




















# Automatic Transmissions and Transaxles, 6e














## Chapter 5 Torque Converters


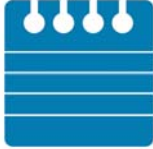







### Opening Your Class

| KEY ELEMENT  | EXAMPLES  |
|--|---|
| <b>Introduce Content</b>   | This course or class covers operation and service of <b>Automatic Transmissions and Transaxles, 6e</b> . It correlates material to task lists specified by ASE and NATEF.   |
| <b>Motivate Learners</b>   | 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.  |
| <b>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.</b> | Explain the chapter learning objectives to the students. <ol style="list-style-type: none"><li>1. Prepare for ASE Automatic Transmissions (A2) certification test content area "A" (General Transmission and Transaxle Diagnosis).</li><li>2. Identify and describe the components of a torque converter.</li><li>3. Explain torque converter operation.</li><li>4. Discuss the parts and operation of torque converter clutches.</li><li>5. Describe the purpose and procedure of a stall test.</li><li>6. Discuss the service of torque converters.</li></ol> |
| <b>Establish the Mood or Climate</b>   | Provide a <i>WELCOME</i> , Avoid put downs and bad jokes.   |
| <b>Complete Essentials</b>   | Restrooms, breaks, registration, tests, etc.  |
| <b>Clarify and Establish Knowledge Base</b>  | 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.  |

| ICONS   | Ch05 TORQUE CONVERTER  |
|---|--|
|    | <p>1. SLIDE 1 TORQUE CONVERTER</p> <p>2. SLIDES 2-3 EXPLAIN OBJECTIVES</p>   |
|    | <p>Check for <b>ADDITIONAL VIDEOS &amp; ANIMATIONS</b><br/> @ <a href="http://www.jameshalderman.com/">http://www.jameshalderman.com/</a><br/> <b>WEB SITE IS CONSTANTLY UPDATED</b></p>   |
|    | <p>4. <b>SLIDES 4-6 EXPLAIN</b> Torque Converter Components</p> <p>7. <b>SLIDE 7 EXPLAIN FIGURE 5-3</b> The split rings in the impeller and turbine help to direct the flow of fluid and improve the efficiency of the torque converter by reducing turbulence.</p>  |
|    | <p><b><u>DISCUSSION:</u> DISCUSS HOW TORQUE CONVERTER DRIVES TRANSMISSION OIL PUMP. HOW DOES INNER PORTION OF FRONT PUMP COUPLE TO TORQUE CONVERTER HUB? <u>FIG 5-3</u></b></p>  |
|   | <p>8. <b>SLIDE 8 EXPLAIN FIGURE 5-4</b> Two fans can be used to show how fluid, or air in case of fans instead of automatic transmission fluid, can be used to transfer energy. If one fan is operating, which represents impeller, &amp; blades of a 2<sup>ND</sup> fan (turbine) will be rotated by flow of air past the fan that is unplugged, causing blades to rotate.</p>                                    |
|  | <p><u>Torque Converter Fluid Flows</u></p> <p><u>Torque Converter Power Flows</u></p>  |
|  | <p><b><u>DISCUSSION:</u> DISCUSS FLUID COUPLINGS. WHAT IS DIFFERENCE BETWEEN A FLUID COUPLING AND A MECHANICAL COUPLING?</b></p>   |
|  | <p><b><u>DEMONSTRATION:</u> SHOW HOW FLUID COUPLING IN CONVERTER WORKS, USE 2 FANS FACING EACH OTHER. TURN ONE FAN ON &amp; HAVE THE STUDENTS OBSERVE OTHER FAN'S BLADES TURNING. <u>FIGURE 5-4</u></b></p>  |
|  | <p>9. <b>SLIDE 9 EXPLAIN FIGURE 5-5</b> torque converter is made from three parts: The impeller is located at the transmission end, attached to the housing, and is driven by the engine. The turbine is located at the engine side and is driven by the fluid flow from the impeller and drives the input shaft of the transmission. The stator redirects the flow to improve efficiency and multiply torque.</p> |

| ICONS   | Ch05 TORQUE CONVERTER  |
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|    | <p><b><u>DEMONSTRATION:</u> USING A CONVERTER THAT HAS BEEN CUT OPEN, SHOW VARIOUS PARTS INSIDE A TORQUE CONVERTER, INCLUDING THE IMPELLER, TURBINE, STATOR, ONE-WAY CLUTCH, AND CONVERTER CLUTCH (IF PRESENT)</b></p>   |
|    | <p><b><u>DISCUSSION:</u> DISCUSS TORQUE CONVERTER ROLE IN AN AUTOMATIC TRANSMISSION. WHAT IS REASON FOR ALLOWING SLIPPAGE?</b></p>   |
|    | <p><b>10. SLIDE 10 EXPLAIN</b> Operation</p>   |
|    | <p><b>11. SLIDE 11 EXPLAIN FIGURE 5-6</b> (a) The fluid flowing around the guide ring is called vortex flow. (b) The fluid flow around the converter is called rotary flow.</p>  |
|    | <p><b>12. SLIDE 12 EXPLAIN FIGURE 5-7</b> The fluid flow from the turbine is turned in the same direction as the impeller by the stator vanes.</p>   |
|   | <p><b><u>DISCUSSION:</u> DISCUSS DIFFERENT CONVERTER PHASES OF TORQUE CONVERTER OPERATION. WHAT ARE ROTARY FLOW, VORTEX FLOW, &amp; TORQUE MULTIPLICATION? <u>FIGURE 5-6</u></b></p> <p><u>Torque Converter Fluid Flows</u></p> <p><u>Torque Converter Power Flows</u></p>   |
|  | <p><b>13. SLIDE 13 EXPLAIN FIGURE 5-8</b> <b>stator</b> contains a one-way roller clutch which locks it from rotating in one direction and allows it to rotate freely in opposite direction.</p>   |
|  | <p><b><u>DISCUSSION:</u> DISCUSS COUPLING PHASE. HOW WILL COUPLING PHASE BE AFFECTED IF THE ONE-WAY CLUTCH (STATOR) FAILS? <u>FIGURE 5-8</u></b></p>   |
|  | <p><b>14. SLIDES 14-15 EXPLAIN</b> Torque Converter Clutches</p>   |
|  | <p><b>16. SLIDE 16 EXPLAIN FIGURE 5-9</b> An expanded view of a typical torque converter assembly showing the torque converter clutch (TCC).</p> <p><b>17. SLIDE 17 EXPLAIN FIGURE 5-10</b> TCC releases fluid flows through the center of the turbine shaft to the front of the clutch disc (left). Pressure to apply the clutch enters between converter hub &amp; stator support (right).</p> |

| ICONS   | Ch05 TORQUE CONVERTER  |
|---|--|
|                       | <p><b><u>DEMONSTRATION: SHOW HOW TO USE A SCAN TOOL TO CHECK &amp; DIAGNOSE A TCC</u></b></p>  |
|    | <p><b><u>HANDS-ON TASK: BASED ON DEMO HAVE STUDENTS USE A SCAN TOOL TO CHECK &amp; DIAGNOSE A TCC</u></b></p>  |
|    | <p><b><u>ON-VEHICLE NATEF TASK: PERFORM LOCK-UP CONVERTER TESTS; DETERMINE NECESSARY ACTION</u></b></p>  |
|    | <p><b><u>HANDS-ON TASK: HAVE STUDENTS CORRECTLY R &amp; R TORQUE CONVERTER. REMIND THEM OF THE IMPORTANCE OF INSTALLING TORQUE CONVERTER CORRECTLY. EVALUATE STUDENTS ON WHETHER THEY CAN IDENTIFY ALL OF PARTS INSIDE A TORQUE CONVERTER AND WHETHER THEY CORRECTLY INSTALL CONVERTER</u></b></p>   |
|    | <p><b><u>TCC OPERATION</u></b><br/> <b><u><a href="http://www.myautomotivelab.com">WWW.MYAUTOMOTIVELAB.COM</a></u></b><br/> <small><a href="http://media.pearsoncmg.com/PH/CHET/CHET_MYLABS/AKAMAI/TEMPLATE/VIDEO640X480.PHP?TITLE=CHECKING%20TORQUE%20CONVERTER%20CLUTCH%20(TCC)&amp;CLIP=PANDC/CHET/2012/AUTOMOTIVE/TRANSMISSION/CHECKING_TORQUE%20CONVERTER_CLUTCH.MOV&amp;CAPTION=CHET/CHET_MYLABS/AKAMAI/2012/AUTOMOTIVE/TRANSMISSION/XML/CHECKING_TORQUE%20CONVERTER_CLUTCH.XML">HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYLABS/AKAMAI/TEMPLATE/VIDEO640X480.PHP?TITLE=CHECKING%20TORQUE%20CONVERTER%20CLUTCH%20(TCC)&amp;CLIP=PANDC/CHET/2012/AUTOMOTIVE/TRANSMISSION/CHECKING_TORQUE%20CONVERTER_CLUTCH.MOV&amp;CAPTION=CHET/CHET_MYLABS/AKAMAI/2012/AUTOMOTIVE/TRANSMISSION/XML/CHECKING_TORQUE%20CONVERTER_CLUTCH.XML</a></small></p> |
|    | <p><b><u>TCC Operation</u></b></p>   |
|   <p>QUESTION</p> | <p><b><u>DISCUSSION: DISCUSS WHAT STALL SPEED IS. HOW DO DIFFERENT STALL SPEEDS AFFECT THE PERFORMANCE &amp; EMISSIONS OF AN ENGINE?</u></b></p>   |
|    | <p>18. SLIDES 18-21 EXPLAIN Stall Test</p>   |
|                   | <p><b><u>DEMONSTRATION OPTIONAL: PERFORM A CONVERTER STALL TEST ON A VEHICLE. HAVE STUDENTS LOOK UP WHAT THE RESULTS. ARE RESULTS WITHIN SPECIFICATION? REMIND STUDENTS THAT A STALL TEST CAN BE DANGEROUS IF THE BRAKES FAIL.</u></b></p>   |
|  <p>QUESTION</p>   |  |

| ICONS   | Ch05 TORQUE CONVERTER  |
|---|--|
|    | <p><b>DISCUSSION: DISCUSS TORQUE MULTIPLICATION QUALITIES OF A TORQUE CONVERTER. WHY DO HIGH-PERFORMANCE VEHICLES USE A SMALL DIAMETER CONVERTER? (ANS. SMALL DIAMETER RESULTS IN HIGHER STALL SPEEDS)</b></p>   |
|    | <p><b>WHEN STALL SPEED IS ABOUT 1/3 OF SPECIFICATION, IT IS AN INDICATOR THAT ONE-WAY (STATOR) CLUTCH IN CONVERTER IS BAD.</b></p>   |
|    | <p><b>DEMONSTRATION: SHOW WHAT "CREEP" IS. THEN SHOW THEM HOW TO CHECK TORQUE CONVERTER STALL SPEED BY POWER BRAKING A VEHICLE &amp; OBSERVING TACHOMETER. MAKE SURE THEY UNDERSTAND THAT A STALL TEST SHOULD LAST FOR ONLY 5 SECONDS SO THAT TRANSMISSION/TRANSAXLE IS NOT DAMAGED. AFTER A STALL TEST IS PERFORMED ENGINE SHOULD BE IDLED FOR A FEW MINUTES TO LET TRANSMISSION COOL DOWN.</b></p> |
|   | <p><b>ON-VEHICLE NATEF TASK: PERFORM STALL TEST; DETERMINE NECESSARY ACTION</b></p>  |
|    | <p>22. SLIDES 22-23 EXPLAIN Service of Torque Converters<br/> 24. SLIDE 24 EXPLAIN FIGURE 5-15 Visually check the pump drive notches or tangs for damage and the hub sealing surface for wear.<br/> 25. SLIDE 25 EXPLAIN FIGURE 5-16 A stator clutch can be checked by reaching into the hub so a finger contacts the splines. The splines should rotate in one direction but not in the other.</p>  |
|   | <p><b>ON-VEHICLE NATEF TASK: MEASURE TORQUE CONVERTER ENDPLAY; CHECK STATOR CLUTCH</b></p>   |
|    | <p>26. SLIDES 26-28 EXPLAIN Summary</p>  |