CHAPTER 7 PLANNED MAINTENANCE AND LUBRICATION

1. INTRODUCTION

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

⚠ Powered industrial trucks may become 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, HD HYUNDAI recommends that the owner set up and follow a periodic planned maintenance (PM) and inspection program. Performed on a regular basis by trained personnel, the program provides through truck. 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.

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 HD 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 HD 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 lift 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 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, or coolant
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 on Page 28 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) Make sure parking brake is applied.
    3) Put the gear selector lever in NEUTRAL.
    4) 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 attachment), and incline the mast forward.
3) Put the gear selector lever in NEUTRAL.
4) Apply the parking brake.
5) Turn the start switch to OFF position.
6) 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, overhead guard 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 for maintenance.

14. 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.

15. 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.**

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

17. 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.

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

19. Trucks must be kept in a clean condition to minimize fire hazards and help in detection of loose or defective parts.

20. 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.

21. 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.

22. 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.

23. 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. Since service meter is virtually identical with period, it is allowed to perform inspection and maintenance in scheduled interval.

2) The scheduled maintenance list is developed based on standard working. 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 250hours, each 100 hours and daily service at the same time.

※ **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 warehouses. The indicated intervals are intended for normal operation. The operating condition classifications are;

☐ **Normal operation**

Eight hours material handling, mostly in buildings or in clean, open air on clean paved surfaces.

☐ **Harsh operation**

- 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

※ **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) Fully understand Safety Hints and lift trucks, and perform inspection and maintenance for preventing personal injury or damage to the truck.
2) Reading the cluster does not fully guarantee the conditions of the truck. Perform routine maintenance in accordance with the specifics in the inspection and maintenance checklists.
3) Ask to your local dealer or HD HYUNDAI for maintenance advise it unknown. Engine and hydraulic components have been preset in the factory.
   Do not allow unauthorized personnel to reset them.
4) 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) Replacement and repair of parts
   It is required to replace the wearable and consumable parts such as hose, tube and filter etc., regularly. Replacing damaged or worn parts at proper time to keep the performance of truck.
2) Use HD 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) Reading cluster gauges
   Confirm if the cluster is in the normal condition after completion of service.
10) Please contract HD HYUNDAI dealer for information of adjustment, disassembling and repair of power transmission, hydraulic devices and electronic devices (e.g., check unit).

※ **Be sure to start the maintenance after fully understanding the Section 1 Safety Hints.**

4. PRECAUTION WHEN INSTALLING HYDRAULIC HOSES OR PIPE

1) Special care should be exercised for preventing joints of hose, pipe and functional part from damage, and intrusion of foreign substances such as dusts or particles. Take dust-preventing measures for each part.
2) Clean joints and surroundings of hose, pipe and functional part, remove cleaning solution clear, and then dry the parts before assembling
3) Use HD HYUNDAI genuine parts Do not damaged or degraded O-rings. Using parts other than genuine parts may cause oil leak or significant reduction of service life because of different materials or harness.
4) Do not assemble the hose in the condition of twisted or sharp radius. Service life of hose may significantly be reduced.
5) Keep the specified tighten torque.

5. PERIODICAL REPLACEMENT OF SAFETY PARTS

1) It is desirable to perform periodical maintenance on lift trucks for operating the trucks safely for a long time, and it is recommended to replace parts relevant to safety upon regular basis for enhancing safety.

2) These parts are subject to variation of materials over time, and deterioration, abrasion and fatigue upon repeated use to cause critical personal and property disasters. The parts are hard to judge remainder service life by operation with his/her operation experiences or visual inspection.

3) Repair or replace if an abnormality of these parts is found even before the recommend replacement interval.

4) Please consult HD HYUNDAI dealer or service shop for replacement of these safety parts.

No.	Name	Replacement cycle
1	Master cylinder and wheel cylinder caps dust seals	Every 1 year
2	Lift cylinder hose	Every 1 year (harsh operation) Every 2 years (normal operation)
3	Tilt cylinder hose	
4	Side shift cylinder hose	
5	Brake hose or tube	
6	Hydraulic pump hose	Every 2 years
7	Power steering hose	
8	Coolant hose and clamps	
9	Packing, seal, and O-ring of steering cylinder	Every 2 years (harsh operation) Every 4 years (normal operation)
10	Lift chain	
11	Brake oil tank tube	
12	Hydraulic pump seal kit	Every 3 years
13	Pressure sensor	Every 5 years

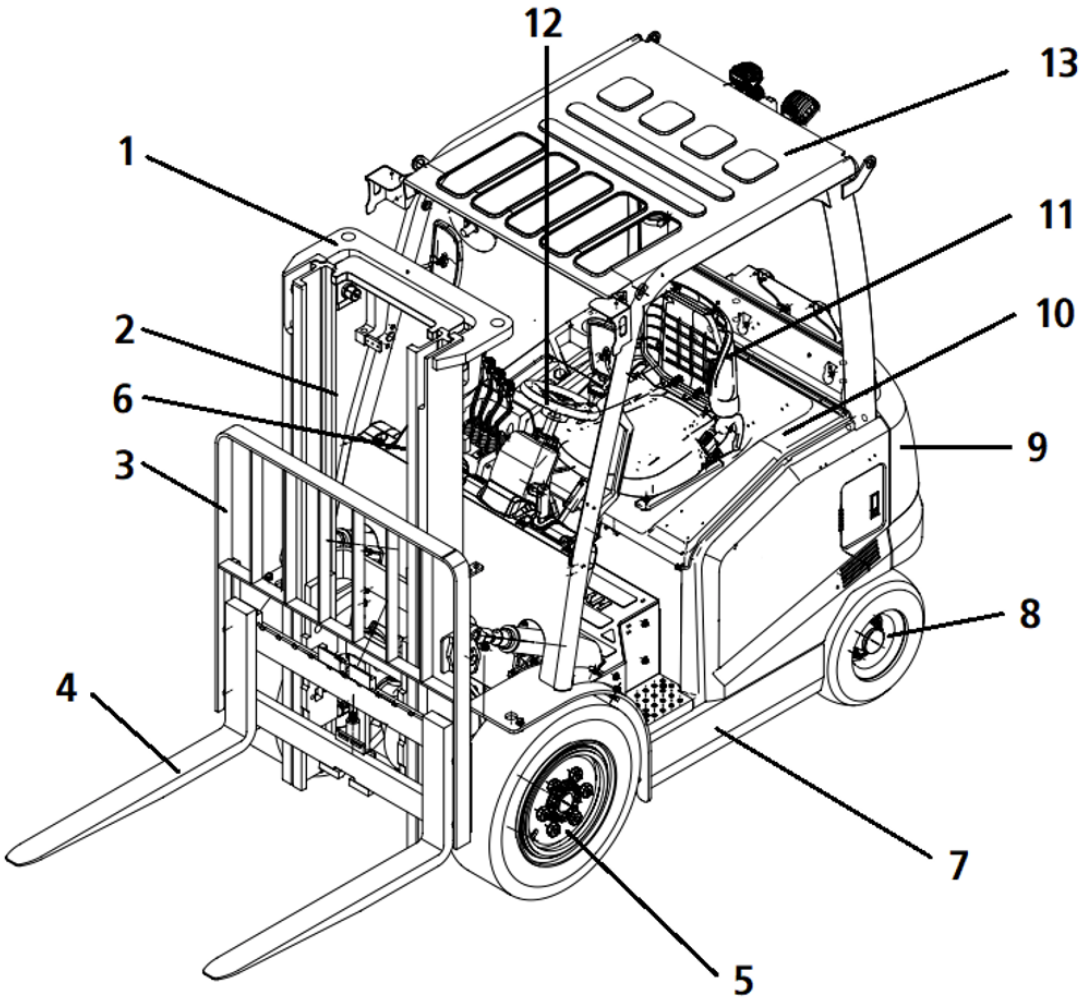
※ **Replace the O-ring and gasket at the same time when replacing the hose.**

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

※ **Refer to the page 81 about the harsh and normal operation.**

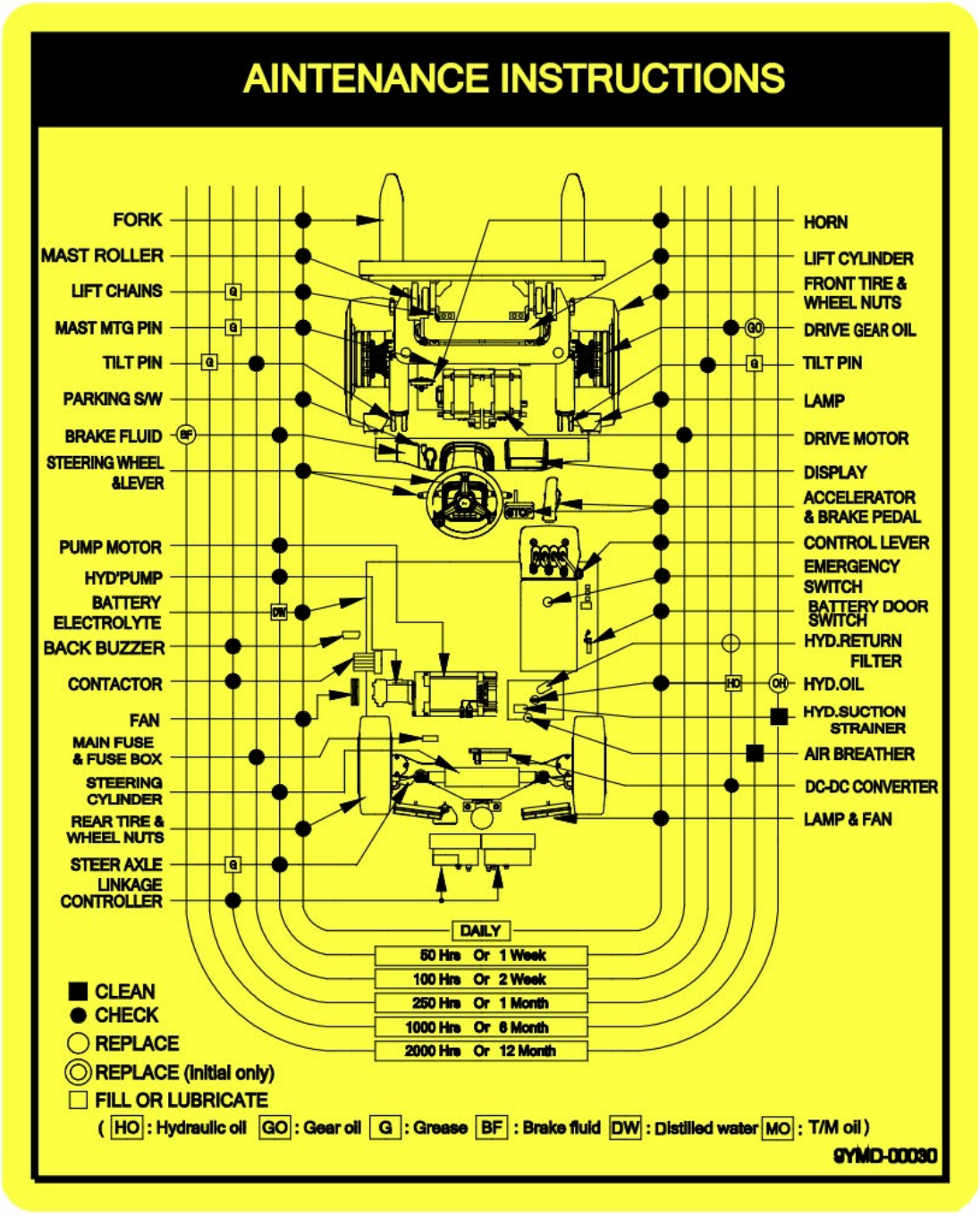
4. MAJOR COMPONENT LOCATIONS

See the figure below to find functional parts for planned maintenance procedures:



1	Mast	6	Cluster	11	Operator's seat
2	Lift Cylinder	7	Frame	12	Steering wheel
3	Carriage and backrest	8	Steering	13	Overhead guard
4	Forks	9	Counterweight		
5	Drive axle	10	Battery cover		

5. MAINTENANCE CHECKLIST



6. HOW TO PERFORM PLANNED MAINTENANCE

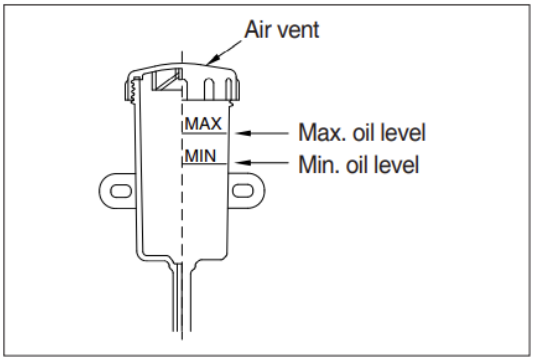
1. BRAKE OIL MAKEUP

Hydraulic brake oil level is checked by viewing oil level in the reserve tank, and made up, if required.

1) Do not mix with brake oil of different types.

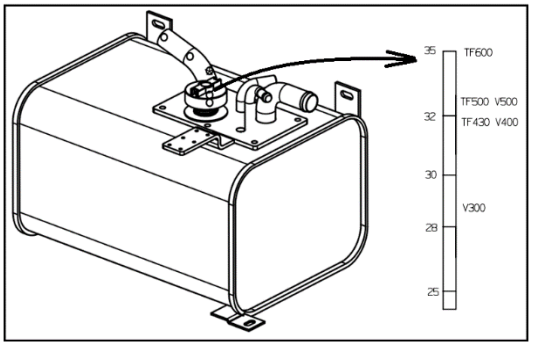
2) Protect the air vent of the oil container stop from clogging by dust.

3) Brake oil change requires skills and experiences. Have designated shop change the oil



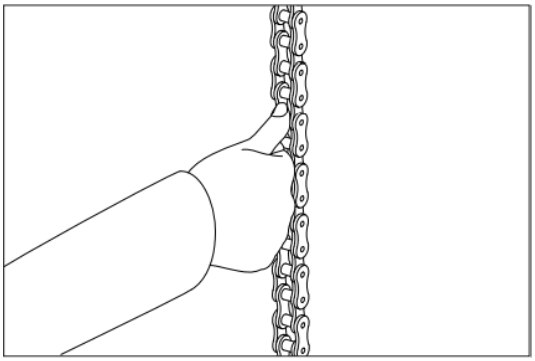
2. Hydraulic oil makeup

Stop the lift truck on flat ground, and fully lower the forks. Check the hydraulic oil level with oil level gauge, make up the oil, if required.



3. CHECKING AND ADJUSTING LIFT CHAIN TENSION

Stop the truck at level ground, lift forks kept horizontal 20-30 cm above the ground, and push the chain with the both hands. If any side of the chain shows excessively high or low tension, adjust the chain with the anchor bolt.

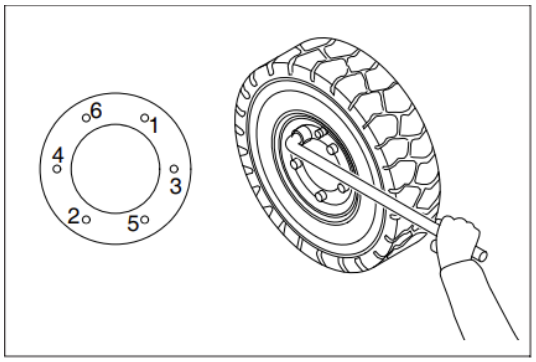


4. CHECKING HUB NUT

Security tighten the hub nut.

Tighten the hub nut in alternate directions for even tightening. (See the figure.)

Item	Nut	Torque (Nm)
Front	M20	300-500
Rear Rim	M14	130-135
Rear Tire	M12	130-135



5. GREASE APPLYING

Wipe the surface with brush or cloth clean, and apply grease.

△ **Do not apply excessive grease.**

Applying	number of applications
Mast support	2 points
Tilt cylinder plate	4 points
Steering cylinder link	4 points
Kingpin	4 points
Steering axle mounting	2 points
Idle wheel bracket	2 points
Mast roller bearing	4 points (V), 8 points (TF, TS), 12 points (QF)

6. GREASE APPLYING ON INDIVIDUAL PARTS

Wipe the surface clean before applying grease.

1) Lift chain: Wipe with SAE 20-30 oil, and then apply grease (applying with brush with gear oil of low viscosity).

2) Working surface of mast guide rail roller: Apply grease with brush.

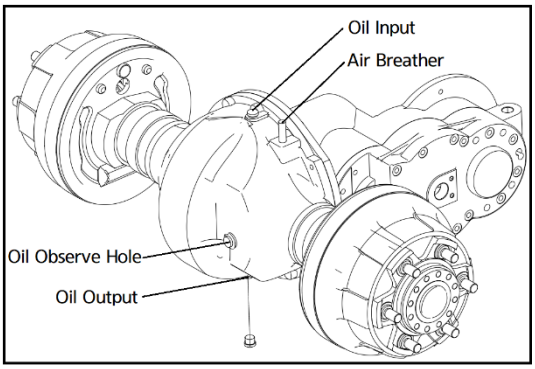
3) Slide guide and slide rail: Apply grease evenly.

4) Sliding section between inner and outer masts: Apply grease evenly.

5) Sliding section between forks and finger bar: Apply grease with brush.

7. DRIVE AXLE OIL LEVEL

Remove the plug from the drive axle, and check the oil level.

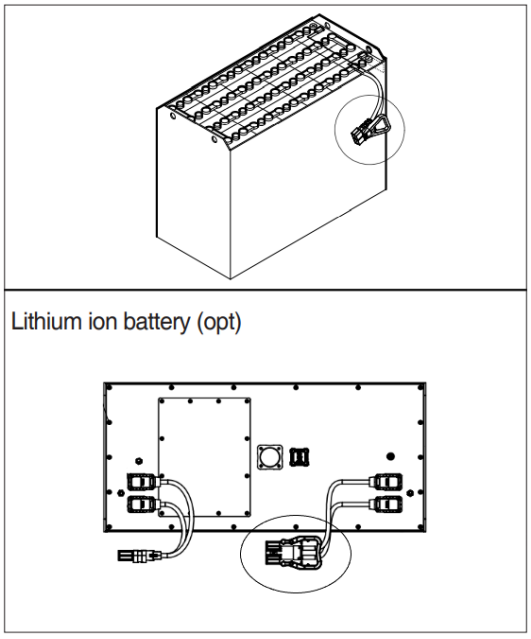


8. TRUCK BODY INSPECTION

Inspect the truck body, and immediately consult with the shop for any defects, if any.

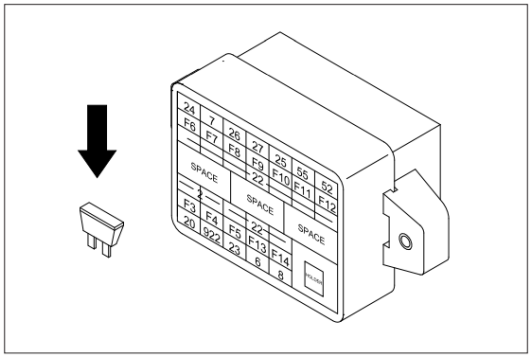
9. FUSE EXCHANGE

1) Separate the battery connector.



2) Remove burnt fuse, and install new fuse.

※ **Use new fuse with capacity same as burnt fuse. If fuses are frequently burnt, contact the shop for inspection. Never use power cable in lieu of fuse.**



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.**

11. INSPECTION AND MEASUREMENT OF LIFT CHAIN

Inspect and lubricate the lift chains in planned maintenance period (500 hours). When operating in corrosive environments, inspect the chains in shorter period. During inspection, check for the following conditions:

6) Rust and corrosion, cracked plates, raised or turned pins, tight joints, wear, and worn pins or holes.
7) 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.
8) Chain wear can be measured 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.

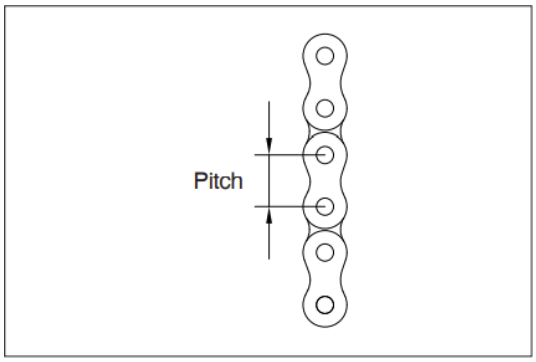
12. LIFT CHAIN LUBRICATION

Lift chain lubrication is an important part of your maintenance program. The lift chains operate more safely and have longer life if they are regularly and correctly lubricated. HD 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.

13. LIFT CHAIN WEAR AND REPLACEMENT CRITERIA

All chains must be replaced if any link has worn from the center of a pin to the center of the next pin of 3% or more, or if any of the damaged conditions notes above are found during inspection. Order replacement chains from your HD 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.**

7. 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 fastened and fit parts for loosening.

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

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

☐ Check for hydraulic oil leaks from the drive axle.

☐ Check for hydraulic oil leaks and loose fittings.

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

☐ Be sure that the driver's overhead guard, backrest and any safety devices are in place, undamaged, and attached securely.

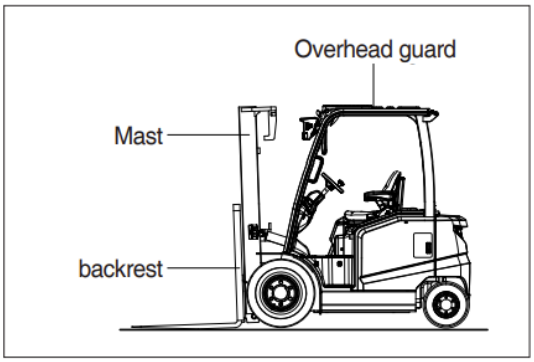
Then, inspect all of major parts handling or moving loads.

1. **OVERHEAD GUARD**

   Check the overhead guard for any damage. Be sure that the driver's overhead guard and any safety devices are in place, undamaged, and attached securely.

2. **BACKREST**

   Check the backrest for damage. Be sure that it is properly positioned on the carriage, and free from cracks. Check all mounting fasteners are in place and tight.



3. **MAST**

   Inspection of mast: Inspect 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. Check connections of all of lift line hydraulic connections for oil leak.

4. **LIFT CHAIN**

   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.

△ **Mast and lift chains require special attention and maintenance to remain in safe operating condition.**

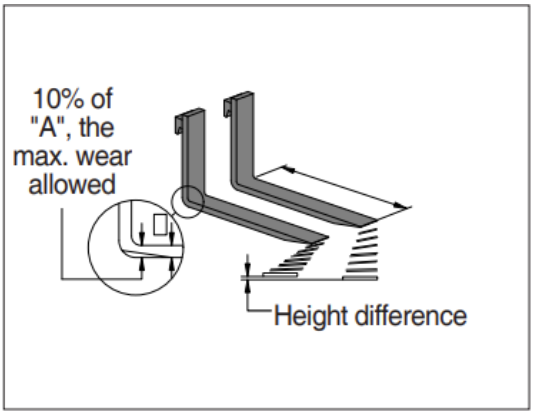
☐ Mast may suddenly drop. Carefully examine the mast; however, never put your hand in it.

☐ Repair and adjustment of the lift chain should be performed by authorized and skilled experts.

5. 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:

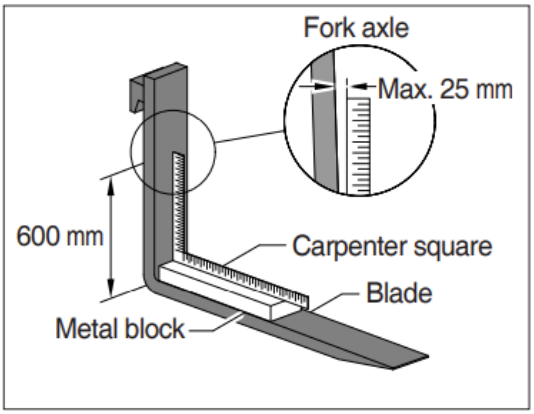
Model	Fork length (mm)	Height difference (mm)
All	≤1500	3
	≥1500	4



⚠ **If the fork blade at the heel is worn down by 10% or more, 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 (24 in) 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 25 mm (1 in) maximum.



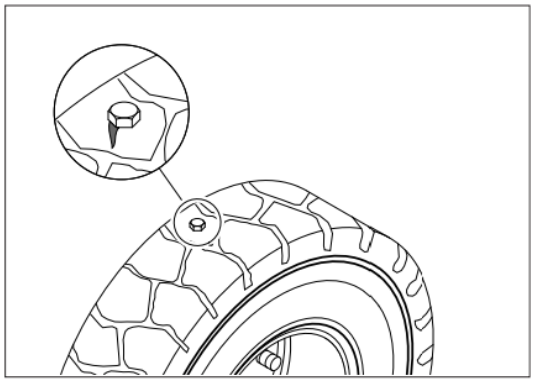
※ **If the fork blades are obviously bent or damaged, have them inspected by a trained maintenance person before operating the truck.**

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

6. WHEEL AND TIRES

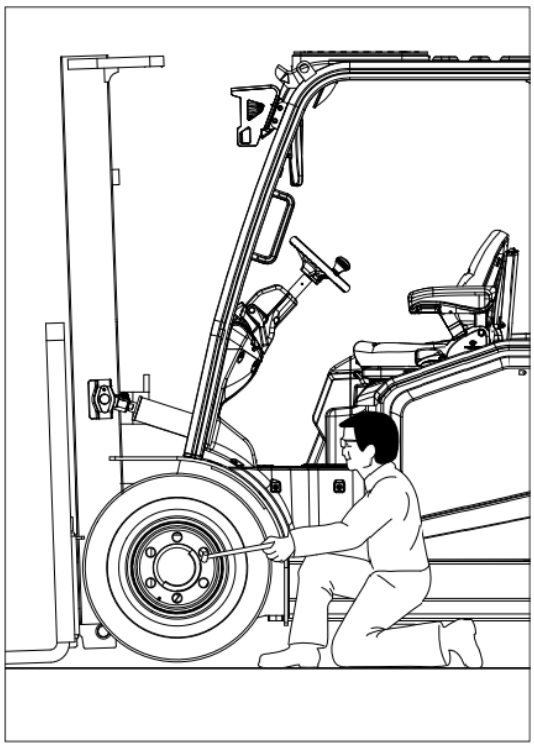
Check the condition of the drive and steering wheels and tires. Remove objects that are embedded in the tread. Inspect the tires for excessive wear and breaks or chunking out.

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 parallel with driving direction. 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 which may result in tire broken or other damages.**

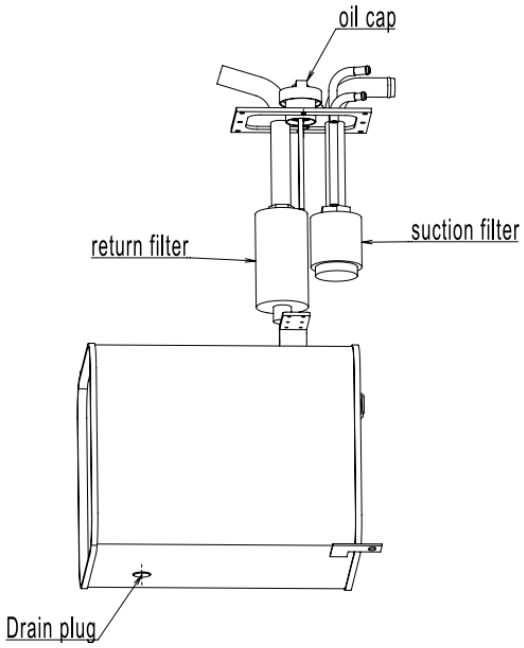
DESCRIPTION	Air pressure		
	bar	kgf/cm^2	psi
Front tire	10	10	145
Rear tire	10	10	145



8. CHANGE OF HYDRAULIC OIL AND CONSUMABLES

1. CHANGE THE HYDRAULIC OIL HANGE 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 (40L or more) and loosen the drain plug.
4) After draining oil, tighten the drain plug.
   Tightening torque: 2-2.2 kgf • m
5) Loosen the fastening bolt of the rear flange, remove and clean the suction strainer, and then mount them again.
   Tightening torque: 1.8-2.0 kgf • m
6) Fill proper amount of recommended oil.
7) Start engine and run continually. Release the air by full stroke of control lever.

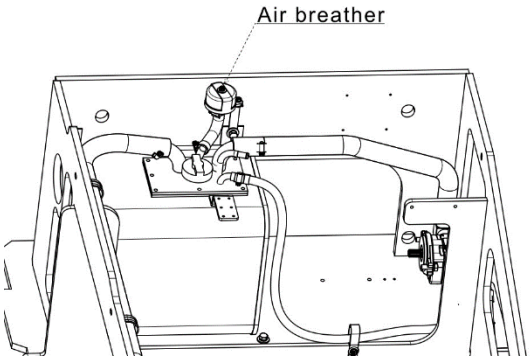


※ **The oil must be free of bubbles. If bubbles are present in the oil, air is entering the hydraulic system. Inspect the suction hoses and hose clamps for leakage or damage.**

2. HYDRAULIC OIL RETURN FILTER EXCHANGING

Observing precautions for supply and change of hydraulic oil, perform the followings:

8) Loosen the fastening bolt to remove the top flange.
   Tightening torque: 1.8-2.0 kgf • m
9) Remove the filter fastening bolt, and replace the return filter element with a new one.
   Tightening torque: 1.5-1.8 kgf • m



3. REPLACEMENT OF AIR BREATHERE ELEMENT

10) Loosen the cap and relieve the pressure in the tank.
11) Loosen the screw on the top of the air breather, and remove the cover
12) Replace the element with a new one.

9. TORQUE CHECKS

Parts 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:

☐ Steering axle mounting
☐ Drive axle mounting
☐ Counterweight mounting
☐ Load backrest extension
☐ Overhead guard
☐ Tilt cylinder mounting and yokes
☐ Mast mounting and components

See Section 8 Specifications for fastening torques.

10. 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 condition helps fire prevention, and keeping cool temperature in cabin during drive of the truck.

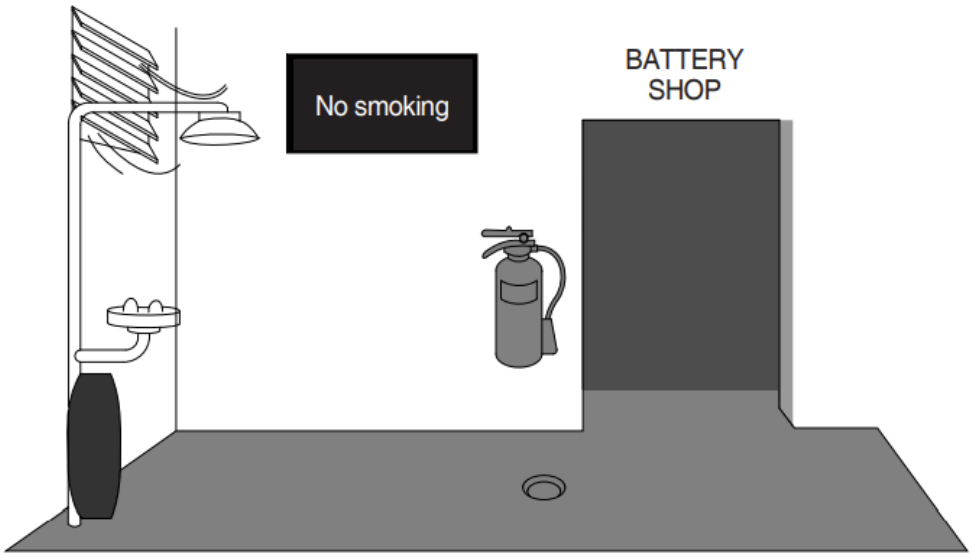
The environment in which a lift truck operates determines how often and to what extent cleaning is necessary

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 psi (207 kPa). (OSHA requirements)

⚠ Wear suitable eye protection and protective clothing when air cleaning.

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.

11. BATTERY MAINTENANCE



Battery charging, replacement and removing should be performed at designated battery shop only. The shop should be free of inflammable materials or combustibles.

Facilities mandatory for the shop:

☐ Electrolyte cleaning facility
☐ Fire preventing and fire-fighting facility
☐ Facility protecting battery from systems
☐ Ventilation facility for gas from battery

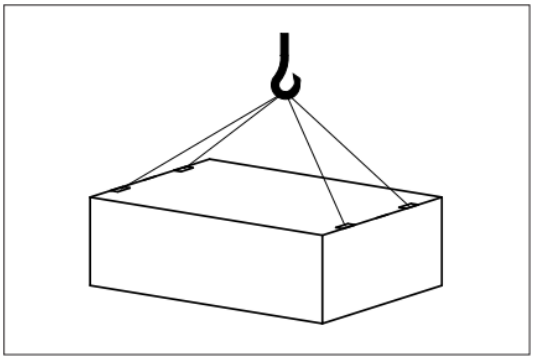
Protection goggles should be worn when handling strong-acid solution of concentration of 50% or higher (density of 1.400 or more), and washing bowl should be provided for emergency.

Transportation facilities such as conveyor and crane should be provided for handling the batteries.

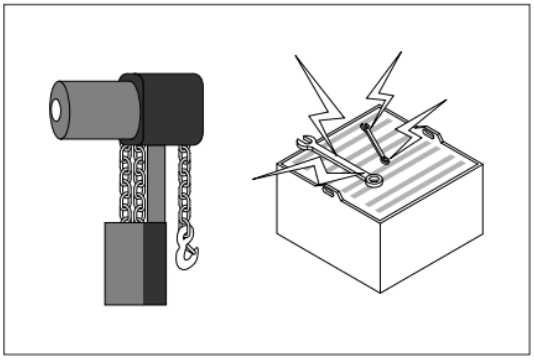
⚠ **The battery of the lift truck is very heavy, and hard to handle. The battery is filled with toxic chemical solutions, and hydrogen and oxygen are generated during charging. These gases may be mixed and explodes. This may lead to large-scale accident. Read and understand the manual before removing, servicing or installing batteries, and comply with the cautions.**

12. BATTERY HANDLING

1. Battery charging, replacement and removing should be performed at designated battery shop only.
2. The battery shop should operate electrolyte cleaning facility, battery gas ventilation facility, and fire-preventing and fire-fighting facilities.
3. Transportation facilities such as conveyor or crane should provide at the shop for removing and installing batteries. Lifting hook with safety locking device should be used.
4. Always use specific lifting tools including insulated cable for lifting batteries. Lifting hook of insulated cable should be compatible with lifting hook of battery to prevent damage to batteries. If lifting hook of insulated cable is mobile type, directly pull the cable upward, and carefully adjust the location (width) of the hook to prevent dispersion of (vertical) lateral load or force (pressure) to battery case. The hook should be of size precisely fitting with the hook of the battery.
5. If there is no battery cover, or terminal or connector is exposed, cover the battery with wooden sheet or thick cardboard to make insulation.



6. Chain container should be mounted on chain crane or motor-driven crane for accommodating excessive length of chain.
7. Any tool or other metal object should not contact with terminal.



13. BATTERY CHARGING

Battery is automatically charge by charger. All you have to do is connecting the plug.

1. HOW TO USE CHARGER

1) Connecting the plug and the battery connector lights up the input power lamp, and the charging indicator lamp, and charging starts few seconds later. Once charging is complete, power is automatically shut down.

2) Normal charging:
   ① Connect the battery; Pay attention to the positive and negative polarity! At the same time, the connecting wires should be firm and not be loosened.
   ② Connect the power supply. The charger automatically starts charging after 10 seconds delay detection according to the program. The charger shows charging current, charging voltage, charging capacity and time. Shut down automatically when sufficient. There is no need to operate the charger during charging.

3) Balanced charging function: Press and hold the message sparingly for about 5 seconds until the equalizing lamp is turned on and loosened, that is, the manual equalizing setting for this charging has been completed.

4) Desulfurization Charging Function: Press and hold the information key for 10 seconds continuously until the desulfurization lamp is turned on and loosen. The desulfurization charging setting for this charging has been completed.

5) Initial charging function: The initial charging settings have been completed by holding down the information key for about 15 seconds until both the equally charged lamp and the desulfurization lamp are on and off simultaneously.

6) Information key:
   ① Press the "Information" button for 5S to set up the balanced charging function.
   ② Press the "Information" button for 10s to set up the desulfurization charging function.
   ③ Press the "Information" button for 15s to set up the initial charging function.
   ④ Press the "information" button for 3S to cancel the functions of balanced charging, initial charging and desulfurization charging.
   ⑤ Press the "Information" key 2s to enter the query interface. (on shutdown or standby)

2. INSTALLATION OF CHARGER

1) Installation place

   The charger should be installed at a place of well ventilation, low temperature/humidity, and free from dusts.

2) Check input power the charger for adequacy with input power of distribution panel.

3) Check grounding line of the charging cable for well grounding of the grounding line.

3. NORMAL CHARGING

1) The charging procedures are as follows:
   - ① Remove the key from the starting switch.
   - ② Be sure the switch is in the CHARGE position.
   - ③ Connect the battery connector the charge connector.
   - ④ Make sure that the indicator lamps normally light up.

2) The procedures after charging are as follows:
   - ① Make sure that CHARGE COMPLETE indicator lamp lights up.
   - ② Remove the battery connector from the charger connector.

3) The procedures of stopping during charging are as follows:
   - ① Press Manual Stop button.
   - ② Remove the battery connector from the charger connector.

4. EVEN CHARGING

Repeated normal charging causes difference of capacity among cells. In such a case, overcharging is often performed to keep capacities of cells uniform; this is called even charging.

1) Even charging should be performed in any of the cases listed below.

2) When battery charging and discharging are repeated every day, even charging should be performed once a month:

3) Battery discharged below specified capacity;

4) Recharging not performed after discharging; and Shot.

5) Even charging method is same as normal charging. All you have to do is press the "Information" button for 5s when starting charging.

△ **Excessive even charging may reduce service life of the battery.**

5. MAKEUP CHARGING

If daily charged capacity is not sufficient for a day's work, normal charging should be performed during idling time.

6. PRECAUTIONS

1) Check input power when installing the charger, and use the charger compatible with the voltage of region.

2) Charge the battery immediately after exhaustively using it. Charge the battery once a month when the battery is kept in standby mode for an extended period of time.

3) Prevent drop of density of the battery, particularly, in winter.

4) Immediately stop charging the battery if temperature of electrolyte exceeds 50 ° C during charging.

5) Combustible gases are generated from the battery during charging. Pay special attention to fire prevention, and ventilation.

14. BATTERY REPLACEMENT

1. GENERAL

☐ Battery can be replaced by making use of lift truck, or palette truck and exclusive jigs.

☐ Capacity of the lift truck for battery replacement should be 2-3 tons, and palette truck of 1.5-2 tons.

☐ Replacing the battery with inadequate method may cause accident by tip-over of battery.

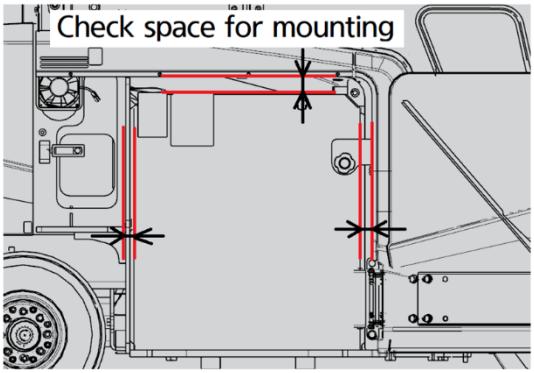
☐ Replace the battery on flat and even ground.

☐ Perform works in accordance with the manual.

☐ When the truck tips over with the locking device of the battery not fastened, the battery may fall outside the truck.

☐ Operate the truck only after the battery locking device is locked

2. CAUTIONS ON REPLACEMENT OF BATTERY



☐ Make sure of mounting space of the battery before replacing the battery.

☐ Open the top cover and the side door of the battery.

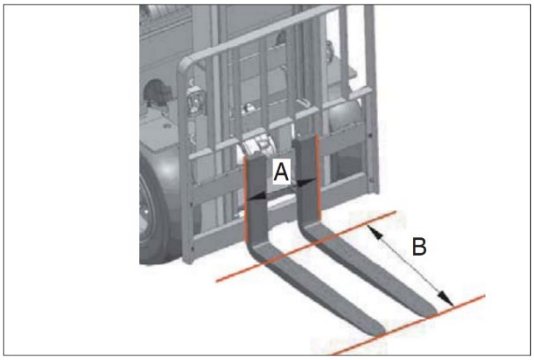
☐ Disconnect the battery cable.

☐ Arrange the battery connectors and cables tidy on the cells to prevent protrusion of the connectors or the cables above the metal housing during replacement of the battery. Protruded cable above the metal housing may be caught in the frame during replacement of the battery.

☐ If it is not allowed to release the locking device with the hands since the battery is attached closely to the locking device, slightly push the battery with the forks or the jig inward, and then release the locking device.

3. REPLACEMENT WITH LIFT TRUCK

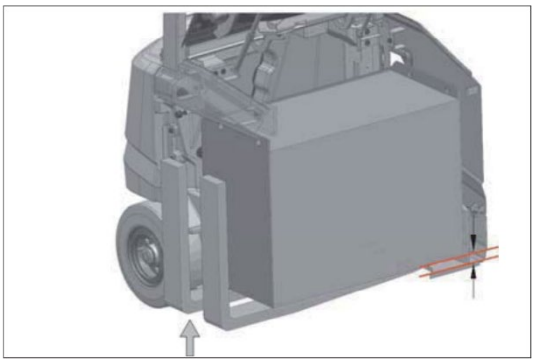
1) Adjust the width of the forks (A) aligned with the opening of the frame floor, and mark insertion depth (B).
   - Width (A): 326 mm
   - Depth (B): 830 mm



2) Replace the battery by working in pair (operator, and signal man). Insert the forks under the center of the battery while preventing collision with the door.

3) Slowly lift the forks to raise the battery above the frame (10-15 mm), tilt the forks to keep the battery horizontal with the ground.

4) Drive the lift truck backward while preventing collision between the top cover and the frame, and cable being caught to remove the battery.



4. REPLACEMENT WITH PALETTE TRUCK

1) Prepare hand-driven palette (outer width of 680 mm), and exclusive jigs

2) Align the exclusive jig on the center of the palette, mark jig insertion depth (B: 780 mm).

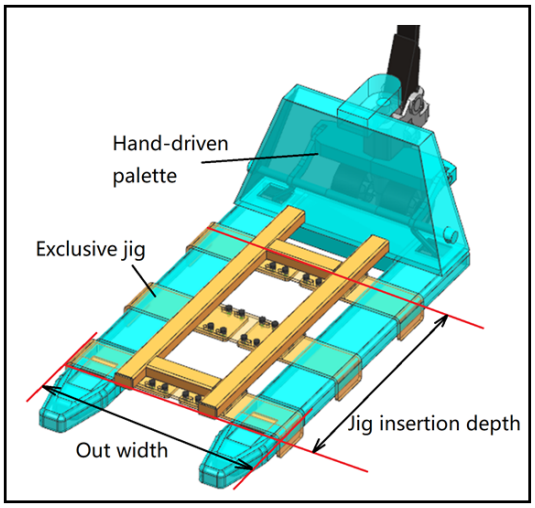
3) Keep the lift truck at elevation of 140 mm from the ground.

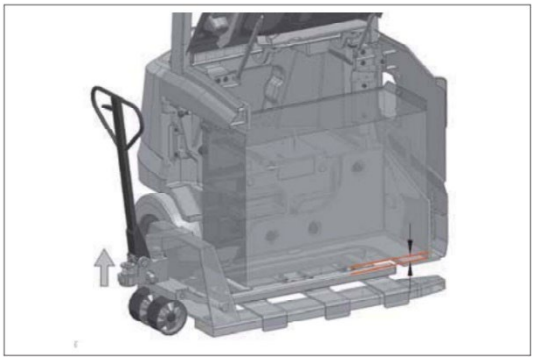
※ **Refer to the min. height of battery lifting.**

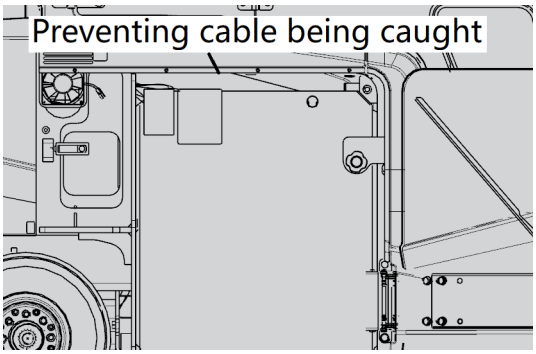
4) Insert the palette under the center of the battery.

5) Slowly lift the forks to raise the battery above the frame (10-15 mm), tilt the forks to keep the battery horizontal with the ground.

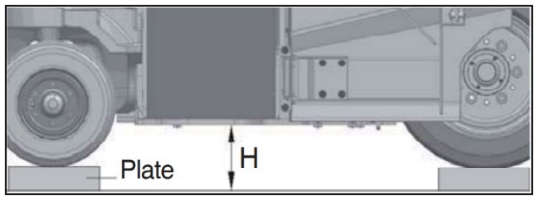
6) Drive the lift truck backward while preventing collision between the top cover and the frame, and cable being caught to remove the battery.







5. MIN. HEIGHT OF BATTERY LIFTING



☐ If the tires have excessively been worn, the height of the lift truck from the ground will be reduced, and the height for inserting the jig may not be allowed.

☐ Install plates (10-20 mm) under the front and the rear wheels to compensate abrasion of tire.

☐ Determine the height of the front and there are plates to keep the lift truck level.

☐ Align the plate height to keep the elevation above the ground (H) at 140 mm or more.

6. TRANSPORTATION OF BATTERY

☐ Extreme care should be exercised for driving while transporting the battery.

☐ Transport the battery on flat and even ground only.

☐ (Not on slope or uneven surface)

☐ Drive at low speed, and slowly steer.

☐ Cautiously brake.

☐ Do not travel long distance with the battery loaded on lift truck or palette truck.

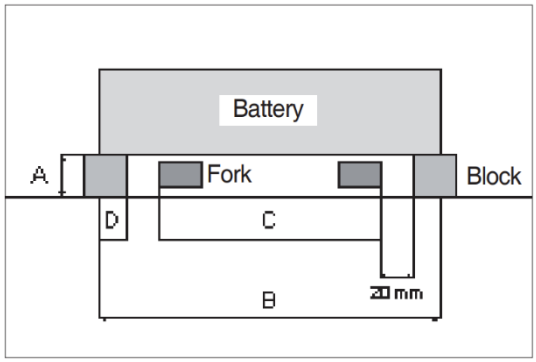
7. BATTERY DOCKING

☐ Prepare a dock by referring to the recommended dimensions of battery dock.

☐ Slowly insert the forks of lift truck or palette truck under the center of the dock.

☐ Slowly lower the forks of lift truck or palette truck to seat the battery on the dock.

☐ Ensure that the battery is stably docked, and then drive lift truck or palette truck slowly backward to withdraw the forks.



1) Battery docking with lift truck

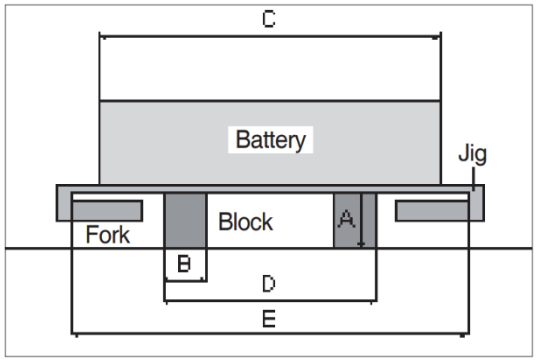
☐ Use block of height of 60 mm or more (A).

Battery width (B)	466mm
Fork width (C)	326mm
Block height (D)	50mm

2) Battery docking with palette truck

☐ Use block of height (A) of 90 mm and width (B) of 60 mm or more.

☐ When operating the truck without interruption by replacing the battery with palette truck, number of jigs for battery replacement should be same as batteries under operation.

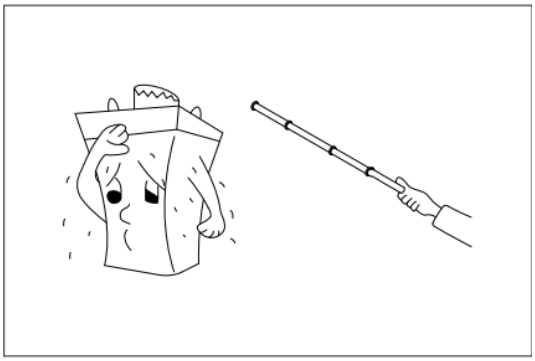


Battery width (C)	466mm
Block gap (D)	300mm
Outer width of fork (E)	680mm

15. BATTERY MAINTENANCE

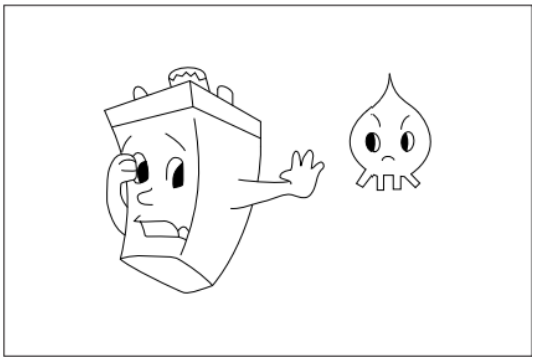
1. PROHIBITION OF OVER-DISCHARGE

   If the battery is so exhaustively consumed that the truck cannot move anymore, the service life of the battery is reduced. When turning the starting switch to ON position, and the battery charging indicator bar blinks, immediately charge the battery



2. STRICTPREVENTIONOFOPENFLAME

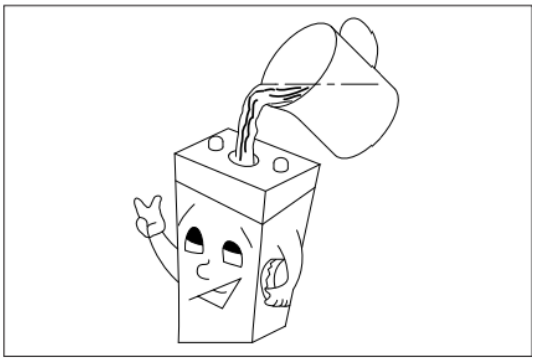
   The battery contains inflammable gas. Never let open fame get near the battery.



3. MAKEUP WITH DISTILLED WATER

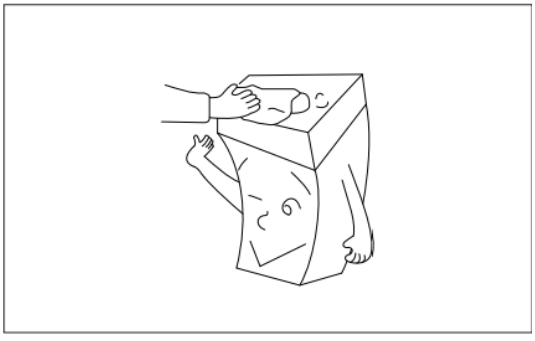
   Electrolyte is reduced by dissolution during charging, and natural evaporation. Make up the electrolyte with distilled water up to the specified level before performing even charging. It is not required to make up with thin sulfuric acid except overflow of electrolyte.

   ※ **Regularly check the electrolyte level, and make up with distilled to keep the normal level. If electrolyte is higher than the specified level, electrolyte overflows to cause damage and failure of the truck.**



4. KEEPING BATTERY CLEAN

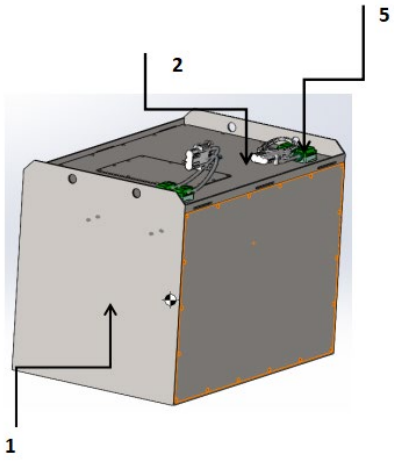
   Keep the top of the battery clean and dry. Securely tighten the stopper of the solution port.

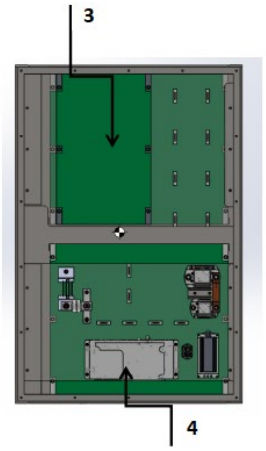


16. LITHIUM ION BATTERY (OPT)

1. STRUCTURE

1) Battery pack

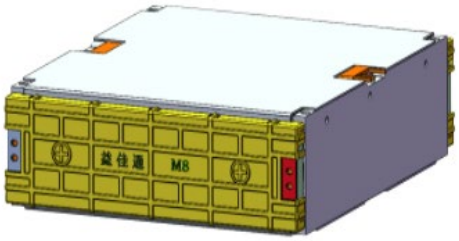


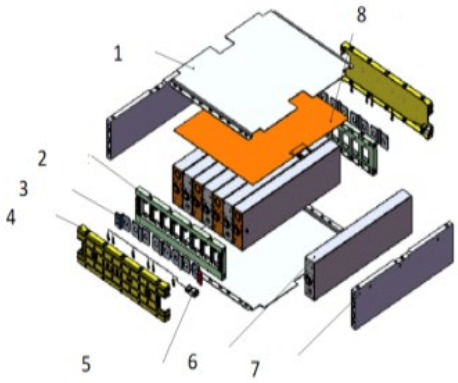


1 Housing 2 Top case 3 Module

4 BMS 5 Cable

2) Battery module

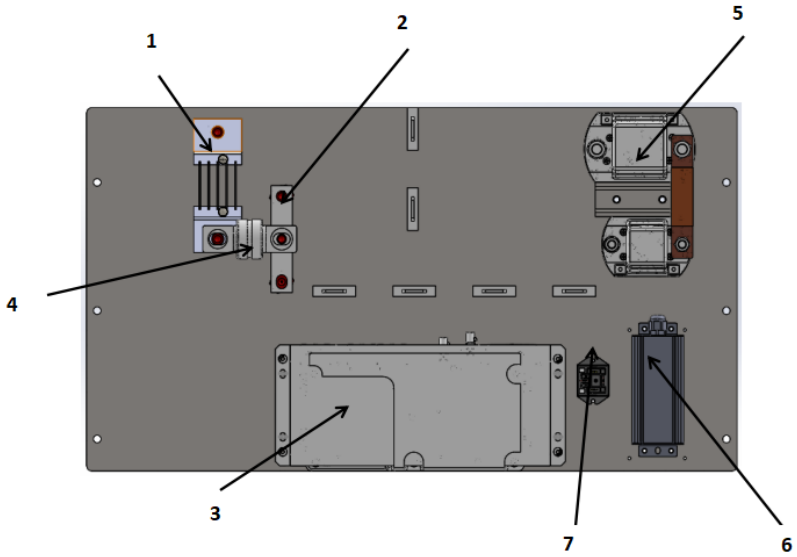




1 Aluminum cover plate 2 Wire harness bracket 3 Tandem array 4 Plastic cover

5 Acquisition harness 6 Electric core 7 End plate 8 Heating plate

3) BMS and BPU



1 Diverter	2 Wiring busbar	3 BMS	4 Fuse
5 Relay	6 DC-DC	7 Relay	

2. INSPECTION PROCEDURES

1) Daily inspection before starting

- Make sure that the battery pack charging terminal (DIN320 connector) is disconnected on the charge.
- Check the battery pack charging terminal for fixed state.
- Check the battery pack charging terminal for damage.
- Check the battery pack charging terminal and system load for fixed state.

2) Measures for abnormality before starting

① Voltage on charging and discharging terminals of battery pack

- Servicing is required for troubleshooting of failure by molten relay, short on both ends of relay.
- Servicing is required in cases of function failure of BMS, or power supply to BMS.

② Measures for poor stationary conditions of charging and discharging terminals of battery pack

- Check tightening status of bolts of charging/discharging terminals.
- Fasten the bolt at specified torque.

③ Damage of battery pack charging terminal

- Replace with specified connector (DIN320).

3) Checking for defects after start stopping

- Check if starting is stopped before connecting charging terminal on battery pack charging terminal.
- Check if voltage is detected before connecting charging terminal on battery pack charging terminal.
- Check the battery pack charging terminal for damage.

4) Measure for defects after start stopping

① When starting is not stopped

- Starting should be stopped.

② Voltage detected on charger terminal

- Make sure that starting is stopped. If so, take servicing action.
- Failure by molten relay is suspected. Take servicing action.

③ Charging terminal of charger or battery pack damaged

- Replace with specified connector (DIN320).

3. Charging process

1) The relationship between battery temperature and charging current when the battery charge SOC ＜100% is shown in the following table.

Battery temperature T(℃)	Charging current I(A)
≤0	0
≤5	60
≤10	120
≤15	160
≤55	200
≤65	90

2) Current drop at charging end

① When the cell voltage Vmax ≥ 3550 mV, the charging current is 90A.

② When the cell voltage Vmax ≥ 3580 mV, the charging current is 30A.

③ When the cell voltage Vmax ≥ 3600mV, full-charge calibration is carried out to calibrate SOC to 100% charge stop.

4. Battery charging heating mode (OPT)

25/30BE-X Charge heating			
Minimum battery temperature	Heating function (current)	Charging function (current)	Total output current
T ≤ 0℃	O(20A)	X	20A
0℃ ＜ T ≤ 5℃	O(20A)	O(60A)	80A
5℃ ＜ T ≤ 10℃	O(20A)	O(120A)	140A
10℃ ＜ T ≤ 15℃	O(20A)	O(160A)	180A
15℃ ＜ T	X	O(200A)	200A

5. Battery discharge heating mode (OPT)

1) When the minimum battery temperature is T≤-30℃, heating mode cannot start.

2) When the minimum battery temperature is -30℃＜T≤-20℃, the battery is turned on in heating mode, and the vehicle cannot run or lift. The fault code “B 49 Battery heating. Vehicle stops” will be displayed on the instrument and the “Lithium Battery heating indicator” will be light on.

3) When the minimum battery temperature -20℃＜T≤-15℃, the battery is turned on in heating mode, and the maximum speed of the vehicle is 8km/h. The fault code “B 1 BMS CUTBACK，B 7 discharge cell temp.low_2” will be displayed on the instrument and the “Lithium Battery heating indicator” will be light on.

4) When the minimum battery temperature -15℃＜T≤5℃, The battery is in heating mode and the vehicle is working normally and the “Lithium Battery heating indicator” will be light on.

5) When the minimum battery temperature T＞ 5 ℃, turn off the heating mode, normal operation of vehicle.

Note: Discharge heating ,Turn on the vehicle key switch to heat, when the battery heating minimum temperature rises to 6℃, stop heating, this time if the vehicle key switch does not restart, then the minimum temperature must be -11℃ when the heating function will be turned on again.

17. LITHIUM ION BATTERY CHARGER (OPT)

※ **Read and understand the following instructions before connecting battery charger to power source and battery.**

1. USE AND OPERATION

1) When using battery charger, safety requirements should be satisfied pursuant to the local laws and regulations, and regulations stipulated by local authorities.
2) User should use charging system by complying with current regulations, avoid actions that may endanger lives and health of others, and prevent damage to properties.

2. WARNING ON INSTALLATION AND SAFETY

Read and understand the following instructions before connecting battery charger to power source and battery.

1) Mount the battery charger on the wall, and fix the charger with plug though slot for ensuring correct functions and improving yield. Special attention should be paid protecting ventilation slots from clogging.
2) Authorized skilled experts are only allowed of opening battery charger.
3) Vent insulation sections of power cable and battery connector before operating the battery charger.
4) Skilled engineers are only allowed of performing works on electric apparatus.
5) Shut power off before connecting or disconnecting the battery.
6) The battery under charging generates explosive gases. Do not smoke in the vicinity of the truck. Avoid open flame and spark, and prevent access of other truck that may cause risky situations on human beings and properties.
7) The battery charger contains electric components generating electric arc and spark, and should be positioned on place adequate for functions of the charger when using it in confined space. Every standard battery charger should be used on hard and flat floor in contained space of well ventilation and free from rainwater and/or water splash. In particular, place of dusty environment, or with water or heat source, or high humidity should be avoided. Do not place the battery charger on floor and/or shelf made of wooden material or other inflammable materials, or do not stack objects around the charger. Never put any item or solution container on the lid of the charger.
8) The battery charger should be connected to grounded receptacle/socket for preventing shock. Further, receptacle/socket for connecting with the battery charger should compliant with the charger capacity, and should be protected by proper electric devices pursuant to the standards (e.g., fuse and auto switch). Protection system should have calibration margin of 10% or higher based on current absorption ratio of the truck for sufficient selectivity.

9) Always use special bipolar connector (DIN 320 REMA).
10) Do not extent existing power connection with additional cable.
11) The charger is free from maintenance except routine cleaning. Cleaning should be performed regularly dependent upon working environments. Disconnect power cable and battery connection cable from power source before cleaning the charger.

3. POWER CONNECTION

The battery charger should be connected to power receptacle compatible with capacity of installed battery charger. Correctly connect the charger to grounding line. It is desirable to verify that main power of 3-phase is supplied on place for operating the battery charger while installing the charger (or moving the batteries).

Battery voltage (V)	Charger current (A)	Module power (kW)	Input LAC norm (A)
51.2	200	12	24
83.2	200	20	40

4. BATTERY CONNECTION

It is recommended to use bipolar connector compliant with the specification pursuant to the standards to prevent inverse connection of the polarity of the battery. Check the cable connection of the connector contact. Skilled engineers are only allowed of performing this work.

※ **USB port should only be used for programming charging variables, and downloading history data and graphs. Disconnect USB cable from the charger to prevent unexpected consequences on the battery charger and the battery by interruption of charging process from EMI noise.**

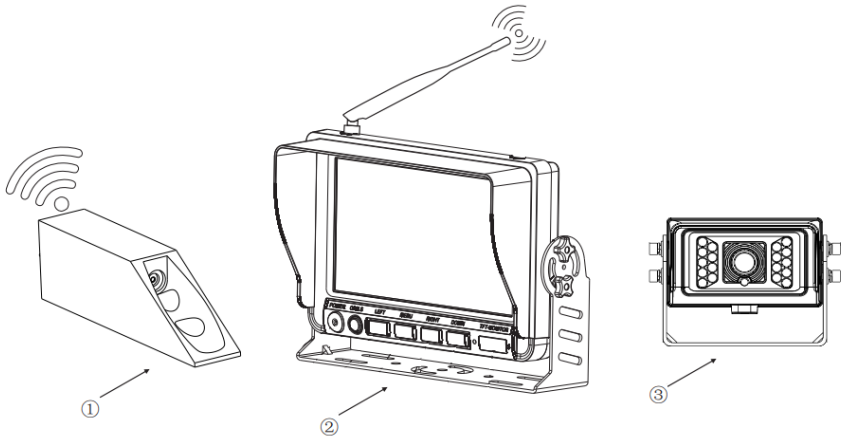
5. PRECAUTION DURING CHARGING

Shut down starting switch, and emergency stop switch of the truck before battery charging.
Completely connect the battery charger to the battery connector for charging. Check texts of CAM Bus on the bottom left of the charger monitor after beginning charging.
Do not disconnect the connector during charging. (Never forget to press the ON/ OFF switch of the charger to stop operation of the charger before disconnecting the connector.)

18. CAMERA (OPT)

1. STRUCTURE

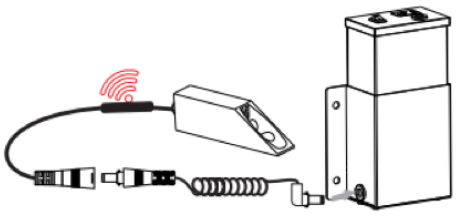
Camera components Front camera, rear camera, and display panel.



1 Front camera 2 Display screen 3 Rear camera

2. FRONT CAMERA

The front-facing camera has a portable power supply.

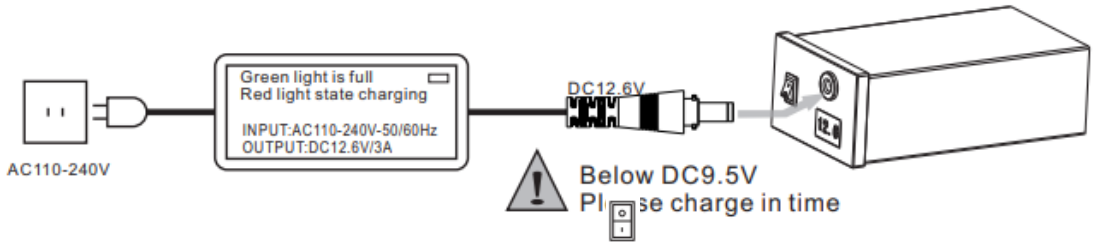


1) 1.This device used for temporary power supply for monitor system Bank Application Manual of forklift, reach trunk, portable device and other small digital electronic products.
2) The power is stored in polymer core battery, with high density energy, long cycling life, environment friendly.
3) With spilt design, stainless fixed base + battery with stainless steel housing, built-in strong magnetic, super easy mounting, user friendly.
4) Built-in short circuit & overcurrent & overcharge protection.
5) Support DC12.6V(1A-4A) fast charge.
6) Smart Charger: Input: AC110-240V; Output: DC12.6V(3A);
7) Base: output DC port; Battery: input DC port, protective rating: IP66.
8) LED Display Board Power Display (>DC9.9V 25%/>DC10.7V 50% >DC11.4V 75%/>DC12.2V 100%)

How to use

Charge with smart power adapter/auto stop voltage: DC12.6V/1-4A.

Charging Voltage Display:>DC9.9V 25%/>DC10.7V 50% >DC11.4V 75%/>DC12.2V 100% .



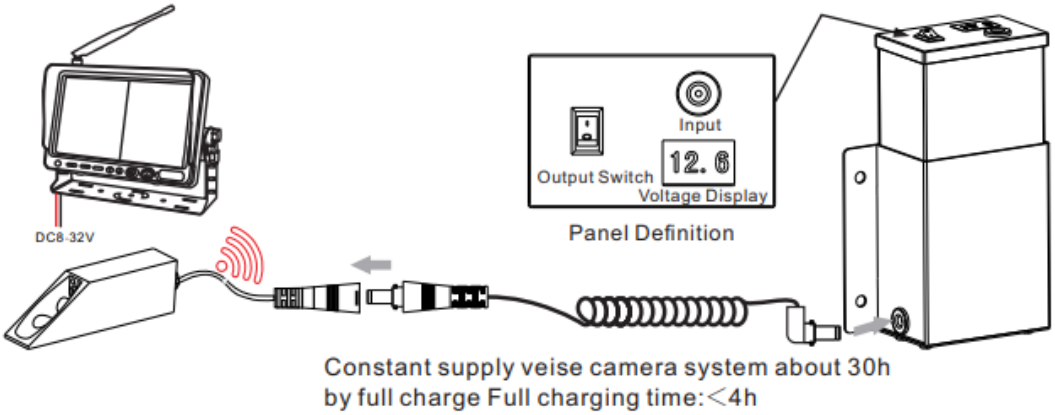
Connect monitor camera to mobile power bank, press on/off.

Discharge Battery Voltage Display:＞DC9.9V 25%/＞DC10.7V 50% ＞DC11.4V 75%/＞DC12.2V 100%.

Protection status:

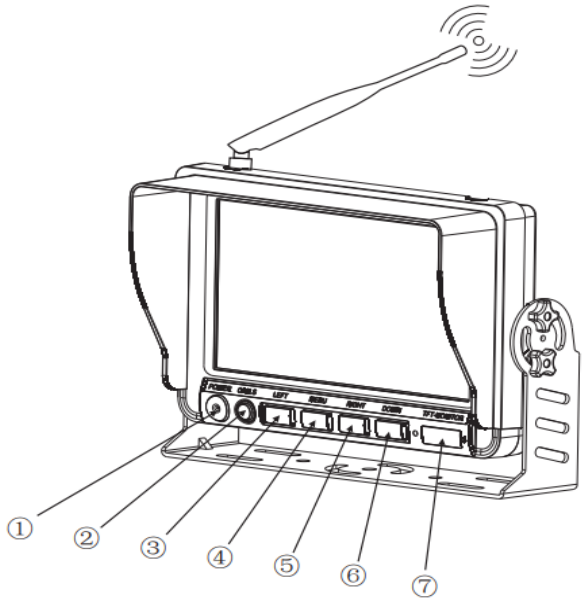
Short circuit protection: no power output if loading short circuit.

Over discharge protection: Auto power off if voltage lower than DC9.5V.



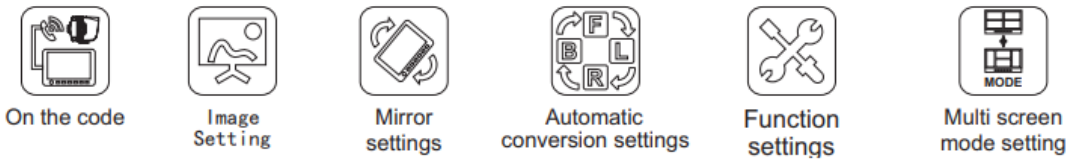
※ **Remark: When the discharge voltage is lower than 9.9V, charge the battery.**

3. DISPLAY SCREEN

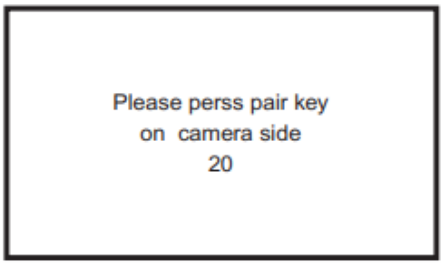


1	Power	4	Menu	7	Nameplate
2	OK	5	Right key / volume +		
3	Left key / volume -	6	Down (CH switch)		

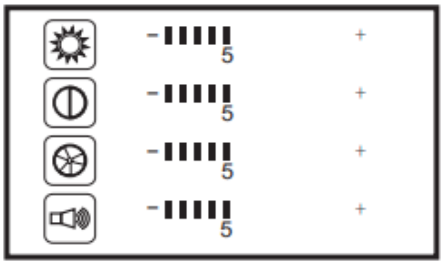
How to use



1) Code settings: Enter the menu, check the code options menu, press the confirmation button to start the code, display the code. Character Please press pair Keyon camera side 20, pair code time. The countdown is 20 seconds, the camera is recharged and waited for 5~10 seconds to display and photograph. The machine connects to the communication and displays the image normally.



2) Image settings: Enter the menu, select the image settings options menu, press the confirmation button to enter the image settings:



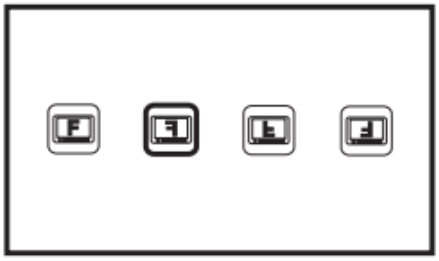
1. Brightness setting: 0-9 (left / right key adjustment step size)

2. Contrast settings: 0-9 (left / right key adjustment step size)

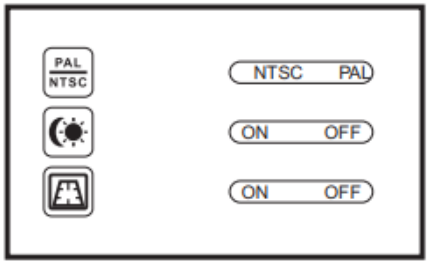
3. Color settings: 0-9 (left / right key adjustment step size)

4. Volume control: 0-9 (left / right key adjustment step size)

3) Mirror settings: Set the four states of the CAM1/CAM2 channel image: Positive image, mirror image, vertical flip image and vertical flip mirror, Default state: Positive image.



4) Automatic switch mode settings: 1.Set up CAM1/CAM2 channel automatic switching mode to turn on and off; 2. Set CAM1/CAM2 channel automatic switching mode time value 5~45, Default state: 5S.

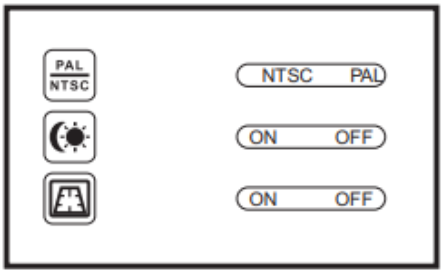


5) Function settings:

1.Switch between NTSC and PAL，Default state: NTSC；

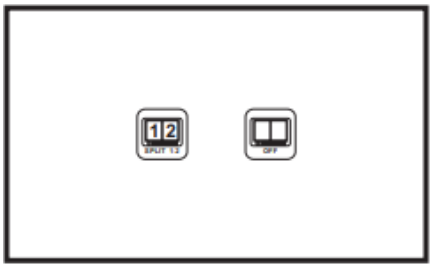
2.Set up the LED screen environment light source mode to turn on and off；

3.Reversing scale setting: set up CAM2 channel reversing scale open and close.



6) Multiscreen mode display settings:

1. Settings screen can be switched to two-screen display, open by default.



4. REAR CAMERA

The rear camera connects to the display via a wireless signal

19. STORAGE

※ **Cautions**

Improper storage of the truck may cause damage and corrosion of major functional parts, or damage and discharging of the battery. The battery of the lift truck should be stored in indoor environment to prevent damage by rainfall.

1. DAILY STORAGE

Follow the instructions below when storing the lift truck in a warehouse.

1) Place the lift truck in dry and clean environment of well ventilation, and free from frost.
2) Make sure parking brake is applied.
3) Make sure that the forks have been lowered on the floor, and the mast vertically inclined.
4) Turn both of the starting switch and the emergency stop switch to OFF position to shut off power to the battery.

2. LONG-TERM STORAGE

Notes on storage

1) Clean the truck clear.
2) Check the functions of the brake, the mast, motor starting, steering, horn, and electric parts.
3) Check the hydraulic oil level, and makeup the oil, if required (See Table Recommended Lubricants).
4) Apply thin film of oil or grease on all of surfaces not coated with paint.
5) Supply grease to the lift truck at injection points specified in 'Regular Checklist.'
6) Coat all of exposed electric connections with adequate spray.
7) Disconnect the battery cable, and then clean the battery. When the lift truck is to store for a month or longer, remove the battery from the truck, and store it in indoor place.

☐ Refer to 'Battery Maintenance' on Page 99 for further information of maintenance of the battery.

3. NOTES DURING STORAGE

1) Drive the truck for a short distance while operating the attachments (e.g., lift, tilt, etc.).
2) Check exposed parts for rust once a month.
3) Check voltage of the battery once a month, and recharge the battery, if required.

4. NOTES AFTER STORAGE

1) Clean the lift truck clear.
2) Reconnect the battery cable, and check the battery voltage.

☐ Recharge the battery, if required, and then check specific gravity of electrolyte.

3) Lubricate the lift truck with grease at injection points specified in 'Regular Checklist.'
4) Check for condensed water in hydraulic oil, gear oil, brake oil, drive axle oil, and driver oil, and drain water or replace the oil, if required.
5) Start the truck, and check for all of functions and oil leak.

☐ Move the truck up to the final cylinder stroke ten times or more to bleed air from the tank to operate the attachments.

☐ Points and electric parts of operation, steering, and noise

☐ Leak from cylinder, MCV, pump, powertrain part, tube and hose

20. LUBRICANTS FOR NEW TRUCK

Lubricants and oils listed below are used on new truck for shipping.

Item	Specifications
Gear oil	85W90 GL5
Hydraulic oil and steering oil	ISO VG32, VG46, VG68, Hyundai's long-life hydraulic oil ISO VG15, Hydraulic oil★
Brake oil	DOT3
Grease	NLGI No.2

ATF: Automatic Transmission Fluid

ISO: International Organization for Standardization

NLGI: National Lubricating Grease Institute

★: Regions of cold climate (Russia, CIS, Mongolia)

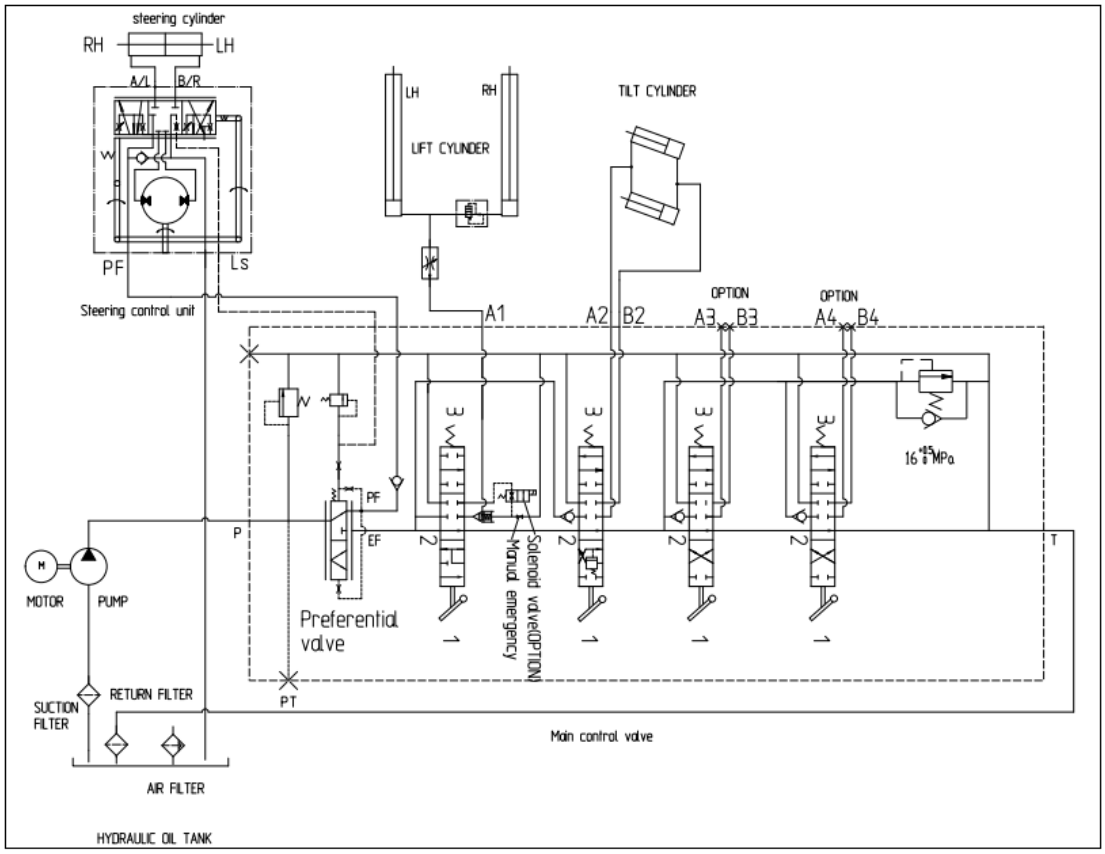
21. RECOMMENDED LUBRICANT

Item	Lubricant type	Capacity (l)	Ambient temperature °C (°F)								
			-50	-30	-20	-10	0	10	20	30	40
			(-58)	(-22)	(-4)	(14)	(32)	(50)	(68)	(86)	(104)
Axle	Gear oil	7	★85W90 GL5								
Hydraulic oil tank	Hydraulic oil	33	★ISO VG 15								
				ISO VG 32							
					ISO VG 46						
						ISO VG 68					
Brake system	Brake oil	0.5	★DOT3								
Fitting (Grease nipple)	Grease	0.1	★NLGI No.1								
						NLGI No.2					

★: Regions of cold climate (Russia, CIS, Mongolia)

22. SCHEMATIC DIAGRAM

1. HYDRAULIC CIRCUIT



1) LIFT ASCENDING, TILTING REAR

When pulling lift and tilt operation lever, spools of first and second blocks move to position of lift ascending tilting backward. Hydraulic oil of hydraulic pump flows into main control valve to push rod check valve of spool to large chamber of lift cylinder and small chamber of tilt cylinder.

At the same time, hydraulic oil from small chamber of lift cylinder and large chamber of tilt cylinder returns to hydraulic oil tank. This hydraulic oil flow forms lift ascending and tile backward.

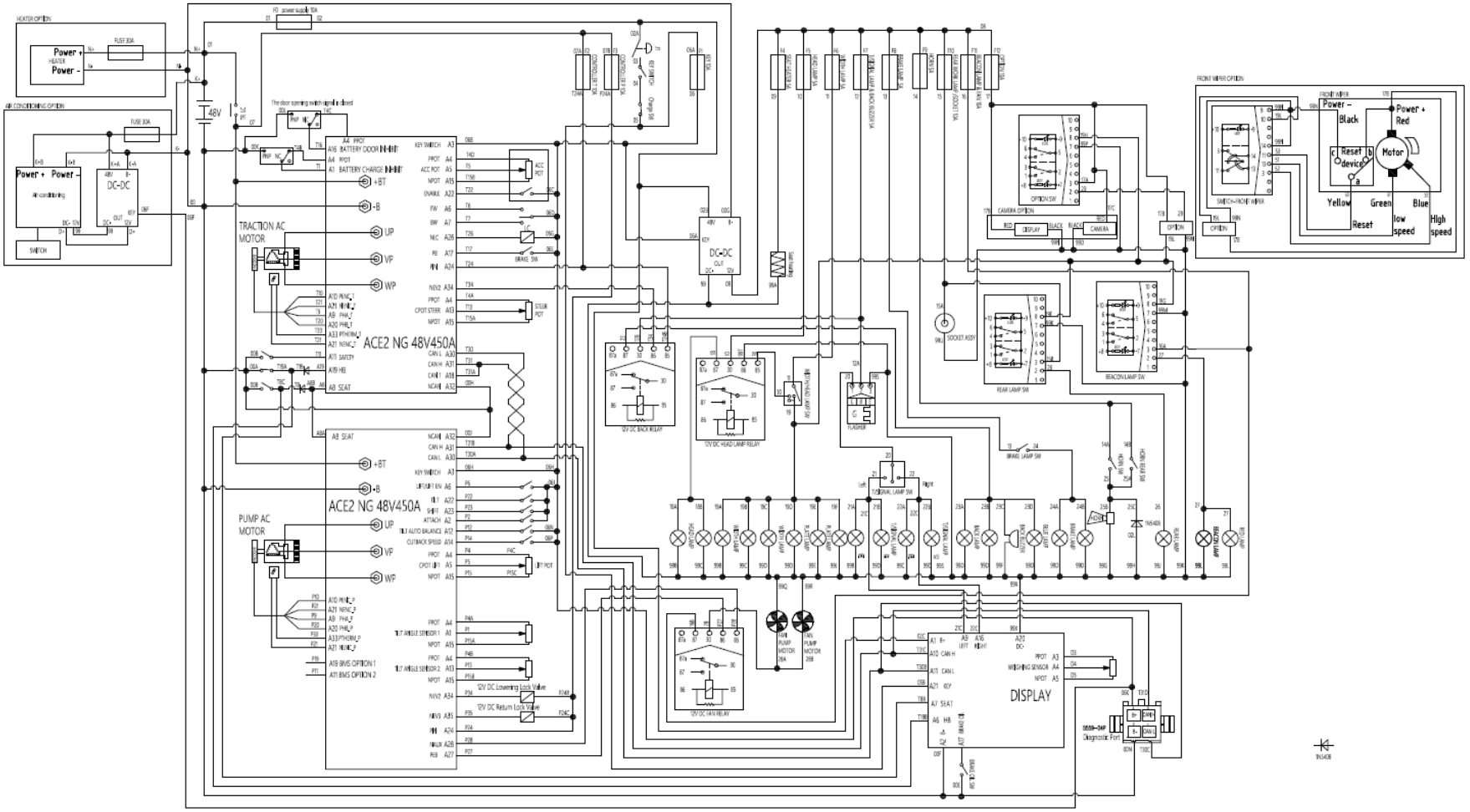
2) LIFT DESCENDING, TILTING FORWARD

When pushing lift and tilt operation lever, spools of first and second blocks move to position of lift descending tilting forward. Hydraulic oil of hydraulic pump flows into main control valve to push rod check valve of spool to move to large chamber of tilt cylinder.

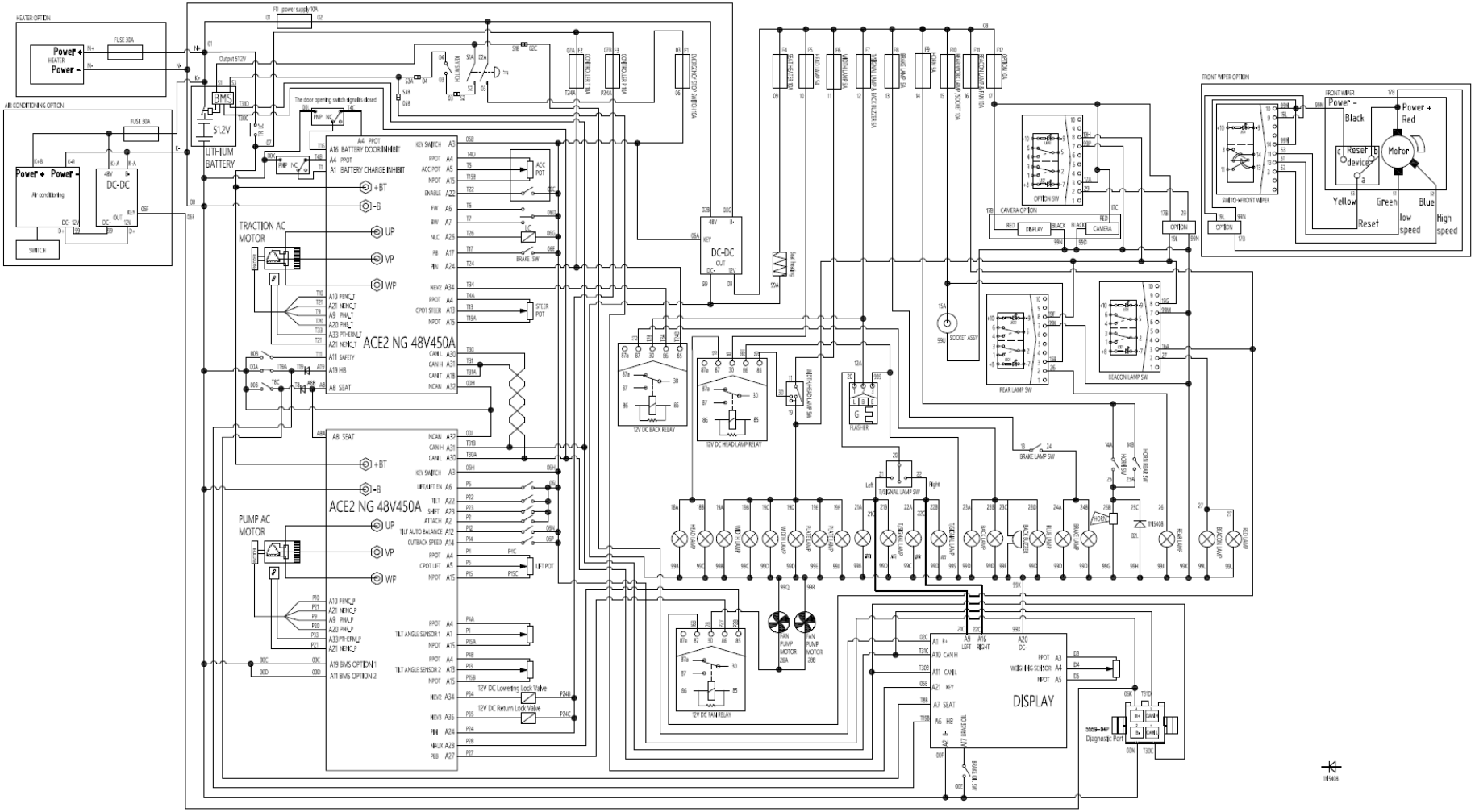
Large and small chambers of lift cylinder are connected to return path to let return of hydraulic oil, and mast descends with weight of forks.

Hydraulic oil from small chamber of tilt cylinder is returned to hydraulic oil tank. This hydraulic oil flow forms tilting forward.

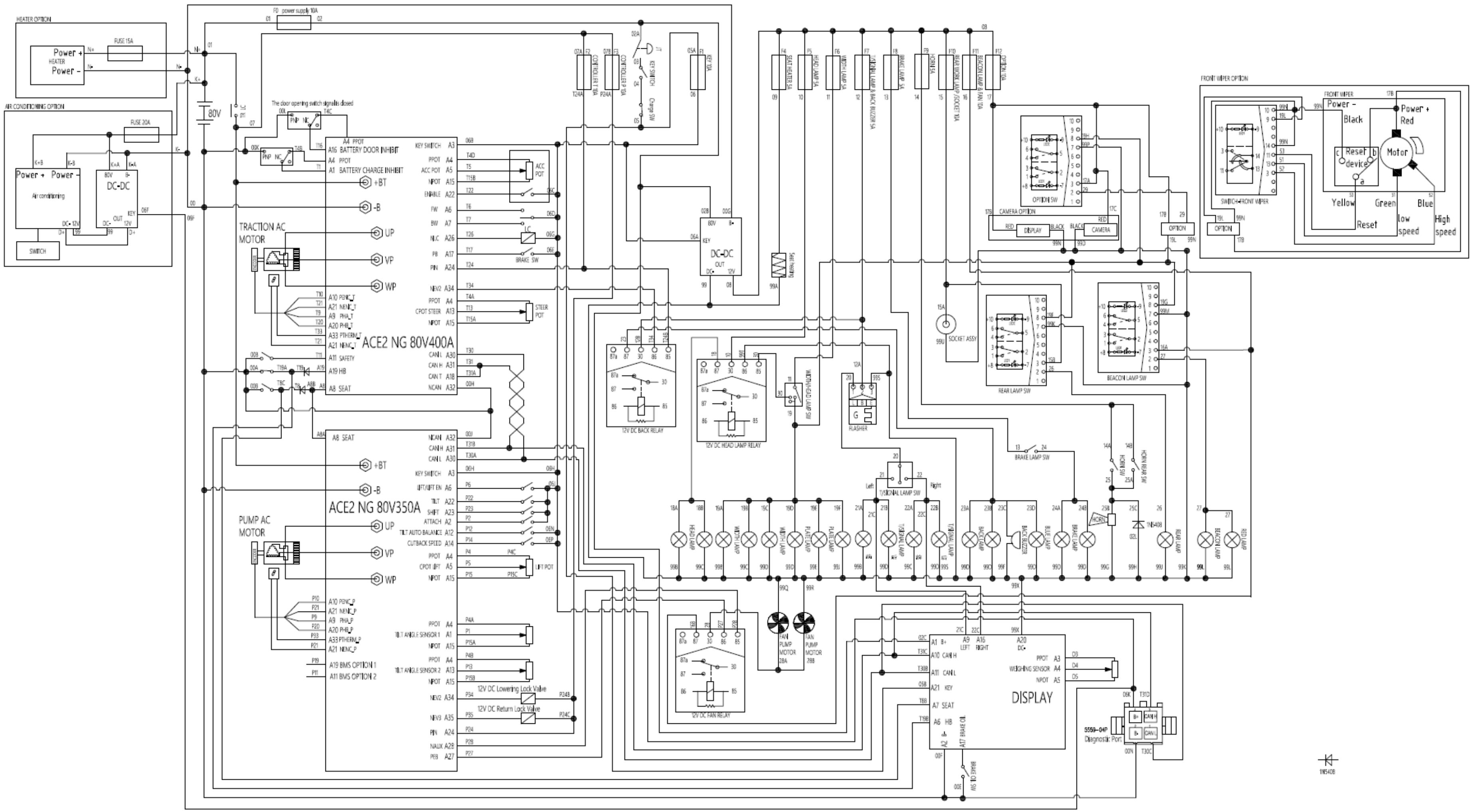
2. ELECTRICAL SCHEMATIC DIAGRAM OF LEAD-ACID BATTERY 25BE-X



3. ELECTRICAL SCHEMATIC DIAGRAM OF LITHIUM BATTERY 25BE-X (OPT)



4. ELECTRICAL SCHEMATIC DIAGRAM OF LEAD-ACID BATTERY 30/35BE-X



5. ELECTRICAL SCHEMATIC DIAGRAM OF LITHIUM BATTERY 30/35BE-X (OPT)