SECTION 2 REMOVAL & INSTALLATION OF UNIT

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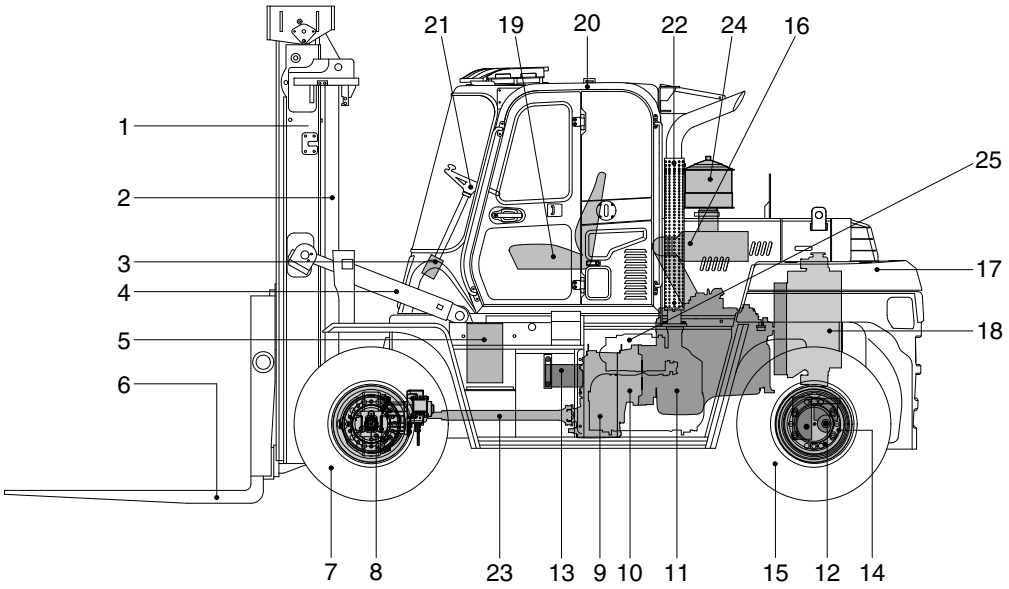
GROUP 1 STRUCTURE



110D9OM21

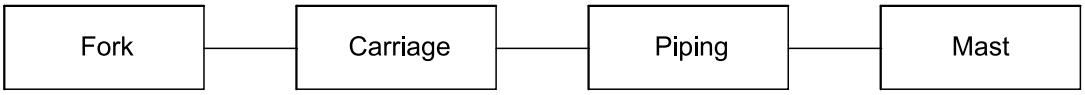
1	Mast	10	Torque converter	19	Seat
2	Lift cylinder	11	Engine	20	Cabin
3	Steering unit	12	Steering cylinder	21	Steering wheel
4	Tilt cylinder	13	Hydraulic pump	22	Silencer
5	Main control valve	14	Steering axle	23	Drive shaft
6	Fork	15	Rear wheel	24	Precleaner
7	Front wheel	16	Air cleaner	25	Aftertreatment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

GROUP 2 REMOVAL AND INSTALLATION OF UNIT

Remove and install following units as explained in the flow chart.

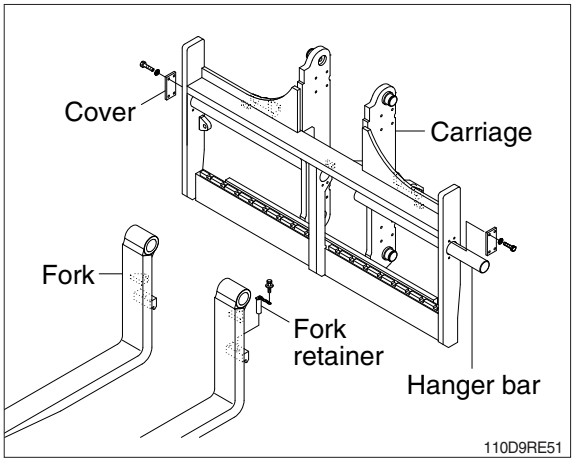
1. MAST

1) REMOVAL



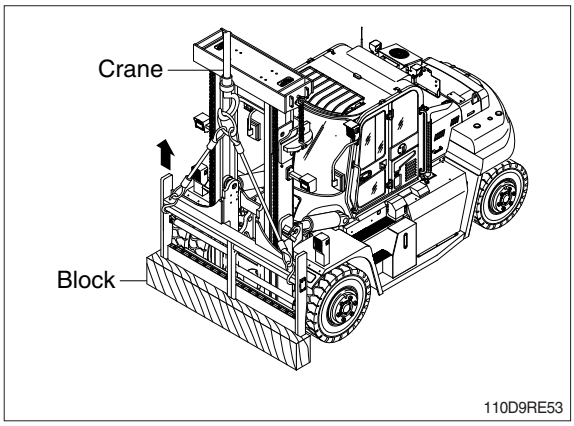
(1) Forks

① Lower the fork carriage until the forks are approximately 25 mm (1 in) from the floor.
② Release fork retainer and remove cover. Slide one hanger bar 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.

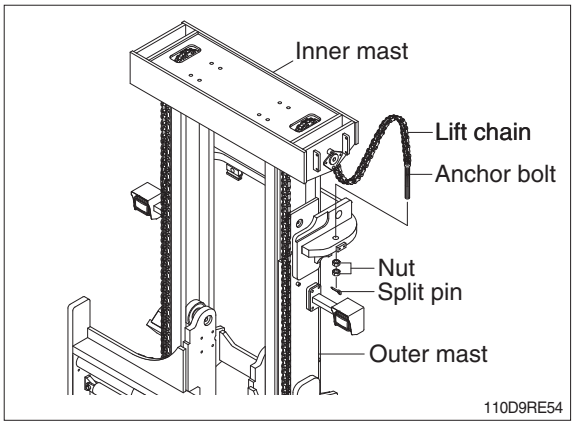


(2) Carriage

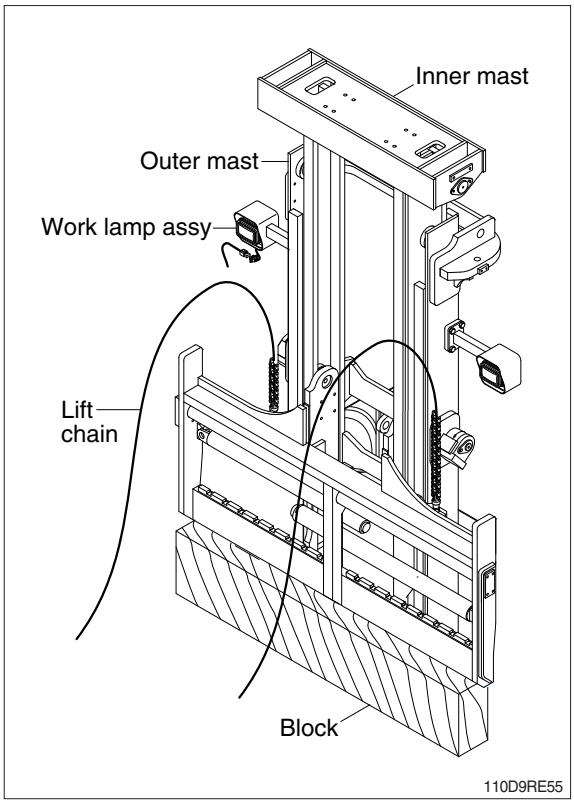
① With the mast vertical, raise the carriage high enough to place blocks under the load forks. This is done to create slack in the load chains when the carriage is lowered. Lower the carriage all the way down to the floor. Make sure the carriage is level, this will prevent any binding when the mast is raised.



② While supporting lift chains, remove nuts from the anchor bolt.



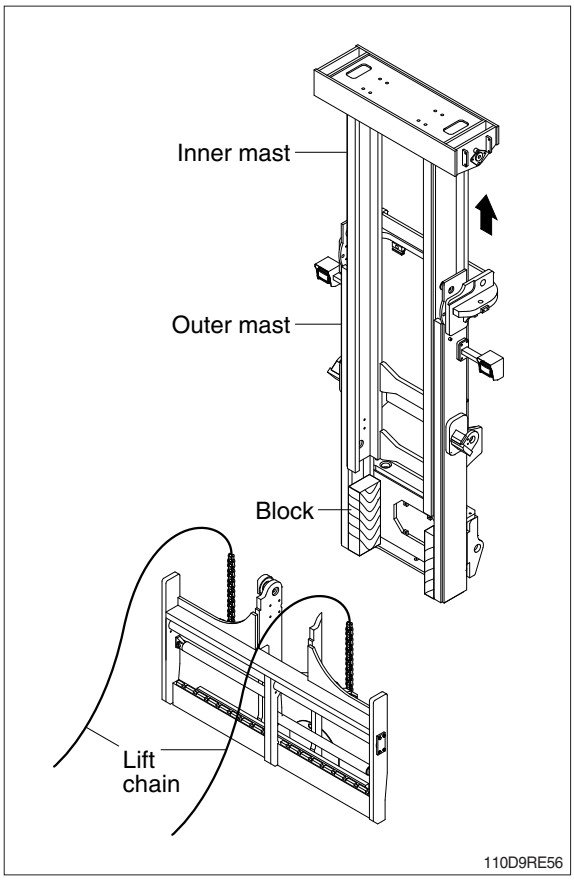
③ Pull the chains out of the sheaves and drape them over the front of the carriage.



④ Slowly raise inner mast upright until mast clears top of fork carriage. Move carriage to work area and lower the mast.

⚠ **Make sure that carriage remains on floor and does not bind while mast is being raised.**

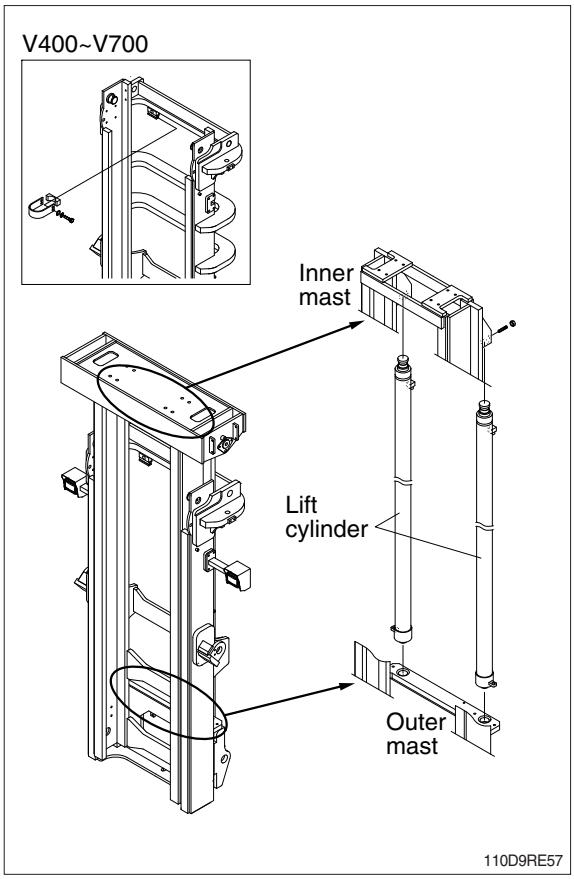
⑤ Inspect all parts for wear or damage. Replace all worn or damaged parts.



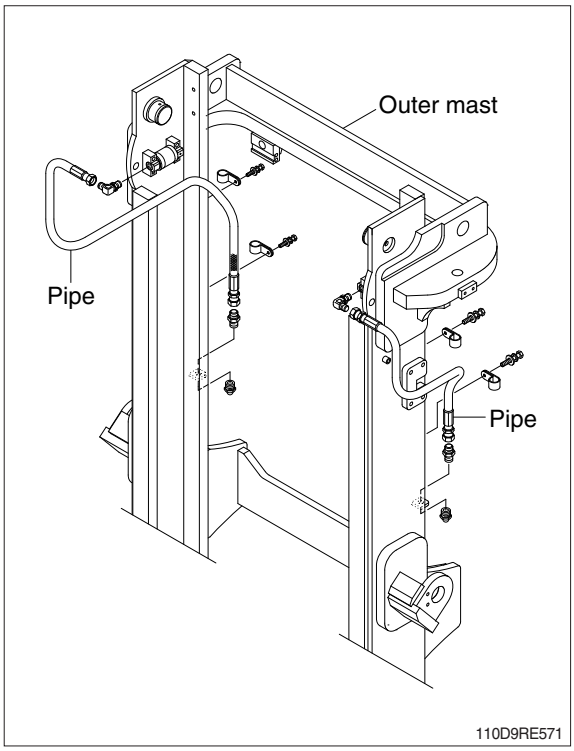
(3) Piping

① Remove the hoses and clamps attached to the cylinder.

※ Put blind plugs in the piping immediately after removing hoses.
This prevents the hydraulic oil from flowing out and also prevents dust and dirt from getting in.



③ Remove the lubrication pipes and clamps.



(4) Lift cylinder

① Loosen and remove hexagon bolts and washers securing lift cylinders to inner mast.

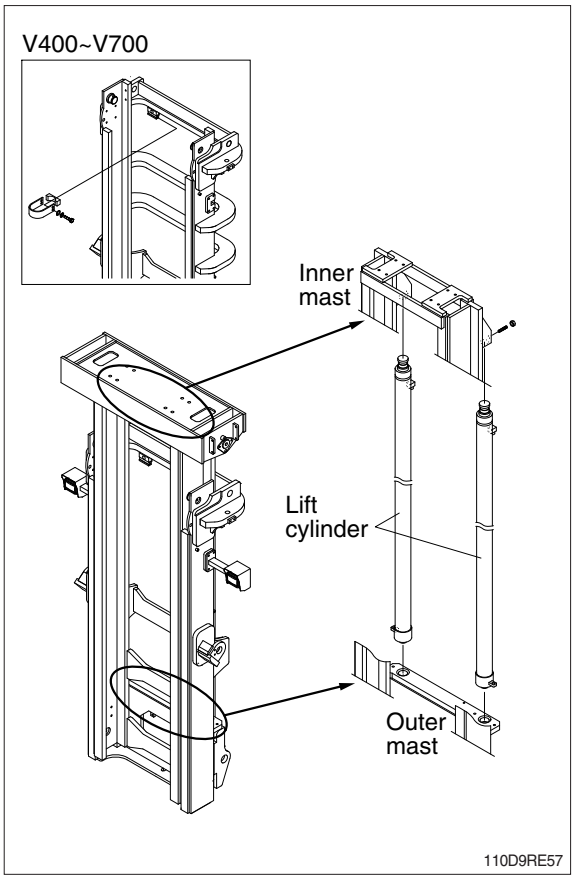
② Bind the lift cylinder with overhead hoist rope and pull up so that the rope has no slack or binding.

⚠ Make sure the lift cylinder be tightened firmly for safety.

③ Loosen and remove hexagon bolts and nuts securing lift cylinders to outer mast.

④ Using an overhead hoist, slowly raise the inner mast high enough to clear lift cylinder.

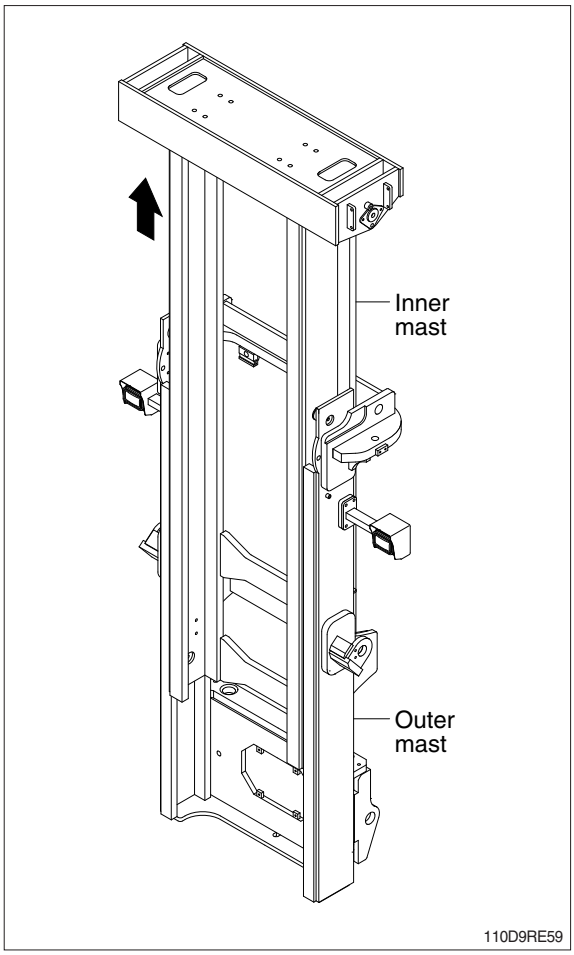
⑤ Using an overhead hoist, draw out lift cylinder carefully and put down on the work floor.



(5) Inner mast

① Using an overhead hoist raise the inner mast straight and carefully draw out of outer mast section.

⚠ Be careful the mast not to swing or fall.



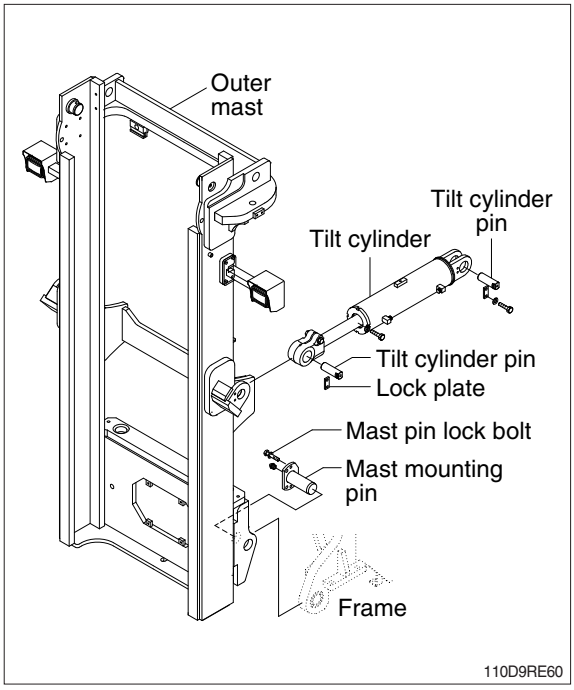
(6) Tilt cylinder pin

Loosen the bolt and remove the lock plate and tilt cylinder pin.

(7) Mast support pin

① Attach a crane to the stay at the top of the outer mast, and raise it.
Loosen the pin lock bolts and remove the mounting pins from drive axle, then slowly raise outer mast the mast support bracket and main frame.

※ This operation is carried out under the machine, so use a pit, or if there is no pit, jack up the machine and loosen with an impact wrench.



2) INSTALLATION

After assembling mast components totally without piping connections, install mast assembly to the equipment.

※ Installation procedure for each of mast component is the reverse of the removal procedure.

(1) Mast support pin

Check the mast mounting pins for wear, then install pins into the mast support bracket and main frame and tighten the mast pin lock bolts.

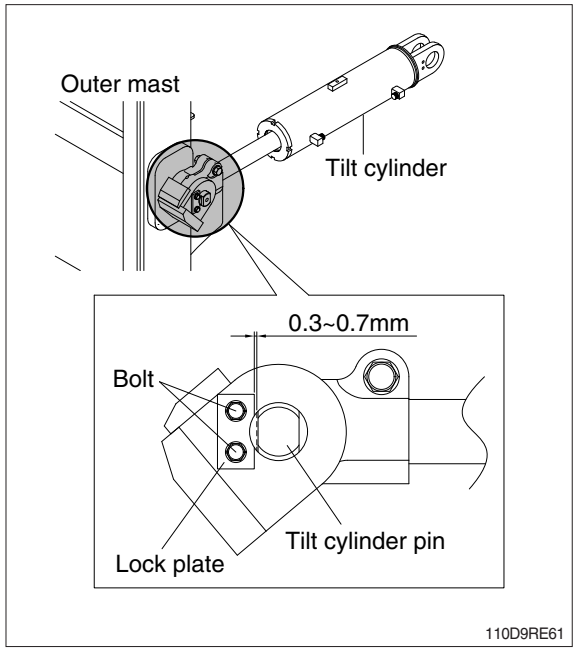
· Tightening torque : 12.5 kgf·m (90.4 lbf·ft)

(2) Tilt cylinder pin

Hold the mast with a crane, operate the tilt control lever and align the holes, then knock the pin and install the lock plate by the bolts.

· Tightening torque : 15.8 kgf·m (114 lbf·ft)

(3) Lift cylinder installation and adjustment



(3) Lift cylinder installation and adjustment

① Assemble the lift cylinder inside the outer mast, then tighten the stopper bolt. If the cylinder assembly has been replaced, adjust as follows so that the left and right cylinders are synchronized at the maximum lifting height.

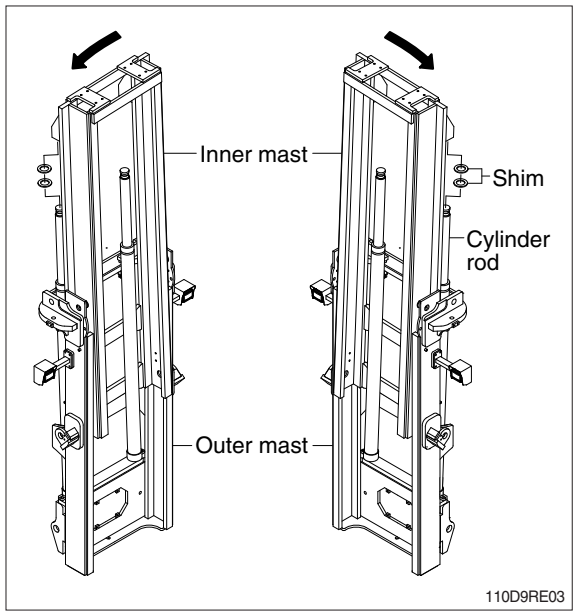
② Assemble the cylinder rod to the inner mast, and check the left-to-right play of the mast at the maximum lifting height.

※ If play is to LEFT, install adjustment shim to LEFT cylinder.

※ If play is to RIGHT, install adjustment shim to RIGHT cylinder.

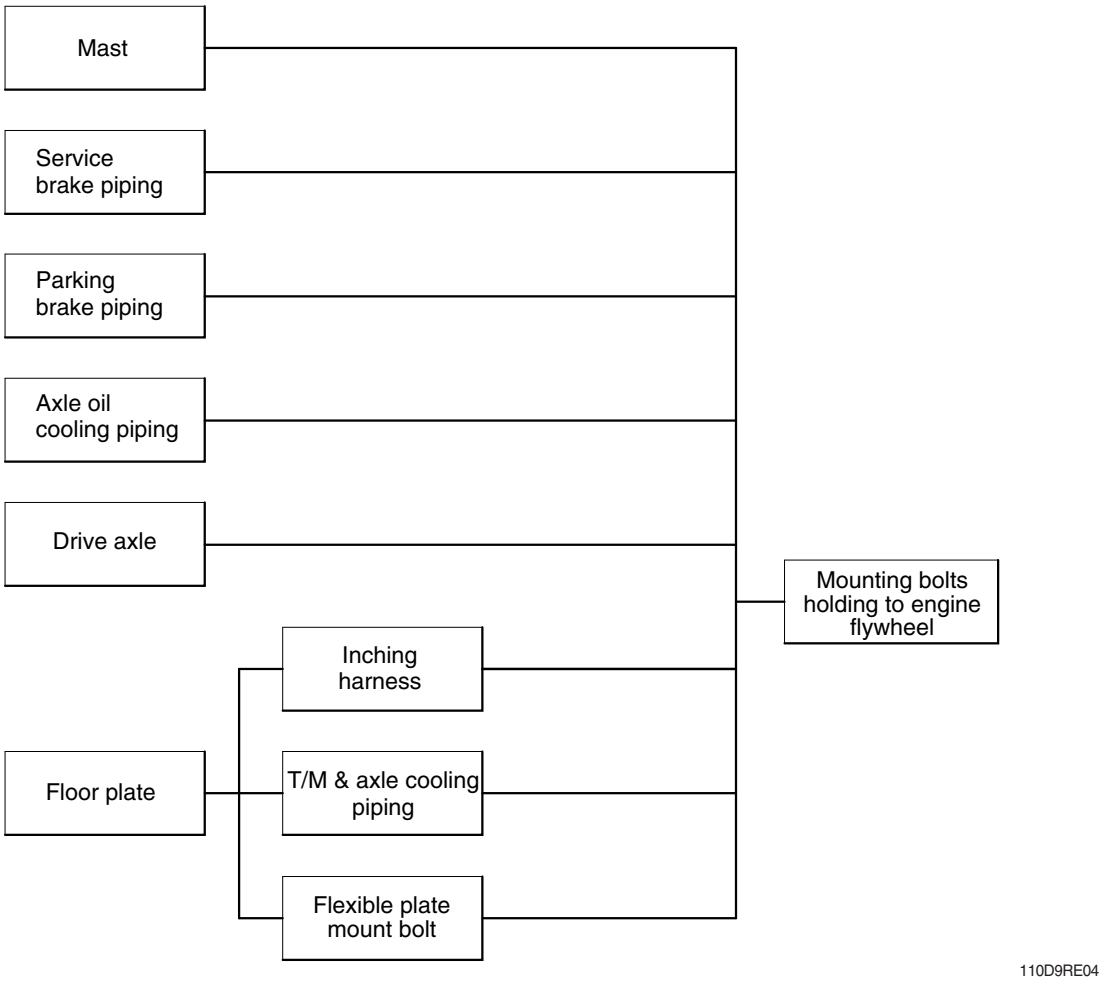
· Shim thickness : 1.0 mm (0.04 in)

※ Lubricate the grease into the nipple sufficiently.



2. POWER TRAIN ASSEMBLY

1) REMOVAL

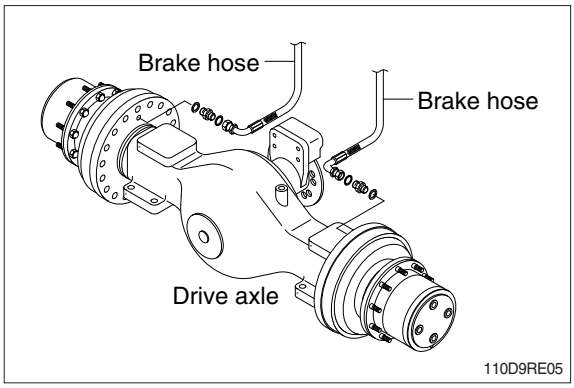


(1) Mast

Refer to section on mast (Page 2-2)

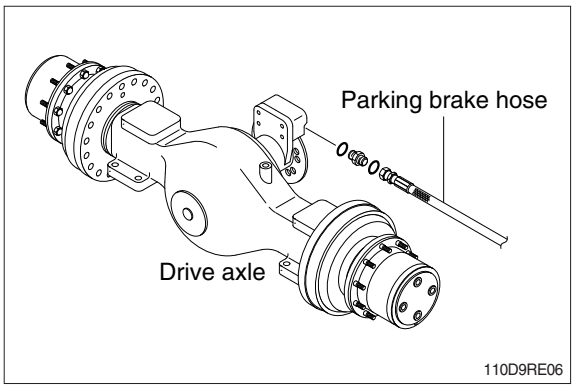
(2) Service brake piping

Disconnect the brake hydraulic hoses from the brake housing of drive axle assy.



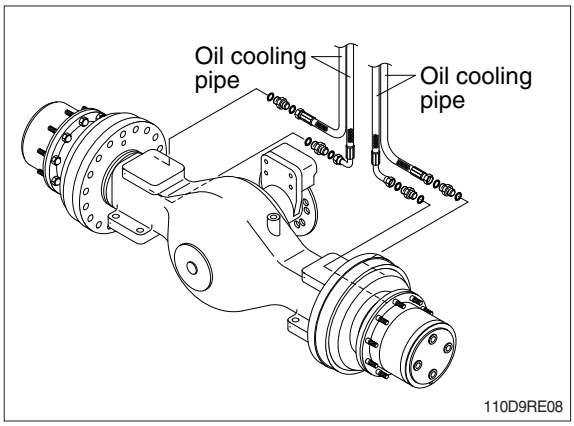
(3) Parking brake piping

Disconnect parking brake piping from the drive axle.



(4) Axle oil cooling piping

Disconnect the brake cooling piping from the drive axle.



(5) Drive axle

※ Before removing the drive axle assy, drain all of the oil from the axle.

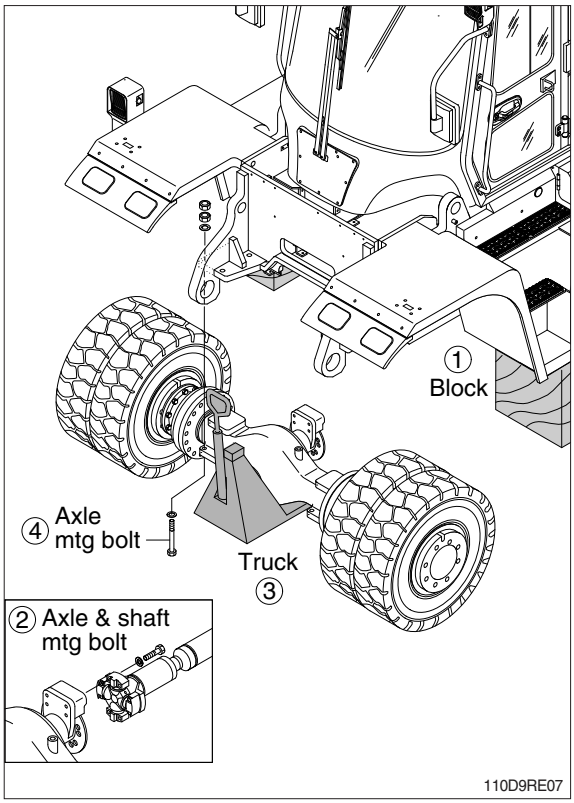
① Jack up the truck and then put the block under the frame.

※ If there is a pit, use the pit for safety.

② Loosen hexagonal bolts connecting drive axle to the drive shaft.

③ Prepare the truck under the drive axle unit to support it.

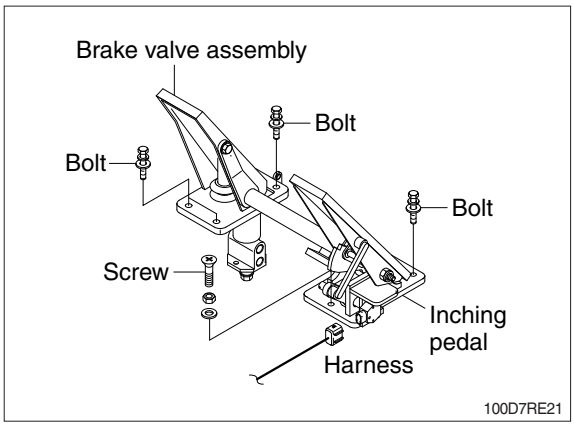
④ Remove mounting bolts fixing the axle to the frame and then carefully draw the truck out of the vehicle with the drive axle unit.



(6) Inching linkage

① Remove bolt and screw fixing the inching linkage assembly.

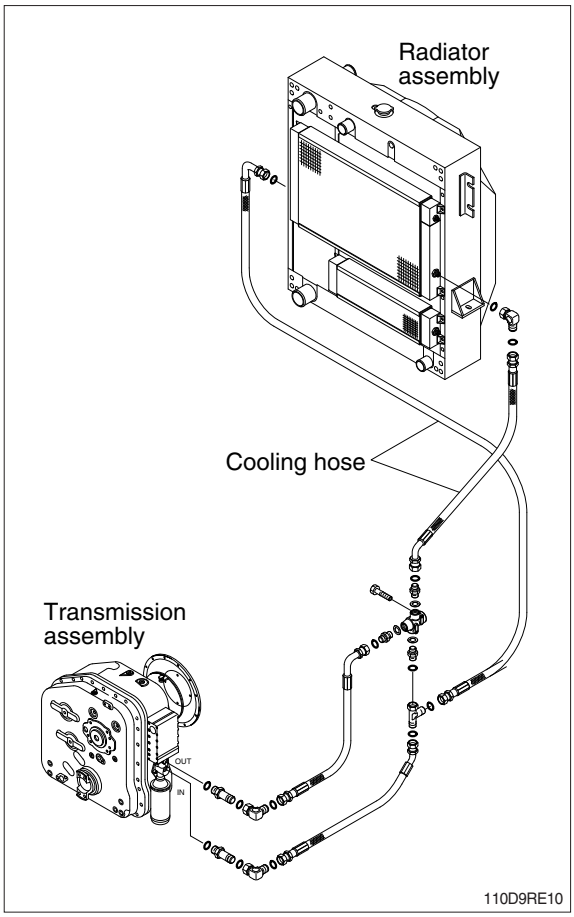
② Disconnect harness cable from the inching pedal assembly.



(7) Transmission and axle cooling piping

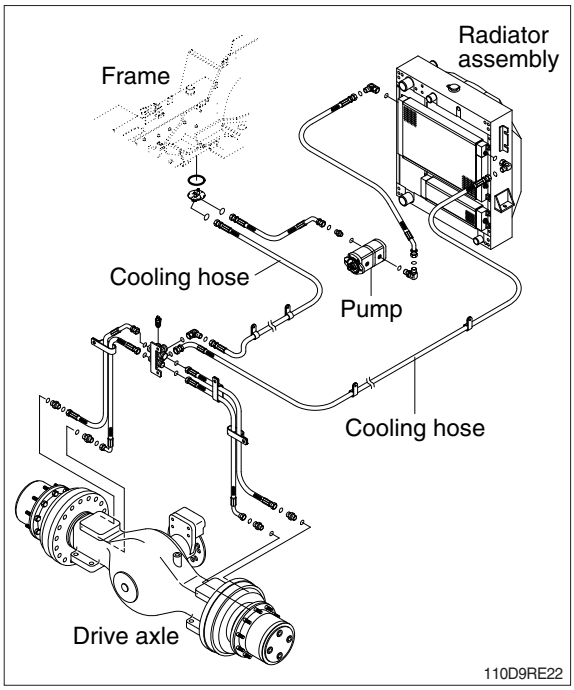
① Disconnect cooling hoses and connectors from the transmission.

※ Make sure that the coolant has been drained from the line.



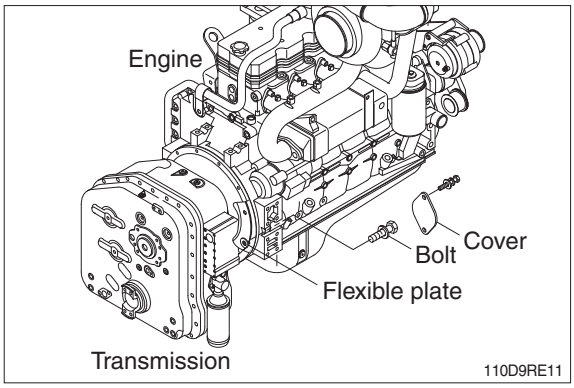
② Disconnect axle cooling hoses and connectors from the axle.

※ Make sure that the axle cooling oil has been drained from the line.



(8) Flexible plate

① Remove the cover on the left side of the flywheel housing then remove the 8 mounting bolts installed to the engine flywheel.
To rotate the flywheel, remove 1 mounting bolt, then insert a turning tool in the mounting hole. One man must turn the engine fan by hand while the other turns the flywheel.

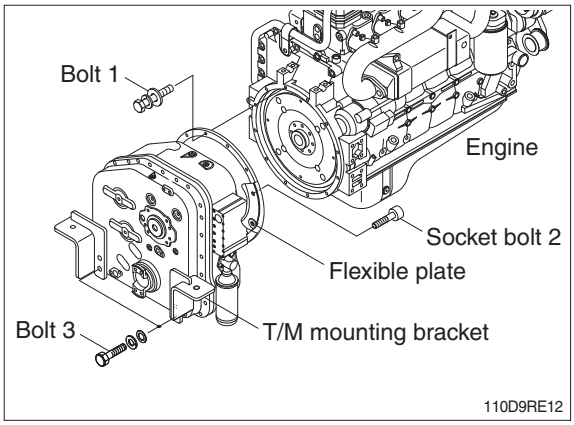


(9) Mounting bolts holding to flywheel housing

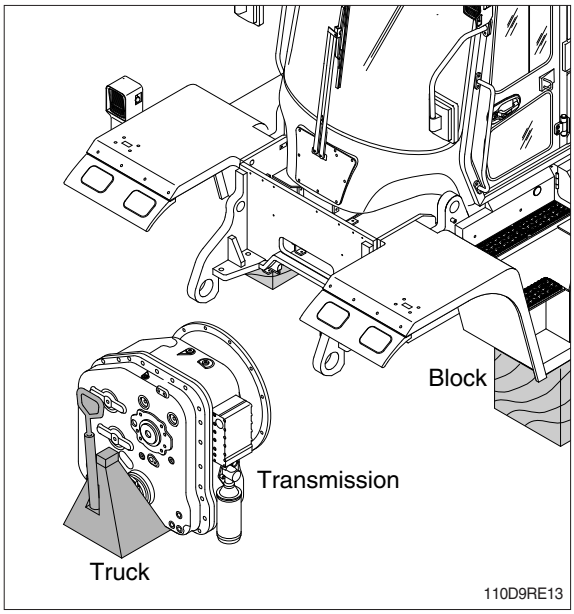
① Loosen the mounting bolt 1 to disconnect the transmission assembly from the torque converter housing.

② Loosen the socket bolts 2 to disconnect the flexible plate from the engine flywheel.

③ Loosen the mounting bolts 3 to disconnect the transmission assembly from the main frame.



④ Using a moving truck slowly pull out transmission assembly to the front.



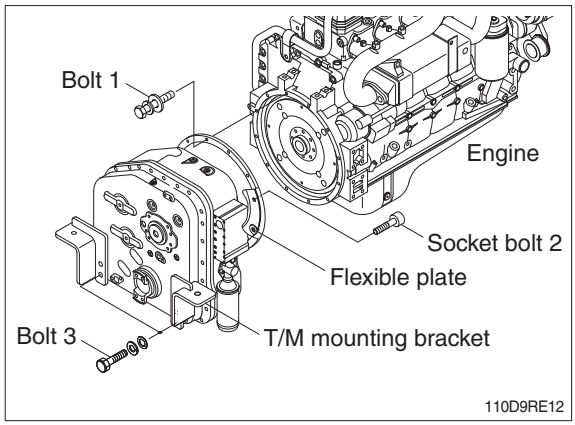
2) INSTALLATION

Installation is the reverse order to removal, but be careful of the following points.

(1) Tightening torque of the mounting bolts for the transmission.

① Bolt 1 : 5.5~8.3 kgf·m (39.8~60.0 lbf·ft)
② Bolt 2 : 3.9~5.1 kgf·m (28.1~36.9 lbf·ft)
③ Bolt 3 : 85~115 kgf·m (615~832 lbf·ft)

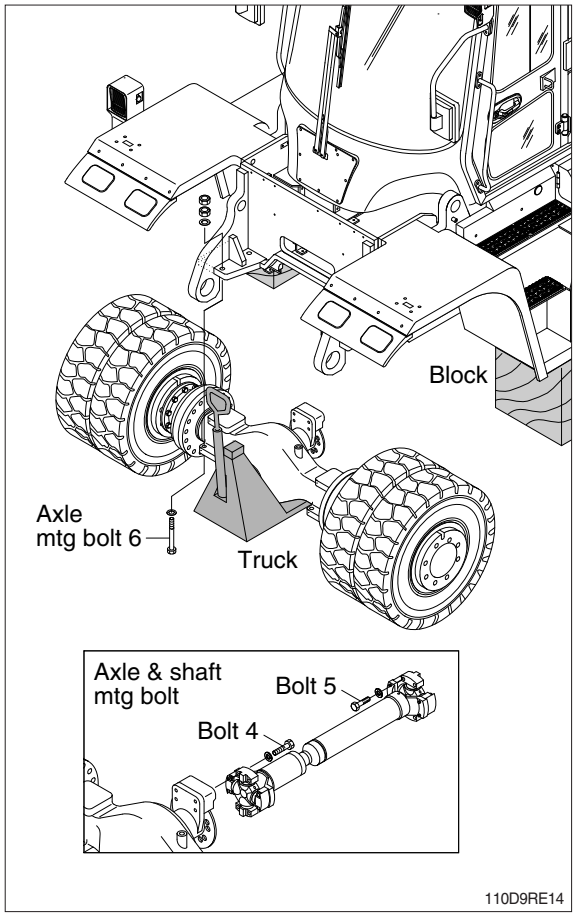
※ Apply loctite #277 on the thread before tightening the bolts 1 and 2.



(2) Tightening torque of the mounting bolts for the drive axle and shaft.

① Bolt 4 : 13~17 kgf·m (94.0~123 lbf·ft)
② Bolt 5 : 13~17 kgf·m (94.0~123 lbf·ft)
③ Bolt 6 : 85~115 kgf·m (615~832 lbf·ft)

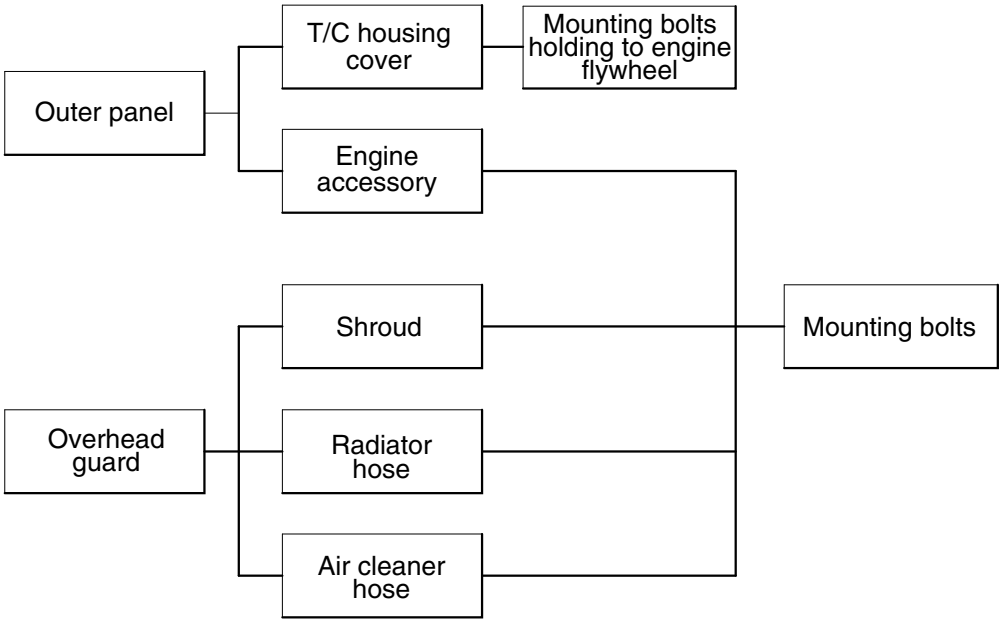
※ Apply loctite #277 on the thread before tightening the bolts.



3. ENGINE

Lever the torque converter, transmission and front axle inside the frame, then remove the engine assembly

1) REMOVAL



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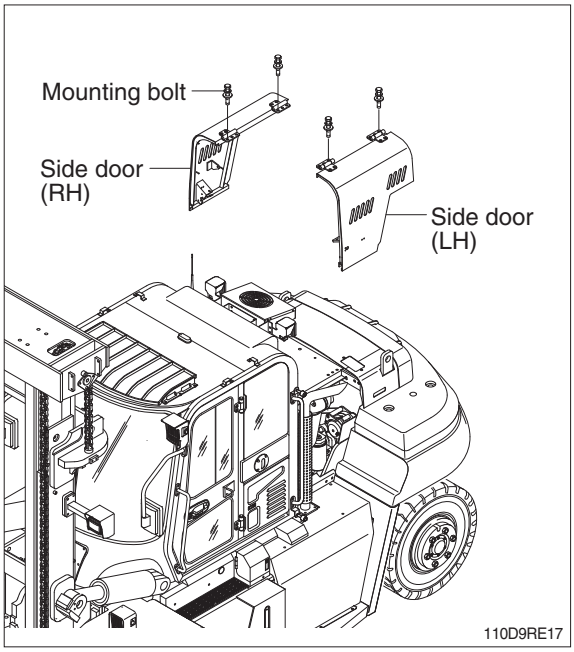
(1) Outer panel

① **Side door (LH, RH)**

Remove side door (LH, RH) by loosening the mounting bolts.



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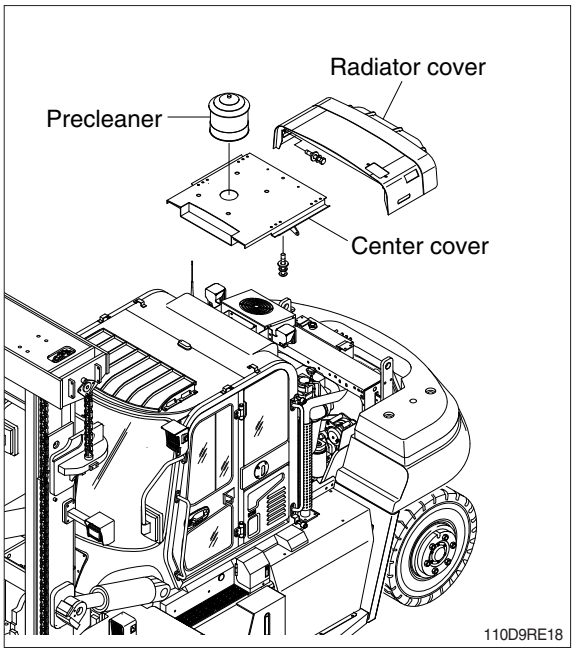
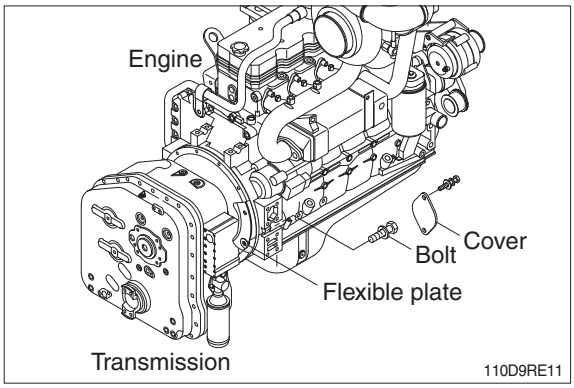
② **Center cover**

a. Pull upside the precleaner by loosening the clamp and seal in the air intake hole of air cleaner.

b. Remove center cover and radiator cover upward.



(2) Flywheel housing cover and mounting bolts. See page 2-12.



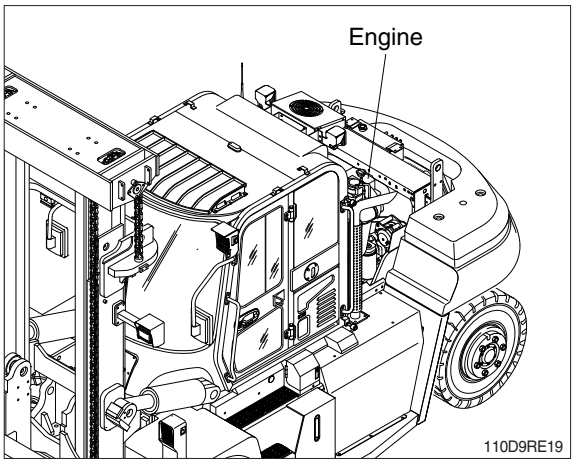
(3) Engine accessory

Remove all wiring harnesses, cables and hoses around the engine, dashboard and frame.

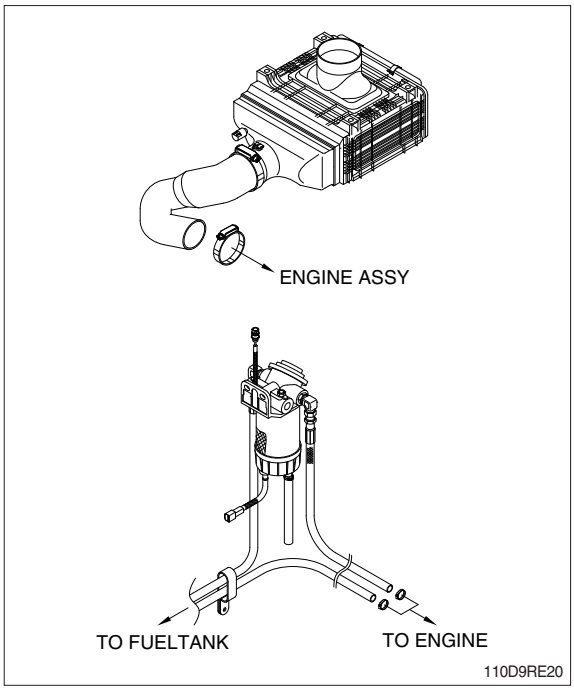
① Wiring harness to alternator and starter.

② Wiring harness for oil pressure and engine water temperature gauges.

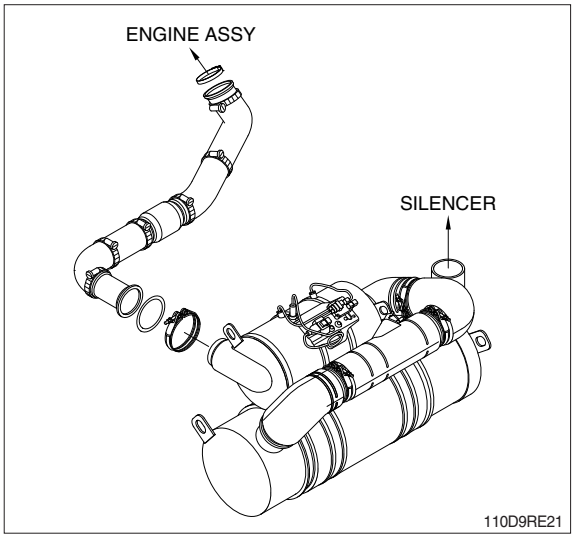
③ Cables for meters, buttons and accelerator pedal.



④ Hoses to fuel tank and air cleaner.

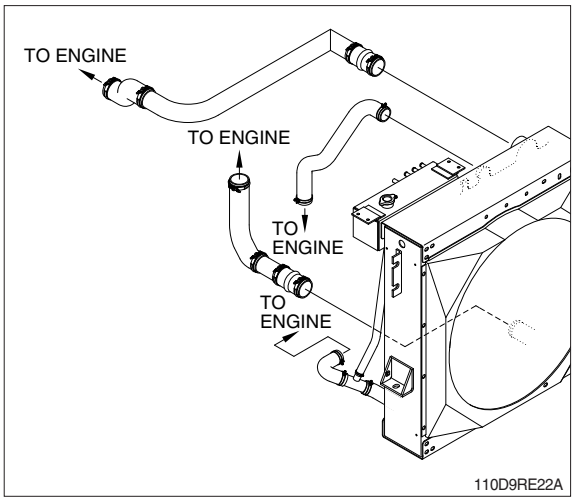


⑤ Exhaust pipe.



(4) Radiator hose

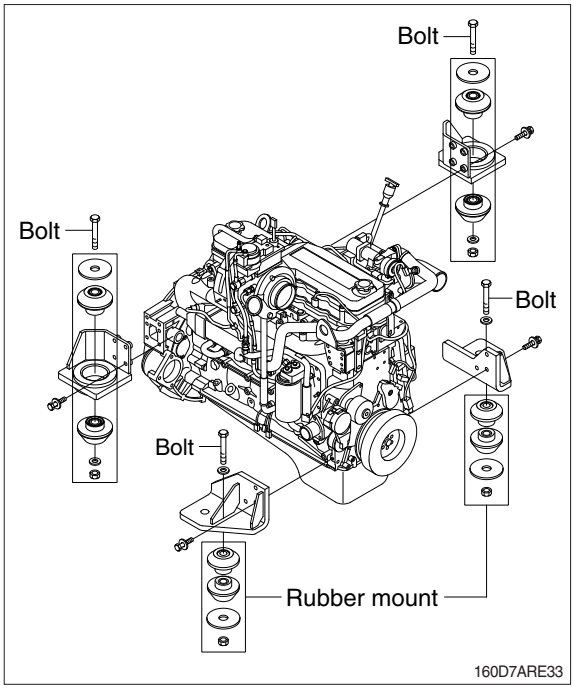
Open the drain valve of the radiator and drain the cooling water, then remove the radiator hose.



(5) Engine mounting bracket

Attach a crane to the engine hook and raise, then remove mounting bolts. Raise the engine slightly, slide towards the radiator, then lift up.

※ When sliding the engine, be careful of the collision of engine and radiator.



2) INSTALLATION

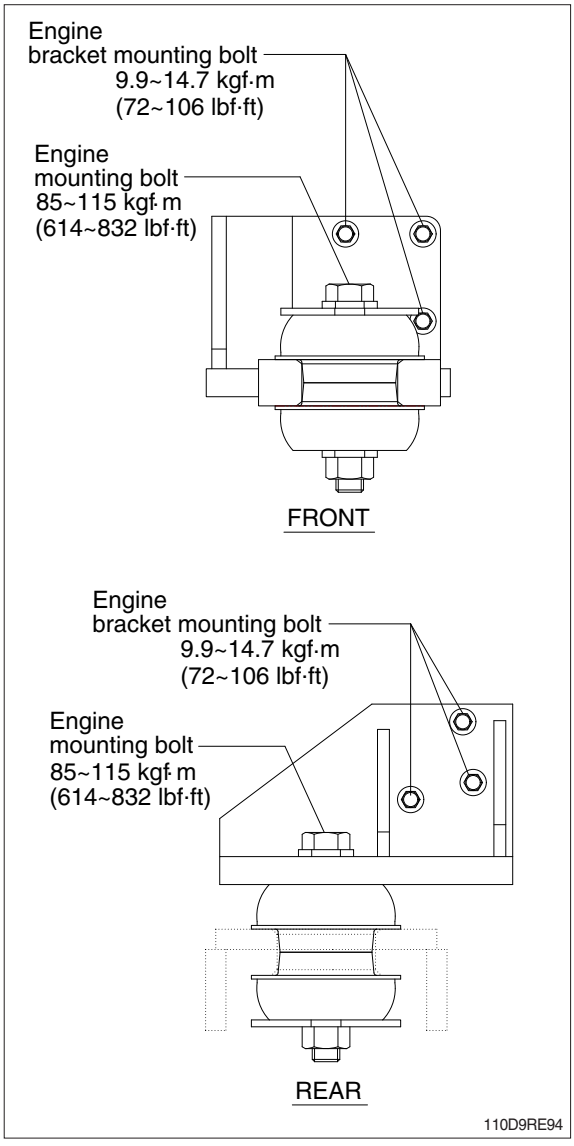
Installation is the reverse order to removal, but be careful of the following points.

(1) Tighten the engine bracket mounting bolts.

※ Do not remove the bolts unless necessary. Loctite is coated over the threads of bolt. So, once the bolts were removed, coat them with loctite(#277) when installing.

※ Before installing the bolts, loctite in the holes should be removed by a tap.

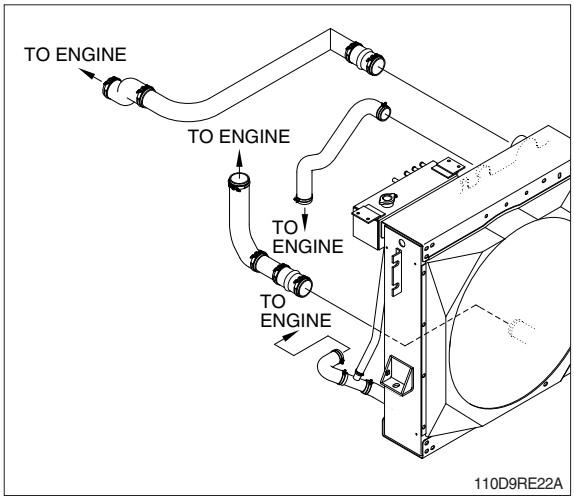
(2) Tighten the engine mounting bolts and nuts.



(3) Tightening torque of mounting bolt installed to torque converter housing.
·See page 2-13, **2) INSTALLATION.**

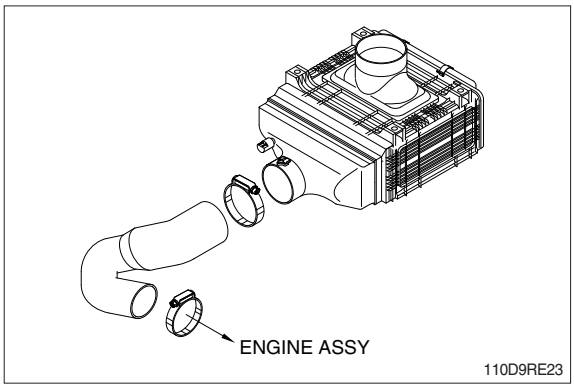
(4) Radiator hoses

Insert the radiator hoses securely and fit the clamps.



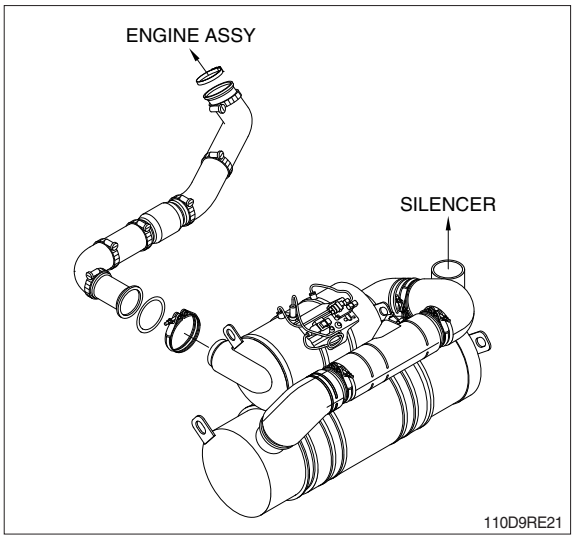
(5) Air cleaner hose

① Insert the air cleaner hose securely and fit a clamp.



(6) Exhaust pipe

Insert the exhaust pipe to the engine securely and fit a clamp.



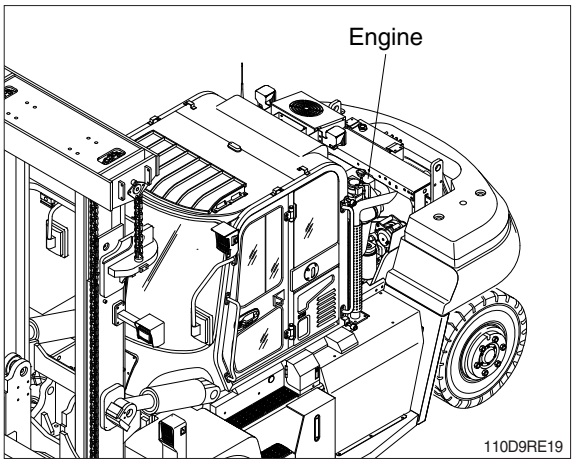
(7) Engine accessory

Install all wiring harnesses, cables and hoses around the engine, dashboard and frame.

① Wiring harness to alternator and starter.

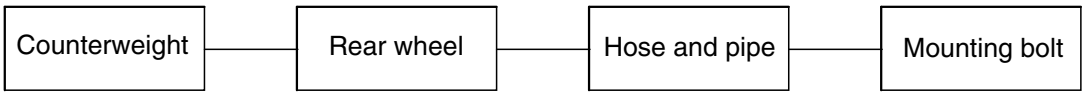
② Wiring harness for oil pressure and engine water temperature gauges.

③ Cables for meters, buttons and accelerator pedal.



4. REAR AXLE

1) REMOVAL



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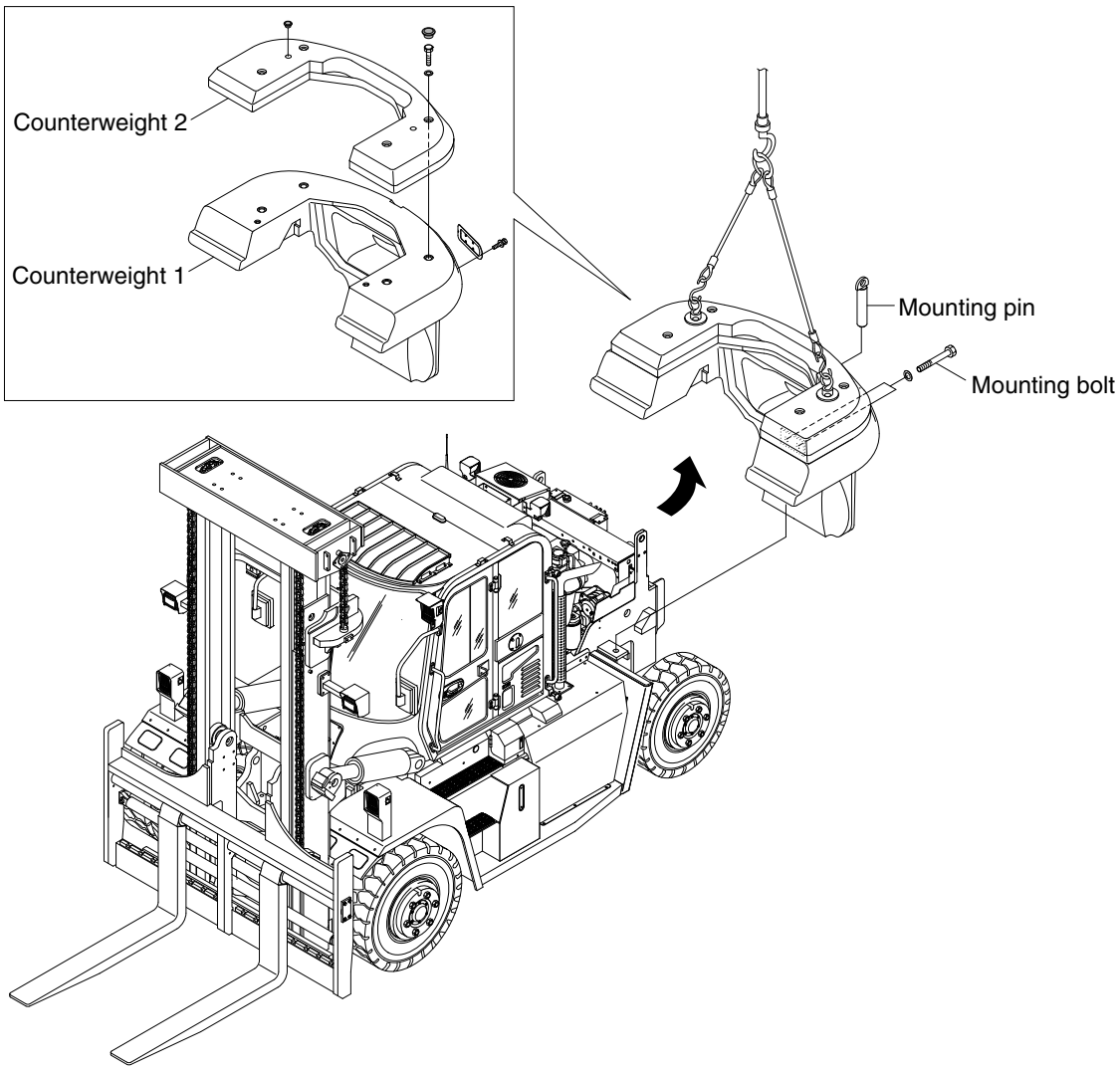


110D9RE30

(1) Counterweight

Hold the counterweight with hoist bars, and raise it with a crane.

Remove the mounting bolts, raise slightly and move it slowly to rear side.

· Weight of counterweight (standard)

Mode	Counter weight 1	Counter weight 2
110D-9	2750 kg (6010 lb)	1390 kg (3065 lb)
130D-9	3505 kg (7730 lb)	1390 kg (3065 lb)
160D-9	4240 kg (9350 lb)	1850 kg (4080 lb)

· Tightening torque : 199±29.9 kgf · m (1440±216 lbf · ft)

(2) Rear wheel

Remove mounting bolt and hub nut with socket wrench and then carefully take out the tire assembly.

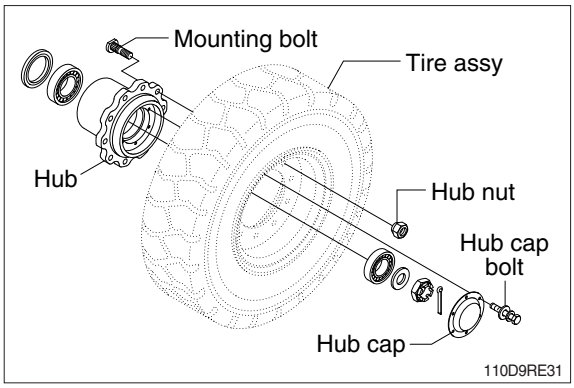
· Tightening torque

- Hub nut

  83.2±10 kgf·m (602±72.3 lbf·ft)

- Hub cap bolt

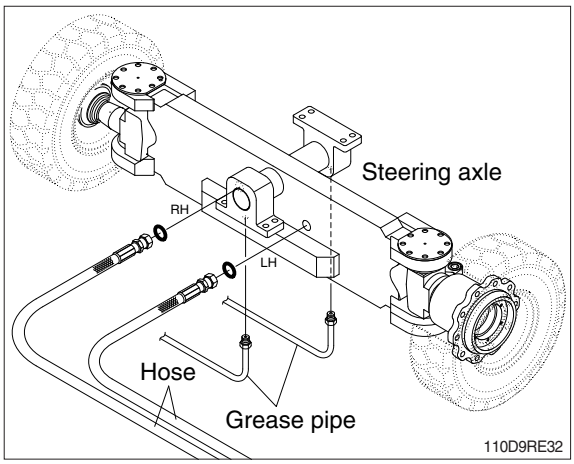
  2.5±0.5 kgf·m (11.8±3.6 lbf·ft)



(3) Hose and piping

① Disconnect the hoses from the steering axle and then drain out oil.

② Disconnect the pipes from the axle support.



(4) Mounting bolt

Put a block under the steering axle, support on a truck, an raise the frame with a crane. Remove the mounting bolts installing to the frame, and pull out to the rear.

There are shims between the support and steering axle to prevent play.

· Mounting bolt tightening torque

  100±15 kgf·m (723±72.3 lbf·ft)

※ Apply loctite #277 on the thread before tightening.