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Eaton® Fuller® and Meritor™ Transmission Removal and Installation

Removal

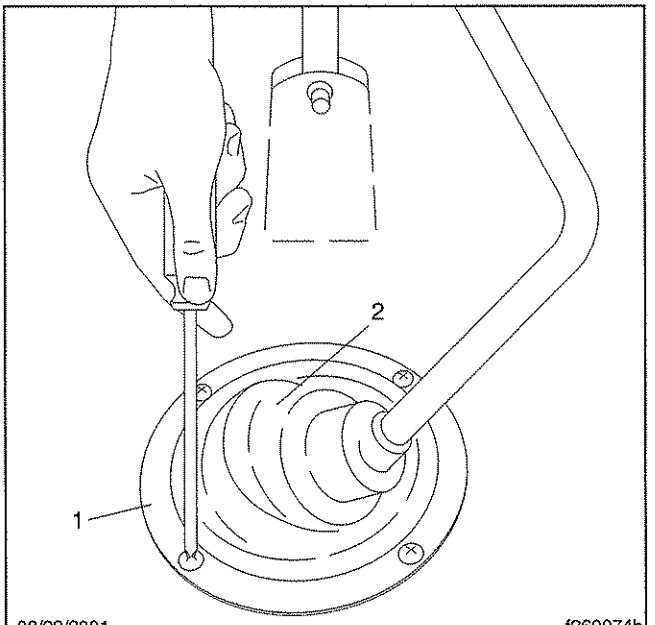
1. Park the vehicle on a level surface. Shut down the engine, set the parking brake, and chock the tires.

⚠ WARNING

Wear safety goggles when draining the air system or loosening an air line because dirt or sludge could fly out at high speeds. Don't direct the airstreams at anyone. Don't disconnect pressurized hoses, since they may whip as air escapes. Failure to take all necessary precautions could result in personal injury.

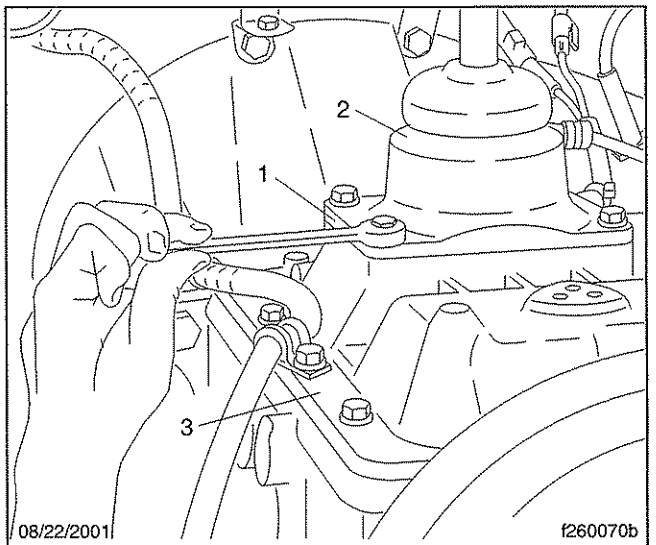
2. If applicable, drain the vehicle system at the air reservoirs.
3. If applicable, disconnect the transmission air supply and signal lines. Label the lines for reconnection.
4. Remove the shift lever from the transmission.
   - 4.1 Place the transmission in high gear.
   - 4.2 Remove the four screws from the retaining ring around the shift lever boot. See **Fig. 1**. Remove the ring and the boot.
   - 4.3 Remove the four capscrews from the plate holding the shift tower to the top cover. See **Fig. 2**.
   - 4.4 Lift up on the shift lever assembly and remove it and the air signal lines (if applicable). See **Fig. 3**.
   - 4.5 Cover the opening in the shift tower to prevent entry of dirt.
5. Disconnect the driveshaft from the transmission.
   - 5.1 If the vehicle is equipped with a driveline parking brake, remove the nuts on the brake flange. See **Fig. 4**.

     If the vehicle is not equipped with a driveline parking brake, remove the transmission yoke U-joint end caps.
   - 5.2 Loosen the bolts holding the midship bearing bracket so that the driveshaft can slide to the rear. See **Fig. 5**.
   - 5.3 Slide the front of the driveshaft off of the driveline brake flange or out of the transmission output yoke.



1. Ring
2. Boot

Fig. 1, Shift Lever Ring and Boot



1. Plate
2. Shift Tower
3. Top Cover

Fig. 2, Shift Tower Removal

Eaton® Fuller® and Meritor™ Transmission Removal and Installation

NOTE: It may be necessary to remove the bolts from the midship bearing bracket so that the driveshaft can be moved far enough back.

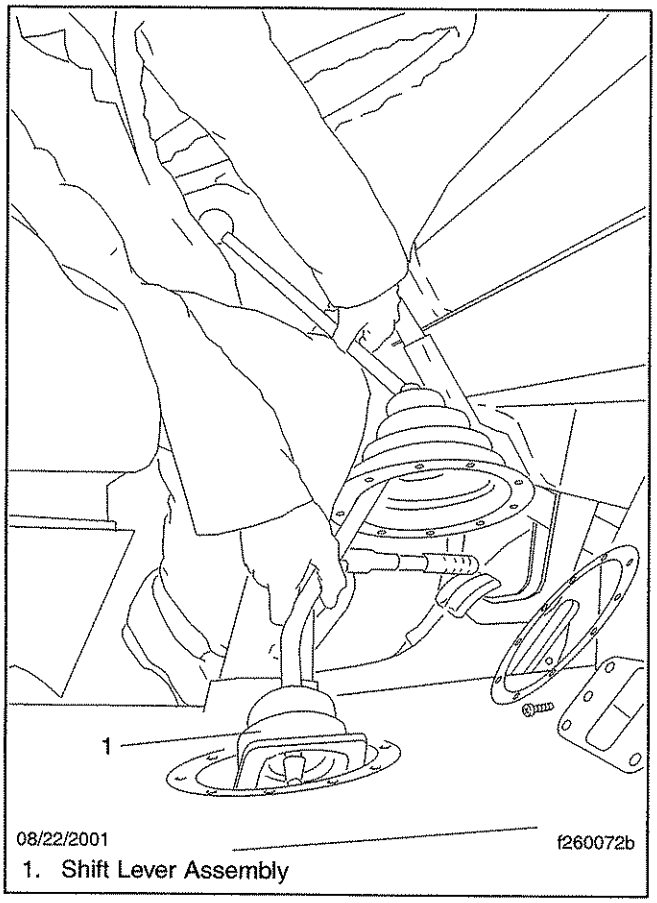
5.4 Support the disconnected driveshaft or tie it out of the way.

6. Remove all electrical connections from the transmission.

6.1 Disconnect the back-up light harnesses. See **Fig. 6**.

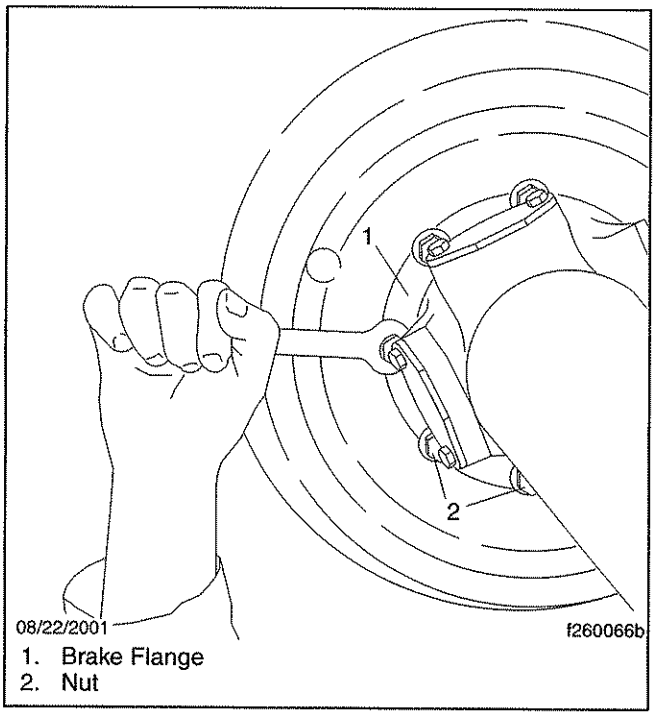
6.2 Disconnect the electrical harness from the speedometer sensor. See **Fig. 7**.

6.3 Loosen the capscrews holding the speedometer sensor wiring harness to the transmission. See **Fig. 8**. Move the harness out of the way.



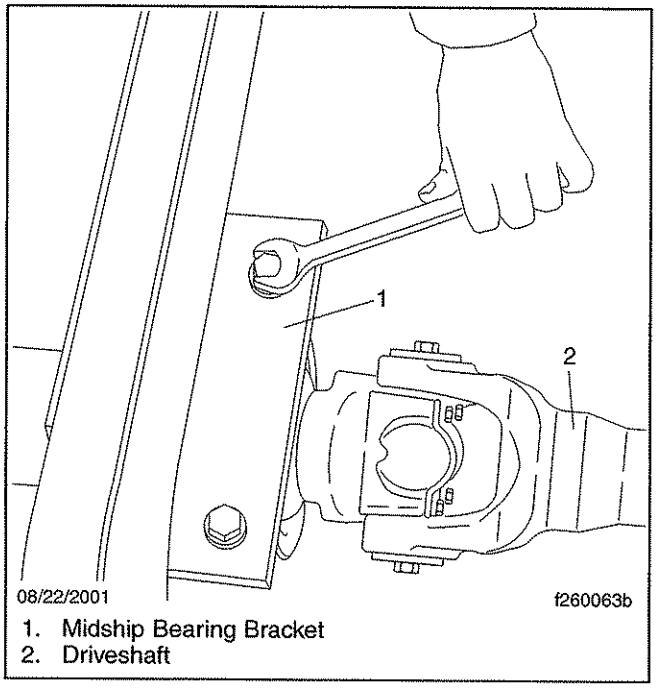
1. Shift Lever Assembly

Fig. 3, Remove the Shift Lever Assembly



1. Brake Flange
2. Nut

Fig. 4, Brake Flange (driveline parking brake)



1. Midship Bearing Bracket
2. Driveshaft

Fig. 5, Midship Bearing Bracket

Eaton® Fuller® and Meritor™ Transmission Removal and Installation

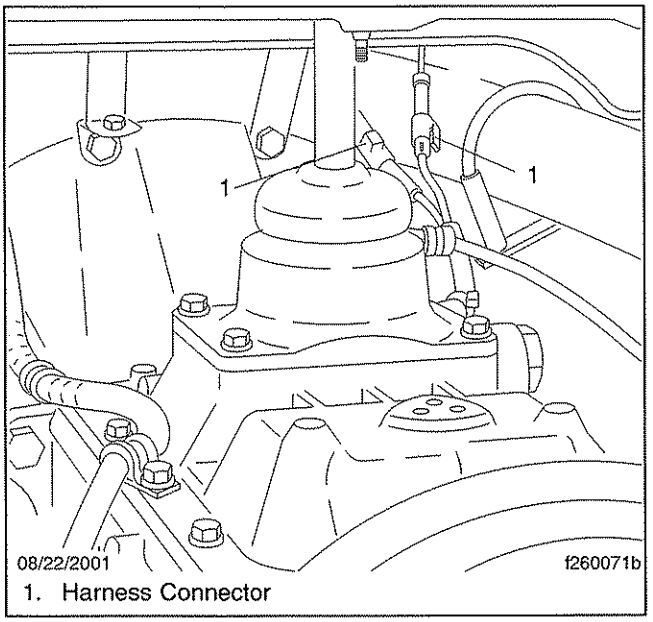


Fig. 6, Back-Up Light Harness Connectors

7. If the vehicle is equipped with a driveline parking brake, remove the cotter pin holding the clevis to the driveline brake lever. See **Fig. 9**. Remove the two bolts holding the driveline brake cable bracket to the transmission, then remove the bracket.
8. On vehicles with a manual clutch, disconnect the clutch linkage rod from the clutch release lever. Rotate the clutch release yoke so it will clear the clutch release bearing.

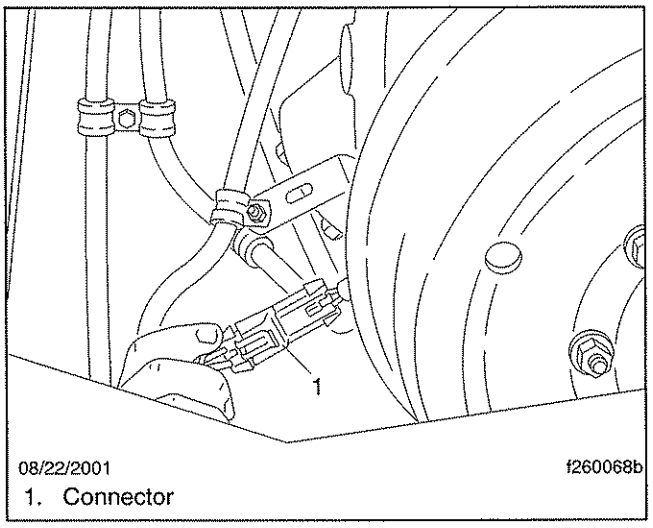


Fig. 7, Speedometer Sensor Connector

9. On vehicles with a hydraulic clutch, disconnect and move the clutch slave cylinder.
   9.1 Remove the cotter pin holding the slave cylinder clevis to the clutch release lever. See **Fig. 10**.

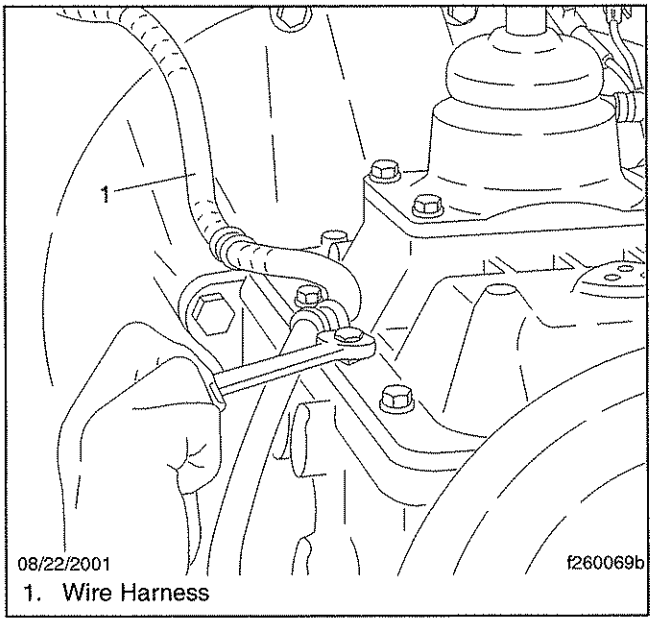


Fig. 8, Speedometer Sensor Wire Harness

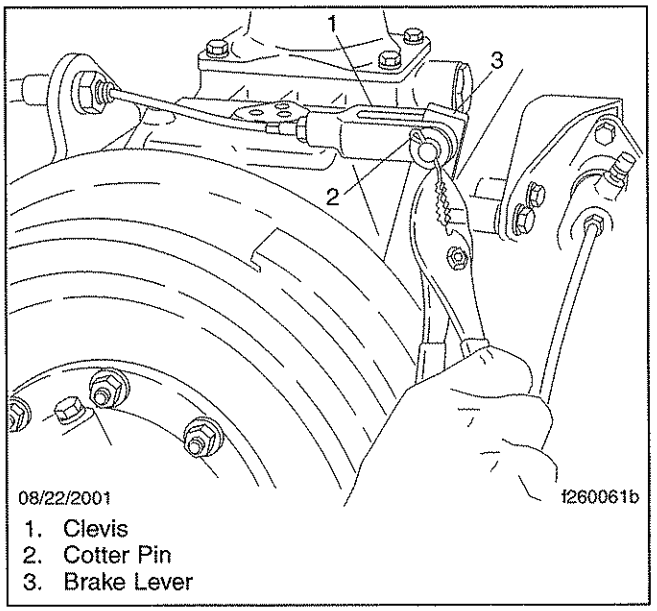


Fig. 9, Driveline Brake Lever and Clevis

Eaton® Fuller® and Meritor™ Transmission Removal and Installation

9.2 Remove the two capscrews holding the clutch slave cylinder bracket to the transmission. See **Fig. 11**. Remove the slave cylinder, and support it.

10. If the vehicle is equipped with optional dual fuel tanks, remove the fuel crossover line and the support between the tanks.

10.1 Remove the mounting clamps holding the fuel crossover line to the support. See **Fig. 12**.

10.2 Remove the support mounting bolts. See **Fig. 13**. Then, remove the support.

10.3 Close the fuel crossover line shutoff valve at the bottom of the passenger-side fuel tank. See **Fig. 14**.

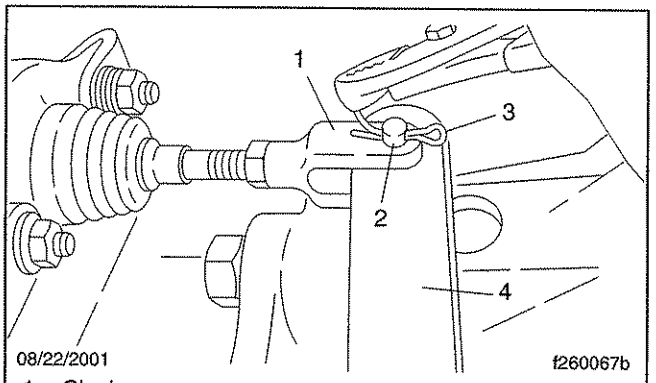
10.4 Remove the allen-head plug in the driver-side fuel tank and drain the tank. See **Fig. 15**.

10.5 Disconnect the fuel crossover line from the driver-side fuel tank. See **Fig. 16**.

11. Support the transmission with a jack.

11.1 Position a transmission jack under the transmission and raise the support plates against the bottom of the transmission.

11.2 Adjust the support plates to cradle the transmission.



1. Clevis
2. Clevis Pin
3. Cotter Pin
4. Clutch Release Lever

Fig. 10, Clutch Release Lever and Clevis

11.3 Using a chain, secure the transmission to the jack.

12. Remove the transmission.

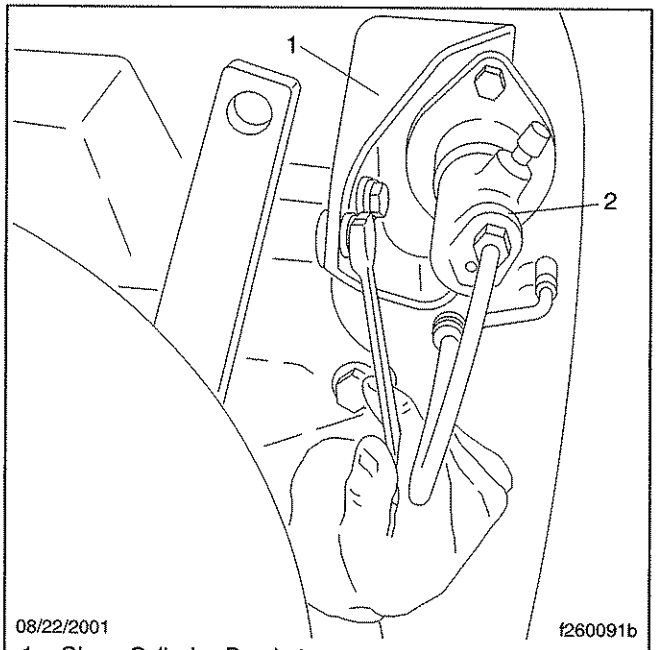
12.1 Remove the capscrews that hold the bell housing to the flywheel housing, and remove the bell housing with the transmission.

12.2 Pull the transmission and jack straight back, until the transmission input shaft is clear of the clutch.

12.3 If required, lower the jack supporting the transmission. Raise the front of the vehicle and slide the transmission and jack out from under the vehicle.

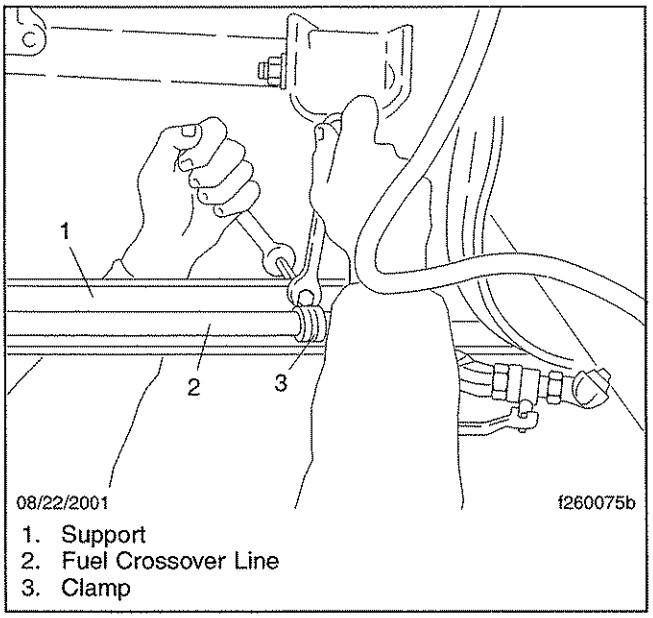
⚠ CAUTION

Do not allow the rear of the transmission to drop, and do not let the transmission hang unsupported in the splined hubs of the clutch disc(s). Keep the flange of the bell housing parallel (all the way around) to the flange of the flywheel housing, until the input shaft is clear of the clutch. Taking these



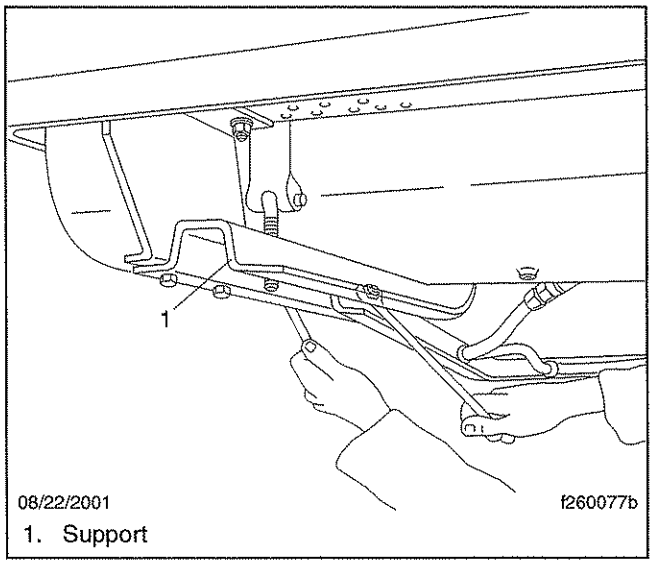
1. Slave Cylinder Bracket
2. Slave Cylinder

Fig. 11, Slave Cylinder and Bracket



1. Support
2. Fuel Crossover Line
3. Clamp

Fig. 12, Fuel Crossover Line Clamp



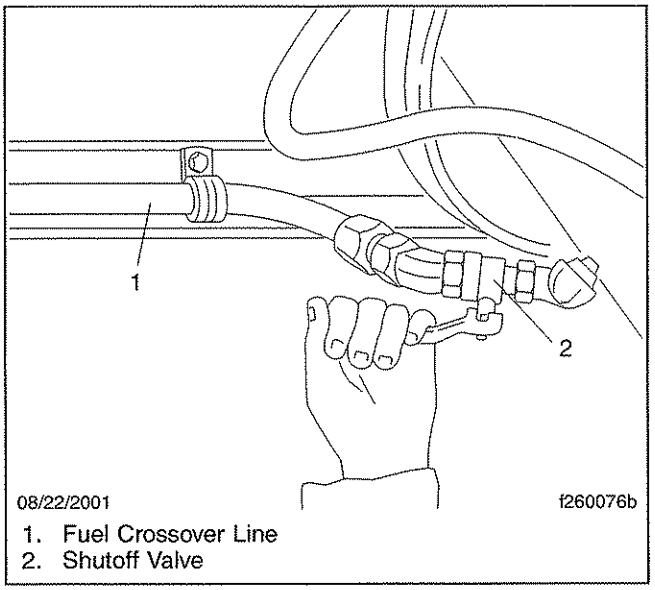
1. Support

Fig. 13, Fuel Crossover Line Support

precautions will prevent damage to the clutch disc(s).

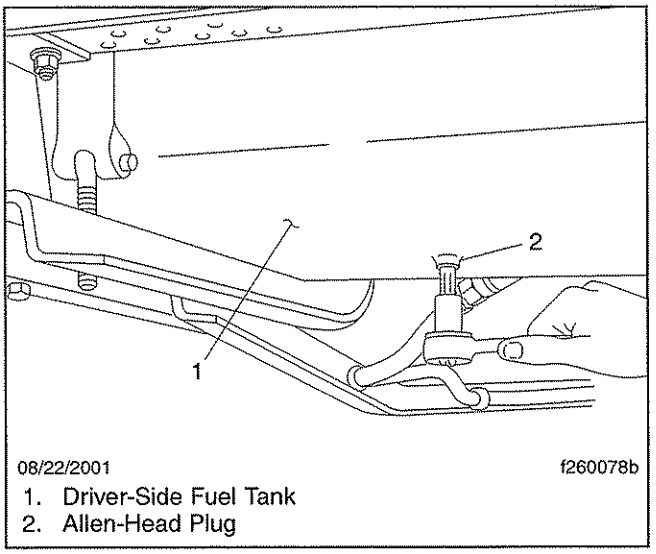
Installation

IMPORTANT: Before installing the transmission, ensure that the rear tires are securely chocked and that



1. Fuel Crossover Line
2. Shutoff Valve

Fig. 14, Fuel Crossover Line Shutoff Valve



1. Driver-Side Fuel Tank
2. Allen-Head Plug

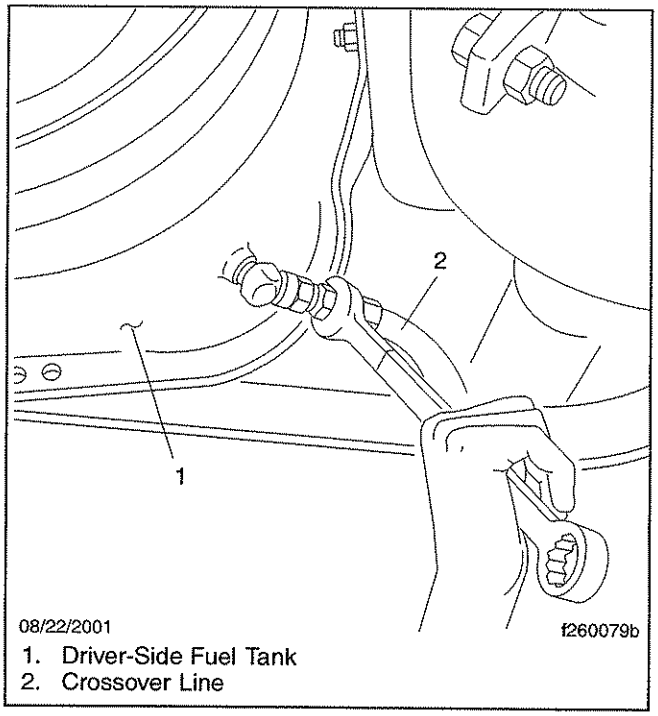
Fig. 15, Fuel Tank Drain Plug

the transmission is securely chained to the transmission jack support plates.

1. If the vehicle is equipped with a clutch brake, install it on the transmission input shaft. Slide it tightly against the input shaft bearing cap.

NOTE: When installing a torque-limiting clutch brake on an Eaton Fuller transmission, install the smaller face toward the transmission.

Eaton® Fuller® and Meritor™ Transmission Removal and Installation



1. Driver-Side Fuel Tank
2. Crossover Line

Fig. 16, Fuel Crossover Line (at driver-side fuel tank)

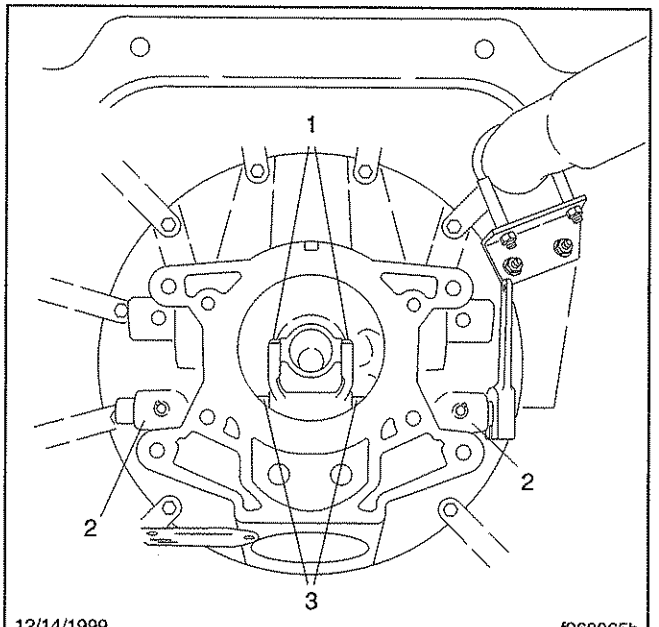
2. Check for wear on the fingers of the clutch release yoke, release shaft, and the release shaft bushings. Replace any worn parts, as needed. See **Fig. 17**.
3. Install the transmission.
   - 3.1 Shift the transmission into gear, so that the transmission input shaft can be rotated during assembly to align it with the clutch driven-disc hub splines.
   - 3.2 Align the jack and the transmission behind the engine. Raise the transmission, and adjust the angle of the jack until the bell housing and the transmission input flange (single-countershaft transmissions) or the flywheel housing flange and the bell housing flange (twin-countershaft transmissions) are parallel.
   - 3.3 Push the transmission and jack straight forward making sure that the flanges remain parallel.

   NOTE: On twin-countershaft transmissions, be sure that the release-bearing yoke clears the bearing, and is rotated over the wear pads as the transmission is moved forward. See **Fig. 18**. Align the splines by turning the transmission output shaft.
   - 3.4 Reach through the access hole in the bottom of the bell housing and hold the release bearing in place by hand. See **Fig. 19**.
   - 3.5 Slide the splined input shaft into the clutch driven disc.

⚠ CAUTION

Use care to avoid springing the driven disc(s) when the transmission is being installed. Do not force the transmission into the bell housing if it does not enter freely. Do not let the transmission drop or hang unsupported in the driven disc(s). These practices can damage the clutch assembly.

   - 3.6 Install the capscrews holding the bell housing to the flywheel housing and tighten 34 lbf·ft (46 N·m).



1. Release Shaft Bushing
2. Clutch Release Yoke Finger
3. Clutch Release Shaft

Fig. 17, Clutch Release Mechanism

3.7 Remove the chain securing the transmission to the jack, then remove the jack.

4. If the vehicle is equipped with the optional dual fuel tanks, install the fuel crossover line and the support between the tanks.

4.1 Install the allen-head drain plug in the driver-side fuel tank. See **Fig. 15**. Tighten it finger tight; then, tighten it 1-1/2 turns more.

4.2 Install the fuel crossover line support and the mounting bolts and tighten 95 lbf·ft (129 N·m). See **Fig. 13**.

4.3 Connect the fuel crossover line to the driver-side fuel tank. See **Fig. 16**.

4.4 Open the fuel crossover line shutoff valve at the bottom of the passenger-side fuel tank. See **Fig. 14**.

4.5 Install the mounting clamps holding the fuel crossover line onto the support and tighten 40 lbf·ft (54 N·m). See **Fig. 12**.

5. On vehicles with a manual clutch, connect the clutch rod to the clutch release lever, as removed.

6. On vehicles with a hydraulic clutch, install and connect the clutch slave cylinder.

6.1 Install the two capscrews holding the clutch slave cylinder bracket to the transmission and tighten 40 lbf·ft (54 N·m). See **Fig. 11**.

6.2 Attach the slave cylinder clevis to the clutch release lever; then, insert and lock the cotter pin. See **Fig. 10**.

7. If the vehicle is equipped with a driveline parking brake, mount the driveline brake cable bracket to the transmission. Install the two bolts and tighten 100 lbf·ft (136 N·m). Attach the clevis to the brake lever; then, insert and lock the cotter pin. See **Fig. 9**.

8. Connect all electrical lines to the transmission.

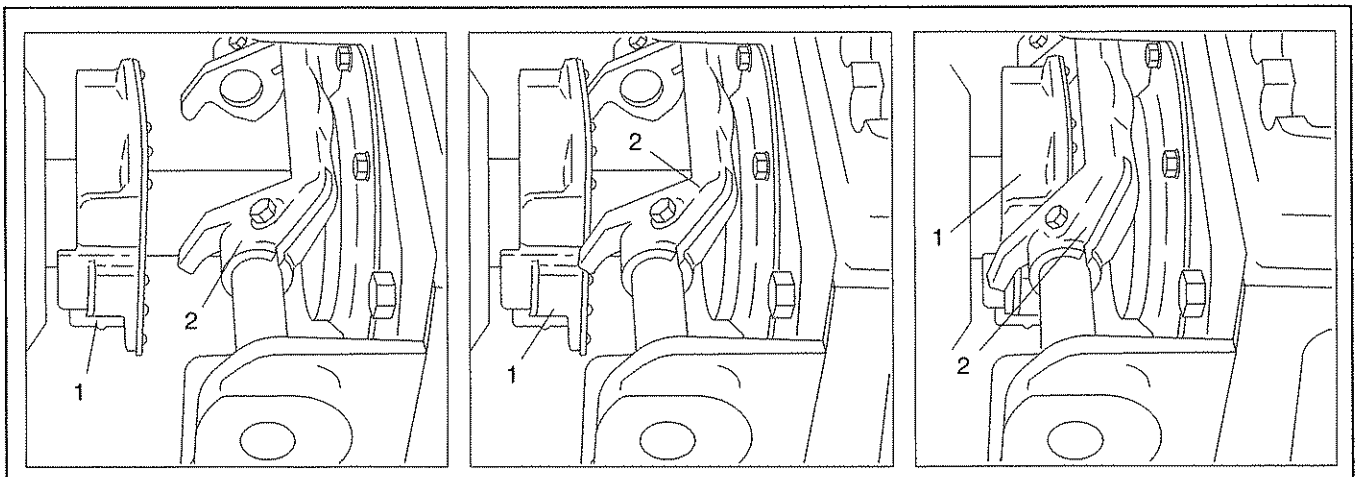
8.1 Connect the back-up light harness connectors. See **Fig. 6**.

8.2 Connect the electrical harness to the speedometer sensor. See **Fig. 7**.

8.3 Install the speedometer sensor wiring harness. Install the capscrews attaching it to the transmission and tighten 40 lbf·ft (54 N·m). See **Fig. 8**.

9. Connect the driveshaft.

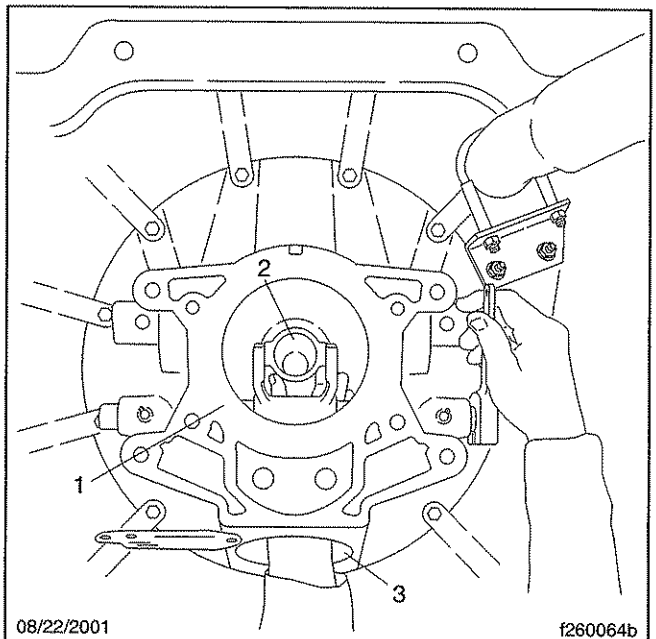
9.1 Slide the front of the driveshaft into the transmission output yoke or onto the driveline parking brake flange, if so equipped.



1. Release Bearing
2. Yoke

Fig. 18, Release Bearing and Yoke

Eaton® Fuller® and Meritor™ Transmission Removal and Installation



1. Bell Housing
2. Release Bearing
3. Access Hole

Fig. 19, Release Bearing

9.2 On vehicles without a driveline parking brake, install the transmission yoke U-joint end caps and tighten 45 lbf·ft (61 N·m).

On vehicles with a driveline parking brake, slide the driveshaft flange onto the studs in the parking brake.

Install the nuts and tighten 40 lbf·ft (54 N·m).

9.3 Install the capscrews and the nuts on the midship bearing bracket and tighten 95 lbf·ft (129 N·m).

10. Install the shift lever.

10.1 Remove the covering from the opening in the shift tower.

10.2 Install the shift lever and the plate. See **Fig. 3**.

10.3 Install the four capscrews in the plate and tighten 40 lbf·ft (54 N·m). See **Fig. 2**.

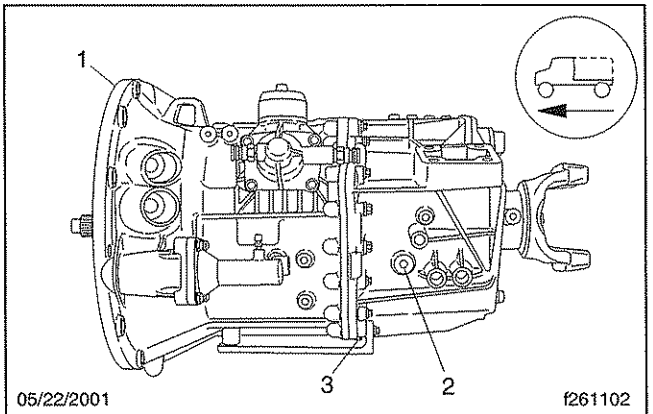
10.4 Install the rubber boot and the retaining ring. Install the four screws and tighten them 28 lbf·ft (38 N·m). See **Fig. 1**.

11. If applicable, connect the air signal and supply lines to the transmission.

Mercedes-Benz Transmission Removal and Installation

Removal

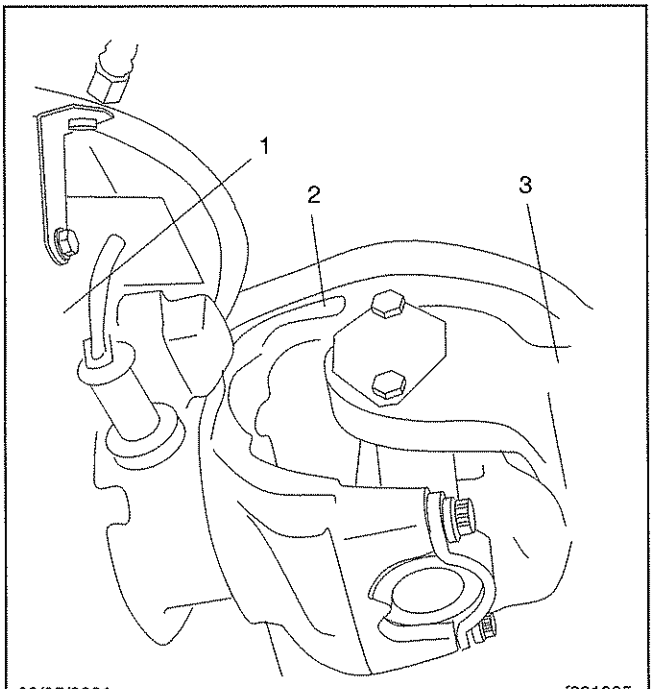
1. Park the vehicle on a level surface. Shut down the engine, set the parking brake, and chock the rear tires.
2. Drain the transmission fluid. See **Fig. 1** for the location of the drain plug.
3. Disconnect the driveshaft from the transmission.
   - 3.1 Support the midship bearing.
   - 3.2 Remove the bolts from the U-joint end caps and slide the front of the driveshaft out of the transmission output yoke. See **Fig. 2**.
   - 3.3 Remove the midship bearing bracket. See **Fig. 3**.
   - 3.4 Support the disconnected driveshaft and chain it out of the way. See **Fig. 4**.
4. Remove the shift lever from the transmission.
   - 4.1 Before removing the shift lever, place the transmission in high gear.
   - 4.2 Disconnect the electrical connector from the shift lever and mark it with a paint pen for ease of installation.
   - 4.3 Remove the four screws from the retaining ring around the shift lever boot. See **Fig. 5**. Remove the ring and the boot.



NOTE: The transmission is shown from the left-hand side.

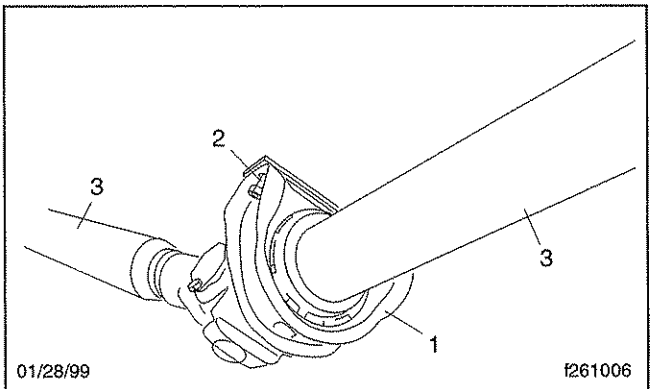
1. Transmission
2. Fill Plug
3. Drain Plug

Fig. 1, Transmission Drain and Fill Plugs



1. Transmission
2. Output Yoke
3. Driveline

Fig. 2, Output Yoke



1. Midship Bracket
2. Mounting Bolt
3. Driveline

Fig. 3, Midship Bearing Bracket

Mercedes-Benz Transmission Removal and Installation

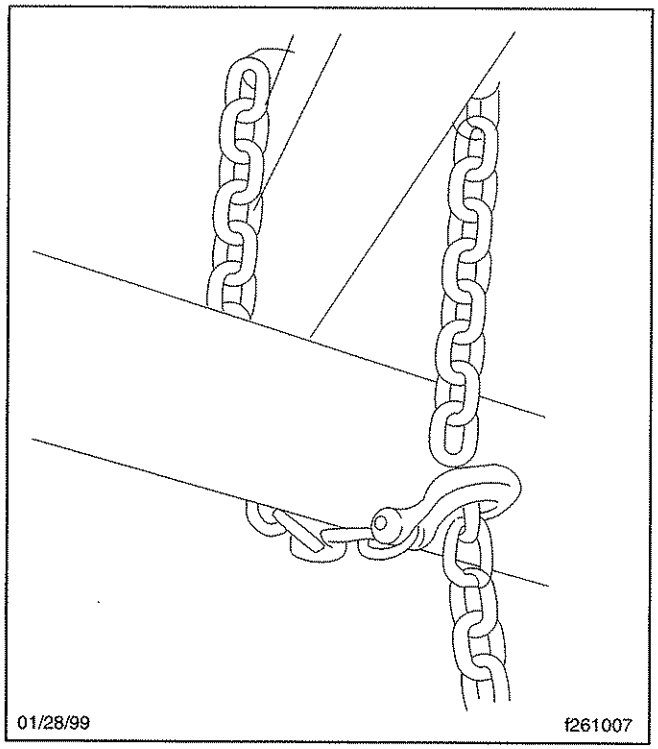


Fig. 4, Support the Driveline

4.4 Remove the head of the shift lever from the shift linkage on the transmission. See **Fig. 6**.

5. Remove the fuel lines and the fuel line standoff bracket from the transmission. See **Fig. 7**.

6. Disconnect the electrical connectors for the reverse gear switch and the optional starter lock switch (if installed). Mark with a paint pen for ease of installation.

⚠ WARNING

Do not press down on the clutch pedal after removing the slave cylinder. Hydraulic brake fluid may squirt out, causing personal injury and damage to the vehicle.

7. Remove the bolts attaching the clutch slave cylinder to the mounting bracket. Move the slave cylinder out of the way. See **Fig. 8**.

8. Bend back the nut retainers and remove the power take-off unit (PTO). See **Fig. 9**.

9. If the vehicle is equipped with optional dual fuel tanks, remove the fuel cross-over line and its support between the tanks.

10. Disconnect the electrical cable from the speedometer sensor and mark it with a paint pen for ease of installation. See **Fig. 10**.

11. Remove the battery cable bracket(s) around the transmission and move the battery cables out of the way. See **Fig. 11**.

12. Remove the exhaust clamp at the exhaust elbow. For ease of transmission removal and installation, move the exhaust pipe to the side and out of the way.

13. Support the transmission with a jack. See **Fig. 12**.

    13.1 Position a transmission jack under the transmission and raise its support plates against the base of the transmission.

    13.2 Adjust the support plates to cradle the transmission.

    13.3 Using a chain, secure the transmission to the jack.

14. Remove the 16-mm capscrews attaching the timing case to the bell housing. See **Fig. 13**.

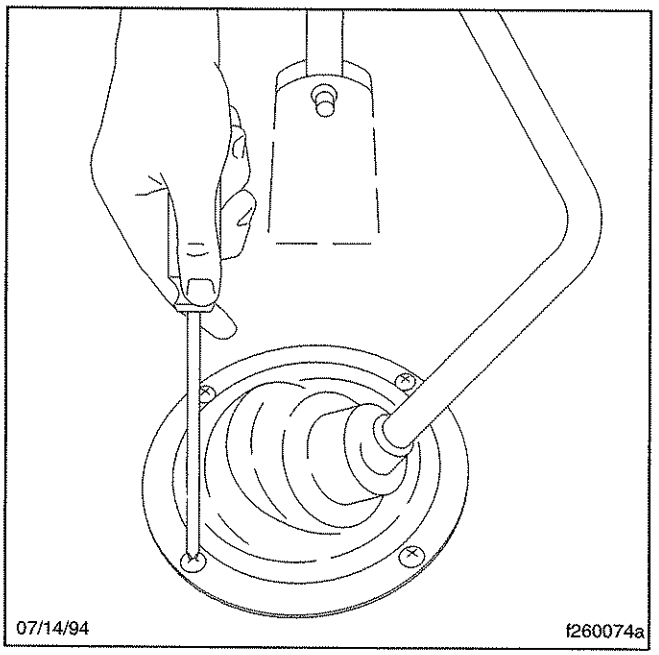
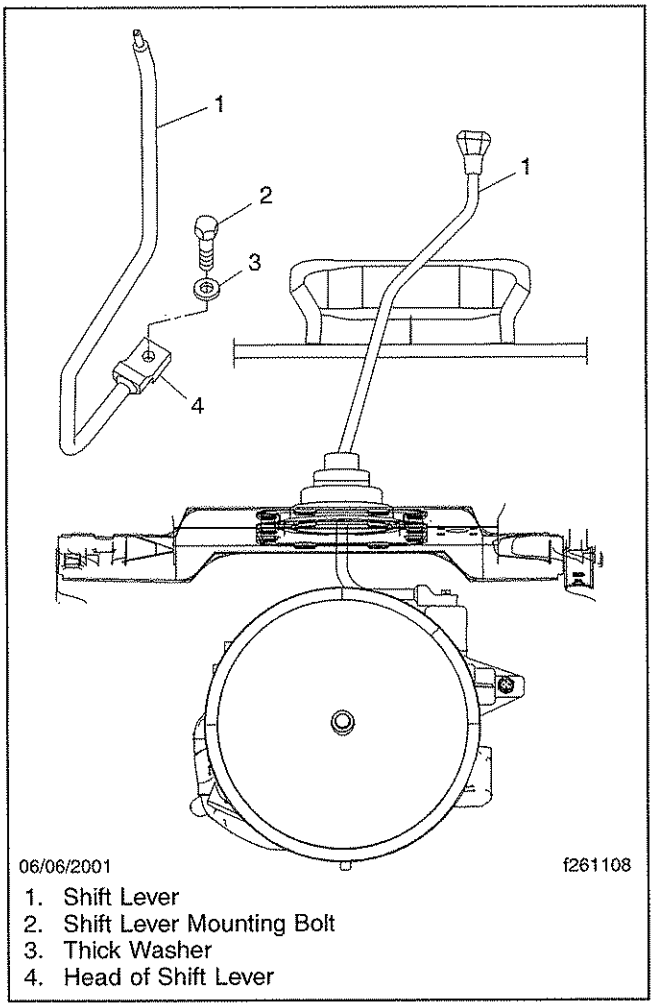


Fig. 5, Shift Lever and Boot

Mercedes-Benz Transmission Removal and Installation



1. Shift Lever
2. Shift Lever Mounting Bolt
3. Thick Washer
4. Head of Shift Lever

Fig. 6, Shift Lever Connection

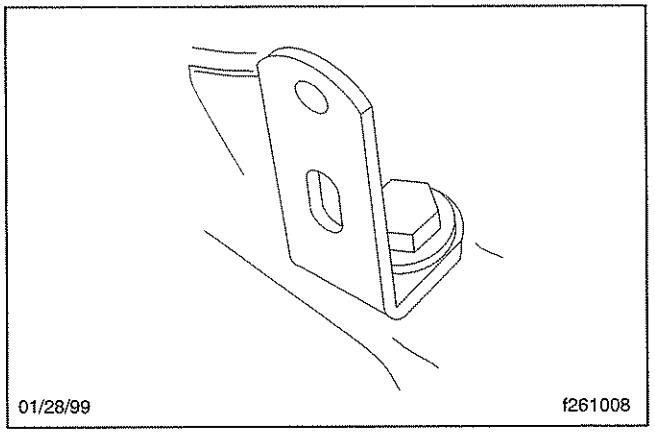
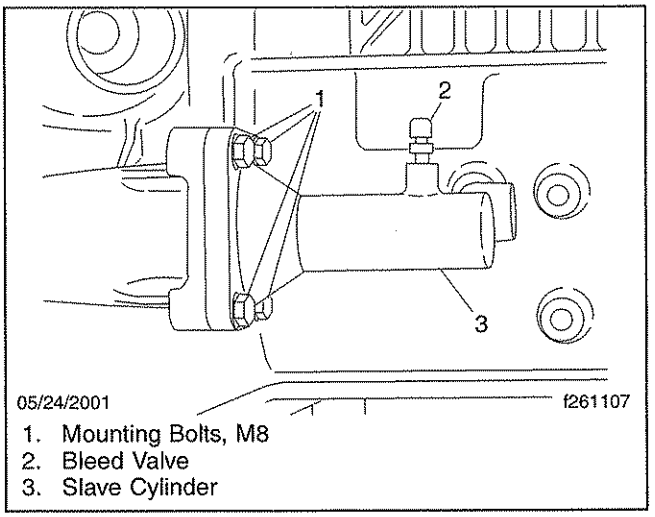
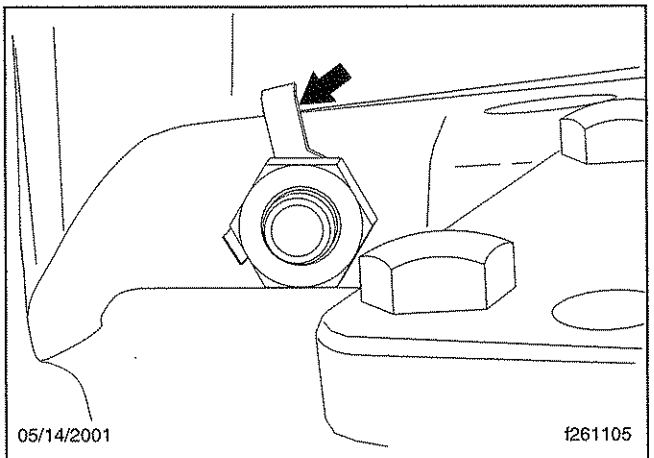


Fig. 7, Fuel Line Standoff Bracket



1. Mounting Bolts, M8
2. Bleed Valve
3. Slave Cylinder

Fig. 8, Hydraulic Clutch Slave Cylinder



Bend back the nut retainer (arrow).

Fig. 9, Power Take-Off Unit (PTO) Nut Retainers

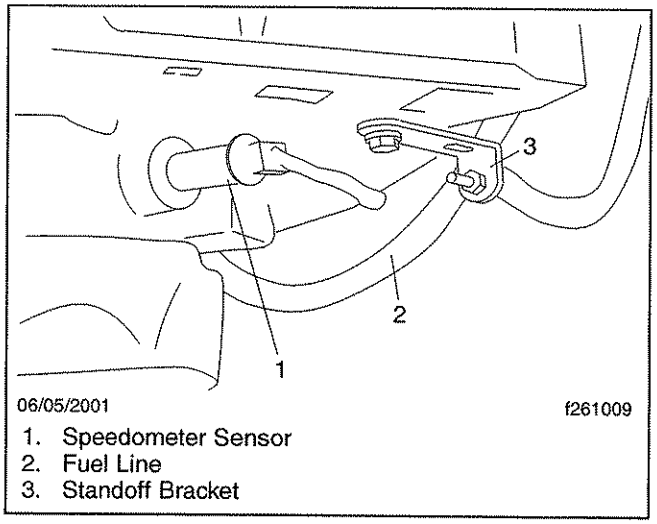
14.1 Remove each of the eleven capscrews.

14.2 After removing the transmission, insert the capscrews into the holes in the timing case for safekeeping.

⚠ CAUTION

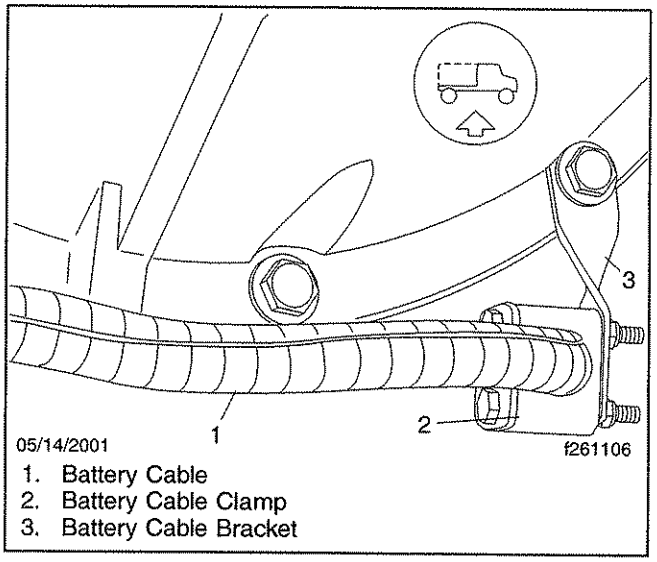
Do not allow the rear of the transmission to drop, and do not allow the transmission to hang unsupported. Keep the flange of the bell housing parallel (all the way around) to the flange of the timing case, until the input shaft is clear of the flywheel.

Mercedes-Benz Transmission Removal and Installation



1. Speedometer Sensor
2. Fuel Line
3. Standoff Bracket

Fig. 10, Speedometer Sensor



1. Battery Cable
2. Battery Cable Clamp
3. Battery Cable Bracket

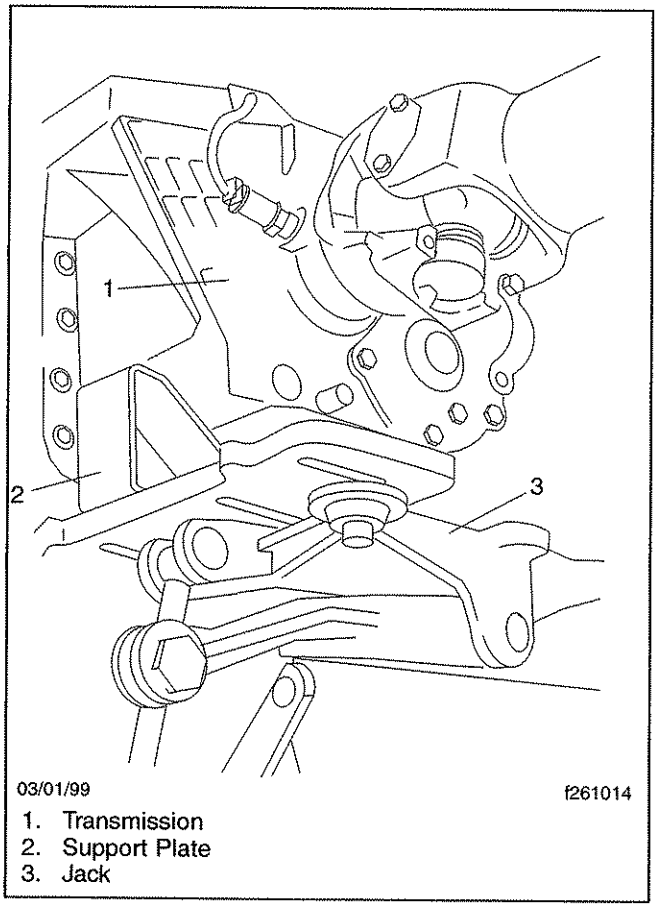
Fig. 11, Battery Cable Routing

Taking these precautions will prevent damage to the input shaft, flywheel, and clutch.

15. Remove the transmission. See **Fig. 14**.

    15.1 Pull the transmission and jack straight back until the transmission input shaft is clear of the clutch.

    15.2 Turn the left-hand front wheel to allow room for the transmission to pass. If necessary, lower the jack supporting the transmission. It might also be necessary to jack up the truck to get enough clearance to allow the transmission to pass.



1. Transmission
2. Support Plate
3. Jack

Fig. 12, Supporting the Transmission

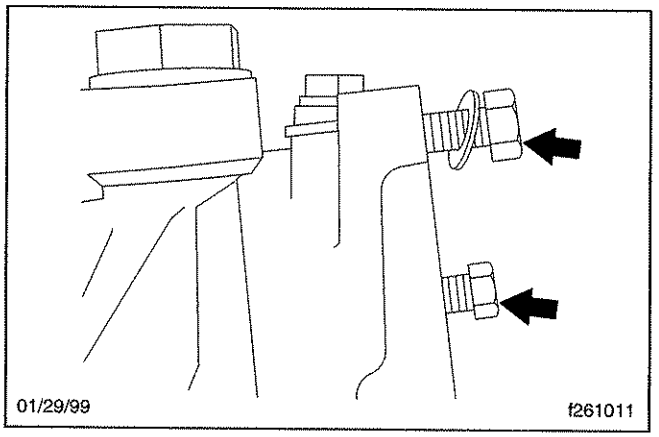


Fig. 13, Insert the Capscrews in the Timing Case

Mercedes-Benz Transmission Removal and Installation

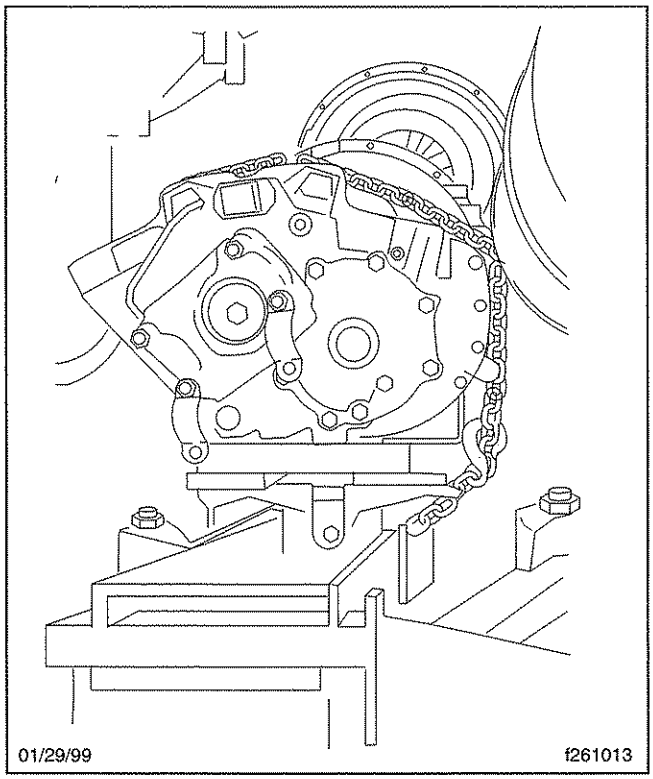


Fig. 14, Remove the Transmission

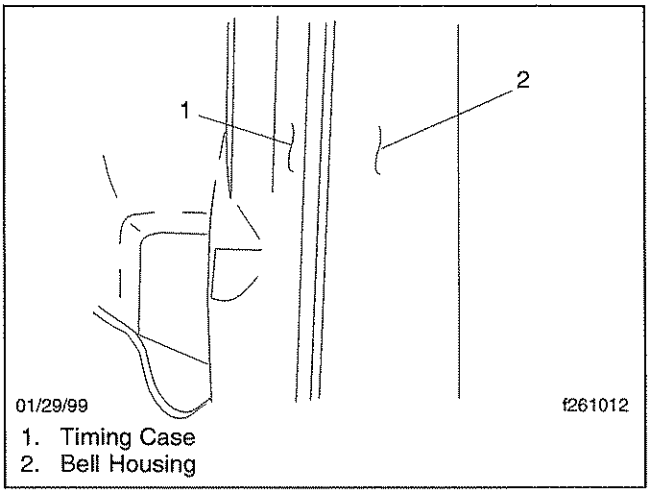
IMPORTANT: Watch closely the clearance between the bell housing and the leaf spring.

15.3 Pull the transmission out through the space behind the front wheel.

Installation

IMPORTANT: Before installing the transmission, make sure that the rear tires are chocked and that the transmission is securely chained to the support plates on the transmission jack.

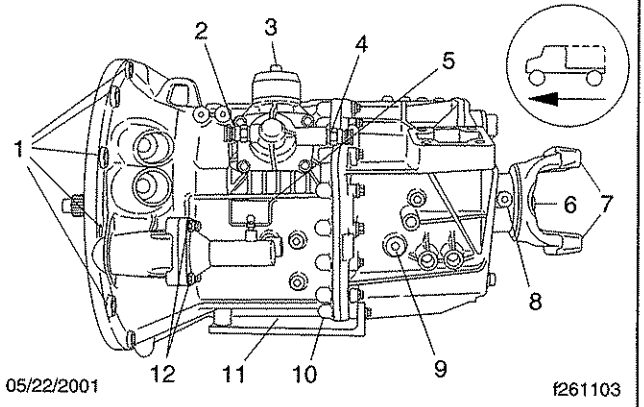
1. Install the transmission.
   - 1.1 Align the jack and the transmission behind the engine.
   - 1.2 Raise the transmission and adjust the angle of the jack until the bell housing and the timing case flange are parallel.
   - 1.3 Push the transmission and jack straight forward, making sure the flanges remain parallel and the mating seals align with each other without overlap as shown in **Fig. 15**.
   - 1.4 Install the eleven M10 capscrews holding the bell housing to the timing case. Use a crossover pattern. Do a final tightening of the capscrews to 33 lbf·ft (45 N·m). See **Fig. 16**.
   - 1.5 While installing the bell housing-to-timing case capscrews, also install the battery cable bracket(s), as removed.
   - 1.6 Remove the chain securing the transmission to the jack; then remove the jack.
2. Install the exhaust clamp at the exhaust elbow, as removed.
3. If the vehicle is equipped with the optional dual fuel tanks, install the fuel cross-over line and its support between the tanks. Tighten the clamps 40 lbf·ft (54 N·m) and the mounting bolts 95 lbf·ft (129 N·m).
4. Install the PTO cover on the transmission. Tighten the M10 hardened mounting capscrews 43 lbf·ft (58 N·m). Bend back the tabs on the nut retainers.
5. Connect the driveshaft.
   - 5.1 Slide the front of the driveshaft into the transmission output yoke.
   - 5.2 Install the U-joint end caps on the output yoke. Tighten the nuts 50 lbf·ft (68 N·m) for



1. Timing Case
2. Bell Housing

Fig. 15, Correct Seal Alignment

Mercedes-Benz Transmission Removal and Installation



NOTE: The transmission is shown from the left-hand side.

1. Bell Housing-to-Timing Case Capscrews
2. Reverse Gear Switch
3. Shift Lever Mounting Bolt
4. Starter Lock Switch
5. Nameplate
6. Pressure Plate Mounting Capscrew
7. U-Joint End Cap Bolts
8. Speedometer Sensor Lock
9. Transmission Fluid Fill Plug
10. Transmission Fluid Drain Plug
11. PTO Mounting Capscrews
12. Clutch Slave Cylinder Mounting Bolts

Fig. 16, Transmission Fasteners

3/8-inch end cap bolts and 110 lbf·ft (149 N·m) for 1/2-inch end cap bolts.

5.3 Install the bolts and nuts on the midship bearing bracket. Tighten the nuts 95 lbf·ft (129 N·m).

6. Install the fuel line standoff bracket and connect the fuel lines to the bracket.

7. Connect the electrical connectors. Connect the electrical cable to the speedometer sensor. Connect the electrical connector(s) on the shift lever.

8. Install the shift lever.

   8.1 Fit the shift lever over the cone of the transmission tower.

   8.2 Insert the hardened M10 x 20 shift lever mounting bolt and a thick washer into the hole in the shift lever. See **Fig. 6**.

   IMPORTANT: Don't forget to install the washer. Without the washer, the shift lever may loosen. The driver could lose control of the vehicle.

   8.3 Tighten the M10 bolt 50 lbf·ft (68 N·m).

   8.4 Install the rubber boot and the metal retaining ring. Install the four screws and tighten against the cab floor 28 lbf·ft (38 N·m). See **Fig. 5**.

9. Fasten the clutch slave cylinder to the mounting bracket and tighten the four M8 mounting bolts 15 lbf·ft (20 N·m).

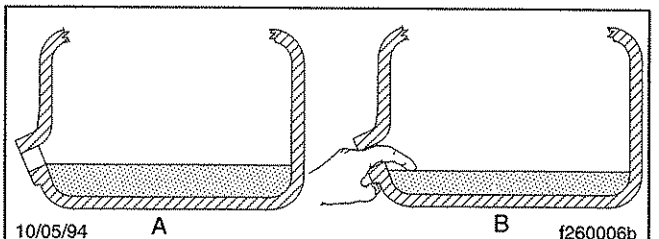
10. Bleed the hydraulic clutch system. For detailed instructions, see **Section 25.03**, Subject 140, in this manual.

11. Clean the transmission drain plug and install it on the transmission, along with a new aluminum gasket. Tighten the drain plug 42 lbf·ft (57 N·m).

12. Add transmission fluid until it is level with the lower edge of the fill opening. See **Fig. 1** for the location of the fill plug and **Fig. 17** for the correct level. See **Chapter 26** of the *Business Class® Trucks Maintenance Manual* for approved transmission lubricants and lubricant capacities.

13. Clean the transmission fill plug and install it on the transmission, along with a new aluminum gasket. Tighten the fill plug 42 lbf·ft (57 N·m).

14. Remove the chocks from the rear tires.



A. Full
B. Low

Fig. 17, Transmission Fluid Level Checking

Mercedes-Benz Transmission Input Shaft Radial Seal Replacement

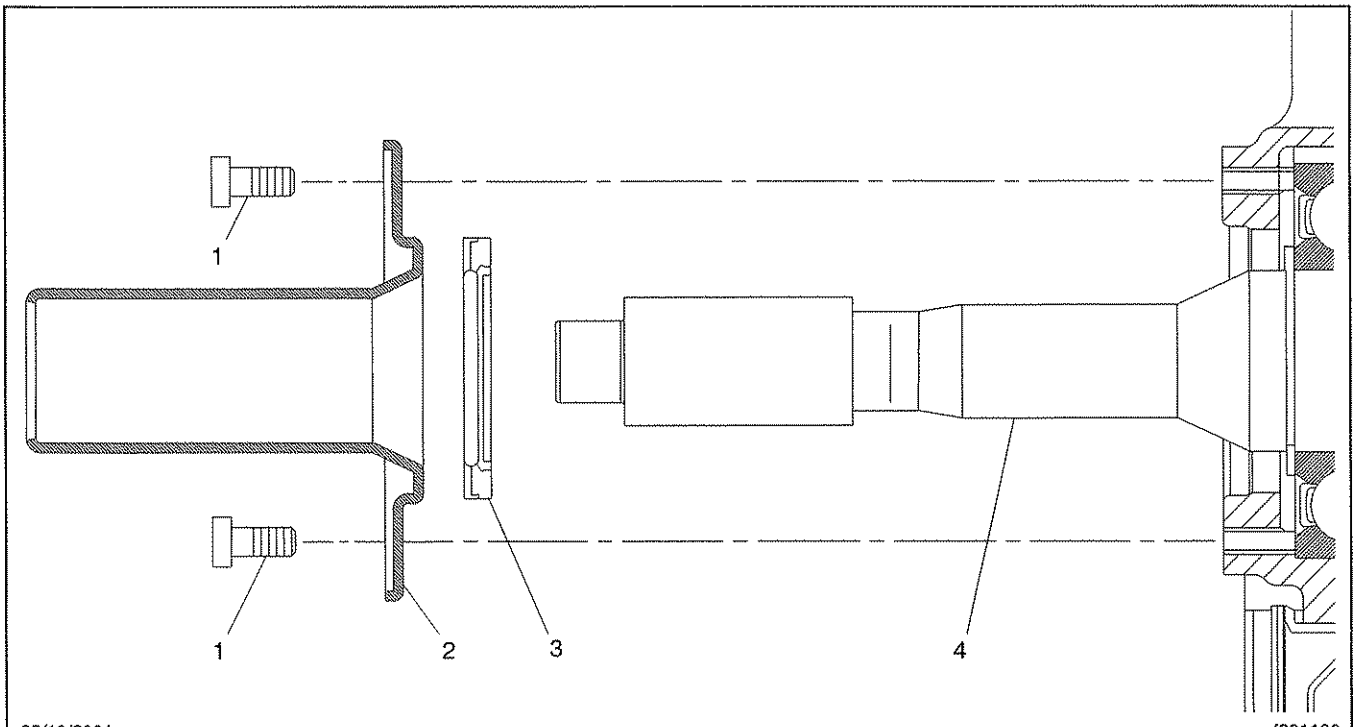
Replacement

1. Remove the transmission from the engine. For procedures, see **Subject 110**.
2. Remove the release fork and release bearing.
3. Remove the guide tube from the transmission case. Discard the mounting bolts. See **Fig. 1**.
4. Remove the radial seal from the input shaft. Discard the old radial seal.

⚠ CAUTION

To prevent damage, make sure that the new radial seal is not installed on the race of the old seal.

5. Install a new radial seal (p/n A 021 997 25 47) on the input shaft.
6. Install the guide tube on the transmission case. Use new mounting capscrews (p/n N000000000761). Tighten the capscrews 17 lbf·ft (23 N·m).
7. Install the release fork and release bearing.
8. Install the transmission on the engine. For procedures, see **Subject 110**.



1. Guide Tube Mounting Capscrew
2. Radial Seal
3. Guide Tube
4. Input Shaft

Fig. 1, Input Shaft Radial Seal Replacement

Mercedes-Benz Transmission Output Shaft Radial Seal Replacement

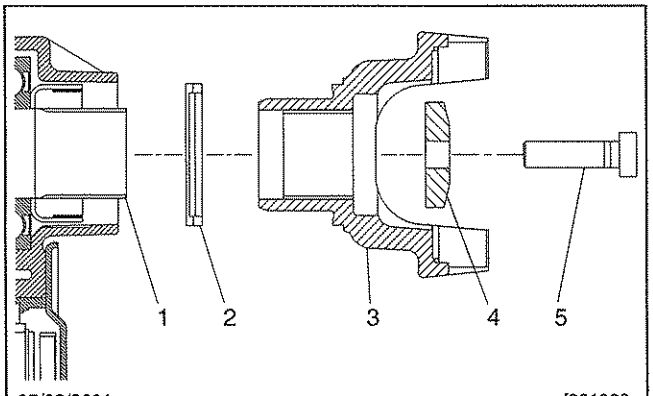
Replacement

1. Secure the output yoke so that it cannot turn on the output shaft.
2. Remove the pressure plate mounting capscrew. Remove the pressure plate. See **Fig. 1**.
3. Remove the output yoke. Use a suitable extractor tool.
4. Remove the radial seal from the output shaft. Discard the old radial seal.

⚠ CAUTION

To prevent damage, make sure that the new radial seal is not installed on the race of the old seal.

5. Install a new radial seal (p/n A 024 997 04 47) on the output shaft. Use a rubber hammer or a piece of wood to prevent damage to the bearings.
6. If the radial seal cannot be pressed on cold, preheat the output yoke to 176°F (80°C) and try again.
7. Position the pressure plate on the output shaft. Secure it to the shaft using the pressure plate mounting capscrew. Tighten the M16 capscrew 190 lbf·ft (258 N·m).



1. Output Shaft
2. Radial Seal
3. Output Yoke
4. Pressure Plate
5. Pressure Plate Mounting Capscrew

Fig. 1, Output Yoke Assembly

Specifications

Torque Values, Eaton/Meritor Transmissions	
Description	**Torque In lbf.ft (N.m)**
Bell Housing-to-Flywheel Housing Capscrews	34 (46)
Clutch Slave Cylinder Bracket Mounting Bolts	40 (54)
Driveline Parking Brake Cable Bracket Mounting Bolts	100 (136)
Driveline Parking Brake Stud Nuts	40 (54)
Fuel Cross-Over Line Mounting Bolts	95 (129)
Fuel Cross-Over Line Mounting Clamps	40 (54)
Fuel Tank Drain Plug	finger-tight + 1-1/2 turns
Midship Bearing Bracket Capscrews	95 (129)
Shift Lever Retaining Ring Screws	28 (38)
Shift Lever Plate Capscrews	40 (54)
Speedometer Sensor Wiring Harness Clamp Mounting Capscrews	40 (54)
Transmission Top Cover Capscrews	40 (54)
U-Joint End Cap Bolts	45 (61)

Table 1, Torque Values, Eaton/Meritor Transmissions

Torque Values, Mercedes-Benz Transmissions			
Description	**Size**	**Grade**	**Torque In lbf.ft (N.m)**
Bell Housing-to-Timing Case Capscrews	M10	8.8	33 (45)
Clutch Slave Cylinder Bracket Mounting Bolts	M8	8.8	15 (20)
Guide Tube Mounting Capscrew	—	—	17 (23)
Fuel Cross-Over Line Mounting Bolts	—	—	95 (129)
Fuel Cross-Over Line Mounting Clamps	—0	—	40 (54)
Midship Bearing Bracket Capscrews	3/4–11	—	95 (129)
Power Take-Off Unit (PTO) Mounting Capscrews	M10	10.9	43 (58)
Pressure Plate Mounting Capscrew	M16	10.9	190 (258)
Reverse Gear Switch	M20	8.8	42 (57)
Shift Lever Mounting Bolt	M10	10.9	50 (68)
Shift Lever Retaining Ring Screws	—	—	28 (38)
Speedometer Sensor Lock	M8	8.8	28 (38)
Starter Lock Switch (optional)	M20	8.8	42 (57)
Transmission Fluid Drain Plug	M24	8.8	42 (57)
Transmission Fluid Fill Plug	M24	8.8	42 (57)
U-Joint End Cap Bolts	3/8–24	—	50 (68)
	1/2–20	—	110 (149)

Table 2, Torque Values, Mercedes-Benz Transmissions

Contents

Subject	Subject Number
Service Operations	
Transmission Removal and Installation	100
ATF Cooler Removal and Installation	110
Specifications	400

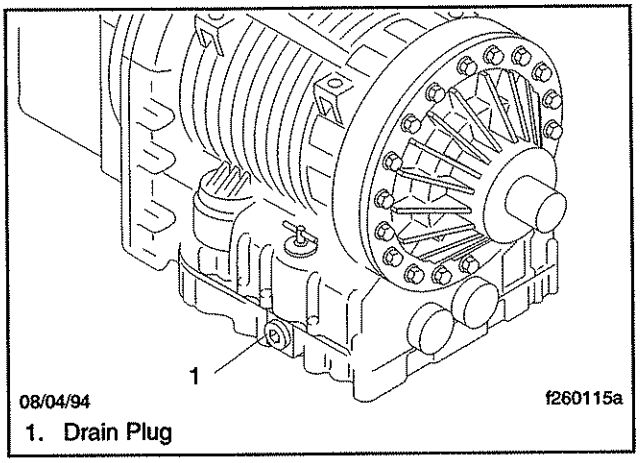
Removal

1. Apply the parking brake, chock the tires, and disconnect the batteries.
2. Remove the transmission drain plug and drain the automatic transmission fluid. **See Fig. 1.** Install the drain plug and tighten it 25 to 32 N·m (18 to 24 lbf·ft).

NOTE: The ATF drained from the transmission can be used again if it is clean and if the container into which it was drained contained no ethylene glycol.

3. Support the driveline with a jack stand between the transmission output yoke and the midship bearing.
4. Disconnect the driveline from the transmission.
   - 4.1 Loosen the bolts holding the midship bearing bracket so the driveshaft can slide to the rear. **See Fig. 2.**
   - 4.2 If the vehicle is equipped with a driveline parking brake, remove the nuts on the brake flange. **See Fig. 3.**

     If the vehicle is not equipped with a driveline parking brake, remove the transmission yoke U-joint end caps or lock straps.
   - 4.3 Slide the front of the driveshaft off the driveline brake flange or out of the transmission output yoke.



1. Drain Plug

Fig. 1

NOTE: It may be necessary to remove the mounting bolts from the midship bearing bracket so the driveshaft can be moved far enough back.

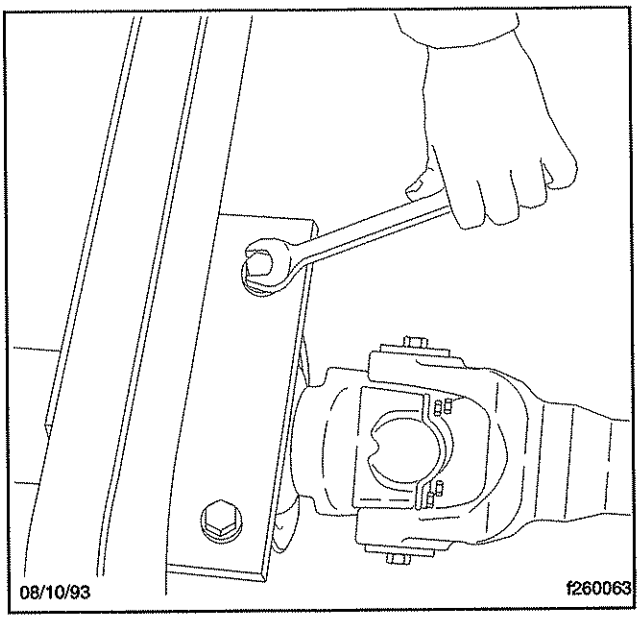


Fig. 2

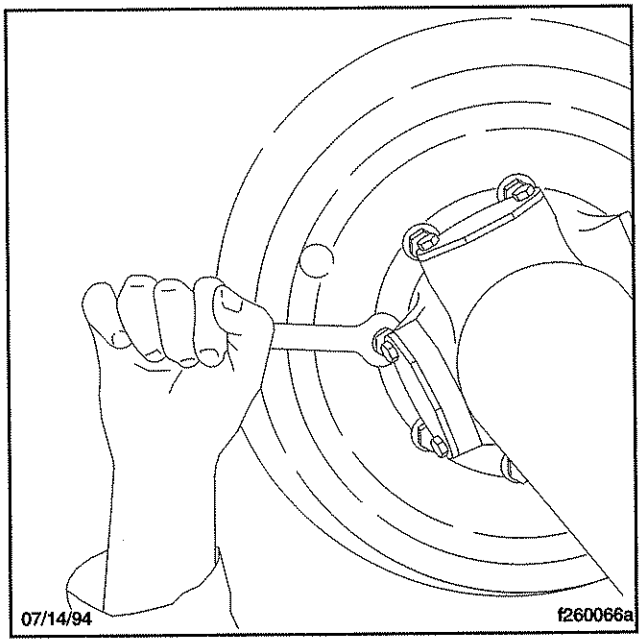


Fig. 3

Removal and Installation

4.4 Support the disconnected driveshaft and tie it to the frame rail.

5. Disconnect the three electrical connections to the transmission. **See Fig. 4.**

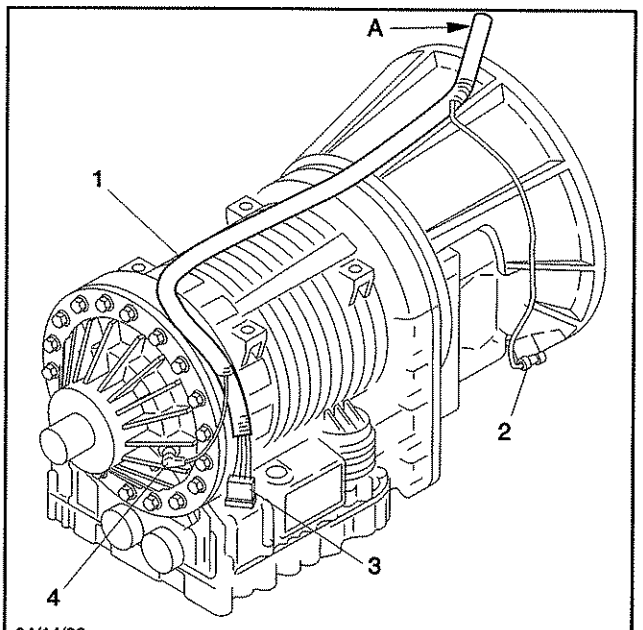
6. If the vehicle is equipped with a driveline parking brake, release the parking brake, and remove the cotter pin holding the clevis to the driveline brake lever. **See Fig. 5.** Remove the flanged bolt and flanged nut holding the driveline brake cable bracket to the transmission; then, remove the bracket.

7. Remove the ATF fill/dipstick tube. **See Fig. 6.**

7.1 Remove the U-bolt holding the fill/dipstick tube to its support bracket.

7.2 Remove the bolt and metal strap holding the fill/dipstick tube.

7.3 Pull the fill/dipstick tube out of the transmission case.



A. to bulkhead connector
1. Transmission Wiring Harness
2. Engine Speed Sensor
3. Transmission Control Connector
4. Output Speed Sensor

Fig. 4

7.4 Plug the hole with a clean rag to prevent entry of foreign material.

8. Disconnect the flexplate from the transmission.

8.1 Remove the capscrews holding the ring gear access cover. Then, remove the cover. **See Fig. 7.**

NOTE: For easier access on Mercedes-Benz engines, first remove the three bolts holding the exhaust pipe to the turbocharger exhaust elbow. Then, lower the exhaust pipe.

8.2 Using a screwdriver, turn the ring gear until one of the capscrews holding the flexplate adapter to the torque converter can be removed. Continue turning the ring gear and removing the capscrews through the access hole until all twelve are removed.

9. Remove the wiring harness and the air line from the standoff bracket (**Fig. 8**) on the right side of the transmission. Remove the standoff bracket.

10. Disconnect the transmission fluid cooler lines (**Fig. 9**) from the transmission and drain the remaining ATF.

11. Place a piece of plywood on a transmission jack to support the transmission.

12. Slide the jack into place under the transmission. Secure the transmission with a chain. Anchor the chain with bolts at the front lifting bosses on the top of the transmission. **See Fig. 10.**

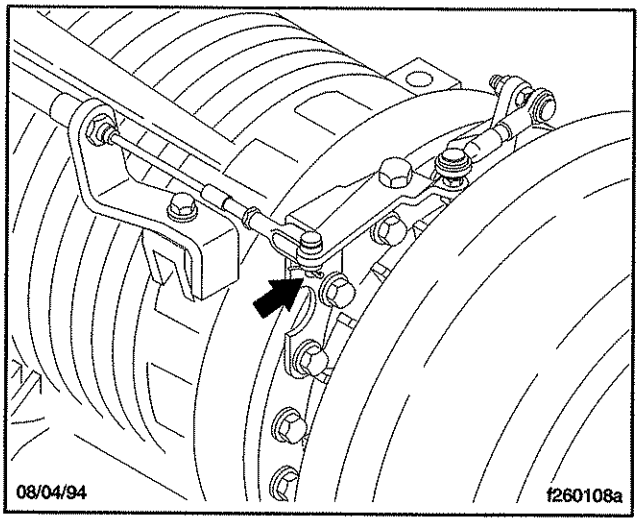
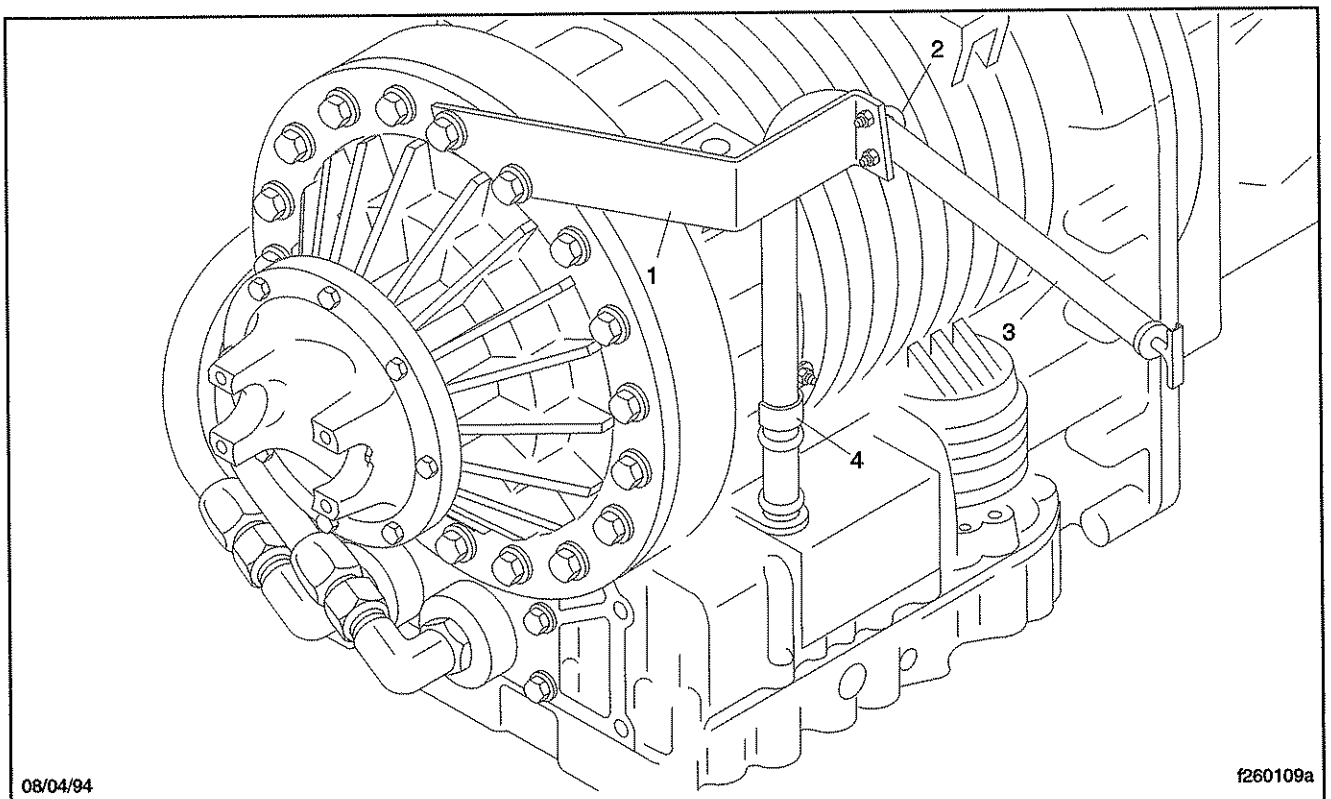


Fig. 5



1. Support Bracket
2. U-Bolt
3. ATF Fill/Dipstick Tube
4. Metal Strap

Fig. 6

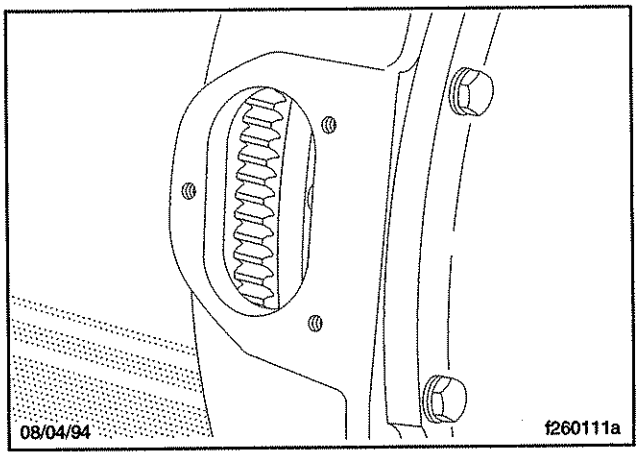
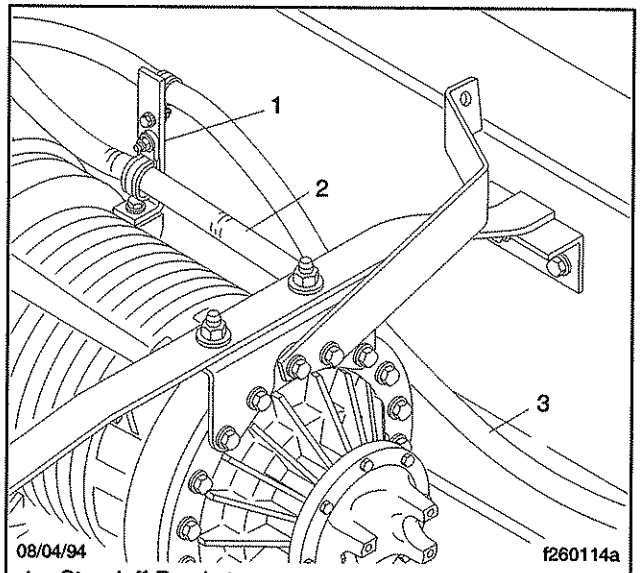


Fig. 7

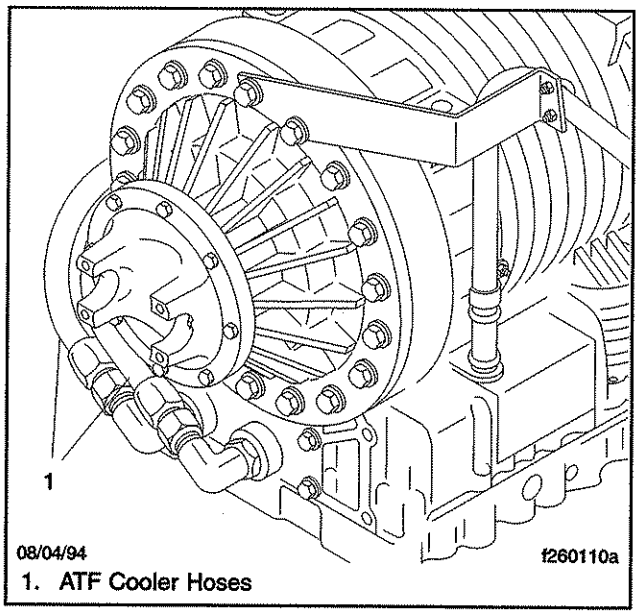
13. Remove the two bolts holding the transmission to the rear overslung transverse support spring. **See Fig. 11.**
14. Remove the twelve transmission flange bolts. **See Fig. 12.**
15. Move the transmission jack to the rear. Lower the jack and lift the front of the truck, as needed, so the transmission clears the frame rail and any attached components.
16. Place jack stands under the raised front of the vehicle.
17. Roll the transmission jack back, and remove the transmission.

Removal and Installation



1. Standoff Bracket
2. Wiring Harness
3. Air Line

Fig. 8



1. ATF Cooler Hoses

Fig. 9

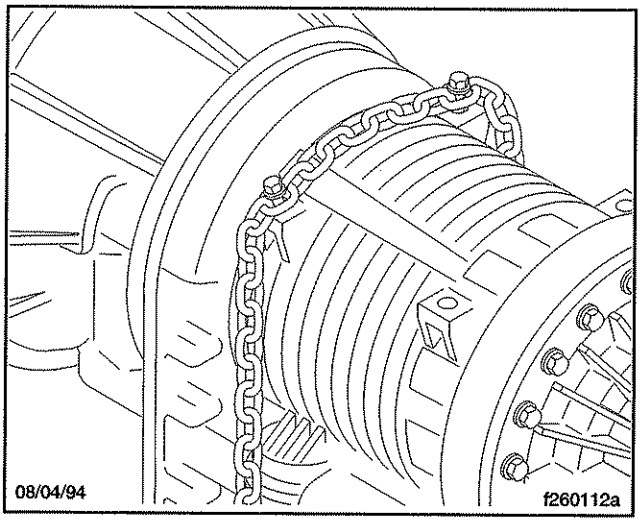


Fig. 10

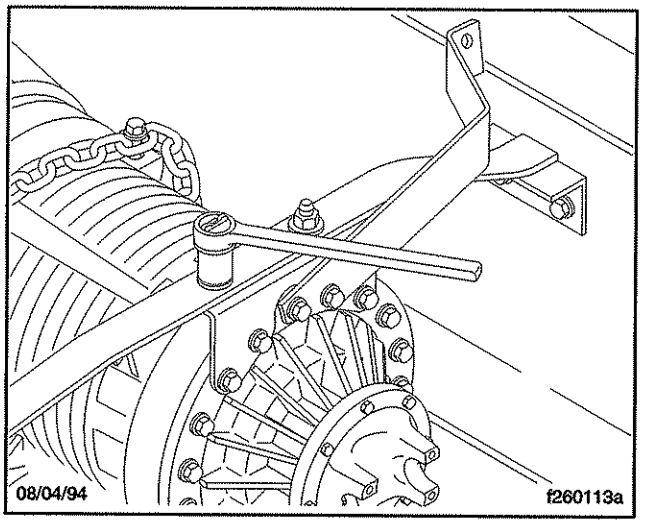


Fig. 11

Installation

IMPORTANT: Before installing the transmission, make sure the rear tires are chocked and the transmission is securely chained to the transmission jack.

1. Raise the front of the vehicle frame with a hydraulic jack to obtain adequate clearance for installing the transmission. Place jack stands under the front of the vehicle.
2. With the transmission on a jack, roll the transmission into place behind the flexplate. Remove

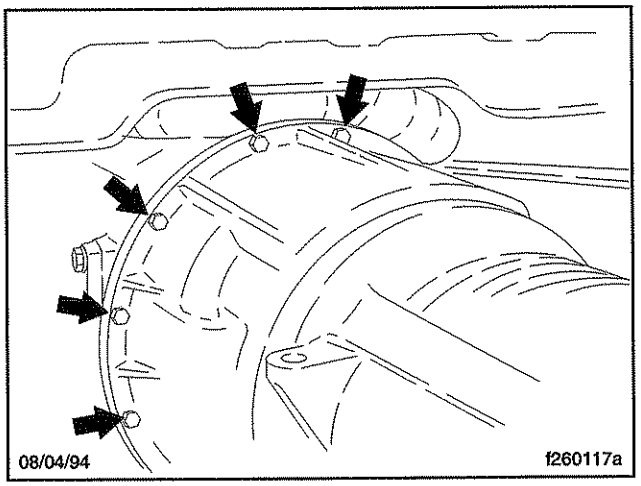


Fig. 12

the jack stands, and lower the front of the vehicle frame.

3. Raise the jack until the transmission lines up with the flexplate.

4. Push the transmission toward the engine until it seats squarely against the engine flywheel housing with the bolt holes in the transmission housing aligned with those in the flywheel housing.

NOTE: No force is required. If interference is encountered, move the transmission away from the engine and correct the problem.

5. Install the transmission flange bolts finger-tight.

6. Install the transverse support spring at the rear of the transmission. Install the two bolts and washers. Tighten the bolts 184 N·m (136 lbf·ft). **See Fig. 11.**

7. Remove the chain holding the transmission to the transmission jack.

8. Lower the transmission jack and remove it.

9. Connect the transmission fluid cooler hoses to the transmission. Tighten the fittings 54 to 68 N·m (40 to 50 lbf·ft). **See Fig. 9.**

10. Install the twelve flexplate adapter capscrews.

    10.1 Turning the ring gear for access, install all the capscrews through the access hole. Don't tighten them now.

    Be careful not to drop the capscrews inside the torque converter cover. The transmission must be removed to get them out.

    IMPORTANT: Install all the capscrews before tightening any of them to prevent cocking of the flexplate adapter.

    10.2 Tighten the capscrews 24 to 29 N·m (18 to 21 lbf·ft) in a star pattern.

    10.3 Install the access cover and its capscrews. There are three capscrews on Mercedes-Benz engines, two on Cummins and Detroit Diesel engines.

11. Tighten the twelve M10 transmission flange bolts (**Fig. 12**) 51 to 61 N·m (38 to 45 lbf·ft) in a star pattern.

12. If the vehicle is equipped with a driveline parking brake, mount the driveline brake cable bracket to the transmission. Install the two flanged bolts and flanged nuts, and tighten them 31 N·m (23 lbf·ft). Attach the clevis to the brake lever; then, insert and lock the cotter pin. **See Fig. 5.**

13. Connect the driveshaft.

    13.1 Slide the front of the driveshaft into the transmission output yoke or onto the driveline parking brake flange if so equipped.

    13.2 On vehicles without a driveline parking brake, install the transmission yoke U-joint end caps or lock straps.

    On vehicles with a driveline parking brake, slide the driveshaft flange onto the studs in the parking brake. Install the nuts, and tighten them 54 N·m (40 lbf·ft).

    13.3 If the midship bearing bracket bolts and nuts were removed, install them. Tighten the nuts 129 N·m (95 lbf·ft).

14. On Mercedes-Benz engines, if the exhaust pipe was disconnected from the turbocharger exhaust elbow, connect the pipe and tighten the bolts 81 N·m (60 lbf·ft).

15. Install the ATF fill/dipstick tube.

    15.1 Install the fill/dipstick tube support bracket. Tighten the two capscrews 108 N·m (80 lbf·ft).

Removal and Installation

15.2 Inspect the fill/dipstick tube seal. Replace it if damaged.

15.3 Install the fill/dipstick tube and clamp. Tighten the capscrew 16 N·m (12 lbf·ft).

15.4 Install the U-bolt and nuts holding the fill/dipstick tube to the bracket. Tighten the U-bolt nuts 11 N·m (8 lbf·ft).

16. Install the standoff bracket on the right side of the transmission.

    Make sure the air line and the wiring harness are securely attached to the standoff bracket.

17. Fill the transmission with ATF.

18. Connect all electrical lines to the transmission.

    18.1 Connect the transmission control connector.

    18.2 Connect the electrical cable to the output speed sensor.

    18.3 Connect the cable to the engine speed sensor.

    18.4 Using tie straps, secure the cables where necessary.

19. Connect the batteries and remove the chocks from the tires.

20. Start the engine, and check for any leaks. Repair leaks as needed.

21. Check the ATF level. Add fluid as needed.

22. Road test the vehicle, and check for correct transmission operation.

ATFCooler Removal and Installation

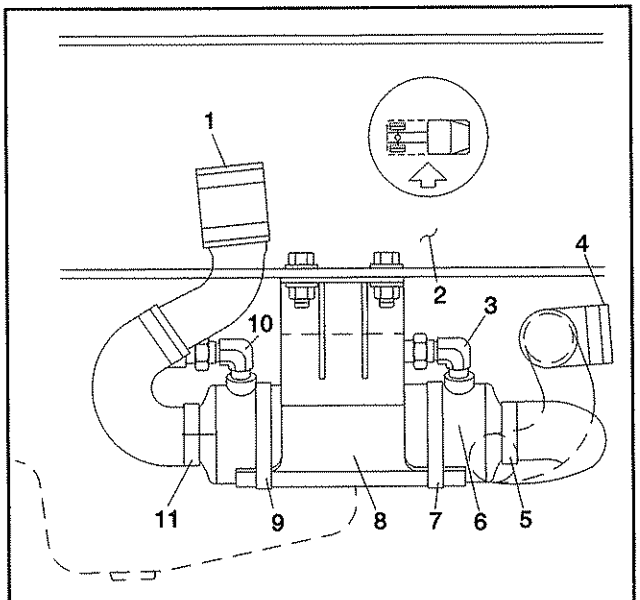
Removal (See Fig. 1 andFig. 2)

1. Apply the parking brakes and chock the tires.

⚠ WARNING

Drain the coolant system only when the coolant and engine are cool. Draining it when these are hot could cause severe personal injury due to scalding.

2. With the engine cool, loosen the surge tank cap to release cooling system pressure.
3. Place a suitable container under the radiator. Open the drain petcock at the bottom of the radiator and drain the cooling system. Close the drain petcock.
4. Disconnect the coolant hoses from the fittings at both sides of the automatic transmission fluid (ATF) cooler. When the coolant stops draining, secure the ends of the hoses to prevent leakage.



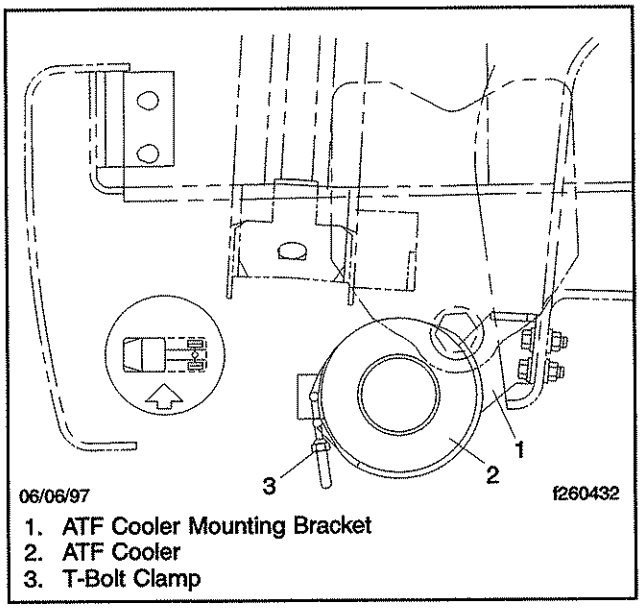
1. Coolant Return Hose
2. Frame Rail
3. ATF Supply Line
4. Coolant Supply Hose
5. Coolant Clamp
6. ATF Cooler
7. T-Bolt Clamp
8. ATF Cooler Mounting Bracket
9. T-Bolt Clamp
10. ATF Return Line
11. Coolant Clamp

Fig. 1, ATF Cooler (frame mounted)

5. Disconnect the ATF hoses from the fittings at both sides of the ATF cooler. Catch the ATF by directing the disconnected end of each hose into a drain pan. When the ATF stops draining, plug the hoses and cap the fittings.
6. Remove the two hexnuts and washers that attach the ATF cooler to the T-bolt mounting bracket assembly, and remove the ATF cooler. Drain the ATF cooler into a drain pan.

Installation

1. Hold the ATF cooler in place; then install the hexnuts and washers on the T-bolt mounting bracket assembly. Tighten them 28 lbf·ft (38 N·m).
2. Attach the coolant hoses to the fittings at both sides of the ATF cooler, as removed.
3. Remove the plugs from the ATF hoses and the caps from the fittings. Attach the ATF hoses to the fittings at both sides of the ATF cooler. Tighten the fittings 40 to 50 lbf·ft (54 to 68 N·m).
4. Fill the coolant system and install the surge tank cap.
5. Start the engine and operate the transmission for one or two minutes, then add the correct ATF to the transmission as needed. For instructions



1. ATF Cooler Mounting Bracket
2. ATF Cooler
3. T-Bolt Clamp

Fig. 2, ATF Cooler (transverse mounted)

ATFCooler Removal and Installation

and lubricant specifications, see **Group 26** of the *Business Class Trucks Maintenance Manual.*

6. Run the engine until operating temperature is reached and check for leaks in the coolant system or ATF cooler. Repair leaks as needed.
7. Check the coolant level and add as needed.
8. Remove the tire chocks.

Fastener Torques	
Description	**Torque lbf·ft (N·m)**
Transmission Drain Plug	136 (184)
ATF Cooler Hose Fittings	40–50 (54–68)
Flexplate Adapter Capscrews	18–21 (24–29)
Transmission Flange Bolts	38–45 (51–61)
Driveline Parking Brake Cable Bracket Mounting Nuts	23 (31)
Driveline Parking Brake Stud Nuts	40 (54)
Midship Bearing Bracket Nuts	95 (129)
Exhaust Pipe-to-Turbocharger Mounting Bolts	60 (81)
ATF Fill/Dipstick Tube Support Bracket Capscrews	80 (108)
ATF Fill/Dipstick Tube Clamp Capscrews	12 (16)
ATF Fill/Dipstick Tube-to-Bracket U-Bolt Nuts	8 (11)
ATF Cooler T-Bolt Nuts	28 (38)

Table 1, Fastener Torques

Contents

Subject	Subject Number
Service Operations	
Removal and Installation	100
ATF Cooler Removal and Installation	110
Specifications	400

Removal

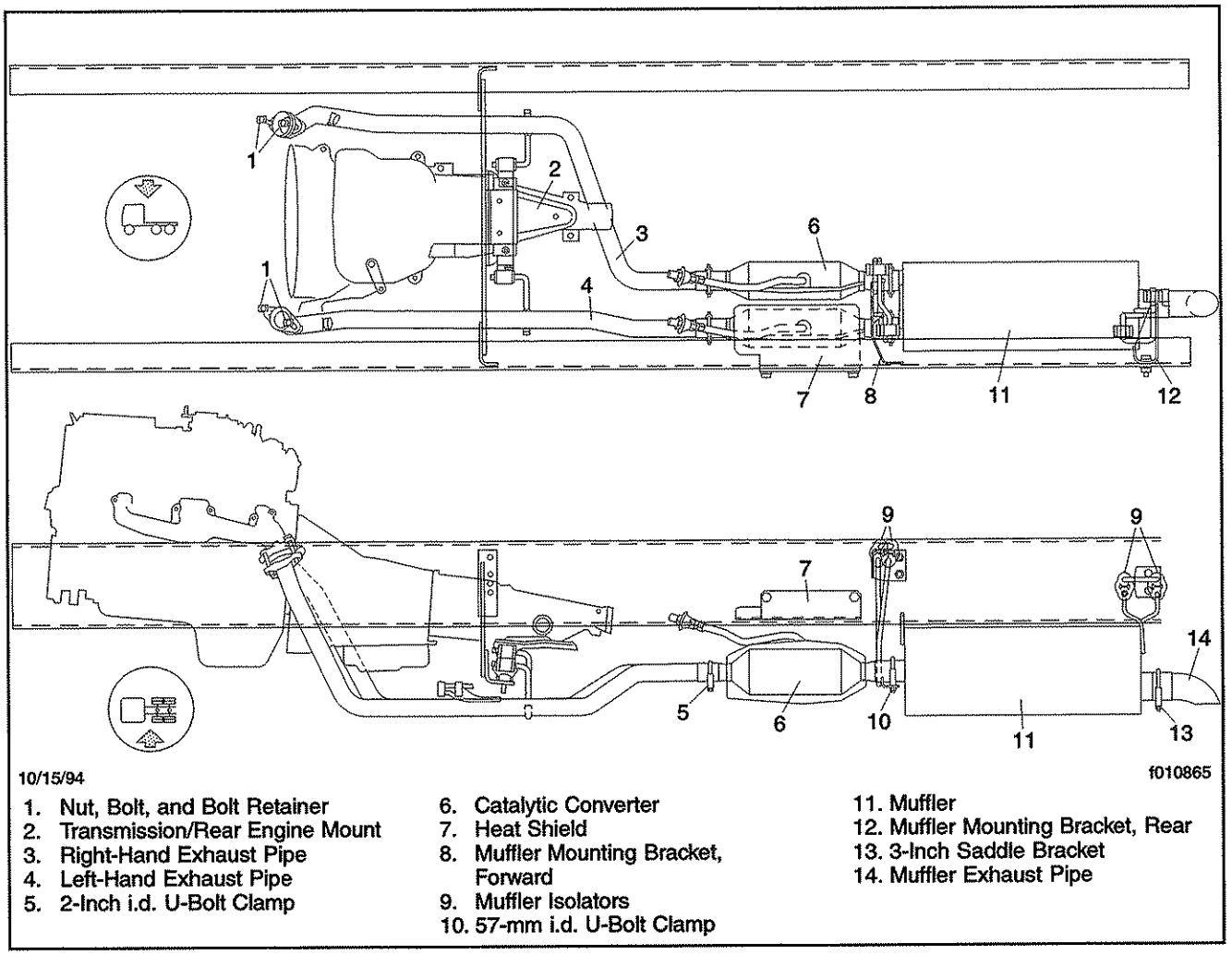
⚠ CAUTION

To avoid component damage, be sure to remove the transmission and torque converter as an assembly. The converter drive plate, pump bushing, and oil seal can be damaged if the converter is left attached to the drive plate during removal.

1. Apply the parking brake, chock the tires, and disconnect the batteries.
2. Drain the automatic transmission fluid (ATF). If equipped, remove the transmission drain plug. Otherwise, remove the transmission oil pan. When removing the drain plug, use one wrench to hold the nut and another to turn the drain plug.

   After draining the ATF, install the oil pan (or drain plug, if equipped). Tighten all oil pan bolts 17 N·m (13 lbf·ft). Tighten the drain plug nut (if equipped) 17 N·m (13 lbf·ft) also.
3. Remove the exhaust system components. See **Fig. 1**.

   IMPORTANT: Mark both oxygen sensors, left-hand and right-hand. Be careful not to mix them up during assembly.



1. Nut, Bolt, and Bolt Retainer
2. Transmission/Rear Engine Mount
3. Right-Hand Exhaust Pipe
4. Left-Hand Exhaust Pipe
5. 2-Inch i.d. U-Bolt Clamp
6. Catalytic Converter
7. Heat Shield
8. Muffler Mounting Bracket, Forward
9. Muffler Isolators
10. 57-mm i.d. U-Bolt Clamp
11. Muffler
12. Muffler Mounting Bracket, Rear
13. 3-Inch Saddle Bracket
14. Muffler Exhaust Pipe

Fig. 1, Exhaust System Components

Removal and Installation

3.1 Remove both oxygen sensors, one from each exhaust pipe.

3.2 Disconnect the exhaust manifold saddle brackets.

3.3 Disconnect the clamps attaching each pipe to the catalytic converter.

3.4 Remove the rubber isolators from the exhaust support. Push the exhaust pipes back until the exhaust hangers clear the brackets. Remove both exhaust pipes from the vehicle.

4. Disconnect the driveline from the transmission. See **Fig. 2.**

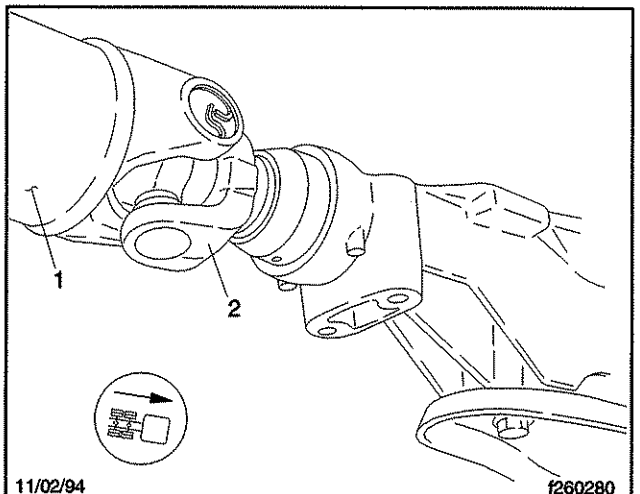
4.1 Support the driveline with a jack stand between the transmission output yoke and the midship bearing.

4.2 Make one reference mark on the driveline and another on the transmission output yoke, for use during assembly.

4.3 Remove the midship bracket and end bracket.

4.4 Pull the driveline straight back until it comes free of the splined shaft on the transmission output yoke.

4.5 Support the disconnected driveline and tie it to the frame rail.



1. Driveline 2. Universal Joint

Fig. 2, Transmission Output Yoke

5. Disconnect the transmission fluid cooler lines (see **Fig. 3**) from the transmission. Disconnect the standoff bracket.

6. Remove the two engine-to-transmission struts. See **Fig. 4.**

6.1 Remove the transmission-to-strut bolt.

6.2 Remove the engine-to-strut bolt. After removing the strut, install the bolt; this bolt is part of the engine mount.

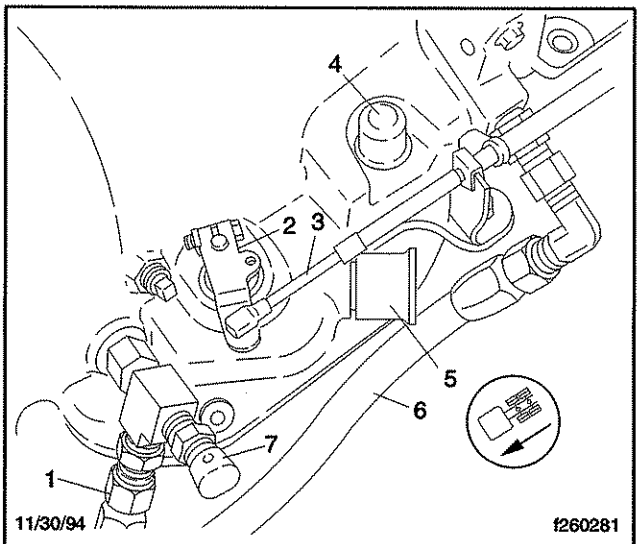
6.3 Remove the strap for the ATF cooler lines from the left-hand strut.

7. Remove the ATF fill/dipstick tube. See **Fig. 5.**

7.1 Remove the bolt attaching the fill/dipstick tube bracket to the engine.

7.2 Pull the fill/dipstick tube out of the transmission case.

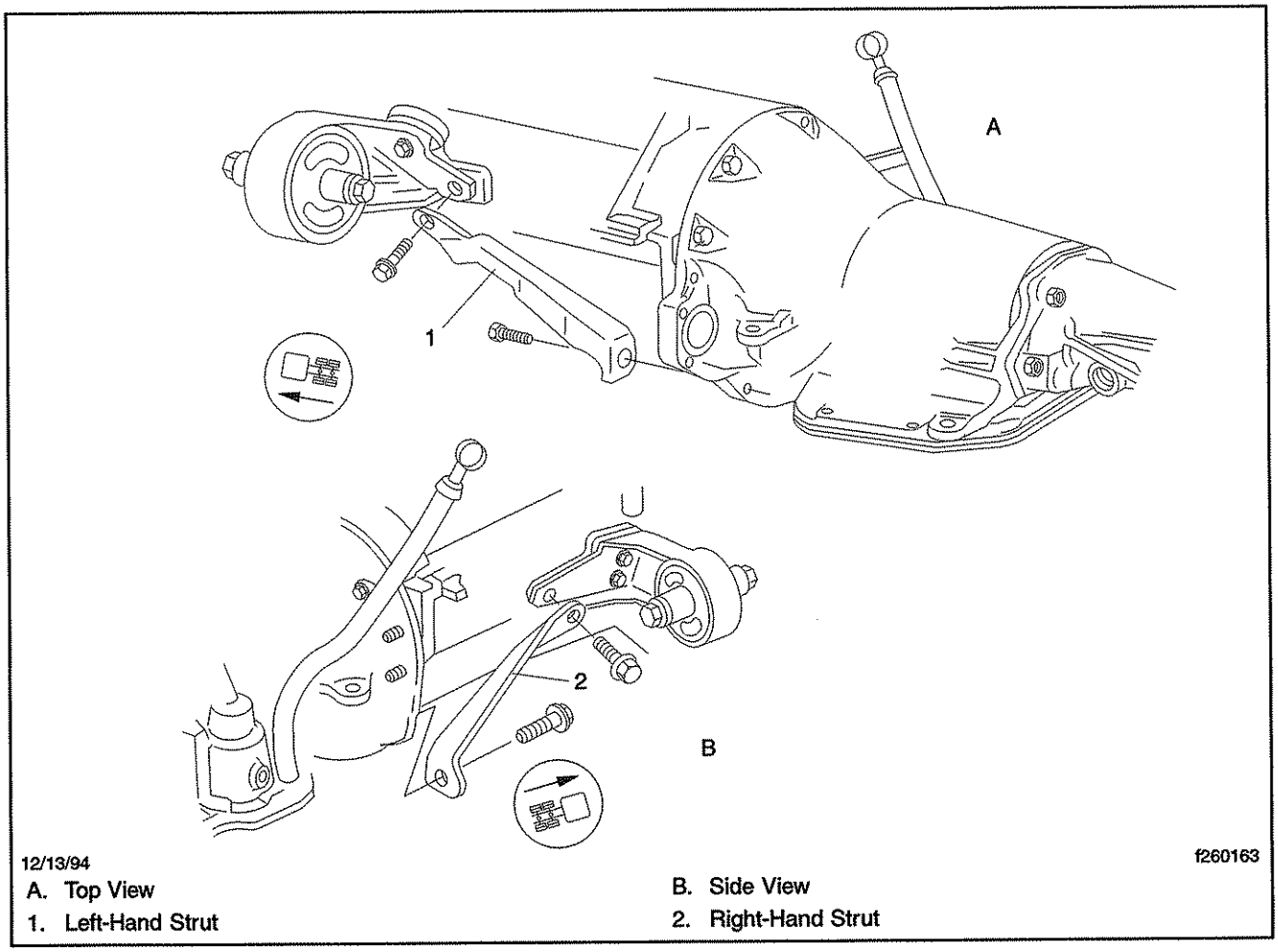
7.3 Plug the hole with a clean rag to prevent entry of foreign material.



NOTE: Inner shift lever and shift cable not shown.

1. Forward Cooler Line
2. Throttle Valve Lever
3. Throttle Valve Cable
4. Transmission Overdrive Solenoid
5. Park/Neutral Position Switch
6. Aft Cooler Line
7. Transmission Temperature Sensor

Fig. 3, ATF Cooler Lines



A. Top View
1. Left-Hand Strut
B. Side View
2. Right-Hand Strut

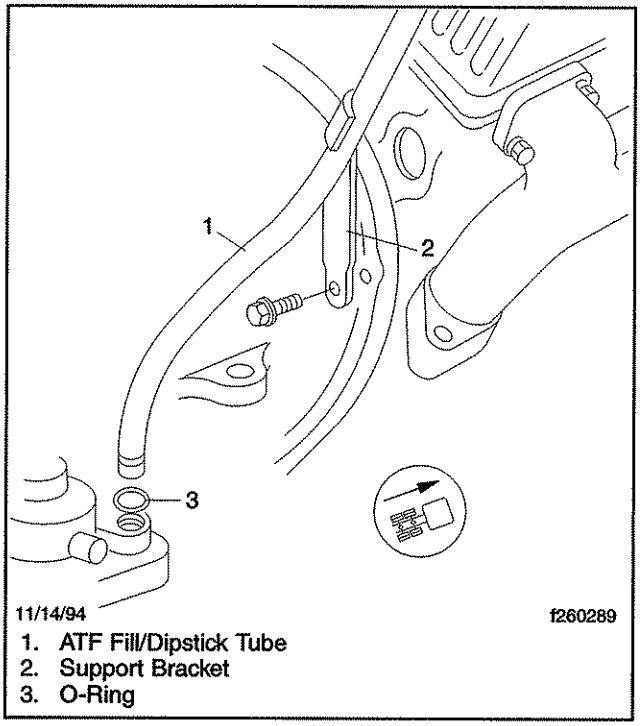
Fig. 4, Engine-to-Transmission Struts

⚠ CAUTION

The crankshaft position sensor will be damaged if the transmission is removed (or installed) while the sensor is still bolted to the engine block. To avoid damage, be sure to remove the sensor before removing the transmission.

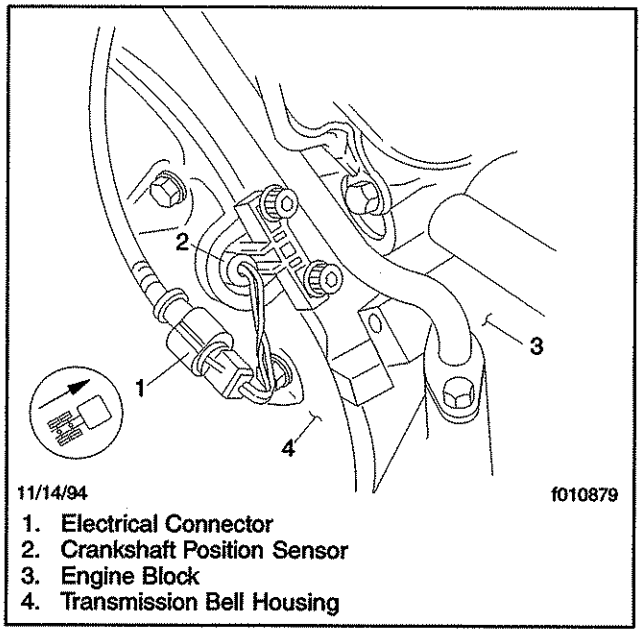
8. Disconnect the five electrical connections to the transmission.
   - 8.1 Remove the crankshaft position sensor (bolted to the engine at the bell housing). See **Fig. 6**.
   - 8.2 Disconnect the transmission temperature sensor attached to the forward ATF cooler line (pressure line) at the transmission case. See **Fig. 7**.
   - 8.3 Disconnect the park-neutral position switch located on the transmission case just aft of the inner shift lever. See **Fig. 7**.
   - 8.4 Disconnect the transmission overdrive solenoid located on the transmission case behind the throttle valve cable. See **Fig. 7**.
   - 8.5 Disconnect the vehicle speed sensor from the speedometer adapter located on the overdrive unit just forward of the U-joint. See **Fig. 7**.
9. Remove the shift linkage from the transmission.

Removal and Installation



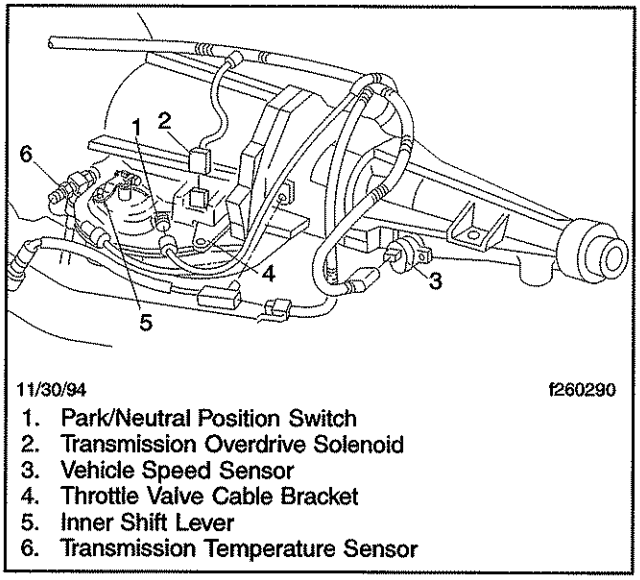
1. ATF Fill/Dipstick Tube
2. Support Bracket
3. O-Ring

Fig. 5, Fill/Dipstick Tube Attachment



1. Electrical Connector
2. Crankshaft Position Sensor
3. Engine Block
4. Transmission Bell Housing

Fig. 6, Crankshaft Position Sensor



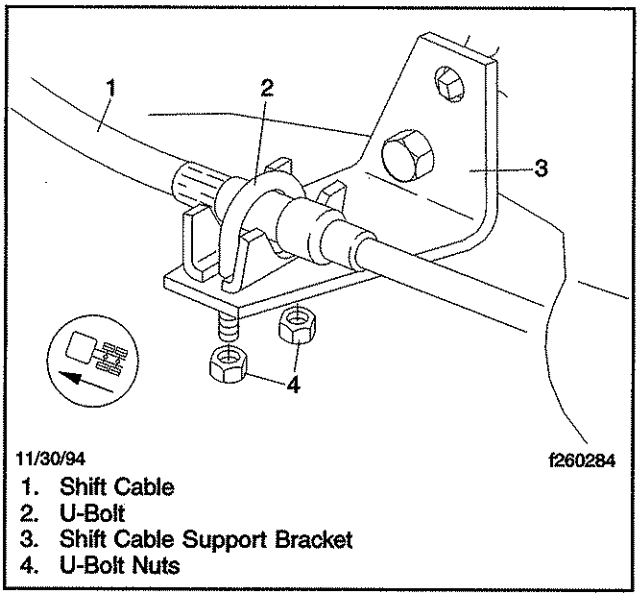
1. Park/Neutral Position Switch
2. Transmission Overdrive Solenoid
3. Vehicle Speed Sensor
4. Throttle Valve Cable Bracket
5. Inner Shift Lever
6. Transmission Temperature Sensor

Fig. 7, Transmission Electrical Connectors

9.1 Remove the U-bolt holding the shift cable to the shift cable support bracket. See **Fig. 8** .

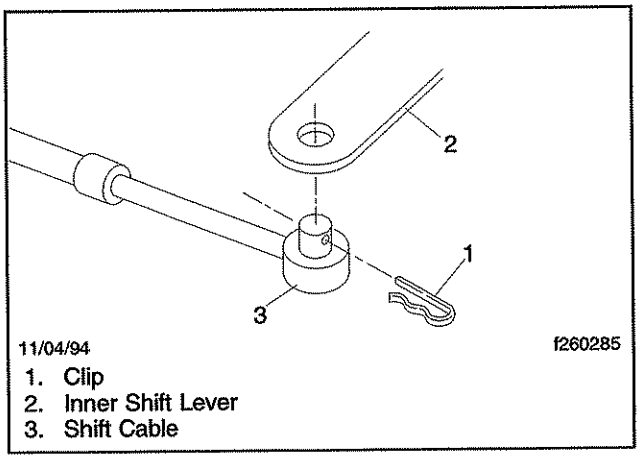
9.2 Remove the clip attaching the shift cable to the inner shift lever. See **Fig. 9** .

10. Remove the throttle valve linkage from the transmission. See **Fig. 10.**



1. Shift Cable
2. U-Bolt
3. Shift Cable Support Bracket
4. U-Bolt Nuts

Fig. 8, Shift Cable U-Bolt

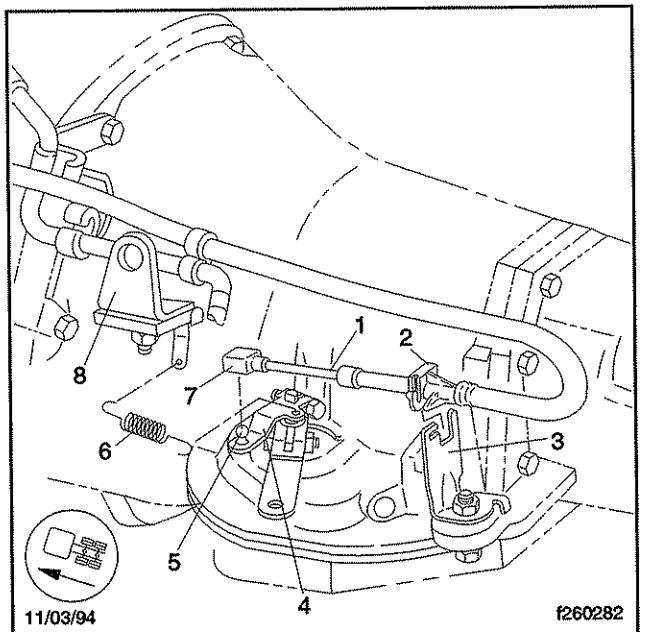


1. Clip
2. Inner Shift Lever
3. Shift Cable

Fig. 9, Disconnecting the Shift Cable

10.1 Disconnect the spring attaching the throttle lever to the spring bracket.

10.2 Using a screwdriver blade, remove the quick-disconnect fitting at the clamp on the throttle valve cable. Then snap off the plastic connector attaching the cable to the ball stud on the throttle lever.



1. Throttle Valve Cable
2. Quick-Disconnect Fitting
3. Cable Bracket
4. Throttle Lever
5. Ball Stud
6. Spring
7. Snap-On Plastic Connector
8. Spring Bracket

Fig. 10, Throttle Valve Linkage

11. Remove the starter from the bell housing.

11.1 Remove the battery cable standoff brackets. Remove the battery cable bolt and bracket. Do not remove the clamp from the battery cable.

11.2 Mark and disconnect the battery and solenoid cable leads. Remove the two starter mounting bolts.

11.3 Move the starter forward until the nose of the starter gear housing clears the lower mounting stud. See **Fig. 11**.

12. Remove the two bolts attaching the fuel line support bracket to the transmission case. Remove it from the fuel lines and set it aside for assembly. See **Fig. 12**. Remove the standoff bracket from the air pump hose going to the catalytic converter.

13. Remove the torque converter from the drive plate.

13.1 Remove the three bolts on the torque converter access cover. Make alignment marks on the torque converter and drive plate for reference. See **Fig. 13**.

13.2 Using a socket wrench, turn the crankshaft vibration damper clockwise until converter bolts are accessible. Then remove the bolts one at a time.

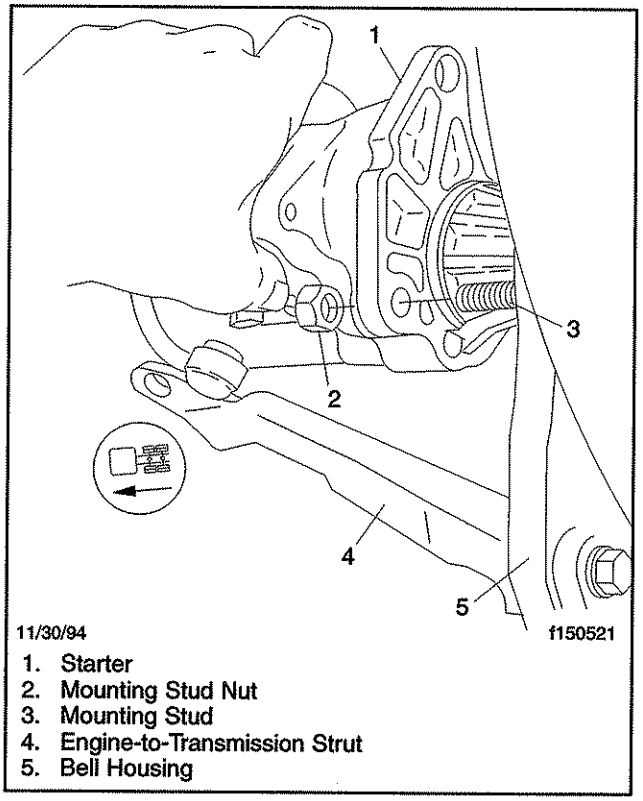
14. Remove the main support crossmember. See **Fig. 14**.

14.1 Lift the front or the rear of the vehicle, as needed, to allow the transmission to clear the frame rail and any attached components. Support the rear of the engine with a safety stand or jack. Place other safety stands under the vehicle as needed.

14.2 Secure the transmission jack to the transmission. Using the jack, raise the transmission slightly to relieve the load on the crossmember.

IMPORTANT: Make sure the chain or cable securing the transmission to the jack is not interfering with the shift and throttle valve linkage levers on the right-hand side of the transmission.

Removal and Installation



1. Starter
2. Mounting Stud Nut
3. Mounting Stud
4. Engine-to-Transmission Strut
5. Bell Housing

Fig. 11, Starter Removal and Installation

14.3 Remove the three bolts holding the transmission to the triangular rear support bracket connected to the crossmember. Remove the bolts attaching the crossmember to each frame rail bracket.

NOTE: The crossmember is not symmetrical. To save installation time, mark the front of the crossmember before removal.

14.4 Remove the crossmember and rear support bracket as a unit. Carefully lower them, taking care to clear the battery cable and any other lines or hoses.

15. Remove the transmission flange bolts attaching the engine block to the bell housing.

15.1 Remove the five out-facing offset bolts on the bell housing.

15.2 Remove the last, in-facing bolt by pushing the transmission forward, loosening the bolt, pushing the transmission backward to gain more room, and repeating this process until the bolt is out. See **Fig. 15.**

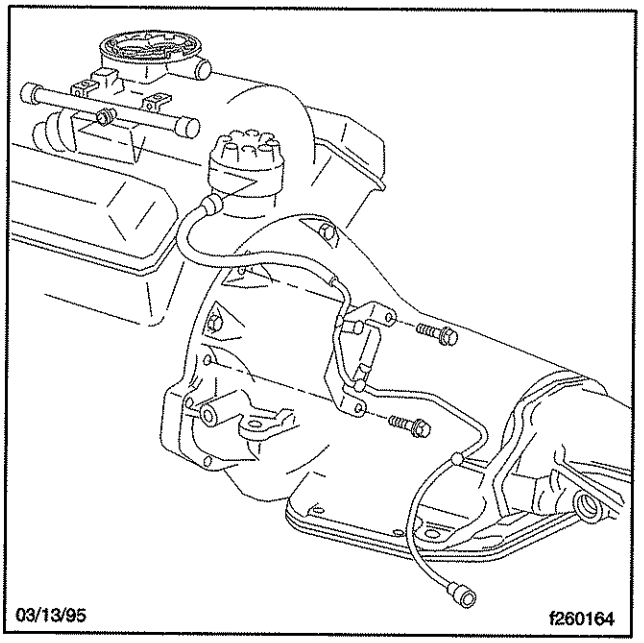


Fig. 12, Fuel Line Support Bracket

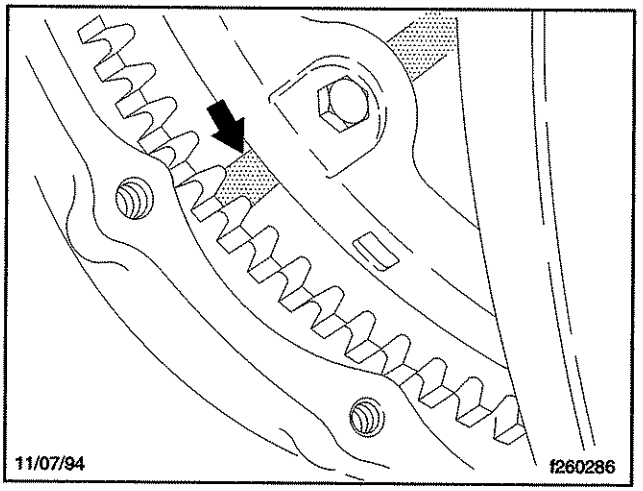
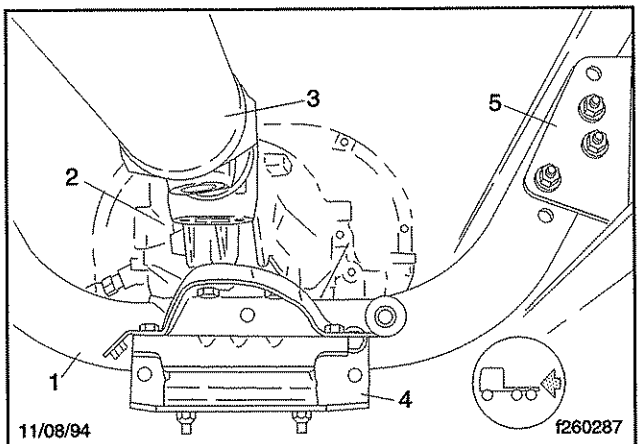


Fig. 13, Alignment of Drive Plate and Torque Converter

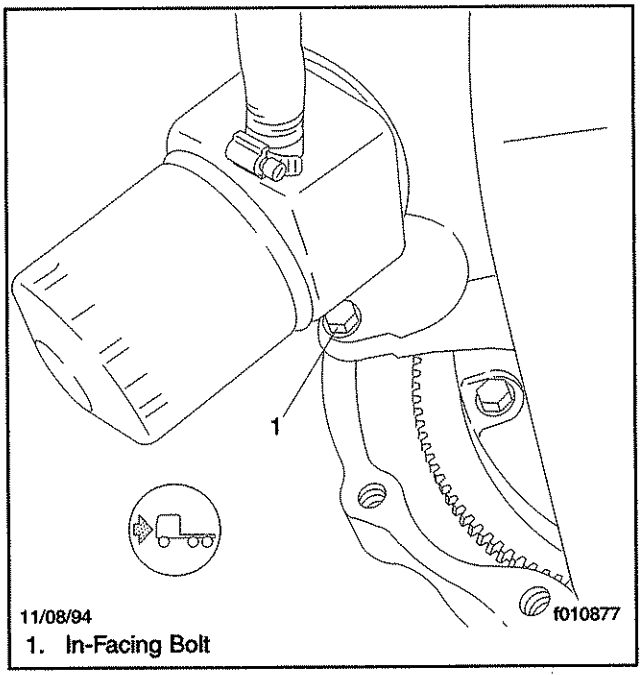
16. Use a C-clamp or wedge tool to hold the torque converter in position while the transmission is being removed. See **Fig. 16.**

17. Remove the transmission from the vehicle. Make sure clearance is adequate and safety stands



1. Main Support Crossmember
2. Transmission
3. Driveline
4. Transmission Rear Support Bracket
5. Frame Rail Bracket

Fig. 14, Main Support Crossmember

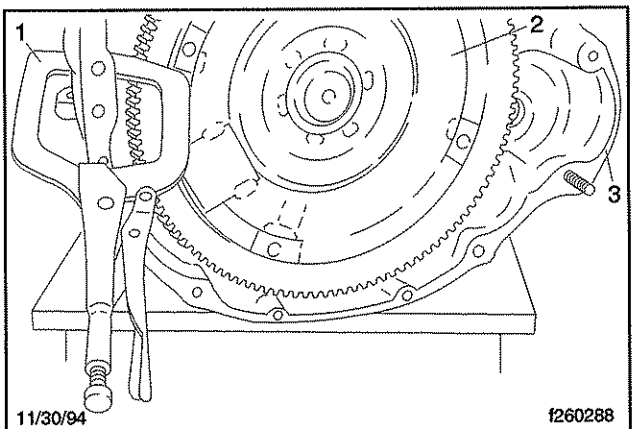


1. In-Facing Bolt

Fig. 15, In-Facing Bolt Location

are properly placed. Adjust vehicle height and placement of supports, if necessary.

18. Inspect the torque converter for damage and replace it if necessary. Check the torque converter drive hub for condition. Lubricate the drive hub and oil pump seal lip with transmission fluid.



1. C-Clamp
2. Torque Converter
3. Bell Housing

Fig. 16, Clamping the Torque Converter

NOTE: If replacing the transmission, replace the torque converter also. Drain the transmission fluid from the torque converter before replacing it.

Installation

IMPORTANT: Before installing the transmission, make sure the rear tires are chocked, the engine is supported, and the transmission is securely chained to the transmission jack.

1. Install the transmission on the vehicle.

   1.1 Raise the front of the vehicle frame with a hydraulic jack to obtain adequate clearance for installing the transmission. Place safety stands under the front of the vehicle.

   1.2 Check converter seating with steel scale and straightedge (see **Fig. 17**). The surface of the converter lugs should be 13 mm (1/2 inch) to the rear of the straightedge when fully seated.

   1.3 With the transmission on a jack, roll the transmission into place behind the drive plate. Remove the C-clamp from the torque converter.

   IMPORTANT: If reinstalling the old transmission, check drive plate for cracks, distortion, and dam-

Removal and Installation

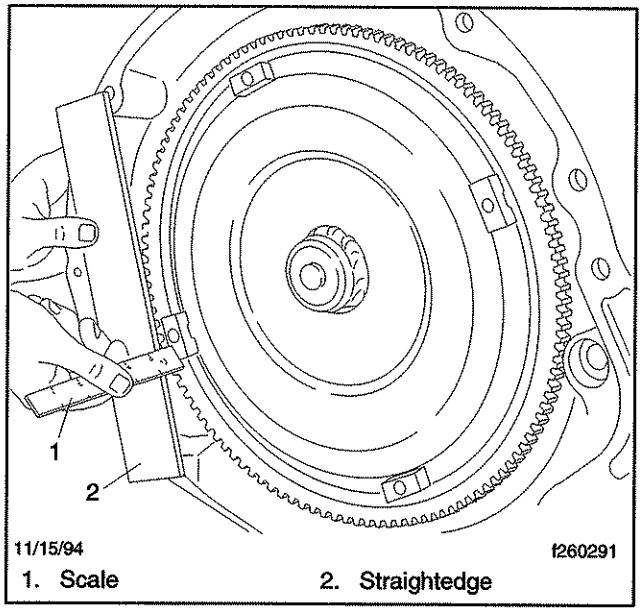


Fig. 17, Typical Method of Checking Converter Seating

age. Be sure the transmission dowel pins are seated in the engine block and that they stick out far enough to hold the transmission in alignment.

1.4 Raise the jack until the transmission lines up with the drive plate.

1.5 Push the transmission toward the engine until it seats squarely against the drive plate, and the bolt holes in the transmission housing align with those in the engine block.

NOTE: No force is required. If interference is encountered, move the transmission away from the engine and correct the problem.

1.6 Install the transmission flange bolts. First, tighten the in-facing bolt (bolt head toward front of vehicle) located directly behind the oil filter. Then, tighten the five out-facing bolts. Tighten all six bolts 41 N·m (30 lbf·ft).

2. Install the main support crossmember and triangular rear support bracket.

2.1 Line up the crossmember using the reference mark made on removal. The crossmember is in front of the frame brackets when correctly installed. See **Fig. 14**.

2.2 Install the standoff bracket for the battery cable to the lower frame rail.

NOTE: Be sure the battery cable is above the crossmember before tightening the bolts.

2.3 Install the crossmember to the frame rail brackets on each side of the vehicle. Tighten all six bolts 68 N·m (50 lbf·ft).

2.4 Adjust the transmission again, if necessary.

2.5 Install the transmission mount onto the transmission using the three bolts on the bottom of the support bracket. Tighten all bolts 68 N·m (50 lbf·ft).

3. Remove the safety stands under the engine. Remove the chain holding the transmission to the jack. Lower the jack and remove it.

4. Align the engine with the transmission.

4.1 Turn the engine until the alignment mark made on removal becomes visible. Use a socket wrench to turn the crankshaft vibration damper clockwise to install the bolts.

NOTE: Be careful not to drop the bolts inside the torque converter. The transmission must be removed to get them out.

4.2 Tighten each torque converter bolt 31 N·m (23 lbf·ft).

4.3 Install the torque converter access cover.

5. Install the ATF fill/dipstick tube.

5.1 Replace the fill/dipstick tube seal.

5.2 Insert the fill/dipstick tube into the hole in the transmission housing.

5.3 Fasten the fill/dipstick tube bracket to the engine.

6. Install the two engine-to-transmission struts. Tighten each transmission-to-strut bolt 102 N·m (75 lbf·ft). Tighten each engine-to-strut bolt 47 N·m (35 lbf·ft).

NOTE: Be sure to install the strap for the transmission fluid cooler lines onto the standoff bracket attached to the left-hand strut.

7. Connect all electrical lines and sensors to the transmission (see **Fig. 6** and **Fig. 7**).

7.1 Install the crankshaft position sensor. Install the bolts and connect the receptacle.

7.2 Connect the coolant temperature sensor to the three-pin plug on the forward transmission cooler line fitting.

7.3 Connect the park-neutral position switch to the three-pin plug on the side of the transmission case just aft of the inner shift lever.

7.4 Connect the transmission solenoid to the three-pin plug on top of the transmission case above the throttle lever.

7.5 Connect the vehicle speed sensor to the three-pin receptacle on the speedometer adapter just before the U-joint.

7.6 Using tie straps, secure all lines and cables as needed.

8. Connect the shift linkage to the transmission.

⚠ CAUTION

Do not overtighten the small U-bolt to the shift cable. If this bolt is too tight, it could squeeze the cable housing and prevent the transmission from shifting.

8.1 Attach the small U-bolt to the shift cable. Tighten the nuts.

8.2 Install the clip attaching the shift cable to the shift lever. See **Fig. 9**.

9. Connect the throttle valve linkage to the transmission.

9.1 Attach the battery cable standoff bracket to the flange on the right-hand side of the transmission case. Using the same bolt, attach the spring bracket to the standoff bracket and fasten the nuts finger-tight.

9.2 Attach the throttle valve cable to the cable bracket and the ball stud on the throttle valve lever.

9.3 Attach the spring on the throttle valve lever to the spring bracket.

9.4 Tighten the nuts on the standoff bracket.

10. Connect the ATF cooler lines to the transmission. Tighten the fittings 18 N·m (13 lbf·ft).

11. Install the starter.

11.1 Attach the battery cable connectors to the starter, as previously marked. Tighten the connector on the battery lead 800 to 1240 N·cm (70 to 110 lbf·in). Tighten the connector on the solenoid lead 500 to 740 N·cm (45 to 65 lbf·in)

11.2 Insert the starter gear housing into the hole in the torque converter access cover. Slip the starter into place over the starter mounting stud.

11.3 Install the two starter mounting bolts and tighten them 68 N·m (50 lbf·ft). Install the starter mounting nut on the stud and tighten it 27 N·m (20 lbf·ft).

11.4 Install the battery cable standoff brackets.

12. Tighten up the wiring harness lines and cables.

12.1 Install the fuel line support bracket on the transmission case and attach the fuel lines to it. See **Fig. 12**.

12.2 Attach the standoff bracket to the air pump hose going to the catalytic converter.

12.3 Attach the standoff bracket to the electrical lines.

12.4 Secure all lines and wires with tie straps as needed.

13. Connect the driveline to the transmission.

13.1 Slide the front of the driveshaft into the splined end of the transmission output yoke. Use the reference marks made on removal to align the driveshaft and output yoke.

13.2 Install the midship bracket and end bracket bolts and nuts. Tighten the nuts 68 N·m (50 lbf·ft).

14. Install the exhaust pipes. Attach the saddle brackets to the exhaust manifold and the clamps to the catalytic converter. Tighten the saddle brackets 34 N·m (25 lbf·ft) and the clamps 43 N·m (32 lbf·ft). Install the rubber isolators (if removed). Attach the left-hand and right-hand oxygen sensors, using the markings made on removal.

Removal and Installation

15. Fill the transmission with Mopar ATF Plus, Type 7176. If the torque converter was drained and/or replaced, add 5.7 liters (6 quarts). If the torque converter was not drained or replaced, add 1.9 liters (2 quarts). Lower the vehicle and remove the safety stands.
16. Connect the batteries and remove the chocks from the tires.
17. Start the engine, and check for any leaks. Repair leaks as needed.
18. With the engine running, check the ATF level. Follow the procedure for checking the fluid level in **Group 26** of the *Business Class Trucks Maintenance Manual*. Add fluid or drain excess as needed.
19. Road test the vehicle, and check the transmission for correct operation.

ATF Cooler Removal and Installation

Removal (See Fig. 1)

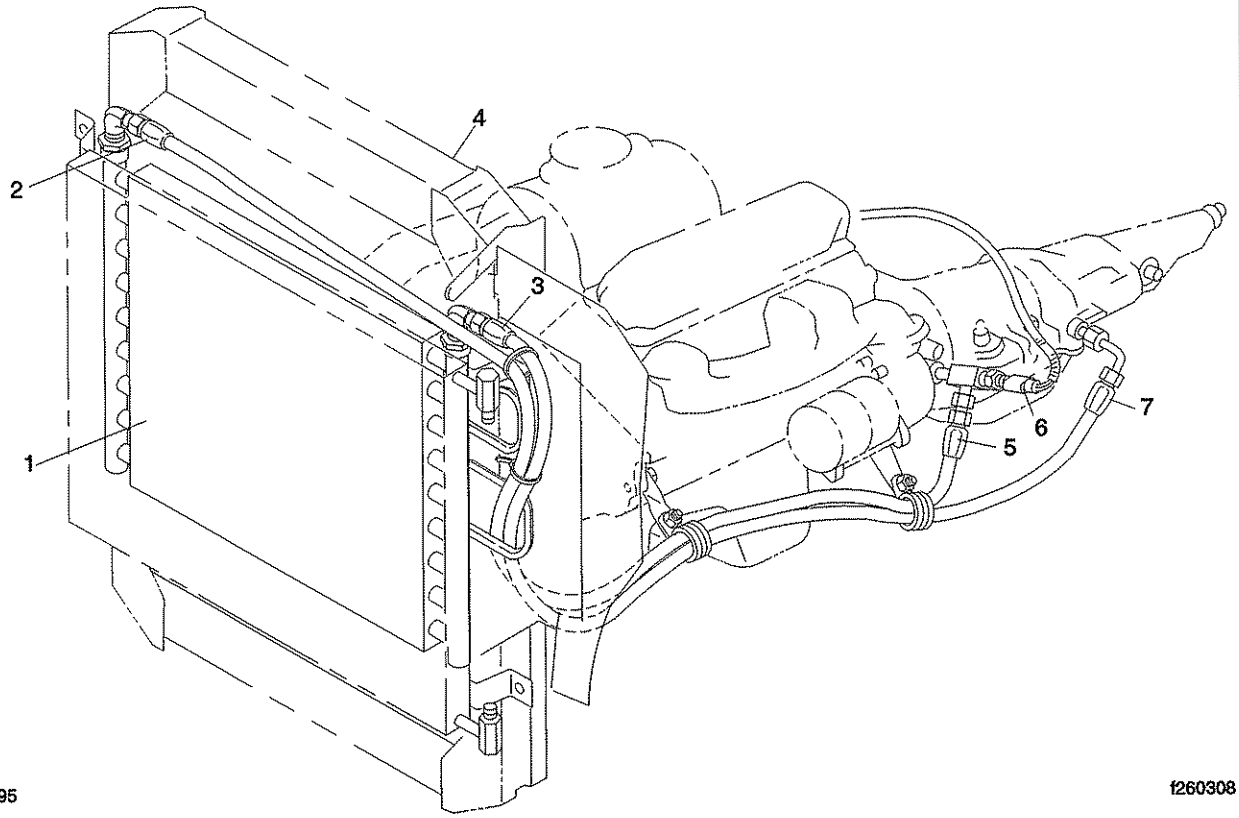
⚠ CAUTION

If a leak should occur inside the internal radiator-mounted transmission ATF cooler, engine coolant may become mixed with automatic transmission fluid (ATF). To prevent damage to the cooling system and the transmission, drain and inspect both systems.

1. Apply the parking brake, chock the tires, and disconnect the batteries.
2. If equipped, remove the air conditioning condenser. For procedures, refer to **Group 83** in this manual.
3. Remove the transmission oil pan and drain the ATF.
4. Disconnect both ATF cooler lines from the cooler. See **Fig. 2.**
5. Remove the four ATF cooler mounting bolts. Remove the ATF cooler from the vehicle.

Installation

1. Install the ATF cooler on the radiator.

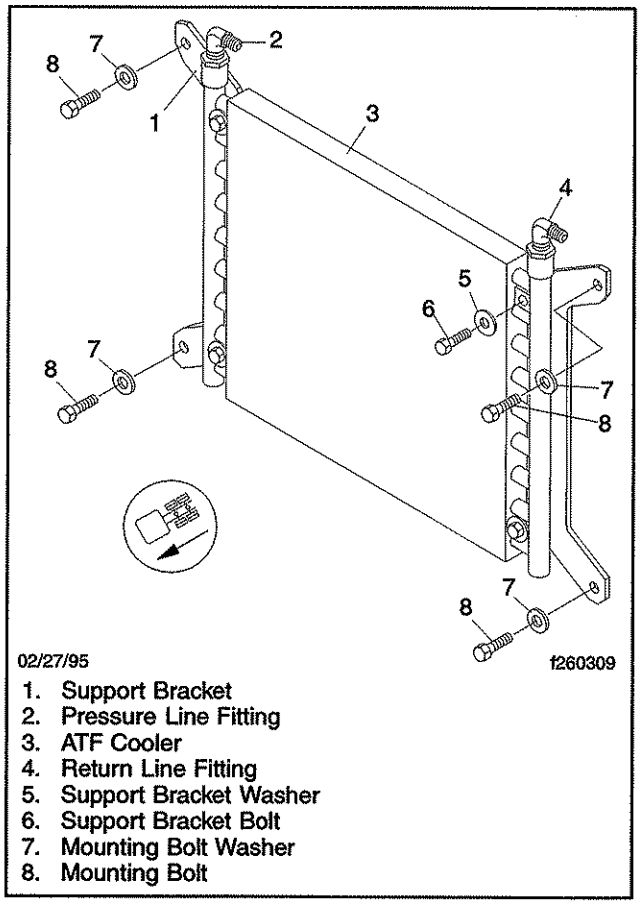


NOTE: On models with air conditioning, the air conditioning condenser is installed in front of the ATF cooler.

1. ATF Cooler
2. Pressure Line (at Cooler)
3. Return Line (at Cooler)
4. Radiator
5. Pressure Line (at Transmission)
6. Transmission Temperature Sensor
7. Return Line (at Transmission)

Fig. 1, Automatic Transmission Fluid (ATF) Cooling System

ATF Cooler Removal and Installation



1. Support Bracket
2. Pressure Line Fitting
3. ATF Cooler
4. Return Line Fitting
5. Support Bracket Washer
6. Support Bracket Bolt
7. Mounting Bolt Washer
8. Mounting Bolt

Fig. 2, ATF Cooler Mounting Components

1.1 Tighten the support bracket bolts 20 N·m (15 lbf·ft), if needed.

1.2 Install the upper mounting bolts but do not tighten them yet.

1.3 Position the oil cooler on the radiator so that the lower mounting bolts line up with the bolt holes on the radiator flange.

1.4 Install the lower mounting bolts. Tighten both the upper and lower mounting bolts 1100 N·cm (95 lbf·in).

2. Connect the ATF cooler lines to the oil cooler.

2.1 If a fitting requires replacement, apply Loctite® 242 to the fitting threads.

2.2 Wipe the cooler line and fitting with a clean, dry cloth.

2.3 Connect the ATF cooler lines and tighten the fittings 18 N·m (13 lbf·ft).

3. Fill the transmission with Mopar ATF Plus, Type 7176. Add 1.9 liters (2 quarts).

4. If equipped, install the air conditioning condenser. For instructions, see **Group 83** in this manual.

5. Connect the batteries and remove the chocks from the tires.

6. Start the engine, and check for leaks. Repair any leaks as needed.

7. With the engine running, check the ATF level. Follow the procedure for checking the fluid level in **Group 26** of the *Business Class Trucks Maintenance Manual*. Add fluid or drain excess as needed.

8. Road test the vehicle, and check the transmission for correct operation.

Specifications

Description	Torque N·m (lbf·ft)	Torque N·cm (lbf·in)
ATF Cooler Line Fittings (Into Transmission)	18 (13)	—
ATF Cooler Mounting Bolts	—	1100 (95)
Driveline Midship and End Brackets	68 (50)	—
Driveplate Bolts	75 (55)	—
Main Support Crossmember Bolts/Nuts	68 (50)	—
Rear Support Bracket Bolts/Nuts	68 (50)	—
Torque Converter Bolts	31 (23)	—
Transmission Drain Plug	17 (13)	—
Transmission Flange Bolts	41 (30)	—
Transmission Oil Pan Bolts	17 (13)	—
Engine-to-Transmission Struts		
Engine-to-Strut Bolt	47 (35)	—
Transmission-to-Strut Bolt	102 (75)	—
Exhaust Lines		
Catalytic Converter Clamps	43 (32)	—
Exhaust Manifold Saddle Brackets	34 (25)	—
Starter		
Starter Mounting Bolts	68 (50)	—
Starter Mounting Nut	27 (20)	—
Starter Battery Lead Connector	—	800–1240 (70–110)
Starter Solenoid Lead Connector	—	500–740 (45–65)

Table 1, Fastener Torques

Contents

Subject	Subject Number
Service Operations	
Transmission Replacement	100
Electronic Control Unit (ECU) Replacement	110
End-Yoke and End-Yoke Seal Replacement	120
Troubleshooting	300
Specifications	400

IMPORTANT: Before replacing the transmission you must call Aisin for approval and a Return Material Authorization (RMA) number. Call 734-354-3968 or 734-354-3995 to speak with an Aisin representative. After hours call 734-453-5551.

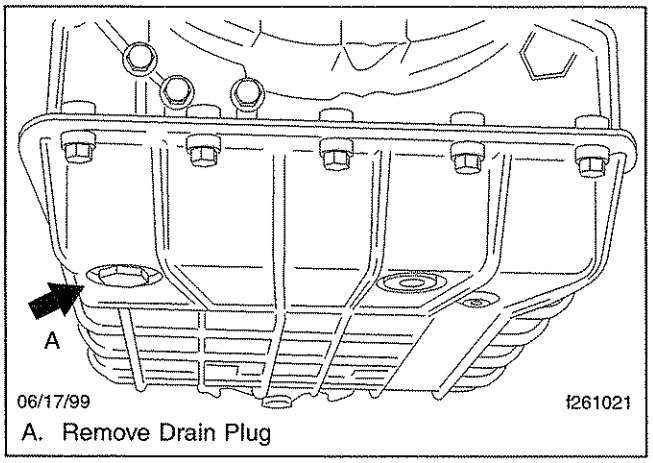
Transmission Replacement

1. Apply the parking brake, chock the tires, and disconnect the batteries.
2. Remove the transmission drain plug and drain the automatic transmission fluid. See **Fig. 1**. Install the drain plug and tighten it 27 to 36 lbf·ft (37 to 49 N·m).

NOTE: The ATF drained from the transmission can be used again if it is clean and if the container into which it was drained contained no ethylene glycol.

3. Support the driveline with a jack stand at the midship bearing.
   - 3.1 Loosen the bolts holding the midship bearing bracket so the driveshaft can slide to the rear. See **Fig. 2**.
   - 3.2 If the vehicle is equipped with a driveline parking brake, remove the nuts on the brake flange. See **Fig. 3**.

     If the vehicle is not equipped with a driveline parking brake, remove the transmission yoke U-joint end caps or lock straps.



A. Remove Drain Plug

Fig. 1, Drain the Transmission Fluid

   - 3.3 Slide the front of the driveshaft off the driveline brake flange or out of the transmission output yoke.

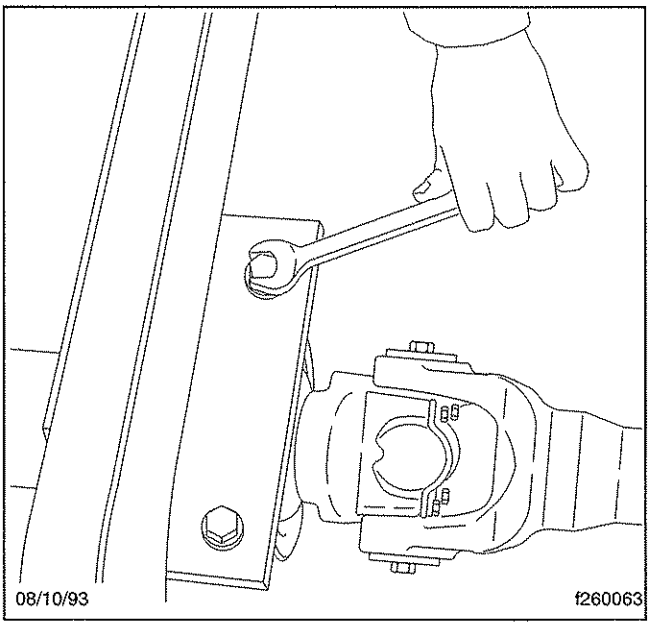


Fig. 2, Loosen the Midship Bearing Bolts

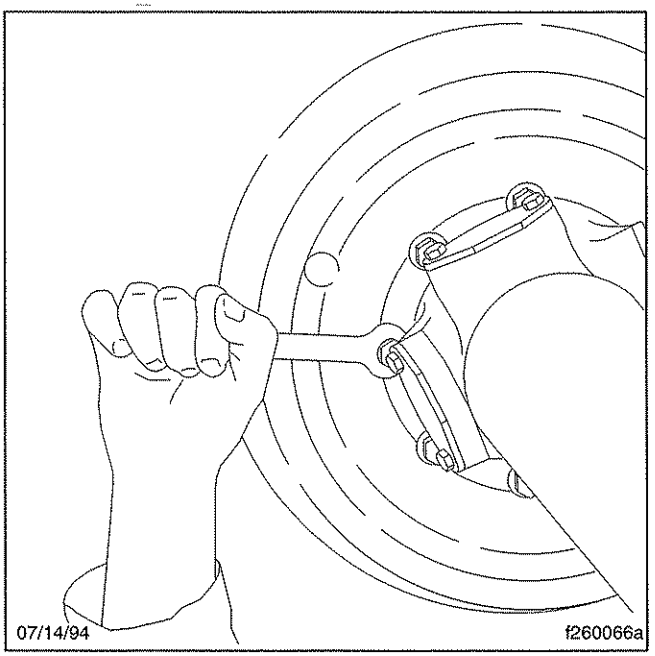


Fig. 3, Remove the Brake Flange Bolts

Transmission Replacement

NOTE: It may be necessary to remove the mounting bolts from the midship bearing bracket so the driveshaft can be moved far enough back.

3.4 Support the disconnected driveshaft and tie it to the frame rail.

4. Remove the shift cable. See **Fig. 4**.

4.1 Pull the cotter pin from the end of the shift assembly.

4.2 Disconnect the shift lever.

5. Disconnect the transmission cooler lines.

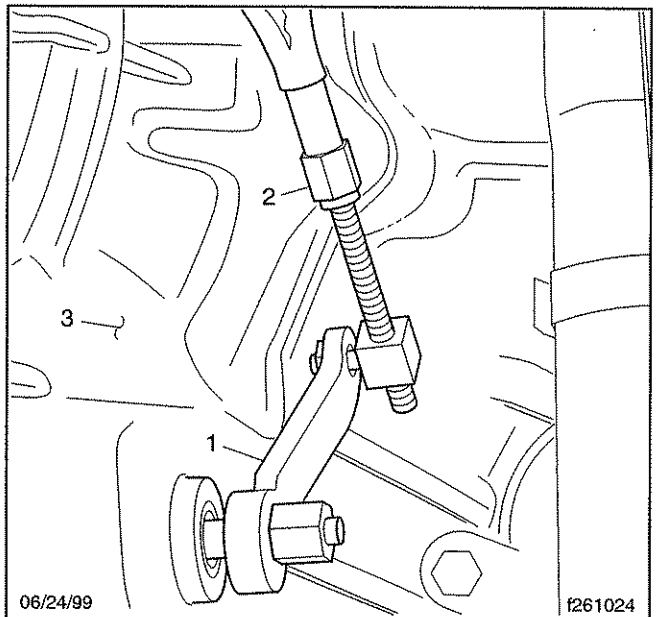
6. Remove the ATF fill/dipstick tube. See **Fig. 5**.

6.1 Remove the U-bolt holding the fill/dipstick tube to its support bracket.

6.2 Remove the two bolts securing the fill/dipstick tube to the transmission.

6.3 Pull the fill/dipstick and O-ring from the transmission case.

6.4 Plug the hole with a clean rag to prevent entry of foreign material.



1. Transmission Shift Arm
2. Shift Cable
3. Transmission

Fig. 4, Transmission Shift Lever

7. Disconnect the flexplate from the transmission.

7.1 Remove the capscrews holding the ring gear access cover. Then, remove the cover.

7.2 Using a screwdriver, turn the ring gear until one of the capscrews holding the flexplate adapter to the torque converter can be removed. Continue turning the ring gear and removing the capscrews through the access hole until all six are removed.

8. Tilt the hood.

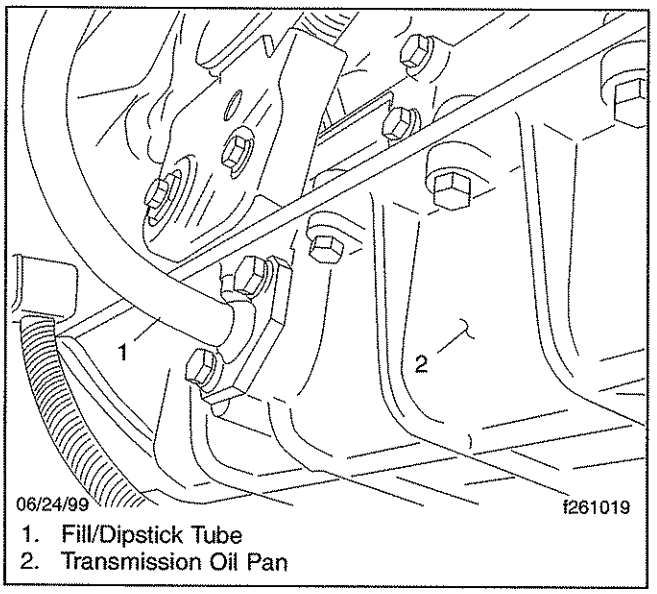
9. Under the hood of the vehicle, disconnect the five electrical harnesses for the transmission. They are bundled together and should be fed down to the transmission to be removed easily.

10. Place a piece of plywood on a transmission jack to support the transmission.

11. Slide the jack into place under the transmission. Secure the transmission with a chain. Anchor the chain with bolts at the front lifting bosses on the top of the transmission.

12. Remove the 12 transmission flange bolts.

13. Move the transmission jack to the rear. Lower the jack and lift the front of the truck, as needed, so the transmission clears the frame rail and any attached components.



1. Fill/Dipstick Tube
2. Transmission Oil Pan

Fig. 5, Fill/Dipstick Tube

14. Place jack stands under the raised front of the vehicle.
15. Roll the transmission jack backward and remove the transmission.

IMPORTANT: Before installing the new transmission, make sure the rear tires are chocked and the transmission is securely chained to the transmission jack.

16. Raise the front of the vehicle frame with a hydraulic jack to obtain adequate clearance for installing the new transmission. Place jack stands under the front of the vehicle.
17. With the transmission on a jack, roll the transmission into place behind the flexplate. Remove the jack stands and lower the front of the vehicle frame.
18. Raise the jack until the transmission lines up with the engine bell housing.
19. Push the transmission toward the engine until it seats squarely against the engine flywheel housing with the bolt holes in the transmission housing aligned with those in the flywheel housing.

NOTE: No force is required. If interference is encountered, move the transmission away from the engine and correct the problem.

20. Install the transmission flange bolts finger-tight.
    - 20.1 Remove the cover from the working port of the fly-wheel housing.
    - 20.2 Gently rotate the fly-wheel, and place the working port on a flexible plate fixing-bolt hole.

      Align a flexible plate fixing bolt of the torque converter with the flexible plate fixing-bolt hole.
    - 20.3 Temporarily tighten the flexible plate fixing bolt. Repeat the above substeps until all six flexible plate fixing bolts are temporarily tightened.
    - 20.4 Securely tighten the eight bolts 32 to 43 (44 to 58 N·m)
21. Remove the chain holding the transmission to the transmission jack.
22. Lower the transmission jack and remove it.
23. Install the ATF fill/dipstick tube.
    - 23.1 Install the fill/dipstick tube (**Fig. 5**). Tighten the two capscrews 11 lbf·ft (15 N·m).
    - 23.2 Inspect the fill/dipstick tube seal. Replace it if damaged.
24. Install the shift cable.
25. Feed the bundle of electrical cables up to the hood area and connect them where the old bundle was disconnected under the hood.
26. Tie strap all electric lines where previously removed.
27. If previously removed, connect the exhaust bracket.
28. Connect the driveshaft.
    - 28.1 Slide the front of the driveshaft into the transmission output yoke or onto the driveline parking brake flange, if so equipped.
    - 28.2 On vehicles without a driveline parking brake, install the transmission yoke U-joint end caps or lock straps.

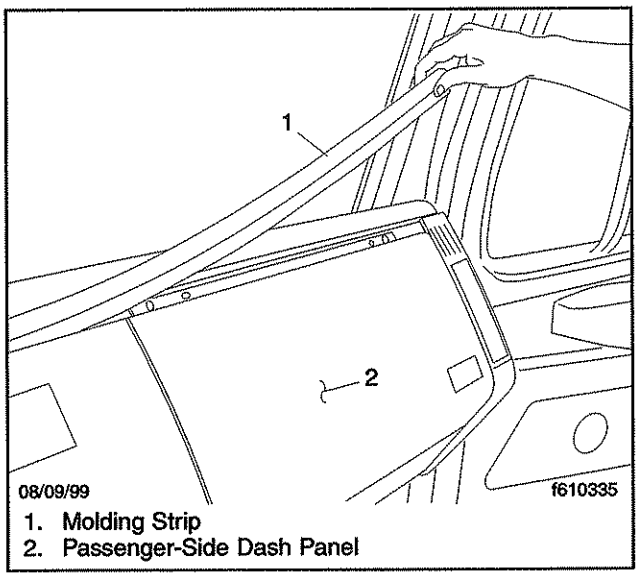
      On vehicles with a driveline parking brake, slide the driveshaft flange onto the studs in the parking brake. Install the nuts and tighten 40 lbf·ft (54 N·m).
    - 28.3 If the midship bearing bracket bolts and nuts were removed, install them. Tighten the nuts 95 lbf·ft (129 N·m).
29. Connect the batteries and remove the chocks from the tires.
30. Start the engine and check for any leaks. Repair leaks as needed.
31. Check the ATF level. Add fluid as needed.
32. Road test the vehicle and check for correct transmission operation.

Electronic Control Unit (ECU) Replacement

ECU Replacement

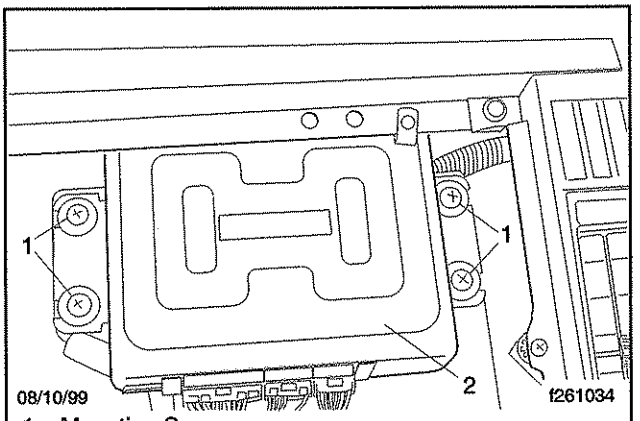
The ECU is located inside the cab, behind the passenger-side upper dash panel. Follow the steps to replace the ECU.

1. Remove the molding strip on the top end of the dash panel. See **Fig. 1**.
2. Under the molding strip are two screws securing the dash panel. Remove the two screws.
3. Remove the panel.
4. Remove the four screws securing the ECU to the mounting bracket. See **Fig. 2**.
5. Pull the ECU away from the mounting bracket.
6. Disconnect all three electrical connectors from the ECU. See **Fig. 3**.
7. Connect the electrical connectors to the new ECU.
8. Install the new ECU onto the bracket, and fasten it with the screws.
9. Install the dash panel.
10. Install the molding strip.



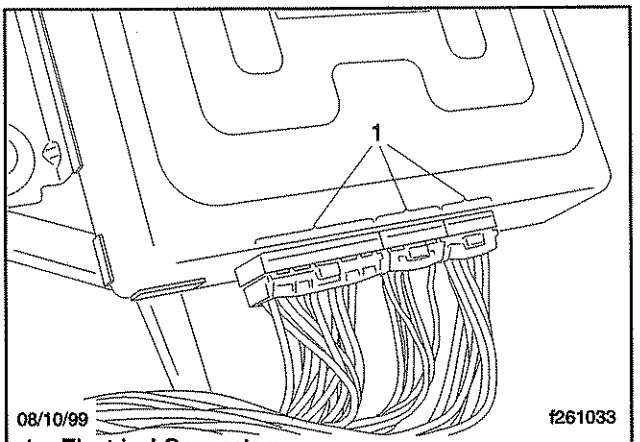
1. Molding Strip
2. Passenger-Side Dash Panel

Fig. 1, Molding Strip on Dash



1. Mounting Screws
2. ECU

Fig. 2, ECU Installed



1. Electrical Connectors

Fig. 3, ECU Electrical Connectors

End-Yoke and End-Yoke Seal Replacement

Special Tools

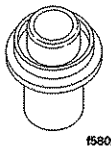
Special Tools			
Tool	**Description**	**Manufacturer**	**Part Number**
 f580269	End-Yoke Seal Installation Tool	Kent-Moore	J-44434

Table 1, Special Tools

Replacement

1. Apply the parking brake, chock the tires, and disconnect the batteries.
2. Support the driveline with a jack stand at the midship bearing.
   - 2.1 Loosen the bolts holding the midship bearing bracket so the driveshaft can slide to the rear. See **Fig. 1.**
   - 2.2 Remove the transmission yoke U-joint end caps or lock straps

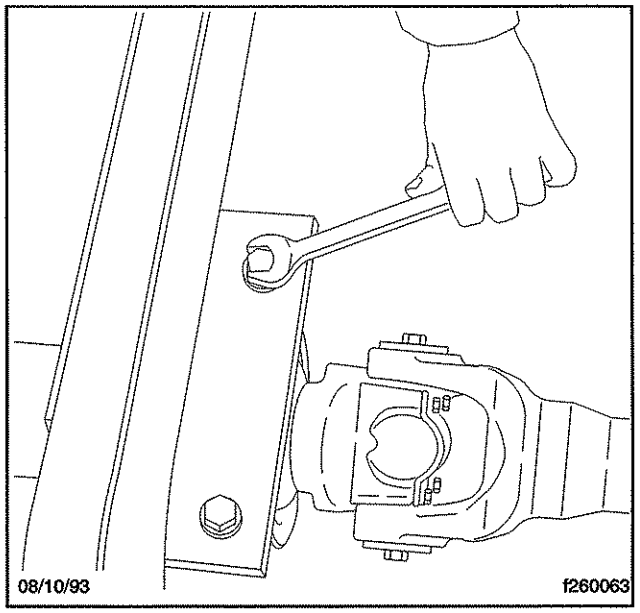


Fig. 1, Loosen the Midship Bearing Bolts

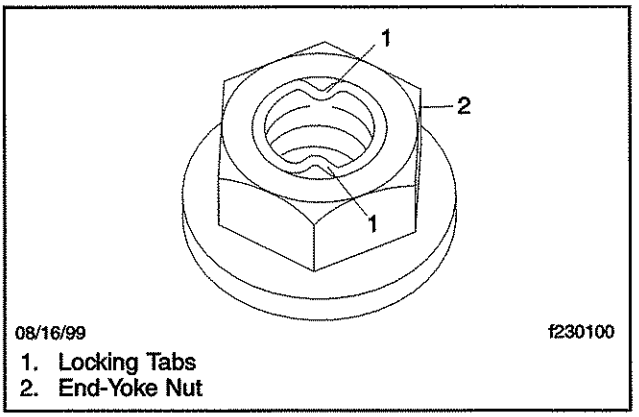
   - 2.3 Slide the front of the driveshaft off the driveline brake flange or out of the transmission output yoke.

   NOTE: It may be necessary to remove the mounting bolts from the midship bearing bracket so the driveshaft can be moved far enough back.

   - 2.4 Support the disconnected driveshaft and tie it to the frame rail.
3. Pry open the locking tabs on the nut. See **Fig. 2.**
4. Secure the end-yoke so it will not rotate and remove the end-yoke nut.

NOTE: Transmission fluid (ATF) may partially drain after removing the end yoke.

5. Slide the end yoke off the end of the output shaft. Discard the O-ring.
6. Remove the oil seal. See **Fig. 3.**



1. Locking Tabs
2. End-Yoke Nut

Fig. 2, End-Yoke Nut

End-Yoke and End-Yoke Seal Replacement

7. Using the special oil seal installation tool (Kent Moore p/n J-44434), install the new oil seal. The tool will set the seal in the transmission. See **Fig. 4**.
8. Wipe away any loose particles at the opening point of the end yoke and lubricate it with grease or ATF.
9. Install the new end yoke (if replacing end-yoke, otherwise use the existing yoke) onto the output shaft slowly. Be careful not to damage the oil seal when installing.

IMPORTANT: The O-ring must be replaced each time the end yoke is removed.

10. Apply ATF to the new O-ring and install it into the groove between the end yoke and the output shaft.

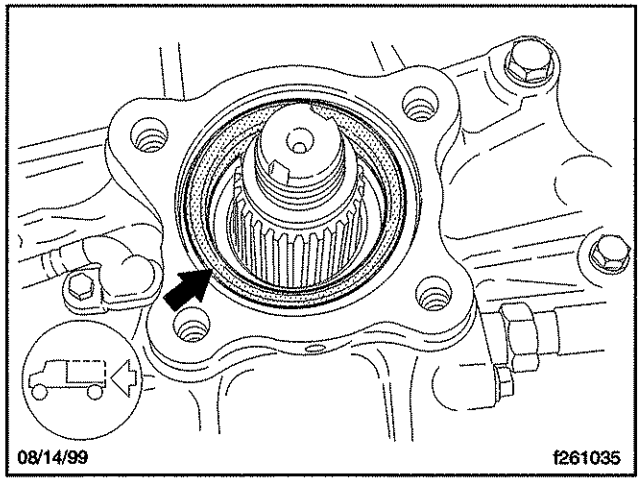


Fig. 3, End-Yoke Seal

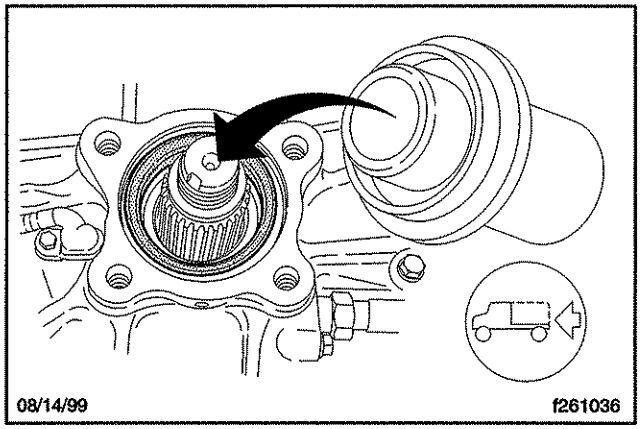


Fig. 4, Install the Seal with the Tool

11. Install the end yoke nut and tighten by hand.

⚠ CAUTION

Do not over tighten the end-yoke nut. Over torquing the nut could result in severe damage to the O-ring. O-ring damage can cause transmission fluid to leak.

12. Tighten the end yoke nut 181 to 214 lbf·ft (245 to 290 N·m).
13. Connect the driveshaft.
    - 13.1 Slide the front of the driveshaft into the transmission output yoke.
    - 13.2 Install the transmission yoke U-joint end caps or lock straps.
    - 13.3 If the midship bearing bracket bolts and nuts were removed, install them. Tighten the nuts 95 lbf·ft (129 N·m).
14. Remove the chocks from the tires.
15. Check the ATF level. Add fluid as needed.
16. Road test the vehicle, and check for correct transmission operation.

Special Tools

See **Table 1** for special tools.

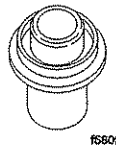
Special Tools			
Tool	**Description**	**Manufacturer**	**Part Number**
 f580269	End-Yoke Seal Installation Tool	Kent-Moore	J-44434

Table 1, Special Tools

Parts

See **Table 2** for service parts.

Part Number	Part Description
AIS 341000-52010	ATM Assembly with Torque Converter with SPL-90 (mounting bolts included)
AIS 341000-52011	ATM Assembly with Torque Converter without End-Yoke (mounting bolts included)
AIS 35168-8700	Oil Pan Gasket
AIS 351754-10010	Drain Plug
AIS 984511-18001	Drain Plug Gasket
AIS 983351-08001	Seal Plug
AIS 983111-06003	Seal Plug Gasket
AIS 33161-8700	PTO Cover
AIS 33162-8700	PTO Cover Gasket
AIS 984651-07005	Breather Hose
AIS 39395-8900	Cooler Union
AIS 39352-8623	Cooler Union O-Ring
AIS 33482-8900	Speed Meter Gear
AAM AA1700 16C	Speed Sensor
A06-30358-000	Speed Sensor Harness
AIS 33404-8900	Sleeve Sub-Assembly
AIS 39352-8632	Sleeve O-Ring
AIS 33485-30020	Speed Meter Lock Plate
AIS 33823-8900	Shift Cable Bracket
AIS 35161-8612	Oil Pan
AIS 86410-4680	ECU

Specifications

Part Number	Part Description
AIS 39358-8601	Rear Oil Seal
AIS 39128-8633	Bolt (engine x ATM)
AIS 39128-8632	Bolt (drive plate x torque converter)
AIS 991411-60825	Bolt (oil pan)
AIS 991411-40814	Bolt (speed meter)
AIS 39128-8606	Bolt (shift cable bracket)
AIS 39310-8600	Nut
AIS 39352-8620	O-Ring

Table 2, Aisin Parts List