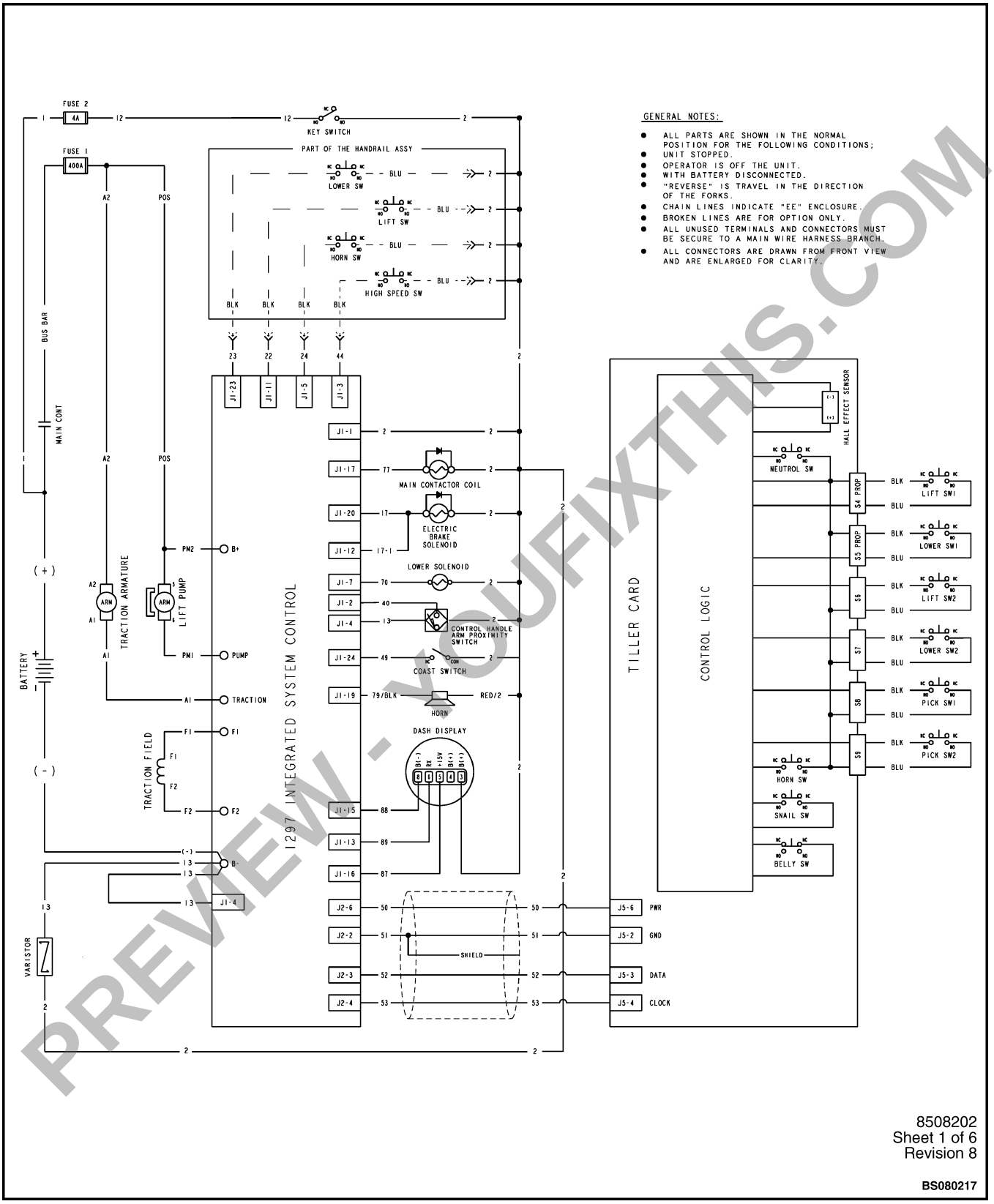


Figure 1. Schematic Diagram - 24 Volt (W60Z and W80Z) (Sheet 1 of 6)

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Description of Operation

The hydraulic system of the B60Z, B80Z, B60Z, B80Z^{AC}, C60Z, C80Z, C60Z, C80Z^{AC}, W60Z, W65Z, and W80Z lift trucks includes:

- Reservoir
- Pump
- Check Valve
- Relief Valve
- Lowering Valve
- Lift Cylinder
- Connecting Hoses and Tubes

WARNING

Always wear the proper protective equipment including eye protection and petroleum-resistant gloves when handling hydraulic oil. Thoroughly wash oil from exposed areas of skin as soon as possible.

Never check for leaks by putting hands on hydraulic lines or components under pressure. Hydraulic oil under pressure can be injected into the skin.

Completely lower forks to relieve hydraulic pressure before disassembling any part of the lift pump or disconnecting any hydraulic hoses.

The hydraulic oil is hot at normal operating temperatures. Be careful when draining the oil.

CAUTION

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

Never operate the pump without the proper amount of oil in the hydraulic system. The operation of the hydraulic pump with low oil levels will damage the pump.

The reservoir contains the hydraulic fluid necessary for the operation of the system. It acts as a heat sink to provide cooling. As the hydraulic oil leaves the reservoir, it passes through a strainer in the reservoir. See Figure 1.

The hydraulic pump provides the flow of the hydraulic oil which activates the cylinder.

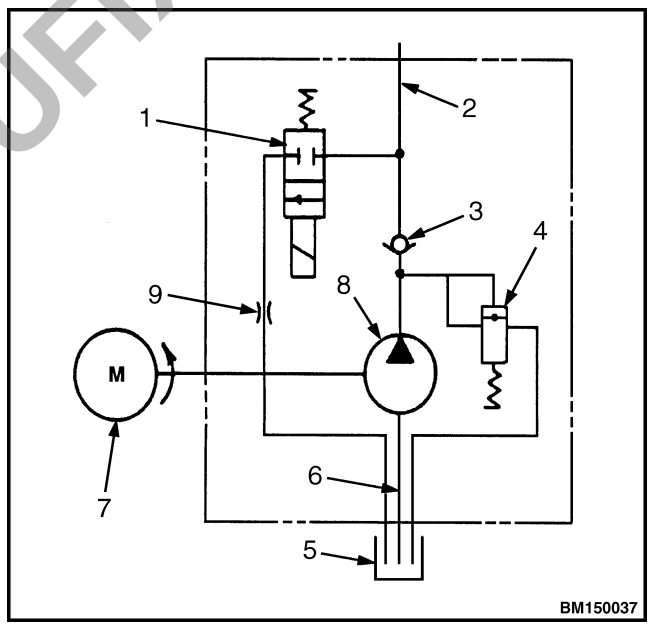
A check valve allows flow of the hydraulic oil in one direction only. In this hydraulic system, it prevents the oil from flowing backwards through the pump.

A relief valve limits maximum system pressure to protect the hydraulic system components.

The lowering valve is a normally closed valve. When it opens, hydraulic oil from the lift cylinder is allowed to return to the reservoir, and the forks lower.

The lift cylinder rod extends to operate the lift linkages to raise the forks.

The connecting hoses and tubing connect the various hydraulic components in the lift truck to complete the hydraulic circuit. See Figure 2 and Figure 3.



1. LOWERING SOLENOID VALVE
2. TO LIFT CYLINDER
3. CHECK VALVE
4. RELIEF VALVE
5. RESERVOIR
6. INLET LINE
7. PUMP MOTOR
8. LIFT PUMP
9. ORIFICE

Figure 1. Lift Pump and Motor Assembly Schematic

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Legend for Figure 1

1. FRAME
2. MACHINED H CASTING
3. COVER
4. FRAME
5. MACHINED H CASTING
6. COVER

Frame Separation and Assembly

FRAME SEPARATION

In some cases a fork frame or a drive unit frame may be damaged, while the rest of the truck is still usable. The two frames may be separated from each other by using the following steps.

1. Raise the motorized lift truck to its maximum height. Move the key to the OFF position. Disconnect the battery.

2. Remove the drive unit compartment covers.

3. Position blocks under both sides of the truck in the area of the battery compartment and under both forks. See How to Put Lift Truck on Blocks in Periodic Maintenance 8000SRM0919 or Periodic Maintenance 8000SRM1298.

4. Remove the battery.

5. Remove the top clevis pin retaining the hydraulic cylinder to the frame. See Hydraulic Cylinder in Walkie Hydraulic Systems 1900SRM0964.

6. Remove both pivot pins retaining the upper link to the drive unit frame. See Upper Link, Remove in Lifting Mechanism 4000SRM0965.

7. Remove both drive unit frame pivot pins retaining the rocker arm to the drive unit frame. See Rocker Arm, Remove in Lifting Mechanism 4000SRM0965.

8. Carefully move one of the frames away from the other.

FRAME ASSEMBLY

1. Align both frames so the pins may be installed to assemble the frames to each other.

2. Install both drive unit frame pivot pins to attach the rocker arms to the drive unit frame. See Rocker Arm, Install in Lifting Mechanism 4000SRM0965.

3. Install both pivot pins to attach the upper link to the drive unit frame. See Upper Link, Install in Lifting Mechanism 4000SRM0965.

4. Install the pivot pin to attach the hydraulic cylinder to the fork frame. See Hydraulic Cylinder, Install in Walkie Hydraulic Systems 1900SRM0964.

5. Install the battery.

6. Install the drive unit compartment covers.

7. Remove the blocks and lower the motorized lift truck to the floor. Check the pull rod adjustment. See Pull Rod Adjustment in Lifting Mechanism 4000SRM0965.

8. Test the operation of the truck before returning the truck to service.

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Torque Specifications

CASTER ASSEMBLY

Mounting Capscrews (4 each)
57 N•m (42 lbf ft)

MASTER DRIVE UNIT

Motor Mount Studs (4 each)
17 N•m (13 lbf ft)

Transmission to Frame Mounting Bolts (4 each)
B60Z, W60Z, W65Z, and W80Z 201 N•m (148 lbf ft)
B80Z 300 N•m (221 lbf ft)

Drain Plug
41 N•m (30 lbf ft)

Fill-Level Plug
27 N•m (20 lbf ft)

Drive Tire Wheel Bolts
200 N•m (148 lbf ft)

STEERING

Dash to Frame Mounting Bolts (4 each)
119 N•m (88 lbf ft)

Steer Swivel to Dash Lock Nut (1 each)
27 N•m (20 lbf ft)

Steer Handle to Tiller Bracket (2 each)
27 N•m (20 lbf ft)

Butterfly Throttle Control to Handle (2 each)
1 N•m (0.5 lbf ft)

Gas Springs Mounting Studs (2 each)
30 N•m (20 lbf ft)

Control Arm Support Bracket Pivot Pins (2 each)
142 ±7 N•m (105 ±5 lbf ft)

BRAKE

Mounting Capscrews
B60Z, W60Z, W65Z, and W80Z 10 N•m (89 lbf in)
B80Z 17 N•m (13 lbf ft)

ELECTRICAL

Traction Motor Power Wire Nuts (4 each)
MPE060E and MPE080E 8 N•m (71 lbf in)
All Others 9 N•m (80 lbf in)

Steady-Rest to Frame - B60Z and B80Z (4 each)
88 N•m (65 lbf ft)

Auxiliary Control Box - B60Z and B80Z (4 each)
9 N•m (7 lbf ft)

LIFT MECHANISM

Pull Rod Jam Nuts (4 each Rod)
176 N•m (130 lbf ft)

Hydraulic Power Unit Mounting Capscrews (2 each)
W60Z and B60Z 35 N•m (26 lbf ft)
W65Z, W80Z and B80Z 69 N•m (51 lbf ft)

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Fault codes 20, 32, or 34 may also intermittently appear after the battery has been changed. If the BDI indicator will not reset, this may indicate that the battery is not properly charged. Always install fully charged, properly functioning batteries to the lift truck.

NOTE: Minimum reset voltage for the BDI is 25.2 volts (open cell), specific gravity should be approximately 1.250 per cell.

Table 8. 1297 Diagnostic and Troubleshooting Menu

LED Code	Programmer LCD Display	Explanation	Possible Cause
1,1	DRIVE SENSOR	Traction motor current sensor error.	1. Incorrect traction motor wiring. 2. Controller defective.
1,2	HW FAIL-SAFE	Self-test or watchdog fault.	1. Controller defective.
1,3	DRIVE M-	External short of traction motor M- to B-, or FET damage.	1. Incorrect traction motor wiring. 2. Controller defective.
1,4	LOWER VALVE FAULT	Lowering valve fault.	1. Lowering valve or connection open.
2,0	BDI LOW	Battery needs to be recharged.	1. Battery state of charge <20%.
2,1	THROTTLE WIPER HI	Traction throttle wiper high.	1. Defective MUX card.
2,1	THROTTLE WIPER LO	Traction throttle wiper low.	1. Defective MUX card.
2,2	PUMP SENSOR	Pump motor current sensor error.	1. Incorrect pump motor wiring. 2. Controller defective.
2,3	HPD	HPD sequencing error.	1. Improper sequence of KSI, interlock, and direction inputs.
2,3	SRO	SRO sequencing error.	1. Improper sequence of KSI, interlock, and direction inputs. 2. Interlock switch open.
2,3	ANTI-TIEDOWN	Mode switch activated at startup.	1. Mode switch shorted to B +. 2. Mode switch "tied down" to select M2 permanently.
2,4	PUMP M-	External short of pump motor M- to B-, or FET damage.	1. Incorrect pump motor wiring. 2. Controller defective.

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Troubleshooting

PROBLEM	POSSIBLE CAUSE	PROCEDURE OR ACTION
Unusual noise from traction motor.	Parking brake not releasing/ damaged.	Troubleshoot the parking brakes.
	Drive unit internal damage.	Check that the drive unit rotates smoothly.
	Traction motor bearing damaged.	Replace end head(s) and check stator and rotor for damage. Replace damaged components or traction motor if necessary.
Truck moves slow or in a jerky motion.	Encoder broken.	Replace encoder bearing.
	Encoder wire broken.	Check and repair encoder wire or replace encoder bearing.
Temperature sensor failure.	Temperature sensor wire damaged.	Measure resistance with ohmmeter. Resistance should be 530 ohms at 25 °C (77 °F). Inspect and repair temperature sensor wire. The temperature sensor wire can be repaired, but the temperature sensor must be replaced if faulty.
	Main wiring harness damaged.	Test temperature sensor circuit through main wiring harness from connection at controller.
	Temperature sensor malfunction.	Measure resistance with ohmmeter. If wiring is ok, resistance should be 530 ohms at 25 °C (77 °F). Replace the temperature sensor.

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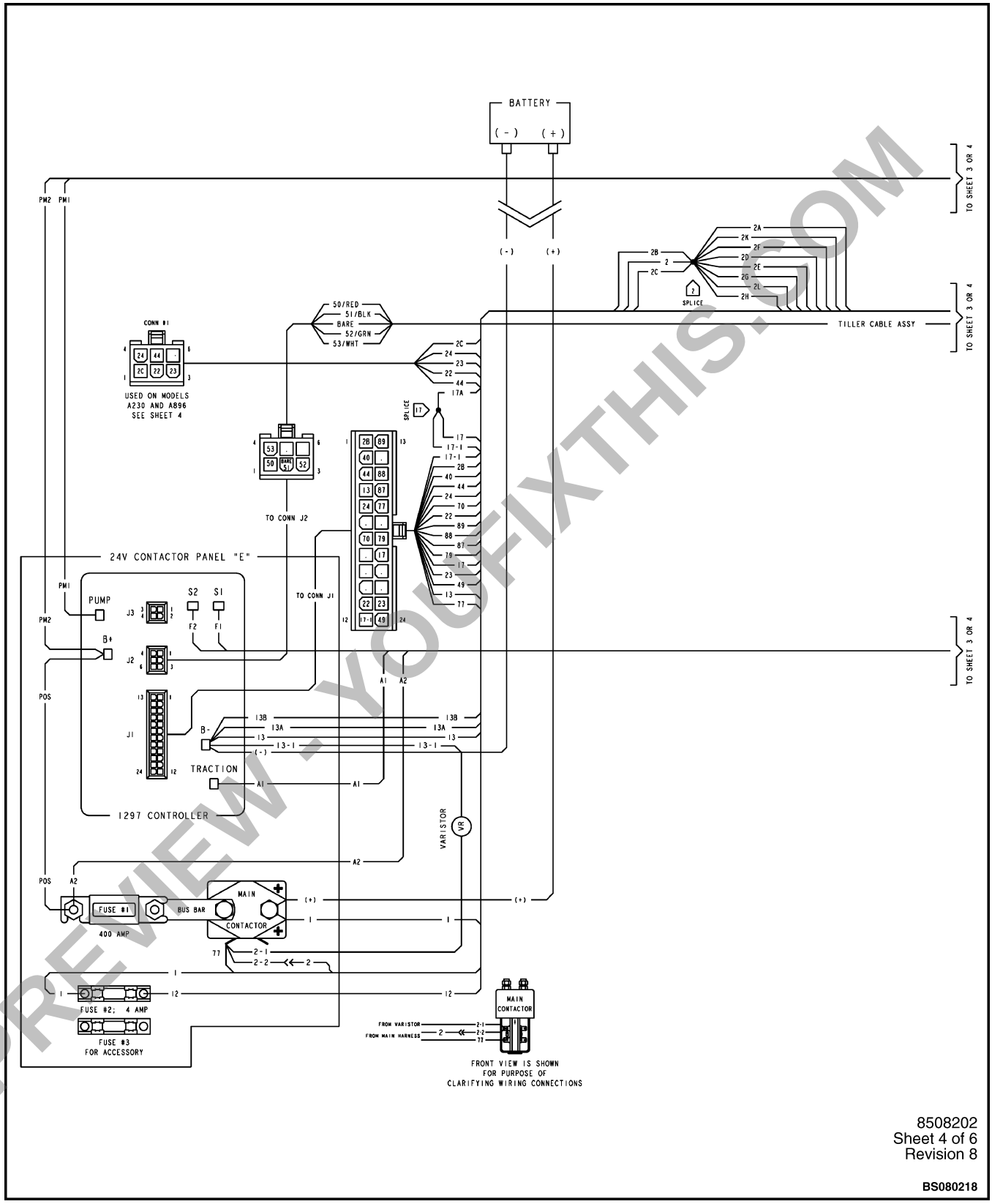


Figure 1. Schematic Diagram - 24 Volt (W60Z and W80Z) (Sheet 2 of 6)

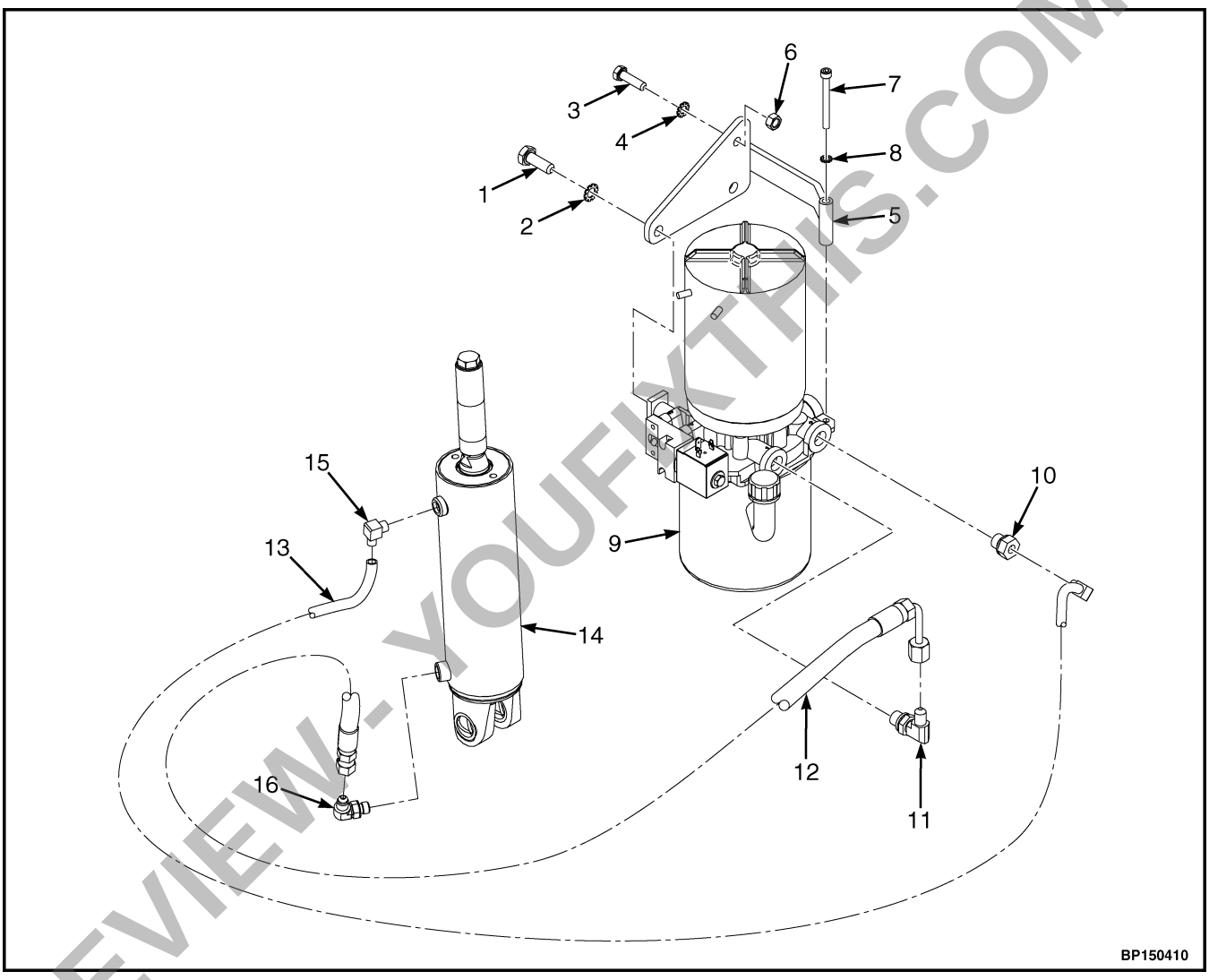
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LIFTING A LOAD

To raise a load, the lift button must be depressed. Depressing this button will activate the lift pump motor. Torque is transferred to the pump from the motor through the motor shaft and the coupling.

Hydraulic oil is pumped through the system as the pump begins to operate. Atmospheric pressure forces oil into the low pressure area at the pump inlet. Air, which is drawn into the reservoir through the breather, displaces the pumped oil, allowing oil to be sent through the system. See Figure 1.



1. CAPSCREW
2. WASHER
3. CAPSCREW
4. WASHER
5. MOUNTING BRACKET
6. NUT
7. SCREW
8. WASHER
9. PUMP AND MOTOR ASSEMBLY
10. ADAPTER
11. FITTING
12. HOSE
13. TUBE
14. CYLINDER ASSEMBLY
15. FITTING
16. FITTING

Figure 2. Hydraulic System for B60Z, B60Z^{AC}, C60Z, C60Z^{AC}, and W60Z Lift Trucks

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AC Motor Repair

REMOVE

WARNING

The AC traction motor is heavy. To prevent injury, use a lifting device of adequate capacity for lifting the assembly.

It is not necessary to remove the traction motor from the lift truck to make some repairs. Perform only the steps necessary to safely complete the required service.

1. Turn the key switch to the OFF position and disconnect the battery connector. Discharge the capacitors. See Special Precautions.
2. Remove the steer support and dash from the lift truck. Refer to
   - Steering Mechanism 1600SRM1637Steering Mechanism 1600SRM1627

CAUTION

Remove the brake only as directed. Changes to adjustment screws may render the brake unusable. The brake is factory set and cannot be adjusted if altered.

NOTE: The brake may be removed at this point. However, it is not necessary to remove the brake if the motor will not be disassembled.

3. Remove the brake from the top of the traction motor if necessary. Refer to
   - Brakes 1800SRM1628 for unit code D476.
   - Brakes 1800SRM1638 for unit code C230.
4. Identify, tag, and disconnect the power cables and wiring connecting the traction motor the truck electrical system.
5. Remove the four capscrews and lockwashers securing the traction motor to the drive unit.
6. Attach a sling and a lifting device to the traction motor. Lift the motor from the drive unit and position it securely at a suitable work station. Remove the sling from the motor.

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TABLE OF CONTENTS

General 1
Frame Separation and Assembly 3
Frame Separation 3
Frame Assembly 3
Painting Instructions 4
Label Replacement 4

This section is for the following models:

(B60Z) [A230];
(W60Z) [A231, B231];
(W65Z) [A229, B229];
(W80Z) [A234, B234];
(B80Z) [A233];
(B60ZAC) [B230];
(B80ZAC) [B233]

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SAFETY PRECAUTIONS
MAINTENANCE AND REPAIR

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

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



WARNING

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



CAUTION

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

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

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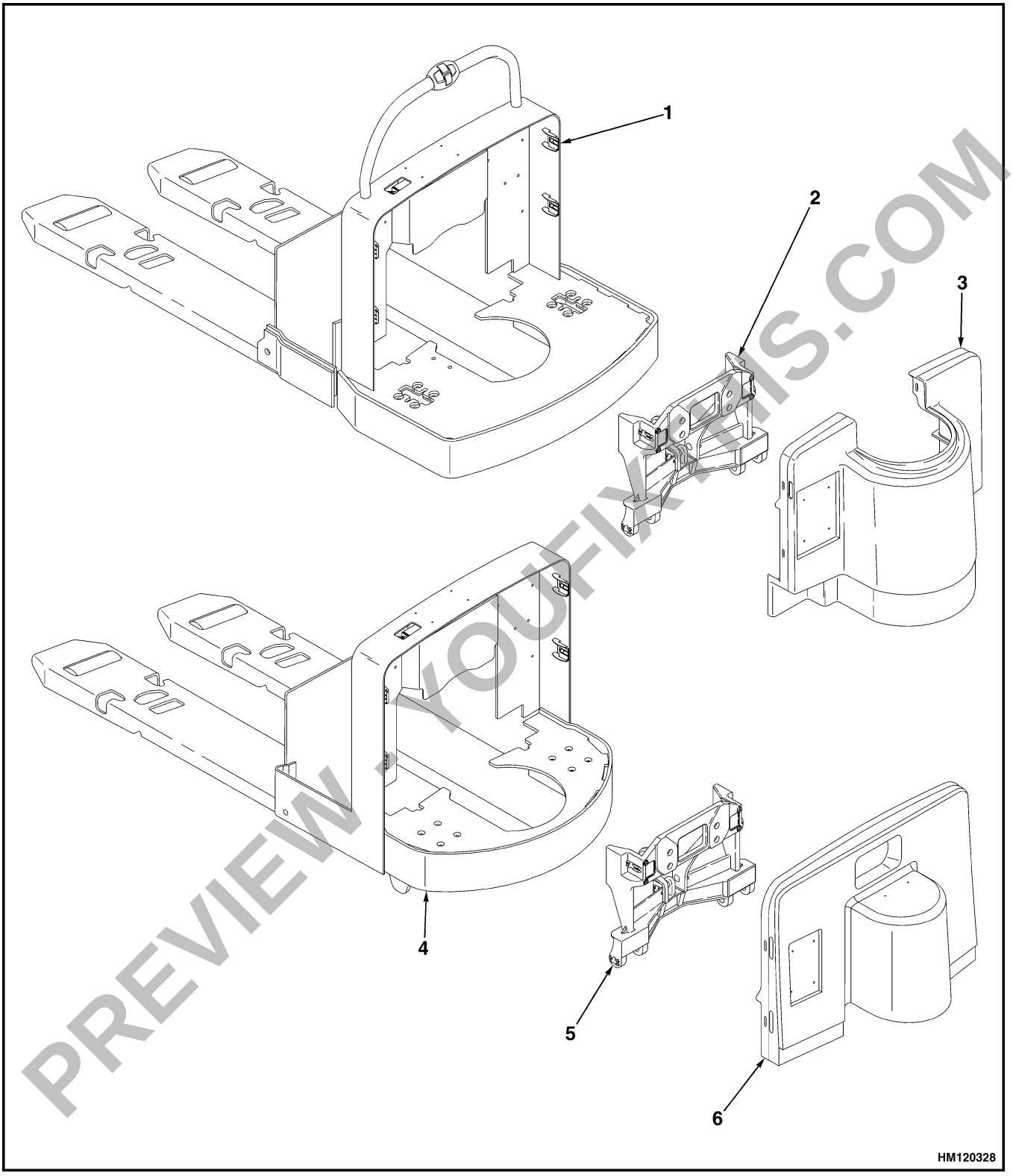


Figure 1. Typical Frame Weldments

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6. Tag and disconnect the control handle wiring harness (three-pin connector).

7. Remove the clamps that hold the wiring harnesses to the right side motor mounting studs.

8. Remove cover from swivel by removing three Allen head screws.

NOTE: Be careful not to damage the brake switch when removing the gas spring.

9. Remove gas spring. See Gas Spring.

10. Remove locking bolt from control handle arm and slide pivot shaft out. Recover shims for later installation. Remove the control handle arm from the swivel.

11. Carefully pull the wiring harnesses through the center of the support.

12. Remove bushings from the control handle arm if necessary.

13. If necessary, remove the control handle head. See Electrical System 2200SRM0929. Remove nut (39) and clamp (36) and pull wiring harness through control handle arm.

14. Remove two screws (43) from the swivel and remove the brake switches and nutplate.

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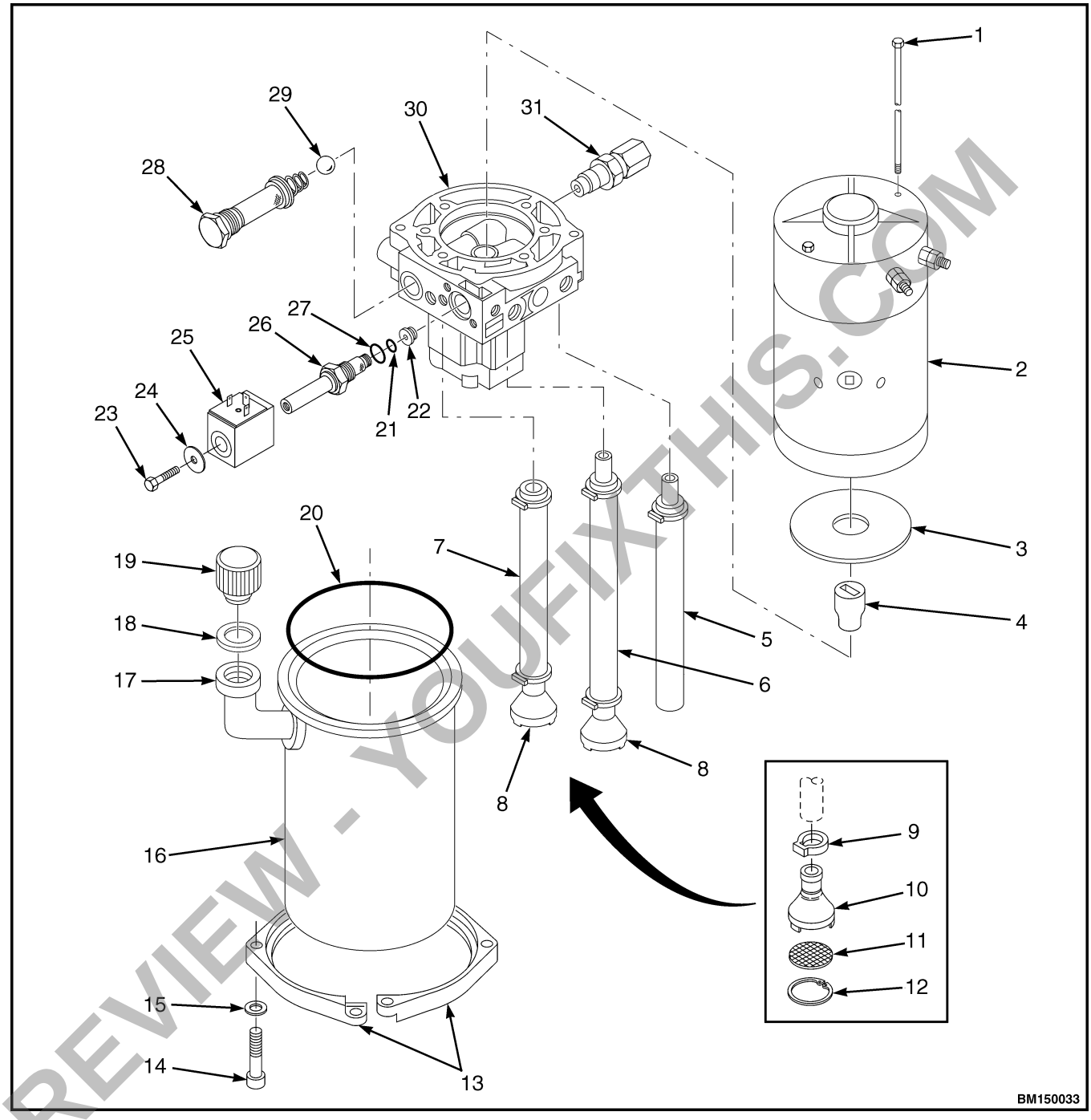


Figure 11. Lift Pump and Motor Assembly for B80Z, B80Z^{AC}, C80Z, C80Z^{AC}, W65Z, and W80Z Lift Trucks

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LED Code	Dash Display	Model	Programmer Display
1,3	Code 13	All	Drive M-

Condition External short of Traction motor M- to B-.

Truck Response No Traction

Possible Causes and Test Procedures

1. Incorrect traction motor wiring.

   Check wiring to traction motor.

   Ensure all wiring connections are tight.

2. Traction motor shorted to frame.

   Disconnect motor leads at motor.

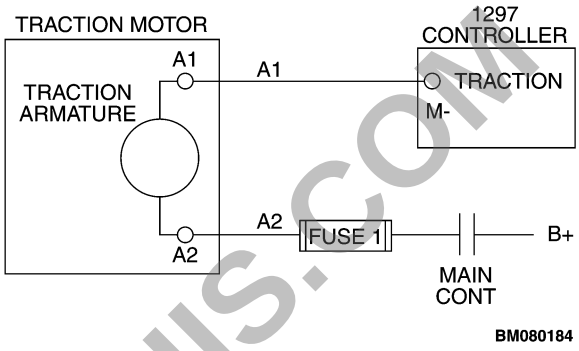
   Measure resistance between motor terminals and truck frame. If less than 1 megohm, replace motor.

3. M- short in controller.

   Verify voltage between B- and M- to be 10% less than nominal battery volts. If greater than 10%, replace controller.

   Disconnect motor leads at controller. Measure resistance between B- and M-. If less than 1 megohm, replace controller.

Circuit Description



Logic The controller uses an internal check to ensure the traction motor M- connection is not shorted to B- (Battery Negative).

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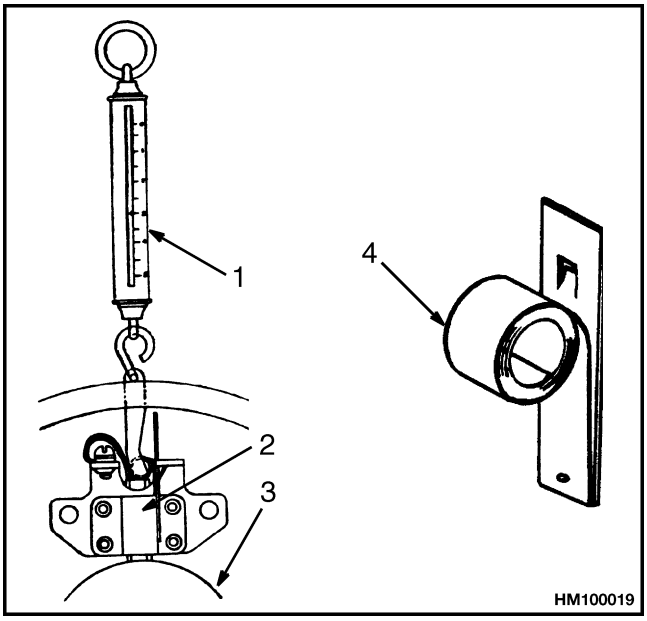


Figure 20. Brush Spring Pressure Check

Legend for Figure 20

1. SPRING SCALE
2. BRUSH IN BRUSH HOLDER
3. COMMUTATOR
4. BRUSH SPRING

Drive Motor

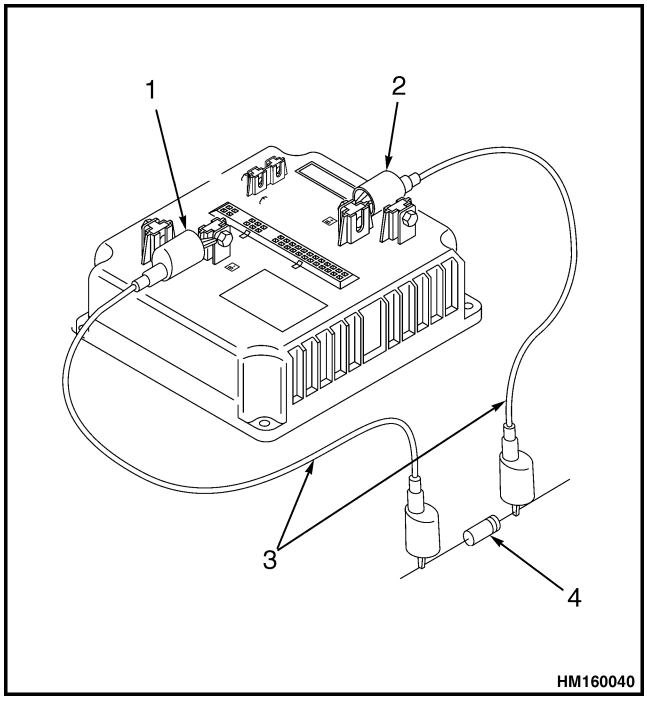
REMOVE

1. Raise drive wheel off floor and block lift truck. Disconnect battery.

2. Remove drive unit compartment cover to access drive unit.

3. Discharge the capacitors in the controllers by connecting a 200-ohm, 2-watt resistor across the B+ and B- controller terminals. 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. See Figure 21 and Figure 22.

4. Remove control handle. Refer to Steering Mechanism 1600SRM0962 for the correct removal procedures for the type of motorized hand truck being serviced.



1. B+ TERMINAL
2. B- TERMINAL
3. JUMPER WIRES
4. 200-OHM, 2-WATT RESISTOR

Figure 21. Discharging the Capacitors

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Load Wheel

REMOVE

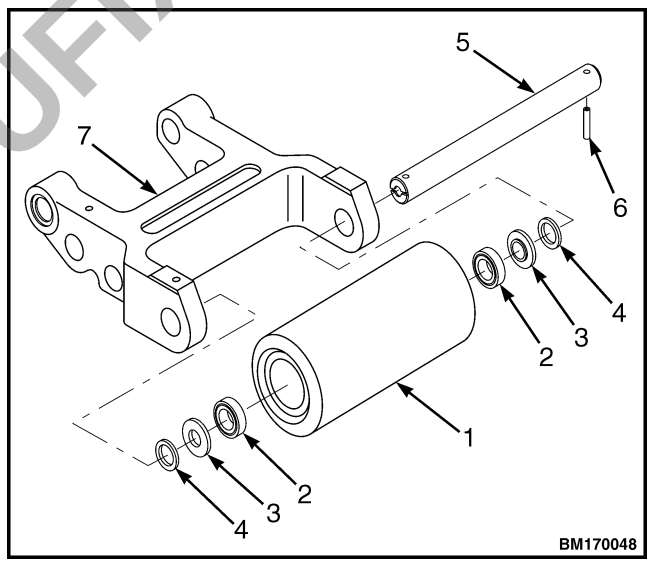
1. Move the lift truck to a safe and level area.
2. Use the lift button to raise the lift truck to its maximum height.
3. Put blocks under both forks and on both sides (front and back) of the drive tire to prevent movement of lift truck. See the sections Periodic Maintenance 8000SRM0919, Periodic Maintenance 8000SRM1032, Periodic Maintenance 8000SRM1368, or Periodic Maintenance 8000SRM1298 - How To Put A Lift Truck On Blocks.
4. Turn the key switch to the OFF position.
5. Drive the roll pin retaining the axle shaft to the rear link out of the link and axle shaft.
6. Turn the key switch to the ON position and retract the lift cylinder using the lower button. This will raise the load wheels off the floor.
7. Turn the key switch to the OFF position. Disconnect the battery.
8. Remove the axle shaft. Remove bearings and load wheel from the link. See Figure 1, Figure 2, and Figure 3. It may be necessary to use a brass or hardwood drift to drive the bearing out of the wheel. Drive the bearing out from the opposite side.
9. Remove all old lubricant. Clean and inspect all parts. Replace all defective parts.

INSTALL

1. Prelubricate the bearings with multipurpose grease. See the sections Periodic Maintenance 8000SRM0919, Periodic Maintenance 8000SRM1032, Periodic Maintenance 8000SRM1368, or Periodic Maintenance 8000SRM1298 - Maintenance Schedule for the proper lubrication specifications. Install the bearings in the load wheel.

NOTE: Bearing seals can only be installed on the outer side of the bearings as assembled in the load wheel.

2. Align the load wheel and bearing assembly, shield bearings, and washers with the opening in the link. On dual wheel assemblies, install the thread guard between the both inner bearing shields. Install the axle shaft.
3. Install the roll pin in the link and through the axle shaft.
4. Connect the battery and turn the key switch to the ON position. Press the lift button to raise the forks and lower the load wheels. Lubricate the load wheels.
5. Remove the blocks from under the forks and from each side of the drive tire. Lower the lift truck.
6. Test the operation of the lift truck before returning the truck to service.



1. LOAD WHEEL
2. BALL BEARING
3. BEARING SHIELD
4. WASHER
5. AXLE SHAFT
6. PIN
7. REAR LINK

Figure 1. Single Load Wheel Assembly B60Z, C60Z, W60Z, W65Z, C60Z^{AC}, and B60Z^{AC}

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Truck Weights

WEIGHT (BASIC TRUCK WITHOUT BATTERY)

Unit	Battery Compartment	Fork Length 1067 mm (36 in.) Weight	Fork Length 1219 mm (42 in.) Weight	Fork Length 2134 mm (48 in.) Weight	Fork Length 2438 mm (54 in.) Weight	Fork Length 2438 mm (60 in.) Weight
W60Z	340 mm (13.4 in.)	448 kg (987 lb)	457 kg (1007 lb)	464 kg (1022 lb)	470 kg (1037 lb)	477 kg (1052 lb)
B60Z	340 mm (13.4 in.)	596 kg (1310 lb)	605 kg (1333 lb)	612 kg (1348 lb)	620 kg (1367 lb)	625 kg (1378 lb)
W65Z	229 mm (9.0 in.)	433 kg (954 lb)	445 kg (981 lb)	457 kg (1008 lb)	470 kg (1035 lb)	482 kg (1062 lb)
W80Z	340 mm (13.4 in.)	456 kg (1006 lb)	469 kg (1033 lb)	481 kg (1060 lb)	493 kg (1087 lb)	505 kg (1114 lb)
B80Z	340 mm (13.4 in.)	615 kg (1356 lb)	627 kg (1383 lb)	640 kg (1410 lb)	652 kg (1437 lb)	664 kg (1464 lb)

Unit	Battery Compartment	Fork Length 2134 mm (84 in.) Weight	Fork Length 2362 mm (93 in.) Weight	Fork Length 2438 mm (96 in.) Weight	Fork Length 3658 mm (114 in.) Weight
B80Z	340 mm (13.4 in.)	686 kg (1512 lb)	698 kg (1539 lb)	710 kg (1566 lb)	--

Tires

DRIVE TIRE

Size	Item	Torque
10 × 5 × 6.5	Wheel Capscrew	200 N•m (148 lbf ft)
12 × 4.5 × 8	Wheel Lug Nut	195 N•m (144 lbf ft)

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