# CONTENTS

## 6. SPECIFICATIONS

# A MESSAGE TO HYUNDAI BATTERY TRACTOR OPERATORS

Battery tracktors are specialized machines with unique operating characteristics, designed to perform a specific job. Their function and operation is not like a car or ordinary truck. They required specific instructions and rules for safe operation and maintenance.

Safe operation of battery tractors is of primary importance to HYUNDAI.
Our experience with battery tractor accidents has shown that when accidents happen and people are killed or injured, the causes are:

- **Operator not properly trained**
- **Operator not experienced with battery tractor operation**
- **Basic safety rules not followed**
- **Battery tractor not maintained in safe operating condition**

For these reasons, HYUNDAI wants you to know about the safe operation and correct maintenance of your battery tractor.

This manual is designed to help you operate your battery tractor safely.
This manual shows and tells you about safety inspections and the important general safety rules and hazards of battery tractor operation. It describes the special components and features of the battery tractor and explains their function. The correct operating procedures are shown and explained. Illustrations and important safety messages are included for clear understanding. A section on maintenance and lubrication is included for the battery tractor mechanic.

The operator's manual is not a training manual. It is a guide to help trained and authorized operators safely operate their battery tractor by emphasizing and illustrating the correct procedures. However, it cannot cover every possible situation that may result in an accident. You must watch for hazards in your work areas and avoid or correct them. It is important that you know and understand the information in this manual and that you know and follow your company safety rules!
Be sure that your equipment is maintained in a safe condition. Do not operate a damaged or malfunctioning battery tractor. Practice safe operation every time you use your battery tractor. Let's join together to set high standards in safety.

Remember, before you start operating this battery tractor, be sure you understand all driving procedures. It is your responsibility, and it is important to you and your family, to operate your battery tractor safely and efficiently.

△ **Be aware that the Federal Occupational Safety and Health Act(OSHA) and state laws require that operators be completely trained in the safe operation of battery tractors; It is also an (OSHA) requirement that a machine inspection be performed before every shift. If you need training in operating or inspecting your battery tractor, ask your supervisor.**

HYUNDAI battery tractors are built to take hard work, but not abuse. They are built to be dependable, but they are only as safe and efficient as the operator and the persons responsible for maintaining them. Do not make any repairs to this battery tractor unless you have been trained in safe battery tractor repair procedures and are authorized by your employer.

This manual describes procedures for operation, handling, lubrication, maintenance, checking and adjustment. It will help the operator realize peak performance through effective, economical and safe machine operation.

# INTRODUCTION

HYUNDAI welcomes you to the growing group of professionals who own, operate and maintain HYUNDAI battery tractors. We take pride in the long tradition of quality products and superior value the HYUNDAI name represents. This manual familiarizes you with safety, operating, and maintenance information about your new battery tractor. It has been specially prepared to help you use and maintain your HYUNDAI battery tractor in a safe and correct manner.

Your HYUNDAI battery tractor has been designed and built to be as safe and efficient as today's technology can make it. As manufactured, for some models, it meets all the applicable mandatory requirements of ANSI B56.1-1988 Safety Standard for Powered Industrial Trucks. Some trucks are also furnished with equipment to help you operate safely; for example, parking brake and horn are standard equipment.

Safe, productive operation of a battery tractor requires both skill and knowledge on the part of the operator. The operator must know, understand, and practice the safety rules and safe driving and load handling techniques described in this manual. To develop the skill required, the operator must become familiar with the construction and features of the battery tractor and how they function, the operator must understand its capabilities and limitations, and see that it is kept in a safe condition.

### Routine Servicing and Maintenance

Regular maintenance and care of your battery tractor is not only important for economy and utilization reasons; it is essential for your safety. A faulty battery tractor is a potential source of danger to the operator, and to other personnel working near it. As with all quality equipment, keep your battery tractor in good operating condition by following the recommended schedule of maintenance.

### Operator Daily Inspection - Safety and Operating Checks

A battery tractor should always be examined by the operator, before driving, to be sure it is safe to operate. The importance of this procedure is emphasized in this manual with a brief illustrated review and later with more detailed instructions. HYUNDAI dealers can supply copies of a helpful **Drivers Daily Checklist.** It is an OSHA requirement.

### Planned Maintenance

In addition to the daily operator inspection, HYUNDAI recommends that a planned maintenance and safety inspection program(PM) be performed by a trained and authorized mechanic on a regular basis. The PM will provide an opportunity to make a thorough inspection of the safety and operating condition of your battery tractor. Necessary adjustments and repairs can be done during the PM, which will increase the lift or components and reduce unscheduled downtime and increase safety. The PM can be scheduled to meet your particular application and battery tractor usage.

The procedures for a periodic planned maintenance program that covers inspections, operational checks, cleaning, lubrication, and minor adjustments are outlined in this manual. Your HYUNDAI dealer is prepared to help you with a Planned Maintenance Program by trained service personnel who know your battery tractor and can keep it operating safely and efficiently.

### Service Manual

In-depth service information for trained service personnel is found in Service Manual.

# HOW TO USE THIS MANUAL

This manual is a digest of essential information about the safe operation, the features and functions and explains how to maintain your battery tractor. This manual is organized into six major parts:

**Section 1. General Safety Rules**, reviews and illustrates accepted practices for safe operation of a battery tractor.

**Section 2. Know your tractor**, describes operating components, systems, controls, and other features of your truck and tells how they function.

**Section 3. Operating procedures**, discusses specific instructions on the safe, efficient operation of your battery tractor.

**Section 4. Battery and charger**, presents details on how to perform the charging and maintaining battery system.

**Section 5. Maintenance and inspection**, discusses specific instructions on maintenance and how to check out the battery tractor.

**Section 6. Specifications**, provides reference information and data on features, components, and tightening torque.

※The descriptions and specifications included in this manual were in effect at the time of printing. HYUNDAI reserves the right to make improvents and changes in specifications or design, without notice and without incurring obligation. Please check with your authorized HYUNDAI dealer for information on possible updates or revisions.

The examples, illustrations, and explanations in this manual should help you improve your skill and knowledge as a professional battery tractor operator and take full advantage of the capabilities and safety features of your new battery tractor.

The first section of the manual is devoted to a review, with illustrations and brief messages, of general safety rules and the major operating hazards you can encounter while operating a battery tractor. Next, you will find descriptions of the components of your specific battery tractor model and how the instruments, gauges, and controls operate. Then, you will find a discussion of safe and efficient operating procedures, followed by instructions on how to tow a disabled battery tractor. The later sections of the manual are devoted to maintenance and battery tractor specifications.

Take time to carefully read the **Know Your Tractor** section. By acquiring a good basic understanding of your battery tractor's features, and how they function, you are better prepared to operate it both efficiently and safely.

In **Planned Maintenance**, you will find essential information for correct servicing and periodic maintenance of your tractor, including charts with recommended maintenance intervals and component capacities. Carefully follow these instructions and procedures.

Each major section has its own table of contents, so that you can find the various topics more easily.

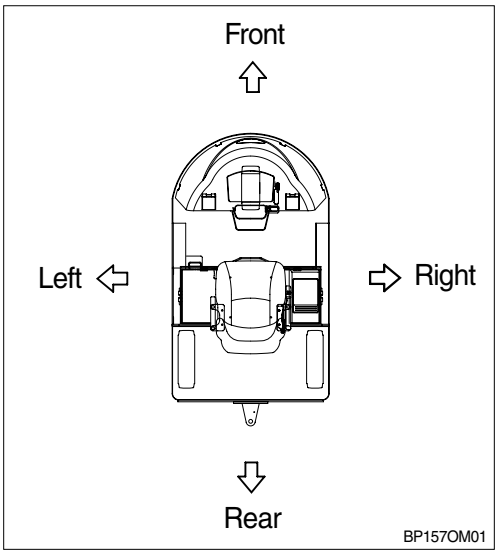
We urge you to first carefully read the manual from cover to cover. Take time to read and understand the information on general safety rules and operating hazards. Acquaint yourself with the various procedures in this manual. Understand how all gauges, indicator lights, and controls function. Please contact your authorized HYUNDAI dealer for the answers to any questions you may have about your battery tractor's features, operation, or manuals.

Operate your battery tractor safely; careful driving is your responsibility.
Drive defensively and think about the safety of people who are working nearby. Know your tractor's capabilities and limitations. Follow all instructions in this manual, including all symbols ( ⚠ △ ※ ) messages to avoid damage to your battery tractor or the possibility of any harm to yourself or others.

This manual is intended to be a permanently attached part of your battery tractor. Keep it on the tractor as a ready reference for anyone who may drive or service it. If the battery tractor you operate is not equipped with a manual, ask your supervisor to obtain one and have it attached to the tractor. And, remember, your HYUNDAI dealer is pleased to answer any questions about the operation and maintenance of your battery tractor and will provide you with additional information should you require it.

## 1. DIRECTION

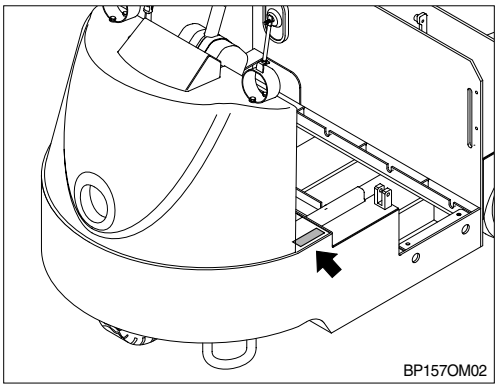
The direction of this machine indicate forward, backward, right and left when machine is in the travelling direction.




## 2. SERIAL NUMBER

Inform following when you order parts or the machine is out of order.

1) MACHINE SERIAL NUMBER
It's shown of the front-left side of the frame.




## 3. SYMBOLS

⚠ **Important safety hint.**

△ **It indicates matters which can cause the great loss on the machine or the surroundings.**

※ **It indicates the useful information for operator.**

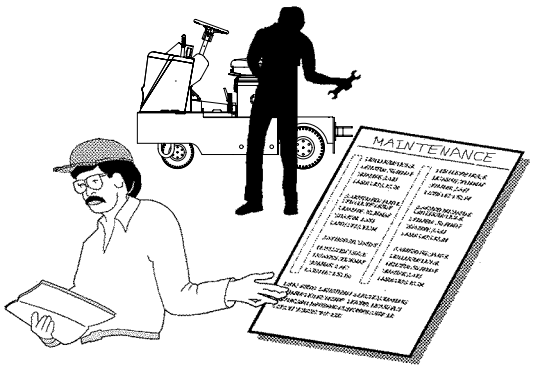
## 1. DAILY INSPECTION

At the beginning of each shift, inspect your battery tractor and fill out a check, maintenance and lubrication table.

Check for damage and maintenance problems.

Have repairs made before you operate the battery tractor.

Do not make repairs yourself. Battery tractor mechanics are trained professionals. They know how to make repairs safe.

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## 2. DO'S AND DON'TS


Do watch for pedestrians.


Do wear safety equipment when required.


Don't mix drugs or alcohol with your job.


Don't block safety or emergency equipment.

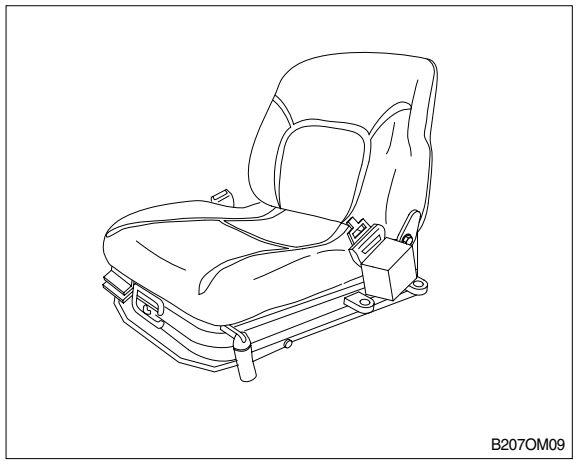

Don't smoke in NO SMOKING areas or when charging.


Don't operate the truck outdoors in rainy day.

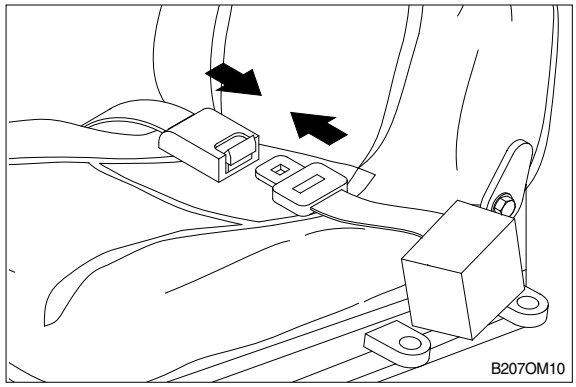

Don't perform battery charging service in the room without adequate ventilation.

## 3. SEAT BELTS

⚠ Always buckle up for the machine equipped with safety belt.

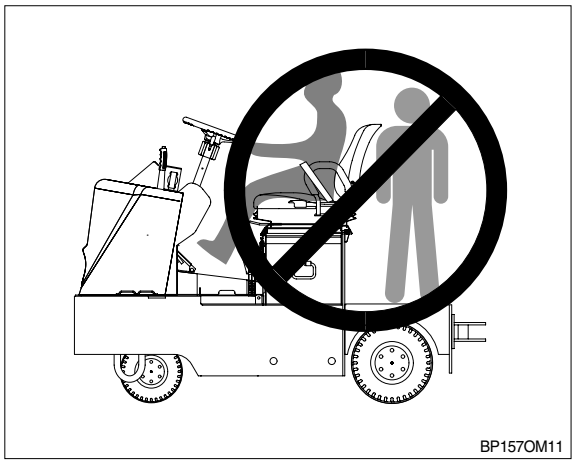



⚠ Seat belts can reduce injuries.



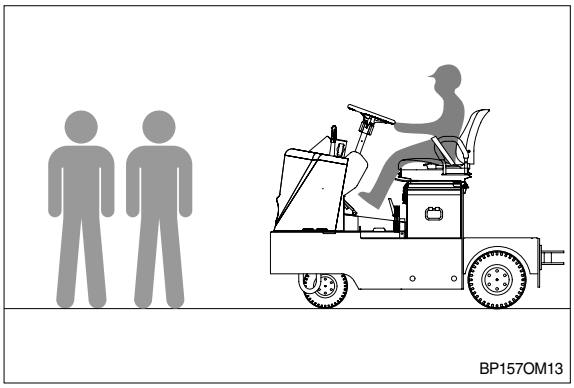
## 4. NO RIDERS

1) The operator is the only one who should be on a battery tractor.

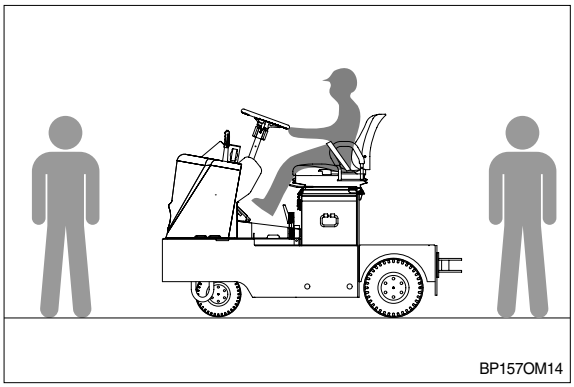


## 5. PEDESTRIANS

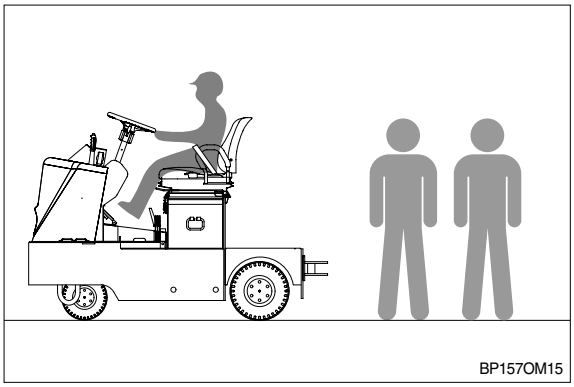
1) Watch where you are going. Look in the direction of travel. Pedestrians may use the same roadway you do. Sound your horn at all intersections or blind spots.




2) Watch for people in your work area even if your battery tractor has warning lights or alarms. People may not watch for you.



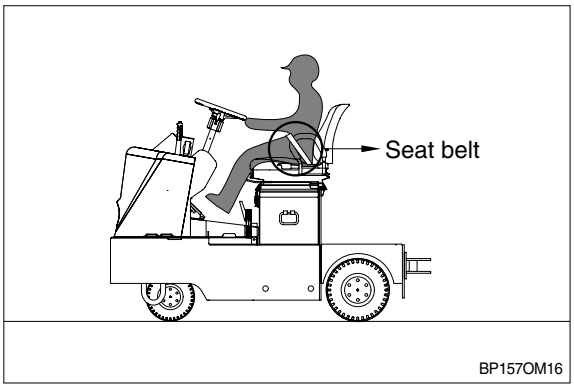

3) Make people stand back, even when you are parked.



## 6. OPERATOR PROTECTION

1) Always keep your body within the confines of the tractor.

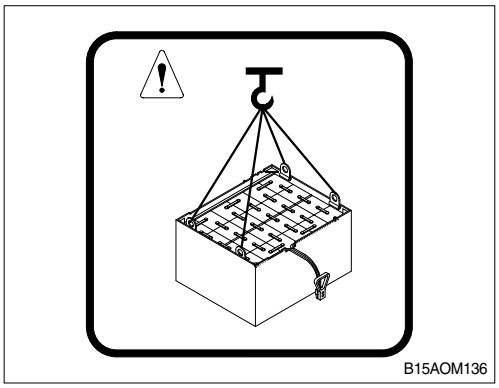
⚠ **Always buckle up for the machine equipped with safety belt.**



## 7. LOADING AND UNLOADING BY CRANE

1) Check the weight, length, width and height of the truck referring to the chapter 8, specifications when you are going to hoist the tractor.

⚠ **Before loading the tractor, battery must be removed. Refer to page 4-4 for a safe battery removal.**




2) Use long wire rope and stay to keep the distance with the tractor as it should avoid touching with the truck body.

3) Put a rubber plate where the wire rope contact with the tractor's body to prevent damage.

4) Place crane on the proper place.

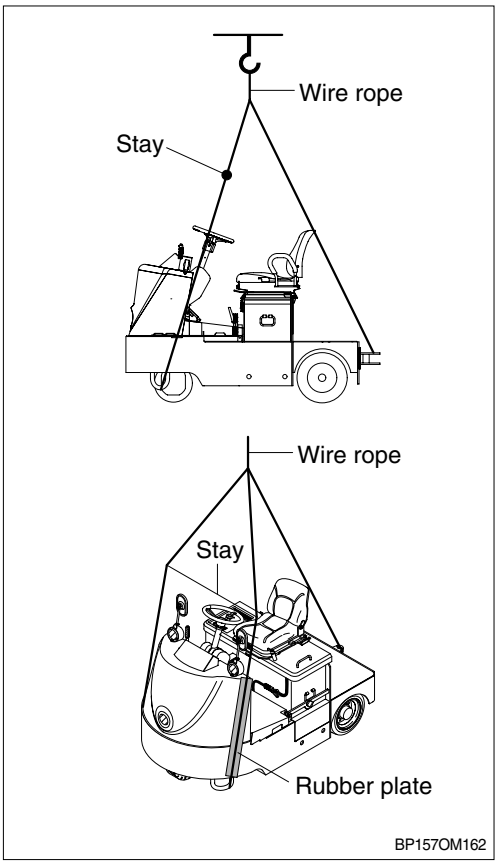
5) Install the wire rope and stay like the illustration.

⚠ **Make sure wire rope is proper size.**

⚠ **The wrong hoisting method or installation of wire rope can cause damage to driver and tractor.**

⚠ **Do not load abruptly.**

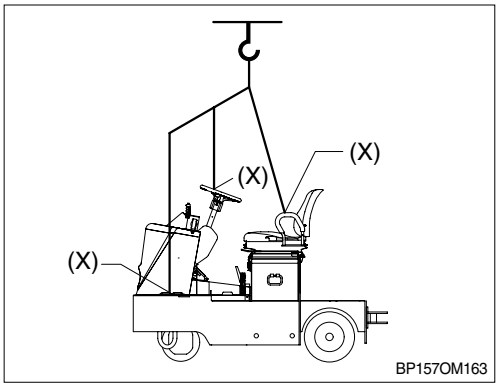
⚠ **Keep area clear of personnel.**




⚠ **Do not install the wire to unsafe position such as seat, steering wheel, front cover, etc.. It can cause a serious damage to driver and tractor.**

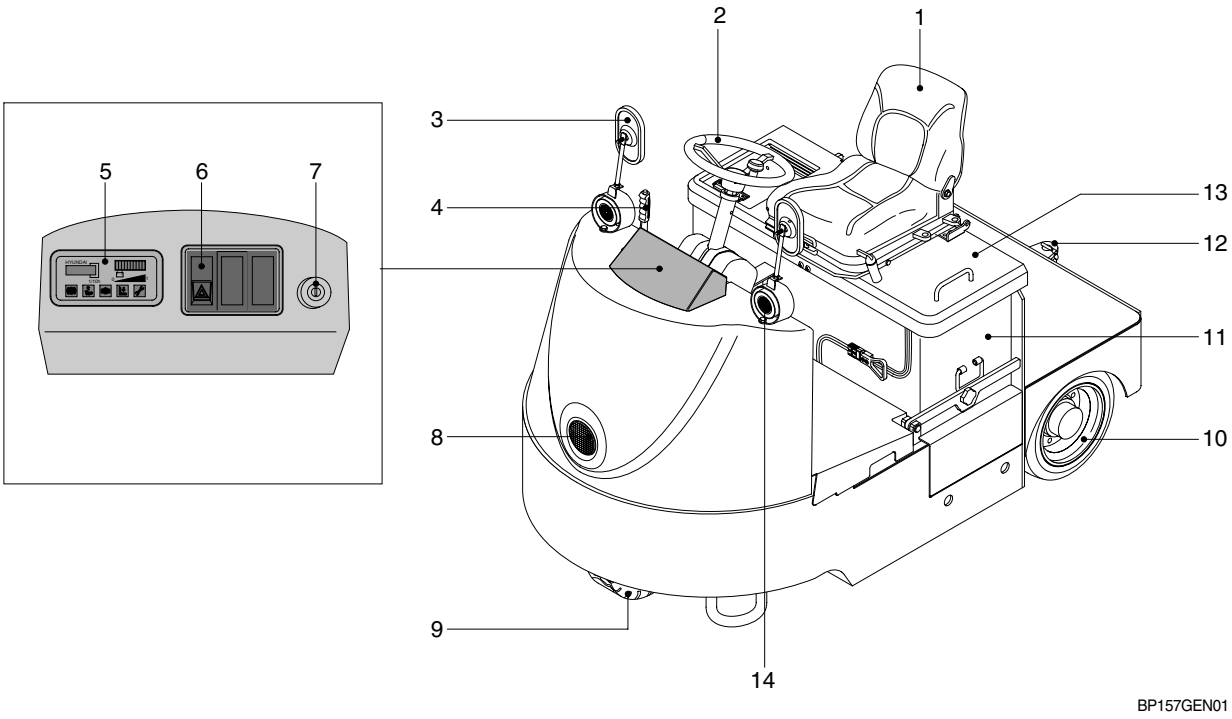
⚠ **If there is any problem to lift a tractor, please contact your dealer.**

⚠ **Perform the lifting service with skilled service man.**



## 1. GENERAL LOCATIONS

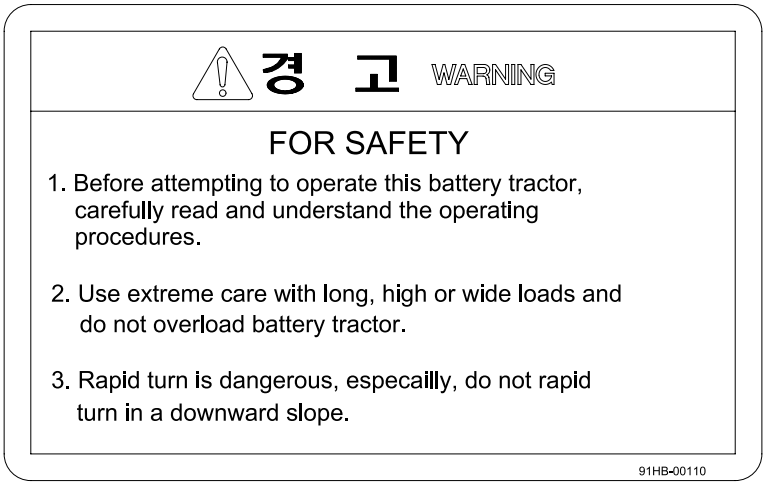
· LAYOUT




| | | | | | |
|---|---|---|---|---|---|
| 1 | Seat | 6 | Emergency switch | 11 | Battery |
| 2 | Steering wheel | 7 | Start switch | 12 | Hook |
| 3 | Rear view mirror | 8 | Head lamp | 13 | Battery cover |
| 4 | Parking brake lever | 9 | Front wheel | 14 | Flasher lamp |
| 5 | Monitor panel | 10 | Rear wheel | | |

# 2. SAFETY PLATES AND DECALS

## 1) SAFETY PLATE

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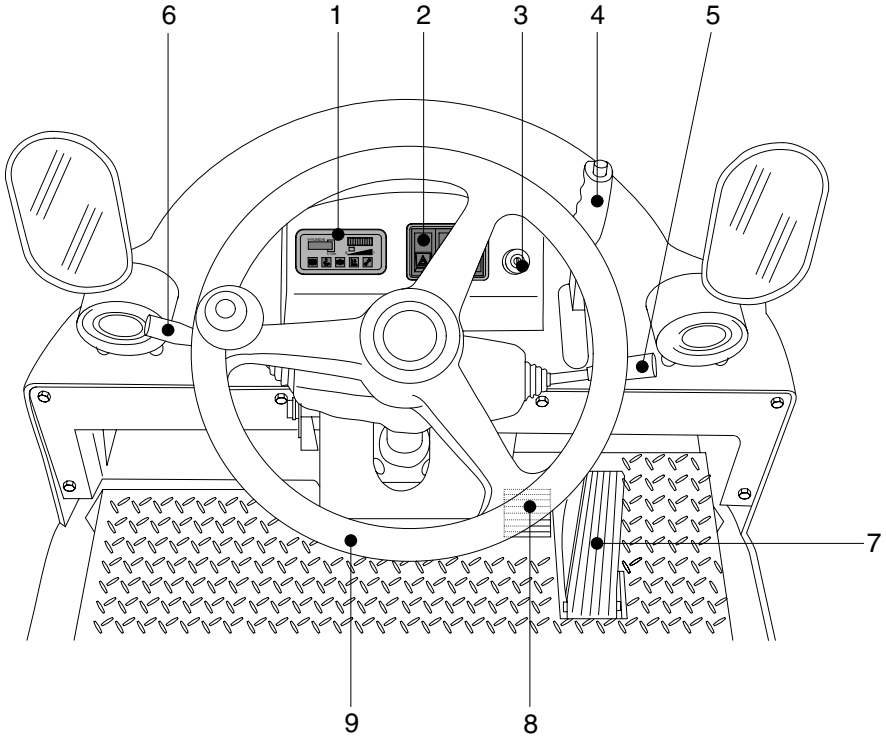
## 3. INSTRUMENTS AND CONTROLS

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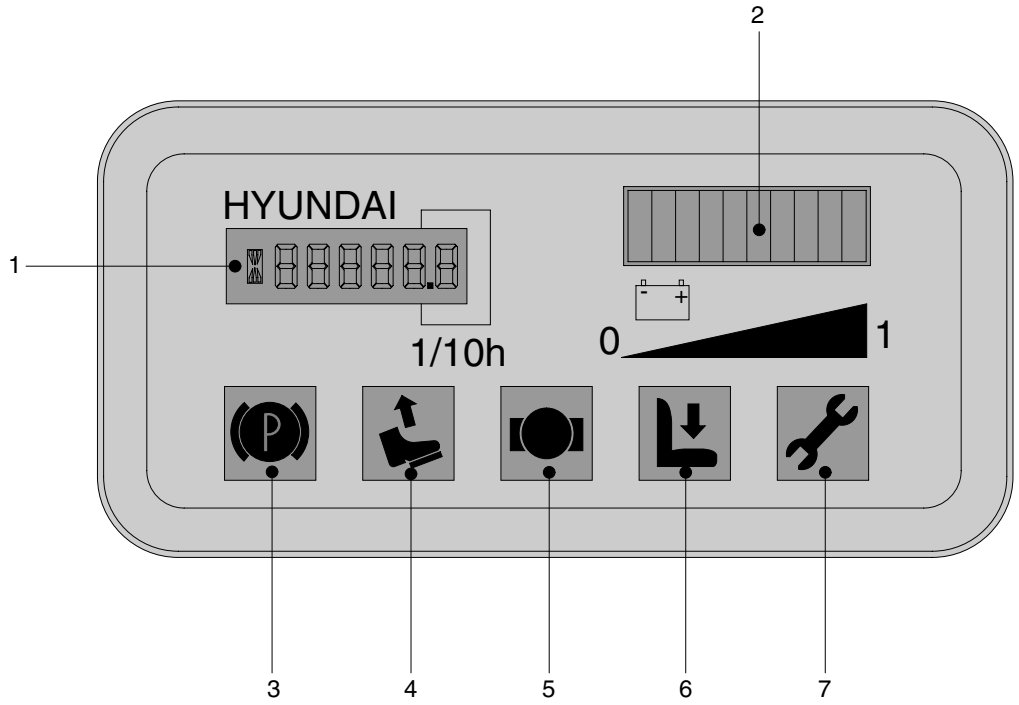
1 Monitor panel
2 Emergency switch
3 Start switch
4 Parking brake lever
5 Flasher, head lamp switch
6 Direction control lever
7 Accelerator pedal
8 Brake pedal
9 Steering wheel

※ Famaliarize yourself with the controls and follow safe operating procedures.

# 4. INSTRUMENT PANEL

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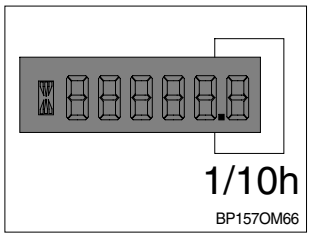
1 Hour meter
2 Battery discharge indicator
3 Parking brake indicator
4 Sequence fault warning lamp
5 Drive motor brush warning lamp
6 Seat switch indicator
7 Diagnostic/service warning lamp

## 5. INDICATOR SYMBOLS

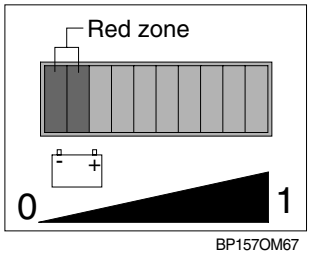
### 1) HOUR METER




(1) This indicates the length of total machine operation.
All service intervals for periodic maintenance are based on service meter readings.

※ **The last digit advances by "1" every six minutes where the starting switch is at the ON position.**

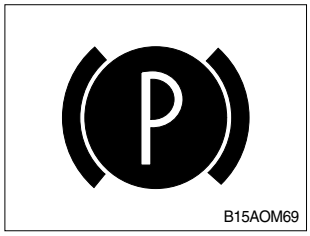
### 2) BATTERY DISCHARGE INDICATOR




(1) The state of battery discharge is indicated by 10 segments on the display. When fully charged, all 10 segments will be lit and when fully discharged, all 10 segments will be extinguished, with each 10% drop in capacity extinguishing 1 segment from the right.

(2) When the battery charge drops below an warning level(20%), warning lit segments will flash to warn the driver of this.

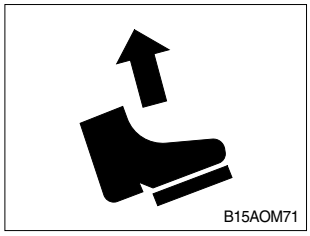
### 3) PARKING BRAKE INDICATOR




(1) This symbol appears if parking brake works.

⚠ **If appeared, you can drive neither forward nor reverse. This prevents abnormal operations, such as rapid battery consumption, overheat of driving motor and wear of brake.**

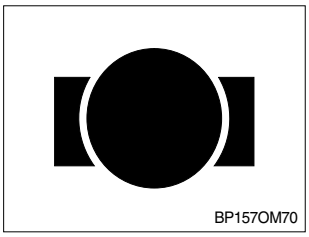
### 4) SEQUENCE FAULT WARNING LAMP




(1) This symbol appears if you don't follow the operating sequence of controller.

※ **To reset this fault, please put direction control lever at neutral position.**

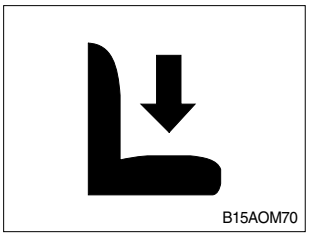
### 5) DRIVE MOTOR BRUSH WARNING LAMP




(1) This symbol appears when drive or pump motor brush is worn out.

※ **The brush has to be replaced with new one. Please contact HYUNDAI dealer for a service.**

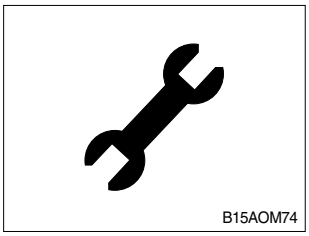
### 6) SEAT SWITCH INDICATOR




(1) This symbol appears if seat switch opens.

⚠ **If appeared, you can drive neither forward nor reverse. For a safe operation, please power up the machine with your body on the seat.**

### 7) DIAGNOSTIC/SERVICE WARNING LAMP

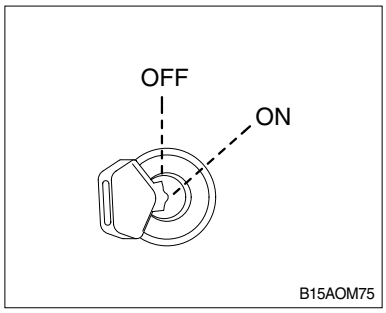



(1) This symbol appears if any failure in controller is detected or error in diagnostic procedure is detected.

※ **If this warning lamp blinks, please notify HYUNDAI dealer of the cycle of glimmering.**

## 6. OPERATING SWITCHES AND LEVERS

### 1) KEY SWITCH

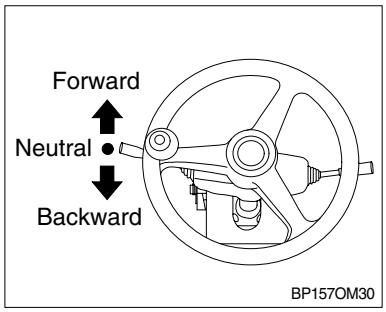



(1) Power is supplied to the control circuit through this switch, which is placed on OFF→ ON clockwise.

① OFF : The Key can be removed or inserted and power is turned off.

② ON : Both control circuits for hydraulics and running can be activated.

### 2) DIRECTIONAL CONTROL LEVER



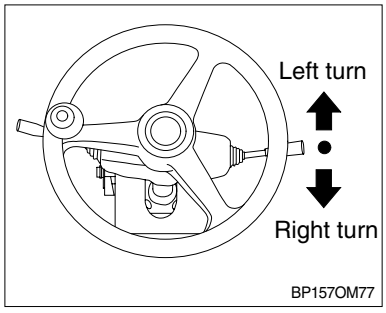

(1) This lever serves to make forward/backward directional changes. For the forward directions, place the lever on the FORWARD position.

(2) In the neutral, the running control circuits is turned off.

(3) For the backward direction, place the lever on the BACKWARD position.

(4) The electrical brake will be applied by shifting the lever to the opposite position of running direction.

### 3) FLASHER SWITCH

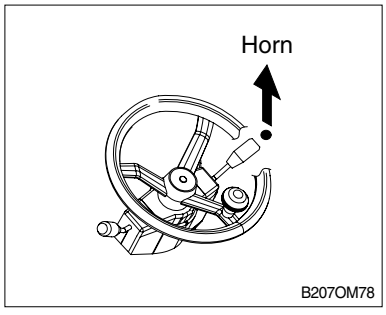



(1) When making a left or right turn, use this switch to flash the flash lamp to indicate which direction the vehicle is turning to.

(2) For a right turn, place the switch on the BACKWARD position.

(3) For a left turn, place the switch on the FORWARD position.

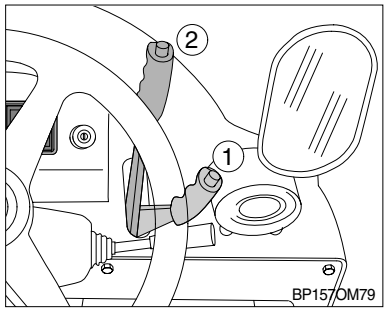
### 4) HORN SWITCH




(1) This horn switch is a upward lever type.

(2) The horn lever is reset automatically, if it is released.

### 5) PARKING BRAKE LEVER

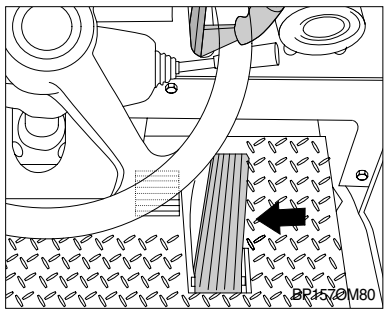



(1) **Position ①**
Parking brake is applied and front wheel is locked.

(2) **Position ②**
Parking brake is released.

※ **Before the tractor starts, confirm the parking brake is released position.**

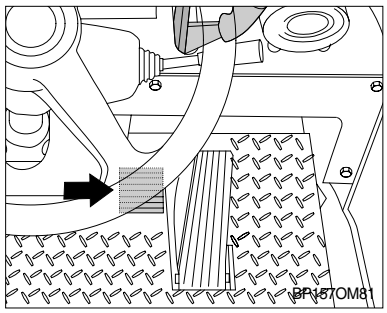
### 6) ACCELERATOR PEDAL




(1) This pedal is used to vary running speed, which depends upon how far the pedal is depressed.

(2) In running, the electrical brake will be smoothly applied by shifting the direction lever to the position opposite to the direction of vehicle advanced, and if the pedal is further depressed, the vehicle will run to the opposite direction after stopping once.

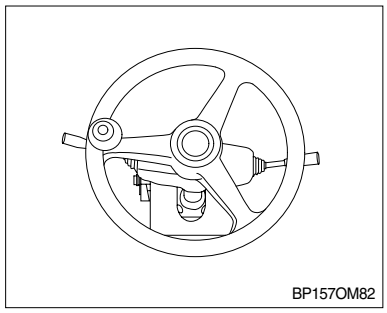
### 7) BRAKE PEDAL




(1) When this pedal is depressed, the vehicle is braked, while the braking lamps attached on the rear light.

⚠ **Special care should be required for the operation of the brake at loading.**

### 8) STEERING WHEEL



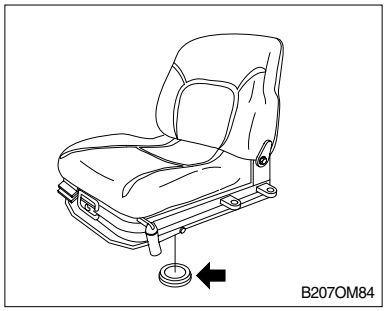

(1) The steering wheel of the vehicle is provided with the knob to allow steering with one hand.

(2) Perform the loading operation with the right hand and operate the steering wheel with the left hand.

(3) Adjustable steering column enables selection of the best driving position.

⚠ **Particular care should be taken for the rapid operation of the steering wheel.**

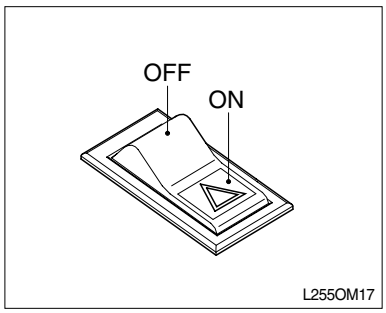
### 9) SEAT SWITCH




(1) This switch is closed automatically when an operator sits down on the seat.

⚠ **Before starting the tractor seat switch must be closed, otherwise, the tractor cannot be started.**

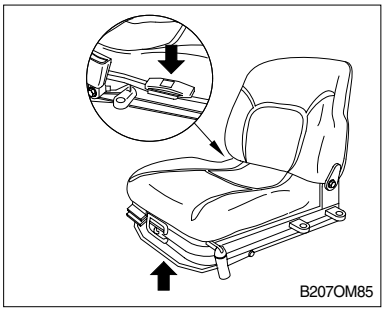
### 10) EMERGENCY SWITCH




(1) Use for parking or loading machine.

※ **If the switch is left ON for a long time, the battery may be discharged.**

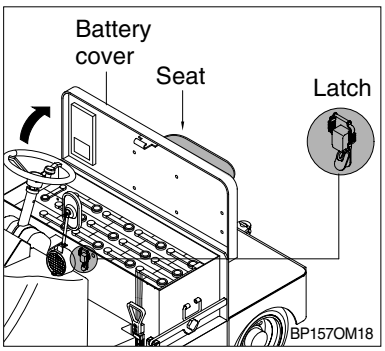
## 7. SEAT ADJUSTMENT




1) The seat adjustment lever is located on the front side under the seat. To unlock, pull the lever up and adjust the seat so that all controls may be comfortably reached. Then release the lever.

2) Be sure that the seat locking mechanism is engaged. The seat mounting base provides an 3 inch fore-and-aft adjustment of its slide.

## 8. BATTERY COMPARTMENT ACCESS



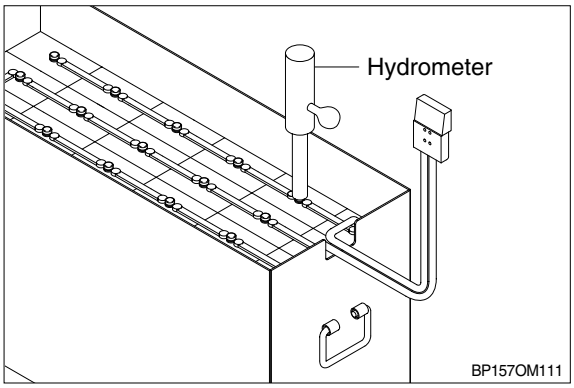

1) Pull the latch to release the cover.

2) You may tilt the steering column pylon forward before raising the cover.

3) The cover is held closed by weight of seat located on the battery cover.

## 1. CHECKS PRIOR TO OPERATION

### 1) CHECKS PRIOR TO OPERATION




(1) Inspection of battery make sure that the battery has been fully charged.
- Voltage : 48V
- Specific gravity of electrolyte
  : 1.28 (at 20°C)

Make sure that the electrolyte level is satisfactory.

Make sure that there is no loose connecting plug. For handling refer to "Instruction manual for battery".

(2) Check the tightness on bolts of drive/idle wheels.

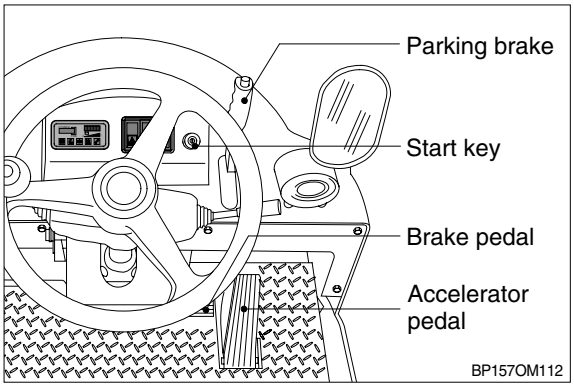
**(3) Check of brake**

Check the brake pedal for pedalling allowance, and the parking brake for braking efficiency.

**(4) Check of steering system**

Check that the steering wheel has no play.

### 2) OPERATION




**(1) Starting/Travelling/Stopping**

① With the direction control lever placed to the neutral position, make sure the parking brake is located at the operating position.

② With the accelerator pedal released insert the start key into the key switch.

③ When the start key turned to "ON" position, the drive control circuit of the F.E.T is connected.

④ Place the direction control lever to the "Forward" position, and release the parking brake lever, thereby the starting preparations are complete.

⑤ Step on the accelerator pedal slowly to start the battery tractor.

⑥ The travelling speed can be obtained optionally from almost zero-speed to the full-speed according to the degree of the pedal stepped on.

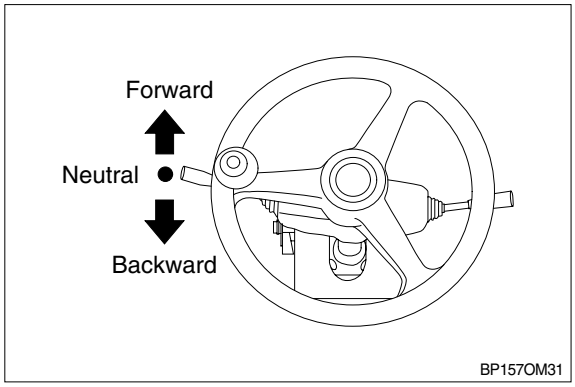
⑦ Even if the accelerator pedal is stepped on suddenly, the truck will start smoothly without applying any notable shock.

⑧ The fine movement and inching operations are also readily available, therefore, neither the resistor will be heated and burnt, nor the electric power be wasted as in the case with the battery tractor of resistance system even if the truck is operated for a long time.

⑨ When stopping the tractor, release the accelerator pedal, and step on the brake pedal at the same time to stop the tractor at the desired place.

⑩ In parking the tractor, turn the direction control lever to the neutral position.
Be sure to pull out the ignition key, and apply the parking brake before leaving the tractor.

### (2) Electric braking




① Turn the direction control lever to the direction opposite to the travelling one to apply the electric brake.

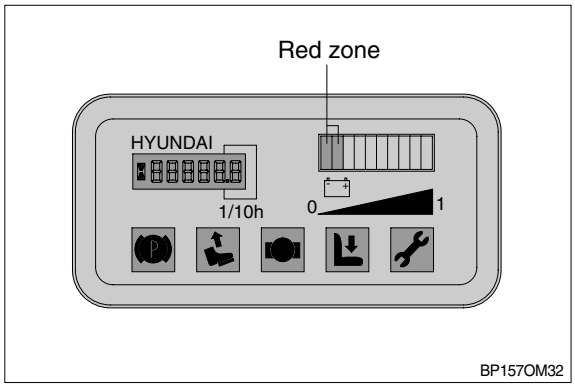
② The electric braking efficiency is varied by the degree of the accelerator pedal stepped on. Bear in mind that fully stepping on the accelerator pedal will cause the brake to apply suddenly.

③ When applying the electric brake while descending a downward slope, turn the direction control lever to the direction opposite to the travelling one at a place where the tractor arrives at the slope, and step on the accelerator pedal slightly to descend the slope, while adjusting the pedalling condition of the accelerator pedal.

④ If the accelerator pedal is stepped on further more continuously after stopping the tractor by the electric brake, the tractor will run in the opposite direction. This operation allows the tractor to turn quickly.

## 3) PRECAUTIONS ON OPERATION

### (1) Check of battery capacity




① If the level meter indicates the red zone during heavy load operations such as starting, full-load travelling, hill-climbing, even the battery needs not to be recharged, however, it incicates that the battery has been considerably discharged.

② If the level meter indicates the red zone during non-load operation as the battery is further discharged, recharge the battery immediately.

### (2) Precautions on operation

① If the tractor has become inoperative during travelling, turn the start key to the stop position, and restart the tractor by turning the start key to "ON" position.
If this procedure fails to travel the tractor, contact the service shop.

② Pay constant caution to the braking efficiency.

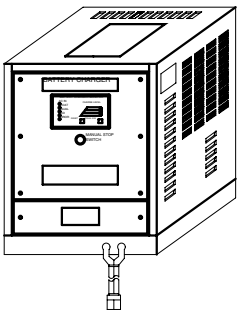
③ Also, pay caution to the vibration, change in weight, etc. of the steering wheel.

④ Care must be taken to the sound generated from the motor and the accelerator system.

⑤ Travelling the tractor continuously with some doubtful things uncorrected may result in a serious accident. When any doubtful thing is suspected, stop the operation immediately to examine the cause.

## 1. 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.



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### 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 electro-magnetic 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.

## 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.

△ **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℃ stop charging.
⑤ During charging, as an inflammable gas is generated out of the battery, particular care should taken for fire and ventilation.

## 2. BATTERY HANDLING

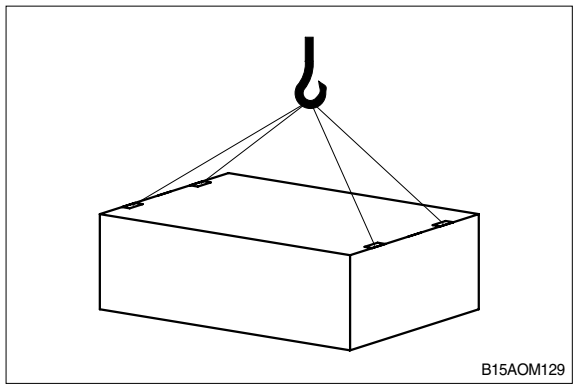
1) Change(remove) or service storage batteries only in an area designated for this purpose.

2) Be sure this area has provisions to flush and neutralize spillage, to ventilate fumes from gassing batteries and for fire protection.

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.

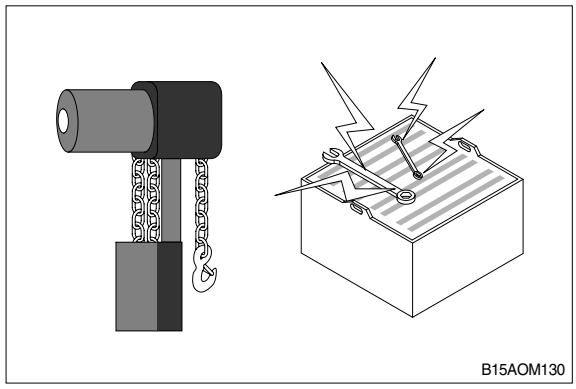
4) Always use a special lifting device such as an insulated spreader bar to attach the hoist to the battery. The width of the spreader bar hooks must be the same as the lifting eyes of the battery, to prevent damage to the battery. If the spreader bar hooks are movable, carefully adjust the position(width) 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.




6) Chain hoists or power battery hoists must be equipped with loadchain containers to accumulate the excess lifting chain.

7) Keep all tools and other metallic objects away from the terminals.




⚠ Open the battery cover when charging. Battery being charged, not only heat, but also inflammable hydrogen gas is produced. So keep fire away.

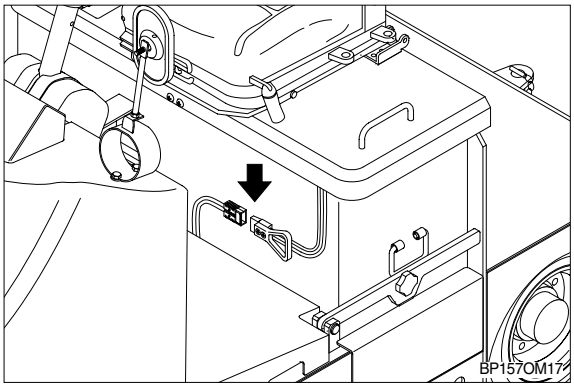
⚠ Hoisting the battery case, use 2 or 4 wires with hook and handle carefully, not to shock.

⚠ The electrolyte solution of battery is dilute sulfuric acid($H_2SO_4$). Be careful not to drop on clothes and mechanical parts.

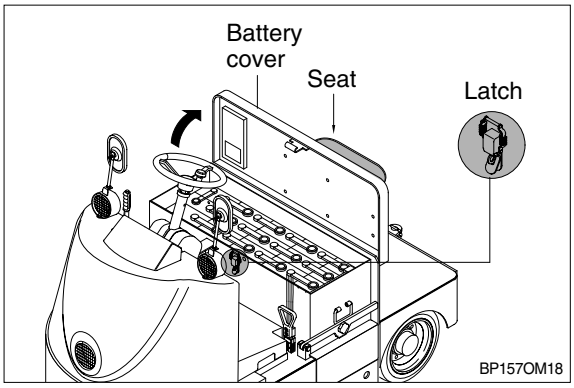
## 3. BATTERY REMOVAL FROM TRACTOR

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:

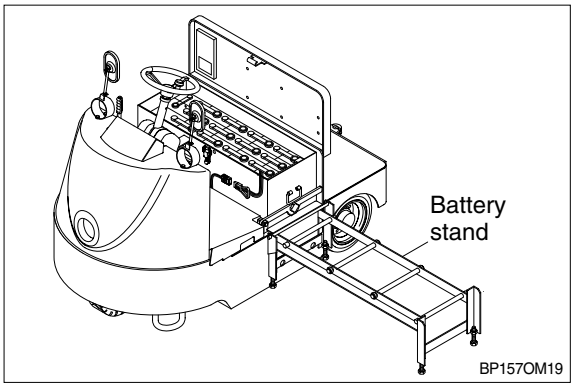
1) Disconnect the battery connector.




2) Open the battery cover.

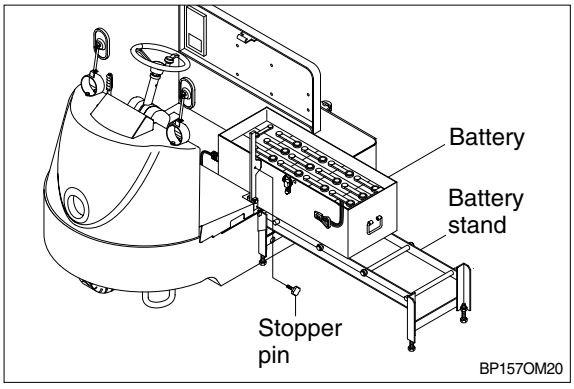



3) Put the battery checking stand to the battery stopper side.



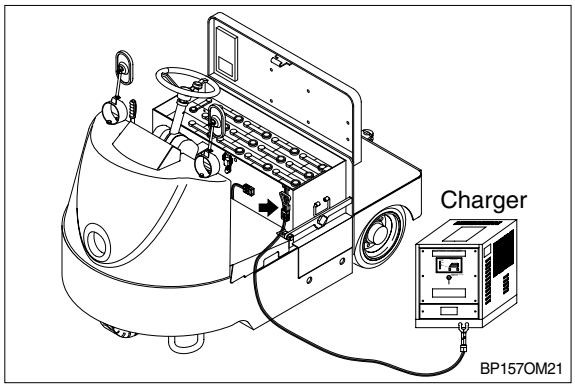

4) Disengage the stopper pin.

5) Adjust the height of the roller of the stand to that of the roller of the vehicle.

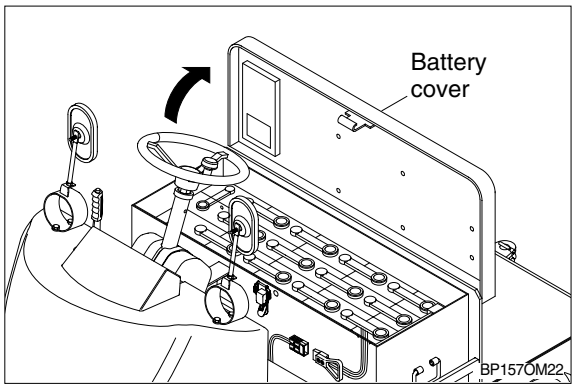


## 6) NOTICES

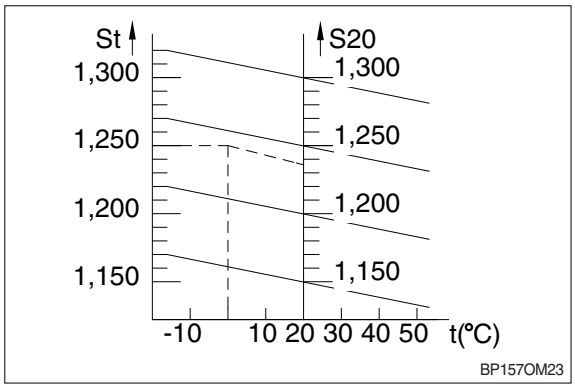
(1) Charge the battery through removing the battery connector and connecting the charging connector of the stationary charger to the battery connector.




(2) Be sure to open the battery cover during charging.

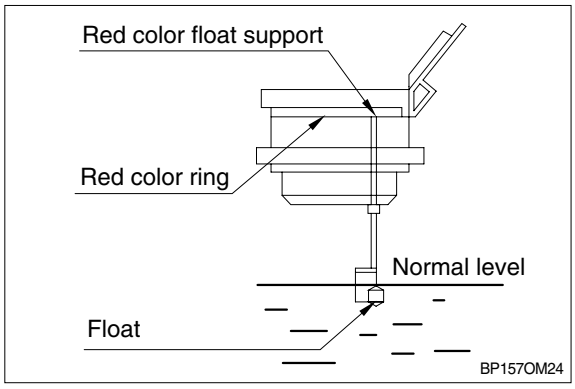



(3) Check specific gravity and electrolyte level once a week. Specific gravity at a temperature of 20°C is as follows :
At charged(completion of charge) : 1.280
At discharged(Charging required) : 1.17

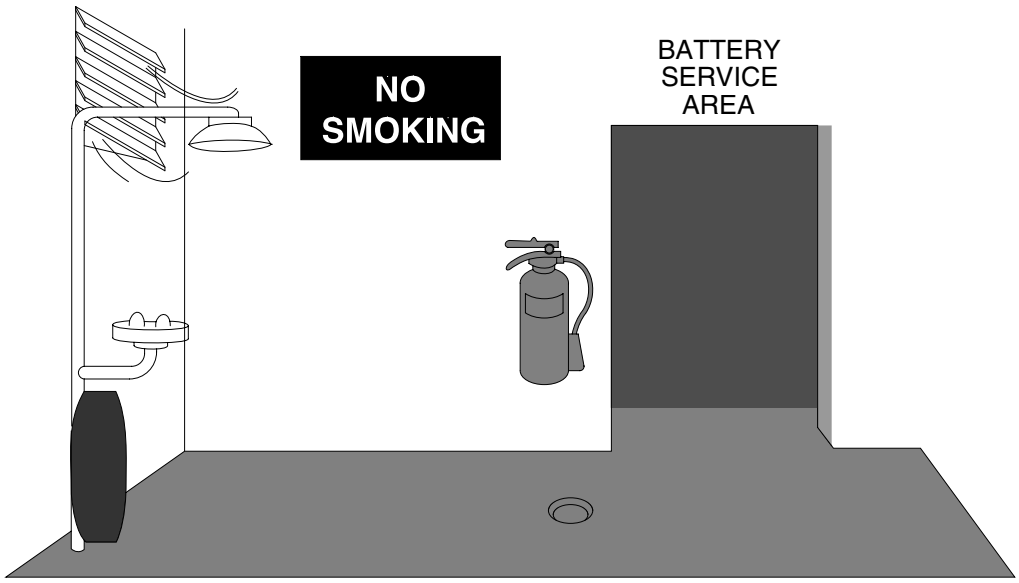



(4) Check electrolyte level, and if it is insufficient, refill distilled water to the specified level.

Distilled water should be refilled to get the red color ring the stopper or come the red color float support out.



## 4. ELECTRIC TRACTOR BATTERY MAINTENANCE

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Battery charging and 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 specifics gravity), an eye wash fountain must be provided.

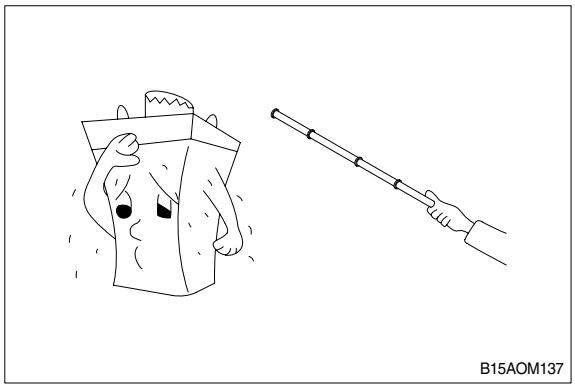
A conveyor, overhead hoist or equivalent material handling equipment must be provided for handling batteries.

**⚠ Electric tractor 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.**

## 5. BATTERY CLEANING AND CARE

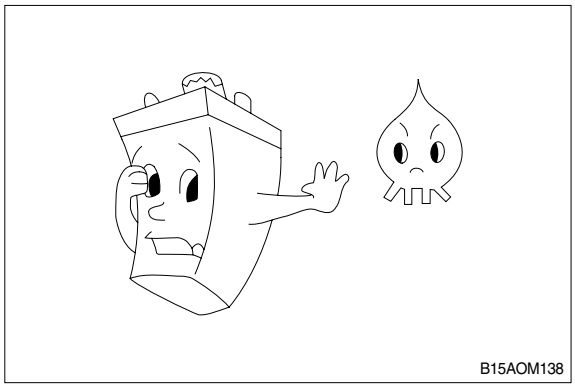
### 1) AVOID OVER-DISCHARGE

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



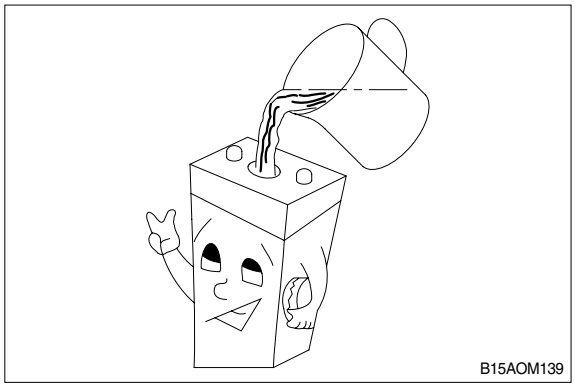

### 2) INFLAMMABLE

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



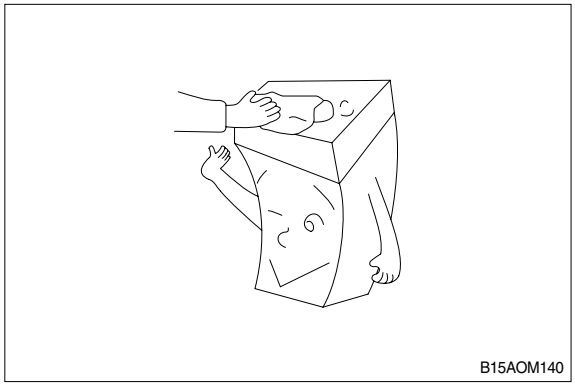

### 3) REFILLING DISTILLED WATER

Refill distilled water to maintain the electrolyte level to the specified height before starting 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.




### 4) KEEP THE BATTERY CLEAN

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



# 5. MAINTENANCE AND INSPECTION

## 1. BODY

### 1) DRIVE WHEELS

(1) Pay constant caution to see that the set bolts of the power axle are not loosened.
(2) Make sure that the wheel tightening nuts are not loosened.
When tightenting the nuts, be sure to tighten the nuts located at diagonal position scquentially so that they should not be tightened in deviant way.
(3) Make sure that there is no oil leakage from the drive gear case.
Also, check that the tightening bolts are not loosened.

### 2) REAR WHEELS

(1) Be sure to pay caution constantly so that the wheel tightening bolts are not loosened as in the case with the drive wheels.
(2) When reassembling the idle wheels after disassembling them for alignment, be sure to reassemble them just in the reverse of disassembling.

### 3) STEERING SYSTEM

(1) Since the steering system is particularly an essential part, be sure to check each part of the system for alignment, damage, deformation, etc., so that it can be always kept under the optimum condition.

### 4) BRAKE

(1) Check the brake pedal for "play" and pedalling allowance when it is stepped on, and looseness of each part, etc.
(2) If the tractor slides laterally when the brake is applied suddenly, the brake is applied unevenly.
In this case, adjust the brake so that it can be applied evenly.
(3) Check and adjust the gap between the parking brake lining and the drum, and the braking efficiency.
(4) Parking brake
Adjust the parking brake to such an extent that there still remains some pulling allowance when the brake lever is fully pulled. Make sure that the brake is held in a condition not to be applied at all when the lever is returned.

## 2. ELECTRICAL SYSTEM

### 1) MOTOR

(1) When the motor brush has been worn to approx. one half(16㎜) that of a new brush, replace it with a new one. At the same time, adjust the brush, as the spring pressure retaining the brush is changed with shortened brush. The recommended brush retaining pressure is 1.4kg±10% (0.35kg/cm$^2$). When the brush is replaced with a new one, be sure to fit it properly so that the entire surface of the brush makes proper contact with the commutator surface.
(2) Do not attempt to move the motor brush position from the current set position in any cases.
(3) Be sure to remove the dust deposit as far as applicable, as it may cause a spark and short-circuit, possible result in a failure.
(4) If the commutator surface is roughened and black, it might be in some trouble.
When the commutator has been worn to rough surface, make contact with service station, as the commutator surface needs to be ground for correction.
(5) When servicing the motor, be careful not to allow any oil to be adhered to the commutator surface. If it is adhered accidentally, wipe it off with a dry cotton cloth.

### 2) DIRECTION CONTROL LEVER

(1) Check the segment-to-finger contact condition.
If they have poor contact, the power application part may be heated, causing the segment to be roughened or consumed.
(2) Check the microswitch for operating point.
The microswitch is adjusted so that it is closed with turning on the main circuit segment and opened before the segment is turned off.
(3) Check each terminal for looseness.

### 3) ACCELERATOR

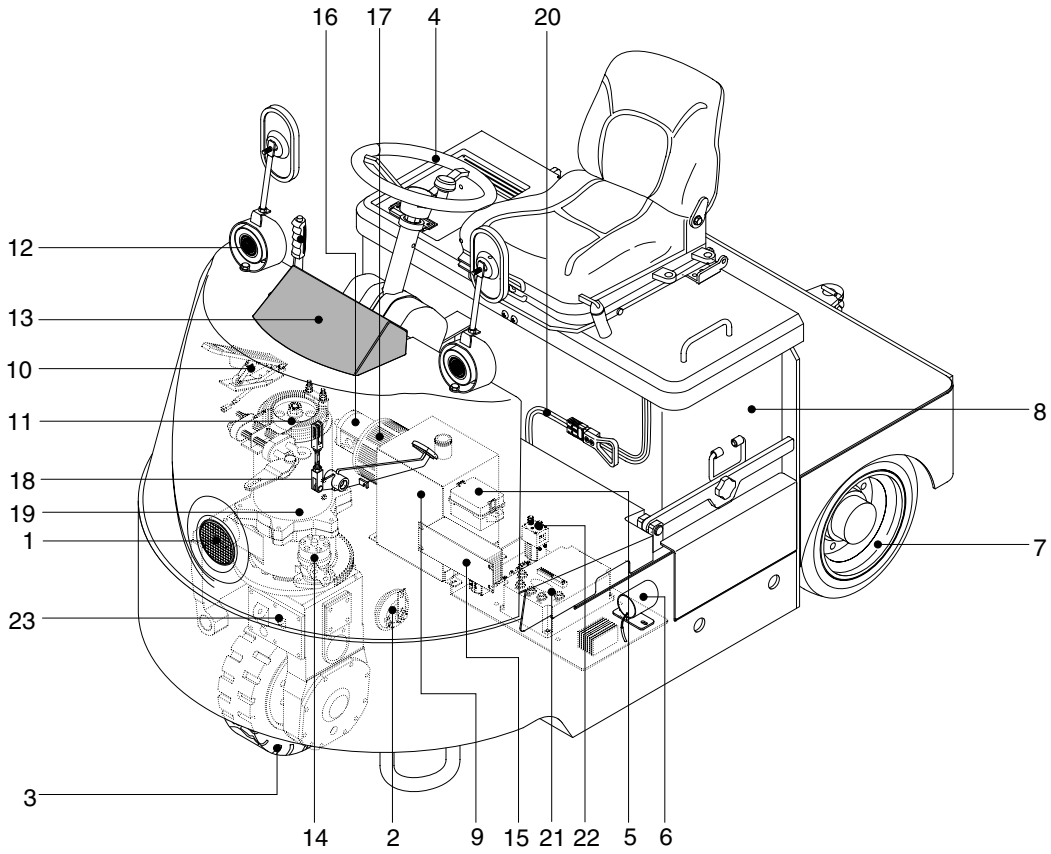
(1) Check the microswitch for operating point.
The microswitch is adjusted so that it is closed to open the slit when the accelerator pedal is stepped on approx. 10%, when the tractor starts.
(2) The electric bulb used to irradiate the CDS(cadmium sulphide photoconductive element) and it may be disconnected during long-time use due to vibration, etc.
Be sure to replace the bulb with a new one when it is blown, as the tractor cannot run with the bulb blown.

### 4) FET UNIT

(1) Be sure to remove the dust, dirt, etc. deposited at each terminal of the FET, as it can cause a trouble.
(2) Check each terminal for looseness. Check the terminal colored in red extremely carefully.
(3) In case the tractor has not any trouble, but it will not travel even if the accelerator pedal is stepped on, check for the following points :
① Check whether the travelling fuse is blown or not.
② Check whether the electric bulb for accelerator is properly connected or not.
③ Make sure that each switch and microswitch operate properly. If no failure is found in the above checks, the FET unit is possibly defective. Since the FET unit is assembled in extremely precise way and adjusted, do not attempt to disassemble the unit unnecessarily. When such disassembling is necessary, be sure to make contact with HYUNDAI service shop.

## 3. MAJOR COMPONENT LOCATIONS

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




BP157OM113

| | | | | | |
|---|---|---|---|---|---|
| 1 | Head lamp | 9 | Hydraulic oil tank | 17 | Steering hyd motor |
| 2 | Horn | 10 | Accelerator | 18 | Brake pedal |
| 3 | Front wheel | 11 | Brake system | 19 | Drive motor |
| 4 | Steering wheel | 12 | Flasher lamp | 20 | Harness |
| 5 | Fuse box | 13 | Monitor panel | 21 | Controller |
| 6 | Buzzer | 14 | Hydraulic motor | 22 | Contactor |
| 7 | Rear wheel | 15 | DC-DC converter | 23 | Drive unit |
| 8 | Battery | 16 | Power steering pump | | |

## 4. DAILY MAINTENANCE CHECKS

The PM intervals depend on hour meter records of operation.

PM interval
A : 8 hours or daily
B : 50 hours or every week(Typical PM interval)
C : 250 hours or every 1 months
D : 1000 hours or every 6 months
E : 2000 hours or every year

| Daily maintenance checks | No. | A | B | C | D | E |
|---|---|---|---|---|---|---|
| Check truck for obvious damages and leaks. | - | ● | | | | |
| Check capacity, warning plates and decals. | - | ● | | | | |
| Check condition of tires and wheels. | 3 | ● | | | | |
| Check for missing or loose wheel lug nuts. | 3,7 | ● | | | | |
| Check for steering wheel. | 4 | ● | | | | |
| Check gauges and instruments. | 13 | ● | | | | |
| Check warning lights and hourmeter. | 13 | ● | | | | |
| Check directional and speed controls operation. | 4 | ● | | | | |
| Check for accelerator operation. | 10 | ● | | | | |
| Check optional safety equipment.(Alarms, Lights etc.) | 13,2,6 | ● | | | | |
| Check for head lamp and work lamp operation. | 1 | ● | | | | |
| Check for flasher lamp operation. | 12 | ● | | | | |
| Check for fuse box. | 5 | ● | | | | |
| Check battery connector's cleanliness. | 20 | ● | | | | |
| Check battery electrolyte level. | 8 | ● | | | | |
| Check hydraulic sump fluid and filter. | 9 | ● | | | | |
| Check for service brake drum and cam. | 11 | ● | | | | |

# 5. PERIODIC MAINTENANCE CHECKS

The PM intervals depend on hour meter records of operation.

PM interval
A : 8 hours or daily
B : 50 hours or every week(Typical PM interval)
C : 250 hours or every 1 months
D : 1000 hours or every 6 months
E : 2000 hours or every year

| Periodic checks and planned maintenance (PM) | No. | A | B | C | D | E |
|---|---|---|---|---|---|---|
| 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. | 8 | | ○ | | | |
| Check battery electrolyte level / Refill. | 8 | ○ | ■ | | | |
| Check battery cables/truck receptacle | 8 | | ○ | | | |
| Perform battery load test. | 8 | | ○ | | | |
| *Check drive motor brushes. | 19 | | | ○ | | |
| *Check steering pump motor brushes. | 17 | | | ○ | | |
| Check steering hydraulic motor. | 14 | | ○ | | | |
| Check power steering pump. | 16 | | ○ | | | |
| Check steering pump motor. | 17 | | ○ | | | |
| Check drive motor. | 19 | | ○ | | | |
| Check brake pedal condition and wear. | 18 | | ○ | | | |
| Check drive unit fluid level. | 23 | | | ○ | ▲ | ● |
| Check harness status. | 20 | | | ○ | | |
| Check controller & DC converter. | 21,15 | ○ | | ○ | | |
| Check contactors<br>(Replace contactor tips if roughness is remarkable) | 22 | | | ○ | | |
| Replace hydraulic sump fluid and strainer. | 9 | | ○ | ■ | | ● ○ |
| Replace hydraulic sump filter | 9 | | | ● | | |
| Replace hydraulic sump breather. | 9 | | ○ | | | |
| Lubricate steering gear and steering bearing of drive unit. | 4,23 | | ○ | | | |
| Lubricate drive unit & suspension link bushing. | 23 | | ○ | | | |
| Check/lubricate steering column and wheel bearing. | 4 | | ○ | | | |

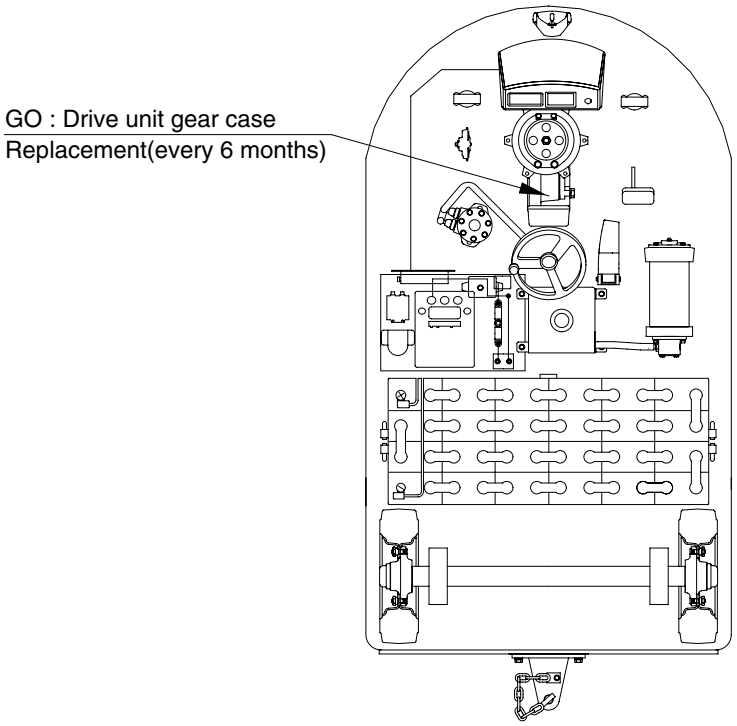
* : Replace as required

○ : Check ● : Replace ■ : Refill ▲ : Refill (Only for the first time)

# 6. LUBRICATION

Since the life of vehicle is dependent upon the quality of lubrication, be sure to perform the lubrication with utmost care so that the tractor will not fall in trouble due to insufficient or improper lubrication oil.

(1) In supplying the oil, be sure to clean the lubrication port so that the oil should not be contaminated.
(2) Sine the oil viscosity will be decreased under high temperature, resulting in decreased lubrication efficiency, be sure to use the oil of high viscosity in summer(for normal temperature of over 32℃) and that of low viscosity in winter(for normal temperature of under 0℃).




BP157OM29

| Description | Specification |
|---|---|
| Gear oil (GO) | SAE 80W-90LSD/API GL-5 |

## 7. NEW MACHINE OILS

New machine uses following lubricants and oils.

| Description | Specification |
|---|---|
| Gear oil (GO) | SAE 80W-90LSD/API GL-5 |
| Hydraulic oil | ISO VG 46 |

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

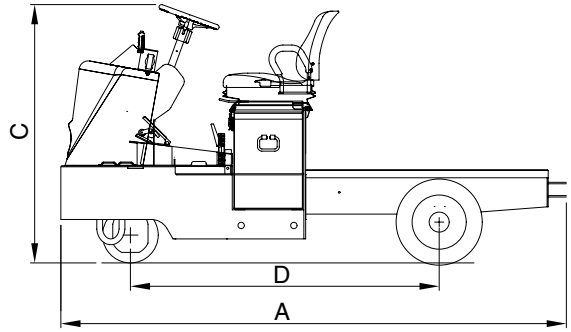
## 8. RECOMMENDED LUBRICANTS

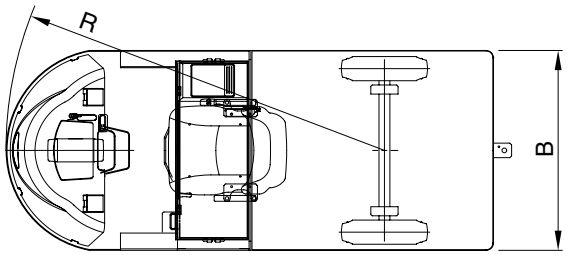
| Service point | Kind of fluid | Capacity ℓ (U.S. gal)<br>15P-7<br>40T-7 | Ambient temperature ℃(°F)<br>-20 (-4) -10 (14) 0 (32) 10 (50) 20 (68) 30 (86) 40 (104) |
|---|---|---|---|
| Axle | Gear oil | 1.6<br>(0.4) | SAE 80W-90LSD/API GL-5 |
| Hydraulic oil tank | Hydraulic oil | 7.6<br>(2.0) | ISO VG 32<br>ISO VG 46<br>ISO VG 68 |

## 1. SPECIFICATIONS

### 1) DIMENSIONS

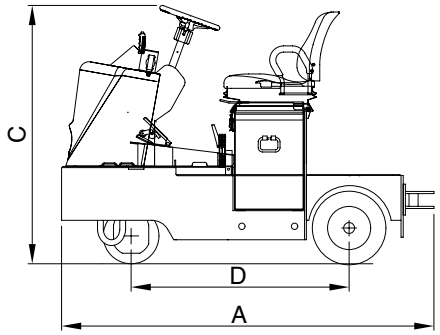
#### (1) 15P-7

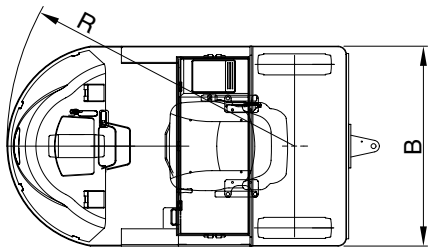



BP157SP01

#### (2) 40T-7




BP157SP01

| Item | | | Unit | 15P-7 | 40T-7 |
|---|---|---|---|---|---|
| Capacity | | | kg(lb) | 1500 | 4000 |
| Travel speed | Loaded | | km/h(mph) | 8 | 8 |
| | Unloaded | | km/h(mph) | 10 | 10 |
| Min. turning radius | | R | mm(in) | 2065 | 1565 |
| Overall length | | A | mm(in) | 2798 | 2050 |
| Overall width | | B | mm(in) | 1100 | 1100 |
| Overall height | | C | mm(in) | 1400 | 1400 |
| Wheel base | | D | mm(in) | 1700 | 1200 |
| Weight(Unloaded) | | | kg(lb) | 1200 | 1250 |
| Drive motor | | | kW | 2.7 | ← |
| Battery | Voltage | | V | 48 | ← |
| | Capacity | | AH/5HR | 280 | ← |
| Charger | Input | | - | 3 ø 220/380V | ← |
| | Type | | - | CC/CV | ← |
| Control type | | | - | FET | ← |
| Tire | FR | | - | ø 305 × 127 | ← |
| | RR | | - | 5.00-8.8PR | 4.00-8 |

## 2) SPECIFICATION FOR MAJOR COMPONENTS

### (1) Controller

| Item | Unit | Drive motor controller |
|---|---|---|
| Model | - | PMC 1274 |
| Type | - | MOSFET |
| Dimension | mm | 229×178×81 |
| Current limit | A | 350 |
| Communication | - | CAN |

### (2) Motor

| Item | Unit | Drive motor | Power steering motor |
|---|---|---|---|
| Model | - | EF5-4003 | 21HB-72090 |
| Type | - | DC SEM, Self ventilated | DC Series |
| Rated voltage | V | 48 | 48 |
| Output | kW | 2.7 | 0.6 |
| Brush size | mm | - | - |
| Insulation | - | Class H | Class H |

### (3) Battery

| Item | Unit | Specification |
|---|---|---|
| Rated voltage | V | 48V |
| Dimension(W×L×H) | mm | 965×380×550 |
| Min. Battery weight | kg | 445 |
| Max. Battery weight | kg | 720 |
| Connector(CE spec) | - | SB 350 |
| Electrolyte | - | Refined dilute sulfuric acid |

### (4) Charger

| Item | Unit | Specification |
|---|---|---|
| Type | - | Constant current constant voltage |
| Battery capacity for charge | V-AH/hr | 48V 450~520/5 |
| AC input | V | Triple phase 410 |
| | | Single phase 220 |
| | | Triple phase 220/380 |
| | | Triple phase 440 |
| DC output | V | 62±1 |
| Charge time | hr | 8±2 |
| Connector | - | SB 350 |

### (5) Power steering pump

| Item | Unit | Specification |
|---|---|---|
| Type | - | Fixed displacement gear pump |
| Capacity | cc/rev | 4 |
| Maximum operating pressure | bar | 100 |
| Rated speed(max/min) | rpm | 3600/900 |

### (6) Steering hydraulic motor

| Item | Unit | Specification |
|---|---|---|
| Model | - | OMR 125 NA |
| Max oil flow | ℓ /min | 60 |
| Displacement | cc | 125.7 |
| Max pressure | bar | 175 |
| Connector size | - | PF 1/2 |

### (7) Steering unit

| Item | Unit | Specification |
|---|---|---|
| Max input pressure | $kgf/cm^2$ | 175 |
| Rated flow | lpm | 22.7 |
| Displacement | cc/rev | 62 |

### (8) Drive unit

| Item | Unit | Specification |
|---|---|---|
| Max drive input | kW | 5.0 |
| Max wheel load | kg/lb | 750/1653 |
| Gear ratio | - | 20.125 |
| Weight without fluid | kg/lb | 28.5/62.8 |
| Oil quantity | ℓ /U.S. · qt | 1.6/1.7 |

### (9) Wheels

| Item | | Front | Rear |
|---|---|---|---|
| Type | | Cushion, Urethane, Non-marking | Pneumatic(solid), Non-marking |
| Quantity | | 1 | 2 |
| Wheel | HBP15-7 | 305×127 | 5.00-8-8PR(5.00-8) |
| | HBT40-7 | 305×127 | 4.00-8 |

### (10) Steering

| Item | | Specification |
|---|---|---|
| Steering | Type | Full hydraulic, power steering |
| | Steering angle | 90° to both right and left angle, respectively |

### (11) Brake

| Item | | | Specification |
|---|---|---|---|
| Type | | | Center brake |
| Brake shoe | W×L×T | | 40×110×5mm(1.6×4.3×0.2in) |
| | Area | | 44cm²(6.8in²) |
| Brake drum diameter | New | | 120mm(4.7in) |
| | Repair limit | | 117mm(4.6in) |
| Brake pedal play | | | 10~15mm(0.4~0.6in) |
| Braking distance | | Unloaded | Less than 5.0m(197in) |
| | | Loaded | Less than 2.0m(79in) |

### (12) Parking brake

| Item | Specification |
|---|---|
| Type | Ratchet |
| Parking lever stroke | 40mm |
| Parking cable stroke | 16mm |

## 3) TIGHTENING TORQUE FOR MAJOR COMPONENTS

| NO | Items | | Size | kgf · m | lbf · ft |
|---|---|---|---|---|---|
| 1 | Electric system | Hyd pump motor mounting bolt | M10×1.5 | 6.9±1.4 | 49.9±10.1 |
| 2 | | Drive motor mounting bolt | M 8×1.25 | 2.0±0.2 | 14.4±1.4 |
| 3 | Hydraulic system | Hydraulic pump mounting bolt | M 8×1.25 | 3.7±0.7 | 26.8±5.1 |
| 4 | | Steering motor mounting bolt, nut | M10×1.5 | 4.0±0.5 | 28.9±3.6 |
| 5 | | Steering unit mounting bolt | M10×1.5 | 4.0±0.5 | 28.9±3.6 |
| 6 | | Hydraulic oil tank mounting bolt | M 8×1.25 | 2.5±0.5 | 18.1±3.6 |
| 7 | Power train system | Drive unit mounting bolt, nut | M18×2.5 | 41±3 | 297±21.7 |
| 8 | | Rear axle mounting bolt, nut | M14×2.0 | 20±2.0 | 145±14.4 |
| 9 | | Front wheel mounting nut | M16×1.5 | 20.5±1.5 | 148.2±10.8 |
| 10 | | Rear wheel mounting nut | M12×1.5 | 10±1.0 | 72.3±7.2 |
| 11 | Others | Seat mounting bolt | M 8×1.25 | 2.5±0.5 | 18.1±3.6 |
| 12 | | Head guard mounting bolt | M12×1.75 | 12.8±3.0 | 92.6±21.7 |