

FOREWORD

We would like to take this opportunity to thank you for choosing a TATA DAEWOO product and assure you of our continuing interest in your motoring pleasure and satisfaction.

This manual has been prepared to acquaint you with the operation and maintenance of your new TATA DAEWOO TRUCK and to provide important safety information. We urge you to read it carefully and follow the recommendations to help assure the most enjoyable, safe and trouble-free operation of your vehicle.

When it comes to service, remember that your TATA DAEWOO dealer knows your vehicle best and is interested in your full satisfaction.

This manual should be considered as a permanent part of your vehicle, and must remain with the vehicle at the time of resale.

All information, illustrations and specifications contained in this manual are based on the latest product information available at the time of publication.

The right is reserved to make changes at any time without notice.

TATA DAEWOO COMMERCIAL VEHICLE

TABLE OF CONTENTS

-
1. HOW TO HANDLE THE VEHICLE
 2. DRIVING
 3. INSPECTION AND MAINTENANCE
 4. TROUBLE SHOOTING AND
CORRECTIONS
 5. MISCELLANEOUS CONTROLS AND
OPTIONS
 6. SPECIFICATIONS AND
SERVICE DATA
-

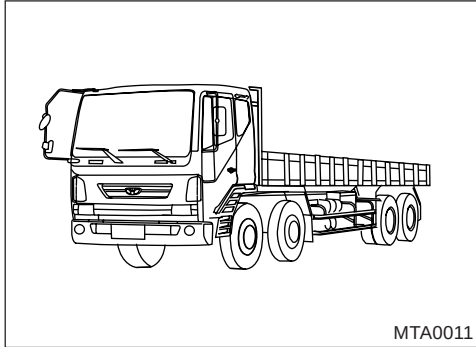
1

HOW TO HANDLE THE VEHICLE

1. OPERATION OF NEW VEHICLE
 2. OPERATION OF CAB TILT
 3. OPENING OR CLOSING OF FRONT LID
 4. INSTRUMENTS AND CONTROLS
 5. SELECTIVE CATALYST REDUCTION
SYSTEM ENGINE POWER LIMITING
-

1-8 HOW TO HANDLE THE VEHICLE

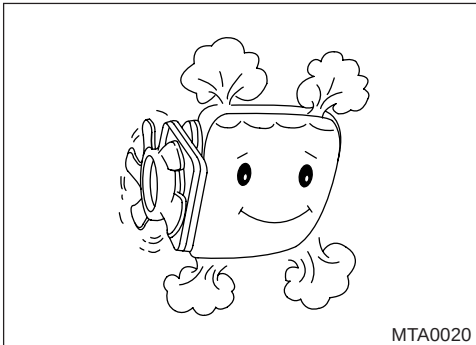
1. OPERATION OF NEW VEHICLE



It is important to follow the instructions as outlined here, because careful breaking-in of your vehicle will greatly increase its life and performance.

1) Follow oil change interval.

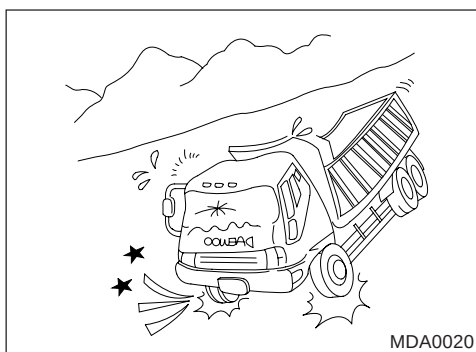
When this vehicle was released, engine oil added with recommended lubricants was used for its diesel engine. After driving, it must be changed with engine oil and filter by period.



2) Follow the instructions on how to operate the new vehicle.

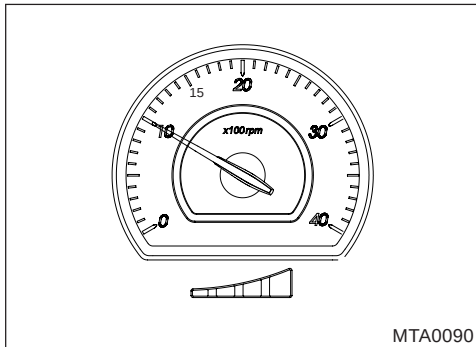
It is necessary to allow the moving parts of the new vehicle to break in for the first 5,000 km.

- (1) Warm up the engine after starting it. In cold weather, especially, warm up the engine sufficiently before starting off.
- (2) Do not abruptly increase rev during idling.

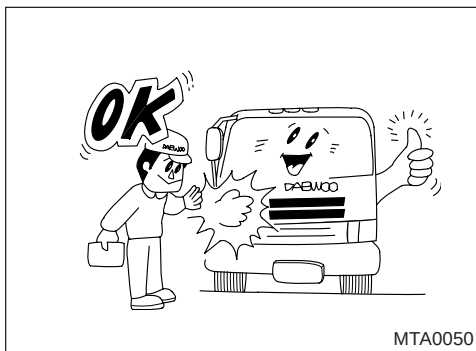


- (3) Avoid jack-rabbit starts, abrupt acceleration, or sudden stops.

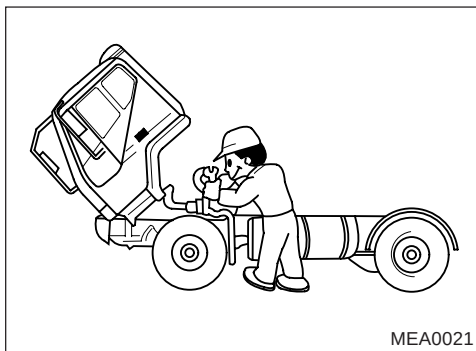
1-10 HOW TO HANDLE THE VEHICLE



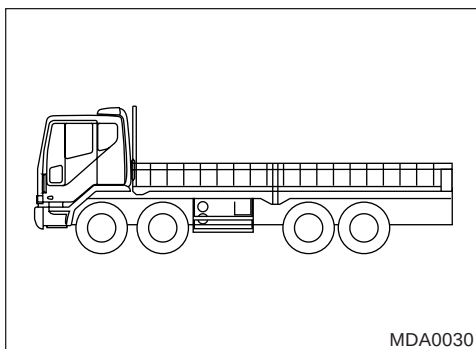
- (4) During the first 5,000 km, limit engine speed to 70 percent of the maximum allowance.



- 3) Through check should be performed according to "CONTROLS AND INSTRUMENTS" and "BEFORE STARTING".

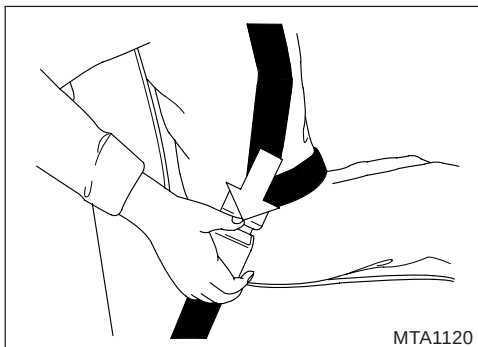


- 4) In order to operate your vehicle safely and dependably, it is imperative to perform necessary inspection and adjustment as outlined in "INSPECTION AND MAINTENANCE".



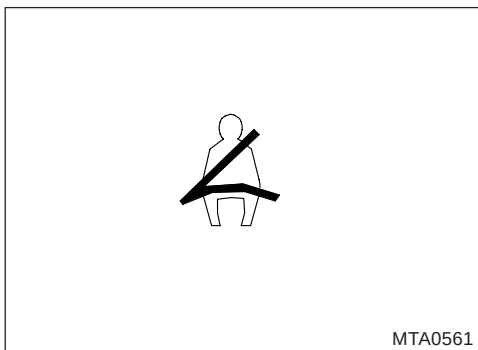
- 5) Overloading may not only shorten the service life of your vehicle but also cause serious problems against your safety. The weight of the payload must be within the GVW rating and distributed over the front and rear axles so as not to exceed their axle capacities. Refer to "SPECIFICATIONS AND SERVICE DATA" for GVW and Axle capacity.

HOW TO HANDLE THE VEHICLE 1-11



6) Seat belts

Always fasten your seat belts when driving over long distance or in downtown. Passengers not wearing their seat belts may endanger your safe driving.



- ✱ The seat belt warning lamp comes on when the ignition switch is placed in the "ON" position unless the driver's seat belts are securely fastened.

WARNING

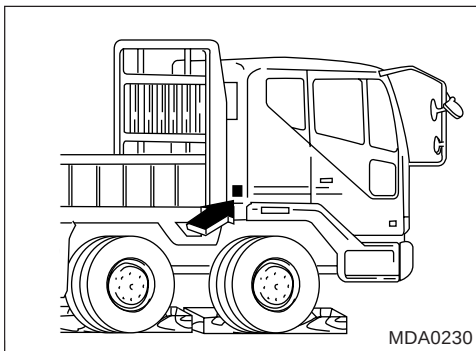
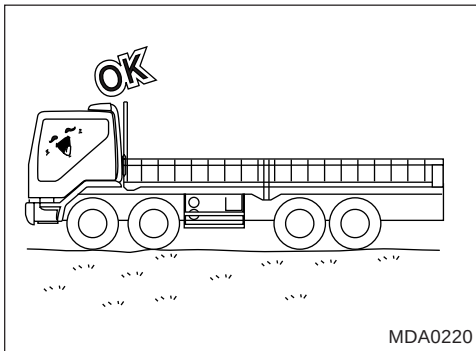
1. Never use a belt for more than one person at a time.
2. Never wear the belts twisted.
3. Make sure seat belts or their attachments not to be thrust in metal parts of the seat or the door.
4. Seat belts should be adjusted as firmly as possible.
5. Do not wear seat belts low under your shoulder.
6. If you replace your seat belts incorrectly, you may be injured by hardwares of the belts at sudden stops.
7. Do not wear your seat belts with hard or breakable objects such as glasses, pens, etc. put into the pocket of your upper garment.

CARE OF BELTS

1. Periodically inspect all parts of the belts and replace any damaged parts.
2. Make sure that the belts are not to be damaged by sharp edged objects.
3. The belts should be changed if webbing has become frayed or damaged.
4. Check if fixing bolts have been firmly installed to the floor.
5. Always keep the seat belts clean and dry.
6. Clean only with tepid soapy water.
7. Do not bleach or dye seat belts.

1-12 HOW TO HANDLE THE VEHICLE

2. OPERATION OF CAB TILT



1) Preparation for cab tilting

- (1) Place the vehicle on level ground and ensure that there is a sufficient space in front of and above the cab. And then, position starter switch "ON".
- (2) Set the parking brake firmly.
- (3) Set the gearshift lever to neutral position.
- (4) Keep interior of the cab free from fragile articles. Close the doors securely.
- (5) All the wheels should be chocked.
- (6) Re-check if there is any person in the cab.
- (7) Open the cab according to the following instructions.

Note

Read thoroughly "CAB TILT OPERATING INSTRUCTIONS" affixed at the rear right-hand side of the cab before manipulating it.

• Recommended cab tilt oil

Specifications : ISO 6743/4HV

EQUIVALENT TO MIL-H-24459

Recommend to EQUIVIS ZS15

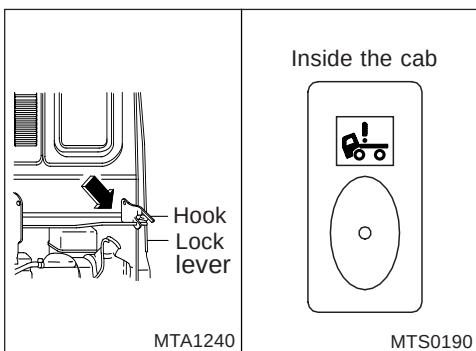
⚠ Caution

Be sure to use recommended cab tilt oil replenishment.

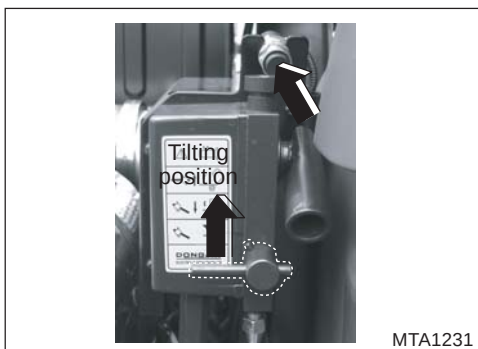
2) How to lift the cab

- (1) To "ON" position located in key box, Pull forward lock lever located at the lower right-hand side of the rear of the cab while lifting the hook, and then the lock will be released.

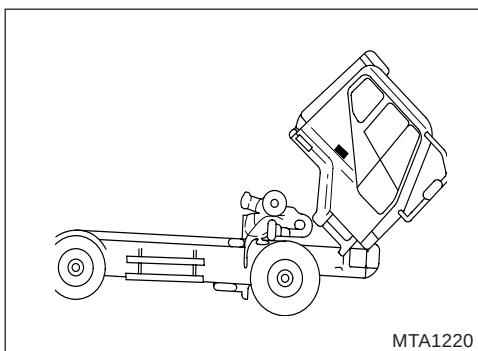
Push cab tilt enable switch to "ON" position located in instrument panel inside the cab in case of the hydraulic cab lock option system is applied in the vehicle.



HOW TO HANDLE THE VEHICLE 1-13



- (2) Turn the direction change lever installed onto the pump located at the rear lower right-hand side of the cab to set it to "U" position.
- (3) Press the switch as shown, and then the pump works and the cab starts to ascend.



- (4) Cab is ascending while pushing the cab-tilt switch. You can manipulate the switch to adjust open angle of the cab as desired. Stop pushing the switch when the cab is tilted over than the cab weight center, if you keep pushing the switch on the noise will be increased. (The 8X4series vehicle power off automatically when fully retracted.)

⚠ Caution

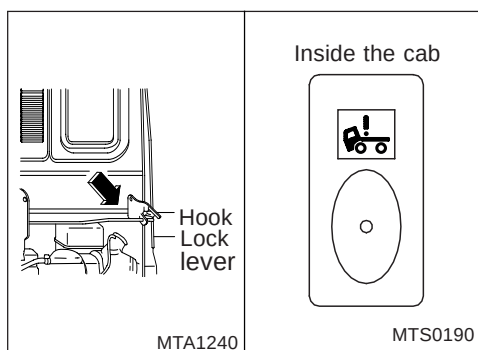
1. Do not work without tilting the cab completely.
2. Do not start engine when the cab does not tilted completely or while descending.
3. Never tilt the cab at a sloped hill.



3) How to lower the cab

- (1) Position the direction change lever in "D" position.
- (2) Press the switch as shown, and then the pump works and the cab starts to descend.
- (3) Once the cab descended completely, stop pushing the switch.

1-14 HOW TO HANDLE THE VEHICLE



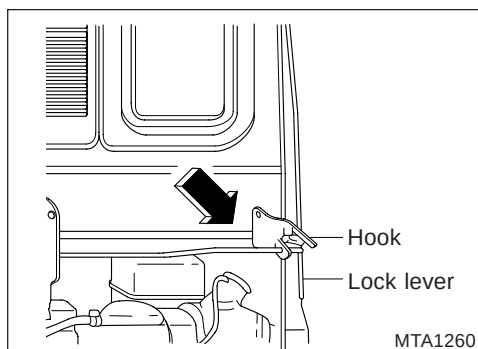
- (4) Once the cab descends completely, check that the lever located at the rear lower right hand side of the cab is locked into hook.
- For hydraulic cab latch type vehicle, make sure that release cab tilt switch to "OFF" and warning lamp is off before driving.

⚠ Caution

1. While driving you should set the direction change lever in "D" position.
2. Be sure to check that the lock lever is locked in hook. In the event of troubles with cab tilting system, call for check and necessary services of your nearest TATA Daewoo dealer.
3. For hydraulic cab latch type, when the cab descends without tilting the cab completely, the cab should be descend after waiting at least 30 sec.

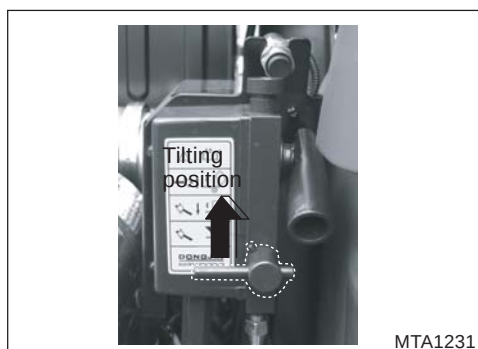
• Troubleshooting for cab tilt

The cab can be tilted by hand at electrical system failure or battery discharge. In the event of troubles with cab tilting system, call for check and necessary service of your nearest TATA Daewoo dealer.



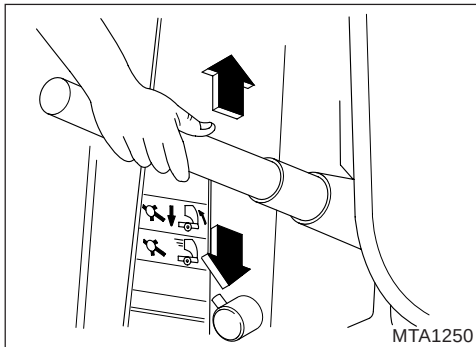
1) How to lift the cab

- (1) Pull forward lock lever located at the lower right-hand side of the rear of the cab while lifting the hook to release lock.
- (Except the hydraulic cab latch type)



- (2) Turn the direction change lever installed onto the pump located at the rear lower right-hand side of the cab to set it to "U" position.

HOW TO HANDLE THE VEHICLE 1-15



- (3) If you insert cab tilt lever into pump socket and move it up and down, the cab will ascend.

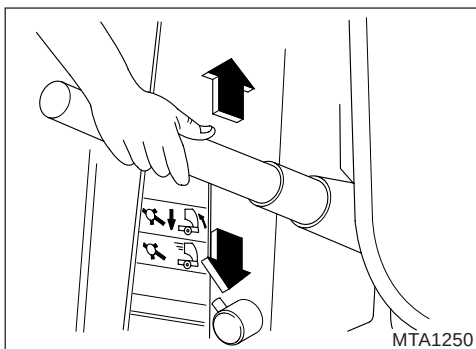
Note

Although hydraulic pump does not work at the first time, continue the manipulation as above, then the cab will be tilted.



2) How to lower the cab

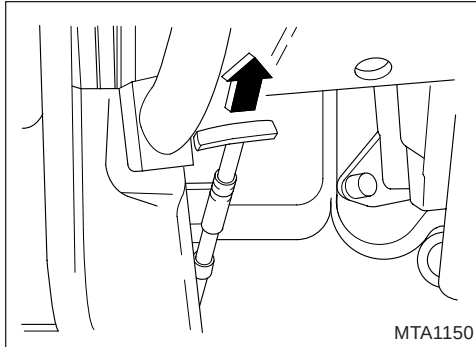
- (1) Position the direction change lever in "D" position.



- (2) If you insert cab tilt lever into pump socket and move it up and down, cab will descend.
- (3) Make sure that lock lever is locked into hook.
(Except the hydraulic cab latch type)

1-16 HOW TO HANDLE THE VEHICLE

3. OPENING OR CLOSING OF FRONT LID

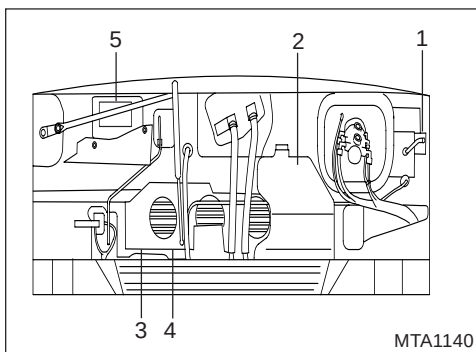


1) Opening procedure

- (1) Place the starter key in "OFF" position.
- (2) Pull forward the front lid lever located at Access panel RH of the instrument panel.

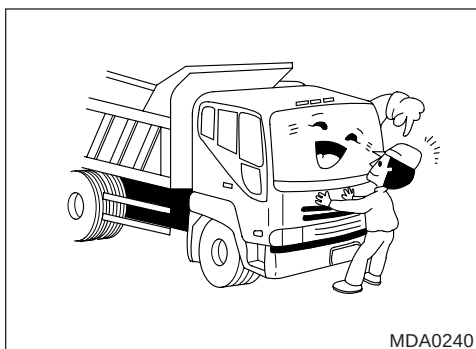


- (3) Put your hand between the front lid and radiator grille to pull forward the lever located in the middle of the front part, and then the front lid becomes unlocked.
- (4) Pull the front lid to open.



- (5) Opening the front lid enables you to easily check, top-up, or clean the following parts.

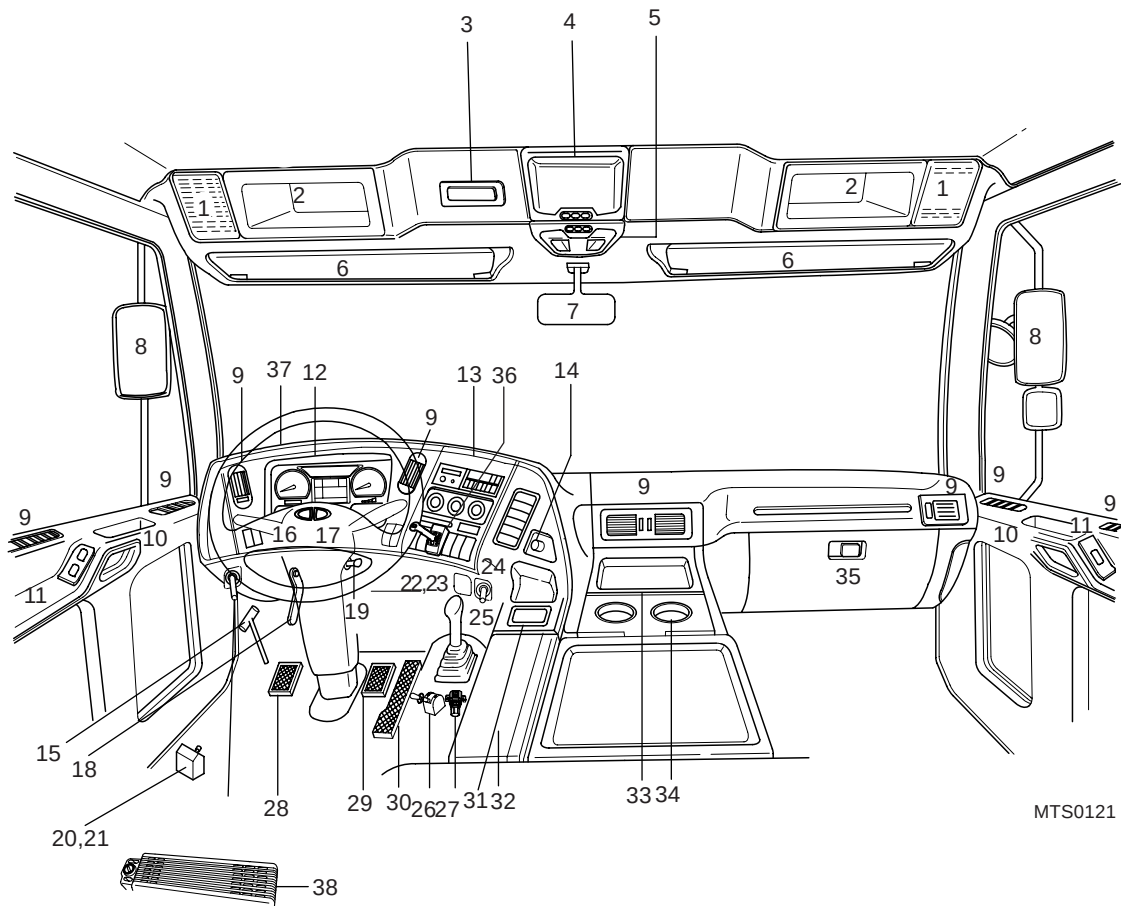
1. Clutch fluid reservoir
2. Washer fluid tank
3. Engine oil level gauge
4. Engine oil filler
5. Air filter



2) Closing procedure

- (1) Push the front lid slowly to close. Keep pushing it until a "click" is heard from its lower part.
- (2) Make sure that it is locked securely.

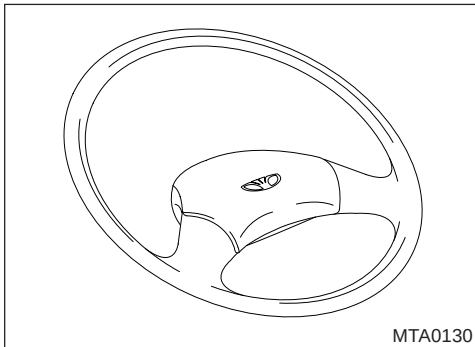
4. INSTRUMENTS AND CONTROLS



MTS0121

- | | | |
|--|---|---|
| 1. Speaker | 17. Wiper and exhaust brake switch, Jake brake switch | 28. Clutch pedal |
| 2. Overhead stowage | 18. Steering wheel adjusting lever | 29. Brake pedal |
| 3. Digital Tachograph
Digital clock | 19. Starter switch | 30. Accelerator pedal |
| 4. Fluorescent room lamp | 20. Dump control lever | 31. Ashtray |
| 5. Spot lamp | 21. Mixer drum control lever | 32. Consent(12V) |
| 6. Sunvisor | 22. ON/OFF air parking brake valve | 33. Fuse and relay box |
| 7. Inside rearview mirror | 23. Gradual parking brake lever
(with trailer) | 34. Cup holder |
| 8. Side mirror | 24. Idle control knob(DE/DV Engine)
Electronic foldable mirror frame switch* | 35. Body computer unit
Can control unit
Power monitoring unit
Intarder ECU |
| 9. Ventilation vents | 25. Manual transmission gearshift lever
Auto transmission* | 36. Intarder lever switch
(ZF transmission) |
| 10. Door inside Knob | 26. Parking brake lever, Trailer hand brake
valve(trailer) | 37. GPS antenna |
| 11. Power window switch | 27. Pusher axle control valve(self steer) | 38. Air heater(driver's seat back) |
| 12. Instrument | | |
| 13. Controls of center console | | |
| 14. Cigarette lighter | | |
| 15. Front lid opening lever | | |
| 16. Combination switch | | |

1-18 HOW TO HANDLE THE VEHICLE

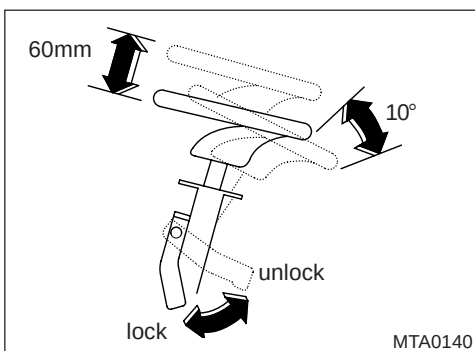


1) Attachments of steering column

- **Steering wheel and horn button**

The steering wheel should not be turned while the vehicle is stationary as it adversely affects the tires and steering system.

Horn button is equipped on the middle of steering wheel.

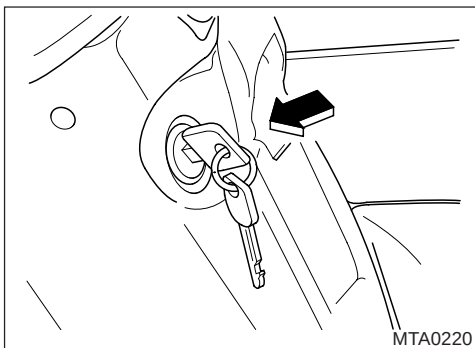


- **Steering wheel adjustment**

Adjust the steering wheel to the desired position after pulling lock lever.

Adjusting angle: 10°

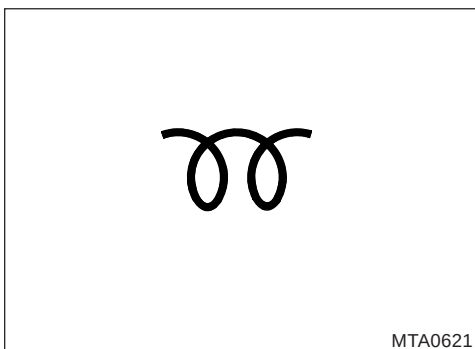
Travel: 60mm



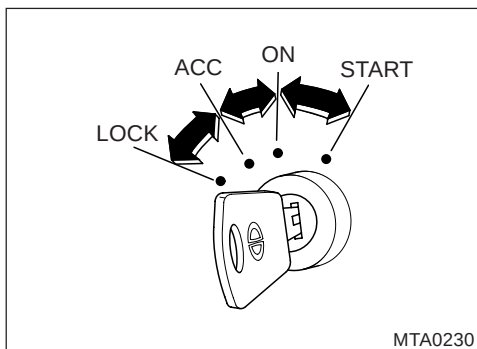
- **Starter switch**

Starter switch operates in the 4 stages as follows:

- (1) **LOCK**: The key can be inserted or removed only when the switch is in this position.
- (2) **ACC** : This position turns on the radio, digital clock, cigarette lighter and consent.
- (3) **ON** : This position turns on the electrical equipment. During the vehicle operation, hold the key in this position.
- (4) **PREHEATING(DL08K/DV11K,DE/DV Engine)** :
 1. TATA Daewoo heavy trucks engines are equipped with the preheating and postheating systems designed to improve engine starting and to reduce the generation of white smoke.
 2. With the starting key positioned "On", it is automatically preheated according to the temperature of coolant. In 0.3 second(in hot season) or 18 seconds(in cold season), the preheating indicator lamp goes out, indicating that preheating is complete.
 3. If you start the engine before the preheater warning lamp goes out, the postheating system would not work, resulting in increase in white smoke.
- (5) **START** : The engine is started when the switch is in this position.

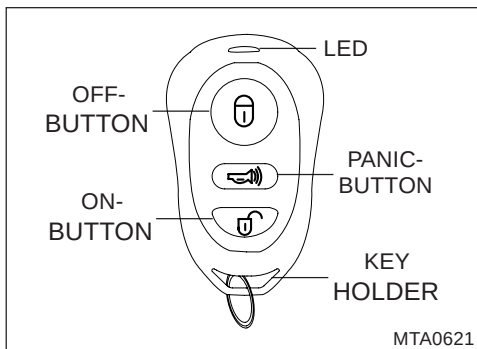


HOW TO HANDLE THE VEHICLE 1-19



⚠ Caution

1. Once the engine is started, release the key immediately.
2. Do not exceed 10 seconds for the operation of starter.
3. Do not restart on the starting if you restart as this may damage the start motor.
4. Gearshift lever should be in neutral position when attempting to start the engine.



• Remote keyless entry system

Button	Time	Feature
ON-BUTTON 	Brief 0.5 sec	Door is unlocked
	Long 2.5 sec	Window down
OFF-BUTTON 	Brief 0.5 sec	Door is locked
	Long 2.5 sec	Window up
PANIC-BUTTON 	Long 2.5 sec	PANIC for 30 sec
ALARM SYSTEM	One time warning siren for 30 sec(on opening door forcefully in alarming status)	

1) Door unlock

Door is unlocked when pressing ON-BUTTON of remote control for 0.5 sec briefly.

2) Door lock

Door is locked when pressing OFF-BUTTON for 0.5 briefly

3) Window Down

Door is down when pressing ON-BUTTON for 2.5 sec long in with 2 times lighting of tail lamp.
(You can stop window down when you unbutton during window-down)

4) Window up

Pressing "OFF-BUTTON" for over 2.5 sec in the status of Door-lock or Door-unlock, window is up with one-time lighting of tail lamp
(You can stop window up when you unbutton during window-up)

1-20 HOW TO HANDLE THE VEHICLE

5) How to remove alarm while it's working

Press ON-BUTTON or OFF-BUTTON during alarming.

6) How to remove alarm system

Open door by key or press ON-BUTTON during alarming.

7) Panic

Press PANIC-BUTTON in Door-lock/Door-unlock status or while driving. (Tail lamp is lighting and warning is alarming for 30 sec.)

8) Warning alarm sounds maximum 30 sec until it's removal.

9) When you will not open the door 30 sec after you open it by key or remote control, the door is automatically closed.

10) The change of remote control battery

Change battery if LED is dimming or stop lighting on pressing ON/OFF BUTTON of remote control.

11) How to exchange battery

- 1) Open in the back side of remote control
- 2) Open the lid and insert new battery into remote control after pulling out old one
- 3) Shutting lid of remote control
- 4) Be sure to check whether it works properly with new battery.

Caution

Remote control can be damage if drown or apply impact the remote control.

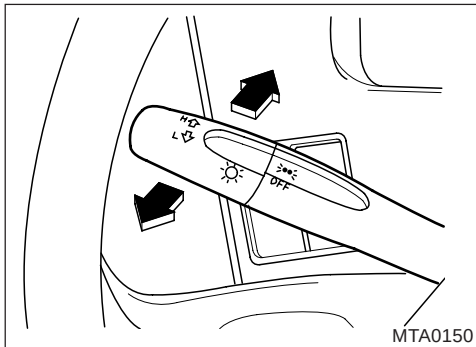
Warning

When leave child or pet in a car, do not lock door applying remote control absolutely. Because temperature in vehicles rises fast and high than outdoor, can lose serious injury or life

Caution

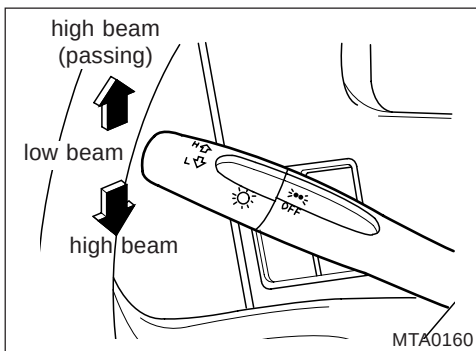
Do not disjoint remote control except battery change. It is cause of breakdown.

HOW TO HANDLE THE VEHICLE 1-21



- **Turn signal switch**

Move this combination switch lever in the desired direction so that the corresponding turn signal lamp operates and causes the turn signal indicator lamp on the instrument panel to flash. The switch lever returns automatically to the neutral position when the steering wheel is returned to the reverse direction. When head lamp switch is in 2nd stage simultaneously with turn signal lamp "ON", cornering lamp also comes on.

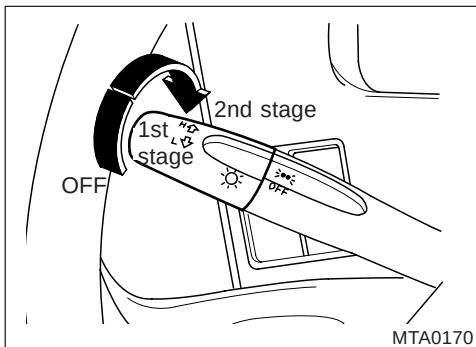


- **High beam switch**

When the head lamps are on, pulling the lever down lights up not only the head lamps with high beam but also the high beam indicator lamp. When pulling it up, head lamps with low beam are on.

- **Passing lamp switch**

To light up passing lamps at any time, pull up the lever towards the steering wheel. The lever will return to the OFF position when released.



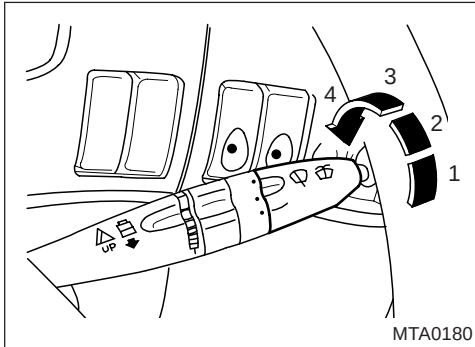
- **Lamp switch(turn type)**

Lamp switch operates in two stages as follows:

1st stage: tail lamp, license plate lamp, instrument panel lamp, clearance lamp

2nd stage: tail lamp, license plate lamp, instrument panel lamp, clearance lamp, head lamp, cornering lamp (simultaneously with turn signal lamp "ON")

1-22 HOW TO HANDLE THE VEHICLE



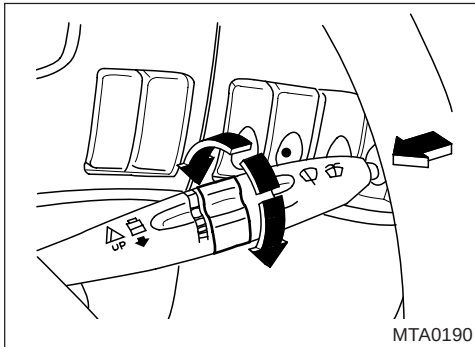
- **Windshield wiper switch**

The windshield wiper switch has 3 positions to control the windshield wiper.

1. OFF = Off
2. INT = Intermittent wipe
3. LO = Continuous wipe, slow speed
4. HI = Continuous wipe, fast speed

⚠ Caution

Do not operate the wipers when the windshield remains dry. They may scratch the windshield glass. Do not operate the wipers if they are covered with snow or ice as this may damage the wiper system.

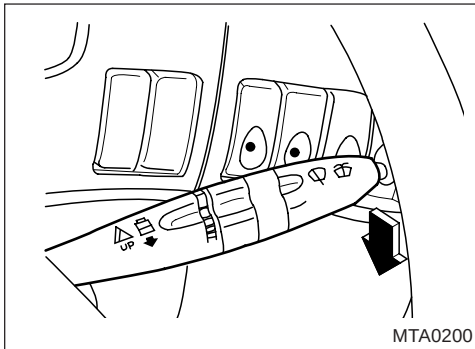


- **Wiper speed control switch**

The desired intermittent operation time can be controlled by turning the knob when the wiper switch is in "INT" position.

- **Windshield washer switch**

To let washer fluid spray on the windshield, press and hold the center button of switch. And the windshield wipers are simultaneously operated for 2-3 cycles.

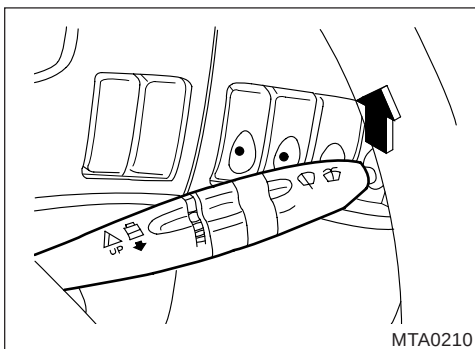


- **Exhaust brake switch**

The exhaust brake system is designed to shut off exhaust pipe when the engine brake is applied, resulting in assisting brake action. When the switch lever is pushed downward, and clutch and accelerator pedals are released, the indicator lamp comes on showing that the exhaust brake is in operation. When the clutch and accelerator pedals are depressed, the exhaust brake stops working.

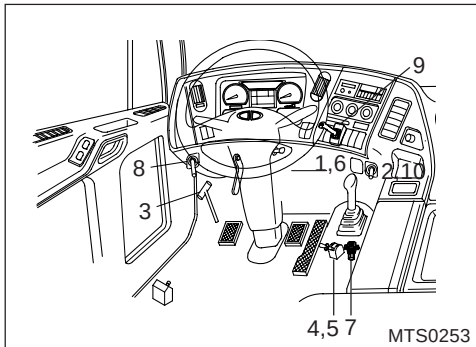
Note

1. Exhaust brake works only on vehicles more than 1,000rpm
2. This operation is done by using the Jake Brake switch. For detail, refer to "Jake brake switch".



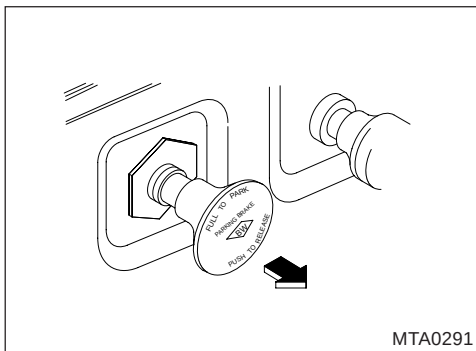
- **Hazard warning flasher switch**

When the right-hand lever is pushed upward, all the turn signal lamps are made to flash regardless of the turn signal switch position. The hazard warning flasher switch is to be used when your vehicle gets in a traffic hazard or is parked in the darkness.



2) Peripheral devices of steering column

- (1) ON/OFF air parking brake valve
- (2) Idle control knob(DE/DV Engine)
- (3) Front lid opening lever
- (4) Parking brake lever
- (5) Trailer hand brake valve
- (6) Gradual parking brake lever(with trailer)
- (7) Pusher axle control valve(self steer)
- (8) Off road switch
- (9) Intarder lever switch(ZF transmission)*
- (10) Electronic foldable mirror frame switch*



(1) ON/OFF air parking brake valve

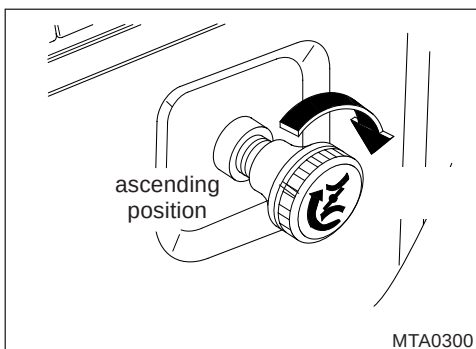
When the valve knob is pulled, the parking brake is actuated to cause the indicator lamp to come on. Pushing in the valve knob release the brake. Make sure that the indicator lamp is off before driving off.

⚠ Caution

Before travel, manipulate the parking brake lever to check for its motion. If you drive on pulling up the lever, you may damage by brake lining broken.

⚠ Caution

If you don't pull up the lever fully to set the parking brake, you may damage by moving vehicle.



(2) Idle control knob(DE/DV engine)

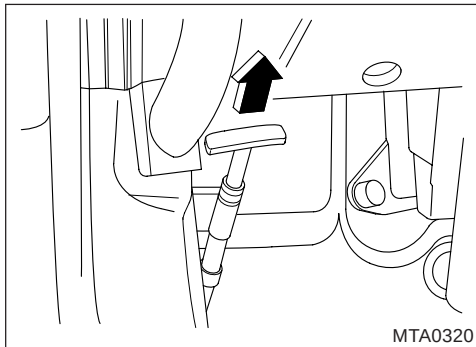
Turning the knob clockwise after cold starting of the engine will increase idling speed and thus facilitate quick normalization of the engine coolant temperature.

Always drive with the knob turned back home.

⚠ Caution

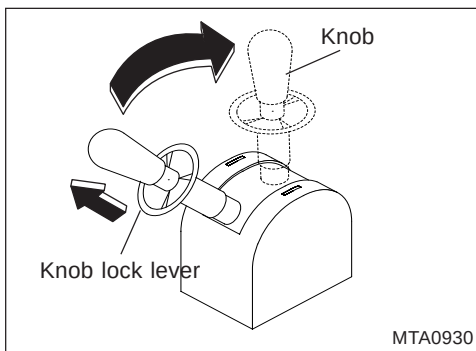
Do not use this knob to stop the engine.

1-24 HOW TO HANDLE THE VEHICLE



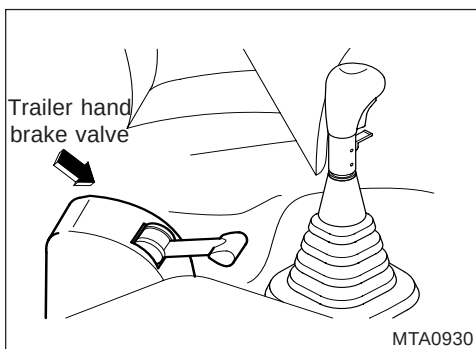
(3) Front lid opening lever

When this lever is pulled up, front lid is released from locking to be ready to open. The levels of engine oil, clutch fluid, and washer fluid can be checked from inside the front lid.



(4) Parking brake lever

If the knob is pulled rearward, parking break is actuated and parking break light flashes on. When getting off the truck, make sure that the lever is correctly locked after pulling it rearward.(Clacking sound)
When releasing, lift up the knob locking lever and then push the knob forward.

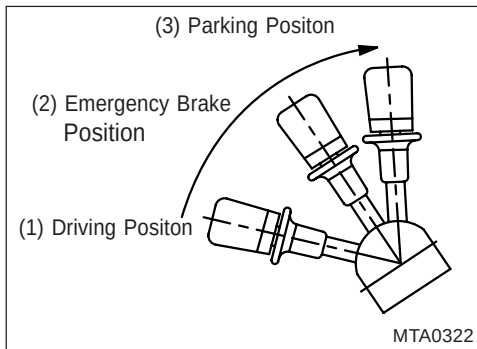


(5) Trailer hand brake valve(trailer)

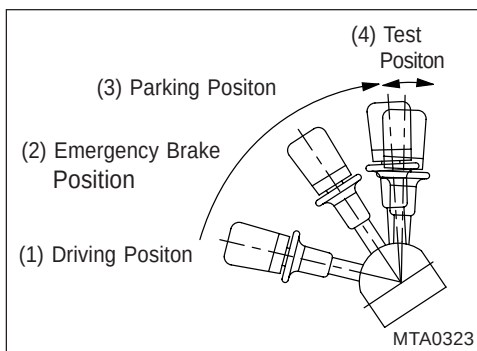
Operate at middle & low speed as brake system for trailer, do not operate at sudden braking.

⚠ Caution

In Case of applied trailer hand brake by excessive braking power, can cause serious danger on vehicles.(jack knife phenomena)



Parking brake without test position
(A cargo & a dump)



Parking brake with test position
(A tractor & a pull cargo)

(6) Gradual parking brake lever(with trailer)

1) Driving position

As a lever is located at the former(1), a parking brake is released.

2) Emergency brake position

As a lever is pulled back from No. (1) to No.(2), a parking brake of a truck is operated in gradual. In case of a parking brake at the test position, a parking brake of a truck & a service brake of a trailer is gradually operated. This brake is for an emergency, and it can be used for speed down as well. During using an emergency brake, a parking, a parking brake emergency lamp and a brake lamp are turned on.

As a lever is unloosened at No.(2), it is automatically returned to No.(1), and a parking brake of a truck & a service brake of a trailer is released as well.

3) Parking position

As a lever is pulled from No.(2) to No.(3), a parking brake of a truck is operated. In case of a parking brake with a test position, a parking brake is operated in a truck, and a service brake is operated in a trailer. As a lever is unlocked and pulled forward, a parking brake is released.

4) Test position(Tractor, Pull cargo vehicle)

As a lever is pushed at the parking position, No.(3) and pulled to No.(4), a brake of a trailer is released with operating a parking brake of a truck. After a confirmation of safety of parking at No.(4) position, let a lever release, and then it is automatically returned to the parking position, No.(3)

This is a stage for a confirmation to keep the parking status if there is a leakage of the compressed air during a driver's absence after parking.

Warning

Must check at the test position if a truck & a trailer do not move in parking status for a tow truck. If it is uncertain, set a supporter under a wheel, or park the vehicle on a level road.

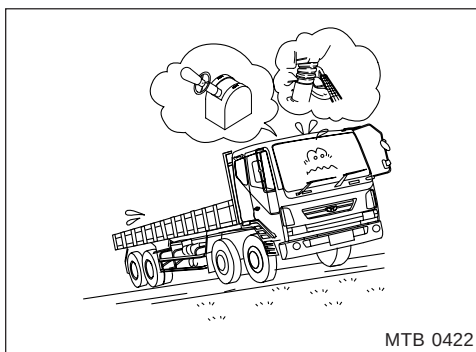
1-26 HOW TO HANDLE THE VEHICLE

⚠ Warning

Must place a parking brake lever to the start position after starting an engine before departure. If it is operated with pulling a parking brake lever, a brake lining can be stuck or there can be an accident from an overheated drum.

⚠ Warning

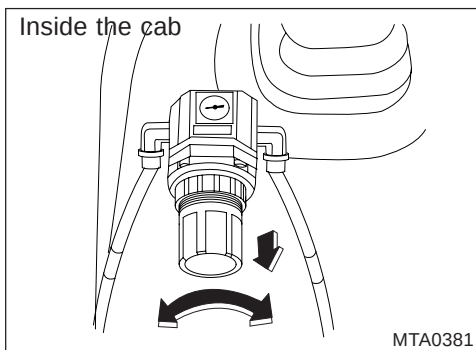
If a parking brake is not operated for sure, there can be an accident because a vehicle can move without any operation.



- A hill start (Applying to ZF automatic transmission)

⚠ Caution

If the vehicle slips backward due to start delay of slow reaction in gas pedal, step on the gas pedal and release the parking break at the same time.



(7) Pusher axle load Control Lever

When loading cargo, lower self-steering by operating self-steering switch in order to share live load and adjust load by pulling valve hand from side to side.

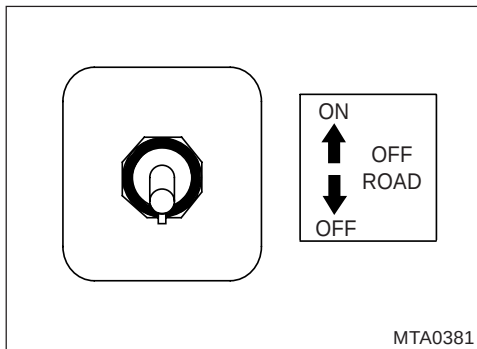
After adjusting, handle should be pushed until "clacking" sound is made. If valve is turned to the "left", pusher axle-load decreases, and if turned to the "right", pusher axle-load increases. Only 24t rear tri-axle dumps have pusher axle load control lever inside the cab, and the other vehicles have on the outside cap(the left of the last rear axle).



* Control Unit

Control Unit, a device to operate air pressure before providing air toward ride spring, consists of pressure operating valve, pressure gauge, and self-steering switch.

Increasing the air pressure makes lifting power large and thus axle load increases, however, decreasing it makes lifting power little and thus axle load decreases.



(8) OFF Road Drive Switch(Rear tri-axle Dump)

If unloaded, lift up pusher axle in order to increase fuel-efficiency, and if loaded, be sure to lower pusher axle. Also, for the pleasant and safe driving, please keep the following points.

⚠ Caution

For the best fuel consumption, please drive at fuel-efficient speed.

⚠ Caution

For the safe driving, if the vehicle is in laden situation, DO NOT lift up pusher axle(lifted-up driving in laden situation can cause serious problems in durability of the vehicle.

⚠ Caution

OFF ROAD drive switch should be used only in case air pressure drops below 6bar in off road driving after loading. If the switch is actuated(upward : air blocking), air consumption can be reduced. However, driving on the paved road and passing the scale, NEVER use OFF ROAD drive switch, which cause serious damage in airbag.

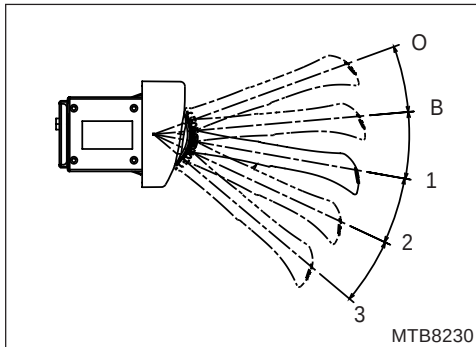
⚠ Caution

Self-steering function cannot be fully actuated as pusher axle which has self-steering function can lose the frictional force between tires and roads under rainy and snowy circumstances, and therefore DO lower gear when wet and passing cornering section.

⚠ Warning

DO NOT step on the lift(self-steering) axle tire. It can cause injury due to rotation of the tire.

1-28 HOW TO HANDLE THE VEHICLE



(9) Intarder lever switch (ZF transmission)

Use this switch in case of stepping on the brake frequently under conditions such as a downhill road. Using intarder helps not only to prolong replacement time of brake linings and pads but also to drive safely by using fluid resistance.

*How to operate

1. Operate intarder switch marked on multi-functional switch. Intarder switch ranges from B to 3.

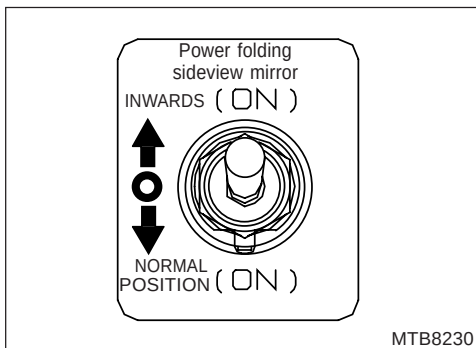
->Reduction range of intarder is as follows;

- B : Use this level in case of driving long downhill. It lets your vehicle maintain a constant speed by controlling vehicle's acceleration due to gravity.
- 1 : 20% of the whole reducible range
- 2 : 60% of the whole reducible range
- 3 : 100% of the whole reducible range

2. If you step on the gas, intarder stops working and the indicator lamp of dashboard is turned off. And if take your foot off the gas, intarder works again; it reduces vehicle speed and the indicator lamp of dashboard is turned on at once.

⚠ Caution

The brake friction heat which is generated while intarder is working is cooled down in engine cooling radiator. If coolant temperature rises near enough to indicate red mark of coolant temperature gauge on dashboard, breaking performance gradually becomes poor. If possible, change the level of intader in serial order from low to high level.

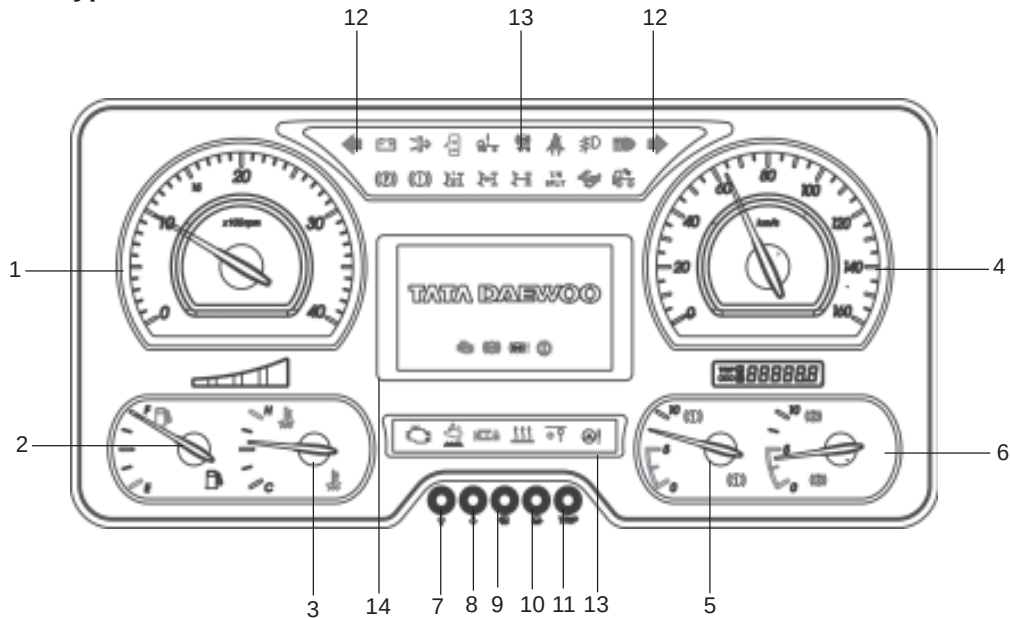


(10) Power folding sideview mirrors frame switch*

When passing alley ways or narrow areas, turn the switch toward "INWARDS (ON)", which makes mirrors be folded inwards and turn the switch toward "NORMAL POSITION(ON)", which makes mirrors restore original position.

3) Instruments and indicator lamps

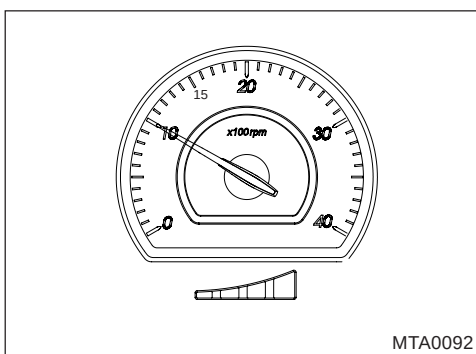
<A Type>



MDA0075

- | | | |
|------------------------------|-----------------------------|---|
| 1. Engine tachometer | 6. Air pressure gauge(Rear) | 11. Trip button |
| 2. Fuel gauge | 7. Up button(Optional) | 12. Turn signal/hazard warning indicator lamp |
| 3. Temperature gauge | 8. Down button(Optional) | 13. Miscellaneous indicator and warning lamp |
| 4. Tachograph | 9. Enter button(Optional) | 14. TFT-LCD display |
| 5. Air pressure gauge(Front) | 10. Escape button(Optional) | |

* Various indicators and warning lamps may vary depending on the specifications



MTA0092

(1) Engine tachometer

This indicates the engine RPM (Revolutions Per Minute).

⚠ Caution

Avoid engine overrun since it can damage the engine severely.

Note

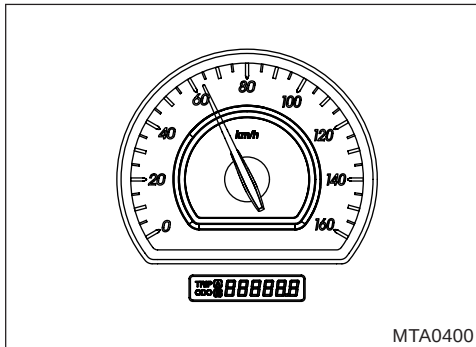
Overrun

This indicates the state that the engine rotates at a speed faster than its maximum speed.

Note

This indicator in different colors is illuminated according to the engine speed. Driving with the green indicator ON can help reduce fuel consumption.

1-30 HOW TO HANDLE THE VEHICLE

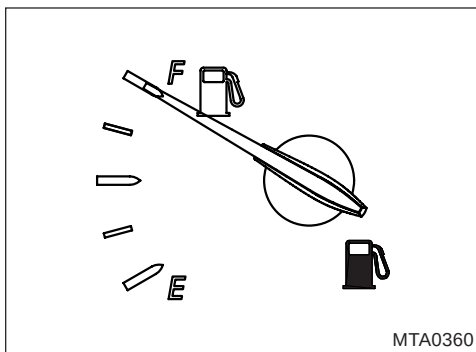


(2) Speedometer*

This indicates the current driving speed of the vehicle in km/h.

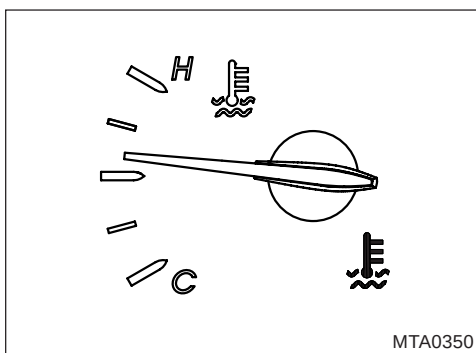
(3) Tachograph*

The tachograph is consisted of speedometer, odometer and clock. The vehicle speed and running distances are registered in a single chart. The speedmeter indicates the vehicle speed in km per hour. The odometer indicates individual trip distances. The odometer records the total distance in km. The unit of registered distance is 100m.



(4) Fuel gauge

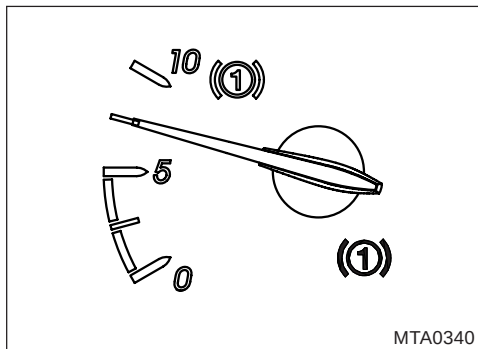
This gauge indicates fuel level of the fuel tank all the time regardless of the starter switch position.



(5) Temperature gauge

The gauge indicates the engine coolant temperature. If the gauge needle stands below the red colored zone, it means that engine coolant temperature is normal.

If the needle stands in "H"(overheating), stop the vehicle and run the engine at a moderately fast idle speed or put the gear in lower position to reduce engine load. If the vehicle is operated in abnormal condition, engine performance will be reduced and fuel consumption will be increased.



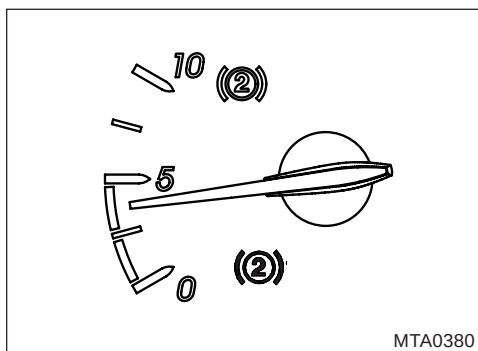
(6) Air pressure gauge(Front)

Air pressure gauge indicates air pressure in the front air tanks. While driving, the gauge needle must be within the range of 7.7~8.5kg/cm².

Be habitual of watching the gauge, while driving, to make sure the gauge needle indicates the normal condition.

⚠ Caution

If the gauge needle stands in the red zone, warning lamp comes on and alarm buzzer sounds. Immediately stop the vehicle, check for unusual conditions, run the engine at a moderately fast idle speed to increase air pressure, then drive off.



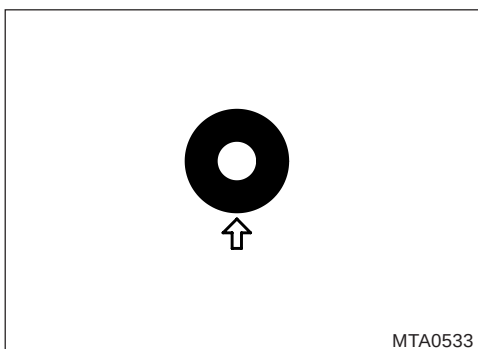
(7) Air pressure gauge(Rear)

Air pressure gauge indicates air pressure in the rear air tanks. While driving, the gauge needle must be within the range of 7.7-8.5kg/cm².

Be habitual of watching the gauge, while driving, to make sure the gauge needle indicates the normal condition.

⚠ Caution

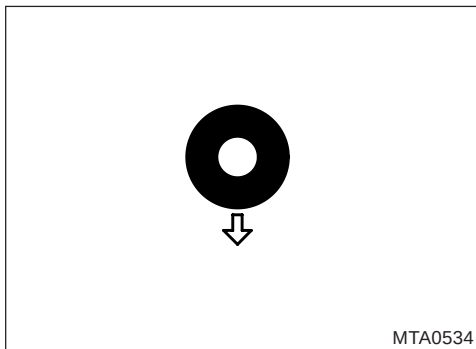
If the gauge needle stands in the red zone, warning lamp comes on and alarm buzzer sounds. Immediately stop the vehicle, check for unusual conditions, run the engine at a moderately fast idle speed to increase air pressure, then drive off.



(8) Up button(Option)

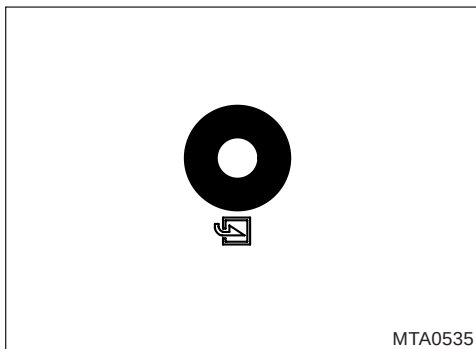
This button is to move up in the function menu in the TFT-LCD display.

1-32 HOW TO HANDLE THE VEHICLE



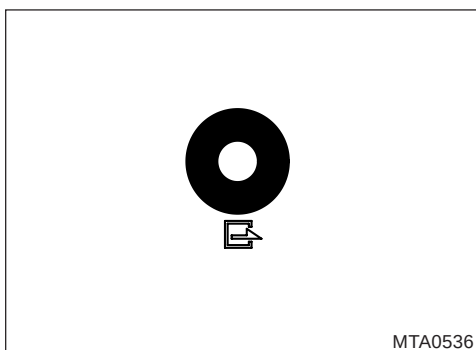
(9) Down button(Option)

This button is to move down in the function menu in the TFT-LCD display.



(10) Enter button(Option)

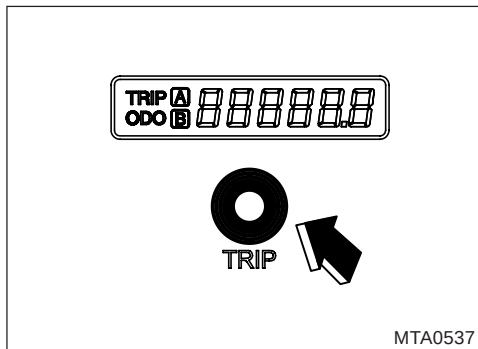
This button is to select the current function in the TFT-LCD display.



(11) Escape button(Option)

This button is to select the current function and exit in the TFT-LCD display.

HOW TO HANDLE THE VEHICLE 1-33



(12) TRIP button

- ODOMETER/TRIPMETER

When pressing TRIP button less than 1 second, display trip record in order as shown below.

- (1). ODOMETER
- (2). TRIP(A)
- (3). TRIP(B)

1. ODOMETER

ODOMETER displays total mileage with km

- 2,3. TRIPMETER

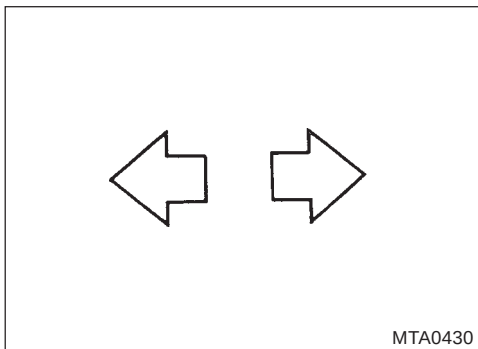
TRIPMETER displays distance traveled in any 2 parts of journey by 0.1km. They are shown as TRIP A & B

Ex) TRIP A: The distance from the starting point to particular point

TRIP B: The distance from the particular point to destination

Press the TRIP button to convert TRIP A into TRIP B

Reset the button shown by "0", if pressing it more than 1 second

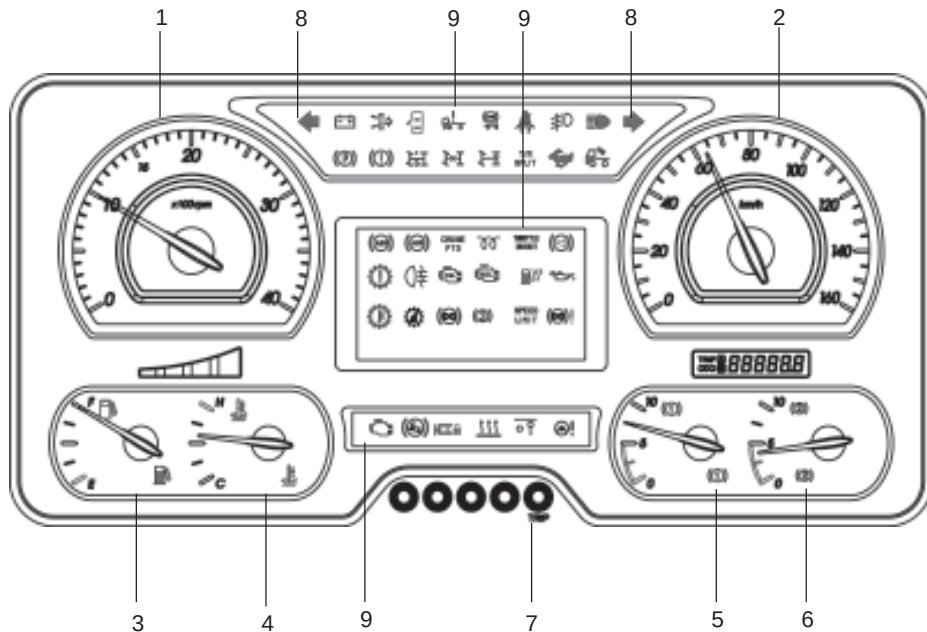


(13) Turn signal/hazard warning indicator lamp

When the turn signal switch or hazard warning flasher switch is turned on, the turn signal indicator lamp flashes to indicate the operation of the external turn signal lamps or hazard warning flashers.

1-34 HOW TO HANDLE THE VEHICLE

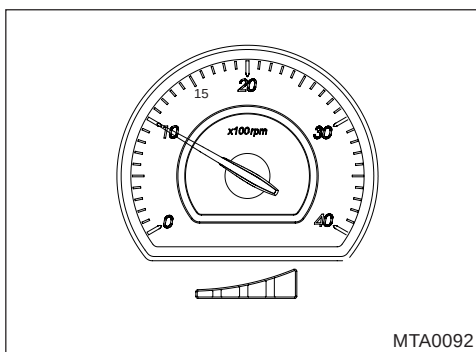
<B Type>



MDA0075

- | | | |
|----------------------|------------------------------|--|
| 1. Engine tachometer | 4. Temperature gauge | 7. Trip button |
| 2. Tachograph | 5. Air pressure gauge(Front) | 8. Turn signal/hazard warning indicator lamp |
| 3. Fuel gauge | 6. Air pressure gauge(Rear) | 9. Miscellaneous indicator and warning lamp |

* Various indicators and waring lamps may very depending on the specifications



MTA0092

(1) Engine tachometer

This indicates the engine RPM(Revolutions Per Minute).

Caution

Avoid engine overrun since it can damage the engine severely.

Note

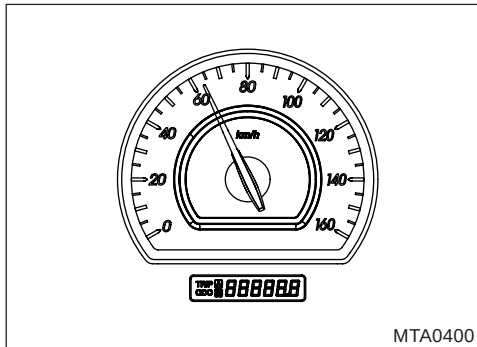
Overrun

This indicates the state that the engine rotate at a speed faster than its maximum speed.

Note

This indicators in different colors are illuminated according to the engine speed. Driving with the green indicator ON can help reduce fuel consumption.

HOW TO HANDLE THE VEHICLE 1-35

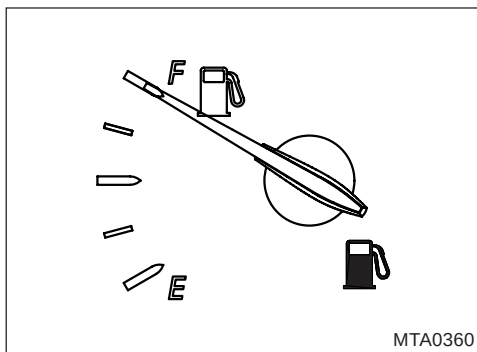


(2) Speedometer*

This indicates the current driving speed of the vehicle in km/h.

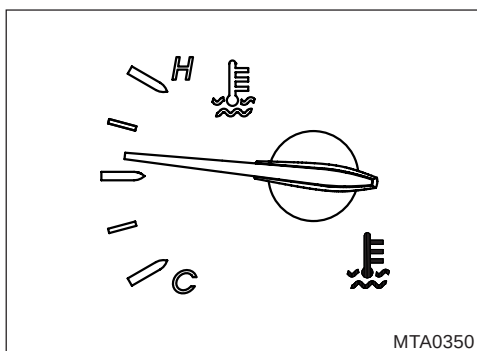
(3) Tachograph*

The tachograph is consisted of speedometer, odometer and clock. The vehicle speed and running distances are registered in a single chart. The speedometer indicates the vehicle speed in km per hour. The odometer indicates individual trip distances. The odometer records the total distance in km. The unit of registered distance is 100m.



(4) Fuel gauge

This gauge indicates fuel level of the fuel tank all the time regardless of the starter switch position.

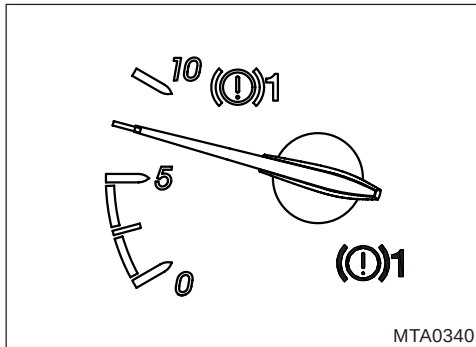


(5) Temperature gauge

The gauge indicates the engine coolant temperature. If the gauge needle stands below the red colored zone, it means that engine coolant temperature is normal.

If the needle stands in "H"(overheating), stop the vehicle and run the engine at a moderately fast idle speed or put the gear in lower position to reduce engine load. If the vehicle is operated in abnormal condition, engine performance will be reduced and fuel consumption will be increased.

1-36 HOW TO HANDLE THE VEHICLE



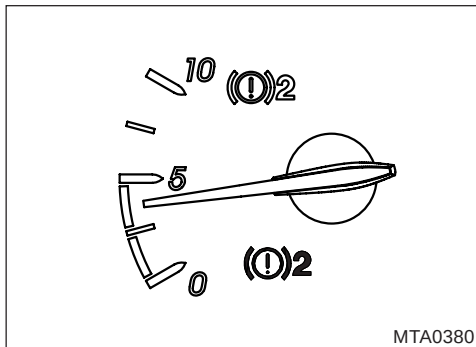
(6) Air pressure gauge(Front)

Air pressure gauge indicates air pressure in the front air tanks. While driving, the gauge needle must be within the range of 7.7~8.5kg/cm².

Be habitual of watching the gauge, while driving, to make sure the gauge needle indicates the normal condition.

⚠ Caution

If the gauge needle stands in the red zone, warning lamp comes on and alarm buzzer sounds. Immediately stop the vehicle, check for unusual conditions, run the engine at a moderately fast idle speed to increase air pressure, then drive off.



(7) Air pressure gauge(Rear)

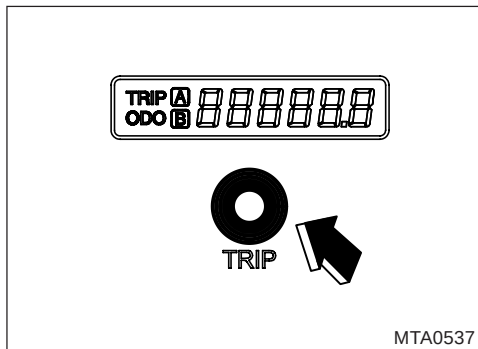
Air pressure gauge indicates air pressure in the rear air tanks. While driving, the gauge needle must be within the range of 7.7-8.5kg/cm².

Be habitual of watching the gauge, while driving, to make sure the gauge needle indicates the normal condition.

⚠ Caution

If the gauge needle stands in the red zone, warning lamp comes on and alarm buzzer sounds. Immediately stop the vehicle, check for unusual conditions, run the engine at a moderately fast idle speed to increase air pressure, then drive off.

HOW TO HANDLE THE VEHICLE 1-37



(8) TRIP button

- ODOMETER/TRIPMETER

When pressing TRIP button less than 1 second, display trip record in order as shown below.

- (1). ODOMETER
- (2). TRIP(A)
- (3). TRIP(B)

1. ODOMETER

ODOMETER displays total mileage with km

- 2,3. TRIPMETER

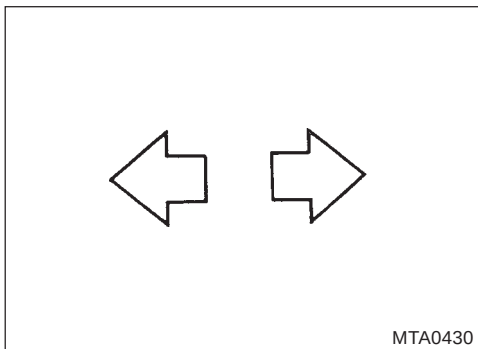
TRIPMETER displays distance traveled in any 2 parts of journey by 0.1km. They are shown as TRIP A & B

Ex) TRIP A: The distance from the starting point to particular point

TRIP B: The distance from the particular point to destination

Press the TRIP button to convert TRIP A into TRIP B

Reset the button shown by "0", if pressing it more than 1 second

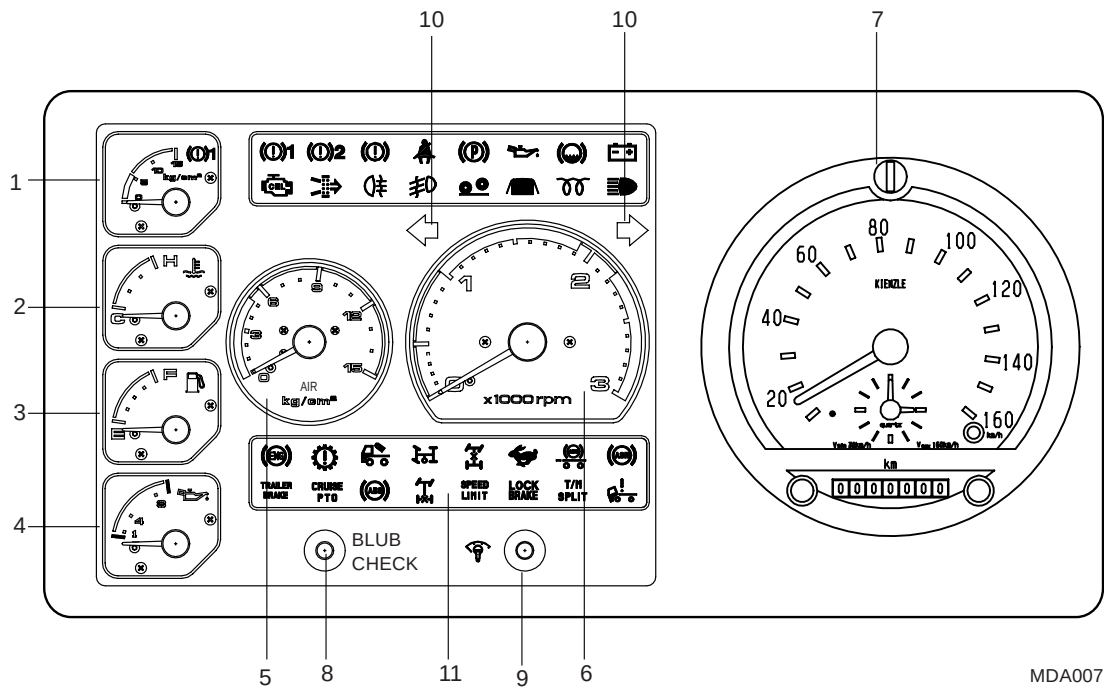


(9) Turn signal/hazard warning indicator lamp

When the turn signal switch or hazard warning flasher switch is turned on, the turn signal indicator lamp flashes to indicate the operation of the external turn signal lamps or hazard warning flashers.

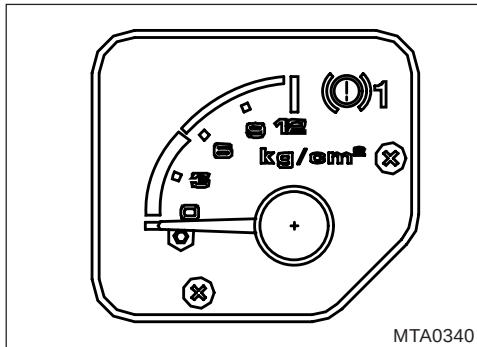
1-38 HOW TO HANDLE THE VEHICLE

<C Type>



MDA0075

- | | | |
|------------------------------|-----------------------|--|
| 1. Air pressure gauge | 5. Air pressure gauge | 9. Illumination control switch |
| 2. Temperature gauge | 6. Engine tachometer | 10. Turn signal/hazard warning indicator |
| 3. Fuel gauge | 7. Tachograph | 11. Miscellaneous indicator and warning lamp |
| 4. Engine oil pressure gauge | 8. Bulb check switch | |



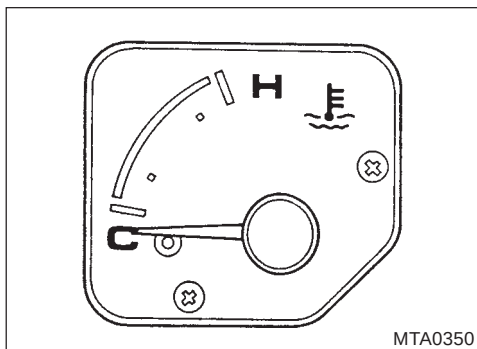
(1) Air pressure gauge(front)

Air pressure gauge indicates air pressure in the front air tanks. While driving, the gauge needle must be within the range of 7.7~8.5kg/cm².

Be habitual of watching the gauge, while driving, to make sure the gauge needle indicates the normal condition.

⚠ Caution

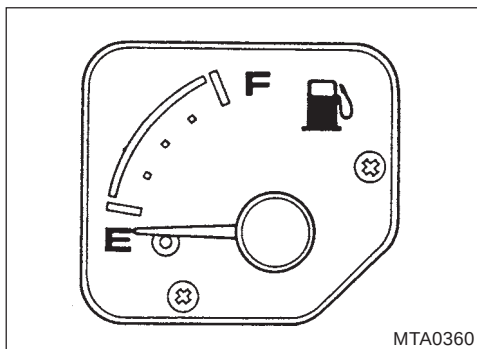
If the gauge needle stands in the red zone, warning lamp comes on and alarm buzzer sounds. Immediately stop the vehicle, check for unusual conditions, run the engine at a moderately fast idle speed to increase air pressure, then drive off.



(2) Temperature gauge

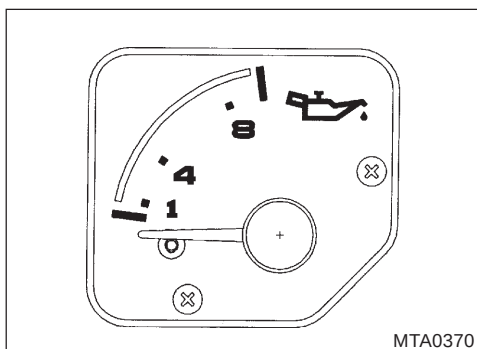
The gauge indicates the engine coolant temperature. If the gauge needle stands below the red colored zone, it means that engine coolant temperature is normal.

If the needle stands in "H"(overheating), stop the vehicle and run the engine at a moderately fast idle speed or put the gear in lower position to reduce engine load. If the vehicle is operated in abnormal condition, engine performance will be reduced and fuel consumption will be increased.



(3) Fuel gauge

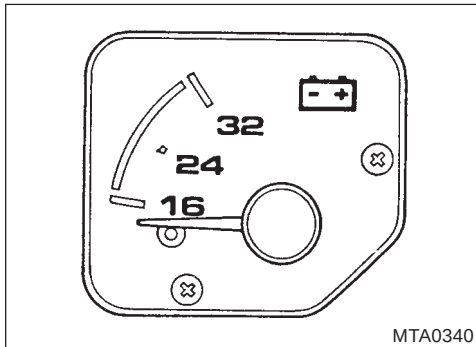
This gauge indicates fuel level of the fuel tank all the time regardless of the starter switch position.



(4) Oil pressure gauge

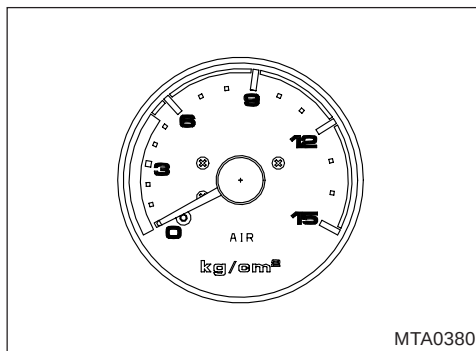
This gauge indicates oil pressure in the engine lubricating system. The indication of the gauge should be 1-3kg/cm² when the engine is at idle; it should be 3-6.5kg/cm² when the engine is running at medium speed.

1-40 HOW TO HANDLE THE VEHICLE



(5) Voltmeter

The voltmeter indicates the battery condition. Check the voltmeter reading with the engine running. The gauge needle should stand between the reading of 24 and 28.

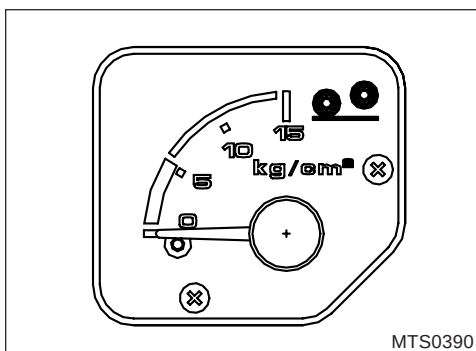


(6) Air pressure gauge(rear)

Air pressure gauge indicates air pressure in the rear air tanks. While driving, the gauge needle must be within the range of 7.7-8.5kg/cm². Be habitual of watching the gauge, while driving, to make sure the gauge needle indicates the normal condition.

⚠ Caution

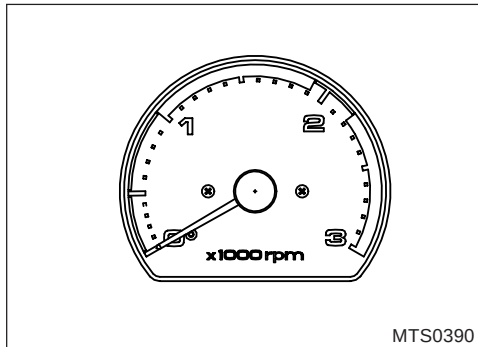
If the gauge needle stands in the red zone, warning lamp comes on and alarm buzzer sounds. Immediately stop the vehicle, check for unusual conditions, run the engine at a moderately fast idle speed to increase air pressure, then drive off.



(7) Air pressure gauge(self steer, bogie lift)

Air pressure gauge indicates air pressure in the air tanks of self steer, bogie lift vehicle. While driving, the gauge needle must be over 6kg/cm². Be habitual of watching the gauge before driving, to make sure the gauge needle indicates the normal condition.

HOW TO HANDLE THE VEHICLE 1-41



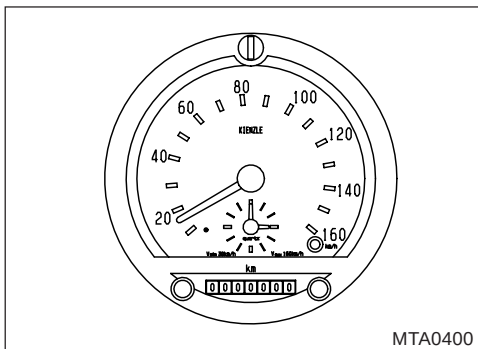
(8) Engine tachometer

The tachometer indicates the engine speed in revolutions per minute (rpm).

⚠ Caution

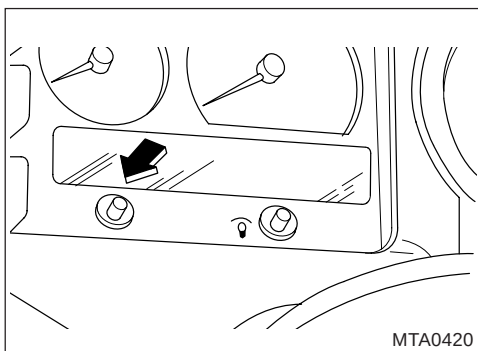
Excessively high engine rpm (red colored zone) may cause damage to the engine. To make sure the gauge needle doesn't indicate the red colored zone.

Engine	Maximum	Economy
DE / DV ISM CUMMINS	2,200rpm	1,000~1,900rpm



(9) Tachograph

The tachograph is consisted of speedometer, odometer and clock. The vehicle speed and running distances are registered in a single chart. The speedometer indicates the vehicle speed in km per hour. The odometer indicates individual trip distances. The odometer records the total distance in km. The unit of registered distance is 100m.

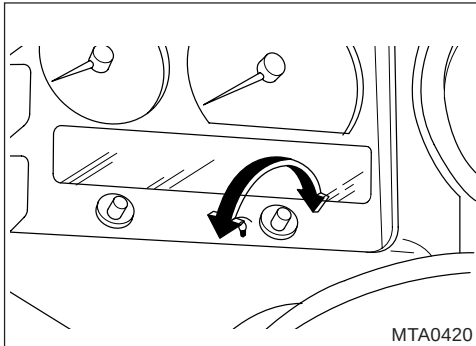


(10) Bulb check switch

When bulb check switch is pressed, warning lamp on instrument panel comes on. And also the warning buzzer sounds.

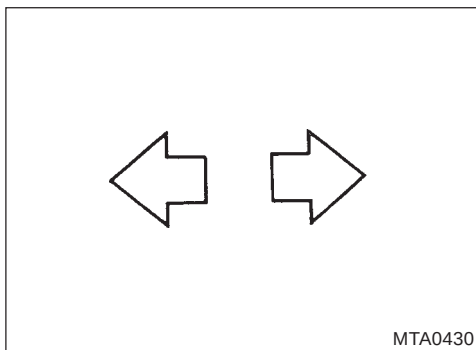
Before driving, use this switch to check that all warning lamps and their circuits are operating normally.

1-42 HOW TO HANDLE THE VEHICLE



(11) Illumination control switch

The instrument panel illuminations can be controlled by turning the control knob; clockwise for brighter, and counterclockwise for dimmer.



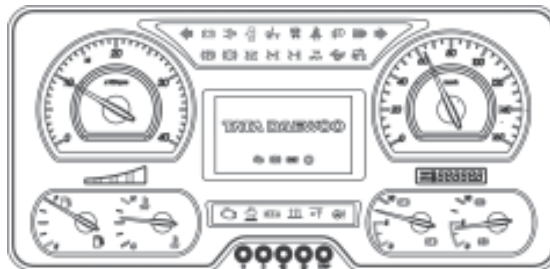
(12) Turn signal/hazard warning indicator lamp

When the turn signal switch or hazard warning flasher switch is turned on, the turn signal indicator lamp flashes to indicate the operation of the external turn signal lamps or hazard warning flashers.

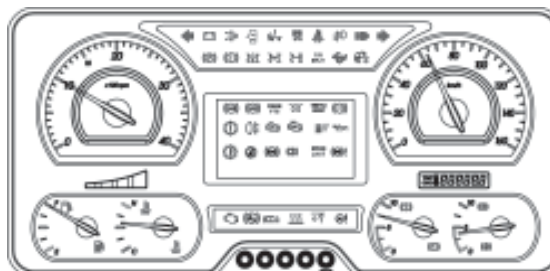
4) Miscellaneous indicator and warning lamp

Indicator lamps come on when corresponding control levers or switches are in operation. When a warning lamp is lit while driving, immediately pull up your vehicle in the roadside, check to locate the cause of trouble, and take proper measures. In the case of serious trouble, call for check and proper services of your nearest TATA Daewoo dealer.

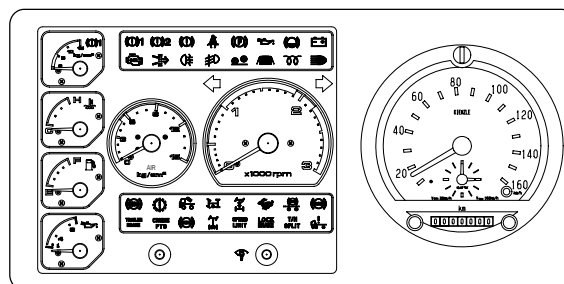
<A Type>



<B Type>



<C Type>



1-44 HOW TO HANDLE THE VEHICLE



MTS0527

- **Front brake system warning lamp (Red color)**

This lamp comes on in the event of trouble with air tank pressure-front(5.3bar). At this time, immediately stop the vehicle and check the braking system for trouble. In the event that trouble is identified, contact your nearest TATA Daewoo dealer for necessary services.

⚠ Caution

To this time, it certainly stops the vehicle at the condition which starting. Run after turn off warning lamp.

⚠ Warning

You can encounter accident's by brake depression, if run continuously that warning lamp is lighted up.



MTS0526

- **Rear brake system warning lamp (Red color)**

This lamp comes on in the event of trouble with air tank pressure-rear(5.3bar). At this time, immediately stop the vehicle and check the braking system for trouble. In the event that trouble is identified, contact your nearest TATA Daewoo dealer for necessary services.

⚠ Caution

To this time, it certainly stops the vehicle at the condition which starting. Run after turn off warning lamp.

⚠ Warning

You can encounter accident's by brake depression, if run continuously that warning lamp is lighted up.

HOW TO HANDLE THE VEHICLE 1-45



MTS0525

- **Low air pressure warning signal for parking brake circuit**

When air pressure in parking tank falls to the "cut-in" pressure (around 5.3bar), the low air pressure warning signal comes on. After that, if it continues to fall to 4.2bar, the low air pressure warning lamp blinks. At this moment, for your safety, do not drive until the air reservoir holds enough air to allow the brake to be used.



MTA0561

- **Seat belt warning lamp**

The seat belt warning lamp comes on when the ignition switch is placed in the "ON" position unless the driver's seat belt is securely fastened.



MTS0571

- **Parking brake indicator lamp**

The parking brake indicator lamp comes on when the parking brake lever is pulled with the starter switch "ON".

Before moving your vehicle, be sure to check that the parking brake indicator lamp is off.



MTA0581

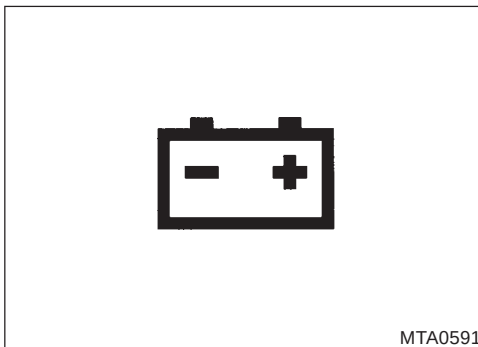
- **Engine oil pressure warning lamp**

This warning lamp and bell come on when oil level is improperly low or lubricating system is out of order. At this time, immediately stop the vehicle and check the engine oil level and lubricating system.

⚠ Caution

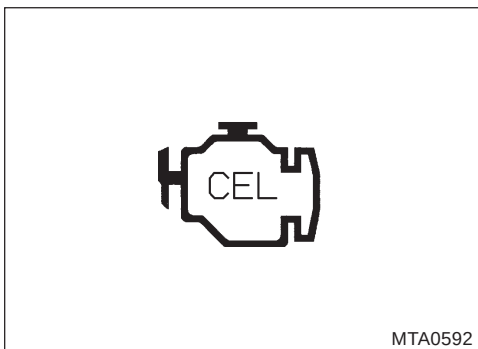
When engine oil pressure warning lamp is lighted up, if do running continuously, engine parts can be damaged extremely.

1-46 HOW TO HANDLE THE VEHICLE



- **Generator indicator lamp**

The generator indicator lamp comes on when the starter switch is turned to "ON" position. If the generator indicator lamp keeps lighting up with bell while driving, have the generator circuit checked by your nearest TATA Daewoo dealer.



- **Check Engine indicator lamp**

Indicates that engine may have malfunction if it turns on with bell during driving.

⚠ Caution

Move to your nearest service center for check up and repair within the earliest possible even engine still operates.

- **Inactive codes**

These codes will be flashed on the "Check Engine" light(CEL). When code flashing is initiated, it means that your vehicle can be operated but the engine has a problem. Therefore, you must contact immediately the nearest TATA Daewoo Service Center for proper service.

- ✱ For DE12TIS engine

1. Check Engine Indicator comes on while ignition key positioned ON when engine problem occurs. Such problems are to be displayed by the codes.
2. 1 pin connector in white can be a substitute for engine diagnosis switch on ECU connector.

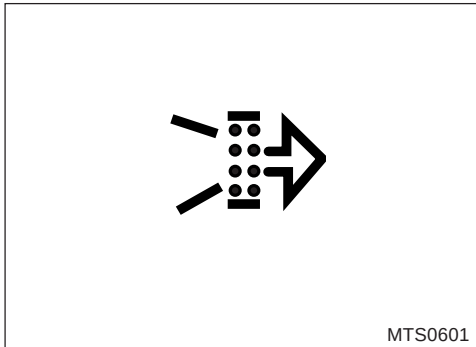
⚠ Caution

Do not remove lead seal of 1 pin connector in black, Memory clear connector. Warranty conditions are not to be effective in this case.

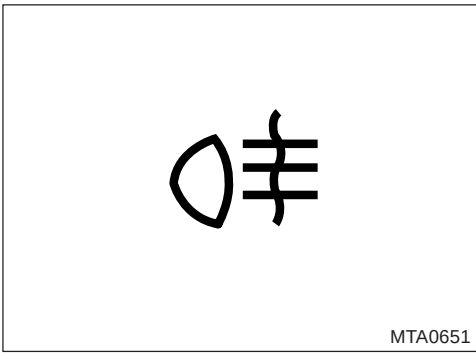
- ✱ For ISM CUMMINS engine

If press engine diagnosis switch in starting switch "ON" at engine problem appearance, the check engine lamp lighted up and then turn off. And, Display engine problem by being lighted up in order happened from situation recently.

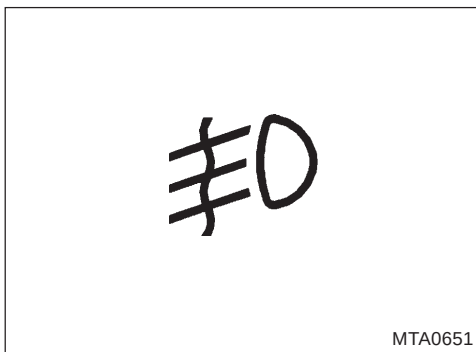
HOW TO HANDLE THE VEHICLE 1-47



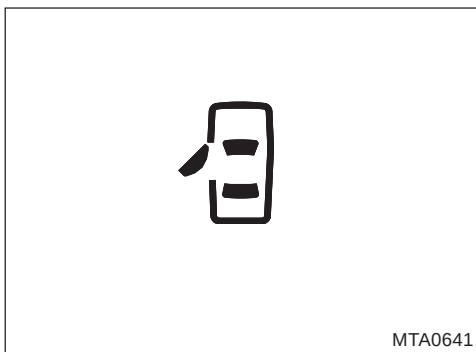
- **Air cleaner dust indicator lamp**
The air cleaner indicator lamp and bell come on when the air cleaner element has been restricted. At this time, clean or replace the element, as required.



- **Rear fog lamp**
The rear fog lamp indicator and external fog lamps are turned on when the rear fog lamp switch is pressed "ON"

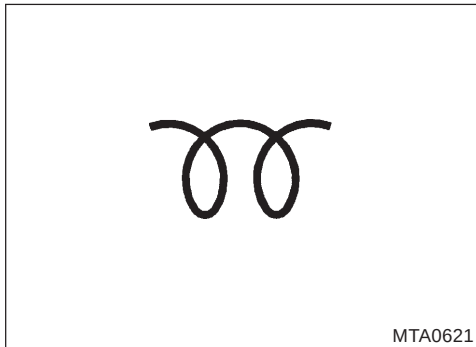


- **Front fog lamp indicator lamp**
The fog lamp indicator and external fog lamps are turned on when the fog lamp switch is pressed "ON".



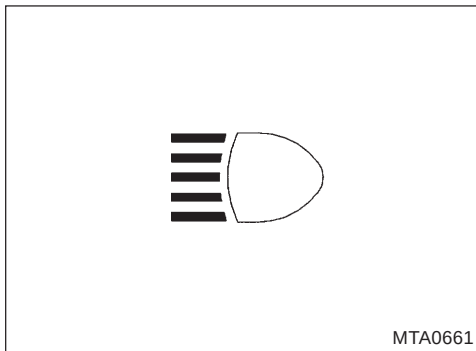
- **Door open warning lamp**
This lamp comes on when a door is either opened or closed insecurely. Before moving your vehicle, check that the warning lamp is off.

1-48 HOW TO HANDLE THE VEHICLE



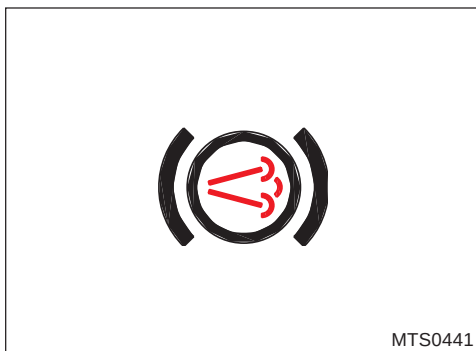
- **Pre-heater warning lamp(DE/DV Engine)**

This lamp is designed to indicate pre-heating of the engine. It comes on when starter switch is positioned "ON", while it goes out when the preheating is completed.



- **High beam indicator lamp**

The high beam indicator lamp comes on when head lamps with high beam are in use.



- **Exhaust brake indicator lamp**

This indicator lamp is turned on when the exhaust brake switch is operated, indicating that the exhaust brake system is in operation.

HOW TO HANDLE THE VEHICLE 1-49



MTS0461

- **Working lamp indicator lamp (mixer, special purpose vehicles)**
When positioning the working lamp switch "ON", the working lamp indicator lamp comes on.

Caution

Working lamp comes on when putting on the lamp if vehicle stops or traveling below 20km/h. It is turned off if pressing again. With "ON" position, the working lamp is automatically turns off if driving above 20km/h. The following state is excepted to backup.



MTA0511

- **ABS indicator lamp**
This is a device designed to shorten braking distance and to prevent slippage on a rain wet road, ice-covered road, or road of abnormal condition. It is lit when there is an irregularity within ABS.

Caution

ABS lamp is lighted up for about 3 seconds at ignition switch "ON". It is not lighted up or is lighted up during running, it is defect to ABS, be inspected in service network quickly.



MTS0471

- **Power take-off indicator lamp (dump, special purpose vehicles)**
This indicator lamp comes on when the power take-off control switch is operated, indicating that the power take-off device is in operative condition. And also the warning buzzer sounds.



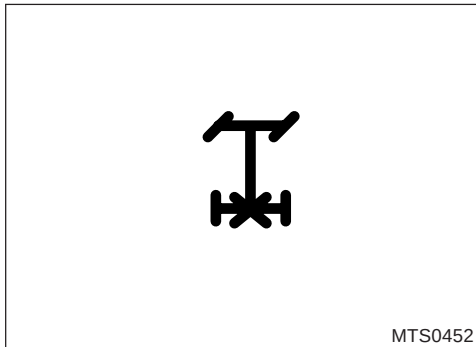
MTS0451

- **Differential lock indicator lamp(FRT/RR)**
When differential lock switch is set to "ON" position, the corresponding indicator lamp comes on and the warning buzzer goes off, which indicates that the two rear axles are not in differential operation.

Caution

Before operating your vehicle, be sure to check that differential lock switch has been set "OFF".

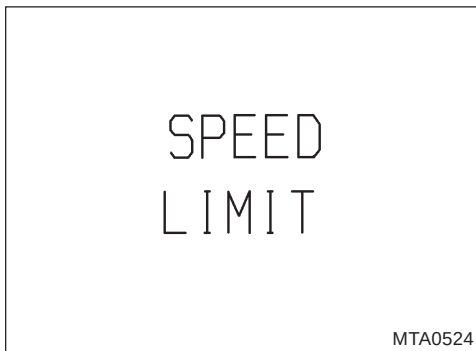
1-50 HOW TO HANDLE THE VEHICLE



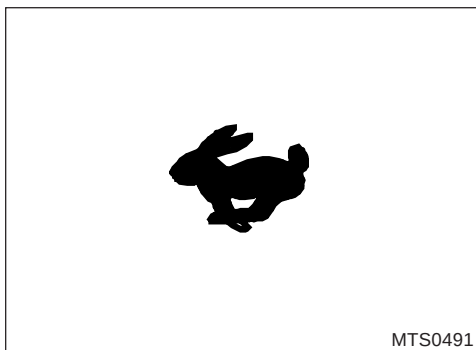
- **Differential lock indicator lamp(L/R)**
When the differential lock switch is turned to the "ON" position, the corresponding indicator lamp comes on and the warning buzzer goes off, which indicates that both left and right axles are in differential operation.

⚠ Caution

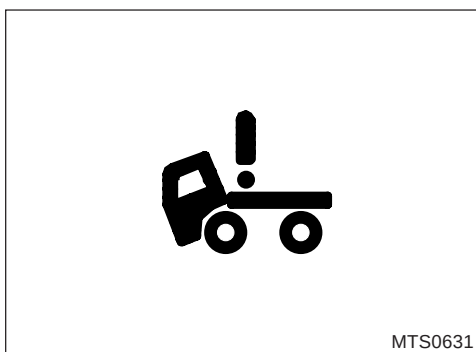
Before operating your vehicle under normal condition, be sure to check that the differential lock switch (left and right) has been placed to "OFF".



- **Speed limit indicator lamp**
If the vehicle speed exceeds the set speed(the limit speed), the lamp is lit to actuate the speed limit device.



- **Shifting lever range HIGH indicator lamp (TIS engine)**
Indicator turns on when gear position is high range between 5th to 8th gear.

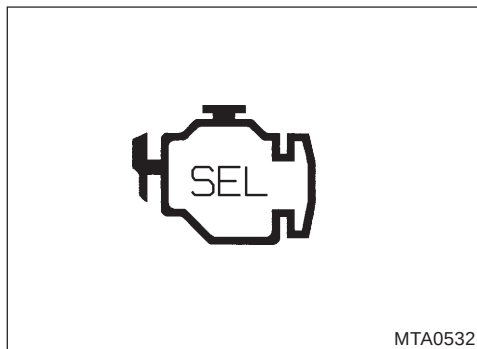


- **Cab tilt warning lamp**
This lamp comes on when the cap is lifted or locking device for cab tilting is defective. Be sure to check the warning lamp before driving, and check the locking device if the lamp is on.

HOW TO HANDLE THE VEHICLE 1-51



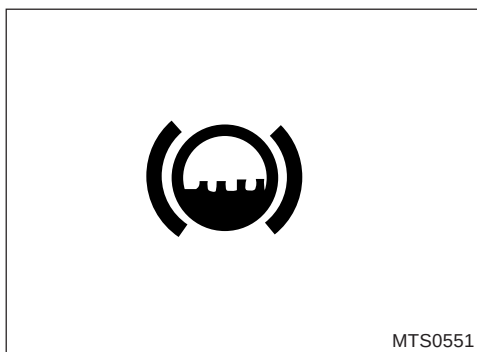
- **Splitter indicator lamp(ZF transmission)**
When the range-change switch attached to the gearshift lever knob is placed in the "HI" position, the indicator lamp comes on.



- **Stop engine warning lamp (CUMMINS engine)**
If the stop-engine warning lamp lighted up with bell while driving, following the next.
 1. Defect occurrence to electric control system of engine
 2. Defect occurrence connected with engine protection stop system.

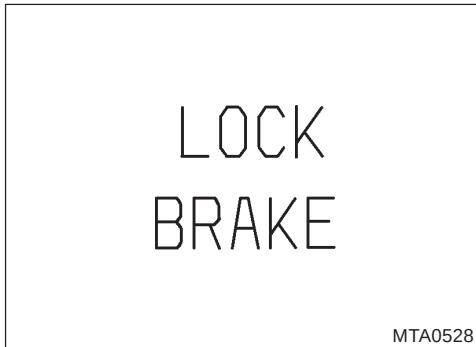
⚠ Caution

In case defect happens to electron control system of engine, stop operation of engine, and contact to our service network and undergo checking equipment quickly.



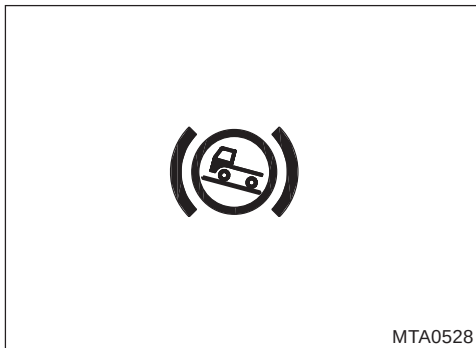
- **Brake oil warning lamp**
This lamp comes on when oil level in the oil tank is low. At this time, immediately stop the vehicle to check the oil level and, if necessary, top it up.

1-52 HOW TO HANDLE THE VEHICLE



- **Lock brake indicator lamp(for mixer truck & concrete pump)**

When the lock brake switch is turned to "ON", the indicator lamp is lit to brake the driving wheels of the front axle and forward rear axle.



- **Hill holder indicator lamp(for eaton automatic transmission)**

Hill holder indicator lamp is lighted up while step on brake pedal after depress the hill holder switch. And if put brake pedal and step on accelerator, as hill holder function is released, (indeed, braking pressure is released) vehicle can depart with putting out the indicator lamp.

Note

** Hill holder function*

When driver is going to be restarted vehicles after stop in a slope way, speak function that hold vehicles temporarily through braking pressure lest vehicles should be pushed backward.

⚠ Caution

Hill holder function operation can confirm through availability whether indicator lamp is lighted up when step on brake pedal.

⚠ Caution

Hill holder function is achieved properly in normal situation with on problem on vehicles and system.

⚠ Warning

After remove brake pedal, this function is defrosted after 3 seconds in case do not step on brake pedal or accelerator. If there is no manufacturing of brake and accelerator in about 3 seconds after brake pedal cancellation, the vehicles move backward in slope way. If the warning lamp is defrosted, step on brake or accelerator immediately.

ZF Automatic transmission



MTA0665

Allison Automatic transmission



MTA0528



MTA0528



MTA0528

- **Automatic transmission oil temperature warning light (Yellow color: ZF, Allison automatic transmission)**

If automatic transmission oil temperature reaches 121°C (250°F), warning light is turned on and ECU keeps from working in high gear. At this moment, stop your vehicle and check transmission oil cooling system. If transmission is overheated in normal operation, check the level of transmission oil. If it is normal, leave transmission in neutral and run the engine at 1200~1500rpm. If it is done so, the temperature of transmission and the engine should be down to the level of normal operation within 2~3 minutes. If the temperature does not fall, reduce the rpm. If problems persist, stop the engine and contact our service station.

⚠ Caution

DO NOT drive the vehicle more than 30 seconds at the maximum acceleration with a condition in which transmission gears are in mesh without engine output. If you do so for a long time, the temperature of transmission oil is overheated, which causes serious damage to transmission.

- **Check automatic transmission warning light (Yellow color: ZF, Allison automatic transmission)**

The warning light is turned on when the ignition is turned "ON" position and turned off when the engine is get started. If warning light is turned on in operation, there should be transmission-related problems and contact the service station quickly.

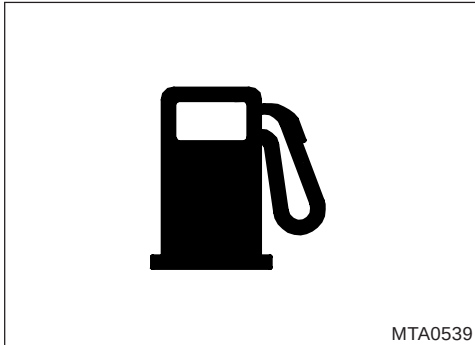
⚠ Caution

If you push "UP(↑)" and "DOWN(↓)" button at the same time, the problems are indicated in CODE.

- **Transmission range inhibitor warning light (Yellow color: Allison automatic transmission)**

The warning light is turned on when the vehicle comes to a condition in which shifting gear is unavailable.

1-54 HOW TO HANDLE THE VEHICLE

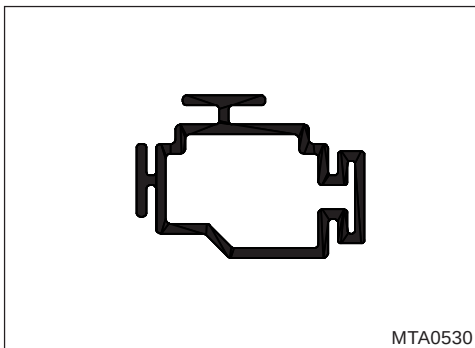


- **Fuel warning light(Red color)**

If the level of the fuel in the fuel tank is low, the warning light is turned on. When warning light is turned on, supply fuel as soon as possible.

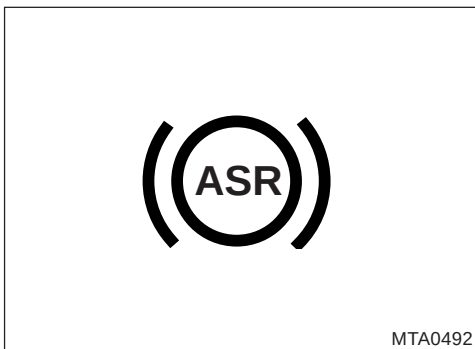
⚠ Caution

If the vehicle is low on fuel and passes a steep slant or bumpy roads, warning light can be turned on.



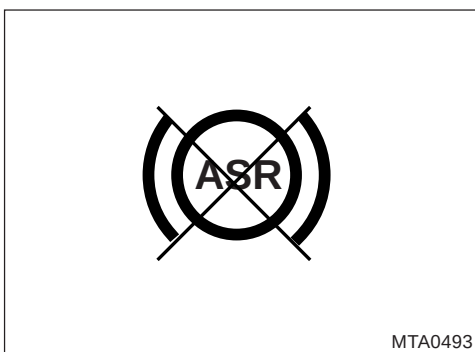
- **OBD warning light(Yellow color)**

OBD warning light is turned on when the selective catalyst reduction system(SCR) is not working properly.(lacking urea water solution, SCR system failure or sensor trouble, motor trouble)



- **ASR(Anti Slip Regulation) indicator(yellow color)**

ASR is a device which prevents the vehicle from slipping by rapid acceleration on icy roads and downhill. The indicator is turned on when ASR is working or in the event of a trouble.



- **ASR OFF indicator(Yellow color)**

The indicator is turned on when ASR OFF switch is activated in order not to use ASR or ASR is disabled.

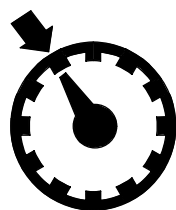
HOW TO HANDLE THE VEHICLE 1-55



MTA0543

- **Water temperature warning light(Red color)**

The light is turned on when the temperature of engine coolant is too high. In this case, check the coolant and add some if needed. If the engine is overheated, have your vehicle serviced at designated service station.



MTS8200

- **Cruise indicator(Green color)**

Cruise indicator indicates that cruise function control is working properly. When cruise function control is working, the green light on TFT-LCD displayer is turned on, however, when disabled, the light is turned to light gray color.

**THROTTLE
INHIBIT**

MTA0542

- **THROTTLE INHIBIT indicator(Yellow color)**

In case of special vehicles, when controlling engine rpm from outside, if the Remote Throttle switch is turned "ON", the indicator is turned on.



MTA0310

- **Emergency power steering system warning light(Red light)**

- Power steering system is in normal condition if starter switch is turned "ON" and warning light is turned on and then it is turned off within 3 seconds of engine start.
- If warning light flashes and warning call is made when starter switch is turned "ON", it indicates that there is a trouble in power steering system.

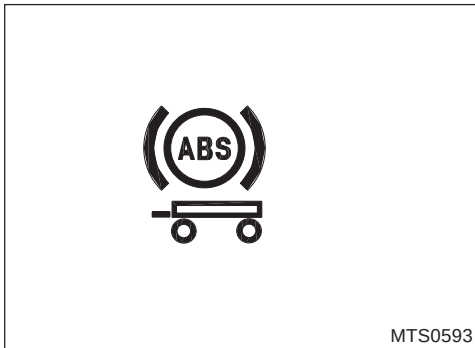
⚠ Caution

If warning light flashes and warning call is made while driving, there can be a trouble in power steering system and therefore bring the vehicle to a stop in a safe place and contact our service station to have your vehicle checked.

1-56 HOW TO HANDLE THE VEHICLE



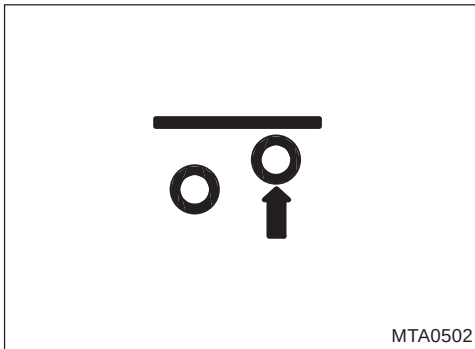
- **Draft link fixing indicator(Yellow color)**
After being linked to the trailer, the indicator is turned on when draft link fixing switch is turned "ON".



- **Trailer ABS Warning light (Red color:tractor, pull cargo truck)**
If there is a trouble in ABS system, ABS warning light is turned on.

⚠ Caution

ABS warning light is turned on for 3 seconds when the starter switch is in the "ON" position. If not turned on or turned on while driving, there should be a trouble in ABS system and therefore contact the service station as soon as possible.



⚠ Caution

1. **Rear tri-axle cargo, 25t dump vehicle**
Self-steering goes up when the engine is stopped in the condition in which self-steering is lowered.
2. **Rear tri-axle dump, 6X2 tractor vehicle**
Self-steering(Bogie lift) goes down when the engine is stopped in the condition in which self-steering(Bogie lift) is raised.

- **Self-steering/Bogie lift indicator(Yellow color)**
1) **Rear tri-axle cargo, 25t cargo vehicle (Yellow color)**

When self-steering switch is turned "ON", self-steering goes down, however, when self-steering switch is turned "OFF", the indicator is turned on and self-steering goes up.

- 2) **Rear tri-axle dump vehicle**

When self-steering switch is turned "OFF", self-steering goes down, however, when self-steering switch is turned "ON", the indicator is turned on and self-steering goes up.

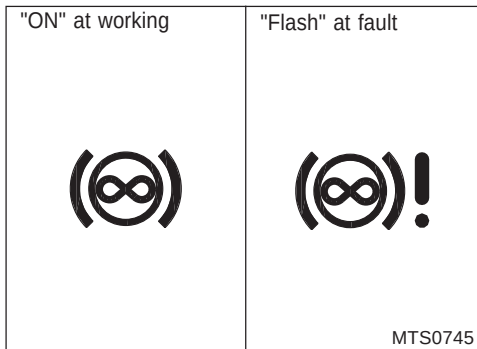
- 3) **6X2 tractor vehicle**

When bogie lift switch is turned "OFF", bogie lift goes down, however, when bogie lift switch is turned "ON", the indicator is turned on and bogie lift goes up.

⚠ Caution

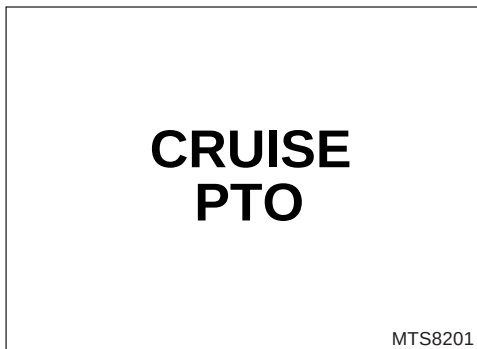
In case of 6X2 tractor vehicle, when being linked or delinked to the trailer, BE SURE to lower bogie lift. If bogie lift is not lowered, the vehicle can be damaged by the contact between the upper trailer and tires.

HOW TO HANDLE THE VEHICLE 1-57



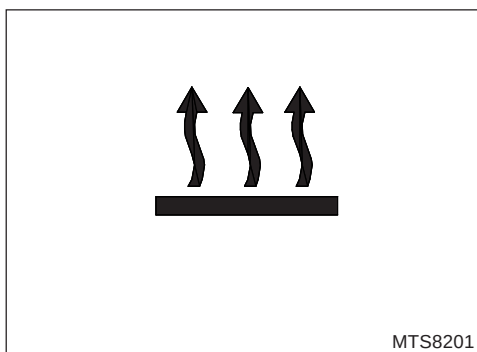
- **Intarder warning light(Yellow color)**

The indicator is turned on when intarder brake is working. Also, when there is a trouble in intarder system, the indicator flashes.



- **CRUISE PTO indicator(Yellow color)**

This indicator indicates that the function adjusting RPM is working in the engine and the indicator is turned on when CRUISE PTO switch is turned "ON".



- **Sideview mirrors heating wire/fuel preheating indicator(Yellow color)**

In order to dehumidify and defrost sideview mirrors and to preheat fuel filter, turn the switch "ON" and then the indicator is turned on. (When needed manual operation, refer to "Sideview mirrors heating wire / fuel preheating switch".)

1-58 HOW TO HANDLE THE VEHICLE

5) TFT-LCD display unit

The CPU receives and processes various information signals from sensors and switches. It displays such information through the gauges and warning lamps. It also displays diagnosis and driving information on the TFT-LCD display unit in the instrument cluster.

Note

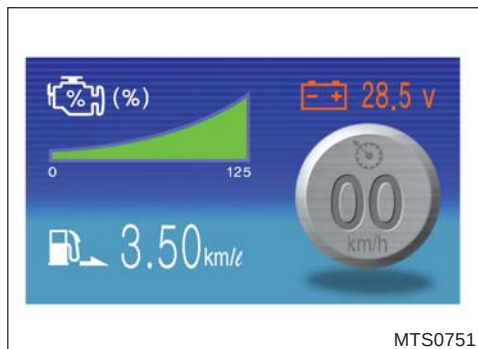
Mileage shown in the display is calculated based on the distance driven for 0.5 liters of fuel. This is not the average mileage. This information changes continuously at intervals of 0.5 liter consumption. Also, decrease in engine load can increase mileage.

Note

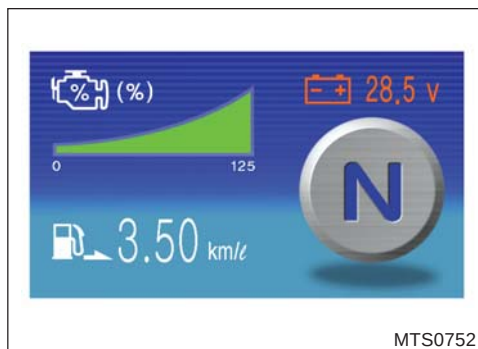
Information shown in this manual is based on the Eaton automatic transmission



- 1) This is a welcome screen which appears when the ignition switch is turned ON. It disappears after the system check.

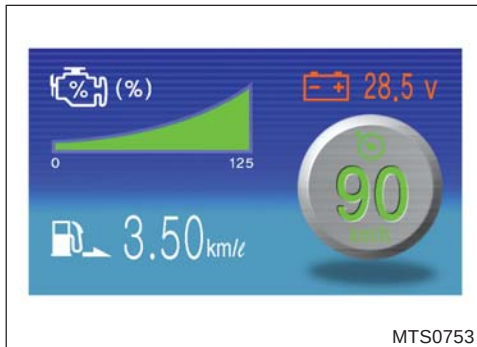


- 2) This screen is displayed after the ignition switch is initially turned ON and the engine check warning lamp goes off (for manual transmission).

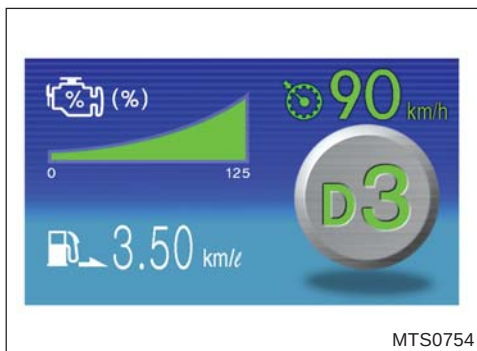


- 3) This screen is displayed after the ignition switch is initially turned ON and the engine check warning lamp goes off (for automatic transmission).

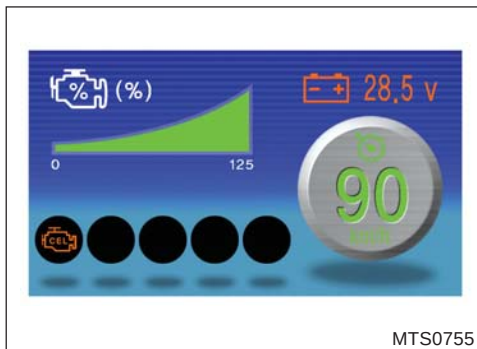
HOW TO HANDLE THE VEHICLE 1-59



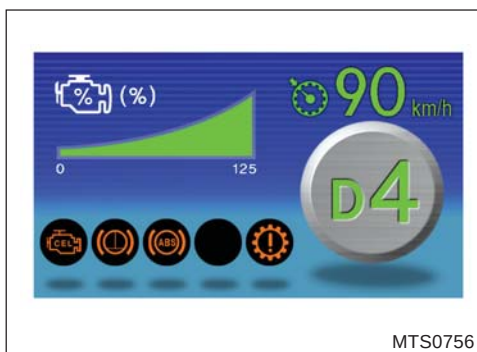
- 4) This screen is displayed when the cruise control is activated during driving (for manual transmission).



- 5) This screen is displayed when the cruise control is activated during driving (for automatic transmission).

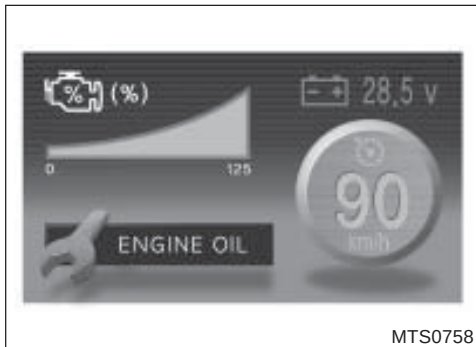


- 6) This screen is displayed when a warning lamp is activated (for manual transmission).



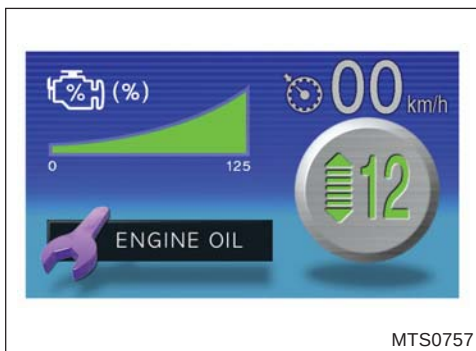
- 7) This screen is displayed when a warning lamp is activated (for automatic transmission).

1-60 HOW TO HANDLE THE VEHICLE



8) This screen is displayed when the service is due after the maintenance interval is set (for manual transmission).

-> This screen is displayed only if the maintenance interval is set.

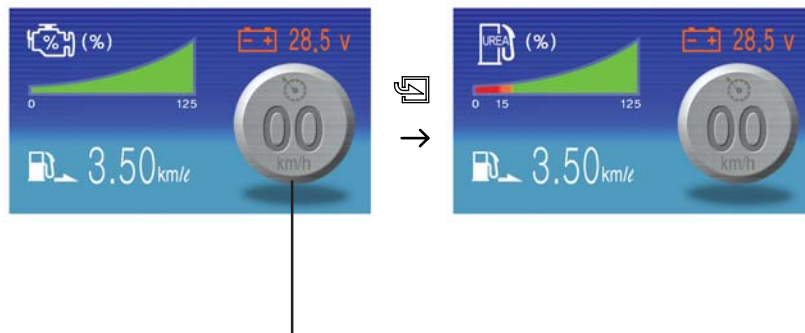


9) This screen is displayed when the service is due after the maintenance interval is set (for automatic transmission).

-> This screen is displayed only if the maintenance interval is set.

10) How to enter various gauge screens from initial display screen (manual transmission)

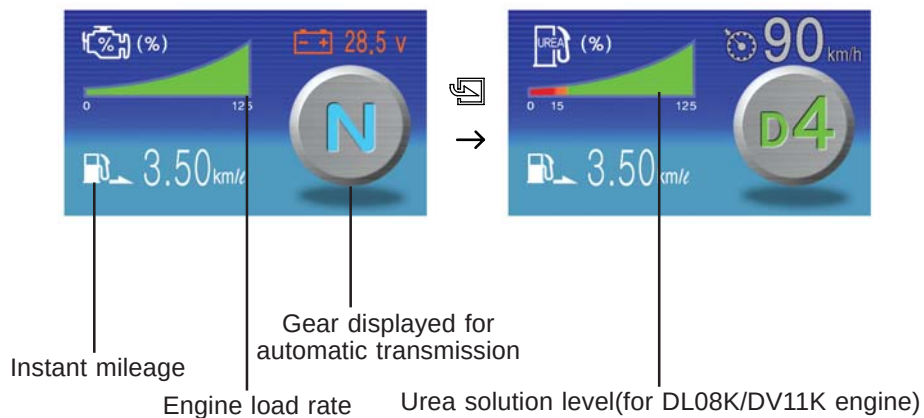
: Press Enter button for 0.5 to 1 second to enter gauge screen in turns. (Option)



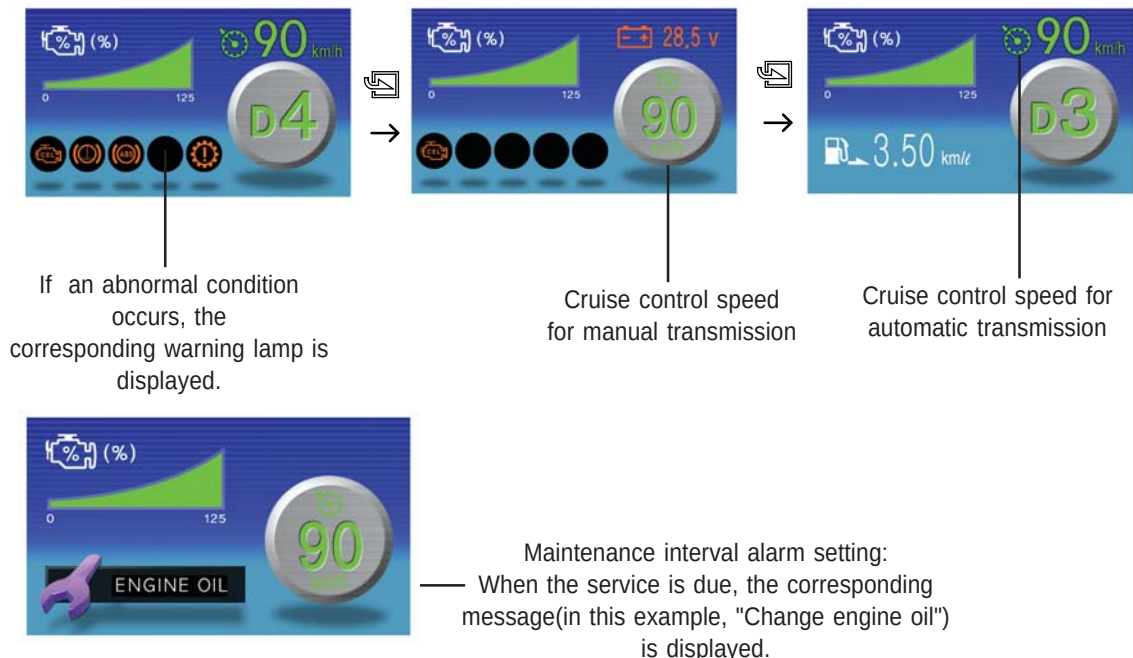
HOW TO HANDLE THE VEHICLE 1-61

11) How to enter various gauge screens from initial display screen (automatic transmission).

: Press Enter button for 0.5 to 1 second to enter gauge screen in turns.



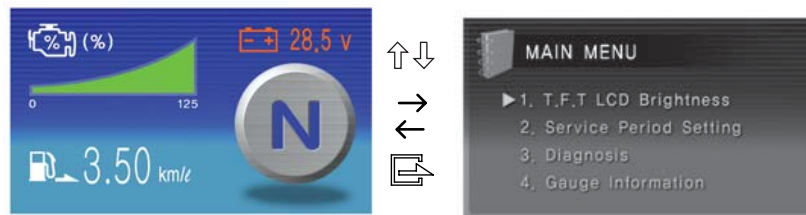
12) Description of each screen



1-62 HOW TO HANDLE THE VEHICLE

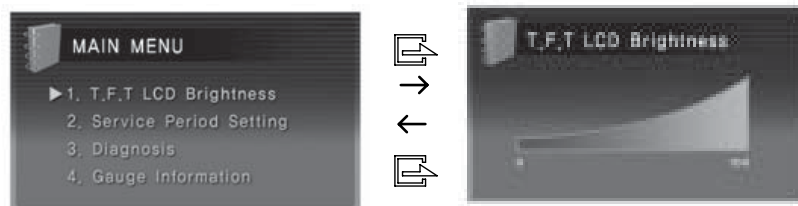
13)How to move to main menu

- > This is how to go to the main menu from the welcome screen in order to make diagnosis or change the Preferences.
- > Press Up and Down buttons simultaneously for 0.5 to 1 second to enter the main menu.
- > Go to the desired function and press Enter button() to enter the corresponding function. Otherwise, press Escape button () to go to the previous screen.



14)Preferences

- > This is how to adjust brightness of the TFT-LCE display.



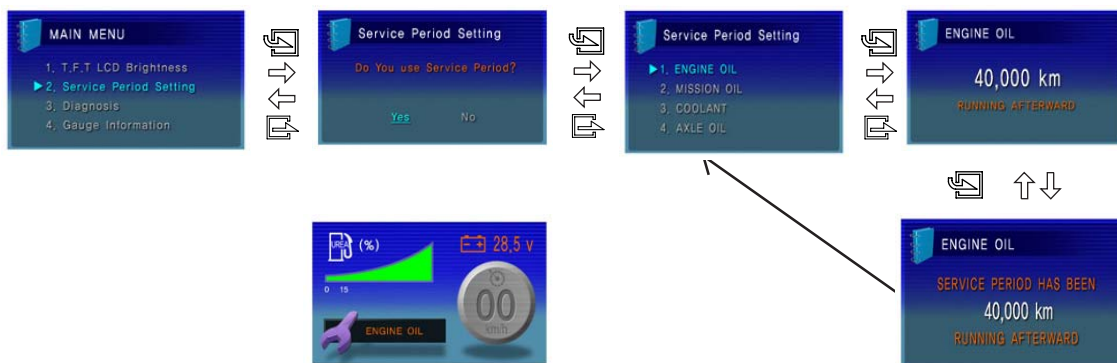
- This display brightness can be adjusted in 0~100 percent.
- Press Up or Down button() to adjust the brightness.
- After changing it to the desired value, press Enter button() to store it.
- When the tail switch is "ON", the display is dimmed.

15) Entering maintenance schedule setting screen(Optional)

- To set the maintenance schedule, select the maintenance schedule setting function and then "Yes" to confirm and press the Enter key (). Then, you can set maintenance schedules for each item.
- To deactivate the maintenance schedule, press Escape button(), or select "ON" and press Enter button().

1) Maintenance schedule setting

- > Go to the desired item using Up and Down buttons( ) and press Enter button () to confirm selection. Then, use Up and Down buttons ( ) to set the desired change interval in km and press Entr button().
- > When it reaches the set distance and the ignition switch is turned ON. "Change Engine Oil" is shown in the display.



1-64 HOW TO HANDLE THE VEHICLE

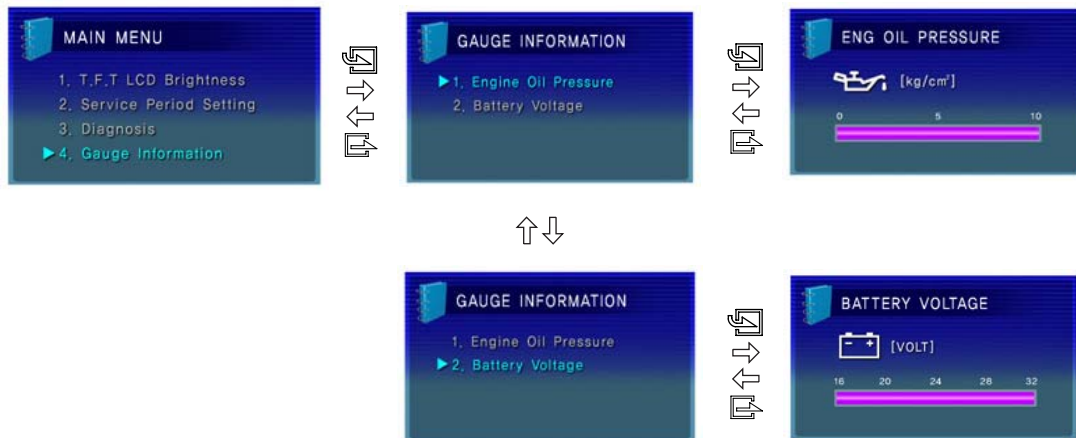
16) Diagnosis(only for active faults)-Option

-> When a warning lamp, such as the engine, ABS, automatic transmission and retarder lamps, is shown in the driving screen, enter the Diagnosis screen, select the corresponding item and press Enter button () to check the error code.

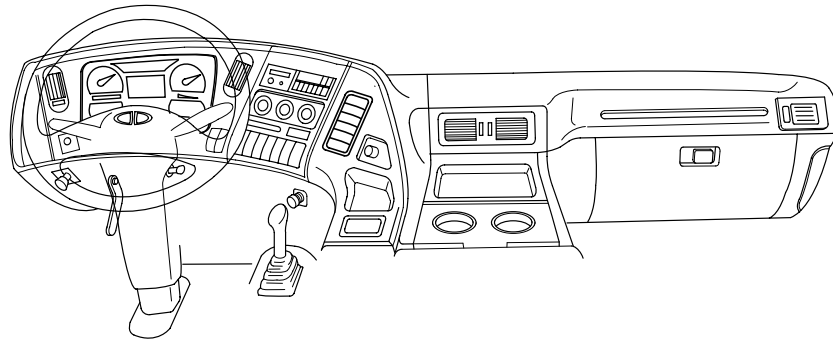


17) Gauge information

-> It displays information regarding engine oil pressure and battery voltage.



6) Controls of center console

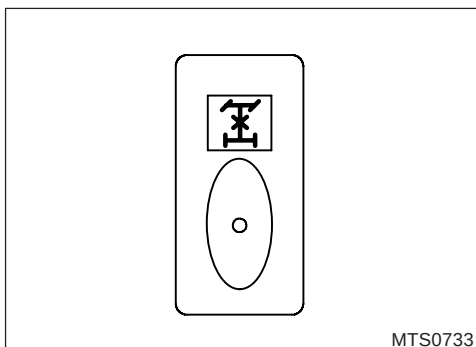


MTD0673

- | | | |
|--------------------------------------|----------------------------|--|
| (1) Differential lock switch(FRT/RR) | (8) Rear fog lamp switch | (15) Diagnostic switch |
| (2) Differential lock switch(L/R) | (9) Side mirror defroster | (16) Malfunctions related to the engine protection stop system |
| (3) Air conditioning switch | (10) Power take-off switch | (17) Jake brake switch |
| (4) Self-steer switch | (11) Lock brake switch | (18) Ether start switch |
| (5) Working lamp switch | (12) CRUISE/PTO switch | (19) Heating and air conditioning control |
| (6) Cab tilt enable switch | (13) RES/INC switch | |
| (7) Front fog lamp switch | (14) SET/DEC switch | |

★ Switch: At the push of switch, the related function is working and if giving the switch another press, the function is not working. Also, when night driving, if light switch is positioned at "1" or "2", the bulb of switch for symbol is turned on.

1-66 HOW TO HANDLE THE VEHICLE

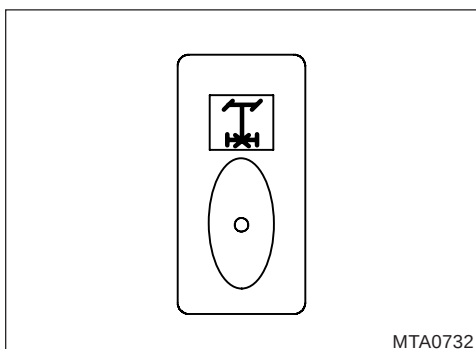


(1) Differential lock switch(FRT/RR)

In the case of two rear axle drive type vehicle, if either rear axle falls in the mire to cause slippage, you must first stop your vehicle and then place differential lock switch to "ON" position in order to easily get out of the mire. The warning buzzer keeps sounding all the while differential lock is in operation.

Note

While the differential lock is operated, the warning sound continuously rings.



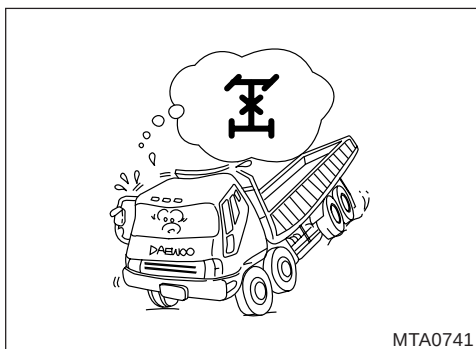
(2) Differential lock switch(L/R)

If it is difficult to get your vehicle out of the mire even by using the differential lock switch which distributes power to both front and rear axles, operate the differential lock switch(left/right). If all the differential lock switches are energized simultaneously, your vehicle will show a tendency to travel straight. Be careful of this.

* Tips for using differential lock system

Note

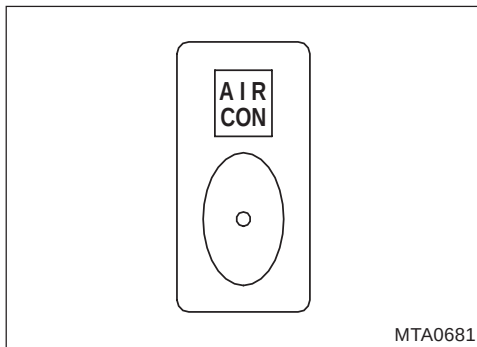
This system cannot be used if the wheels in connection with the two rear axles are idled simultaneously



⚠ Caution

1. Do not exceed 30 seconds for one time use of this system. If it is not possible to get out of the mire even by using this system once or twice, do not use it any more. Your vehicle requires towing.
2. Continuous use of differential lock system may cause defects to ring gear set of rear axles and other drive systems.
3. It cannot receive a warranty of the damage which is caused by excessive using of differential lock system.

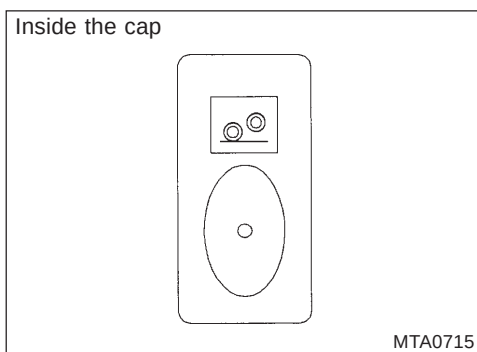
HOW TO HANDLE THE VEHICLE 1-67



MTA0681

(3) Air conditioning switch

Pressing this switch turns on the air conditioner and indicator lamp simultaneously.



MTA0715

(4) Self-steering switch (Vehicles with self-steering)

Drive your vehicle after lowering self-steering in order to spread loading capacity when loading. And when driving an unloaded vehicle, drive your vehicle after raising self-steering.

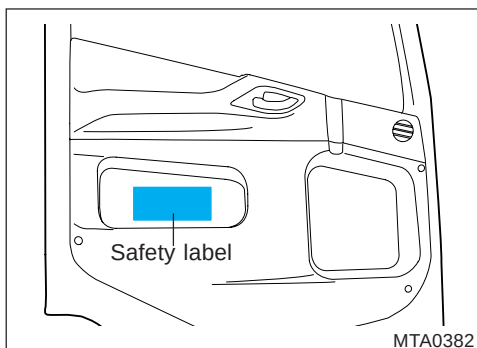
⚠ Caution

1. On a rainy or icy road, slow down over 40% of speed than usual because slipped self-steering does not correspond to your intended direction.
2. By law, self-steering switch MUST NOT be moved to the cap inside.



Control unit

MTA0386



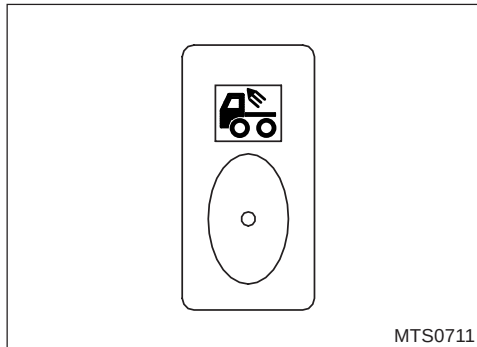
MTA0382

* When operating self-steering

⚠ Caution

1. When raising & lowering pusher axle, BE SURE to operate with a stationary state of the vehicle after checking both sides.
2. Lower pusher axle in case of loaded driving and raise pusher axle in case of unloaded driving. If lowering is need in case of unloaded driving, the air pressure of tires should be adjusted to 1~2BAR. Otherwise, the axle weight of driving axle is supported by pusher axle, which results in losing driving power of driving axle.
3. In case of parking on a slope way, BE SURE to raise pusher axle when unloaded condition. If pusher axle is lowered, the vehicle can be pushed back or forth.
4. In case of backing the vehicle, start the vehicle after the complete separation of tires from the ground. Otherwise, tires and spring damper can be damaged.
5. Do not frequently raise or lower pusher axle. (over twice consecutively)
6. Observe prescribed maximum load. If overloaded, air spring can be damaged or its durability can be destroyed.
7. Tires of pusher axle can be dragged, which results in damage to tires and their surrounding parts and therefore raise axle when backing the vehicle on S-curves.

1-68 HOW TO HANDLE THE VEHICLE

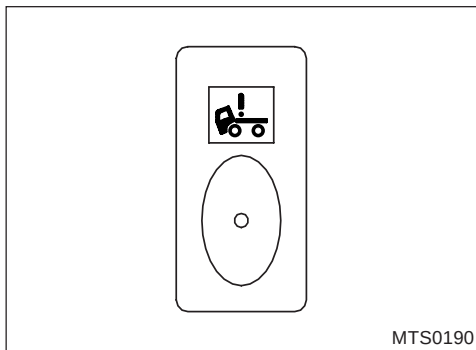


(5) Working lamp switch (tractor, special purpose vehicle)

The working lamp switch is facilitating night working. When the working lamp switch is positioned "ON" indicator lamp and working lamps come on.

Caution

Working lamp comes on when putting on the lamp if vehicle stops or traveling below 20km/h. It is turned off if pressing again. With "ON" position, the working lamp is automatically turns off if driving above 20km/h. The following state is excepted to backup.

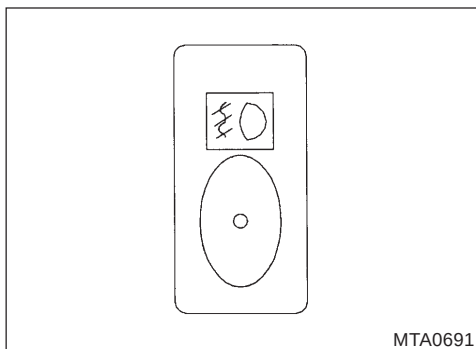


(6) Cab tilt enable switch(The Vehicle that the hydraulic cab lock option system is applied.)

Before you tilt the cab, press this switch and release cab lock at first. And then lift the cab by pressing the switch located outside cab. While this switch is pressed to "ON", cab-tilt indicator lamp on the instrument panel is turned on and warning buzzer is sounded.

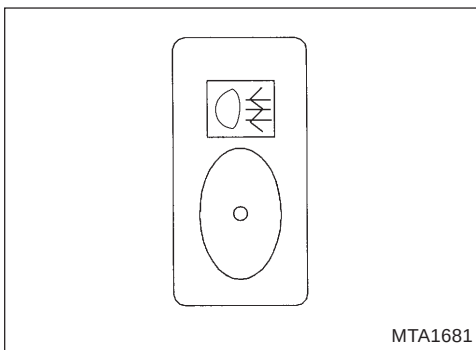
Caution

Before driving, push the cab-tilt switch again to make "OFF" and check the indicator lamp "OFF".



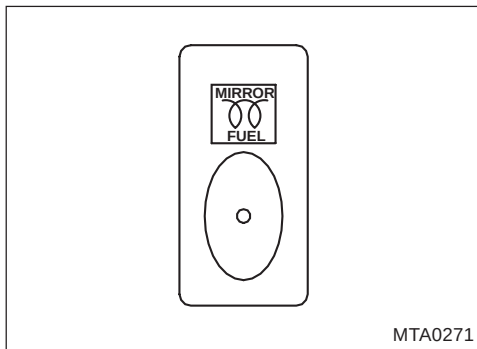
(7) Front fog lamp switch

Fog lamps provide auxiliary illumination and improve your vision in fog or snow.



(8) Rear fog lamp switch

Fog lamps provide auxiliary illumination and improve your vision in fog or snow.



⚠ Warning

If you cannot secure a clear view of the rear due to the breakage of heating wire, accidents can arise.

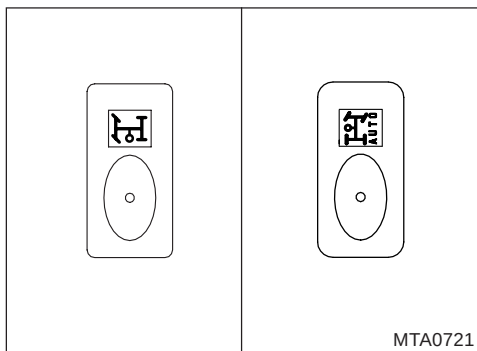
(9) Sideview mirrors heating wire/Fuel preheating switch

When trying to defrost and dehumidify sideview mirrors, press the switch and frost and humidity is removed by heating wire inside sideview mirrors. When pressed, heating wire automatically works for 15 minutes and the switch is not locked and is automatically turned "OFF".

Also, if pressed, not only heating wire in sideview mirrors but fuel filter is heated and therefore you can use this function when fuel is frozen in winter season.

⚠ Caution

If you press the switch when the engine is not switched on, batteries can become dead and therefore use the function after starting the engine.



(10) Power take-off switch

(dump, special purpose truck)

This switch is used to operate the power take-off device. When the switch is pressed to "ON", the P.T.O. device starts working, P.T.O. indicator lamp on the instrument panel is turned on, and warning buzzer sounds all the while P.T.O. works. When the deck is raised, warning buzzer sounds continuously even though the P.T.O. switch is turned to "OFF".

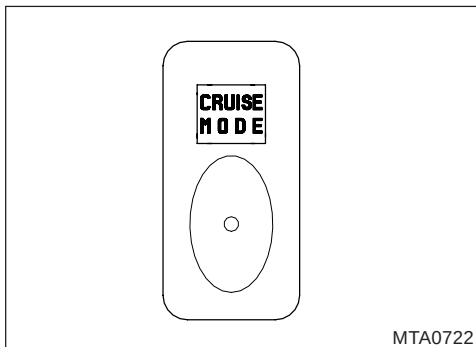
Note

When the dump rear-body being risen, if PTO switch makes "OFF" and the warning sound continuously rings.

⚠ Caution

Stop the vehicle and depress the clutch pedal all the way to the floor before operating this switch.

1-70 HOW TO HANDLE THE VEHICLE



(11) CRUISE CONTROL switch

1) CRUISE MODE switch

CRUISE CONTROL is a function that a driver can maintain a constant speed by controlling fuel quantity. CRUISE MODE switch which makes CRUISE CONTROL possible while driving and during the operation of PTO, it makes idle RPM for PTO rise to 700RPM.

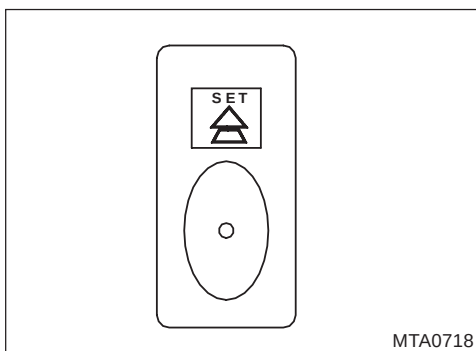
★ Mixer vehicle

If CRUISE MODE switch is pushed, the switch inside water pump switch box can be operated.

1. Engine start / stop switch
2. Engine RPM increase / decrease switch
3. Hand lever switch

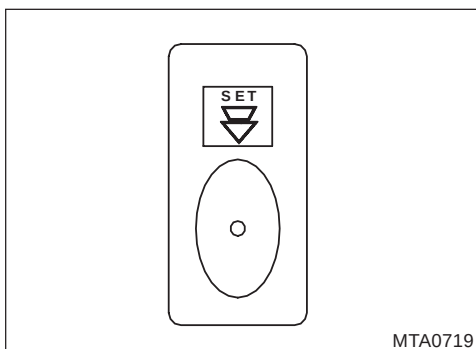
2) SET/INC switch

If SET/INC switch is being pushed continuously with CRUISE MODE switch being pushed, the speed of your vehicle steadily increases and if you stop pushing SET/INC switch, the speed of your vehicle is steadily kept at the current speed.



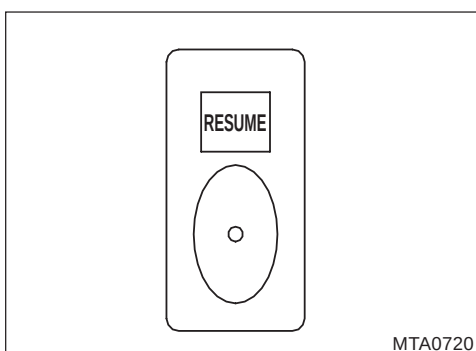
3) SET/DEC switch

If you press and release SET/DEC switch with CRUISE MODE switch being pushed, the speed of your vehicle is steadily kept at the current speed. Also, if you keep pressing SET/DEC switch while the CRUISE CONTROL function is in operation, the speed of your vehicle steadily decreases. If SET/DEC switch is released again, the speed of your vehicle is kept at that speed.

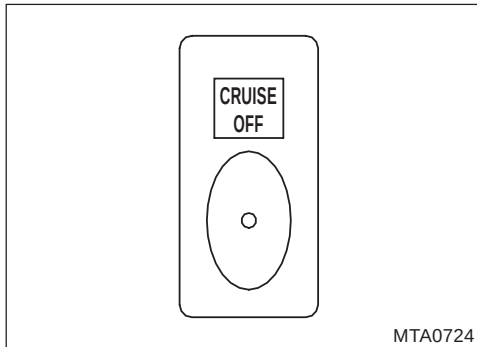


4) RESUME switch

If you press RESUME switch, the speed of your vehicle is kept at the speed of not stepping on the pedal.

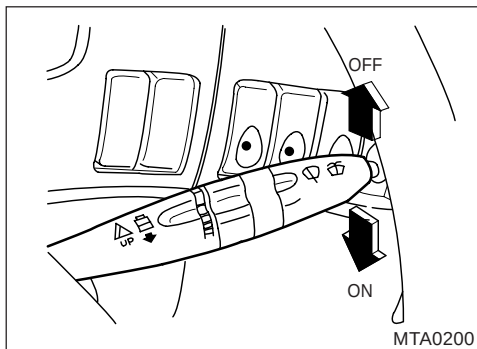


HOW TO HANDLE THE VEHICLE 1-71



5) CRUISE OFF switch

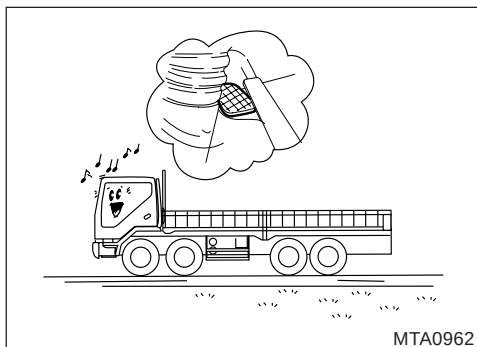
If brake or clutch pedal is stepped on while CRUISE CONTROL function is in operation, CRUISE CONTROL function stops temporarily and if CRUISE OFF switch is pressed, CRUISE CONTROL function stops completely.



(12) Jake brake switch

If you pull the right lever of combination switch, Jake brake works and the indicator on the dashboard is turned on. Jake brake system cuts energy net loss and does not make the engine overwork by blocking fueling into the cylinders and by releasing pressed air through opening the exhalation valve. If you pull the right lever of combination switch, Jake brake of 6 cylinders goes into working and therefore use properly according to road conditions.

Jake brake works only in the condition of not stepping on gas pedal or clutch pedal and if you step on gas pedal or clutch pedal or RPM is low, Jake brake does not work any longer.

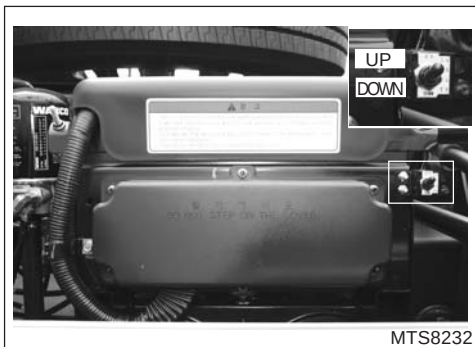


* About using Jake brake on flat ground (ZF automatic transmission vehicle)

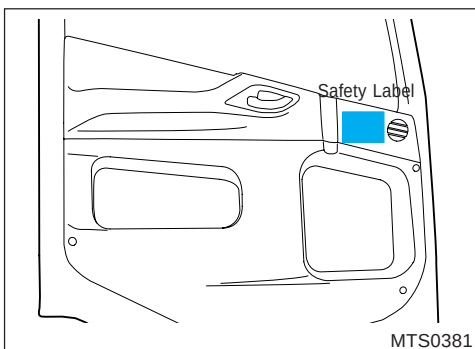
⚠ Caution

If you only use Jake brake, braking power is weak. Therefore, if you step on brake pedal once, the gear is lowered and the engine RPM increases, which results in strong braking power.

1-72 HOW TO HANDLE THE VEHICLE



MTS8232



MTS0381

(13) Bogie lift switch(6X2 tractor vehicle)

In order to share live load when loading, drive after lowering Bogie lift (Bogie lift switch "OFF"). If unloaded, drive after raising Bogie lift.

* When operating Bogie lift(6X2 tractor vehicle)

Caution



(2) Unloaded driving (tri-axle up)

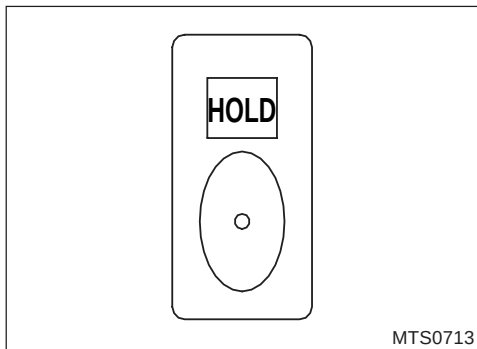
(1) Loaded driving

* If used in normal condition, the vehicle can be damaged.

Caution

1. When raising & lowering Bogie lift, BE SURE to operate with a stationary state of the vehicle after checking both sides.
2. Bogie lift SHOULD be lowered when driven loaded. Otherwise, it can cause damage in driving axle and air spring.
3. Do not frequently raise or lower Bogie lift. (over twice consecutively)
4. Observe prescribed maximum load. If overloaded, air spring can be damaged or its durability can be destroyed.
5. Your vehicle cannot be guaranteed if a trouble comes up due to overloading.
6. When you use the remote controller, make sure that you fully understand the instructional manual (Vehicle Handling).
7. DO NOT get on the tires of Bogie lift (tri-axle).

HOW TO HANDLE THE VEHICLE 1-73

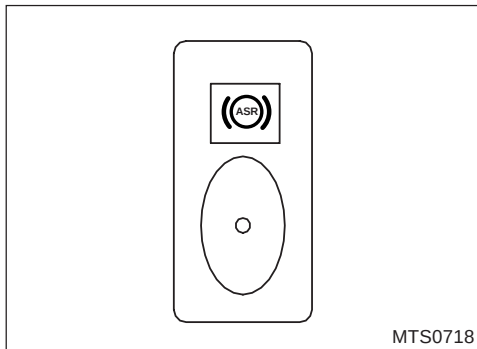


(14) HOLD switch

(Allison automatic transmission)

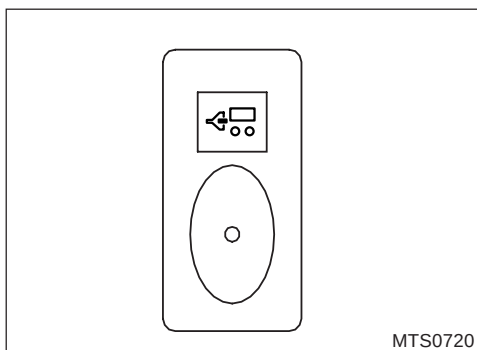
If you press "HOLD" when transmission selector is in "D", you can only shift gears below currently interlocked gear. Whenever the switch is pressed, the mode is chosen alternatively.

EX) In case of pressing "HOLD" switch in 3rd gear
(Shifting gear from 1st to 3rd)



(15) ASR OFF switch

If tires start to slip in case of escaping from a rough road, ASR function is automatically operated and excessive slipping reduces engine power. At this time, if the switch is pressed, your vehicle can escape from a rough road because ASR function does not work without reducing engine power.



(16) Draft link fixing switch(Full cago)

After linked to trailer, press the switch in order to fix draft link. The switch should be turned "ON" all the time when the vehicle is driven after being linked to trailer.

1-74 HOW TO HANDLE THE VEHICLE

(17) ISX CUMMINS engine diagnostics(Optional)

Driving on the screen ENGINE, ABS, AUTO T/M, RETARDER warning in case of fault diagnosis on the screen, select each item and then press ENTER KEY() if the error code for each item can be found.



(18) Diagnostic switch

1) For DE12TIS engine

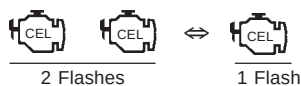
1. Check Engine Indicator comes on while ignition key positioned ON when engine problem occurs. Such problems are to be displayed by the codes.
2. 1 pin connector in white can be a substitute for engine diagnosis switch on ECU connector.

Caution

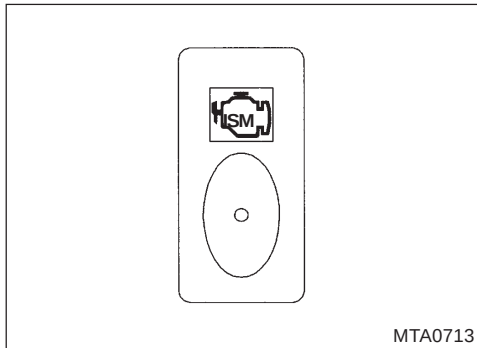
Do not remove lead seal of 1 pin connector in black, Memory clear connector. Warranty conditions are not to be effective in this case.

3. How to read engine diagnosis codes

Code 21(CEL → Inactive codes)



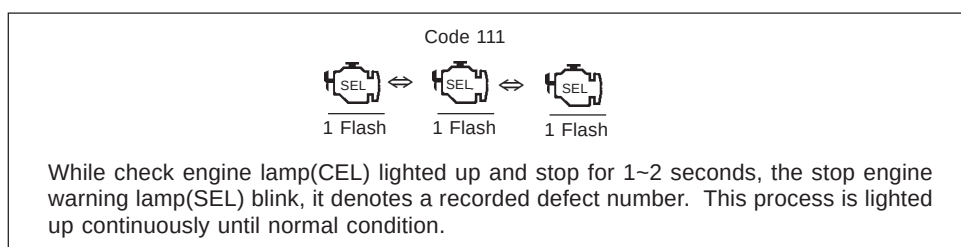
The process of flashing all the inactive codes will repeat until the conditions for code flashing are no longer satisfied.



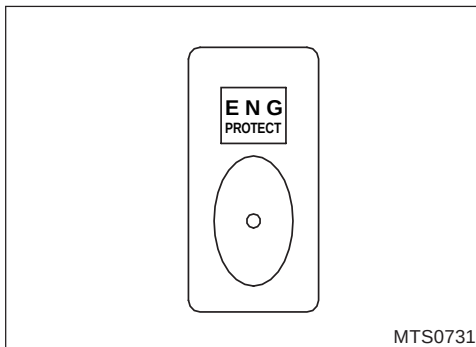
2) For ISM CUMMINS engine

1. Press the diagnosis switch with the ignition switch is at "ON" position
2. Check engine light and stop engine light will come on unless any of the malfunction codes are stored.
3. When malfunction codes exist, Stop engine light comes on and off, then the stored malfunction code is displayed after check engine light comes on for 1 or 2 seconds.
4. The malfunction codes have 3 digits and are displayed for 1 or 2 seconds for each ones.
5. After display of malfunction codes is done, the check engine light comes on again and the malfunction codes are displayed repeatedly until disrupted.
6. To identify the next malfunction codes, turn the RES/INC switch and, to identify the previous malfunction codes, turn the SET/DEC switch during the short period of time
7. The only one malfunction code will be displayed regardless of the control of switch when singular malfunction code is generated.

8. How to read engine diagnosis codes



1-76 HOW TO HANDLE THE VEHICLE

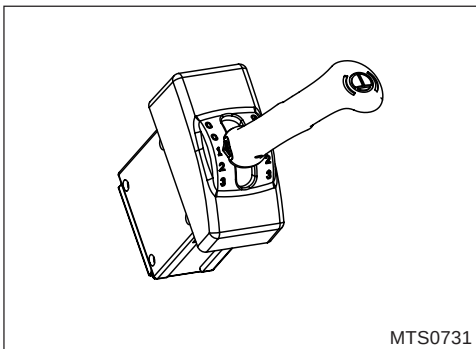


(19) Malfunctions related to the engine protection stop system(ISM cummins engine)

1. The stop engine lamp comes on and off it one or multiple following items exceed specified limit.
 - Coolant temperature
 - Coolant level
 - Engine oil temperature
 - Engine oil pressure
 - Air temperature in intake manifold
2. This case means that a serious malfunction had occurred. Engine power and speed will be decreased by the malfunction. The engine stops after 30 seconds when 'stop engine light' begins to come on.
3. Pull up the vehicle to the roadside delay, press 'engine stop ignore switch' for resetting engine stop signal and earning extra 30 seconds for pulling up the vehicle.

Caution

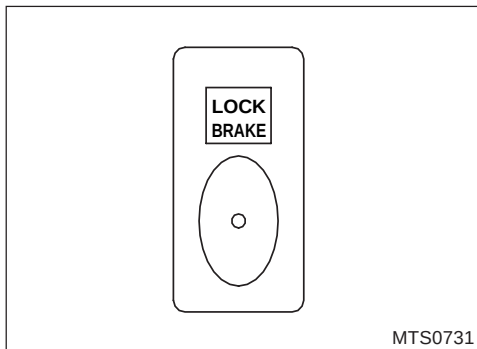
If it is using the engine stop ignore switch repeatedly in spite of engine problem, It caused the serious damage to engine please don't use it except an emergency.



(20) Jake brake switch

Jake brake switch is composed of 3 steps.(OFF-OFF-1-2-3) Jake Brake system isolates fuel from entering the cylinder and opens cylinder exhaust valves to release compressed air, the effect reducing a net energy loss and preventing the engine from being overstrained. The Jake Brake is actuated only in such a state that both accelerator pedal and clutch pedal are not depressed. If either of accelerator pedal or clutch pedal is depressed, the Jake Brake is disengaged.

HOW TO HANDLE THE VEHICLE 1-77

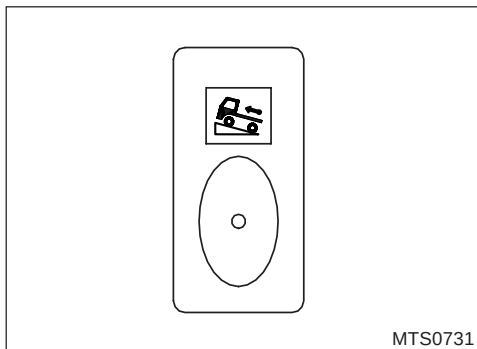


(21) Lock brake switch(for mixer and concrete pump)

Press for lock front and forward-rear axle when parking during work. Lock brake can still operate even the engine is off.

⚠ Caution

Do not use lock brake for parking. Use parking brake lever for parking.

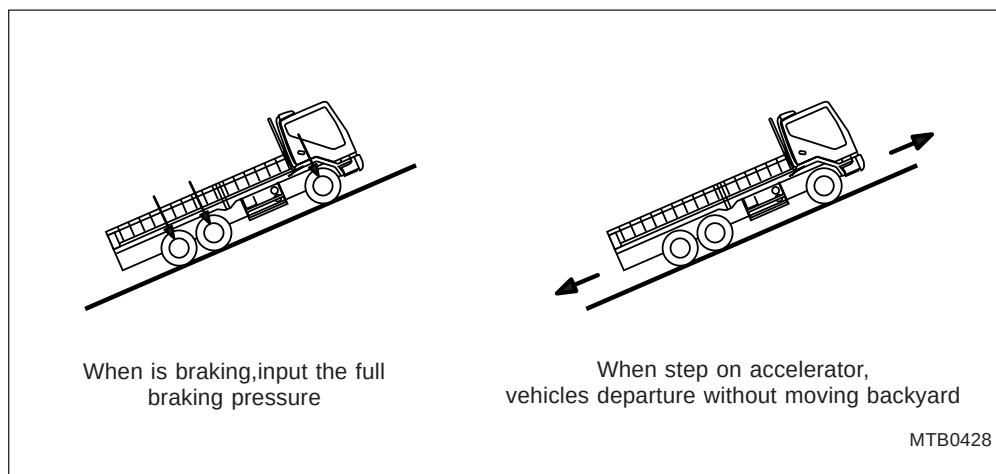


(22) Hill holder switch(for eaton automatic transmission)

If driver press the hill holder switch in a slope way such as hill, full braking pressure comes, and vehicles starting is possible without moving backward in case of step on accelerator.

1. Hill holder function

When driver is going to be restarted vehicles after stop in a slope way, speak function that hold vehicles temporarily through braking pressure lest vehicles should be pushed backward.



1-78 HOW TO HANDLE THE VEHICLE

2. Operation(Step 1)

- If apply hill holder function, must confirm priority condition as below.
 - (1) Confirm whether the parking brake is defrosted.
 - (2) Confirm whether the pressure in air tank is 6.5 bar or more.
- After confirm the Step1
 - (1) Press the hill holder switch().
 - (2) T/M lever must not be 'N' state.
 - (3) Step on brake pedal and confirm whether vehicles is stop state.
- While step on brake pedal, confirm that the hill holder indicator lamp() is lighted up to instrument

3. Operation(Step 2)

- (1) If put brake pedal and step on accelerator, as the hill holder function is defrosted, (indeed, braking pressure is released) vehicle can depart.
- (2) In this time, be put out the indicator lamp().
- (3) While driving when do not to cancel the hill holder function, the hill holder function is operated again if step on brake pedal.

4. Warning

- When remove brake pedal only, take care following articles because braking pressure is defrosted automatically after a while.
- * After remove brake pedal, this function is defrosted after 3 seconds in case do not step on accelerator.

Warning

Despite driver were warned, the braking pressure is defrosted automatically if do not step on brake pedal or accelerator again. And then, vehicles can be dangerous because can be moved backward in case is a slope way. Therefore, driver must prepare always in reply.

Warning

- The hill holder function is function that help to move vehicles departure little more easily in slope way. Therefore, switch must be "OFF" state when unuse the hill holder function.
- Never use the hill holder switch by parking brake substitution because it is not parking brake. When park, can happen unexpected accident in case of use the hill holder switch by parking brake substitution.

Caution

- Hill holder function operation can confirm through availability whether indicator lamp() is lighted up when step on brake pedal.
- Hill holder function is achieved properly in normal situation with on problem on vehicles and system
- When hill holder function is operated, it is defrosted if remove brake pedal. Then, take care because full brake operate by operating hill holder function if step on brake pedal again.

(23) Heating and air conditioning control

Caution

1. When going up a long hill, operate the air conditioner at intervals of about 3~5 minutes.
2. In winter season, operate the air conditioner once or twice a month in order to prevent refrigerants from leakage, improve the circulation of oil, and have your air conditioner in good condition all the time.
3. Select the recirculation modes when the outside air contains smoke or odors. But after passing the area, release the recirculation modes so that fresh air can flow into your vehicle.
4. As the air used for the air conditioner or heater flows through the front grill of the windshield, keep it clear from dead leaves, snow, and other substances. operating hill holder function if step on brake pedal again.

• Air filter check

- Air filter is located at air inlet of blower unit and if something dusty is stuck, blast volume or cooling capacity can be reduced as well as low pressure switch can be turned on that score and therefore checks and replacement must be done according to replacement period.
- Replacement period : every 10,000km
- If used under serious air pollution and after a long time driving on an unpaved road, etc. : frequent checks and replacement

• Condenser check

If something dusty attaches to condenser fin, heat exchange efficiency is lowered and, moreover, low pressure switch can be turned on. Therefore, remove debris with compressed air or clean water and if there is any bent fin, have it straightened.

• Refrigerants check

Cooling performance can be degraded due to insufficient refrigerants. Also, over charge of refrigerants has a bad influence on the air conditioning system and therefore if abnormality is found, contact our service station and have your vehicle checked.

Warning

As refrigerants are in the condition of high pressure gas, your air conditioner should be checked and serviced by those with certifications. Improper servicing can inflict injury on you.

Caution

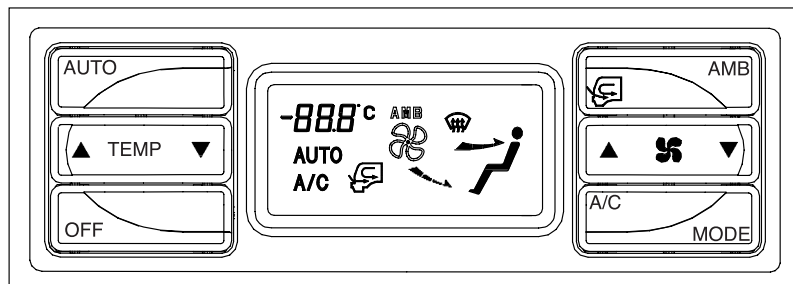
1. High pressure washing can raise refrigerants pressure, which can results in damage to refrigerant pipes.
2. When washing with water, pay attention to electric equipment.
3. As tiny amount from gas leakage cannot be detected by a detector, have your vehicle checked and serviced periodically at our service station.

Warning

Sleeping while the air conditioner or heater is turned on can kill.

1-80 HOW TO HANDLE THE VEHICLE

1) Auto air conditioner



If you set the temperature you desire after pressing <AUTO> button, the air conditioner is automatically adjusted to the set temperature.

- When cooling or heating, the idle speed automatically increases by 200 RPM.
- DO NOT put any objects on the solar radiation measuring sensor or ambient temperature sensor, which results in mechanical failure.
- When the engine is cut off, air conditioning setting will be persisted. However, after replacing the battery, the setting will not be persisted and the set temperature will be adjusted to 25!.
- In the early stage of air conditioning, the outside air flows in, which seems like mist. This is because of the inflow of moisture-laden air.

(1) Functions

- <AUTO>
This button is for selecting automatic air conditioning.
- <TEMP>
▲ If is pressed, the desired temperature rises by 0.5°, up to 32.0°.
▼ If is pressed, the desired temperature goes down to 17.0°.
- <OFF>
– This button disables 0AUTO0 function.
– If pressed, the air conditioning system is changed to manual operation.
- <AMB>
– If pressed, the outside temperature is displayed.
– The displayed temperature can be different from the actual temperature due to circumstances and conditions.
- <THE RECIRCULATION MODES> 
– If pressed, the recirculation modes are altered and the indicator is turned on.
External air flow mode : If selected, the outside air flows into the cabin, which removes the moisture on the windows and cigarette smoke of your cabin.
-  Recirculation mode : This feature allows for recirculation of interior air only. Use this mode on a dusty road or for quick cooling or heating.
- <Blower control>
– You can control blower when the ignition key is "ON".
– You can also control blower speed and the indicator is turned on.
– If pressed three times, one level of indicating lamp is turned on. 
- <A/C>
– The A/C button is that control "ON/OFF" on air conditioner.

HOW TO HANDLE THE VEHICLE 1-81

- <Mode>Modes select switch
Choose the mode you desire by pressing 0MODE0 button. When pressing the button, the indicating lamp you have chosen is turned on.

Panel Mode



Air flows through the outlets located in the instrument panel.

Bi-Level Mode



Air flows through the outlets located in the instrument panel and those located on the floor.

Floor Mode



Air flows primarily through the floor outlets located under the instrument panel.

Floor and Defrost Mode



Air flows in equal proportions through the floor and defroster outlets.

Defrost Mode

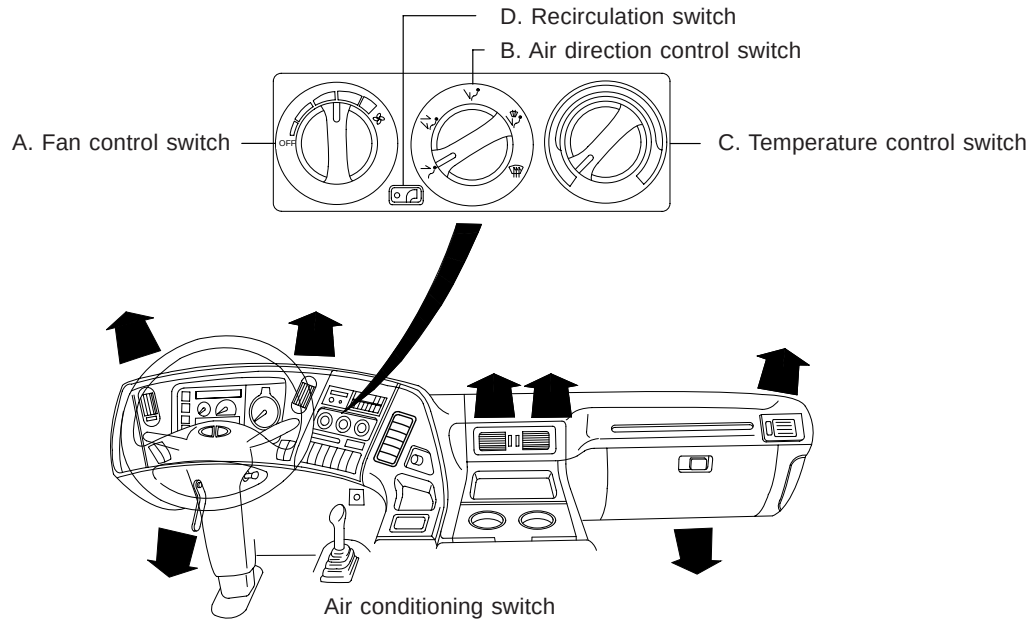


Air is primarily directed to the windshield through the defroster outlets located at the base of the windshield and side window demist outlets.

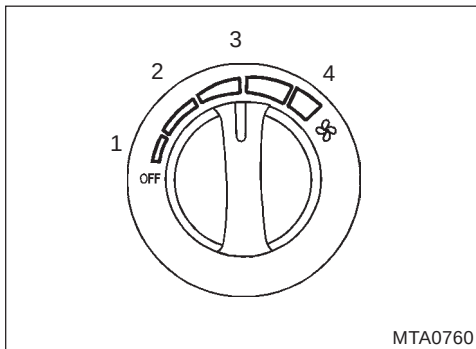
- (2) How to operate the automatic air conditioner
Operate as follows with 0AUTO0 mode.
 - Press <AUTO> button and the indicating lamp is turned on. Blower modes and the speed of blower will be automatically adjusted.
The air conditioner mode (ECONO-economic operation) is automatically operated according to the season.
 - Adjust the temperature you desire by pressing <TEMP> button.
 - If other buttons are pressed except <AUTO> button, the function will be operated in consecutive order of being pressed. The unselected function will be automatically adjusted. If you want to operate automatically again, press <AUTO> button.
- (3) Operating the air conditioner manually
 - Even if your vehicle is equipped with the AUTO air conditioner, you can operate the air conditioner manually.
 - When <OFF> button is pressed, the modes can be completely operated manually.
 - As explained in "Modes select switch", you can operate the air conditioner as you desire.

1-82 HOW TO HANDLE THE VEHICLE

2) Manual air conditioning

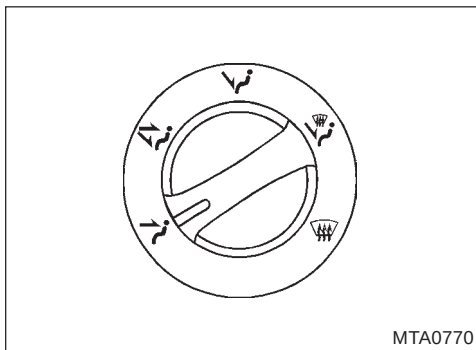


MTA0750



A. Fan control switch

The fan control switch can control the speed of air flow in 4 steps.



B. Air direction control switch

This switch allows you to change the direction of air flow.

→ : Air flows in through the center and side air vents.

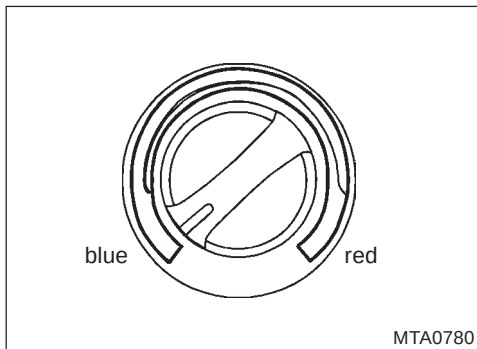
↘ : Air flows in through the center, side and foot vents.

↓ : Air flows in through the foot vent.

↗ : Air flows in through the foot vent to defrost windshield and side windows.

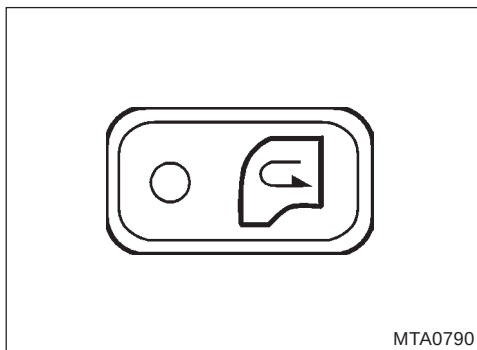
☰ : Defrosting the windshield and side windows.

HOW TO HANDLE THE VEHICLE 1-83



C. Temperature control switch

This switch is used to adjust the flow of the engine coolant to control indoor temperature.

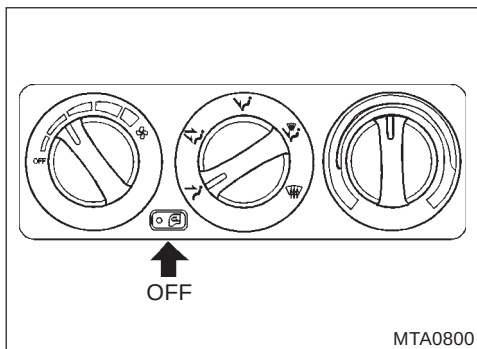


D. Recirculation switch

Press this switch when driving in dusty conditions or traffic fumes, and also when quick cooling or heating is required, and the inside air will be recirculated in the vehicle.

Recirculation: switch position (ON) 

Circulation : switch position (OFF) 



• Ventilation

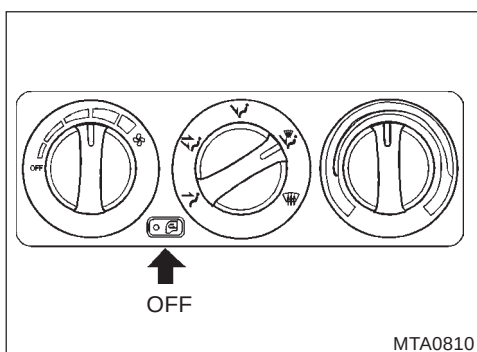
Air conditioning switch: "OFF"

Recirculation switch: "OFF"

Temperature switch: As required

Fan control switch: As required

Press this switch again will draw outside air into the cab so that the cab can be ventilated.



• Defrosting

Air conditioning switch: "ON"

Recirculation switch : "OFF"

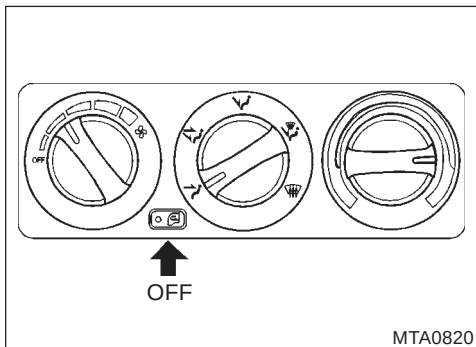
Temperature switch : As required

Fan control switch : As required

Air direction switch:  or 

Use this procedure to defrost the windshield and side windows.

1-84 HOW TO HANDLE THE VEHICLE



- **Normal heating**

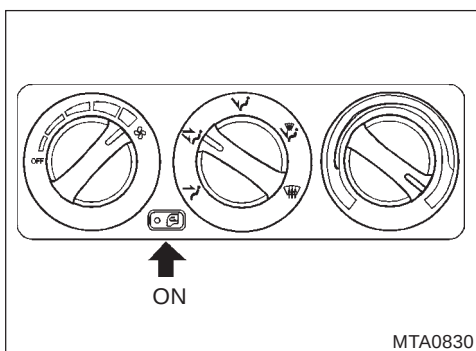
Air conditioning switch: "OFF"

Recirculation switch: "OFF"

Temperature switch: As required
(in red colored zone)

Fan control : As required

Use this procedure to adjust inside temperature in cold weather.



- **Maximum heating**

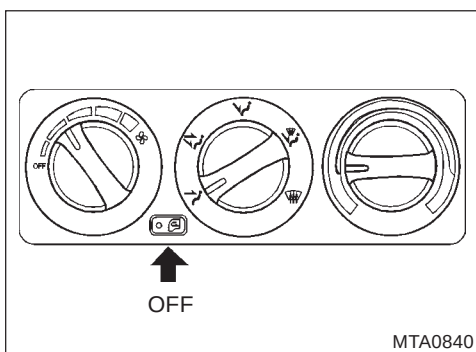
Air conditioning switch : "OFF"

Recirculation switch : "ON"

Temperature switch: right-end(in red colored zone)

Fan control switch: 4 steps

Using this function for extended time is not good for your health as only inside air is circulated. And when the vehicle is forced to slow down due to traffic jam or for any other reasons, a long-time use of this operation may cause battery discharge.



- **Normal cooling**

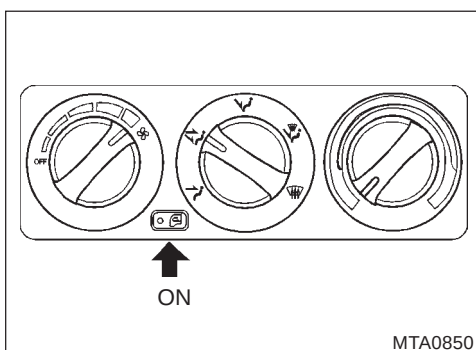
Air conditioning switch: "ON"

Recirculation switch: "OFF"

Temperature switch: As required
(in blue colored zone)

Fan control switch: As required

Use this procedure to enhance your motoring pleasure on a long-distance journey in hot weather.



- **Maximum cooling**

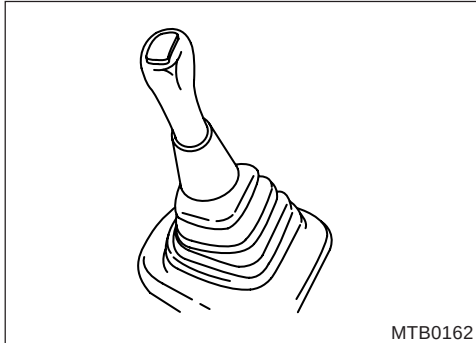
Air conditioning switch: "ON"

Recirculation switch: "ON"

Temperature switch: left-end(in blue colored zone)

Fan control switch: 4 steps

Using this function for extended time is not good for your health as only inside air is circulated. And when the vehicle is forced to slow down due to traffic jam or for any other reasons, a long-time use of this operation may cause battery discharge.



MTB0162

7) Miscellaneous controls

• Manual transmission

When shifting gear, fully depress the clutch pedal with changing the position of gearshift lever and then release it slowly. You must stop the vehicle completely and then shift to "R" or "1" position.

Caution

- *Make sure that keep a safe distance from rear, left and right side of the vehicle and then move it backward.*
- *You must stop the vehicle completely and then shift to "R" in neutral position 3 seconds later.*
- *Do not rest your foot on the clutch pedal when driving the vehicle unless the clutch dist will be worn out.*
- *When shifting the gear high to low position, the rpm does not indicate the red colored zone in the tachometer.*
- *If operating half clutch when the vehicle stops uphill, it may cause early damage to the clutch.*

Caution

- *If shifting gear properly, it may help smooth driving and fuel consumption reduction.*
- *Make sure that gauge needle does not indicate the red zone unless it may cause damage to engine.*

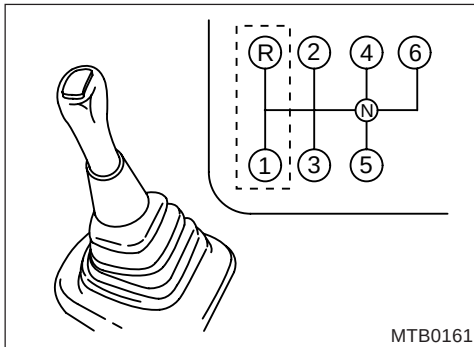
Caution

- *When parking or stopping the vehicle in a uphill road, parking brake is firmed securely to prevent a possible accident. When starting the vehicle on the uphill road, shift gear to '1' and then release the clutch pedal while deprssing the accelerator pedal fully(engine rpm:2,000 rpm). If the vehicle begins to move onward, release parking brake and then start the vehicle.*
- *The low temperature allows the gear to be shift more roughly. It is usual before oil warming-up.*
- *With vehicle stops condition, if it is difficult to shift gear to "1"or "R"(reverse)position, set the gear in the neutral position and then release the clutch pedal and depress it again. 3 seconds later, shift gear to "1"or"R"(reverse) position.*
- *On driving, you must not drive with putting a hand on the change lever except a gear change. Becomes the cause of transmission internal parts attrition.*

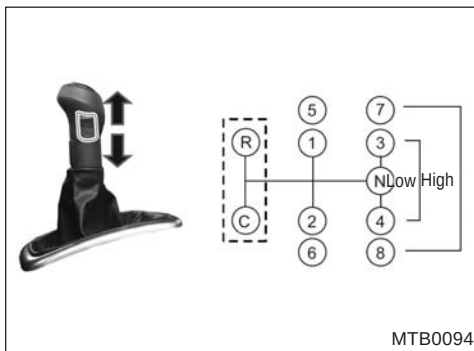
Warning

- *When you leave your vehicle, make sure that park the vehicle on level ground with firming the parking brake securely and then turn off the ignition switch.*
- *Place the gearshift lever in "1" or "R"position. If you don't, the vehicle may move accidentally, resulting in an accident.*

1-86 HOW TO HANDLE THE VEHICLE



MTB0161



MTB0094

Note

The "C" position of the EATON, Shaanxi Fast Gear transmission (FSO10309A, 9JS150A) can be used instead of the "1" position when massive power is needed such as when driving off on a slope under heavy load.

Caution

Move the shift lever to the position "1" or "R" indicated in a dotted line in the figure in approx. 3 seconds after the engine is stopped. Shifting into these position with the engine running can damage the transmission. The shift lever can be shifted to the "R"(Reverse) and "C"(Creep speed) only in the range(1st to 4th gear).

Warning

If shifting from the 4th gear to the 5th gear position without setting the range switch to the "H" position, the transmission is shifted to the 1st gear, resulting in damages to components in the engine and transmission.

(1) 6th manual transmission(S&T)

Caution

When shifting gear to " " ("1" or "R") position, stop the vehicle securely and then change the position of the transmission after 3 seconds roughly unless the transmission may damage.

(2) 9th manual transmission(Eaton-FSO10309A/ Shaanxi Fast Gear - 9JS150TA)

• Range switch

1. When the range switch is in the LOW position, the shift lever can be shifted to the R,C,1,2,3 and 4th gear position. When it is in the HIGH position, the shift lever can be shifted to the 5,6,7 and 8th gear position.

2. Shift between ranges "H"(High speed) and "L"(Low speed)

Example:when shifting between 4th gear<->5th gear

- (1) Place the range switch to the "H"(High speed) or "L"(Low speed) position

- (2) Move the shift lever to the desired position(either 4th or 5th gear position) while depressing the clutch pedal.(The shift lever can be shifted to another position only from the neutral position in this case.)

- (3) The shift lever can be shifted from the 5th gear to the 4th gear only when the vehicle speed is lower than the specification in order to prevent an engine overrun.

- (4) When the range switch is placed in the "H" position, the shift lever high range indicator () on the instrument cluster comes on.

3. The shift lever can be shifted to the "R" and "C" position only when the range switch is in the "L" position, and the ignition switch is in the "ON" position or the engine is running.

• How to use the 9J150TA(Shaanxi Fast Gear) transmission PTO

1. To use PTO When vehicle stop condition
 - (1) Change lever "N" position
 - (2) To select "HIGH" of knob switch
 - (3) Switch "ON" of vehicle stop PTO switch
 - (4) Switch "ON" of PTO switch

HOW TO HANDLE THE VEHICLE 1-87

- (5) To select "LOW" of knob switch
- (6) After to press down thoughly clutch pedal, change gear "1st" speed in 1/2/3/4 speed
2. To use PTO when driving condition
 - (1) Change lever "N" position
 - (2) To select "HIGH" of knob switch
 - (3) Switch "ON" of PTO switch
 - (4) To select "LOW" of knob switch
 - (5) After to press down thoughly clutch pedal, change gear "1st" speed in 1/2/3/4 speed

(3) 10th manual transmission(S&T)

• Splitter shift switch

- High and Low ranges

The gear shift lever can be shifted to 5 speeds in each speed range while the splitter can be set to the "H"(High speed) and "L"(Low speed). Therefore, 10 forward driving speeds can be used in total.

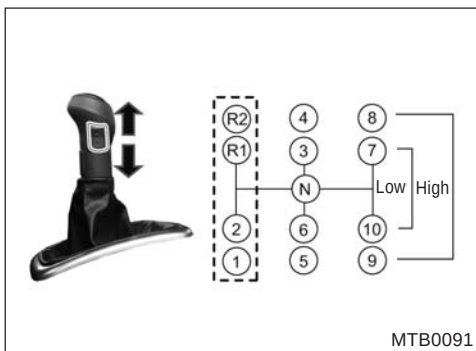
- How to shift

Move the shift lever to the desired position with the same procedure for any other vehicles.

- splitter in between "H"(High speed) and "L"(Low speed) positions.

Example:when shifting between 3rd gear<->4th gear

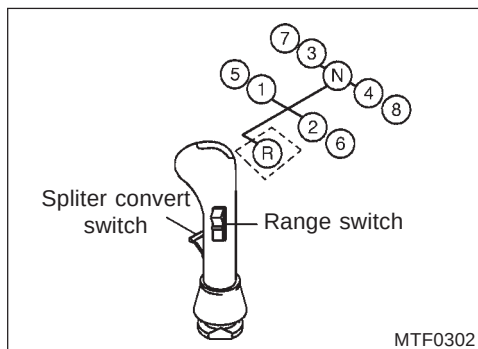
- (1) Place the splitter shift switch to the "H"(High speed) or "L"(Low speed).
- (2) Release the accelerator pedal and depress the clutch pedal to its deepest position. Then, the splitter is shifted to the "H" or "L" position automatically.
- (3) When the splitter shift switch is placed in the "H" position, the splitter indicator ($\frac{T/M}{SPLIT}$) on the instrument cluster comes on.
- (4) Shift to "H" or "L" only when the engine speed is below 1,800 RPM. Make sure to check the engine speed from the tachometer to prevent an engine overrun.
- (5) The splitter shift switch cannot be operated during driving unless the clutch pedal is depressed.



Caution

Move the shift lever to the position "1" and "C" indicated in a dotted line in the figure in approx. 3 seconds after the engine is stopped. Shifting into these positions with the engine running can damage the transmission.

1-88 HOW TO HANDLE THE VEHICLE



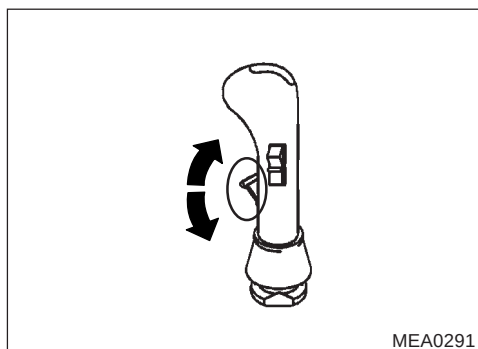
(4) 16th manual transmission(ZF16S1820TO/ ZF16S1830TO/ZF16S2220TO, ZF16S2523TO)

⚠ Caution

- When shifting gear to " " ("1" or "R") position, stop the vehicle securely and then change the position of the transmission after 3 seconds roughly unless the transmission may damage.
- Operating the reverse gear of ZF transmission : Manipulate the reverse gear after adjusting the position of range to "LOW". If manipulating the reverse gear when range change is positioned "HIGH", it cause a car accident by rising speed abruptly.
- At above 30km/hr, it is not allow for range switch to change into "LOW"

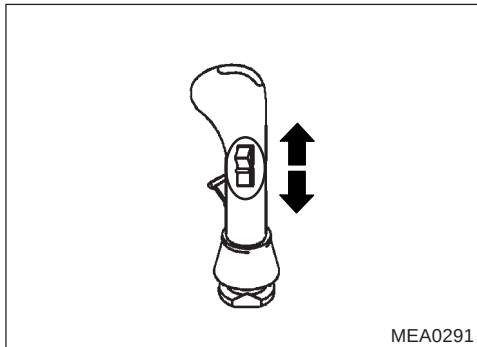
⚠ Warning

In interder type vehicle, do not place gear in neutral position on a downhill road. If you don't, it may cause an accident by accelerating vehicle speed.



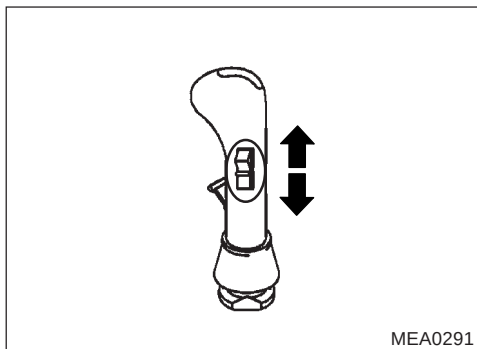
1. Splitter convert switch

- 1) When the splitter switch is in LOW position, the gear is shifted to "L". When the splitter switch is in HIGH position, the gear is shifted to "H"
- 2) How to shift "H" to "L" or "L" to "H"
 - (1) The splitter switch is turned to "H" or "L"
 - (2) Take your foot off the accelerator pedal and then depress the clutch pedal fully to shift gear to "H" to "L" or "L" to "H"
 - (3) When splitter switch is positioned to HIGH, splitter indicator lamp ($\frac{T/M}{SPI L I}$) comes on in the instrument panel
- 3) Even with the splitter control switch malfunctioned, the switch is not changed, if you do not depress the clutch pedal. Place the switch to original position if the switch does not work properly.



2. Range switch

- 1) If the range switch is in "LOW", you may shift lever 1,2,3 and 4th position. If the range switch is in HIGH, you can shift lever to 5,6,7, and 8th position.
- 2) How to shift 4th to 5th or 5th to 4th
 - (1) Set the range switch to "H" or "L" position
 - (2) Manipulate the gearshift lever from 4th to 5th or 5th to 4th position while pressing the clutch pedal
 - (3) To prevent engine over-run, you can shift gear below certain vehicle speed.
 - (4) If the range switch is in HIGH, the instructor lamp, HIGH(), of gearshift lever comes on in the instrument panel.



(5) 16th manual transmission(ZF16S151/ZF16S221)

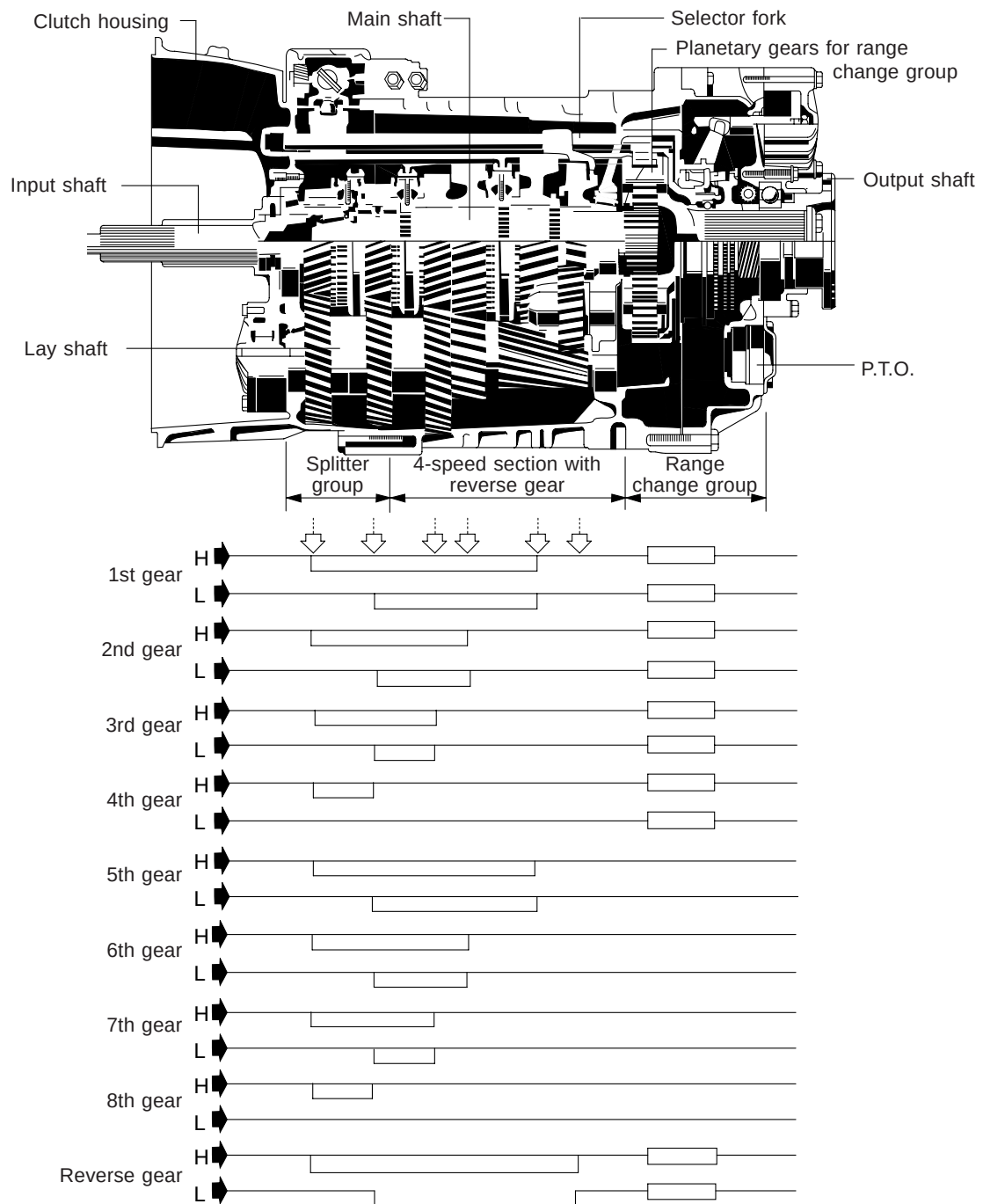
1. In case of ZF transmission, after manipulating the HI-LO adjusting switch attached to knob without changing the position of gearshift lever, depress the clutch and then release it to change gears.

Note

When preparing to shift from 4th position to 5th position, disconnect the gearshift lever from 4th position and snap it lightly toward the right-hand side to put it into 5th position.

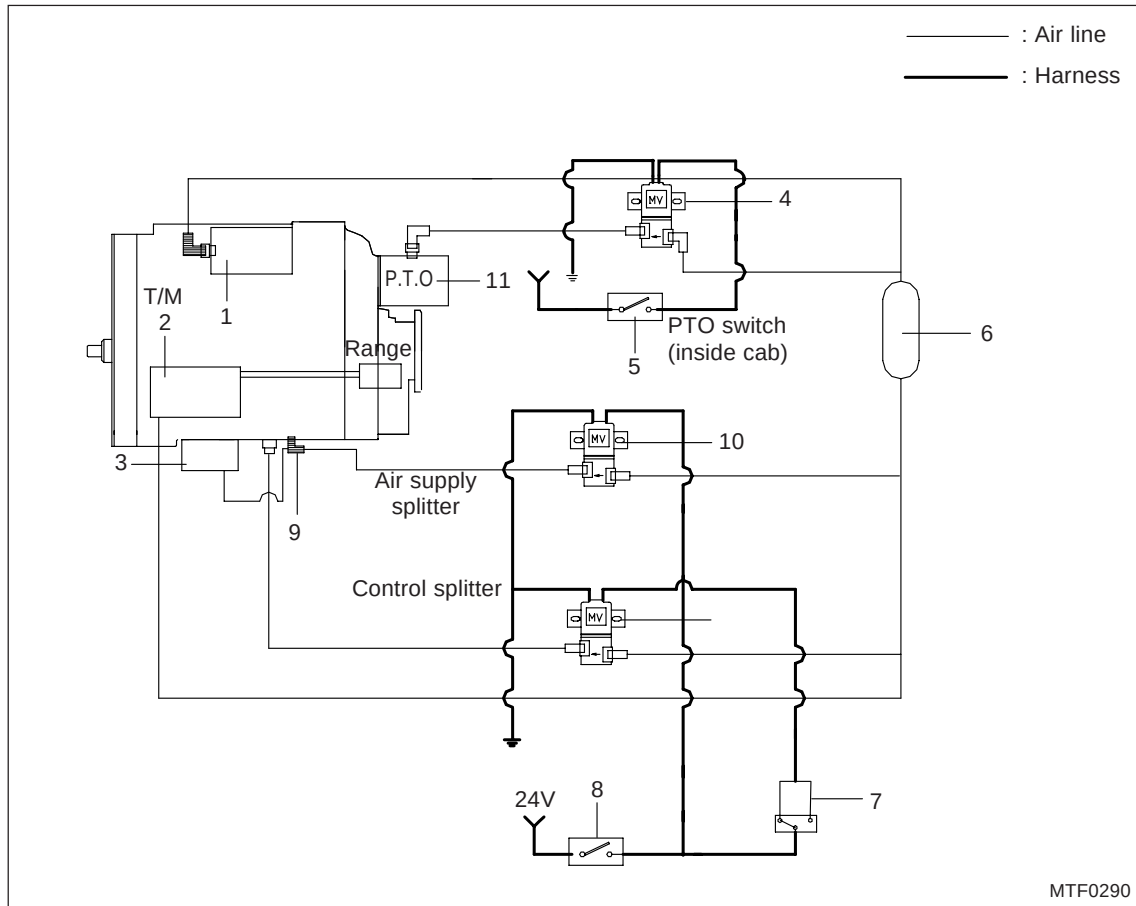
1-90 HOW TO HANDLE THE VEHICLE

2. Construction and power flow diagram



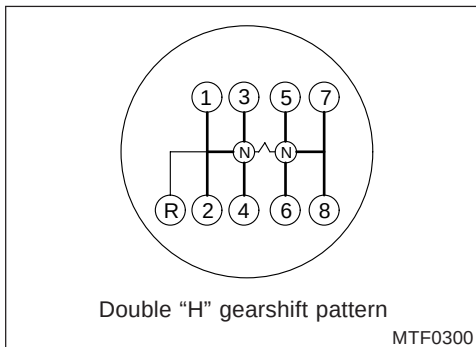
MTF0280

3. Connection diagram for pneumatic control



- | | |
|--------------------------|--------------------------------------|
| 1. Clutch booster | 7. High/low switch (At knob) |
| 2. Range change cylinder | 8. Clutch pedal |
| 3. Power shift | 9. Splitter relay valve |
| 4. Magnetic valve | 10. Magnetic valve |
| 5. P.T.O switch | 11. P.T.O (Power take off operation) |
| 6. Air tank | |

1-92 HOW TO HANDLE THE VEHICLE

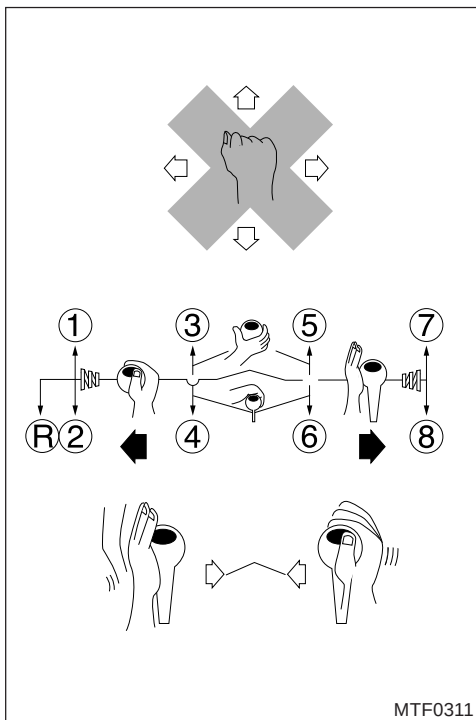


4. Operation

As ZF transmission is of synchro mesh change gear type, gear shifting can be performed with no need to use double clutch, and so it is very easy to manipulate it.

(1) How to range change group

Double "H" gearshift pattern provides 8 forward gearshifts and reverse gearshift. The neutral position of gearshift lever is obtained on the shaft for the 3rd and 4th gears in LOW RANGE, while it is on the shaft for the 5th and 6th gears in HIGH RANGE. Namely, there are two neutral positions available. Therefore, when changing gears from high range to low range or vice versa, it is necessary to quickly change gears so that the engine speed may not be reduced abruptly. In addition, as the reverse gear is of dog clutch type, when attempting to change to reverse gear, do so after the vehicle is stopped completely. Otherwise, gears may be damaged. If gears are abruptly changed to low range at high engine rpm, or especially, when gears are changed abruptly from high range to low range, damage may be caused to the clutch, engine, or transmission.

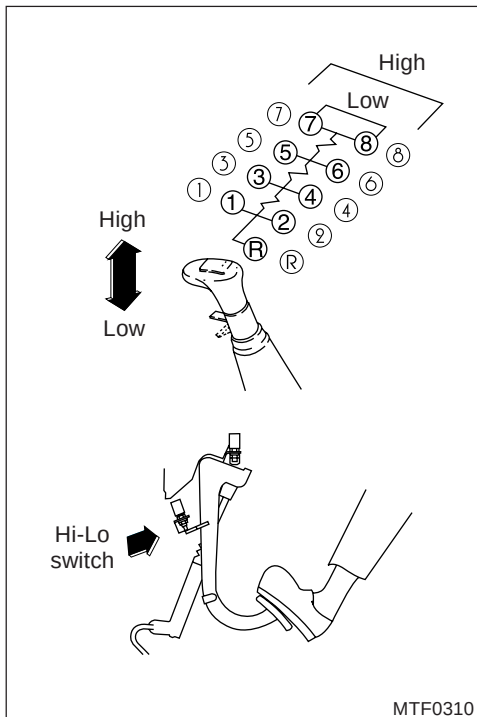


(2) How to change ranges

- As ZF transmission is of synchro mesh change gear type, avoid changing gears forcibly.
- When changing ranges in the neutral section, lightly tap to right or left with the palm for gear changing operation.
- Namely, when changing gears from the fourth to the fifth, draw back the gearshift lever (to the neutral position between 3rd and 4th gears), then lightly tap to right with the palm. And then, lightly push forward the gearshift lever which has been in the neutral position between 5th and 6th gears to change to the 5th gear.

Note

You may feel a slight resistance when changing gears for the first time. It indicates that the synchro meshes are being engaged synchronously. At this time, do not apply unnecessary force to change gears.



(3) Operation of the splitter

As high and low ranges are provided at each gearshift position, the splitter offers diverse gear ratios to ensure economical operation of the vehicle and to increase in traction efficiency.

- Select the HI or LO switch installed on the gearshift lever knob depending on traffic condition.
- After the proper switch, depress the clutch pedal gently all the way without changing the position of the gearshift lever, then release it.

* Advantages of the splitter select valve

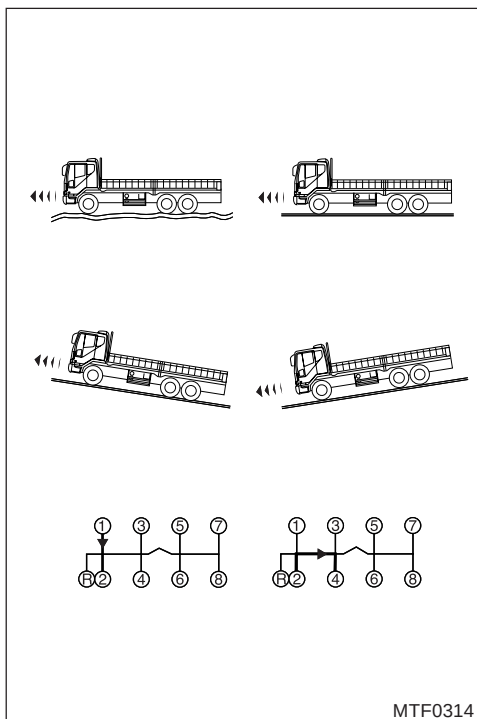
- Loss of engine power and excessive engine turning due to gear changes can be prevented.
- Optimum operation economy can be obtained.

* Examples of the use of splitter

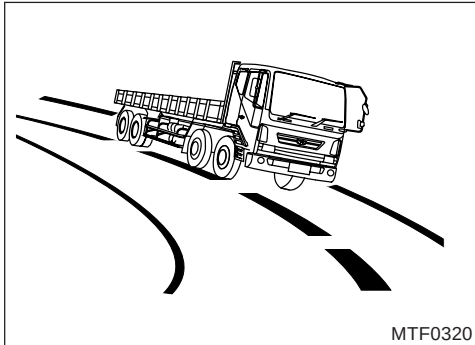
- To produce sufficient engine output when passing a vehicle ahead or driving on an uphill or it is difficult to raise the speed after driving off the vehicle.
- For a vehicle towing a heavy cargo on a pavement, the splitter can be used to achieve economical operation such as reduction of fuel consumption.

(4) Gear jump

- ZF transmission has the change range from HIGH 8th gear to LOW 8th gear and can be manipulated as desired, irrespective of road condition.
- In the case of bad road condition or running on slope, apply gears in stage like "3rd gear → 4th gear → 5th gear".
- When running on a level ground or on the downgrade, carry out gear jump like "3rd LOW → 4th HIGH → 5th HIGH → 7th LOW → 8th HIGH" to reach high gear with 4 gear change activities.



1-94 HOW TO HANDLE THE VEHICLE



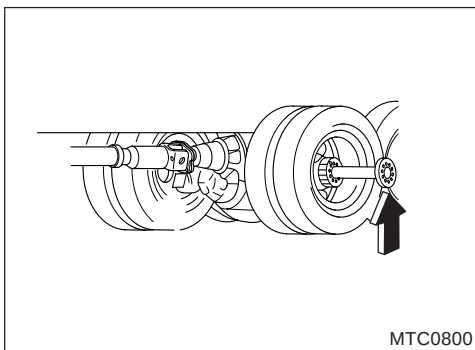
(5) How to operate

- a. When operating the vehicle, be plainly dressed, and make sure of the route in advance keeping busy or smooth traffic sections and obstacles in mind.
- b. On slopes, gear down appropriately in advance. On the downgrade, use the same change group as that for slopes.
- c. Namely, if running up a slope with the 5th gear applied, use the 5th gear on the downgrade, too and do not use a high gear(8th gear).

(6) Operating of the clutch

The clutch pedal must always be depressed fully for each gear shift movement.

If the clutch is not engaged or disengaged completely, or if the clutch discs have been excessively worn, gearshift problems will occur. In addition, wear on the synchronizers and at the gear teeth and dogs will be greatly increased.



(7) Towing away

If the vehicle suffers a breakdown and has to be towed away, note the following precautions.

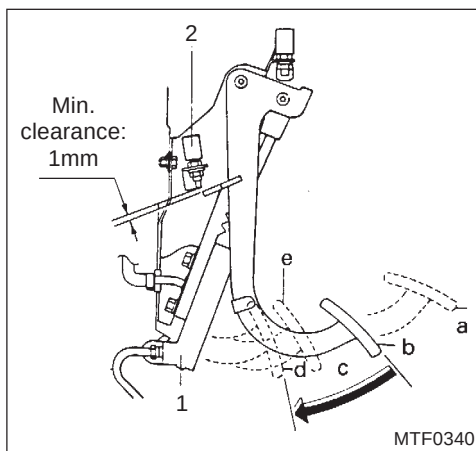
- a. If the towing distance is 50km or less
Put the gearshift lever in the neutral position(on the shaft for the 5th and 6th gears) in the HIGH range and keep the towing speed within 60 km per hour. If the gearshift lever would not be put in the neutral position,disconnect the rear axle shaft before having your vehicle towed.
- b. If the towing distance is more than 50km
Separate the propeller shaft from the rear axle.

(8) Adjustment of HI-LO switch at the rear of clutch pedal

For the trouble-free shifting of the splitter group, it is absolutely necessary that the HI/LO electrical switch at the rear of the clutch pedal is correctly adjusted.

If HIGH-LOW gears are used when the clutch discs do not separate completely or the HI-LO electrical switch is not correctly adjusted, the synchronizer may suffer damage.

- a: Position "clutch fully engaged".
- b: Position "clutch fully disengaged".
- c: Excess travel range of clutch
- d: Final stop
- e: Operating position of HI-LO switch
 - 1. Clutch master cylinder
 - 2. HI-LO electrical switch



★ Inspection for the clearance of HIGH-LOW switch

The HI-LO electrical switch must be operated between the position b and d as shown.

Namely, it should be operated at the position e.

- a. How to identify the point where the clutch is completely disengaged:

With the engine on and the vehicle being stationary, apply the reverse gear until "bawl" is heard. (The reverse gear is not of synchronizer type.) Then depress the clutch until the "bawl" is not heard any longer. The very point is the point where the clutch is completely disengaged.

- b. Adjustment of HI-LO switch clearance

The HI-LO switch should be operated when the clutch pedal is depressed slightly deeper (by about 5mm) from the point where the clutch is completely disengaged. Namely, it should be operated at the position e.

- c. Therefore, the clearance between the stopper interlocked with the clutch pedal and HIGH-LOW electrical switch 2 should be minimum 1mm at the point b.

- d. The clearance of the HI-LO switch should be checked periodically and each time the clutch is adjusted.

1-96 HOW TO HANDLE THE VEHICLE

1. Regular oil level check
2. Regular oil change
3. Using the recommended lubricants

5. Care

(1) Using the recommended lubricants

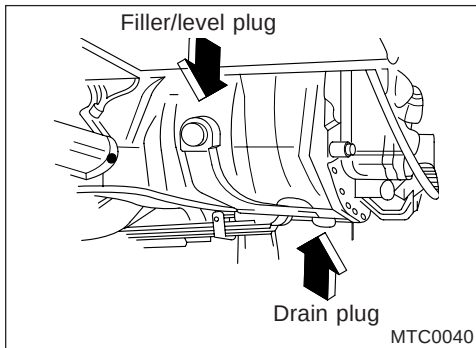
Specifications

Engine oil : API CD/CE/CF/SF/SG, SAE 30

(Use only ZF16S151, ZF16S221 transmission)

Gear oil : API GL-4, SAE 80W 90

Model	Oil change	At overhaul
ZF16S151	8L	11L
ZF16S221	10L	13L



(2) Oil level check and oil change

- a. Check oil level at end of first 5,000km operation and thereafter every 20,000km. Park the vehicle on a level ground and allow some length of time to pass, then open the level plug for check and fill the tank as required.

- b. Oil change

Oil should be changed first 5,000km operation and thereafter every 45,000km.

There are 3 oil drain plugs. When draining oil, use the drain plug located on the 4-speed section.

When you want to drain the tank quickly or you cannot unscrew the plug located on the 4-speed section, open the plugs located on range change section and splitter section to drain oil.

(3) Breather

The breather installed on the upper side of transmission is designed to relieve the pressure generated inside the transmission during the operation of the vehicle. Therefore, it is desirable to always keep the breather clean so that it can perform satisfactorily all the time.

(4) Inspection of oil system

Air under pressure condenses into moisture in some degree depending on changes in atmospheric temperature and atmospheric pressure.

Air under pressure in the air tank should be relieved once or more a week. Especially, in cold weather, relieve the air every day so that rust, foreign substances, or moisture may not enter the air pipe.

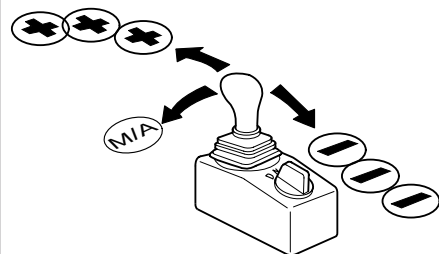
The entry of foreign substances into the air pipe will cause not only damage or malfunction to the range change and splitter cylinder seal but also harm to the brake system.

6. Inspection and adjustment of the clutch pedal

Items	How to adjust
a. The clutch would not be dis-engaged even though it has been fully depressed. b. No resistance is felt on the clutch pedal even though it has been depressed.	a. Check the oil tank for the clutch master cylinder for clutch oil level. b. Bleed air through the air bleeder installed on the clutch booster. c. In the event of no effect obtained from the above operations, check if the sealing cup inside the clutch master cylinder has been damaged, and replace the clutch master cylinder as required. The diagram illustrates the mechanical components of the clutch system. It shows a rectangular oil tank with a 'MAX MIN' level indicator. A line connects the tank to the clutch master cylinder. The master cylinder is part of a linkage system that operates the clutch pedal. The pedal is shown in a depressed position. Labels with leader lines identify the 'Oil tank', 'Clutch master cylinder', and 'Clutch pedal'. MTF0370

1-98 HOW TO HANDLE THE VEHICLE

ZF-AS Troinc



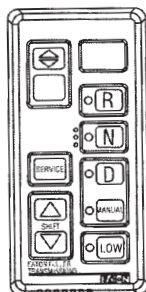
ZF0004

Allison

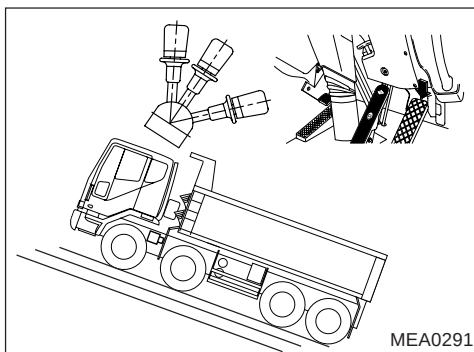


MTS0730

Eaton



MTS0730



MEA0291

• Automatic transmission*

How to operate automatic transmission

- (1) When stuck in sand, mud or snow
Move the shift lever to the position "D" and "R" repeatedly and gently while depressing the accelerator pedal slowly to allow inertia get your vehicle out.

⚠ Warning

Make sure there are no obstacles or people around before trying to get out of snow, mud or sand. The vehicle may abruptly get out and move forward or backward, resulting in a serious accident.

Note

If it is stuck and impossible to get out, get a help from another vehicle.

- (2) Engine brake

Using engine brake on a downhill can prolong the life span of the brake. To use engine brake, move the shift lever to the 2nd or 1st gear position.

Note

Moving the shift lever from a high speed position to the 1st gear position directly can apply excessive load to the transmission. In this case, move the shift lever to the 2nd gear position, wait until the vehicle speed decreases, and then move the shift lever to the 1st gear position.

- (3) When stopping or parking

Depress the brake pedal to stop the vehicle completely. Then, place the shift button to the "N" position and pull up the parking brake lever.

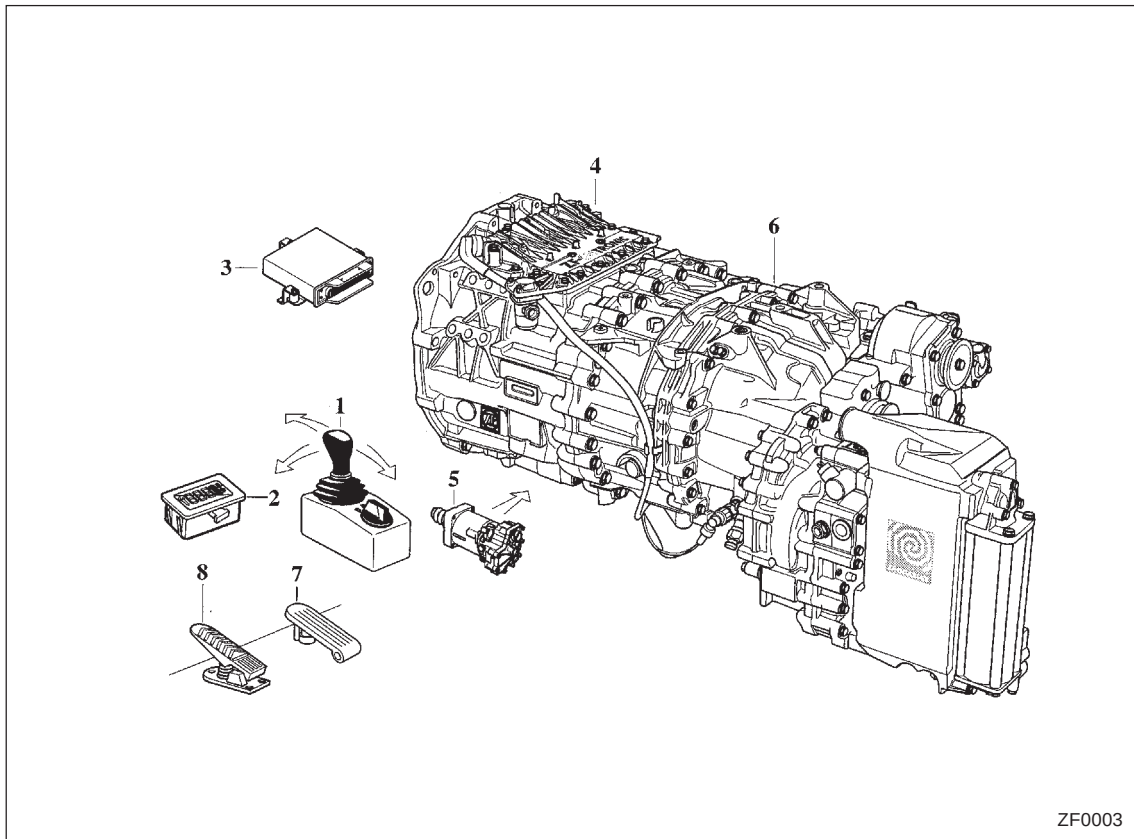
- (4) Precautions when driving off on a hill
(for ZF automatic transmission)

⚠ Caution

If the vehicle rolls down due to slow reaction to the acceleration pedal operation, depress the accelerator pedal while releasing the parking brake at the same time.

1. Operation and Handling of ZF-AS Tronic

1) ZF-AS Tronic-basic system diagram



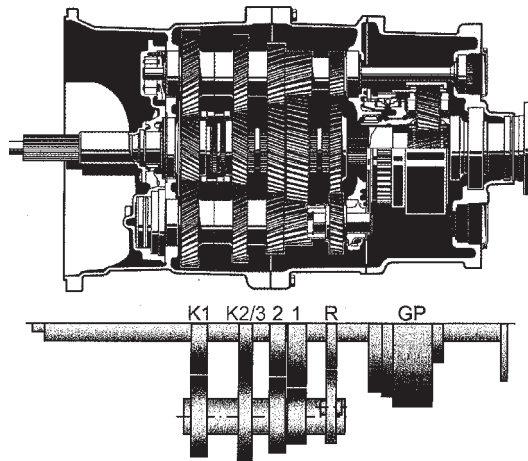
- 1. Operation lever
- 2. Instrument cluster
- 3. E-Module

- 4. Transmission/TCU integrated
- 5. Clutch operator
- 6. Truck automatic transmission

- 7. Accelerator

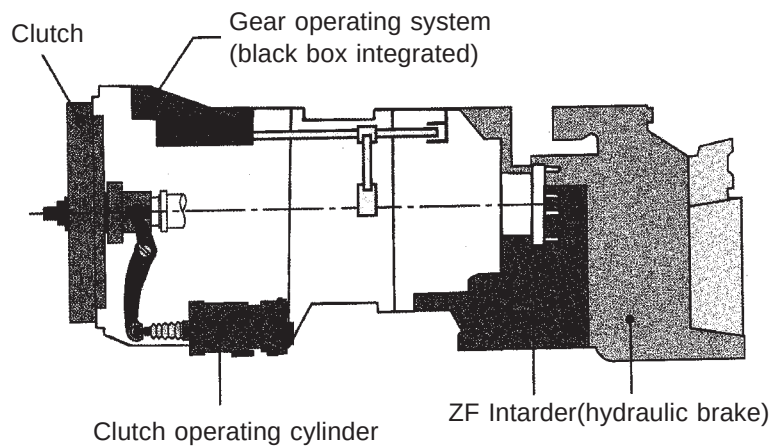
1-100 HOW TO HANDLE THE VEHICLE

2) ZF-AS Tronic-basic structure diagram



ZF0001

12-Speed
ZF12AS1930TO
ZF12AS2330TO



ZF0002

3) System components description

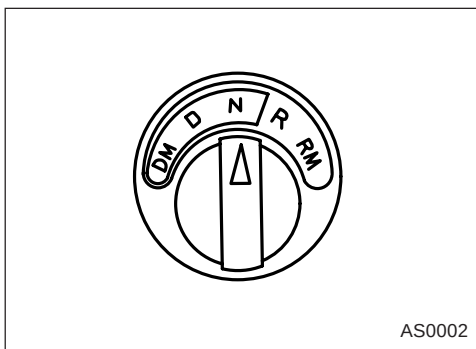
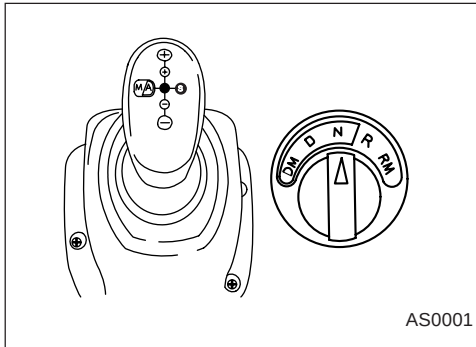
(1) Range Selector

The range selector consists of the tip lever and rotary switch.

1) Tip lever

The tip lever is used to select a gear or switch an operating mode. In other words, it is possible to shift a gear with the tip lever in the manual mode.

- ⊕ : Upshift one gear
- ⊕ : Upshift two gears
- ⊖ : Downshift one gear
- ⊖ : Downshift two gears
- M/A : Manual/Automatic mode switch
- S : Shifted to the most suitable gear for the current driving condition in the manual mode



2) Rotary switch

The rotary switch is used to select the driving direction

- >DM< : Low-speed forward driving (forward 1st speed)
- >D< : Forward driving
- >N< : Neutral
- >R< : Reverse driving
- >RM< : Low-speed reverse driving (Reverse low gear)

Note

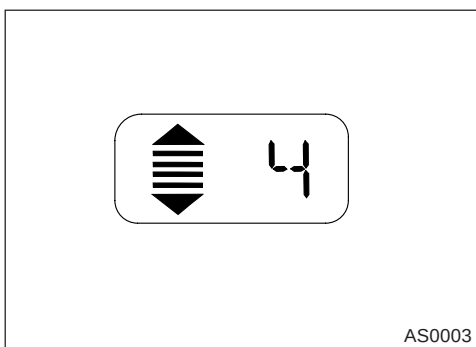
When "DM" or "RM" is selected, it is impossible to switch to the automatic mode.

(2) Display

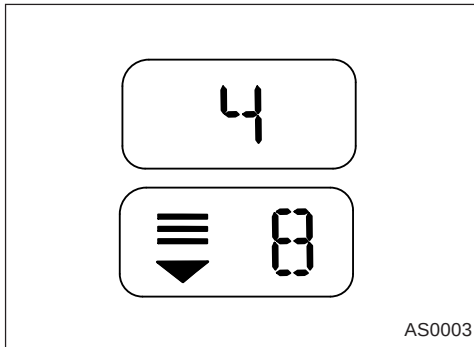
This displays shows the currently selected gear, neutral position, possible downshift, and error details.

1) In automatic mode

- Four bars and up/down arrow marks->Automatic mode
- 4: Currently 4th gear selected



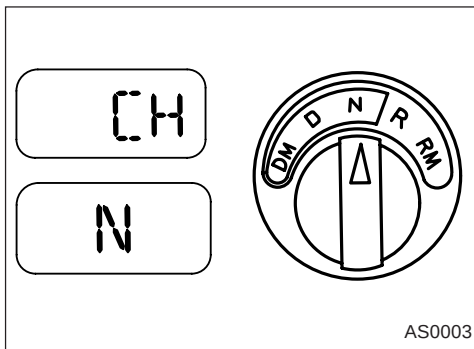
1-102 HOW TO HANDLE THE VEHICLE



2) In manual mode

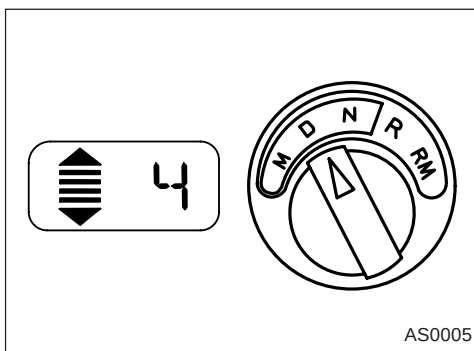
- 4: Currently 4th gear selected
- Three bars, one down arrow mark and number 8: possible to downshift to 5th gear from 8th gear (one bar corresponds to 1 gear)

4) Driving instruction



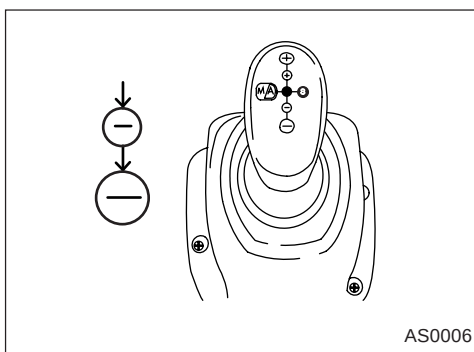
(1) How to start engine

- 1) Apply the parking brake.
- 2) Place the rotary switch to the "N" position
- 3) Turn the ignition switch to the "ON" position
- 4) The system is self-diagnosed.
(The display shows "CH")
- 5) The engine is started and running
- 6) As the system diagnose is completed, the display shows "N"



(2) Preparing to drive off forward

- 1) Start the engine
- 2) Place the rotary switch from the "N"
- 3) To the "D" position
- 4) The automatic mode is activated
- 5) The starting gear is automatically selected and is shown on the display (example: 4th gear automatic).
- 6) Release the parking brake and apply the accelerator pedal to drive off.

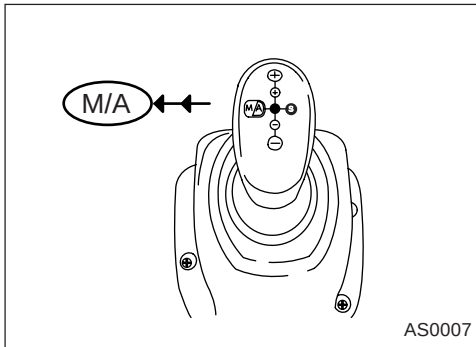


(3) Selecting starting gear

Automatically selected start gear can be changed manually.

How to : Lower the tip lever to "-" to display all the possible start gears on the display.

HOW TO HANDLE THE VEHICLE 1-103

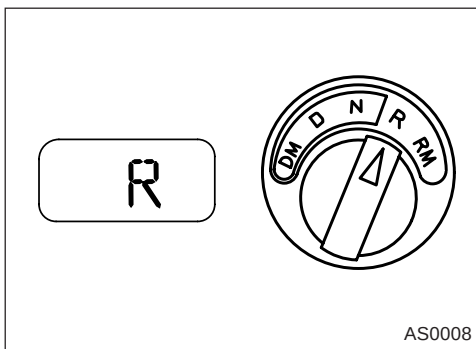


(4) Switching between automatic and manual modes during driving

Pushing the tip lever to the left to switch from the manual mode to the automatic mode or vice versa.

(5) Shifting

- Shifting in automatic mode
In the automatic mode, shifting is automatically performed and the selected gear is shown on the display.



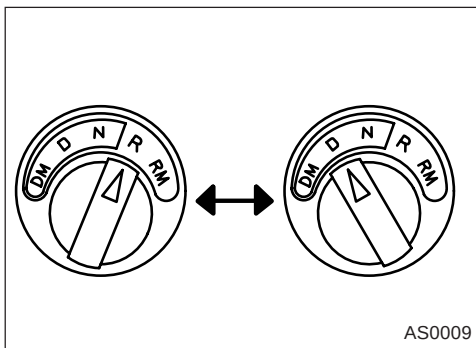
(6) Driving backward

- 1) Stop the vehicle completely
- 2) Place the rotary switch to the "R" position.
- 3) Then, "R" is shown on the display.
- 4) Release the parking brake while depressing the accelerator pedal.
- 5) Then, the vehicle is moving backward.

Note

It is possible to select "R" in advance during driving forward. In this case, the brake pedal should be operated until the vehicle stops completely in order to prevent the vehicle from rolling.

- Switching driving direction
Operate the rotary switch from "R" to "D" or vice versa.



⚠ Caution

- The engine can stop in the following case:
 - If depressing the accelerator and brake pedals simultaneously
 - If the vehicle is rolling down excessively when driving off on a slope with excessive load
 - If braking abruptly (vehicle stopped within 0.3 seconds)
- The AS Tronic vehicle needs time to learn to calculate the vehicle weight in order for the correct shift operation suitable for the current driving condition.
 - In the learning mode, the transmission can be shifted one gear at one time continuously.
 - Unsuitable gear may be selected when driving off.
- The new AS Tronic vehicle model selected the 3rd gear (with load) or 5th gear (without load) for the start gear. (when turning the rotary switch from "N" to "D" after the engine is started)
 - Another gear may be selected according to the change in the load condition. Select the proper start gear in the manual mode according to the load conditions.
- In order to prevent the clutch wear, select a low gear (1st or 2nd) to start off on a hill or unpaved road.

1-104 HOW TO HANDLE THE VEHICLE

(7) Information on display

As long as the display is in normal operation, the display shows the selected speed and gear position. (ex:1-12 or "N", "R")



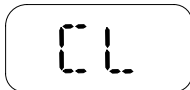
CH : This is displayed when the system is being self-diagnosed or the battery main switch is ON



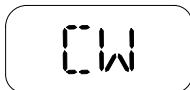
AL : Insufficient air

Note

In case of insufficient air, the neutral gear position can be maintained.



CL : Clutch malfunction -> clutch under excessive load



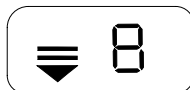
CW : Clutch wear -> clutch replacement schedule notice



Automatic mode : Four bars and 2 up/down arrows indicates the automatic mode



Manual mode : Example) 4th gear engaged



Manual mode : Example) Currently 8th gear engaged.
Shiftable down to 5th gear.



Spanner symbol : System error. Inspection and repair necessary



Spanner and "STOP" marks : immediate repair necessary

Note

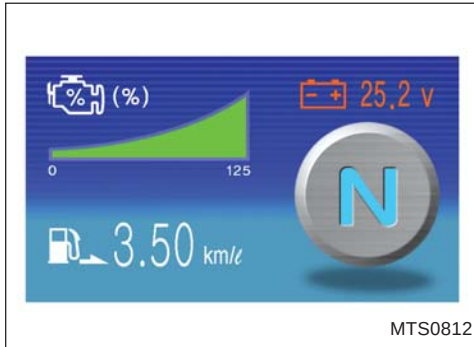
If the spanner symbol disappears after starting the engine in 5 seconds after stopping it, the system is correctly restored and it normally operates.

5) Transmission fluid

Transmission	Fluid	Change interval	Amount(liter)
ZF12AS1930TO ZF12AS2330TO	API GL-4, SAE 80W 90	Every 60,000km	Exchange : 11L Total: 13L
ZF12AS1931TO (equipped with intarder) ZF12AS2331TO (equipped with intarder)			Exchange : 12L Total: 21L

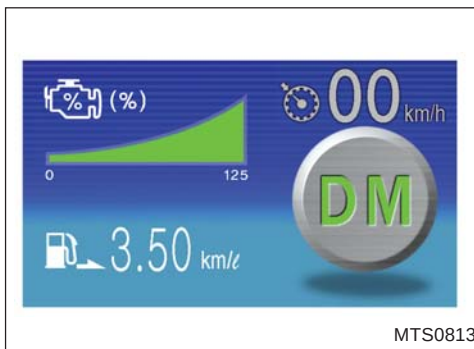
1-106 HOW TO HANDLE THE VEHICLE

6) TFT-LCD display unit for ZF automatic transmission

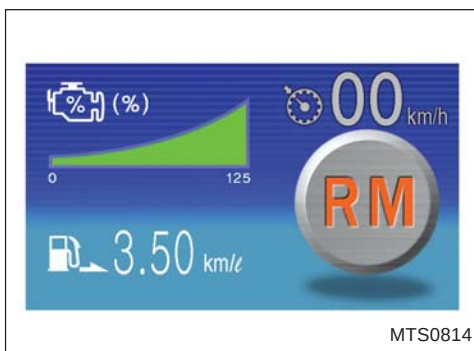


(1) This screen is displayed after the ignition switch is initially turned ON and the engine check warning lamp goes off. It shows the transmission is in neutral.

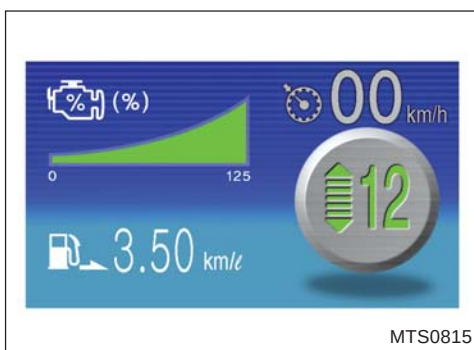
- "N" is displayed after the automatic system check.



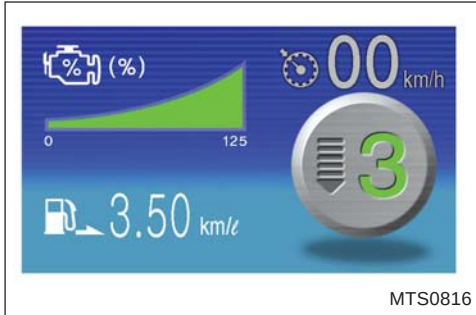
(2) "DM" Display shows that the vehicle can move forward with 1th gear slowly.



(3) "RM" Display shows that the vehicle can move backward with low gear.



(4) This screen shows that the 12th gear is engaged with auto mode display.



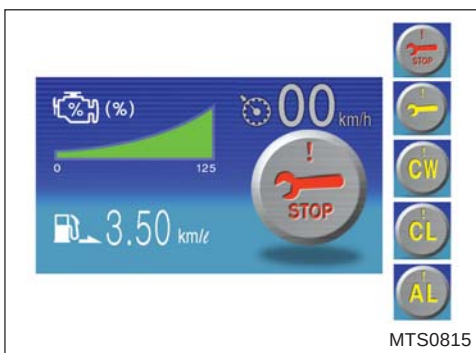
- (5) Manual mode display is 3th gear now. If low gear value is "3", Expressed as left. If low gear value is equaled a current gear, only the singular is expressed.



- (6) Manual mode display is 3th gear now. If low gear value is "2", Expressed as left.



- (7) Manual mode display is 12th gear now. If low gear value is "10", expressed as left.



- (8) This indicates the warning light mode

- 1) Spanner & Stop : Immediate repair
- 2) Spanner : System error, check maintenance
- 3) CW : Wear of clutch -> Notice of change
- 4) CL : Error of clutch
-> Clutch is overworked
- 5) AL : Air insufficient
-> Gear can remain neutral.

Note

Scanner display disappears when restarting the engine after 5 seconds. Continue to use it because the system has been restored to normal

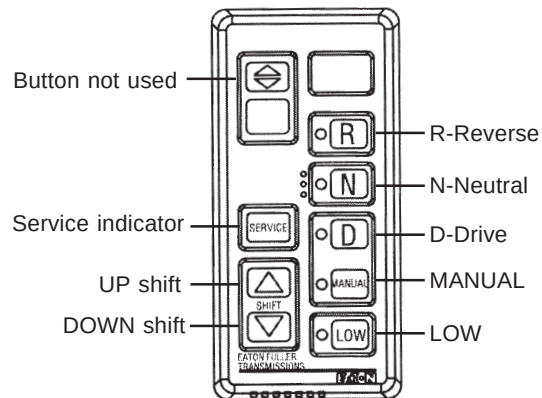
Note

If warning are encountered while stop or driving, screen changes are represented at 2 sec. intervals.

1-108 HOW TO HANDLE THE VEHICLE

2. Operation and handling of FO-18E318B-MXP(Eaton)

1) Shift Console Positions



R	Selects Reverse (see page 4 for more details)
N	Mode used for Start-up and Power- down
D	Selects Drive (see page 5 for more details)
Manual	Selects Manual (see page 6 fr more details)
Low	Selects Low (see page 7 more details)
Service	The service indicator alerts the driver of potential transmission problems.
Up/Down	Used in the MANUAL mode to select upshifts and downshifts
Buttons	and to change start gear, if available.

2) Gear Display

The gear display shows the current gear position of the transmission. The gear display will flash the target gear position of the transmission when in neutral during a shift.



Clutch Abuse

"CA" will appear in the gear display if a clutch abuse event is occurring.



Auto Neutral

"AN" will appear in the gear display if the transmission goes into Auto Neutral.



Grease interval

In heavy-duty Ultrashift PLUS models, "GI" may briefly appear in the gear display after the engine is started. This indicates that the clutch release bearing will need to be greased soon. See "Optional automated lube schedule" section for more information



Product service

A "PS" will appear in the gear display when the transmission is in Pretest service mode. This mode indicates that a service Bay initiated test is in process. These tapes of tests are initiated manually through Eaton's ServiceRanger diagnostic software. The engine will not start while this test is in process.



Product Diagnostic

In the event the transmission is put in Product Diagnostic Mode, a "PD" will be displayed on the gear display, and the truck will not start. Use the following procedure to exit product diagnostic Mode:

1. Select Neutral "N" and turn the key off.
2. Wait at least 2 minutes.
3. Turn the key on and power the system up.
4. Verify there is an "N" on the gear display.
5. Start the engine.



Fault

"F" indicator alerts the driver of potential transmission problems.

3) Start-up and Power down

(1) Start-up

1. Turn the ignition key to "ON" and allow the Fuller^R Ultrashift^R PLUS to power-up
 - Engine cranking is delayed until the transmission power-up is complete and the gear display shows a solid "N".
2. Start the engine
3. Apply service brake.
 - If the service brake is not applied while selecting a starting gear, the initial start gear will not be found and the driver will have to re-select Neutral and press the brake while re-selecting the desired mode.
4. Select the desired mode and starting gear on the shift console.

Note

The transmission will over-ride inappropriate start gear selections to avoid damaging the transmission.

5. Release the vehicle parking brakes.
6. Release service brake and apply accelerator.

1-110 HOW TO HANDLE THE VEHICLE

(2) Power Down

1. Select neutral on the shift control.
 - If gear display does not show solid "N", neutral has not yet been obtained.

Note

Neutral should always be reached before the Fuller ultrashift PLUS power down is performed except in cases of emergency.

2. Set the vehicle parking brakes.
3. Turn off the ignition key and allow the engine to shut down.

(3) Reverse Mode

- Selects default reverse gear(see note*)
- Each time reverse is selected from neutral, the default reverse gear is engaged.
- The vehicle will not engage reverse above 2 mph.
- On multi-speed auxiliary models, R1 to R2 and R3 to R4 shifts will only be made by manually using up and downshift buttons while driving.
- Single-speed auxiliary (10-speed) and medium-duty models have only one reverse speed.

Note

You cannot range shift while moving, but you can split shift while moving if the vehicle is equipped with a multi-speed auxiliary section.

Note

R4 is only available on the Ultrashift PLUS multipurpose extreme performance(MXP) and Ultrashift PLUS vocational extreme performance (VXP) models.

Note

** If you attempt to select a non-neutral mode without depressing the service brakes the transmission will not shift into gear and you will have to return to neutral and depress the brakes before selecting the desired mode again.*

Warning

Launching the vehicle in high range increases the likelihood of clutch abuse, and depending on the level of usage, could have a detrimental impact on clutch life.

HOW TO HANDLE THE VEHICLE 1-111



Fuller Ultrashift PLUS passenger vehicle(PV)

LO Range



Fuller Ultrashift PLUS Linehaul Active Shifting(LAS)

LO Range

Fuller Ultrashift PLUS Multipurpose High Performance(MHP)



**LO Range
LO Split**



**LO Range
HI Split**



**HI Range
LO Split**

Fuller Ultrashift PLUS Vocational construction series(VCS) and
Fuller Ultrashift PLUS Vocational Multipurpose series(VMS)



**LO Range
DR LO**



**LO Range
DR HI**



**HI Range
DR HI**

Fuller Ultrashift PLUS Multipurpose extreme performance(MXP) and
Fuller Ultrashift PLUS Vocational extreme Performance(VXP)



**LO Range
LO Split**



**LO Range
HI Split**



**HI Range
LO Split**



**HI Range
HI Split**

1-112 HOW TO HANDLE THE VEHICLE

(4) Drive Mode

- Automatically selects the start gear (see Note*). The selected start gear will vary depending on several vehicle inputs like load, grade, and axle/transmission ratio. This start gear can be changed by using the up/down buttons, as long as the selection still falls into a gear that would allow the vehicle to launch without allowing the transmission to obtain damage.
- If the start gear is changed using the up/down buttons, it will remain as the default until the vehicle is powered down or the selection is changed with the buttons again.
- Automatically performs all upshifts and downshifts in all gears except 1st (Only on the UltraShift PLUS Vocational Multipurpose Series (VMS) models) and Reverse on all models.
- A shift can be advanced by pressing the up/down buttons when the transmission is near the shift point.
- The transmission may also deny a shift while ascending or descending grades if the load of the vehicle, and grade of the terrain in combination with the drivetrain ratio and engine torque will fall outside of the acceptable range to perform a shift. If the shift is denied it will sound a tone.

Note

Prior to ascending a steep grade you should reduce your default start gear by one or ensure you apply full throttle for the duration of the grade so the vehicle maintains the proper engine and vehicle speed during the entire grade. You can button down by using the down arrow on the shift lever.

Note

**If you attempt to select a non-neutral mode without depressing the service brakes the transmission will not shift into gear and you will have to return to Neutral and depress the brakes before selecting the desired mode again.*

Note

If you depress and hold both pedals (even if done accidentally) the launch will be abrupt and the engine and brake forces may rock and bounce the vehicle. Releasing either pedal will stop this immediately.

(5) Manual Mode

MANUAL mode should be used whenever the driver wants to select the shifts instead of letting UltraShift select them automatically. For example, when the driver is moving around the yard, over railroad tracks, or on steep grades.

- Driver manually selects the start gear and uses the up/down buttons to shift (see Note *).
- System holds current gear unless otherwise prompted by using up / down-shift buttons, except for the "Transmission Override" conditions noted below.
- The system will automatically shift or inhibit shifts to prevent overspeed or under-speed of the engine.
- The transmission may also deny a shift while ascending or descending grades if the load of the vehicle, and grade of the terrain in combination with the drivetrain ratio and engine torque will fall outside of the acceptable range to perform a shift. If the shift is denied it will sound a tone.

(6) Transmission Manual Override:

- If the vehicle is being back driven and the engine is approaching a higher than normal level, the transmission system will override the MANUAL position and perform and upshift.
- If the start gear is changed and it causes the engine to lug at takeoff, the transmission system will override the MANUAL position and select the best available gear.

Note

**If you attempt to select a non-neutral mode without depressing the service brakes the transmission will not shift into gear and you will have to return to Neutral and depress the brakes before selecting the desired mode again.*

Note

If you depress and hold both pedals (even if done accidentally) the launch will be abrupt and the engine and brake forces may rock and bounce the vehicle. Releasing either pedal will stop this immediately.

(7) Low Mode

LOW mode should be used any time you want to maximize engine braking and minimize the use of the brake pedal. For example, when driving down long grades or when coming to a stop.

- Selects lowest available gear for start gear. (see Note *). The starting gear cannot be changed in LOW mode.
- If LOW is selected while moving, the transmission will not upshift (except for the Transmission Override conditions noted below). The transmission system will downshift at the earliest opportunity to provide maximum engine braking.

(8) Transmission Low Override:

- If the vehicle is being back driven and the engine is approaching a higher than normal level, the transmission system will override the MANUAL position and perform and upshift.

Note

LOW is the only means to achieve the curbing gear or 1st on the UltraShift PLUS Vocational Multipurpose Series (VMS) mixer models.

Note

**If you attempt to select a non-neutral mode without depressing the service brakes the transmission will not shift into gear and you will have to return to Neutral and depress the brakes before selecting the desired mode again.*

Note

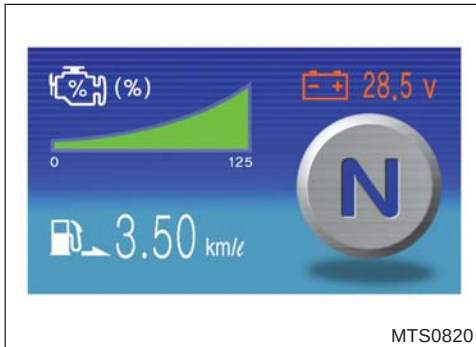
If you depress and hold both pedals (even if done accidentally) the launch will be abrupt and the engine and brake forces may rock and bounce the vehicle. Releasing either pedal will stop this immediately.

1-114 HOW TO HANDLE THE VEHICLE

4) Transmission fluid

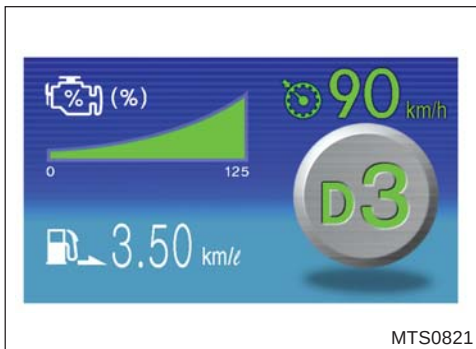
Transmission	Fluid	Change interval	Amount(liter)
FO-18E318B-MXP	SAE 50	Every 800,000km or 5 years (Vehicles off-road driving : Every 288,000km or 3 years)	Exchange : 13.2L Total: 14.2L

5) TFT-LCD display unit for eaton automatic transmission

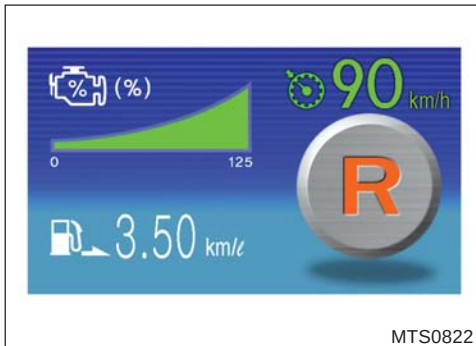


- (1) This screen is displayed after the ignition switch is initially turned ON and the engine check warning lamp goes off. It shows the transmission is in neutral.

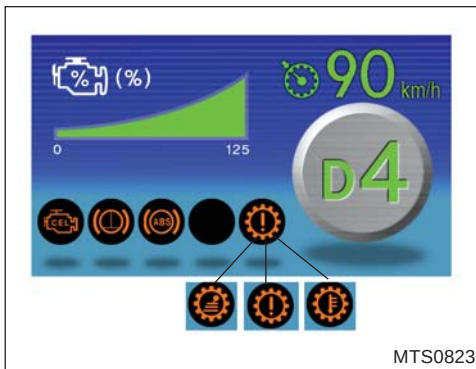
- "N" is displayed after the automatic system check.



- (2) This screen is displayed when the 3rd gear is engaged in the automatic mode.



- (3) This screen shows that the reverse gear is engaged and the vehicle can move backward.



- (4) This screen shows the warning lamps.

- 1) Transmission range inhibitor warning lamp
 - This is displayed when the transmission cannot be shifted.
- 2) Check automatic transmission warning lamp
 - If this lamp is displayed during driving, malfunction in a part related to the automatic transmission is occurred.
- 3) High transmission fluid temperature warning lamp
 - This lamp is displayed and the ECU prevents high gear operation when the temperature of the transmission fluid in the tank reaches 250°F(121°C).

1-116 HOW TO HANDLE THE VEHICLE

3. Operation and handling of Allison

1) Range Selector



⚠ Warning

If you leave the vehicle and the engine is running, the vehicle can move suddenly and you or others could be injured. If you must leave the engine running, do not leave the vehicle until you have completed all of the following procedures:

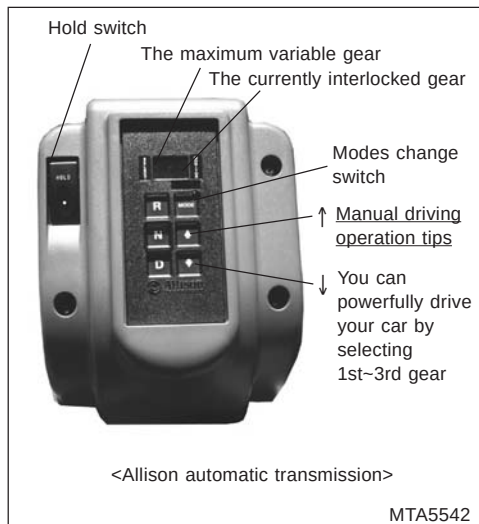
- *Put the transmission in N(Neutral)*
- *Ensure that the engine is at low idle(500–800rpm)*
- *Apply the parking brake and emergency brakes and make sure they are properly engaged.*
- *Chock the wheels and take any other steps necessary to keep the vehicle from moving.*

R	Completely stop the vehicle and let the engine return to idle before shifting from a forward range to Reverse or from Reverse to a forward range. The digital display will display R When Reverse is selected.
N	Use Neutral when you start the engine, to check vehicle accessories, and for extended periods of engine idle operation(longer than five minutes). For vehicles equipped with the pushbutton selector, Neutral is selected by the ECU at startup. For vehicles equipped with the lever selector, the vehicle will not start unless Neutral has been selected. If the vehicle starts in any range other than Neutral, seek service immediately. Neutral is also used during stationary operation of the power takeoff (if your vehicle is equipped with a PTO). The digital display will show N when Neutral is selected. Always select N(Neutral) before turning off the vehicle engine. ⚠ Caution <i>If gears are disengaged when the vehicle is going downhill, transmission is damaged. Also, if the vehicle is put in neutral, deceleration by exhaust brake or Jake brake is impossible.</i>
D	The transmission will initially attain first range when D(Drive) is selected (Except for those units programmed to start in second range). As vehicle speed increase, the transmission will upshift automatically through each range. As the vehicle slows, the transmission will downshift automatically through each range. The digital display will show the highest range available in D(Drive).
7 6 5 4 3 2	Occasionally, road conditions, load, or traffic conditions will make it desirable to restrict automatic shifting to a lower range. Lower ranges provide greater engine braking for going downgrades(The lower the range, the greater the braking effect). The pushbutton selector utilizes arrow buttons to select individual forward ranges. Push the ↑ (up) or ↓ (down) arrow to the desired range. The digital display will show your choice of range. Even though a lower range was selected, the transmission may not downshift until vehicle speed is reduced(this prevents excessive engine speed in the lower range).
1	Use this range when pulling through mud and deep snow, when maneuvering in tight spaces, or while driving up or downgrades. First-range provides the vehicle with its maximum driving torque and maximum engine braking effect. For vehicles equipped with the pushbutton selector, push the ↓ (Down) arrow until first-range appears in the select window.

Note

The transmission of your vehicle has a HOLD function, which prohibits transmission from being shifted to the higher gear which exceeds fixed range. However, when the vehicle is going downhill, transmission is automatically shifted to high gear in order to protect engine if engine speed exceeds the maximum allowed RPM.

HOW TO HANDLE THE VEHICLE 1-117



- MODES CHANGE switch is a mode for more economical driving and therefore use this mode restrictively when unloaded or lightly loaded.
- If MODES CHANGE switch is pressed, red color lamp will be turned on and changed to fuel-saving mode.
- When going up a hilly road, select the low gear you desire by press “↓” button, which allows you a powerful driving. If you feel that 3rd or 2nd gear does not make sufficient power, press “↓” button additionally so that you can drive your vehicle with 1st gear.

⚠ Caution

If a trouble comes up while driving, red color lamp can be turned on by cases. In this case, have your vehicle checked and serviced at our service station nearby as soon as possible.

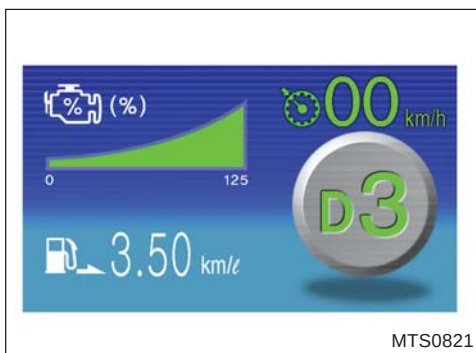
1-118 HOW TO HANDLE THE VEHICLE

2) TFT-LCD display unit for Allison automatic transmission



(1) This screen is displayed after the ignition switch is initially turned ON and the engine check warning lamp goes off. It shows the transmission is in neutral.

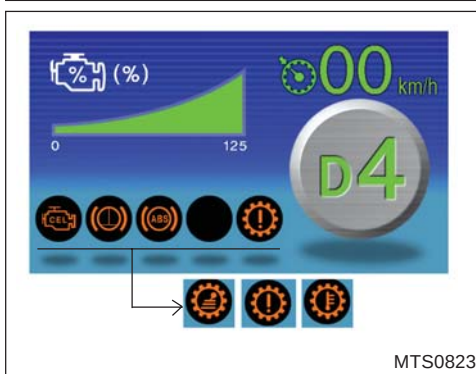
- "N" is displayed after the automatic system check.



(2) This screen is displayed when the 3rd gear is engaged in the automatic mode.



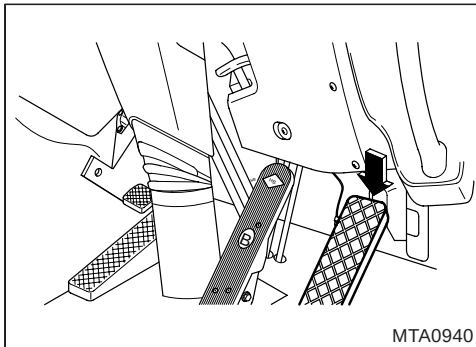
(3) This screen shows that the reverse gear is engaged and the vehicle can move backward.



(4) This screen shows the warning lamps.

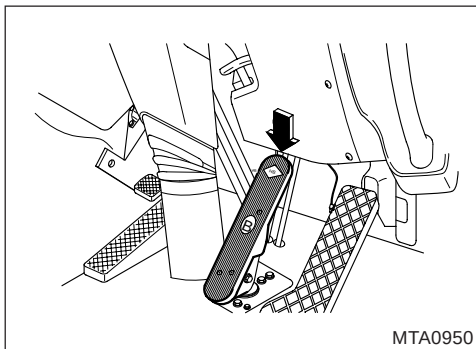
- 1) Transmission range inhibitor warning lamp
 - This is displayed when the transmission cannot be shifted.
- 2) Check automatic transmission warning lamp
 - If this lamp is displayed during driving, malfunction in a part related to the automatic transmission is occurred.
- 3) High transmission fluid temperature warning lamp
 - This lamp is displayed and the ECU prevents high gear operation when the temperature of the transmission fluid in the tank reaches 250°F(121°C).

HOW TO HANDLE THE VEHICLE 1-119



- **Accelerator pedal**

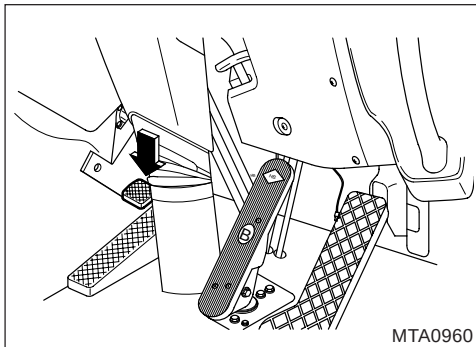
To avoid unnecessary increase in fuel consumption, the accelerator pedal should be operated smoothly and reasonably. Make sure that injection pump lever reaches maximum speed stopper when pressing accelerator pedal fully. If the lever won't reach the stopper, use accelerator pedal cable adjusting nut to adjust the cable length.



- **Brake pedal**

When stopping your vehicle, do not press the pedal forcibly but try to press it repeatedly. On a downhill, use this pedal together with exhaust brake as required.

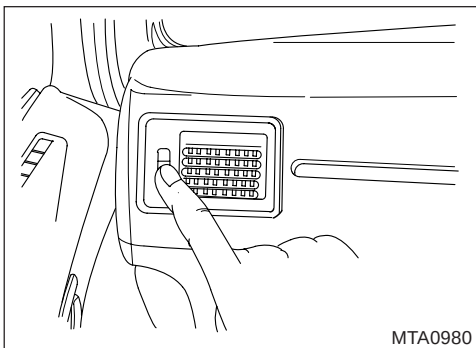
Even one air line of brake have a defect, another air line is normal. Therefore, press the pedal more strong. And, braking distance become longer.



- **Clutch pedal**

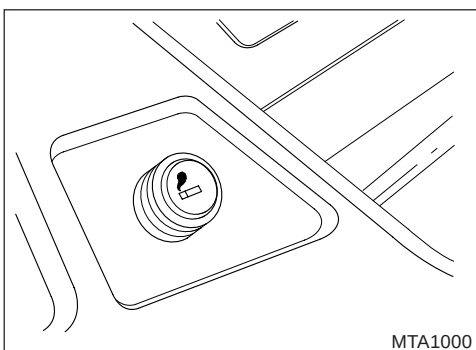
Fully depress the clutch pedal when changing gears. Do not rest your foot on the pedal when the clutch is not in use. Premature wear of the clutch will result.

1-120 HOW TO HANDLE THE VEHICLE



- **Vents**

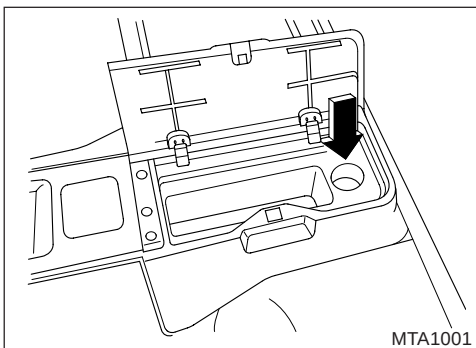
Outdoor air can be directed into the cab through these vents. Airflow and air direction can be adjusted as desired.



- **Cigarette lighter**

Push in this lighter and wait about 15 seconds until it is heated, then it will pop out.

If it won't pop out within 20 seconds, pull it back to the original position as it has been faulty. Do not keep pushing it or leave the vehicle without removing it. If overheated, it may cause a fire.

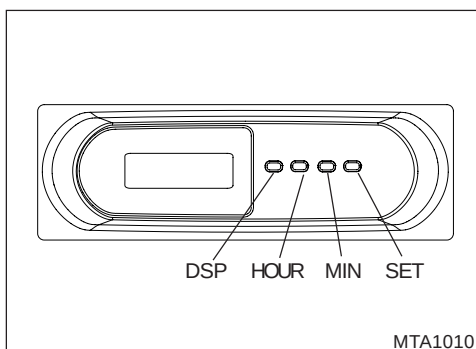


- **Consent(12V)**

Use this consent for other convenience electric appliances.

⚠ Caution

Be sure to switch off these convenience electric appliances when leaving your vehicle, as leaving the vehicle with them in operation and unattended may cause overload resulting in a fire.



- **Digital clock**

In case control digital clock time, set a time by pressing the time control button.

- **SET** : To set correct time, switch that do ZERO SET
- **MIN, HOUR** : Switch that change "Minute", "hour"
- **DSP** : Switch that mark current time during pressing switch in ignition switch "OFF"

Note

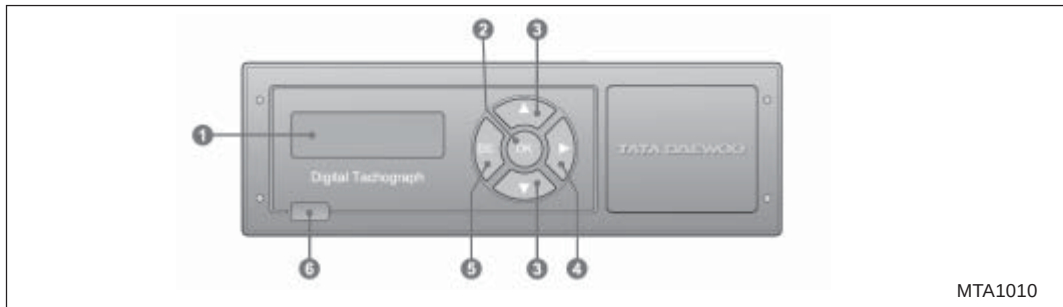
After separate battery, clock or fuse, set time when assembly.

- **Digital Tachograph**

The digital tachograph provides driving information such as driving speed, distance and hour.

Note

Please refer to the attached digital tachograph owner's manual for details.



MTA1010

(1) Display/Button lamp

Graphic LCD of 122x32 dots is used. Some areas display symbols to show the system state of the system or messages.

(2) OK Button



- If you want to enter the setup menu or other menus, press the OK button and hold it for a while (1 second or longer).
- 'Select' or 'Save' functions can be performed in all of menu states.

(3) Button



- The cursor will move up or down in the menu bar.
- If you press and hold the button for a second, it starts counting at every 300 ms interval continuously. If you release the button, it stops counting.
- When changing values, you may increase or decrease values with these buttons.
- If it reaches the highest value or the lowest value, it begins to recounting.
- If you hold the  button for a long time (1 second or longer) on the initial screen, the driver's name and ID saved in USB will be saved in the Digital Tachograph.
- If you hold the  button for a long time (1 second or longer) on the initial screen, you may go to the download menu to download driving records.

4) Button



- If you press this button, the cursor will move to the next digit in the menu bar
- If you press it even after the cursor reaches farthest to the right, it will move to farthest to left.
- If you press and hold the button for a while (1 second or longer) at the initial screen state, you may set the screen displayed on the initial screen.
- The driver can set the initial screen according to his/her own taste.

1-122 HOW TO HANDLE THE VEHICLE

5) ESC Button



- This button is used when canceling the value you have just chosen or moving to the upper menu.

6) USB port



- USB 1.1 series "A" Receptacle Connector shall be used to download driving records and the structure of the connector shall satisfy USB 1.1 standard.

Caution

When using USB memory stick, do not use uncertified products because they may not be compatible.

Caution

Since this product is recording driving information during the operation of the vehicle, all of the above buttons do not work and you can not access to any menu while driving.

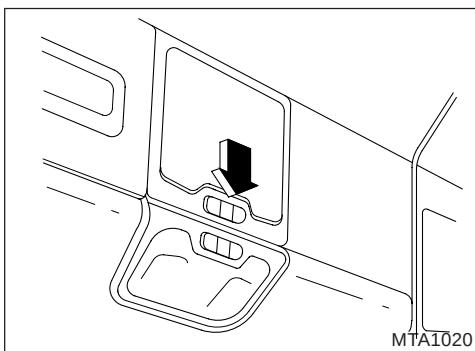


• **GPS Antenna**

The moving path of your vehicle can be checked by using GPS data information. You can check the information of each driving section such as start and end time of driving, driving mileage, driving speed per time (maximum, minimum, and average), idle speed, and etc.

Caution

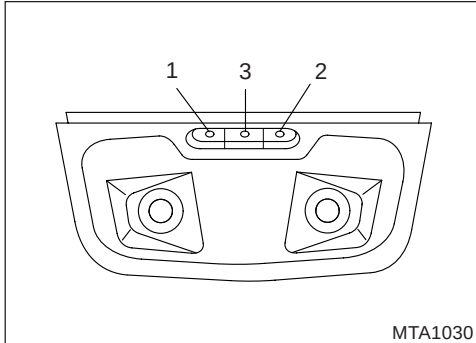
The installation of GPS Antenna is defined by law and thus do not remove it on your own discretion.



• **Fluorescent room lamp**

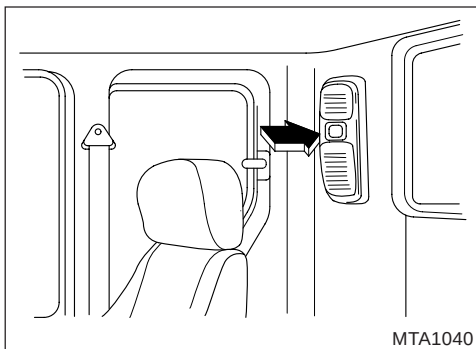
Press fluorescent room lamp switch to illuminate the vehicle cab. Press again this switch to put out the fluorescent lamp.

HOW TO HANDLE THE VEHICLE 1-123



- **Spot lamps**

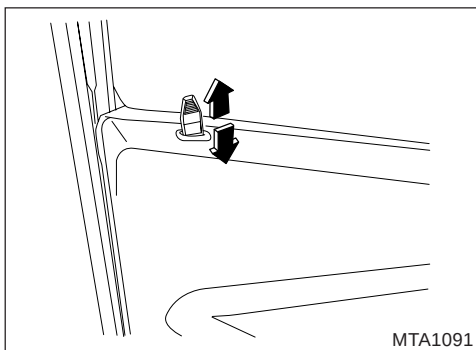
- (1) Left lamp "ON", "OFF"
- (2) Right lamp "ON", "OFF"
- (3) Center lamp "ON", "OFF" (The light is turned on when a door remains open.)



- **Mode and reading lamps**

The mode and reading lamps switch is located at the rear upper side of the cab. It is used to illuminate the cab while in bed.

- ★ mode and reading lamps can be turned on regardless of starter switch position, i.e., "ON" or "OFF".

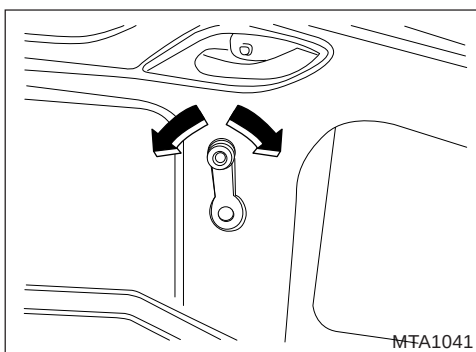


- **Door**

- (1) Using the starter key, open and close the door on the driver's seat side or the fellow driver's seat side.
- (2) Pressing the door lock button up and down, open and close each door.

⚠ Caution

Ensure that all the doors are closed firmly before travel. If any door is opened during travel, danger will follow.



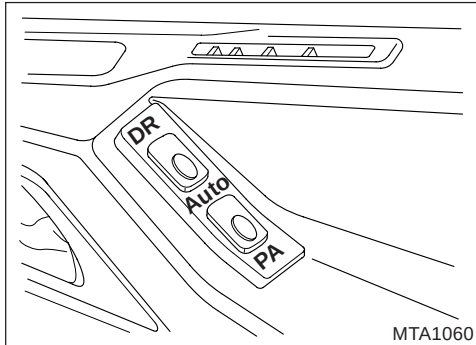
- **When opening and closing door window**

Turning a door handle, open and close the appropriate door window.

⚠ Caution

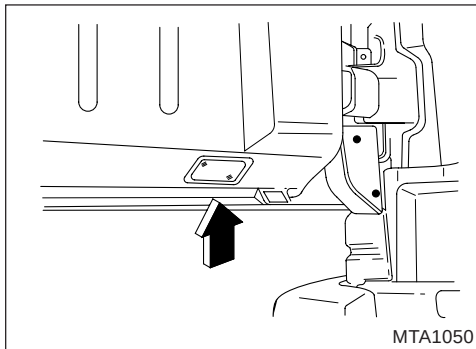
When closing a door window, exercise care so that your hand or head is not caught in it.

1-124 HOW TO HANDLE THE VEHICLE



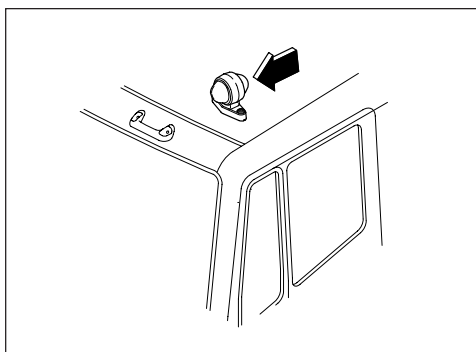
- **Power window switches(one touch)**

These switches can open or close side windows. Once either switch is pressed, the corresponding side window is completely opened or closed. While pressing a switch, adjust the position of the corresponding window as desired.



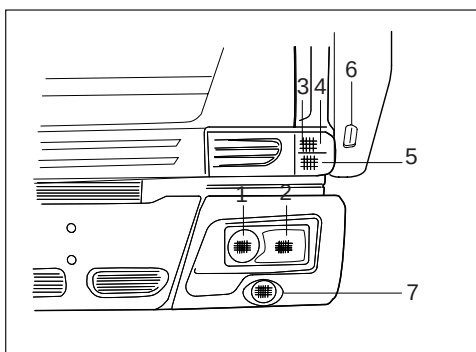
- **Step lamp**

When opening the driver side door, the step lamp equipped on the lower face of the door is turned on.



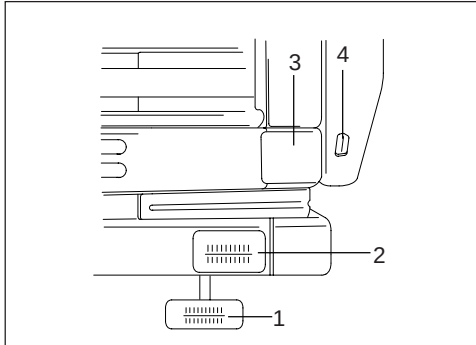
- **End-outline marker lamp**

It shall be fitted near to the extreme outer edge and as close as possible to the top of the vehicle and intended to indicate clearly the vehicle's overall width.

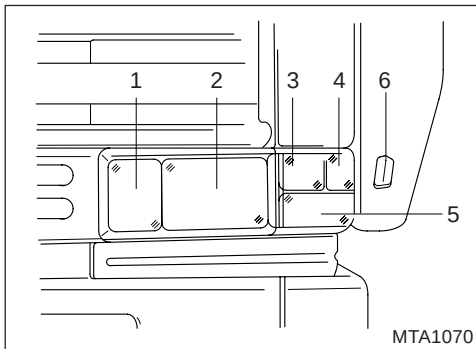


- **Front lamp(A type)**

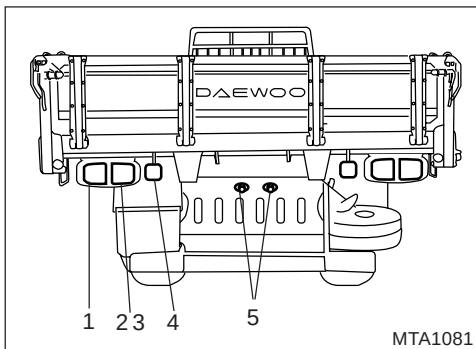
- (1) Head lamp(High)
- (2) Head lamp(Low)
- (3) Turn signal lamp
- (4) Parking lamp
- (5) Position lamp
- (6) Sub turn signal lamp
- (7) Fog lamp



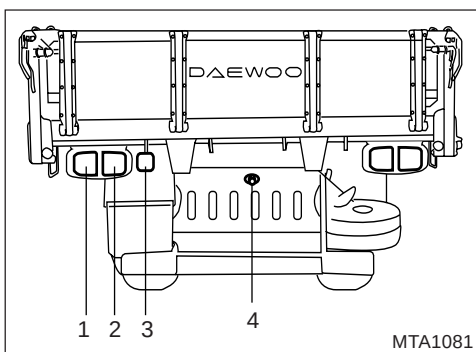
- **Front lamp(B type)**
 - (1) Fog lamp
 - (2) Head lamp
 - (3) Turn signal lamp
 - (4) Sub turn signal lamp



- **Front lamp(C type)**
 - (1) Fog lamp
 - (2) Head lamp
 - (3) Turn signal lamp
 - (4) Parking lamp
 - (5) Clearance lamp and cornering lamp
 - (6) Sub turn signal lamp

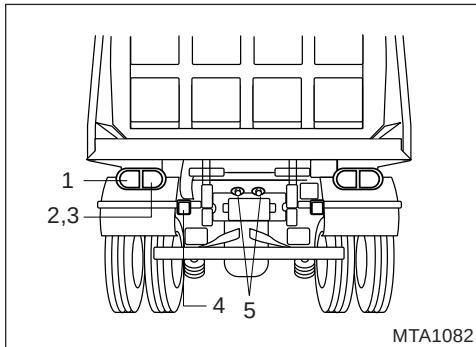


- **Rear lamp(cargo-A type)**
 - (1) Turn signal lamp
 - (2) Stop/Clearance lamp
 - (3) Parking lamp
 - (4) Back up lamp
 - (5) License plate lamp

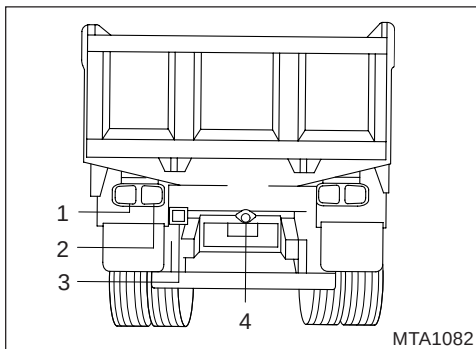


- **Rear lamp(cargo-B type)**
 - (1) Turn signal lamp
 - (2) Parking lamp, clearance lamp, and stop lamp
 - (3) Back up lamp
 - (4) License plate lamp

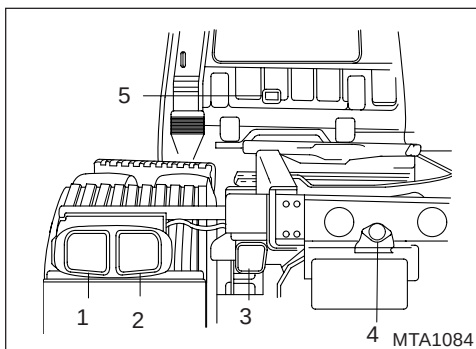
1-126 HOW TO HANDLE THE VEHICLE



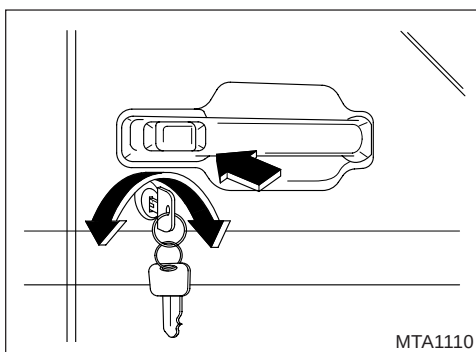
- **Rear lamp**
(8ton/15ton/Rear 3axle dump-A type)
 - (1) Turn signal lamp
 - (2) Stop/Clearance lamp
 - (3) Parking lamp
 - (3) Back up lamp
 - (4) License plate lamp



- **Rear lamp(dump-B type)**
 - (1) Turn signal lamp
 - (2) Parking lamp, clearance lamp, and stop lamp
 - (3) Back up lamp
 - (4) License plate lamp

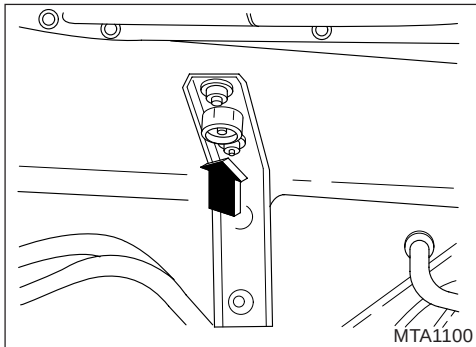


- **Rear lamp(tractor)**
 - (1) Turn signal lamp
 - (2) Parking lamp, clearance lamp, and stop lamp
 - (3) Back up lamp
 - (4) License plate lamp
 - (5) Working lamp



- **Auto door lock switch**
This switch locks or opens both the driver's door and co-driver's door simultaneously.

HOW TO HANDLE THE VEHICLE 1-127

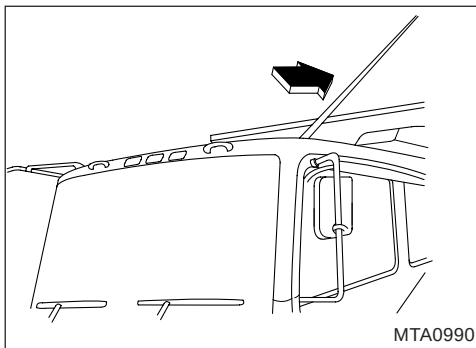


- **Remote starter switch**

This switch can operate the engine when attempting to check the engine with cab tilted,

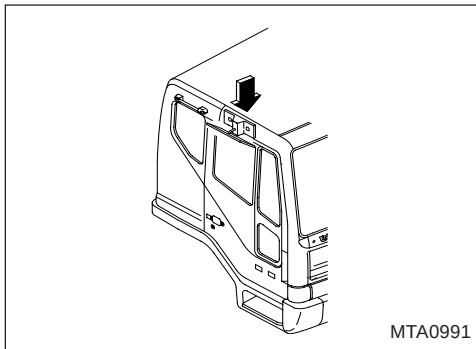
⚠ Caution

Before using this switch to start the engine, always be sure to place gearshift lever in neutral position and to apply the parking brake. And also starter key must be positioned "ON".



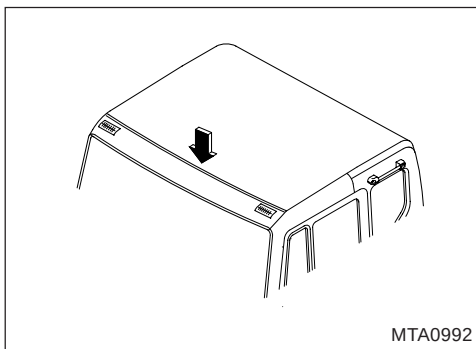
- **Antenna**

Place the antenna as upright as possible to obtain good radio reception.



- **Surveillance rear-view mirror**

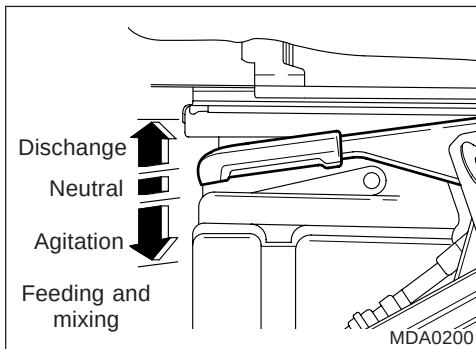
It shall be fitted to the outside of the vehicle in order to provide the field of vision which shall be such that the driver can see a flat horizontal portion of the road along the passenger's side of the vehicle.



- **Sun visor**

It is designed for preventing the dazzling from sun lights coming in front of the vehicle.

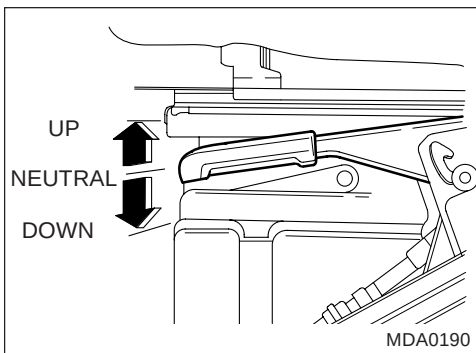
1-128 HOW TO HANDLE THE VEHICLE



- **Mixer drum control lever(Mixer)**

While the mixer truck is running, press down the lever with the lever button fully depressed to prevent discharge of remicon(ready-mix concrete). When discharging remicon, lift the lever.

- Follow the maximum loading capacity(6M³).
- Overload of remicon is against the applicable law and deteriorates the quality of remicon.

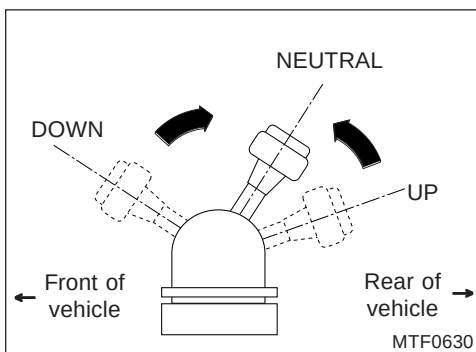


- **Dump control lever**

To raise the deck, press the P.T.O. switch "ON" and then lift the dump control lever. To lower the deck, press down the lever. Always depress fully the lever button while manipulating the lever.

⚠ Caution

- At time of maintenance or when the deck is to be raised for a long time, make sure that the lever in the cab is placed in "UP" and turn off the P.T.O. switch.
- Placing the lever in "NEUTRAL" is used only for stopping the deck momentarily.

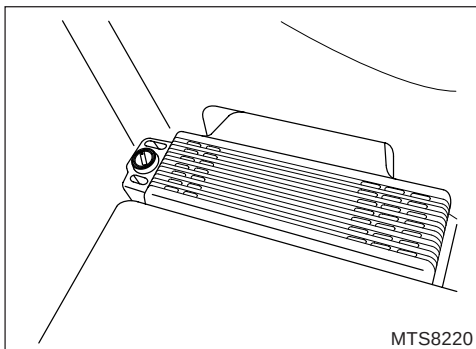
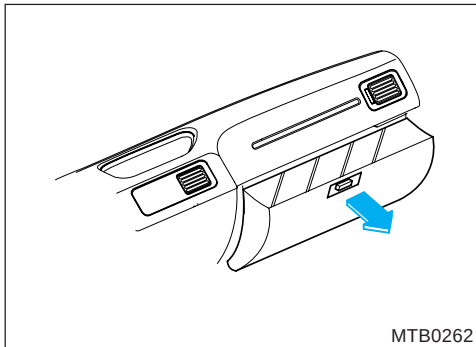


- **Dump control lever(8X4 Dump)**

With the clutch pedal depressed and the PTO switch in the "ON" position, move the dump control lever to the "UP" or "DOWN" position to move the dump deck up and down.

⚠ Caution

1. During servicing or dumping for an extended period of time, place the dump control lever to the "UP" position and the PTO switch to the "OFF" position.
2. Put the dump control lever to the "NEUTRAL" position during driving.



⚠ Warning

In order to avoid fire and injury, comply with following requirements.

- *Installing or repair should not be done on your own discretion. This SHOULD be done by the expert trained by us. Otherwise, it can cause serious injuries and death from suffocation by the leakage of carbon monoxide.*
- *When in the area of inflammables, turn the switch off in order to prevent explosion by air heater.*
- *As the outlet temperature of air heater comes to 130!, keep a safe distance between the heater and thermo sensitive objects or humans, at least 305mm.*
- *Be careful not to block the inlet and outlet mesh of air heater with cloth or fabric and do not get rid of the outlet mesh.*

⚠ Caution

When you fill the tank of your vehicle, turn of the control switch of auxiliary heater. If you fill the tank on condition that the control switch of auxiliary heater is turned on, this can allow air or other substances to run into fuel hose line, which results in a system failure.

• Integrated Control Unit/CAN Control unit/Constant Power supply Check Unit/Intarder ECU Box.

- Integrated Control Unit :

This unit includes wiper int., power window function, power folding mirrors control unit, timer room lamp function, blinker unit function, auto door lock unit function, mirrors heating control unit, CAN communication termination resistance, transmission blocking function.

- CAN control unit :

This unit transmits signals the engine ECU focused on CAN by receiving CRUISE related switch signals.

- Constant Power Supply Check Unit :

This unit provides warning on the dashboard if there is a trouble by monitoring the starter, air heater, and ESS motor actuating power, and if there is a trouble in the air heater or ESS motor, current is cut by the unit.

• Auxiliary Heater(The back of driver's seat)

Without starting the engine, you can operate the heater in the cab. The control switch can be used when you want to turn on & off the auxiliary heater, to set the temperature of the cab (from 10! to 25! of intake port for heating) and to reset forcibly stopped state by system failure. The attached red color LED displays operating condition (LED is turned on constantly), error condition (LED flashes), and error codes.

Note

- *Auxiliary heater is located at the lower part of the bed behind driver's seat, which operated by the control switch.*
- *For further information, refer to the instructional manual for the digital temperature controller of auxiliary heater in diesel vehicles, which is provided separately.*

Note

It takes about 2 minutes to provide warm air to the cab. In case of turning off the heater, the heater will be automatically turned "OFF" after "RUN-DOWN (radiating heat)".

Note

If you turn off and turn on again on condition that the control switch is turned on, EROOR LOCK-OUT function of the control unit starts to operate, which prohibits auxiliary heater from working. In this case, BE SURE to turn off the control switch and back on again.

1-130 HOW TO HANDLE THE VEHICLE

1) Troubles in operation

The possible troubles while controlling the sequence in operation are as follows.

Symptoms	Elapsed time after operating	Probable causes
LED is turned off and failure in operation.	Immediately	Faulty electrical wiring
Revolves slowly but not working	Immediately	Idle control process : Failure in controlling (the desired temperature is lower than the current temperature) or abnormal conditions (the air flowing into the intake port for heating is abnormally high).
The motor revolves momentarily but comes to a standstill shortly.	1	Hot short, disconnection, failure in the control unit of the ignition plug or spark sensor
Stops without "RUN-DOWN"	5	The motor revolves badly or other substances are in the motor.
Under"RUN-DOWN" condition.	1	Failure in sensing spark
Under"RUN-DOWN" condition.	20	The input pressure of the control unit is too low.
Under"RUN-DOWN" condition.	120	Troubles in fuel pump itself or faulty electrical wiring
Under"RUN-DOWN" condition.	40~120	Contact failure of the fuel pump wiring or troubles in thermo limiter
Under"RUN-DOWN" condition.	40~120	Ignition failure : troubles in fuel supply or fan RPM, blocking burner (especially around pilot flame), blocking in intake and exhaust line for combustion), or blocking in heat exchanger or fuel pump not working
"RUN-DOWN"	During combustion	Overheated, low voltage, ,or troubles in the parts (flame sensor, ignition plug, overheating sensor, fuel pump, burner), or failure in fuel supply or blocking in intake and exhaust line for combustion
Stop without "RUN-DOWN"	During combustion	Troubles in fan motor or power supply shutting off
Fuel pump stops working during the operation and starts working again after revolving of fan for 30 seconds at the highest speed.	During combustion	Flame is shut off due to the intermixing of fuel and bubbles or a strong wind blows into exhaust line through exhaust duct, or troubles in sensing flame.

2) Self diagnostic system(Reading flash codes)

A flash code will be generated on the indicator light of the control element. These codes indicate a malfunction and subsequent operational interruption. Regarding malfunction and error code, see section Diagnostic code table

In order to make a correct analysis, it is necessary to understand the flash code event.

The flash code display the control element only.

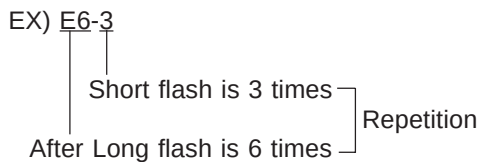
If heater is switch off, flash code not display.

If heater is switch on, display error code.

During the flash code event, first long flash is error group.

Continuing, short flash is malfunction code.

If you want to perceive for error code, check the time and count continuing.



The error code will be repeated by taking a measure, the code will be stored in the control unit memory

⚠ Caution

After any correction of a malfunction, a functional test has to be performed with the heater installed in the vehicle.

⚠ Caution

In surrounding temperature for Heater operating must be below setting temperature of control element.

Diagnostic code table

No	Error Code	Error	Symptom	Check and Correct
1	E0-0	Control circuit Error	Heater trouble	Request maintenance in service center
2	E0-1	Ignition fail	Burner ignition fail	1. Check the fuel level and supplement 2. According to paraffin element in sub-zero temperatures, fuel line is blocked. Check and clean 3. When same error occur, request maintenance in service center
3	E0-2	When driving, flame-out	Burner flame-out	1. Check the fuel level and supplement 2. According to paraffin element in sub-zero temperatures, fuel line is blocked. Check and clean 3. When same error occur, request maintenance in service center
4	E0-4	Premature flame detection	Burner error occur	Request maintenance in service center

1-132 HOW TO HANDLE THE VEHICLE

Dignostic code table

No	Error Code	Error	Symptom	Check and Correct
5	E1-0	Heater overheating detection	Heater overheating	1. Keep the heating air outlet and outlet clear of obstructions 2. When same error occur, request maintenance in service center
6	E1-1	Overheating sensor operation	Heater overheating	Request maintenance in service center
7	E1-3	Fuel refuel fail	Fuel refuel fail	Request maintenance in service center
8	E1-4	electric current error	When control element turn on, Main power resupply	1. After control element off, restart when same error occur. 2. Request maintenance in service center
9	E1-5	Control element trouble	Control element trouble	Request maintenance in service center
10	E1-6	Battery discharge protection	9 hour continuity operation	1. After control element off, restart when same error occur. 2. Request maintenance in service center
11	E3-1 E3-2	Low tension/ overvoltage happen	Battery voltage badness	1. Check battery voltage 2. Check battery recharger and maintenance 3. When same error occur, request maintenance in service center
12	E5-1 E5-2	Flame sensor error	Burner trouble	Request maintenance in service center
13	E6-1 E6-2 E6-3 E6-4	Heater temperature sensor error	Heater temperature sensor trouble	Request maintenance in service center
14	E7-1 E7-2	Fuel pump error	Fuel pump trouble	1. Check fuel pump connector and maintenance 2. When same error occur, request maintenance in service center
15	E8-1 E8-2 E8-3	Fan error	Fan trouble	Request maintenance in service center
16	E9-1 E9-2	glow plug error	glow plug trouble	Request maintenance in service center

Caution

After any correction of a malfunction, a functional test has to be performed with the heater installed in the vehicle.

Caution

In surrounding temperature for heater operating must be below setting temperature of control element

HOW TO HANDLE THE VEHICLE 1-133



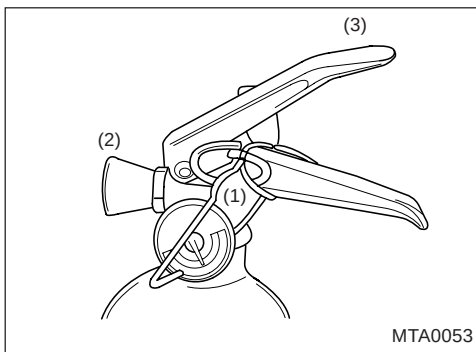
MTA0053

• Fire extinguisher

- Two ABC dry chemical extinguishers are installed at the side of the passenger seat and inside the tool box outside.
- When releasing a fire extinguisher, release it by unfastening the strap (1).

Caution

As a fire extinguisher can be unusable due to solidifying of the contents, release and shake it well periodically.

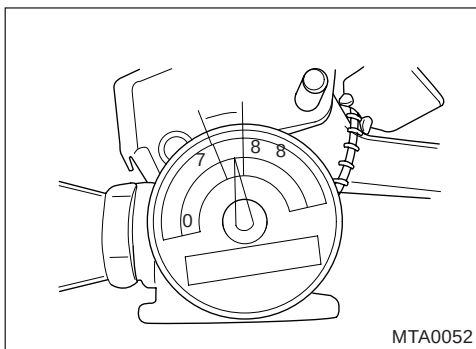


MTA0053

1) Fire extinguisher handling

1. With wind at your back, pull the pin(1) at the top of the extinguisher.
2. Aim the nozzle(2) at the base of the fire.
3. Squeeze the lever(3) slowly and sweep from side to side.

Fire extinguisher	The fire extinguisher in the cab (0.7kg)	The fire extinguisher inside the tool box(1.5kg)
Spraying distance	2~3m	3~4m
Spraying duration	10sec	11sec



MTA0052

2) Check and maintenance of a fire extinguisher

1. More than once a month, check that the indicator of the pressure gauge points to the normal position (green) and in case of loss in pressure or other troubles, have it checked and serviced immediately.
2. The fire extinguisher is in normal operating condition for 5 years under normal conditions and maintenance, and after a five-year lapse, it should be checked by a fire fighting engineer.
3. After the fire extinguisher has been used, completely empty the remaining dry chemical powder(ABC) and then DO recharge it with ABC dry chemical powder.
4. As a fire extinguisher can be unusable due to solidifying of the contents, release and shake it well periodically.

1-134 HOW TO HANDLE THE VEHICLE



IMG6072



IMG6075

- **Air connector**

- Air connector is installed at the lower side of the passenger seat for using air. Clean the driver's seat or its surroundings by connecting air connector. Also, you can use high pressure air tools by connecting to air connector.
- BE SURE to use air connector after starting the engine. Otherwise, you can use it only until the air in air tank will run out.
- As the items provided vary according to vehicle model, the tools you need to use will be purchased separately.

5. SELECTIVE CATALYST REDUCTION SYSTEM ENGINE POWER LIMITING

(1) The procedure of engine power limiting of the vehicle equipped with SCR

- 1) Relevant error code generated -> OBD warning light turned on / off & Check engine warning light(CEL) turned on -> meeting the criteria of power limiting -> power limiting is working
- 2) If urea tank is empty, the engine power is limited regardless of being equipped with NOX sensor in DL08K/DV11K(DOOSAN) engine.

* Engine power limiting condition

– DL08K/DV11K(DOOSAN) engine : 0km/h

(2) The Vehicle equipped with DL08K/DV11K(DOOSAN) engine(SCR)

No	Regulations	OBD warning light turned ON/OFF	Check engine warning light(CEL) turned ON/OFF	Limiting engine power or not	Corrective measures
A	Urea filled in tank is fully consumed.		X	O	Recharge urea
B	Faulty urea is used or devices such as injector are arbitrarily modified in order to reduce urea consumption		X	O	The engine power will be limited within 50 hours and therefore have your vehicle checked and serviced at the service station nearby.
C	Optional catalyst system is arbitrarily removed.		X	O	
D	Technical troubles are found due to the failure in urea injector of optional catalyst system.		X	O	
E	There is a problem in NOX sensor (if equipped with NOX sensor) or the sensor sensing the volume of urea or they are arbitrarily modified or removed.		X	O	
F	There is a problem in the normal operation of other optional circulation systems.		X	O	

Caution

Use only genuine urea and do not add other materials, which results in system failure of exhaust system.

Note

"X" : This means check engine warning light is not turned on.

"O" : This means engine power is limited immediately or within 50 hours if satisfying engine power limiting condition.

1-136 HOW TO HANDLE THE VEHICLE

(3) The procedure of lifting engine power limiting

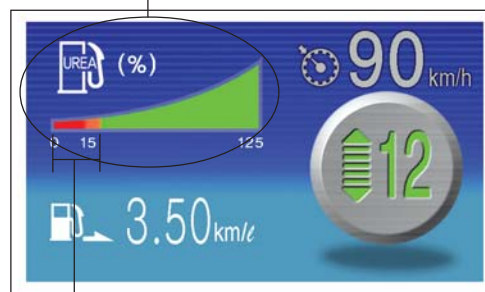
- * DL08K/DV11K(DOOSAN) engine
 - Take measures to the relevant error code -> ECU OK(Error is removed.) -> Normal condition
 - In case of error in dosing valve, take measures to the relevant error code -> ECU OK(Error is removed.) -> Ignition key "OFF" -> Ignition key "ON" -> Normal condition

DRIVER'S PROCESSING METHOD IN CASE OF ON & FLASHING OF UREA RELATED WARNING LIGHT(INDICATOR)

Drive your vehicle on condition that the urea tank is properly charged.

1. Residual displayer of urea in dashboard(TFT-LCD displayer)

Residual displayer of urea



Residual urea level

2. Processing method in case of ON & FLASHING of urea related warning light(indicator)

Urea related warning light(indicator)	DL08K/DV11K(DOOSAN) engine
Urea symbol (White color)	• When residual quantity is over 20%. (Normal) -> Recharge urea if needed.
Urea symbol (Red color)	• When residual quantity is below 20% : warning light ON (CAUTION) • When residual quantity is below 15% : warning light FLASHING (DANGER) -> Recharge urea.
OBD warning light (Yellow color)	• When residual quantity is below 7%, this warning light is ON or FLASHING. • In this case, continuous driving without recharging generates engine power limiting. • However, when the troubles related to other SCR system are found, the warning light can be ON. • When normal operating of your vehicle after recharging urea, the warning light is automatically turned off and engine power limiting is lifted as well. • If properly recharged, the warning light will be turned off, however, if the warning light is turned on due to other troubles, have you vehicle checked and serviced at the service station nearby.
Residual urea level	• This is a gauge which shows you the current residual urea level. • Residual urea level will be shown when you give a press of ENTER button, which is located at the lower side of dashboard.

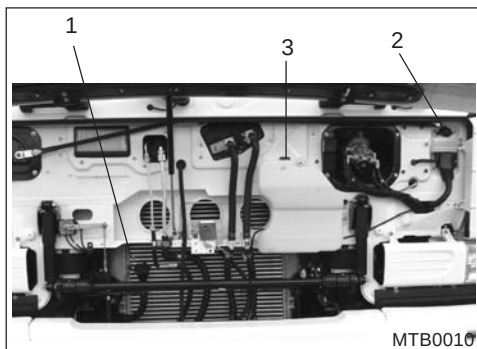
2

DRIVING

1. BEFORE STARTING THE ENGINE
 2. STARTING AND STOPPING THE ENGINE
 3. BEFORE DRIVING OFF
 4. WHEN DRIVING OFF
 5. ECONOMY DRIVING
 6. WHILE TRAVELING
 7. TRAVEL ON HIGHWAY
 8. OPERATION AND CARE IN HOT WEATHER
 9. OPERATION AND CARE IN COLD WEATHER
 10. VEHICLES POSTURE
 11. FRAME WELDING AND HOLE PROCESSING
-

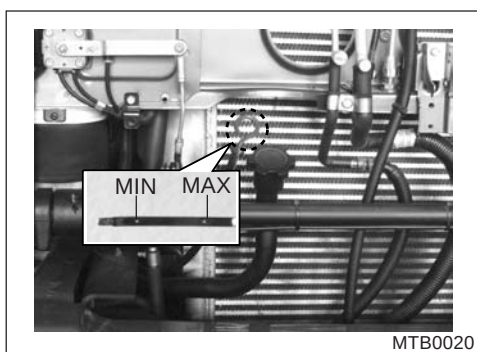
2-2 DRIVING

1. BEFORE STARTING THE ENGINE



1) Check items for the inside of front lid

- (1) Engine oil level
- (2) Clutch fluid level
- (3) Windshield washer fluid level



(1) Engine oil level

1. Pull out the oil level gauge(oil dipstick) to check if the oil tank has been filled up to the specified level.
2. When the oil level is low, add the same brand oil according to "RECOMMENDED LUBRICANTS" and wait a while to check the level again. Also check for purity and viscosity of the oil before replenishing it.
3. Always check the oil level with the vehicle parked on level ground and the engine stopped.

Note

Oil level should be located between Max and Min of oil gauge. If ascend by Min indication Low, supplement oil.

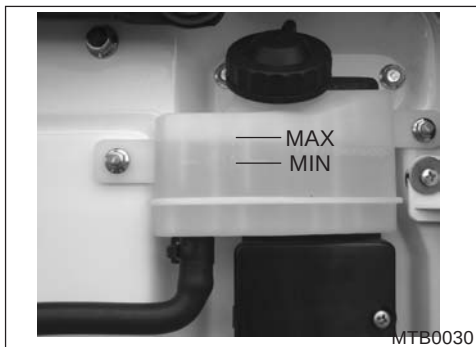
⚠ Caution

If fill oil more than maximum indication, because phenomenon of excessive accumulation like carbon deposit happens to burner causing negative impact in engine, can become cause of engine damage.

⚠ Warning

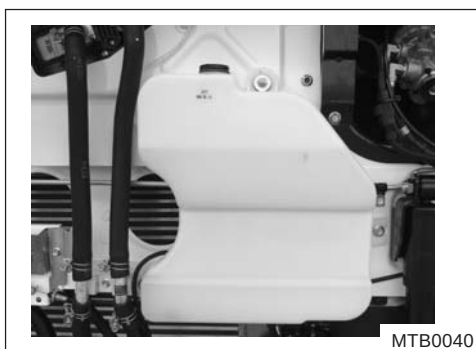
When engine oil check after running, care lest should wound burn because oil and engine parts are high temperature state.

2-4 DRIVING



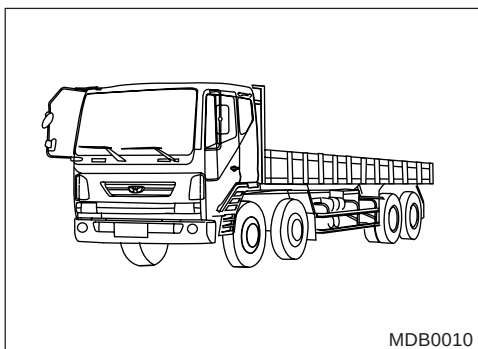
(2) Clutch fluid level

1. Check the clutch fluid tank for fluid level and contamination.
2. If the level of clutch fluid in the tank is too low, replenish up to the MAX mark.
3. Check the clutch fluid tank for fluid leakage.



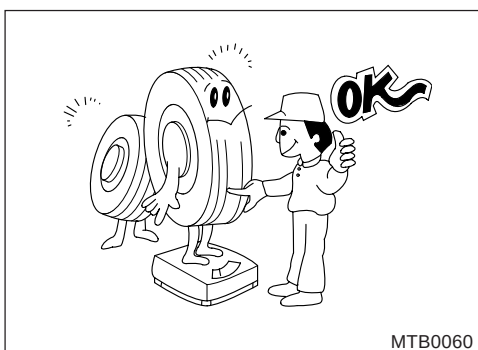
(3) Windshield washer fluid level

Check the fluid level in the tank and replenish as necessary.



2) Check items the outside of vehicle

- (1) Tire
- (2) Spare tire carrier check
- (3) Chassis spring
- (4) Draining of air tank
- (5) Battery
- (6) Power steering fluid level
- (7) Coolant level

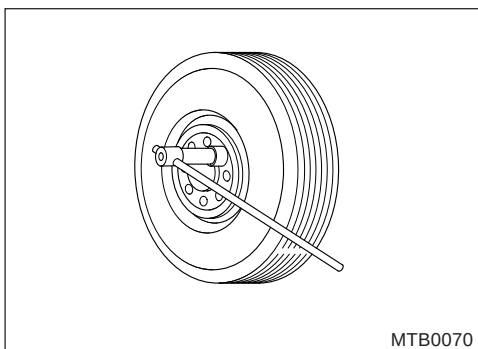


(1) Tire

Check inflation pressure and abrasion of the tires with a tire air gauge for safe driving. Desire to exchange that fit in standard at tire exchange.

Warning

TATA DAEWOO is not liable for any damage caused by the use of tires outside the specifications. Make sure to use tires with the specified size.



Warning

Tighten the wheel nuts to the specified torque after initial 50 to 100km and 1,000km of driving after replacing the tire or purchasing the vehicle. After that, tighten them every 4,000km of driving. Otherwise, the tires may come off, leading to a serious injury or property damage. Especially, for vehicles equipped with an additional modified axle(pushover/tag), make sure to check that the wheel nuts are properly tightened before and after driving.

Caution

Tightening the nuts excessively can damage the wheel pin. Tighten them only to the specified torque. Specified tightening torque for wheel nut-front/rear wheel(10stud type):M22(55~65kg.m)



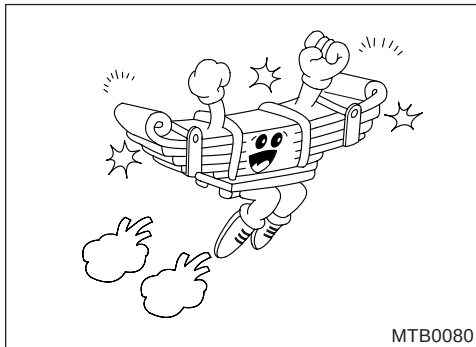
(2) Spare tire carrier check

Check the operation of spare tire carrier every 6 months and apply grease.

Caution

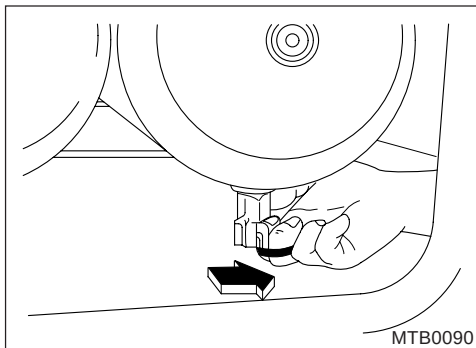
After checking the operation of spare tire carrier, apply grease in order to prevent the solidifying of spare tire carrier.

2-6 DRIVING



(3) Chassis spring

Check chassis springs for damage and tightening condition of "U" bolt.



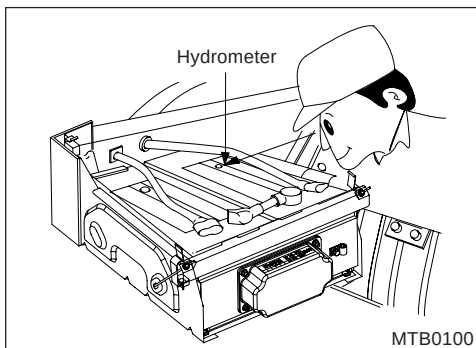
(4) Draining of air tank

From time to time, pull forward the drain cock installed underneath the air tank to drain off condensates produced in it.

★ When opening the drain cock, pull it forward as shown.

⚠ Caution

Water of the tank inside may cause heavy damage to brake system.

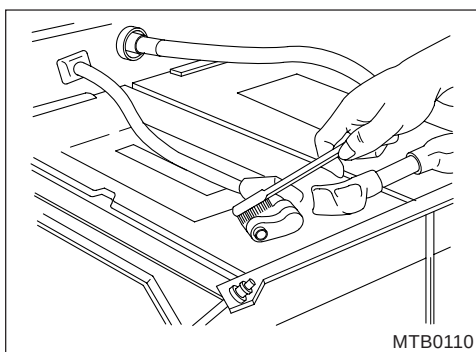


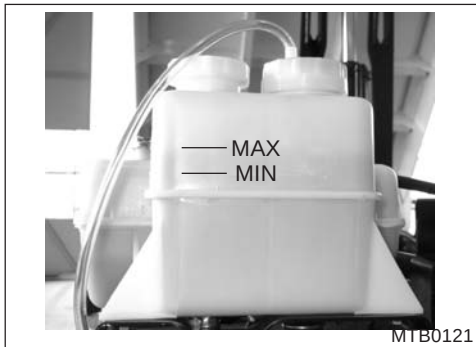
(5) Battery(Semipermanent Maintenance Free Battery)

1. This Maintenance Free Battery needs no periodic maintenance as long as it is used properly.
2. Check the state of charge by the test indicator installed on the face of the battery.

Test indicator	State of charge	Correction
Green	Normal	Use
Black	Low charge level	Recharge
Transparent	Low electrolyte level	Replace

3. If the external part of the battery is found foul, clean it with tepid water. Apply a thin coat of vaseline or grease to the battery terminals to prevent corrosion.



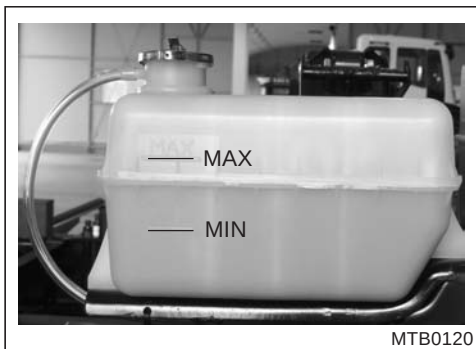


(6) Power steering fluid level

1. Check the fluid level and replenish as necessary.
2. Check the pipe joints for fluid leakage.

⚠ Caution

We strongly urge you to use TATA Daewoo-recommended power steering fluid for replenishment.



(7) Coolant level

The coolant level in the surge tank should be maintained between "MIN" and "MAX" marks. When the coolant level is found to be lower than "MIN" mark, check the cooling system for leaks, and then top it up to the "MAX" mark.

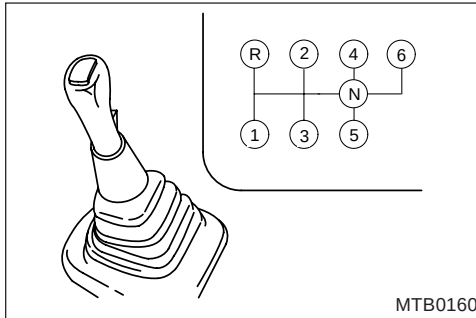
⚠ Caution

1. Do not remove the coolant surge tank cap when the engine and radiator are hot. Scalding hot coolant and steam may be blown out under pressure, which could cause serious injuries.
2. Replenishing the surge tank with cold water abruptly when coolant is hot may affect adversely the cylinder block or cylinder head. Therefore, allow a few minutes for the coolant to cool down before replenishing.

2-8 DRIVING

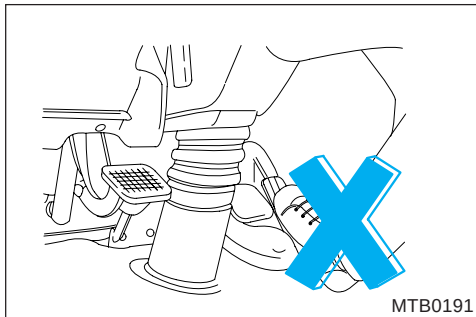
2. STARTING AND STOPPING THE ENGINE

* DL08K, DV11K ENGINES



1) Starting procedure

- (1) Place the shift lever in NEUTRAL and apply the parking brake.



- (2) Do not press the accelerator. If you press the accelerator, ECM does not recognize idling condition.
- (3) Do not press the clutch.

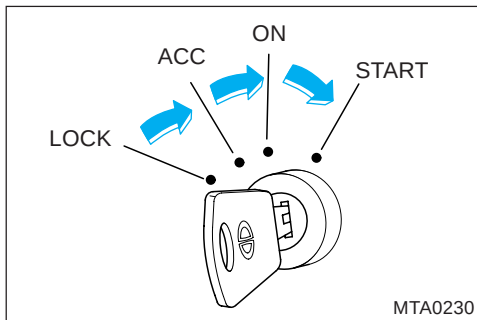
- (4) Turn the ignition key to "ON" position

Note

When starting the engine, the shift lever should be on NEUTRAL position.

⚠ Caution

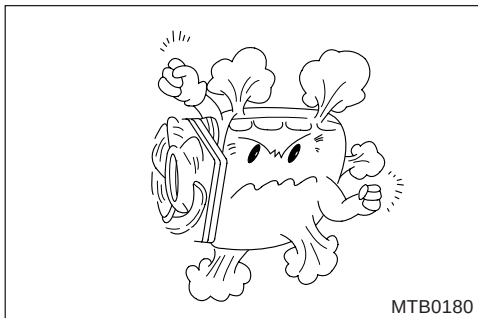
When you place the ignition key on "ON" position, ECU checks the system for 5 seconds and therefore turn the ignition after 5 seconds.



(5) Turn the ignition key to "START" position

⚠ Caution

1. Do not place the ignition key on "START" position for more than 10 seconds. It could damage the starter motor and batteries.
2. If the engine fails to start, wait about 30 seconds before trying again.
3. BE SURE to place the shift lever in NEUTRAL, and apply the parking brake when you start the engine.
4. The idle speed is automatically controlled by ECM according to outside temperature, oil, and coolant temperature and therefore does not need to be adjusted additionally.



⚠ Caution

1. A lengthy idling causes reducing engine life, low fuel-efficiency, and plenty of air pollutants and therefore refrain from unnecessary engine idling.
2. If you race the engine without warming up the engine, this causes damage to the engine life and excessive fuel consumption.

⚠ Warning

Do not stay for a long time with the engine idling under the circumstances of a badly ventilated garage or indoors. You could be gassed to a serious injury or death.

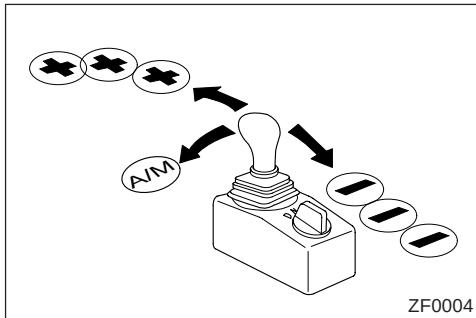
Note

If you start the engine when there is no fuel in the fuel tank, you should expel the air in the fuel supply system. If you do not expel the air, the engine will not start even though the fuel tank is filled.

⚠ Caution

The idling speed could rise to 800~900 RPM when cooling down. As the white smoke emission will be controlled by ECM, do not control the idling speed. (about 20~40 seconds)

2-10 DRIVING



Starting procedure(Automatic transmission vehicle)

- Starting the engine with the ignition key

- 1) Apply the parking brake.
- 2) Start the engine by turning the ignition key to "START" position with pressing the brake and without pressing the accelerator. If the engine fails to start, crank the engine again after placing the ignition key on "LOCK" or "ACC" position for about 10 seconds.
- 3) Check that the shift button is on "N" position.



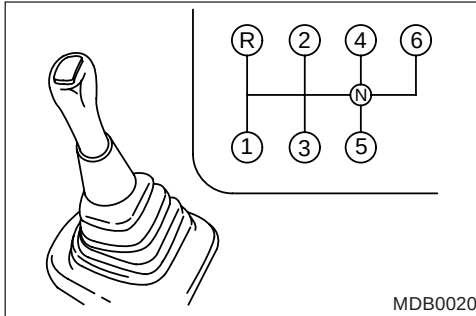
Warning

In case of automatic transmission vehicle, start the engine while pressing the brake and change the shift button to "D" or "R" position while pressing brake before start of your vehicle.

Note

All sorts of vehicles can be started in the "NEUTRAL" position.

* DE08TIS, D1146TI, DE12, DE12TI, DE12TIS, DV15T, DV15TIS, CUMMINS ENGINES

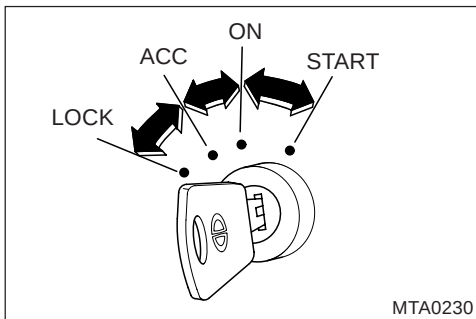


1) Starting the engine

- (1) Apply the parking brake so that the vehicle is not moved and move the gearshift lever to NEUTRAL position.
- (2) Turn the starter key to "ON".

⚠ Caution

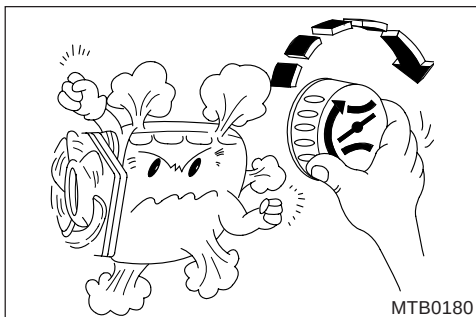
To start the engine, the gearshift lever should be positioned to NEUTRAL.



- (3) Turn the starter key to START position.

⚠ Caution

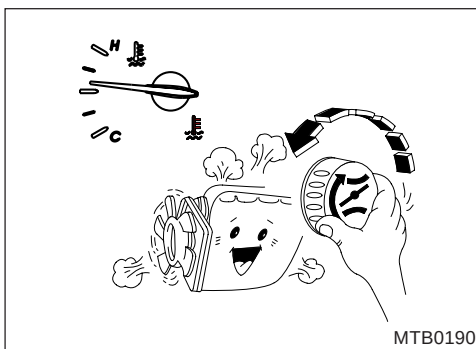
Avoid excessive starter cranking (in excess of 10 seconds) to prevent any possible damage to starter motor or batteries. If the engine fails to start, wait about 30 seconds before again attempting to start your vehicle.



- (4) Use the idle control knob to idle the engine at the normal speed (rpm) until the normal operating temperature is reached.

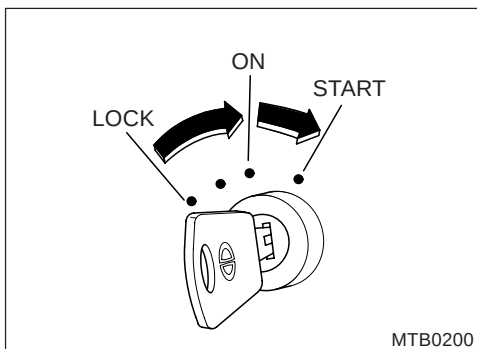
⚠ Caution

1. *Avoid unnecessary idling as prolonged idling may accelerate wear of valves, pistons, and piston rings, shorten engine life, and bring about waste of fuel and a large quantity of air pollutants due to incomplete combustion of fuel. (Idling for heavy trucks: about 10 minute)*
2. *Do not overrun the engine when the normal operating temperature is not yet obtained. This may shorten the engine life and increase fuel consumption.*



- * Take exceptional care to adjust idle speed when the engine temperature is low.
- * If you attempted to start the engine with no fuel in the fuel tank, you should bleed the fuel system. With no bleeding operation, you cannot start the engine even though you refill the fuel tank. (Refer to "Air bleeding of fuel system").

2-12 DRIVING



2) Starting the engine in cold weather

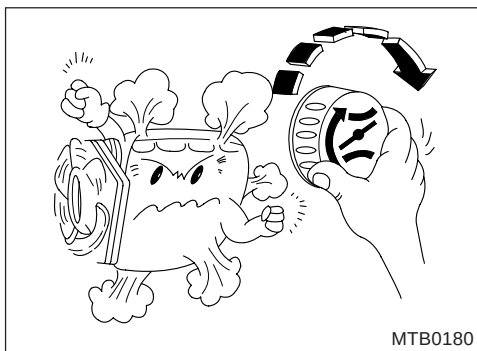
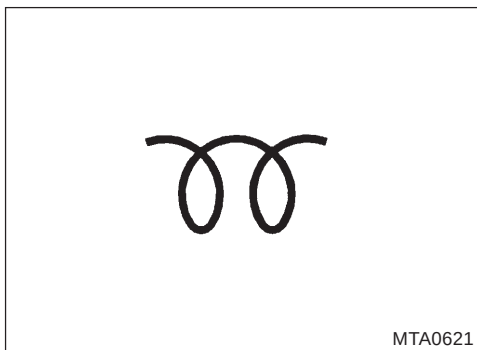
- (1) With the switch in the "ON" position the indicator lamp will light up showing the engine is pre-heated automatically. After pre-heating is completed, the indicator lamp will go out.
- (2) After pre-heating is completed, press the clutch pedal and accelerator pedal to start the engine.
- (3) Use the idle control knob to idle the engine at a moderately fast speed.
Normal idle speed: 550–600 rpm

- (4) Avoid unnecessary idling of the engine when it reaches normal temperature.

⚠ Caution

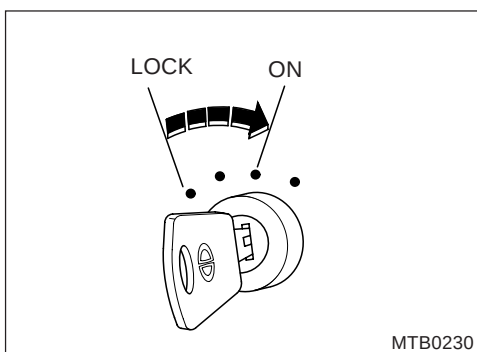
Abrupt start during warming-up operation may shorten the engine life.

- (5) After warming up the engine, bring the idle control knob back to its original position.



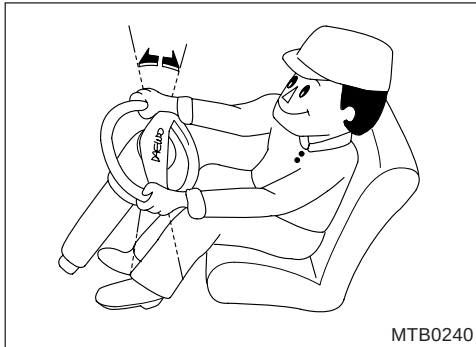
3) Stopping the engine

- ✱ Sudden stopping of the engine with full load or after ascending a slope causes overflow of coolant. In this case, idle the engine for 1 or 2 minutes before stopping it.



- ✱ Diesel engine is apt to keep running even after the starter switch is off. If it continues to run even after the starter switch is off, place the starter key again in "ON" position to start the engine. Otherwise, alternator circuit may fail.

3. BEFORE DRIVING OFF

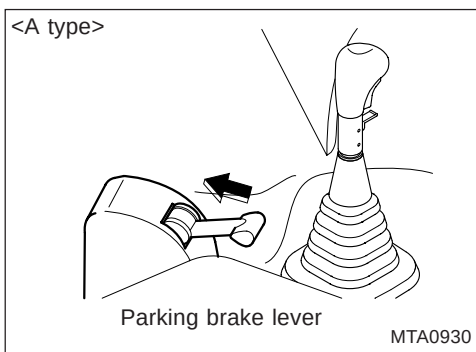


1) Steering wheel free play

Check the amount of the steering wheel free play by gently turning the wheel in both directions. The free play should be within the range of 30~50mm at the periphery of the wheel when checked with the front wheels positioned straight ahead.

⚠ Caution

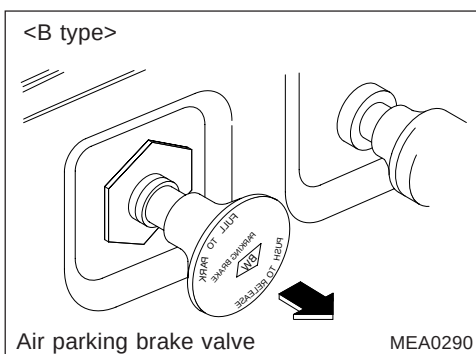
Check steering wheel for free play with the engine running.



2) Parking brake

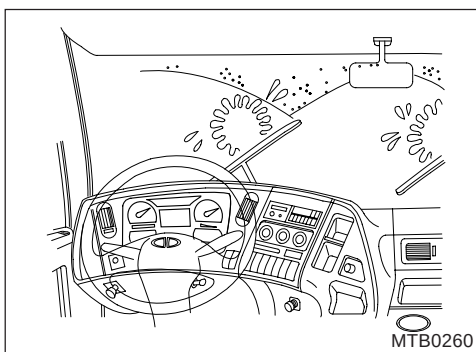
< A Type>

Before driving, manipulate the parking brake lever to check for its motion. If the lever is lowered, the vehicle is in "Driving" condition.



< B Type>

Before travel, manipulate the air parking brake valve to check for its motion. If the valve is pressed, the vehicle is in "Driving" condition.

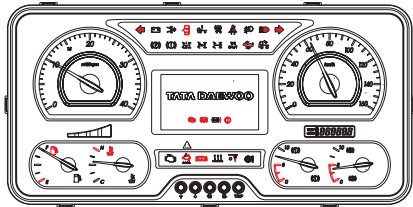


3) Windshield wipers

Check the operation of windshield wipers and keep them clean all the time.

2-14 DRIVING

<A type>

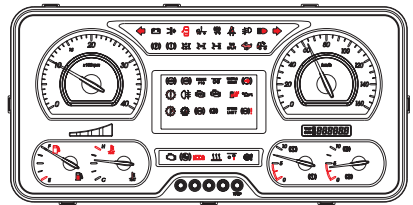


MDA0075

4) Instrument panel and indicator lamps

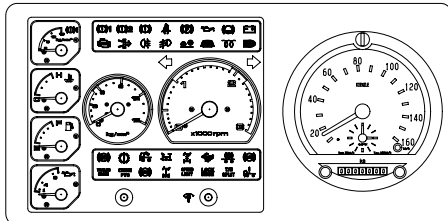
Check the operation of instrument panel, indicator and warning lamps with the starter switch "ON".

<B type>

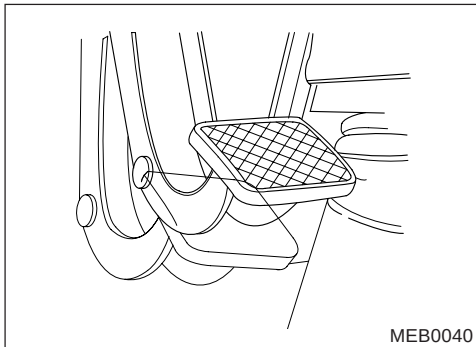


MDA0076

<C type>

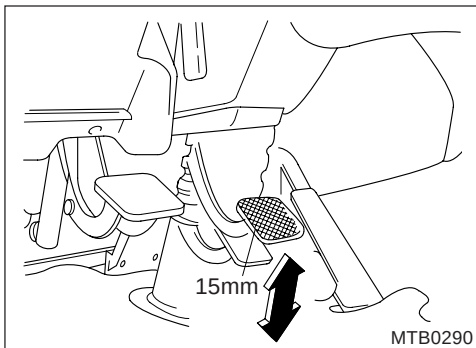


MTD0590



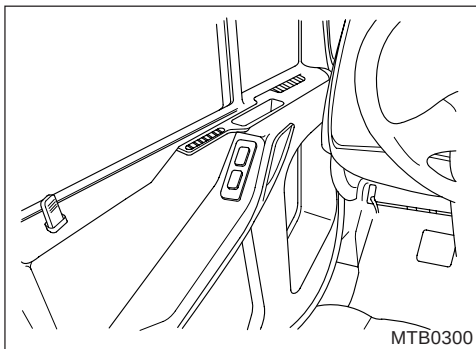
5) Clutch pedal free play

Pedal free play should be within the range of 3~5mm.



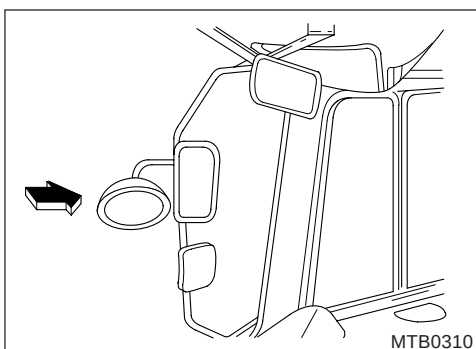
6) Brake pedal free play

Pedal free play should be 15mm. Make brake pedal adjustment by using the adjusting bolt fitted to the pedal. Also check the brake warning lamp switch for its electrical contact.



7) Door lock

Check the operation of door locking mechanism.

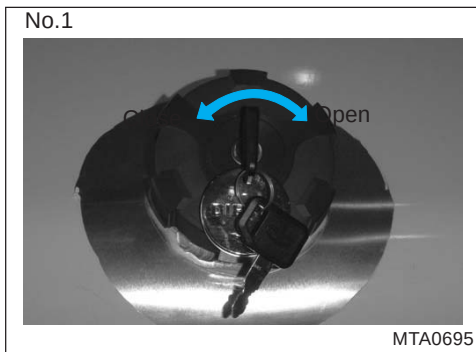


8) Exterior mirrors

Adjust side and under mirrors for best rearward and forward visibility.

Adjust the room mirror to have a clear sight behind the vehicle.

2-16 DRIVING



9) Opening and closing of the fuel cap

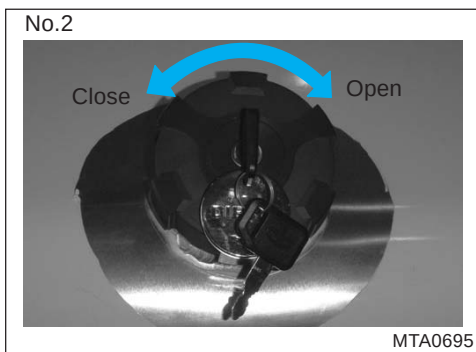
- (1) Stop the engine.
- (2) Turn the fuel cap key clockwise to the end.
- (3) Fill the fuel tank after opening the fuel cap by turning it counterclockwise.

⚠ Caution

Using faulty fuel or improper fuel additive could damage the engine and the devices related to exhaust gases. BE SURE to use proper fuel.

⚠ Caution

If the surface of the vehicle is stained with the fuel, it could be damaged and therefore rinse the surface with cold water.



- (4) After filling the fuel tank, close it by turning the fuel cap clockwise.
- (5) BE SURE to put out the fuel cap key by turning the key counterclockwise.
- (6) Check whether the fuel cap spins or not. (The cap is in locked condition when the fuel cap spins.)

⚠ Warning

To prevent fire, never have any smoking materials lit in or near the vehicle when you fill the fuel tank.

10) Opening and closing of the urea cap

- (1) Stop the engine.
- (2) Turn the urea cap counterclockwise to the end.

Caution

If your skin is stained with urea, this could cause skin disease. If your skin(or hair) is stained, remove all the stained clothes immediately and rinse your skin with water.

Caution

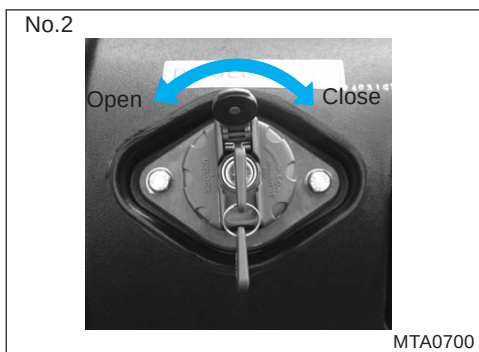
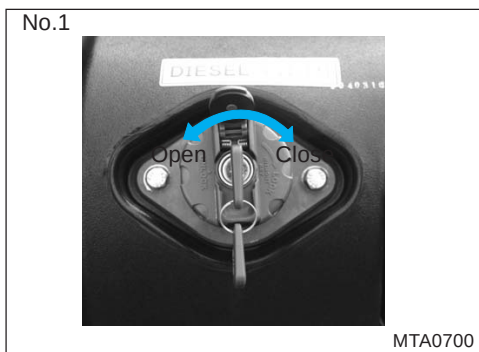
Use only genuine urea when you fill the urea tank. Filling the urea tank with diesel or other additives causes the failure in the exhaust system.

Caution

Do not fill the fuel tank with urea. Filling the fuel tank with urea causes the failure in the fuel system.

Warning

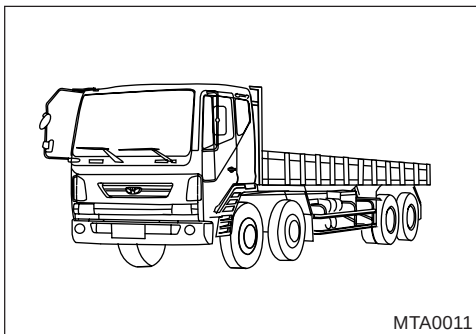
If your vehicle is damaged by not observing the above NOTICES, your vehicle will not be under warranty repair and there will be excessive repair cost.



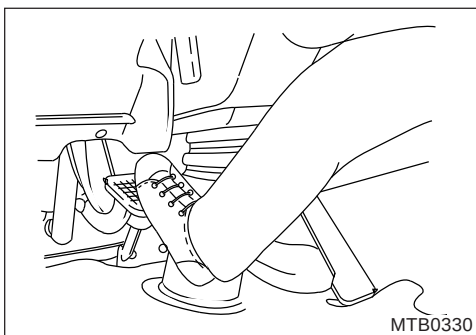
- (3) Fill the urea tank with urea after opening the cap by turning the urea cap key counterclockwise.
- (4) After filling the urea tank with urea, close the cap by turning it clockwise.
- (5) BE SURE to put out the key by turning the urea cap key clockwise.
- (6) Check whether the urea cap spins or not.
(The cap is in locked condition when the urea cap spins.)

2-18 DRIVING

4. WHEN DRIVING OFF



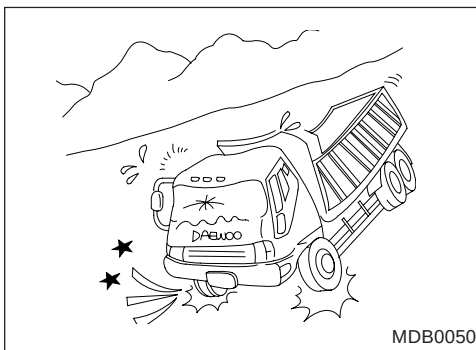
- 1) Check if the needle of air pressure gauge indicates 5.3kg/cm² or above. If the gauge indicates below this range of air pressure, keep the engine running at fast idle until the gauge needle points to the rated pressure.
- 2) Release the parking brake and check the parking brake indicator lamp goes out.
- 3) Let the engine idle until it is fully warmed up and start the vehicle with the shift lever in 1st position.



⚠ Caution

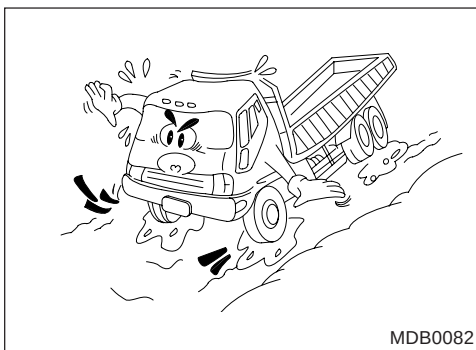
1. Service life of the clutch could be reduced when keeping it in a partially engaged condition.
2. Don't start the vehicle when the level of coolant engine oil and powersteering oil lowers beyond the "Min" marked level.

5. ECONOMIC DRIVING



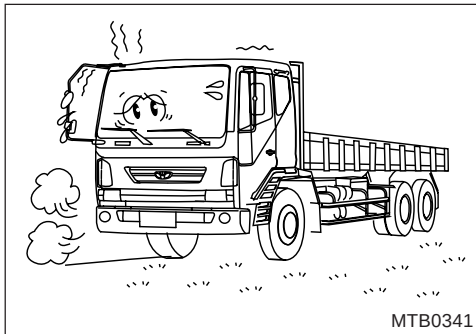
★ It is more economic to keep below contents during driving

- 1) Check the checking points before starting the engine and periodic inspection chart.
- 2) Avoid hard idling, sudden acceleration and sudden stops.

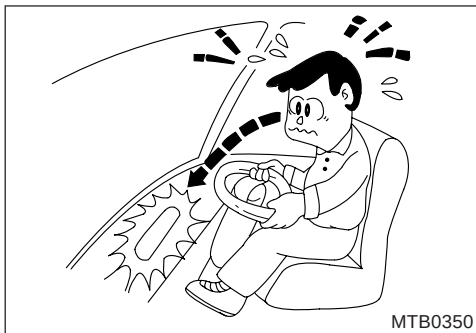


- 3) When accelerating, don't shift into excess engine rpm.
- 4) Use air conditioner if only necessary.
- 5) Slow down when driving on rough roads.
- 6) Keep standard tire inflation pressure.
- 7) Do not carry unnecessary weight in the vehicle.

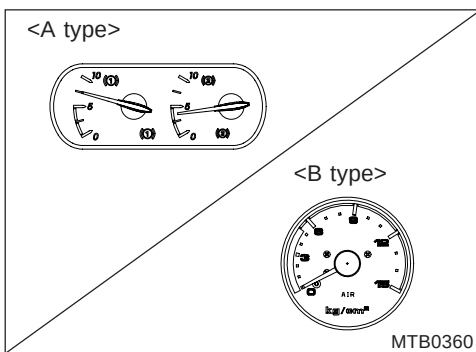
6. WHILE TRAVELING



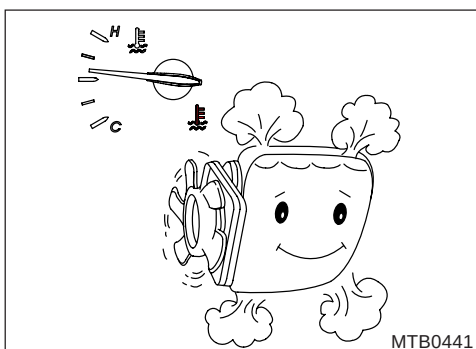
- 1) Avoid overrunning the engine during break-in period of new vehicle.
- 2) If unusual sound or smell becomes noticeable while driving, stop the engine and check to locate the cause of trouble.



- 3) If indicator lamps or instruments give an indication of abnormal condition while driving, stop the vehicle and check to locate the cause of trouble.
 - ★ If the cause of trouble was not located, check at your nearest Daewoo dealer.



- 4) If the air pressure falls below 5.3kg/cm², stop the engine and check to locate the cause of trouble.

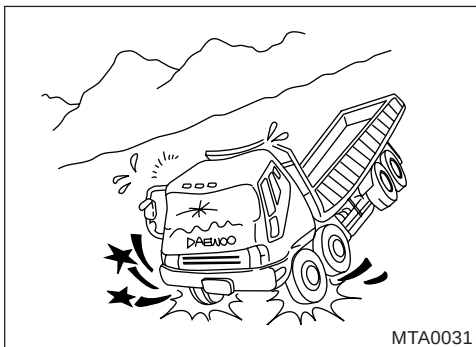


- 5) The engine coolant temperature gauge needle should indicate below the red point. If the gauge indicates above red point, stop the vehicle and keep the engine running at idle, and check the engine coolant level.

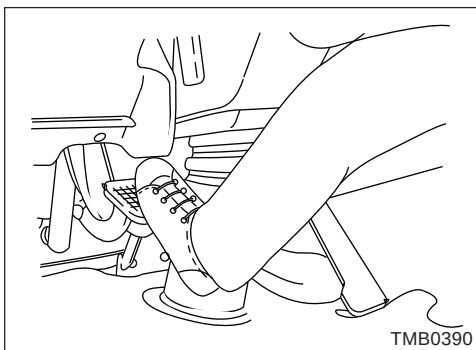
⚠ Caution

Severe burns to the skin can result from removing the pressure cap from a hot radiator. Wait until the engine temperature goes down and use rags to remove the cap for check-up and refilling operations.

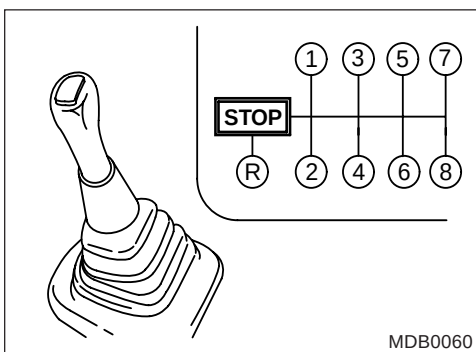
2-20 DRIVING



- 6) Avoid engine racing, unnecessary sudden acceleration, or sudden stops.



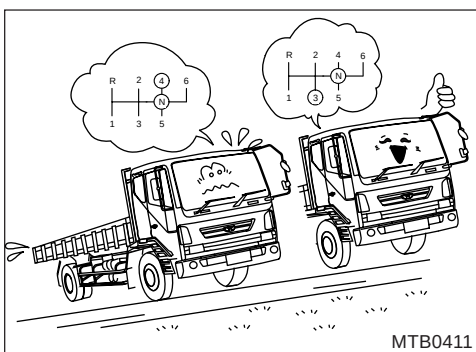
- 7) Do not drive with your foot resting on the clutch pedal as it produces a partially disengaged condition, causing premature wear of clutch facing.



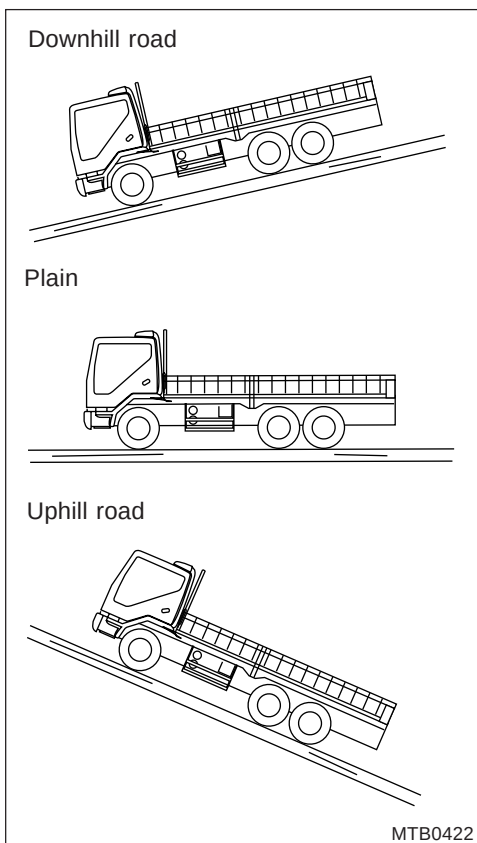
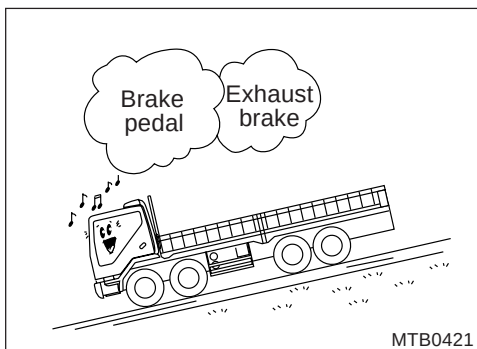
- 8) Stop your vehicle completely when attempting to shift into reverse.

Note

When change to 1st or reverse gear, would better change gears after 3 seconds, depress the clutch pedal.



- 9) When ascending a slope, shift to lower gear to relieve the engine from overload.



- 10) When descend sloping road, use with exhaust brake and engine brake. Specially, if use only main brake in long stop, brake operating is not quick in an emergency because braking power is fallen by overheating of brake drum and insufficiency of compressed air.

Warning

Observe lest engine should exceed maximum permission RPM. A forced rotation of engine comes into being problem on engine each part, and valve spring and push rod can be damaged specially.

Warning

An engine brake and exhaust brake that take by engine compression pressure without stepping on accelerator in driving, are more effective when is gear down.

Warning

It is advisable to use the exhaust brake and engine brake in combination when descending a slope. Frequent use of foot brakes while descending a long slope will cause brake drum overheating and consequential malfunction of the brake.

Warning

If use engine brake or exhaust brake rapidly in slippery declension or icy road, vehicles can slide and then cause a accident.

Warning

When is travling engine brake on high way, As off daytime shifts by off than off, you should change shift to lower gear step by step. If you do not trans-mission and engine can be damaged.

Warning

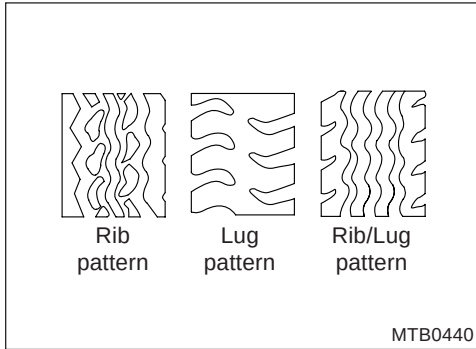
When damage by engine overrun, it is excepted in warranty repair. Repair expense can be happened overmuch.

Warning

Engine overrun can occur regardless of road condition (Downhill, plain, uphill road etc.), If you operate gear from high to low rapidly, it can cause damage of engine interior parts and transmission by increasing engine rotation rapidly.

2-22 DRIVING

7. TRAVEL ON HIGHWAY



⚠ Caution

It is dangerous to drive your vehicle with tires whose treads have been worn out excessively, because the vehicle may lose traction.

Limit of use : The depth of the tread grooves should be more than 3.2mm.

You must fully understand vehicle features in traveling on highway.

1. Acceleration
As running resistance increases greatly while traveling on highway, the vehicle should be accelerated with allowance for its engine power.
2. Grade ability
Maintain suitable engine rpm taking into account the relation of grade and maximum speed at each gearshift position.
3. Fuel consumption
Check fuel level before long distance travel.

The following checks should be performed to maintain safe and dependable vehicle operation.

1) Check before driving

More special care should be taken to drive on highway than on urban road. Make the thorough inspection according to "DAILY CHECK BEFORE DRIVING".

2) Tire

Heat generation depends on vehicle speeds and load weights. For the vehicle which travels frequently on highway, rib pattern tires are preferable.

3) Check while traveling on highway

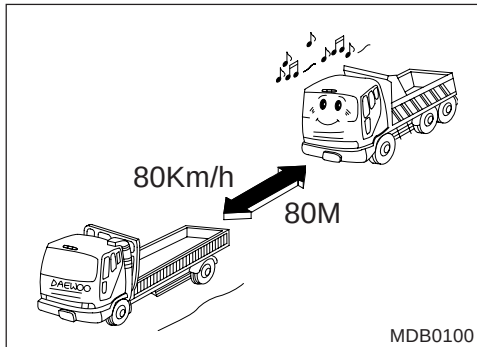
Generally, since driving on highway is more dangerous than on the urban road, you should be more alert and also have a composed and calm attitude.

(1) Speed perception

On highway, driver's speed perception is liable to become dull because its road surface is even and commands a wider prospect than urban road does. Always watch speedometer readings for vehicle speeds.

(2) Braking distance

Braking efficiency is the most important thing when driving on highway. When recognizing the hazard ahead and preparing to apply the brake, your reaction time will take about one second. This means that your vehicle, if assumed to have run at speed of 80km/h, will travel additional 20 to 30m the moment you applied the brake. Therefore, you should maintain a safe following distance.

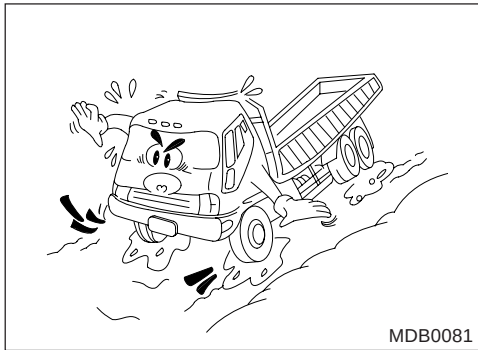


(3) Distance between vehicles

Normally, the following distance between your vehicle and the vehicle ahead depends on vehicle speeds. A safe following distance of about 80m should be maintained in 80km/h traffic.

(4) Passing

To pass, increase your vehicle's speed by at least 10km/h greater than the speed of the vehicle ahead. Before preparing to pass, be sure to check the traffic behind you and then pull out into the left lane(in case of RHD, the right lane) promptly with turn signal "ON".



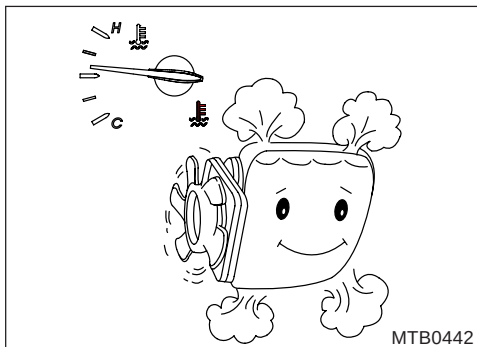
(5) Turning on a curve

Generally curves of highway are given grade on their either side. With a light movement of the steering wheel the vehicle turns very easily. Therefore, be careful of tire slippage when applying the brake on a curve, especially in rainy weather or on an icy road.

(6) Others

1. To enhance braking efficiency, use the exhaust and engine brakes in combination.
2. Reckless steering may cause danger not only to your own vehicle but also oncoming vehicles.
3. In the event that a tire was punctured during driving, hold the steering wheel firmly and employ exhaust brake to slow down. Abrupt braking can cause damage to tires.

2-24 DRIVING



4) Necessary actions after parking and operation

- **Engine stopping and parking**

1. If there is an indication of engine overheating, do not stop the engine immediately and, instead, keep it running at idle condition for a while.
2. To park, place the shift lever in NEUTRAL position and set the parking brake securely.

- **Servicing after operation**

After operating the vehicle, always clean it thoroughly and check the following points:

1. Re-check the troubles found during the previous operation and take necessary corrective actions. For such troubles difficult to correct, contact your nearest Daewoo dealer.
2. Inspect and clean each part, and check for leakage and oil levels.

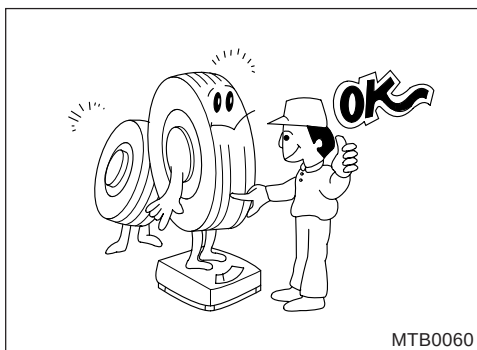
8. OPERATION AND CARE IN HOT WEATHER

How to wash off cooling system

Open the drain cock of radiator to drain off the remaining coolant and to inject soft water into it. Drive the engine as about 30 minutes and again drain out the soft water. Repeat this operation until the washings become clean.

1) Cooling system

Scale or rust in the cooling system may cause engine overheating. Carefully follow the "**How to wash off cooling system**" as described in the left box, and also wash off the cooling system before and after using antifreeze.



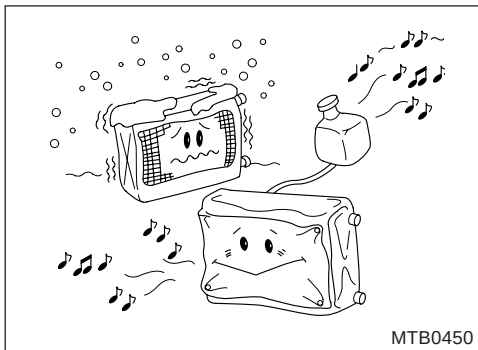
2) Engine oil and gear oil

Always use the specified oil. (Refer to "RECOMMENDED LUBRICANT")

3) Tire inflation pressure

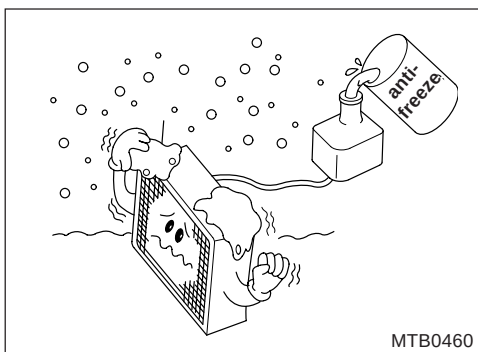
Tire inflation pressure should be checked more frequently than ever.

9. OPERATION AND CARE IN COLD WEATHER



1) Protection of the engine against freezing

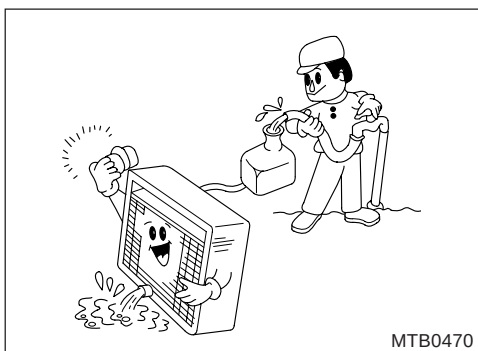
When operating the vehicle in cold places, be sure to install radiator curtain to protect the engine from freezing. Overcooled engine not only accelerates wear of its vital parts but also reduces fuel economy. When the radiator curtain is used, watch the temperature gauge frequently to prevent engine overheating.



2) Use of antifreeze

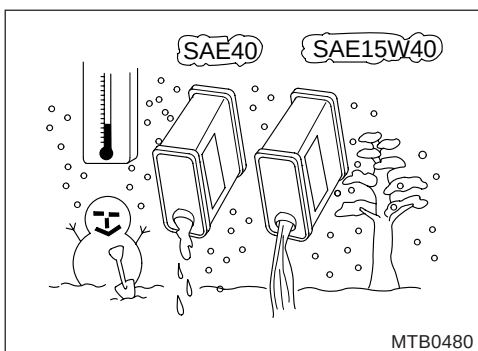
To prevent freezing and corrosion of the engine when operating the vehicle in extremely cold places, be sure to add a specified amount of antifreeze to coolant. It is strongly recommended to use Daewoo-approved antifreeze.

- ★ Fill up the coolant circulation system with a 50/50 mixture of specified antifreeze and water in all seasons.



3) Precautions when using antifreeze

- (1) Wash off the inside of the cooling system including the radiator before using anti-freeze.
- (2) Replace any damaged rubber hoses. If there is just a hair crack on these hoses, antifreeze is liable to leak.
- (3) Antifreeze should be handled with extreme care as it can cause damage to coated surfaces of peripheral components.



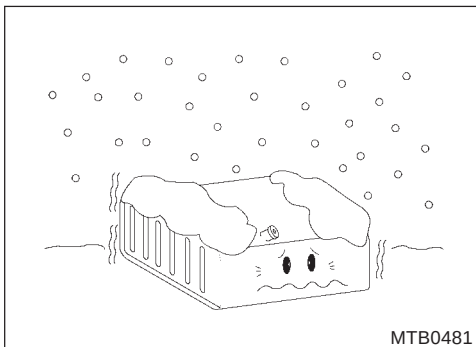
4) Engine oil

Engine oil tends to harden when the ambient temperature falls in cold weather. Use the specified engine oil having proper viscosity.

5) Batteries

Battery condition tends to get worse with drop in ambient temperature. In extremely cold weather, maintain the battery in a full charge state.

2-26 DRIVING



6) Use of light oil in winter

- (1) Paraffin composition included fuel may cause troubles to fuel lines. Due to solidification at temperatures below 0°C.
- (2) In cold weather, use winter-fuels supplied by the oil companies.

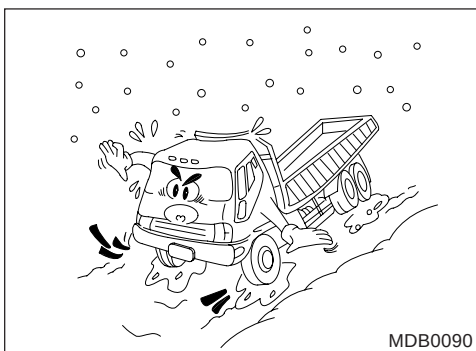
7) Use of light oil in hard winter

A hard winter (below -15°C) may cause troubles due to the solidification of paraffin even though winter fuel is used.

At that time, use a 80:20 mixture of light oil and kerosene.

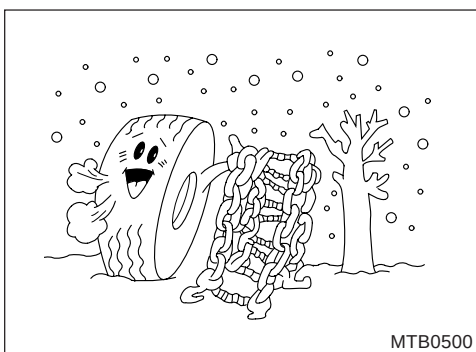
Caution

1. Increase of smoke and engine noise is caused by excessive fill of petroleum.
2. In the winter, water may be generated in fuel tank, because of different temperature between the atmosphere and inside of fuel tank. Drain the water in the fuel tank and the fuel filter more than two times a month as sedimental water can make engine and fuel lines damaged.



8) Driving on ice or snow

- It is advisable that chains or snow tires be used when traveling on an icy or snow-covered road. If you apply the brake hard on a slippery road, your vehicle is apt to lose its traction, resulting in losing the control of steering wheel.



- Carefully fit chains on your tires so that the chain band may not scratch the other parts or not interrupt their movements.
 - (1) Be sure to use the chain of the same dimensions as the target tire.
 - (2) Fit the chains on the rear tires and tighten them so that motions of the other parts may not be interrupted.

10. VEHICLES POSTURE

Left, right height difference of cap or deck can happen about 20mm. It is that appear by the permissible weight of vehicles suspension so, there is no problem on function or performance of vehicles.

11. FRAME WELDING AND HOLE PROCESSING

Note

Do to take care following elements at frame welding and hole processing

- Avoid incongruent welding and hole processing in vehicle use purpose.
- When is judged that in vehicle use purpose, process in frame side as hole like Fig xx. and Fig. yy.
- Welding must be within 30~50mm for length dircetion, and does not invade 1/4H oblique section in the end of side.

Fig yy. Regulation at frame hole processing

Vehicle	a	b	c
Truck	20 below	1/4 over	40 over

a:hole diameter b:resfriction section of bend c:hole interval H:Frame height

- To the flange section of the frame will not be able to add the hole absolutely. It be comes the cause which is direct in frame crack
- Use drill necessarily without processing hole by gas welding at hole processing
- Install volt necessarily on chassis frame at serve frame installation

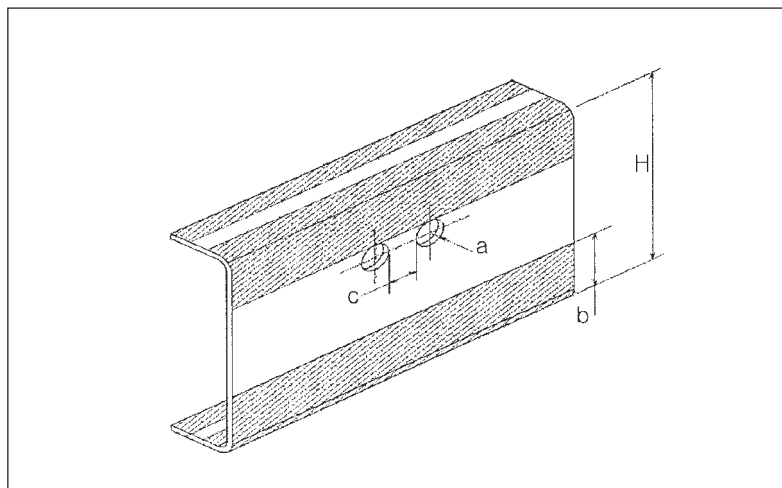


Fig xx. Regulation at frame welding and hole processing

3

INSPECTION AND MAINTENANCE

1. DAILY CHECK BEFORE DRIVING
 2. PERIODIC INSPECTION AND MAINTENANCE
 3. PERIODIC INSPECTION CHART
 4. MOUNTING PARTS FOR NOISE AND VIBRATION PREVENTION
 5. IN CASE OF EMERGENCY
 6. VEHICLE REPAIR
 7. HOW TO HANDLE THE ENGINE IN WINTER SEASON
 8. EXHAUST GAS REDUCTION SYSTEM
-

3-2 INSPECTION AND MAINTENANCE

1. DAILY CHECK BEFORE DRIVING

In order to maintain safety and dependable operation, following checks should be performed daily before driving:

System	Check item	Check point
1) Steering	Steering wheel and system	- Vibrations or shimmy of steering wheel - Hard steering or sticky - Damage or looseness of component parts - Replenishment of grease - Damage of Ball-joint dust cover
2) Brake	- Brake pedal - Parking brake - Air tank and pressure	- Free play, stroke and force of pedal - Function - Moisture in tank and fluctuation of air pressure
3) Running	Wheels and tires	- Damage or looseness of bolts and nuts - Damage or severe wear of wheels and tires, and tire inflation pressure
4) Suspension	Chassis spring	Damage of spring, and tightening state of U-bolts and nuts
5) Engine	Engine	- Engine starting - Leakage of fuel, lubricants and coolants - Cleanliness or damage of air cleaner element - Exhaust gas - Damage of fan belt - Engine oil level
6) Power train	- Clutch - Clutch oil - Transmission - Propeller shaft and rear axle	- Clutch pedal free play, stroke and function - Oil level - Function and oil leakage - Vibration of propeller shaft, oil leakage in rear axle
7) Dump truck, tractor	- Control lever - P.T.O. - Others	- Function - Switch, function - Replenishment of grease and dump function
8) Self steer	- Valve - Air spring - Spring damper - Hinge	- Function status(axle up/down), Leakage - Damage or tear - Leakage - Replenishment of chassis grease, function status

3-4 INSPECTION AND MAINTENANCE

2. PERIODIC INSPECTION AND MAINTENANCE

1) Engine oil and engine oil filter

✱ Engine oil and engine oil filter for DL08K, DV11K engines

(1) Engine oil for DL08K, DV11K Engines

To assure proper lubrication and cooling action of your vehicles' engine, the engine oil must be maintained at the correct level, which improves the engine power and extend the engine life. And the engine oil filter filters the foreign objects in the engine oil.

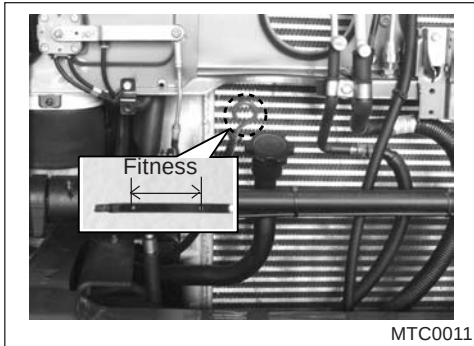
Although there is no oil leak, the engine oil may be consumed bit by bit, which is a normal state. If you drive your vehicle under severe conditions, or with rapid acceleration and quick braking, the engine oil will be consumed more than the normal condition.

⚠ Caution

If your skin is stained with the engine oil, this could cause skin disease. Clean the stained part with soap and water or hand cleaners.

⚠ Warning

Keep the engine oil out of reach of children. If children drink the engine oil, they could be seriously injured or lose their lives.



Note

If the engine oil pressure warning light is turned on, check the engine oil with the engine oil level gauge.

⚠ Warning

When you check the engine oil right after driving your vehicle, beware lest you should be got a burn by the hot engine oil and other hot engine parts.

1) Checking oil level

Check the engine oil as follows.

1. Park your vehicle on level ground and stop the engine.
2. Wait for about 6 minutes until the engine oil gathers to the oil pan.
3. Pull out the engine oil level gauge, clean it up, and put the level gauge in the tube again.

⚠ Caution

BE SURE to clean the engine oil level gauge with clean cloth. If the engine oil is mixed with foreign objects, the engine could break down.

4. Pull out the engine oil level gauge again, read the oil level and check if the engine oil is contaminated or not. Always maintain the oil level between MAX and MIN and when the reading is below the MIN, supplement the engine oil.

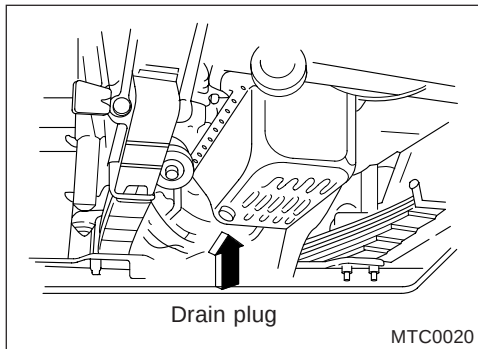
⚠ Caution

If you fill the engine oil over the MAX level, the engine will be overloaded, resulting in damage to the engine.

INSPECTION AND MAINTENANCE 3-5

Supplement the engine oil as follows.

1. Open the oil cap which is located on the upper section of the engine and add the genuine engine oil of ours.
2. Wait about 6 minutes after you add the engine oil and check again that the engine oil is at the correct level.



Note

Change the engine oil after enough warming up of the engine in order to completely remove the moisture in the oil. Also, clean up the metal powder attached to the drain plug.

Caution

When you change or supplement the engine oil, BE SURE to use the genuine engine oil designated by our company. If you use the engine oil of unlike components, it could cause damage to the engine.

Caution

When you supplement the engine oil, beware that you do not bring dust or other foreign objects into the engine, resulting in the failure of the engine.

2) Used engine oil

According to the maintenance schedule or when the oil change indicator is turned on, change the engine oil as follows.

1. After stopping the engine and while the engine is warm, release the drain plug of the oil pan and the oil filter in order to drain the engine oil.
2. Tighten the drain plug and add the engine oil through the engine oil inlet.
3. Keep the engine idling for several minutes in order to check whether the engine oil leaks or not.
4. Stop the engine and wait for more than 6 minutes. And then read the oil level gauge. If you check the engine oil right after stopping the engine, the oil level will be lower than it actually is.

• Types

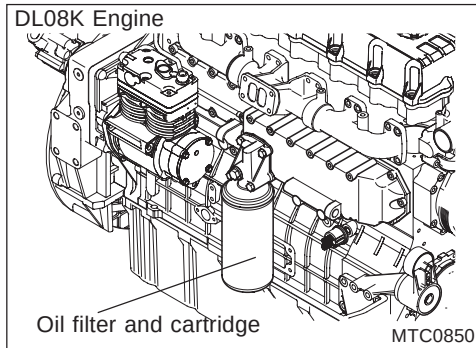
– DL08K/DV11K(DOOSAN) Engine : ACEA-E5

Engine	Change cycle	Oil volume
DL08K (DOOSAN)	The first change at 5,000km, After that, every 40,000/ 60,000km (If your vehicle covers no more than 500km a day, change the engine oil every 40,000km.)	Exchange : 28L Total : 30L
DV11K (DOOSAN)		Exchange : 32L Total : 35L

Note

The above conditions as applicable when the engine oil and the oil filter should be changed at the same time.

3-6 INSPECTION AND MAINTENANCE

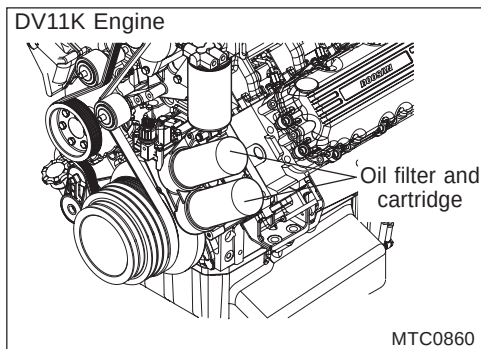


(2) Engine oil filter for DL08K, DV11K engines

Change the engine oil filter as follows.

⚠ Caution

BE SURE to use the genuine oil filter of ours. Any damage to the engine lubrication and cooling system caused by using imitations will not be under warranty repair.

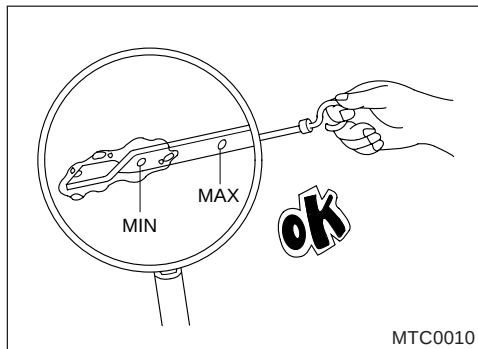


* DL08K/DV11K(DOOSAN) engine oil filter

- 1) Tighten the engine oil filter with your hand until the filter reaches the engine oil filter bracket.
- 2) Rotate the engine oil filter more with the prescribed torque(1.8kg•m) through 270 degrees.
- 3) Open the oil cap and add the engine oil as follows.

Engine	Change cycle	Numbers of filter
DL08K (DOOSAN)	The first change at 5,000km, After that, every 40,000/ 60,000km	1
DV11K (DOOSAN)	(If your vehicle covers no more than 500km a day, change the engine oil filter every 40,000km.)	2

★ Engine oil and engine oil filter for D1146TI, DE08TIS, DE12, DE12TI, DE12TIS, DV15T, DV15TIS, ISM engines



(1) Engine oil for D1146TI, DE08TIS, DE12, DE12TI, DE12TIS, DV15T, DV15TIS, ISM engines

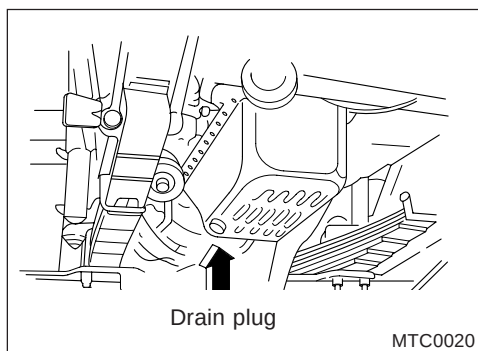
1) Oil level check

Check oil level and replenish if required.

2) Type of oil

- D1146TI, DE08TIS, DE12, DE12TI, DE12TIS, DV15T, DV15TIS, ISM engine specifications:
API CH-4, SAE 15W 40
- ISX CUMMINS engine specifications :
API CI-4, SAE 10W 40

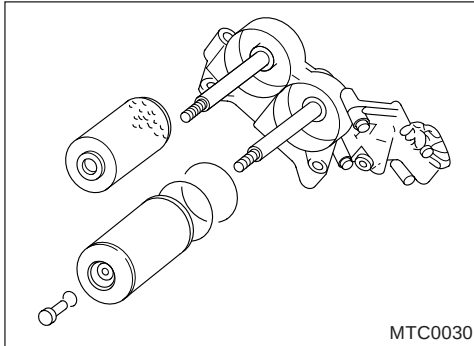
- ★ When changing oil, warm up the engine sufficiently to remove moisture contained in oil. Thoroughly remove any fine metal particles that may have accumulated on drain plug.



Model	Change intervals	Capacity
D1146TI DE08TIS DE12 DE12TI DE12TIS	At end of first 5,000km, every 20,000km	Exchange(18L) Total(20L)
DV15T DV15TIS		Cargo/Tractor: Exchange(22L), Total(24L) Dump: Exchange(20L), Total(22L)
ISM CUMMINS		Exchange(30L), Total(32L)
ISX CUMMINS	Every 48,500km (When used with ultra-low sulfur diesel fuel(15ppm sulfur). In the fuel is greater than 15 ppm, the oil change intervals must percent)	Exchange(45.4L) Total(49.2L)

- ★ Above oil capacity standard level when changing together with oil filters.

3-8 INSPECTION AND MAINTENANCE



⚠ Caution

It is strongly advisable to use genuine Daewoo oil filter element.

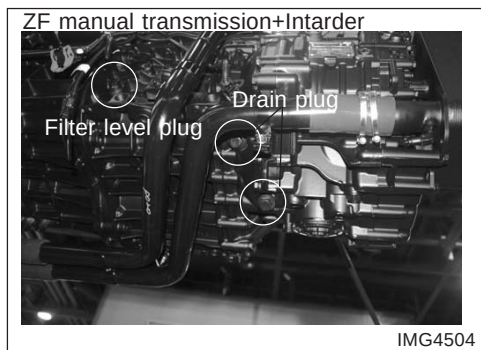
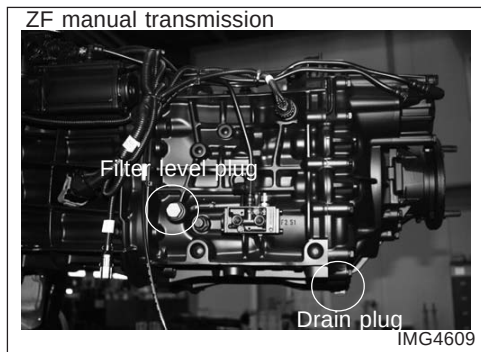
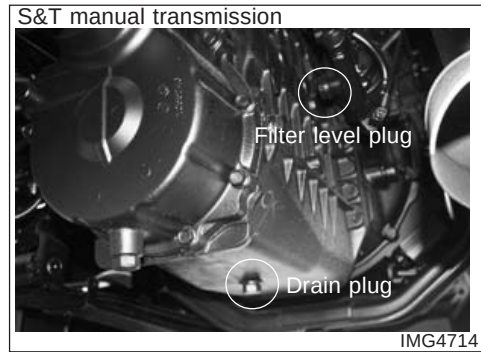
(2) Engine oil filter for D1146TI, DE08TIS, DE12, DE12TI, DE12TIS, DV15T, DV15TIS, ISM engines

Engine oil filter element should be changed together with engine oil at the same time.(DE engine is of cartridge type)

- 1) To drain oil, remove the drain plug installed on the lower part of oil filter body. Remove any fine metal particles that may have accumulated on drain plug, and check gasket and replace as necessary.
- 2) Loosen the center bolt and remove the filter body together with the element.
- 3) Clean the inside of filter body and replace with the new filter element.
 - * Clean the element with diesel fuel and visually check gaskets installed on the upper and lower sides of element for damage and hardening, and replace as necessary.

Model	Change intervals	No. of filters
D1146TI DE08TIS DE12 DE12TI DE12TIS	At end of first 5,000km, every 20,000km	1
DV15T DV15TIS		2
ISM CUMMINS		1
ISX CUMMINS	Every 48,500km (When used with ultra-low sulfur diesel fuel(15ppm sulfur). In the fuel is greater than 15 ppm, the oil change intervals must percent)	1

2) Transmission oil



⚠ Caution

Make sure to use only the genuine fluid. Otherwise, the manual transmission can be damaged during driving, leading to an accident.

(1) Manual transmission oil

Manual transmission oil works smoothly the moving parts inside the transmission.

Note

Special facilities and equipments are needed to change the manual transmission cab be damaged during driving, leading to an accident.

Note

Oil drain is carried when the vehicle is stopped and oil is warmed.

1) Oil level check

At end of first 1,000km and thereafter at every 4,000km driving, check oil level and replenish if oil remains below the level plug.

- FSO10309A transmission oil level check

Thereafter at every 20,000km driving, check oil level and replenish if oil remains below the level plug.

2) Oil change

- Specifications

* Gear oil : API GL-4, SAE 80W 90

* Engine oil : API CD/CE/CF/SF/SG, SAE30 (Available ZF 16S1830TO, ZF16S2230TO transmission)

* Gear oil : API GL-4, SAE 30

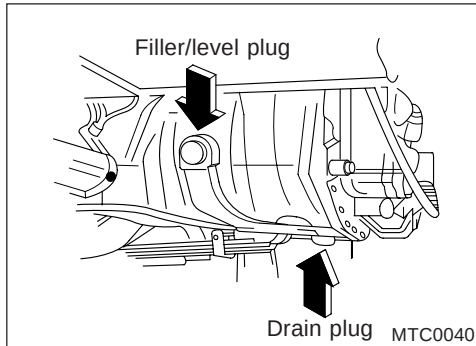
ZF transmission with interarder (ZF16S2231TO)

Model		Change intervals	Capacity
S&T	T10S6	At end of first 5,000km, Every 40,000km	14L(15L)
	T15S6		17L(18L)
	T16S6		
EA TON	FSO 10309A	At end of first 10,000km, Every 60,000km or 1year	12.3L(12.3L)
ZF	ZF16S 1830TO	Every 60,000km or 1 year	Exchange(12L) Total(13L)
	ZF16S 2230TO		Exchange(12L) Total(13L)
	ZF16S 2231TO (Intarder)		Exchange(14.5L) Total(22.5L)

Note

Oil of T/M with interarder based on the initial amount, and must be supplemented with additional after driving.

3-10 INSPECTION AND MAINTENANCE



(2) Manual transmission oil for middle east

1) Oil level checks

At end of first 5,000km and thereafter at every 20,000km driving, check oil level and replenish if oil remains below the level plug.

2) Oil or oil filter change

Specifications: API GL-4, SAE 80W90

ZF16S2523TO Transmission specifications:

ECO FLUID M SAE 75W80

Tropical region specifications:

API GL4, SAE85W140(thermostat-open 71°C)

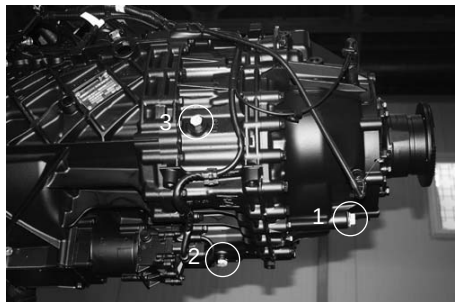
Engine oil API CD/CE/CF/SF/SG,SAE 30

(ZF16S151, ZF16S1820TO, ZF16S1830TO, ZF16S221, ZF16S2220TO)

★ Drain the oil while it is hot.

Model		Change intervals	Capacity
DYMOS	K805	At end of first 5,000km, Every 30,000km	9.8L(PTO:11.8L)
	K1406		16L(PTO:16.2L)
S&T	T9S6		12.5L(PTO:13.5L)
	T10S6		14L(PTO:15L)
	T14S10		18L(PTO:19L)
	T15S6		17L(PTO:18L)
	T16S6		17L(PTO:18L)
SHAANXI	9JS150TA		13L(PTO:14.5L)
EATON	FSO10309A (Eaton)	At end of first 5,000 km, Every 45,000km	12.3L(PTO:12.3L)
ZF	ZF16S-151	At end of first 5,000km Every 45,000km	Exchange(8L)
	ZF16S1820TO		Total(11L)
	ZF16S1830TO		Exchange(12L)
	ZF16S-221		Total(13L)
	ZF16S2220TO		Exchange(10L)
	ZF16S2523TO		Total(13L)

ZF auto transmission



IMG4562

★ A TYPE

(3) Auto transmission oil

A proper amount of automatic transmission fluid is used for smooth operation and function of the automatic transmission.

1) Oil level check

At end of first 1,000km and thereafter at every 4,000km driving, check oil level and replenish if oil remains below the level plug.

2) ZF automatic transmission fluid

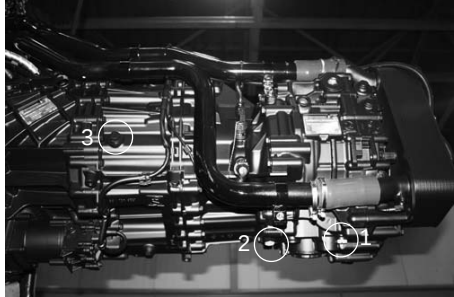
1. Draining fluid

⚠ Warning

It is recommended to change fluid after driving. When the fluid remperature is high, hot fluid may be blown out and burn you.

INSPECTION AND MAINTENANCE 3-11

ZF auto transmission+ Intarder



IMG4543

- Open the drain plug and drain the fluid
- Clean the drain plug and replace the seal with a new one.
- Tighten the plug to the specified torque.
- 1. Oil drain plug:tightening torque;T=60Nm
- 2. Oil drain plug:tightening torque;T=60Nm
- 3. Fluid inlet and level point:tightening tourque;T=60Nm

Note

Make the next fluid change schedule onto the filler.

2. Adding fluid
Add fluid through the oil filler plug (No. 3 in figure) and check the level.
3. Checking fluid

⚠ Caution

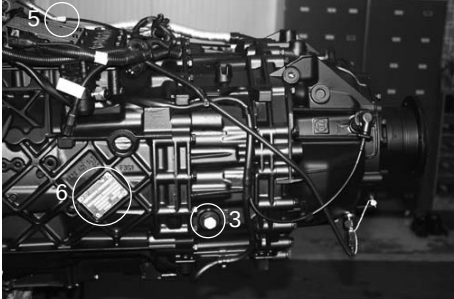
Insufficient fluid can result in transmission damage.

- Check its level regularly.
- Check the fluid level on level ground.
- Do not check the fluid right after driving(fluid level may not be accurate. Check the fluid level only when its temperature is below 40°C
- Open the fluid level check hole and check the level. If the level is under the specification, add fluid to an inch of overflow.

⚠ Caution

Check for leakage as well whenever checking the fluid.

ZF auto transmission

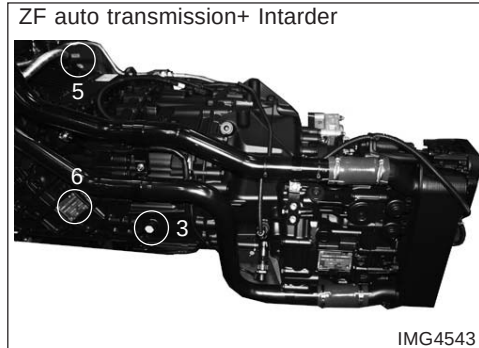


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4. Transmission breathing
When the transmission temperature changes by its operation, its internal pressure rises. As this pressure is regulated through the breathing passage valve, make sure the passages are not blocked by anything, such as plastic caps, to ensure normal operation of the breather(No. 5 in figure).
3. Fluid filler
5. Transmission breather
6. Transmission name plate
5. Fluid specification
 - * Specifications
 - Gear oil :API GL-4, SAE80W90 (ZF12AS2330TO)
 - Gear oil : ZF-ECOFLUID M

Avaiable ZF auto transmission with intarder (ZF12AS2331TO)

3-12 INSPECTION AND MAINTENANCE



Model	Change intervals	Capacity
ZF12AS1930TO	Every 60,000km or 1 year	Exchange(11L) Total(12L)
ZF12AS2330TO		Exchange(11L) Total(12L)
ZF12AS2331TO (Intarder)	Every 360,000km or 2 years	Exchange(12L) Total(21L)

Note

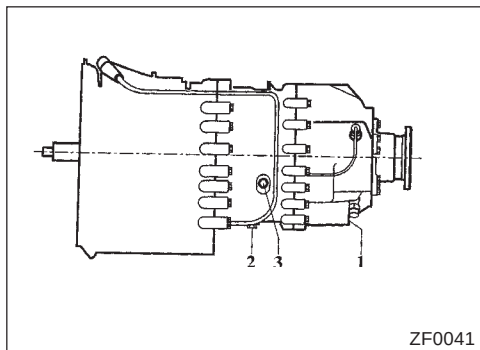
The oil of transmission with intarder based on the initial amount, it must be supplement after driving.

Note

Spcial facilites and equipments are needed to change the automatic transmission can be damaged during driving, leading to an accident.

⚠ Caution

Make sure to use only the genuine fluid. Otherwise, the auto ransmission can be damaged during driving, leading to an accident



★ B TYPE

(4) Auto transmission oil for middle east

A proper amount of automatic transmission fluid is used for smooth operation and function of the automatic transmission.

1) Oil level check

At end of first 5,000km and thereafter at every 20,000km driving, check oil level and replenish if oil remains below the level plug.

2) ZF automatic transmission fluid

1. Draining fluid

⚠ Warning

It is recommended to change fluid after driving. When the fluid remperature is high, hot fluid may be blown out and burn you.

INSPECTION AND MAINTENANCE 3-13

- Open the drain plug and drain the fluid
- Clean the drain plug and replace the seal with a new one.
- Tighten the plug to the specified torque.
 1. Oil drain plug:tightening torque;T=60Nm
 2. Oil drain plug:tightening torque;T=60Nm
 3. Fluid inlet and level point:tightening torque;T=60Nm

Note

Make the next fluid change schedule onto the filler.

2. Adding fluid

Add fluid through the oil filler plug (No. 3 in figure) and check the level.

3. Checking fluid

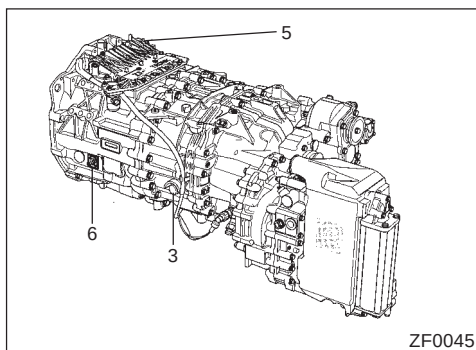
⚠ Caution

Insufficient fluid can result in transmission damage.

- Check its level regularly.
- Check the fluid level on level ground.
- Do not check the fluid right after driving(fluid level may not be accurate. Check the fluid level only when its temperature is below 40°C
- Open the fluid level check hole and check the level. If the level is under the specification, add fluid to an inch of overflow.

⚠ Caution

Check for leakage as well whenever checking the fluid.



ZF0045

4. Transmission breathing

When the transmission temperature changes by its operation, its internal pressure rises. As this pressure is regulated through the breathing passage valve, make sure the passages are not blocked by anything, such as plastic caps, to ensure normal operation of the breather(No. 5 in figure).

3. Fluid filler

5. Transmission breather

6. Transmission name plate

5. Fluid specification

- Standard
- API GL-4, SAE 80W90
 - : ZF12AS1930TO, ZF12AS2330TO
- ZF-ECOFUID M
 - : ZF12AS1931TO, ZF12AS2331TO
 - (equipped with interarder)

3-14 INSPECTION AND MAINTENANCE

Transmission	Change interval	Amount
ZF12AS1930TO ZF12AS2330TO	Every 60,000km	Exchange : 11L Total : 13L
ZF12AS1931TO (equipped with intarder)		Exchange : 12L Total : 21L
ZF12AS2331TO (equipped with intarder)		

Note

Special facilities and equipments are needed to change the automatic transmission fluid. Contact your local Dealer for change.

⚠ Caution

Make sure to use only the genuine fluid. Otherwise, the automatic transmission can be damaged during driving, leading to an accident.



IMG5595

(5) Allison automatic transmission fluid

Excessive or insufficient fluid can cause malfunction of the automatic transmission. Check the automatic transmission fluid level only when the vehicle is parked on level ground, the engine coolant temperature is normal and the shift lever is in the "N" position. If the fluid is discolored or contaminated, change the fluid as well as the fluid filter in the transmission.

⚠ Caution

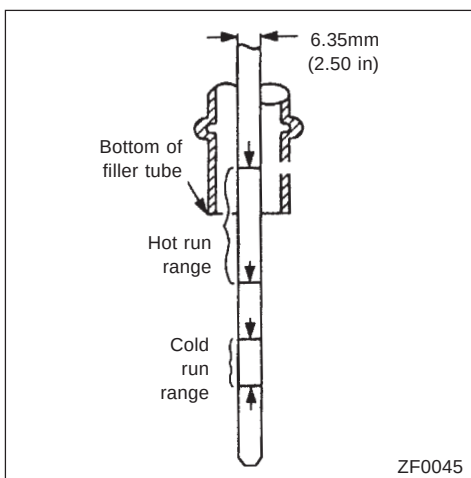
Keeping driving with the fluid discolored or contaminated for an extended period of time can damage the transmission.

1) Checking level

Check the fluid level frequently. If the level is low, add more fluid or change the fluid

2) Fluid specification

- Standard
- DEXRON III
- : ALLISON 3000, ALLISON 3200
- ALLISON 4500



ZF0045

INSPECTION AND MAINTENANCE 3-15

Transmission		Change interval	Amount
ALLISON	ALLISON3000 ALLISON3200	Every 40,000km or 1year	Exchange : 18L Total : 27L
	ALLISON4500		Exchange : 37L Total : 48L

Note

Special facilities and equipments are needed to change the automatic transmission fluid. Contact your local Dealer for change.

3) Checking automatic transmission fluid level

Check the level according to the following procedures.

1. Park the vehicle on level ground and run the engine.
2. Check the fluid level when the fluid temperature is 71 to 93°C
3. With the parking brake lever pulled up and the brake pedal depressed, move the shift lever to each gear position 2 to 3 times repeatedly and then place the lever to the "N" position.
4. Pull out the dipstick, wipe it clean and fit it to the tube again.
5. Pull out the dipstick, again and check the fluid level.

Note

The fluid level should be between the MAX and MIN lines within the hot run range. If it is below the MIN line, add more fluid.

⚠ Warning

Be careful not to get burnt as the automatic transmission fluid and engine components are hot.

4) Adding automatic transmission fluid

Add the transmission fluid according to the following procedures.

1. Add fluid through the tube in which the dipstick is inserted.
2. After adding fluid, check the fluid level again to see that it is within the specification.

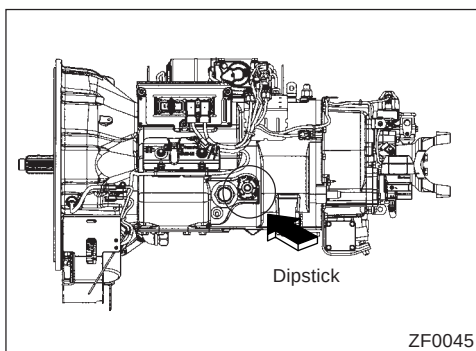
3-16 INSPECTION AND MAINTENANCE

⚠ Caution

Insufficient or excessive transmission fluid can occur particular defects. Make sure to maintain proper fluid level.

⚠ Caution

To optimized the performance of the automatic transmission, use only TATA DAEWOO genuine automatic transmission fluid. Nongenuine fluid can damage the transmission.



(6) FO-18E318B-MXP(Eaton) automatic transmission fluid

Excessive or insufficient fluid can cause malfunction of the automatic transmission. Check the automatic transmission fluid level only when the vehicle is parked on level ground, the engine coolant temperature is normal and the shift lever is in the "N" position. If the fluid is discolored or contaminated, change the fluid as well as the fluid filter in the transmission.

⚠ Caution

Keeping driving with the fluid discolored or contaminated for an extended period of time can damage the transmission.

1) Checking level

Check the fluid level frequently. If the level is low, add more fluid or change the fluid

2) Fluid specification

- Standard
- SAE 50
- : FO-18E318B-MXP

Transmission		Change interval	Amount
E A T O N	FO-18E318B-MXP	Every 800,000km or 5 years (Vehicles off-load driving : Every 288,000km or 3 years)	Exchange : 13.2L Total : 14.2L

Note

Special facilities and equipments are needed to change the automatic transmission fluid. Contact your local Dealer for change.

3) Lubrication Requirements and Specifications

Fuller UltraShift PLUS (VCS, VMS, VXP, MXP, MHP and LAS) Transmission Gear Box
Lubrication Requirements

Eaton requires the use of a transmission lubricant that meets PS-164 rev 7 specification.
A list of approved lubricants and suppliers can be found in the Approved Lubricant Supplier Manual, TCMT0020.

Not using the required lubricant will result in degraded performance and shortened life of the product. Refer to the Lubrication Manual, TCMT0021, for the latest information regarding lubrication requirements.

Note

Eaton recommends the use of Eaton Roadranger Lubricants. Roadranger SAE 50 Synthetic Lubricant and Eaton PS-164 rev 7 are the only approved synthetic lubricants. Failure to adhere to Eaton installation requirements may affect the transmission performance and / or warranty coverage.

Required Lubricant

Transmission gear box - Eaton Roadranger SAE 50
Synthetic Lubricant or PS164 Rev 7 approved lubricant

Caution

- Before working on a vehicle, place transmission in neutral, set brakes, and block wheels.
- Do not introduce additives and / or friction modifiers. Additives of any kind added later to the oil can result in unpredictable consequences. No liability of any kind will be accepted by Eaton for any damage resulting from the use of such additives.
- Do not mix lubricants of different grades.
- Use clean containers when transferring lubricant from the bulk storage to the transmission. Containers used for antifreeze or water should be cleaned prior to use.
- Do not re-use lubricant.
- Failure to use the required lubricant will affect the transmission performance and the warranty coverage.
- SAE 15W-40 viscosity grades are not allowed in Eaton transmissions.

4) Operating Temperatures

Transmissions must not be operated at temperatures above 250° F (121° C.) Operation at temperatures above 250° F (121° C) causes loaded gear tooth temperatures to exceed 350° F (177° C) which will ultimately destroy the heat treatment of the gears.

The following conditions in any combination can cause operating temperatures over 250° F (121° C.)

- Operating consistently at high loads / slower speeds
- High ambient temperatures
- Restricted air flow around transmission
- Exhaust system too close to the transmission

3-18 INSPECTION AND MAINTENANCE

5) Transmission Oil Level

Note

Before checking oil level, engine must be idling in neutral for at least two minutes and lubricant temperature must be between 60° F and 120° F (15.5° C and 48.8° C.) This will ensure that all oil coolers are filled.

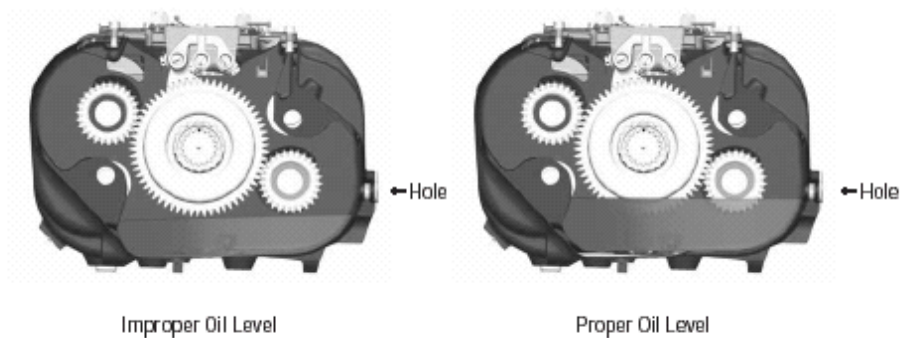
Transmission Capacity(Approximate)	
VCS, VMS, VXP, MXP, MHP	28 pints(13.2 liters)
LAS	26 pints(12.3 liters)

1. Place vehicle on level ground.
2. Turn engine off.
3. Remove fill hole plug.
4. Lubricant must be level with the bottom of the fill hole (+/- 3mm).
5. Reinstall the fill hole plug and torque to recommended torque value.
6. Clean off any oil residue.

Make sure that the transmission lubricant is level with the bottom of the fill opening(+/-3mm)

Note

Being able to reach the lubricant with your finger does not indicate that the lubricant is at the proper level. (On heavy-duty transmissions, one inch of lubricant equals about nine pints of oil.)



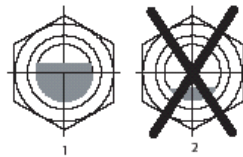
DO NOT remove the Electric Shifter (XY Shifter) to fill the transmission with oil. The transmission must be filled through the fill hole.

INSPECTION AND MAINTENANCE 3-19

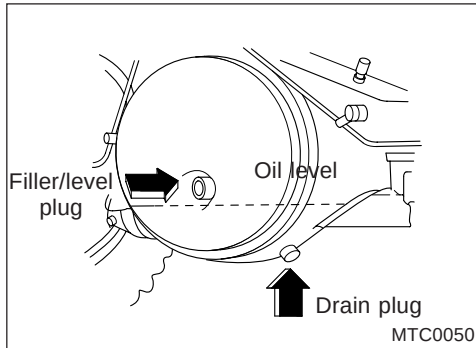
The transmission is equipped standard with an oil level sight glass. When the transmission oil level is at or above $\frac{3}{4}$ of the sight glass then it is at or above the minimum oil fill level.

To check the oil level with the sight glass:

- Vehicle engine shall be stopped and parked on level ground.
- Wipe dirt from the oil level sight glass.
- When the transmission oil level is at or above $\frac{3}{4}$ of the sight glass then it is at or above the minimum oil fill level.



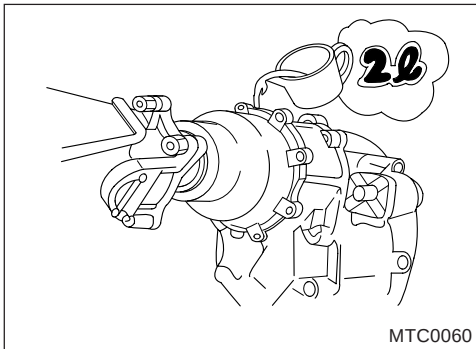
3-20 INSPECTION AND MAINTENANCE



3) Rear axle oil

(1) Oil level check

Check oil level at end of first 1,000km and thereafter every 4,000km for new vehicle, and replenish if the oil remains below the level plug.



(2) Type of oil

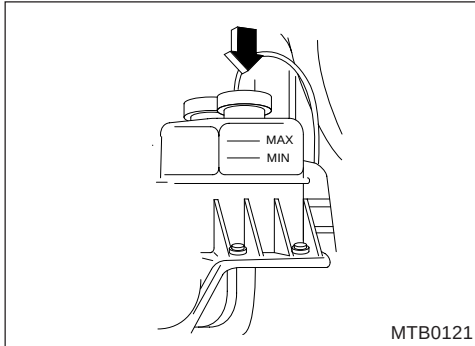
Specifications: API GL-5, SAE 80W90

Tropical region specifications:

API GL5, SAE85W140 (thermostat-open 71°C)

★ When changing oil for the forward rear axle, be sure to change oil for inter-differential (about 2L)(S&T inter-differential: 1.5L) at the same time.

Model		Change intervals	Capacity
DYMOS	R165H	* Cargo, Tractor At end of first 8,000km, Every 40,000km or 1year	12L
	R185HT		Front: 20L, Rear: 12L
S&T	T10H, T13H		10L
	T12H T19H		15L
	T10HT T13HT T14HT T15HT T16HT T17HT		Front: 11.5L, Rear: 10L
	THR20S	* Dump, Mixer At end of first 8,000km, Every 30,000km or 1year	13L wheel hubs:2.5L
	THR20ST		Front: 14L, Rear: 13L, Wheel hubs:2.5L
SHAA-NXI	HD-STYER		Front: 8.3L, Rear: 6.0L, Wheel hubs:2.0L



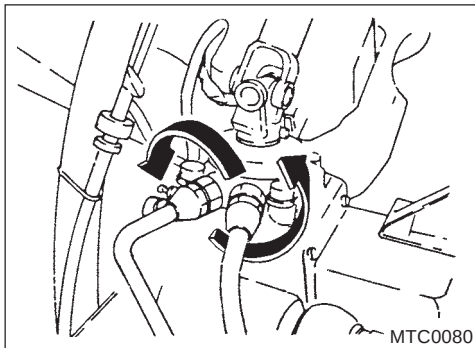
4) Power steering oil and oil filter

(1) Oil level check

At end of first 1,000km and thereafter every 5,000km operation, keep the front wheels straight ahead and check oil level with level mark on oil tank.

(2) Type of oil

Specifications: ATF(DEXRON II-D)



(3) Oil change

Exchange of power steering oil & filter is at oil pollution or maintenance

★ Tank capacity

- General : 7.3L
- 8x4 series : 9L

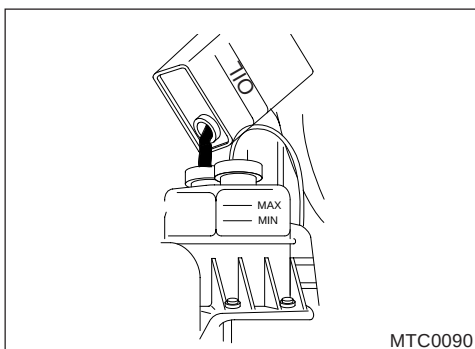
1. To drain the steering oil, jack up the front wheels to raise from the ground with the engine stopped, loosen the two joint bolts fitted to the upper face of steering unit and turn the steering wheel slowly in both direction.

2. Tighten the joint bolts securely and fill the oil tank to the specified level with the specified fluid.

3. After 2~3 minutes, lower the front wheels to ground, and idle the engine for 2~3 minutes.

4. Recheck the oil level while the engine is idling and replenish as necessary.

5. After filling, if unusual sound is heard when the steering wheel is turned, perform air-bleeding operation.



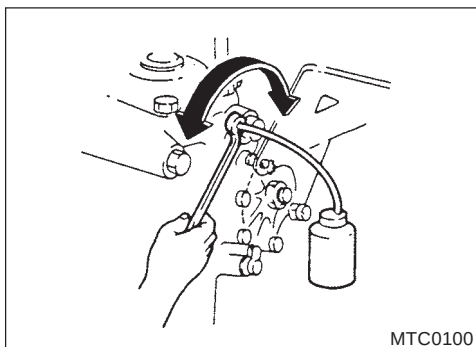
⚠ Caution

When topping up the oil tank, ensure the strainer is installed in the filler port. Replenishing oil through the filler port without strainer will cause foreign matters to come in the tank.

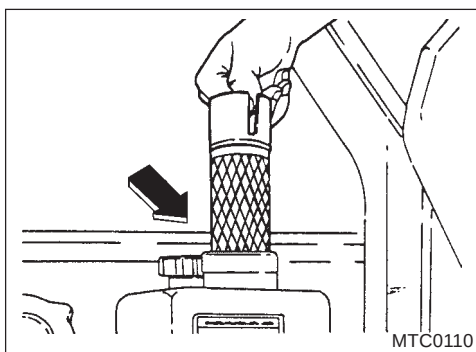
(4) Air bleeding of steering unit

1. After stopping the engine, jack up the front wheels clear of the ground and remove the air bleeder cap installed on the upper face of the steering unit.

3-22 INSPECTION AND MAINTENANCE



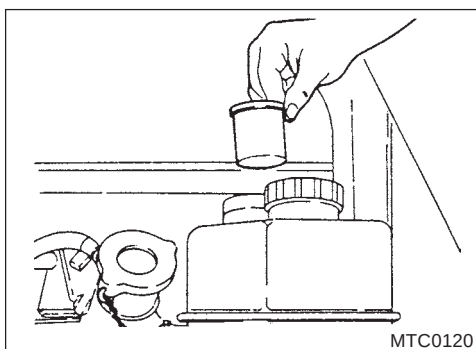
2. Connect a vinyl tube to air bleeder and insert the other end of the vinyl tube into a transparent container.
3. Bleed the circuit by loosening the bleeder with the steering wheel turned to lock in the right direction. Tighten the bleeder as soon as fluid and air bubbles are forced out. Then repeat the above procedure with the steering wheel turned to lock in the left direction.
4. When air is removed completely, install the cap on the bleeder and check fluid level. Lower the wheels to ground and check the system for fluid leakage. Before running, check the steering wheel works smoothly and unusual sound is not heard.



(5) Change of oil filter element

Oil filter element of paper type shall be changed at the same time when oil is changed.

After draining the oil, remove oil filter cap of oil tank, and replace oil filter element.

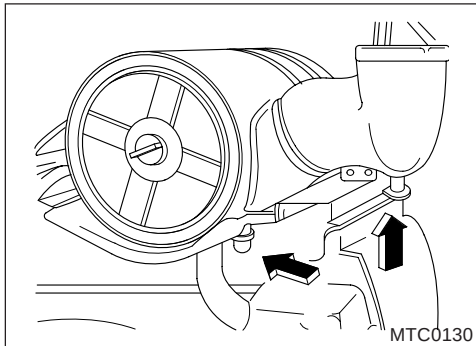


(6) Cleaning oil strainer

Prior to changing steering oil or filter element, oil strainer installed in the filler of oil tank shall be cleaned. Remove dust or other foreign matters from the oil strainer before reinstalling it.

⚠ Caution

It is strongly advisable to use genuine TATA Daewoo oil filter element.



5) Air cleaner(dry type)

(1) Replacement or cleaning of element

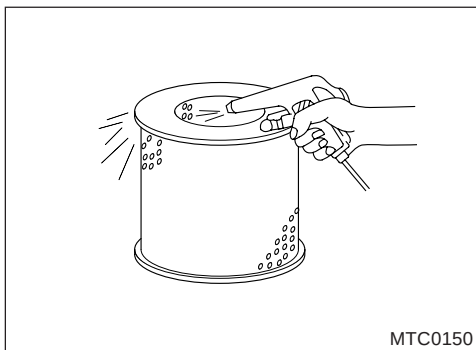
A partially blocked air cleaner will restrict the flow of air to the engine. Restricted air flow will decrease the performance of the engine and increase the fuel consumption and discharging of black smoke. Check and clean the element every 12,000km or frequently

⚠ Caution

When polluted or every 48,000km, exchange and clean the element.

(2) Cleaning

If the engine is operating in dusty areas or on dirt road, it should be cleaned every day.



⚠ Caution

For the dump truck, avoid loosening the wing nut fixing the inner element. Only clean the outer element. Replace both the outer and inner elements simultaneously.

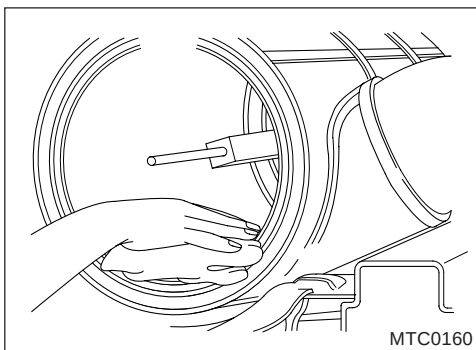
1. Loosen the wing nut to remove the top cover. Remove the wing nut retaining the element and take out the element. Handle the element carefully so as not to cause damage to it.
2. Blow the dust particle away by directing compressed air to the inner face of element.

⚠ Caution

Pressure of compressed air should be 7kg/cm² (100 psi) or lower. The stream of compressed air should be directed from the inside of element to its outside. Blowing compressed air in a direction opposite to this will pollute the inside of element. Use only compressed air, as applying a shock to the outside of element to remove dust particles will cause damage to it.

When the rubber valve designed to remove foreign matters has fallen off, do not block up the valve hole with a piece of vinyl but RENEW it. Blocking up the hole with a piece of vinyl can cause damage to the combustion system or lubricating system.

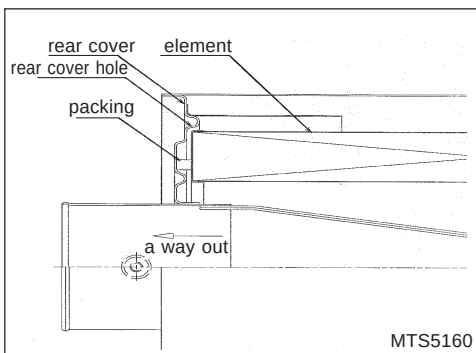
3-24 INSPECTION AND MAINTENANCE



3. Thoroughly clean the inside of air cleaner housing and outer cover to remove dust particles before refitting the element.
4. Attach the element horizontally, tighten the element retaining wing nuts, refit the outer cover, and then tighten the wing nuts to retain the air cleaner securely.

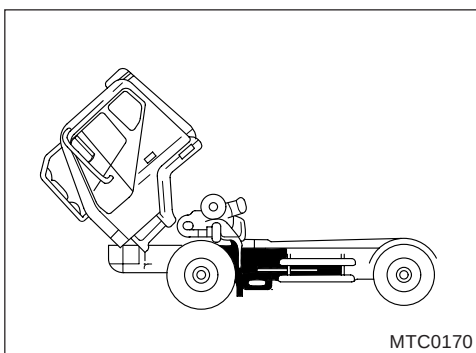
⚠ Caution

It is strongly advisable to use genuine TATA Daewoo air cleaner element.



⚠ Caution

Be sure to match element to rear cover inside keeping horizontality to prevent the dirt from inflowing. If not, it may cause engine burn.



(3) Replacement

Replacement intervals for air cleaner depend on the conditions of working area(dust, earth, or sand) and contamination or deformation of the element.

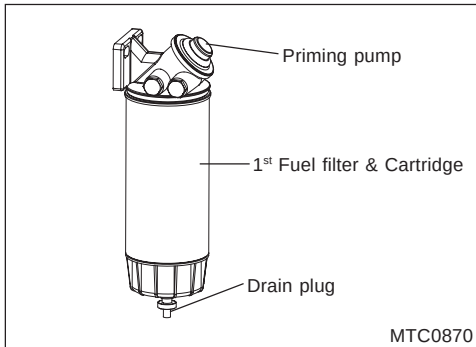
Must be replaced after 4 times cleaning

(4) Other cautions

1. When refitting the element after cleaning or replacing it, hold it horizontally and be sure to fit wing nuts to retain the air cleaner housing and element securely.
When replacing the inner element, do not forget to tighten the inner element with the wing nut.
2. When washing off the vehicle with the cab tilted, be careful to prevent the entry of water into the air cleaner housing. Otherwise, the air cleaner will get wet and not perform its functions. If water comes into the engine, critical trouble will result.
3. Inner element is available for dump and mixer truck only.

⚠ Caution

When changing the fuel filter, DO NOT smoke. Also, refrain from flammable materials. And DO NOT inhale the fumes from the fuel filter. If you do not observe the above matters, you could be injured seriously.



6) Engine fuel filter

Change the engine fuel filter as follows.

⚠ Caution

BE SURE to use the genuine engine fuel filter of ours. Any damage to the engine combustion system caused by using imitations will not be under warranty repair.

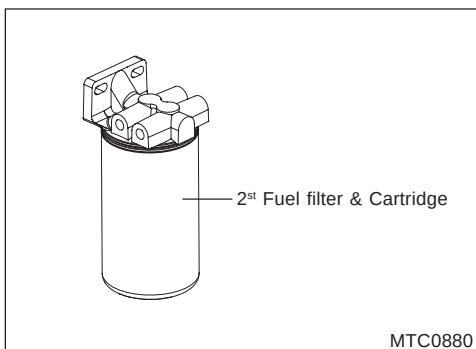
* DL08K/DV11K(DOOSAN) engine fuel filter

(1) 1st fuel filter

1. Get rid of the 1st fuel filter with tools.
2. Before you reattach a new 1st fuel filter, drench the seal(sealer) with diesel or engine oil.
3. Tighten the 1st fuel filter with your hand until the filter reaches the fuel filter bracket.
4. Rotate the engine oil filter more with the prescribe torque(1.8kg.m) through 270 degrees.
5. Remove the air.
6. After removing the air in the filter, pump the air out of the engine fuel lines several times until you are not able to push the priming pump well.

⚠ Caution

Get rid of the water in the cartridge by periodically releasing the plug located in the lower section of the 1st fuel filter cartridge. If you do not get rid of the water, it could cause the freeze of the fuel filter, difficulties in starting the engine and the engine failure while driving.



(2) 2nd fuel filter

1. Get rid of the 2nd fuel filter with tools.
2. Before you reattach a new 2nd fuel filter, drench the seal(sealer) with diesel or engine oil.
3. Tighten the 2nd fuel filter with your hand after checking that the contact surface between the 2nd fuel filter and the rubber seal remains clean.
4. After installing the fuel filter with your hand, rotate the fuel filter more with the prescribed torque(1.8kg.m) through 270 degrees.

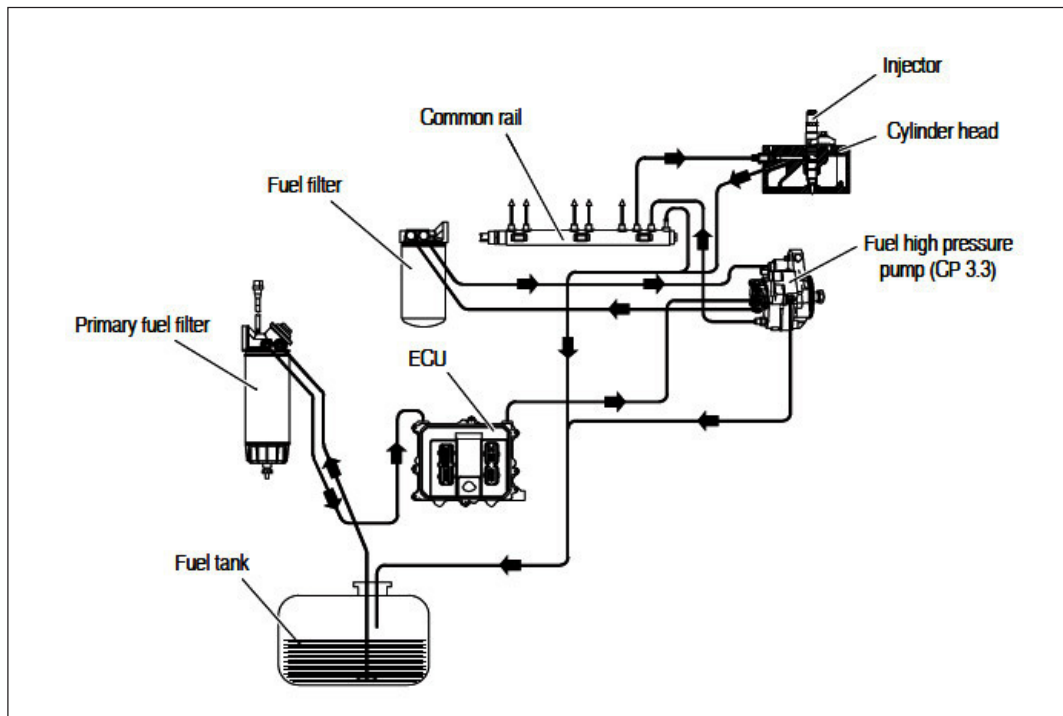
3-26 INSPECTION AND MAINTENANCE

7) How to pump out the air in the fuel system

Do pump out the air in the fuel system when you disassemble the fuel feed pump or the fuel filter in order to clean them or when the engine stops due to an insufficient supply of fuel.

(1) Fuel injection system

The fuel is stored under pressure in the common rail ready for injection. The injected fuel quantity is defined by the driver, and the start of injection pressure are calculated by the ECU on the basis of the stored maps. The ECU then triggers the solenoid valves so that the injector(injection unit) at each engine cylinder injects accordingly.



(2) Bleeding the fuel system

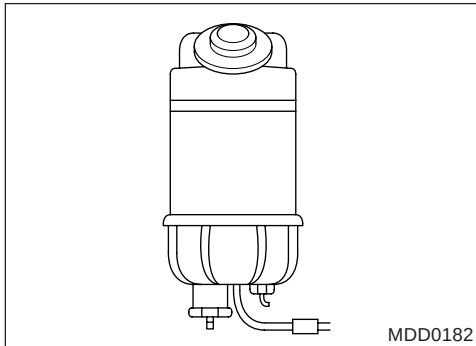
Loosen the fuel delivery pipe connected to the fuel high pressure pump from the secondary fuel filter, operate manually the priming pump until bubbles are not found, and bleed the system.

⚠ Caution

When fuelling, keeping cleanliness is of importance. As the unclean fuel causes the failure in the fuel system or the early wear and tear of the injection pump and nozzles, periodically get rid of the residues in the fuel tank.

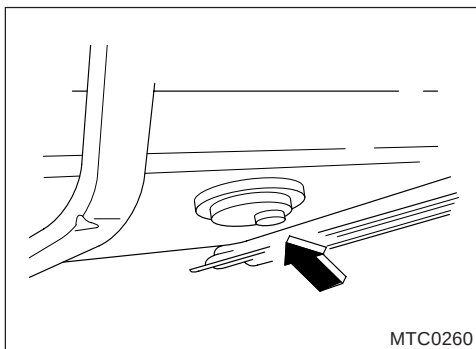
⚠ Caution

Fuel leakage is a fire hazard.



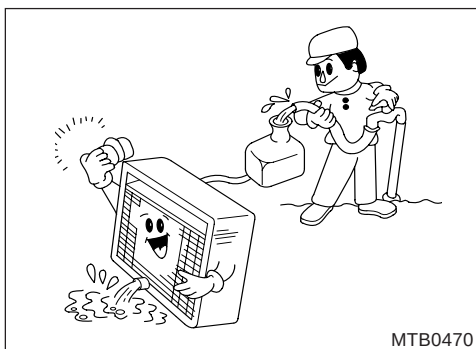
8) Fuel heater(ISM CUMMINS engine)

If paraffin is created to fuel system by decline of temperature in winter, it does not start because fuel supply is discontinued. So, fuel heater prevent paraffin creation raising temperature of fuel and do function that make circulation of fuel smoothly so that it may can start well.



9) Fuel tank

Clean the inside of the fuel tank and drain water and sediments at every 24,000km.



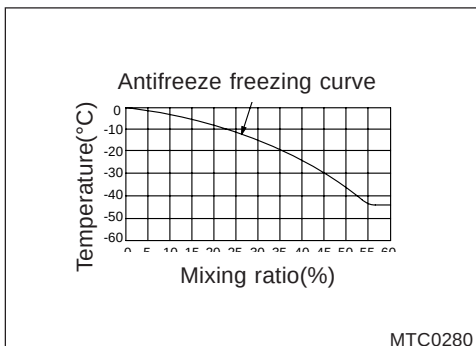
10) Change of coolants

Drain the coolant by opening the radiator drain cock, engine water drain cock and oil cooler cover plug. After completely draining off, close the drain cock and fill with water. Run the engine for about 10 minutes and then recheck the coolant level. In the case that antifreeze is added to coolant, it is advisable to clean the inside of the radiator and engine water jacket 2 times a year(in spring and autumn).

Specifications: EDS M-8207

Note

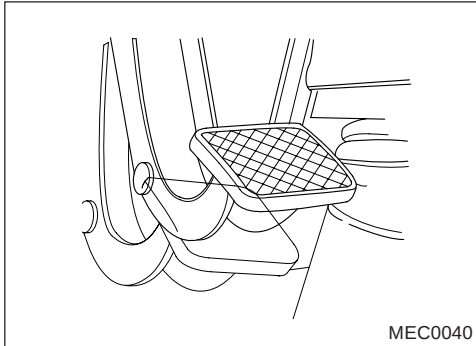
Mixing ratio of antifreeze:50%



Caution

- After changing coolant, confirm whether coolant is leaked.
- If you do not use antifreeze or use only water, it may cause corrosion of engine or cooling components, resulting in shorten life of engine. Use the genuine antifreeze.
- Follow coolant & coolant filter change interval. If you don't, it may result in corrosion of main engine parts (water pump, cylinder block etc.) and leakage of radiator.

3-28 INSPECTION AND MAINTENANCE



11) Inspection and adjustment of clutch pedal

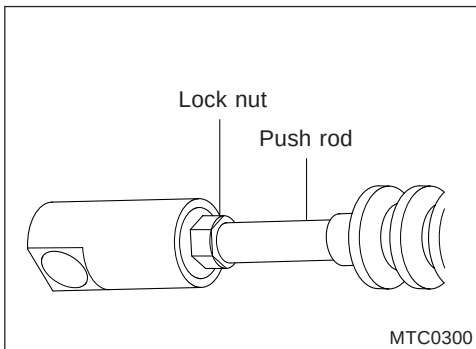
Clutch pedal free play is checked every 10,000km, if it is not in standard, control by following.

- Free play

Vehicle	Free play
All	3~5 mm

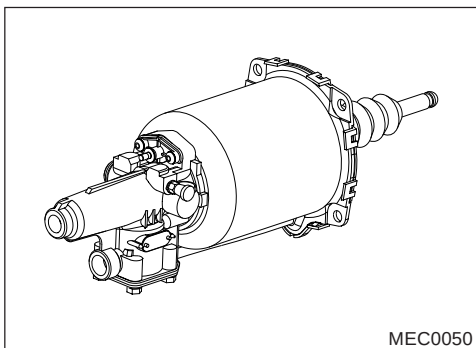
(1) Inspection of free play

To check the amount of pedal free play, release air completely from the main air tank and depress the clutch pedal carefully by hand until a strong resistance is felt, and then take the distance between the initial position of the pedal and the point where a strong resistance is felt.



(2) Adjustment of free play

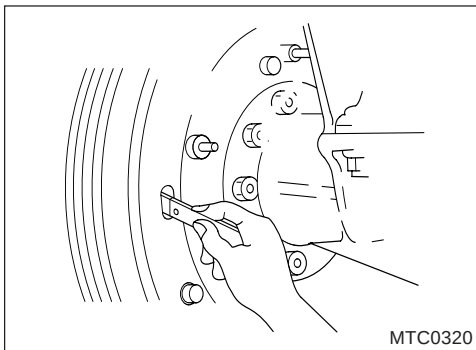
1. Master cylinder
 - a. Loosen the lock nut.
 - b. Turn the push rod until its end is brought into contact with the piston lightly, back off the rod 1/2 (about 0.5mm) of a turn and tighten the lock nut.



2. Booster
Adjust only clutch master free play as the booster of transmission can be automatically adjusted.
3. After enforce 1,2 clauses, adjust air pressure to 0kg/cm². Check the pedal free play when the pedal starts to meet the resistance.

⚠ Caution

Frequently check the check hole of back plate for the amount of brake lining abrasion.



12) Adjustment and control of brake

The use of brake system with excessive brake lining clearance is dangerous as the brake performance decreases with an increase in the lining clearance.

The brake lining clearance should be checked and adjusted regularly (first 1,000km, every 4,000km)

(1) Inspection of brake lining wear

Check the brake linings for wear through the check hole.

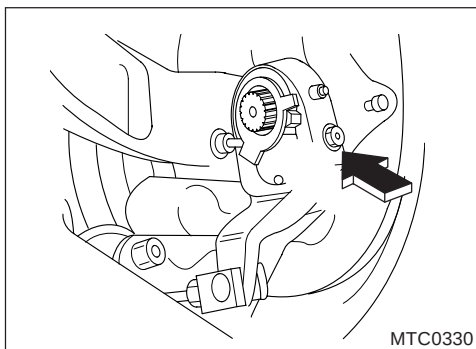
⚠ Caution

If the section of the brake linings becomes semi-circular, it indicates excessive wear beyond the limit. Frequently check and replace them, and contact your nearest TATA Daewoo dealer, if necessary.

(2) Manual slack adjuster of brake lining clearance

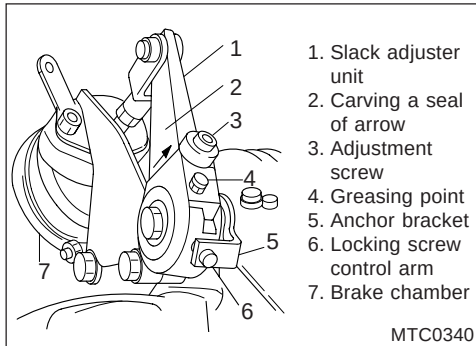
1. Insert a 0.3mm feeler gauge into the lining clearance through the check hole and adjust with the manual slack adjuster connected to the power chamber or spring chamber, so that the feeler gauge fits snugly into the clearance.

Lining clearance	0.3mm
------------------	-------



2. Adjust lining clearance by rotating the adjustment screw.

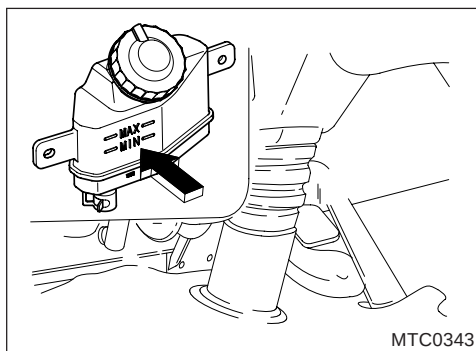
3-30 INSPECTION AND MAINTENANCE



(3) Auto slack adjuster of brake lining clearance

Item		All vehicles
Lining Clearance	Front	0.6~0.8mm
	Rear	

Auto lining clearance adjuster is designed to automatically adjust brake lining clearance.

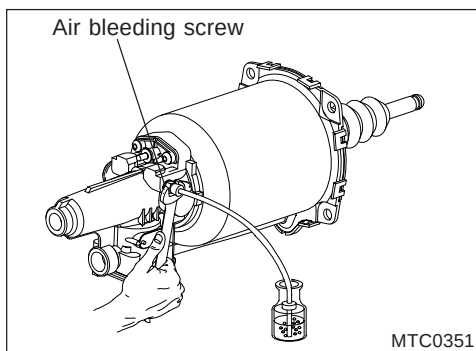


13) Air bleeding of clutch hydraulic circuits

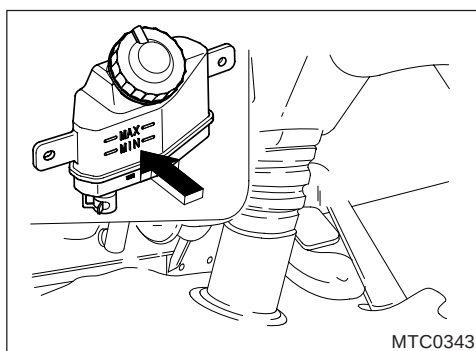
1. Fill the clutch fluid reservoir to the specified level with clutch.

⚠ Caution

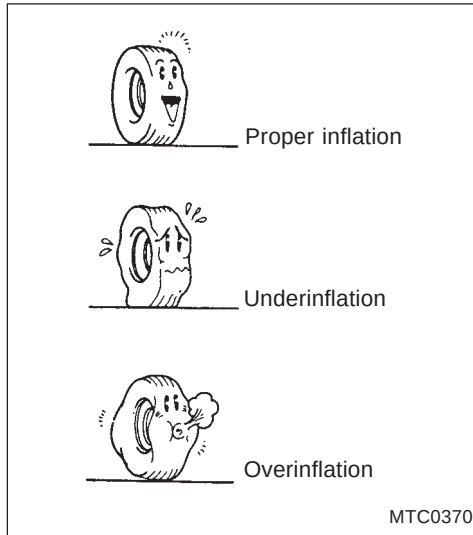
Keep it filled during bleeding operation.



2. Remove bleeder rubber cap and connect a vinyl pipe to the bleeder and hold free end of the pipe in a transparent container filled with clutch fluid.
3. Pump the clutch pedal several times and hold the pedal depressed.
4. With the pedal depressed, loosen the bleeder half a turn to discharge air-mixed clutch fluid and tighten it immediately.



5. Repeat the above steps of operation until air bubbles disappear completely from the fluid being forced out.
6. After the completion of bleeding operation, check for pedal free play and clutch operation, then check that the level of clutch fluid in the reservoir is normal.



14) Tires

(1) Tire pressure inspection

The tire air press wishes inspecting from the condition where the tire is cooled.

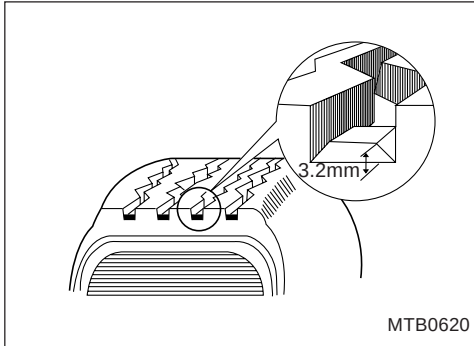
Warning

If the tire air press will be excessive or too little, the tire will be damaged on driving and then, you will encounter contingency.

• Tire air pressure

Tire size	Normal inflation pressure
11R22.5-16PR	8.4kg/cm ²
12R22.5-16PR	8.4kg/cm ²
12.00R20-18PR	8.4kg/cm ²
12.00R24-18PR	8.4kg/cm ²
13R22.5-18PR	8.4kg/cm ²
315/80R22.5-18PR	Kumho:Lug type 9.1kg/cm ² Rib type 8.4kg/cm ² Hankook:8.4kg/cm ²
315/80R22.5-20PR	9.1kg/cm ²
385/65R22.5-18PR	8.4kg/cm ²
385/65R22.5-20PR	9.1kg/cm ²

3-32 INSPECTION AND MAINTENANCE

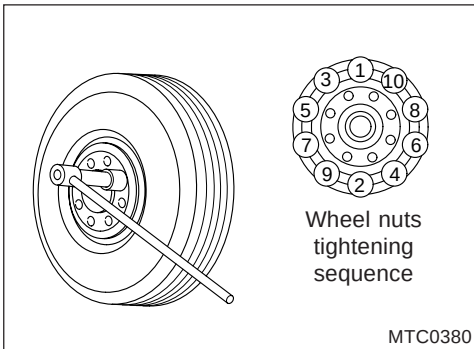


(2) Tire wear inspection

When the tire thread arrives, to attrition boundary line, exchange the tire, certainly. It remains 3.2mm thread.

Warning

When continuously uses the tire which is worn away above provision, the braking distance will be long and the handle control will be difficult and then, you will encounter contingency.



(3) Tire rotation

Tire wear depends on tire position, road conditions, or a habit of applying brakes. To avoid unbalanced wear of your tires and to prolong their lives, rotate tires periodically (every 5,000km normally).

Warning

TATA DAEWOO is not liable for any damage caused by the use of tires outside the specifications. Make sure to use tires with the specified size.

Warning

Do not put jack or OVM tool on the interior. At a urgent braking or clash, passenger can be damaged. Keep the tool safely.

Caution

When changing tire, be sure to support it with safety post in the opposition side tire.

Caution

Before lifting the vehicle with the jack, does not release the wheel nut completely.

Warning

Tighten the wheel nuts to the specified torque after initial 50 to 100km and 1,000km of driving after replacing the tire or purchasing the vehicle. After that, tighten them every 4,000km of driving. Otherwise, the tires may come off, leading to a serious injury or property damage. Especially, for vehicle equipped with an additional modified axle(pushover/tag), make sure to check that the wheel nuts are properly tightened before and after driving.

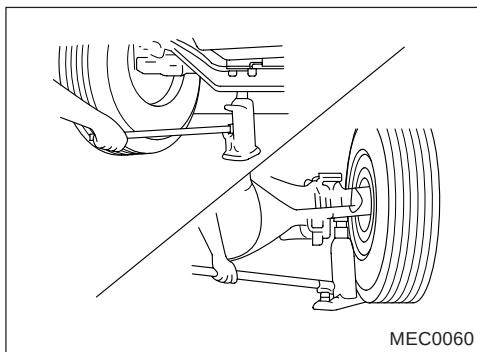
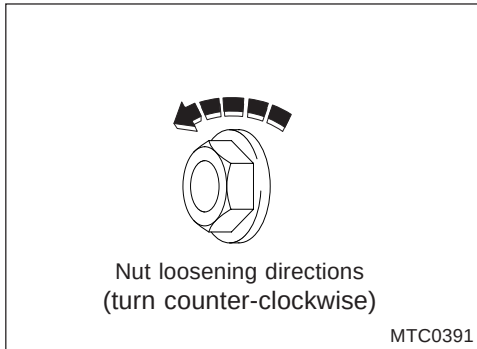
Caution

Tightening the nuts excessively can damage the wheel pin. Tighten them only to the specified torque. Specified tightening torque for wheel nut-front/rear wheel(10stud type):M22(55~65kg.m)

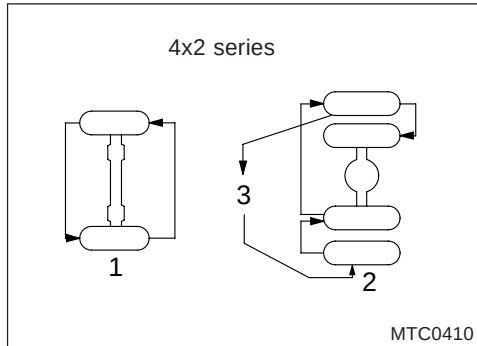
INSPECTION AND MAINTENANCE 3-33

Follow these instructions with care when rotating tires.

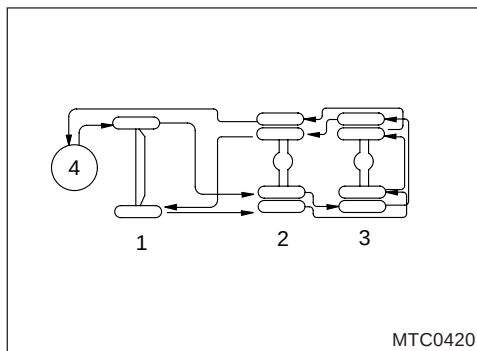
1. Wheel nuts are of right hand thread regardless of wheel locations.



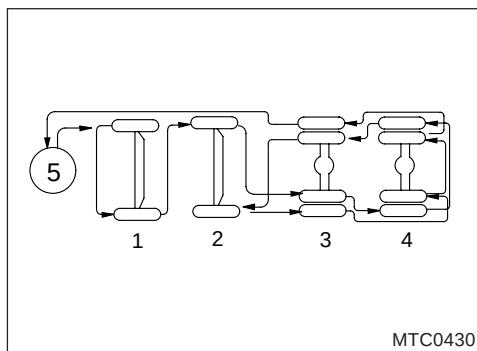
3-34 INSPECTION AND MAINTENANCE



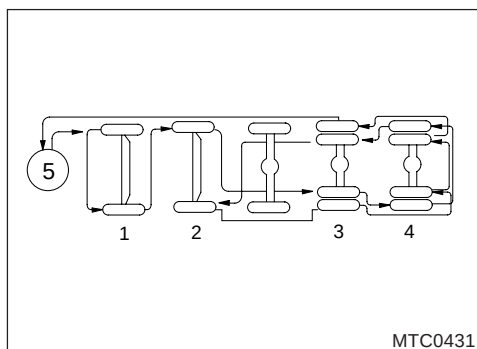
- **4x2 series**
 1. Front wheel
 2. Rear wheel
 3. Spare tire



- **6x4 series**
 1. Front wheel
 2. Rear front wheel
 3. Rear rear wheel
 4. Spare tire



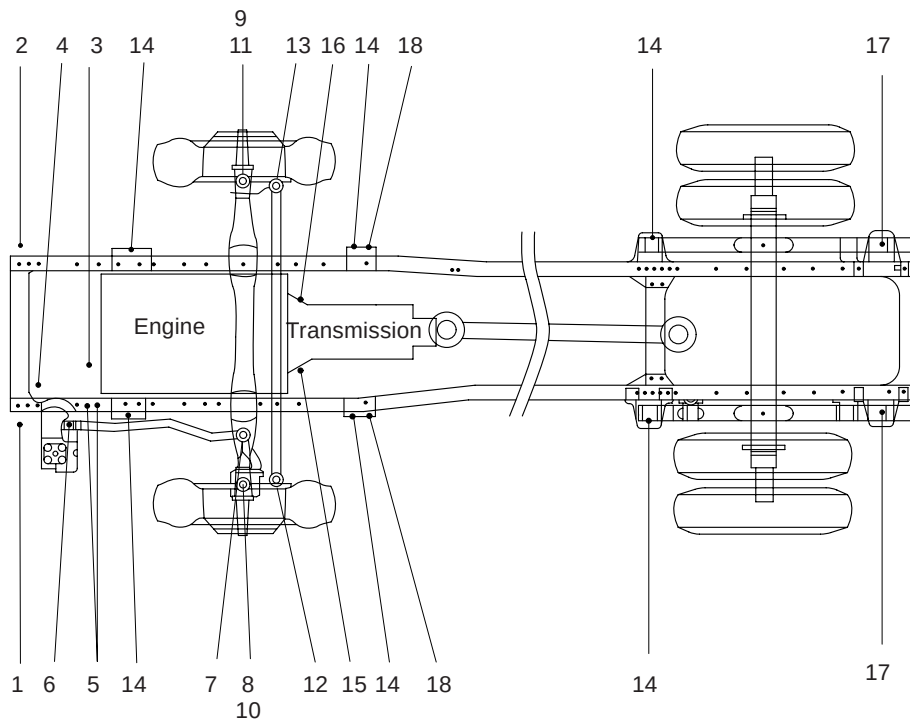
- **8x4 series**
 1. Front front wheel(1st shaft)
 2. Front rear wheel(2nd shaft)
 3. Rear front wheel(3rd shaft)
 4. Rear rear wheel(4th shaft)
 5. Spare tire



- **10x4 series**
 1. Front front wheel(1st shaft)
 2. Front rear wheel(2nd shaft)
 3. Self steer wheel(3rd shaft)
 4. Rear front wheel(4th shaft)
 5. Rear rear wheel(5th shaft)
 6. Spare tire

15) Greasing points

(1) 4x2 series chassis greasing point diagram

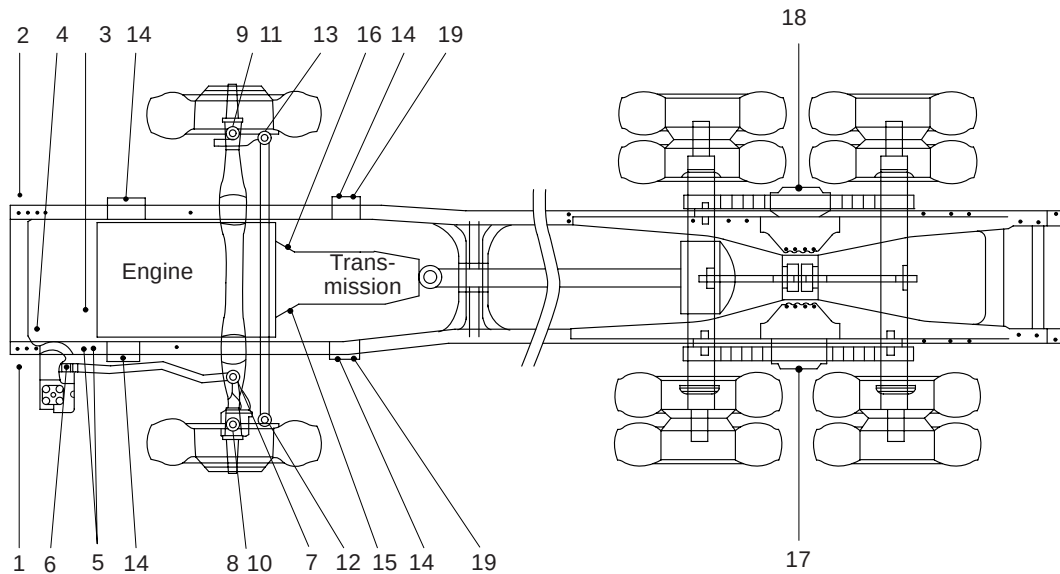


MEC0080

- | | | |
|---|----------------------------|----------------------------------|
| 1. Bracket support cap sus.
upper, left | 7. Drag link, rear | 14. Spring pin, front |
| 2. Bracket support cap sus.
upper, right | 8. King pin, left, upper | 15. Transmission release bearing |
| 3. Change lever | 9. King pin, right, upper | 16. Transmission release bearing |
| 4. 1st relay | 10. King pin, left, lower | 17. Bracket spring |
| 5. 2nd relay | 11. King pin, right, lower | 18. Shackle |
| 6. Drag link, front | 12. Tie rod, left | |
| | 13. Tie rod, right | |

3-36 INSPECTION AND MAINTENANCE

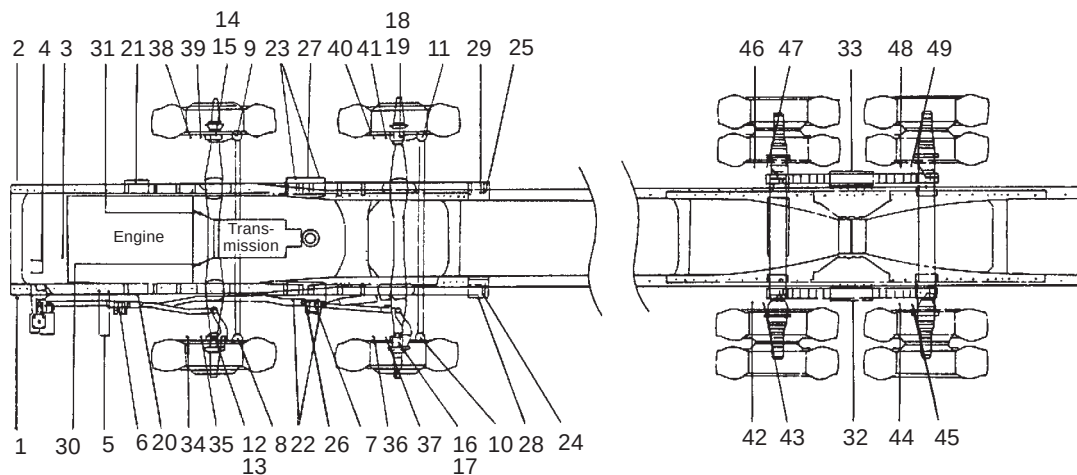
(2) 6x4 series chassis greasing point diagram



MDC0130

- | | |
|--|----------------------------------|
| 1. Bracket support cap sus. upper, left | 11. King pin, right, lower |
| 2. Bracket support cap sus. upper, right | 12. Tie rod, left |
| 3. Change lever | 13. Tie rod, right |
| 4. 1st relay | 14. Spring pin, front |
| 5. 2nd relay | 15. Transmission release bearing |
| 6. Drag link, front | 16. Transmission release bearing |
| 7. Drag link, rear | 17. Spring seat, left |
| 8. King pin, left, upper | 18. Spring seat, right |
| 9. King pin, right, upper | 19. Shackle |
| 10. King pin, left, lower | |

(3) 8x4 series chassis greasing point diagram

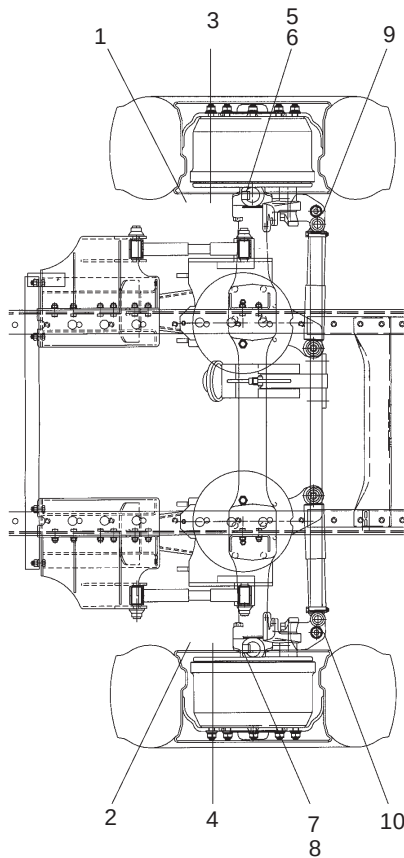


MTC0610

- | | | |
|--|--|--|
| 1. Bracket support cap sus. upper, left | 19. King pin, rear right, lower | 37. Slack adjuster, forward rear, left |
| 2. Bracket support cap sus. upper, right | 20. Spring pin, front, left | 38. Brake cam shaft, forward front, right |
| 3. Change lever | 21. Spring pin, front, right | 39. Slack adjuster, forward front, right |
| 4. 1st relay | 22. Spring pin, inter, left | 40. Brake cam shaft, forward rear, right |
| 5. 2nd relay | 23. Spring pin, inter, right | 41. Slack adjuster, forward rear, right |
| 6. Idle arm | 24. Spring pin, rear, left | 42. Brake cam shaft, rearward front, left |
| 7. Relay arm | 25. Spring pin, rear, right | 43. Slack adjuster, rearward front, left |
| 8. 1st tie rod, left | 26. Shackle, front, left | 44. Brake cam shaft, rearward rear, left |
| 9. 1st tie rod, right | 27. Shackle, front, right | 45. Slack adjuster, rearward rear, left |
| 10. 2nd tie rod, left | 28. Shackle, rear, left | 46. Brake cam shaft, rearward front, right |
| 11. 2nd tie rod, right | 29. Shackle, rear, right | 47. Slack adjuster, rearward front, right |
| 12. King pin, front left, upper | 30. Transmission release bearing | 48. Brake cam shaft rearward rear, right |
| 13. King pin, front left, lower | 31. Transmission release bearing | 49. Slack adjuster, rearward rear, right |
| 14. King pin, front right, upper | 32. Spring seat, left | |
| 15. King pin, front right, lower | 33. Spring seat, right | |
| 16. King pin, rear left, upper | 34. Brake cam shaft, forward front, left | |
| 17. King pin, rear left, lower | 35. Slack adjuster, forward front, left | |
| 18. King pin, rear right, upper | 36. Brake cam shaft, forward rear, left | |

3-38 INSPECTION AND MAINTENANCE

(4) 10x4 series(self steer axle), chassis greasing point diagram



MTC0601

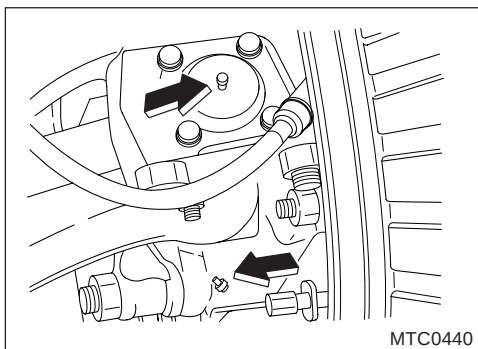
- | | |
|---------------------------|---------------------------|
| 1. Brake cam shaft, right | 6. King pin, right, lower |
| 2. Brake cam shaft, left | 7. King pin, right, upper |
| 3. Slack adjuster, right | 8. King pin, right, lower |
| 4. Slack adjuster, left | 9. Tie rod, right |
| 5. King pin, right, upper | 10. Tie rod, left |

★ Other 10x4 vehicle's drawing for greasing is same as 8x4 vehicles.

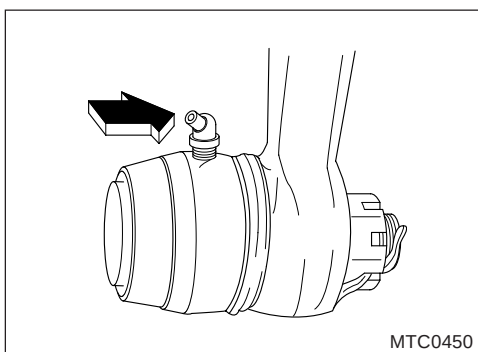
(5) Greasing points(nipples)

Use a greasing pump to inject every 5,000km of grease to each nipple.

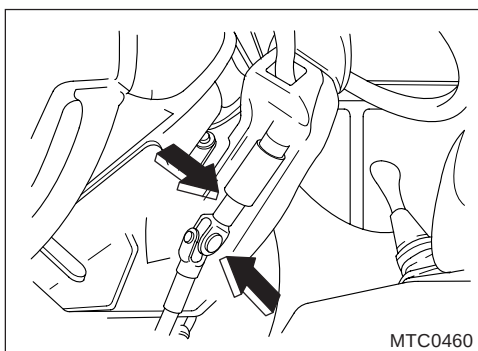
- **King pin**



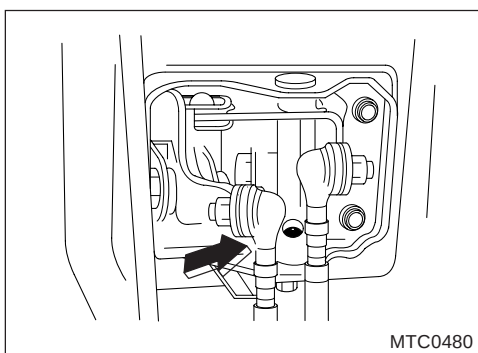
- **Drag link**



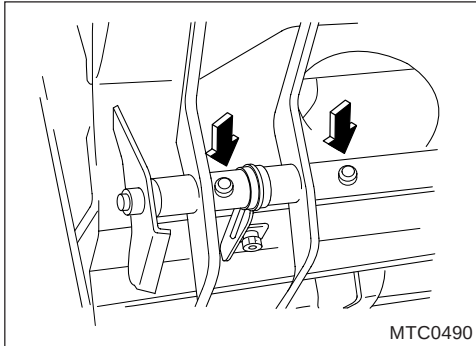
- **Inside spline shaft of steering column**



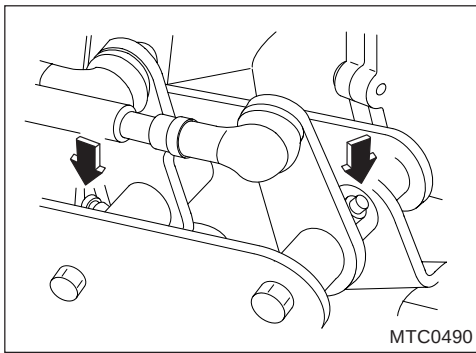
- **Gearshift control rod (to gearshift lever)**



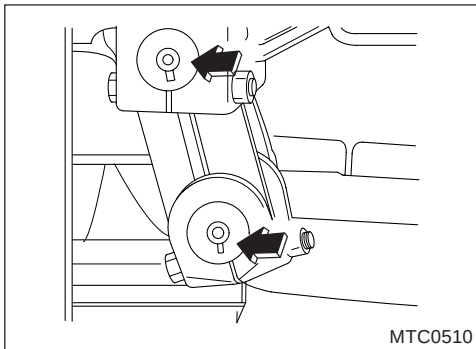
3-40 INSPECTION AND MAINTENANCE



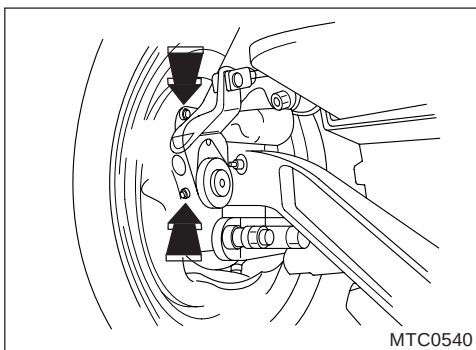
- Gearshift control rod-First relay (to under cap)



- Gearshift control rod-Second relay (to frame)

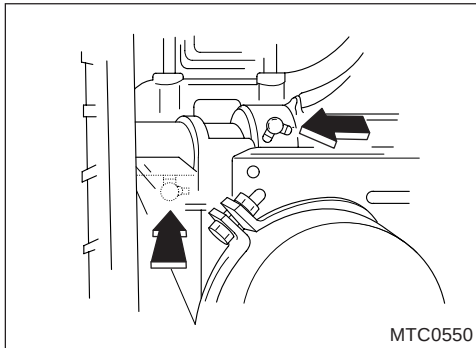


- Spring pins and shackle pins

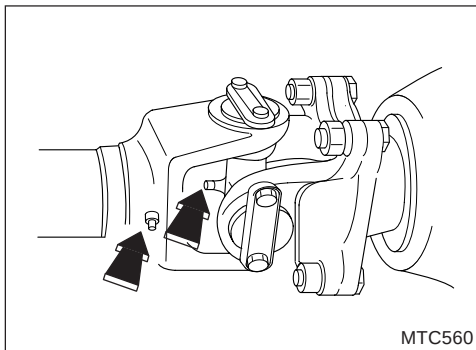


- Front S-cam shaft and slack adjuster

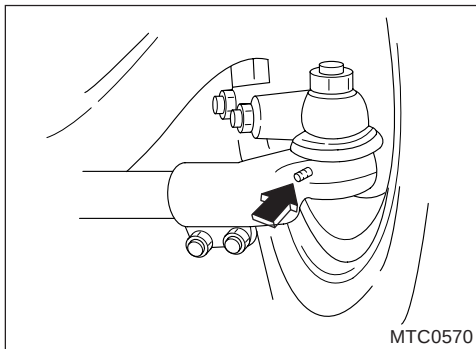
INSPECTION AND MAINTENANCE 3-41



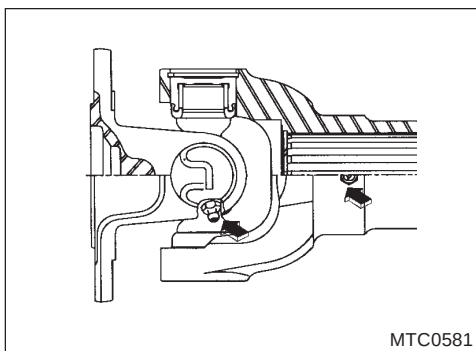
- **Rear S-cam shaft and slack adjuster**



- **Propeller shaft universal joints and sliding sleeve**

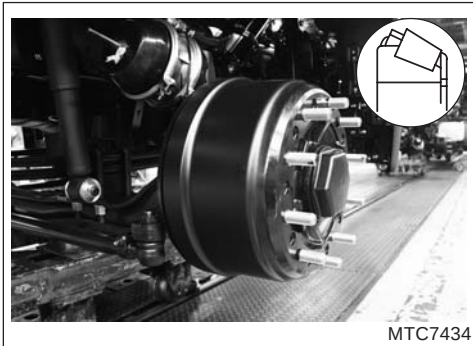


- **Tie rod ends**



- **P.T.O drive shaft**

3-42 INSPECTION AND MAINTENANCE

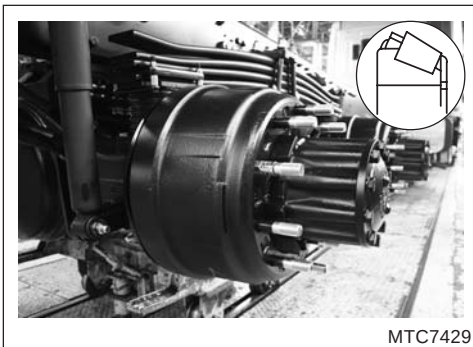


(6) Greasing the front hub and the rear hub

- Vehicles equipped with drum brake(equipped with insulation hub bearing)

• Front hub

When changing the brake lining, remove the front hub, get rid of the remaining grease of the hub bearings, and then apply the new clean grease. At this point, BE SURE to change the oil seal of the front hub.



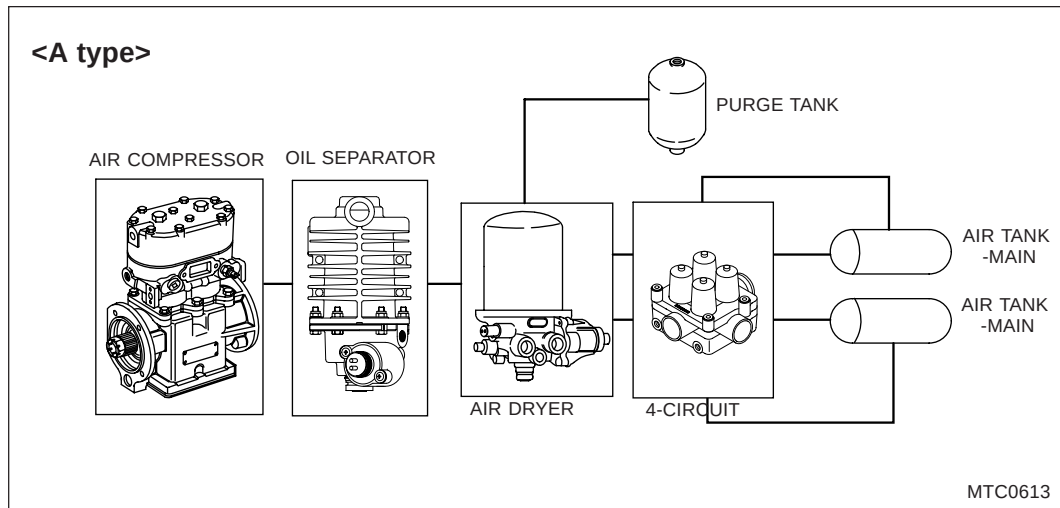
• Rear hub

When changing the brake lining, remove the rear hub, get rid of the remaining grease of the hub bearings, and then apply the new clean grease. At this point, BE SURE to change the oil seal of the rear hub(both the inside and the outside of it).

⚠ Caution

If your vehicle is equipped with disk brakes(equipped with unit hub bearings), you do not need additional application of grease.

16) Air dryer



* It is different from the mounted location of part by vehicles

⚠ Caution

1. Dirt and water of the air dryer inside may cause heavy damage to break system. To prevent the entry of foreign substances, exchange clean pipe or clean the surroundings.
2. The pressure of governor valve that attached on the air dryer was setted about vehicle. Do not operate separately. Before driving, always check it whether the pressure in vehicle is equal to the pressure of filter cartridge in air dryer.
ex) TATA Daewoo truck's pressure : $8.5 \pm 0.2 \text{ bar}$ (8.3~8.7 bar)-self steer/bogie lift vehicle: 12 bar
3. Change filter cartridge at end of every 12 months or 50,000km operation for normal state.
4. When exchanging air dryer filter, please remove debris by overhaul of oil separator
5. It is strongly advisable to use genuine TATA Daewoo, if you buy the filter cartridge.

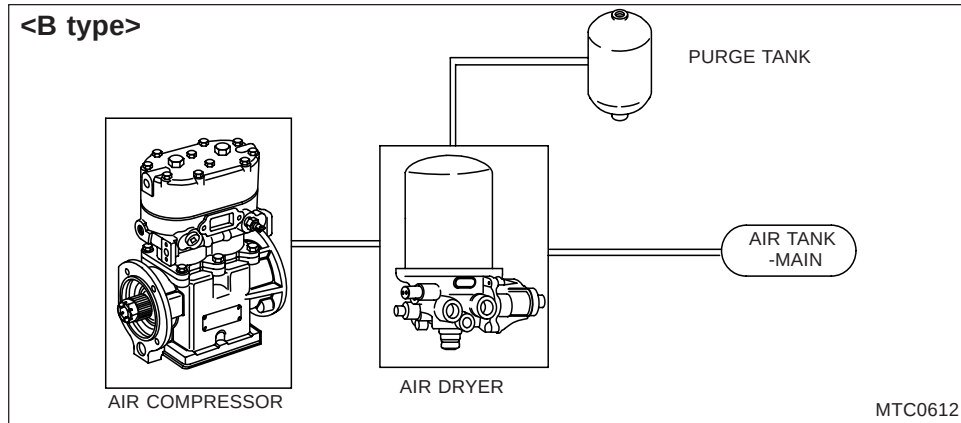
⚠ Caution

Air dryer is only exchanged by repairman

• Air dryer exchange procedure

- 1) Disassemble air dryer
 - (1) Remove an air in the air tank.
 - (2) Remove the pipe of air dryer.
 - (3) After loosening the installed bolt, remove air dryer cleaning pipe and surroundings.
- 2) Cleaning pipe and surroundings
Care should be taken to prevent the entry of foreign substances inside air dryer by cleaning pipe inside and surroundings, or exchanging clean pipe.
- 3) Assemble air dryer
For reassembly, reverse the disassembly.
((3)→(2)→(1))

3-44 INSPECTION AND MAINTENANCE



* It is different from the mounted location of part by vehicles

⚠ Caution

1. Dirt and water of the air dryer inside may cause heavy damage to brake system. To prevent the entry of foreign substances, exchange clean pipe or clean the surroundings.
2. The pressure of governor valve that attached on the air dryer was setted about vehicle. Do not operate separately. Before driving, always check it whether the pressure in vehicle is equal to the pressure of filter cartridge in air dryer.
ex) TATA Daewoo truck's pressure : $8.5 \pm 0.2 \text{ bar}$ (8.3~8.7bar)-self steer/bogie lift vehicle:12bar
3. Change filter cartridge at end of every 12 months or 50,000km operation for normal state.
4. It is strongly advisable to use genuine TATA Daewoo, if you buy the filter cartridge.

⚠ Caution

Air dryer is only exchanged by repairman

• Air dryer exchange procedure

- 1) Disassemble air dryer
 - (1) Remove an air in the air tank.
 - (2) Remove the pipe of air dryer.
 - (3) After loosening the installed bolt, remove air dryer cleaning pipe and surroundings.
- 2) Cleaning pipe and surroundings
Care should be taken to prevent the entry of foreign substances inside air dryer by cleaning pipe inside and surroundings, or exchanging clean pipe.
- 3) Assemble air dryer
For reassembly, reverse the disassembly.
((3)->(2)->(1))

17) Oil separator

• Maintenance and inspection

1) The function of the oil separator

The oil separator, which is located in front of the air dryer, improves the efficiency of the air dryer and prolongs its life by filtering foreign objects or moisture in the compressed air. The filtered foreign objects and moisture are sporadically released little by little due to the internal pressure difference of the oil separator.

2) The inspection interval of the oil separator

Inspect the air separator when changing the air dryer cartridge. (every 50,000km or every 12 months)

3) How to inspect the oil separator

(1) With the idling condition, check that the tank pressure indicator indicates $8.5 \pm 0.2 \text{ bar}$ (8.3~8.7bar) while the air dryer is being purified after consuming the air by forcefully pressing the brake pedal 4~5 times.

(2) After that, the foreign objects are sporadically released into the atmosphere gradually by the internal pressure difference of the oil separator, which is normal condition.

Caution

- For your safe driving, periodical inspection should be done according to maintenance schedules.
- If the foreign objects such as carbon residues remaining around the inlet of pipes flow in the VALVE BODY of the oil separator, it could cause a failure and therefore clean up the pipes or replace them with clean ones.

Caution

- NEVER drive your vehicle and have your vehicle checked and serviced at the service center nearby if the air pressure is NOT in the normal condition of $8.5 \pm 0.2 \text{ bar}$ (8.3~8.7bar) and if there is a leakage in the oil separator. If you drive your vehicle with abnormal condition, you could be seriously injured by the failure in the brake system.
- If the brake system warning light is turned on and the warning call is made, -immediately apply the main brake(brake pedal) and the parking brake lever, pull over your vehicle to a safe place and have your vehicle checked.
- You can stop your vehicle by applying the parking brake(once) even if the main brake(brake pedal) does not work due to the running out of the whole pressure in the air tank while driving and therefore do not be embarrassed and slowly bring your vehicle to a stop.

3-46 INSPECTION AND MAINTENANCE

18) Air compressor

- **Maintenance and inspection**

- 1) Function of air compressor

The air compressor is mounted on the engine and is a device which produces the compressed air that is used for the main brake(brake pedal), the parking brake, the suspension system and etc.

- 2) Air compressor maintenance schedule

DL08K/DV11K(DOOSAN) engine : every 48,000km

⚠ Caution

For your safe driving, DO have your vehicle checked and serviced according to the maintenance schedules.

- 3) How to check Air compressor

With the idling condition, check that the air compressor works properly until the tank pressure indicator indicates $8.5 \pm 0.2 \text{ bar}$ (8.3~8.7bar) by forcefully pressing the brake pedal 4~5 times.

⚠ Warning

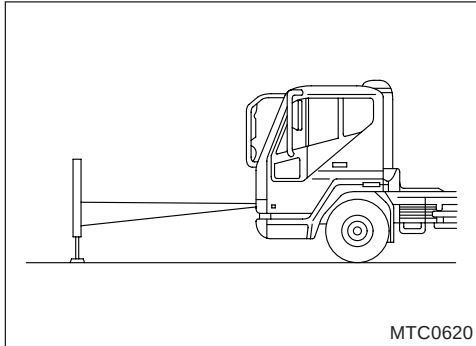
NEVER drive your vehicle and have your vehicle checked and serviced at the service center nearby if the air pressure is NOT in the normal condition of $8.5 \pm 0.2 \text{ bar}$ (8.3~8.7bar) and if there is a leakage in the oil separator. If you drive your vehicle with abnormal condition, you could be seriously injured by the failure in the brake system.

- 4) How to handle the failure in Air compressor while driving

When there is a failure or damage in air compressor or air system, the pressure in the air tank drops to the dangerous level and then the brake system warning light is turned on(#1/#2) and the warning call is made.

⚠ Caution

- *If the brake system warning light is turned on and the warning call is made, immediately apply the main brake(brake pedal) and the parking brake lever, pull over your vehicle to a safe place and have your vehicle checked.*
- *You can stop your vehicle by applying the parking even if the air pressure is completely used.*



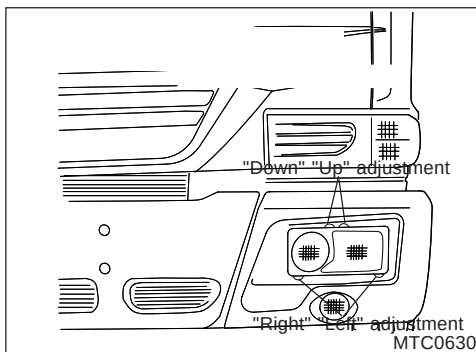
19) Electrical

(1) Headlamp aiming

1. Be sure to have the headlamps be aimed correctly after changing or refitting.
2. Use a head lamp tester or aimer to aim the headlamps.
3. Use the 4 aiming screws to make low or high beam adjustment.

⚠ Caution

Do not adjust angle individually as it is related to safety issues. Visit our service shop to adjust light angle if necessary.



(2) Bulb replacement and kinds

Follow these instructions when changing bulbs, and always use the specified bulbs.

1. Remove the bulb cap of head lamp.
2. Press straight the bulb and turn it left to remove the existing bulb, and then fit the new one.
3. When changing halogen bulb(for fog lamps or headlamps), never touch the surface of the new halogen bulb by hand.

⚠ Warning

Do not use nonstandard size lamp unless it may results in parts broken or a fire. Use the standard lamp for your safety.

⚠ Warning

When you touch lighting lamp with your hand, it may burn your hand. You have to wait to work with lamp until cooling it after turn it off.

Note

You will remove any oil from your hand, which can cause staining on cover lamp.

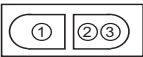
Classification	"UP" Move in the direction	"DOWN" Move in the direction	"Left" Move in the direction	"Right" Move in the direction
Headlamp	Turn the aiming bolt to the right	Turn the aiming bolt to the left	Turn the aiming bolt to the right	Turn the aiming bolt to the left

3-48 INSPECTION AND MAINTENANCE



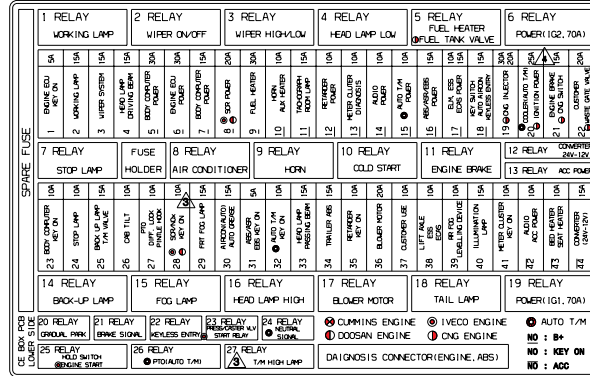
⚠ Warning

Do not install additional headlamps. If you install additional headlamps, the current of the wiring system of the headlamps will exceed the allowable current, which could cause a fire by influencing the headlamp relay.

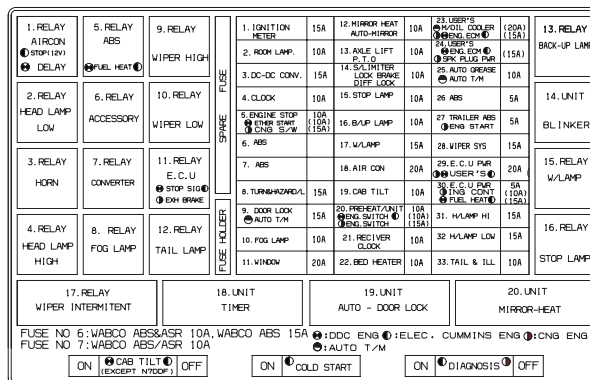
No	Description				Wattage	Quantity	Remarks
1	Front head & fog lamp	Head lamp		75/70W(H4)	2	"A" type (&T42)	
		Fog lamp		70W(H3)	2		
	Front combination lamp	Turn signal lamp		25W	2		
		Parking lamp		5W	2		
		Position lamp		25/10W	2		
2	Front combination lamp	Head lamp	High(H1)	70W	2	"B" type (&T54)	
			Low(H7)	70W			
		Turn signal lamp		25W	2		
		Parking lamp		5W	2		
		Position lamp		25/10W	2		
		Fog lamp(H3)		70W	2		
3	Rear combination lamp	"A" Type	(1)	Turn signal lamp	25W	2	"A" Type 
			(2)	Stop lamp	25W/10W	2	
			(3)	Parking lamp	5W	2	
		"B" Type	(1)	Rear end outline marker	10W	2	"B" Type 
			(2)	Rear turn signal lamp	21W	2	
			(3)	Stop lamp	21W	2	
			(4)	License plate lamp	-	-	
			(5)	Rear position lamp	5W	2	
			(6)	Rear fog lamp	-	-	
			(7)	Reversing lamp	21W	2	
4	Room lamp	Large room lamp		27W	1		
				10W	1		
		Room & Spot lamp	Left lamp		12W	1	
			Center lamp		12W	1	
			Right lamp		12W	1	
		Reading lamp		10W	1	White color	
		Mood lamp		10W	1	Amber color	
		Step lamp		10W	1		
5	Door side lamp			12W	2		
6	License plate lamp			12W	1		
7	Back up lamp			12W	1		
8	Working lamp			40W	1	Tractor	
				40W	2	Mixer	
9	Side marker lamp	to fender		R5W	2		
10	End outline marker lamp	to cab roof		R10W	2		
		to side deck		4W	2		

(3) Fuse and relay box (Inside the cab) 1) Fuse and relay positions

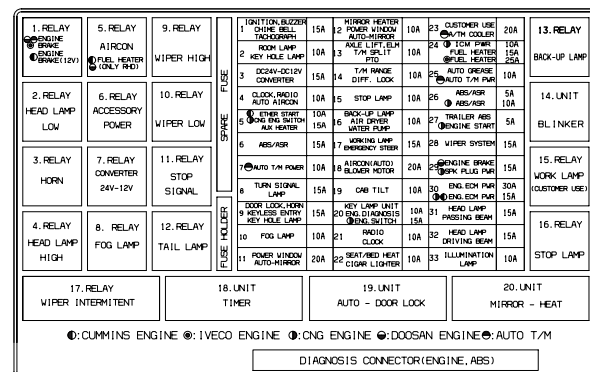
<A Type>



<B Type>



<C Type>



MTC0641

✱ Fuse: "F", Relay and unit: "R"

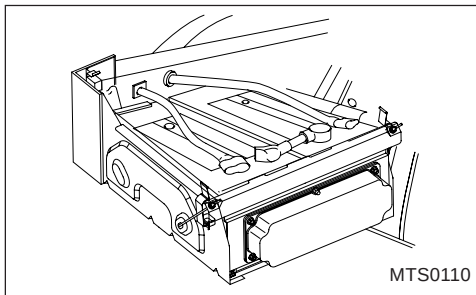
(4) Auxiliary fuse and relay box(To side battery)

<A TYPE>

1) Fuse, relay and unit positions

1 RELAY	FAN MOTOR (CONDENSER)	15A	30A	15A
2 RELAY	WORK LAMP (CUSTOMER)	5A	10A	5A
3 RELAY	PARK LAMP TANK VALVE	5A	10A	5A
4 RELAY	STARTER	5A	10A	5A
5 RELAY	ACC	5A	10A	5A
6 RELAY	TRAILER	5A	10A	5A
7 RELAY	TRAILER	5A	10A	5A
8 RELAY	TRAILER	5A	10A	5A
9 RELAY	TRAILER	5A	10A	5A
10 RELAY	TRAILER	5A	10A	5A
11 RELAY	TRAILER	5A	10A	5A
12 RELAY	TRAILER	5A	10A	5A
13 RELAY	TRAILER	5A	10A	5A
14 RELAY	TRAILER	5A	10A	5A
15 RELAY	TRAILER	5A	10A	5A
16 RELAY	TRAILER	5A	10A	5A
17 RELAY	TRAILER	5A	10A	5A
18 RELAY	TRAILER	5A	10A	5A
19 RELAY	TRAILER	5A	10A	5A
20 RELAY	TRAILER	5A	10A	5A

2) Fuses corresponding to each position of the starter key



The auxiliary fuse and relay box is installed to side of the vehicle battery.

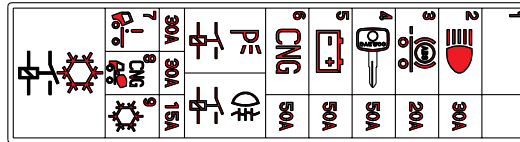
Warning

Installed in safe place that vehicles does not pass at fuse and relay checking.

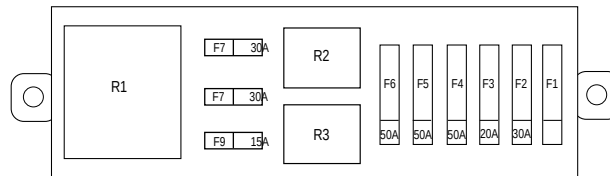
3-52 INSPECTION AND MAINTENANCE

<B TYPE>

1) Fuse, relay and unit positions

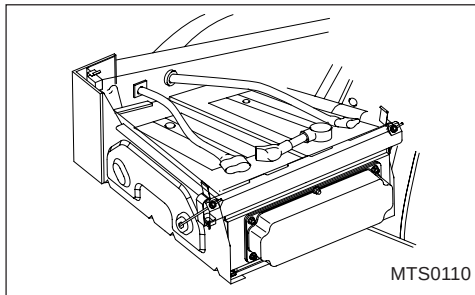


MTS0112



MTS0111

2) Fuses corresponding to each position of the starter key



MTS0110

The auxiliary fuse and relay box is installed to side of the vehicle battery.

Warning

Installed in safe place that vehicles does not pass at fuse and relay checking.

3) Designations of fuses

No.	Capa	Use	No.	Capa	Use
F1	-	-	F6	50A	CNG
F2	30A	Headlamp with high beam/Headlamp with low beam,Tail lamps and instrument panel lamps	F7	30A	Cab tilt
F3	20A	Trailer ABS	F8	30A	CNG
F4	50A	Power supply to cabin in Key On position	F9	15A	Air con
F5	50A	Constant power supply to cabin	-	-	-

4) Designations of relays

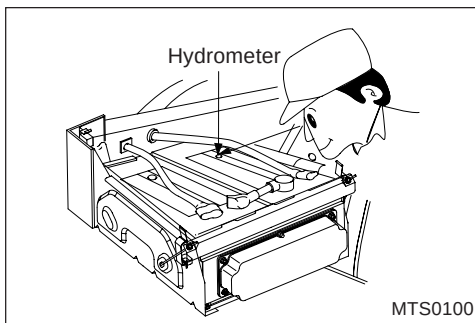
No.	Use
R1	Fan motor relay
R2	Parking lamp relay
R3	Rear fog lamp relay

⚠ Caution

1. Be sure to set the ignition switch to "OFF" position before attempting to disconnect battery terminals.
2. Never disconnect battery terminals while the engine is running, since failure to do this will cause severe damage to the electrical system.
3. Engine does not starting due to discharge of battery

⚠ Caution

1. Using batteries when electrolyte is insufficient may generate too much gas, results in detonation.
2. Be sure to let the batteries not exposed to open flames, static electricity, unnecessary spark/short or it can detonate.



20) Battery care

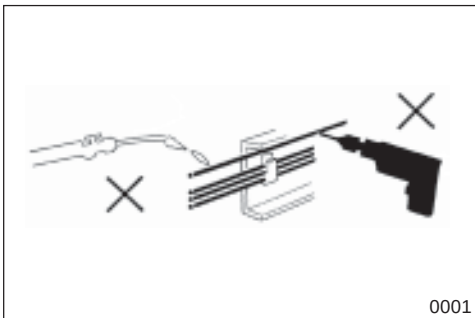
(1) Battery checks(MF Battery)

1. Your vehicle is equipped with maintenance free(MF) batteries, which do not require periodic maintenance as long as they are used properly.
2. Check the state of charge by the hydrometer(test indicator) installed on the face of the battery.

Test indicator	State of charge	Correction
Green	Normal	Use
Black	Low charge level	Recharge
Transparent	Low electrolyte level	Replace

3. If you do not operate your vehicle for extended period of time, start the engine every 5 days to recharge the batteries.

• NOTICES before electric welding or drilling on the chassis and the frame



⚠ Caution

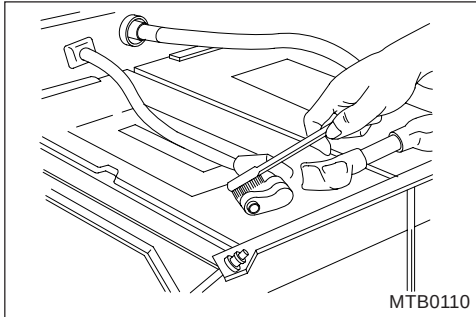
Before electric welding is processed on the chassis or the frame, BE SURE to separate both the positive(+) terminal and the negative(-) terminal and disassemble all the control unit connectors. Otherwise, such electronic control units as ECU, TCU, BCM, meters, etc. could be seriously damaged.

- (1) When welding or drilling, beware that you DO NOT damage the function of the parts of the chassis.
- (2) Especially, SERIOUS INJURIES can be caused by the brake system, piping & wiring, and security parts.
- (3) Also, when you install special equipment around the vehicle identification number which is located on the front side of the side frame, be aware that the vehicle identification number should be verified from the side of your vehicle.

⚠ Caution

1. Turn the ignition key "OFF".
2. Release the negative terminal(-) and the positive terminal(+), cover the cap.
3. Disassemble all the connectors such as control units.
4. BE SURE to place the ground connector of the welding machine near to the welding zone.

3-54 INSPECTION AND MAINTENANCE



⚠ Caution

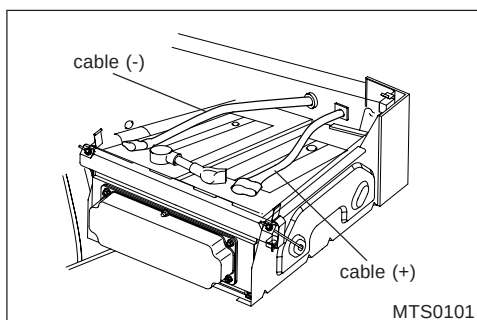
The case electric welding in the frame, work after disconnecting the "(+)", "(-)" terminal of the battery. If not disconnect, it can break down a ECU(engine, ABS, Auto-grease, chime-bell, speed limit, etc.)

(2) Cautions when handling batteries

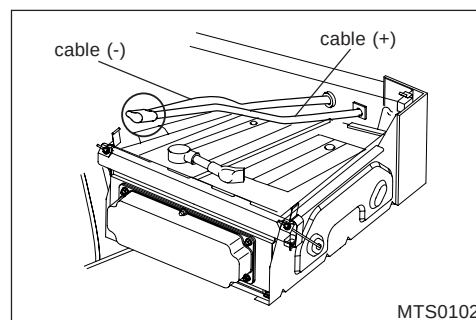
⚠ Caution

1. Wipe the battery terminals thoroughly and carefully with a soft brush and baking soda to remove corrosion around them. Then, wipe them again with hot water-soaked rag and apply vaseline or grease to them.
2. Never have the batteries exposed to open flames or electric sparks.
3. If electrolyte(sulfuric acid) contacts your skin, eyes, clothing or vehicle body, immediately flush with water.
4. To avoid short circuits, remove all jewelry and watches and do not permit any metal tools to make contact between the positive battery terminal and other metal on the vehicle.
5. When installing the battery, do not incline it above 45°.

- 1) Battery would be dead if you leave the vehicle long time. Disconnect power connector. To disconnect power connector, open battery cover and then take off red tapping connector (1 pin) on Key off position
- 2) Whenever starting ON/OFF, take 30 minutes after starting on to maintain battery condition.
- 3) How to disconnect battery cable in welding work: Before welding, disconnect battery cable unless welding work has serious impact on electric & electronic assembly.



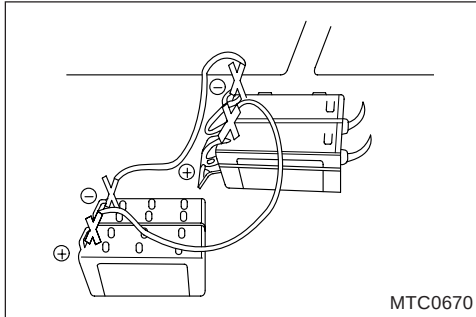
Normal



Welding work

⚠ Caution

Disconnect positive cable and negative cable figure as below and then carry out welding work, overlapping two cables.



Note

The electrode of each terminal indicates on the front of battery.

⚠ Caution

When connecting them, it start by connecting the positive(+) cable. Does not connect to the battery(-) directly with(-) pole of discharge vehicle. If does not follow it, you can have a wounded body or a broken vehicle by battery explosion.

Note

If it does not charge properly, visit our service shop to inspect your vehicle

In case of battery discharge, you can start your vehicle by connecting other vehicle's battery or auxiliary battery with jumper cable.

1) Directions for connecting jumper cable

⚠ Warning

Follow the directions as below. If you don't, your vehicle body may severely damage, caused by battery explosion.

- If you use other vehicle's battery or auxiliary battery for charging, they should be 24V battery.
- Battery should keep away from cigarette or spark.
- Do not touch the cable terminal by anyone else.
- Turn off all the electronic devices like audio.

2) How to starting on useing jumper cable

Follow the dirctions as below in order

- (1) Pull the parking brake lever
- (2) For the manual transmission type vehicle, set the gearshift lever to neutral position
- (3) Turn off all the electronic devices.
- (4) Connect positive electrode on the normal battery with positive electrode on the discharge battery using jumper cable.
- (5) Connect a normal battery(-) with chassis frame near the discharge battery bracket by a jumper cable.
- (6) Get starting normal engine vehicle and then start on discharged battery vehicle.
- (7) Once starting up the engine, take away the jumper cable from the negative electrode.
- (8) For discharged vehicle, charge engine on MAX RPM during 2 hours after starting up.

[illegible]

[illegible]

(1) Exchange items

No.	Items		Mileage(km)	5,000	10,000	20,000	30,000	40,000	50,000	60,000	70,000	80,000	90,000	100,000	Remarks
1	Engine	Dry type air cleaner element-exchange				●		●		●		●		●	
2		Engine oil and filter - exchange (based on CH level) - DE/DV/ISM Cummins		●		●		●		●		●		●	
3		Engine oil and filter-exchange (based on CI level-ISX Cummins)		Every 48,500km (When used with ultra-low sulfur diesel fuel(15ppm sulfur). In the fuel is greater than 15 ppm, the oil change intervals must percent)											
4		Fuel filter - exchange				●			●			●			
5		Coolant filter - exchange(Cummins)					●			●			●		
6		Exchange of coolant(including antifreezing solution) and cleaning inside								●					
7	Clutch	Clutch oil - add(if required top up)							●					●	
8	T/M	Manual T/M oil-exchange	S&T	●			●			●			●		
9			ZF	●					●				●		
10			EATON(FSO10309A)	●					●				●		
11			SHAANXI(9JS150TA)	●			●			●			●		
12		Auto T/M oil-exchange	ZF							●					
			ALLISON					●				●			
13			EATON (FO-18E318B-MXP)	Every 800,000km or 5 years (Vehicles off-road driving : Every 288,000km or 3 years)											
14	RR axle	RR axle oil - exchange		●			●			●			●		
15	Steering system	Power steering oil - top up								●					
16		Power steering oil filter - exchange				●				●				●	
17	Brake	Air dryer filter cartridge - exchange							●					●	
18	BELT	V-belt-exchange (alternator, fan)							●					●	
19	Air conditioning	External air intake air filter-exchange		Every 10,000km (If severe air pollution in the early exchangses)											

INSPECTION AND MAINTENANCE 3-61**(3) Daily inspection items**

No.	Items		Remarks
1	Engine	Engine oil leak, level of oil - inspection	
2		Dirt in fuel filter - Drain	
3		Coolant - inspection for leakage (Radiator, s/tank, hose)	
4	Wheel	Wheel nut - tightening	
5		Damage in wheel disc - inspection	
6	Steering system	Loosened parts in MTG portion - inspection	
7		Damage or loosening of linkage - inspection	
8	Brake	Remove moisture from air tank and inspection	
9		Damage and air leak(spring chamber/hose/pipe) - inspection	
10		Function of parking brake - inspection	
11	Coupler	Wear of coupler	
12		Wear of king pin jaw	
13	Belt	Inspection for any damage	
14	Dumping system	Cylinder/Tank oil leak - inspection	
15		Linkage gap and function - inspection	
16		RR Gate function - inspection	
17		Crack in welding part of Deck - inspection	
18	Miscellaneous	Grease insertion(Coupler, Frt axle, P/shaft, Linkage, RR Hinge, Dumping)	

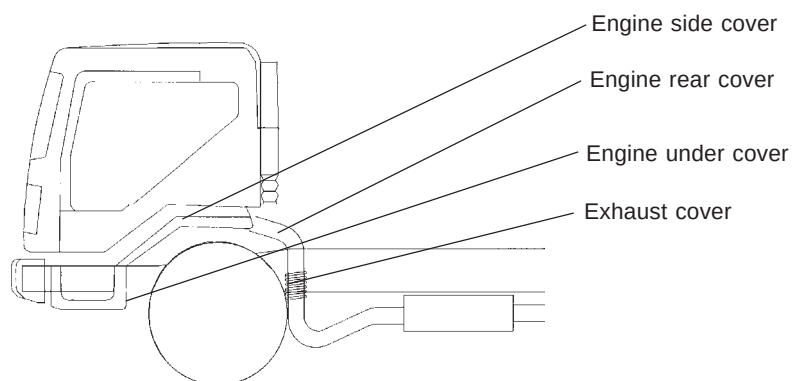
3-62 INSPECTION AND MAINTENANCE

4. MOUNTING PARTS FOR NOISE AND VIBRATION PREVENTION

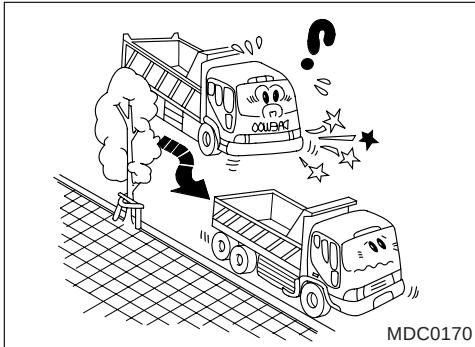
⚠ Caution

If modify the noise prevention device, or equipped with a removable or non genuine parts, it can be occurred a noise. Please refrain so concerned about the noise acceptance criteria exceed.

Noise prevention overview

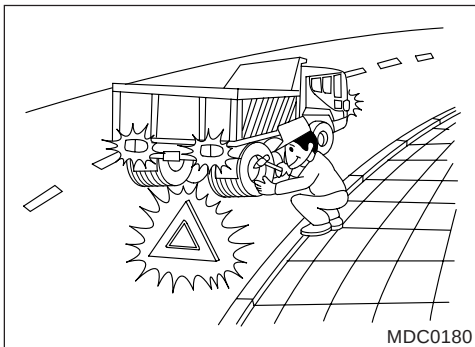


5. IN CASE OF EMERGENCY

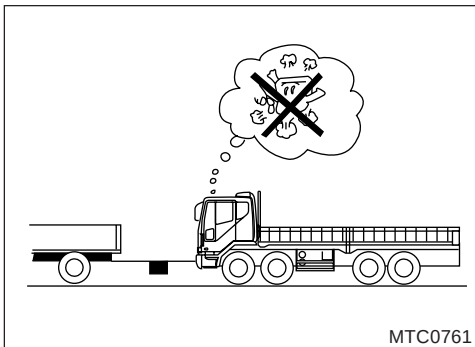


1) Emergency stopping

- (1) In case of vehicle trouble or emergency stopping, pull up the vehicle to the roadside as early as possible.

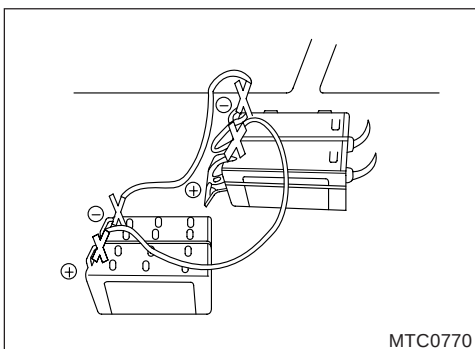


- (2) Set the parking brake and turn on the emergency warning lamp to prevent possible safety hazard.



2) Emergency starting

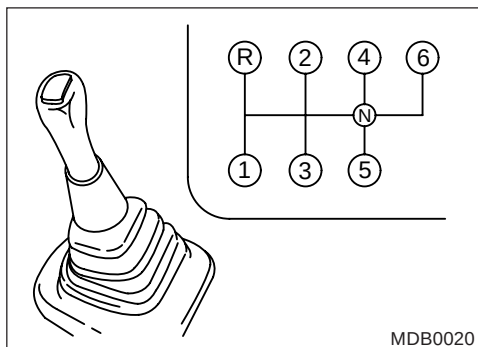
- (1) Avoid starting the engine while your vehicle is being towed as it may collide with the towing vehicle.



(2) Battery jumping

- In the case that the battery has been "dead", refer to "BATTERY CARE" in this manual and make an emergency start as illustrated.

3-64 INSPECTION AND MAINTENANCE



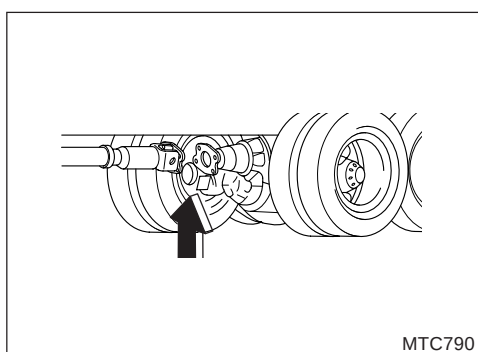
3) Cautions when being towed

- (1) Put the gearshift lever in the NEUTRAL position.

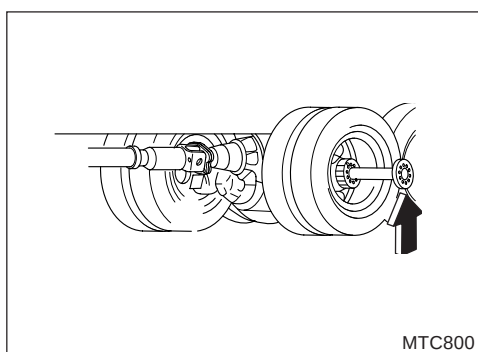
⚠ Caution

** FSO10309A, ZF TRANSMISSION*

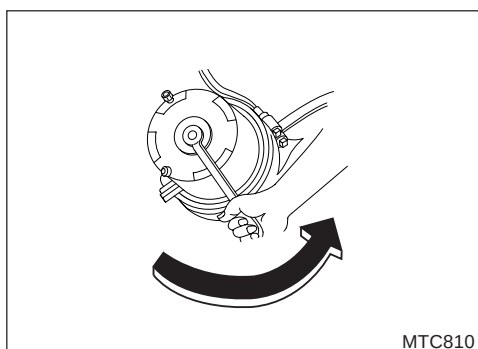
It should only be towed in high-speed section(range switch is "high" section) for protection of FSO and ZF transmission



- (2) When the transmission is found to have been bound into gear, disconnect completely propeller shaft from rear axle flange to tightly fix the propeller shaft to the frame.



- (3) When damage is found at the differential gear or rear axle gear, remove the rear axle shaft before your vehicle is towed.



- (4) In case of defects in the air feed system, the spring brake is engaged automatically. At this time, insert release bolt attached chamber side, and fasten the nut clockwise to fully release the brake.

⚠ Caution

Always be wheel locked to the vehicle does not move. It is very important when working at bottom of the vehicle.

- (5) Vehicle equipped with an emergency steering system must be towed that the ignition switch is "OFF" state because this system is worked at "ON" state with towing.

6. VEHICLE REPAIR



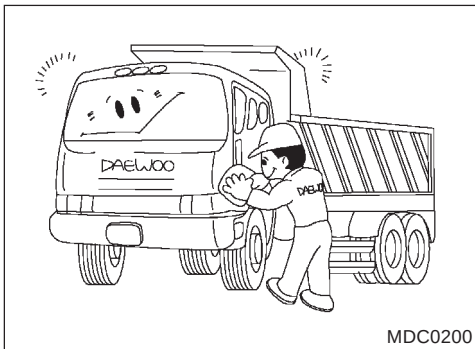
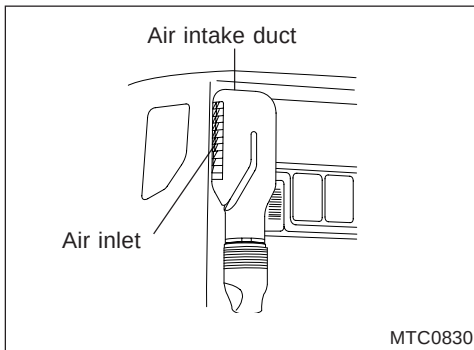
For the maintaining the proper performance and operations for the long hours, refer to the follows.

Vehicle cleaning

- 1) Remove dust while sprinkling water on the cabin, tires, fenders, etc.
- 2) Remove any cleaner on the surface with water, then wipe off with the piece of sponge.

Caution

1. Avoid pouring water to electrical devices, connectors, air hose etc.
2. Wash off water on the door to prevent it from being frozen, making it unable to open in the cold area.
3. Do not apply thinner or gasoline for the cleaning of plastic parts.
4. Avoid pouring water into the inlet of air intake duct when water hose is used.
5. Make sure to clean the vehicle after running of the vehicle near the coast or on the road where snow remover is sprayed.



Polishing

- 1) Apply wax once in a month or so.
- 2) Wax should be used in the shade after cleaned when the surface of body is cool.

3-66 INSPECTION AND MAINTENANCE

7. HOW TO HANDLE THE ENGINE IN WINTER SEASON

DL08K/DV11K(DOOSAN) engine

- (1) In the coldest weather conditions, "if possible, it is recommended that you change the fuel filter elements with new ones. The reason is that the more foreign objects filtered on the outer wall of the filter bed are accumulated, the easier the fuel filter could be blocked by the wax constituents generated from fuel.
- (2) The water stagnating in the lower section of the free filter (the 1st fuel filter) could cause the freeze of the fuel filter, difficulties in starting the engine and the engine failure while driving and therefore DO get rid of the water at least twice a month. (When in normal condition, once every 10,000km)
- (3) When in winter season, BE SURE to use winterized "diesel and NEVER use the alternative fuel which is made artificially or additives.

The additives for fuel efficiency and improving engine power which are on sale on the market are NEVER tested or reviewed for the safety in the common rail direct injection system. Especially, the alcohol constituents in the additives are turned out to paralyze the function the de-oiler and the other constituents have not yet been verified for their harmfulness.

- (4) It is recommended that you start your vehicle after idling for 3~5 minutes at least. If you race the engine in order to quickly increase the engine temperature right after the engine start, sufficient fuel supply will not be made because of the increased pipe resistance from the wax constituents generated in the moisture or fuel. Instead, your vehicle will stall owing to the lack of fuel.

Therefore, idling, which requires reduced fuel, gives an advantage in keeping your vehicle running with the increased pipe resistance. In addition, racing the engine while it is not fully warmed up actuates wear and tear on the engine, resulting in shortening engine life.

- (5) If the pre-filter is equipped with preheating system, it will be automatically operated according to the fuel temperature. Also, as it can be manually operated, use it by operating the preheating switch (side view mirrors heating wire).

When you press the switch, the heating wire will be operated for 15 minutes. But the switch will not be locked and turned "OFF" automatically and not only will the mirrors heating wire but also preheating the fuel filter be operated, which can be used when the fuel has frozen in winter season.

Caution

As the batteries of your vehicle could be dead if you operate the heating wire switch more than two times without running the engine, BE SURE to use it after starting the engine.

Caution

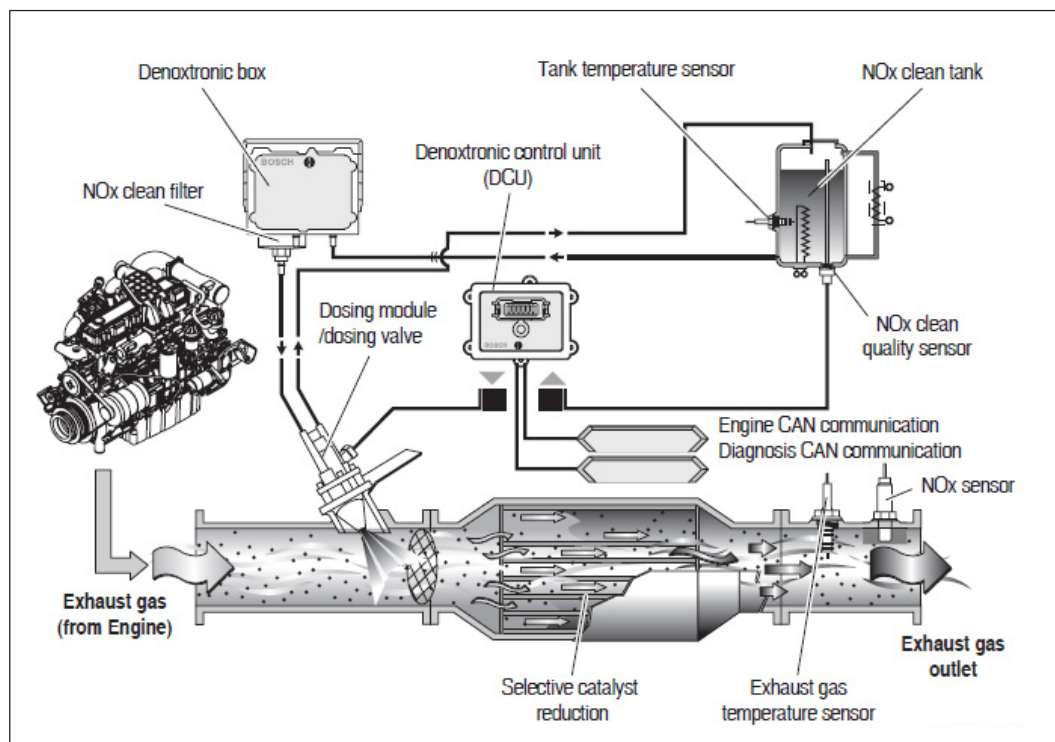
In order to improve starting performance in winter season, the fuel recirculation system is equipped with your vehicle. Therefore, when you start the engine after a long stop of your vehicle, the engine could start to shake (engine vibration) about 2~3 seconds, which means that your vehicle is in the normal condition.

8. EXHAUST GAS REDUCTION SYSTEM

SCR(Selective Catalyst Reduction) system.

(1) SCR(Selective Catalyst Reduction)

SCR system is a device which converts NO_x of the exhaust gas into N₂ and H₂O, which are harmless to humans, with the aid of a catalyst by injecting urea into the exhaust gas of the engine.

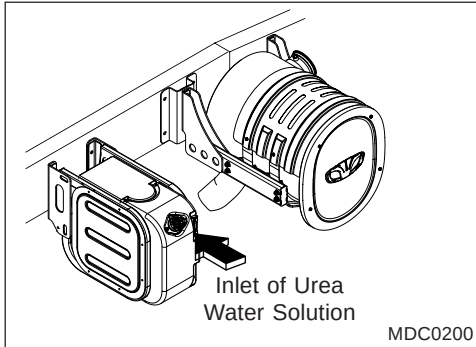


Note

Nitrogen oxide is a mixture of oxygen and nitrogen and it is produced during combustion. Nitrogen oxide is a major contributor to acid rain. Living organisms are directly damaged by its reaction of constructing ozone in the atmosphere and destructing ozone in the stratosphere. And it accelerates global warming.

3-68 INSPECTION AND MAINTENANCE

(2) Urea Water Solution



Note

Under the low temperature of the atmosphere, the engine could emit vapor with the exhaust gas. This phenomenon results from the function which prechecks the function of urea water solution injection, which does not affects vehicle performance.

Urea Water Solution is a solution which reduces NOx of vehicle exhaust gas and about 5% of the diesel consumption is consumed (If 100L of diesel is consumed, 5L of urea water solution is consumed). And therefore urea water solution should be continuously filled.

⚠ Caution

If you drive your vehicle without refilling urea water solution, it can cause generating NOx and the failure in the urea Dosing system. If urea water solution has been exhausted, DO refill urea water solution before driving your vehicle.

⚠ Caution

- As the quality of urea water solution could influence on the normal operation of SCR life and the related parts, apply the authentic parts of ours.
- You may have to pay a penalty if you do not use the catalyst which is not standardized for Para. 3 of Art. 74 of Clean Air Conservation Act.

⚠ Caution

If your skin is stained with urea, this could cause skin disease. If your skin (or hair) is stained, remove all the stained clothes immediately and rinse your skin with water.

⚠ Warning

Use only genuine urea when you fill the urea tank. Filling the urea tank with diesel or other additives causes the failure in the exhaust system.

⚠ Warning

Do not fill the fuel tank with urea. Filling the fuel tank with urea causes the failure in the fuel system.

(3) NOx clean filter

- Pre and second NOx clean filters are located within the Denoxtronic Control Unit (DCU).
- NOx clean filter element change intervals. NOx clean filter element should be change interval in normal operating condition of the vehicle is as follows.

Condition	Change intervals
Normal operation condition	Every 180,000km or 1,400hours or 1year

⚠ Warning

The damage caused by not following these precautions. Excessive repair costs are excluded from the warranty.

4

TROUBLESHOOTING AND CORRECTIONS

- 1. ENGINE AND RELATED PARTS**
 - 2. CHASSIS AND RELATED PARTS**
 - 3. ELECTRICAL**
 - 4. DUMP**
-

4-2 TROUBLESHOOTING AND CORRECTIONS

TROUBLESHOOTING AND CORRECTIONS 4-3

1. ENGINE AND RELATED PARTS

- **Starter motor won't turn over or turns over slowly.**

Cause	Correction
Irregular action of contact point of battery relay	Place battery main switch in "ON" position.
Dead or weak battery	Recharge or replace battery.
Battery terminals disconnected, loosened, or corroded	After trimming the corrosion with a file, connect terminals securely.
Poor ground connection	Tighten connections.
Too high oil viscosity	Change with oil having proper viscosity.

- **Starter motor turns over but engine won't start.**

Cause	Correction
Fuel tank empty	Replenish
Insufficient pre-heating	Pre-heat again.
Air in fuel injection lines	Bleed
Air cleaner element restricted	Clean or change element.

- **Engine stops easily at low rpm.**

Cause	Correction
Too low idle rpm	Adjust idle rpm.
Air cleaner element restricted	Clean or change air cleaner element.
Engine overcooling	Cover radiator with curtain.

- **Engine lacks power.**

Cause	Correction
No parking brake release	Operate parking brake repeatedly.
Air cleaner element restricted	Clean or change element.
Brake pedal cramped	Adjust brake lining clearance.

- **Black exhaust smoke**

Cause	Correction
Air cleaner restricted	Clean or change element.

- **Engine overheating**

Cause	Correction
Radiator covered with curtain	Remove curtain.
Lack of coolant	Replenish coolant. Check for coolant leakage and ensure radiator cap should be closed tightly.
Dirts deposited in radiator	Clean radiator.
Rust and dirts in coolant	Clean radiator or change coolant.
Fan belt slipping or damaged	Adjust tension or change belt.

- **High fuel consumption**

Cause	Correction
Fuel leaks	Check fuel system. Re-tighten loose parts.
Air cleaner element restricted	Clean or change air cleaner element.
Tire underinflated	Correct
Engine overcooling	Cover radiator with curtain.

- **High oil consumption**

Cause	Correction
Poor quality oil	Change with the specified oil.
Too high oil level maintained	Maintain oil level as specified.
Oil leaks	Check lubrication system and tighten loosened parts.
Failure to observe oil changing intervals	Follow the scheduled intervals.
Negligence in engine warming up	Perform engine warming up as instructed.

- **Low engine oil pressure**

Cause	Correction
Lack of engine oil	Replenish
Oil leakage	Inspect lubrication system and retighten loosened parts.
Improper oil viscosity	Change with oil having proper viscosity.

4-4 TROUBLESHOOTING AND CORRECTIONS

2. CHASSIS AND RELATED PARTS

- **Abnormal noise in transmission or differential**

Cause	Correction
Lack of gear oil	Replenish

- **Hard steering**

Cause	Correction
Underinflated front tires	Inflate to specified air pressure.
Lack of power steering oil	Replenish

- **Steering wheel fails to return to its position**

Cause	Correction
Lack of grease in each steering unit	Inject grease.

- **Steering wheel shimmy**

Cause	Correction
Loose hub nuts	Tighten to regular torque.
Left and right hand tires are different in inflation pressure.	Adjust the pressure uniformly.
Irregular tire wear	Change

- **Poor brake action**

Cause	Correction
Tire overinflation	Adjust to specified air pressure.
Air leakage in brake circuit	Check brake lines.
Too large brake lining clearance	Adjust clearance exactly.

- **One-sided brake action**

Cause	Correction
Left and right hand tires are different in inflation pressure.	Adjust the pressure uniformly.
Irregular tire wear	Change

- **Brake dragging**

Cause	Correction
Irregular brake lining clearance	Adjust braks lining clearance exactly.

3. ELECTRICAL

- **Battery discharge**

Cause	Correction
Battery terminals disconnected, loosened, or corroded	After trimming the corrosion with a file, connect terminals securely.
Low charge level (Test indicator is black)	Recharge
Lamp switch remains on.	Turn off the switch.

- **Lamps won't turn on.**

Cause	Correction
Faulty lamp	Change
Fuse burnt out	Change
Poor ground connection	Tighten connections.

4. DUMP

Cause	Correction
Vessel doesn't raise to its maximum height	Bleed air and replenish oil
Not smooth vessel raising	Bleed air and replenish oil
Air entering in oil line	Bleed air for long times
Abnormal noise in connection	Inject chassis grease

5

MISCELLANEOUS CONTROLS AND OPTIONS

1. SEATS AND OCCUPANT PROTECTION SYSTEMS
 2. AUTO GREASER
 3. TURBO CHARGER
 4. OPERATION OF DUMP SYSTEM
 5. SELF STEER
 6. CAUTION FOR OPERATION
 7. HOW TO HANDLE MIXER SYSTEM
 8. SEPARATE ENGINE VEHICLE
 9. TOOL LIST
 10. SERVICE ELECTRIC EQUIPMENTS FOR USER
 11. DIRECTIONS FOR EQUIPPING TRAILER WITH TRACTOR
 12. CAUTION AT PTO DRIVE SHAFT INSTALLATION
 13. HOW TO USE SPARE TIRE
-

5-2 MISCELLANEOUS CONTROLS AND OPTIONS

1. SEATS AND OCCUPANT PROTECTION SYSTEM

1) Seat belt

Always wear your safety belts!

Occupant protection has been the focus of much private and public research and development for many years. The two vehicle components which are incorporated into the vehicle solely for the protection of the occupants in vehicle accidents are the safety belts provided at each seating position and the supplemental restraint system, or air bags, provided at the driver and front passenger seat positions. The safety belts can protect you and your passengers only if they are used. The air bag is a supplemental protective device that is more effective and safer as a restraining device when the safety belts are being used.

Why wear safety Belts?

Safety belts are helpful for several distinct reasons:

- (1) Safety belts attach the occupants to the vehicle so that they will not be ejected during an accident.
- (2) Safety belts attach the occupant to the vehicle so that they can use the space between their pre-crash seating position and the front of the vehicle to slow down to a stop more gradually, as their safety belts stretch and the front end of the vehicle absorbs the energy of the crash by crumpling.
- (3) Safety belts keep the driver in his seat, so that the driver might have a chance to regain control in certain accident situations.
- (4) Safety belts keep occupants from being catapulted into and injuring the driver and other occupants.

Warning

In most country, the law requires safety belt use. As the owner and driver of your vehicle, you must make certain that each occupant is properly wearing the safety belt provided at the seating position.

Warning

While run when do not put seat belt, can not receive legal guarantee of cost injury of life when accident happens.

Warning

Pregnant women, injured, and physically impaired persons should also wear safety belts. Like all other occupants, they are more likely to suffer serious injury or death, if they do not do so.

Warning

Why safety belts work, how to wear them, and how to adjust your seat position properly, is explained in this section. Read all of the information provided and always observe these instructions and warnings in order to gain the full benefit of these safety systems.

Warning

Safety belts have been shown to be the single most effective protection against injury or death in a vehicular accident!

Warning

Safety belts have been shown to be the single most effective protection against injury or death in a vehicular accident!

Warning

2 persons of seat belt cannot use together by 1 seat. If 2 persons use together, can not receive protection by seat belt.

Warning

Don't fix any assist device to seat belt, because protection effect of seat belt is decreased.

Warning

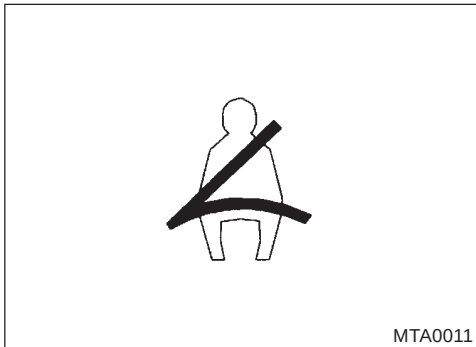
If confirm the problem of seat belt you must inspect in service station.

Caution

Safety belts cannot work unless they use in crash.

5-4 MISCELLANEOUS CONTROLS AND OPTIONS

2) Seat belt lamp

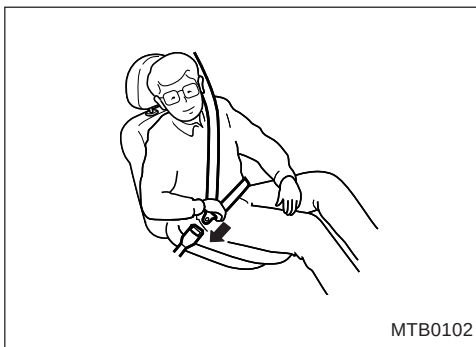


Seat belt lamp light up on ignition switch "ON" position, and then the lamp light off putting seat belt.

⚠ Caution

If the seat belt lamp light up or off continually, you must inspect in service station.

3) Using seat belt

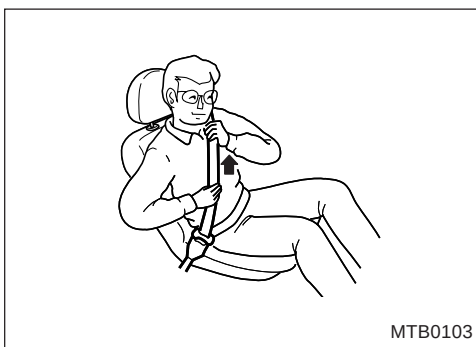


(1) Three-point safety belts

3 points seat belt is installed to seat.

Desire to put by following order.

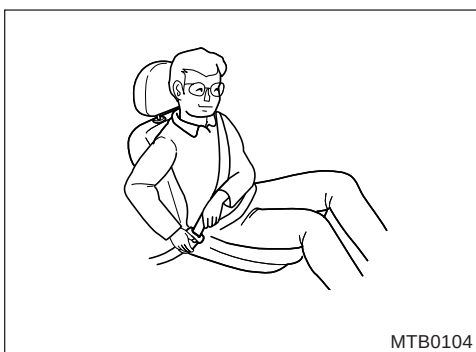
- Driver control a good position of seat before put seat belt
- Pick up the safety belt latch plate and use it to pull the belt across your body. Make sure the belt is not twisted, push the latch plate firmly into the buckle until the mechanism clicks.



⚠ Warning

Position the shoulder belt midway over the shoulder and cross the chest. Never place the shoulder belt across the neck. This assures that in the case of a collision, the belt applies force to the shoulder bones and keeps the impact away from ribs or neck, helping to avoid serious internal injuries.

- Pull up on the latch plate to make sure it is secure.

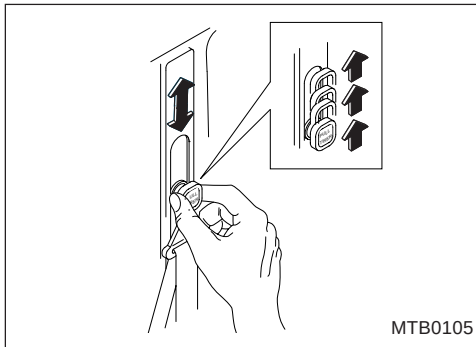


⚠ Warning

Do not put belt loosely absolutely protection effect of seat belt is decreased.

To remove the seat belt, press the red button on the buckle.

MISCELLANEOUS CONTROLS AND OPTIONS 5-5



(2) Seat belt height adjustment

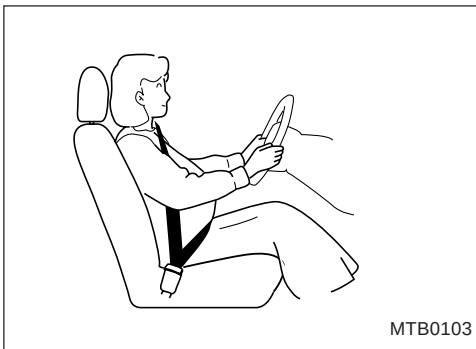
To operate safety belts with a height adjustable upper point, do the following.

- Put on the safety belt
- Pull the safety belt height adjuster in the area indicated by the arrow in the illustration
- Adjust the safety belt height

Warning

Mis adjustment of the safety belt height could reduce the effectiveness of the safety belt in a crash.

4) Putting on pregnant's seat belt



Safety belts work for everyone, including pregnant women.

Warning

Like all occupants, pregnant women are more likely to be seriously injured if they do not wear safety belt. To provide maximum protection, a pregnant woman should wear a three-point belt, she should wear the lap portion of the belt as low as possible throughout her pregnancy.

Control position of seat so that handle and pedal control may be convenient.

Warning

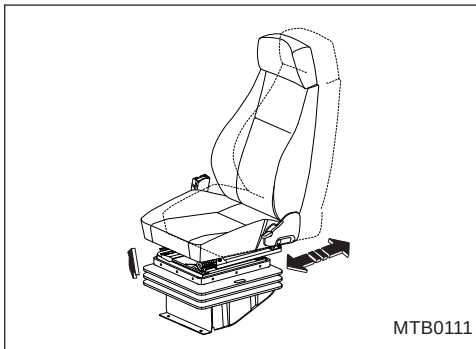
Do not adjust the driver's seat while the vehicle is moving.

Warning

Desire to confirm whether seat fixed certainly after seat control.

5-6 MISCELLANEOUS CONTROLS AND OPTIONS

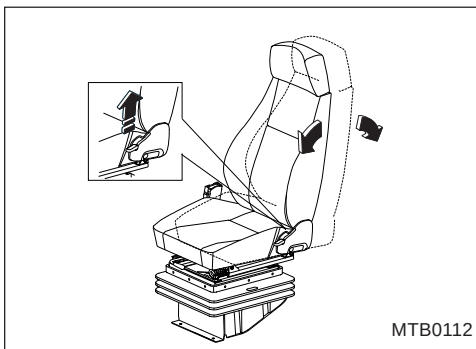
5) Seat adjustment



(1) Seat slide adjustment

To move the front seat forward or backward:

1. Pull up and hold the lever located under the front side of the front seat.
2. Slide the seat to the desired position.
3. Release the lever.



(2) Seat reclining adjustment

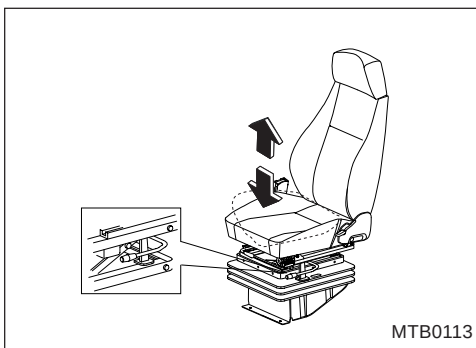
To tilt seatback forward or backward, lift the lever on the outside of the seat cushion until the seatback is adjusted to the desired position.

Warning

- Do not adjust the driver's seat while the vehicle is moving.
- Driver could lose control of the vehicle.
- Injury and property damage could result.

Warning

- Do not position either front seat-back in the reclined position while the vehicle is being operated.
- If a crash occurs, front occupants in reclined seats can lose restraining benefits of the seatback and safety belts by sliding out from under the safety belt or by being thrown into the seat belt in an awkward position.
- Serious injuries, death, and ejection from the vehicle can result.



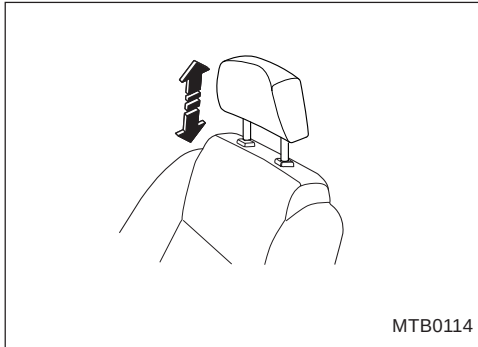
(3) Driver seat height adjustment

To adjust the driver's seat cushion angle, lift the lever on the outside of the seat cushion

Warning

- Do not adjust the driver's seatback while the vehicle is moving
- Driver could lose control of the vehicle.
- Injury and property damage could result.

MISCELLANEOUS CONTROLS AND OPTIONS 5-7



(4) Head restraint adjust

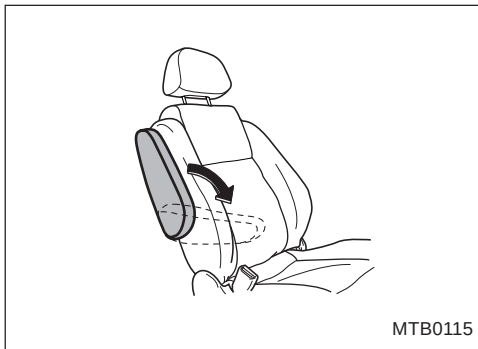
If the head restraint must be removed for any reason.

1. Pull it up to the stop position.
2. While pushing the release button, lift the head restraint from the guide sleeve.

Warning

Make sure that the head restraint has been put back into place and readjusted before driving.

3. Replace head restraint and reset it in intended position before driving.



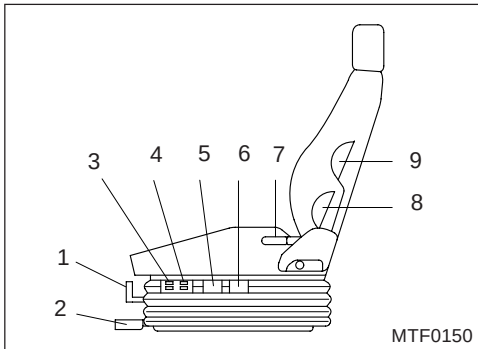
(5) Arm restraint adjust

Use the arm restraint after folding to front.

Caution

Make sure that the arm restraint interrupt control of vehicle on driving.

6) Air suspension seat*



1. Seat lock lever
2. Slide adjustment lever
3. Lumbar support adjustment buttons(or lever)
4. Lumbar support adjustment buttons(or lever)
5. Height and tilt adjustment lever(forward)
6. Height and tilt adjustment lever(backward)
7. Back angle adjustment lever
8. Lumbar support air pack(lower)
9. Lumbar support air pack(upper)

✳ Adjustment of the seat

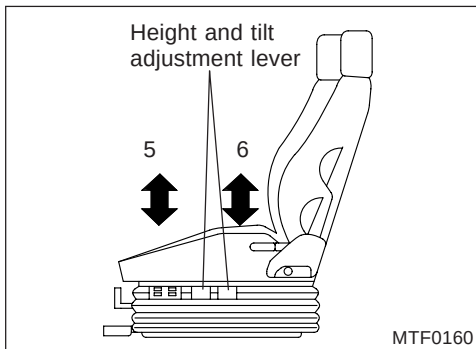
1. Seat lock lever: Use it when you need to secure the seat.
2. Slide adjustment lever: This lever is used for moving the seat forward or backward.

Caution

If the lever 3, 4, 5, or 6 is manipulated after the seat lock lever has been locked, the seat lock lever is put under overload. To release it, depress the brake pedal to release air from the air tank, then manipulate the seat lock lever.

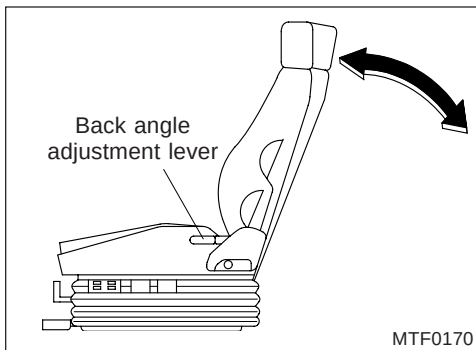
- 3, 4. Lumbar support adjustment buttons: These buttons are used for properly adjusting the seat to your posture.
Manipulating of the buttons 3: Use the upper button when supplying air for the air pack 8, and use the lower button when releasing air from it.
Manipulating of the buttons 4: Use the upper button when supplying air for the air pack 9, and use the lower button when releasing air from it.

5-8 MISCELLANEOUS CONTROLS AND OPTIONS



5, 6. Height and tilt adjustment lever(5: forward, 6: backward)

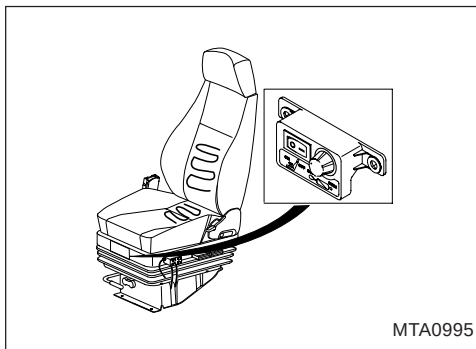
Lifting up of the lever will adjust the seat as shown; pulling down of the lever will bring it back to its original position.



7. Back angle adjustment lever

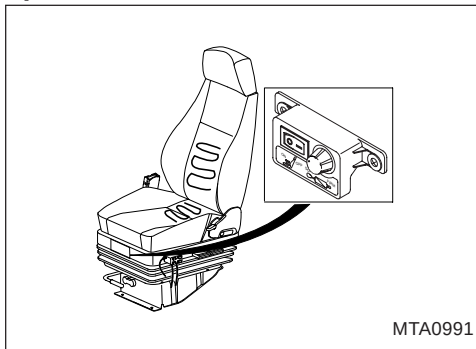
This lever is used for adjusting the seat back to obtain the desired back angle.

7) MR damper seat*



You can control the cushion of damper.

8) Seat heater*



Over "Acc" Ignition switch, If you turn on a seat heater switch, seat cushion and back is warm

- Bimetal
- 20 ± 3°C : ON
- 30 ± 3°C : OFF

2. AUTO GREASER*

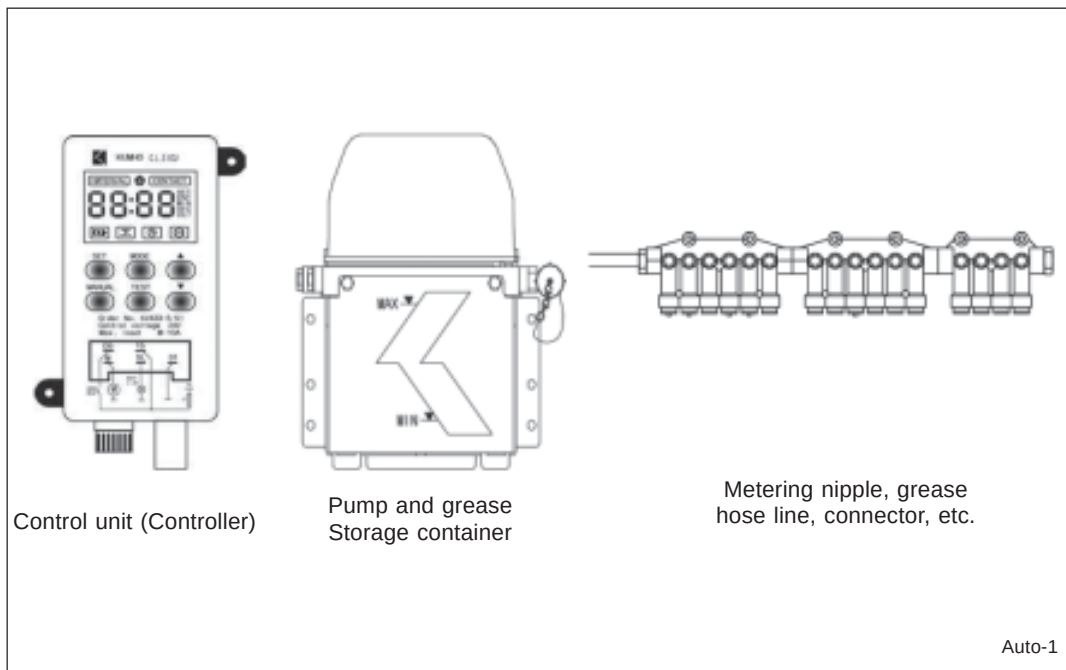
1) Overview

The subject device is one that automatically injects an adequate volume of grease into the grease-injection regions of the vehicle chassis periodically, at set intervals.. The device eliminates the inconvenience and loss of time associated with manual injection, thus contributing to more efficient vehicle management.

Note

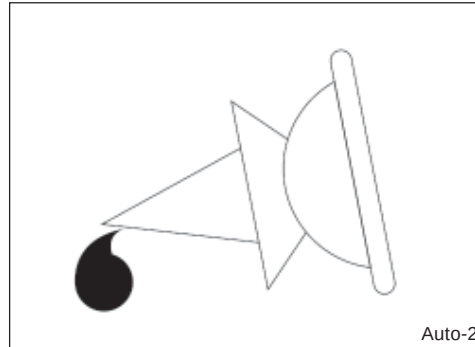
1. Some vehicles are equipped with models of the grease auto-injecting device that does not inject grease into certain regions. In cases such as this, these regions should be manually injected with grease every 4,000km.
2. Manually injected regions: Rotational areas of the propeller shaft, engine idle pulley, etc.

2) Components of the grease auto-injecting device



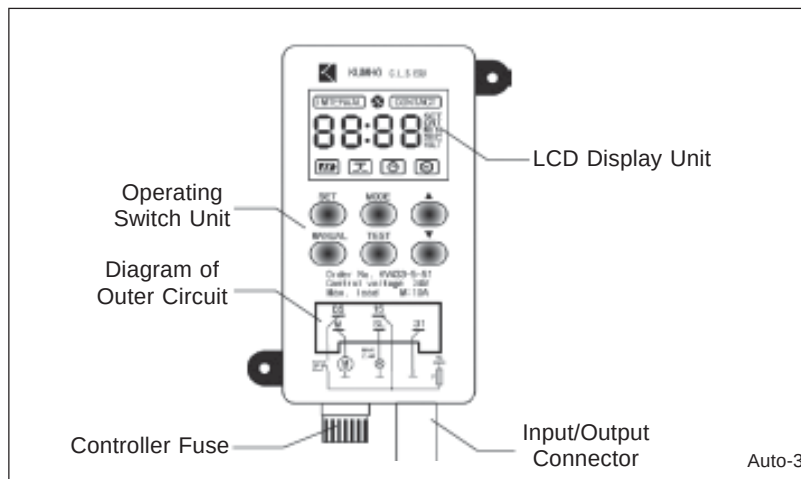
5-10 MISCELLANEOUS CONTROLS AND OPTIONS

3) Operation of the grease auto-injecting device



- In the condition whereby the main switch of the battery is "ON", the warning lamp of the grease autoinjection lights for three seconds and then goes out when the device is started.
- In the event the grease auto-injecting device fails, the warning lamp of the grease auto-injection will light.
- According to the times input in the controller, the pump operates automatically to inject grease into each region. Whenever the main switch of the battery is turned from ON to OFF or vice versa, the cycle of interval time (idle time) is repeated. Given the condition whereby the main switch of the battery is "OFF", interval times (idle times) are not accumulated.
- When vehicles are shipped, the interval time (idle time) is set for 7 hours and the contact time (operating time) is set for 2 minutes 30 seconds. Please maintain the set times, if possible.

4) How to use the controller of the grease auto-injecting device



1) Functions of the Controller Display and Switches

(1) Operating Switch Unit

- . SET : This switch is used to apply the content of settings in the event it is changed.
[Interval time (idle time) / Contact time (operating time) / Count (number of cycles of operation)]

MISCELLANEOUS CONTROLS AND OPTIONS 5-11

- . MODE : A switch used to move to each item
[Interval time (idle time) -> Contact time (operating time) -> Count (number of cycles of operation) -> Voltage -> Error Code -> Interval time (idle time)...]
- . MANUAL : A switch used to operate the motor manually The first, single press of the switch operates the motor for the set contact time(operating time), and then the motor stops (also used when releasing the failure of DS).
- . TEST: The interval time (idle time) and contact time (operating time) are reduced to a certain cycle (15 seconds:15 seconds), and operation/stop is repeated continuously.
- . ▲ : This switch is used to increase the value. If pressed down continuously, the increase in value is sped up due to the automatic repeat function.
- . ▼ : This switch is used to decrease the value. If pressed down continuously, the decrease in value is sped up due to the automatic repeat function.

(2) LCD Display Unit

 : This is lighted when the controller is powered up, and the light goes out when the power is off. (However, if voltage below 15V DC is sensed, it will flash at intervals of 0.5 second.)

 : This is lighted when the DS is input normally, and the light goes out in the case of no input. (However, in the event of a DS input error it flashes at intervals of 0.5 second.)

 : This is lighted for three seconds after starting, and then the light goes out. (However, in the event SL lamp becomes disconnected or overcurrent is sensed, it flashes at intervals of 0.5 second.)

 : This is lighted while the pump motor is operating, and the light goes out when the pump stops. (However, in the event the pump motor becomes disconnected or overcurrent is sensed, it flashes at intervals of 0.5 second.)

 : Displays the interval time (the idle time of the pump motor)

 : Displays the contact time (the operating time of the pump motor)

 : Segments rotate clockwise, lighting in the order of interval time (idle time) / contact time (operating time).

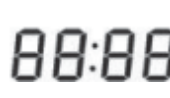
. SET : Lighted while the button "SET" of the operating switch unit is being pressed down

. CNT : Lighted when the count (number of cycles of operation) is displayed

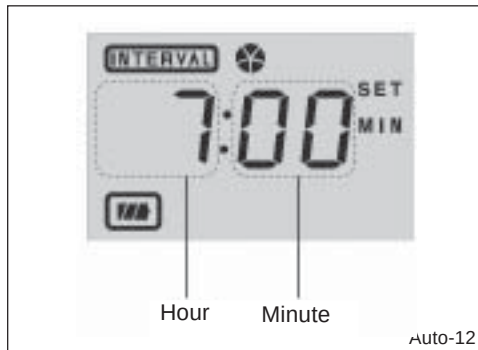
. MIN : Unit of interval time (idle time); lighted during the interval time (idle time)

. SEC : Unit of contact time (operating time); lighted during the contact time (operating time)

. VOL : Lighted while the voltage of the controller input is being displayed

 : Displays Interval Time (idle time) / Contact Time (operating time) / Count (number of cycles of operation) / Voltage (voltage value) / Error Code / Mode, etc.

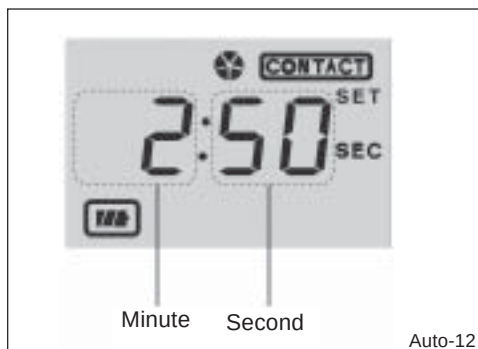
5-12 MISCELLANEOUS CONTROLS AND OPTIONS



2) How to set the controller

(1) How to set the interval time(idle time)

- The picture on the left is an example of the interval time (idle time) being set to seven hours.
- The SET display lamp flashes at intervals of 0.5 second during the setting process and stops flashing when the setting is complete.
- If, after the time has been changed, the switch "SET" is not operated, the condition returns to the previous condition after an interval of five seconds in order to make the change in setting ineffective.
- Using the "MODE" switch, the interval display lamp is selected (so that it lights) and the "SET" switch is pressed down once. Then, using the ▲ or ▼ switch, the desired time is set and the "SET" switch is pressed down once more to complete the setting. Then the light of the SET display lamp goes out.



(2) How to set the contact time(operating time)

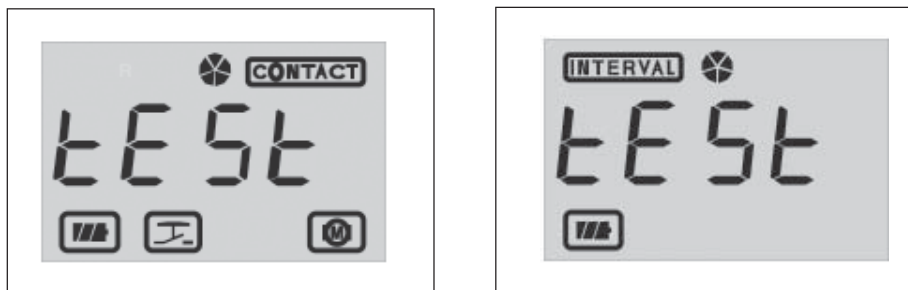
Picture on the left is an example of the contact time (operating time) being set to 2 minutes 50 seconds. The SET display lamp flashes at intervals of 0.5 second during the setting procedure and stops flashing when the setting is complete.

If, after the time has been changed, the switch "SET" is not operated, the condition returns to the previous condition after an interval of five seconds in order to make the change in setting ineffective.

Using the "MODE" switch, the contact display lamp is selected (so that it lights) and the "SET" switch is pressed down once. Then, using the ▲ or ▼ switch, the desired time is set and the "SET" switch is pressed down once more to complete the setting. Then the light of the SET display lamp goes out.

MISCELLANEOUS CONTROLS AND OPTIONS 5-13

(3) Function of the test mode



The contact time (operating time) being applied (waiting for 15 seconds). The interval time (idle time) being applied (operating for 15 seconds)

- If the "TEST" switch is pressed down for three seconds, the pump motor operates as the initial contact time (operating time) is applied for 15 seconds, whereupon the pump motor stops and waits as the interval time (idle time) is applied for 15 seconds. This condition is repeated. Then, if the "TEST" switch is pressed down again, the mode returns to the previous function.

Note

If the grease auto-injecting device has been checked using the function of the test mode, the "TEST" switch should be pressed down, without fail, in order to stop the test function. If this is not done, grease will be injected continuously at intervals of 15 seconds.



Auto-12

(4) Manual function

- If the "MANUAL" switch is pressed down once, the system will switch to the manual function and the pump motor will operate during the initial contact time (operating time) and then stop.
- When all the errors need to be released, if the "MANUAL" switch is pressed down once, the errors are released and then the pump motor operates once using the manual function. While the pump motor is stopped the accumulated time is initialized, whereupon the motor operates during the contact time (operating time) set previously and then stops.

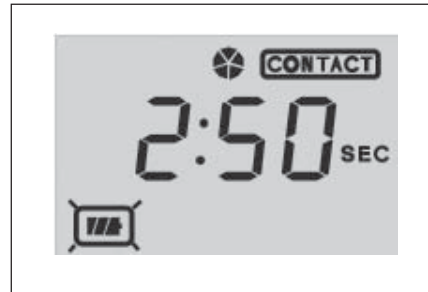
5-14 MISCELLANEOUS CONTROLS AND OPTIONS



(5) Time reducing function

- Display lamps of the interval and the contact flash continuously at intervals of 0.5 second.
- The "In Operation" display normally flashes sequentially clockwise.
- With the controller stopped (with the main switch of the battery "OFF") and with the "TEST" switch pressed down, the power is applied (the main switch of the battery is turned "ON"). When the characters "TEST" appear, the "TEST" switch is released. Then the motors operate in the order of "Contact time (operating time)"
- "Interval time (idle time)." This function reduces the normal operating time to 1/60th of a second. This function is used to check functions in a short time and determine whether the controller has failed.
- In order to release the time-reducing function, the power is reset (the main switch of the battery is turned ON/OFF). Alternatively, it will be released automatically after five minutes.

(6) Function of sensing low voltage



The contact time (operating time) being applied (waiting for 15 seconds). The interval time (idle time) being applied (operating for 15 seconds)

- If the power supply voltage is maintained below 14V DC during the contact time (operating time), the display lamp will flash continuously and the pump motor will stop.
- At a power supply level of up to 7V DC, the lamp of the switch operation is lighted normally and the accumulated time is stopped.
- Display of () flashes continuously until the voltage returns to its normal level.

MISCELLANEOUS CONTROLS AND OPTIONS 5-15



(7) Function of counting the number of pump-motor operation cycles

- The picture on the left is an example showing that the number of times the pump motor has operated is "9999."
- The count is increased whenever the pump motor operates according to the contact time (operating time).
- To initialize the count, press down the "SET" switch on the count screen for five seconds.

(8) Changing the control mode of the controller

- Press down the "MODE" switch for five seconds, and the mode currently set will be illuminated on the LCD display unit ("CLS1" or "CLS2"). Press down the "▲" or "▼" switch to change to the desired mode, and then press down the "SET" switch to save the changed mode in the controller. (If the "SET" switch is not pressed down within three seconds, the system display will return to its previous state.)

Note

The grease auto-injecting device of Kumho currently applied to TATA Daewoo is the liquid grease auto-injecting device and should use the "CLS1" mode only.

- CLS1 mode : This mode is used in the case of a liquid grease auto-injecting device.



If the input of the DS (pipe pressure switch) is not sensed within one minute while grease is being injected during the initial contact time (operating time), the pipe system is deemed to have failed, grease is injected only during the initial contact time (operating time) and the controller stops. (However, if the input of the DS is sensed before the initial contact time (operating time) is applied, the stopped condition will be maintained and the DS icon will flash.)

- CLS2 mode : The mode is used in the case of a solid grease auto-injecting device



If the input of the DS (pipe pressure switch) is not sensed within five minutes while grease is being injected during the initial contact time (operating time), the pipe system is deemed to have failed, grease is injected only during the initial contact time (operating time) and the controller stops. (However, if the input of the DS is sensed before the initial contact time (operating time) is applied, the stopped condition is maintained and the DS icon flashes.)

5-16 MISCELLANEOUS CONTROLS AND OPTIONS

(9) Function of data memory

- Because memory is embedded in the controller (ECU) for the storing of various content settings, you do not have to make the settings again when you turn the main switch of the battery from ON to OFF or vice versa.
- Saved set content:
 - . Interval time (idle time of pump motor)
 - . Contact time (operating time of pump motor)
 - . Number of times of operation (number of pump-motor operation cycles)
 - . Set mode of CLS1 or CLS2 operation

3) Function of troubleshooting the controller failure and the method of releasing the failure

(1) Failure of input of DS(pipe pressure switch)

- If the DS input is not "ON" even once in one minute while the pump motor is operating due to the breakage of the pipeline or any of various other reasons, finish the contact time (operating time) and indicate the failure (have the display lamp flash continuously), and immediately stop all the operations.
- The error of DS (pipe pressure switch) input failure is likewise applied to the time-reducing function.

(2) Short-circuit of SL lamp

- If a short-circuit is sensed while the outside SL lamp (warning lamp of the grease autoinjection in the instrument panel) is operating, the overcurrent circuit breaker will operate and the LCD display lamp of  will light continuously.
- The short-circuit error of the SL lamp is likewise applied to the time-reducing function.

(3) Disconnection of SL lamp

- If a disconnection is sensed while the outside SL lamp (warning lamp of the grease autoinjection in the instrument panel) is operating, the current-sensing circuit is activated and the LCD display lamp of () flashes continuously.
- The "disconnection" error of the SL lamp is likewise applied to the time-reducing function.

(4) Short-circuit of the pump motor

- If a short-circuit is sensed while the outside pump motor is operating, the overcurrent breaking circuit is operated and the LCD display lamp of () is lighted continuously.
- The error of the short-circuit of the pump motor is applied in the time reducing function in the same way.

(5) Disconnection of the pump motor

- If disconnection is sensed while the outside pump motor is operating, the current-sensing circuit is activated and the LCD display lamp of () flashes continuously.
- The "disconnection" error of the pump motor is likewise applied to the time-reducing function.

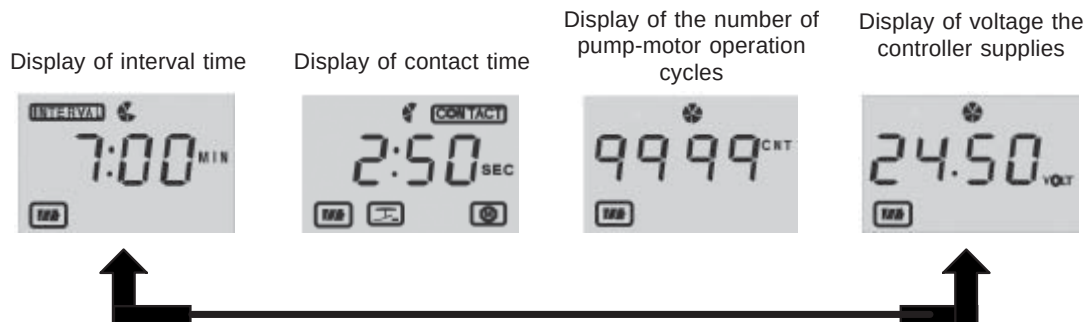
(6) How to release failures

- Pressing down the "MANUAL" switch deletes the memorized errors.

MISCELLANEOUS CONTROLS AND OPTIONS 5-17

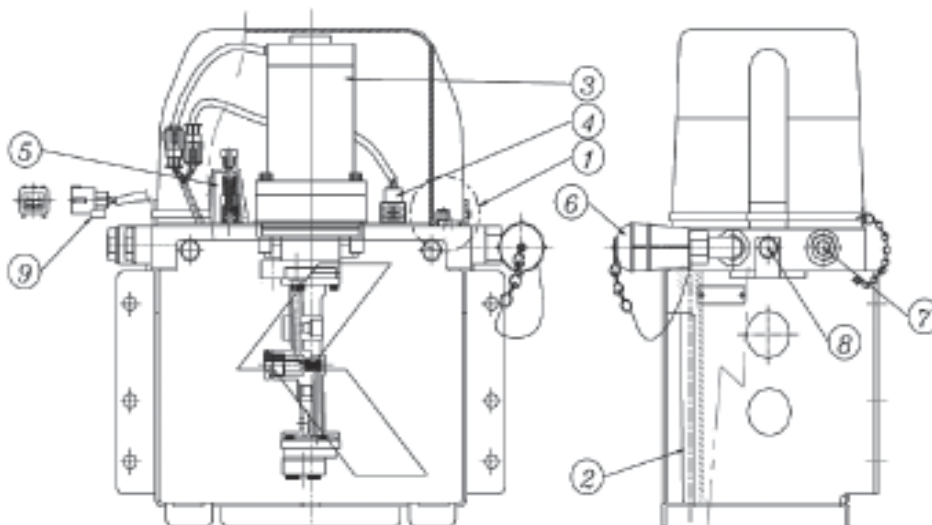
(7) Confirmation function

- When the "MODE" switch is pressed down, the order is changed as follows:



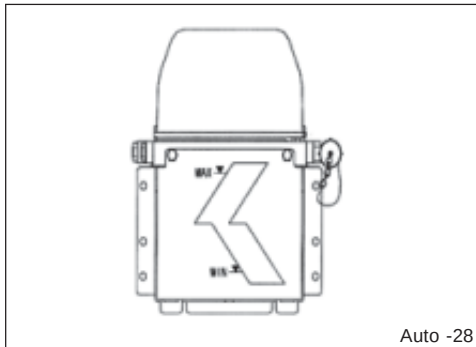
- If switches are not operated for five seconds, the system return to its current status.

5) Pump of the grease auto-injecting device



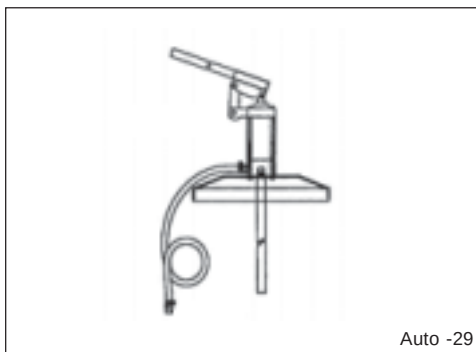
- 1. Cover
- 2. Overflow pipe
- 3. Motor box
- 4. Pressure switch
- 5. Safety valve
- 6. Grease make-up feed gate
- 7. Grease ejector gate
- 8. Bracket fastener
- 9. Wiring harness

5-18 MISCELLANEOUS CONTROLS AND OPTIONS



Auto -28

- Grease make-up feed and air discharge of the auto-injecting device
- The grease in the auto-injecting device should always be kept above the minimum line ("MIN"). When make-up feeding, the grease is filled to the maximum line ("MAX") using the storage container and make-up feeder.
- After grease has been make-up fed, the air should be discharged from the grease line.
- With the main switch of the battery "ON," the plug at the end of the sorter is opened and the "TEST" switch of the controller of the grease auto-injection is pressed down until grease flows out, and then the plug at the end is replaced and the "TEST" switch is pressed down again.

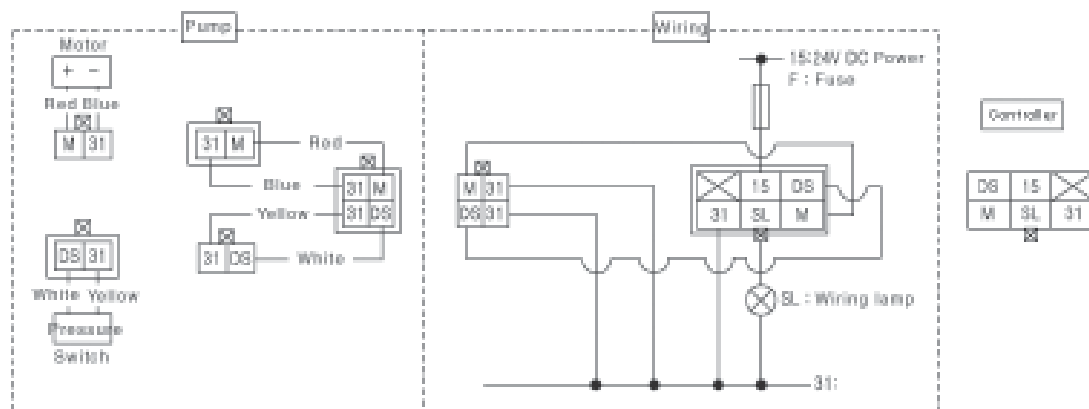


Auto -29

Note

Please be it sure that foreign particulates do not flow in during grease make-up feeding, and confirm that the grease is being properly injected into the grease auto lubricating area.

6) Wiring diagram of the grease auto-injecting device



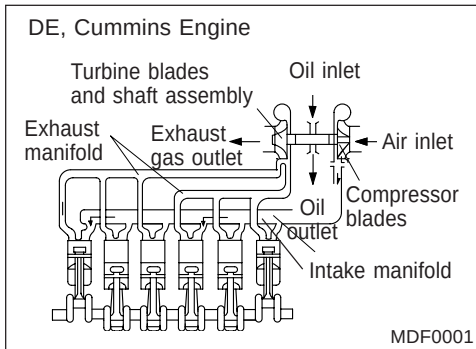
MISCELLANEOUS CONTROLS AND OPTIONS 5-19

7) Wiring diagram of the grease auto-injecting device.

Phenomenon of defect	Checking point	Remark
The warning lamp at the operator stand lit continuously.	Whether or not the pump has grease	Make-up for grease
	Check the status of the controller's LCD lighting.	
After power is applied(the main switch of the battery is "ON") the warning lamp at the operator stand is not lit.	Failure of the vehicle's power	
	Disconnection of the warning lamp at the operator stand	Replace the warning lamp at the operator stand.
	Disconnection of the vehicle's fuse	Replace the vehicle's fuse.
	Disconnection of the controller's fuse	Replace the controller's fuse.
	Check the status of the controller's LCD lighting.	
Grease leakage	Pump grease leakage	
	Sorter grease leakage	
	Main pipe grease leakage	
	Grease leakage from secondary pipe	
Excessive injection of grease into the total system	A long time waiting or parking after the vehicle's power is applied	The vehicle's power is turned off.
	Check the cycle in which the controller operates the pump.	
Injected volume is small	Check the cycle in which the controller operates the pump.	
The controller's power lamp is not lit.	Failure of the vehicle's power	
	Disconnection of the vehicle's fuse	Replace the vehicle's fuse
	Disconnection of the controller's fuse	Replace the controller's fuse.
	Failure of the controller	
The controllers power lamp is flashing	Check the vehicle's voltage(below 15V).	
The controller's warning lamp is flashing.	Disconnection of the warning lamp at the operator stand	
	When the vehicle's overcurrent is sensed	Recheck after releasing the error.
The controller's pressure display lamp is lit continuously.	Abnormal input of the pipe pressure switch	Recheck after releasing the error.
(Continuous flashing when the pump does not operate)	Check the wiring of the pressure switch and then check the pipe.	
The pump-motor display lamp on the controller is lit continuously.	Short-circuit in the pump motor wiring.	Recheck after releasing the error.
The controller's pump motor display lamp flashes	Disconnection of the pump-motor wiring	Recheck after releasing the error.

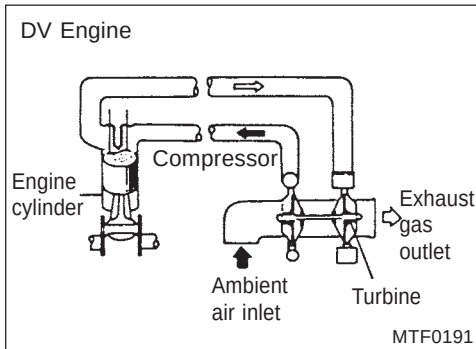
5-20 MISCELLANEOUS CONTROLS AND OPTIONS

3. TURBO CHARGER



1) Basic rules of operation

When the turbine blades installed at exhaust gas outlet are rotated at high speed by the high pressure and heat energy of exhaust gas discharged after combustion in the engine, the compressor blades connected integrally with the turbine shaft start rotating at the same speed, so that an ample amount of fresh air flows into the engine cylinder. A sufficient supply of fresh air enables complete combustion, resulting in decrease in fuel consumption and increase in output.



2) Type of turbo charger

Type	Engine	No.
TBP45(Allied signal)	DE	1
TB4122(Allied signal)	DV	1
TB2222(Holset)	ISM CUMMINS	1
TB1374(Holset)	ISX CUMMINS	1

3) Tips for vehicle operation

As the turbo charger rotates at high speed, failure to replenish engine oil within scheduled period or lack of engine oil may cause damage to bearings, etc.

Be sure to observe how to start and the operation instructions before or after operation.

(1) Starting

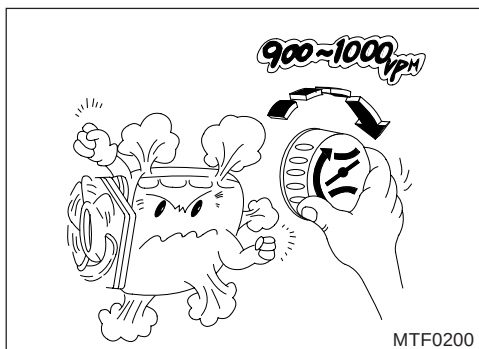
Start the engine and check if the engine oil pressure warning lamp is turned on and then go out. Also, check if engine oil pressure is normal when idling the engine.

After starting the engine, revolve the engine at low speed(600~650 rpm) for about 1 minute, increase the idle speed to approximately 900~1000 rpm to achieve further engine revolution for 3~4 minutes, then drive off the vehicle.

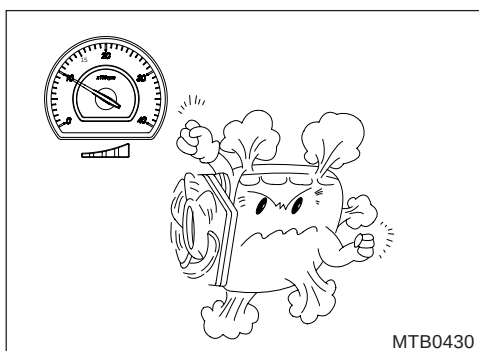
⚠ Caution

Be sure to follow the instructions on "(1) Starting" after oil and oil filter are changed or in winter where oil viscosity becomes higher, or the engine is left unattended over prolonged time(1 week or more). (However, limit the starting key working time to 10 seconds or less, and perform re-starting operation, if needed, in about 30 seconds from the initial operation.

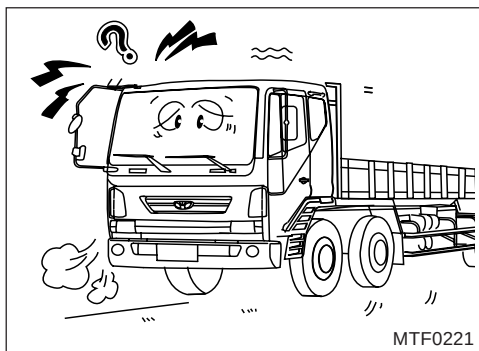
MISCELLANEOUS CONTROLS AND OPTIONS 5-21



The low speed idling for first 1 minute forms hydraulic pressure in the engine lubrication system. Then, if increasing the idle speed for 3~4 minutes, engine oil can be distributed from the oil pump sufficiently up to the individual lubricating points of the turbo charger installed considerably high above the other engine components.

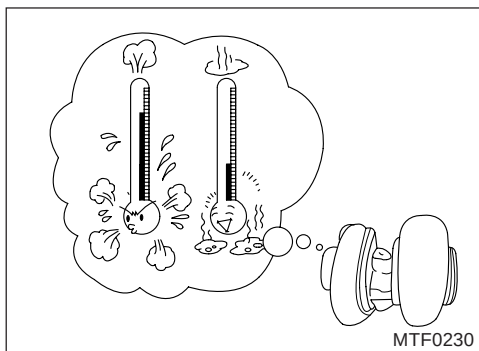


If the engine is accelerated with the lubricating points of the turbo charger supplied insufficiently with engine oil, intense heat generated by high speed revolution(100,000 rpm) of the turbo charger may cause burns to bearings and the rotating part of the shaft.



(2) When parking the vehicle for prolonged time

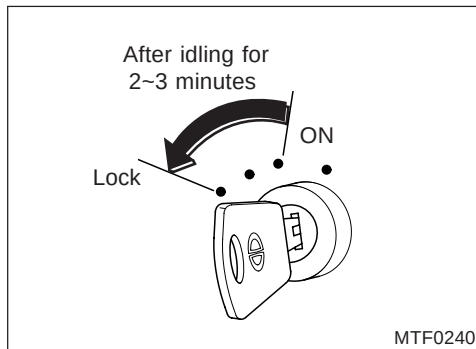
If the engine is idled at low speed of 600~650 rpm for prolonged time, a sufficient amount of oil cannot be distributed to the turbo charger, resulting in premature wear of the rotating part due to lack of lubrication. Therefore, when it is unavoidable to park the vehicle for 30 minutes or longer with the engine started, increase engine idle speed to 900~1,000 rpm so that the turbo charger can be supplied with a sufficient amount of oil.



(3) After starting

Avoid stopping the engine immediately after driving off the vehicle. If the engine is stopped immediately after the vehicle is driven off with full load, the turbo charger fails to immediately stop its revolution due to rotative inertia force so that engine oil remaining on rotating part can be completely burnt by the intense heat generated from the turbo charger heated during the operation of the vehicle, resulting in damage to rotating part.

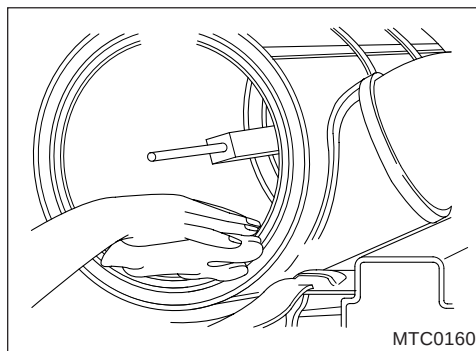
5-22 MISCELLANEOUS CONTROLS AND OPTIONS



In addition, thermal stress resulting from quick cooling of the turbo charger will lower the durability of engine components and accelerate consumption of coolant. Accordingly, idle the engine for 2~3 minutes after finishing the operation of the vehicle, so that the turbo charger may be cooled down slowly and complete burn of engine oil may be prevented.

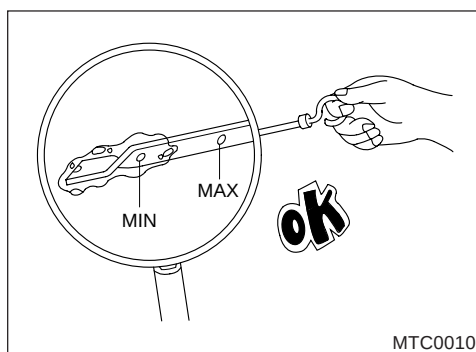
4) Care of turbo charger

As the turbo charger revolves at very fast speed (100,000 rpm or more), it is very sensitive to foreign substances carried in the air, fouled engine oil, and lack of oil supply. So, exceptional care is needed for it.



(1) Care of air cleaner

Clean or change the air cleaner element as required to prevent premature wear and damage to the compressor blades and drive portion of the turbo charger due to the entry of foreign substances such as dust or dirt. It is also needed to check the hose coupling the air cleaner and turbo charger for irregularities.



(2) Care of engine oil

Fouled engine oil may cause wear or damage to the bearings of the turbo charger, rotating shaft, and internal part of bearing housing, resulting in premature deterioration of performance of both the turbo charger and engine. This situation will lead to reduction of engine output as well as increase in discharge of black smoke and abnormal noise. Be sure to use specified oil and oil filters and observe replacement intervals.

MISCELLANEOUS CONTROLS AND OPTIONS 5-23

5) Diagnosis chart

Complaints Cause	Lack of engine output	Discharge of black smoke	Excessive consumption of engine oil	Discharge of blue smoke	Unusual sound from turbo charger	Repeated generation of high and low unusual sound from turbo charger	Oil leakage from compressor sealing	Oil leakage from turbine sealing
Restricted element of air cleaner	○	○		○	○		○	
Obstructions in air intake channel		○	○	○	○	○	○	
Obstructions in air exhaust channel from compressor housing to intake manifold	○	○			○			
Obstructions in intake manifold	○	○			○			
Air leak from some point between air cleaner and compressor housing					○			
Air leak from some point between compressor housing and intake manifold	○	○	○	○	○			
Air leak from some point between intake manifold and engine cylinder	○	○	○	○	○			
Obstructions in intake manifold	○	○	○	○	○		○	
Obstructions in muffler or exhaust pipe	○	○					○	
Gas leak from exhaust manifold	○	○			○		○	
Gas leak from the turbine inlet positioned at exhaust manifold coupling portion	○	○			○		○	
Gas leak from the outlet channel of turbine housing					○			
Obstructions in oil discharge pipe of turbo charger			○	○			○	○
Restricted ventilation channel of engine crank case			○	○			○	○
Entry of foreign substances into turbo charger bearing housing			○	○			○	○
Poor fuel injection	○	○						
Irregularities in injection timing or valve clearance	○	○						
Excess wear of engine piston ring or liner	○	○	○	○			○	○
Troubles inside the engine(valves, piston, etc.)	○	○	○	○			○	○
Foreign substances scaled on compressor blades	○	○	○	○	○	○	○	○
Damage of turbo charger	○	○	○	○	○		○	○

5-24 MISCELLANEOUS CONTROLS AND OPTIONS

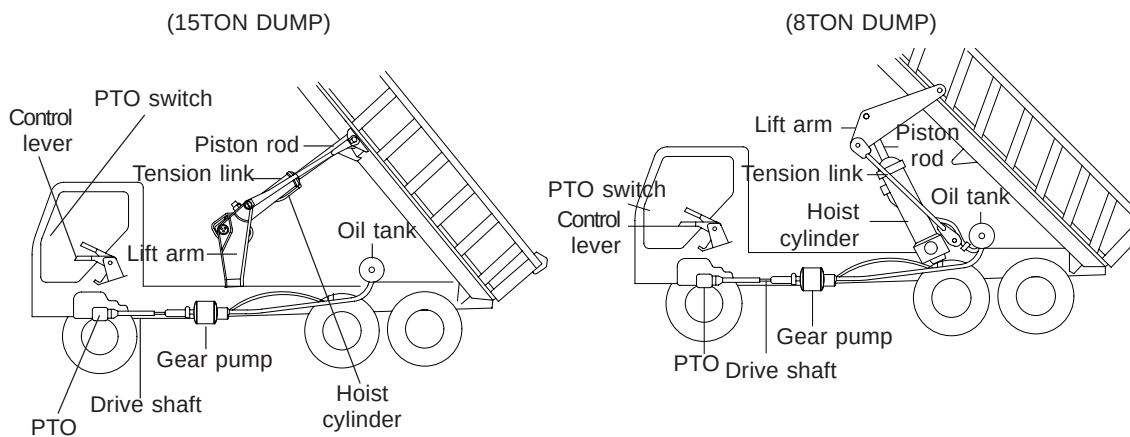
4. OPERATION OF DUMP SYSTEM

4-1. 8TON/15TON DUMP

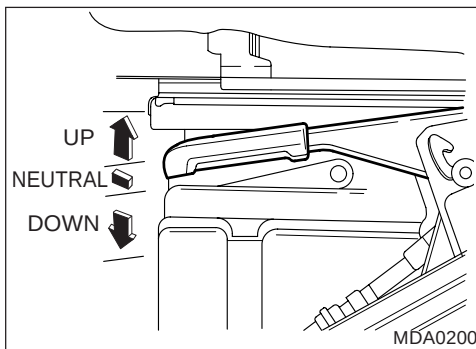
1) Control lever

The deck is hydraulically operated and can be controlled by manipulating both the P.T.O. switch installed on the dash board box and the control lever installed on the left-hand side of the driver's seat.

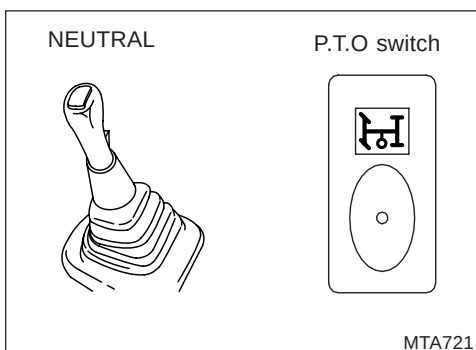
The P.T.O. switch and control lever have the function of controlling the engagement or disengagement of the P.T.O. gear and operating the hydraulic line valve to raise or lower the deck.



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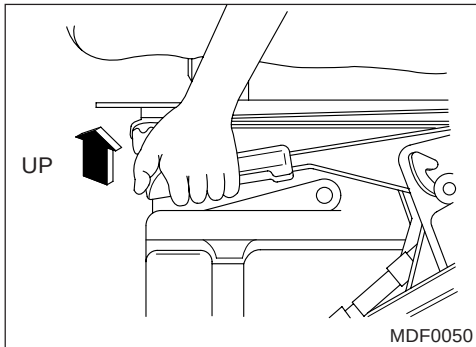
★ While driving, you must place the control lever in "DOWN" position and PTO switch in "OFF" position.



2) When attempting to raise the rear body

- (1) Let the engine run at idle, place the gear in neutral, depress the clutch pedal, place the P.T.O. switch in "ON", and the P.T.O. gear is engaged. And then release the clutch pedal slowly.

MISCELLANEOUS CONTROLS AND OPTIONS 5-25



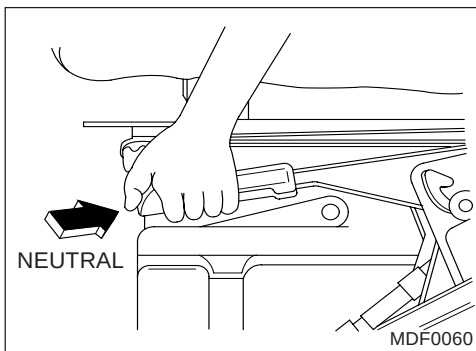
- (2) Place the deck control lever in "UP" position, and at the same time depress the accelerator pedal slowly.

Then, the rear gate locking device is automatically released, the lower portion of the rear gate is opened, and materials can be unloaded from the deck. Increase engine speed slowly up to 1,000~1,200 rpm.

⚠ Caution

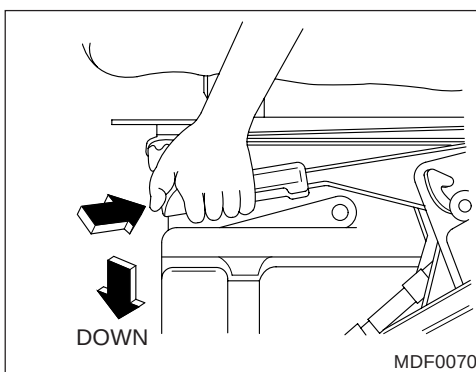
Do not exceed the range of 1,500 rpm, or gear pump components will be burnt. And any trouble or defect occurring from overloading or incorrect manipulation shall not be covered by our WARRANTY.

- (3) Immediately after the deck is raised and unloading operation is finished, depress the clutch pedal and turn off the PTO switch.



3) When attempting to stop the deck halfway

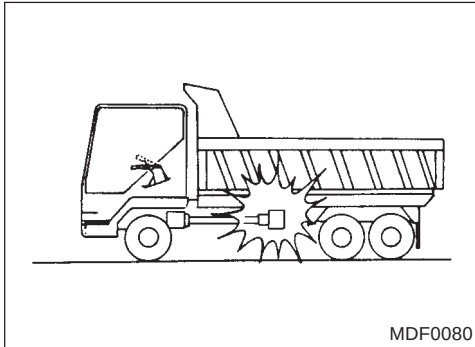
- (1) Grip the control lever in the "NEUTRAL" position.
- (2) When attempting to stop the deck for a long interval in the middle of ascending or descending, switch off the PTO and place the control lever in the "UP" position.



4) When attempting to lower the deck

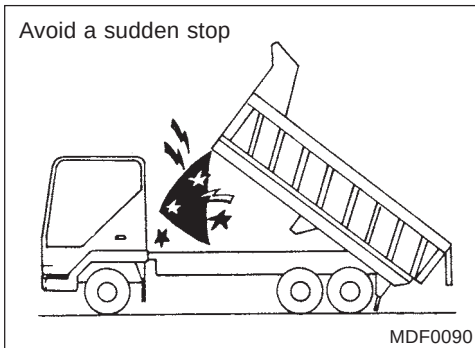
- (1) Place the control lever in the "DOWN" position.
- (2) The deck can be lowered even when the engine is stopped.
The lowering speed can be controlled by placing the control lever between the "DOWN" position and "NEUTRAL" position.
- (3) When attempting to stop the deck in the middle of descending, switch off the PTO and place the control lever in the "UP" position.

5-26 MISCELLANEOUS CONTROLS AND OPTIONS

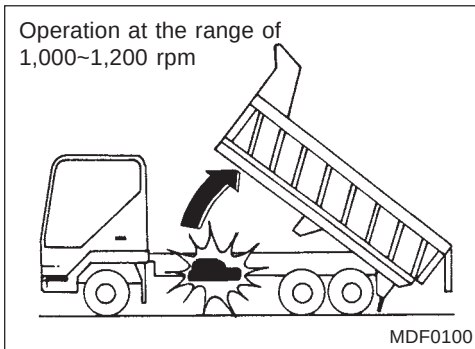


5) Cautions

- (1) With the PTO switch being in operation, driving of the vehicle over a prolonged time may cause damage to PTO and gear pump. Lowering the deck while running the vehicle will cause damage to the dump system.



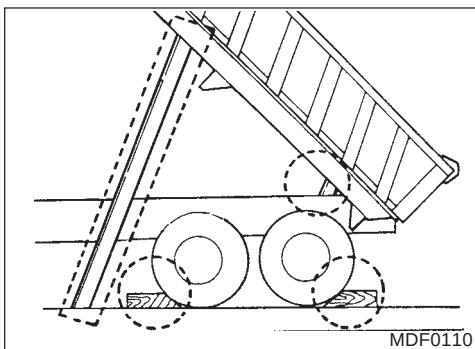
- (2) Applying a sudden stop to the vehicle with the deck raised, or stopping suddenly the deck in the middle of descending, may cause damage to dump system and, in the worst case, even to the deck frame or main frame of the vehicle. For the same reason, avoid a sudden stop while running with the deck loaded with materials.



- (3) Raising the deck with the engine speed accelerated over the range of 1,500 rpm will cause damage to the gear pump components.

⚠ Caution

Our WARRANTY shall not apply to any defects caused by non-compliance with the above cautions or overloading.

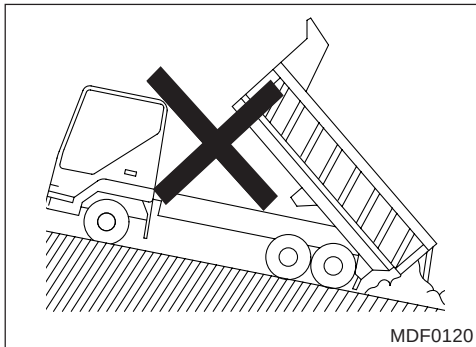


- (4) Observe the following cautions when servicing the vehicle or working with the dump deck raised.

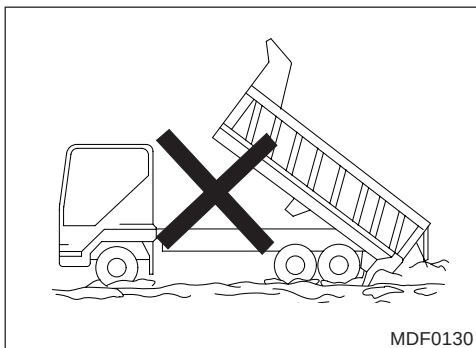
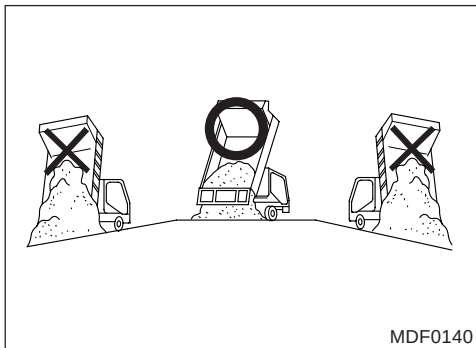
⚠ Warning

1. Empty the dump deck before work.
2. Secure the area sufficient to lift the dump deck. Also, park the vehicle on level ground, apply the parking brake and chock the wheels.
3. After raising the dump deck, place the dump lever in the "NEUTRAL" position and stop the engine.
4. Place the safety support securely as shown in the figure. If the above cautions are not followed strictly, a serious injury or even death can occur.

MISCELLANEOUS CONTROLS AND OPTIONS 5-27



(5) Do not raise the dump deck on a slope or down-hill road.



(6) Never raise the dump deck on an unpaved road or muddy ground. The vehicle can be bogged down in mud due to uneven load distribution.

- ★ Replenish the dump system with oil and perform air bleeding operation
 - when the deck will not ascend up to the full height, and/or
 - when the deck will not be raised smoothly.

6) Oil change, oil replenishment and air bleeding for the dump system

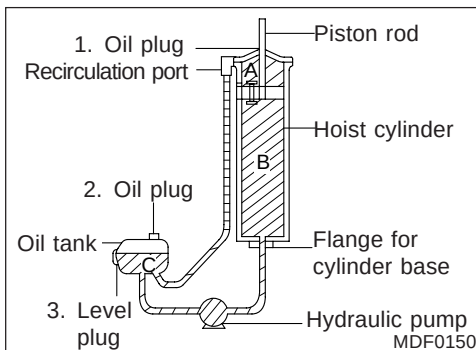
When adding oil, use the same brand and replenish oil with the deck raised all the way. When the deck will not ascend to the top, keep adding oil until it reaches the full height. With the deck raised up to the full height, hoist cylinder should be fully filled and oil tank should be filled up to the specified oil level.

5-28 MISCELLANEOUS CONTROLS AND OPTIONS

⚠ Caution

Keep adding hydraulic oil until the deck ascends to the maximum height.

- (1) With the deck raised as fully as possible, erect safety posts and safety wood blocks under the deck, and chock the wheels.
- (2) Unscrew oil filler and level plug of the oil tank, replenish hydraulic oil until the fluid overflows from the level plug, then re-fit them.
- (3) Unscrew oil filler located on the upper side of hoist cylinder, replenish hydraulic oil until the fluid overflows from the filler, then re-fit it.



- Open the plugs 2 and 3.
- Replenish hydraulic oil through 2 until it overflows from 3.
- Re-fit plugs 2 and 3, and fill the chamber A through plug 1.
- Use the same brand when adding hydraulic oil.
- For maximum dumping, fill the chambers A, B and the oil reservoir up to level C, as indicated with oblique lines in the illustration.
- 8ton dump : 35L
15ton dump : 50L(Marrel)/55L(New Marrel)

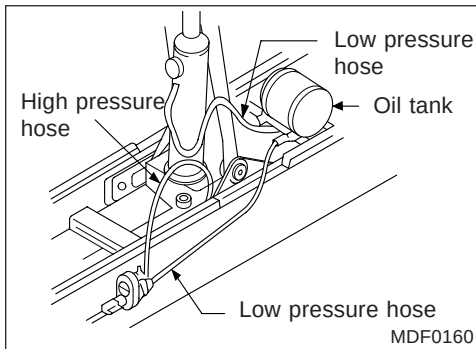
Leakage of hydraulic oil

During a long term operation, oil leakage and air penetration may occur at the connecting portions. Operating of the pump with air in the hydraulic oil will produce unusual sound. In such a case, retighten the loose connections.

The rubber hoses should be replaced every two years, as they deteriorates with time.

At each overhaul or inspection, clean deposited mud and dust, and check the outer surface, curved portions and cracks in connecting area with metal fittings.

If anything wrong is evident, the rubber hoses should be replaced.



Inspection of control wire

- Check for loose clips and disconnection of wire.
- Check for interference of wire with another object.
- Check to ensure that, when the cab is tilted or the body is placed in dumping position, the wire is not pulled with undue force.

MISCELLANEOUS CONTROLS AND OPTIONS 5-29

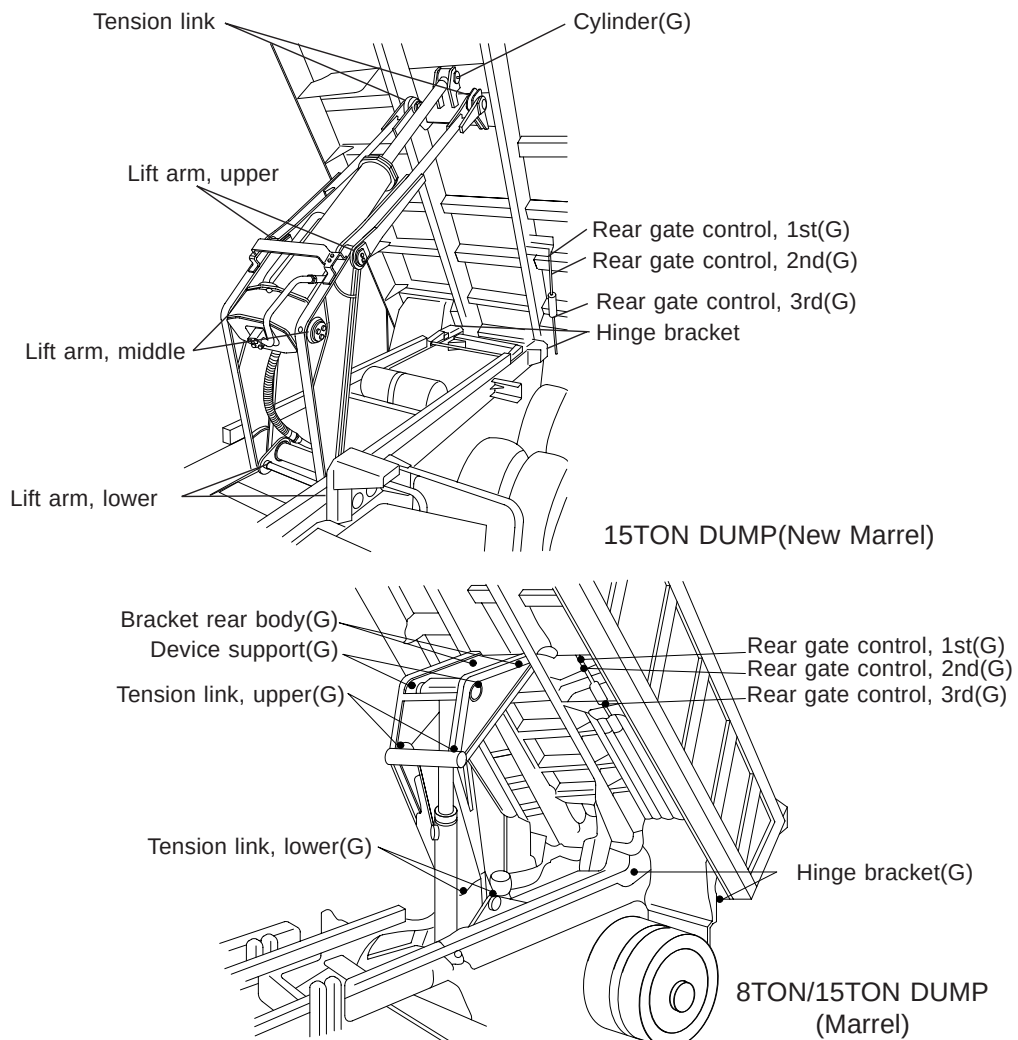
- Specification of hydraulic oil
 - ISO VG32 : General
 - ISO VG15 : Arctic

- Recommended hydraulic oil for dump hoist
 - Azola ZS32
 - Hydraulic 28
 - Harmony AW32
 - Tellas 32
 - Rando 32

7) Greasing points of dump system

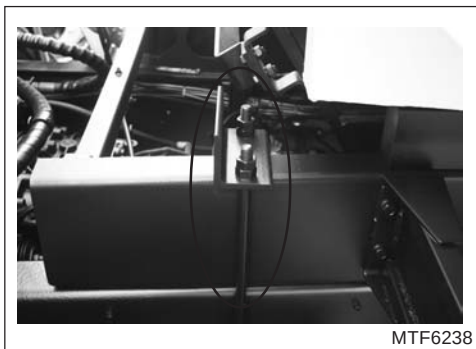
Greasing should be performed once a week for the first two months and at least once a month thereafter. The truck used frequently should be greased every other day or once 100 times of dumping. Periodic lubrication is absolutely required for the assurance of long life and top performance of the dumping mechanism.

(G)	Chassis grease
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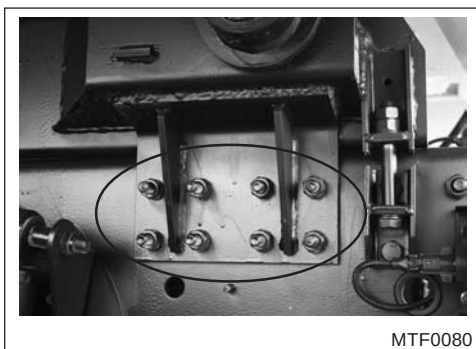
5-30 MISCELLANEOUS CONTROLS AND OPTIONS

Re-tightening bolt of the new vehicle(After 1 week driving)



Caution

Check and re-tightening "U" bolts and brackets connected to the chassis frame and sub-frame after 1 week driving. Because bolts and nuts tend to be loosened during the use of new vehicle.



MISCELLANEOUS CONTROLS AND OPTIONS 5-31

Inspection and Lubrication

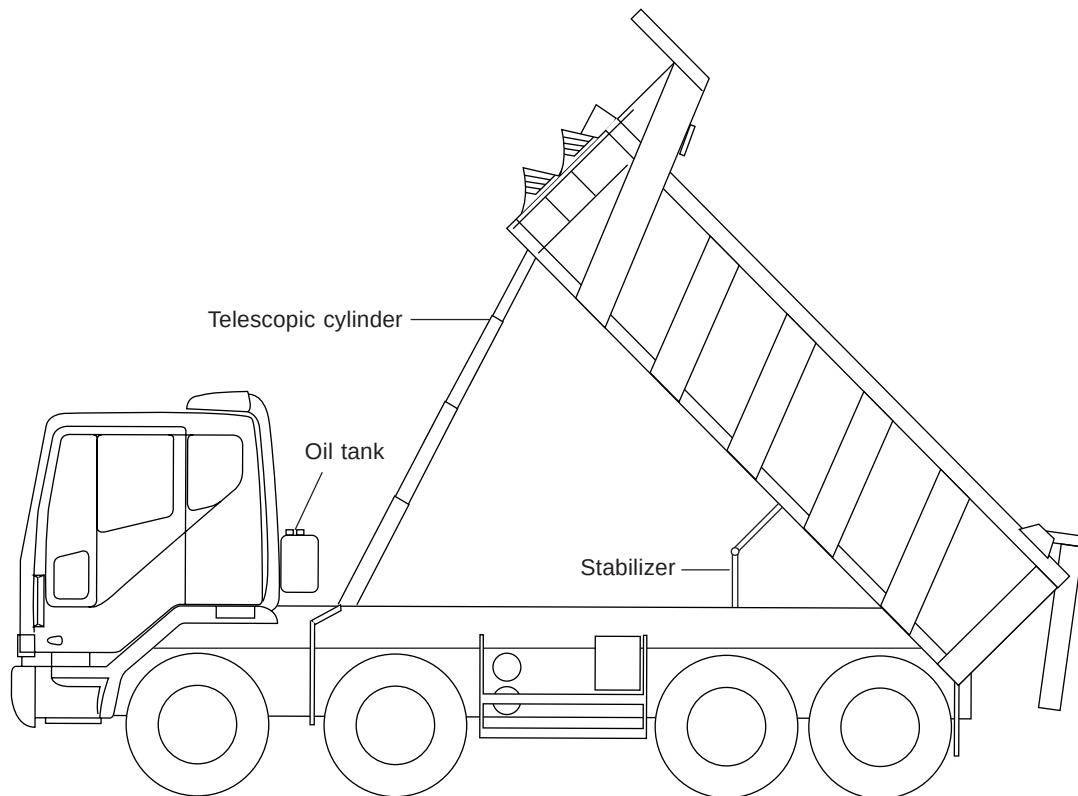
Troubles or damage, however minor they are, must be corrected immediately. It is recommended to check the vehicle each day to ensure a long life and trouble-free operation.

Check items		Service intervals						Action
		Daily	Weekly	Every3 months	Every6 months	Every12 months	Every24 months	
Drive system	Check the status of drive shaft vibration		●					Correct or change
	Check the status of flange yoke mounting bolt tightening		●					Re-tighten
Dumping hydraulic & Pneumatic system	Check the status of the hydraulic pump & cylinder mounting bolt tightening		●					Re-tighten
	Check the leakage of hydraulic pump & cylinder	●						Correct or change
	Check the hydraulic fluid oil level			Initial Change		Change		Replenish or change
	Check the damage, leakage and interference of hydraulic hose	●					Change	Correct or change
	Check the operation and connection status of the control lever & wire	●						Correct or change
	Check the leakage of all connection	●						Correct or change
Sub frame mounting system	Check the tightening status of "U" bolt and brackets connected to the chassis frame and sub-frame		●					Re-tighten
Others	Check the grease inlet	●						Greasing
	Check the operation of automatic rear gate locking device and the status of connection	●						Correct or change
	Check loosened status of the other bolts and re-tightening							Re-tighten

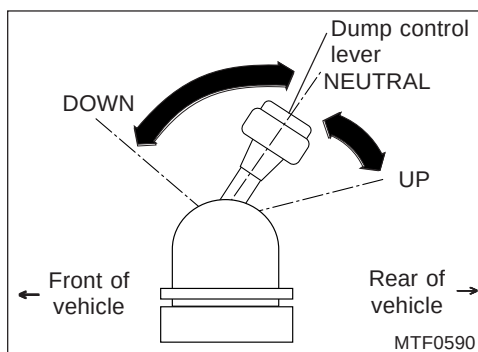
5-32 MISCELLANEOUS CONTROLS AND OPTIONS

4-2. 24TON/25.5TON DUMP

The dump system is operated hydraulically and controlled by manipulating the P.T.O. switch and control lever which are installed at the left-hand side of the driver's seat.



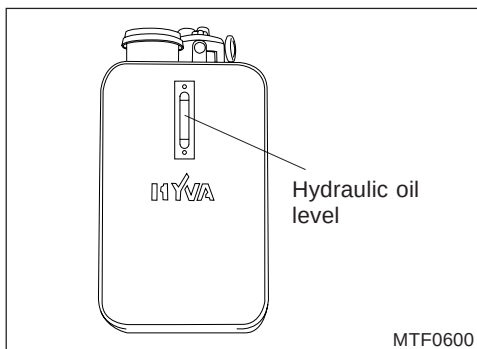
MTF0580



MTF0590

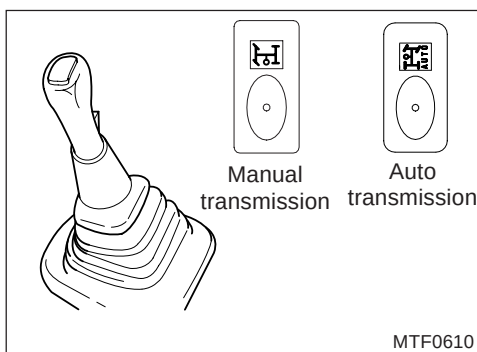
- ✱ When operating the vehicle, turn off the P.T.O. switch and place the dump control lever in "NEUTRAL" position all the time.

MISCELLANEOUS CONTROLS AND OPTIONS 5-33



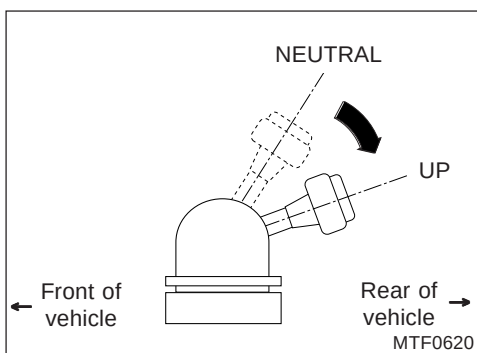
1) Inspection prior to operation

Check the hydraulic oil level in the oil tank. The hydraulic oil level should be normally brought to the high level on the oil tank gauge with the deck lowered fully.



2) When raising the deck

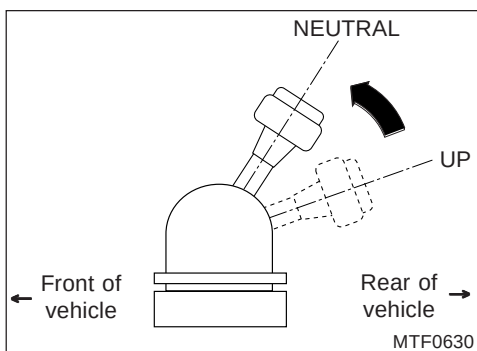
(1) If the clutch pedal is depressed and the PTO switch is "ON" with the engine at idle and gear-shift lever in the neutral position, the PTO gears are engaged. If the PTO gears are engaged, release the foot from the clutch pedal slowly.



(2) If the dump control lever is pulled to the "UP" position and the accelerator pedal is depressed slowly, the deck starts to ascend. Then the rear gate is opened automatically so that the materials in the deck are unloaded. Accelerate the engine up to 1,000~1,200 rpm gradually.

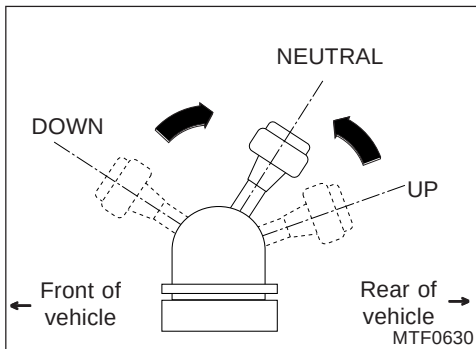
⚠ Caution

Do not exceed the range of 1,500 rpm, or gear pump components will be burnt. And any trouble or defect occurring from overloading or incorrect manipulation shall not be covered by our WARRANTY.



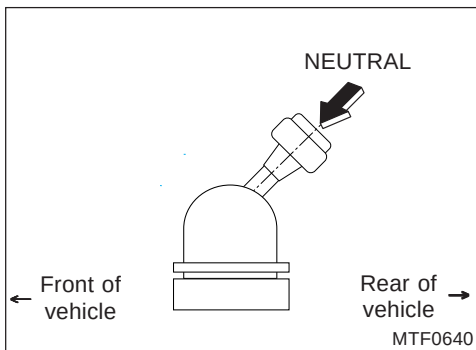
(3) Place the control lever in the "NEUTRAL" position immediately after raising the deck to unload the materials.

5-34 MISCELLANEOUS CONTROLS AND OPTIONS

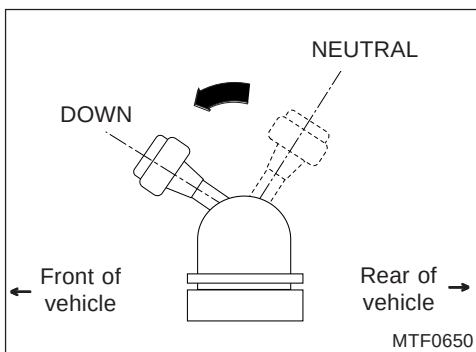


3) When attempting to stop the deck halfway

- (1) When attempting to stop the deck for a short interval in the middle of ascending or descending, place the control lever in the "NEUTRAL" position.



- (2) When attempting to stop the deck for a long interval in the middle of ascending or descending, with the clutch pedal depressed and the PTO switch in the "OFF" position and place the control lever in the "NEUTRAL" position.



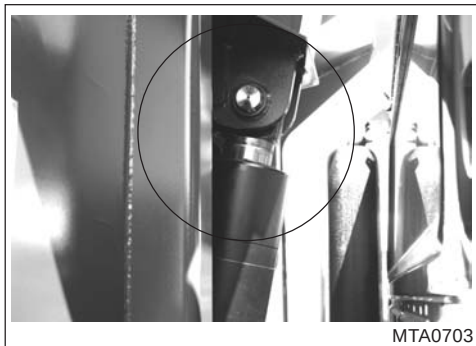
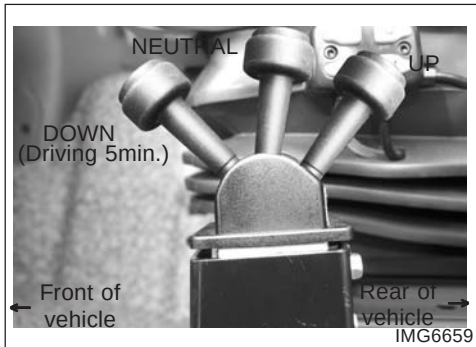
4) When attempting to lower the deck

- (1) Place the dump control lever in the "DOWN" position.

Note

1. If the dump control lever is placed in the "DOWN" position, the PTO switch also turn off.
2. The deck descends by its own weight.

MISCELLANEOUS CONTROLS AND OPTIONS 5-35



(1) Correct position of cylinder tube(4th stage tube protruded)



(2) Incorrect position of cylinder tube(1st stage tube protruded)

- (2) How to place each cylinder stage tube for dump truck in correct position

Keep the following instructions in order to place each stage tube of the multi-stage cylinder for the dump truck.

- 1) Drive the vehicle for approx. 5 minutes with the dump control lever in the "DOWN" position after the dump deck is lowered completely.
- 2) After 5 minutes of driving, check that each stage tube of the multi-stage cylinder is in the correct position ((1) correct position of cylinder tube:4th stage tube protruded).

⚠ Caution

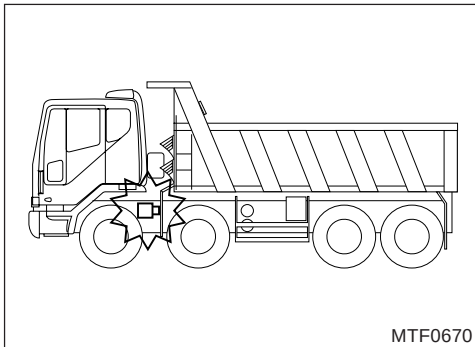
If driving with the stage tube of the multi-stage cylinder in the incorrect position(2) incorrect position of cylinder tube: 1st stage tube protruded), the cylinder tube can be damaged.

- 3) If each stage tube of the multi-stage cylinder is in the correct position((1) correct position of cylinder tube:4th stage tube protruded), make sure to place the dump control lever to the "NEUTRAL" position.

⚠ Caution

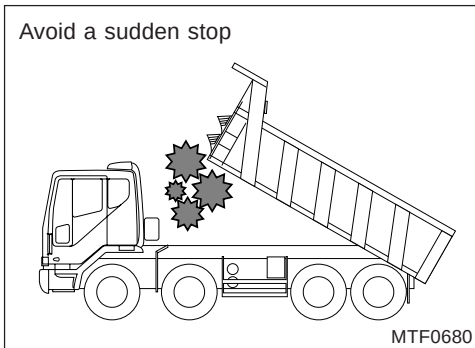
If driving for an extended period of time with the dump control lever in the "DOWN" position, oil in the cylinder is drained completely, causing internal damage. Make sure to place the dump control lever to the "NEUTRAL" position after driving for 5 minutes with it in the "DOWN" position.

5-36 MISCELLANEOUS CONTROLS AND OPTIONS

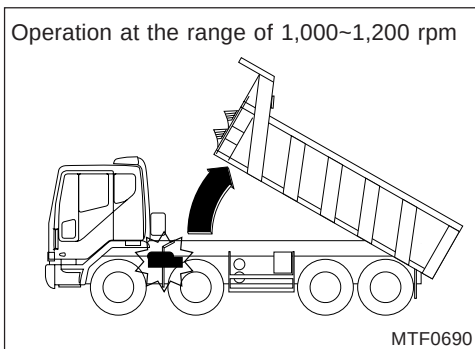


5) Cautions

- (1) With the PTO being in operation, driving of the vehicle over a prolonged time may cause damage to PTO and gear pump. Lowering the deck while running the vehicle will cause damage to the dump system.



- (2) Applying a sudden stop to the vehicle with the deck raised, or stopping suddenly the deck in the middle of descending, may cause damage to dump system and, in the worst case, even to the deck frame or main frame of the vehicle. For the same reason, avoid a sudden stop while running with the deck loaded with materials.

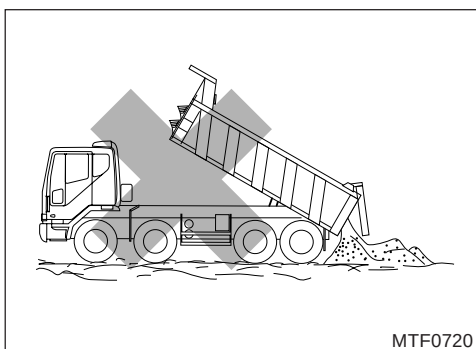
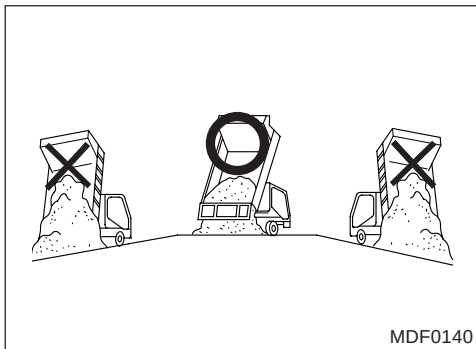
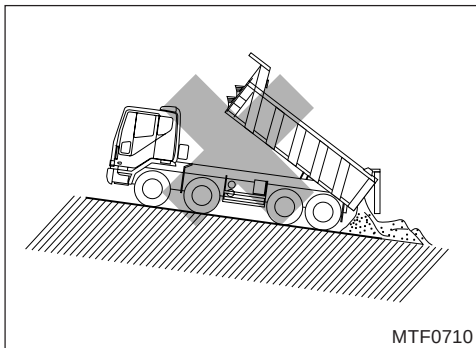
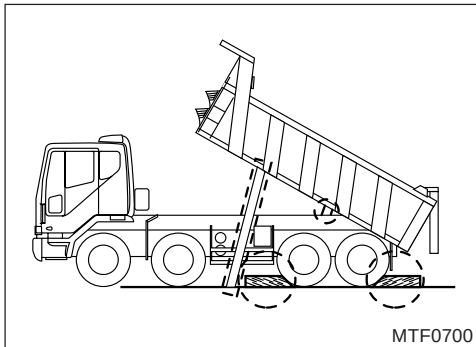


- (3) Raising the deck with the engine accelerated at 1,500 rpm or more will cause damage to the components of the gear pump.

⚠ Caution

Your WARRANTY shall not apply to any defects caused by non-compliance with the above cautions or overloading exceeding the pay load.

MISCELLANEOUS CONTROLS AND OPTIONS 5-37



- (4) Observe the following cautions when servicing the vehicle or working with the dump deck raised.

⚠ Warning

1. Empty the dump deck before work.
2. Secure the area sufficient to lift the dump deck. Also, park the vehicle on level ground, apply the parking brake and chock the wheels.
3. After raising the dump deck, place the dump lever in the "NEUTRAL" position and stop the engine.
4. Place the safety support securely as shown in the figure. If the above cautions are not followed strictly, a serious injury or even death can occur.

- (5) Do not raise the dump deck on a slope or down-hill road.

- (6) Never raise the dump deck on an unpaved road or muddy ground. The vehicle can be bogged down in mud due to uneven load distribution.

5-38 MISCELLANEOUS CONTROLS AND OPTIONS

Suggested hydraulic oil

Manufacturer	Suggested oil
Esoo Chemical	AZOLA ZS 32
Mobil Korea	HYDRAULIC 28
Yukong	HARMONY AW 32
Korea Shell	TELLAS 32
Honam Refinery	RANDO 32

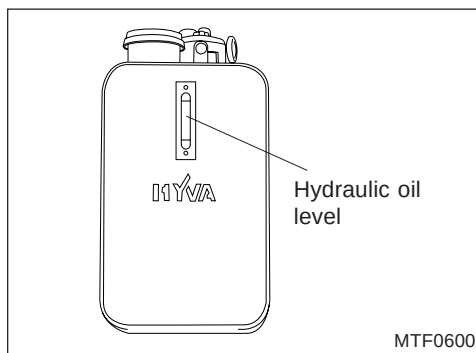
6) Checking and changing of hydraulic oil

(1) Specification of hydraulic oil

- ISO VG 32(hydraulic oil)

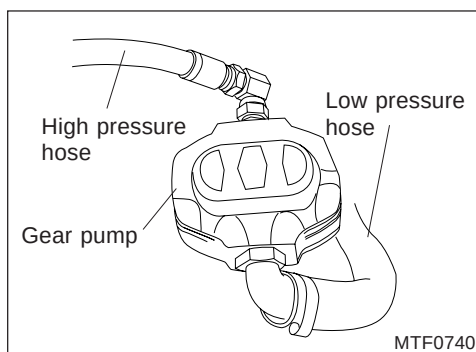
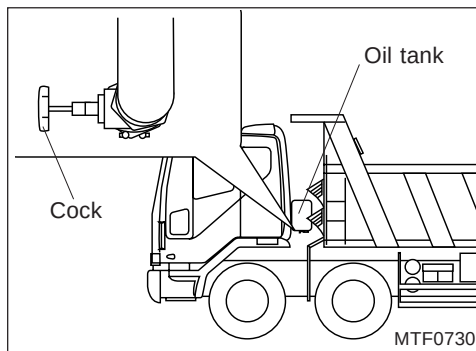
(2) Checking the hydraulic oil level(with the engine stopped)

Always check the hydraulic oil level prior to operation of the dump system and add the same brand oil if necessary. Check the hydraulic oil level through the transparent sight glass installed on the oil tank. If the hydraulic oil level reaches the high level of the sight glass with the dump control lever placed in the “DOWN” position and the deck lowered completely, it is normal.



(3) Changing of hydraulic oil(with the engine stopped)

Check the hydraulic oil at regular intervals. Replace the hydraulic oil at end of the first three months and once a year thereafter. Close the cock installed beneath the oil tank, place an oil container under the gear pump, release the clamp(on the gear pump side) of the low pressure hose connected to the cock, then drain out the old hydraulic oil by removing the cock. Hydraulic oil change should be performed with the deck lowered completely, engine stopped, and the dump control lever placed in the “DOWN” position.

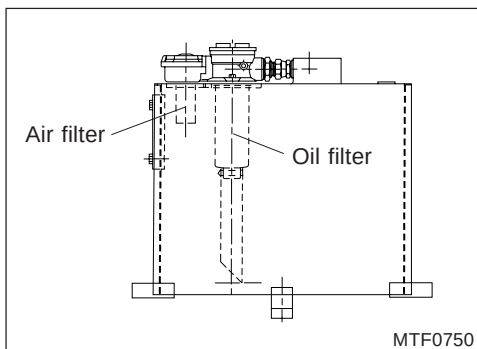


Fill capacity : 90L

- 24ton/25.5ton dump : 97L

- Rear 3-axle dump : 100L

MISCELLANEOUS CONTROLS AND OPTIONS 5-39



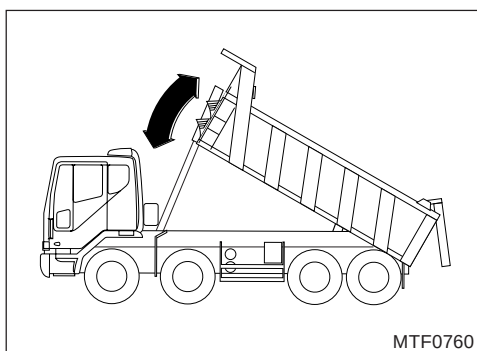
(4) Changing of air filter and oil filter(with engine stopped)

Replace the air filter and oil filter concurrently with hydraulic oil change.

The air filter is a paper type filter installed within the oil filler, while the oil filter is a paper type filter installed on the line through which the hydraulic oil returns to the oil tank from the hoist cylinder. The air filter and oil filter are installed on top of the oil tank separately.

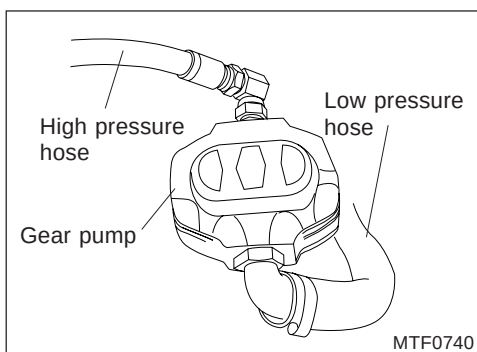
Caution

Be sure to use genuine HYVA filter elements for air filter and oil filter. Your WARRANTY shall not apply to any defects or damage caused to the dump system by reason of using non-genuine parts.



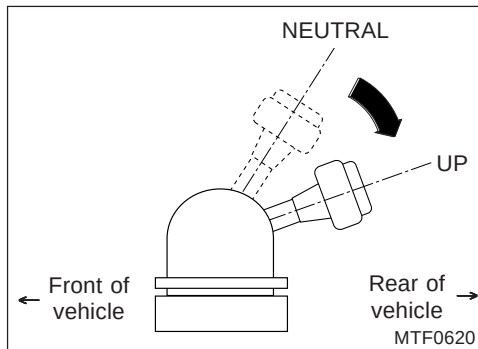
7) Air bleeding of dump system

The dump system has no specific screw for air bleeding. When a slight amount of air has entered the hoist cylinder, perform the deck ascending and descending operation several times to remove the air through the oil tank. If a large amount of air has entered after servicing the dump system or changing hydraulic oil and even the deck ascending and descending operation has no effect on air bleeding with unusual sound and vibration of the hydraulic hose produced, bleed the air in the following procedure:



- (1) Stop the engine and loosen the high pressure hose on gear pump side slightly, then the gear pump and low pressure hose linking the oil tank to the gear pump will be bled and filled up with hydraulic oil. If the hydraulic oil starts to flow out, retighten the high pressure hose.

5-40 MISCELLANEOUS CONTROLS AND OPTIONS



⚠ Caution

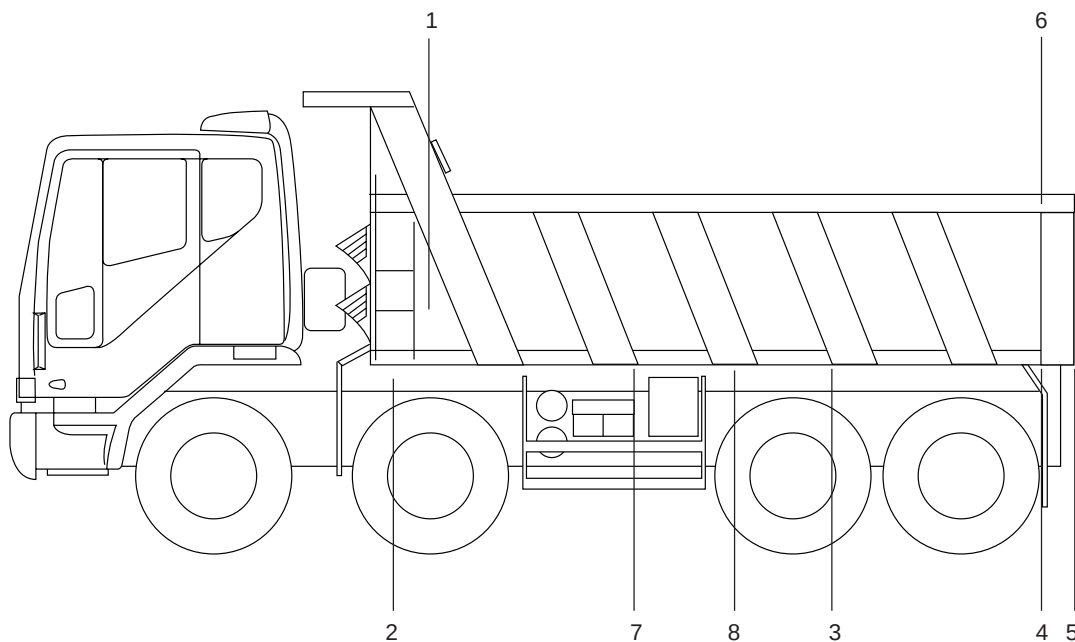
*Check each joint on the dump system, then perform bleeding operation.
If the dump system has abnormality even after performing the air bleeding operation, bring the vehicle the nearest maintenance shop for inspection and maintenance.*

- (2) Restarts the engine and turn the gear pump at the minimum speed to place the tipping valve in the "UP" position. Slightly loosen and then retighten the high pressure hose on the gear pump side until the air is not seen in the hydraulic oil which is flowing out. In the same manner, slightly loosen and then retighten the hose on the hoist cylinder side.
- (3) Operate the deck several times to bleed the air remaining in the hoist cylinder through the oil tank.
- (4) Recheck the hydraulic oil level and top up if necessary.

MISCELLANEOUS CONTROLS AND OPTIONS 5-41

8) Greasing points

Greasing should be performed once a week. The greasing points are illustrated as follows:

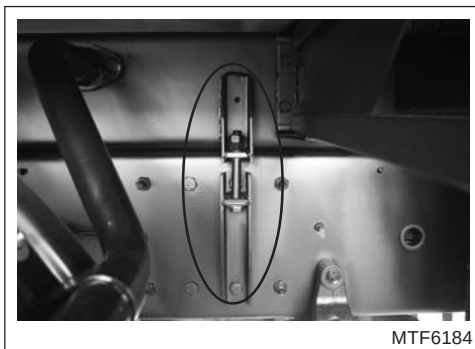


MTF0770

No.	Greasing points	The number
1	Lifting bracket, right and left	2
2	Chassis bracket, right and left	2
3	Rear gate locking device, right and left	2
4	Deck hinge, right and left	4
5	Rear gate locking device rod	5
6	Rear gate pivot, right and left	2
7	High picks	1
8	Stabilizer, right and left	8

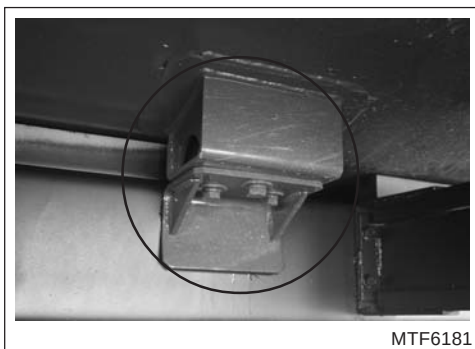
5-42 MISCELLANEOUS CONTROLS AND OPTIONS

Re-tightening bolt of the new vehicle(After 1 week driving)



⚠ Caution

Check and re-tightening bolts and nuts connected to the chassis frame and sub-frame after 1 week driving. Because bolts and nuts tend to be loosened during the use of new vehicle.



MISCELLANEOUS CONTROLS AND OPTIONS 5-43

Inspection and Lubrication

Troubles or damage, however minor they are, must be corrected immediately. It is recommended to check the vehicle each day to ensure a long life and trouble-free operation.

Check items		Service intervals						Action
		Daily	Weekly	Every3 months	Every6 months	Every12 months	Every24 months	
Drive system	Check the status of PTO tightening bolt		●					Correct or change
	Check the PTO oil leakage	●						Correct or change
	Check the PTO driven air tube for damage, leakage & interference	●						Correct or change
Dumping hydraulic & Pneumatic system	Check the status of the hydraulic pump mounting bolt tightening		●					Re-tighten
	Check leakage of hydraulic pump	●						Correct or change
	Check leakage and cleaning of hydraulic cylinder	Leakage	Cleaning					Correct or change
	Check leakage of valves and all connections	●						Correct or change
	Check the damage, leakage and interference of hydraulic hose	●					Change	Correct or change
	Check the damage, leakage and interference of air tube	●						Correct or change
	Check the hydraulic fluid oil level	●		Initial Change		Change		Replenish or change
	Check the contamination of oil filter		●	Initial Change	Change			change
	Check the contamination of air filter		●	Initial Change	Change			change
Sub frame mounting system	Check the tightening status of brackets connected to the chassis frame and sub-frame		●					Re-tighten
Others	Check the grease inlet	●						Greasing
	Check the operation of automatic rear gate locking device and the status of connection	●						Correct or change
	Check loosened status of the other bolts and re-tightening		●					Re-tighten

5-44 MISCELLANEOUS CONTROLS AND OPTIONS

5. SELF STEER

1) Maintenance

Items	Inspection
Busings	Check for excessive wear & movement every 30 days.
Air leaks	Check for air leaks daily before using.
Bolt torque	Check unit for bolt torque per instruction given in section 10.
Brake operation	Check for proper operation daily before moving and using the unit in any manner.
Structural	Inspect daily for signs of structural damage, cracks or wear in all components of suspension parts(arms, hangers, axle seats & etc.) inform manufacturer immediately of any structural damage of any kind.

2) Troubleshooting

Items	Possible cause	Remedy
Not getting the desired load on axle	Not having the proper air pressure to load bags.	Increase or decrease air pressure at regulator valve
	Air control system not properly installed	Check piping of air system
Insufficient air pressure to system	Defective brake protection valve or truck compressor	Replace brake protection valve and check air compressor
Unit not getting the correct lift	Lift air bags not getting proper air pressure	1. Check systems pressure. 2. Check air system piping drawing refer to control schematic
	Interference with chassis drive line other chassis and components	Inspect for interference
	Unit not installed properly	Check installation with factory installation drawing

3) Air pressure control(regulation pressure)

(1) Pressure control

Desire to observe test should be run being adjusted by regulation pressure low when run ordinarily.

★ Pusher axle load by air spring pressure

- Rear 3-axle cargo vehicles(Except 21ton Rear 3-axle cargo)

Air pressure (BAR)	Axle load	Status
3.2 ± 0.2	5 Ton	Data of the state that is distributed by 100% equality load
4.1 ± 0.2	6 Ton	
4.8 ± 0.2	7 Ton	
5.8 ± 0.2	8 Ton	

- Rear 3-axle dump vehicles

Air pressure (BAR)	Axle load	Status
3.8 ± 0.2	6 Ton	Data of the state that is distributed by 100% equality load
4.7 ± 0.2	7 Ton	
5.8 ± 0.2	8 Ton	
6.4 ± 0.2	9 Ton	

Caution

When parking, air pressure control by 50%(half) low of air pressure on driving. If anticipation axle load is less than 5 ton, do by lowest that air pressure does control possibility. If air pressure is high, influence in parking brake performance and vehicles can be pushed.

- 25Ton cargo vehicle(DV engine)

Air pressure (BAR)	Axle load	Status
2.8 ± 0.2	5 Ton	Data of the state that is distributed by 100% equality load
3.5 ± 0.2	6 Ton	
4.2 ± 0.2	7 Ton	
5.1 ± 0.2	8 Ton	

- 25Ton cargo vehicle(CUMMINS engine)

Air pressure (BAR)	Axle load	Status
3.3 ± 0.2	5 Ton	Data of the state that is distributed by 100% equality load
4.0 ± 0.2	6 Ton	
4.8 ± 0.2	7 Ton	
5.9 ± 0.2	8 Ton	

5-46 MISCELLANEOUS CONTROLS AND OPTIONS

- 6X2 cargo vehicle

Air pressure (BAR)	Axle load	Status
2.3 ± 0.2	4 Ton	Data of the state that is distributed by 100% equality load
3.2 ± 0.2	5 Ton	
3.9 ± 0.2	6 Ton	
4.8 ± 0.2	7.2 Ton	

Note

Data of the state that is distributed by 100% equality load. If it is not distributed by equality load, it may be different from standard data.

⚠ Caution

Never overload for vehicles and self-steer device protection. Overload is responsible for vehicles damage and air spring life shortening.

(2) Pressure control method

If it turns for watch direction pulling the control knob of pressure regulator forward, pressure is ascending. And, pressure becomes low in the opposite direction.

(3) Air charge

As is cost about ordinary 100 seconds, do charge enough about 2 minutes.

(4) Air leak

If is air leak, Normal pressure is not created and can be been short to axle load. Run a vehicle after repair in our service-network necessarily.

★ Notice through a truck scale indicator

The axle-load can be been short by air pressure down at sliding bump, pass slowly with the speed fewer than 5km/h.

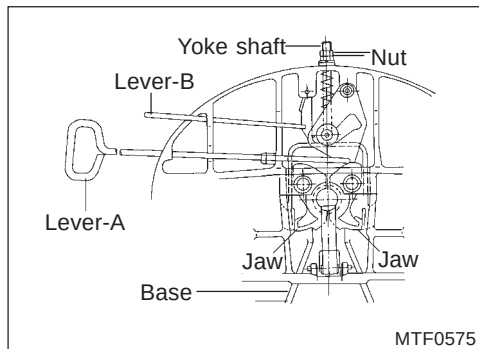
⚠ Caution

If pusher-axle operate up/down more than 2nd contiguously, Our vehicle's air can be lacking. Please, work after recharge.

6. CAUTION FOR OPERATION (DU20BS COUPLER)

(1) Coupler greasing

Greasing point	Oil
Upper face of base	Graphite grease
Sliding surface of jaw and yoke (left, right)	Graphite grease or chassis grease
Bushing of beam shaft (left, right)	Graphite grease or chassis grease



(2) Caution when coupling up and uncoupling

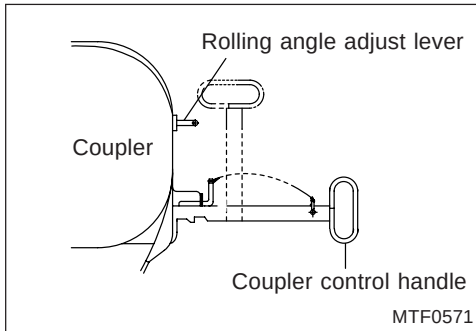
⚠ Caution

1. Ensure the yoke is completely fixed between the base and jaws. Also the end of yoke shaft (protrusion from base) should be engaged into the base, and adjust nut and base should contact together via cushion rubber. At the same time, the lever-A and lever-B should be positioned as shown in Fig. MTF0575.
2. Check the sliding face of the base for sand, gravel or other foreign substances and remove if any.
3. Align the centers of coupler and king pin accurately before coupling up.
4. Be sure to apply the parking brake both at coupling up and uncoupling.
5. Apply grease sufficiently for smooth operation of each part.

⚠ Caution

Driving of the 6x2, 6x4 tractors with trailer, may cause damage to backward center rear fender. Desire to run after removing from backward center rear fender.

5-48 MISCELLANEOUS CONTROLS AND OPTIONS



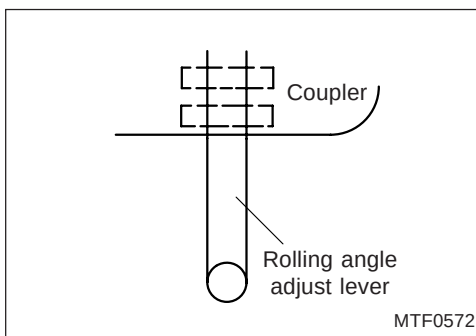
(3) Coupler angle adjustment

1) Range of rolling angle adjustment

- For travel at high speed: 0°
- For travel on narrow road: 3°, 7°

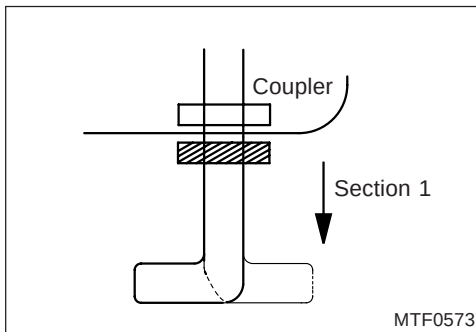
⚠ Caution

In case use rolling each 7°, because there is trailer turning over danger, it is safe that unused so far as possible except special case.



2) How to adjust rolling angle

1. At 0° of rolling angle

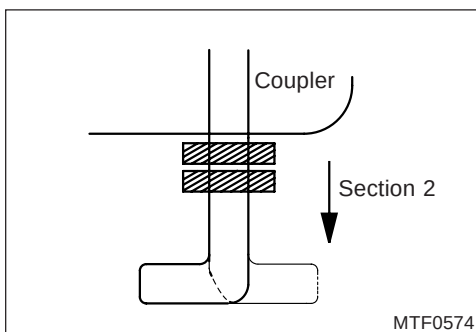


2. At 3° of rolling angle

Pull back the rolling angle adjust lever to section 1, then turn it 90° in any direction.

⚠ Caution

- Be sure to match both right and left rolling angles to each other when adjusting the rolling angle.
- When travelling, fold the coupler control handle so that it faces forward.



3. At 7° of rolling angle

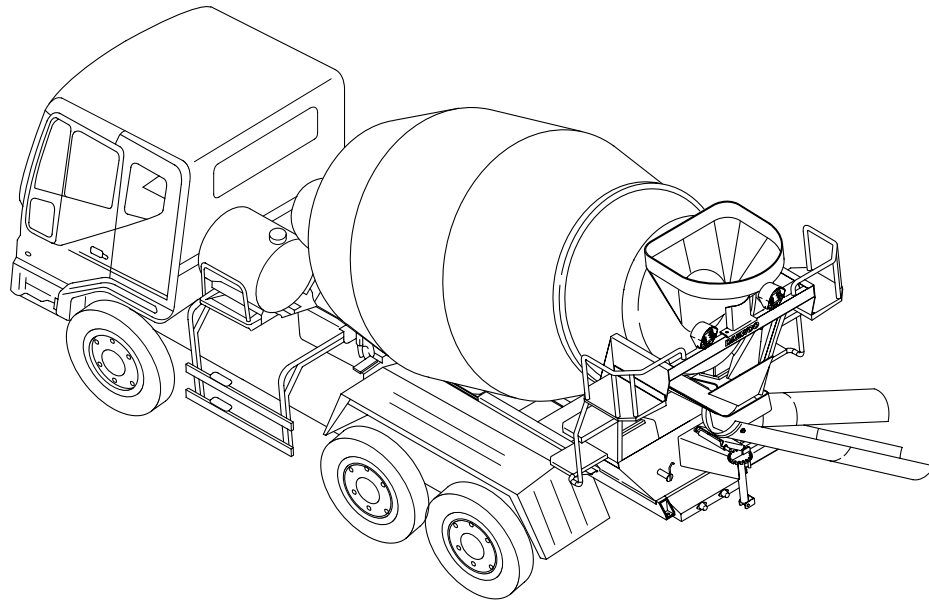
Pull back the rolling angle adjust lever to section 2, then turn it 90° in any direction.

⚠ Caution

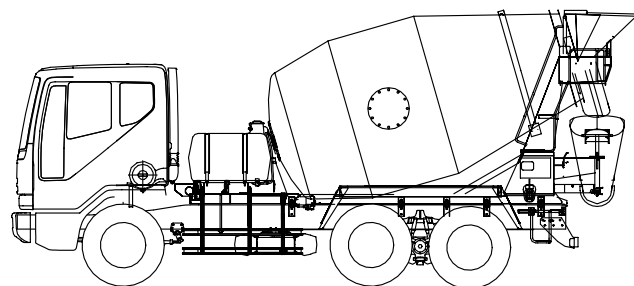
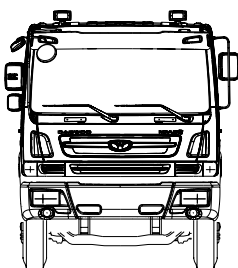
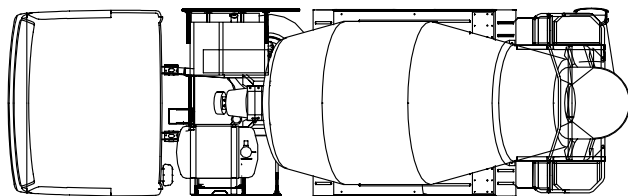
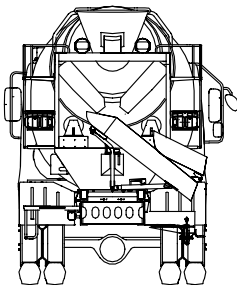
- Be sure to match both right and left rolling angles to each other when adjusting the rolling angle.
- When travelling, fold the coupler control handle so that it faces forward.

7. HOW TO HANDLE MIXER SYSTEM

1) Exterior



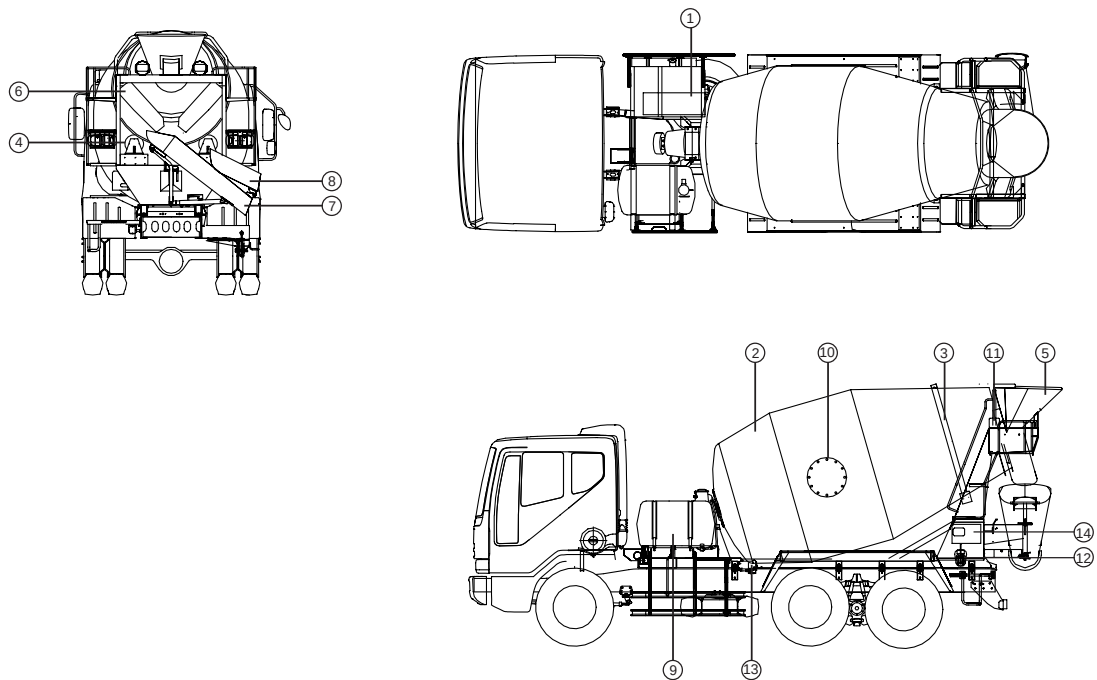
MDF0180



MDF0190

5-50 MISCELLANEOUS CONTROLS AND OPTIONS

2) Designations of main components



MDF0192

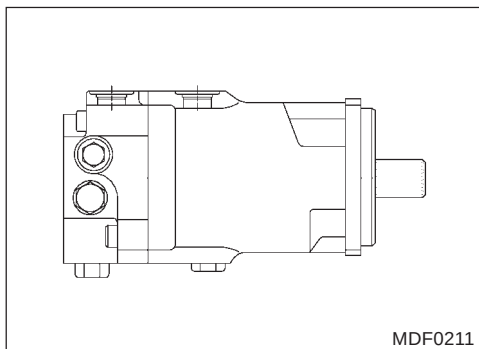
- | | |
|-------------------|-------------------------------|
| 1. Reduction gear | 8. Sub chute |
| 2. Drum assembly | 9. Water tank |
| 3. Drum band | 10. Manhole |
| 4. Guide roller | 11. Upper control lever |
| 5. Hopper | 12. Drum control lever |
| 6. Scoop | 13. Water pump |
| 7. Main chute | 14. Water pump switch & lever |

MISCELLANEOUS CONTROLS AND OPTIONS 5-51

3) Specifications

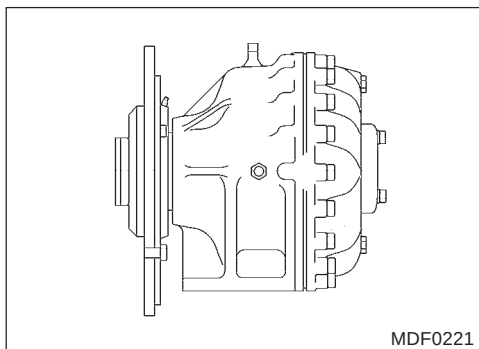
Designation of machine			Concrete mixer truck		Manufacturer		Daewoo Heavy Industries Ltd.		
Drum	Type		K4M, K5M, K6M		Chassis		15 ton		
	Gross capacity(m³)		10.7		Size of hopper receptacle(mm)		1,000 x 1,000		
	Loading capacity(m³)		6		Chute length(mm)		1,830		
	Inclination(°)		16		Sub chute(mm)		850		
	Blade		Double spiral blade		Control lever		One each(rod type) at the right and left of the rear flank		
Drum rotation	Agitation		1~2 rpm						One each(rod type) in the cab and in the upper of the rear
	Feeding		1~10 rpm						
	Mixing		8~12 rpm				Cleansing device	Water tank capacity(L)	
	Discharging		1~10 rpm		Water supply			Water pump	
Drum drive system	Power take-off		Flywheel P.T.O.		Nozzle			One for cleansing the rear part, another automatic nozzle	
	Hydraulic pump		Variable capacity plunger pump		Water supply line			One for the drum	
	Hydraulic motor		Planetary reduction gear mounted plunger motor (fixed piston motor)		Mixed mode		Mounted on truck		
	Hydraulic pressure	Service pressure (kg/cm²)	25~210		Instruments	Agitation capacity(m³)		6	
		Maximum (kg/cm²)	350			Mixing capacity(m³)		6	
	No. of gearshift positions		Continuously variable transmission		Notes) 1. Drum rotation should comply with the specified ratings as indicated above. 2. Operate the machine at ambient temperature of 5°~38°C. 3. Slump of raw concrete should be within 5~21cm(gravel diameter: within 40mm)				
	Hydraulic capacity(L)		18						
	Hydraulic oil		Engine oil 15W40 (ISO VG 46)						
Reduction gear oil		(ISO VG 320)							

4) Characteristics of main parts



(1) Hydraulic motor (Split type)

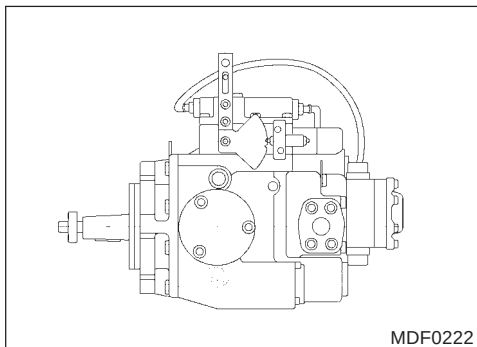
1. Type: Fixed piston motor(MF22-546-45)
2. Delivery per rotation: 69.8cc/rev
3. Normal pressure: 210kg/cm²
4. Max rotation: 3,200 rpm
5. Set pressure of high pressure relief valve: 315kg/cm²
6. Weight: 30kg



(2) Reduction gear (Split type)

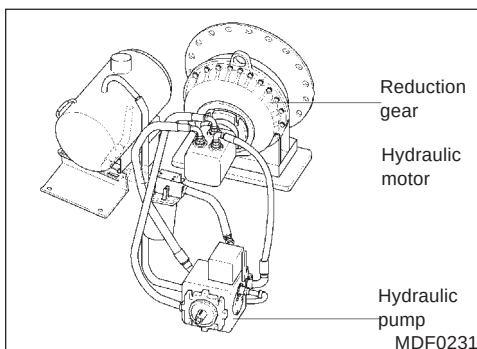
1. Type: PK86
2. Max. output torque: 40,000 N·m
3. Swivel angle: ±2°40'
4. Reduction ratio: 1/132
5. Max. drum speed: 14 rpm
6. Gear oil: ISO VG 320
7. Weight: 225 kg

5-52 MISCELLANEOUS CONTROLS AND OPTIONS



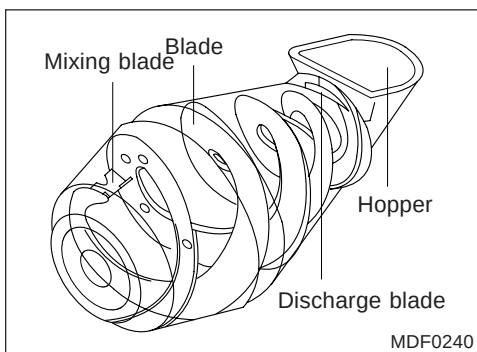
(3) Hydraulic oil pump(Split type)

1. Type: Variable piston pump(PV22-728)
2. Delivery per rotation : 0~69.8cc/rev
3. Normal pressure : 210kg/cm²
4. Max. pressure : 350 kg/cm²
5. Max. rotation : 2,700 rpm
6. Delivery of auxliary pump : 18cc/rev
7. Set pressure of auxliary relief valve: 17.5~18.5kg/cm²
8. Allowable temperature of hydraulic oil : -10~82°C
9. Constant speed control flow : 15±1 L/min
10. Weight : 64kg



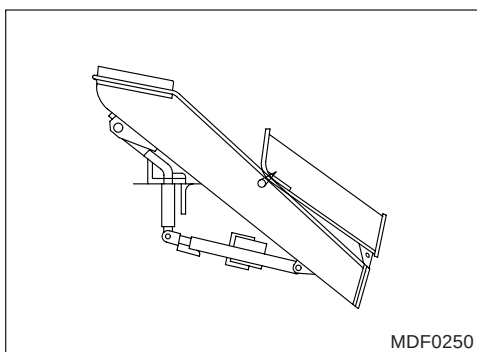
(4) Hydraulic system (Split type)

1. The motor and reduction gear are separated, and so it is possible to operate and main tain easily.
2. The maintenance cost is low.
3. It has excellent durability.
(Compression bearing: Taper roller bearing)
4. It has excellent driving force. (Max: 40,000 N·m)
5. The hydraulic pump is mounted with c.s.v (constant speed valve), so it is possible to control the speed (1.5~1.7 rpm) of drum comstantly.



(5) Drum: Double spiral blade

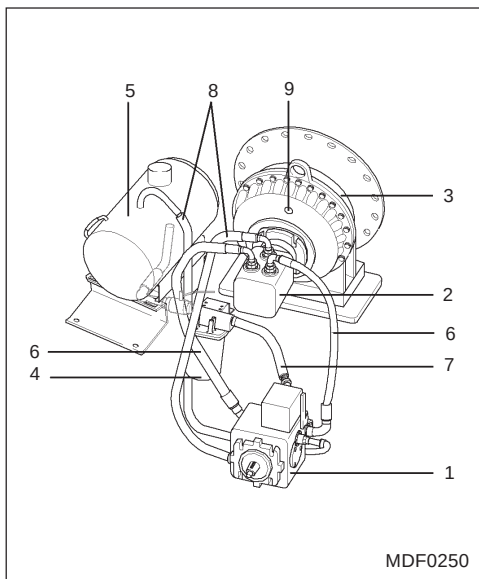
1. Discharge and mixing: The blades have been improved in their pitches, resulting in excellent performance in discharge and mixing.
2. The drum blades are of high tension steel, as-suring excellent anti-abrasion.



(6) Chute

1. The strength of the support shaft has been increased, resulting in enhanced durability and reduced vibration and noise.
2. Chute lock is of a simple and hard type, resulting in enhanced durability and reduced vibration and noise.
3. The strength of thrust bar, thrust pin and internal spring have been increased, resulting in reduced manipulating force.

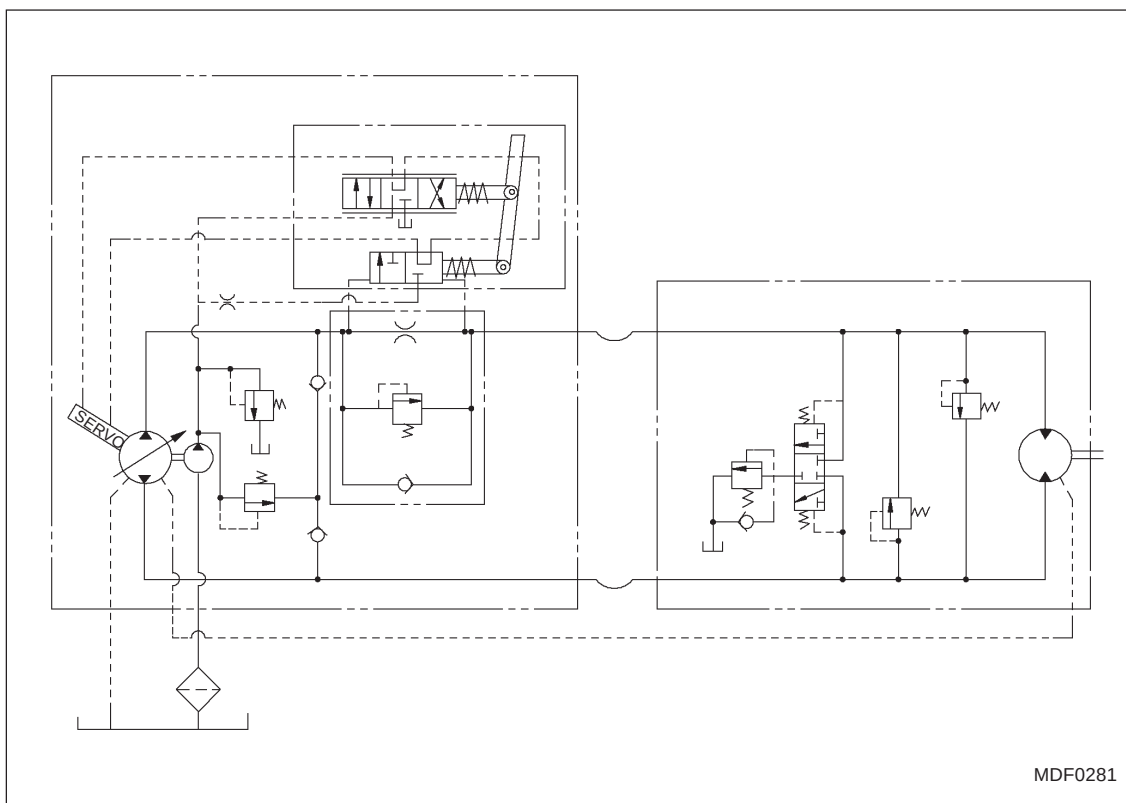
MISCELLANEOUS CONTROLS AND OPTIONS 5-53



5) Power train and hydraulic system diagram

Unit type

Number	Designations
1	Hydraulic pump
2	Hydraulic motor
3	Reduction gear
4	Oil filter
5	Oil tank
6	High pressure hose
7	Suction hose
8	Oil return hose
9	Reduction gear oil filler cap



5-54 MISCELLANEOUS CONTROLS AND OPTIONS

6) Cautions when handling the mixer truck

(1) When implementing cleaning operations inside the drum

In the event of removing concrete sludges sticking to the interior wall of the drum or implementing miscellaneous operations inside the drum, warn peoples nearby that the drum should not be rotated.

1. Pull out the engine key and lock the doors.
2. Remove the battery cords.
3. Post a notice reading "OPERATION IN DRUM" at a conspicuous place.

(2) Shifting the rotating direction of the drum

To shift the rotating direction of the drum, first stop the drum and then rotate it to opposite direction slowly. Abrupt shifting to opposite direction will greatly reduce the life of hydraulic system.

(3) Parking during operation

When you leave the driver's seat to check the state of concrete discharge, you must completely apply the parking brakes, push and actuate the lock brake switch installed on the front face of the drive's seat, then chock the wheels.

(4) Do not allow unauthorized persons to get access to the rotating part when operating the drum.

When the drum is operated or cleansed with the vehicle being stationary, special care must be exercised to prevent possible injuries by the drum driving portion(such as drum guide roller, etc.) or rotating part. Especially, unauthorized persons or children should keep away from the mixer.

(5) Engine warming-up

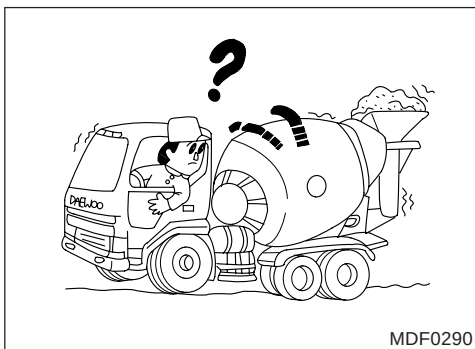
Warm up the engine for a few minutes, especially, in cold weather or cold place, so that oil can be properly distributed to each part of mixer driving system before operating the mixer.

If the mixer is started just with cold oil, miscellaneous drive system such as hydraulic pump or hydraulic motor may be damaged.

At ambient temperature of 10°C or less, it is necessary to warm up the engine at low rev for about 10 minutes with the drum control lever placed in the NEUTRAL position.

(6) Chute fixing

When the chute shakes as it is not secured to the drum, pedestrians or vehicles running behind may be exposed to danger. Therefore, everytime completing discharge operation, be sure to secure the chute in position.



(7) Lubricating the guide roller and drum tire

If no oil film is formed between guide roller and drum tire, noise or one-side abrasion will be produced when the drum rotates. It is essential to periodically lubricate the guide roller and drum tire every one month.

★ Refer to "RECOMMENDATION TABLE FOR LUBRICANTS".

(8) Re-tightening the tightening parts of new vehicle(after first one month operation of the new vehicle)

In general, while operating a new vehicle, you will find that the bolts and nuts on the vehicle are slackened prematurely. Therefore, they require re-tightening after the first one month operation. At this time, check the "U" bolt and bracket which connect the chassis frame and body and re-tighten them as required. The pipe line flanges and portions connected to them also should be checked and re-tightened as necessary.

(9) Securing of spare tire

While operating the vehicle, ensure that spare tires are secured in position.

(10) Complete draining after finishing the operation(Refer to "CLEANSING SYSTEM")

(11) Travel on rough roads

When getting access to a rough road with the drum filled with concrete, stop rotating the drum. After getting out of the rough road, again rotate the drum as usual.

When you drive the vehicle at high speed on a rough road with the drum rotating on, the vehicle may be possibly overturned or the hydraulic system may be damaged.

(12) Drum rotation with no load

When attempting to drive the vehicle with no load, place the control lever in the NEUTRAL position to stop the drum, then start off.

(13) Drum rotation(1.5~1.7 rpm) when running the vehicle with concrete loaded in the drum.

When running the vehicle with concrete loaded in the drum, place the pump lever in the CSV(constant speed valve) position and then rotations of drum are controlled automatically.

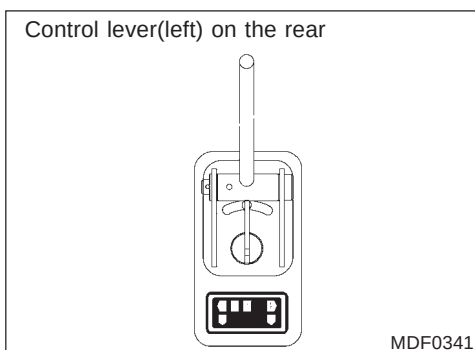
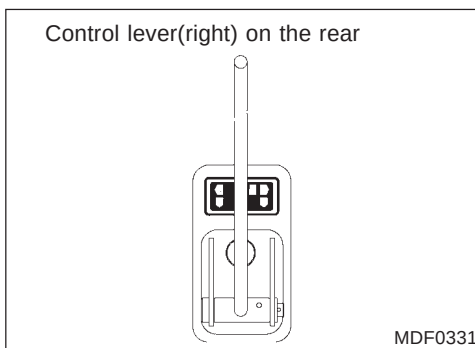
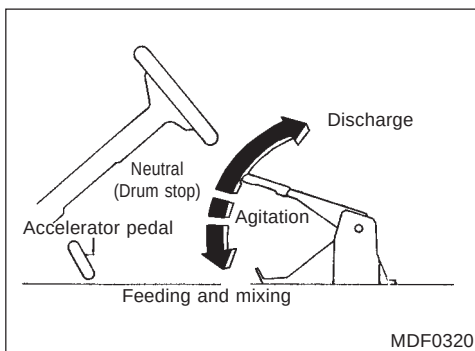
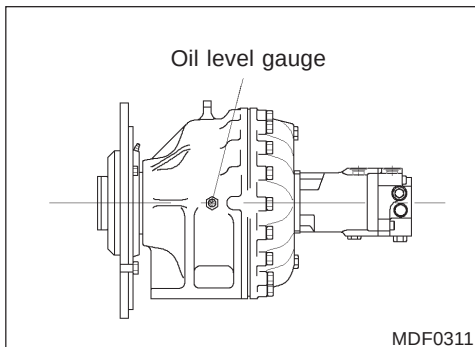
(14) Remixing(10 rpm or less) before discharge

When the drum is rotated for extended time, already-mixed concrete therein may be segregated. In this case, have the concrete be remixed before being discharged in order to obtain quality concrete.

(15) Using of low viscosity hydraulic oil in cold place.

When working in cold season or at ambient temperature of 0°C or below, be sure to use hydraulic oil with low viscosity to prevent any trouble with the hydraulic system.

5-56 MISCELLANEOUS CONTROLS AND OPTIONS



7) Operation method

(1) Rotation of drum

1. Starting procedure

- Check oil level: Check oil level of oil tank and reduction gear(The position of oil level gauge should be center-line)
- Position of control lever: Check control levers for their positions: The control lever located at the driver's stand and another control lever located on the rear part of the vehicle should be set to the NEUTRAL(drum stop) position.
- Warming-up

Rotate the drum with no load at low speed.

When working in cold season or at low ambient temperature, be sure to warm up the engine for about 10 minutes so that the hydraulic oil obtains reaches normal working temperature.

- Check after starting

Check for unusual sound, smell, over-heating, and oil or water leakage.

2. Control levers

There are 4 control levers in all; one at the driver's seat, each one on the right- and left-hand sides of the rear of the vehicle, and at the upper side of hopper. These levers have been so designed that once any lever is activated, the remainders are all activated simultaneously.

3. How to set rotation speed of the drum

- Control lever at the driver's seat: The control lever must be used together with the accelerator pedal.
- Control levers on the rear: If the control lever is pulled downward from the "MIXING" or "DIS-CHARGE" position, the rotation speed will increase.

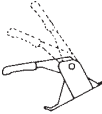
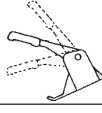
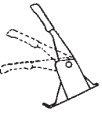
⚠ Caution

Avoid increasing engine rpm with the control lever placed in "NEUTRAL" or "AGITATION" position.

MISCELLANEOUS CONTROLS AND OPTIONS 5-57

(2) How to manipulate control lever

★ "AGITATION" position: Between "MIXING" and "STOP".

Activities	Lever position		Control of operations
Feeding	On the rear	  Increase in speed (left) Increase in speed (right)	• Pull downward the control lever from "FEEDING" position to increase the engine speed. • Engine speed: 600~1,300 rpm • Drum rotation: 1~10 rpm (Clockwise when viewed from the front of the vehicle) • Operation time: 1~5 minutes
	At driver's stand	FEEDING 	• Place the control lever in "FEEDING" position. • Depress the accelerator pedal. • Drum rotation: 1~10 rpm • Operation time: 1~5 minutes
Running	On the rear	  (left) (right)	• Place the control lever in "AGITATION" position. • Drum rotation: 1.5~1.7 rpm (Clockwise when viewed from the front)
	At driver's stand	RUNNING 	• Place the control lever in "AGITATION" position. • Drum rotation: 1.5~1.7 rpm
Mixing	On the rear	  Increase in speed (left) Increase in speed (right)	• Pull downward the control lever from "FEEDING" position to accelerate the engine. • Engine speed: 1,000~1,500 rpm • Drum rotation: 8~12 rpm (Clockwise when viewed from the front) • Operation time: 3~5 minutes
	At driver's stand	AGITATION 	• Place the control lever in "FEEDING" position. • Depress the accelerator pedal. • Drum rotation: 8~12 rpm • Operation time: 3~5 minutes
Discharge	On the rear	  (left) (right)	• Pull downward the control lever from "DISCHARGE" position to accelerate the engine. • Engine speed: 600~1,000 rpm • Drum rotation: 1~10 rpm (Anti-clockwise when viewed from the front) • Operation time: 5~10 minutes
	At driver's stand	DISCHARGE 	• Place the control lever in "DISCHARGE" position. • Depress the accelerator pedal. • Drum rotation: 1~10 rpm • Operation time: 5~10 minutes

5-58 MISCELLANEOUS CONTROLS AND OPTIONS

1. Feeding raw concrete.

- a. Place the control lever in "FEEDING", "AGITATION" position and put in the raw concrete when the drum starts rotating.
- b. In the case that the slump exceeds 5cm, the drum can draw in the concrete even at low engine speed.
- c. When the accelerator pedal is depressed or the control lever on the rear is pulled downward, the engine will be accelerated to have the drum rotate at high speed.

2. Agitation

Place the control lever in "AGITATION" position after completing the feeding of raw concrete.

3. Mixing for discharge

When the drum is rotated for extended time, already-mixed concrete therein may be segregated. To prevent this phenomenon, it is desirable to have the concrete be remixed before being discharged. In this case, place the control lever in "AGITATION" position and to accelerate the engine, then re-mix the concrete for 2 to 3 minutes.

4. Discharge

- a. Place the control lever in "DISCHARGE" position, and the drum will rotate reversely and discharge of concrete can be controlled.
- b. Control the drum rotation speed to control concrete discharge as required.
- c. When attempting to stop concrete discharge, relocate the control lever in NEUTRAL position.

(3) Inspection after operation

1. Check if the control lever on the rear is placed in NEUTRAL(STOP) position before attempting to set the starting switch OFF, then stop the engine.
2. Thoroughly clean both the interior and exterior of the drum after completing the operation. (Especially, in hot season, carry out this operation immediately.)
For a new vehicle, as concrete sludge may easily stick to the interior wall of the drum, special care is required. Removal of concrete sludge will ensure full load.
3. Greasing: Refer to "RECOMMENDATION TABLE FOR LUBRICANTS" to perform greasing operation as indicated therein after operation.
4. When running the vehicle with no load after operation, fill the drum with water and rotate it at low speed(AGITATION) to thoroughly cleanse its interior. This operation will prevent concrete sludge from sticking to the interior wall.
5. Do not manipulate the control lever when the engine has been stopped. As hydraulic pressure remains stationary, the manipulation of the control lever becomes difficult. If the control lever is manipulated by force, ring and miscellaneous components may be damaged.

8) Cleansing system

(1) Operation of cleansing system

1. Operating procedure for the cleansing system

- a. Ensure that all discharge-related levers such as discharge lever installed under the water tank should be placed in "LOCK" position. Fill the water tank with water.

MISCELLANEOUS CONTROLS AND OPTIONS 5-59

- b. When attempting to use water for cleansing operation, release the applicable valve with the engine started, unlock the discharge lever of the water tank, then set the pump switch "ON".
- c. After the discharging operation, put water into the drum and place the control lever in "AGITATION" position, to cleanse the inside drum.
- d. When attempting to stop using water or completing the use of water, set the water pump switch "OFF" and then place the lever in LOCK position.
- e. When attempting to cleanse the interior of the drum, using the upper cleansing nozzle. When cleansing the exterior of the drum, close the water supply and auto nozzle valves and open the cleansing nozzle.
- f. After completing all the operations for the vehicle including the cleansing operation, open the cleansing nozzle and all the valves such as discharge valve to drain out water completely. Especially, in cold season or when not in use for extended time, do not forget to carry out this operation.

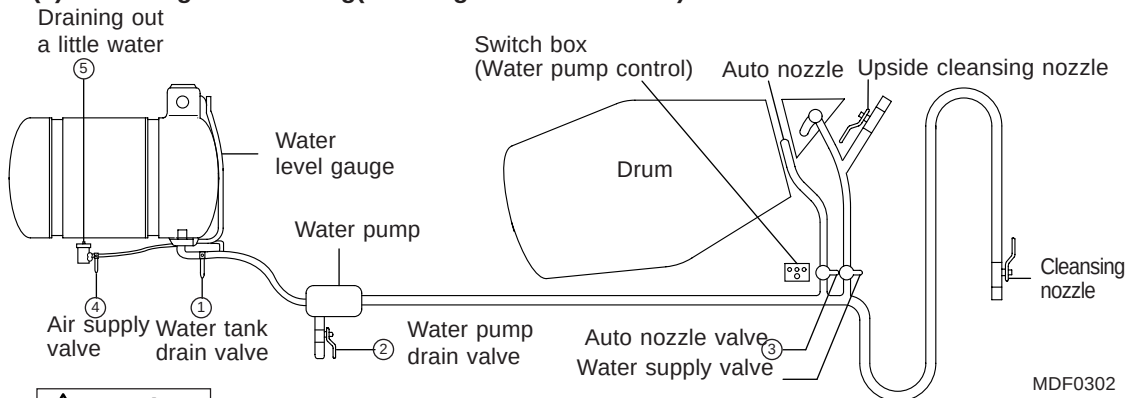
2. Caution for cleansing operation

- a. The engine must be started to operate the water pump. Therefore, when cleansing the exterior of the drum, hopper, scoop, and chutes, avoid unnecessary rotation of the drum with the engine started.
- b. Never get up on the chute. A fall from it will hurt you.

3. Switch box and heater operation

- a. The heater installed around the water pump turns ON under room temperature of 2, and turns OFF at room temperature of 18.
- b. When the engine startup key is ON or the vehicle is in a driving status, heater is designed to operate regardless of ON-OFF condition of a water pump switch.
- c. In case of overload due to abnormal operation of the pump, normal lamp and buzzer turn OFF but overload lamp is turned on instead.
- d. When the pump is not operated by overload, stop the pump operation and check for any trouble.

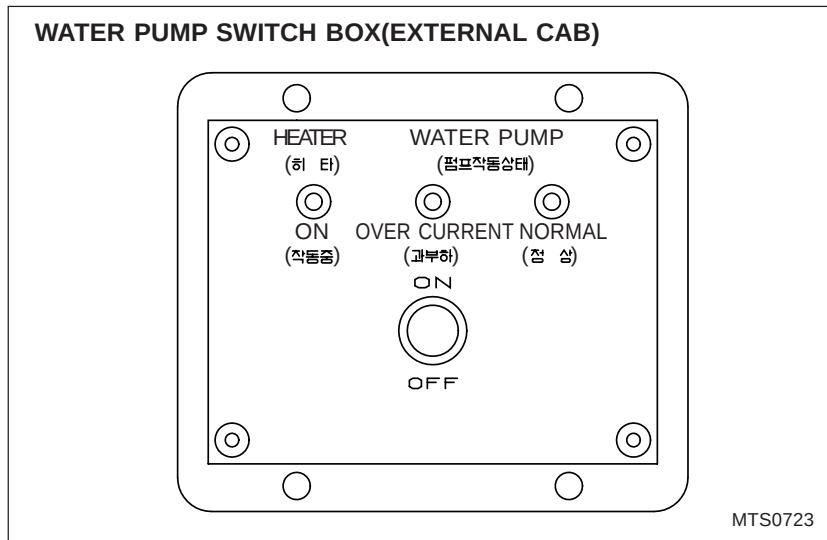
(2) Cleansing and draining(Draining out a little water)



⚠ Caution

1. Cleanse the interior of the drum by rotating it.
2. After completing the cleansing operation, completely drain out water from the drum by placing the control lever in "DISCHARGE" position to have the drum rotate reversly.
3. Care should be taken to prevent the entry of foreign substances. To prevent freezing in cold season, drain out water through the water pump drain valve. In addition, also the water tank should be completely drained through the water level gauge.
4. After finishing the operation, be sure to drain water in the water tank, pipings, and cleansing nozzle. Especially in cold weather, open the valves 1, 2, and 3 as shown to drain out water in order to prevent freezing of each part.
5. In winter season, use water removing device ⑤ for frozen prevention. Before open air supply valve ④, ① ② valve closes and, Opens washing nozzle. (Parts can be damaged in case do not open)

5-60 MISCELLANEOUS CONTROLS AND OPTIONS



9) Water pump switch box(Engine control device from vehicles outside)

(1) ON/OFF water pump switch

: Buzzer operates at water pump switch "ON"

(2) Heater lamp

: Heater lamp is lighted up at heater operating.

(3) Overload lamp

: Overload lamp is lighted up at overload by pump problem.

(4) Normal lamp

: Normal lamp is lighted up at normal

(5) Buzzer and normal lamp must become "OFF" at overload lamp lighting.

MISCELLANEOUS CONTROLS AND OPTIONS 5-61

10) Inspection and lubrication

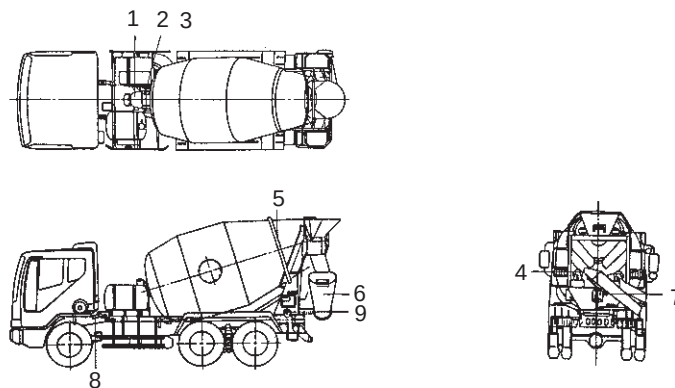
(1) Periodical inspection

Troubles or damage, however minor they are, must be corrected immediately. It is recommended to check the vehicle each day to ensure a long life and trouble-free operation.

Check items		Service intervals						Action
		Before operation	Every month	Every 3 months	Every 6 months	Every 12 months	Every 24 months	
Drive system	Check drive shaft for vibration state			○				Correct or change
	Check spline for rotating direction			○				Change
	Check flange yoke fixing bolts for looseness			○				Re-tighten
Hydraulic system	Check fixing bolts on hydraulic pump for looseness			○				Re-tighten
	Check hydraulic pump for oil leak	○						Correct or change
	Check hydraulic motor for oil leakage	○						Correct or change
	Check hydraulic oil level	○	Initial change	2nd change		Change		Replenish or change
	Check rubber hoses for crack and interference				○		Change	Correct or change
	Check pipings and joints for oil leakage	○						Oil change
	Check oil filter for contamination		Initial change	2nd change		Change		Change
Drum, scoop, chutes	Check interior of drum for concrete sludges				○			Scrape out
	Check clearance between drum tire and band			○				Adjust
	Check rubber part of feed chute for abrasion				○			Change
	Check chute rotating shaft retaining portion for wear			○				Change
	Check chute lock system			○				Change
Others	Check pipings and joints for water or oil leakage	○						Correct or change
	Check "U" bolt on chassis frame for looseness		○					Re-tighten
	Check bolts on miscellaneous joints for looseness		○					Re-tighten

(2) Oil supply points

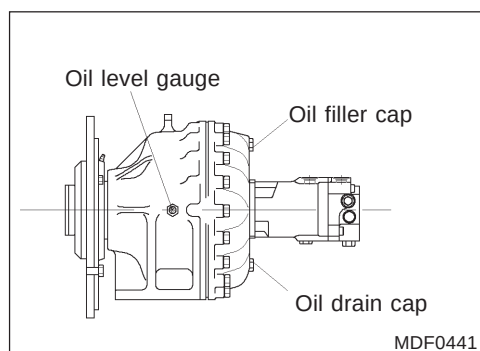
If oil is used for prolonged time without being changed, the inside of piping will be coated with rubber chips or sludges, resulting in damage to hydraulic system. This situation will lead to critical damage to the vehicle. Refer to the "RECOMMENDATION TABLE FOR LUBRICANTS" on the following page and change oil and lubricant in a timely manner.



5-62 MISCELLANEOUS CONTROLS AND OPTIONS

(3) Recommendation table for lubricants

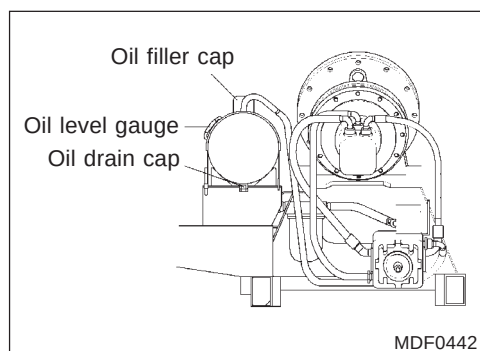
No.	Oil supply points	Specified oils and lubricants	Oil replenishment or change intervals
1	Hydraulic pump Hydraulic motor (oil tank)	• ISO VG 46	• Change at end of first 500 hours, every 1 year.
2	Reduction gear	• ISO VG 320	• Change at end of first 100~250 hours, every 1 year.
3	Reduction gear flange	• Chassis grease	• Replenish at end of first 100~250 hours, every 500~750 hours or every 6 months, • Oil capacity : 0.3L
4	Guide roller	• Chassis grease	Replenish every 1 month.
5	Drum band	• Chassis grease	Replenish every 1 month.
6	Chute turning shaft	• Chassis grease	Replenish every 1 month.
7	Chute lock system	• Chassis grease	Replenish after operation
8	Drive shaft	• Chassis grease	Replenish every 1 month.
9	Control linkage	• Chassis grease or machine oil #120	Replenish every 1 month.



(4) Change of lubricant for reduction gear

⚠ Caution

Check oil level in the oil tank and gear box from time to time, do not overfill.



(5) Change of hydraulic pump and motor hydraulic oil

(6) Inspection and change of oil and filter

1. Refer to RECOMMENDATION TABLE FOR LUBRICANTS for oil change intervals.
2. When exchanging the hydraulic oil or reduction gear oil, remove each exhaust plug that is located at the bottom of the oil tank or reduction gear in order to drain out all the oil remained.
3. Be sure to use only the specified oil in accordance with the appropriate oil level gauge and take care not to get dirt or moisture accumulated into or around the inlet part when supplying the oil.
4. After supplying the oil, set the adjustment lever on the "NEUTRAL" position and idle the engine for 5 min. Then the oil is properly distributed to the oil pressure pump and all the other pipes connected.
5. Then bleed the air inside the hydraulic line before starting normal operation. You can automatically remove the air by moving the pump lever 2~4° in the forward and in the backward direction and starting to drive for 1~2 min.
6. Check the oil level again and then refill it up to the medium line of the oil tank gauge.

Caution

- Perform oil change at a dust-free place to prevent the entry of foreign substances.
- When adding some oil, always use the same brand.
- Be sure to perform the air bleeding as directed in the item 5. above specially prior to the initial mixer operation and after oil exchange.

7. As an oil filter clogged with dirt or sludges blocks the oil passage, suction of the hydraulic pump will increase excessively, resulting in generation of unusual sound or damage to the pump. Thoroughly check the oil filter for contamination and change if required.
8. When exchanging the oil filter element, first close the exhaust valve lever of the oil tank that is assembled toward the tank.
9. Proper timing to exchange the oil filter element: Replace the oil filter element after 24 hours of initial usage, and once per year when exchanging the driving oil every year.

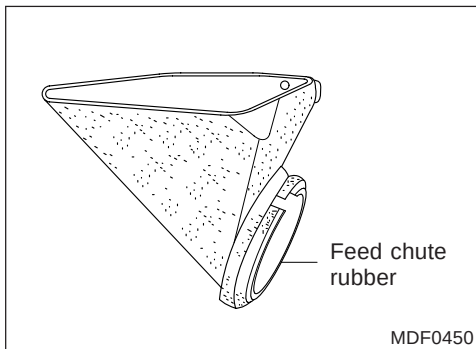
Caution

Always use the genuine Daewoo oil filter. Our WARRANTY shall not apply to any damage to the reduction gear and hydraulic pump system resulting from the use of non-compliance parts.

(7) Inspection and change of hydraulic rubber hose

The oil pressure rubber hose is a specially designed part. But if it is used for an excessive amount of time, there may be dangers of getting harm due to aging of the part itself. Check the part regularly and frequently, remove mud or dirt accumulated around the hose, and replace the part with a new one when a sign of possible explosion or partial expansion is noticed.

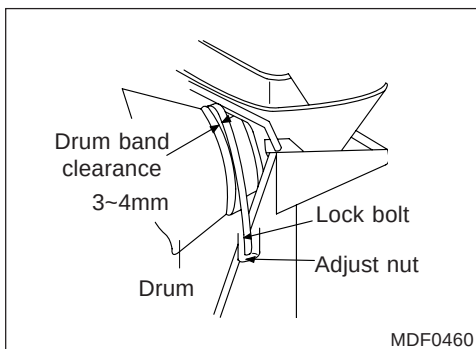
5-64 MISCELLANEOUS CONTROLS AND OPTIONS



(8) Inspection and change of the feed chute

The feed chute rubber is designed to provide air-tightness between the hopper and the drum. If used for prolonged time, it may suffer wear and lose its flexibility.

This situation will cause concrete leakage when feeding the concrete. Replace if required.



(9) Drum band clearance adjustment

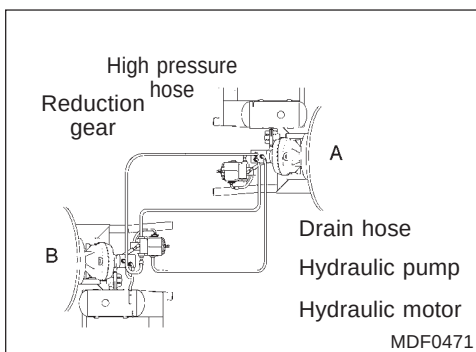
1. If the drum band becomes loose from a long term use, the vibration transmitted to both the top and bottom of the drum will become severer. In this case, loosen the lock bolt, turn the adjust nut, then adjust the clearance of the drum band.
 2. Clearance between drum band and drum tire: 3~4mm
 3. Replace if the pad has been worn away.
- ✱ Properly tighten the lock bolt after completing the adjusting operation.

11) Emergency discharge

- When the mixer truck breaks down or an accident happens to it, the concrete must be immediately discharged from the drum to prevent it from being hardened inside the drum. There are two methods of emergency discharge as follows. Take a suitable method depending on the state of the trouble.

A: Defective vehicle

B: Emergency vehicle



MISCELLANEOUS CONTROLS AND OPTIONS 5-65

Location of defect	Method		
	I	II	
1. Chassis engine	O	O	O: usable X: unusable
2. Hydraulic pump	O	O	
3. Hydraulic motor	X	O	
4. Reduction gear	X	O	

★ Any method can be used for the above items "1" and "2".

- Required equipment
 - (1) High pressure hose for emergency discharge: 5m long x 2
 - (2) Drain hose(genuin TATA Daewoo part) : 5m long x 1
 - (3) Intake hose: 5m long x 1

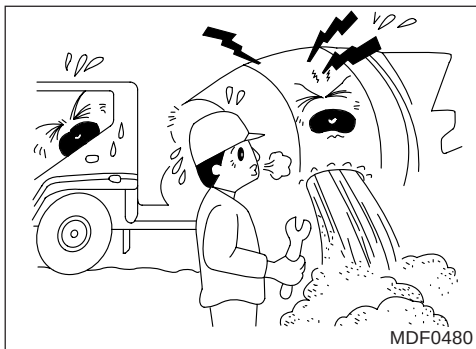
(1) Emergency discharge(I)

1. Bring a normal mixer truck(B) of the same type to the defective truck(A) as close as possible to arrange them as shown above.
2. Connect the hydraulic motor of the defective truck(A) and the hydraulic pump of the emergency truck(B) with two high pressure hose as shown.
3. Connect the drain hose coming from the hydraulic pump of the emergency truck(B) to the hydraulic motor of the defective truck(A). At this time the hoses must be fastened tightly.
4. Place the control lever of the (B) in "NEUTRAL(STOP)" position, idle the engine for about 10 minutes, then manipulate the control lever of the (B) to completely discharge the concrete from the drum of the (A).
5. After discharging the concrete completely from the (A), re-install and fasten all the pipes in position and replace the oils in (A) and (B) with new ones.

⚠ Caution

- Check oil level in the reduction gear of the emergency truck(B) before using it.
- When performing emergency discharge, be sure to rotate the drum slowly to discharge concrete.
- When connecting emergency rubber hoses, take care to prevent the entry of dust or dirt.

(2) Emergency discharge(II)



Rotate the drum so that its manhole is positioned facing down, then remove the lid of the manhole to completely discharge the concrete.

5-66 MISCELLANEOUS CONTROLS AND OPTIONS

8. SEPARATE ENGINE VEHICLE

1) Separate engine

(1) Separate engine START/OFF must be used by the switch.

(Switch location : 1. lower panel in cab 2. Switch box)

: If you close Fuel-supply-valve by compulsion, FUSE(No.16) could be damaged.

(2) If a belt is cut, ring a reverse buzzer(common use) by V-BELT monitoring system.

1. Do not confuse a reverse buzzer.

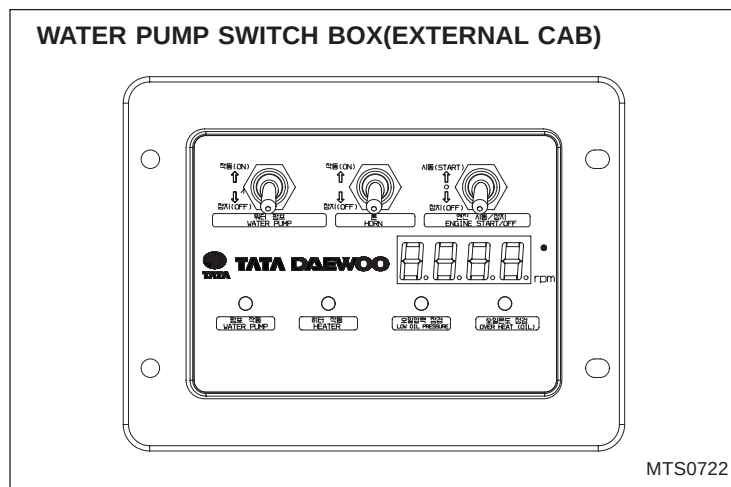
2. If a belt is cut, stop the engine and go to the nearest service center because engine cooling is not operated

3. If a belt is cut, starting device is not operated for engine protection. It is not starting device trouble.

(3) Do not work on main engine off for a long time.

: Battery can be discharged.

(4) If main engine is Key-off on work, Separate engine is stopped by closing Fuel-supply-valve. So, Do not be "Key-off" on work.



2) How to use switch box

✱ Switch box can be working on "Key-on" only.

(1) Display device : Separate engine RPM on normal condition.

(Various information is displayed by operating a below switch)

(2) SWITCH

1. WATER PUMP SWITCH : WATER PUMP ACTION SWITCH

- POLE UPPER : ON

- POLE DOWN : OFF

MISCELLANEOUS CONTROLS AND OPTIONS 5-67

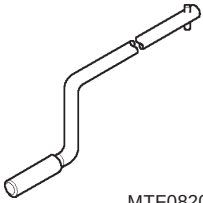
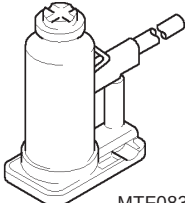
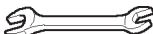
2. HORN SWITCH : TYPE-SELF RETURN
 - POLE UPPER : ON
 - POLE DOWN : OFF
3. SEPARATE ENGINE START/OFF SWITCH : TYPE-SELF RETURN
 - POLE UPPER : START
 - POLE MIDDLE : NORMAL
 - POLE DOWN : STOP(PRESS FOR 3 SECOND)

(3) LED

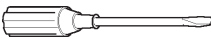
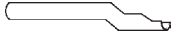
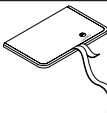
1. WATER PUMP : "ON" by operating water pump.
2. LOW OIL PRESSURE : If Gauge get to dangerous condition because of lower separate engine oil pressure, it is ON.
3. OVER HEAT(OIL) : If gauge get to dangerous condition because of higher Separate engine oil temperature, it is ON.
4. HEATER : "ON" by operating heater inside Mixer unit.

5-68 MISCELLANEOUS CONTROLS AND OPTIONS

9. TOOL LIST

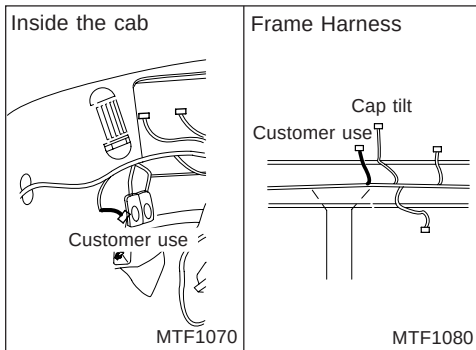
No.	Tool	Name	Q'ty	Vehicle model
1	 MTF0820	Handle - S/Tire Carrier 100x200x610	1	All vehicles (except dump, tractor)
2	 MTF0830	Oil jack asm - w/lever	1	All vehicles
3	 MTF0840	Plier	1	All vehicles
4	 MTF0850	Wrench monkey	1	All vehicles
5	 MTF0860	Spanner 7x8	1	All vehicles
6	 MTF0870	Spanner 10x12	1	All vehicles
7	 MTF0880	Spanner 14x17	1	All vehicles
8	 MTF0890	Spanner 19x22	1	All vehicles

MISCELLANEOUS CONTROLS AND OPTIONS 5-69

No.	Tool	Name	Q'ty	Vehicle model
9	 MTF0920	Screw driver	1	All vehicles
10	 MTF0930	Screw driver 150mm	1	All vehicles
11	 MTF0940	Wrench - Wheel nut ø32	1	All vehicles
12	 MTF0950	Handle-wrench wheel nut	1	All vehicles
13	 MTF0960	Cab tilt lever	1	19ton/19.5ton/25ton cargo (All vehicles except above vehicles: Use the oil jack lever)
14	 MTF0980	Tool bag	1	All vehicles

5-70 MISCELLANEOUS CONTROLS AND OPTIONS

10. SERVICE ELECTRIC EQUIPMENTS FOR USER

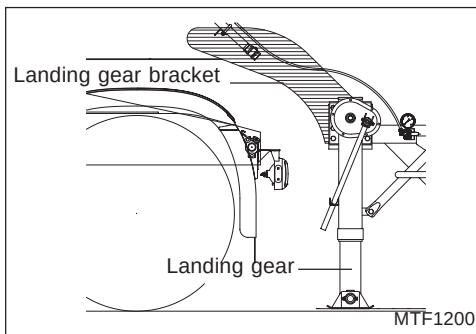


Harness for Customer use

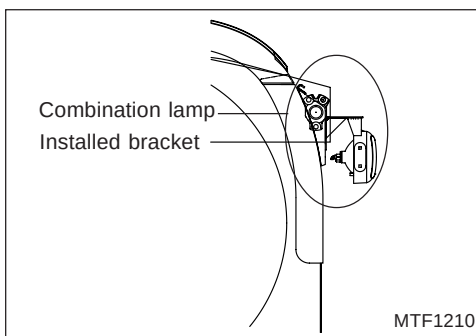
There is special harness available for customer at the inside and outside of cab.

- (1) Fuse: F23, F24
- (2) Special harness available for customer is located at the under pannel of handle left side. There is a tag "customer use" on the connector.
- (3) Special harness available for customer is located at the inside right frame of cab rear.

11. DIRECTIONS FOR EQUIPPING TRAILER WITH TRACTOR

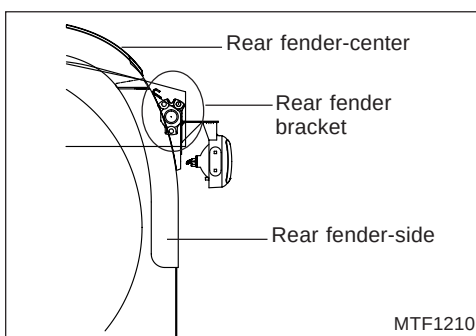


Keep a distance of above 230cm(ISO1726) between the center of coupler and landing gear of trailer to prevent interference while vehicle unless it may damage vehicle.



⚠ Caution

If you fit improper bracket on container chassis trailer or bulk cement trailer(BCT) to protect landing gear, it may cause to interference while traveling. If you must use bracket, turn over rear combination lamp bracket and then fit it. It may prevent interference.



⚠ Caution

When you drive low-bed trailer for delivering heavy equipment, the trailer may interfere with rear fender in the back side. In the case, drive the trailer after taking off center rear fender, rear fender bracket and side rear fender.

12. CAUTION AT PTO DRIVE SHAFT INSTALLATION

Desire to thread PTO pump in our firm. And, observe following item when thread PTO drive shaft after special device loading in market.

Caution

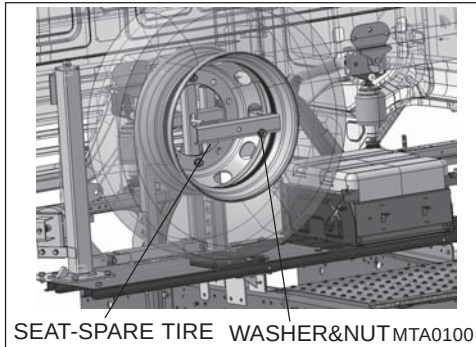
1. *When thread PTO drive shaft, use genuine PTO.*
2. *Desire to observe installation angle.*
3. *Angle of intersection of PTO drive shaft does by 12° low and establish so that also angle of intersection of PTO drive shaft end is same.*
4. *Because there is displacement about top and bottom direction, right and left direction $\pm 10\text{mm}$ at PTO outlet position at driving, observe to PTO drive shaft permission angle.*
5. *PTO output shaft direction is contrary directions of engine*
6. *In case of never observing caution, PTO drive shaft can cause fatal damage gearbox and PTO by rotation shock.*

Warning

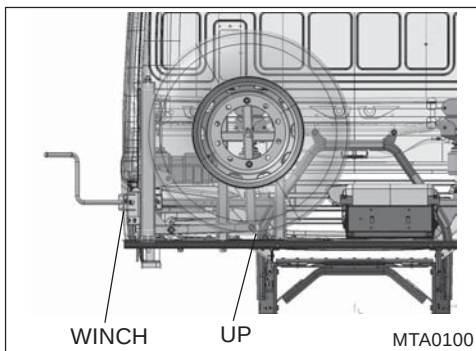
When damage, that is happened because do not observe the points mentioned above, be excepted in assurance repair and desire to observe repair expense is happened overmuch.

5-72 MISCELLANEOUS CONTROLS AND OPTIONS

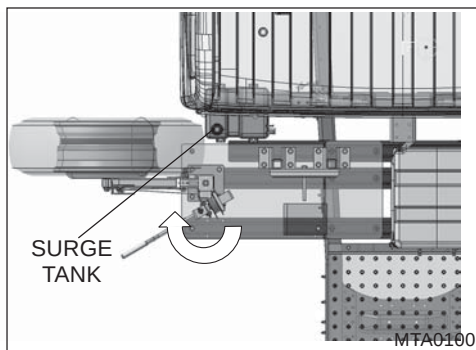
13. HOW TO USE SPARE TIRE



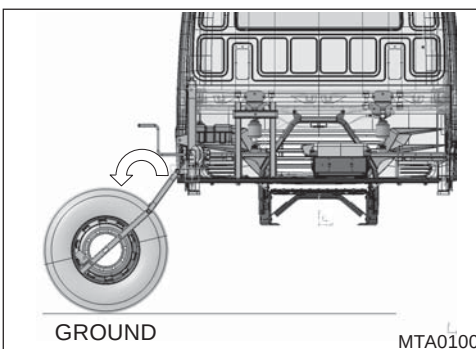
1. Release nut which is fixing spare tire center
2. Pull out seat-SpareTire.
3. Lift a spare tire slightly using winch, then rotate it to vehicle outside.



4. Rotate slowly when move tire.
5. Otherwise, it can damage surge tank as result of quick handling. Surge tank is very close to spare tire rotating trace.



6. Put down the tire on the ground using winch.
7. Release the bolts and replace the tire.
8. Install spare tire in reverse order.



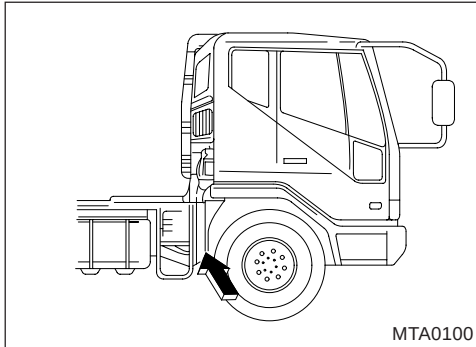
6

SPECIFICATIONS AND SERVICE DATA

- 1. LOCATION OF CHASSIS NUMBER AND
ENGINE NUMBER**
 - 2. MAIN DATA**
 - 3. RECOMMENDED LUBRICANTS**
-

6-2 SPECIFICATIONS AND SERVICE DATA

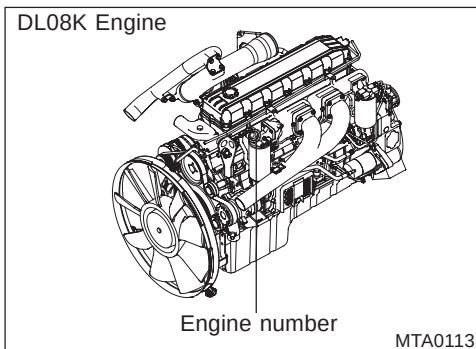
1. LOCATION OF CHASSIS NUMBER AND ENGINE NUMBER



1) Vehicle identification number

The chassis number is stamped on the front face of the right-hand chassis frame.

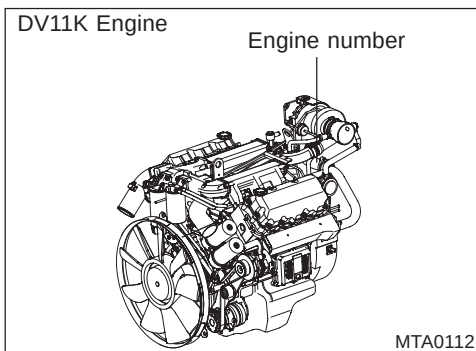
Please, always refer to this information when ordering parts or servicing.



2) Engine number

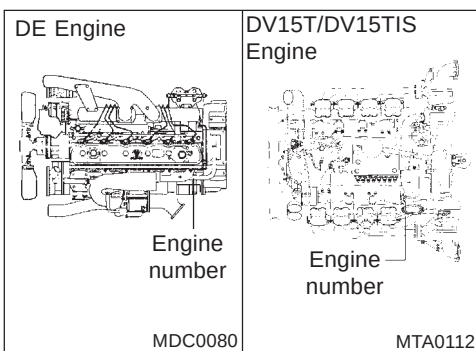
1. DL08K Engine

The engine number is stamped on the front left upper face of the cylinder block.



2. DV11K Engine

The engine number is stamped on the rear left upper face of the cylinder block.

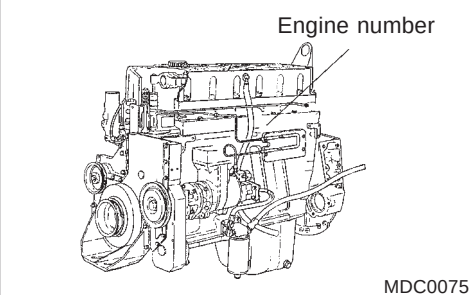


3. DE, DV15T/DV15TIS Engine

The engine number is stamped on the rear left upper face of the cylinder block.

6-4 SPECIFICATIONS AND SERVICE DATA

ISM CUMMINS Engine

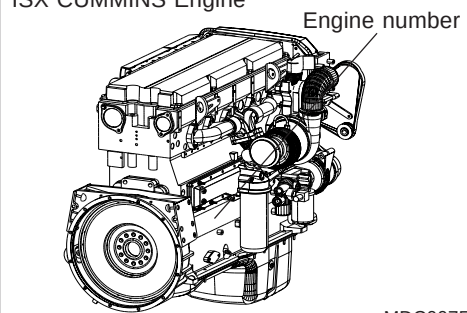


MDC0075

4. ISM Cummins Engine

The engine number is stamped on the lower face of the lower intake manifold.

ISX CUMMINS Engine



MDC0075

5. ISX Cummins Engine

The engine number is stamped right rear the middle of the front of the flywheel housing.

SPECIFICATIONS AND SERVICE DATA 6-5
2. MAIN DATA

Model		8.5Ton cargo short		16Ton cargo short		15Ton Dump	
Item							
Model code		CH2CK		CL6CR		CL4DY	
Curb weight(kg)		11,500		16,500		10,870	
Permissible G.V.W(kg)		19,100		30,100		33,100	
Deck (mm)	length	4,310		5,265		4,900	
	width	2,100		1,940		2,300	
	height	1,840		2,050		900	
Overall (mm)	length	8,060		9,975		7,765	
	width	2,490		2,495		←	
	height	3,350		3,700		3,180	
Wheel base(mm)		4,030		5,875		4,705	
Tread (mm)	Front	2,080		←		←	
	Rear	1,860		←		1,850	
Max. speed(km/h)		121		111		110	
Engine model		DL08K		DV11K		←	
Air cleaner type		Dry		←		←	
Clutch type		Disc friction, dry single plate, coil spring	-	Disc friction, dry single plate, diaphragm	-	Disc friction, dry single plate, diaphragm	
T/M	Model		T10S6	Allison3000	T16S6	Allison4500	ZF16S1830TO
	Forward (Hi/Lo)	CRAWLER	-	-	-	-	-
		1st/2nd	7.077/4.100	3.487/1.864	7.263/4.207	4.70/2.21	13.80/11.54
		3rd/4th	2.370/1.576	1.409/1.00	2.526/1.569	1.53/1.00	9.49/7.93
		5th/6th	1.000/0.744	0.750/0.652	1.000/0.699	0.76/0.67	6.53/5.46
		7th/8th	-	-	-	-	4.57/3.82
		9th/10th	-	-	-	-	3.02/2.53
		11th/12th	-	-	-	-	2.08/1.74
		13th/14th	-	-	-	-	1.43/1.20
		15th/16th	-	-	-	-	1.00/0.84
	Reverse	1st/2nd	6.720	5.027	6.857	5.55	12.92/10.80
	Capacity (L)	W/O PTO	14	27	17	48	11
PTO		15	-	18	-	11	
Rear axle	Model		T13H		T14HT/R185HT		T16HT/R185HT
	Ratio		4.875		←		4.111
	Capacity(L)		10		FRT11.5, RR:10/FRT:20,RR:12		←
Tire size		12R22.5-16PR		←		←	

* : Permissible G.C.W(kg)

6-6 SPECIFICATIONS AND SERVICE DATA

Model		6X4 Tractor W/cummins ISX	6X4 Tractor W/cummins ISX	
Item				
Model code		V3TXF	V3TXF	
Curb weight(kg)		9,710	10,410	
Permissible G.V.W(kg)		*75,000	*100,000	
Deck (mm)	length	-	-	
	width	-	-	
	height	-	-	
Overall (mm)	length	6,840	6,885	
	width	2,555	2,590	
	height	2,910	3,165	
Wheel base(mm)		4,480	4,565	
Tread (mm)	Front	2,035	2,050	
	Rear	1,890	1,900	
Max. speed(km/h)		138	92	
Engine model		ISX	←	
Air cleaner type		Dry	←	
Clutch type		Disc friction, dry twin plate, diaphragm	Disc friction, dry single plate, diaphragm	
T/M	Model		FO-18E318B-MXP	ZF16S2523TO
	Forward (Hi/Lo)	1st/2nd	14.40/12.29	13.80/11.54
		3rd/4th	8.51/7.26	9.49/7.93
		5th/6th	6.05/5.16	6.53/5.46
		7th/8th	4.38/3.74	4.57/3.82
		9th/10th	3.20/2.73	3.02/2.53
		11th/12th	2.28/1.94	2.08/1.74
		13th/14th	1.62/1.38	1.43/1.20
		15th/16th	1.17/1.00	1.00/0.84
	17th/18th	0.86/0.73	-	
	Reverse	1st/2nd	15.06/12.85	12.92/10.80
		3rd/4th	4.03/3.43	-
	Capacity (L)	W/O PTO	14.2	13
		PTO	-	13
Rear axle	Model		T17HT/HD-STYER	←
	Ratio		3.909/5.73	←
	Capacity(L)		FRT:11.5,RR:10/FRT:8.3,RR:6.0,Wheel hubs:2.0	←
Tire size		315/80R22.5-18PR		←

* : Permissible G.C.W(kg)

SPECIFICATIONS AND SERVICE DATA 6-7

Model		8.5 Ton Cargo Short	8.5 Ton Cargo SHT, FAB-2000	8.5 Ton Cargo Standard	8.5 Ton Cargo Standard	
Item						
Model code		F3C4F	F3CBF	F4C4F	F4CEF	
Curb weight(kg)		6,870	←	7,170	←	
Permissible G.V.W(kg)		18,000	←	←	←	
Deck (mm)	length	5,000	←	5,700	←	
	width	2,350	←	←	←	
	height	450	←	←	←	
Overall (mm)	length	7,470	←	8,155	8,170	
	width	2,490	←	←	←	
	height	3,080	←	2,915	3,080	
Wheel base(mm)		4,030	←	4,650	←	
Tread (mm)	Front	2,050	←	←	←	
	Rear	1,855	←	←	←	
Max. speed(km/h)		111	←	←	99	
Engine model		D1146TI	DE08TIS	D1146TI	DE12TIS	
Air cleaner type		Dry	←	←	←	
Clutch type		Disc friction, dry single plate, coil spring	←	←	←	
T/M	Model		T9S6	←	←	T10S6
	Forward (Hi/Lo)	CRAWLER	-	-	-	-
		1st/2nd	7.076/4.777	←	←	7.077/4.100
		3rd/4th	2.640/1.575	←	←	2.370/1.576
		5th/6th	1.000/0.744	-	-	1.000/0.744
		7th/8th	-	-	-	-
		9th/10th	-	-	-	-
		11th/12th	-	-	-	-
		13th/14th	-	-	-	-
		15th/16th	-	←	←	-
	Reverse	1st/2nd	6.720	←	←	6.720
	Capacity (L)	W/O PTO	12.5	←	←	14
		PTO	13.5	←	←	15
Rear axle	Model		T10H/R165H	←	←	T12H
	Ratio		5.571	←	←	←
	Capacity(L)		10/12	←	←	15
Tire size		12R22.5-16PR	←	←	←	

* : Permissible G.C.W(kg)

6-8 SPECIFICATIONS AND SERVICE DATA

Model		8.5Ton Cargo Standard	8.5Ton Cargo STD, FAB-2000	8.5 Ton Cargo Long	8.5 Ton Cargo Long, W/DE12TIS	
Item						
Model code		F4C5F	F4CBF	F6C4F	F6CEF	
Curb weight(kg)		7,170	7,350	7,470	←	
Permissible G.V.W(kg)		18,000	←	←	←	
Deck (mm)	length	5,800	7,300	←	←	
	width	2,350	←	←	←	
	height	450	←	←	←	
Overall (mm)	length	8,273	8,225	9,770	←	
	width	2,495	2,490	←	←	
	height	2,915	2,950	3,080	←	
Wheel base(mm)		4,650	←	5,800	←	
Tread (mm)	Front	2,050	←	←	←	
	Rear	1,855	←	←	←	
Max. speed(km/h)		106	111	←	99	
Engine model		DE12	DE08TIS	D1146TI	DE12TIS	
Air cleaner type		Dry	←	←	←	
Clutch type		Disc friction, dry single plate, coil spring	←	←	←	
T/M	Model		T9S6	←	←	T10S6
	Forward (Hi/Lo)	CRAWLER	-	-	-	-
		1st/2nd	7.076/4.777	←	←	7.077/4.100
		3rd/4th	2.640/1.575	←	←	2.370/1.576
		5th/6th	1.000/0.744	←	←	1.000/0.744
		7th/8th	-	-	-	-
		9th/10th	-	-	-	-
		11th/12th	-	-	-	-
		13th/14th	-	-	-	-
		15th/16th	-	-	-	-
	Reverse	1st/2nd	6.720	←	←	6.720
	Capacity (L)	W/O PTO	12.5	←	←	14
		PTO	13.5	←	←	15
Rear axle	Model		T10H/R165H	←	←	T12H
	Ratio		5.571	←	←	←
	Capacity(L)		10/12	←	←	12
Tire size		12R22.5-16PR	←	←	←	

* : Permissible G.C.W(kg)

SPECIFICATIONS AND SERVICE DATA 6-9

Model Item		8 Ton Cargo Super Long	8 Ton Dump W/DE12TIS	16Ton Cargo Short, DE12TI			
Model code		F8A4F	F3DEF	K7C6F			
Curb weight(kg)		7,870	8,530	9,570			
Permissible G.V.W(kg)		18,000	←	29,500			
Deck (mm)	length	8,500	4,000	7,460			
	width	2,350	2,290	2,350			
	height	450	590	450			
Overall (mm)	length	10,970	6,800	9,995			
	width	2,490	←	←			
	height	3,080	3,020	3,080			
Wheel base(mm)		6,500	4,030	5,800			
Tread (mm)	Front	2,050	←	←			
	Rear	1,855	←	←			
Max. speed(km/h)		111	101	99(103)			
Engine model		D1146TI	DE12TIS	DE12TI			
Air cleaner type		Dry	←	←			
Clutch type		Disc friction, dry single plate, coil spring	←	←			
T/M	Model		T9S6	T10S6	T10S6	T14S10	9JS150TA
	Forward (Hi/Lo)	CRAWLER	-	-	-	-	12.57
		1st/2nd	7.076/4.777	7.077/4.100	7.077/4.100	9.555/7.428	7.47/5.28
		3rd/4th	2.640/1.575	2.370/1.576	2.370/1.576	4.664/3.625	3.82/2.79
		5th/6th	1.000/0.744	1.000/0.744	1.000/0.744	2.730/2.122	1.95/1.38
		7th/8th	-	-	-	1.658/1.289	1.00/0.73
		9th/10th	-	-	-	1.000/0.777	-
		11th/12th	-	-	-	-	-
		13th/14th	-	-	-	-	-
		15th/16th	-	-	-	-	-
	Reverse	1st/2nd	6.720	6.720	6.720	9.668/7.516	13.14
	Capacity (L)	W/O PTO	12.5	14	14	18	13
		PTO	13.5	15	15	19	14.5
Rear axle	Model		T10H/R165H	T12H	T10HT/T14HT		
	Ratio		5.571	←	←		
	Capacity(L)		10/12	12	FRT:11.5,RR:10/FRT:11.5,RR:10		
Tire size		12R22.5-16PR	←	←			

* : Permissible G.C.W(kg)

6-10 SPECIFICATIONS AND SERVICE DATA

Model		16Ton Cargo Short				
Item						
Model code		K7CEF				
Curb weight(kg)		9,570				
Permissible G.V.W(kg)		29,500				
Deck (mm)	length	7,460				
	width	2,350				
	height	450				
Overall (mm)	length	9,995				
	width	2,490				
	height	3,080				
Wheel base(mm)		5,800				
Tread (mm)	Front	2,050				
	Rear	1,855				
Max. speed(km/h)		99(103)				
Engine model		DE12TIS				
Air cleaner type		Dry				
Clutch type		Disc friction, dry single plate, diaphragm				
T/M	Model		T15S6	T14S10	ZF16S151	9JS150TA
	Forward (Hi/Lo)	CRAWLER	-	-	-	12.57
		1st/2nd	7.263/4.207	9.555/7.428	13.80/11.54	7.47/5.28
		3rd/4th	2.526/1.569	4.664/3.625	9.49/7.93	3.82/2.79
		5th/6th	1.000/0.699	2.730/2.122	6.53/5.46	1.95/1.38
		7th/8th	-	1.658/1.289	4.57/3.82	1.00/0.73
		9th/10th	-	1.000/0.777	3.02/2.53	-
		11th/12th	-	-	2.08/1.74	-
		13th/14th	-	-	1.43/1.20	-
		15th/16th	-	-	1.00/0.84	-
	Reverse	1st/2nd	6.857	9.668/7.516	12.92/10.80	13.14
	Capacity (L)	W/O PTO	17	18	11	13
PTO		18	19	11	14.5	
Rear axle	Model		T14HT			
	Ratio		5.571			
	Capacity(L)		FRT:11.5,RR:10			
Tire size		12R22.5-16PR				

* : Permissible G.C.W(kg)

SPECIFICATIONS AND SERVICE DATA 6-11

Model		14Ton Cargo Long W/DE12TIS	16Ton Cargo Standard			6X4 Cargo STD, W/ISM350	
Item							
Model code		K9KEF	K8C6F			K8CMF	
Curb weight(kg)		11,150	9,970			10,250	
Permissible G.V.W(kg)		29,500	←			←	
Deck (mm)	length	9,500	8,260			←	
	width	2,350	←			←	
	height	450	←			←	
Overall (mm)	length	12,025	10,740			←	
	width	2,495	2,490			2,495	
	height	2,990	3,080			2,905	
Wheel base(mm)		7,000	6,250			←	
Tread (mm)	Front	2,060	2,050			←	
	Rear	1,855	←			←	
Max. speed(km/h)		108	99(103)			109	
Engine model		DE12TIS	DE12TI			ISM	
Air cleaner type		Dry	←			←	
Clutch type		Disc friction, dry single plate, diaphragm	Disc friction, dry single plate, coil spring			Disc friction, dry single plate, diaphragm	
T/M	Model		T15S6	T10S6	T14S10	9JS150TA	T14S10
	Forward (Hi/Lo)	CRAWLER	-	-	-	12.57	-
		1st/2nd	7.263/4.207	7.077/4.100	9.555/7.428	7.47/5.28	9.555/7.428
		3rd/4th	2.526/1.569	2.370/1.576	4.664/3.625	3.82/2.79	4.664/3.625
		5th/6th	1.000/0.699	1.000/0.744	2.730/2.122	1.95/1.38	2.730/2.122
		7th/8th	-	-	1.658/1.289	1.00/0.73	1.658/1.289
		9th/10th	-	-	1.000/0.777	-	1.000/0.777
		11th/12th	-	-	-	-	-
		13th/14th	-	-	-	-	-
		15th/16th	-	-	-	-	-
	Reverse	1st/2nd	6.857	6.720	9.668/7.516	13.14	9.668/7.516
	Capacity (L)	W/O PTO	17	14	18	13	18
		PTO	18	15	19	14.5	19
Rear axle	Model		T14HT	T10HT/T14HT			T14HT
	Ratio		5.571	←			4.875
	Capacity(L)		FRT:11.5,RR:10	FRT:11.5,RR:10/FRT:11.5,RR:10			FRT:11.5,RR:10
Tire size		12R22.5-16PR	←			←	

* : Permissible G.C.W(kg)

6-12 SPECIFICATIONS AND SERVICE DATA

Model		11.5Ton Cargo Long	6X2 Cargo	11.5Ton Cargo-Long, W/DE12TIS	15Ton Dump, L/PWR, Light (South Africa)	
Item						
Model code		K9A6F	K9BEF	K9AEF	K5EEF	
Curb weight(kg)		10,670	10,170	11,120	10,485	
Permissible G.V.W(kg)		29,500	25,500	29,500	33,500	
Deck (mm)	length	9,100	9,200	9,100	4,345	
	width	2,350	←	←	2,310	
	height	450	←	←	1,010	
Overall (mm)	length	11,625	11,725	11,625	7,445	
	width	2,490	←	2,495	2,520	
	height	3,080	←	2,990	3,165	
Wheel base(mm)		7,000	←	←	4,880	
Tread (mm)	Front	2,050	←	2,060	←	
	Rear	1,855	←	←	←	
Max. speed(km/h)		99	←	108	85	
Engine model		DE12TI	DE12TIS	←	←	
Air cleaner type		Dry	←	←	←	
Clutch type		Disc friction, dry single plate, diaphragm	←	←	←	
T/M	Model		T10S6	T15S6	T15S6	T10S6
	Forward (Hi/Lo)	CRAWLER	-	-	-	-
		1st/2nd	7.077/4.100	7.263/4.207	7.263/4.207	7.077/4.100
		3rd/4th	2.370/1.576	2.526/1.569	2.526/1.569	2.370/1.576
		5th/6th	1.000/0.744	1.000/0.699	1.000/0.699	1.000/0.744
		7th/8th	-	-	-	-
		9th/10th	-	-	-	-
		11th/12th	-	-	-	-
		13th/14th	-	-	-	-
		15th/16th	-	-	-	-
	Reverse	1st/2nd	6.720	6.857	6.857	6.720
	Capacity (L)	W/O PTO	14	17	17	14
		PTO	15	18	18	15
Rear axle	Model		T10HT	T12H	T14HT	T13HT
	Ratio		5.571	←	←	6.666
	Capacity(L)		FRT:11.5,RR:10	12	FRT:11.5,RR:10	←
Tire size		12R22.5-16PR	←	←	315/80R22.5-18PR	

* : Permissible G.C.W(kg)

SPECIFICATIONS AND SERVICE DATA 6-13

Model		6X4 Dump, STD-E2(390)	4X2 8Ton Dump	4X2 8Ton Dump W/DE12TI	
Item					
Model code		K4DVF	F3D4F	F3D6F	
Curb weight(kg)		11,925	7,970	8,530	
Permissible G.V.W(kg)		29,500	18,000	←	
Deck (mm)	length	4,900	4,000	←	
	width	2,300	2,290	←	
	height	900	590	←	
Overall (mm)	length	7,745	6,800	←	
	width	2,490	←	←	
	height	3,080	3,020	←	
Wheel base(mm)		4,580	4,030	←	
Tread (mm)	Front	2,050	←	←	
	Rear	1,855	←	←	
Max. speed(km/h)		93	100	99	
Engine model		DV15TIS	D1146TI	DE12TI	
Air cleaner type		Dry	←	←	
Clutch type		Disc friction, dry single plate, diaphragm	Disc friction, dry single plate, coil spring	←	
T/M	Model		T16S6	T9S6	T10S6
	Forward (Hi/Lo)	CRAWLER	-	-	-
		1st/2nd	7.263/4.207	7.076/4.777	7.077/4.100
		3rd/4th	2.526/1.569	2.640/1.575	2.370/1.576
		5th/6th	1.000/0.699	1.000/0.744	1.000/0.744
		7th/8th	-	-	-
		9th/10th	-	-	-
		11th/12th	-	-	-
		13th/14th	-	-	-
		15th/16th	-	-	-
	Reverse	1st/2nd	6.857	6.720	6.720
	Capacity (L)	W/O PTO	17	12.5	14
		PTO	18	13.5	15
Rear axle	Model		T15HT	T10H/R165H	T12H
	Ratio		6.166	←	5.571
	Capacity(L)		FRT:11.5,RR:10	10/12	12
Tire size		12R22.5-16PR	←	←	

* : Permissible G.C.W(kg)

6-14 SPECIFICATIONS AND SERVICE DATA

Model		6X4 Dump Cab Chassis, Long				6X4 15T Dump-ECO, 6Speeds			
Item									
Model code		K6E6F				K4D6F			
Curb weight(kg)		-				11,020			
Permissible G.V.W(kg)		40,000				29,500			
Deck (mm)	length	-				4,900			
	width	-				2,300			
	height	-				900			
Overall (mm)	length	9,480				7,700			
	width	2,585				2,490			
	height	2,995				3,145			
Wheel base(mm)		5,650				4,580			
Tread (mm)	Front	2,020				2,050			
	Rear	1,910				1,855			
Max. speed(km/h)		88(94,89,90)				90(93)			
Engine model		DE12TI				DE12TI			
Air cleaner type		Dry				←			
Clutch type		Disc friction, dry single plate, diaphragm				Disc friction, dry single plate, coil spring			
T/M	Model		9JS150TA	T14S10	ZF16S151	T10S6	T14S10	ZF16S151	9JS150TA
	Forward (Hi/Lo)	CRAWLER	12.57	-	-	-	-	-	12.57
		1st/2nd	7.47/5.28	9.555/7.428	13.80/11.54	7.077/4.100	9.555/7.428	13.80/11.54	7.47/5.28
		3rd/4th	3.82/2.79	4.664/3.625	9.49/7.93	2.370/1.576	4.664/3.625	9.49/7.93	3.82/2.79
		5th/6th	1.95/1.38	2.730/2.122	6.53/5.46	1.000/0.744	2.730/2.122	6.53/5.46	1.95/1.38
		7th/8th	1.00/0.73	1.658/1.289	4.57/3.82	-	1.658/1.289	4.57/3.82	1.00/0.73
		9th/10th	-	1.000/0.777	3.02/2.53	-	1.000/0.777	3.02/2.53	-
		11th/12th	-	-	2.08/1.74	-	-	2.08/1.74	-
		13th/14th	-	-	1.43/1.20	-	-	1.43/1.20	-
		15th/16th	-	-	1.00/0.84	-	-	1.00/0.84	-
	Reverse	1st/2nd	13.14	9.668/7.516	12.92/10.80	6.720	9.668/7.516	12.92/10.80	13.14
	Capacity (L)	W/O PTO	13	18	11	14	18	11	13
PTO		14.5	19	11	15	19	11	14.5	
Rear axle	Model		T16HT			T13HT			
	Ratio		6.833			6.166			
	Capacity(L)		FRT:11.5,RR:10			←			
Tire size		12.00R24-18PR			12R22.5-16PR				

* : Permissible G.C.W(kg)

SPECIFICATIONS AND SERVICE DATA 6-15

Model		6X4 15Ton Dump, W/DV15T	6X4 15Ton Dump-ECO,FAB (South Africa)	6X4 15Ton Dump- ECO, FAB			
Item							
Model code		K4D8F	K5DEF	K4DEF			
Curb weight(kg)		11,370	11,690	11,170			
Permissible G.V.W(kg)		29,500	33,500	29,500			
Deck (mm)	length	4,900	←	←			
	width	2,300	←	←			
	height	900	←	←			
Overall (mm)	length	7,705	7,775	7,705			
	width	2,490	2,495	←			
	height	3,145	3,060	←			
Wheel base(mm)		4,580	4,880	4,580			
Tread (mm)	Front	2,050	2,035	2,050			
	Rear	1,855	←	←			
Max. speed(km/h)		93	97	96(93)			
Engine model		DV15T	DE12TIS	←			
Air cleaner type		Dry	←	←			
Clutch type		Disc friction, dry single plate, diaphragm	←	←			
T/M	Model		T15S6	←	T15S6	9JS150TA	T14S10
	Forward (Hi/Lo)	CRAWLER	-	-	-	12.57	-
		1st/2nd	7.263/4.207	←	7.263/4.207	7.47/5.28	9.555/7.428
		3rd/4th	2.526/1.569	←	2.526/1.569	3.82/2.79	4.664/3.625
		5th/6th	1.000/0.699	←	1.000/0.699	1.95/1.38	2.730/2.122
		7th/8th	-	-	-	1.00/0.73	1.658/1.289
		9th/10th	-	-	-	-	1.000/0.777
		11th/12th	-	-	-	-	-
		13th/14th	-	-	-	-	-
		15th/16th	-	-	-	-	-
	Reverse	1st/2nd	6.857	←	6.857	13.14	9.668/7.516
	Capacity (L)	W/O PTO	17	←	17	13	18
		PTO	18	←	18	14.5	19
Rear axle	Model		T14HT	←	←		
	Ratio		6.666	6.166	←		
	Capacity(L)		FRT:11.5,RR:10	←	←		
Tire size		12R22.5-16PR	←	←			

* : Permissible G.C.W(kg)

6-16 SPECIFICATIONS AND SERVICE DATA

Model		6X4 Dump W/DV15T,HUB Reduction		6X4 Dump Cab Chassis	6X4 Dump		
Item							
Model code		K6D8F		K6D6F	K6D6F		
Curb weight(kg)		13,195		-	14,030		
Permissible G.V.W(kg)		38,000		40,000	40,000		
Deck (mm)	length	5,830		-	5,480		
	width	2,300		-	←		
	height	1,210		-	1,200		
Overall (mm)	length	8,890		8,285	8,850		
	width	2,585		←	←		
	height	3,280		2,995	3,270		
Wheel base(mm)		5,650		←	←		
Tread (mm)	Front	2,020		←	2,050		
	Rear	1,855		1,910	←		
Max. speed(km/h)		97(105)		88	88(94)		
Engine model		DV15T		DE12TI	←		
Air cleaner type		Dry		←	←		
Clutch type		Disc friction, dry single plate, coil spring		←	←		
T/M	Model		T14S10	9JS150TA	T14S10	T14S10	9JS150TA
	Forward (Hi/Lo)	CRAWLER	-	12.57	-	-	12.57
		1st/2nd	9.555/7.428	7.47/5.28	9.555/7.428	9.555/7.428	7.47/5.28
		3rd/4th	4.664/3.625	3.82/2.79	4.664/3.625	4.664/3.625	3.82/2.79
		5th/6th	2.730/2.122	1.95/1.38	2.730/2.122	2.730/2.122	1.95/1.38
		7th/8th	1.658/1.289	1.00/0.73	1.658/1.289	1.658/1.289	1.00/0.73
		9th/10th	1.000/0.777	-	1.000/0.777	1.000/0.777	-
		11th/12th	-	-	-	-	-
		13th/14th	-	-	-	-	-
		15th/16th	-	-	-	-	-
	Reverse	1st/2nd	9.668/7.516	13.14	9.668/7.516	9.668/7.516	13.14
	Capacity (L)	W/O PTO	18	13	18	18	13
PTO		19	14.5	19	19	14.5	
Rear axle	Model		THR20ST		T16HT	T16HT	
	Ratio		6.676		6.833	←	
	Capacity(L)		FRT:14,RR:13,Wheel hubs:2.5		FRT:11.5,RR:10	←	
Tire size		12.00R24-18PR		←	←		

* : Permissible G.C.W(kg)

SPECIFICATIONS AND SERVICE DATA 6-17

Model Item		6X4 Mixer, Separate		6X4 Concrete Mixer	6X4 Concrete Mixer	6X4 Concrete Mixer(8m³)	
Model code		K4M6F		K4M7F	K4MVF	K4MVF	
Curb weight(kg)		12,200		11,370	11,420	11,920	
Permissible G.V.W(kg)		29,500		←	←	32,500	
Deck (mm)	length	-		-	-	-	
	width	-		-	-	-	
	height	-		-	-	-	
Overall (mm)	length	8,335		8,275	←	8,790	
	width	2,495		←	←	←	
	height	3,770		3,720	←	3,870	
Wheel base(mm)		4,580		←	←	←	
Tread (mm)	Front	2,020		2,050	←	←	
	Rear	1,855		←	←	←	
Max. speed(km/h)		95(103)		97	95	96	
Engine model		DE12TI		DV15T	DV15TIS	←	
Air cleaner type		Dry		←	←	←	
Clutch type		Disc friction, dry single plate, coil spring		←	Disc friction, dry single plate, diaphragm	←	
T/M	Model		T14S10	9JS150TA	T15S6	T16S6	T16S6
	Forward (Hi/Lo)	CRAWLER	-	12.57	-	-	-
		1st/2nd	9.555/7.428	7.47/5.28	7.263/4.207	7.263/4.207	7.263/4.207
		3rd/4th	4.664/3.625	3.82/2.79	2.526/1.569	2.526/1.569	2.526/1.569
		5th/6th	2.730/2.122	1.95/1.38	1.000/0.699	1.000/0.699	1.000/0.699
		7th/8th	1.658/1.289	1.00/0.73	-	-	-
		9th/10th	1.000/0.777	-	-	-	-
		11th/12th	-	-	-	-	-
		13th/14th	-	-	-	-	-
	15th/16th	-	-	-	-	-	
	Reverse	1st/2nd	9.668/7.516	13.14	6.857	6.857	6.857
	Capacity (L)	W/O PTO	18	13	17	17	17
		PTO	19	14.5	18	18	18
Rear axle	Model		T14HT		T14HT	R185HT	←
	Ratio		5.571		6.666	6.143	←
	Capacity(L)		FRT:11.5,RR:10		←	FRT:20,RR:12	←
Tire size		12R22.5-16PR		←	←	←	

* : Permissible G.C.W(kg)

6-18 SPECIFICATIONS AND SERVICE DATA

Item \ Model		6X4 Concrete Mixer, long	8X4 24Ton dump-W/DV15TIS	8X4 dump W/Cummins RHD	4X2 Tractor W/DE12TI	
Model code		K5MVF	N7DVF	N7DNF	M2T6F	
Curb weight(kg)		11,760	14,465	-	7,010	
Permissible G.V.W(kg)		33,500	44,000	48,000	*40,000	
Deck (mm)	length	-	5,115	-	-	
	width	-	2,305	-	-	
	height	-	1,480	-	-	
Overall (mm)	length	8,304	8,960	8,120	6,010	
	width	2,495	2,490	2,580	2,490	
	height	3,690	3,170	3,540	2,910	
Wheel base(mm)		4,880	5,890	5,790	3,460	
Tread (mm)	Front	2,035	2,055	2,015	2,050	
	Rear	1,855	1,820	1,910	1,855	
Max. speed(km/h)		98	115	←	95(103)	
Engine model		DV15TIS	DV15TIS	ISM	DE12TI	
Air cleaner type		Dry	←	←	←	
Clutch type		Disc friction, dry single plate, diaphragm	←	←	Disc friction, dry single plate, coil spring	
T/M	Model		T16S6	ZF16S1820TO	←	9JS150TA T14S10
	Forward (Hi/Lo)	CRAWLER	-	-	-	12.57 -
		1st/2nd	7.263/4.207	13.80/11.54	←	7.47/5.28 9.555/7.428
		3rd/4th	2.526/1.569	9.49/7.93	←	3.82/2.79 4.664/3.625
		5th/6th	1.000/0.699	6.53/5.46	←	1.95/1.38 2.730/2.122
		7th/8th	-	4.57/3.82	←	1.00/0.73 1.658/1.289
		9th/10th	-	3.02/2.53	←	- 1.000/0.777
		11th/12th	-	2.08/1.74	←	- -
		13th/14th	-	1.43/1.20	←	- -
		15th/16th	-	1.00/0.84	←	- -
	Reverse	1st/2nd	6.857	12.92/10.80	←	13.14 9.668/7.516
	Capacity (L)	W/O PTO	17	11	←	13 18
		PTO	18	11	←	14.5 19
Rear axle	Model		R185HT	THR20ST	←	T12H
	Ratio		6.143	4.248	6.676	5.571
	Capacity(L)		FRT:20,RR:12	FRT:14,RR:13, Wheel hubs:2.5	←	12
Tire size		12R22.5-16PR	385/65R22.5-20PR FRT 12R22.5-16PR RR	12.00R24-18PR	12R22.5-16PR	

* : Permissible G.C.W(kg)

SPECIFICATIONS AND SERVICE DATA 6-19

Model		4X2 Tractor W/DE12TIS		6X4 Dump W/DE12TIS	6X4 Dump W/DV15TIS	9M**3 Mixer W/DV15TIS	
Item							
Model code		M2TEF		K6DEF	K6DVF	K6MVF	
Curb weight(kg)		6,770		14,030	13,900	13,887	
Permissible G.V.W(kg)		*40,000		←	38,000	←	
Deck (mm)	length	-		5,830	←	-	
	width	-		2,300	←	-	
	height	-		1,210	←	-	
Overall (mm)	length	6,010		8,895	8,890	8,575	
	width	2,490		2,585	←	2,560	
	height	2,910		3,290	3,285	4,000	
Wheel base(mm)		3,460		5,650	←	←	
Tread (mm)	Front	2,050		←	2,020	←	
	Rear	1,855		1,910	1,885	1,910	
Max. speed(km/h)		109(118)		97(104)	98	←	
Engine model		DE12TIS		←	DV15TIS	←	
Air cleaner type		Dry		←	←	←	
Clutch type		Disc friction, dry single plate, diaphragm		Disc friction, dry single plate, coil spring	←	Disc friction, dry single plate, diaphragm	
T/M	Model		9JS150TA	T14S10	←	ZF16S1820TO	←
	Forward (Hi/Lo)	CRAWLER	12.57	-	←	-	-
		1st/2nd	7.47/5.28	9.555/7.428	←	13.80/11.54	←
		3rd/4th	3.82/2.79	4.664/3.625	←	9.49/7.93	←
		5th/6th	1.95/1.38	2.730/2.122	←	6.53/5.46	←
		7th/8th	1.00/0.73	1.658/1.289	←	4.57/3.82	←
		9th/10th	-	1.000/0.777	←	3.02/2.53	←
		11th/12th	-	-	-	2.08/1.74	←
		13th/14th	-	-	-	1.43/1.20	←
		15th/16th	-	-	-	1.00/0.84	←
	Reverse	1st/2nd	13.14	9.668/7.516	←	12.92/10.80	←
	Capacity (L)	W/O PTO	13	18	←	11	←
		PTO	14.5	19	←	11	←
Rear axle	Model		T12H		T16HT	THR20ST	T16HT
	Ratio		4.857		6.166	5.648	6.166
	Capacity(L)		12		FRT:11.5, RR:10	FRT:14,RR:13, Wheel hubs:2.5	FRT:11.5, RR:10
Tire size		12R22.5-16PR		12.00R24-18PR	←	←	

* : Permissible G.C.W(kg)

6-20 SPECIFICATIONS AND SERVICE DATA

Model		6X4 Mixer, Separate, W/DE12TIS		4X2 Tractor Long W/DE12TI	4X2 Tractor Long W/Hub Reduction	4X2 Tractor Long W/DE12TIS		
Item								
Model code		K4MEF		M2S6F	M2S6F	M2SEF		
Curb weight(kg)		12,710		7,010	7,114	7,010		
Permissible G.V.W(kg)		29,500		*40,000	*60,000	*40,000		
Deck (mm)	length	-		-	-	-		
	width	-		-	-	-		
	height	-		-	-	-		
Overall (mm)	length	8,335		6,190	←	←		
	width	2,495		←	←	2,490		
	height	3,770		2,905	←	2,910		
Wheel base(mm)		4,580		3,700	←	←		
Tread (mm)	Front	2,020		2,050	←	←		
	Rear	1,885		←	←	←		
Max. speed(km/h)		97(103)		95(103)	94	109(118)		
Engine model		DE12TIS		DE12TI	←	DE12TIS		
Air cleaner type		Dry		←	←	←		
Clutch type		Disc friction, dry single plate, coil spring		←	←	Disc friction, dry single plate, diaphragm		
T/M	Model		9JS150TA	T14S10	←	T14S10	9JS150TA	T14S10
	Forward (Hi/Lo)	CRAWLER	12.57	-	←	-	12.57	-
		1st/2nd	7.47/5.28	9.555/7.428	←	9.555/7.428	7.47/5.28	9.555/7.428
		3rd/4th	3.82/2.79	4.664/3.625	←	4.664/3.625	3.82/2.79	4.664/3.625
		5th/6th	1.95/1.38	2.730/2.122	←	2.730/2.122	1.95/1.38	2.730/2.122
		7th/8th	1.00/0.73	1.658/1.289	←	1.658/1.289	1.00/0.73	1.658/1.289
		9th/10th	-	1.000/0.777	←	1.000/0.777	-	1.000/0.777
		11th/12th	-	-	←	-	-	-
		13th/14th	-	-	←	-	-	-
		15th/16th	-	-	←	-	-	-
	Reverse	1st/2nd	13.14	9.668/7.516	←	9.668/7.516	13.14	9.668/7.516
	Capacity (L)	W/O PTO	13	18	←	18	13	18
PTO		14.5	19	←	19	14.5	19	
Rear axle	Model		T14HT		T12H/T19H	←	T12H	
	Ratio		5.571		←	←	4.875	
	Capacity(L)		FRT:11.5, RR:10		12/15	←	12	
Tire size		12R22.5-16PR		←	←	←		

* : Permissible G.C.W(kg)

SPECIFICATIONS AND SERVICE DATA 6-21

Model		4X2 Tractor W/HUB Reduction	4X2 Tractor Long W/DV15TIS	4X2 Tractor Long W/DV15TIS	6X4 Tractor W/DE12TI(10S)	
Item						
Model code		M2SEF	M2SVF	M2SNF	V3T6F	
Curb weight(kg)		6,975	7,410	6,930	8,600	
Permissible G.V.W(kg)		*60,000	←	←	*55,000	
Deck (mm)	length	-	-	-	-	
	width	-	-	-	-	
	height	-	-	-	-	
Overall (mm)	length	6,190	6,225	6,295	6,835	
	width	2,490	←	2,495	←	
	height	2,910	←	2,905	2,900	
Wheel base(mm)		3,700	←	←	4,480	
Tread (mm)	Front	2,050	←	2,080	2,050	
	Rear	1,855	←	1,850	1,855	
Max. speed(km/h)		94	87	←	95	
Engine model		DE12TIS	DV15TIS	ISM	DE12TI	
Air cleaner type		Dry	←	←	←	
Clutch type		Disc friction, dry single plate, diaphragm	←	←	Disc friction, dry single plate, coil spring	
T/M	Model		T14S10	ZF16S1820TO	←	T14S10
	Forward (Hi/Lo)	CRAWLER	-	-	-	-
		1st/2nd	9.555/7.428	13.80/11.54	←	9.555/7.428
		3rd/4th	4.664/3.625	9.49/7.93	←	4.664/3.625
		5th/6th	2.730/2.122	6.53/5.46	←	2.730/2.122
		7th/8th	1.658/1.289	4.57/3.82	←	1.658/1.289
		9th/10th	1.000/0.777	3.02/2.53	←	1.000/0.777
		11th/12th	-	2.08/1.74	←	-
		13th/14th	-	1.43/1.20	←	-
		15th/16th	-	1.00/0.84	←	-
	Reverse	1st/2nd	9.668/7.516	12.92/10.80	←	9.668/7.516
	Capacity (L)	W/O PTO	18	11	←	18
		PTO	19	11	←	19
Rear axle	Model		T12H	THR20S	←	T14HT
	Ratio		4.875	5.648	4.248	5.571/4.875
	Capacity(L)		12	13,Wheel hubs:2.5	←	FRT:11.5,RR:10
Tire size		12R22.5-16PR	←	←	←	

* : Permissible G.C.W(kg)

6-22 SPECIFICATIONS AND SERVICE DATA

Model		6X4 Tractor W/DE12TI	6X4 Tractor W/DV5T	6X4 Tractor W/Hub Reduction	6X4 Tractor W/DE12TIS(10S)		
Item							
Model code		V3T6F	V3T8F	V3T8F	V3TEF		
Curb weight(kg)		8,600	8,750	9,335	8,780		
Permissible G.V.W(kg)		*55,000	←	*85,000	*55,000		
Deck (mm)	length	-	-	-	-		
	width	-	-	-	-		
	height	-	-	-	-		
Overall (mm)	length	6,835	6,840	←	6,835		
	width	2,495	2,490	←	2,495		
	height	2,900	2,910	←	2,900		
Wheel base(mm)		4,480	←	←	←		
Tread (mm)	Front	2,050	←	←	←		
	Rear	1,855	←	←	←		
Max. speed(km/h)		103	119(129)	97	109		
Engine model		DE12TI	DE15T	←	DE12TIS		
Air cleaner type		Dry	←	←	←		
Clutch type		Disc friction, dry single plate, coil spring	Disc friction, dry single plate, diaphragm	←	←		
T/M	Model		9JS150TA	9JS150TA	T14S10	ZF16S151	9JS150TA
	Forward (Hi/Lo)	CRAWLER	12.57	12.57	-	-	12.57
		1st/2nd	7.47/5.28	7.47/5.28	9.555/7.428	13.8/11.54	7.47/5.28
		3rd/4th	3.82/2.79	3.82/2.79	4.664/3.625	9.49/7.93	3.82/2.79
		5th/6th	1.95/1.38	1.95/1.38	2.730/2.122	6.53/5.46	1.95/1.38
		7th/8th	1.00/0.73	1.00/0.73	1.658/1.289	4.57/3.82	1.00/0.73
		9th/10th	-	-	1.000/0.777	3.02/2.53	-
		11th/12th	-	-	-	2.08/1.74	-
		13th/14th	-	-	-	1.43/1.20	-
	15th/16th	-	-	-	1.00/0.84	-	
	Reverse	1st/2nd	13.14	13.14	9.668/7.516	12.92/10.80	13.14
	Capacity (L)	W/O PTO	13	13	18	11	13
PTO		14.5	14.5	19	11	14.5	
Rear axle	Model		T14HT	←	←	←	
	Ratio		5.571/4.875	4.875	←	←	
	Capacity(L)		FRT:11.5,RR:10	←	←	←	
Tire size		12R22.5-16PR	←	←	←		

* : Permissible G.C.W(kg)

SPECIFICATIONS AND SERVICE DATA 6-23

Model		6X4 Tractor W/DE12TIS	6X4 Tractor W/DV15TIS	6X4 Tractor W/DV15TIS W/Hub Reduction	4X2 Pull Cargo		
Item							
Model code		V3TEF	V3TVF	V3TVF	M4P6F		
Curb weight(kg)		8,780	8,800	9,093	7,900		
Permissible G.V.W(kg)		*55,000	←	*85,000	18,000		
Deck (mm)	length	-	-	-	5,800		
	width	-	-	-	2,350		
	height	-	-	-	450		
Overall (mm)	length	6,835	6,840	←	8,270		
	width	2,495	2,490	←	←		
	height	2,900	2,910	←	3,115		
Wheel base(mm)		4,480	←	←	4,650		
Tread (mm)	Front	2,050	←	←	←		
	Rear	1,855	←	←	1,900		
Max. speed(km/h)		118	110	87	109		
Engine model		DE12TIS	DV15TIS	←	DE12		
Air cleaner type		Dry	Dry	←	Dry		
Clutch type		Disc friction, dry single plate, diaphragm	←	←	Disc friction, dry single plate, coil spring		
T/M	Model		T14S10	ZF16S1820TO	←	9JS150TA	T14S10
	Forward (Hi/Lo)	CRAWLER	-	-	-	12.57	-
		1st/2nd	9.555/7.428	13.80/11.54	←	7.47/5.28	9.555/7.428
		3rd/4th	4.664/3.625	9.49/7.93	←	3.82/2.79	4.664/3.625
		5th/6th	2.730/2.122	6.53/5.46	←	1.95/1.38	2.730/2.122
		7th/8th	1.658/1.289	4.57/3.82	←	1.00/0.73	1.658/1.289
		9th/10th	1.000/0.777	3.02/2.53	←	-	1.000/0.777
		11th/12th	-	2.08/1.74	←	-	-
		13th/14th	-	1.43/1.20	←	-	-
		15th/16th	-	1.00/0.84	←	-	-
	Reverse	1st/2nd	9.668/7.516	12.92/10.80	←	13.14	9.668/7.516
	Capacity (L)	W/O PTO	18	11	←	13	18
		PTO	19	11	←	14.5	19
Rear axle	Model		T14HT	T185HT	←	T12H	
	Ratio		4.875	4.444	←	4.875/5.571	
	Capacity(L)		FRT:11.5,RR:10	FRT:20,RR:12	←	15	
Tire size		12R22.5-16PR	←	←	←		

* : Permissible G.C.W(kg)

6-24 SPECIFICATIONS AND SERVICE DATA

Model		Pull Cargo	21Ton Cargo	8X4 Mixer C/chassis	19.5Ton Cargo Short	
Item						
Model code		V8PVF	M8AEF	M8MVF	M9AVF	
Curb weight(kg)		11,070	10,870	-	12,170	
Permissible G.V.W(kg)		29,500	38,000	41,000	36,000	
Deck (mm)	length	8,300	7,620	-	9,100	
	width	2,480	2,350	-	2,350	
	height	450	←	-	450	
Overall (mm)	length	10,840	10,445	8,905	11,590	
	width	2,495	2,490	2,580	2,490	
	height	3,080	←	3,035	3,080	
Wheel base(mm)		6,550	6,250	6,410	7,101	
Tread (mm)	Front	2,050	←	←	←	
	Rear	1,855	←	1,910	1,855	
Max. speed(km/h)		110	101	97	110	
Engine model		DV15TIS	DE12TIS	DV15TIS	←	
Air cleaner type		Dry	←	←	←	
Clutch type		Disc friction, dry single plate, diaphragm	←	←	←	
T/M	Model		ZF16S1820TO	ZF16S151	ZF16S1820TO	←
	Forward (Hi/Lo)	CRAWLER	-	-	-	-
		1st/2nd	13.80/11.54	13.80/11.54	13.80/11.54	←
		3rd/4th	9.49/7.93	9.49/7.93	9.49/7.93	←
		5th/6th	6.53/5.46	6.53/5.46	6.53/5.46	←
		7th/8th	4.57/3.82	4.57/3.82	4.57/3.82	←
		9th/10th	3.02/2.53	3.02/2.53	3.02/2.53	←
		11th/12th	2.08/1.74	2.08/1.74	2.08/1.74	←
		13th/14th	1.43/1.20	1.43/1.20	1.43/1.20	←
		15th/16th	1.00/0.84	1.00/0.84	1.00/0.84	←
	Reverse	1st/2nd	12.92/10.80	12.92/10.80	12.92/10.80	←
	Capacity (L)	W/O PTO	11	11	11	←
		PTO	11	11	11	←
Rear axle	Model		T185HT/T15HT	T14HT	HD-STYER	T185HT/T15HT
	Ratio		4.444	4.875	5.73	4.444
	Capacity(L)		FRT:20, RR:12/ FRT:11.5, RR:10	FRT:11.5,RR:10	FRT:8.3, RR:6.0, Wheel hubs:2.0	FRT:20, RR:12/ FRT:11.5, RR:10
Tire size		12R22.5-16PR	←	12.00R24-18PR	12R22.5-16PR	

* : Permissible G.C.W(kg)

SPECIFICATIONS AND SERVICE DATA 6-25

Model		19Ton Cargo Long	25Ton Cargo
Item			
Model code		M9CVF	P9CVF
Curb weight(kg)		12,870	13,670
Permissible G.V.W(kg)		36,000	45,000
Deck (mm)	length	10,100	←
	width	2,350	←
	height	450	←
Overall (mm)	length	12,585	←
	width	2,490	←
	height	3,080	←
Wheel base(mm)		7,900	←
Tread (mm)	Front	2,050	←
	Rear	1,855	←
Max. speed(km/h)		110	←
Engine model		DV15TIS	←
Air cleaner type		Dry	←
Clutch type		Disc friction, dry single plate, diaphragm	←
T/M	Model		ZF16S1820TO
	Forward (Hi/Lo)	CRAWLER	-
		1st/2nd	13.80/11.54
		3rd/4th	9.49/7.93
		5th/6th	6.53/5.46
		7th/8th	4.57/3.82
		9th/10th	3.02/2.53
		11th/12th	2.08/1.74
		13th/14th	1.43/1.20
		15th/16th	1.00/0.84
	Reverse	1st/2nd	12.92/10.80
	Capacity (L)	W/O PTO	11
		PTO	11
Rear axle	Model		T185HT/T15HT
	Ratio		4.444
	Capacity(L)		FRT:20, RR:12/FRT:11.5, RR:10
Tire size		12R22.5-16PR	←

* : Permissible G.C.W(kg)

6-26 SPECIFICATIONS AND SERVICE DATA

Engine specifications

Model	DL08K	DV11K
Engine type	Water-Cooled, 4cycle, In-line Turbo charged & inter-cooled	Water-Cooled, 4cycle, V-type 90°, Turbo charged & inter-cooled
Cylinder bore x stroke - No. of cylinders	108mmx139 - 6	128mmx142 - 6
Total displacement	7,640cc	10,964cc
Compression ratio	17.1:1	←
Maximum power(PS)	340ps/2,200rpm	440ps/1,900rpm
Maximum torque ratings	145kg•m/1,200rpm	205kg•m/1,200rpm
Injection timing	BTDC 10°~ATDC 1°	BTDC 15°~ATDC 1°
Firing order	1-5-3-6-2-4	1-4-2-5-3-6
Injection nozzle	9-ø0.147	8-ø0.183
Oil pump type	Gear	←
Oil cooler type	Water-cooled	←
Oil filter type	Full flow	←
Thermostat	Wax-pallet	←
Oil capacity	• Exchange (28L) • Total (30L)	• Exchange (32L) • Total (35L)
Water capacity	• Engine (13.3L) • Vehicle standards(34L)	• Engine (14.3L) • Intarder(45L) • Without intarder(35L)
Starter voltage-output	24V-6.0kW	←
Alternator	24V-100A	←
Air compressor capacity	442cc/rev(Clutch type)	550cc/rev

SPECIFICATIONS AND SERVICE DATA 6-27

Model	DE08TIS	D1146TI	DE12	DE12TI
Engine type	4cycle in-line, water-cooled type Turbo charged & intercooled	←	4cycle in-line, water-cooled type Naturally aspirated	4cycle in-line, water-cooled type Turbo charged & intercooled
Cylinder bore x stroke - No. of cylinders	111mmx139 - 6	←	123mmx155 - 6	←
Total displacement	8,071cc	←	11,051cc	←
Compression ratio	16.7:1	16.8:1	17.1:1	16.5:1
Maximum power(PS)	225ps/2,300rpm	←	225ps/2,200rpm	340ps/2,100rpm
Maximum torque ratings	82kg•m/1,200rpm	←	81.5kg•m/1,400rpm	135kg•m/1,260rpm
Injection timing	BTDC 3°	BTDC 9°	BTDC 12°	←
Firing order	1-5-3-6-2-4	←	←	←
Injection nozzle	5-ø0.29	←	←	5-ø0.33
Oil pump type	Gear	←	←	←
Oil cooler type	Water-cooled	←	←	←
Oil filter type	Full flow	←	←	←
Thermostat	Wax-pallet	←	←	←
Oil capacity	• Exchange(18L) • Total(20L)	←	←	←
Water capacity	11L	←	19L	←
Starter voltage-output	24V-4.5kW	←	24V-6.0kW	←
Alternator	24V-60A	←	←	←
Air compressor capacity	300cc/rev	←	318cc/rev	←

6-28 SPECIFICATIONS AND SERVICE DATA

Model	DE12TIS	DV15T	DV15TIS	ISM CUMMINS	ISX CUMMINS
Engine type	4cycle in-line, water-cooled type Turbo charged & intercooled	Water-cooled, 4cycle, V type Turbo charged & intercooled	←	4cycle in-line, water-cooled type Turbo charged & intercooled	←
Cylinder bore x stroke - No. of cylinders	123mmx155-6	128mmx142 - 8	←	125mmx147	137mmx169
Total displacement	11,051cc	14,618cc	←	10,824cc	15,000cc
Compression ratio	16.8:1	16.5:1	17.4:1	16.2:1	19.0:1
Maximum power(PS)	340ps/2,100rpm	370ps/2,300rpm	420ps/2,100rpm	415ps/1,900rpm	481ps/2,000rpm
Maximum torque ratings	145kg•m/1,260rpm	145kg•m/1,300rpm	170kg•m/1,200rpm	187kg•m/1,200rpm	256kg•m/1,200rpm
Injection timing	BTDC 1°	BTDC 7°	BTDC 5.5°	BTDC 24°	←
Firing order	1-5-3-6-2-4	1-5-7-2-6-3-4-8	←	1-5-3-6-2-4	←
Injection nozzle	5-ø0.33	5-ø0.313	←	-	←
Oil pump type	Gear	←	←	←	←
Oil cooler type	Water-cooled	←	←	←	←
Oil filter type	Full flow	←	←	←	←
Thermostat	Wax pellet	←	←	←	←
Oil capacity	Exchange(18L) Total(20L)	Cargo/Tractor: Exchange(22L), Total(24L) Dump : Exchange(20L), Total(22L)	←	Exchange(30L) Total(32L)	Exchange (45.4L) Total(49.2L)
Water capacity	19L	←	←	9.1L	24L
Starter voltage-output	24V-6.0kw	24V-6.6kw	24V-7.0kw	24V-7.5kw	←
Alternator	24V-60A	←	←	←	24V-80A
Air compressor capacity	318cc/rev	300cc/rev	318cc/rev	413cc/rev	318cc/rev

SPECIFICATIONS AND SERVICE DATA 6-29

3. RECOMMENDED LUBRICANTS

Lubricating point	Fluid	Recommended oil	Type & fill capacities
Engine	Engine oil	ACEA-E5	DOOSAN engine DL08K : Exchange(28L), Total(30L) DV11K : Exchange(32L), Total(35L)
		API CH-4, SAE 15W40	DOOSAN engine D1146TI/DE08TIS DE12/DE12TI/DE12TIS : Exchange(18L), Total(20L) DV15T/DV15TIS Cargo/Tractor : Exchange(22L), Total(24L) Dump : Exchange(20L), Total(22L) CUMMINS engine ISM CUMMINS : Exchange(30L), Total(32L)
		API CI-4, SAE 10W40	ISX CUMMINS : Exchange(45.4L), Total(49.2L)
Transmission	Gear oil	API GL-4, SAE80W90	DYMOS manual transmission K805 : 9.8L(PTO:11.8L) K1406 : 16L(PTO:16.2L) S&T manual transmission T9S6 : 12.5L(PTO:13.5L) T10S6 : 14L(PTO:15L) T14S6 : 18L(PTO:19L) T15S6 : 17L(PTO:18L) T16S6 : 17L(PTO:18L) 9JS150TA : 13L(PTO:14.5L) EATON manual transmission FSO10309A : 12.3L(PTO :12.3L)
		API GL-4, SAE80W90 (Engine oil : API CD/CE/CF/SF/SG, SAE30)	ZF manual transmission ZF16S151, ZF16S1820TO, ZF16S1830TO Exchange : 8L, Total : 11L ZF16S221, ZF16S2220TO Exchange : 10L, Total : 13L
		ECOFUID M SAE75W80	ZF manual transmission ZF 16S2523TO Exchange : 10L, Total : 13L
		API GL-4, SAE 80W90	ZF auto transmission ZF12AS1930TO Exchange : 11L, Total : 13L ZF12AS2330TO Exchange : 11L, Total : 13L
		DEXRON III	ALLISON auto transmission MD3060P, HD4560P Exchange : 18L, Total : 27L HD4560P Exchange : 37L, Total : 48L
		SAE 50	EATON auto transmission FO-18E318B-MXP Exchange : 13.2L Total : 14.2L

6-30 SPECIFICATIONS AND SERVICE DATA

Lubricating point	Fluid	Recommended oil	Type & fill capacities
Rear axle	Gear oil	API GL-5, SAE80W90	DYMOS R165H(12L) R185HT(FRT:20L, RR:12L) S&T T10H,T13H(10L) T10HT,T13HT,T14HT,T15HT,T16HT (FRT:11.5L, RR:10L) T12H,T19H(15L) THR20S(13L, Wheel hubs:2.5L) THR20ST(FRT:14L, RR:13L, Wheel hubs:2.5L) SHAANXI HD-STYER (FRT:8.3L,RR:6.0L, Wheel hubs:2.0L)
Dump hoist	Machine oil	ISO VG 32	8ton dump:35L, 15ton dump:41L 24ton/25.5ton dump:97L Rear 3-Axle dump:100L
Mixer hydraulic oil	Hydraulic oil	ISO VG 46	Total : 52~54L In tank : 45L
	Gear oil	ISO VG 320	In reduction gear : 6.5~8L
Power steering	Power steering oil	ATF DEXRON II-D	7.3L(8X4series : 9L)
Wheel bearing and chassis	Grease	Viscosity grade 000,00 grease	As required
Clutch	Brake	SSK 201(SAE J1703, DOT3)	As required
Coolant	Antifreeze	EDS M-8207	As required(Concentration 50%)
Cab tilting oil	Shipping oil	MIL-H-24459	As required

Caution

1. Above periodic oil change is under the normal conditions so in case of severe driving conditions, more frequent maintenance is required.
2. It is oil capacity of dry condition so it is variable at the time of change.
3. Use only genuine TATA Daewoo part oil filters and in order to use no recommended oil, must be confirmed above specification before use.