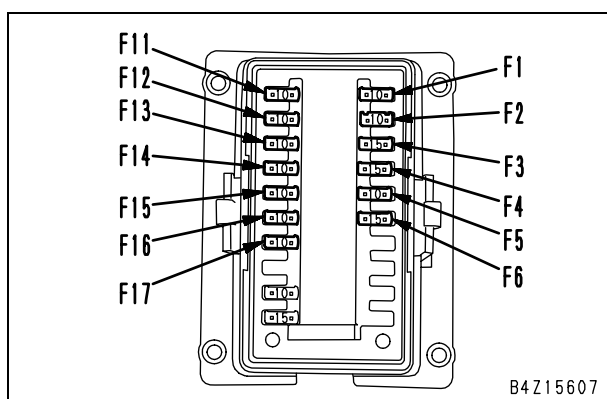
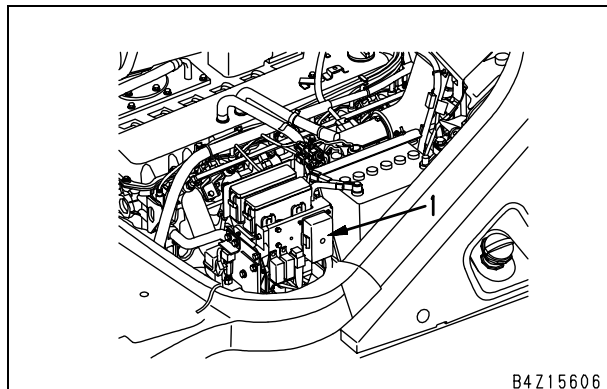
*: Applied to EBT-TB45-2A engine (Gasoline/LPG) only

Fuse box 2

Type of power supply (Source)	Fuse name	Capacity of fuse	Destination of power
Switch power supply (Starting switch terminal ST)	LF1	10A	Brake relay
Switch power supply (ISO controller)	LF2	10A	C/V solenoid

Locations of fuses and fuse No.

- The fuses F1 – F17 are installed in fuse box 1 (1) at the front of the battery on the left side of the engine compartment.

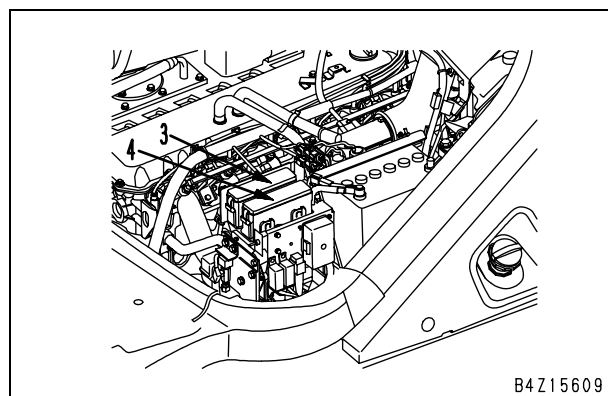


Slow blow fuse

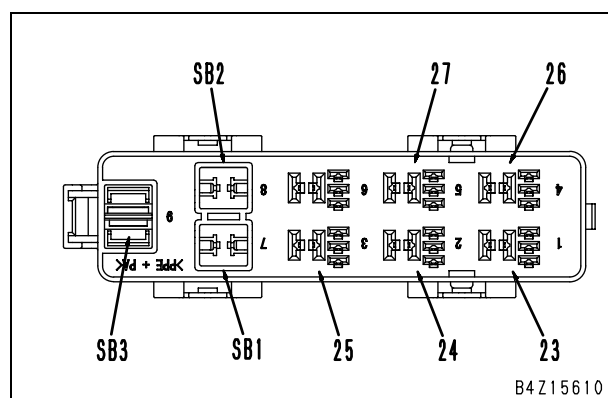
Type of power supply (Source)	Fuse name	Capacity of fuse	Destination of power
Constant power supply (Battery)	SB1	40A	Starting switch terminal B
	SB2	40A	Starting motor relay
	SB3	120A	Alternator
	SB6	100A	Fuses F1 – F6

Locations of slow blow fuses and fuse No.

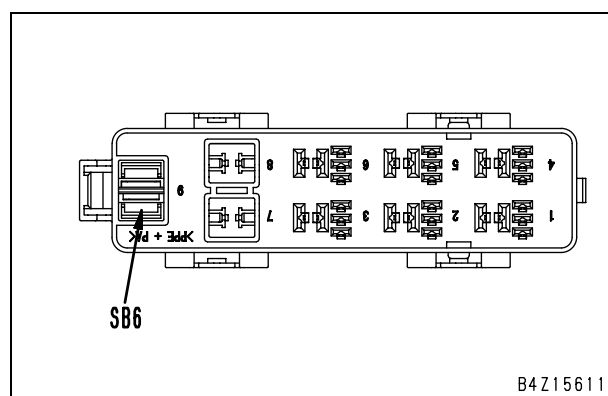
- The slow blow fuses are installed in relay case 1 (3) and relay case 2 (4) at the front of the battery on the left side of the engine compartment.



Relay case 1



Relay case 2



FORKLIFT TRUCK

CX50 Series

Applicable model Serial number

For general

FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up

For USA

FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

40 Troubleshooting

201 Troubleshooting by failure code (ISO controller system (*)) (Part 1)

Applicable model: Lift truck with ISO controller (For general)

Failure code display by ISO controller	2
Failure code [!]: 1 flashing, [N]: Flashing, [L]: Flashing] Seat switch trouble	6
Failure code [!]: 2 flashings, [N]: Flashing, [L]: OFF] F/R lever trouble	8
Failure code [!]: 3 flashings, [N]: OFF, [L]: OFF] Parking brake reminder buzzer output abnormality or N (neutral) lamp and lift interlock warning lamp output abnormality	10
Failure code [!]: 4 flashings, [N]: OFF, [L]: Flashing] Lift interlock relay output abnormality (1)	14
Failure code [!]: 4 flashings, [N]: Flashing, [L]: Flashing] Lift interlock relay output abnormality (2)	16
Failure code [!]: 5 flashings, [N]: OFF, [L]: Flashing] Travel interlock relay output abnormality (1)	18
Failure code [!]: 5 flashings, [N]: Flashing, [L]: Flashing] Travel interlock relay output abnormality (2)	20
Failure code [!]: 6 flashings, [N]: Flashing, [L]: Flashing] Main relay output abnormality	22
Failure code [!]: 7 flashings, [N]: Flashing, [L]: Flashing] Controller abnormality	24

*: Operator Presence Sensing (OPS) system

Failure code display by ISO controller

1. Outline

- If the ISO controller detects a trouble, it indicates the trouble information with the 3 lamps.

2. Lamps used for indicating troubles and notification in Troubleshooting

- If the ISO controller detects a trouble, it indicates that trouble with the following 3 lamps on the instrument panel.

1) Failure indicator

- The controller indicates the contents of the trouble and category of the cause with the number of flashes of the failure indicator. Furthermore, the controller indicates the details by flashing/turning off the neutral lamp and lift interlock warning lamp.
- The lamps flash by the number corresponding to each trouble for a short time and then repeat flashing at intervals until the controller resets.
- In Troubleshooting, the failure indicator is expressed with the symbol of [I].

2) Neutral lamp

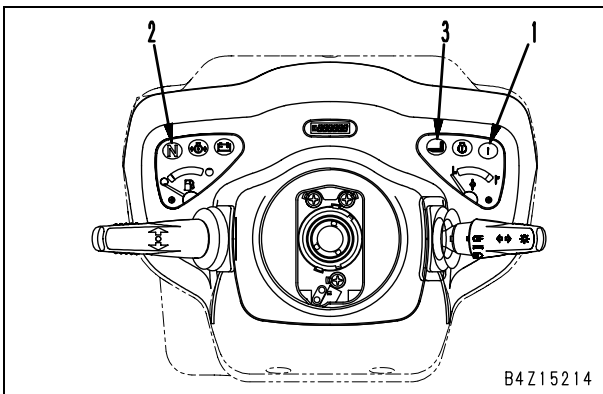
- When the failure indicator flashes, the controller shows the details of the trouble information by flashing or turning off the neutral lamp.
- In Troubleshooting, the neutral lamp is expressed with the symbol of [N].

Reference: Since the F-R switch position is indicated first, if F (forward)/R (reverse) lever is in neutral, the neutral lamp does not flash but lights up.

3) Lift interlock warning lamp

- When the failure indicator flashes, the controller shows the details of the trouble information by flashing or turning off the lift interlock warning lamp.
- In Troubleshooting, the lift interlock warning lamp is expressed with the symbol of [L].

Remark: In Troubleshooting, letter [L] which has an image similar to the lift interlock warning lamp is used for convenience.



1. Failure indicator
2. Neutral lamp
3. Lift interlock warning lamp

3. Outline of failure indication

No.	Trouble	Failure indicator [I] Number of flashings	Condition of neutral lamp [N]	Condition of lift interlock warning lamp [L]	Contents of trouble	Repair method	Reset method	Remarks
1	Travel system and work equipment do not operate.	1	Flashing *1	Flashing	Seat switch trouble (Disconnection or short circuit)	1) Check and repair seat switch circuit	Restoration to normal	See remark table 1
2	Lift truck cannot travel.	2	Flashing *1	OFF	F/R lever trouble (Short circuit)	1) Check and repair F/R lever circuit	Restoration to normal	See remark table 2
3	1) Parking brake reminder buzzer 1-1) When parking brake lever is pulled, buzzer does not stop sounding. 1-2) When operator leaves lift truck with parking brake released, buzzer does not sound. 2) Neutral lamp and lift interlock warning lamp 2-1) When F/R lever is set in neutral, neutral lamp does not light. 2-2) When F/R lever is not set in neutral, neutral lamp does not go off. 2-3) When key is turned to ON position, lift interlock warning lamp does not light for certain period. 2-4) After key is turned to ON position, lift interlock warning lamp does not go off.	3	OFF	OFF	1) Parking brake reminder buzzer output abnormality (Disconnection or short circuit) 2) "Neutral lamp" or "Lift interlock warning lamp" output abnormality (Disconnection or short circuit)	1) Check and repair PARKING relay of parking brake remainder buzzer and buzzer circuit 2) Neutral lamp Check and repair circuits of neutral lamp and lift interlock warning lamp.	1) Parking brake reminder buzzer: Restoration to normal 2) Neutral lamp: Turn key to OFF position.	
4	1) Only work equipment does not operate. 2) Travel system and work equipment do not operate.	4	1) OFF 2) Flashing *1	Flashing	Lift interlock relay output abnormality (Disconnection or short circuit) 1) Opening of controller output transistor or disconnection in relay 2) Short circuit in controller output transistor or short circuit in MAST, F or R relay	1) Only work equipment Check and repair MAST relay and relay circuit 2) Travel system and work equipment Check and repair MAST relay, F relay, R relay and relay circuit.	1) Restoration to normal or turn key to OFF position. 2) Turn key to OFF position.	
5	1) Only travel system does not operate. 2) Travel system and work equipment do not operate.	5	Flashing *1	1) OFF 2) Flashing	Travel interlock relay output abnormality (Disconnection or short circuit) 1) Opening of controller output transistor or disconnection in relay 2) Short circuit in controller output transistor or short circuit in MAST, F or R relay	1) Only travel system Check and repair F and R relays and relay circuit 2) Travel system and work equipment Check and repair F relay, R relay, MAST relay and relay circuit.	1) Restoration to normal or turn key to OFF position. 2) Turn key to OFF position.	
6	Travel system and work equipment do not operate.	6	Flashing *1	Flashing	Main relay output abnormality (Disconnection or short circuit)	Check and repair MAIN relay and relay circuit	Turn key to OFF position.	
7	Travel system and work equipment do not operate.	7	Flashing *1	Flashing	Controller abnormality	1) Check and repair power supply circuit. 2) Replace controller.	Turn key to OFF position.	Return controller, then check.

*1: When the F/R lever is in neutral, the neutral lamp lights.

*2: The neutral lamp is also used as the travel interlock warning lamp.

Remark table 1

Input		Output	Remarks
SEAT_SW1	SEAT_SW2	Failure indicator	
OFF	OFF	Error No. 1 (1 flashing)	Open
OFF	ON	OFF	Normal
ON	OFF	OFF	Normal
ON	ON	Error No. 1 (1 flashing)	Short circuit

Remark table 2

Input		Output	Remarks
F_SW1	R_SW2	Failure indicator	
OFF	OFF	OFF	Normal (neutral)
ON	OFF	OFF	Normal (F)
OFF	ON	OFF	Normal (R)
ON	ON	Error No. 2 (1 flashing)	Failure indicator

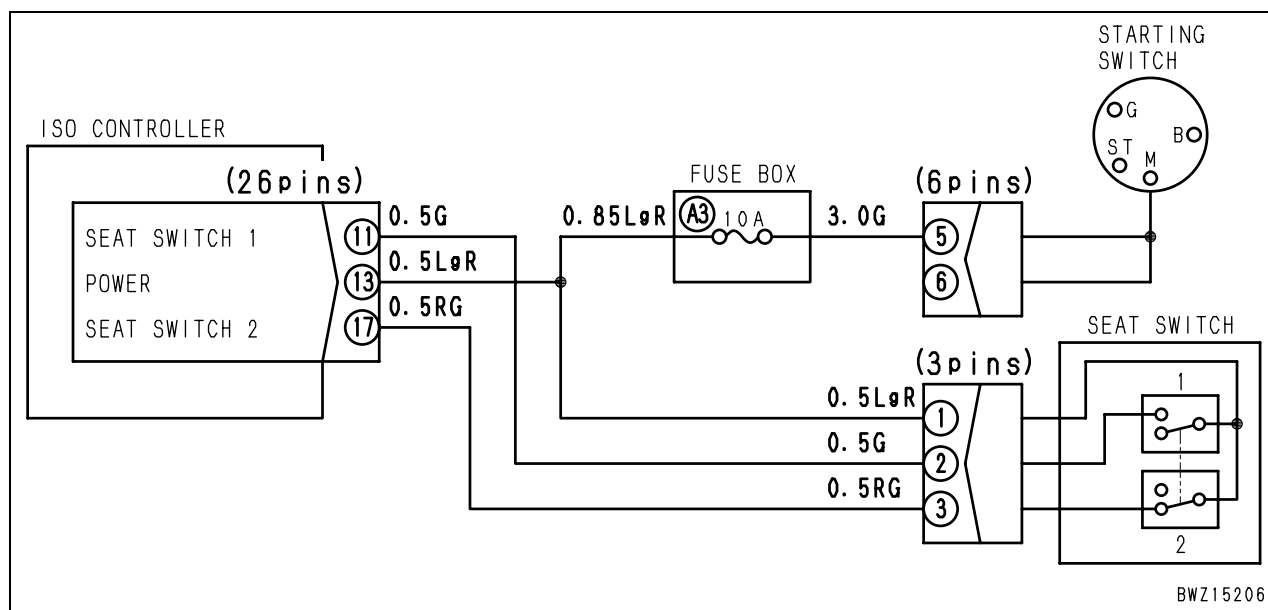
Failure code [!]: 1 flashing, [N]: Flashing, [L]: Flashing ([!]: Failure indicator, [N]: Neutral lamp, [L]: Lift interlock warning lamp)

Seat switch trouble

Failure code	Trouble	Seat switch trouble (ISO controller system)
[!]: 1 flashing, [N]: Flashing, [L]: Flashing		
Contents of trouble	Travel system and work equipment do not move because of seat switch system trouble (Disconnection or short circuit).	
Action of controller	- Stops outputting signals to F/R relay and mast relay. - Flashes warning lamp shown in failure code column (Continues flashing until cause of trouble is repaired).	
Problem that appears on lift truck	Lift truck cannot travel or move work equipment.	
Related information	- When trouble is displayed, if F/R lever is in neutral, [N]: neutral lamp does not flash but light up. - If trouble is repaired, controller resets itself.	

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse A3	If fuse is broken, circuit probably has ground fault (See cause 4).		
	2	Defective seat switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			SEAT SWITCH (male)	Operator	Resistance
			Between (1) and (2)	Seated	Max. 1 Ω
				Not seated	Min. 1 MΩ
			Between (1) and (3)	Seated	Min. 1 MΩ
				Not seated	Max. 1 Ω
			Between (2) and (3)	Always	Min. 1 MΩ
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
	4	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	5	Short circuit in wiring harness (Contact with another circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and terminal of another circuit.		
			Measure resistance between related circuits shown in figure for short circuit.	Resistance	Min. 1 MΩ

Related circuit diagram

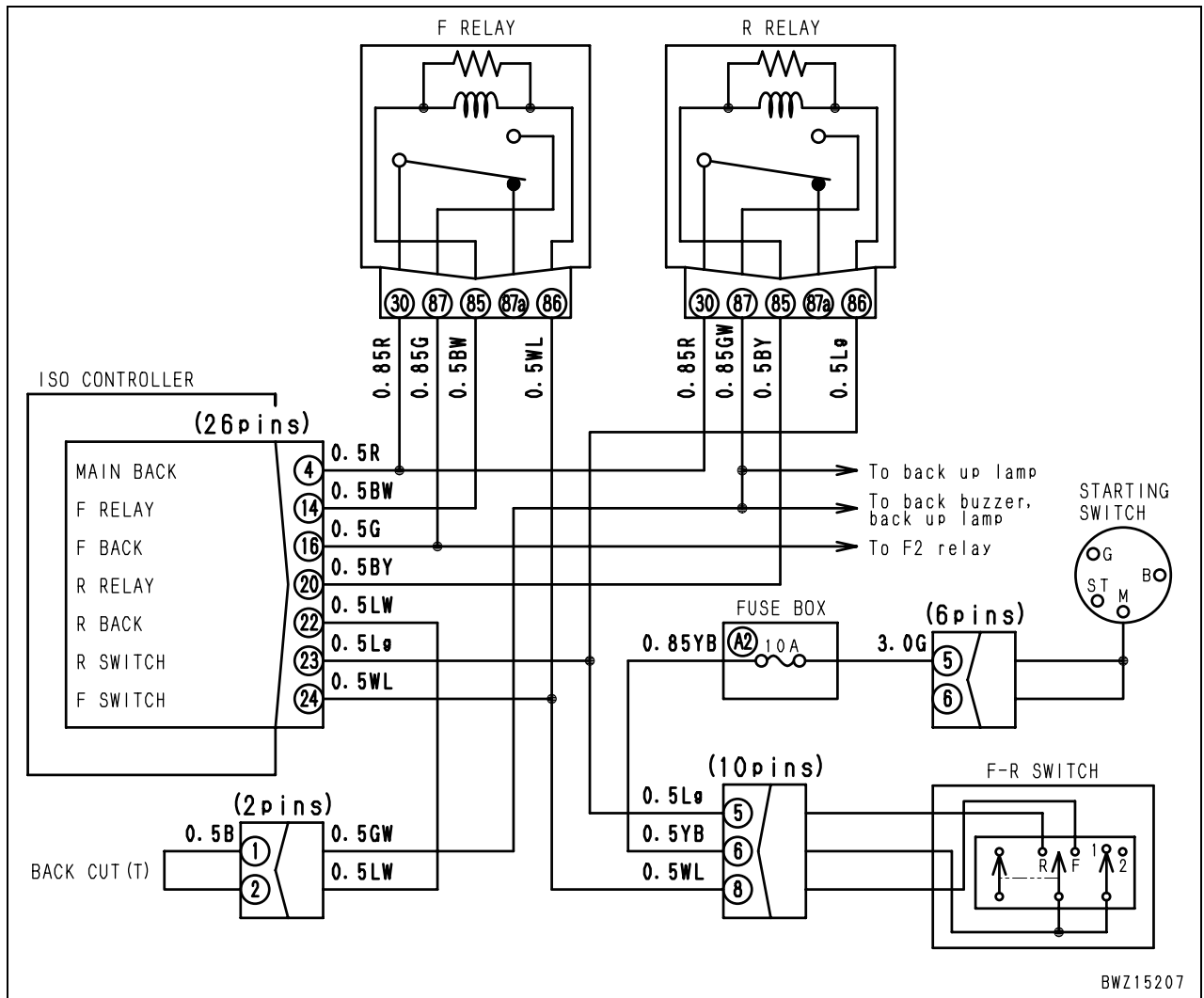


Failure code [!]: 2 flashings, [N]: Flashing, [L]: OFF ([!]: Failure indicator, [N]: Neutral lamp, [L]: Lift interlock warning lamp) F/R lever trouble

Failure code	Trouble	F/R lever trouble (ISO controller system)
[!]: 2 flashings, [N]: Flashing, [L]: OFF		
Contents of trouble	Lift truck cannot travel because of F/R lever system trouble (short circuit).	
Action of controller	- Stops outputting signals to F/R relay. - Flashes warning lamp shown in failure code column (Continues flashing until cause of trouble is repaired).	
Problem that appears on lift truck	Lift truck cannot travel.	
Related information	- When trouble is displayed, if F/R lever is in neutral, [N]: neutral lamp does not flash but light up. - If trouble is repaired, controller resets itself.	

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective F/R lever (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			F-R SWITCH (male)	Lever position	Resistance
			Between (6) and (8)	Forward	Max. 1 Ω
				Reverse	Min. 1 MΩ
			Between (6) and (5)	Forward	Min. 1 MΩ
				Reverse	Max. 1 Ω
			Between (5) and (8)	Always	Min. 1 MΩ
	2	Short circuit in wiring harness (Contact with another circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and terminal of another circuit.		
			Measure resistance between related circuits shown in figure for short circuit.	Resistance	Min. 1 MΩ

Related circuit diagram



Failure code [[!]: 3 flashings, [N]: OFF, [L]: OFF]**[[!]: Failure indicator, [N]: Neutral lamp, [L]: Lift interlock warning lamp)****Parking brake reminder buzzer output abnormality or N (neutral) lamp and lift interlock warning lamp output abnormality**

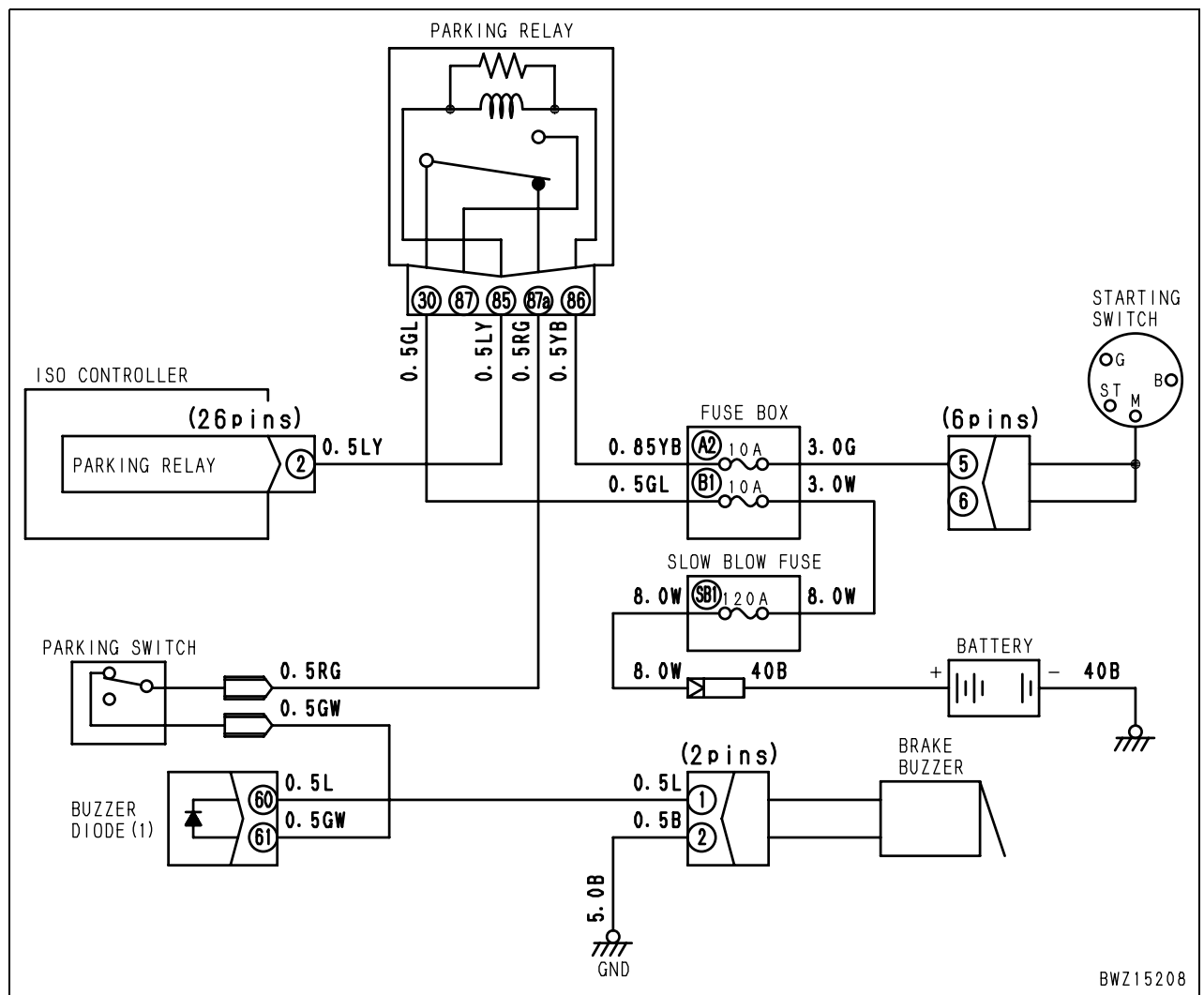
Failure code		Trouble	Parking brake reminder buzzer output abnormality or N (neutral) lamp and lift interlock warning lamp output abnormality (ISO controller system)
[!]: 3 flashings, [N]: OFF, [L]: OFF			
Contents of trouble	1) Parking brake reminder buzzer output abnormality (disconnection or short circuit) was detected. 2) Neutral lamp or lift interlock warning lamp output abnormality (disconnection or short circuit) was detected.		
Action of controller	• Flashes warning lamp shown in failure code column (Continues flashing until cause of trouble is repaired).		
Problem that appears on lift truck	1) Following phenomena occur because of parking brake reminder buzzer output abnormality (disconnection or short circuit). • After parking brake lever is pulled, buzzer continues sounding. • When operator leaves lift truck with parking brake released, buzzer does not sound. 2) Following phenomena occur because of neutral lamp or lift interlock warning lamp output abnormality (disconnection or short circuit). • When F/R lever is in neutral, neutral lamp does not light. • When F/R lever is not in neutral, neutral lamp does not go off. • When starting switch is turned to ON position, lift interlock warning lamp does not light for several seconds. • After starting switch is turned to ON position, lift interlock warning lamp does not go off.		
Related information	1) If parking brake reminder buzzer output abnormality is repaired, controller resets itself. 2) When neutral lamp or lift interlock warning lamp output abnormality occurs, if starting switch is turned to OFF position, controller resets itself.		

1) Parking brake reminder buzzer output abnormality

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse A2 or B1	If fuse is broken, circuit probably has ground fault (See cause 7).		
	2	Defective parking brake switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			PARKING SWITCH (Terminal on switch side)	Parking brake lever operation	Resistance
			Between terminals	ON (park)	Max. 1 Ω
	3	Defective brake buzzer (Internal defect)	★ Prepare with starting switch OFF. ★ Check buzzer unit. ★ Connect (+) to (1) and (–) to (2).		
			BRAKE BUZZER (male)	12 V applied	Buzzer sounds
			Between (1) and (2)	Other than above	Buzzer does not sound
	4	Defective buzzer diode (1) (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and measure with (61) on (+) side.		
			Between BUZZER DIODE (1) (male) (61) and (60)		Continues
	5	Defective parking brake relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Parking brake relay is defective
				Normal state is not recovered	Parking brake relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			PARKING RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87a)	12 V applied (Relay: ON)	Min. 1 MΩ
				Other than above (Relay: OFF)	Max. 1 Ω

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	6	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals. Check continuity between related circuit terminals shown in figure for disconnection.		
	7	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
	8	Hot short in wiring harness (Contact with 12V circuit)	★ If buzzer does not stop sounding, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting. Between PARKING SWITCH – BRAKE BUZZER (female) (1) wiring harness and ground		
				Resistance	Max. 1 Ω
				Resistance	Min. 1 MΩ
				Voltage	Max. 1 V

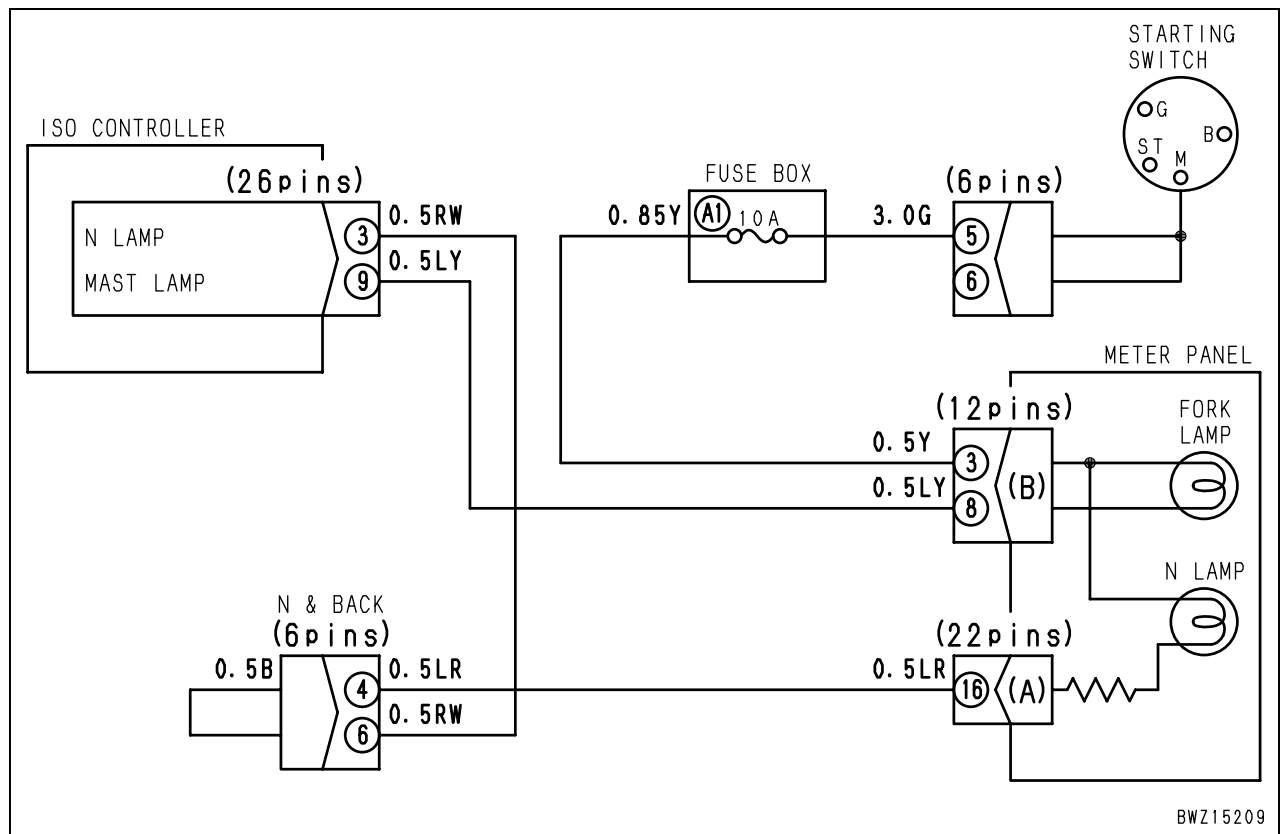
Related circuit diagram



2) Neutral lamp or lift interlock warning lamp output abnormality

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective fuse A1	If fuse is broken, circuit probably has ground fault (See cause 5).			
	2	Defective neutral lamp (Internal defect)	Between METER PANEL (B) (male) (3) and METER PANEL (A) (male) (16)	12 V applied	ON	
				Other than above	OFF	
	3	Defective lift interlock warning lamp (Internal defect)	Between METER PANEL (B) (male) (3) and (8)	12 V applied	ON	
				Other than above	OFF	
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω
	5	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 MΩ
	6	Hot short (Contact with 12V circuit) in wiring harness	★ If lamp does not go off, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.			
			Between CONTROLLER (female) (3) – METER PANEL (A) (male) (16) wiring harness and ground		Voltage	Max. 1 V
			Between CONTROLLER (female) (9) – METER PANEL (B) (male) (8) wiring harness and ground		Voltage	Max. 1 V

Related circuit diagram

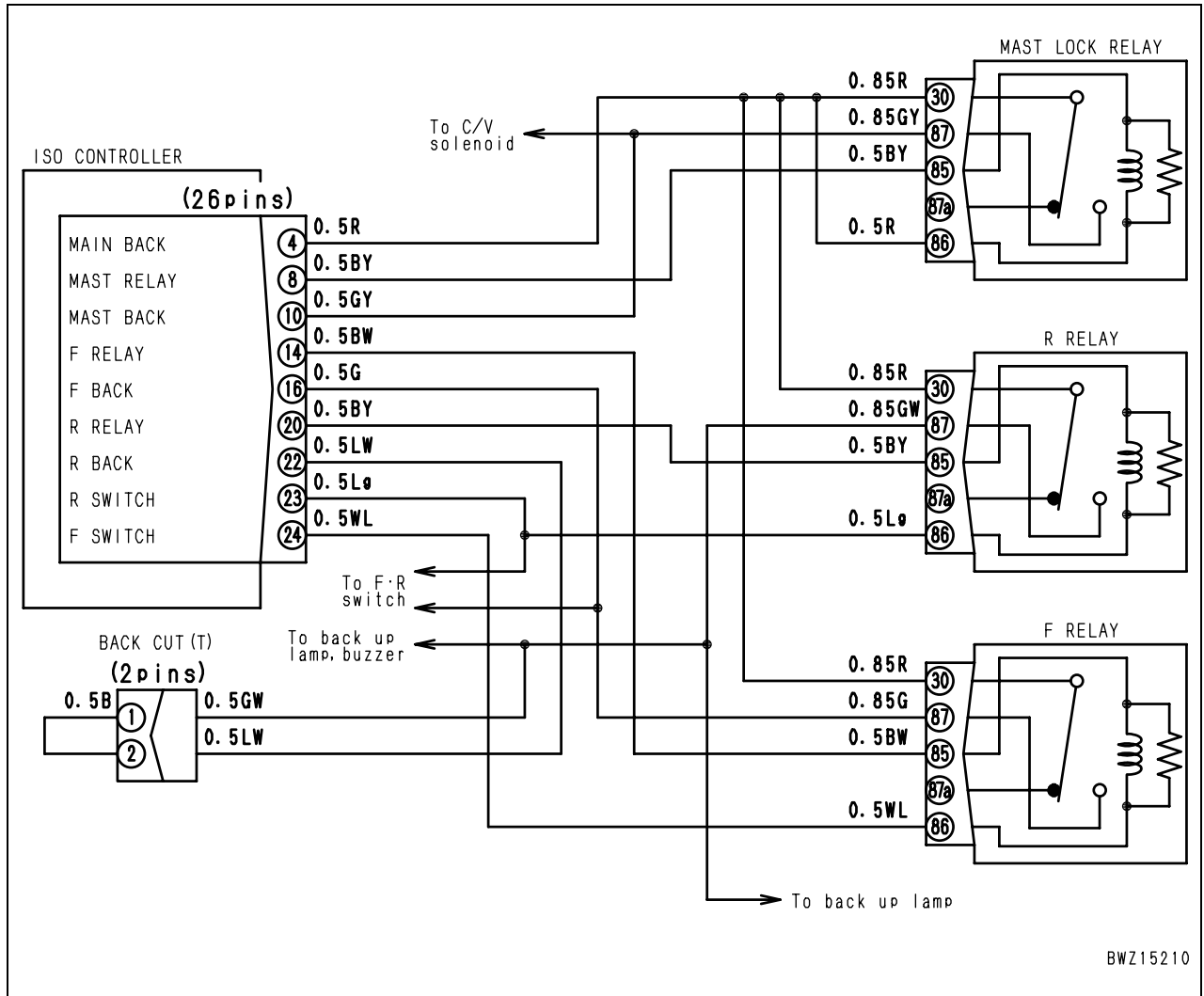


Failure code [!]: 4 flashings, [N]: OFF, [L]: Flashing ([!]: Failure indicator, [N]: Neutral lamp, [L]: Lift interlock warning lamp) Lift interlock relay output abnormality (1)

Failure code	Trouble	Lift interlock relay output abnormality (1) (ISO controller system)
[!]: 4 flashings, [N]: OFF, [L]: Flashing		
Contents of trouble	Lift truck cannot move work equipment because of lift interlock relay output abnormality (disconnection or opening of controller output transistor) (It can travel, however.)	
Action of controller	Flashes warning lamp shown in failure code column (Continues flashing until cause of trouble is repaired).	
Problem that appears on lift truck	Lift truck cannot move work equipment (It can travel, however.)	
Related information	If trouble is repaired or starting switch is turned to OFF position, controller resets itself.	

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective lift interlock relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Lift interlock relay is defective
				Normal state is not recovered	Lift interlock relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			MAST LOCK RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance Max. 1 Ω
	3	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance Min. 1 MΩ
4	4	Defective ISO controller (Internal defect)	If above causes are not the cause for the trouble, ISO controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)		

Related circuit diagram



Failure code [!]: 4 flashings, [N]: Flashing, [L]: Flashing] ([!]: Failure indicator, [N]: Neutral lamp, [L]: Lift interlock warning lamp)

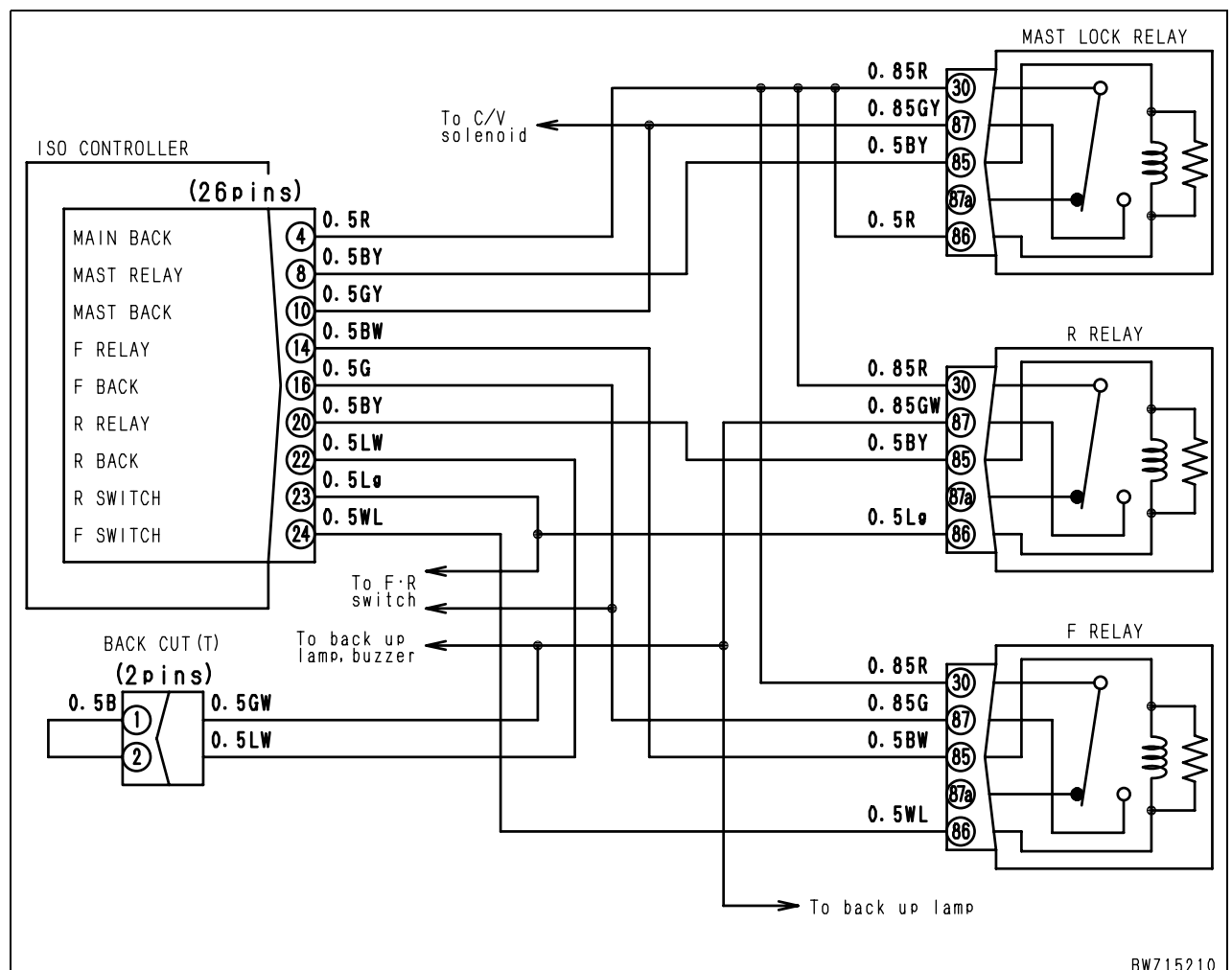
Lift interlock relay output abnormality (2)

Failure code		Trouble	Lift interlock relay output abnormality (2) (ISO controller system)
[!]: 4 flashing, [N]: Flashing, [L]: Flashing			
Contents of trouble	• Lift truck cannot move work equipment or travel because of lift interlock relay output abnormality (relay or controller output transistor has short circuit).		
Action of controller	• Flashes warning lamp shown in failure code column (Continues flashing until cause of trouble is repaired).		
Problem that appears on lift truck	• Lift truck cannot move work equipment or travel.		
Related information	• When trouble is displayed, if F/R lever is in neutral, [N]: neutral lamp does not flash but light up. • If starting switch is turned to OFF position, controller resets itself.		

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective lift interlock relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Lift interlock relay is defective
				Normal state is not recovered	Lift interlock relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			MAST LOCK RELAY (male)	Between (85) and (86)	Resistance
	2	Defective F relay (Internal defect)	Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
			★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	F relay is defective
				Normal state is not recovered	F relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			F RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	3	Defective R relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	R relay is defective
				Normal state is not recovered	R relay is normal

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	3	Defective R relay (Internal defect)	★ Prepare with starting switch OFF. ★ Check relay unit.		
			R RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance Max. 1 Ω
	5	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance Min. 1 MΩ
	6	Defective ISO controller (Internal defect)	If above causes are not the cause for the trouble, ISO controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)		

Related circuit diagram

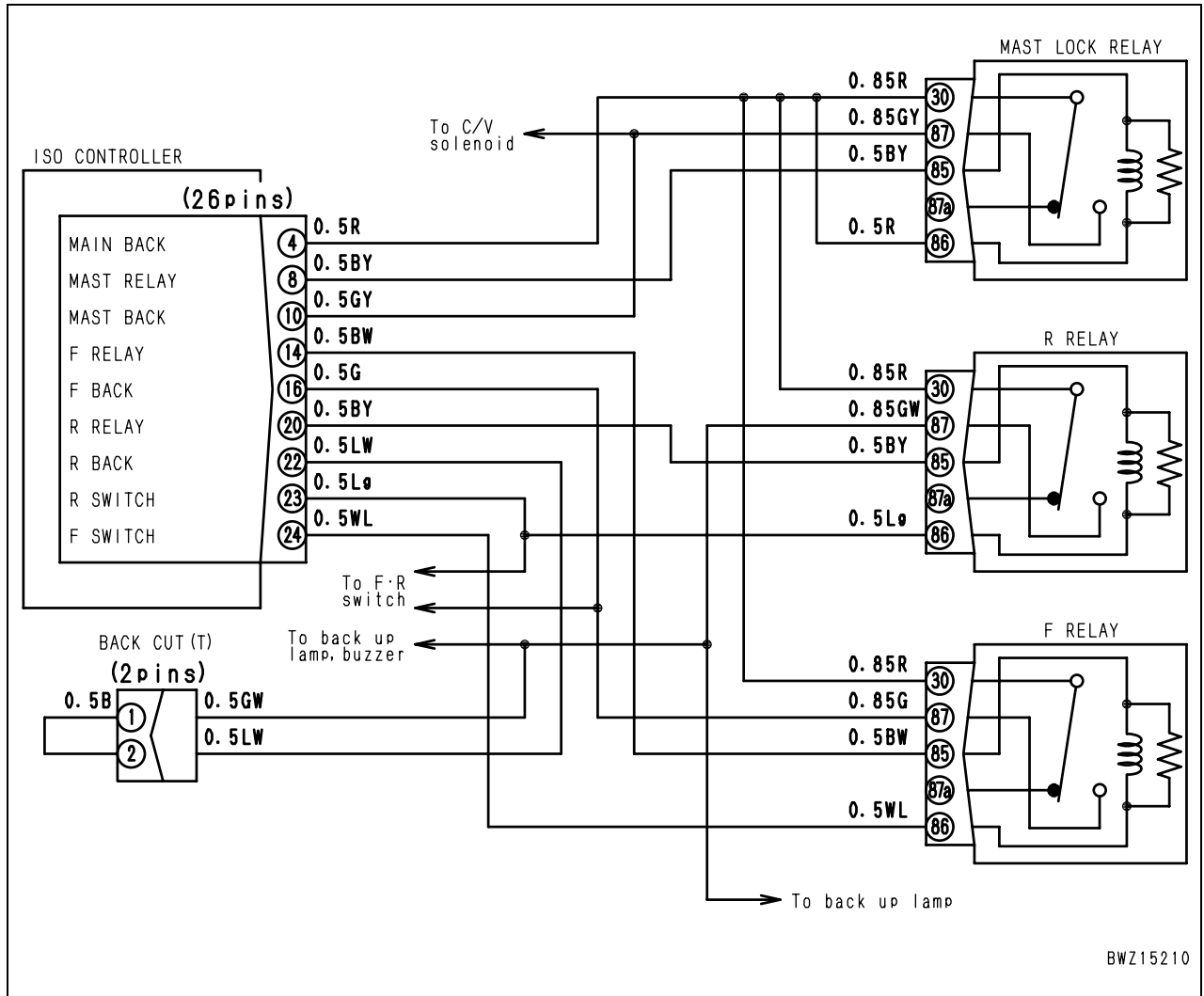


Failure code [!]: 5 flashings, [N]: OFF, [L]: Flashing] ([!]: Failure indicator, [N]: Neutral lamp, [L]: Lift interlock warning lamp) Travel interlock relay output abnormality (1)

Failure code		Trouble	Travel interlock relay output abnormality (1) (ISO controller system)
[!]: 5 flashings, [N]: OFF, [L]: Flashing			
Contents of trouble	• Lift truck cannot travel because of travel interlock relay output abnormality (disconnection or opening of controller output transistor) (It can move work equipment, however.)		
Action of controller	• Flashes warning lamp shown in failure code column (Continues flashing until cause of trouble is repaired).		
Problem that appears on lift truck	• Lift truck cannot travel (It can move work equipment, however.)		
Related information	• If trouble is repaired or starting switch is turned to OFF position, controller resets itself.		

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective F relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	F relay is defective	
				Normal state is not recovered	F relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			F RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	2	Defective R relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	R relay is defective	
				Normal state is not recovered	R relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			R RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω
	4	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 MΩ
	5	Defective ISO controller (Internal defect)	If above causes are not the cause for the trouble, ISO controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)			

Related circuit diagram



Failure code [!]: 5 flashings, [N]: Flashing, [L]: Flashing] ([!]: Failure indicator, [N]: Neutral lamp, [L]: Lift interlock warning lamp)

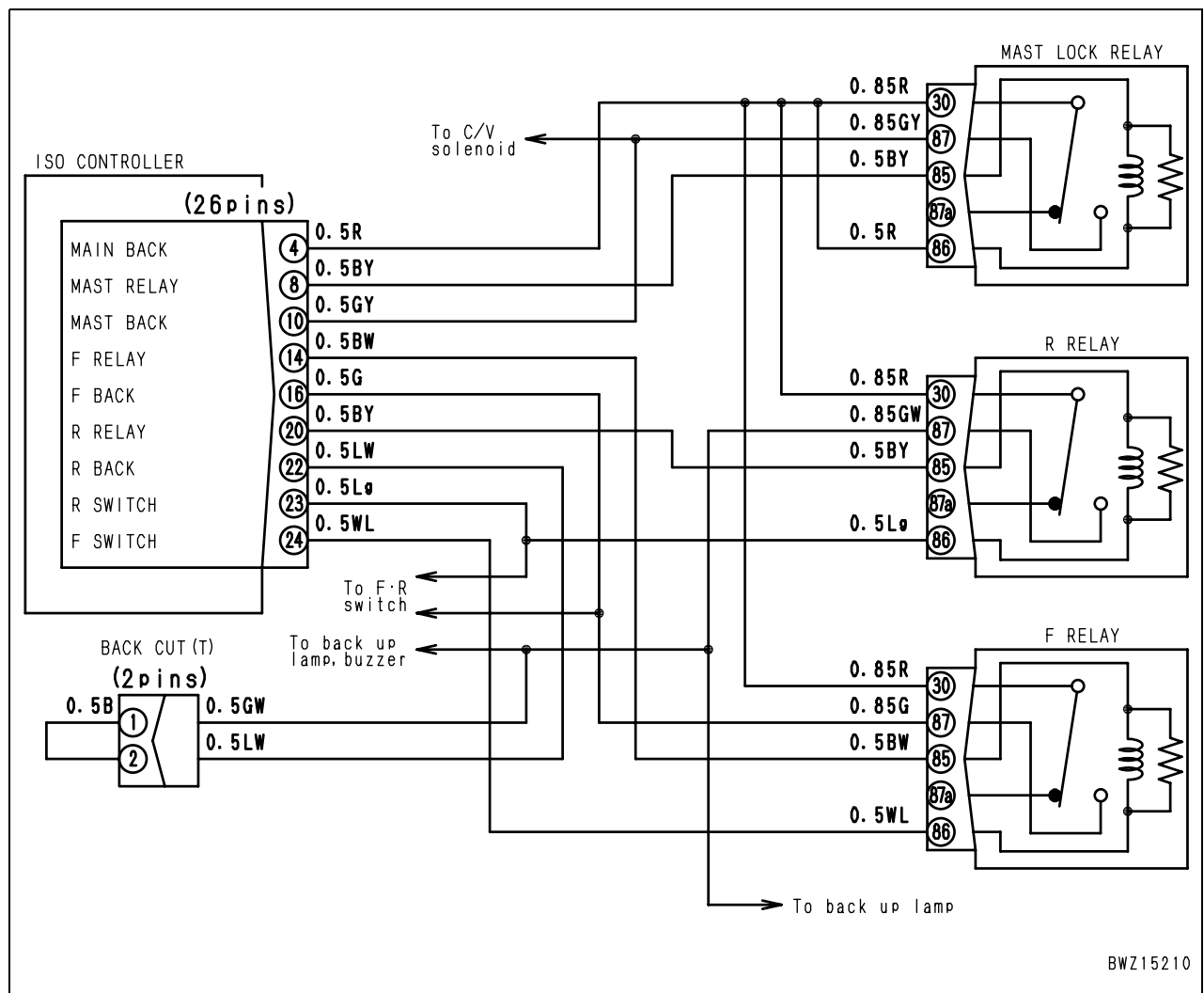
Travel interlock relay output abnormality (2)

Failure code		Trouble	Travel interlock relay output abnormality (2) (ISO controller system)
[!]: 5 flashing, [N]: Flashing, [L]: Flashing			
Contents of trouble	• Lift truck cannot travel or move work equipment because of travel interlock relay output abnormality (relay or controller output transistor has short circuit).		
Action of controller	• Flashes warning lamp shown in failure code column (Continues flashing until cause of trouble is repaired).		
Problem that appears on lift truck	• Lift truck cannot travel or move work equipment.		
Related information	• When trouble is displayed, if F/R lever is in neutral, [N]: neutral lamp does not flash but light up. • If starting switch is turned to OFF position, controller resets itself.		

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective F relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	F relay is defective
				Normal state is not recovered	F relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			F RELAY (male)	Between (85) and (86)	Resistance
	2	Defective R relay (Internal defect)	Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
			★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	R relay is defective
				Normal state is not recovered	R relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			R RELAY (male)	Between (85) and (86)	Resistance
	3	Defective lift interlock relay (Internal defect)	Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
			★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Lift interlock relay is defective
				Normal state is not recovered	Lift interlock relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	3	Defective lift interlock relay (Internal defect)	MAST LOCK RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 M Ω	
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω
	5	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 M Ω
	6	Defective ISO controller (Internal defect)	If above causes are not the cause for the trouble, ISO controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)			

Related circuit diagram



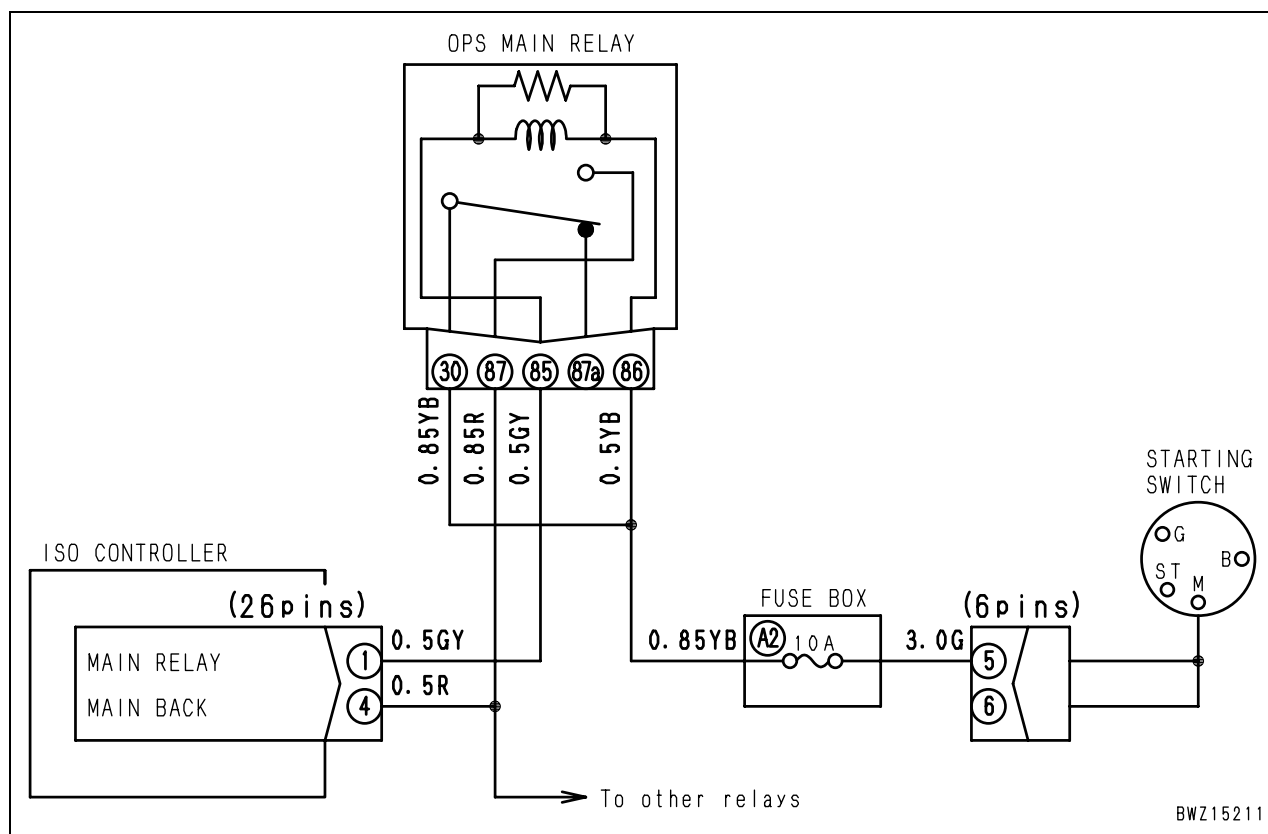
Failure code [!]: 6 flashings, [N]: Flashing, [L]: Flashing] ([!]: Failure indicator, [N]: Neutral lamp, [L]: Lift interlock warning lamp)

Main relay output abnormality

Failure code	Trouble	Main relay output abnormality (ISO controller system)
[!]: 6 flashings, [N]: Flashing, [L]: Flashing		
Contents of trouble	Lift truck cannot travel or move work equipment because of main relay output abnormality (disconnection or short circuit).	
Action of controller	Flashes warning lamp shown in failure code column (Continues flashing until cause of trouble is repaired).	
Problem that appears on lift truck	Lift truck cannot travel or move work equipment.	
Related information	- When trouble is displayed, if F/R lever is in neutral, [N]: neutral lamp does not flash but light up. - If starting switch is turned to OFF position, controller resets itself.	

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse A2	If fuse is broken, circuit probably has ground fault (See cause 4).		
	2	Defective main relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Main relay is defective
				Normal state is not recovered	Main relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			MAIN RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance Max. 1 Ω
	4	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance Min. 1 MΩ

Related circuit diagram



Failure code [!]: 7 flashings, [N]: Flashing, [L]: Flashing] ([!]: Failure indicator, [N]: Neutral lamp, [L]: Lift interlock warning lamp) Controller abnormality

Failure code		Trouble	Controller abnormality (ISO controller system)
[!]: 7 flashings, [N]: Flashing, [L]: Flashing			
Contents of trouble	• Lift truck cannot travel or move work equipment because of controller or power supply system abnormality.		
Action of controller	• Flashes warning lamp shown in failure code column (Continues flashing until cause of trouble is repaired).		
Problem that appears on lift truck	• Lift truck cannot travel or move work equipment.		
Related information	• When trouble is displayed, if F/R lever is in neutral, [N]: neutral lamp does not flash but light up. • If starting switch is turned to OFF position, controller resets itself.		

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse A3	If fuse is broken, circuit probably has ground fault (See cause 4).		
	2	Defective slow blow fuse SB3	If slow blow fuse is broken, circuit probably has ground fault (See cause 4).		
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
	4	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	5	Defective ISO controller (Internal defect)	If above causes are not the cause for the trouble, ISO controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)		

FORKLIFT TRUCK

CX50 Series

Applicable model Serial number

For general

FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up

For USA

FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

40 Troubleshooting

202 Troubleshooting by failure code (ISO controller system (*)) (Part 2)

Applicable model: Lift truck with ISO controller (For USA)

Failure code display by ISO controller	2
Failure code [!]: 1 flashing, [N]: Flashing, [L]: Flashing] Seat switch trouble	6
Failure code [!]: 2 flashings, [N]: Flashing, [L]: OFF] F/R lever trouble	8
Failure code [!]: 3 flashings, [N]: OFF, [L]: OFF] Parking brake reminder buzzer output abnormality or N (neutral) lamp and lift interlock warning lamp output abnormality	10
Failure code [!]: 4 flashings, [N]: OFF, [L]: Flashing] Lift interlock relay output abnormality (1)	14
Failure code [!]: 4 flashings, [N]: Flashing, [L]: Flashing] Lift interlock relay output abnormality (2)	16
Failure code [!]: 5 flashings, [N]: OFF, [L]: Flashing] Travel interlock relay output abnormality (1)	18
Failure code [!]: 5 flashings, [N]: Flashing, [L]: Flashing] Travel interlock relay output abnormality (2)	20
Failure code [!]: 6 flashings, [N]: Flashing, [L]: Flashing] Main relay output abnormality	22
Failure code [!]: 7 flashings, [N]: Flashing, [L]: Flashing] Controller abnormality	24

*: Operator Presence Sensing (OPS) system

Failure code display by ISO controller

1. Outline

- If the ISO controller detects a trouble, it indicates the trouble information with the 3 lamps.

2. Lamps used for indicating troubles and notification in Troubleshooting

- If the ISO controller detects a trouble, it indicates that trouble with the following 3 lamps on the instrument panel.

1) Failure indicator

- The controller indicates the contents of the trouble and category of the cause with the number of flashes of the failure indicator. Furthermore, the controller indicates the details by flashing/turning off the neutral lamp and lift interlock warning lamp.
- The lamps flash by the number corresponding to each trouble for a short time and then repeat flashing at intervals until the controller resets.
- In Troubleshooting, the failure indicator is expressed with the symbol of [I].

2) Neutral lamp

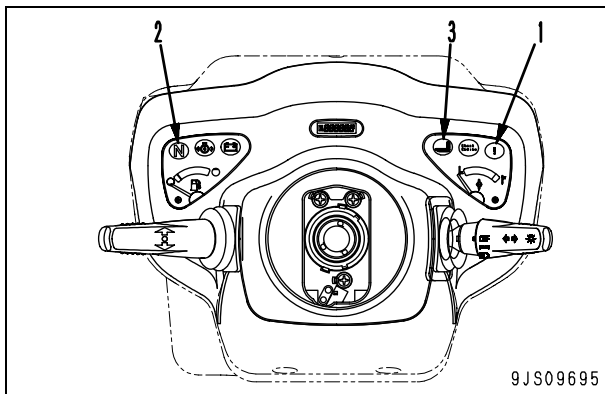
- When the failure indicator flashes, the controller shows the details of the trouble information by flashing or turning off the neutral lamp.
- In Troubleshooting, the neutral lamp is expressed with the symbol of [N].

Reference: Since the F-R switch position is indicated first, if F (forward)/R (reverse) lever is in neutral, the neutral lamp does not flash but lights up.

3) Lift interlock warning lamp

- When the failure indicator flashes, the controller shows the details of the trouble information by flashing or turning off the lift interlock warning lamp.
- In Troubleshooting, the lift interlock warning lamp is expressed with the symbol of [L].

Remark: In Troubleshooting, letter [L] which has an image similar to the lift interlock warning lamp is used for convenience.



1. Failure indicator
2. Neutral lamp
3. Lift interlock warning lamp

3. Outline of failure indication

No.	Trouble	Failure indicator [I] Number of flashings	Condition of neutral lamp [N]	Condition of lift interlock warning lamp [L]	Contents of trouble	Repair method	Reset method	Remarks
1	Travel system and work equipment do not operate.	1	Flashing *1	Flashing	Seat switch trouble (Disconnection or short circuit)	1) Check and repair seat switch circuit	Restoration to normal	See remark table 1
2	Lift truck cannot travel.	2	Flashing *1	OFF	F/R lever trouble (Short circuit)	1) Check and repair F/R lever circuit	Restoration to normal	See remark table 2
3	1) Parking brake reminder buzzer 1-1) When parking brake lever is pulled, buzzer does not stop sounding. 1-2) When operator leaves lift truck with parking brake released, buzzer does not sound. 2) Neutral lamp and lift interlock warning lamp 2-1) When F/R lever is set in neutral, neutral lamp does not light. 2-2) When F/R lever is not set in neutral, neutral lamp does not go off. 2-3) When key is turned to ON position, lift interlock warning lamp does not light for certain period. 2-4) After key is turned to ON position, lift interlock warning lamp does not go off.	3	OFF	OFF	1) Parking brake reminder buzzer output abnormality (Disconnection or short circuit) 2) "Neutral lamp" or "Lift interlock warning lamp" output abnormality (Disconnection or short circuit)	1) Check and repair PARKING relay of parking brake remainder buzzer and buzzer circuit 2) Neutral lamp Check and repair circuits of neutral lamp and lift interlock warning lamp.	1) Parking brake reminder buzzer: Restoration to normal 2) Neutral lamp: Turn key to OFF position.	
4	1) Only work equipment does not operate. 2) Travel system and work equipment do not operate.	4	1) OFF 2) Flashing *1	Flashing	Lift interlock relay output abnormality (Disconnection or short circuit) 1) Opening of controller output transistor or disconnection in relay 2) Short circuit in controller output transistor or short circuit in MAST, F or R relay	1) Only work equipment Check and repair MAST relay and relay circuit 2) Travel system and work equipment Check and repair MAST relay, F relay, R relay and relay circuit.	1) Restoration to normal or turn key to OFF position. 2) Turn key to OFF position.	
5	1) Only travel system does not operate. 2) Travel system and work equipment do not operate.	5	Flashing *1	1) OFF 2) Flashing	Travel interlock relay output abnormality (Disconnection or short circuit) 1) Opening of controller output transistor or disconnection in relay 2) Short circuit in controller output transistor or short circuit in MAST, F or R relay	1) Only travel system Check and repair F and R relays and relay circuit 2) Travel system and work equipment Check and repair F relay, R relay, MAST relay and relay circuit.	1) Restoration to normal or turn key to OFF position. 2) Turn key to OFF position.	
6	Travel system and work equipment do not operate.	6	Flashing *1	Flashing	Main relay output abnormality (Disconnection or short circuit)	Check and repair MAIN relay and relay circuit	Turn key to OFF position.	
7	Travel system and work equipment do not operate.	7	Flashing *1	Flashing	Controller abnormality	1) Check and repair power supply circuit. 2) Replace controller.	Turn key to OFF position.	Return controller, then check.

*1: When the F/R lever is in neutral, the neutral lamp lights.

*2: The neutral lamp is also used as the travel interlock warning lamp.

Remark table 1

Input		Output	Remarks
SEAT_SW1	SEAT_SW2	Failure indicator	
OFF	OFF	Error No. 1 (1 flashing)	Open
OFF	ON	OFF	Normal
ON	OFF	OFF	Normal
ON	ON	Error No. 1 (1 flashing)	Short circuit

Remark table 2

Input		Output	Remarks
F_SW1	R_SW2	Failure indicator	
OFF	OFF	OFF	Normal (neutral)
ON	OFF	OFF	Normal (F)
OFF	ON	OFF	Normal (R)
ON	ON	Error No. 2 (1 flashing)	Failure indicator

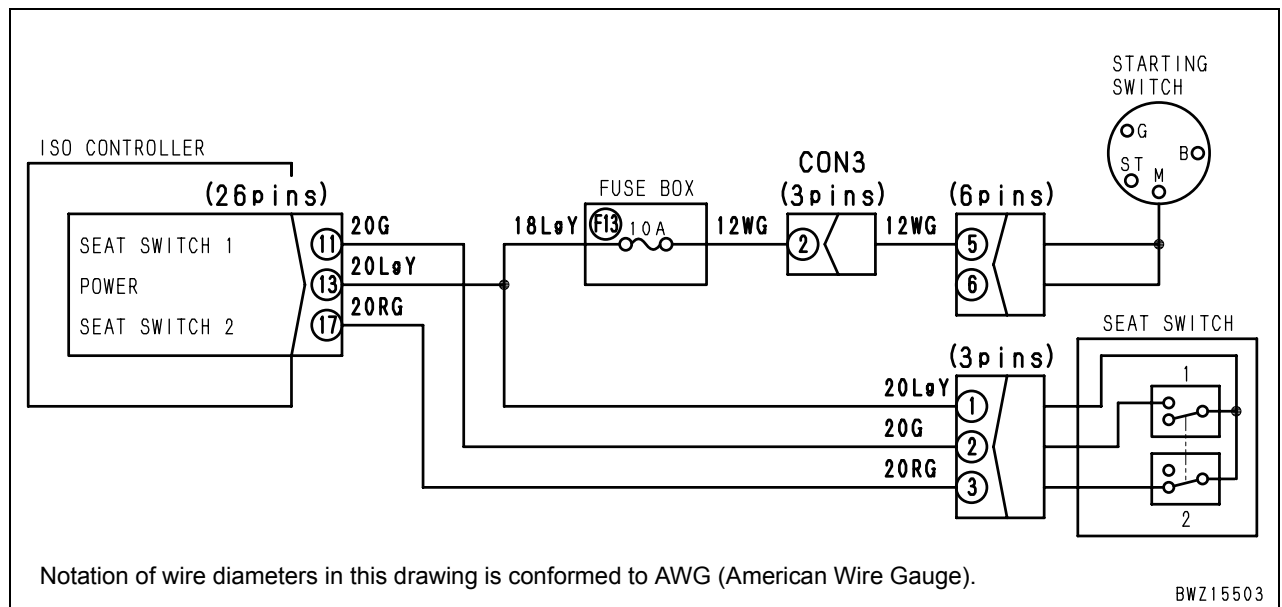
Failure code [!]: 1 flashing, [N]: Flashing, [L]: Flashing] ([!]: Failure indicator, [N]: Neutral lamp, [L]: Lift interlock warning lamp)

Seat switch trouble

Failure code	Trouble	Seat switch trouble (ISO controller system)
[!]: 1 flashing, [N]: Flashing, [L]: Flashing		
Contents of trouble	Travel system and work equipment do not move because of seat switch system trouble (Disconnection or short circuit).	
Action of controller	- Stops outputting signals to F/R relay and mast relay. - Flashes warning lamp shown in failure code column (Continues flashing until cause of trouble is repaired).	
Problem that appears on lift truck	Lift truck cannot travel or move work equipment.	
Related information	- When trouble is displayed, if F/R lever is in neutral, [N]: neutral lamp does not flash but light up. - If trouble is repaired, controller resets itself.	

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse F13	If fuse is broken, circuit probably has ground fault (See cause 4).		
	2	Defective seat switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			SEAT SWITCH (male)	Operator	Resistance
			Between (1) and (2)	Seated	Max. 1 Ω
				Not seated	Min. 1 MΩ
			Between (1) and (3)	Seated	Min. 1 MΩ
				Not seated	Max. 1 Ω
			Between (2) and (3)	Always	Min. 1 MΩ
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
	4	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	5	Short circuit in wiring harness (Contact with another circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and terminal of another circuit.		
			Measure resistance between related circuits shown in figure for short circuit.	Resistance	Min. 1 MΩ

Related circuit diagram



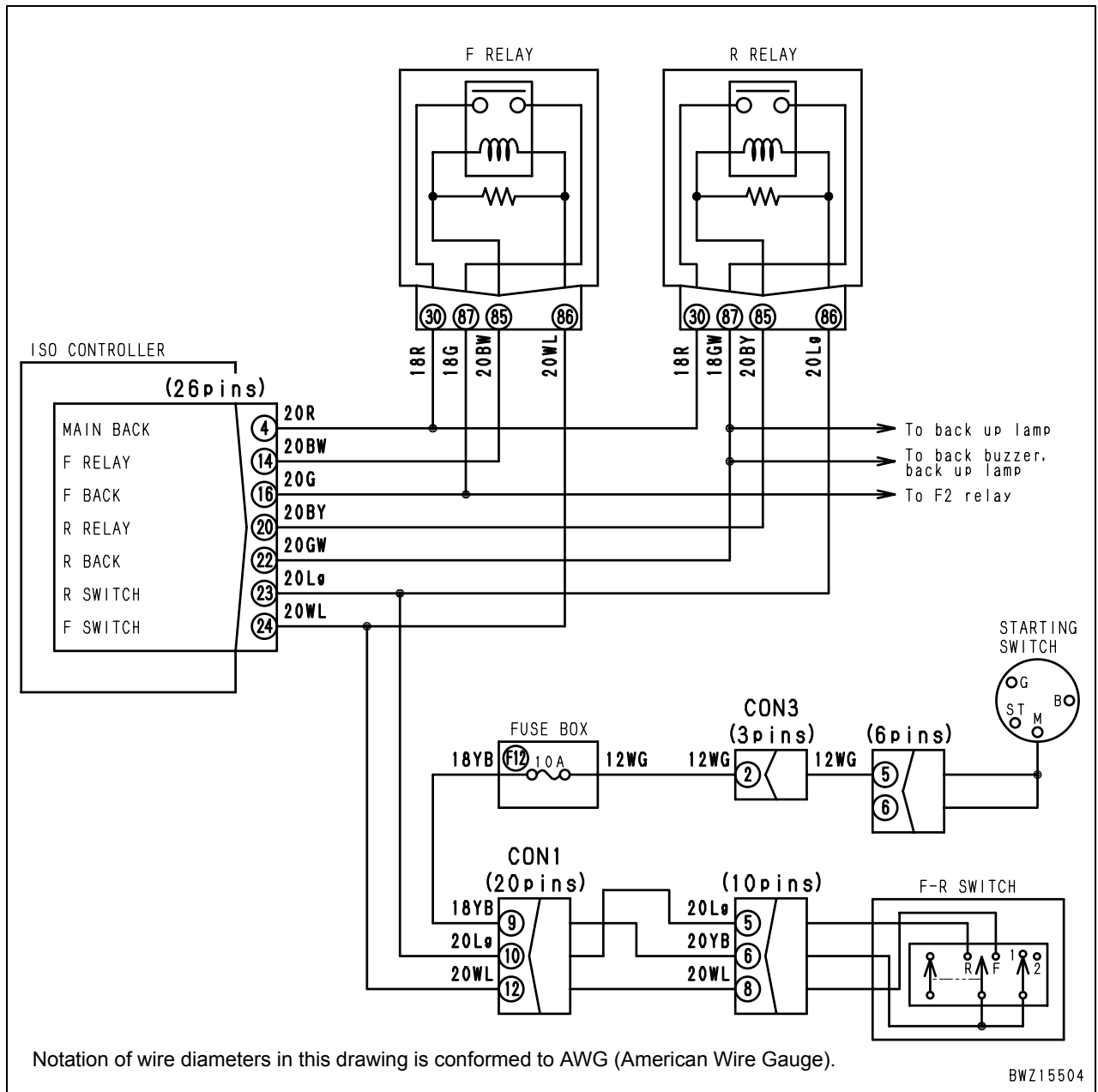
Failure code [!]: 2 flashings, [N]: Flashing, [L]: OFF ([!]: Failure indicator, [N]: Neutral lamp, [L]: Lift interlock warning lamp)

F/R lever trouble

Failure code	Trouble	F/R lever trouble (ISO controller system)
[!]: 2 flashings, [N]: Flashing, [L]: OFF		
Contents of trouble	Lift truck cannot travel because of F/R lever system trouble (short circuit).	
Action of controller	- Stops outputting signals to F/R relay. - Flashes warning lamp shown in failure code column (Continues flashing until cause of trouble is repaired).	
Problem that appears on lift truck	Lift truck cannot travel.	
Related information	- When trouble is displayed, if F/R lever is in neutral, [N]: neutral lamp does not flash but light up. - If trouble is repaired, controller resets itself.	

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective F/R lever (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			F-R SWITCH (male)	Lever position	Resistance
			Between (6) and (8)	Forward	Max. 1 Ω
				Reverse	Min. 1 MΩ
			Between (6) and (5)	Forward	Min. 1 MΩ
				Reverse	Max. 1 Ω
			Between (5) and (8)	Always	Min. 1 MΩ
	2	Short circuit in wiring harness (Contact with another circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and terminal of another circuit.		
			Measure resistance between related circuits shown in figure for short circuit.	Resistance	Min. 1 MΩ

Related circuit diagram



Failure code [[!]: 3 flashings, [N]: OFF, [L]: OFF]

([!]: Failure indicator, [N]: Neutral lamp, [L]: Lift interlock warning lamp)

Parking brake reminder buzzer output abnormality or N (neutral) lamp and lift interlock warning lamp output abnormality

Failure code		Trouble	Parking brake reminder buzzer output abnormality or N (neutral) lamp and lift interlock warning lamp output abnormality (ISO controller system)
[!]: 3 flashings, [N]: OFF, [L]: OFF			
Contents of trouble	1) Parking brake reminder buzzer output abnormality (disconnection or short circuit) was detected. 2) Neutral lamp or lift interlock warning lamp output abnormality (disconnection or short circuit) was detected.		
Action of controller	• Flashes warning lamp shown in failure code column (Continues flashing until cause of trouble is repaired).		
Problem that appears on lift truck	1) Following phenomena occur because of parking brake reminder buzzer output abnormality (disconnection or short circuit). • After parking brake lever is pulled, buzzer continues sounding. • When operator leaves lift truck with parking brake released, buzzer does not sound. 2) Following phenomena occur because of neutral lamp or lift interlock warning lamp output abnormality (disconnection or short circuit). • When F/R lever is in neutral, neutral lamp does not light. • When F/R lever is not in neutral, neutral lamp does not go off. • When starting switch is turned to ON position, lift interlock warning lamp does not light for several seconds. • After starting switch is turned to ON position, lift interlock warning lamp does not go off.		
Related information	1) If parking brake reminder buzzer output abnormality is repaired, controller resets itself. 2) When neutral lamp or lift interlock warning lamp output abnormality occurs, if starting switch is turned to OFF position, controller resets itself.		

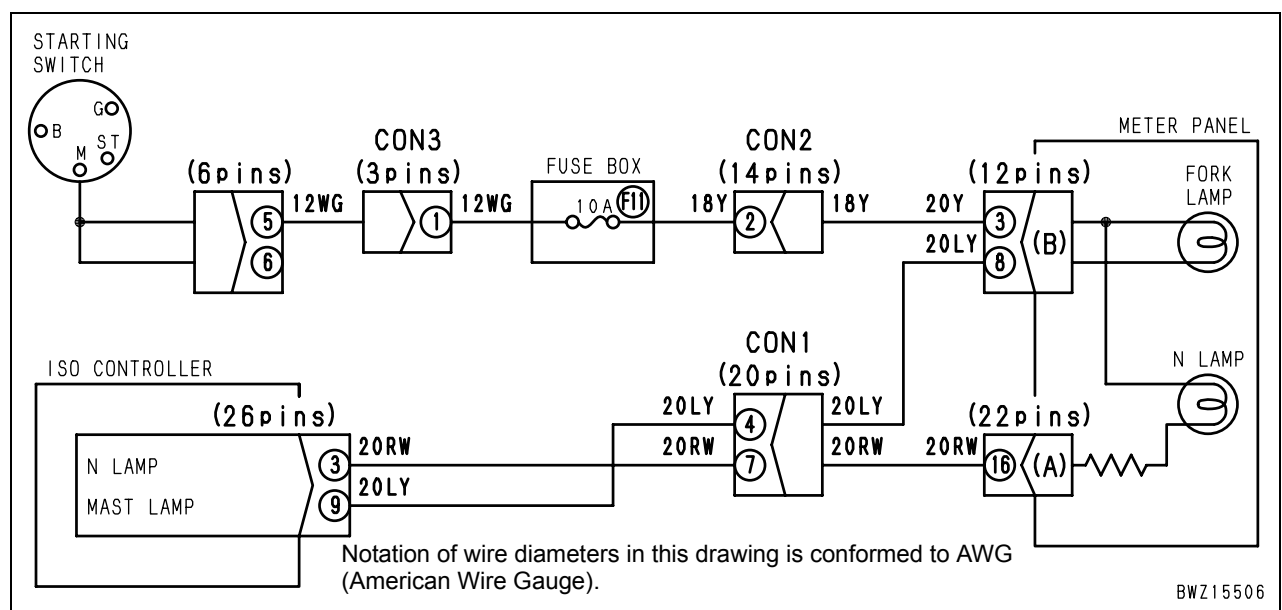
1) Parking brake reminder buzzer output abnormality

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse F2 or F12	If fuse is broken, circuit probably has ground fault (See cause 7).		
	2	Defective parking brake switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			PARKING SWITCH (Terminal on switch side)	Parking brake lever operation	Resistance
			Between terminals	ON (park)	Max. 1 Ω
	3	Defective brake buzzer (Internal defect)	★ Prepare with starting switch OFF. ★ Check buzzer unit. ★ Connect (+) to (1) and (–) to (2).		
			BRAKE BUZZER (male)	12 V applied	Buzzer sounds
			Between (1) and (2)	Other than above	Buzzer does not sound
	4	Defective buzzer diode (1) (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and measure with (61) on (+) side.		
			Between BUZZER DIODE (1) (male) (61) and (60)		Continues
	5	Defective parking brake relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Parking brake relay is defective
				Normal state is not recovered	Parking brake relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			PARKING RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87a)	12 V applied (Relay: ON)	Min. 1 MΩ
				Other than above (Relay: OFF)	Max. 1 Ω

	Cause		Standard value in normal condition/Remarks on troubleshooting		
Possible causes and standard value in normal state	6	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
	7	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	8	Hot short in wiring harness (Contact with 12V circuit)	★ If buzzer does not stop sounding, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between PARKING SWITCH – BRAKE BUZZER (female) (1) wiring harness and ground	Voltage	Max. 1 V

2) Neutral lamp or lift interlock warning lamp output abnormality

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective fuse F11	If fuse is broken, circuit probably has ground fault (See cause 5).			
	2	Defective neutral lamp (Internal defect)	Between METER PANEL (B) (male) (3) and METER PANEL (A) (male) (16)	12 V applied	ON	
				Other than above	OFF	
	3	Defective lift interlock warning lamp (Internal defect)	Between METER PANEL (B) (male) (3) and (8)	12 V applied	ON	
				Other than above	OFF	
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω
	5	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 MΩ
	6	Hot short (Contact with 12V circuit) in wiring harness	★ If lamp does not go off, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.			
			Between CONTROLLER (female) (3) – METER PANEL (A) (male) (16) wiring harness and ground		Voltage	Max. 1 V
			Between CONTROLLER (female) (9) – METER PANEL (B) (male) (8) wiring harness and ground		Voltage	Max. 1 V

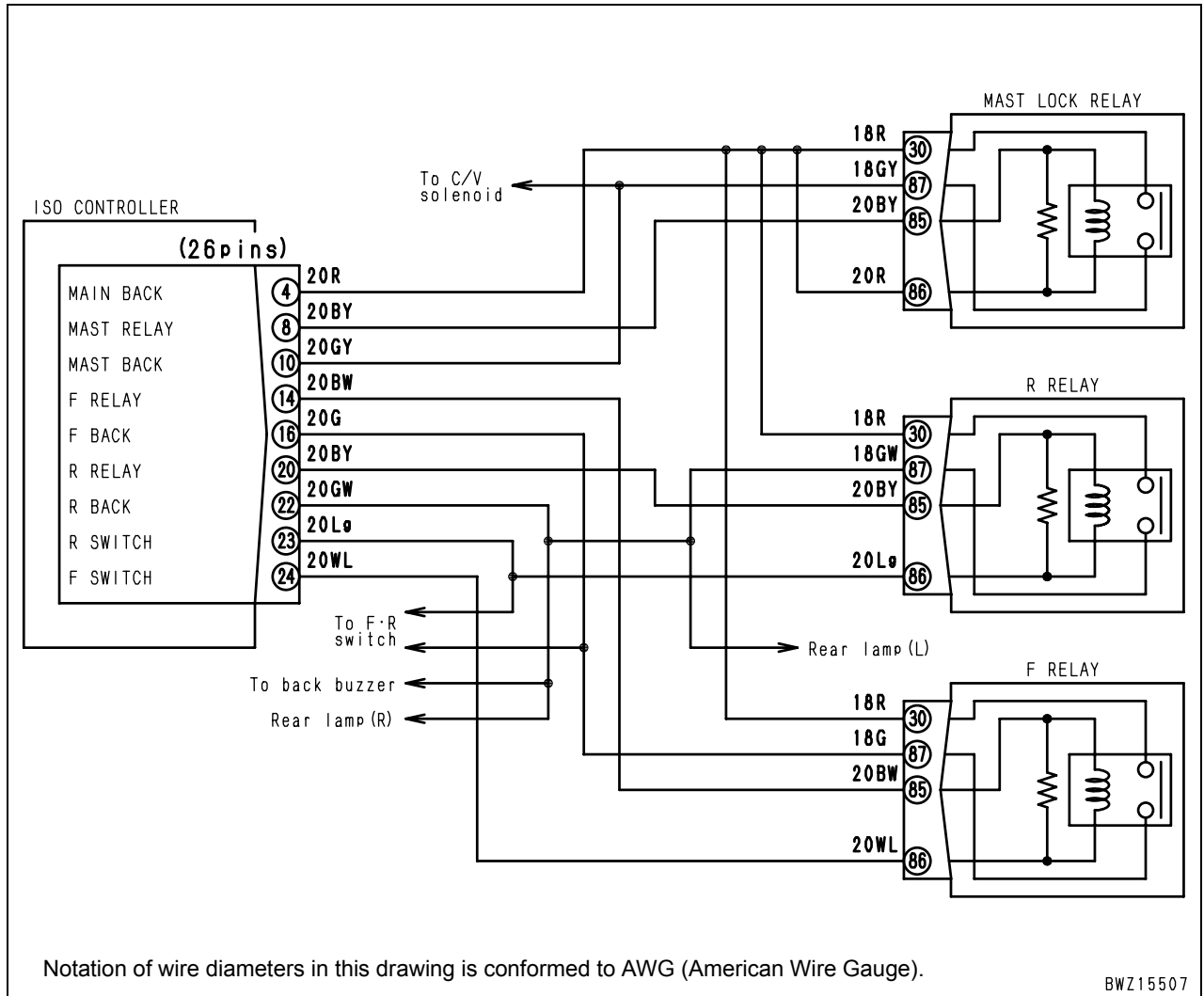
Related circuit diagram

Failure code [!]: 4 flashings, [N]: OFF, [L]: Flashing ([!]: Failure indicator, [N]: Neutral lamp, [L]: Lift interlock warning lamp) Lift interlock relay output abnormality (1)

Failure code	Trouble	Lift interlock relay output abnormality (1) (ISO controller system)
[!]: 4 flashings, [N]: OFF, [L]: Flashing		
Contents of trouble	Lift truck cannot move work equipment because of lift interlock relay output abnormality (disconnection or opening of controller output transistor) (It can travel, however.)	
Action of controller	Flashes warning lamp shown in failure code column (Continues flashing until cause of trouble is repaired).	
Problem that appears on lift truck	Lift truck cannot move work equipment (It can travel, however.)	
Related information	If trouble is repaired or starting switch is turned to OFF position, controller resets itself.	

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective lift interlock relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Lift interlock relay is defective
				Normal state is not recovered	Lift interlock relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			MAST LOCK RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance Max. 1 Ω
	3	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance Min. 1 MΩ
	4	Defective ISO controller (Internal defect)	If above causes are not the cause for the trouble, ISO controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)		

Related circuit diagram



Failure code [!]: 4 flashings, [N]: Flashing, [L]: Flashing] ([!]: Failure indicator, [N]: Neutral lamp, [L]: Lift interlock warning lamp)

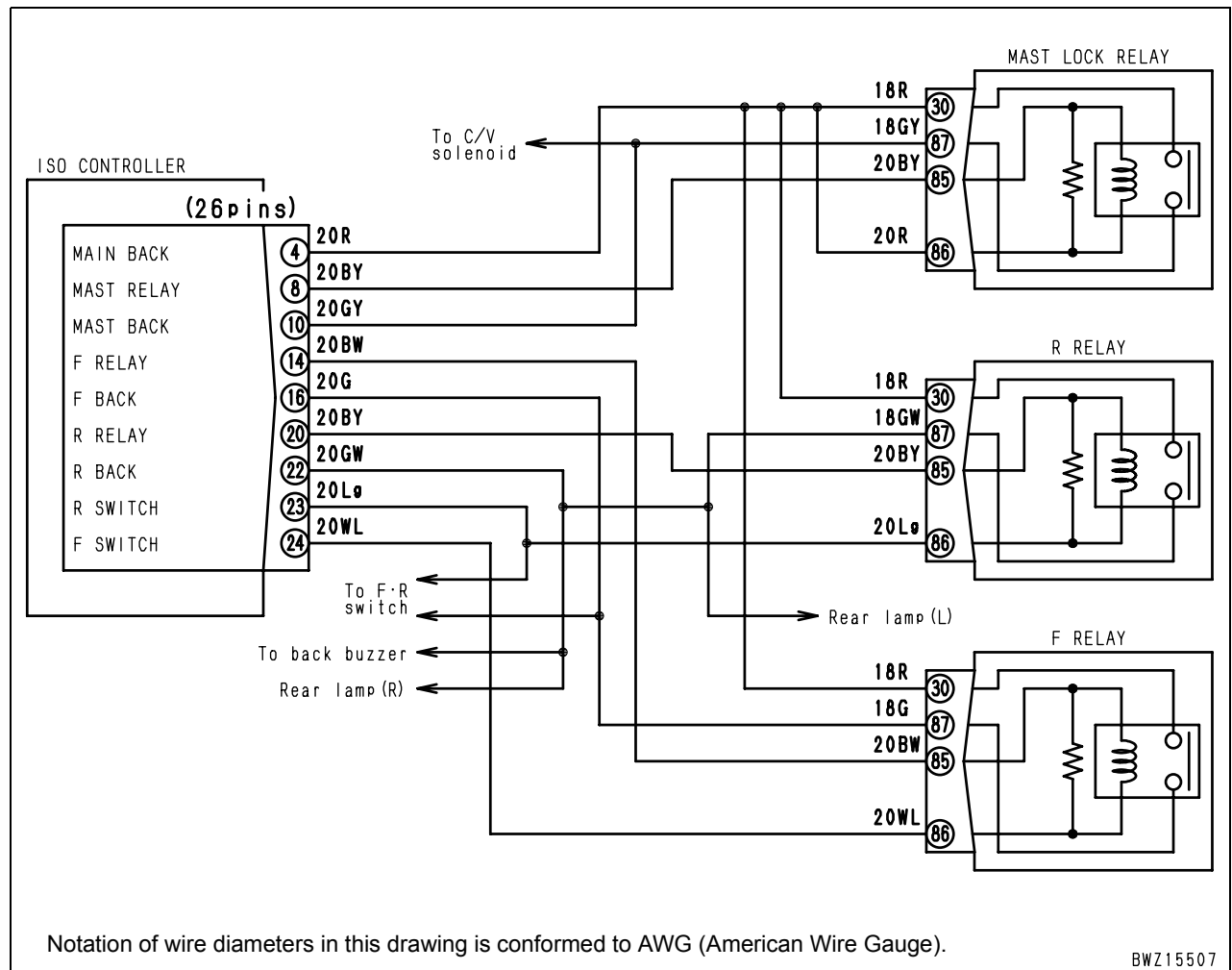
Lift interlock relay output abnormality (2)

Failure code		Trouble	Lift interlock relay output abnormality (2) (ISO controller system)
[!]: 4 flashing, [N]: Flashing, [L]: Flashing			
Contents of trouble	• Lift truck cannot move work equipment or travel because of lift interlock relay output abnormality (relay or controller output transistor has short circuit).		
Action of controller	• Flashes warning lamp shown in failure code column (Continues flashing until cause of trouble is repaired).		
Problem that appears on lift truck	• Lift truck cannot move work equipment or travel.		
Related information	• When trouble is displayed, if F/R lever is in neutral, [N]: neutral lamp does not flash but light up. • If starting switch is turned to OFF position, controller resets itself.		

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective lift interlock relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Lift interlock relay is defective
				Normal state is not recovered	Lift interlock relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			MAST LOCK RELAY (male)	Between (85) and (86)	Resistance
	2	Defective F relay (Internal defect)	Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
			★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	F relay is defective
				Normal state is not recovered	F relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			F RELAY (male)	Between (85) and (86)	Resistance
	3	Defective R relay (Internal defect)	Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
			★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	R relay is defective
				Normal state is not recovered	R relay is normal

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	3	Defective R relay (Internal defect)	★ Prepare with starting switch OFF. ★ Check relay unit.		
			R RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance Max. 1 Ω
	5	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance Min. 1 MΩ
	6	Defective ISO controller (Internal defect)	If above causes are not the cause for the trouble, ISO controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)		

Related circuit diagram

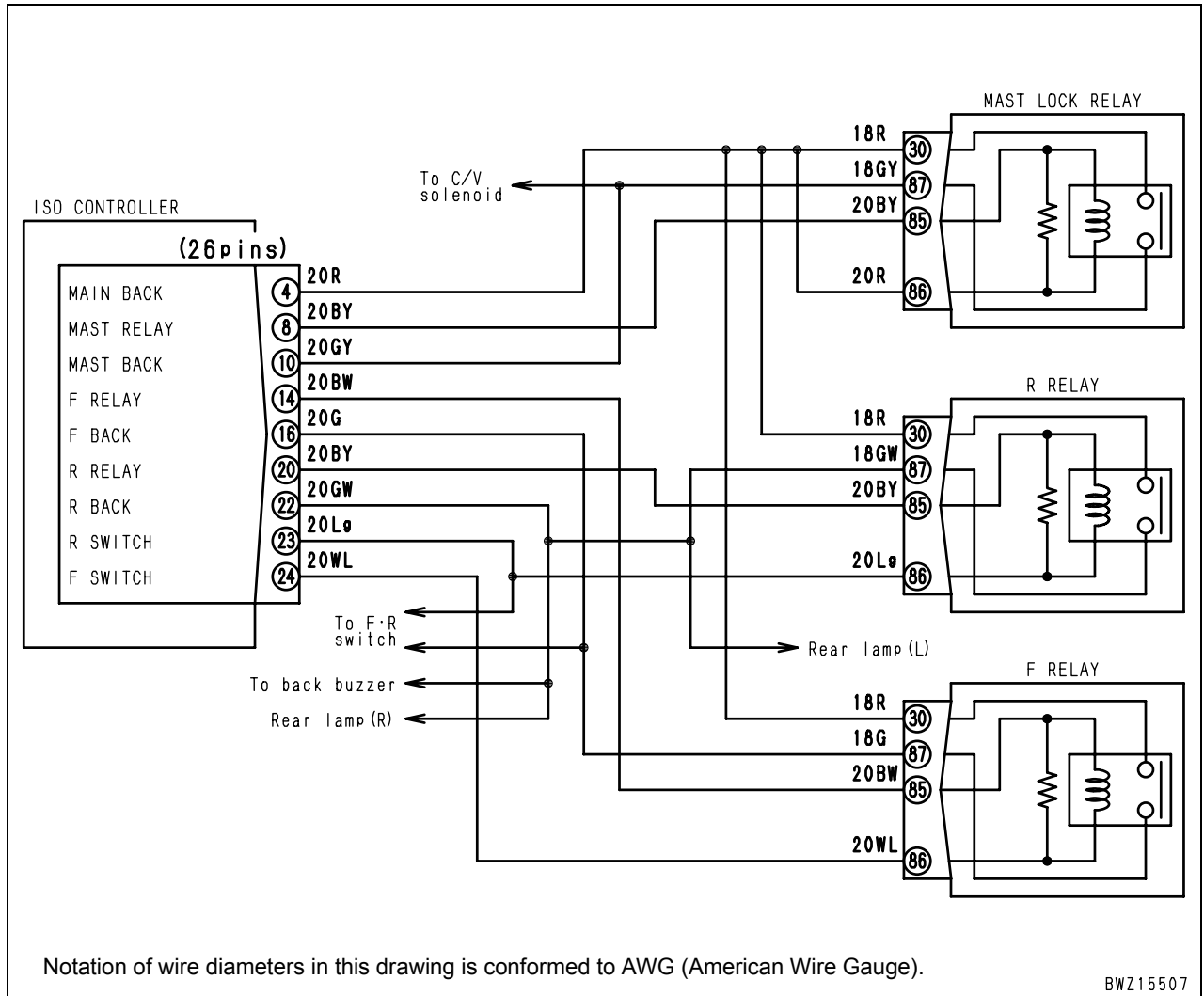


Failure code [!]: 5 flashings, [N]: OFF, [L]: Flashing]**([!]: Failure indicator, [N]: Neutral lamp, [L]: Lift interlock warning lamp)****Travel interlock relay output abnormality (1)**

Failure code		Trouble	Travel interlock relay output abnormality (1) (ISO controller system)
[!]: 5 flashings, [N]: OFF, [L]: Flashing			
Contents of trouble	• Lift truck cannot travel because of travel interlock relay output abnormality (disconnection or opening of controller output transistor) (It can move work equipment, however.)		
Action of controller	• Flashes warning lamp shown in failure code column (Continues flashing until cause of trouble is repaired).		
Problem that appears on lift truck	• Lift truck cannot travel (It can move work equipment, however.)		
Related information	• If trouble is repaired or starting switch is turned to OFF position, controller resets itself.		

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective F relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	F relay is defective	
				Normal state is not recovered	F relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			F RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	2	Defective R relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	R relay is defective	
				Normal state is not recovered	R relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			R RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω
	4	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 MΩ
	5	Defective ISO controller (Internal defect)	If above causes are not the cause for the trouble, ISO controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)			

Related circuit diagram



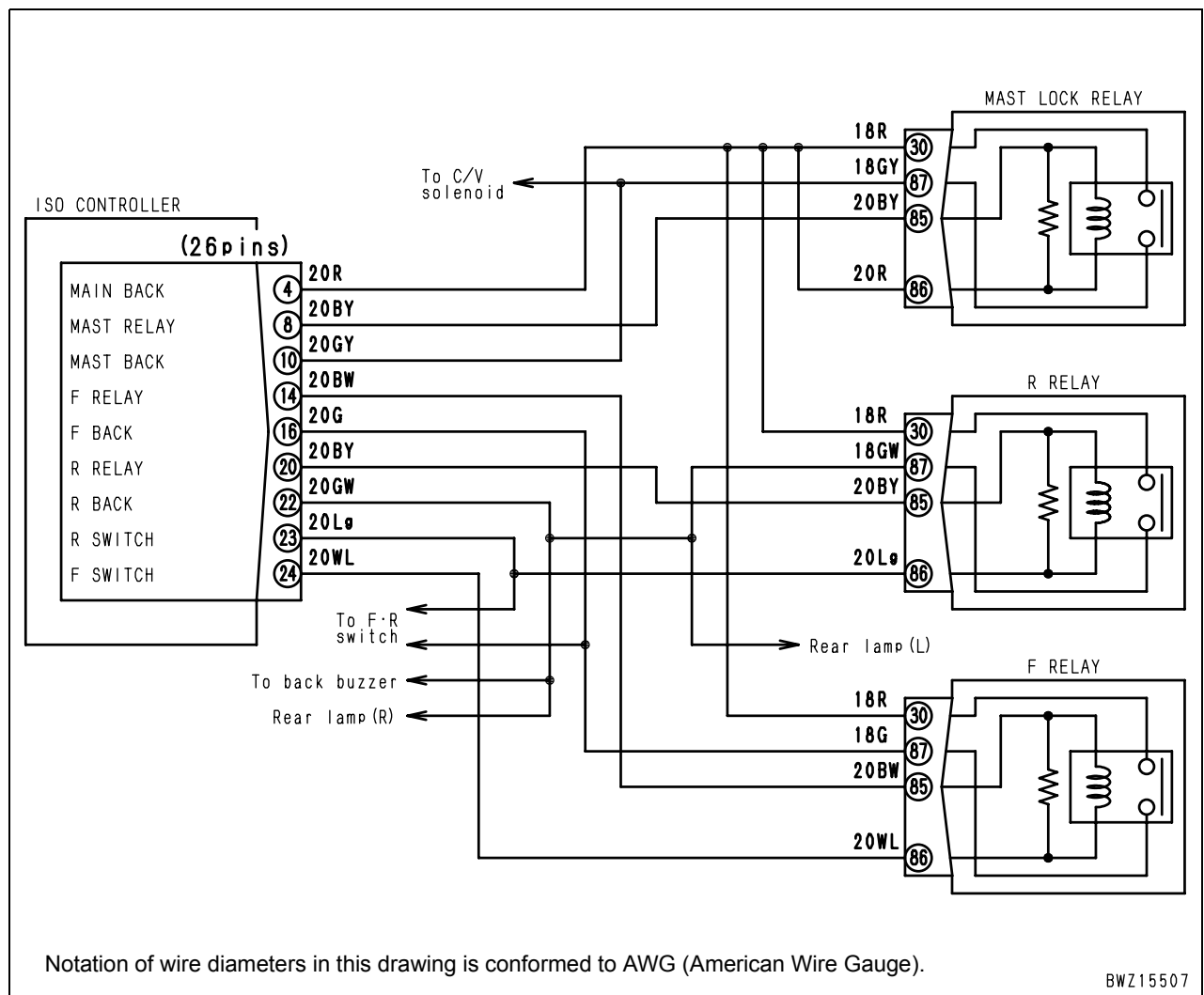
Failure code [!]: 5 flashings, [N]: Flashing, [L]: Flashing] ([!]: Failure indicator, [N]: Neutral lamp, [L]: Lift interlock warning lamp) Travel interlock relay output abnormality (2)

Failure code		Trouble	Travel interlock relay output abnormality (2) (ISO controller system)
[!]: 5 flashing, [N]: Flashing, [L]: Flashing			
Contents of trouble	• Lift truck cannot travel or move work equipment because of travel interlock relay output abnormality (relay or controller output transistor has short circuit).		
Action of controller	• Flashes warning lamp shown in failure code column (Continues flashing until cause of trouble is repaired).		
Problem that appears on lift truck	• Lift truck cannot travel or move work equipment.		
Related information	• When trouble is displayed, if F/R lever is in neutral, [N]: neutral lamp does not flash but light up. • If starting switch is turned to OFF position, controller resets itself.		

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective F relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	F relay is defective
				Normal state is not recovered	F relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			F RELAY (male)	Between (85) and (86)	Resistance
	2	Defective R relay (Internal defect)	Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
			★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	R relay is defective
				Normal state is not recovered	R relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			R RELAY (male)	Between (85) and (86)	Resistance
	3	Defective lift interlock relay (Internal defect)	Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
			★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Lift interlock relay is defective
				Normal state is not recovered	Lift interlock relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	3	Defective lift interlock relay (Internal defect)	MAST LOCK RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω
	5	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 MΩ
	6	Defective ISO controller (Internal defect)	If above causes are not the cause for the trouble, ISO controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)			

Related circuit diagram



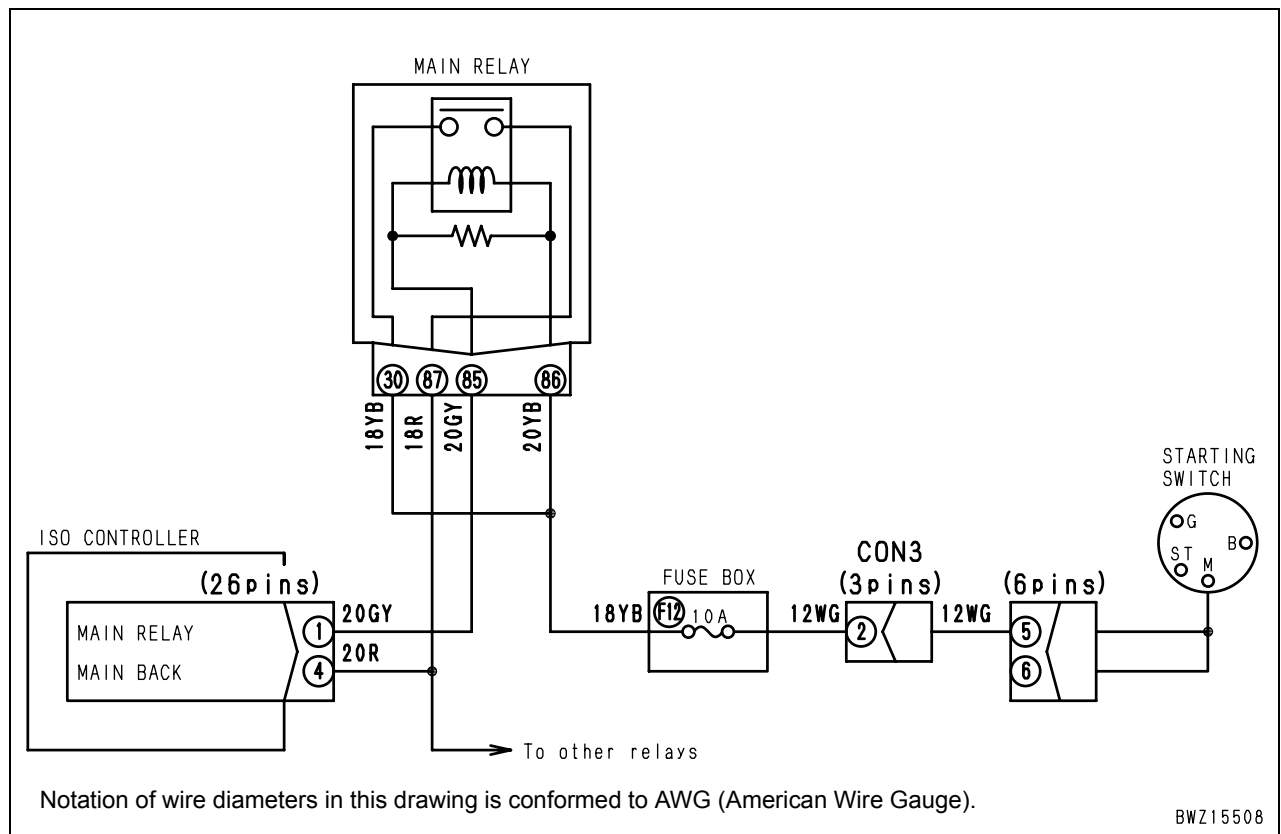
Failure code [!]: 6 flashings, [N]: Flashing, [L]: Flashing] ([!]: Failure indicator, [N]: Neutral lamp, [L]: Lift interlock warning lamp)

Main relay output abnormality

Failure code	Trouble	Main relay output abnormality (ISO controller system)
[!]: 6 flashings, [N]: Flashing, [L]: Flashing		
Contents of trouble	Lift truck cannot travel or move work equipment because of main relay output abnormality (disconnection or short circuit).	
Action of controller	Flashes warning lamp shown in failure code column (Continues flashing until cause of trouble is repaired).	
Problem that appears on lift truck	Lift truck cannot travel or move work equipment.	
Related information	- When trouble is displayed, if F/R lever is in neutral, [N]: neutral lamp does not flash but light up. - If starting switch is turned to OFF position, controller resets itself.	

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse F12	If fuse is broken, circuit probably has ground fault (See cause 4).		
	2	Defective main relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Main relay is defective
				Normal state is not recovered	Main relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			MAIN RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance Max. 1 Ω
	4	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance Min. 1 MΩ

Related circuit diagram

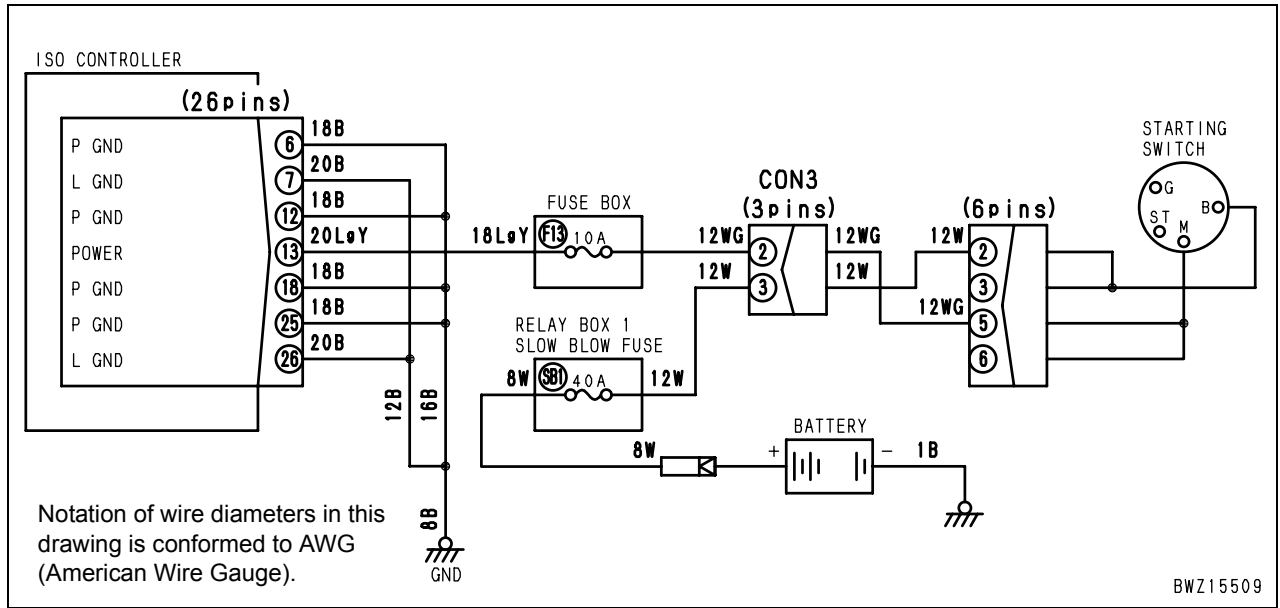


Failure code [!]: 7 flashings, [N]: Flashing, [L]: Flashing] ([!]: Failure indicator, [N]: Neutral lamp, [L]: Lift interlock warning lamp) Controller abnormality

Failure code		Trouble	Controller abnormality (ISO controller system)
[!]: 7 flashings, [N]: Flashing, [L]: Flashing			
Contents of trouble	• Lift truck cannot travel or move work equipment because of controller or power supply system abnormality.		
Action of controller	• Flashes warning lamp shown in failure code column (Continues flashing until cause of trouble is repaired).		
Problem that appears on lift truck	• Lift truck cannot travel or move work equipment.		
Related information	• When trouble is displayed, if F/R lever is in neutral, [N]: neutral lamp does not flash but light up. • If starting switch is turned to OFF position, controller resets itself.		

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse F13	If fuse is broken, circuit probably has ground fault (See cause 4).		
	2	Defective slow blow fuse SB3	If slow blow fuse is broken, circuit probably has ground fault (See cause 4).		
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
	4	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	5	Defective ISO controller (Internal defect)	If above causes are not the cause for the trouble, ISO controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)		

Related circuit diagram



FORKLIFT TRUCK

CX50 Series

Applicable model Serial number

For general

FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up

For USA

FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

40 Troubleshooting

203 Troubleshooting by failure code (EPACS controller system) (Part 3)

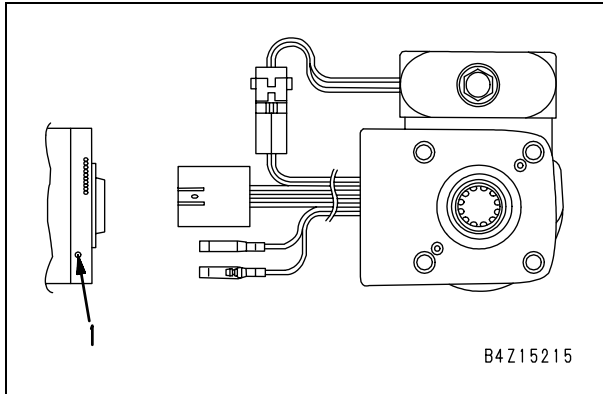
Applicable model: Lift truck with EPACS controller (For general)

Display of EPACS controller failure code	2
Failure code [LED: OFF] EPACS controller abnormality	3
Failure code [LED: 1 flashing] Initialization is not completed	4
Failure code [LED: 2 flashings] Controller is being initialized	5
Failure code [LED: 3 flashings] Steering wheel angle sensor abnormality	6
Failure code [LED: 4 flashings] Tyre angle sensor abnormality	8

Display of EPACS controller failure code

1. Outline

- The EPACS controller LED is turned ON during normal operation.
- The LED is at near the wiring harness base of the EPACS controller and its color is red.
- If the EPACS controller detects a trouble, it indicates the trouble information by turning OFF or flashing the LED.
- Even while the LED is lighting, the EPACS may not work and the steering wheel knob may deviate (The details of this phenomena are described in "E-mode".)



1. LED

2. Outline of trouble display

No.	Trouble	Condition of LED on controller	Contents of trouble	Repair method	Remarks
1	Knob deviates	OFF	Controller abnormality	1) Check and repair controller power supply circuit 2) Replace controller.	(*1)
2	↑	Repeats 1 flashing	Initialization is not completed	1) Check that controller plug is open (It is normally open: disconnected) 2) Initialize	
3	↑	Repeats 2 flashings	Controller is being initialized (May be normal)	1) Perform initialization from first 2) Check and correct tyre angle sensor installation 3) Check orbit roll rotor for loose installation and repair and fix it (tighten set screw and lock).	
4	↑	Repeats 3 flashings	Steering wheel angle sensor abnormality	Replace controller.	
5	↑	Repeats 4 flashings	Tyre angle sensor abnormality • Disconnection or short circuit of signal line with GND • Tyre angle sensor installation abnormality (direction)	1) Check and repair tyre angle sensor (including installation) 2) Check and repair tyre angle sensor circuit	
6	↑	ON	(1) Short circuit of tyre angle sensor power supply with signal line	1) Check and repair tyre angle sensor (including installation) 2) Check and repair tyre angle sensor circuit	(*2)
			(2) Correction solenoid valve trouble	1) Check if solenoid valve is turned ON/OFF during steering operation 2) Check and repair solenoid valve wiring harness	
			(3) Idle rotation of orbit roll rotor	1) Check rotor for loose installation and repair and fix it (tighten set screw and lock).	
			(4) Controller solenoid valve drive circuit trouble	1) Perform (2) 2) Replace controller.	
			(5) Short circuit in steering wheel angle sensor	1) Check if system can be initialized 2) Perform (1) 3) Replace controller.	

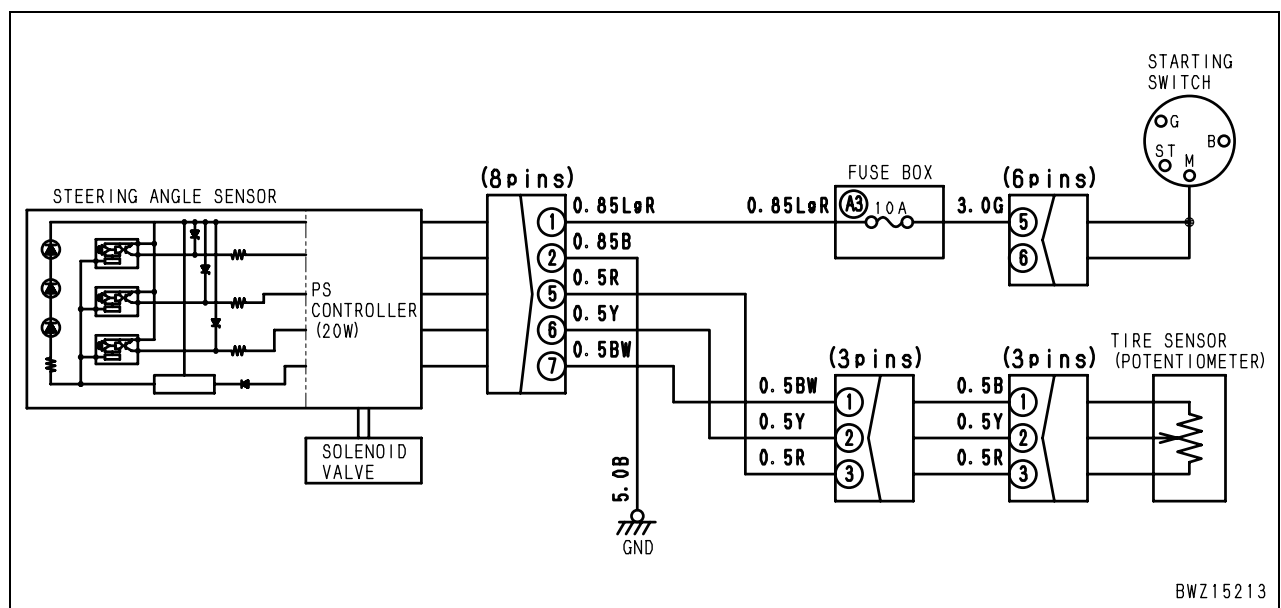
*1. When the controller is detecting trouble (abnormality). For troubleshooting, see "Troubleshooting by failure code (EPACS controller system)".

*2. When the controller is not detecting trouble (abnormality). For troubleshooting, see "Troubleshooting of electrical system (E-mode)".

Failure code [LED: OFF] EPACS controller abnormality

Failure code	Trouble	EPACS controller abnormality (EPACS controller system)
LED: OFF		
Contents of trouble	- Controller power supply voltage lowered to below rating. - CPU in controller unit does not function normally.	
Action of controller	None in particular.	
Problem that appears on lift truck	Knob position is not corrected and knob deviates.	
Related information	LED is turned OFF for a short time during initialization of controller.	

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse A3	If fuse is broken, circuit probably has ground fault (See cause 3).		
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
	3	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	4	Defective EPACS controller (Internal defect)	If above causes are not the cause for the trouble, EPACS controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)		

Related circuit diagram

Failure code [LED: 1 flashing] Initialization is not completed

Failure code		Trouble	Initialization is not completed. (EPACS controller system)
LED: 1 flashing			
Contents of trouble	• Initialization is not completed (If completed afterward, it has no trouble).		
Action of controller	• Flashes LED 1 time as alarm (Repeats flashing until cause of trouble is removed).		
Problem that appears on lift truck	• Steering wheel knob deviation is not corrected normally.		
Related information	• If initialization plug is connected, initialization is not performed.		

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting
	1	Initialization is not completed.	
	2	Defective EPACS controller (Internal defect)	If above causes are not the cause for the trouble, EPACS controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)

Failure code [LED: 2 flashings] Controller is being initialized

Failure code		Trouble	Controller is being initialized (EPACS controller system)
LED: 2 flashing			
Contents of trouble	• Initialization mode is selected (If completed afterward, it has no trouble).		
Action of controller	• Flashes LED 2 times as alarm (Repeats flashing until cause of trouble is removed).		
Problem that appears on lift truck	• Steering wheel knob deviation is not corrected normally.		
Related information			

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting
	1	Initialization is not completed.	
	2	Defective installation of tyre angle sensor	Referring to Testing and adjusting, "Initialization of orbit roll", perform initialization.
	3	Loose orbit roll rotor	Check tyre angle sensor installed condition and correct if necessary.
	4	Defective EPACS controller (Internal defect)	Check orbit roll rotor for loose installation, then retighten and lock if necessary.
			If above causes are not the cause for the trouble, EPACS controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)

Failure code [LED: 3 flashings] Steering wheel angle sensor abnormality

Failure code		Trouble	Steering wheel angle sensor abnormality (EPACS controller system)
LED: 3 flashing			
Contents of trouble	• Steering wheel angle sensor became abnormal (disconnection in coil etc.)		
Action of controller	• Flashes LED 3 times as alarm (Repeats flashing until cause of trouble is removed).		
Problem that appears on lift truck	• Operation amount of steering wheel cannot be sensed and knob deviates.		
Related information	• Steering wheel angle sensor is built in orbit roll and cannot be repaired or replaced singly.		

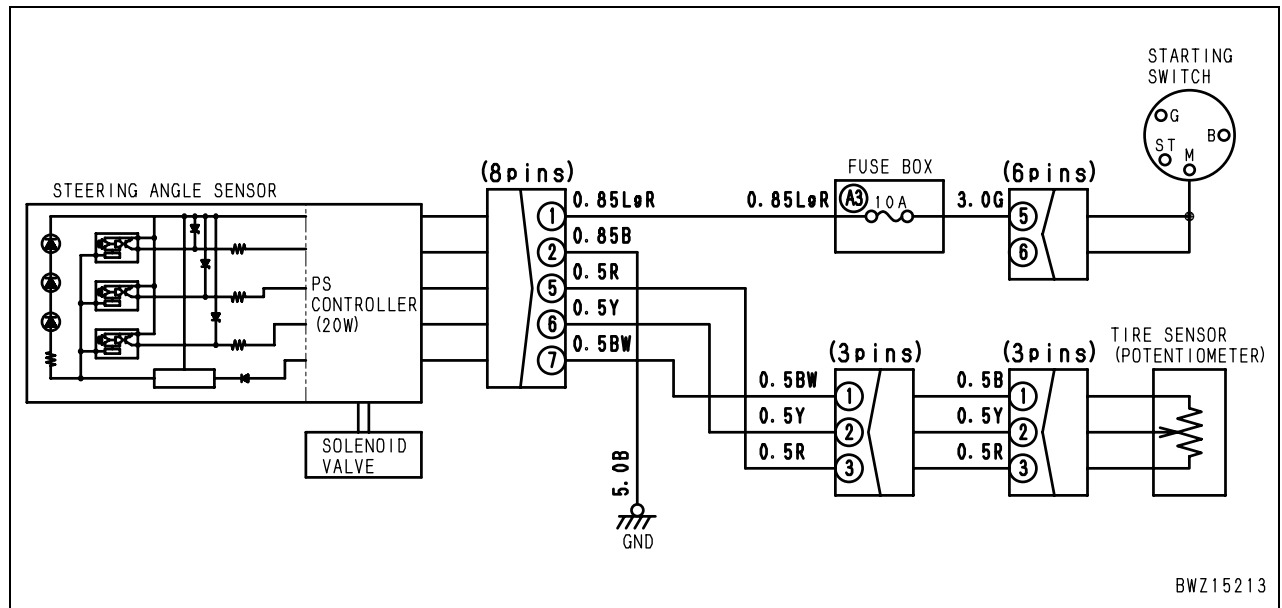
Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting
	1	Defective steering wheel angle sensor (Internal defect)	
		Defective EPACS controller (Internal defect)	
	1	Defective steering wheel angle sensor (Internal defect)	Steering wheel angle sensor may be defective (Since trouble is in system, troubleshooting cannot be performed.)
	2	Defective EPACS controller (Internal defect)	If above causes are not the cause for the trouble, EPACS controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)

Failure code [LED: 4 flashings] Tyre angle sensor abnormality

Failure code	Trouble	Tyre angle sensor abnormality (EPACS controller system)
LED: 4 flashing		
Contents of trouble	• Tyre angle sensor or related circuit had abnormality.	
Action of controller	• Flashes LED 4 times as alarm (Repeats flashing until cause of trouble is removed).	
Problem that appears on lift truck	• Rear wheel angle cannot be sensed and steering wheel knob deviates.	
Related information		

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective installation of tyre angle sensor	Check tyre angle sensor installed condition and correct if necessary.			
	2	Defective tyre angle sensor (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			TIRE SENSOR (male)		Resistance	
			Between (3) and (1)		2 kΩ ± 20 %	
			Between (2) and (1)		Resistance changes linearly according to rotation amount of shaft.	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω
	4	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 MΩ
	5	Short circuit in wiring harness (Contact with another circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and terminal of another circuit.			
			Measure resistance between related circuits shown in figure for short circuit.		Resistance	Min. 1 MΩ
	6	Defective EPACS controller (Internal defect)	If above causes are not the cause for the trouble, EPACS controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)			

Related circuit diagram



FORKLIFT TRUCK

CX50 Series

Applicable model	Serial number
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For general

FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up

For USA

FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

40 Troubleshooting

301 Troubleshooting of electrical system (E-mode) (Part 1)

**Applicable model: Lift truck with SAA4D95LE-5-A engine
(For general)**

E-1 Engine does not start	2
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E-8 EPACS is abnormal	22
E-9 Headlamp, clearance lamp, tail lamp and license plate lamp do not light or go off	24
E-10 Turn signal lamps do not light or go off	26
E-11 Brake lamps do not light or go off	28
E-12 Backup lamps do not light or go off	30
E-13 Backup buzzer does not sound or does not stop sounding	32
E-14 Horn does not sound or does not stop sounding	34
E-15 Fuel level is not displayed normally	36

E-1 Engine does not start

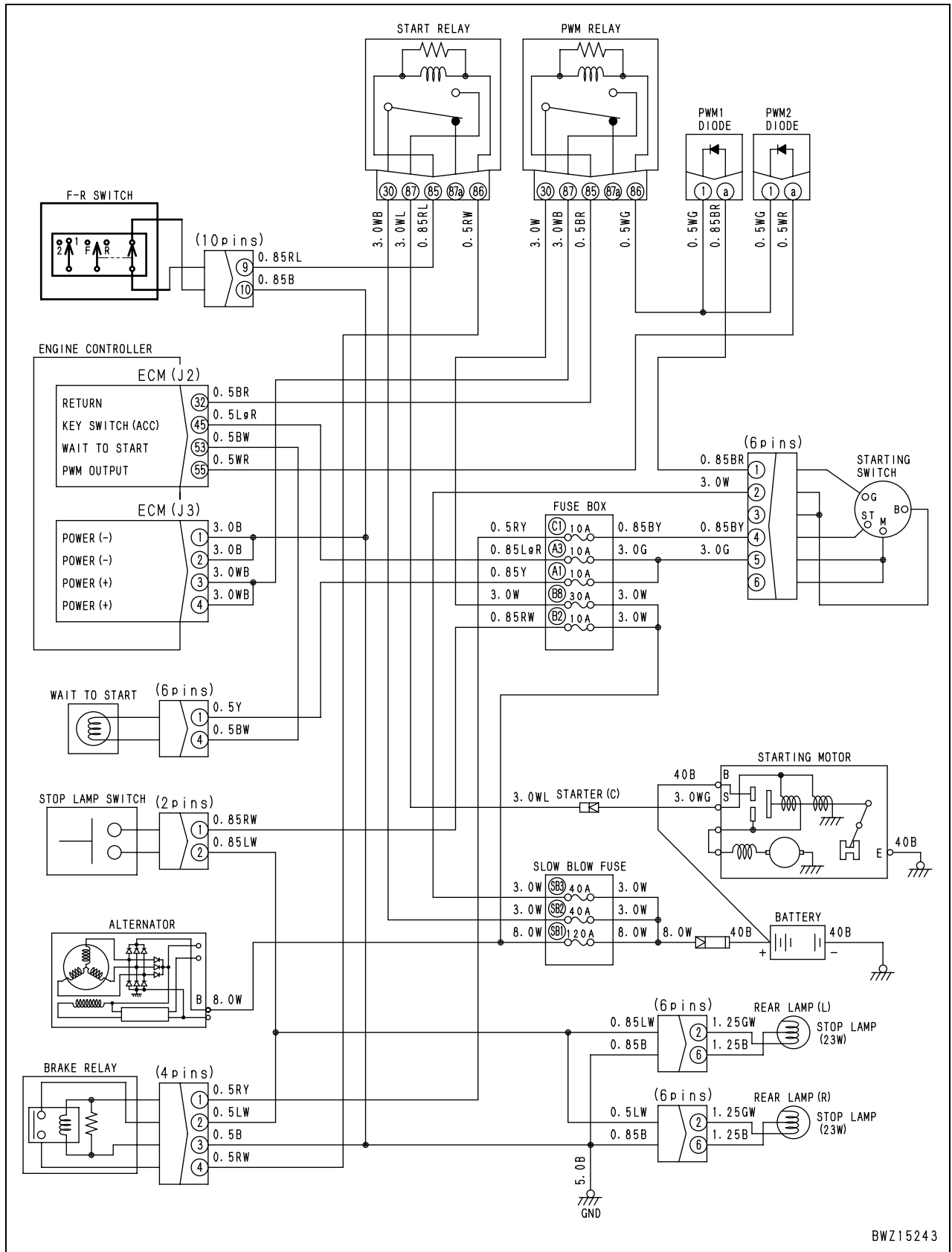
Contents of trouble	Since starting motor does not rotate because of trouble in starting motor system or starting signal system of starting switch, engine does not start.
Related information	- Check following before troubleshooting. - F/R lever is in N (neutral) position. - Brake pedal is depressed. - Fuse or slow blow fuse is not broken (If broken, check related wiring harness for ground fault.) - Battery cable is not disconnected from battery.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective battery	Specific gravity		Min. 1.26	
			Voltage		Min. 12 V	
	2	Defective fuse A3, B2, B8, or C1	If fuse is broken, circuit probably has ground fault (See cause 12).			
	3	Defective slow blow fuse SB1, SB2, or SB3	If slow blow fuse is broken, circuit probably has ground fault (See cause 12).			
	4	Defective starting motor	★ Prepare with starting switch OFF, then perform troubleshooting P without turning starting switch to ON position.			
			Between STARTING MOTOR (1) and ground		Resistance	Max. 1 Ω
			★ Prepare with starting switch OFF, then start engine and perform troubleshooting.			
			Between STARTING MOTOR (B) and ground		Voltage	10 – 15 V
			Between STARTING MOTOR (S) and ground		Voltage	10 – 15 V
			★ If above troubleshooting result is normal and starting motor does not rotate, starting motor is defective.			
	5	Defective PWM relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	PWM relay is defective	
				Normal state is not recovered	PWM relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			PWM RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	6	Defective starting motor relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	Starting motor relay is defective	
Normal state is not recovered				Starting motor relay is normal		

	Cause		Standard value in normal condition/Remarks on troubleshooting		
Possible causes and standard value in normal state	6	Defective starting motor relay (Internal defect)	★ Prepare with starting switch OFF. ★ Check relay unit.		
			START RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	7	Defective PWM1 diode or PWM2 diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in diode range and check continuity with (a) on (+) side.		
			PWM1 DIODE (male) PWM2 DIODE (male)	Resistance	
			Between (a) and (1)		Continues
	8	Defective stop lamp switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			STOP LAMP SWITCH (male)	Brake	Resistance
			Between (1) and (2)	Released (Not depressed)	Min. 1 MΩ
				Depressed	Max. 1 Ω
	9	Defective brake relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Brake relay is defective
				Normal state is not recovered	Brake relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			BRAKE RELAY (male)	Between (1) and (3)	Resistance
			Between (2) and (4)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	10	Defective starting switch (Internal defect)	★ Prepare with starting switch OFF. ★ Check switch unit.		
			STARTING SWITCH (male)	Key position	Resistance
			Between (2) and (3) Between (5) and (6)	OFF	Max. 1 Ω
			Other than above		Min. 1 MΩ
			Between (1), (2), (3), (5) and (6)	1 (ON)	Max. 1 Ω
			Other than above		Min. 1 MΩ
			Between (1), (2), (3), (5), (4) and (6)	2 (START)	Max. 1 Ω

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	11	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
	12	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	13	Defective engine controller (Internal defect)	★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting		
			ENGINE CONTROLLER ECM (J3)	Voltage	
			Between (3), (4) and (1), (2)	10 – 15 V	

Related circuit diagram



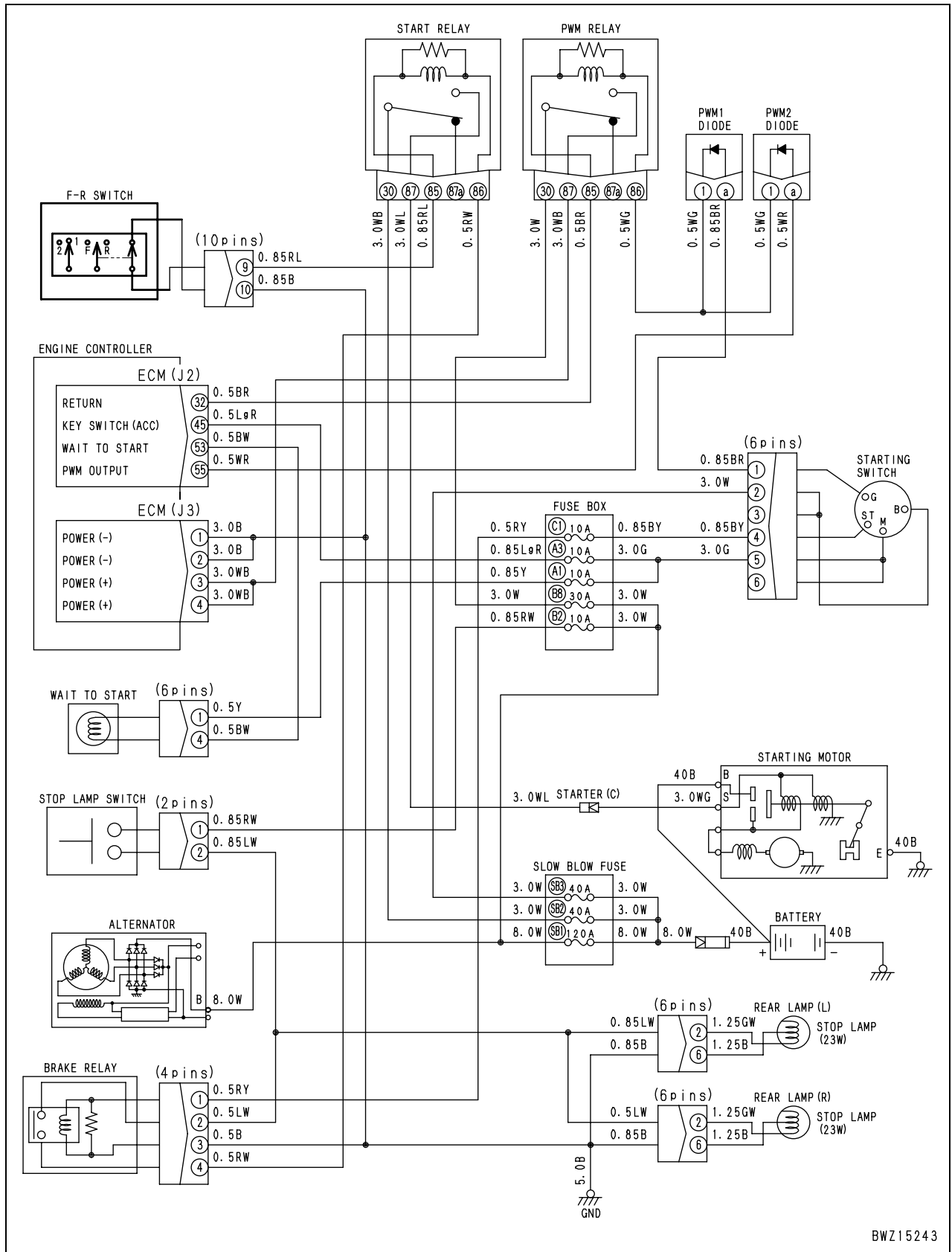
BWZ15243

E-2 Engine does not stop

Contents of trouble	When starting switch is turned to OFF position, engine does not stop.
Related information	- If power to engine controller is turned OFF, engine stops. - When performing troubleshooting, disconnect battery negative terminal to stop engine.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective PWM relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	PWM relay is defective	
				Normal state is not recovered	PWM relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			PWM RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	2	Defective starting switch (Internal defect)	★ Prepare with starting switch OFF. ★ Check switch unit.			
			STARTING SWITCH (male)	Key position	Resistance	
			Between (2) and (3) Between (5) and (6)	OFF	Max. 1 Ω	
			Other than above		Min. 1 MΩ	
			Between (1), (2), (3), (5) and (6)	1 (ON)	Max. 1 Ω	
			Other than above		Min. 1 MΩ	
			Between (1), (2), (3), (4), (5) and (6)	2 (START)	Max. 1 Ω	
	3	Hot short in wiring harness (Contact with 12 V circuit)	★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.			
			Between ENGINE CONTROLLER ECM (J3) (female) (3), (4) – PWM RELAY (female) (87) wiring harness and ground		Voltage	Max. 1 V
			Between PWM RELAY (female) (86) – PWM1 DIODE (female) (1) wiring harness and ground		Voltage	Max. 1 V
			Between PWM RELAY (female) (86) – PWM2 DIODE (female) (1) wiring harness and ground		Voltage	Max. 1 V
	4	Defective engine controller (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			ENGINE CONTROLLER ECM (J3)	Voltage		
			Between (3), (4) and (1), (2)	Max. 1 V		

Related circuit diagram



BWZ15243

E-3 Lift truck cannot travel

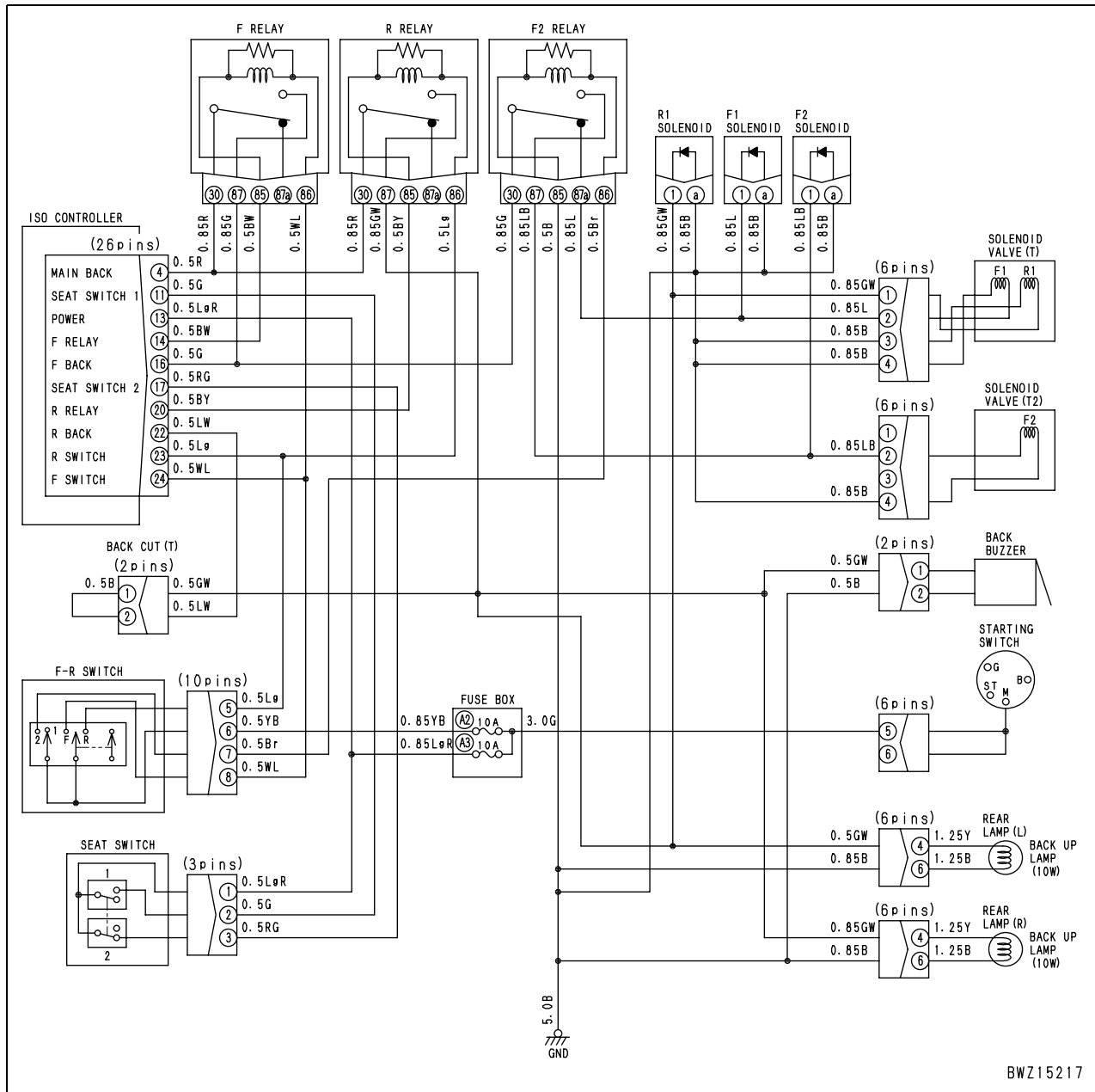
Contents of trouble	Lift truck cannot travel (It can move work equipment, however)
Related information	If any failure code is displayed, carry out troubleshooting for it first.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective fuse A2 or A3	If fuse is broken, circuit probably has ground fault (See cause 13).			
	2	Defective seat switch (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			SEAT SWITCH (male)	Operator	Resistance	
			Between (1) and (2)	Seated	Max. 1 Ω	
				Not seated	Min. 1 MΩ	
			Between (1) and (3)	Seated	Min. 1 MΩ	
				Not seated	Max. 1 Ω	
	Between (2) and (3)	Always	Min. 1 MΩ			
	3	Defective F/R lever (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			F-R SWITCH (male)	Lever position	Resistance	
			Between (6) and (8)	Forward	Max. 1 Ω	
				Reverse	Min. 1 MΩ	
			Between (6) and (5)	Forward	Min. 1 MΩ	
				Reverse	Max. 1 Ω	
			Between (5) and (8)	Always	Min. 1 MΩ	
	4	Defective F1/R1 solenoid (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between SOLENOID VALVE F1/R1 (male) (2) and (4)		Resistance	6 ± 0.5 Ω
			Between SOLENOID VALVE F1/R1 (male) (1) and (3)		Resistance	6 ± 0.5 Ω
	5	Defective F2 solenoid (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between SOLENOID VALVE F2 (male) (2) and (4)		Resistance	6 ± 0.5 Ω
	6	Defective F1 diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.			
			Between F1 SOL DIODE (1) (male) (a) and (1)		Continues	
	7	Defective F2 diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.			
			Between F2 SOL DIODE (1) (male) (a) and (1)		Continues	
8	Defective R1 diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.				
		Between R1 SOL DIODE (1) (male) (a) and (1)		Continues		

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	9	F relay is defective (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Replace with normal relay	Normal state is recovered	F relay is defective	
				Normal state is not recovered	F relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			F RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	10	R relay is defective (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Replace with normal relay	Normal state is recovered	R relay is defective	
				Normal state is not recovered	R relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			R RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	11	Defective F2 relay (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Replace with normal relay	Normal state is recovered	F2 relay is defective	
				Normal state is not recovered	F2 relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			F2 RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	12	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. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
Check continuity between related circuit terminals shown in figure for disconnection.			Resistance	Max. 1 Ω		

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	13	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	14	Defective ISO controller (Internal defect)	If above causes are not the cause for the trouble, ISO controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)		

Related circuit diagram



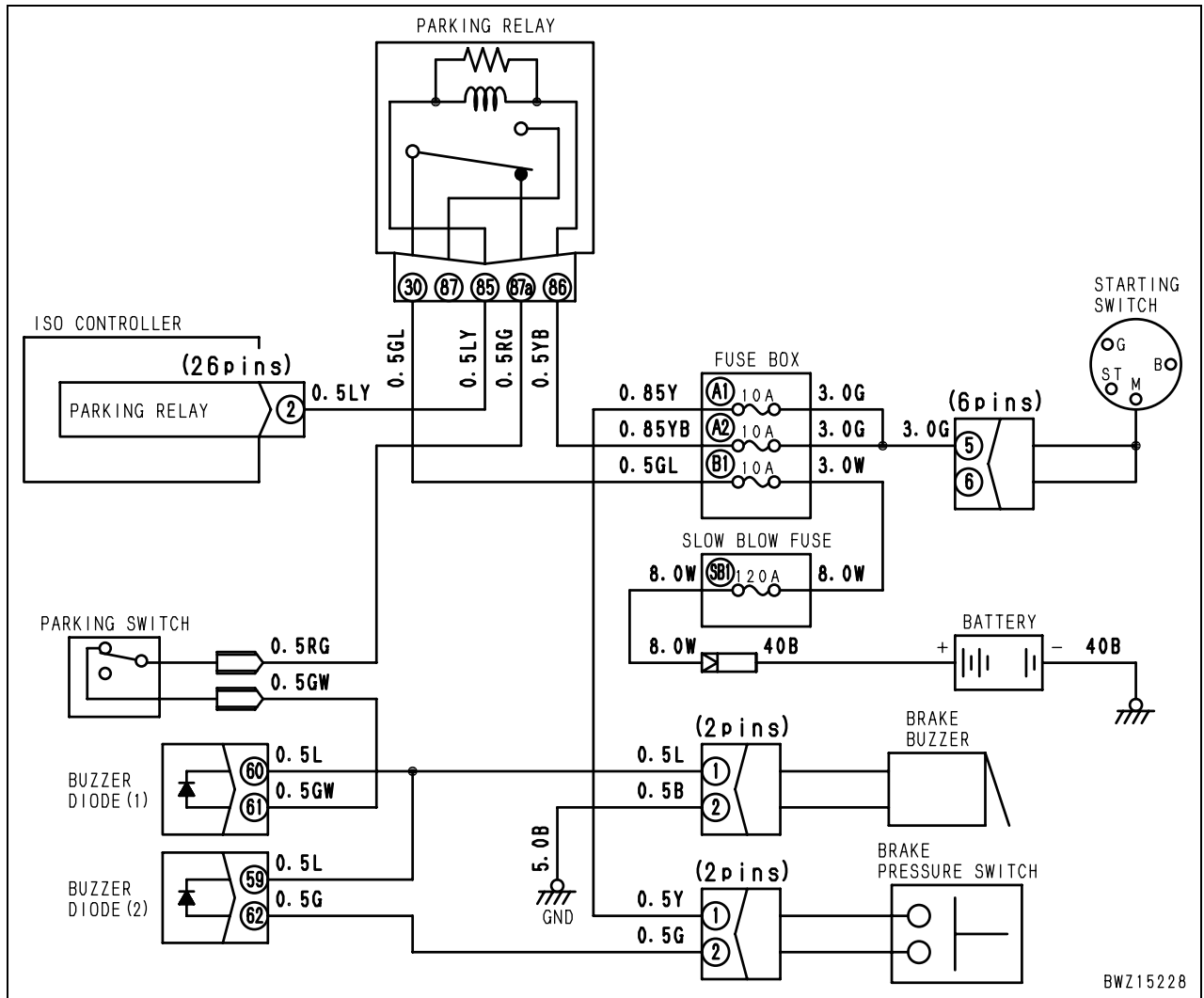
E-4 Parking brake reminder alarm does not sound or does not stop sounding

Contents of trouble	- When operator leave seat without applying parking brake, alarm buzzer does not sound. - While parking brake is applied, alarm buzzer does not stop sounding.
Related information	If any failure code is displayed, carry out troubleshooting for it first.

	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse A1, A2 or B1	If fuse is broken, circuit probably has ground fault (See cause 8).		
Possible causes and standard value in normal state	2	Defective parking brake switch (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			PARKING SWITCH (Terminal on switch side)	Parking brake lever operation	Resistance
			Between terminals	ON (park)	Max. 1 Ω
	3	Defective brake pressure switch (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			BRAKE SWITCH (Terminal on switch side)	Switch condition	Resistance
			Between terminals	ON	Max. 1 Ω
	4	Defective brake buzzer (Internal defect)	★ Prepare with starting switch OFF. ★ Check buzzer unit. ★ Connect (+) to (1) and (–) to (2).		
			Between BRAKE BUZZER (male) (1) and (2)	12 V applied	Buzzer sounds
				Other than above	Buzzer does not sound
	5	Defective buzzer diode (1) (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and measure with (61) on (+) side.		
			Between BUZZER DIODE (1) (male) (61) and (60)		Continues
	6	Defective parking brake relay (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Replace with normal relay	Normal state is recovered	Parking brake relay is defective
				Normal state is not recovered	Parking brake relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			PARKING RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87a)	12 V applied (Relay: ON)	Min. 1 MΩ
				Other than above (Relay: OFF)	Max. 1 Ω

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	7	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. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
	8	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	9	Hot short in wiring harness (Contact with 12 V circuit)	★ If buzzer does not stop sounding, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between PARKING SWITCH – BRAKE BUZZER (female) (1) wiring harness and ground	Voltage	Max. 1 V

Related circuit diagram



E-5 Travel direction is not changed normally

Contents of trouble	When F-R lever is moved, travel direction does not change
Related information	If any failure code is displayed, carry out troubleshooting for it first.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective fuse A2	If fuse is broken, circuit probably has ground fault (See cause 12).			
	2	Defective F/R lever (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			F-R SWITCH (male)	Lever position	Resistance	
			Between (6) and (8)	Forward	Max. 1 Ω	
				Reverse	Min. 1 MΩ	
			Between (6) and (5)	Forward	Min. 1 MΩ	
				Reverse	Max. 1 Ω	
	Between (5) and (8)	Always	Min. 1 MΩ			
	3	Defective F1/R1 solenoid (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Between SOLENOID VALVE F1/R1 (male) (2) and (4)		Resistance	6 ± 0.5 Ω
			Between SOLENOID VALVE F1/R1 (male) (1) and (3)		Resistance	6 ± 0.5 Ω
	4	Defective F2 solenoid (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Between SOLENOID VALVE F2 (male) (2) and (4)		Resistance	6 ± 0.5 Ω
	5	Defective F1 diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.			
			Between F1 SOL DIODE (1) (male) (a) and (1)		Continues	
	6	Defective F2 diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.			
			Between F2 SOL DIODE (1) (male) (a) and (1)		Continues	
	7	Defective R1 diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.			
			Between R1 SOL DIODE (1) (male) (a) and (1)		Continues	
	8	F relay is defective (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	F relay is defective	
Normal state is not recovered				F relay is normal		

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	8	F relay is defective (Internal defect)	★ Prepare with starting switch OFF. ★ Check relay unit.			
			F RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	9	R relay is defective (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	R relay is defective	
				Normal state is not recovered	R relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			R RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	10	Defective F2 relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	F2 relay is defective	
				Normal state is not recovered	F2 relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			F2 RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	11	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω
	12	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 MΩ
13	Defective ISO controller (Internal defect)	If above causes are not the cause for the trouble, ISO controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)				

The diagram illustrates the electrical wiring for an ISO controller system. The central component is the ISO controller (26 pins), which is connected to various subsystems:

- Relays:** F RELAY, R RELAY, and F2 RELAY are connected to the controller's pins. Each relay has a coil and a switch contact.
- Solenoids:** R1 SOLENOID, F1 SOLENOID, and F2 SOLENOID are connected to the controller's pins. Each solenoid has a coil and a switch contact.
- Switches:** SEAT SWITCH 1, SEAT SWITCH 2, R SWITCH, F SWITCH, and BACK CUT (T) are connected to the controller's pins.
- Valves:** SOLENOID VALVE (T1) and SOLENOID VALVE (T2) are connected to the controller's pins.
- Other Components:** A BACK BUZZER, STARTING SWITCH, and two REAR LAMP BACK UP LAMP (10W) units are also connected to the controller's pins.

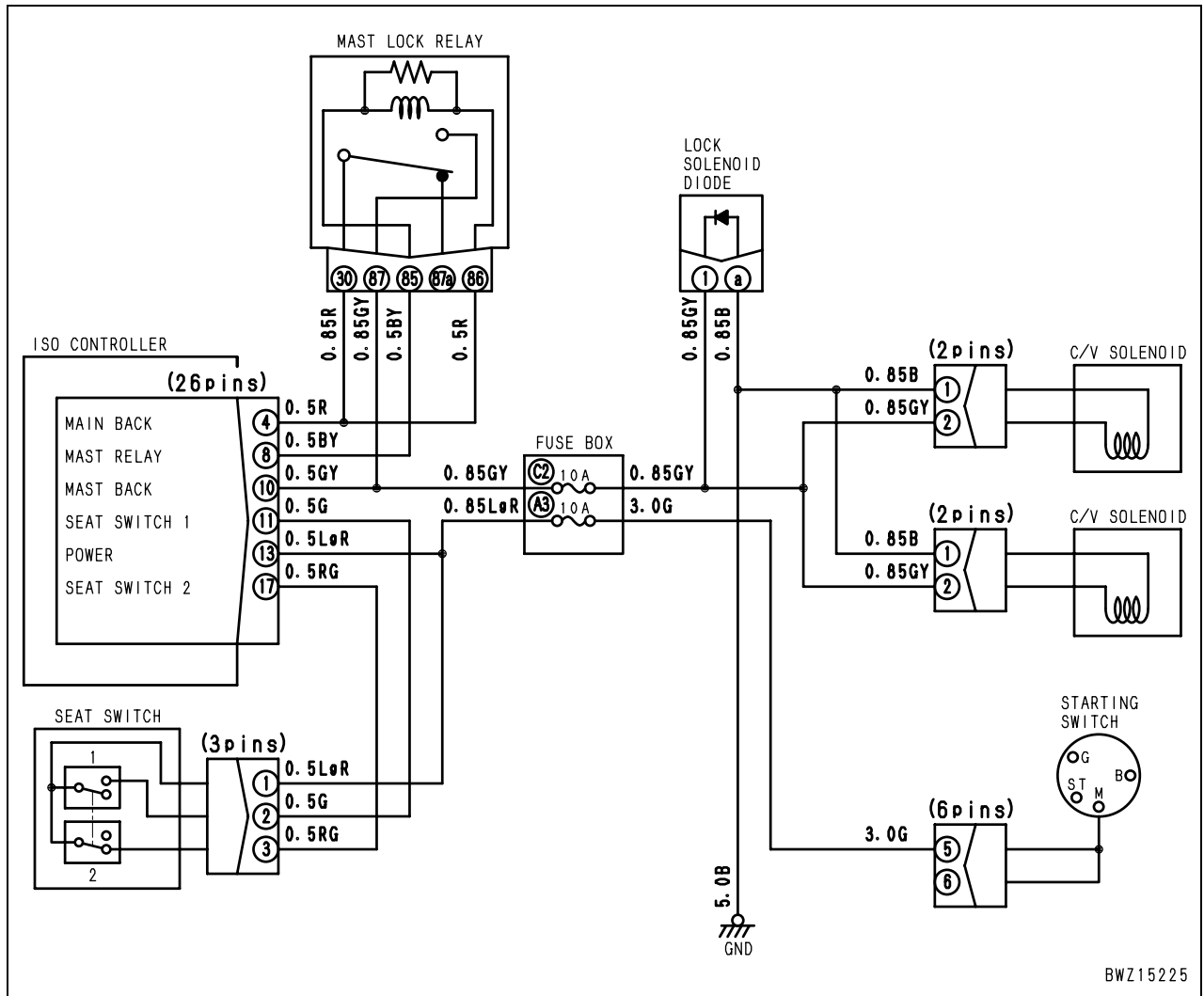
The diagram includes a detailed pinout for the ISO controller (26 pins) and the F-R SWITCH (10 pins). The F-R SWITCH is connected to the controller's pins 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10. The F-R SWITCH is also connected to the controller's pins 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10. The F-R SWITCH is connected to the controller's pins 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10. The F-R SWITCH is connected to the controller's pins 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10.

E-6 Lift truck cannot move work equipment

Contents of trouble	Lift truck cannot move work equipment (It can travel, however.)
Related information	- If any failure code is displayed, carry out troubleshooting for it first. - Perform following troubleshooting when work equipment does not move because of electrical system trouble. (For trouble in hydraulic and mechanical system, see "Troubleshooting of hydraulic and mechanical system (H-mode)".)

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective fuse A3 or C2	If fuse is broken, circuit probably has ground fault (See cause 7).			
	2	Defective seat switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			SEAT SWITCH (male)	Operator	Resistance	
			Between (1) and (2)	Seated	Max. 1 Ω	
				Not seated	Min. 1 MΩ	
			Between (1) and (3)	Seated	Min. 1 MΩ	
				Not seated	Max. 1 Ω	
	Between (2) and (3)		Always	Min. 1 MΩ		
	3	Defective lock solenoid diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.			
			Between LOCK SOLENOID DIODE (male) (a) and (1)		Continues	
	4	Defective work equipment lock solenoid valve (Internal defect) ★ 2 work equipment lock solenoid valves are installed	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Between C/V SOLENOID (male) (1) and (2)		Resistance	9.9 ± 0.5 Ω
	5	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω
	6	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 MΩ
7	Defective ISO controller (Internal defect)	If above causes are not the cause for the trouble, ISO controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)				

Related circuit diagram

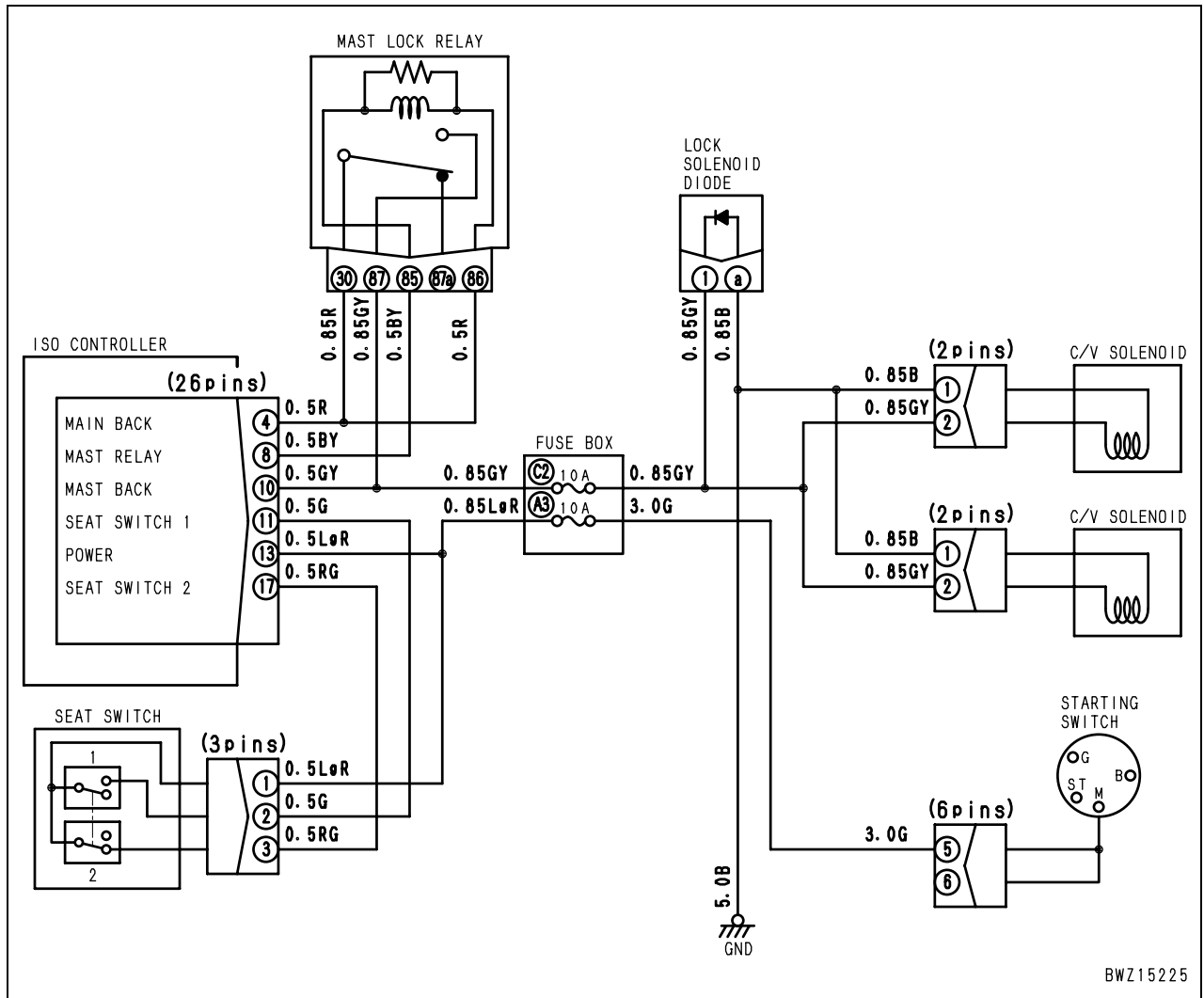


E-7 Work equipment cannot be locked

Contents of trouble	Work equipment cannot be locked
Related information	- If any failure code is displayed, carry out troubleshooting for it first. - Perform following troubleshooting when work equipment cannot be locked because of electrical system trouble. (For trouble in hydraulic and mechanical system, see "Troubleshooting of hydraulic and mechanical system (H-mode)".)

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective lock solenoid diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.			
			Between LOCK SOL DIODE (male) (a) and (1)		Continues	
	2	Defective work equipment lock solenoid valve (Internal defect) ★ 2 work equipment lock solenoid valves are installed	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Between C/V SOLENOID (male) (1) and (2)		Resistance	9.9 ± 0.5 Ω
	3	Defective lift interlock relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	Lift interlock relay is defective	
				Normal state is not recovered	Lift interlock relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			MAST LOCK RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	4	Hot short in wiring harness (Contact with 12 V circuit)	★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.			
			Between ISO CONTROLLER (10) – C/V SOLENOID (female) (2) wiring harness and ground		Voltage	Max. 1 V
			Between MAST LOCK RELAY (87) – C/V SOLENOID (female) (2) wiring harness and ground		Voltage	Max. 1 V
	5	Defective ISO controller (Internal defect)	If above causes are not the cause for the trouble, ISO controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)			

Related circuit diagram

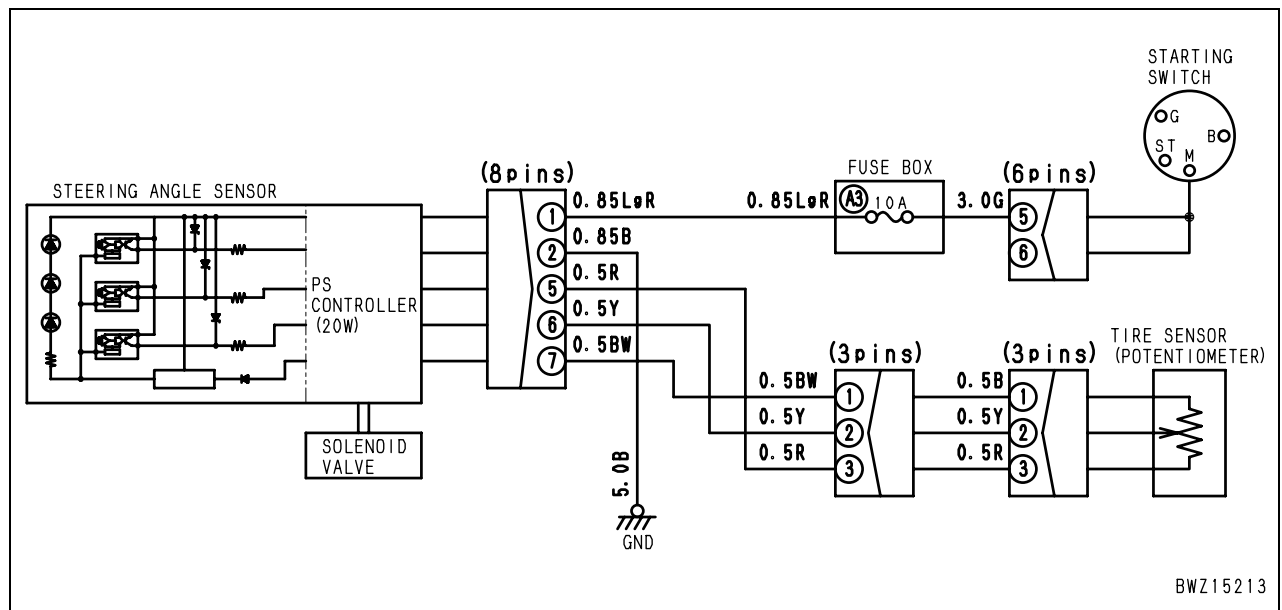


E-8 EPACS is abnormal

Contents of trouble	Knob position is not corrected normally and knob deviates.
Related information	Perform following troubleshooting when EPACS controller LED is ON (controller has not detected trouble) and knob deviates. (If EPACS controller LED is OFF or flashing and knob deviates, see "Troubleshooting by failure code (EPACS controller system)".)

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse A3	If fuse is broken, circuit probably has ground fault (See cause 8).		
	2	Defective installation of tyre angle sensor	Check tyre angle sensor installed condition and correct if necessary.		
	3	Defective tyre angle sensor (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			TIRE SENSOR (male)		Resistance
			Between (3) and (1)		2 kΩ ± 20%
			Between (2) and (1)		Resistance changes linearly according to rotation amount of shaft.
	4	Defective EPACS solenoid valve (Internal defect)	★ Start engine, steer lift truck, and perform troubleshooting.		
			When steering, check reaction of solenoid valve to see if it is turned ON and OFF.		
	5	Loose or idle rotation of orbit roll rotor	Check rotor for loose installation and retighten mounting screw if loose.		
	6	Defective steering wheel angle sensor (Internal defect)	Perform initialization again to see if system can be initialized.		
	7	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
8	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
		Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ	
9	Defective EPACS controller (Internal defect)	If above causes are not the cause for the trouble, EPACS controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)			

Related circuit diagram



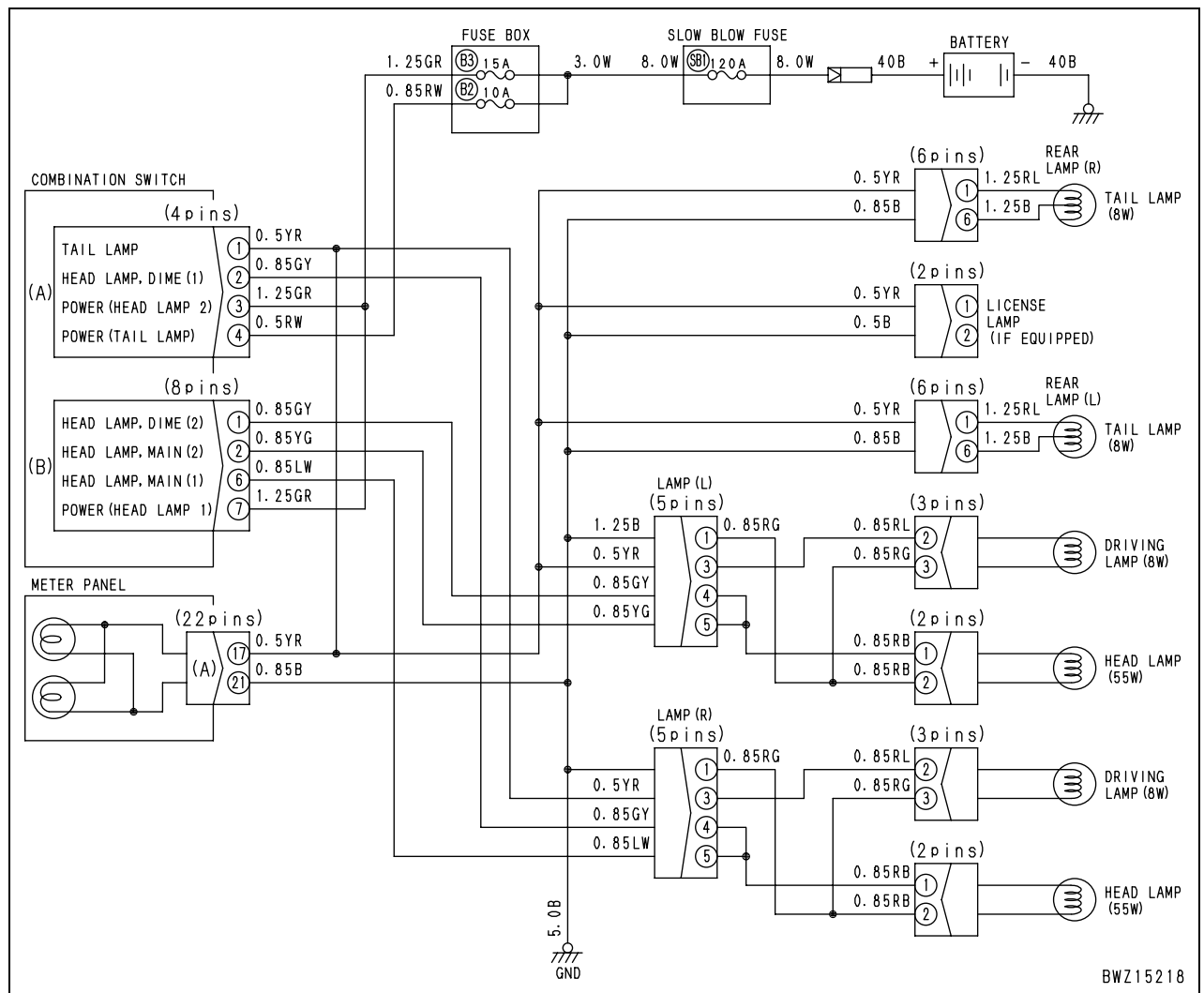
E-9 Headlamp, clearance lamp, tail lamp and license plate lamp do not light or go off

Contents of trouble	• Headlamp, clearance lamp, tail lamp and license plate lamp do not light or go off
Related information	• Check each bulb for breakage. • License plate lamp is optional.

	Cause		Standard value in normal condition/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective fuse B3	If fuse is broken, circuit probably has ground fault (See cause 5).		
	2	Defective slow blow fuse SB1	If slow blow fuse is broken, circuit probably has ground fault (See cause 5).		
	3	Defective combination switch (Internal defect)	★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between COMBINATION SWITCH (A) (3), (B) (7) and ground	Voltage	10 – 15 V
			COMBINATION SWITCH	Lamp switch position	Voltage
			Between (A), (1) and ground	OFF	Max. 1 V
				1st position	10 – 15 V
				2nd position	10 – 15 V
			Between (A) (2), (B) (1) and ground	OFF position	Max. 1 V
				1st position	Max. 1 V
				2nd position	10 – 15 V
			Between (B) (2), (B) (6) and ground	OFF position	Max. 1 V
				1st position	Max. 1 V
				2nd position	10 – 15 V
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
	5	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	6	Hot short in wiring harness (Contact with 12 V circuit)	★ When switch is turned OFF, if left headlamp does not go off, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between COMBINATION SWITCH (B) (1) – LAMP (L) (4) wiring harness and ground	Voltage	Max. 1 V
			Between COMBINATION SWITCH (B) (2) – LAMP (L) (5) wiring harness and ground	Voltage	Max. 1 V

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	6	Hot short in wiring harness (Contact with 12 V circuit)	★ When switch is turned OFF, if right headlamp does not go off, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between COMBINATION SWITCH (A) (2) – LAMP (R) (4) wiring harness and ground	Voltage	Max. 1 V
			Between COMBINATION SWITCH (B) (6) – LAMP (R) (5) wiring harness and ground	Voltage	Max. 1 V
			★ When switch is turned OFF, if clearance lamp and tail lamp do not go off, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			COMBINATION SWITCH (A) (1) – LAMP (R) (3), LAMP (L) (3), REAR LAMP (R) (1), REAR LAMP (L) (1), LICENSE LAMP (1) wiring harness and ground	Voltage	Max. 1 V

Related circuit diagram

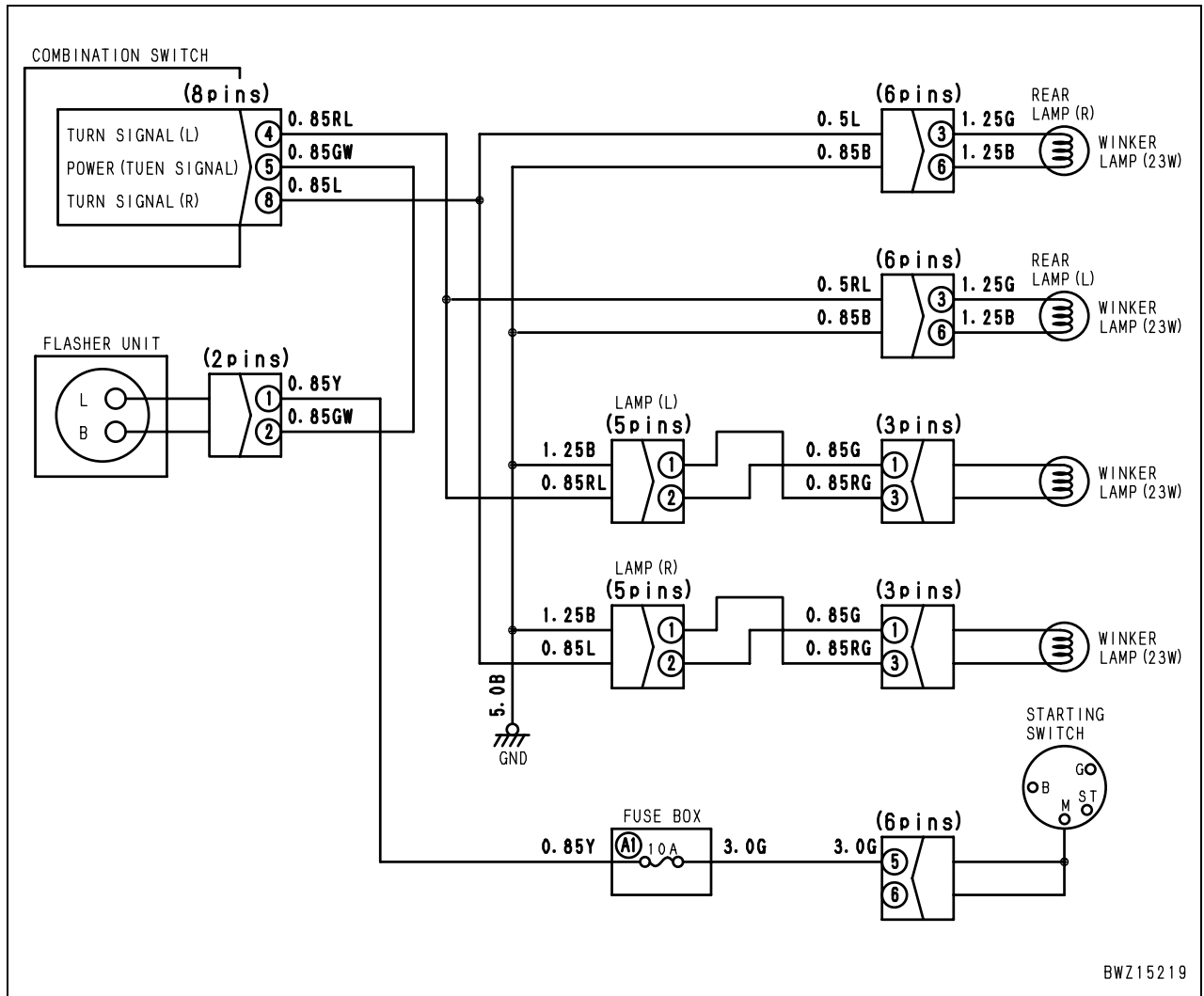


E-10 Turn signal lamps do not light or go off

Contents of trouble	• Turn signal lamps do not light or go off
Related information	• Check each bulb for breakage.

	Cause		Standard value in normal condition/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective fuse A1	If fuse is broken, circuit probably has ground fault (See cause 4).		
	2	Defective combination switch (Internal defect)	★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between COMBINATION SWITCH (B) (5) and ground	Voltage	10 – 15 V
			★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			COMBINATION SWITCH	Direction signal lever position	Voltage
			Between (B), (4) and ground	Neutral	Max. 1 V
				Left	10 – 15 V
				Right	Max. 1 V
			Between (B), (8) and ground	Neutral	Max. 1 V
				Left	Max. 1 V
				Right	10 – 15 V
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
	4	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	5	Hot short in wiring harness (Contact with 12 V circuit)	★ When switch is turned OFF, if left front and rear turn signal lamps do not go off, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between COMBINATION SWITCH (B) (4) – LAMP (L) (2) wiring harness and ground	Voltage	Max. 1 V
			Between COMBINATION SWITCH (B) (4) – REAR LAMP (L) (3) wiring harness and ground	Voltage	Max. 1 V
			★ When switch is turned OFF, if right front and rear turn signal lamps do not go off, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between COMBINATION SWITCH (B) (8) – LAMP (R) (2) wiring harness and ground	Voltage	Max. 1 V
			Between COMBINATION SWITCH (B) (8) – REAR LAMP (R) (3) wiring harness and ground	Voltage	Max. 1 V

Related circuit diagram

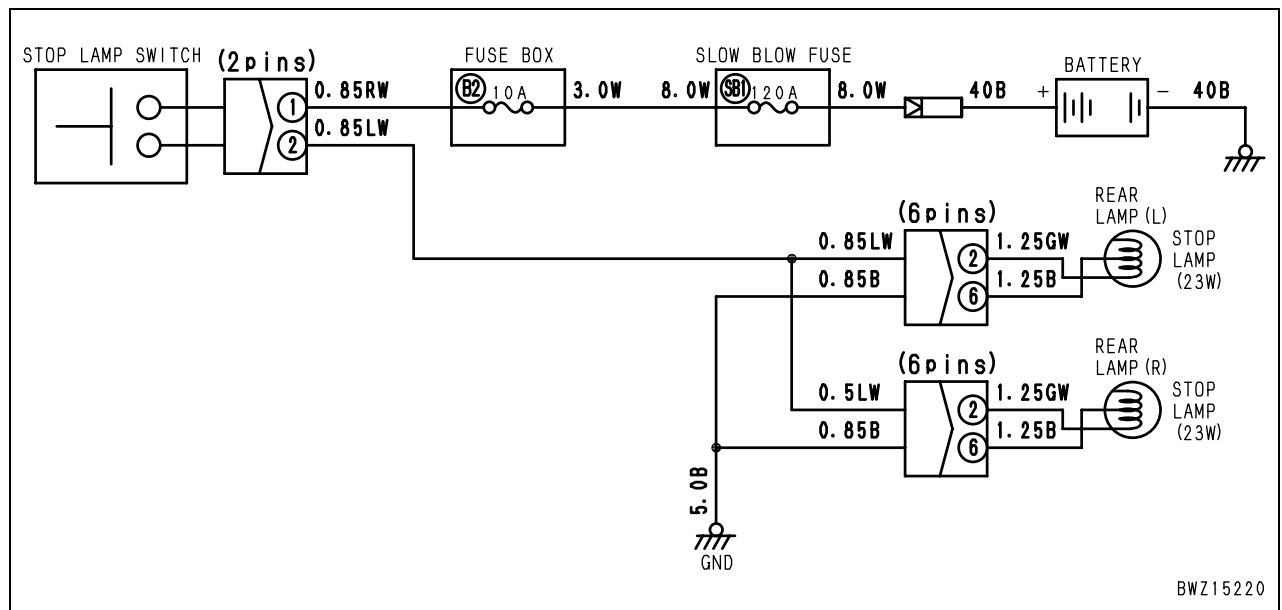


E-11 Brake lamps do not light or go off

Contents of trouble	• Brake lamps do not light or go off
Related information	• Check each bulb for breakage.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse B2	If fuse is broken, circuit probably has ground fault (See cause 5).		
	2	Defective slow blow fuse SB1	If slow blow fuse is broken, circuit probably has ground fault (See cause 5).		
	3	Defective stop lamp switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			STOP LAMP SWITCH (male)	Brake	Resistance
			Between (1) and (2)	Depressed	Max. 1 Ω
				Released	Min. 1 MΩ
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance Max. 1 Ω
	5	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance Min. 1 MΩ
	6	Hot short in wiring harness (Contact with 12 V circuit)	★ When switch is turned OFF, if right and left brake lamps do not go off, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between STOP LAMP SWITCH (female) (1) – REAR LAMP (female) (L) (2) wiring harness and ground		Voltage Max. 1 V
			Between STOP LAMP SWITCH (female) (1) – REAR LAMP (female) (R) (2) wiring harness and ground		Voltage Max. 1 V

Related circuit diagram

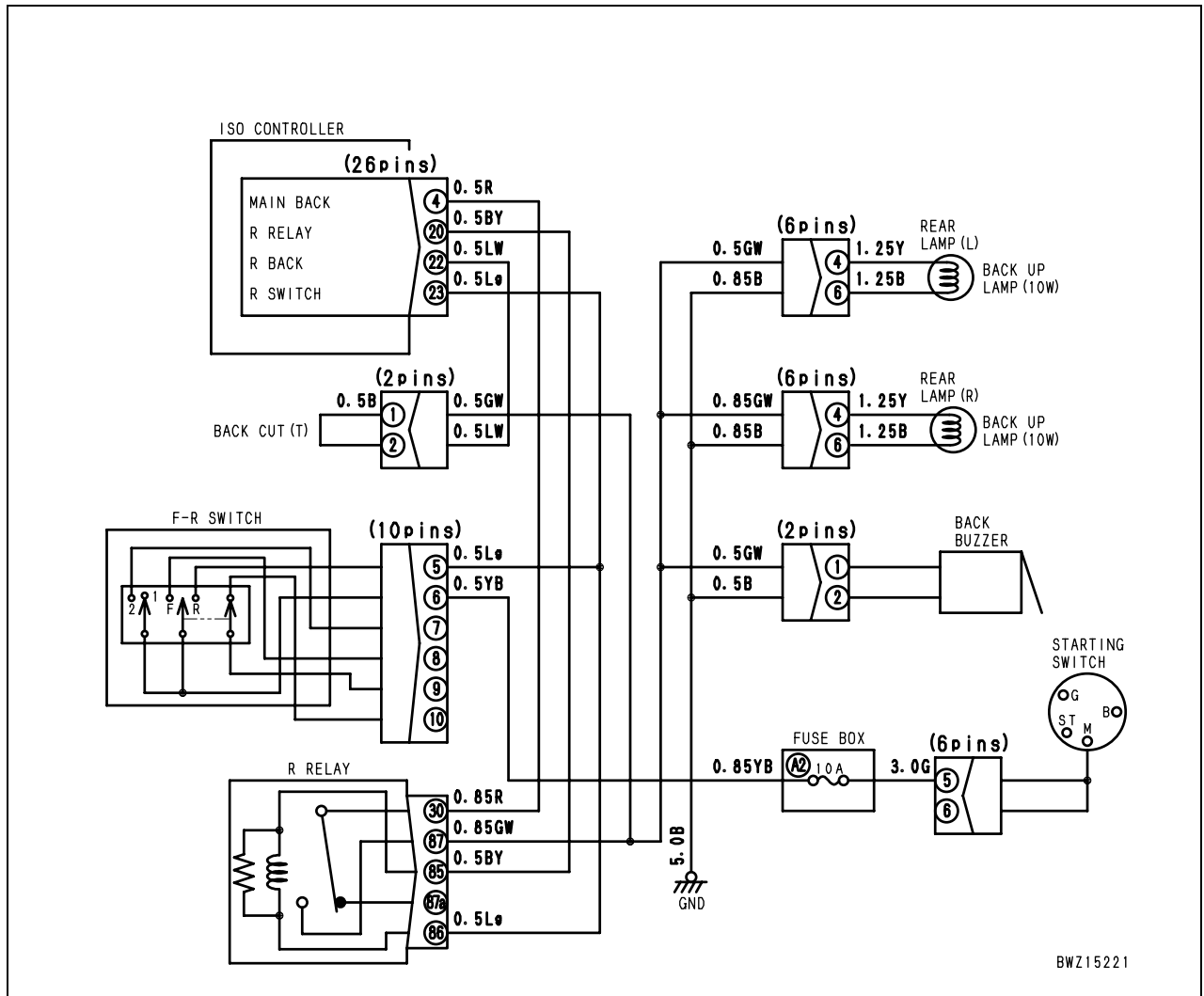


E-12 Backup lamps do not light or go off

Contents of trouble	• Backup lamps do not light or go off
Related information	• Check each bulb for breakage.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting				
	1	Defective fuse A2	If fuse is broken, circuit probably has ground fault (See cause 5).				
	2	Defective F-R switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.				
			F-R SWITCH (male)	F-R lever position	Resistance		
			Between (5) and (6)	Reverse		Max. 1 Ω	
				Other than above		Min. 1 MΩ	
	3	Defective R relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.				
			Replace with normal relay	Normal state is recovered		R relay is defective	
				Normal state is not recovered		R relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.				
			R RELAY (male)	Between (85) and (86)		Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)		Max. 1 Ω	
				Other than above (Relay: OFF)		Min. 1 MΩ	
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.				
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω	
	5	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.				
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 MΩ	
6	Hot short in wiring harness (Contact with 12 V circuit)	★ When F-R lever is set to position other than "Reverse", if backup lamps do not go off, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.					
		R RELAY (female) (87) – REAR LAMP (L) (4) wiring harness and ground		Voltage	Max. 1 V		
		R RELAY (female) (87) – REAR LAMP (R) (4) wiring harness and ground		Voltage	Max. 1 V		

Related circuit diagram

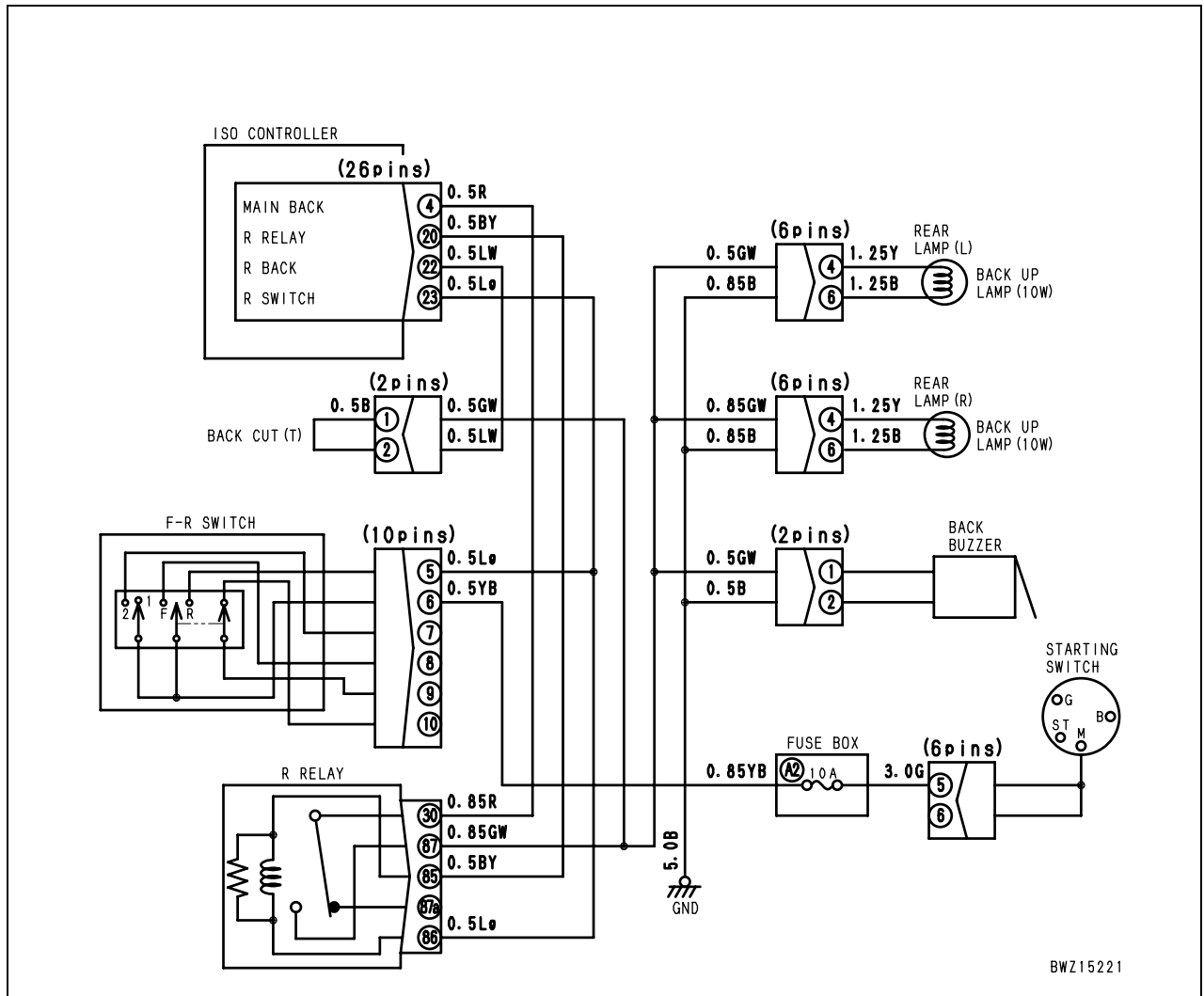


E-13 Backup buzzer does not sound or does not stop sounding

Contents of trouble	• Backup buzzer does not sound or does not stop sounding
Related information	

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse A2	If fuse is broken, circuit probably has ground fault (See cause 6).		
	2	Defective backup buzzer (Internal defect)	★ Prepare with starting switch OFF. ★ Check buzzer unit. ★ Connect (+) to (1) and (–) to (2).		
			Between BACK BUZZER (female) (1) and (2)	12 V applied Other than above	Buzzer sounds Buzzer does not sound
	3	Defective F-R switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			F-R SWITCH (male)	F-R lever position	Resistance
			Between (5) and (6)	Reverse Other than above	Max. 1 Ω Min. 1 MΩ
	4	Defective R relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	R relay is defective
				Normal state is not recovered	R relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			R RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	5	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance Max. 1 Ω
	6	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance Min. 1 MΩ
	7	Hot short in wiring harness (Contact with 12 V circuit)	★ When F-R lever is set to position other than "Reverse", if backup buzzer do not stop sounding, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between R RELAY (female) (87) – BACK BUZZER (1) wiring harness and ground		Voltage Max. 1 V

Related circuit diagram



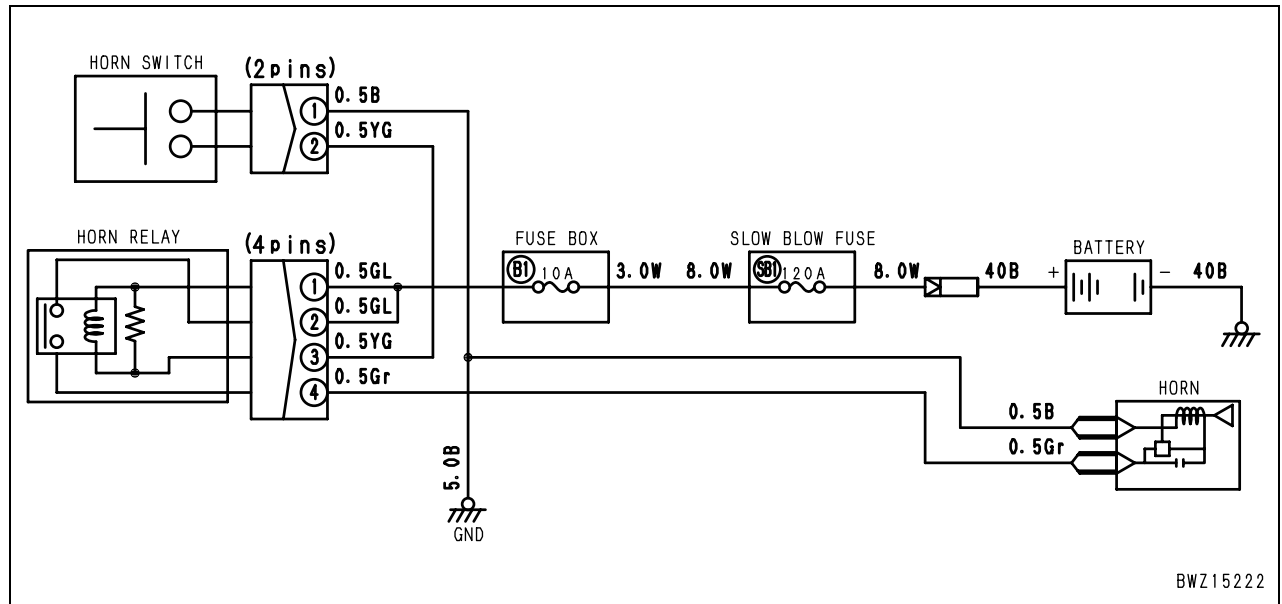
E-14 Horn does not sound or does not stop sounding

Contents of trouble	• Horn does not sound or does not stop sounding
Related information	

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse B1	If fuse is broken, circuit probably has ground fault (See cause 7).		
	2	Defective slow blow fuse SB1	If slow blow fuse is broken, circuit probably has ground fault (See cause 7).		
	3	Defective horn (Internal defect)	★ Prepare with starting switch OFF. ★ Check horn unit. ★ Connect (+) to gray wiring connection side and (–) to black wiring connection side.		
			HORN Between (+) terminal and (–) terminal	12 V applied Other than above	Horn sounds Horn does not sound
	4	Defective horn switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			HORN SWITCH (male)	Horn button	Resistance
			Between (1) and (2)	Pressed	Max. 1 Ω
				Other than above	Min. 1 MΩ
	5	Defective horn relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Horn relay is defective
				Normal state is not recovered	Horn relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			HORN RELAY (male)	Between (1) and (3)	Resistance
			Between (2) and (4)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	6	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance Max. 1 Ω
	7	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance Min. 1 MΩ

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	8	Hot short in wiring harness (Contact with 12 V circuit)	★ If horn does not stop sounding, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
		Between HORN RELAY (female) (4) – HORN (+) terminal wiring harness and ground	Voltage	Max. 1 V	

Related circuit diagram



E-15 Fuel level is not displayed normally

Contents of trouble	Fuel level is not displayed normally
Related information	Perform following troubleshooting when there is remarkable difference between actual fuel level and displayed fuel level.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective fuse A1	If fuse is broken, circuit probably has ground fault (See cause 4).			
	2	Defective fuel level sensor (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			FUEL LEVEL SENSOR (male)	Fuel level (Float position)	Resistance	
			Between (1) and (3)	FULL (Max. position)	0 – 2 Ω	
				EMPTY (Min. position)	140 – 160 Ω	
				Between FULL and EMPTY	Changes continuously as float moves	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω
	4	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 MΩ
	5	Hot short in wiring harness (Contact with 12 V circuit)	★ If displayed level is higher than actual level, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting			
			Between FUEL LEVEL SENSOR (female) (3) – METER PANEL (A) (female) (19) wiring harness and ground		Voltage	Max. 1 V
	6	Defective instrument panel (Internal defect)	If above causes are not the cause for the trouble, instrument panel may be defective. (Since trouble is in system, troubleshooting cannot be performed.)			

FORKLIFT TRUCK

CX50 Series

Applicable model	Serial number
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For general

FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up

For USA

FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

40 Troubleshooting

302 Troubleshooting of electrical system (E-mode) (Part 2)

**Applicable model: Lift truck with EBT-TB45-1A/2A/3A engine
(Gasoline, Gasoline/LPG, LPG) (For general)**

E-1 Engine does not start	2
E-2 Engine does not stop	12
E-3 Lift truck cannot travel	14
E-4 Parking brake reminder alarm does not sound or does not stop sounding	14
E-5 Travel direction is not changed normally	14
E-6 Lift truck cannot move work equipment	14
E-7 Work equipment cannot be locked	14
E-8 EPACS is abnormal	14
E-9 Headlamp, clearance lamp, tail lamp and license plate lamp do not light or go off	14
E-10 Turn signal lamps do not light or go off	15
E-11 Brake lamps do not light or go off	15
E-12 Backup lamps do not light or go off	15
E-13 Backup buzzer does not sound or does not stop sounding	15
E-14 Horn does not sound or does not stop sounding	15
E-15 Fuel (Gasoline) level is not displayed normally	15

E-1 Engine does not start

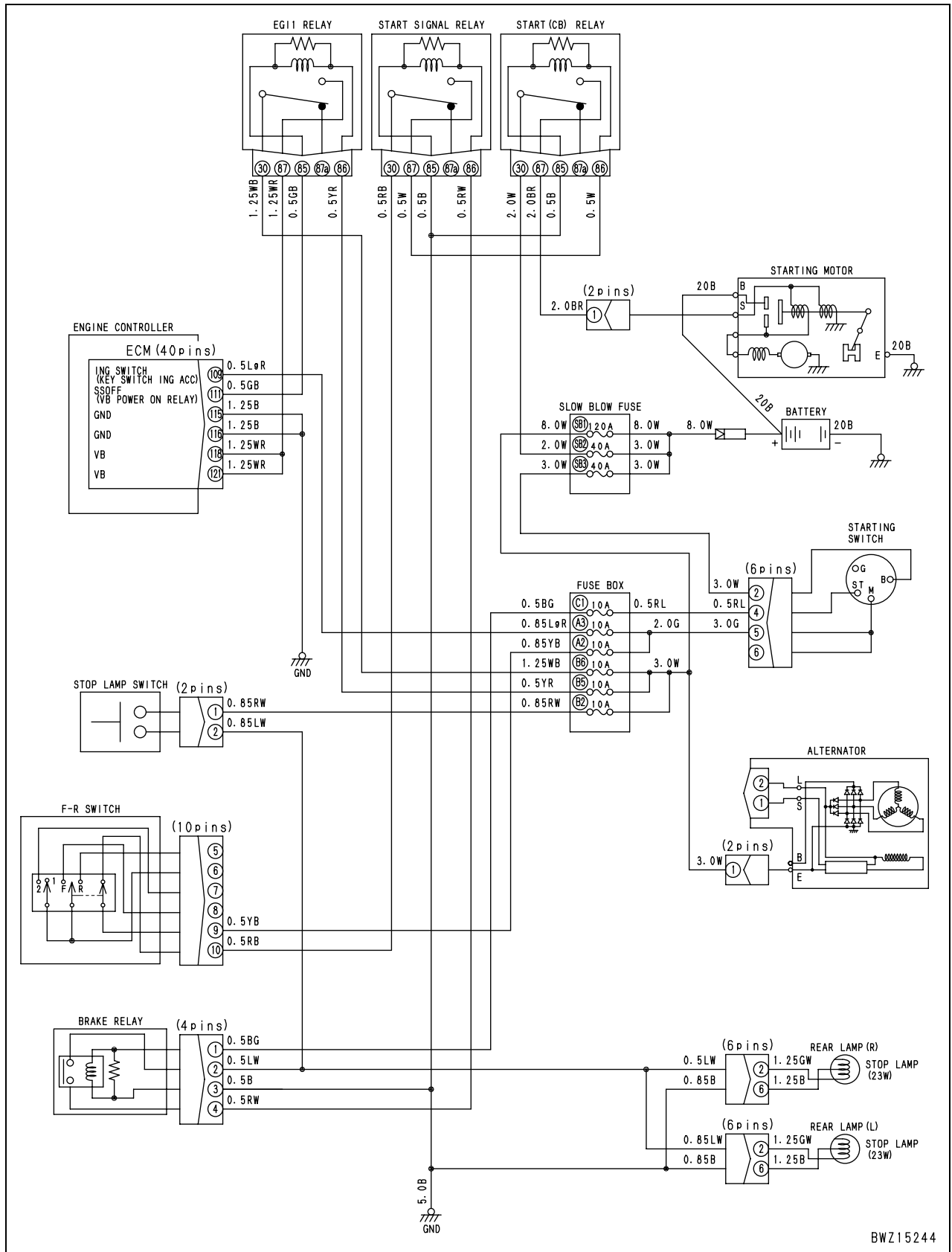
Contents of trouble	(1) Since starting motor does not rotate because of trouble in starting motor system or starting signal system of starting switch, engine does not start.
Related information	- Check following before troubleshooting. - F/R lever is in N (neutral) position. - Brake pedal is depressed. - Fuse or slow blow fuse is not broken (If broken, check related wiring harness for ground fault.) - Battery cable is not disconnected from battery.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective battery	Specific gravity		Min. 1.26
			Voltage		Min. 12 V
	2	Defective fuse A2, A3, B2, B5, B6 or C1	If fuse is broken, circuit probably has ground fault (See cause 12).		
	3	Defective slow blow fuse SB1, SB2, or SB3	If slow blow fuse is broken, circuit probably has ground fault (See cause 12).		
	4	Defective starting motor	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Between STARTING MOTOR (E) and ground	Resistance	Max. 1 Ω
			★ Prepare with starting switch OFF, then start engine and perform troubleshooting.		
			Between STARTING MOTOR (B) and ground	Voltage	10 – 15 V
			Between STARTING MOTOR (S) and ground	Voltage	10 – 15 V
			★ If above troubleshooting result is normal and starting motor does not rotate, starting motor is defective.		
	5	Defective starting motor relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Starting motor relay is defective
				Normal state is not recovered	Starting motor relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			START RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	6	Defective start signal relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Start signal relay is defective
				Normal state is not recovered	Start signal relay is normal

	Cause		Standard value in normal condition/Remarks on troubleshooting		
Possible causes and standard value in normal state	6	Defective start signal relay (Internal defect)	★ Prepare with starting switch OFF. ★ Check relay unit.		
			START SIGNAL RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	7	Defective EGI 1 relay (Internal defect)	Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	EGI 1 relay is defective
				Normal state is not recovered	EGI 1 relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			EGI 1 RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	8	Defective stop lamp switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			STOP LAMP SWITCH (male)	Brake	Resistance
			Between (1) and (2)	Released (Not depressed)	Min. 1 MΩ
				Depressed	Max. 1 Ω
	9	Brake relay is defective (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Brake relay is defective
				Normal state is not recovered	Brake relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			BRAKE RELAY (male)	Between (1) and (3)	Resistance
			Between (2) and (4)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	10	Defective starting switch (Internal defect)	★ Prepare with starting switch OFF. ★ Check switch unit.			
			STARTING SWITCH (male)	Key position	Resistance	
			Between (2) and (3) Between (5) and (6)	OFF	Max. 1 Ω	
			Other than above		Min. 1 MΩ	
			Between (1), (2), (3), (5) and (6)	1 (ON)	Max. 1 Ω	
			Other than above		Min. 1 MΩ	
			Between (1), (2), (3), (4), (5) and (6)	2 (START)	Max. 1 Ω	
	11	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω
	12	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 MΩ

Related circuit diagram



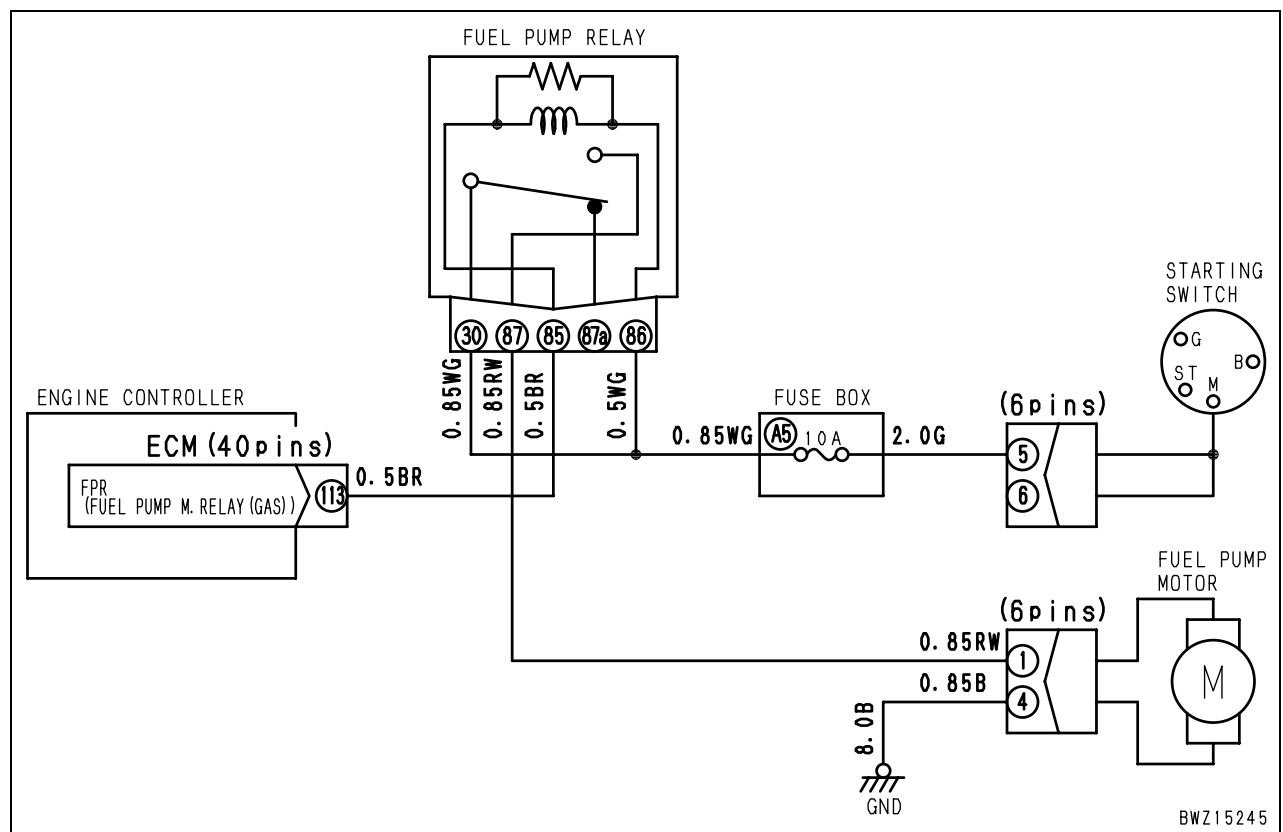
Applicable model: EBT-TB45-1A (Gasoline), EBT-TB45-2A (Gasoline/LPG)

Contents of trouble	(2) Since fuel (gasoline) is not sent because of fuel pump system trouble, engine does not start.
Related information	- Check following before troubleshooting. a. Fuel level is sufficient. b. Fuel filter is not clogged. c. Air passage of fuel tank cap is not clogged. - Apply EBT-TB45-1B (Gasoline/LPG) when "Gasoline" is selected as fuel.

	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse A5	If fuse is broken, circuit probably has ground fault (See cause 6).		
Possible causes and standard value in normal state	2	Defective fuel pump relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Fuel pump relay is defective
				Normal state is not recovered	Fuel pump relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			FUEL PUMP RELAY(male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	3	Defective fuel pump (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			★ Prepare with starting switch OFF. ★ Check pump unit.		
			FUEL PUMP MOTOR (male)		Fuel pump operation
			Between (1) and (4)	12 V applied (Starting switch ON)	Motor in operation
				Power is not connected (Starting switch OFF)	Motor stopped
	4	Defective starting switch (Internal defect)	★ Prepare with starting switch OFF. ★ Check switch unit.		
			STARTING SWITCH (male)	Key position	Resistance
			Between (2) and (3) Between (5) and (6)	OFF	Max. 1 Ω
			Other than above		Min. 1 MΩ
			Between (1), (2), (3), (5) and (6)	1 (ON)	Max. 1 Ω
			Other than above		Min. 1 MΩ
			Between (1), (2), (3), (4), (5) and (6)	2 (START)	Max. 1 Ω
	5	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance Max. 1 Ω

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	6	Ground fault of wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	7	Defective engine controller (Internal defect)	★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting. ★ Check about 1 second after turning starting switch to ON position.		
			ECM (40 PIN CONNECTOR)	Voltage	
			Between (113) and ground	10 – 15 V	

Related circuit diagram



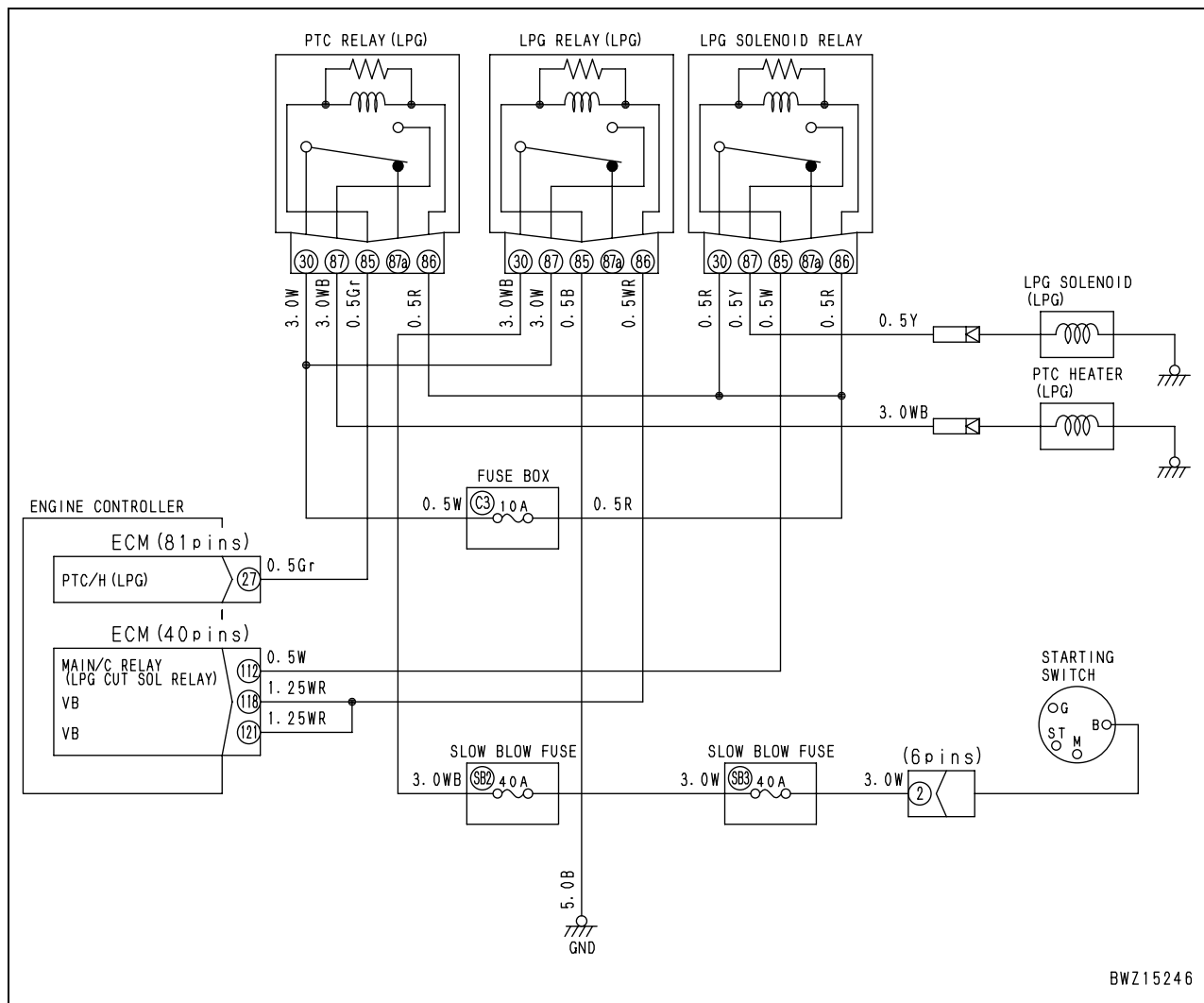
Applicable model: EBT-TB45-2A (Gasoline/LPG), EBT-TB45-3A (LPG)

Contents of trouble	(3) Since fuel (LPG) is not sent because of LPG solenoid system trouble, engine does not start.
Related information	- Check following before troubleshooting. a. Fuel level is sufficient. b. Fuel filter is not clogged. - Apply EBT-TB45-1B (Gasoline/LPG) when "LPG" is selected as fuel.

	Cause		Standard value in normal condition/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective fuse C3	If fuse is broken, circuit probably has ground fault (See cause 9).		
	2	Defective slow blow fuse SB3	If slow blow fuse is broken, circuit probably has ground fault (See cause 9).		
	3	Defective LPG solenoid relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	LPG solenoid relay is defective
				Normal state is not recovered	LPG solenoid relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			LPG SOLENOID RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	4	Defective PTC relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	PTC relay is defective
				Normal state is not recovered	PTC relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			PTC RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	5	Defective LPG relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	LPG relay is defective
				Normal state is not recovered	LPG relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			LPG RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	6	Defective LPG solenoid (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			★ Prepare with starting switch OFF. ★ Check solenoid unit (Connect (+) of battery to (+) terminal of installed solenoid)			
			LPG SOLENOID (+) terminal		Operation of LPG solenoid	
			12 V applied (Starting switch ON)		Opens (Operating sound is heard)	
			Disconnect power from above condition (Starting switch ON → OFF)		Closes (Operating sound is heard)	
	7	Defective starting switch (Internal defect)	★ Prepare with starting switch OFF. ★ Check switch unit.			
			STARTING SWITCH (male)	Key position	Resistance	
			Between (2) and (3) Between (5) and (6)	OFF	Max. 1 Ω	
			Other than above		Min. 1 MΩ	
			Between (1), (2), (3), (5) and (6)	1 (ON)	Max. 1 Ω	
			Other than above		Min. 1 MΩ	
			Between (1), (2), (3), (4), (5) and (6)	2 (START)	Max. 1 Ω	
	8	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω
	9	Ground fault of wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 MΩ
	10	Defective engine controller (Internal defect)	★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.			
			ECM (40 PIN CONNECTOR)		Voltage	
			Between (112) and ground		10 – 15 V	

Related circuit diagram



E-2 Engine does not stop

Contents of trouble	When starting switch is turned to OFF position, engine does not stop.
Related information	- If power to engine controller is turned OFF, engine stops. - When performing troubleshooting, disconnect battery negative terminal to stop engine.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective EGI 1 relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	EGI relay is defective	
				Normal state is not recovered	EGI relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			EGI 1 RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	2	Defective starting switch (Internal defect)	★ Prepare with starting switch OFF. ★ Check switch unit.			
			STARTING SWITCH (male)	Key position	Resistance	
			Between (2) and (3) Between (5) and (6)	OFF	Max. 1 Ω	
			Other than above		Min. 1 MΩ	
			Between (1), (2), (3), (5) and (6)	1 (ON)	Max. 1 Ω	
			Other than above		Min. 1 MΩ	
			Between (1), (2), (3), (4), (5) and (6)	2 (START)	Max. 1 Ω	
	3	Hot short in wiring harness (Contact with 12 V circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Between ECM (40PIN CONNECTOR) (female) (118), (121) – EGI 1 RELAY (female) (87) wiring harness and ground		Voltage	Max. 1 V
	4	Defective engine controller (Internal defect)	If above causes are not the cause for the trouble, engine controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)			

The diagram illustrates the electrical system for a vehicle, featuring the following components and their connections:

- ENGINE CONTROLLER (ECM 40 pins):**
 - Pin 109 (ING SWITCH KEY SWITCH ING ACC) to 0.5LgR
 - Pin 111 (SSOFF VB POWER ON RELAY) to 0.5GB
 - Pin 115 (GND) to 1.25B
 - Pin 116 (GND) to 1.25B
 - Pin 118 (VB) to 1.25WR
 - Pin 121 (VB) to 1.25WR
- RELAYS:**
 - EGII RELAY:** 1.25WB (30), 0.87 (87), 0.5GB (85), 0.5YR (87a), 0.5R (86)
 - START SIGNAL RELAY:** 0.5RB (30), 0.5W (87), 0.5B (85), 0.5RW (87a), 0.5R (86)
 - START (CB) RELAY:** 2.0W (30), 2.0BR (87), 0.5B (85), 0.5W (87a), 0.5R (86)
 - BRAKE RELAY:** 0.5BG (1), 0.5LW (2), 0.5B (3), 0.5RW (4)
- STOP LAMP SWITCH (2 pins):** 0.85RW (1), 0.85LW (2)
- F-R SWITCH (10 pins):** 0.5YB (5), 0.5RB (6), 0.5YB (8), 0.5RB (9), 0.5YB (10)
- FUSE BOX:**
 - 0.5BG (C1) 10A
 - 0.85LgR (A3) 10A
 - 0.85YB (A2) 10A
 - 1.25WB (B6) 10A
 - 0.5YR (B5) 10A
 - 0.85RW (B2) 10A
 - 0.5RL (0.5RL)
 - 2.0G (2.0G)
 - 3.0W (3.0W)
- STARTING MOTOR:** 2.0BR (2 pins), 20B (B), 20B (S), 20B (E)
- STARTING SWITCH (6 pins):** 3.0W (2), 0.5RL (4), 3.0G (5), 0.5YB (6)
- ALTERNATOR (2 pins):** 3.0W (1), 3.0W (2)
- REAR LAMP (R) (6 pins):** 0.5LW (2), 1.25GW (2), 0.85B (6), 1.25B (6)
- REAR LAMP (L) (6 pins):** 0.85LW (2), 1.25GW (2), 0.85B (6), 1.25B (6)

The diagram also shows a common ground (GND) and a 5.0B wire connected to the ground.

E-3 Lift truck cannot travel

See Troubleshooting of electrical system (E-mode) (Part 1), Lift truck with SAA4D95LE-5-A engine (For general), **E-3**.

E-4 Parking brake reminder alarm does not sound or does not stop sounding

See Troubleshooting of electrical system (E-mode) (Part 1), Lift truck with SAA4D95LE-5-A engine (For general), **E-4**.

E-5 Travel direction is not changed normally

See Troubleshooting of electrical system (E-mode) (Part 1), Lift truck with SAA4D95LE-5-A engine (For general), **E-5**.

E-6 Lift truck cannot move work equipment

See Troubleshooting of electrical system (E-mode) (Part 1), Lift truck with SAA4D95LE-5-A engine (For general), **E-6**.

E-7 Work equipment cannot be locked

See Troubleshooting of electrical system (E-mode) (Part 1), Lift truck with SAA4D95LE-5-A engine (For general), **E-7**.

E-8 EPACS is abnormal

See Troubleshooting of electrical system (E-mode) (Part 1), Lift truck with SAA4D95LE-5-A engine (For general), **E-8**.

E-9 Headlamp, clearance lamp, tail lamp and license plate lamp do not light or go off

See Troubleshooting of electrical system (E-mode) (Part 1), Lift truck with SAA4D95LE-5-A engine (For general), **E-9**.

E-10 Turn signal lamps do not light or go off

See Troubleshooting of electrical system (E-mode) (Part 1), Lift truck with SAA4D95LE-5-A engine (For general), **E-10**.

E-11 Brake lamps do not light or go off

See Troubleshooting of electrical system (E-mode) (Part 1), Lift truck with SAA4D95LE-5-A engine (For general), **E-11**.

E-12 Backup lamps do not light or go off

See Troubleshooting of electrical system (E-mode) (Part 1), Lift truck with SAA4D95LE-5-A engine (For general), **E-12**.

E-13 Backup buzzer does not sound or does not stop sounding

See Troubleshooting of electrical system (E-mode) (Part 1), Lift truck with SAA4D95LE-5-A engine (For general), **E-13**.

E-14 Horn does not sound or does not stop sounding

See Troubleshooting of electrical system (E-mode) (Part 1), Lift truck with SAA4D95LE-5-A engine (For general), **E-14**.

E-15 Fuel (Gasoline) level is not displayed normally

Applicable model: EBT-TB45-1A engine (Gasoline), EBT-TB45-2A engine (Gasoline/LPG)

See Troubleshooting of electrical system (E-mode) (Part 1), Lift truck with SAA4D95LE-5-A engine (For general), **E-15**.

FORKLIFT TRUCK

CX50 Series

Applicable model Serial number

For general

FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up

For USA

FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

40 Troubleshooting

303 Troubleshooting of electrical system (E-mode) (Part 3)

Applicable model: Lift truck with S4D95LE-3 engine (For general)

E-1 Engine does not start	2
E-2 Engine does not stop	8
E-3 Engine preheater does not operate normally	10
E-4 Lift truck cannot travel	12
E-5 Parking brake reminder alarm does not sound or does not stop sounding	16
E-6 Travel direction is not changed normally	18
E-7 Lift truck cannot move work equipment	22
E-8 Work equipment cannot be locked	28
E-9 EPACS is abnormal	34
E-10 Headlamp, clearance lamp and tail lamp do not light or go off	36
E-11 Turn signal lamps do not light or go off	38
E-12 Brake lamps do not light or go off	38
E-13 Backup lamps do not light or go off	38
E-14 Backup buzzer does not sound or does not stop sounding	38
E-15 Horn does not sound or does not stop sounding	38
E-16 Fuel level is not displayed normally	38

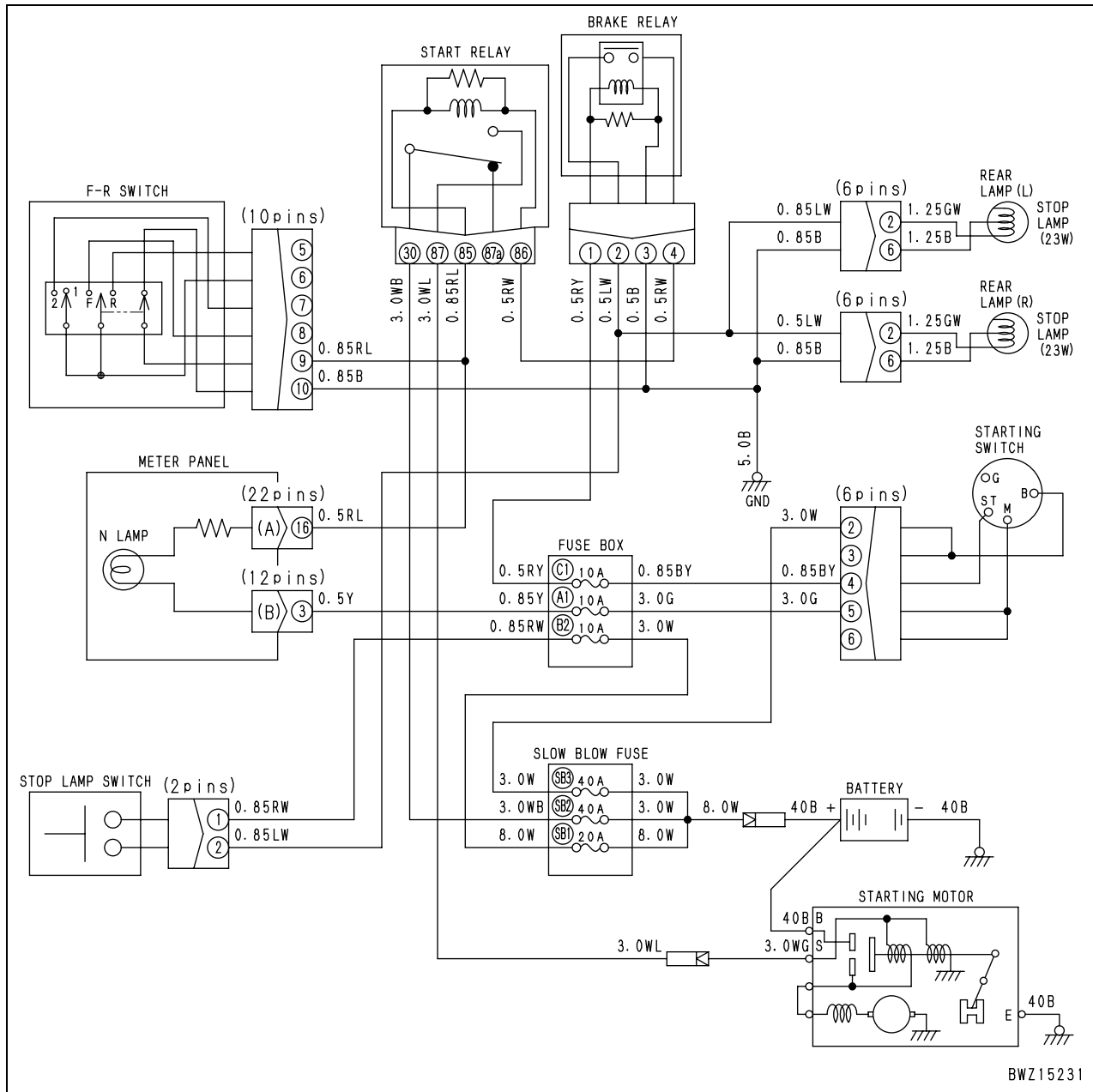
E-1 Engine does not start

Contents of trouble	(1) Since starting motor does not rotate because of trouble in starting motor system or starting signal system of starting switch, engine does not start.
Related information	- Check following before troubleshooting. - F/R lever is in N (neutral) position. - Brake pedal is depressed. - Fuse or slow blow fuse is not broken (If broken, check related wiring harness for ground fault.) - Battery cable is not disconnected from battery.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective battery	Specific gravity		Min. 1.26
			Voltage		Min. 12 V
	2	Defective fuse A1, B1 or C1	If fuse is broken, circuit probably has ground fault (See cause 10).		
	3	Defective slow blow fuse SB1, SB2 or SB3	If slow blow fuse is broken, circuit probably has ground fault (See cause 10).		
	4	Defective starting motor	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Between STARTING MOTOR (E) and ground		Resistance Max. 1 Ω
			★ Prepare with starting switch OFF, then start engine and perform troubleshooting.		
			Between STARTING MOTOR (B) and ground		Voltage 10 – 15 V
			Between STARTING MOTOR (S) and ground		Voltage 10 – 15 V
			★ If above troubleshooting result is normal and starting motor does not rotate, starting motor is defective.		
	5	Starting motor relay is defective (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Starting motor relay is defective
				Normal state is not recovered	Starting motor relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			START RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	6	Defective stop lamp switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			STOP LAMP SWITCH (male)	Brake	Resistance
			Between (1) and (2)	Released (Not depressed)	Min. 1 MΩ
Depressed				Max. 1 Ω	

	Cause		Standard value in normal condition/Remarks on troubleshooting		
Possible causes and standard value in normal state	7	Defective brake relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Brake relay is defective
				Normal state is not recovered	Brake relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			BRAKE RELAY (male)	Between (1) and (3)	Resistance
			Between (2) and (4)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	8	Defective starting switch (Internal defect)	★ Prepare with starting switch OFF. ★ Check switch unit.		
			STARTING SWITCH (male)	Key position	Resistance
			Between (2) and (3) Between (5) and (6)	OFF	Max. 1 Ω
			Other than above		Min. 1 MΩ
			Between (1), (2), (3), (5) and (6)	1 (ON)	Max. 1 Ω
			Other than above		Min. 1 MΩ
			Between (1), (2), (3), (4), (5) and (6)	2 (START)	Max. 1 Ω
	9	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance Max. 1 Ω
	10	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance Min. 1 MΩ

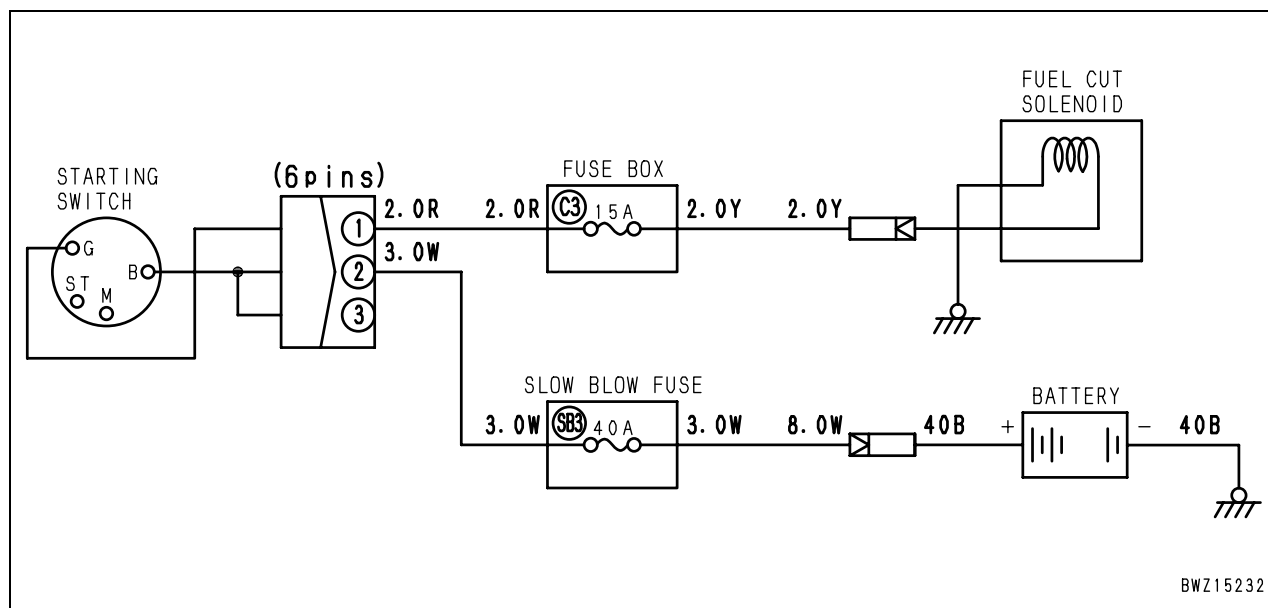
Related circuit diagram



Contents of trouble	(2) Since gasoline is not sent because of fuel cut solenoid system trouble, engine does not start.
Related information	- Check following before troubleshooting. - Fuel level is sufficient. - Fuel filter is not clogged. - Air passage of fuel tank cap is not clogged.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective fuse C3	If fuse is broken, circuit probably has ground fault (See cause 6).			
	2	Defective slow blow fuse SB3	If slow blow fuse is broken, circuit probably has ground fault (See cause 6).			
	3	Defective fuel cut solenoid (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			★ Prepare with starting switch OFF. ★ Check solenoid unit.			
			FUEL CUT SOLENOID		Rod operation	
			(+) terminal (male)	12 V applied (Starting switch ON)	Moves in fuel passage "Open" direction	
	Power is not connected (Starting switch OFF)	Returns in fuel passage "Close" direction				
	4	Defective starting switch (Internal defect)	★ Prepare with starting switch OFF. ★ Check switch unit.			
			STARTING SWITCH (male)	Key position	Resistance	
			Between (2) and (3) Between (5) and (6)	OFF	Max. 1 Ω	
			Other than above		Min. 1 MΩ	
			Between (1), (2), (3), (5) and (6)	1 (ON)	Max. 1 Ω	
			Other than above		Min. 1 MΩ	
			Between (1), (2), (3), (4), (5) and (6)	2 (START)	Max. 1 Ω	
	5	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω
6	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.				
		Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 MΩ	

Related circuit diagram

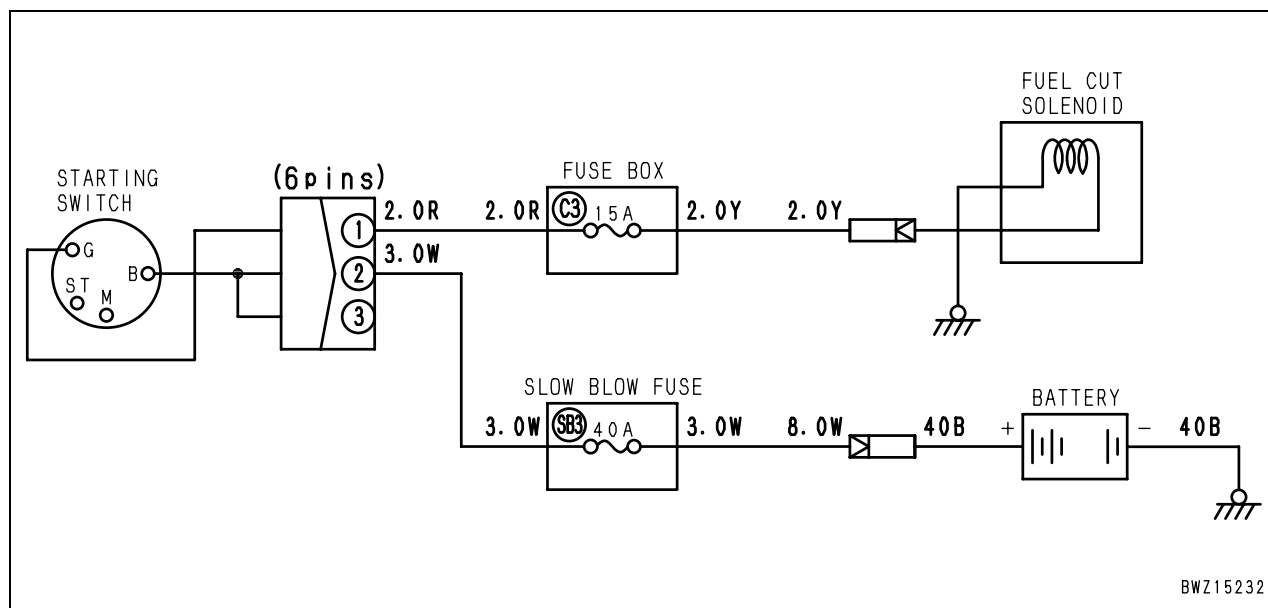


E-2 Engine does not stop

Contents of trouble	When starting switch is turned to OFF position, engine does not stop.
Related information	- If power to fuel cut solenoid is turned OFF, engine stops. - When performing troubleshooting, disconnect battery negative terminal to stop engine.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective fuel cut solenoid (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			★ Prepare with starting switch OFF.			
			★ Check solenoid unit.			
			FUEL CUT SOLENOID		Rod operation	
			(+) terminal (male)	12 V applied (Starting switch ON)	Moves in fuel passage "Open" direction	
	Power is not connected (Starting switch OFF)	Returns in fuel passage "Close" direction				
	2	Defective starting switch (Internal defect)	★ Prepare with starting switch OFF.			
			★ Check switch unit.			
			STARTING SWITCH (male)	Key position	Resistance	
			Between (2) and (3)	OFF	Max. 1 Ω	
			Between (5) and (6)		Min. 1 MΩ	
			Other than above	1 (ON)	Max. 1 Ω	
			Between (1), (2), (3), (5) and (6)		Min. 1 MΩ	
			Other than above	2 (START)	Max. 1 Ω	
	Between (1), (2), (3), (4), (5) and (6)					
	3	Hot short in wiring harness (Contact with 12 V circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Between STARTING SWITCH (female) (1) – FUEL CUT SOLENOID (+) terminal (female) wiring harness and ground	Voltage	Max. 1 V	

Related circuit diagram



E-3 Engine preheater does not operate normally

Contents of trouble	• Engine preheater does not operate normally
Related information	

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting				
	1	Defective fuse A2	If fuse is broken, circuit probably has ground fault (See cause 7).				
	2	Defective preheater switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.				
			★ Prepare with starting switch OFF.				
			★ Check switch unit.				
			HEATER SWITCH (male)	Switch operation	Resistance		
		Between (3) and (6)	Preheater switch ON		Max. 1 Ω		
			Preheater switch OFF		Min. 1 MΩ		
	3	Defective heater relay (relay box side) (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.				
			Replace with normal relay	Normal state is recovered		HEATER relay is defective	
				Normal state is not recovered		HEATER relay is normal	
			★ Prepare with starting switch OFF.				
			★ Check relay unit.				
			HEATER RELAY (male)	Between (85) and (86)		Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)		Max. 1 Ω	
	Other than above (Relay: OFF)			Min. 1 MΩ			
	4	Defective heater relay (intake heater side) (Internal defect)	★ Prepare with starting switch OFF.				
			★ Check relay unit.				
			HEATER RELAY	Between coil terminals		Resistance	
			Between switch terminals	12 V applied (Relay: ON)		Max. 1 Ω	
	Other than above (Relay: OFF)			Min. 1 MΩ			
	5	Defective intake heater (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.				
			HEATER		Resistance		
			Between power supply terminal and ground terminal		0.050 – 0.059 Ω		
	6	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.				
			★ Disconnect connectors at both ends of circuit and measure resistance between terminals.				
Check continuity between related circuit terminals shown in figure for disconnection.			Resistance	Max. 1 Ω			

E-4 Lift truck cannot travel

Contents of trouble	Lift truck cannot travel (It can move work equipment, however)
Related information	If any failure code is displayed, carry out troubleshooting for it first. (Code is displayed on only lift truck with ISO controller)

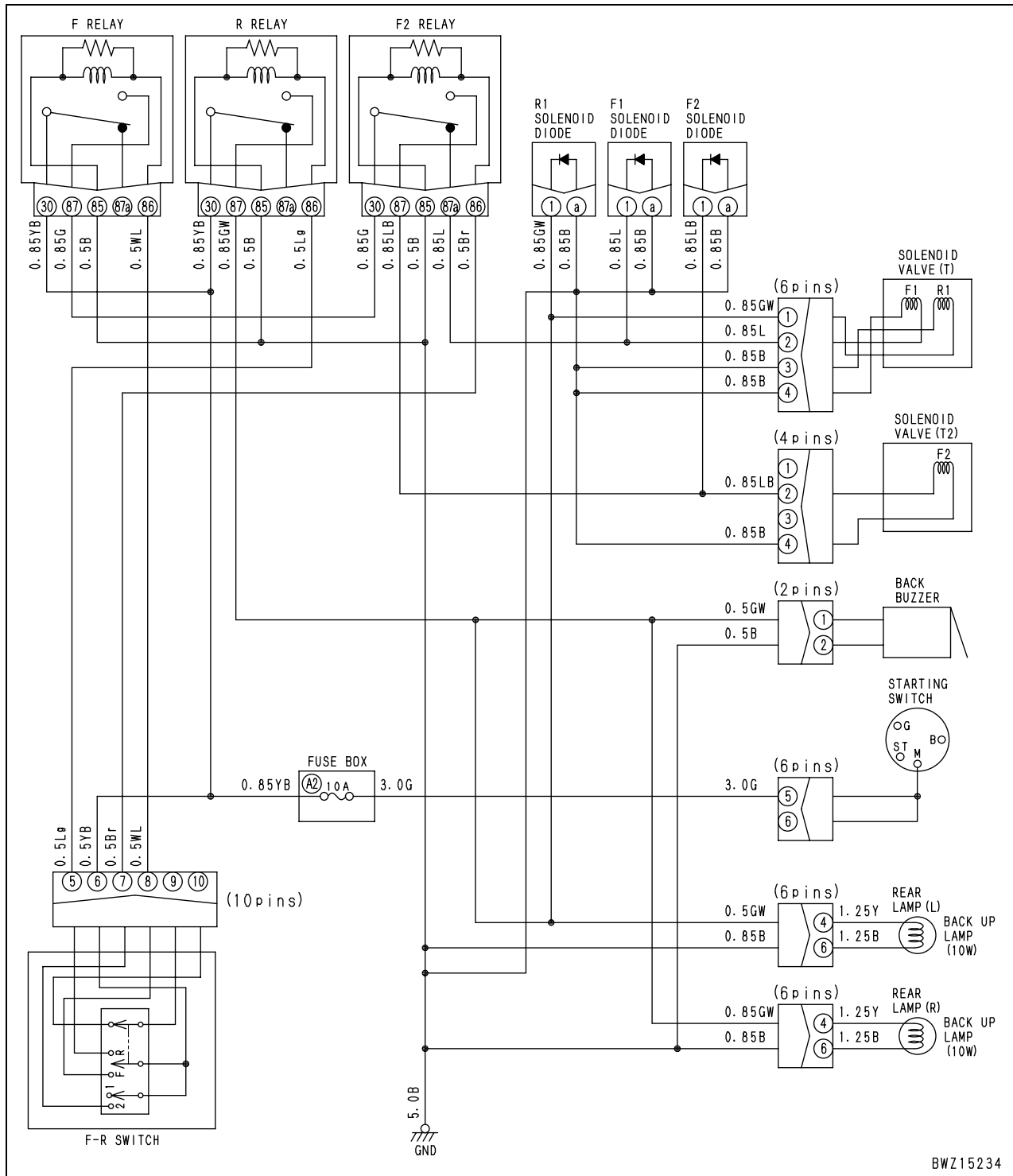
Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective fuse A2 or A3	If fuse is broken, circuit probably has ground fault (See cause 13).			
	2	Defective seat switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			SEAT SWITCH (male)	Operator	Resistance	
			Between (1) and (2)	Seated	Max. 1 Ω	
				Not seated	Min. 1 MΩ	
			Between (1) and (3)	Seated	Min. 1 MΩ	
				Not seated	Max. 1 Ω	
	Between (2) and (3)	Always	Min. 1 MΩ			
		3	Defective F/R lever (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
	F-R SWITCH (male)			Lever position	Resistance	
	Between (6) and (8)			Forward	Max. 1 Ω	
				Reverse	Min. 1 MΩ	
	Between (6) and (5)			Forward	Min. 1 MΩ	
				Reverse	Max. 1 Ω	
	Between (5) and (8)	Always	Min. 1 MΩ			
		4	Defective F1/R1 solenoid (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
	Between SOLENOID VALVE F1/R1 (male) (2) and (4)			Resistance	6 ± 0.5 Ω	
	Between SOLENOID VALVE F1/R1 (male) (1) and (3)			Resistance	6 ± 0.5 Ω	
	5	Defective F2 solenoid (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Between SOLENOID VALVE F2 (male) (2) and (4)		Resistance	6 ± 0.5 Ω
	6	Defective F1 diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.			
			Between F1 SOLENOID DIODE (1) (male) (a) and (1)		Continues	
	7	Defective F2 diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.			
			Between F2 SOLENOID DIODE (1) (male) (a) and (1)		Continues	
8	Defective R1 diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.				
		Between R1 SOLENOID DIODE (1) (male) (a) and (1)		Continues		

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	9	Defective F relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	F relay is defective	
				Normal state is not recovered	F relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			F RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	10	Defective R relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	R relay is defective	
				Normal state is not recovered	R relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			R RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	11	Defective F2 relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	F2 relay is defective	
				Normal state is not recovered	F2 relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			F2 RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	12	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω
	13	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.			Resistance	Min. 1 MΩ		

*: Only lift truck with ISO controller

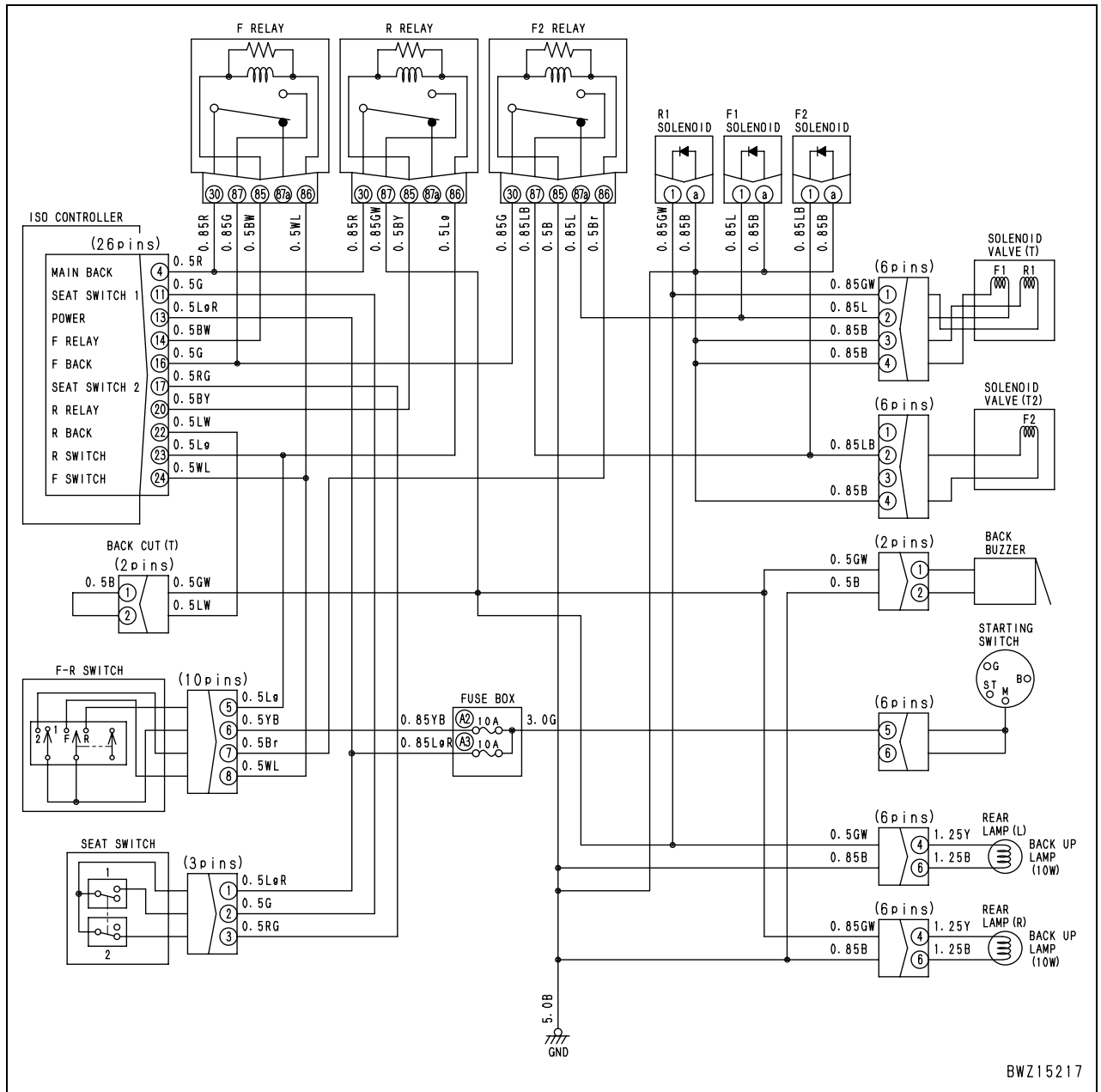
Related circuit diagram

- Standard lift truck



Related circuit diagram

- Lift truck with ISO controller



E-5 Parking brake reminder alarm does not sound or does not stop sounding

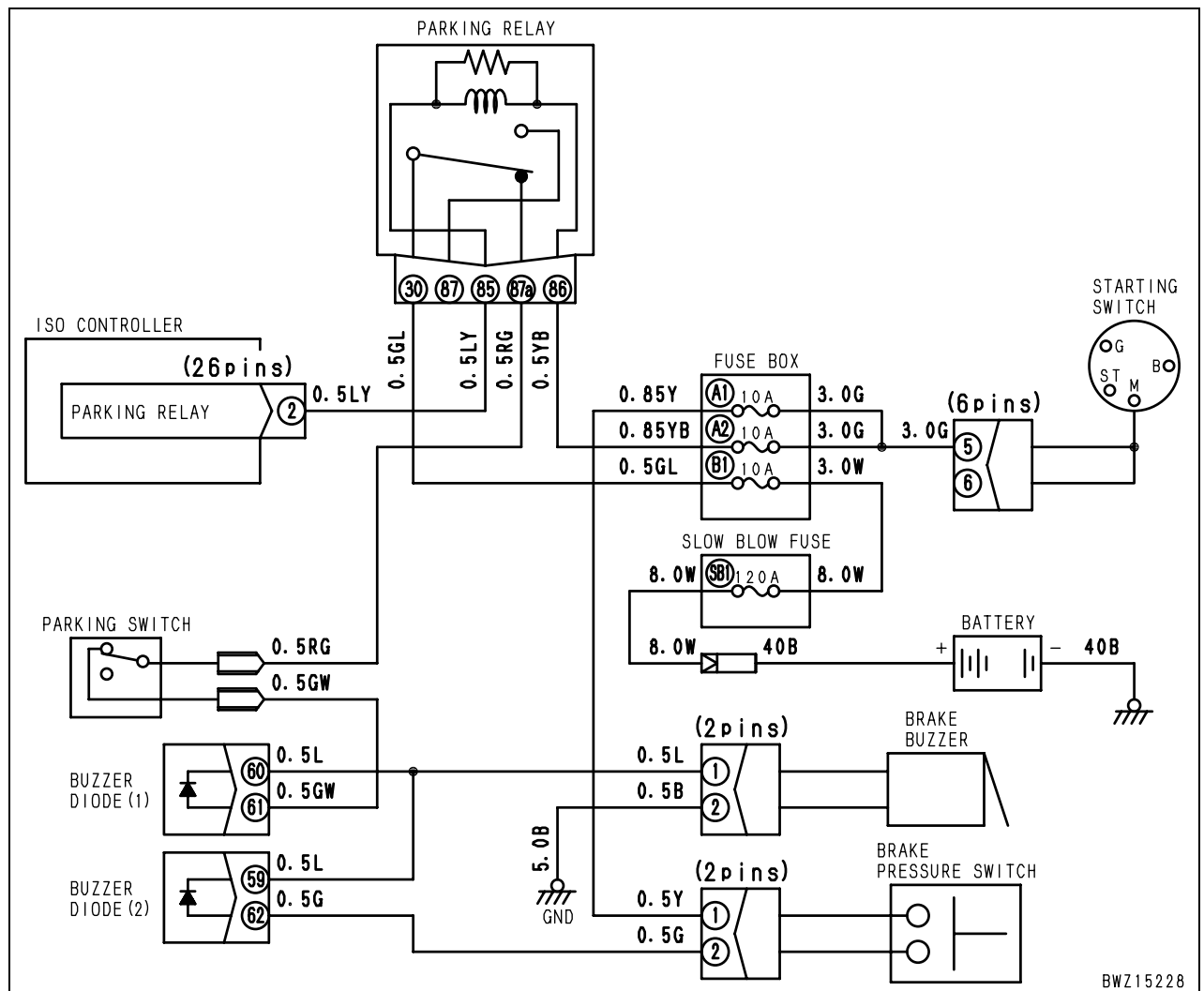
Applicable model: Lift truck with ISO controller

Contents of trouble	- When operator leave seat without applying parking brake, alarm buzzer does not sound. - While parking brake is applied, alarm buzzer does not stop sounding.
Related information	If any failure code is displayed, carry out troubleshooting for it first.

	Cause		Standard value in normal condition/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective fuse A1, A2 or B1	If fuse is broken, circuit probably has ground fault (See cause 8).		
	2	Defective parking brake switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			PARKING SWITCH (Terminal on switch side)	Parking brake lever operation	Resistance
			Between terminals	ON (park)	Max. 1 Ω
				OFF (release)	Min. 1 MΩ
	3	Defective brake pressure switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			BRAKE SWITCH (Terminal on switch side)	Switch condition	Resistance
			Between terminals	ON	Max. 1 Ω
				OFF	Min. 1 MΩ
	4	Defective brake buzzer (Internal defect)	★ Prepare with starting switch OFF. ★ Check buzzer unit. ★ Connect (+) to (1) and (–) to (2).		
			Between BRAKE BUZZER (male) (1) and (2)	12 V applied	Buzzer sounds
				Other than above	Buzzer does not sound
	5	Defective buzzer diode (1) (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and measure with (61) on (+) side.		
			Between BUZZER DIODE (1) (male) (61) and (60)		Continues
	6	Defective parking brake relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Parking brake relay is defective
				Normal state is not recovered	Parking brake relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			PARKING RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87a)	12 V applied (Relay: ON)	Min. 1 MΩ
				Other than above (Relay: OFF)	Max. 1 Ω

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	7	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
	8	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	9	Hot short in wiring harness (Contact with 12 V circuit)	★ If buzzer does not stop sounding, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between PARKING SWITCH – BRAKE BUZZER (female) (1) wiring harness and ground	Voltage	Max. 1 V

Related circuit diagram



BWZ15228

E-6 Travel direction is not changed normally

Contents of trouble	When F-R lever is moved, travel direction does not change
Related information	If any failure code is displayed, carry out troubleshooting for it first. (Code is displayed on only lift truck with ISO controller)

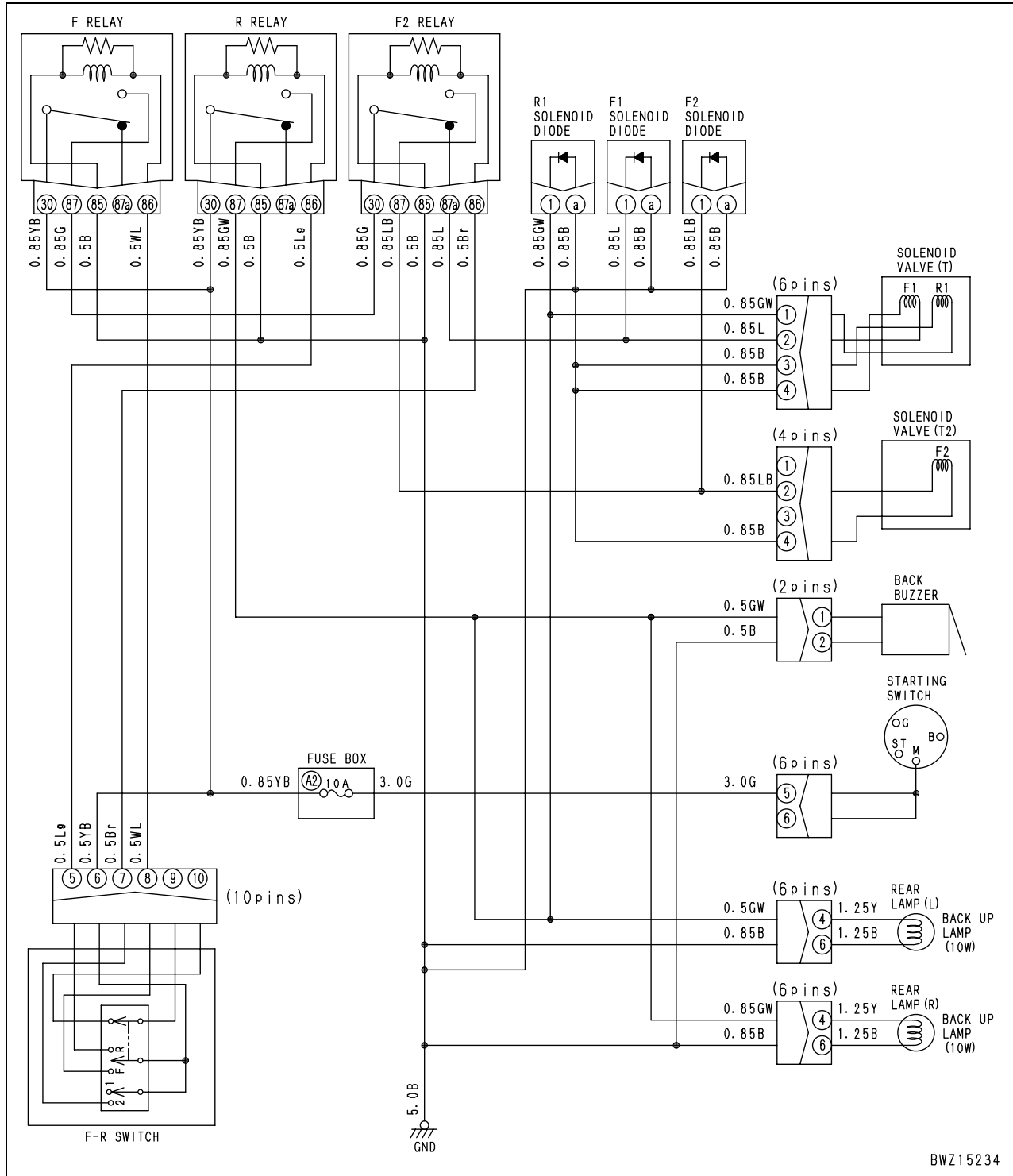
Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective fuse A2	If fuse is broken, circuit probably has ground fault (See cause 12).			
	2	Defective F/R lever (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			F-R SWITCH (male)	Lever position	Resistance	
			Between (6) and (8)	Forward	Max. 1 Ω	
				Reverse	Min. 1 MΩ	
			Between (6) and (5)	Forward	Min. 1 MΩ	
				Reverse	Max. 1 Ω	
	Between (5) and (8)	Always	Min. 1 MΩ			
	3	Defective F1/R1 solenoid (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Between SOLENOID VALVE F1/R1 (male) (2) and (4)		Resistance	6 ± 0.5 Ω
			Between SOLENOID VALVE F1/R1 (male) (1) and (3)		Resistance	6 ± 0.5 Ω
	4	Defective F2 solenoid (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Between SOLENOID VALVE F2 (male) (2) and (4)		Resistance	6 ± 0.5 Ω
	5	Defective F1 diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.			
			Between F1 SOLENOID DIODE (1) (male) (a) and (1)		Continues	
	6	Defective F2 diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.			
			Between F2 SOLENOID DIODE (1) (male) (a) and (1)		Continues	
	7	Defective R1 diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.			
			Between R1 SOLENOID DIODE (1) (male) (a) and (1)		Continues	
	8	Defective F relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
Replace with normal relay			Normal state is recovered	F relay is defective		
			Normal state is not recovered	F relay is normal		

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	8	Defective F relay (Internal defect)	★ Prepare with starting switch OFF. ★ Check relay unit.			
			F RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	9	R relay is defective (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	R relay is defective	
				Normal state is not recovered	R relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			R RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	10	F2 relay is defective (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	F2 relay is defective	
				Normal state is not recovered	F2 relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			F2 RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	11	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω
	12	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 MΩ
13	Defective ISO controller [*] (Internal defect)	If above causes are not the cause for the trouble, ISO controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)				

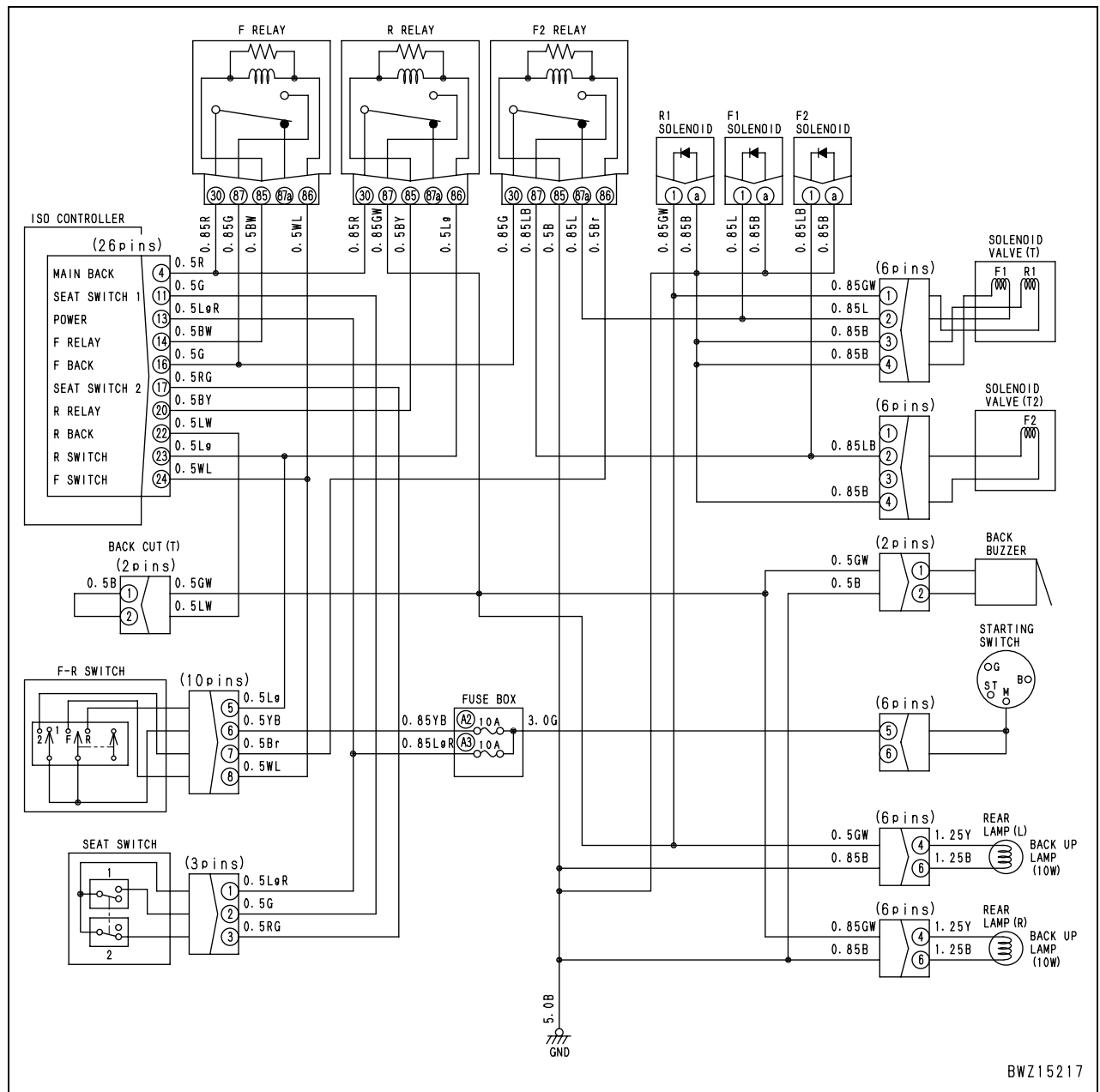
*: Only lift truck with ISO controller

Related circuit diagram

- Standard lift truck



- Lift truck with ISO controller



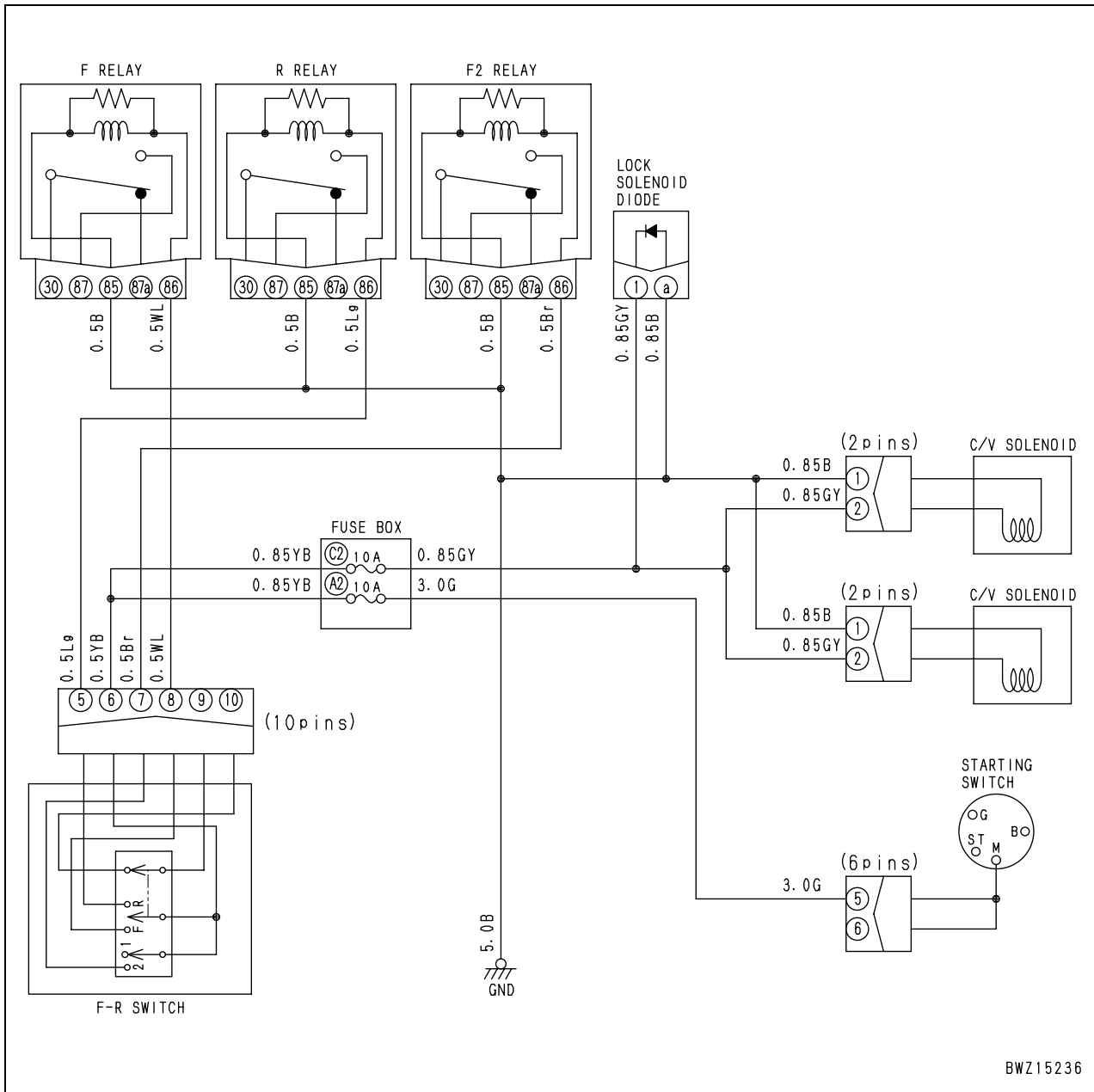
E-7 Lift truck cannot move work equipment**Applicable model: Standard lift truck**

Contents of trouble	Work equipment does not move
Related information	Perform following troubleshooting when work equipment does not move because of electrical system trouble. (For trouble in hydraulic and mechanical system, see "Troubleshooting of hydraulic and mechanical system (H-mode)".)

	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse C2	If fuse is broken, circuit probably has ground fault (See cause 9).		
Possible causes and standard value in normal state	2	Defective F/R lever (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			F-R SWITCH (male)	Lever position	Resistance
			Between (6) and (8)	Forward	Max. 1 Ω
				Reverse	Min. 1 MΩ
			Between (6) and (5)	Forward	Min. 1 MΩ
				Reverse	Max. 1 Ω
			Between (5) and (8)	Always	Min. 1 MΩ
	3	Defective lock solenoid diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.		
			Between LOCK SOLENOID DIODE (male) (a) and (1)		Continues
	4	Defective work equipment lock solenoid valve (Internal defect) ★ 2 work equipment lock solenoid valves are installed	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Between C/V SOLENOID (male) (1) and (2)		Resistance 9.9 ± 0.5 Ω
	5	Defective F relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	F relay is defective
				Normal state is not recovered	F relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			F RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	6	Defective R relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	R relay is defective
				Normal state is not recovered	R relay is normal

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	6	Defective R relay (Internal defect)	★ Prepare with starting switch OFF. ★ Check relay unit.			
			R RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	7	Defective F2 relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	F2 relay is defective	
				Normal state is not recovered	F2 relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			F2 RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	8	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω
	9	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 MΩ

Related circuit diagram

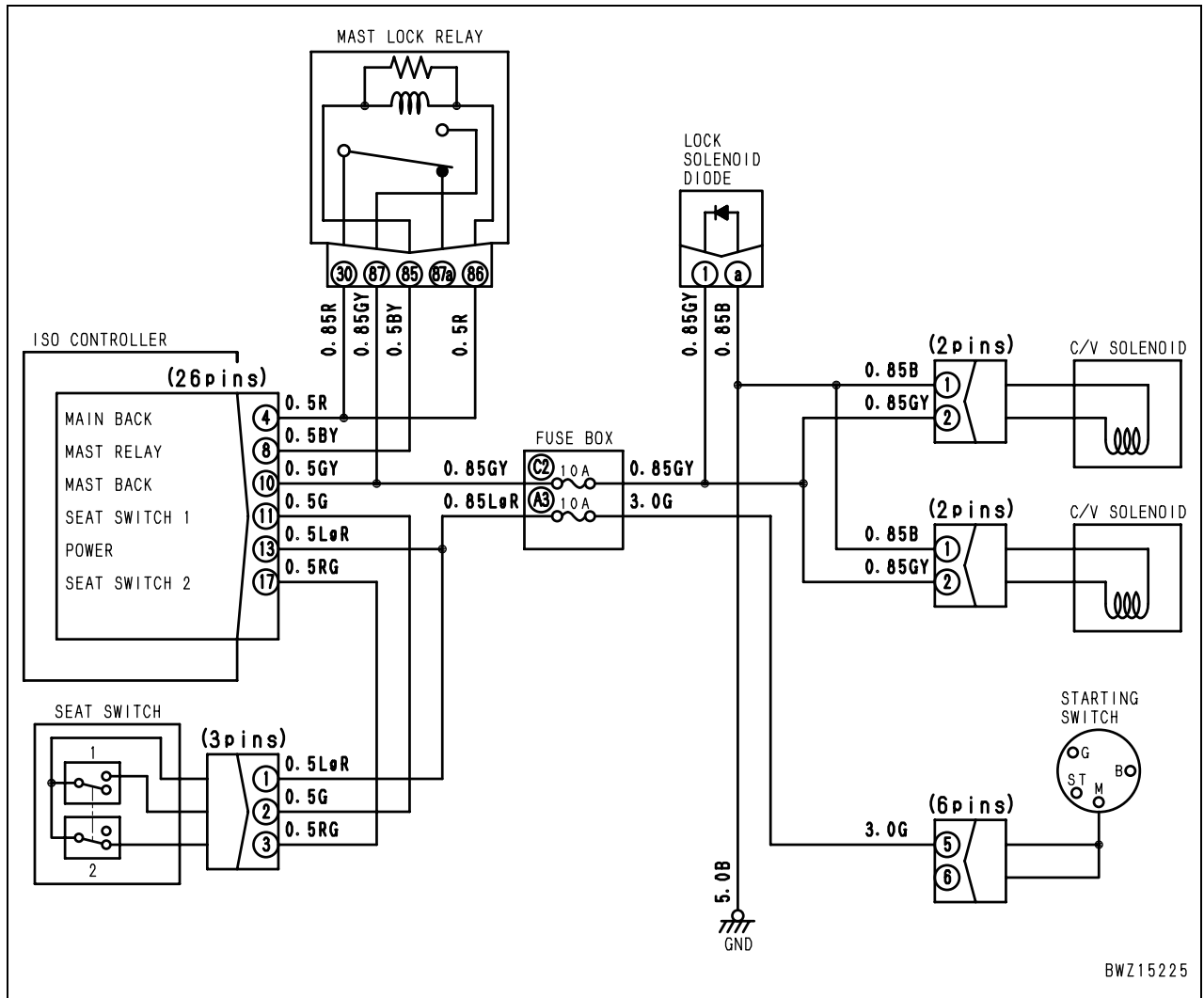


Applicable model: Lift truck with ISO controller

Contents of trouble	Lift truck cannot move work equipment (It can travel, however.)
Related information	- If any failure code is displayed, carry out troubleshooting for it first. - Perform following troubleshooting when work equipment does not move because of electrical system trouble. (For trouble in hydraulic and mechanical system, see "Troubleshooting of hydraulic and mechanical system (H-mode)".)

	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse A3 or C2	If fuse is broken, circuit probably has ground fault (See cause 6).		
Possible causes and standard value in normal state	2	Defective seat switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			SEAT SWITCH (male)	Operator	Resistance
			Between (1) and (2)	Seated	Max. 1 Ω
				Not seated	Min. 1 MΩ
			Between (1) and (3)	Seated	Min. 1 MΩ
				Not seated	Max. 1 Ω
			Between (2) and (3)	Always	Min. 1 MΩ
	3	Defective lock solenoid diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.		
			Between LOCK SOLENOID DIODE (male) (a) and (1)		Continues
	4	Defective work equipment lock solenoid valve (Internal defect) ★ 2 work equipment lock solenoid valves are installed	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Between C/V SOLENOID (male) (1) and (2)		Resistance 9.9 ± 0.5 Ω
	5	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance Max. 1 Ω
	6	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance Min. 1 MΩ
	7	Defective ISO controller (Internal defect)	If above causes are not the cause for the trouble, ISO controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)		

Related circuit diagram



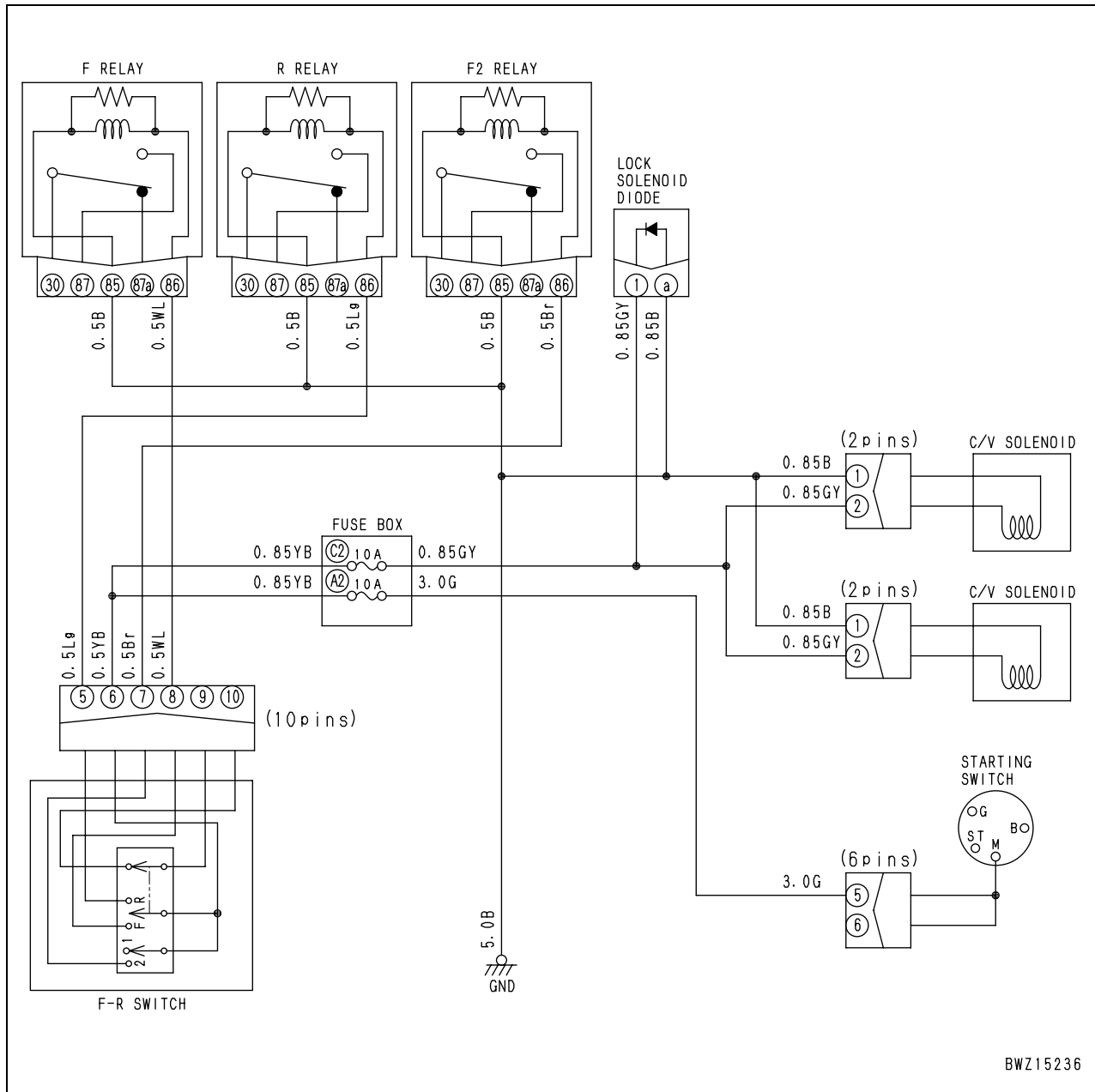
E-8 Work equipment cannot be locked**Applicable model: Standard lift truck**

Contents of trouble	Work equipment cannot be locked
Related information	Perform following troubleshooting when work equipment cannot be locked because of electrical system trouble. (For trouble in hydraulic and mechanical system, see "Troubleshooting of hydraulic and mechanical system (H-mode)".)

	Cause		Standard value in normal condition/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective F/R lever (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			F-R SWITCH (male)	Lever position	Resistance
			Between (6) and (8)	Forward	Max. 1 Ω
				Reverse	Min. 1 MΩ
			Between (6) and (5)	Forward	Min. 1 MΩ
				Reverse	Max. 1 Ω
			Between (5) and (8)	Always	Min. 1 MΩ
	2	Defective lock solenoid diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.		
			Between LOCK SOLENOID DIODE (male) (a) and (1)		Continues
	3	Defective work equipment lock solenoid valve (Internal defect) ★ 2 work equipment lock solenoid valves are installed	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Between C/V SOLENOID (male) (1) and (2)	Resistance	9.9 ± 0.5 Ω
	4	Defective F relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	F relay is defective
				Normal state is not recovered	F relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			F RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	5	Defective R relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	R relay is defective
				Normal state is not recovered	R relay is normal

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	5	Defective R relay (Internal defect)	★ Prepare with starting switch OFF. ★ Check relay unit.			
			R RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	6	Defective F2 relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	F2 relay is defective	
				Normal state is not recovered	F2 relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			F2 RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	7	Hot short in wiring harness (Contact with 12 V circuit)	★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.			
Between STARTING SWITCH (female) (5) – C/V SOLENOID (female) (2) wiring harness and ground			Voltage	Max. 1 V		

Related circuit diagram

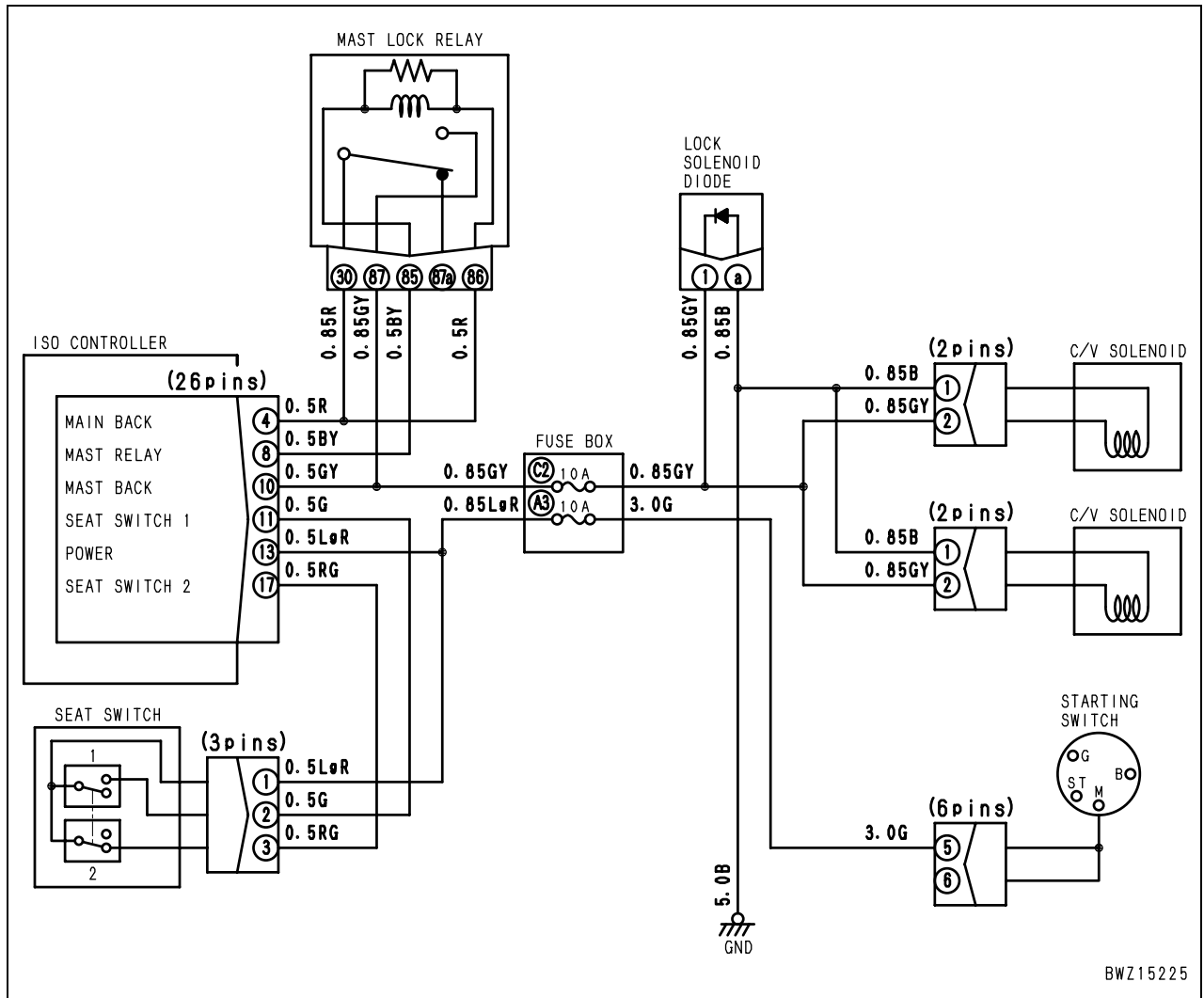


Applicable model: Lift truck with ISO controller

Contents of trouble	Work equipment cannot be locked
Related information	- If any failure code is displayed, carry out troubleshooting for it first. - Perform following troubleshooting when work equipment cannot be locked because of electrical system trouble. (For trouble in hydraulic and mechanical system, see "Troubleshooting of hydraulic and mechanical system (H-mode)".)

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective lock solenoid diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.			
			Between LOCK SOLENOID DIODE (male) (a) and (1)		Continues	
	2	Defective work equipment lock solenoid valve (Internal defect) ★ 2 work equipment lock solenoid valves are installed	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Between C/V SOLENOID (male) (1) and (2)		Resistance	9.9 ± 0.5 Ω
	3	Defective lift interlock relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	Lift interlock relay is defective	
				Normal state is not recovered	Lift interlock relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			MAST LOCK RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	4	Hot short in wiring harness (Contact with 12 V circuit)	★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.			
			Between CONTROLLER (10) – C/V SOLENOID (female) (2) wiring harness and ground		Voltage	Max. 1 V
			Between MAST LOCK RELAY (87) – C/V SOLENOID (female) (2) wiring harness and ground		Voltage	Max. 1 V
	5	Defective ISO controller (Internal defect)	If above causes are not the cause for the trouble, ISO controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)			

Related circuit diagram

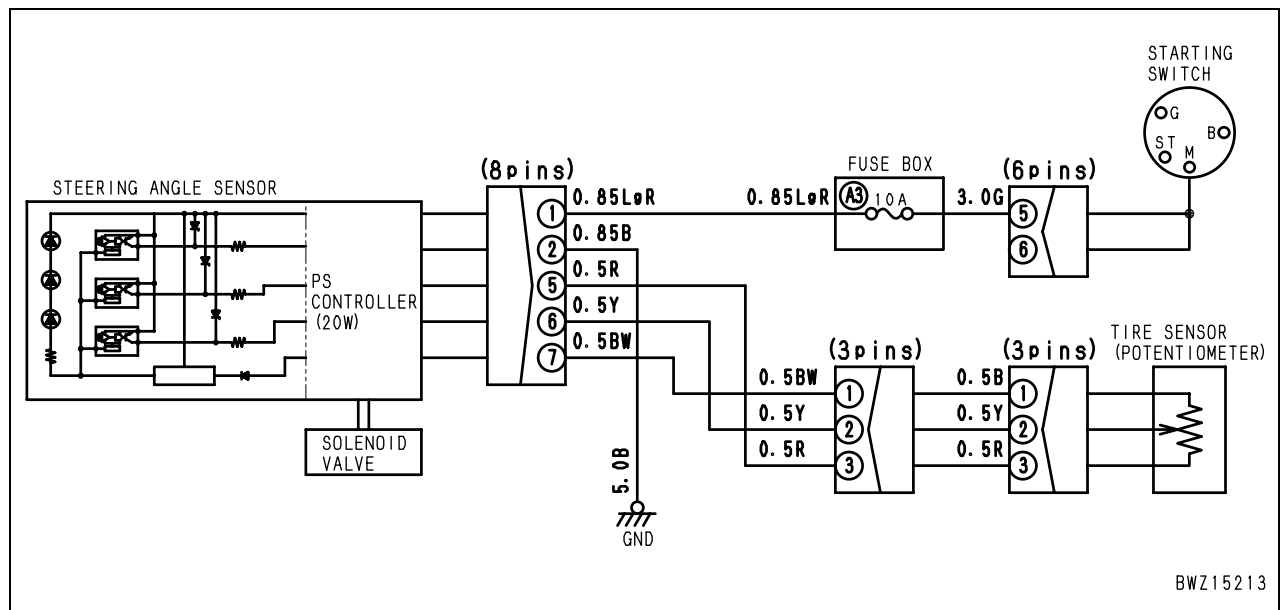


E-9 EPACS is abnormal**Applicable model: Lift truck with EPACS controller**

Contents of trouble	Knob position is not corrected normally and knob deviates.
Related information	Perform following troubleshooting when EPACS controller LED is ON (controller has not detected trouble) and knob deviates. (If EPACS controller LED is OFF or flashing and knob deviates, see "Troubleshooting by failure code (EPACS controller system)".)

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse A2	If fuse is broken, circuit probably has ground fault (See cause 8).		
	2	Defective installation of tyre angle sensor	Check tyre angle sensor installed condition and correct if necessary.		
	3	Defective tyre angle sensor (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			TYRE SENSOR (male)		Resistance
			Between (3) and (1)		2 kΩ ± 20%
			Between (2) and (1)		Resistance changes linearly according to rotation amount of shaft.
	4	Defective EPACS solenoid valve (Internal defect)	★ Start engine, steer lift truck, and perform troubleshooting.		
			When steering, check reaction of solenoid valve to see if it is turned ON and OFF.		
	5	Loose or idle rotation of orbit roll rotor	Check rotor for loose installation and retighten mounting screw if loose.		
	6	Defective steering wheel angle sensor (Internal defect)	Perform initialization again to see if system can be initialized.		
	7	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
8	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
		Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ	
9	Defective EPACS controller (Internal defect)	If above causes are not the cause for the trouble, EPACS controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)			

Related circuit diagram



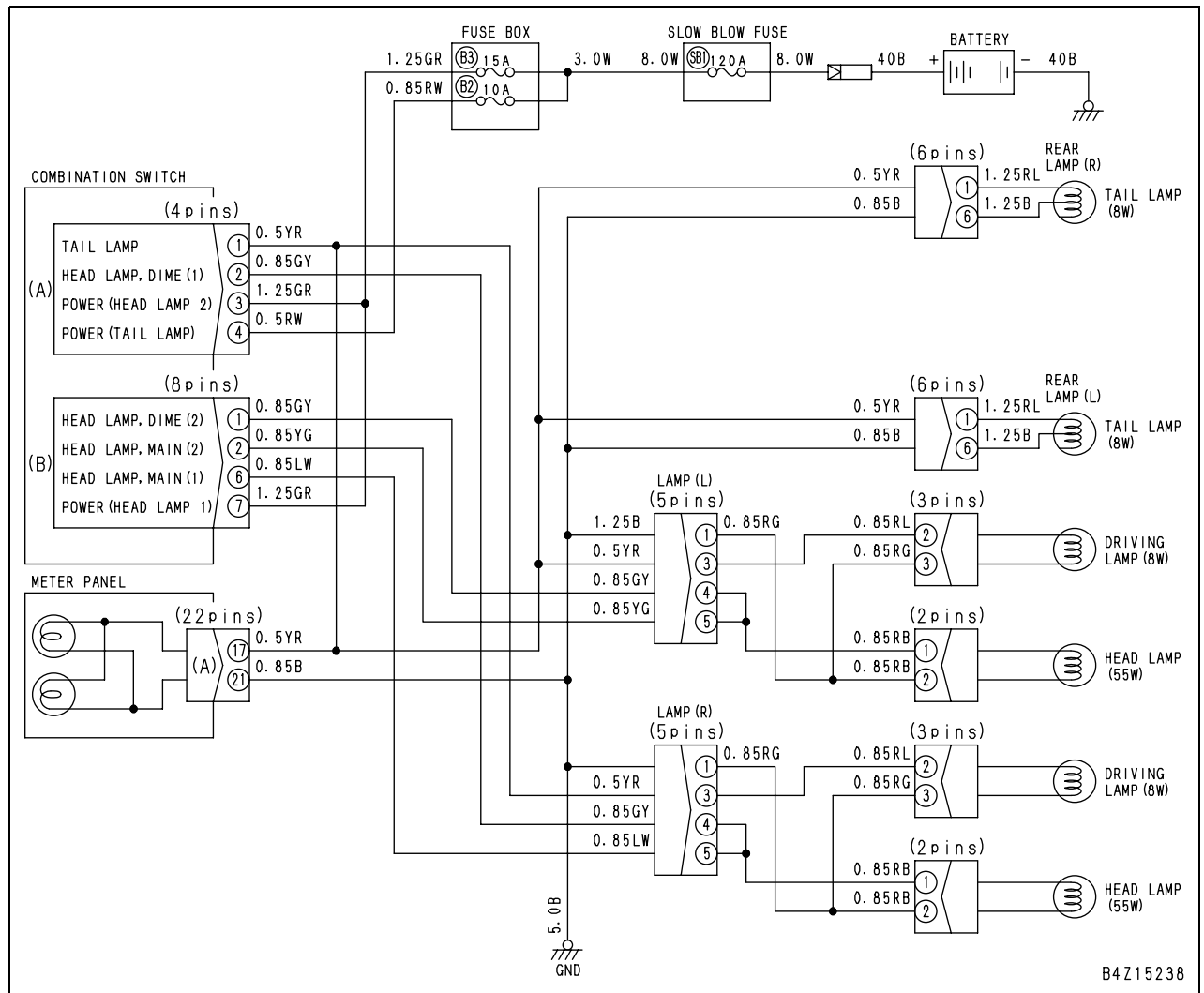
E-10 Headlamp, clearance lamp and tail lamp do not light or go off

Contents of trouble	• Headlamp, clearance lamp and tail lamp do not light or go off
Related information	• Check each bulb for breakage.

	Cause		Standard value in normal condition/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective fuse B3	If fuse is broken, circuit probably has ground fault (See cause 5).		
	2	Defective slow blow fuse SB1	If slow blow fuse is broken, circuit probably has ground fault (See cause 5).		
	3	Defective combination switch (Internal defect)	★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between COMBINATION SWITCH (A) (3), (B) (7) and ground	Voltage	10 – 15 V
			COMBINATION SWITCH	Lamp switch position	Voltage
			Between (A), (1) and ground	OFF	Max. 1 V
				1st position	10 – 15 V
				2nd position	10 – 15 V
			Between (A) (2), (B) (1) and ground	OFF	Max. 1 V
				1st position	Max. 1 V
				2nd position	10 – 15 V
			Between (B) (2), (B) (6) and ground	OFF	Max. 1 V
				1st position	Max. 1 V
				2nd position	10 – 15 V
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
	5	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	6	Hot short in wiring harness (Contact with 12 V circuit)	★ When switch is turned OFF, if left headlamp does not go off, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between COMBINATION SWITCH (B) (1) – LAMP (L) (4) wiring harness and ground	Voltage	Max. 1 V
			Between COMBINATION SWITCH (B) (2) – LAMP (L) (5) wiring harness and ground	Voltage	Max. 1 V
			★ When switch is turned OFF, if right headlamp does not go off, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between COMBINATION SWITCH (A) (2) – LAMP (R) (4) wiring harness and ground	Voltage	Max. 1 V
			Between COMBINATION SWITCH (B) (6) – LAMP (R) (5) wiring harness and ground	Voltage	Max. 1 V

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting	
	6	Hot short in wiring harness (Contact with 12 V circuit)	★ When switch is turned OFF, if clearance lamp and tail lamp do not go off, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting. Between COMBINATION SWITCH (A) (1) – LAMP (R) (3), LAMP (L) (3), REAR LAMP (R) (1), REAR LAMP (L) (1) wiring harness and ground	Voltage Max. 1 V

Related circuit diagram



E-11 Turn signal lamps do not light or go off

- See Troubleshooting of electrical system (E-mode) (Part 1), Lift truck with SAA4D95LE-5-A engine (For general), **E-10**.

E-12 Brake lamps do not light or go off

- See Troubleshooting of electrical system (E-mode) (Part 1), Lift truck with SAA4D95LE-5-A engine (For general), **E-11**.

E-13 Backup lamps do not light or go off

- See Troubleshooting of electrical system (E-mode) (Part 1), Lift truck with SAA4D95LE-5-A engine (For general), **E-12**.

E-14 Backup buzzer does not sound or does not stop sounding

- See Troubleshooting of electrical system (E-mode) (Part 1), Lift truck with SAA4D95LE-5-A engine (For general), **E-13**.

E-15 Horn does not sound or does not stop sounding

- See Troubleshooting of electrical system (E-mode) (Part 1), Lift truck with SAA4D95LE-5-A engine (For general), **E-14**.

E-16 Fuel level is not displayed normally

- See Troubleshooting of electrical system (E-mode) (Part 1), Lift truck with SAA4D95LE-5-A engine (For general), **E-15**.

FORKLIFT TRUCK

CX50 Series

Applicable model Serial number

For general

FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up

For USA

FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

40 Troubleshooting

304 Troubleshooting of electrical system (E-mode) (Part 4)

**Applicable model: Lift truck with SAA4D95LE-5-A engine
(For USA)**

E-1 Engine does not start	2
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E-1 Engine does not start

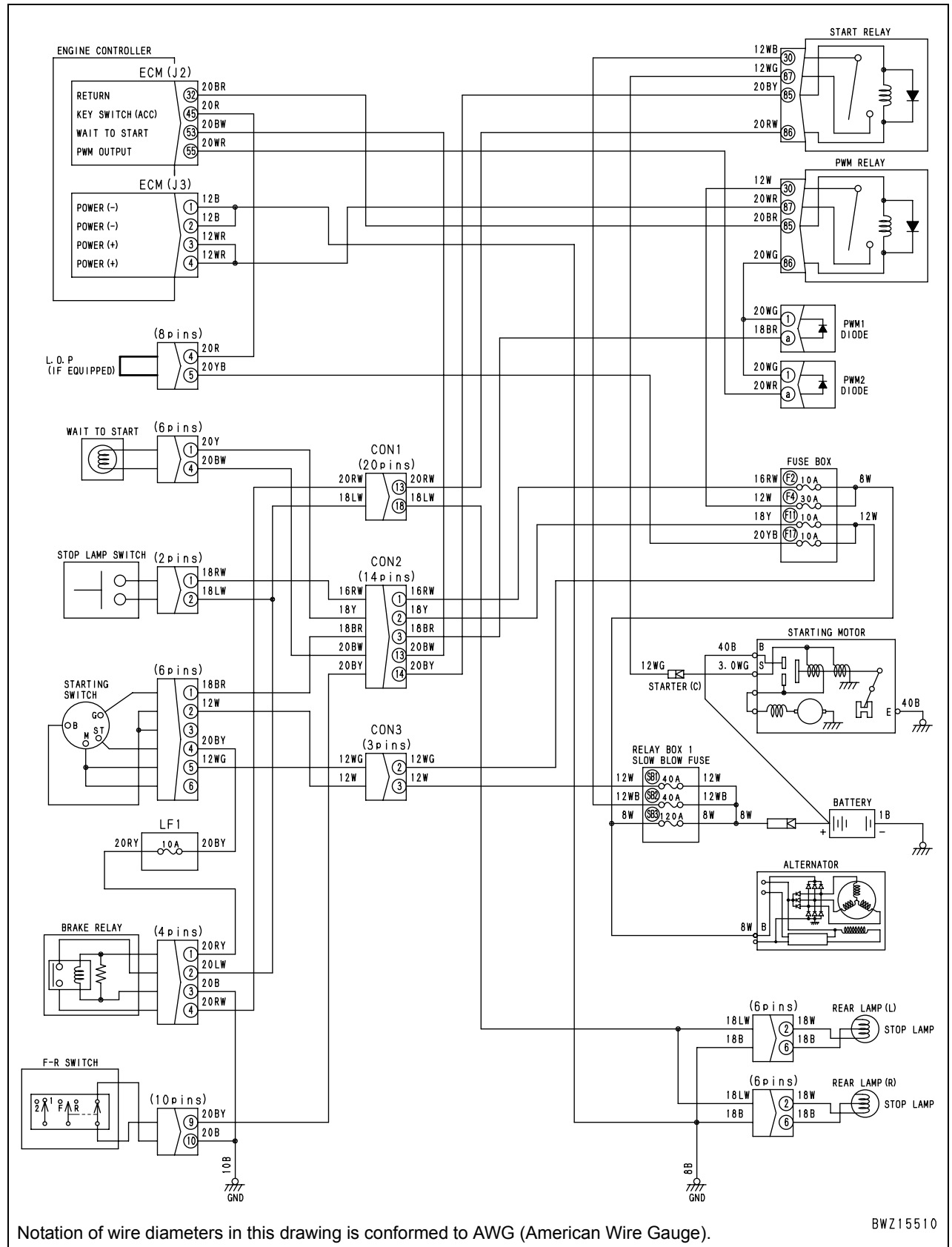
Contents of trouble	Since starting motor does not rotate because of trouble in starting motor system or starting signal system of starting switch, engine does not start.
Related information	- Check following before troubleshooting. - F/R lever is in N (neutral) position. - Brake pedal is depressed. - Fuse or slow blow fuse is not broken (If broken, check related wiring harness for ground fault.) - Battery cable is not disconnected from battery.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective battery	Specific gravity		Min. 1.26	
			Voltage		Min. 12 V	
	2	Defective fuse F2, F4, F11, F17 or LF1	If fuse is broken, circuit probably has ground fault (See cause 12).			
	3	Defective slow blow fuse SB1, SB2, or SB3	If slow blow fuse is broken, circuit probably has ground fault (See cause 12).			
	4	Defective starting motor	★ Prepare with starting switch OFF, then perform troubleshooting P without turning starting switch to ON position.			
			Between STARTING MOTOR (1) and ground		Resistance	Max. 1 Ω
			★ Prepare with starting switch OFF, then start engine and perform troubleshooting.			
			Between STARTING MOTOR (B) and ground		Voltage	10 – 15 V
			Between STARTING MOTOR (S) and ground		Voltage	10 – 15 V
			★ If above troubleshooting result is normal and starting motor does not rotate, starting motor is defective.			
	5	Defective PWM relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	PWM relay is defective	
				Normal state is not recovered	PWM relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			PWM RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	6	Defective starting motor relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	Starting motor relay is defective	
Normal state is not recovered				Starting motor relay is normal		

	Cause		Standard value in normal condition/Remarks on troubleshooting		
Possible causes and standard value in normal state	6	Defective starting motor relay (Internal defect)	★ Prepare with starting switch OFF. ★ Check relay unit.		
			START RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	7	Defective PWM1 diode or PWM2 diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in diode range and check continuity with (a) on (+) side.		
			PWM1 DIODE (male) PWM2 DIODE (male)	Resistance	
			Between (a) and (1)		Continues
	8	Defective stop lamp switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			STOP LAMP SWITCH (male)	Brake	Resistance
			Between (1) and (2)	Released (Not depressed)	Min. 1 MΩ
				Depressed	Max. 1 Ω
	9	Defective brake relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Brake relay is defective
				Normal state is not recovered	Brake relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			BRAKE RELAY (male)	Between (1) and (3)	Resistance
			Between (2) and (4)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	10	Defective starting switch (Internal defect)	★ Prepare with starting switch OFF. ★ Check switch unit.		
			STARTING SWITCH (male)	Key position	Resistance
			Between (2) and (3) Between (5) and (6)	OFF	Max. 1 Ω
			Other than above		Min. 1 MΩ
			Between (1), (2), (3), (5) and (6)	1 (ON)	Max. 1 Ω
			Other than above		Min. 1 MΩ
			Between (1), (2), (3), (5), (4) and (6)	2 (START)	Max. 1 Ω

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	11	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
	12	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	13	Defective engine controller (Internal defect)	★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting		
			ENGINE CONTROLLER ECM (J3)	Voltage	
			Between (3), (4) and (1), (2)	10 – 15 V	

Related circuit diagram

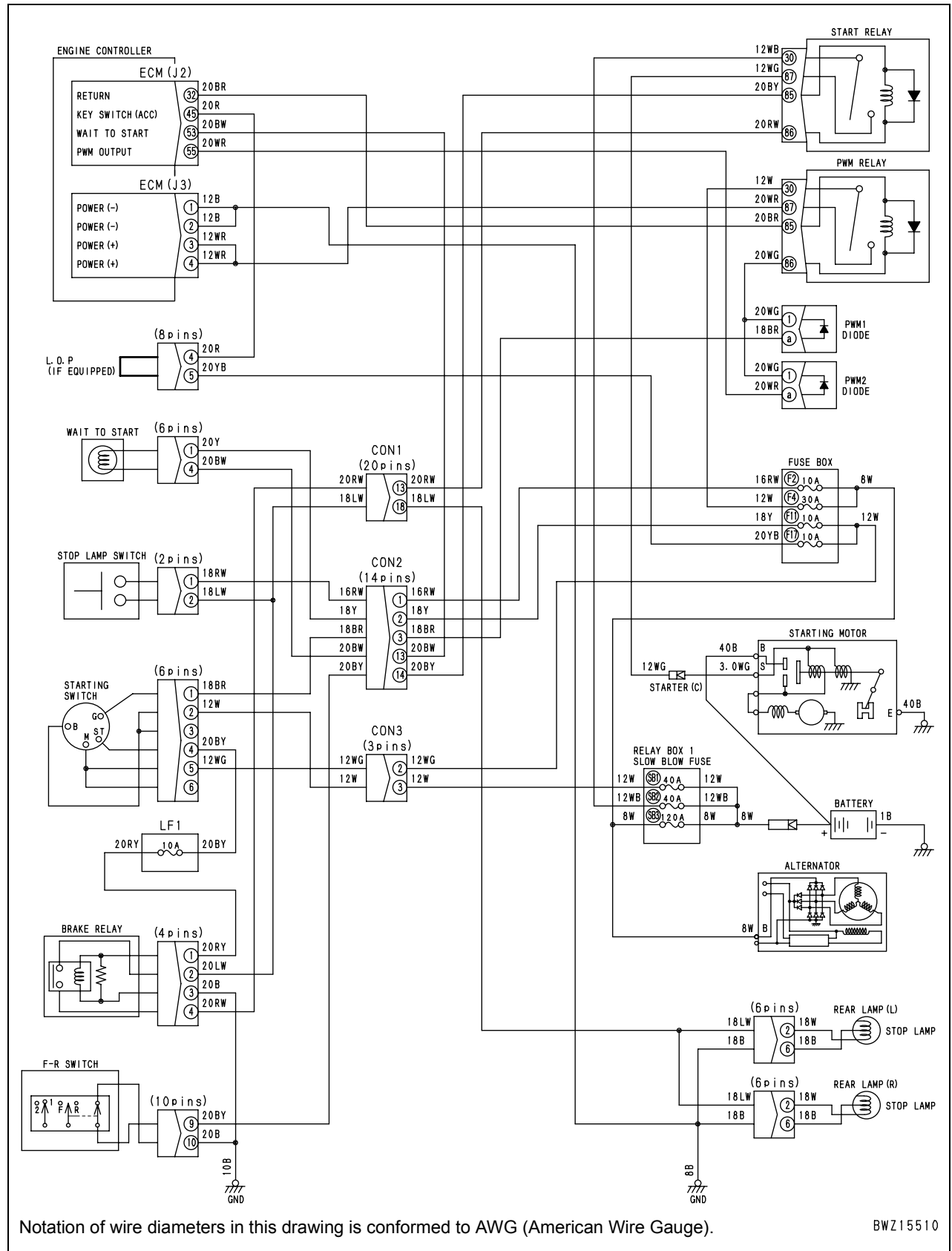


E-2 Engine does not stop

Contents of trouble	When starting switch is turned to OFF position, engine does not stop.
Related information	- If power to engine controller is turned OFF, engine stops. - When performing troubleshooting, disconnect battery negative terminal to stop engine.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective PWM relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	PWM relay is defective	
				Normal state is not recovered	PWM relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			PWM RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	2	Defective starting switch (Internal defect)	★ Prepare with starting switch OFF. ★ Check switch unit.			
			STARTING SWITCH (male)	Key position	Resistance	
			Between (2) and (3) Between (5) and (6)	OFF	Max. 1 Ω	
			Other than above		Min. 1 MΩ	
			Between (1), (2), (3), (5) and (6)	1 (ON)	Max. 1 Ω	
			Other than above		Min. 1 MΩ	
			Between (1), (2), (3), (4), (5) and (6)	2 (START)	Max. 1 Ω	
	3	Hot short in wiring harness (Contact with 12 V circuit)	★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.			
			Between ENGINE CONTROLLER ECM (J3) (female) (3), (4) – PWM RELAY (female) (87) wiring harness and ground		Voltage	Max. 1 V
			Between PWM RELAY (female) (86) – PWM1 DIODE (female) (1) wiring harness and ground		Voltage	Max. 1 V
			Between PWM RELAY (female) (86) – PWM2 DIODE (female) (1) wiring harness and ground		Voltage	Max. 1 V
	4	Defective engine controller (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			ENGINE CONTROLLER ECM (J3)		Voltage	
			Between (3), (4) and (1), (2)		Max. 1 V	

Related circuit diagram



E-3 Lift truck cannot travel

Contents of trouble	Lift truck cannot travel (It can move work equipment, however)
Related information	If any failure code is displayed, carry out troubleshooting for it first.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective fuse F12 or F13	If fuse is broken, circuit probably has ground fault (See cause 13).			
	2	Defective seat switch (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			SEAT SWITCH (male)	Operator	Resistance	
			Between (1) and (2)	Seated	Max. 1 Ω	
				Not seated	Min. 1 MΩ	
			Between (1) and (3)	Seated	Min. 1 MΩ	
				Not seated	Max. 1 Ω	
	Between (2) and (3)	Always	Min. 1 MΩ			
		3	Defective F/R lever (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
	F-R SWITCH (male)			Lever position	Resistance	
	Between (6) and (8)			Forward	Max. 1 Ω	
				Reverse	Min. 1 MΩ	
	Between (6) and (5)			Forward	Min. 1 MΩ	
				Reverse	Max. 1 Ω	
	Between (5) and (8)	Always	Min. 1 MΩ			
		4	Defective F1/R1 solenoid (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
	Between SOLENOID VALVE F1/R1 (male) (2) and (4)			Resistance	6 ± 0.5 Ω	
	Between SOLENOID VALVE F1/R1 (male) (1) and (3)			Resistance	6 ± 0.5 Ω	
	5	Defective F2 solenoid (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between SOLENOID VALVE F2 (male) (2) and (4)		Resistance	6 ± 0.5 Ω
	6	Defective F1 diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.			
			Between F1 SOL DIODE (1) (male) (a) and (1)		Continues	
	7	Defective F2 diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.			
			Between F2 SOL DIODE (1) (male) (a) and (1)		Continues	
8	Defective R1 diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.				
		Between R1 SOL DIODE (1) (male) (a) and (1)		Continues		

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	9	F relay is defective (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Replace with normal relay	Normal state is recovered	F relay is defective	
				Normal state is not recovered	F relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			F RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	10	R relay is defective (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Replace with normal relay	Normal state is recovered	R relay is defective	
				Normal state is not recovered	R relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			R RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	11	Defective F2 relay (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Replace with normal relay	Normal state is recovered	F2 relay is defective	
				Normal state is not recovered	F2 relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			F2 RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	12	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. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
Check continuity between related circuit terminals shown in figure for disconnection.			Resistance	Max. 1 Ω		

The diagram illustrates the electrical architecture of a vehicle, centered around an ISO controller (26 pins). Key components and their connections include:

- ISO CONTROLLER (26 pins):**
 - MAIN BACK (4) to 20R
 - SEAT SWITCH 1 (11) to 20G
 - POWER (13) to 20LgY
 - F RELAY (14) to 20BW
 - F BACK (16) to 20G
 - SEAT SWITCH 2 (17) to 20RG
 - R RELAY (20) to 20BY
 - R BACK (22) to 20GW
 - R SWITCH (23) to 20Lg
 - F SWITCH (24) to 20WL
- RELAYS:**
 - F RELAY:** 30 (18R), 87 (18G), 85 (20BW), 86 (20WL)
 - R RELAY:** 30 (18R), 87 (18G), 85 (20BY), 86 (20Lg)
 - F2 RELAY:** 30 (18G), 87 (18LB), 85 (20B), 86 (18L), 87a (20Br)
- SOLENOIDS:**
 - R1 SOLENOID:** 18GW (1), 18B (a)
 - F1 SOLENOID:** 18L (1), 18B (a)
 - F2 SOLENOID:** 18LB (1), 18B (a)
- SOLENOID VALVES:**
 - SOLENOID VALVE (T1):** 18GW (1), 18L (2), 18B (3), 18B (4)
 - SOLENOID VALVE (T2):** 18LB (1), 18B (2), 18B (3), 18B (4)
- SEAT SWITCH:** 1 (20LgY), 2 (20G), 3 (20RG)
- FUSE BOX:** 18YB (F12 10A), 18LgY (F13 10A), 12WG
- CONNECTORS:**
 - CON1 (20 pins):** 5 (20Lg), 6 (20YB), 7 (20Lg), 8 (20Br), 9 (20YB), 10 (20Lg), 11 (20Br), 12 (20WL)
 - CON3 (3 pins):** 12WG (2)
- Other Components:**
 - BACK BUZZER:** 20Y (1), 20B (2)
 - STARTING SWITCH:** OG, ST, M, BO
 - REAR LAMP (L) BACK UP LAMP:** 18GW (4), 18B (6)
 - REAR LAMP (R) BACK UP LAMP:** 18GW (4), 18B (6)

Notation of wire diameters in this drawing is conformed to AWG (American Wire Gauge).

BWZ15511

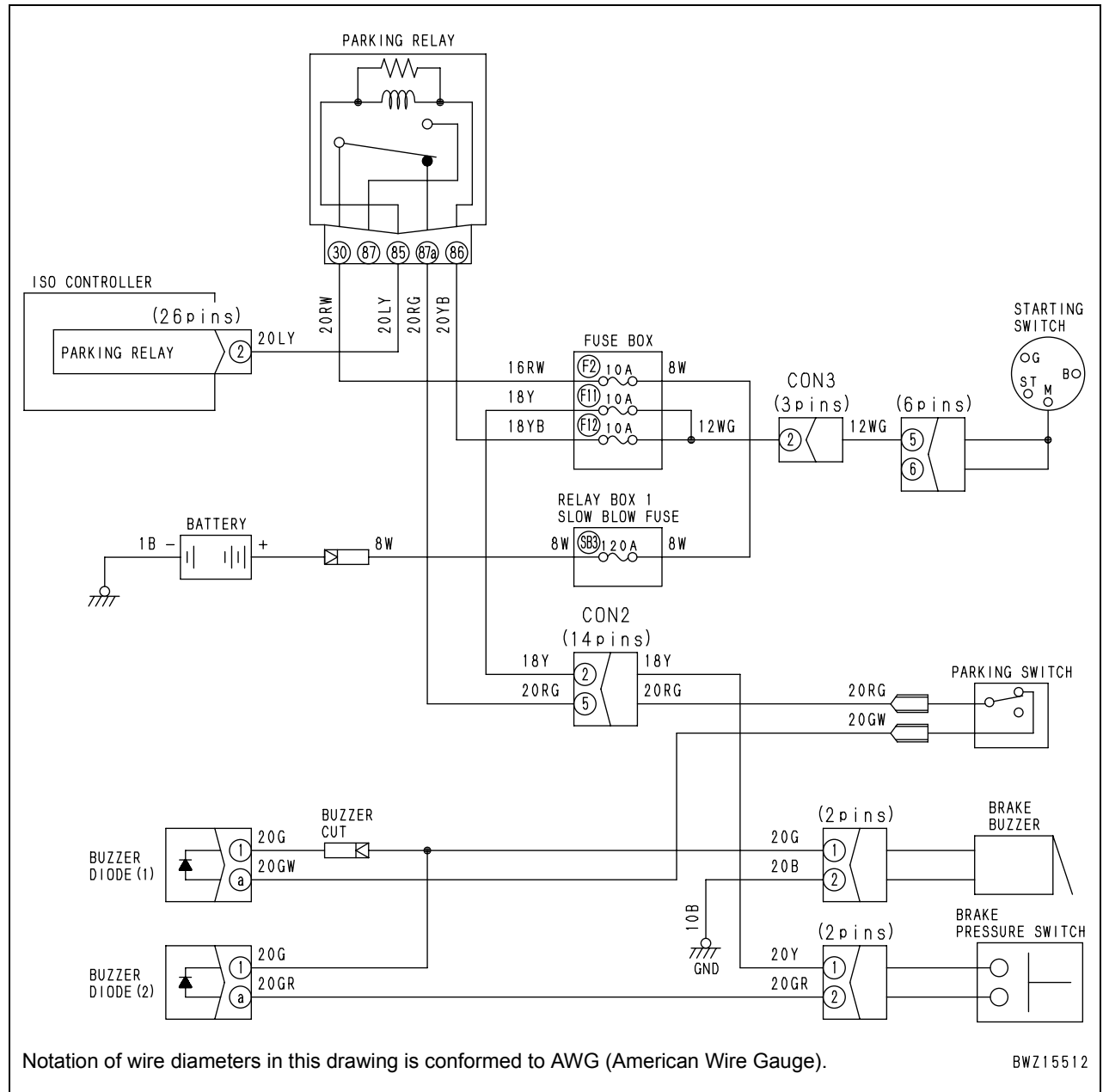
E-4 Parking brake reminder alarm does not sound or does not stop sounding

Contents of trouble	- When operator leave seat without applying parking brake, alarm buzzer does not sound. - While parking brake is applied, alarm buzzer does not stop sounding.
Related information	If any failure code is displayed, carry out troubleshooting for it first.

	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse A1, A2 or B1	If fuse is broken, circuit probably has ground fault (See cause 8).		
Possible causes and standard value in normal state	2	Defective parking brake switch (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			PARKING SWITCH (Terminal on switch side)	Parking brake lever operation	Resistance
			Between terminals	ON (park)	Max. 1 Ω
	3	Defective brake pressure switch (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			BRAKE SWITCH (Terminal on switch side)	Switch condition	Resistance
			Between terminals	ON	Max. 1 Ω
	4	Defective brake buzzer (Internal defect)	★ Prepare with starting switch OFF. ★ Check buzzer unit. ★ Connect (+) to (1) and (–) to (2).		
			Between BRAKE BUZZER (male) (1) and (2)	12 V applied	Buzzer sounds
				Other than above	Buzzer does not sound
	5	Defective buzzer diode (1) (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and measure with (61) on (+) side.		
			Between BUZZER DIODE (1) (male) (61) and (60)		Continues
	6	Defective parking brake relay (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Replace with normal relay	Normal state is recovered	Parking brake relay is defective
				Normal state is not recovered	Parking brake relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			PARKING RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87a)	12 V applied (Relay: ON)	Min. 1 MΩ
				Other than above (Relay: OFF)	Max. 1 Ω

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	7	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. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
	8	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	9	Hot short in wiring harness (Contact with 12 V circuit)	★ If buzzer does not stop sounding, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between PARKING SWITCH – BRAKE BUZZER (female) (1) wiring harness and ground	Voltage	Max. 1 V

Related circuit diagram



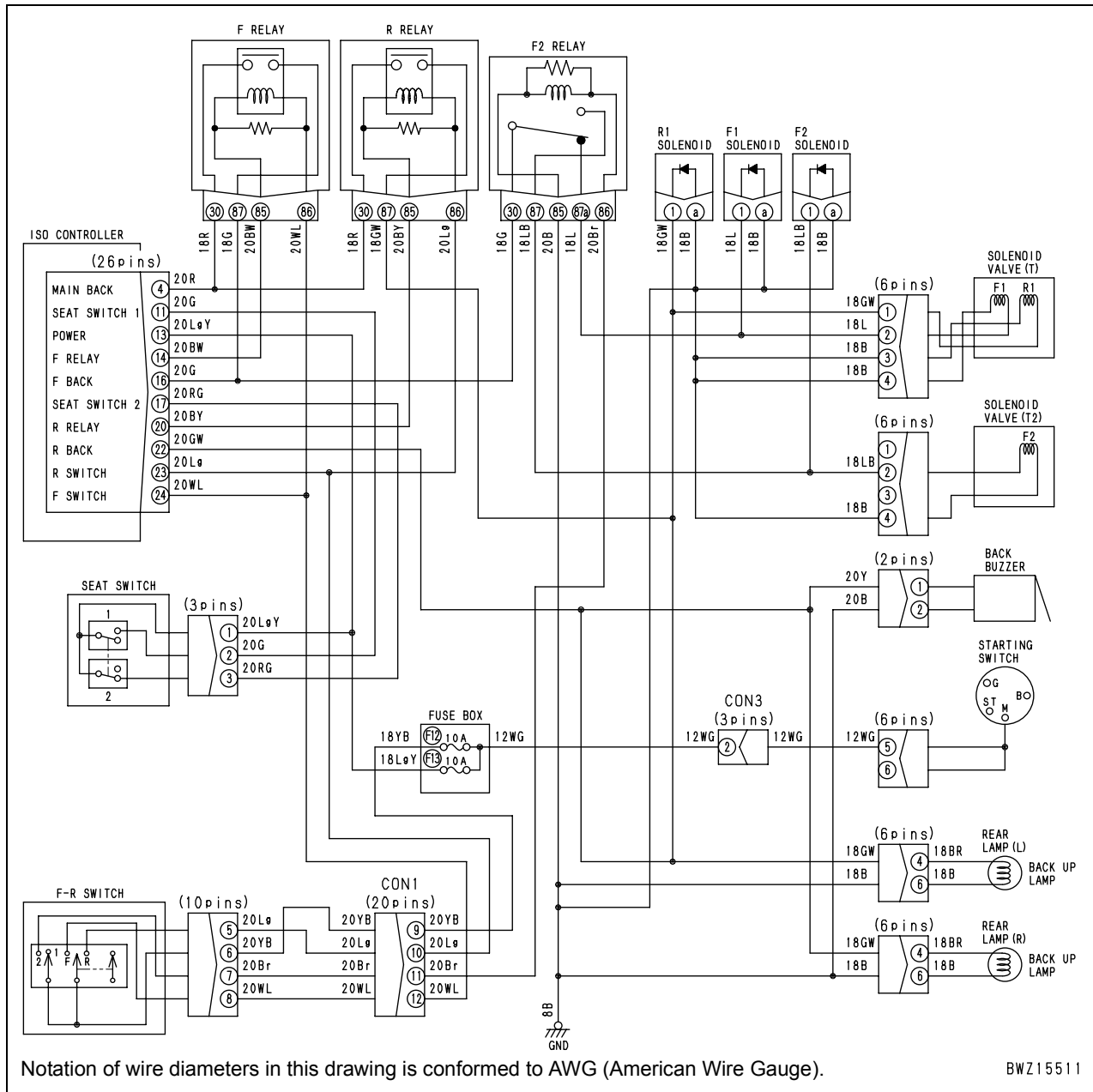
E-5 Travel direction is not changed normally

Contents of trouble	When F-R lever is moved, travel direction does not change
Related information	If any failure code is displayed, carry out troubleshooting for it first.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective fuse F2, F11 or F12	If fuse is broken, circuit probably has ground fault (See cause 12).			
	2	Defective F/R lever (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			F-R SWITCH (male)	Lever position	Resistance	
			Between (6) and (8)	Forward	Max. 1 Ω	
				Reverse	Min. 1 MΩ	
			Between (6) and (5)	Forward	Min. 1 MΩ	
				Reverse	Max. 1 Ω	
	Between (5) and (8)	Always	Min. 1 MΩ			
		3	Defective F1/R1 solenoid (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
	Between SOLENOID VALVE F1/R1 (male) (2) and (4)			Resistance	6 ± 0.5 Ω	
	Between SOLENOID VALVE F1/R1 (male) (1) and (3)			Resistance	6 ± 0.5 Ω	
	4	Defective F2 solenoid (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Between SOLENOID VALVE F2 (male) (2) and (4)		Resistance	6 ± 0.5 Ω
	5	Defective F1 diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.			
			Between F1 SOL DIODE (1) (male) (a) and (1)		Continues	
	6	Defective F2 diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.			
			Between F2 SOL DIODE (1) (male) (a) and (1)		Continues	
	7	Defective R1 diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.			
			Between R1 SOL DIODE (1) (male) (a) and (1)		Continues	
	8	F relay is defective (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	F relay is defective	
Normal state is not recovered				F relay is normal		

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	8	F relay is defective (Internal defect)	★ Prepare with starting switch OFF. ★ Check relay unit.			
			F RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	9	R relay is defective (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	R relay is defective	
				Normal state is not recovered	R relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			R RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	10	Defective F2 relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	F2 relay is defective	
				Normal state is not recovered	F2 relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			F2 RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	11	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω
	12	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 MΩ
13	Defective ISO controller (Internal defect)	If above causes are not the cause for the trouble, ISO controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)				

Related circuit diagram



E-6 Lift truck cannot move work equipment

Contents of trouble	Lift truck cannot move work equipment (It can travel, however.)
Related information	- If any failure code is displayed, carry out troubleshooting for it first. - Perform following troubleshooting when work equipment does not move because of electrical system trouble. (For trouble in hydraulic and mechanical system, see "Troubleshooting of hydraulic and mechanical system (H-mode)".)

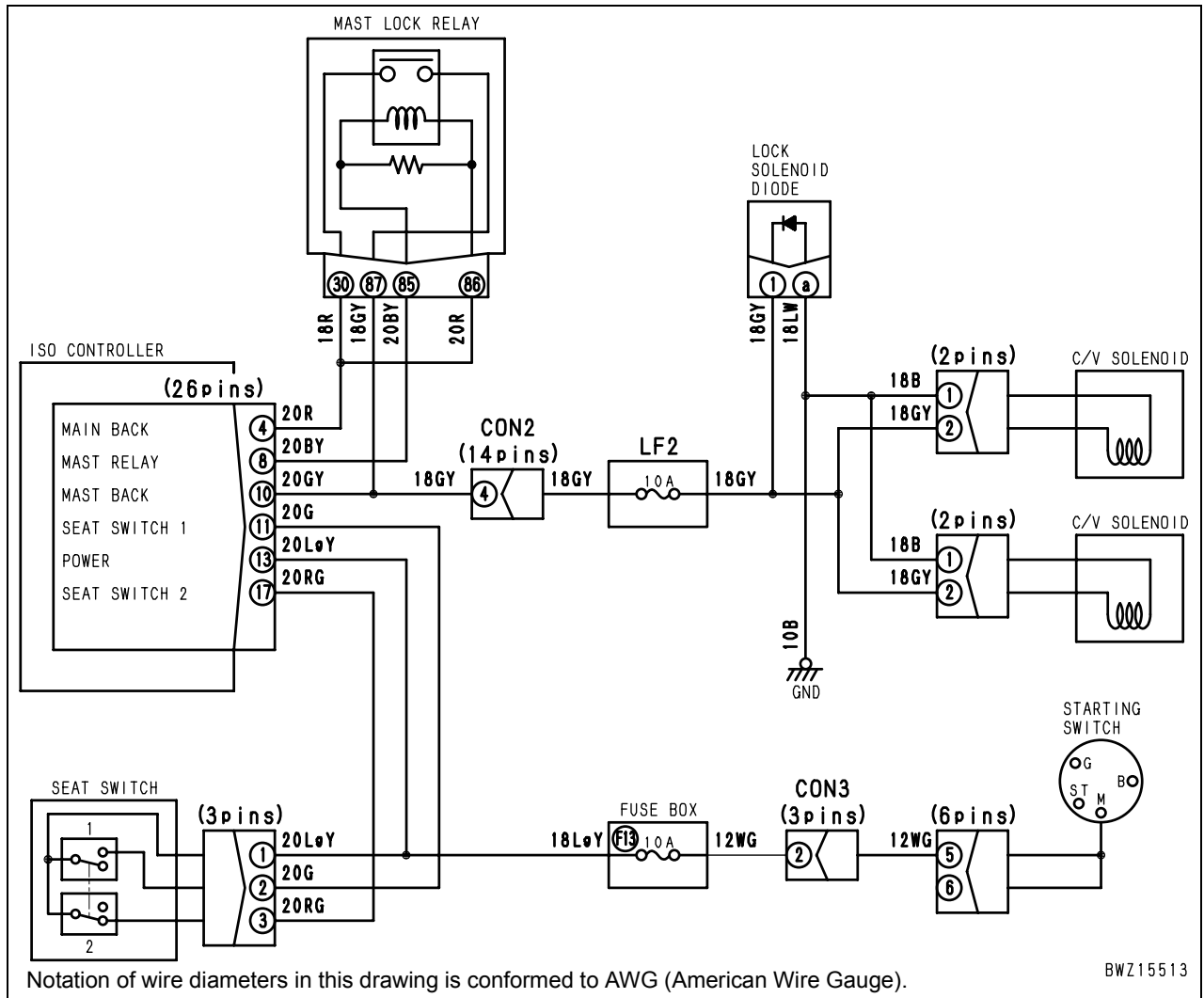
Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective fuse F13 or LF2	If fuse is broken, circuit probably has ground fault (See cause 7).			
	2	Defective seat switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			SEAT SWITCH (male)	Operator	Resistance	
			Between (1) and (2)	Seated	Max. 1 Ω	
				Not seated	Min. 1 MΩ	
			Between (1) and (3)	Seated	Min. 1 MΩ	
				Not seated	Max. 1 Ω	
	Between (2) and (3)		Always	Min. 1 MΩ		
	3	Defective lock solenoid diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.			
			Between LOCK SOLENOID DIODE (male) (a) and (1)		Continues	
	4	Defective work equipment lock solenoid valve (Internal defect) ★ 2 work equipment lock solenoid valves are installed	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Between C/V SOLENOID (male) (1) and (2)		Resistance	9.9 ± 0.5 Ω
	5	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω
	6	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 MΩ
7	Defective ISO controller (Internal defect)	If above causes are not the cause for the trouble, ISO controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)				

E-7 Work equipment cannot be locked

Contents of trouble	Work equipment cannot be locked
Related information	- If any failure code is displayed, carry out troubleshooting for it first. - Perform following troubleshooting when work equipment cannot be locked because of electrical system trouble. (For trouble in hydraulic and mechanical system, see "Troubleshooting of hydraulic and mechanical system (H-mode)".)

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective lock solenoid diode (Internal defect)	★ Prepare with starting switch OFF. ★ Set tester in "diode range" and check continuity with (a) on (+) side.			
			Between LOCK SOL DIODE (male) (a) and (1)		Continues	
	2	Defective work equipment lock solenoid valve (Internal defect) ★ 2 work equipment lock solenoid valves are installed	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Between C/V SOLENOID (male) (1) and (2)		Resistance	9.9 ± 0.5 Ω
	3	Defective lift interlock relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	Lift interlock relay is defective	
				Normal state is not recovered	Lift interlock relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			MAST LOCK RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	4	Hot short in wiring harness (Contact with 12 V circuit)	★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.			
			Between ISO CONTROLLER (10) – C/V SOLENOID (female) (2) wiring harness and ground		Voltage	Max. 1 V
			Between MAST LOCK RELAY (87) – C/V SOLENOID (female) (2) wiring harness and ground		Voltage	Max. 1 V
	5	Defective ISO controller (Internal defect)	If above causes are not the cause for the trouble, ISO controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)			

Related circuit diagram



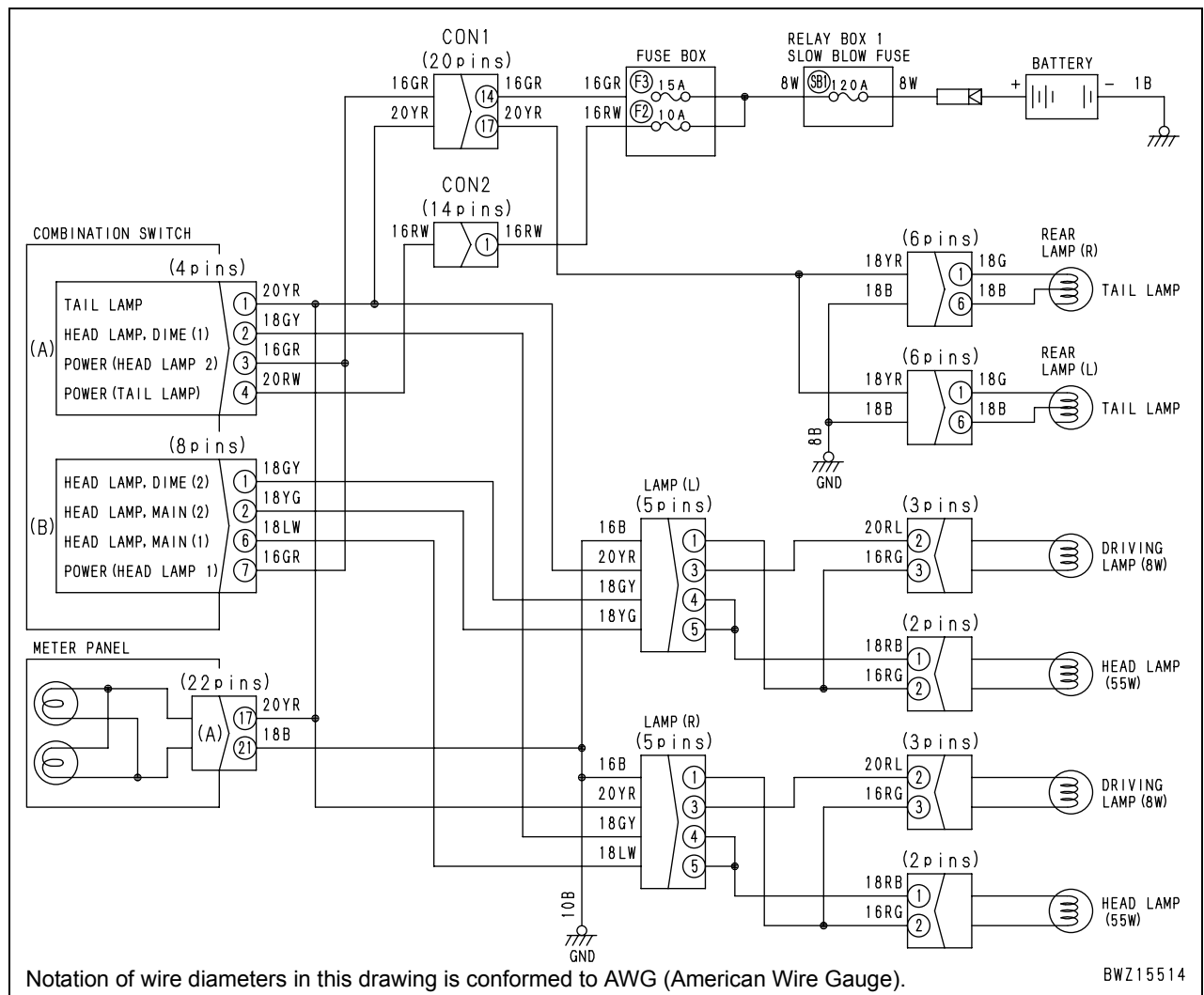
E-8 Headlamp, clearance lamp and tail lamp do not light or go off

Contents of trouble	Headlamp, clearance lamp and tail lamp do not light or go off
Related information	- Check each bulb for breakage. - License plate lamp is optional.

	Cause		Standard value in normal condition/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective fuse F2 or F3	If fuse is broken, circuit probably has ground fault (See cause 5).		
	2	Defective slow blow fuse SB1	If slow blow fuse is broken, circuit probably has ground fault (See cause 5).		
	3	Defective combination switch (Internal defect)	★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between COMBINATION SWITCH (A) (3), (B) (7) and ground	Voltage	10 – 15 V
			COMBINATION SWITCH	Lamp switch position	Voltage
			Between (A), (1) and ground	OFF	Max. 1 V
				1st position	10 – 15 V
				2nd position	10 – 15 V
			Between (A) (2), (B) (1) and ground	OFF position	Max. 1 V
				1st position	Max. 1 V
				2nd position	10 – 15 V
			Between (B) (2), (B) (6) and ground	OFF position	Max. 1 V
				1st position	Max. 1 V
				2nd position	10 – 15 V
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
	5	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	6	Hot short in wiring harness (Contact with 12 V circuit)	★ When switch is turned OFF, if left headlamp does not go off, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between COMBINATION SWITCH (B) (1) – LAMP (L) (4) wiring harness and ground	Voltage	Max. 1 V
			Between COMBINATION SWITCH (B) (2) – LAMP (L) (5) wiring harness and ground	Voltage	Max. 1 V

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	6	Hot short in wiring harness (Contact with 12 V circuit)	★ When switch is turned OFF, if right headlamp does not go off, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between COMBINATION SWITCH (A) (2) – LAMP (R) (4) wiring harness and ground	Voltage	Max. 1 V
			Between COMBINATION SWITCH (B) (6) – LAMP (R) (5) wiring harness and ground	Voltage	Max. 1 V
			★ When switch is turned OFF, if clearance lamp and tail lamp do not go off, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			COMBINATION SWITCH (A) (1) – LAMP (R) (3), LAMP (L) (3), REAR LAMP (R) (1), REAR LAMP (L) (1), LICENSE LAMP (1) wiring harness and ground	Voltage	Max. 1 V

Related circuit diagram

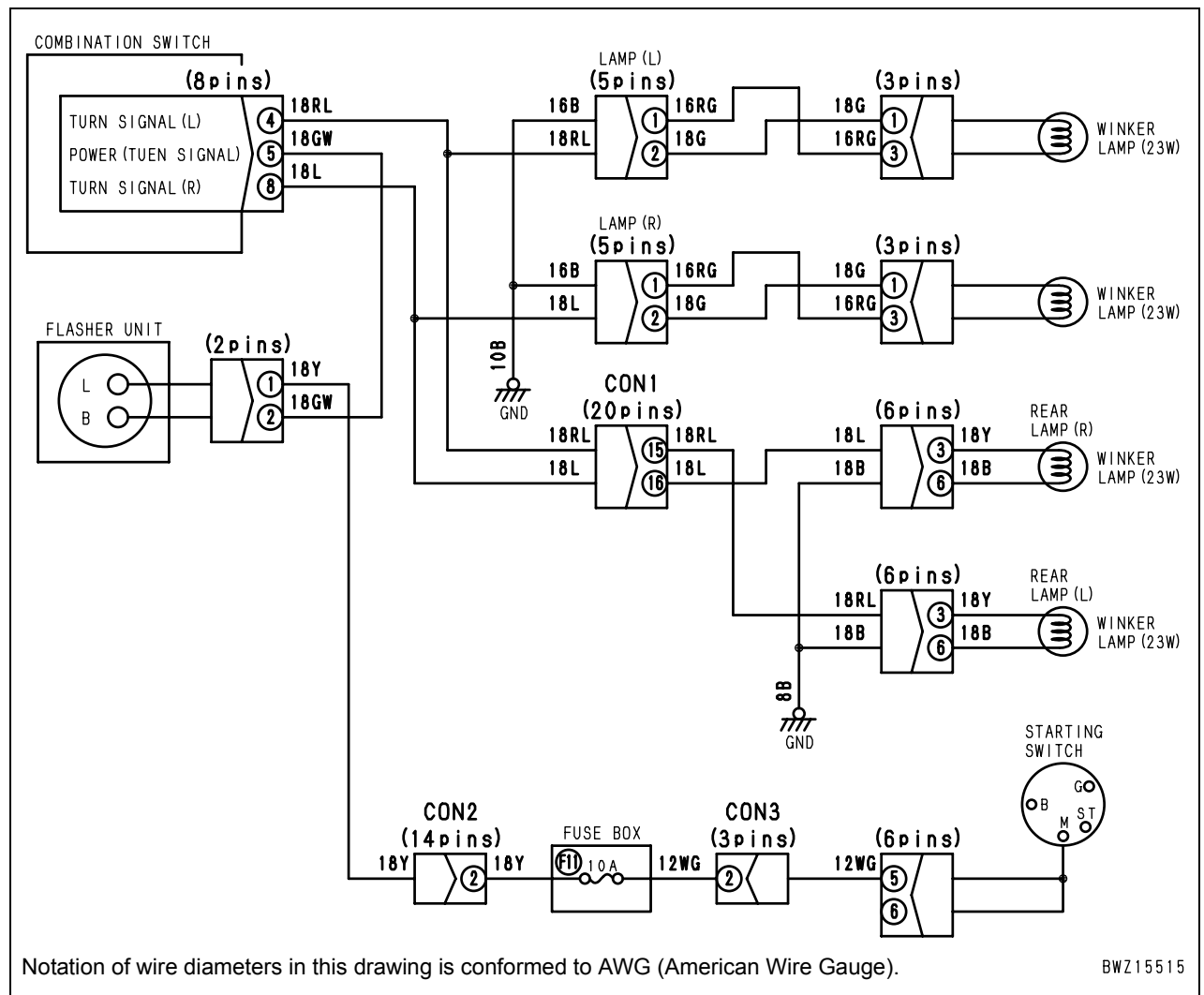


E-9 Turn signal lamps do not light or go off

Contents of trouble	• Turn signal lamps do not light or go off
Related information	• Check each bulb for breakage.

	Cause		Standard value in normal condition/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective fuse F11	If fuse is broken, circuit probably has ground fault (See cause 4).		
	2	Defective combination switch (Internal defect)	★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between COMBINATION SWITCH (B) (5) and ground	Voltage	10 – 15 V
			★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			COMBINATION SWITCH	Direction signal lever position	Voltage
			Between (B), (4) and ground	Neutral	Max. 1 V
				Left	10 – 15 V
				Right	Max. 1 V
			Between (B), (8) and ground	Neutral	Max. 1 V
				Left	Max. 1 V
				Right	10 – 15 V
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
	4	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	5	Hot short in wiring harness (Contact with 12 V circuit)	★ When switch is turned OFF, if left front and rear turn signal lamps do not go off, perform following troubleshooting.		
			★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between COMBINATION SWITCH (B) (4) – LAMP (L) (2) wiring harness and ground	Voltage	Max. 1 V
			Between COMBINATION SWITCH (B) (4) – REAR LAMP (L) (3) wiring harness and ground	Voltage	Max. 1 V
			★ When switch is turned OFF, if right front and rear turn signal lamps do not go off, perform following troubleshooting.		
			★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between COMBINATION SWITCH (B) (8) – LAMP (R) (2) wiring harness and ground	Voltage	Max. 1 V
			Between COMBINATION SWITCH (B) (8) – REAR LAMP (R) (3) wiring harness and ground	Voltage	Max. 1 V

Related circuit diagram

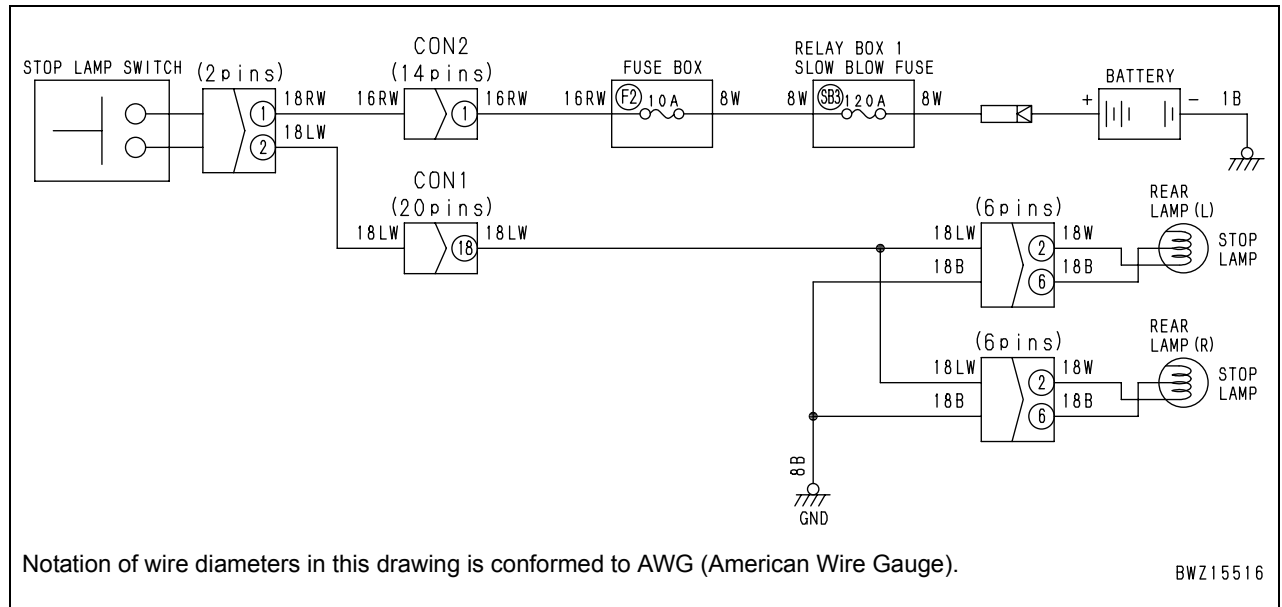


E-10 Brake lamps do not light or go off

Contents of trouble	• Brake lamps do not light or go off
Related information	• Check each bulb for breakage.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse F2	If fuse is broken, circuit probably has ground fault (See cause 5).		
	2	Defective slow blow fuse SB1	If slow blow fuse is broken, circuit probably has ground fault (See cause 5).		
	3	Defective stop lamp switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			STOP LAMP SWITCH (male)	Brake	Resistance
			Between (1) and (2)	Depressed	Max. 1 Ω
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	Check continuity between related circuit terminals shown in figure for disconnection.	Released	Min. 1 MΩ
				Resistance	Max. 1 Ω
				Resistance	Max. 1 Ω
	5	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
	6	Hot short in wiring harness (Contact with 12 V circuit)	★ When switch is turned OFF, if right and left brake lamps do not go off, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between STOP LAMP SWITCH (female) (1) – REAR LAMP (female) (L) (2) wiring harness and ground	Voltage	Max. 1 V
			Between STOP LAMP SWITCH (female) (1) – REAR LAMP (female) (R) (2) wiring harness and ground	Voltage	Max. 1 V

Related circuit diagram

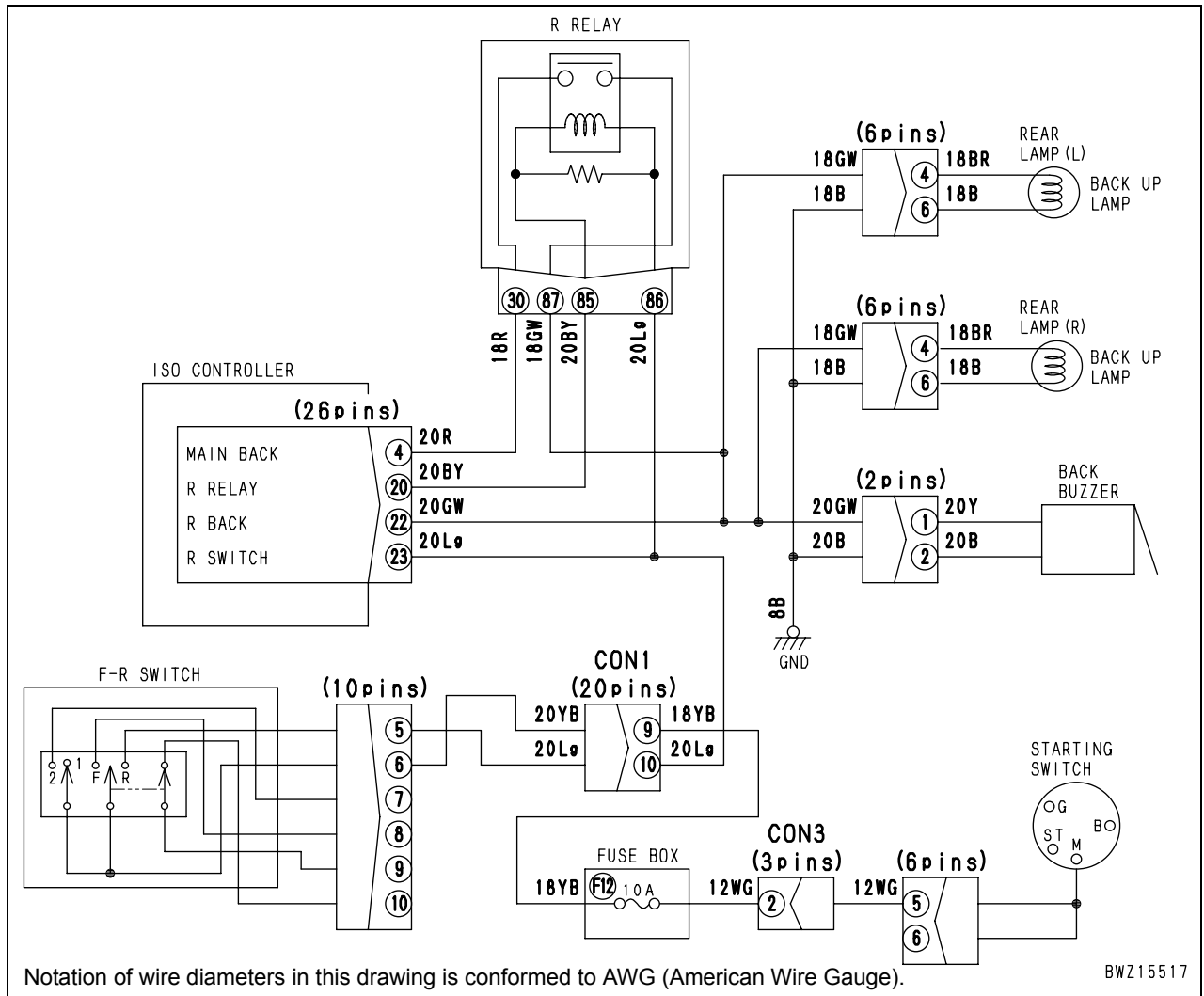


E-11 Backup lamps do not light or go off

Contents of trouble	• Backup lamps do not light or go off
Related information	• Check each bulb for breakage.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting				
	1	Defective fuse F12	If fuse is broken, circuit probably has ground fault (See cause 5).				
	2	Defective F-R switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.				
			F-R SWITCH (male)	F-R lever position	Resistance		
			Between (5) and (6)	Reverse		Max. 1 Ω	
				Other than above		Min. 1 MΩ	
	3	Defective R relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.				
			Replace with normal relay	Normal state is recovered		R relay is defective	
				Normal state is not recovered		R relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.				
			R RELAY (male)	Between (85) and (86)		Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)		Max. 1 Ω	
				Other than above (Relay: OFF)		Min. 1 MΩ	
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.				
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω	
	5	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.				
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 MΩ	
	6	Hot short in wiring harness (Contact with 12 V circuit)	★ When F-R lever is set to position other than "Reverse", if backup lamps do not go off, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.				
			R RELAY (female) (87) – REAR LAMP (L) (4) wiring harness and ground		Voltage	Max. 1 V	
			R RELAY (female) (87) – REAR LAMP (R) (4) wiring harness and ground		Voltage	Max. 1 V	

Related circuit diagram

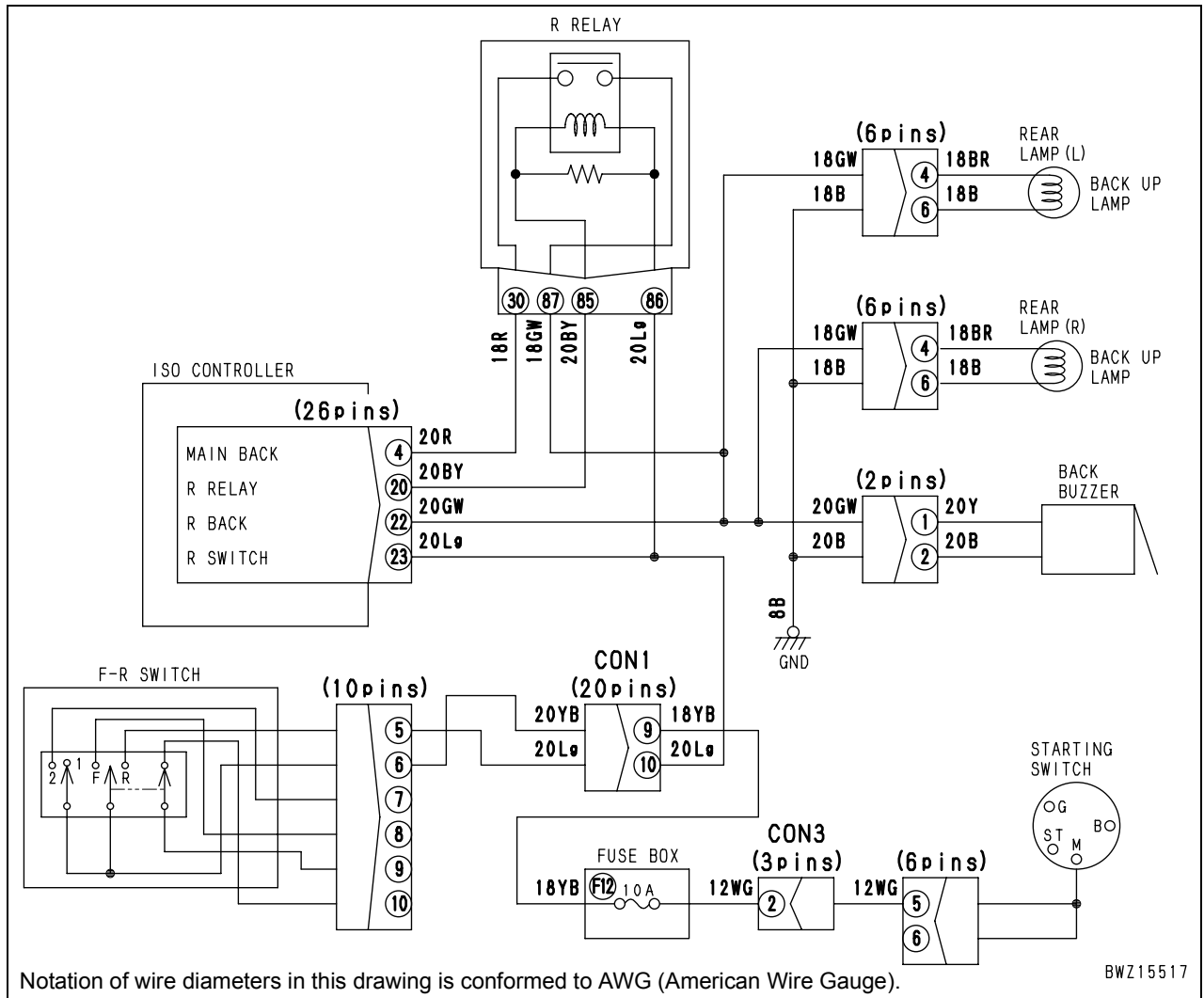


E-12 Backup buzzer does not sound or does not stop sounding (Option)

Contents of trouble	• Backup buzzer does not sound or does not stop sounding
Related information	

	Cause		Standard value in normal condition/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective fuse F12	If fuse is broken, circuit probably has ground fault (See cause 6).		
	2	Defective backup buzzer (Internal defect)	★ Prepare with starting switch OFF. ★ Check buzzer unit. ★ Connect (+) to (1) and (–) to (2).		
			Between BACK BUZZER (female) (1) and (2)	12 V applied Other than above	Buzzer sounds Buzzer does not sound
	3	Defective F-R switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			F-R SWITCH (male)	F-R lever position	Resistance
			Between (5) and (6)	Reverse Other than above	Max. 1 Ω Min. 1 MΩ
	4	Defective R relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	R relay is defective
				Normal state is not recovered	R relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			R RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	5	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
	6	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	7	Hot short in wiring harness (Contact with 12 V circuit)	★ When F-R lever is set to position other than "Reverse", if backup buzzer do not stop sounding, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			Between R RELAY (female) (87) – BACK BUZZER (1) wiring harness and ground	Voltage	Max. 1 V

Related circuit diagram



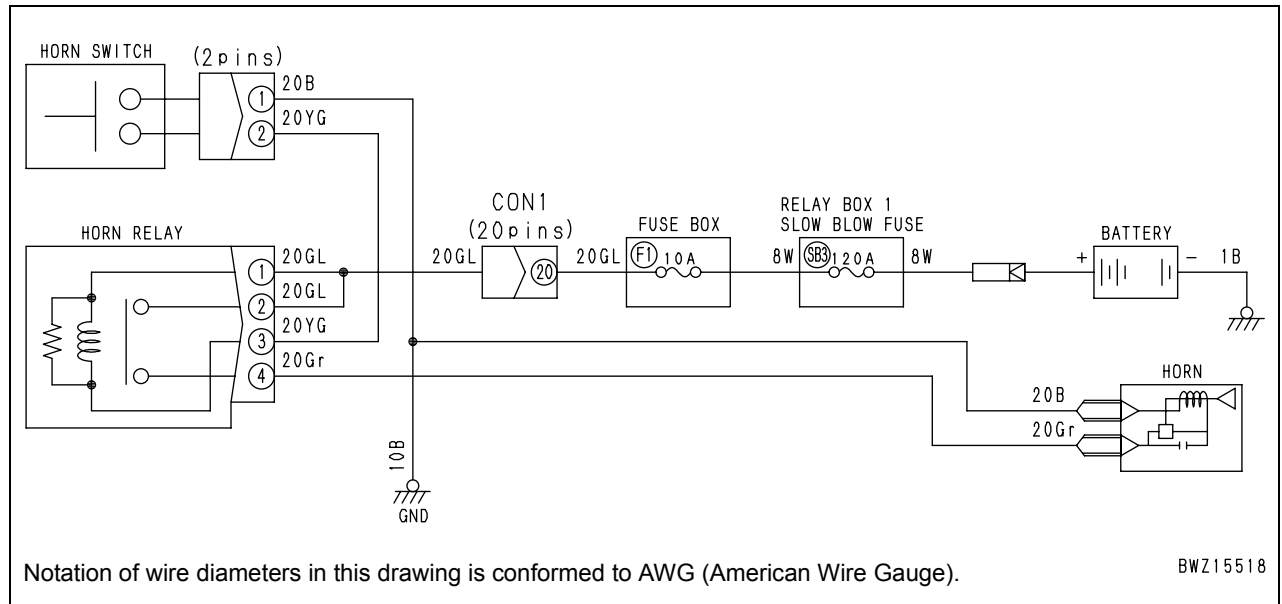
E-13 Horn does not sound or does not stop sounding

Contents of trouble	• Horn does not sound or does not stop sounding
Related information	

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse F1	If fuse is broken, circuit probably has ground fault (See cause 7).		
	2	Defective slow blow fuse SB1	If slow blow fuse is broken, circuit probably has ground fault (See cause 7).		
	3	Defective horn (Internal defect)	★ Prepare with starting switch OFF. ★ Check horn unit. ★ Connect (+) to gray wiring connection side and (–) to black wiring connection side.		
			HORN	12 V applied	Horn sounds
	4	Defective horn switch (Internal defect)	Between (+) terminal and (–) terminal	Other than above	Horn does not sound
			★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			HORN SWITCH (male)	Horn button	Resistance
			Between (1) and (2)	Pressed	Max. 1 Ω
				Other than above	Min. 1 MΩ
Possible causes and standard value in normal state	5	Defective horn relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Horn relay is defective
				Normal state is not recovered	Horn relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			HORN RELAY (male)	Between (1) and (3)	Resistance
			Between (2) and (4)	12 V applied (Relay: ON)	Max. 1 Ω
	6	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
Possible causes and standard value in normal state	7	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	8	Hot short in wiring harness (Contact with 12 V circuit)	★ If horn does not stop sounding, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
		Between HORN RELAY (female) (4) – HORN (+) terminal wiring harness and ground	Voltage	Max. 1 V	

Related circuit diagram

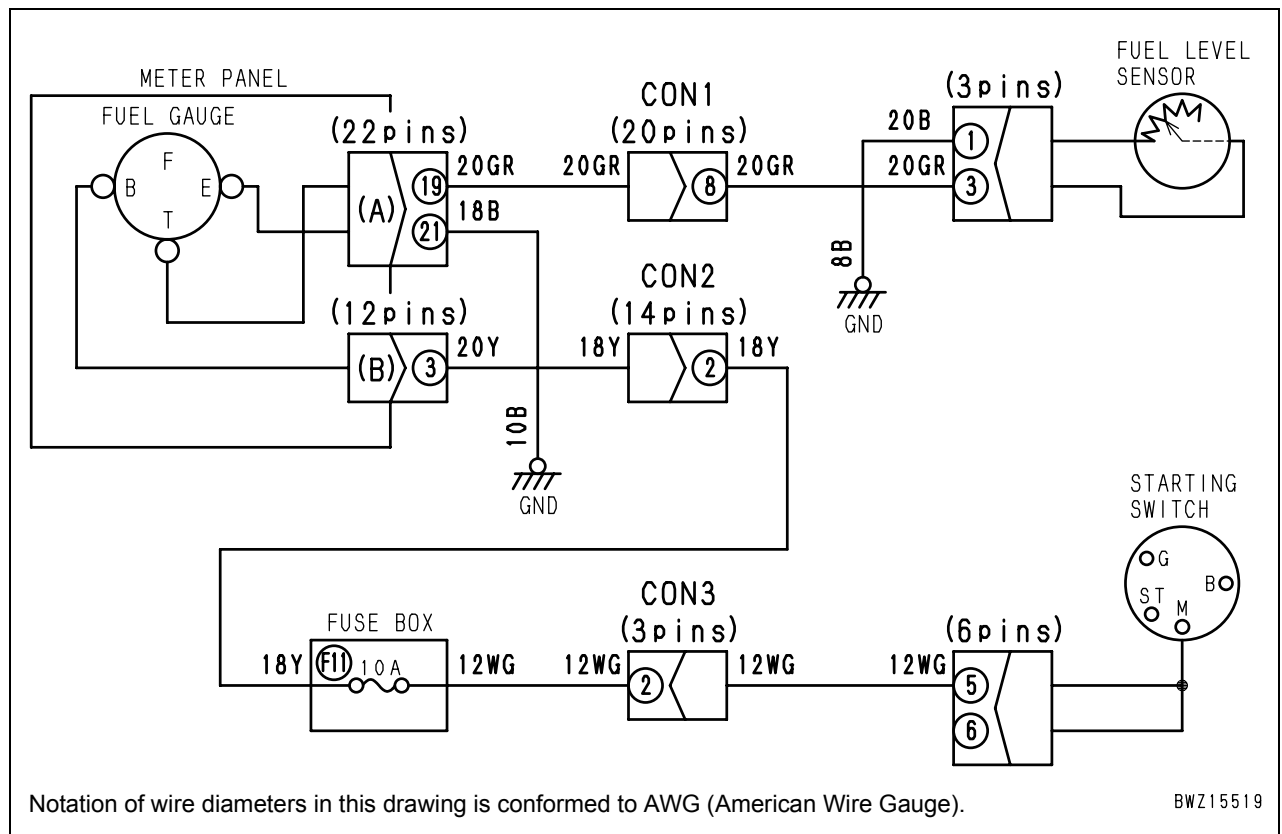


E-14 Fuel level is not displayed normally

Contents of trouble	Fuel level is not displayed normally
Related information	Perform following troubleshooting when there is remarkable difference between actual fuel level and displayed fuel level.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective fuse F11	If fuse is broken, circuit probably has ground fault (See cause 4).			
	2	Defective fuel level sensor (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			FUEL LEVEL SENSOR (male)	Fuel level (Float position)	Resistance	
			Between (1) and (3)	FULL (Max. position)	0 – 2 Ω	
				EMPTY (Min. position)	140 – 160 Ω	
				Between FULL and EMPTY	Changes continuously as float moves	
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.			
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance	Max. 1 Ω
	4	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 MΩ
	5	Hot short in wiring harness (Contact with 12 V circuit)	★ If displayed level is higher than actual level, perform following troubleshooting. ★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting			
			Between FUEL LEVEL SENSOR (female) (3) – METER PANEL (A) (female) (19) wiring harness and ground		Voltage	Max. 1 V
	6	Defective instrument panel (Internal defect)	If above causes are not the cause for the trouble, instrument panel may be defective. (Since trouble is in system, troubleshooting cannot be performed.)			

Related circuit diagram



FORKLIFT TRUCK

CX50 Series

Applicable model Serial number

For general

FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up

For USA

FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

40 Troubleshooting

305 Troubleshooting of electrical system (E-mode) (Part 5)

**Applicable model: Lift truck with EBT-TB45-2A/3A engine
(Gasoline/LPG, LPG) (For USA)**

E-1 Engine does not start	2
E-2 Engine does not stop	10
E-3 Lift truck cannot travel	12
E-4 Parking brake reminder alarm does not sound or does not stop sounding	12
E-5 Travel direction is not changed normally	12
E-6 Lift truck cannot move work equipment	12
E-7 Work equipment cannot be locked	12
E-8 Headlamp, clearance lamp and, tail lamp do not light or go off	12
E-9 Turn signal lamps do not light or go off	12
E-10 Brake lamps do not light or go off	13
E-11 Backup lamps do not light or go off	13
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E-14 Fuel (Gasoline) level is not displayed normally	13

E-1 Engine does not start

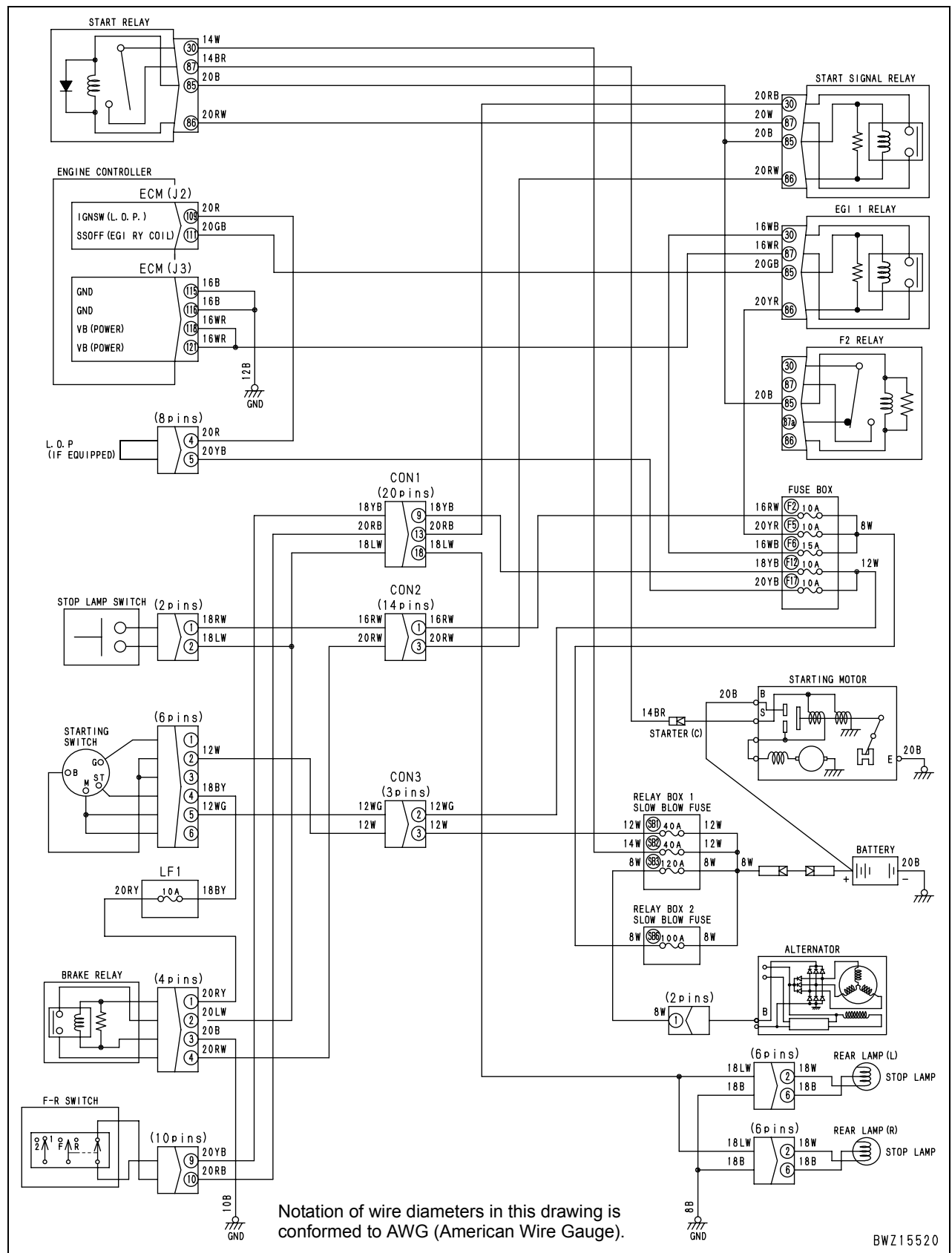
Contents of trouble	(1) Since starting motor does not rotate because of trouble in starting motor system or starting signal system of starting switch, engine does not start.
Related information	- Check following before troubleshooting. - F/R lever is in N (neutral) position. - Brake pedal is depressed. - Fuse or slow blow fuse is not broken (If broken, check related wiring harness for ground fault.) - Battery cable is not disconnected from battery.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective battery	Specific gravity		Min. 1.26
			Voltage		Min. 12 V
	2	Defective fuse F2, F5, F6, F12, F17 or LF1	If fuse is broken, circuit probably has ground fault (See cause 12).		
	3	Defective slow blow fuse SB1, SB2, or SB3	If slow blow fuse is broken, circuit probably has ground fault (See cause 12).		
	4	Defective starting motor	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Between STARTING MOTOR (E) and ground	Resistance	Max. 1 Ω
			★ Prepare with starting switch OFF, then start engine and perform troubleshooting.		
			Between STARTING MOTOR (B) and ground	Voltage	10 – 15 V
			Between STARTING MOTOR (S) and ground	Voltage	10 – 15 V
			★ If above troubleshooting result is normal and starting motor does not rotate, starting motor is defective.		
	5	Defective starting motor relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Starting motor relay is defective
				Normal state is not recovered	Starting motor relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			START RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	6	Defective start signal relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Start signal relay is defective
				Normal state is not recovered	Start signal relay is normal

	Cause		Standard value in normal condition/Remarks on troubleshooting		
Possible causes and standard value in normal state	6	Defective start signal relay (Internal defect)	★ Prepare with starting switch OFF. ★ Check relay unit.		
			START SIGNAL RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	7	Defective EGI 1 relay (Internal defect)	Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	EGI 1 relay is defective
				Normal state is not recovered	EGI 1 relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			EGI 1 RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	8	Defective stop lamp switch (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			STOP LAMP SWITCH (male)	Brake	Resistance
			Between (1) and (2)	Released (Not depressed)	Min. 1 MΩ
				Depressed	Max. 1 Ω
	9	Brake relay is defective (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Brake relay is defective
				Normal state is not recovered	Brake relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			BRAKE RELAY (male)	Between (1) and (3)	Resistance
			Between (2) and (4)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	10	Defective starting switch (Internal defect)	★ Prepare with starting switch OFF. ★ Check switch unit.			
			STARTING SWITCH (male)	Key position	Resistance	
			Between (2) and (3) Between (5) and (6)	OFF	Max. 1 Ω	
			Other than above		Min. 1 MΩ	
			Between (1), (2), (3), (5) and (6)	1 (ON)	Max. 1 Ω	
			Other than above		Min. 1 MΩ	
			Between (1), (2), (3), (4), (5) and (6)	2 (START)	Max. 1 Ω	
			11	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.	
	Check continuity between related circuit terminals shown in figure for disconnection.				Resistance	Max. 1 Ω
	12	Ground fault of wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.			
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.		Resistance	Min. 1 MΩ

Related circuit diagram



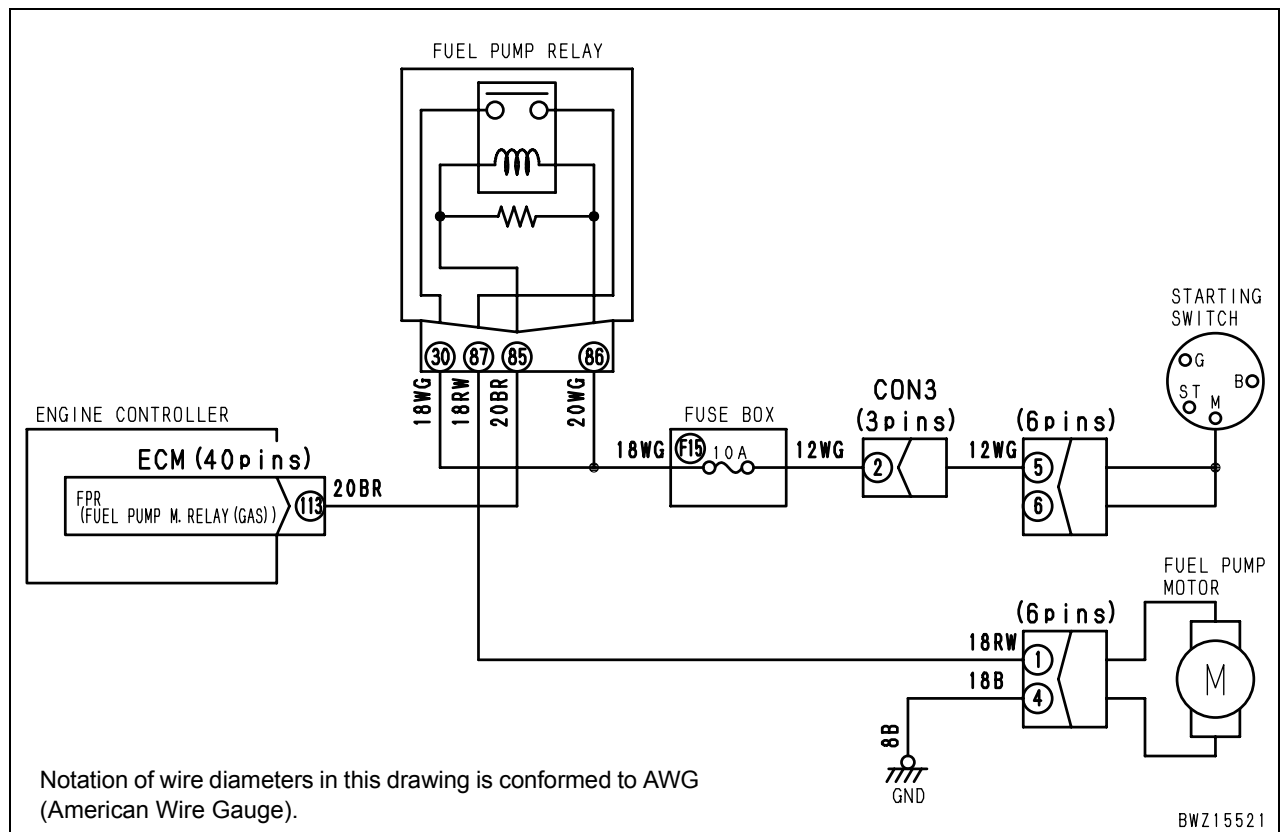
Applicable model: EBT-TB45-2A engine (Gasoline/LPG)

Contents of trouble	(2) Since fuel (gasoline) is not sent because of fuel pump system trouble, engine does not start.
Related information	- Check following before troubleshooting. a. Fuel level is sufficient. b. Fuel filter is not clogged. c. Air passage of fuel tank cap is not clogged. - Apply when "Gasoline" is selected as fuel.

	Cause		Standard value in normal condition/Remarks on troubleshooting		
	1	Defective fuse F15	If fuse is broken, circuit probably has ground fault (See cause 6).		
Possible causes and standard value in normal state	2	Defective fuel pump relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	Fuel pump relay is defective
				Normal state is not recovered	Fuel pump relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			FUEL PUMP RELAY(male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	3	Defective fuel pump (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			★ Prepare with starting switch OFF. ★ Check pump unit.		
			FUEL PUMP MOTOR (male)		Fuel pump operation
			Between (1) and (4)	12 V applied (Starting switch ON)	Motor in operation
				Power is not connected (Starting switch OFF)	Motor stopped
	4	Defective starting switch (Internal defect)	★ Prepare with starting switch OFF. ★ Check switch unit.		
			STARTING SWITCH (male)	Key position	Resistance
			Between (2) and (3) Between (5) and (6)	OFF	Max. 1 Ω
			Other than above		Min. 1 MΩ
			Between (1), (2), (3), (5) and (6)	1 (ON)	Max. 1 Ω
			Other than above		Min. 1 MΩ
			Between (1), (2), (3), (4), (5) and (6)	2 (START)	Max. 1 Ω
	5	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.		Resistance Max. 1 Ω

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	6	Ground fault of wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	7	Defective engine controller (Internal defect)	★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting. ★ Check about 1 second after turning starting switch to ON position.		
			ECM (40 PIN CONNECTOR)	Voltage	
			Between (113) and ground	10 – 15 V	

Related circuit diagram

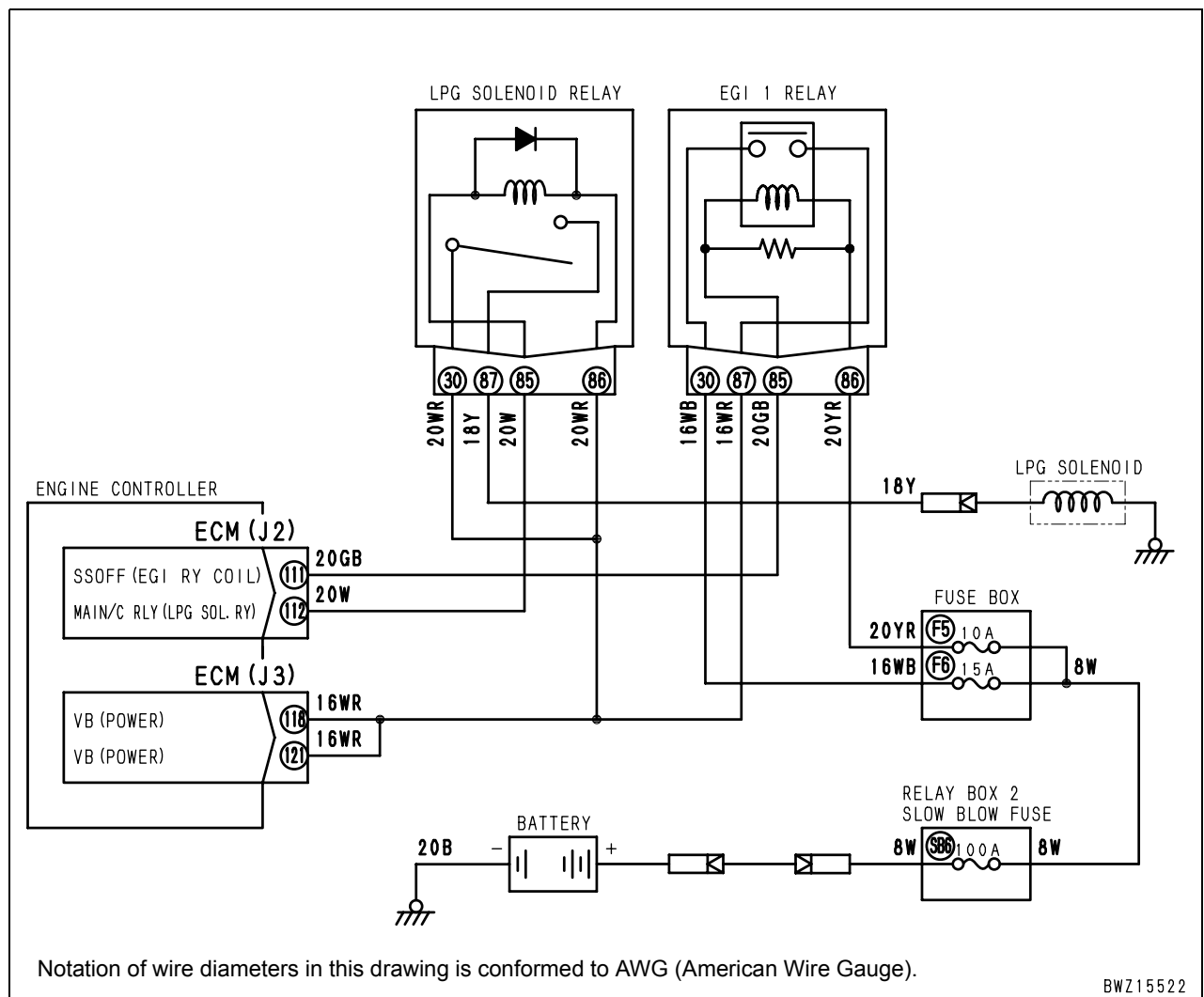


Contents of trouble	(3) Since fuel (LPG) is not sent because of LPG solenoid system trouble, engine does not start.
Related information	- Check following before troubleshooting. a. Fuel level is sufficient. b. Fuel filter is not clogged. - Apply EBT-TB45-1B (Gasoline/LPG) when "LPG" is selected as fuel.

	Cause		Standard value in normal condition/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective fuse F5 or F6	If fuse is broken, circuit probably has ground fault (See cause 7).		
	2	Defective slow blow fuse SB3	If slow blow fuse is broken, circuit probably has ground fault (See cause 7).		
	3	Defective LPG solenoid relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	LPG solenoid relay is defective
				Normal state is not recovered	LPG solenoid relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			LPG SOLENOID RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	4	Defective EGI relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			Replace with normal relay	Normal state is recovered	EGI relay is defective
				Normal state is not recovered	EGI relay is normal
			★ Prepare with starting switch OFF. ★ Check relay unit.		
			PTC RELAY (male)	Between (85) and (86)	Resistance
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω
				Other than above (Relay: OFF)	Min. 1 MΩ
	5	Defective LPG solenoid (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.		
			★ Prepare with starting switch OFF. ★ Check solenoid unit (Connect (+) of battery to (+) terminal of installed solenoid)		
			LPG SOLENOID (+) terminal	Operation of LPG solenoid	
			12 V applied (Starting switch ON)	Opens (Operating sound is heard)	
			Disconnect power from above condition (Starting switch ON → OFF)	Closes (Operating sound is heard)	

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting		
	6	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between terminals.		
			Check continuity between related circuit terminals shown in figure for disconnection.	Resistance	Max. 1 Ω
	7	Ground fault of wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position. ★ Disconnect connectors at both ends of circuit and measure resistance between each terminal and ground.		
			Measure resistance between related power supply system circuit, signal system circuit and ground shown in figure for ground fault.	Resistance	Min. 1 MΩ
	8	Defective engine controller (Internal defect)	★ Prepare with starting switch OFF, then turn starting switch to ON position and perform troubleshooting.		
			ECM (40 PIN CONNECTOR)	Voltage	
			Between (112) and ground	10 – 15 V	

Related circuit diagram

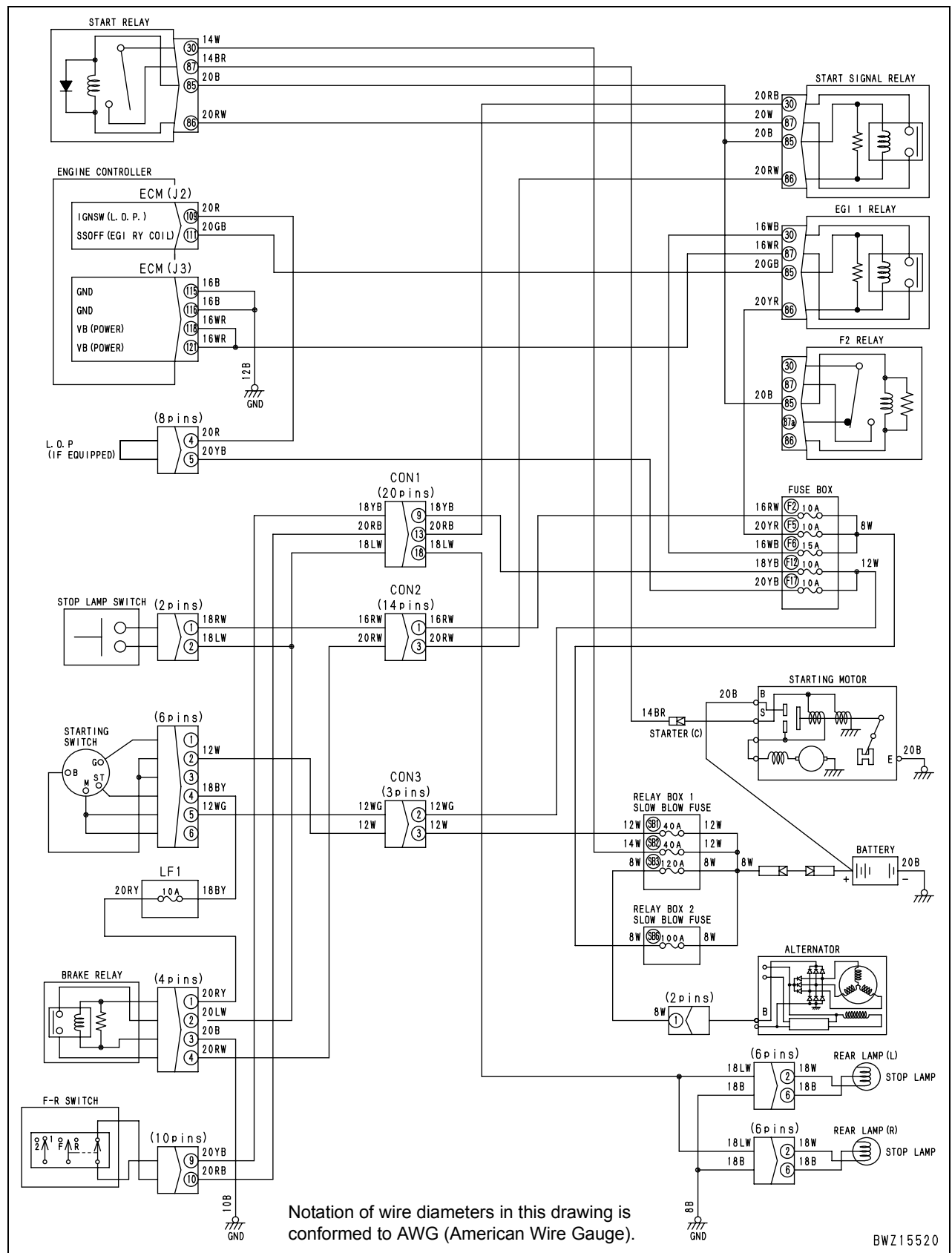


E-2 Engine does not stop

Contents of trouble	When starting switch is turned to OFF position, engine does not stop.
Related information	- If power to engine controller is turned OFF, engine stops. - When performing troubleshooting, disconnect battery negative terminal to stop engine.

Possible causes and standard value in normal state	Cause		Standard value in normal condition/Remarks on troubleshooting			
	1	Defective EGI 1 relay (Internal defect)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.			
			Replace with normal relay	Normal state is recovered	EGI relay is defective	
				Normal state is not recovered	EGI relay is normal	
			★ Prepare with starting switch OFF. ★ Check relay unit.			
			EGI 1 RELAY (male)	Between (85) and (86)	Resistance	
			Between (30) and (87)	12 V applied (Relay: ON)	Max. 1 Ω	
				Other than above (Relay: OFF)	Min. 1 MΩ	
	2	Defective starting switch (Internal defect)	★ Prepare with starting switch OFF. ★ Check switch unit.			
			STARTING SWITCH (male)	Key position	Resistance	
			Between (2) and (3) Between (5) and (6)	OFF	Max. 1 Ω	
			Other than above		Min. 1 MΩ	
			Between (1), (2), (3), (5) and (6)	1 (ON)	Max. 1 Ω	
			Other than above		Min. 1 MΩ	
			Between (1), (2), (3), (4), (5) and (6)	2 (START)	Max. 1 Ω	
			3	Hot short in wiring harness (Contact with 12 V circuit)	★ Prepare with starting switch OFF, then perform troubleshooting without turning starting switch to ON position.	
	Between ECM (40PIN CONNECTOR) (female) (118), (121) – EGI 1 RELAY (female) (87) wiring harness and ground				Voltage	Max. 1 V
	4	Defective engine controller (Internal defect)	If above causes are not the cause for the trouble, engine controller may be defective. (Since trouble is in system, troubleshooting cannot be performed.)			

Related circuit diagram



E-3 Lift truck cannot travel

See Troubleshooting of electrical system (E-mode) (Part 4), Lift truck with SAA4D95LE-5-A engine (For USA), **E-3**.

E-4 Parking brake reminder alarm does not sound or does not stop sounding

See Troubleshooting of electrical system (E-mode) (Part 4), Lift truck with SAA4D95LE-5-A engine (For USA), **E-4**.

E-5 Travel direction is not changed normally

See Troubleshooting of electrical system (E-mode) (Part 4), Lift truck with SAA4D95LE-5-A engine (For USA), **E-5**.

E-6 Lift truck cannot move work equipment

See Troubleshooting of electrical system (E-mode) (Part 4), Lift truck with SAA4D95LE-5-A engine (For USA), **E-6**.

E-7 Work equipment cannot be locked

See Troubleshooting of electrical system (E-mode) (Part 4), Lift truck with SAA4D95LE-5-A engine (For USA), **E-7**.

E-8 Headlamp, clearance lamp and, tail lamp do not light or go off

See Troubleshooting of electrical system (E-mode) (Part 4), Lift truck with SAA4D95LE-5-A engine (For USA), **E-8**.

E-9 Turn signal lamps do not light or go off

See Troubleshooting of electrical system (E-mode) (Part 4), Lift truck with SAA4D95LE-5-A engine (For USA), **E-9**.

E-10 Brake lamps do not light or go off

See Troubleshooting of electrical system (E-mode) (Part 4), Lift truck with SAA4D95LE-5-A engine (For USA), **E-10**.

E-11 Backup lamps do not light or go off

See Troubleshooting of electrical system (E-mode) (Part 4), Lift truck with SAA4D95LE-5-A engine (For USA), **E-11**.

E-12 Backup buzzer does not sound or does not stop sounding (Option)

See Troubleshooting of electrical system (E-mode) (Part 4), Lift truck with SAA4D95LE-5-A engine (For USA), **E-12**.

E-13 Horn does not sound or does not stop sounding

See Troubleshooting of electrical system (E-mode) (Part 4), Lift truck with SAA4D95LE-5-A engine (For USA), **E-13**.

E-14 Fuel (Gasoline) level is not displayed normally

Applicable model: EBT-TB45-2A engine (Gasoline/LPG)

See Troubleshooting of electrical system (E-mode) (Part 4), Lift truck with SAA4D95LE-5-A engine (For USA), **E-14**.

FORKLIFT TRUCK

CX50 Series

Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

40 Troubleshooting

400 Troubleshooting of hydraulic and mechanical system (H-mode)

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Table of failure modes and causes	6
H-1 Lift truck does not start	12
H-2 Travel speed is low, rush force is low, gradeability is low and/or gear is not shifted	13
H-3 Large shocks are made when lift truck starts and gear is shifted	14
H-4 Long time lag is made when lift truck starts and gear is shifted	15
H-5 Torque converter oil temperature is high	16
H-6 Lift truck does not turn	17
H-7 Response is low during turning	18
H-8 Steering is heavy	19
H-9 Lift truck is unstable or large shock is made when it turns	20
H-10 Right and left turning radii are different	21
H-11 When steering wheel is released it does not return to neutral or it rotates by itself	21
H-12 Steering wheel is turned in reverse or it kicks	21

H-13 EPACS does not work	22
H-14 Steering wheel vibrates	23
H-15 Steering system makes abnormal sound	23
H-16 Oil leaks from steering circuit	23
H-17 Service brake does not work or its performance is low	24
H-18 Service brake is not reset or it drags	25
H-19 Parking brake does not work or its performance is low	26
H-20 Parking brake is not reset or it drags	27
H-21 Lift cylinder and fork do not lift	28
H-22 Lifting speed or force of lift cylinder and fork is insufficient	29
H-23 Fork lifting speed lowers at specific height	30
H-24 Lift cylinder cannot lift load	30
H-25 Lift cylinder natural drift is large	30
H-26 Fork lowering speed is too high	31
H-27 Mast does not tilt forward or backward	32
H-28 Forward/backward tilting speed or force of mast is insufficient	33
H-29 Tilting speed lowers halfway	34
H-30 Tilt cylinder cannot lift load	34
H-31 Tilt cylinder natural forward drift is large	34
H-32 Mast is unstable during travel with load	34
H-33 Lift and tilt levers do not move smoothly and they are heavy	35
H-34 Engine speed lowers remarkably or engine stalls when work equipment is operated	36
H-35 Large shocks are made when work equipment is started and stopped	36
H-36 Another part of work equipment moves when work equipment is relieved singly	36
H-37 Work equipment speed or force is low	37
H-38 When work equipment and steering are operated, engine speed lowers remarkably or engine stalls	37
H-39 Work equipment and steering system do not move	38
H-40 Abnormal sound is heard from around work equipment and steering pump	38
H-41 Work equipment fine control performance is low or response is low	39
H-42 Work equipment is not locked (It operates while operator is not in operator seat) or only work equipment does not move	39
H-43 Work equipment (lift-up) does not move, moves but slow or moves but force is low	40
H-44 Lift cylinder drift is large (while operator is not in operator seat)	41
H-45 Lift cylinder drift is large (while operator is in operator seat)	41
H-46 Work equipment (lift-down) lowering speed is low or high or fine control performance is low or response is low	42
H-47 Fork does not lower	43
H-48 Mast does not tilt/tilts but slow/tilts but force is low	44
H-49 Tilt cylinder natural forward drift is large	44
H-50 Attachment does not move/moves but low/moves but force is low	45
H-51 Attachment cylinder natural drift is large	45
H-52 Steering is heavy	46
H-53 Large shock is made when steering wheel is returned	46
H-54 Work equipment is heavy when work equipment and steering are operated simultaneously	47
H-55 Steering is heavy when work equipment and steering are operated simultaneously	47

Method of using troubleshooting table

This troubleshooting chart determines the location from the problem of occurring on the machine and categorizes the problem under one of the main components, such as the steering system or work equipment hydraulic system. Use the following procedure to carry out accurate troubleshooting swiftly.

Step 1. Ask operator questions

- The questions to ask the operator are given under the problem. If the answer to the question matches the content given, the cause given after the arrow is the probable cause. Keeping the content of the questions in mind, read the matrix and proceed with **Step 2** and **Step 3** to pinpoint the correct cause.

Example: Steering wheel will not turn

Ask the operator and check the following points.

- Did the problem suddenly start?
→ **Broken part in steering equipment**
- Was the steering wheel heavy before?
→ **Internal wear, defective seal in steering related equipment**

Step 2. Checks before troubleshooting

- Before measuring the oil pressure or starting the troubleshooting, confirm the checks before starting items, check for leakage of oil, or for loose bolts. This will prevent wasting time when troubleshooting. The items given under Checks before troubleshooting are checks that are particularly important to make about the condition of the machine before starting the actual troubleshooting.

Example: Check before starting troubleshooting

- Is oil level and type of oil in hydraulic tank correct?
- Is there any oil leakage from steering valve or demand valve?
- Is steering linkage adjusted properly?

Step 3. Method of reading matrix

- Operate the lift truck when perform troubleshooting of the items in the Diagnosis column. If any problems occur as the result of the troubleshooting, put a check against the item.
 - ★ When perform the troubleshooting, check the easier items first. It is not necessary to follow the number order

(Example)

No.	Diagnosis	Remedy
1	Steering wheel does not turn in either direction (left and right)	
2	Steering wheel turns only in one direction (left or right)	
3	Steering wheel is heavy in both right and left directions	
4	Steering wheel is too heavy to turn in either right or left direction	
5	Work equipment moves.	

- Find the matching cause in the Cause column. If problem is found, the ○ marks on the same line as the troubleshooting are the causes. (In Diagnosis item 2 in the same diagram below the cause is **c** or **e**.)

[When there is one ○ mark]

Perform troubleshooting for the other items marked with ○ in the same Cause column to check if the problem occurs, then make repairs.

[When there are two ○ marks]

Go to Step 3 to narrow down the cause.

		Cause				
		a	b	c	d	e
Diagnosis	Remedy	×	C	△	A	×
				×		
1		○	○	○	○	
2				●		●
3			○		○	
4		○			○	
5			○			○

TJW03147

3. Operate the lift truck and perform troubleshooting of the items not checked in Step 1., and if any problem occurs, put a check against the item. (In troubleshooting item 5 in the diagram below, the problem was re-enacted.)
4. Find the matching cause in the cause column. If a problem is found, the ○ marks on the same line for the troubleshooting item are the causes. (In Diagnosis item 5 in the diagram below, the cause is **b** or **e**.)

		Cause				
		a	b	c	d	e
Remedy	Diagnosis	×	C	△	A	×
1	1	○	○	○	○	
✓ 2	2			●		●
3	3		○		○	
4	4	○			○	
✓ 5	5		●			●

Applicable items found in Step 3)
Applicable items found in Step 1) T JW03148

6. Repeat the operation in Step 3., 4., 5. until the cause is narrowed down to 1 item (1 common item).

★ If cause items are 2 or more, continue until number of items becomes minimum.

7. Remedy

After narrowing down the common causes, taken the action given in the remedy line.

[Symbols in remedy column and their meanings]

× : Replace, △: Repair, A: Adjust, C: Clean

		Cause					Nature of remedy
		a	b	c	d	e	
Remedy	Diagnosis	×	C	△	A	×	
1	1	○	○	○	○		
✓ 2	2			●		●	
3	3		○		○		
4	4	○			○		
✓ 5	5		○			●	

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5. Narrow down the causes

Of the causes found in Step 2. and Step 4., there are common items (○ marks on the line for each Diagnosis item and in the same Cause column as each other) that have causes common with the problem items found in the troubleshooting in Step 1. and Step 3.

★ The items that are not common (items that do not have ○ marks in the same cause common as each other) are probably not the cause, so they can be eliminated. (The causes for Diagnosis item 2 in the diagram below are **c** or **e**, and the causes in Diagnosis item 5 are **b** or **e**, so Cause **e** is a common cause.)

		Cause					Nature of remedy
		a	b	c	d	e	
Remedy	Diagnosis	×	C	△	A	×	
1	1	○	○	○	○		
✓ 2	2			●		●	
3	3		○		○		
4	4	○			○		
✓ 5	5		●			●	

T JW03149

Table of failure modes and causes

Part that can cause failure		Failure mode															
		Defective engine	Defective PTO	Clogged torque converter charge pump	Clogging or sucked air on torque converter charge pump side	Defective torque converter charge pump	Internal breakage of torque converter	Defective regulator valve	Clogged or broken torque converter oil cooler	Malfunction of torque converter relief valve	Reduction of transmission main relief valve set pressure	Clogged last chance filter	Malfunction of corresponding solenoid valve	Internal damage of transmission	Worn or seized corresponding clutch disc	Oil pressure reduction caused by defective transmission valve	Defective clutch piston
Power train	Lift truck does not start		○	○	○	○	○			○	○	○	○	○	○	○	
	Travel speed is low, rush force is low, gradeability is low and/or gear is not shifted	○		○	○	○	○	○	○	○	○	○	○	○			○
	Large shocks are made when lift truck starts and gear is shifted			○	○	○							○				○
	Long time lag is made when lift truck starts and gear is shifted			○	○	○					○	○	○				○
	Torque converter oil temperature is high	○		○	○	○	○		○		○			○			○
Steering	Steering wheel does not turn		○														
	Response is low during turning		○														
	Steering is heavy																
	Lift truck is unstable or large shock is made when it turns																
	Right and left turning radii are different																
	When steering wheel is released it does not return to neutral or it rotates by itself																
	Steering wheel is turned in reverse or it kicks																
	EPACS does not work (*)																
	Steering wheel vibrates																
	Steering system makes abnormal sound																
	Oil leaks from steering circuit																
Brake	Service brake does not work or its performance is low																
	Service brake is not release or it drags																
	Parking brake does not work or its performance is low																
	Parking brake is not release or it drags																
Work equipment	Lift cylinder and fork do not lift		○														
	Fork lifting speed is low																
	Fork lifting speed lowers at specific height																
	Lift cylinder cannot lift load																
	Lift cylinder natural drift is large																
	Fork lowering speed is too high																
	Mast does not tilt forward or backward		○														
	Forward/backward tilting speed or force of mast is insufficient																
	Tilting speed lowers halfway																
	Tilt cylinder cannot lift load																
	Tilt cylinder natural forward drift is large																
	Tilt system is unstable during travel with load																
	Lift and tilt levers do not move smoothly and they are heavy																
	Engine speed lowers remarkably or engine stalls when work equipment is operated.	○															
	Large shocks are made when work equipment is started and stopped																
	Another part of work equipment moves when work equipment is relieved singly																

*: Related to only lift truck with EPACS

400 Troubleshooting of hydraulic and mechanical system (H-mode)
Table of failure modes and causes

BEC10E1-01FJ

Defective seal of corresponding clutch piston	Defective seal of corresponding clutch shaft	Defective seal of pump shafts in work equipment and steering system	Clogging or sucked air on steering pump suction side	Defective steering pump	Defective steering pump servo	Defective control valve	Defective orbit roll	Misaligned orbit roll	Foreign matter caught in orbit roll	Defective steering main relief valve	Defective flow control spool	Defective steering valve spool	Defective adjustment of steering valve	Defective adjustment of steering linkage	Troubleshooting No.
☐	☐														H-1
☐	☐														H-2
☐	☐														H-3
☐	☐														H-4
		☐													H-5
			☐	☐		☐	☐				☐	☐			H-6
			☐	☐	☐	☐	☐			☐	☐	☐			H-7
				☐	☐		☐	☐	☐	☐		☐	☐		H-8
										☐	☐	☐	☐		H-9
														☐	H-10
								☐	☐	☐					H-11
								☐	☐	☐					H-12
			☐				☐								H-13
			☐												H-14
															H-15
								☐		☐					H-16
															H-17
															H-18
															H-19
															H-20
		☐													H-21
															H-22
															H-23
															H-24
															H-25
															H-26
															H-27
															H-28
															H-29
															H-30
															H-31
															H-32
															H-33
															H-34
															H-35
															H-36

Failure mode		Part that can cause failure															
		Defective overload relief valve	Defective seal of steering cylinder piston	Malfunction of steering wheel or shaft	Defective steering wheel or steering shaft	Defective electrical system of EPACS valve (*)	Defective hydraulic system of EPACS valve (*)	Defective EPACS controller (*)	Damaged EPACS valve O-ring (*)	Defective installation of tyre angle sensor (*)	Wrong connection of steering piping (after removal)	Foreign matter caught in hydraulic equipment of steering system	Interference of steering piping or equipment	Defective seal of steering piping or equipment	Defective seal of brake piston	Malfunction of brake piston	Internal defect of wheel brake
Power train	Lift truck does not start																
	Travel speed is low, rush force is low, gradeability is low and/or gear is not shifted																
	Large shocks are made when lift truck starts and gear is shifted																
	Long time lag is made when lift truck starts and gear is shifted																
	Torque converter oil temperature is high																
Steering	Steering wheel does not turn	○	○														
	Response is low during turning	○	○					○									
	Steering is heavy		○	○	○												
	Lift truck is unstable or large shock is made when it turns	○	○														
	Right and left turning radii are different																
	When steering wheel is released it does not return to neutral or it rotates by itself																
	Steering wheel is turned in reverse or it kicks									○							
	EPACS does not work (*)					○	○	○		○							
	Steering wheel vibrates			○	○												
	Steering system makes abnormal sound											○	○				
Oil leaks from steering circuit								○					○				
Brake	Service brake does not work or its performance is low														○	○	○
	Service brake is not release or it drags															○	
	Parking brake does not work or its performance is low																
	Parking brake is not release or it drags																
Work equipment	Lift cylinder and fork do not lift																
	Fork lifting speed is low																
	Fork lifting speed lowers at specific height																
	Lift cylinder cannot lift load																
	Lift cylinder natural drift is large																
	Fork lowering speed is too high																
	Mast does not tilt forward or backward																
	Forward/backward tilting speed or force of mast is insufficient																
	Tilting speed lowers halfway																
	Tilt cylinder cannot lift load																
	Tilt cylinder natural forward drift is large																
	Tilt system is unstable during travel with load																
	Lift and tilt levers do not move smoothly and they are heavy																
	Engine speed lowers remarkably or engine stalls when work equipment is operated.																
	Large shocks are made when work equipment is started and stopped																
	Another part of work equipment moves when work equipment is relieved singly																

*: Related to only lift truck with EPACS

Contact of metallic part caused by complete wear of wheel disc	Defective brake pump	Clogging or sucked air on pump suction side	Air sucked in wheel brake circuit	Defective brake valve	Defective slack adjuster	Defective parking brake spring	Malfunction of parking brake drive mechanism	Worn parking brake lining	Caught parking brake lining flakes	Clogging or sucked air on work equipment pump suction side	Defective work equipment pump	Defective work equipment pump servo	Defective work equipment valve spool	Foreign matter caught or defective seal in work equipment valve	Defective suction valve seat on work equipment valve lift cylinder side	Troubleshooting No.
																H-1
																H-2
																H-3
																H-4
																H-5
	○															H-6
																H-7
																H-8
																H-9
																H-10
																H-11
																H-12
																H-13
																H-14
																H-15
																H-16
○	○	○	○	○	○											H-17
○	○			○	○											H-18
						○	○	○								H-19
						○	○		○							H-20
		○								○	○		○			H-21
										○	○		○			H-22
										○	○		○			H-23
										○	○		○		○	H-24
													○			H-25
																H-26
										○	○		○			H-27
										○	○		○			H-28
										○	○		○			H-29
																H-30
																H-31
																H-32
																H-33
											○					H-34
											○	○	○			H-35
																H-36

Part that can cause failure		Failure mode															
		Defective work equipment main relief valve	Malfunction or defective adjustment of work equipment main relief valve	Defective work equipment unload valve	Malfunction of tilt lock valve of control valve	Defective valve body and spool of control valve	Defective oil-tightness of tilt spool	Malfunction of tilt pressure compensation valve	Malfunction of lift pressure compensation valve	Internal breakage of work equipment valve	Malfunction of back pressure valve	Defective seal of lift cylinder piston	Defective seal of tilt cylinder piston	Deformed lift cylinder	Deformed tilt cylinder	Insufficient tilt lever stroke	Defective main spool
Power train	Lift truck does not start																
	Travel speed is low, rush force is low, gradeability is low and/or gear is not shifted																
	Large shocks are made when lift truck starts and gear is shifted																
	Long time lag is made when lift truck starts and gear is shifted																
	Torque converter oil temperature is high																
Steering	Steering wheel does not turn																
	Response is low during turning																
	Steering is heavy																
	Lift truck is unstable or large shock is made when it turns																
	Right and left turning radii are different																
	When steering wheel is released it does not return to neutral or it rotates by itself																
	Steering wheel is turned in reverse or it kicks																
	EPACS does not work (*)																
	Steering wheel vibrates																
	Steering system makes abnormal sound																
	Oil leaks from steering circuit																
Brake	Service brake does not work or its performance is low																
	Service brake is not release or it drags																
	Parking brake does not work or its performance is low																
	Parking brake is not release or it drags																
Work equipment	Lift cylinder and fork do not lift	○		○					○	○		○					
	Fork lifting speed is low	○				○						○					
	Fork lifting speed lowers at specific height	○		○					○	○	○			○			
	Lift cylinder cannot lift load	○		○					○	○	○	○					
	Lift cylinder natural drift is large											○					
	Fork lowering speed is too high					○						○					
	Mast does not tilt forward or backward	○			○			○		○			○				
	Forward/backward tilting speed or force of mast is insufficient	○	○	○	○			○	○	○	○		○				
	Tilting speed lowers halfway	○	○	○	○			○	○	○	○		○		○	○	
	Tilt cylinder cannot lift load											○				○	
	Tilt cylinder natural forward drift is large				○		○					○		○			
	Tilt system is unstable during travel with load				○												
	Lift and tilt levers do not move smoothly and they are heavy					○											
	Engine speed lowers remarkably or engine stalls when work equipment is operated.																
	Large shocks are made when work equipment is started and stopped																
	Another part of work equipment moves when work equipment is relieved singly																○

*: Related to only lift truck with EPACS

Air in hydraulic circuit	Improper selection of roller and roller size	Defective adjustment of roller shim	Defective joint or hose	Troubleshooting No.
				H-1
				H-2
				H-3
				H-4
				H-5
				H-6
				H-7
				H-8
				H-9
				H-10
				H-11
				H-12
				H-13
				H-14
				H-15
				H-16
				H-17
				H-18
				H-19
				H-20
				H-21
○	○	○	○	H-22
				H-23
			○	H-24
			○	H-25
			○	H-26
			○	H-27
				H-28
				H-29
				H-30
				H-31
				H-32
				H-33
				H-34
				H-35
				H-36

H-1 Lift truck does not start

Ask the operator about the following:

- Did the lift truck stop starting suddenly?
→ **Seized clutch or broken part**
Was abnormal sound heard at that time? From what part was it heard?

Inspection before diagnosis

- Check that the level and type of the oil in the transmission are proper.
- Check the transmission oil for deterioration and burning smell.
- Check the transmission filter and strainer for clogging.
- Check for visible damage and oil leakage.
- Check the drive shaft for breakage.
- Check that the service brake and parking brake are not locked.
- Check that the inching pedal and inching spool are at the normal positions.

		Cause													
		Torque converter charge pump				Torque converter		Main relief valve		Transmission valve		Transmission			
		a	b	c	d	e	f	g	h	i	j	k	l	m	n
		Defective PTO	Clogged strainer	Clogging or sucked air on suction side	Defective charge pump	Internal breakage of torque converter inlet	Malfunction of torque converter relief valve	Reduction of main relief valve set pressure	Clogged last chance filter	Malfunction of corresponding clutch	Malfunction of inching valve	Internal breakage of transmission	Worn or seized corresponding clutch disc	Defective seal of corresponding clutch piston	Defective seal of corresponding clutch shaft
No.	Diagnosis	△	○	△	×	△	△	△	○	×	△	△	×	×	×
1	Lift truck does not start in any gear speed	○	○	○	○	○	○	○	○		○	○			
2	Lift truck does not start in only specific gear speed									○		○	○	○	○
3	Charge pump or transmission filter makes abnormal sound when transmission oil temperature is low		○	○											
4	Lift truck does not start after transmission oil temperature increases				○						○			○	○
5	Metallic dust (aluminum, copper, steel, etc.) are sticking to transmission filter or strainer				○	○						○			
6	Measured torque converter stall speed is	high in all gear speeds				○	○	○	○		○				
7		low in specific gear speed								○		○	○	○	○
8	Measured clutch oil pressure is	low in all gear speeds				○	○	○			○				
9		high in specific gear speed								○		○		○	○
10		not stable and gauge pointer swings					○	○							
11	Measured torque converter relief (inlet) oil pressure is low	○	○	○	○	○	○								

H-2 Travel speed is low, rush force is low, gradeability is low and/or gear is not shifted

Ask the operator about the following:

- Did the trouble occur suddenly?
→ **Breakage of related device**
- Was abnormal sound heard at that time? From what part was it heard?
- Did the trouble level increase gradually?
→ **Wear of related device or defective seal**

Check of abnormality

- Measure the travel speed on a flat ground and on a slope to see if the phenomenon is an actual abnormality or a normal phenomenon felt abnormally by the operator.

Inspection before diagnosis

- Check that the level and type of the oil in the transmission are proper.
- Check the transmission filter and strainer for clogging.
- Check the piping and valve joints around the torque converter and transmission for external leakage.
- Check the service brake and parking brake for dragging.
- Check that the air pressure and treads of the tyres are proper.
- Check that the working method is correct.

Ask the operator about the following: - Did the trouble occur suddenly? → Breakage of related device - Was abnormal sound heard at that time? From what part was it heard? - Did the trouble level increase gradually? → Wear of related device or defective seal Check of abnormality - Measure the travel speed on a flat ground and on a slope to see if the phenomenon is an actual abnormality or a normal phenomenon felt abnormally by the operator. Inspection before diagnosis - Check that the level and type of the oil in the transmission are proper. - Check the transmission filter and strainer for clogging. - Check the piping and valve joints around the torque converter and transmission for external leakage. - Check the service brake and parking brake for dragging. - Check that the air pressure and treads of the tyres are proper. - Check that the working method is correct.			Cause																																																											
			Torque converter charge pump			Torque converter oil cooler		Torque converter		Main relief valve			Transmission valve		Transmission				Others																																											
			a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s																																									
			Clogged strainer			Clogging or sucked air on pump suction side			Defective charge pump			Clogged oil cooler or piping (after torque converter outlet)			Broken oil cooler or piping (after torque converter outlet)			Internal oil leakage of torque converter			Internal breakage of torque converter			Malfunction of torque converter inlet relief valve			Reduction of main relief valve set pressure			Clogged last chance filter			Malfunction of corresponding solenoid valve			Malfunction of inching valve			Internal breakage of transmission			Defective seal of corresponding clutch piston			Defective seal of corresponding clutch shaft			Clogged breather			Defective seals of work equipment and steering system hydraulic pump			Entry of hydraulic oil in transmission case			Lowered engine performance			Defective seal of brake cooling system hydraulic pump shaft		
No.	Diagnosis		C X	△ X	X	△ X	X	△ X	△ X	△ X	△ X	C X	X	△ X	△ X	X	X	C X	△ X	A △ X	△ X																																									
1	There is abnormality in all gear speeds		○	○	○	○	○	○	○	○	○	○		○	○			○	○	○	○																																									
2	There is abnormality in only specific gear speed												○		○	○	○																																													
3	Charge pump or transmission filter makes abnormal sound when transmission oil temperature is low		○	○																																																										
4	Torque converter oil overheats		○	○	○	○	○	○	○	○					○			○	○		○																																									
5	Transmission oil level changes					○	○											○		○																																										
6	Metallic dust (aluminum, copper, steel, etc.) are sticking to transmission filter or strainer				○				○						○																																															
7	Measured engine low idle and high idle speeds are abnormal								○						○					○																																										
8	Measured torque converter stall speed is	high	○	○	○		○	○	○		○		○	○			○																																													
9		low																	○																																											
10	Measured clutch oil pressure is	low when oil temperature is high			○									○		○	○																																													
11		low in all gear speeds	○	○	○						○	○		○	○					○																																										
12		low in specific gear speed											○		○	○	○																																													
13		not stable and gauge pointer swings	○	○																																																										
14	Measured torque converter relief (inlet) oil pressure is low				○			○	○	○																																																				

H-3 Large shocks are made when lift truck starts and gear is shifted

Ask the operator about the following:

- Did the shock increase suddenly? → **Breakage of related device**
Was abnormal sound heard at that time? From what part was it heard?
- Did the shock increase gradually?
→ **Wear of related device or defective seal**

Check of abnormality

- Check if the following troubles are detected simultaneously; Travel speed is low, rush force is low, gradeability is low and/or gear is not shifted.

Inspection before diagnosis

- Check that the level and type of the oil in the transmission are proper.
- Check the transmission filter and strainer for clogging.
- Check the piping and valve joints around the torque converter and transmission for external leakage.
- Check that the low idle speed is not high.
- Check that each drive shaft clearance is not large.

Cause									
Torque converter charge pump			Main relief valve		Solenoid valve		Transmission		
a	b	c	d	e	f	g	h	i	j
Clogged strainer									
Clogging or sucked air on pump suction side									
Defective charge pump									
Malfunction of main relief valve									
Clogged last chance filter									
Malfunction of corresponding solenoid valve									
Defective transmission controller system									
Defective seal of corresponding clutch piston									
Defective return (cutting) of corresponding clutch piston									
Defective seal of corresponding clutch shaft									

No.	Diagnosis		Remedy									
			○	△	×	△	○	×	×	×	△	×
1	Shock is large in all gear speeds		○	○	○	○	○	○	○	○	○	○
2	Shock is large in specific gear speed							○	○	○	○	○
3	Measured clutch oil pressure is	low in all gear speeds	○	○	○	○	○					
4		low in specific gear speed						○		○		○
5		high in all gear speeds				○						

H-5 Torque converter oil temperature is high

Ask the operator about the following:

- Did oil temperature increase when torque converter stalls and lower when no load is applied?
→ **Selection of improper gear speed**
Was abnormal sound heard at that time? From what part was it heard?
- Does oil temperature increase only during lifting work?
→ **Improvement of working method**

Check of abnormality

- Measure the torque converter oil temperature to see if it is actually high.

Inspection before diagnosis

- Check that the radiator coolant level and fan belt tension are proper.
- Check that the level and type of the oil in the transmission are proper.
- Check the transmission filter and strainer for clogging.

Cause													
Torque converter charge pump			Torque converter oil cooler			Torque converter		Main relief valve	Trans-mission	Trans-mission valve	Others		
a	b	c	d	e	f	g	h	i	j	k	l	m	n
Clogged strainer													
Clogging or sucked air on pump suction side													
Defective charge pump													
Clogged oil cooler core													
Clogged oil cooler or piping (after torque converter outlet)													
Broken oil cooler or piping (after torque converter outlet)													
Internal oil leakage of torque converter													
Internal breakage of torque converter													
Reduction of main relief valve set pressure													
Internal damage of transmission													
Malfunction of inching valve													
Defective seals of work equipment and steering system hydraulic pump													
Entry of hydraulic oil in transmission case													
Lowered engine performance													
Defective seal of brake cooling system hydraulic pump shaft													
Entry of axle oil in transmission case													

No.	Diagnosis	Remedy											
		C	△	×	C	△	×	△	△	△	△	△	△
1	Charge pump or transmission filter makes abnormal sound when transmission oil temperature is low	○	○										
2	Travel speed, rush force and gradeability are low in all gear speeds	○	○	○	○	○	○	○	○	○	○	○	
3	Travel speed, rush force and gradeability are low in specific gear speed								○				
4	Transmission oil level changes				○	○							○
5	Metallic dust (aluminum, copper, steel, etc.) are sticking to transmission filter or strainer			○			○		○				
6	Measured engine low idle and high idle speeds are abnormal						○		○			○	
7	Measured torque converter stall speed is high	○	○	○		○	○	○	○	○			
8	Measured clutch oil pressure is			○						○			
9		low when oil temperature is high											
10		low in all gear speeds	○	○	○				○	○			
11		low in specific gear speed							○				
11		not stable and gauge pointer swings	○	○									
12	Measured torque converter relief (inlet) oil pressure is low						○	○	○				

H-6 Lift truck does not turn

Ask the operator about the following:

- Did the lift truck stop turning suddenly?

→ **Breakage of related device**

Was abnormal sound heard at that time? From what part was it heard?

Inspection before diagnosis

- Check that the level and type of the oil in the hydraulic tank are proper.
- Check the steering shaft for breakage.
- Check that the steering valve is adjusted correctly.

			Cause									
			Hydraulic pump				Control valve	Orbit roll	Steering valve		Hydraulic cylinder	
			a	b	c	d	e	f	g	h	i	j
			Defective PTO	Clogging or sucked air on pump suction side	Defective steering pump	Defective brake valve	Defective priority valve	Defective orbit roll	Malfunction of flow control spool	Malfunction of steering spool	Defective overload relief valve	Defect in steering cylinder (piston seal)
No.	Diagnosis	Remedy	△ ×	△	△ ×	△ ×	△ ×	△ ×	△ ×	△ ×	×	×
1	Lift truck turns neither right nor left		○	○	○	○	○	○	○	○		○
2	Lift truck does not turn right or left										○	
3	Steering wheel is heavy in both right and left directions					○	○	○		○		
4	Steering wheel is too heavy to turn in either right or left direction											
5	Work equipment moves				○			○	○	○	○	○
6	Work equipment does not move		○	○		○	○					
7	Abnormal sound is heard from PTO		○									
8	Abnormal sound is heard from fan pump or hydraulic tank			○		○						
9	When steering relief pressure is measured	Oil pressures on both right and left sides are low or zero	○	○	○	○	○	○	○	○		○
10		Oil pressures on either right or left side is low or zero									○	
11	Measured orbit roll discharge pressure is low or zero		○	○		○	○	○				
12	Measured orbit roll basic pressure	is low	○	○		○	○					
13		is zero	○	○		○						

- ★ Since the steering circuit and work equipment circuit are related closely with each other, check the operating condition of the work equipment, too, if abnormality is felt in the steering.

H-7 Response is low during turning

Ask the operator about the following:

- Did response to steering operation become low suddenly? → **Broken device related to steering**
Was abnormal sound heard at that time? From what part was it heard?
- Did the trouble increase gradually?
→ **Worn part or defective seal in device related to steering**

Inspection before diagnosis

- Check that the level and type of the oil in the hydraulic tank are proper.

Ask the operator about the following:

- Did response to steering operation become low suddenly? → **Broken device related to steering**
Was abnormal sound heard at that time? From what part was it heard?
- Did the trouble increase gradually?
→ **Worn part or defective seal in device related to steering**

Inspection before diagnosis

- Check that the level and type of the oil in the hydraulic tank are proper.

		Cause											
		Hydraulic pump				Control valve	Orbit roll	EPACS valve	Steering valve				Correction cylinder
		a	b	c	d	e	f	g	h	i	j	k	l
		Defective PTO											
		Clogging or sucked air on pump suction side											
		Defective steering pump											
		Defective steering pump servo											
		Defective accumulator charge valve											
		Defective orbit roll											
		Defective EPACS valve											
		Malfunction of control spool											
		Defective main relief spool											
		Defective steering spool											
		Defective overload relief valve											
		Defect in steering cylinder (piston seal)											

No.	Diagnosis		Remedy											
			△ ×	△ △	△ ×	△ ×	△ ×	△ ×	△ ×	△ ×	△ ×	△ ×	△ ×	△ ×
1	Response is low in both right and left steering directions		○	○	○	○	○	○	○	○	○	○	○	○
2	Response is low in either right or left steering direction												○	
3	Steering wheel is heavy in both right and left directions						○	○	○			○		
4	Steering wheel is heavy in either right or left direction													
5	Work equipment moves				○	○		○	○	○	○	○	○	○
6	Work equipment does not move		○	○			○							
7	Abnormal sound is heard from PTO		○											
8	Abnormal sound is heard from pump or hydraulic tank			○	○									
9	When steering relief pressure is measured	Oil pressures on both right and left sides are low or zero	○	○	○	○	○	○		○	○			○
10		Oil pressures on either right or left side is low or zero										○		
11	Measured orbit roll discharge pressure is low or zero		○	○			○	○						
12	Oil pressures on both right and left sides are low or zero		○	○			○							
13	If steering pump servo assembly is replaced, oil pressure becomes normal					○								

- ★ Since the steering circuit and work equipment circuit are related closely with each other, check the operating condition of the work equipment, too, if abnormality is felt in the steering.

H-8 Steering is heavy

Check of abnormality

- Does the lift truck turn smoothly? → **See H-6 and H-7**

Measure the steering wheel operating effort and time required to rotate the steering wheel and check them with the criteria.

Ask the operator about the following:

- Did the steering wheel operating effort become heavy suddenly?
→ **Damaged device related to steering**
- Has there been symptom of heavy steering effort?
→ **Worn part or defective seal in device related to steering**

Inspection before diagnosis

- Check that the level and type of the oil in the hydraulic tank are proper.
- Check that the tyre inflation pressure is normal.

		Cause					
		Steering pump	Steering valve			Orbit roll	Other devices
		a	b	c	d	e	f
		Malfunction of steering pump	Malfunction of steering spool	Defective adjustment of steering valve play	Internal defect of steering valve Defective bearing	Defective orbit roll	Malfunction of steering wheel or steering shaft
No.	Diagnosis	Remedy	△ ×	△ ×	△ △ ×	△ △ ×	△ △ ×
1	Steering wheel is heavy in both right and left directions		○	○	○	○	○
2	Steering wheel is heavy in either right or left direction					○	
3	Steering wheel is still heavy after steering shaft and orbit roll is disconnected						○
4	When steering relief pressure is measured	Oil pressures on both right and left sides are low or zero	○	○		○	
5		Oil pressures on either right or left side is low or zero				○	

H-9 Lift truck is unstable or large shock is made when it turns

Check of abnormality

- Does the lift truck turn smoothly? → **See H-6 and H-7**
- Is abnormal sound heard from a device related to the steering?

Inspection before diagnosis

- Check that the steering wheel play is normal.
- Check that the tyre inflation pressure is normal.

		Cause				
		Steering valve				Cylinder
		a	b	c	d	e
		Malfunction of slow control spool	Defective main relief valve	Malfunction of steering spool	Defective overload relief valve	Defect in steering cylinder (piston seal)
No.	Diagnosis	△	△	△	△	△
		×	×		×	×
1	Lift truck is unstable or large shock is made when it turns in both directions	○	○	○		○
2	Lift truck is unstable or large shock is made when it turns in either right or left direction				○	
3	Lift truck is unstable or large shock is made when it lifts load or travels with steering in neutral			○	○	○
4	When steering relief pressure is measured	○	○	○		○
5	it is not stable on right and left sides				○	
	it is not stable on either right or left side					

H-10 Right and left turning radii are different

Cause

- Defective adjustment of steering linkage
- Distribution to right and left and stopper lock position
(Valve relief sound is heard at end of turn)

H-11 When steering wheel is released it does not return to neutral or it rotates by itself

Cause

- Too high back pressure
→ **Adjust back pressure**
- Misalignment with orbit roll column
→ **Check installed condition and correct misalignment**
- Foreign matter caught in orbit roll hydraulic circuit
→ **Clean or replace**

H-12 Steering wheel is turned in reverse or it kicks

Cause

- Wrong connection of hydraulic piping related to orbit roll
→ **Reconnect correctly**

H-13 EPACS does not work

Applicable model: Lift truck with EPACS controller

Check the following points.

- Check to see if orbit roll LED is OFF or flashing
→ **If the LED is OFF or flashing, see "Troubleshooting by failure code (EPACS controller system)".**

Cause

- Air in hydraulic circuit
→ **Bleed air**
- Internal defect of orbit roll (wear etc.)
→ **Replace, clean or adjust**
- Defect in following parts of EPACS valve
 - a. Defective solenoid
→ **Replace**
 - b. Disconnection in electrical system
→ **Repair or replace**
 - c. Improper voltage
→ **Check power supply and replace if necessary**
→ **Repair power supply circuit**
 - d. Foreign matter between housing spools
→ **Clean or replace**
 - e. Clogged orifice
→ **Clean or replace**
- Defective EPACS controller
→ **Since LED goes off or flashes, see "Troubleshooting by failure code (EPACS controller system)".**
- Defective installation of tyre angle sensor
→ **Reinstall correctly and eliminate play**

H-14 Steering wheel vibrates

Ask the operator about the following:

- Location and condition of vibration occurrence

Cause

- Air in hydraulic circuit
→ **Bleed air**
- Wear, damage or defective installation of part
→ **Repair, replace or adjust**

H-15 Steering system makes abnormal sound

Ask the operator about the following:

- Location and condition of abnormal sound occurrence

Cause

- Air in hydraulic circuit
→ **Bleed air**
- Wear, damage or defective installation of part
→ **Repair, replace or adjust**
- Foreign matter caught in hydraulic part
→ **Clean or replace**

H-16 Oil leaks from steering circuit

Cause

- Contamination or improper viscosity of hydraulic oil
→ **Replace hydraulic oil and filter**
- Too high back pressure
→ **Adjust back pressure**
- Misalignment with orbit roll column
→ **Check installed condition and correct misalignment**
- Wear, damage or defective installation of part
→ **Repair, replace or adjust**
- Damaged O-ring
→ **Replace**

H-17 Service brake does not work or its performance is low

Ask the operator about the following:

- Did the brake stop working suddenly?
→ **Broken brake device**
- Did the brake performance lower gradually?
→ **Deteriorated seals, worn linings and discs**

Inspection before diagnosis

- Check that the hydraulic oil level is proper.
- Check that the brake pedal has proper play.
- Check the brake tube and connectors for oil leakage and deformation.
- Check the tyre inflation pressure and tyre tread.

Check of abnormality

- Referring to Testing and adjusting, "Measurement of brake performance", check the actual brake performance to see if it is actually low or felt low by the operator.

Cause											
Pump	Charge valve	Accumulator	Brake valve	Slack adjuster	Service brake					Others	
a	b	c	d	e	f	g	h	i	j	k	l
Defective pump	Malfunction of charge valve	Defective accumulator piston seal or insufficient gas pressure	Defective brake valve	Oil leakage from check valve or piston seal	Clogged orifice	Defective brake piston seal in axle	Malfunction of brake piston in axle	Defective brake portion in axle	Worn or abnormal brake disc in axle	Contact of metallic part caused by complete wear of brake disc in axle	Air in brake circuit
△ ×	△ ×	△ ×	△ ×	△ ×	△ ×	△ ×	△ ×	△ ×	△ ×	△ ×	△ △
1	When brake pedal is depressed, its response is low		○	○		○					○
2	Brake pedal is heavy to depress		○								
3	Abnormal depressing force is required to obtain specified braking force	○	○				○	○	○	○	○
4	When brake operates, axle brake makes abnormal sound								○	○	
5	Lift truck does not travel normally (Traction force is insufficient)		○								
6	When front wheels are raised and brake is applied with transmission in 1st gear, specific wheels rotates fast.			○	○	○	○	○	○	○	○
7	Air is bled from brake circuit by air bleeding operation and then brake is normal										○
8	Brake oil leakage inside axle is abnormal					○					
9	Much metallic dust is contained in axle oil									○	
10	Depressing effort and stroke of brake pedal are normal but brake performance is low			○	○		○	○	○	○	
11	Brake works less times after engine is stopped	○	○	○	○		○	○	○		
12	Accumulator is not charged and buzzer sounds	○	○	○							
13	Brake works with time lag				○						○

H-18 Service brake is not reset or it drags

Inspection before diagnosis

- Check that the brake pedal has returned perfectly.
- Check that the parking brake is reset perfectly.

Check of abnormality

- Check that the brake oil is not overheating.
- Check that the lift truck coasts smoothly on a flat ground.

Inspection before diagnosis

- Check that the brake pedal has returned perfectly.
- Check that the parking brake is reset perfectly.

Check of abnormality

- Check that the brake oil is not overheating.
- Check that the lift truck coasts smoothly on a flat ground.

		Cause				
		Brake valve	Slack adjuster	Service brake		
		a	b	c	d	
		Internal defect of brake valve (Stuck piston)	Malfunction of piston	Brake disc trouble in axle	Malfunction of brake piston in axle	
No.	Diagnosis	Remedy	△ ×	△ ×	△ ×	△ ×
1	Brake keeps working after brake pedal is released		○	○	○	○
2	When brake pedal is released, if oil is drained through air bleeder, circuit pressure lowers and brake is reset		○			
3	When front wheels are raised, engine is stopped, parking brake is released, and tyres are rotated by hand, specific tyre is heavy			○	○	○

H-19 Parking brake does not work or its performance is low**Ask the operator about the following:**

- Did the brake stop working suddenly? → **Damaged related device**
Was abnormal sound heard at that time? From what part was it heard?
- Did the brake performance lower gradually? → **Worn related device**

Inspection before diagnosis

- Check that the parking brake pulling effort and clearance between the drum and lining are proper.

		Cause		
		Parking brake		
		a	b	c
		Defective parking brake spring	Malfunction of parking brake piston	Worn parking brake disc
		△ ×	×	×
No.	Diagnosis	Remedy		
1	When engine is stopped, parking brake does not work	○	○	○
2	Measured parking brake disc thickness is below standard value			○
3	Parking brake drum is worn unevenly		○	

H-20 Parking brake is not reset or it drags

Inspection before diagnosis

- Check that the parking brake pulling effort and clearance between the drum and lining are proper.

		Cause		
		Parking brake		
		a	b	c
		Caught parking brake lining flakes	Malfunction of parking brake operation mechanism	Defective parking brake operation linkage
No.	Diagnosis	△ ×	△ ×	△ ×
1	When parking brake lever is returned, parking brake is not reset	○	○	○
2	When parking brake lever is pulled, parking brake does not work sufficiently	○	○	
3	When parking brake lever is returned, cable does not return.		○	○

H-21 Lift cylinder and fork do not lift

Ask the operator about the following:

- Did the lift truck stop lifting suddenly? → **Seized or broken device**
Was abnormal sound heard at that time? (From what part was it heard?)
- Has there been symptom such as lowering of speed?
→ **Worn part or fatigued spring**

Inspection before diagnosis

- Check that the oil level in the hydraulic tank is proper.
- Check that the control lever stroke is proper.
- Check that the engine speed is proper.

		Cause								
		Tank - Pump			Work equipment valve				Cyl-inder	
		a	b	c	d	e	f	g	h	i
		Clogging or sucked air on pump suction side	Defective PTO	Defective work equipment pump	Malfunction of spool	Malfunction of main relief valve	Malfunction of unload valve	Malfunction of lift pressure compensation valve	Internal breakage of valve body (Lift arm spool portion)	Damaged lift cylinder piston seal
No.	Diagnosis	○	△	△	△	△	△	△	×	×
1	Mast cannot be tilted and fork cannot be lifted	○	○	○	○	○	○	○	○	○
2	Mast can be tilted but fork cannot be lifted	○	○	○	○	○	○	○	○	○
3	Fork can be lifted when not loaded and cannot be lifted when loaded	○	○	○	○	○	○	○	○	○
4	Hydraulic pump makes abnormal sound	○	○	○	○	○	○	○	○	○
5	Lift cylinder natural drift is large	○	○	○	○	○	○	○	○	○
6	Fork cannot be lifted while mast is being tilted	○	○	○	○	○	○	○	○	○

H-22 Lifting speed or force of lift cylinder and fork is insufficient

Inspection before diagnosis

- Check that the control lever stroke is proper.
- Check that the engine speed is proper.
- Check that the mast rollers are free from crack etc.

Check of abnormality

- Lifting force trouble and lifting speed trouble are closely related to each other and these troubles are detected as insufficient lifting speed at first. Measure the lifting speed of the loaded fork and check it with the criterion.

Inspection before diagnosis

- Check that the control lever stroke is proper.
- Check that the engine speed is proper.
- Check that the mast rollers are free from crack etc.

Check of abnormality

- Lifting force trouble and lifting speed trouble are closely related to each other and these troubles are detected as insufficient lifting speed at first. Measure the lifting speed of the loaded fork and and check it with the criterion.

		Cause												
		Tank - pump		Work equipment valve							Cylinder	Hydraulic piping	Mast	
		a	b	c	d	e	f	g	h	i	j	k	l	m
		Clogging or sucked air on pump suction side Defective work equipment pump Malfunction of spool Malfunction of main relief valve Malfunction of unload valve Malfunction of lift arm pressure compensation valve Malfunction of tilt pressure compensation valve Malfunction of back pressure valve Internal wear or breakage of valve body (Lift spool portion) Damaged lift cylinder piston seal Foreign matter or air in hydraulic circuit Defective adjustment of clearance between roller and rail Defective adjustment of roller shim												
No.	Diagnosis	C	△	△	△	△	△	△	△	△	△	△	A	A
1	Tilting force and speed are abnormal and fork lifting speed is low	○	○		○	○	○	○						
2	Tilting force and speed are normal and fork lifting speed is low			○			○			○	○			
3	If oil temperature increases in 1, fork lifting speed lowers further		○											
4	Hydraulic pump makes abnormal sound	○	○									○		
5	Lift cylinder natural drift is large									○	○			
6	Relief pressure of relief valve of work equipment valve is low				○	○				○	○			
7	Relief pressure of relief valve of work equipment valve is too high								○					
8	Fork lifting speed is too low while mast is being tilted						○							
9	No-load fork lifting speed is low												○	○

H-23 Fork lifting speed lowers at specific height

Inspection before diagnosis

- External deformation of lift cylinder

Cause

- Inflation or internal damage of lift cylinder tube
- ★ For other troubles during lifting operation, see "H-22 Lifting speed or force of lift cylinder and fork is insufficient".

H-24 Lift cylinder cannot lift load

See "H-22 Lifting speed or force of lift cylinder and fork is insufficient".

Checks before troubleshooting

- Check that the lift control lever stroke is proper.

Cause

- Defective suction valve seat on lift cylinder head side of work equipment valve
- Oil leakage through lift cylinder piston seal

H-25 Lift cylinder natural drift is large

Ask the operator about the following

- Did the natural drift increase suddenly? → **Dirt in valve or broken part**
- Did the natural drift increase gradually? → **Worn part**

Checks before troubleshooting

- Is the lift spool in neutral? → **Defective spool detent portion**

Check of abnormality

- Check the lift cylinder natural drift with the criterion to see if it is actually large.

Cause

- Internal oil leakage of lift cylinder
- Defective oil-tightness of lift spool

H-26 Fork lowering speed is too high

Inspection before diagnosis

- Check that the lift control lever stroke is proper.
- Check for oil leakage and deformation and damage of hoses and pipes.

		Cause	
		Work equipment valve	Cylinder
		a	c
		Defective seal in control valve	Defective seal in cylinder
No.	Diagnosis	Remedy	
1	Slow when loaded	×	×
2	Natural drift is large	○	○

H-27 Mast does not tilt forward or backward

Ask the operator about the following:

- Did the mast stop tilting suddenly? → **Seized or broken device**
Was abnormal sound heard at that time? (From what part was it heard?)
- Has there been symptom such as lowering of speed?
→ **Worn part or fatigued spring**

Inspection before diagnosis

- Check that the oil level in the hydraulic tank is proper.
- Check that the tilt control lever stroke is proper.
- Check that the engine speed is proper.

Ask the operator about the following:

- Did the mast stop tilting suddenly? → **Seized or broken device**
Was abnormal sound heard at that time? (From what part was it heard?)
- Has there been symptom such as lowering of speed?
→ **Worn part or fatigued spring**

Inspection before diagnosis

- Check that the oil level in the hydraulic tank is proper.
- Check that the tilt control lever stroke is proper.
- Check that the engine speed is proper.

		Cause										
		Tank - pump			Work equipment valve							Cylinder
		a	b	c	d	e	f	g	h	i	j	k
		Clogging or sucked air on pump suction side										
		Defective PTO										
		Defective work equipment pump										
		Malfunction of relief valve										
		Malfunction of spool										
		Malfunction of main relief valve										
		Malfunction of unload valve										
		Malfunction of tilt lock valve of control valve										
		Malfunction of bucket pressure compensation valve										
		Internal breakage of valve body (Bucket spool portion)										
		Damaged tilt piston seal										

No.	Diagnosis	Remedy	○	△	×	△	×	△	×	△	×	△	×
1	Fork cannot be lifted and mast cannot be tilted		○	○	○	○		○					
2	Fork can lift load but mast cannot be tilted						○				○	○	
3	Fork can be operated but mast cannot be tilted						○				○	○	○
4	Mast can be tilted when not loaded but cannot be tilted when loaded		○		○			○	○	○	○		
5	Hydraulic pump makes abnormal sound		○		○								
6	Tilt cylinder natural forward drift is large								○		○	○	
7	Mast cannot be tilted while fork is being lifted									○	○		
8	Condition becomes normal when work equipment pump and servo assembly is replaced												

H-28 Forward/backward tilting speed or force of mast is insufficient

Inspection before diagnosis

- Check that the tilt control lever stroke is proper.
- Check that the engine speed is proper.
- Check that the mast bushing is not seized (Check for abnormal sound).

Check of abnormality

- Operate the lift truck actually to see if the tilt-back force is insufficient.
- Measure the tilting speed and check it with the criterion.

Inspection before diagnosis

- Check that the tilt control lever stroke is proper.
- Check that the engine speed is proper.
- Check that the mast bushing is not seized (Check for abnormal sound).

Check of abnormality

- Operate the lift truck actually to see if the tilt-back force is insufficient.
- Measure the tilting speed and check it with the criterion.

		Cause												
		Tank - pump		Work equipment valve									Cylinder	
		a	b	c	d	e	f	g	h	i	j	k	l	
		Clogging or sucked air on pump suction side												
		Defective work equipment pump												
		Malfunction of relief valve												
		Malfunction of spool												
		Malfunction or defective adjustment of main relief valve												
		Malfunction of unload valve												
		Malfunction of tilt lock valve of control valve												
		Malfunction of lift arm pressure compensation valve												
						</								

H-29 Tilting speed lowers halfway

Inspection before diagnosis

- External deformation of tilt cylinder

Cause

- Inflation or internal damage of tilt cylinder tube
For other troubles during tilting operation, see "H-28 Forward/backward tilting speed or force of mast is insufficient".

H-30 Tilt cylinder cannot lift load

See "H-28 Forward/backward tilting speed or force of mast is insufficient".

Inspection before diagnosis

- Check that the tilt control lever stroke is proper.

Cause

- Oil leakage through tilt cylinder piston seal
- Improper tilt lever stroke

H-31 Tilt cylinder natural forward drift is large

Ask the operator about the following:

- Did the natural forward drift increase suddenly? → **Dirt in valve or broken part**
- Did the natural forward drift increase gradually? → **Worn part**

Inspection before diagnosis

- Is the tilt spool in neutral? → **Defective spool detent portion**

Check of abnormality

- Check the tilt cylinder natural drift with the criterion to see if it is actually large.

Cause

- Internal oil leakage of tilt cylinder
- Defective oil-tightness of tilt spool

H-32 Mast is unstable during travel with load

Inspection before diagnosis

- Check the pins and bushings of the mast (Check for abnormal sound).

Cause

- Defective tilt cylinder piston seal
- If malfunction of the tilt lock valve of the control valve or another trouble is occurring, see the troubleshooting for it.

H-33 Lift and tilt levers do not move smoothly and they are heavy

Check of abnormality

- Check the lever operating effort with the criterion to see if it is actually large.

		Cause			
		Control valve			
		a	b	c	d
		Bent valve spool	Improper clearance between valve body and spool	Improper roundness between valve body and spool	Foreign matter caught in valve spool
No.	Diagnosis	Remedy			
1	Lever becomes heavy when load is applied and oil pressure is high	×	△	△	○
2	Lever becomes heavy as oil pressure changes	×	×	×	△
3	Lever is generally heavy, regardless of oil pressure and oil temperature	○	○	○	○

H-34 Engine speed lowers remarkably or engine stalls when work equipment is operated

Inspection before diagnosis

Check that the work equipment main relief pressure is normal.

Cause

- Defective work equipment pump servo
- Defective work equipment pump
- Defective engine system

H-35 Large shocks are made when work equipment is started and stopped

Cause

- Dirt in work equipment valve
- Malfunction of control valve spool

H-36 Another part of work equipment moves when work equipment is relieved singly

Cause

- Pressure relief trouble of main spool on moving work equipment side → **Replace main spool**

H-37 Work equipment speed or force is low

		Cause	Remedy
<pre> graph TD Q1[Is main pump relief pressure normal?] -- YES --> Q2[When work equipment is operated, is LS differential pressure normal?] Q1 -- NO --> Q3[When LS relief valve is adjusted or replaced, is normal state recovered?] Q2 -- YES --> C1[Defective work equipment valve] Q2 -- NO --> C2[Defective main pump] Q3 -- YES --> C3[Defective LS relief valve] Q3 -- NO --> Q4[When LS shuttle valve is replaced, is normal state recovered?] Q4 -- YES --> C4[Defective LS shuttle valve] Q4 -- NO --> C5[Go to step 2] </pre>	2 YES	Defective work equipment valve	Repair or replace
	NO	Defective main pump	Repair or replace
	3 YES	Defective LS relief valve	Adjust or replace
	4 YES	Defective LS shuttle valve	Replace
	NO	Go to step 2	

H-38 When work equipment and steering are operated, engine speed lowers remarkably or engine stalls

★ Check that the main relief pressure is normal.

		Cause	Remedy
<pre> graph TD Q1[Is LS circuit orifice clogged?] -- YES --> C1[Clogged LS circuit orifice] Q1 -- NO --> Q2[When oil is relieved, is engine speed normal?] Q2 -- YES --> C2[Defective pump] Q2 -- NO --> C3[Defective engine unit or transmission] </pre>	1 YES	Clogged LS circuit orifice	Clean
	2 YES	Defective pump	Repair or replace
	NO	Defective engine unit or transmission	Test and repair

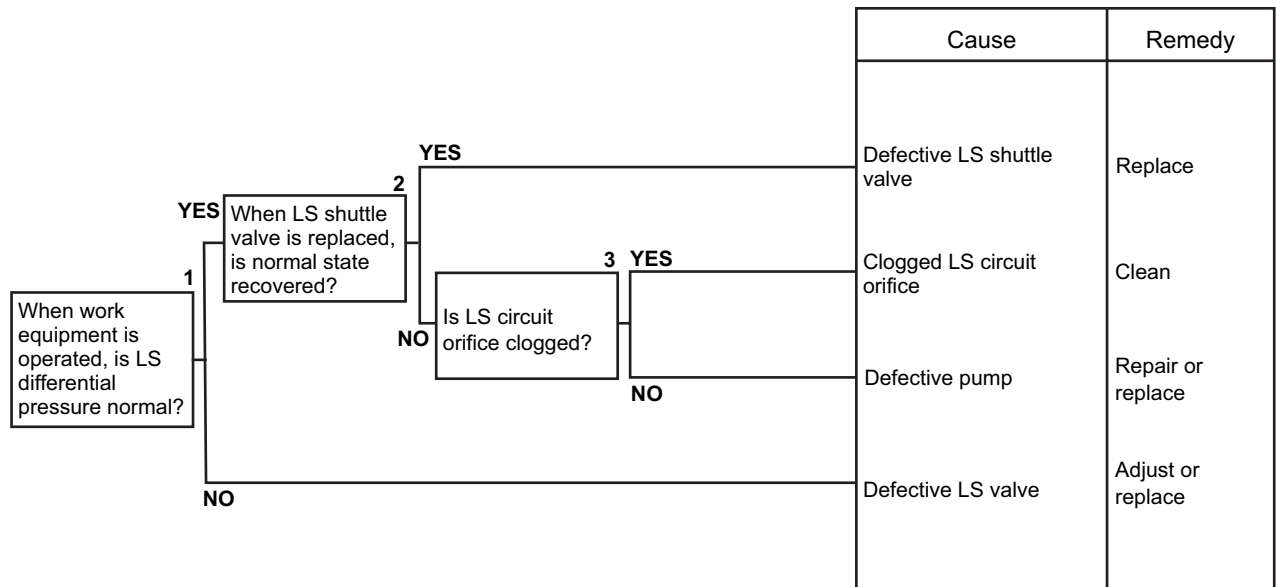
H-39 Work equipment and steering system do not move

		Cause	Remedy
1 YES Is PTO spline normal?	YES	Defective main pump	Repair or replace
	NO	Defective PTO spline	Repair or replace

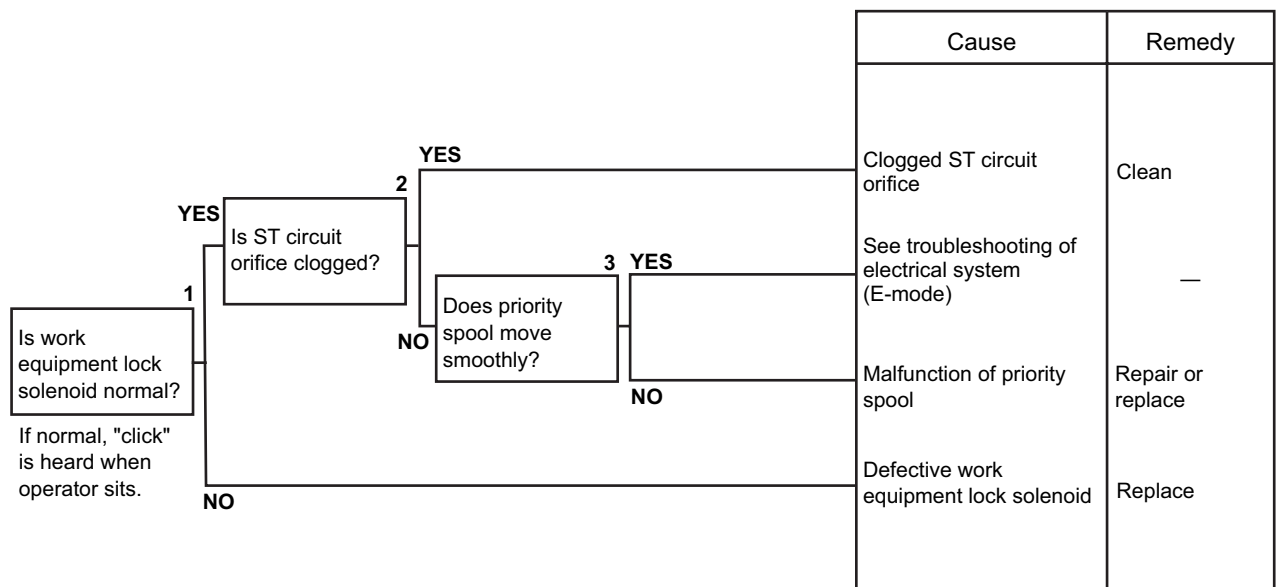
H-40 Abnormal sound is heard from around work equipment and steering pump

		Cause	Remedy
1 YES Is hydraulic tank oil level normal?	YES	Go to step 4	
	NO	Insufficient hydraulic oil	Add hydraulic oil
	YES	Improper hydraulic oil	Replace hydraulic oil
	NO	Clogging with foreign matter	Remove
	YES	Internal defect of pump	Repair or replace
	NO	Operate for a while and check phenomenon for change	Recheck (according to change of phenomenon)
	NO	When stopped temporarily, do bubbles disappear?	
2 YES Are there bubbles in hydraulic tank?	YES	Is suction strainer clogged with foreign matter?	
	NO	Is suction strainer clogged with metallic matter? Is metallic dust sticking to drain plug?	
3 YES When stopped temporarily, do bubbles disappear?	YES	Go to step 4	
	NO	Is suction strainer clogged with foreign matter?	
4 YES Is suction strainer clogged with foreign matter?	YES	Is suction strainer clogged with metallic matter? Is metallic dust sticking to drain plug?	
	NO	Is suction strainer clogged with metallic matter? Is metallic dust sticking to drain plug?	
5 YES Is suction strainer clogged with metallic matter? Is metallic dust sticking to drain plug?	YES	Internal defect of pump	Repair or replace
	NO	Operate for a while and check phenomenon for change	Recheck (according to change of phenomenon)

H-41 Work equipment fine control performance is low or response is low

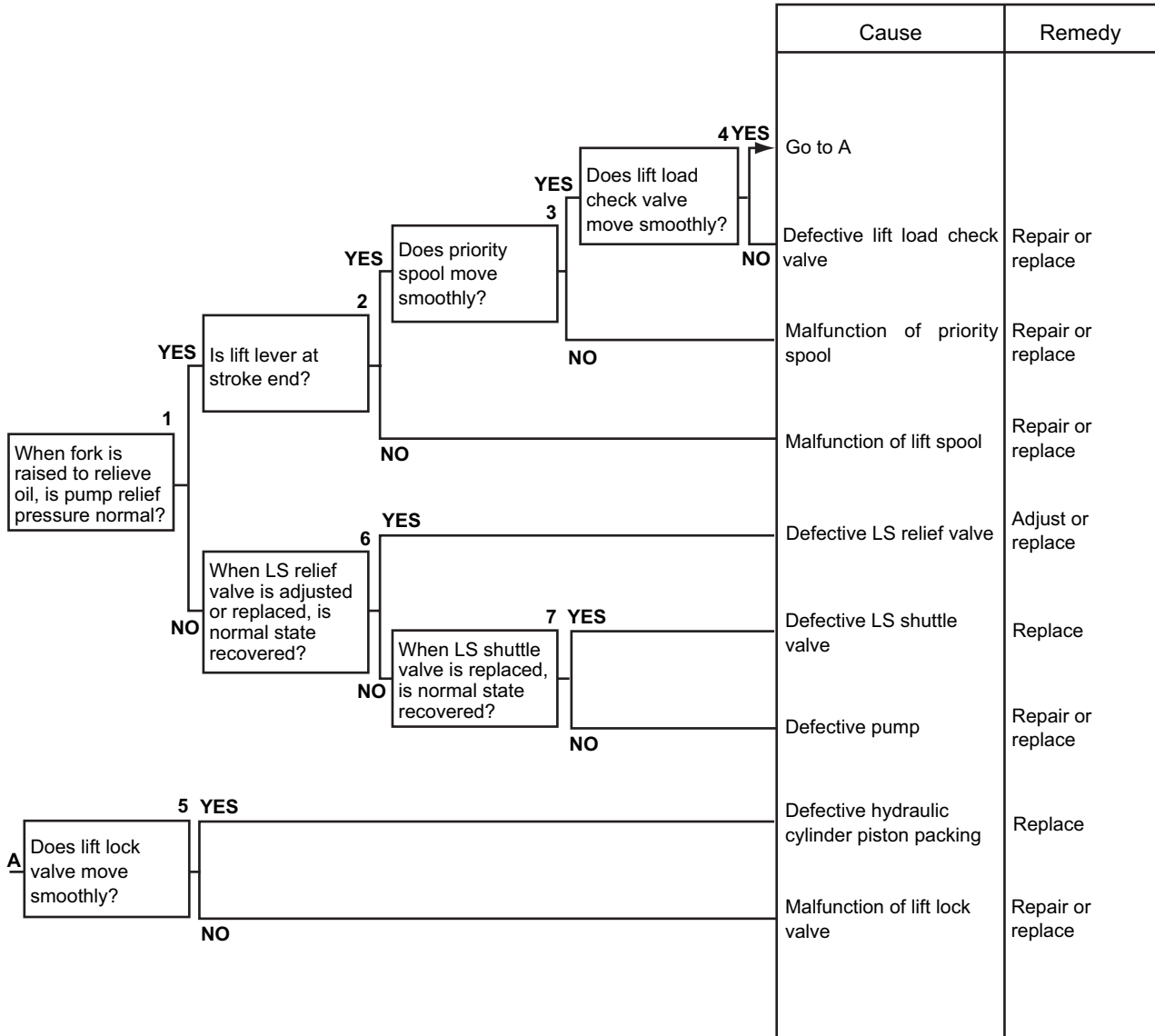


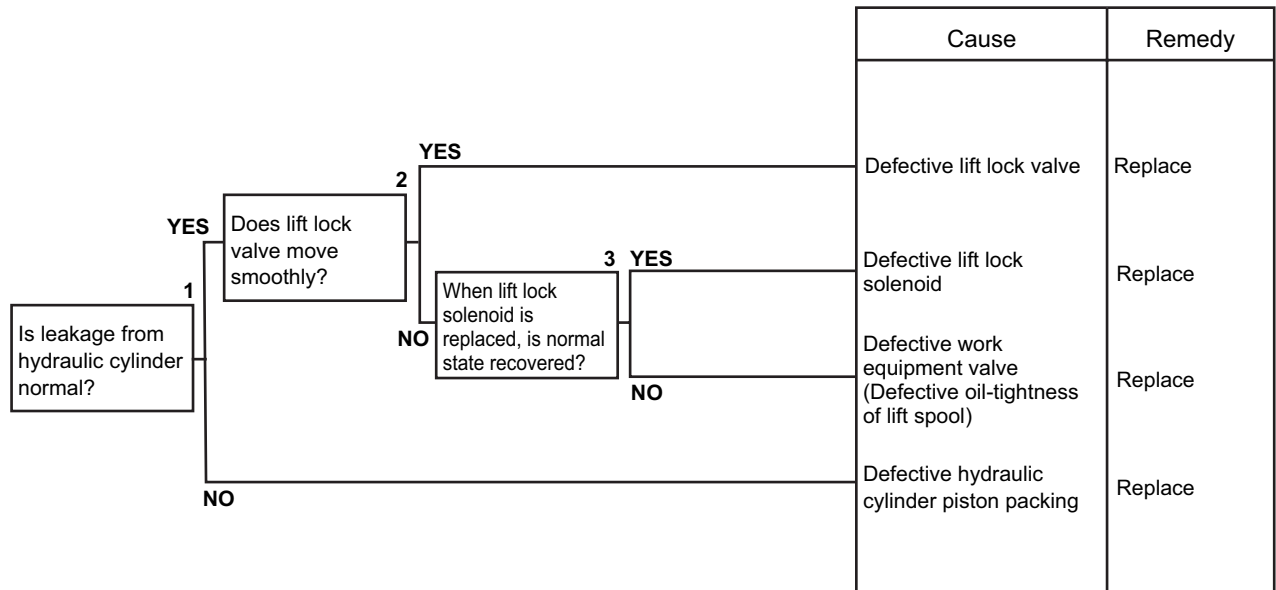
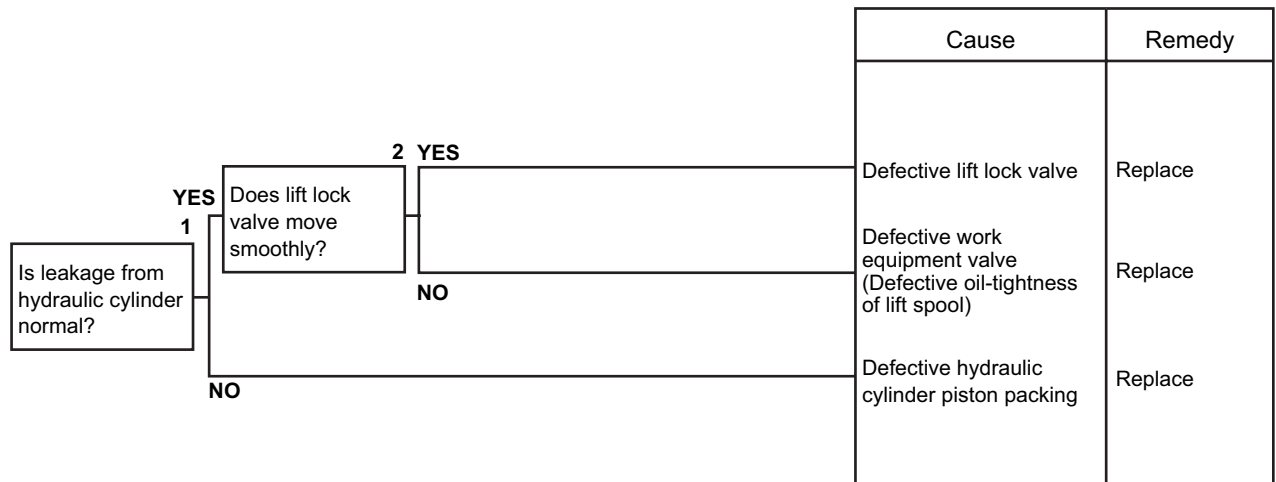
H-42 Work equipment is not locked (It operates while operator is not in operator seat) or only work equipment does not move



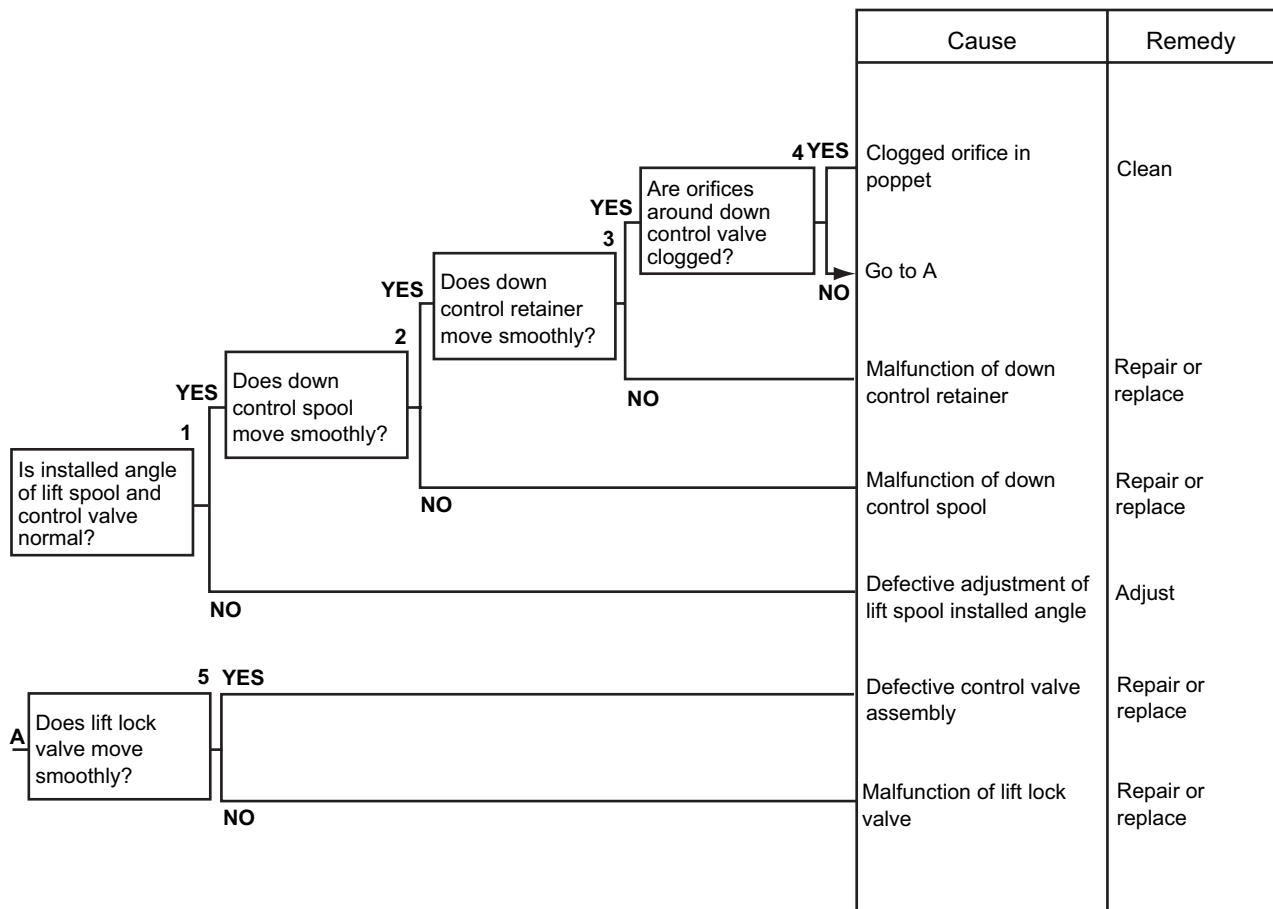
H-43 Work equipment (lift-up) does not move, moves but slow or moves but force is low

★ Perform the following troubleshooting when the tilting and steering speeds are normal.

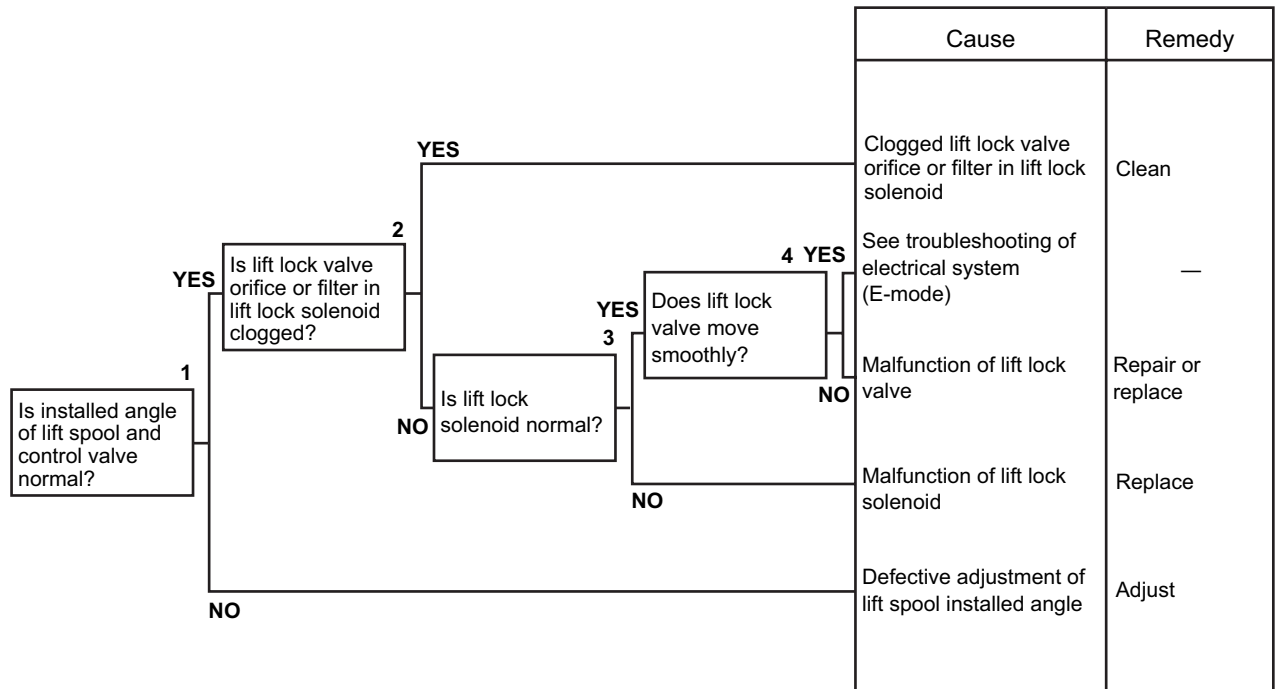


H-44 Lift cylinder drift is large (while operator is not in operator seat)**H-45 Lift cylinder drift is large (while operator is in operator seat)**

H-46 Work equipment (lift-down) lowering speed is low or high or fine control performance is low or response is low

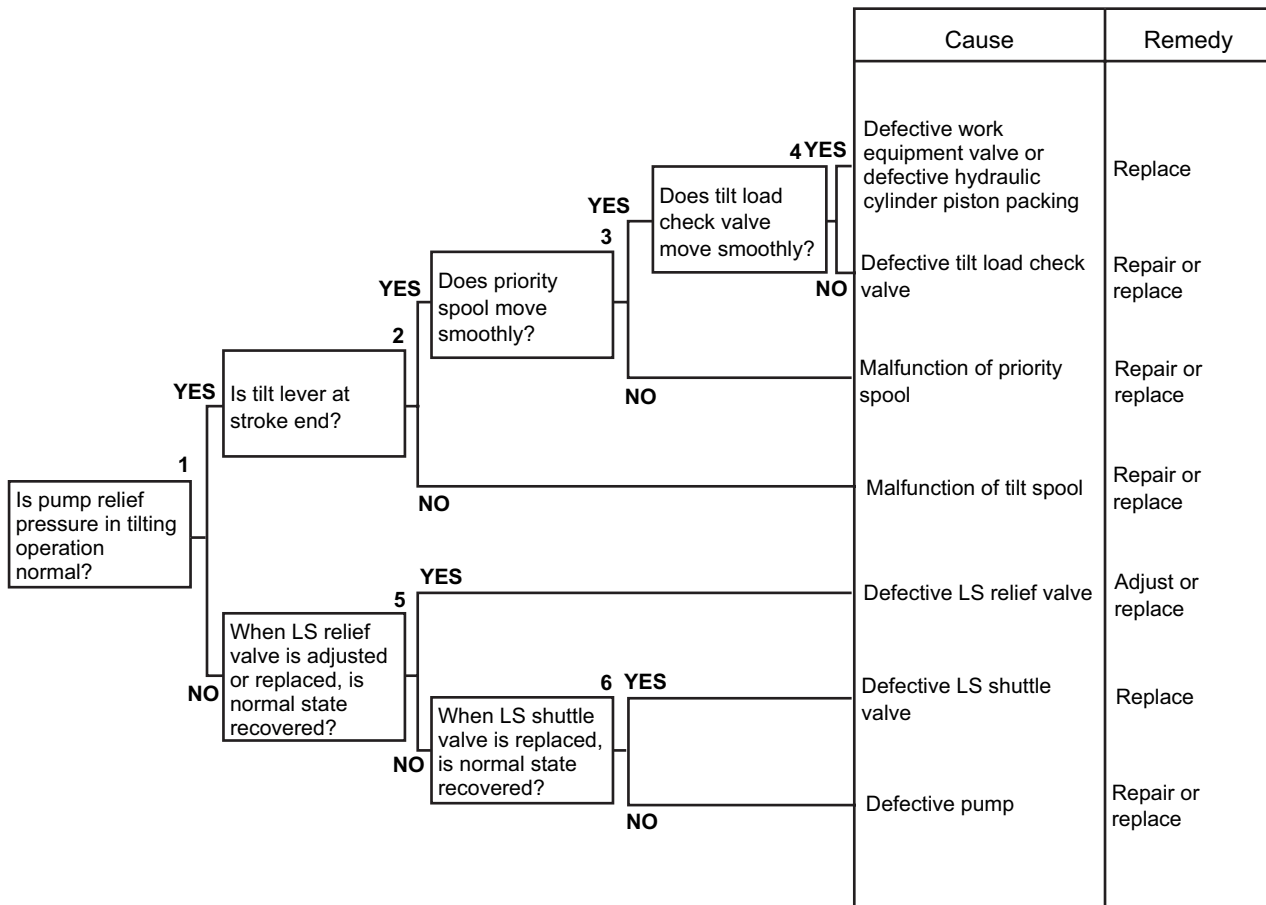


H-47 Fork does not lower

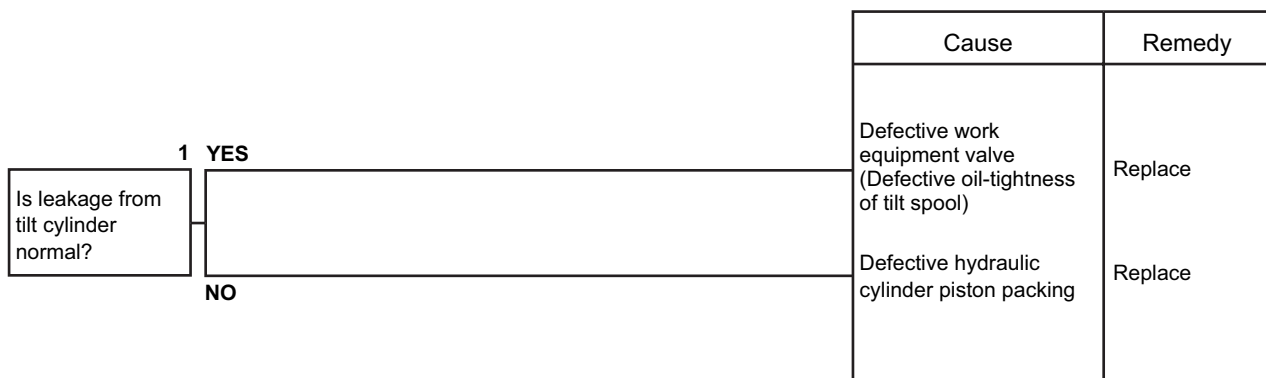


H-48 Mast does not tilt/tilts but slow/tilts but force is low

★ Perform the following troubleshooting when the lifting and steering speeds are normal.

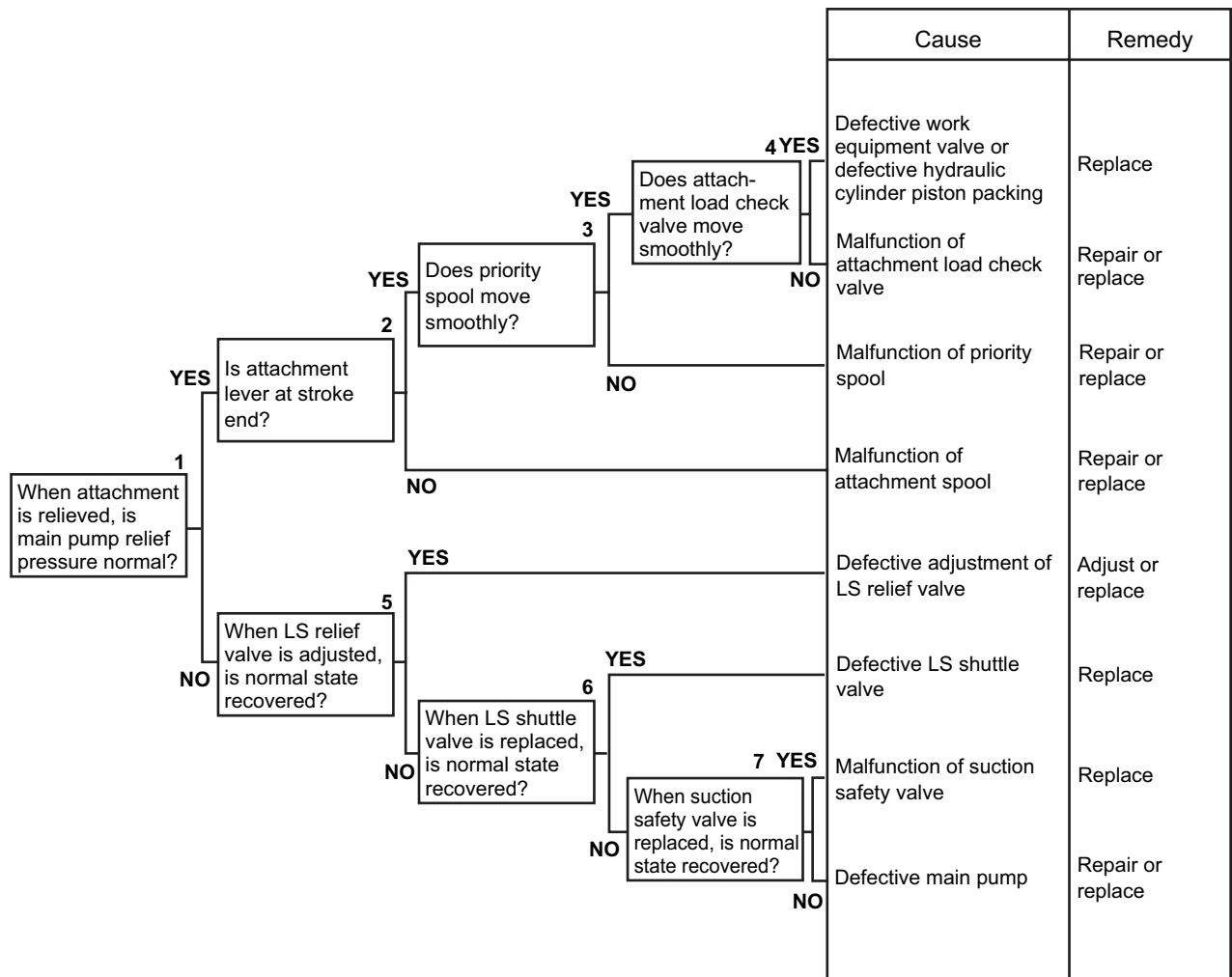
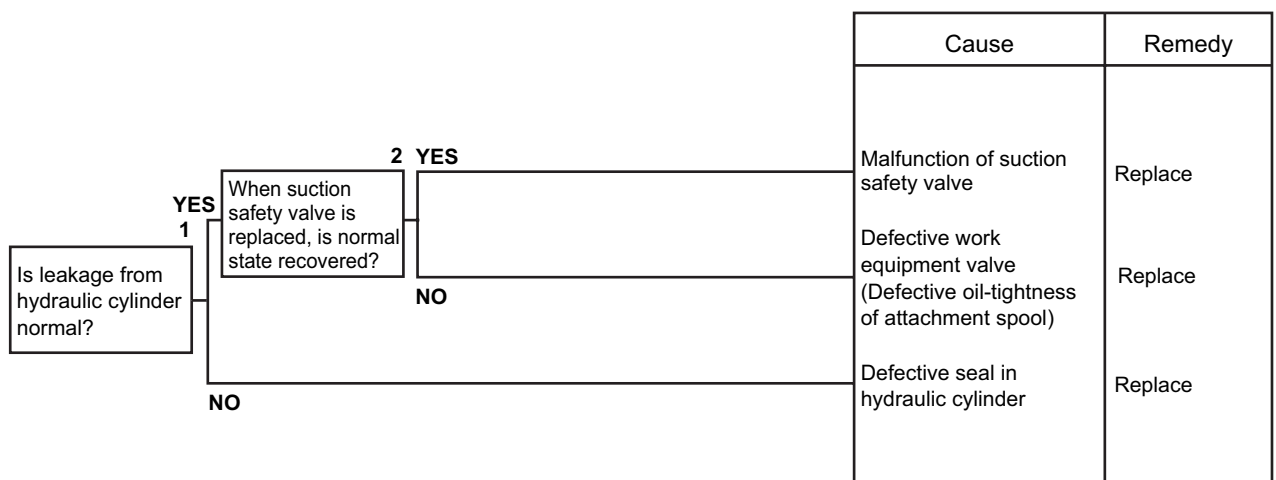


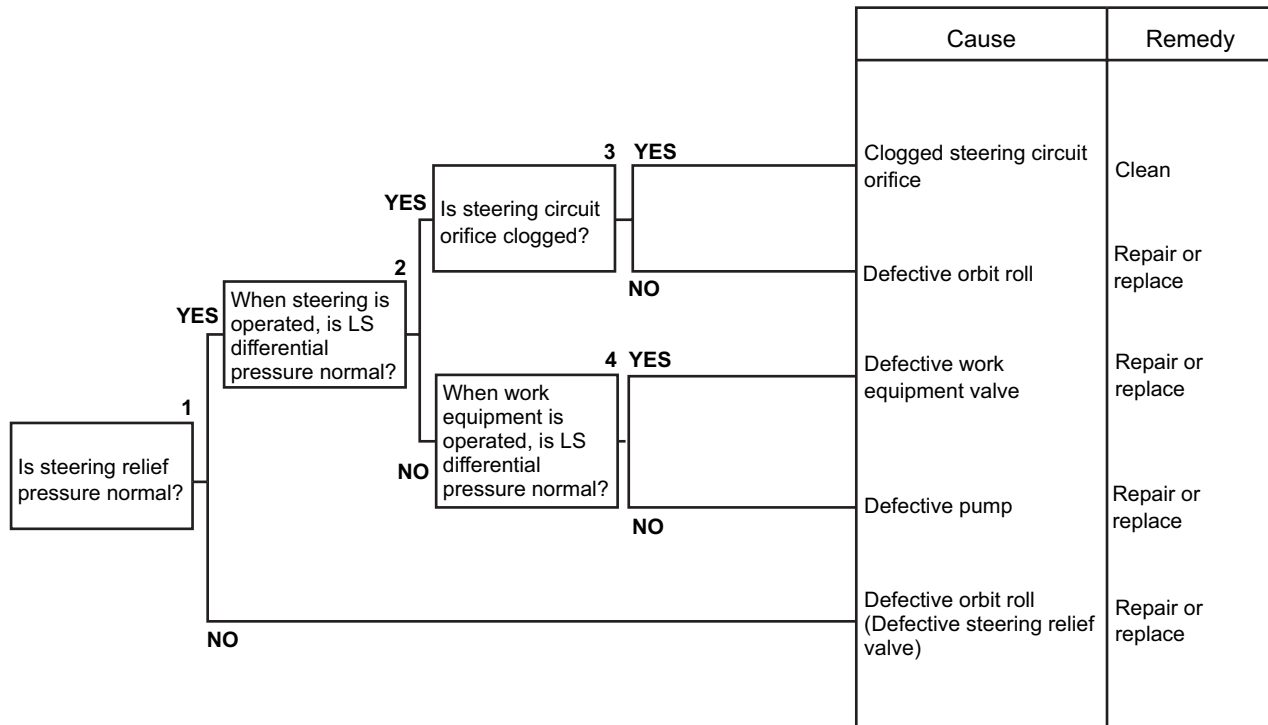
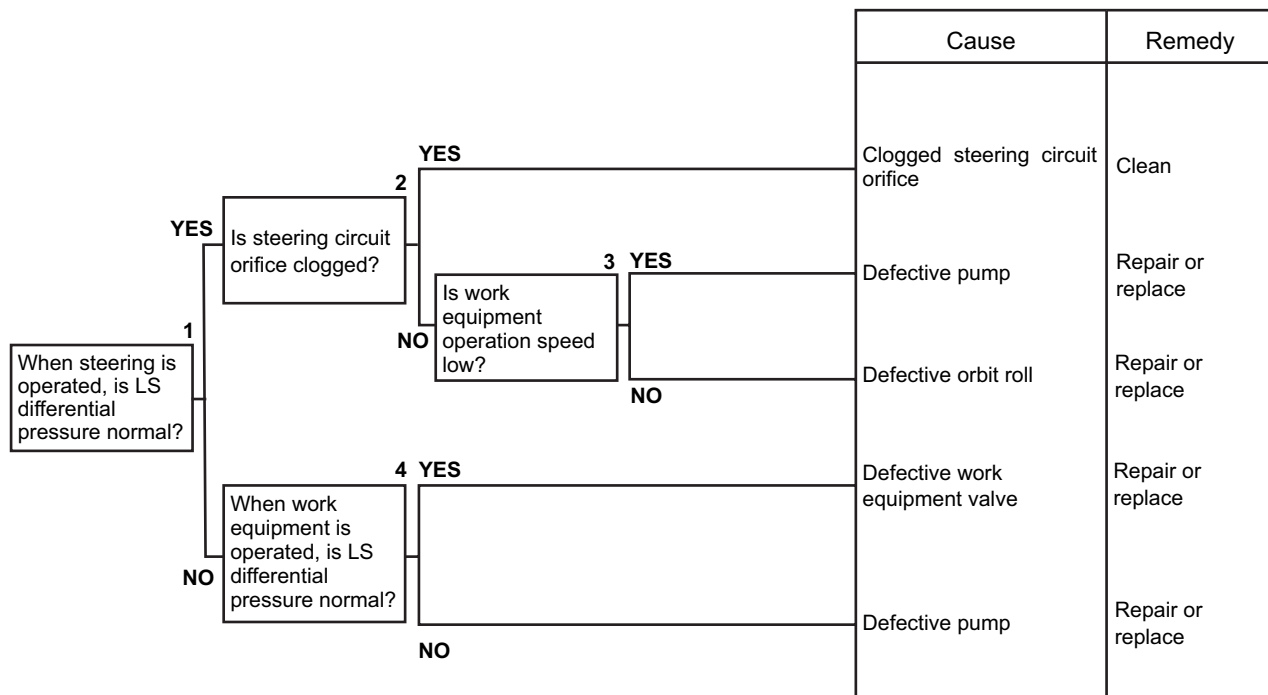
H-49 Tilt cylinder natural forward drift is large



H-50 Attachment does not move/moves but low/moves but force is low

★ Perform the following troubleshooting when the lifting, tilting and steering speeds are normal.

**H-51 Attachment cylinder natural drift is large**

H-52 Steering is heavy**H-53 Large shock is made when steering wheel is returned**

H-54 Work equipment is heavy when work equipment and steering are operated simultaneously

		Cause	Remedy
When work equipment and steering are operated simultaneously, is LS differential pressure normal? 1 YES Is work equipment relief pressure normal? 2 YES NO Is work equipment operation speed low? 3 YES NO		Defective pump	Repair or replace
		Defective LS relief valve	Adjust or replace
		Defective pump (Defective LS valve)	Repair or replace
		Defective work equipment valve	Repair or replace

H-55 Steering is heavy when work equipment and steering are operated simultaneously

		Cause	Remedy
When work equipment and steering are operated simultaneously, is LS differential pressure normal? 1 YES Is steering relief pressure normal? 2 YES Is work equipment operation speed low? 3 YES NO NO NO	Defective pump	Repair or replace	
	Defective orbit roll	Repair or replace	
	Defective orbit roll	Repair or replace	
	Defective work equipment valve	Repair or replace	

FORKLIFT TRUCK

CX50 Series

Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

50 Disassembly and assembly

100 General information on disassembly and assembly

Method of using this manual	2
Special tool list	3
How to use LOCTITE	7

Method of using this manual

Disassembly

- In "Disassembly", work procedures and precautions and knowledge for performing those procedures and the oil and coolant quantities to be drained are described.
- The meaning of the symbols used in "Disassembly" is as follows.

 : Safety precautions for performing work.

★ : Knowledge and precautions for performing work.

 : Oil or coolant quantity to be drained.

 : Weight of a part or a device.

Assembly

- In "Assembly", work procedures and precautions and knowledge for performing those procedures and the oil and coolant quantities to be added are described.
- The meaning of the symbols used in "Assembly" is as follows.

 : Safety precautions for performing work.

★ : Contents of work to be performed with special care for safety of the lift truck.

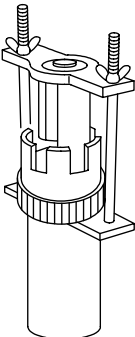
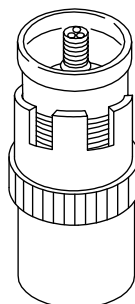
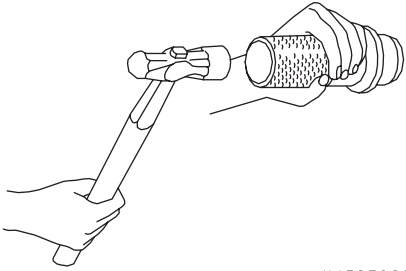
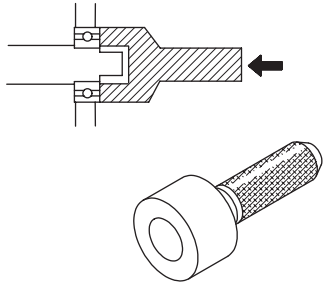
★ : Knowledge and precautions for performing work.

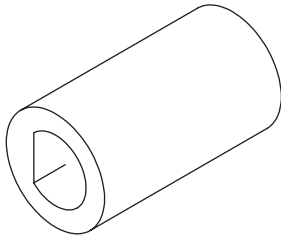
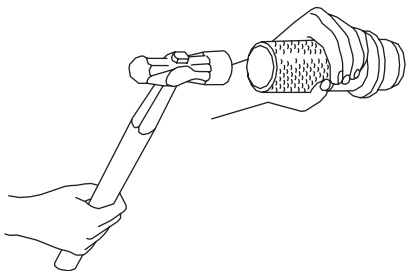
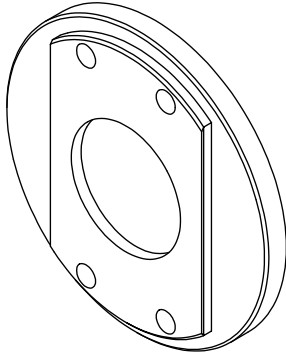
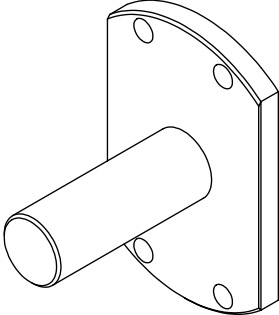
 : Type of coating material.

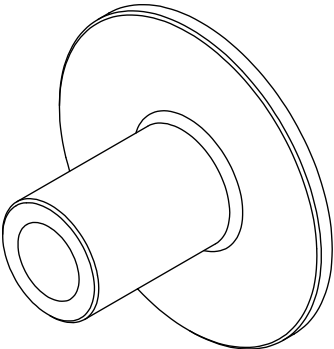
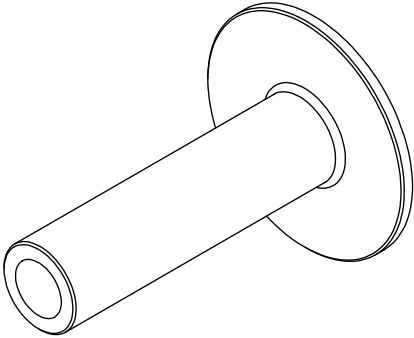
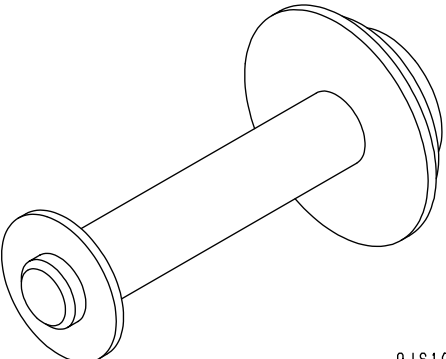
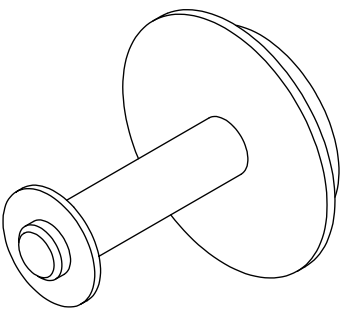
 : Tightening torque.

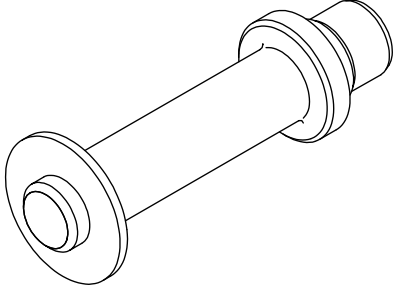
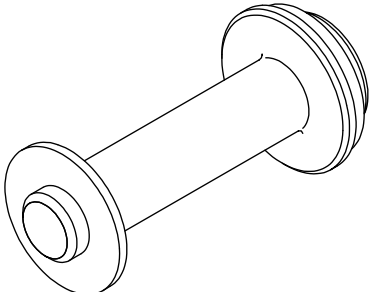
 : Oil or coolant quantity to be added.

Special tool list

Item	Tool part No.	Sketch
Compression of clutch pack return spring	3EC-97-99001	 9JS10338
Insertion of clutch pack piston	3EC-97-99030	 9JS10339
Driving of transmission output shaft bearing and oil seal	3EC-97-99110	 HJZ05292
Driving of bearing	3EC-97-99210	 HJZ05541

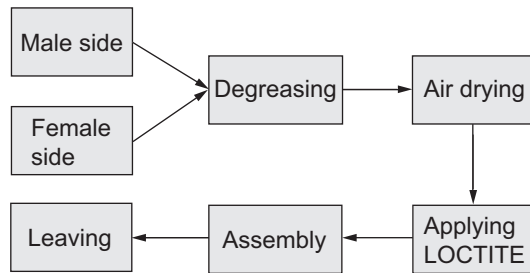
Item	Tool part No.	Sketch
Removal and installation of rear wheel and rim jointing bolt	3BA-97-13310	 HWZ01119
Driving of transmission F shaft and R shaft bearings	3EC-97-99190	 HJZ05292
Drive axle side jig (A)	3EB-97-99340	 9JS10371
Transmission side jig (B)	3EB-97-99350	 9JS10372

Item	Tool part No.	Sketch
Jig (C) for gasoline engine	3EB-97-99360	 9JS10373
Jig (C) for diesel engine	3EC-97-99130	 9JS10374
Oil seal driving jig	3EC-97-99170	 9JS10375
Oil seal driving jig	3EC-97-99180	 9JS10376

Item	Tool part No.	Sketch
Oil seal driving jig	972-EC-579-000	 9JS10390
Oil seal driving jig	972-EC-579-100	 9JS10391

How to use LOCTITE

Using procedure for LOCTITE



1. Degreasing and cleaning

- 1) Clean with trichloroethylene, acetone, ether or alkaline solution which is highly volatile.
- 2) It is important to decrease as completely as possible.
- 3) It is not recommended to use gasoline, diesel fuel, kerosene, etc. since they are not so volatile. When they are used, dry them thoroughly.
- 4) When the mating face is thermosetting plastic, apply LOCQUICK PRIMER after degreasing.

2. Air drying

- 1) Wait until the detergent is dried up.
- 2) If LOCQUICK PRIMER is applied, do not wipe it but dry it in air for 5 – 10 minutes. (If LOCTITE is used before LOCQUICK PRIMER dries up, the effect of LOCTITE decreases.)

3. Applying LOCTITE

Apply sufficient quantity of LOCTITE to fill the gap between the threaded portion or fitting part and its mating face to either or both faces by one of the following method.

- Applying directly from the container nozzle.
- Dipping (for threads, using a receiving pan)
- Tumbling
- Brushing (for fitting, using a receiving pan)
- Sponge
- Automatic coating machine

Do not put metallic foreign matter in LOCTITE or return LOCTITE used in a pan to the container.

4. Assembly

After applying LOCTITE, tighten or fit as ever. [When using an adhesive for structures or an instant glue, press the jointed faces lightly (approx. 49 kPa {0.5 kg/cm²})].

Removal of parts

When LOCTITE is used to lock a screw or a shaft, that screw or shaft can be removed with a common tool such as a spanner, wrench, pulley puller, etc. If LOCTITE is so strong that the parts may be broken, heat the locked parts with a soldering iron, gas torch, etc. (to 200 – 250 °C), and they can be removed easily. It is difficult to dissolve in chemical liquid, in general.

When reassembling

- 1) If a screw is locked with LOCTITE and unlocked, the used LOCTITE keeps sticking in a form of white powder. However, it is no problem to apply new LOCTITE over the used LOCTITE.
- 2) If LOCTITE is applied to a shaft fitting part or a flange face, an excessive part may need to be removed, and it can be removed easily with a wire brush, etc.
- 3) If a plane stuck with LOCTITE needs to be removed and stuck again, remove all the hardened LOCTITE and roughen the surface with sandpaper.

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FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

50 Disassembly and assembly

200 Engine and cooling system

Removal and installation of power train	2
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Removal and installation of power train

Removal

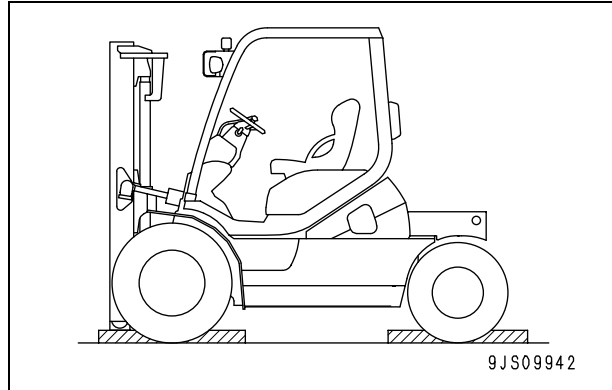
1. Overhead guard (Ceiling section)

Hood

Counterbalance-weight

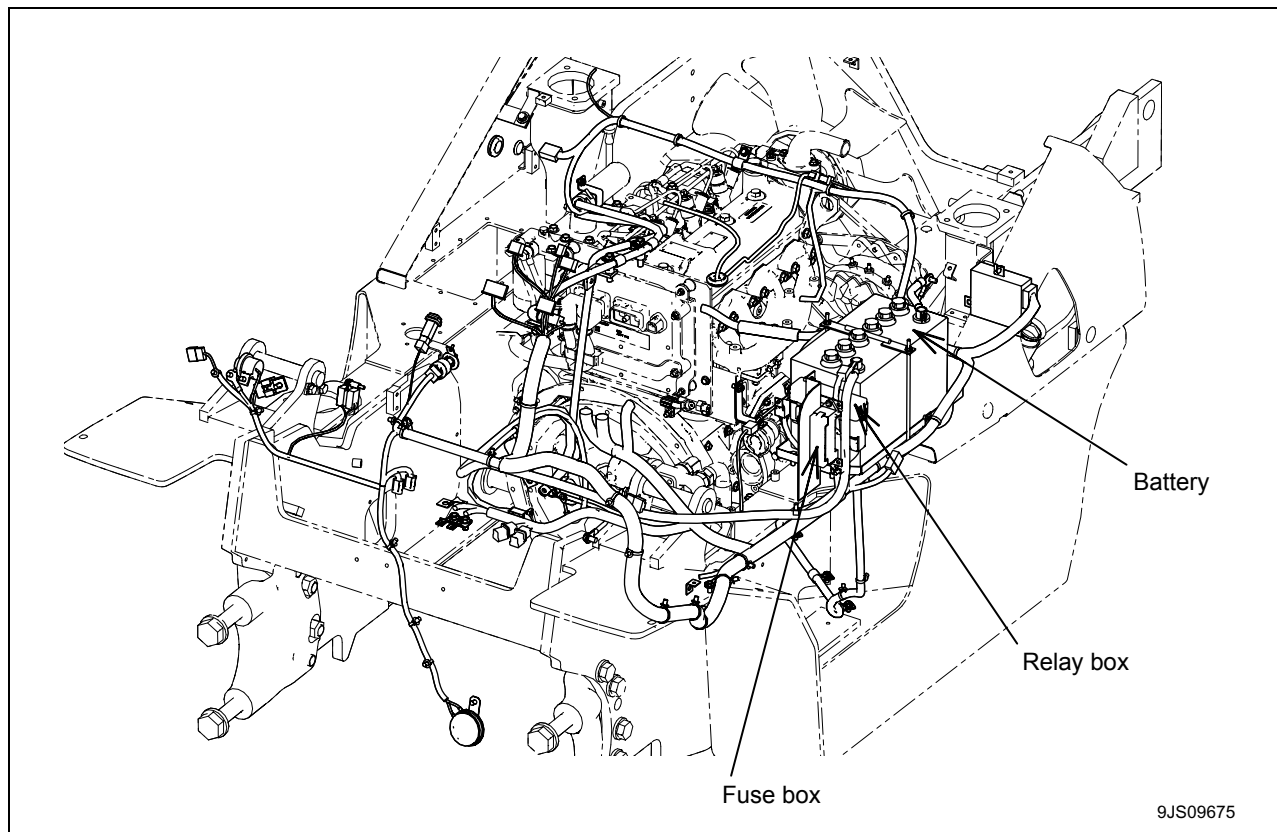
⚠ Be sure to lower the fork and attachment to the ground or remove them.

(If the counterbalance-weight is removed with the mast and attachment raised, the lift truck will tip over.)

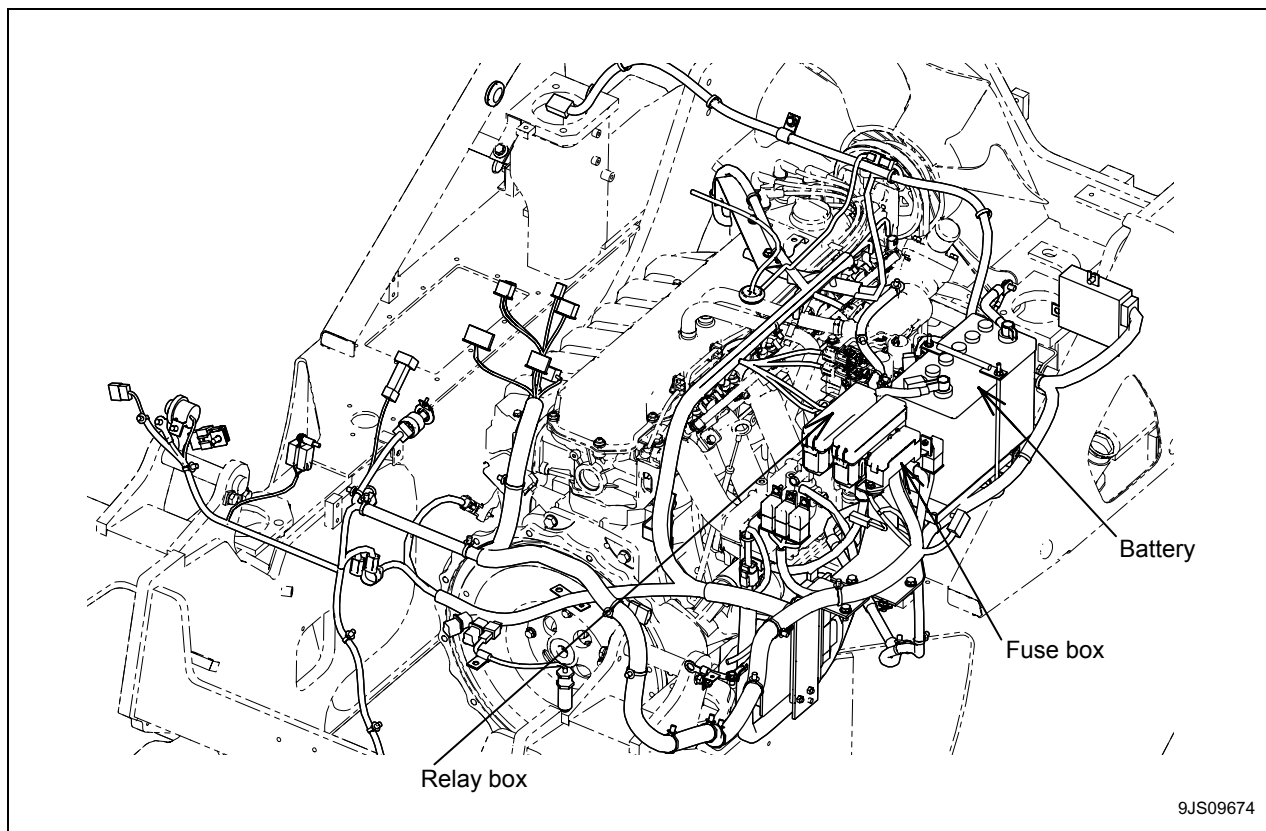


2. Wiring and battery

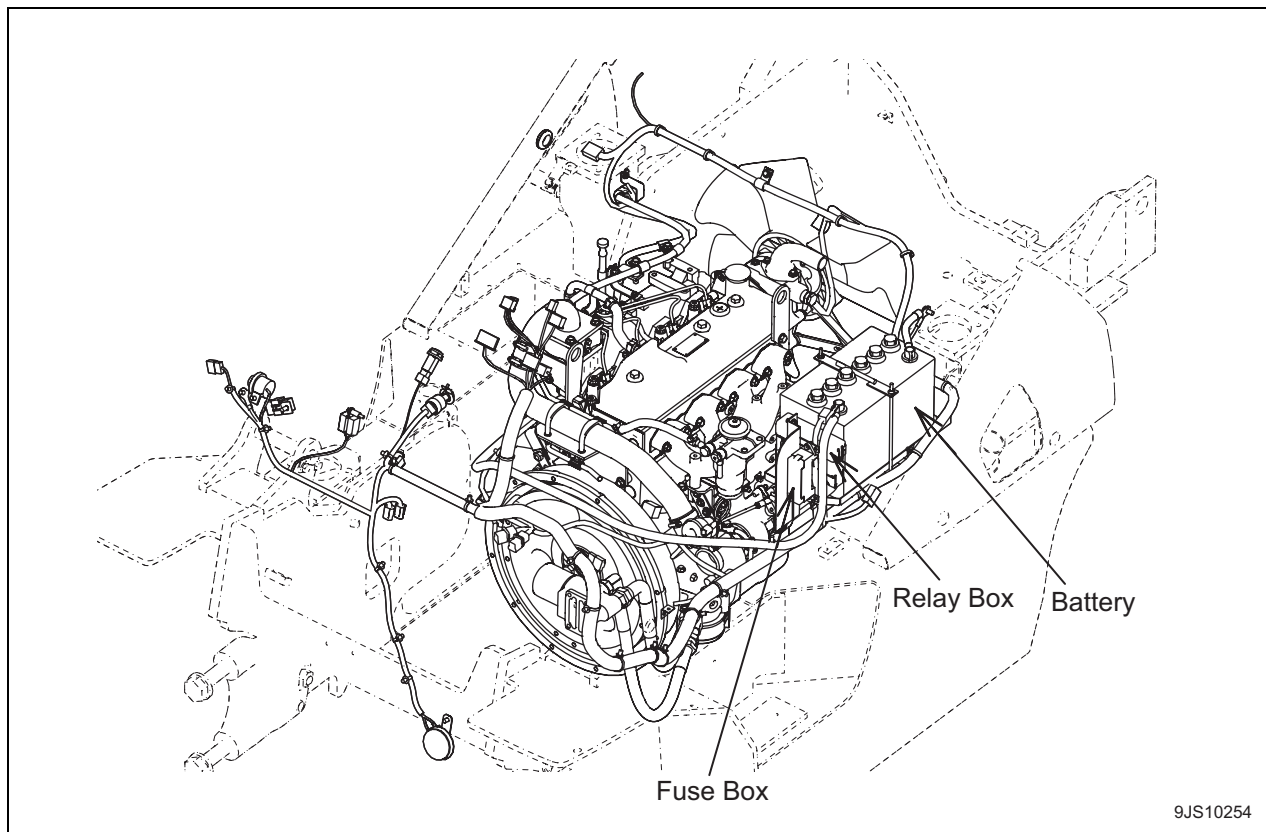
(Applicable model: Lift truck with SAA4D95LE-5-A engine)



(Applicable model: Lift truck with EBT-TB45-1A engine)



(Applicable model: Lift truck with S4D95LE-3)



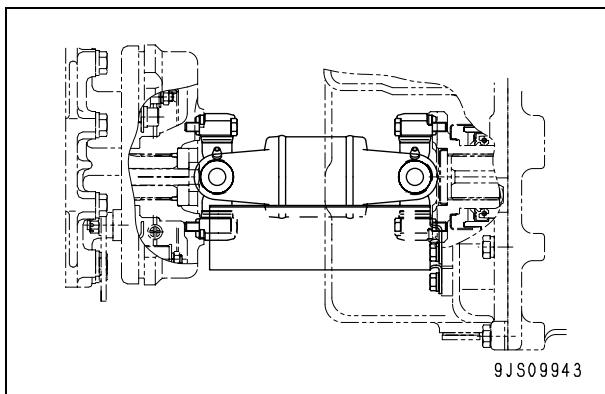
3. Accelerator cable, inching cable and forward/reverse lever cable

4. Remove the wiring harness fixed to the transmission case. Remove the connectors of the travel speed sensor, neutral switch, FR solenoid, etc.

5. Piping (hydraulic and torque converter) and hoses (radiator, air cleaner and fuel)

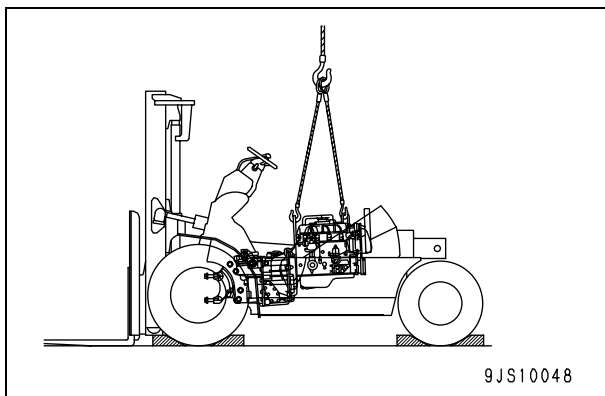
6. Radiator, shroud and exhaust pipe

7. Remove the drive shaft.

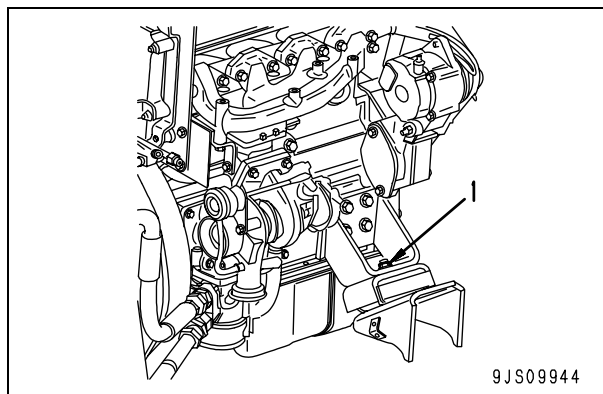


8. Power train

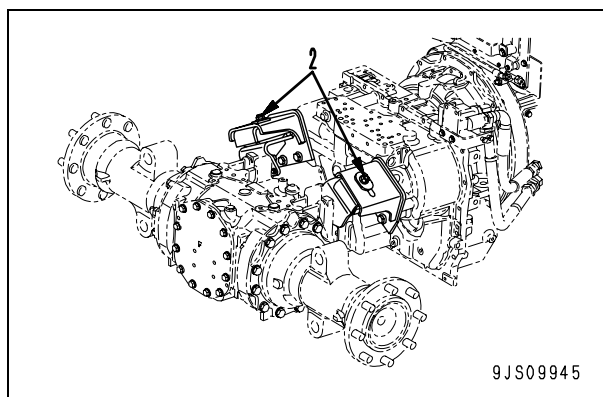
1) Sling and hold the power train with the crane.



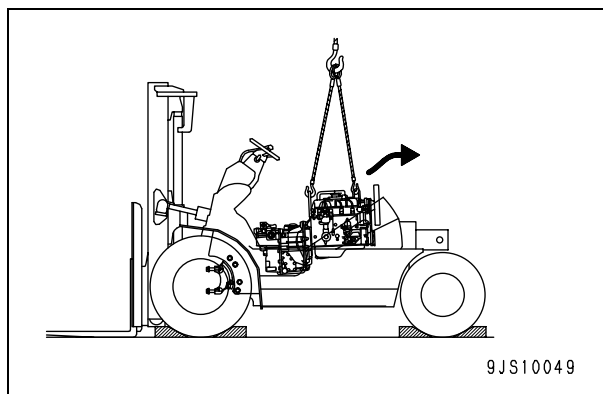
2) Remove engine mounting nuts (1) from the right and left of the engine.



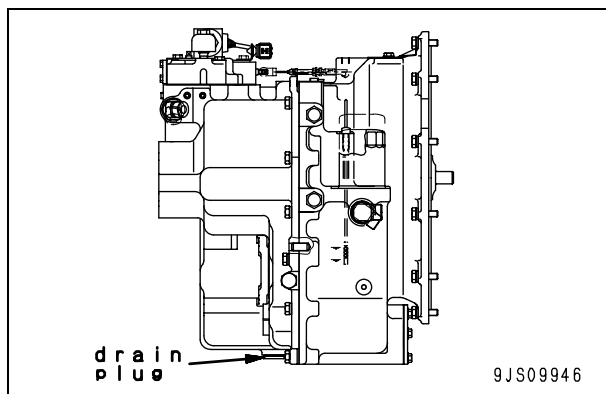
3) Remove transmission mounting nuts (2).



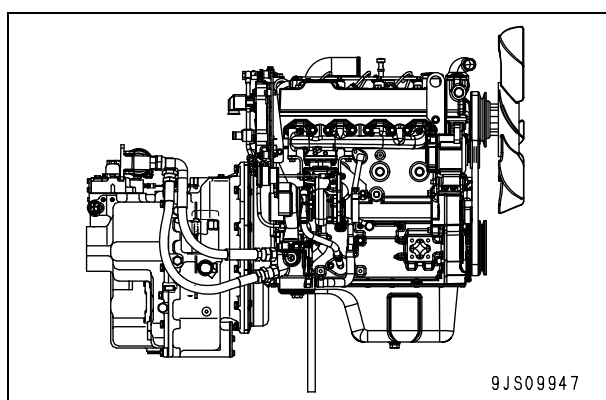
4) Sling the power train with the crane and remove it toward the rear.



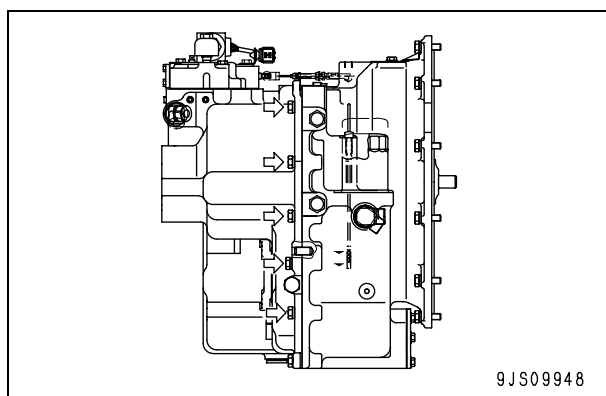
- 5) Drain the oil from the transmission case.



- 6) Lower to the work stand slowly and disconnect the power train.



- 7) Remove the bolts and disconnect the torque converter and transmission. (Torque converter model)

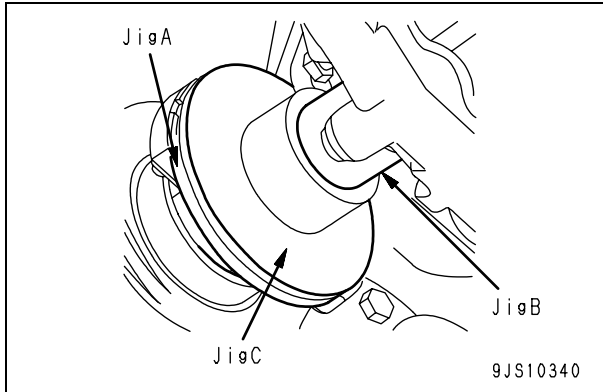


Installation

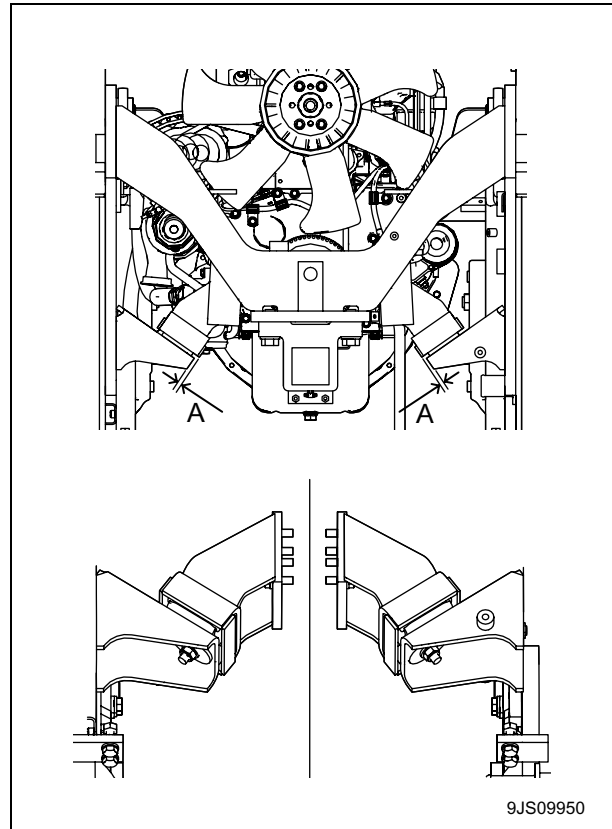
1. Installation of power train

Insert centering jig C in jig B and install them to the power train side.

- ★ Use the attached 8 mm bolts (35 mm long, 1 mm pitch bolts).



- 1) Lower the power train slowly and set it to the center of the engine frame.
- 2) Sling the power train again and adjust it so that dimension A at the engine mount will be 0 mm – 5 mm on the right and left sides.
 - ★ Since the engine mount is made of rubber and not slippery, the power train cannot be adjusted once it is set on the engine mount. Sling the power train again and adjust the dimensions on the right and left sides evenly. (Touch the engine mount with the hand from above to judge.)
 - ★ For centering of the power train, see Disassembly and assembly, Power train, "Centering of power train", page 50-300-7.

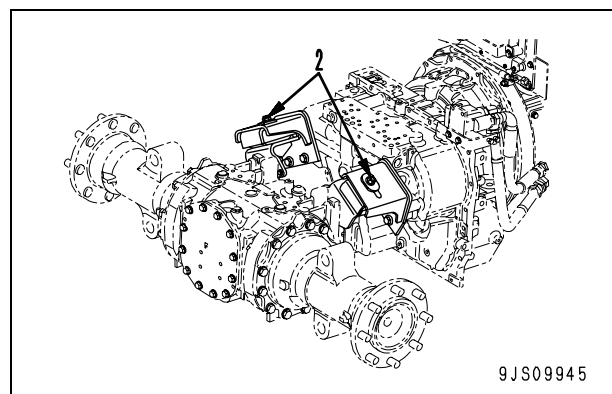


2. Centering of power train

- ★ For centering of the power train, see Disassembly and assembly, Power train, "Centering of power train", page 50-300-7.
- ★ When centering the power train, raise it with the lifting device.

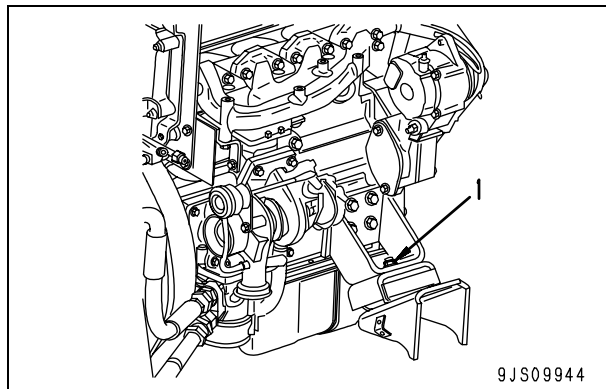
3. Tightening of transmission mounting nuts

- ⌚ Mounting nut: 98 – 123 Nm {10 – 12.5 kgfm}



4. Tightening of right and left engine mounting nuts

 Mounting nut: **98 – 123 Nm {10 – 12.5 kgfm}**



5. Piping (hydraulic and torque converter) and hoses (radiator, air cleaner and fuel)

★ For tightening torque, see Index and foreword, "Standard tightening torque table", page 00-200-34.

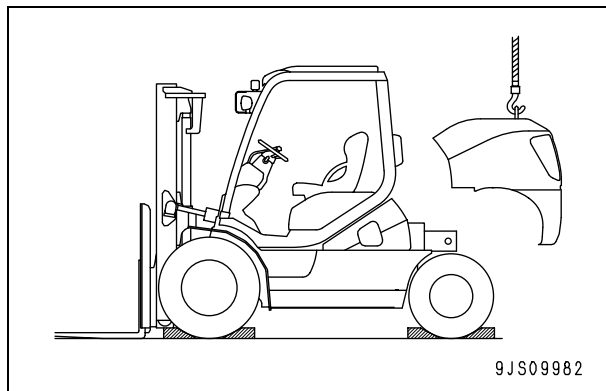
6. Accelerator cable, inching cable and forward/reverse lever cable

7. Installation of wiring and battery

8. Installation of hood and overhead guard

9. Tightening of counterbalance-weight mounting bolts

 Mounting bolt: **686 ± 98 Nm {70 ± 10 kgfm}**



FORKLIFT TRUCK

CX50 Series

Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

50 Disassembly and assembly

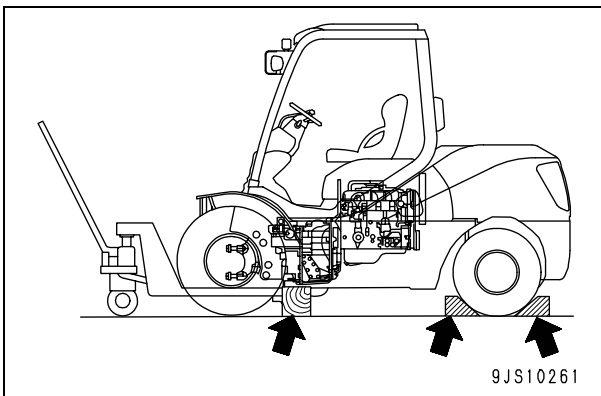
300 Power train

Removal and installation of front axle	2
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Disassembly and assembly of torque converter	16
Disassembly and assembly of drive shaft	21
Disassembly and assembly of differential	22
Disassembly and assembly of axle housing assembly	34
Disassembly and assembly of parking brake.....	43
Disassembly and assembly of rear axle	44
Disassembly and assembly of power steering cylinder	47
Disassembly and assembly of brake pedal.....	50
Disassembly and assembly of brake valve	51

Removal and installation of front axle

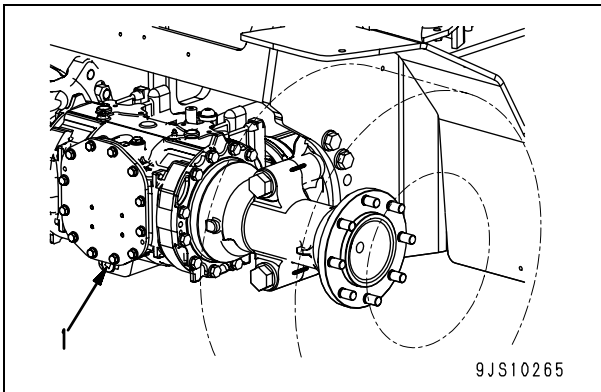
Removal

1. Remove the mast.
 - ★ For "Removal and installation of mast", see Disassembly and assembly, Work equipment, "Removal and installation of mast", page 50-500-2.
2. **Front axle**
 - 1) Lock the rear wheels with chocks.
 - 2) Set a block under the frame so that the front wheels will be raised about 10 mm.

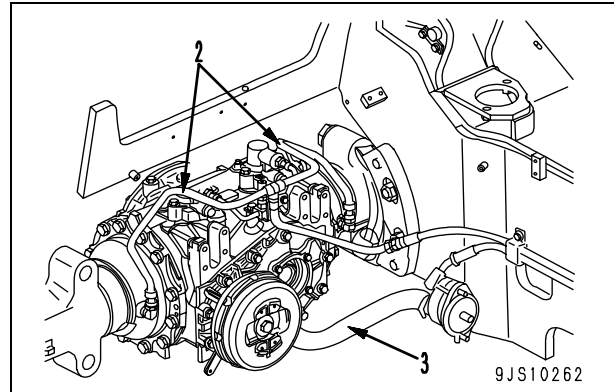


- 3) Remove drain plug (1) to drain the axle oil.

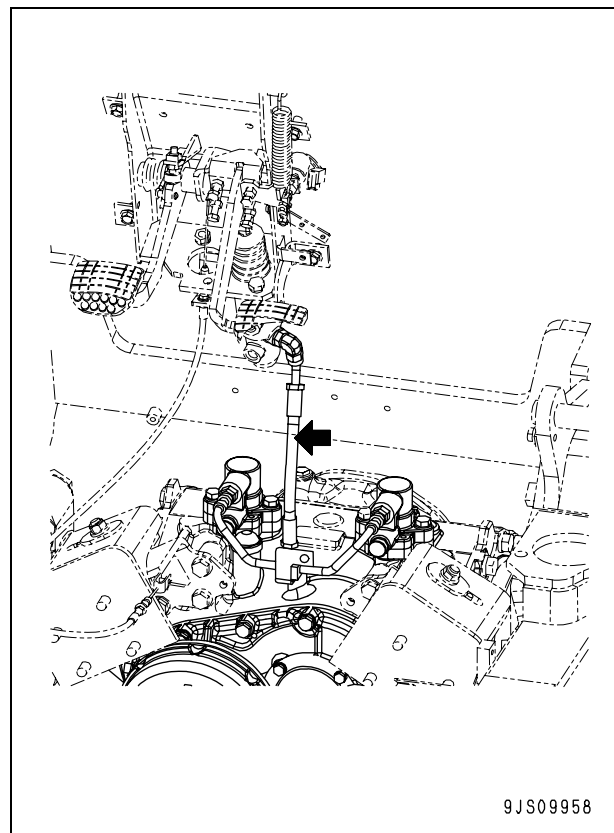
 Axle oil: **10.5 ℓ**



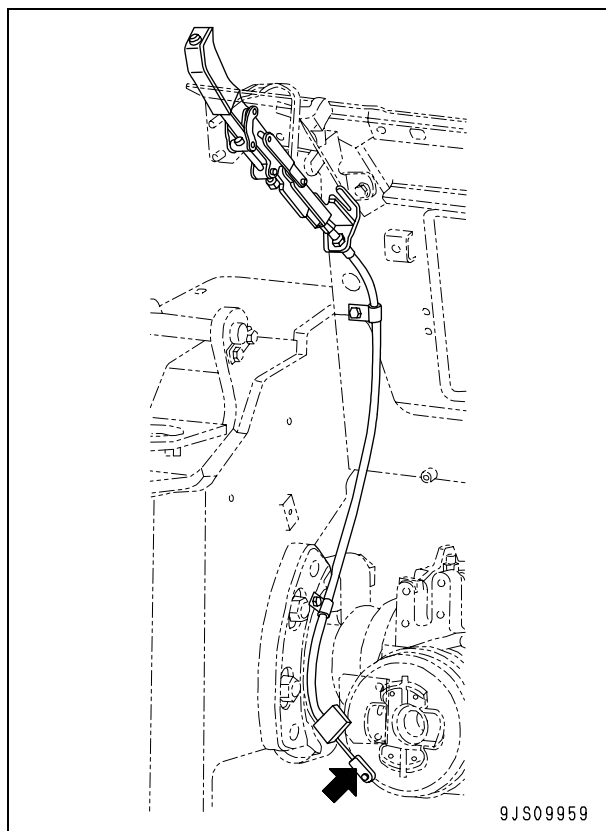
3. Remove inlet pipe (2) and suction hose (3) from the brake cooling piping.



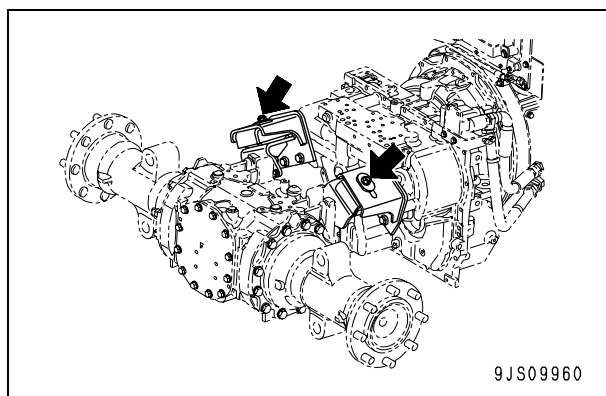
4. Remove the brake actuating piping.



5. Remove the parking brake cable.

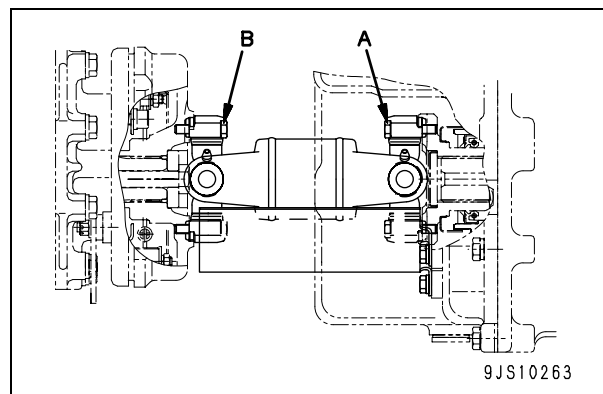


6. Remove the transmission mounting bolts.

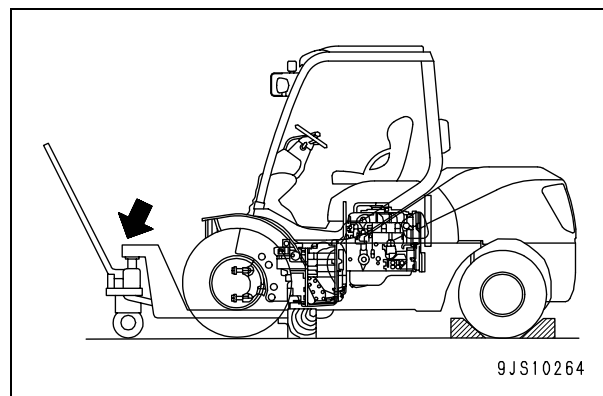


7. Remove the drive shaft.

Remove the bolt on the **A** side first since the coupling on the transmission side is sliding type.

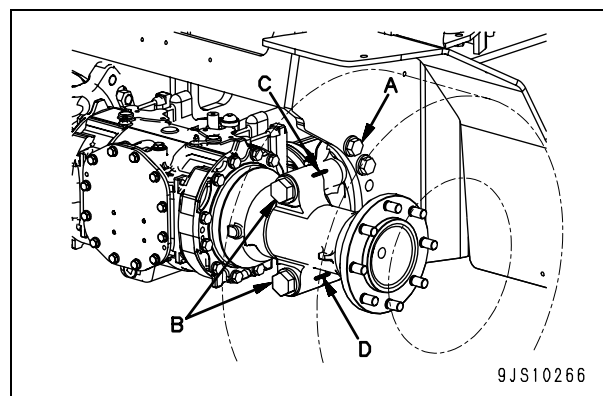


8. Set a hand pallet truck under the front axle to support the front axle as shown below.



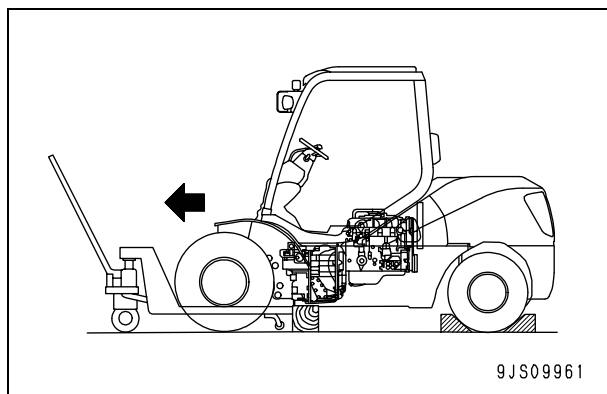
9. Make match marks **C** and **D** on the axle support and front axle.

- ★ Make the marks on both sides.
- Remove front axle mounting bolts **B**.
- ★ Do not remove support bolt **A** when replacing the front axle support.

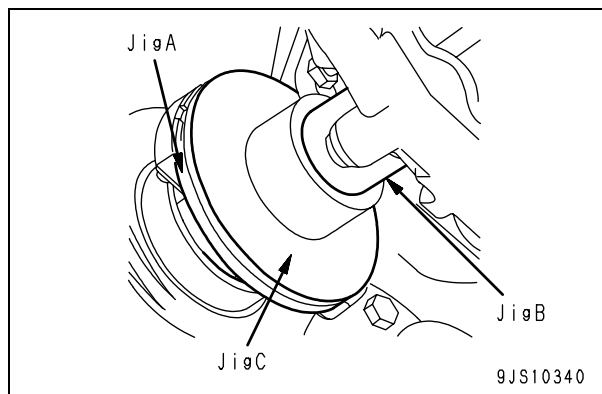


10. Pull out the front axle.

Remove the front axle support from the frame and pull out the front axle on the hand pallet truck.

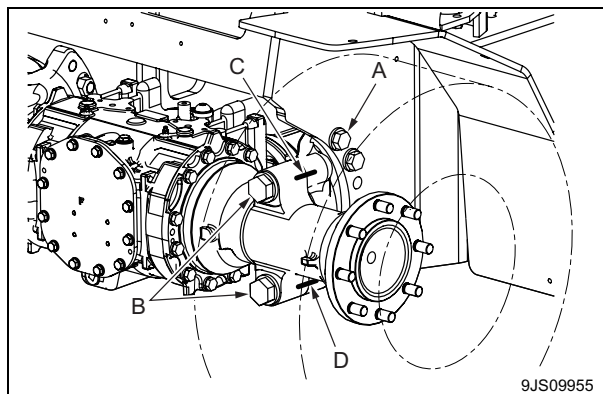
**Installation****1. Front axle**

- 1) Install centering jig **A** to the differential side. Insert centering jig **B** in **C** and install to the transmission side.



- 2) Install the front axle while setting it to match marks **C** and **D** made when the front axle was removed.

Front axle support mounting bolt:
1,520 – 1,910 Nm {155 – 195 kgfm}



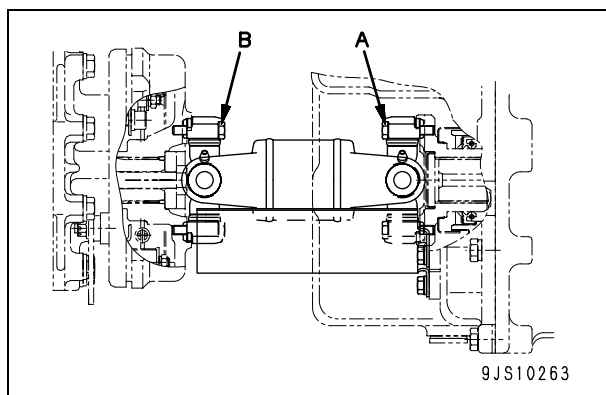
- 3) Center the power train

★ For centering of the power train, see Disassembly and assembly, Power train, "Centering of power train", page 50-300-7.

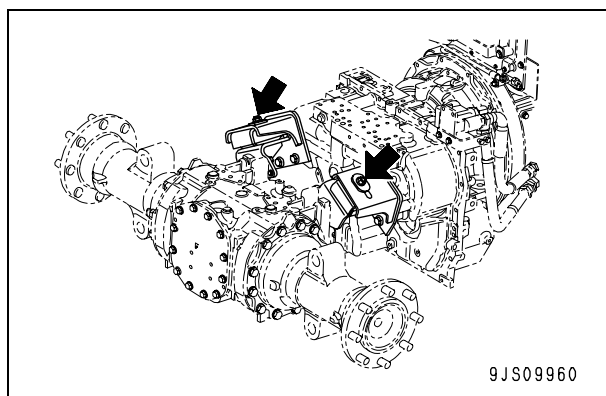
2. Drive shaft

- ★ Install the bolt on the **B** side first since the cup on the transmission side is sliding type.

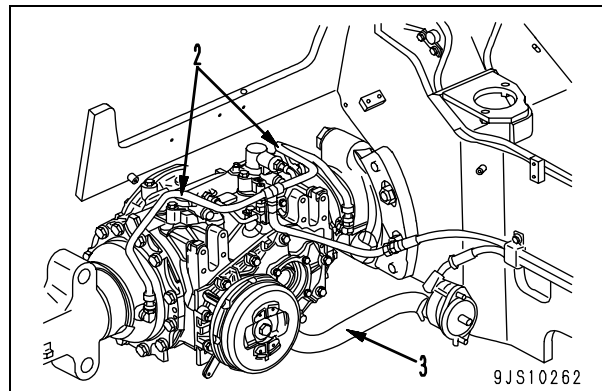
🔧 Drive shaft mounting bolt:
32 – 38 Nm {3.3 – 3.9 kgfm}

**3. Tighten the transmission mounting bolts.**

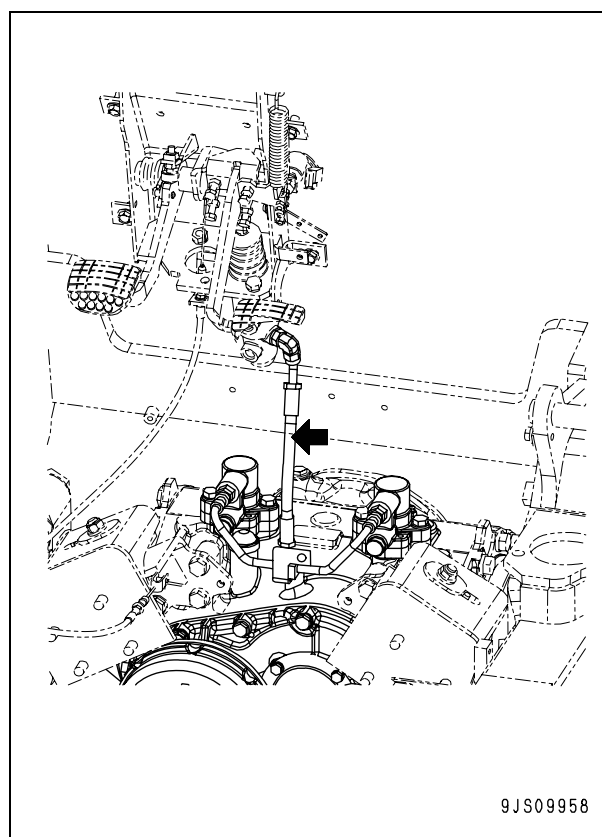
🔧 Engine mount mounting bolt:
98 – 123 Nm {10 – 12.5 kgfm}

**4. Install inlet pipe (2) and suction hose (3) to the brake cooling piping.**

🔧 Tightening torque of brake pipe:
54 – 78 Nm {5.5 – 8 kgfm}

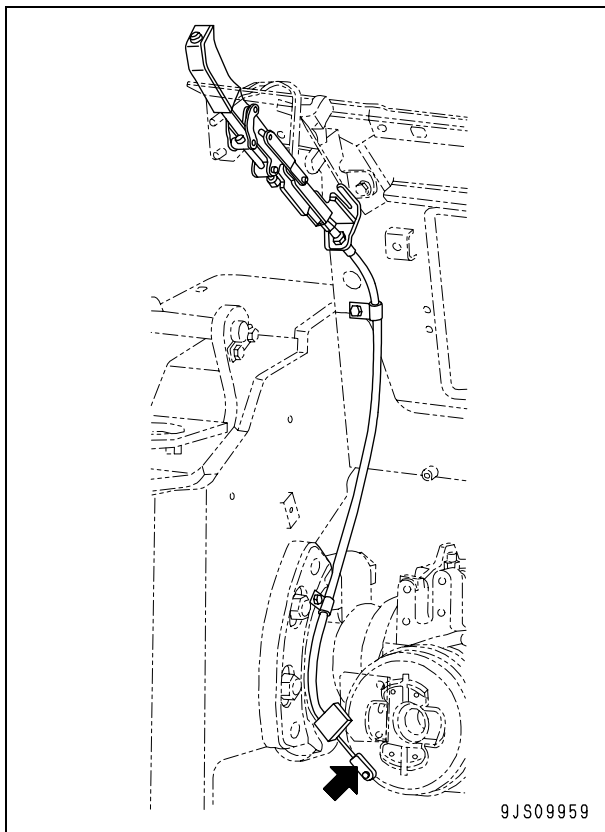
**5. Install the brake actuating piping.**

🔧 Hose clamp: **4.4 ± 0.5 Nm {45 ± 5 kgfm}**



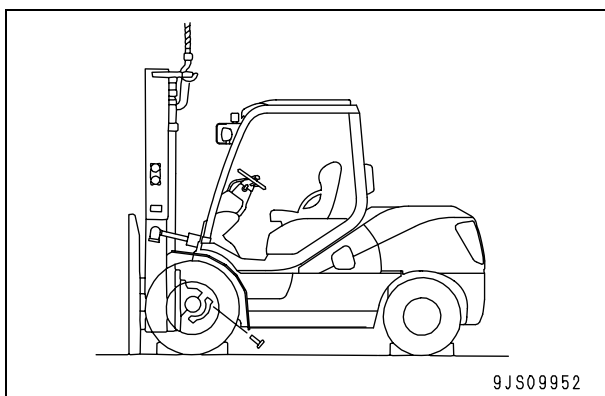
- ★ Bleeding air from brake circuit
For air bleeding procedure, see Testing and adjusting, "Bleeding air", page 30-100-24.

6. Install the parking brake cable.



7. Install the mast.

- ★ For "Removal and installation of mast", see Disassembly and assembly, Work equipment, "Removal and installation of mast", page 50-500-2.



Centering of power train

- ★ Once you remove the front axle and transfer or power train, be sure to center the power train.

Measurement of misalignment

1. Make or purchase the jigs shown below.

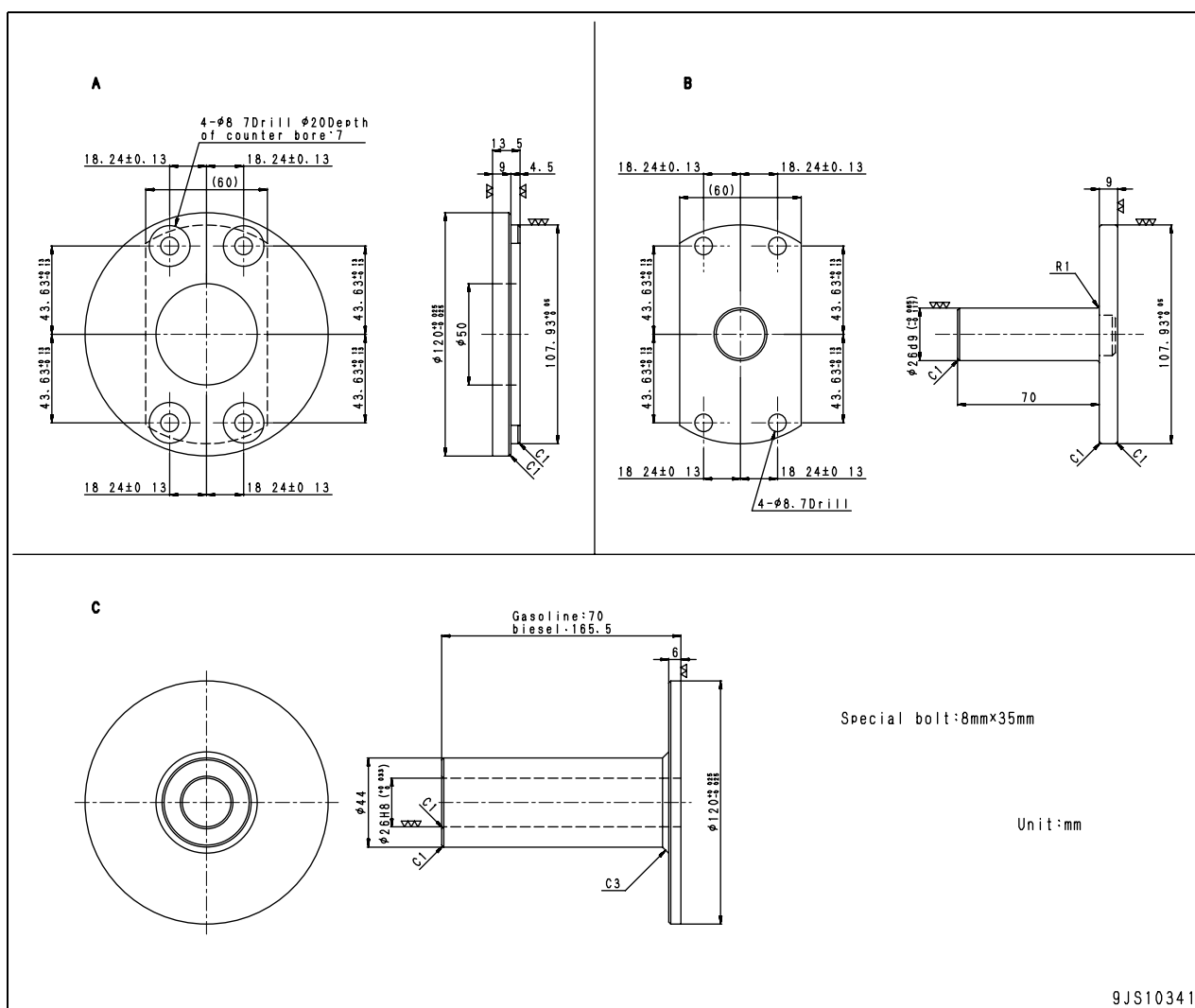
Note) We will not be responsible at all for special tools made according to these drawings.

- 1) Jig on drive axle side (A) 3EB-97-99340
- 2) Jig on transmission side (B) 3EB-97-99350
- 3) Jig (C)

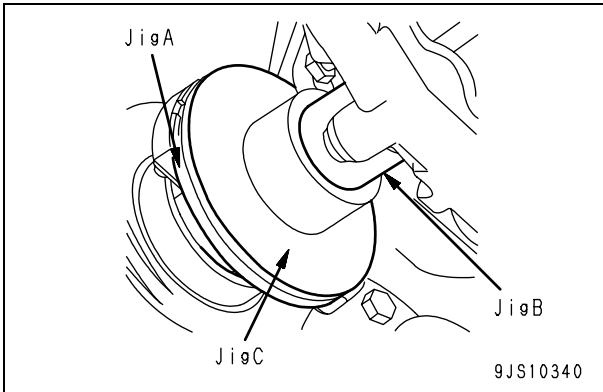
For gasoline engine: 70 mm 3EB-97-99360

For diesel engine:

165.5 mm 3EC-97-99130



2. Install jig **A** to the front axle side.
3. Insert jig **B** in jig **C** and install them to the transmission side.
 - ★ Use the attached 8-mm bolts (35 mm long, 1 mm pitch bolts). Take care not to lose them.
 - ★ Note that there are 2 kinds of jigs **C**. The longer one is for diesel engine (SAA4D95LE-5-A) and the shorter one is for gasoline engine (ETB-TB45-1A).

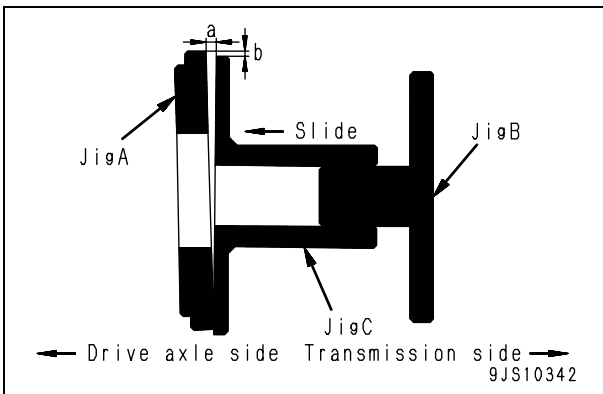


4. Slide jig **C** toward jig **A** and measure clearance **a** and level difference **b**.

Criteria

Clearance a and level difference b between jig A and jig C	Below approx. 0 – 3 mm
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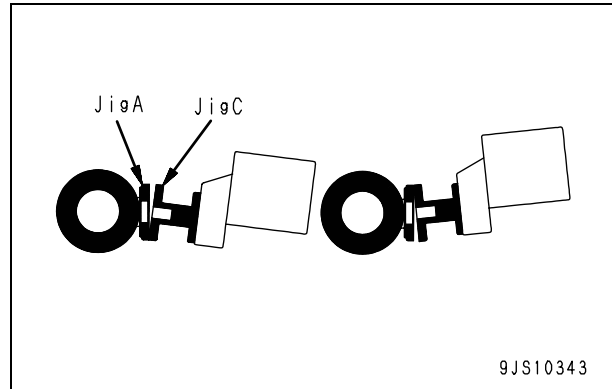
- ★ If the measurement result with the jigs is 3 mm or larger, the power train is not installed in position. Sling the power train again and adjust its position.

**Centering (Adjusting) method****1. When there is opening at top or bottom**

Cause: Deterioration of front and rear mount rubbers

Remedy: Replacement of front and rear mount rubbers

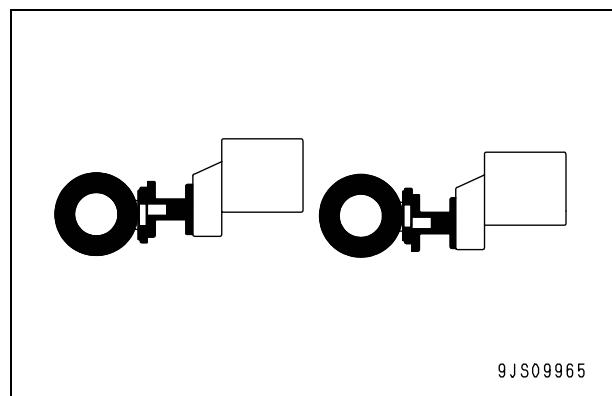
- ★ If the clearance cannot be corrected by replacing the mount rubbers, check the installed condition of the front axle. If a loosened bolt etc. is found, adjust the installed position of the front axle. (The clearance cannot be adjusted with shims)

**2. When there is vertical misalignment**

Cause: Deterioration of front and rear mount rubbers

Remedy: Replacement of front and rear mount rubbers

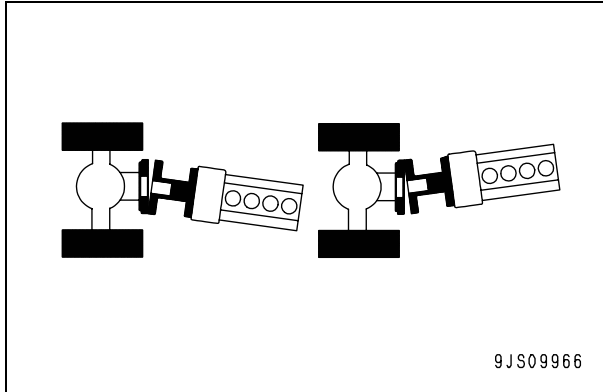
- ★ If the clearance cannot be corrected by replacing the mount rubbers, check the installed condition of the front axle. If a loosened bolt etc. is found, adjust the installed position of the front axle. (The clearance cannot be adjusted with shims)



3. When there is opening at right or left

Cause: The mounts on the engine side and transmission side are not set in position.

(Especially on engine side)



Remedy: Sling the power train again and adjust it so that dimension **A** at the engine mount will be 0 – 5 mm on the right and left sides.

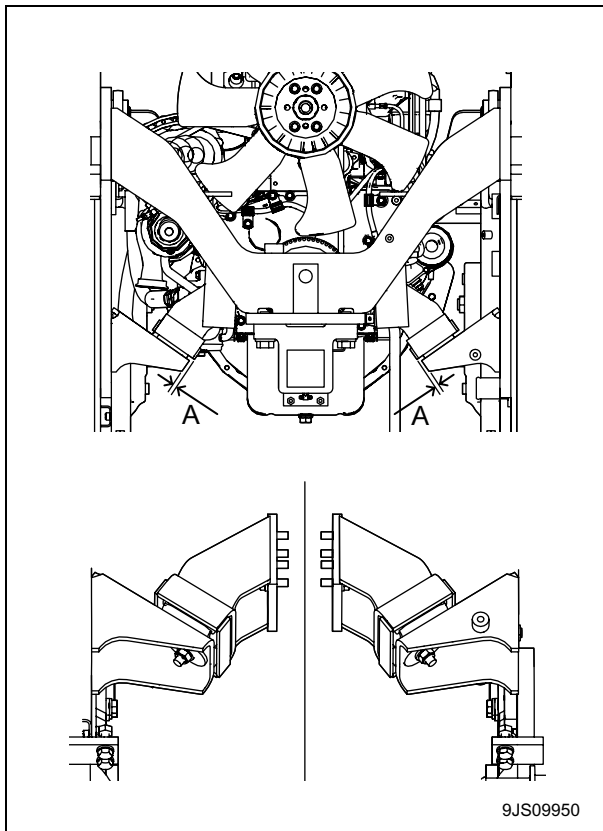
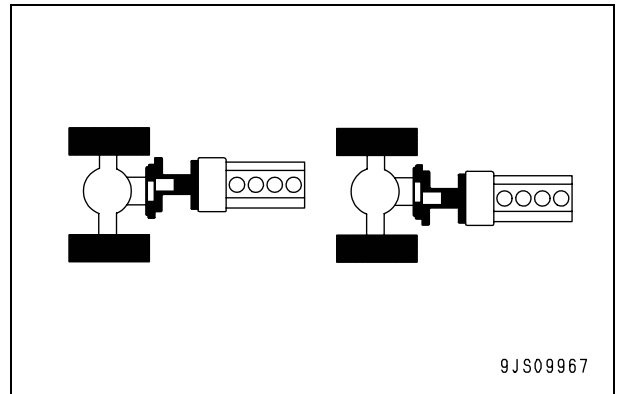
4. When there is lateral misalignment

Cause: The mounts on the engine side and transmission side are not set in position.

(Especially on transmission side)

Remedy: When adjusting the mount hole position on the transmission side, do not pry it.

Sling and adjust the power train again.



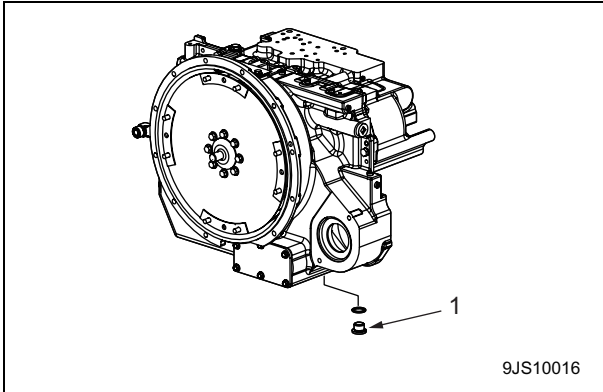
Disassembly and assembly of transmission

Disassembly

1. Transmission case

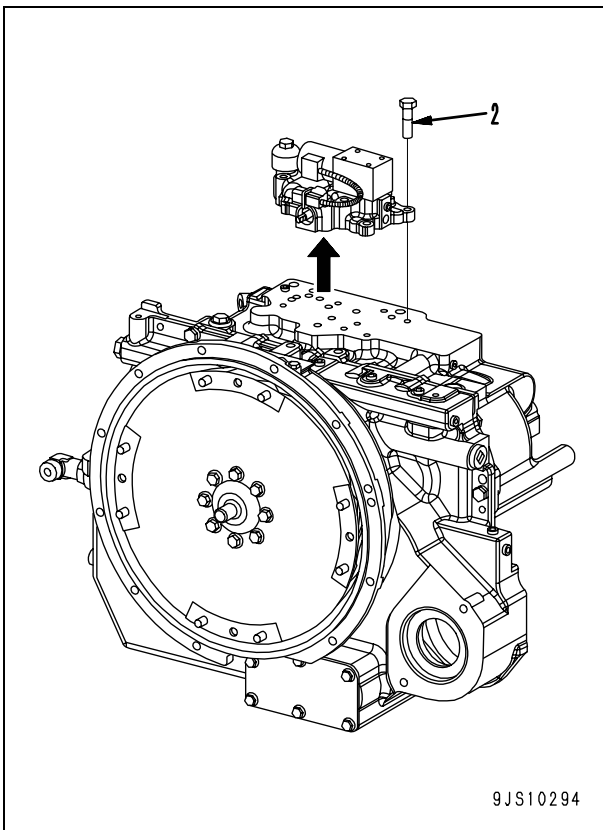
Remove drain plug (1) to drain the oil from the case.

 Transmission oil: **17 l**



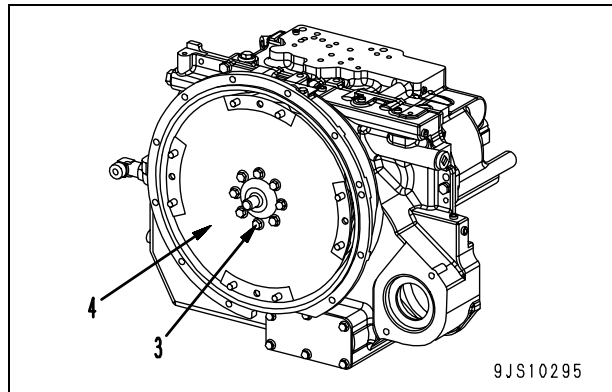
2. Transmission valve

Remove bolts (2) and take out the transmission valve.

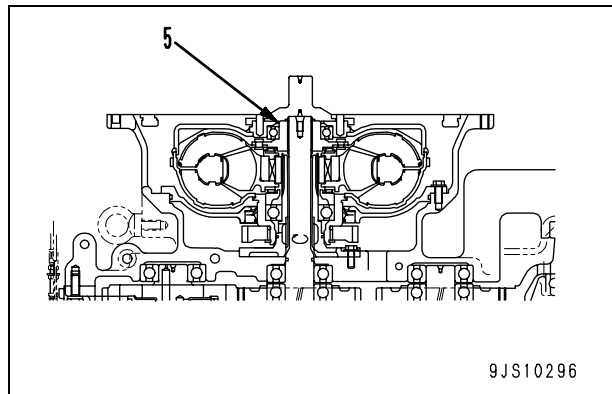


3. Torque converter

- 1) Set the transmission assembly on wooden pieces as shown in the figure below.
- 2) Remove bolts (3) and input plate (4).

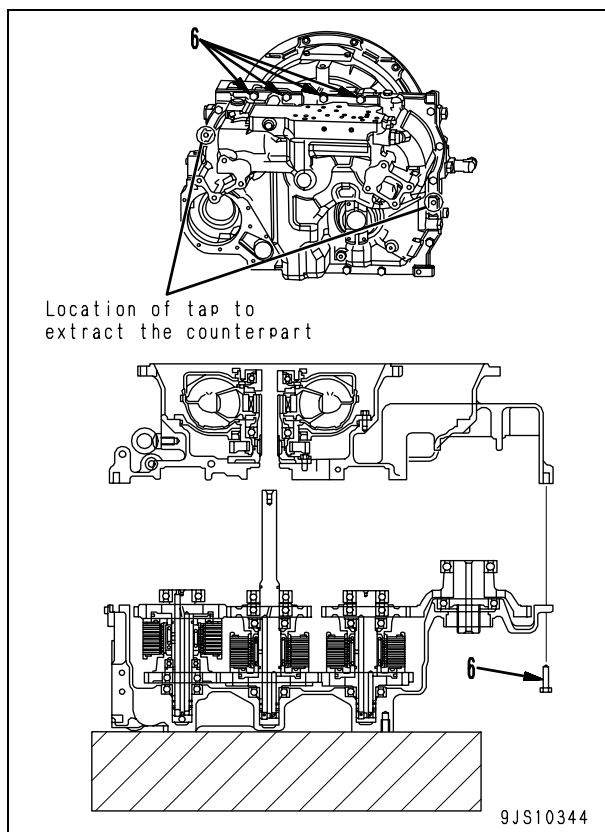


- 3) Remove snap ring (5).



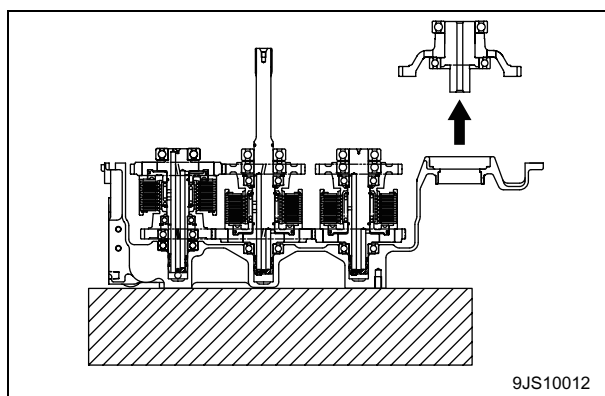
- 4) Remove 21 connecting bolts (6) between the torque converter and transmission case.
- 5) Tighten screws into the 3 forcing taps to separate the torque converter and transmission case.

★ Use gasket remover or a scraper made of plastic to remove the gasket sealant so that the mating faces will not be scratched.



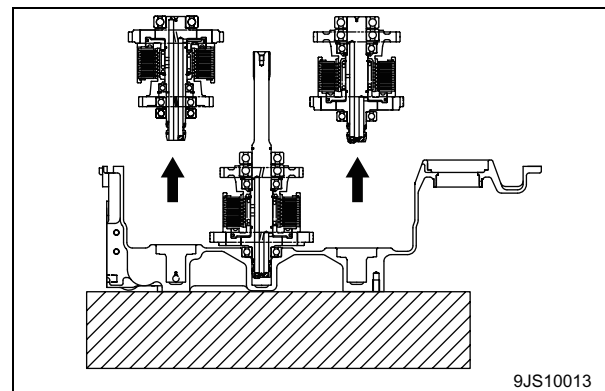
4. Output shaft

Pull out the output shaft sub-assembly from the case.



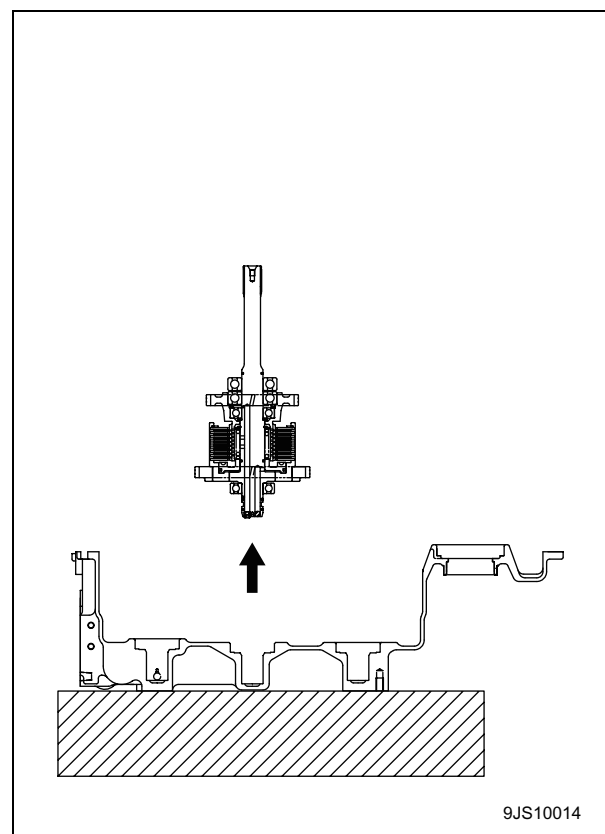
5. Intermediate shaft sub-assembly

Pull out the intermediate shaft sub-assembly from the case.

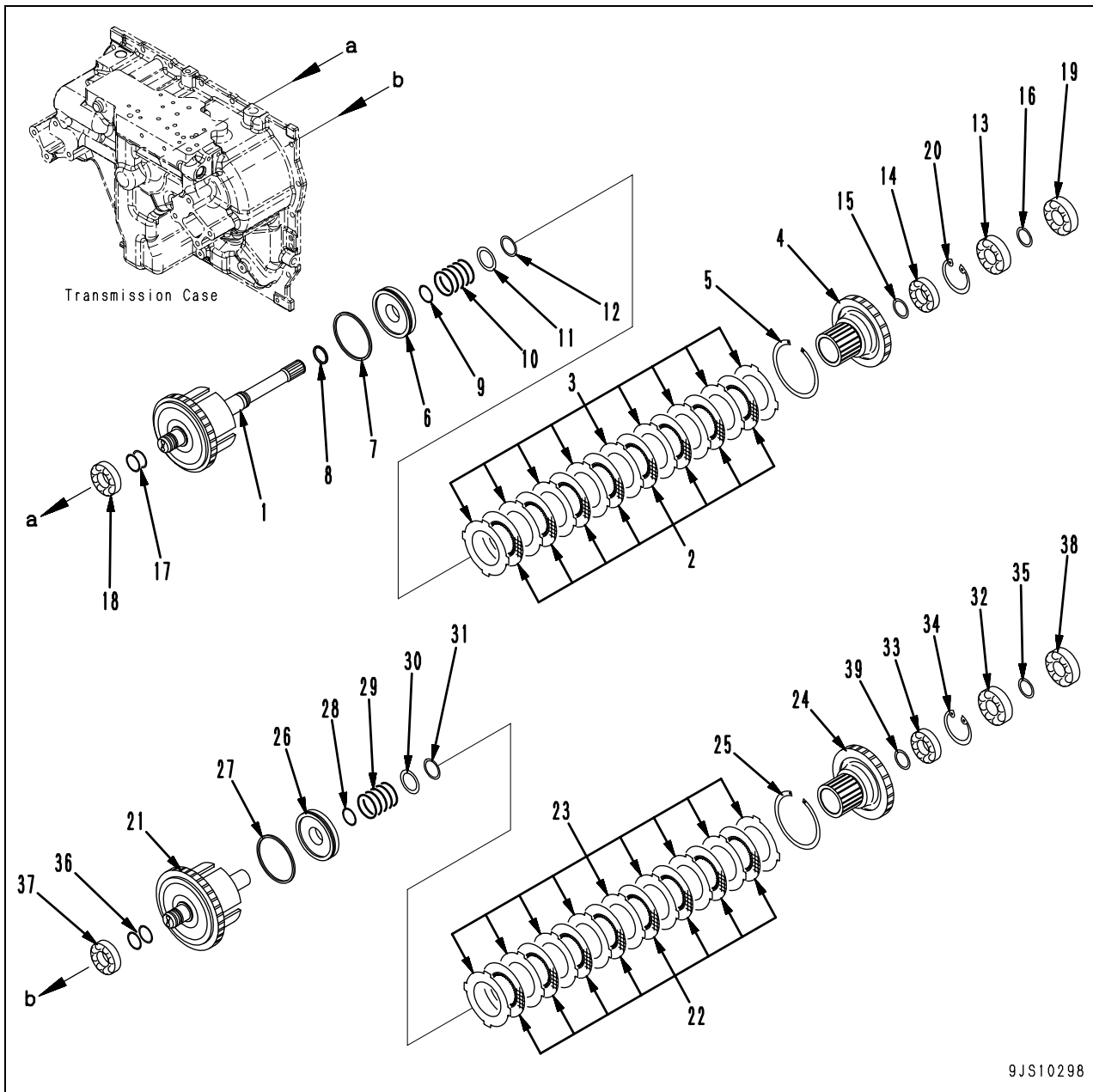


6. Input shaft sub-assembly

Pull out the input shaft sub-assembly (with clutch pack assembly) from the case.

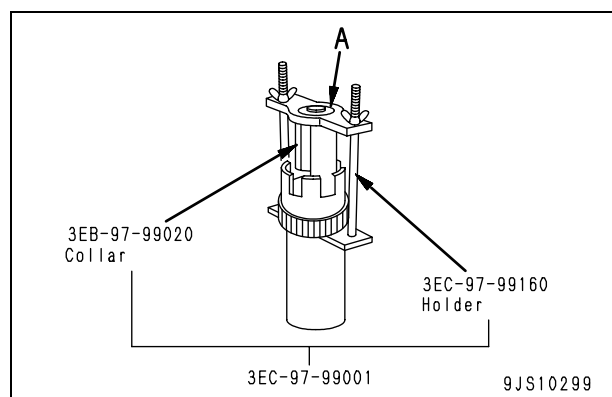


7. Disassembly of clutch pack assembly



*1. There is danger in removing snap ring (12) since the spring tension is applied. Be sure to use special tool A to remove.

Special tool A	3EC-97-99001
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Assembly**1. Cleaning of transmission case and blowing air**

- 1) Clean the transmission case.
- 2) Blow air into machined holes of the transmission case.

2. Installation of blind plug to transmission case

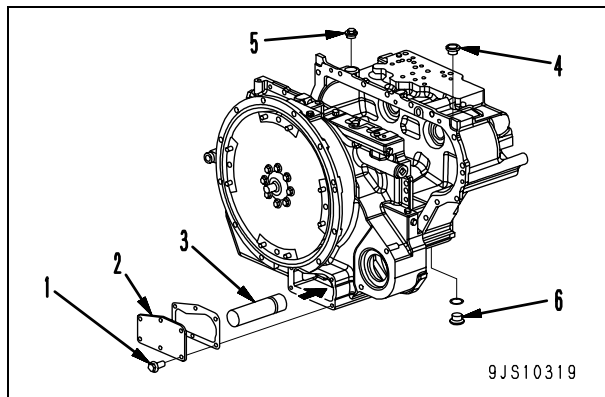
Install blind plug (5) and cap (4) to the transmission case.

3. Install drain plug (6).

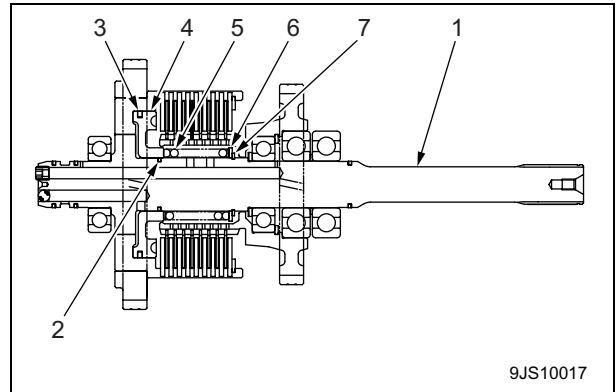
- ⌘ Tightening torque of drain plug:
118 – 162 Nm {12 – 16.5 kgfm}

4. Installation of strainer

Fit the O-ring to strainer (3) and put it in the case and then install plate (2) with bolts (1) through the gasket.

**5. Input shaft sub-assembly**

- 1) Fit seal (2) to shaft assembly (1) and install piston (4) fitted with seal (3).
 - 2) Install spring (5) and washer (6) and fix them with snap ring (7).
- ★ When installing the snap ring, use special tool **A** and push in the washer and spring.



- 3) Install clutch discs (8) and plates (9) and fix them with ring (10).

4) Installation of gear

Put the bearing in gear (11) and install them to the shaft.

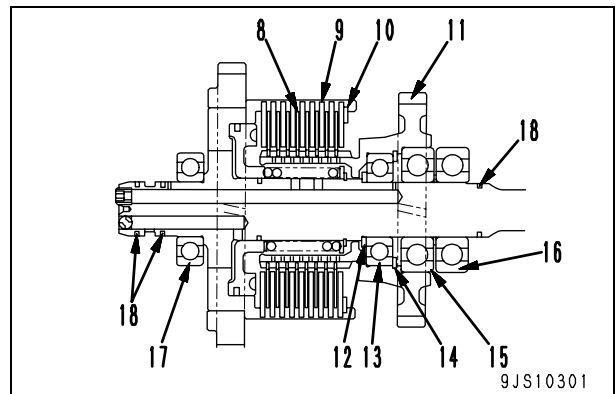
- ★ Pass the spline of gear (11) through all clutch discs (8).

- 5) Fit washer (12) to the shaft, install bearing (13), and fix them with snap ring (14).

- 6) Install bearing (15), (16) and (17).

- 7) Install seal ring (18).

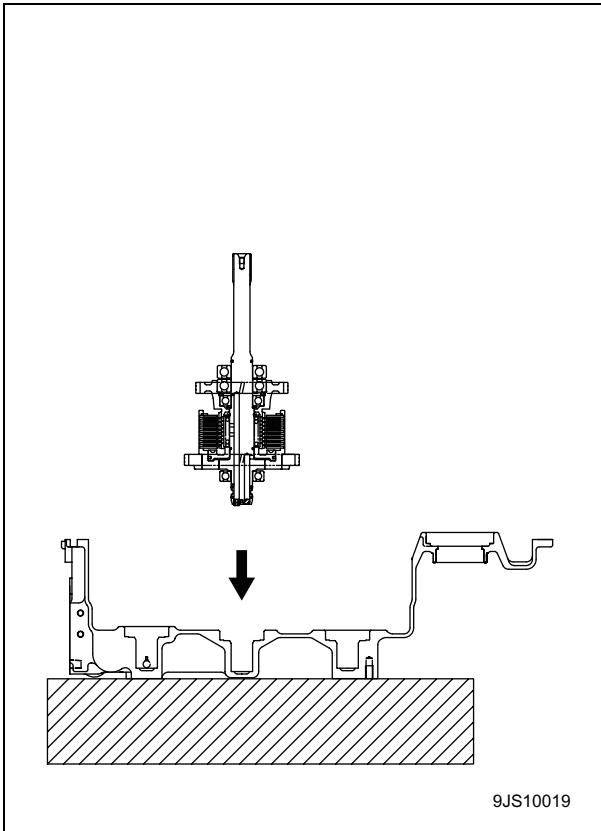
- ★ After installing the seal ring, apply engine oil round it.



- ★ Install the intermediate shaft sub-assembly and output shaft sub-assembly similarly to the input shaft sub-assembly.

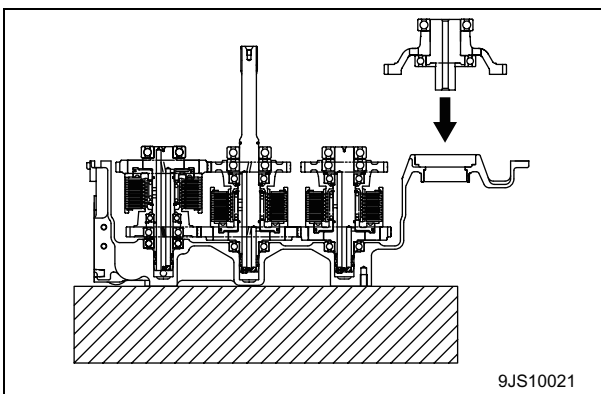
6. Installation of input shaft sub-assembly

Install the seal ring to the input shaft and install them into the transmission case.



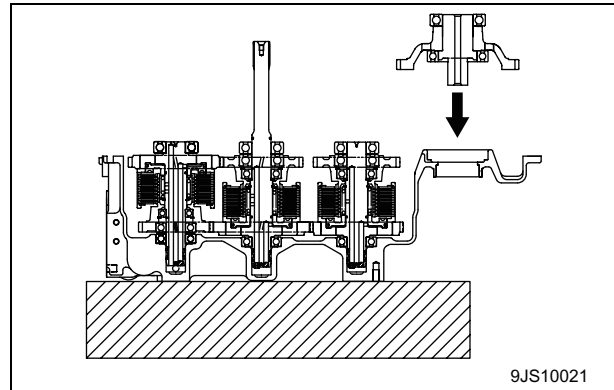
7. Installation of intermediate shaft sub-assembly

Install the intermediate shaft sub-assembly into the transmission case.



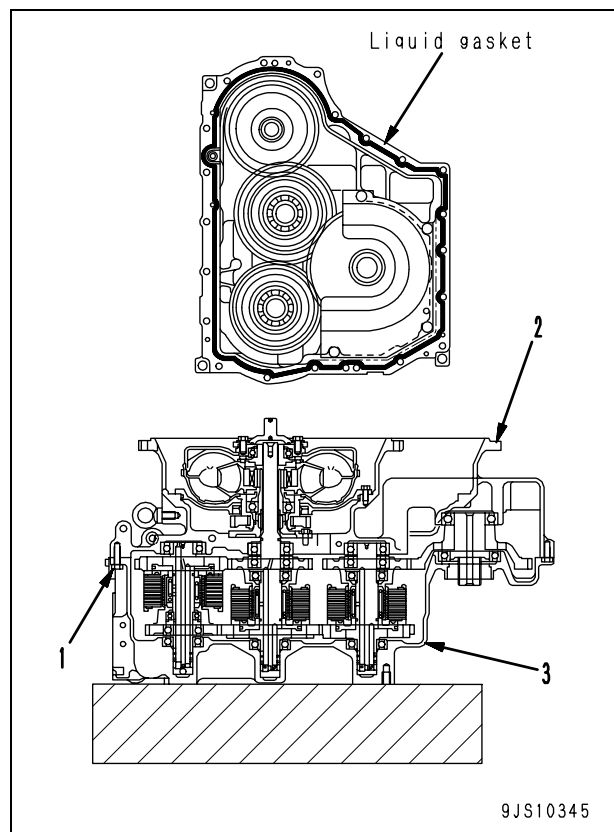
8. Output shaft

Install the output shaft sub-assembly into the transmission case.



9. Installation of torque converter

Apply gasket sealant to the torque converter joint face of the transmission case and install torque converter (2) and transmission case (3) with bolts (1).



10. Installation of transmission valve

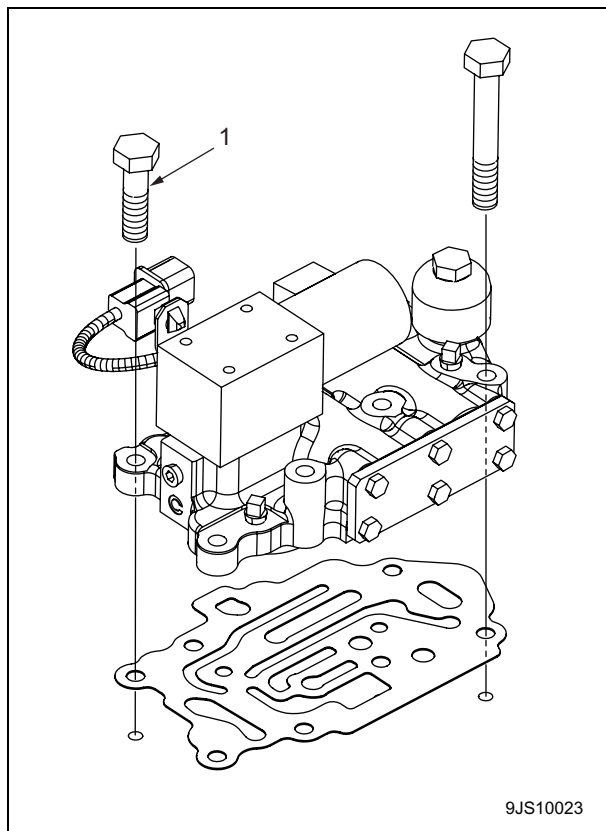
Install the transmission valve with bolts (1) through the gasket.

 Mounting bolt:

27 – 34 Nm {2.8 – 3.5 kgfm}

11. Installation of torque converter cooler filter

Install the oil filter and piping.



Disassembly and assembly of torque converter

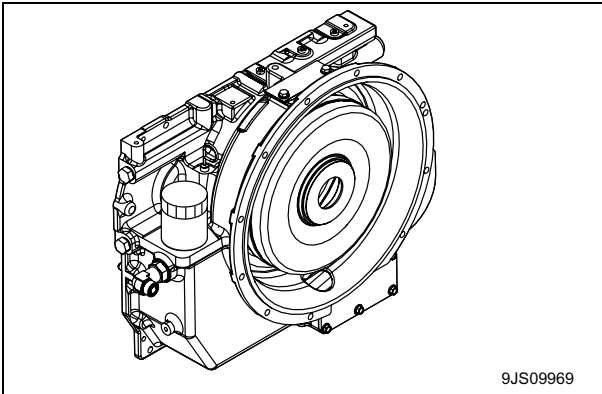
Clean the outside of the torque converter and then disassemble and assemble the torque converter in a clean place according to the following procedure.

Disassembly

1. Removal of torque converter assembly

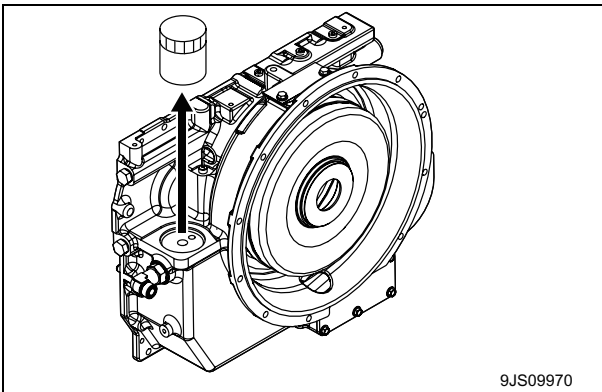
Drain the oil from the transmission and then remove the torque converter assembly from the transmission assembly.

- ★ For disassembly and assembly of the transmission, see Disassembly and assembly, Power train, "Disassembly and assembly of transmission", page 50-300-10.



2. Removal of oil filter

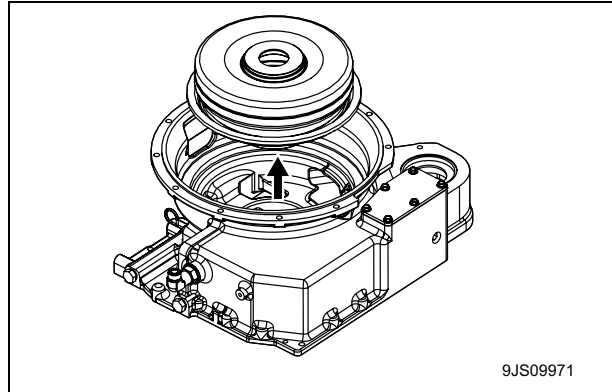
Using the filter wrench, remove the oil filter from the housing.



3. Removal of torque converter

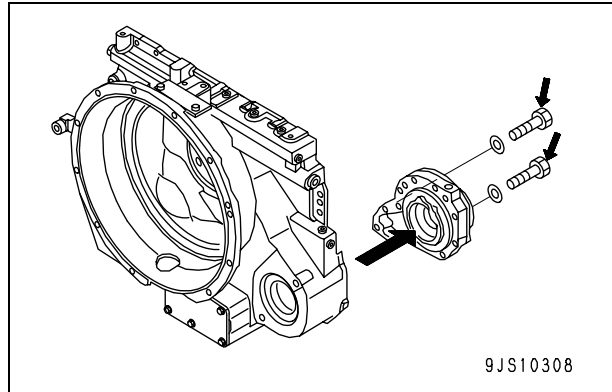
Pull out the torque converter straight slowly from the housing.

- ★ Take care not to scratch the oil seal and sealing parts of the gear pump.



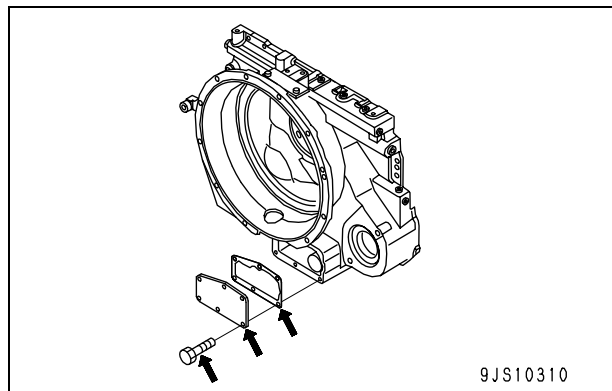
4. Removal of gear pump

Remove all the pump mounting bolts.

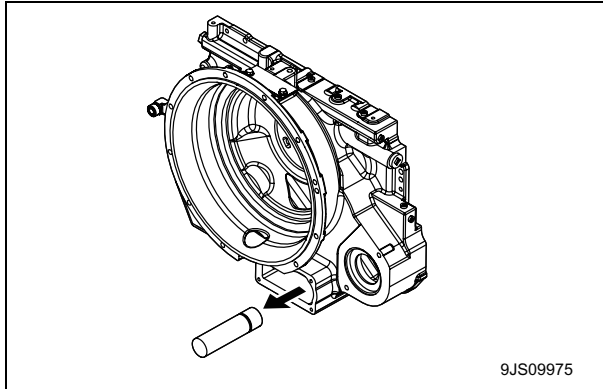


5. Removal of strainer assembly

- 1) Remove all the strainer cover mounting bolts and then remove the cover and gasket.



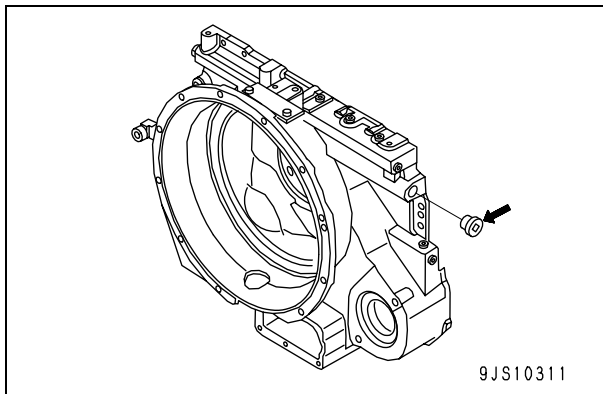
- 2) Pull out the strainer assembly from the housing.
★ Take care not to damage the O-ring fitted to the strainer assembly.



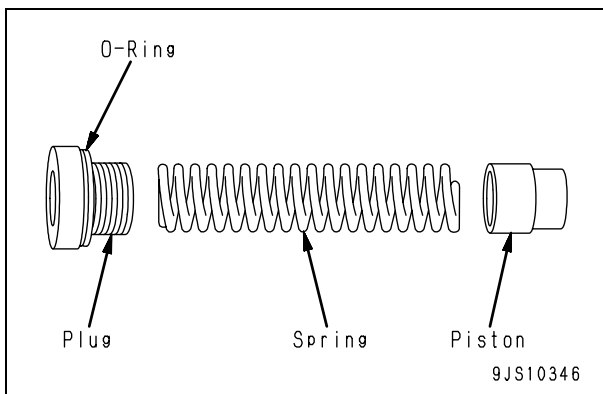
6. Removal of main relief valve

- 1) Remove the main relief valve plug.

⚠ The plug may be shot out by the spring in the valve. Be careful when handling the valve.



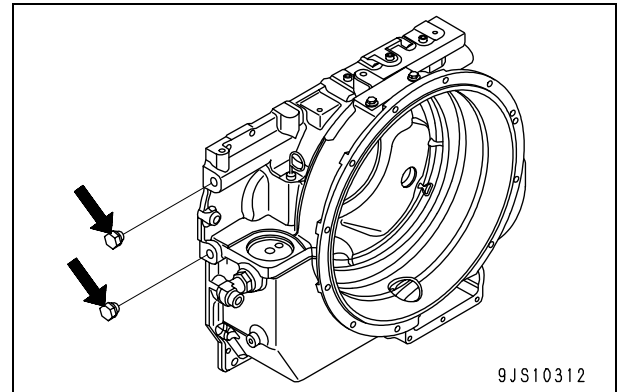
- 2) Pull out the piston and spring from the plug.



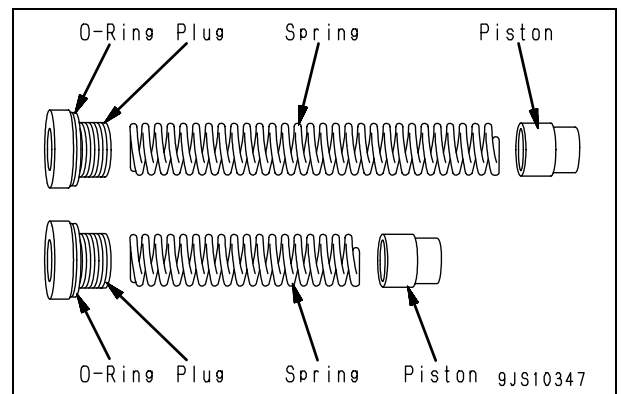
7. Removal of torque converter inlet relief valve and lubricating oil relief valve

- 1) Remove the plugs of the torque converter inlet relief valve and lubricating oil relief valve.

⚠ The plug may be shot out by the spring in the valve. Be careful when handling the valve.

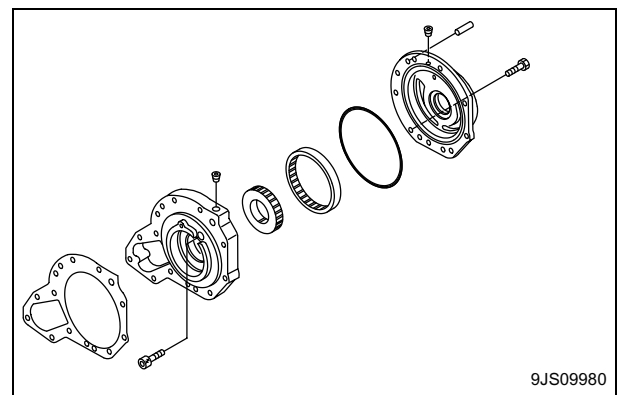


- 2) Pull out the piston and spring from each plug.



8. Disassembly of gear pump

⚠ Disassemble the gear pump to the necessary minimum.



20-26Nm
{2-2.7køfm}

7

10

4

1

21

40

41

22

59-74Nm
{6-7.5køfm}

49-64Nm
{5-6.5køfm}

49-64Nm
{5-6.5køfm}

34

35

38

37

39

43

42

42

19

24

20

12

14

44

15

24

29

30-36Nm
{3.1-3.7køfm}

23

2

18

17

16

11

12

42

42

42

45

28

25

27

26

3

8

9

13

6

5

20-26Nm
{2-2.7køfm}

10

10

20-26Nm
{2-2.7køfm}

60-80Nm
{6-8.2køfm}

33

32

31

30

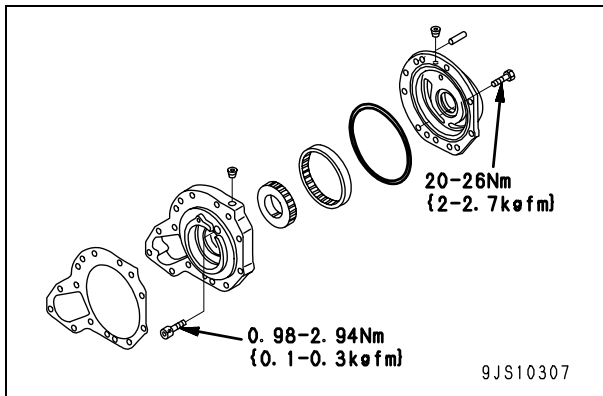
1. Torque converter circuit
2. Gear pump assembly
3. Housing
4. Cover
5. Oil seal
6. Gear
7. O-ring
8. Stator support
9. Seal ring
10. Bolt
11. Gear
12. Bearing
13. Snap ring
14. Idler shaft
15. Bolt
16. Gear
17. Bearing
18. Bearing
19. Cover
20. Bolt
21. O-ring
22. Bolt
23. Bolt
24. Washer
25. Strainer
26. Cover
27. Gasket
28. Plug
29. Bolt
30. Plug
31. O-ring
32. Pressure spring
33. Piston
34. Plug
35. O-ring
36. Pressure spring
37. Piston
38. Pressure spring
39. Filter
40. Guide
41. Input plate assembly
42. Plug
43. Nipple
44. Washer
45. Plug

Assembly

Carry out assembly in the reverse order to disassembly, while observing the following.

- Clean the removed parts in clean oil and remove all foreign matter.
In particular, clean the oil grooves and oil passages carefully.
- Replace the removed O-rings, oil seals and gaskets with new ones.
- Referring to the inspection items in the maintenance standard, take care not to make an assembly trouble.
- When replacing an oil seal with new one, apply semi-dry gasket (e.g. THREEBOND No. 1211, No. 1104) around the new one. Do not apply the semi-dry gasket to the lip and shaft sliding surface, however.

1. Assembly of gear pump



2. Installation of main relief valve

Insert the piston (take care of its inserted direction) and spring and tighten plug (30).

Plug: **60 – 80 Nm {6.1 – 8.2 kgfm}**

3. Installation of torque converter inlet relief valve and lubricating oil relief valve

Insert the piston (take care of its inserted direction) and spring and tighten plug (34).

(Different springs are used for the torque converter inlet valve and lubricating oil valve. Take care not to mistake them when installing.)

Mounting bolt:

49 – 64 Nm {5 – 6.5 kgfm}

4. Installation of gear pump

Install the gear pump and tighten bolts (23).

- ★ When installing the gear pump, match the notch at the end of gear (16) to the position of the gear pump.

Mounting bolt:

30 – 36 Nm {3.1 – 3.7 kgfm}

5. Installation of torque converter

Insert the torque converter slowly, while taking care not to break or scratch the oil seal and seal ring.

Fill to 1/3 – 1/2 of the space between the oil seal lips with lithium grease or apply clean hydraulic oil. Tighten bolts (10).

Mounting bolt:

20 – 26 Nm {2 – 2.7 kgfm}

6. Installation of torque converter assembly

Install the torque converter assembly to the transmission.

- ★ For disassembly and assembly of the transmission, see Disassembly and assembly, Power train, "Disassembly and assembly of transmission", page 50-300-10.

7. Installation of snap ring

Install the snap ring to the groove at the shaft end.

- ★ For disassembly and assembly of the transmission, see Disassembly and assembly, Power train, "Disassembly and assembly of transmission", page 50-300-10.

8. Installation of input plate

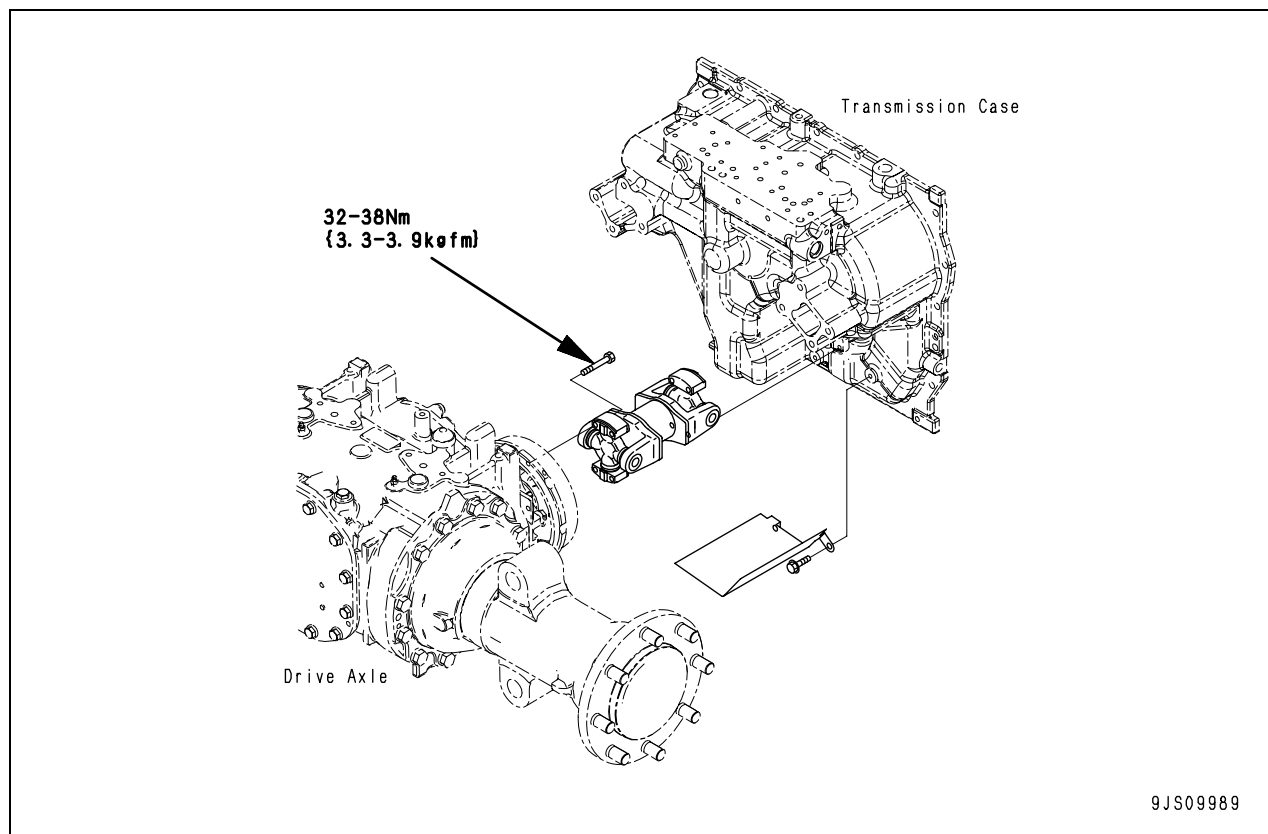
Install guide (40), O-ring (21) and input plate (41).

Mounting bolt:

59 – 74 Nm {6 – 7.5 kgfm}

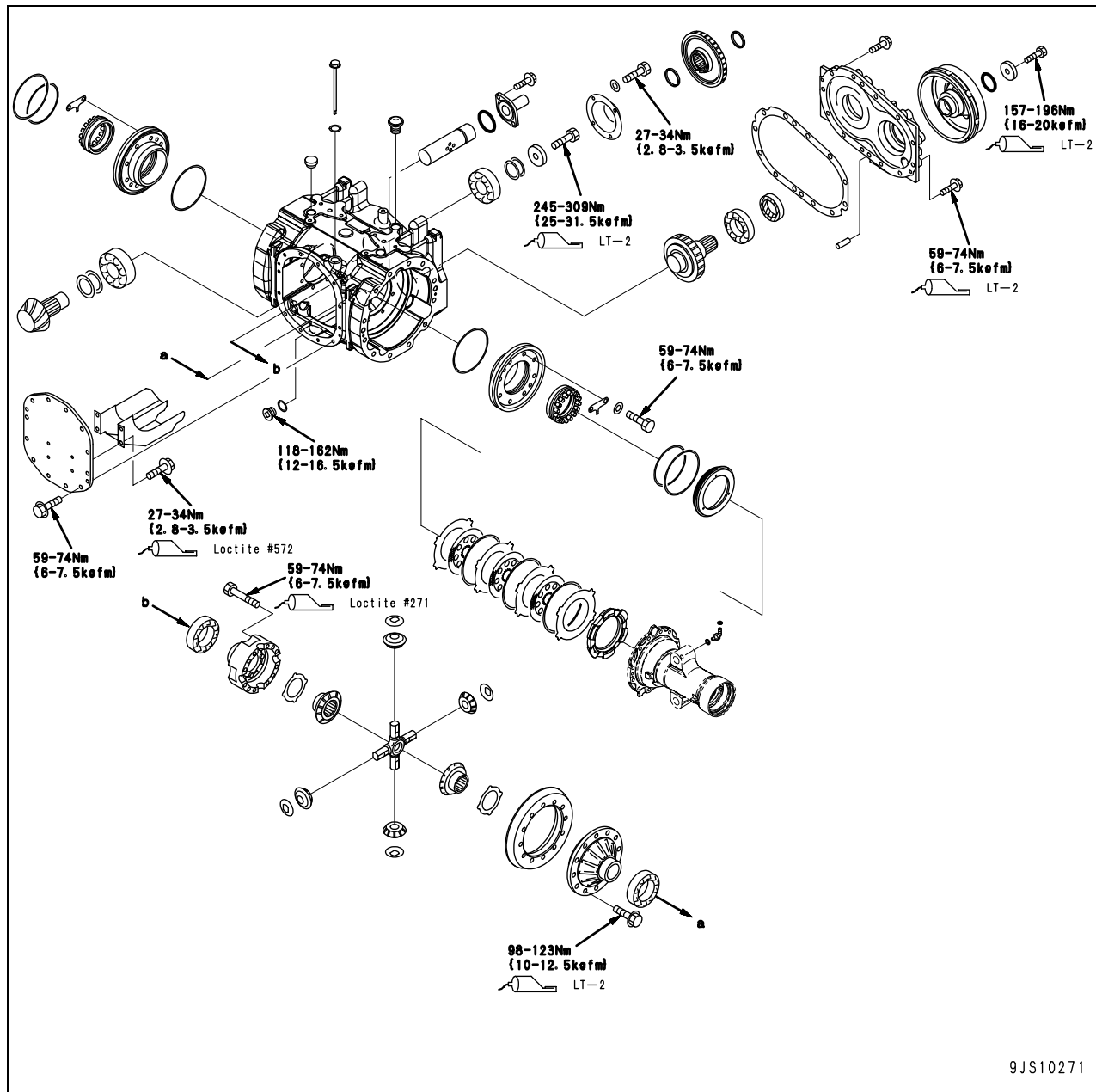
- ★ For disassembly and assembly of the transmission, see Disassembly and assembly, Power train, "Disassembly and assembly of transmission", page 50-300-10.

Disassembly and assembly of drive shaft



Disassembly and assembly of differential

Disassembly and assembly



9JS10271

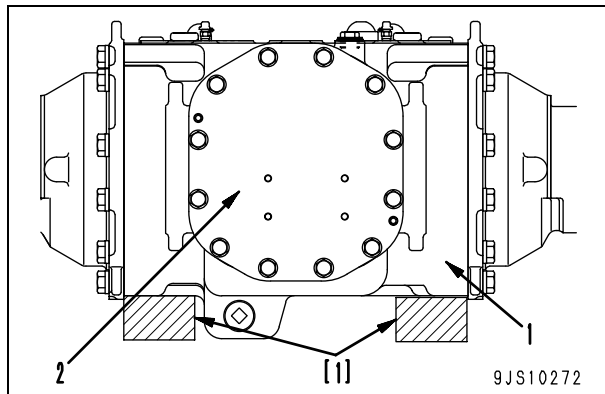
Disassembly**1. Axle housing assembly**

- 1) Remove the right and left axle housing assemblies. For detail, see Disassembly and assembly, Power train, "Disassembly and assembly of axle housing assembly", page 50-300-34.

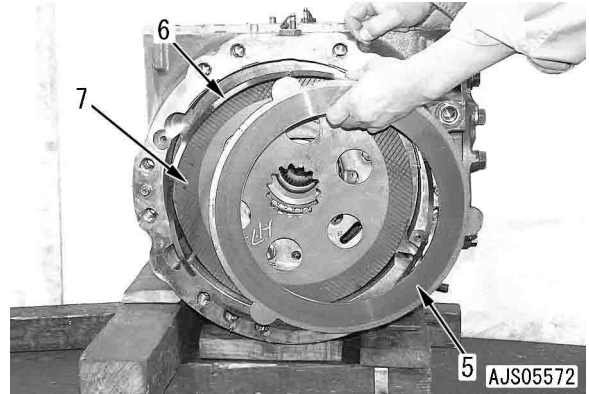
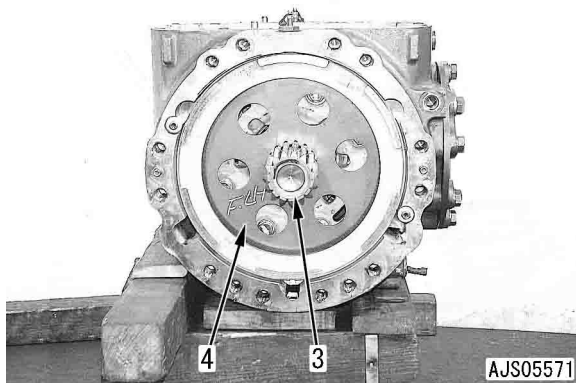


Axle housing assembly: **285 kg**

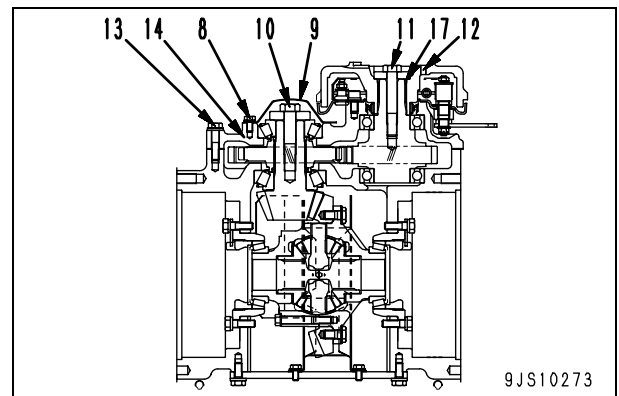
- 2) Place differential assembly (1) on blocks [1] and stabilize it.
 - 3) Remove differential cover (2).
- ★ Use forcing screws.

**2. Brake**

- 1) Remove shaft (3).
 - 2) Remove outer plate (4).
- ★ The outer plate is on the axle housing side.
- 3) Remove disc (7), spring (6) and plate (5).
- ★ Make marks on the right-hand and left-hand parts so that they will not be mistaken.

**3. Transfer case**

- 1) Remove bolts (8) and cover (9).
 - 2) Remove bolt (10).
- ★ Use the tap holes of drum (12) to lock.
- 3) Remove bolt (11) and remove parking brake drum (12) and O-ring (17).
- ★ Use the tapped holes of drum (12) to lock.
- ★ When removing the oil seal on the transfer case side, take extreme care not to damage the oil seal mounting portion.
- 4) Remove bolt (13) and tighten a forcing screw to remove transfer case (14).
- ★ When removing the sleeve on the drum side, take extreme care not to damage the machined surface of the drum.



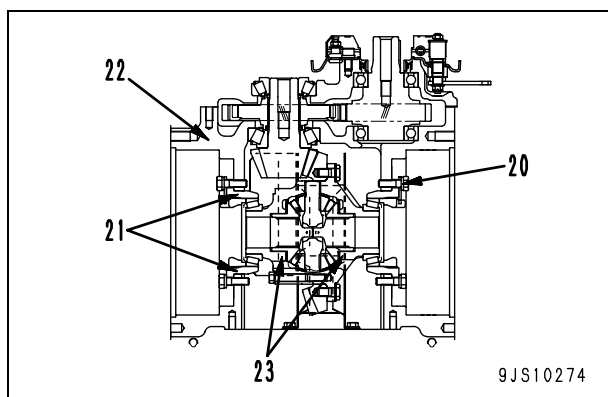
4. Bearing carrier

Remove bolts (20). While raising the differential assembly, tighten a forcing screw to remove bearing carrier (21).

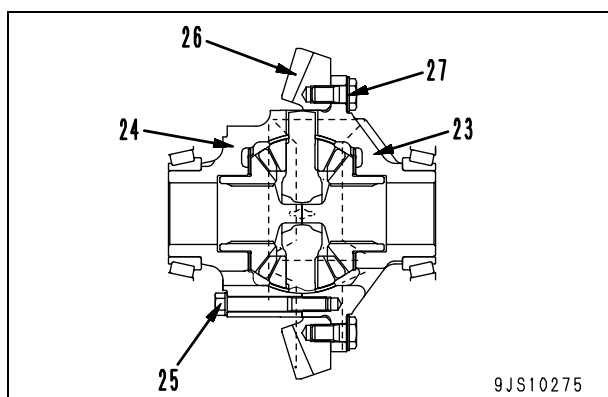
★ Make marks on the right and left bearing carriers so that they will not be mistaken.

5. Differential assembly

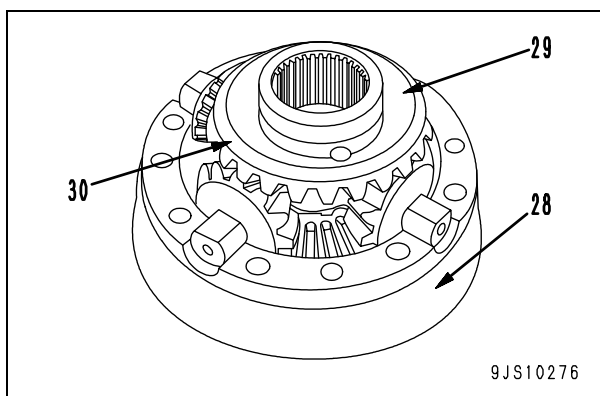
- 1) Remove differential assembly (23) from differential housing (22).



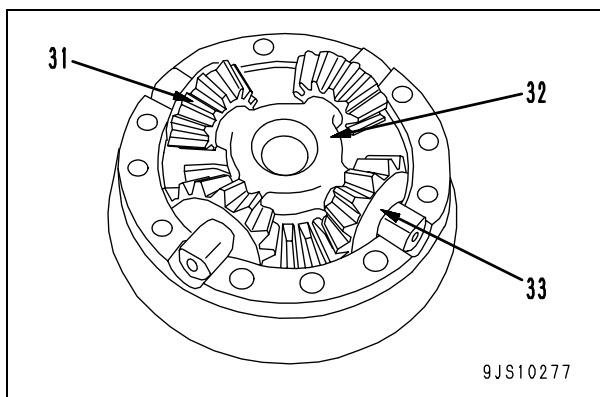
- 2) Remove bolts (27) and remove bevel gear (26) from differential assembly (23).
- 3) Remove bolts (25) and remove small case (24) from the differential assembly.



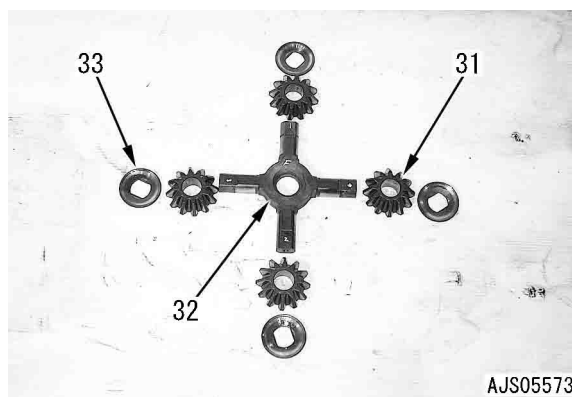
- 4) Remove thrust washer (29) from large case (28) and remove side gear (30).



- 5) Remove pinion gear (31), spider shaft (32) and spherical bushing (33) together.

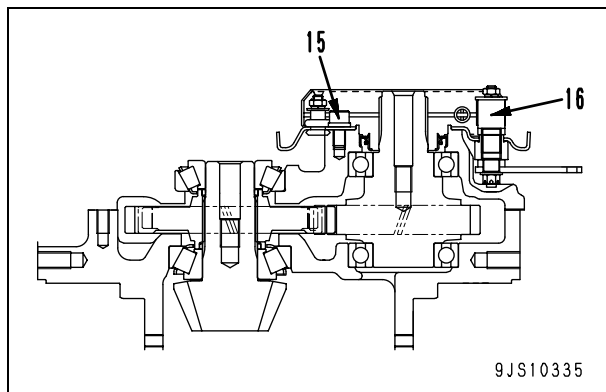


- 6) Remove spherical washer (33) and pinion gear (31) from removed spider shaft (32).

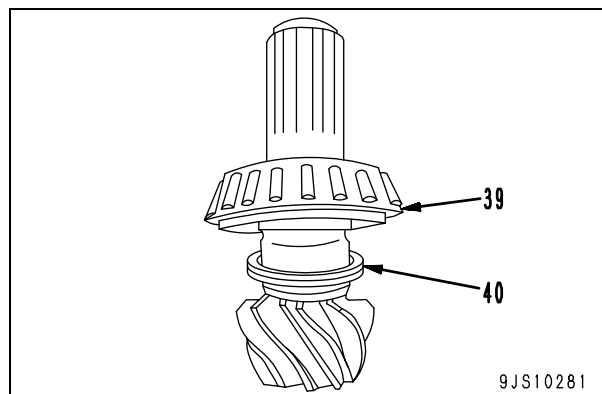


6. Parking brake

Remove bolts (15) and parking brake (16).



3) Remove bearing (39).

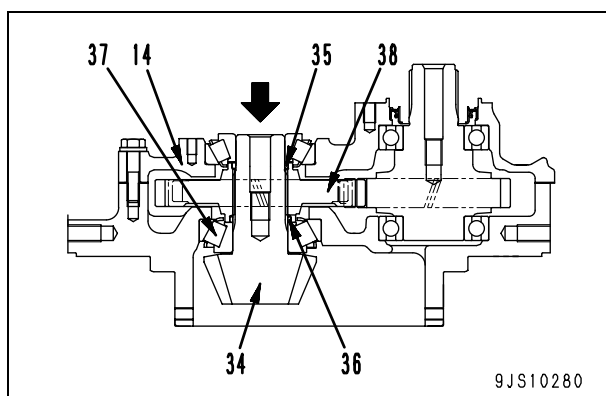


7. Pinion shaft

1) Using a press, pull pinion shaft (34) out of transfer case (14).

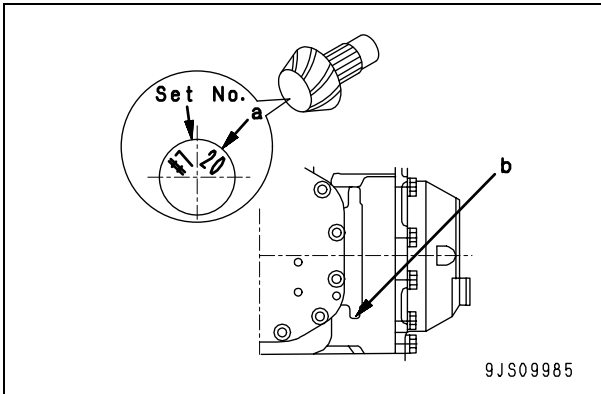
★ Since the pinion shaft may fall and its teeth may be damaged, spread a cloth etc. under it.

2) Remove spacers (35) and (36), transfer gear (38) and bearing (37) from pinion shaft (34).

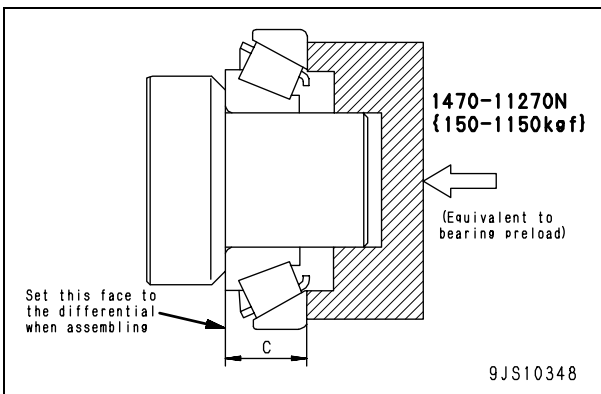


Assembly**1. Adjustment of pinion shaft shim**

- 1) Dimension difference **a**
Read indicated value **a** at the pinion shaft end.
- 2) Dimension difference **b**
Read stamp **b** on the case.



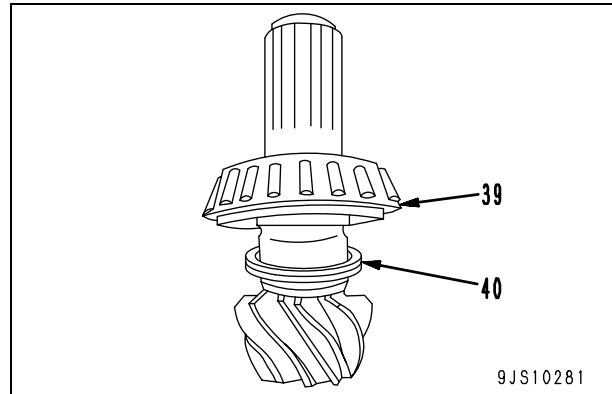
- 3) Dimension difference **c**
Measure dimension **c** and indicate its difference from the standard dimension of 27.44 mm by the unit of 1/100.
★ The dimension may be calculated on the assumption that it is almost constant, considering the accuracy of the bearing. Use the following value in this case. However, if the tooth contact mark is not obtained, assemble again.
c = 10 mm



- 4) Calculation of shim thickness **S₁**
Substitute the values of dimension differences **a**, **b** and **c** obtained above for **a**, **b** and **c** in the following expression to calculate shim thickness **S₁**.

$$S_1 = 0.65 + \frac{a + b + c}{100}$$

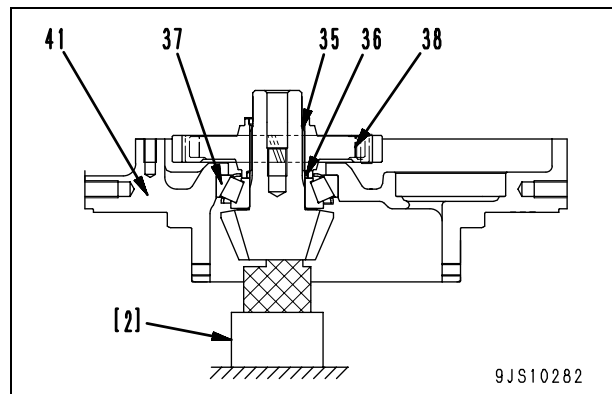
- 5) Insert shim (40) and press fit bearing (39).



★ Check that there is not a gap between the mating faces.

2. Installation of pinion shaft

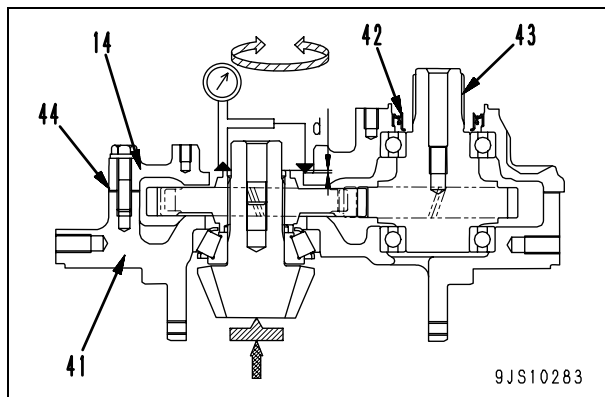
- 1) Install outer race (37) to differential housing (41).
- 2) Set differential housing (41) as shown below.
- 3) Insert the pinion shaft assembly from the center side of the housing.
★ Support the pinion with jack [2] so that it will not fall after the pinion shaft assembly is inserted.



- ★ Apply oil to the large flange of the inner race.
- 4) Using the jig, install oil seal (42) to transfer case (14).
Jig: 972-EC-579-1000
The oil seal is the same part as parking brake sleeve (18).
Remove only the oil seal and install it.
- ★ Direct the oil seal as shown in the figure.
- 5) Install spacer (36), transfer gear (38) and spacer (35).
- 6) Press fit the ball bearings to both sides of shaft mounted gear (43) and then install them to the differential housing (41).
- 7) Set gasket (44) and install transfer case (14).

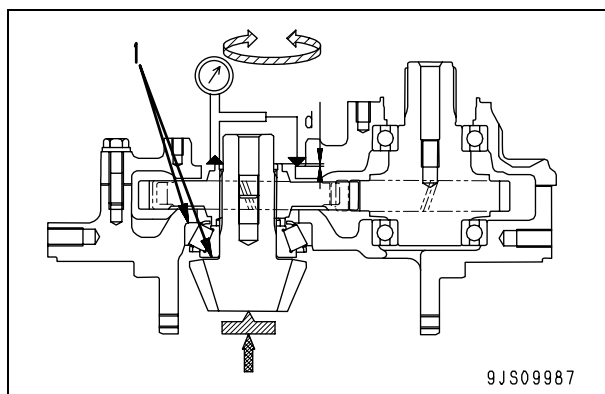
⌘ Mounting bolt:

59 – 74 Nm {6 – 7.5 kgfm}



3. Adjustment of preload on pinion bearing

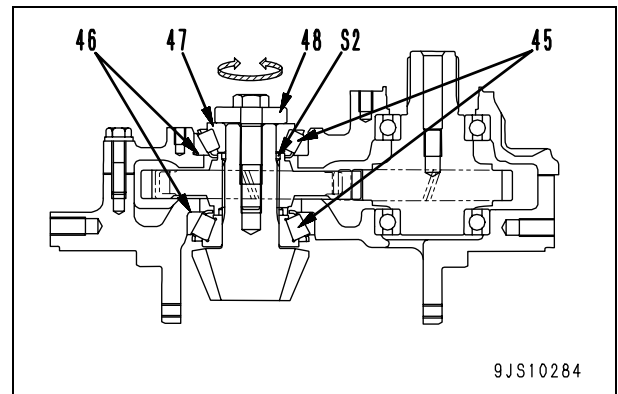
- 1) Measurement of level difference **d**
 - 1] Press the pinion shaft from below to fix.
 - 2] Rotate the bearing about 10 turns each to the right and left to fit.
 - 3] Measure level difference **d**
 - ★ There must not be a gap in (1).



- 2) Calculation of shim thickness **S₂**
 - 1] Calculate shim thickness **S₂** from dimension **d** measured above.

$$S_2 = 2.26 - d$$

- 2] Select shims so that measured level difference **S₂** will be obtained.
- 3) Assembly
Install shim (S₂) selected above and bearing inner race (47) and then install holder (48) and tighten the bolts.



- ★ Apply oil to bearing (45).
- ★ There must not be a gap in (46).
- ★ Install parking brake drum (12) temporarily to lock rotation by using the bolt holes.

⌘ Mounting bolt:

245 – 309 Nm {25 – 31.5 kgfm}

⌘ Mounting bolt: **Adhesive LT-2**

- 4) Tighten the bolt to the specified torque and then rotate the bearing 20 turns each to the right and left to fit.
- 5) If bearing starting torque **T** is not in the following range, disassemble and adjust the shim thickness again.

Starting torque

5.78 – 11.08 Nm {0.59 – 1.13 kgfm}

- ★ If starting torque **T** is larger than 11.08 Nm {1.13 kgfm}, increase the shim thickness.
- ★ If starting torque **T** is smaller than 5.78 Nm {0.59 kgfm}, decrease the shim thickness.

4. Parking brake

- 1) Install parking brake (16) and tighten bolts (15).

🔧 Mounting bolt:

59 – 74 Nm {6 – 7.5 kgfm}

🔧 Mounting bolt: **Adhesive LT-2**

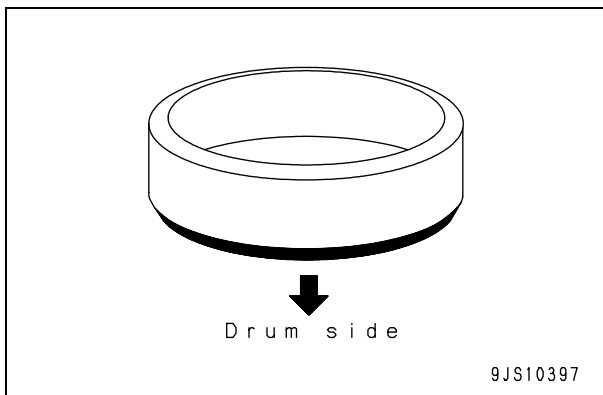
- 2) Using the jig, Insert sleeve (18) in parking brake drum (12).

Jig: 972-EC-579-0000

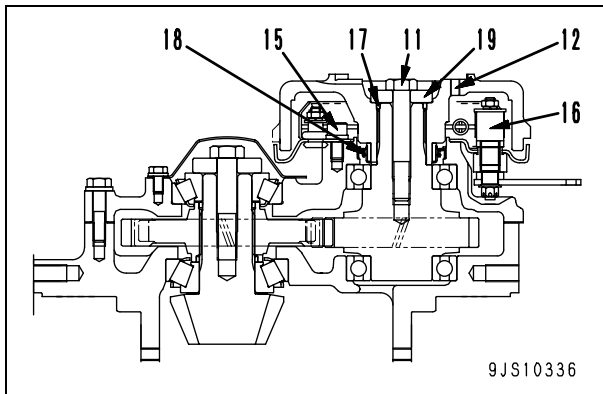
The sleeve is the same part as transfer case oil seal (42).

Remove only the sleeve and install it.

- ★ Insert the sleeve until it stops.
- ★ Clean the press fitting section and do not use oil etc.
- ★ Direct the sleeve as shown in the figure.



- 3) Install drum (12), O-ring (17) and holder (19), and then tighten bolt (11).



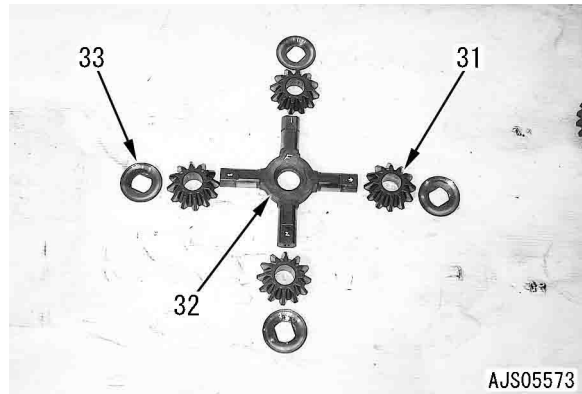
🔧 Mounting bolt:

157 – 196 Nm {16 – 20 kgfm}

🔧 Mounting bolt: **Adhesive LT-2**

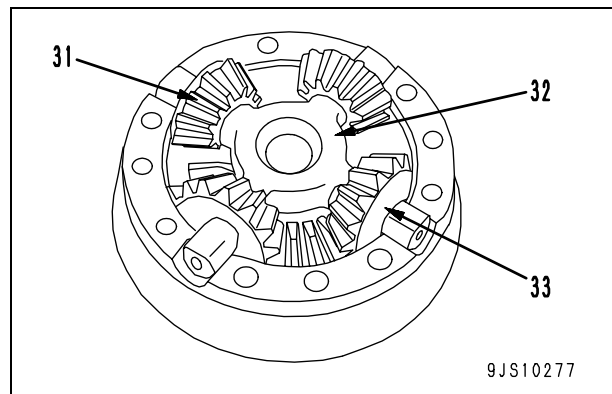
5. Differential case assembly

- 1) Install pinion (31) and spherical washer (33) to shaft (32).

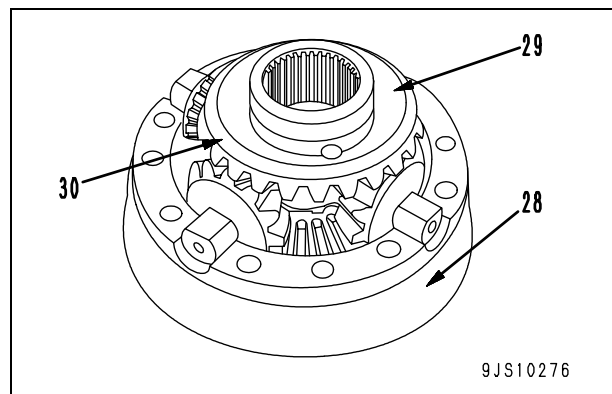


- 2) Install thrust washer (29) and side gear (30) and then install the upper shaft assembly together.

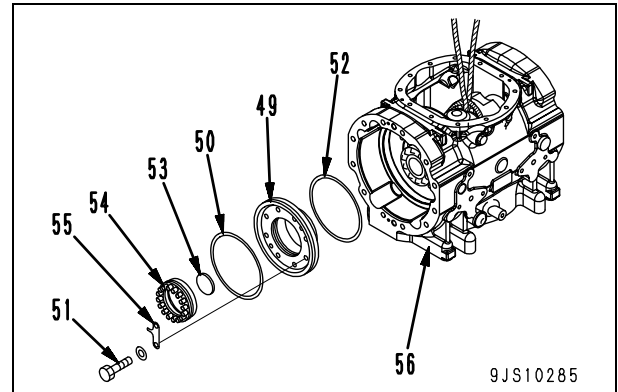
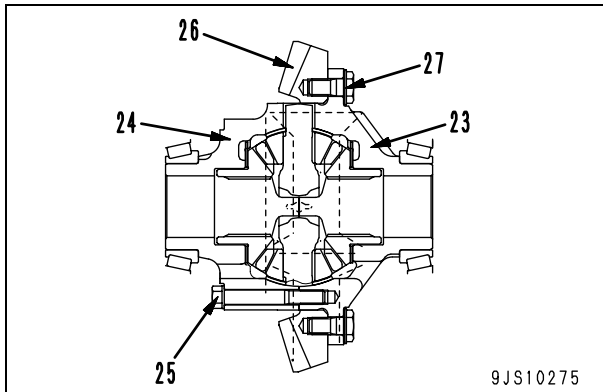
- ★ Install thrust washer (29), while matching its claw to the groove of the case.



- 3) Install side gear (30) and thrust washer (29).



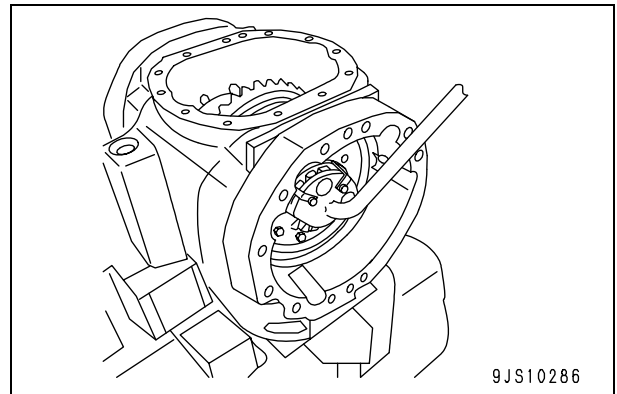
- 4) Install case (24) and tighten bolts (25).
 - ★ Match the groove of case (24) to the claw of thrust washer (29).
 -  Mounting bolt:
59 – 74 Nm {6 – 7.5 kgfm}
 -  Mounting bolt: **LOCTITE #271**
- 5) Install bevel gear (26) and tighten bolts (27).
 -  Mounting bolt:
98 – 123 Nm {10 – 12.5 kgfm}
 -  Mounting bolt: **Adhesive LT-2**



- ★ Use special tool **A** to tighten adjustment screw (54).

Special tool **A**

3EC-97-99150



6. Adjustment of differential and bearing

- 1) Sling the differential case assembly and put it in differential housing (56).
- 2) Fit O-ring (52) and seal (50) to carrier (49), install them to each side of differential housing (56), and tighten bolts (51).
 -  Mounting bolt:
59 – 74 Nm {6 – 7.5 kgfm}
- 3) Install bearing outer race (53) and screw (54) temporarily.
- 4) Tighten screw (54) on the bevel gear back side lightly so that the backlash (55) will be 0 (zero).
- 5) Tighten screw (54) on the bevel gear tooth surface side.
- 6) Loosen screw (54) on the bevel gear back side so that the backlash will be 0.15 – 0.23.

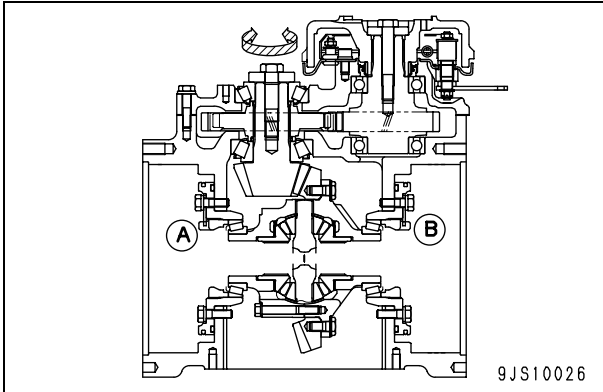
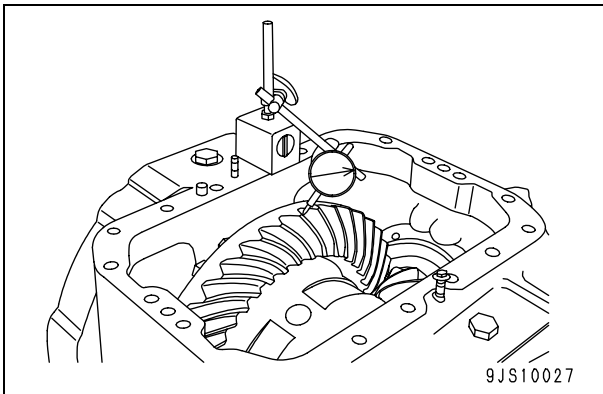
- 7) Tighten screw (54) on the bevel gear tooth surface side (A).
After tightening, rotate the bearing about 10 turns each to the right and left to fit.
- 8) Adjust the tightness of screw (54) so that the starting torque of the bevel pinion will be 0.49 – 1.86 Nm {0.05 – 0.19 kgfm} larger than the torque measured "T" in 3. 5).
 - ★ Starting torque of bevel pinion =
 $T + 0.49 - 1.86 \text{ Nm } \{0.05 - 0.19 \text{ kgfm}\}$

7. Adjustment of backlash of bevel gear

- 1) After adjusting the differential bearing, measure the backlash of the bevel gear.

Backlash between ring gear and pinion gear	0.15 – 0.23 mm
--	----------------

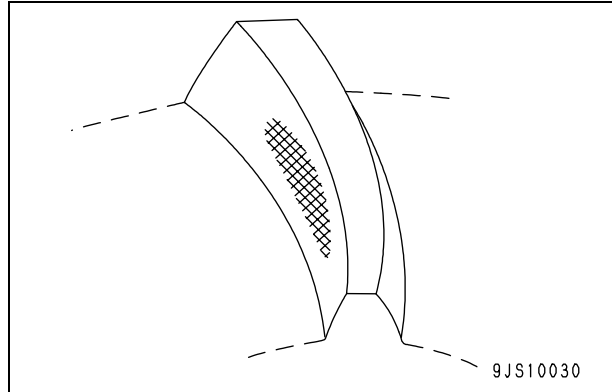
- 2) If the backlash is out of the standard range, adjust it again.
 - ★ If the screw on either side is loosened, tighten the screw on the opposite side by the same number of notch.

**8. Adjustment method of backlash of bevel gear**

- 1) After finishing adjustment, check again that the starting torque of the differential side bearing is in the standard range.
- 2) After finishing adjustment, install lock plate (55) to lock the screw. (Both sides)
 - ★ To install the lock plate, remove carrier mounting bolt (2).
 - ★ Remove the bolt that is closest to the groove of the screw.
 - Mounting bolt:
59 – 74 Nm {6 – 7.5 kgfm}

9. Check of tooth contact

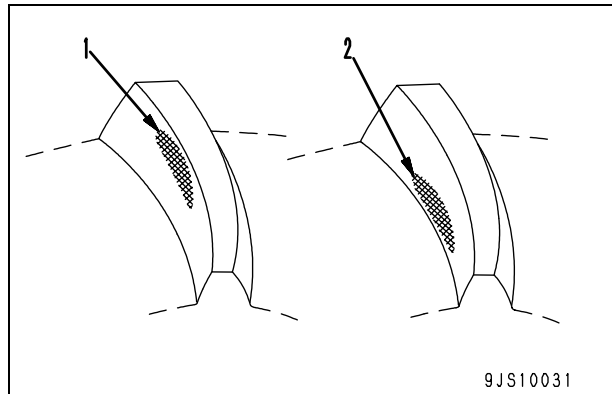
- 1) Thinly apply red lead to the bevel gear tooth surfaces.
- 2) Rotate the bevel gear in the forward and reverse directions several turns.
- 3) Judge the tooth contact by the pattern made on the tooth surface.
- 4) If the tooth contact is improper, adjust the shim thickness.



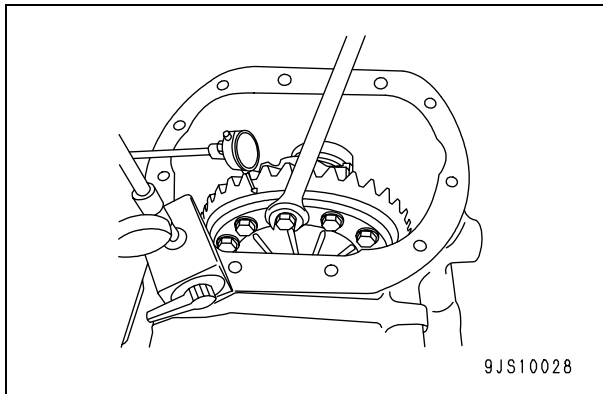
- **Proper tooth contact (no load)**

The tooth contact pattern must be at the center of the tooth and must be even in the tooth depth direction.

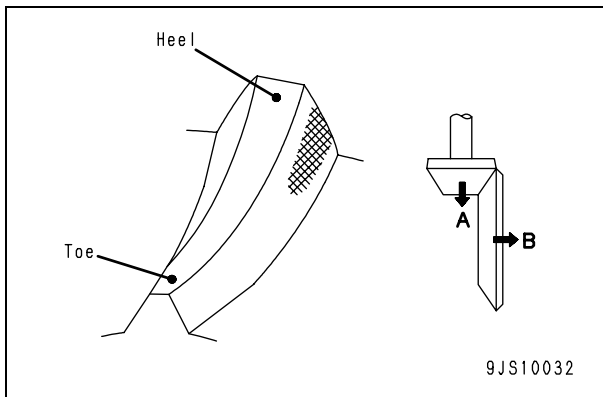
- ★ If there is strong tooth contact (1) at the tooth tip, increase the shim.
- ★ If there is strong tooth contact (2) at the tooth root, decrease the shim.



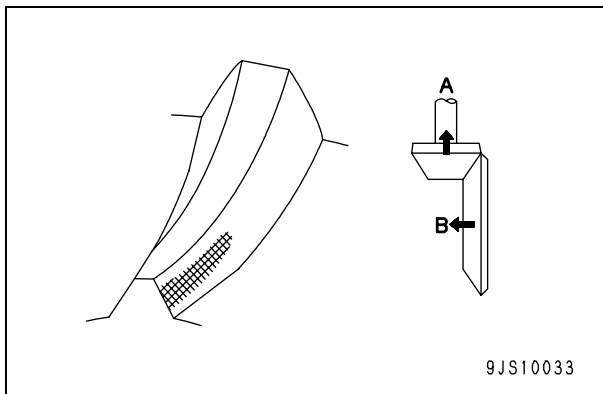
- ★ The tooth contact must be adjusted properly in both forward and reverse directions.

Bevel gear runout: Max. 0.1 mm**10. Correction of tooth contact**

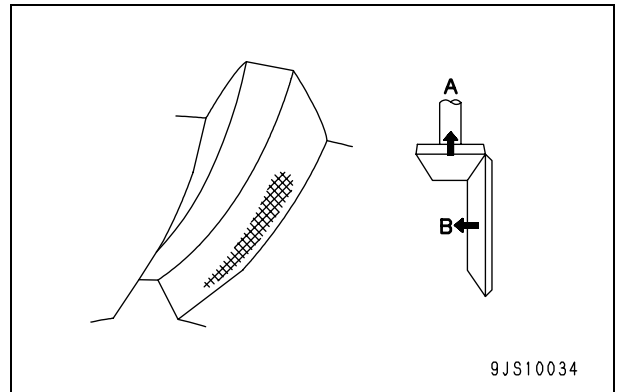
- Increase the pinion shaft shim to increase the projection of the pinion. (Direction **A**) Then, move the bevel gear far from the pinion (Direction **B**) to adjust the backlash.



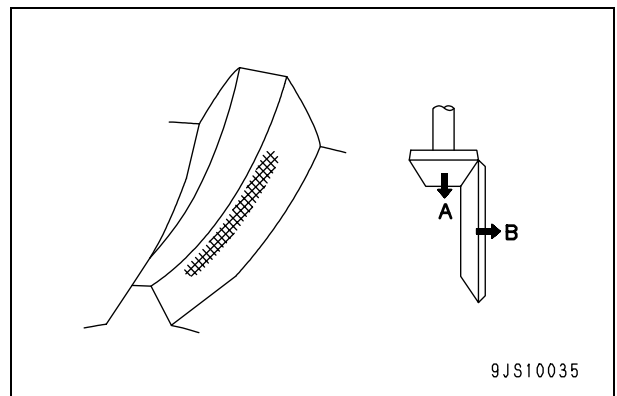
- Decrease the pinion shaft shim to decrease the projection of the pinion. (Direction **A**) Then, move the bevel gear near the pinion (Direction **B**) to adjust the backlash.



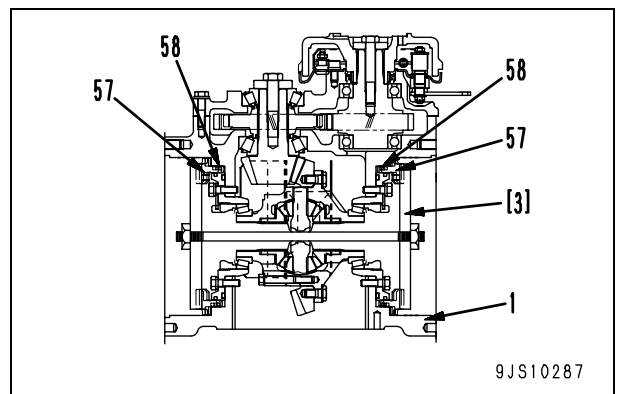
- Decrease the pinion shaft shim to decrease the projection of the pinion. (Direction **A**) Then, move the bevel gear near the pinion (Direction **B**) to adjust the backlash.



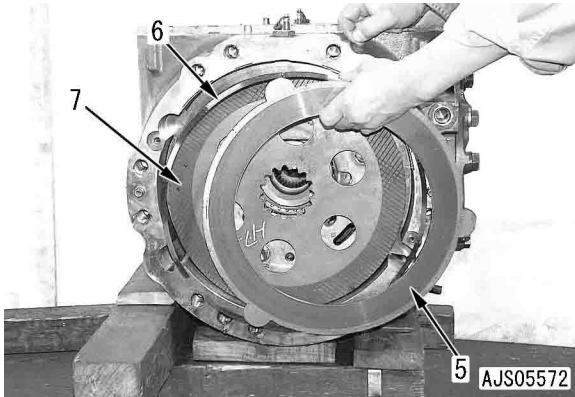
- Increase the pinion shaft shim to increase the projection of the pinion. (Direction **A**) Then, move the bevel gear far from the pinion (Direction **B**) to adjust the backlash.

**11. Assembly of brake**

- 1) Install seal (58) to piston (57) and install them to each side of differential housing (1).
 - ★ Since the piston seal is hard, apply engine oil to the sealing section.
 - ★ If jig [3] is prepared, the piston can be installed easily.

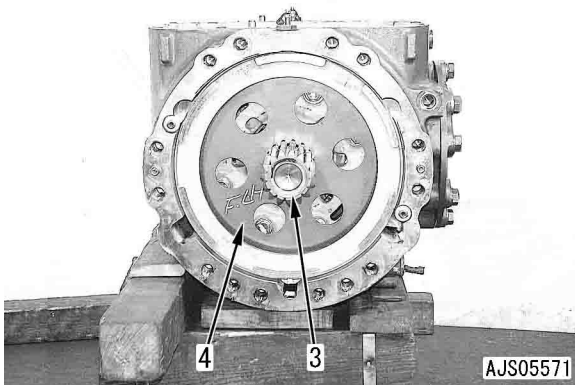


- 2) Install disc (7), spring (6) and plate (5).
 ★ Note that there are multiple discs, springs and plates.
 ★ When assembling, match the marks.



	Disc	Spring	Plate
3.5t/4t =	3 pieces	3 pieces	4 pieces
4.5t/5t =	4 pieces	4 pieces	5 pieces

- 3) Install shaft (3).



12. Installation of axle housing assembly

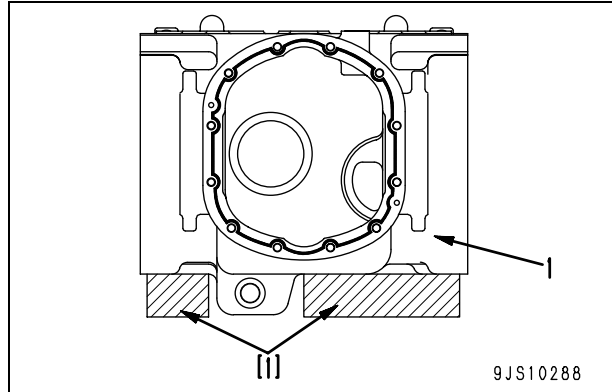
See "Disassembly and assembly of axle housing assembly".

13. Installation of differential front cover

- 1) Degrease, clean and air-dry the face to be coated with gasket sealant.
- 2) Apply gasket sealant 2 – 3 mm wide continuously as shown below.

Mounting bolt:

THREEBOND (TB1207B)

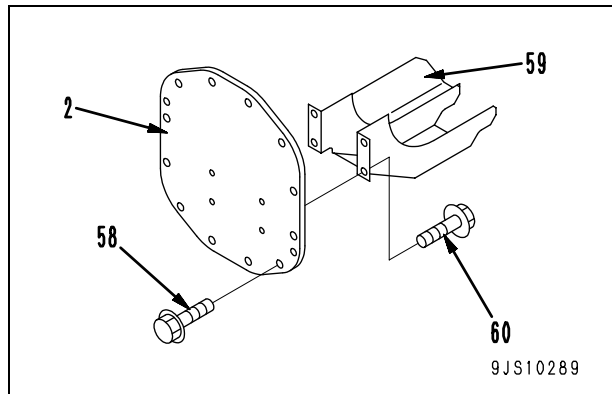


- 3) Install shroud (59) to front cover (2) and tighten bolts (60).

Mounting bolt:

27 – 34 Nm {2.8 – 3.5 kgfm}

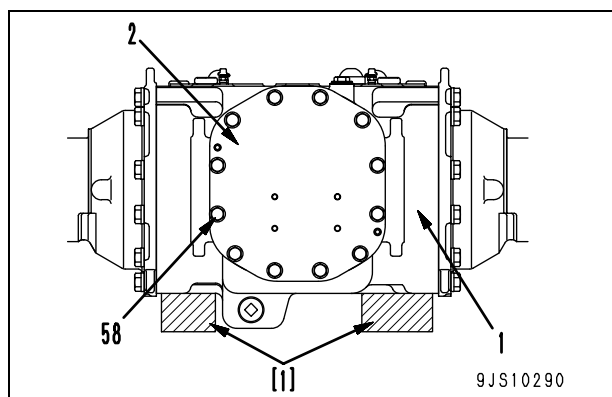
Mounting bolt: **LOCTITE #572**



- 4) Install front cover (2) to differential housing (1) and tighten bolts (58).

Mounting bolt:

59 – 74 Nm {6 – 7.5 kgfm}

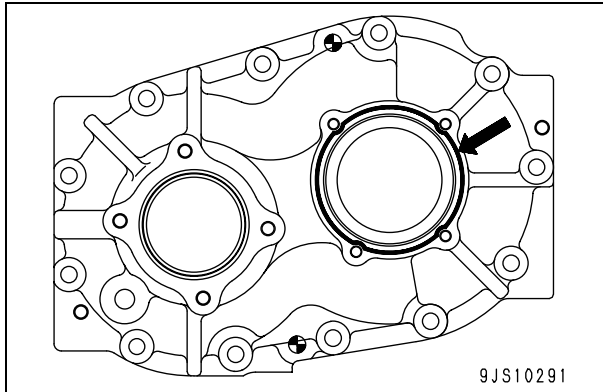


14. Installation of pinion shaft cover

- 1) Degrease, clean and air-dry the face to be coated with gasket sealant.
- 2) Apply gasket sealant 2 – 3 mm wide continuously as shown at right.

 Mounting bolt:

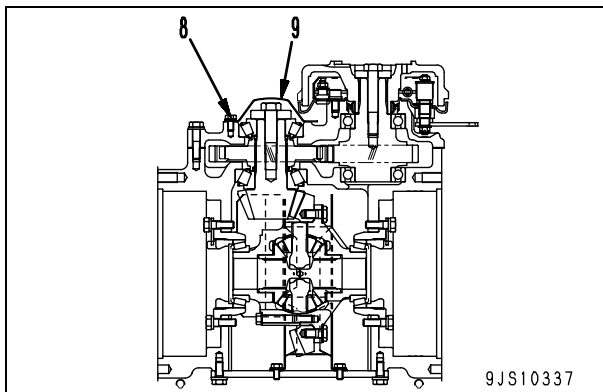
THREEBOND (TB1207B)



- 3) Install cover (9) and tighten bolts (8).

 Mounting bolt:

27 – 34 Nm {2.8 – 3.5 kgfm}



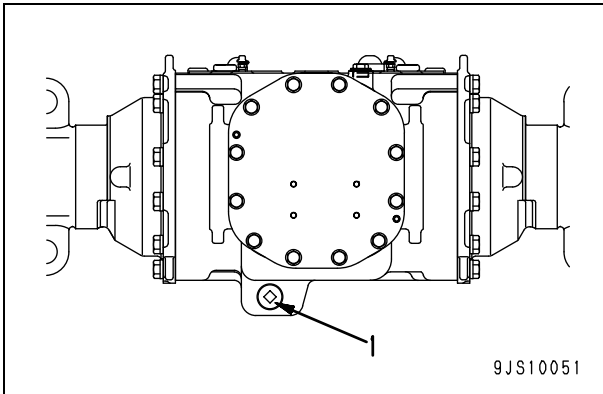
Disassembly and assembly of axle housing assembly

Disassembly

1. Draining of oil

Remove plug (1) to drain the oil.

 Axle oil: 10.5 ℓ



2. Axle assembly

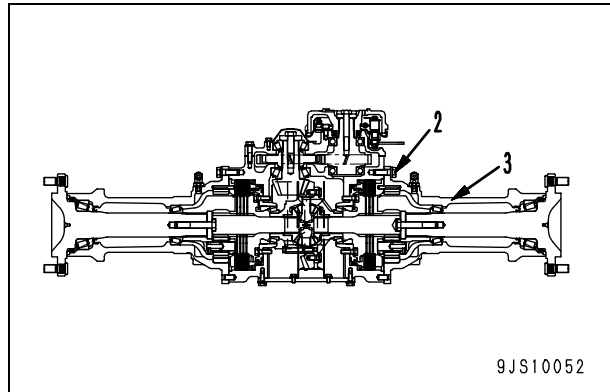
Remove the brake actuating piping, parking brake cable, brake cooling piping and drive shaft from the axle assembly and remove the axle assembly from the lift truck.

- ★ For "Removal and installation of front axle", see Disassembly and assembly, Power train, "Removal and installation of front axle", page 50-300-2.

3. Axle housing assembly

Remove bolts (2), separate axle housing assembly (3) from the axle assembly, and place it vertically.

- ★ When removing both of the right and left axle housing assembly, make match marks on the housings and differential cases to prevent mixing up before disassembling. (Both right and left)
- ★ If either axle housing assembly is removed, the axle is unbalanced and it tilts in the opposite direction. To prevent this, take a measure to prevent the axle from tilting.
- ★ Since the housings are stuck with gasket sealant, use the forcing taps to disassemble.



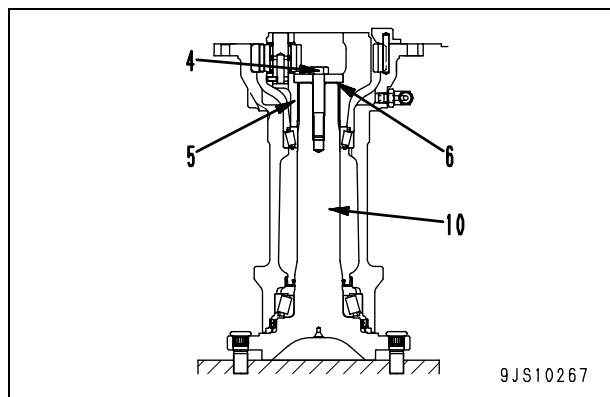
4. Planetary carrier assembly

- 1) Remove axle shaft mounting bolt (4) and lift off planetary carrier assembly (5).

- ★ When removing mounting bolt (4), protect its threads using cloth, etc. and lock the axle shaft.

- 2) Remove shim (6).

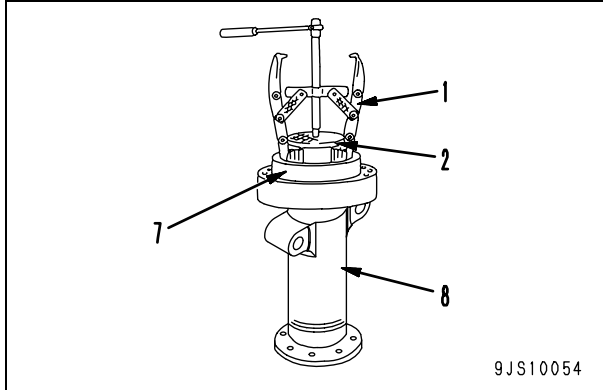
- ★ Record the shim thickness and use it for reference when assembling.



5. Ring gear

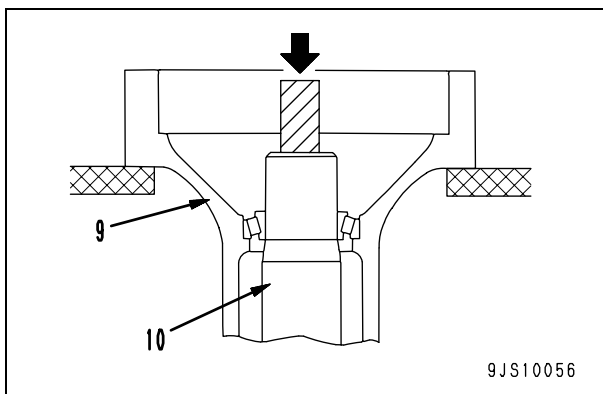
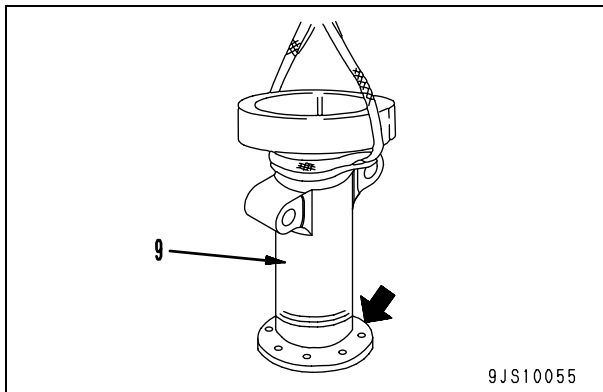
Using puller (1), pull up ring gear (7) evenly to remove from housing assembly (8).

- ★ Install spacer (2) to the puller bolt end to adjust the height.
- ★ Take care that the puller claw will not come off the ring gear.



6. Axle shaft

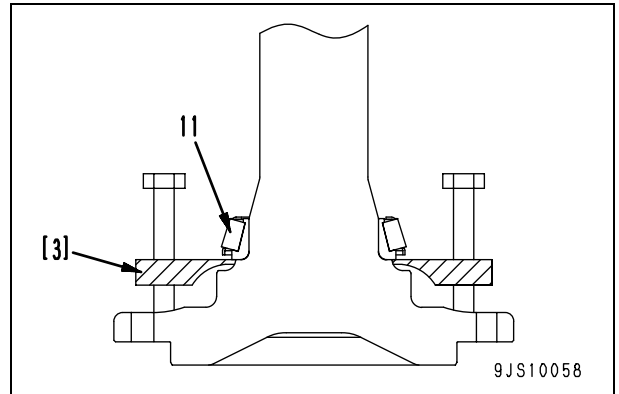
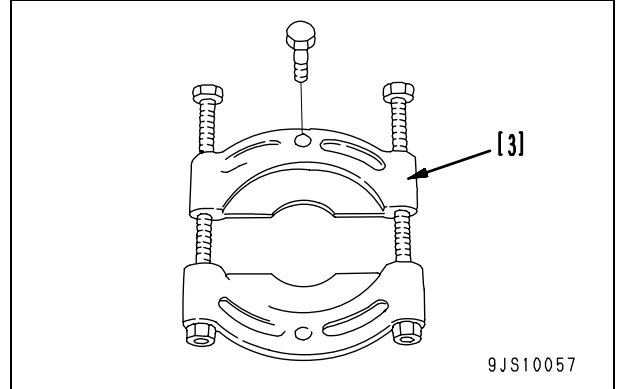
- 1) Sling axle housing (9).
- 2) Hit the flange end of axle shaft (10) with a copper hammer to drive out the axle shaft. Or, drive out axle shaft (10) with a press.



7. Wheel bearing

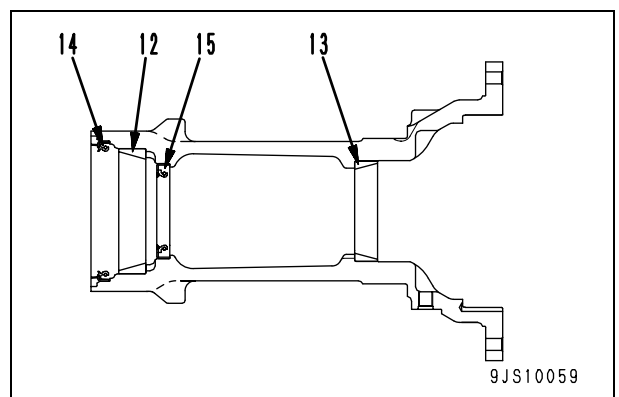
⚠ Do not remove the bearing heating or melting it.

- 1) Install and fix bearing race puller [3] securely to the bottom of bearing (11).
- 2) Tighten the bolt to remove bearing (11).



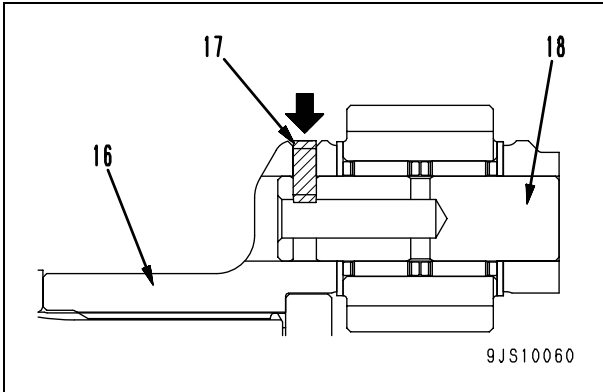
8. Axle housing

Remove bearing outer races (12) and (13) and oil seals (14) and (15) from axle housing (9).

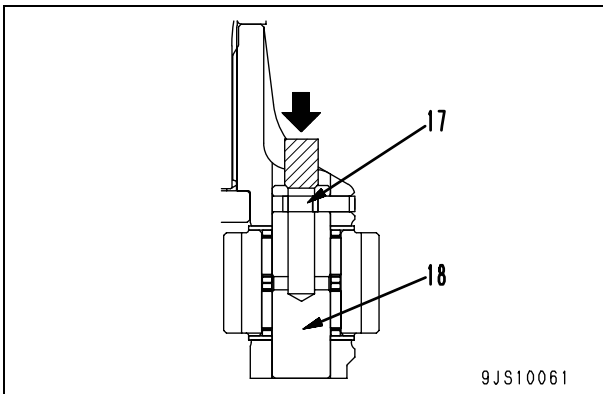


9. Planetary carrier

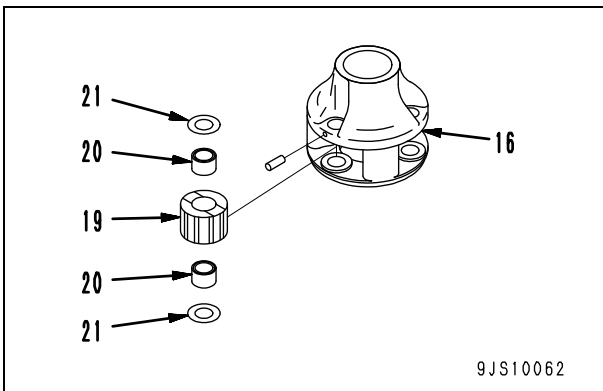
- 1) Drive in spring pin (17) of planetary carrier (16) to a range where it will be set in shaft (18).
 - ★ Take care not to drive the spring pin too much.



- 2) Using a press, pull out shaft (18).
- 3) Pull out spring pin (17) from removed shaft (18).



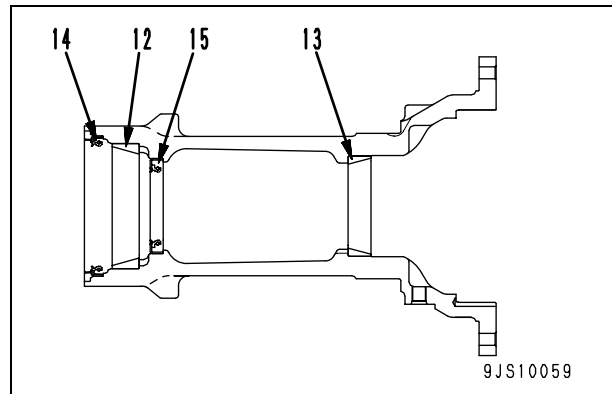
- 4) Remove pinion gear (19), bearing (20) and spacer (21) from planetary carrier (16).



Assembly

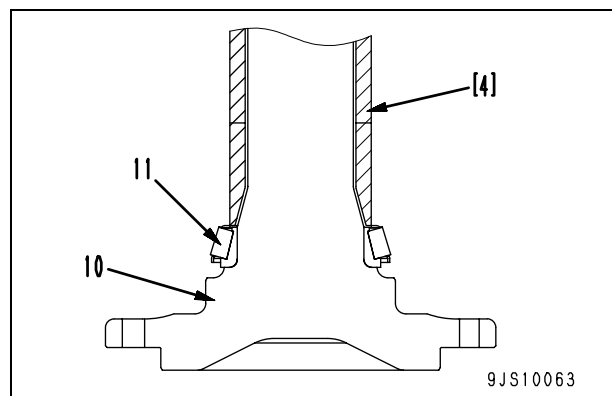
1. Axle housing

- 1) Press fit bearing outer races (12) and (13) to axle housing (9).
- 2) Using the jig, install oil seals (14) and (15) to axle housing (9).
 - Jig: 3EC-97-99170
 - Jig: 3EC-97-99180
 - Oil seal lip surface: **Grease (G2-LI)**
 - Periphery of oil seal outer ring: **LOCTITE (#572)**

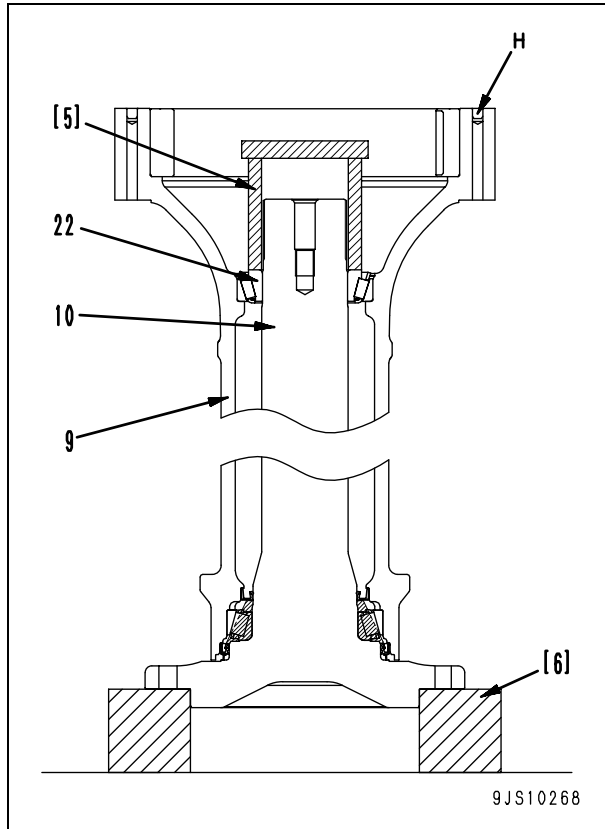


2. Axle housing and shaft

- 1) Using tool [4], press fit bearing (11) to axle shaft (10).

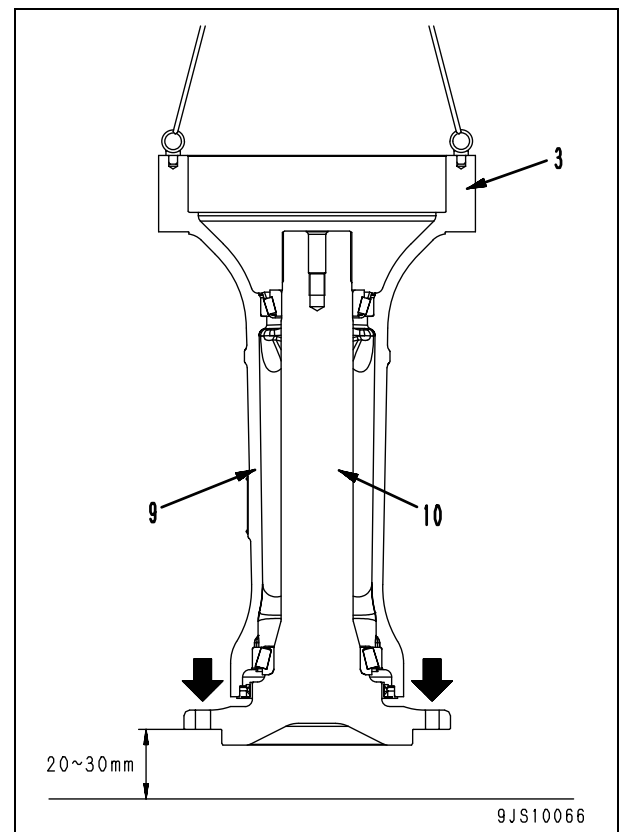


- 2) Erect axle shaft (10) on block [6] and fix it securely. Apply bearing grease.
- 🔧 Bearing: **Grease (G2-LI)**
- 3) Sling axle housing (9) vertically and install it to axle shaft (10) by utilizing its own weight.
- 4) Using tool [5], press fit bearing (22) with a press.
 - ★ Rotate the housing to fit the bearing.
 - ★ Apply engine oil (EO10) to the bearing.

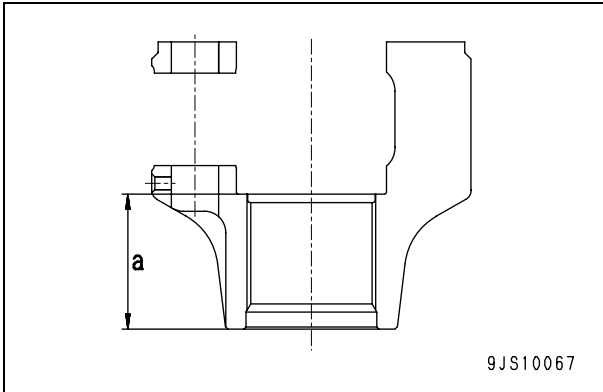


3. Adjustment of preload on wheel bearing

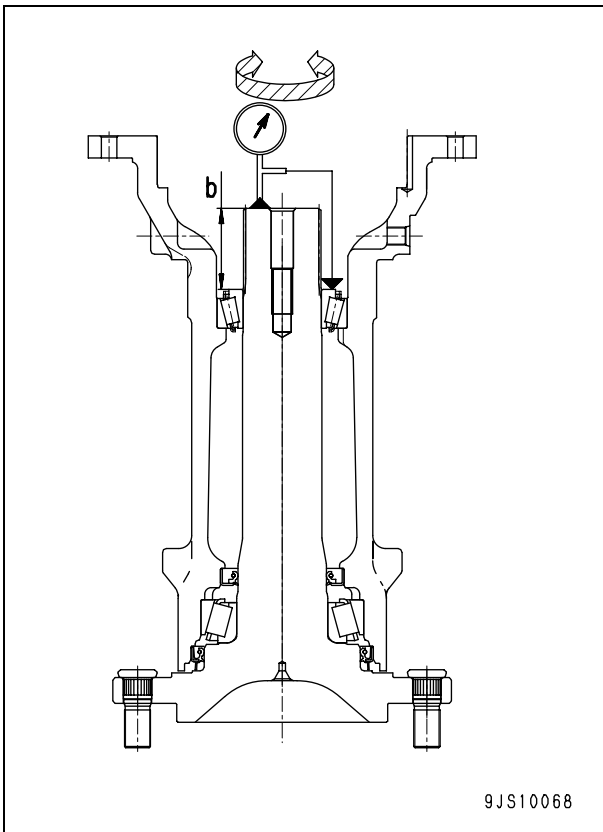
- 1) After fitting the bearing, measure its starting torque by using hole H of the axle housing.
- 2) If the starting torque of the bearing is 0.78 Nm {0.08 kgfm}, the preload on the bearing cannot be adjusted. In this case, reduce the preload on the bearing according to the following procedure.
 - 1] Sling axle shaft and housing assembly (3) by 2 points about 20 – 30 mm, as in disassembly of the axle housing.
 - 2] While rotating axle shaft (10), hit the flange with a copper hammer several times to drive axle shaft (10) out of axle housing (9).
 - 3] Perform step 1) to lower the starting torque to below 0.78 Nm {0.08 kgfm}.



- 3) Measure dimension **a** of the planetary carrier.



- 4) Give preload of 2,940 – 5,880 N {300 – 600 kgf} to the bearing and measure dimension **b** from the bearing to the shaft end.



- 5) Perform the following calculation to obtain dimension **c** and decide the shim thickness.
c = a – b

Dimensions $\square$	Part number			
	shim thickness			
0.30 < $\square$ < 0.35	0.30		1	
0.35 < $\square$ < 0.40	0.35	1	1	
0.40 < $\square$ < 0.45	0.40	2		
0.45 < $\square$ < 0.50	0.45	1	1	
0.50 < $\square$ < 0.55	0.50	1	1	
0.55 < $\square$ < 0.60	0.55	1	2	
0.60 < $\square$ < 0.65	0.60			2
0.65 < $\square$ < 0.70	0.65	1	1	1
0.70 < $\square$ < 0.75	0.70	2	1	
0.75 < $\square$ < 0.80	0.75	1	2	
0.80 < $\square$ < 0.85	0.80			1
0.85 < $\square$ < 0.90	0.85	1	2	1
0.90 < $\square$ < 0.95	0.90		3	
0.95 < $\square$ < 1.00	0.95	1		1
1.00 < $\square$ < 1.05	1.00	1	1	
1.05 < $\square$ < 1.10	1.05	1	3	
1.10 < $\square$ < 1.15	1.10		1	1
1.15 < $\square$ < 1.20	1.15	1	1	1
1.20 < $\square$ < 1.25	1.20	2	1	
1.25 < $\square$ < 1.30	1.25	1	1	1
1.30 < $\square$ < 1.35	1.30	1	1	1
1.35 < $\square$ < 1.40	1.35	1	2	1
1.40 < $\square$ < 1.45	1.40		2	1
1.45 < $\square$ < 1.50	1.45	1	1	1
1.50 < $\square$ < 1.55	1.50	2	1	1
1.60 < $\square$ < 1.65	1.55	1	2	1
1.60 < $\square$ < 1.65	1.60			2
1.65 < $\square$ < 1.70	1.65	1	2	1
1.70 < $\square$ < 1.75	1.70		3	1

9JS10349

- 6) Insert shim (6) as shown below and tighten bolt (4).

 Mounting bolt:

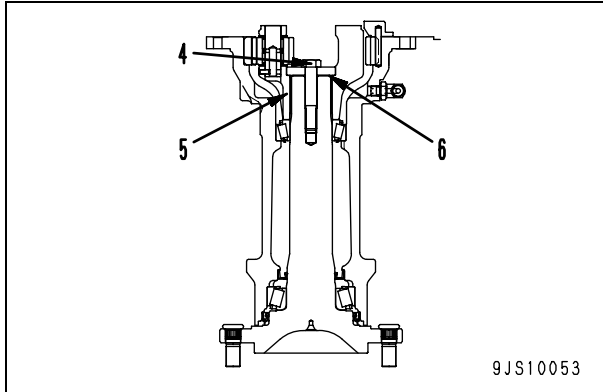
245 – 309 Nm {25 – 31.5 kgfm}

 Mounting bolt: **Adhesive LT-2**

Starting torque of bearing:

0.78 – 4.61 Nm {0.08 – 0.47 kgfm}

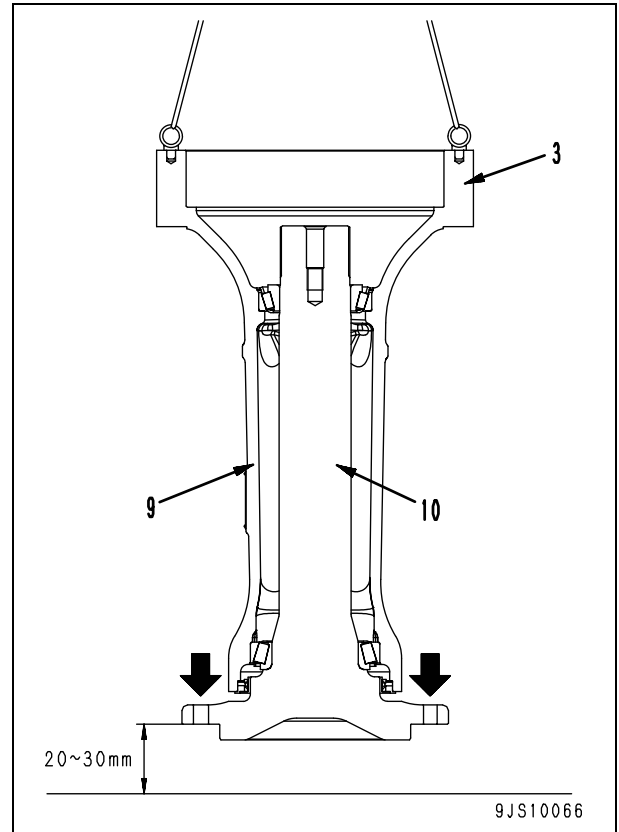
- ★ Rotate the housing to the right and left sufficiently to fit the bearing.



- ★ If the starting torque of the bearing is below the standard value, decrease the shim and readjust the bearing to set the bearing in the standard range.

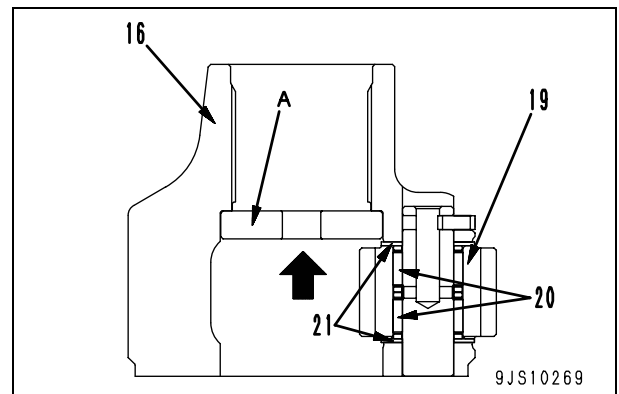
- ★ If the rotation force exceeds the standard value, adjust it according to following steps 1] - 3].

- 1] Sling axle shaft and housing assembly (3) by 2 points about 20 – 30 mm, as in installation of the axle housing.
- 2] While rotating axle shaft (10), hit the flange with a copper hammer several times to drive axle shaft (10) out of axle housing (9).
- 3] Perform step 1) to set the starting torque in the standard range.



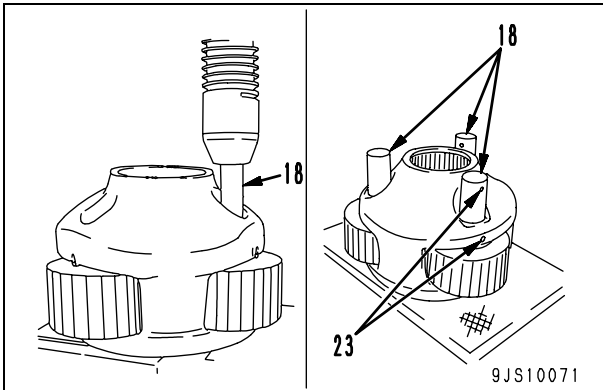
4. Planetary carrier

- 1) Install holder (A) into planetary carrier (16) in advance.
- 2) While raising holder (A), install bearing (20) and spacer (21) to gear (19) and then install them to the carrier.

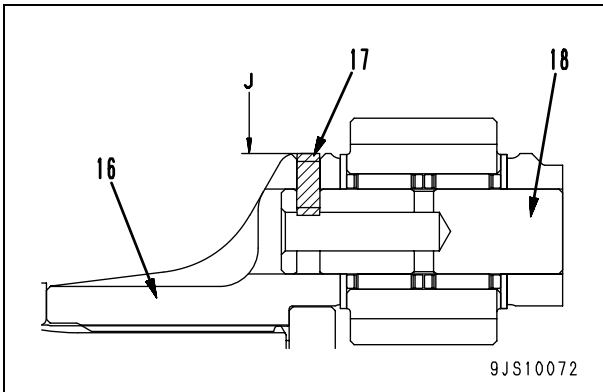


- 3) While matching shaft (18) and spring pin hole (23), press fit the shaft.

 Shaft: **Oil (Axle oil)**



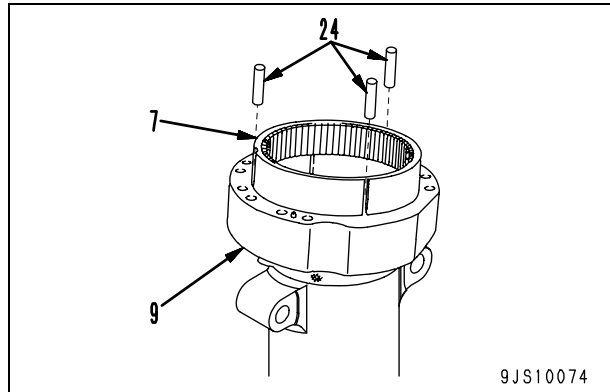
- ★ Match shaft (18) and the hole of spring pin (17) and then drive spring pin (17) until it will be flush with carrier (16) (part J).



5. Ring gear

Press fit ring gear (7) to axle housing (9) and insert pin (24).

- ★ When assembling, match the pin holes of the housing and ring gear.
- ★ Press fit the pin horizontally, taking care that the ring gear will not slant.
- ★ Pin (24) is projected from the housing mounting face. Take care.



6. Planetary carrier assembly

- 1) Install shim (6) selected when the preload on the wheel bearing was adjusted to the axle shaft end.
- 2) Install planetary carrier assembly (5) and tighten mounting bolt (4).

- ★ Thoroughly degrease and clean the bolt hole of the axle shaft and bolt.

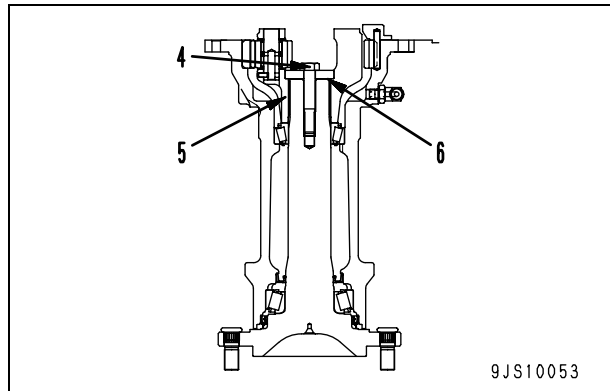
⚠ When installing the planetary carrier, take care not to catch your finger in the gear etc.

 Mounting bolt: **Adhesive (LT-2)**

★  Mounting bolt:

245 – 309 Nm {25 – 31.5 kgfm}

- ★ When assembling, thoroughly clean the shaft end and planetary carrier spline.



- 3) After fitting the bearing sufficiently, check its starting torque by using hole H of the axle housing (9).

- Starting torque:

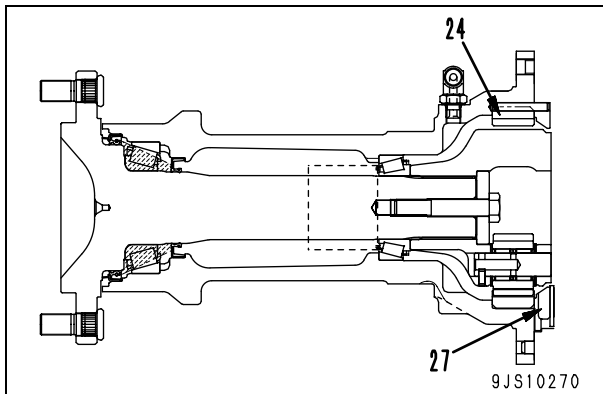
0.78 – 4.61 Nm {0.08 – 0.47 kgfm}

- ★ If the starting torque is out of the standard value, perform the shim selection procedure again.

7. Axle housing assembly

- 1) Install plate (27) to the axle housing assembly.

- ★ When installing the plate, match pin (24) projected from the housing to the hole on the plate.

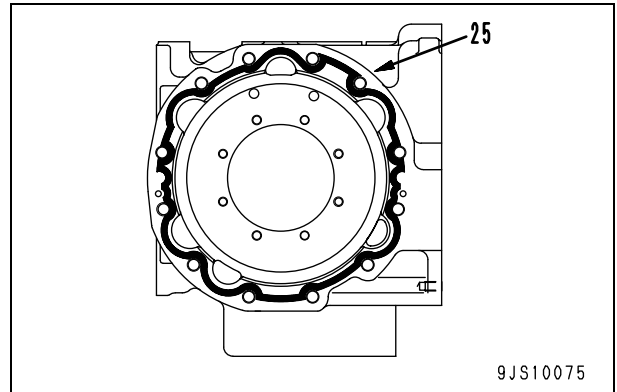


- 2) Apply gasket sealant to the mounting faces of axle housing assembly (3) and differential housing (25). (Apply the gasket sealant to the differential housing side)

- 1] Degrease, clean and air-dry the face to be coated with gasket sealant.
- 2] Apply gasket sealant 2 - 3 mm wide continuously as shown at right.

↙ Mating face of housing:

THREEBOND (TB1207B)

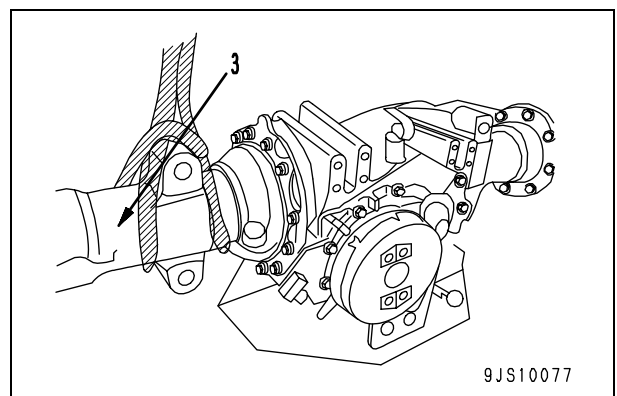
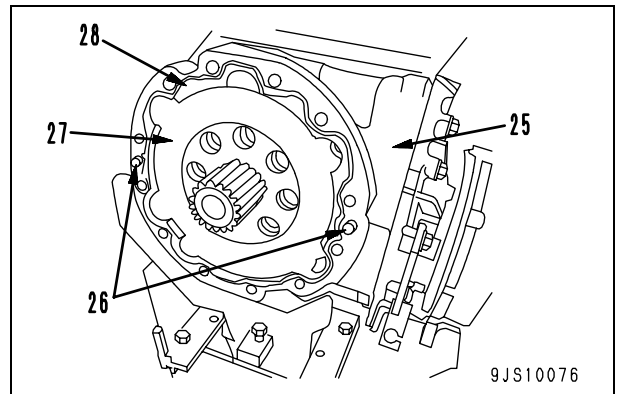


- 3) Install dowel pin (26) to differential housing (25).

- 4) Sling axle housing assembly (3) horizontally and install it slowly, while matching it to the gear and dowel pin (26).

- ★ When installing the axle housing assembly, take care that plate (27) and spring (28) of the brake section will not fall.

- ★ Note that the right and left portions and the upper and lower portions of the axle housing assembly (3) are different.



- 5) Install and tighten the mounting bolts in the diagonal order.

 Housing mounting bolt

157 – 196 Nm {16 – 20 kgfm}

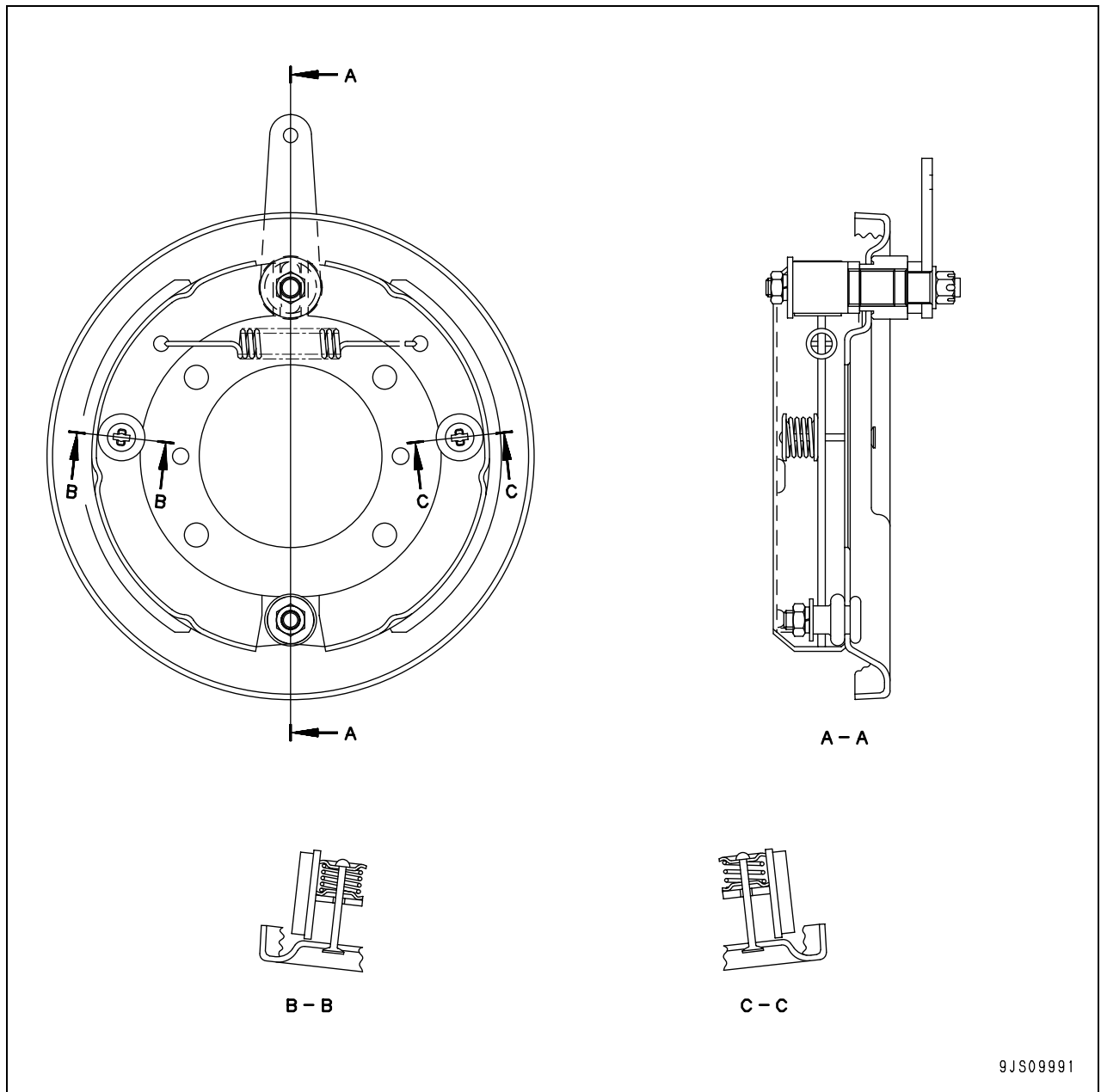
8. Refilling with oil

Tighten the drain plug and add oil through the oil filler to the specified level.



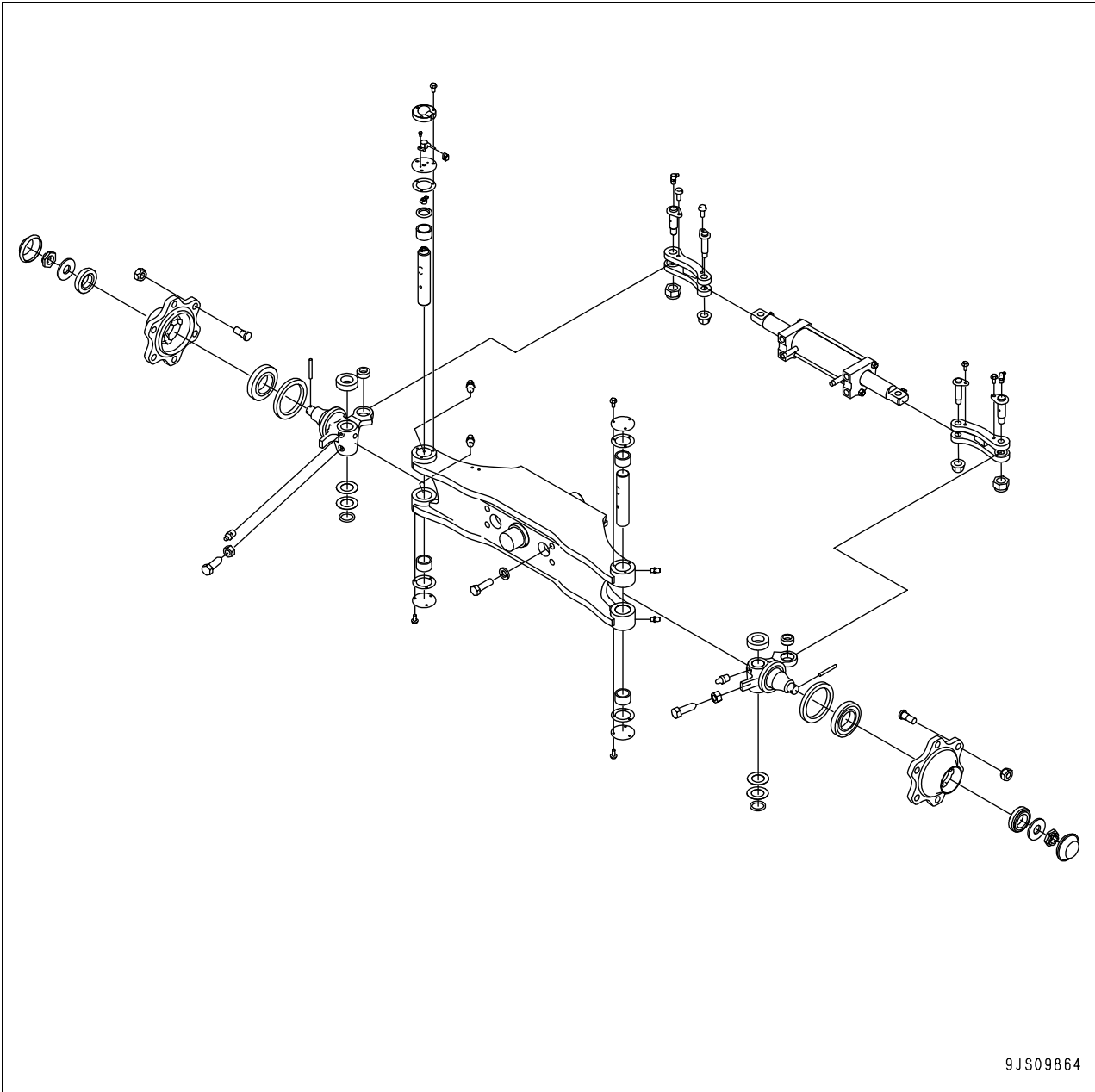
Axle oil: **10.5 ℓ**

Disassembly and assembly of parking brake



Disassembly and assembly of rear axle

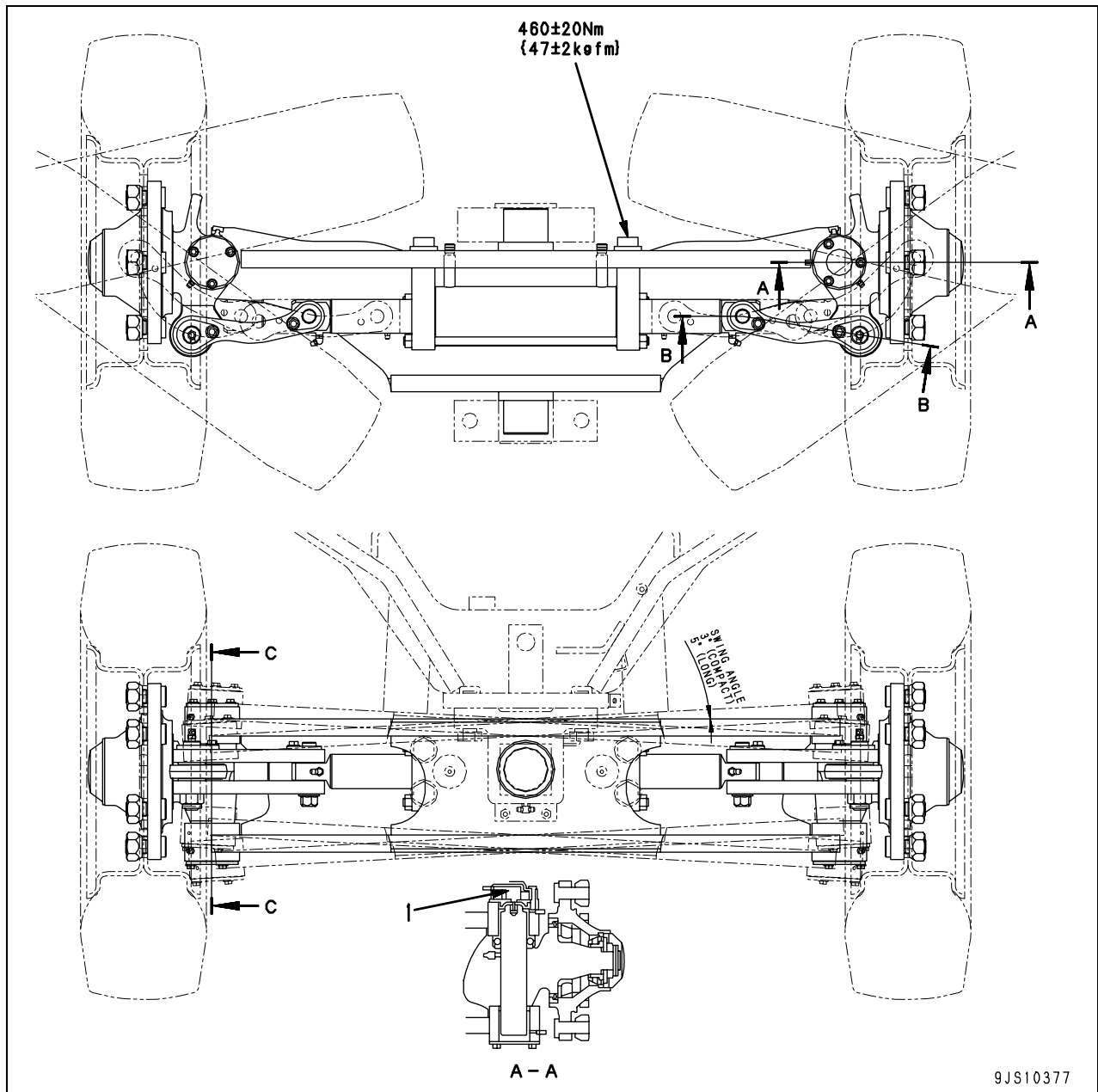
Disassembly drawing



Assembly drawing

1. Installation of ball socket

When installing the ball socket to the bell crank, check that each tapered part is free from oil, grease and paint.



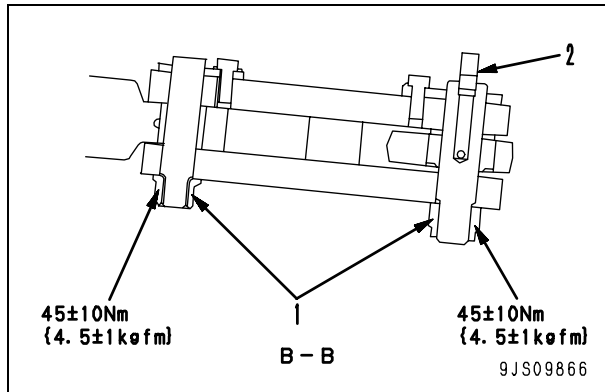
1. Tyre angle sensor

2. Refilling with oil

Add lithium grease (G2-LI) to the grease nipple and hub.

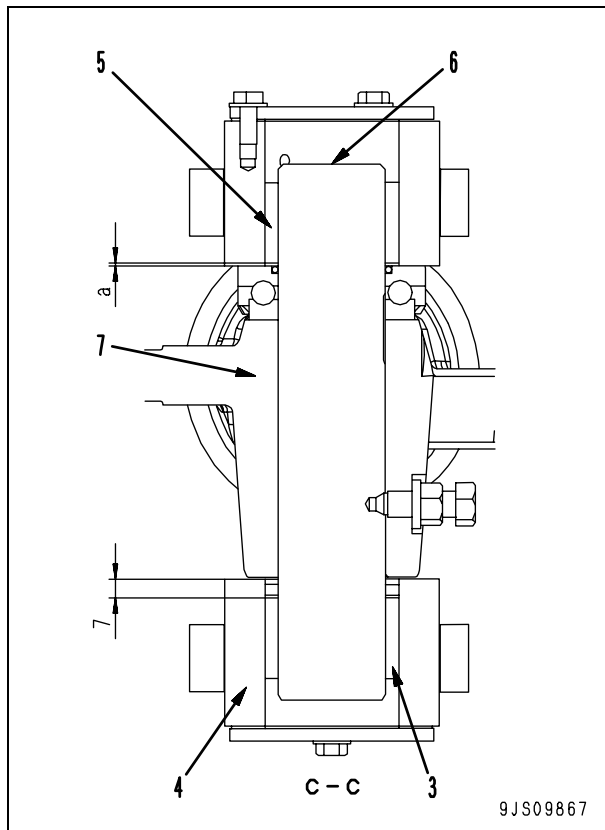
Details of each part of rear axle**1. Bell crank**

- 1) Locknut (1)
- 2) Grease nipple (2)

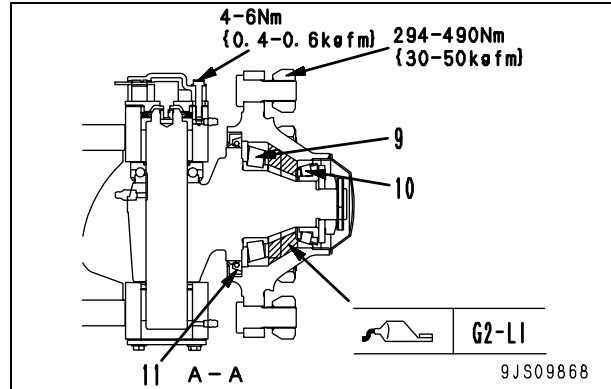
**2. King pin**

- 1) Set the end face of needle bearing (3) to 7 mm from the end face of boss (4).
- 2) Set the end face of needle bearing (5) to the end face of boss (6).
- 3) Minimize the play at the top and bottom of knuckle (7).

Standard clearance a: 0 – 1 mm

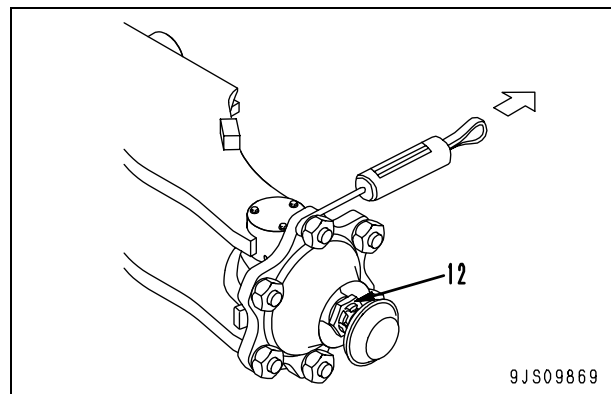
**3. Hub**

- 1) Fully fill hub bearings (9) and (10) with grease (G2-LI) and fill the space in the hub with grease to 1/2 - 2/3 (hatched part) (on both sides).
- 2) When installing the hub, apply grease (G2-LI) to seal (11) and lip.

**4. Adjustment of starting force of hub**

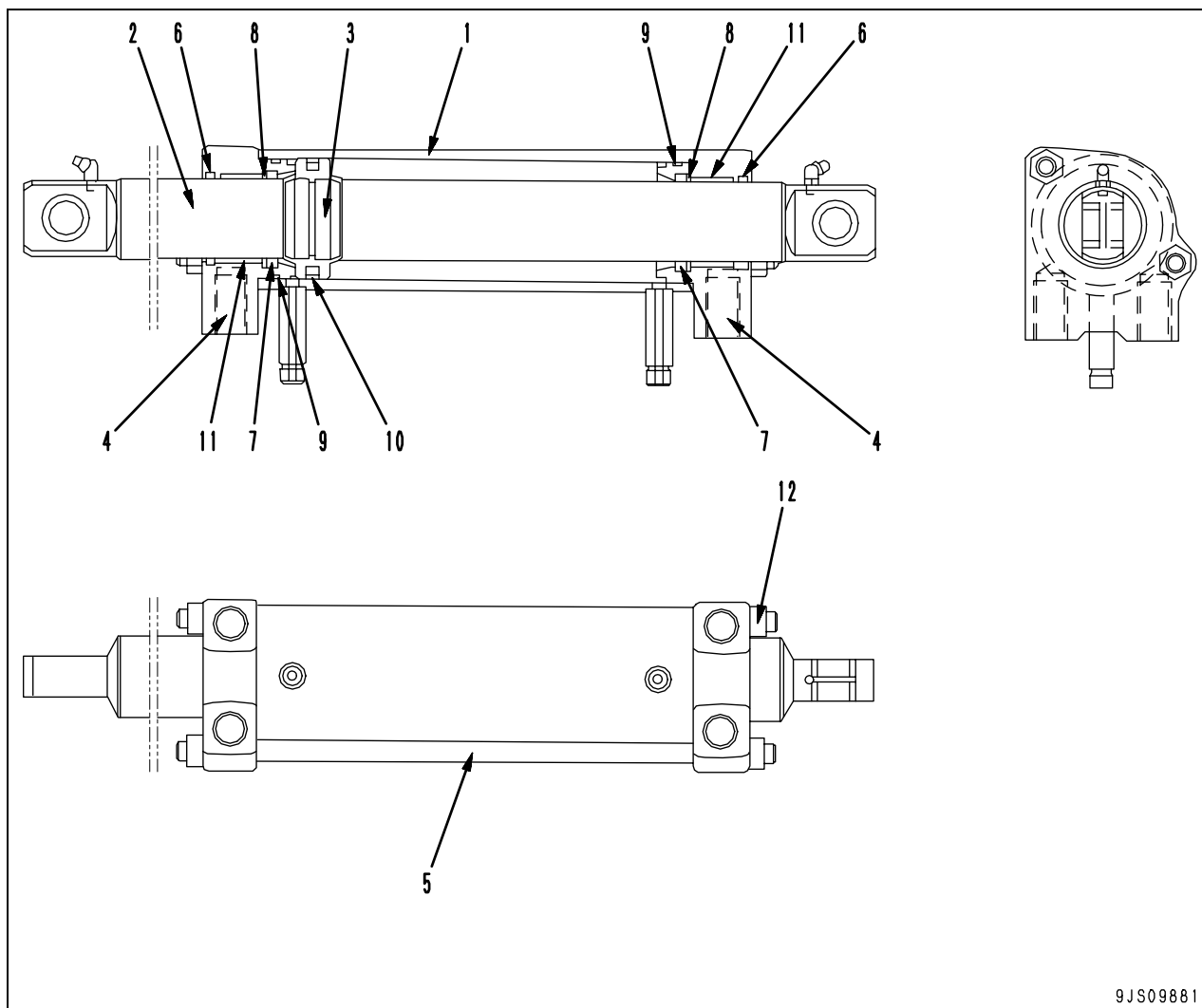
- 1) Tighten the locknut until you cannot rotate the hub with one hand, and then return it 1/4 turn. Hitch a spring balance to the hub bolt and give a preload to the taper roller bearing, while adjusting the starting force to the following range with nut (12).

Starting force	39.2 – 78.5 N {4.0 – 8.0 kgf}
Starting torque	431 – 862 Ncm {44 – 88 kgfcm}



- 2) After finishing adjustment, insert a cotter pin (for locking) in aligned holes of the nut and shaft and bend it securely.

Disassembly and assembly of power steering cylinder

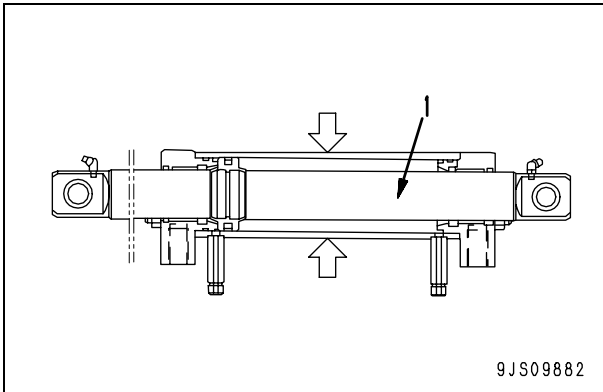


1. Cylinder tube
2. Piston rod
3. Piston
4. Rod guide
5. Tie rod
6. Dust seal

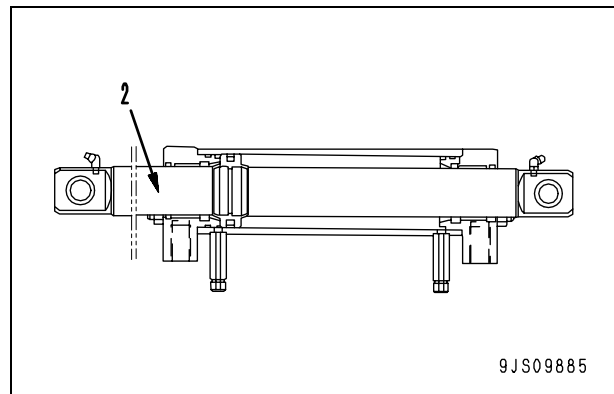
7. Rod packing
8. Backup ring
9. O-ring
10. Piston packing
11. Roll bushing
12. Small flange nut

Disassembly

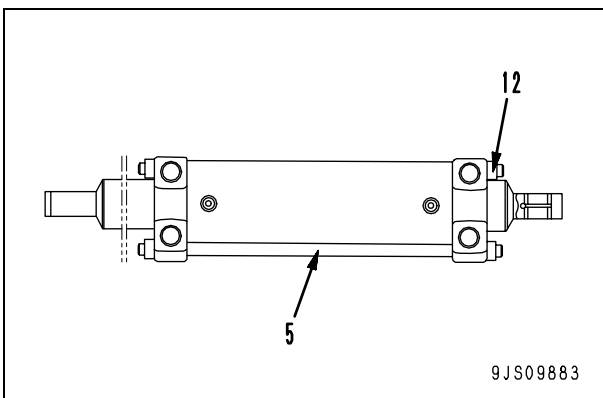
1. Fix cylinder tube (1) with a clamp.



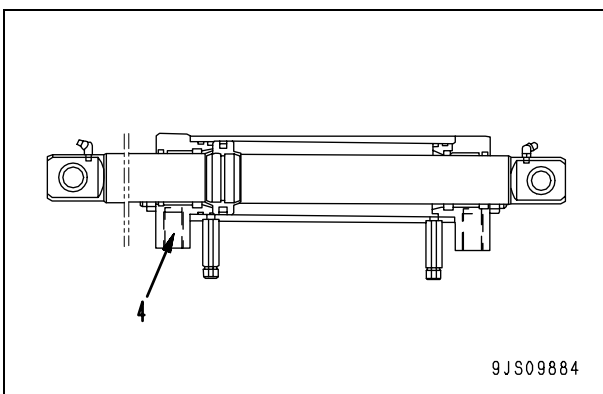
4. Pull out piston rod (2) straight.



2. Loosen 4 nuts (12) and remove tie rod (5).



3. Pull out right and left rod guides (4) slowly.
★ Take care not to scratch the packing when the rod guides are pulled out.



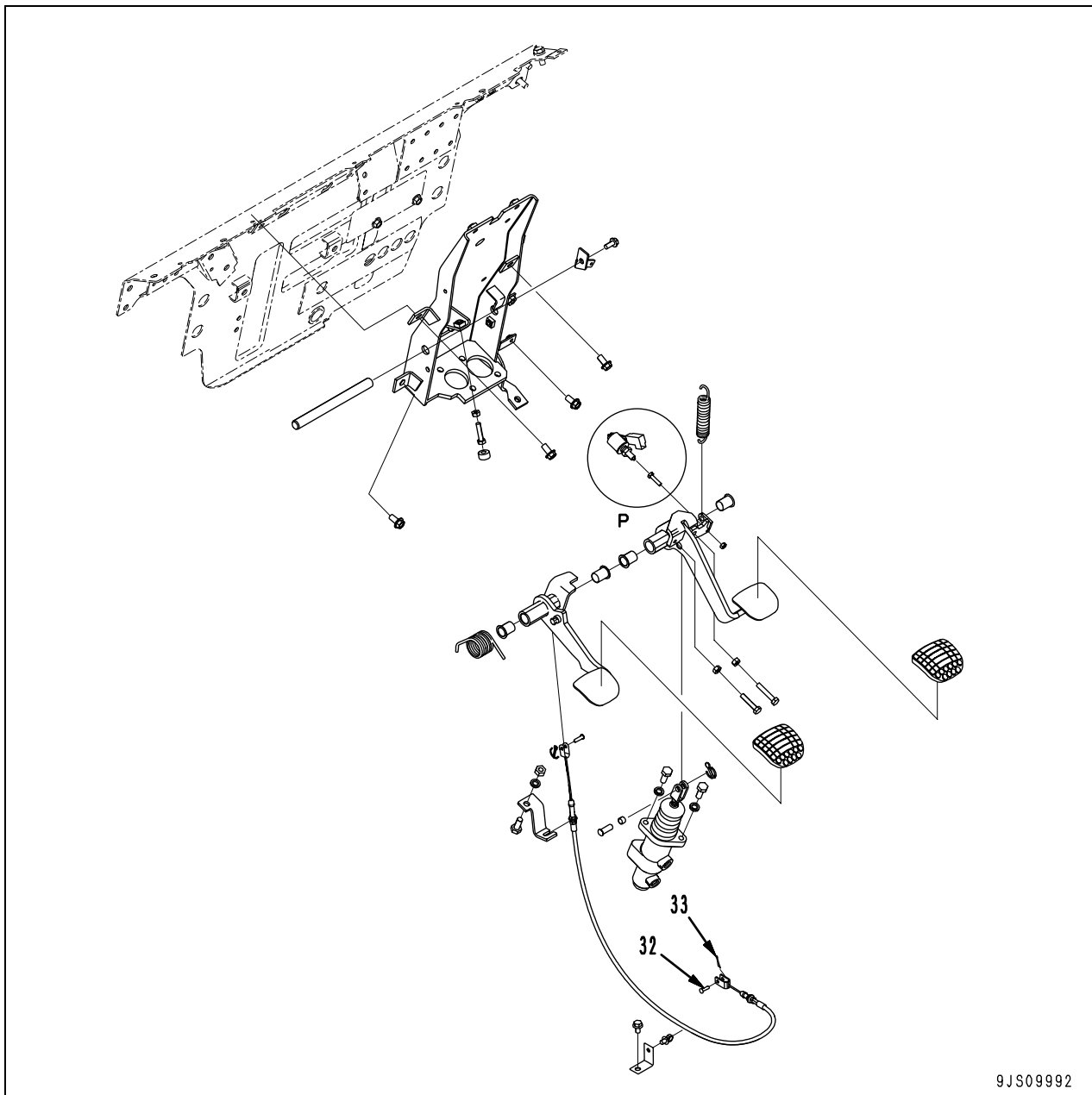
Assembly

1. Perform assembly in the reverse order to disassembly, while taking care of the following.

Precautions

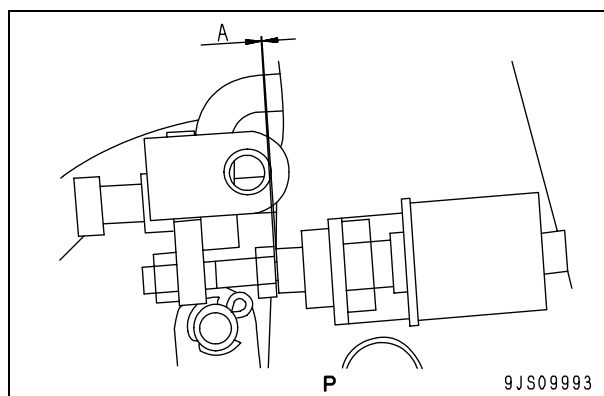
- ★ When installing, apply grease or hydraulic oil to the O-ring, dust seal and packing lip.
- ★ Before applying adhesive, degrease the threaded portions (4) and (11).
- ★ When fitting the piston packing, heat it (to below 80 °C).

Disassembly and assembly of brake pedal

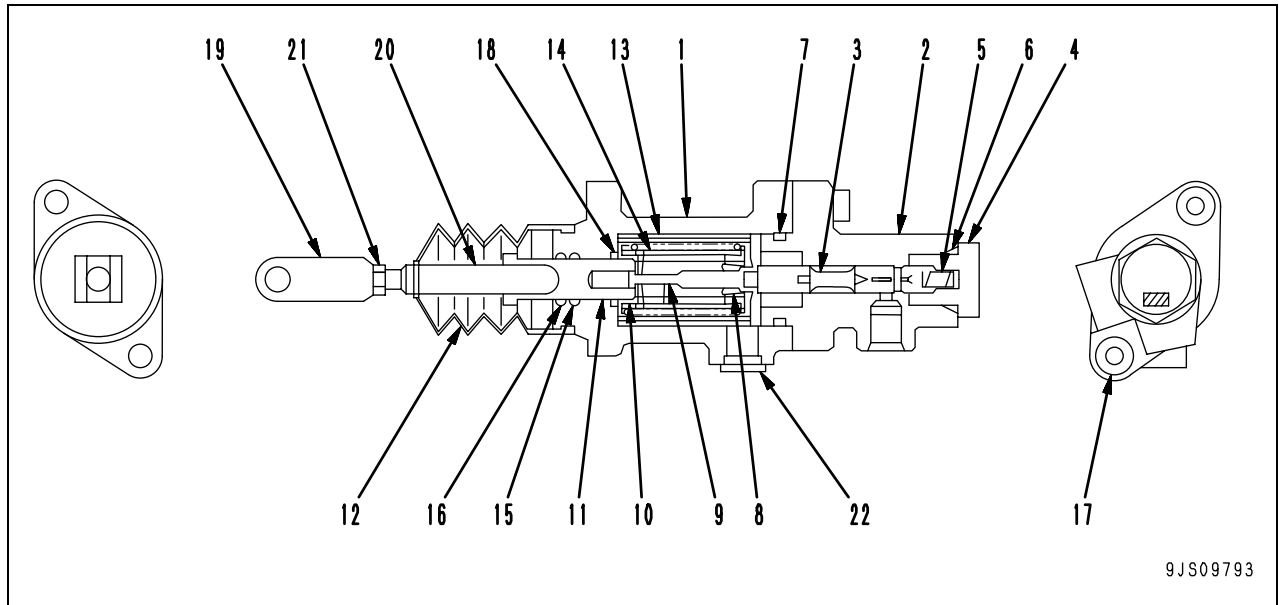


Adjustment procedure for stop lamp switch

After adjusting the brake pedal, adjust clearance **A** (detail P in the above illustration) to 0 – 0.4 mm.



Disassembly and assembly of brake valve

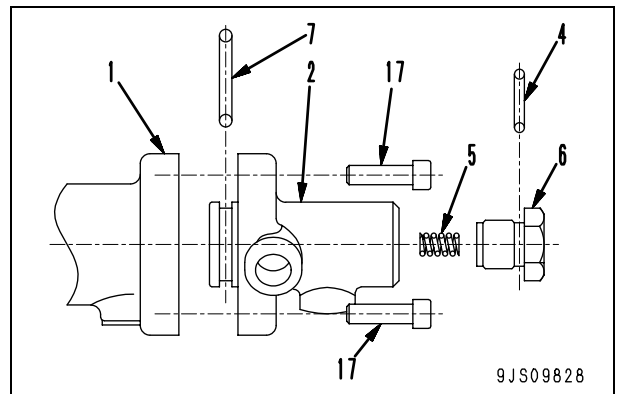


Precautions for disassembly and assembly

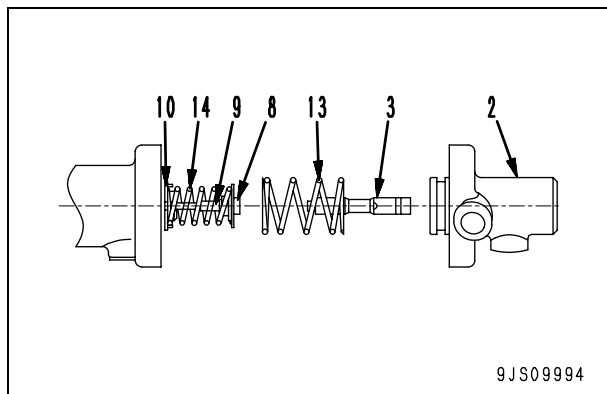
- Since the brake valve assembly is lowered in performance if dirt, dust and others enter it, do not disassemble it, except for the boot and push rod.
- Disassemble and assemble in a clean place. The cylinder and spool has a very narrow clearance and foreign matter in it can have bad effects to the spool operation.
- Since the cylinder and spool are combined so that proper clearance can be obtained, do not replace only the spool or cylinder unit or change the combination of the parts.
- Use hydraulic oil made from mineral oil to clean the parts and O-rings.
- Do not reuse the "ring" and "packing" once they are installed to the flange.

Disassembly procedure

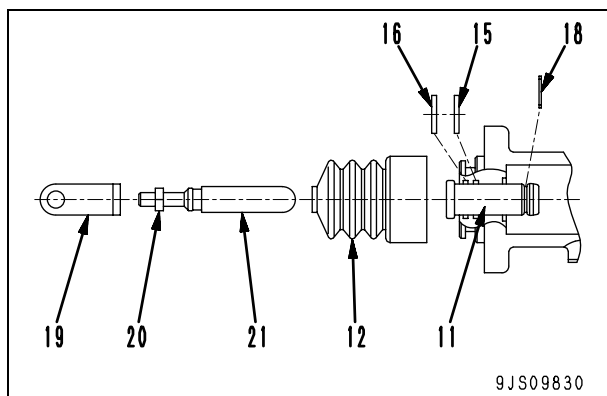
1. Remove plug (4) from cylinder (2).
2. Loosen coupling bolts (17) (M8 cap bolts) of flange (1) and cylinder (2), and separate the flange and cylinder.



3. Take spool (3) out of cylinder (2) and take springs (13) and (14) out of flange (1).

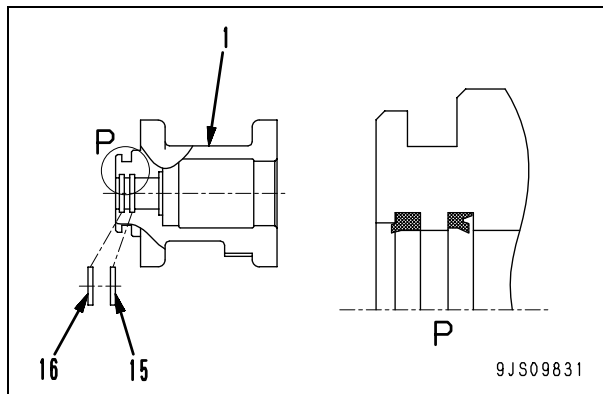


4. Take boot (12) out of flange (1) and pull out piston (11) from flange (1).
5. Remove snap ring (18) from the piston groove and pull it out of the piston. Or, remove packing (15) and ring (16) from flange (1), as necessary.

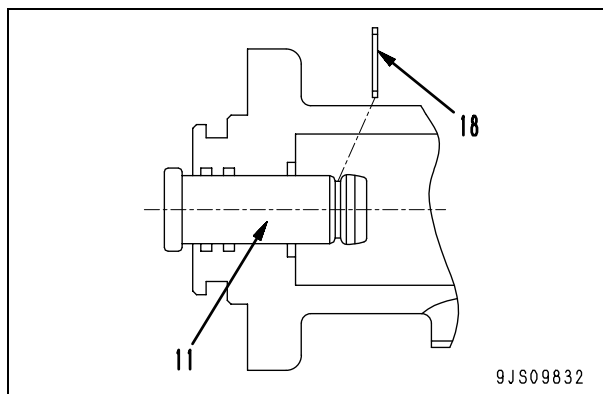


Assembly procedure

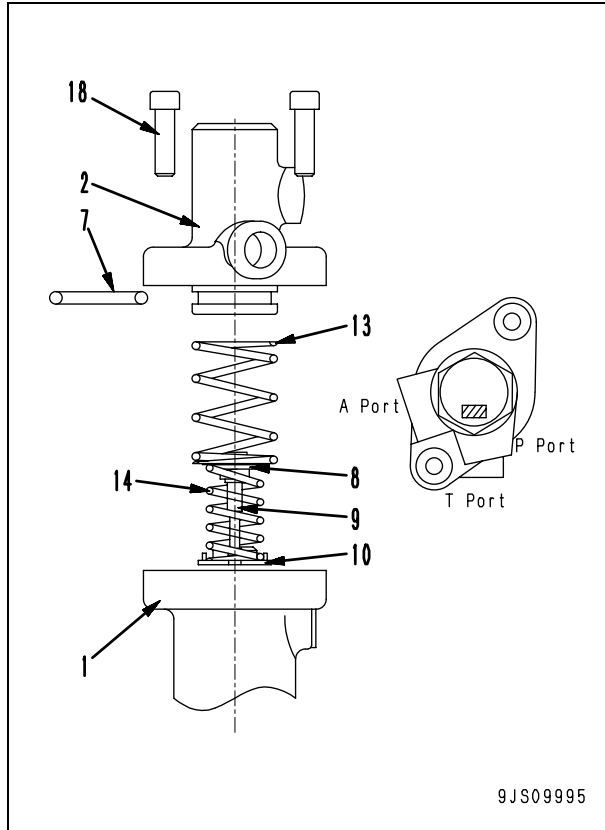
1. Install packing (15) and ring (16) to flange (1) in order. (When installing, apply assembly oil)
* Take care of the directions of packing (15) and ring (16).



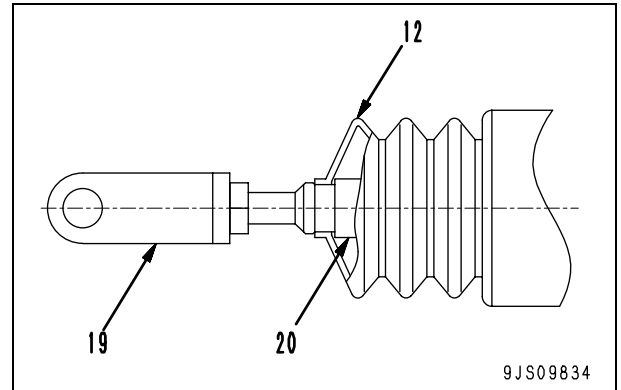
2. After applying assembly oil to the inside of the flange, insert piston (11) and install snap ring (18).



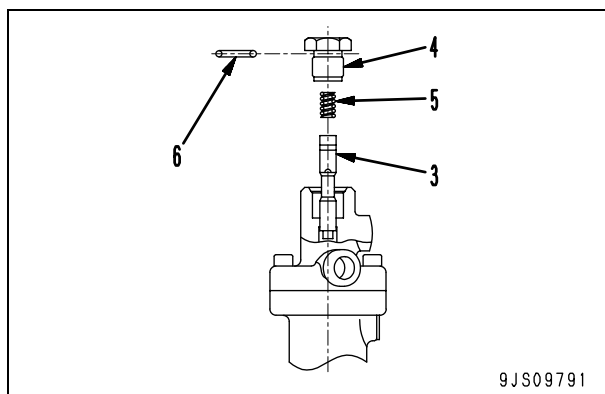
3. Assemble springs (13) and (14), retainer (10), holder (8) and rod (9), and put them in the flange as shown below.
Fit O-ring (7) to the cylinder and assemble cylinder (2) and flange (1).
★ Take care of the direction of each port.



5. Install boot (12) to flange (1).
Insert push rod (20) until the boot end reaches the push rod groove.



4. After applying assembly oil to the inside of the cylinder, insert spool (3) as shown below and tighten plug (4).



FORKLIFT TRUCK

CX50 Series

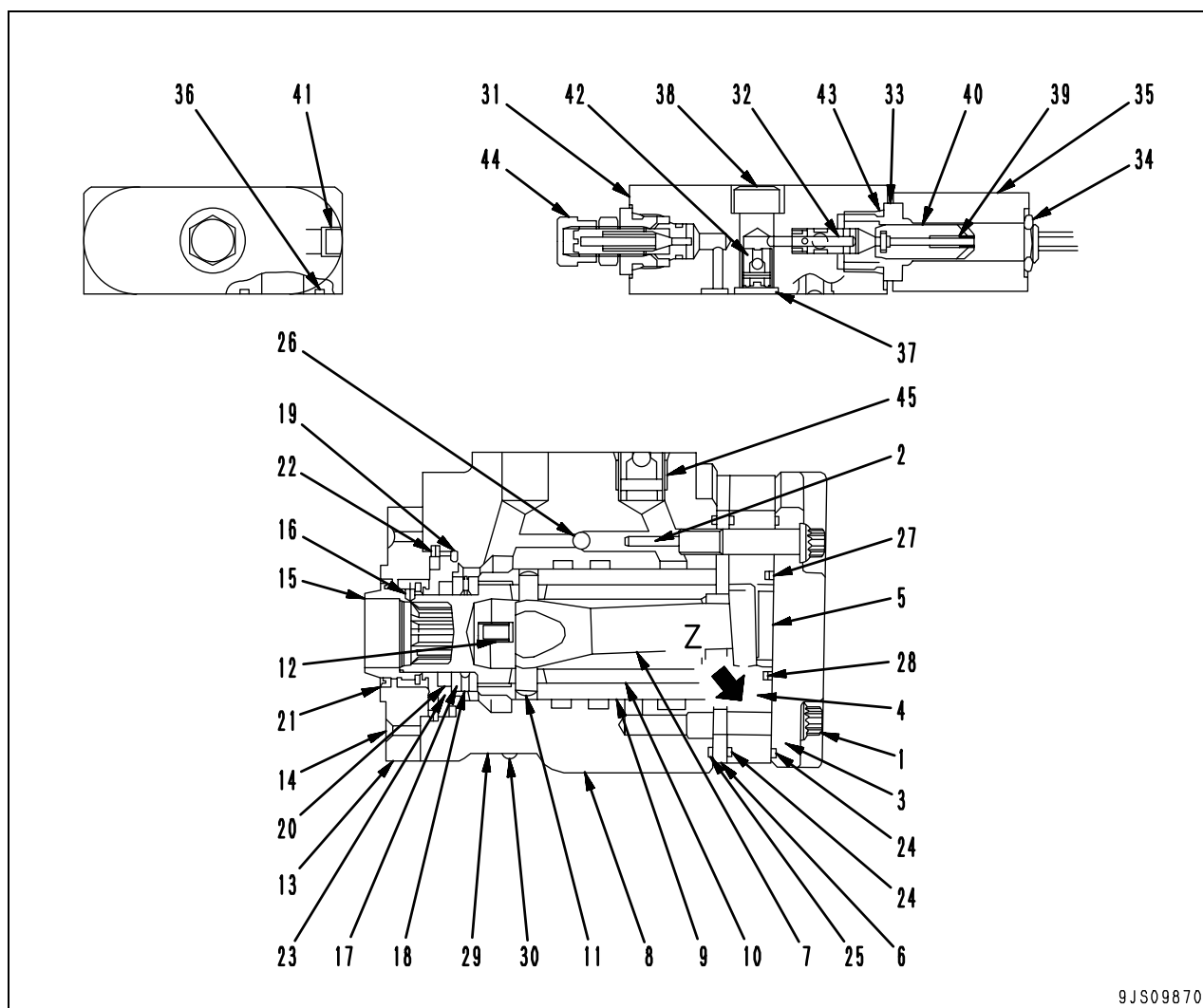
Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

50 Disassembly and assembly

400 Hydraulic equipment

Disassembly and assembly of steering valve	2
Disassembly and assembly of control valve assembly	9
Removal and installation of lift cylinder	15
Disassembly and assembly of lift cylinder	17
Disassembly and assembly of tilt cylinder	19

Disassembly and assembly of steering valve

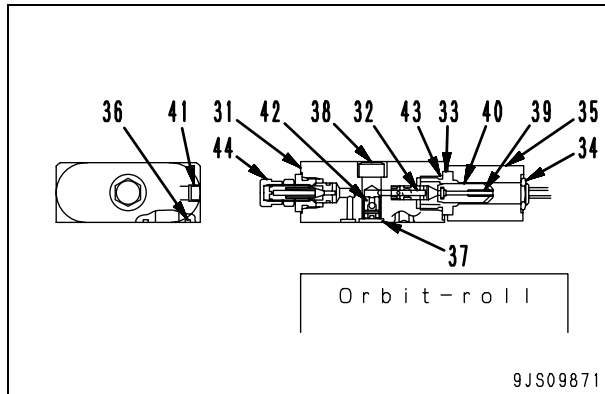


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- | | | |
|--|-------------------------|--------------------------------|
| 1. Screw | 17. Race bearing | 33. Tube assembly |
| 2. Spring pin | 18. Thrust needle | 34. Nut |
| 3. End cap | 19. O-ring | 35. Coil with connector |
| 4. Gerotor | 20. Oil seal | 36. O-ring |
| 5. Spacer | 21. Dust seal | 37. O-ring |
| 6. Spacer plate | 22. Retaining ring | 38. Hexagonal socket head bolt |
| 7. Drive | 23. Seal gland bushing | 39. Spring |
| 8. Housing | 24. O-ring | 40. Core |
| 9. Sleeve | 25. O-ring | 41. Hexagonal socket head plug |
| 10. Spool | 26. Ball | 42. Orifice plug |
| 11. Pin | 27. Face seal (or plug) | 43. O-ring |
| 12. Centering spring | 28. O-ring | 44. Relief valve |
| 13. EPACS controller | 29. Nameplate | 45. (Check valve assembly) |
| 14. Cross-recessed flat head machine screw | 30. Rivet | 46. O-ring |
| 15. Rotor | 31. Valve block | |
| 16. Hexagon socket head set screw | 32. Spool | |

Replacement of EPACS valve seal

Clean the outside (around ports and joints) before removing the piping, and then replace the seal in a clean place according to the following procedure.

**Disassembly**

★ Do not press the outside wall strongly with a vice etc.

1. Remove nut (34) and remove coil with connector (35).
2. Remove tube assembly (33).
★ Take care not to lose spring (39) and core (40) which may come off.
3. Remove 2 hexagonal socket head bolts (38) and remove valve block (31) from housing (8).
4. Remove O-ring (43) from tube assembly (33).
5. Remove O-ring (37) and 4 O-rings (36) from valve block (31).

Assembly

★ Replace all the O-rings with new ones.

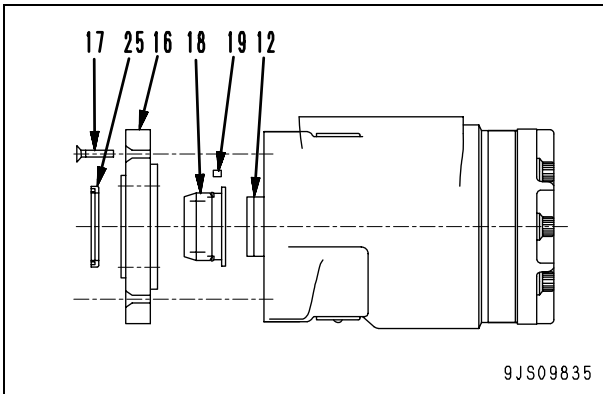
1. Insert O-ring (43) in tube assembly (33).
 2. Insert O-ring (37) and 4 O-rings (36) in valve block (31).
 3. Install tube assembly (33).
⌘ **34 – 40 Nm {3.5 – 4.1 kgfm}**
 4. Install coil with connector (35) and tighten nut (34).
⌘ Nut: **5 – 8 Nm {0.51 – 0.81 kgfm}**
 5. Install valve block (31) to housing (8) with 2 hexagonal socket head bolts (38).
⌘ Hexagonal socket head bolt:
34 – 44 Nm {3.5 – 4.5 kgfm}
- ★ When installing, take that the O-ring will not be caught.

Steering valve: Replacement of shaft side

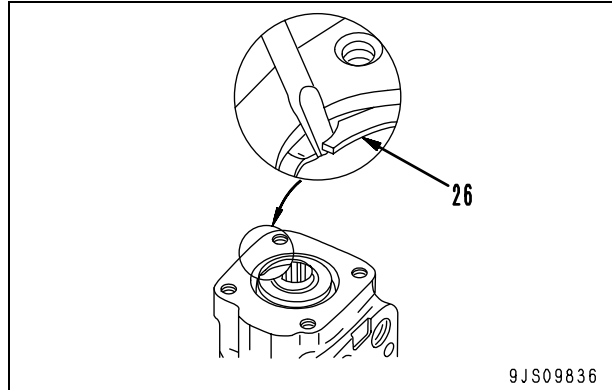
Clean the outside (around ports and joints) before removing the piping, and then replace the seal in a clean place according to the following procedure.

Disassembly

1. Remove 2 cross-recessed flat head machine screws (17) and remove EPACS controller (16).
2. Remove dust seal (25) from EPACS controller (16).
3. Remove hexagonal socket head set screw (19) and remove rotor (18) from spool (12).
 - ★ Since hexagonal socket head set screw (19) may not be removed since it is coated with LOCTITE. In that case, replace the steering unit.
 - ★ Take care not to lose removed hexagonal socket head set screw (19).



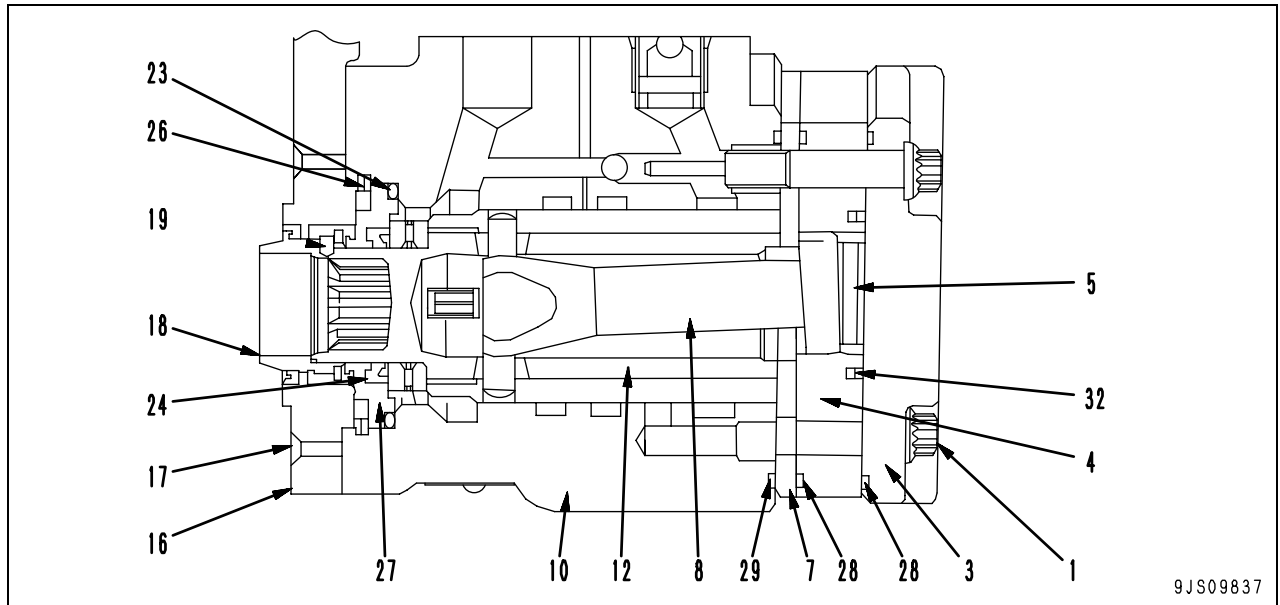
4. Remove retaining ring (26) from housing (10).
 - ★ Be sure to wear safety glasses since retaining ring (26) may jump out of housing (10).



5. Remove seal gland bushing (27) and oil seal (24).
6. Remove O-ring (23).

Assembly

- ★ Replace all the O-rings and oil seals with new ones.



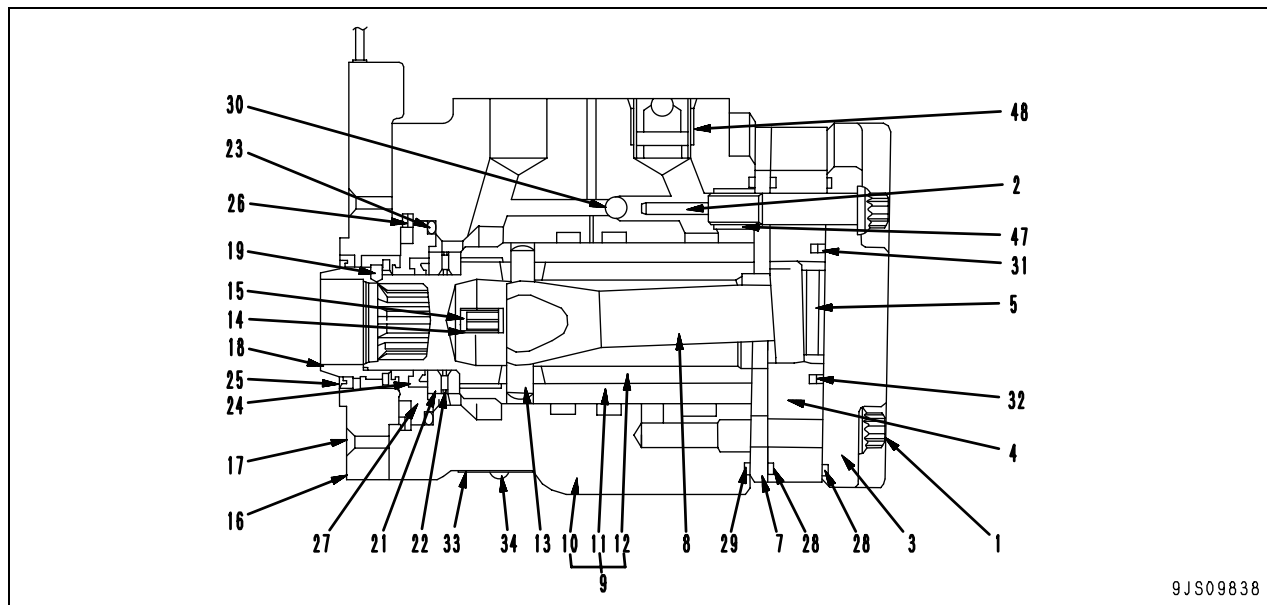
1. Insert O-ring (23).
2. Install oil seal (24).
 - ★ Take care of the direction of oil seal (24) and take care that it will not be twisted or deformed.
3. Install seal gland bushing (27) to housing (10) and install retaining ring (26).
 - ★ Push stretch retaining ring (26) with a flat-head screwdriver so that it will be perfectly fitted to the groove of housing (10).
 - ★ Be sure to wear safety glasses since retaining ring (26) may jump out of housing (10).
4. Align the screw hole of rotor (18) with the hole of spool (12).
5. Apply LOCTITE to hexagonal socket head set screw (19) and install rotor (18) to spool (12).
6. Install EPACS controller (16) to housing (10) with 2 cross-recessed flat head machine screws (17).

Steering valve: Replacement of gerotor side

Clean the outside (around ports and joints) before removing the piping, and then replace the seal in a clean place according to the following procedure.

Disassembly

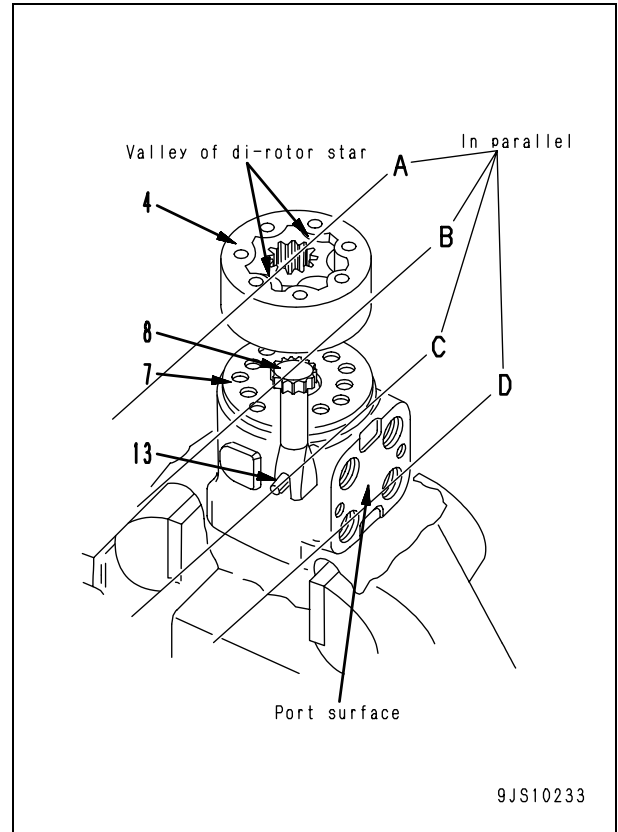
★ Do not press the outside wall strongly with a vice etc.



1. Fix the housing with the end cap side up.
2. Remove 7 screws (1).
3. Remove end cap (3) and O-ring (28).
4. Remove spacer (5) in the internal spline of the gerotor (4) star.
★ Spacer (5) may not be installed and 2 pieces of it may be installed, depending the specification.
5. Remove gerotor (4) and O-ring (28).
★ Take care not to drop the star from the ring around gerotor (4).
6. Remove gerotor star O-ring (32).
★ Do not use O-ring (32) for the standard specification since it is special for the low-slip specification.
7. Remove drive (8).
8. Remove spacer plate (7).
9. Remove O-ring (29) of housing (10).
★ O-ring (28) and O-ring (29) are different in size. Take care.

Assembly

- ★ Replace all the O-rings and oil seals with new ones.
 - ★ O-ring (28) and O-ring (29) are different in size. Take care.
1. Insert O-ring (32).
 - ★ Do not use O-ring (32) for the standard specification since it is for the low-slip specification.
 2. Insert O-ring (28).
 3. Insert O-ring (29) in housing (10).
 4. Place spacer plate (7) on housing (10) and align the bolt holes.
 - ★ The pitch circle diameter of the bolt holes is different from that of the oil holes. Take care.
 5. Insert drive (8) and engage the drive yoke to pin (13).
 - ★ Draw a line on the end face of drive (8) with a marker in parallel with pin (13) for secure positioning.
(Perform this work carefully since it is necessary for adjusting the valve timing.)
 6. Install gerotor (4) with its O-ring side toward spacer plate (7) while setting the root of the gerotor star tooth to the line drawn with the marker. At this time, check that pin (13), the line drawn with the marker on drive (8) and the gerotor star root are in parallel as shown in the figure.



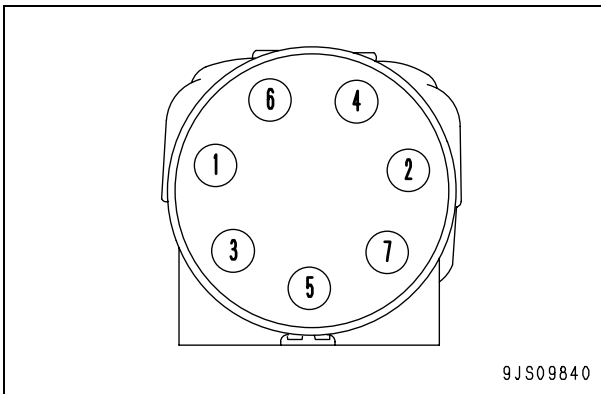
7. Align the bolt holes by rotating the gerotor ring, taking care not to disconnect the gerotor from drive (8).
 - ★ Since wrong assembly can cause a malfunction and a serious accident, align securely.
8. Install spacer (5) to the internal spline of the gerotor star.
 - ★ Spacer (5) may not be installed and 2 pieces of it may be installed, depending the specification.
9. Place end cap (3) on gerotor (4) and align the bolt holes.

10. Apply hydraulic oil to the threaded portions of 7 screws (1) and install end cap (3).

Tighten all the screws evenly first to 14.7 Nm {1.5 kgfm} evenly and then tighten them to the following torque.

- ★ Tighten the screws in the order shown in the figure.

Specification	Displacement	Tightening torque Nm {kgfm}
Standard specification	Max. 51 cm ³ /rev	28 {2.9}
	60 - 277 cm ³ /rev	23 {2.3}
	Min. 369 cm ³ /rev	28 {2.9}
Low-slip specification	Below 51 cm ³ /rev	28 {2.9}
	Min. 51 cm ³ /rev	21 {2.1}



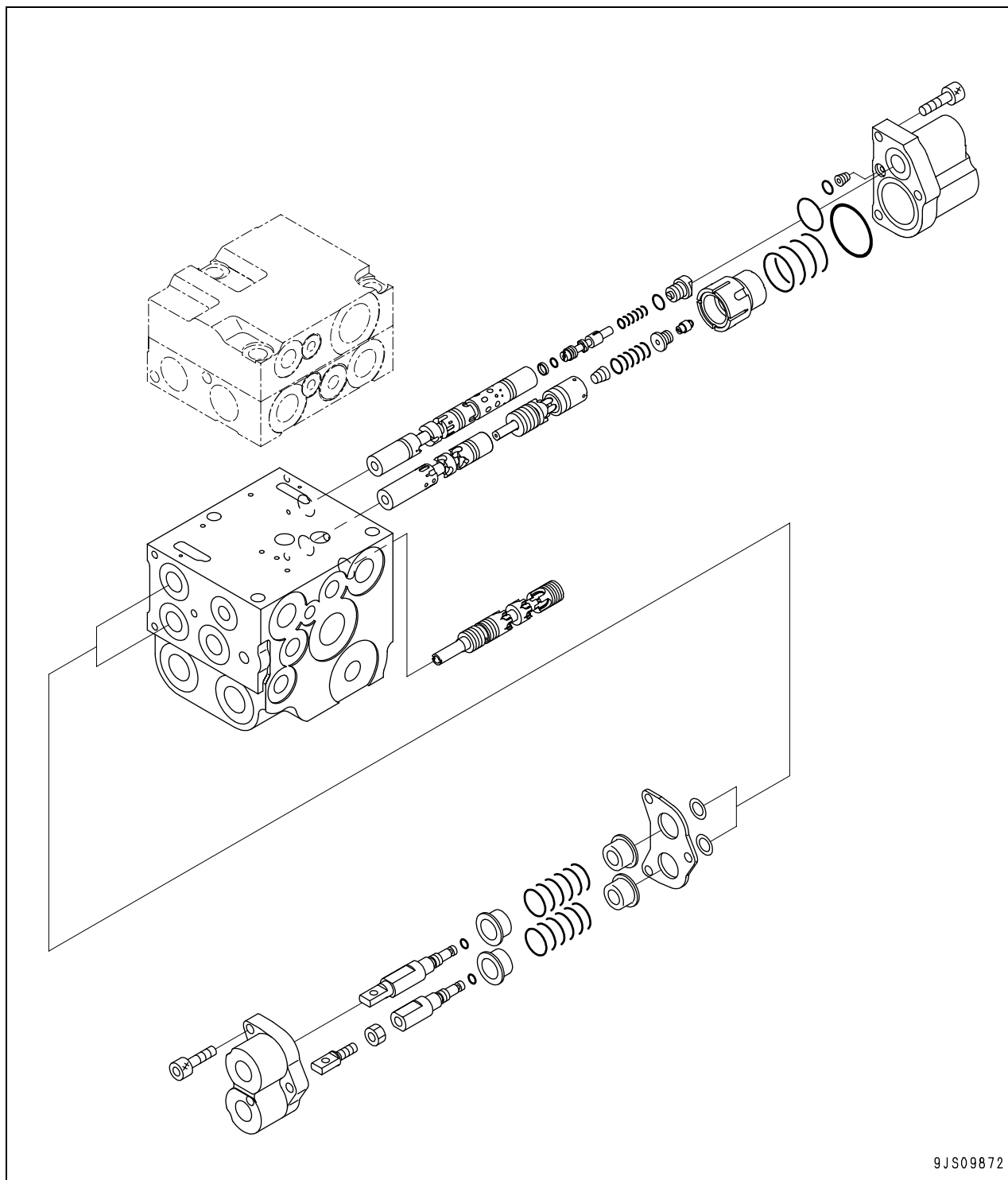
11. Install the handle to spool (12).

- ★ Check that spool (12) rotates.

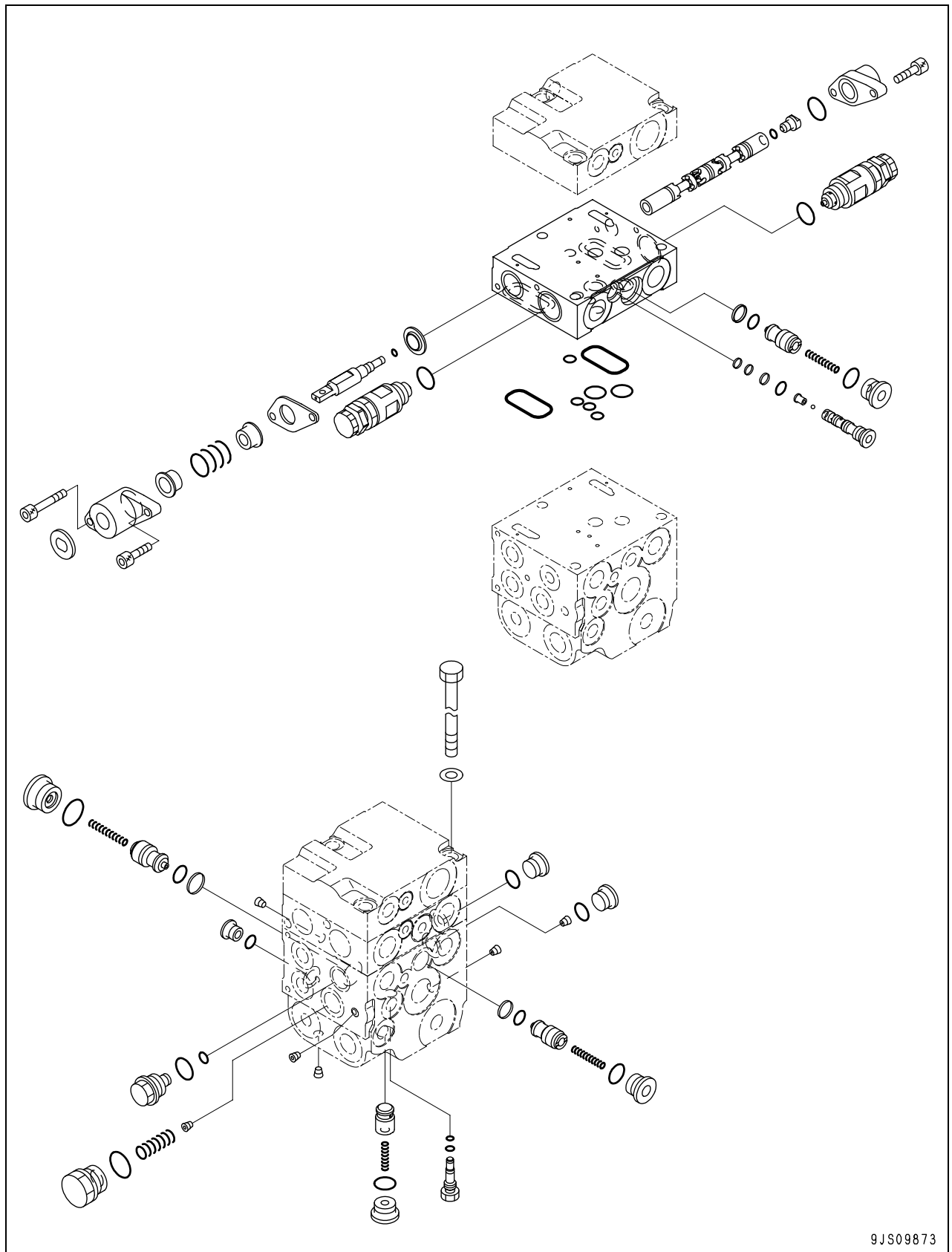
Disassembly and assembly of control valve assembly

In this section, only the precautions for assembling the control valve assembly are described.

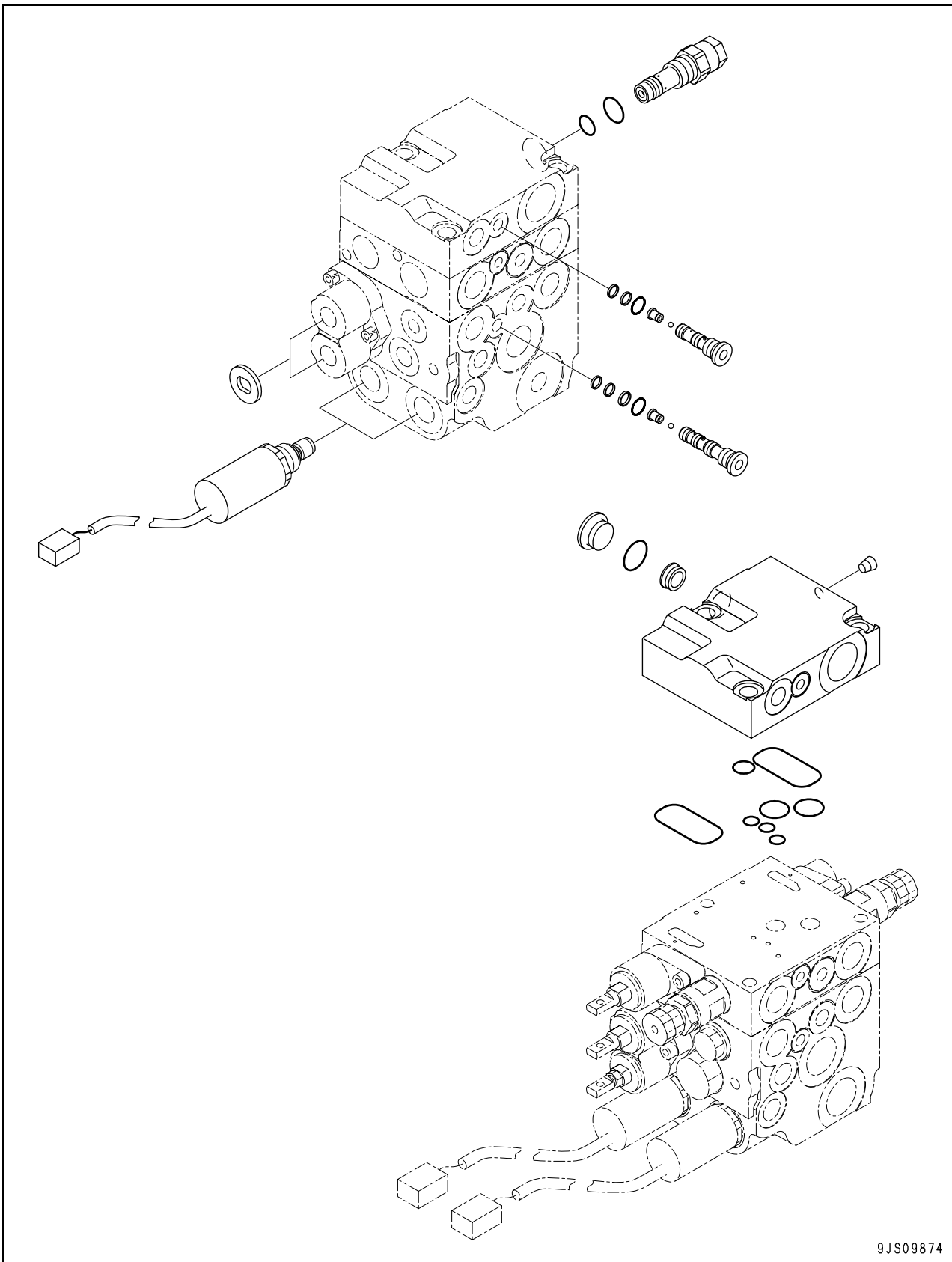
- ★ Work in an indoor clean place free from dirt and dust.
- ★ Clean the parts with clean solvent and dry them with compressed air.
- ★ Replace any part having burrs or a fin with new one.
- ★ Apply engine oil to the sliding parts before assembling.
- ★ Take care of the installed direction of each spool.
- ★ Apply a drop (approx. 0.02 g) of LOCTITE (No. 638) to the plug of each spool before tightening.
- ★ Apply SEALEND 242 or equivalent to each mating face.
- ★ For the tightening torque of each part, see Structure and function, Maintenance standard, "Hydraulic equipment, control valve".
- ★ Tighten the control valve top cover mounting bolts in 3 times in the order of (1), (2) and (3).
 - 1st tightening torque:
9.8 – 14.7 Nm {1 – 1.5 kgm}
 - 2nd tightening torque:
19.2 – 24.5 Nm {2 – 2.5 kgm}
 - 3rd tightening torque:
29.4 – 34.3 Nm {3 – 3.5 kgm}
- ★ Do not bend the wiring harness more sharply than R35 mm or give it tension higher than 4.9N {0.5 kg}.



9JS09872



9JS09873



Precautions for servicing control valve

When servicing control valve (1), if you loosen locknut (3) of lift spool (2) by mistake, the fork may lower quickly even if you operate lift lever (8) slowly after raising the fork.. (The fork will fall suddenly)

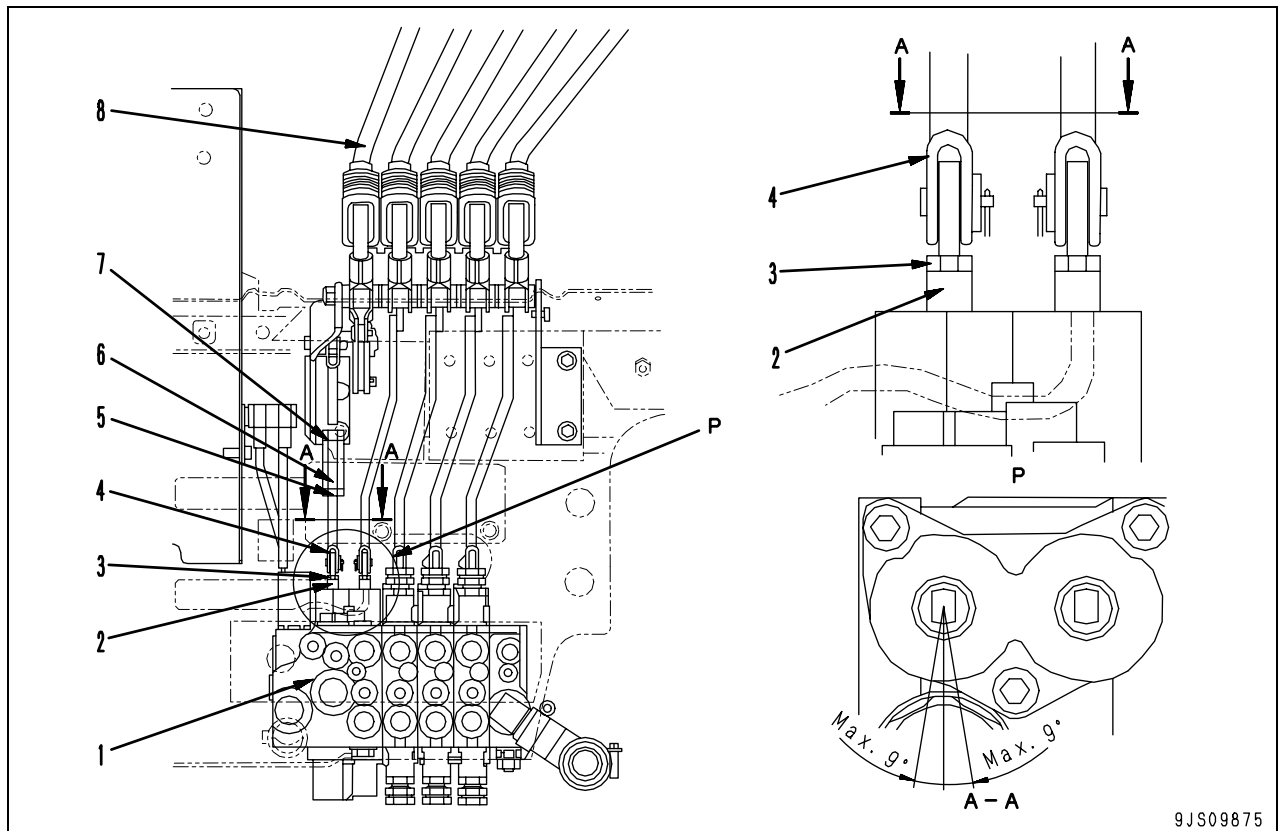
1. Precautions for replacing control valve (1)

When performing the following work, observe the given precautions.

- Replacement of control valve (1)
- Replacement of lift lever (8) of control valve (1) and adjustment of knob height
- Removal and installation of lift lever (8) for replacement of other parts

Precautions

- ★ When assembling lift spool (2) and yoke (4) of control valve (1), do not loosen locknut (3). If the locknut is loosened, it will be difficult to adjust the lift lowering speed.
- ★ Since lift spool (2) has directionality, assemble so that its direction can be judged by the direction of yoke (4). If locknut (3) is loosened, the direction of the lift spool cannot be judged and disassembly and adjustment will be required.
- ★ Loosen nut (right-hand thread) (7) and nut (left-hand thread) (5) and then rotate yoke (4) to adjust lift spool (2) while rotating nut (6).
- ★ Assemble lift spool (2) of control valve (1) in the adjustment range of $\pm 9^\circ$ from the forward and backward direction of the lift truck as shown in section A-A.
- ★ Install lift spool (2) so that yoke (4) (inverted U-shaped) will be seen from the operator seat.
- ★ After finishing assembly, operate according to the check method in 2 to check that the operation is normal.



2. Check method after finishing maintenance
★ Park the lift truck in a safe place and then start the work.

Step 1: Start the engine and operate lift lever (8) slowly with no load.

(Lift lever (8): From N to D)

↓

Step 2: Operate lift lever (8) slowly. Check that the fork lowers slowly when the lift lever is operated approx. 45 mm.

(Near point (A))

If the fork does not lower, go to step 3.

↓ → **If the fork lowers slowly, the assembly is normal.**

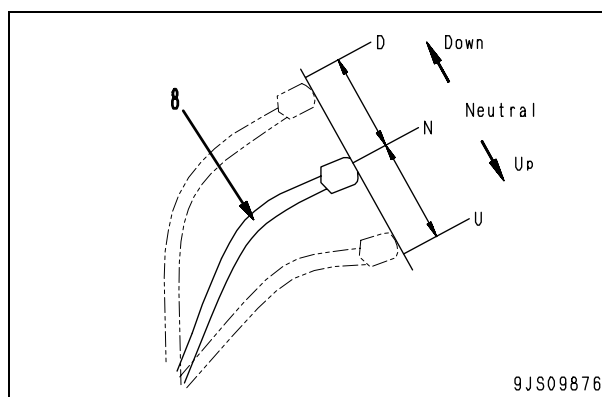
Step 3: If the fork does not lower in step 2, further operate the lever slowly.

↓ → The fork starts lowering quickly during operation.

(Near point B): "Fork falls suddenly"

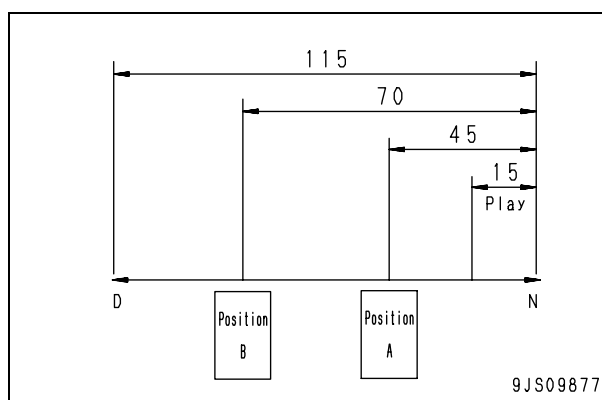
Step 4: When steps 1 – 3 are repeated 3 – 5 time, if "the fork falls suddenly" repeatedly, locknut (3) of lift spool (2) might have been loosened during servicing.

Explanation of lift lever



Lever stroke for lowering fork (Unit: mm)

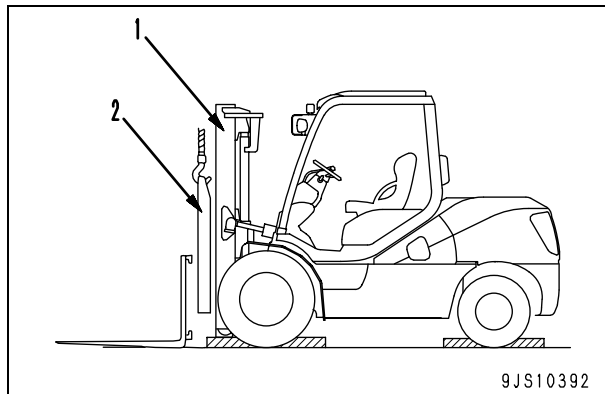
★ The values disperse more or less.



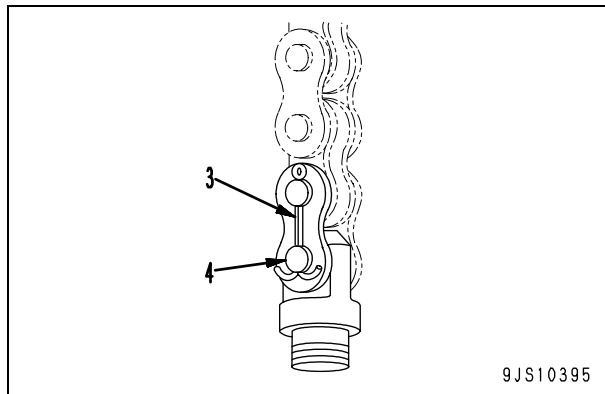
Removal and installation of lift cylinder

Removal

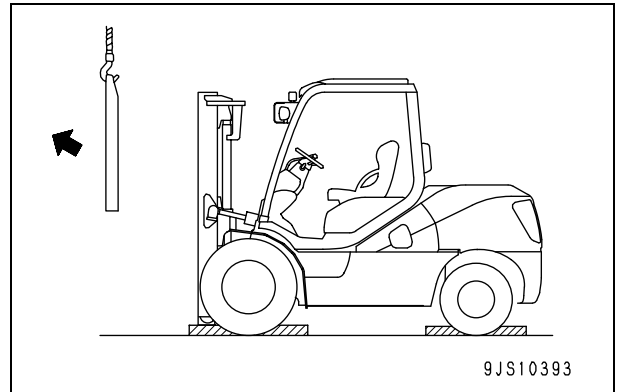
1. Lock the front and rear wheels with chocks.
2. Set the mast (1) vertically.
3. Remove the fork.
4. Sling finger board (2) about 300 mm with the crane.



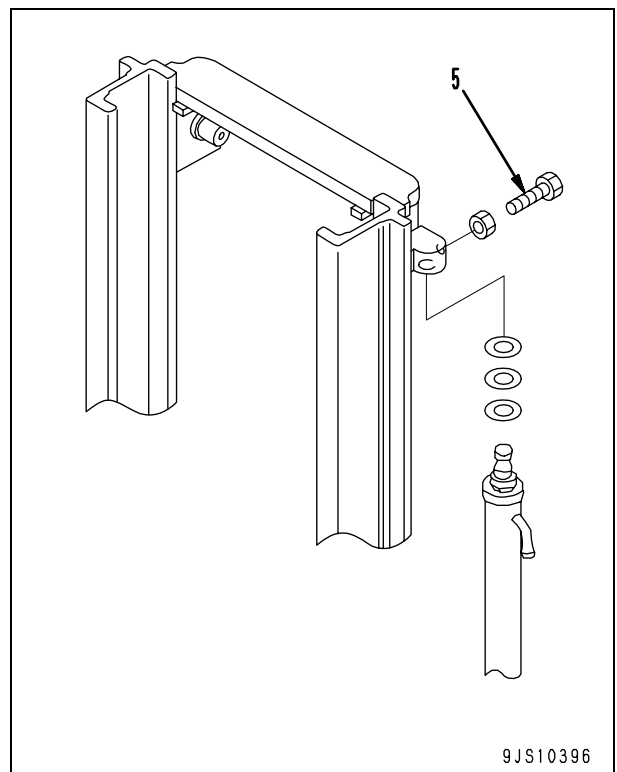
5. Remove cotter pin (3) and pull out pin (4) to disconnect the chain. Remove the chain from the chain roller.



6. Operate the lift lever to raise the mast. Sit on the seat correctly for load handling operation. The load handling operation is disabled when you are not seated properly or off the seat.
7. Pull out the finger board forward.



8. Put blocks under the inner mast.
9. Remove stopper bolt (5).
10. Operate the lift lever to lower the cylinder rod.
11. Release the residual pressure in the piping, and then remove the piping.
 - ★ For the hydraulic piping pressure release procedure, see Testing and adjusting, "Hydraulic piping pressure release procedure", page 30-100-5.
 - ★ After removing the piping, install plugs immediately to prevent flowing out of the hydraulic oil and entry of dirt.
12. Remove the cylinder clamps. The cylinder clamps vary depending on the mast.
13. Using sling belts, lift off the cylinder.

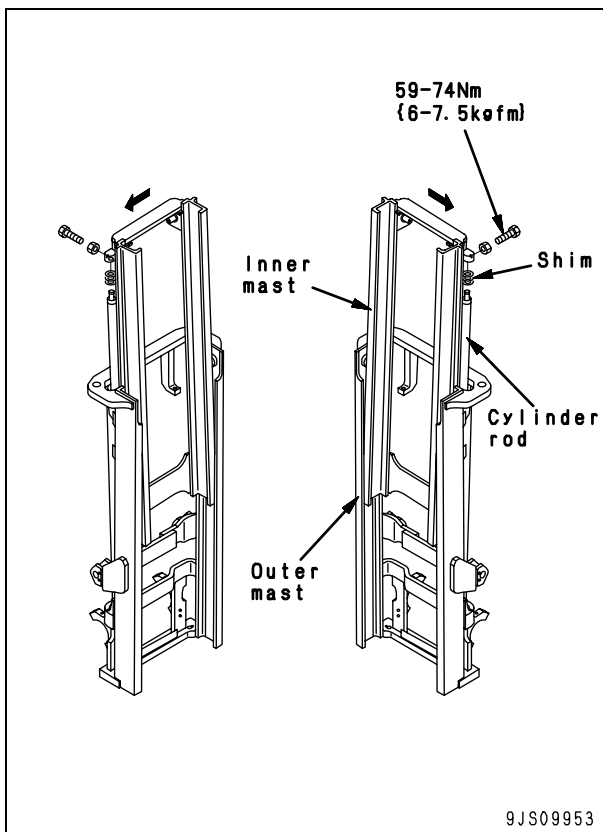


Installation

Synchronization of mast

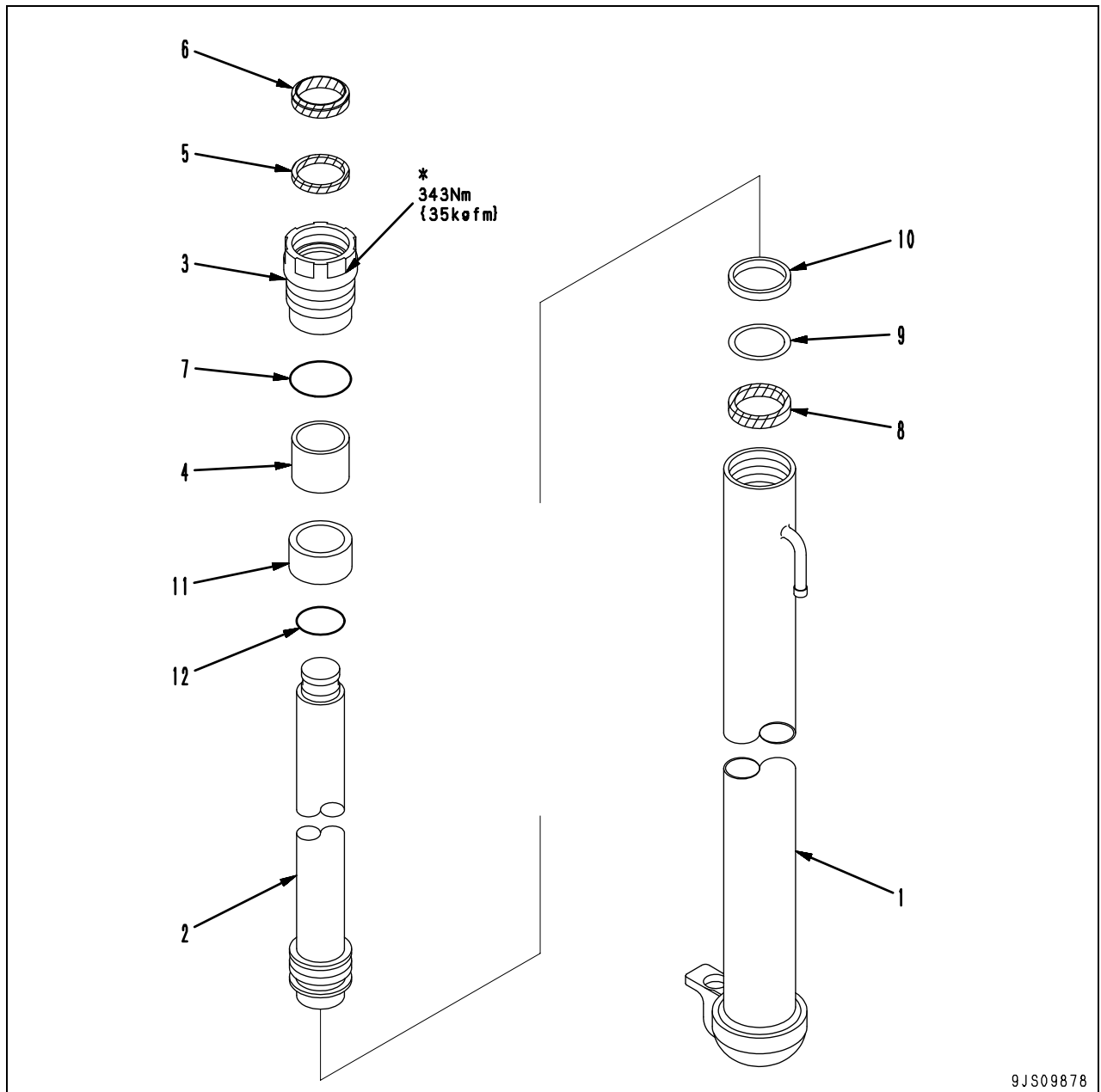
1. Raise the mast to the maximum lifting height.
2. Check the mast for lateral play.
3. Adjust the shims so that the right and left cylinders will be synchronized at the maximum lifting height.

Runout to left	Insert shim in left cylinder
Runout to right	Insert shim in right cylinder



Disassembly and assembly of lift cylinder

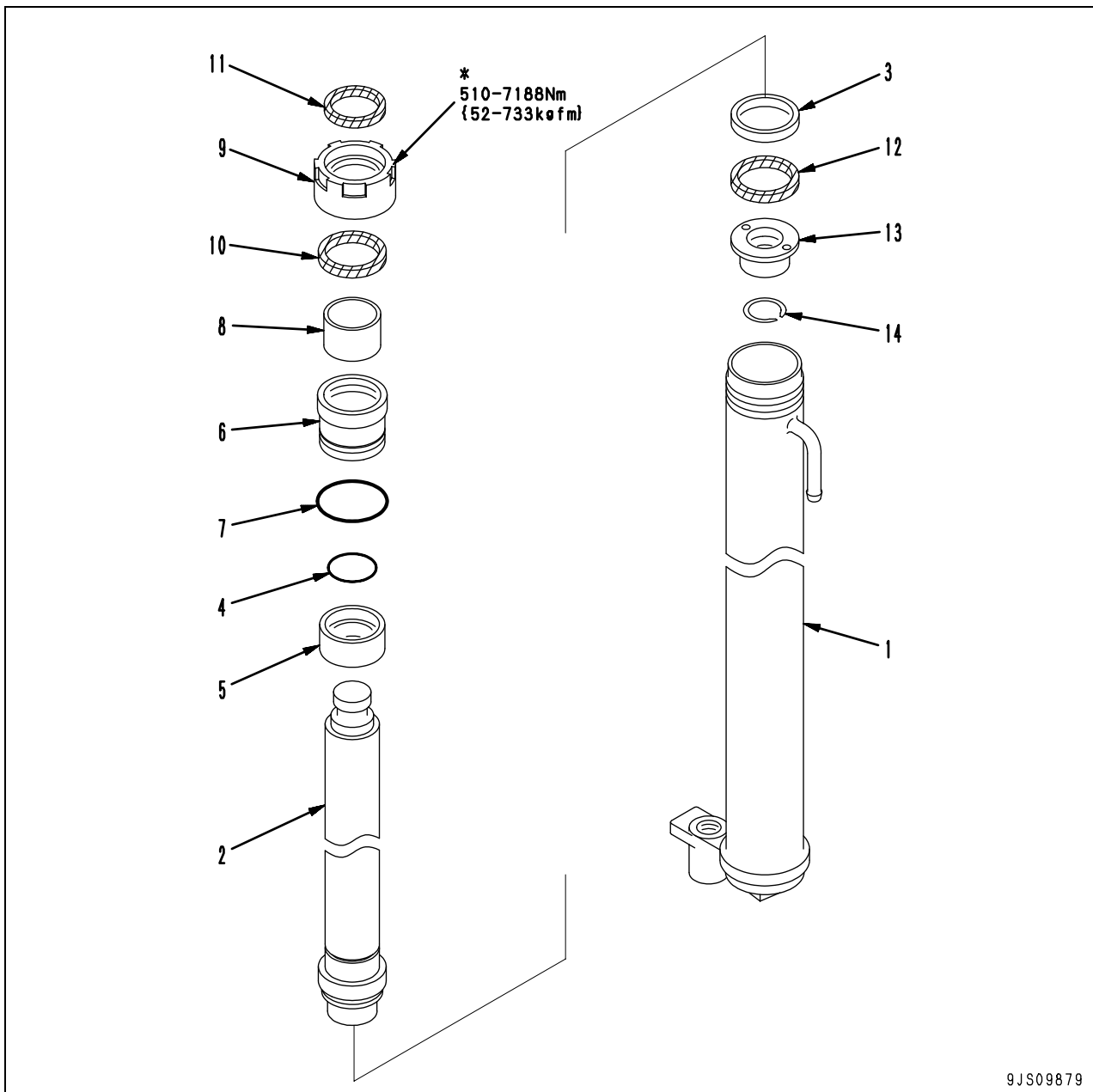
3.5 – 4.5 ton



★ *: When tightening the head, apply Threebond #1901 to the threaded portions.

- | | |
|------------------|----------------|
| 1. Cylinder | 7. O-ring |
| 2. Piston rod | 8. U-ring |
| 3. Cylinder head | 9. Backup ring |
| 4. Bushing | 10. Bushing |
| 5. Rod packing | 11. Spacer |
| 6. Dust seal | 12. O-ring |

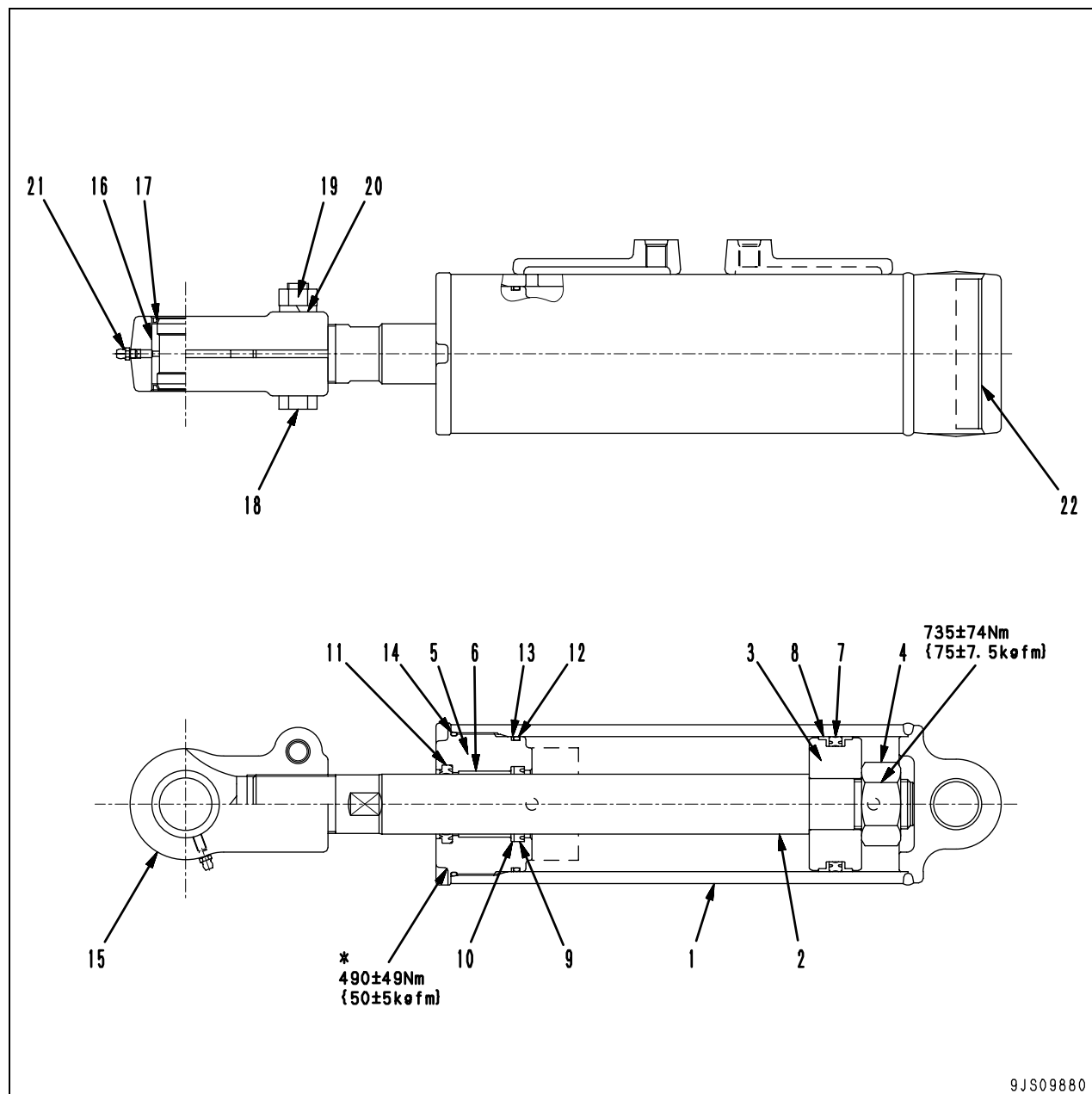
4.5 – 5.0 ton



★ *: When tightening the head, apply Threebond #1901 to the threaded portions.

- | | |
|-------------------|----------------|
| 1. Cylinder | 8. Bushing |
| 2. Piston rod | 9. Backup ring |
| 3. Ring | 10. U-ring |
| 4. O-ring | 11. Wiper |
| 5. Spacer | 12. Packing |
| 6. Overhead guard | 13. Retainer |
| 7. O-ring | 14. Stopper |

Disassembly and assembly of tilt cylinder



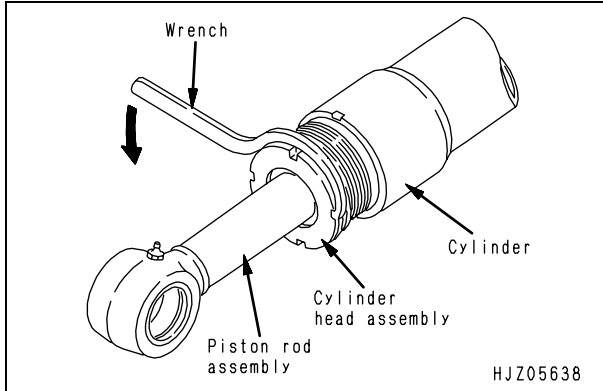
★ *: When tightening the head, apply Threebond #1344 to the threaded portions.

- | | |
|--------------------------|--------------------|
| 1. Cylinder sub-assembly | 12. O-ring |
| 2. Rod | 13. Backup ring |
| 3. Piston | 14. O-ring |
| 4. Nut | 15. Overhead guard |
| 5. Overhead guard | 16. Bushing |
| 6. Bushing | 17. Dust seal |
| 7. Packing | 18. Bolt |
| 8. Backup ring | 19. Nut |
| 9. Packing | 20. Washer |
| 10. Backup ring | 21. Grease fitting |
| 11. Dust seal | 22. Bushing |

Disassembly of lift and tilt cylinders

1. Removal of cylinder head assembly

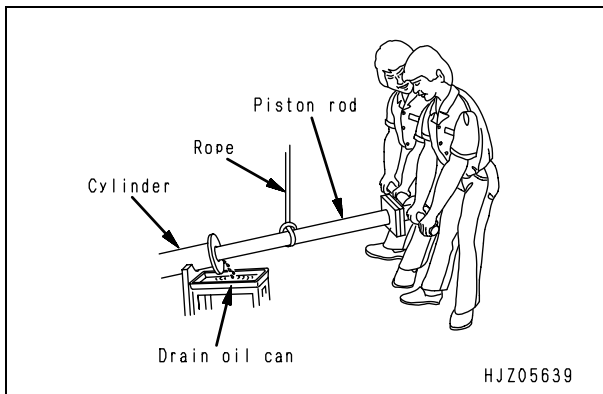
Remove the cylinder head assembly with the wrench.



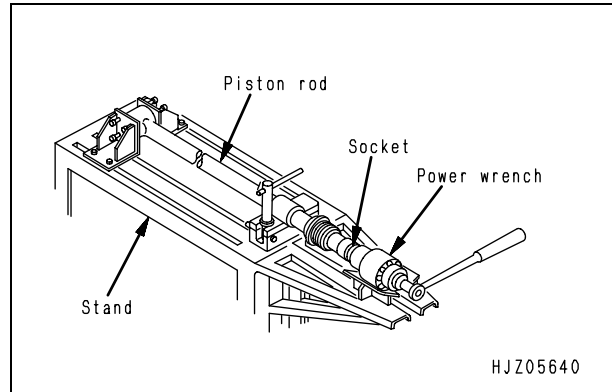
2. Removal of piston rod assembly

Pull the piston rod and cylinder head assembly out of the cylinder.

- ★ When slinging with wires, insert cloths to protect the rod from being damaged.
- ★ Prepare a waste oil can to receive hydraulic oil flowing out when the piston rod is pulled out.
- ★ If the piston rod cannot be pulled out easily, pull it while rotating it.
- ★ When pulling out the piston rod, take care not to damage the piston seal with the threaded portion of the cylinder.

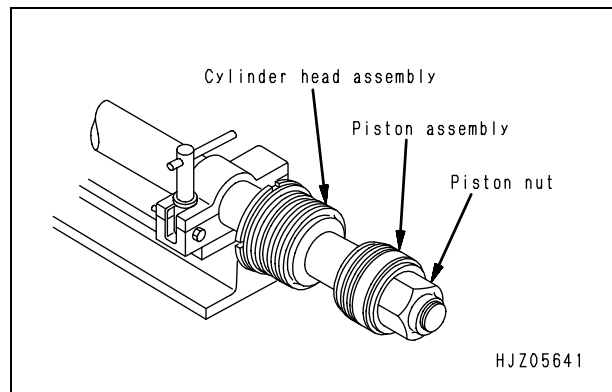


- ★ Support the piston rod and cylinder head assembly with the supporting tool shown in the figure and loosen the piston nut with the power wrench and socket.
- ★ For the torque of the power wrench and the width across flats of the socket, see Index and foreword, "Standard tightening torque table", page 00-200-34.

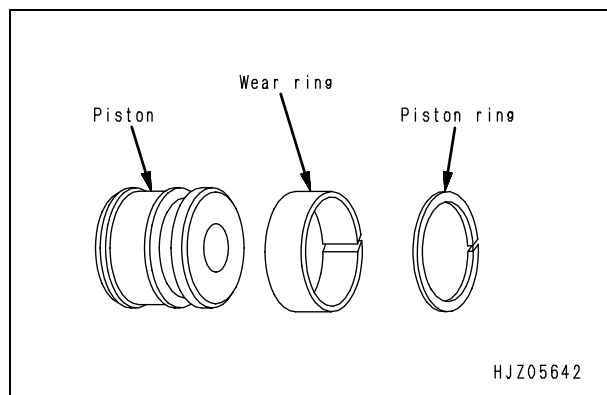


3. Disassembly of piston rod assembly

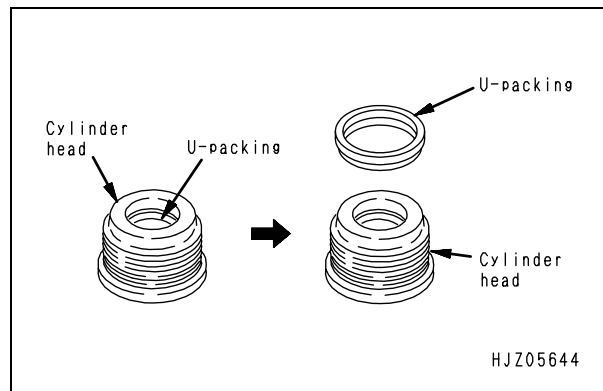
- 1) Remove piston rod head.
(Tilt cylinder only)
- 2) Remove the cylinder head assembly from the piston rod assembly.
 - ★ Take care not to damage the cylinder head seal with the threaded portion of the piston rod.



- 3) Remove the wear ring.
- 4) Remove the piston ring.
 - ★ Do not remove the rings etc. if they are free from damage. Replace the removed parts with new ones.

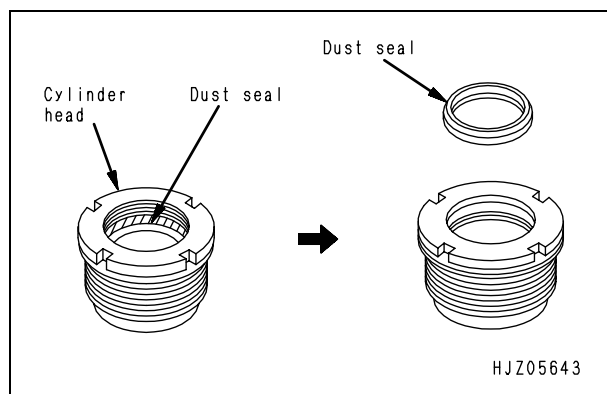


- 2) Using a screwdriver, remove the U-packing.
 - ★ Take care not to damage a portion other than the U-packing.



4. Disassembly of cylinder head assembly

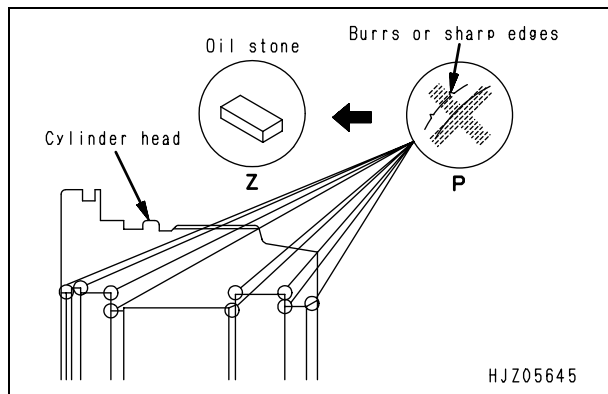
- ★ Do not disassemble if the seals are free from damage. If the cylinder head assembly is disassembled, replace the seals with new ones.
- 1) Remove the snap ring (tilt cylinder only) and remove the dust seal.



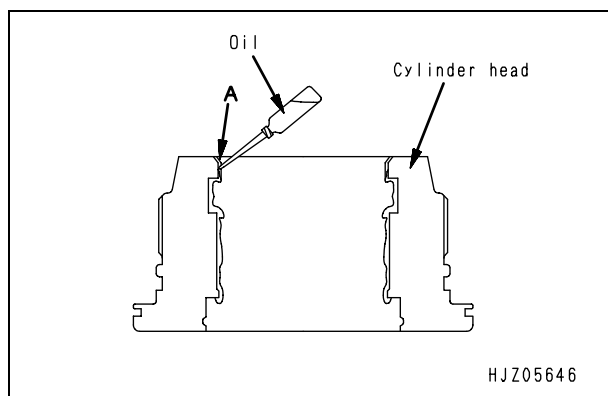
Assembly of lift and tilt cylinders

1. Assembly of cylinder head assembly

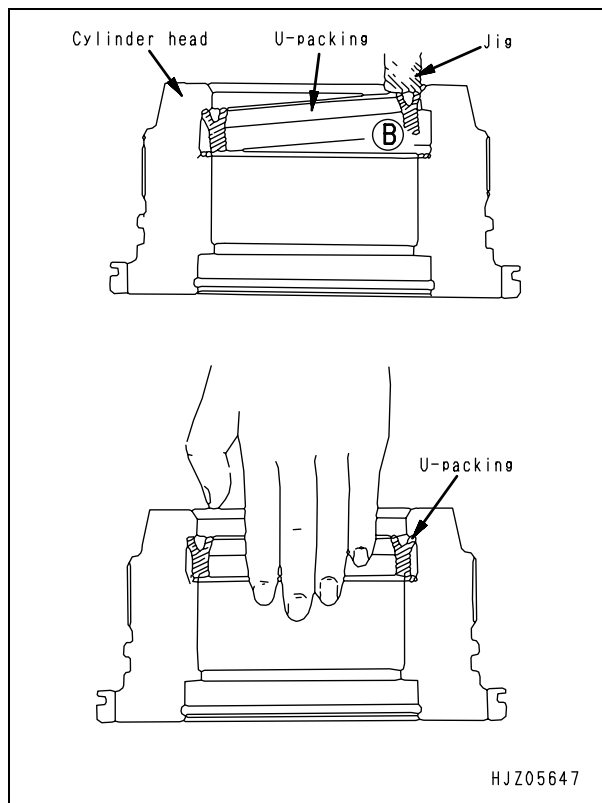
- 1) If there are burrs or a sharp fin at part P shown below, remove them with oilstone Z to prevent the seal from being damaged.



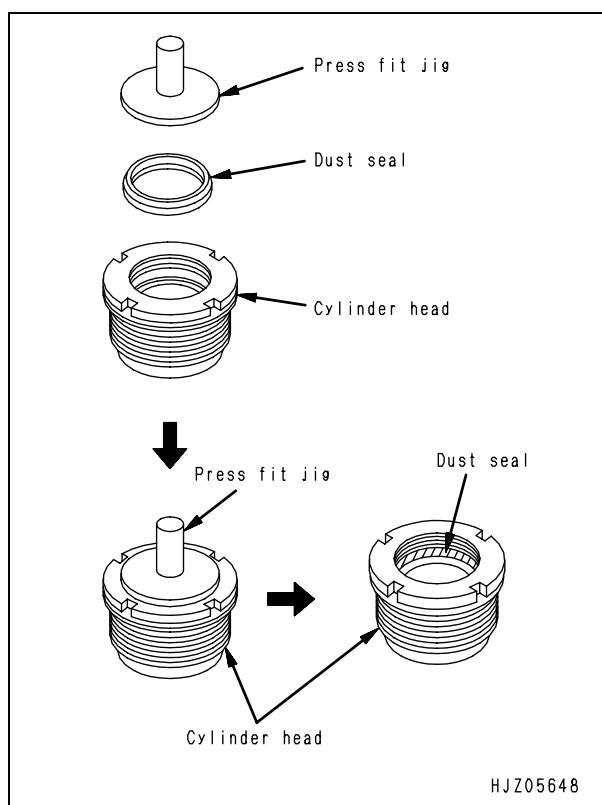
- 2) Apply grease or hydraulic oil to the inside and packing of the cylinder head and O-ring groove A.



- 3) Crush the U-packing and push it into groove B.
 - ★ When pushing in the U-packing with a jig, use one made of copper, aluminum or plastics having no burrs and fins on the faces to be in contact with the U-packing.
 - ★ Install with the hand and a jig should not be used, as long as possible.
- 4) While pushing the inside of the U-packing outward, check the internal lip for abnormality and confirm the fitting condition to the groove.



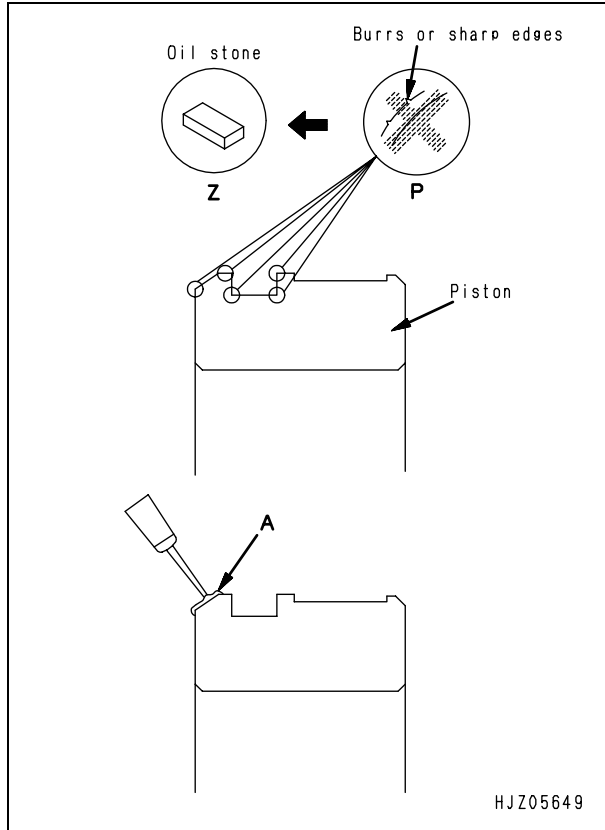
- 5) Using the press fitting jig, press fit the dust seal.



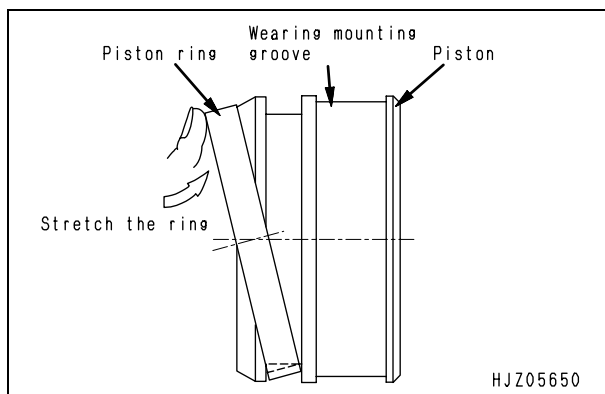
- 6) Install the O-ring.

2. Assembly of piston assembly

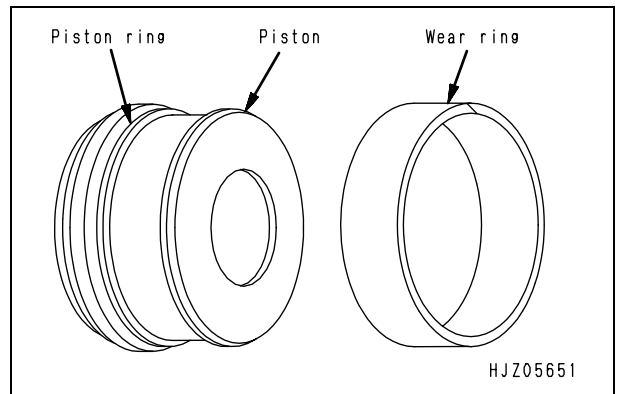
- 1) If there are burrs or a sharp fin at part P shown below, remove them with oilstone Z to prevent the seal from being damaged.
- 2) Apply grease or hydraulic oil to part A on the tapered face of the piston.



- 3) Put either end of the piston ring in the groove first and then put the other end in the groove along the tapered face while pushing expanding it with hands.



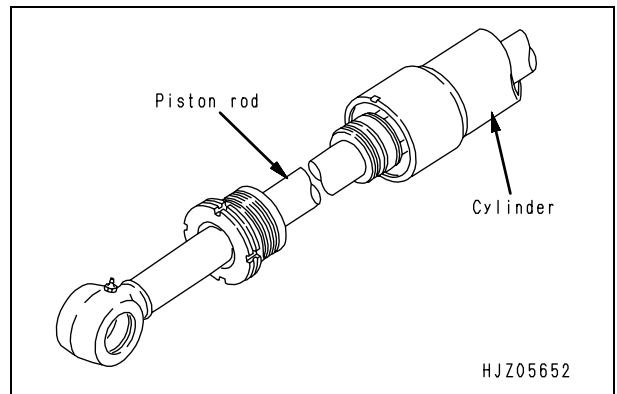
- 4) Install the wear ring.



3. Assembly of piston rod assembly

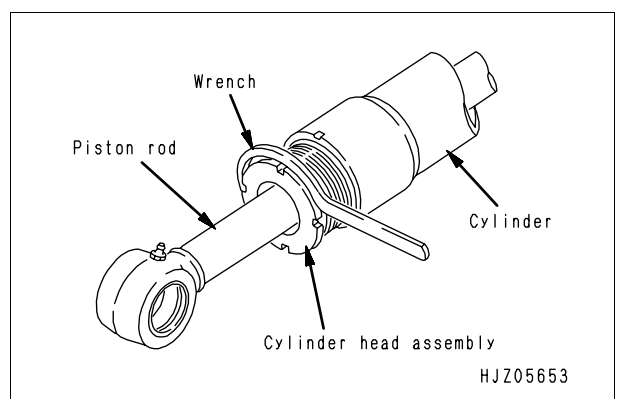
Install the piston rod assembly to the cylinder.

- ★ Take care not to damage the seals of the piston rod assembly with the threaded portion of the cylinder.



4. Assembly of cylinder head assembly

Using the wrench, tighten the cylinder head assembly to the cylinder.



FORKLIFT TRUCK

CX50 Series

Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

50 Disassembly and assembly

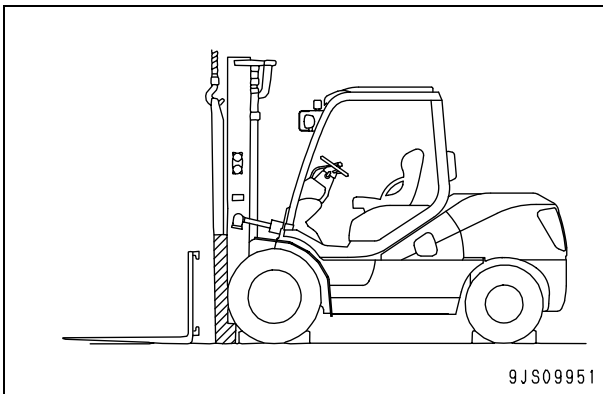
500 Work equipment

Removal and installation of mast	2
Disassembly and assembly of mast	3

Removal and installation of mast

Removal

1. Put blocks under the front and rear wheels.
2. Remove the fork.
3. Raise the finger board with crane to remove the hydraulic piping.
4. Put blocks under the finger board.
5. Release the residual pressure in the piping, and then remove the piping.
 - ★ See "Hydraulic piping pressure release procedure".
 - ★ After removing the piping, install plugs immediately to prevent flowing out of the hydraulic oil and entry of dirt.
6. Sling the finger board a little with the crane and remove the blocks.



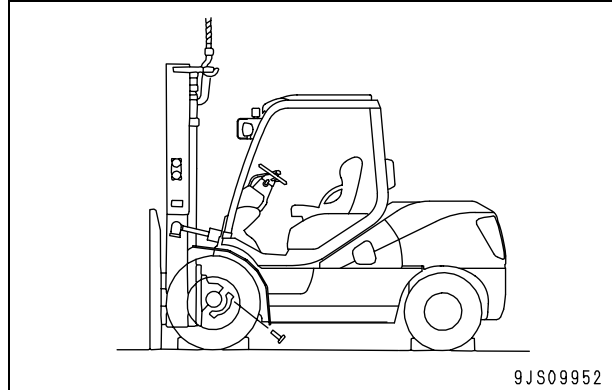
7. Lower the fork carriage.
 - ★ Fix the outer mast lower stay and finger board with wires etc. so that the finger board will not move and prepare for slinging the mast with the crane.
8. Install the crane to the mast.
9. Remove the tilt pin.

10. Tilt the mast forward from the vertical position and remove the front axle mount cap bolts.

Note: If the cap bolts are removed while the mast is tilted back, the mast may fall down suddenly.

 Mast cap mounting bolt:

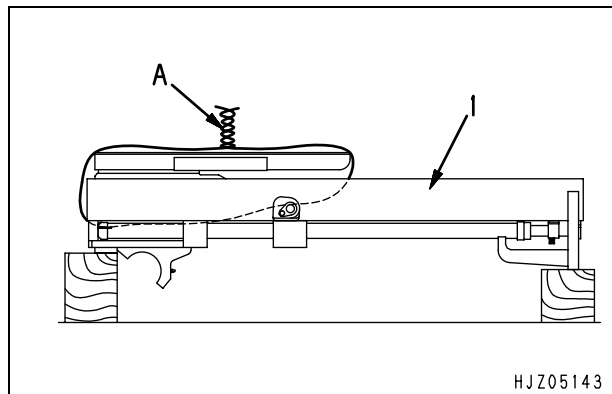
343 – 427 Nm {35 – 43.5 kgfm}



11. Remove the mast.

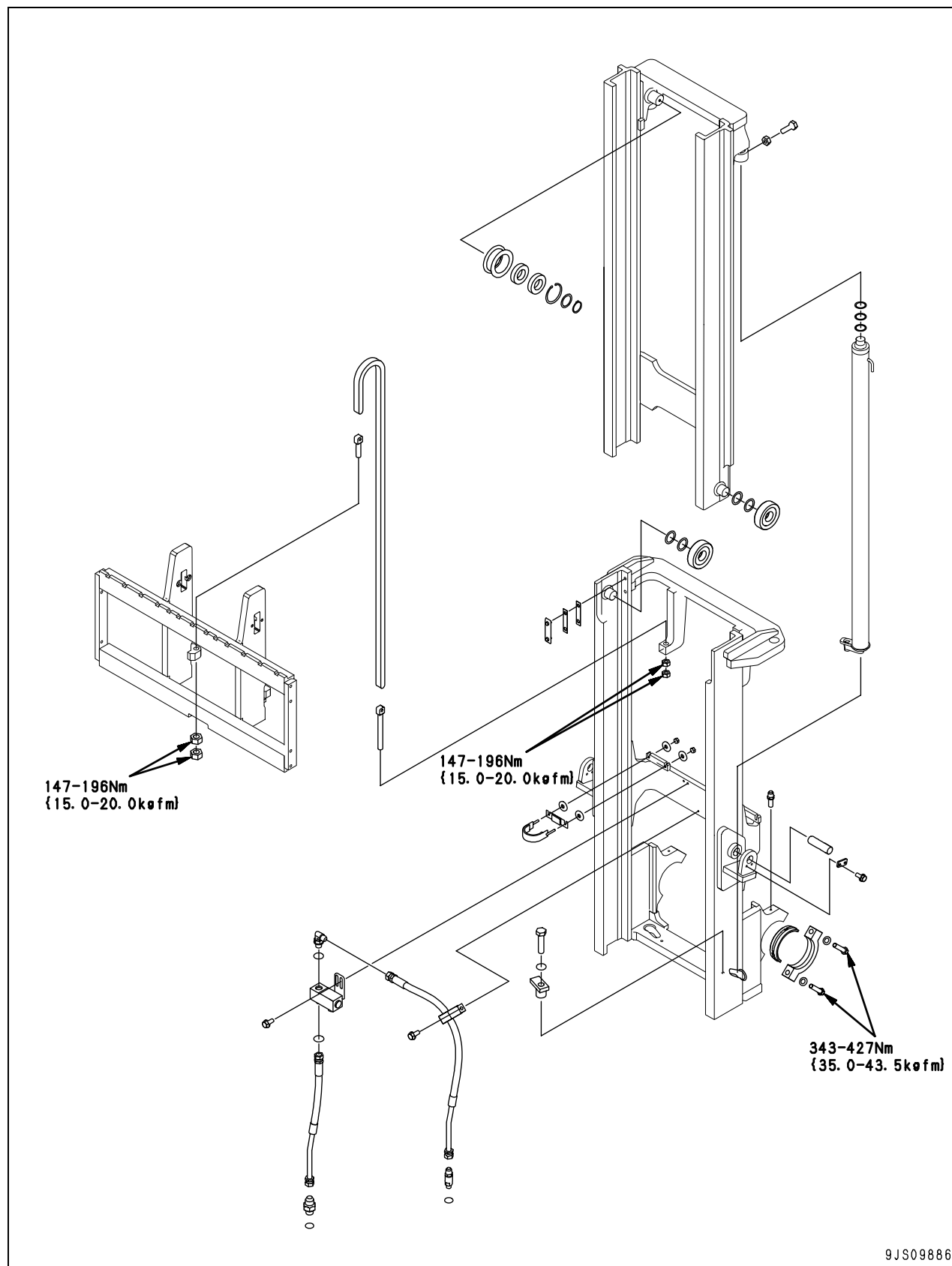
Note: When carrying the remove mast in the horizontal position, fix the outer mast lower stay and the finger board with wire A.

▲ Place mast assembly (1) horizontally on blocks with the finger board up.

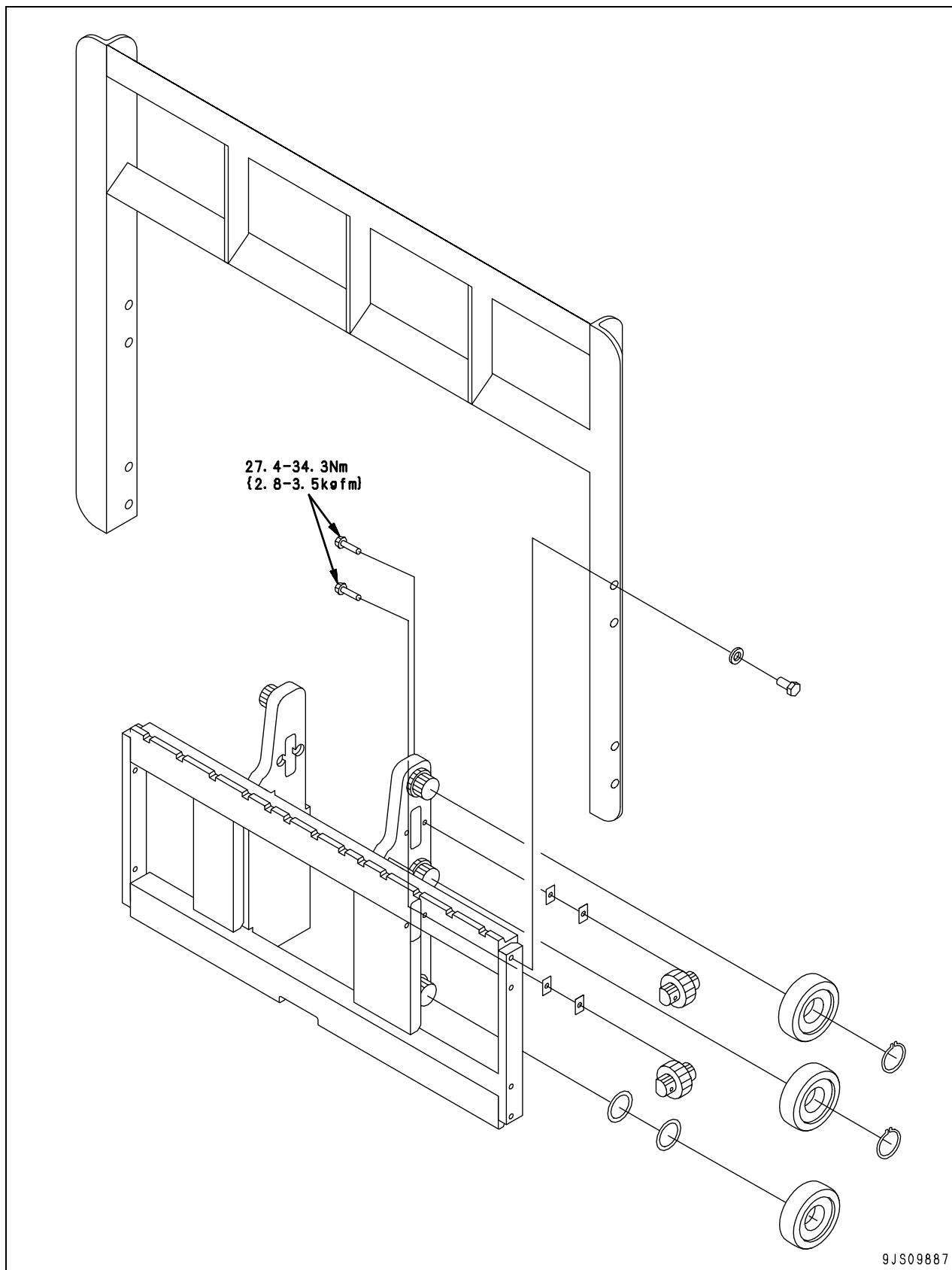


- ★ Carry out installation in the reverse order to removal.

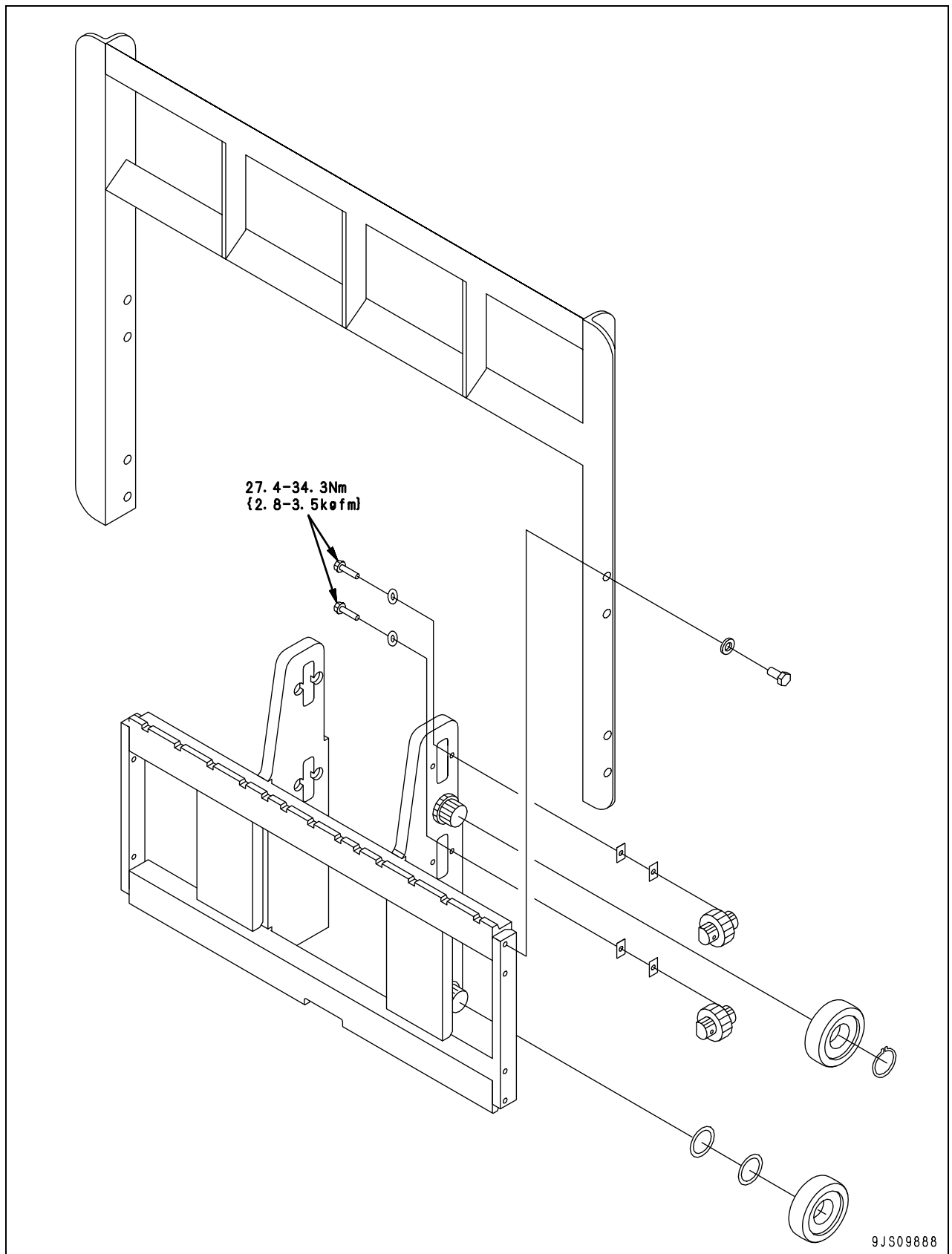
Disassembly and assembly of mast



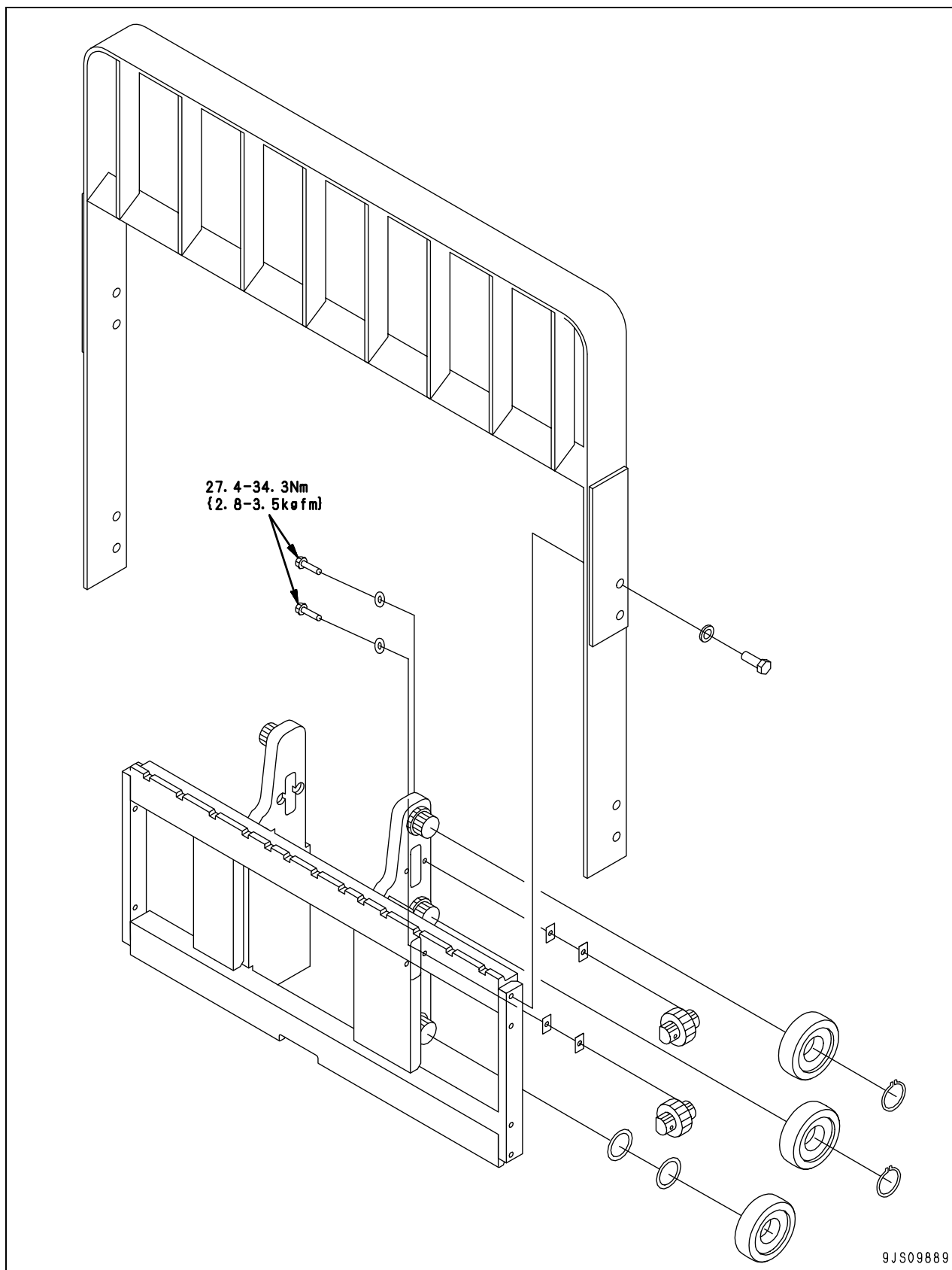
Finger board
3.5 – 4.0 ton



4.5 ton



5.0 ton



FORKLIFT TRUCK

CX50 Series

Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

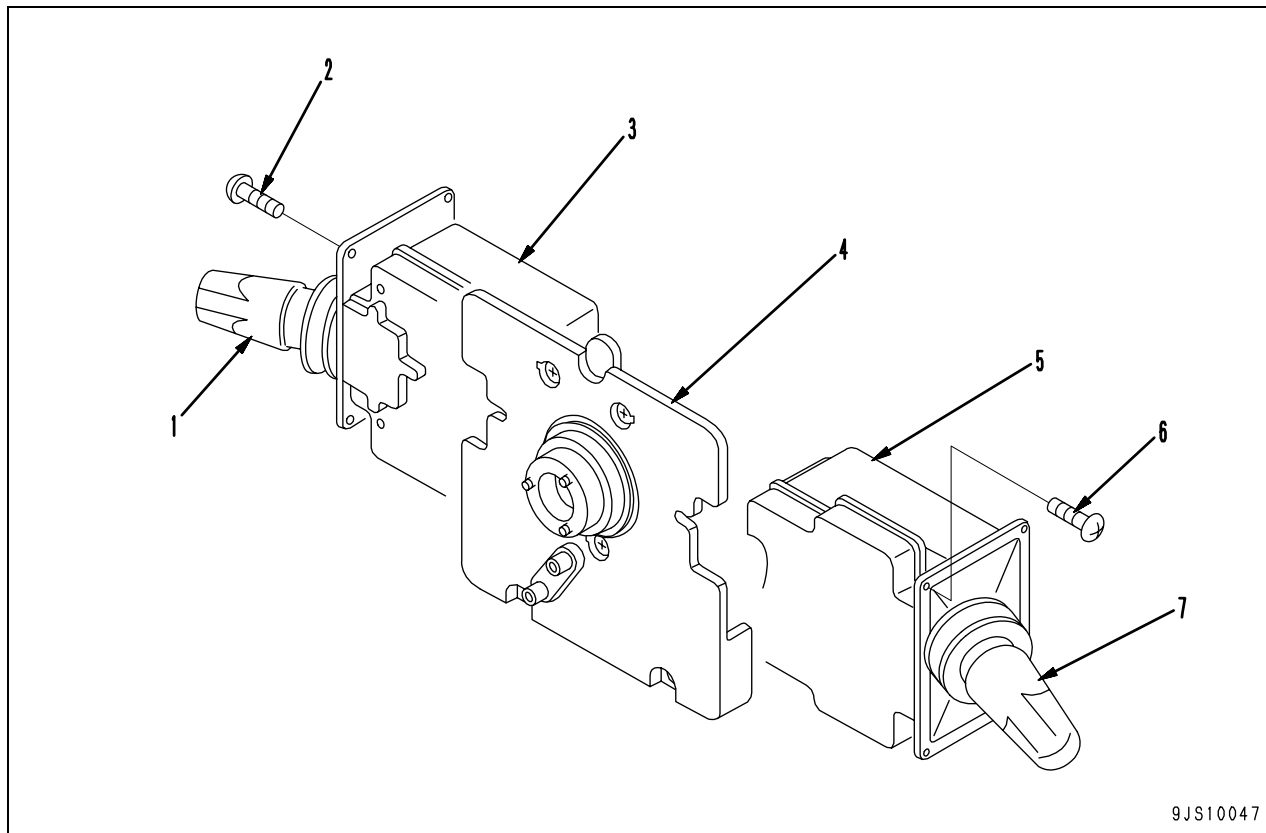
50 Disassembly and assembly

600 Electric devices

Combination switch	2
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Combination switch

Component parts



1. FR switch
2. Screw
3. Cover
4. Body
5. Cover
6. Screw
7. Turn signal switch

FORKLIFT TRUCK

CX50 Series

Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

80 Yearly inspection criteria

100 Yearly inspection criteria

Yearly inspection criteria	2
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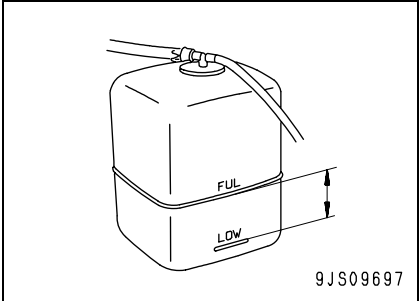
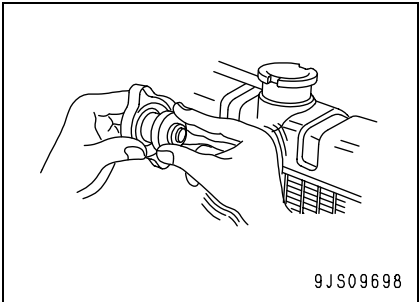
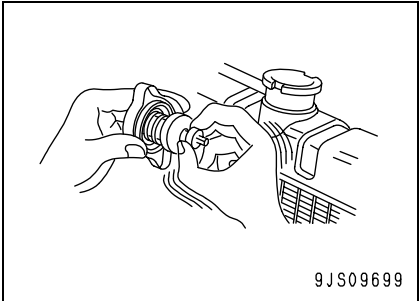
Yearly inspection criteria

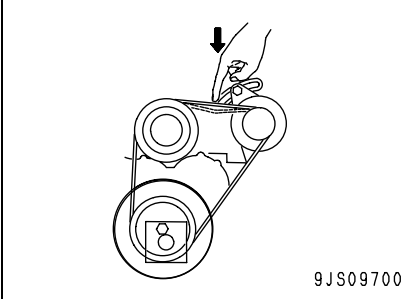
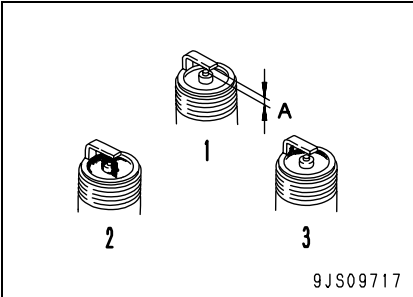
Com- ponent	Inspection item	Contents of inspection											
Prime mover	1. Engine startability, abnormal sound, etc.	- Check the following items on engine startability. ★ Set the forward/reverse lever in neutral position, pull the parking brake lever, and start the engine. Check that the engine starts smoothly. Check for abnormal sound. Check that the electric heater operates. Check that the accelerator pedal operates smoothly.											
	2. Engine rotating condition and exhaust gas.	- Check the following items on engine rotating condition and exhaust gas. ★ When depressing the accelerator pedal, set the forward/reverse lever in neutral position and pull the parking brake lever. Check the engine for stumble. Check for abnormal sound. Check the engine for abnormal combustion. Check for irregular engine vibration. Check that the engine starts rotation smoothly. Check the exhaust connecting pipe and muffler for gas leakage. Check the exhaust gas color for abnormality.<table><tr><td>During idling</td><td>Colorless</td></tr><tr><td>When pedal is depressed</td><td>Pale black</td></tr></table>	During idling	Colorless	When pedal is depressed	Pale black							
	During idling	Colorless											
When pedal is depressed	Pale black												
3. Idling speed	- Check the following items on engine idling speed. ★ Warm up the engine before starting the inspection. ★ When depressing the accelerator pedal, set the forward/reverse lever in neutral position and pull the parking brake lever. Check that the low idling speed is in the specified range. Unit: rpm <table><tr><td>Engine</td><td>Idling speed</td></tr><tr><td>SAA4D95LE-5-A</td><td>800 ± 25</td></tr><tr><td>EBT-TB45-1A</td><td>700 – 800</td></tr></table> Check that the high idling speed (maximum speed) is in the specified range. Unit: rpm <table><tr><td>Engine</td><td>Idling speed</td></tr><tr><td>SAA4D95LE-5-A</td><td>2,500 ± 25</td></tr><tr><td>EBT-TB45-1A</td><td>2,350 – 2,450</td></tr></table>	Engine	Idling speed	SAA4D95LE-5-A	800 ± 25	EBT-TB45-1A	700 – 800	Engine	Idling speed	SAA4D95LE-5-A	2,500 ± 25	EBT-TB45-1A	2,350 – 2,450
Engine	Idling speed												
SAA4D95LE-5-A	800 ± 25												
EBT-TB45-1A	700 – 800												
Engine	Idling speed												
SAA4D95LE-5-A	2,500 ± 25												
EBT-TB45-1A	2,350 – 2,450												

Com- ponent	Inspection item	Contents of inspection											
Prime mover	4. Air cleaner	- Check the following items on the air cleaner and element. ★ When inspecting the air cleaner and element, stop the engine. 1. Check the air cleaner body and cover for cracking and deformation. 2. Check the air cleaner mounting section for looseness. 3. Check the air cleaner connecting pipes for looseness. 4. Check the element for contamination and damage. ★ For cleaning and replacement when the element is contaminated, see the corresponding section of "Testing and adjusting".											
	5. Cylinder head and manifolds	- Check the following items on the cylinder head. 1. Check the cylinder head mounting bolts for looseness. 2. Check the cylinder head for water leakage and gas leakage. ★ For the tightening torque for the cylinder head mounting bolt, see the Shop Manual for the engine. - Check the following items on the exhaust and intake manifolds. 1. Check the exhaust and intake manifold mounting bolts for looseness. 2. Check the exhaust and intake manifolds for gas leakage. ★ For the tightening torque for the exhaust and intake manifold mounting bolt, see the Shop Manual for the engine.											
	6. Valve clearance	- Check the following items on the valve clearance. 1. Check that the valve clearance is the specified range. Unit: mm (Cold) <table border="1"> <tr> <th>Engine</th><th>Intake valve</th><th>Exhaust valve</th></tr> <tr> <td>SAA4D95LE-5-A</td><td>0.35</td><td>0.5</td></tr> </table> Unit: mm (Warm) <table border="1"> <tr> <th>Engine</th><th>Intake valve</th><th>Exhaust valve</th></tr> <tr> <td>EBT-TB45-1A</td><td>0.35</td><td>0.35</td></tr> </table> ★ For the adjustment method of the valve clearance, see the Shop Manual for the engine.	Engine	Intake valve	Exhaust valve	SAA4D95LE-5-A	0.35	0.5	Engine	Intake valve	Exhaust valve	EBT-TB45-1A	0.35
Engine	Intake valve	Exhaust valve											
SAA4D95LE-5-A	0.35	0.5											
Engine	Intake valve	Exhaust valve											
EBT-TB45-1A	0.35	0.35											

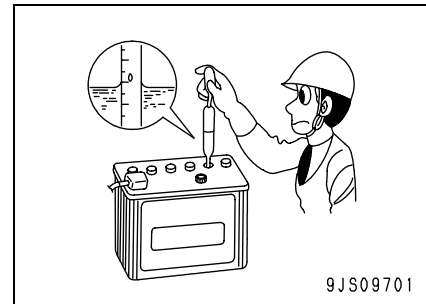
Com- ponent	Inspection item	Contents of inspection												
Prime mover	7. Compression pressure	- Check the following items on the compression pressure of the engine. 1. Check that the compression pressure is in the limit range. Unit: MPa {kgf/cm²}/rpm <table><tr><th>Engine</th><th>Standard value</th><th>Limit value</th></tr><tr><td>SAA4D95LE-5-A</td><td>2.9 {30}/150 – 250</td><td>2.0 {20}/150 – 250</td></tr></table> Unit: MPa {kgf/cm²}/rpm <table><tr><th>Engine</th><th>Standard value</th><th>Limit value</th></tr><tr><td>EBT-TB45-1A</td><td>1.19 {12.1}/200</td><td>8.92 {9.1}/200</td></tr></table> ★ Difference between cylinders: 0.98 {1.0}/200 ★ For the measurement method of the compression pressure, see the Shop Manual for the engine.	Engine	Standard value	Limit value	SAA4D95LE-5-A	2.9 {30}/150 – 250	2.0 {20}/150 – 250	Engine	Standard value	Limit value	EBT-TB45-1A	1.19 {12.1}/200	8.92 {9.1}/200
	Engine	Standard value	Limit value											
	SAA4D95LE-5-A	2.9 {30}/150 – 250	2.0 {20}/150 – 250											
	Engine	Standard value	Limit value											
	EBT-TB45-1A	1.19 {12.1}/200	8.92 {9.1}/200											
8. Fuel injection pressure (Diesel engine lift truck)	- No relation to this model -													
9. Fuel injection condition (Diesel engine lift truck)	- No relation to this model -													
10. Turbocharger (Diesel engine lift truck)	- Check the following items on the turbocharger. ★ Check the operation of the wastegate valve, too. 1. Check for abnormal vibration in the range from low idle to high idle. 2. Check for abnormal sound in the range from low idle to high idle. 3. Check the turbocharger and intake and exhaust pipe connections for gas leakage.													
11. Engine mount	Check the following items on the engine mount. 1. Check the bracket for cracking and deformation. 2. Check the mounting bolts and nuts for looseness and missing. If any bolt or nut is loosened, tighten it to the specified torque. 3. Check the cushion rubbers for damage and deterioration.													

Com- ponent	Inspection item	Contents of inspection						
Prime mover	12. Lubrication system (Engine oil and engine oil filter)	- Check the following items on the engine lubrication system. 1. Check that the oil level is sufficient. Check with the oil level gauge and add oil if necessary. Engine oil pan specified oil level Unit: ℓ<table><tr><th>Engine</th><th>Capacity</th></tr><tr><td>SAA4D95LE-5-A</td><td>11</td></tr><tr><td>EBT-TB45-1A</td><td>8.4</td></tr></table> 2. Check the oil for extreme contamination. Check the color of the oil sticking to the oil level gauge. ★ The engine oil needs to be replaced periodically. Check the replacement condition and replace the oil if necessary. (See the lubricant list.) 3. Check for oil leakage. 4. Check the engine oil filter element for contamination and clogging. ★ Contamination and clogging cannot be checked visually. Since the engine oil filter is cartridge type, replace it periodically.	Engine	Capacity	SAA4D95LE-5-A	11	EBT-TB45-1A	8.4
	Engine	Capacity						
	SAA4D95LE-5-A	11						
	EBT-TB45-1A	8.4						
13. Fuel system	- Check the following items on the fuel system. 1. Check the fuel tank, fuel pump, hoses and pipes for fuel leakage. 2. Check the fuel hoses for damage and deterioration. 3. Check the fuel filter element for contamination and clogging. ★ Contamination and clogging cannot be checked visually. Since the fuel filter is cartridge type, replace it periodically.							
14. High-pressure fuel gas system	- Check the following items on the high-pressure fuel system. 1. Check the feed pipe and its joints for gas leakage. 2. Check the feed pipe and its joints for cracking and damage. 3. Check LP gas cylinder fittings for looseness and damage.							
15. Blow-by gas reducing device	- Check the following items on the blow-by gas reducing device. 1. Check that the PCV valve operates normally. 2. Check the piping for clogging and damage.							

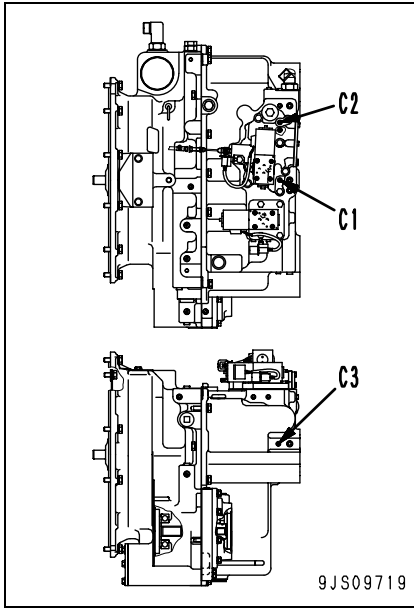
Com- ponent	Inspection item	Contents of inspection
Prime mover	16. Coolant and radiator	Check the following items on the coolant and radiator.
		1. Check that the coolant level is sufficient. Check the coolant level in the reservoir tank. ★ The shape and location of the reservoir tank vary, depending on each lift truck.  9JS09697 2. Check the coolant for contamination. 3. Check the radiator body, engine body, water pump and hoses for coolant leakage. 4. Check the radiator fins for clogging. 5. Check the hoses for damage, cracking and deterioration. 6. Check that the function of the radiator cap is proper. ⚠ Do not remove the radiator cap just after stopping the engine. Hot coolant will spout out and can scald you. ⚠ Even after the coolant temperature has decreased, do not open the radiator cap quickly. Turn the radiator cap slowly to release the pressure and then remove it. 1) Check of pressure regulator valve Push down the cap spring with your finger to see if there is proper tension.  9JS09698 2) Check of vacuum valve Check that the valve closes when it is pulled.  9JS09699 7. Check the radiator cap valve seat surface for damage. ★ If the radiator cap valve seat surface is damaged, replace the radiator cap assembly.

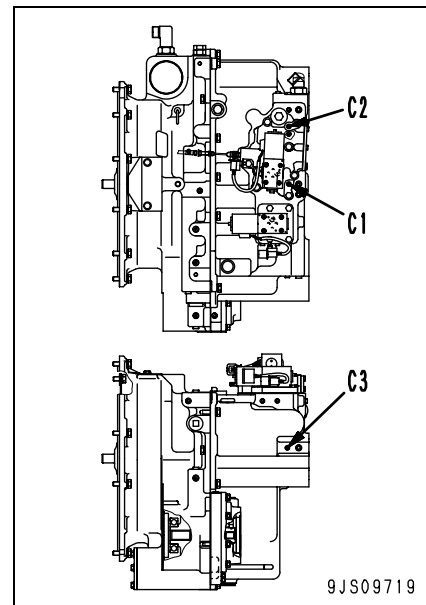
Com- ponent	Inspection item	Contents of inspection						
Prime mover	17. Fan and fan belt	- Check the following items on the fan and fan belt. Check that the fan belt deflection is in the specified range. Press the fan belt at the center between the fan pulley and alternator pulley and measure the deflection. Unit: mm<table><tr><th>Engine</th><th>Deflection</th></tr><tr><td>SAA4D95LE-5-A</td><td>7 – 10 (Finger pressure: 58.5 N {6 kgf})</td></tr><tr><td>EBT-TB45-1A</td><td>15 – 17 (Finger pressure: 98 N {10 kgf})</td></tr></table> ★ For adjustment of the fan belt deflection, see the Shop Manual for the engine. Check the fan belt for wear and damage. Check the inside of the belt, too. ★ Check the groove bottoms of each pulley, too. If the pulley groove bottoms are lustrous, the belts are worn. Since the fan tends to slip, replace the belts. Check the fan and fan cover (shroud) for cracking, damage and deformation. Check the fan and fan cover (shroud) mounting bolts for looseness. If any bolt is loosened, tighten it to the specified torque.	Engine	Deflection	SAA4D95LE-5-A	7 – 10 (Finger pressure: 58.5 N {6 kgf})	EBT-TB45-1A	15 – 17 (Finger pressure: 98 N {10 kgf})
	Engine	Deflection						
	SAA4D95LE-5-A	7 – 10 (Finger pressure: 58.5 N {6 kgf})						
EBT-TB45-1A	15 – 17 (Finger pressure: 98 N {10 kgf})							
18. Distributor	- Check the following items on the distributor. Check the distributor cap for cracking. Check the high-tension cable end for damage.							
19. Ignition plug and ignition timing (Gasoline engine lift truck)	- Check the following items on the ignition plug and ignition timing. Check that the ignition plug gap is proper. Remove the plug with the plug wrench, measure the gap with the gauge, and check the plug for sticking carbon and burn. Specified plug gap (A): 0.7 – 0.8 mm<table><tr><td>1</td><td>Normal</td></tr><tr><td>2</td><td>Burned too much</td></tr><tr><td>3</td><td>Sooted</td></tr></table> ★ If the plug has a gap out of the specified range or is burned, replace with new one. Check the plug end for sticking carbon. Remove carbon sticking to the plug end with a brush etc.	1	Normal	2	Burned too much	3	Sooted	
1	Normal							
2	Burned too much							
3	Sooted							

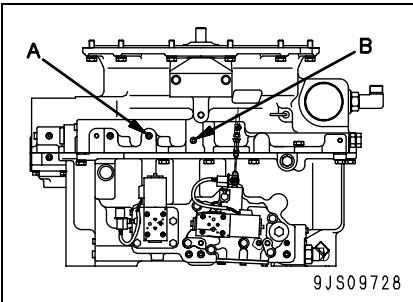
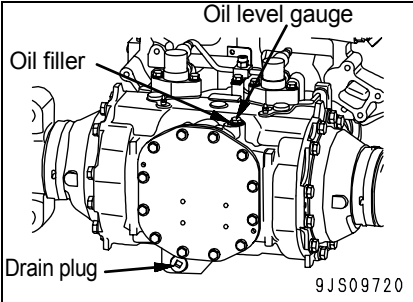
Com- ponent	Inspection item	Contents of inspection													
Prime mover	20. Wiring of charger etc.	Check the following items on the wiring of charger etc. ⚠ Since the battery electrolyte is strong acid, if it sticks to your skin or gets in your eye, your skin will be injured and your eyesight may be lost. Be sure to wear rubber gloves and goggles. 1. Check that the specific gravity of the battery electrolyte is proper. <table><tr><th>Specific gravity of battery electrolyte</th><th>Charge level</th><th>Necessity of charging</th></tr><tr><td>1.280</td><td>Fully charged</td><td rowspan="2">Unnecessary</td></tr><tr><td>1.240</td><td>Charge by 1/4</td></tr><tr><td>1.210</td><td>Charge by 1/5</td><td rowspan="2">Necessary</td></tr><tr><td>1.130</td><td>Fully discharged</td></tr></table> If the battery needs to be charged, charge it. ★ When the battery needs to be charged, the charging condition may be defective. Check the alternator in this case. 2. Check that the battery electrolyte level is proper. ★ If the battery electrolyte level is low, add distilled water. 3. Check the battery terminals for looseness and corrosion. 4. Check the wiring connections for looseness. 5. Check the wiring for damage.	Specific gravity of battery electrolyte	Charge level	Necessity of charging	1.280	Fully charged	Unnecessary	1.240	Charge by 1/4	1.210	Charge by 1/5	Necessary	1.130	Fully discharged
		Specific gravity of battery electrolyte	Charge level	Necessity of charging											
		1.280	Fully charged	Unnecessary											
		1.240	Charge by 1/4												
		1.210	Charge by 1/5	Necessary											
		1.130	Fully discharged												



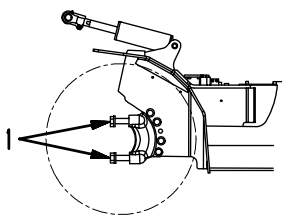
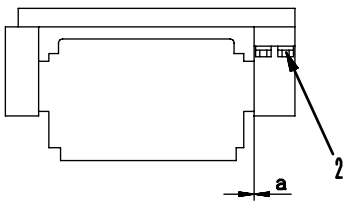
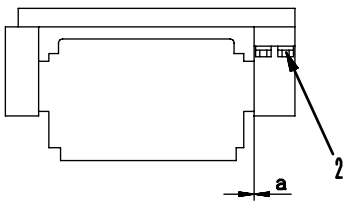
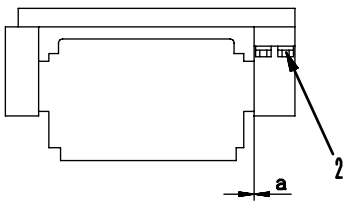
Com- ponent	Inspection item	Contents of inspection																
Power train	22. Transmission	7. Check that the inching pedal stroke (static) is normal. Unit: mm <table><tr><td>Pedal stroke (C)</td><td>137 ± 2</td></tr></table> 8. Check that the inching pedal play is proper. Unit: mm <table><tr><td>Play</td><td>0 – 4</td></tr></table>	Pedal stroke (C)	137 ± 2	Play	0 – 4												
	Pedal stroke (C)	137 ± 2																
Play	0 – 4																	
23. Torque converter	• Check the following items on the torque converter. ⚠ When performing the following inspection, lock the wheels with chocks and apply the parking brake so that the lift truck will not move during the inspection. If the lift truck moves, it can cause a serious accident. 1. Check that the clutch operating pressure is proper. Depress the brake pedal and set the forward/reverse lever in F, R or F2 and measure the oil pressure. Unit: MPa {kgf/cm²} <table><tr><td>Clutch operating pressure</td><td>1.12 ± 1.25 {11.4 ± 12.7}</td></tr></table> Oil pressure pickup port <table><tr><td>C1</td><td>F clutch oil pressure pickup port</td><td>(R 1/8)</td></tr><tr><td>C2</td><td>R clutch oil pressure pickup port</td><td>(R 1/8)</td></tr><tr><td>C3</td><td>F2 clutch oil pressure pickup port</td><td>(R 1/8)</td></tr></table> ★ For details of measurement of the clutch operating pressure, see the corresponding section of "Testing and adjusting". 2. Check that the stall speed is proper. Depress the brake pedal, set the forward/reverse lever in the forward or reverse position, depress the accelerator pedal fully, and then measure the engine speed. Unit: rpm <table><tr><td>Engine</td><td>Idling speed</td></tr><tr><td>SAA4D95LE-5-A</td><td>2,000 ± 50</td></tr><tr><td>EBT-TB45-1A</td><td>1,930 ± 50</td></tr></table> ★ Since the torque converter oil temperature increases while the stall speed is being measured, do not stall the torque converter for a long period.	Clutch operating pressure	1.12 ± 1.25 {11.4 ± 12.7}	C1	F clutch oil pressure pickup port	(R 1/8)	C2	R clutch oil pressure pickup port	(R 1/8)	C3	F2 clutch oil pressure pickup port	(R 1/8)	Engine	Idling speed	SAA4D95LE-5-A	2,000 ± 50	EBT-TB45-1A	1,930 ± 50
Clutch operating pressure	1.12 ± 1.25 {11.4 ± 12.7}																	
C1	F clutch oil pressure pickup port	(R 1/8)																
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C3	F2 clutch oil pressure pickup port	(R 1/8)																
Engine	Idling speed																	
SAA4D95LE-5-A	2,000 ± 50																	
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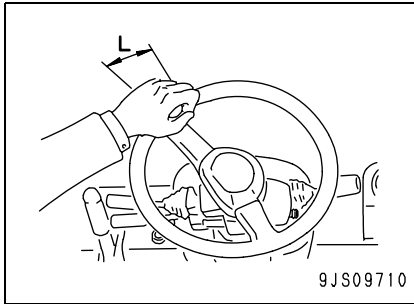
Com- ponent	Inspection item	Contents of inspection				
Power train	23. Torque converter	3. Check that the main relief pressure is proper. Unit: MPa {kgf/cm²} <table><tr><td>Main relief pressure (A)</td><td>1.13 ± 0.12 {11.5 ± 1.2}</td></tr></table> ★ For details of the measurement of the main relief pressure, see the corresponding section of "Testing and adjusting". 4. Check that the torque converter inlet relief pressure is proper. Unit: MPa {kgf/cm²} <table><tr><td>Torque converter inlet relief pressure (B)</td><td>0.5 – 0.7 {5 – 7}</td></tr></table> ★ For details of the measurement of the torque converter inlet relief pressure, see the corresponding section of "Testing and adjusting". 	Main relief pressure (A)	1.13 ± 0.12 {11.5 ± 1.2}	Torque converter inlet relief pressure (B)	0.5 – 0.7 {5 – 7}
	Main relief pressure (A)	1.13 ± 0.12 {11.5 ± 1.2}				
	Torque converter inlet relief pressure (B)	0.5 – 0.7 {5 – 7}				
	24. Drive shaft	- Check the following items on the drive shaft. 1. Drive the lift truck and check the drive shaft for abnormal runout. 2. Check the center spline, universal joint and center bearing for play and damage. 3. Check the coupling bolts etc. for looseness, damage and missing. ★ For details of check of drive shaft, see the corresponding section of "Testing and adjusting".				
25. Differential (Front axle)	- Check the following items on the differential. 1. Check the differential for abnormal sound from it. Float and drive the front wheels and check for abnormal sound. 2. Check that the differential case oil level is proper. ★ For details of the oil level check method, see the corresponding section of "Testing and adjusting". 3. Check the oil for contamination. ★ It is important to replace the differential axle oil periodically. ★ For details of the differential axle oil replacement method, see the corresponding section of "Testing and adjusting". 4. Check the differential case for oil leakage. If oozing oil forms a drop, replace the case packing. 					
26. Final drive	★ Since the final drive is installed to the front axle, see 25. Differential.					

Traveling equipment

Com- ponent	Inspection item	Contents of inspection								
	27. Front axle	• Check the following items on the front axle. 1. Check for deformation, cracking and damage. Check visually or by dye penetrant check method. In particular, check around the main frame mounting bolts and welded parts. ★ If there seems to be a crack, check by the dye penetrant check method. 2. Check the mounting bolts for looseness. If any bolt is loosened, tighten it to the specified torque. Tightening torque for frame mounting bolt (1) Unit: Nm {kgfm} <table><tr><td></td><td>1,520 – 1,910 {155 – 195}</td></tr></table>  9JS09722 <tr><td>28. Rear axle</td><td> • Check the following items on the rear axle. 1. Check for deformation, cracking and damage. Check visually or by dye penetrant check method. ★ If there seems to be a crack, check by the dye penetrant check method. 2. Check the center pin for play. If there is much play, replace the pin bushing. 3. Check that the thrust clearance of the center pin is proper. If thrust clearance (a) of the center pin is larger than the specified value, adjust it with shims. Unit: mm <table><tr><td>Standard clearance (a)</td><td>Max. 0.5</td></tr></table> If the clearance is larger than the allowable clearance, adjust it to the standard range with shims. 4. Check support mounting bolt for looseness. Tightening torque for support mounting bolt (2) Unit: Nm {kgfm} <table><tr><td></td><td>490 – 608 {50 – 62}</td></tr></table>  9JS09709 </td></tr>		1,520 – 1,910 {155 – 195}	28. Rear axle	• Check the following items on the rear axle. 1. Check for deformation, cracking and damage. Check visually or by dye penetrant check method. ★ If there seems to be a crack, check by the dye penetrant check method. 2. Check the center pin for play. If there is much play, replace the pin bushing. 3. Check that the thrust clearance of the center pin is proper. If thrust clearance (a) of the center pin is larger than the specified value, adjust it with shims. Unit: mm <table><tr><td>Standard clearance (a)</td><td>Max. 0.5</td></tr></table> If the clearance is larger than the allowable clearance, adjust it to the standard range with shims. 4. Check support mounting bolt for looseness. Tightening torque for support mounting bolt (2) Unit: Nm {kgfm} <table><tr><td></td><td>490 – 608 {50 – 62}</td></tr></table>  9JS09709	Standard clearance (a)	Max. 0.5		490 – 608 {50 – 62}
		1,520 – 1,910 {155 – 195}								
28. Rear axle	• Check the following items on the rear axle. 1. Check for deformation, cracking and damage. Check visually or by dye penetrant check method. ★ If there seems to be a crack, check by the dye penetrant check method. 2. Check the center pin for play. If there is much play, replace the pin bushing. 3. Check that the thrust clearance of the center pin is proper. If thrust clearance (a) of the center pin is larger than the specified value, adjust it with shims. Unit: mm <table><tr><td>Standard clearance (a)</td><td>Max. 0.5</td></tr></table> If the clearance is larger than the allowable clearance, adjust it to the standard range with shims. 4. Check support mounting bolt for looseness. Tightening torque for support mounting bolt (2) Unit: Nm {kgfm} <table><tr><td></td><td>490 – 608 {50 – 62}</td></tr></table>  9JS09709	Standard clearance (a)	Max. 0.5		490 – 608 {50 – 62}					
Standard clearance (a)	Max. 0.5									
	490 – 608 {50 – 62}									

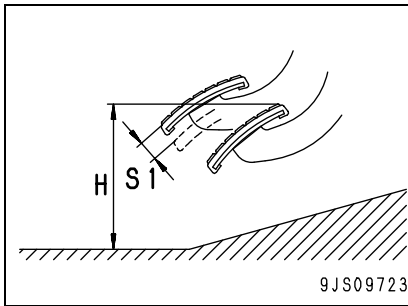
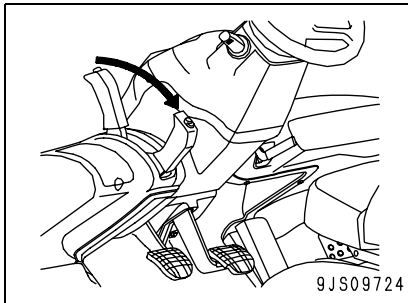
Traveling equipment

Com- ponent	Inspection item	Contents of inspection																																						
	29. Tyres	- Check the following items on the tyres. Check that the tyre inflation pressure is proper. Unit: kPa {kgfm/cm²}<table><tr><td rowspan="2">FG(D)40Z/40ZU-10</td><td rowspan="8">Single</td><td>Front wheel</td><td>250-15-16PR(I)</td><td>835 {8.5}</td></tr><tr><td>Rear wheel</td><td>7.00-12-12PR(I)</td><td>835 {8.5}</td></tr><tr><td rowspan="2">FG(D)35-10</td><td>Front wheel</td><td>8.25-15-12PR(I)</td><td>685 {7.0}</td></tr><tr><td>Rear wheel</td><td>7.00-12-12PR(I)</td><td>835 {8.5}</td></tr><tr><td rowspan="2">FG(D)40/40U-10</td><td>Front wheel</td><td>300-15-18PR(I)</td><td>785 {8.0}</td></tr><tr><td>Rear wheel</td><td>7.00-12-12PR(I)</td><td>835 {8.5}</td></tr><tr><td rowspan="2">FG(D)45/45U/50A/50AU-10</td><td>Front wheel</td><td>300-15-18PR(I)</td><td>785 {8.0}</td></tr><tr><td>Rear wheel</td><td>7.00-12-14PR(I)</td><td>980 {10.0}</td></tr><tr><td>FG(D)40Z/40ZU-10</td><td rowspan="2">Double</td><td>Front wheel</td><td>7.00-15-10PR(I)</td><td>685 {7.0}</td></tr><tr><td>FG(D)35/40/45/50A-10</td><td>Front wheel</td><td>7.50-16-12PR(I)</td><td>685 {7.0}</td></tr></table> Check the tread and side wall for cracking. If a tyre is cracked badly, replace the tyre. Check that the tread is not worn to the limit. If the slip sign (wear limit mark) of a pneumatic tyre appears, replace the tyre. Check for abnormal wear. If a tyre is worn unevenly or steppedly, replace the tyre. Check for metal pieces caught in tyres. Remove all caught metal pieces.	FG(D)40Z/40ZU-10	Single	Front wheel	250-15-16PR(I)	835 {8.5}	Rear wheel	7.00-12-12PR(I)	835 {8.5}	FG(D)35-10	Front wheel	8.25-15-12PR(I)	685 {7.0}	Rear wheel	7.00-12-12PR(I)	835 {8.5}	FG(D)40/40U-10	Front wheel	300-15-18PR(I)	785 {8.0}	Rear wheel	7.00-12-12PR(I)	835 {8.5}	FG(D)45/45U/50A/50AU-10	Front wheel	300-15-18PR(I)	785 {8.0}	Rear wheel	7.00-12-14PR(I)	980 {10.0}	FG(D)40Z/40ZU-10	Double	Front wheel	7.00-15-10PR(I)	685 {7.0}	FG(D)35/40/45/50A-10	Front wheel	7.50-16-12PR(I)	685 {7.0}
	FG(D)40Z/40ZU-10	Single			Front wheel	250-15-16PR(I)	835 {8.5}																																	
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FG(D)35-10	Front wheel		8.25-15-12PR(I)		685 {7.0}																																			
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FG(D)45/45U/50A/50AU-10	Front wheel		300-15-18PR(I)		785 {8.0}																																			
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FG(D)40Z/40ZU-10	Double	Front wheel	7.00-15-10PR(I)	685 {7.0}																																				
FG(D)35/40/45/50A-10		Front wheel	7.50-16-12PR(I)	685 {7.0}																																				
	30. Wheel	- Check the following items on the wheels. Check that the hub nuts are tightened to proper torque. Unit: Nm {kgfm}<table><tr><td rowspan="6"></td><td rowspan="2">FG(D)35-10</td><td>Front wheel</td><td>294 – 490 {30 – 50}</td></tr><tr><td>Rear wheel</td><td>294 – 490 {30 – 50}</td></tr><tr><td rowspan="2">FG(D)40Z/40ZU-10</td><td>Front wheel</td><td>294 – 490 {30 – 50}</td></tr><tr><td>Rear wheel</td><td>294 – 490 {30 – 50}</td></tr><tr><td rowspan="2">FG(D)40/45/50A-10 FG(D)40U/45U/50AU-10</td><td>Front wheel</td><td>294 – 490 {30 – 50}</td></tr><tr><td>Rear wheel</td><td>294 – 490 {30 – 50}</td></tr></table> Check the side ring for deformation and cracking. Check visually or by dye penetrant check method. ★ If there seems to be a crack, check by the dye penetrant check method. Check that the rim mating bolt tightening torque is proper. (Rear wheel) Unit: Nm {kgfm}<table><tr><td rowspan="3"></td><td>FG(D)40Z/40ZU-10</td><td>196 – 294 {20 – 30}</td></tr><tr><td>FG(D)35/40/45/50A-10 FG(D)40U/45U/50AU-10</td><td>196 – 294 {20 – 30}</td></tr><tr><td></td><td></td></tr></table>		FG(D)35-10	Front wheel	294 – 490 {30 – 50}	Rear wheel	294 – 490 {30 – 50}	FG(D)40Z/40ZU-10	Front wheel	294 – 490 {30 – 50}	Rear wheel	294 – 490 {30 – 50}	FG(D)40/45/50A-10 FG(D)40U/45U/50AU-10	Front wheel	294 – 490 {30 – 50}	Rear wheel	294 – 490 {30 – 50}		FG(D)40Z/40ZU-10	196 – 294 {20 – 30}	FG(D)35/40/45/50A-10 FG(D)40U/45U/50AU-10	196 – 294 {20 – 30}																	
	FG(D)35-10	Front wheel			294 – 490 {30 – 50}																																			
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	FG(D)35/40/45/50A-10 FG(D)40U/45U/50AU-10	196 – 294 {20 – 30}																																						

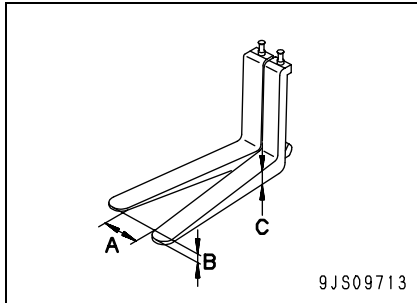
Com- ponent	Inspection item	Contents of inspection		
Steering system	31. Steering wheel	• Check the following items on the steering wheel. 1. Check the steering wheel for runout, unstable driving and abnormal returning condition. 2. Check that the steering effort is proper. If the steering effort is heavy, check the steering valve and hydraulic system. 3. Check that the steering wheel play is proper. Unit: mm <table><tr><td>Play (L) (When engine is at low idle)</td><td>10 – 30</td></tr></table> If the play is large, adjust it with the steering valve. 4. Move the steering wheel up, down, right and left to check for looseness and play. Check the mounting bolts for looseness and retighten if necessary. 	Play (L) (When engine is at low idle)	10 – 30
	Play (L) (When engine is at low idle)	10 – 30		
	32. Steering valve (Orbit roll valve)	• Check the following items on the steering valve. 1. Check the steering valve for oil leakage. 2. Check the mounting bolts for looseness and missing.		
	33. Rods and arms	- No relation to this model -		
34. Knuckles	• Check the following items on the knuckles. 1. Check the wheel bearings for play and abnormal sound. Raise the rear wheels and check the following. 1) Move the tyre up and down with the hands to check for play. 2) Rotate the tyre with the hands to check for abnormal sound. 2. Check the king pins and their mounting sections for cracking and damage. 3. Check the knuckles for damage. Check visually or by dye penetrant check method.			

Steering system

Com- ponent	Inspection item	Contents of inspection														
	35. Right and left turning radii	- Check the following items on the turning radius of the lift truck. Check that the minimum turning radius is in the specified range. - Measure the right and left turning radii in the forward travel direction of the lift truck. - Measure while driving the lift truck at the minimum speed and turning the steering wheel to the stroke end. - Install a rod with chalk at its end to the outermost part of the counterbalance-weight during turning and draw a circle on the ground. ★ The outermost part during turning depends on the turning direction. ★ Change the position of the rod having the chalk for each turning direction. Specified minimum turning radius Unit: mm <table><tr><td>FG(D)40ZU-10</td><td>2,580 (± 5%)</td></tr><tr><td>FG(D)40Z-10</td><td>2,640 (± 5%)</td></tr><tr><td>FG(D)35-10</td><td>2,730 (± 5%)</td></tr><tr><td>FG(D)40/40U-10</td><td>2,770 (± 5%)</td></tr><tr><td>FG(D)45/45U-10</td><td>2,820 (± 5%)</td></tr><tr><td>FG(D)50A/50AU-10</td><td>2,850 (± 5%)</td></tr></table><table><tr><td>Difference between right and left</td><td>Max. ± 100</td></tr></table> ★ If the minimum turning radius is not in the specified range, check the steering valve and steering cylinder.	FG(D)40ZU-10	2,580 (± 5%)	FG(D)40Z-10	2,640 (± 5%)	FG(D)35-10	2,730 (± 5%)	FG(D)40/40U-10	2,770 (± 5%)	FG(D)45/45U-10	2,820 (± 5%)	FG(D)50A/50AU-10	2,850 (± 5%)	Difference between right and left	Max. ± 100
	FG(D)40ZU-10	2,580 (± 5%)														
	FG(D)40Z-10	2,640 (± 5%)														
	FG(D)35-10	2,730 (± 5%)														
FG(D)40/40U-10	2,770 (± 5%)															
FG(D)45/45U-10	2,820 (± 5%)															
FG(D)50A/50AU-10	2,850 (± 5%)															
Difference between right and left	Max. ± 100															
36. Steering wheel (wheel)	- Check the following items on the steering wheel (wheel). Check the stopper bolts for looseness and missing. If any bolt is loosened, tighten it to the specified torque. Check the steering wheel (wheel) for contact with another part.															
37. Power steering system (Power steering cylinder)	- Check the following items on the power steering system (power steering cylinder). Check the power steering cylinder and hoses for oil leakage. Drive the lift truck, operate the hydraulic pump, and check. Check the hoses for damage and deterioration. Check the mounting bolts for looseness and missing. If any bolt is loosened, tighten it to the specified torque. Check the power steering cylinder and hoses for interference with the lift truck body.															
38. Steering chain etc.	- No relation to this model -															

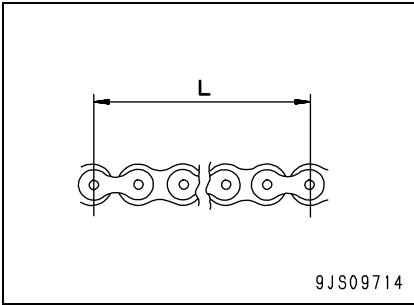
Com- ponent	Inspection item	Contents of inspection										
Brake system	39. Travel brake	• Check the following items on the travel brake. 1. Check that the brake pedal height is in the specified range. Unit: mm <table><tr><td>Brake pedal height</td><td>62 ± 2</td></tr><tr><td>Height at stroke end (H)</td><td>82 – 86</td></tr></table>  2. Check that the brake pedal play in the specified range. Unit: mm <table><tr><td>Play (S1)</td><td>0 – 4.0</td></tr></table> 3. Check that the brake effect is proper. Drive the lift truck and brake it suddenly on a dry, flat, and paved road and check the following. 1) Check that the steering wheel is stable. 2) Check that both brake work evenly. 3) Check for abnormal sound. 4) Check that the brake distance is proper. <table><tr><td>With no load</td><td>Max. 5 m (from max. ravel speed)</td></tr><tr><td>With load</td><td>Max. 2.5 m (from 10 km/h)</td></tr></table>	Brake pedal height	62 ± 2	Height at stroke end (H)	82 – 86	Play (S1)	0 – 4.0	With no load	Max. 5 m (from max. ravel speed)	With load	Max. 2.5 m (from 10 km/h)
	Brake pedal height	62 ± 2										
Height at stroke end (H)	82 – 86											
Play (S1)	0 – 4.0											
With no load	Max. 5 m (from max. ravel speed)											
With load	Max. 2.5 m (from 10 km/h)											
40. Parking brake	• Check the following items on the parking brake. 1. Check that the parking brake lever operating effort is proper. Unit: N {kgf} <table><tr><td>Parking brake lever operating effort</td><td>59 – 64 {6 – 6.5}</td></tr></table>  2. Check that the parking brake force is proper. Check that the lift truck is held stopped on slopes of the following gradients. <table><tr><td>With no load</td><td>Slope of 20° gradient</td></tr><tr><td>With load</td><td>Slope of 15° gradient</td></tr></table>	Parking brake lever operating effort	59 – 64 {6 – 6.5}	With no load	Slope of 20° gradient	With load	Slope of 15° gradient					
Parking brake lever operating effort	59 – 64 {6 – 6.5}											
With no load	Slope of 20° gradient											
With load	Slope of 15° gradient											

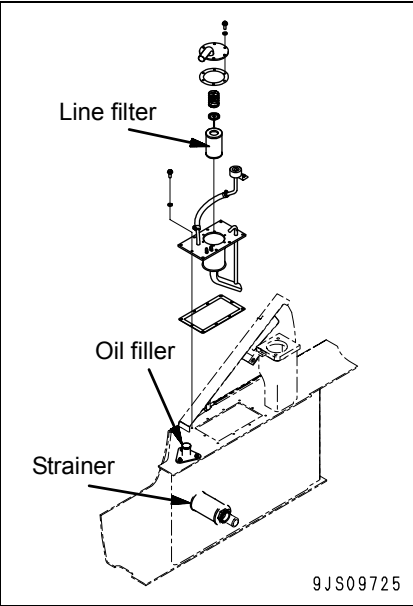
Com- ponent	Inspection item	Contents of inspection		
Brake system	41. Rods, links and cables	- Check the following items on the rods, links and cables. - Check the rods, links and cable for damage, looseness and play. - Check the connections for looseness and play when the brake is applied repeatedly. - Check the cotter pins for breakage.		
	42. Brake piping	- Visually check the following on the pipes, hoses and joints of the brake system. - Check the brake piping for damage. - Check for oil leakage when the brake is applied. - Check the braking piping for a part that will or may contact with another part. - Check the brake piping hoses for deterioration. - Check the brake piping mounting bolts for looseness. If any bolt is loosened, tighten it to the specified torque.		
	43. Oil brake	- No relation to this model -		
	44. Pneumatic brake	- No relation to this model -		
	45. Brake booster	- No relation to this model -		
	46. Brake shoe and lining	- No relation to this model -		
	47. Brake drum	- No relation to this model -		
	48. Back plate	- No relation to this model -		
	49. Brake disc	- Check the following items on the brake disc. - Measure the wear quantity. Check that brake disc wear check gauge (2) does not rotate full one turn in brake disc wear check port (1). (Right and left rotations)<table border="1"><tr><td>Brake disc wear check gauge (2)</td><td>Does not rotate full one turn</td></tr></table> ★ For details of brake disc wear measurement, see the corresponding section of "Testing and adjusting".	Brake disc wear check gauge (2)	Does not rotate full one turn
	Brake disc wear check gauge (2)	Does not rotate full one turn		
50. Brake pad	- No relation to this model -			

Com- ponent	Inspection item	Contents of inspection				
Brake system	51. Parking brake drum	- Check the following items on the parking brake drum. 1 Check the drum mounting bolts for looseness and missing. If any bolt is loosened, tighten it to the specified torque. 2. Check the drum for cracking, damage and wear. Measure the following dimension and check that the result is in the allowable range. Unit: mm <table><tr><td>Drum inside diameter</td><td>Max. 181</td></tr></table>	Drum inside diameter	Max. 181		
	Drum inside diameter	Max. 181				
52. Parking brake shoe and lining	- Check the following items on the parking brake shoe and lining. 1. Check for abnormality in operating condition, rust and wear. 2. Check the lining for flaking, damage and wear. Unit: mm <table><tr><td>Lining thickness</td><td>Min. 3.5</td></tr></table> 3. Check the anchor pin for corrosion.	Lining thickness	Min. 3.5			
Lining thickness	Min. 3.5					
Loading equipment	53. Fork (1)	- Check the following items on the fork. 1. Check the fork lock pin for deformation, cracking and wear. 2. Check that the fork tip opening and height difference are in the specified range and the forks are not bent. Unit: mm <table><tr><td>Opening (A)</td><td>Max. 35</td></tr><tr><td>Height difference (B)</td><td>Max. 15</td></tr></table> 	Opening (A)	Max. 35	Height difference (B)	Max. 15
	Opening (A)	Max. 35				
Height difference (B)	Max. 15					

Com- ponent	Inspection item	Contents of inspection						
Loading equipment	54. Fork (2)	- Check the following items on the fork. Check the fork upper hook and lower hook for cracking and wear. Check the fork base for cracking and wear. Check that fork base thickness (C) is in the specified range. Unit: mm <table><tr><td>FG(D)35/40Z/40ZU-10</td><td>Min. 48</td></tr><tr><td>FG(D)40/40U/45/45U/50A/50AU-10</td><td>Min. 50</td></tr></table> ★ Check the fork base and hook where stresses are concentrated by the dye penetrant check method.	FG(D)35/40Z/40ZU-10	Min. 48	FG(D)40/40U/45/45U/50A/50AU-10	Min. 50		
	FG(D)35/40Z/40ZU-10	Min. 48						
	FG(D)40/40U/45/45U/50A/50AU-10	Min. 50						
	55. Mast (1)	- Check the following items on the mast. Check the mast for deformation, cracking and damage. Check the following parts visually or by dye penetrant check method. - Mast stay - Tilt cylinder bracket - Welded parts of roller shaft Check the mast roller for wear and play and check the roller shaft for cracking.						
56. Mast (2)	- Check the following items on the mast. Check the mast support for play. Check that there is oil groove on the mast support bushing. Check the mast cap mounting bolts for looseness. If any bolt is loosened, tighten it to the specified torque. Unit: Nm {kgfm} <table><tr><td rowspan="3"></td><td>FG(D)35-10</td><td>343 – 427 {35 – 43.5}</td></tr><tr><td>FG(D)40Z/40ZU/40/40U-10</td><td>343 – 427 {35 – 43.5}</td></tr><tr><td>FG(D)45/45U/50A/50AU-10</td><td>343 – 427 {35 – 43.5}</td></tr></table>		FG(D)35-10	343 – 427 {35 – 43.5}	FG(D)40Z/40ZU/40/40U-10	343 – 427 {35 – 43.5}	FG(D)45/45U/50A/50AU-10	343 – 427 {35 – 43.5}
	FG(D)35-10		343 – 427 {35 – 43.5}					
	FG(D)40Z/40ZU/40/40U-10		343 – 427 {35 – 43.5}					
	FG(D)45/45U/50A/50AU-10	343 – 427 {35 – 43.5}						
57. Fork carriage	- Check the following items on the fork carriage. Check the fork carriage for deformation, cracking and damage. Check the roller for wear and play. Check the roller shaft for cracking.							

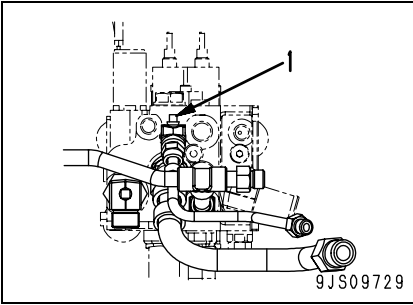
Loading equipment

Com- ponent	Inspection item	Contents of inspection								
Loading equipment	58. Lift chain	• Check the following items on the lift chain. 1. Check that the right and left chain tensions are proper. Position the mast vertically, raise the forks 10 cm above the ground, and press the center of the lift chain with your finger to check that the right and left tensions are the same. 2. Check that chain elongation is in the specified range. Measure length (L) over 17 links and check that the result is in the specified range. <table><tr><td>Length (L) over 17 links</td><td>Unit: mm</td></tr><tr><td>FG(D)35-10</td><td>Max. 440</td></tr><tr><td>FG(D)40Z/40ZU/40/40U-10</td><td>Max. 440</td></tr><tr><td>FG(D)45/45U/50A/50AU-10</td><td>Max. 440</td></tr></table>  3. Check the thread parts of the anchor bolts for abnormality. Visually check for abnormality.	Length (L) over 17 links	Unit: mm	FG(D)35-10	Max. 440	FG(D)40Z/40ZU/40/40U-10	Max. 440	FG(D)45/45U/50A/50AU-10	Max. 440
	Length (L) over 17 links	Unit: mm								
	FG(D)35-10	Max. 440								
	FG(D)40Z/40ZU/40/40U-10	Max. 440								
FG(D)45/45U/50A/50AU-10	Max. 440									
59. Chain wheel	• Check the following items on the chain wheel. 1. Check the chain wheel for deformation, damage and play. • Visually check the faces in contact with the chain. • Rotate the chain wheel with your hands to check the bearing for play.									
60. Attachments (1)	• Check the following items on the attachments. 1. Check the mounting condition on the lift truck for abnormality. 2. Check the bolts and nuts of each part for looseness. If any bolt or nut is loosened, tighten it to the specified torque.									
61. Attachments (2)	• Check the following items on the attachments. 1. Check each part for cracking, deformation, damage and wear. 2. Check each part for abnormality and abnormal sound.									

Com- ponent	Inspection item	Contents of inspection
Hydraulic equipment	62. Hydraulic tank and filter	- Check the following items on the hydraulic tank and filter. Check the hydraulic tank for oil leakage. Check that the oil level is proper. - Check the oil level with the oil level gauge and add new oil if necessary. - Check the oil for contamination, and replace it if contaminated extremely. Check that the strainer is cleaned. Check that the line filter is replaced. ★ For the check method of the hydraulic tank and filter, see the corresponding section of "Testing and adjusting". 
	63. Piping of lift truck body	- Check the following items on the piping of the lift truck body. Check the piping for cracking, damage, deterioration and twist. If any part is cracked, damaged, deteriorated or twisted, replace it. Check for oil leakage. - Retighten the piping clamps to the specified torque. - If the oil does not stop leaking even after the clamps are retightened to the specified torque, replace the parts. Check the mounting bolts and nuts for looseness. If any bolt or nut is loosened, tighten it to the specified torque.
	64. Piping of attachments	- Check the following items on the piping of the attachments. Check the piping for cracking, damage, deterioration and twist. If any part is cracked, damaged, deteriorated or twisted, replace it. Check the piping joints for oil leakage. - Retighten the piping joints to the specified torque. - If the oil does not stop leaking even after the joints are retightened to the specified torque, replace the parts. Check the mounting bolts and nuts for looseness. If any bolt or nut is loosened, tighten it to the specified torque.

Com- ponent	Inspection item	Contents of inspection
Hydraulic equipment	65-1. Hydraulic pump	- Check the following items on the hydraulic pump. Check the pipes, hoses, joints and seals of the hydraulic pump for oil leakage. While operating with and without load, check for abnormal vibration. While operating with and without load, check for abnormal sound. Check the spline for abnormal wear. Check the mounting bolts for looseness. If any bolt is loosened, tighten it to the specified torque.
	65-2. Flow divider	- No relation to this model -
	66. Oil motor	- No relation to this model -
	67. Lift cylinder	- Check the following items on the lift cylinder. Check that the lift cylinder operates smoothly and no oil leaks. - Check that the lift cylinder operates smoothly. - Extend and retract the lift cylinder several times and check the seals for oil leakage. Check the lift cylinder and rod for bruise, cracking, bend and scratch. Check the mounting bolts and nuts for looseness. If any bolt or nut is loosened, tighten it to the specified torque.
	68. Tilt cylinder	- Check the following items on the tilt cylinder. Check that the tilt cylinder operates smoothly and no oil leaks. - Check that the tilt cylinder operates smoothly. - Extend and retract the tilt cylinder several times and check the seals for oil leakage. Check the tilt cylinder and rod for bruise, cracking, bend and scratch. Check the mounting bolts and nuts for looseness. If any bolt or nut is loosened, tighten it to the specified torque.
	69. Reach cylinder	- No relation to this model -
	70. Attachment cylinder	- Check the following items on the attachment cylinder. Check that the attachment cylinder operates smoothly and no oil leaks. - Check that the attachment cylinder operates smoothly. - Extend and retract the attachment cylinder several times and check the seals for oil leakage. Check the attachment cylinder and rod for bruise, cracking, bend and scratch. Check the mounting bolts and nuts for looseness. If any bolt or nut is loosened, tighten it to the specified torque.

Hydraulic equipment

Com- ponent	Inspection item	Contents of inspection				
Hydraulic equipment	71. Hydraulic drift and hydraulic forward drift	- Check the hydraulic cylinder for hydraulic drift and hydraulic forward drift. Check that the hydraulic drift and hydraulic forward drift of the hydraulic cylinder are in the specified range. - If the hydraulic drift or hydraulic forward drift is out of the specified range, replace the packings of the control valve and hydraulic cylinder. <table><tr><td>Hydraulic drift</td><td>Max. 50 mm/15 min</td></tr><tr><td>Hydraulic forward drift</td><td>Max. 45 mm/15 min</td></tr></table> ★ For the measurement of the hydraulic drift and hydraulic forward drift of the hydraulic cylinders, see the corresponding section of "Testing and adjusting".	Hydraulic drift	Max. 50 mm/15 min	Hydraulic forward drift	Max. 45 mm/15 min
	Hydraulic drift	Max. 50 mm/15 min				
	Hydraulic forward drift	Max. 45 mm/15 min				
	72. Control valve (1)	- Check the following items on the control valve. Check that the control valve operates smoothly and no oil leaks. - Operate the levers and check that the control valve operates smoothly. - Check the control valve for oil leakage. Check the mounting bolts and nuts for looseness. If any bolt or nut is loosened, tighten it to the specified torque.				
73. Control valve (2)	- Check the following items on the control valve. Check that the relief pressure is in the standard range. - Install the oil pressure gauge to relief pressure pickup port (1). - Tilt back the mast until the oil is relieved and measure the oil pressure. (Control valve relief pressure pickup port (R 1/8)) Unit: MPa {kgf/cm²} <table><tr><td>Standard relief pressure</td><td>20.6 {210}</td></tr></table> 	Standard relief pressure	20.6 {210}			
Standard relief pressure	20.6 {210}					
74. Solenoid valve	- Check the following items on the solenoid valve. Check that the solenoid valve operates normally without generating abnormal sound. Check for abnormal heating. Check the solenoid valve and piping joints for oil leakage.					

Com- ponent	Inspection item	Contents of inspection
Lift truck body, safety devices, etc.	75. Lift truck frame and body	- Check the following items on the lift truck frame and body. Check the lift truck frame and body for cracking and deformation. - Check the chassis frame, cross member, fender and side guard for cracking and deformation. Check the mounting bolts and nuts for looseness and missing. If any bolt or nut is loosened, tighten it to the specified torque.
	76. Cab	- Check the following items on the cab. Check the outside of the cab for cracking and deformation. Check for corrosion and rain leakage. Check the door for bad opening/closing condition, locking, play and breakage.
	77. Seat	- Check the following items on the seat. Check that the seat adjustment and lock devices operate normally. Check the mounting bolts for looseness. If any bolt is loosened, tighten it to the specified torque.
	78. Getting on/off equipment and slip-proof parts	- Check the following items on the getting on/off equipment and slip-proof parts. Check the getting on/off equipment and slip-proof parts for cracking, damage and deformation. Check the mounting bolts for looseness. If any bolt is loosened, tighten it to the specified torque.
	79. Display board	- Check the following items on the display board. ★ Check the display board and certification labels specified in the structure standard. Check the display board for damage. Check that the display board is installed normally.
	80. Overhead guard	- Check the following items on the overhead guard. Check the overhead guard mounting section for looseness. Check the overhead guard for cracking, damage and deformation.
	81. Load backrest	- Check the following items on the load backrest. Check the load backrest mounting bolts for looseness. If any bolt is loosened, tighten it to the specified torque. Check the load backrest for cracking, damage and deformation.

Com- ponent	Inspection item	Contents of inspection
Lift truck body, safety devices, etc.	82. Lamps, instruments and alarms	- Check the following items on the lamps, instruments and alarms. 1. Check that the lamps, instruments and alarms operate normally. Operate each switch and check the operation of the corresponding device. 2. Check the mounting condition of the lamps, instruments and alarms for breakage and entry of water. Check the lamps for breakage of the lenses, and check the mounting condition of the lamps, instruments and alarms for breakage and entry of water. 3. Check that the instruments operate normally. While running the engine and while traveling the lift truck, check the operations of the instruments.
	83. Rear view mirrors and reflectors	- Check the following items on the rear view mirrors and reflectors. 1. Check the rear view mirrors and reflectors for stain and damage. 2. Check that the mirrors reflect the objects normally.
	84. Supplying oil and grease	- Check the following items on oiling and greasing. 1. Check that the oiling and greasing conditions are proper. 2. Check that the auto-oiling and greasing systems operate normally. - No relation to this model -
Comprehensive test	85. Function of each device	- Perform the comprehensive test and check the following items. 1. Check that the functions are normal during the travel and loading tests. Perform the travel and loading tests and check that each device operates normally without generating abnormal vibration, abnormal sound or abnormal heat.

FG(D)35/50A-10 FORKLIFT TRUCK

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Product Support Div.

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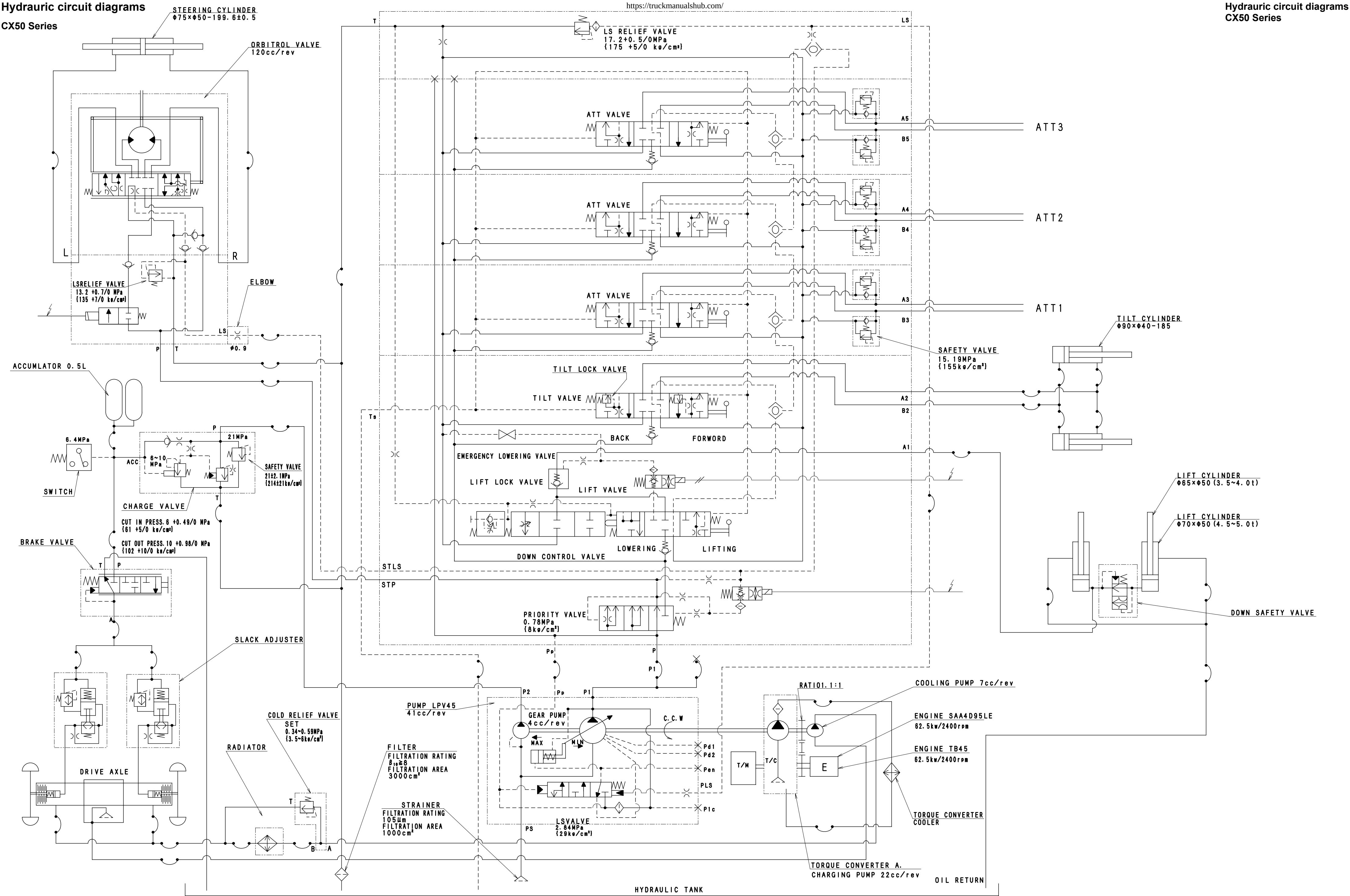
CX50 Series

Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

90 Diagrams and drawings

100 Hydraulic circuit diagrams

Hydraulic circuit diagrams	3
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BEC10E1-01JA

FG(D)35/50A-10 FORKLIFT TRUCK

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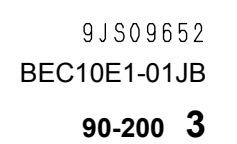
CX50 Series

Applicable model	Serial number
For general	
FG40Z-10	M251-133001 and up
FG35/40/45/50A-10	M253-133001 and up
FD40Z-10	M250-133001 and up
FD35/40/45/50A-10	M252-133001 and up
FD40ZY-10	M250-133001 and up
FD35Y/40Y/45Y/50AY-10	M252-133001 and up
For USA	
FG40ZU-10	M251-133001 and up
FG40U/45U/50AU-10	M253-133001 and up
FD40ZU-10	M250-133001 and up
FD40U/45U/50AU-10	M252-133001 and up

90 Diagrams and drawings

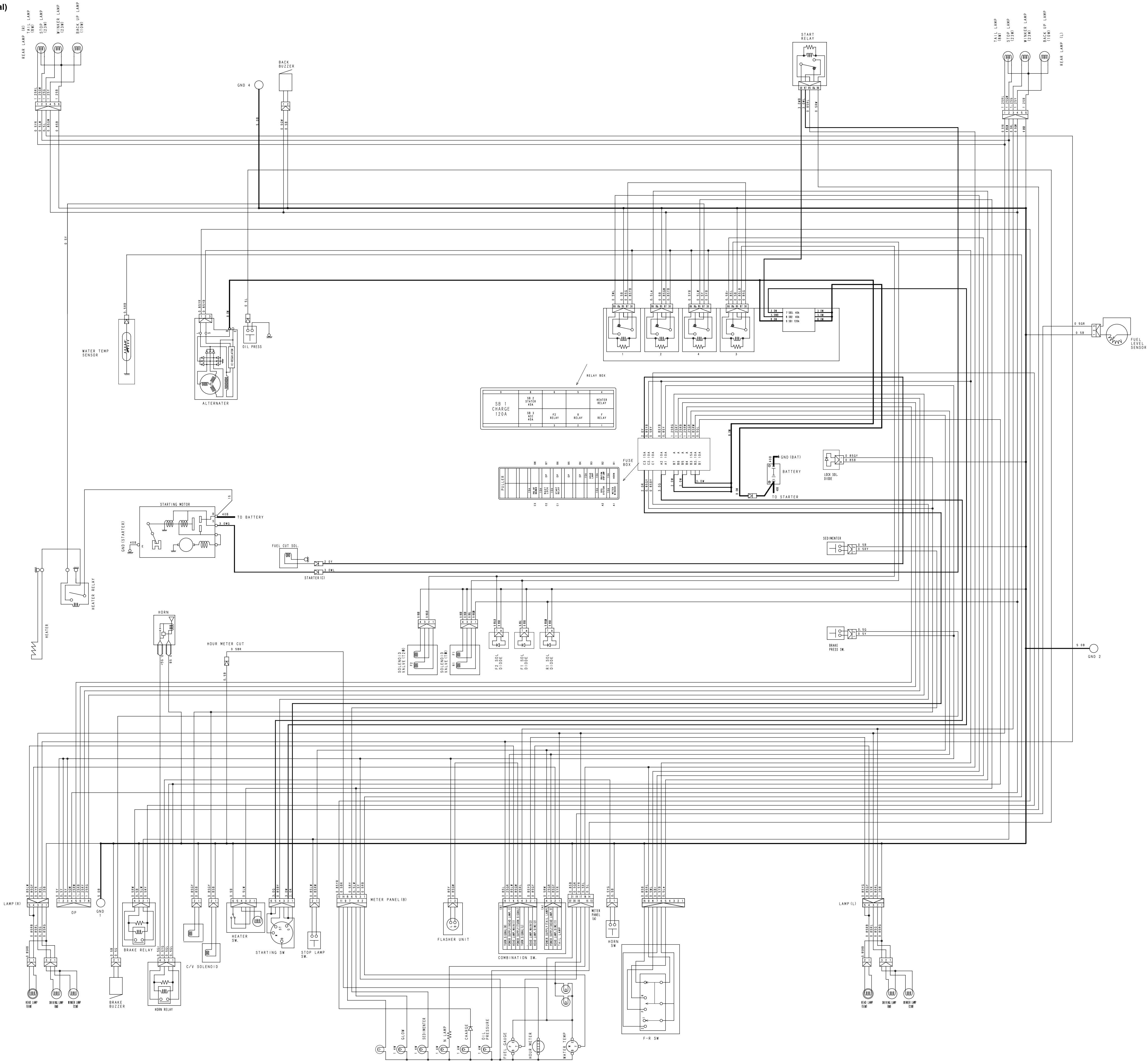
200 Electrical diagrams and drawings

Electrical diagrams and drawings	3
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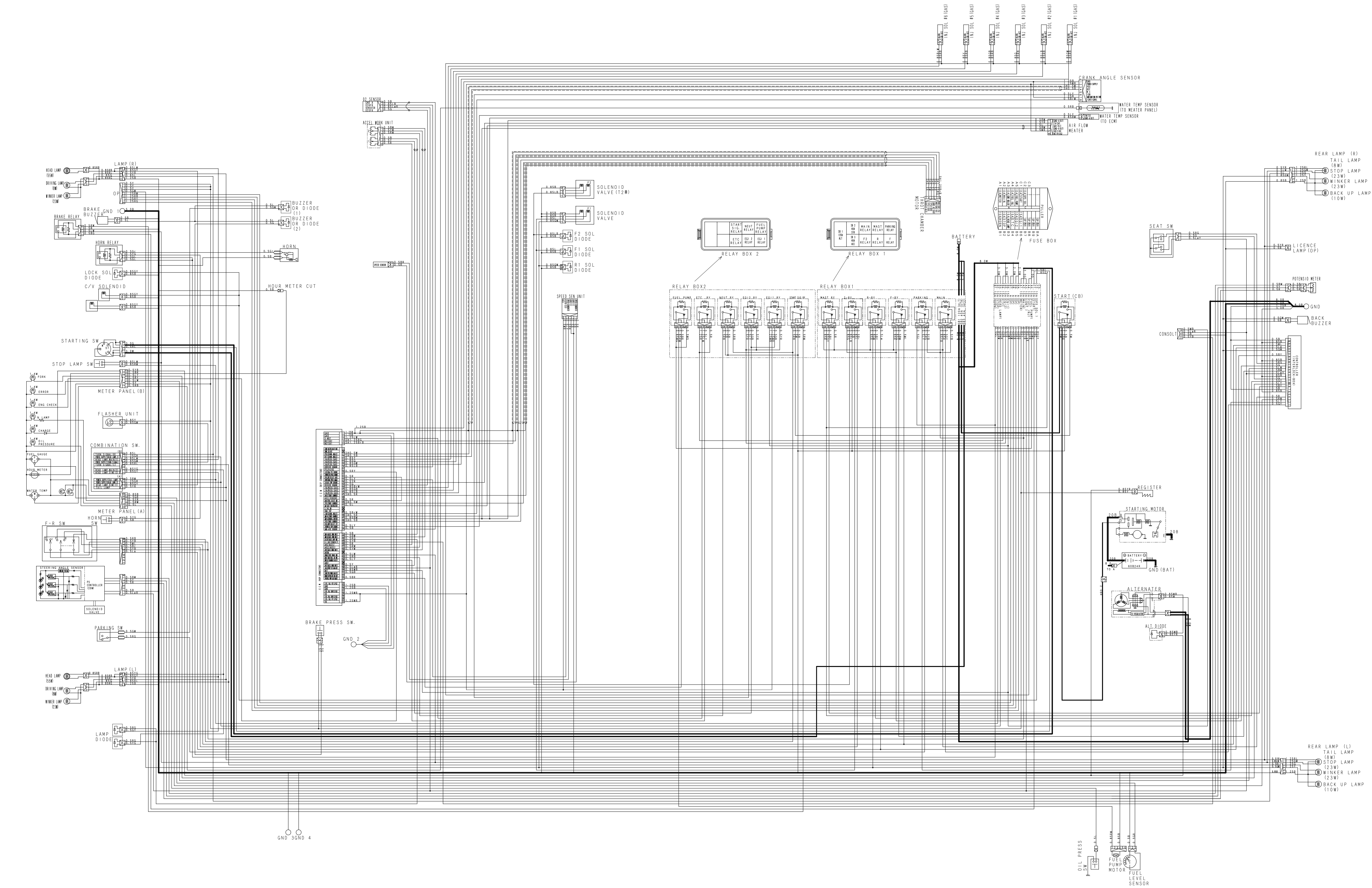


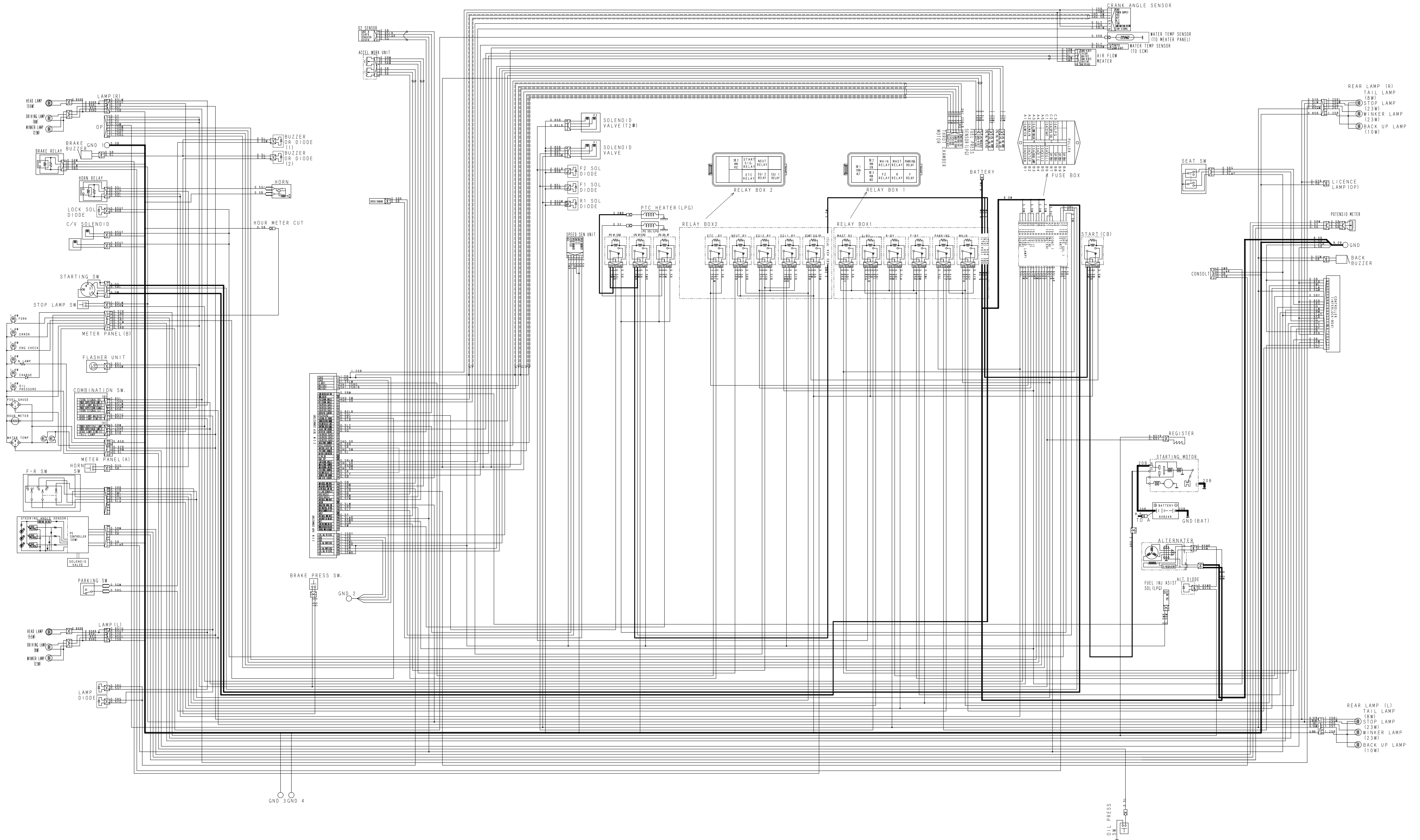
Electrical diagrams and drawings
Applicable model: Lift truck with S4D95LE-3 engine (For general)
CX50 Series

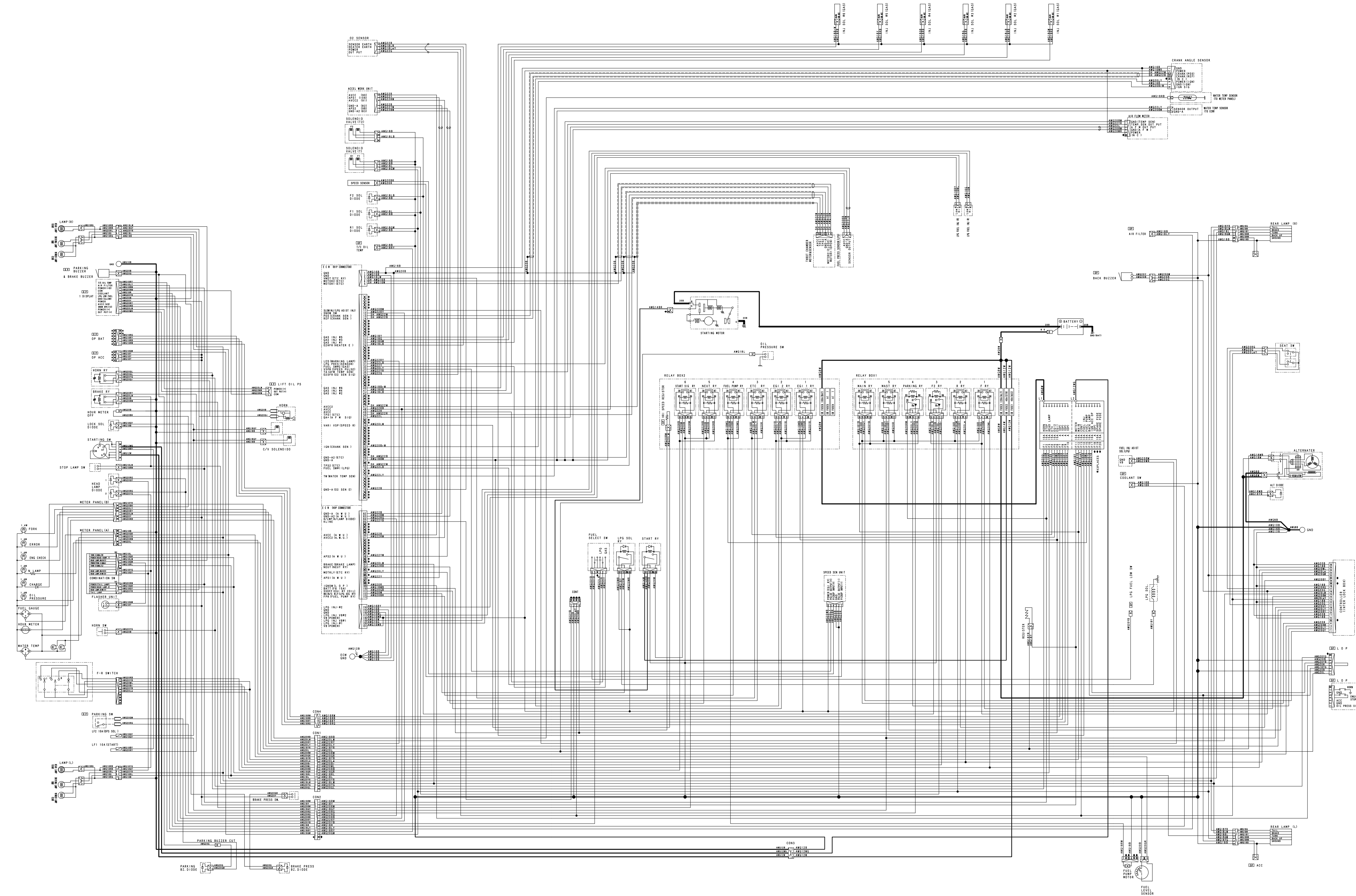
Electrical diagrams and drawings
CX50 Series

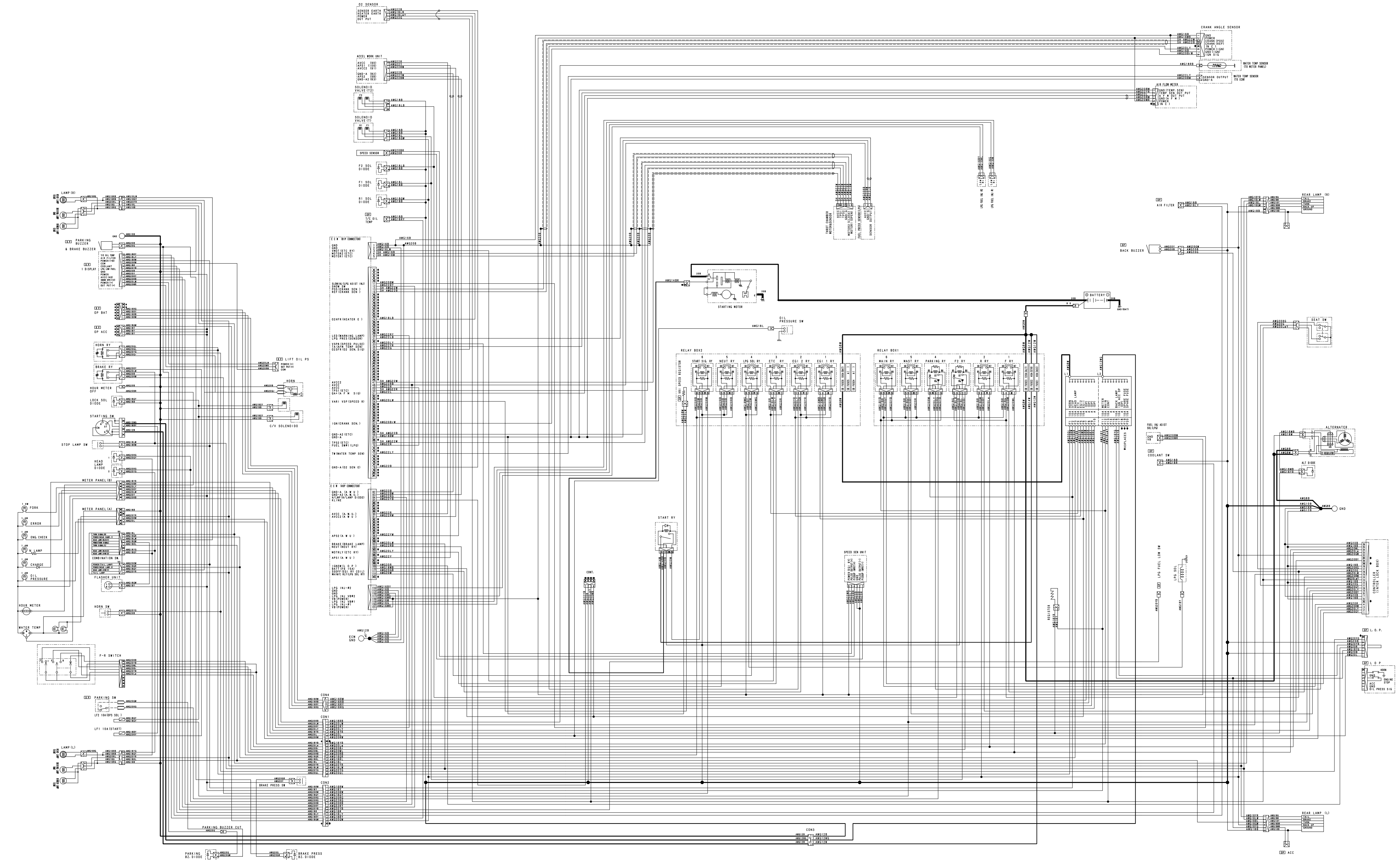












BEC10E1-01JB

FG(D)35/50A-10 FORKLIFT TRUCK

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