



Service Manual

6HBW23

Serial Number 22,000 and up



INDUSTRIAL EQUIPMENT

SERVICE MANUAL

4,500 lb. Powered Pallet Walkie

Model: 6HBW23

Serial No. 22,000 and up

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Manual Design

The Toyota Model 6HBW23 Service Manual is designed with the following objectives in mind:

- Provide technical coverage for expected levels of user expertise
- Anticipate your needs and reduce your decisions regarding maintenance
- Reduce page flipping through a “one-stop shopping” approach

The two-line running page header at the top of each page tells you the following:

- Name of the manual
(Toyota Model 6HBW23 Service Manual)
- Current chapter title
(example: this page *How to Use This Manual*)
- Current topic
(example: this page *Manual Design*)

We suggest you get in the habit of turning to the **START** page first when you use this manual.

The **START** page asks a few simple questions to guide you to the correct chapter.

- **How to Use This Manual** explains the manual format and design and contains the **START** page.
- **Safety** explains warning and caution notes, general safety rules and safety rules for batteries, static, jacking, and welding.
- **Systems Overview** includes truck specifications and theory of operation information.
- **Planned Maintenance** outlines the recommended schedule of preventive services to keep your truck working most efficiently.
- **Troubleshooting** is a set of “decision-tree” charts and symptom tables designed to take you from a symptom to a specific sequence of tests in order to isolate a bad component.

- “**TS1: START TROUBLESHOOTING**” on page 5-33 will guide you to the individual troubleshooting symptom chart you need.
- When you are familiar with the symptoms listed, you may instead find the symptom chart from the “**List of Troubleshooting Charts/Tables**” on page 5-31.
- When you complete a troubleshooting procedure, make sure to follow the steps in the “**END1: End of Troubleshooting Procedure**” on page 5-35.

- **Component Procedures** gives step-by-step procedures for testing, removal, installation, and adjustment of individual truck components. Components are listed in an order that considers:

- Frequency of attention
- Physical attachment (example: brake must be removed before drive motor)
- Functional relation (for example: drive motor and drive unit components are grouped together)

To find a component procedure, you may use one of three methods:

- Look up the component name. See “**Component Procedures**” on page 6-1.
- Find the component. See “**Component Locator Photo**” on page 6-3.
- Look up the component name in the Index. See “**Index**” on page I-1.
- **Appendix** contains reference information such as torque values, lubricants, and schematics.
- **Index** lists subjects alphabetically.

Section 2. Safety

Definitions

Definitions

Throughout this manual, you will see two kinds of safety reminders:

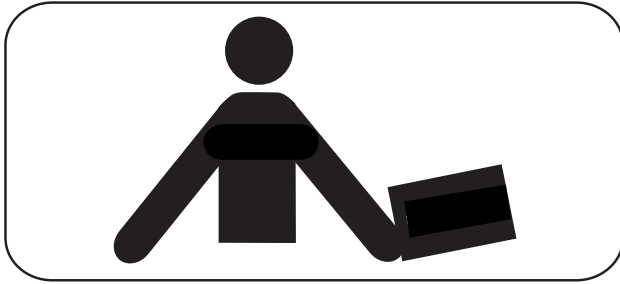
WARNING

Warning means a potentially hazardous situation exists that, if not avoided, could result in death or serious injury.

CAUTION

Caution means a potentially hazardous situation exists that, if not avoided, could result in minor or moderate injury or in damage to the truck or nearby objects.

General Safety



Do *not* operate or work on this truck unless you are trained, qualified, and authorized to do so and have read the Owner/Operator Manual.



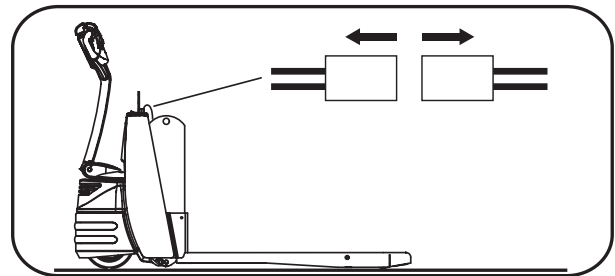
Know the truck's controls and what they do.



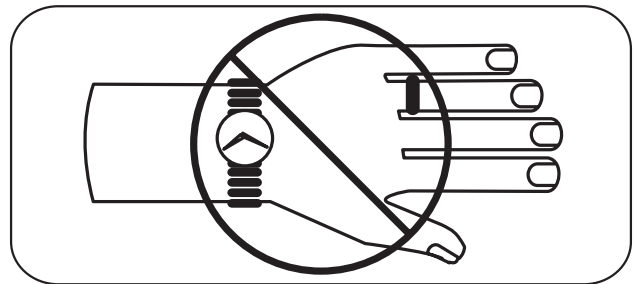
Do *not* operate this truck if it needs repair or if it is in any way unsafe.



Operate this truck only from the operator's position.

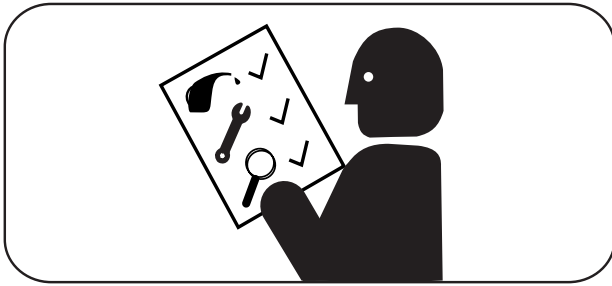


Before working on this truck, always press the red OFF key (●) on the keypad and disconnect the truck's battery connector (unless this manual tells you otherwise).

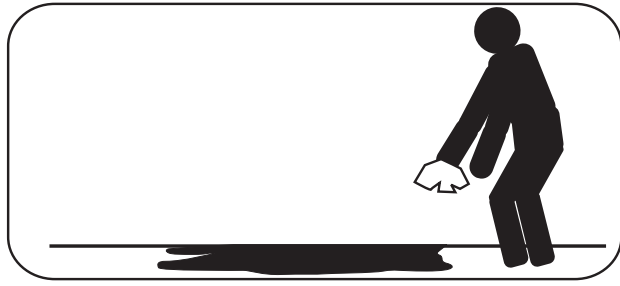


Do *not* wear watches, rings, or jewelry when working on this truck.

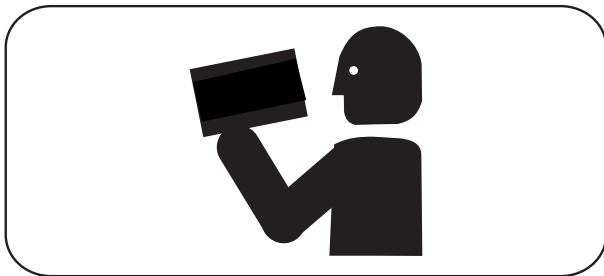
General Safety



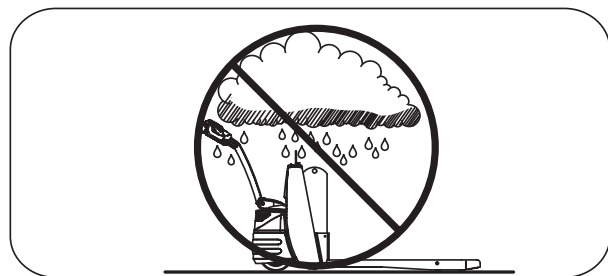
Follow the scheduled lubrication, maintenance, and inspection steps.



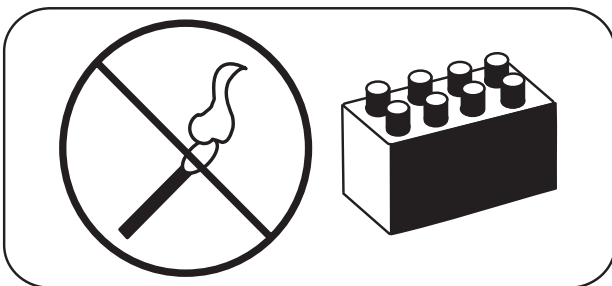
Clean up any hydraulic fluid, oil, or grease that has leaked or spilled on the floor.



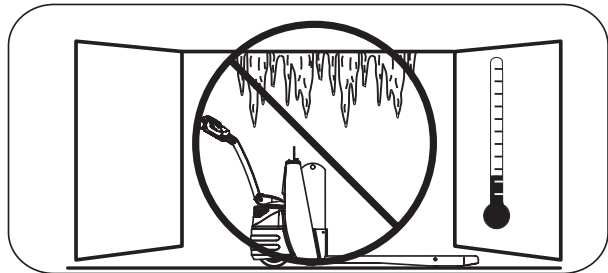
Follow exactly the safety and repair instructions in this manual. Do *not* take "shortcuts."



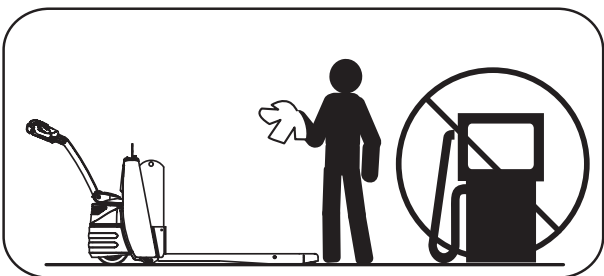
Always park this truck indoors.



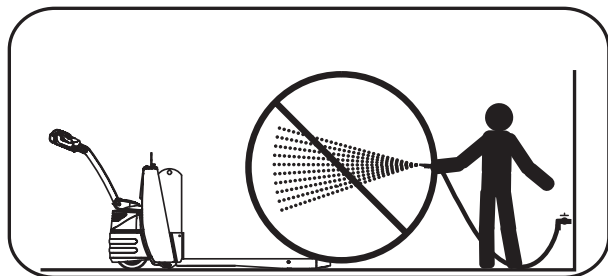
Do *not* use an open flame near the truck.



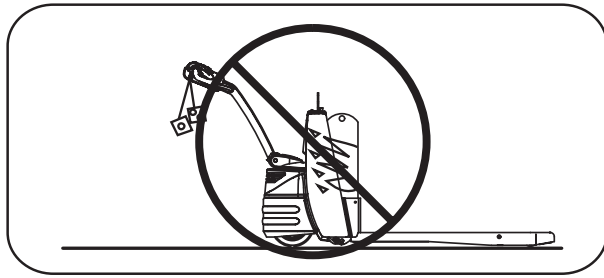
Do *not* park this truck in a cold storage area overnight.



Do *not* use gasoline or other flammable liquids for cleaning parts.



Do *not* wash this truck with a hose.



Do *not* add to or modify this truck until you contact your local Toyota Industrial Equipment Dealer to receive written manufacturer approval.

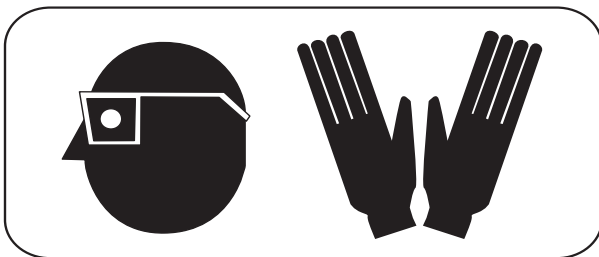
Battery Safety

Battery Safety**⚠ WARNING**

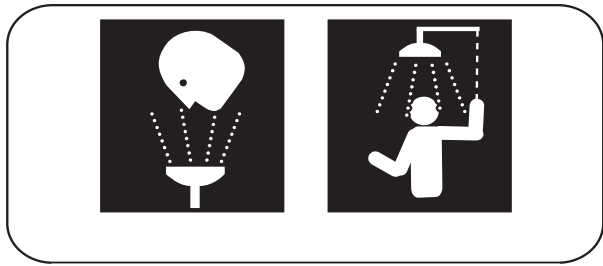
As a battery is being charged, an explosive gas mixture forms within and around each cell. If the area is not properly ventilated, this explosive gas can remain in or around the battery for several hours after charging. Make sure there are no open flames or sparks in the charging area. An open flame or spark can ignite this gas, resulting in serious damage or injury.

⚠ WARNING

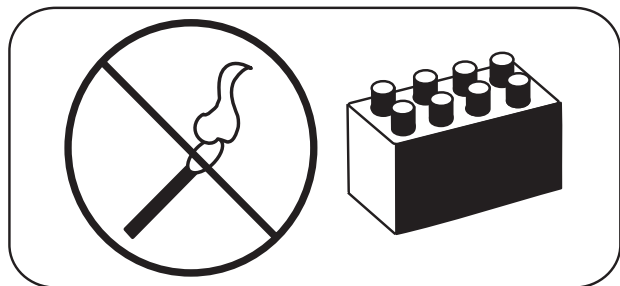
Battery electrolyte is a solution of sulfuric acid and water. Battery acid causes burns. If any electrolyte comes in contact with your clothing or skin, flush the area immediately with cold water. If the solution gets on your face or in your eyes, flush the area with cold water and get medical help immediately.



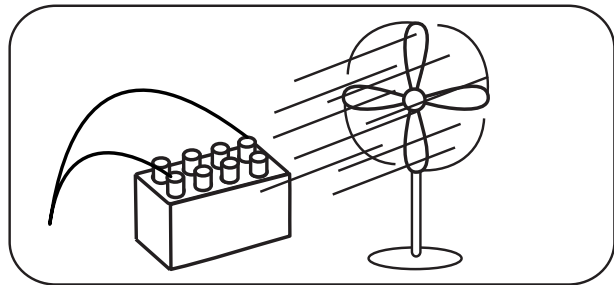
Wear personal protective equipment to protect eyes, face, and skin when checking, handling, or filling batteries. This equipment includes goggles or face shield, rubber gloves (with or without arm shields), and a rubber apron.



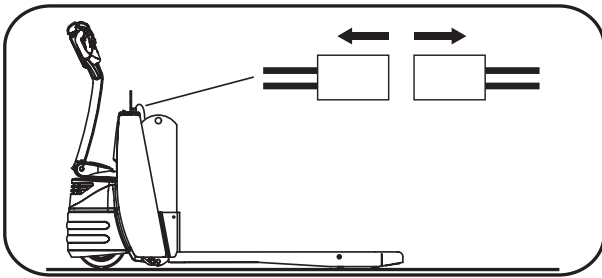
Make sure a shower and eyewash station are nearby in case there is an accident.



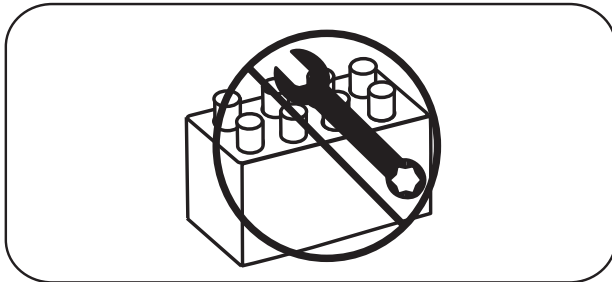
A battery gives off explosive gases. *Never* smoke, use an open flame, or use anything that gives off sparks near a battery.



Keep the charging area well-ventilated to avoid hydrogen gas concentration.



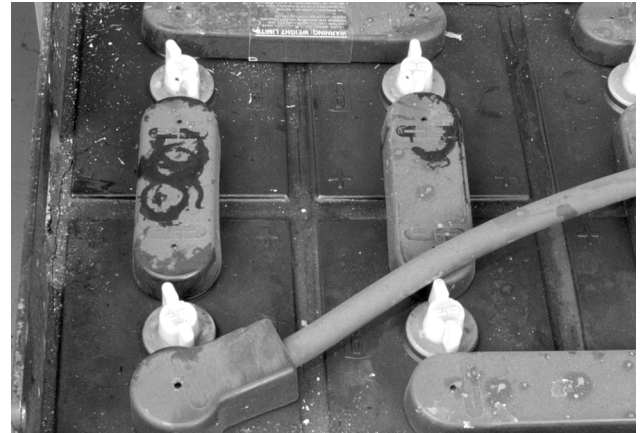
Press the red OFF key (●) on the keypad *before* disconnecting the battery from the truck at the battery connector. Do *not* break live circuits at the battery terminals. A spark often occurs at the point where a live circuit is broken.



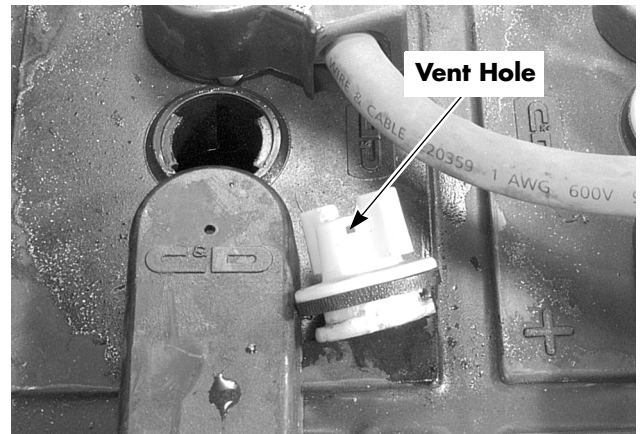
Do *not* lay tools or metal objects on top of the battery. A short circuit or explosion could result.



Keep batteries clean. Corrosion causes shorts to the frame and possibly sparks.



Keep plugs, terminals, cables, and receptacles in good condition to avoid shorts and sparks.



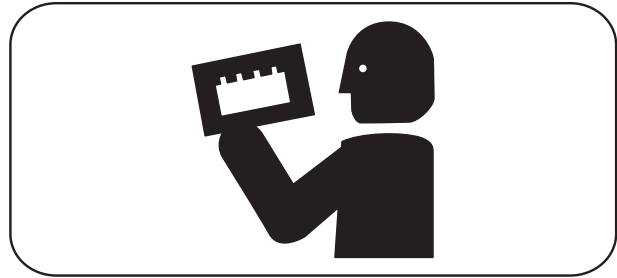
Keep filler plugs firmly in position at all times *except* when the electrolyte level is checked, when water is added to the cells, or when the specific gravity is checked.

Make sure the vent holes in the filler plugs are open to permit the gas to escape from the cells.

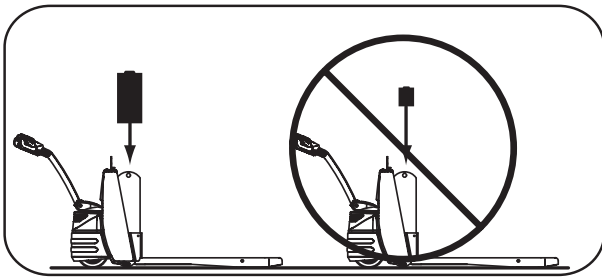
Battery Safety



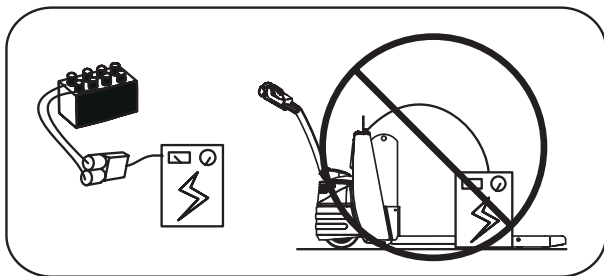
Do *not* permit cleaning solution, dirt, or any foreign matter to enter the cells.



Follow the charging procedures in the Battery Instruction Manual and in the Battery Charger Instruction Manual.



Make sure you install the correct size battery. A smaller or lighter weight battery could seriously affect truck stability. See the truck's specification plate for more information.



Never plug a battery charger into the truck's battery connector. Plug the battery charger only into the battery connector from the battery.

Jacking Safety

When it is necessary to jack the truck off the floor to perform maintenance procedures, observe the following safety precautions:

1. Lower the forks completely. Remove any load.
2. Position all controls in neutral.
3. Block the wheels to prevent movement of the vehicle.
4. Press the red OFF key (●) on the keypad and disconnect the battery connector.
5. Position the jack under the designated jacking points.



Use extreme care when the truck is jacked up. Keep hands and feet clear from vehicle while jacking the truck. After the truck is jacked, position solid blocks beneath it to support it. DO NOT rely on the jack alone to support the truck.

Fork Section

1. Using the lift button, raise the forks to maximum height.
2. Block the fork section. The tractor section will remain on the floor.
3. Lower the forks on the blocks.
4. Press the red OFF key (●) on the keypad and disconnect the battery connector.

Tractor Section

1. Position the jack in the designated jacking position.
2. Jack one side of the truck so that the drive tire is off the floor no more than 1 in. (25.4 mm).
3. Block that side of the truck in place.
4. Jack the other side of the truck level with the first side.
5. Block that side of the truck in place.

NOTE: After working on a vehicle, test all controls and functions to assure correct operation.

Towing

Towing

To safely tow this truck:

1. Lower the forks and remove any load.
2. Press the red OFF key (●) on the keypad and disconnect the battery connector.
3. Using a suitable towing vehicle, lift the tractor end of the truck until the drive tire is no more than 1 in. (25.4 mm) off the floor.
4. Tow the truck slowly in the tractor-first direction.

NOTE: If a suitable towing vehicle is not available, the electromagnetic brake must be disabled to move this truck. See “Mechanically Releasing the Brake” on page 6-34.

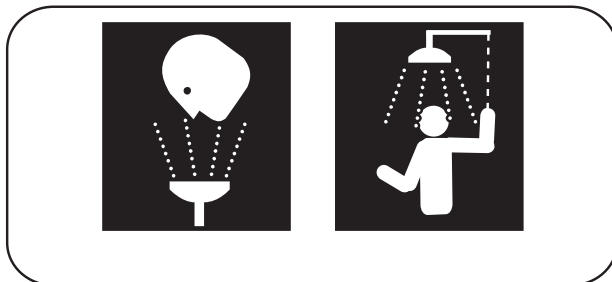
Welding Safety

⚠ WARNING

Flame cutting or welding on painted surfaces may produce potentially harmful fumes, smoke and vapors. Prior to performing flame cutting or welding operations, it is recommended that the coating be removed in the vicinity where the operation(s) will be performed.

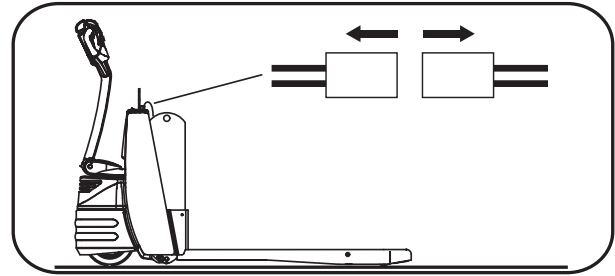
⚠ WARNING

Coating removal may be by mechanical methods, chemical methods or a combination of methods. Flame cutting and/or welding operations must be carried out only in well ventilated areas using local exhaust if necessary.



Before working on this truck, make sure that:

- Fire protection equipment is nearby.
- You know where the nearest eyewash station is located.



- Disconnect the battery before you attempt to inspect, service, or repair the lift truck. Discharge residual charge in the power amplifier by connecting a load across the power amplifiers B+ and B- (such as a contactor coil or by pressing the horn button).
- Do a test for shorts to frame. See “Checking for Shorts from Components to Truck Frame” on page 5-3. If any shorts are detected, remove them before you proceed with the welding operation.
- Clean the area to be welded.
- Protect all truck components from heat, weld spatter, and debris.
- Attach the ground cable as close to the weld area as possible.
- Do not perform any welding operations near the electrical components.
- If welding must be done near the battery compartment, remove the battery from the truck.
- When you are finished welding, perform all ground tests and electrical inspections before the vehicle is operated.

Section 3. Systems Overview

Truck Model Identification

Truck Model Identification

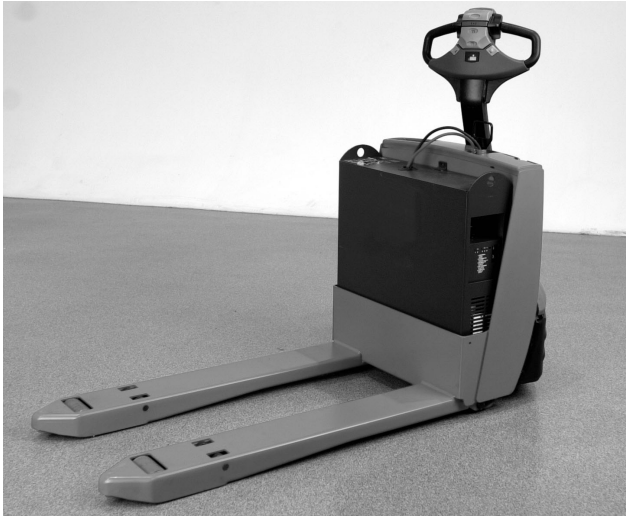


Figure 3-1. Model 6HBW23 Pallet Truck

Vehicle Specifications

⚠ WARNING

The total weight of the load must include the pallet and the container or the device holding the load.

Category	
Maximum Load Capacity	4,500 lb. (2,041 kg)
Upright Height	50.8 in. (129.1 cm)
Overall Length (Handle Raised)	up to 81.8 in. (207.8 cm)
Overall Width	28.0 in. (711 mm)
Maximum Lift Height	8.65 in. (219.7 mm)
Regular Speed, Maximum	3.9 mph (6.3 kph)
Stopping Distance	6 ft. (1.83 m)
Battery Compartment Width	7.8 or 9.0 in. (198 or 228 mm)
Battery Voltage	24V
Minimum Battery Weight	200 lb. (91 kg)
Maximum Battery Weight	660 lb. (299 kg)
Truck Weight Without Battery	800 lb. (362 kg)
Wheel: Drive	10 x 5 in. Rubber
Wheel: Load	3.25 x 5 in. Polyurethane (2)

General Information

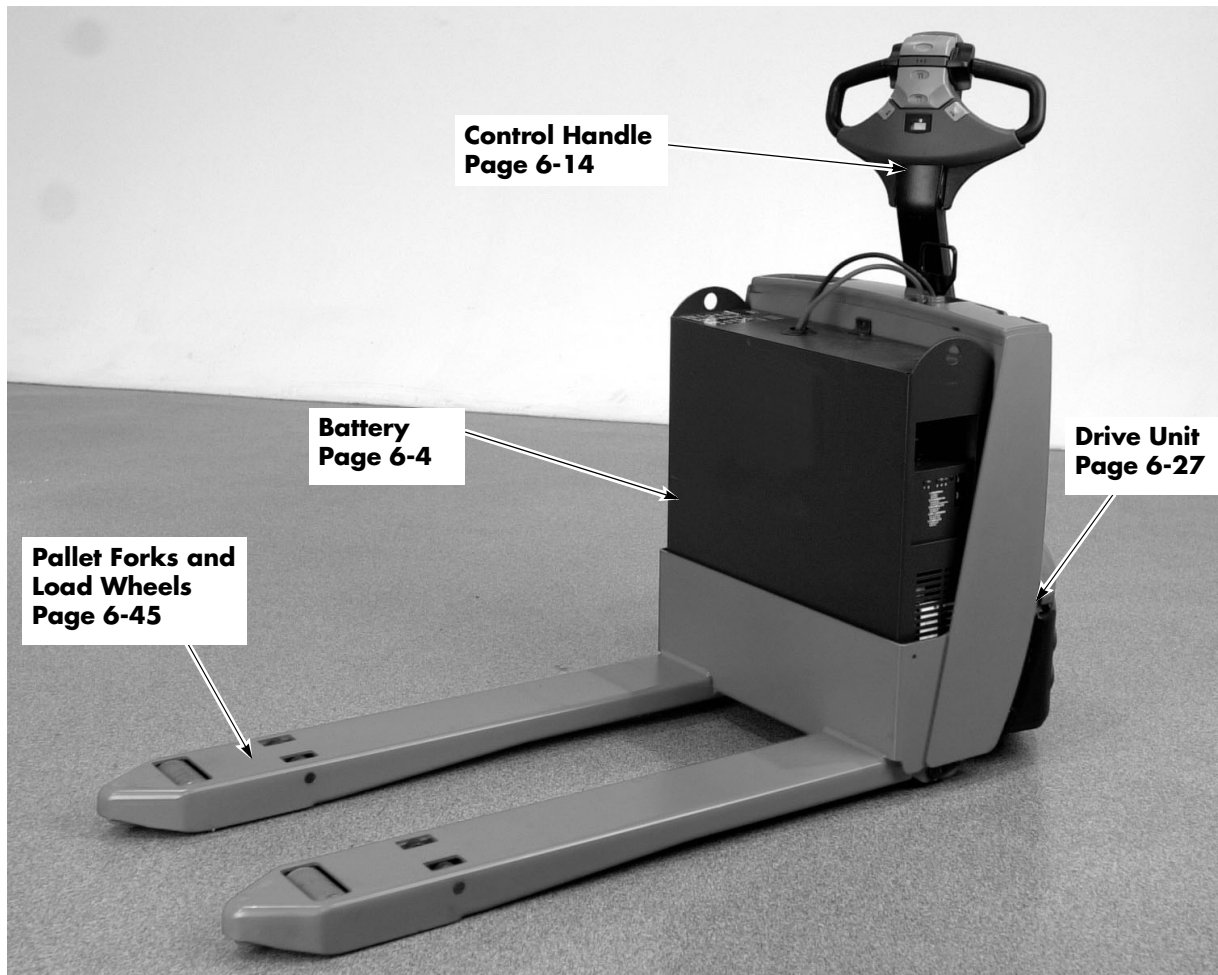


Figure 3-2. Model 6HBW23 General Information



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Special Tools

Special Tools

Programmable Maintenance Tool



Figure 3-3. Programmable Maintenance Tool

The optional Programmable Maintenance Tool (PMT) (P/N 00590-49981-71) permits you to test and diagnose the power amplifier in the truck. See Figure 3-3.

The PMT is powered by the host power amplifier through the four-pin connector installed at the bottom of the power amplifier.

Service Key



Figure 3-4. Service Key

Use the optional Service Key (P/N 00590-42683-71) directly on the truck to troubleshoot and program the truck service parameter settings. See “Parameters (P)” on page 5-16.

Theory of Operation

Truck Starting

To start the truck, the battery is plugged in, the Master Control ON/OFF switch is in the ON position, the PIN-key code is entered in the keypad, and the green ON (I) key pressed (or optional key switch is ON). See "Service Display" on page 5-21.

Lift/Lower

The lift/lower system consists of an electrically operated hydraulic pump assembly and related components.

The hydraulic pump assembly consists of a positive displacement rotary gear pump with reservoir mounted to an adapter. A DC electric motor is mounted to the opposite side of the pump adapter. An adjustable relief valve, check valve, and a solenoid operated lowering valve are installed within the adapter.

With the forks elevated, the normally closed solenoid valve and the check valve prevent hydraulic fluid from returning to the reservoir.

Lift

When the battery is connected, the truck is ON, and the lift button pressed:

- a lift signal is detected via hall effect sensors, converted into the lift instruction, and transmitted via the Controller Area network (CAN) to the power amplifier.
- the lift pump contactor (K30) closes, applying B+ to the lift pump motor (M3) causing the lift pump to operate.
- hydraulic fluid is drawn into the lift pump.
- as the pump rotates, oil is forced out the pressure port through the lift hose to the lift cylinder. Oil cannot return to the reservoir because of the closed pressure relief valve and closed lowering solenoid valve.

- hydraulic pressure in the lift cylinder raises the forks.
- lift limit switch (S36) transmits a lift limit signal to the power amplifier which removes power to the lift motor when the forks reach a preset lift limit.

When the lift button is released:

- the pump contactor coil (K30) is de-energized. This stops the lift motor and pump. The forks are held in position by hydraulic fluid trapped in the cylinder by the check valve, the static position of the relief valve, and the closed lowering solenoid valve (Y10).
- the relief valve opens if the hydraulic pressure exceeds the preset limit.

Lower

When the battery is connected, the truck is ON, and the lower button is pressed:

- lower signal is detected via hall effect sensors, converted into the lower instruction, and transmitted via the CAN to the power amplifier.
- lowering solenoid valve (Y10) opens.
- hydraulic fluid in the lift cylinder returns to the hydraulic reservoir through the lowering valve and the flow control valve. The lowering speed is regulated by the flow control valve.
- the forks lower.

Direction/Speed Control

The following descriptions assume the battery is charged and connected, the truck is ON, and main contactor (K10) is energized.

Control Handle Positioning

When the control handle is in the upright position, the parking brake is engaged. When the control handle is within 6 to 46° of the upright position, the brake is allowed to

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