



Service Manual

7BRU18, 7BRU23, 7BDRU15,
7BSU20, and 7BSU25

Serial Numbers

21,000 and up for 24 Volt

32,000 and up for 36 Volt



SERVICE MANUAL

Reach Lift Truck

Models: 7BRU18

7BRU23

7BDRU15

7BSU20

7BSU25

24 Volt Models - Serial No. 21,000 and Up

36 Volt Models - Serial No. 32,000 and Up

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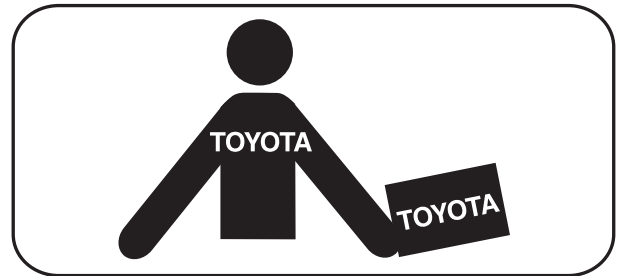
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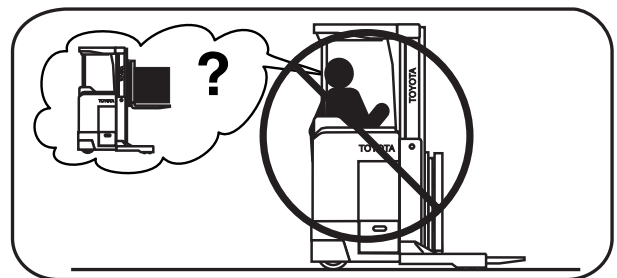
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General Safety

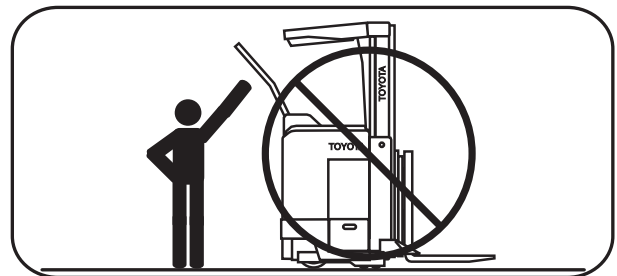
Do not operate or work on this lift truck unless you have read the operator's manual and are trained, qualified, and authorized to do so.



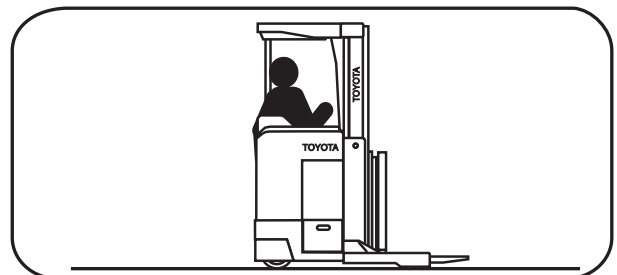
Know the lift truck's controls and what they do.



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

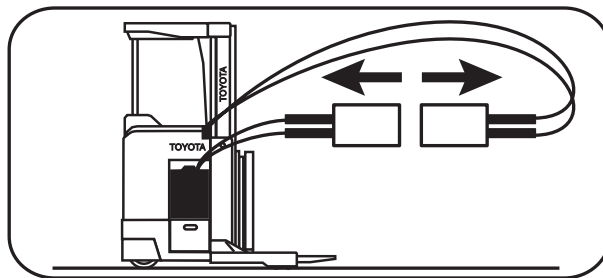


Operate this lift truck only from the operator's position.

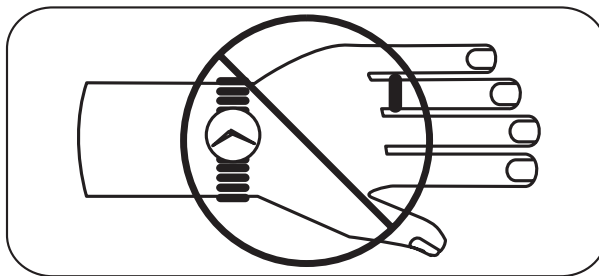


General Safety

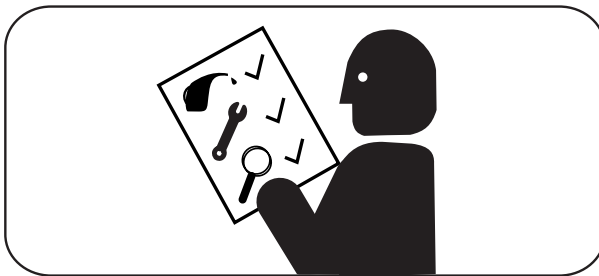
Before working on this lift truck, always turn the key switch to OFF and disconnect the lift truck's battery connector (unless this manual tells you otherwise).



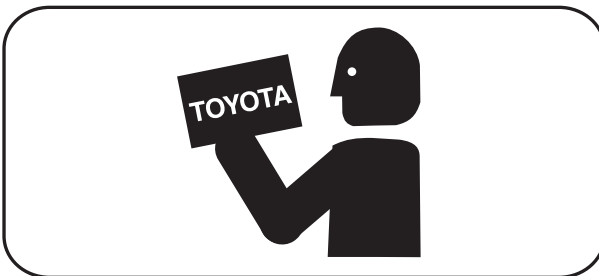
Do *NOT* wear watches, rings, or jewelry when working on this lift truck.



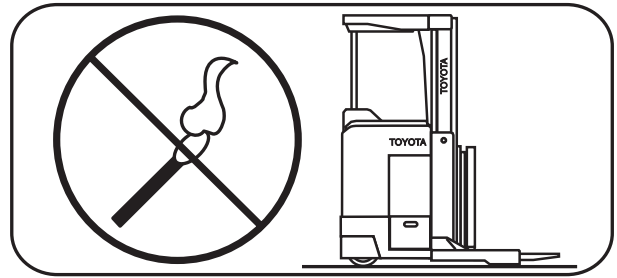
Follow the scheduled lubrication, maintenance and inspection steps.



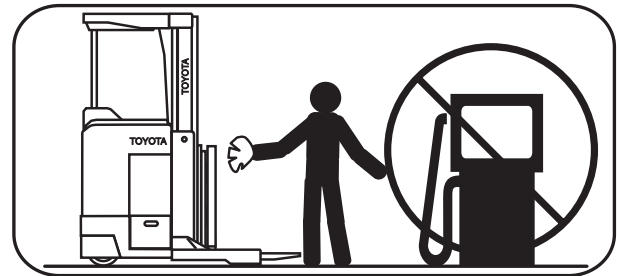
Follow exactly the safety and repair instructions in this manual. Do not take "shortcuts".



Do *NOT* use an open flame near the lift truck.



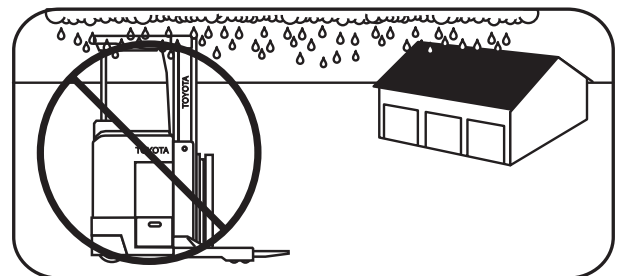
Do *NOT* use gasoline or other flammable liquids for cleaning parts.



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

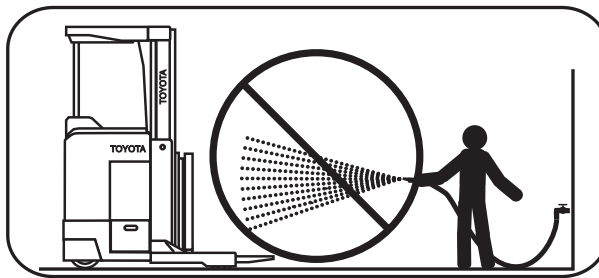


Always park this lift truck indoors.

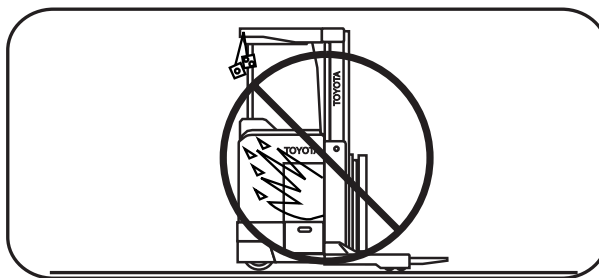


General Safety

Do *NOT* wash this lift truck with a hose.



Do *NOT* add to or modify this lift truck until you contact your local Dealer to receive written manufacturer approval.



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

Battery Safety

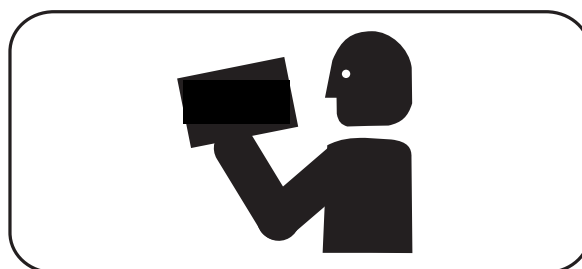
⚠ WARNING

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. Be 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.

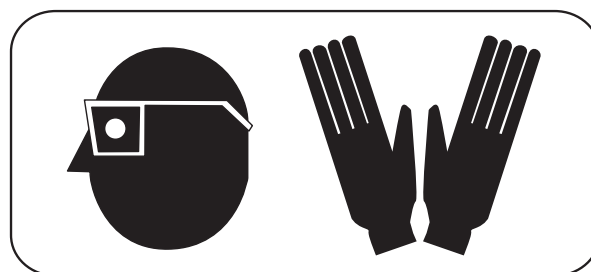
⚠ WARNING

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

Read, understand and follow procedures, recommendations and specifications in the battery and battery charger manufacturer's manuals.

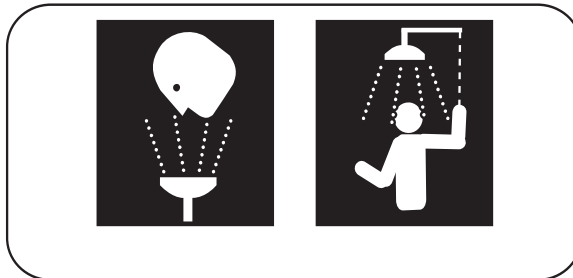


Wear personal protective equipment to protect eyes, face and skin when checking, handling or filling batteries. This equipment includes goggles or face shield, rubber gloves (with or without arm shields) and a rubber apron.

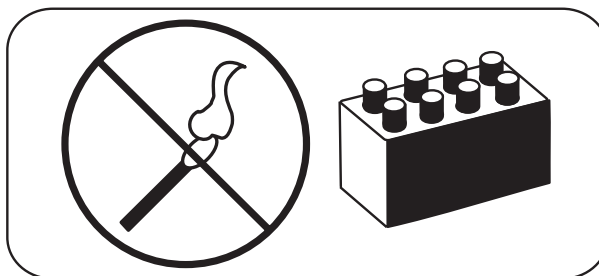


Battery Safety

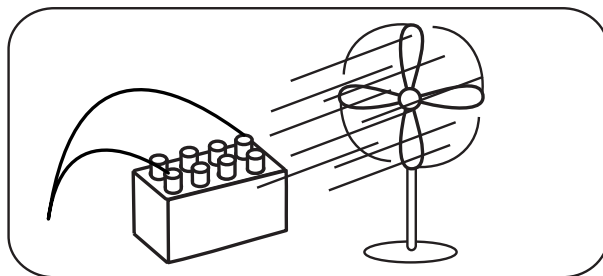
Make sure a shower and eyewash station are nearby in case there is an accident.



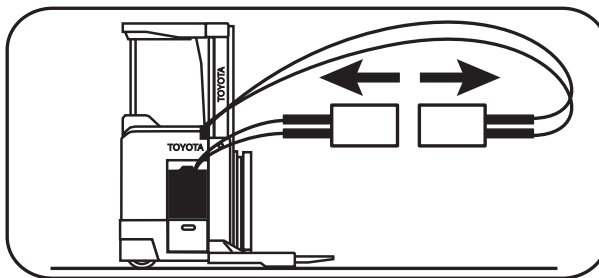
A battery gives off explosive gases. *NEVER* smoke, use an open flame, or use anything that gives off sparks near a battery.



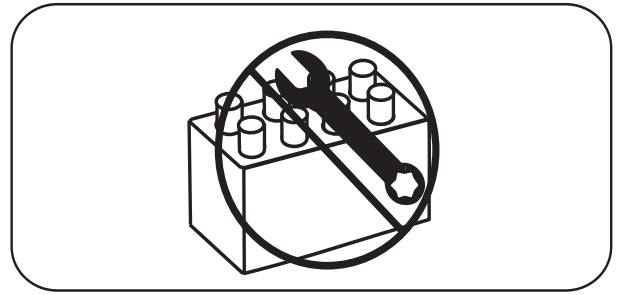
Keep the charging area well-ventilated to avoid hydrogen gas concentration.



Turn the key switch OFF *before* disconnecting the battery from the lift 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.

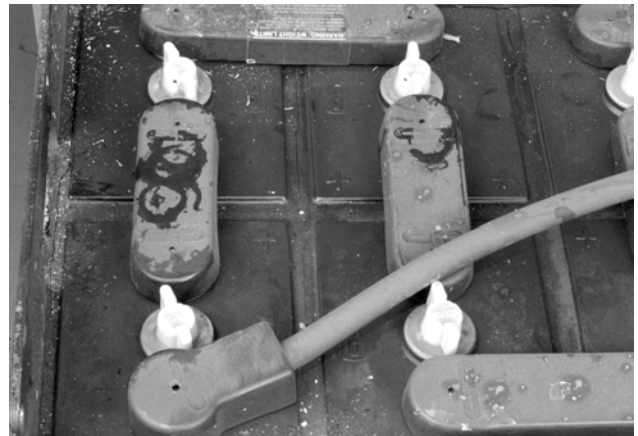


Do not lay tools or metal objects on top of the battery. A short circuit or explosion could result.



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 place at all times *except* when the electrolyte level is checked, when water is added to the cells or when the specific gravity is checked.

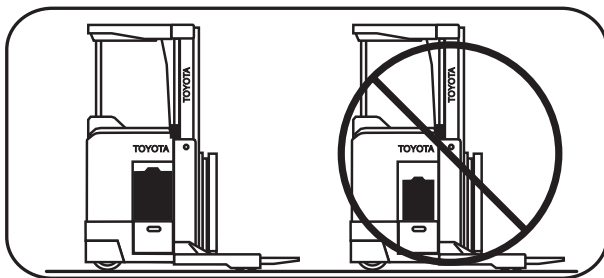
Make sure the vent holes in the filler plugs are open to allow the gas to escape from the cells.



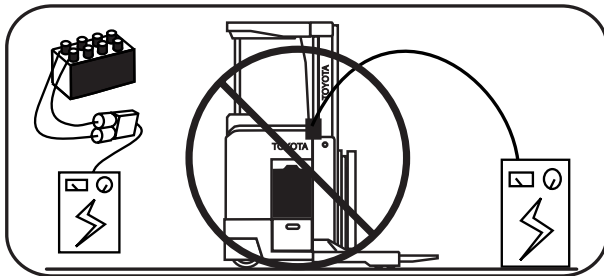
Battery Safety

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

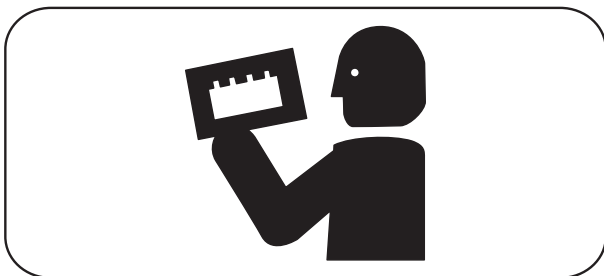
Make sure you install the correct size battery. A smaller or lighter weight battery could seriously affect lift truck stability. See the lift truck's specification plate for more information.



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



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



Static Safety

Electronic circuit boards and devices used on the Toyota lift truck can be damaged by the discharge of static electricity, called electrostatic discharge (ESD).

Static charges can accumulate from normal operation of the lift truck as well as movement or contact between non-conductive materials such as plastic bags, synthetic clothing, synthetic soles on shoes and styrofoam coffee cups.

Accumulated static can be discharged through human skin to a circuit board or component by touching the parts. Static discharge is also possible through the air when a charged object is placed close to another surface at a different electrical potential. *Static discharge can occur without seeing or feeling it.*

Whenever working on or near static-sensitive electronics, always follow these ESD precautions:

- Wear an ESD wrist strap.
- Connect the ground plug to the ESD ground jack on the lift truck. See Figure 2-1. If you cannot use the ground jack, connect the ground clamp to an unpainted, grounded surface on the lift truck frame.
- Handle circuit boards by the edges only. Avoid touching the edge connectors.
- If you will be removing or installing static-sensitive components, place them on a properly grounded antistatic mat.
- To transport static sensitive components, including failed components being returned, place the components in an antistatic bag or box (available from your local authorized Toyota Dealer).

The wrist strap and associated accessories should be tested monthly to verify they are working properly. A defective static discharge wrist band will not alert you that it is bad.



Figure 2-1: Ground Jack

Static Safety

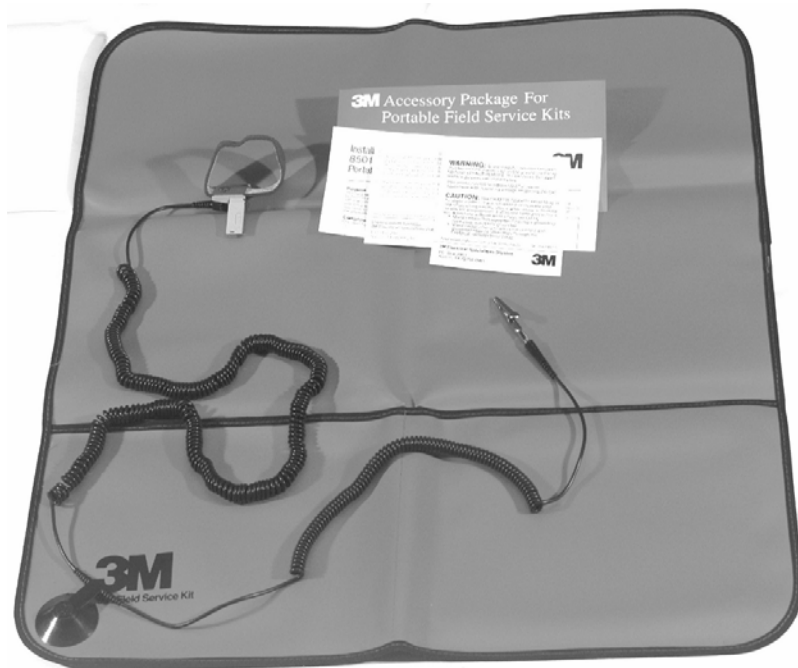


Figure 2-2: Anti-Static Kit with Wrist Strap and Mat

Figure 2-2 shows the components of the Toyota antistatic field service kit, Part Number (P/N) 00590-04849-71. The kit includes a wrist strap, ground cord and static-dissipative work surface (mat). Follow the instructions packaged with this kit.

Wrist straps are available in quantities of 25, as P/N 00590-04848-71.

A wrist strap tester is available as P/N 00590-04850-71.

Contact your local Dealer for information.

Jacking Safety

It may be necessary to jack the lift truck off the floor to perform maintenance procedures. When doing so, observe the following safety precautions:

1. Make sure the floor surface is level or move the truck to a location where it is level.
2. Lower the forks completely. Remove any load.
3. Place all controls in neutral.
4. Block the wheels to prevent movement of the vehicle.
5. Disconnect the battery connector.
6. Place the jack under the designated jacking points. See Figure 2-3.

⚠ WARNING

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

Tractor

1. Place the jack in the designated jacking position. See Figure 2-3.
2. Jack the rear of the lift truck so that the drive tire is off the floor no more than 2 in. (50 mm).
3. Block the lift truck in place.

Mast

1. Place the jack in the designated jacking position. See Figure 2-3.
2. Jack the side of the truck so that the load wheel is off the floor no more than 1/2 in. (13 mm).
3. Block the lift truck in place.

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

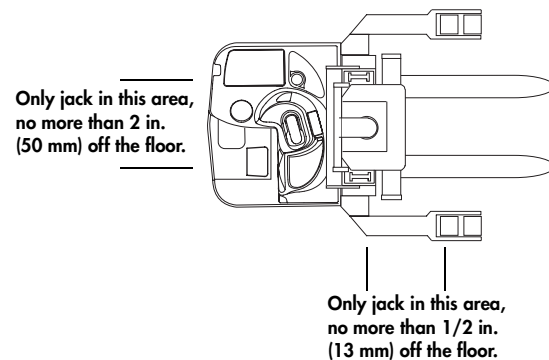


Figure 2-3: Correct Jacking Locations

Tie-down for Transport

Tie-down for Transport

To transport your Toyota lift truck in an over-the-road vehicle or rail car, follow these steps:

1. Lower the forks and locate the lift truck in the center of the transport vehicle.
2. Using a suitable lifting device, remove the battery. See "Battery Safety" on page 2-7.
3. Position the adjustable chain over and through the battery compartment.
4. Position an additional adjustable chain over and through the battery compartment.
5. Position the chain ends of one chain toward the front of the vehicle bed and the chain ends of the other chain to the back of the vehicle bed and draw taut.

NOTE: This will secure the lift truck to the vehicle bed and prevent tip-over and forward or backward movement.

6. Secure the battery according to the battery manufacturer's instructions.

Welding Safety

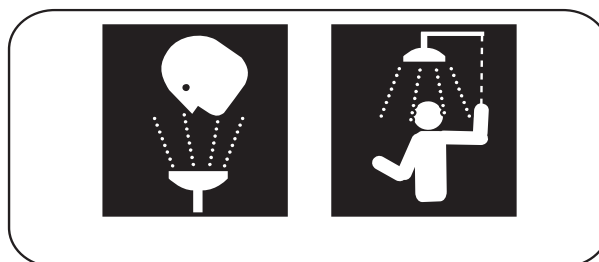
⚠ WARNING

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.

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

Before working on this lift truck, make sure that:

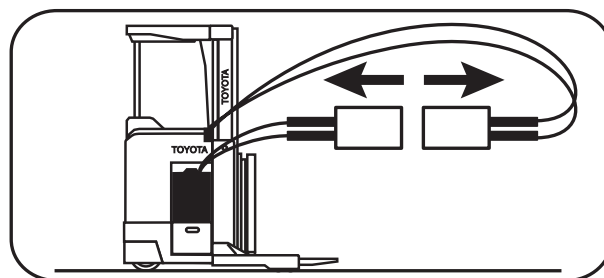
- Fire protection equipment is nearby.
- You know where the nearest eyewash station is.



⚠ CAUTION

Disconnect the battery before you attempt to inspect, service or repair the lift truck.

- Check for shorts to frame as described in "Shorts to Frame Test" on page 5-4. If any shorts are detected, remove them before you proceed with the welding operation.
- Clean the area to be welded.
- Protect all lift truck components from heat, weld spatter and debris.
- Attach the ground cable as close to the weld area as possible.



Welding Safety

- Disconnect all electrical cards before any type of electric resistance welding is done.
- Do not perform any welding operations near the electrical components.
- If welding must be done near the battery compartment, remove the battery from the lift truck.
- When you are finished welding, perform all ground tests and electrical inspections before the vehicle is operated.

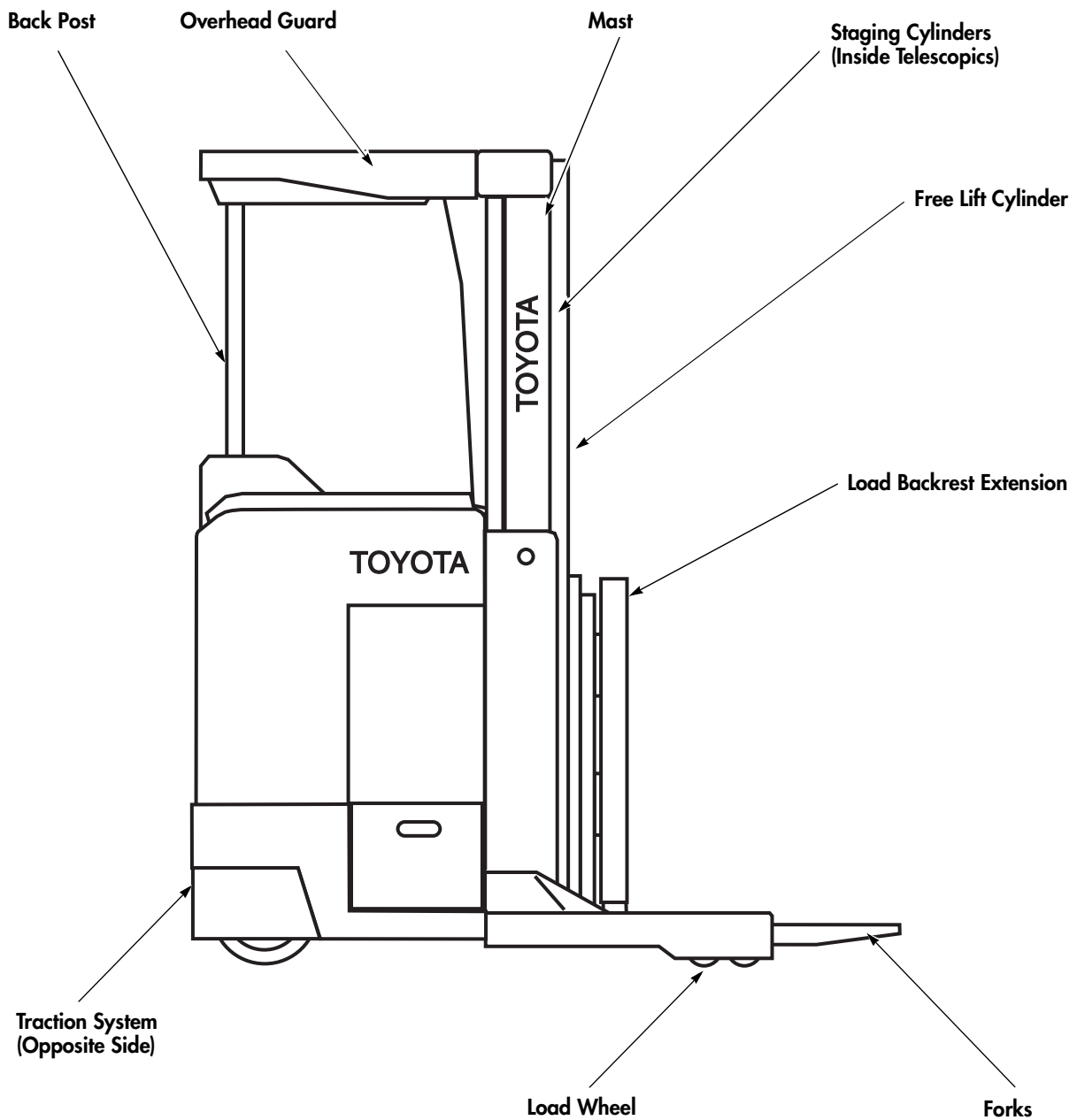
Systems Overview

Vehicle Specifications

Vehicle Specifications

Category		Single Deep Reach			Double Deep Reach		Straddle				
Unless otherwise noted, all dimensions are in inches.											
Model Designation		7BRU18		7BRU23		7BDRU15		7BSU20		7BSU25	
Max. Load Capacity (w/41 in. BLO)		3500 lb. to 270 in.		4500 lb. to 270 in. 3500 lb. to 330 in.		3000 lb. to 300 in. 2700 lb. to 330 in.		4000 lb. to 270 in.		5000 lb. to 270 in.	
Lift Height, Max. (EH)		270 in.		330 in. (B) 360 in. (C)				270 in.		330 in. (B) 360 in. (C)	
Lift Speed	Loaded	40 fpm	60 fpm	60 fpm				40 fpm	60 fpm	60 fpm	
	Empty	60 fpm	80 fpm	95 fpm				60 fpm	80 fpm	95 fpm	
Lowering Speed	Loaded	80 fpm	80 fpm	95 fpm				80 fpm		95 fpm	
	Empty	80 fpm	80 fpm	90 fpm				80 fpm		90 fpm	
Reach/Retract Speed (seconds)	Loaded	5.0	4.5	4.0		5.0		n/a			
	Empty	4.0	3.5	3.0		4.0		n/a			
Travel Speed (mph)	Loaded	5.5	6.0	6.8 <300 in. 6.0 >300 in.				5.5	6.0	6.8 <300 in. 6.0 >300 in.	
	Empty	6.0	6.5	6.8 <300 in. 6.5 >300 in.				6.0	6.5	6.8 <300 in. 6.5 >300 in.	
Acceleration, Empty (max. seconds)		5.5	5.3	5.0				5.5	5.3	5.0	
Overall Length (without Forks)		70.5 (A) 72.5 (B)	72.5	75.0 (B) 79.5 (C)				72.5 (A) 74.5 (B)	74.5	77.0 (B) 81.5 (C)	
Base Leg Opening (inside)		32 - 50 in.									
Reach Distance (in.)		23	23	22		39.7		n/a			
Battery Compartment (in.)		14.4 or 16.4	16.4	16.4 or 21				14.4 or 16.4	16.4	16.4 or 21	
Battery Voltage		24	36				24	36			
Min. Battery Weight		1600 lb.	2000 lb.	2600 lb. ≥330 2400 lb. <330		2000 lb. (B) 2600 lb. (C)		1600 lb.	2000 lb.	2000 lb. (B) 2400 lb. (C)	
*A = 14.4 in. Battery Compartment B = 16.4 in. Battery Compartment C = 21 in. Battery Compartment											

General System Data



Brake

Brake

The braking system meets all requirements of ASME B56.1 and is the recommended system for stopping the vehicle in an emergency. Plugging is the recommended procedure for stopping the lift truck under normal operating conditions. The brake assembly is mounted on top of the drive motor. The brake assembly consists of a rotor mounted on the drive motor armature shaft and a stationary friction disc. The brake is electrically applied and released.

Steering

The steering system consists of the following:

- steering wheel
- electric steer tach
- electric steer controller
- electric steer motor

The electric steer controller supplies electrical voltage for the steering system. The electric steering motor receives direction commands from the operator through steering wheel turns. The electric steer motor turns the drive unit. The steer tach monitors rotation of the steering wheel, sending + or - voltage to the steer controller.

Lift/Lower System

All inputs and outputs related to the lift/lower system are controlled by the Display card. The Display card determines what actions are required based on inputs from the operator and from system feedback.

As VR2 is moved by the operator, a voltage, proportional to the position of the control, is sent through the Tractor Interface card to the Display card where it is processed.

When the Lift/Lower control is moved to lift, voltage from VR2 increases; when it is moved to lower, the voltage from VR2 decreases. As the lift/lower control is moved, VR2 voltage is sensed by the Tractor Interface card. This data is then transmitted to the Display card, which determines whether to lift or lower. This is

accomplished by the Display card comparing the present voltage to the learned voltage value.

Remember that the neutral value for VR2 is learned and stored for future reference by the Display card during Calibrate mode.

Unique Lift/Lower System Features

All coils used for the lift/lower system are 24V, even on 36V lift trucks. This is accomplished by the Display card pulsing the appropriate coil driver located on the Tractor Interface card. If a lift truck is 36V, the coil driver will be pulsed at a rate of 66% ($66\% \times 36V = 24V$).

The Display card monitors lift pump motor rotation (back EMF) at JP8-9. If the control is moved from lift to lower, the Display card will not allow the carriage to lower until the lift pump motor has stopped. This allows smooth, controlled movement of the carriage without a "bump". The length of the delay will depend on the oil viscosity, pump/motor tightness, temperature, and the load on the carriage.

Auxiliary System

The auxiliary system consists of auxiliary controls and cylinder(s) for reach/retract, sideshift or tilt. The lift/lower and auxiliary systems share the same reservoir, motor and pump.

Reach/Retract

Reach extends the forks away from the mast assembly when the reach button on the multi-function control handle is depressed. Inputs for reach are received by the Tractor Interface card at JP10-1.

Retract moves the forks toward the mast assembly when the retract button on the multi-function control handle is depressed. Inputs for retract are received by the Tractor Interface card at JP10-2.

If the lift truck is configured for two speed reach and retract, the sequence in which the Reach/Retract buttons are depressed determines the

speed and direction the reach mechanism travels.

- Depressing and holding the Reach button, then depressing the Retract button activates high speed reach.
- Depressing and holding the Retract button, then pressing the Reach button activates high speed retract.

Display card, which determines the desired direction of travel. This is accomplished by the Display card comparing the present voltage to the learned voltage value.

Remember that the neutral value for VR1 is learned and stored for future reference by the Display card during Calibrate mode.

Sideshift

Sideshift allows the operator to move the fork carriage to the left or right in relation to the mast. The amount of sideshift will be 2 or 4 in. (5 or 10 cm) in either direction depending on the Base Leg Opening (BLO). Inputs for sideshift right are received by the Tractor Interface card at JP10-3. Inputs for sideshift left are received by the Tractor Interface card at JP10-4.

Fork Tilt

Fork tilt allows the operator to raise or lower the tips of the forks. Standard fork tilt is 5° up and 2° down. Inputs for fork tilt up are received by the Tractor Interface card at JP10-5. Inputs for fork tilt down are received by the Tractor Interface card at JP10-6.

Traction System

All inputs and outputs related to the traction system are controlled by the Display card. The Display card determines what actions are required based on inputs from the operator and from system feedback.

As VR1 is moved by the operator, a voltage, proportional to the position of the control, is sent through the Tractor Interface card to the Display card where it is processed.

When the directional/speed control handle is moved in the forward direction (away from the operator), voltage from VR1 increases; when it is moved in the reverse direction (toward the operator), the voltage from VR1 decreases. As the directional/speed control handle is moved, VR1 voltage is sensed by the Tractor Interface card. This data is then transmitted to the

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