CHART 127–1  Automatic transmission use, while available in some models much sooner, increased in great numbers in the 1950s.

CHART 127–1 (continued)  Automatic transmission use, while available in some models much sooner, increased in great numbers in the 1950s.
Figure 127-1 A cutaway of a Chrysler PowerFlite two speed automatic transmission used in the 1950s.

Figure 127-2 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 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.

Figure 127-3 The slip rings help direct the flow of fluid and improve the efficiency of the torque converter by reducing turbulence.
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, the blades of a second fan will be rotated by the flow of air past the fan that is unplugged, causing the blades to rotate.

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

The flat sections that are cut into the hub of the torque converter are used to drive the fluid pump.
Figure 127-7 The internal splines inside the torque converter are connected to the splines on the stator support shaft and the turbine splines to the input shaft.

Figure 127-8 Torque multiplication occurs when fluid leaving the turbine strikes the front of the stator vanes and is redirected back to the impeller.

Figure 127-9 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.
Figure 127-10 An expanded view of a typical torque converter assembly showing the torque converter clutch (TCC).

Figure 127-11 Torque converter clutch friction material is determined by the vehicle manufacturer to provide the needed coefficient of friction needed. 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.

Figure 127-12 A cross-sectional view of a pulse-width modulated (PWM) torque converter clutch. The powertrain control module (PCM) pulses the control solenoid which then controls the fluid flow to apply the torque converter clutch.
The gear selector is often called the "PRNDL," pronounced "prindle," regardless of the actual letters or numbers used.

A typical planet carrier which supports all of the pinion gears (also called planet pinion gears).
Figure 127-16 Maximum reduction can be achieved by using the sun gear as the input, holding the ring gear and using the planet carrier as the output.

Figure 127-17 Minimum reduction can be achieved by using the ring gear as the input, holding the sun gear and using the planet carrier as the output.

Figure 127-18 Reverse can be achieved by using the sun gear as the input, holding the planet carrier and using the ring gear as the output.
A Simpson planet gear set is composed of two ring gears and two planet carrier assemblies that share one sun gear.

**CHART 127–2**

| Gear | Planet Gear | Ring Gear | S1 | S2 | D | B
|------|-------------|-----------|----|----|---|---
| S1   | Helical     | Helical   |     |     |   |   |
| S2   | Helical     | Helical   |     |     |   |   |
| D    | Helical     | Helical   |     |     |   |   |
| B    | Helical     | Helical   |     |     |   |   |
| S1   | Helical     | Helical   |     |     |   |   |
| S2   | Helical     | Helical   |     |     |   |   |
| D    | Helical     | Helical   |     |     |   |   |
| B    | Helical     | Helical   |     |     |   |   |

If any two members are locked together, then the resulting output is 1:1 ratio in the same direction as the input planet drive. If no member is held (locked) then there is no output (neutral).

**FREQUENTLY ASKED QUESTION:** What Companies Build Automatic Transmissions?

Many large automobile manufacturers make their own automatic transmissions, including General Motors, Ford, Chrysler, and Honda. However, several companies manufacture automatic transmissions and transaxles that are used in a variety of vehicles. These include:

- **ZF Friedrichshafen AG.** This German company manufactures manual and automatic transmissions and transaxles for many vehicle manufacturers, including Mercedes, BMW, Volvo, Audi, Jaguar, Chrysler, Bentley, and Maserati.

- **Aisin AW.** This Japanese company makes automatic transmissions for many vehicle manufacturers, including Ford, Toyota, Nissan, Mazda, Mitsubishi, Subaru, Kia, and VW.

- **JATCO (Japan Automatic Transmission Company).** This is a Japanese manufacturer of automatic transmissions and transaxles for many vehicle manufacturers, including Nissan, Mazda, Infinity, VW, Mitsubishi, and Suzuki.
FREQUENTLY ASKED QUESTION: What Do All the Letters and Numbers Mean in Transmission Designations?

The numbers and letters usually mean the following:

• Number of forward speeds. The number of forward speeds may include four, five, or six (such as GM 4T60-E four speed unit).
• Front-wheel drive or rear-wheel drive. The letter T usually means transverse (front-wheel-drive transaxle) such as the Chrysler 41-TE; the L means longitudinal (rear-wheel-drive transmission) such as the General Motors 6L80; and the R means rear-wheel drive such as the Ford 5R55E.
• Electronically controlled. The letter E is often used to indicate that the unit is electronically controlled, and M or H is used to designate older mechanically (hydraulically) controlled units. All automatic transmissions built since the late 1980s are electronically controlled.
• Torque rating. The torque rating is usually designated by a number directly following the letter. The higher the number, the more torque the transmission is designed to handle. A high torque rating is required for vehicles being driven under heavy loads.

Always check service information for the exact transmission designation for the vehicle being studied or serviced.

Figure 127-20 A Ravigneaux gear set is composed of two sun gears, one planet carrier that supports two sets of pinion gears, and a single ring gear.

Figure 127-21 On one style of transaxle the turbine shaft drives the input shaft through a drive chain assembly.
Another type of transaxle uses a chain to transfer engine torque from the output of the gear sets to the differential assembly (final drive).

Figure 127-23: A cutaway showing the final drive assembly of a transaxle.

A Honda nonplanetary gear set automatic transmission that uses helical cut gear boxes to transfer power. Hydraulic and electrical components are controlled by the PCM with fluid flow controlled by shift solenoids to make the shifts.

Figure 127-24: A Honda nonplanetary gear set automatic transmission that uses helical cut gear boxes to transfer power. Hydraulic and electrical components are controlled by the PCM with fluid flow controlled by shift solenoids to make the shifts.
A belt and pulley CVT uses variable width pulleys and a special chain to provide an infinite number of speed ratios.

**Figure 127-25 (a)**

**Figure 127-25 (b)**

**Figure 127-26** Honda CVT belt construction.
Figure 127-27  Honda CVT power flow in park (P) and neutral (N).

Figure 127-28  Honda CVT operation in drive (D) or low (L).

Figure 127-29  Location of the Honda CVT start clutch.
FREQUENTLY ASKED QUESTION: What Is It Like to Drive a Vehicle Equipped with CVT?

For most, driving a vehicle equipped with a continuously variable transmission (CVT) is the same as driving a vehicle equipped with a conventional automatic transmission/transaxle. The vehicle creeps slightly when the brake is released and the vehicle accelerates normally when the throttle is opened. Because no shifts occur, the first thing the driver and passenger notice is that it is very smooth. If the vehicle is equipped with a tachometer, the driver may notice that the engine speed increases when first accelerating and often remains higher until the vehicle speed increases. During periods of increased acceleration, the engine speed may be closer to its maximum and thereby create noise and vibration often not experienced in a similar vehicle. However, the fuel economy savings of a CVT compared to a conventional automatic transmission makes the slight difference a reasonable trade-off.

Figure 127-30 The Honda CVT transmission control module (TCM) showing the inputs (sensors) on the left and the outputs on the right.

Figure 127-31 A dual-clutch automatic uses the best features of an automatic transmission without the power loss of a torque converter.
Dual clutch automatic transaxes that use two dry clutches. The larger clutch drives the odd number gear ratios (1st, 3rd, and 5th) and the smaller clutch drives the even number gear ratios (2nd, 4th, and 6th).