7. PLANNED MAINTENANCE AND LUBRICATION

1. INTRODUCTION

ONLY TRAINED AND AUTHORIZED PERSONNEL should perform planned maintenance. Local HYUNDAI dealers are prepared to help customers put in place a planned maintenance program for checking and maintaining their lift trucks according to applicable safety regulations.

⚠ Powered industrial trucks may becomes hazardous if maintenance is neglected.

As outlined in section 4, operator maintenance and care, the operator should make a safety inspection of the lift truck before operating it. The purpose of this daily examination is to check for any obvious damage and maintenance problems, and to have minor adjustments and repairs made to correct any unsafe condition.

In addition to the operator's daily inspection, HYUNDAI recommends that the owner set up and follow a periodic planned maintenance (PM) and inspection program. The PM identifies needed adjustments, repairs, or replacements so they can be made before failure occurs. The specific schedule(frequency) for the PM inspections depends on the particular application and lift truck usage.

Planned maintenance is the normal maintenance necessary to provide proper and efficient machines operation. To protect your investment and prolong the service life of your machine, follow the scheduled maintenance check list.

This section recommends typical planned maintenance and lubrication schedules for items essential to the safety, life, and performance of the truck. It also outlines safe maintenance practices and gives brief procedures for inspections, operational checks, cleaning, lubrication, and minor adjustments.

Specifications for selected components, fuel, lubricants, critical bolt torques, refill capacities, and settings for the truck are found in section 8.

If you have needed for more information on the care and repair of your truck, see your HYUNDAI dealer.

2. SAFE MAINTENANCE PRACTICES

The following instructions have been prepared from current industry and government safety standards applicable to industrial truck operation and maintenance. These recommended procedures specify conditions, methods, and accepted practices that aid in the safe maintenance of industrial trucks. They are listed here for the reference and safety of all workers during maintenance operations. Carefully read and understand these instructions and the specific maintenance procedures before attempting to do any repair work. When in doubt of any maintenance procedure, please contact your local HYUNDAI dealer.

1) Powered industrial trucks can become hazardous if maintenance is neglected. Therefore, suitable maintenance facilities and trained personnel and procedures shall be provided.

2) Maintenance and inspection of all powered industrial trucks shall be performed in conformance with the manufacturer's recommendations.

3) Follow a scheduled planned maintenance, lubrication, and inspection system.

4) Only trained and authorized personnel are permitted to maintain, repair, adjust, and inspect industrial trucks and must do so in accordance with the manufacturer's specifications.

5) Always wear safety glasses. Wear a safety (hard) hat in industrial plants and in special work areas where protection is necessary and required.

6) Properly ventilate work area, vent exhaust fumes, and keep shop clean and floors dry.

7) Avoid fire hazards and have fire protection equipment present in the work area. Do not use an open flame to check for level or leakage fuel, electrolyte, or coolant. Do not use open pans of fuel or flammable cleaning fluids for cleaning parts.

8) Before starting work on truck.

(1) Raise drive wheels free of floor and use oak blocks or other positive truck positioning devices.

(2) Remove all jewelry(watches, rings, bracelets, etc.).

(3) Put oak blocks under the load engaging means, inner masts, or chassis before working on them.

(4) Disconnect the battery ground cable (-) before working on the electrical system.

※ **Refer to the jacking and blocking section in the service manual for proper procedures.**

9) Operation of the truck to check performance must be conducted in an authorized, safe, clear area.

10) Before starting to operate the truck.

(1) Be seated in a safe operating position and fasten your seat belt.

(2) Put the parking brake switch in the LOCK position.

(3) Put the gear selector lever in NEUTRAL.

(4) Start the engine.

(5) Check functioning of lift and tilt systems, direction and speed controls, steering, brakes, warning devices, and load handling attachments.

11) Before leaving the truck.

(1) Stop the truck.

(2) Fully lower the load-engaging means: mast, carriage, forks or attachments.

(3) Put the gear selector lever in NEUTRAL.

(4) Put the parking brake switch in the LOCK position.

(5) Stop the engine.

(6) Turn the start switch to the OFF position.

(7) Put blocks at the wheels if the truck must be left on an incline.

12) Brakes, steering mechanisms, control mechanisms, warning devices, lights, governors, lift overload devices, lift and tilt mechanisms, articulating axle stops, load backrest, cab and frame members must be carefully and regularly inspected and maintained in a safe operating condition.

13) Special trucks or devices designed and approved for hazardous area operation must receive special attention to insure that maintenance preserves the original approved safe operating features.

14) Fuel systems must be checked for leaks and condition of parts. Extra special consideration must be given in the case of a leak in the fuel system. Action must be taken to prevent the use of the truck until the leak has been corrected.

15) All hydraulic systems must be regularly inspected and maintained in conformance with good practice. Tilt and lift cylinders, valves, and other parts must be checked to assure that drift or leakage has not developed to the extent that it would create a hazard.

16) When working on the hydraulic system, be sure the engine is turned off, mast is in the fully-lowered position, and hydraulic pressure is relieved in hoses and tubing.

⚠ Always put oak blocks under the carriage and mast rails when it is necessary to work with the mast in an elevated position.

17) The truck manufacturer's capacity, operation, and maintenance instruction plates, tags, or decals must be maintained in legible condition.

18) Batteries, limit switches, protective devices, electrical conductors, and connections must be maintained in conformance with good practice. Special attention must be paid to the condition of electrical insulation.

19) To avoid injury to personnel or damage to the equipment, consult the manufacturer's procedures in replacing contacts on any battery connection.

20) Industrial trucks must be kept in a clean condition to minimize fire hazards and help in detection of loose or defective parts.

21) Modifications and additions that affect capacity and safe truck operation must not be done without the manufacturer's prior written approval. This is an OSHA requirement.
Capacity, operation, and maintenance instruction plates, tags, or decals must be changed accordingly.

22) Care must be taken to assure that all replacement parts, including tires, are interchangeable with the original parts and of a quality at least equal to that provided in the original equipment. Parts, including tires, are to be installed per the manufacturer's procedures. Always use genuine HYUNDAI or HYUNDAI-approved parts.

23) When removing tires follow industry safety practices. Most importantly, deflate pneumatic tires completely prior to removal. Following assembly of tires on multi-piece rims, use a safety cage or restraining device while inflating.

24) Use special care when removing heavy components, such as counterweight, mast, etc.. Be sure that lifting and handling equipment is of the correct capacity and in good condition.

3. INSTRUCTIONS BEFORE MAINTENANCE

1) INTERVAL OF MAINTENANCE

(1) You may inspect and service the truck by the period as described at based on service meter of LCD.

(2) Shorten the interval of inspect and service depending on site condition.(Such as dusty area, quarry, sea shore and etc.)

(3) Practice the entire related details at the same time when the service interval is doubled.
For example, in case of 250 hours, carry out all the maintenance each 250 hours, each 100 hours and daily sevice at the same time.

Service meter

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※ Time intervals between maintenance are largely determined by operating conditions. For example, operation in sandy, dusty locations requires shorter maintenance intervals than operation in clean ware-houses. The indicated intervals are intended for normal operation. The operating condition classifications are ;

① **Normal operation**
Eight hour material handling, mostly in buildings or in clean, open air on clean paved surfaces.

② **Harsh operation**

a. All harsh working environment

b. Long term heavy load operation

c. High and low temperature working environment

d. Sudden change in temperature

e. Dusty or sandy working environment

f. Highly corrosive chemical working environment

g. Damp working environment

If the lift truck is used in severe or extreme operating conditions, you must shorten the maintenance intervals accordingly.

※ **Since the operating environment of lift trucks varies widely, the above descriptions are highly generalized and should be applied as actual conditions dictate.**

2) PRECAUTION

(1) Start maintenance after you have the full knowledge of truck.

(2) The monitor installed on this truck does not entirely guarantee the condition of the truck.
Daily inspection should be performed according to maintenance.

(3) Engine and hydraulic components have been preset in the factory.
Do not allow unauthorized personnel to reset them.

(4) Ask to your local dealer or Hyundai for maintenance advise it unknown.

(5) Drain the used oil and coolant in a container and handle according to the method of handling for industrial waste to meet with regulations of each province or country.

3) PROPER MAINTENANCE

(1) Replace and repair of parts
It is required to replace the wearable and consumable parts such as fork, chain, hose, tube and filter etc., regularly. Replaced damaged or worn parts at proper time to keep the performance of truck.

(2) Use Hyundai genuine parts.

(3) Use the recommended oil.

(4) Remove the dust or water around the inlet of oil tank before supplying oil.

(5) Drain oil when the temperature of oil is warm.

(6) Do not repair anything while operating the engine.

(7) Stop the engine when you fill the oil.

(8) Relieve hydraulic system of the pressure by opening of breather when repairing the hydraulic system.

(9) Confirm if the cluster is in the normal condition after completion of service.

(10) For more detail information of maintenance, please contact local Hyundai dealer.

※ Be sure to start the maintenance after fully understanding the section 1, safety hints.

4) PRECAUTION WHEN INSTALLING HYDRAULIC HOSES OR PIPE.

(1) Be particularly careful that joint of hose, pipe and functioning item are not damaged.
Avoid contamination.

(2) Assemble after cleaning the hose, pipe and joint of function item.

(3) Use Hyundai genuine parts.

(4) Do not assemble the hose in the condition of twisted or sharp radius.

(5) Keep the specified tighten torque.

5) PERIODICAL REPLACEMENT OF SAFETY PARTS

(1) These are the parts which the operator cannot judge the remained lifetime of them by visual inspection.

(2) Repair or replace if an abnormality of these parts is found even before the recommended replacement interval.

※ **Replacement of consumable service parts is not covered under warranty.**

Periodical replacement of safety parts		Interval
1	Fuel hose	Every 2 to 4 years
2	Hydraulic pump hose	Every 2 years
3	Power steering hose	Every 2 years
4	Packing, seal, and O-ring of steering cylinder	Every 2 to 4 years
5	Lift chain	Every 2 to 4 years
6	Lift cylinder hose	Every 1 to 2 years
7	Tilt cylinder hose	Every 1 to 2 years
8	Side shift cylinder hose	Every 1 to 2 years
9	Master cylinder and wheel cylinder caps dust seals	Every 1 years
10	Brake hose or tube	Every 1 to 2 years
11	Brake reservoir tank tube	Every 2 to 4 years
12	Intake air line	Every 2 years
13	Coolant hose and clamps	Every 2 years

※ **Replace the O-ring and gasket at the same time when replacing the hose.**

※ **Replace clamp at the same time if the hose clamp is cracked when checking and replacing hose.**

6) EMISSION-RELATED COMPONENTS WARRANTY (USA AND CANADA ONLY)

Hyundai shall have obligation under the EPA (Environmental Protection Agency) regulation of warranty about Emission-related components. This warranty shall exist for 3,000 hours or five years, whichever occurs first.

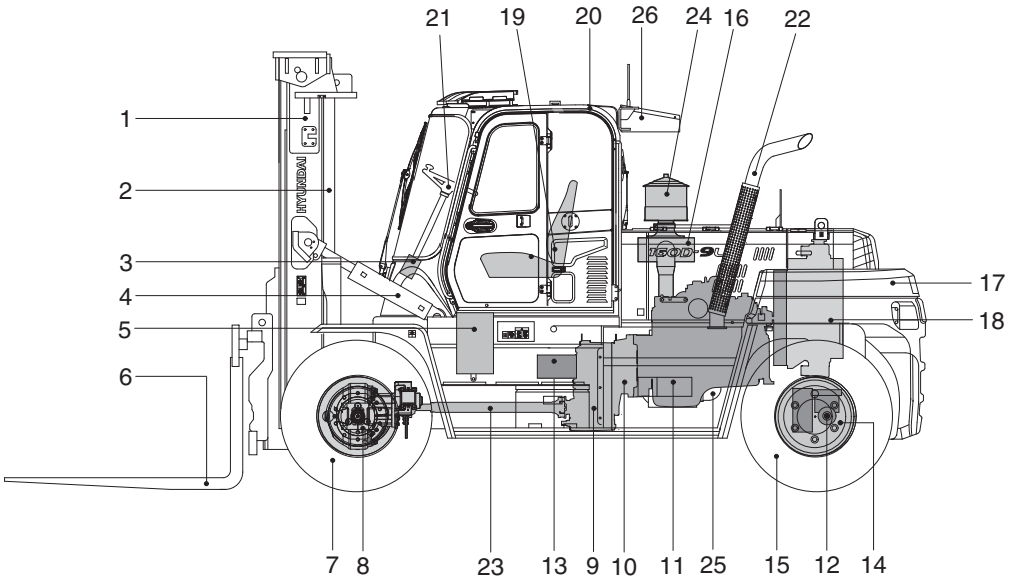
Naturally, this warranty does not cover to damage arising from accident, misuse or negligence, use of non-Hyundai parts, or from alterations not authorized by Hyundai.

※ **Emission-related components according to the EPA regulation.**

1. Air-induction system.
2. Fuel system.
3. Ignition system.
4. Exhaust gas recirculation systems.
5. After treatment devices.
6. Crankcase ventilation valves.
7. Sensors.
8. Electronic control units.

4. PLANNED MAINTENANCE INTERVALS

1) MAJOR COMPONENTS LOCATION



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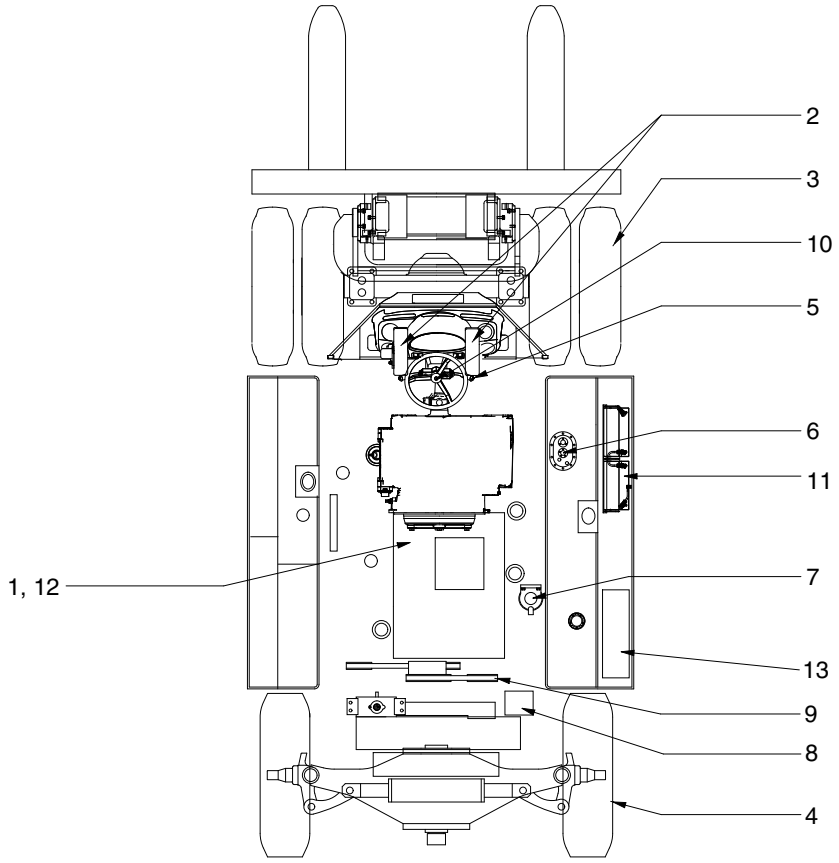
1	Mast	10	Torque converter	19	Seat
2	Lift cylinder	11	Engine	20	Cabin
3	Steering unit	12	Steering cylinder	21	Steering wheel
4	Tilt cylinder	13	Hydraulic pump	22	Silencer
5	Main control valve	14	Steering axle	23	Drive shaft
6	Fork	15	Rear wheel	24	Precleaner
7	Front wheel	16	Air cleaner	25	Aftertreatment device
8	Drive axle	17	Counterweight	26	Air conditioner (opt)
9	Transmission	18	Radiator		

2) SERVICE LOCATIONS



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※ Service intervals are based on the hourmeter reading.
※ Stop the engine when servicing.
※ Do not open the cap or drain plug to avoid injury by unexpected spouting of high temperature fluid or gas.
※ Open the cap slowly to relieve pressure.
※ Always keep the surface of control & instrument panels clean in case of damage or malfunction detected in panel, replace it with a new one.
※ Depending on the ambient and operation contions, the replacement cycle may be shortened.
- All harsh working environment
- Long term heavy load operation
- High and low temperature working environment
- Sudden change in temperature
- Dusty or sandy working environment
- Highly corrosive chemical working environment
- Damp working environment

※ For other details, refer to the service manual.

3) DAILY (OR EVERY 10 HOURS) CHECK LIST

Item No.	Description	Service Action	Oil symbol	Capacity ℓ (U.S. gal)	Service point	Remark
1	Engine oil level	Check, Add	EO	14.2 (3.8)	1	7-17
2	Pedal linkage operation	Check, Adjust	-	-	1	7-54
3	Drive rim and tire air pressure	Check, Add	-	-	2	5-3, 7-14
4	Steer rim and tire air pressure	Check, Add or Replace	-	-	2	5-3, 7-14
5	Lamp operation	Check, Replace	-	-	9	7-54
6	Fuel level	Check, Add	DF	260 (68.7)	1	5-14
7	Prefilter	Check, Drain	-	-	1	7-26
8	Radiator coolant	Check, Add	C	30 (7.9)	1	7-19
9	Fan belt tension and damage	Check, Adjust, Replace	-	-	1	7-23
10	Horn operation	Check, Replace	-	-	1	7-52
11	Battery	Check, Clean	-	-	2	7-50, 51
12	Crankcase breather hose	Check	-	-	1	-
13	DEF level	Check, Add	DEF	37.8 (10.0)	1	7-29

※ Oil symbol
Refer to the recommended lubricants for specification.
DF : Diesel fuel HO : Hydraulic oil EO : Engine oil GO : Gear oil G : Grease
MO : Transmission oil BO : Brake cooling oil C : Coolant DEF : Diesel Exhaust Fluid

4) PERIODICAL CHECK LIST

Service item		Oil Symbol	Service interval Hours								Initial Hours		
			50	250	500	1000	1500	2000	3000	4000	50i	100i	250i
Tightening (Mounting bolt)	Pump, MCV, steering unit, priority valve				T								T
	Tilt cylinder rod cover				T								T
	Lift, attachment, steering cylinder							T					
	Mast				T								
	Drive and steering axle				T								
	Drive and steering axle wheel		T										
	Counterweight, cabin		T										
	Engine, radiator, transmission		T										
	Hose, fitting, clamp (fuel, coolant, hydraulic)							T					
Lubrication	Tilt pin and mast roller	G			L								L
	Lift chain	EO			L								L
	Steering axle (linkage, kingpin, trunnion	G		L									
	Attachment cylinder rod and tube end			L									
	Pedal pivot				L								
	Drive shaft			L*1	L*2								
	Tilt cylinder rod	G		L*1	L*2								
	Tilt cylinder tube end	G			L								
	Steering unit spline (column shaft)	G						L					
Oli Leakage	Hydraulic tank				I								I
	Valve (MCV, priority, brake)				I								I
	Pump, steering unit				I								I
	Lift, tilt, steering cylinder			I*1	I*2								I
Function test	Steering wheel operation				I								I
	Natural drop and forward tilt							I					
	Fork load indicator (option)							I					
	Mast tilt angle measurement							M					
Periodic replacement parts	Engine oil	EO			R						R		
	Engine oil filter				R						R		
	Fuel filter				R								
	Prefilter element				R								
	Air cleaner element			Clean		R							
	Transmission oil	MO			A	R						R	
	Transmission oil filter					R						R	
	Axle gear oil	GO			A	R						R	
	Brake cooling oil and straniner	BO		A		R							
	Radiator coolant	C						R					
	Pilot line filter element					R					R		
	Aftertreatment DEF dosing unit filter					C				R			
	Urea level sensor suction filter									R			
	Crankcase breather filter							R					
	Charge air cooler				Clean								
	Brake line filter				Clean*5	Clean*6							
	Air conditioner filter				Clean	R							
	Fan belt tensioner					C							
	Fan belt					R							
	Hydraulic oil tank air breather filter			R*1	R*2								
	Hydraulic oil return filter					R							
	Hydraulic oil suction strainer							Clean					
	Hydraulic oil	HO		A				R*3		R*4 (5000)			

*1 Harsh condition *2 Normal condition *3 Conventional hydraulic oil *4 Hyundai genuine long life hydraulic oil

A : Aid C : Checking L : Lubrication R : Replacement T : Retightening

I : Visual inspection (repair or replace if required) M : Measurement (adjust if required)

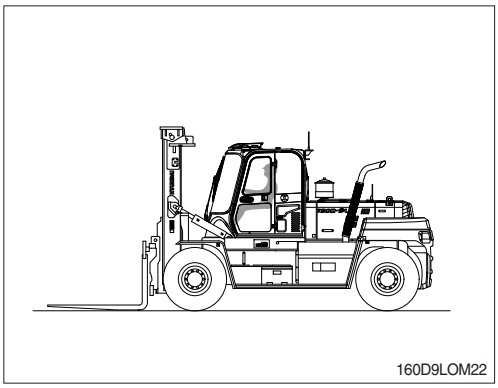
*5 160D-9L : ~#126 *6 160D-9L : #127~

5. HOW TO PERFORM PLANNED MAINTENANCE

1) VISUAL INSPECTION

First, perform a visual inspection of the lift truck and its components. Walk around the truck and take note of any obvious damage or maintenance problems.

Check to be sure all capacity, safety, and warning plates are attached and legible.



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※ **NAMEPLATES AND DECALS: Do not operate a lift truck with damage or lost decals and nameplates. Replace them immediately. They contain important information.**

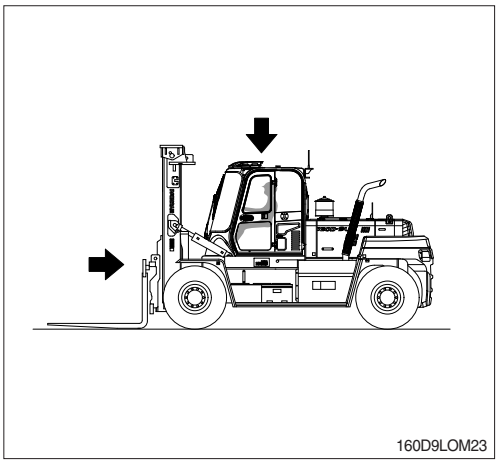
Inspect the truck, before and after starting the engine, for any sign of external leakage of fuel, engine coolant, transmission fluid, etc..

Check for hydraulic oil leaks and loose fittings.

⚠ **HYDRAULIC FUILD PRESSURE: Do not use your hands to check for hydraulic leakage. Fluid under pressure can penetrate your skin and cause serious injury.**

2) CABIN

Be sure that the driver's cabin and any safety devices are in place, undamaged, and attached securely. Check the cabin for damage. Be sure that it is properly positioned and all mounting fasteners are in place and tight.



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3) LOAD HANDLING COMPONENTS

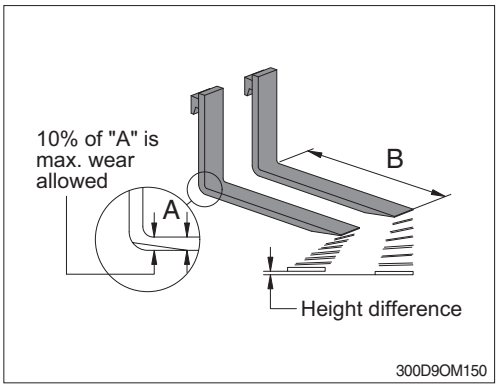
Inspect the mast assembly, load backrest, rails, carriage rollers, lift chains, and lift and tilt cylinders. Look for obvious wear and maintenance problems and damaged or missing parts. Check for any loose parts or fittings. Check for leaks, damaged or loose rollers, and rail wear (metal flaking). Carefully check the lift chains for wear, rust, corrosion, cracked or broken links, stretching etc.. Check that the lift and carriage chains are correctly adjusted to have equal tension. Check that the lift chain anchor fasteners and locking means are in place and tight. Inspect all lift line hydraulic connections for leaks.

△ **Mast and lift chains require special attention and maintenance to remain in safe operating condition. Refer to lift chain maintenance in this section for additional information.**

4) FORKS

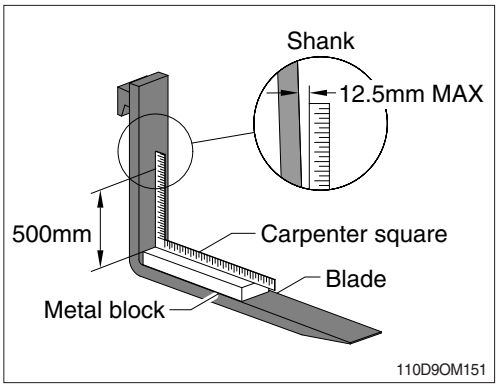
Inspect the load forks for cracks, breaks, bending, and wear. The fork top surfaces should be level and even with each other. The height difference between both fork tips refer to below table.

Model	Fork length (B) (mm)	Height difference (mm)
160D-9L, 180D-9B	below 1500	3
	above 1500	6



⚠ If the fork blade at the heel is worn down by more than 10%, the load capacity is reduced and the fork must be replaced.

Inspect the forks for twists and bends. Put a 50 mm (2 in) thick metal block, at least 100 mm (4 in) wide by 600 mm (24in) long with parallel sides, on the blade of the fork with the 100 mm (4 in) surface against the blade. Put a 600 mm (24 in) carpenter's square on the top of the block and against the shank. Check the fork 500 mm (20 in) above the metal block to make sure it is not bent more than 12.5 mm (0.5 in) maximum.

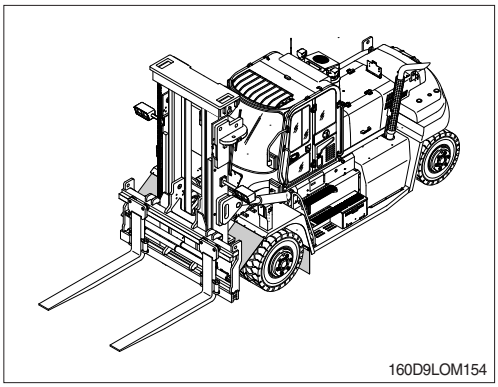


※ If the fork blades are obviously bent or damaged, have them inspected by a trained maintenance person before operating the truck.

Inspect the fork locking pins for cracks or damage. Reinsert them and note whether they fit properly.

5) SIDE SHIFT

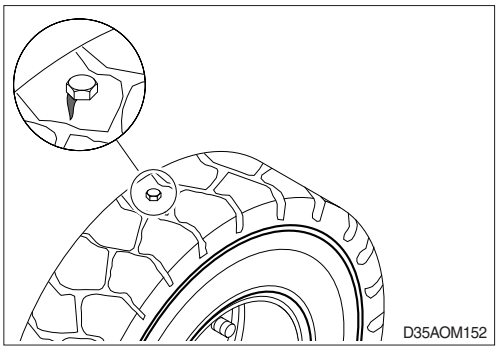
When operating the lever for the side shift and the hanger bar which the forks and the backrest are mounted on it, operator can accurately insert the forks under pallets or stack loads correctly without moving the fork lift.



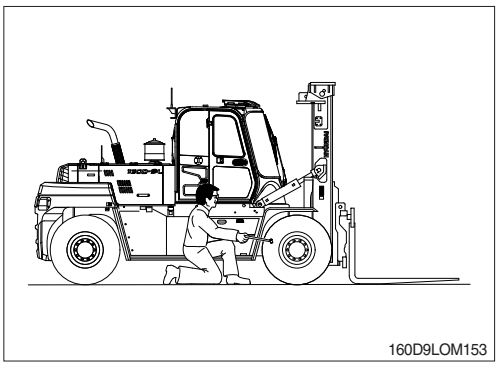
6) WHEEL AND TIRES

Check the condition of the drive and steering wheels and tires. Remove objects that are embedded in the tread. Inspect the tires for excessive wear and breaks or **chunking out**.

Check all wheel lug nuts or bolts to be sure none are loose or missing. Replace missing bolts or lug nuts. Torque loose or replaced items to specifications.



⚠ Check tire pressure from a position facing the tread of the tire, not form the side. Use a long handled gauge to keep your body away from the side. If tires are low, do not operate and do not add air. Check with a mechanic. The tire may require removal and repair.
Incorrect (low) tire pressure can reduce the stability of your lift truck. Do not operate truck with low tire pressure.



· Proper cold inflation : Refer to attached decal.

7) TILTING CABIN

⚠ **Keep clearance of people except the operator before tilting the cabin.**

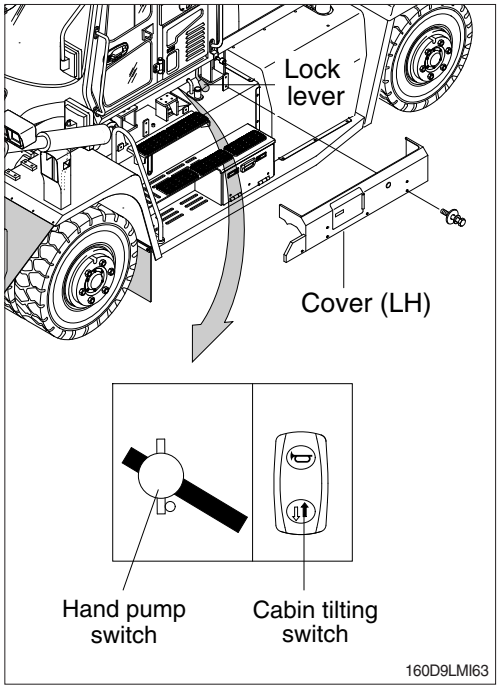
⚠ **Before tilting the cabin, make sure that the mast is vertical or tilted forward. Otherwise, the operation could be blocked by mast tilt cylinders.**

(1) Locate the truck on the plain and stable floor.

※ **Apply parking brake before servicing.**

(2) Turn the start switch to OFF position.
Remove the frame cover (LH) by removing the mounting bolts. The cabin tilt switch is located between cabin and side frame.

(3) By tilting the cabin, service of hydraulic and electric system such as hydraulic components, hydraulic pipings, electric components, and electric wirings can be easily performed. It is recommended that the service requiring tilting cabin must be carefully performed with a skilled service man.



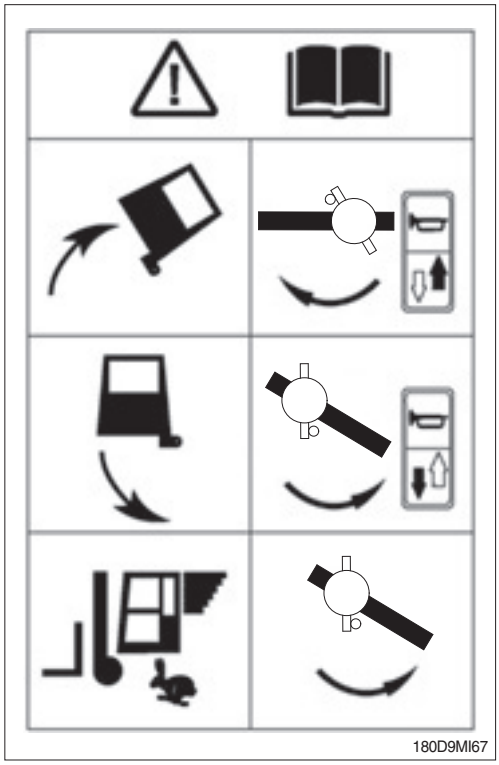
(4) Tilting and returning cabin

※ **Refer to page 3-39 for the cabin tilt switch and hand pump lever.**

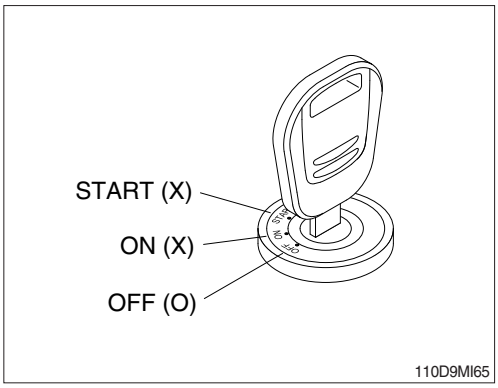
① **Tilting cabin**
After keeping clearance of the people except the operator along with sounding horn, turn the hand pump lever clockwise and then, continuously press the cabin tilt switch to tilt the cabin to right side.

② **Returning cabin**
After keeping clearance of the people except the operator along with sounding horn, turn the hand pump lever counterclockwise and then, continuously press the cabin tilt switch to return the cabin to original location.

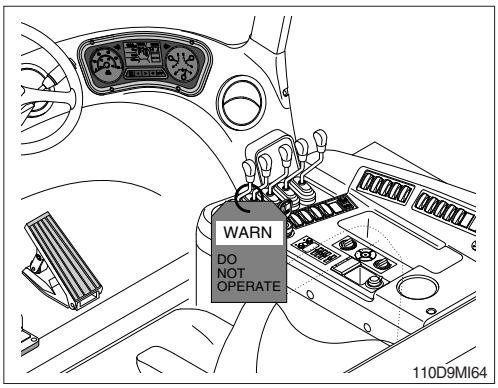
※ **Take care that it must perform by a trained people in order to prevent from abnormal operation.**



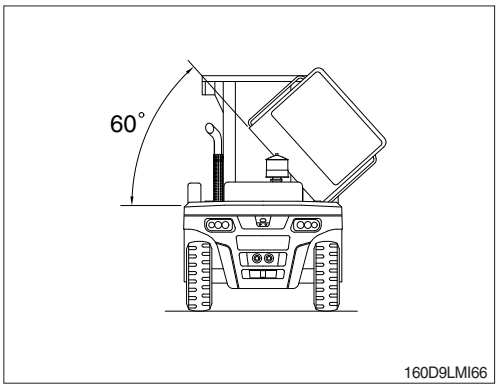
⚠ Do not operate cabin tilting function while the power is ON or engine is running.



⚠ Do not operate the tilt control switch or any control parts while servicing under the tilted cabin. It can cause severe injury or death.



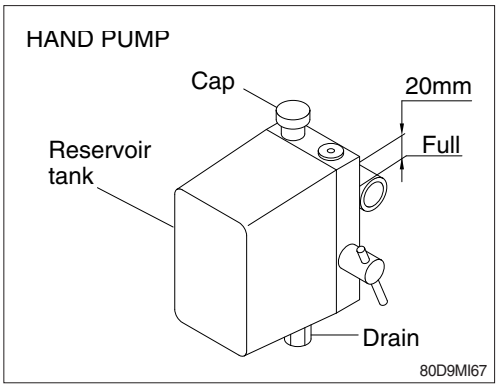
※ The angle of fully tilted cabin is 60°.



(5) Fill and check hydraulic oil for hand pump.

Open upper cap and fill 0.8 ℓ by using funnel. After filling, operate tilt cylinder 2~3 times and close the cabin completely to check the oil level in tank. If necessary, fill more oil to keep the level.

· Tank capacity : 0.7 ℓ
· System total capacity : 1.2 ℓ



1) CHECK ENGINE OIL LEVEL

Check the oil level with the truck on a flat ground before starting the engine.

(1) Pull out the dipstick and wipe with a clean cloth.

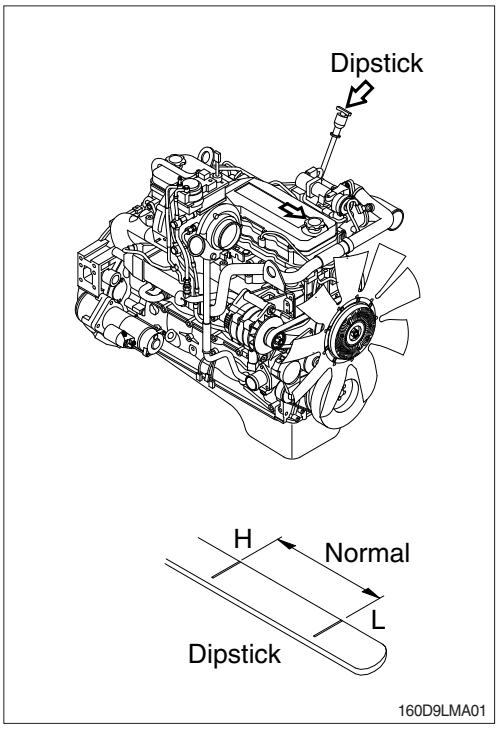
(2) Check the oil level by inserting the dipstick completely into the hole and pulling out again.

(3) If oil level is LOW, add oil and then check again.

※ **If the oil is contaminated or diluted, change the oil regardless of the regular change interval.**

※ **Check oil level after engine has been stopped for 15 minutes.**

⚠ **Do not operate unless the oil level is in the normal range.**

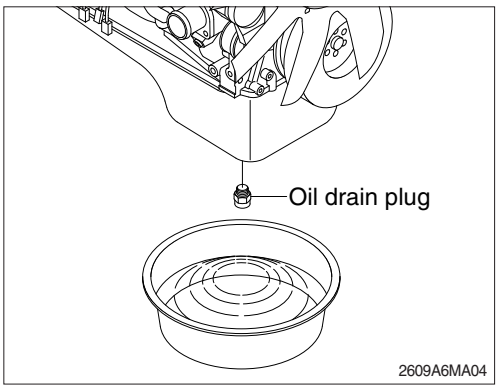


2) REPLACEMENT OF ENGINE OIL AND OIL FILTER

(1) Warm up the engine until the water temperature reaches 60 ˚C (140 ˚F).

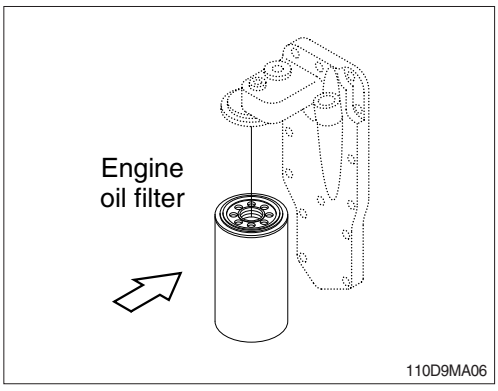
(2) Remove the oil drain plug. Drain the oil immediately to be sure all the oil and suspended contaminants are removed from the engine.

※ **A drain pan with a capacity of 30 liters (7.9 U.S. gallons) will be adequate.**



(3) Clean around the filter head, remove the filter by the filter wrench and clean the gasket surface.

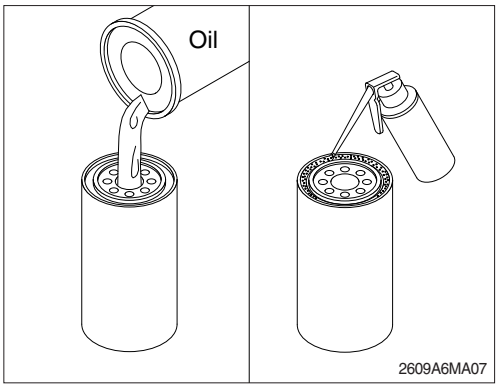
※ **The O-ring can stick on the filter head. Be sure it is removed before installing the new filter.**



(4) Apply a light film of lubricating oil to the gasket sealing surface before installing the filter.

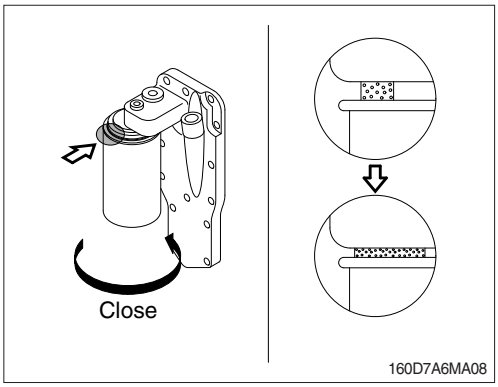
※ **Fill the filter with clean lubricating oil.**

⚠ **The lack of lubrication during the delay until the filter is pumped full of the start-up can damage the engine.**



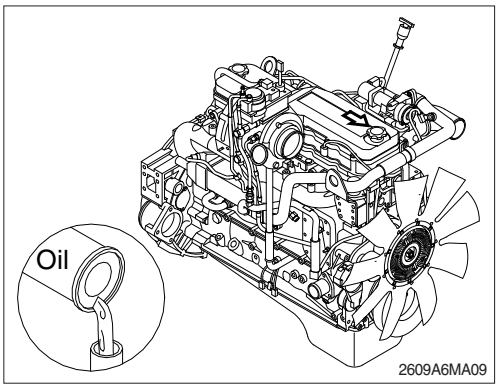
(5) Install the filter to the filter head.
Tighten the filter until the gasket contacts the filter head surface.
Tighten 3/4 to 1 turn the gasket makes contact with filter head.

※ **Mechanical over-tightening may distort the threads or damage the filter element seal.**



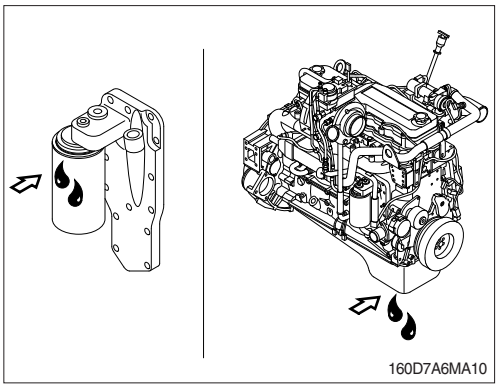
(6) Clean and check the lubricating oil drain plug threads and sealing surface.
Install the lubricating oil pan drain plug.
· Tightening torque
M18 : 6.1 kgf · m (44 lbf · ft)
M22 : 8.2 kgf · m (59 lbf · ft)

(7) Fill the engine with clean oil to the proper level.
· Quantity : 14.2 ℓ (3.7 U.S.gallons)



(8) Operate the engine at low idle and inspect for leaks at the filters and the drain plug.
Shut the engine off and check the oil level with the dipstick. Add oil as necessary to bring the oil level to the H (high) mark on the dipstick.

※ **Allow 15 minutes for oil to drain down before checking.**



3) CHECK COOLANT LEVEL

(1) Check the coolant level at reservoir tank when the engine is cooled.

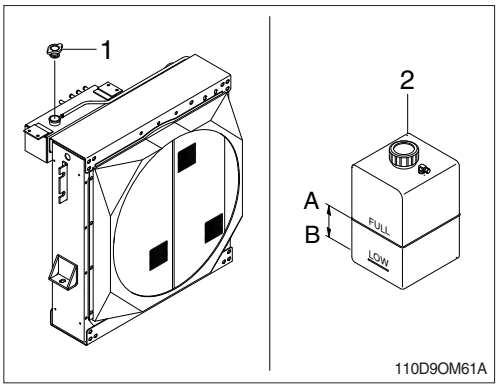
(2) Add the mixture of antifreeze and water after removing the cap of the reservoir tank if coolant is not sufficient.

(3) The coolant level should indicate between FULL and LOW.

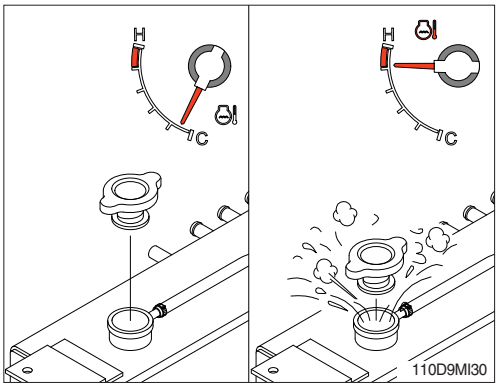
(4) Replace gasket of surge tank cap when it is damaged.

⚠ **Do not remove the surge tank cap from a hot engine. Wait until the coolant temperature is below 50 ˚C (120 ˚F) before removing the surge tank cap. Heated coolant spray or steam can cause personal injury.**

※ **Do not add cold coolant to a hot engine ; engine castings can be damaged. Allow the engine to cool to below 50 ˚C (120 ˚F) before adding coolant.**



1	Surge tank cap	A	FULL
2	Reservoir tank	B	LOW

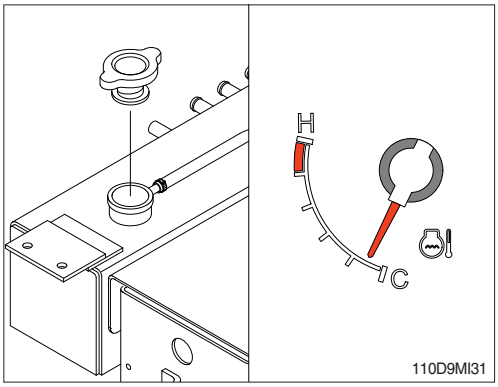


4) FLUSHING AND REFILLING OF RADIATOR

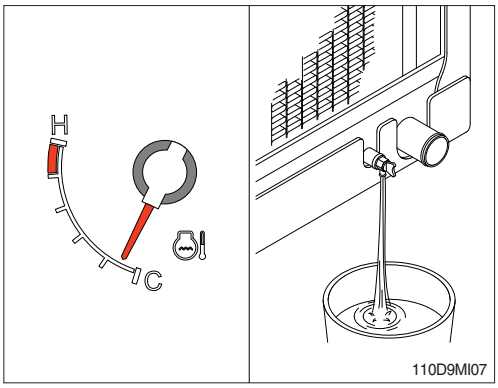
(1) Change coolant

⚠ **Avoid prolonged and repeated skin contact with used antifreeze. Such prolonged repeated contact can cause skin disorders or other bodily injury.**
Avoid excessive contact-wash thoroughly after contact.
Keep out of reach of children.

※ **Protect the environment : Handling and disposal of used antifreeze can be subject to federal, state, and local law regulation.**
Use authorized waste disposal facilities, including civic amenity sites and garages providing authorized facilities for the receipt of used antifreeze.
If in doubt, contact your local authorities for guidance as to proper handling of used antifreeze.



⚠ Wait until the temperature is below 50 ˚C (122 ˚F) before removing the coolant system pressure cap.
Failure to do so can cause personal injury from heated coolant spray.
Drain the cooling system by opening the drain valve on the radiator and opening the drain valve on the bottom of the engine oil cooler housing.
A drain pan with a capacity of 45 liters (11.9 U.S. gallons) will be adequate.

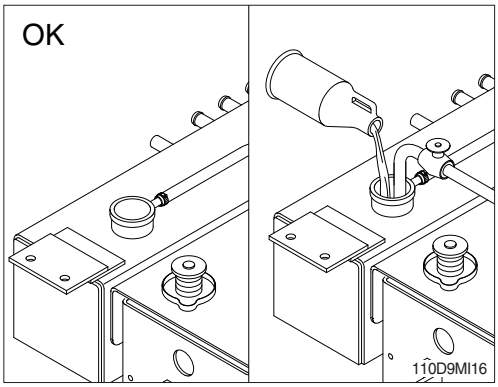


(2) Flushing of cooling system

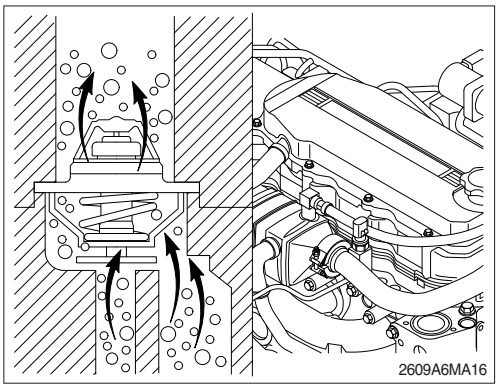
① Fill the system with a mixture of sodium carbonate and water (or a commercially available equivalent).

※ Use 0.5 kg (1.0 pound) of sodium carbonate for every 23 liters (6.0 U.S. gallons) of water.

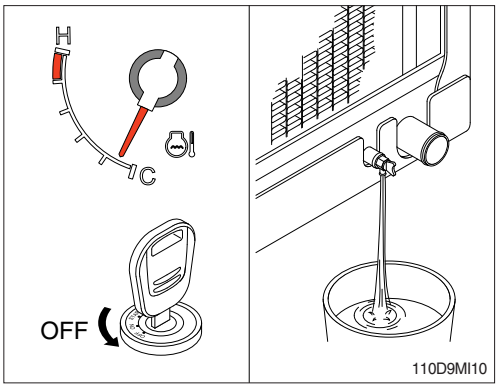
※ Do not install the surge tank cap. The engine is to be operated without the cap for this process.



※ During filling, air must be vented from the engine coolant passages.
The system must be filled slowly to prevent air locks or serious engine damage can result. Wait 2 to 3 minutes to allow air to be vented, then add mixture to bring the level to the top.



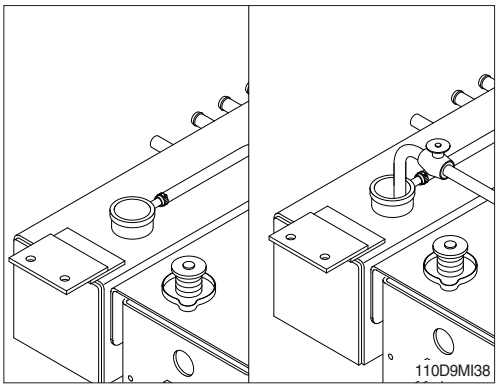
② Operate the engine for 5 minutes with the coolant temperature above 80 ˚C (176 ˚F).
Shut the engine off, and drain the cooling system.



③ Fill the cooling system with clean water.

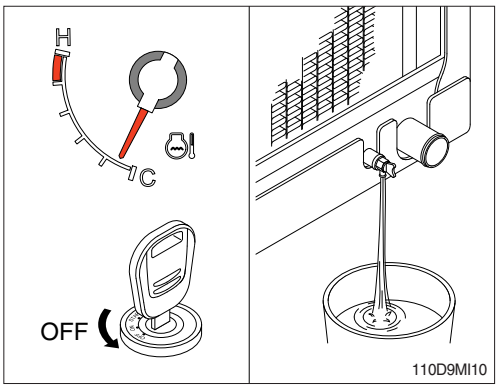
※ **Be sure to vent the engine and aftercooler for complete filling.**

※ **Do not install the surge tank cap or the new coolant filter.**



④ Operate the engine for 5 minutes with the coolant temperature above 80 ˚C (176 ˚F).
Shut the engine off, and drain the cooling system.

※ **If the water being drained is still dirty, the system must be flushed again until the water is clean.**

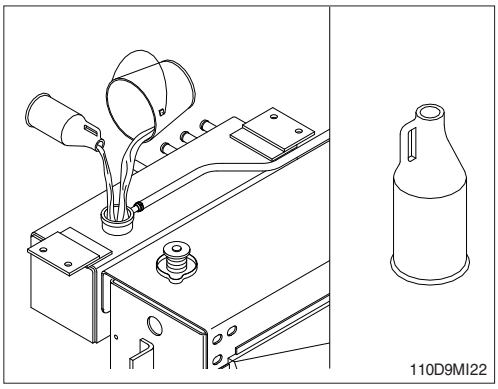


(3) Cooling system filling

① Use a mixture of 50 percent water and 50 percent ethylene glycol antifreeze to fill the cooling system. Refer to the page 7-63.
Coolant capacity (engine only) : 10 ℓ (2.6 U.S. gallons)

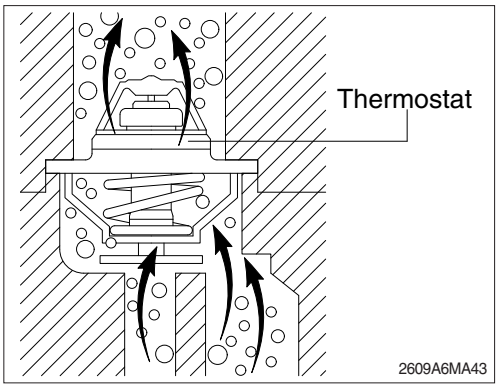
※ **Use the correct amount of DCA4 corrosion inhibitor to protect the cooling system.**

※ **Do not use hard water such as river water or well water.**

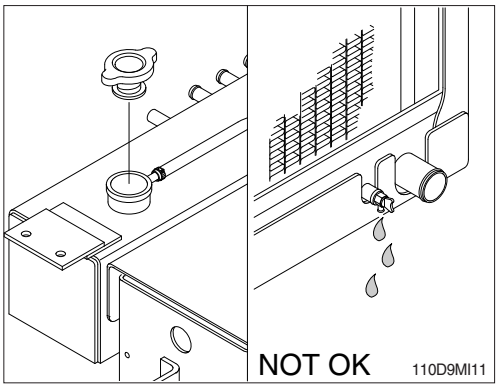


② The system has a maximum fill rate of 19 liters (5.0 U.S. gallons) per minute.
Do not exceed this fill rate.

※ **The system must be filled slowly to prevent air locks.**
During filling, air must be vented from the engine coolant passage.



③ Install the surge tank cap. Operate the engine until it reaches a temperature 80 ˚C (176 ˚F), and check for coolant leaks.
Check the coolant level again to make sure the system is full of coolant.

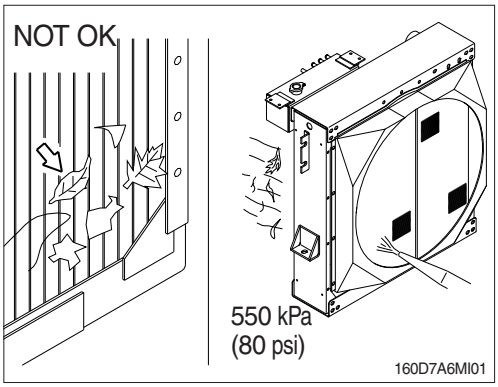


5) CLEAN RADIATOR AND OIL COOLER

Check, and if necessary, clean and dry outside of radiator and oil cooler. After working in a dusty place, clean radiator more frequently.

(1) Visually inspect the radiator for clogged radiator fins.

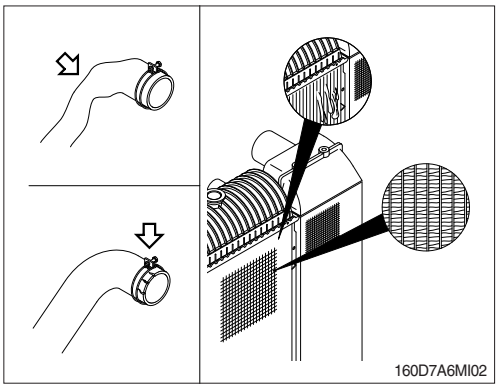
(2) Use 550 kPa (80 psi) air pressure to blow the dirt and debris from the fins.
Blow the air in the opposite direction of the fan air flow.



(3) Visually inspect the radiator for bent or broken fins.

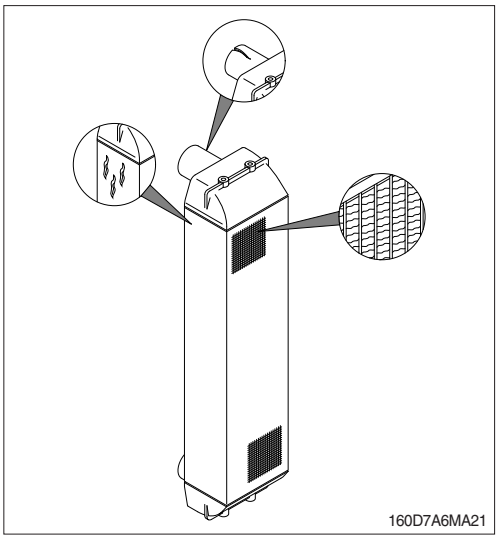
※ **If the radiator must be replaced due to bent or broken fins which can cause the engine to overheat, refer to the manufacturer's replacement procedures.**

(4) Visually inspect the radiator for core leaks.



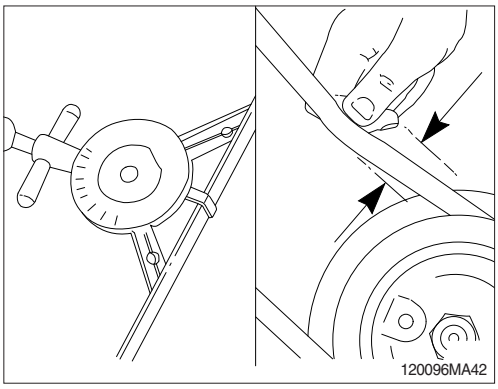
6) CHECK CHARGE AIR COOLER

Inspect the charge air cooler for dirt and debris blocking the fins. Check for cracks, holes, or other damage. If damage is found, please contact Hyundai distributor.



7) FAN BELT

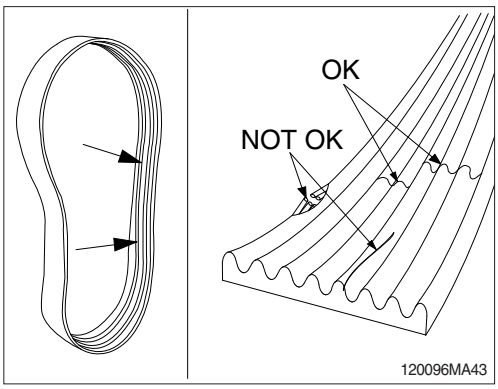
(1) An deflection method can be used to check belt tension by applying 11.3 kgf (25 lbf) force between the pulleys on V-belts. If the deflection is more than one belt thickness per foot of pulley center distance, the belt tension must be adjusted.



(2) Inspect the drive belt for damage.

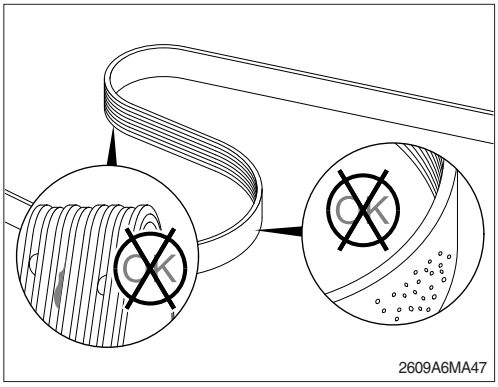
① Transverse (across the belt) cracks are acceptable.

② Longitudinal (direction of belt rids) cracks that intersect with transverse cracks are not acceptable.



③ Inspect the belt
- Embedded debris
- Uneven/excessive rib wear
- Exposed belt cords
- Glazing (high heat)

※ If any of the above conditions are pressnt, the belt is unacceptable for reuse and must be replaced.



8) INSPECTION OF COOLING FAN

※ Personal injury can result from a fan blade failure. Never pull or pry on the fan. This can damage the fan blade and cause fan failure.

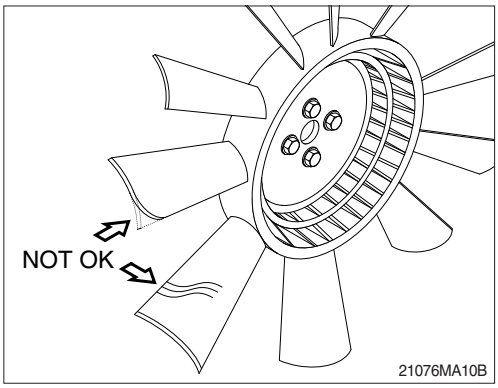
※ Rotate the crankshaft by using the engine bearing gear.

※ A visual inspection of the cooling fan is required daily.

Check for cracks, loose rivets, and bent or loose blades.

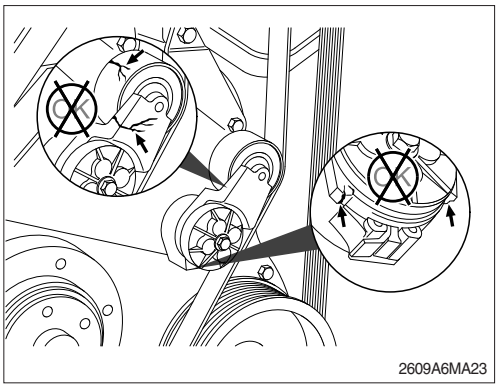
Check the fan to make sure it is securely mounted. Tighten the capscrews if necessary.

Replace any fan that is damaged.

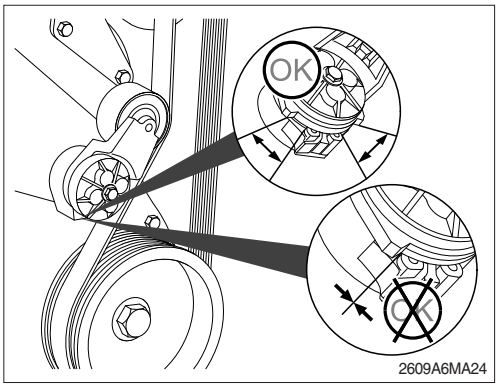


9) FAN BELT TENSIONER

(1) With the engine stopped, check the tensioner arm, pulley, and stops for cracks. If any cracks are found, the tensioner must be replaced.

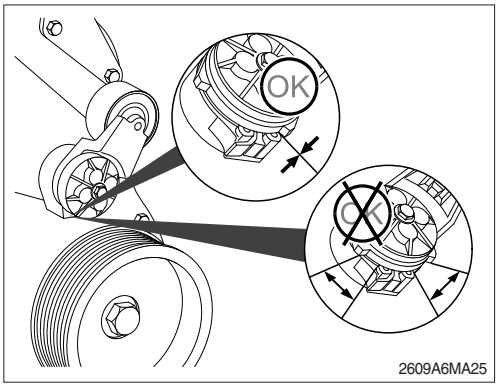


(2) With the belt installed, verify that neither tensioner arm stop is in contact with the spring case stop.
After replacing the belt, if the tensioner arm stops are still in contact with the spring case stop, replace the tensioner.

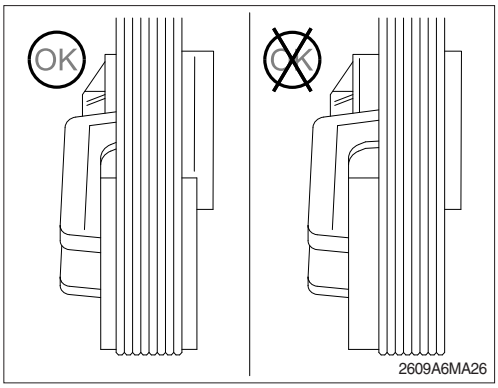


(3) With the belt removed, verify that the tensioner arm stop is in contact with the spring case stop.
If these two are not touching, the tensioner must be replaced.

※ **After replacing the belt, if the tensioner arm stop is still in contact with the spring case stop, the tensioner must be replace.**



(4) Check the location of the drive belt on the belt tensioner pulley. The belt should be centered on, or close to the middle of, the pulley. Misaligned belts, either too far forward or backward, can cause belt wear, belt roll-offs, or increase uneven tensioner bushing wear.



10) CLEANING OF AIR CLEANER

(1) Primary element

① Open the cover and remove the element.

② Wipe all contaminant and debris from inside the housing body.

③ Do not clean the filter element by striking or hitting the filter against any object to shake the debris from the filter element.

④ Clean the filter element with compressed air.

a. Remove dust from filter element by directing the compressed air into the opening of the air filter element.

b. Use 3 kg/cm^2 (40 psi) maximum air pressure and hold the compressed air nozzle at least 2.5 cm (1") away from the pleats while cleaning. Make sure to keep the clean side of air filter free of debris.

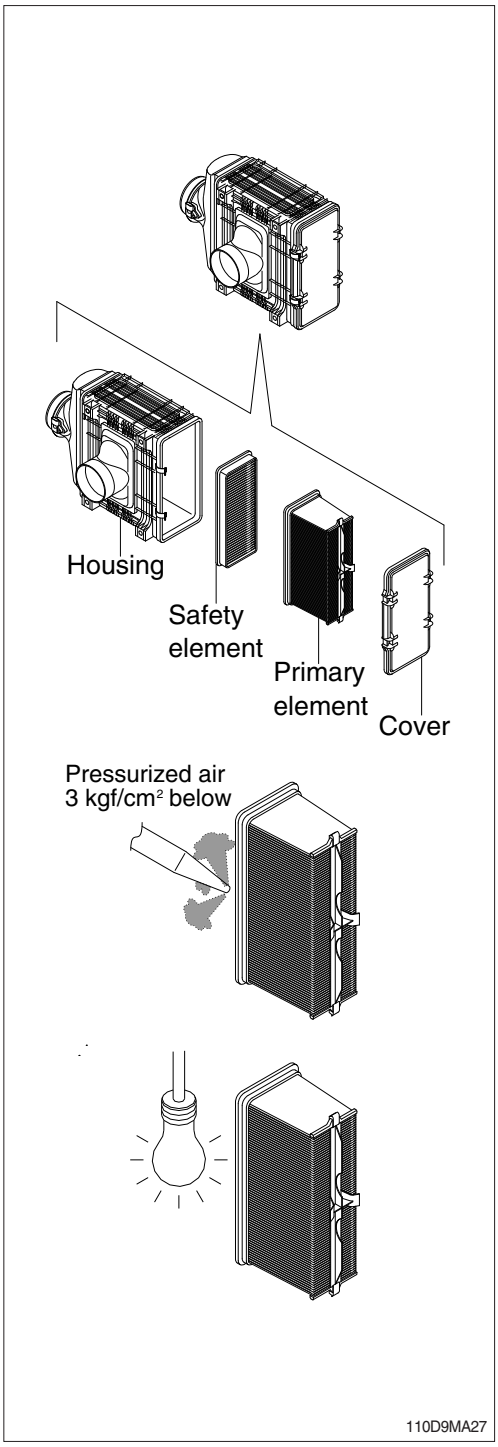
⑤ Visually inspect for damage to the filter elements and components. Use a light source to help identify any defects in the media. If any defects are observed discard the filter element and replace with a new primary filter element.

a. Before any type of cleaning, a visual inspection of the filter is needed. If there is any damage to the filter body, gaskets or endplates, do not clean or reuse; the filter should be discarded. Always clean filters in a clean environment, observe strict inspection procedures and repackage filters immediately after the cleaning process with appropriate materials.

b. Use observe proper safety precautions and dispose of waste materials in an environmentally compliant manner.

⑥ Re-install filter element into the air housing.

⑦ Replace the primary element at the fourth cleaning.



(2) Safety element

The safety filter element should never be cleaned since the safety filter is the last barrier to contaminant before it reaches engine.

The useful life of the safety filter is equivalent to that of the primary air filter only if the primary filter element is being regularly cleaned. If the primary filter element is not cleaned, the safety filter should be changed at every third primary air filter change or after one year of continuous service, whichever occurs first.

11) FUEL TANK

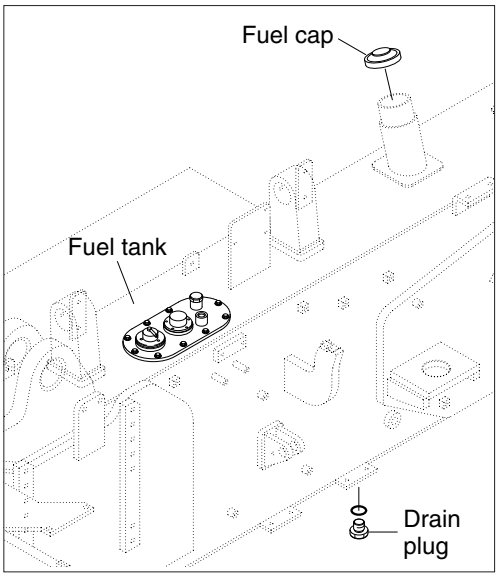
(1) Fill fuel fully when system the operation to minimize water condensation, and check it with fuel gauge before starting the truck.

(2) Drain the water and sediment in the fuel tank by opening the drain plug.

※ **Be sure to LOCK the cap of fuel tank.**

※ **Remove the strainer of the fuel tank and clean it if contaminated.**

⚠ **Stop the engine when refueling.**
All lights and flames shall be kept at a safe distance while refueling.



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12) PREFILTER

※ **Inspect or drain the collection bowl of water daily and replace the element every 500 hours.**

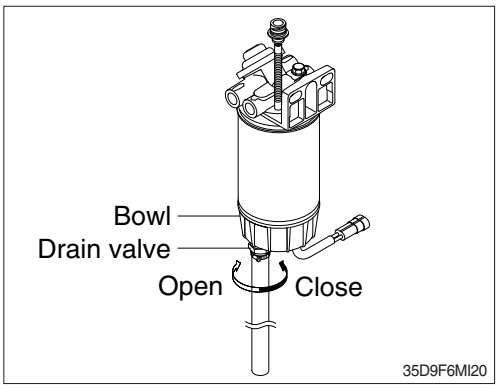
(1) Drain water

① Open bowl drain valve to evacuate water.

② Close drain valve.

※ **Don't tighten up a drain valve so strong.**

※ **Please inspect and drain water frequently for remain water volume to be less than 1/3 volume of a collection bowl.**



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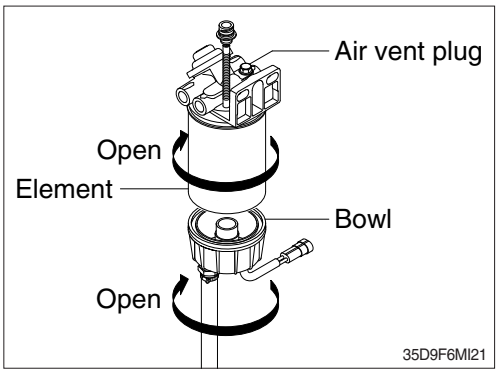
(2) Replace element

① Loosen the air vent plug and drain the fuel of the unit. Follow "Drain water" instructions above.

② Remove element and bowl from filter head.

※ **The bowl is reusable, do not damage or discard.**

③ Separate element from bowl. Clean bowl and seal gland.



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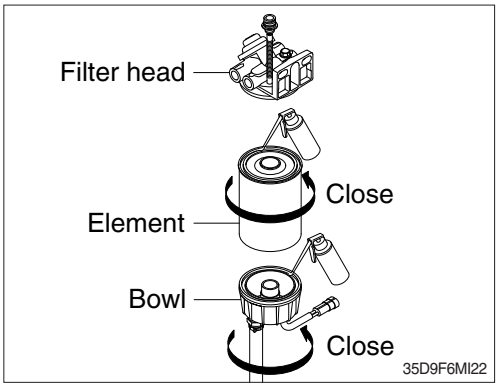
④ Lubricate new bowl seal with clean fuel or motor oil and place in bowl gland.

⑤ Attach bowl to new element firmly by hand.

⑥ Lubricate new element seal and place in element top gland.

⑦ Attach the element and bowl to the head.



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13) REPLACEMENT OF FUEL FILTER

※ Clean all around the filter area before remove the fuel filter. Dirt or contaminants can damage the fuel system.

(1) Remove the fuel filter cartridge (1) with 1 inch hex wrench.

※ Make sure the O-ring does not stick to the fuel filter head.
Remove the O-ring with a screwdriver, if necessary.

(2) Apply a thin layer of fuel to the surface of the new filter cartridge O-ring before you put it on.

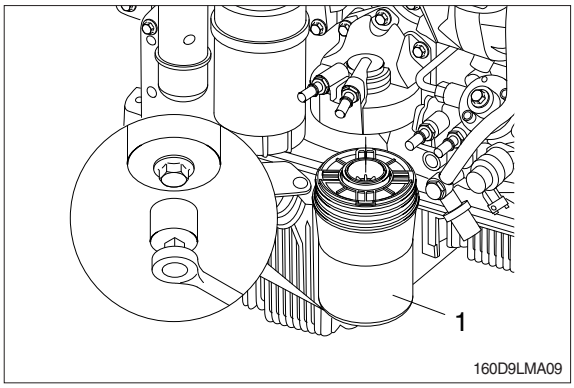
※ Do not pour fuel directly in the center of the filter, since this will allow unfiltered fuel to enter the system and can cause damage to fuel system components.

(3) Tighten the new cartridge until the gasket contacts the filter head surface and tighten it an additional 3/4 turn after contact by hand.

· Tightening torque : 3.9 kgf · m (38 lbf · ft)

※ It is not necessary to vent air from the high pressure system before starting the engine.
Cranking the engine will prime the fuel system.

(4) Operate the engine for a while and check if there is not the fuel leakage from the filter.



1 Fuel filter cartridge

14) BLEEDING THE FUEL SYSTEM

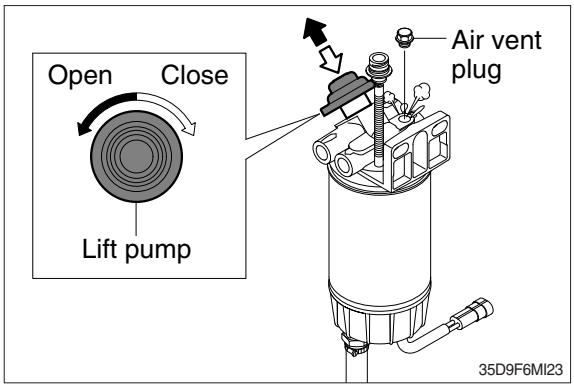
(1) Loosen air vent plug at the outlet of prefilter.

(2) Do hand-priming the lift pump repeatedly until air bubbles comes out from air vent plug hole completely.

(3) Tighten air vent plug to its origin position.

⚠ **Do not vent the fuel system on a hot engine. this can cause fuel to spill onto a hot exhaust manifold, which can cause a fire.**

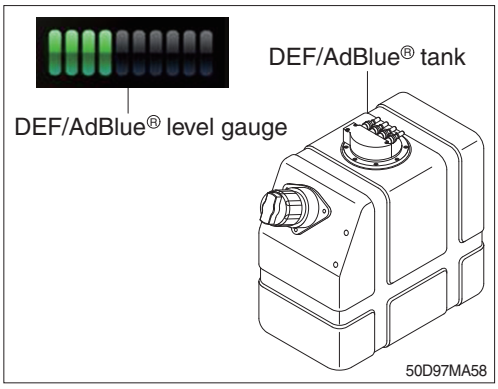
⚠ **The fuel pump, high-pressure fuel lines, and fuel rail contain very high-pressure fuel. Do not loosen any fittings while the engine is running. Personal injury and property damage can result. Wait at least 10 minutes after shutting down the engine before loosening any fittings in the high-pressure fuel system to allow pressure to do decrease to a lower level.**



15) DEF/AdBlue® TANK

(1) The DEF/AdBlue® tank level must be checked daily with DEF/AdBlue® level gauge.

⚠ **It is unlawful to tamper with or remove any component of the aftertreatment system. It is also unlawful to use a catalyst solution that does not meet the specifications provided or the operate the truck with no catalytic solution.**

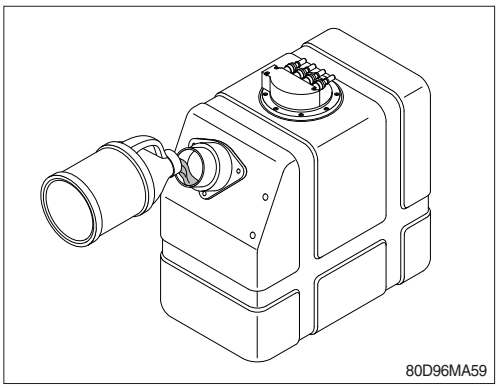


(2) If the DEF/AdBlue® level is found to below, DEF/AdBlue® must be added.

Before filling the tank

① Switch off the engine.

② Secure the truck against rolling away. Always fill the tank with at least 5 liters, as smaller amounts could cause malfuctions.



⚠ **Be careful to entering dust, sand or other contamination substance when you refill the DEF/AdBlue® into the tank. Otherwise, fatal problem such as engine idle locking, derating or engine stopping can be happen.**

⚠ **Do not allow diesel fuel to run into the DEF/AdBlue® tank. Otherwise, you could damage the exhaust gas aftertreatment system.**

⚠ **Do not mix additives to DEF/AdBlue®.**

16) DEF/ADBLUE® DOSING UNIT FILTER

(1) Remove

※ There may be residual DEF in the filter housing. A collection container placed below the DEF filter cap is recommended.

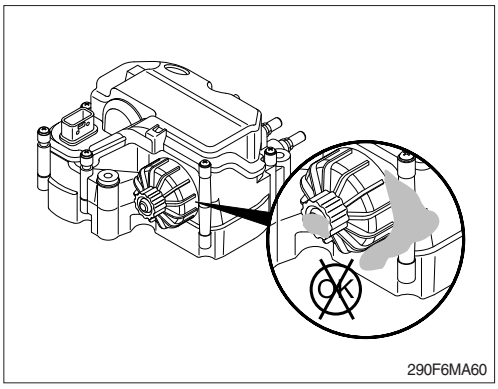
① Inspect the area around the seal and vent of DEF/AdBlue® supply module filter cap for signs of leakage.

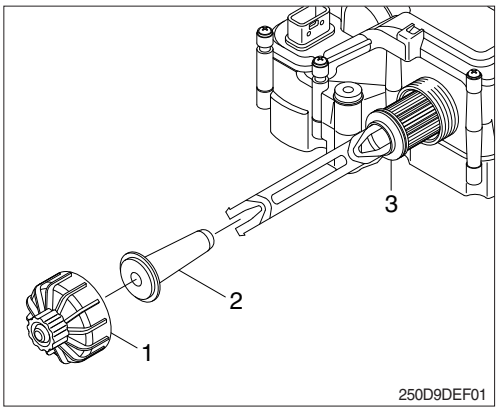
② Unscrew the DEF filter cap (1). A 27 mm wrench can be used on the cap to aid in removal.

③ Remove the aftertreatment DEF filter equalizing element (2).

④ Remove the old aftertreatment DEF dosing unit filter element (3). A disposable service tool is included with the filter to aid in filter removal.
Use the appropriate end of the tool, depending on the color of the plastic on the filter. When inserting the tool, a "click" sound can be heard which indicates proper engagement with the filter.

※ If the filter element and equalizing element are removed from the aftertreatment DEF dosing unit, they must be discarded and replaced; regardless of condition.





1 DEF dosing unit filter cap
2 DEF filter equalizing element
3 DEF dosing unit filter element

(2) Clean and inspect for reuse

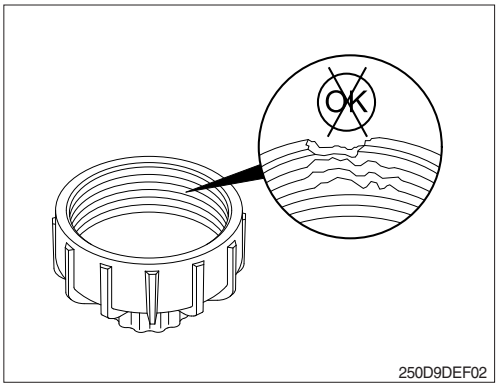
① Inspect the aftertreatment DEF dosing unit filter cap for cracks or holes that could create a DEF leak path.

② Check the condition of the threads on the aftertreatment DEF dosing unit cap.

※ If the threads are damaged, replace the aftertreatment DEF dosing unit filter cap.

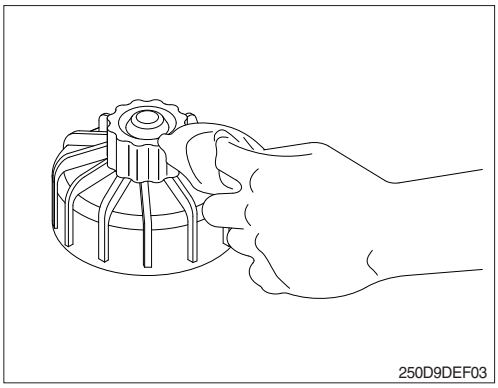
③ Inspect the aftertreatment DEF dosing unit threads. This is especially important if the aftertreatment DEF dosing unit cap was damaged.

※ If the aftertreatment DEF dosing unit threads are damaged, replace the entire aftertreatment DEF dosing unit.



④ Clean the aftertreatment DEF dosing unit cap and threads on the dosing unit with warm water and a clean cloth.

※ Never operate the truck with the DEF cap removed.



(3) Install

① Slide the DEF filter equalizing element (2) into the DEF filter cartridge (3).

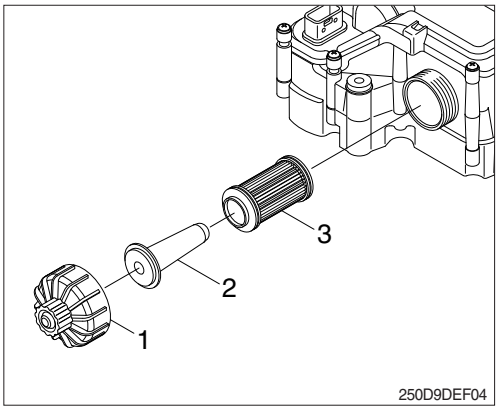
② Insert the assembly into the aftertreatment DEF dosing unit.

③ Install and tighten the cap (1). A 27 mm wrench can be used to install and tighten the filter cap.

· Tightening torque : 2.0 kgf · m (14.5 lbf · ft)

※ Lubrication of the DEF filter O-rings is not required.

※ The aftertreament DEF dosing system will not prime until the correct SCR temperatures are reached. To verify that there are no DEF leaks, test drive the truck for a minimum of 15 mimutes to get the SCR system up to temperature.

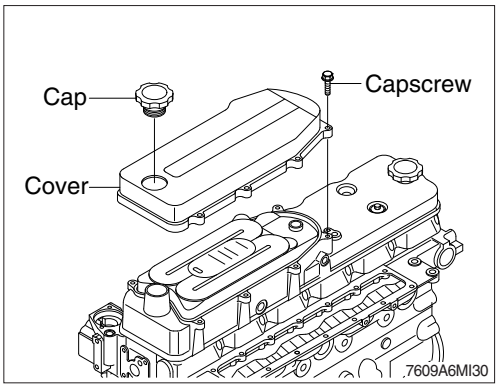


1 DEF dosing unit filter cap
2 DEF filter equalizing element
3 DEF dosing unit filter element

17) CRANKCASE BREATHER FILTER

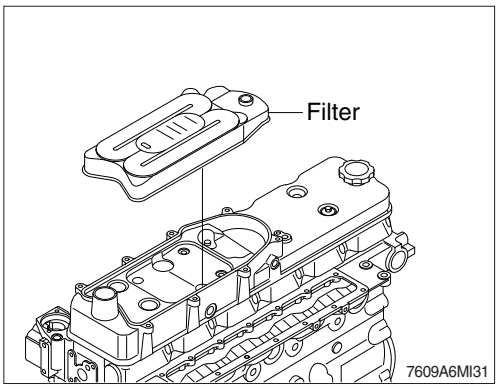
※ **Do not use pneumatic tools to remove the breather cover capscrews. Damage to the rocker cover can result.**

(1) Remove the oil fill cap.
(2) Remove the crankcase breather filter cover capscrews.
(3) Remove the filter cover.

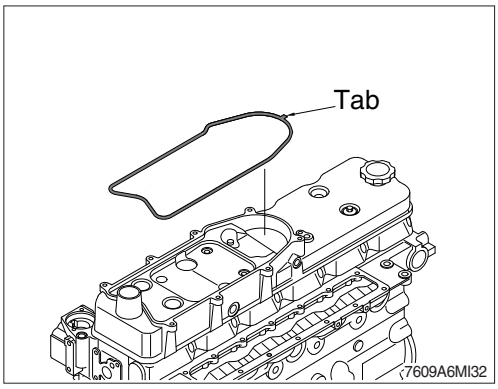


(4) Remove the crankcase breather filter from the rocker lever cover.

※ **Do not disturb the crankcase breather filter gasket located on the rocker lever cover.**
※ **Exposure to oil can cause the gasket to swell, which can make it difficult to install the gasket back into groove. If the gasket comes out of the groove, do not attemp to install the gasket. Replace it with a new gasket.**

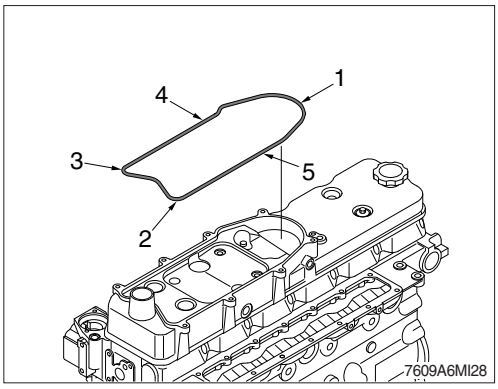


(5) If the gasket is damaged, remove the gasket by grasping the tab on the gasket and pulling up.
(6) Clean the crankcase breather filter mounting surface and O-ring sealing surfaces on the rocker lever cover.
(7) Clean the crankcase breather filter cover with warm soapy water.
Inspect the cover for cracks.
Replace the cover if damage is found.



(8) If the gasket was removed, install the gasket into the rocker lever cover groove starting with the tab end first. Then install the corners opposite the gasket tab end. Finish by pushing in the sides (see illustration).

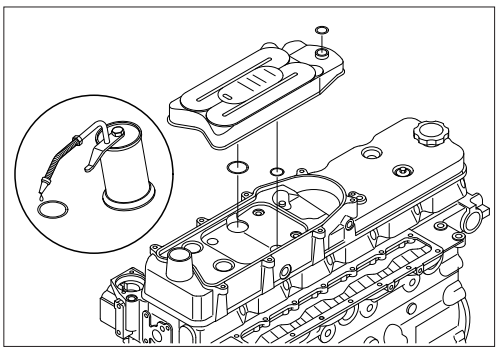
Gently push the gasket down into the groove. Do not used a finger to trace the gasket around into the groove during installation, as this will stretch the gasket, making it difficult to fully seat into the groove.



※ **Do not cut the gasket to make it fit into the groove, as this will result in an oil leak.**
The gasket must be fully seated around the entire perimeter of the rocker lever cover groove.

(9) Apply clean engine oil to the O-rings on the crankcase breather filter.

Install the filter onto the rocker lever cover.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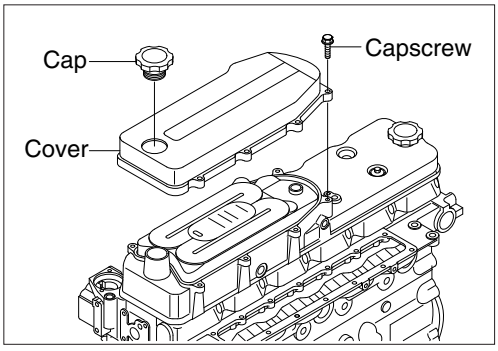
(10) Install the crankcase breather filter cover.
Install the filter cover capscrews.
Tighten the capscrews, starting with the inner-most capscrews and working outward in a circular manner.
· 0.71 kgf · m (5.16 lbf · ft)
Install the oil fill cap.



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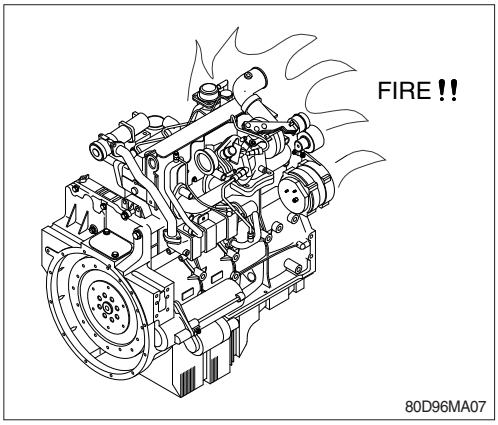
18) LEAKAGE OF FUEL

⚠ **Be careful and clean the fuel hose, injection pump, fuel filter and other connections as the leakage from these part can cause fire.**



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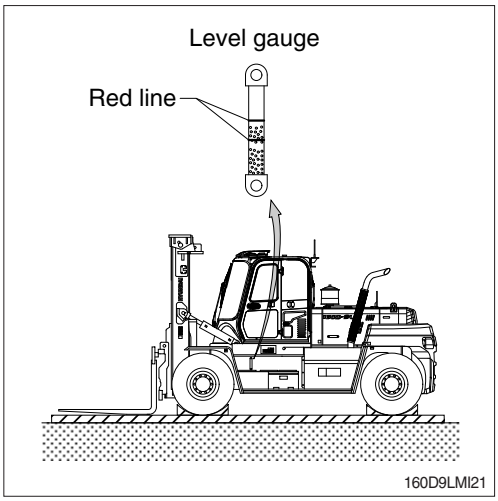
19) HYDRAULIC OIL CHECK



(1) Lower the forks on the ground at a flat location as in the illustration.
Stop the engine and then leave for about 5 minutes.

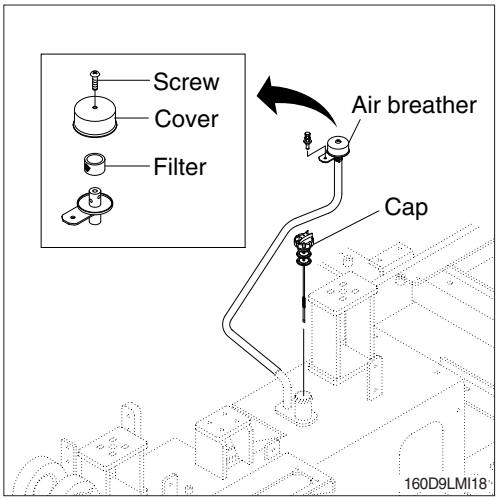
(2) Check the oil level at the level gauge. The level gauge is located on the left side of the hydraulic oil tank.

(3) The level gauge should indicate the middle position (between red lines).

※ **Add hydraulic oil, if necessary.**

※ **Refer to the page 5-6 for details.**

20) FILLING HYDRAULIC OIL



(1) Stop the engine to the position of level check.

(2) Check air breather element and replace it if necessary.

(3) Loosen cap and fill the oil to the specified level.

(4) Start engine after filling and operate the work equipment several times.

(5) Check the oil level at the level check position after engine stops.

21) CHANGE THE HYDRAULIC OIL

(1) Lower the forks on the ground and extend the tilt cylinder to the maximum.

(2) Loosen the cap and relieve the pressure in the tank.

(3) Prepare a suitable drain pan.

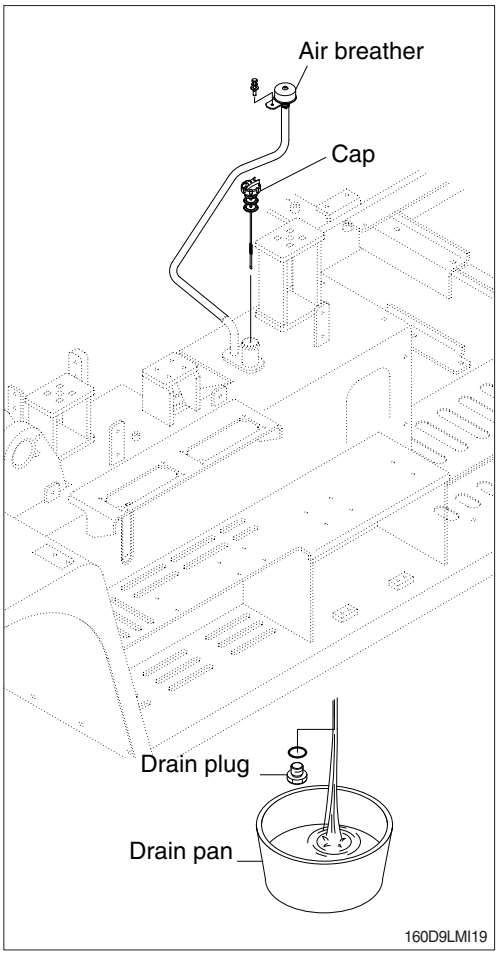
(4) To drain the oil loosen the drain plug.

(5) After draining oil, tighten the drain plug.

(6) Fill proper amount of recommended oil.

(7) Start engine and run continually. Release the air by full stroke of control lever.

※ **The oil must be free of bubbles. If bubbles are present in the oil, air is entering the hydraulic system. Inspect the suction hoses and hose clamps for leakage or damage.**



22) CLEAN SUCTION FILTER AND REPLACE RETURN FILTER

Clean and replace the return filter in the following manner.

(1) Remove the flange by loosening the mounting bolt.

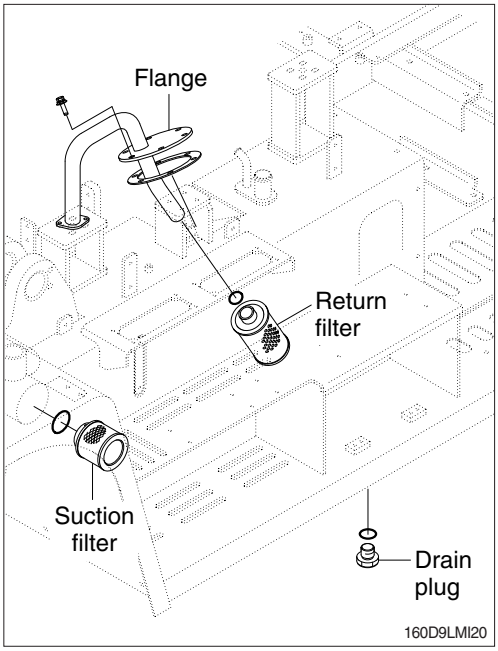
(2) Remove the return filter from the tank.

(3) Replace the return filter element with a new one.

(4) Remove the suction filter and clean and install it.

(5) Install the flange on the tank.

· Tightening torque : 3.4±0.7kgf · m
(24.6±5.0lbf · ft)



23) REPLACEMENT OF ELEMENT IN HYDRAULIC TANK BREATHER

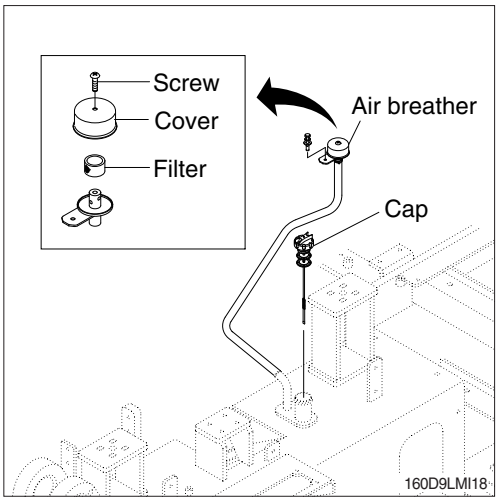
(1) Loosen the cap and relieve the pressure in the tank.

(2) Loosen the screw and remove the cover.

(3) Pull out the element.

(4) Replace the element with a new one.

(5) Reassemble by reverse order of disassembly.
· Tightening torque : 1.14~1.74kgf · m
(8.2~12.6lbf · ft)



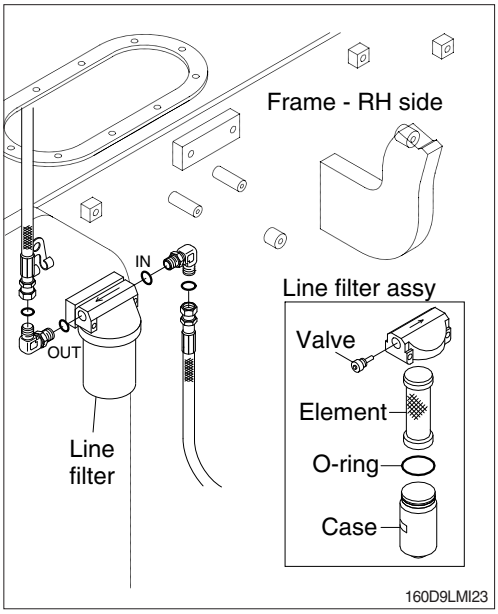
24) REPLACE OF PILOT LINE FILTER

(1) Loosen the filter case.

(2) Pull out the filter element and clean the filter case.

(3) Replace the filter element and O-ring with new parts.

(4) Reassemble the line filter.

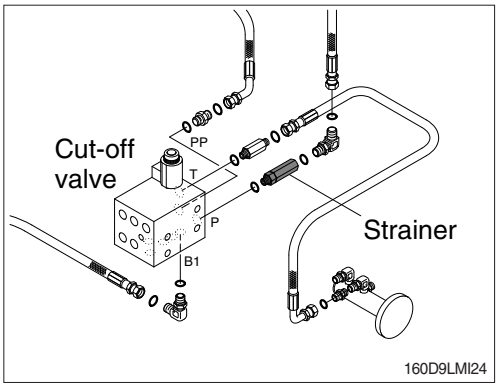


25) CLEANING BRAKE LINE FILTER

(1) Remove the strainer from the filter body.

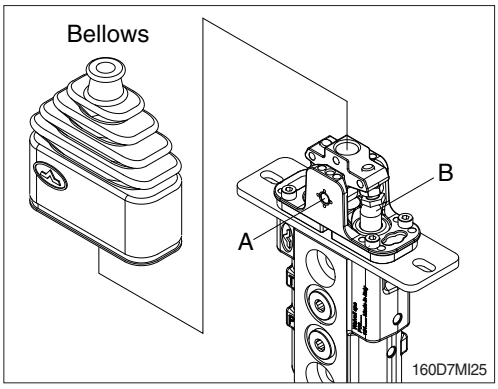
(2) Wash the strainer with cleaning oil.

(3) Install and tighten with specified torque.
· Tightening torque : 4.5~5.5 kgf · m
(32.5~39.8 lbf · ft)



26) LUBRICATE RCV LEVER

Remove bellows and grease the joint (A) and the sliding parts (B).



27) TIRE PRESSURE

(1) Inappropriate tire pressure is a primary cause for tire damage. Insufficient tire pressure will damage internal carcass of tire. Repeated excessive bending will damage or break the carcass. Excessive pressure will also cause premature damage of tire.

(2) Recommended tire pressure (when tire is cooled)

Model	Size	Pressure
160D-9L, 180D-9B	12.00-20, 20PR	10.2 kgf/cm^2 (145 psi)

(3) Continuous operation will produce heat and increase pressure on tire. But such phenomenon was already taken into account when designing a tire. Do not try to remove normally increased air because tires may be crushed or overinflated.

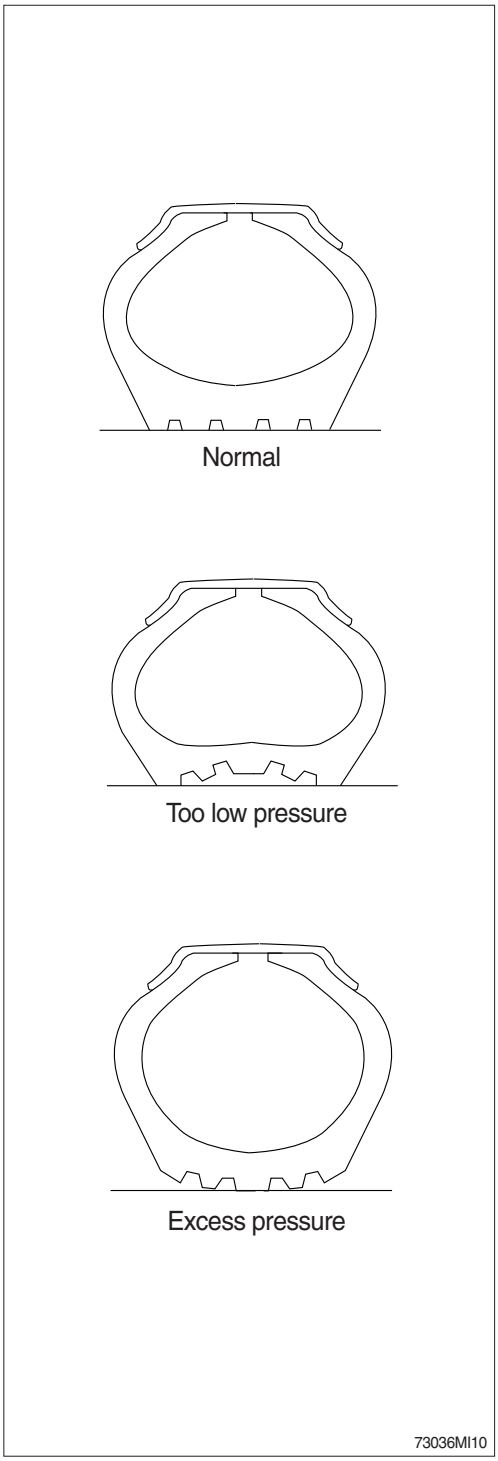
(4) The three major causes for excessive heat and pressure of tire are insufficient pressure, excessive load and overspeed. Avoid excessive load and overspeed in order to keep tires in good shape.

⚠ Do not inflate tires using flammable gases or alcohol injector.
This cause explosion or personal injury.

⚠ Inflate tires at the pressure level recommended by the manufacturer, and check periodically pressure and wear of tires.

⚠ When replacing the inflated tire, do not stand near the tire.

※ Check the tire when the tire is at normal temperature and the truck is not loaded.



⚠ Do not use recycled wheel parts.

⚠ When removing lockering or inflating tire, use safety cable or chain to ensure safety.
Be sure to bleed air before removing lockering. Never inflate tires unless the lockering is assembled in its place.

※ Avoid the followings when traveling.

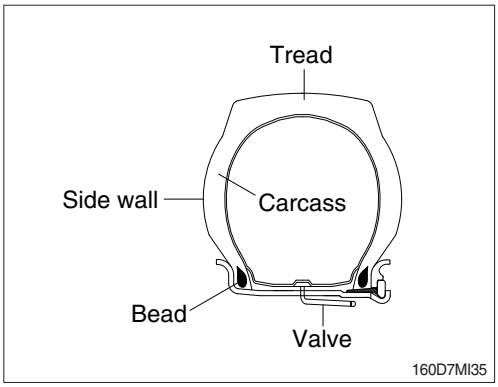
① Rubbing tires against road bank or rack at cargo-unloading spot.
② Tires slippage during working.
③ Abrupt starting of the truck.
④ When oil, grease or gasoline smeared on tire, clean those. Otherwise it may cause of permanent deformation.

28) REPLACEMENT OF TIRE

⚠ Disassembly, reassembly, replacement and repair of tire requires special skills and equipment. Contact a tire repair shop.

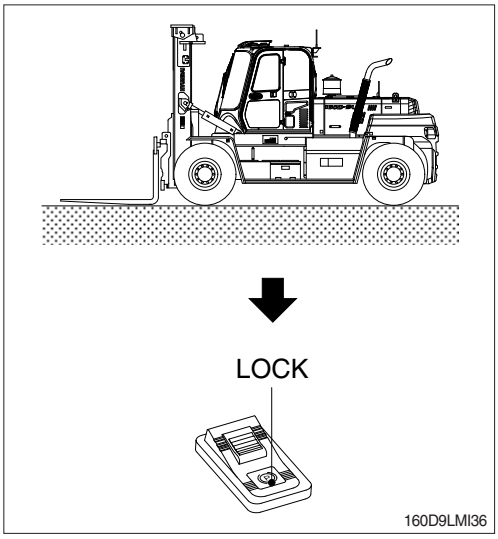
(1) Tires to be replaced

① Tires with broken or bent bead wires
② Tires exposed more than 1/4 of carcass fly.
③ Tires whose carcass is damaged more than 1/3 of the tire width.
④ Tires which show fly separation.
⑤ Tires which has a radial crack near the carcass.
⑥ Tires which are judged to be unsuitable for use because of deformation or damage.

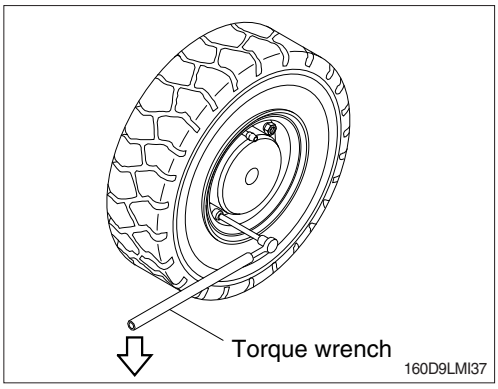


(2) Separation of tire

① After moving the truck to flat ground, lower the bucket to the ground and put the parking brake switch in LOCK position.

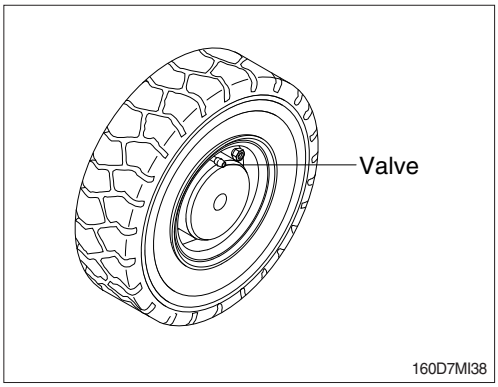


② Loosen slightly all wheel mounting.
· Tools : Socket 32 mm
Torque wrench
Extension bar
③ Lift the truck with a jack.
④ Loosen all wheel mounting nuts and replace the tire.



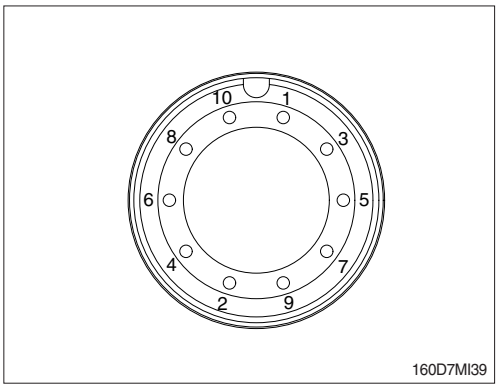
(3) Direction of tire to be installed

① Be careful that the valve should be facing the outside.



(4) Mounting of tire

① Lightly tighten nuts as shown in the illustration.
② Lower the jack after tire is replaced.
③ Tighten nuts according to the specified tighten torque.
· Tightening torque : 83.2±10.0 kgf · m
(602±72.3 lbf · ft)

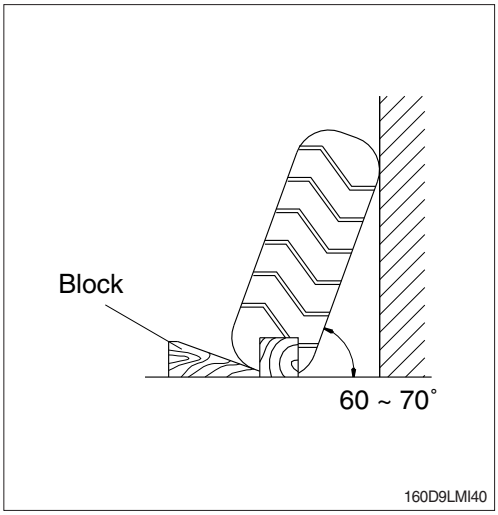


29) STORING TIRES AFTER REMOVAL

As a basic rule, store the tires in a warehouse which unauthorized persons cannot enter. If the tire are stored outside, always erect a fence around the tires and put up "No Entry" and other warning signs that even young children can understand.

Stand the tire on level ground, and block it securely so that it cannot roll or fall over.

If the tire should fall over, get out of the way quickly. The tires for the industrial truck are extremely heavy, so trying to hold the tire may lead to serious injury.



30) CHECK TRANSMISSION OIL LEVEL

The oil level check must be carried out as follows;

(1) Oil level check (weekly).

(2) At horizontally standing truck.

(3) Transmission in neutral position.

(4) In cold start phase, the engine must be running about 2~3 minutes at idling speed, and the marking on the oil dipstick must then be lying above the cold start mark COLD.

(5) Check oil level at operating temperature of the transmission (about 80~90 ˚C) and the engine idling speed.

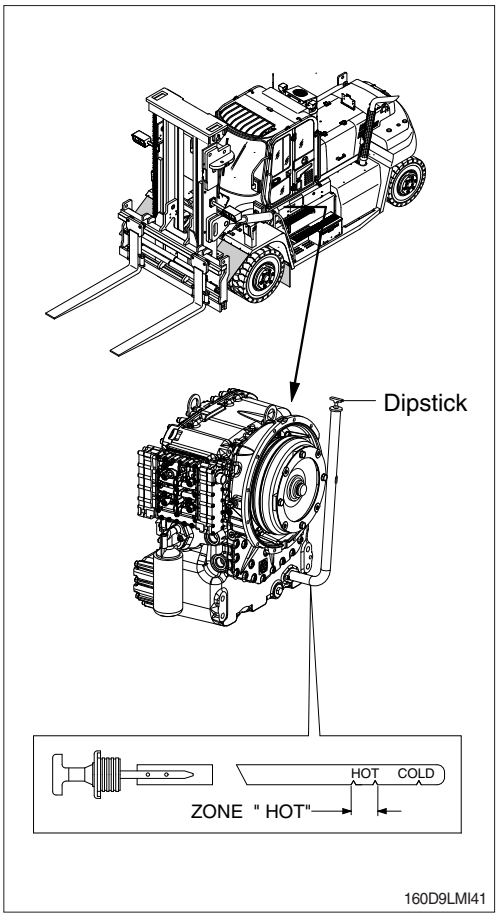
① Loosen oil dipstick by counterclock wise rotation, remove and clean it.

② Insert oil dipstick slowly into the oil level tube until contact is obtained, and pull it out again.

③ On the oil dipstick the oil level must be lying in the zone HOT.

④ Insert the oil dipstick again, and tighten it by clockwise rotation.

⚠ When checking, put the parking brake switch in the LOCK position and fix the tires with blocks.



31) REPLACEMENT OF TRANSMISSION OIL AND FILTER ELEMENT

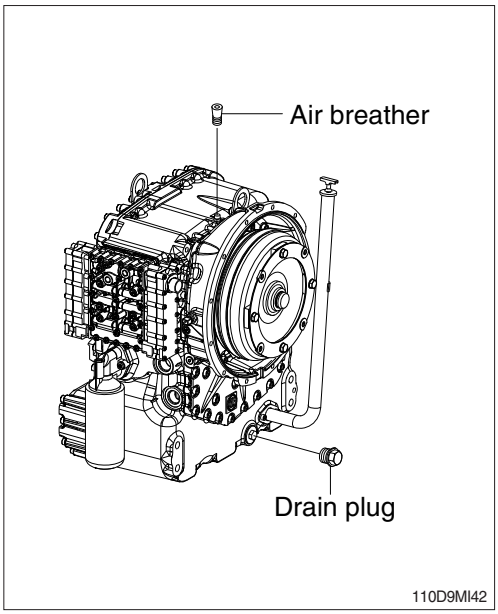
(1) Operate the truck for a few minutes in order to warm the transmission oil.

(2) Move the truck to flat ground. Lower the forks to the ground and slightly apply downward force.

(3) Put the parking brake switch in the LOCK position and stop the engine.

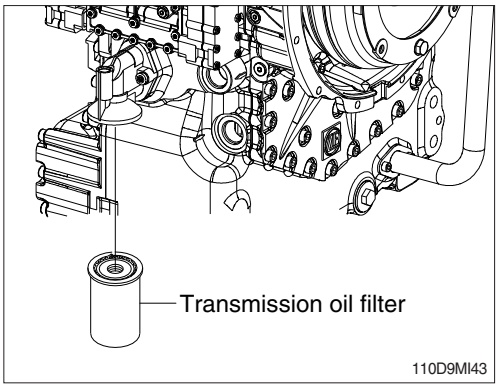
(4) Open transmission air breather to relieve internal air pressure.

(5) Remove the transmission drain plug. Allow the transmission oil to drain into a suitable container.



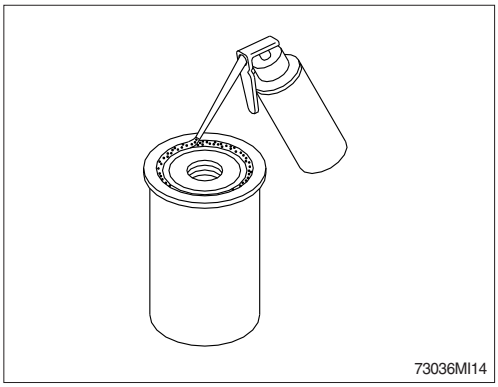
(6) Remove the transmission oil filter cartridge. Dispose of the used transmission oil filter cartridge properly.

(7) Clean the filter cartridge mounting base. Remove any part of the filter cartridge gasket that remains on the filter cartridge mounting base.



(8) Apply a light coat of oil to the gasket of a new transmission oil filter cartridge.

(9) Install the new transmission oil filter cartridge. Screw the filter in until contacts with the sealing surface is obtained and tighten it now by hand about 1/3 to 1/2 turn.



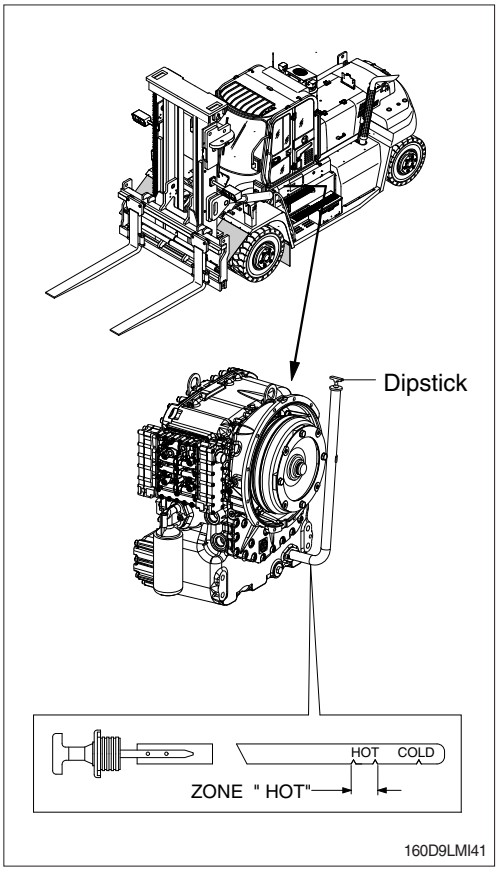
(10) Mount the drain plug of the transmission after cleaning it.

(11) Fill the oil through the dipstick inlet and check if the oil is at the appropriate level.

(12) The proper oil amount is 16 liters (4.2 U.S. gallons)

⚠ As the truck is hot after operation wait until the temperature has dropped.

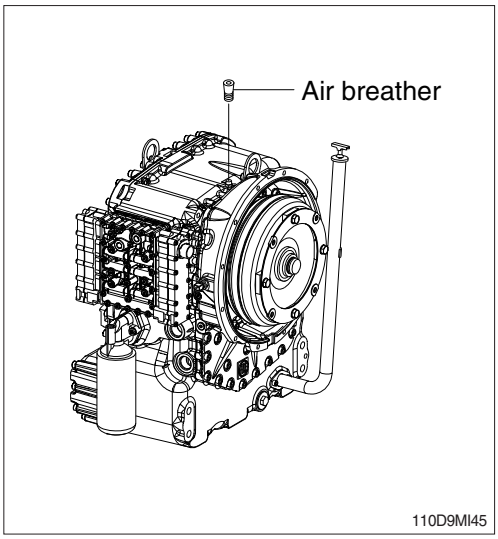
⚠ It is imperative to pay attention to absolute cleanliness of oil and filter.
Binding is in any case the marking on the oil level gauge.



32) CLEANING TRANSMISSION AIR BREATHER

(1) Remove dust or debris around the air breather.

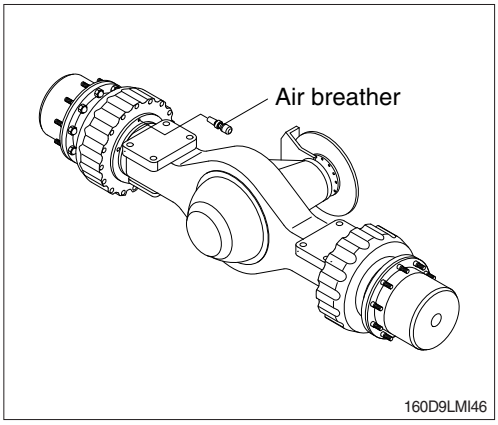
(2) Remove the air breather and wash it with a cleaning oil.



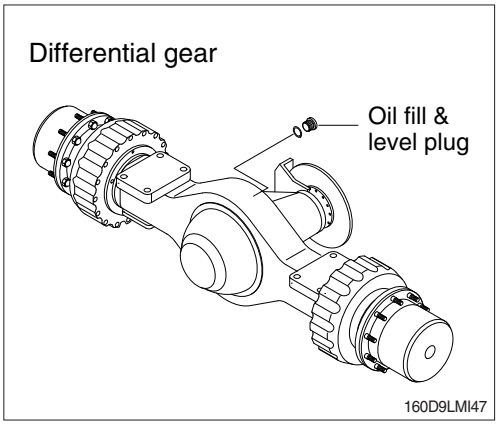
33) CHECK AND SUPPLYING AXLE OIL

(1) Move the truck to flat ground.

(2) Open the axle air breather to relieve internal air pressure.



(3) Remove the plug and check the oil amount.
If the oil level is at the hole of the plug, it is normal.

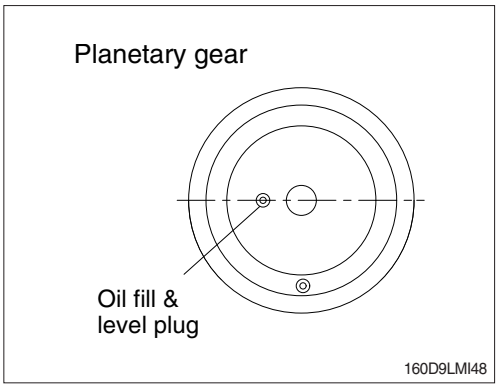


(4) If the oil level is below the plug hole, supply oil through a plug hole.

⚠ **When checking the oil level, engage the parking brake and fix the tires with blocks.**

⚠ **As the truck is hot after operation, wait until the temperature has dropped.**

※ **Set the plug of planetary gear in parallel to the ground.**



34) CHANGE THE AXLE OIL

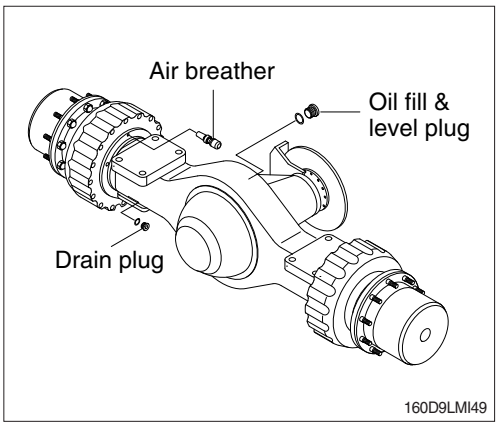
(1) Place a case under drain plug to catch oil.

(2) Remove the air breather to relieve internal pressure.

(3) Drain oil the differential gear.

① Remove the refilling plug and remove the drain plug to drain oil off.

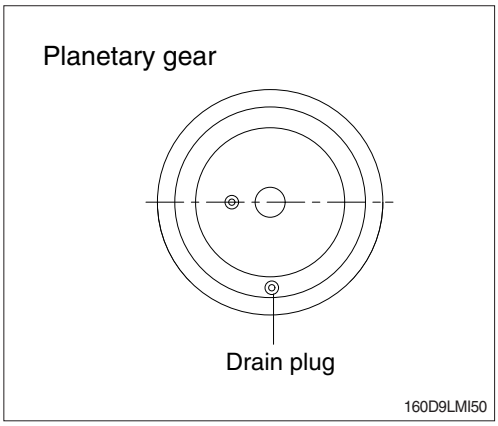
② Wash drain plug and install it.



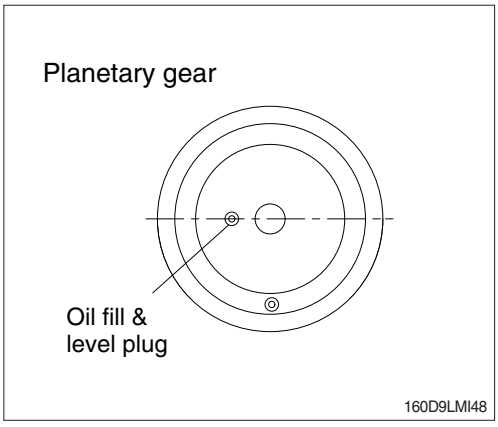
(4) Drain oil planetary gear.

① Drain oil by removing drain plug.

※ **The drain plug should be facing the ground.**



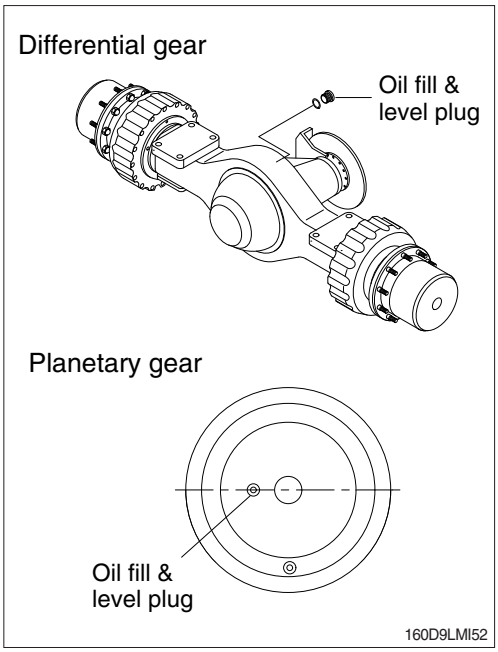
(5) After draining, put the filling plug of planetary gear in parallel to the ground.



(6) Supply oil into the differential gear and the planetary gear.
 · Oil amount : 19 ℓ (5.0 U.S. gal)
(7) Supply oil until it overflows from the oil filler, then install the plug.

⚠ As the truck is hot after operation, wait until the temperature has dropped.

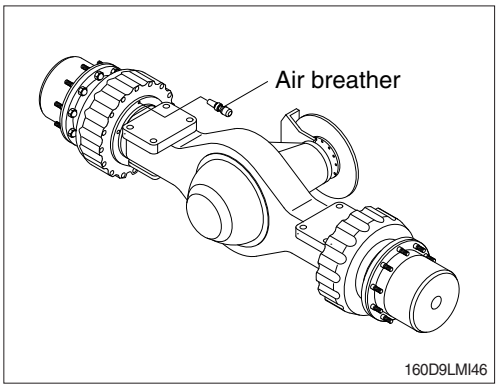
※ If a work requires frequent use of brake, replace it earlier than normal change interval.



35) CLEANING AXLE BREATHER

(1) Remove dust or debris around the breather.

(2) Remove the breather and wash it with a cleaning oil.

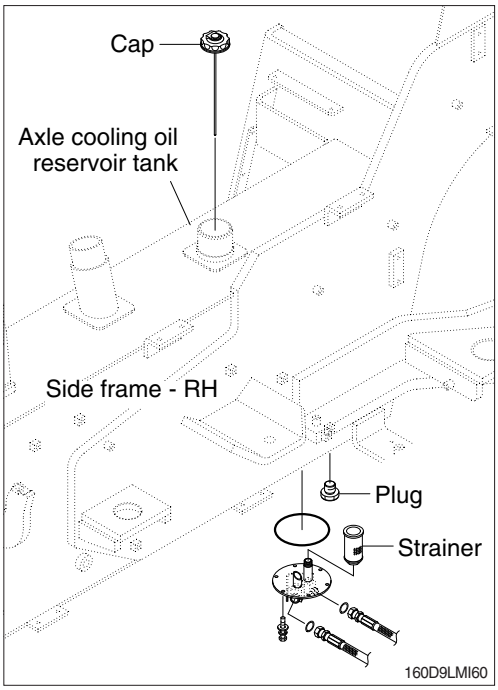


36) BRAKE COOLING OIL AND STRAINER

(1) Check the oil level.

(2) If oil level is near or under the lower limit, add oil immediately.

(3) Change oil and strainer completely every 1000 hours operation.



37) LUBRICATION

(1) Lubricate the grease to grease nipple in accordance with lubrication intervals.

※ **Shorten lubricating interval when working in the water or dusty place.**

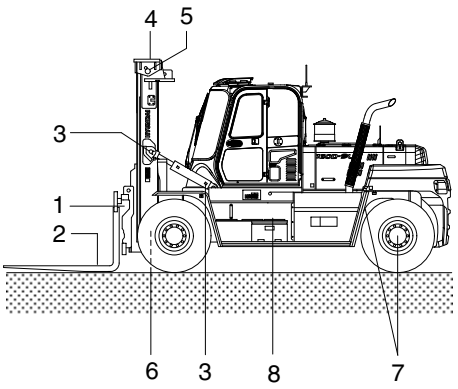
(2) After lubricating, clean off spilled grease.

⚠ **Put the parking brake switch in the LOCK position and fix front and rear tires with blocks.**

⚠ **Set the mast and forks in a stable position.**

(3) Lubrication points

① Fork adjust cylinder : 2EA
② Forks : 2EA
③ Tilt cylinder : Left/Right, 2EA
④ Lift chain : 2EA
⑤ Chain sheave pin : 2EA
⑥ Mast support : Left/Right, 2EA
⑦ Steering axle : 6EA
⑧ Hydraulic pump drive spline : 1EA

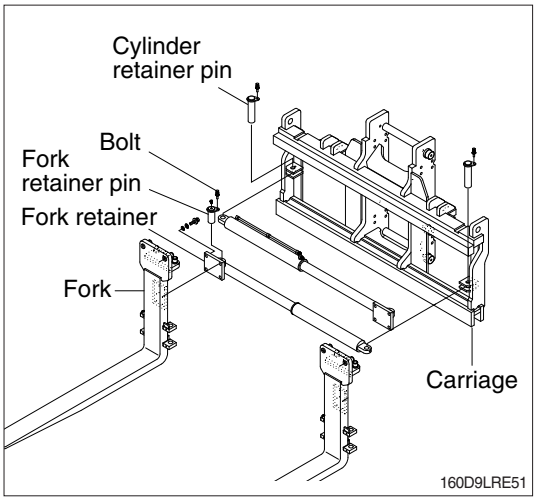


1 Adjust cylinder (2EA)
2 Fork (2EA)
3 Tilt cylinder (Left/Right, 2EA)
4 Lift chain (2EA)
5 Chain sheave pin (2EA)
6 Mast support (Left/Right, 2EA)
7 Steering axle (6EA)
8 Hyd pump drive spline (1EA)

160D9LOP17

38) FORKS REPLACEMENT

① Lower the fork carriage until the forks are approximately 25 mm (1 in) from the floor.
② Loosen the bolt and take out the fork retainer pin and release the fork retainer with the fork.
Remove the cylinders at a time out of carriage assembly.
③ Remove only one fork at a time.
※ **On larger forks it may be necessary to use a block of wood.**
④ Reverse the above procedure to install the forks.



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39) MAINTENANCE OF WORK EQUIPMENT

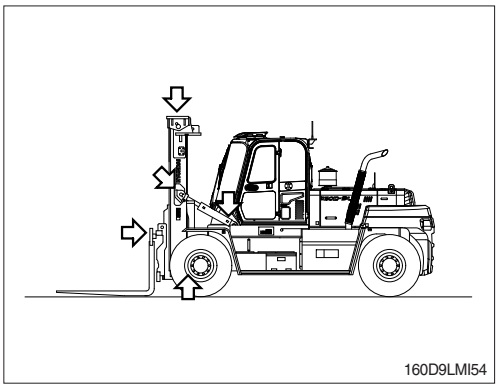
(1) Lubricate to each point of working device.

※ **Refer to page 7-45.**

(2) Check for wear and tear of work equipment pins and bushings.

(3) Check for damage of forks and mast linkage part.

※ **Check daily and lubricate the fork positioner hanger bar and bottom plate where the fork is contacted, or the forks may vibrate temporarily while positioning.**

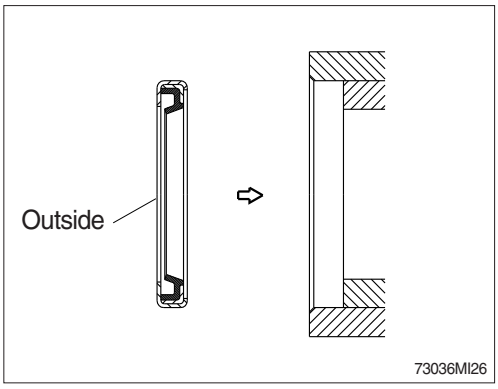


(4) Dust seal are mounted on the rotating part of working device to extend the lubricating interval.

※ **Mount the lip to be faced out side when replace the dust seal.**

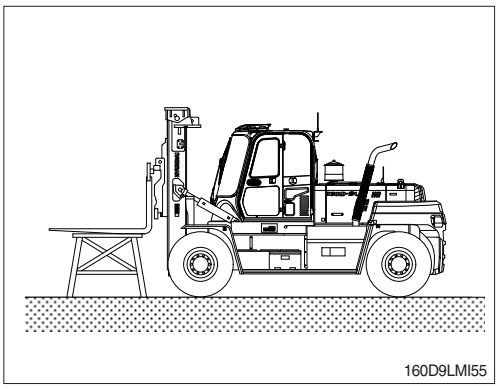
※ **If it is assembled in wrong direction, it will cause fast wear of pin and bushing, and create noise and vibration during operation.**

※ **Make sure the seals are not damaged or deformed.**



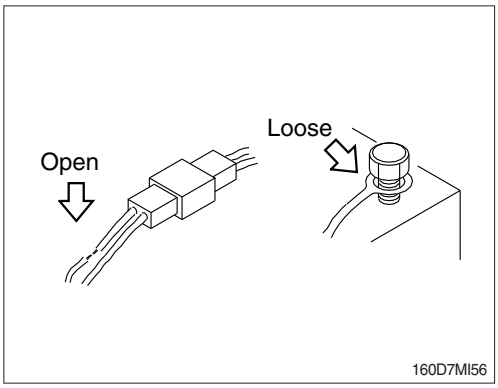
40) WORK EQUIPMENT SUPPORT

When carrying out inspection and maintenance with the forks raised, fit a stand under the forks securely to prevent the work equipment from coming down. In addition, set the work equipment control levers to the Hold position.



1) WIRING, GAUGES

Check regularly and repair loose or malfunctioning gauges when found.



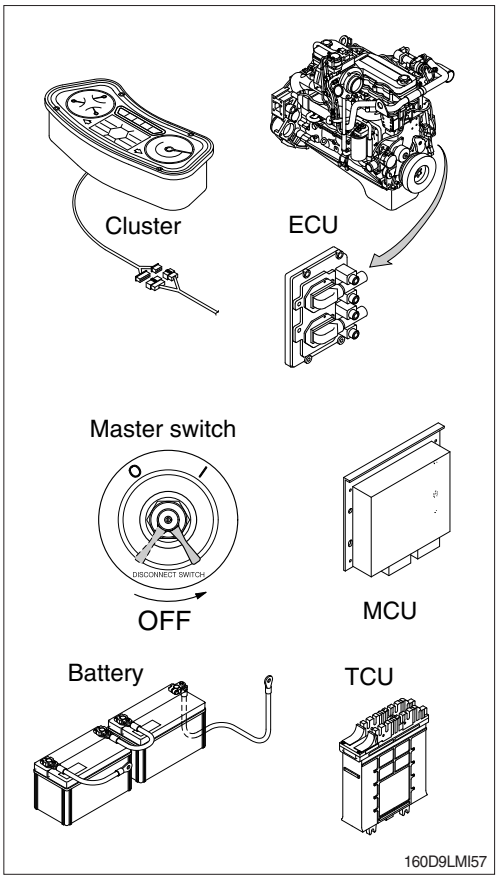
2) WELDING REPAIR

Before start to welding, follow the below procedure.

(1) Shut off the engine and remove the start switch.
(2) Disconnect ground cable from battery by master switch.
(3) Before carrying out any electric welding on the truck, the battery cables should be disconnected and the connectors pulled out of the electronic control units (MCU, ECM, TCU, cluster etc).
(4) Connect the earth (ground) lead of the welding equipment as close to the welding points as possible.

※ Do net weld or flame cut on pipes or tubes that contain flammable fluids. Clean them thoroughly with nonflammable solvent before welding or flame cutting on them.

⚠ Do not attempt to welding work before carry out the above.
If not, it will caused serious damage at electric system.

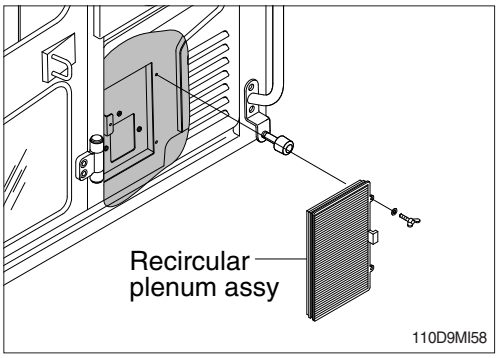


8. AIR CONDITIONER AND HEATER

1) CLEANING AND REPLACING FILTER

※ Always stop the engine before servicing.

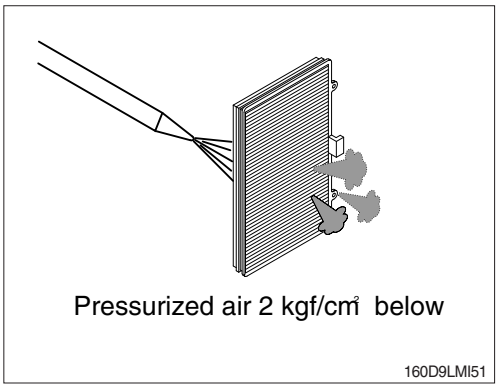
(1) Open the door, loosen the wing bolt and remove the recirculation plenum assembly.



(2) Clean the recircular plenum assy using a pressurized air (Below 2 kgf/cm², 28 psi).

△ **When using pressurized air, be sure to wear safety glasses.**

(3) Inspect the filter after cleaning. If it is damaged or badly contaminated, use a new filter.



2) PRECAUTIONS FOR USING AIR CONDITIONER

(1) When using the air conditioner for a long time, open the window once every one hour.

(2) Be careful not to overcool the cab.

(3) The cab is properly cooled if the operator feels cool when entering there from outside (About 5°C lower than the outside temperature).

(4) When cooling, change air occasionally.

3) CHECK DURING SEASON

Ask the service center for replenishment of refrigerant or other maintenance service so that the cooling performance is not damaged.

4) CHECK DURING OFF-SEASON

Operate the air conditioner 2 or 3 times a month (Each for a few minutes) to avoid loss of oil film in the compressor.

5) REFRIGERANT

(1) Equipment contains fluorinated greenhouse gas.

Model	Type	Quantity	GWP
160D-9L, 180D-9B	HFC-134a	0.55 kg (1.21 lb)	787 CO2 eq.

※ **GWP**

Global warming potential (GWP) is a measure of how much heat a gas traps in the atmosphere relative to that of carbon dioxide (CO2). GWP is calculated in terms of the 100-year warming potential of 1 kg of a greenhouse gas relative to 1 kg of CO2.

(2) Envior

The air conditioning system of the machine is filled with HFC-134a refrigerant at the factory.
HFC-134a refrigerant is a flourinated greenhouse gas and contributes to global warming.
Do not release refrigerant into the environment.

(3) Safety precautions

Work on the air conditioning system must only be performed by a qualified service technician.
Do not attempt to preform work on the air conditioning system.
Wear safety goggles, chemical resistant gloves and appropriate personal protective equipment to protect bare skin when there is a risk of contact with refrigerant.

(4) Action in case of exposure

① Eye contact / Limited skin contact
Rinse with warm water and apply a light bandage. Seek medical attention immediately.

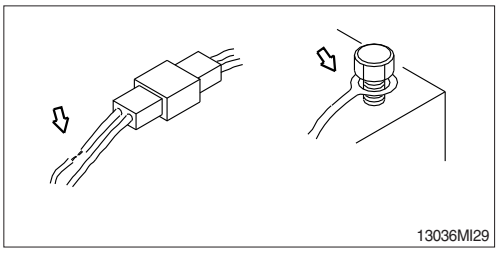
② Extensive skin contact
Rinse with warm water and carefully heat the area with warm water or warm clothing.
Seek medical attention immediately.

③ Inhalation
Leave the area and find fresh air. Seek medical attention immediately.

9. REPLACEMENT AND CHECK

1) WIRING, GAUGES

Check regularly and repair the loose or malfunctioning gauges when found.



2) BATTERY

(1) Clean

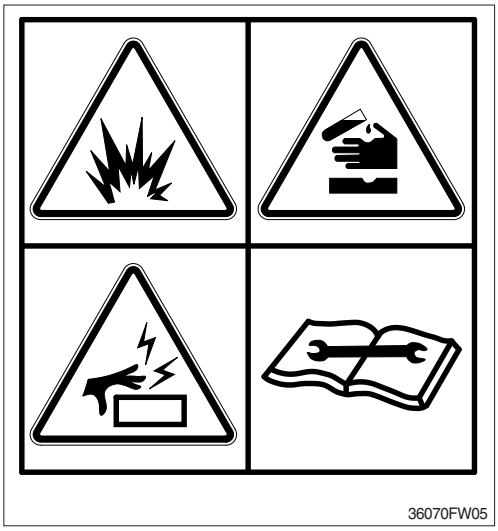
① Wash the terminal with hot water if it is contaminated, and apply grease to the terminals after washing.

⚠ **The battery gas can explode. Keep sparks and flames away from the batteries.**

⚠ **Always wear protective glasses when working with the batteries.**

⚠ **Do not stain clothes or skin with the electrolyte as it is acid.**

Be careful not to get the electrolyte in the eyes. Wash with clean water and go to the doctor if it enters the eyes.



(2) Recycle

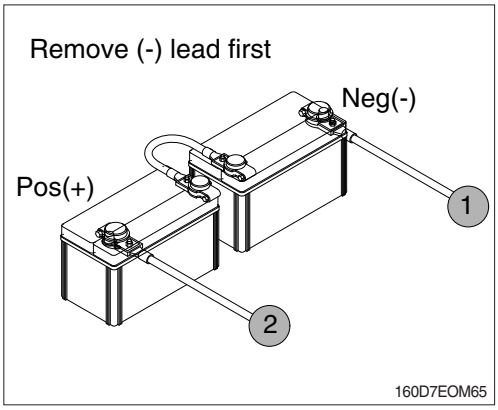
Never discard a battery.

Always return used batteries to one of the following locations.

- A battery supplier
- An authorized battery collection facility
- Recycling facility

(3) Removing and installing

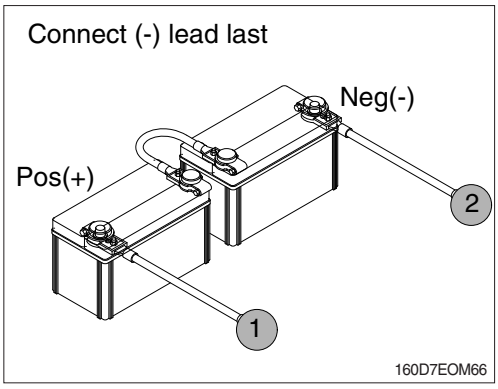
① Remove the lead from the ground side (Normally the (-) terminal side) of the battery. It is dangerous to let a tool, etc., touch the (+) terminal and the body at the same time, since this causes a spark.



② When remounting, connect the ground connection last.

⚠ **Do not allow tools to touch the (+) terminal and the body of the truck at the same time. This can cause sparking and explosion.**

Dispose of old battery in locally approved manner.



3) TIRE REPLACEMENT

(1) Park the truck in a safe and level place suitable for changing the tire. Then lower the forks, stop the engine, and apply the parking brake.

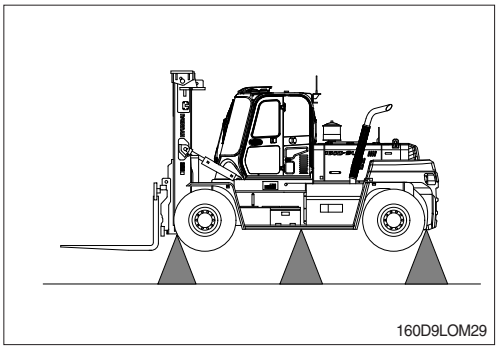
⚠ The tires are under high inflation pressure, so failure to follow the correct procedures, when changing or servicing the tires and rims could cause the tire to explode, causing serious injury or damage. The tires and rims should always be serviced or changed by trained personal using the correct tools and procedures. For details of procedures, contact your HYUNDAI dealer. Wear safety glasses and a face shield when using compressed air.

(2) Block the tire at the opposite corner from the tire to be replaced.
(3) Loosen the lug nuts slightly with a lug nut wrench.
(4) Jack up the truck to raise the tire from the ground, then remove the lug nuts and take off the tire.

(5) Points to fit jack when jacking up

① Front tires : Bottom of outer mast or bottom of the frame.
② Rear tires : Bottom of counterweight or bottom of the rear axle.

⚠ When jacking up the truck, always check carefully that the jack does not come out of position. When jacking up the truck, never go under the truck. For wheels using a separate type rim, check first that the rim nut is not loose before loosening the lug nuts. Be careful not to mistake the rim nuts and lug nuts.
When assembling separated type rims with bolts and nuts, check any damage and tighten them to the specified tightening torque. Change the bolts and nuts with new ones after using twice for your safety.


160D9LOM29

(6) Replace the tire and tighten the lug nuts partially. The mounting faces of the wheel, lug nuts and wheels must be free from any dirt or lubricant of any kind.
(7) Tighten the lug nuts on opposite sides in turn,
and check that there is no play in the wheel.
(8) Lower the jack to lower the truck to the ground, then tighten the lug nuts to the specified tightening torque (For details, see service data).
(9) Check and adjust the inflation pressure.
Tire inflation pressure : For details, see page 5-3, 3. CHECK BEFORE STARTING ENGINE.

⚠ Precautions for adjusting the inflation pressure when repairing a puncture.

※ The tires used on the forklift trucks have a high inflation pressure, so any cracks or deformation of the rim are extremely dangerous. When adjusting the inflation pressure, do not raise the pressure above the correct level under any circumstances. If the pressure of the compressor is not adjusted beforehand, the pressure inside the tire will rise to the maximum air pressure of the compressor, and this may cause a serious accident. Therefore, always be extermely careful when carrying out this work.

4) FUSE AND RELAY REPLACEMENT

(1) Fuse box #1

COVER P/N : 21FT-20431

15A 30A

FUSE BOX B+
퓨즈박스 B+
30A

5A 5A 10A 10A 15A

DEF LINE HEATER 재생 라인 히터	DEF SUPPLY POWER 재생 전압	START KEY(B+) 시동키	TCU (B+) 티씨유	TURN LAMP(B+) 방향지시등		MP3 PLAYER (B+) 씨디플레이어	ROOM LAMP(B+) 실내등	CLUSTER/ MCU(B+) 클러스터/ 팬속도제어기	SERVICE TOOL 서비스 툴
15A	15A	10A	10A	10A		5A	5A	5A	5A
CABIN TILT 캐빈 틸트	MONITOR/ RMCU(B+) 모니터 알엠씨유	HORN (B+) 경음기	DEF SENSOR 재생 센서	AIRCON B+ 에어컨					
15A	5A	10A	10A	5A					
						REVERSE FAN 역방향 팬	RELAY NEUTRAL 중립 릴레이	ECM B+ 제어기 전원	
						5A	10A	30A	

(2) Fuse box #2

COVER P/N : 21FT-20441

VALVE POWER
밸브 파워
30A

15A 30A

FUSE BOX IG
퓨즈박스 IG
60A

5A 5A 10A 10A 15A

BACK-UP 백업램프 부저	OPS SYSTEM 운전자 감지장치	CIGAR LIGHTER 시가 라이타	DC/DC CONVERTER 디씨 컨버터	MCU/ SENSOR 팬속도제어기	MP3/ HANDS FREE 씨디플레이어 핸즈프리	MONITOR 모니터	AIRCON MAIN 에어컨 전원	AIRCON IG 에어컨 상시전원	PARK SOLENOID 주차 솔레노이드
5A	10A	15A	15A	10A	15A	10A	20A	15A	10A
ILLUM LAMP 미등	HEAD LAMP 헤드램프	WORK LAMP FRONT 전방작업등	WORK LAMP REAR 후방작업등	F/R WIPER HORN 와이퍼 혼	F/WARMER 연료 예열	BEACON LAMP 경광등	CLUSTER/ RMCU 계기판 알엠씨유	BRAKE LAMP SELECTOR VALVE 브레이크램프 셀렉트 밸브	TCU IG 티씨유
10A	15A	20A	20A	15A	15A	5A	5A	10A	15A
ECM 제어기	E/G PREHEAT RELAY 엔진 예열	DEF SENSOR RELAY 재생 센서	TOP WIPER 상단와이퍼		SEAT HEATER 시트 히터				
10A	10A	5A	10A		15A				

(3) Relay box #1

COVER P/N : 21FT-20450

배선방향
WIRE DIRECTION

REVERSE FAN RELAY 역방향 팬 CR-54				
PREHEAT RELAY 작업장치 차단 CR-42	NEUTRAL RELAY 중립 CR-5	ANTI RESTART RELAY 재시동 방지 CR-36	AUTO PARK RELAY 자동 주차 CR-56	TRAVEL-CUT RELAY 주행 차단 CR-50

(4) Relay box #2

COVER P/N : 21FT-20461

배선방향
WIRE DIRECTION

DEF HEATER1 RELAY 재생 라인 히터1 CR-61	DEF HEATER2 RELAY 재생 라인 히터2 CR-62	DEF HEATER3 RELAY 재생 라인 히터3 CR-63	SIDE SHIFT RELAY 사이드 시프트 CR-57	
ATTACH-CUT RELAY 작업장치 차단 CR-52	WIPER HI RELAY 와이퍼 고속 CR-4	WIPER LO RELAY 와이퍼 저속 CR-26	WASHER PUMP RELAY 와셔 펌프 CR-38	BACKUP RELAY 백업 CR-39

160D9LOM165

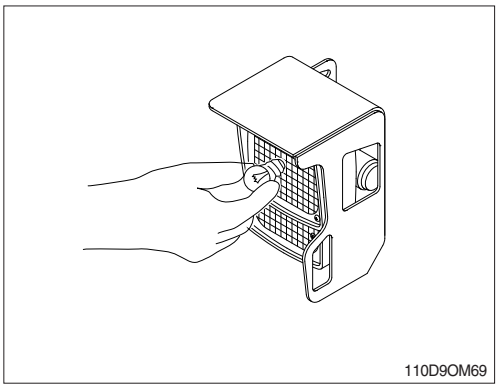
① Turn the starting swich OFF.

② Open the cover of the fuse box or relay box, and replace fuses or relays inside (to open the cover of the fuse box or relay box, push the side of the cover lightly with a finger, and pull the cover forward to remove it.)

⚠ When replacing the fuse or relay, check the relationship between the fuse or relay and the electrical components it protects. Always replace fuses or relays with a same capacity. Always turn the start switch OFF before replacing any fuse or relay.

5) LAMP BULBS REPLACEMENT

Lamp	Spec (24V)
Head lamp	70W
Turn signal lamp	LED
Clearance lamp	LED
Stop lamp	LED
Backup lamp	10W
License lamp (option)	10W
Beacon lamp (option)	Strobe type
Work lamp (front/rear)	LED/HID



⚠ **After checking that the fuse is not blown and that there is no disconnection in the wiring harness, replace the lamp bulb.**

6) FUNCTIONAL TESTS

You will start the engine to complete the functional tests, so be sure that:

- The parking brake switch is in LOCK position.
- The gear selector lever is in NEUTRAL.
- Forks are fully lowered to the floor or ground.
- All controls are in neutral or other correct position.
- You are familiar with the safety procedures given in section 5, **Starting and operating procedures**, in this manual.

As you test the following components, be sure they are properly mounted and working correctly.

(1) Horn

Press the horn button to check the horn function. If the horn or any other part does not operate, report the failure and have it repaired before the truck is put into operation.

(2) Hour meter

Start the engine and let it warm up until it runs evenly and accelerates smoothly when you push on the accelerator pedal. Check the hour meter for operation with the engine running. Write the hour meter reading on the PM report form. Report any malfunction or damage.

(3) Indicator lights

Check that all lights are functioning and indicate normal truck operation as described in section 3, **Know your truck**, in this manual.

(4) Service brakes and inching pedal

With the gear selector lever in NEUTRAL and the engine running, push the sevice brake pedal fully down and hold. The brakes should apply before the pedal reaches the floorplate. If the pedal continues to creep downward, report the failure immediately. Do not operate the truck until the brakes are repaired. Perform the same check with the inching pedal. (Additional braking/ inching checks will follow).

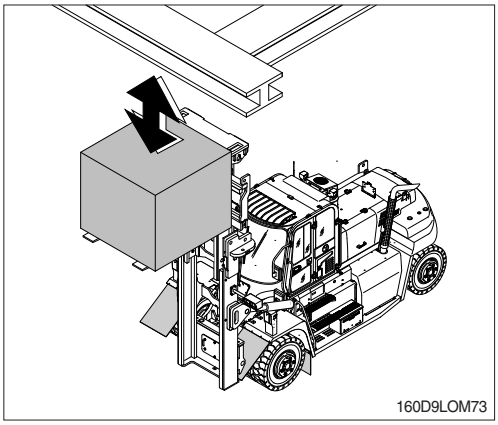
(5) Parking brake

Check the function of the parking brake. Release, then reapply. To check parking brake holding capability, park the lift truck on a grade and apply the parking brake. The parking brake should hold a lift truck with rated load on a 15% grade.

⚠ Do not operate a lift truck if the service or parking brakes are not operating properly.

(6) Lift mechanisms and controls

Pull back on the tilt control lever and hold until the mast reaches the full back tilt position. Push forward on the lever to return the mast to the vertical position. Release the lever.



⚠ Be sure that there is adequate overhead clearance before raising the mast.

Pull back on the lift control lever and raise the fork carriage to full height. Watch the mast assembly as it rises. Release the lever.

If the maximum fork height is not reached, this indicates there is an inadequate(low) oil level in the hydraulic sump tank or severe binding within the mast.

Push forward on the lift control lever. Watch the mast as it lowers. When the forks reach the floor, release the lever.

All movements of the mast, fork carriage, and lift chains must be even and smooth, without binding or jerking. Watch for chain wobble or looseness; the chains should have equal tension and move smoothly without noticeable wobble.

(7) Auxiliary controls (option)

If your lift truck is equipped with an attachment, test the control lever for correct function and briefly operate the attachment.

(8) Steering system

※ The steering system, steering axle, and steering linkage on your truck should be inspected periodically for abnormal looseness and damage, leaking seals, etc.. Also, be alert for any changes in steering action. Hard steering, excessive freeplay (Looseness), or unusual sound when turning or maneuvering indicates a need for inspection or servicing.

Check the steering system by moving the steering handwheel in a full right turn and then in a full left turn. Return the handwheel to the straight ahead position. The steering system components should operate smoothly when the handwheel is turned. Never operate a truck that has a steering system fault.

⚠ Fasten your seat belt before driving the truck.

(9) Direction control, braking and inching

※ Be sure that the travel area is clear in front of the truck.

① Push firmly on the brake pedal. Release the parking brake. Move the gear selector lever from NEUTRAL to FORWARD.

② Remove your right foot from the service brake pedal and put it on the accelerator pedal. Push down until the truck moves slowly forward. Remove your foot from the accelerator pedal and push down on the service brake pedal to stop the truck. The brakes should apply smoothly and equally.

※ Be sure the travel area is clear behind the truck.

③ Put the gear selector lever in the REVERSE travel position. Release the service brake and push down on the accelerator pedal until the truck moves slowly in the reverse direction. Remove your foot from the accelerator pedal and push down on the service brake pedal to stop the truck. The brakes should apply smoothly and equally.

④ Put the gear selector lever in FORWARD. Press the inching pedal fully down and hold. Depress the accelerator pedal. The truck should not move. Now, with the accelerator pedal still depressed, slowly release the inching pedal until the truck **Inches** forward smoothly and slowly.

※ Report any problems.

※ When you have completed the operational tests, park and leave the truck according to standard shut down procedure as described in section 5 of this manual. Be sure to make a record of all maintenance and operating problems you find.

7) LUBRICATION

(1) Truck chassis inspection and lubrication

Lubrication and inspection of the truck chassis components, including the steering wheels, steering axle linkage, steering cylinder and wheel bearings are easier if the truck is raised and blocked up under the frame. Refer to page 7-52 for additional information on truck blocking and jacking. Also refer to page 7-45 for the location of grease fittings.

Inspect the steering cylinder piston rods, seals, and fasteners for damage, leaks, and looseness. Lubricate the steering axle linkage rod ends and linkage pivot points. Be sure to clean the grease fittings before lubricating, and remove the excess grease from all points after lubricating. Lubricate miscellaneous linkage as needed.

(2) Mast and tilt cylinder lubrication

Clean the fittings and lubricate the tilt cylinder rod end bushings (forward end) and both the base rod-end bushings (rear end). Clean and lubricate the mast mounting pin.

(3) Lift chains

Lubricate the entire length of the mast rail lift and carriage chains with HYUNDAI chain and cable lube.

8) AIR CLEANING

Always maintain a lift truck in a clean condition. Do not allow dirt, dust, lint, or other contaminants to accumulate on the truck. Keep the truck free from leaking oil and grease. Wipe up all oil spills. Keep the controls and floorboards clean, dry, and safe. A clean truck makes it easier to see leakage and loose, missing, or damaged parts, and helps prevent fires. A clean truck runs cooler. The environment in which a lift truck operates determines how often and to what extent cleaning is necessary.

For example, trucks operating in manufacturing plants that have a high level of dirt, dust, or lint (for example, cotton fibers or paper dust) in the air or on the floor or ground, require more frequent cleaning. The radiator especially may require daily air cleaning to ensure correct cooling.

If air pressure does not remove heavy deposits of grease, oil, etc., it may be necessary to use steam or liquid spray cleaner.

Lift trucks should be air cleaned at every PM interval, or more often if necessary.

Use an air hose with special adapter or extension, a control valve, and a nozzle to direct the air properly. Use clean, dry, low pressure, compressed air. Restrict air pressure to 2.0 kgf/cm^2 (30 psi), maximum (OSHA requirement).

⚠ Wear suitable eye protection and protective clothing when air cleaning. Never point the air nozzle at anyone.

Air clean the mast assembly, drive axle, radiator- from both counterweight and engine side, engine and accessories, drive line and related components, and steering axle and cylinder.

9) CRITICAL FASTENER TORQUE CHECKS

Fasteners in highly loaded (critical) components can quickly fail if they become loosened. Also, loose fasteners can cause damage or failure of the component. For safety, it is important that the correct torque be maintained on all critical fasteners of the components that directly support, handle, or control the load and protect the operator.

Critical items include:

- Drive axle mounting
- Cabin
- Drive and steering wheel mounting
- Tilt cylinder mounting and yokes
- Counterweight mounting
- Mast mounting and components

Refer to page 8-4 for torque specifications.

10) LIFT CHAIN MAINTENANCE

The chain system on the mast was designed for safe, efficient, and reliable transmission of lifting force from hydraulic cylinder to the forks. Safe use of your truck with minimum down time depends on the correct care and maintenance of the lift chains. Most complaints of unacceptable chain performance are a result of poor maintenance. Chains need periodic maintenance to give maximum service life.

⚠ Do not attempt to repair a worn chain. Replace worn or damaged chains with a set (LH & RH). Do not piece chains together.

(1) Lift chain inspection and measurement

Inspect and lubricate the lift chains every 10 hours or daily and check tension every 250 hours or monthly. When operating in corrosive environments, inspect the chains every 50 hours. During the inspection, check for the following conditions:

- Rust and corrosion, cracked plates, raised or turned pins, tight joints, wear, and worn pins or holes.
- When the pins or holes become worn, the chain becomes longer. When a section of chain is 3% longer than a section of new chain, the chain is worn and must be discarded.
- Chain wear can be masured by using a chain scale or a steel tape measure. When checking chain wear, be sure to measure a segment of chain that moves over a sheave. Do not repair chains by cutting out the worn section and joining in a new piece. If part of a chain is worn, replace all the chains of both sides on a truck.

(2) Lift chain lubrication

Lift chain lubrication is an important part of your maintenance program. The lift chains operate under heavy loadings and function more safely and have longer life if they are regularly and correctly lubricated. HYUNDAI chain lubricant is recommended; it is easily sprayed on and provides superior lubrication. Heavy motor oil may also be used as a lubricant and corrosion inhibitor.

(3) Lift chain wear and replacement criteria

① **New chain length**

The distance from the first pin counted to the last pin counted in a span while the chains are lifting a small load.

② **Worn chain length**

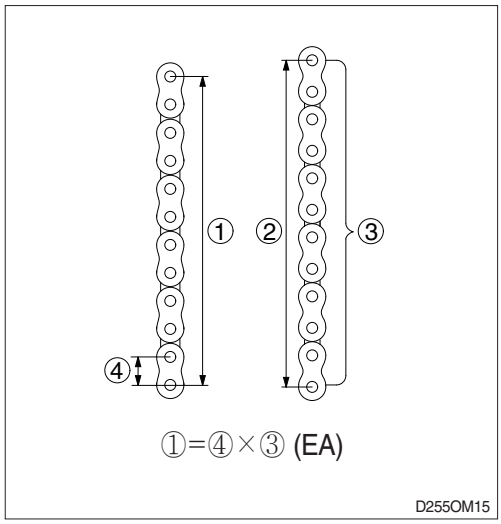
The distance from the first pin counted to the last pin counted in a span while the chains are lifting a small load.

③ **Span**

The number of pins in the length (segment) of chain to be measured.

④ **Pitch**

The distance from the center of one pin to the center of the next pin.

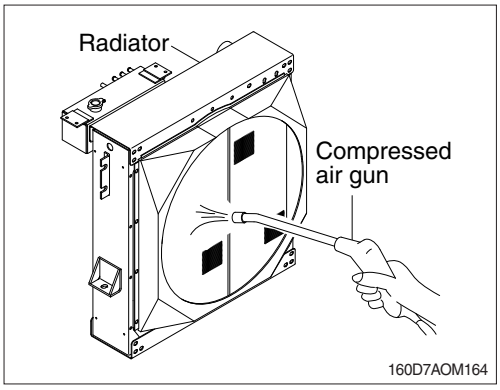


All chains must be replaced if any link has wear of 3% or more, or if any of the damaged conditions notes above are found during inspection. Order replacement chains from your HYUNDAI dealer. Replace all chains as a set. Do not remove factory lubrication or paint new chains. Replace anchor pins and worn or broken anchors when installing new chains. Adjust tension on new chains. Lubricate chains when they are installed on the mast.

※ **Please refer to your service manual for additional information on lift chain measurement and maintenance.**

10. HANDLING TRUCK IN EXTREMELY HOT PLACES

Pay careful attention particularly to the following points when handling the truck in extremely hot places.



1) Scale and rust form more easily in the cooling system, so wash with anticorrosion liquid. Always try to have clean and soft water circulating in the system.

2) Clogging of the radiator fins is one cause of overheating, so use air or water jets to clean the fins. When doing this, the air nozzle must be at right angles to the radiator.
   · Air pressure max : 2 kgf/cm^2 (30 psi)

3) Check the fan belt tension. If it is too slack, adjust the tension. (refer to the page 5-5.)

4) In case of overheating, do not stop the engine immediately.
   (1) Run the engine at low idling.
   (2) Open the hood to ventilate the engine compartment.
   (3) When the water temperature drops, stop the engine.
   (4) Check the cooling water level. If it is low, add more water.

⚠ Wear safety glasses and a face shield when using compressed air. Never touch the radiator cap while the engine is hot. Steam may spurt out. Wait until the water temperature drops. It is extremely dangerous to try to check the fan belt tension while the engine is running. When inspecting the fan belt or other moving parts, or near such parts, always stop the engine first.

11. COLD WEATHER OPERATION

1) PREPARATION FOR LOW TEMPERATURE

(1) Replace lubrication oil with oil of the prescribed viscosity.

(2) Fuel of low pour point must be used. ASTM D975 No.1 diesel fuel should be used at ambient temperature lower than -5 ˚C.

(3) Use a mixture of 50 percent soft water and 50 percent ethylene glycol antifreeze to fill the cooling system. Refer to the page 7-63.

⚠ Use ethylene glycol base antifreeze.
⚠ Use soft water (city water, etc.) as mixing water.
⚠ Cooling system must be thoroughly flushed before filling with antifreeze mixture.
⚠ Do not expose antifreeze to flame. It is inflammable.

※ Dispose of old antifreeze mixture in locally approved manner.

2) BATTERY

As the ambient temperature drops, the battery capacity will drop and the electrolyte may sometimes freeze if the battery charge is low. Maintain the battery at a charge level of over 75% and insulate it against cold temperature so that the truck can be readily started the next morning.

※ When the electrolyte level is low, add distilled water in the morning before work instead of after the day's work. This is to prevent fluid from freezing at night.

3) CARE AFTER DAILY OPERATION

(1) Drain water from the fuel system to prevent freezing.
(2) Fill the tank at the end of each day of operation to drive out moisture laden air to prevent condensation.
Do not fill the tank to top.

⚠ Explosive fumes may be present during refueling.

12. RECOMMENDATION TABLE FOR LUBRICANTS

1) NEW TRUCK

New truck uses following fuel, coolant and lubricant.

Description	Specification
Engine oil	SAE 10W-30/15W-40 (API CJ-4 class or better)
DEF/AdBlue®	ISO 22241 (32.5% high-purity urea and 67.5% deionized water)
Transmission oil	Engine oil SAE10W-30 (API CF4 class or better)
Drive axle gear oil	SAE 80W-90
Brake cooling oil	Donax TD
Hydraulic oil	ISO VG46/VG68, Hyundai genuine long life hydraulic oil ISO VG15, Conventional hydraulic oil★1
Grease	Lithium base grease NLGI No.2
Fuel	ASTM D975-No.2
Coolant	Mixture of 50% ethylene glycol base antifreeze and 50% water

- SAE : Society of Automotive Engineers
- API : American petroleum Institute
- ISO : International Organization for Standardization
- NLGI : National Lubricating Grease Institute
- ASTM : American Sociery of Testing and Material
- DEF : Diesel Exhaust Fluid
  DEF compatible with AdBlue®

★1 : Cold region
Russia, CIS, Mongolia

13. FUEL AND LUBRICANTS

Use only oils listed below or equivalent. Do not mix different brand oil.

Service point	Kind of fluid	Capacity ℓ (U.S. gal)	Ambient temperature ˚C(˚F)
		160D-9L, 180D-9B	-50 (-58) -30 (-22) -20 (-4) -10 (14) 0 (32) 10 (50) 20 (68) 30 (86) 40 (104)
Engine oil pan	Engine oil	14.2 (3.8)	★SAE 5W-40 SAE 30 SAE 10W SAE 10W-30 SAE 15W-40
DEF/ AdBlue® tank	Mixture of urea and deionized water	37.8 (10.0)	ISO 22241 (High-purity urea + deionized water (32.5:67.5))
Torque converter transmission	Engine oil	35 (9.2)	SAE 10W-30 SAE 15W-40
Drive axle	Gear oil	19 (5.0)	SAE 80W-90/API GL-5
Brake	Cooling oil	27 (7.1)	DONAX TD
Hydraulic tank	Hydraulic oil★2	242 (53.2)	★ISO VG 15 ISO VG 46
Cabin tilt hand pump	Hydraulic oil	0.7 (0.2)	ISO VG 68
Fuel tank	Diesel fuel★1	260 (68.7)	★ASTM D975 NO.1 ASTM D975 NO.2
Fitting (Grease nipple)	Grease	-	★NLGI NO.1 NLGI NO.2
Radiator	Antifreeze:Water 50:50	30 (7.9)	Ethylene glycol base permanent type ★Ethylene glycol base permanent type (60 : 40)

NOTES :

① SAE numbers given to engine oil should be selected according to ambient temperature.

② For engine oil used in engine oil pan, use SAE 10W oil when the temperature at the time of engine start up is below 0 ˚C, even if the ambient temperature in daytime is expected to rise to 10 ˚C or more.

③ Use engine oil of API service class CJ-4.

★1 : Ultra low sulfur diesel
- sulfur content ≤ 15 ppm

★ : Cold region
Russia, CIS, Mongolia

★2 : Hydraulic oil capacity
Refer to page 5-6.