

Automatic Transmissions and Transaxles
Seventh Edition

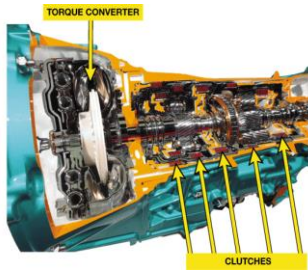
Automatic Transmissions and Transaxles
Seventh Edition
James D. Halderman

Chapter 5
Torque Converters



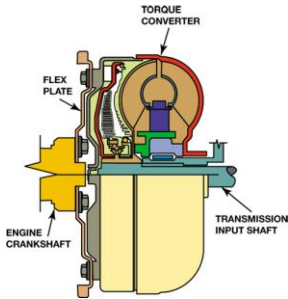
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FIGURE 5-1 A cutaway of an eight speed automatic transmission showing the torque converter and the clutches needed to engage all eight forward speeds, plus reverse.



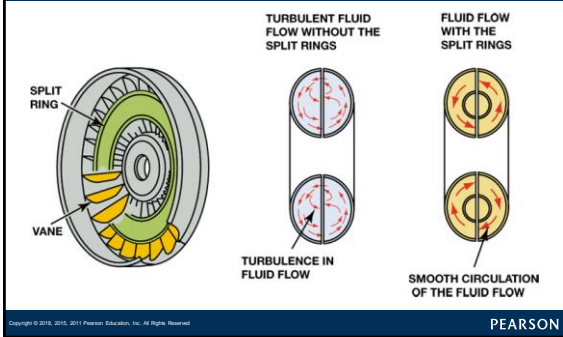
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FIGURE 5-2 The torque converter bolts to the flexplate which is attached to the engine crankshaft and rotates at engine speed.



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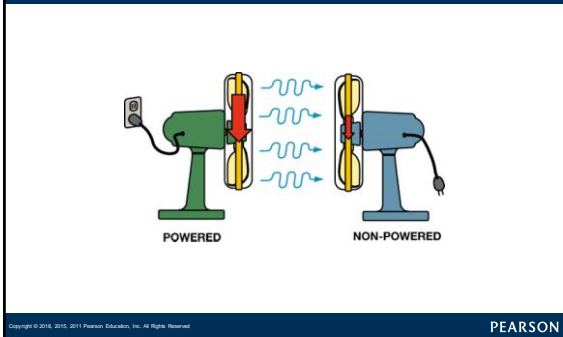
FIGURE 5-3 The split rings in the impeller and turbine help to direct the flow of fluid and improve the efficiency of the torque converter by reducing turbulence.



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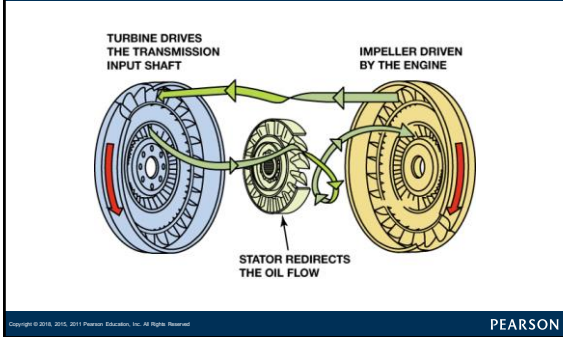
FIGURE 5-4 Two fans can be used to show how fluid, or air in the case of fans instead of automatic transmission fluid, can be used to transfer energy. If one fan is operating, which represents the impeller, the blades of a second fan (turbine) will be rotated by the flow of air past the fan that is unplugged, causing the blades to rotate.



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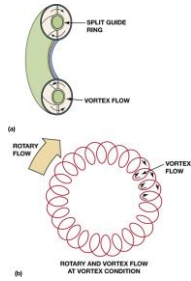
FIGURE 5-5 A torque converter is made from three parts: The impeller is located at the transmission end, attached to the housing, and is driven by the engine. The turbine is located at the engine side and is driven by the fluid flow from the impeller and drives the input shaft of the transmission. The stator redirects the flow to improve efficiency and multiply torque.



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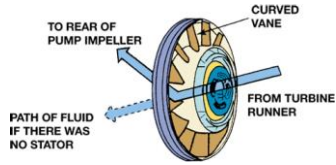
FIGURE 5-6 (a) The fluid flowing around the guide ring is called vortex flow. (b) The fluid flow around the converter is called rotary flow.



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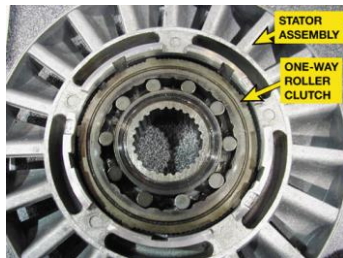
FIGURE 5-7 The fluid flow from the turbine is turned in the same direction as the impeller by the stator vanes.



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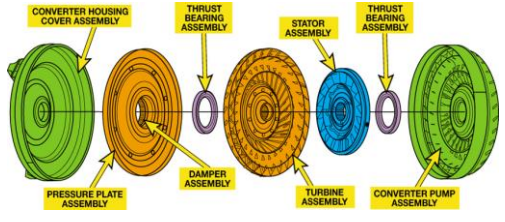
FIGURE 5-8 A stator contains a one-way roller clutch which locks it from rotating in one direction and allows it to rotate freely in the opposite direction.



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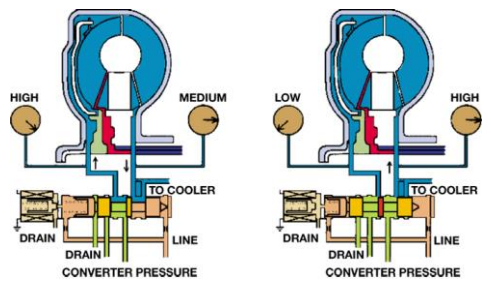
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FIGURE 5-9 An expanded view of a typical torque converter assembly showing the torque converter clutch (TCC).



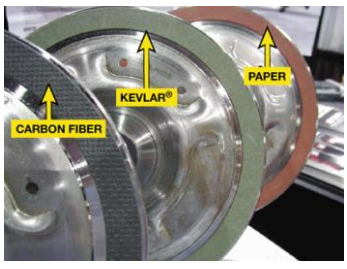
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FIGURE 5-10 TCC releases fluid flows through the center of the turbine shaft to the front of the clutch disc (left). Pressure to apply the clutch enters between the converter hub and the stator support (right).



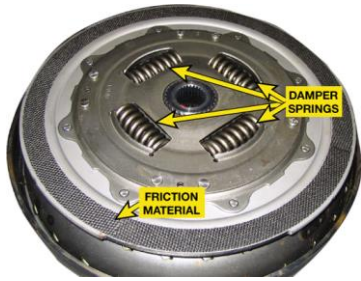
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FIGURE 5-11 Torque converter clutch friction material is determined by the vehicle manufacturer to provide the needed coefficient of friction. For example, many older units use a paper-type friction material because they are fully applied or released, whereas most newer units use a synthetic material such as Kevlar® or carbon fiber because the torque converter clutch is pulsed on and off, therefore requiring a more robust material for long service life.



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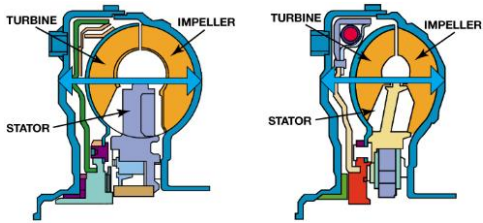
FIGURE 5-12 The damper springs used in many torque converter clutches are similar to the damper springs used in clutch discs used with a manual transmission.



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FIGURE 5-13 Most torque converters have a round cross section (top). Some new transmissions use a shorter, elliptical, squashed converter (bottom) that is about 13% shorter than a round style.



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FIGURE 5-14 This 4-cylinder General Motors vehicle has a stall speed of about 2350 RPM. Notice that the gear selector is in drive and the speedometer is reading zero.



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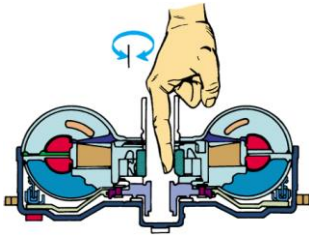
FIGURE 5-15 Visually check the pump drive notches or tangs for damage and the hub sealing surface for wear.



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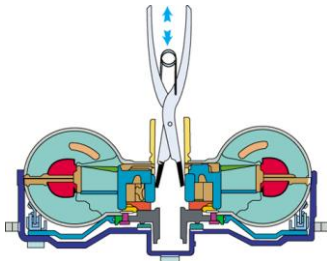
FIGURE 5-16 A stator clutch can be checked by reaching into the hub so a finger contacts the splines. The splines should rotate in one direction but not in the other.



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FIGURE 5-17 A quick end-play check can be made by gripping the turbine or stator splines and trying to move the turbine or stator in and out.



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FIGURE 5-18 A leak-test fixture has been placed on the torque converter. It will be filled with ATF and then inspected for leaks.



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1 A restored 1971 Chevrolet Camaro has an aftermarket high-lift camshaft and does not idle correctly in drive with the stock torque converter.



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2 The stall speed of the stock torque converter was tested at 1850 RPM, which is normal for a stock engine but not for an engine equipped with a high-performance camshaft.



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3 The inspection cover is removed.



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4 The torque converter retaining bolts are removed requiring the engine be rotated using a flywheel turning tool.



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5 The speedometer cable was removed.



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6 The vacuum hose to the modulator valve was removed.



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7 The cooling lines and the dip stick tube are removed.



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8 After removing the driveshaft, the cross member was unbolted and removed after supporting the transmission using a transmission jack.



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9 The bell housing bolts were removed using a long extension and a swivel socket.



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10 The transmission is removed from the engine with the torque converter still in place.



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11 The flexplate was inspected for cracks or worn ring gear teeth and found to be normal.



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12 The torque converter was removed and the front seal was found to be leaking. All seals were replaced on this transmission before it was returned to the customer.



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13 The new replacement higher stall speed converter is on the left, which is noticeably smaller in diameter than the stock converter



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14 The new torque converter is filled with ATF before being installed.



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15 The torque converter is wiggled back and forth to ensure that all of the splines are engaged.



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16 The holes in the flexplate were enlarged so that the new larger torque converter bolts would fit.



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17 The transmission was installed and all parts reconnected, then the transmission was filled to the proper level with the specified ATF.



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18 The stall speed was retested and the new converter is 2350 RPM, which worked well for this engine. The customer was very happy with the results.



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