SERVICE REPAIR

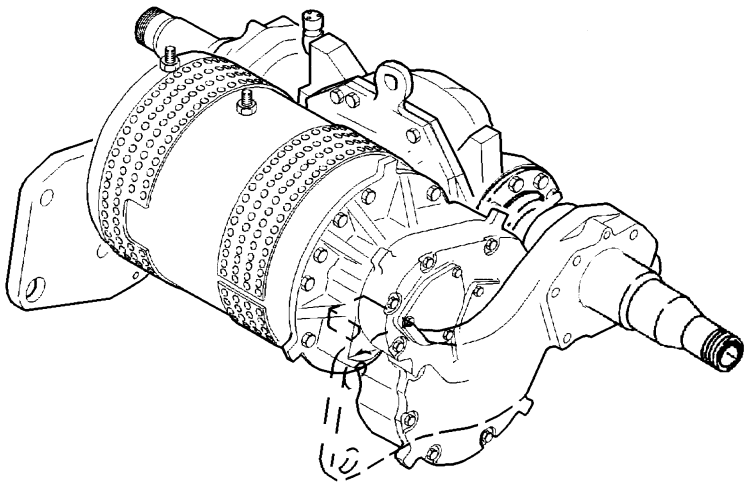
MANUAL

Hyster A216 (J2.00XM, J2.50XM, J3.00XM, J3.20XM Europe)

HYSTER

DRIVE AXLE, SPEED REDUCER, AND DIFFERENTIAL

J2.00-3.20XM (J40-60XM, J40-60XM$_2$) [A216]; J2.00-3.20XM (J40-60Z) [A416]



HM070089

HYSTER

PART NO. 897670

1400 SRM 575

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!

TABLE OF CONTENTS

This section is for the following models:

J2.00-3.20XM (J40-60XM, J40-60XM$_2$) [A216];
J2.00-3.20XM (J40-60Z) [A416]

"THE
QUALITY
KEEPERS"

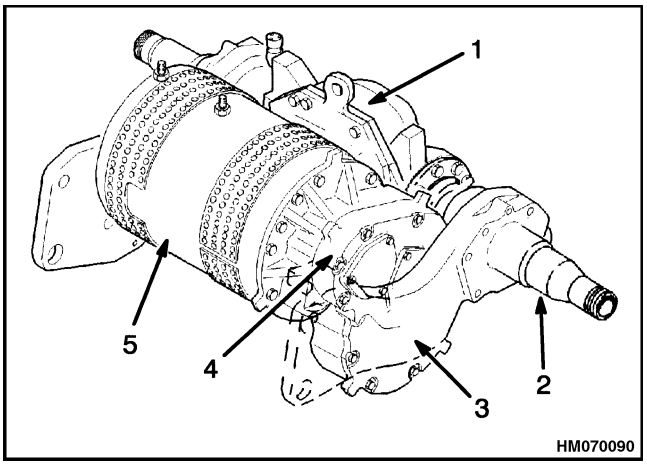
HYSTER
APPROVED
PARTS

General

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

Description

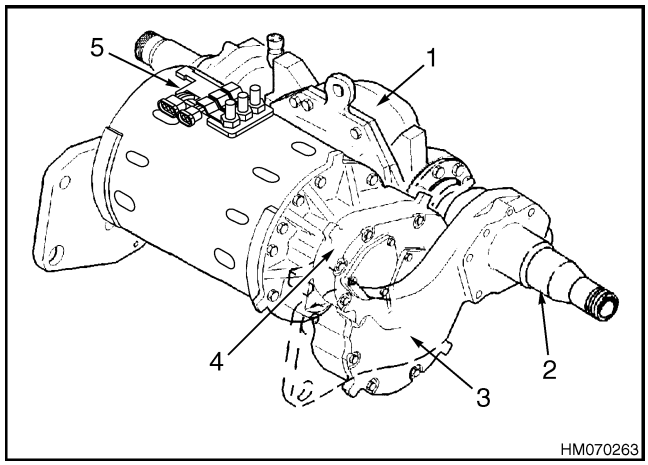
The drive unit assembly is fastened to the frame of the lift truck by the axle mounts. See Figure 1 and Figure 2. The outer ends of the axle housings are the spindles for the wheel bearings. The cups for the wheel bearings are pressed into the wheel hubs. The nut on the end of the spindle holds and adjusts 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 axle mounts.



1. DIFFERENTIAL
2. SPINDLE (AXLE HOUSING)
3. AXLE MOUNT
4. SPEED REDUCER
5. TRACTION MOTOR

Figure 1. Drive Unit Assembly J2.00-3.20XM (J40-60XM, J40-60XM$_2$) (A216)

The speed reducer and differential are assembled as a single unit. See Figure 8. The pinion in the speed reducer engages the splines on the shaft of the traction motor. The cluster gear transfers power from the pinion to the reduction gear. The reduction gear is engaged with the drive gear on the differential.



1. DIFFERENTIAL
2. SPINDLE (AXLE HOUSING)
3. AXLE MOUNT
4. SPEED REDUCER
5. TRACTION MOTOR

Figure 2. Drive Unit Assembly J2.00-3.20XM (J40-60Z) (A416)

Drive Axle, Speed Reducer, and Differential Repair

REMOVE

NOTE: The traction motor can be removed as a separate unit. See the section **Frame** 100 SRM 582 for the procedure to remove the traction motor.

WARNING

The lift truck must be put on blocks for some types of maintenance and repair. The removal of the following assemblies will cause large changes in the center of gravity: attachment, mast, drive axle, battery, and the counterweight. When the lift truck is put on blocks, put additional blocks in the following positions:

a. Before removing the 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. Disconnect the battery connector.

2. Remove the mast assembly as described in **Mast Repair** 4000 SRM 522.

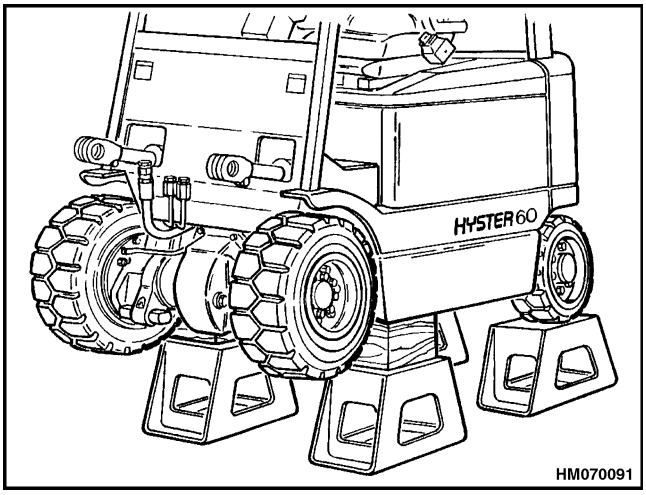


Figure 3. Put Lift Truck on Blocks

3. Use a crane and chains to put the lift truck on blocks as shown in Figure 3. Make sure the crane has the capacity to lift the weight of the lift truck. See the nameplate for the weight of the lift truck.

4. Remove the floor plates. Remove the drive wheels. Disconnect the brake lines to the wheel cylinders. Put caps on the open fittings.

5. Disconnect the parking brake cables from the levers of the service brakes. Drain the oil from the differential.

6. Put a floor jack under the drive unit assembly. Make sure the drive unit assembly has stability; then, remove the nuts and bolts from the axle mounts. Remove the alignment pins from the frame. The alignment pins can be a tight fit. See the procedures in Figure 4 and Figure 5. Slide the drive unit assembly from the lift truck.

   a. Method 1. See Figure 4.

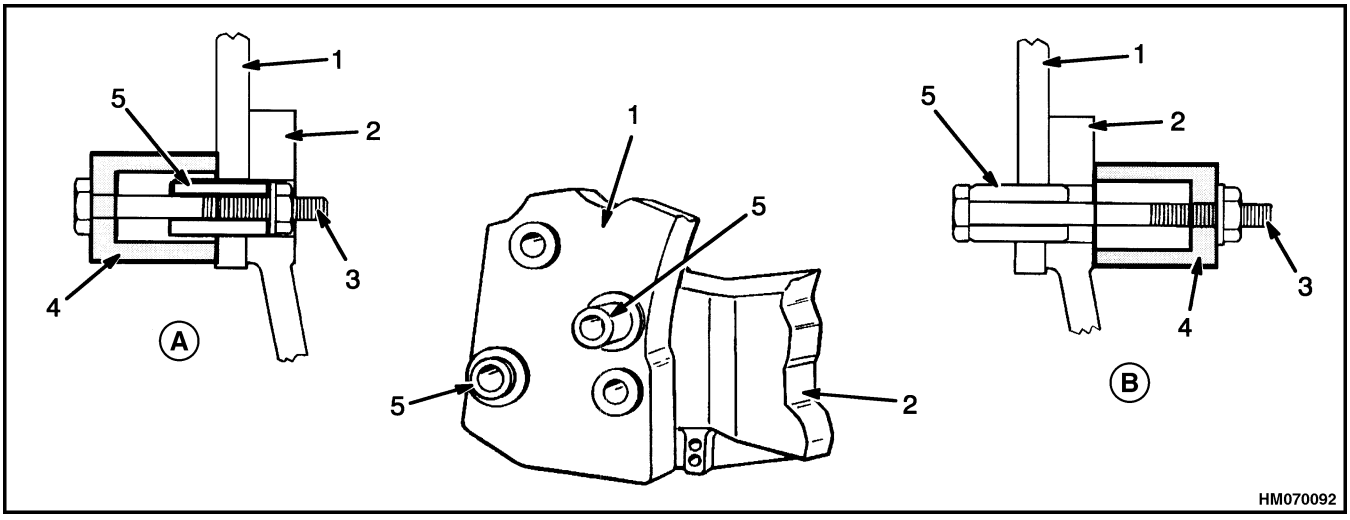
      (1) Use a grade 8 bolt that is the maximum diameter possible and long enough to go through the spacer (cup) and pin. Put a washer and nut on the threaded end against the alignment pin. The washer and nut must be smaller than the holes in the frame and axle mount.

      (2) Install the spacer and bolt through the pin from the frame side. Use a wrench to pull the alignment pin out of (removal) or into (installation) the axle mount and frame members.

   b. Method 2. See Figure 5.

      (1) Use a threaded rod (bolt) as described in Method 1, but long enough to go through the alignment pin, spacer (cup), and hydraulic cylinder with a hollow piston. The washer and nut on the end of the bolt must be smaller than the holes in the frame and axle mount when the pin is removed.

      (2) Install the spacer (cup), hydraulic cylinder, and threaded rod through the alignment pin from the frame side. Operate the hydraulic cylinder in the direction away from the frame and pull the pin out of (removal) or into (installation) the axle mount and frame members.



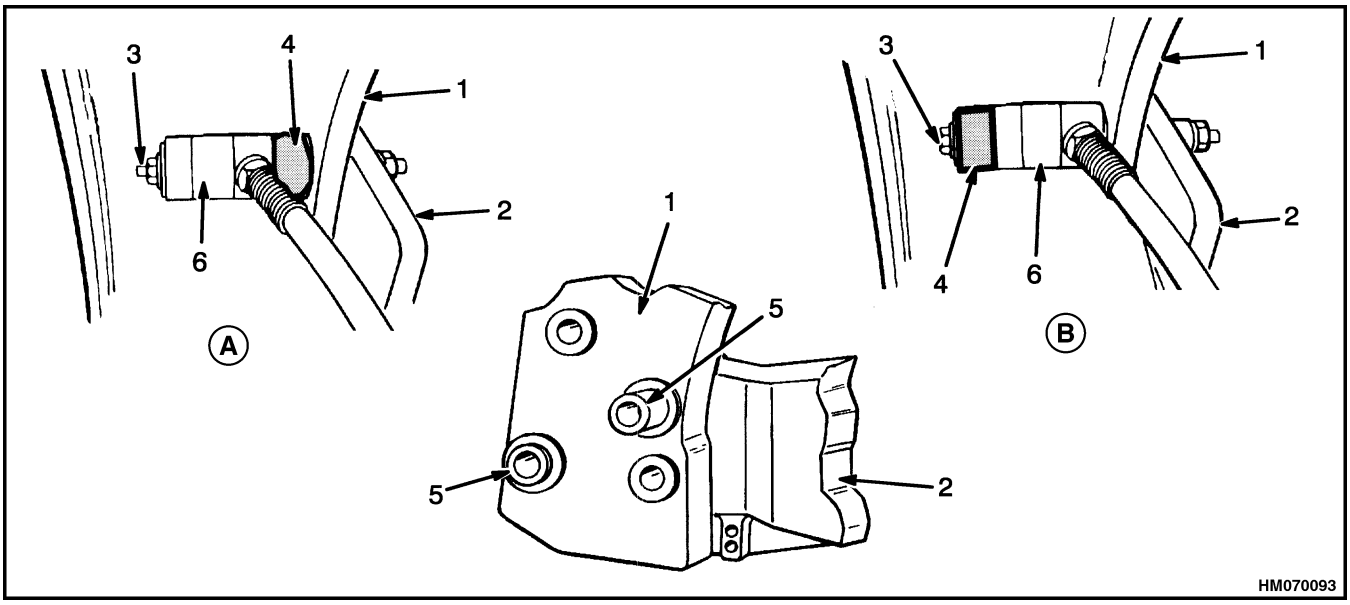
A. REMOVAL

1. FRAME
2. AXLE MOUNT
3. BOLT

B. INSTALLATION

4. SPACER (CUP)
5. ALIGNMENT PIN

Figure 4. Axle Mount Arrangement (Method 1)



A. REMOVAL

1. FRAME
2. AXLE MOUNT
3. BOLT

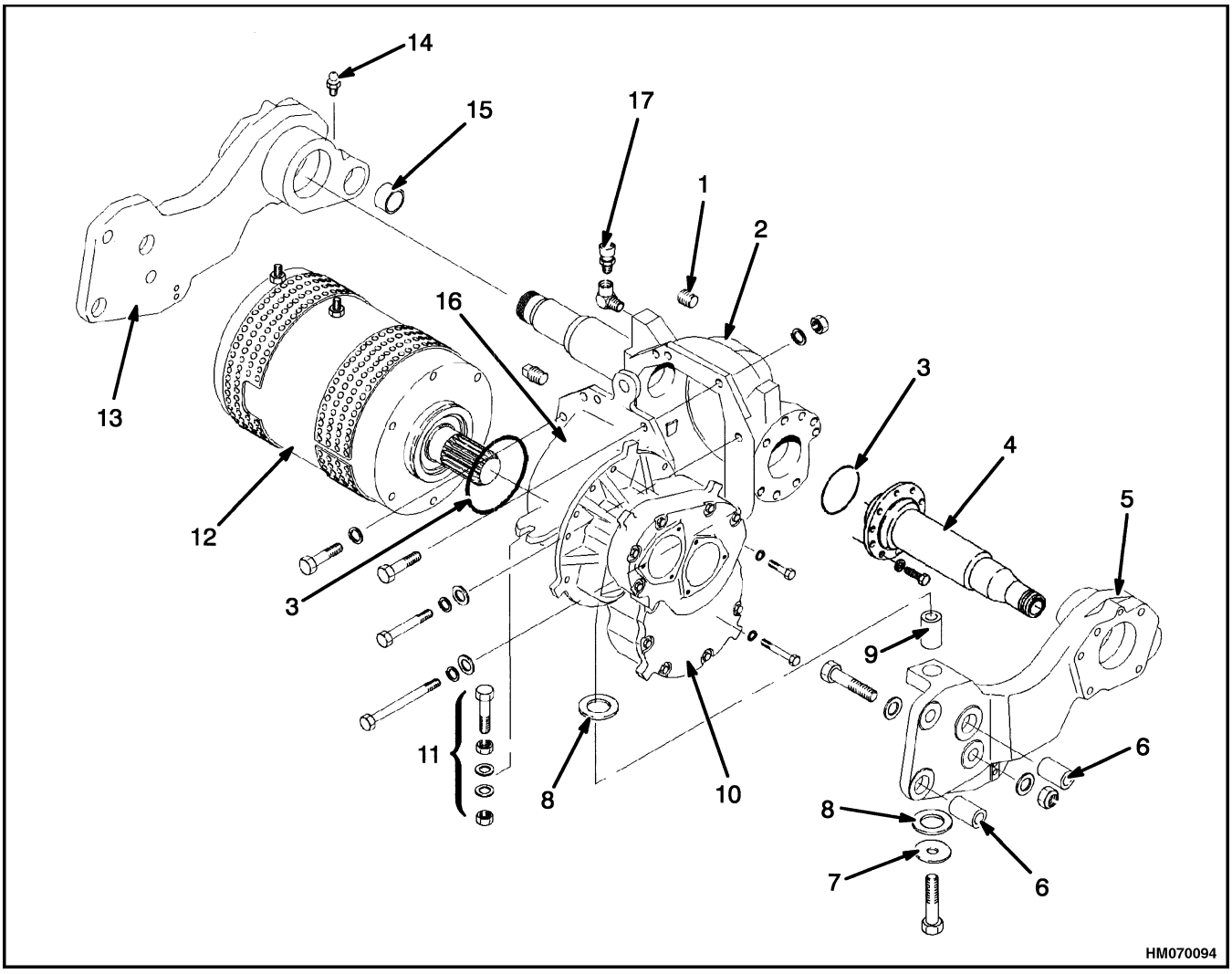
B. INSTALLATION

4. SPACER (CUP)
5. ALIGNMENT PIN
6. HYDRAULIC CYLINDER (WITH HOLLOW PISTON)

Figure 5. Axle Mount Arrangement (Method 2)

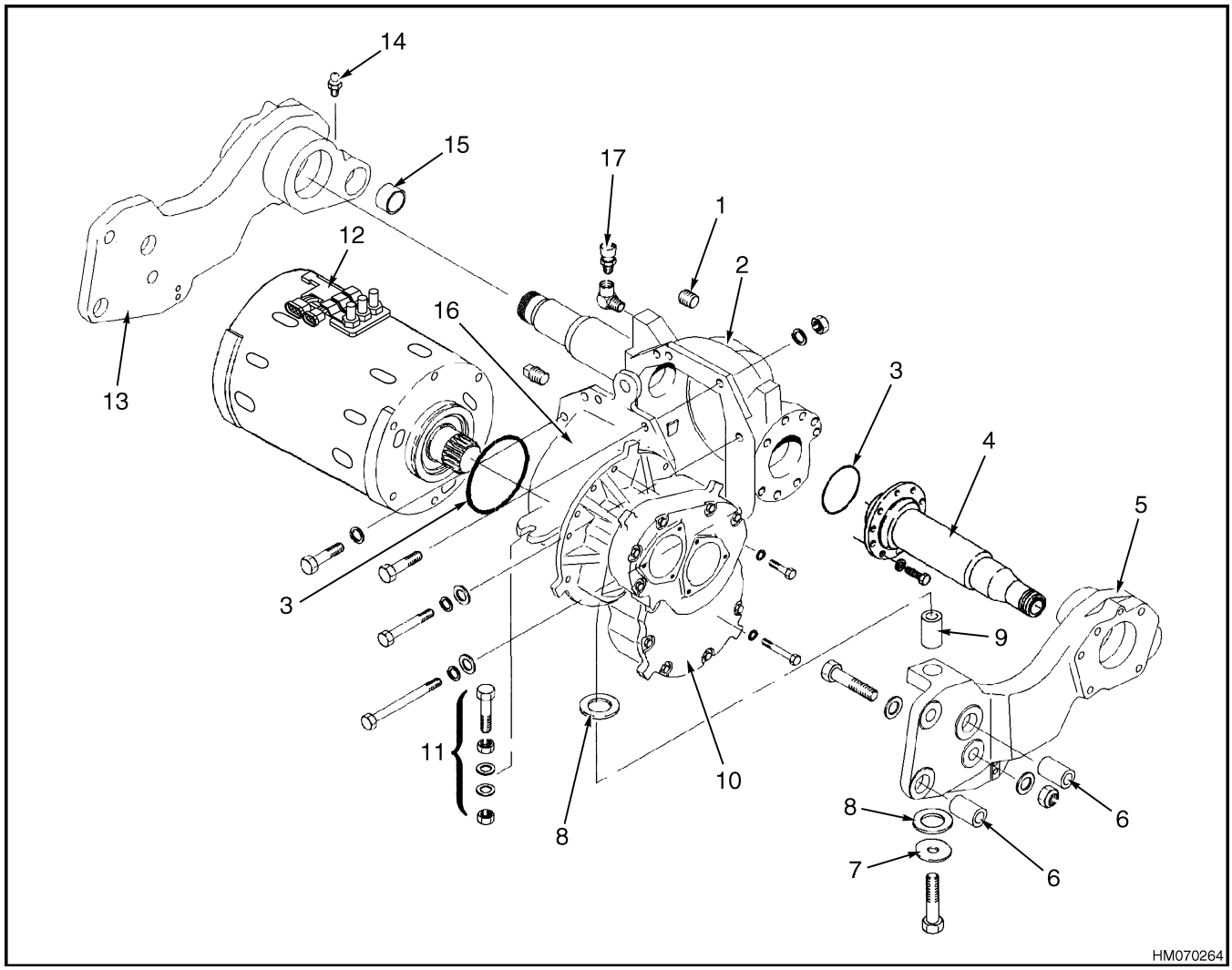
DISASSEMBLE

1. Remove the axle shafts. See Figure 6 and Figure 7. If necessary, remove the brake assemblies as described in **Brake System** 1800 SRM 566.
2. Remove the capscrew that holds the right-hand axle mount to the speed reducer housing. Remove the axle mounts from the axle housing.
3. Remove the expansion plug from the differential housing. Remove the nuts and washer from the reduction gear.
4. Remove the capscrews that hold the speed reducer housing to the differential housing. Separate the housings.



1. OIL LEVEL PLUG
2. DRIVE AXLE HOUSING
3. O-RING
4. SPINDLE
5. RH AXLE MOUNT
6. ALIGNMENT PIN
7. WASHER
8. ISOLATOR
9. SPACER
10. SPEED REDUCER HOUSING
11. NUTS AND BOLT (MOTOR SUPPORT)
12. DC TRACTION MOTOR
13. LH AXLE MOUNT
14. GREASE FITTING
15. BUSHING
16. DIFFERENTIAL HOUSING
17. BREATHER

Figure 6. Drive Unit Parts J2.00-3.20XM (J40-60XM, J40-60XM$_2$) (A216)



1. OIL LEVEL PLUG
2. DRIVE AXLE HOUSING
3. O-RING
4. SPINDLE
5. RH AXLE MOUNT
6. ALIGNMENT PIN
7. WASHER
8. ISOLATOR
9. SPACER
10. SPEED REDUCER HOUSING
11. NUTS AND BOLT (MOTOR SUPPORT)
12. AC TRACTION MOTOR
13. LH AXLE MOUNT
14. GREASE FITTING
15. BUSHING
16. DIFFERENTIAL HOUSING
17. BREATHER

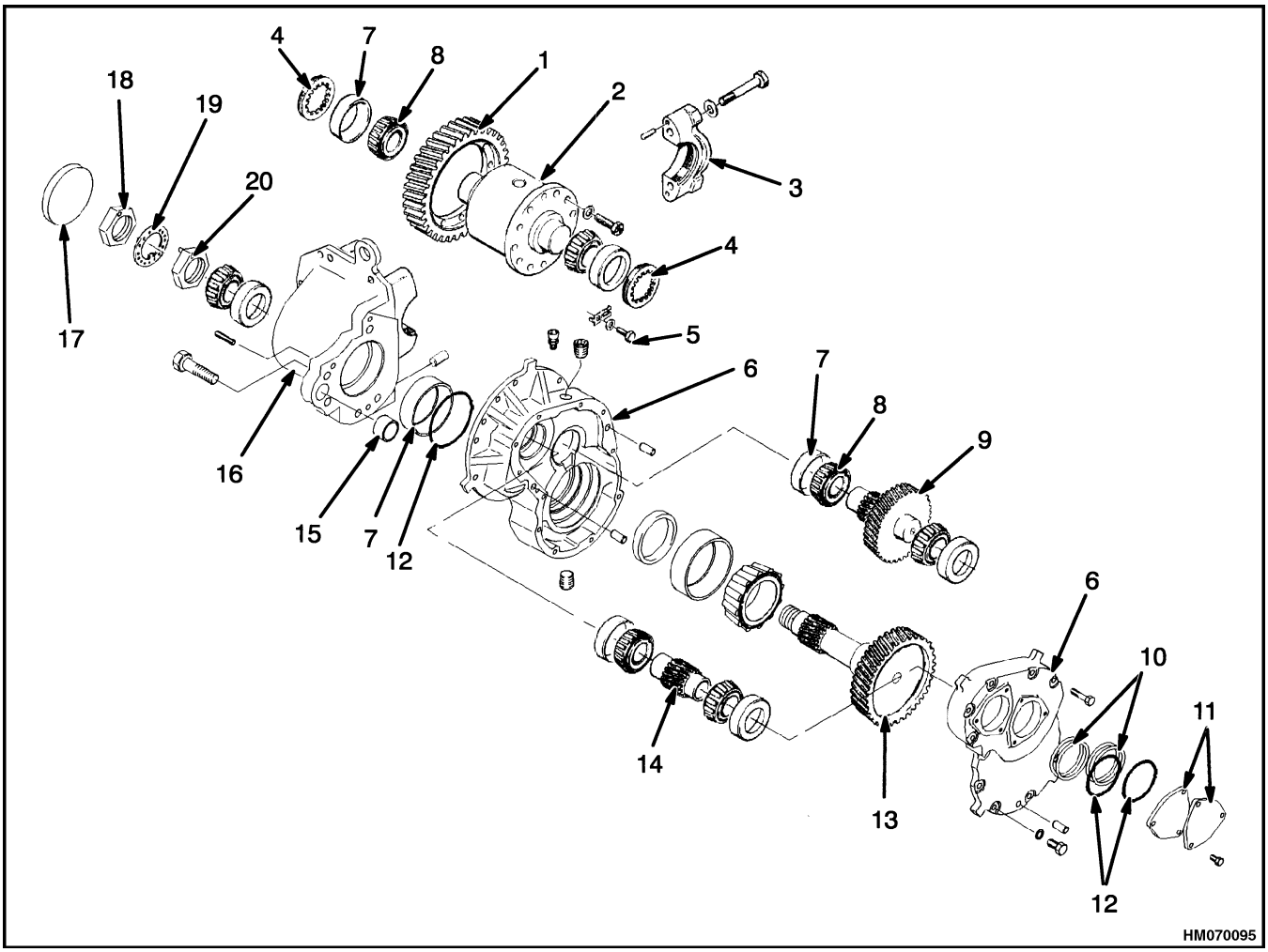
Figure 7. Drive Unit Parts J2.00-3.20XM (J40-60Z) (A416)

5. Remove the bearing caps from the speed reducer housing. Remove the capscrews that hold the halves of the speed reducer housing together. Separate the housings.

6. Remove the gears, bearings, and shims from the speed reducer housing.

7. Remove the lock plates for the adjustment nuts for the differential. Remove the capscrews for the differential bearing caps. Remove the bearing caps and adjustment nuts.

8. Remove the drive gear from the differential case. See Figure 8. If necessary, disassemble the differential. See Figure 9.



1. DRIVE GEAR
2. DIFFERENTIAL
3. DIFFERENTIAL BEARING CAP
4. ADJUSTMENT NUT
5. CAPSCREW AND LOCK PLATE
6. SPEED REDUCER HOUSING
7. BEARING CUP
8. BEARING CONE
9. CLUSTER GEAR
10. SHIMS
11. BEARING CAP
12. O-RING
13. REDUCTION GEAR
14. PINION
15. ALIGNMENT PIN
16. DIFFERENTIAL HOUSING
17. EXPANSION PLUG
18. LOCK NUT
19. LOCK RING
20. BEARING LOCK NUT

Figure 8. Speed Reducer and Differential Assembly

CLEAN

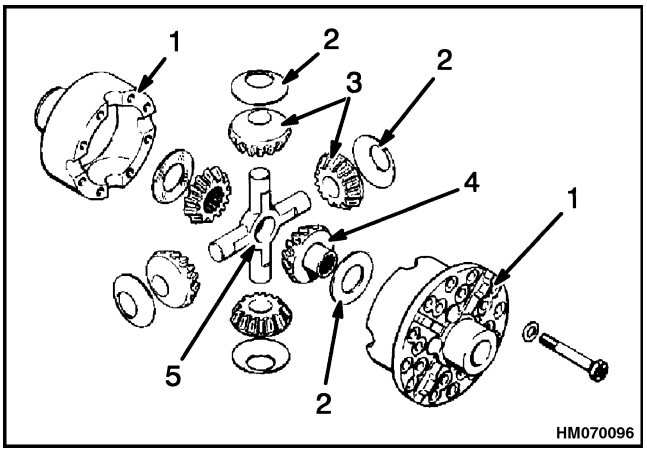
WARNING

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 a cleaning solvent. Dry the parts with compressed air.



1. DIFFERENTIAL CASE
2. THRUST WASHER
3. PINION
4. SIDE GEAR
5. SPIDER

Figure 9. Differential

INSPECT

1. Check the gears for wear or damage. 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 bearing surfaces for damage.

3. The mounts must turn freely on the axle housing. The splines for the axle shafts must not be damaged.

ASSEMBLE

WARNING

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

1. If the drive gear was removed from the differential case, put the drive gear in hot water that is 82 to 105°C (180 to 220°F) for approximately 10 minutes. Remove the drive gear from the water and put it on the differential case. Do not use a press or a hammer to install the drive gear. Install the twelve capscrews and special hardened washers. Tighten the capscrews to 111 N•m (82 lbf ft). Make sure the drive gear is in the correct position against the flange of the differential case.

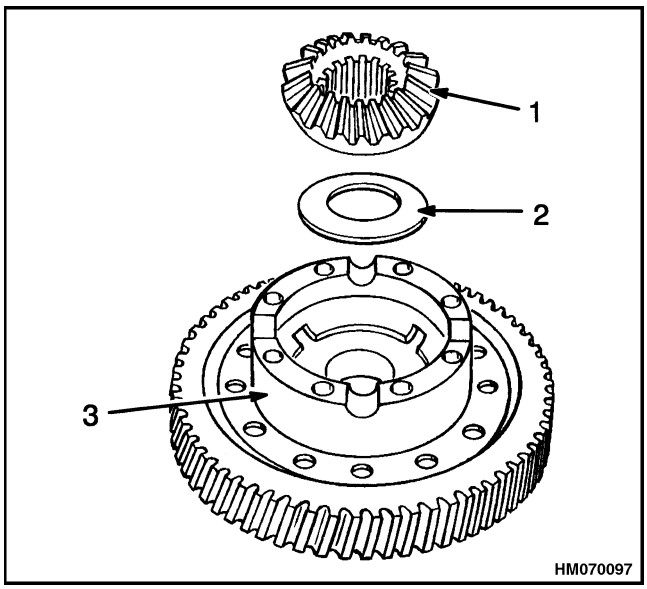
2. Lubricate and install a side gear and thrust washer in the differential case as shown in Figure 10. Make sure the side of the thrust washer with dents is toward the side gear.

3. Install the spider (cross), differential pinions, and thrust washers into the differential case as shown in Figure 11.

4. Install the second side gear and thrust washer over the spider and differential pinions as shown in Figure 12. Put the second half of the differential case over the first half and the gears as shown in Figure 12. Make sure the marks are aligned. Install four of the capscrews in a cross pattern. Tighten the capscrews to 50 N•m (37 lbf ft). Install the remaining capscrews and tighten them in a cross pattern.

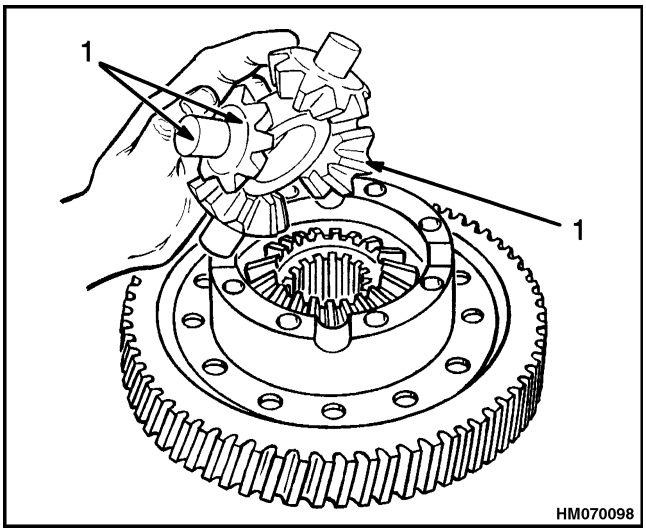
5. Install the bearing cones on the differential case.

6. 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 housing.



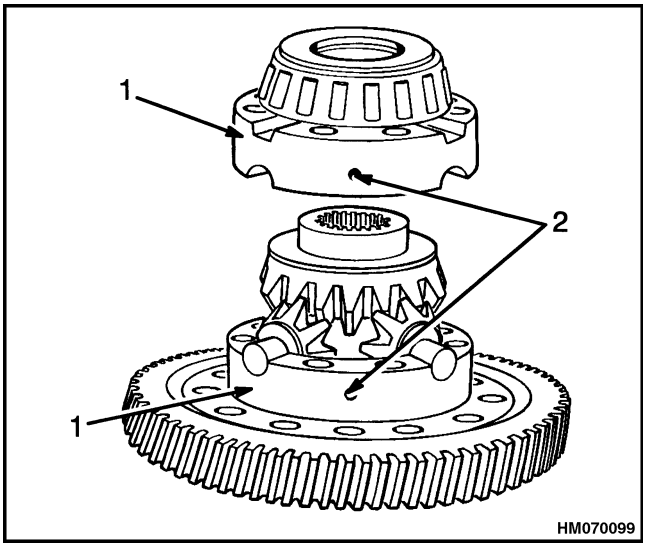
1. SIDE GEAR
2. THRUST WASHER
3. DIFFERENTIAL CASE

Figure 10. Install Side Gear and Thrust Washer



1. SPIDER, DIFFERENTIAL PINIONS, AND THRUST WASHERS

Figure 11. Spider (Cross), Pinions, and Thrust Washers Installation



1. DIFFERENTIAL CASE
2. ALIGNMENT MARKS

Figure 12. Second Half of Differential Case Installation

7. Install the differential assembly into the housing. The bearing cups must fit correctly into the bores of the housing.

8. Install the two bearing adjustment nuts into position in the housing bores. Use your hand to tighten each adjustment nut against the bearing cup. Use the adjustment nuts to put the drive gear in the correct location as shown in Figure 13.

9. Align the marks on the bearing caps with the marks on the housing. See Figure 14. Tighten the capscrews for the bearing caps to 95 to 110 N•m (70 to 81 lbf ft).

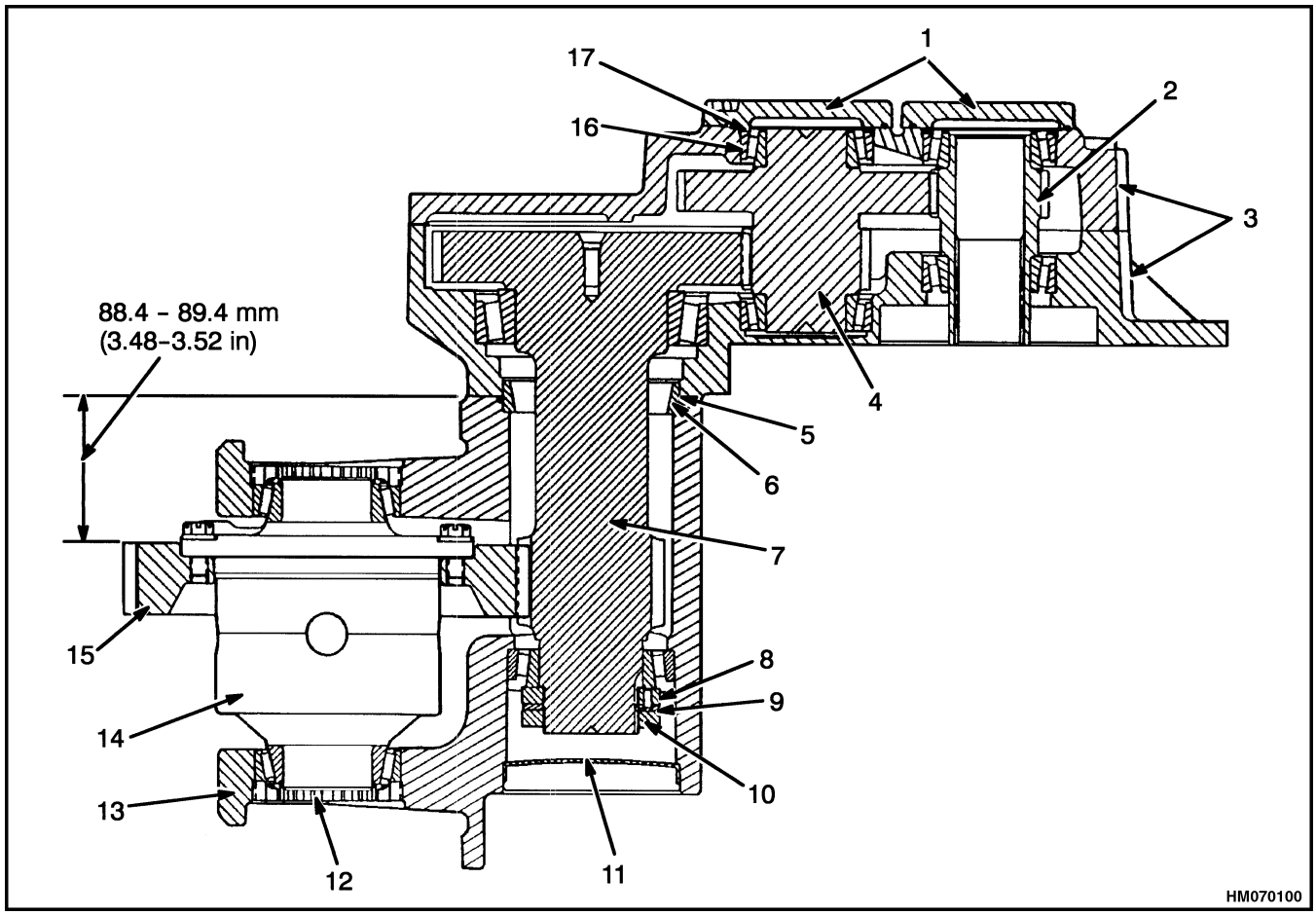
10. Tighten the adjustment nuts to 14 N•m (10 lbf ft) to remove the clearance between the adjustment nuts and the bearings. Loosen the adjustment nut only until there is zero clearance between the bearings and the adjustment nuts. Tighten each adjustment nut one notch more than zero clearance to put a preload on the bearings. Check that the rotating torque is 1.7 to 4.0 N•m (15 to 35 lbf in).

11. Install the retainers for the adjustment nuts. Tighten the hex capscrews to 19 N•m (14 lbf ft).

12. Install the bearing cup and O-ring in the differential housing. Apply a bead of sealant (Loctite® 515 or equivalent) to the flange of the differential housing. Install the speed reducer housing to the differential housing. Tighten the capscrews to 52 N•m (38 lbf ft).

13. Install the reduction gear in the speed reducer housing. Install the bearing cone. Install the lock nut with the pin away from the gear. Use a thread adhesive (Loctite 271 or equivalent) on the threads of the nut. Tighten the lock nut to 135 N•m (100 lbf ft). Rotate the reduction gear at least five times. Loosen the lock nut until the bearings are loose. Tighten the lock nut to 7 N•m (5 lbf ft). Install the lockwasher, rotating the nut as necessary to align the holes. Install the outer lock nut. Use a thread adhesive (Loctite 271 or equivalent) on the threads of the nut. Tighten the lock nut to 135 N•m (100 lbf ft).

14. Install the bearings and the cluster gear and pinion in the speed reducer housing. Apply a bead of sealant (Loctite 515 or equivalent) to the flange of the speed reducer housing. Install the other half of the speed reducer housing. Use a thread sealant on the capscrews and tighten the capscrews to 38 N•m (28 lbf ft).



1. BEARING CAP
2. PINION
3. SPEED REDUCER HOUSING
4. CLUSTER GEAR
5. O-RING
6. BEARING CUP (ALIGNMENT)
7. REDUCTION GEAR
8. BEARING LOCK NUT
9. LOCK RING
10. LOCK NUT
11. EXPANSION PLUG
12. ADJUSTMENT NUT
13. DIFFERENTIAL BEARING CAP
14. DIFFERENTIAL
15. DRIVE GEAR
16. BEARING CUP
17. SHIMS

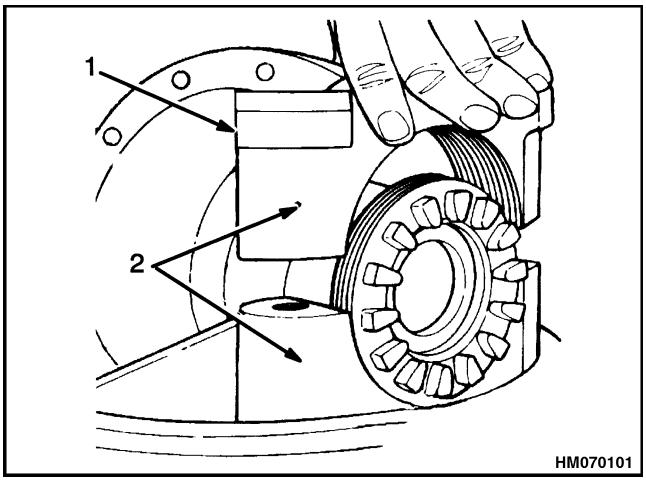
Figure 13. Speed Reducer and Differential

15. Install the bearing cap for the cluster gear with a 2.54 mm (0.100 in.) shim pack and the bearing cup. Install the capscrews for the bearing cap and tighten them evenly to 1.2 N•m (10 lbf in) while rotating the gears. Measure the clearance between the bearing cap and the housing in three places (near the capscrews). Find the average of the three measurements. Add 0.15 mm (0.006 in.) to the average measurement. Subtract this dimension from 2.54 mm (0.100 in.) to obtain the required shim pack. Install the shims, O-ring, and bearing cap. Use a thread sealant on the capscrews and tighten the capscrews to 19 N•m (14 lbf ft).

16. Adjust and install the bearing cap for the pinion using the procedures described in Step 15.

17. Apply a bead of sealant (Loctite 515 or equivalent) to the flange of the axle housing. Install the differential housing onto the axle housing. Tighten the bolts and capscrews that fasten the two housings together to 38 N•m (28 lbf ft).

18. If removed, install the axle spindles on the axle housing, Install new O-rings on the axle spindles. See Figure 15. Install the axle spindle into the axle housing. Tighten the capscrews to 90 N•m (66 lbf ft). Lubricate the axle spindles with Never Seez® and slide the mounts on the axle spindles.



1. BEARING CAP
2. ALIGNMENT MARKS

Figure 14. Bearing Caps Installation

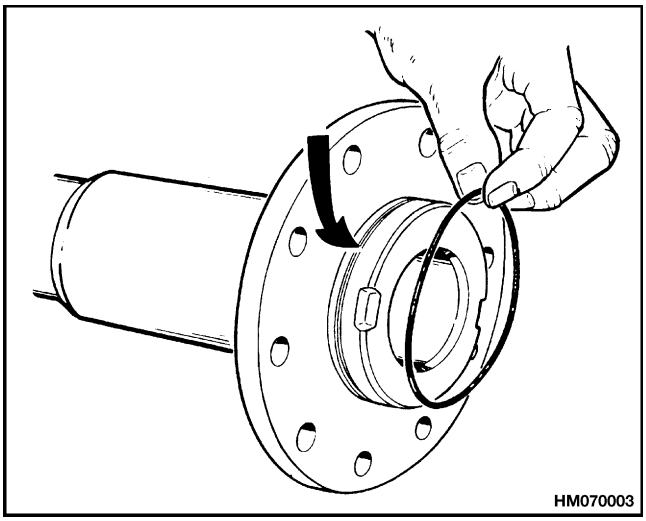


Figure 15. New O-Rings Installation

19. Install the capscrew, washer, isolators, and spacer between the right-hand axle mount and the speed reducer housing. See Figure 6. Tighten the capscrew to 165 N•m (122 lbf ft).

20. Install a new O-ring on the flange of the motor. Use a sling to lift the traction motor. Align the traction motor with the pinion in the speed reducer.

21. Align the holes in the speed reducer and the motor housing. Install the capscrews that hold the traction motor to the speed reducer. Tighten the capscrews to 38 N•m (28 lbf ft).

22. Install the bolt and nuts at the support on the bottom of the speed reducer housing. Adjust the bolt until it touches the motor housing. Turn the bolt an additional 1/2 turn counterclockwise to push on the traction motor. Tighten the upper nut. Tighten the lower nut to 33 N•m (24 lbf ft) without moving the bolt.

INSTALL

1. Use a floor jack to slide the drive unit assembly in position under the lift truck.

2. Align the bolt holes in the axle mounts and the frame. Lubricate the alignment pins with Never-Seez and install them. The alignment pins can be a tight fit. See the procedures in Figure 4 and Figure 5. Install the bolts that fasten the axle mounts to the frame. Tighten the nuts and bolts as follows:

a. If the torque wrench is on the head of the bolt, tighten the bolt to 780 N•m (575 lbf ft).

b. If the torque wrench is on the nut, tighten the nut to 715 N•m (528 lbf ft).

3. Assemble the brake assembly to the axle mount as described in **Brake System** 1800 SRM 566.

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.

4. 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. Put wheel bearing grease on the inner bearing.

5. Install hub on the axle spindle. Be careful that the seals are not damaged during installation. Install the outer bearing, lock plate, and lock nut. Tighten the lock nut to 205 N•m (151 lbf ft) while rotating the hub. Loosen the lock nut until the hub turns freely. The torque must be less than 27 N•m (20 lbf ft). Tighten the lock 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 lock nut. See Figure 16.

6. Apply a bead of sealant (Loctite 515 or equivalent) on the flange of the axle shaft. Install the axle shafts and capscrews. Tighten the capscrews to 98 N•m (72 lbf ft).

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

8. Adjust the clearance of the brake shoes as described in **Brake System** 1800 SRM 566.

9. Install the wheels and tires. Tighten the wheel nuts to 237 to 305 N•m (175 to 225 lbf ft).

10. Install and tighten the drain plug. Fill the differential housing with SAE 90 EP gear oil through the fill hole until the oil level is even with the bottom of the fill hole. Install the plug.

11. Install the mast as described in **Mast Repair** 4000 SRM 522. Install the battery as described in **Periodic Maintenance** 8000 SRM 1060. Remove the blocks so the lift truck is on its tires.

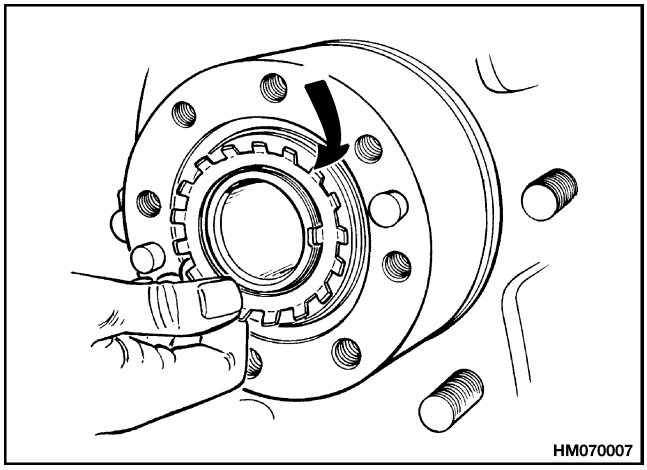


Figure 16. Lock Plate Installation

Torque Specifications

Axle Mounts to Frame
Torque Wrench on Head of Bolt 780 N•m (575 lbf ft)
Torque Wrench on Nut of Bolt 715 N•m (527 lbf ft)

Axle Housing to Differential Housing
38 N•m (28 lbf ft)

Axle Shaft Capscrews
98 N•m (72 lbf ft)

Back Plate to Axle Mount Capscrews
5/8 in. Capscrews 245 N•m (180 lbf ft)
1/2 in. Capscrews 125 N•m (92 lbf ft)

Bearing Cap Capscrews for Differential Bearings
95 to 110 N•m (70 to 81 lbf ft)

Bearing Cap Capscrews for Speed Reducer
19 N•m (14 lbf ft)

Differential Case Halves
50 N•m (37 lbf ft)

Drive Gear to Differential Case
111 N•m (82 lbf ft)

Retainer Capscrews for Adjustment Nuts
19 N•m (14 lbf ft)

Speed Reducer Housing to Differential Housing
52 N•m (38 lbf ft)

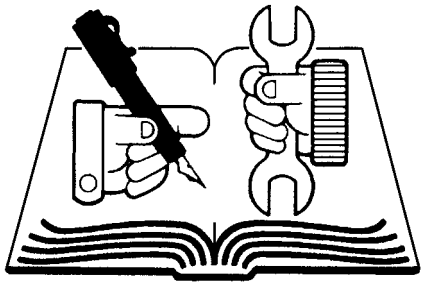
Traction Motor to Speed Reducer Housing
38 N•m (28 lbf ft)

Wheel Cylinder Capscrews
7/16 in. Capscrews 78 to 91 N•m (58 to 67 lbf ft)
1/2 in. Capscrews 91 to 102 N•m (67 to 75 lbf ft)

Wheel Nuts
237 to 305 N•m (175 to 225 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.
	Pinion is damaged.	Install a new pinion.
	Cluster gear or reduction gear is damaged.	Install new gear(s).
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.
	Speed reducer housing is cracked.	Install a new 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.
	Speed reducer gears are damaged.	Install new gears.



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