Chapter 7
Automatic transaxle

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Specifications

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1 General information

The vehicles covered by this manual are equipped with the AX4S or AX4N electronic four-speed automatic transaxle, equipped with Overdrive and very similar to the AXOD that has been in use for many years.

Due to the complexity of the clutches and the hydraulic control system, and because of the special tools and expertise required to perform an automatic transaxle overhaul, it should not be undertaken by the home mechanic. Therefore, the procedures in this chapter are limited to general diagnosis, engine performance, improper adjustments, hydraulic malfunctions, mechanical malfunctions or failures in the control module or its signal network. Diagnosis of these problems should always begin with a check of the easily repaired items: fluid level and condition (see Chapter 1) and shift linkage adjustment. Next, perform a road test to determine if the problem has been corrected or if more diagnosis is necessary. If the problem persists after the preliminary tests and corrections are completed, additional diagnosis should be done by a dealer service department or transaxle repair shop using a scan tool to diagnose the electronics of the transaxle. Refer to the Troubleshooting section at the front of this manual for information on symptoms of transaxle problems.

2 Diagnosis - general

Note: Automatic transaxle malfunctions may be caused by five general conditions: poor engine performance, improper adjustments, hydraulic malfunctions, mechanical malfunctions or failures in the control module or its signal network. Diagnosis of these problems should always begin with a check of the easily repaired items: fluid level and condition (see Chapter 1) and shift linkage adjustment. Next, perform a road test to determine if the problem has been corrected or if more diagnosis is necessary. If the problem persists after the preliminary tests and corrections are completed, additional diagnosis should be done by a dealer service department or transaxle repair shop using a scan tool to diagnose the electronics of the transaxle. Refer to the Troubleshooting section at the front of this manual for information on symptoms of transaxle problems.

Preliminary checks

1 Drive the vehicle to warm the transaxle to normal operating temperature.
Check the fluid level as described in Chapter 1:

- If the fluid level is unusually low, add enough fluid to bring the level within the designated area of the dipstick, then check for external leaks (see below).
- If the fluid level is abnormally high, drain off the excess, then check the drained fluid for contamination by coolant. The presence of engine coolant in the automatic transaxle fluid indicates that a failure has occurred in the internal radiator walls that separate the coolant from the transaxle fluid (see Chapter 3).
- If the fluid is foaming, drain it and refill the transaxle, then check for coolant in the fluid or a high fluid level.

Check the engine idle speed. **Note:** If the engine is malfunctioning, do not proceed with the preliminary checks until it has been repaired and runs normally.

Check the shift cable (see Section 5). Make sure it's properly adjusted and operates smoothly.

**Fluid leak diagnosis**

Most fluid leaks are easy to locate visually. Repair usually consists of replacing a seal or gasket. If a leak is difficult to find, the following procedure may help. Identify the fluid. Make sure it's transaxle fluid and not engine oil or brake fluid (automatic transaxle fluid is a deep red color).

Try to pinpoint the source of the leak. Drive the vehicle several miles, then park it over a large sheet of cardboard. After a minute or two, you should be able to locate the leak by determining the source of the fluid dripping onto the cardboard.

Make a careful visual inspection of the suspected component and the area immediately around it. Pay particular attention to gasket mating surfaces. A mirror is often helpful for finding leaks in areas that are hard to see.

If the leak still cannot be found, clean the suspected area thoroughly with a degreaser or solvent, then dry it.

Drive the vehicle for several miles at normal operating temperature and varying speeds. After driving the vehicle, visually inspect the suspected component again.

Once the leak has been located, the cause must be determined before it can be properly repaired. If a gasket is replaced but the sealing flange is bent, the new gasket will not stop the leak. The bent flange must be straightened.

Before attempting to repair a leak, check to make sure that the following conditions are corrected or they may cause another leak. **Note:** Some of the following conditions cannot be fixed without highly specialized tools and expertise. Such problems must be referred to a transaxle repair shop or a dealer service department. A factory technician with the proper scan tool can quickly diagnose many transaxle problems with an electronic transaxle such as the AX4S or AX4N.

**Gasket leaks**

Check the pan periodically. Make sure the bolts are tight, no bolts are missing, the gasket is in good condition and the pan is flat (dents in the pan may indicate damage to the valve body inside).

If the pan gasket is leaking, the fluid level or the fluid pressure may be too high, the vent may be plugged, the pan bolts may be too tight, the pan sealing flange may be warped, the sealing surface of the transaxle housing may be damaged, the gasket may be damaged or the transaxle casing may be cracked or porous. If sealant instead of gasket material has been used to form a seal between the pan and the transaxle housing, it may be the wrong type of sealant.

**Seal leaks**

If a transaxle seal is leaking, the fluid level or pressure may be too high, the vent may be plugged, the seal bore may be damaged, the seal itself may be damaged or improperly installed, the surface of the shaft protruding through the seal may be damaged or a loose bearing may be causing excessive shaft movement.

Make sure the dipstick tube seal is in good condition and the tube is properly seated. Periodically check the area around the speedometer gear or speed sensor for leakage. If transaxle fluid is evident, check the O-ring for damage.

**Case leaks**

If the case itself appears to be leaking, the casting is porous and will have to be repaired or replaced.

Make sure the oil cooler hose fittings are tight and in good condition.

**Fluid comes out vent pipe or fill tube**

If this condition occurs, the transaxle is overfilled, there is coolant in the fluid, the case is porous, the dipstick is incorrect, the vent is plugged or the drain-back holes are plugged.

**3 Driveaxle oil seals - replacement**

Refer to illustration 3.3

1. Raise the vehicle and support it securely on jackstands. **Warning:** On models equipped with an air suspension system, always disconnect the electrical power to the air suspension before raising the vehicle (see Chapter 10). Failure to do so may result in unexpected shifting or movement of the vehicle, which could cause personal injury.
2. Remove the driveaxle(s) (see Chapter 8).
3. The seal is a two-piece design, with an outer metal ring and an inner rubber seal. Use a hammer and hook tool to pry up the outer lip of the seal to dislodge it so it can be pried out of the housing (see illustration).
4. Compare the new seal to the old one and make sure they’re the same.
5. Coat the lips of the new seal with transaxle fluid.
6. Place the new seal in position and tap it into the bore with a hammer and a large socket or a piece of pipe that’s the same diameter as the outside metal edge of its seal.
7. Reinstall the various components in the reverse order of removal.

**4 Vehicle Speed Sensor (VSS) - replacement**

Refer to illustrations 4.4, 4.5 and 4.8

**Note:** Any time the speed sensor is removed, you MUST install a new O-ring.

1. Disconnect the negative battery cable.
2. The speed sensor is located on the right (passenger) side of the extension housing. Determine if the O-ring is leaking, look for transaxle fluid around the sensor.
3. Refer to Chapter 4 and remove the exhaust system flex pipe, being careful not to bend either of the two flex portions, then remove the exhaust Y-pipe.
4. Remove the transaxle heat shield (see illustration). It is retained by three push-nuts.
5. Unplug the sensor electrical connector (see illustration).
6. On some models, there is a speedometer cable mounted to the end of the sensor. Disconnect the cable from the speed sensor.
7. Remove the sensor hold-down bolt and remove the sensor (see illustration 4.5).
8. Remove the old O-ring (see illustration) and install a new O-ring on the sensor. **Note:** If a new speed sensor is being installed, remove the clip and swap the plastic gear onto the new sensor and secure it to the clip.
9. Installation is the reverse of removal. Tighten the sensor hold-down bolt securely.
4.4 Remove the transaxle heat shield, retained by three push-nuts (arrows)

4.5 Disconnect the electrical connector (A) from the speed sensor (B), then remove the hold-down bolt (C) and sensor (this view is through the fenderwell)

4.8 Before reinstalling the speed sensor, replace the O-ring (A) with a new one - if the gear (B) is to be changed, remove the clip (C)

5.3 Use a small screwdriver to release the shift cable terminal lock (A) until the “window” (B) shows black, then pull the terminal from the transaxle lever (C)

5 Shift cable - removal and installation

Refer to illustrations 5.3, 5.4 and 5.6

Warning: The models covered by this manual are equipped with airbags. Always disable the airbag system before working in the vicinity of the impact sensors, steering column or instrument panel to avoid the possibility of accidental deployment of the airbag(s), which could cause personal injury (see Chapter 12). The yellow wires and connectors routed through the console are for this system. Do not use electrical test equipment on these yellow wires or tamper with them in any way while working around the dash or console.

1 Disconnect the cable from the negative battery terminal, see Warning above.
2 Refer to Chapter 4 and remove the air cleaner and duct.
3 Disconnect the shift cable from the shift lever on the transaxle (see illustration).
4 Remove the bolts holding the shift cable bracket to the transaxle (see illustration).

Caution: Do not remove the cable from the bracket. If the cable is removed from the bracket, the cable and its retaining clip must be replaced.
5 Refer to Chapter 11 and remove the driver’s side knee bolster.
6 Disconnect the cable end from the shift control lever, and remove the cable and bracket from the U-shaped mount on the steering column (see illustration).

5.4 Remove the bolts (arrows) holding the shift cable bracket to the transaxle - do not remove the cable from the bracket!

5.6 Pry off the cable end (A) at the steering column, then remove the cable and bracket from the channel (B)
6.4a Pry up the plastic boot from the pin (arrow) at the top of the column...

7 Pull the cable through the hole in the firewall to the engine side.
8 Installation is the reverse of removal.

Note: When attaching the cable end to the transaxle lever, make sure that the window in the terminal lock shows yellow (locked position).

6 Shift lever assembly - removal and installation

Refer to illustrations 6.4a, 6.4b and 6.5

Warning: The models covered by this manual are equipped with airbags. Always disable the airbag system before working in the vicinity of the impact sensors, steering column or instrument panel to avoid the possibility of accidental deployment of the airbag(s), which could cause personal injury (see Chapter 12).

The yellow wires and connectors routed through the dash and steering column are for this system. Do not use electrical test equipment on these yellow wires or tamper with them in any way while working around the dash or steering column.

1 Disconnect the negative cable from the battery, see Warning above.
2 Remove the driver's side knee bolster and upper and lower steering column covers (see Chapter 11).
3 Disconnect the electrical connector from the transmission control switch (see Section 9).
4 Remove the boot by prying up one end and pulling the bottom out of a slot in the column (see illustrations).
5 Drive the retaining pin from the shift lever base with a small punch and hammer (see illustration). Remove the shift lever and the clip.
6 Installation is the reverse of removal.

7 Shift indicator cable - replacement and adjustment

Warning: The models covered by this manual are equipped with airbags. Always disable the airbag system before working in the vicinity of the impact sensors, steering column or instrument panel to avoid the possibility of accidental deployment of the airbag(s), which could cause personal injury (see Chapter 12).

The yellow wires and connectors routed through the dash and steering column are for this system. Do not use electrical test equipment on these yellow wires or tamper with them in any way while working around the dash or steering column.

7.4a Pry off the washer and remove the cable loop from the pin (arrow)

Replacement

Refer to illustrations 7.4a, 7.4b and 7.5

1 Disconnect the negative battery cable, see Warning above.
2 Refer to Chapter 11 and remove the driver's side knee bolster and the upper and lower steering column covers.
3 Remove the ignition lock cylinder (see Chapter 12).
4 The shift indicator cable attaches to the shift control lever on the top side of the steering column (see illustrations).

7.4b Remove the bolt (A) and detach the cable end from the column - B is the adjustment thumbwheel

7.5 Remove the indicator cable mount (arrow) at the instrument panel
1 Follow the cable routing from there to the instrument panel, removing any retaining clips along the way, and disconnect the upper and from the shift indicator in the instrument panel (see illustration).
2 Replacement is the reverse of the removal process.

Adjustment
1 Position the shift lever in the Overdrive position, which is two clicks counterclockwise from the right position. Observe the indicator, which has a "flag" around the indicated position (with standard instrument panels) or a pointer (electronic instrument panel).
2 Put a few pounds of pressure downward (clockwise) on the shifter. If the flag or pointer isn't correctly centered on the Overdrive symbol, adjust the thumbwheel on the shifter indicator cable until it is centered (see illustration 7.4b).
3 After adjustment, try the shifter lever in all positions to make sure the indicator matches all the shift lever detents.

Solenoid replacement
8 Disable the airbag system (see Chapter 12). Remove the driver's side knee bolster and upper and lower steering column covers (see Chapter 11).
9 Lower the steering column and support it (see Chapter 10).
10 Unplug the electrical connector from the solenoid, and remove the solenoid mounting screws (see illustration 8.2). Remove the solenoid.
11 Installation is the reverse of the removal procedure.

Solenoid replacement
8 Disable the airbag system (see Chapter 12). Remove the driver's side knee bolster and upper and lower steering column covers (see Chapter 11).
9 Lower the steering column and support it (see Chapter 10).
10 Unplug the electrical connector from the solenoid, and remove the solenoid mounting screws (see illustration 8.2). Remove the solenoid.
11 Installation is the reverse of the removal procedure.

9 Transaxle Control Switch (TCS) check and replacement
1 The Transmission Control Switch located on the shift lever allows the driver to turn the Overdrive capability On or Off. In normal driving the Overdrive is always turned On.

Check
Refer to illustrations 9.2 and 9.7
2 Pull the cover (on the end of the shift lever) from the TCS (see illustration).
3 Check the 10-amp fuse in the engine compartment fuse panel.
11 Transaxle range sensor - check and replacement

Check
Refer to illustrations 11.1 and 11.2
Note: The testing procedure described below applies to 1995 through 1998 models. Later models require the use of an OBD-II scan tool for accurate testing.

1. With the ignition key Off, remove the electrical connector from the TRS (see illustration). Caution: Disconnect the connector by hand, do not use a pry tool.

10 Auxiliary oil cooler - removal and installation

Refer to illustrations 10.2a, 10.2b, 10.3 and 10.4

1. On 3.8L models with trailer-towing option, an auxiliary oil cooler is provided for the automatic transaxle fluid. The cooler looks like as small radiator and is mounted in front of the engine radiator and air-conditioning condenser, just behind the grille. Transaxle fluid flow comes from the transaxle to the auxiliary cooler through the transaxle fluid output line, and then from the auxiliary cooler to the standard cooler in the right-hand tank of the engine radiator. Note: Do not confuse the auxiliary transaxle oil cooler with the similar-looking power steering fluid cooler, which is mounted to the left (facing the front of the radiator) of the transaxle cooler. They are both mounted with the same bolt.

2. To remove the cooler, Place a suitable drain pan under the transaxle to catch the fluid and use a fuel-line disconnect tool to remove the lower fluid line from the transmission (see illustrations). Plug the line after the fluid stops draining.

3. Remove the screws holding the two tubing clamps to the left side of the radiator support (see illustration).

4. At the transaxle cooler at the right side of the radiator, disconnect the lower tube fitting (see illustration).
11.2 TRS sensor terminal identification

1. Battery power
2. Signal return
3. TRS to PCM
4. To liftgate release
5. Starter control to interlock
6. To backup lamps
7. Fused accessory feed
8. To starter control

Use small mirror to examine the end of the connector for loose, corroded or bent pins (see illustration).

1. Major testing of the TRS sensor harness should be conducted using a factory test tool. However, you can check for basic continuity between the terminals on the sensor with an ohmmeter or continuity tester.
2. Check for continuity between the white/pink terminal and the red/light blue terminal. There should be continuity only when in Park or Neutral (Key Off).
3. To check the backup light portion of the sensor, check for continuity between the purple/orange terminal and the black/pink terminal. There should be continuity only when the transaxle is shifted to Reverse.
4. Further testing should be done with the factory tool.

Replacement
Refer to illustration 11.13

7. Disconnect the negative cable from the battery.
8. Shift the transaxle into Neutral.
9. Raise and support the front of the vehicle securely on jackstands.
10. Refer to Section 5 and remove the shift cable from the shift lever and the cable bracket.
11. Make a paint or scribe mark on the transaxle shift lever, relative to its position on the splined shaft from the transaxle when in Neutral, then remove the nut and take off the shift lever.
12. Disconnect the electrical connectors from the TRS sensor (see illustration 11.1).
13. Remove the bolts and detach the sensor (see illustration).
14. To install the sensor (transaxle shaft still in Neutral position), line up the flats on the sensor with the flats in the shaft and lower the sensor onto the shaft.
15. Install the bolts. The alignment of the sensor is made by moving the switch slightly when tightening the two mounting bolts. A factory tool makes this easier, but the tool isn't absolutely necessary. If you are reinstalling your original switch, the bolts will have made a scratched circle on the mounting bosses. If you bolt it down with the bolts aligned exactly over these circles, the switch will be positioned correctly.
16. The remainder of installation is the reverse of removal.
17. Connect the negative battery cable, apply the parking brake and verify that the engine will start only in Neutral or Park.

12 Transaxle mount - check and replacement

Refer to illustrations 12.1, 12.5a and 12.5b

1. Insert a large screwdriver or prybar into the space between the transaxle bracket and the mount and try to pry the transaxle up slightly (see illustration). The transaxle bracket should not move away from the insulator much at all.
2. To replace the mount, raise and suitably support the vehicle on jackstands. Warning: On models equipped with an air suspension system, always disconnect the electrical power to the air suspension system before raising the vehicle (see Chapter 10). Failure to do so may result in unexpected shifting or movement of the vehicle, which could cause personal injury.
3. Remove the left front wheel and the inner splash shield (see Chapter 11).
4. Support the engine with a floorjack and a block of wood, and raise the engine/transaxle enough to take some tension off the transaxle mount.
5. Remove the nuts attaching the insulator to the front subframe and the nuts attaching the insulator to the transaxle (see illustrations).

12.1 Pry on the transaxle mount to check for a broken insulator

12.5a Remove the mount-to-chassis bolts (A), then the mount-to-transaxle-bracket nuts (B) - 3.0L models

12.5b Remove the mount-to-chassis bolts (A), then the mount-to-transaxle-bracket throughbolt (B) - 3.8L models
13.5 Make paint marks (arrows) on the driveplate and torque converter stud to align them in later assembly.

6 Raise the engine/transaxle slightly with the jack and remove the insulator, noting which holes are used in the support for proper alignment during installation.
7 Installation is the reverse of the removal procedure. Be sure to tighten the nuts/bolts to the torque listed in this Chapter's Specifications.

13 Automatic transaxle - removal and installation

Caution: This is a difficult procedure for the home mechanic, requiring the use of several specialized tools, including a transaxle jack and a three-bar engine support fixture. Such tools can be rented, but the job is still difficult to do without a hydraulic lift. Safely raising the vehicle enough for the transaxle and subframe to be pulled out from under the car is a problem without a hoist.

Removal
Refer to illustrations 13.5, 13.14, 13.18 and 13.19
1 Disconnect the negative cable from the battery. Refer to Chapter 5 and remove the battery and battery tray.
2 Raise the vehicle and support it securely on a vehicle hoist. Warning: On models equipped with an air suspension system, always disconnect the electrical power to the air suspension system before raising the vehicle (see Chapter 10). Failure to do so may result in unexpected shifting or movement of the vehicle, which could cause personal injury.
3 Drain the transaxle fluid (Chapter 1).
4 Remove the torque converter cover.
5 Mark the torque converter-to-driveplate relationship with white paint so they can be installed in the same position (see illustration).
6 Remove the torque converter-to-driveplate nuts. Turn the crankshaft pulley bolt for access to each nut.
7 Remove the starter motor (see Chapter 5).
8 Remove the driveaxles from the transaxle (see Chapter 8).
9 Disconnect the speed sensor (see Section 4).
10 Disconnect the electrical connectors from the transaxle.
11 Remove any exhaust components which will interfere with transaxle removal (see Chapter 4).
12 Disconnect the shift linkage from the transaxle (see Section 3).
13 Support the engine using a three-bar support fixture to retain the engine in the body (Refer to Chapter 2). Note: You will probably have to remove the hood and upper cowl panel to install the three-bar fixture (see Chapter 11).
14 Remove the upper transaxle-to-engine bolts and set aside the wiring harness attached to one of the studs on some models (see illustration).
15 Disconnect and plug the transaxle cooler lines (see Section 10). Make sure all of the fluid has drained out into a suitable container.
16 Remove the dipstick tube.
17 Refer to Chapter 10 and disconnect the tie rod ends, steering column lower coupler, lower balljoints and stabilizer links. Warning: Lock the steering wheel in the straight-ahead position before disconnecting the steering column lower coupler and DO NOT allow the steering wheel to rotate or damage to the airbag clockspring could occur.
18 Refer to Chapter 2 and disconnect the engine mount nuts at the chassis, then support the front subframe assembly with a jack and remove the four bolts holding the subframe to the vehicle (see illustration). Warning: Never put any part of your body under the front subframe while it is unbolted from the vehicle.
19 Lower the front subframe and roll it out of the way on the subframe jack. Position a transmission jack under the transaxle and remove the lower transaxle bolts (see illustration).
20 Move the transaxle back to disengagement from the engine block dowel pins and make sure the torque converter is detached from the driveplate. Secure the torque converter to the transaxle so it will not fall out during removal. Lower the transaxle with the transaxle jack.

Installation
21 Prior to installation, make sure that the torque converter hub is securely engaged in the pump. Lubricate the torque converter hub with multi-purpose grease.
22 With the transaxle secured to the jack, raise it evenly into position. Be sure to keep the level so the torque converter does not tilt out.
23 Turn the torque converter to line up the studs with the holes in the driveplate. The white paint mark on the torque converter and the driveplate made in Step 5 must line up.
24 Move the transaxle forward carefully until the dowel pins and the torque converter are engaged.
25 Install the transaxle-to-engine bolts. Tighten them securely.
26 Install the torque converter-to-driveplate nuts. Tighten the bolts to the specified torque.
27 Install the front subframe and reconnect the suspension and chassis components which were removed. Tighten the bolts and nuts to the torque specified in Chapter 10.
28 The remainder of the installation is the reverse of the removal procedure.
29 Fill the transaxle with new fluid (Chapter 1), run the vehicle and check for fluid leak and proper shifting. Verify before driving the vehicle will start only in Park or Neutral.