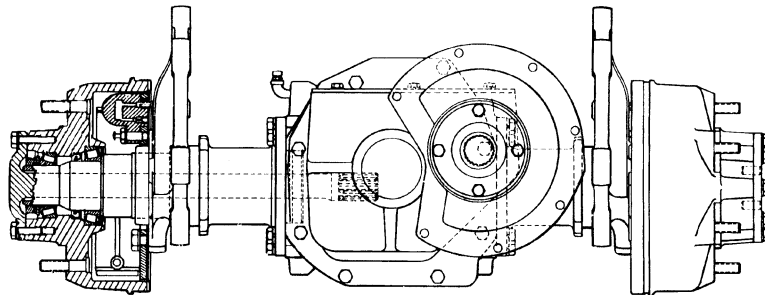


DRIVE AXLE, SPEED REDUCER, AND DIFFERENTIAL

**E/J1.25-1.75XL (E/J25-35XL) [C114];
E/J2.00-3.00XL (E/J40-60XL) [B168, C108];
E2.00-3.20XM (E45-65XM, E45-65XM₂) [F108];
N30XMH, N30XMH₂ [C210]; E2.00-3.20XM
(E45-65Z) [G108]; V30ZMD [D210/E210]**



HM070208

HYSTER

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This section is for the following models:

E/J1.25-1.75XL (E/J25-35XL) [C114];
 E/J2.00-3.00XL (E/J40-60XL) [B168, C108];
 E2.00-3.20XM (E45-65XM, E45-65XM₂) [F108];
 N30XMH, N30XMH₂ [C210];
 E2.00-3.20XM (E45-65Z) [G108];
 V30ZMD [D210/E210]

General

This section has the description and repair procedures for the differential, speed reducer, drive axle, wheel bearings, and mounts for the axle housing.

Description



WARNING

The lift truck must be put on blocks for some types of maintenance and repair. See the Operating Manual or the service manual section Periodic Maintenance, for your lift truck model, for the procedures to put the lift truck on blocks. The removal of the following assemblies will cause large changes in the center of gravity:

- Attachment
- Mast
- Drive axle
- Battery
- Counterweight

When the lift truck is put on blocks, put additional blocks in the following positions:

- a. Before removing the mast and drive axle, put blocks under the counterweight so the lift truck cannot tip backward.
- b. Before removing the battery or counterweight, put blocks under the mast assembly so the lift truck cannot tip forward.

Put the lift truck on blocks only if the surface is solid, even, and level. Make sure that any blocks used to support the lift truck are solid, one-piece units.

The mount brackets for the drive axle housing are fastened to the frame of the lift truck with six bolts on the E/J1.25-1.75XL (E/J25-35XL) (C114) models and eight bolts on the E2.00-3.00XL (E40-60XL) (C108), E2.00-3.20XM (E45-65XM, E45-65XM₂) (F108), E2.00-3.20XM (E45-65Z) (G108), J2.00-3.00 (J40-60XL) (B168), N30XMH₂, and N30XMH (C210), V30ZMD (D210/E210) models. See Figure 1. The

outer ends of the axle housings are the spindles for the wheel bearings. The cups for the tapered roller bearings for the wheel bearings are pressed into the wheel hubs. The nut on the end of the spindle holds and adjusts the preload on the wheel bearings. The axle shafts are fastened to the hubs by capscrews. Studs and nuts fasten the wheel to the hub and brake drum. The back plate and brake assemblies are fastened to the mount brackets for the axle housing.

The speed reducer and differential are a single assembly. See Figure 4. The speed reducer has a gear that engages the splines on the shaft of the traction motor. A second speed reducer gear is fastened to the pinion shaft for the differential.

There are three configurations of drive wheel mounts used on the E/J1.25-1.75XL (E/J25-35XL) (C114) series of lift trucks because of the variations in tires that are available:

E1.25-1.75XL (E25-35XL)

Standard solid tires

Wide tread solid tires

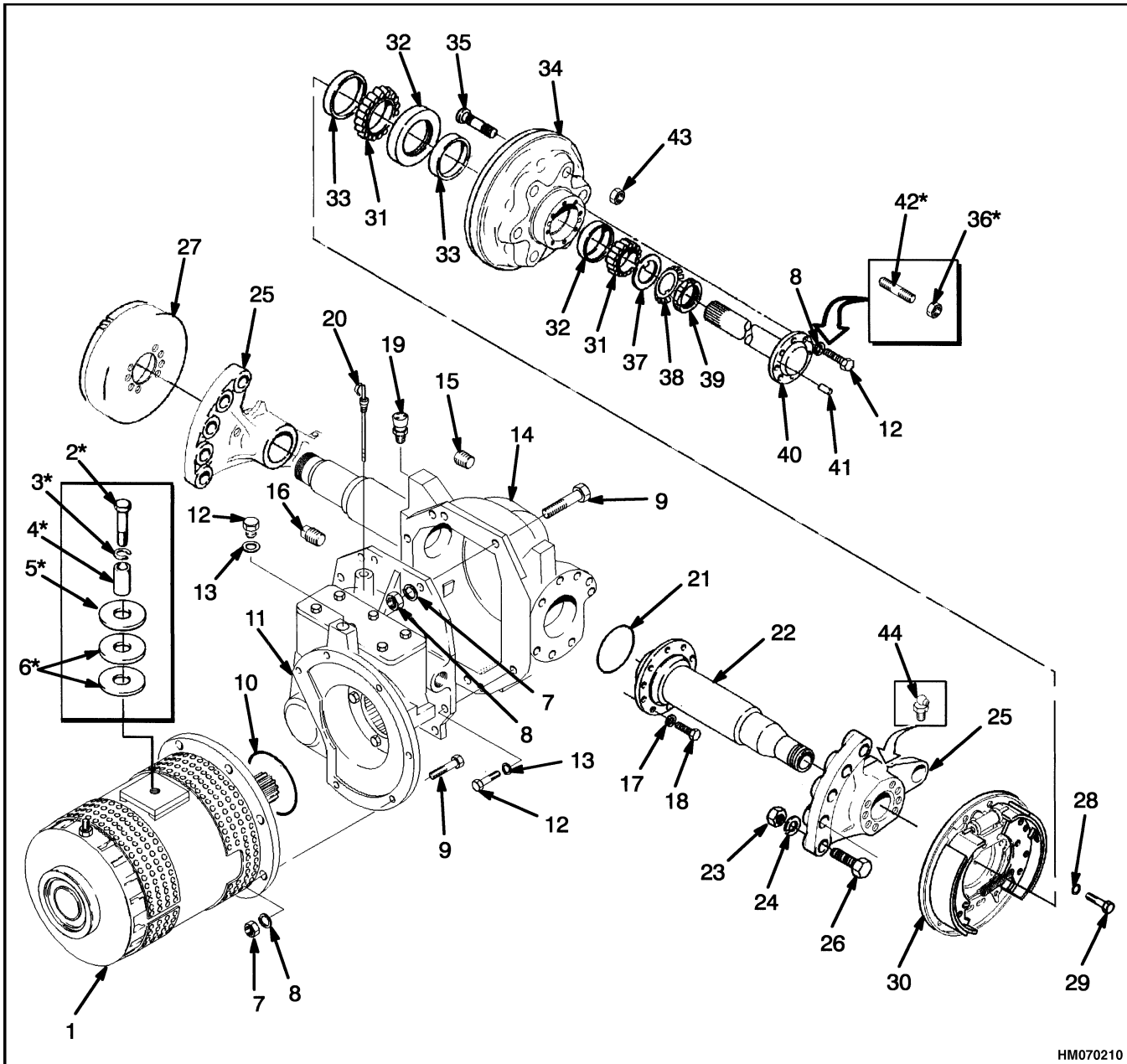
J1.25-1.75XL (J25-35XL)

Pneumatic tires

Solid tires shaped like pneumatic tires

The pneumatic tires are available in standard and wide tread configurations, but the mount to the drive axle is the same.

The methods used to fasten the drive wheels to the hub are different for the three configurations. See Figure 2. When the drive axle is disassembled or assembled, small changes in the procedure must be made for the differences in the axles.



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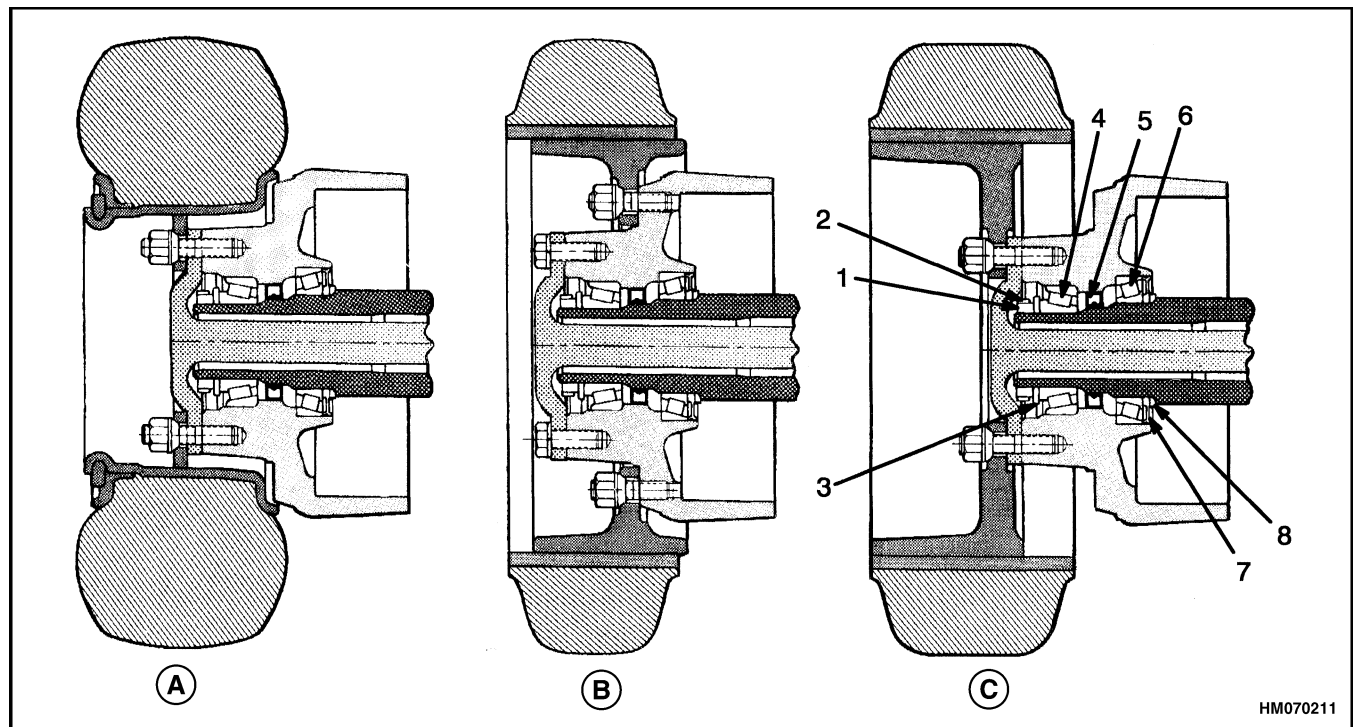
Figure 1. Drive Axle Assembly

Legend for Figure 1

NOTE: E2.00-3.20XM (E45-65XM, E45-65XM₂) (F108), AND E2.00-3.20XM (E45-65Z) (G108) DRIVE AXLES SHOWN. OTHER MODELS ARE SIMILAR. WHEEL CONFIGURATIONS FOR E/J1.25-1.75XL (E/J25-35XL) (C114) ARE SHOWN IN FIGURE 2.

- | | | |
|------------------------------------|----------------|---------------------|
| 1. TRACTION MOTOR | 15. PLUG | 30. RH BRAKE |
| 2. CAPSCREW, MOTOR MOUNT* | 16. PLUG | 31. BEARING CONE |
| 3. WASHER* | 17. WASHER | 32. BEARING CUP |
| 4. SPACER* | 18. CAPSCREW | 33. OIL SEAL |
| 5. WASHER* | 19. BREATHER | 34. BRAKE DRUM |
| 6. WASHER* | 20. DIPSTICK | 35. STUD |
| 7. NUT | 21. O-RING | 36. WHEEL/AXLE NUT* |
| 8. LOCKWASHER | 22. SPINDLE | 37. WASHER |
| 9. CAPSCREW | 23. NUT | 38. LOCKWASHER |
| 10. O-RING | 24. WASHER | 39. NUT |
| 11. SPEED REDUCER AND DIFFERENTIAL | 25. HANGER | 40. AXLE |
| 12. CAPSCREW | 26. CAPSCREW | 41. DOWEL PIN |
| 13. WASHER | 27. LH BRAKE | 42. STUD* |
| 14. AXLE HOUSING | 28. LOCKWASHER | 43. WHEEL NUT |
| | 29. CAPSCREW | 44. GREASE FITTING |

*NOT USED ON E2.00-3.20XM (E45-65XM, E45-65XM₂) (F108), E2.00-3.20XM (E45-65Z) (G108), N30XMH AND N30XMH₂ (C210), V30ZMD (D210/E210)



- A. PNEUMATIC
- B. STANDARD

- C. WIDE TREAD

- 1. LOCK NUT
- 2. LOCK PLATE
- 3. WASHER
- 4. OUTER BEARINGS

- 5. OIL SEAL
- 6. INNER BEARING
- 7. SEAL
- 8. SPACER

Figure 2. Drive Wheel Mounting E/J1.25-1.75XL (E/J25-35XL) (C114) Shown

Drive Axle, Speed Reducer, and Differential Repair

DRIVE AXLE, REMOVE

WARNING

The lift truck must be put on blocks for some types of maintenance and repairs. See the Operating Manual or the Periodic Maintenance section for your lift truck model, for the procedures to put the lift truck on blocks. The removal of the following assemblies will cause large changes in the center of gravity:

- Attachment
- Mast
- Drive axle
- Battery
- Counterweight

When the lift truck is put on blocks, put additional blocks in the following positions:

- a. Before removing the mast and drive axle, put blocks under the counterweight so the lift truck cannot tip backward.
- b. Before removing the battery or counterweight, put blocks under the mast assembly so the lift truck cannot tip forward.

Put the lift truck on blocks only if the surface is solid, even, and level. Make sure that any blocks used to support the lift truck are solid, one-piece units.

1. Remove the battery as described in your vehicle's Periodic Maintenance SRM.
2. Remove the mast assembly as described in your vehicle's Mast SRM. Drain the oil from the differential. Remove the floor plates.

NOTE: The drive axle can be removed with the traction motor as one unit. Many service persons remove the traction motor before the drive axle is removed to reduce the weight of the unit. See your vehicle's Frame SRM for procedures to remove the traction motor. The procedure in this section will describe removal of the drive axle after the traction motor has been removed.

3. Disconnect the brake lines to the wheel cylinders. Put caps on the open fittings.
4. E/J1.25-1.75XL (E/J35-35XL) (C114). Disconnect the hand lever assembly for the parking brake from the cowl. Loosen the retainer that

holds the hydraulic lines and cables near the floor plate. Carefully slide the hand lever assembly and cables past the hydraulic lines and electric wires so that the hand lever assembly and cables can be removed with the drive axle.

E/J2.00-3.00XL (E/J40-60XL) (B168, C108). Disconnect the parking brake cables at the brakes.

E2.00-3.20XM (E45-65XM, E45-65XM₂) (F108), E2.00-3.20XM (E45-65Z) (G108), N30XMH, and N30XMH₂ (C210), V30ZMD (D210/E210). Disconnect the return spring from the park brake pedal. Remove the park brake pedal. Disconnect the park brake assembly from the frame. Do not remove the mounting bolts from the park brake assembly. Remove the nuts and washers so that the bolts will keep the park brake assembly in one unit. After the park brake assembly has been removed from the frame bracket, put the nuts and washers on the bolts.

5. Remove the 7/8 × 14 UNF bolts that hold the axle mounts to the frame. Turn the axle mounts forward so that there is additional clearance for removal of the drive axle.
6. Attach a lifting device to front of truck frame and lift truck frame high enough to allow axle to be rolled out from under frame. See Figure 3.

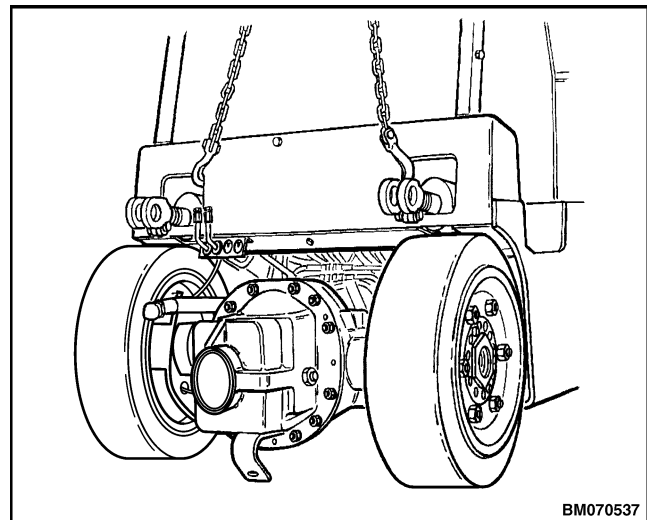


Figure 3. Attach Lifting Device to Truck Frame

7. Lower truck frame onto support blocks. See the **WARNING** at the beginning of this section.
8. Attach another lifting device to drive axle and move drive axle to an appropriate work area. Remove the wheels.

NOTE: Some early models of the electric XL series of lift trucks have M20 × 2.5 × 80 bolts instead of 7/8 × 14 UNF bolts.

9. Remove the mounting bolts for the hydraulic filter. With the hoses still attached to the filter, move the filter to improve access to the mounting bolt for the speed reducer. Remove the mounting bolt that is located on the top of the speed reducer/differential assembly. See Figure 1.

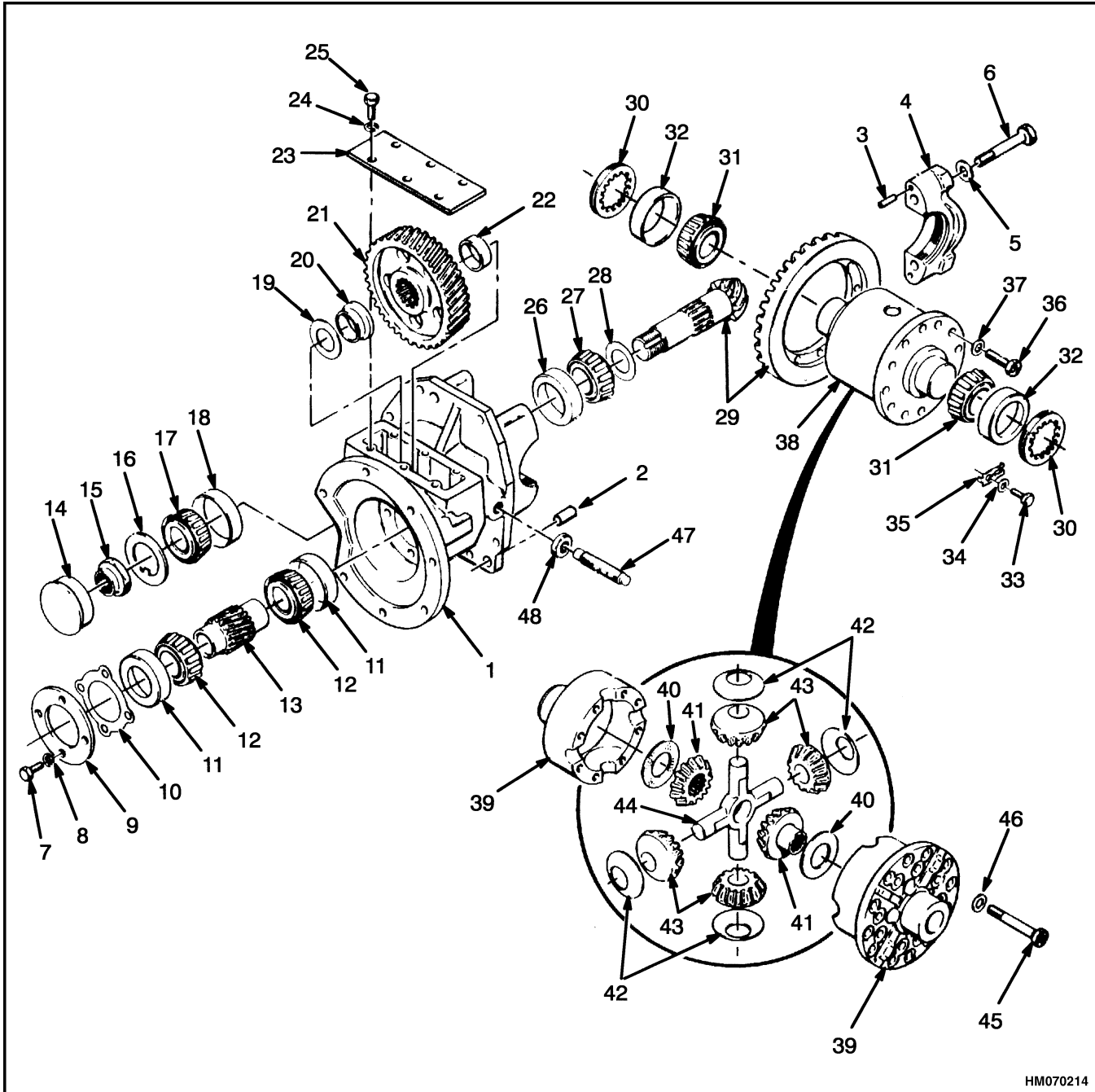
Drive Axle, Disassemble

1. Remove the capscrews that hold the axle shaft to the hub. There are two holes with threads in the flange of the axle shaft. Put capscrews (M12 × 1.75) in these holes to loosen the axle shaft from the hub.
2. Bend the lock plate so that the nut can be removed from the axle spindle. Remove the nut, lock plate, washer, and bearing cone. Carefully slide the hub and brake drum assembly from the spindle. Keep the spindle in the center of the hub and brake drum assembly during removal so that the oil seal in the hub is not damaged. Do not permit oil or grease to get on the brake shoes.
3. Remove the inner bearing cone from the spindle. E/J1.25-1.75XL (E/J25-35XL) (C114) models also have a spacer between the grease seal and the shoulder of the wheel spindle.
4. If the brakes must be repaired, disassemble the brake assembly as described in your vehicle's **Brakes** SRM. If disassembly of the brakes is not required, slide the brake assembly and the axle mount bracket from the axle spindle.
5. The axle spindles are not normally removed from the differential housing. If repairs are necessary, remove the 16 M12 × 1.75 × 35 capscrews that hold the axle spindles to the differential housing. Remove the axle spindles.
6. Remove the six M10 × 1.5 × 30 capscrews and washers and the two M10 × 1.5 × 40 capscrews

and washers from the bottom of the differential housing. Remove the speed reducer and differential assembly from the differential housing.

Speed Reducer and Differential, Disassemble

1. Remove the access plate from the top of the speed reducer. See Figure 4. Use a small pry bar to remove the hub cap from the end of the pinion shaft.
2. Disassemble only the parts of the speed reducer and differential that must be repaired. If the ring gear and pinion are not to be replaced, but parts of the differential must be replaced, check the contact pattern before disassembly. The pattern and the gear clearance are used as references for assembly. See the Assemble section for the procedures.
3. Loosen or remove the thrust screw for the ring gear. Remove the lock plates for the adjusting nuts. Remove the inner bearing caps, adjusting nuts, bearing cups, and differential assembly. Make sure you do not change the parts from the right and left sides of the differential.
4. Use a sharp punch to raise the lock detent from the slot in the pinion shaft. Raise the lock detent as carefully as possible so there is minimum damage to the threads on the pinion shaft when the special lock nut is removed.
5. Use a piece of soft metal (copper or aluminum) to prevent the speed reducer gear from turning when the special lock nut is removed. Use the soft piece of metal between the speed reducer gears or between the speed reducer gear and the housing. Remove the special lock nut. This special lock nut is tightened to 340 N•m (250 lbf ft). Discard the special lock nut.
6. Remove the special washer with the key tab. Use a brass hammer to remove the pinion from the transmission case. The speed reducer gear and spacer will slide from the pinion shaft as it is removed from the speed reducer housing. Make a note of the shim arrangement between the bearing and the spacer.
7. Remove the speed reducer gear and spacer from the speed reducer housing.



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Figure 4. Speed Reducer and Differential

Legend for Figure 4

1. SPEED REDUCER HOUSING	17. BEARING CONE	33. CAPSCREW
2. DOWEL PIN	18. BEARING CUP	34. LOCKWASHER
3. DOWEL PIN	19. SHIM	35. LOCK PLATE
4. INNER BEARING CAP	20. SPACER	36. PLACEBOLT
5. WASHER	21. SPEED REDUCER GEAR	37. WASHER
6. CAPSCREW	22. SPACER	38. DIFFERENTIAL
7. CAPSCREW	23. PLATE	39. DIFFERENTIAL HOUSING
8. LOCKWASHER	24. LOCKWASHER	40. WASHER
9. BEARING RETAINER	25. CAPSCREW	41. SIDE GEAR
10. SHIM	26. BEARING CUP	42. THRUST WASHER
11. OUTER BEARING CUP	27. BEARING CONE	43. SPIDER GEAR
12. BEARING CONE	28. SHIM	44. CROSS
13. INPUT GEAR	29. RING GEAR AND PINION	45. CAPSCREW
14. HUB CAP	30. ADJUSTING NUT	46. WASHER
15. SPECIAL LOCK NUT	31. BEARING CONE	47. THRUST SCREW
16. WASHER	32. BEARING CUP	48. JAM NUT

8. Remove the spacer from the pinion shaft. Use a press to remove the bearing cone from the pinion. Make a note of the shim arrangement between the bearing cone and the pinion.
9. Use a press or a puller to remove the bearing cones from the differential case.
10. Remove the ring gear. Remove the 12 7/16 UNF × 1 inch bolts and the special hardened washers. Do not use a press or a hammer to remove the ring gear. Heat the differential in hot oil or water to 82 to 100°C (180 to 212°F) to loosen the ring gear.
11. Disassemble the differential. Remove the eight 3/8 UNF × 3-1/2 inch capscrews and washers and separate the differential case. Remove the cross, spider gears, and axle gears.
12. Remove the four M8 × 1.25 × 25 capscrews and washers. Remove the bearing retainer, shims, outer bearing cup, and input gear assembly. Make a note of the shim arrangement. If the inner bearing is damaged, use a puller to remove the inner bearing cup from the speed reducer housing.

CLEAN**WARNING**

Always wear safety glasses.

Cleaning solvents may be flammable and toxic and can cause severe skin irritation. When using cleaning solvents, always comply with the solvent manufacturer's recommended safety precautions.

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.

Clean the parts of the drive axle with solvent. Dry the parts with compressed air.

INSPECT

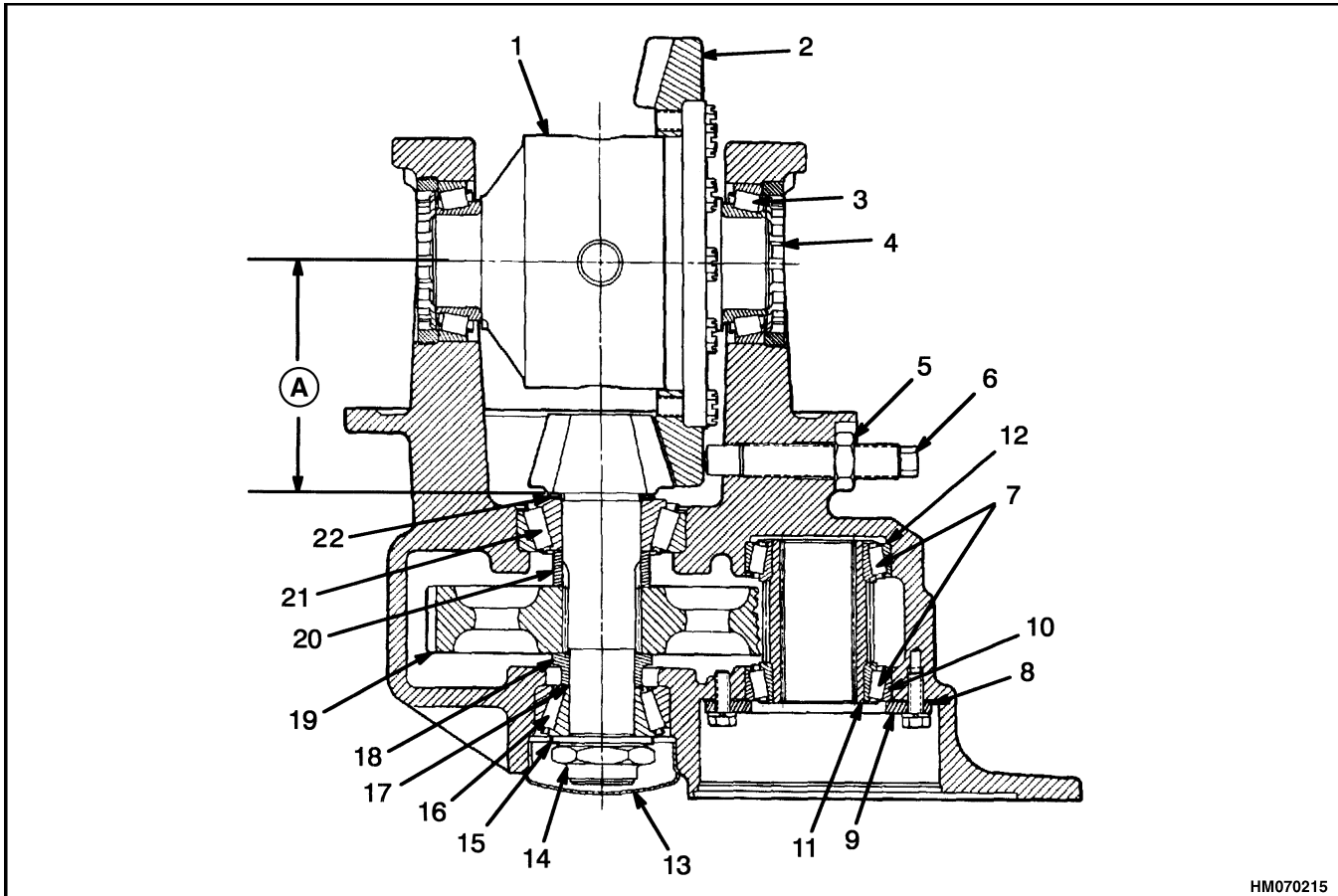
1. Check the pinion and ring gear for wear. Inspect the spider gears and axle gears for worn teeth. Inspect the cross for wear where the gears turn. The cross and the holes for the cross in the differential case must fit tightly.
2. Inspect the bearings and seals for wear or damage. If bearings are damaged, replace bearing cups.
3. The mount brackets must turn freely on the axle housings. The splines for the axle shafts must not be damaged.

ASSEMBLE**Speed Reducer and Differential, Assemble***Input Gear Assembly, Install*

1. If removed, install the inner bearing cup in the end of the bore in the speed reducer housing. Use a press to install bearing cones on each end of the input gear. Install the input gear and bearings into the speed reducer housing. See Figure 5. Install the outer bearing cup.

2. Install the shims and the bearing retainer. Install the four M8 × 1.25 × 25 capscrews and washers. Tighten the capscrews to 19 N•m (14 lbf ft). Check the bearing clearance. Add

or remove shims to adjust for zero bearing clearance. The input gear must turn smoothly with a maximum rotation torque of 0.133 N•m (1.2 lbf in).



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A. THE GAUGE DISTANCE IS 129.20 mm (5.087 in.) PLUS OR MINUS THE VARIATION SHOWN ON THE END OF THE PINION. THE ADJUSTMENT MUST BE WITHIN ±0.0254 mm (0.001 in.) OF THE ACTUAL DISTANCE.

- | | |
|--------------------------|-----------------------|
| 1. DIFFERENTIAL ASSEMBLY | 12. INNER BEARING CUP |
| 2. RING GEAR | 13. HUB CAP |
| 3. BEARING | 14. SPECIAL NUT |
| 4. ADJUSTER NUT | 15. WASHER (KEYED) |
| 5. JAM NUT | 16. BEARING |
| 6. THRUST SCREW | 17. SHIM |
| 7. BEARING (2) | 18. SPACER |
| 8. SHIM | 19. GEAR |
| 9. RETAINER | 20. SPACER |
| 10. OUTER BEARING CUP | 21. BEARING |
| 11. INPUT GEAR | 22. SHIMS |

Figure 5. Differential and Speed Reducer Assembly

New Pinion Assembly, Install

If the ring gear and pinion are worn or damaged, they must be replaced as a set. The ring gear and pinion must have the same reference numbers. When the pinion bearings are replaced or the ring gear and pinion are replaced, the shim arrangement must be adjusted for the new parts. Service persons must often make more than one adjustment before the clearances are correct. The speed reducer must be disassembled for shim adjustment and then assembled again for checks. The adjustments are correct when the gear clearance and contact pattern between the pinion and ring gear are correct and the preload on the pinion bearings is correct.

**CAUTION**

Do not lock the special nut on the pinion shaft until the adjustments of the pinion are complete. The lock on the special nut will damage the threads on the pinion shaft if the special nut must be removed several times for adjustments. If the threads are damaged on the pinion shaft, the pinion and ring gear must be replaced.

The dimension on the end of the pinion is the variation from the standard Gauge Distance. The Gauge Distance is the distance from the center of the ring gear to the bearing shoulder behind the pinion gear. Shims must be added between the pinion and the bearing to adjust for manufacturing tolerances.

Look at the number on the pinion that was removed. Subtract the variation number that is on the new pinion. The remainder is the amount of shim thickness that must be adjusted from the shim set on the pinion that was removed. See Table 1 for examples. In example 3 you can see that a negative number shows that shims must be added. Examples 1, 2, and 4 show that shims must be subtracted from the original shim set. Use this shim set as a reference. The final adjustment is according to the contact pattern on the ring gear teeth. See Figure 13.

1. If the bearing cups for the pinion were removed, install them in the speed reducer housing.
2. Install the shims on the pinion and use a press to install the bearing cone. Install the spacer on the pinion shaft. See Figure 6.
3. Put the speed reducer gear and spacer in the speed reducer housing. Install the pinion in the speed reducer housing and slide the speed reducer gear and spacer on the pinion shaft when it is installed.
4. Install the shims on the pinion shaft that control the preload on the pinion bearings. Install the bearing cone, washer with the key tab, and special lock nut. Use a soft piece of metal (copper or aluminum) to prevent the speed reducer gear from turning. Tighten the special lock nut to 340 N•m (250 lbf ft). Do not lock the special nut at this time.

Table 1. Adjustment of Shims for Pinion Assembly

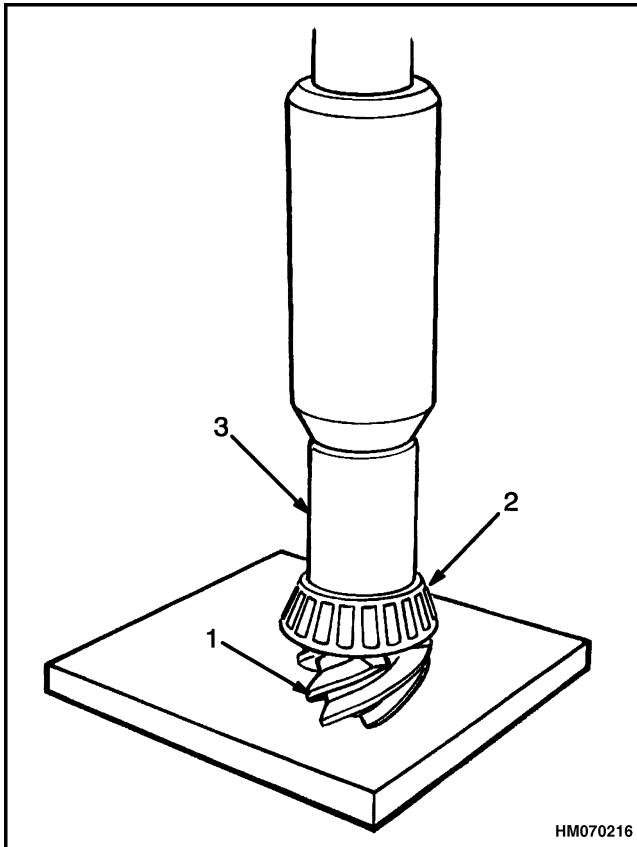
Examples	1	2	3	4
If the numbers are given in inches: Number on OLD GEAR Number on NEW GEAR	+0.012 – (+0.010)	+0.012 – (–0.010)	+0.010 – (+0.012)	–0.010 – (–0.012)
Shims to be Removed from Old Set	+0.002 in.	+0.022 in.	–0.002 in. (ADD SHIMS)	+0.002 in.
If the numbers are given in millimeters: Number on OLD GEAR Number on NEW GEAR	+0.31 – (+0.26)	+0.31 – (–0.26)	+0.26 – (+0.31)	–0.26 – (–0.31)
Shims to be Removed from Old Set	+0.005 mm	+0.57 mm	–0.005 mm (ADD SHIMS)	+0.05 mm

(More Content includes: Brake system, Capacities, and specifications, Frame, Hydraulic, System, Industrial battery, Main control, Valve, Mast repair, Fasteners, Schematics diagrams, Steering axle, Steering system, Wire harness repair And more)

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- 1. PINION
- 2. BEARING CONE
- 3. PRESS TOOL

Figure 6. Use Press to Install Parts on Pinion

- 5. Check the rotating torque of the pinion and speed reducer assembly. The correct rotating torque is 1.13 to 2.26 N•m (10 to 20 lbf in). Lightly hit the outside of the housing to adjust the bearings in their seats. Add or remove shims between the spacer and the bearing cone to adjust the bearing preload.

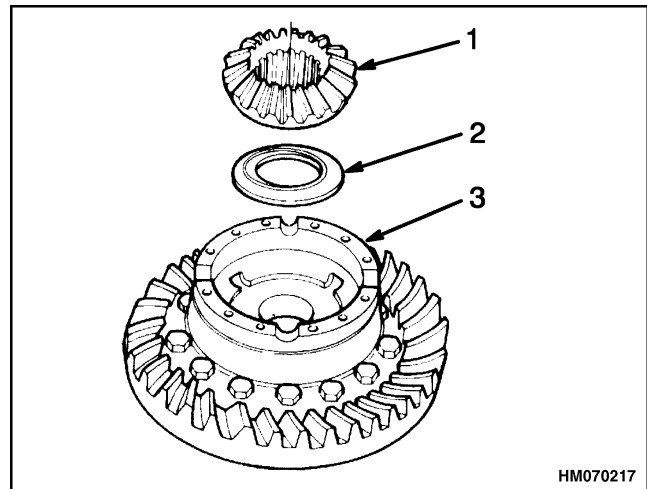
WARNING

Hot parts. Wear protective clothing and gloves to prevent burns.

- 6. If the ring gear was removed from the differential case, put the ring gear into hot oil or water [82 to 100°C (180 to 212°F)] for approximately 10 minutes. Remove the ring gear from the liquid and put it into position on the differential case. Do not use a press or a hammer to install the ring gear. Install the 12 7/16 UNF × 1 inch bolts and

the special hardened washers. Tighten the bolts to 111 N•m (82 lbf ft). Make sure the ring gear is in the correct position against the flange of the differential case.

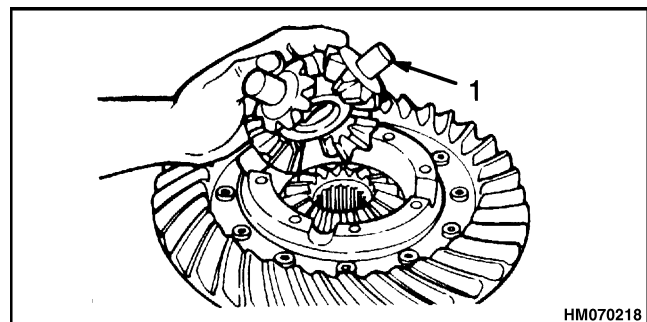
- 7. Lubricate and install a thrust washer and side gear in the differential case as shown in Figure 7.



- 1. SIDE GEAR
- 2. THRUST WASHER
- 3. DIFFERENTIAL CASE

Figure 7. Thrust Washer and Side Gear Installation

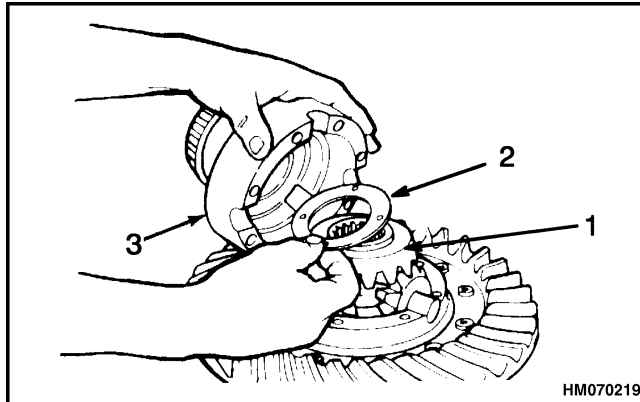
- 8. Lubricate and install the spider gears and thrust washers on the cross and put the spider gear assembly into the differential case. See Figure 8.



- 1. SPIDER GEARS AND THRUST WASHERS

Figure 8. Spider Gears (Cross) and Thrust Washers Installation

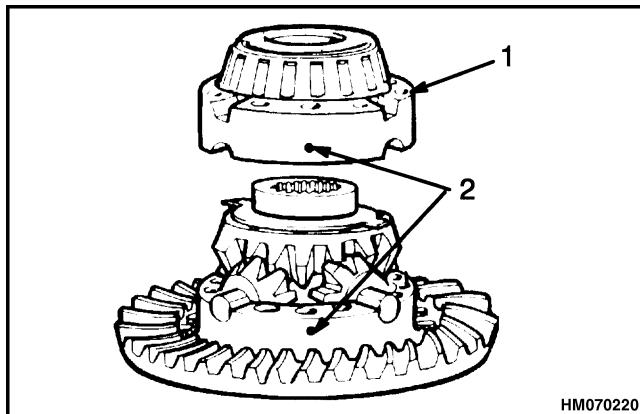
- 9. Lubricate and install the second side gear and thrust washer over the spider gear assembly as shown in Figure 9.



- 1. SIDE GEAR
- 2. THRUST WASHER
- 3. DIFFERENTIAL CASE

Figure 9. Second Side Gear and Thrust Washer Installation

10. Put the two halves of the differential case together (make sure the matchmarks are aligned) and install the eight 3/8 UNF × 3-1/2 inch capscrews and washers. Tighten the capscrews to 50 N•m (37 lbf ft). See Figure 10.



- 1. DIFFERENTIAL CASE
- 2. MATCHMARKS

Figure 10. Second Half of Differential Case Installation

11. Use a press to install the bearing cones on each side of the differential case. See Figure 11. Apply axle lubricant on the inner diameter of the bearing cups and on both bearing cones that are installed on the differential. Do not permit lubricant on the outer diameter of the bearing cups or the bearing bores of the differential housing.

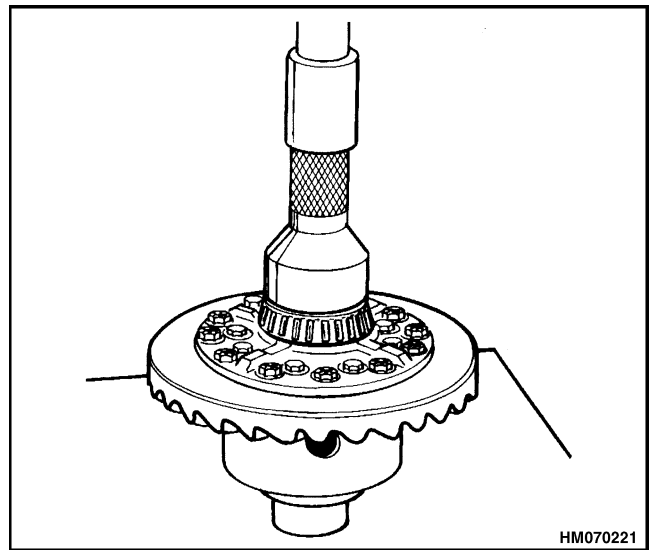
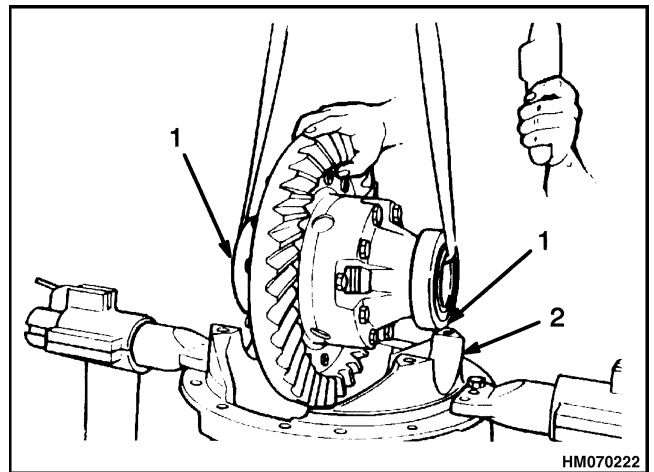


Figure 11. Bearing Cones Installation

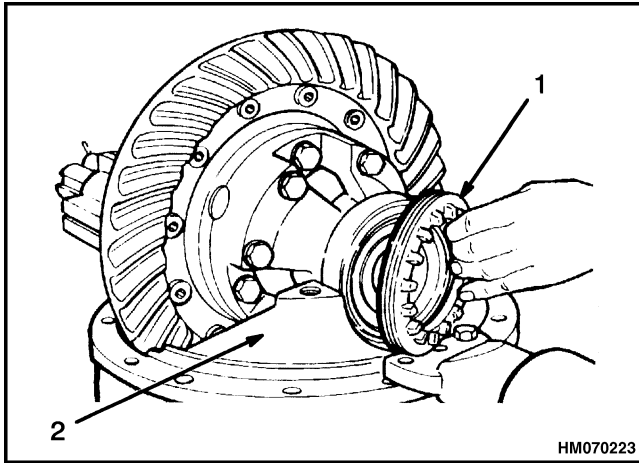
12. Install the differential assembly into the differential housing. The bearing cups must fit correctly into the bores of the housing. See Figure 12.



- 1. BEARING CUP
- 2. HOUSING

Figure 12. Differential Assembly Installation Into Housing

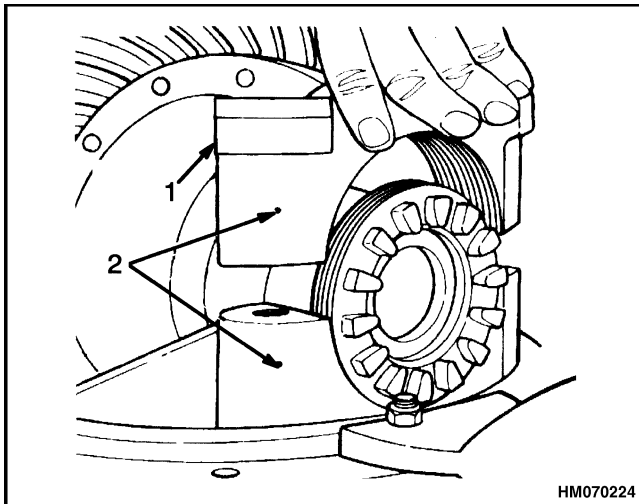
13. Install the two bearing adjusting nuts into position in the housing bores. See Figure 13. Use your hand to tighten each adjusting nut against the bearing cup.



1. ADJUSTING NUT 2. HOUSING

Figure 13. Adjusting Nuts Installation

14. Align the marks on the bearing caps with the marks on the housing. See Figure 14. The cap-screws for the bearing caps should be tightened only enough to hold the adjusting nuts in position and allow them to be rotated for adjustment.



1. BEARING CAP 2. MATCHMARKS

Figure 14. Bearing Caps Installation

15. Tighten the adjusting nuts to 14 N•m (10 lbf ft) to remove the clearance between the adjusting nuts and the bearings. Make sure there is clearance

between the ring gear and the pinion. Loosen an adjusting nut until there is zero clearance (no preload) between the bearings and the adjusting nuts. Tighten both adjusting nuts two notches more than zero clearance to apply the correct preload on the bearings.

16. Check the clearance between the ring gear and pinion. The ring gear and pinion must have a clearance of 0.20 to 0.28 mm (0.008 to 0.011 in.). Use the adjusting nuts to move the ring gear toward or away from the ring gear to increase or decrease the clearance. Loosen one adjusting nut the same amount as the other adjusting nut is tightened to adjust the clearance between the ring gear and pinion. When the clearance is correct, tighten the capscrews for the bearing caps to 95 to 110 N•m (70 to 81 lbf ft). See Figure 15.

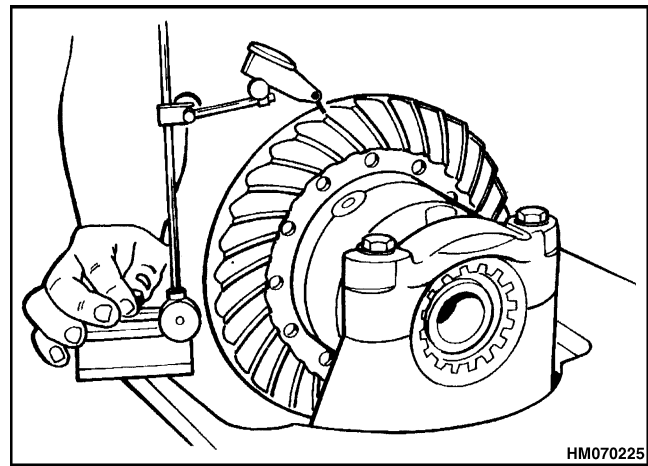


Figure 15. Clearance Check Between Ring Gear and Pinion

17. Check the pattern on the teeth of the ring gear. Apply an indicator color (Prussian blue or yellow) to the teeth. Use a pry bar between the ring gear and the housing to prevent the ring gear from turning freely. Turn the pinion shaft. Compare the pattern on the ring gear teeth with the patterns shown in Table 2. Adjust the gear clearances as necessary. An adjustment of the pinion to move the contact pattern also normally requires an adjustment of the ring gear clearance as described in Step 16.

Table 2. Ring and Pinion Tooth Contact Adjustment

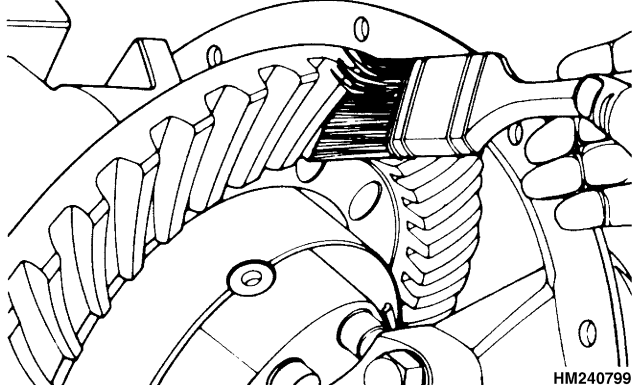

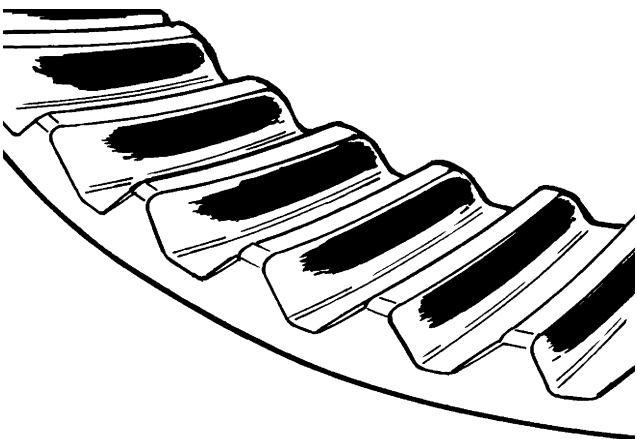
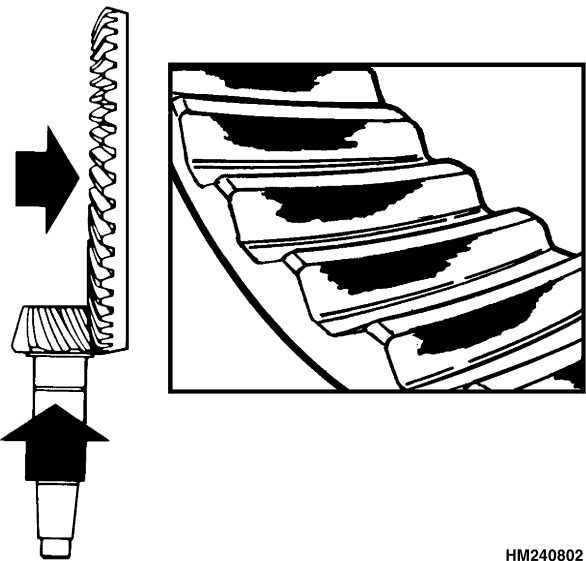
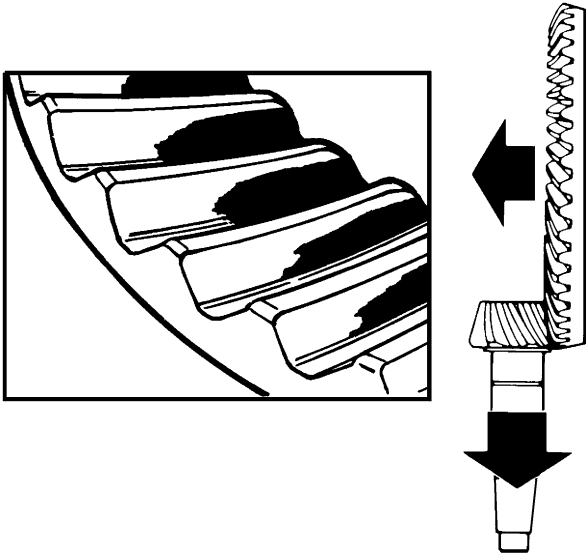
<p>1. Apply a colored dye or grease to approximately 12 of the ring gear teeth.</p>	 <p>HM240799</p>
<p>2. Rotate ring gear forward and backward so that the 12 gear teeth go past the drive six times to get to the contact patterns. Repeat if needed to get a clearer pattern.</p>	
<p>3. Check the tooth contact pattern on the ring gear. Make sure that the pattern is checked on the side of the tooth where the pinion applies the force.</p>	
<p>Correct Tooth Contact</p>	
<p>The contact area is the center between the top and bottom of the tooth. The contact area is toward the inner circumference of the ring gear.</p>	<p>NOTE: Normal pattern during adjustment shown.</p>  <p>HM240800</p>
<p>The contact area is the center between the top and the bottom of the tooth. The contact area will be almost the full length of the tooth.</p>	<p>NOTE: Wear pattern from operation shown.</p>  <p>HM240801</p>

Table 2. Ring and Pinion Tooth Contact Adjustment (Continued)

Incorrect Tooth Contact	
<p>The pinion is too far away from the center of the gear. Add shims to move pinion toward ring gear. Check that the clearance is correct. Some movement of ring gear away from pinion may be necessary.</p>	 <p style="text-align: right;">HM240802</p>
<p>The pinion is too close to the center of the ring gear. Remove shims to move pinion away from the ring gear. Check that the clearance is correct. Some movement of the ring gear toward the pinion may be necessary.</p>	 <p style="text-align: right;">HM240879</p>

- 18. Install the lockplates for the adjusting nuts. Tighten the capscrews to 19 N•m (14 lbf ft). See Figure 4.
- 19. Adjust the thrust bolt after the final adjustment of the ring and pinion. Turn the thrust bolt clockwise until it contacts the ring gear. Then loosen the thrust bolt counterclockwise 1/6 of a turn. Tighten the lock nut to 68 to 95 N•m (50 to 70 lbf ft).

- 20. Make sure that the special lock nut on the pinion has been tightened to 340 N•m (250 lbf ft). Use a punch with an 8 mm round tip to lock the special nut on the end of the pinion shaft. Make sure that the metal from the special nut contacts the bottom of the slot in the pinion shaft.
- 21. Apply liquid sealant to the hub cap and install it in the speed reducer housing at the end of the pinion nut. Apply liquid sealant to the access

plate and install it on the speed reducer housing over the speed reducer.

Drive Axle, Assemble

1. If the axle spindles were removed from the differential housing, do this step. Install new O-rings on the axle spindles. See Figure 16. Install the axle spindle into the differential housing. Install the 16 M12 × 1.75 × 35 capscrews and lockwashers that fasten the axle spindles to the differential housing.

E/J1.25-1.75XL (E/J25-35XL) (C114): Tighten the capscrews to 66 N•m (48 lbf ft).

E/J2.00-3.00XL (E/J40-60XL) (B168, C108): Tighten the capscrews to 98 N•m (72 lbf ft).

E2.00-3.20XM (E45-65XM, E45-65XM₂) (F108), E2.00-3.20XM (E45-65Z) (G108), N30XMH and N30XMH₂ (C210), V30ZMD (D210/E210): Tighten the capscrews to 90 N•m (66 lbf ft).

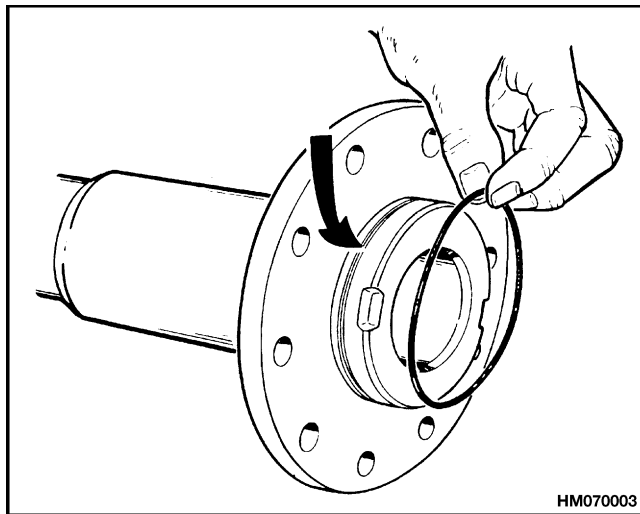


Figure 16. New O-Rings Installation

2. Apply liquid sealant to the areas where the two housings are joined. Install the differential assembly and speed reducer housing into the differential housing. The two M10 × 1.5 × 40 bolts go into the top holes that fasten the housings together. Install the other six M10 × 1.5 × 30 bolts to fasten the two housings together. Tighten the bolts to 38 N•m (28 lbf ft).
3. Assemble the brake assembly to the mount for the axle housing as described in your vehicle's **Brakes SRM**.

4. Lubricate the axle spindles with Never Seez® and slide the mount brackets with the brake assembly on the axle spindles.

NOTE: The outer wheel bearing is lubricated by gear oil from the differential housing. The inner wheel bearing is lubricated by wheel bearing grease. Do not use too much grease to lubricate the inner wheel bearing so that grease is pushed past the seal into the area for the brakes.

5. Install a new oil seal in each hub. Install the oil seal with the lip toward the outer bearing. Install the inner bearing and seal as shown in Figure 1. Put wheel bearing grease on the inner bearing.
6. Install hub assembly on the axle housing. Be careful that the seals are not damaged during installation.
7. Install the outer bearing cone on the axle housing. Install the washer and lock plate. See Figure 17. Install the nut. Using the lock nut wrench (Hyster Part Number 1304091), tighten the nut to 205 N•m (151 lbf ft) while rotating the hub. Loosen the nut until the hub turns freely. The torque must be less than 27 N•m (20 lbf ft). Tighten the nut to 34 N•m (25 lbf ft) or until the first alignment position after 34 N•m (25 lbf ft). Bend the lock plate over the nut.

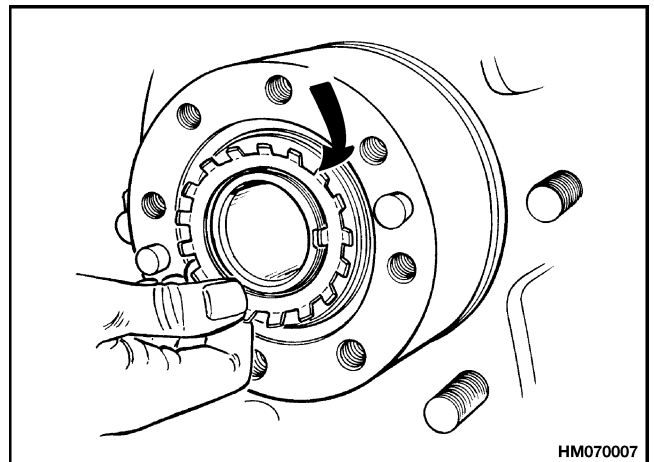


Figure 17. Lock Plate Installation

8. Put liquid sealant on the flange of the axle shaft. Install the axle shafts.

E1.25-1.75XL (E/J25-35XL) (C114). Install the four M8 × 1.25 × 16 capscrews and tighten them to 20 N•m (15 lbf ft). See Figure 2 for the variation in the mounts for the drive wheels and axles. When the capscrews are not used for the drive

wheel mounts, install the 10 M14 × 1.75 × 35 capscrews and tighten them to 155 N•m (115 lbf ft).

E2.00-3.00XL (E40-60XL) (C108). Install the eight M12 × 1.75 × 35 capscrews and tighten to 90 N•m (66 lbf ft).

J2.00-3.00XL (J40-60XL) (B168). Install the eight M12 × 1.75 × 35 capscrews and tighten to 98 N•m (72 lbf ft).

E2.00-3.20XM (E45-65XM, E45-65XM₂) (F108), E2.00-3.20XM (E45-65Z) (G108), N30XMH and N30XMH₂ (C210), V30ZMD (D210/E210). Install the eight M12 × 1.75 × 35 capscrews and tighten to 90 N•m (66 lbf ft).

DRIVE AXLE ASSEMBLY, INSTALL

1. Use a crane to move the drive axle assembly to the floor in front of the lift truck. Slide the drive axle assembly in position under the lift truck. Turn the axle mounts forward so that there is additional clearance for installation of the drive axle.
2. Align the bolt holes in the axle mounts and the frame. The lower edge of the speed reducer housing must be raised over the frame crossmember so that the drive axle assembly can be aligned with the frame. Install the bolts to fasten the mount brackets to the frame. See the following **NOTE**.

NOTE: Some early models of the electric XL series of SitDrives™ used M20 × 2.5 × 80 bolts to fasten the mount brackets to the frame. If the lift truck has these metric bolts, use the following torque values:

If the torque wrench is on the head of the bolt, tighten the bolt to 540 N•m (400 lbf ft). If the torque wrench is on the nut, tighten the nut to 473 N•m (350 lbf ft).

Later models of the electric XL series SitDrives™ use special 7/8 × 14 UNF bolts. This special set of hardware has the following Hyster part numbers: 366714 (7/8 × 14 UNF bolt), 366713 (washer), and 366715 (hex nut). Other nuts and bolts must not be used to replace these special bolts because of the high torque values.

3. Use a crane or jack to raise the drive axle from the floor so that the drive wheels can be installed. Install the drive wheels.

E1.25-1.75XL (E/J25-35XL) (C114). Tighten the wheel nuts to 155 N•m (115 lbf ft).

E/J2.00-3.00XL (E/J40-60XL) (B168, C108). Tighten the wheel nuts to 237 to 305 N•m (175 to 225 lbf ft).

E2.00-3.20XM (E45-65XM, E45-65XM₂) (F108), E2.00-3.20XM (E45-65Z) (G108), N30XMH and N30XMH₂ (C210), V30ZMD (D210/E210). Tighten the wheel nuts to 237 to 305 N•m (175 to 225 lbf ft).

4. Put the drive wheels of the lift truck on blocks.

E/J1.25-1.75XL (E/J25-35XL) (C114). Install the hand lever assembly for the parking brake. Carefully slide the hand lever assembly and cables past the hydraulic lines and electric wires so that the hand lever assembly can be fastened in position on the cowl. Tighten the retainer that holds the lines and cables near the floor plate. Install the two M8 × 1.25 × 40 capscrews and washers that hold the hand lever assembly to the cowl mount. **DO NOT** tighten the capscrews more than 12 N•m (9 lbf ft) or you will bend the hand lever assembly enough to cause it to malfunction.

E/J2.00-3.00XL (E/J40-60XL) (B168, C108). Connect the parking brake cables at the brakes.

E2.00-3.20XM (E45-65XM, E45-65XM₂) (F108), E2.00-3.20XM (E45-65Z) (G108), N30XMH and N30XMH₂ (C210), V30ZMD (D210/E210). Attach the park brake assembly to the frame.

5. Connect the brake lines to the wheel cylinders. Make sure there is brake fluid in the reservoir. Remove the air from the brake lines.

CAUTION

If brake fluid is permitted to flow freely over the parts of the drive axle in this area, it can cause problems in the lubrication in the mast pivots and cause early failure of some grease seals.

6. Make sure that a small hose is installed from the special fitting to a container for brake fluid when air is removed from the brake lines.
7. Adjust the clearance of the brake shoes as described in your vehicle's **Brakes SRM**.
8. Install the traction motor. See your vehicle's **Frame SRM** for procedures to install the traction motor.

9. Install and tighten the drain plug. Fill the differential housing with Ultra Gear Lubrication Gear Oil® SAE 80W (Chevron) through the fill hole until the oil level is even with the bottom of the fill hole. Install the plug.
10. Install the mast as described in your vehicle's **Mast SRM**. Install the battery as described in your vehicle's **Periodic Maintenance SRM**. Remove the blocks so that the lift truck is on its wheels.

Torque Specifications

WHEEL NUTS

E/J1.25-1.75XL (E/J25-35XL) (C114)
155 N•m (115 lbf ft)

E/J2.00-3.00XL (E/J40-60XL) (B168, C108)
237 to 305 N•m (175 to 225 lbf ft)

**E2.00-3.20XM (E45-65XM, E45-65XM₂) (F108),
E2.00-3.20XM (E45-65Z) (G108), N30XMH and
N30XMH₂ (C210), V30ZMD (D210/E210)**
237 to 305 N•m (175 to 225 lbf ft)

AXLE SHAFT CAPSCREWS

E/J1.25-1.75XL (E/J25-35XL) (C114)
M8 x 1.25 x 16 capscrews (4) 20 N•m (15 lbf ft)
M14 x 1.75 x 35 capscrews (10) 155 N•m (115 lbf ft)

E2.00-3.00XL (E40-60XL) (C108)
90 N•m (66 lbf ft)

J2.00-3.00XL (J40-60XL) (B168)
98 N•m (72 lbf ft)

**E2.00-3.20XM (E45-65XM, E45-65XM₂) (F108),
E2.00-3.20XM (E45-65Z) (G108), N30XMH and
N30XMH₂ (C210), V30ZMD (D210/E210)**
90 N•m (66 lbf ft)

AXLE HANGERS TO FRAME

M20 x 2.5 x 80 bolts (early models)
Torque wrench on head of bolt 540 N•m (400 lbf ft)
Torque wrench on nut of bolt 473 N•m (350 lbf ft)

7/8 x 14 UNF bolts (later models)
Torque wrench on head of bolt 745 to
780 N•m (550 to 575 lbf ft)
Torque wrench on nut of bolt 680 to 715 N•m
(500 to 525 lbf ft)

BACK PLATE TO AXLE MOUNT CAPSCREWS

E/J1.25-1.75XL (E/J25-35XL) (C114)
(10 capscrews)
122 N•m (90 lbf ft)

E/J2.00-3.00XL (E/J40-60XL) (B168, C108)
Top 3 (6) 110 N•m (81 lbf ft)
Bottom 4 (8) 245 N•m (180 lbf ft)

**E2.00-3.20XM (E45-65XM, E45-65XM₂) (F108),
E2.00-3.20XM (E45-65Z) (G108), N30XMH and
N30XMH₂ (C210), V30ZMD (D210/E210)**
255 N•m (188 lbf ft)

WHEEL CYLINDER CAPSCREWS

E/J1.25-1.75XL (E/J25-35XL) (C114)
(8 capscrews)
10 to 14 N•m (7 to 10 lbf ft)

E/J2.00-3.00XL (E/J40-60XL) (B168, C108)
Top 2 (4) 78 to 85 N•m (58 to 66 lbf ft)
Bottom 2 (4) 80 to 102 N•m (67 to 75 lbf ft)

**E2.00-3.20XM (E45-65XM, E45-65XM₂) (F108),
E2.00-3.20XM (E45-65Z) (G108), N30XMH and
N30XMH₂ (C210), V30ZMD (D210/E210)**
13 to 20 N•m (10 to 15 lbf ft)

RING GEAR TO DIFFERENTIAL CASE

7/16 UNF x 1 bolts (12)
111 N•m (82 lbf ft)

DIFFERENTIAL CASE HALVES

3/8 UNF x 3-1/2 capscrews (8)
50 N•m (37 lbf ft)

BEARING CAP CAPSCREWS

**Bearing cap capscrews for differen-
tial bearings (4)**
95 to 110 N•m (70 to 80 lbf ft)

RETAINER CAPSCREWS

Retainer capscrews for adjusting nuts (2)
 19 N•m (14 lbf ft)

AXLE HOUSING TO DIFFERENTIAL HOUSING

E/J1.25-1.75XL (E/J25-35XL) (C114)
 M12 x 1.75 x 35 capscrews (16) 66 N•m (48 lbf ft)

E/J2.00-3.00XL (E/J40-60XL) (B168, C108)
 M12 x 1.75 x 35 capscrews (16) 98 N•m (72 lbf ft)

**E2.00-3.20XM (E45-65XM, E45-65XM₂) (F108),
 E2.00-3.20XM (E45-65Z) (G108), N30XMH and
 N30XMH₂ (C210), V30ZMD (D210/E210)**
 90 N•m (66 lbf ft)

PINION NUT

Pinion Nut
 340 N•m (250 lbf ft)

SPEED REDUCER HOUSING TO DIFFERENTIAL HOUSING

M10 x 1.5 x 30 bolts (6)
 38 N•m (28 lbf ft)

M10 x 1.5 x 40 bolts (2)
 38 N•m (28 lbf ft)

TRACTION MOTOR TO TRANSMISSION

M10 x 1.5 x 40 bolts (7)
 38 N•m (28 lbf ft)

Troubleshooting

PROBLEM	POSSIBLE CAUSE	PROCEDURE OR ACTION
The lift truck will not move.	An axle shaft is broken.	Install new axle shaft.
	The differential is damaged.	Repair differential.
The drive axle has leaks.	The drain or fill plug has damaged threads, is loose, or is missing.	Repair threads. Tighten plug. Install missing part.
	The O-rings or seals have damage.	Install new O-rings and seals.
	The drive axle housing is cracked.	Install new drive axle housing.
The drive axle makes noise.	The bearings have damage.	Install new parts.
	The brake assembly is damaged.	Repair brake assembly.
	The oil level is low.	Fill as required. Check for leaks.
	The axle mounting capscrews are loose.	Tighten capscrews to specified torque.

