

7. PLANNED MAINTENANCE

1. INTRODUCTION

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

2. LIFT TRUCK MAINTENANCE

Regular maintenance and care of your lift truck is not only important for full and efficient truck life also essential for your safety. The importance of maintaining your lift truck in a safe operating condition by servicing it regularly and, when necessary, repairing it promptly cannot be emphasized too strongly. Experience has shown that powered industrial trucks can cause injury if improperly used or maintained. In the interest of promoting safety, several current industry and government safety standards specify that any powered industrial truck not in safe operating condition be removed from service and that all repairs be made by trained and authorized persons.

To assist you in keeping your lift truck in service and in good operating condition, this section outlines maintenance procedures that should be done at regular intervals. This planned approach is considered essential to the life and safe performance of your truck.

It is your responsibility to be alert for any indication that your truck may need service and have it attended to promptly. You play an important part in maintenance. Only you can make sure that your lift truck regularly receives the care it needs.

▲ Powered industrial truck may become hazardous if maintenance is neglected.

3. PLANNED MAINTENANCE

As outlined in Section 4, **Daily safety inspection** 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 operators daily inspection, HYUNDAI recommends that the owner set up and follow a periodic planned maintenance (PM) and inspection program. The **PM** identifies needed adjustments, repairs or replacements so they can be made before failure occurs. The specific schedule (frequency) for the PM inspections depends on the particular application and lift truck usage.

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

4. PLANNED MAINTENANCE INTERVALS

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

1) Normal Operation

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

2) Severe Operation

Prolonged operating hours or constant usage.

3) Extreme Operation

- (1) In sandy or dusty locations, such as cement plants, lumber mills and coal dust or stone crushing sites.
- (2) High-temperature locations, such as steel mills and foundries.
- (3) Sudden temperature changes, such as constant trips from buildings into the open air or in refrigeration plants.

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

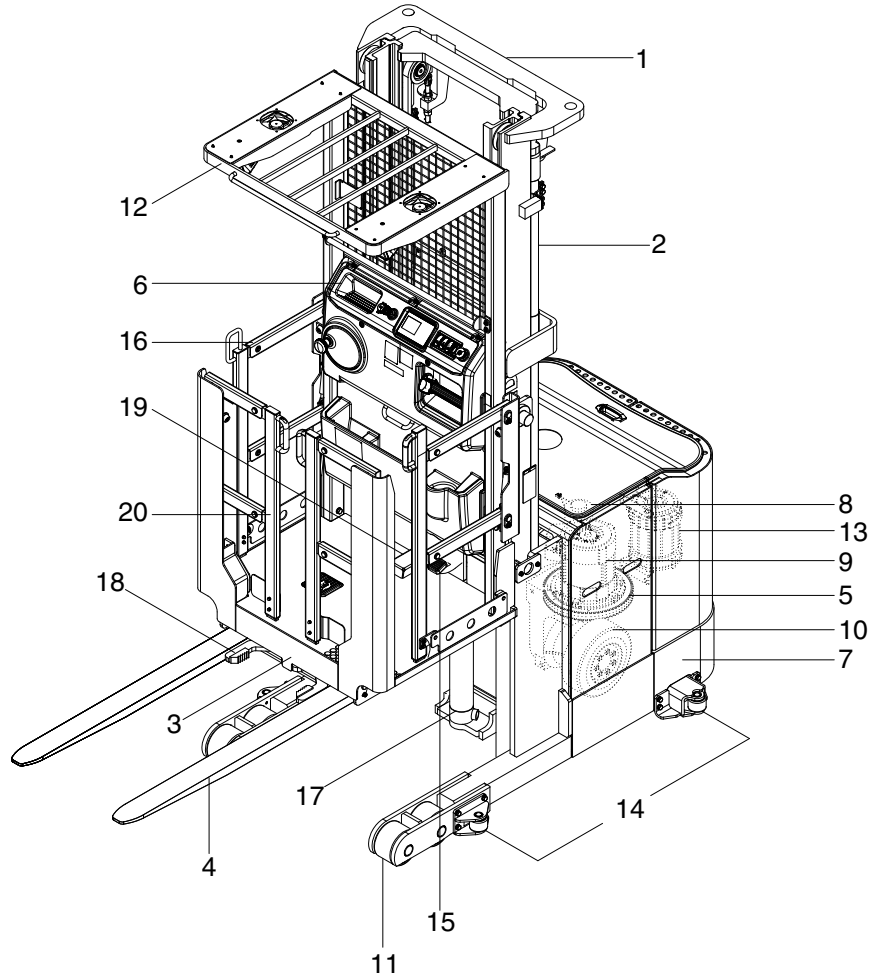
※ Since the operating environment of lift trucks varies widely, the above descriptions are highly generalized and should be applied as actual conditions dictate.

The maintenance time intervals referred to in this manual relate to truck operating hours as recorded on the hourmeter, and are based on experience which HYUNDAI has found to be convenient and suitable under typical (normal or average) operating conditions.

5. MAJOR COMPONENT LOCATIONS

Use the illustration below to locate components included in the PM procedures.

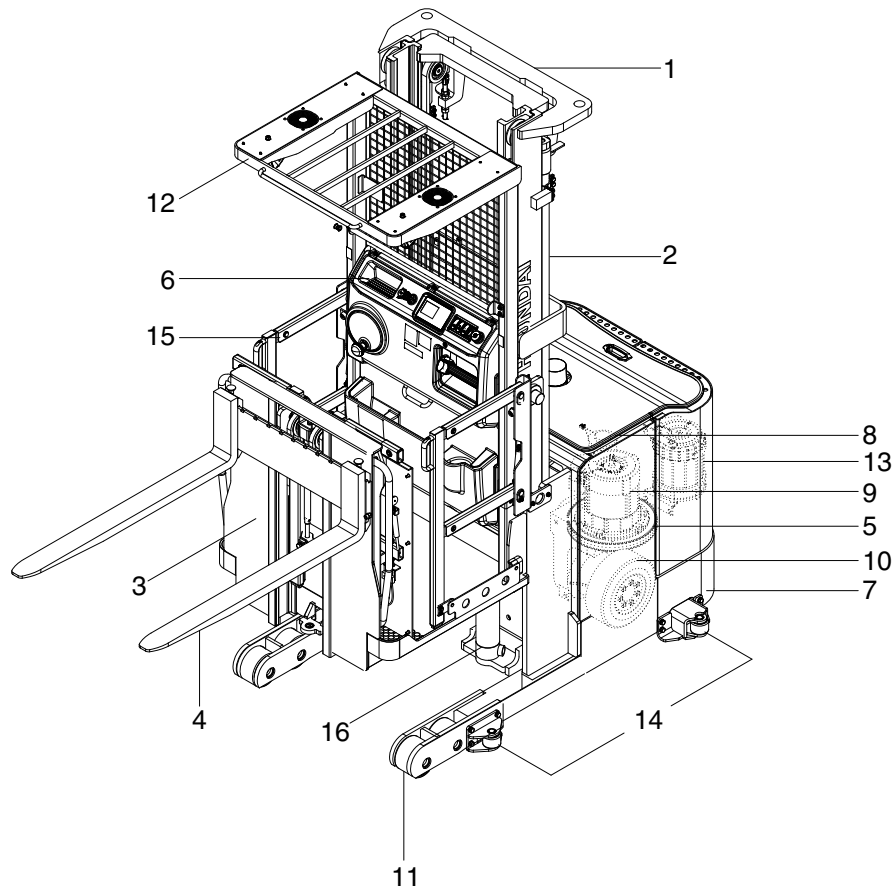
1) PLATFORM



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1	Mast	8	EPS motor	15	Pallet clamp pedal
2	Lift cylinder	9	Traction motor	16	Side gate
3	Platform	10	Drive wheel	17	Free lift cylinder
4	Forks	11	Load wheel	18	Pallet clamp
5	Drive unit	12	Overhead guard	19	Pallet release pedal
6	Dash board	13	Pump motor	20	Rear gate
7	Frame	14	Guide roller		(EU : STD, Other : OPT)

2) ADDITIONAL LIFT (OPT)



13BOP97PM02

- | | | |
|-------------------|-------------------|-----------------------|
| 1 Mast | 7 Frame | 13 Pump motor |
| 2 Lift cylinder | 8 EPS motor | 14 Guide roller |
| 3 Additional lift | 9 Traction motor | 15 Side gate |
| 4 Forks | 10 Drive wheel | 16 Free lift cylinder |
| 5 Drive unit | 11 Load wheel | |
| 6 Dash board | 12 Overhead guard | |

6. DAILY MAINTENANCE CHECKS

The PM intervals depend on hour meter records of operation.

PM interval

A : 8~10 hours or daily

B : 50~250 hours or every month (Typical PM interval)

C : 450~500 hours or every 3 months

D : 900~1000 hours or every 6 months

E : 2000 hours or every year

Daily maintenance checks	A	B	C	D	E
Check truck for obvious damages and leaks.	●				
Check clean battery terminals.	●				
Check electrolyte level.	●				
Check capacity, warning plates and decals.	●				
Check condition of tires and wheels. Remove embedded objects.	●				
Check for missing or loose wheel nuts.	●				
Check gauges and instruments.	●				
Check warning lights and hourmeter.	●				
Check overhead guard condition and bolts.	●				
Check horn operation and other warning devices.	●				
Check steering operation.	●				
Check brake operation.	●				
Check directional and speed controls operation.	●				
Check lift operation.	●				
Check mast, lift chains and fasteners.	●				
Check platform or attachments and forks.	●				
Check optional safety equipment.(Alarms, Lights etc.)	●				
Check for missing or loose outrigger bolts.	●				
Check operator safety bar and belt.	●				
Check legibility of noticed on safety restraint belt.	●				

7. PERIODIC MAINTENANCE CHECKS

The PM intervals depend on hour meter records of operation.

PM interval

A : 8~10 hours or daily

B : 50~250 hours or every month (Typical PM interval)

C : 450~500 hours or every 3 months

D : 900~1000 hours or every 6 months

E : 2000 hours or every year

F : 5000 hours (Hyundai genuine long life hydraulic oil)

Periodic checks and planned maintenance (PM)	A	B	C	D	E	F
Check truck visually and inspect components.		●				
Test drive truck/check functional performance.		●				
Check torque on critical fasteners.		●				
Lubricate truck.(See component)		●				
Clean/Check battery terminals, electrolyte level.		●				
Check battery cables/truck receptacle.		●				
Perform battery load test.		●				
Test ground.		●				
Check drive unit fluid level.		●				
Drain and replace drive unit fluid.					●	
Check drive unit mounting and fasteners.		●				
Check brake condition and wear.		●				
Lubricate steering gear and steering bearing of drive unit.		●				
Lubricate drive unit & suspension link bushing.		●				
Check hydraulic tank oil level.		●				
Replace hydraulic oil.					★ ¹ ●	★ ² ●
Replace hydraulic return filter.				●		
Lubricate mast fittings.		●				
Check lift chain adjustment and wear.		●				
Check/lubricate lift chains.		●				
Check contactors (Replace contactor tips if roughness is remarkable)		●				

★¹ Conventional hydraulic oil

★² Hyundai genuine long lift hydraulic oil

8. SAFE MAINTENANCE PRACTICES

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

- 1) Powered industrial trucks can become hazardous if maintenance is neglected. Therefore, suitable maintenance facilities, trained personnel and procedures shall be provided.
- 2) Maintenance and inspection of all powered industrial trucks shall be performed in conformance with the manufacturer's recommendations.
- 3) Follow a scheduled planned maintenance, lubrication and inspection system.
- 4) Only trained and authorized personnel are permitted to maintain, repair, adjust and inspect industrial trucks and must do so in accordance with the manufacturer's specifications.
- 5) Always wear safety glasses. Wear a safety(hard) hat in industrial plants and in special work areas where protection is necessary and required.
- 6) Properly ventilate work area 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 fluid or electrolyte levels.

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 blocks under the load-engaging means, inner masts or chassis before working on them.
- (4) Disconnect the battery connector before working on the electrical system.
 - Electric discharge of the controller

It is necessary to discharge of electricity for the condenser prior to setting the controller.

▲ First of all, take care to make sure that the battery cables are disconnected from the battery socket.

Connect 10 watt of resistor and the negative pole of the power input between the positive pole of the controller for 10 seconds to discharge of electricity for the condenser.

※ Refer to the 1-12 "Jacking and Blocking" section 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) Make sure that the multifunction lever is in NEUTRAL.
- (2) Turn the key switch to the ON position.
- (3) Check functioning of lift 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, platform, forks or attachments.
- (3) Make sure that the multifunction lever is in NEUTRAL.
- (4) Turn the key switch to the OFF position.
- (5) Put blocks at the wheels if the truck must be left on an incline.

▲ Do not park the truck on a slope if possible before leaving the operator's platform or operating position.

- 12) Brakes, steering mechanisms, control mechanisms, warning devices, lights, overload devices, lift mechanisms, 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 to insure that maintenance preserves the original approved safe operating features.
- 14) All hydraulic systems must be regularly inspected and maintained in conformance with good practice. 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 battery is disconnected, mast is in the fully-lowered position and hydraulic pressure is relieved in hoses and tubing.

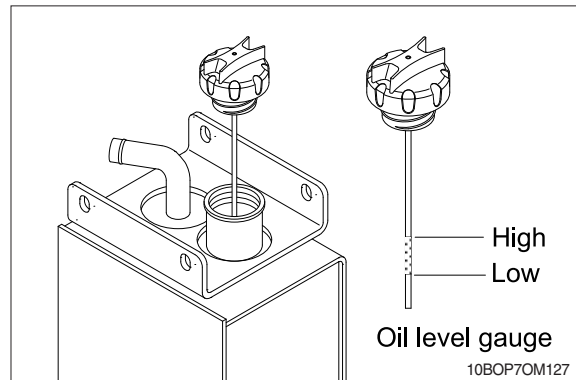
▲ Always put blocks under the platform and mast rails when it is necessary to work with the mast in an elevated position.

- 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) Industrial 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. 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. Parts, including tires are to be installed per the manufacturer's procedures. Always use genuine HYUNDAI or HYUNDAI-approved parts.
- 22) Use special care when removing heavy components, such as mast, etc. Be sure that lifting and handling equipment is of the correct capacity and in good condition.

9. MAINTENANCE GUIDE

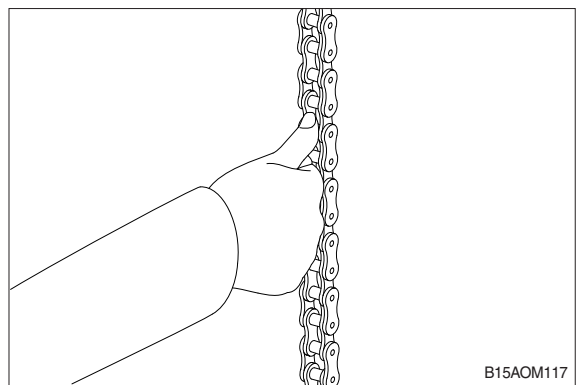
1) SUPPLYING HYDRAULIC OIL

Lower the fork in its lowest position on an even ground. Check for the hydraulic oil level with the oil level gauge. When the level is low, refill.



2) CHECKING AND ADJUSTMENT OF LIFT CHAIN TENSION

Set the fork in its horizontal position on an even ground. Raise it up to 20~30cm from the ground and push the chain with both hands. If the tension is too high or too low on one side, adjust it with the chain anchor bolt.



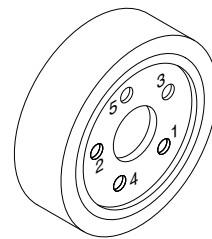
3) CHECKING OF HUB NUT TIGHTENING CONDITION

Make sure that the hub nuts and bolts are firmly tightened.

Tightening and checking should be made in a diagonal order to prevent unbalanced tightening. (See the figure.)

· Tightening torque : $14 \pm 1.5 \text{ kgf} \cdot \text{m}$

DRIVE TIRE



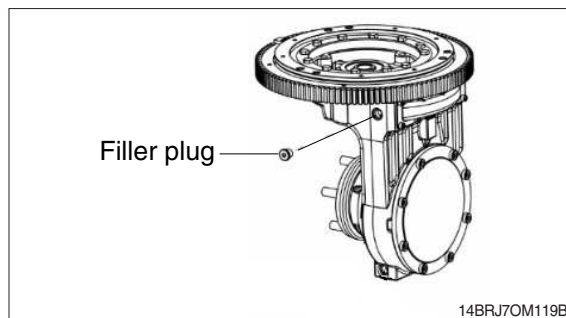
4) GREASING OF EACH PARTS

Clean the following parts before greasing.

- (1) Lift chain : Clean the chain with a brush greased with SAE 30~40 (Brush over the gear oil low viscosity).
- (2) Rolling part of mast guide rail roller : Brush over grease.
- (3) Slide guide and slide rail : Brush over leaked oil.
- (4) Sliding parts of inner mast and outer mast : Brush over leaked oil.

5) CHECK FOR THE OIL LEVEL OF THE DRIVING GEAR CASE

Check for the oil level by taking out the filler plug provided front side of the gear case.



6) OIL CHANGE & FILL OF DRIVE UNIT

(1) Oil change

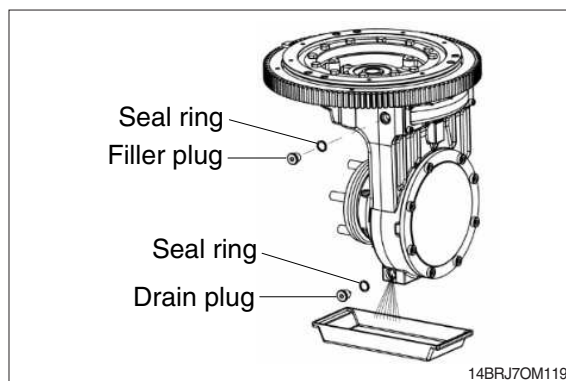
▲ Do not drain drive unit oil into the soil or the sewerage system.

Pay attention to the type and quantity of debris.

▲ High oil temperatures are to be expected after continuous operation of the drive unit.

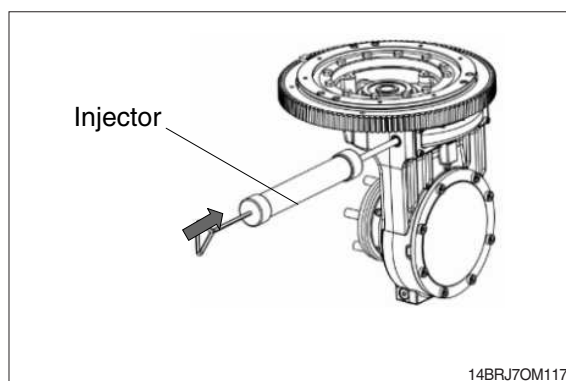
Wear temperature-resistant gloves!

- Position the vehicle on even ground and lock the wheels for safety purposes.
- Carefully clean the area around the oil filler and oil drain plug.
- Place a suitable big oil collecting vessel under the oil drain plug.
- Loosen the oil filler plug with a 6mm allen wrench. Remove the oil filler plug and the sealing ring.
- Loosen the oil drain plug with a 6mm allen wrench. Remove the oil drain plug and the sealing ring.
- Have the transmission oil drained into the vessel completely.



(2) Fill in the drive unit oil

- Clean magnet on the oil drain plug and always reattach it with a new sealing ring.
 - Tightening torque : 2.24 kgf · m (22 Nm)
- Fill in the drive unit oil.(Refer to page 7-26)
- For filling use a suction and pressure injector. This allows an easy and rapid filling of the drive unit with oil.
- The correct oil level and the correct oil quantity is achieved when the oil level is at the lower edge of the oil filler plug, at least when oil penetrates at the filler plug.
- Attach the oil filler plug with a new sealing ring.
 - Tightening torque : 2.24 kgf · m (22 Nm)

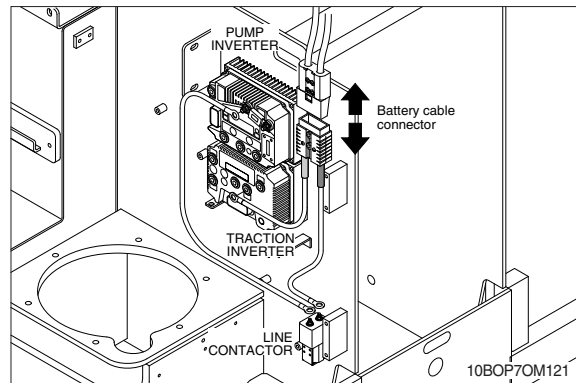


7) EXTERNAL APPEARANCE CHECK OF THE VEHICLE

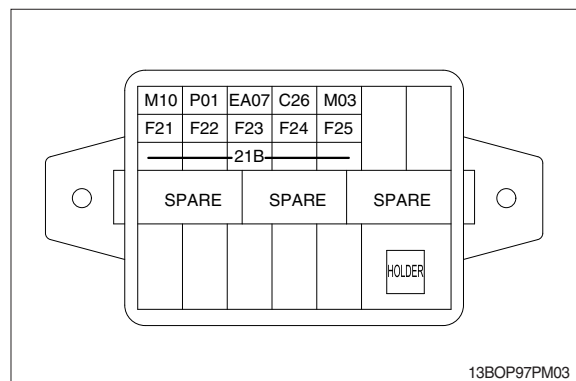
Check for the external appearance of vehicles. If any defect is found immediately contact the service station.

8) FUSE REPLACEMENT

- (1) Disconnect the battery connector.



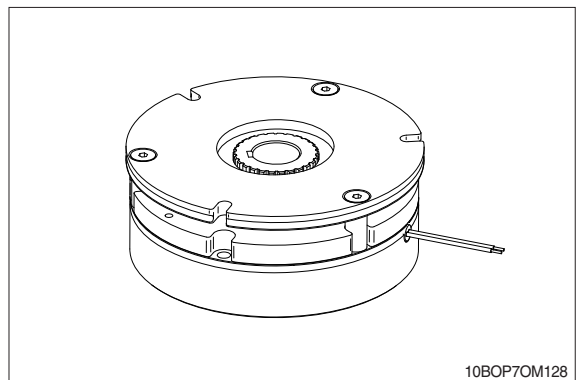
- (2) Remove the blown fuse and replace with a new one.



※ The blown fuse must be replaced with a fuse of the same capacity. When the fuses are often blown out contact the service station for inspection. Never use a conductor for a fuse.

9) BRAKE

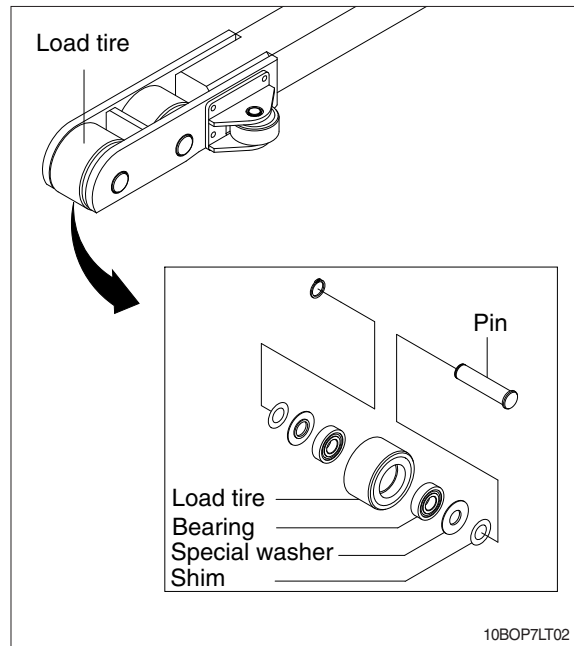
- (1) The equipment is designed for dry running. Friction faces must be kept completely clean of any oil, grease or abrasive dust.
- (2) The electrically released brake is installed horizontally.
- (3) All interventions have to be made by qualified personal.



10) LOAD TIRE

The load tires are mounted on the leg of the machine to enable it to drive smoothly. When operating the machine, make sure that the bearings are operated properly and the load tires are maintained good condition at any time. Inspect excessive worn out or debris around the load tires.

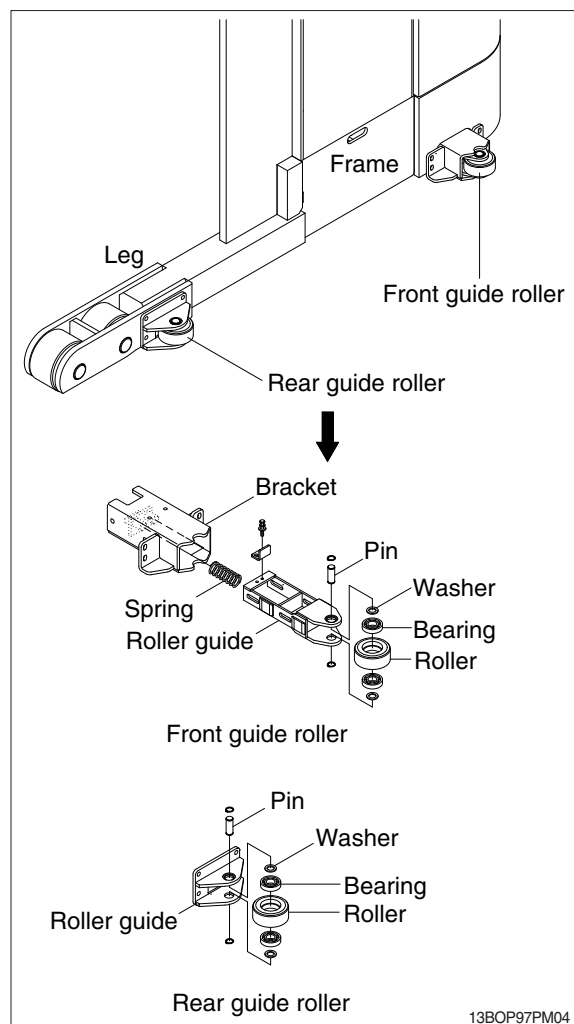
※ Particularly, be sure whether the ball bearings are bounded or excessive play.



11) GUIDE ROLLER

The guide rollers are mounted on the leg and the frame respectively. When operating the machine, make sure that the bearings and springs are operated properly and guide rollers are maintained good condition. Inspect excessive worn out or debris around the guide rollers.

※ Particularly, be sure whether the ball bearings are bounded or excessive play.



12) 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.

13) LIFT CHAIN INSPECTION AND MEASUREMENT

Inspect and lubricate the lift chains every PM (50~250 hours). When operating in corrosive environments, inspect the chains every 50 hours. During the inspection, check for the following conditions:

- (1) Rust and corrosion, cracked plates, raised or turned pins, tight joints, wear and worn pins or holes.
- (2) 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.
- (3) 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.

14) LIFT CHAIN LUBRICATION

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

※ It is important that all lift chain and pivots are kept in a clean condition all the times. Never clean with chains steam jet, high pressure cleaners, or chemical cleaning agents.

15) LIFT CHAIN WEAR AND REPLACEMENT CRITERIA

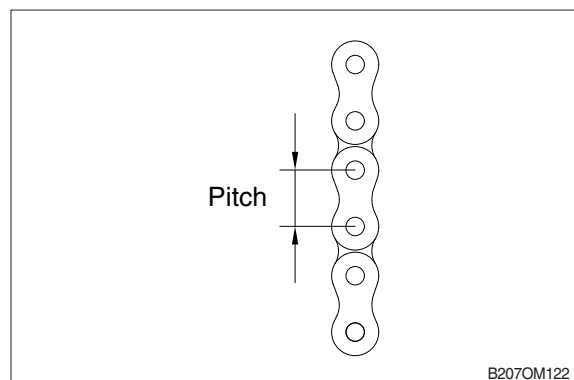
All chains must be replaced if any link has wear of 3% or more, or if any of the damaged conditions noted above are found during inspection. Order replacement chains from your HYUNDAI dealer. Replace all chains as a set. Do not remove factory lubrication or paint new chains. Replace anchor pins and worn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

anchors when installing new chains. Adjust tension on new chains. Lubricate chains when they are installed on the mast.

※ In case that the truck is fitted with two lift chains, it should be placed the both chains with new genuine parts at the same time.

It is the only way to ensure load distribution over two chains.

※ Please refer to your Service Manual for additional information on lift chain measurement and maintenance.



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10. 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 and maintenance problems. Check for loose fasteners and fittings.
- Check to be sure all capacity, safety, and warning plates or decals are attached and legible.

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

- Inspect the truck for any sign of external leakage: fluid of the drive unit
- 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, platform and safety devices are in place, undamaged and attached securely.

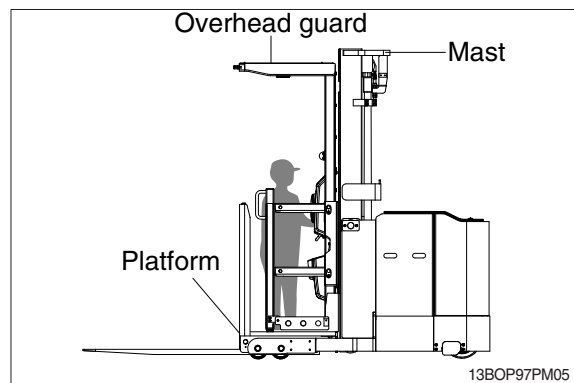
Then check all of the critical components that handle or carry the load.

1) OVERHEAD GUARD

Check the overhead guard for damage. Be sure that it is properly positioned and all mounting fasteners are in place and tight.

⚠ The major purpose for installation of the overhead guard on the machine takes an operator under his protection from the falling objects which can be caused by unexpected accident such as severe personal injury or death.

Therefore, always be sure that it is maintained good condition to protect the operator without defects.



2) PLATFORM

Check platform for damage. Inspect the welds and cracks on the platform.

Be sure that the mounting fasteners are all in place and tight.

3) MAST ASSEMBLY

Inspect the mast assembly : Rails, lift chains and lift cylinders. Look for obvious wear and maintenance problems and damaged or missing parts. Check for any loose parts or fittings. Check for leaks, any damaged or loose rollers and rail wear(metal flaking). Inspect all lift line hydraulic connections for leaks.

4) LIFT CHAIN

Carefully check the lift chains for wear, rust, corrosion, cracked or broken links, etc.. Check that the lift chains are adjusted to have equal tension. Check that the lift chain anchor fasteners and locking means are in place and tight.

△ **Masts and lift chains require special attention to maintain them in safe operating condition.**

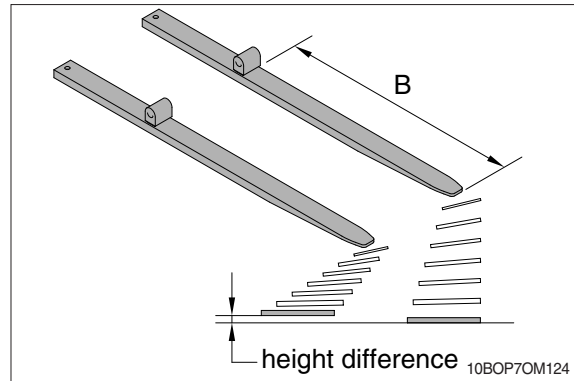
- **Mast can drop suddenly. Look at the mast, but keep hands out.**
- **Lift chain repairs and adjustments should be made by trained service personnel.**

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.

Fork length (mm)	Height difference (mm)
$B \leq 1500$	3
$B > 1500$	4

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



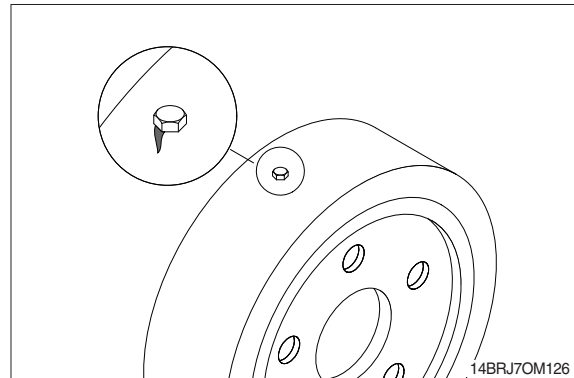
6) WHEELS AND TIRES

Check the condition of the drive, load tire and guide rollers. Remove objects that are embedded in the tread. Inspect the tires for excessive wear and breaks or chunking out.

Check all wheel nuts or bolts to be sure none of them is loose or missing. Replace missing bolts or nuts. Torque loose or replace items to specifications.

※ The condition of wheels and tires affects the stability and performance of the truck.

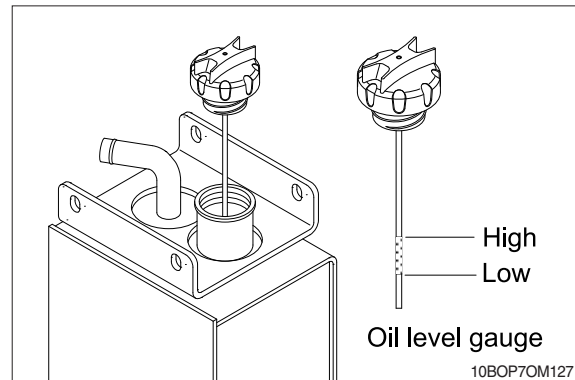
When replacing the wheels and tires which has defects, it should be replaced with genuine parts.



11. CHECKING THE HYDRAULIC FLUID

Check the hydraulic tank oil level. Correct fluid level is important for proper system operation. Low fluid level can cause pump damage.

Hydraulic fluid expands as its temperature rises. Therefore, it is preferable to check the fluid level at operating temperature (after approximately 30 minutes of truck operation). To check the fluid level, first park the truck on a level surface.



Put the mast upright in a vertical position and lower the fork and platform fully down. Check the oil level. Keep the oil level above the LOW mark by refilling recommended hydraulic fluid only, as required . **Do not overfill.**

Check the condition of the hydraulic fluid (age, color or clarity, contamination). Change (replace) the oil as necessary.

12. CRITICAL FASTENER CHECKS

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

Check critical items, including :

- Platform
- Overhead guard
- Mast mounting & components

Refer to 「8. SPECIFICATIONS」 for critical tightening torque value.

13. AIR CLEANING THE TRUCK

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. A clean condition helps prevent fires and helps the truck run cooler.

▲ Lift trucks should be air cleaned at every PM interval and more often if needed.

Use an air hose with special adapter or extension having a control valve and a nozzle to direct the air properly. Use clean, dry, low pressure, compressed air. Restrict air pressure to 30 psi (207 kPa), maximum. (OSHA requirement.)

▲ Wear suitable eye protection and protective clothing.

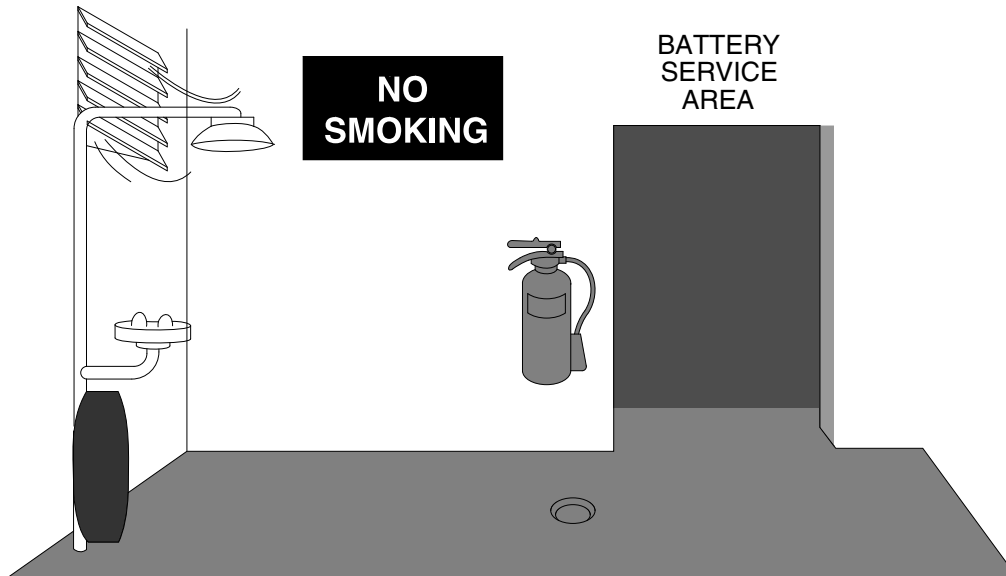
Air clean : mast assembly; drive unit; battery; cables; switches and wiring harness; drive and pump motors; and drive tire, load tire, guide roller, suspension, linkage.

▲ When cleaning the machine, it should not be used inflammable liquids to clean it.

Prior to cleaning the machine, it must be taken all safety measures to prevent it from the spark etc due to short circuit.

Especially, in the event of cleaning the electrical components, it had better use compressed air or non-conductive antistatic brushes in order that it can avoid from short circuit or unexpected accident.

14. ELECTRIC TRUCK BATTERY MAINTENANCE



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Battery charging installations must be located in areas designated for that purpose. These areas must be kept free of all non-essential combustible materials.

Facilities must be provided for :

- Flushing spilled electrolyte.
- Fire protection.
- Protecting charging apparatus from damage by trucks.
- Adequate ventilation for dispersal of fumes from gassing batteries.

When handling acid concentrates greater than 50 percent acid (above 1,400 specific gravity), an eye wash fountain must be provided.

A conveyor, overhead hoist or equivalent material handling equipment must be provided for handling batteries.

⚠ Electric truck batteries are heavy and awkward to handle. They are filled with a very hazardous chemical solution. On charge, they give off hydrogen and oxygen which, in certain concentrations, are explosive. And they are costly. Before you remove, service or install a truck battery, carefully read the following recommendations and instructions.

15. BATTERY HANDLING

- 1) Change (remove) or service storage batteries only in an area designated for this purpose.
- 2) Be sure this area has provisions to flush and neutralize spillage, to ventilate fumes from gassing batteries and for fire protection.

Battery contains sulfuric acid (H_2SO_4) which is toxic and corrosive solution.

Therefore, when handling the battery, wear protective clothing and safety goggles.

Do not smoke and avoid naked flames when handling the battery.

Avoid coming into contact with the battery acid. If battery acid accidentally comes into contact with cloth, skin or eyes, wash the affected parts of the body thoroughly with clean water and seek medical attention.

Battery acid spillage must be neutralized immediately.

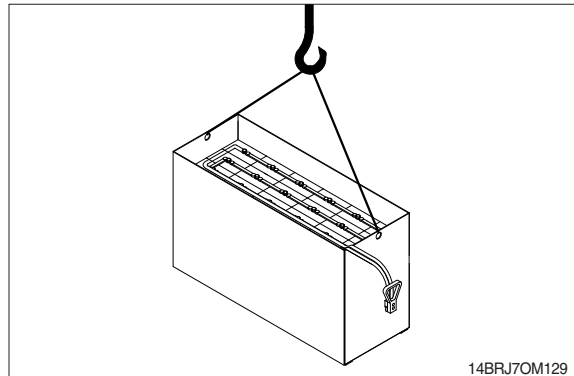
- 3) This area should be equipped with material-handling tools designed for removing and replacing batteries, including a conveyor or overhead hoist. Use lift hooks that have safety latches.
- 4) Always use a special lifting device such as an insulated spreader bar to attach the hoist to the battery. The width of the spreader bar hooks must be the same as the lifting eyes of the battery, to prevent damage to the battery. If the spreader bar hooks are movable, carefully adjust the position (width) of the hooks so that the pull is directly upward (vertical) and no side load or force (pressure) is exerted on the battery case. Be sure the lift hooks are the correct size to fit the lifting eyes of the battery.

- 5) If the battery does not have a cover of its own or has exposed terminals and connectors, cover the top with a non-conductive (insulating) material, e.g., a sheet of plywood or heavy cardboard, prior to attaching the lifting device.

When handling the battery, use 2 or 4 wires with hook to retain balance of weight.

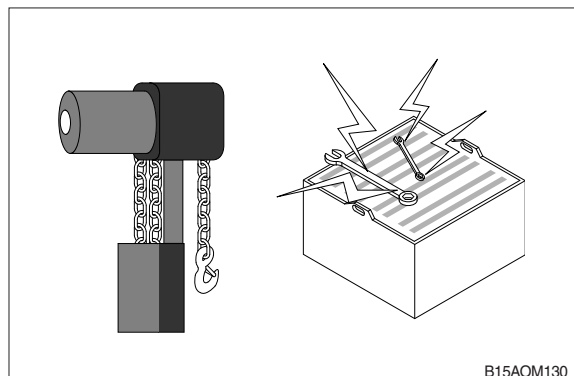
It can be prevented from shaking of the battery.

Take care of handling the battery so that it can not happened shock or damage.



⚠ When handling the battery, only it should be used appropriate lifting appliances such as lifting eyes, spread bar hooks, etc which have sufficient capacity for handling of the battery weight.

- 6) Chain hoists or power battery hoists must be equipped with load chain containers to accumulate the excess lifting chain.
- 7) Keep all tools and other metallic objects away from the terminals.



16. BATTERY CHARGING

The charger is of the automatic type so that only requirement for charging is to insert the plug, there being no need for maintaining watch.

Before starting to charge the battery, inspect all cable joints and connections for visible damage.

Do not place any metallic objects on the battery.

The cell screw caps on the battery must be kept dry and clean.

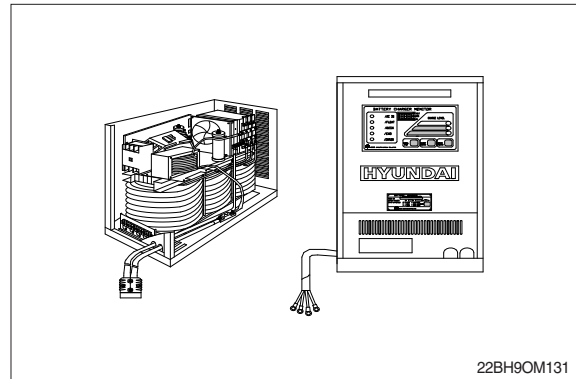
There must be no flammable substances or spark-generating materials around truck parking for the purpose of battery charging.

The area in which the battery is charged must be well-ventilated and have appropriate fire-protection equipment. Battery being charged not only heat but also inflammable hydrogen gas is produced.

Keep fire away.

※ **Make sure that the charger cables must be connected to ensure a good contact and take care that the polarity is correct.**

If it is not correct, battery, vehicle or charger could be damaged.



1) INSTRUCTION

- (1) When inserting the plug and connecting the battery connector, the input power lamp and the battery connection lamp light on and charge is started after a few seconds.

The power is automatically cut off after completion of charge.

(2) Functions

The function of indication lamps and switches.

- | | |
|----------------------------------|---|
| ① Input power lamp | : Only lighting on during charge. Check the plug and input power if the lamp does not light on. |
| ② Battery connection lamp | : Lighting on when the charger and the battery are connected. Check the connector if the lamp does not light on. |
| ③ 75% charge lamp | : Lighting on from 75% charge to completion. |
| ④ Full charge lamp | : Lighting on when charging is completed. |
| ⑤ Input disconnect lamp | : Lighting on when the input supply line is disconnected. At this time, check the input power. |
| ⑥ Over voltage lamp | : Lighting on when the manual stop button is pushed or charger voltage is above 66. At this time, unplug and disconnect the battery and charger connectors. |
| ⑦ Over current lamp | : Lighting on when the current is overload. At this time, unplug, open charger door and push the thermal relay button on the electromagnetic switch plug again after about 5 minutes and if this lamp lights on again stop charging and call A/S. |

- ⑧ **Ordinary/Equalizing charge convert switch** : Place the switch to left side for ordinary charge and to right side for equalizing charge.
- ⑨ **Manual stop button** : During charge, push this button to stop charging.
- ⑩ **Reversion button** : After stop charging artificially or push the manual stop button, use this button to revert to charging.
- ⑪ **Voltage/current confirming button** : The indicator always show battery voltage and when push this button, the current is displayed in the indicator.

2) INSTALLATION OF THE CHARGER

(1) Place for installation

Install the charger at a place with good ventilation, no excessive temperature, low humidity and little dust.

- (2) For the primary of the transformer, use the taps corresponding to the power voltage difference. For example, 218V (measured value)-220V (primary).
- (3) Confirm the earth line of charging cable wire and make sure the earth line connects the earth of building.

3) ORDINARY CHARGE

(1) The procedure for charging is as follows:

- ① Remove the key of vehicle.
- ② Confirm the convert switch at ordinary charge position.
- ③ Connect the battery connector and the charging connector.
- ④ Make sure the pilot lamp lights.

(2) The procedure after completion of charging is as follows:

- ① Ensure that the full charge lamp lights on.
- ② Disconnect the battery connector from the charge connector.

(3) The procedure for stopping charging halfway is as follows :

- ① Push the manual stop button.
- ② Disconnect the battery connector from the charge connector.

※ If you have been asked to charge the battery on the machine, make sure whether battery acid level is correct or not and air can circulate freely before connecting the charger to the power source.

4) EQUALIZING CHARGE

- (1) Continual repetition of ordinary charge will create a certain amount of performance difference among the cells. For this reason, the battery is slightly overcharged from time to time to equalize the performance among the cells, that is, given equalizing charge.

Equalizing charge should be given in the following cases:

- ① A battery that is subject to daily repetition of charge and discharge. For the battery, equalizing charge should be performed once a month.
- ② When discharged over the designated capacity.
- ③ When recharge had been delayed after discharge.
- ④ When a short-circuit has occurred.

Equalizing charge is performed in the same way as in ordinary charge. However, place the ordinary/equalizing charge convert switch on the equalizing charge position.

※ Equalizing charges are used to safeguard the life of the battery and maintain its capacity.

△ Excessive equalizing charge may shorten the life of the battery.

5) SUPPLEMENTARY CHARGE

If one day operation cannot be completed with single charge, rest period should be utilized to charge and it is performed in almost the same way as ordinary charge.

6) NOTICES

- ① When installing the charger, confirm the input voltage and use the tops corresponding to the poser voltage in the area.
- ② Charge the battery immediately after use and once a month even in storage.
- ③ Take care not to let the battery specific gravity lower in winter time especially.
- ④ During charging, if electrolyte temperature of the battery in above 50°C stop charging.
- ⑤ During charging, as an inflammable gas is generated out of the battery, particular care should taken for fire and ventilation.

※ In case that batteries are taken out of service for a long period, they should be stored in the fully charged condition in a dry and frost-free room.

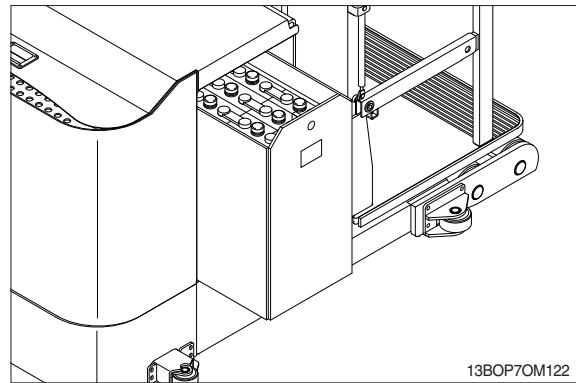
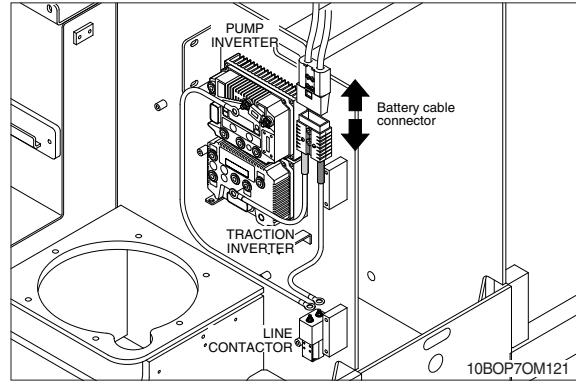
▲ When charging the battery, the surfaces of the battery cells should be uncovered during charging process in order that it can allow for adequate ventilation and do not place any metallic objects on the battery because it can cause to take a fire due to the electric spark. Furthermore, inspect all cable joints and plug connections for visible damage prior to starting to charge the battery all the times.

17. BATTERY INSTALLATION & REMOVAL FROM TRUCK

When the spare battery is used for continuous operation or it is required to check the battery, motor, etc., remove the battery through the following procedure:

1) BATTERY REMOVAL

- (1) Turn off the key.
 - (2) Release the lock screw of side support in frame.
 - (3) Disconnect the battery connectors.
Visually inspect connectors and cables.
Particularly, negative and positive cables should be visually inspected for breaks and damage.
 - (4) Pull out the battery and using a battery hanger, carefully raise the battery assembly.
 - (5) Check the battery housing for cracks and any spilled acid.
 - (6) Remove any oxidation residue for the battery terminals and apply an acid-free grease.
- ※ The truck must be horizontal to prevent from falling out when the battery is removed.



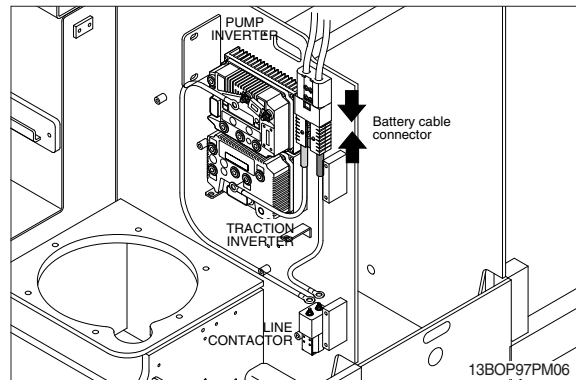
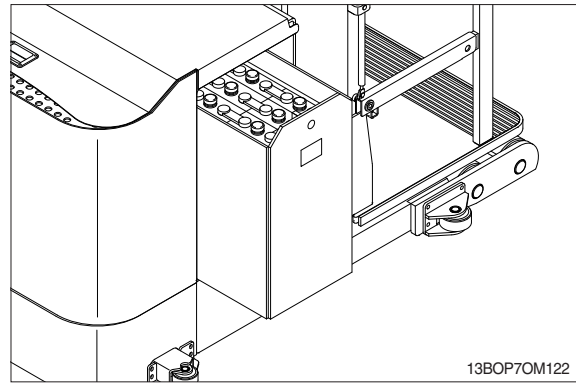
2) BATTERY INSTALLATION

- (1) Using a battery hanger, carefully put the battery assembly compartment push the battery assembly to the frame.
- (2) Adjust the lock screw of side support in frame.
- (3) Connect the battery connector.
- (4) Complete installation.

※ **Make certain that the battery is securely installed in the battery assembly compartment and the battery cover is properly closed.**

※ **It is very important that all cables and connectors of the battery should not be happened damage so that it may prevent the battery from unexpected problems.**

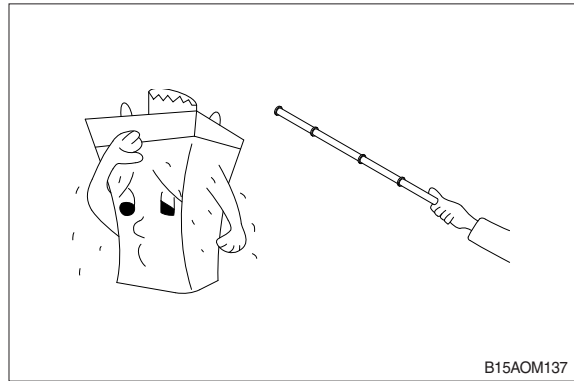
※ **It is necessary to be sure whether the battery cables and connectors are damaged or not prior to closing the battery cover all the times.**



18. BATTERY CLEANING AND CARE

1) AVOID OVER-DISCHARGE

If used until the vehicle can no longer run, battery life will be shortened. If the battery capacity indicator's red lamps turn on at on load lift, stop operation and charge the battery without delay.



2) INFLAMMABLE

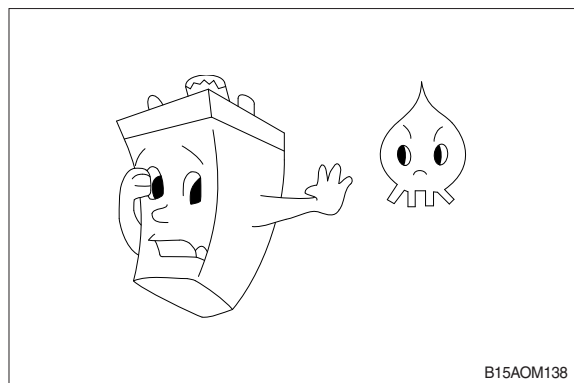
In any case, keep fire away from the battery because it contains an inflammable gas.

▲ Do not smoke and avoid naked flames around charging area of the battery or near battery.

When the truck is parked for charging of the battery, there should not be inflammable material or consumables to create sparks around truck.

It can cause to happen severe personal injury or death.

※ Fire protection equipment must be provided around the truck.



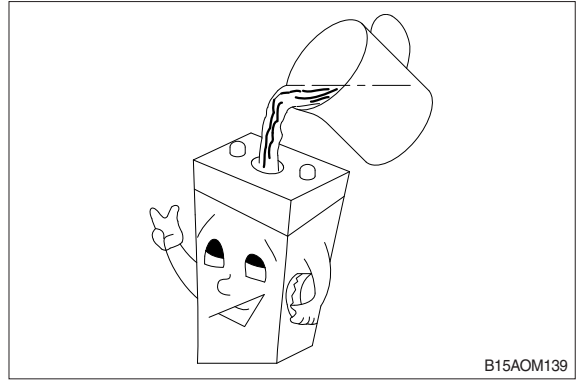
3) REFILLING DISTILLED WATER

Refill distilled water to maintain the electrolyte level to the specified height after finishing equalizing charge, because electrolyte is lost through decomposition during charge and also through natural evaporation. It is unnecessary to refill dilute sulfuric acid into the battery except the case of losing electrolyte by running over.

⚠ Bear in mind that an acid solution which is contained in the battery is very dangerous material on account of poisonous and corrosive solution.

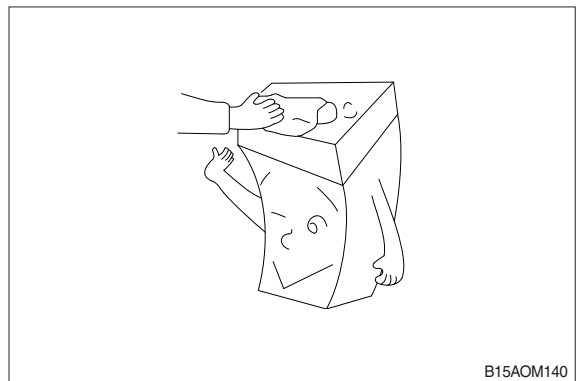
When refilling distilled water in the battery, always wear protective clothing and eye protection glass. Avoid contact with battery acid.

If skin or eyes come in contact with acid, the affected parts should be rinsed thoroughly with plenty of clean water and consult a doctor immediately.



4) KEEP THE BATTERY CLEAN

Keep the battery, in particular the upper surface, clean and dry and keep the filler plugs tightly screwed.



19. NEW MACHINE OILS

New machine uses following lubricants and oils.

Description	Specification
Gear oil	ZF TE-ML 17B/17H class lubricants
Hydraulic oil	ISO VG46, Hyundai genuine long life hydraulic oil
Grease	NLGI No.2

- API : American Petroleum Institute
- SAE : Society of Automotive Engineers
- ISO : International Organization for Standardization
- NLGI : National Lubricating Grease Institute

20. RECOMMENDED LUBRICANTS

Service point	Kind of fluid	Capacity ℓ (U.S. gal)	Ambient temperature °C (°F)										
			-50	-30	-20	-10	0	10	20	30	40		
			(-58)	(-22)	(-4)	(14)	(32)	(50)	(68)	(86)	(104)		
Drive unit	Gear oil	2.2 (0.58)											
Hydraulic oil tank	Hydraulic oil	28 (7.4)											
Fitting (Grease nipple)	Grease	0.1 (0.03)											

★ : Cold region
Russia, CIS, Mongolia