



Technical Bulletin

Driver-Controlled Differential Lock (DCDL) Service Instructions

Meritor MT-14X Series Differential Carriers for Off-Highway Applications

Hazard Alert Messages

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

⚠ WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip and fall over. Serious personal injury and damage to components can result.

How to Obtain Additional Maintenance and Service Information

Refer to Maintenance Manual MM-0970, MT-14X Series Single-Reduction Forward Differential Carriers on Tandem Axles; and Maintenance Manual MM-0990, Amboid Rear Differential Carrier, Rear/Rear Carrier on MT-40-14X Series Tandem Drive Axles. To obtain these publications, visit Literature on Demand at meritor.com.

How to Obtain Tools

Call Meritor's Commercial Vehicle Aftermarket at 888-725-7355.

- IAD/DCDL spring compression tool
- Centering tool

Description

Some Meritor drive axle models have a driver-controlled main differential lock (DCDL). This differential lock is operated by a carrier-mounted, air-actuated shift unit. When activated, the shift unit moves a sliding collar that is installed on the splines of the axle shaft. When engaged, the collar locks the axle shaft to the differential case. Both driven wheels are then simultaneously engaged. Figure 1.

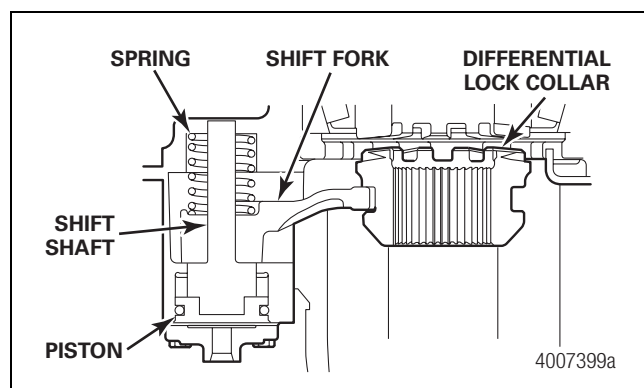


Figure 1

Service Procedures

Removing the Differential Carrier from the Axle Housing

Before the differential carrier can be removed or installed, the differential lock must be shifted into and held in the locked or engaged position. The locked position gives enough clearance between the shift collar and the axle housing to permit the removal or installation of the carrier.

If the Axle Shafts Were Removed for Towing with the Differential in the Unlocked or Disengaged Position

Install the left-hand axle shaft into the housing before continuing. Perform the following steps for reinstalling the axle shafts into the axle housing.

1. Remove the protective covers, if used, from the wheel-end hubs.
2. If the drive axles are equipped with a main differential lock, shift the differential to the unlocked or disengaged position. Install the axle shaft with two sets of splines and new gaskets in the correct location as follows.
 - A. Push the axle shaft and gasket into the hub and housing until the shaft stops against the differential lock collar.

- B. Push down and in on the axle shaft flange and rotate the shaft until the splines of the shaft and the shift collar are engaged.
- C. Push the axle shaft further into the housing until the shaft stops against the differential side gear.
- D. Push down on the axle shaft flange and rotate the shaft until the splines of the shaft and the side gear are engaged.
- E. Push the axle shaft completely into the housing until the axle shaft flange and gasket are flush against the wheel hub.

Engagement or Lockout of the DCDL

Manual Method

Use the following manual engaging method to shift the DCDL into the locked position, if an auxiliary air supply is not available or if the differential carrier is to be stored for later use.

1. Wear safe eye protection. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Remove the drain plug from the bottom of the housing and drain the lubricant.
3. Use a jack to raise the left-hand wheel of the drive axle.
4. Place a jackstand under the left-hand spring seat to hold the vehicle in the raised position.
5. Disconnect the driveline from the input yoke.
6. Disconnect the wiring harness from the DCDL switch.
7. Disconnect the vehicle air line from the inter-axle differential, if equipped, and main differential lock actuator assemblies.
8. Remove the caging bolt from the side of the housing. Figure 2 and Figure 3.

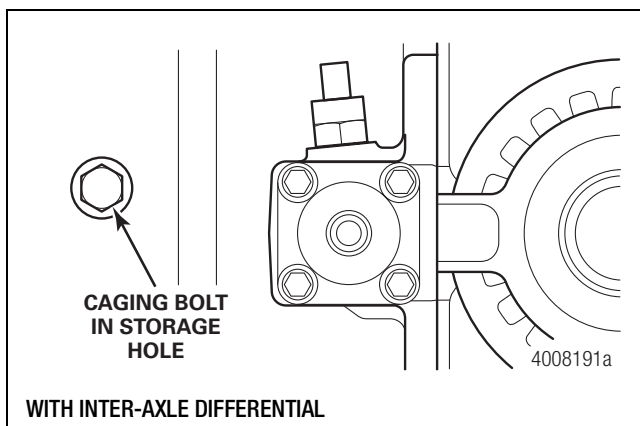


Figure 2

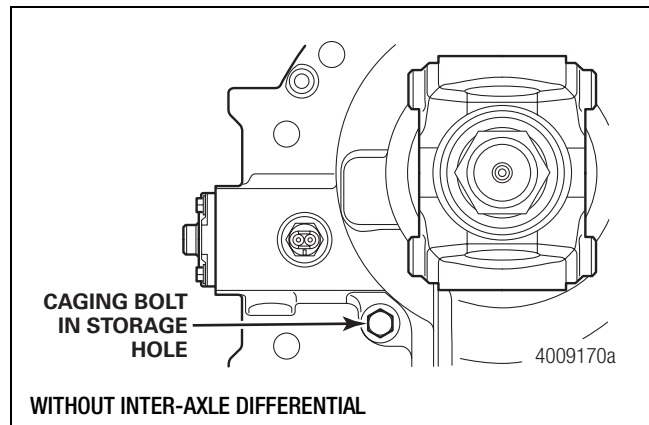


Figure 3

9. Install the caging bolt into the threaded hole in the center of the DCDL cover. Figure 4.

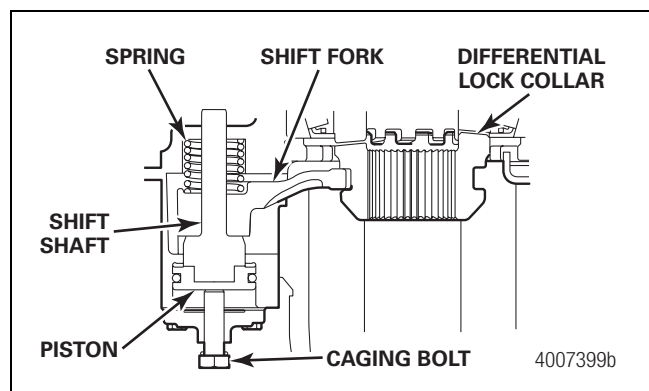



Figure 4

⚠ CAUTION

There will be a small amount of spring resistance felt when you turn in the caging bolt. If a high resistance is felt before reaching the locked or engaged position, stop turning the caging bolt to prevent damage to the cover, fork and bolt threads.

10. Turn the caging bolt clockwise until the head is approximately 0.25-inch (6 mm) from the cylinder cover. Do not turn the caging bolt beyond its normal stop. Figure 4. A high resistance on the caging bolt indicates that the teeth of the shift collar and the differential case half are not aligned or engaged. To align the teeth, use the following procedure.
 - A. Rotate the left-hand wheel to align the teeth of the shift collar and case half while you turn in the caging bolt.

- B. When the normal amount of spring resistance is again felt on the caging bolt, the teeth are aligned. Continue to turn in the caging bolt until the head is approximately 0.25-inch (6 mm) from the cylinder cover. The caging bolt is now in the service position and the main differential lock is completely engaged.

11. Remove the carrier from the axle housing. Refer to the procedures in Maintenance Manual MM-0970 or MM-0990.
12. Release the differential lock by removing the caging bolt from the hole in the center of the DCDL cover. Reinstall the caging bolt with the washer into its original position on the carrier/housing. Tighten the caging bolt to 7-9 lb-ft (10-12 N•m). 

Auxiliary Air Supply Method

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Remove the drain plug from the bottom of the housing and drain the lubricant.
3. Use a jack to raise the left-hand wheel of the drive axle. Place a safety stand under the left-hand axle housing leg to support the vehicle in the raised position.
4. Disconnect the driveline from the input yoke.
5. Disconnect the wiring harness from the DCDL switch.
6. Disconnect the vehicle air line from the inter-axle differential, if equipped, and main differential lock actuator assemblies.
7. Install a suitable air line coupling into the main differential actuator assembly.
8. Install the air line into the coupling.

CAUTION

When you use an auxiliary air supply to engage the driver-controlled main differential lock (DCDL), you must supply air to the DCDL until you remove the carrier. Do not disconnect the air line or reduce air pressure to the DCDL before you remove the carrier from the housing. Damage to components can result.

9. Supply 85 psi (586 kPa) regulated air pressure through the air line.
10. Verify that the DCDL is engaged. Figure 5.
 - A. Rotate the left wheel until the collar engages the teeth on the differential case.
 - B. When the collar engages the teeth on the differential case, the left wheel will not rotate with the right wheel on the ground.

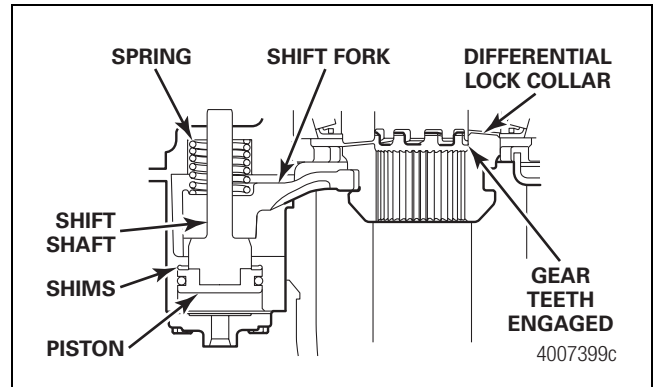


Figure 5

11. Remove the carrier from the axle housing. Refer to the procedures in Maintenance Manual MM-0970 or MM-0990.
12. Shut-off the air supply to the DCDL.
13. Disconnect the air line from the main differential actuator assembly coupling.

Removing the DCDL Shift Unit

1. Remove the sensor switch. Figure 6.

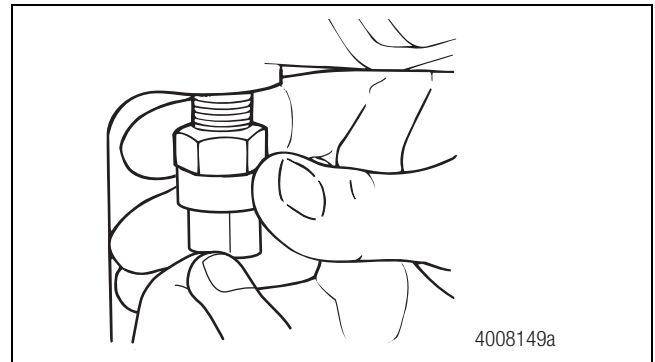


Figure 6

2. Remove the four capscrews and washers that hold the cover. Remove the cover. Figure 7.

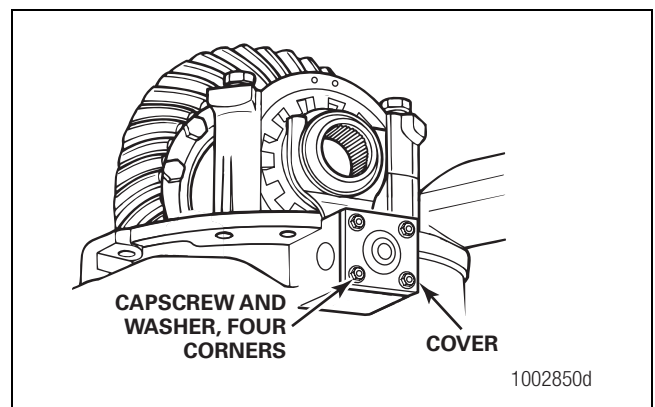


Figure 7

- Use a high-powered magnet or magnetic base of a dial indicator to remove the piston. Inspect the O-ring for any damage such as cracks, cuts or breaks and replace if necessary. Figure 8.

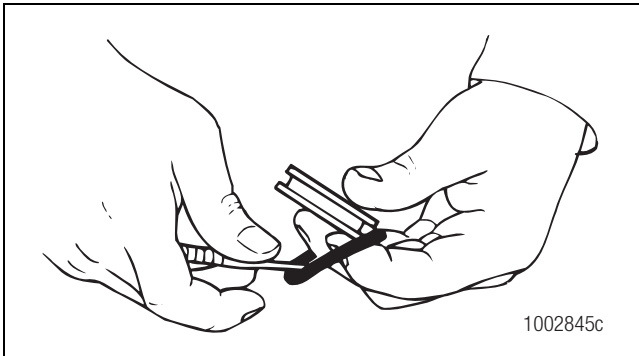


Figure 8

- Remove the shift shaft from the shift fork. Figure 9.

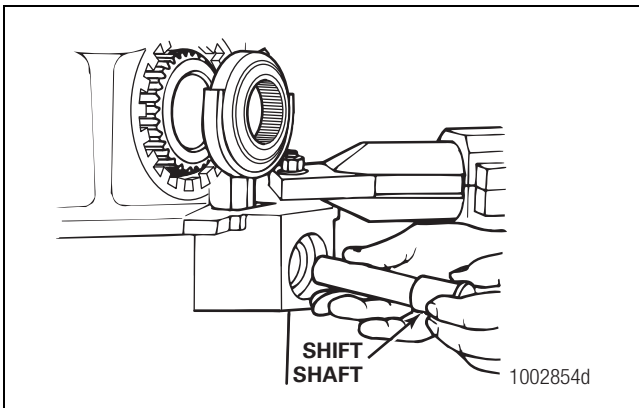


Figure 9

- Remove the shims from the bore.
- Install the spring compression tool over the DCDL bore and finger tighten the retaining screws. The ends of the tool fit through recesses in the housing bore and around the fork. Figure 10.

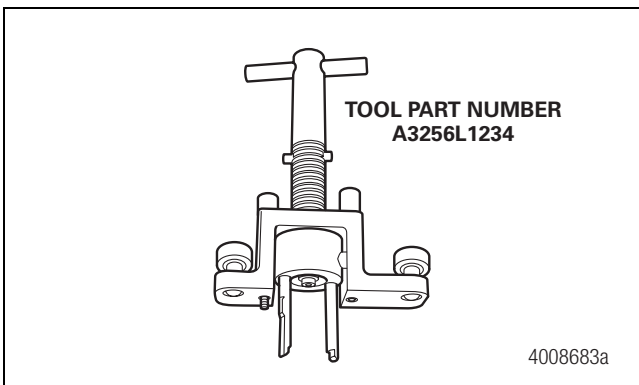


Figure 10

- Tighten the tool handle down until it bottoms to compress the spring. When the spring is compressed below the fork, pull the fork out with the shift collar. Figure 11.

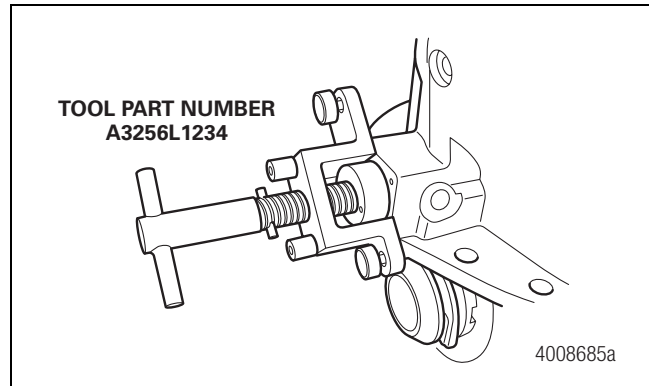


Figure 11

- Loosen the handle on the spring compression tool to release the spring. Loosen the retaining screws and remove the spring compression tool from the carrier.
- Remove the spring. Figure 12.

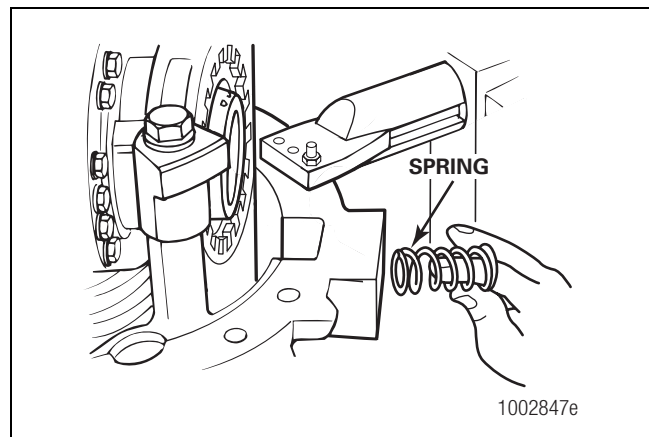


Figure 12

- Further disassembly of these carriers is the same as axles without the driver-controlled main differential lock.

Installing the DCDL Shift Unit

⚠ WARNING

When you apply some silicone gasket materials, a small amount of acid vapor is present. To prevent serious personal injury, ensure that the work area is well-ventilated. Read the manufacturer's instructions before using a silicone gasket material, then carefully follow the instructions. If a silicone gasket material gets into your eyes, follow the manufacturer's emergency procedures. Have your eyes checked by a physician as soon as possible.

Take care when you use Loctite® adhesive to avoid serious personal injury. Read the manufacturer's instructions before using this product. Follow the instructions carefully to prevent irritation to the eyes and skin. If Loctite® adhesive material gets into your eyes, follow the manufacturer's emergency procedures. Have your eyes checked by a physician as soon as possible.

Install the differential shift assembly after the differential carrier is assembled and the gear and bearing adjustments are made.

1. If removed, reinstall the main differential and ring gear assembly. Refer to the procedures in Maintenance Manual MM-0970 or MM-0990.
2. Install the spring into the housing. Figure 13.

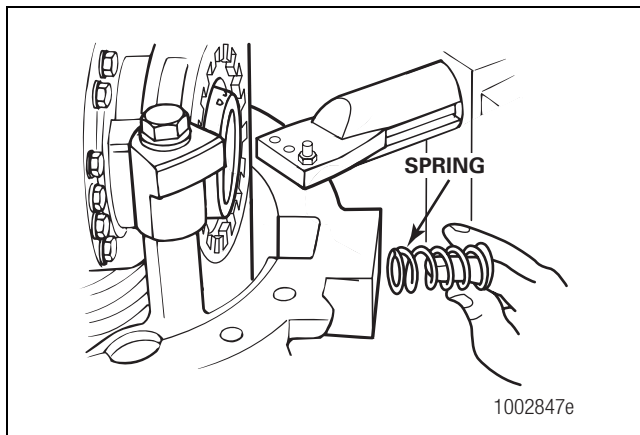


Figure 13

3. Install the spring compression tool over the DCDL bore and finger tighten the retaining screws. Tighten the tool handle down until it bottoms to compress the spring. Figure 14.

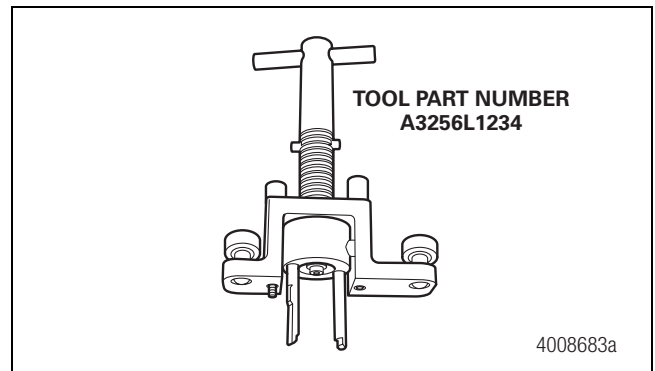


Figure 14

4. Install the clutch collar onto the fork. Slide the clutch collar and fork into position. Insert the end of the fork above the compressed spring while you position the clutch collar to the main differential. The teeth of the clutch collar must face the main differential case teeth. Ensure the spring is correctly seated within the raised areas of the fork. Figure 15.

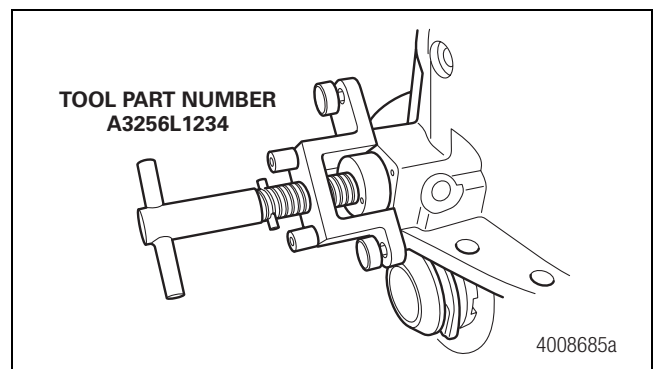


Figure 15

5. While holding the fork in position, loosen the tool handle to release the spring. Loosen the retaining screws and remove the spring compression tool.
6. Insert a centering tool, screwdriver or other suitable tool to align the fork with the shift shaft housing bore. Refer to the tool drawing at the end of this bulletin. Figure 16.

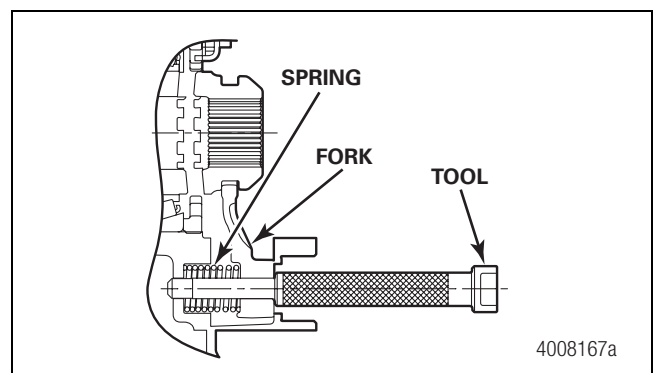


Figure 16

- Apply grease, Meritor specification 2297-U-4519 or 1199-U-1113, to the tapered surface of the shift shaft. Insert the shift shaft into the housing bore through the shift fork and spring. Figure 17. Use a centering tool to seat the shift shaft in the housing bore. Refer to the tool drawing at the end of this bulletin.

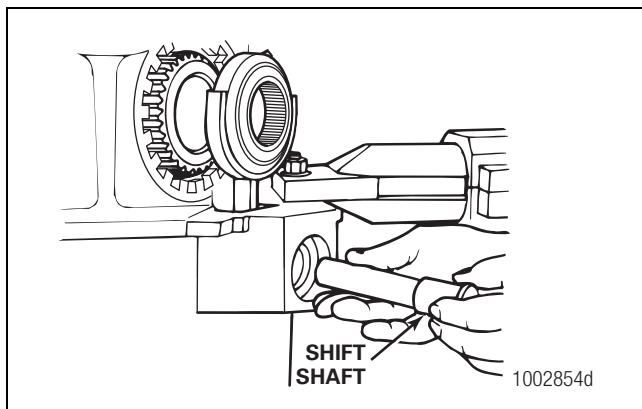


Figure 17

- Install the same amount of shims as were removed.
- Apply grease, Meritor specification 2297-U-4519 or 1199-U-1113, to the O-ring and piston. Install the O-ring onto the piston. Install the piston into the housing.
- Apply Loctite® 242 threadlocker to the capscrew holes. Install the DCDL cover plate with the gasket onto the housing. Install the washers and capscrews. Tighten the capscrews to 50 ± 10 lb-in (6 ± 1 N•m). Figure 18.

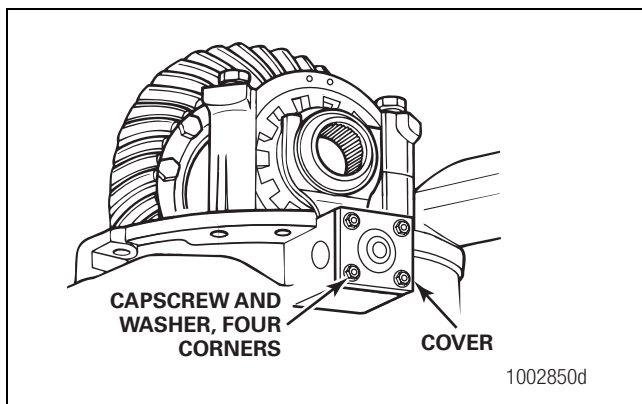


Figure 18

- Apply shop air to the DCDL assembly to engage the DCDL lock collar into locked position.
- Ensure the collar moves freely in the engaged position and is not binding on the fork levers.

- Check the clearance between the teeth of the clutch collar and the main differential case to ensure there is 0.020-0.040-inch (0.5-1.0 mm) clearance. If necessary, remove the piston and add or remove shims. Reassemble and retest until correct clearance is achieved. Figure 19.

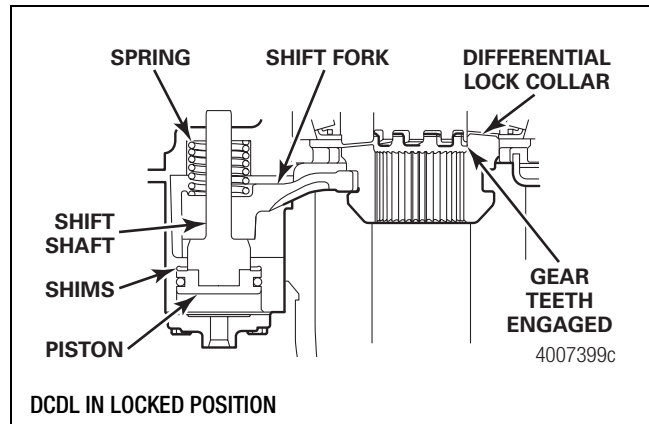


Figure 19

CAUTION

When tightening the caging bolt, do not exceed 50 lb-in (7 N•m). Damage to components can result.

- Remove the shop air from the DCDL lock cover and install the DCDL caging bolt. Check to see that the DCDL teeth are engaged with the main differential case teeth while engaging the caging bolt. Do not exceed 50 lb-in (7 N•m) when tightening the caging bolt. When installing the carrier, leave the caging bolt in until the axle shafts are installed. Also, it is necessary to cage the DCDL when removing the carrier. Figure 20.

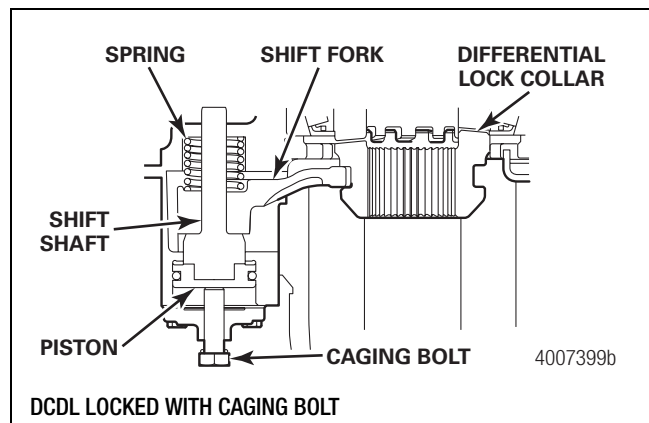


Figure 20

- Engage the DCDL so the shift collar is in the locked position and install the sensor switch into its hole but do not tighten. Figure 21.

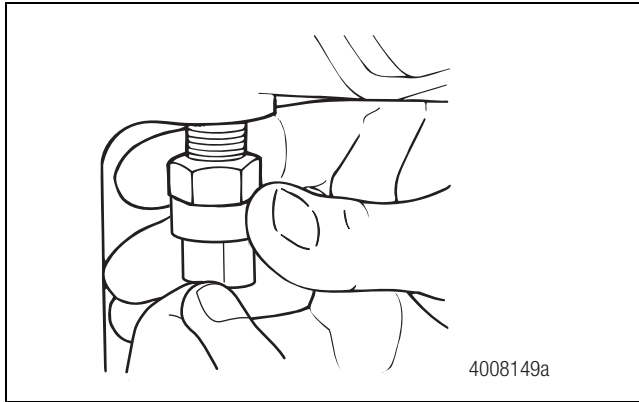




Figure 21

16. Connect a volt-ohm meter to the sensor switch. Select ohms on the meter. Rotate the switch CLOCKWISE until the meter reading changes from infinity to less than one ohm. Turn in the switch fully and tighten to 25-55 lb-ft (35-75 N•m). 
17. Connect the wiring harness to the DCDL switch.
18. Apply 85 psi (586 kPa) of air and verify the DCDL engages.
19. Check the sensor switch operation with the air applied. The differential lock indicator light in the cab of the vehicle should be ON when the DCDL is engaged, and OFF when disengaged. The indicator light will also activate if the DCDL is partially engaged.
20. When testing is complete, reinstall the caging bolt into its threaded hole and tighten to 7-11 lb-ft (10-15 N•m). 

Checking the Differential Lock

1. Shift the vehicle transmission into neutral. Start the engine to get the system air pressure to the normal level.

WARNING

Do not start the engine and engage the transmission during disassembly of the driver-controlled main differential lock (DCDL), or when the DCDL is in the locked or engaged position, and the vehicle's wheels are raised from the floor. The vehicle can move and cause serious personal injury and damage to components.

2. Place the differential lock switch in the cab of the vehicle in the unlocked or disengaged position.
3. Drive the vehicle at 5-10 mph (8-16 km/h) and check the differential lock indicator light. The light must be off when the switch is in the unlocked or disengaged position.

4. Continue to drive the vehicle and place the differential lock switch in the locked or engaged position. A slight left or right turn may be required to lock the DCDL. Let up on the accelerator to remove the driveline torque and permit the shift. The indicator light must be on when the switch is in the locked position.

- **If the indicator light remains ON with the switch in the unlocked position:** The differential is still in the locked position. A slight left or right turn may be required to unlock the DCDL.
- **If the indicator light remains on after completing a slight left or right turn:** Check the piston and shift shaft for binding. If necessary, take them apart and check both for burrs, scratches and damage. Replace the parts if necessary. Refer to the removal procedure for further instructions.

DCDL Driver Caution Alert Label

Verify that the driver caution label is installed in the vehicle cab. Figure 22. The caution label must be placed in a location that is easily visible to the driver. The recommended location is on the instrument panel, next to the differential lock switch and lock indicator light.

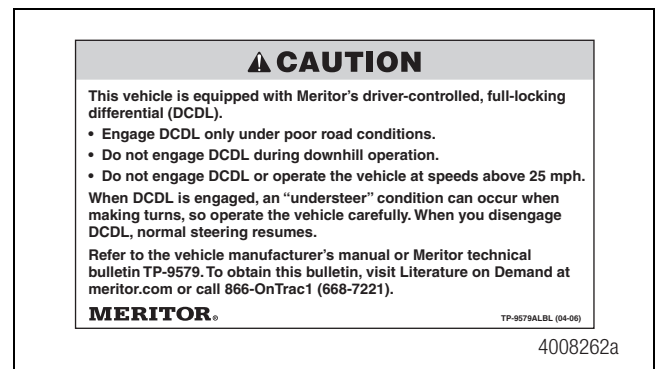
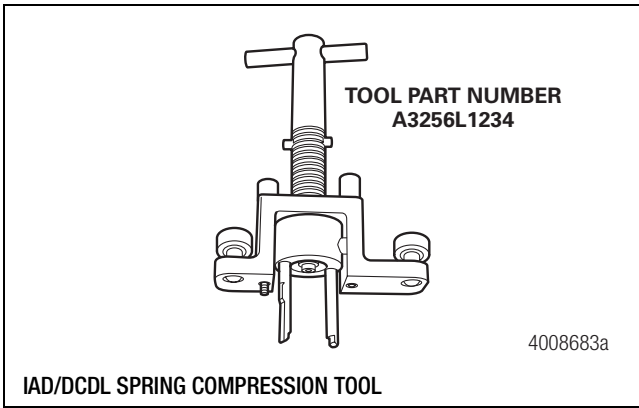


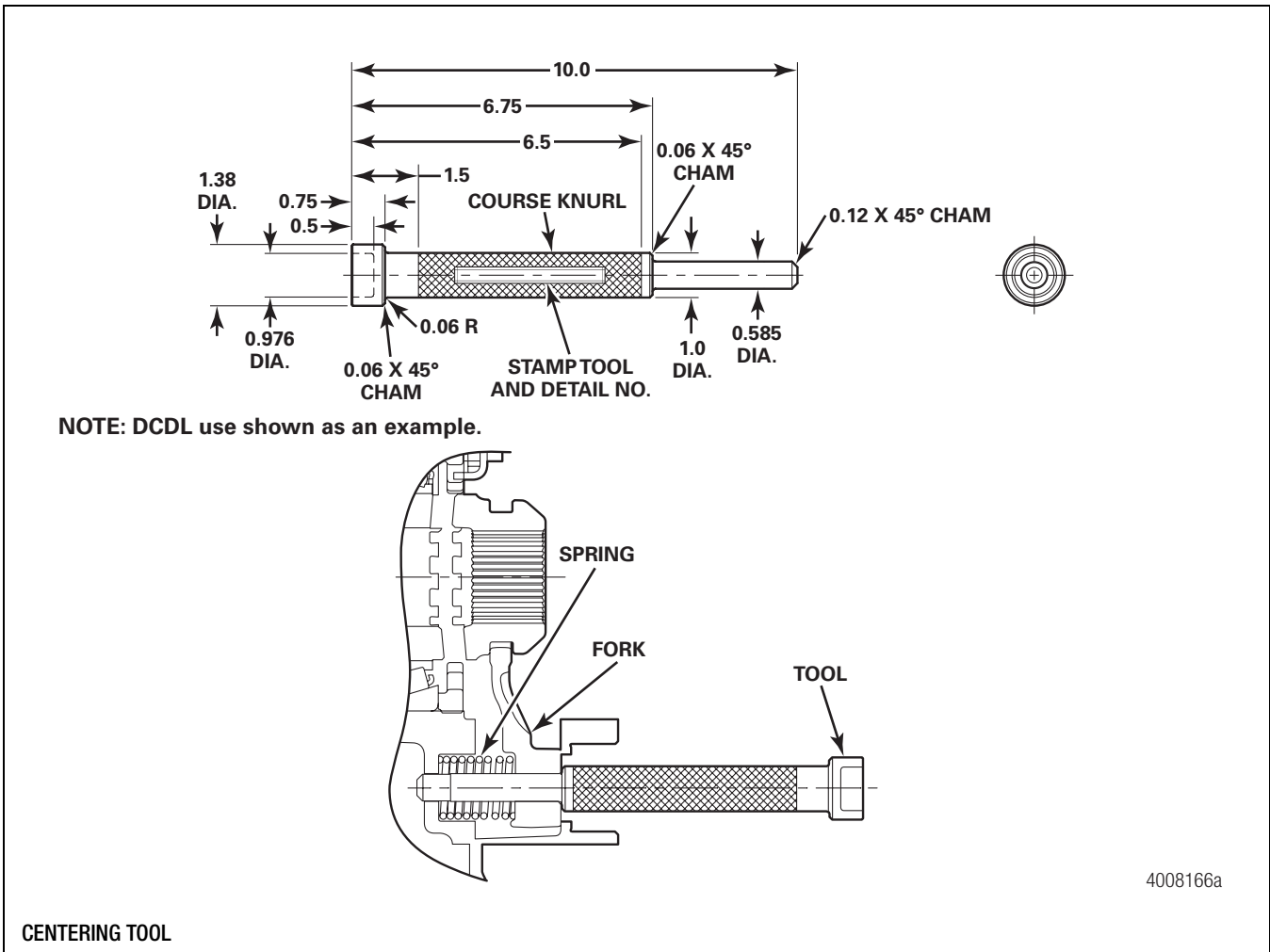
Figure 22

Tools



IAD/DCDL SPRING COMPRESSION TOOL

Figure 23



NOTE: DCDL use shown as an example.

CENTERING TOOL

Figure 24



Meritor Heavy Vehicle Systems, LLC
 2135 West Maple Road
 Troy, MI 48084 USA
 866-OnTrac1 (668-7221)
 meritor.com

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