MASTER DRIVE UNIT

B60Z [A230]; W60Z [A231]; W65Z [A229];
B80Z [A233]; W80Z [A234]; T5Z [A476];
T7Z [A477]; C60Z [A478]; C80Z [A479];
T5Z$^\text{AC}$ [B476]; T7Z$^\text{AC}$ [B477]; C60Z$^\text{AC}$ [B478];
C80Z$^\text{AC}$ [B479]; W30-40ZA [B453];
W20-30ZR [B455]; W25-30-40ZC [B454];
B60Z$^\text{AC}$ [B230]; B80Z$^\text{AC}$ [B233]
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 condition that can cause immediate death or injury!

⚠️ **CAUTION**
Indicates a condition that can cause 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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This section is for the following models:

- B60Z [A230];
- W60Z [A231];
- W65Z [A229];
- B80Z [A233];
- W80Z [A234];
- T5Z [A476];
- T7Z [A477];
- C60Z [A478];
- C80Z [A479];
- T5Z\(^{AC}\) [B476];
- T7Z\(^{AC}\) [B477];
- C60Z\(^{AC}\) [B478];
- C80Z\(^{AC}\) [B479];
- W30-40ZA [B453];
- W20-30ZR [B455];
- W25-30-40ZC [B454];
- B60Z\(^{AC}\) [B230];
- B80Z\(^{AC}\) [B233]
"THE QUALITY KEEPERS"

HYSTER APPROVED PARTS
General

The master drive unit (MDU) includes the drive motor, brake assembly, drive unit, and drive tire and wheel assembly.

The drive motor is vertically mounted on top of the MDU. In some instances, it may be necessary to remove the drive motor to work on the MDU. In other cases, the drive motor may remain attached to the MDU while repairs are made. The complete MDU, including the motor, may also be removed if necessary. Determine the extent of disassembly required before proceeding with any repairs. Refer to the section Electrical System 2200 SRM 1357, Electrical System 2200 SRM 1052, Electrical System 2200 SRM 929, Electrical System 2200 SRM 1287, or Electrical System 2200 SRM 1026 for a general description, maintenance information, and repair procedures of the drive motor.

NOTE: The drive unit bearings used on these models are lubricated by the drive unit gear oil and do not require packing with grease.

The upper housing of the MDU supports the traction motor. A bevel pinion gear is attached to the traction motor shaft. The bevel pinion gear drives the bevel gear, which is mounted on the wheel shaft. The wheel shaft is machined with spur gear teeth that drive the idler gear located in the lower housing.

Two different MDU designs are used:
   Top Mount Handle
   Bottom Mount Handle

The MDUs for these trucks are the Carraro™ MDU115 and MDU150. These assemblies are available with three different gear ratios. Refer to Table 1.

<table>
<thead>
<tr>
<th>Model</th>
<th>Gear Ratio</th>
<th>MDU</th>
</tr>
</thead>
<tbody>
<tr>
<td>W60/65/80Z, W30/40ZA, W20/30ZR, W25/30/40ZC</td>
<td>25:1</td>
<td>Carraro™ MDU115</td>
</tr>
<tr>
<td>B80Z, T7Z, C80Z, T7Z^AC, C80Z^AC, B80Z^AC</td>
<td>17.8:1</td>
<td>Carraro™ MDU150</td>
</tr>
<tr>
<td>B60Z, T5Z, C60Z, T5Z^AC, C60Z^AC, B60Z^AC</td>
<td>16:1</td>
<td>Carraro™ MDU115</td>
</tr>
</tbody>
</table>

The highest ratio is 16:1 which will produce higher output speed with lower torque. The lowest ratio (25:1) produces lower output speed with higher torque.

CHECK OIL LEVEL

1. Rotate the steering control handle until the oil fill plug is exposed.
2. Remove the oil fill plug.
3. Move the directional control knobs, turning the drive wheel slightly forward or backward until one of the gear holes lines up with the fill hole. Check the level of lubricant. There is enough lubricant in the MDU when the lubricant level is up to the bottom of the gear or halfway to the top of the gear. See Figure 1.
1. MASTER DRIVE UNIT FRAME
2. OIL FILL HOLE
3. OIL LEVEL SHOULD BE AT THE BOTTOM EDGE OF GEAR OR HALFWAY UP.

Figure 1. Check Oil Level

Safety Precautions

**WARNING**
Put blocks under each side of the truck under the drive unit frame. Position blocks on both sides of the load wheels. The blocks must prevent the motorized hand truck from falling and causing injury or damage.

**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 MDU compartment. Wear safety glasses. Make certain the battery has been disconnected. DO NOT use a screwdriver to make a short circuit across the B+ and B− terminals of the transistor controller.

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

**WARNING**
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 procedure when servicing the controller.

1. Block the lift truck so that the drive wheel is off the floor. See the section for your truck, Periodic Maintenance 8000 SRM 919, Periodic Maintenance 8000 SRM 1027, Periodic Maintenance 8000 SRM 1368, or Periodic Maintenance 8000 SRM 1032 - How to Put a Lift Truck on Blocks.

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

4. If the lubricant level is low, add additional lubricant. See Capacities and Specifications 8000 SRM 1033, Capacities and Specifications 8000 SRM 918, Capacities and Specifications 8000 SRM 1299, or Capacities and Specifications 8000 SRM 1028.

**CHANGE GEAR OIL (T5-7Z^{AC}, B60-80Z^{AC}, AND C60-80Z^{AC})**

**NOTE:** The oil used in the master drive unit should be drained and replaced after the initial 500 hours break-in period. After the initial oil change, the MDU gear oil should be changed every 2000 hours.

Operate the lift truck MDU for several minutes to warm the gear oil. Elevate truck to access drive unit. Keep truck level. Remove drive unit cover. Remove both drain and oil fill plugs and drain gear oil into a suitable container. Replace drain plug. Add gear oil through oil fill plug until oil is level with top of gear without covering gear. Replace oil fill plug. DO NOT OVERFILL.
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 2, Figure 3, or Figure 4. **DO NOT** short across the motor controller terminals with a screwdriver or a jumper wire. Remove the 200-ohm, 2-watt resistor before reconnecting the battery.

**Figure 2. Discharging Controller - B60-80Z, C60-80Z, T5-7Z, and W60-65-80Z**

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

**Figure 3. Discharging Controller - W30-40ZA, W20-30ZR, and W25-30-40ZC**

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

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

Figure 4. Discharging Controller - B60Z-80Z\textsuperscript{AC}, T5-7Z\textsuperscript{AC}, and C60-80Z\textsuperscript{AC}
Drive Tire

REMOVE

⚠️ WARNING
Block each side of the truck under the drive unit frame. Position blocks on both sides of the load wheels to prevent the truck from falling.

1. Block the lift truck so the drive tire is off the floor. Refer to the section Periodic Maintenance 8000 SRM 919, Periodic Maintenance 8000 SRM 1027, Periodic Maintenance 8000 SRM 1298, Periodic Maintenance 8000 SRM 1368, or Periodic Maintenance 8000 SRM 1032 - How to Put Lift Truck on Blocks.

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

3. Loosen and remove five wheel bolts and washers (B80Z, C80Z, C80Z AC, T7Z, T7Z AC, and B80Z AC drive tire is secured with lug nuts) securing drive tire and wheel assembly to axle shaft.

4. Remove the drive tire and wheel assembly.

INSTALL

1. Mount the drive tire and wheel assembly on drive axle shaft.

2. Install washers and wheel bolts or lug nuts. Tighten wheel bolts or lug nuts to 200 ± 9 N•m (148 ± 7 lbf ft).

3. Remove blocks and lower the lift truck to floor. Reconnect the battery.

Master Drive Unit

REMOVE

The master drive unit (MDU) has five main components: the traction motor, brake, steering control handle, drive unit, and drive tire and wheel assembly.

Separate parts of the MDU can be removed without removing the complete MDU. It is not necessary to perform each step of the entire procedure to remove some parts of the MDU. This procedure has steps to remove and disassemble the complete MDU. Read the entire procedure first and perform only the steps necessary to make the required repairs.

For the following procedures, refer to Figure 5 or Figure 6.

⚠️ WARNING
Cleaning solvents can be flammable and toxic and can cause skin irritation. Wear protective gear when handling solvents and always follow the recommendations of the manufacturer.

⚠️ WARNING
Put blocks under each side of the truck under the MDU frame. Position blocks on both sides of the load wheels. The blocks must prevent the lift truck from falling and causing personal injury or property damage.

1. Raise the drive tire off the floor. Block the lift truck. Refer to the section Periodic Maintenance 8000 SRM 919, Periodic Maintenance 8000 SRM 1032, Periodic Maintenance 8000 SRM 1298, Periodic Maintenance 8000 SRM 1368, or Periodic Maintenance 8000 SRM 1027 - How to Put Lift Truck on Blocks.

⚠️ WARNING
Always disconnect the battery connector so that the connector is completely free before repairing the brake system. If the connector is not completely free, it can reconnect the battery. Tag the connector - DO NOT CONNECT.

2. Turn the key switch OFF and disconnect the battery connector.

3. Remove the drive unit compartment cover to access the MDU.

4. Discharge the capacitors. Refer to Safety Precautions in this section.

5. Remove the lug bolts/lug nuts and remove drive tire and wheel.

6. Drain the gear oil from the MDU into a suitable container with at least 2.0 liter (2.1 qt) capacity.
7. Identify and tag all wires and cables connected to MDU for later installation.

8. Disconnect all wires and cables connected to MDU and the harness clamps on the drive motor.

9. Remove the steering components as necessary for repair. See the section Steering Mechanism 1600 SRM 1031, Steering Mechanism 1600 SRM 1284, or Steering Mechanism 1600 SRM 962.

10. Assisted steering models have a steering motor and a lower bearing assembly for the articulating shaft that mounts to the MDU housing. If removed, the lower bearing pin and gear must be aligned with the notch in the pinion shaft facing straight ahead and with the drive tire in the same position during installation. Refer to the section Steering Mechanism 1600 SRM 1284 for steer motor and lower bearing assembly removal.

NOTE: The traction motor is most commonly removed BEFORE the drive unit is removed from the truck. However, it can also be removed after the MDU has been removed from the truck.

11. Remove the traction motor and brake as a single assembly:

NOTE: Wire clamp(s) placement may vary with models. Note where each wire clamp is located prior to removal.

a. Remove four nuts, lockwashers, washers, and wire clamp from the studs retaining the drive motor.

b. Attach a sling and an overhead hoist to the drive motor.

c. Lift the drive motor from the drive unit.

d. Remove the brake assembly from the traction motor if necessary. Refer to the section Brakes 1800 SRM 963 or Brakes 1800 SRM 1285 for your lift truck model.

e. Remove wire guard from lower end of studs.

f. Remove studs, nuts, and two alignment pins from drive unit.

WARNING
To avoid personal injury, keep the MDU supported at all times using a sling and an overhead hoist when removing the MDU from the lift truck.

12. Attach a sling and an overhead hoist to the drive unit. Remove the four capscrews and nuts attaching the drive unit to the frame.

13. Lift the drive unit out of the truck and place on a clean work bench. Remove the sling.
Figure 5. Drive Unit Assembly B60-80Z, C60-80Z, and W60-65-80Z
Figure 6. Drive Unit Assembly W30/40ZA, W20/30ZR, W25/30/40ZC, and T5-7Z
Legend for Figure 6

1. NUT
2. WASHER
3. WASHER
4. WASHER
5. CAPSCREW
6. CAPSCREW
7. WIRE GUIDE
8. STUD
9. NUT
10. CAPSCREW
11. DRIVE UNIT
12. MOTOR SHAFT SEAL
13. OIL PLUG
14. OIL GASKET
15. ELECTRIC BRAKE
16. TRACTION MOTOR
17. TIRE AND WHEEL ASSEMBLY
18. DRIVE WHEEL
19. TIRE
20. COVER
21. WIRE CLAMP
22. PIN
Figure 7. Drive Unit Assembly B60ZAC and B80ZAC (Power Assist Shown)
Legend for Figure 7

1. CAPSCREW
2. BRAKE
3. WOODRUFF KEY
4. TRACTION MOTOR
5. CAPSCREW
6. LOCK WASHER
7. WASHER
8. STEER MOTOR
9. STEER MOTOR GEAR
10. DRIVE UNIT
11. DRAIN PLUG
12. TIRE
13. WHEEL
14. LUG NUT (BOLT USED ON B60Z AC)
15. CAPSCREW
16. BUSHING
17. LOCK WASHER
18. NUT
19. PIN
20. MOTOR SHAFT SEAL
1. CAPSCREW
2. SNAP RING
3. BRAKE
4. WOODRUFF KEY
5. CAPSCREW
6. DRIVE UNIT
7. DRIVE TIRE AND WHEEL
8. WHEEL
9. TIRE
10. CAPSCREW
11. WASHER
12. DOWEL
13. NUT
14. TRACTION MOTOR
15. WASHER
16. WASHER
17. CAPSCREW

Figure 8. Drive Unit Assembly C60ZAC and T5ZAC
INSTALL

**WARNING**
To avoid personal injury when installing the drive unit in the lift truck, keep the drive unit supported at all times using a sling and an overhead hoist.

1. Attach a sling and an overhead hoist to the drive unit.

2. Align the drive unit with the four screw holes in the frame and install the four capscrews and nuts attaching the drive unit to the frame. Tighten all of the capscrews to:
   - **M14 bolt** - 145 N•m (107 lbf ft) (W60-65-80Z, T5Z, T7Z\(^{AC}\), W30-40ZA, W25-40ZC, W20-30ZR, B60Z, C60Z, B60Z\(^{AC}\), and C60Z\(^{AC}\)).
   - **M16 bolt** - 225 N•m (166 lbf ft) (T7Z, T7Z\(^{AC}\), B80Z, C80Z, B80Z\(^{AC}\), and C80Z\(^{AC}\)).

**NOTE:** The traction motor is easily installed **AFTER** the housing support has been mounted to the frame of the lift truck. However, it can be mounted to the drive unit before the drive unit is installed.

3. Install the traction motor:
   a. Install motor shaft seal and pins into drive unit housing.
   b. Apply a light coat of moly paste lubricant Hyster\(^{®}\) part no. 339068 to the traction motor splines.
   c. Position traction motor over drive unit using an overhead lifting device and sling. Lower motor slowly to check for proper entry into the seal and to align pins.

**NOTE:** The following step applies ONLY to models B60-80Z\(^{AC}\), T5-7Z\(^{AC}\), and C60-80Z\(^{AC}\).

d. Secure motor to drive unit:
   1. Install four studs and attaching hardware to secure motor as removed.
   2. Install wire guide and secure between nuts on bottom of front studs.
   3. Torque nuts to 20 N•m (15 lbf ft).

**NOTE:** The following step applies ONLY to models B60-80Z\(^{AC}\), T5-7Z\(^{AC}\), and C60-80Z\(^{AC}\).

e. Secure motor to drive unit.
   1. Install four capscrews to secure motor as removed.
   2. 17 ±1 N•m (150 ±9 lbf in).

**CAUTION**
To prevent damage to the brake assembly always follow the special procedure for brake adjustment when adjusting the brake.

4. Install and adjust the brake if removed. Refer to the section **Brakes** 1800 SRM 963 or **Brakes** 1800 SRM 1285 for your lift truck model.

5. Mount the drive wheel on the axle shaft, install washers, and install wheel bolts or lug nuts. Tighten wheel bolts to 200 N•m (148 lbf ft) or lug nuts to 195 N•m (144 lbf ft).

6. Connect the motor wires and cables. Attach the harness clamps.

7. Install the steer components as removed. See the section **Steering Mechanism** 1600 SRM 1031, **Steering Mechanism** 1600 SRM 1284, or **Steering Mechanism** 1600 SRM 962.

**CAUTION**
Lowering bearing assemblies must be aligned correctly with the drive tire during installation for the steering system to function properly.

8. Assisted steering models have a steering motor and a lower bearing assembly for the articulating shaft that mounts to the drive unit housing. See Figure 9. If removed, the lower bearing pin and gear must be installed so the notch in the pinion shaft faces "straight ahead" with the drive tire aligned in the same position. Refer to **Steering Mechanism** 1600 SRM 1284.

9. Lower the truck to the floor.

10. Fill the gear oil in the MDU to the correct level. See **General**, Figure 1 in this section and the section **Capacities and Specifications** 8000 SRM 1033, **Capacities and Specifications** 8000 SRM 918, **Capacities and Specifications** 8000 SRM 1299, or **Capacities and Specifications** 8000 SRM 1028.
11. Connect the battery and turn the key switch to the **ON** position.

12. Test the operation of the truck.

13. Install the drive unit compartment cover and the operator mat, and return truck to service.

---

**Figure 9. Steer Motor and Lower Gear Assembly**

1. PIN
2. BRACKET
3. GEAR
4. STEER MOTOR GEAR
5. SCREWS
6. STEER GEAR
7. DRIVE UNIT HOUSING
8. TRACTION MOTOR
9. STEER MOTOR
# Troubleshooting

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>PROCEDURE OR ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lift truck will not move.</td>
<td>Motor not operating.</td>
<td>Check wiring or repair motor. Check battery, battery connection, and truck fuses.</td>
</tr>
<tr>
<td></td>
<td>Damaged gears or bearings.</td>
<td>Replace drive unit.</td>
</tr>
<tr>
<td></td>
<td>There is not enough lubricant.</td>
<td>Fill with correct lubricant to proper level.</td>
</tr>
<tr>
<td></td>
<td>Dry or damaged bearings.</td>
<td>Replace drive unit.</td>
</tr>
<tr>
<td></td>
<td>Worn or damaged gears.</td>
<td>Replace drive unit.</td>
</tr>
<tr>
<td>Oil leakage at fill plug or</td>
<td>Dirt between sealing ring and housing.</td>
<td>Clean sealing ring and housing.</td>
</tr>
<tr>
<td>drain plug.</td>
<td>Old sealing ring installed.</td>
<td>Replace sealing ring.</td>
</tr>
<tr>
<td></td>
<td>Loose drain or fill plugs.</td>
<td>Tighten drain or fill plugs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Torque drain plug to 60 N•m (44 lbf ft).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Torque fill plug to 45 N•m (33 lbf ft).</td>
</tr>
<tr>
<td>Oil leakage at upper part in</td>
<td>Too much oil in drive unit.</td>
<td>Check oil level and correct to proper level.</td>
</tr>
<tr>
<td>Oil leakage at housing cover.</td>
<td>Housing cover not sealed to housing.</td>
<td>Clean, seal, and tighten housing cover capscrews to correct torque.</td>
</tr>
<tr>
<td></td>
<td>Capscrews not sealed or not tighten-</td>
<td>Tighten housing cover capscrews to correct torque, 32 N•m (24 lbf ft).</td>
</tr>
<tr>
<td></td>
<td>ened to correct torque.</td>
<td></td>
</tr>
</tbody>
</table>