



# **SERVICE MANUAL**

## **Stand-Up End-Control Lift Truck**

**Models: 7BNCU15**  
**7BNCU18**  
**7BNCU20**  
**7BNCU25**

**Serial No. 50,001 and up**

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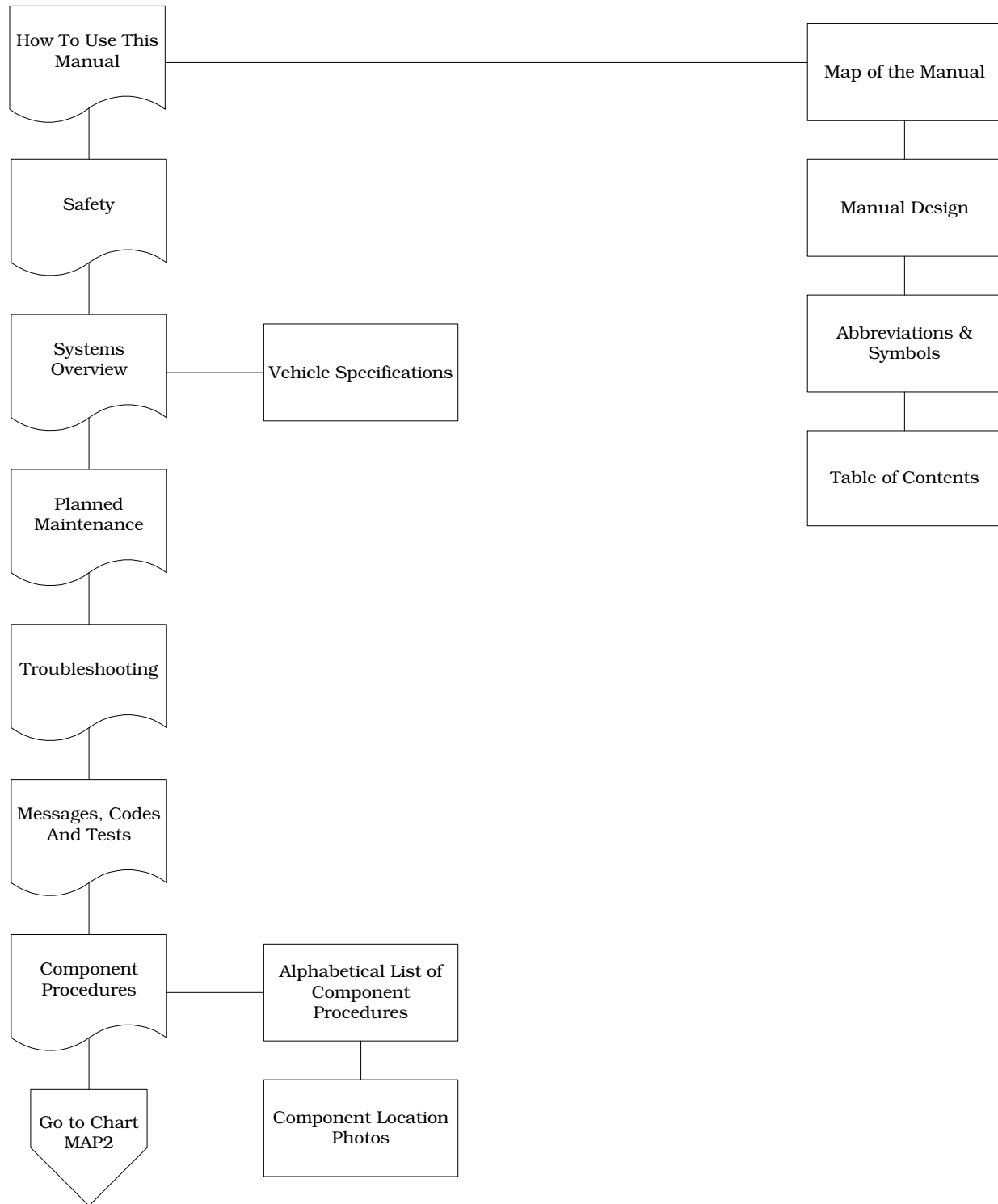
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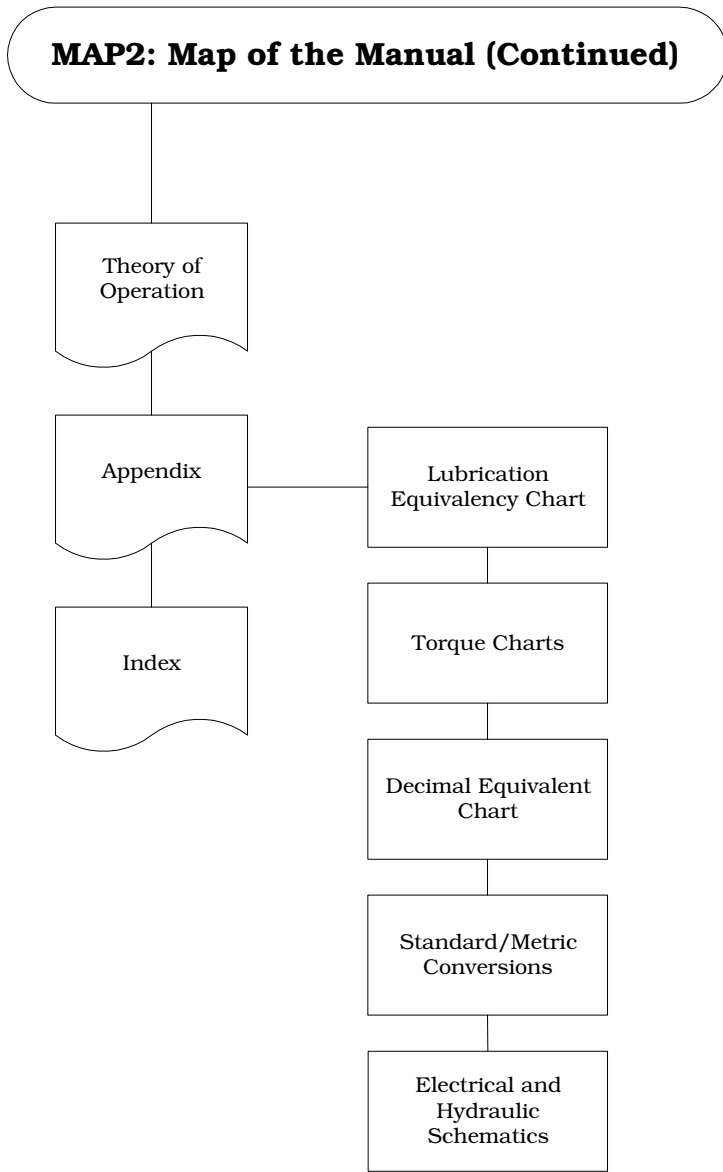
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# How to Use This Manual

Map of the Manual

# Map of the Manual





## Manual Design

## Manual Design

This 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:

- Name of the manual  
(*Toyota Stand-Up End Control Service Manual*)
- Current Chapter Title  
(for example; *How to Use This Manual*)
- Current topic  
(for example; *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 proper chapter.

- **How to Use This Manual** explains the format and design of the manual as well as abbreviations and symbols used within the manual.
- **Safety** explains warning and caution notes, general safety rules and safety rules for batteries, static, jacking, and welding.
- **Systems Overview** includes lift truck specifications and theory of operation information.
- **Planned Maintenance** outlines the recommended schedule of preventive services to keep your lift truck working most efficiently.
- **Troubleshooting** is designed to take you from a symptom to a specific sequence of tests in order to isolate a failing component.
- **Messages, Codes, and Tests** lists the electrical fault codes and procedures for running firmware electrical tests.

- **Component Procedures** gives step-by-step procedures for testing, removal, installation, and adjustment of individual truck components. Components are grouped by truck system.

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

- Look up the component name in the **List of Component Procedures**.
- Find the component in the **Component Locator Photos**.
- Look up the component name in the **Index**.
- **Theory of Operation** explains signal flow within the hydraulic and electrical schematics for various conditions of lift truck operation.
- **Appendix** contains reference information such as torque values, lubricants, standard/metric conversions, and electrical and hydraulic schematics.
- **Index** lists subjects alphabetically.



## Abbreviations & Symbols

These abbreviations, acronyms, and symbols are used in this manual.

<b>Term/Symbol</b>	<b>Definition</b>	<b>Term/Symbol</b>	<b>Definition</b>
A	ampere	lb.	pound, pounds
approx	approximately	LED	Light Emitting Diode
amp	ampere or amplifier	LPC	Lift Power Control
aux	auxiliary		
AWG	American Wire Gauge	mA	milliamperere
		max	maximum
BDI	Battery Discharge Indicator	min	minute or minimum
BSOC	battery state-of-charge	mm	millimeter
BWI	Brush Wear Indicator	mph	miles per hour
CAN	Controller Area Network	NV	non-volatile
cm	centimeter	Nm	newton meter
COP	Computer Operating Program		
		OACH	Overall Collapsed Height
dia.	diameter	ODI	Operator Display Interface
DGND	Digital Ground	OSHA	Occupational Safety and Health Association
DVM	Digital Volt Meter	oz.	ounce
EE	UL Electric Truck Type Certification Rating where electrical equipment is completely enclosed	PC	personal computer
		psi	pounds per square inch
EPO	Emergency Power Off	PWM	pulse width modulation
ESD	Electrostatic Discharge	P/N	part number
ft.	foot	RAM	random access memory
		ROM	read only memory
		Regen	regenerative braking
gal.	gallon or gallons	SAE	Society of Automotive Engineers
gm	gram		
Gnd	ground	SG	Specific Gravity
		SOL	solenoid
HD	hours on deadman	spec	specification
Ht.	height	STR	Steer Contactor
in.	inch, inches		
kg	kilogram(s)	TPC	Traction Power Control
km/h	kilometers per hour		
kPa	kilo Pascal	UL	Underwriter's Laboratories

## Abbreviations &amp; Symbols

<b>Term/Symbol</b>	<b>Definition</b>
V	volt
VDC	volts direct current
wrt	with respect to
w/	with
w/o	without
@	at
™	trademark
©	copyright
®	registered
+	plus or positive
-	minus or negative
±	plus or minus
°	degrees
°F	degrees Fahrenheit
°C	degrees Celsius
<	less than
>	greater than
%	percent
=	equals

# Safety

## Definitions

## Definitions

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

### **▲WARNING**

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

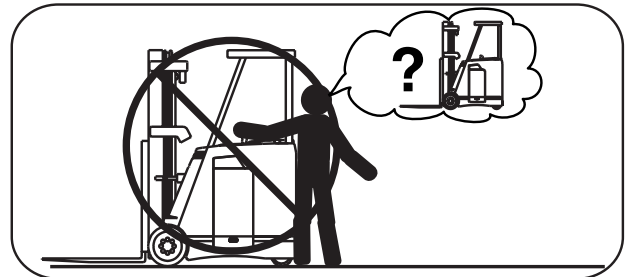
### **▲CAUTION**

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

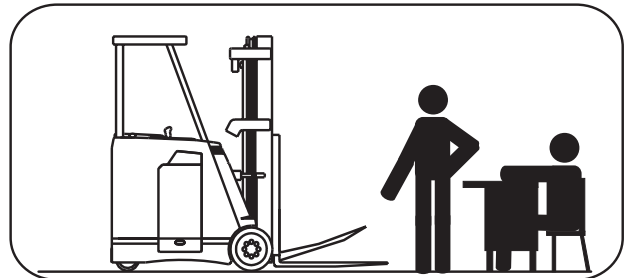
## General Safety

*Do not* operate or work on this truck unless you have reviewed the Operator's Manual (Publication No. 00700-AUCL1-2) and are trained, qualified, and authorized to do so.

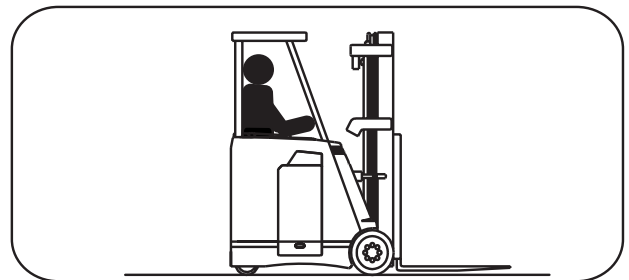
Know the truck's controls and what they do.



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

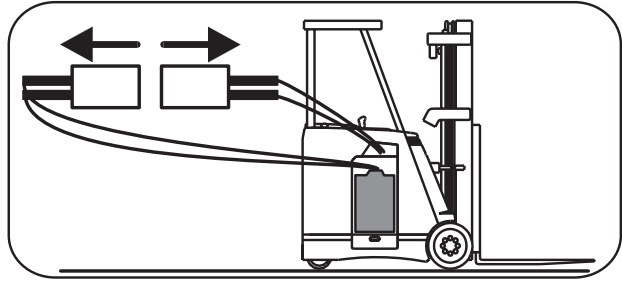


Operate this truck only from the operator's compartment.

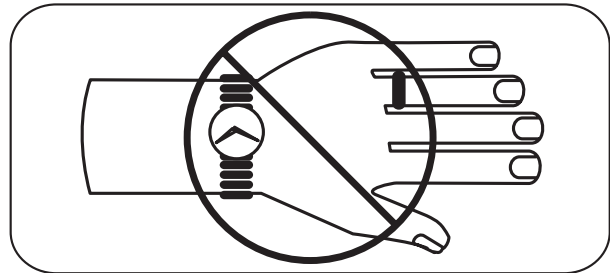


## General Safety

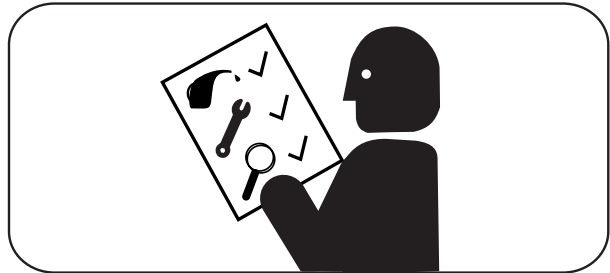
Before working on this truck, *always* turn the key switch to OFF and disconnect the truck's battery connector (unless this manual tells you otherwise).



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

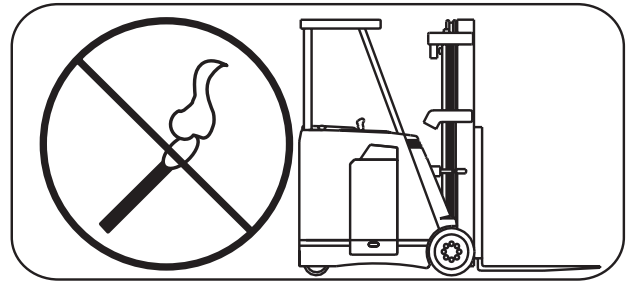


Follow the scheduled lubrication, maintenance, and inspection steps.



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

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

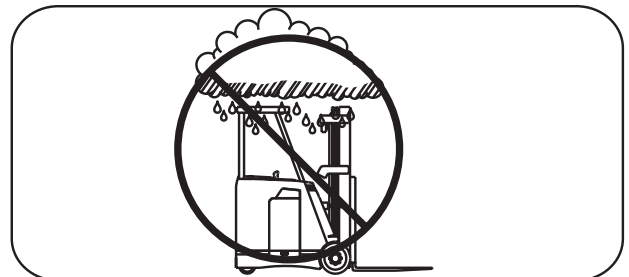


*Do not* use gasoline or other flammable liquids for cleaning parts.

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



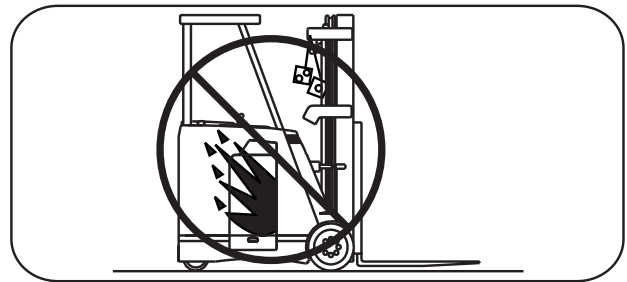
Use and park this truck indoors. *Do not* operate outdoors (except for dock or ramp operation, if permitted).



## General Safety

*Do not wash this truck with a hose. Do not steam clean inside compartments.*

*Do not add to or modify this truck without written approval from Toyota. Refer to the Standards Compliance section of the Operator's Manual (Publication No. 00700-AUCL1-2).*





# Battery Safety

Before working on or near a battery, review the general safety rules. Always follow these safety rules.

See the battery manufacturer’s instruction manual for specific instructions on battery maintenance. The instructions found there take precedence over the instructions found in this truck manual.

## Size and Type

When you install a battery in this truck, make sure that it is the correct size and voltage.

### **▲WARNING**

**Do not install a battery that weighs less than the recommended minimum weight. This could affect the truck’s stability.**

The truck’s specification plate gives you important information about the battery used in this truck. See Figure 2-1.

The following list explains the numbered items in the figure:

1. Truck weight without battery (pounds/kilograms)
2. Truck voltage
3. Minimum/maximum allowable weight of battery (pounds/kilograms)
4. Maximum rating of battery (amp-hours)

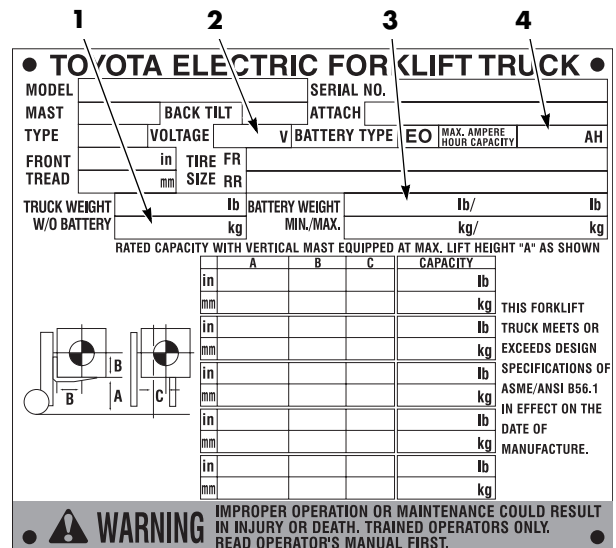


Figure 2-1: Truck Specification Plate

## Battery Safety

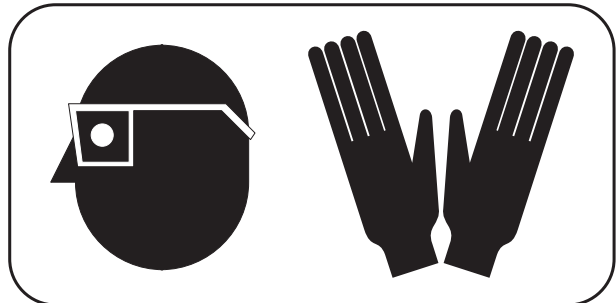
**⚠ WARNING**

**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.**

**⚠ CAUTION**

**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.**

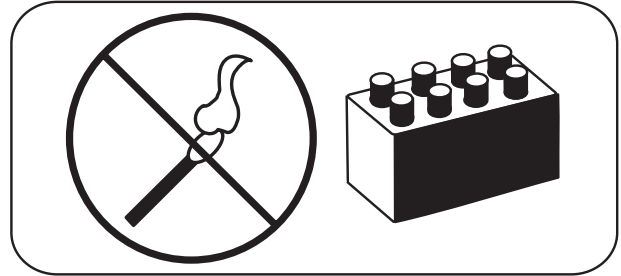
Wear personal protective equipment to protect eyes, face, and skin when checking, handling, or filling batteries. This equipment includes goggles or face shield, rubber gloves (with or without arm shields), and a rubber apron.



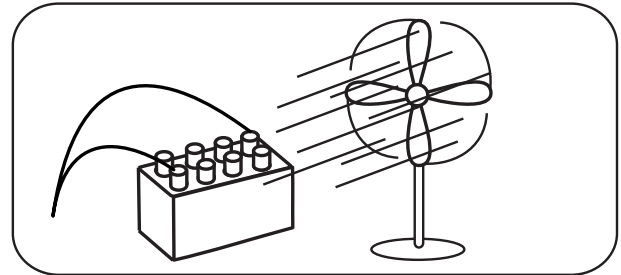
Make sure a shower and eyewash station are nearby in case of an accident.



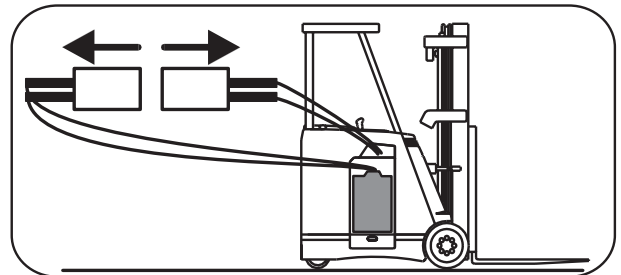
A battery gives off explosive gases. *Never* smoke, use an open flame, or use anything that gives off sparks near a battery.



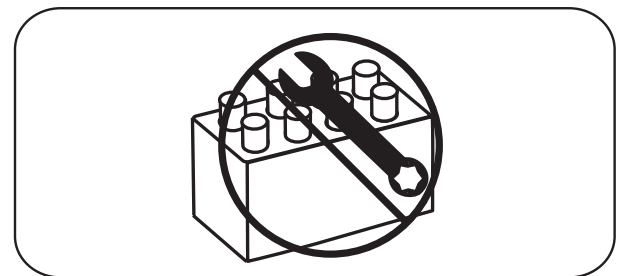
Keep the charging area well-ventilated to avoid hydrogen gas concentration.



Disconnect the battery from the truck at the battery connector, after turning the key switch OFF. 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.

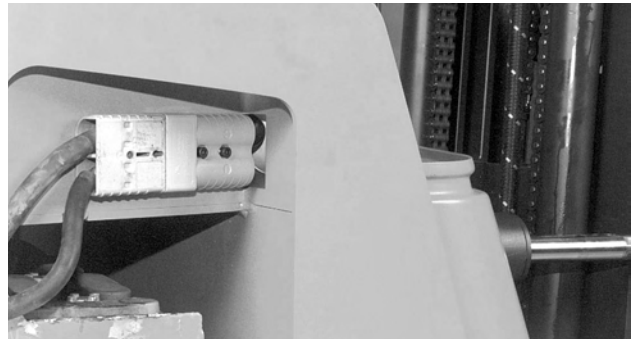


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**Battery Safety**

Keep batteries clean. Corrosion causes shorts to the frame.

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



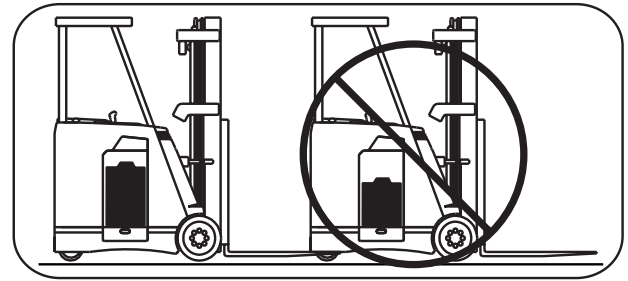
Keep filler plugs firmly in place at all times *except* when the electrolyte level is checked, when water is added to the cells, or when the specific gravity is checked.

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

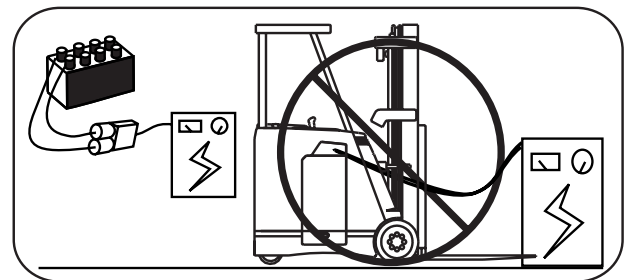


Do not allow cleaning solution, dirt, or any foreign matter to enter the cells.

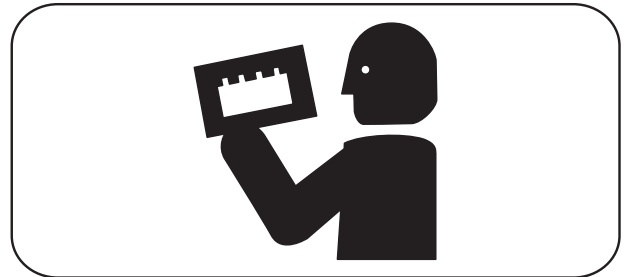
Make sure that the battery you are installing in this truck is the correct size. A smaller or lighter weight battery could seriously affect truck stability. See the truck's specification plate for more information.



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



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



## Static Precautions

## Static Precautions

Electronic circuit boards and devices used on this 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 (plastic bags, synthetic clothing, synthetic soles on shoes, 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 use static discharge precautions.

1. Place a static discharge wrist strap around your wrist. Connect the ground lead to the wrist strap connector. The wrist strap should be equipped with a 1 megohm resistor to protect against shock hazard.
2. Connect the ground plug to the ESD ground jack on the lift truck. The ESD ground jack is located on the tractor frame near the steer tiller. If you cannot use the ground jack, connect the ground clamp to an unpainted, grounded surface on the lift truck frame.
3. Handle circuit boards by edges only. Avoid touching edge connectors.
4. If you will be removing or installing static-sensitive components, place them on a properly grounded static mat.
5. To transport static sensitive components, including failed components being returned, place the components in an antistatic bag or box (available from your Dealer).

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



Figure 2-2: Anti-Static Ground Jack

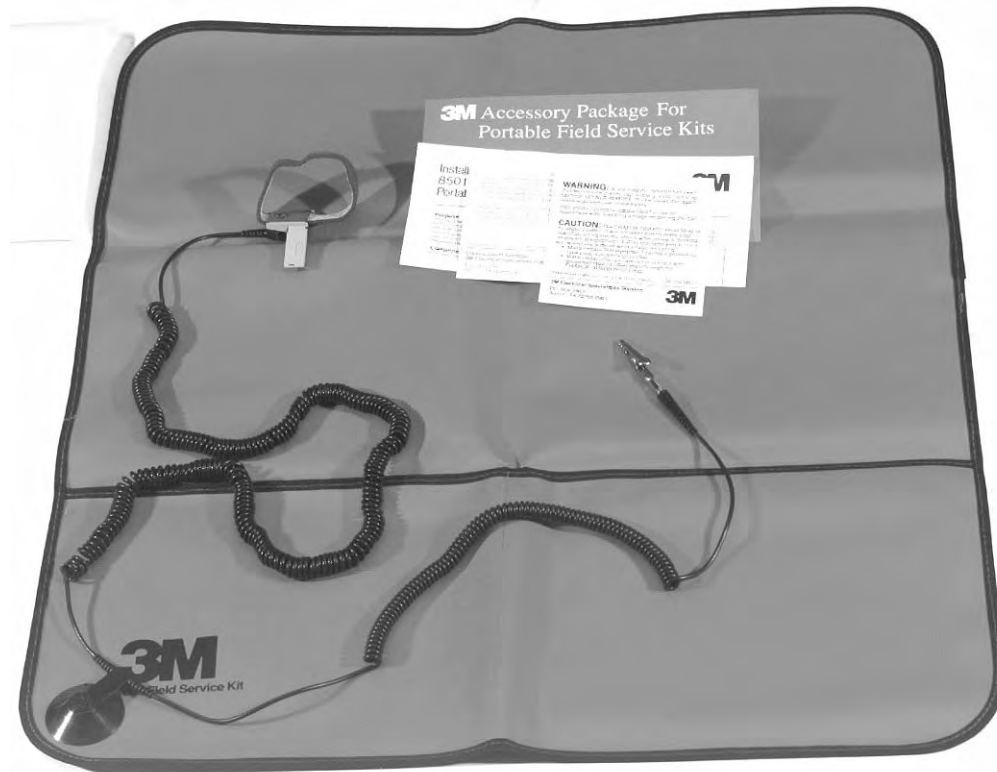


Figure 2-3: Anti-Static Kit (P/N 00590-04849-71) with Wrist Strap and Mat

Figure 2-3 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 the 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 Toyota dealer for information.

## Jacking Safety

## Jacking Safety

Sometimes you may need to jack the truck off the floor to perform maintenance procedures. When doing so, observe the proper safety precautions:

1. Lower the carriage and forks completely to the floor. Remove any load.
2. Place all controls in neutral.
3. Block the wheels to reduce the risk of movement of the vehicle.
4. Disconnect battery connector.
5. Place the jack under the designated jacking points. See Figures 2-4 and 2-5.

### **⚠ WARNING**

**Use extreme care whenever the truck is jacked up. Never block the truck between the telescopic and the floor. Keep hands and feet clear from vehicle while jacking the truck. After the truck is jacked, place solid blocks beneath it to support it. DO NOT rely on the jack alone to support the truck.**

6. To jack the drive wheel: Place the jack in the designated jacking position. See Figure 2-4. Jack the truck up just high enough to raise the drive wheel off the floor. Place a block under the frame as shown.
7. To jack the tractor: Place the jack in the designated jacking position near the steerable wheel. See Figure 2-5. Jack the truck so that the steerable wheel is off the floor no more than 1 in. (25.4 mm). Block under the frame as shown.

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

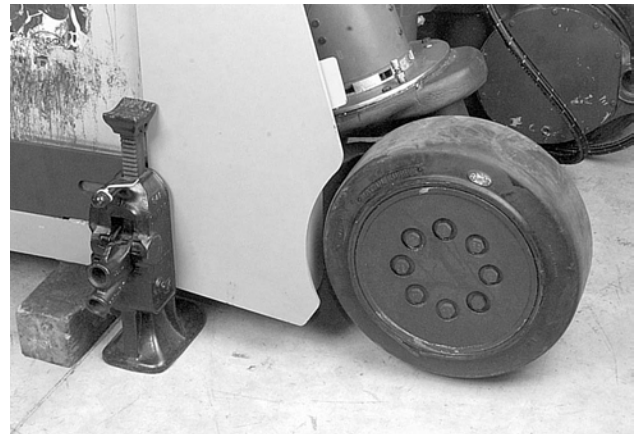


Figure 2-4: Jacking Drive Wheel

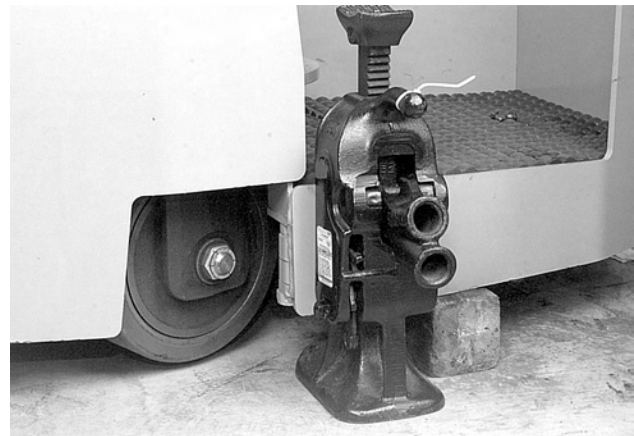


Figure 2-5: Jacking Tractor



## Towing

To safely tow this lift truck:

1. Lower the carriage and remove any load from the forks.
2. Turn the key switch OFF and disconnect the battery connector.
3. Install the brake release bolts.
4. Using a suitable towing vehicle, lift the truck until the steer tire is no more than 1 in. (25.4 mm) off the floor.
5. Tow the truck slowly in the tractor-first direction.

### **⚠ WARNING**

**When towing is complete, make sure to remove the brake release bolts. Failure to do so could cause serious injury.**

## Welding Safety

**Welding Safety****▲ CAUTION**

**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. Perform flame cutting and/or welding operations in well ventilated areas. Use local exhaust if necessary.**

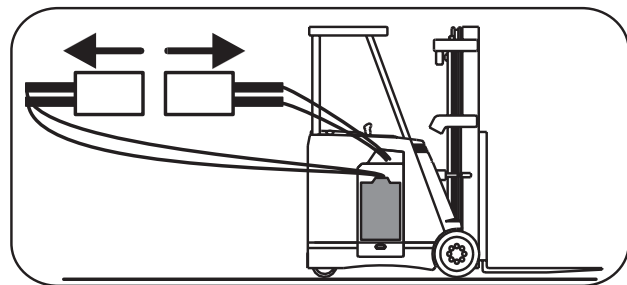
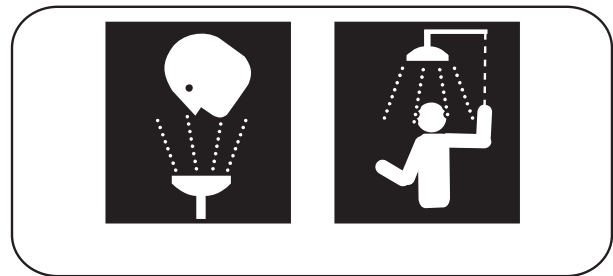
Before working on this truck, make sure that:

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

**▲ CAUTION**

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

- Check for shorts to frame as described on page 5-15. If any shorts are detected, remove them before you proceed with the welding operation.
- Clean the area to be welded.
- Remove Interface Card, Translator Card, and power amplifiers from the lift truck.
- 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.
- Remove battery from truck if welding must be done near the battery compartment.



# **Systems Overview**

Lift Truck Dimensions and Specifications

# Lift Truck Dimensions and Specifications

This lift truck is rated for performance by load center and load weight.

Review the specification plate located in the battery compartment for detailed load capacity and load center information.

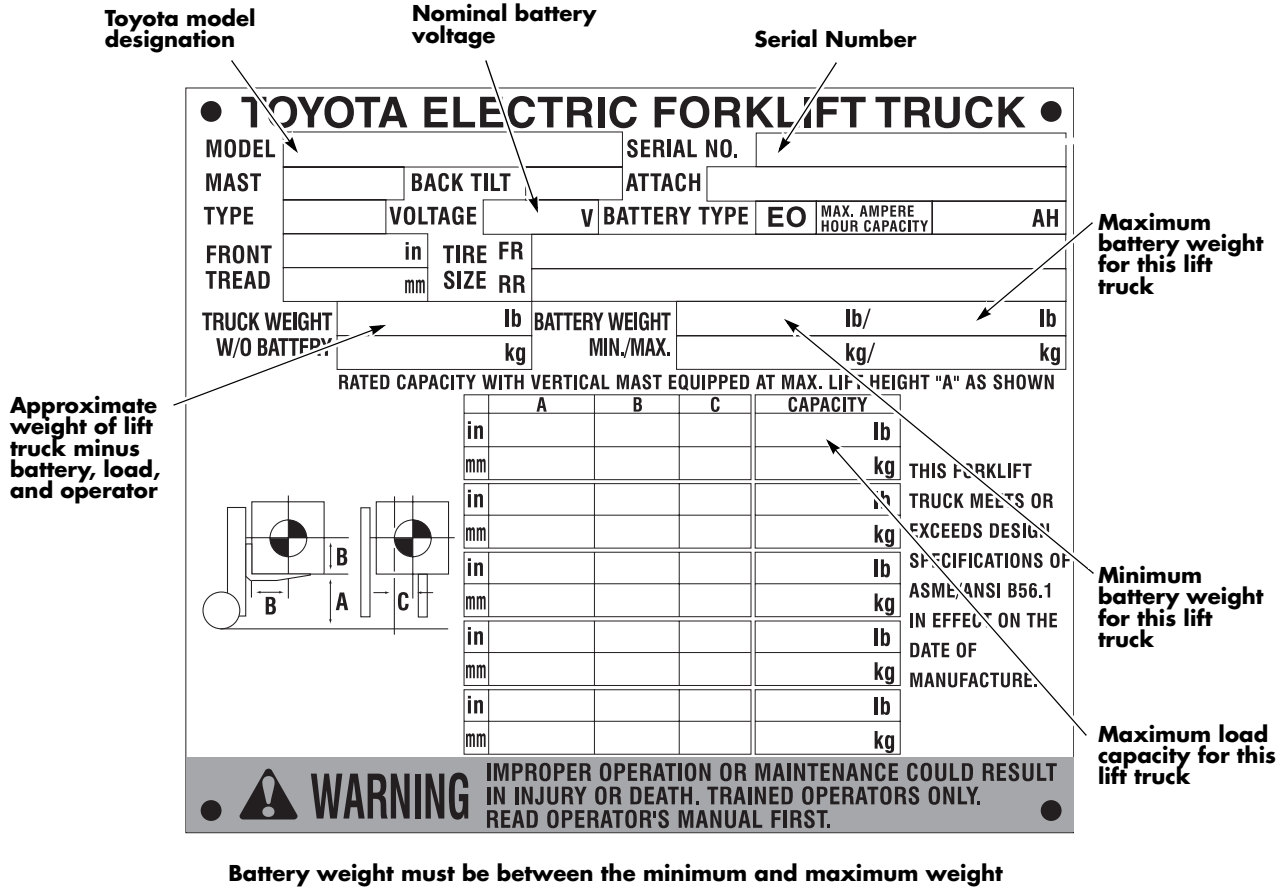


Figure 3-1: Lift Truck Specification Plate

For basic dimensions, see Table 3-1, Lift Truck Dimensions and Specifications on page 3-3.

## Lift Truck Dimensions and Specifications

Table 3-1: Lift Truck Dimensions and Specifications

Category	Model			
	7BNCU15	7BNCU18	7BNCU20	7BNCU25
Max Load @ 24 in. (610 mm) Load Center	3000 lb. (1361 kg)	3500 lb. (1588 kg)	4000 lb. (1814 kg)	5000 lb. (2268 kg)
Overall Collapsed Height* (OACH)	83 - 107 in. (2108 - 2716 mm)			
Elevated Height*	127 to 258 in. (3226 to 6553 mm)			123 to 251 in. (3124 to 6375 mm)
Extended Height w/Load Backrest*	175 to 306 in. (4445 to 7772 mm)			175 to 299 in. (4445 to 7594 mm)
Truck Wheelbase	50.3 in. (1280 mm)		53.1 in. (1349 mm)	55.6 in. (1412 mm)
Truck Head Length w/o Sideshift*	68.5 in. (1740 mm)		71.2 in. (1808 mm)	73.7 in. (1872 mm)
Truck Head Length w/Sideshift	70.9 in. (1801 mm)		73.6 in. (1869 mm)	76.1 in. (1933 mm)
Battery Compartment	39.6 x 18.5 x 32.3 in. (1007 x 470 x 820 mm)		39.6 x 21.25 x 32.3 in. (1007 x 540 x 820 mm)	39.6 x 23.75 x 32.3 in. (1007 x 603 x 820 mm)
Battery Voltage	36V			
Minimum Battery Weight	2300 lb. (1044 kg)		2600 lb. (1180 kg)	2700 lb. (1226 kg)
*Specifications will vary according to mast type				

## General System Data

## General System Data

### Modes of Operation

There are four different modes of operation for this lift truck:

- Performance Selection Mode
- Configure Mode
- Maintenance Mode
- Learn Mode

To select a mode, enter the correct password (see page 3-5 for instructions on entering a password).

### Performance Selection Mode

Entering Performance Selection Mode will allow the operator or supervisor to choose between four different performance modes. Each performance mode can be configured and stored for use in different types of applications. Use the MODE button on the operator display to view the mode being used. Pressing the MODE button will cycle through all four performance modes.

Configurable settings in Performance Selection Mode include maximum forward and reverse speeds, acceleration strength and coast distances. To configure each mode individually, use the operator display to enter Configure Mode and select Mode #1, Mode #2, Mode #3, or Mode #4.

### Configure Mode

Entering the Configuration Password lets you access the lift truck's Configure Mode.

This mode lets you enter the lift truck's software and change the lift truck's performance limits.

Use the Configure Mode Chart on page 3-6 to see which items you can change and the selections that are available.

### Maintenance Mode

This mode lets you test a circuit in the lift truck while the lift truck is stationary.

You cannot operate the lift truck while it is in Maintenance Mode.

## **WARNING**

### Before placing the lift truck in Maintenance Mode:

- 1. Jack the lift truck so that the drive tires are off the floor.**
- 2. Make sure the controls are in neutral.**
- 3. Make sure the lift truck is blocked to keep it from moving.**
- 4. Lower the forks all the way to the floor.**

See Maintenance Mode on page 3-11.

### Learn Mode

You can select Learn Mode after entering Maintenance Mode.

Learn Mode lets you re-calibrate the lift truck's control handle. You would enter Learn Mode and perform the instructions that are shown on the operator display if you replace any of these components:

- Interface Card
- Control Handle
- Firmware

**NOTE:** The lift truck automatically asks the technician to perform Learn on initial power-up. It does not need to be run again.



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