

SERVICE REPAIR

MANUAL

Hyster B262 (B60ZHD, B80ZHD) Forklift

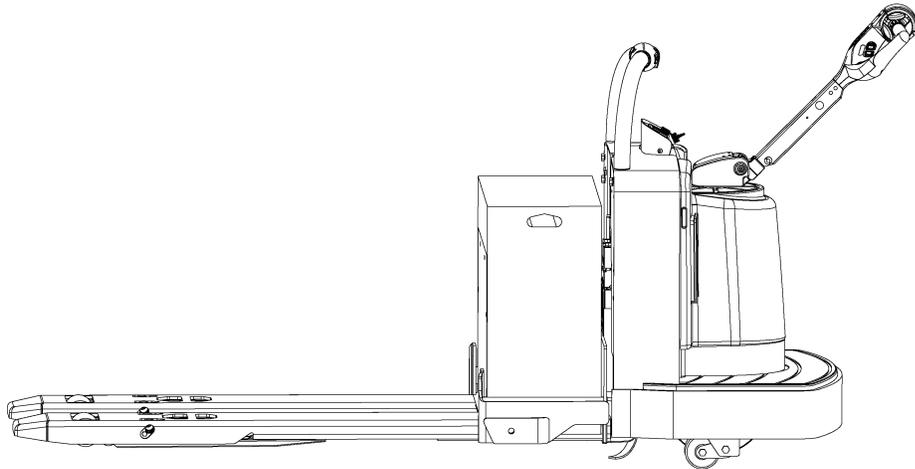
HYSTER

ELECTRICAL SYSTEM

B60Z^{AC} [C230];

B60Z^{HD} [B262];

B80Z^{HD} [B257]



HYSTER

SAFETY PRECAUTIONS

MAINTENANCE AND REPAIR

- The Service Manuals are updated on a regular basis, but may not reflect recent design changes to the product. Updated technical service information may be available from your local authorized Hyster® dealer. Service Manuals provide general guidelines for maintenance and service and are intended for use by trained and experienced technicians. Failure to properly maintain equipment or to follow instructions contained in the Service Manual could result in damage to the products, personal injury, property damage or death.
- When lifting parts or assemblies, make sure all slings, chains, or cables are correctly fastened, and that the load being lifted is balanced. Make sure the crane, cables, and chains have the capacity to support the weight of the load.
- Do not lift heavy parts by hand, use a lifting mechanism.
- Wear safety glasses.
- DISCONNECT THE BATTERY CONNECTOR before doing any maintenance or repair on electric lift trucks. Disconnect the battery ground cable on internal combustion lift trucks.
- Always use correct blocks to prevent the unit from rolling or falling. See HOW TO PUT THE LIFT TRUCK ON BLOCKS in the **Operating Manual** or the **Periodic Maintenance** section.
- Keep the unit clean and the working area clean and orderly.
- Use the correct tools for the job.
- Keep the tools clean and in good condition.
- Always use **HYSTER APPROVED** parts when making repairs. Replacement parts must meet or exceed the specifications of the original equipment manufacturer.
- Make sure all nuts, bolts, snap rings, and other fastening devices are removed before using force to remove parts.
- Always fasten a DO NOT OPERATE tag to the controls of the unit when making repairs, or if the unit needs repairs.
- Be sure to follow the **WARNING** and **CAUTION** notes in the instructions.
- Gasoline, Liquid Petroleum Gas (LPG), Compressed Natural Gas (CNG), and Diesel fuel are flammable. Be sure to follow the necessary safety precautions when handling these fuels and when working on these fuel systems.
- Batteries generate flammable gas when they are being charged. Keep fire and sparks away from the area. Make sure the area is well ventilated.

NOTE: The following symbols and words indicate safety information in this manual:



WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury and property damage.

On the lift truck, the WARNING symbol and word are on orange background. The CAUTION symbol and word are on yellow background.

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manual**

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This section is for the following models:

- (B60ZAC) [C230];
- (B60ZHD) [B262];
- (B80ZHD) [B257]

General

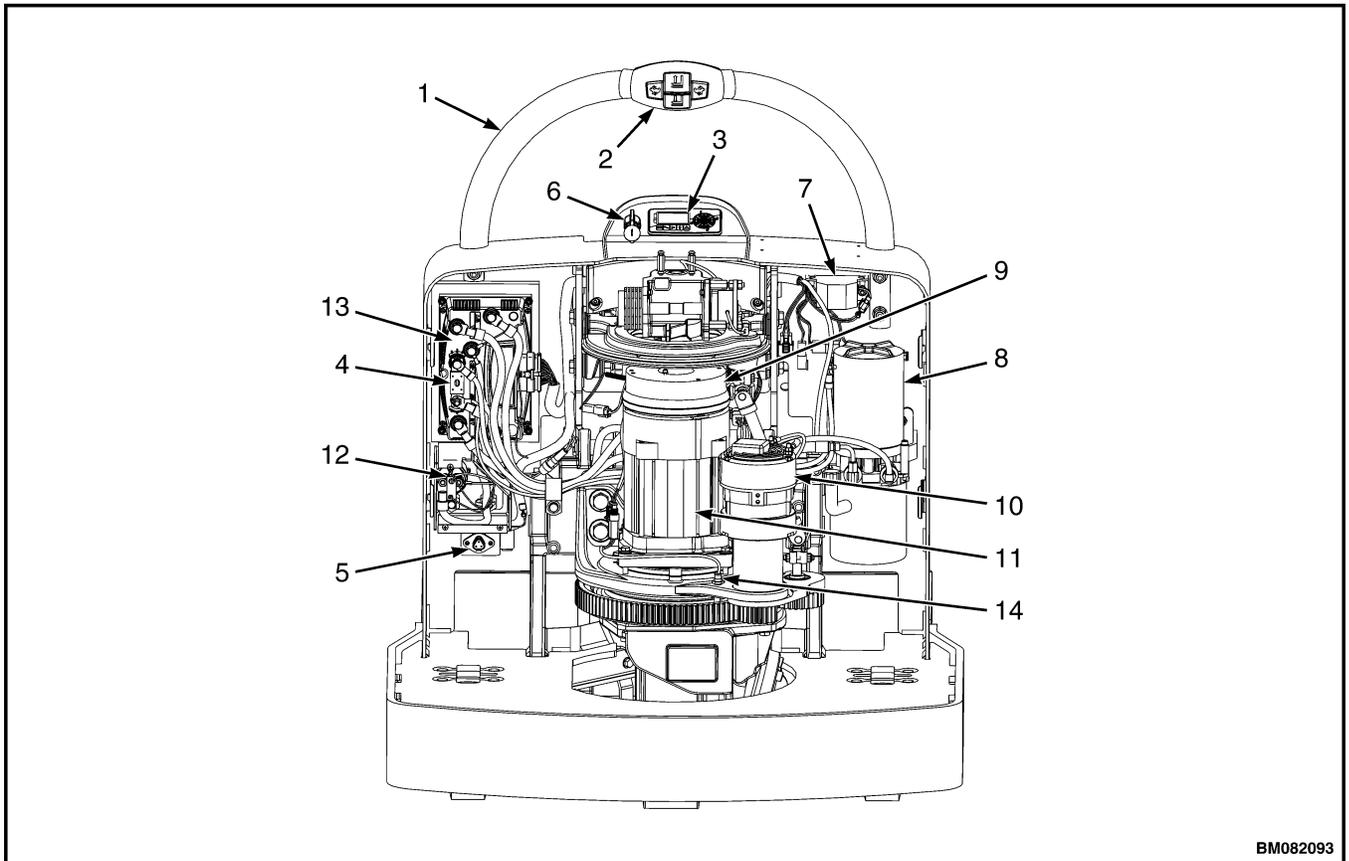


WARNING

DO NOT make repairs or adjustments unless you have been properly trained and authorized to do so. Improper repairs and adjustments can create dangerous operating conditions. DO NOT operate a lift truck that needs repairs. Report the need for

repairs to your supervisor immediately. If repair is necessary, attach a DO NOT OPERATE tag to the control handle and disconnect the battery.

This section describes the electrical systems used on the motorized hand lift trucks. Procedures are outlined for the maintenance, adjustment, and repair that may be required when servicing these lift trucks. See Figure 1.



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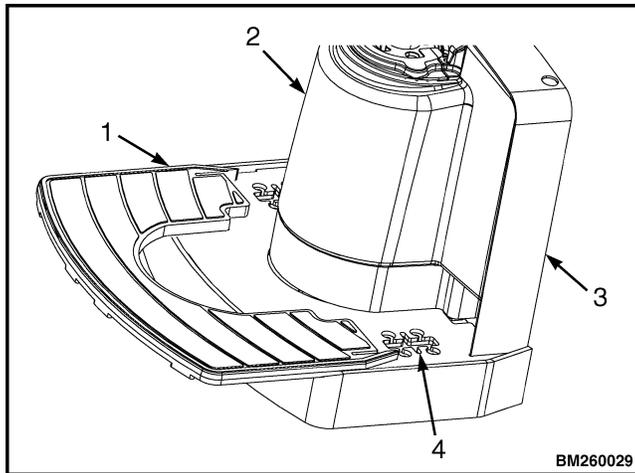
- | | |
|--------------------------------|----------------------|
| 1. GRAB RAIL | 8. PUMP MOTOR |
| 2. CONTROL BOX | 9. BRAKE |
| 3. BATTERY DISCHARGE INDICATOR | 10. STEER MOTOR |
| 4. FUSE | 11. TRACTION MOTOR |
| 5. DIAGNOSTIC CONNECTOR | 12. CONTACTOR |
| 6. KEY SWITCH | 13. CONTROLLER |
| 7. HORN | 14. PROXIMITY SENSOR |

Figure 1. Drive Unit Compartment (Power Assist Shown)

ACCESSING THE DRIVE UNIT COMPARTMENT

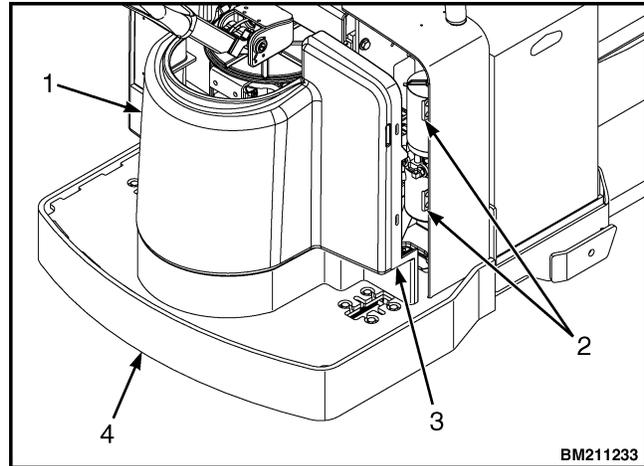
The drive unit compartment is concealed behind a molded cover which fits securely around the drive unit and steer support to the frame. The floor mat fits snugly in the operator platform after the drive unit cover is installed.

To remove the drive unit cover, first lift the corners of the floor mat and pull it out away from the drive unit. See Figure 2. Next, reach under the side of the drive unit cover near the bottom and find the grip slot. With both hands, pull up and away from the truck until the bottom of the cover kicks out from the retaining clips. See Figure 3. Repeat this for the other side of the cover. Work around the edge of the cover until it is freed from the truck.



1. FLOOR MAT
2. DRIVE UNIT COMPARTMENT COVER
3. FRAME
4. CASTER ADJUSTMENT ACCESS

Figure 2. Floor Mat



1. DRIVE UNIT COMPARTMENT COVER
2. RETAINING CLIPS
3. GRIP SLOT
4. FRAME

Figure 3. Drive Unit Compartment Cover

To install the drive unit cover, make sure the floor mat is pulled away from the drive unit. Place the bottom of the drive unit cover onto the operator platform and position the lower edges partially into the lower retaining clips. Push the top of the cover partially into the upper retaining clips. Do not push either edge of the cover in completely before starting all edges into the proper place. When the cover is aligned and started properly, press the cover completely into the retaining clips and place the floor mat into the operator platform around the cover.

Special Precautions

DISCHARGING THE INTERNAL CAPACITORS

When working with the electrical systems of the truck, it is necessary to discharge the internal capacitors of the controllers associated with each circuit affected.

WARNING

Capacitors inside the controllers can hold an electrical charge after the battery is disconnected. Discharge the internal capacitors before servicing the electrical system to prevent injury or electronic damage.

1. Move the lift truck to a safe, level area and completely lower the mast. Turn the key switch to the **OFF** position and attach a **DO NOT OPERATE** tag to the control handle. Block the drive wheel to prevent unexpected movement.
2. Disconnect the battery power cable connector from the truck connector located on the right side of the frame. Pull the battery cable connector handle to separate the battery connector from the truck connector.
3. Remove the operator compartment cover.
4. Discharge the internal capacitor in the controllers by connecting a 200-ohm, 2-watt resistor across the controller B+ and B- terminals of the motor controller for 10 seconds. Remove the resistor after discharging the capacitors. See Figure 4.

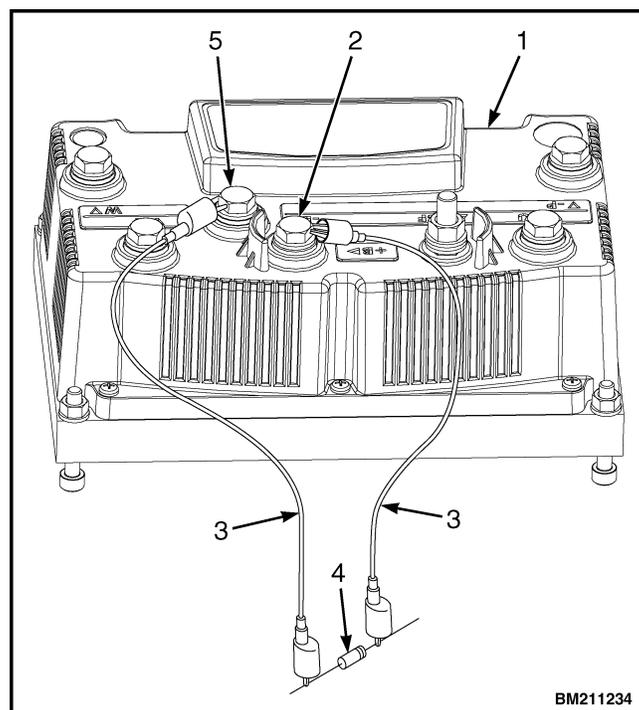
ELECTROMAGNETIC SHIELD

WARNING

Never operate Power Assist Steering models with the Electromagnetic Shield removed.

A metallic shield is installed between the MDU and brake assembly and the steering assembly on power assist steering units. This shield deflects the electromagnetic field gen-

erated by the MDU and brake assembly which can interfere with the operation of the torque sensor. Make certain that the Electromagnetic Shield is reinstalled before operating the lift truck after servicing to prevent erratic operation of the power assist steering function.



1. CONTROLLER
2. POSITIVE CONNECTION (B+)
3. INSULATED JUMPER WIRES
4. 200-OHM, 2-WATT RESISTOR
5. NEGATIVE CONNECTIONS (B-)

Figure 4. Discharging the Controller

Electrical System Checks

WARNING

Disconnect the battery before opening the compartment cover or inspecting or repairing the electrical system. If a tool causes a short circuit, the high current flow from the battery can cause personal injury or property damage.

The capacitor in the transistor controller can hold an electrical charge after the battery is disconnected. To prevent electrical shock and personal injury, discharge the capacitor before inspecting or repairing any component in the drive unit compartment. Wear safety glasses. Make certain the battery has been disconnected.

All checks, adjustments, and repairs in the drive unit compartment are done with the compartment cover removed. Remove the drive unit compartment cover for access to the electrical components.

SAFETY PRECAUTIONS

WARNING

Some checks require the battery to be reconnected. **DO NOT** connect the battery until the procedure tells you to do so. Make sure the drive wheel is raised to prevent truck movement and possible injury. Raise the drive wheel. The blocks must prevent the lift truck from falling and causing personal injury or property damage.

CAUTION

To avoid controller damage, always disconnect the battery before disconnecting any cables from the controller. Discharge the capacitor, and never put power to the controller with any power wire disconnected. Never short any controller terminal or motor terminal to the battery. Make sure to use proper procedure when servicing the controller.

1. Block lift truck so the drive tire is raised slightly off the floor to prevent unexpected movement when making checks.

WARNING

DO NOT put the lift truck on blocks unless the surface is solid, even, and level. Make sure that all blocks used to support the lift truck are solid,

one-piece units. Put a block in front and back of the tire or wheels touching the ground to prevent unexpected movement of the lift truck.

WARNING

DO NOT raise the lift truck by attaching an overhead crane to areas that will be damaged. Some of these points are not designed to support the weight of the lift truck. The lift truck can be damaged or it can fall, causing serious injury. Attach the chain or sling to a support structure of the lift truck frame.

WARNING

Never raise the forks any higher than necessary to change the load wheels. Always raise both forks at the same time. Raising the forks too high or unevenly can cause the lift truck tip over and cause personal injury or property damage.

2. Use a crane or jack to raise the forks or motor compartment assembly. Put blocks under the forks or the edge plates of the motor compartment assembly. See Figure 5. Make sure the lifting device has a capacity of at least two-thirds (2/3) of the combined weight of the lift truck and the battery as listed on the nameplate.
3. Turn the key switch to the **OFF** position and disconnect the battery.
4. Discharge the capacitors. See Special Precautions in this section.

NOTE: These checks require a volt-ohmmeter with a meter movement. Most digital meters will not operate correctly for some of these checks. Specific checks require additional equipment.

NOTE: The correct meter polarity is necessary for the checks. The voltage checks are made between the point indicated in Table 1 and battery negative. Connect the meter negative to battery negative.

NOTE: The battery does not have to be removed to check the specific gravity.

5. Using a hydrometer, check the specific gravity of the battery. If the specific gravity is less than 1.260, the battery is not fully charged or is damaged. A fully-charged battery has a specific gravity of 1.270 to 1.290. A discharged battery has a specific gravity of approximately 1.165.

6. The electric lift truck has a two-wire system. The frame must not be a common electrical path. Check for 50,000 ohms or more between each battery terminal and a clean connection on the frame. Remove any circuit paths between the controller and the frame of the lift truck, such as a dirty battery case. Carbon dust in a motor or other parts can cause a circuit path. Check for additional equipment that may cause a circuit path to the frame.
7. Check for voltage between each terminal of the connector that fastens to the battery and a clean connection on the frame. Normally, there is small voltage (less

than 30 percent of the battery voltage) between the battery and the frame, even though the resistance is very high. A higher voltage can indicate a dirty battery or a damaged battery. Clean the battery and battery compartment as necessary.

8. Visually check for parts or wires that are loose or damaged.

NOTE: Make an identification of any wires before you disconnect them. The wires must be reconnected correctly after checks or repairs.

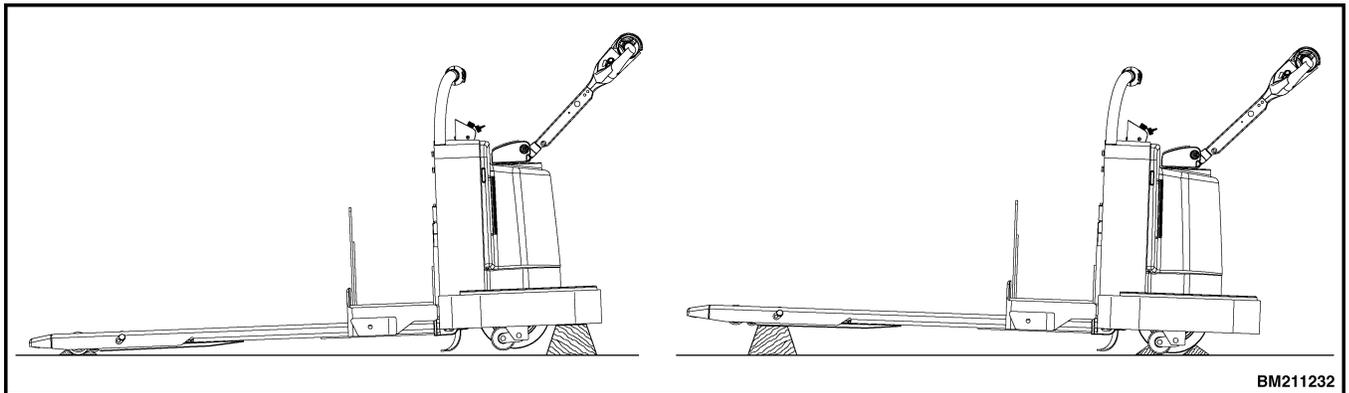
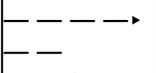
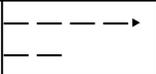
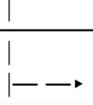
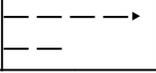
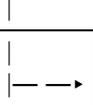


Figure 5. Putting the Lift Truck on Blocks

Table 1. Voltage Checks

| LIFT TRUCK WILL NOT MOVE IN EITHER DIRECTION. NO FAULT IS DISPLAYED ON THE CONTROLLER. | | |
|--|---|---|
| Possible Causes: | | |
| 1. Battery not connected. | | |
| 2. Control fuse is damaged. | | |
| 3. Key switch or brake switch is damaged. | | |
| 4. Transistor controller connector unplugged. | | |
| 5. Transistor controller is damaged. | | |
| 1.0 Check for battery voltage on the battery side of control fuse. |  | 1.01 Battery voltage at control fuse. Check for open control fuse. |
| |  | 1.02 No battery voltage at control fuse. Connect battery or check wiring between battery and fuse. |
| 1.1 Check for battery voltage at control fuse terminal of key switch. |  | 1.1.1 Battery voltage at key switch. Check for damaged key switch. Check connector. |
| |  | 1.1.2 No voltage at key switch. Wire to key switch or connections is damaged. |
| 1.3 Key switch closed. Brake switch closed. Check for battery voltage at B+ terminal of transistor controller. |  | 1.3.1 Battery voltage at B+ terminal. Check fault code. If no fault code, possible damaged control handle card. |
| |  | 1.3.2 No voltage at B+ terminal. Check B- terminal. Check fault code. |

Calibration

POWER ASSIST STEERING SENSOR



WARNING

If at any time a tiller handle slowly moves in one direction during startup, it is likely calibration needs to be performed.

Power assist steering calibration should be performed if either the torque sensor or EPAS unit is serviced or replaced or anytime the drive tire is replaced.

1. Position the lift truck on a normal, smooth surface floor away from personnel or other equipment.
2. Turn the key switch to the **OFF** position and remove the drive unit compartment cover.
3. The Calibration Tab is an unconnected wire with a female spade connector hanging near the ETACC CAN connector. Attach the Calibration Tab to the B+ terminal of the controller, using a 914 mm (36 in.) 14 Ga. jumper wire with an alligator clip on one end and a male spade connector on the other.



WARNING

DO NOT interfere with the lift truck or tiller handle during the calibration cycle.

4. Standing clear of the steer handle, turn the key switch to the **ON** position.
5. The lift truck will start up in calibration mode and the tiller handle will begin to move on its own power during the calibration cycle.
6. Wait at least 5 seconds after the calibration cycle has ended (the tiller has stopped moving) and remove the jumper wire.
7. Wait at least 5 seconds after the jumper wire is removed and cycle the key switch to the **OFF** position and then back to the **ON** position.
8. Check the lift truck for proper operation. Reinstall the drive unit compartment cover.

Repairs



WARNING

DO NOT make repairs or adjustments unless you have been properly trained and authorized to do so. Improper repairs and adjustments can create dangerous operating conditions. **DO NOT** operate a lift truck that needs repairs. Report the need for repairs to your supervisor immediately. If repair is necessary, attach a **DO NOT OPERATE** tag to the control handle and disconnect the battery.

Disconnect the battery and separate the connector before opening the drive unit compartment cover or inspecting or repairing the electrical system. If a tool causes a short circuit, the high current flow from the battery can cause personal injury or property damage.

The capacitor in the transistor controller can hold an electrical charge after the battery is disconnected. To prevent electrical shock and personal injury, discharge the capacitor before inspecting or repairing any component in the drive unit compartment. See **Discharging the Internal Capacitors** in this section.

All checks, adjustments, and repairs in the drive unit compartment are done with the compartment cover removed. Remove the drive unit compartment cover for access to the electrical components and discharge the capacitor. See **Accessing the Drive Unit Compartment** in this section.

CONTROLLER, REPLACE

WARNING

Some checks require the battery to be connected. **DO NOT** connect the battery until the procedure tells you to do so. Make sure the drive wheel is raised to prevent movement and possible injury. Raise the drive wheel. See the section Periodic Maintenance 8000SRM1644 - How to Put a Lift Truck on Blocks. The blocks must prevent the lift truck from falling and causing personal injury or property damage.

DO NOT replace the controller until you have thoroughly checked all other electrical components and are sure the controller is malfunctioning. .

Remove

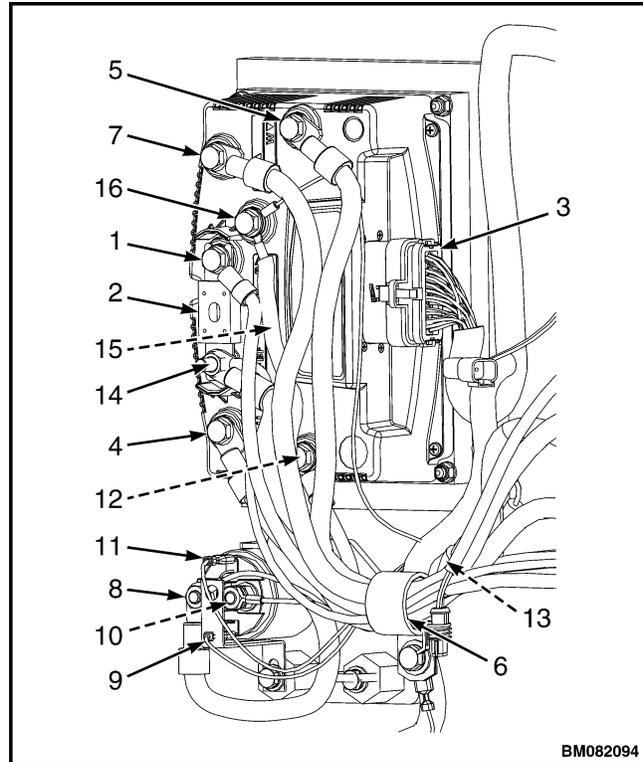
1. Move the truck to a safe, level location. Turn the key switch to the **OFF** position, disconnect the battery, and block the drive tire to prevent unexpected movement.
2. Remove the drive unit compartment covers.
3. Discharge the capacitor. See Discharging the Internal Capacitors in this section.
4. Tag and disconnect wires from the controller. See Figure 6.
5. Remove nuts securing shield box to controller if equipped.
6. Remove mounting screws and remove controller.

Install

1. Install replacement controller on lift truck using mounting hardware.
2. Connect wires and cables to the proper terminals as identified during the removal procedure.
3. Connect battery and turn the key switch to the **ON** position. Test the brake for proper operation.

Turn the key switch to the **OFF** position and disconnect the battery again to continue installation.

4. Install the drive unit compartment covers.



1. B+ CONTROLLER TERMINAL
2. MAIN FUSE
3. MAIN CONNECTOR
4. TRACTION MOTOR POS (TERMINAL U)
5. TRACTION MOTOR POS (TERMINAL W)
6. CABLE CLAMP
7. TRACTION MOTOR POS (TERMINAL V)
8. MAIN CONTACTOR (IN)
9. BATTERY POS
10. MAIN CONTACTOR (OUT)
11. BATTERY NEG
12. PUMP MOTOR POS (TERMINAL P)
13. IN-LINE FUSE
14. BATT POS (FROM CONTACTOR)
15. BATT NEG (FROM CONTROLLER)
16. B- CONTROLLER TERMINAL

Figure 6. Controller Wiring (Manual Steer Shown)

CONTACTOR COIL, CHECK

Disconnect coil wires. Test contactor coil using an ohmmeter to measure the resistance. The coil should read 23 ohms $\pm 10\%$. Remove and replace contactor if resistance readings indicate a short circuit in both directions or if there is an open circuit in both directions. Make sure coil wires are connected to the proper terminals. See Figure 7.

NOTE: The contactor contains no serviceable parts and must be replaced as a complete assembly.

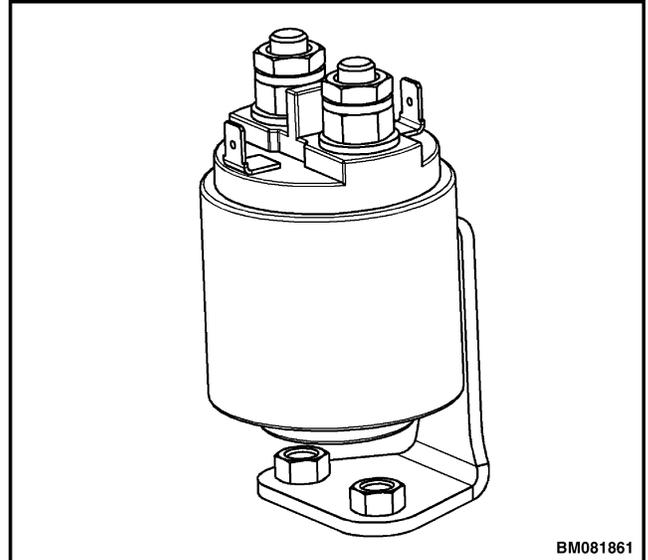


Figure 7. Contactor



WARNING

The capacitor in the transistor controller can hold an electrical charge after the battery is disconnected. To prevent electrical shock and personal injury, discharge the capacitor before inspecting or repairing any component in the drive unit compartment. Wear safety glasses. Make certain the battery has been disconnected.

The motorized hand trucks use a single 4-amp in-line fuse (FU 5) for the control circuit, and a single 400-amp (FU 1) fuse mounted on the controller for both the drive motor and

Fuses

the hydraulic pump motor. Trucks with power assisted steering have a 30-amp in-line fuse in the steering motor circuit. Remove and replace as required.

If it cannot be determined visually that a fuse has failed, check for continuity using an ohmmeter. Make certain that any replacement fuse is of the right amperage before installation.

Horn

REPLACE

1. Move the truck to a safe, level location; turn the key switch to the **OFF** position; and disconnect the battery. Block the drive tire to prevent unexpected movement.
2. Remove the drive unit compartment covers. See GeneralGeneral in this section.
3. Discharge the capacitor. See Special Precautions in this section.
4. Disconnect the horn wiring from the main wiring harness.



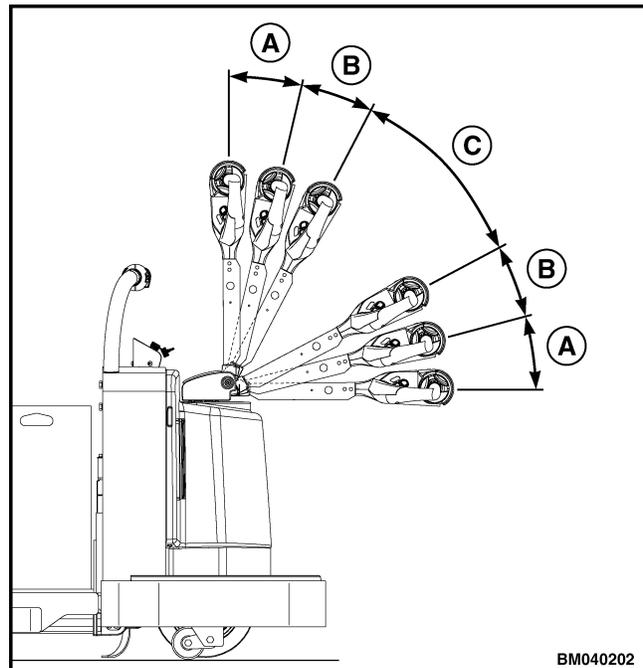
CAUTION

DO NOT overtighten horn mounting hardware.

5. Remove nuts and washers from bolts securing horn to frame. Remove horn from bolts. Position new horn onto bolts as removed and install washers and nut.
6. Install wiring to horn as removed.
7. Connect the battery, turn the key switch to the **ON** position, and test for proper operation. Turn the key switch back to the **OFF** position and disconnect the battery again to finish repairs.
8. Install the drive unit compartment covers as removed. See GeneralGeneral in this section. Return the lift truck to service.

Brake Switch Operation

The brake is applied when the control handle is in the full up or full down position. The brake is released by lowering the control handle to the Brake Off (operating position) and selecting a direction with the speed/direction control. Regen braking is activated when the control arm approaches full up or full down position. This slows the truck using the traction motor before applying the parking brake. See Figure 8. The parking brake is controlled by a switch(es) and/or a potentiometer (depending on model) that monitors the control arm position. If the parking brake does not release or apply properly, check the operation of the brake switches and/or potentiometer.



- A. BRAKE ON C. BRAKE OFF
B. REGEN BRAKING

Figure 8. Brake Operation

Brake and Interlock Switches

STANDARD STEERING

1. Position the lift truck on a level surface. Turn the key switch to the **OFF** position and disconnect the battery.

NOTE: The screws have been installed using Loctite® 290.

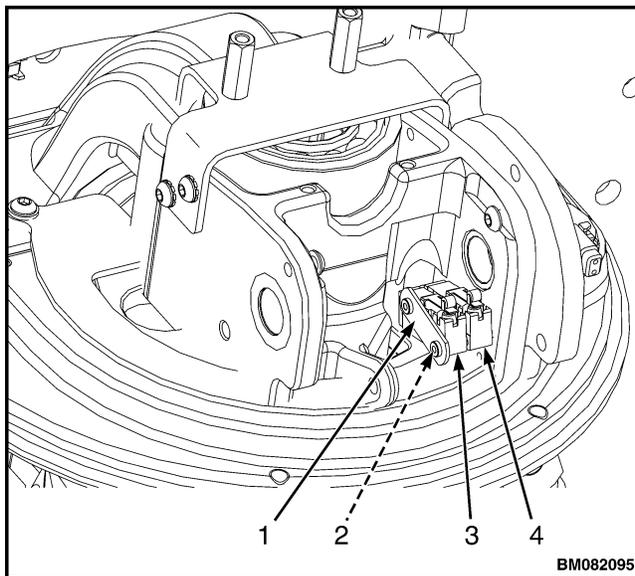
2. Remove the two screws and the nut plate retaining the switches to the control handle hub. See Figure 9.
3. Tag all wiring connections to the switches for later use when assembling the switches to the hub. Remove the switch wires.
4. Attach wiring to correct switch terminals as noted during removal.



CAUTION

Overtightening the screws can damage the switches.

5. Position switches to the hub as removed and secure with two screws and nutplate. Apply Loctite® 290 to the screws, install, and tighten.



- | | |
|-------------|-----------------|
| 1. NUTPLATE | 3. REGEN SWITCH |
| 2. SCREW | 4. BRAKE SWITCH |

Figure 9. Brake and Interlock Switches

6. Connect battery and turn the key switch to the **ON** position.
7. Test for proper operation before returning the truck to service.

POWER ASSIST STEERING

Truck may be equipped with one or two brake switches depending on model. To replace the brake switch(es):



WARNING

The capacitor in the transistor controller can hold an electrical charge after the battery is disconnected. To prevent electrical shock and personal injury, discharge the capacitor before inspecting or repairing any component in the drive unit compartment. Wear safety glasses. Make certain the battery has been disconnected.

1. Move the truck to a safe, level location, turn the key switch to the **OFF** position, and disconnect the battery. Block the drive tire to prevent unexpected movement.
2. Remove two screws securing the cover to the steer support and lift the cover off. See Figure 10.
3. Tag and disconnect the wiring from the brake switch(es).
4. Remove the two screws and nutplate securing the brake switch(es) to the steer swivel. Remove the brake switch(es). See Figure 11.

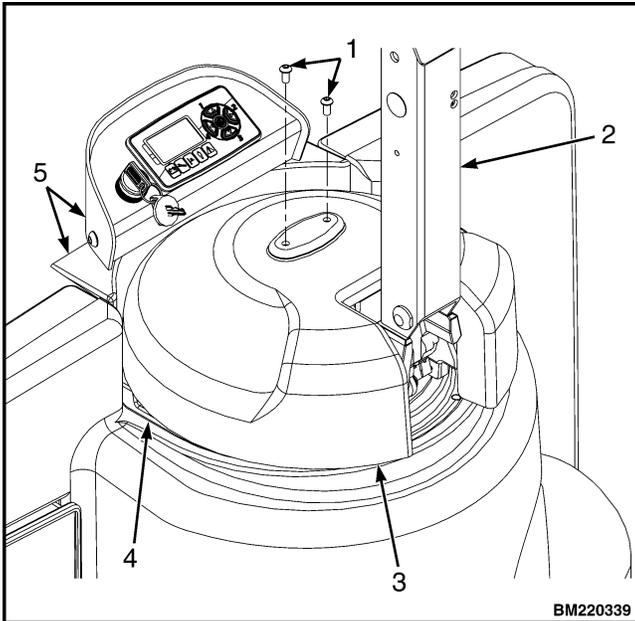


CAUTION

DO NOT overtighten switch mounting hardware.

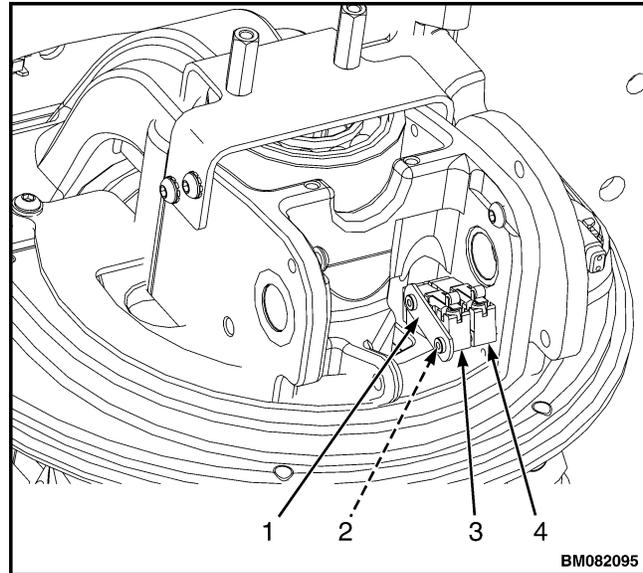
5. Position the brake switch(es) to the steer swivel as removed. Align the switch holes with the mounting holes in the steer swivel and install screws and nutplate. Make sure the switch actuator is aligned properly within the control arm notches.
6. Install wiring to switch(es) as removed.

7. Connect the battery, turn the key switch to the **ON** position, and test for proper operation. Turn the key switch back to the **OFF** position and disconnect the battery again to finish repairs.
8. Position the cover to the steer swivel and install the two screws to secure.
9. Install the drive unit compartment covers as removed. Return the lift truck to service.



- | | |
|----------------|-----------------------|
| 1. SCREW | 4. STEER SUPPORT BASE |
| 2. CONTROL ARM | |
| 3. COVER | 5. DASH |

Figure 10. Swivel Cover (Power Assist Steering)



- | | |
|-------------|-----------------|
| 1. NUTPLATE | 3. REGEN SWITCH |
| 2. SCREW | 4. BRAKE SWITCH |

Figure 11. Brake Switch(es)

Height Limit

Height limiting is controlled by the height limit switch in the controller. When the controller senses a high current draw from the hydraulic pump, it will shut down the pump. There are two separate incidents that will cause this current draw: The first is when the lift cylinder reaches maximum

height, and the second is when the load exceeds the rated capacity. In either case, the controller will shut down the pump.

Control Handle (Standard)

DISASSEMBLE



WARNING

DO NOT make repairs or adjustments unless you have been properly trained and authorized to do so. Improper repairs and adjustments can create

dangerous operating conditions. **DO NOT** operate a lift truck that needs repairs. Report the need for repairs to your supervisor immediately. If repair is necessary, attach a **DO NOT OPERATE** tag to the control handle and disconnect the battery.

NOTE: It is not always necessary to remove and disassemble all the components that make up the control section of the steering handle to replace a damaged part. Perform only the steps necessary to replace the damaged parts. See Figure 12.

1. Move the lift truck to a safe, level area and block the drive wheel to prevent movement of the lift truck.
2. Turn the key switch to the **OFF** position and disconnect the battery.
3. The handle is comprised of two molded-plastic halves and is held together by capscrews. Remove the screws.
4. Disengage the hooks under the auto-reverse switch. Slide the upper half off of the lower half using a gentle rocking motion while lifting and pulling the upper half away from lower half.
5. Unplug the handle wiring harness from the control handle card.
6. Place upper half of the handle upside down on a secure, level work surface so the internal parts are facing up.

NOTE: Make note of the position of the butterfly knobs relative to the handle **BEFORE** removal.

7. Remove one of the butterfly knobs by removing the screw that holds it to the handle (8).

8. Using the remaining butterfly knob, slide the shaft out of the handle. Be careful not to rotate the shaft within the control handle card.
9. Refer to the wiring diagram, or draw a sketch of where each of the push button switches are plugged into the control handle card. Unplug switches from the control handle card and remove the card.

ASSEMBLE

1. Install control handle card in the upper half of control handle. See Figure 12.

NOTE: When inserting knobs, make sure that flange on one of the butterfly knobs inserts between spring on handle (9).

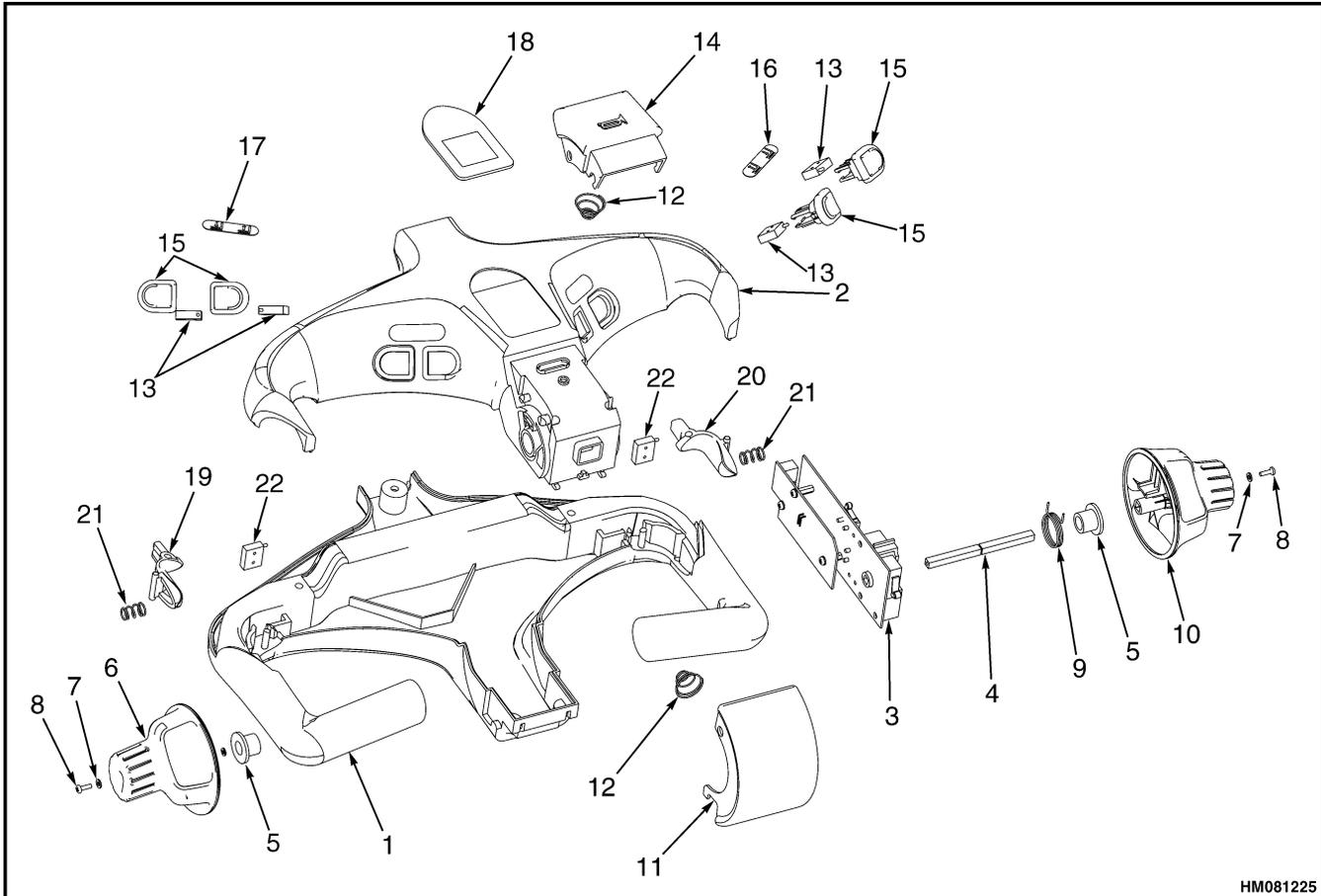
2. Slide shaft and butterfly knob into control handle card. Be careful not to rotate the shaft inside the control handle card.
3. Connect the switches and wire harness connectors.
4. Plug handle wiring harness into control handle card.



CAUTION

DO NOT force the upper half onto the lower half as this will cause damage to the retaining hooks of the upper half.

5. To install upper half of handle onto the lower half:
 - a. Tip the upper half up and align the hooks under the auto-reverse switch.
 - b. Lower the upper half onto the lower half.
6. Install capscrews to retain upper half of control handle to lower half.
7. Connect battery cable and test control handle operation.



HM081225

- | | |
|---------------------------------|-----------------------|
| 1. LOWER HALF | 12. SPRING |
| 2. UPPER HALF | 13. SWITCH |
| 3. CONTROL HANDLE CARD ASSEMBLY | 14. HORN SWITCH COVER |
| 4. SHAFT | 15. SWITCH ASSEMBLY |
| 5. BUSHING | 16. LABEL |
| 6. LH BUTTERFLY KNOB | 17. LABEL |
| 7. WASHER | 18. LABEL |
| 8. SCREW | 19. ACTUATOR |
| 9. SPRING | 20. ACTUATOR |
| 10. RH BUTTERFLY KNOB | 21. SPRING |
| 11. SWITCH COVER | 22. MICROSWITCH |

Figure 12. Control Handle

Control Handle (HD Option)

DISASSEMBLE

Remove Top Cover

NOTE: Cover screws near the traction reverse switch are shorter than the cover screws near the control handle arm.

NOTE: The actuator for the traction reverse switch is held in place by flanges in the top cover and base. The actuator is spring loaded. Use caution when removing the actuator.

1. While holding the top cover in place, remove the four cover screws securing the top cover to the base from the bottom of the handle assembly.
2. Slowly lift the top cover from the base while holding the traction reversing actuator. Remove the traction reverse actuator as the top cover is removed. Recover the two springs and actuator pin from behind the actuator.
3. Tag, identify, and disconnect the wiring connecting the top cover switches to the control handle.

Remove Function Switches

1. Remove the top cover. See Remove Top Cover in this section.
2. The switch mount is held to the switch retainer by four tabs - two on each side of the switch mount. See Figure 13.
3. Remove the switch mount from the switch retainer by lightly applying pressure to the tabs on one side of the switch mount and slightly lifting the switch mount away from the retainer. Once clear, remove the switch mount from the top cover.
4. Remove the pin retaining the traction reversing switch at the front of the switch mount.
5. Slide each switch from the switch mount and remove the switches with the attached wiring.

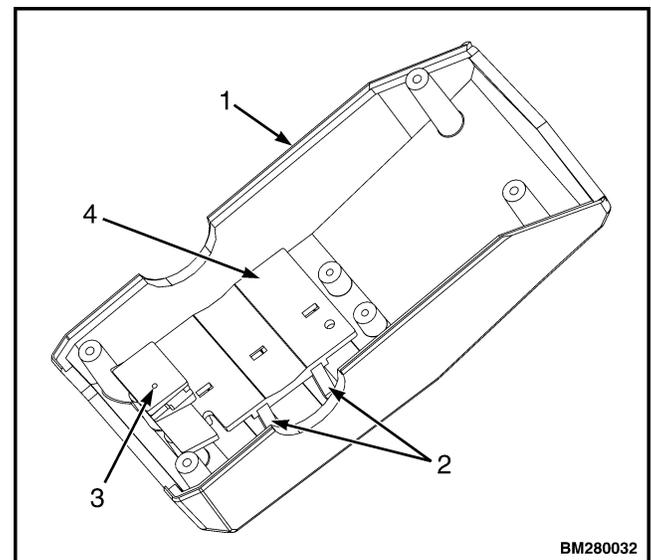
NOTE: The switches are not individually serviceable. The switch assembly must be serviced as a unit.

Remove Throttle Sensor Assembly

1. Remove the top cover. See Remove Top Cover in this section.

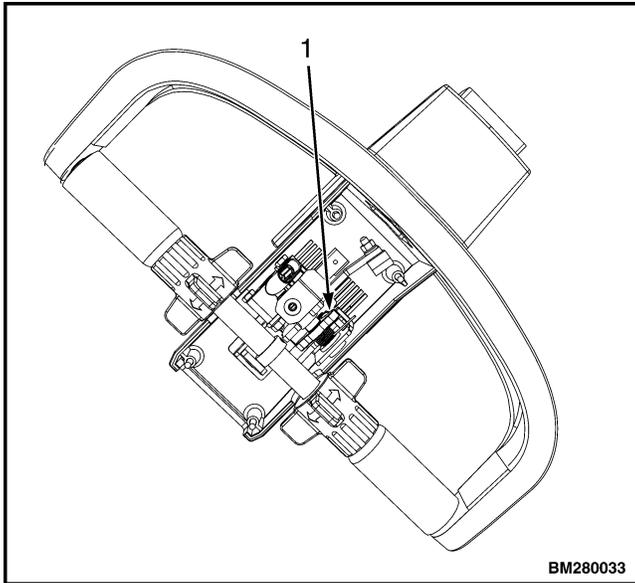
NOTE: Position the handle vertically to access the screws securing it to the base. Hold the switch while removing screws from the base.

2. Remove the two screws from the bottom center of the handle base.
3. While lifting the throttle sensor assembly, remove the pin securing the link to the throttle sensor assembly using needle-nose pliers. See Figure 14.
4. Maneuver the link to disconnect it from the throttle sensor assembly.
5. Disconnect the wiring connected to the throttle sensor.
6. Remove the two capscrews, washers, spacers, and nuts securing the sensor to the throttle sensor and remove the sensor.



- | | |
|--------------|------------------|
| 1. TOP COVER | 3. RETAINING PIN |
| 2. TABS | 4. SWITCH MOUNT |

Figure 13. Switch Mounting



1. PIN

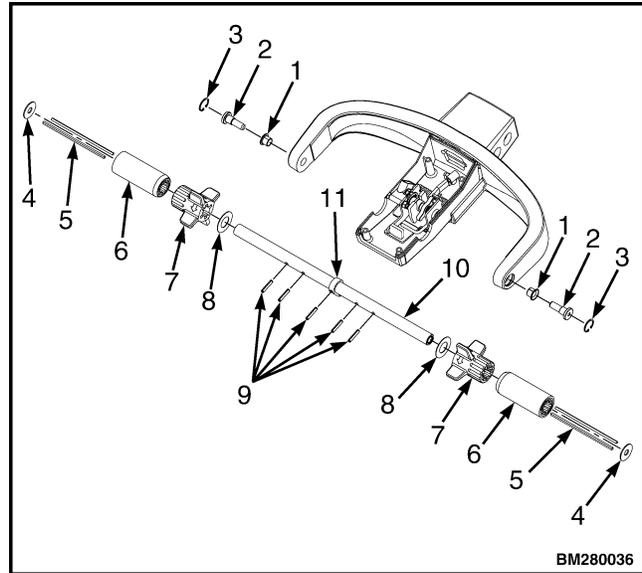
Figure 14. Retaining Pin

7. Remove the inner bushing supporting the throttle sensor end of the throttle cam.
8. Slide the cam out of the outer bushing. Take care to ensure the throttle return spring tangs slide off the sensor mounting bracket and remain in the cam. Remove the cam and spring from bracket.
9. Remove the outer spring from the bracket.
10. Inspect the bushings for excessive wear and replace as needed.

Remove Handle Shaft Assembly

1. Remove the top cover. Refer to Remove Top Cover in this section.
2. Remove the retaining rings from either side of the handle to access the handle shaft pins. See Figure 15.
3. Install an M6 capscrew into the threaded end of the handle shaft pin and remove the pin from the handle casting.
4. Lift the handle shaft assembly from the handle casting and maneuver the link to disconnect it from the throttle sleeve.
5. Slide the grips from the shaft. Recover the locking rods from inside the grips if equipped.

6. Move the butterfly actuators as required to remove the spiral pins from the shaft (2 pins per side).
7. Remove the butterfly actuators from the shaft.



- | | |
|-------------------|---------------|
| 1. BUSHING | 7. ACTUATOR |
| 2. SHAFT PIN | 8. SHIM |
| 3. RETAINING RING | 9. SPIRAL PIN |
| 4. WASHER | 10. SHAFT |
| 5. LOCKING ROD | 11. SLEEVE |
| 6. GRIP | |

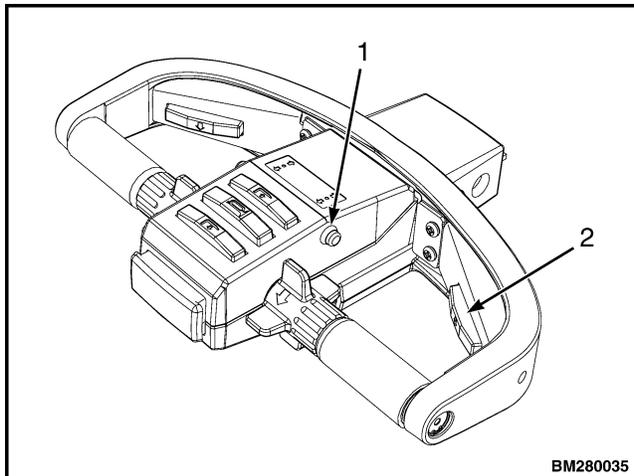
Figure 15. Handle Shaft

Remove Side Glide Switches

1. Remove the top cover. See Remove Top Cover in this section.

NOTE: Hold the cover when removing the screws.

2. Remove the two screws and washers holding the Side Glide switch assembly to the handle. See Figure 16.
3. Carefully separate the cover, actuator, and spring from the switch base.
4. Disconnect the wiring connector from the switch.
5. Remove the two screws retaining the Side Glide switch to the switch base and remove the switch.



1. COAST CONTROL SWITCH
2. SIDE GLIDE SWITCH

Figure 16. Side Glide and Coast Control Switches

Remove the Coast Control Switches

1. Remove the top cover. Refer to Remove Top Cover in this section.
2. Tag, identify, and disconnect the wiring from the coast control switches.
3. Disconnect the two leads from the switch at the wiring connector. The individual switch wires must be removed from the connector body to remove the switch from the lift truck.
4. Remove the locking nut and washer from the switch body and remove the switch from the top cover.

ASSEMBLE

Install the Coast Control Switches

1. Install the switch and wiring through the mounting hole in the top cover.
2. Install washer and lock nut removed during disassembly.
3. Connect leads from the switch wiring to the connector body and reconnect the connector.

Install Side Glide Switches

1. Install the switch to the switch base with the two screws removed during disassembly.
2. Connect the wiring removed during disassembly.

3. Install the actuator and two springs into the cover.
4. Place the switch base on the cover and install the assembly to the handle with the two screws and washers removed during disassembly.

Install Handle Shaft Assembly

1. Slide the butterfly actuators onto the handle shaft and engage the spiral pins in the shaft.



CAUTION

Make sure the lock rods are installed opposite one another in capped slots of the butterfly actuators.

NOTE: Locking rods can be installed or removed depending on operational preference.

2. If equipped, install the locking rods into the capped slots of the butterfly actuators. Some slots of the butterfly actuators are open completely through and some are capped at the end. Make certain that the rods are installed in slots that are capped to hold the rod in place. See Figure 17.

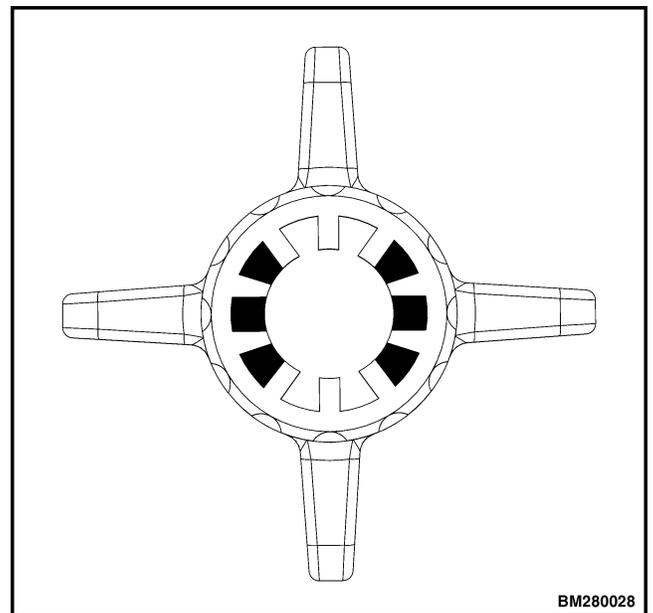


Figure 17. Capped Slots in Butterfly Knob

3. Align the grips with the locking rods and install the grips onto the handle shaft.
4. Install the link from the throttle sensor into the shaft sleeve and the throttle sensor assembly.

5. Position the handle shaft assembly into the handle.

NOTE: The pins are a slight press fit to the handle and may require slight tapping with a hammer and punch to install.

6. Install the handle shaft pins through the handle, shims, and into the ends of the handle shaft. Ensure the butterfly actuators rotate freely.
7. Install the retaining pin in the link at the throttle sensor end of the link.
8. Install the retaining rings removed during disassembly into the handle. Replace the retaining rings if the rings show any sign of damage.
9. Install the top cover assembly. See Install Top Cover in this section.

Install Throttle Sensor Assembly

1. Install the outer cam shaft bushing into the mounting bracket.
2. Install the cam and spring assembly removed during disassembly. Insert the spring end into the outer bushing and spread the spring tangs over the tab on the mounting bracket.
3. While holding the cam shaft in place, slide the inner bushing over the shaft and install into the mounting bracket.
4. Apply a light coating of white lithium grease onto the throttle return spring.
5. Apply a light coating of white lithium grease to both ends of the link and maneuver the link into the throttle sensor assembly and the handle shaft sleeve. Install the retaining pin into the link and the throttle sensor end of the link.
6. Install the throttle sensor to the base using the capscrews, washers, and nuts removed during disassembly. Ensure the tang on the sensor aligns correctly with the shaft on the bottom assembly.
7. Torque the capscrews to 2 N•m (17.7 lbf in).
8. Install the wiring connector into the base of the throttle sensor.
9. Install the two capscrews and washers to retain the sensor assembly to the handle base.
10. Operate the linkage to ensure there is no binding.

11. Install the top cover. See Install Top Cover in this section.

Install Function Switches

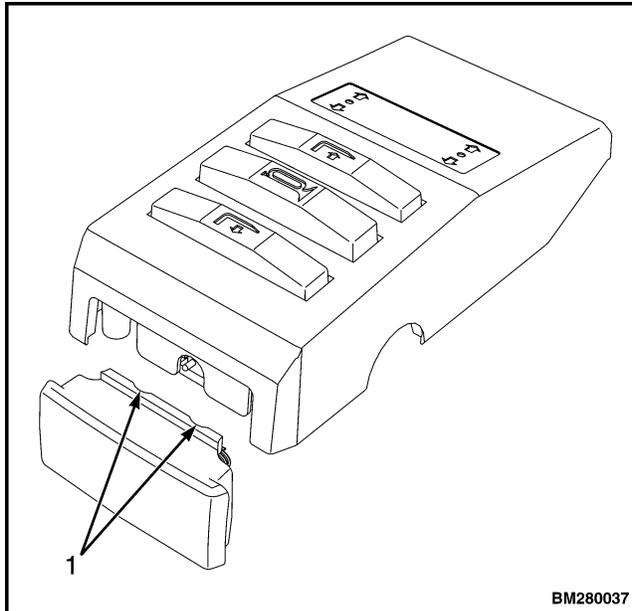
1. Slide each switch into its mounting slot in the switch mount.

NOTE: The retaining pin must be installed from the bottom of the switch mount.

2. Install the retaining pin for the traction reversing switch into the switch mount.
3. Spread the retaining pin legs and ensure the legs lay as flat as possible against the top of the switch mount for correct fit up with the switch retainer.
4. Install two of the mounting tabs on one side of the switch mount into the corresponding mounting slots of the switch retainer.
5. Snap the opposite side tabs into the switch retainer.
6. Reconnect any wiring disconnected during disassembly.
7. Install top cover. See Install Top Cover in this section.

Install Top Cover

1. Reconnect any wiring disconnected during disassembly.
2. Install the traction reversing switch actuator and springs into the top cover. The springs mount between the actuator and the front of the switch retainer plate. See Figure 18 for position of actuator.



1. RELIEFS

Figure 18. Traction Reverse Actuator

3. Hold the traction reversing actuator and springs in place in the top cover and install the traction reversing actuator into the recess in the bottom half of the handle. Lower the cover onto the handle base.
4. Ensure no wiring is pinched between the cover and the handle base.

NOTE: Exercise caution when installing the four self tapping screws into the top cover. The screws must be installed into the existing threads. Ensure the screws are started into the existing threads of the top cover or stripping of the threads may occur.

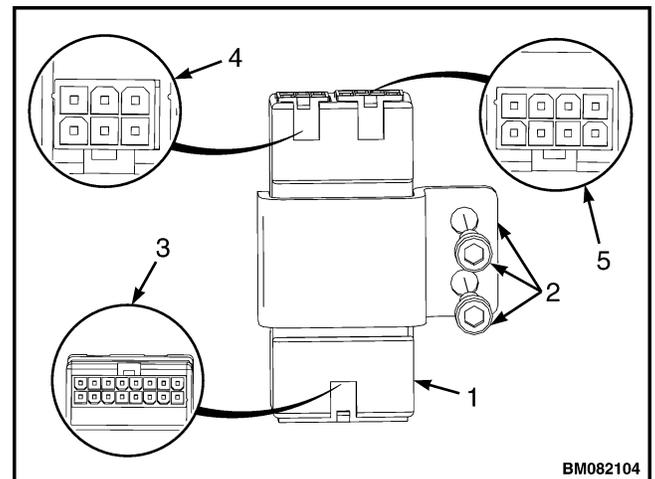
5. Install the four screws in the corners of the handle base to retain the top cover.

Control Module

CHECK

The control module converts analog signals from the control handle to digital signals for the controller to read. If the controller is reporting an input error fault code, then the control module may be malfunctioning. Check the control module using the following steps.

1. Remove drive unit compartment covers for access to the electrical components, and raise the drive tire off the floor to prevent unexpected movement. See the section **Periodic Maintenance 8000SRM1644**.
2. Connect the battery and turn the key switch to the **ON** position. Make sure the parking brake switch is in the **OFF** position.
3. Connect the negative voltmeter lead to the negative battery cable connection at the controller.
4. Disconnect 6way connector B, check pin 3 (on the harness side) for +24V. See Figure 19.



1. CONTROL MODULE
2. MOUNTING HARDWARE
3. CONNECTOR A = 16WAY
4. CONNECTOR B = 6WAY
5. CONNECTOR C = 8WAY

Figure 19. Control Module Connectors

5. Reconnect 6way connector B, check pin 9 on connector A for +5V.
6. If there is no voltage at A9 (+5V), then troubleshoot the module. See the **Troubleshooting Manual** section.
7. If the voltages are proper readings (in Step 4 and Step 55), then check inputs at connector A while activating each function.

NOTE: Voltage should be present at A3, A4, A5, A6 and **ONLY** while activating the corresponding function. See Table 2.

8. If the input values differ from those in the table, troubleshoot the control handle components, controller, and wiring. Make any necessary repairs, and recheck the input values.
9. If the input values are correct, replace the control module. See Remove.

NOTE: ETACC may be used to check communication between control handle, control module, and traction controller. See the **Troubleshooting Manual** section.

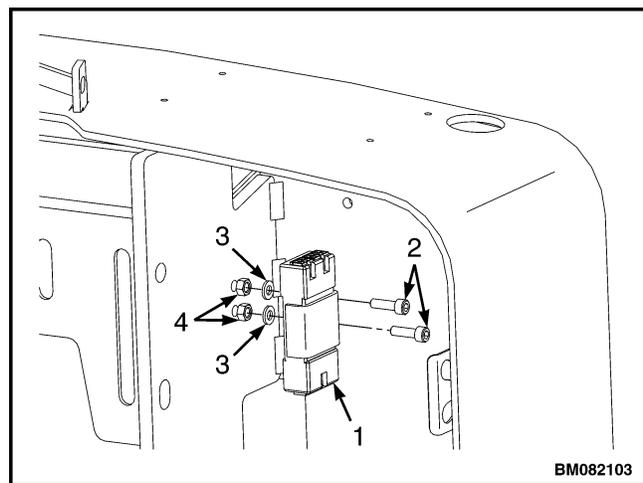
REMOVE

1. Turn the key switch to the **OFF** position and disconnect the battery.
2. Remove drive unit compartment covers for access to the electrical components. See the section **Periodic Maintenance** 8000SRM1644.
3. Discharge the capacitors. See Discharging the Internal Capacitors in this section.
4. Disconnect all connectors from the control module.
5. Remove capscrews, lock nuts, and washers securing control module to the frame.
6. Inspect the inserts. Replace as necessary. See Figure 20.

INSTALL

NOTE: Install new control module with the 16way connector (A) orientation toward the floor mat.

1. Position new control module frame.
2. Install capscrews, washers, and lock nuts to secure module to frame. Tighten to 3.5 N•m (31.0 lbf in).
3. Install connectors to control module.
4. Connect the battery and turn the key switch to the **ON** position. Test truck for proper operation.
5. Install the drive unit compartment covers. See the section **Periodic Maintenance** 8000SRM1644. Test the lift truck for proper operation, and return the truck to service.



- | | |
|-------------------|--------------|
| 1. CONTROL MODULE | 3. WASHERS |
| 2. CAPSCREWS | 4. LOCK NUTS |

Figure 20. Control Module Mounting

Table 2. Input Connector A

| 16 Pin Connector A | | | |
|--------------------|-----|----------------------|------|
| A1 | DI1 | First Digital Input | BS |
| A2 | DI2 | Second Digital Input | SR |
| A3 | DI3 | Third Digital Input | Horn |
| A4 | DI4 | Fourth Digital Input | FWD |