

Automatic Transmissions and Transaxles, 7e

Chapter 3 Automatic Transmission/Transaxle Hydraulic System

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers Automatic Transmissions and Transaxles 7th Edition. It correlates material to task lists specified by ASE and ASE Education (NATEF) .
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 the chapter learning objectives to the students. <ol style="list-style-type: none">1. Prepare for ASE Automatic Transmissions (A2) certification test content area "A" (General Transmission and Transaxle Diagnosis).2. Discuss hydraulic principles and Pascal's Law.3. Describe the types and operation of automatic transmission/transaxle pumps.4. Explain the different methods for controlling fluid flow and regulating pressure.5. Identify the types of hydraulic seals.
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: This lesson plan is based on automatic Transmissions & Transaxle 7th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com
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ICONS



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1. SLIDE 1 Automatic Transmission/Transaxle Hydraulic System

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Videos

At the beginning of this class, you can download
the crossword puzzle & Word Search from
http://www.jameshalderman.com/books_a2.html
to familiarize your class with the terms in this
chapter & then discuss them












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2. **SLIDE 2 EXPLAIN FIGURE 3-1** Fluid pressure is transmitted undiminished in all directions. Note that the pressure is equal throughout the system.
3. **SLIDE 3 EXPLAIN FIGURE 3-2** A 100 lb force applied on an input piston that has an area of 1 sq. in. will produce a fluid pressure of 100 PSI.
4. **SLIDE 4 EXPLAIN FIGURE 3-3** A simple memory triangle can be used to help remember the commonly used hydraulic formulas.

PASCAL'S LAW OR PRINCIPLE: FLUID PRESSURE IS TRANSMITTED UNDIMINISHED IN ALL DIRECTIONS.

5. **SLIDE 5 EXPLAIN FIGURE 3-8a** Gear-type pump, **b.** Gerotor-type pump, **c** Vane-type pump
6. **SLIDE 6 EXPLAIN FIGURE 3-9** As a pump rotates, a low pressure (vacuum) is created as the pumping members move apart in one area, and atmospheric pressure will force fluid into this area. Pressure is created where the pumping members move together.

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	<p><u>BASIC HYDRAULIC SYSTEM (VIEW) (DOWNLOAD)</u> <u>PRESSURE REGULATOR VALVE (VIEW)</u> <u>(DOWNLOAD)</u></p>
	<p>EXPLAIN FREQUENTLY ASKED QUESTION: What Is a Front Pump?</p>
	<p>7. SLIDE 7 EXPLAIN FIGURE 3–6 A variable displacement vane pump in maximum and minimum output positions. The slide is moved to the high output position by a spring. Decreased pressure comes from the pressure regulator valve..</p>
	<p>8. SLIDE 8 EXPLAIN FIGURE 3–7 A dual-stage, external gear pump. Both stages are used at low engine speeds to produce enough fluid for the transmission’s needs. At higher engine speeds, the output of secondary stage is vented.</p>
	<p>EXPLAIN FREQUENTLY ASKED QUESTION</p>
	<p>9. SLIDE 9 EXPLAIN FIGURE 3–8 A chain-driven pump allows the transaxle to be shorter compared to a conventional pump that is driven by the torque converter.</p>
	<p>10. SLIDE 10 EXPLAIN FIGURE 3–9 A spool valve resembles a spool for thread (top).</p>
	<p>11. SLIDE 11 EXPLAIN FIGURE 3–10 A spool valve and its bore. Note the names of the various parts.</p>
	<p>12. SLIDE 12 EXPLAIN FIGURE 3–11 When pressure on the face of the pressure regulator valve overcomes spring force, the valve moves to open the exhaust port.</p>
	<p><u>Hydraulic Controlled Manual Shifts (View)</u> <u>(Download)</u></p>
	<p>13. SLIDE 13 EXPLAIN FIGURE 3–12 typical valve body as installed on a GM 4T65-E transaxle.</p> <p>14. SLIDE 14 EXPLAIN FIGURE 3–13 typical upper valve body showing the fluid passages (“worm holes”).</p> <p>15. SLIDE 15 EXPLAIN FIGURE 3–14 When pressure on the face of the pressure regulator valve overcomes spring force, the valve moves to open the exhaust port.</p>

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      	<p>16. SLIDE 16 EXPLAIN FIGURE 3–15 Typical pressure relief valves as found in the pump circuit.</p> <p>17. SLIDE 17 EXPLAIN FIGURE 3–16 GM 4T45-E uses an auxiliary electric pump to maintain hydraulic pressure when the engine stops during a stop-start event.</p> <p>18. SLIDE 18 EXPLAIN FIGURE 3–17A rooster comb is the detent that helps retain the manual valve in the various positions in the valve body.</p> <p>EXPLAIN FREQUENTLY ASKED QUESTION How is pressure maintained in the automatic transmission during stop-start operation?</p> <p>DEMONSTRATION: SHOW TRANSMISSION AUXILIARY EXTERNAL PUMPS FOR STOP-START SYSTEMS</p> <p>19. SLIDE 19 EXPLAIN FIGURE 3–18A typical shift valve has a spring to move the valve to a downshift position where the throttle pressure works with this spring. When governor pressure gets high enough, the valve will move to an upshift position</p> <p>20. SLIDE 20 EXPLAIN FIGURE 3–19 Some automatic transmissions, such as this VW/Audi unit use an electric motor to move the manual valve inside the transaxles itself. Other vehicles use an external actuator to move the manual valve. Check service information for the exact method used on the vehicle being serviced</p> <p>DEMONSTRATION: SHOW EXTERNAL VW ELECTRIC MOTOR IF AVAILABLE</p> <p>21. SLIDE 21 EXPLAIN FIGURE 3–20 rotary knob type electronic shifter used on a Chrysler 200.</p> <p>EXPLAIN FREQUENTLY ASKED QUESTION: What is a Shift-By-Wire System?</p> <p>22. SLIDE 22 EXPLAIN FIGURE 3–21 A new O-ring seal being installed on a cover.</p> <p>23. SLIDE 23 EXPLAIN FIGURE 3–22 The sealing member of a metal-clad lip seal makes a dynamic seal with the rotating shaft while the metal case forms a static</p>

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seal with the transmission case.

DISCUSSION: DISUCUSS DIFFERENT TYPES OF HYDRAULIC SEALS. IS THERE A RIGHT OT WRONG WAY TO INSTALL A SEAL?

24. **SLIDE 24 EXPLAIN FIGURE 3–23** Sealing rings are used to seal the passages between stationary and rotating members. For example, the seal rings at the right keep the fluid flows from the pump to the front clutch from escaping.
25. **SLIDE 25 EXPLAIN FIGURE 3–24** Fluid pressure forces a sealing ring outward in both directions to make firm contact with the side of the groove and outer diameter of the bore.
26. **SLIDE 26 EXPLAIN FIGURE 3–25** Metal seal rings (bottom) have plain or hooked ends. Teflon rings (top) are either uncut, scarf cut, or butt cut.

DEMONSTRATION: SHOW DIFFERENT TYPES OF TRANSMISSION SEALING RINGS

DISCUSSION: DISUCUSS DIFFERENT TYPES OF SEALING RINGS USED. IS THERE A RIGHT OT WRONG WAY TO INSTALL A SEALING RING? WHEN DID THEY START TO USE SCRAF CUT TEFLON SEALING RINGS AND WHY?

27. **SLIDE 27 EXPLAIN FIGURE 3–27** Clutch and servo piston seals are usually O-rings, lathe-cut rings, or lip seals⁴