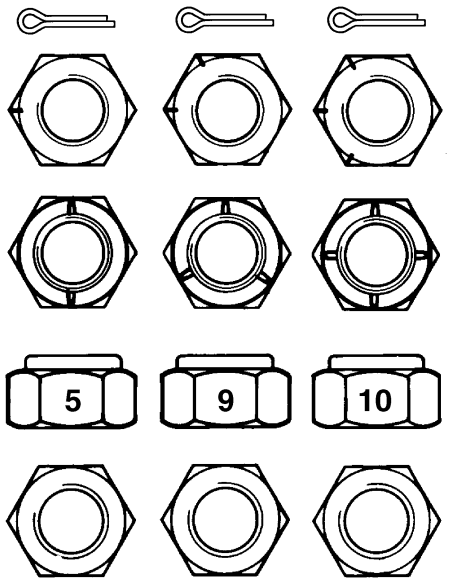
Yale®

Maintenance

METRIC AND INCH (SAE) FASTENERS



HM210064

Table 2. Studs and Nuts

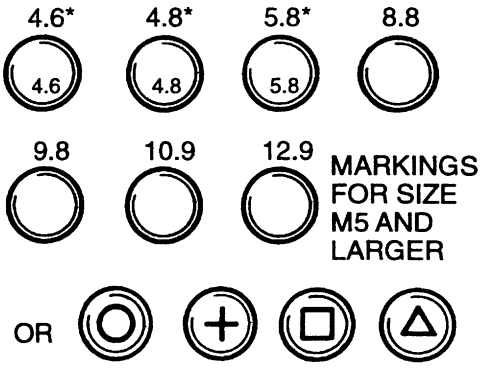
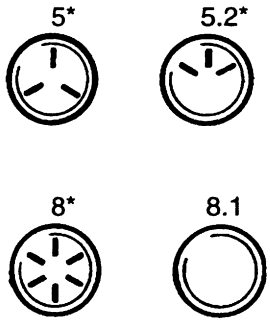
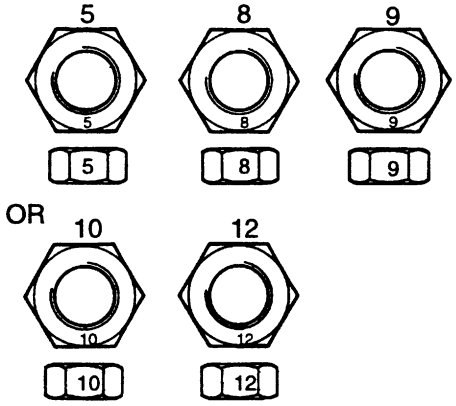
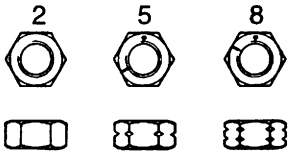
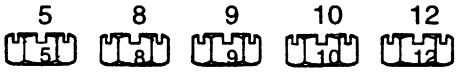
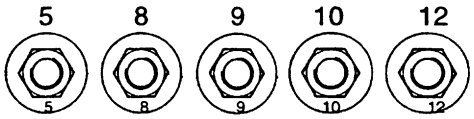
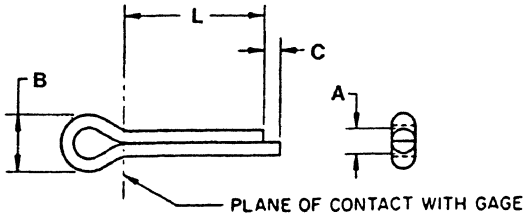
TYPE OF FASTENER	METRIC FASTENERS STRENGTH LEVELS: PROPERTY CLASS * MARKINGS NOT REQUIRED	INCH FASTENERS STRENGTH LEVELS: SAE GRADES * MARKINGS NOT REQUIRED
 STUDS		
 HEX NUTS		OR 
 HEX SLOTTED NUTS		MARKINGS NOT REQUIRED
 HEX FLANGE NUTS		MARKINGS NOT REQUIRED HM210067

Table 11. Cotter Pin Dimensional Data

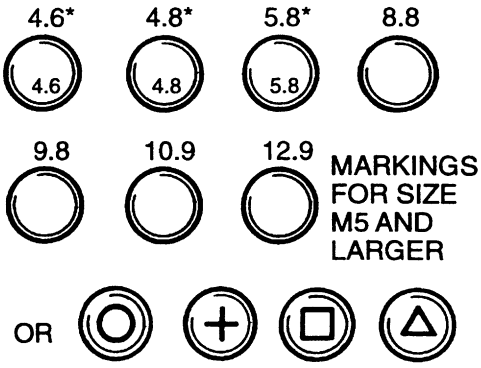
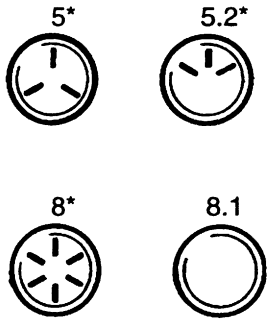
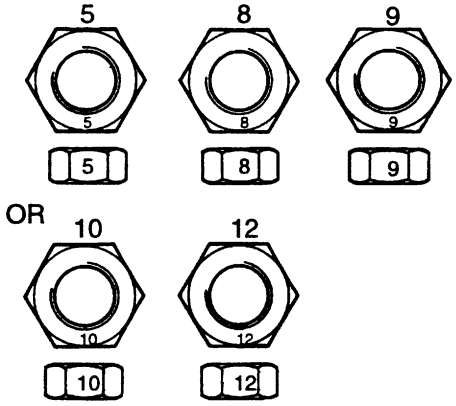
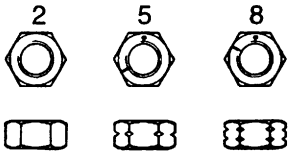
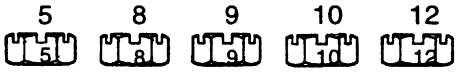
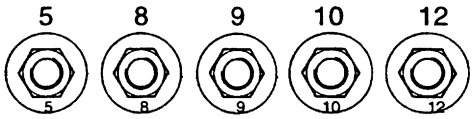
Nominal Length L	Length Range		Nominal Size - Part Numbers	
	max	min	13.0 mm (0.500 in.)	16.00 mm (0.625 in.)
19.05 mm (0.750 in.)	20.5 mm (0.807 in.)	18.3 mm (0.720 in.)		
25.4 mm (1.00 in.)	26.9 mm (1.060 in.)	23.9 mm (0.940 in.)		
31.75 mm (1.250 in.)	33.3 mm (1.310 in.)	29.2 mm (1.150 in.)		
38.1 mm (1.500 in.)	40.9 mm (1.610 in.)	36.6 mm (1.440 in.)		
44.45 mm (1.750 in.)	46.0 mm (1.810 in.)	42.9 mm (1.690 in.)	0221889	
50.8 mm (2.000 in.)	52.3 mm (2.060 in.)	49.3 mm (1.940 in.)	0221890	
57.15 mm (2.250 in.)	58.7 mm (2.310 in.)	55.1 mm (2.170 in.)	0221891	
63.5 mm (2.500 in.)	65.0 mm (2.560 in.)	62.0 mm (2.440 in.)	0221892	
69.85 mm (2.750 in.)	72.1 mm (2.840 in.)	68.3 mm (2.690 in.)	0221893	0221895
76.2 mm (3.000 in.)	81.3 mm (3.200 in.)	74.7 mm (2.940 in.)	0015291	0221896
88.9 mm (3.500 in.)	91.4 mm (3.600 in.)	87.4 mm (3.440 in.)	0015292	0221897
101.6 mm (4.000 in.)	113.3 mm (4.460 in.)	98.8 mm (3.890 in.)	0015293	0221898
127.0 mm (5.000 in.)	128.5 mm (5.060 in.)	123.7 mm (4.870 in.)	0015295	0221899
152.4 mm (6.000 in.)	153.9 mm (3.060 in.)	138.7 mm (5.460 in.)	0015297	0221900



EXTENDED PRONG

HM211587

Table 2. Studs and Nuts

TYPE OF FASTENER	METRIC FASTENERS STRENGTH LEVELS: PROPERTY CLASS * MARKINGS NOT REQUIRED	INCH FASTENERS STRENGTH LEVELS: SAE GRADES * MARKINGS NOT REQUIRED
 STUDS		
 HEX NUTS		OR 
 HEX SLOTTED NUTS		MARKINGS NOT REQUIRED
 HEX FLANGE NUTS		MARKINGS NOT REQUIRED HM210067

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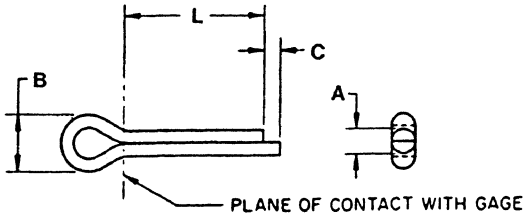

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During the discharge of the cell, lead peroxide and sponge lead mix with sulfuric acid to make lead sulfate ($PbSO_4$) on both plates. See Figure 4. This action decreases the voltage in the cell. When the sulfuric acid is removed from the electrolyte, the specific gravity of the electrolyte decreases. See Figure 5. The potential difference of a discharged cell is approximately 1.75 volts.

When a direct current is applied to a discharged cell, the lead sulfate is changed into lead and sulfuric acid. The lead goes to the positive plate and stays as lead and to the negative plate and stays as lead peroxide. See Figure 6. The concentration of sulfuric acid in the electrolyte increases. The specific gravity of the electrolyte increases as the concentration of sulfuric acid increases. In a fully charged cell, the positive plate again contains the lead peroxide and the negative plate contains the sponge lead.

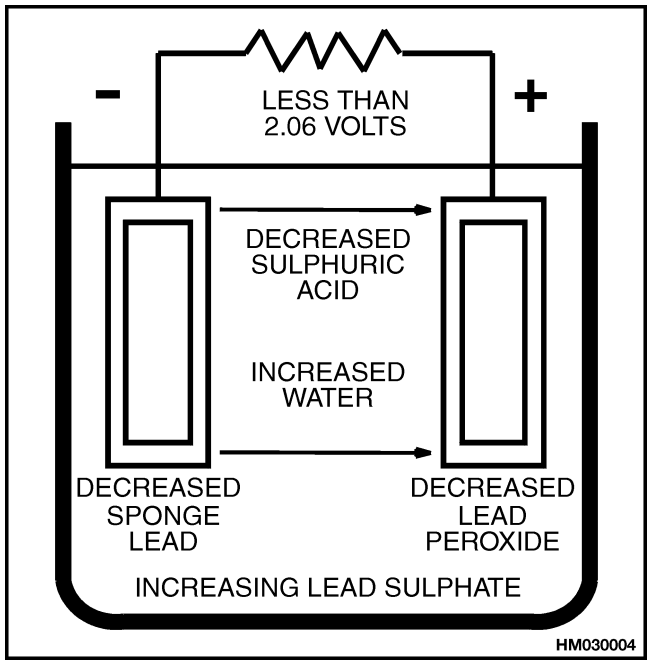

Figure 4. Discharging Cell

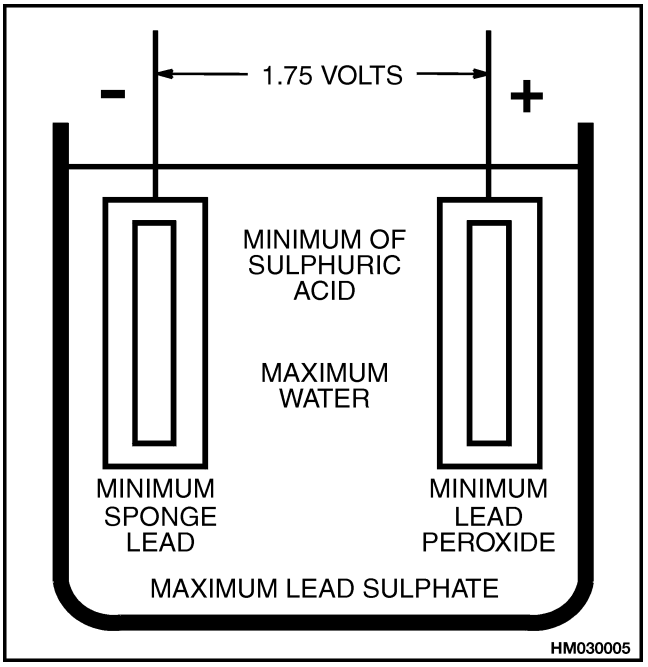

Figure 5. Discharged Cell

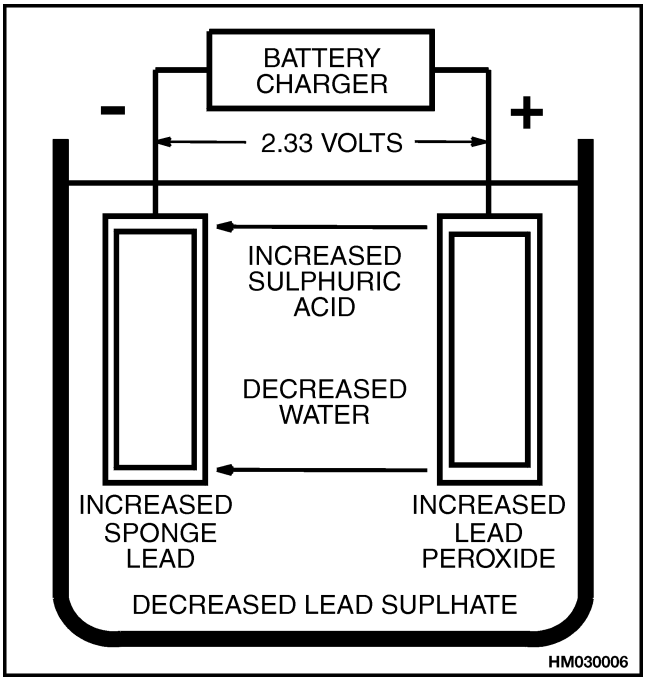

Figure 6. Charging Cell

battery manufacturer. A fully charged battery will have a specific gravity of 1.265 to 1.310 at 25°C (77°F). See Figure 15. NEVER charge a battery at a rate that will raise the electrolyte temperature above 49°C (120°F). Never let a battery stay discharged for long periods.

Types of Battery Charges

1. NORMAL CHARGE. This charge is usually given to a battery that is discharged from normal operation. This is often an 8-hour charge. Many customers charge the battery at regular intervals that depend on use. This procedure will keep the battery correctly charged if the battery is not discharged below the limit. Always use a hydrometer to check the battery if the battery is charged at regular intervals. Frequent charging of a battery that has a 2/3 or more charge can decrease the life of the battery.

2. EQUALIZING CHARGE. This charge is at a low rate and balances the charge in all the cells. The equalizing charge is usually given approximately once a month. It is a charge at a slow rate for 3 to 6 hours in addition to the regular charging cycle. Do not give an equalizing charge more than once a week. The most accurate specific gravity measurements for a charged battery will be after an equalizing charge. If the specific gravity difference is more than 0.020 between cells of the battery after an equalizing charge, there can be a damaged cell. Consult your battery dealer.

NOTE: Many customers have battery chargers that can follow a program to automatically charge a battery according to recommendations of the battery manufacturer. Use the recommendations of the battery manufacturer for charging the battery.

When performing a monthly equalization charge it is recommended to check individual cell voltages.

1 Complete an equalization charge.

2 Measure and compare the voltage for each cell.

3 Record any cells differing more than 0.5 volts from other cells.

4 Calculation the expected specific gravity (average cell voltage -0.845 = specific gravity). For example 2.09 volts - 0.845 = 1.24.

5 Verify calculated specific gravity by performing a specific gravity measurement of each cell with a hydrometer.

The discharge limits and the limits for the specific gravity before the battery must be charged again are shown in Figure 17. NEVER discharge a battery below the limits shown in Figure 18. Discharging a battery beyond the design limits will decrease the service life of the battery.

NOTE: Sometimes the capacity of a battery is not enough to complete a work period. Check for the following conditions:

- The battery is too small for the job.
- The battery is not fully charged.
- The battery charger is not operating correctly.
- The battery is near the end of its service life.

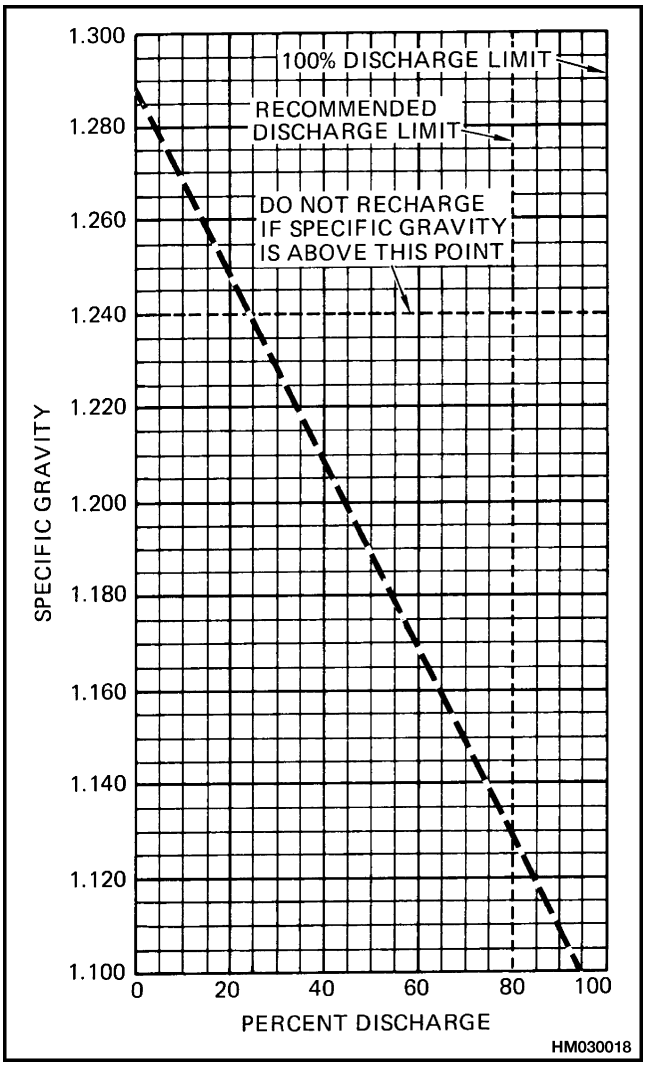

Figure 17. Specific Gravity Versus Percent Discharge

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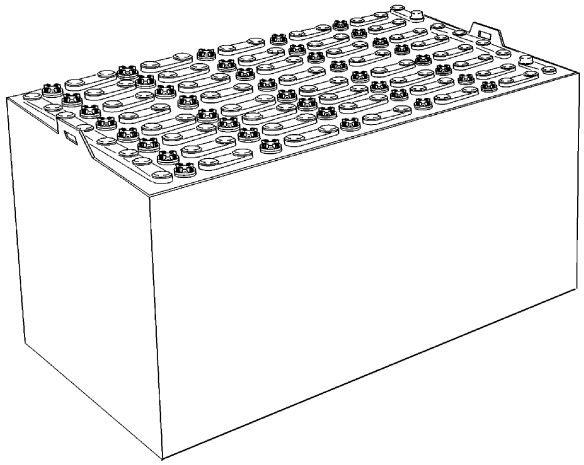
INDUSTRIAL BATTERY



PART NO. 524158040

2240 YRM 0001

3. Lift batteries correctly with a crane or equipment designed for the job. Always use a spreader bar designed and adjusted for the battery. Move batteries with a lift truck or a conveyor or rollers designed for that purpose. If the battery does not have a cover, a rubber mat or insulating material must be put over the top of the battery to prevent a short circuit with other equipment. Make sure the lifting equipment has enough capacity for the job. Do not use chain or wire rope slings.

4. Never put metal materials or tools on a battery.

5. Disconnect battery from lift truck before doing maintenance or repairs.

6. When maintenance on the battery or the battery charger is required, disconnect both the AC and DC power. If the battery connectors must be replaced, make sure the positive and negative terminals and cables are kept separate and insulated from each other. Even a momentary short circuit can cause an explosion and damage the battery.

7. Keep water readily available to flush spilled electrolyte. Electrolyte in the eyes must be flushed with water immediately, and then quickly get medical attention. Special showers and eye wash systems are required in areas where battery maintenance is done.

8. If electrolyte is spilled on a work surface or the floor, flush area with water, use a solution of soda (sodium bicarbonate) to make the acid neutral.

9. Only trained persons are permitted to do maintenance on batteries and battery chargers. Make sure the regulations by government safety agencies, government insurers, private insurers, and private organizations are followed when doing maintenance on batteries.

MAINTENANCE RECORDS

NOTE: Follow the same sequence when you record the cell number. Always begin the record with a positive cell. Follow a sequence so the last cell is always the cell for the negative cable.

Record the beginning ampere reading of the charger each time the battery is charged. Any difference in the daily ampere reading can indicate a problem with the battery or the charger.

NEW BATTERY

CAUTION

Always use a spreader bar and slings that lift vertically on the lifting eyes of the battery. DO NOT use a chain or sling without a spreader bar or you will damage the battery case.

Use the correct blocks or spacers to hold the battery in position in the lift truck. Make sure the battery compartment is clean and dry. All vent caps must be in position when the battery is in service. If the vent caps are not installed, the electrolyte will leak, causing corrosion on the battery case and in the battery compartment.

Inspect a new battery for damage. Make sure the electrolyte in each of the cells is at the correct level. Charge the battery for 6 hours or until the specific gravity is correct. Make sure the battery is correctly installed in the lift truck. Use a spreader bar with slings designed for the battery to lift and move the battery. See Figure 10.

Always complete the Battery Inspection Report and the Daily Battery Report. See Figure 11 and Figure 12.

CLEANING BATTERY

WARNING

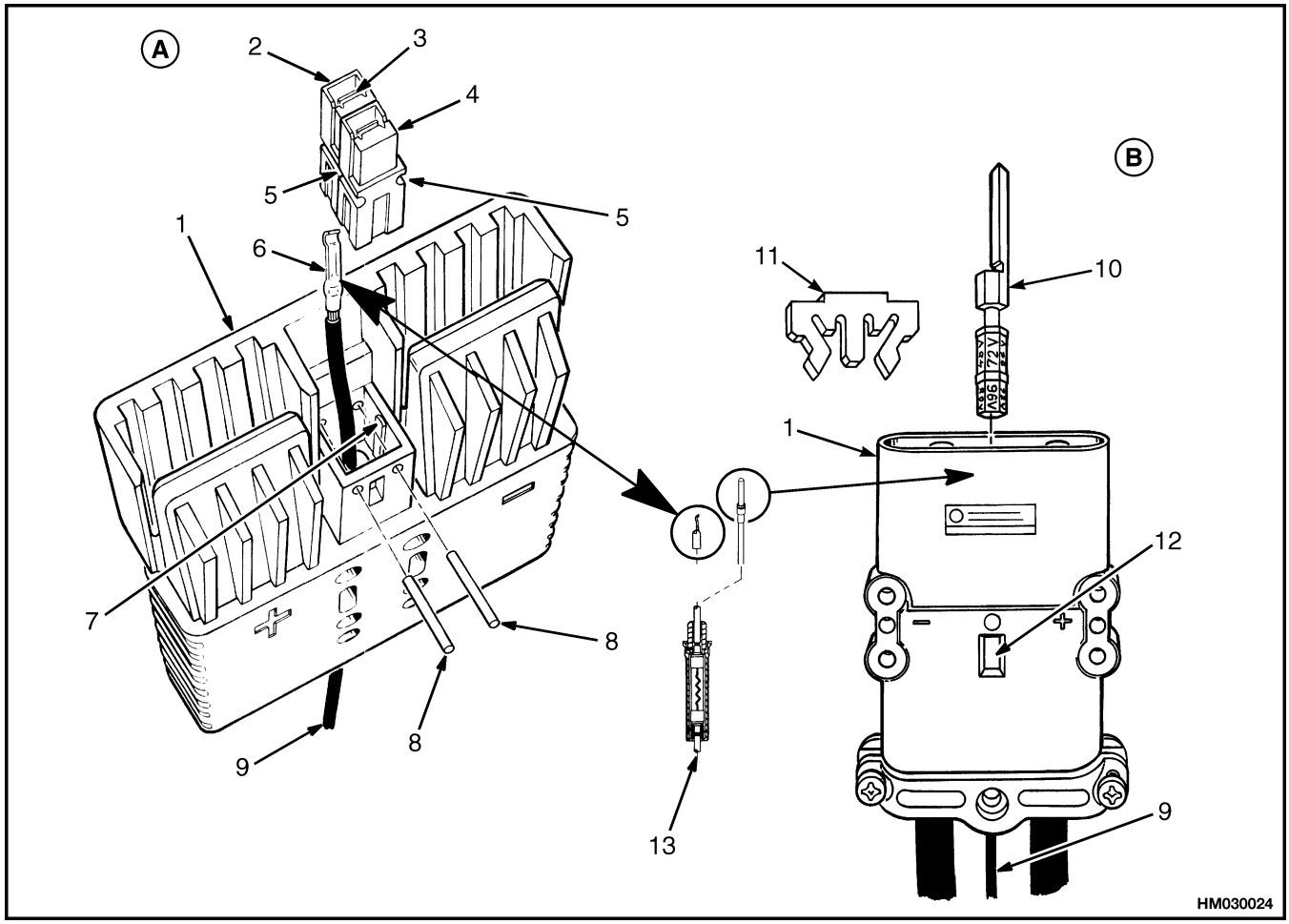
Compressed air can move particles so that they cause injury to the user or to other personnel. Make sure that the path of the compressed air is away from all personnel. Wear protective goggles or a face shield to prevent injury to the eyes.

Keep the battery compartment clean and dry. Use a clean cloth to wash the battery with water. Dry with compressed air.

CAUTION

Do not clean the battery with steam or hot water. Do not use a high-pressure hose.

Remove any electrolyte from the battery compartment to prevent corrosion. If there is electrolyte on the top of the battery, apply a solution of bicarbonate of soda. Mix a solution containing 0.5 kg of soda for every 4 liters of water. Apply the solution, then flush the solution from the battery with clean water. Wash the battery and battery compartment as needed, but within a 6-month period as the maximum time.



NOTE: INDICATOR INSERT (2). GREEN - FOR BATTERY WITH CELL CAPS. GRAY - FOR BATTERY WITH SEALED CELLS.

NOTE: CONNECTOR BODY COLOR [ANDERSON SBE CONNECTOR ONLY (1)]. GRAY - 36-VOLT BATTERY. BLUE - 48-VOLT BATTERY. GREEN - 72-VOLT BATTERY. BLACK - 80-VOLT BATTERY.

A. ANDERSON SBE OR SBX CONNECTOR

B. FEM OR DIN CONNECTOR

1. HALF OF CONNECTOR SET
2. RED HOUSING FOR +12 VOLT "BATTERY TAP"
3. LOCK SPRING (TIP OF CONTACT MUST LOCK OVER TOP OF LOCK SPRING)
4. BLACK CONNECTOR HOUSING (ASSEMBLED ON RED HOUSING WITH SLOTS FOR LOCK PINS ALIGNED AS SHOWN - NO WIRE OR CONTACT IN HOUSING)
5. SLOT FOR LOCK PIN
6. CONTACT FOR CONNECTOR OF +12 VOLT BATTERY TAP
7. KEY [RED (2) AND BLACK (4) CONNECTORS ALIGN ON KEY]
8. LOCK PINS FOR +12 VOLT CONNECTOR (MUST INSTALL FROM FRONT OF CONNECTOR THROUGH RED AND BLACK CONNECTORS)
9. +12 VOLT WIRE TO TRUCK (TRUCK HALF) OR TO BATTERY (BATTERY HALF)
10. INDICATOR INSERT FOR BATTERY VOLTAGE AND BATTERY TYPE [ROTATE FOR CORRECT VOLTAGE IN WINDOW (12); COLOR SHOWS BATTERY TYPE]
11. LOCK FOR ALL CABLE TERMINALS AND INDICATOR
12. WINDOW SHOWING BATTERY VOLTAGE
13. IN-LINE FUSE ASSEMBLY AND CONTACT FOR +12 VOLT CONNECTOR (TRUCK HALF OF BATTERY CONNECTOR ONLY) (SBE/SBX CONTACT SHOWN)

Figure 23. Detail of Battery Connectors With +12 Volt Tap

General

This section contains repair and maintenance procedures for the AC traction and hydraulic motors. Additional information concerning the traction motor may be included in other sections when the information is more closely related to other systems.

For lift truck model MPR080VG and MPR100VG (A284) see:

- **Periodic Maintenance** 8000YRM1644
- **Electrical System** 2200YRM1640
- **Master Drive Unit * (With EPAS)** 0630YRM0961
- **Master Drive Unit S/N D801N03000L=> S/N A474N03000L=> S/N A497N030000L=> S/N E826N03000L=>** 0630YRM1609

Special Precautions

DISCHARGING THE CAPACITORS

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. Wear safety glasses. Make certain the battery has been disconnected. DO NOT use a screwdriver to discharge the traction motor controller.

WARNING

To avoid personal injury and prevent electrical shock, perform the following steps before performing any troubleshooting or adjustments, and connecting or disconnecting a handset or PC.

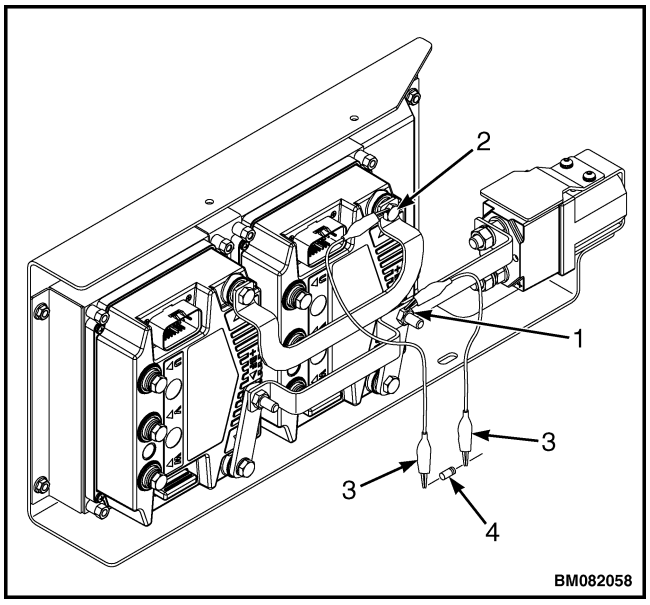
CAUTION

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

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

2. Remove the electrical compartment cover for access to the traction motor controller. Remove the capscrews retaining the cover to the frame.

3. Discharge the capacitors in the controllers by connecting a 200-ohm, 2-watt resistor across the controller's B+ and B− terminals using insulated jumper wires. See Figure 1. **DO NOT** short across the motor controller terminals with a screwdriver or jumper wire. Remove the 200-ohm, 2-watt resistor before reconnecting the battery.



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

Figure 1. Discharging the Capacitors

- See **Steering Mechanism** 1600YRM1637 lift truck model MPE060-VG (B292) and MPE080-VG (B287).
- See **Steering Mechanism** 1600YRM2101 lift truck model MPE060VH (C292) and MPE080VH (C287).

8. Install the hydraulic tank and hydraulic motor.

- See **Hydraulic System** 1900YRM1616 for lift truck models NDR035EB, NR045EB (D861) and NDR030EB, NR035-040EB (E815).
- See **Hydraulic System** 1900YRM1307for lift truck model NDR030DB, NR035-040DB (B295).
- See **Hydraulic System [D801 (OS030EF)]** 1900YRM1464 or **Hydraulic System** 1900YRM1465 for lift truck models SS030BF (A474), FS030BF (A497), OS030EF (D801) and OS030BF (E826).
- See **Walkie Hydraulic System** 1900YRM1629 for lift truck models MPC060-VG (A372) and MPC080-VG (A283).
- See **Hydraulic System** 1900YRM1639 for lift truck model MPE060-VG (B292), MPE080-VG (B287), MPE060VH (C292) and MPE080VH (C287).

9. Install the operator cover.

- See **Frame** 0100YRM1615, Covers, Panels, and Plates Repair for lift truck models NDR035EB, NR045EB (D861), NDR030EB, NR035-040EB (E815) and NDR030DB, NR035-040DB (B295).
- See **Frame** 0100YRM0760, Frame Repair for lift truck models SS030BF (A474), FS030BF (A497), OS030EF (D801) and OS030BF (E826).
- See **FRAME** 0100YRM1580, Covers for lift truck models MPC060-VG (A372) and MPC080-VG (A283).
- See **Frame** 0100YRM1636, Covers for lift truck model MPE060-VG (B292) and MPE080-VG (B287).
- See **Frame** 0100YRM2100, Covers for lift truck model MPE060VH (C292) and MPE080VH (C287).

10. Route and connect all wiring and connectors as removed.

11. Connect the battery connector, turn the key switch to the **ON** position, and test the lift truck for proper operation. Remove the lift truck from blocks and return to service.

Hydraulic Motor Repair

DISASSEMBLE

1. Remove the pump and motor assembly from the lift truck.

- See **Hydraulic System** 1900YRM1616 for lift truck models NDR035EB, NR045EB (D861) and NDR030EB, NR035-040EB (E815).
- See **Hydraulic System** 1900YRM1307 for lift truck model NDR030DB, NR035-040DB (B295).
- See **Hydraulic System [D801 (OS030EF)]** 1900YRM1464 or **Hydraulic System** 1900YRM1465 for lift truck models SS030BF (A474), FS030BF (A497), OS030EF (D801) and OS030BF (E826).
- See **Walkie Hydraulic System** 1900YRM1629 for lift truck models MPC060-VG (A372) and MPC080-VG (A283).
- See **Walkie Hydraulic System** 1900YRM1629 lift truck model MPE060-VG (B292), MPE080-VG (B287), MPE060VH (C292), and MPE080VH (C287).

2. For the hydraulic motor repair procedure on lift truck models SS030BF (A474), FS030BF (A497), OS030EF (D801) and OS030BF (E826) see the section **AC Motor Repair** 0620YRM1461, **Hydraulic Motor Repair**.

3. Place the pump and motor assembly on a clean work bench or other suitable surface.

4. Remove the two capscrews and two lockwashers holding the pump to the motor. See Figure 10 and Figure 11. Remove the pump.

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MASTER DRIVE UNIT
S/N D801N03000L=>
S/N A474N03000L=>
S/N A497N030000L=>
S/N E826N03000L=>

NDR030EB, NR035-040EB [E815];NDR030DB, NR035-040DB [B295];NDR035EB, NR045EB [D861];SS030BF [A474];FS030BF [A497];OS 030EF [D801];OS030BF [E826];MPC060-VG [A372];MPC080-VG [A283];MPE060-VG [B292];MPE080-VG [B287];MTR005-F, MTR007-F [C903];MPR080VG, MPR100VG [A284];MEP060VH [C292]; MPE080VH [C287]

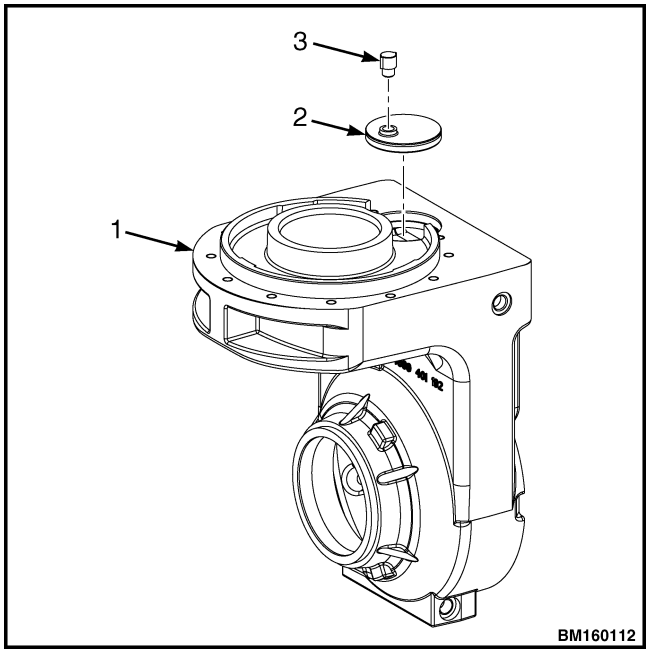
PART NO. 550073167 **0630 YRM 1609**

CAUTION

DO NOT damage surface area around sealing cap during removal.

NOTE: Remove breather valve from sealing cap and set aside to be installed into new sealing cap.

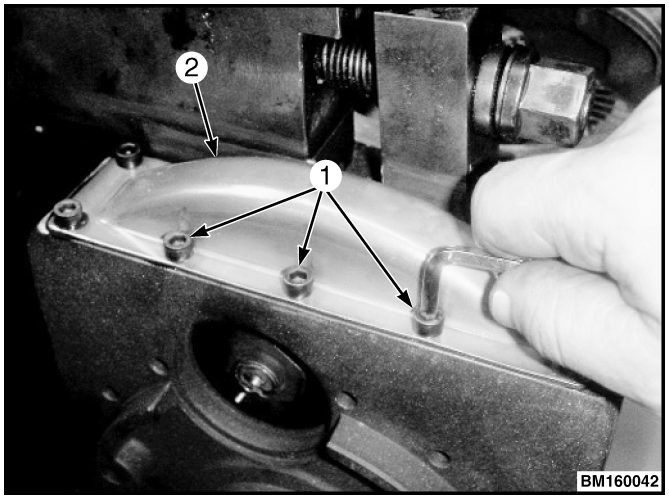
STEP 3.
Remove and discard sealing cap from top of MDU housing.



1. MDU HOUSING
2. SEALING CAP
3. BREATHER CAP

NOTE: For Step 4, place MDU on a solid work surface and the housing cover and side cover facing up.

STEP 4.
Remove ten capscrews and side cover from MDU housing.



1. CAPSCREW
2. SIDE COVER

CLEAN AND INSPECT

Inspect all contact surfaces and wear surfaces for damage and cracks. Replace as necessary.

Clean all sealing surfaces as needed.

TABLE OF CONTENTS

This section is for the following models:

(MPC080-VG) [A283];
(MPC060-VG) [A372];
(MTR005-F) [C902, D902];
(MTR007-F) [C903]

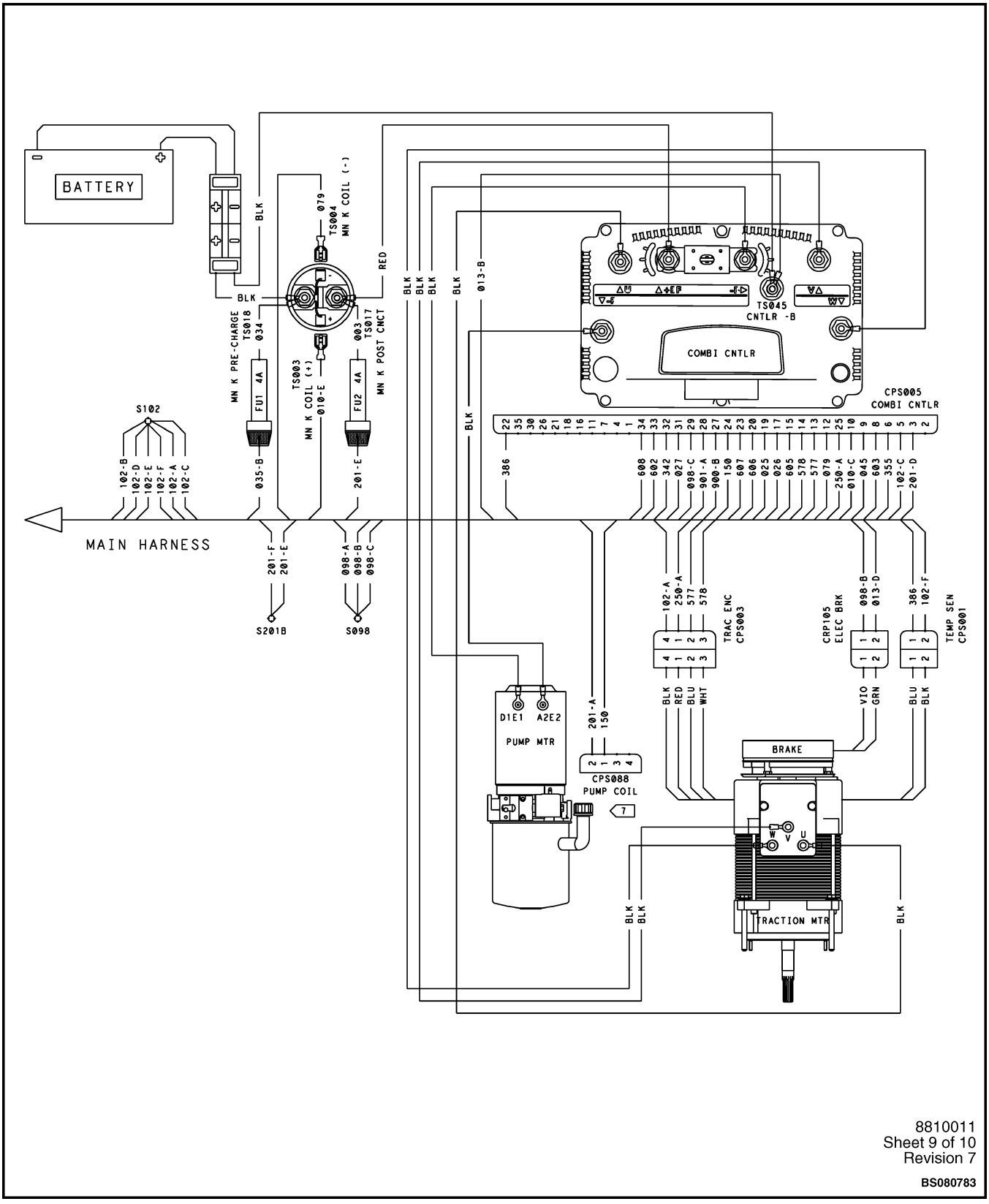


Figure 1. Schematic/Wiring (Sheet 9 of 10)

Introduction

GENERAL

This section contains the instructions for periodic maintenance and inspection and a Maintenance Schedule.

The Maintenance Schedule has time intervals for inspection, lubrication, and periodic maintenance. The time intervals are based on normal operation. Normal operation is considered to be one 8-hour shift per day in a relatively clean environment on an improved surface. Multiple shifts, dirty operating conditions, etc., will require a reduction in the recommended time periods in the Maintenance Schedule.

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 truck that needs repairs. If repair is necessary, attach a DO NOT OPERATE tag to the control handle. Report the need for repairs to your supervisor immediately.

Some users have service personnel and facilities to perform the procedures listed in the Maintenance Schedule. Service Manuals are available from your Yale™ lift truck dealer to help users who do their own repairs.

Your Yale™ lift truck dealer has the trained personnel and equipment to conduct a complete program of inspection, lubrication, and maintenance. This program will help maximize your truck's performance and reliability.

NOTE: The front end of the truck is the control handle end. Forward travel refers to movement in the direction of the control handle with the load wheels trailing. Reverse is travel in the direction of the forks with the drive tire trailing. Left and right refer to the operator's left- and right-hand sides when standing on the truck, driving in the forward direction. See Figure 1.

Battery

WARNING

DO NOT lay tools on top of the battery.

The acid in the electrolyte can cause injury. If the electrolyte is spilled, make the acid neutral with a solution of sodium bicarbonate (soda) and water, then flush the area with water. Acid in the eyes must be immediately flushed with water continuously for 15 minutes, then seek medical attention.

Batteries generate explosive fumes. Keep the vents in the caps clean. Keep sparks or open flames away from the battery area. DO NOT make a spark from the battery connections. Disconnect the battery when performing maintenance.

The battery must fit the battery compartment so the battery restraint panels will operate correctly. Use spacers to prevent the battery from moving more than 13.0 mm (0.5 in.) in any direction.

NOTE: Battery water levels can be maintained without removing the battery from the truck.

Check for loose or broken electrical connections and damaged wires or cables. Examine the battery case for damage and leakage. See the battery dealer in the area to repair any damage to the battery or cables.

Check that the vent caps are clear. Check the level of the electrolyte daily on a minimum of one cell. Add only distilled water, as necessary, if the cell is low. If one cell is low, check the rest of the cells. The correct level is halfway between the top of the plates and the bottom of the fill hole. Use a hydrometer to check that the battery is not discharged below the minimum specific gravity given by the manufacturer and has enough charge to complete a work period. See How to Charge the Battery in this section.

Remove the battery as described in the section **Industrial Battery** 2240YRM0001. Check the battery case, connector, and cables for damage, cracks, or breaks. See the battery dealer in your area to repair any damage. Keep the battery case and the battery compartment clean and painted. Leaks and corrosion from the battery can cause a malfunction in the electric controls of the lift truck. Use a water and soda solution to clean the battery and the battery compartment. Keep the top of the battery clean, dry, and free of corrosion.

Make sure the battery is the correct weight and voltage size. Prevent side-to-side movement of the battery by adjusting the brackets on either side of the battery. The correct battery is specified in How to Change the Battery and in the **Operating Manual**. The **Operating Manual** is located in the container on the Drive Unit cover. This is a permanent reference and must be available for use at all times.

Frame

WARNING

Forklift truck frames and components may have polyurethane paint. Welding, burning, or other heat sufficient to cause thermal decomposition of the paint may release isocyanates. These chemicals are allergic sensitizers to the skin and respiratory tract and overexposure may occur without odor warning. Always utilize good industrial hygiene practices, including removal of all paint (prime and finish coats) to the metal around the area to be welded. Use local ventilation and/or supplied-air respiratory protection when repairing the frame.

CAUTION

All welding repairs must be pre-approved by Yale™ company Contact Management.

Check the frame for damage. Inspect for rust and cracks especially near welds. All surfaces of the frame should be covered with paint to prevent rust and corrosion. Heat can weaken metal, preventing some areas of the frame from being repaired. See Welding Repairs.

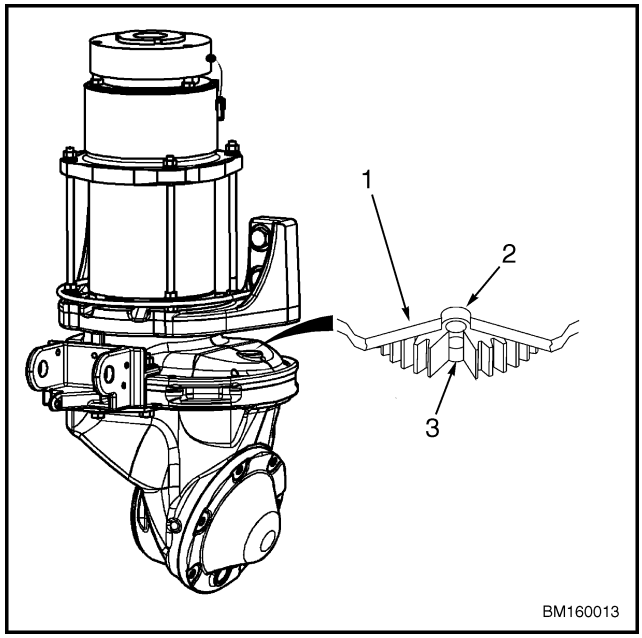


Figure 10. Oil Fill Hole

Legend for Figure 10

1. MDU HOUSING
2. OIL FILL HOLE
3. OIL LEVEL

Welding Repairs

WARNING

Disconnect the battery connector and remove the battery before welding. Welding can cause a fire and/or an explosion. Make sure there is no fuel, oil, or grease near the weld area. Make sure the area is well ventilated.

Forklift truck frames and components may have polyurethane paint. Welding, burning, or other heat sufficient to cause thermal decomposition of the paint may release isocyanates. These chemicals are allergic sensitizers to skin and respiratory tract and overexposure may occur without odor warning. When performing work, utilize good industrial hygiene practices, including removal of all paint (prime and finish coats) to the metal around the area to be welded. Use local ventilation, and/or supplied-air respiratory protection.

CAUTION

All welding repairs must pre-approved by Yale™ company Contact Management.

Always disconnect the battery connector to prevent damage to circuit components when welding. Connect the welding ground clamp as close to the weld area as possible to prevent welding current from damaging components.

Observe the previous **WARNING** and **CAUTION** before performing any welding repairs.

TABLE OF CONTENTS (Continued)

This section is for the following models:

(MPC060-VG) [A372];
(MPC080-VG) [A283];
(MTR005-F) [C902/D902];
(MTR007-F) [C903]

Clear Log

Use this screen to clear all stored information from the operator log.

OPERATOR LOGS

An operator log is created when a new user password is created. Logs are visible at the supervisor and service technician levels. 150 logs are available at a time.

See Table 7. Scroll through the Operator Logs menu using the UP (#1) and DOWN (#3) buttons and press the RIGHT (#2) button to enter the desired selection. Press the LEFT (#4) button to return to the previous menu.

Table 7. Operator Logs Menu

OPERATOR LOGS	Press → Button	L 1
		↓↑
		L 2
		↓↑
		L 3
		↓↑
		L 150

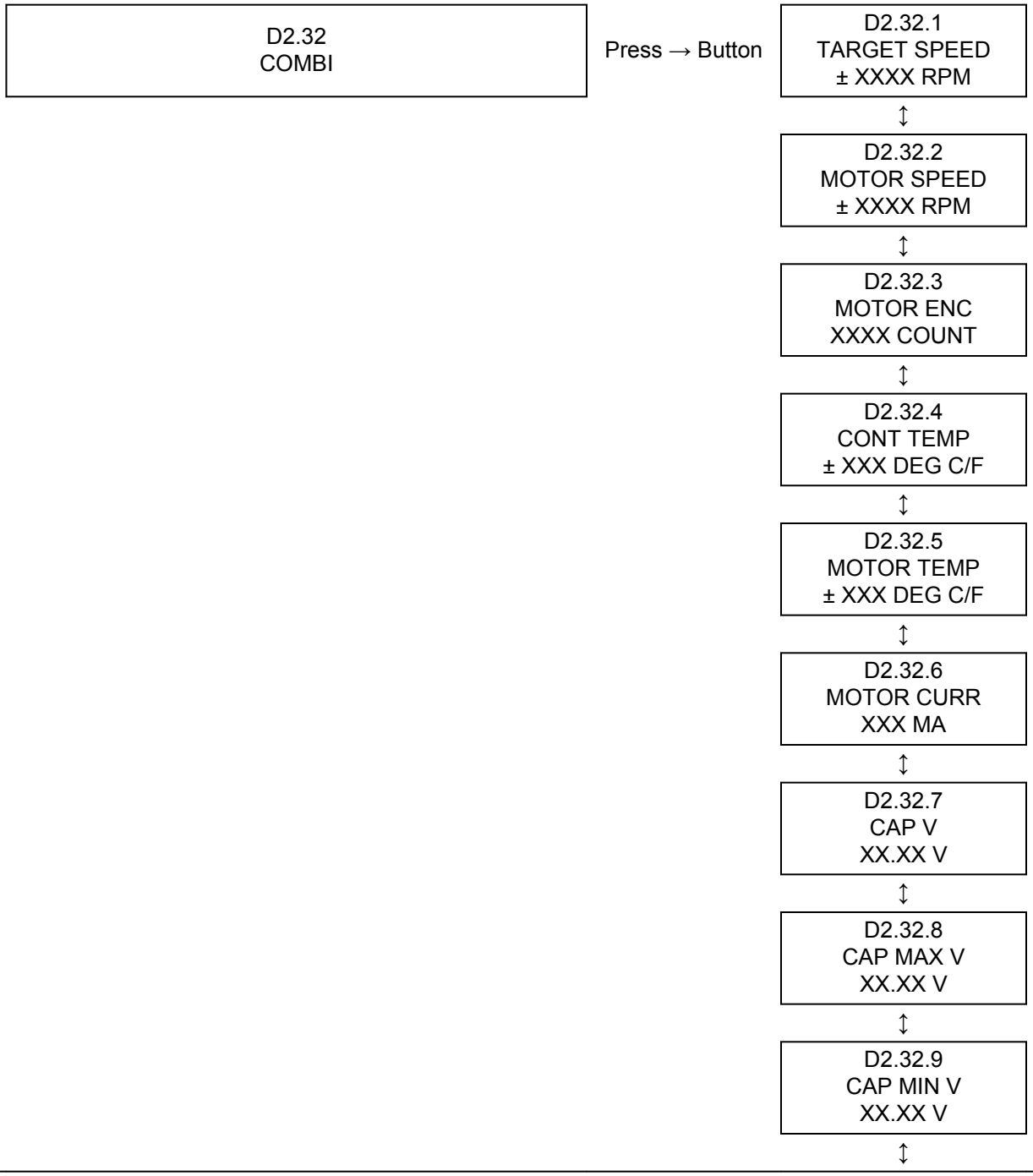
Operator 1-150

Shows the number of hours the selected operator has operated the truck. Accumulates time when the key switch is in the **ON** position and the operator presence switch is activated.

D2.32 Combination Controller

Table 15. D2.32 Combination Controller Menu

NOTE: Depending on how an individual lift truck is equipped, some functions shown on the display may not be available for viewing.



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, turn the key switch to the OFF position, disconnect the battery connector, and attach a DO NOT OPERATE tag to the control handle.

In some cases a main frame weldment or a fork frame weldment may be damaged, while the rest of the truck is still usable. The two frames may be separated from each other.

The main frame weldment is connected to the fork frame weldment by the lift cylinder, upper links, and rocker arms. Disconnect/connect these components to separate/assemble the frames.

See the section **Lifting Mechanism** 4000YRM1589. Refer to Upper Link - Remove/Install, and Rocker Arm - Remove/Install.

See the section **Walkie Hydraulic System** 1900YRM1629. Refer to Lift Cylinder - Remove/Install.

Painting Instructions

WARNING

Always use solvents and paints in an area with ventilation. DO NOT use solvents or paints near heat or fire.

Cleaning solvents can be flammable and toxic and can cause skin irritation. Wear protection for eyes and skin. When using cleaning solvents, always follow the recommendations of the manufacturer.

1. Remove all dirt from surface to be painted. Clean the area to be painted using a solvent for painted surfaces. Remove all oil and grease.
2. Remove the top surface of paint and all rust from the metal using sandpaper. Paint all metal surfaces where the paint is completely removed using primer. Apply the primer before applying the color paint.
3. Protect all surfaces that will not be painted. **DO NOT** paint cylinder rods, cables, labels, plates, or controls.
4. Paint all surfaces the original color, using Yale® paint. Follow directions on the container.

Label Replacement

WARNING

Replace damaged WARNING or CAUTION labels immediately.

If labels or information plates are missing or damaged, they must be replaced. See Figure 3.

NOTE: The nameplate is installed using rivets. Remove old rivets before installing a new nameplate. See your Yale® lift truck dealer to make sure the nameplate information is correct and complete before installing a new nameplate. Fasten the nameplate with the rivet heads outside.

1. Make sure the surface is dry and has no oil or grease. **DO NOT** use solvent on new paint. Clean the surface of old paint using a cleaning solvent.
2. Remove the paper from the back of the label. **DO NOT** touch the adhesive surface.

NOTE: The label cannot be moved after it touches the surface.

3. Carefully hold the label in the correct position above the surface. Put the label in the correct position on the surface. Make sure all air is removed from under the label and the corners and edges are tight.

Introduction

GENERAL

This section provides a description of the steering system used on the MTR005/007-F and MPC060/080-VG lift trucks. Procedures for removal, disassembly, repair, assembly, and installation of the steering assembly are outlined in this section.

See the section **Electrical System** 2200YRM1632 for information on removal and disassembly of the control handle.

See the section

- **Master Drive Unit * (With EPAS)** 0630YRM0961

or

- **Master Drive Unit S/N D801N03000L=> S/N A474N03000L=> S/N A497N030000L=> S/N E826N03000L=>** 0630YRM1609

for information on the traction motor, drive unit, or drive tire and wheel assembly.

See the section **Periodic Maintenance** 8000YRM1635 for instructions on removing and installing the General.

DESCRIPTION OF OPERATION

The steering system consists of a top-mounted, fixed, tower-type control handle assembly, a support assembly, a steer plate, a Master Drive Unit (MDU), and the drive tire and wheel assembly. The operator moves the control handle assembly left or right to steer the truck. Direction and speed controls are located on the control handle assembly which is attached to the hub on the support assembly. The control handle assembly is adjustable. A spring-loaded pin locks it into position. The support is attached to the truck frame and houses a set of tapered roller bearings. The hub is attached to the upper end of the spindle. The steer plate connects the lower end of the spindle to the MDU and turns the MDU left or right when the control handle is moved to steer the truck.

AIR GAP

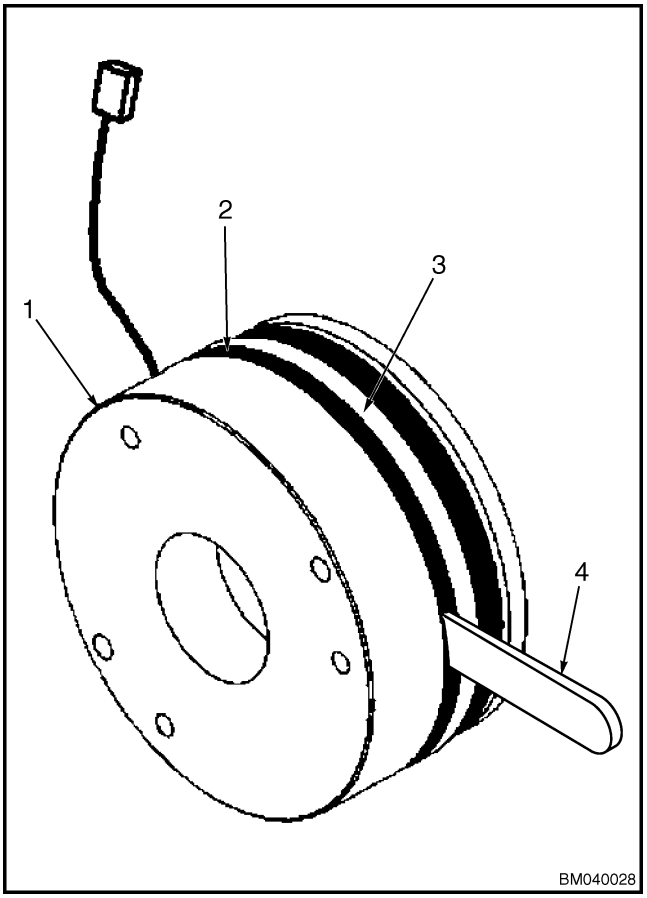
CAUTION

The brake is not adjustable. Check the air gap to determine if repair or replacement is necessary.

1. Check the three outer socket head screws for appropriate torque to secure the brake to the motor.

NOTE: The air gap is very thin and cannot be checked visually. Illustrations are not to scale and are for location references only.

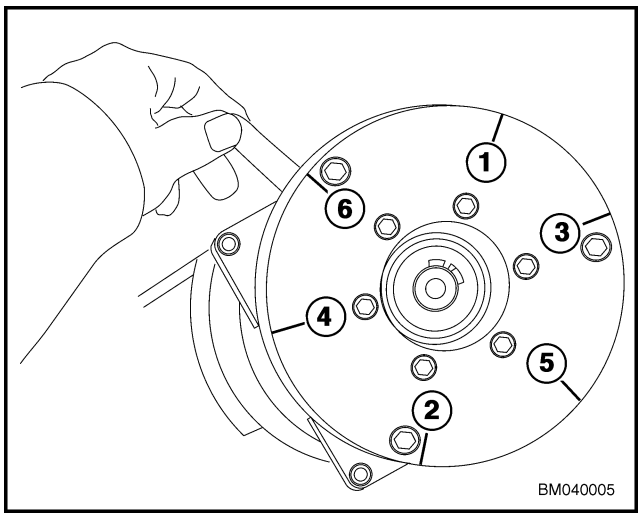
2. Check for correct air gap by measuring the distance between the bottom of the stator and the top of the pressure plate with the brake applied (disconnected) using feeler gauges. See Figure 3. Specifications vary, depending on truck model. See Table 2.



1. STATOR
2. AIR GAP
3. PRESSURE PLATE
4. FEELER GAUGE

Figure 3. Air Gap

3. The air gap should be checked for maximum and minimum clearance at the six locations shown in Figure 4.



1. LOCATION 1
2. LOCATION 2
3. LOCATION 3
4. LOCATION 4
5. LOCATION 5
6. LOCATION 6

Figure 4. Check Locations (Typical Brake)

4. If the air gap allows the maximum feeler gage to enter any of the six locations, replace the friction disk or the entire brake assembly. See Brake Assembly Repair.

5. If the air gap is too tight for a minimum feeler gage to enter any of the six locations, the air gap has been altered by internal damage or tampering. Replace the brake assembly.

NOTE: During brake operation, brake should engage and release with a solid, single-click noise. A double-clicking noise indicates that one side of the brake is releasing before the other.

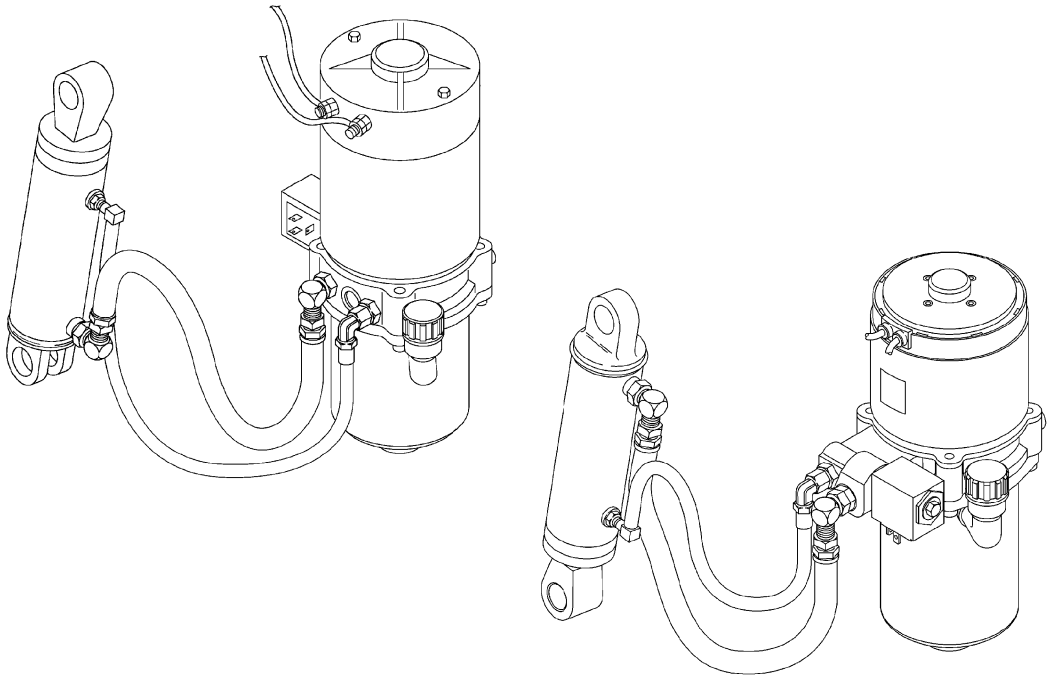
6. Listen to verify brake releases and applies in one smooth operation. A double-clicking noise indicates that one side of the brake is releasing before the other due to internal damage or tampering. Replace the brake assembly.

Yale

Maintenance

WALKIE HYDRAULIC SYSTEM

MPC080-VG [A283];
MPC060-VG [A372]



PART NO. 550090939

1900 YRM 1629

4. Block load wheels to prevent lift truck from moving. Refer to the section **Periodic Maintenance** 8000YRM1635 - How to Put A Lift Truck on Blocks.

5. Remove the drive unit compartment covers. See Drive Unit Compartment Covers.

6. Discharge the capacitor. See Special Precautions.

7. Tag and disconnect all power wires and control wires to the lift pump and motor assembly.

8. Disconnect the hydraulic hoses.

WARNING

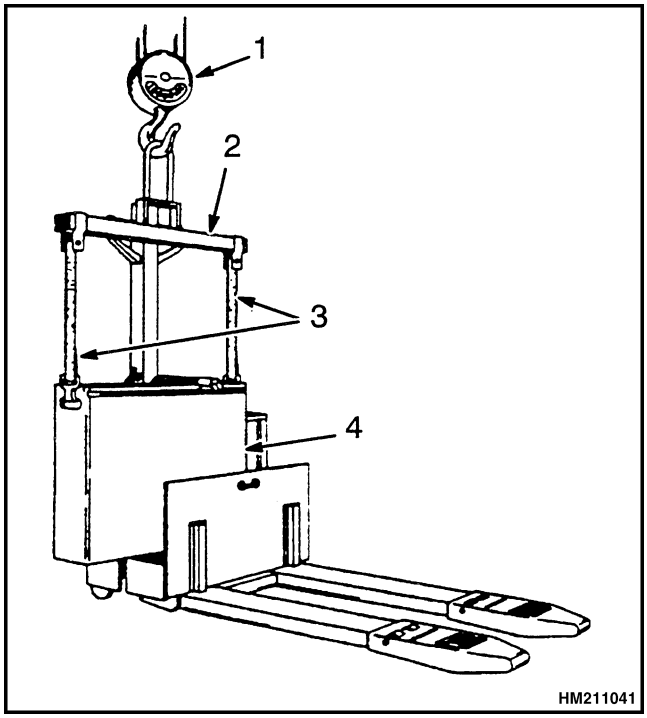
Batteries are heavy and can cause personal injury. Use care to avoid injury. DO NOT put hands, arms, feet, and/or legs between the battery and a solid object. Make sure the capacity of the crane and spreader bar is greater than the weight of the battery. The weight of the battery is normally shown on the battery case. The maximum battery weight is shown on the lift truck nameplate. The spreader bar must NOT be made of metal or it must have insulated straps.

9. If necessary, remove the battery. Use a spreader bar and an overhead lifting device (crane) to remove the battery. **DO NOT** let the battery move from side to side. Make sure the battery cables have clearance. See Figure 4.

NOTE: It is recommended to connect a piece of string/rope to the power wires to help guide the wires back to the controller when reinstalling the lift pump and motor assembly.

10. Loosen and remove the three capscrews and lockwashers retaining the lift pump and motor assembly to the frame. Support the lift pump and motor assembly as the capscrews are being removed. Remove lift pump and motor assembly.

11. Place lift pump and motor assembly in a vise on a workbench in an upright position.



1. CRANE
2. SPREADER BAR
3. INSULATOR STRAPS
4. BATTERY

Figure 4. Battery Removal

DISASSEMBLE

Remove Reservoir

1. If the lift pump and motor assembly has not been previously removed, perform Step 1 through Step 6 in RemoveLift Pump and Motor Assembly.

NOTE: The capscrews that hold the reservoir to the pump assembly also hold the motor to the pump assembly. When the capscrews are removed, the motor will be resting on the pump assembly. When reinserting the capscrews, ensure that the motor is located correctly and the coupling is seated properly.

2. Remove the four capscrews retaining the reservoir to the lift pump. See Figure 5.

CAUTION

DO NOT OVERFILL RESERVOIR. Oil will leak from the breather/filler cap during operation if reservoir is over filled.

NOTE: Check the hydraulic oil level in the reservoir when oil is at room temperature. Remove breather cap and add recommended hydraulic oil to proper level, as required. See Hydraulic Reservoir in this section.

1. Operate lift truck until hydraulic oil reaches operating temperature [43 to 49°C (110 to 120°F)].
2. Lower the forks completely to relieve pressure from hydraulic circuit.
3. Turn the key switch to the **OFF** position and disconnect the battery.
4. Block load wheels to prevent lift truck from moving. Refer to the section **Periodic Maintenance** 8000YRM1635 - **How to Put a Lift Truck on Blocks**.
5. Remove the drive unit compartment covers. See Drive Unit Compartment Covers.
6. Discharge the capacitor. See Special Precautions.
7. Clean any buildup of dirt from around the lift pump and motor assembly.

CAUTION

Protect the hydraulic system from dirt and contaminants when servicing the hydraulic system.

8. Disconnect the hydraulic hose at the pump.
9. Install a tee fitting and a pressure gauge having at least a 24.8 MPa (3600 psi) rating.
10. Verify the oil is at an operating temperature of 43 to 49°C (110 to 120°F).
11. Raise the forks completely and continue to hold the lift button. Read the pressure gauge while the pump is in relief.

NOTE: The pump will stop after a short period of time. Release the lower button then press and hold again to continue.

12. The relief pressure should be 24.2 (+0.6 -0.0) MPa (3500 (+87 -0) psi). If the pressure is incorrect, refer to Relief Valve Adjust.
13. After the proper relief pressure is obtained, lower the forks completely to relieve pressure from hydraulic circuit.
14. Turn the key switch to the **OFF** position. Disconnect the battery.
15. Discharge the capacitor. See Special Precautions.
16. Remove the pressure gauge and tee.
17. Reconnect the hydraulic hose to pump.
18. Connect the battery and turn the key switch to **ON** position.
19. Operate the hydraulic functions several times to purge the air from the hydraulic circuit.
20. Remove blocks from wheels.
21. Test the lift truck by lifting and lowering a load several times. Visually check for leaks.

CAUTION

DO NOT OVERFILL. Oil will leak from the breather/filler cap if too full.

22. Check the hydraulic oil level in the reservoir. Remove breather cap and add recommended hydraulic oil to proper level, as required. See Hydraulic Reservoir.
23. Install the drive unit compartment covers. See Drive Unit Compartment Covers.

RELIEF VALVE ADJUST

The relief valve is non-adjustable and comes preset to the correct pressure from the factory. Refer to Relief Valve Pressure Check to see if replacement of the relief valve is required.

TABLE OF CONTENTS

This section is for the following models:

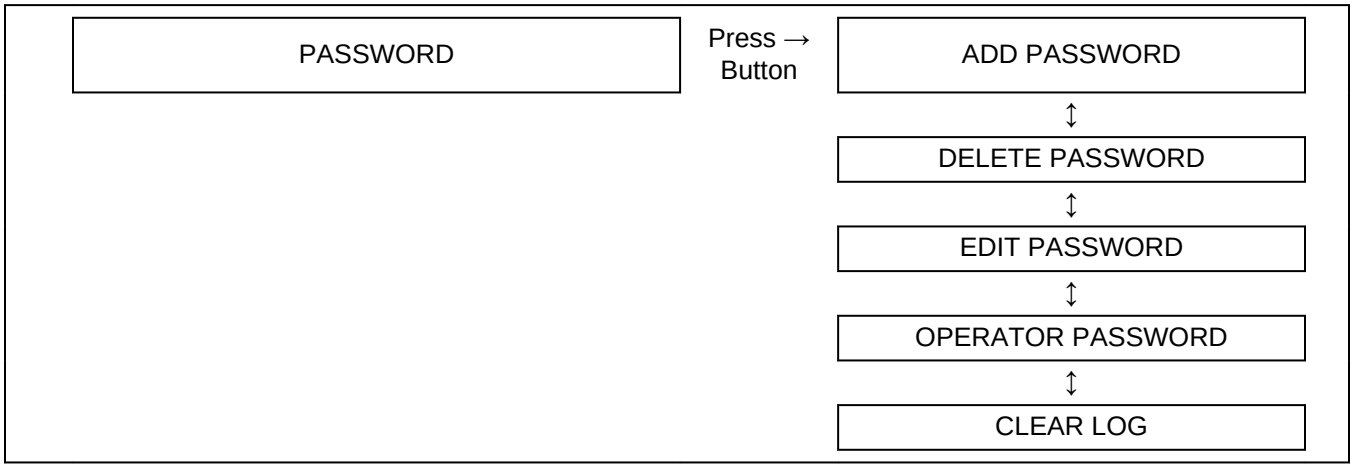
(MPC050-VG) [A372];
(MPC080-VG) [A283];
(MTR005-F) [C902/D902];
(MTR007-F) [C903]

- **User Type** - For each password, you can set the access level or "User Type" under the "U" character. The "O" is selected for operator, the "S" for supervisor and the "T" for the technician (service).

NOTE: A total of 100 passwords can be setup. Multiple passwords can be setup for either service, operator, or supervisor but all have to be unique for each.

NOTE: Parameter in Display "Perform Enable" set to:
0 = Off, Operator can choose to set performance mode.
1 = On, Operator is limited to the set performance mode only.

Table 6. Operator Password Menu



Add Password

Use this menu to add operator passwords. To enter a new password at the Passwords screen, enter the password to be added and press enter to activate.

Delete Password

Use this menu to delete operator or supervisor passwords. To delete a password at the Passwords screen, enter the password to be deleted and press enter to finalize.

Edit Password

Use this menu to edit operator passwords. To edit a password at the Edit Passwords screen, enter the password to be edited and press enter to select. Change the password and press enter to select.

Operator Password

Use this screen to turn the operator password feature ON or OFF.

Clear Log

Use this screen to clear all stored information from the operator log.

OPERATOR LOGS

An operator log is created when a new user password is created. Logs are visible at the supervisor and service technician levels. 150 logs are available at a time. See Table 7. Scroll through the Operator Logs menu using the UP (#1) and DOWN (#3) buttons and press the RIGHT (#2) button to enter the desired selection. Press the LEFT (#4) button to return to the previous menu.

General

This section includes removal, disassembly, checks, adjustments, assembly, installation, and troubleshooting procedures for the electrical system components on the MTR005/007-F and MPC060/080-VG truck models. Components covered in other sections, such as motors and industrial batteries, are not included in this section.

See the section **Controller Diagnostics** 9000YRM1657 for additional information on the AC motor controller and for information on troubleshooting fault codes, adjusting parameters, and testing the motor controller.

See the section **AC Motor Repair * (With EPAS)** 0620YRM1283 for general information on traction motor troubleshooting and repair for lift truck models:

- MTR005/007-F

See the section **A/C Motor Repair S/N A474N03000L=> S/N A497N030000L=> S/N D801N02161L=> S/N E826N01917L=>** 0620YRM1621 for general information on traction motor troubleshooting and repair for lift truck models:

- MPC060/080-VG

See the section **Periodic Maintenance** 8000YRM1635 for instructions on removing and installing the drive unit compartment covers and for minimum motor brush length specifications.

See the section **Diagrams** 8000YRM1634 for the wiring diagrams and schematics.

Throughout this section the terms right, left, front, rear, forward, and reverse relate to the viewpoint of an operator riding on the truck with the forks trailing. See Figure 1.

CONTROL MODULE

Check

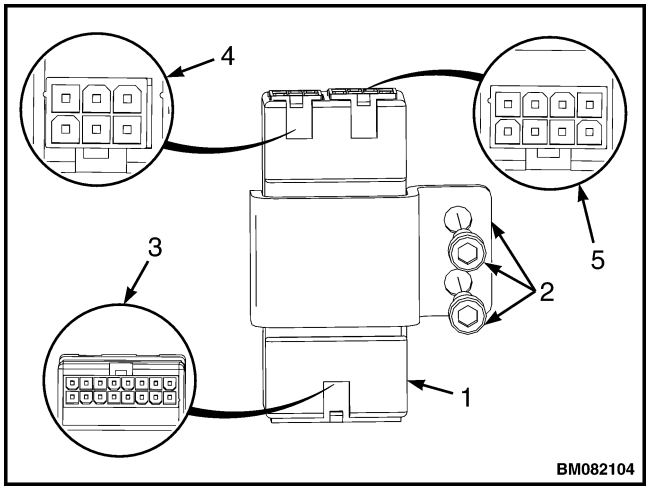
The control module converts analog signals from the control handle to digital signals for the controller to read. If the controller is reporting an input error fault code, then the control module may be malfunctioning. Check the control module using the following steps.

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** 8000YRM1635.

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 7.



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

Figure 7. Control Module Connectors

9. Remove wires and replace switch(es) if defective.

Handle Shaft

For the following instructions, refer to Figure 15.

1. Remove cotter pin (38) and link rod (37).

2. Remove two screws (23), lockwasher (35), and washers (24) securing handle to bracket.

3. Remove handle shaft (27) from bracket (22).

4. Remove left and right handles (26), link sleeve (36), and backup washers (25).

Lower Cover

1. Remove cotter pin from link rod and remove link rod.

2. Tag and identify all wire connections for reference during assembly.

3. Unplug connector 4A (throttle Hall effect sensor wiring harness).

4. Unplug four wires connected to forward and reverse switches.

5. Remove two capscrews (29) and lockwashers (30) that hold the plate and lower cover of control handle head to the control arm shaft (31).

6. Remove plate and lower cover of control handle head and place on a clean workbench.

Directional/Throttle Switch

1. Remove two screws (19) and lockwashers (18) that hold directional/throttle switch assembly to lower cover of control handle head. See Figure 15.

2. Tag and identify all wire connections for reference during reassembly.

3. Disconnect all wires.

4. Remove directional/throttle switch assembly.

Neutral Switches

Refer to Figure 17 for the following procedures.

1. Use locking pliers to hold the threaded standoff while removing screw (5).

2. Remove upper screws (7).

3. Remove nutplate.

4. Remove directional switches, insulators, and spacer.

Throttle Sensor

Refer to Figure 17 for the following procedures.

NOTE: Make note of the orientation of the gears or mark alignment to assist in reassembly.

1. Make note or mark alignment of gears (refer to Figure 18).

2. Loosen two setscrews (13) that hold sensor gear to sensor and remove gear. See Figure 17.

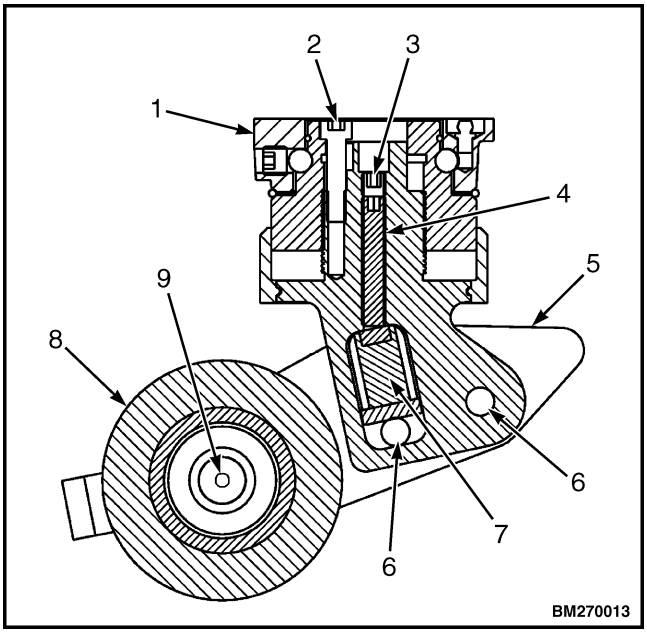
3. Remove nut (11) and lockwasher (10) that holds sensor to bracket.

4. Remove sensor (8).

CAUTION

The caster is under tension from the elastomeric spring. The tension must be released before the caster can be disassembled.

4. Remove the setscrew from the center of the caster swivel assembly.



1. SWIVEL ASSEMBLY
2. HEIGHT ADJUSTMENT LOCKING BOLT
3. SETSCREW
4. TENSION SETSCREW
5. ARM
6. PIVOT BOLT
7. SPRING
8. LOAD WHEEL
9. WHEEL AXLE

Figure 7. Heavy-Duty Caster

5. Loosen the tension setscrew until there is no tension remaining on the elastomeric spring.
6. Remove the lock nuts and washers retaining the pivot bolts.
7. Remove the arms, pivot bolts, and spacers.
8. Remove the elastomeric springs and thrust plate.
9. Remove the height adjustment locking bolt from the swivel assembly.
10. Unscrew the yoke from the swivel assembly.

ASSEMBLE

Heavy-Duty

1. Screw the yoke into the swivel assembly.
2. Install the elastomeric spring and thrust plate into the yoke.
3. Align the arms and spacers with the yoke. Install the capscrews, washers, and lock nuts to secure the arms to the yoke.
4. Align the wheel between the arms and install the axle, spacers, washer, and lock nut.
5. Tighten the tension setscrew.
6. Install the locking setscrew.
7. Install the caster into the truck. See Caster Replacement in this section.
8. Check caster height adjustment. See Caster Adjustment Check in this section.
9. Install the height adjustment locking screw.

Rear Link and Load Wheel

REMOVE

1. Move the lift truck to a safe and level area.
2. Use the lift button to raise the lift truck to its maximum height.
3. Put blocks under both forks and on both sides of the drive tire. See the section **Periodic Maintenance** 8000YRM1635 - **How to Put a Lift Truck On Blocks**.
4. Retract the lift cylinder using the lower button. This will raise the load wheels off the floor.
5. Remove the capscrew (3) retaining the pivot pin (24) to the yoke assembly. Remove the pivot pin. See Figure 8.

PROBLEM	POSSIBLE CAUSE	PROCEDURE OR ACTION
	Deformed lifting components.	Disassemble, repair, or replace.
	Bent lift cylinder piston rod.	See the section **Walkie Hydraulic System** 1900YRM1629.
	Lower switch or solenoid not operating properly.	Troubleshoot lower switch, lowering solenoid, and wiring.

Grease

Fittings and Bearings			
Application	**Standard/CS/Freezer**	**Arctic/Food Processing**	**Steer Bearings**
Approved Vendor	Mobilgrease® 28	Amsoil GHD®	Amsoil GHD®
Oil	Synthetic	Synthetic	Synthetic
Thickener	Clay	Lithium Complex	Lithium Complex
Grade NGLI	1.5	2.0	2.0
Moly-Fortified	No	Yes	Yes
Dropping Pt.	310°C (590°F)	288°C (550°F)	288°C (550°F)
Field Personnel Note: The product listed above is the approved source that meets or exceeds **Yale** specifications. The use of products other than that listed above is unauthorized.			

Tire Specifications

Lift Truck Model	Drive Tire		Load Wheel		Casters	
	Size	**Composition**	**Size**	**Composition**	**Size**	**Composition**
MTR005-F	10.0 × 5.0 in.	Poly[1] (Standard) Rubber[2] (Optional) Siped-Poly[1] (Optional)	8.0 × 5.0 in.	Rubber[2] (Standard) Poly[3] (Optional)	Not Available	
MTR007-F	12.0 × 4.5 in.	Poly[1]	8.0 × 5.0 in.	Rubber[2] (Standard) Poly[3] (Optional)	Not Available	
MPC060-VG	10.0 × 5.0 in.	Rubber[2] (Standard) Poly[1] (Optional) Siped-Poly[1] (Optional)	3.25 × 6.50 in.	Single/Poly[4] (Standard)	4.0 × 2.5 in.	Poly[4]
			3.250 × 3.125 in.	Dual/Poly[4] (Optional)		
MPC080-VG	12.0 × 4.5 in.	Poly[1]	3.25 × 6.50 in.	Single/Poly[4] (Standard	4.0 × 2.5 in.	Poly[5]
			3.250 × 3.125 in.	Dual/Poly[4] (Optional)		
[1]Durometer 90 [2]Durometer 65 [3]Durometer 93 [4]Durometer 95 [5]Durometer 92						

TABLE OF CONTENTS

This section is for the following models:

(MPC060-VG) [A372];
(MPC080-VG) [A283];
(MTR005-F) [C902/D902];
(MTR007-F) [C903]

Automatic Diagnostics

This feature allows for immediate access to diagnostics associated with status codes. To use this feature, press the 5 button while viewing the status code screen. If diagnostics are available with the code, the diagnostics will be immediately entered.

Status Code Indication

This feature indicates if a status code is available when in the normal screen. If a status code is present, the mode indicator will display “!”.

Status Codes and Descriptions

STATUS CODES

Status codes give an indication to the operator that a possible malfunction or incorrect truck use has occurred. Status codes are a code number of a symptom or malfunction. The wrench symbol will flash and the status code number will be shown on the LCD screen if an incorrect truck use or malfunction occurs during operation. Have an authorized service person check and repair the lift truck if a status code number appears. The symptoms for each status code are shown in this manual. This manual also provides in-depth troubleshooting procedures for each fault broken down into the following system or node:

NODE 10: DISPLAY

NODE 32: COMBI

Status Codes are displayed as four lines. Line one consist of the Node and Code number. The second line consists of the Node name while lines three and four contain code descriptions. For example, Status Code 32003 is shown in the Status Code Structure Table 9030-03-1. This Status Code is set when a lower coil circuit fault is detected by the combination controller.

Table 9030-03-1. Status Code Structure

LINE NUMBER	LINE DESCRIPTION
LINE 1	32003
LINE 2	Combination
LINE 3	Lower Coil
LINE 4	Circuit

DTC xx109 (Cont)
CANBus Communications - Display

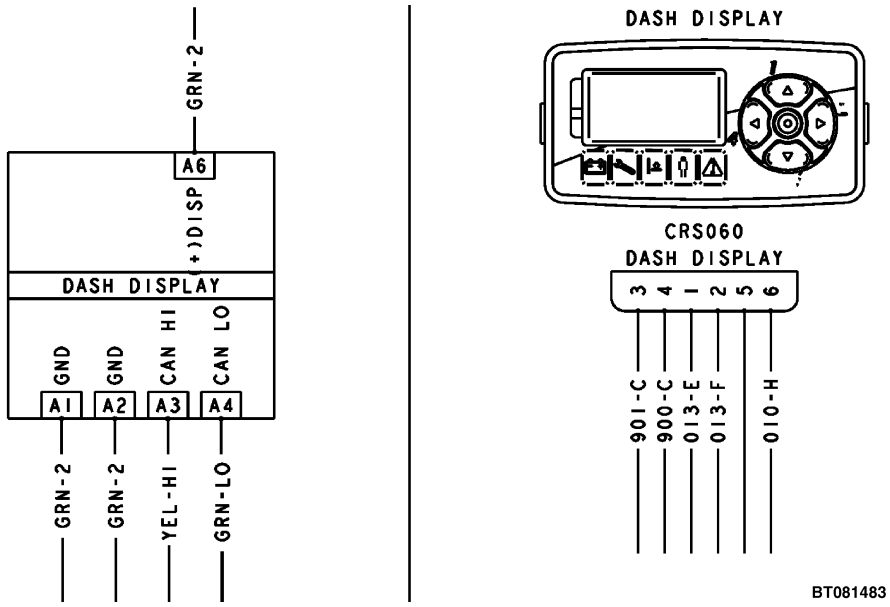
CAUSE C - FAULTY DISPLAY

PROCEDURE OR ACTION:

1. Replace faulty display. Make sure to indicate the DTC code(s) on the warranty claim to include an accurate problem description leading to controller replacement.

END POSSIBLE CAUSES

DTC XX109 CANBUS COMMUNICATIONS - DISPLAY DIAGRAMS



Troubleshooting Scenes

END FAULT

Main Contactor Coil (Cont)

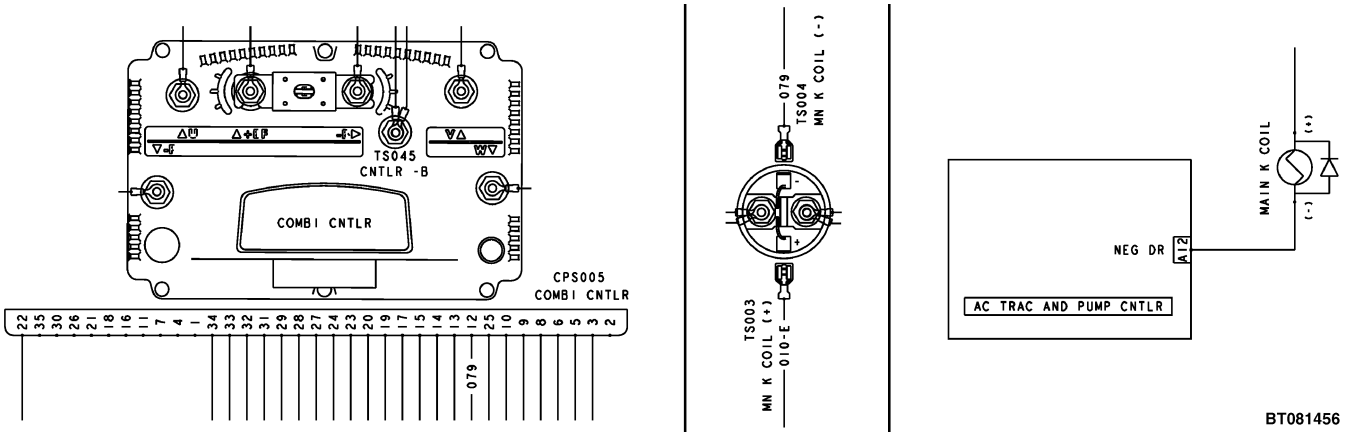
CAUSE C - FAULTY COMBINATION CONTROLLER

PROCEDURE OR ACTION:

1. If no faults are found, replace controller. Make sure to indicate the DTC code(s) on the warranty claim to include an accurate problem description leading to controller replacement.

END POSSIBLE CAUSES

DIAGRAMS



Troubleshooting Scenes

END FAULT

Main Contactor (Cont)

CAUSE B - MAIN CONTACTOR STUCK CLOSED

PROCEDURE OR ACTION:

1. Measure voltage between the main contactor B(+) output terminal and B(-).
   Is voltage 24 ± 2.5 Vdc / 36 ± 3.5 Vdc?
   YES: Replace faulty main contactor.
   NO: Proceed to Cause D.

CAUSE C - MAIN CONTACTOR STUCK OPEN

PROCEDURE OR ACTION:

NOTE: Key in ON position.

1. Measure voltage between the main contactor B(+) output terminal and B(-).
   Is voltage present?
   YES: Proceed to Cause D.
   NO: Replace faulty main contactor.

CAUSE D - FAULTY COMBINATION CONTROLLER

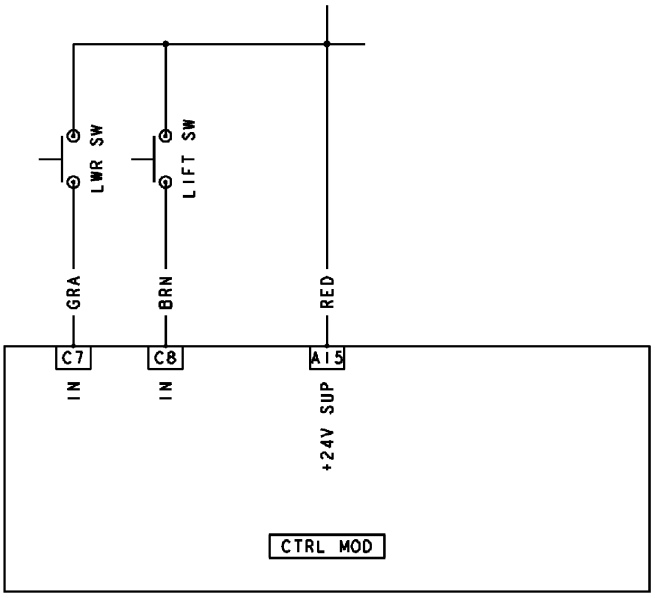
PROCEDURE OR ACTION:

1. If no faults are found, replace controller. Make sure to indicate the DTC code(s) on the warranty claim to include an accurate problem description leading to controller replacement.

END POSSIBLE CAUSES

DTC 32200 (Cont)
Combi - Release - Lift/Lower

DTC 32200 COMBI - RELEASE - LIFT/LOWER DIAGRAMS



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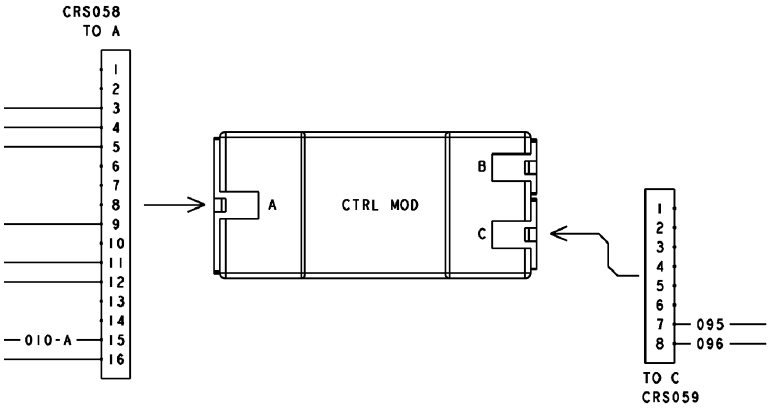

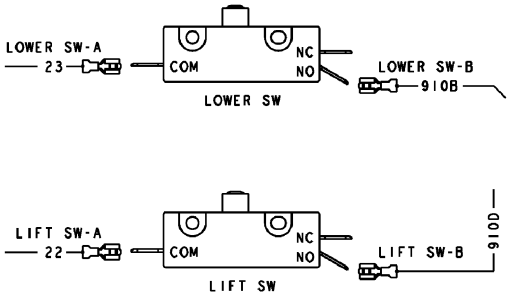

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Troubleshooting Scenes

END FAULT