Modern Automotive Technology
Chapter 57
Automatic Transmission Fundamentals
Learning Objectives

- Identify the basic components of an automatic transmission (AT)
- Describe the function and operation of the major parts of an AT
- Trace the flow of power through an AT
- Explain how an AT shifts gears
- Compare the different types of AT
- Follow all safety rules while working on an AT
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1. The VALVE BODY is operated by the shift lever and sensors, and controls oil flow to pistons and servos.

2. The PLANETARY GEARSETS provide different gear ratios and reverse gearing for an automatic transmission/transaxle.
Valve Body

- Valve body
- Throttle lever assembly
- Switch valve
- Throttle valve
- Throttle valve spring
- Manual valve
- Kickdown valve
- Kickdown detent
- Switch valve spring
- Line pressure regulator valve
- Line pressure regulator spring
- Spring retainer and adjusting screw
- Throttle pressure adjusting screw
Planetary Gearset

Planetary gearset components:
- Ring gear
- Planet gears
- Sun gear
- Planet carrier
- Sun gear
- Planet gears
- Ring gear
- Planet carrier
Compound Gearset

- Ring gear
- Long planet gear
- Rear sun gear
- Short planet gear
- Forward sun gear
- Planet carrier
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3. The TORQUE CONVERTER is a fluid coupling that connects and disconnects engine and transmission.

4. The OIL PUMP produces the pressure needed to operate the hydraulic components in the transmission.
Torque Converter
Principles of Torque Converter Operation

One part can drive another by force of air or oil
In high gear, oil is channeled to the converter piston, locking up converter
Transmission Oil Pumps

Diagram showing the components of a transmission oil pump, including:
- Pump body
- Pump cover
- Drive gear
- Driven gear
- Front oil seal
- O-ring
- Oil seal rings
- Reaction shaft or stator support
- Inner rotor
- Outer rotor
- Oil pump body
- Seal rings
- Thrust washer
- Gasket
- Rotor pump
5. The **IMPELLER** is a driving fan that produces oil movement inside the converter whenever the engine is running.

6. The **TURBINE** is the driven fan splined to the input shaft of the automatic transmission that is driven by the energy of the oil driven by the impeller.
Torque Converter

Turbine (driven fan)

Stator

Impeller (driving fan)

Housing
Overrunning Clutches

- Used to hold a planetary gearset member
- One-way roller clutch that locks in one direction and freewheels in the other
A: This action can stop movement of planetary member
B.: The two races are free to turn independently
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7. The INPUT SHAFT transfers power from torque converter to internal drive members and gear sets.

8. The BANDS and CLUTCHES apply clamping or driving pressure on different parts of gear sets to operate them.
Power Flow
Band

One end is anchored to the case
Clutch Operation

Released
- Springs hold piston away from clutch discs
- Drum stationary
- Oil pressure low
- No power transfer through clutch discs to drum
- Input shaft and clutch hub rotate
- Check valve closed

Applied
- Piston forced into clutch discs
- Drum rotates
- Oil pressure enters
- Clutch discs locked and transfer power to drum
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9. PISTONS and SERVOS actuate (move or hold) the bands and clutches to produce the different gear ratios needed to shift an automatic transmission/transaxle.

10. The OUTPUT SHAFT transfers engine torque from the transmissions gear sets to the drive shaft, and ultimately, the rear wheels.
Clutches and Pistons

- Hub or cylinder
- Piston seal ring (inner)
- Apply piston
- Spring retainer
- Clutch release spring
- Snap ring
- Pressure plate
- Driving discs
- Driven discs
- Snap ring (waved)
- Drum for another clutch assembly
- Hub
Hydraulic Circuit

- Torque converter
- Oil pump
- Front clutch
- Rear clutch
- Pressure regulator
- Band servo
- Band
- 1-2 shift valve
- 2-3 shift valve
- Manual valve
- PRND21
- Governor pressure
- Line pressure
- Governor pressure
- Torque converter pressure
- Throttle pressure

Throttle pressure or vacuum modulator
Governor pressure
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