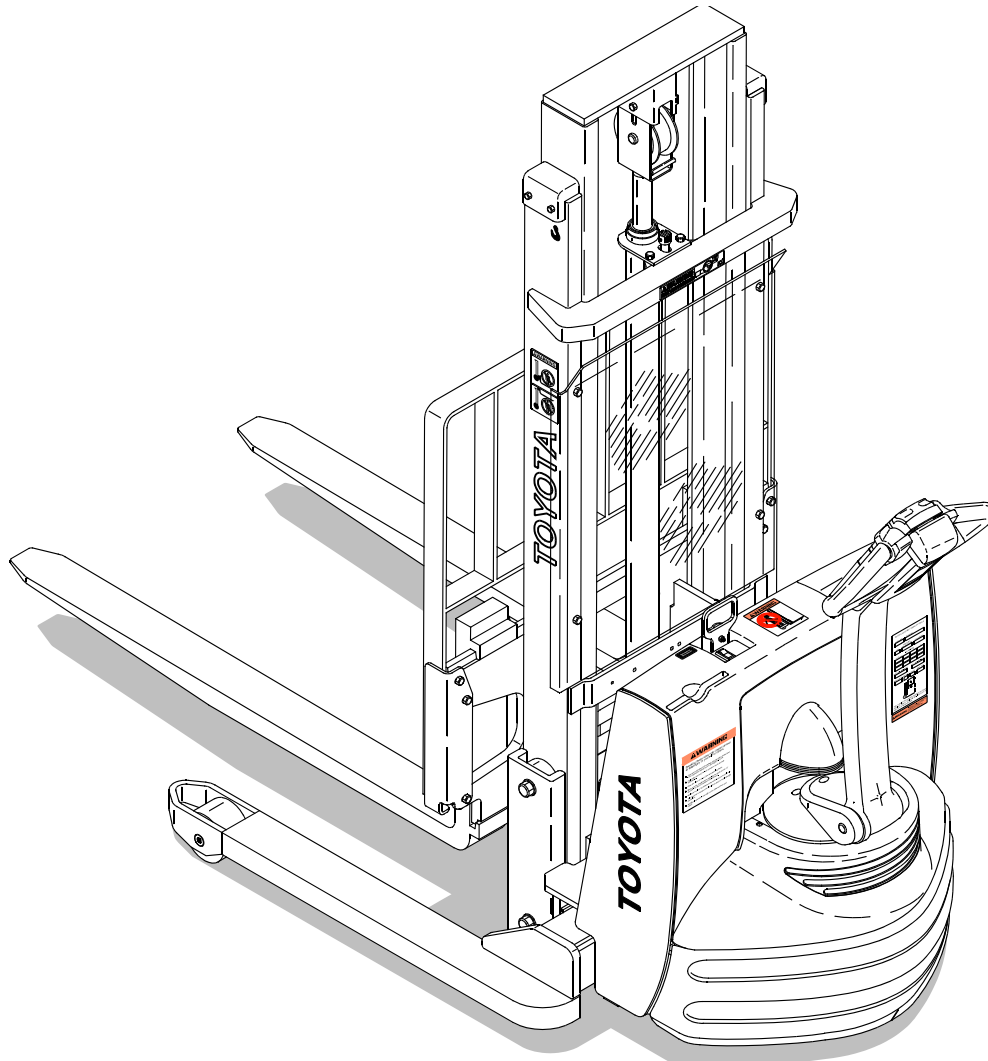




## 7BWS10/13

Electric Walkie Low-Lift Pallet Truck  
Effective Serial Number 40500 - UP



-  **Warning** Read and observe all warnings on this unit before operating it.
-  **Warning** **DO NOT** operate this equipment unless all factory installed guards and covers are properly secured in place.

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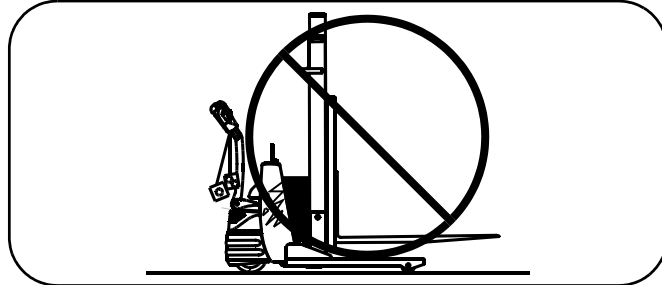
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Do **NOT** add to or modify truck without written approval from **Toyota**



---

## Introduction, Service Manual

The information in this service manual covers model 7BWS10/13.

Federal and State laws require that operators be completely trained in the safe operation of lift trucks in accordance with OSHA regulation 1910.178.

An operator's manual is sent with every Toyota truck when it is manufactured. If the operator's manual is missing from the truck, a new manual may be obtained by contacting:

**Toyota Industrial Equipment**

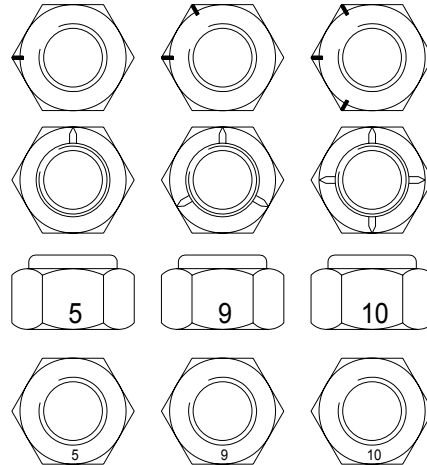
**[www.toyotaforklift.com](http://www.toyotaforklift.com)**

The information contained in this service manual is intended as a guide to help trained, qualified, and authorized technicians safely service the truck.

The service manual is divided into four separate sections which cover needed information for servicing the truck types. The main subject for each of these sections is described below.

<u>SECTION</u>	<u>SUBJECT</u>
M	MACHINE INFORMATION
P	PLANNED MAINTENANCE
S	SERVICE INSTRUCTIONS
O	OPTIONS

# Inch (SAE) and Metric Fasteners



## 1. Introduction

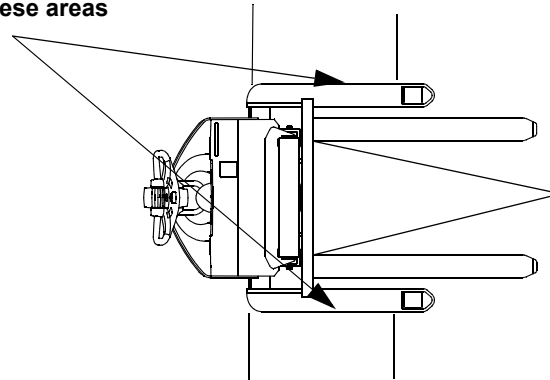
Threaded fasteners such as bolts, nuts, cap screws, and studs are made to specifications that describe mechanical strength and hardness of fastener. A fastener used in a design application is selected in accordance with its specifications. Parts used on this truck are purchased from many countries. Many fasteners are similar but cannot be used as direct replacements.

Service technicians must use replacement fasteners that have the same specifications. Fasteners made to each specification have identification marks for that specification. This specification is commonly called “grade” for SAE standards and “property” for metric standards. This section describes identification of some common fasteners.

The metric system used is described as SI (International System of Units, also called SI in all languages). The SI system of measurement is described in ISO Standard 1000, 1973.

<b>TEMPERATURE</b>					
<b>Multiply</b>	<b>By</b>	<b>To Get</b>	<b>Multiply</b>	<b>By</b>	<b>To Get</b>
(Fahrenheit -32)	0.56	Celsius (C)	(Celsius x 1.8)	+32	Fahrenheit (F)
<b>TORQUE</b>					
<b>Multiply</b>	<b>By</b>	<b>To Get</b>	<b>Multiply</b>	<b>By</b>	<b>To Get</b>
inch pound	0.113	Newton meter (N•m)	Newton meter	8.851	inch pounds in-lbs
feet pound	1.356	Newton meter (N•m)	Newton meter	0.738	foot pounds ft-lbs
<b>VELOCITY</b>					
<b>Multiply</b>	<b>By</b>	<b>To Get</b>	<b>Multiply</b>	<b>By</b>	<b>To Get</b>
miles/hour	1.609	kilometer/hour (km/h)	kilometer/hour	0.621	miles/hour (mph)
<b>VOLUME</b>					
<b>Multiply</b>	<b>By</b>	<b>To Get</b>	<b>Multiply</b>	<b>By</b>	<b>To Get</b>
inches <sup>3</sup>	16.387	centimeters <sup>3</sup> (cm <sup>3</sup> )	centimeters <sup>3</sup>	0.061	inches <sup>3</sup> (in <sup>3</sup> )
inches <sup>3</sup>	0.016	liters	liters	61.024	inches <sup>3</sup> (in <sup>3</sup> )
quarts, U.S.	0.946	liters	liters	1.057	quarts, U.S. (qt)
quarts, U.S.	0.83	quarts, Imp. (qt)	quarts, Imp.	1.205	quarts, U.S. (qt)
gallons, U.S.	3.785	liters	liters	0.264	gallons, U.S. (gal)
gallons, U.S.	0.83	gallons, Imp. (gal)	gallons, Imp.	1.205	gallons, U.S. (gal)
ounces	29.57	milliliters (ml)	milliliters	0.034	ounces (oz)

Jack only in these areas



Jack under frame  
only. "DO NOT Jack  
directly on mast.

Figure 0-1: Jacking Truck Off the Floor

## 1.2. Elevate Either Side of Truck

1. Place jack in the designated jacking position.
2. Jack the side of the truck so that the load wheel is off the floor no more than 0.50 inch (12.7 mm).
3. Block the truck in place.

## 2. Lubricants

### 2.1. Standard

The standard conditioning truck is designed for operation in temperatures down to 32 degrees F (0 degrees C).

2. Before replacing the brake disc see [page 115](#).

### **2.3.5. Electrical Control System**

Check tiller arm angle switches for adjustment (see [page 223](#)).

Check for electrical shorts to chassis (see [page 160](#).)

### **2.3.6. Battery**

Check battery mounting bolt. Check freeplay in battery mounting area.

### **2.3.7. Electrical Panel**

Clean and check electrical panel mounting to chassis. Check for connections in harness connectors. Check contactors for welded conditions. Check contactor tips for free movement. Clean operation of contactors for proper operation (see [page 237](#).)

### **2.3.8. Hydraulic System**

Check the fluid level in the hydraulic reservoir (see [page 258](#)). Check hoses and connections on the hydraulic system for leaks. Repair or replace hoses if worn or damaged. Check oil reservoir for cracks, leaks and mounting.

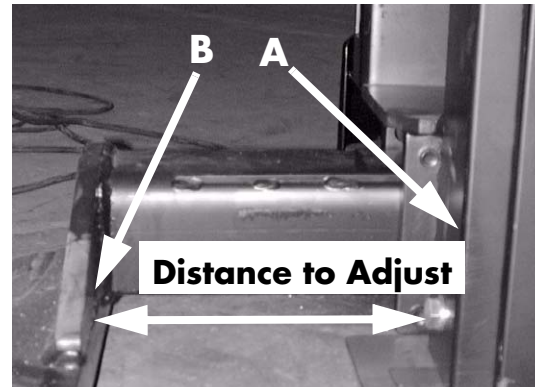
### **2.3.9. Mast**

Check mast (see [page 275](#)) for damage and cracks. Check clearance of rollers. Check lateral play of inner section. Check for wear and adjustment of lift chains. Check chain anchors and sheaves.

### **2.3.10. Lifting Devices**

Inspect the fork carriage and forks for damage and cracks.

(Desired I.D.) Divided by (2) minus 12 = Distance between Surface "A" and Surface "B". (See Figure 0-6.)




*Figure 0-6: Support Arm Adjustment*

8. Move one support arm outward until the width calculated in step 7 is reached. Repeat this step for the other support arm. Tighten bolts to 40 ft-lbs (54.2 N•m) in a cross pattern for both arms.
9. Measure the distance between points "C" and "D" as shown in Figure 0-7. If the measurement is less than desired ID, adjust each support arm equally until the desired ID is reached. Make sure adjustments made to each arm are in equal amount and are torqued to 40 ft-lbs (54.2 N•m) before remeasuring. Make sure the distance between points "A" and "B" on both support arms are equal once desired ID is achieved.
10. Snug the adjustment bolts in a cross pattern in 40 ft-lbs (54.2 N•m) increments and continue in a cross pattern until all bolts reach 180-200 ft-lbs (244-271 N•m) It is very important that a cross pattern is maintained in 40 ft-lbs (54.2 N•m) increments and each bolt is torqued between 180-200 ft-lbs (244-271 N•m) when finished.
11. Using a toe jack remove the blocks that were installed under the frame one side at a time returning the unit to the ground.
12. Using a carpenters level, check the mast again ensuring it is plumb and level. See Figure 0-4.

#### 4.1.2. Installation

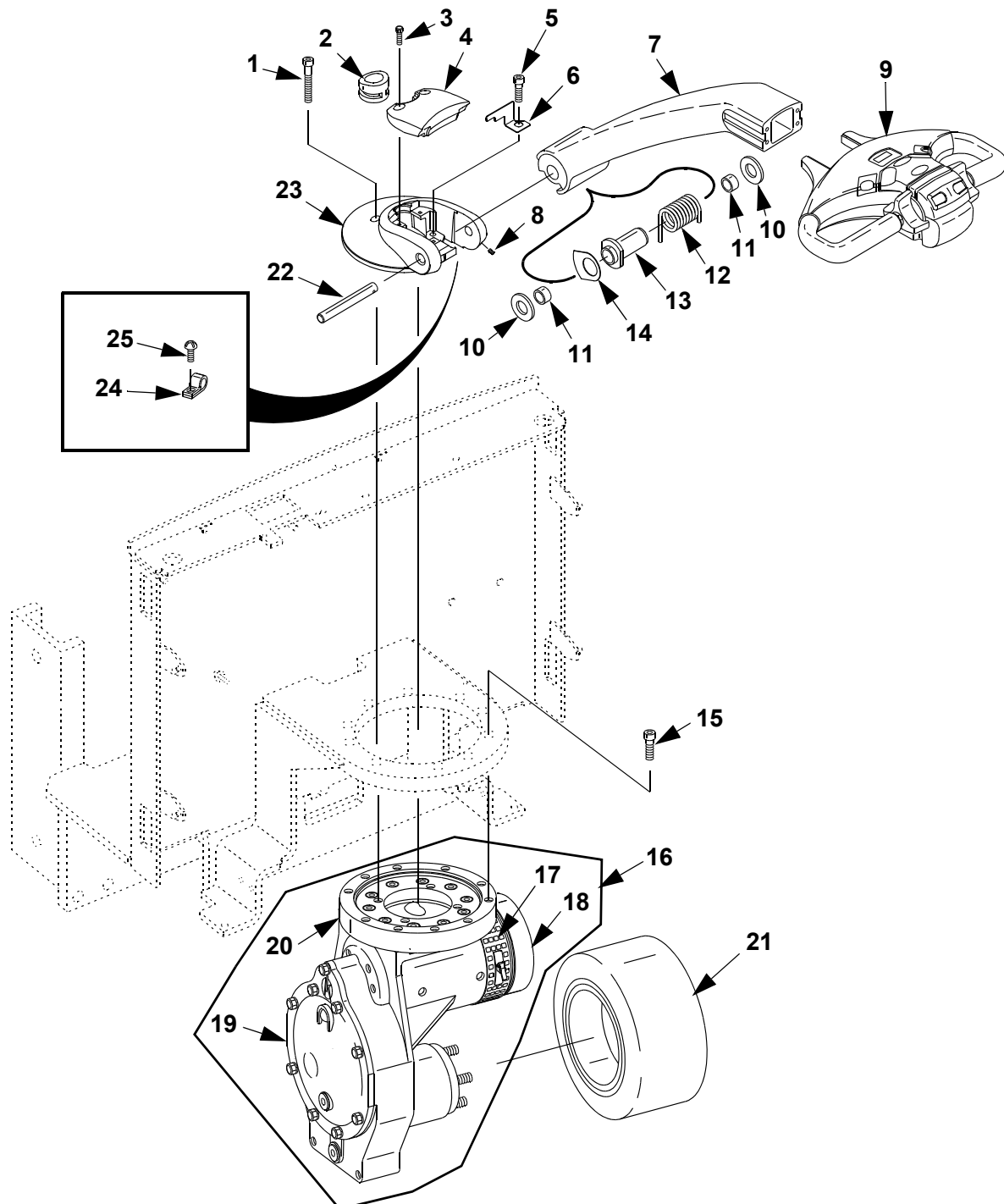


 **WARNING** When using compressed air, wear effective chip-guarding and personal protective equipment. Compressed air used for cleaning **MUST** be reduced to less than 30 psi (207 kPa).

1. Thoroughly clean all parts with non-corrosive cleaning fluid and air dry all parts.
2. Install pump/motor assembly in truck and secure with bolts to truck frame. (For torque values see [page 47](#).)
3. Properly connect electrical power cables and coil wiring, noting their positions recorded earlier. For torque values see [page 47](#).
4. Uncap and connect hydraulic hose to hydraulic pump assembly.
5. Fill hydraulic reservoir with new clean oil ([see “Lubricants” on page 72](#)).
6. Install battery and secure with mounting bolt, if applicable (see [page 203](#).)
7. Install truck cover(s) [[see page 81](#)].
8. Reconnect battery connector to the truck.
9. Remove wheel blocks.
10. Turn the main ON/OFF switch to the ON position. Enter key code and press the press green ON button (I) on the keypad.
11. Check the reservoir fluid level. Operate the truck’s hydraulic system and check operation of system as a whole. Inspect for leaks.

# Transmission

## Transmission Mounting



17. Install truck covers (4, 8) as shown on [page 81](#).
18. Reconnect battery connector to the truck.
19. Turn the main ON/OFF switch to the ON position.  
Enter key code and press the press green ON button (I) on the keypad.



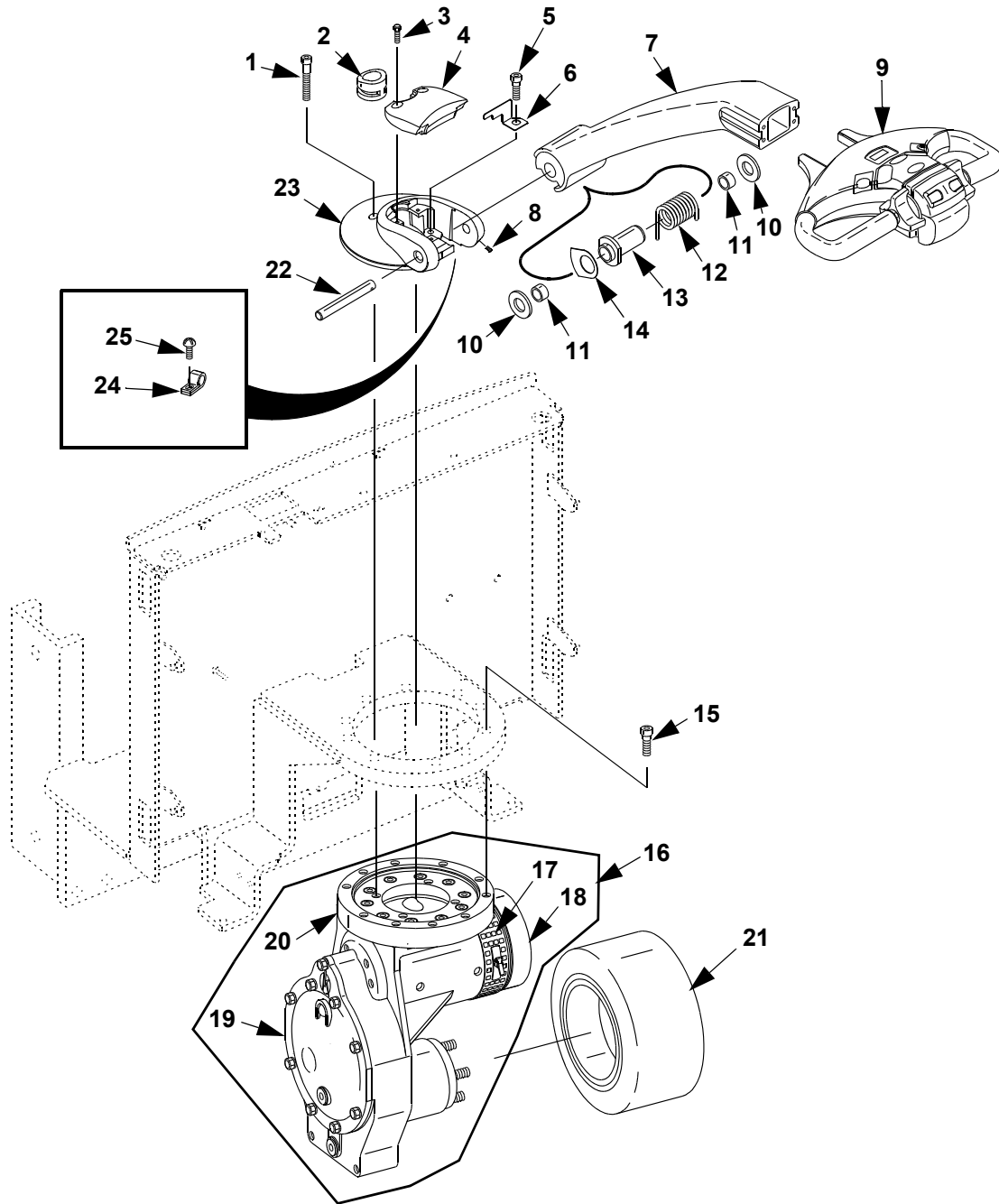
*Figure 3-4: Support Arm Toe Jack Positioning*

7. Visually inspect lug nuts for signs of being loose. Inspect studs to see if one or more studs protrude through the lug nut farther than the others. If either condition exists, proceed as follows.
8. Loosen lug nuts to finger tight. If one or more studs turn while loosening the lug nuts, proceed as follows.
9. If any of the studs appear damaged, replace studs.

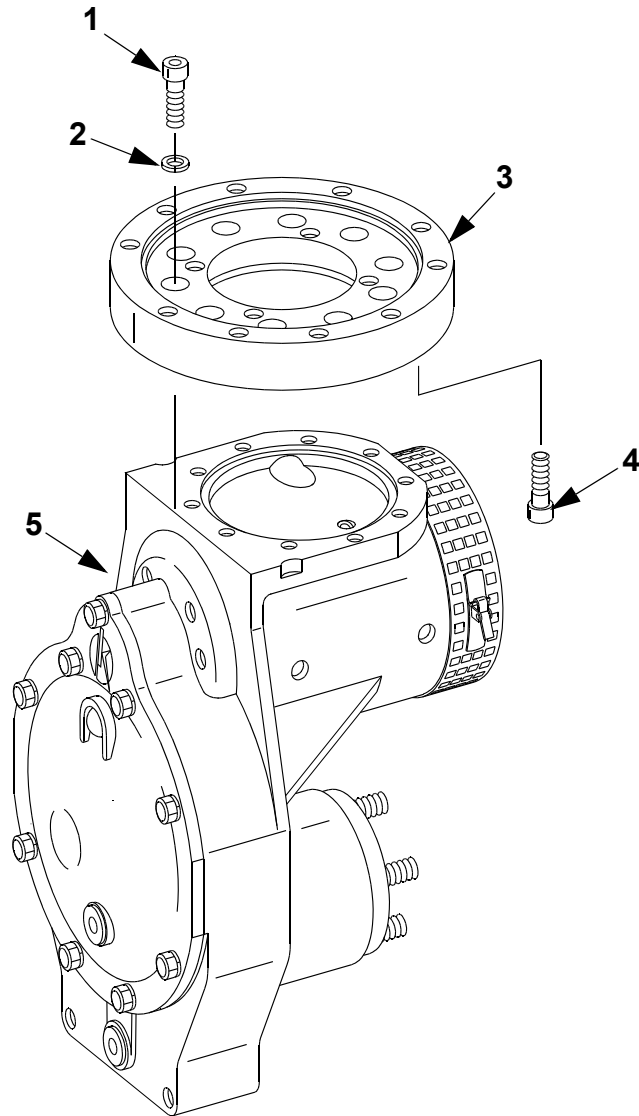
**NOTE!** The installation procedure of the studs, wheel and lug nuts must be completed in less than 0.50 hour to ensure the thread locking compound does not start to set up before the installation is complete.

10. Remove and clean studs.
11. Install two lug nuts, jammed together, to the end of the stud. This will allow the tightening of the studs using a torque wrench.
12. Apply Loctite 290<sup>®</sup> thread-locking compound to studs.

# Tiller Arm Handle



## Steering Bearing



Item No.	Description
1	Screw
2	Lockwasher
3	Bearing
4	Stop, steering
5	Transmission assembly

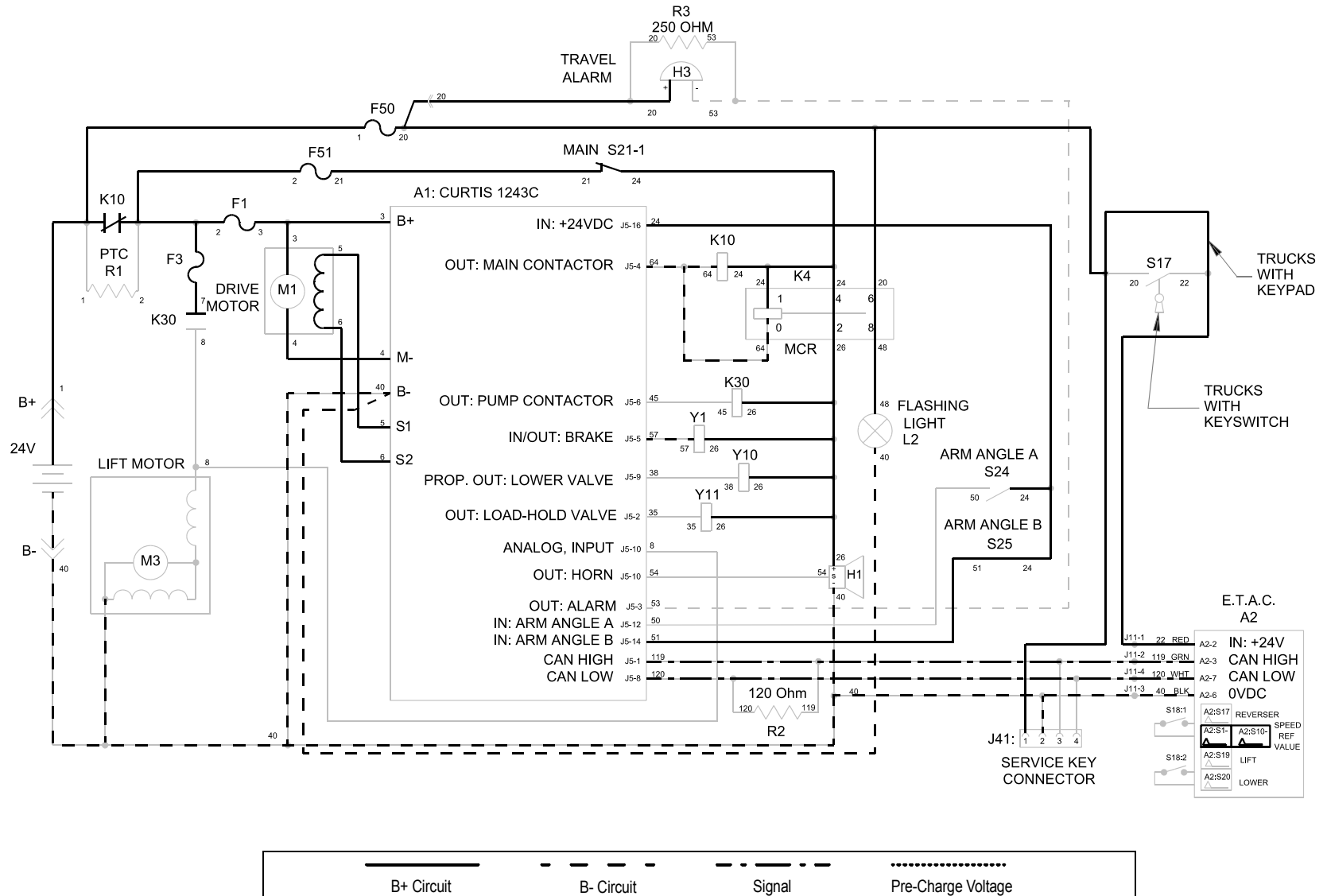
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**NOTE:** Electrical schematics are found in Appendix A starting on [page 302](#).

## 2. Maintenance

Connections must be kept clean and tight. The electrical components should be protected from moisture.

### 2.1. Wiring

Many electrical problems are caused by a bad or dirty battery. Make sure battery is clean. Check the electrolyte level and battery level.



**CAUTION** Unless otherwise directed, disconnect battery connector when checking electrical circuits or components with an ohmmeter. Electrical current can damage the ohmmeter.

Visually inspect all wiring and electrical components for the following:

- Loose connections or connectors
- Loose or broken terminals
- Damaged terminals, blocks, or strips
- Broken wiring and shorted conditions (especially those that are close to metal edges or surfaces)

Use an ohmmeter to check for wiring continuity.

#### 2.1.1. Definitions

**Continuity.** A continuous and uninterrupted path between two or more locations in an electrical circuit, typically having a resistance of less than 1 ohm.

**Open Circuit.** A lack of a continuous path between two or more electrical connections. Generally, when such a circuit is tested, it will have a resistance greater than one megohms.

**Pulse Width Modulation.** Pulse Width Modulation (PWM), also called “chopping,” controls the speed of the motor by switching the battery voltage to the motor on and off very quickly.

**Overtemperature.** Overtemperature of the transistor controller is from 185 degrees F (85 degrees C) and above. At overtemperature, the drive current limit is linearly decreased from full set current down to zero. Plug current is

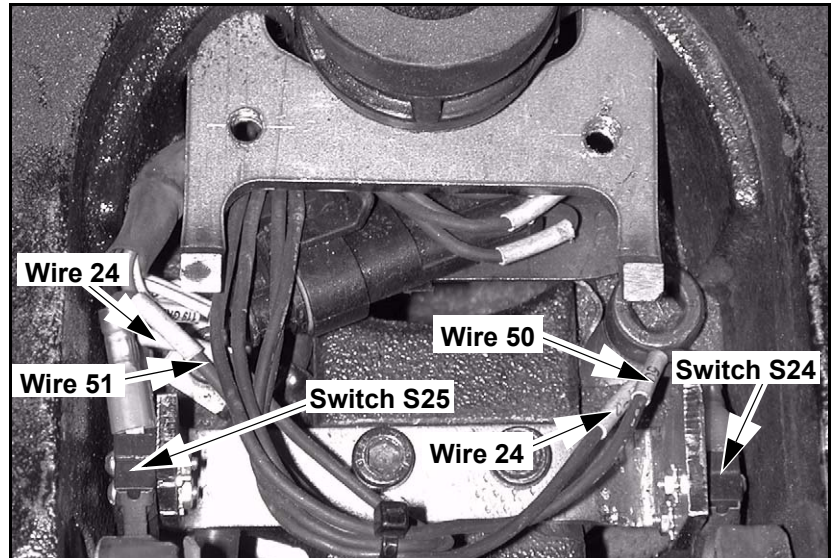


Figure 5-6: Stem Mount Switch Wiring

15. Refer to [Figure 5-3 on page 166](#) when installing ring terminals. Install ring terminal and secure middle nut and torque to 79 in-lbs (8.9 N•m). Install ring terminal and secure outer nut, making sure wire is out of the way, before torquing outer nut to 79 in-lbs (8.9 N•m).
16. Install the up-stop ([see Figure 5-4 on page 167](#)) and truck covers.
17. Reconnect battery connector to the truck.
18. Turn the main ON/OFF switch to the ON position. Enter the key code and press the green ON button (I) on the keypad or turn the key switch ON.
19. Check all operating functions on the tiller arm handle.

### Service Parameters

Parameters 1-7 (driver number) are Driver Parameters, 10-40 are Service Parameters

Parameter	Name	Unit	Range	Step	Default	Description
39	Access code		1 to 4	1	3	Defines whether truck has key switch or keypad and what access level personnel will have to parameters 1=key switch/operator parameters open 2=key switch and closed 3=keypad and open 4=keypad and closed (when closed, service key is required to access driver parameters)
All other parameter numbers not listed above	Not defined		0	0	0	Not used (always 0)

#### 3.5.1. Parameter Description

##### Parameter 1

Maximum speed value sent to transistor controller while in Slow mode except during turtle torque (gives torque boost if high load is encountered).

##### Parameter 2

Reduces speed value sent from the Electronic Tiller Arm Card (ETAC) to the transistor controller while in Fast mode (all throttle positions).

##### Parameter 3

Defines truck's acceleration characteristic when truck starts from a stop. A high number gives maximum acceleration, a lower number gives less aggressive acceleration.

##### Parameter 4

Defines truck's automatic plug-braking characteristic when throttle is reduced (including to neutral). A lower number gives less aggressive acceleration.

##### Parameter 5

Time until the truck is switched OFF (energy saving feature) when truck is idle and the brake is applied. Time is counted from the latest power output is requested. **If truck has the key switch option, the truck never powers OFF.**

### Code E104 - Brake Power Error

Reason	Transistor controller could not detect presence of brake coil.
Possible Causes with corrective actions/checks	<ol style="list-style-type: none"> <li>1. Open circuit in brake circuit. <ol style="list-style-type: none"> <li>a. Check brake and wiring.</li> </ol> </li> <li>2. Master control relay missing or stuck open.</li> <li>3. Main contactor open circuit (especially after it has closed).</li> <li>4. Communication error due to transistor controller handset. <ol style="list-style-type: none"> <li>a. Unplug handset from transistor controller, allow handset to completely boot before turning truck ON.</li> </ol> </li> <li>5. Bad transistor controller. <ol style="list-style-type: none"> <li>a. Check transistor controller for error code.</li> </ol> </li> </ol>

### Code E106 - Digital Output or Field Overcurrent

Reason	Transistor controller attempted to deliver more current than allowed to main contactor coil; traction motor field winding, or digital output.
Possible Causes with corrective actions/checks	<ol style="list-style-type: none"> <li>1. Short circuit in transistor controller output circuit. <ol style="list-style-type: none"> <li>a. Check main contactor coil, traction motor field winding, digital output and associated wiring.</li> <li>b. Replace transistor controller.</li> </ol> </li> </ol>

### Code E110 - Braking System Fault

Reason	Transistor controller detected problem with braking functions.
Possible Causes with corrective actions/checks	<ol style="list-style-type: none"> <li>1. Short circuit in brake circuit. <ol style="list-style-type: none"> <li>a. Check brake and wiring.</li> </ol> </li> <li>2. Bad transistor controller. <ol style="list-style-type: none"> <li>a. Check transistor controller for error code.</li> </ol> </li> </ol>

### Code E112 - Arm Angle Sequence Fault

Reason	Improper sequence of arm angle inputs.
Possible Causes with corrective actions/checks	<ol style="list-style-type: none"> <li>1. Arm angle input stuck on or off.</li> <li>2. Problem with tiller arm angle input wiring.</li> <li>3. Problem with tiller arm. <ol style="list-style-type: none"> <li>a. Check for proper sequence of arm angle switches (see step 2 above).</li> </ol> </li> <li>4. Communication error due to transistor controller handset. <ol style="list-style-type: none"> <li>a. Unplug handset from transistor controller, allow handset to completely boot before turning truck ON.</li> </ol> </li> </ol>

### Code E114 - Traction (Drive) Motor Speed Fault

Reason	Transistor controller detected stalled traction motor.
Possible Causes with corrective actions/checks	<ol style="list-style-type: none"> <li>1. Traction motor stalled.</li> <li>2. Excessive traction motor load at low speed. <ol style="list-style-type: none"> <li>a. Check brake adjustment (see <a href="#">page 114</a>).</li> </ol> </li> <li>3. Bad transistor controller. <ol style="list-style-type: none"> <li>a. Check transistor controller for error code.</li> </ol> </li> </ol>

# Battery

## 1. Theory of Operation

Check the truck's data plate for the weight of battery required for the truck. Contact your local battery supplier for the purchase of a proper voltage battery. A 24 volt battery may not be supplied with the truck.

## 2. Maintenance

Information in this section does not supercede or replace information available by the battery and battery charger supplier. Read, understand, and follow the procedures available by the battery and battery charger supplier. Notify your supervisor if there are any concerns or questions regarding the battery or procedures.

### 2.1. Inspection and Care

**WARNING**

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

**CAUTION**

Before working on the battery, review Battery Safety beginning on [page 20](#). Batteries may weigh more than 375 pounds (125 kg). Use extreme care during replacement. Use a suitable replacement device or hoist for lifting.

**NOTE!**

Read, understand, and follow procedures, recommendations and specifications available by the battery and battery charger supplier.



**INDUSTRIAL EQUIPMENT**

F-code

Section

C-code

**S5.2**

**5110**

**Swing Out Battery Pack**

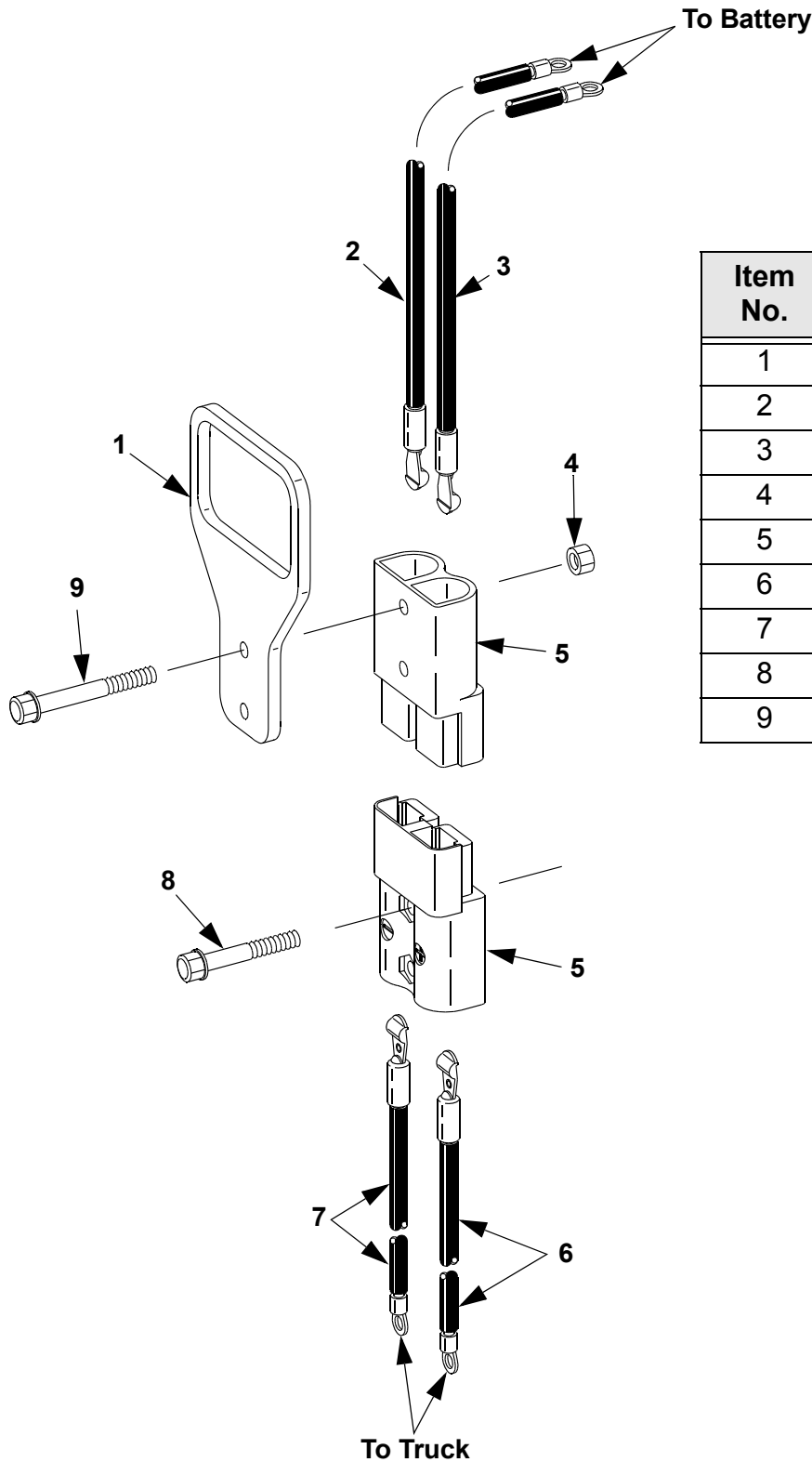
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T-code

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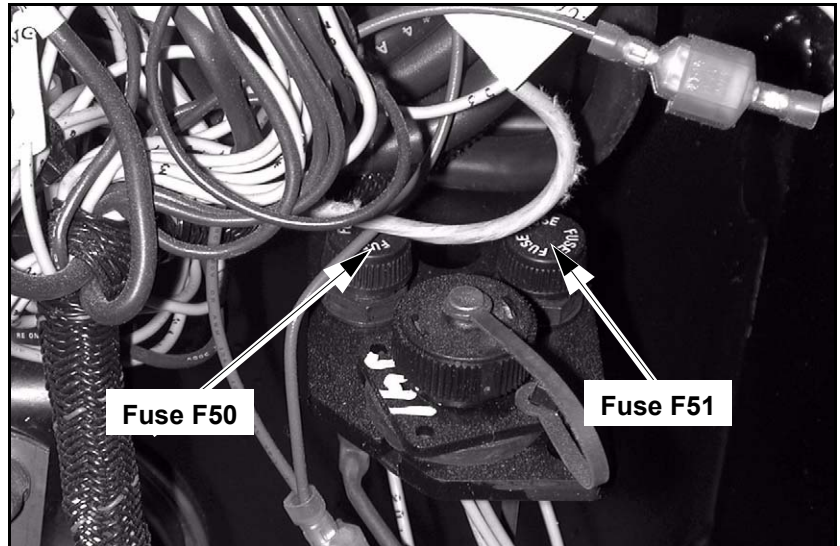
**7BWS10/13**

Item No.	Description	Item No.	Description
1	Battery pack assembly	12	Decal, serial number
2	Pallet pro™ battery pack, 24 Volt	13	Bracket
3	Charger assembly (does not include item 17)	14	Tray
4	Battery, 6 Volt	15	Cable, SB175 plug
5	Grommet	16	Battery connector
6	Decal, Champion	17	Cable, AC power
7	Decal, DANGER	18	Screw
8	Cable assembly	19	Bracket
9	Bolt, M6x20	20	Screw
10	Lockwasher	21	Clip, nut
11	Washer, flat		



Item No.	Description
1	Puller
2	Cable, negative
3	Cable, positive
4	Nut
5	Connector, SB-175
6	Cable, positive
7	Cable, negative
8	Screw, cap
9	Screw, cap

## Fuses



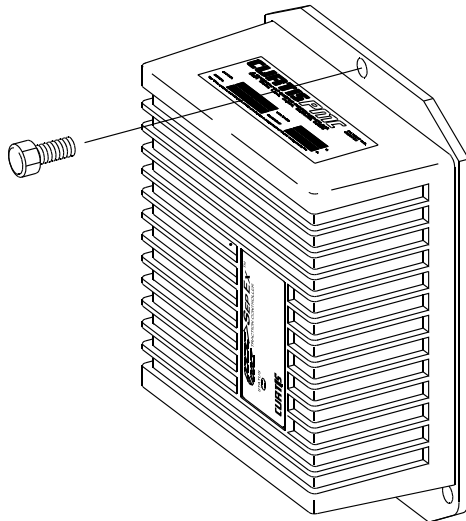
### 1. Theory of Operation

The keypad and electronic tiller arm card (ETAC) circuit FU50 fuse is 10 Amps. The main ON/OFF switch circuit fuse FU51 is 10 Amps. The fuses located on the contactor panel are as follows:

- 10A, Fuse Keypad and ETAC, part number 00590-42566-71 (supplied with main harness)
- 10A, Fuse Main ON/OFF, part number 00590-42566-71 (supplied with main harness)
- 130A, Fuse (one for drive motor and one for pump motor,) part number 00590-46786-71

### 2. Maintenance

Examine the fuse for signs of overheating, discoloration, cracking, or other physical damage. Check for blown fuse through the fuse window. If the fuse is damaged replace it. To test a fuse, remove or isolate it from the electrical circuit. Do this by removing the fuse from the truck or by removing all the connections from one side of the fuse. Use an ohmmeter set to Rx1 scale and measure the resistance across the fuse. The resistance should be less than 1 ohm.



# Transistor Controller

## 1. Theory of Operation

**⚠ WARNING** Interchanging the transistor controller with different truck model could cause internal failure to the transistor controller. The warranty will be void if the transistor controller is interchanged from one truck to another!

The transistor controller is programmed specifically for this truck. It is microprocessor based and programmable designed for separately excited motors. The transistor controller provides smooth control of the traction (drive) motor utilizing four distinct operating modes. An LED is built into the transistor controller that indicates controller status.

### 1.1. Basics Of Circuit Operation

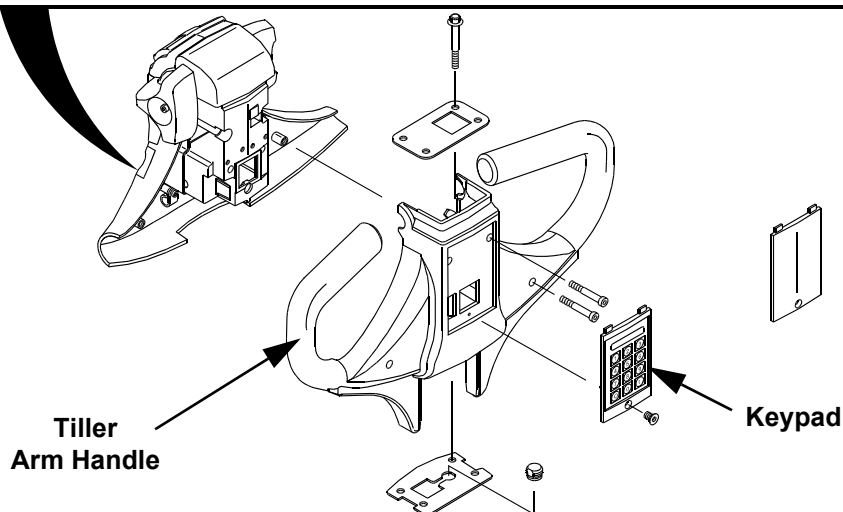
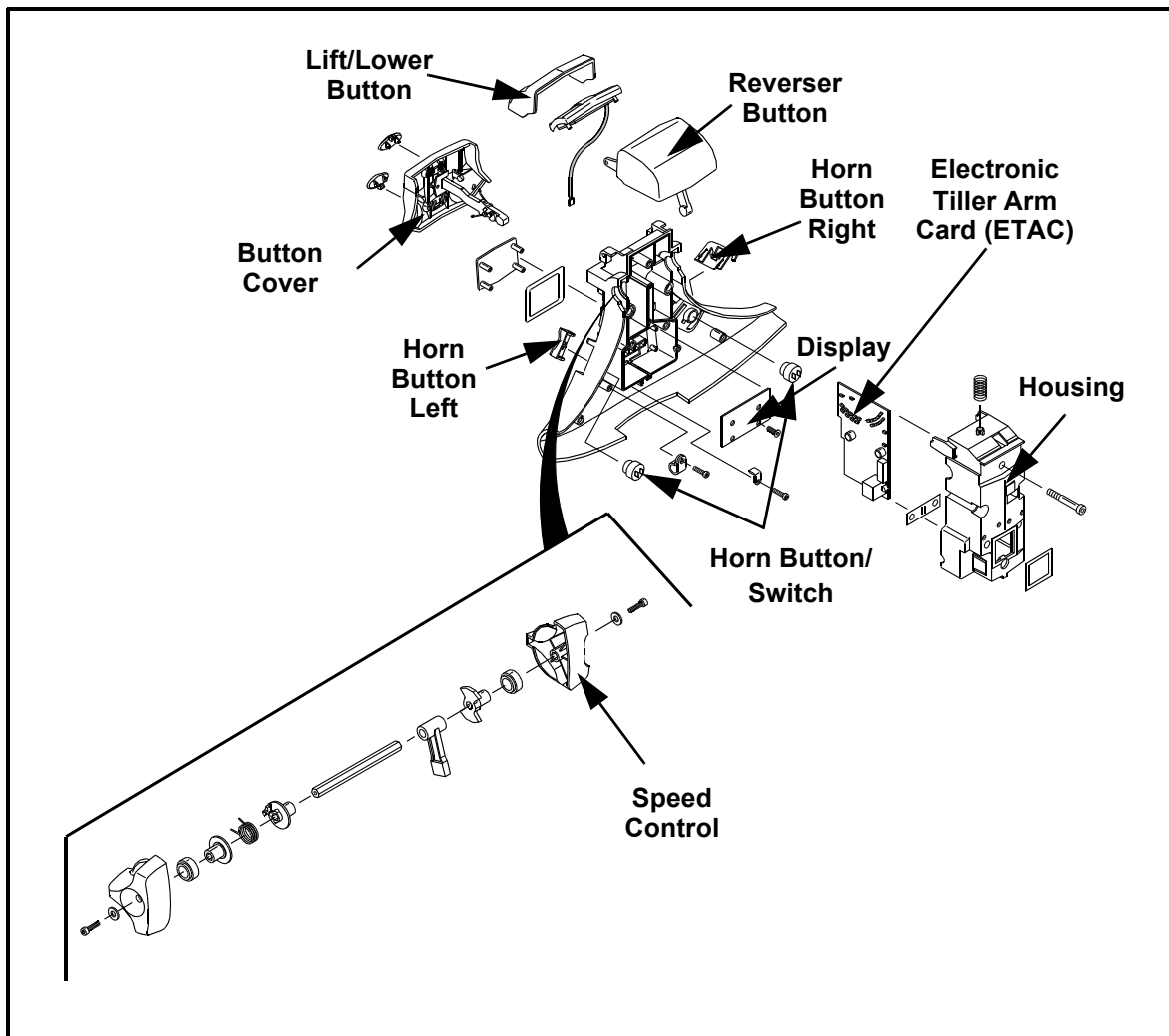
The transistor controller provides both armature and field outputs. Through these outputs, it regulates the voltage and current applied to the motor according to its programmed motor control algorithm. The polarity and magnitude of the field is controlled to provide solid state, contactor-less direction control and plug braking.

As the transistor controller is powered up, it performs an internal self test.

- A short between M- and Ground.  
(Insures the M- output or power MOSFETs are not shorted.)
- Continuity in the field coil.  
(Occurs each time tractor-first or forks-first travel is selected.)

Selecting either tractor-first or forks-first travel selects the direction of current flow in the field. The voltage and current in the armature circuit raises when the throttle increases. The field current will then follow a predetermined current map to match the armature current. In this manner, the motor is kept in its optimal commutation range and arcing on the commutator is minimized. As the throttle is increased and the

# Electronic Tiller Arm Card (ETAC)



## 2.2. Hydraulic Pump Pressure Relief Valve

The hydraulic system is protected by a relief valve installed in the adapter body. The relief valve is set by the supplier to open at specific pressure (3100 psi [213 bar]). There is no need to ever adjust the relief valve on this truck.

## 3. Troubleshooting

**NOTE!** Proper care and cleanliness should be observed in servicing to insure oil does not become contaminated with dirt or other foreign material. Contaminants can be drawn into pump so as to stick or score pump which will cause failure of pump assembly.

If the hydraulic pump assembly does not operate properly, the following preliminary checks should be made:

1. Proper oil level
2. All electrical connections tight
3. Battery fully charged

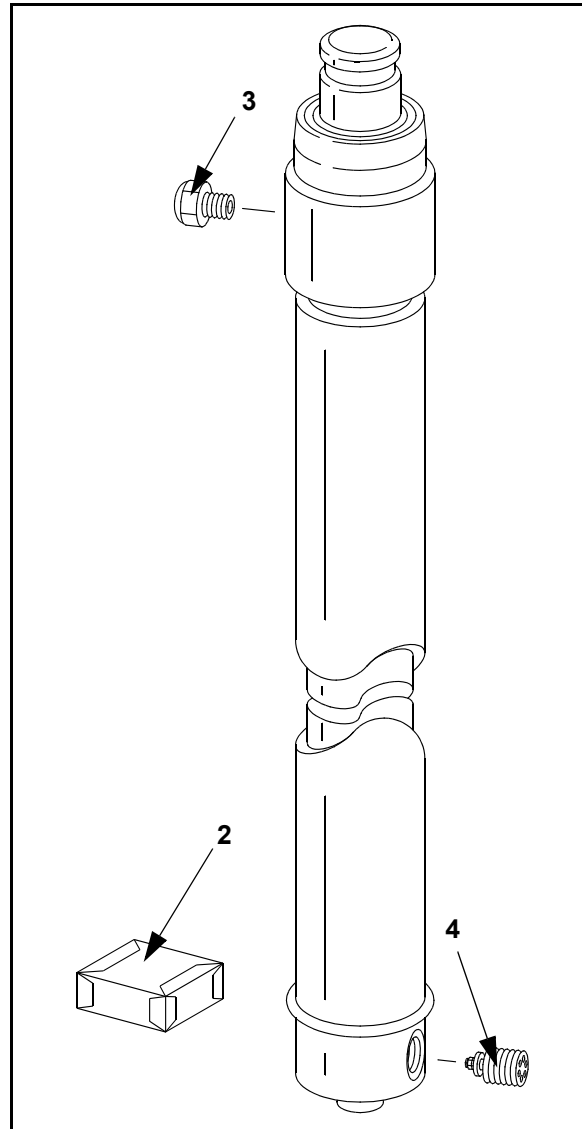
When checking voltage at contactors, make sure hydraulic lines and components are fully installed.

When possible, keep the main ON/OFF switch OFF and battery connector disconnected.

After the preliminary check is accomplished, install a 0-5000 psi (0-34473 kPa) pressure gauge in between the adapter in the manifold and hydraulic hose. The installation of a pressure gauge is required to insure proper observation of what is occurring in the unit during trouble shooting. Start pump and raise lift cylinder to its upper limit stops to develop maximum pressure of the unit, which will normally be passing all flow over a relief valve. Pressure gauge should be reading the set pressure of the relief valve. Remove pressure on hydraulic system by actuating the solenoid operated lowering valve.

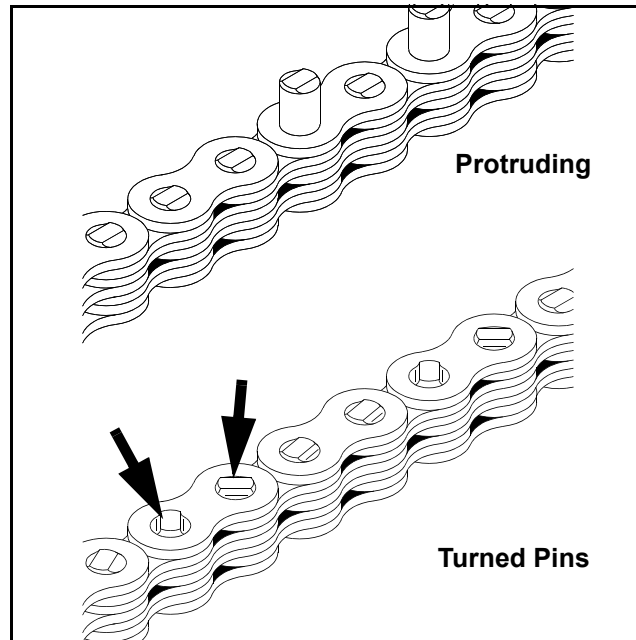
Different hydraulic and electrical sources may be causing improper operation. Refer to the following troubleshooting chart.

## Lift Cylinder



Item No.	Description	Item No.	Description
1	Cylinder assembly	3	Bleeder
2	Kit, seal	4	Valve

**NOTE!** Chains with turned or with protruding pins should be replaced. Do not attempt to repair chain by driving pins back into chain.



Out-of-line flats on “V” heads indicate that pins have turned in place.

### Chain Side Wear

A wear pattern on pin heads and outside plates indicates misalignment. This condition damages chain and sheaves as well as increasing internal wear in the chain system.

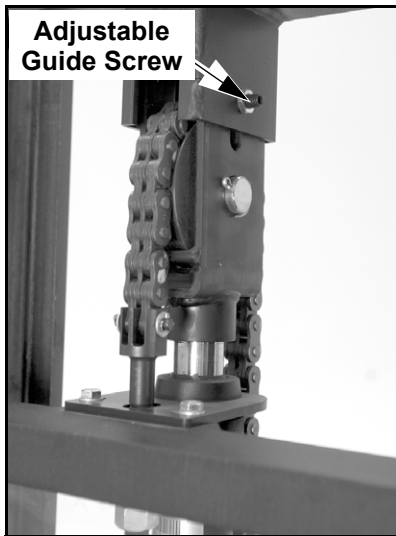
### Chain Anchors and Sheaves

**See “Planned Maintenance Schedule” on page 61.** An inspection of the chain system includes a close look at chain anchors and sheaves. Check chain anchors for wear, breakage, and misalignment. Anchors with worn, cracked or broken fingers should be replaced. Anchors should be adjusted to eliminate twisting or misalignment in chain. When chain is misaligned, load is not spread uniformly between plates. Prolonged operation will result in premature failure. Worn or seized sheaves should be replaced. Heavy flange wear indicates chain misalignment.

## Removal

**⚠ WARNING** Block all wheels to prevent truck from rolling. Park the truck on a level surface and make sure all wheels are blocked to prevent accidental movement.

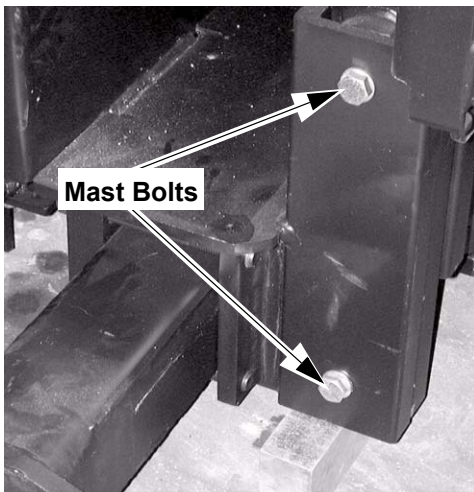
1. Press red OFF button (○) on the keypad. Depress main ON/OFF switch to the OFF position.
2. Disconnect battery connector from the truck.
3. Remove battery from the truck.



**⚠ CAUTION** Replacement of the mast assembly requires the use of a hoist capable of safely lifting 10,000 lbs (4536 kg). Failure to use proper hoisting equipment could cause personal injury or damage to equipment.

4. Attach a hoist to the top of the inner column assembly.
5. Remove forks (see [page 299](#)).
6. Remove the adjustable guide screws and nuts from the inner mast cross tie.

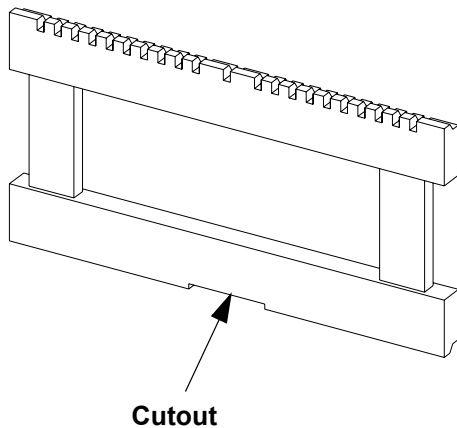
**⚠ WARNING** When blocking mast columns to prevent lowering, always block both sides of column. If truck is not blocked, it could tip on its side.



7. Disconnect the lift chain at the fork carriage.
8. Use the hoist attached to the inner column to raise it sufficiently enough to clear the fork carriage bearings. If repairs are replace of the fork carriage is required see [page 299](#).
9. Separate inner column from the main mast by lifting the column until it clears the mast and lift cylinder.
10. Separate the mast from the straddle chassis. Remove lift cylinder (see [page 271](#)).
11. Place a suitable hoist around the mast cross tie.

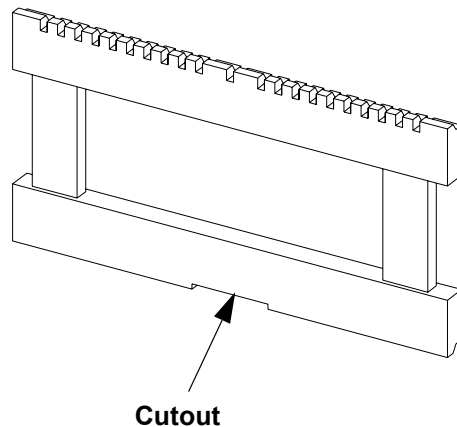
## 4. Repair and Rebuild

### Removal



1. Press red OFF button (O) on the keypad. Depress main ON/OFF switch to the OFF position.
2. Disconnect battery connector from the truck.
3. Remove battery from truck.
4. Release fork locking mechanism by lifting up latch on top of fork.
5. Slide fork toward cutout on bottom of carriage. Once fork is aligned with cutout, pull up on tip of fork and move fork away from lower cross member.
6. Remove by lifting top of fork up and away from upper cross member.

### Installation



1. Place top of fork onto upper cross member, over cutout in lower cross member.
2. Carefully lower bend in fork toward cutout until fork is in position at carriage lower cross member.
3. Slide fork to desired location on carriage and secure in position by pushing fork latch down to lock it. Latch will engage if fork is over one of the slots on upper carriage cross member.

**NOTE!**

Ensure lateral fork stops are in place. The load backrest or bolts in the fork bar face are commonly used methods.

4. Try to slide fork back and forth to be sure it is locked into position.
5. Turn the main ON/OFF switch to the ON position. Enter key code and press the press green ON button (I) on the keypad
6. Test truck for proper operation before returning to service.

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