SERVICE REPAIR

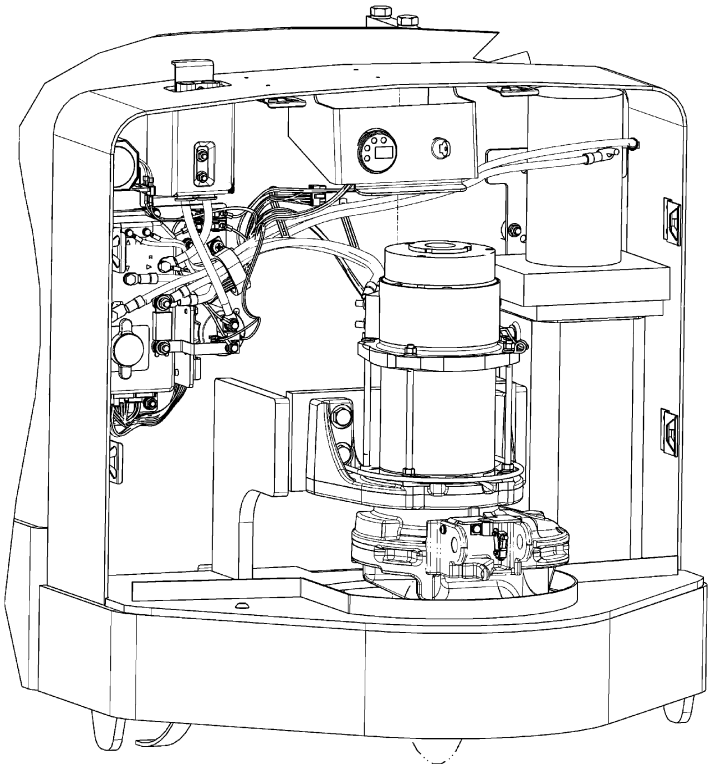
MANUAL

Hyster B455 (W20ZR W30ZR) Forklift Service Repair Manual

HYSTER

ELECTRICAL SYSTEM

W30-40ZA [B453];
W20-30ZR [B455];
W25-30-40ZC [B454]



HYSTER

PART NO. 1524252

2200 SRM 1026

SAFETY PRECAUTIONS
MAINTENANCE AND REPAIR

- 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.

TABLE OF CONTENTS

This section is for the following models:

W30-40ZA [B453];
W20-30ZR [B455];
W25-30-40ZC [B454]

"THE
QUALITY
KEEPERS"

HYSTER
APPROVED
PARTS

General

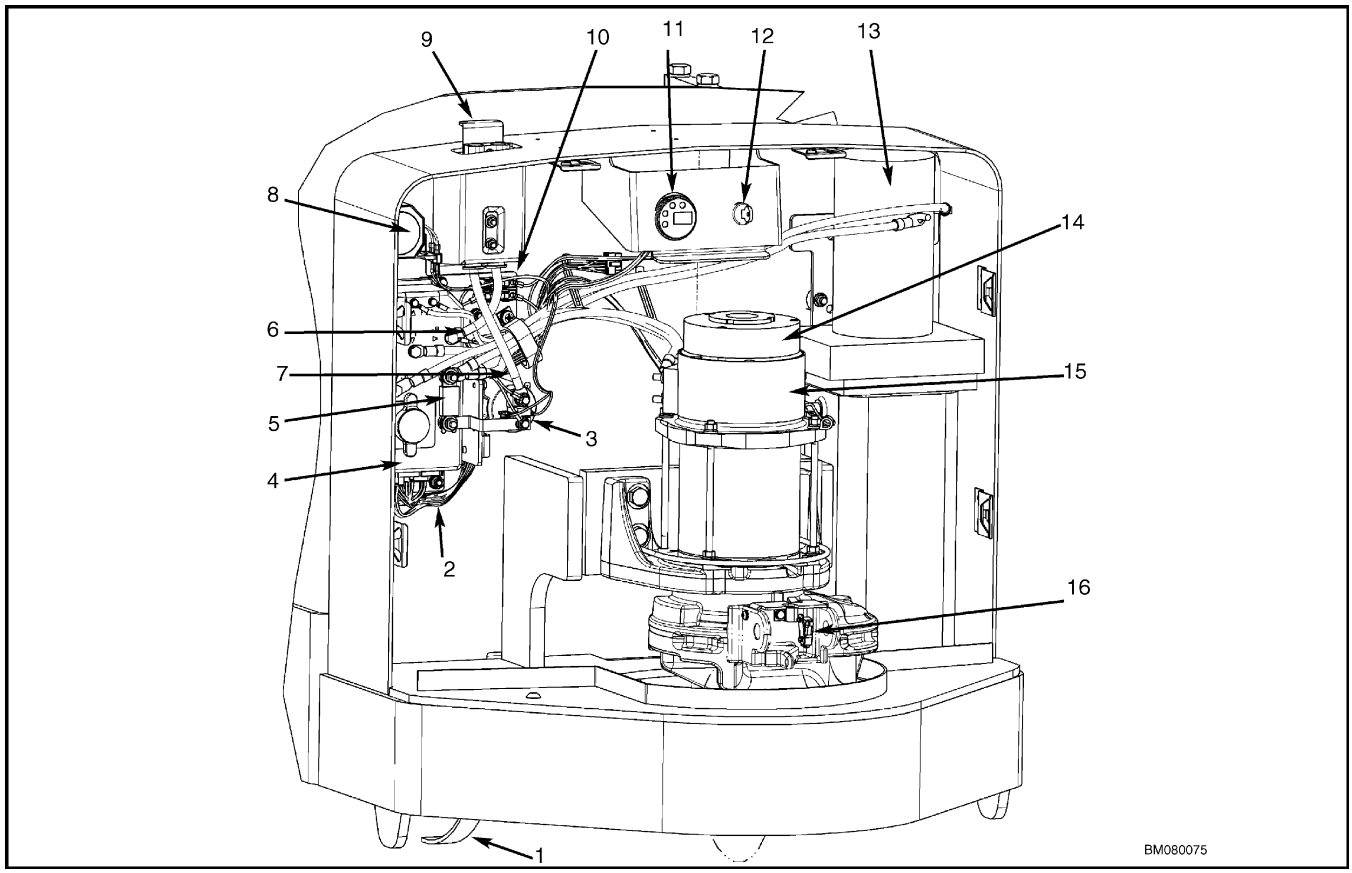
This section includes removal, disassembly, checks, adjustments, assembly, installation, and troubleshooting procedures for the electrical system components on the W30/40ZA, W20/30ZR, and W25/30/40ZC truck models. This section does **NOT** include the electrical components covered in other sections such as motors and industrial batteries. See Figure 1 for electrical system components.

See the section **ZAPI™ Controllers** 2200 SRM 1064 for additional information on the ZAPI display and for information on troubleshooting fault codes, adjusting parameters, and testing the ZAPI motor controller.

See the section **DC Motor Maintenance** 620 SRM 294 for general information on DC motors.

See the section **Periodic Maintenance** 8000 SRM 1027 for information on checking the motor brushes and for minimum brush specifications.

See the section **Diagrams** 8000 SRM 1029 for the wiring diagrams and schematics.



1. STATIC STRAP
2. MAIN WIRING HARNESS
3. MAIN CONTACTOR
4. ZAPI™ CONTROLLER (WITHOUT AUX BOARD)
5. POWER FUSE
6. NEGATIVE BATTERY CABLE
7. POSITIVE BATTERY CABLE
8. HORN
9. BATTERY CONNECTOR
10. CONTROL FUSES
11. BATTERY INDICATOR/HOURMETER DISPLAY
12. KEY SWITCH
13. LIFT PUMP MOTOR
14. ELECTRIC BRAKE
15. DRIVE MOTOR
16. BRAKE SWITCH

Figure 1. Electrical Components

Description of Operation

See Figure 2 for the logic diagram.

This section includes information on the following components:
- Control handle switches (ON/OFF and proportional)
- Hall effect directional/speed control
- Control handle card
- ZAPI™ motor controller
- Auxiliary board
- Traction motor
- Main contactor
- Brake coil
- Lift pump motor
- Pump mounted solenoid coils
- Mast mounted solenoid coils

ON/OFF switches are used for:
- Single speed lift and lower functions
- Other hydraulic functions such as sideshift, tilt, and reach
- Horn
- Traction reversing
- Creep (Turtle) speed
- Throttle neutral signal
- Tilt/Aux selector

Proportional switches provide a variable output to regulate the speed of the lift and lower functions.

A Hall effect throttle control is used to provide a directional/speed signal. The neutral switch verifies the neutral position during the self check at startup. The Hall effect throttle control, neutral switch, traction reversing switch, horn switch, and creep (turtle) speed switch are an integral part of the control handle card and not serviced separately. The switches that control the hydraulic functions mount into the control handle and are serviced separately.

The Hall effect throttle control, the proportional switches and all the ON/OFF switches (except the tilt/aux selector switch) provide input signals to the control handle card. The control handle card uses serial communication to send these signals to the ZAPI™ motor controller.

The ZAPI™ motor controller contains the system logic. The motor controller receives the inputs, processes the commands, and provides outputs to the appropriate component to activate them.

An auxiliary board is used in conjunction with the ZAPI™ motor controller on trucks that have hydraulic functions other than just lift and lower. The auxiliary board is used to power additional hydraulic solenoid coils. It receives inputs from the motor controller. The selector switch also provides an input to the auxiliary board.

The traction motor armature and separately excited field are powered directly by the motor controller. No contactors are involved in the traction circuit.

The main contactor opens to remove power from the truck to disable all traction and lift functions in the event of an electric failure.

Energizing the brake coil pulls the brake pressure plate away from the friction disc to disengage the brake. The controller powers the brake coil based on signals from the control handle arm switch and the Directional/Speed Control. The controller also contains logic to engage the brake regardless of handle position if the truck is stationary.

The traction motor controller energizes the series wound lift pump motor whenever a hydraulic function switch (other than lower) is depressed. The applied voltage to the motor varies to adjust motor RPM and pump output to the particular hydraulic function activated.

All trucks have a solenoid operated lowering valve at the pump. The motor controller activates the solenoid coil to open the lowering valve. The motor controller varies the voltage to the lowering solenoid to provide proportional lowering.

Trucks with hydraulic functions other than just lift and lower, have a solenoid operated lift valve at the pump. The motor controller activates the solenoid coil to open the lift valve during lift. The lift solenoid coil is de-energized during other hydraulic functions, isolating the lift circuit.

Trucks with double acting cylinders, such as sideshift, have a pair of directional solenoid coils at the pump for each directional valve. The motor controller activates these solenoid coils through the auxiliary board to open the directional valve. Activating one coil provides flow in one direction. Activating the other coil reverses the flow.

Solenoid operated selector valves control multiple hydraulic functions from the output of a single directional valve. The motor controller activates the selector valve coils through the auxiliary board. The number of coils varies depending on the number of hydraulic functions. A MRW020/030-E truck with tilt, reach, and sideshift would have three coils.

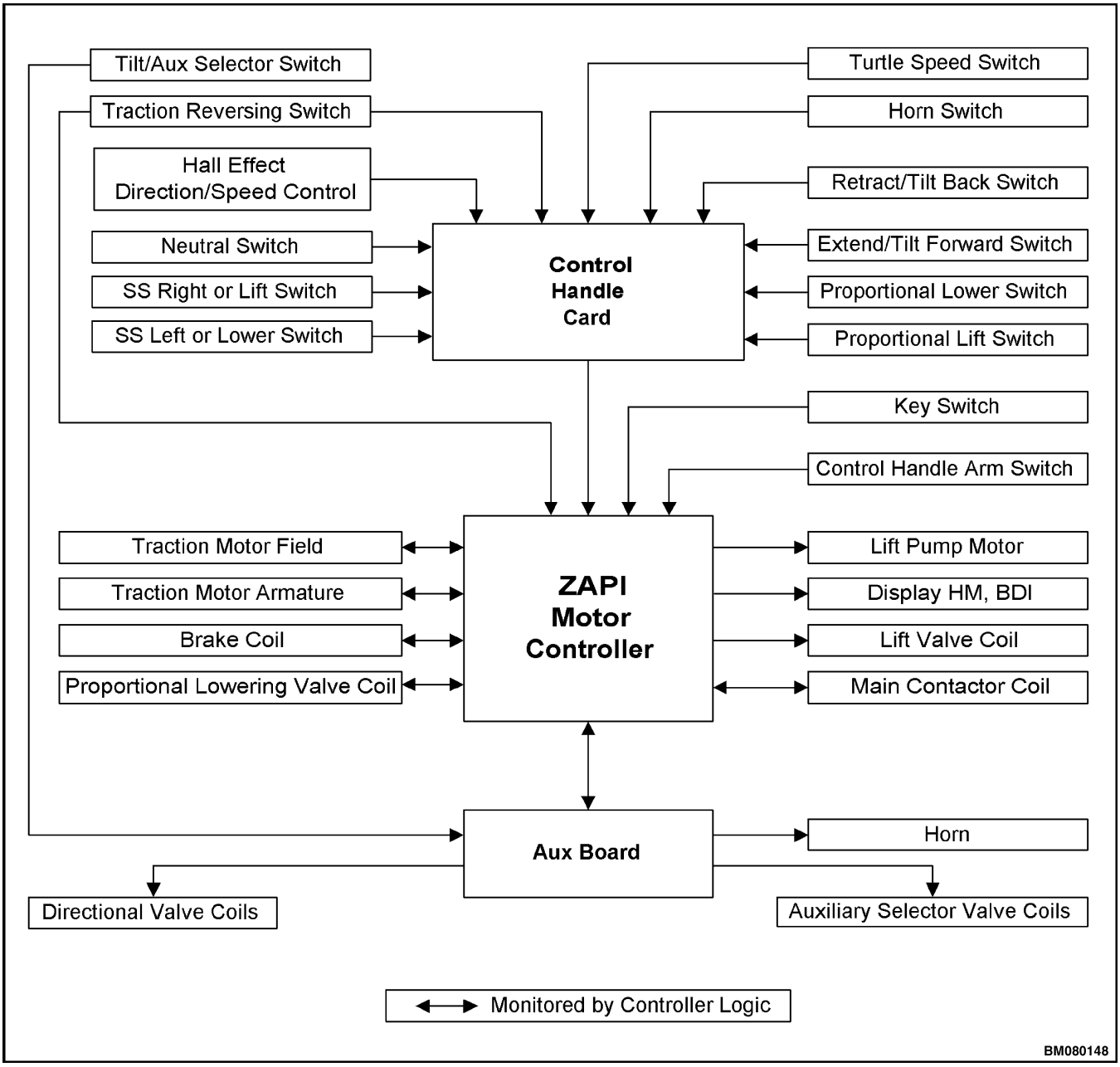


Figure 2. Logic Diagram

Special Precautions

WARNING

DO NOT make repairs or adjustments unless you have both authorization and training. Repairs and adjustments that are not correct 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.

WARNING

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.

WARNING

Some checks and adjustments are done with the battery connected. DO NOT connect the battery until the procedure tells you to do so. Never have any metal on your fingers, arms, or neck. Metal items can accidentally make an electrical connection and cause injury.

WARNING

Before doing any tests or adjustments, raise the vehicle off the ground and block the lift truck to prevent unexpected movement. See the section Periodic Maintenance 8000 SRM 1027. Refer to How to Put The Lift Truck on Blocks.

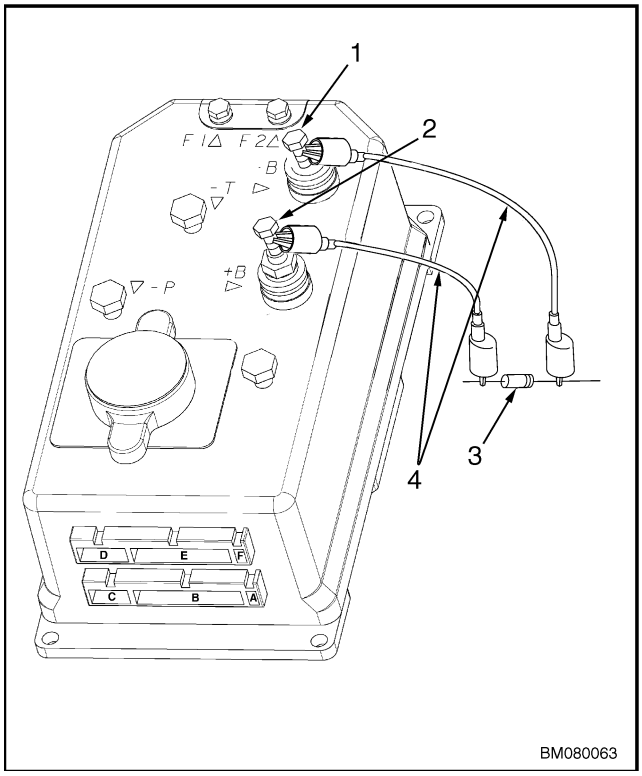
WARNING

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

CAUTION

To avoid controller damage, always disconnect the battery, discharge the capacitor, and never put power to the controller while any power wires are disconnected. Never short any controller terminal or motor terminal to the battery. Make sure to use proper procedure when servicing the controller.

1. Block load wheels to prevent lift truck from moving. Refer to the section **Periodic Maintenance** 8000 SRM 1027.
2. Turn the key switch to the **OFF** position and disconnect the battery.
3. Discharge the capacitors in the controllers by connecting a 200-ohm, 2-watt resistor across the controller's B+ and B− terminals. **DO NOT** short across the motor controller terminals with a screwdriver or jumper wire. See Figure 3.
4. Remove the 200-ohm, 2-watt resistor before reconnecting the battery.



1. NEGATIVE CONNECTION
2. POSITIVE CONNECTION
3. 200-OHM, 2-WATT RESISTOR
4. INSULATED JUMPER WIRES

Figure 3. Discharging the Capacitor (W20-25ZA, W45-50Z, and W25-30ZA$_2$)

Moving a Disabled Lift Truck

In order to move a disabled lift truck, the electric brake must be released by powering the brake coil with 24 volts. A jumper is provided in the wiring harness to supply battery voltage directly to the electric brake to release it. The truck will roll freely, but the drive motor will not activate while the jumper is installed.

⚠ WARNING

Prior to releasing the electric brake, make sure the lift truck is blocked correctly to prevent movement causing personal injury or damage to equipment.

1. Turn the key switch **OFF**.
2. Disconnect and separate the battery connectors.
3. Remove the drive unit cover to allow access to the wiring harness.
4. Locate the brake harness and brake override circuit connector (three 4-pin, Molex™ connectors in the wiring harness near the brake). See Figure 4.
5. Unplug the brake harness connector from the normal operation connector.
6. Plug the male side of the brake override circuit into the female side of the brake harness.

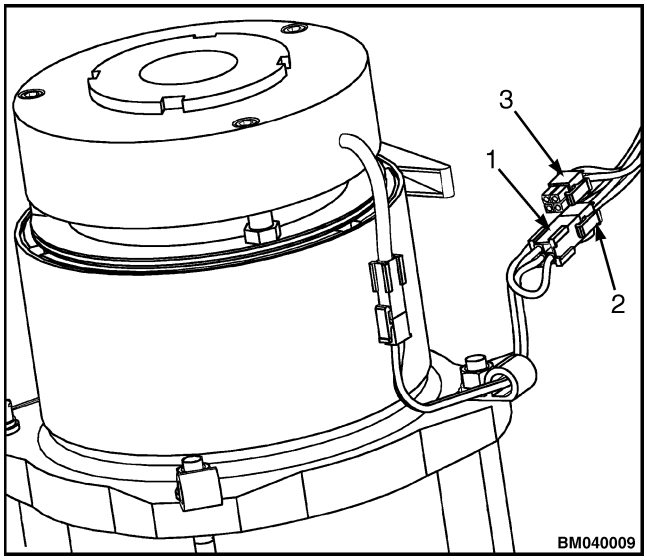
NOTE: The brake will release when battery is connected. The brake will remain released until the battery is disconnected or the brake override circuit is disconnected.

7. Connect the battery connectors.
8. Roll the lift truck to a safe, level area prior to performing any repairs on it.

⚠ CAUTION

Always unplug the Brake Override Circuit and connect the Brake Harness prior to operating the lift truck.

9. Make sure the brake override circuit is disconnected from the brake harness. The brake will remain released until the battery or the brake override circuit is disconnected. Restore the harness connector to the normal operation connector correctly before attempting to operate the lift truck.



1. BRAKE HARNESS CONNECTOR
2. BRAKE OVERRIDE CIRCUIT CONNECTOR
3. NORMAL OPERATION CONNECTOR

Figure 4. Brake Override Connector

Electrical System Checks

SAFETY PRECAUTIONS

NOTE: The dash indicator will display the code: EP 107 (or a higher number) for 1 to 2 seconds every time the key switch is turned to the ON position. This code represents the EEPROM software version and DOES NOT INDICATE A FAULT CODE.

NOTE: These checks require a volt-ohmmeter. Specific checks require additional equipment.

NOTE: The correct meter polarity is necessary for the checks. The voltage checks are made between the individual points and battery negative. Connect the meter negative to battery negative.

1. 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.

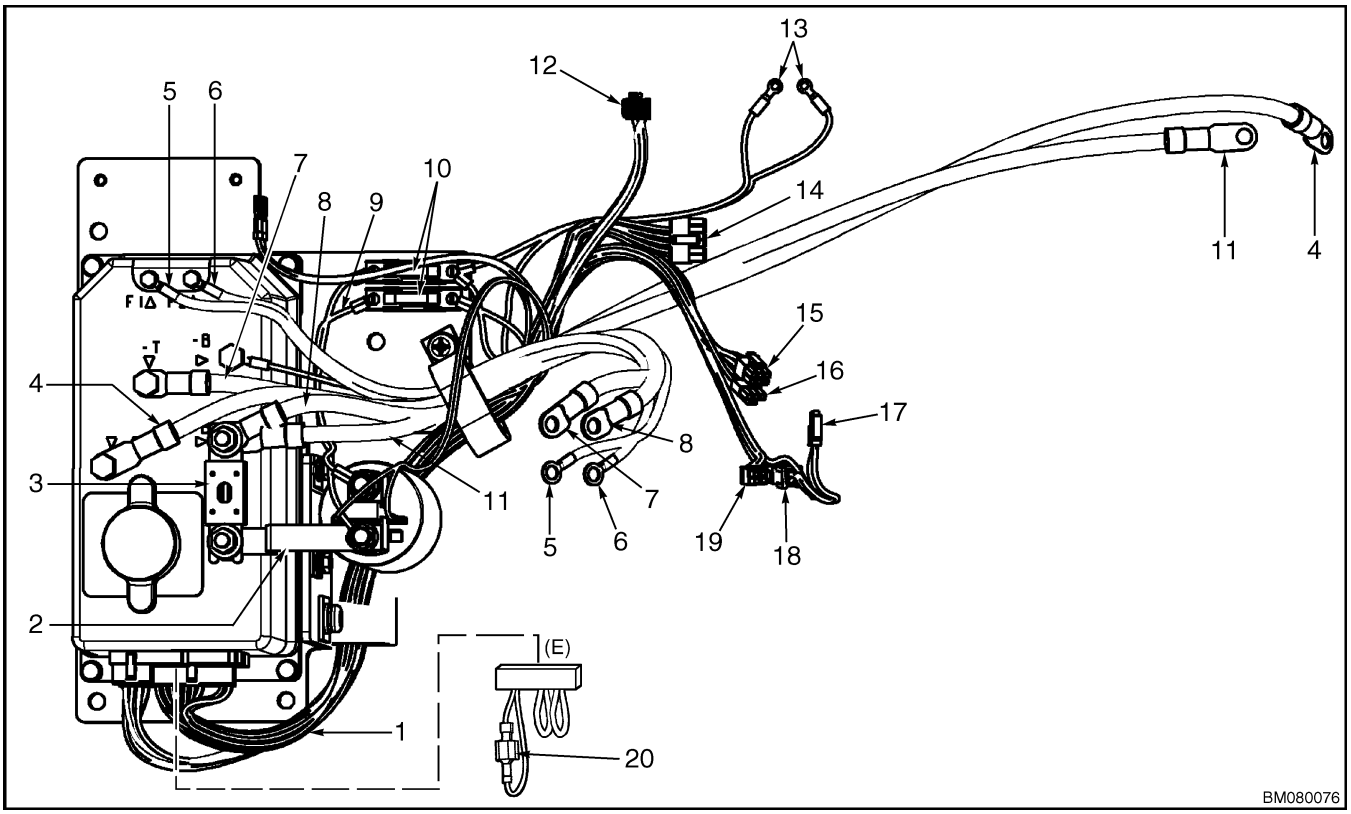
A discharged battery has a specific gravity of approximately 1.165.

2. The truck has an isolated electrical system; neither battery terminal is connected to the truck frame. Check for 50,000 ohms or more between each terminal of the battery connector of the lift truck 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.

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

4. Visually check for parts or wires that are loose or damaged. See Figure 5 for a list of the major cables and wiring harnesses.

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



1. MAIN WIRING HARNESS
2. BUSS BAR
3. 300-AMP FUSE
4. LIFT PUMP MOTOR NEGATIVE CABLE
5. F1 CABLE
6. F2 CABLE
7. A1 CABLE
8. A2 CABLE
9. FUSE WIRING HARNESS
10. 10-AMP FUSE
11. LIFT PUMP MOTOR POSITIVE CABLE
12. DISPLAY CONNECTOR
13. KEY SWITCH HARNESS
14. HYDRAULIC FUNCTIONS SUBHARNESS
15. CONTROL HANDLE HARNESS
16. BRAKE SWITCH HARNESS
17. ELECTRIC BRAKE HARNESS
18. NORMAL OPERATION CONNECTOR
19. BRAKE OVERRIDE CONNECTOR
20. BATTERY SELECTOR JUMPER

Figure 5. Wiring Harness and Wiring Connections

Repairs

CONTROLLER, REPLACE

When experiencing problems with the auxiliary hydraulic functions, the controller may not be at fault. The controller and the auxiliary module can be tested to determine where the fault has occurred. Refer to Hydraulic Troubleshooting in this section. **ALWAYS** troubleshoot to verify the component(s) at fault before replacing the controller. Refer to the section **ZAPI™ Controllers** 2200 SRM 1064.

Remove

Refer to Figure 6 for the following removal instructions.

1. Move lift truck to a safe, level area.
2. Turn the key switch to the **OFF** position and disconnect battery connectors.
3. Block drive tire to prevent movement.

NOTE: If removing the entire control panel assembly to include the electrical panel plate, it will be necessary to perform Step 4. If only removing the controller, contactor, horn, fuses, or wires, it is not necessary to perform Step 4.

4. Remove battery to gain access to control panel screws. See the section **Frame** 100 SRM 1024 for instructions on how to remove the battery.
5. Remove drive unit compartment cover for access to electrical components.
6. Discharge the capacitor. See Special Precautions.
7. Mark wires and cables for identification and later installation. Refer to Figure 5.
8. Disconnect all wires and cables from the controller.

NOTE: The battery selector jumper adjusts the discharge voltage setting of the controller. This allows the user to run either a flooded cell or maintenance-free battery.

9. Remove the battery selector jumper from the E port, located on the bottom of the controller.
10. Remove four mounting screws and lockwashers that hold controller to plate and remove controller.

Install

Refer to Figure 6 during the following installation instructions.

NOTE: If installing the entire control panel assembly to include the electrical panel plate, it will be necessary to perform Step 1. If only installing the controller, contactor, horn, fuses, or wires, it is not necessary to perform Step 1.

1. Install control panel assembly to lift truck by aligning four holes of electrical panel plate with four holes in frame and inserting countersunk capscrews into holes from the battery box side. Install washer, lockwasher, and nut on countersunk capscrews.
2. Install replacement controller on electrical panel plate by aligning four holes of controller with four holes in electrical panel plate. Install four capscrews and lockwashers.
3. Connect wires and cables to the same terminals as identified during the removal procedure.
4. Connect the battery selector jumper (25) to the E port, located on the bottom of the controller. See Figure 6.
   To use a maintenance free battery, disconnect the wire terminals on the battery selector jumper.
   To use a flooded cell battery, connect the wire terminals on the battery selector jumper.
5. Install 300-ampere fuse.
6. Reconnect battery connectors.
7. Turn the key switch to the **ON** position.
8. Test lift truck in a safe area away from other personnel and equipment.

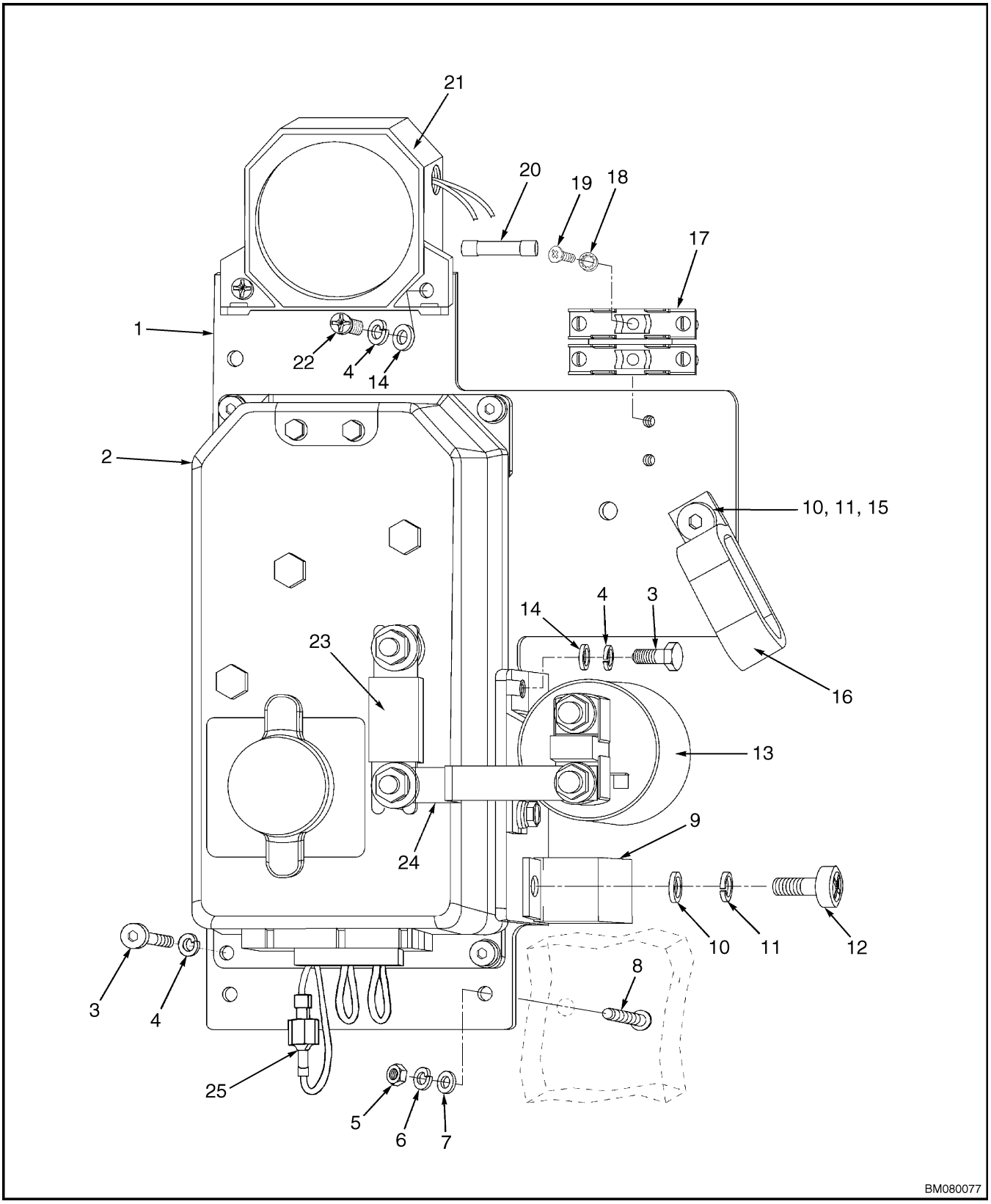


Figure 6. Control Panel Assembly

Legend for Figure 6

1. ELECTRICAL PANEL PLATE
2. CONTROLLER
3. CAPSCREW
4. LOCKWASHER
5. NUT
6. LOCKWASHER
7. WASHER
8. COUNTERSUNK CAPSCREW
9. WIRE CLAMP
10. WASHER
11. LOCKWASHER
12. SCREW
13. CONTACTOR, 300A
14. WASHER
15. SCREW
16. WIRE CLAMP
17. FUSE BLOCK
18. LOCKWASHER
19. SCREW
20. 10A FUSE
21. HORN
22. SCREW
23. 300A FUSE
24. BUSS BAR
25. BATTERY SELECTOR JUMPER

CONTACTOR COIL, CHECK

For the following instructions, remove drive unit compartment cover for access to electrical components.

1. Tag and disconnect contactor coil wires.

2. Test contactor coil using an ohmmeter.

3. Touch the probes of the ohmmeter to the coil terminals and measure the resistance between the terminals.

4. Replace contactor if resistance readings are a short circuit or an open circuit. A new contactor typically has a value of about 12.5Ω.

5. Connect contactor wires to the correct terminals.

CONTACTOR, REPLACE

Remove

1. Move lift truck to a safe, level area.

2. Block drive tire so it cannot roll.

3. Turn the key switch to the **OFF** position and disconnect battery connectors.

4. Remove drive unit compartment cover for access to electrical components.

5. Discharge the capacitor. See Special Precautions.

6. Mark wires and cables for identification and later installation. Refer to Figure 5.

7. Disconnect all wires and cables from the contactor.

8. Loosen two mounting screws and lockwashers that hold contactor to plate and remove contactor.

Install

1. Install contactor by aligning it with mounting screws on electrical plate and sliding into place. Tighten mounting screws.

2. Connect wires and cables to the same terminals as identified during the removal procedure.

3. Reconnect battery connectors.

4. Turn the key switch to the **ON** position.

5. Test lift truck in a safe area away from other personnel and equipment.

Key Switch

REMOVE

Toggle switches may be used in place of key switches certain applications. The term "key switch" will be used for both types of switches in the following instructions. See Figure 7 or Figure 8.

1. Move lift truck to a safe area and block drive wheel to prevent unexpected movement.
2. Disconnect battery and turn the key switch to the **OFF** position.
3. Remove drive unit compartment covers. See **Periodic Maintenance** 8000 SRM 1027.
4. Discharge the capacitor. See Special Precautions in this section.

NOTE: Make note of the orientation of the key switch for proper installation.

5. Remove retaining nut from top of the key switch.
6. Remove the key switch from mounting hole in frame.
7. Tag and identify all wires and connections for reference during reassembly. Disconnect wires from switch.

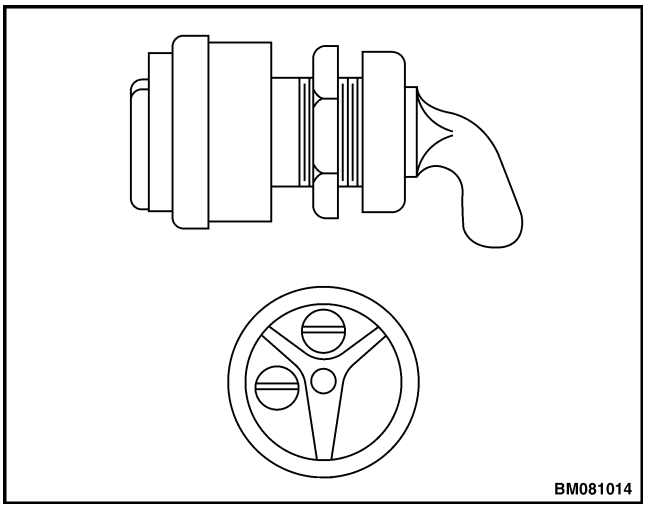


Figure 7. Key Switch (Toggle Type)

INSTALL

Toggle switches may be used in place of key switches certain applications. The term "key switch" will be used for both types of switch in the following instructions. See Figure 7 or Figure 8.

1. Connect wires to proper terminals, as identified during removal.
2. Position the key switch through mounting hole in frame and adjust switch to proper height by turning lower jam nut.
3. Install retaining nut to the key switch. Make certain switch is properly aligned by referencing label before tightening retaining nut.
4. Connect battery and test the key switch by turning it to the **ON** and **OFF** positions. Check for proper operation.
5. Install drive unit compartment covers. See **Periodic Maintenance** 8000 SRM 1027.

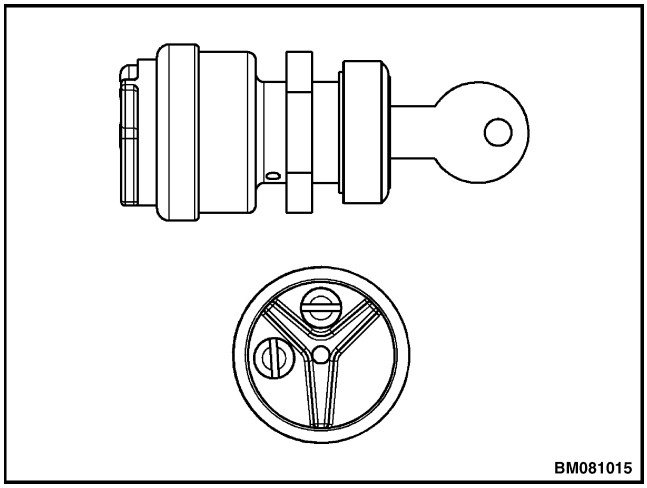


Figure 8. Key Switch

Battery Indicator/Hourmeter Display

NOTE: The dash indicator will display the code: EP 107 (or a higher number) for 1 to 2 seconds every time the key switch is turned to the ON position. This code represents the EEPROM software version and DOES NOT INDICATE A FAULT CODE.

The Battery Indicator/Hourmeter Display shows battery charge status, truck hours, and fault codes. See Figure 9.

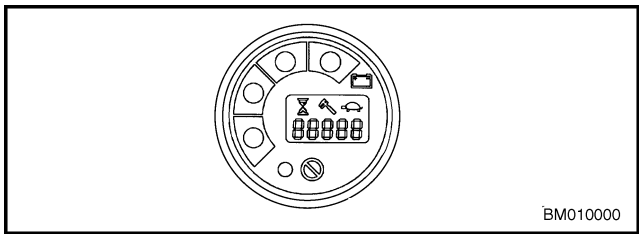


Figure 9. Battery Indicator/Hourmeter Display

REMOVE

1. Turn the key switch to the **OFF** position and disconnect battery.
2. Pull the top drive unit compartment cover away from the carriage and remove.
3. Discharge the capacitor. See Special Precautions in this section.
4. Disconnect the wire harness plug from the back of the display. Locking tab is hidden underneath rubber boot.
5. Remove nuts and washers holding retaining bracket. Remove bracket and gauge from control panel.

INSTALL

1. Install gauge in control panel.
2. Install retaining bracket, washers, and nuts. Tighten nuts.
3. Reconnect display wire harness plug.
4. Connect battery and turn the key switch to the **ON** position.
5. Test operation of lift truck in a safe area.
6. Install drive unit compartment cover.

Fuses

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 High Lift Walkie trucks use a single 300-amp (FU 1) fuse for both the lift pump motor and the drive motor, and two 10-amp (FU 2 and FU 3) fuses for the control circuit. The fuses are located on the contactor panel. See Figure 5. Remove and replace as required.

If it cannot be determined visually that any of the fuses have failed, check for continuity using an ohmmeter. To replace FU 1, loosen capscrews retaining it. Install a new fuse and tighten capscrews. FU 2 and FU 3 are retained in a fuse block. Make certain that any replacement fuse is of the right amperage before installation.

Brake Switch

DESCRIPTION

The brake switch (Figure 1, Item 16) is located behind the control handle arm under a removable cover. Its function is to send a signal to the controller. The controller energizes the solenoid to release the brake when the control handle arm is in the operating position and travel is selected. See Figure 10.

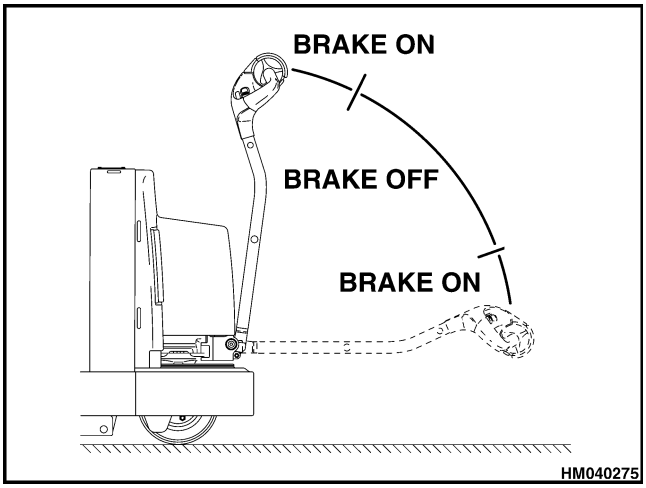


Figure 10. Brake Operation

REMOVE

1. Move lift truck to a safe, level area before performing any repairs.

2. Turn the key switch to the **OFF** position and disconnect battery.

3. Remove drive unit compartment cover to allow access to controller, wiring harness, and brake switch hardware.

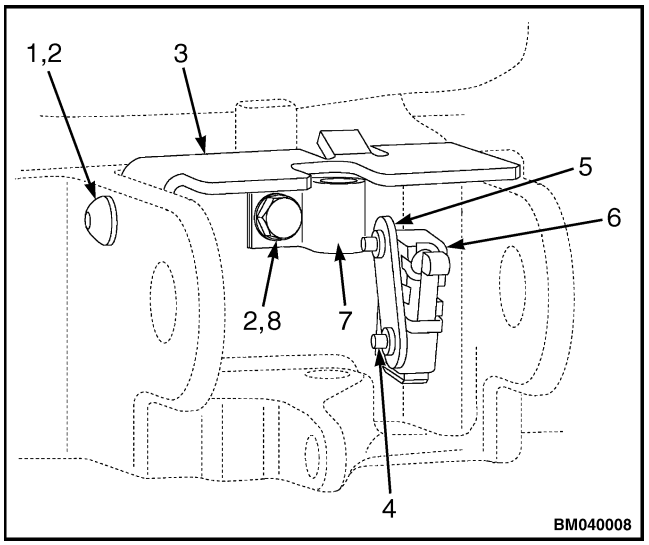
4. Discharge the capacitor. See Special Precautions.

5. Disconnect brake switch wiring harness from main wiring harness.

NOTE: You may also use the ZAPI™ handset tester function to monitor the operation of the brake switch. See **ZAPI™ Controllers** 2200 SRM 1064.

6. To test brake switch circuit install leads of an ohmmeter into the connector for the brake switch wiring harness and raise and lower control handle arm. The ohmmeter should change from near infinite resistance to almost zero resistance as the brake switch is opened and closed by the control handle arm.

For the following instructions, refer to Figure 11.



1. CAPSCREW
2. LOCKWASHER
3. SWITCH COVER
4. SCREW
5. NUTPLATE
6. BRAKE SWITCH
7. WIRE CLAMP
8. CAPSCREW

Figure 11. Brake Switch Assembly

7. Remove capscrew and lockwasher holding switch cover to the control handle bracket.

8. Remove switch cover.

9. Remove capscrew and lockwasher holding wire clamp.

10. Slide wire clamp up brake switch wiring harness to allow room to remove brake switch.

11. Remove two screws and nutplate holding brake switch.

12. Unplug brake switch wires from brake switch.

13. Check brake switch for continuity and replace if defective.

NOTE: If brake switch wiring harness is damaged or inoperative perform the following steps to remove it.

14. Remove two wire clamps mounted on top of motor that are used to protect and route the brake switch wires.

15. Remove brake switch wires from the three wire clamps.

INSTALL

1. Plug brake switch wires into main wiring harness.
2. Install brake switch wires into the three wiring clamps.
3. Install the two wiring clamps on top of the motor. Do not install third wiring clamp near brake switch until after brake switch is installed.
4. Install brake switch, tighten the two screws that hold switch to bracket.
5. Install third wiring clamp near brake switch.
6. Connect battery and turn the key switch to the **ON** position.
7. Test operation of lift truck in a safe area.
8. Install switch cover.
9. Install drive unit compartment cover.

Control Handle

DISASSEMBLE

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. Do only the steps necessary to replace the damaged parts.

1. Turn the key switch to the **OFF** position and disconnect battery.
2. Discharge the capacitor. See Special Precautions.

NOTE: The handle is comprised of two molded-plastic halves and is held together by capscrews.

3. Remove three capscrews retaining upper half of control handle to lower half.

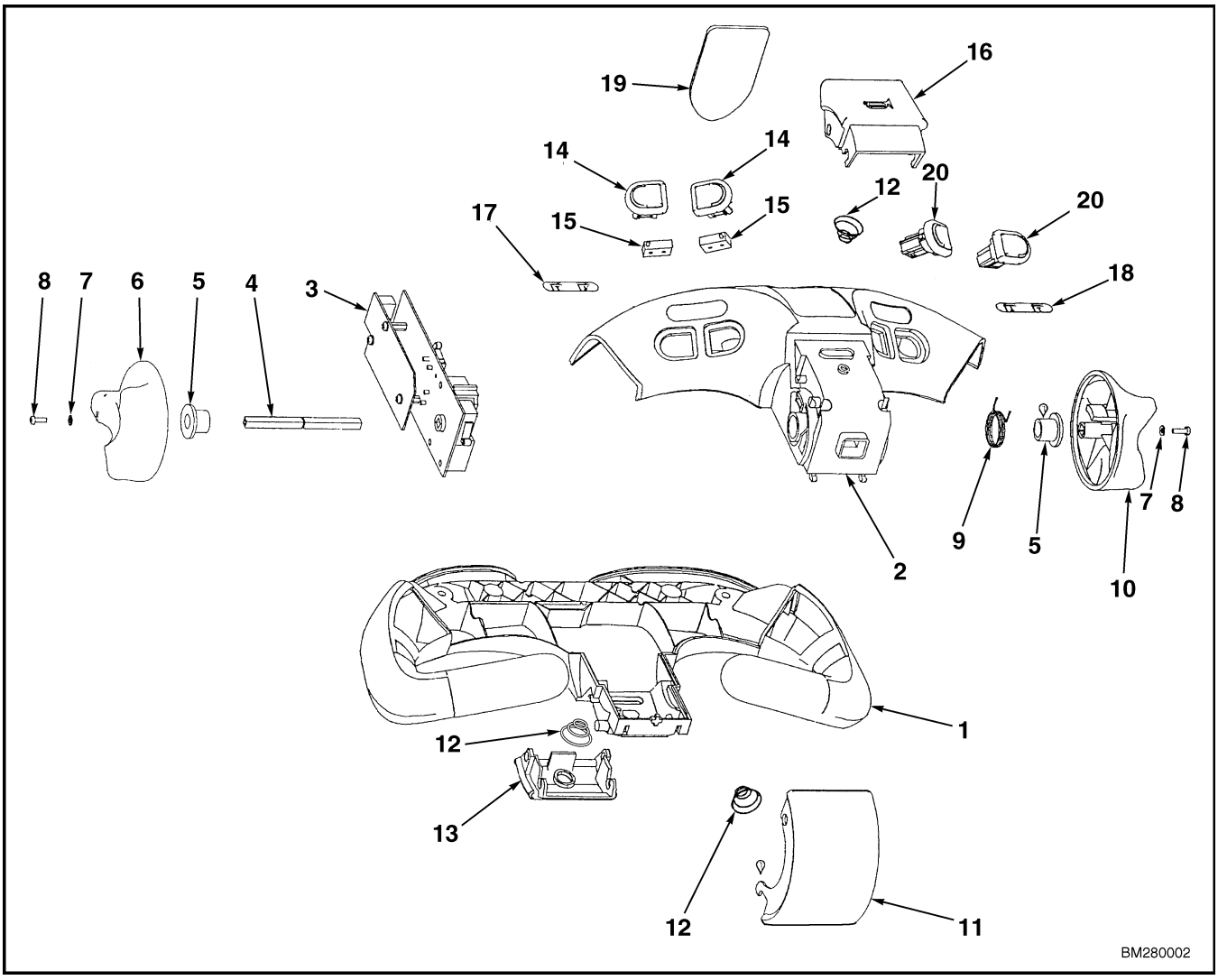
⚠ CAUTION

DO NOT use a screwdriver or pry bar to separate the upper half of control handle from the lower half as this will cause damage to the retaining hooks of the upper half.

4. Disengage hooks under the traction-reverse switch cover. Slide upper half of control handle off the lower half using a gentle rocking motion while lifting and pulling upper half away from lower half. See Figure 12 and Figure 13.
5. Unplug handle wiring harness from control handle card.
6. Place upper half of handle upside down on a secure, level work surface so the internal parts are facing up.

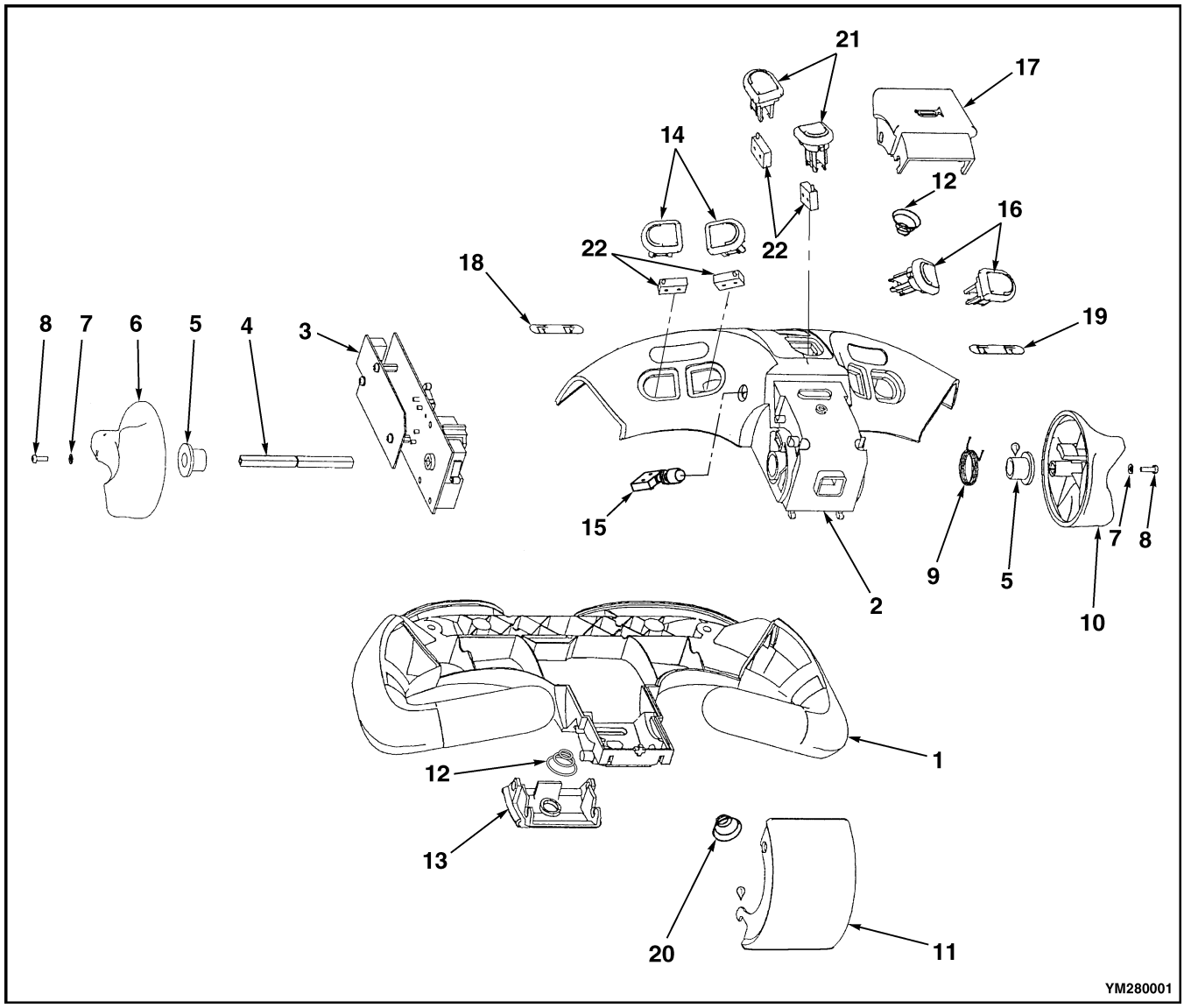
NOTE: The following procedure may not be necessary unless control handle lower half is damaged and must be replaced.

7. Remove lower half of cover from control handle shaft by removing two capscrews.
8. Remove one of the butterfly knobs by removing the screw that holds it onto the shaft.
9. Using the remaining butterfly knob, slide the shaft out of the handle. Be careful not to rotate the shaft within the control handle card.
10. 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 control handle card and remove card.



1. COVER (LOWER HALF)
2. COVER (UPPER HALF)
3. CONTROL HANDLE CARD
4. SHAFT
5. BUSHING
6. BUTTERFLY KNOB (LH)
7. WASHER
8. SCREW
9. NEUTRAL RETURN SPRING
10. BUTTERFLY KNOB (RH)
11. TRACTION REVERSE SWITCH COVER
12. SPRING
13. TURTLE SWITCH COVER
14. LIFT/LOWER OR SIDESHIFT BUTTONS
15. SWITCH ASSEMBLY - ON/OFF
16. HORN SWITCH COVER
17. LABEL
18. LABEL
19. LABEL
20. PROPORTIONAL SWITCH

Figure 12. Control Handle



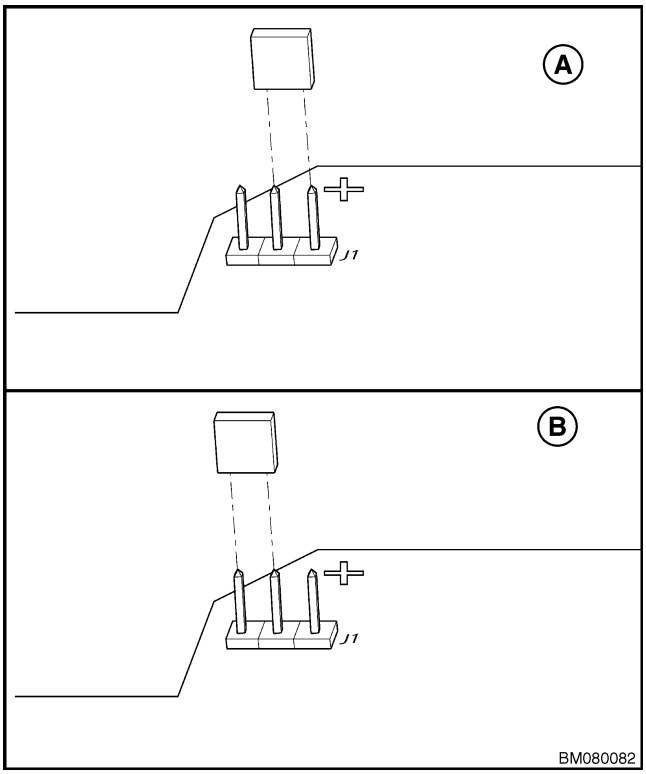
1. COVER (LOWER HALF)
2. COVER (UPPER HALF)
3. CONTROL HANDLE CARD
4. SHAFT
5. BUSHING
6. BUTTERFLY KNOB (LH)
7. WASHER
8. SCREW
9. NEUTRAL RETURN SPRING
10. BUTTERFLY KNOB (RH)
11. TRACTION REVERSE SWITCH COVER
12. SPRING
13. TURTLE SWITCH COVER
14. LIFT/LOWER OR SIDESHIFT BUTTONS
15. AUXILIARY SELECTOR SWITCH
16. LIFT/LOWER PROPORTIONAL SWITCHES
17. HORN SWITCH COVER
18. LABEL
19. LABEL
20. SPRING
21. TILT AND REACH BUTTONS
22. SWITCH ASSEMBLY - ON/OFF

Figure 13. Control Handle (W20/30ZR and W25/30/40ZC)

CONTROL HANDLE CARD (OLD STYLE)

After servicing the control handle head, it is necessary to calibrate the control handle card. If replacing with a new style card (usually blue in color), refer to Control Handle Card (New Style).

1. Reassemble the upper half. Refer to Assemble for instructions on how to assemble the upper half.
2. Connect the switches and wire harness.
3. Connect battery.
4. Move the jumper on the J1 terminal to the calibrate mode. See Figure 14.



A. RUN MODE **B.** CALIBRATE MODE

Figure 14. Control Handle Card Calibration

5. With the handle in the full upright position, turn the key switch to the **ON** position.
6. Slowly rotate butterfly knobs in the forward direction and hold at maximum rotation for 5 seconds.
7. Slowly rotate butterfly knobs back to the neutral position and leave for 5 seconds.
8. Slowly rotate butterfly knobs in the reverse direction and hold at maximum rotation for 5 seconds.
9. Slowly rotate butterfly knobs back to the neutral position and leave for 5 seconds.
10. Slowly press proportional lift button and hold down for 5 seconds.
11. Slowly release proportional lift button and wait for 5 seconds.
12. Slowly press proportional lower button and hold down for 5 seconds.
13. Slowly release proportional lower button and wait for 5 seconds.
14. Move the jumper on the J1 terminal to the RUN mode.
15. Turn the key switch to the **OFF** position.
16. Install the upper half of control handle on the lower half. Refer to Assemble for instructions on how to install the upper half of control handle on the lower half.
17. Test the lift truck to verify correct travel and lift and lower speeds.

CONTROL HANDLE CARD (NEW STYLE)

NOTE: New style control handle cards will be blue in color and should be used as replacement cards regardless of color of the card removed. If simply calibrating and existing old style card (green in color), refer to Control Handle Card (Old Style).

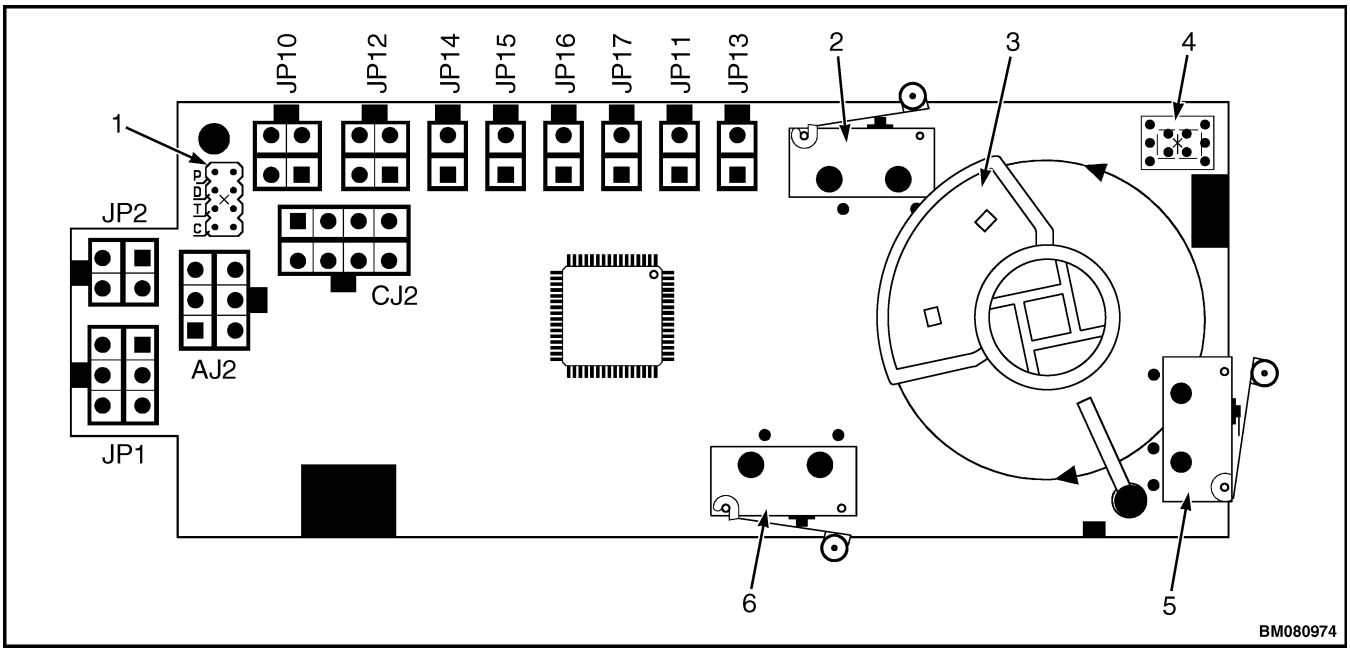
NOTE: Verify that the magnetic holder of the thumbwheel switch has been installed in the proper position. See Figure 15.

After servicing the control handle head, it may be necessary to configure and/or calibrate the control handle card.

Configure

Refer to Figure 15 for the following instructions.

1. Partially assemble control handle head. Refer to Assemble.



1. JUMPER TERMINALS (SV2)
2. HORN SWITCH (S1)
3. THUMBWHEEL SWITCH (MAGNETIC HOLDER)
4. LED DISPLAY SCREEN
5. BELLY SWITCH (S)
6. TURTLE SWITCH (S2)

Figure 15. Control Handle Card (New Style)

2. Connect the control handle card wiring, verify that the battery is connected, and turn the key switch to the **ON** position.

3. The LED will display the program setting for approximately five seconds. The proper control handle card setting for this model is number **4**. If the correct number is displayed on the LED, the control handle card is configured correctly.

4. To begin configuring the card, turn the key switch to the **OFF** position.

5. Move the jumper from P (park) to C (configure). See Figure 16.

6. Turn the key switch to the **ON** position and view the LED display.

Legend for Figure 16

1. P (PARK/ HOME POSITION)
2. D (NOT USED)
3. T (TEACH/CALIBRATE)
4. C (CONFIGURE)
5. JUMPER TERMINAL (SV2)

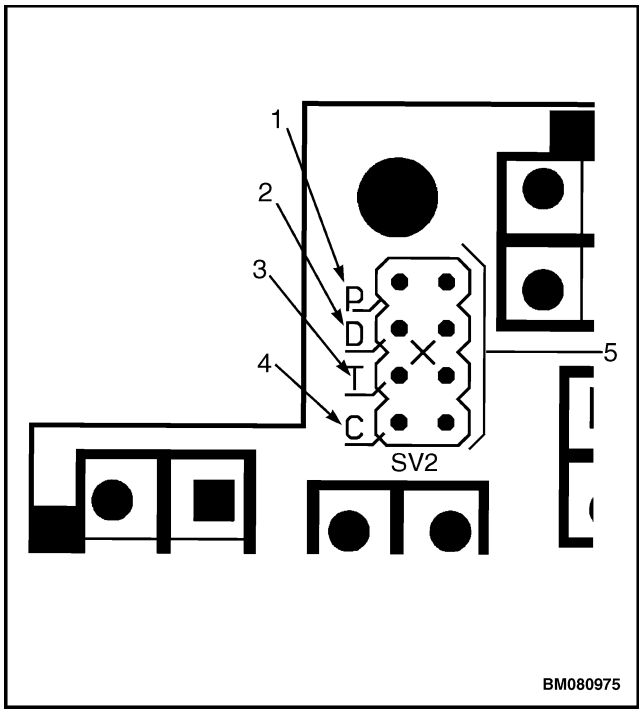


Figure 16. Jumper Terminal (SV2)