

Automotive Technology 6th Edition

Chapter 135 AUTOMATIC TRANSMISSION/TRANSAXLE DIAGNOSIS & IN-VEHICLE SERVICE

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This Automotive Technology 6th text provides complete coverage of automotive components, operation, design, and troubleshooting. It correlates material to task lists specified by ASE and ASEEducation (NATEF) and emphasizes a problem-solving approach. Chapter features include Tech Tips, Frequently Asked Questions, Case Studies, Videos, Animations, and ASEEducation (NATEF) Task Sheets.
Motivate Learners	Explain how the knowledge of how something works translates into the ability to use that knowledge to figure why the engine does not work correctly and how this saves diagnosis time, which translates into more money.
State the learning objectives for the chapter or course you are about to cover and explain this is what they should be able to do as a result of attending this session or class.	Explain learning objectives to students as listed below: <ol style="list-style-type: none"> 1. Explain the process of diagnosing transmission problems. 2. Discuss the procedures for performing in-vehicle service.
Establish the Mood or Climate	Provide a <i>WELCOME</i> , Avoid put downs and bad jokes.
Complete Essentials	Restrooms, breaks, registration, tests, etc.
Clarify and Establish Knowledge Base	Do a round robin of the class by going around the room and having each student give their backgrounds, years of experience, family, hobbies, career goals, or anything they want to share.

NOTE: Lesson plan is based on 6th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com

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NOTE: You can use Chapter Images or possibly Power Point files:

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1. SLIDE 1 CH135 AUTOMATIC TRANSMISSION/TRANSAXLE DIAGNOSIS & IN-VEHICLE SERVICE

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Videos

ASE EDUCATION TASK: check fluid level in a in transmission or a transaxle equipped with dipstick. Check fluid level in a Transmission or a transaxle not equipped With a dip-stick. Check transmission fluid Condition; check for leaks.

2. **SLIDE 2 EXPLAIN FIGURE 135–1** typical automatic transmission dipstick (fluid level indicator). Many use a clip to keep it from being forced upward due to pressure changes inside the automatic transmission. A firm seal also helps keep water from getting into the fluid, which can cause severe damage to the clutches and bands.

3. **SLIDE 3 EXPLAIN FIGURE 135–2** “add” mark on most automatic transmission dipsticks indicates the level is down 0.5 quart (0.5 liter). Always follow instructions stamped or printed on the dipstick.

EXPLAIN TECH TIP: Quick-and-Easy Automatic Transmission/Transaxle Diagnosis. An experienced technician told the beginning technician that automatic transmission/transaxle diagnosis is often very easy. For example: If vehicle does not move in drive or reverse, remove transmission/transaxle for service because problem is likely mechanical rather than hydraulic (valve body) or electrical (computer, solenoids, or sensors). If the unit will not power vehicle, unit will more than likely require

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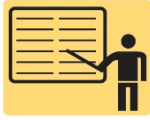
removal for a thorough mechanical inspection and repair. If vehicle moves, but does not shift correctly, problem is likely electrical (computer, solenoid, or sensor) or hydraulic (valve body) rather than mechanical. This is usually true because if the vehicle is able to move forward and backward, the major mechanical components, though not in like-new condition, are at least able to function. Therefore, correcting the non-mechanical problem should be the technician's first consideration.

4. **SLIDE 4 EXPLAIN FIGURE 135-3** temperature of automatic transmission fluid is displayed on a factory or factory-level scan tool. It may require that vehicle be driven under a load for the fluid to reach specified temperature and can often be achieved by simply allowing the engine to idle.
5. **SLIDE 5 EXPLAIN FIGURE 135-4** Most factory or factory-level scan tools are capable of bidirectional control of the automatic transmission or transaxle.
6. **SLIDE 6 EXPLAIN FIGURE 135-5** Tech 2 scan tool is able to display shift solenoid current. Use this information and check service information for the specified current to help diagnose shift solenoid-related faults.

DISCUSS CHART 135-1 Transmission/transaxle-related diagnostic trouble codes (DTCs). For transmission-related diagnostic trouble codes for vehicles older than 1996, check service information on how to retrieve and read the codes.

EXPLAIN TECH TIP: *You'd Ask a Friend, Wouldn't You?* If you were stuck on a difficult transmission problem, you would probably ask a technician friend for ideas. Think of service information as a friend with some inside information. It is written by the people who know how the system works in detail. Such advice is available in service information. If technician follows recommended steps, chances are excellent of finding problem—just like getting the advice of an experienced technician. ● **SEE FIGURE 135-6.**

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7. **SLIDE 7 EXPLAIN FIGURE 135-6** Checking service information for how to perform diagnosis on an automatic transmission fault is a wise step.

DISCUSS CASE STUDY: *Stalling Impala*

The owner of a Chevrolet Impala complained that vehicle would occasionally stall when slowing to a stop. Problem only occurred after at least 20 miles and occurred more frequently in warm weather. The owner also indicated even though this vehicle was equipped with an automatic transmission it felt like clutch not being depressed on a manual transmission. Thankfully, service technician was aware of this common problem and installed a new torque converter clutch solenoid. When original solenoid got hot, it became stuck in applied position. Even though voltage was removed from solenoid when brakes were applied, solenoid and TCC remained applied.

• SEE FIGURE 135-7.

Summary:

- **Complaint—owner of vehicle complained that engine would stall when slowing to a stop, but only after car was driven for 20 miles or further.**
- **Cause—defective TCC solenoid.**
- **Correction—Replacing TCC solenoid cured engine staling problem**

8. **SLIDE 8 EXPLAIN FIGURE 135-7** torque converter clutch (TCC) solenoid. This TCC can be replaced on a General Motors vehicle without having to remove the transmission/transaxle from the vehicle.

9. **SLIDE 9 EXPLAIN FIGURE 135-8** This 4-cylinder General Motors vehicle has a stall speed of about 2350 RPM. Notice that the gear selector is in drive and speedometer is reading zero

10. **SLIDE 10 EXPLAIN FIGURE 135-9** Sometimes location of a transmission fluid leak is easy to see, but

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with others it can be difficult to find exact location. Look closely at places where O-rings or gaskets are used, as these are most common areas where fluid leaks occur..

DISCUSS CHART 135-2 Typical automatic transmission/transaxle sensor values as displayed on scan tool.

DEMONSTRATION: SHOW HOW TO ADD DYE TO TRANSMISSION & USE A BLACK LIGHT TO DIAGNOSE A FLUID LEAK. WARN STUDENTS THAT ENGINE COOLANT WILL OFTEN GLOW LIKE DYE, WHICH COULD RESULT IN MISDIAGNOSIS.

11. **SLIDE 11 EXPLAIN FIGURE 135-10** black light being used to locate the source of automatic transmission fluid leak.
12. **SLIDE 12 EXPLAIN FIGURE 135-11** locations (taps) for connecting a pressure gauge to measure pressure of various hydraulic circuits are usually found on side of automatic transmission/transaxle. Check service information for exact locations for vehicle being tested..
13. **SLIDE 13 EXPLAIN FIGURE 135-12** Six pressure gauges are installed on this vehicle to show students how the pressures vary and how the gauges can be used to find faults or possible problem areas before the unit is removed and disassembled.

ON-VEHICLE ASE EDUCATION TASK A6:

Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine needed action.

ON-VEHICLE ASE EDUCATION TASK B2:

Inspect for leakage; replace external seals, gaskets, and bushings

DISCUSS CHART 135-3 typical range chart shows forward clutch is applied in all forward gears. Notice that if low-reverse clutch were to fail, it would prevent vehicle from moving in both reverse and forward.

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EXPLAIN TECH TIP: *Vibration—Engine or*

Transmission? A vibration is often difficult to diagnose. One method is to separate (unbolt) torque converter from the engine drive flex plate. Push torque converter as far toward transmission/transaxle as possible, then start engine. If vibration is gone, the problem is due to a fault in torque converter, pump assembly, or other component that is constantly rotating with the engine running. If vibration is still present, then the cause is due to an engine or accessory problem.

EXPLAIN TECH TIP: *Look at the Command and the*

Engine Speed. Using a scan tool is very helpful when diagnosing automatic transmission problems. However, the display often shows when the shift has been commanded and may not show if the shift or the TCC engagement actually occurred. To help ensure that the shifts have in fact occurred, also watch the engine speed. Many factory or enhanced scan tools can also display engagement speed. A slow engagement is usually caused by worn clutches. Check service information for the exact parameters and range of proper operation for the vehicle being diagnosed..

14. SLIDE 14 **EXPLAIN** FIGURE 135–13 Draining fluid from an automatic transaxle by allowing fluid to flow into a container after most of the retaining bolts have been removed
15. SLIDE 15 **EXPLAIN** FIGURE 135–14 This is a normal amount of wear material in bottom of an automatic transmission pan.
16. SLIDE 16 **EXPLAIN** FIGURE 135–15 Always check that the filter is secured by a clip or other fastener to keep it from dropping out of location.

DISCUSS FREQUENTLY ASKED QUESTION:

What Is Wrong When My Automatic Transmission Does Not Upshift?

The following examples can cause automatic transmission/ transaxle to fail to upshift.

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QUESTION

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- **Defective governor (if so equipped) will often not allow any automatic transmission/transaxle to shift out of first gear or stuck in high gear.**
- **Defective vacuum modulator (if so equipped) or misadjusted throttle valve will often delay the shift until a very high speed is achieved.**
- **Fault in PCM, TCM, or a speed sensor on electronically controlled automatic transmissions/transaxles will occur when one gear, usually 2ND or 3RD is selected and unit will not shift out of that gear.**

WARNING automatic transmission fluid may be hot enough to cause personal injury. Wear protective clothing and avoid contact with the hot fluid.

EXPLAIN TECH TIP: *Using the Wrong ATF Could Cause Shifting.* If incorrect automatic transmission fluid has been used, such as during a previous repair, the following problems could occur:

- **Hard shifts**
- **Slipping**
- **Shudder (feels like a vibration similar to driving over a rippled road surface)**

If any of these conditions are present, check with the customer to find out if the transmission had been recently serviced or if the customer added new fluid or some additive. Often, some of the above concerns can be solved by replacing fluid with the specified fluid.

[Transmission Fluid Exchange \(View\) \(Download\)](#)

DISCUSSION: DISCUSS NEED TO WATCH FOR FALLING PARTS WHEN REPLACING A TRANSMISSION FILTER. SOME MODELS USE CHECK VALVE THAT WILL FALL WHEN THE FILTER

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DISCUSSION: discuss importance of correctly installing filter in an automatic transmission. What Will happen if filter sucks air?

HANDS-ON TASK: IDENTIFY TRANSMISSION OR TRANSAXLE IN A SPECIFIC VEHICLE. USING SERVICE INFORMATION OR AN OIL-PAN SHAPE CHART MAY BE HELPFUL FOR THEIR ID PROCESS.

DEMONSTRATION: SUPERVISE A FLUID & FILTER CHANGE

ON-VEHICLE ASE EDUCATION TASK B4:
Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.

DISCUSSION: DISCUSS WITH STUDENTS WHAT PROBLEMS COULD ARISE IF THE LINKAGE ADJUSTMENT IS NOT CORRECT. WHAT WOULD HAPPEN IF TRANSMISSION DID NOT GO ALL THE WAY INTO PARK?

DEMONstration: DEMO HOW TO INSPECT, ADJUST, AND REPLACE EXTERNAL MANUAL VALVE SHIFT LINKAGE, TRANSMISSION RANGE SENSOR/SWITCH, AND PARK/NEUTRAL POSITION SWITCH

17. SLIDE 17 **EXPLAIN** FIGURE 135–16 fluid exchange machine uses the engine and transmission pump to force fluid into machine where old fluid is used to push against a diaphragm, which then forces new fluid back through transmission. A sight glass is used to show technician the fluid, so process can be stopped when only clean, new fluid is seen flowing through cooler line.
18. SLIDE 18 **EXPLAIN** FIGURE 135–17 In this case, cork-rubber gasket is glued to pan and is ready to be installed. The retaining bolts need to be tightened in sequence, but be aware that overtightening will cause a

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leak. Also, some manufacturers recommend using only an RTV sealer, but never use RTV sealer & gasket together.

ON-VEHICLE ASE EDUCATION TASK B2:

Inspect for leakage; replace external seals, gaskets, and bushings

19. SLIDE 19 **EXPLAIN** FIGURE 135–18 Adjusting intermediate band on a Ford A4LD transmission.

EXPLAIN TECH TIP: Use Old Headlights to Check Wiring. The proper operation of any electronically controlled automatic transmission/transaxle depends on having electrical power available to operate the solenoids. Before removing unit from vehicle, use a headlight to check if there is enough current being sent to the unit. Unplug electrical connection that supplies 12 volts, usually from ignition switch. Use a headlight and attach wires to ground and the bright filament terminals. Attach one test lead from a headlight to the terminal that supplies 12 volts to the unit. Attach other lead from the headlight to a good clean chassis or transmission ground such as case. Turn ignition **Key On, Engine Off (KOE0)** and observe headlight.

- If headlight is dim, there is voltage drop between source (battery) and transmission feed. Check wires directly leaving ignition switch or transmission control relay. If headlight is still dim, replace ignition switch or transmission feed relay.
- **• SEE FIGURE 135–19.**
- If headlight is off, then there is an open circuit between battery and transmission/transaxle. Follow electrical troubleshooting procedures to find and repair open circuit.
- If headlight is bright, there is enough voltage and current being supplied to

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transmission/transaxle to correctly operate all of the solenoids. • SEE FIGURE 135–20.

20. **SLIDE 20 EXPLAIN FIGURE 135–19** dim headlight indicates excessive resistance between the battery and the electrical connector to automatic transmission/transaxle
21. **SLIDE 21 EXPLAIN FIGURE 135–20** A bright headlight indicates that there should be sufficient current flow available at the automatic transmission/transaxle to operate all the solenoids correctly.

DEMONSTRATION: DEMO HOW TO ADJUST A BAND

HANDS-ON TASK: HAVE THE STUDENTS RAISE VEHICLE ON A LIFT USING ALL SAFETY PROCEDURES. HAVE THE STUDENTS INSPECT THE AUTOMATIC TRANSMISSION OR TRANSAXLE FOR ANY FLUID LEAKS. HAVE THEM REPORT THEIR FINDINGS, ALONG WITH RECOMMENDED SERVICE

HANDS-ON TASK: HAVE THE STUDENTS RAISE VEHICLE ON A LIFT USING PROPER SAFETY PROCEDURES. ASK THEM TO DETERMINE WHETHER THE BANDS CAN BE ADJUSTED WITH THE TRANSMISSION IN VEHICLE.

21. SLIDES 21-32 EXPLAIN Transmission Pan Replacement SLIDE SHOW.

ON-VEHICLE ASE EDUCATION TASK A1: Identify/interpret transmission/transaxle concerns, differentiate between engine performance and transmission/transaxle concerns; determine needed action.

ON-VEHICLE ASE EDUCATION TASK B1: Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch.

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DEMONSTRATION: DEMO HOW TO INSPECT TRANSMISSION AND ENGINE MOUNTS

ON-VEHICLE ASE EDUCATION TASK B5:

Inspect, replace and align powertrain mounts.

ASE EDUCATION TASK A10: Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.

ON-VEHICLE ASE EDUCATION TASK B11.

Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information.

ON-VEHICLE ASE EDUCATION TASK A12:

Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law).

ON-VEHICLE ASE EDUCATION TASK B3:

Inspect, test, adjust, repair, and/or replace electrical/electronic components and circuits including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses; demonstrate understanding of the relearn procedure.

ON-VEHICLE ASE EDUCATION TASK A9.

Perform lock-up converter system tests; determine needed action.