

INTRODUCTION

THE EQUIPMENT

The TOYOTA 6BNCU15 - 30 and 6BVNCU13 lift trucks represent the next generation in electric, stand-up, counterbalance lift trucks. The weakest link in the design of a lift truck has traditionally been in the mechanical systems. These lift trucks have been designed to utilize leading-edge technology and reduce mechanical complexity. Through the use of advanced electronics and hydraulics, the mechanical systems have been reduced and reliability increased. Gone are the complicated linkages and cam systems previously used and in their place are electronic components which react to the touch of the operator. This eliminates the need for constant adjustments that affect the operation of the lift truck.

The advanced design also allows TOYOTA to present the most user friendly lift truck in the industry. Featuring the Ergonomically Advanced Control Handle, the controls are logically laid out and easy to use. Powered with integrated controls, performance characteristics may be

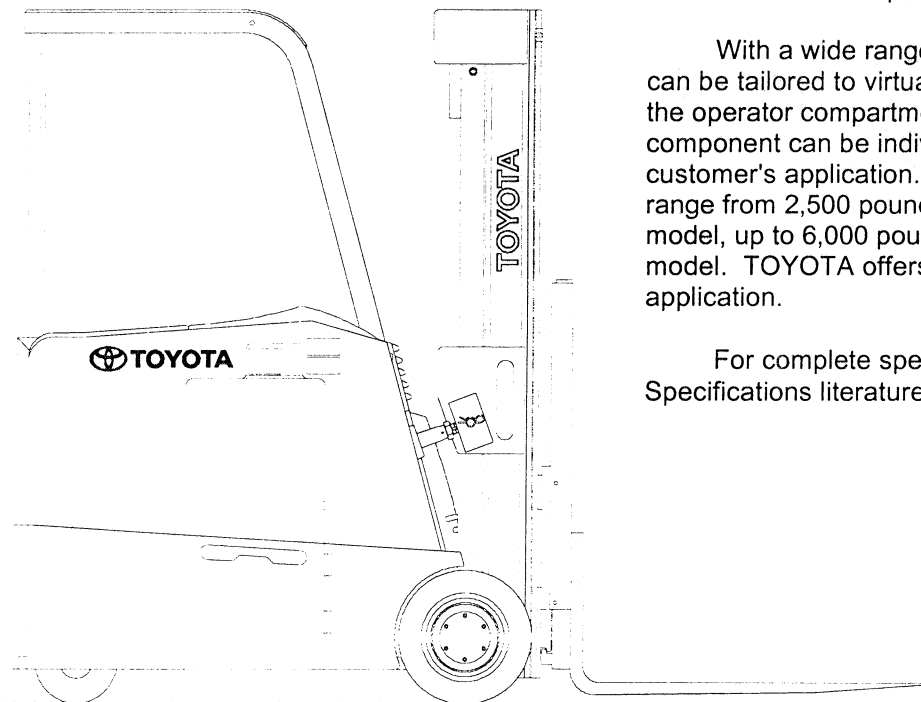
adjusted to suit application/operator needs. The comprehensive operator display enhances awareness and safety. The operator compartment is large and well padded for increased operator comfort. These lift trucks also offers exceptional visibility for improved safety and productivity.

Maneuverability is a hallmark of these lift trucks. The three-wheeled design and standard power steering allow them to be operated in tight spaces. The Electronic Traction Control system operates each of the drive wheels independently to further enhance the maneuverability of the unit. With the power to negotiate ramps up to 15% grade, yet with the precision to control the travel speed from a creep to full speed in an infinite range, these lift trucks are the leader in material handling equipment.

The lift truck has a built-in Power-On Self Test and run-time diagnostics for precise problem identification and reduced mean-time-to-repair. Built-in periodic maintenance interval warnings, calibration means, and diagnostic input and output tests also aid the service technician in maintenance and repair.

With a wide range of options, the lift truck can be tailored to virtually any application. From the operator compartment to the mast, each component can be individually selected to fit your customer's application. Nominal lifting capacities range from 2,500 pounds on the 6BVNCU13 model, up to 6,000 pounds on the 6BNCU30 model. TOYOTA offers a truck for every application.

For complete specifications refer to the Specifications literature.



ABOUT THIS MANUAL

CAUTIONARY STATEMENTS

Throughout this manual you will note a variety of warnings. Each one has a specific purpose, whether to make the procedure easier or to prevent injury to the service person or damage to the lift truck. The three that are consistently used are: "**NOTE**", "**CAUTION**", and "**WARNING**". Review the following descriptions of each of the warnings since they will aid you in performing the procedures properly and safely.

WARNING

A warning denotes a serious hazard which could cause injury or death to either the operator or service personnel. It may refer to either the operation of the unit or a particular service procedure. A warning note always precedes the procedure or step posing the threat. Whenever a warning note is present, you are advised to fully review the complete procedure to assure adequate precautions are taken or proper tools are available to make the procedure as safe as possible.

CAUTION

A caution denotes a less serious hazard which could cause less serious injury to the operator or damage to the lift truck. A caution will always precede the procedure or step that poses the threat. Whenever a caution is present, you are advised to fully review the complete

procedure to assure adequate precautions are taken or that the proper tools are available to maintain the safety of the people involved and the equipment.

NOTE

A note is a statement pertaining to a step or procedure. Notes are designed to alert you to obscure or hidden facts about a particular system. They are used to assist you in efficiently and effectively servicing the lift truck.

TOYOTA cannot foresee all circumstances that may involve potential hazards; therefore, the warnings, cautions, and notes in this Service Manual and on the lift truck are not all inclusive. TOYOTA does not endorse the use of any procedure, tool, or work method not specifically recommended by TOYOTA.

If you should ever have any questions regarding service, or if your lift truck requires service, contact your authorized TOYOTA dealer.

All information, specifications, and illustrations in this manual are based on the latest available data at the time of publication. TOYOTA is constantly striving to improve its products, and therefore reserves the right to change design, materials, and/or specifications without notice and without incurring obligation or liability.

SERVICE PRECAUTIONS

GENERAL MAINTENANCE INSTRUCTIONS

Industrial lift trucks may become hazardous if adequate maintenance is neglected. Only trained technicians, using approved procedures, in adequate maintenance facilities should work on this or any lift truck.

- Follow a scheduled lubrication, maintenance, and inspection schedule.
- Only qualified, authorized technicians are permitted to inspect, maintain, adjust, and repair the lift truck.

WARNING

Before working on this vehicle:

- Remove rings, watches, and all jewelry.
- Lower the carriage completely to the floor.
- All controls must be in neutral and the brake applied.
- Release any trapped pressure in the steering or lift and auxiliary hydraulic system.
- Block the wheels to prevent movement of the vehicle.
- Disconnect the battery and discharge the capacitor bank (refer to the ELECTRICAL section in MAINTENANCE).
- Elevate the drive wheels off the floor. Use extreme care whenever the truck is jacked up for any reason. Keep hands and feet clear from beneath the vehicle while jacking. Use jack stands or solid blocks to support the truck - do not rely on jacks. Refer to the GENERAL section in MAINTENANCE for instructions on how to jack this vehicle.

WARNING

Before working on the mast, use a suitable hoist to prevent movement.

- After working on the vehicle, test all controls and functions to assure proper operation.
- Work in a clean, dry, well-ventilated area.

- Avoid fire hazards. Have adequate fire-fighting equipment in the maintenance area.
- **DO NOT** use open flame or sparking devices around the battery. The gasses given off by the battery are explosive. Refer to APPENDIX A: INDUSTRIAL BATTERY and the battery manufacturer for specific warnings and instructions about the battery.
- Use extreme caution when using flammable cleaning solutions.

More information pertaining to operating and maintenance procedures may be obtained from:

American National Standards Institute
1430 Broadway
New York, NY 10018

Ask for ANSI B56.1 - 1988

ELECTRONIC ASSEMBLY PRECAUTIONS

Handling Static Sensitive Assemblies

The electronic assemblies used in the lift truck are sensitive to the effects of static electricity. If proper procedures are not followed, the pc boards or electronic assemblies used in the lift truck can be seriously damaged. It is very important to note that potentially damaging static levels for electronic components are not always felt by a human and may not appear as a spark. The use of proper static elimination techniques will decrease down time and cause fewer failures.

When handling electronic components or circuit boards, you are advised to wear some form of grounding strap. This is a device that contacts your skin and connects via a wire lead to a stable earth ground. If a circuit board is to be removed from a lift truck, any static charge must be removed from the frame of the lift truck. This can be accomplished by connecting the frame of the lift truck to a known ground. It is advisable to use a resistance of 500,000 to 2,000,000 ohms to eliminate any potential of electric shock. Refer to the ELECTRICAL section in MAINTENANCE for specific precautions when working with electronic components.

Prior to performing any electric resistance welding on the truck, the following steps **MUST** be performed:

- Turn the key switch off.
- Disconnect and remove the battery.
- Disconnect and remove the System Controller (refer to the ELECTRICAL section in MAINTENANCE).
- Disconnect all of the control connectors from the amplifier units (refer to the ELECTRICAL section in MAINTENANCE).

GENERAL SAFETY

1. Before lifting parts or assemblies, ensure that all slings, chains, and cables are correctly fastened and balanced.
2. Ensure the lifting device has the capacity to lift the weight of the part or assembly.
3. Do not lift heavy parts or assemblies by hand - use a lifting device.
4. Always wear safety glasses.
5. Disconnect the battery and discharge the capacitor bank (refer to the ELECTRICAL section in MAINTENANCE) before performing any maintenance or repair on the lift truck.
6. Always chock the wheels and use blocks to prevent the truck from rolling or falling.
7. Keep the truck and working area clean and orderly.
8. Use the correct tools for the job.
9. Keep tools clean and in good condition.
10. Always use TOYOTA-approved parts when making repairs.
11. Ensure that all nuts, bolts, snap rings, and other fastening devices are removed before using force to remove parts.
12. Attach a "DO NOT OPERATE" tag to the control handle of the truck until repairs have been completed.
13. Read all WARNING and CAUTION notes in the instructions prior to performing a procedure.
14. Keep fire and sparks away from charging batteries, and ensure adequate ventilation.
15. DO NOT use compressed air for cleaning purposes except where reduced to less than 30 psi, and then only with effective chip-guarding and personal protective equipment.
16. DO NOT work under a raised carriage. Lower the carriage and forks to the ground, or use a suitable blocking device (such as a 4x4 hardwood block) to prevent the carriage and inner rail from lowering.
17. Place 4x4 hardwood blocks under the frame, next to the tires, when raising the truck to make repairs or perform maintenance. Put the truck on blocks only on a solid, smooth, level surface.

GENERAL MAINTENANCE PROCEDURES

MOVING A DISABLED LIFT TRUCK

In some cases it is possible to move the disabled lift truck under its own power.

1. Enter the Performance and Diagnostics menu (PERFDIAG) using a high-level password (refer to the Programming and Diagnostics section).
2. Enter the Diagnostic menu (DIAGNSTC) and select the Output Test mode (OUTPUTS).
3. Select Output Test 17 or 18 (O 17 or O 18) and press tilt forward or backward to activate the left or right drive system and steering. Power will not be supplied to any other systems.

CAUTION

DO NOT slow down by plugging the lift truck when moving it in diagnostic mode. Plugging while in diagnostic mode can damage the traction amplifier.

TOWING A DISABLED LIFT TRUCK

A lift truck is not normally towed. If the traction system will not operate, make necessary repairs at the location first, if possible. If it is necessary to tow the truck, follow these guidelines:

WARNING

- **DO NOT tow a lift truck if there is a problem with the brakes, tires, or steering.**
- **DO NOT tow a lift truck if traction conditions are bad (slippery floors).**
- **DO NOT tow a lift truck up or down grades.**
- **DO NOT tow this lift truck if there is power to the drive motors; the Ramp Hold feature will oppose towing.**
- **Ensure personnel are clear of the tow chain, the towing vehicle, and the towed truck during the towing operation to prevent injury.**
- **The vehicle used for towing must have equal or greater towing capacity than the weight of the disabled lift truck.**
- **If another lift truck is used as the towing vehicle, carry an approximate half-capacity**

load on the forks of the towing lift truck to increase traction and stability. Carry the load so that the forks are lowered for maximum visibility.

- **The towed lift truck must have an operator.**
1. Raise the forks approximately 12 inches from the floor. Use a chain if necessary to make the carriage and mast stay in position during travel.
 2. If possible, tilt the mast fully back. Carefully attach a tow chain completely around the mast, just above the pivot points. Make sure the tow chain is installed so that it will not cause damage.
 3. Enter the Performance and Diagnostics menu (PERFDIAG) using a high-level password (refer to the Programming and Diagnostics section).
 4. Enter the Diagnostic menu (DIAGNSTC) and select the Output Test mode (OUTPUTS).
 5. Select Output Test 02 (O 02) and set it to "CLOSED" to supply power to the steering system. Power will not be supplied to any other systems. **DO NOT** tow the lift truck if there is no power to the steering system.
 6. Tow the lift truck slowly and smoothly to maintain full control of the operation. The brake pedal may be used to stop or slow the truck during the towing procedure.

When the destination has been reached, release the brake pedal on the towed truck, remove the key, and attach a "DO NOT OPERATE" tag to the control handle.

LIFTING A DISABLED LIFT TRUCK

In the event that the disabled lift truck cannot be towed and there is no other way to move it, it is possible to lift the truck by strictly following these guidelines:

WARNING

Read these procedures carefully before attempting to lift a disabled lift truck.

1. A disabled lift truck can weigh 10,000 pounds with the battery. It should be lifted only by a lift truck with adequate capacity.

2. Lifting should be done from the left side only because of the location of the counterweight (the left side is the operator's left side when facing the mast from the operator compartment). Place the left fork of the lifting truck just behind the left drive tire of the disabled truck. Place the right fork of the lifting truck just in front of the steer tires.
3. Tilt the mast on the disabled truck as far back as possible. Place the face of the lifting truck's forks against the side of the disabled truck.
4. Lift very slowly, watching for instability. When the disabled truck is off the ground, tilt the mast on the lifting truck as far back as possible.
5. Travel slowly and carefully to the repair location.
6. Lower the disabled truck carefully.
7. Place a "DO NOT OPERATE" tag on the control handle of the disabled truck until repairs have been completed.

PUTTING THE LIFT TRUCK ON BLOCKS

⚠ WARNING

The removal of the battery or mast will cause large changes in the lift truck's center of gravity. If the battery or mast will be removed, do so before putting the truck on blocks.

The lift truck must be raised to change the drive wheels or steer wheel(s), to drain the hydraulic oil, or to make other repairs. Use a jack or crane and chains to raise the truck one end at a time. Make sure the lifting device has a capacity of at least two-thirds the total combined weight of the truck and the battery, as listed on the nameplate.

Install 4x4 hardwood blocks under the edge of the frame on both sides to support the truck. Place chocks behind the tires to prevent movement of the truck when making repairs. Put the lift truck on blocks only on a solid, smooth, and level surface. Make sure that the blocks are solid, one-piece units.

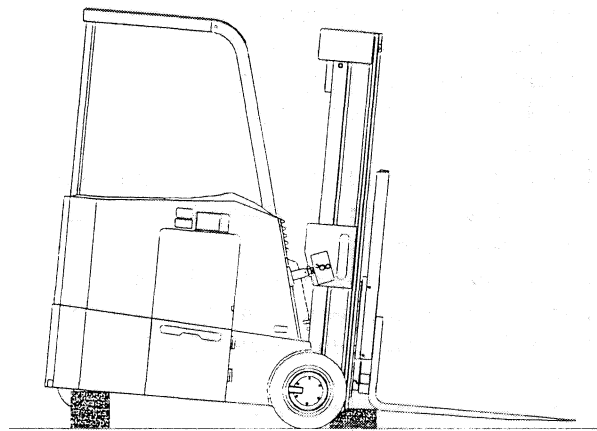
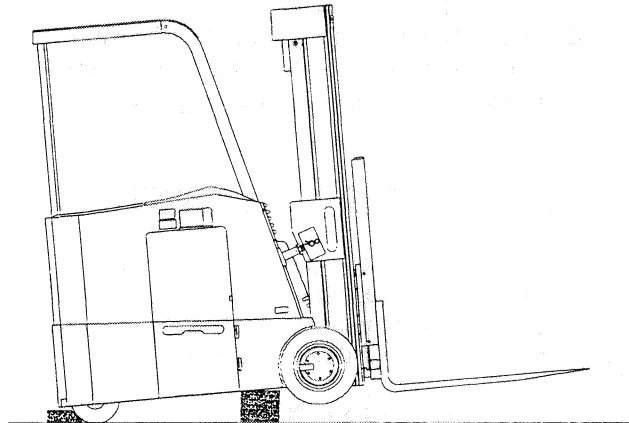


FIG. 0.1 - PUTTING THE LIFT TRUCK ON BLOCKS

GENERAL MAINTENANCE PROCEDURES

CLEANING INSTRUCTIONS

1. The operator compartment and the area in front of the battery compartment may be cleaned with high-pressure hot water (with **NO SOAP** or other cleaners added). This includes the lift pump and motor, the hydraulic valve block (manifold) and everything below: drive motors, gearboxes, hydraulic reservoir, steer pump and motor, and wheel wells.

 **CAUTION**

Avoid direct pressure spray to the encoders.

 **CAUTION**

Aim high pressure spray away from the amplifiers and system controller.

Before operating the forklift, remove excess water from the drive motors, disc brake units and lift pump motor.

NOTE

Aerosol or pump brake cleaning fluid may be used to clean the disc brake units. Any brake fluid spills can be cleaned with a water dampened cloth then wiped dry.

2. The top area around the amplifiers and system controller should be wiped with a clean cloth. A cloth dampened with warm water may be used to remove spills such as syrup or honey.
3. The steering compartment and counterweight area should be wiped with a clean cloth.
4. The plastic top and front covers can be cleaned with a water dampened cloth (mild household cleaners or isopropyl alcohol may also be used).

 **CAUTION**

DO NOT use paint thinner or solvent cleaners on the plastic covers. This will dull the surface and damage the decals.

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for your reading.**

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