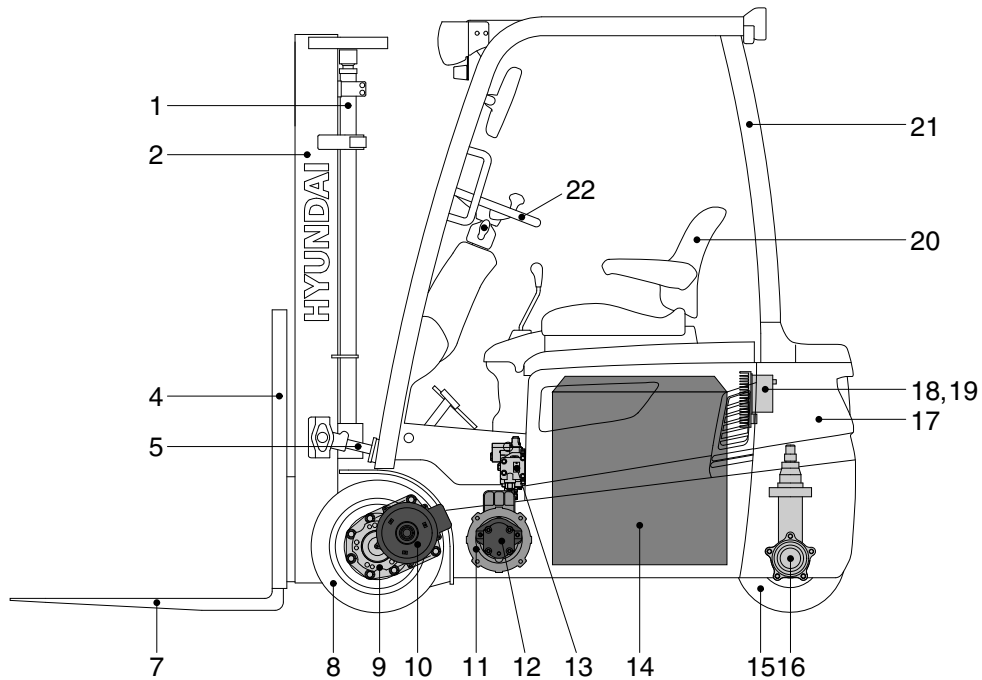


# SECTION 2 REMOVAL & INSTALLATION OF UNIT

Group 1	Major components .....	2-1
Group 2	Removal and installation of unit .....	2-2

## SECTION 2 REMOVAL & INSTALLATION OF UNIT

### GROUP 1 MAJOR COMPONENTS



15BT9USM0201

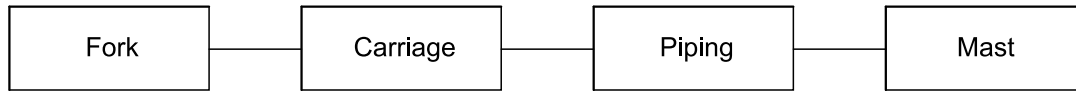
1	Lift cylinder	10	Drive motor	17	Counterweight
2	Mast	11	Hydraulic motor	18	Traction controller
4	Backrest	12	Pump motor	19	Pump controller
5	Tilt cylinder	13	Main control valve	20	Seat
7	Forks	14	Battery	21	Overhead guard
8	Front wheel	15	Rear wheel	22	Steering wheel
9	Drive unit	16	Steering axle		

## GROUP 2 REMOVAL AND INSTALLATION OF UNIT

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

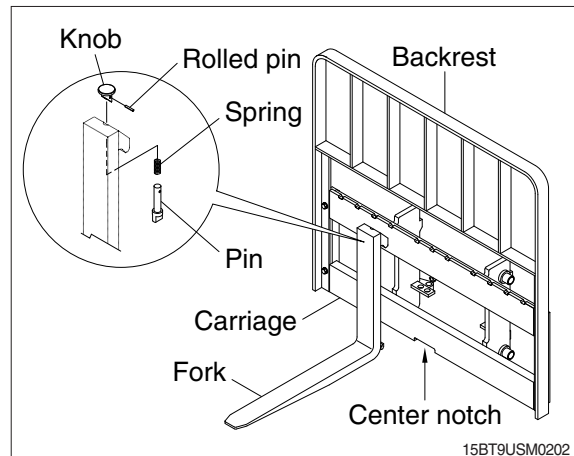
### 1. MAST

#### 1) REMOVAL



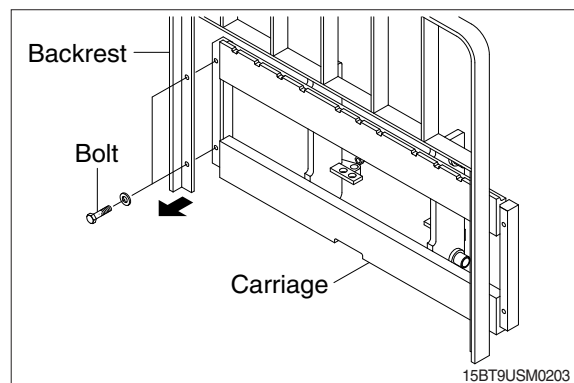
##### (1) Forks

- ① Lower the fork carriage until the forks are approximately 25mm(1in) from the floor.
  - ② Turn knob up and slide one fork at a time toward the center of the carriage where a notch has been cut in the bottom plate for easy removal.
  - ③ Remove only one fork at a time.
- ※ On larger forks it may be necessary to use a block of wood.



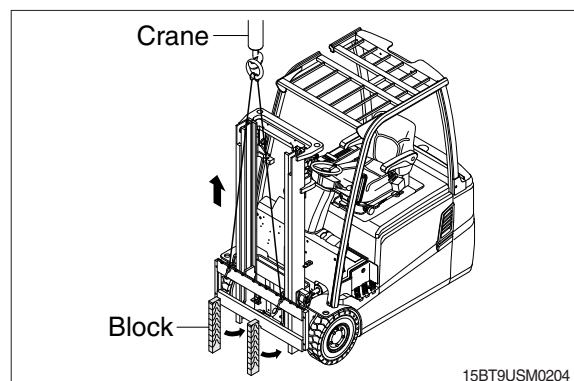
##### (2) Backrest(If necessary)

- ① Remove bolts securing backrest to fork carriage. Disassemble the backrest from the carriage.

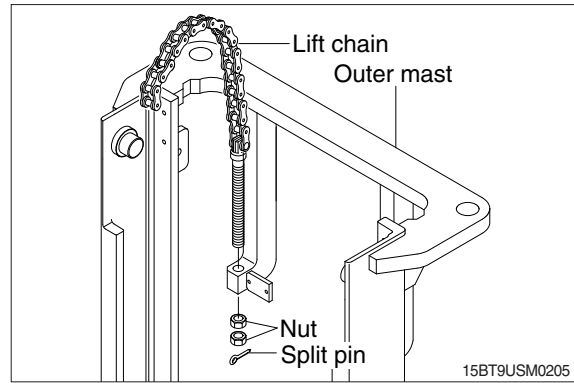


##### (3) Carriage

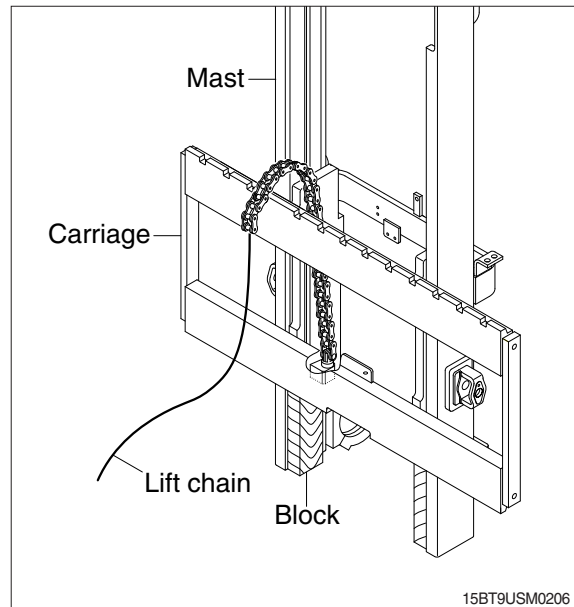
- ① With the mast vertical, raise the carriage high enough to place blocks under the load forks. This is done to create slack in the load chains when the carriage is lowered. Lower the carriage all the way down to the floor. Make sure the carriage is level, this will prevent any binding when the mast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



- ② While supporting lift chains, remove the split pins and slide out chain anchor pins from the chain anchors of stationary upright.



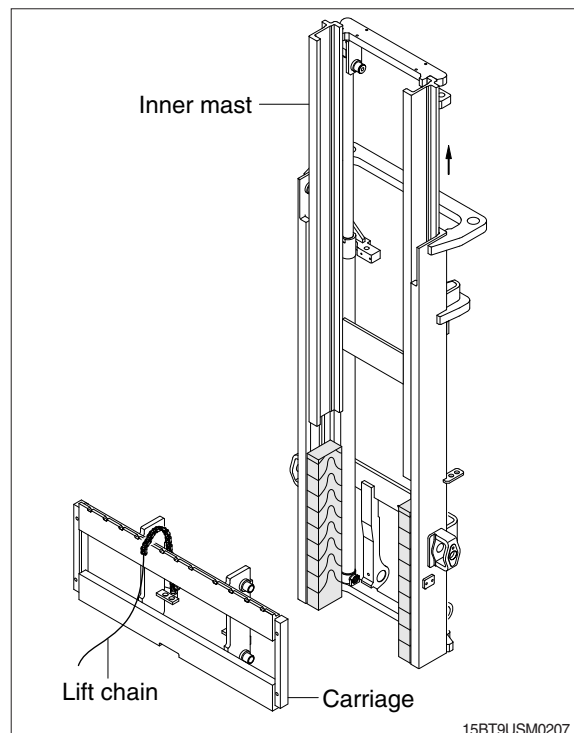
- ③ Pull the chains out of the sheaves and drape them over the front of the carriage.



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

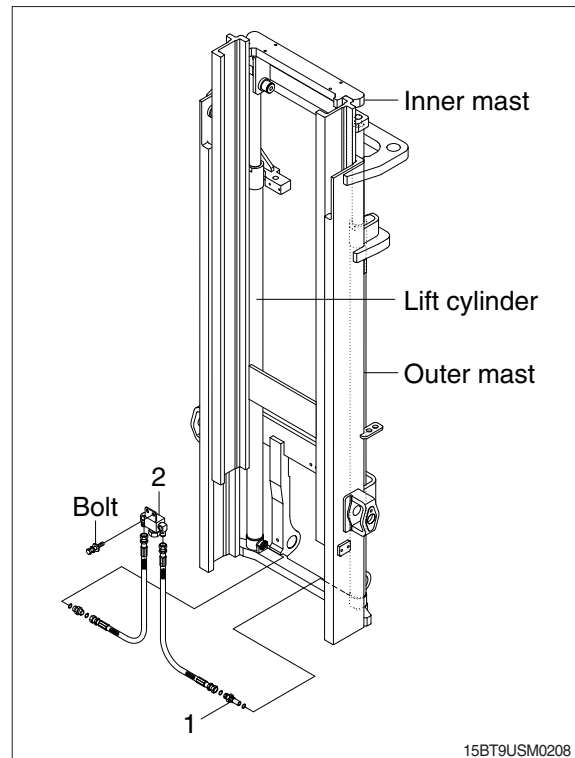
▲ **Make sure that carriage remains on floor and does not bind while mast is being raised.**

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



#### (4) Piping

- ① Loosen the bolts (2EA) of the weld-connector (2) from low crossmember of the outer mast.
- ② Disconnect the connectors from the lift cylinders.
- ③ Disassemble the velocity fuse valve (1), hoses, and weld-connector (2).

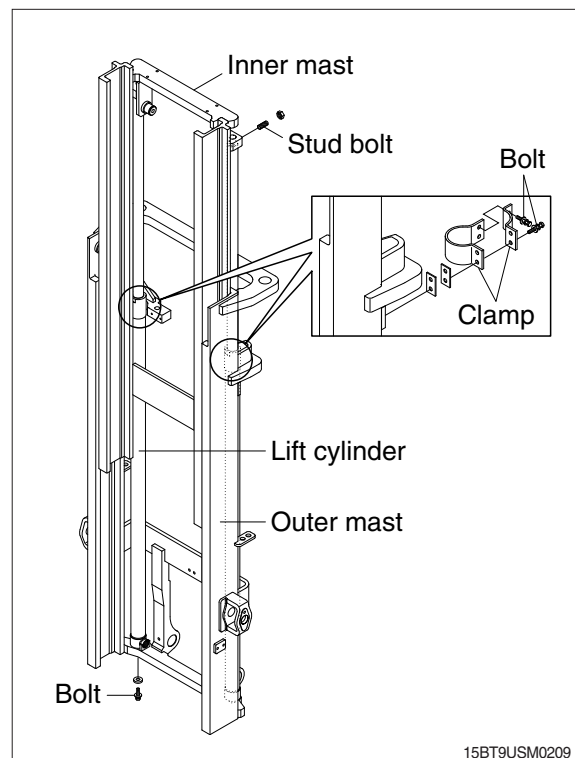


#### (5) Lift cylinder

- ① Loosen hexagonal bolts and remove washers securing the lift cylinders to outer mast.
- ② Bind the lift cylinder with overhead hoist rope and pull up so that the rope has no slack or binding.

**▲ Make sure that the lift cylinder be tightened firmly for safety.**

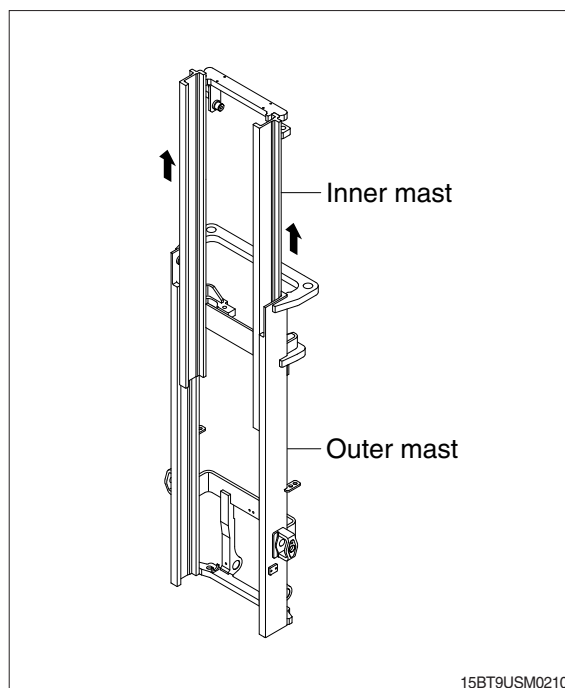
- ③ Loosen and remove hexagon bolts and clamp securing the lift cylinder to outer mast.
- ④ Using an overhead hoist, slowly raise the inner mast high enough to clear lift cylinder.
- ⑤ Using an overhead hoist, draw out lift cylinder carefully and put down on the work floor.



## (6) Inner mast

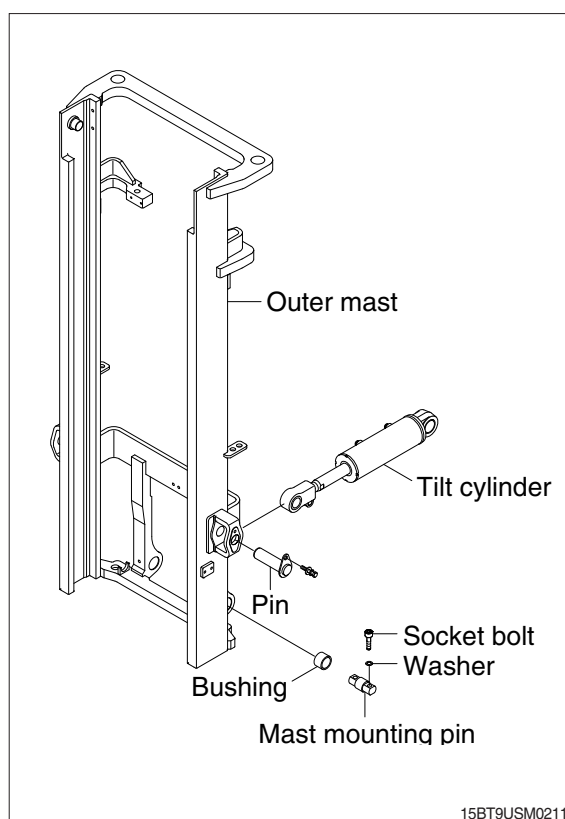
- ① Using an overhead hoist raise the inner mast straight and carefully draw out of outer mast section.

▲ Be careful the mast not to swing or fall.



## (7) Tilt cylinder pin

- ① Attach a crane to the stay at the top of the outer mast, and raise enough to sustain jacked up machine.
- ※ This operation is carried out from under the machine, so use a pit, or if there is no pit, jack up the machine and loosen with on impact wrench.
- ② Remove the socket bolts, washers from the mast mounting pins and take out the mast mounting pins, and then slowly raise up the outer mast



## 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) Bronze bushings

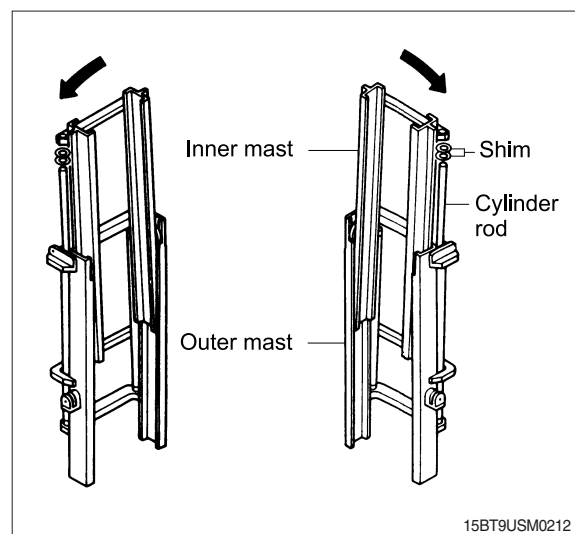
- ① Check the inside of the bronze bushings for wear which are the contact area with the mast mounting pins.
- ② Jack up the machine so that the front is raised and then using an overhead hoist assemble outer mast to drive axle unit.

### (2) Tilt cylinder pin

Hold the mast with a crane, operate the tilt control lever and align the holes, then knock the pin.

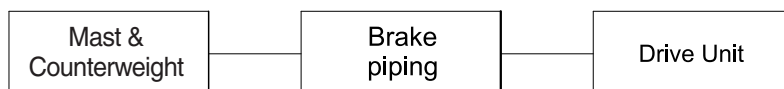
### (3) Lift cylinder installation and adjustment

- 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 : 1.0mm(0.04in)



## 2. POWER TRAIN ASSEMBLY

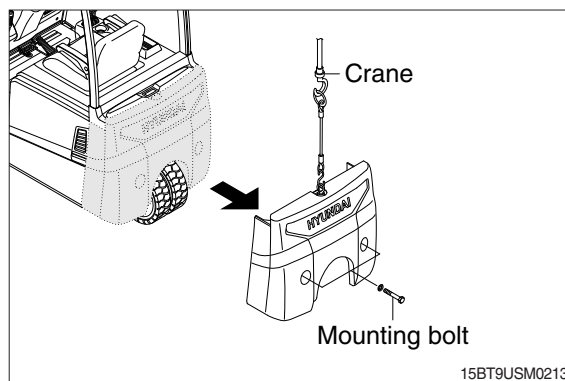
### 1) REMOVAL



#### (1) Mast and counterweight

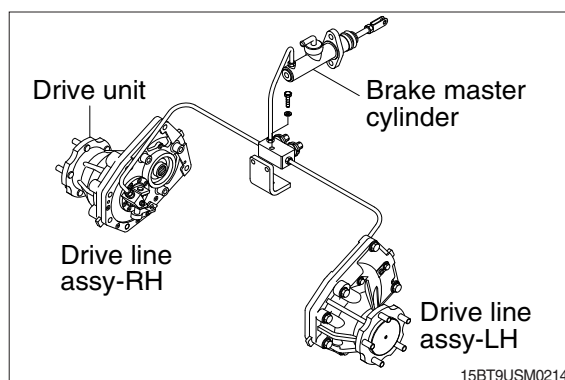
Refer to section on mast (Page 2-5)

After removing mast, remove the counterweight to prevent the truck from turning over.



#### (2) Brake piping

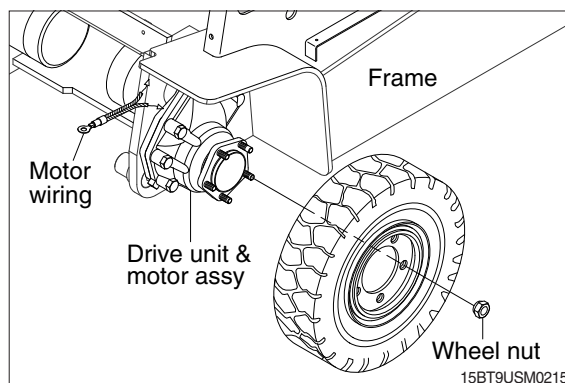
Disconnect the brake piping from the drive unit.



#### (3) Drive unit & motor assy

※ Drain the oil before disassembling the drive unit.

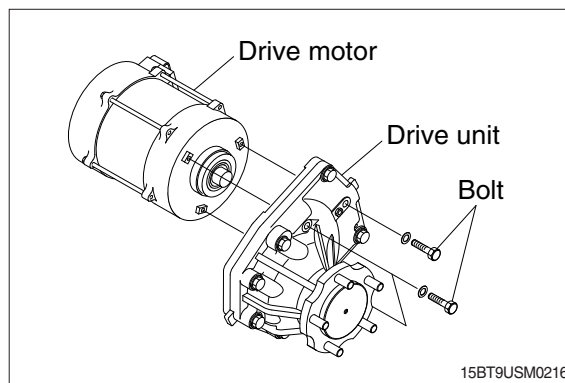
① Unscrew five wheel nuts and remove the wheel.



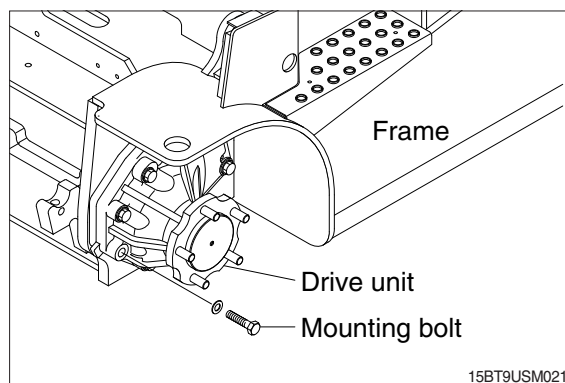


- ② Remove three hexagon bolts holding the drive motor in place.
- ③ Carefully remove the drive motor from the drive unit.

USE pm 4010 page DWG



- ④ Loosen seven mounting bolts on the truck frame and carefully take out the drive unit.

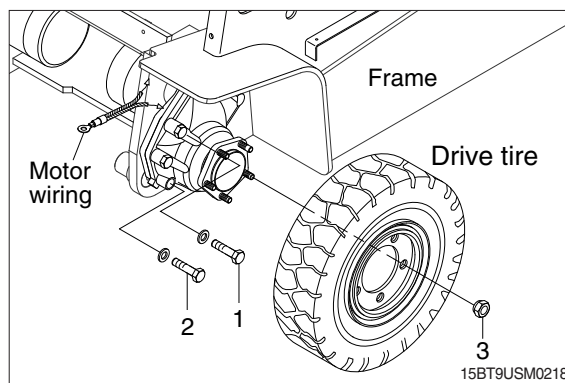


## 2) INSTALLATION

Installation is the reverse order of removal, but be careful of the following tightening torque.

· Tightening torque

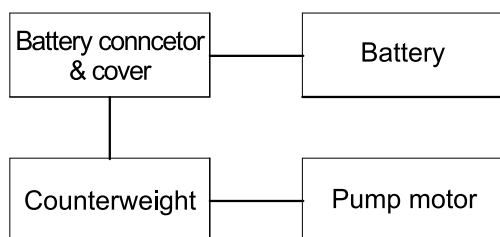
Item	kgf · m	lbf · ft
Drive motor (1)	5.6 ~ 8.2	40.5 ~ 59.3
Drive unit (2)	12.5 ~ 15	90.4 ~ 109
Wheel nut (3)	12.5 ~ 15.5	90.4 ~ 112



### 3. ELECTRICAL COMPONENTS

Before removing each component, disconnect cables and earth lines attached to the component.

#### 1) REMOVAL



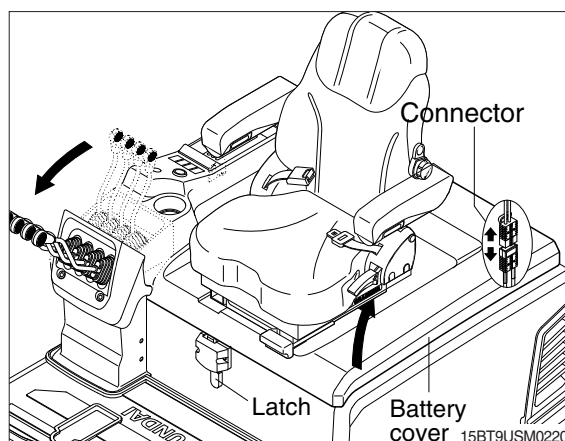
15BT9USM0219

##### (1) Battery

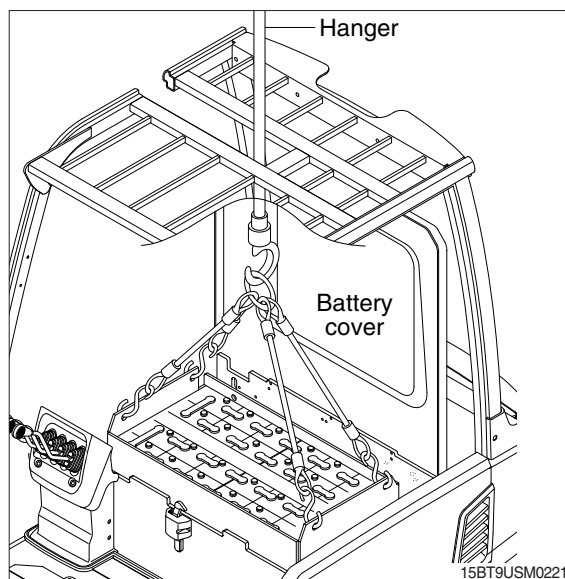
**▲** Before pulling out the battery plug, tilt the mast forward a little, and lower the fork to the lowest position.

The batteries weigh from around 780kg to 950 kg so the extreme care must be taken when handling them.

- ① Disconnect the battery connector.  
Release the battery cover latch and open the battery cover.

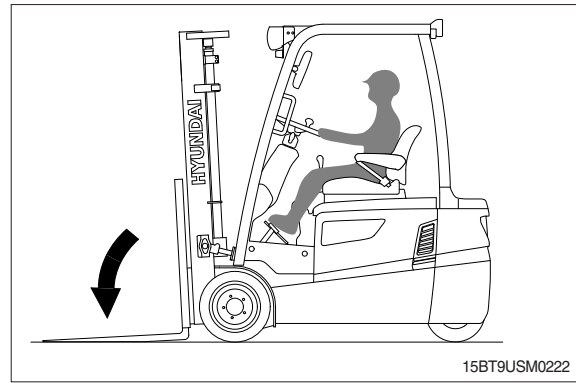


- ② Using a battery hanger, carefully raise the battery assembly.
- ※ Be careful not to damage overhead guard or control system.

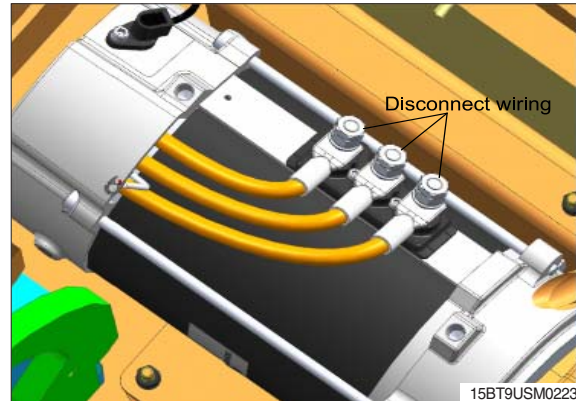


## (2) Pump motor

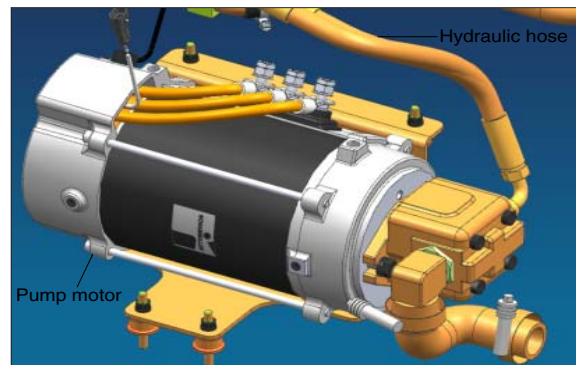
- ① Lower the fork to floor.



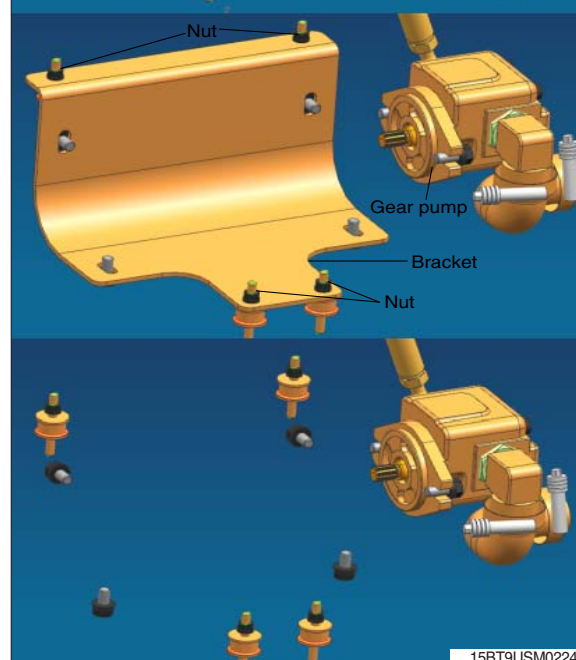
- ② Remove floor mat and rear floor plate.  
Disconnect the wiring of pump motor.



- ③ Empty all hydraulic oil in the hydraulic tank.
- ④ Disconnect the hydraulic hoses from the gear pump.



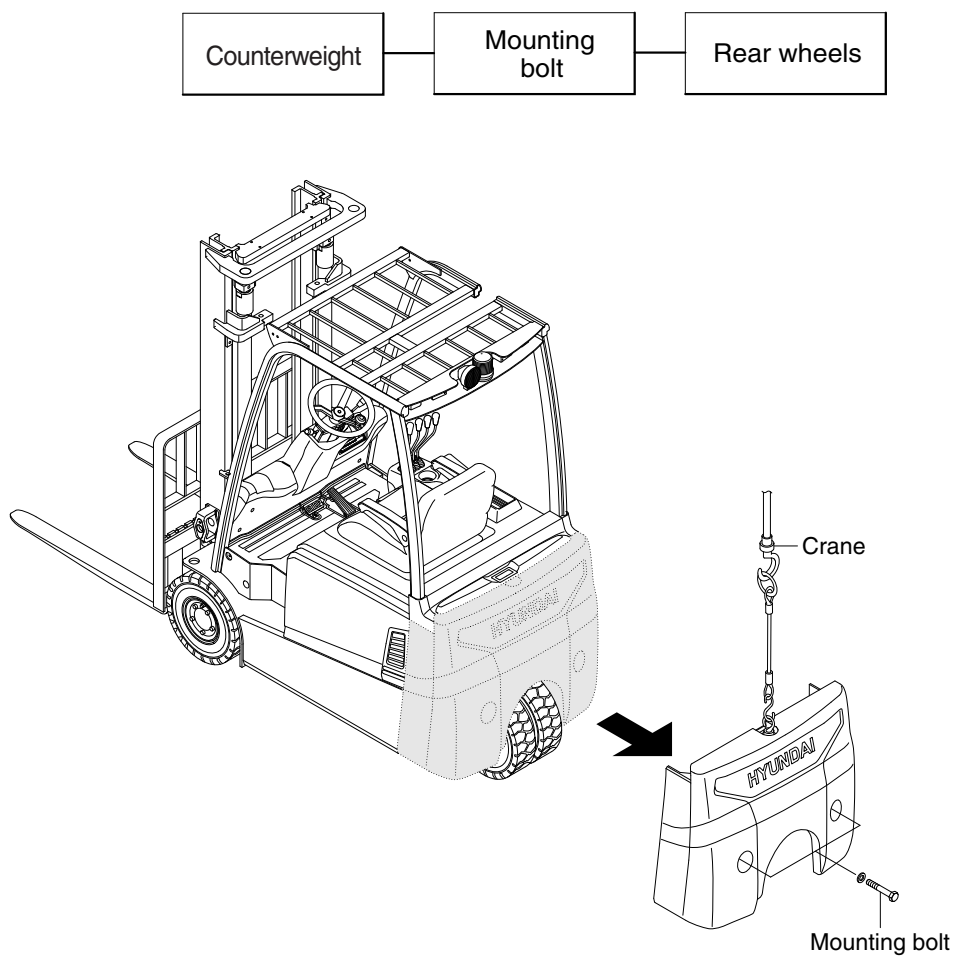
- ⑤ Remove the nuts of the motor mounting bracket.
- ⑥ Lift the motor & pump ass'y with a crane.
- ⑦ Remove the mounting bolts of the motor and remove the bracket.



## 4. STEERING AXLE

### 1) 15/18/20BT-9U

#### (1) Removal



15BT9USM0225

#### ① Counterweight

Install a lifting tool in the counterweight, and raise with a crane.

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

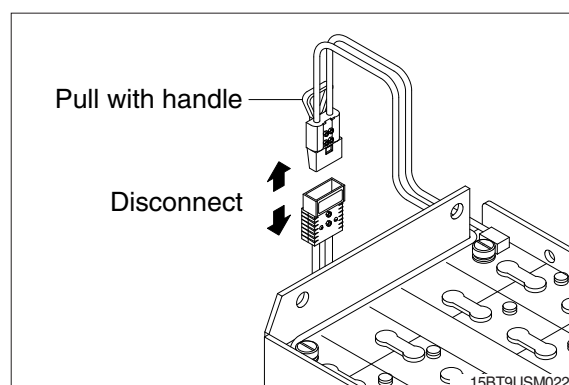
· Weight of counterweight(standard)

15BT-9U	575kg (1267lb)
18BT-9U	655kg (1444lb)
20BT-9U	790kg (1741lb)

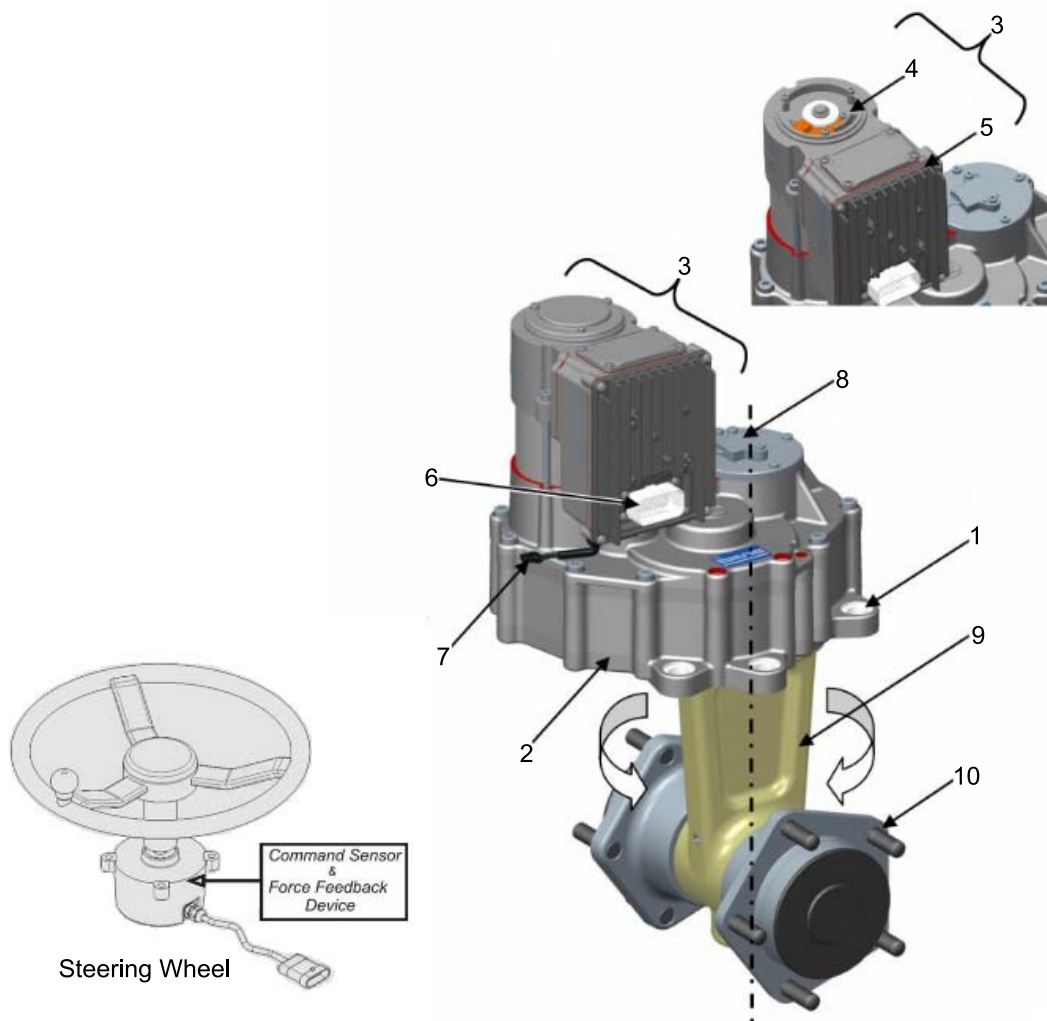
· Tightening torque : 85~115 kgf · m (614~831lbf · ft)

#### ② Battery connector

Disconnect the battery connector.



15BT9USM0226



- |   |                                       |   |  |    |               |
|---|---------------------------------------|---|--|----|---------------|
| 1 | Hole (connection to Forklift chassis) | 5 | Steering controller                      | 8  | Angle sensor  |
| 2 | Helical gear (3 stage)                | 6 | Steering controller connection           | 9  | Axle carrier  |
| 3 | Motor controller unit                 | 7 | Connection for angles-of-rotation sensor | 10 | Output flange |
| 4 | AC Steering motor                     |   |  |    |               |

### ③ Cable

Disconnect the cable connection from steering wheel (TFD) to steering controller.

④ Loosen socket bolts and remove steering motor assy from steering axle bracket.

⑤ Jacking up the chassis of truck.

Loosen the hub nut and take off the steering wheel tire assembly.

⑥ Remove the hub cap. Pull out split pin and remove castle nut and washer.

⑦ Loosen bolts and remove steering axle assy from chassis.

※ Refer to Section 5. Steering System for more details.