DESCRIPTION AND OPERATION

TRANSMISSION DESCRIPTION

This transmission has the following features:

- 5 forward speeds
- Electronic shift, pressure and torque converter clutch controls
- 3 compound planetary gearsets
- 3 bands
- 3 multi-plate clutches
- 2 one-way clutches

All hydraulic functions are directed by electronic solenoids. The solenoids control:

- static engagement feel.
- shift feel.
- shift scheduling.
- modulated torque converter clutch (TCC) applications.
- engine braking utilizing the coast clutch and band.
- manual 1st and 2nd timing.
- reverse inhibit timing.

Transmission View

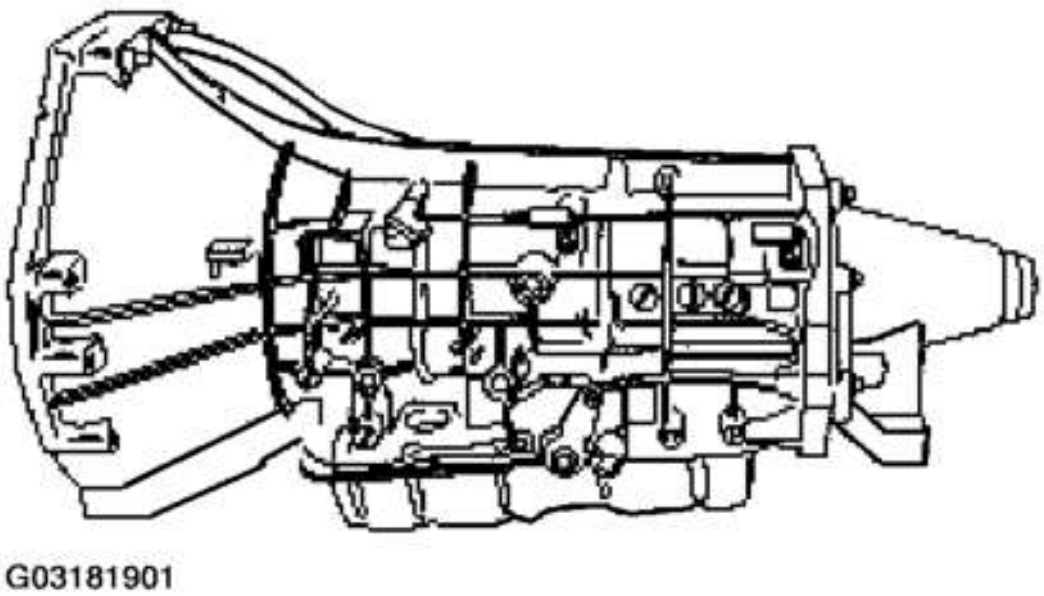
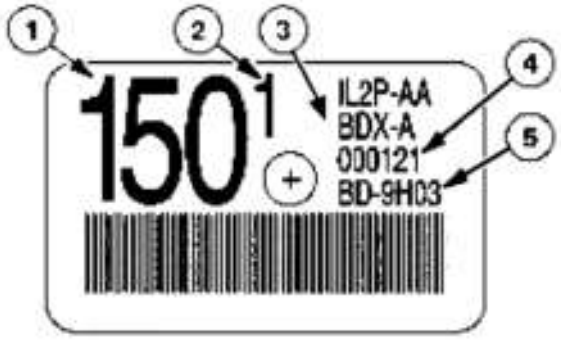


Fig. 1: Identifying Transmission View

Courtesy of FORD MOTOR CO.

IDENTIFICATION TAGS

I. D. Tag Located on Transmission Case



Item	Part Number	Description
1	—	Model number
2	—	Assembly level
3	—	Build code
4	—	Serial number
5	—	Build date (YMDD)

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Fig. 2: Identifying I. D. Tag On Transmission Case
Courtesy of FORD MOTOR CO.

All vehicles are equipped with a Vehicle Certification Label, located on the driver side door lock post. Refer to the code in the space marked TR. For model, service ID level or build date information, refer to the transmission service ID tag located on the transmission case.

RANGE SELECTION

The transmission has 6 range positions: P, R, N, (D), 3, 2 and 1.

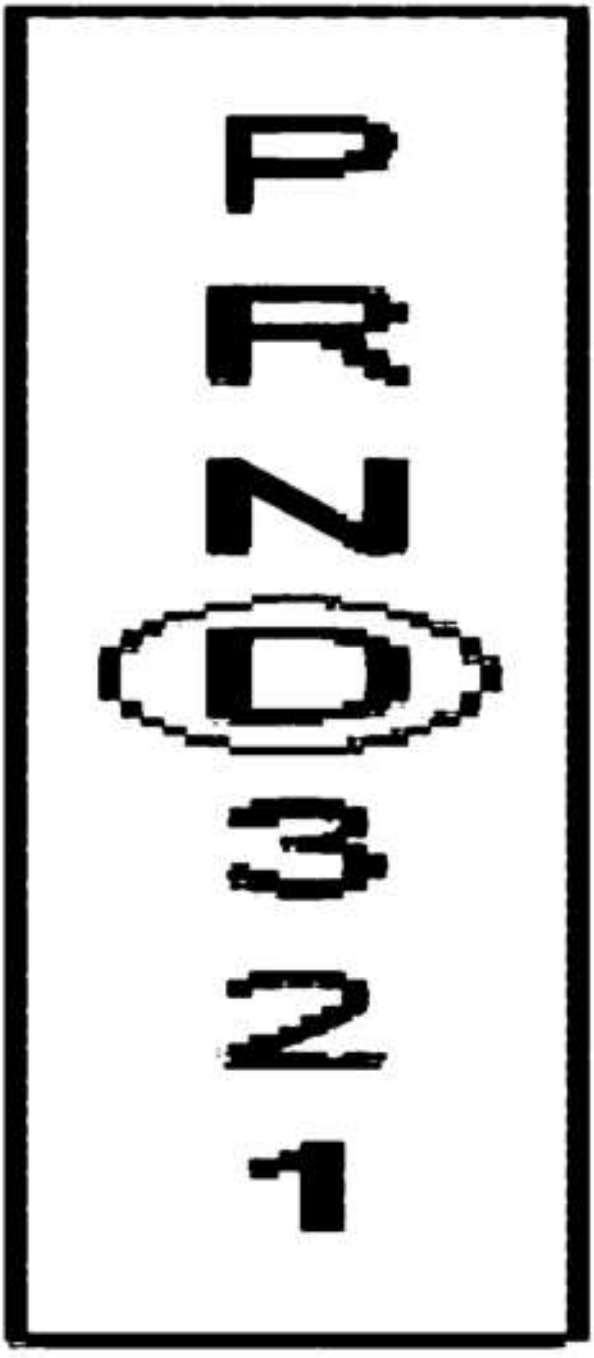


Fig. 3: Identifying Transmission 6 Range Positions
Courtesy of FORD MOTOR CO.

Park

In the PARK position:

- there is no power flow through the transmission.

- the parking pawl locks the output shaft to the case.
- the engine may be started.
- the ignition key may be removed.

Reverse

In the REVERSE position:

- the vehicle may be operated in a rearward direction, at a reduced gear ratio.

Neutral

In the NEUTRAL position:

- there is no power flow through the transmission.
- the output shaft is not held and is free to turn.
- the engine may be started.

Overdrive

Overdrive is the normal position for most forward driving.

The OVERDRIVE (D) position provides:

- automatic shifts 1-5 and 5-1.
- apply and release of the torque converter clutch.
- maximum fuel economy during normal operation.
- engine braking in 5th gear.

Drive - Overdrive Canceled

The OVERDRIVE position provides:

- automatic shifts 1-4 and 4-1.
- apply and release of the torque converter clutch.
- maximum fuel economy during normal operation.
- engine braking in 4th gear.

3rd Position - 3rd Gear

The 3rd position provides:

- 3rd gear start and hold.
- torque converter clutch apply and release.
- improved traction on slippery roads.
- engine braking.

2nd Position - 2nd Gear

If this position is selected at normal road speeds, the transmission will downshift into the next lower gear and continue downshifting until the vehicle reaches 2nd gear.

The 2nd position provides:

- 2nd gear start and hold.
- torque converter clutch apply and release.
- improved traction on slippery roads.
- engine braking.

Manual Low Position

If this position is selected at normal road speeds, the transmission will downshift into the next lower gear and continue downshifting until the vehicle reaches 1st gear.

This position provides:

- 1st gear operation only.
- engine braking for descending steep grades.

SHIFT PATTERNS

Upshifts

Transmission upshifting is controlled by the powertrain control module (PCM). The PCM receives inputs from various engine or vehicle sensors and driver demands to control shift scheduling, shift feel and torque converter clutch (TCC) operation.

The PCM has an adaptive learn strategy to electronically control the transmission which will automatically adjust the shift feel. When the battery has been disconnected or a new battery installed, certain transmission operating parameters may be lost. The PCM must relearn these parameters. During this learning process you may experience slightly firm shifts, delayed or early shifts. This operation is considered normal and will not affect the function of the transmission. Normal operation will return once these parameters are stored by the PCM.

Downshifts

Under certain conditions the transmission will downshift automatically to a lower gear range (without moving the range selector lever). There are 3 categories of automatic downshifts: coastdown, torque demand and forced or kickdown shifts.

Coastdown

The coastdown downshift occurs when the vehicle is coasting down to a stop.

Torque Demand

The torque demand downshift occurs (automatically) during part throttle acceleration when the demand for torque is greater than the engine can provide at that gear ratio. If applied, the transmission will disengage the TCC to provide added acceleration.

Kickdown

For maximum acceleration, the driver can force a downshift by pressing the accelerator pedal to the floor. A forced downshift into a lower gear is possible below calibrated speeds. Specifications for downshift speeds are subject to variations due to tire size and engine and transmission calibration requirements.

DISASSEMBLED VIEWS

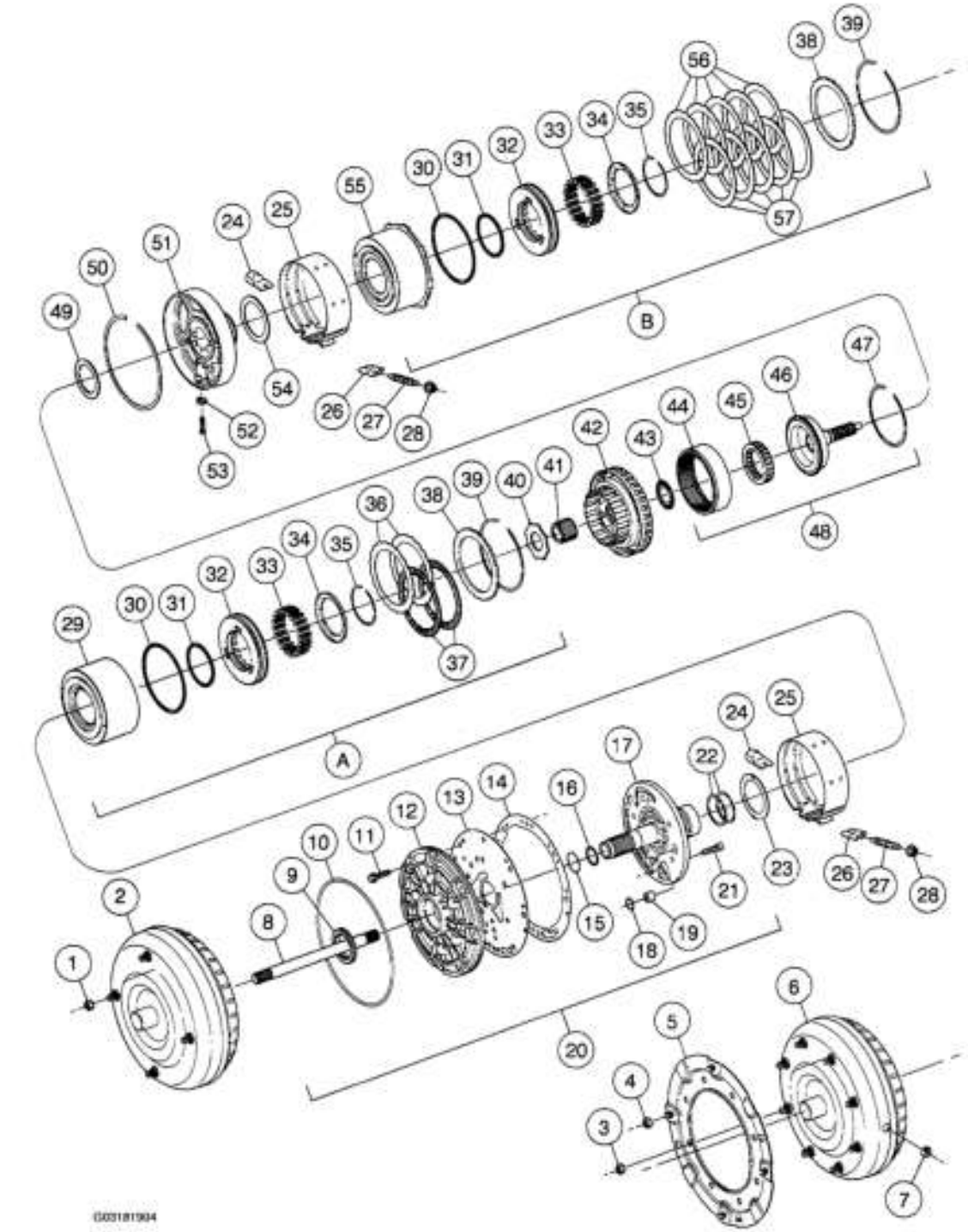


Fig. 4: Exploded View Of Transmission Case (1 Of 8)

Courtesy of FORD MOTOR CO.

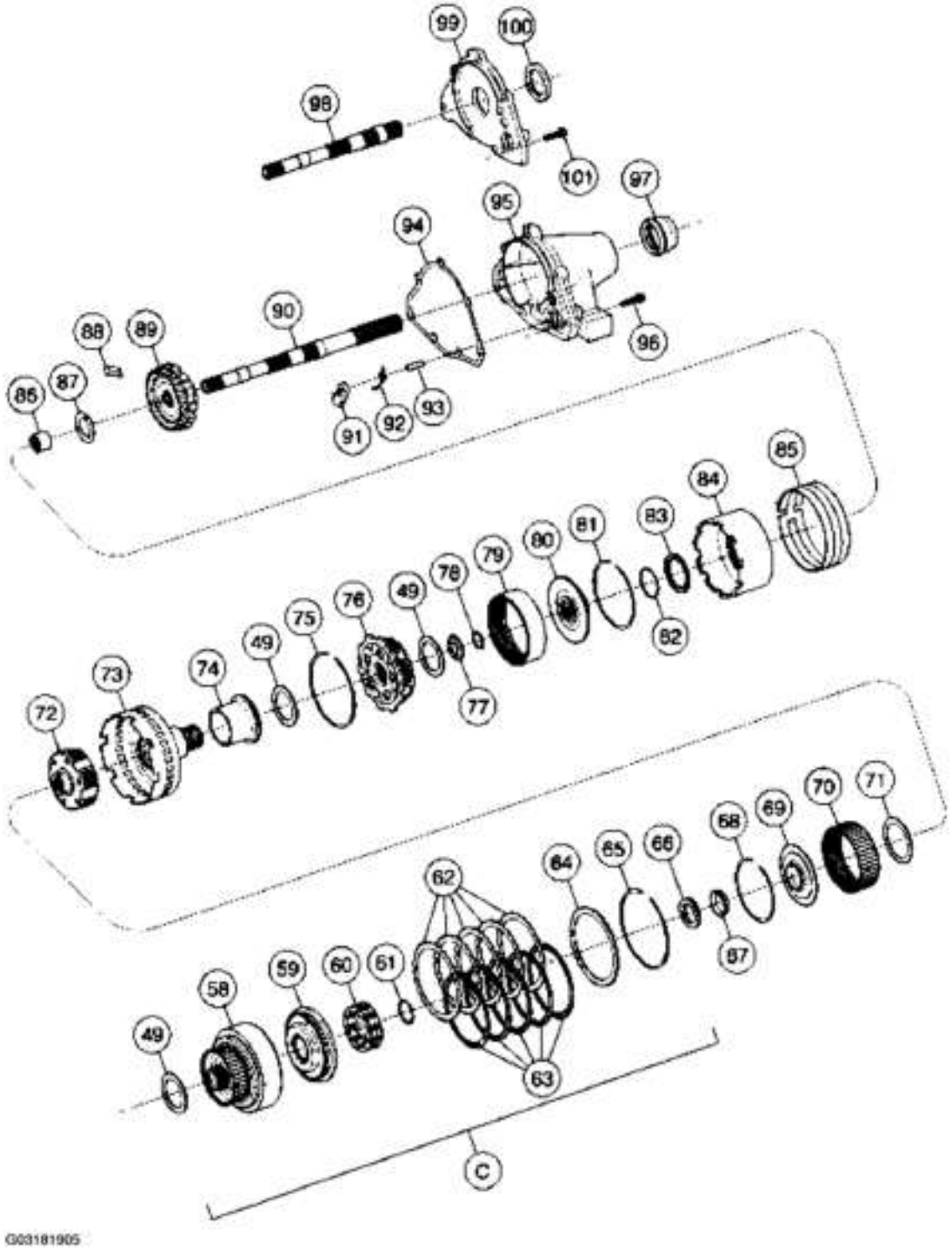
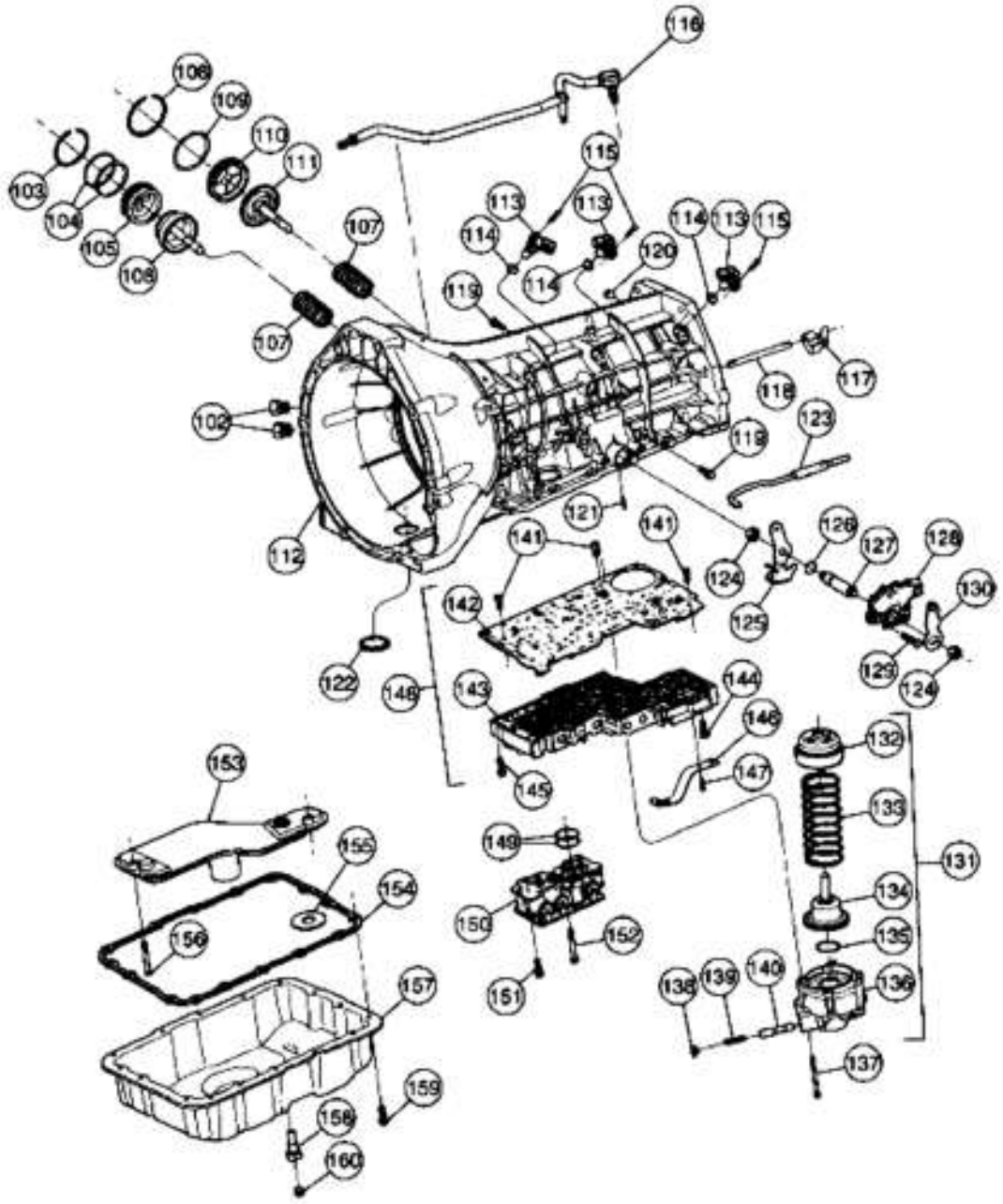


Fig. 5: Exploded View Of Transmission Case (2 Of 8)
Courtesy of FORD MOTOR CO.



Item	Part Number	Description
1	379299-S2	Converter-to-flexplate nut (attaches the converter assembly to the flexplate)
2	7902	Converter assembly
3	6441	Converter-to-adapter plate nut (attaches the converter assembly to the adapter plate)
4	6441	Adapter plate-to-flexplate nut (attaches adapter plate to the flexplate)

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Fig. 6: Exploded View Of Transmission Case (3 Of 8)
Courtesy of FORD MOTOR CO.

5	6K374	Adapter plate assembly
6	7902	Converter assembly
7	6730	Torque converter drain plug
8	7017	Input shaft
9	7A248	Front fluid pump seal assembly
10	7A248	Front fluid pump seal
11	W704892-S300	M8 x 35 internal lobe screw and washer assembly (attaches pump-to-case) (8 req'd)
12	7G178	Fluid pump cover assembly
13	7B472	Fluid pump adapter plate
14	7A136	Front fluid pump gasket
15	W701431-S300	Fluid pump shaft-to-inner gear O-ring seal (also in pump assembly)
16	7L323	Stator support seal
17	7A108	Front pump support assembly
18	7H416	O-ring
19	7H411	Fluid pump control valve
20	7A103	Fluid pump assembly
21	W701429-S309M	M8 x 1 x 35 internal lobe screw (attaches pump support to pump assembly) (8 req'd)
22	7D025	Overdrive brake drum seal
23	7D014	Fluid pump input thrust washer No. 1
24	7D029	Intermediate and overdrive brake band anchor strut (2 req'd)
25	7D034	Intermediate and overdrive brake band (2 req'd)
26	7D029	Intermediate and overdrive brake band apply strut (2 req'd)
27	7C492	Overdrive/intermediate band adjusting screw
28	71000	Overdrive/intermediate locking nut
29	7L669	Overdrive brake band drum assembly
30	7A548	Direct and overdrive piston outer seal
31	7D404	Direct and overdrive piston inner seal
32	7A262	Direct and overdrive clutch piston
33	7A480	Direct and overdrive clutch piston spring
34	7A527	Clutch piston spring retainer (2 req'd)
35	E860125-S	Retaining ring (retains 7D041 to drum) (2 req'd)
36	7B442	Coast clutch external splined plate (steel) (2 req'd)
37	7B164	Coast clutch internal splined friction plate (2 req'd)
38	7B066	Coast and direct clutch pressure plate (2 req'd)
39	E860126-S/129-S	Coast and direct clutch plates retaining ring (select fit) (2 req'd)

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Fig. 7: Exploded View Of Transmission Case (4 Of 8)
Courtesy of FORD MOTOR CO.

40	7660	Coast clutch to overdrive carrier adapter
41	7D063	Overdrive sun gear
42	7B446	Overdrive planetary gear carrier (with trigger wheel)
43	7L495	Overdrive planet thrust bearing No. 2
44	7A153	Overdrive ring gear
45	7A069	Center shaft one-way clutch assembly
46	7A658	Overdrive center shaft
47	W702037-S300	Retaining ring (retains 7686 to 7653)
48	7L678	Hub and ring gear assembly (includes 7C109, 7A153, 7A658, W702037-S300)
49	7M153	Center shaft and forward clutch cylinder bearing assembly No. 3, No. 5, No. 8 and No. 9 (4 req'd)
50	W702465-S300	Retaining ring
51	7A130	Center support assembly
52	E826160-S76	Nut and cage assembly (attaches center support to case)
53	E804373-S	Bolt
54	7D014	Intermediate clutch drum bearing No. 4
55	7D044	Intermediate brake drum assembly
56	7B442	Direct clutch external splined steel plates (5 req'd)
57	7B164	Direct clutch internal splined friction plates (5 req'd)
58	7A360	Forward clutch cylinder
59	7A262	Forward clutch piston assembly
60	7G299	Forward clutch support and spring assembly
61	E860109-S	Forward clutch piston and spring retaining ring in forward clutch cylinder
62	7B442	Forward clutch external spline steel plate (5 req'd)
63	7B164	Forward clutch internally spline friction plate (5 req'd)
64	7B066	Forward clutch pressure plate
65	7D483	Retaining ring 141.45 x 1.37 internal (select fit)
66	7D234	Forward ring gear hub thrust bearing No. 6A
67	7D090	Forward clutch thrust washer No. 6B
68	7G375	Forward clutch hub retainer ring
69	7B067	Forward ring gear hub
70	7D392	Forward ring gear
71	7F374	Forward planet thrust bearing No. 7
72	7A398	Forward planetary
73	7A019	Shell and sun gear assembly
74	7C176	Low and reverse spacer gear

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Fig. 8: Exploded View Of Transmission Case (5 Of 8)
Courtesy of FORD MOTOR CO.

75	W702775-S300	Reverse carrier drum snap ring
76	7D006	Reverse planet assembly
77	7B167	Output shaft sleeve
78	E860527-S	External retainer ring
79	7A153	Output shaft ring gear
80	7D164	Output shaft hub
81	7C122	Output shaft ring gear retaining ring
82	7D019	Output shaft hub seal
83	7H027	Low/intermediate sun gear bearing assembly
84	7C498	Reverse brake drum and clutch assembly (includes OWC)
85	7D095	Low/reverse band assembly bearing
86	7R205	Output shaft to case
87	7B368	Output shaft thrust washer No. 11
88	7C058	Deflector assembly
89	7A233	Transmission parking gear assembly
90	7060	Output shaft
91	7A441	Parking pawl
92	7D070	Parking pawl return spring
93	7D071	Parking pawl shaft
94	7086	Extension housing gasket
95	7A039	Extension housing (4x2)
96	W500311-S309	M8 x 1.25 extension housing to case screw (5 req'd)
97	7052	Extension housing seal (4x2)
98	7060	Output shaft assembly
99	7A039	Extension housing (4x4)
100	7052	Extension housing seal (4x4)
101	W500224-S309	Extension housing-to-case screw
102	7D273	Fluid tube connector assembly (2 req'd)
103	7H074	Ring overdrive servo retainer
104	W703119-S300	Overdrive servo cover seals (2 req'd)
105	7D027	Overdrive servo cover
106	7D021	Overdrive servo piston and rod
107	7D028	Intermediate/overdrive servo piston spring (2 req'd)
108	W702777-S300	Ring intermediate servo retainer
109	W702969-	Intermediate servo cover seal (1 req'd)

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Fig. 9: Exploded View Of Transmission Case (6 Of 8)
Courtesy of FORD MOTOR CO.

	S300	
110	7D027	Intermediate servo cover
111	7D021	Intermediate servo piston and rod
112	7005	Case assembly
113	7H103	Output shaft speed, turbine shaft speed, and intermediate shaft speed sensors
114	W702981-S300	Speed sensor-to-case O-ring seal
115	W705534-S309	Speed sensor-to-case screw (M6 x 19)
116	7034	Case vent (4x2)
117	7A179	Reverse brake drum lever
118	7D433	Reverse band actuating lever shaft
119	390318-S2	Pipe plug
120	6026	Fluid fill plug
121	7B210	Manual lever shaft retaining pin
122	7N171	Converter drain access plug
123	7A232	Parking pawl actuating rod
124	W703001-S309	Manual lever shaft outer and inner nut
125	7A115	Manual valve inner lever
126	7B498	Manual control lever seal
127	7C493	Manual lever shaft
128	7F293	Digital transmission range (TR) sensor
129	W500015-S309	Digital transmission range (TR) sensor screw and washer (2 req'd)
130	7A256	Manual control lever
131	7B193	Reverse servo assembly
132	7D372	Reverse servo plate
133	7D466	Reverse servo accumulator Spring
134	7D189	Reverse servo piston and seal
135	7423	Reverse servo piston O-ring seal
136	7D036	Reverse servo cover
137	W702359-S309	Reverse servo piston-to-case screw (4 req'd)
138	7D321	Control valve spring retainer
139	7A270	Main fluid pressure spring regulator valve
140	7D488	Reverse servo check valve
141	W701099-S1430	Main control valve body separating plate screw
142	7Z490	Main control valve body separating plate (bonded)

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Fig. 10: Exploded View Of Transmission Case (7 Of 8)
Courtesy of FORD MOTOR CO.

143	7A101	Lower main control valve body
144	W500102-S1300	Main control valve body screws
145	W500102-S300	Main control valve body screws
146	7E332	Manual valve detent spring
147	W500100-S300	Screw detent spring
148	7A100	Main control valve body
149	W705928-S300	Solenoid body connector O-ring seal
150	7G391	Transmission control solenoid body
151	W702921-S300	Transmission control solenoid body screw
152	W702921-S1300	Transmission control solenoid body screws (7 req'd)
153	7A098	Transmission fluid pan filter
154	7A191	Transmission fluid pan gasket
155	7L027	Transmission fluid pan magnet
156	W705559-S300	Transmission fluid pan filter screws
157	7A194	Transmission fluid pan
158	7A010	Transmission fluid pan drain tube
159	W500213-S1309	Transmission fluid pan screw
160	W704999-S309	Transmission fluid pan drain tube plug (short hex)
A	—	Overdrive/coast clutch assembly
B	—	Direct clutch assembly
C	—	Forward clutch assembly

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Fig. 11: Exploded View Of Transmission Case (8 Of 8)
Courtesy of FORD MOTOR CO.

TORQUE CONVERTER

The torque converter transmits and multiplies torque. The torque converter is a 4-element device:

- Impeller assembly
- Turbine and damper assembly
- Reactor assembly
- Clutch

The standard torque converter components operate as follows:

- Rotation of the converter housing and impeller set the fluid in motion.
- The turbine reacts to the fluid motion from the impeller, transferring rotation to the geartrain through the input shaft.
- The reactor redirects fluid going back into the impeller, allowing for torque multiplication.
- The clutch and damper assembly dampens powertrain torsional vibration and provides a direct mechanical connection for improved efficiency.
- Power is transmitted from the torque converter to the planetary gearsets and other components through the input shaft.

GEARTRAIN

Power is transmitted from the torque converter to the planetary gearsets through the input shaft. Bands and clutches are used to hold and drive certain combinations of gearsets. This results in five forward ratios and one reverse ratio, which are transmitted to the output shaft and differential.

GEAR RATIO SPECIFICATIONS

Gear Ratio	
1st	3.22 to 1
2nd	2.29 to 1
3rd	1.55 to 1
4th	1.00 to 1
5th	0.71 to 1
Reverse	3.07 to 1

Planetary Gearset - Overdrive

For component location, refer to **DISASSEMBLED VIEWS**.

The planetary gear overdrive carrier is driven by the input shaft.

- The overdrive planetary gearset carrier drives the center shaft via the overdrive one-way clutch in first, third, fourth, and reverse gears.
- In second and fifth gears the overdrive sun gear is held causing the pinion gears to rotate around the overdrive sun gear.
- The pinion gears, in turn, drive the overdrive ring gear resulting in the fifth (overdrive) gear ratio.
- The overdrive planetary gearset is internally splined to the coast clutch for engine braking.

Planetary Gearset - Forward

For component location, refer to **DISASSEMBLED VIEWS**.

The forward planetary gearset is splined to the output shaft.

- The forward planetary gearset is driven by the forward ring gear when the forward clutch is applied.
- The forward planetary gearset pinions drive the forward sun gear.
- The forward sun gear is splined to the input shell.
- The forward carrier is splined to the output shaft.

Planetary Gearset - Low/Reverse

For component location, refer to **DISASSEMBLED VIEWS**.

The low/reverse planetary gearset is connected to the reverse brake drum by lugs from the low/reverse brake drum to the lugs of the low/reverse planetary gearset.

- The low/reverse planetary gearset is driven by the forward sun gear which is splined to the input shell.
- The forward sun gear drives the pinions in the low/reverse planetary gearset.
- The pinions of the low/reverse planetary gearset drive the output shaft ring gear and output shaft hub which is splined to the output shaft.
- The low/reverse planetary gearset can be held by the low one-way clutch in the low/reverse brake drum, or by the low/reverse band.

Input Shaft

For component location, refer to **DISASSEMBLED VIEWS**.

- The radial positioning of the input shaft is controlled by two bushings in the stator support.
- Axial positioning of the input shaft is controlled by the splines in the converter turbine hub and the retaining ring in the overdrive planetary carrier.

Output Shaft

For component location, refer to **DISASSEMBLED VIEWS**.

The output shaft is supported by a bearing in the case and by a bearing in the extension housing. End positioning is controlled by the parking gear and by the reverse ring gear hub and snap ring.

APPLY COMPONENTS

Band - Overdrive

For component location, refer to **DISASSEMBLED VIEWS**.

During 2nd and 5th gear operation, hydraulic pressure is applied to the overdrive servo.

- This pressure causes the piston to move and apply force to the band.
- This action causes the overdrive band to hold the overdrive drum.
- This causes the overdrive sun gear to be held stationary through the adapter plate and the overdrive drum.

Band - Low/Reverse

For component location, refer to **DISASSEMBLED VIEWS**.

During second gear operation, first gear operation and reverse, hydraulic pressure is applied to the low/reverse servo.

- This pressure causes the servo to move and apply force to the low/reverse band.
- This action causes the low/reverse brake drum to be held.
- This action causes the low/reverse planetary assembly to be held stationary.

Band - Intermediate

For component location, refer to **DISASSEMBLED VIEWS**.

During third gear operation, hydraulic pressure is applied to the intermediate servo.

- This pressure causes the servo to move and apply force to the intermediate band.
- This action causes the direct clutch drum to be held.
- The intermediate band holds the intermediate brake and direct clutch drum to the case in 3rd gear.
- This causes the input shell and forward sun gear to be held stationary.

Clutches - Direct

For component location, refer to **DISASSEMBLED VIEWS**.

The direct clutch is a multi-disc clutch made up of steel and friction plates.

- The direct clutch is applied with hydraulic pressure and disengaged by return springs and the exhaust of the hydraulic pressure.
- It is housed in the direct clutch drum.
- During 4th, 5th, and reverse gear application, the direct clutch is applied transferring torque from the forward clutch cylinder to the direct clutch drum.
- This action causes the forward sun gear to drive the pinions of the low/reverse planetary carrier.

Clutches - Forward

For component location, refer to **DISASSEMBLED VIEWS**.

The forward clutch is a multi-disc clutch made up of steel and friction plates.

- The forward clutch is applied with hydraulic pressure and disengaged by return springs and the exhaust of the hydraulic pressure.
- The forward clutch is applied in all forward gears.
- When applied, the forward clutch provides a direct mechanical coupling between the center shaft and the forward ring gear and hub.

Clutches - Coast

For component location, refer to **DISASSEMBLED VIEWS**.

The coast clutch is a multi-disc clutch made up of steel and friction plates.

- The coast clutch is applied with hydraulic pressure and disengaged by return springs and the exhaust of the hydraulic pressure.
- The coast clutch is housed in the overdrive drum.
- The coast clutch is applied when in first, third, D, and reverse positions.
- When applied, the coast clutch locks the overdrive sun gear to the overdrive planetary carrier, thus preventing the one-way clutch from overrunning when the vehicle is coasting.
    - This allows the use of engine compression to help slow the vehicle and provide engine braking.

One-Way Clutch - Direct

For component location, refer to **DISASSEMBLED VIEWS**.

The direct one-way clutch is a sprag-type one-way clutch that is pressed into the center shaft.

- The direct one-way clutch is driven by the ring gear of the overdrive planetary carrier.
- The direct one-way clutch holds and drives the outer splines of the center shaft in first, third, fourth and reverse gears.
- The direct one-way clutch overruns during all coast operations and at all times in second and fifth gear.

One-Way Clutch - Low/Reverse

For component location, refer to **DISASSEMBLED VIEWS**.

The low/reverse one-way clutch is a sprag-type one-way clutch.

- The low/reverse one-way clutch holds the low/reverse drum and low/reverse planetary assembly to the case in first and second gear.
- In all other gears the low/reverse one-way clutch overruns.

HYDRAULIC SYSTEM

Fluid Pump

For component location, refer to **DISASSEMBLED VIEWS**.

- The fluid pump provides the fluid pressure necessary to charge the torque converter, main control assembly, transmission cooling system, lubrication system and apply devices.
- The fluid pump is a positive displacement, gear type pump.
    - The fluid pump is driven by the torque converter impeller hub.

Filter

For component location, refer to **DISASSEMBLED VIEWS**.

- All fluid drawn from the transmission fluid pan by the fluid pump passes through the fluid filter.
- The transmission fluid filter and its accompanying seals are part of the fluid path from the sump (pan) to the fluid pump.
    - The transmission fluid filter has a bypass section which allows fluid vented at the main regulator valve to be recirculated to the fluid pump, without passing through the transmission fluid filter.

Main Control

For component location, refer to **DISASSEMBLED VIEWS**.

- The main control assembly and related components are part of the pressure side of the hydraulic system.
- The main control assembly consists of the solenoids, the valve body assembly and the separator plate.
- These components combine to convert electrical signals into hydraulic actions.
    - All valves in the main control assembly are anodized aluminum and cannot be sanded, filed, or dressed in any other way. If there is any damage to the valves that prevents or restricts their movement, install a new main control assembly.

TRANSMISSION ELECTRONIC CONTROL SYSTEM

Electronic System Description

The powertrain control module (PCM) and its input/output network control the following transmission operations:

- Shift timing
- Line pressure (shift feel)
- Torque converter clutch

The transmission control strategy combined with the engine control provides optimum powertrain operation under all conditions. When determining the best operating strategy for transmission operation, the PCM uses input information from certain engine-related and driver-demand related sensors and switches.

In addition, the PCM receives input signals from certain transmission-related sensors and switches. The PCM also uses these signals when determining transmission operating strategy.

Using all of these input signals, the PCM can determine when the time and conditions are right for a shift or when to apply or release the torque converter clutch. It will also determine the pressure needed to optimize shift feel. To accomplish this the PCM uses 3 pressure controls, 1 torque converter clutch and 4 shift solenoids to control transmission operation.

The following provides a brief description of each of the sensors and actuators used to control transmission operation.

Powertrain Control Module (PCM)

The operation of the transmission is controlled by the powertrain control module (PCM). Many input sensors provide information to the PCM. The PCM then controls the actuators which determine transmission

operation.

Air Conditioning (A/C) Clutch

An electromagnetic clutch is energized when the clutch cycling pressure switch closes. The switch is located on the suction accumulator/drier. The closing of the switch completes the circuit to the clutch and draws it into engagement with the compressor driveshaft. When the A/C is engaged, operating pressures are adjusted to compensate for additional load on the engine.

Brake Pedal Position (BPP) Switch

The brake pedal position (BPP) switch tells the powertrain control module (PCM) when the brakes are applied. The torque converter clutch disengages when the brakes are applied. The BPP switch closes when the brakes are applied and opens when they are released. The BPP is also used to disengage the brake shift interlock.

Engine Coolant Temperature (ECT) Sensor

The engine coolant temperature (ECT) sensor detects temperature of engine coolant and supplies the information to the powertrain control module (PCM). The ECT sensor is used to control torque converter clutch (TCC) operation.

Electronic Ignition (EI) System

The electronic ignition consists of a crankshaft position sensor, 2 4-tower ignition coils and the powertrain control module (PCM). The ignition control module operates by sending crankshaft position information from the crankshaft position sensor to the ignition control module. The ignition control module generates a profile ignition pickup (PIP) signal (engine rpm) and sends it to the PCM. The PCM uses PIP signal in the transmission strategy, wide-open throttle (WOT) shift control, torque converter clutch control and operating pressures.

Intake Air Temperature (IAT) Sensor

The intake air temperature (IAT) sensor provides the sequential fuel injection (SFI) system mixture temperature information. The IAT sensor is used both as a density corrector for air flow calculation and to proportion cold enrichment fuel flow. The IAT sensor is installed in the air cleaner outlet tube. The IAT sensor is also used in determining control pressures.

Mass Air Flow (MAF) Sensor

The mass air flow (MAF) sensor measures the mass of air flowing into the engine. The MAF sensor output signal is used by the powertrain control module (PCM) to calculate injector pulse width. For transmission strategies the MAF sensor is used to regulate electronic pressure control, shift and torque converter clutch scheduling.

Transmission Control Switch (TCS)

The transmission control switch (TCS) is a momentary contact switch that allows the driver to cancel operation of 5th (D) gear.

The TCS is located on the end of the selector lever.

When the driver initially presses the TCS a signal is sent to the powertrain control module (PCM).

The PCM uses the shift solenoids to disengage/disable 5th gear operation and activate the coast clutch.

At the same time, the PCM illuminates the transmission control indicator lamp (TCIL) to notify the driver that 5th gear is canceled.

When the TCS is pressed again, 5th (D) gear operation is enabled, the coast clutch is released and the TCIL is turned off.

Whenever the ignition is cycled (vehicle shut off, then started again), the TCS is turned off and 5th gear will be enabled, even if the TCS had been on when the ignition was shut off.

Transmission Control Indicator Lamp (TCIL)

The transmission control indicator lamp (TCIL) is located in the instrument panel and is labeled O/D OFF. It is illuminated in conjunction with the transmission control switch (TCS).

The TCIL will flash if the electronic pressure control (EPC) solenoid circuit is open, shorted to battery, ground or a fault has been detected in a monitored sensor used for transmission operation.

Throttle Position (TP) Sensor

The throttle position (TP) sensor is a potentiometer mounted on the throttle body. The TP sensor detects the position of the throttle plate and sends this information to the powertrain control module (PCM). The TP sensor is used for shift scheduling, electronic pressure control (EPC) and torque converter clutch (TCC) control.

Accelerator Pedal Position (APP) Sensor

The accelerator pedal position (APP) sensor is mounted on the accelerator pedal. The APP sensor detects the position of the accelerator pedal and inputs this information as a voltage to the powertrain control module (PCM). The PCM uses the APP sensor information to aid in determining shift scheduling, electronic pressure control (EPC) and torque converter (TCC) control.

Digital Transmission Range (TR) Sensor

The digital transmission range (TR) sensor is located on the outside of the transmission at the manual lever. The digital TR sensor completes the start circuit in PARK, NEUTRAL and the back-up lamp circuit in REVERSE. The digital TR sensor also opens and closes a set of 4 switches that are monitored by the powertrain control module (PCM) to determine the position of the manual lever (P, R, N, (D), 3, 2, 1).

Turbine Shaft Speed (TSS) Sensor

The turbine shaft speed (TSS) sensor is a magnetic pickup that sends the powertrain control module (PCM) torque converter turbine speed information.

The TSS sensor is mounted externally on the case.

The PCM uses TSS information to help determine appropriate operating pressures and torque converter clutch (TCC) operation.

Output Shaft Speed (OSS) Sensor

The output shaft speed (OSS) sensor is a magnetic pickup, located at the park gear trigger wheel assembly, that sends a signal to the powertrain control module (PCM) to indicate transmission output shaft speed. The OSS sensor is mounted externally on the case. The OSS is used for torque converter clutch control, shift scheduling and to determine pressure control (PC).

Intermediate Shaft Speed Sensor

The intermediate shaft speed sensor is a magnetic pickup that sends planetary sun gear speed information to the powertrain control module (PCM). It is mounted externally on the center of the case.

The PCM uses the intermediate shaft speed sensor information to aid in determining pressure requirements.

Pressure Control Solenoids (PCA, PCB, PCC)

The pressure control (PC) solenoids are a variable-force style (VFS) solenoid. The VFS-type solenoid is an electrohydraulic actuator combining a solenoid and a regulating valve.

The line pressure tap is used to verify output pressure from PC A or PC B by turning either one off while verifying the output from the other solenoid. The 2nd pressure tap is used to verify the output from the PC C solenoid.

There are 3 PC solenoids located in the solenoid body assembly used to control line pressure, band and clutch application pressure within the transmission.

The powertrain control module (PCM) varies the current to the PC solenoid.

The PCM has an adaptive learn strategy to electronically control the transmission which will automatically adjust the shift feel. When the battery has been disconnected or a new battery installed, certain transmission operating parameters may be lost. The PCM must relearn these parameters. During this learning process you may experience slightly firm shifts, delayed or early shifts. This operation is considered normal and will not affect the function of the transmission. Normal operation will return once these parameters are stored by the PCM.

Torque Converter Clutch (TCC) Solenoid

The torque converter clutch (TCC) solenoid is a pulse width modulating type solenoid which is used to control the apply and release of the TCC.

Shift Solenoids - (SSA, SSB, SSC, SSD)

Four On/Off shift solenoids allow the powertrain control module (PCM) to control shift scheduling.

- The solenoids are 3-way, normally open style.
- The shift solenoids SSA, SSB, SSC and SSD provide gear selection of 1st through 5th and reverse gears by directing PC pressures to the appropriate elements.

Coast braking and manual gears are also controlled by the shift solenoids.

Transmission Fluid Temperature (TFT) Sensor

- The transmission fluid temperature (TFT) sensor is a thermistor-type sensor that varies a reference voltage signal. The resistance in the TFT varies with temperature. The powertrain control module (PCM) monitors the voltage signal across the TFT and uses this information to determine the transmission fluid temperature.
- The TFT is located on the solenoid body.
- The PCM uses the TFT signal to help determine shift scheduling, torque converter clutch operation and pressure control requirements.

It sends a voltage signal to the PCM. The voltage signal varies with transmission fluid temperature. The PCM uses this signal to determine whether a cold start shift schedule is necessary. The shift schedule is compensated when the transmission fluid temperature is cold. The PCM also inhibits torque converter clutch (TCC) operation at low transmission fluid temperatures and use to determine pressure control (PC) solenoid operations.

TRANSMISSION COOLING

Vehicles equipped with automatic transmissions have a transmission auxiliary fluid cooler which is mounted between the radiator and the A/C condenser. In operation, transmission fluid travels from the transmission to the auxiliary transmission fluid cooler then back to the transmission. The transmission auxiliary fluid cooler transfers heat from the transmission fluid to the outside air.

EXTERNAL CONTROLS

The transmission shift cable transfers the transmission operating mode from the shift control selector lever to the transmission. The indicated position of the shift control selector lever is transferred to the transmission through the transmission floor shifter linkage, then to the shift cable and bracket, and down to the manual control lever on the transmission.

Shift Interlock System

The shift interlock system prevents the shifting from PARK unless the brake pedal is depressed. The shift interlock system consists of a shift lock actuator mounted on the floor shifter. If the ignition switch is in the RUN position, the shift lock actuator is continually on unless the brake pedal is depressed.

If the selector lever will not move out of park with the key in the ON position, it will need to be unlocked manually.

Transmission Control Switch (TCS)

The transmission control switch (TCS) is a momentary contact switch located on the floor shifter knob. Pushing the transmission control switch (TCS) will either disengage or engage the overdrive function of the transmission. If the overdrive (D) is disengaged, the message O/D OFF will illuminate on the instrument panel.