

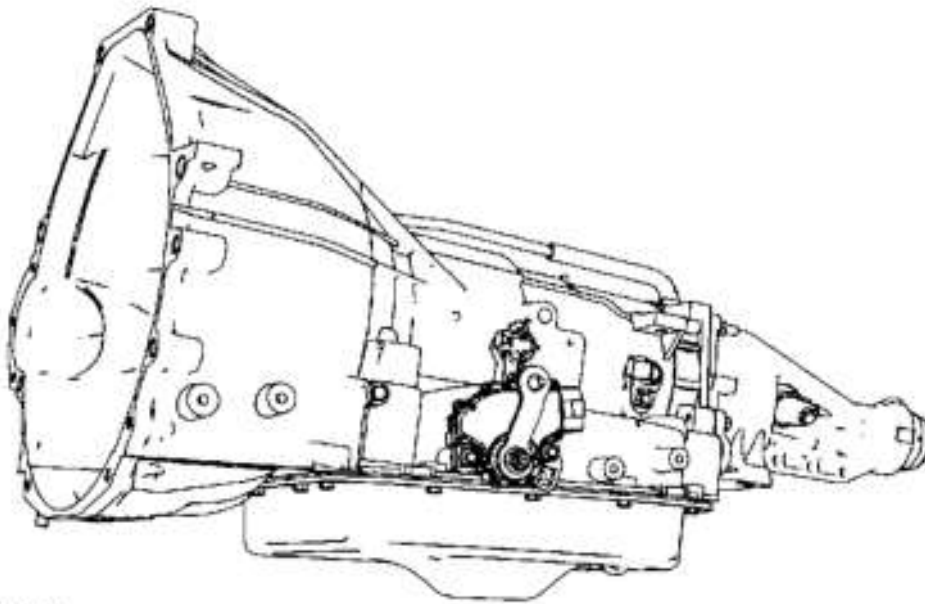
DESCRIPTION AND OPERATION

TRANSMISSION DESCRIPTION

The transmission has the following features:

- Wide ratio gears
- Four speeds
- Rear wheel drive
- Automatic
- Electronic shift
- Torque converter clutch control
- Line pressure controls

The transmission uses Ravigneaux-style double-pinion gearset with 2 bands, 1 one-way roller clutch, 1 mechanical diode and 4 friction clutches to produce 4 forward gears and Reverse.



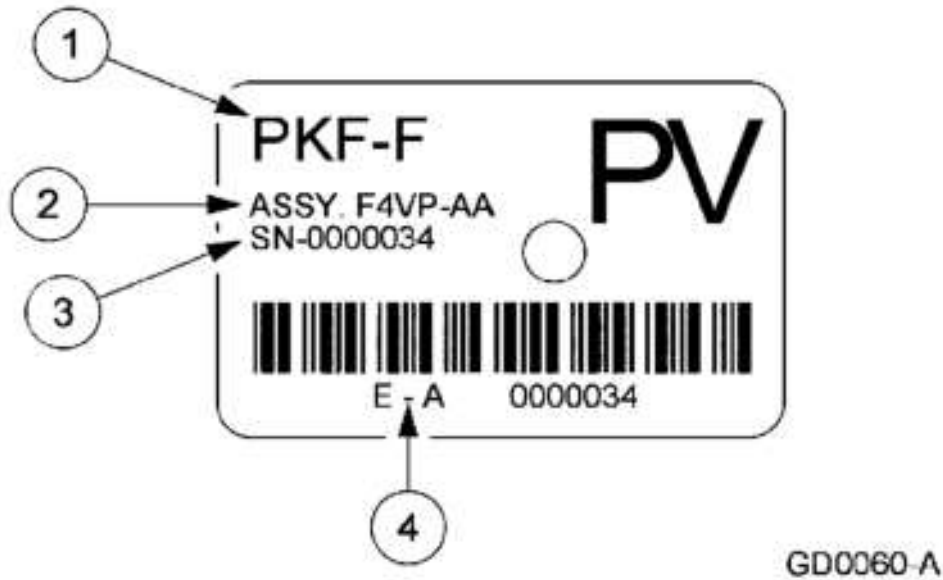
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Fig. 1: Identifying Automatic Transmission
Courtesy of FORD MOTOR CO.

IDENTIFICATION TAGS

All vehicles are equipped with a Vehicle Certification Label, located on the driver side door lock post. For correct transmission identification, 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.



Item	Part Number	Description
1	—	Model number
2	—	Assembly number
3	—	Serial number
4	—	Model and serial number

Fig. 2: Identifying Identification Tag
 Courtesy of FORD MOTOR CO.

RANGE SELECTION

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



GD0065-A

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

Park

In the PARK position:

- there is no powerflow through the transmission.
- the parking pawl locks the output shaft to the case.
- the engine can be started.
- the ignition key can be removed.

Reverse

In the REVERSE position:

- the vehicle can be operated in a rearward direction, at a reduced gear ratio.
- engine braking will occur.

Neutral

In the NEUTRAL position:

- there is no powerflow through the transmission.
- the output shaft is not held and is free to turn.
- the engine can be started.

Overdrive

Overdrive is the normal position for most forward driving.

The OVERDRIVE position provides:

- automatic shifts.
- apply and release of the torque converter clutch.
- maximum fuel economy during normal operation.

Second Position

This position provides:

- second gear start and hold.
- torque converter clutch apply and release.
- improved traction and engine braking on slippery roads.
- engine braking for descending steep grades.

First Position

If this position is selected at normal road speeds, the transmission will shift into second gear, then into first when the vehicle reaches a speed below approximately 45 km/h (28 mph).

This position provides:

- first 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.

Downshifts

Under certain conditions the transmission will downshift automatically to a lower gear range (without moving the gearshift 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.

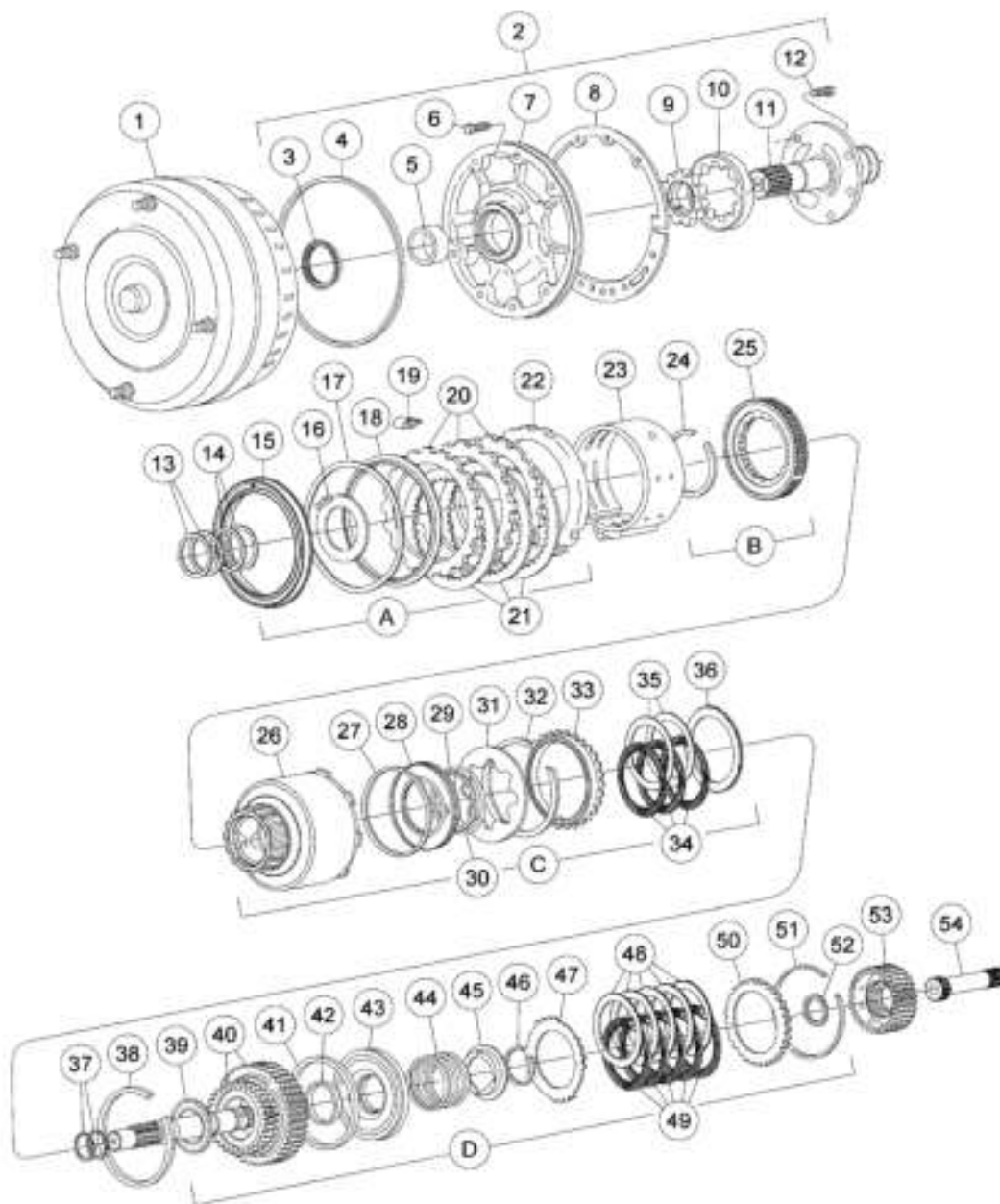
Torque Demand

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

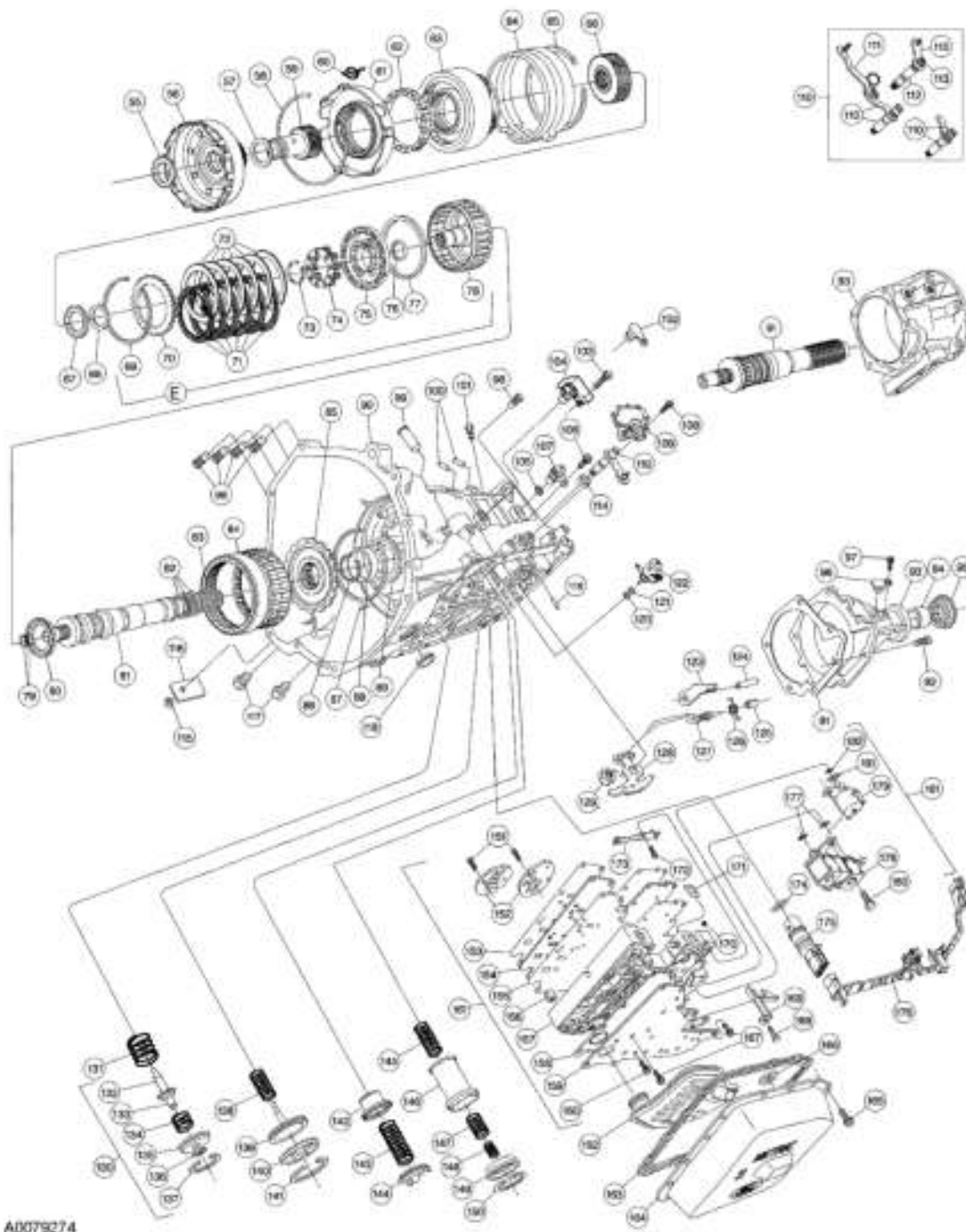
For maximum acceleration, the driver can force a downshift by pressing the accelerator pedal to the floor. A forced downshift into a lower gear is possible below calibrated speeds. Specifications for downshift speeds are subject to variations due to tire size, engine and transmission calibration requirements.

DISASSEMBLED VIEWS



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Fig. 4: Exploded View Of Automatic Transmission (1 Of 6)
Courtesy of FORD MOTOR CO.



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Fig. 5: Exploded View Of Automatic Transmission (2 Of 6)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	7902	Converter assembly (model dependent)
2	7A103	Pump and piston assembly — fluid
3	7A248	Seal assembly — fluid pump
4	7A248	Seal — Fluid pump
5	7B258	Bushing — Fluid pump
6	N605789-S101	Bolt — M8-1.25 x 35 hex head (7-attaches 7A103 to 7005)
7	7A106	Body assembly — fluid pump (part of 7A103)
8	7A136	Gasket — front pump
9	7H169	Gear — pump inner gerotor (part of 7A103)
10	7H169	Gear — pump outer gerotor (part of 7A103)
11	7A108	Support assembly — front pump
12	N605787-S1000	Bolt — M8-1.25 x 25 hex flange head (5-attaches 7A108 to 7A103)
13	7D020	Seals — reverse clutch cylinder (2 required)
14	7D019	Seals — forward clutch cylinder (2 required)
15	7E005	Piston and valve assembly — intermediate clutch
16	7D014	Washer — front pump support thrust — select fit No. 1
17	7B070	Spring — intermediate clutch piston return
18	7G154	Support — intermediate clutch piston return spring
19	7A609	Anti-rattle clip — intermediate clutch (model dependent)
20	7B442	Plate — intermediate clutch external spline (select fit) (steel)
21	7B164	Plate assembly — intermediate clutch internal spline (friction)
22	7B066	Plate — intermediate clutch pressure
23	7F196	Band assembly — overdrive
24	391267-S	Ring — 3-21/64 retains type SU external (retains 7F262 to 7F215)

Item	Part Number	Description
25	7A089	Clutch assembly — intermediate one-way clutch
26	7D044	Drum assembly — reverse clutch
27	7D403	Seal — reverse clutch piston outer
28	7D402	Piston assembly — reverse clutch
29	7D404	Seal reverse clutch piston inner
30	7D256	Ring — reverse clutch piston pressure
31	7B070	Spring — reverse clutch piston return
32	7A577	Spring — reverse clutch piston spring
33	7B066	Plate — reverse clutch front pressure
34	7B164	Plate — reverse clutch internal spline (friction)
35	7B442	Plate — reverse clutch external spline (steel)
36	7B066	Plate — reverse clutch rear pressure
37	7B497	Seals — input shaft (2 required)
38	7D483	Retainer — reverse clutch pressure plate — (select fit)
39	7A166	Bearing and race assembly — forward clutch No. 2
40	7F207	Cylinder and input shaft assembly — forward clutch
41	7A548	Seal — forward clutch piston outer
42	7C099	Seal — forward clutch piston inner
43	7A262	Piston — forward clutch
44	7A480	Spring — forward clutch piston return
45	7A527	Retainer return spring — forward clutch
46	388099-S	Snap ring — retaining — 1-59/64 (retains 7A529 in 7F207)
47	7E085	Spring — rear clutch pressure plate (model dependent)
48	7B442	Plate — forward clutch external spline (steel)

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

Item	Part Number	Description
49	7B164	Plate — forward clutch internal spline (friction)
50	7B066	Plate — forward clutch pressure
51	7D483	Snap ring — retaining (select fit)
52	7F231	Bearing and race assembly — forward clutch front No. 3
53	7B067	Hub — forward clutch
54	7F351	Shaft — intermediate stub
55	7C096	Bearing and race assembly — forward clutch hub No. 4
56	7A019	Gear assembly — reverse clutch sun
57	7D234	Bearing and race assembly — forward clutch sun gear No. 5
58	388501-S	Retaining ring — center support — 7-7/92
59	7A399	Gear assembly — forward clutch sun
60	7F277	Spring — case to planet support
61	7A130	Support assembly — planetary gear
62	7A089	OWC cage spring and roller assembly — planetary
63	7A398	Planetary assembly (model dependent)
64	7D095	Band assembly — reverse
65	392004-S300	Retaining ring — 0.58 thick (locates reverse band during assembly)
66	7F236	Hub — direct clutch
67	7F243	Bearing and race assembly — direct clutch inner No. 7
68	7F237	Support — direct clutch inner bearing
69	7D483	Retaining ring — direct clutch pressure plate (select fit)
70	7B066	Plate — direct clutch pressure
71	7B164	Plate — direct clutch internal spline (friction)
72	7B442	Plate — direct clutch external spline (steel)
73	388104-S	Retainer ring — 1-19/32 (retains 7F235 to 7F283)
74	7F235	Retainer and spring assembly — direct clutch

Item	Part Number	Description
75	7A262	Piston assembly — direct clutch
76	7C099	Seal — direct clutch piston inner
77	7A548	Seal — direct clutch piston outer
78	7F283	Cylinder assembly — direct clutch
79	7F274	Seals — output shaft small — direct clutch (2 required)
80	7F240	Bearing and race assembly — direct clutch outer No. 8
81	7060	Shaft assembly — output (model dependent)
82	7F273	Seal — output to case shaft large (3 required)
83	87054-S94	Seal — O-ring (piloted output shaft only) (model dependent)
84	7A233	Gear — output shaft ring
85	7D164	Hub — output shaft
86	97713-S	Snap ring — 1-13/16 retaining (retains 7D164 to 7060)
87	7C122	Snap ring — retaining (retains 7D164 to 7A153)
88	7025	Bushing — rear case
89	7F242	Bearing and race assembly — case rear No. 9
90	7005	Case assembly
91	7086	Gasket — extension (model dependent)
92	N803747-S102	Bolt — M8-1.25 x 30 (6-attaches 7A039 to 7005) (model dependent)
93	7A039	Extension housing assembly (model dependent)
94	7A034	Bushing — extension housing (part of 7A039)
95	7052	Seal assembly — extension housing (model dependent)
96	7H183	Plug assembly — transmission extension housing
97	57621-S2	Bolt and washer assembly — speedometer plug
98	390318-S100	Pipe plug — 1/8-27 Dryseal tapered (5 required)
99	7F295	Pin — overdrive band anchor
100	388142-S	Pin — reverse band anchor (part of 7005)

Fig. 7: Exploded View Of Automatic Transmission (4 Of 6)
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
101	7A246	Vent assembly — case
102	7H398	Plug — non TSS applications
103	W700005-S309	Bolt — M6-1.0X25 hex flange HD (attaches TSS sensor to case)
104	7M101	Sensor assembly — transmission turbine shaft speed sensor
105	N811757-S100	Seal — 14.0 x 1.78 O-ring
106	N605771-S427	Bolt — M6-1.0 x 14 hex head (attaches output shaft speed sensor to case)
107	7H103	Sensor assembly — transmission output shaft speed
108	W500015-S309	Bolt and washer assembly — M6-1.0 x 25 mm (1 in) (2-attaches 7F293 to 7005) (model dependent)
109	7F293	Sensor — transmission range
110	7A256	Lever assembly — manual control (model dependent)
111	7H296	Link assembly — manual control (model dependent)
112	7C493	Shaft — transmission manual control lever (model dependent)
113	N808737-S427	Nut — M10-1.5 (attaches 7A256 to 7C493)
114	7B498	Seal assembly — manual control lever
115	373907-S2	Nut — 1/4 spring (retains identification tag to 7000)
116	7B148	Tag — identification (part of 7005)
117	7D273	Connector assembly — fluid tube (2 required)
118	7N171	Plug — converter housing access
119	7B210	Pin — manual lever shaft retainer
120	391131	Seal — 0.426 x 0.070 O-ring
121	N805862	Seal — 14.0 x 1.78 O-ring
122	7G383	Solenoid valve — transmission pressure control
123	7A441	Pawl — parking pawl
124	7D071	Shaft — parking pawl
125	7D419	Cup — park rod guide (part of 7A039)
126	7D070	Spring — parking pawl return

Item	Part Number	Description
127	7A232	Rod assembly — park pawl actuating
128	7A115	Lever assembly — manual valve detent lever
129	N800287-S536	Nut — M14 x 1.5 hex intermediate detent lever (attaches 7A115 to 7A256)
130	7H188	Piston assembly — overdrive servo
131	7F201	Spring — overdrive servo piston
132	7F203	Rod — overdrive servo actuating
133	7H179	Washer — backup overdrive servo bellville
134	7G277	Spring — bellville overdrive cushion spring
135	7F200	Piston assembly — overdrive servo
136	97411-S	Ring — retaining
137	391377-S	Ring — 2.85 retaining type TVP "H" internal (retains 7H188 to 7005)
138	7D031	Spring — reverse band servo piston
139	7D189	Piston assembly — reverse band servo
140	7D036	Cover assembly — reverse band servo piston
141	388215-S100	Retaining ring internal — 3-13/16
142	7H292	Piston and seal assembly — 2-3 accumulator (bonded seals)
143	7F285	Ring — 2-3 shift accumulator piston (model dependent)
144	7B264	Retainer — 2-3 shift accumulator spring
145	7F284	Spring — 1-2 shift accumulator (model dependent)
146	7F251	Piston assembly — 1-2 shift accumulator (bonded seals)
147	7F284	Spring — 1-2 shift accumulator
148	7F284	Nested spring — 1-2 (inner spring) (vehicle dependent)
149	7F247	Cover and seal assembly — 1-2 accumulator

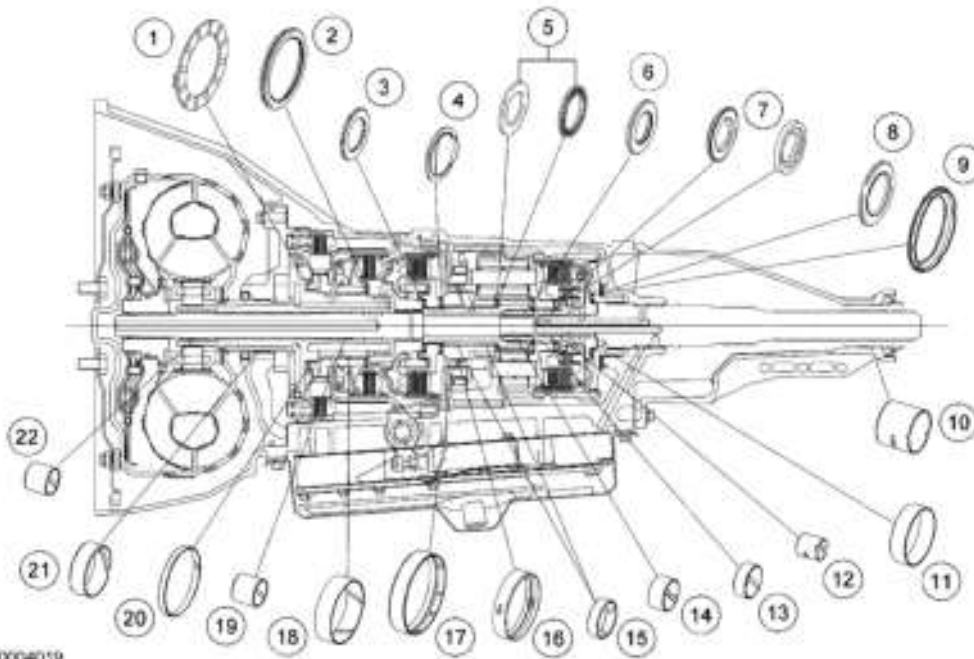
Fig. 8: Exploded View Of Automatic Transmission (5 Of 6)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
150	7384	Ring — 2-1/16 retaining type HU internal (retains 7H300 to 7005)
151	N807178-S1000	Bolt — M6-1.0 x 18 hex head (12-attaches reinforcing plate to valve body)
152	7F282	Plate — valve body reinforcing (part of 7A100)
153	7C155	Gasket — valve body separator upper
154	7A008	Plate — control valve body separator (part of 7A100)
155	7D100	Gasket — valve body separator lower
156	7D174	Valve — converter drainback
157	7A091	Body assembly — main control
158	7H173	Gasket — valve body cover plate
159	7C034	Plate — valve body cover (part of 7A100)
160	N807178-S1000	Bolt — M6-1.0 x 18 hex head (11-attaches 7C034 to 7A100 (part of 7A100)
161	7A100	Control assembly — main (model dependent)
162	7A098	Filter and seal assembly — fluid
163	7A191	Gasket — transmission pan
164	7A194	Pan — transmission
165	N605785-S1036	Bolt — M8-1.25 x 18 hex flange head (14-attaches 7A194 to 7005)
166	7L027	Magnet — ceramic case (part of 7A194)
167	N808947-S1300	Bolt — M8-1.25 x 46 hex shoulder pilot (2-attaches 7C034 to 7A100)

Item	Part Number	Description
168	N807179-S1000	Bolt — M6-1.0 x 52 hex flange head (12-attaches 7A100 to 7005)
169	7H111	Retainer — solenoid
170	7E195	Ball — 1/4 diameter coast booster valve shuttle (8 required)
171	7H187	Screen — solenoid pressure supply
172	N800670-S1000	Bolt — M6-1.0 x 40 hex flange head (13-attaches 7A100 to 7005)
173	7E332	Spring assembly — manual valve detent
174	7Z276	Seal — 0.864 x 0.070 O-ring (2 required)
175	7G276	Bulkhead assembly — wiring connector
176	7G276	Bulkhead assembly — connector (molded lead frame)
177	7Z484	Seal — 6.07 x 1.70 O-ring (2 required)
178	7G484	Solenoid valve — transmission shift
179	7G136	Solenoid valve — transmission torque converter clutch
180	N807178-S1000	Bolt — M6-1.0 x 16 hex head (retains 7D136 and 7G484 to 7A100)
181	7Z136	Seal — 0.489 x 0.070 O-ring
182	7Z484	Seal — 0.176 x 0.070 O-ring
A	—	Intermediate clutch assembly
B	—	Intermediate one-way clutch
C	—	Reverse clutch assembly
D	—	Forward clutch assembly
E	—	Direct clutch assembly

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

BUSHINGS, BEARING AND THRUST WASHER LOCATOR



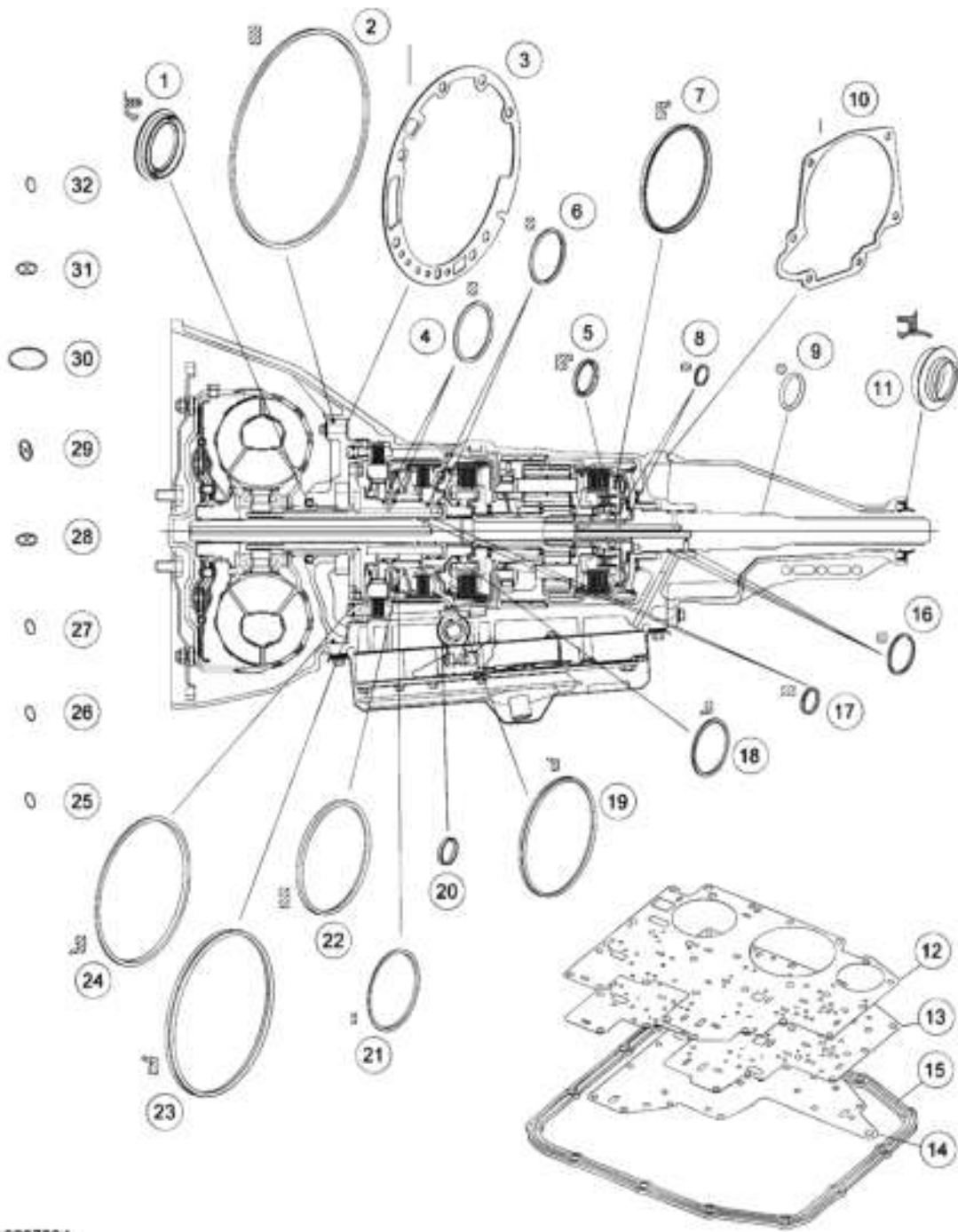
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Item	Part Number	Description
1	7D014	Pump No.1 thrust washer (select fit)
2	7A166	Forward clutch No. 2 bearing and race assembly
3	7F231	Forward clutch bearing and race assembly — front No. 3
4	7F244	Forward clutch hub bearing and race assembly No. 4
5	7F244	Forward clutch sun gear bearing and race assembly No. 5 (2 piece)
6	7F241	Planet assembly bearing and race No. 6
7	7F243, 7F237	Direct clutch inner bearing, race assembly No. 7 and direct clutch inner bearing support No. 7
8	7F240	Direct clutch outer bearing and race assembly No. 8

Item	Part Number	Description
9	7F242	Outer bearing and race assembly — rear No. 9
10	—	Extension bushing (part of 7A039)
11	7025	Case bushing
12	7B233	Output shaft bushing
13	7B375	Planet carrier bushing — rear
14	7F209	Forward clutch sun gear bushing
15	7N193	Reverse clutch sun gear bushing
16	7B374	Carrier bushing — front
17	7A132	Planetary support bushing
18	7F218	Reverse clutch drum bushing — rear
19	7B261	Front pump support bushing
20	7F217	Reverse clutch drum bushing — front
21	7B258	Front pump bushing
22	7B261	Front pump support bushing

Fig. 10: Identifying Bushings, Bearing And Thrust Washer Locations
 Courtesy of FORD MOTOR CO.

SEALS, RINGS AND GASKET LOCATOR



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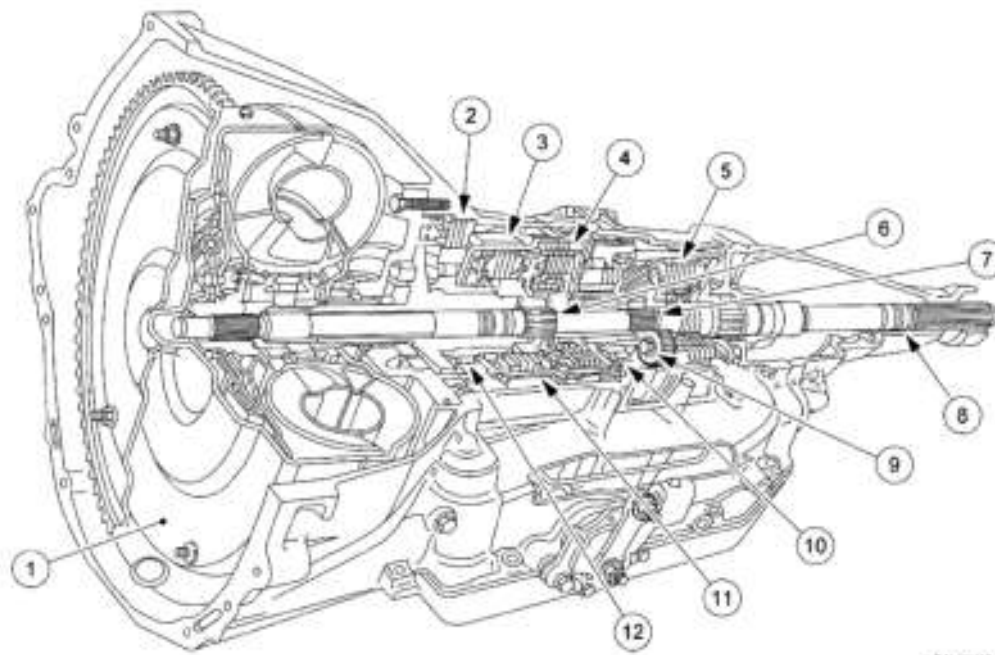
Fig. 11: Identifying Seals, Rings And Gasket Location (1 Of 2)
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	7A248	Front pump seal assembly
2	7A248	Front pump seal
3	7A136	Front pump gasket
4	7D020	Reverse clutch cylinder seal (2 required)
5	7C099	Direct clutch piston inner seal
6	7D019	Forward clutch cylinder
7	7A548	Direct clutch piston outer seal
8	7F274	Output shaft to direct clutch cylinder seal (2 required)
9	87054-S94	O-ring seal (piloted) (model dependent)
10	7086	Extension gasket
11	7052	Extension housing seal assembly
12	7C155	Control valve body upper gasket
13	7D100	Valve body separator plate lower gasket
14	7H173	Valve body cover plate gasket
15	7A191	Transmission pan to case gasket
16	7F273	Output shaft to case seal (3 required)
17	7B497	Input shaft seal (2 required)

Item	Part Number	Description
18	7C099	Forward clutch piston inner seal
19	7A548	Forward clutch piston outer seal
20	7B498	Manual control lever seal assembly
21	7D403	Reverse clutch piston outer seal
22	7D404	Reverse clutch piston inner seal
23	7F224	Intermediate clutch piston outer seal
24	7F225	Intermediate clutch piston inner seal
25	391308-S	Fill tube level indicator seal
26	7Z484	TCC solenoid seal (large)
27	7Z136	TCC solenoid seal (small)
28	7Z484	Shaft solenoid seal (2 required)
29	N811757-S100	Output shaft speed sensor seal
30	7Z276	Bulkhead seal (1 required)
31	N805862-S	Pressure control solenoid seal (large)
32	391131	Pressure control solenoid seal (small)

Fig. 12: Identifying Seals, Rings And Gasket Location (2 Of 2)
 Courtesy of FORD MOTOR CO.

MAIN COMPONENTS AND FUNCTIONS



GD0066-B

Item	Part Number	Description
1	7902	Torque converter
2	7B164	Intermediate clutch (friction)
3	7B164	Reverse clutch (friction)
4	7B164	Forward clutch (friction)
5	7B164	Direct clutch (friction)
6	7F207	Forward clutch cylinder and shaft

Item	Part Number	Description
7	7F351	Shaft — intermediate stub
8	7060	Output shaft
9	7A089	Planetary one-way clutch
10	7D095	Reverse clutch band
11	7F196	Overdrive band
12	7A089	Intermediate one-way clutch

Fig. 13: Sectional View Transmission Main Components
 Courtesy of FORD MOTOR CO.

TORQUE CONVERTER

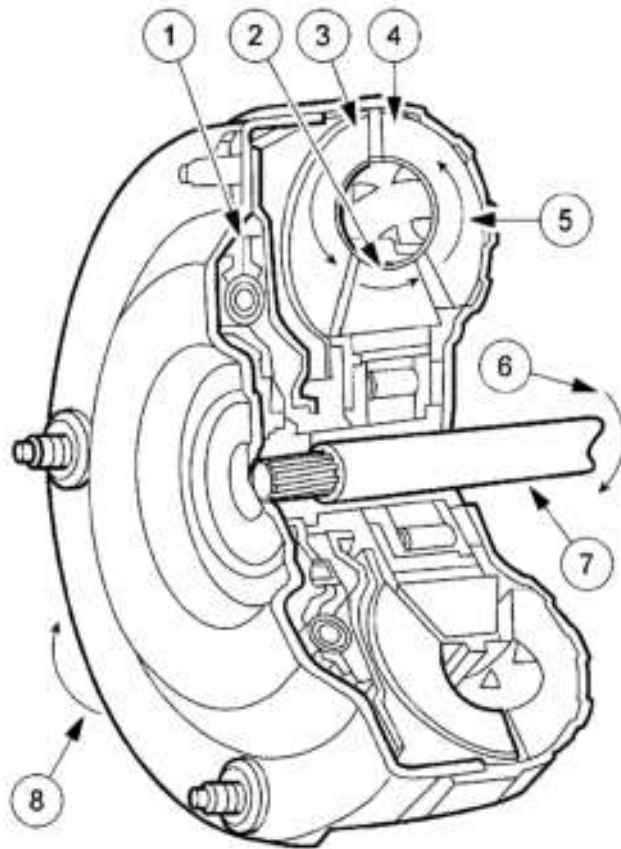
The torque converter transmits and multiplies torque. The torque converter is a 4-element device:

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

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.



AD1223-A

Item	Part Number	Description
1	—	Converter clutch and damper (part of 7902)
2	—	Reactor (part of 7902)
3	—	Turbine (part of 7902)
4	—	Impeller (part of 7902)
5	—	Fluid motion
6	—	Transmission input rotation
7	—	Input shaft
8	—	Engine rotation

Fig. 14: Cut View Torque Converter
 Courtesy of FORD MOTOR CO.

Power is transmitted from the torque converter to the Ravigneaux geartrain components through the input shaft and forward clutch cylinder.

- The geartrain contains a Ravigneaux planetary set connected by dual pinion gears.
- By holding or driving certain components of the gearset, 4 FORWARD ratios and 1 REVERSE ratio are obtained and transmitted to the output shaft. The ratios are as follows:

GEAR RATIO REFERENCE

Gear Ratio	
1st	2.84 to 1
2nd	1.55 to 1
3rd	1.00 to 1
4th	0.70 to 1
Reverse	2.32 to 1

- Components of the geartrain can be held by bands or clutches and driven by clutches only.

The transmission uses:

- two bands.
- two one-way clutches (one roller, one mechanical diode).
- four friction clutches.

Planetary Gearset

The planetary gearset in the transmission is a Ravigneaux-type set consisting of the following components:

- Forward clutch sun gear
- Reverse clutch sun gear
- Pinion carrier
- Long and short pinions
- Output ring gear

Components are held or driven to produce forward and reverse gear ratios.

Input Shaft

The forward clutch cylinder and shaft transfers speed and torque from the converter turbine to the geartrain. This shaft is splined to the turbine on one end and to the forward clutch sun gear and stub shaft on the other end.

Stub Shaft

The stub shaft transfers power from the input shaft to the planet carrier (through the direct clutch) during 3rd and 4th gear operation.

Output Shaft

The output shaft provides torque to the driveshaft and rear axle assembly. It is driven by the ring gear of the

planetary gearset.

APPLY COMPONENTS

There are 8 apply components used to drive or hold the planetary gear set components.

Band - Overdrive

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

The overdrive band holds the reverse clutch drum stationary in 4th gear and manual 2. This action causes the reverse sun gear to be held in these ranges.

Band - Low and Reverse

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

The low and reverse band holds the pinion carrier in reverse. The reverse band also applies in manual 1 position to provide engine braking.

Clutch - Intermediate

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

The intermediate clutch works with the intermediate one-way clutch to hold the reverse sun gear stationary in 2nd gear. The intermediate clutch remains applied in 3rd and 4th gears, but does not transmit power.

Clutch - Forward

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

The forward clutch couples the forward clutch cylinder and input shaft to the forward sun gear in 1st, 2nd and 3rd gears. The forward clutch is not applied in 4th gear.

Clutch - Direct

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

The direct clutch couples the input shaft to the planet carrier through the stub shaft in 3rd and 4th gears.

Clutch - Reverse

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

The reverse clutch couples the input shaft to the reverse sun gear, applied in reverse range only.

One-Way Clutch - Planetary (Low)

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

The planetary (low) one-way clutch is a roller clutch that holds the planetary gearset in 1st gear, (D) and D ranges. During automatic coasting downshifts into 1st gear ((D) and D ranges), the planetary one-way clutch

freewheels so there is no engine braking.

One-Way Clutch - Intermediate

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

The intermediate one-way clutch works with the intermediate friction clutch to hold the reverse clutch drum and reverse sun gear stationary in 2nd gear during acceleration. The intermediate one-way clutch freewheels in 3rd gear and during coasting in 2nd gear, (D) and D ranges.

HYDRAULIC SYSTEM

Fluid Pump

For component location, refer to **Transmission** .

The transmission uses a gerotor-type design front pump support and gear. The pump provides the volume of fluid needed to charge the torque converter, main control assembly, cooling system and lube system. Pump pressure is regulated by the main regulator valve. The pump has an internal boost circuit which is more efficient at lower engine speeds.

Filter

For component location, refer to **Transmission** .

All fluid drawn from the transmission pan by the pump passes through the filter. The filter and its accompanying seal are part of the fluid path from the sump (pan) to the fluid pump.

Main Control

For component location, refer to **Transmission** .

The main control valve body houses 3 electronic solenoids:

- Two shift solenoids
- One torque converter clutch solenoid (TCC solenoid)

Accumulators

For component location, refer to **Transmission** .

The transmission uses 2 accumulators:

- 1-2 Accumulator - The 1-2 accumulator is used to soften the 1-2 shift by absorbing some of the pressure directed to the intermediate clutch. Constant line pressure is applied to the middle section of the 1-2 accumulator piston, opposing the intermediate clutch pressure, until the pressure is high enough to overcome line pressure. The top of the piston is exhausted to the sump.
- 2-3 Accumulator - The 2-3 accumulator is used to soften the 2-3 shift by absorbing some of the direct clutch pressure. Forward clutch pressure is applied to the top side of the 2-3 accumulator piston, holding the piston down until clutch pressure is high enough to overcome it. The middle section of the piston is exhausted to the sump.

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 is separate from the engine control strategy in the PCM, although some of the input signals are shared. 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 best line pressure needed to optimize shift feel. To accomplish this the PCM uses hydraulic solenoids to control transmission operation.

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

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 PCM to calculate injector pulse width. For transmission strategies the MAF sensor is used to regulate electronic pressure control (EPC), shift and torque converter clutch scheduling.

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 actuators which determine transmission operation.

Transmission Control (TC) Switch and Transmission Control Indicator Lamp (TCIL)

The transmission control (TC) switch is a momentary contact switch. When the switch is pressed, a signal is sent to the PCM to allow automatic shifts from 1st through 4th gears or 1st through 3rd gears only. The PCM energizes the transmission control indicator lamp (TCIL) when the switch is off. The TCIL indicates overdrive cancel mode activated (lamp on) and EPC circuit shorted (lamp flashing) or a monitored sensor failure.

Output Shaft Speed (OSS) Sensor

The output shaft speed (OSS) sensor is a magnetic pickup, located at the output shaft ring gear, that sends a signal to the powertrain control module to indicate transmission output shaft speed. The OSS is used for torque converter clutch control, shift scheduling and to determine electronic pressure control.

Turbine Shaft Speed (TSS) Sensor

The turbine shaft speed (TSS) sensor is a magnetic pickup, that sends a signal to the powertrain control module to indicate transmission turbine shaft speed. The TSS is mounted externally on the case. The PCM uses the TSS signal to help determine appropriate operating pressure and torque converter clutch (TCC) operation.

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 and NEUTRAL, the back-up lamp circuit in REVERSE and the neutral sense circuit (4x4 only) in NEUTRAL. The digital TR sensor also opens and closes a set of 4 switches that are monitored by the PCM to determine the position of the manual lever (P, R, N, D, 2, 1).

Transmission Fluid Temperature (TFT) Sensor

The transmission fluid temperature (TFT) sensor is located on the lead frame assembly near the shift solenoids on the main control valve body. It is a temperature sensitive device called a thermistor. 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 TCC operation at low transmission fluid temperatures and corrects electronic pressure control.

Electronic Pressure Control (EPC) Solenoid

The electronic pressure control (EPC) solenoid regulates transmission pressure. EPC valve pressure is used to control line pressure.

Shift Solenoid - SSA, SSB

Two on/off shift solenoids provide gear selection of 1st through 4th gears by controlling the pressure to the 3 shift valves. One unit containing the 2 shift solenoids is located in the main control valve body. The shift solenoids are 2-way normally open style.

SOLENOID OPERATION CHART

Gear Lever Position	PCM Commanded Gear	Solenoids		
		SSA	SSB	TCC
P/R/N	1	ON	OFF	GD
(D)	1	ON	OFF	HD
(D)	2	OFF	OFF	EC
(D)	3	OFF	ON	EC
(D)	4	ON	ON	EC
w/OD OFF				
1	1	ON	OFF	HD
2	2	OFF	OFF	EC
3	3	OFF	ON	EC
Manual 2	2	OFF	OFF	EC
Manual 1	1	ON	OFF	HD
1(1)	2	OFF	OFF	EC

(1) When a manual pull-in occurs above a calibrated speed, the transmission will not downshift from the higher gear until the vehicle speed drops below this calibrated speed.

EC = Electronically Controlled.

HD = Hydraulically Disabled.

Torque Converter Clutch (TCC) Solenoid

The torque converter clutch (TCC) solenoid is used to control the apply and release of the TCC.

4x4 Low (4x4L) Range Switch

The 4x4 low (4x4L) range switch is located on the transfer case cover. It provides an indication of when the 4x4 transfer case gear system is in the low range. The PCM then modifies shift schedule for 4x4L operation.

Brake Pedal Position (BPP) Switch

The brake pedal position (BPP) switch tells the 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.

Electronic Ignition (EI) System

The electronic ignition (EI) system consists of a crankshaft position sensor, two 4-tower ignition coils and the 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 EPC pressure.

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 clutch is engaged, EPC is adjusted by the PCM to compensate for additional load on the engine.

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 EPC pressures.

Engine Coolant Temperature (ECT) Sensor

The engine coolant temperature (ECT) sensor detects temperature of engine coolant and supplies the information to the PCM. The ECT sensor is used to control TCC operation. The ECT is installed in the heater outlet fitting or cooling passage on the engine. For engine control applications, the ECT signal is used to modify ignition timing, ERG flow and air-to-fuel ratio as a function of engine coolant temperature.

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 PCM. The TP sensor is used for shift scheduling, electronic pressure control and TCC control.

TRANSMISSION COOLING

The transmission fluid cooling system, without an auxiliary transmission fluid cooler, consists of the following:

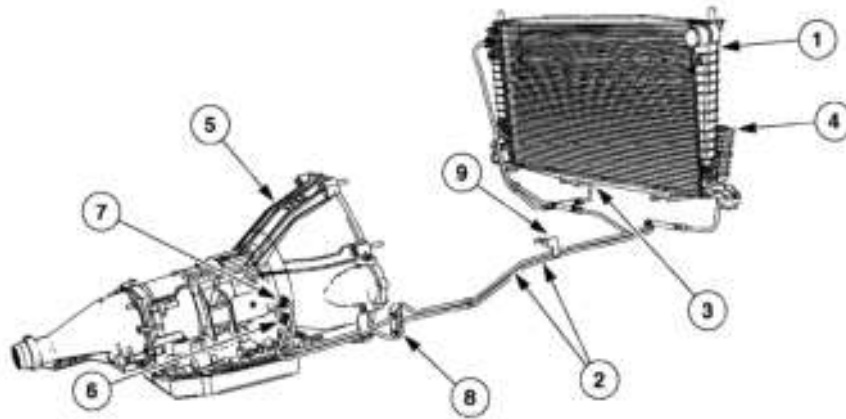
- Intank fluid cooler inlet tube
- Non-repairable intank transmission fluid cooler
- Intank fluid cooler return tube

The transmission fluid cooling system, with an auxiliary transmission fluid cooler, consists of the following:

- Intank fluid cooler inlet tube
- Non-repairable intank transmission fluid cooler
- Auxiliary fluid cooler inlet tube
- Auxiliary transmission fluid cooler
- Auxiliary fluid cooler return tube

The transmission fluid flows from the transmission bottom fitting for the intank transmission fluid cooler, to the auxiliary transmission fluid cooler, if so equipped and returns to the transmission top fitting.

For fluid cooler flow testing and backflushing and cleaning procedures, refer to **TRANSMISSION FLUID COOLER - BACKFLUSHING AND CLEANING.**

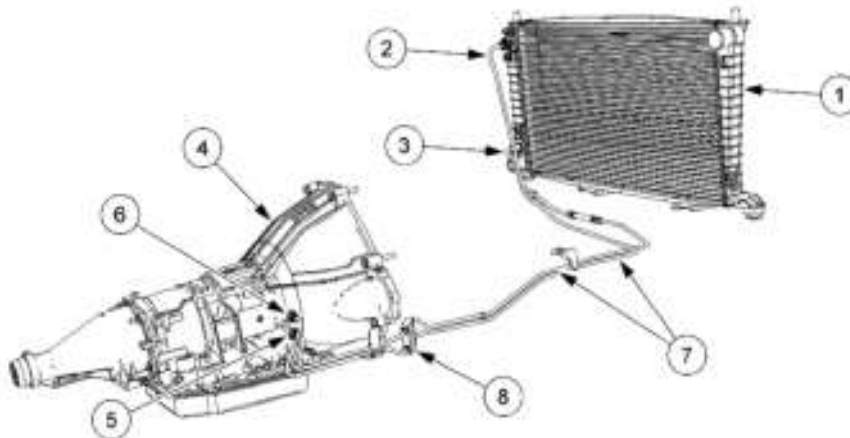


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Item	Part Number	Description
1	8005	Radiator
2	7H420	In-tank fluid cooler inlet and outlet tubes
3	7F113	Auxiliary fluid cooler inlet tube
4	7A095	Auxiliary fluid cooler

Item	Part Number	Description
5	7005	Transmission
6	7D273	Transmission fluid outlet
7	7D273	Transmission fluid inlet
8	7H322	Fluid cooler bypass valve
9	7N291	Fluid cooler tube bracket

Fig. 15: Locating Transmission With An Auxiliary Transmission Fluid Cooler Component
 Courtesy of FORD MOTOR CO.



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Item	Part Number	Description
1	8005	Radiator
2	7A030	In-tank fluid cooler inlet tube
3	7A031	In-tank fluid cooler return tube
4	7005	Transmission

Item	Part Number	Description
5	7D273	Transmission fluid outlet
6	7D273	Transmission fluid inlet
7	7R081	Fluid cooler tubes
8	7H322	Fluid cooler by-pass valve

Fig. 16: Locating Transmission Without An Auxiliary Transmission Fluid Cooler Component
 Courtesy of FORD MOTOR CO.

EXTERNAL CONTROLS

The transmission shift cable transfers the transmission operating mode from the gearshift lever to the

automatic transmission. The indicated position of the transmission control selector lever is transferred to the transmission either through the steering column shift selector tube or through the floor shifter, then to the cable 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 either on the base of the steering column tube or 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.

Transmission Control Switch (TCS)

The transmission control switch (TCS) is a momentary contact switch that is located either on the end of the transmission control selector lever or the center console bezel of the floor shifter. Pushing the TCS will either disengage or engage the overdrive function of the transmission. If the OVERDRIVE is disengaged, the word "OFF" will illuminate on the instrument cluster or in the message center.