Transmission Case

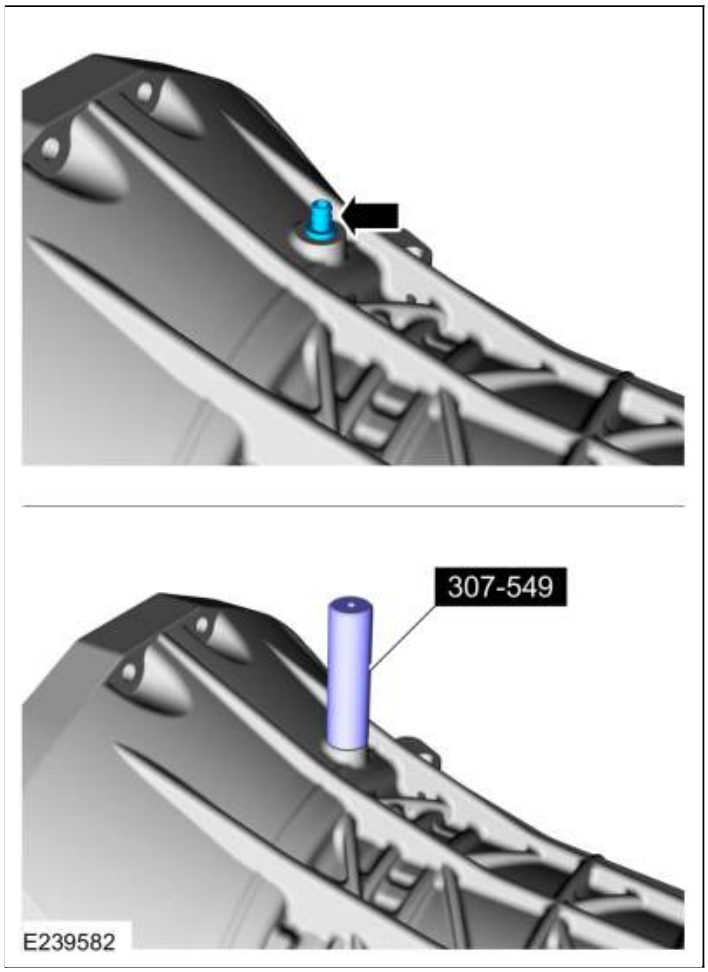
Base Part Number: 7005

Special Tool(s) / General Equipment

 E131850	204-594 Forcing screw
 E270043	307-549 Installer, Shift Shaft Fluid Seal TKIT-2005D1-F1
 E297570	307-648 Remover/Installer, Rear Bearing TKIT-2009C-F TKIT-2009C-ROW
 E234910	307-738 Installer, R2 Bearing
 E234911	307-739 Installer, R3 Bearing
 E234912	307-740 Installer, Dog Bone
 E234931	307-745 Installer, Park Sleeve Roll Pin

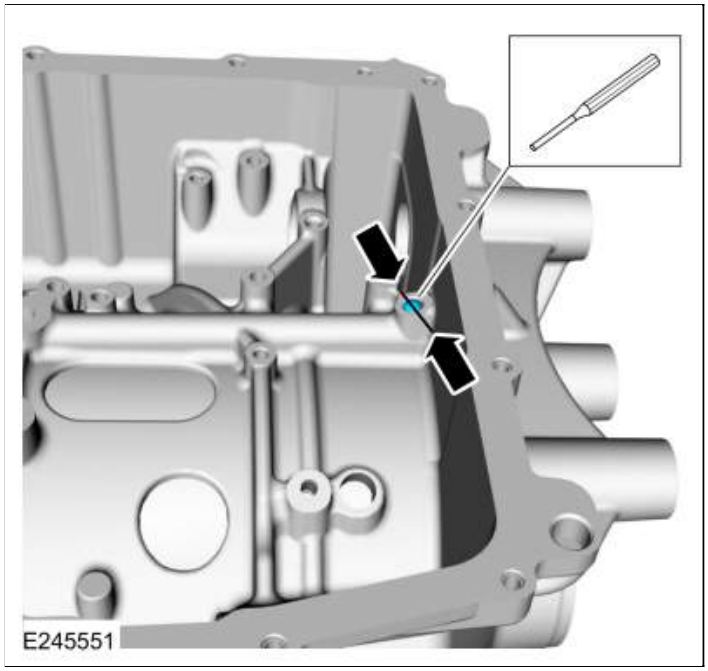
1. **NOTE:** *This step is only necessary if the transmission case is being replaced. A new transmission case will not come with a vent tube.*

Using the special tool, install the vent tube in the transmission case.
Use Special Service Tool: 307-549 Installer, Shift Shaft Fluid Seal.

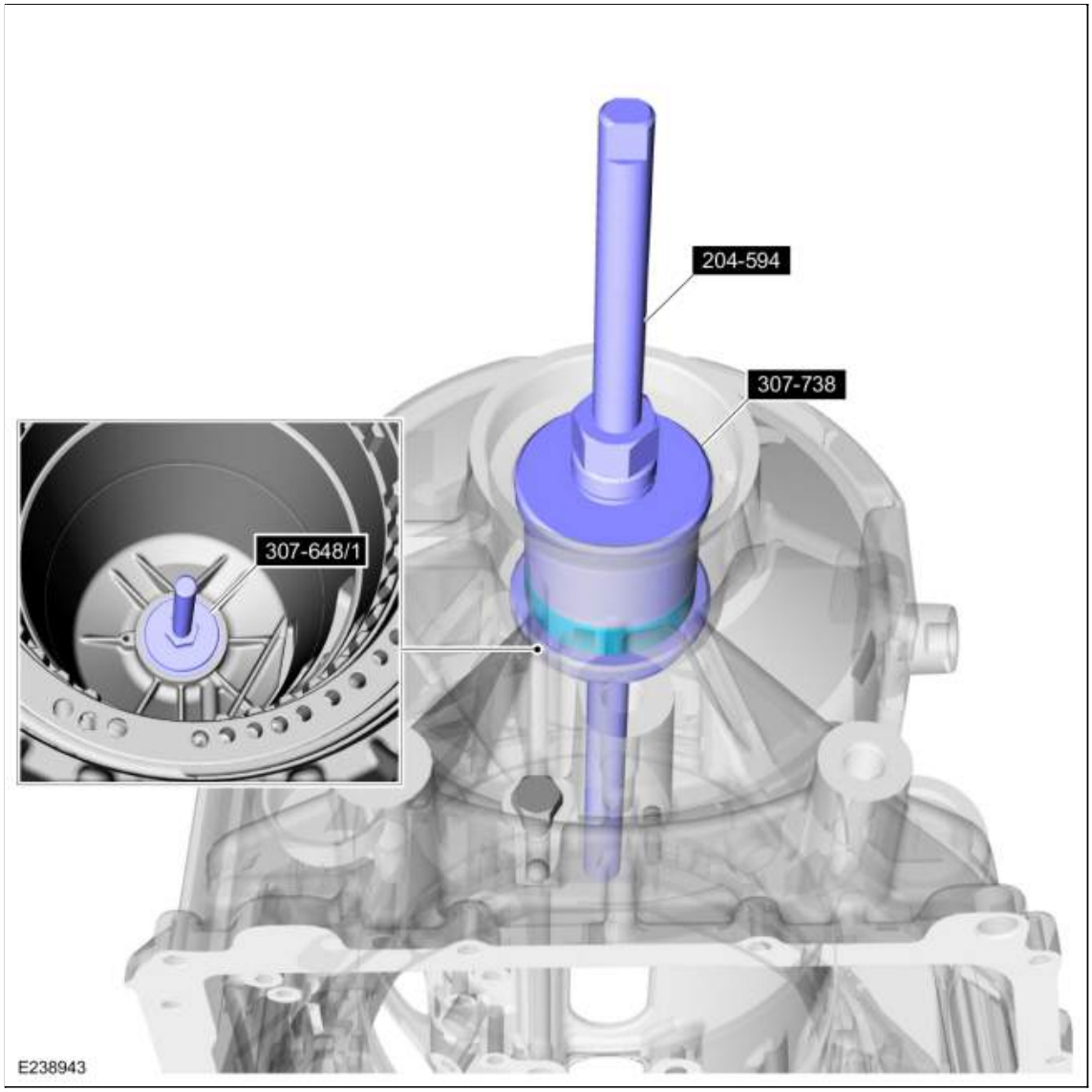


2. **NOTE:** *This step is only necessary if the transmission case is being replaced.*

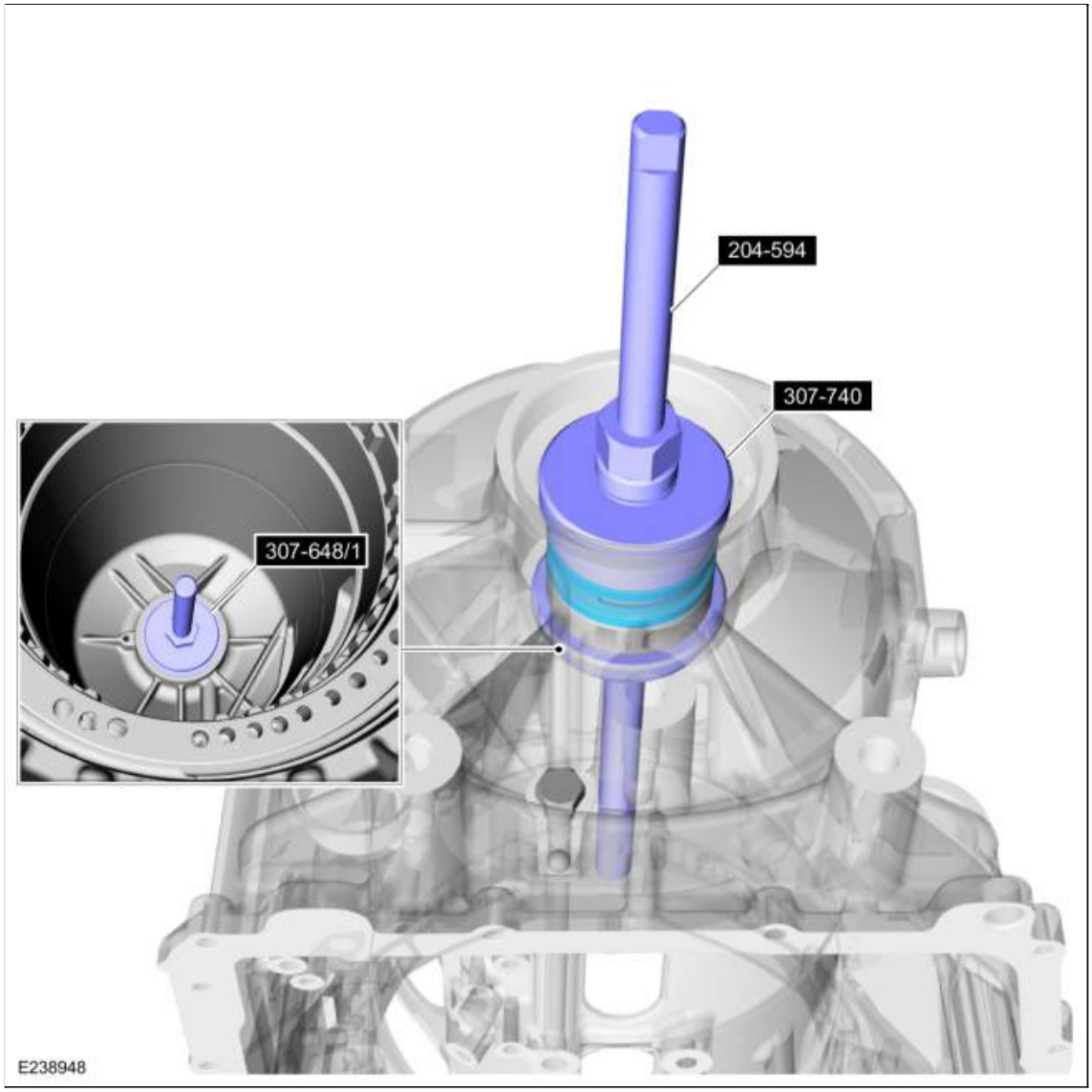
   Using a brass punch, install the ball plug (7E195) flush with the transmission case surface.



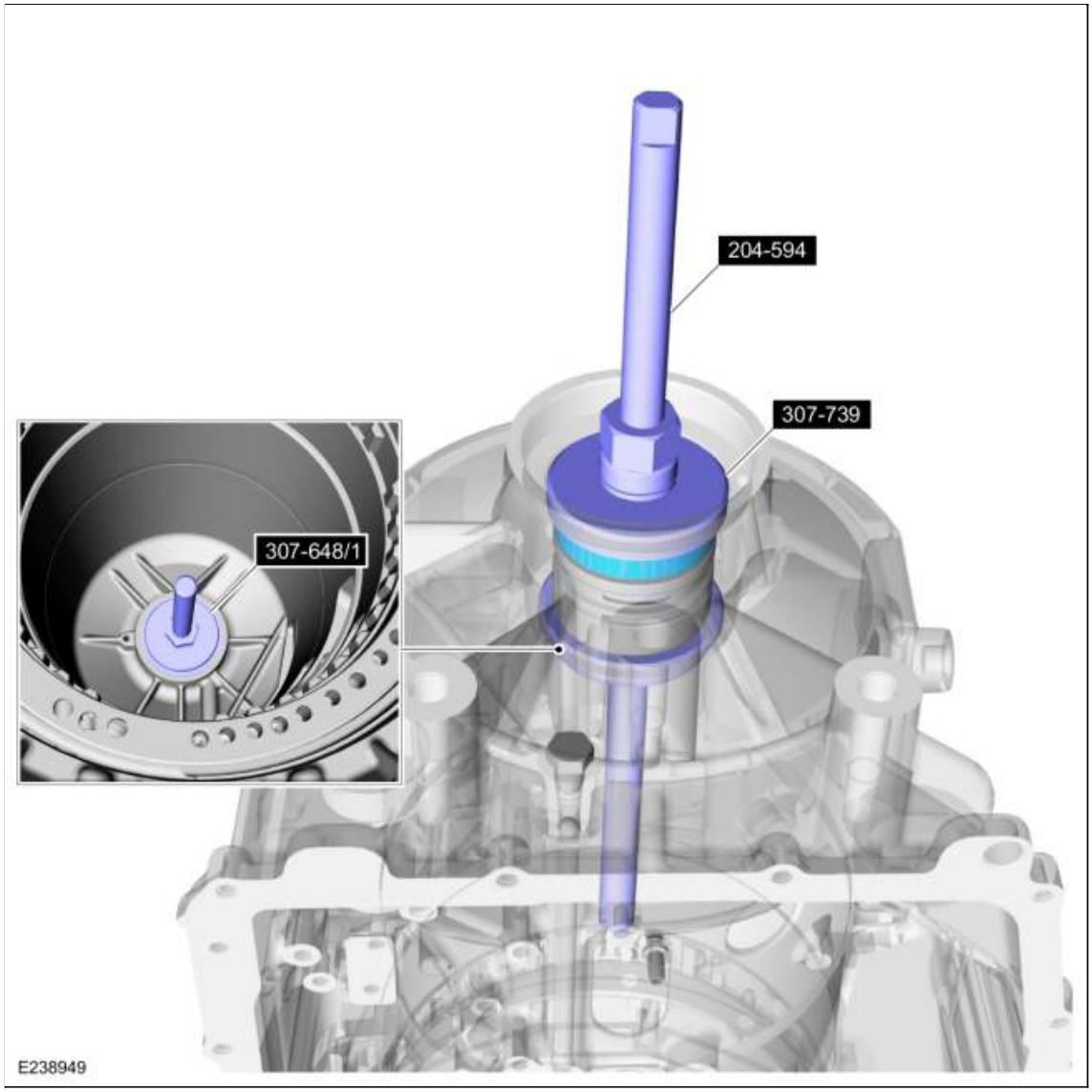
3. Using the special tools, install the inner output shaft bearing.
   Use Special Service Tool: 204-594 Forcing screw. , 307-648 Remover/Installer, Rear Bearing. , 307-738 Installer, R2 Bearing.



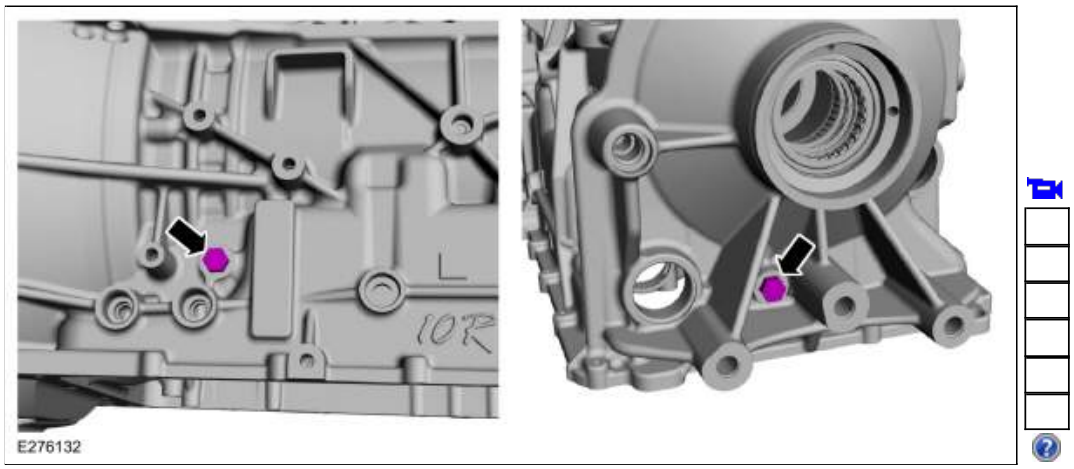
4. Using the special tools, install the fluid passage sleeve.
   Use Special Service Tool: 204-594 Forcing screw. , 307-648 Remover/Installer, Rear Bearing. , 307-740 Installer, Dog Bone.



5. Using the special tools, install the outer output shaft bearing.
   Use Special Service Tool: 204-594 Forcing screw. , 307-648 Remover/Installer, Rear Bearing. , 307-739 Installer, R3 Bearing.

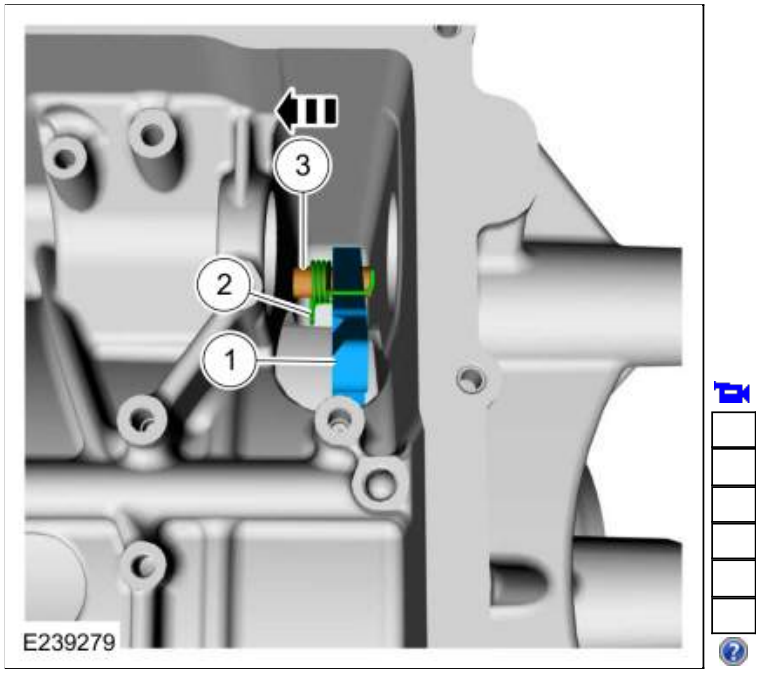


6. Install the line pressure port and rear case plugs.
Torque: 119 lb.in (13.5 Nm)

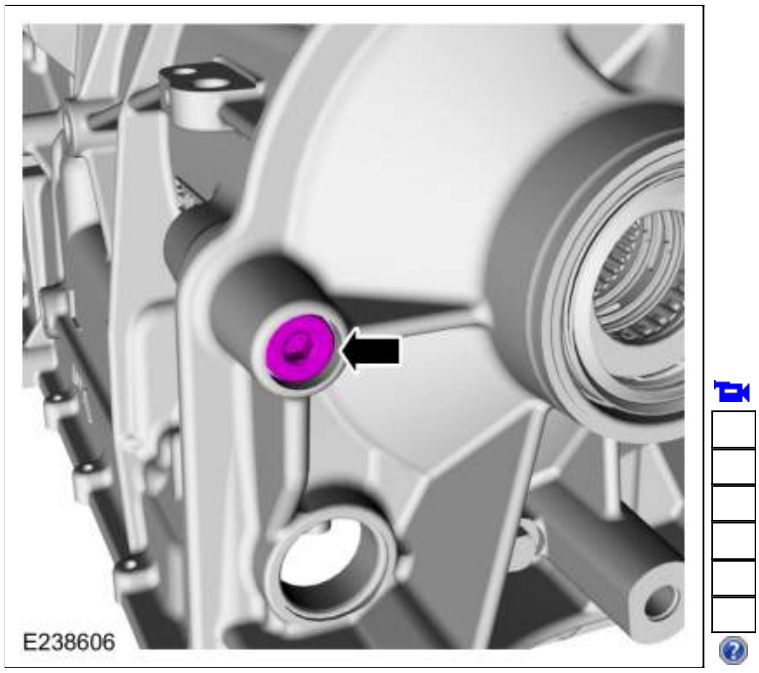


7.

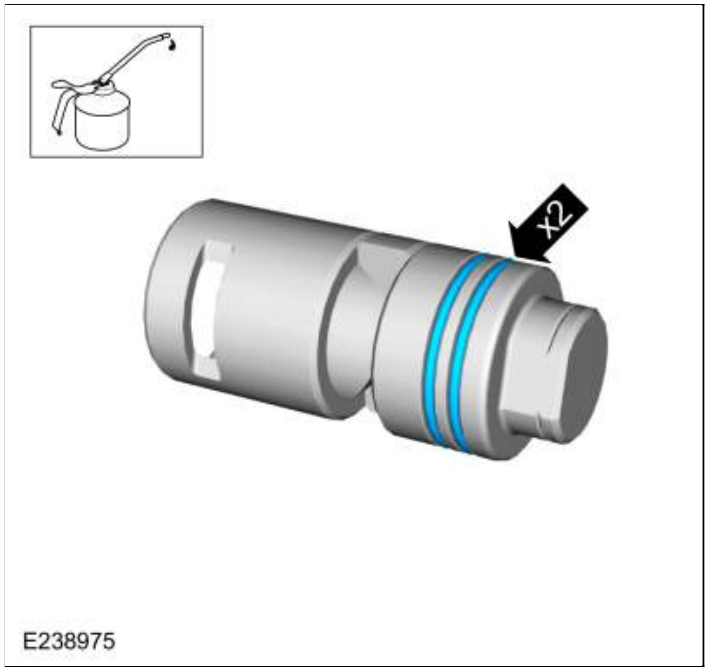
1. Install the park pawl.
2. Install the park pawl return spring.
3. Install the park pawl shaft.



8. Install the park pawl shaft plug.
Torque: 17 lb.ft (23 Nm)



9. Install new park pawl actuator rod sleeve seals and lubricate them with petroleum jelly.

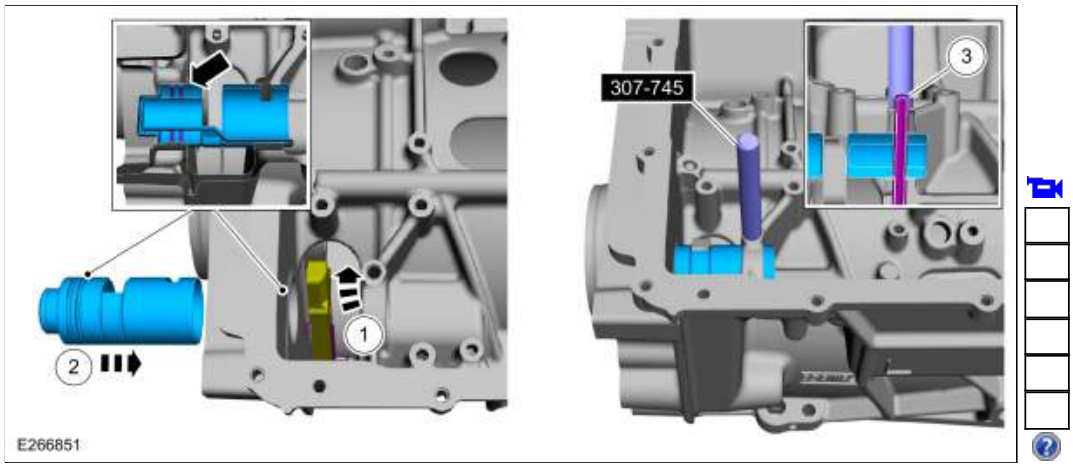


10.

1. Position the park pawl towards the inside of the transmission case.
2. **NOTICE: Do not slide the park pawl actuator rod sleeve to far into the transmission case or the inner seal will be damaged.**

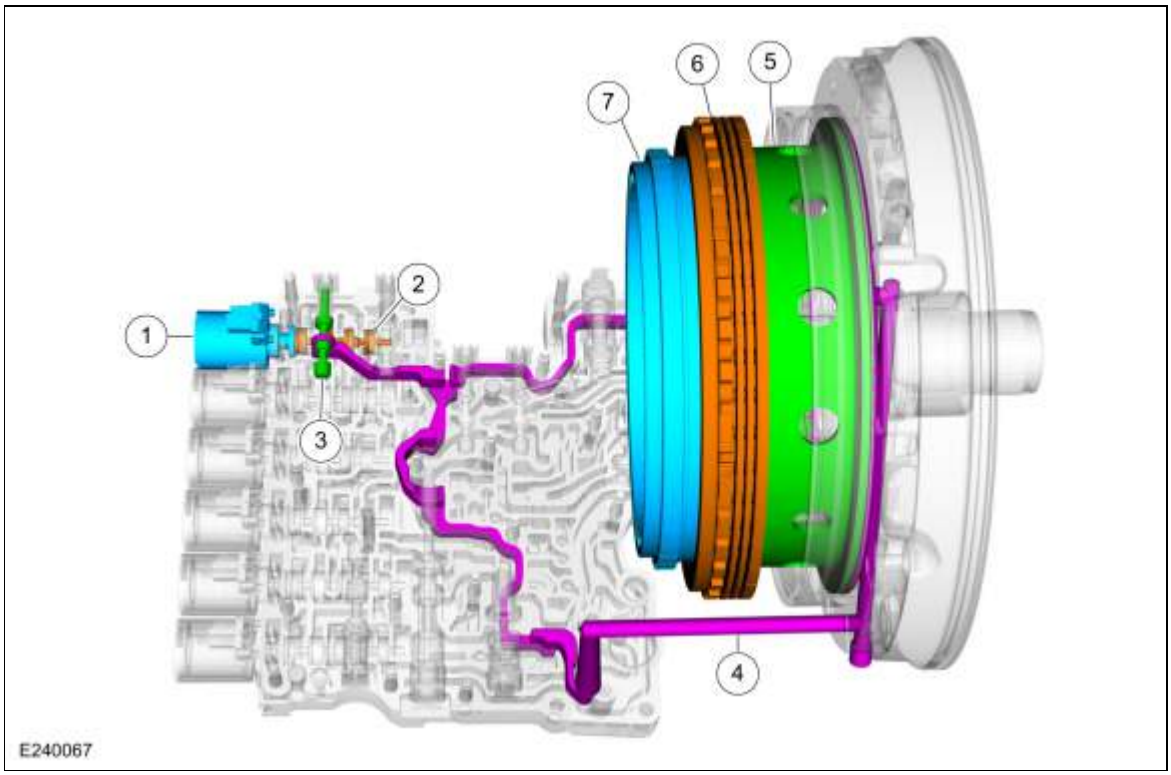
   Slide the park pawl actuator rod sleeve into the transmission case.
3. **NOTE:** *Align the roll pin seam to the inside of the transmission.*

   Using the special tool install the roll pin to the correct depth.
   Use Special Service Tool: 307-745 Installer, Park Sleeve Roll Pin.



A Clutch

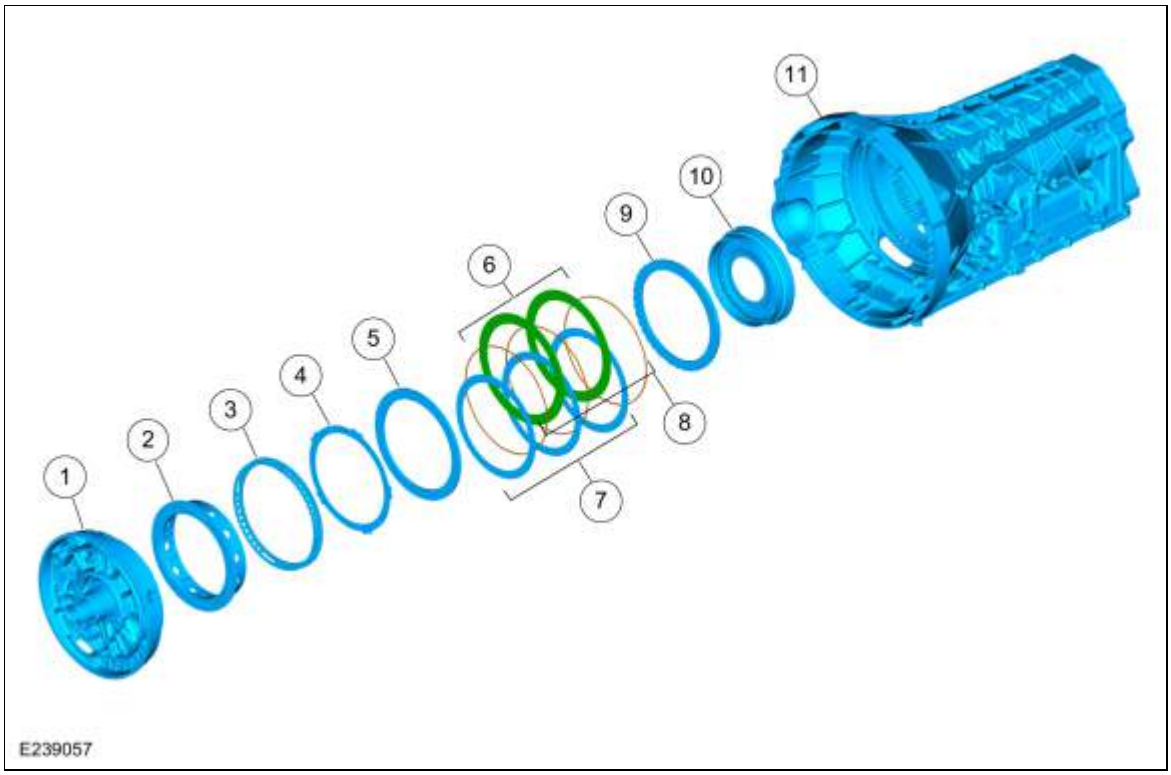
Overview



Item	Description
1	SSA
2	A clutch control valve
3	A clutch latch valve
4	A clutch apply circuit
5	A clutch piston
6	A clutch assembly
7	Ring gear No. 1

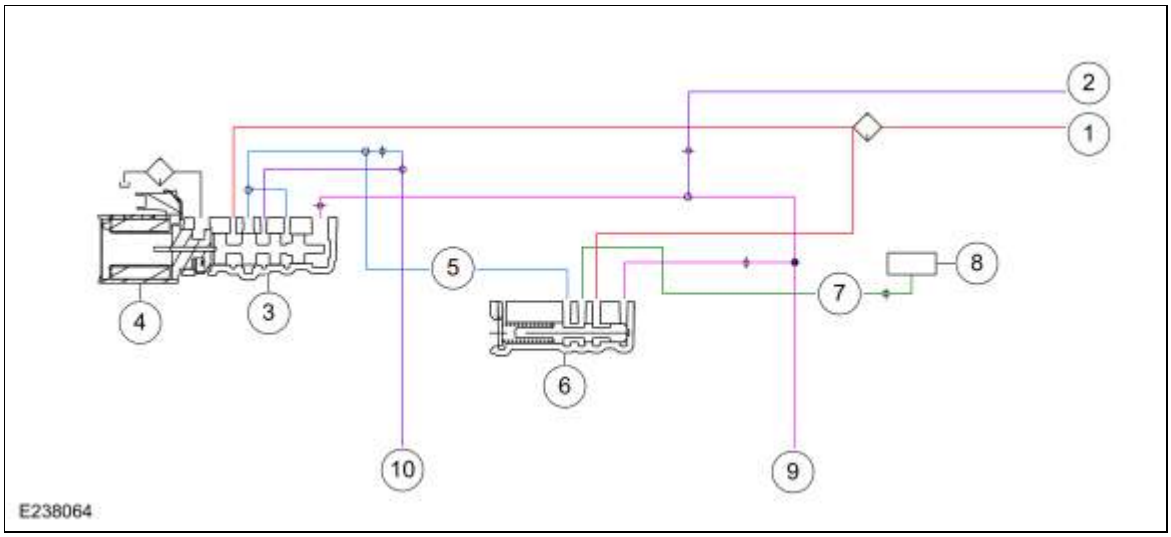
Ring gear No. 1 is connected to the A clutch. When the A clutch applies, it holds the ring gear No. 1 stationary.

A Clutch Exploded View



Item	Description
1	Front support assembly
2	A clutch piston
3	A clutch piston return spring
4	A clutch wave spring
5	A clutch apply plate
6	A clutch steel plates
7	A clutch friction plates
8	A clutch separating springs
9	A clutch pressure plate
10	Ring gear No. 1
11	Transmission case

A Clutch Hydraulic Circuits

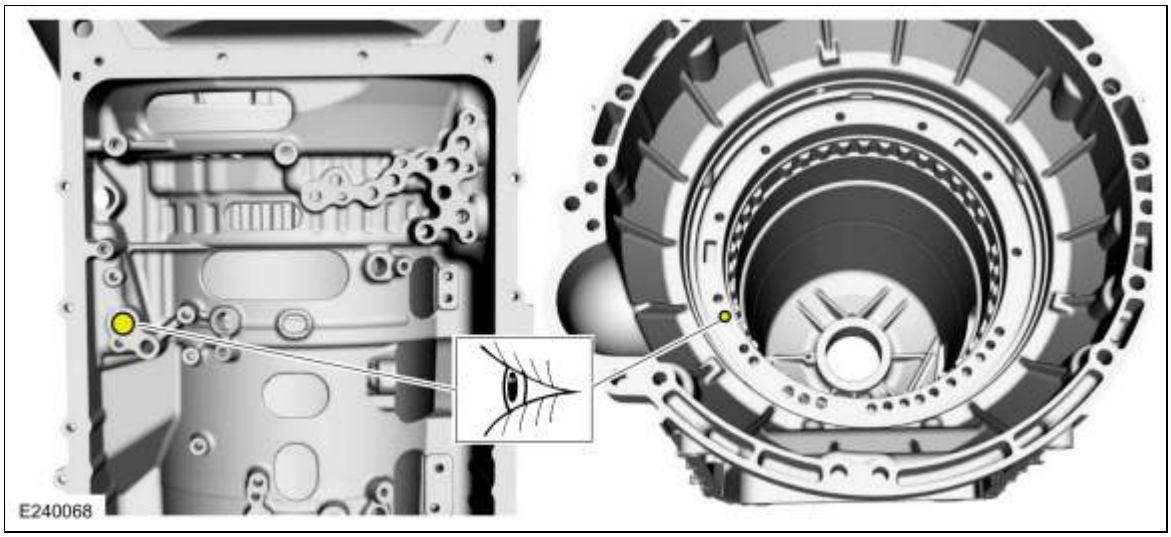


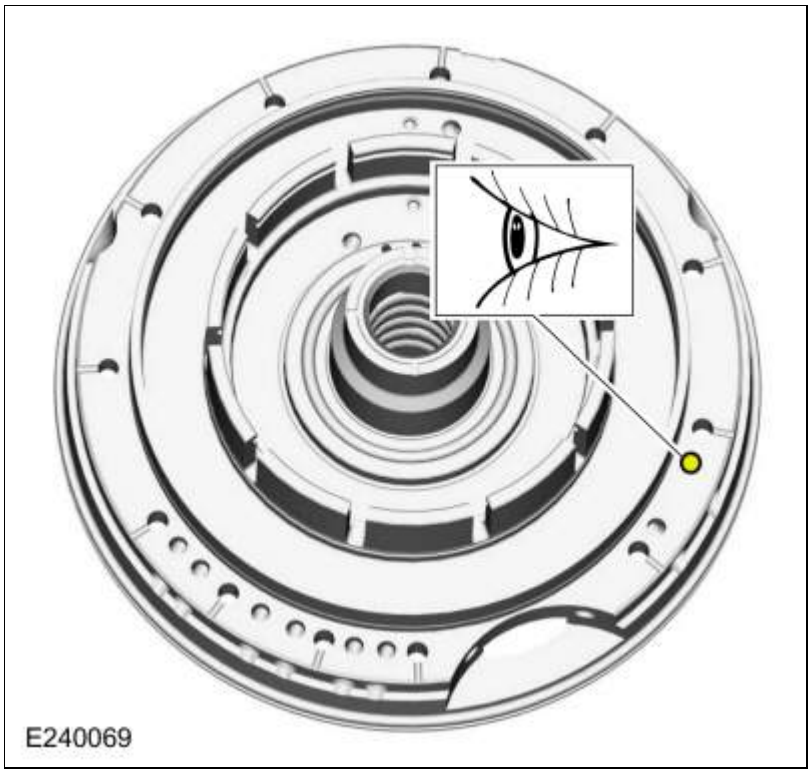
Item	Description
1	Line pressure
2	Pump output
3	A clutch control valve
4	SSA
5	Control pressure to latch valve
6	A clutch latch valve
7	Apply pressure to mechanical A clutch
8	Mechanical A clutch
9	Elevated exhaust pressure
10	Clutch exhaust

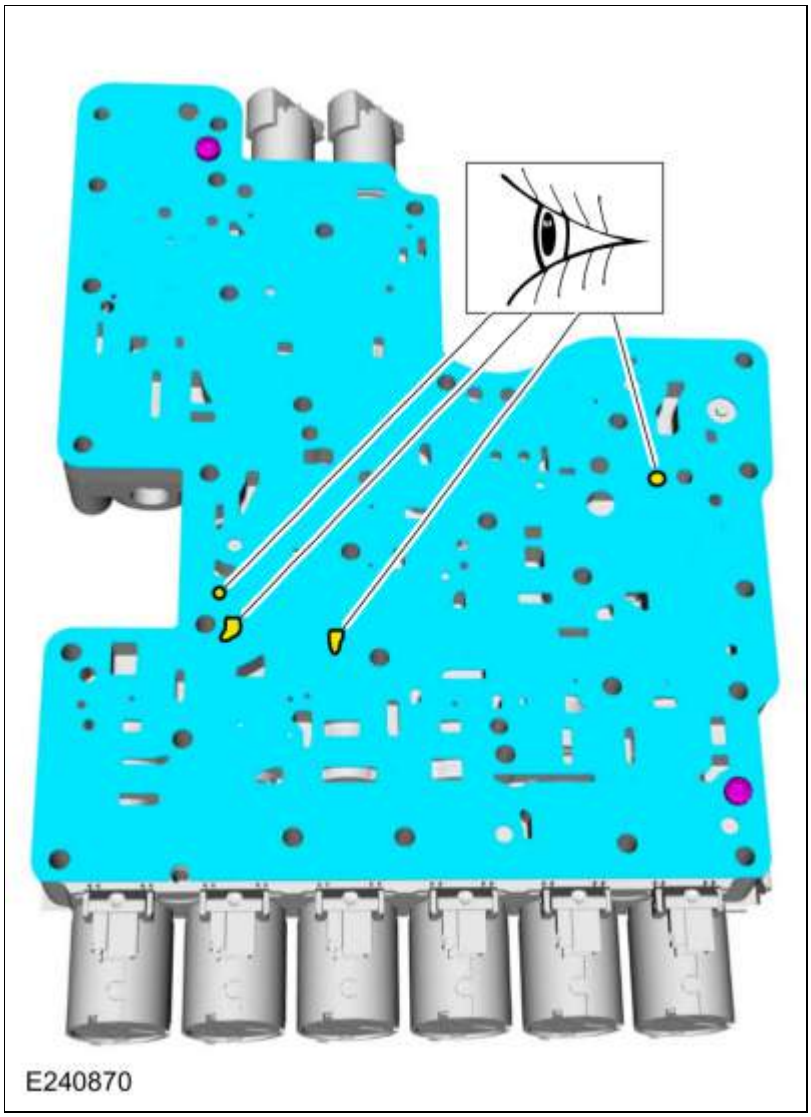
A Clutch Hydraulic Operation

Line pressure is supplied to the A clutch control valve and the A clutch latch valve. As SSA turns on, it moves the control valve allowing regulated line pressure to flow to the A clutch latch valve and than to the mechanical A clutch. When the regulated line pressure in the A clutch control circuit reaches approximately 100 psi, the mechanical A clutch is fully applied. The pressure in the A clutch control circuit moves the A clutch latch valve to the left which allows line pressure to hold the mechanical A clutch applied.

A Clutch Hydraulic Passages

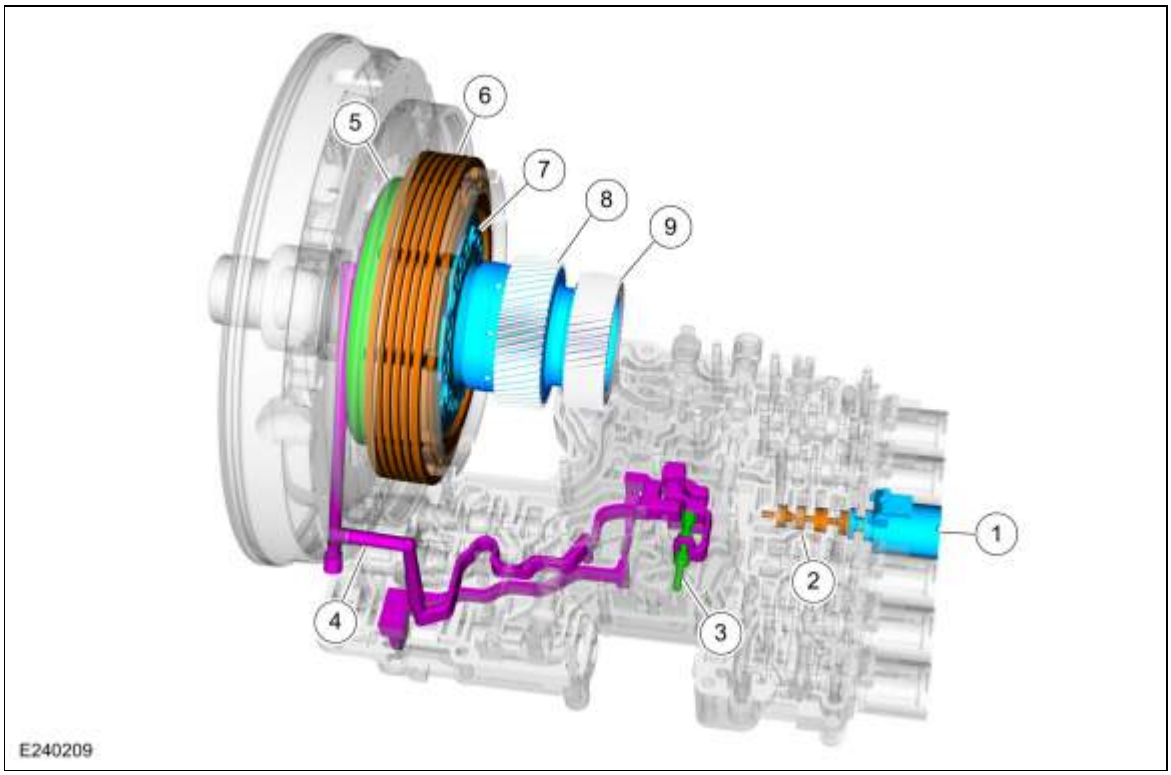






B Clutch

Overview

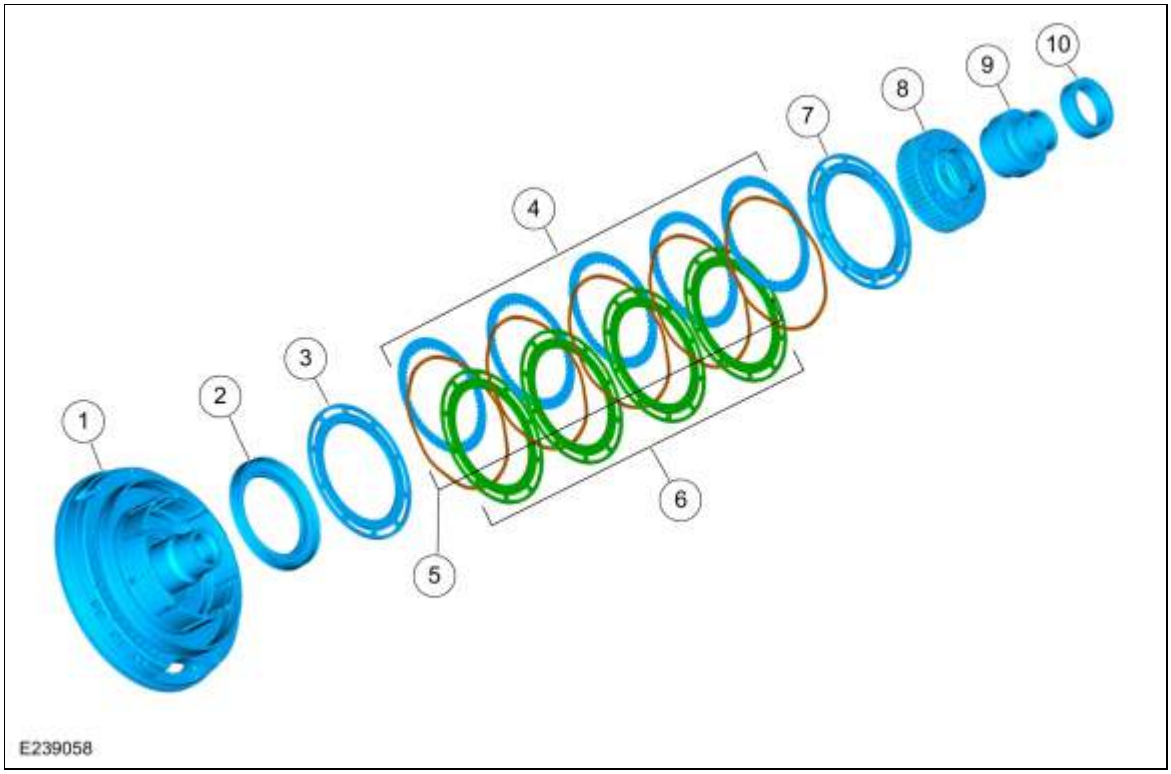


Item	Description
1	SSB
2	B clutch control valve
3	B clutch latch valve
4	B clutch apply circuit
5	B clutch piston
6	B clutch assembly
7	One-Way Clutch (OWC)
8	Sun gear No. 1
9	Sun gear No. 2

Sun gear No. 1 is mechanically connected to sun gear No. 2. Sun gear No. 1 is also connected to the B clutch. When the B clutch applies, it holds the sun gear No. 1 and sun gear No. 2 stationary. The One Way Clutch (OWC) also holds the sun gear No. 1 and sun gear No. 2 stationary during acceleration in first and

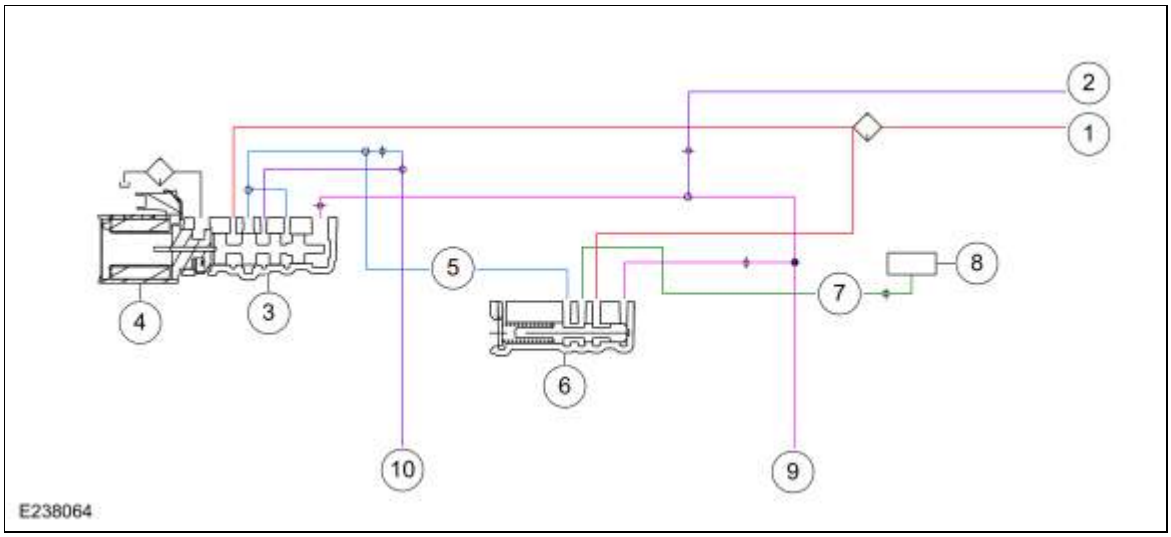
second gear when the shifter is in the D position.

B Clutch Exploded View



Item	Description
1	Front support assembly
2	B clutch piston
3	B clutch apply plate
4	B clutch friction plates
5	B clutch separating springs
6	B clutch steel plates
7	B clutch pressure plate
8	One-Way Clutch (OWC)
9	Sun gear No. 1
10	Sun gear No. 2

B Clutch Hydraulic Circuits

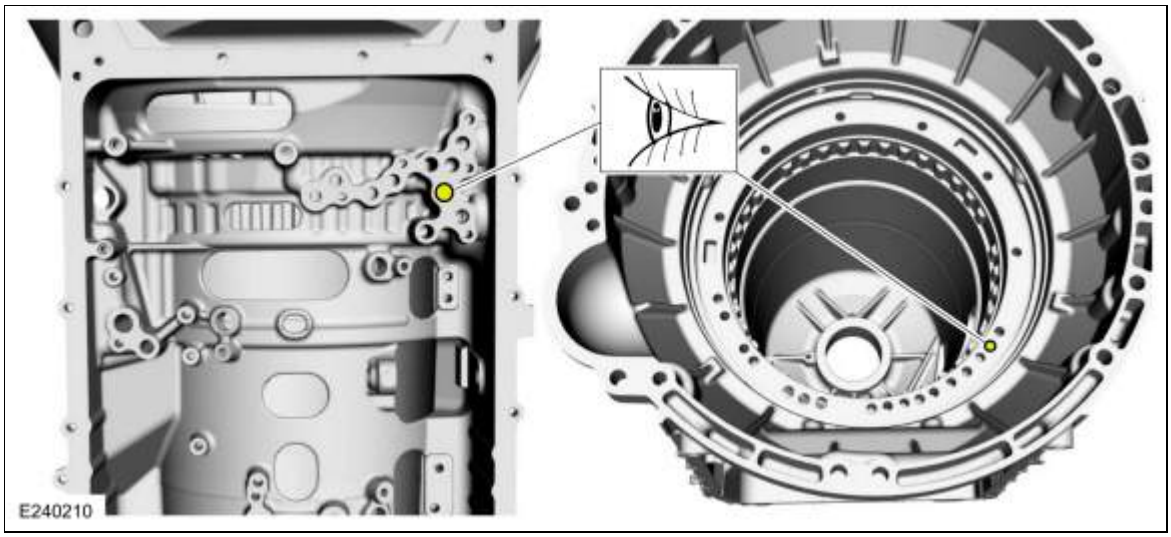


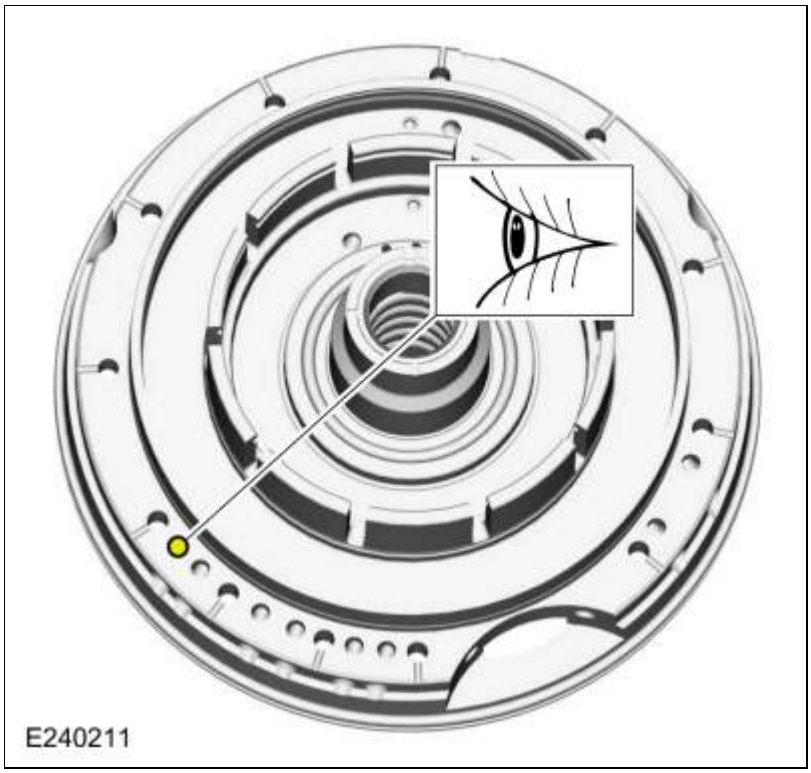
Item	Description
1	Line pressure
2	Pump output
3	B clutch control valve
4	SSB
5	Control pressure to latch valve
6	B clutch latch valve
7	Apply pressure to mechanical B clutch
8	Mechanical B clutch
9	Elevated exhaust pressure
10	Clutch exhaust

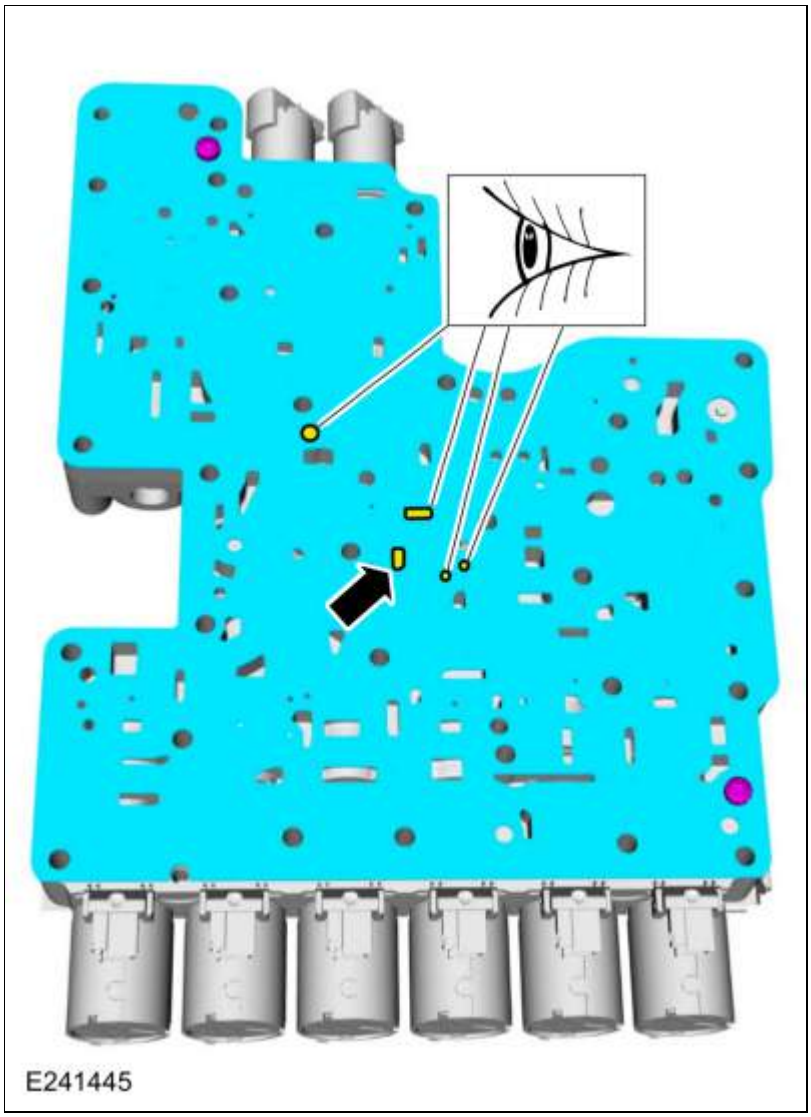
B Clutch Hydraulic Operation

Line pressure is supplied to the B clutch control valve and the B clutch latch valve. As SSB turns on, it moves the control valve allowing regulated line pressure to flow to the B clutch latch valve and than to the mechanical B clutch. When the regulated line pressure in the B clutch control circuit reaches approximately 100 psi, the mechanical B clutch is fully applied. The pressure in the B clutch control circuit moves the B clutch latch valve to the left which allows line pressure to hold the mechanical B clutch applied.

B Clutch Hydraulic Passages

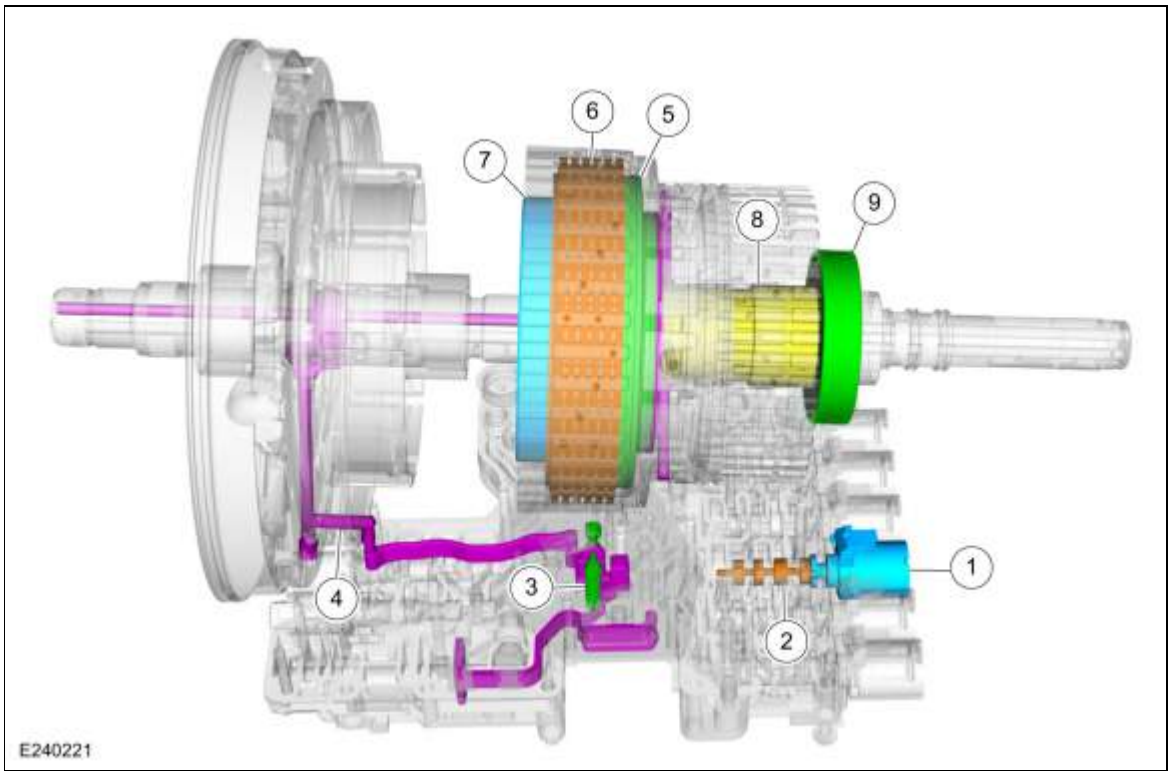






C Clutch

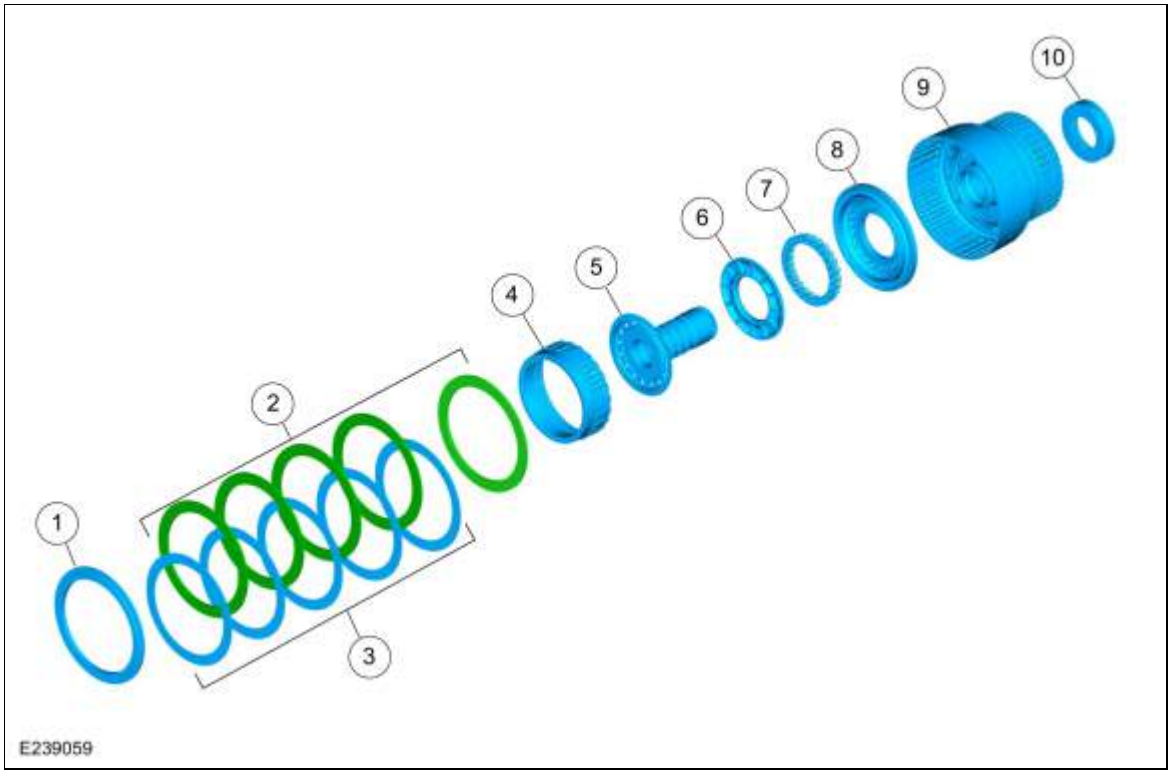
Overview



Item	Description
1	SSC
2	C clutch control valve
3	C clutch latch valve
4	C clutch apply circuit
5	C clutch piston
6	C clutch assembly
7	Ring gear No. 2
8	Shaft (sun gear No. 3)
9	Sun gear No. 3

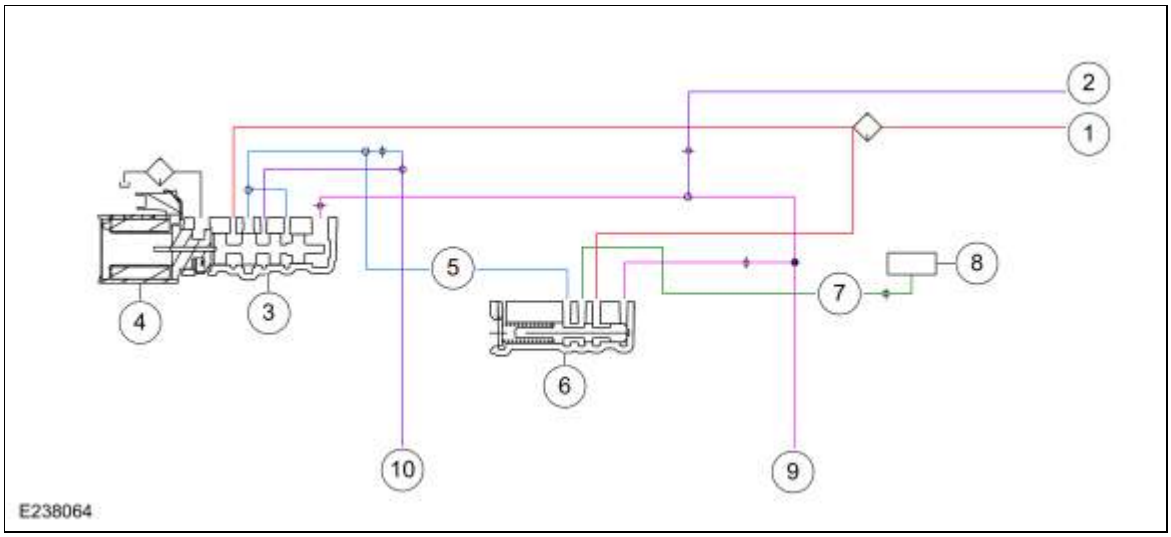
Ring gear No. 2 is mechanically connected to sun gear No. 3 and is also connected to the C clutch. When the C clutch applies, torque from ring gear No. 2 may be applied the planetary carrier No. 3.

C Clutch Exploded View



Item	Description
1	C clutch pressure plate
2	C clutch steel plates
3	C clutch friction plates
4	Ring gear No. 2
5	Shaft (sun gear No 3)
6	C clutch balance dam
7	C clutch piston return spring
8	C clutch piston
9	CDF clutch cylinder
10	Sun gear No. 3

C Clutch Hydraulic Circuits

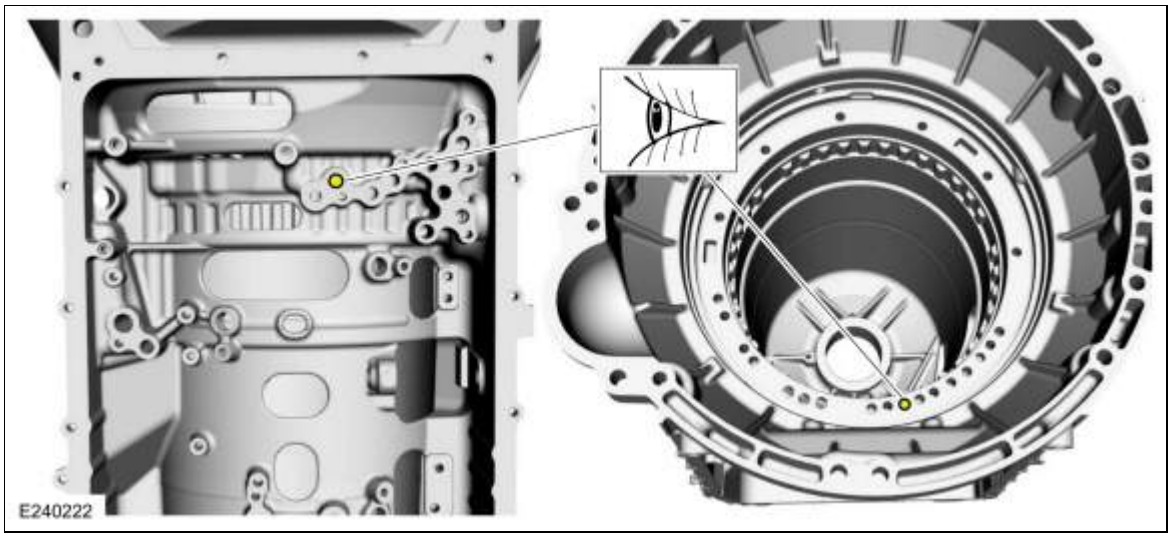


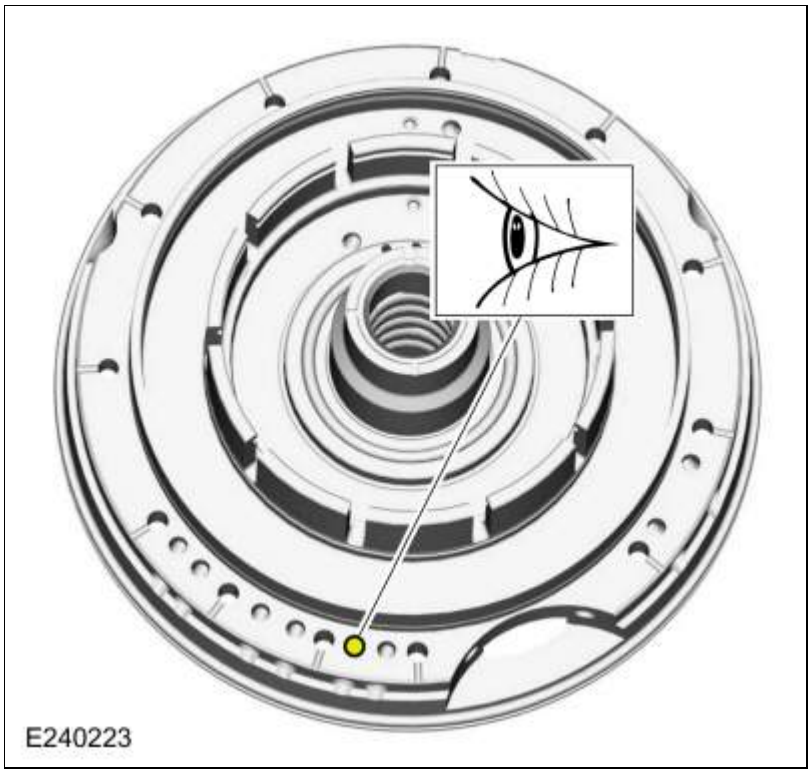
Item	Description
1	Line pressure
2	Pump output
3	C clutch control valve
4	SSC
5	Control pressure to latch valve
6	C clutch latch valve
7	Apply pressure to mechanical C clutch
8	Mechanical C clutch
9	Elevated exhaust pressure
10	Clutch exhaust

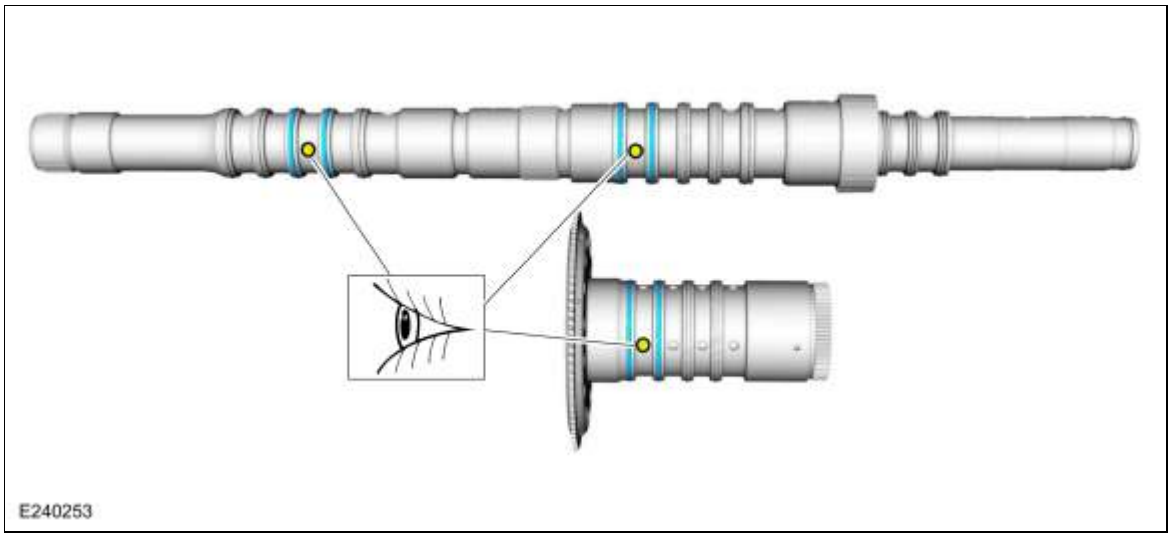
C Clutch Hydraulic Operation

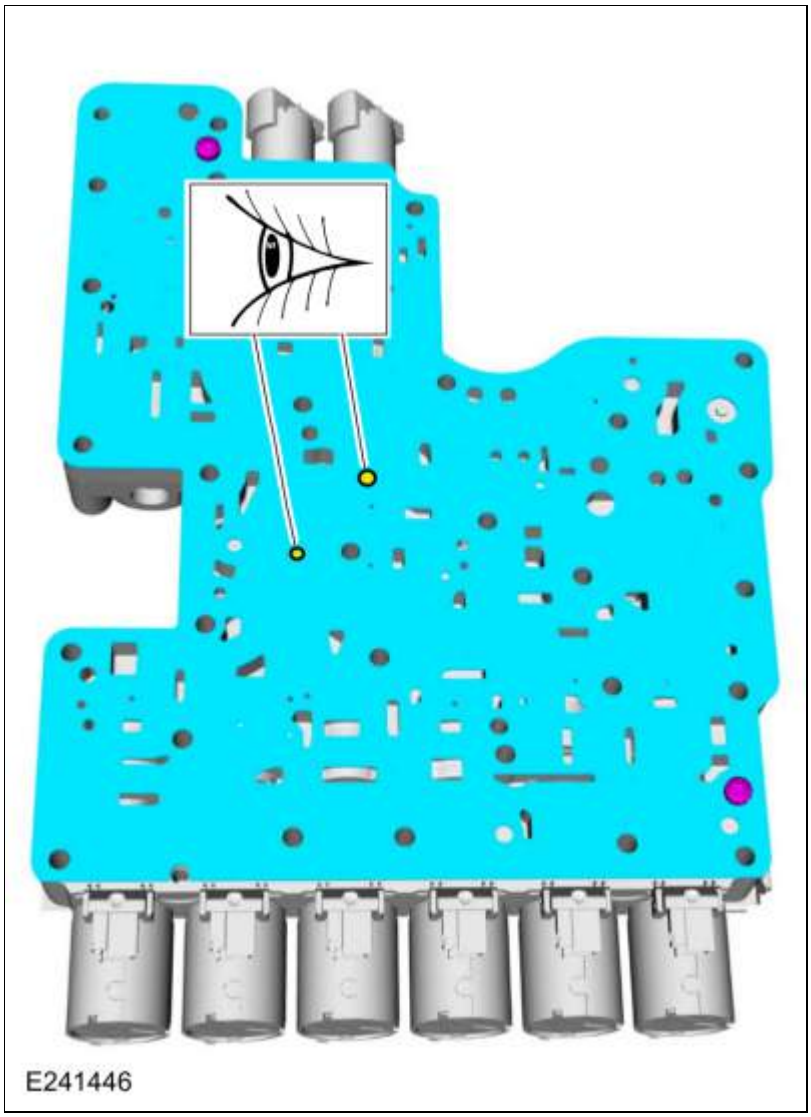
Line pressure is supplied to the C clutch control valve and the C clutch latch valve. As SSC turns on, it moves the control valve allowing regulated line pressure to flow to the C clutch latch valve and than to the mechanical C clutch. When the regulated line pressure in the C clutch control circuit reaches approximately 100 psi, the mechanical C clutch is fully applied. The pressure in the C clutch control circuit moves the C clutch latch valve to the left which allows line pressure to hold the mechanical C clutch applied.

C Clutch Hydraulic Passages



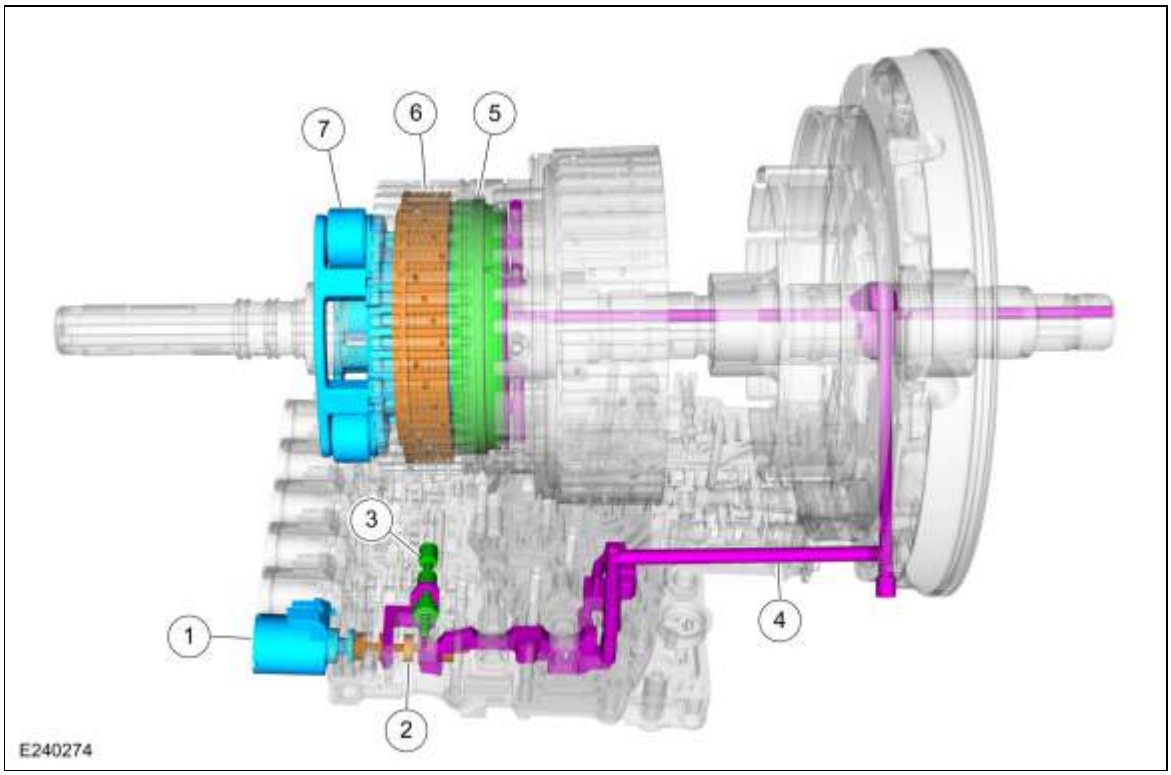






D Clutch

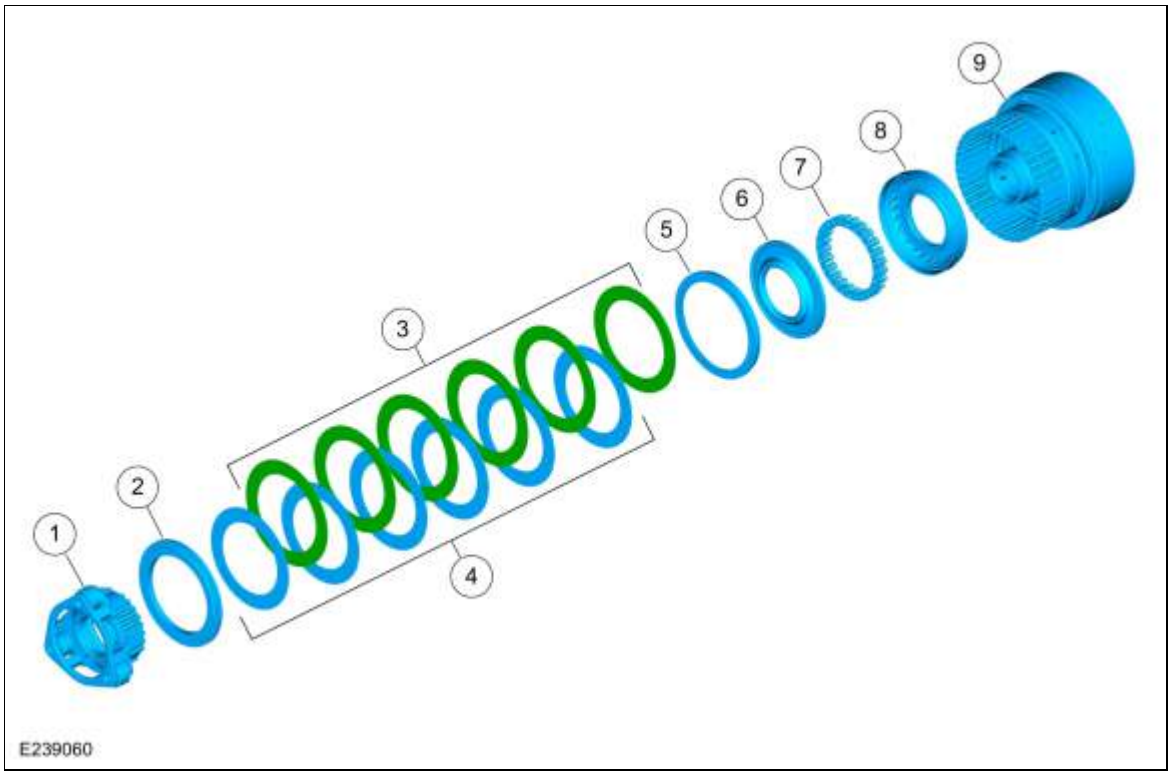
Overview



Item	Description
1	SSD
2	D clutch control valve
3	Clutch gain control valve
4	D clutch apply circuit
5	D clutch piston
6	D clutch assembly
7	Planetary carrier No. 3

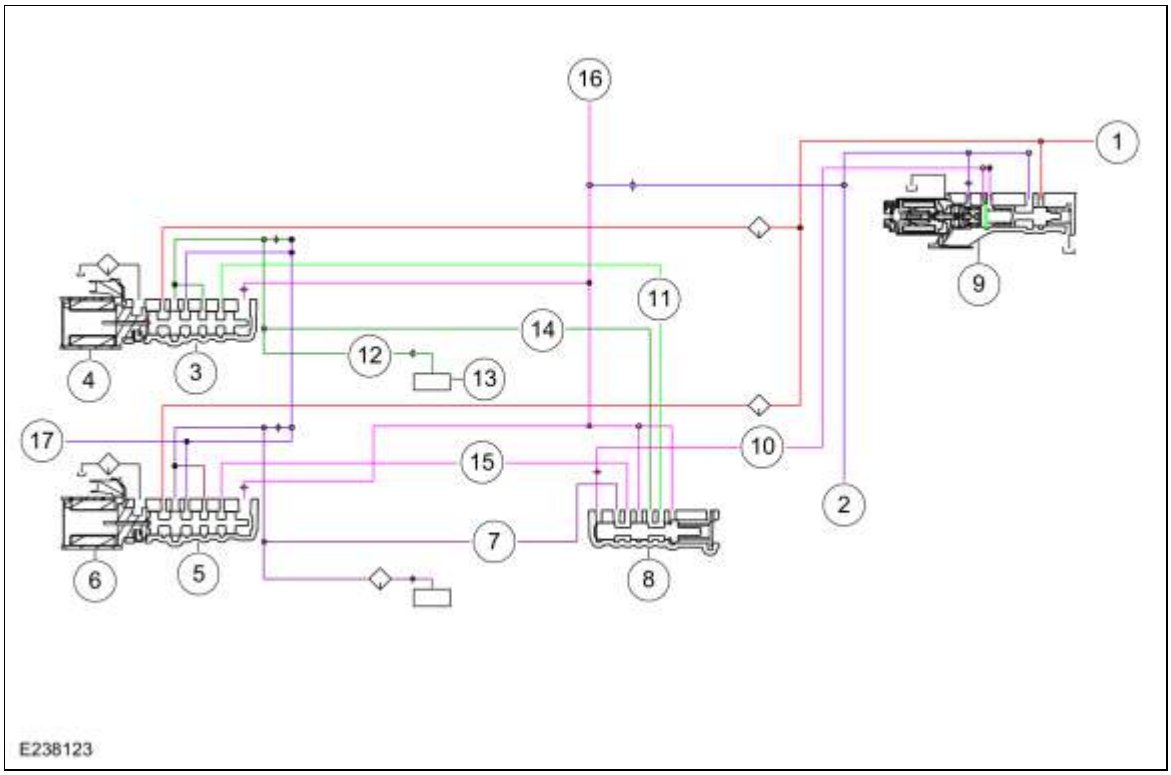
Planetary carrier No. 3 is located in the CDF clutch and planetary carrier assembly. Planetary carrier No. 3 is connected to the D clutch. When the D clutch applies, the planetary carrier No. 3 may be connected to ring gear No. 2.

D Clutch Exploded View



Item	Description
1	Planetary carrier No. 3
2	D clutch pressure plate
3	D clutch steel plates
4	D clutch friction plates
5	D clutch apply ring
6	D clutch balance dam
7	D clutch piston return spring
8	D clutch piston
9	CDF clutch cylinder

D Clutch Hydraulic Circuits



Item	Description
1	Line pressure
2	Pump output
3	D clutch control valve
4	SSD
5	E clutch control valve
6	SSE
7	E clutch apply pressure to clutch gain control valve
8	Clutch gain control valve
9	LPC solenoid
10	LPC pressure
11	D clutch feedback pressure
12	Apply pressure to mechanical D clutch
13	Mechanical D clutch
14	D clutch apply pressure to clutch gain control valve
15	E clutch feedback pressure
16	Elevated exhaust pressure
17	Clutch exhaust

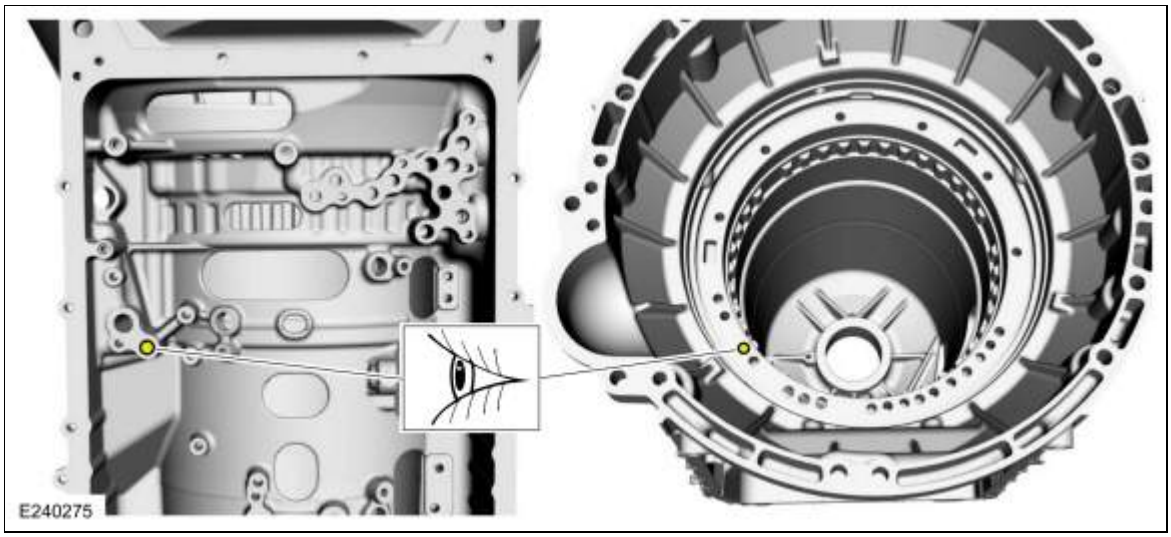
D Clutch Hydraulic Operation 5th-6th Shift

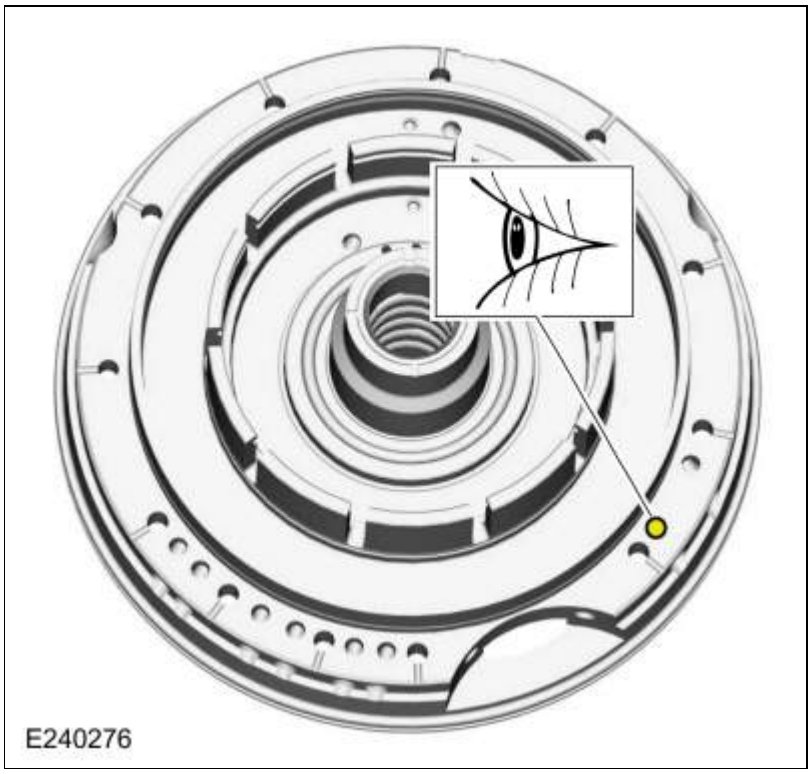
Line pressure is supplied to the D clutch control valve. LPC pressure is supplied to the gain control valve. LPC pressure positions the gain control valve to the right end of the valve bore. As SSD turns on, it moves the D clutch control valve allowing regulated line pressure to flow to the mechanical D clutch.

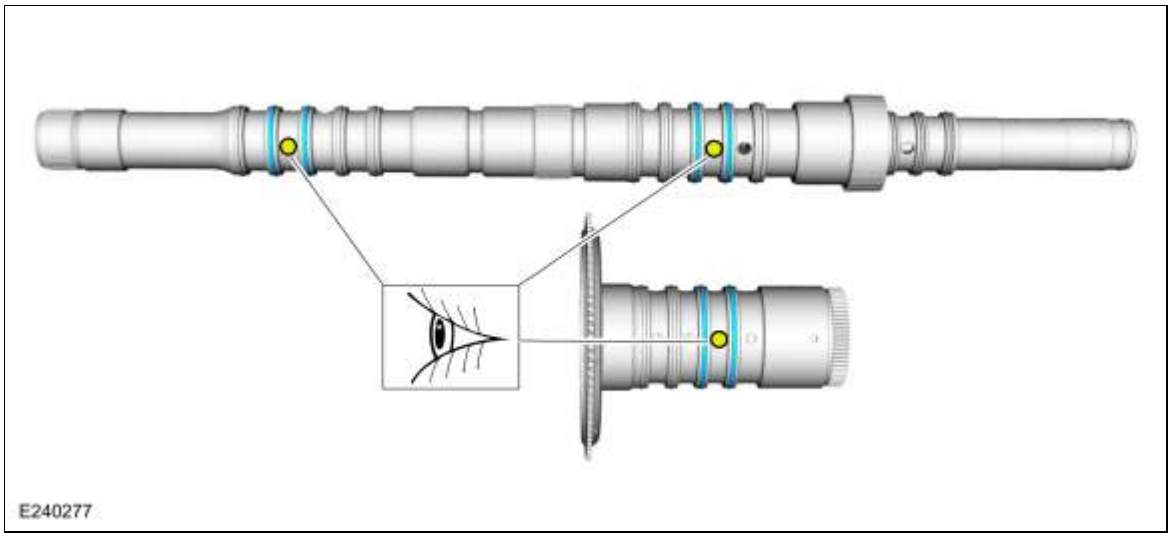
D Clutch Hydraulic Operation 2nd-3rd, 4th-5th, and 9th-10th Shifts

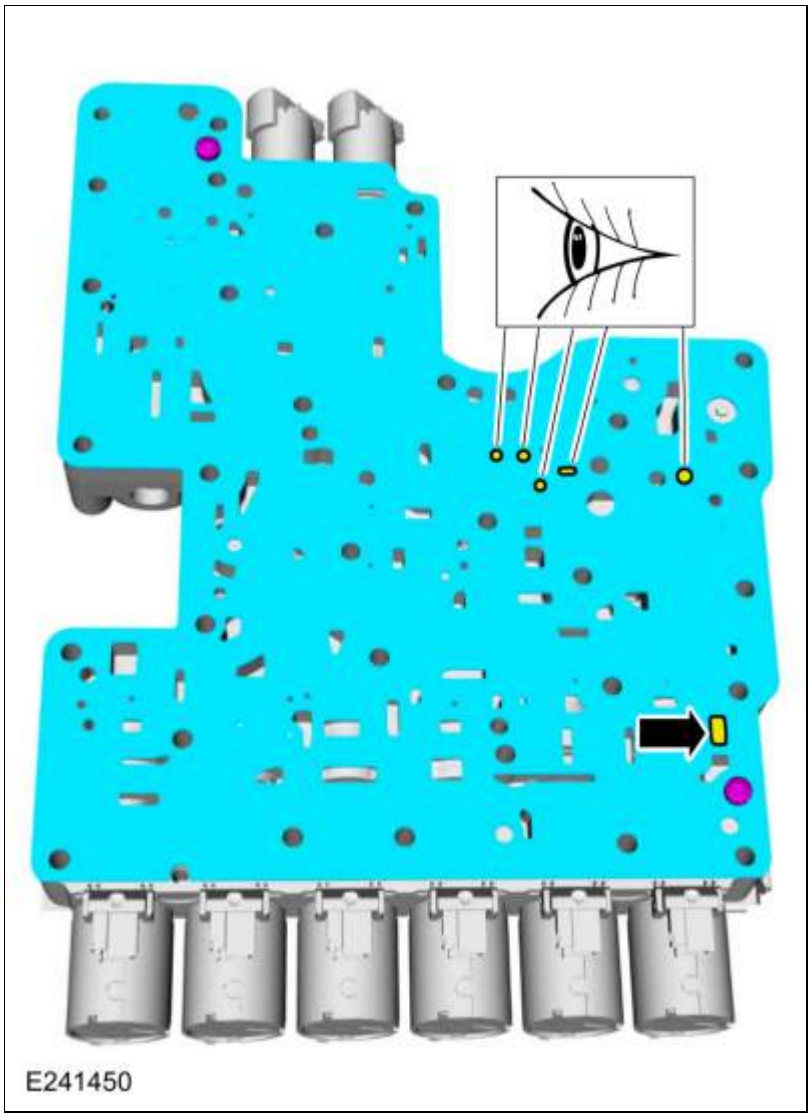
Line pressure is supplied to the D clutch control valve. LPC pressure is supplied to the gain control valve. The LPC pressure is low and the gain control valve stays in the default position at the left end of the valve bore. As SSD turns on, it moves the D clutch control valve allowing regulated line pressure to flow to the mechanical D clutch.

D Clutch Hydraulic Passages



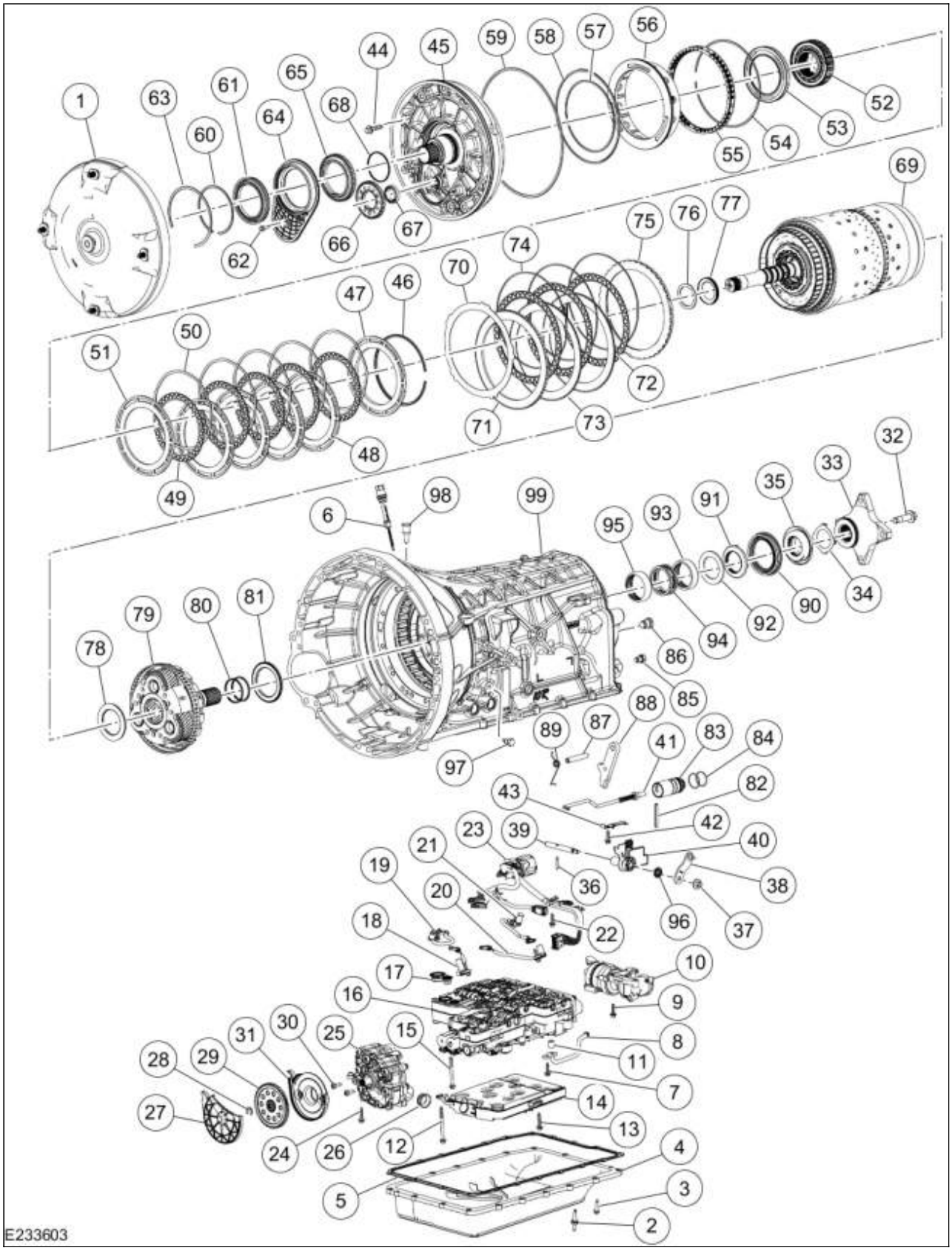






Transmission Description

Transmission Assembly

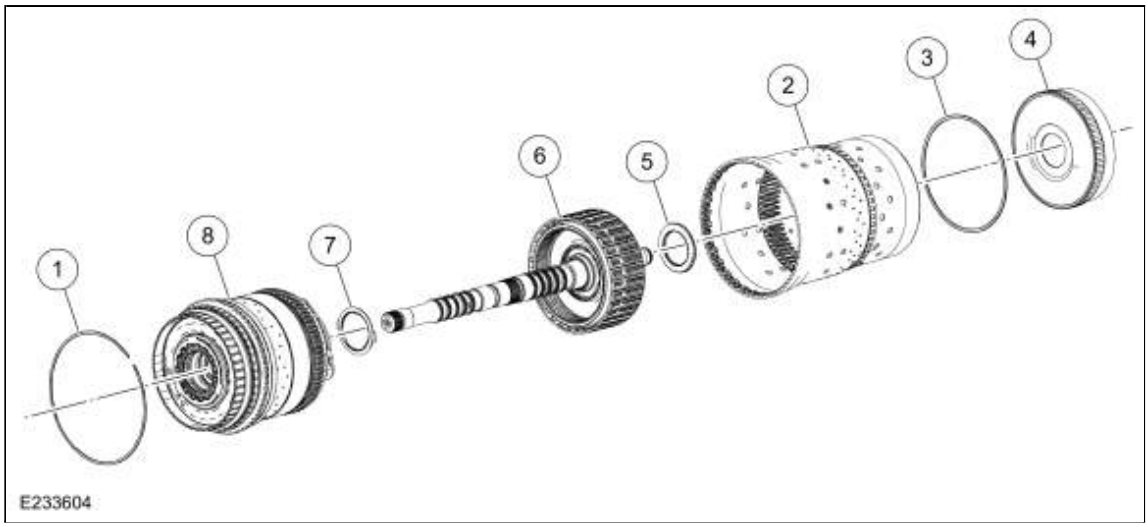


Item	Part Number	Description
1	7902	Torque converter
2	W714629	Transmission fluid pan stud bolts (6 required)
3	W500215	Transmission fluid pan bolts (12 required)
4	7A194	Transmission fluid pan
5	7A191	Transmission fluid pan gasket
6	7E389	Transmission fluid level indicator and plug assembly
7	W708500	Transmission fluid auxiliary pump tube bolt (model dependent)
8	7A209	Transmission fluid auxiliary pump tube (model dependent)
9	W718548	Transmission fluid auxiliary pump bolts (3 required) (model dependent)
10	7P086	Transmission fluid auxiliary pump (model dependent)
11	7J135	Transmission fluid auxiliary pump tube seal (model dependent)
12	W700123	Transmission fluid filter bolt (71 mm length)
13	W500214	Transmission fluid filter bolt (20 mm length)
14	7G186	Transmission fluid filter
15	W708500	Main control-to-transmission case bolts (68 mm length) (8 required)
16	7A100	Main control assembly
17	7N265	Main control-to-transmission fluid pump seal
18	7M183	Intermediate Speed A (ISSA) sensor
19	7M101	Turbine Shaft Speed (TSS) sensor
20	7H103	Intermediate Speed B (ISSB) sensor
21	7H103	Output Shaft Speed (OSS) sensor
22	W500213	Transmission internal wiring harness bolts (2 required)
23	7G276	Transmission internal wiring harness
24	W500215	Transmission fluid pump bolts (quantity model dependent)
25	7A103	Transmission fluid pump
26	7Z302	Transmission fluid pump seal
27	6658	Transmission fluid pump driven gear outer cover
28	W718158	Transmission fluid pump retaining ring
29	7A080	Transmission fluid pump driven gear
30	W504755	Transmission fluid pump driven gear inner cover bolts (2 required)
31	6658	Transmission fluid pump driven gear inner cover
32	7N134	Output shaft flange bolt (RWD only)

33	7K177	Output shaft flange (RWD only)
34	7N135	Output shaft flange anti-ting ring (RWD only)
35	7085	Output shaft nut (RWD only)
36	7G100	Manual control shaft-to-Transmission Range (TR) sensor roll pin
37	W712713 -S442	Manual control lever nut
38	7A256	Manual control lever (model dependent)
39	7C493	Manual control shaft
40	7H557	Transmission Range (TR) sensor (model dependent)
41	7D410	Park pawl actuator rod
42	W716607	Transmission Range (TR) sensor detent spring bolt
43	7E332	Transmission Range (TR) sensor detent spring
44	7N134	Front support assembly bolts (12 required)
45	7G033	Front support assembly
46	7M157 -C	B clutch (overdrive) snap ring
47	7C576	B clutch (overdrive) pressure plate
48	7B442 -A	B clutch (overdrive) steel plates (quantity model dependent)
49	7B164	B clutch (overdrive) friction plates (quantity model dependent)
50	7J402	B clutch (overdrive) separating springs (quantity model dependent)
51	7B442 -B	B clutch (overdrive) apply plate
52	7G206	One-Way Clutch (OWC)
53	7G418	B clutch (overdrive) piston
54	7N169	A clutch (intermediate) piston return spring snap ring
55	7G297	A clutch (intermediate) piston return spring
56	7J015	A clutch (intermediate) piston
57	7F225	A clutch (intermediate) piston inner seal
58	7F224	A clutch (intermediate) piston outer seal
59	7B031	Front support-to-case seal
60	7M157 -J	Torque converter hub seal snap ring
61	7A248	Torque converter hub seal
62	7N134 -C	Front support cover and seal assembly bolt
63	7M157	Front support cover and seal assembly snap ring
64	7570	Front support cover and seal assembly
65	7F073	Transmission fluid pump drive gear

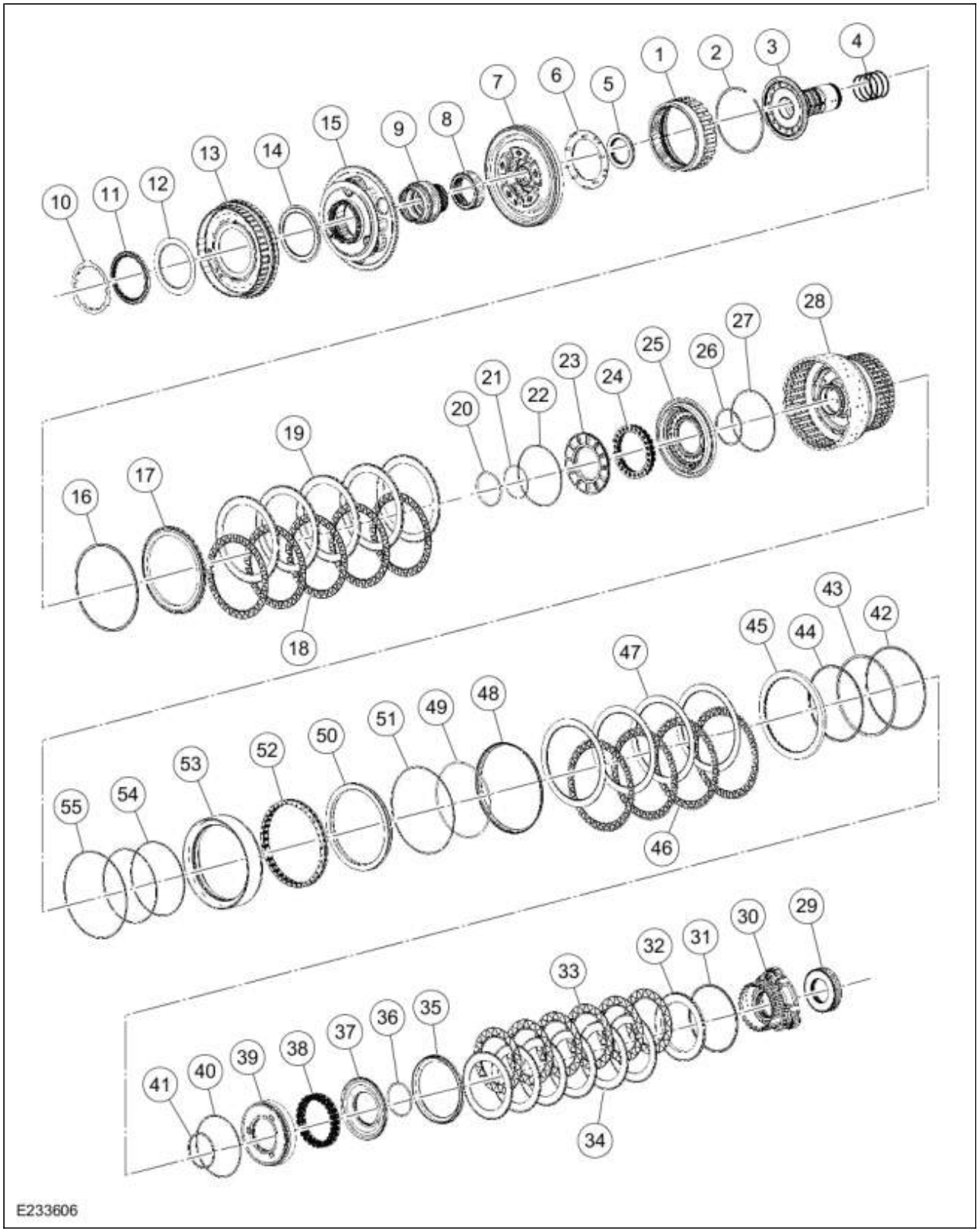
66	6651	Transmission fluid pump idler gear
67	7Z426	Transmission fluid pump idler gear bearing
68	7G090	Stator support seal
69	—	Clutch and planetary assembly
70	7P080	A clutch (intermediate) wave spring
71	7A406	A clutch (intermediate) apply plate (select fit)
72	7F219	A clutch (intermediate) friction plates (quantity model dependent)
73	7F220	A clutch (intermediate) steel plates (quantity model dependent)
74	7G159	A clutch (intermediate) separating springs (quantity model dependent)
75	7B437	A clutch (intermediate) pressure plate
76	7J300	Selective shim
77	7H032	Thrust bearing (T3)
78	7M152 -A	Thrust bearing (T9)
79	7P198	Output shaft and planetary carrier No. 4 assembly (model dependent)
80	7D019	Output shaft seals (2 required)
81	7D146	Thrust bearing (T10)
82	7G100	Park pawl actuator rod sleeve roll pin
83	2N613	Park pawl actuator rod sleeve
84	2D330	Park pawl actuator rod sleeve seals (2 required)
85	W715937	Plug assembly transmission case
86	W716240	Plug assembly park pawl shaft
87	7D071	Park pawl shaft
88	7A441	Park pawl
89	7D070	Park pawl return spring
90	7052	Output shaft seal (model dependent)
91	7G355	Thrust bearing (T11) (RWD only)
92	7A433	Thrust washer (RWD only)
93	7A415 -B	Output shaft bearing (outer)
94	7B314	Fluid passage sleeve
95	7A415 -A	Output shaft bearing (inner)
96	7F337	Manual control shaft seal
97	W715937	Plug (line pressure tap)
98	7G063	Transmission case vent assembly
99	7006	Transmission case

Clutch and planetary assembly



Item	Part Number	Description
1	7H579	Planetary carrier No.1 snap ring
2	7B177	Cylinder (clutch and planetary container)
3	7B002	Ring gear No. 4 snap ring
4	7D163	Ring gear No. 4
5	7M152	Thrust bearing (T8)
6	—	E clutch and input shaft assembly
7	7F373	Thrust bearing (T6)
8	—	CDF clutch and planetary carrier assembly

CDF Clutch and planetary carrier assembly

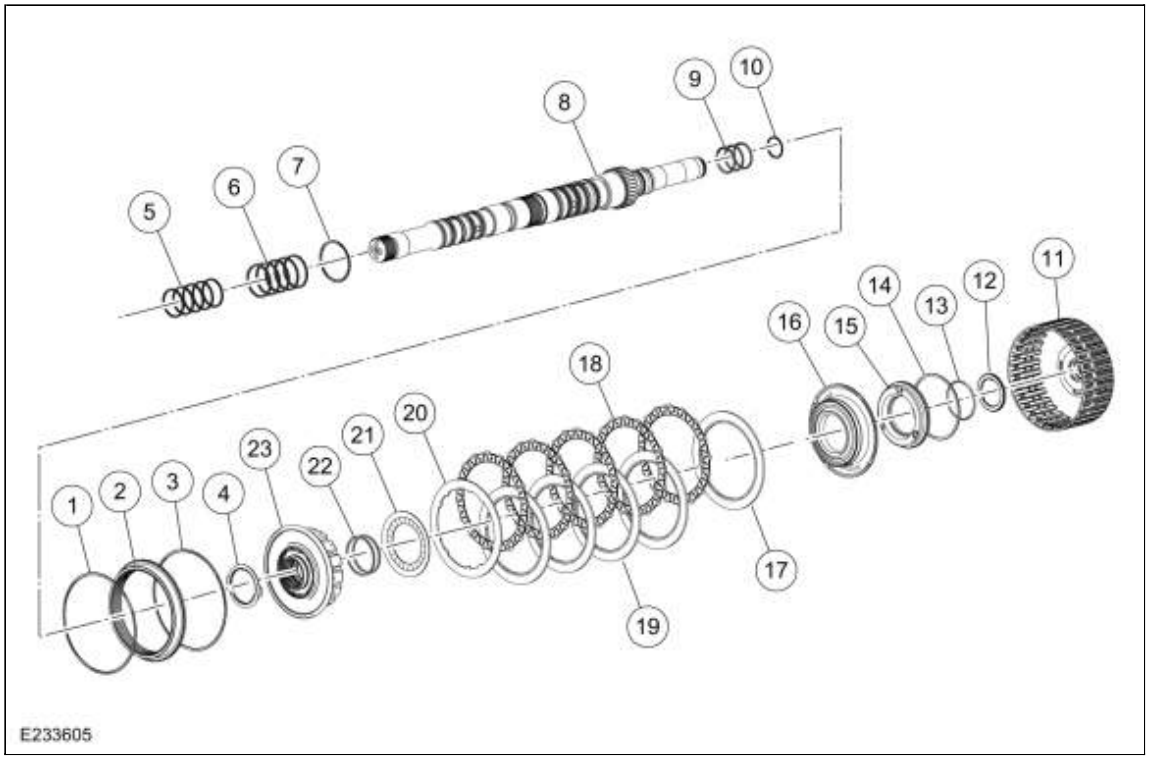


Item	Part Number	Description

1	7D392	Ring gear No. 2
2	7H379	Ring gear No. 2 snap ring
3	7D159	Shaft (sun gear No 3)
4	7B399	Shaft (sun gear No 3) Teflon® seals (4 required)
5	7D283	Thrust bearing (T5)
6	7H578	Fluid collector
7	7A398	Planetary carrier No. 2
8	7H580	Sun gear No. 2
9	7G230	Sun gear No. 1
10	1195	Ring gear No. 1 bearing support locking ring
11	7P074	Ring gear No. 1 bearing support
12	7C096	Ring gear No. 1 bearing
13	7P136	Ring gear No. 1
14	7C096	Ring gear No. 1 bearing
15	7G218	Planetary carrier No. 1
16	7H076	C clutch (direct) snap ring
17	7B477	C clutch (direct) pressure plate
18	7H095	C clutch (direct) friction plates (quantity model dependent)
19	7F238	C clutch (direct) steel plates (quantity model dependent)
20	7B492	C clutch (direct) balance dam retainer
21	7F234	C clutch (direct) balance dam inner seal
22	7C000	C clutch (direct) balance dam outer seal
23	7H359	C clutch (direct) balance dam
24	7B488	C clutch (direct) piston return spring
25	7C117	C clutch (direct) piston
26	7G444	C clutch (direct) piston inner seal
27	7C000	C clutch (direct) piston outer seal
28	7P182	CDF clutch cylinder
29	7D063	Sun gear No. 3
30	7D006	Planetary carrier No. 3
31	7B421	D clutch (low) snap ring
32	7G486	D clutch (low) pressure plate
33	7E312	D clutch (low) friction plates (quantity model dependent)
34	7G474	D clutch (low) steel plates (quantity model dependent)
35	7P176	D clutch (low) apply ring
36	7B492	D clutch (low) balance dam retainer
37	7D343	D clutch (low) balance dam

38	7D405	D clutch (low) piston return spring
39	7D402	D clutch (low) piston
40	7G445	D clutch (low) piston outer seal
41	7G444	D clutch (low) piston inner seal
42	7P200	F clutch (high) keeper snap ring
43	7H318	F clutch (high) snap ring keeper
44	7P174	F clutch (high) snap ring
45	7A450	F clutch (high) pressure plate
46	7E313	F clutch (high) friction plates (quantity model dependent)
47	7E316	F clutch (high) steel plates (quantity model dependent)
48	7P175	F clutch (high) apply ring
49	7P172	F clutch (high) balance dam retainer
50	7P171	F clutch (high) balance dam
51	7A590	F clutch (high) balance dam outer seal
52	7C295	F clutch (high) piston return spring
53	7R247	F clutch (high) piston
54	7A590 -B	F clutch (high) piston and balance dam seals (2 required)
55	7A590 -A	F clutch (high) piston seal

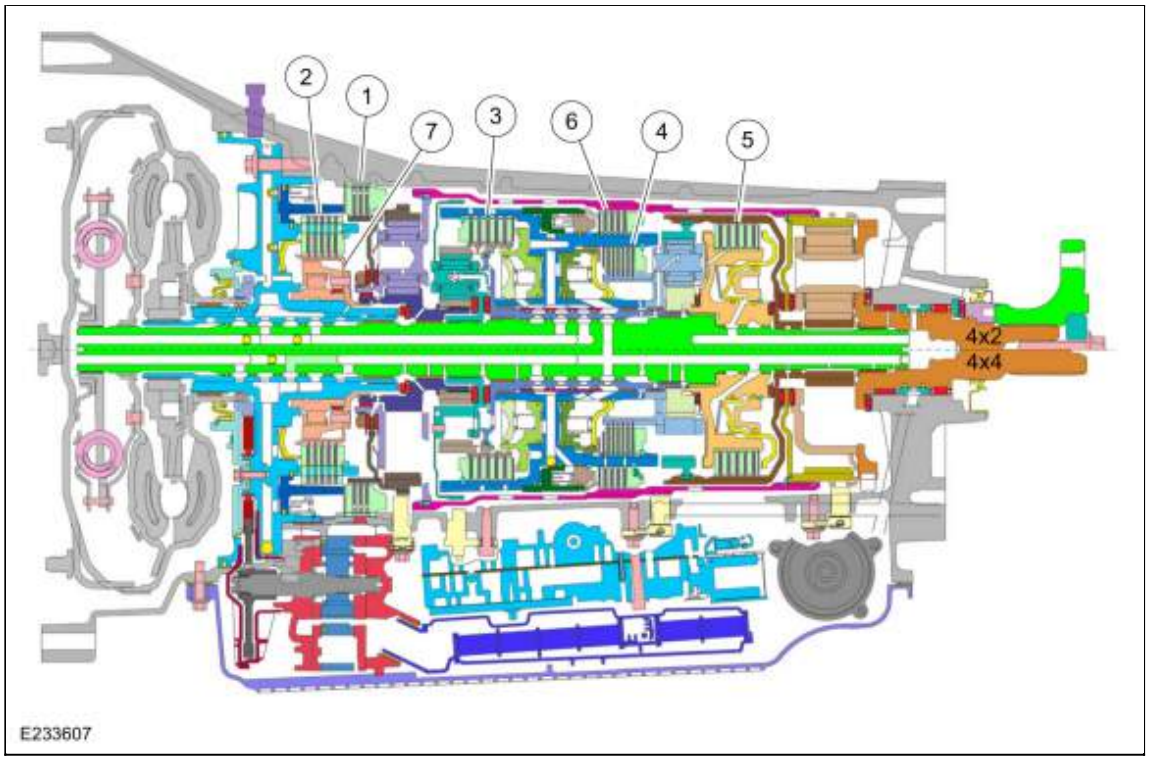
E Clutch and input shaft assembly



Item	Part Number	Description
1	7H361	Ring gear No. 3 outer snap ring
2	7H053	Ring gear No. 3
3	7H361	Ring gear No. 3 inner snap ring
4	7F373	Thrust bearing (T6)
5	7G091 -A	Input shaft front Teflon® seals (5 required)
6	7G091 -B	Input shaft-to-sun gear No 3 shaft Teflon® seals (5 required)
7	7J410	Input shaft snap ring
8	7015	Input shaft
9	7G242	Input shaft D-ring seals (3 required)
10	7G091	Input shaft Teflon® seal
11	7D062	Shell and sun gear No. 4
12	7G008	Thrust bearing (T7)
13	7H365	E clutch (forward) balance dam retainer
14	7F227	E clutch (forward) balance dam outer seal
15	7P169	E clutch (forward) balance dam
16	7A262	E clutch (forward) piston
17	7B066	E clutch (forward) apply plate (2.9-3.0 mm)
18	7H091	E clutch (forward) friction plates (quantity model dependent)

19	7H089	E clutch (forward) steel plates (quantity model dependent)
20	7B066	E clutch (forward) pressure plate (select fit)
21	7B070	E clutch (forward) piston return spring
22	7G242	E clutch (forward) piston and balance dam inner seals (2 required)
23	7P211	E clutch (forward) hub

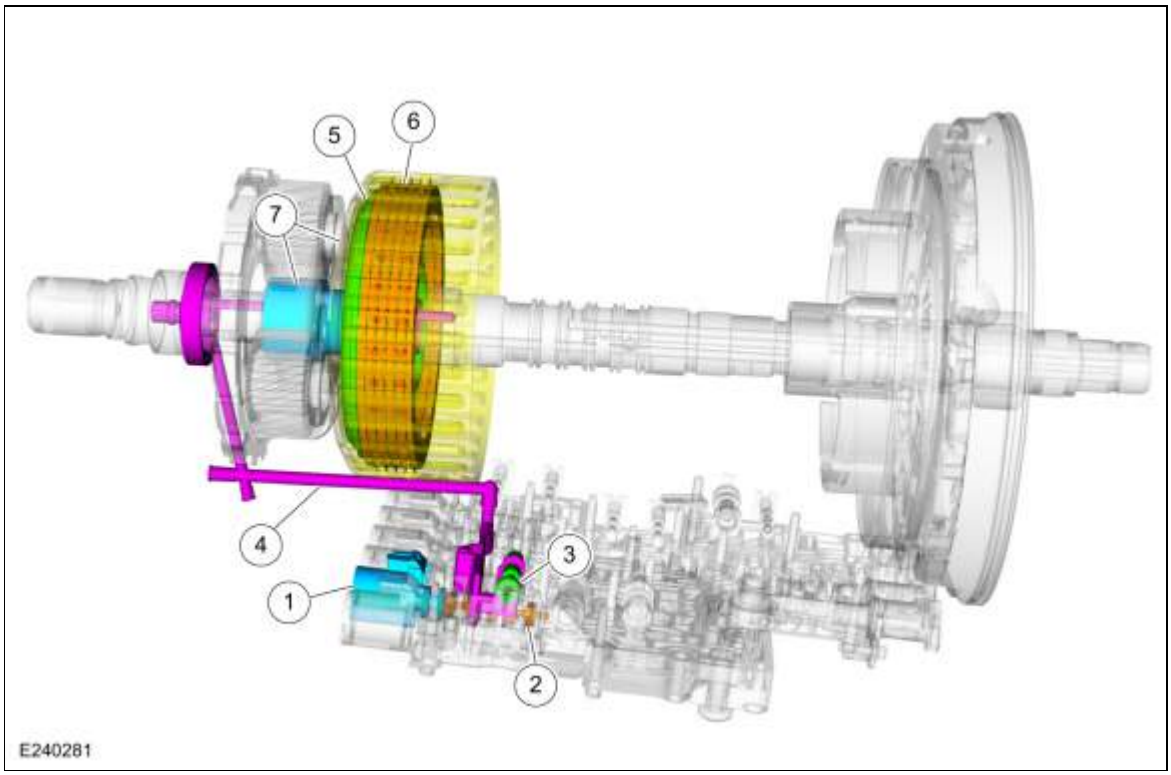
Component Location



Item	Part Number	Description
1	—	A clutch assembly
2	—	B clutch assembly
3	—	C clutch assembly
4	—	D clutch assembly
5	—	E clutch assembly
6	—	F clutch assembly
7	—	One-Way Clutch (OWC)

E Clutch

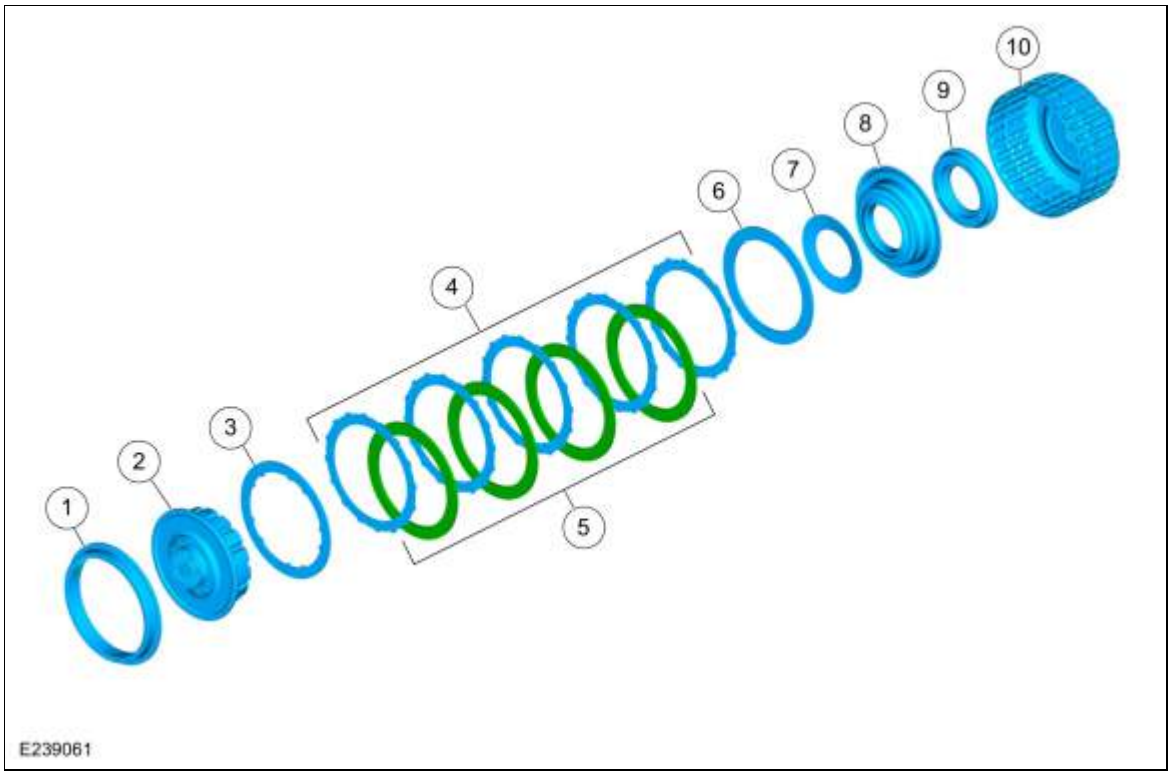
Overview



Item	Description
1	SSE
2	E clutch control valve
3	Clutch gain control valve
4	E clutch apply circuit
5	E clutch piston
6	E clutch assembly
7	Shell and sun gear No. 4

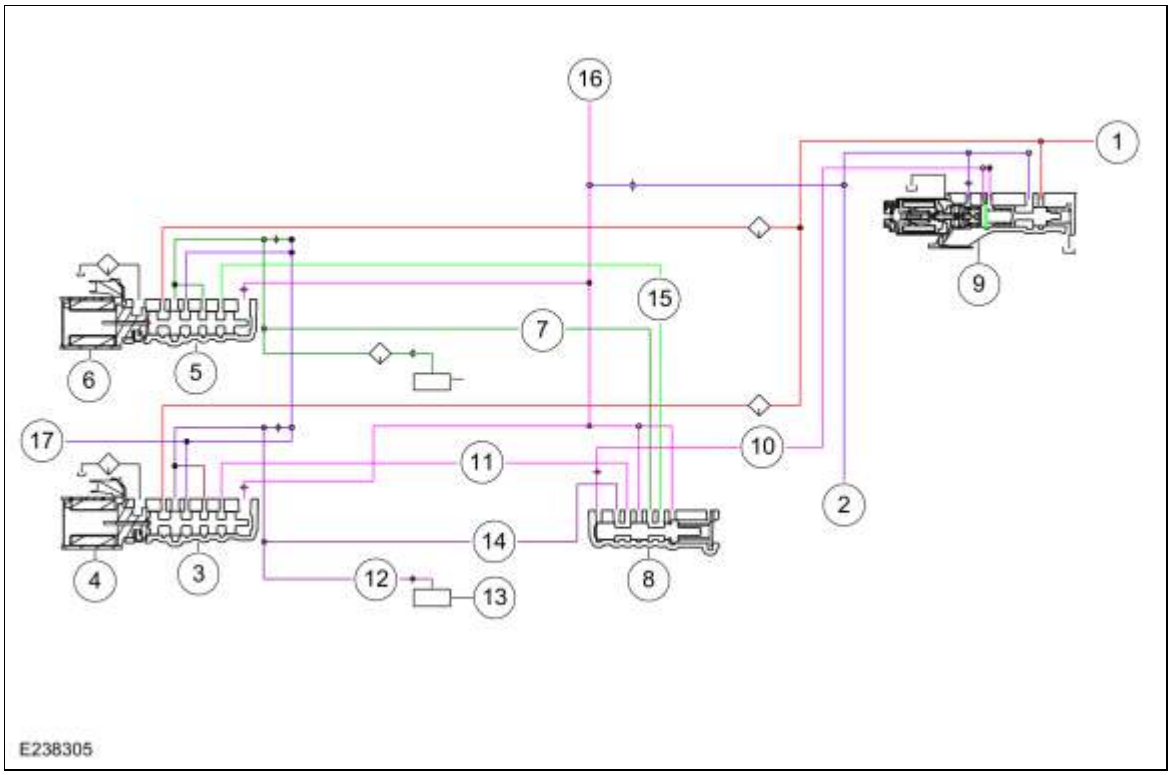
Ring gear No. 3 is mechanically connected to sun gear No. 4 is and connected to the E clutch. When the E clutch applies, torque from the input shaft is transferred to ring gear No. 3 and sun gear No. 4.

E Clutch Exploded View



Item	Description
1	Ring gear No. 3
2	E clutch hub
3	E clutch pressure plate (select fit)
4	E clutch friction plates (quantity model dependent)
5	E clutch steel plates (quantity model dependent)
6	E clutch apply plate (2.9-3.0 mm)
7	E clutch piston return spring
8	E clutch piston
9	E clutch balance dam
10	Shell and sun gear No. 4

E Clutch Hydraulic Circuits



Item	Description
1	Line pressure
2	Pump output
3	E clutch control valve
4	SSE
5	D clutch control valve
6	SSD
7	D clutch apply pressure to clutch gain control valve
8	Clutch gain control valve
9	LPC solenoid
10	LPC pressure
11	E clutch feedback pressure
12	Apply pressure to mechanical E clutch
13	Mechanical E clutch
14	E clutch apply pressure to clutch gain control valve
15	D clutch feedback pressure
16	Elevated exhaust pressure
17	Clutch exhaust

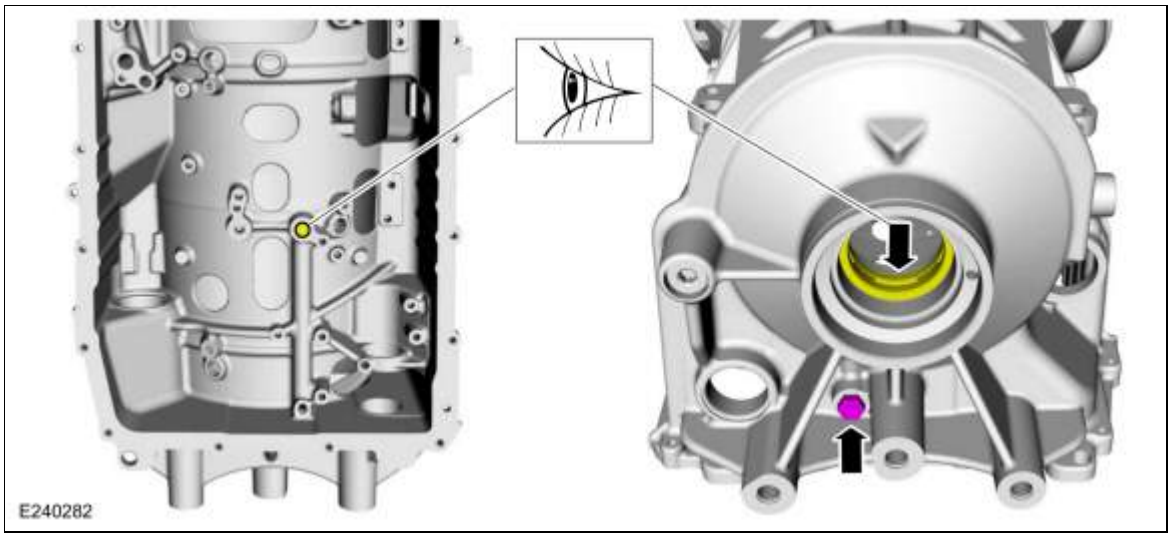
E Clutch Hydraulic Operation 5th-6th Shift

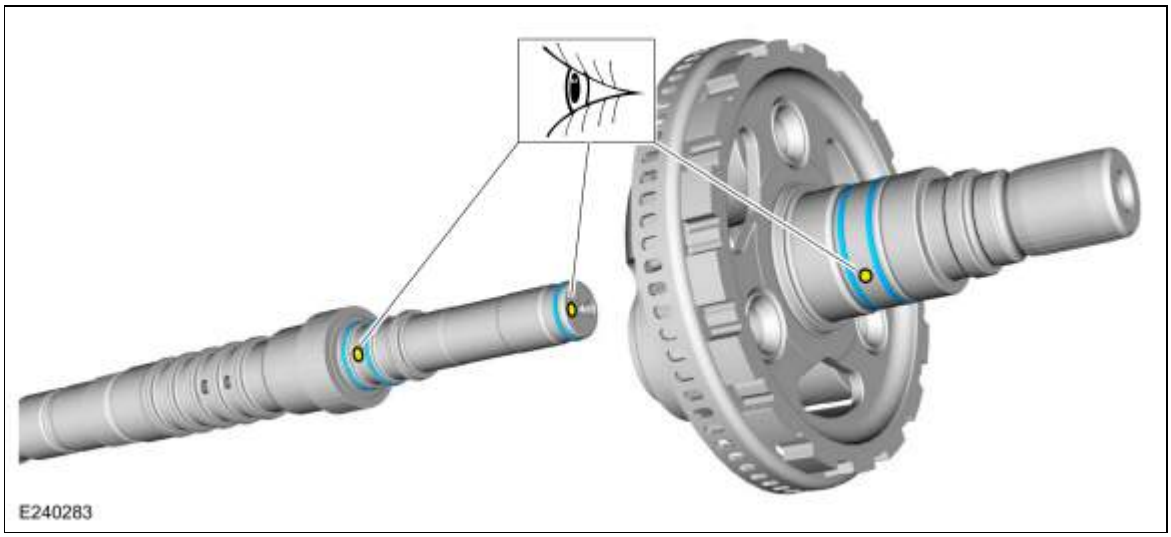
Line pressure is supplied to the E clutch control valve. LPC pressure is supplied to the gain control valve. LPC pressure positions the gain control valve to the right end of the valve bore. As SSE turns on, it moves the E clutch control valve allowing regulated line pressure to flow to the mechanical E clutch.

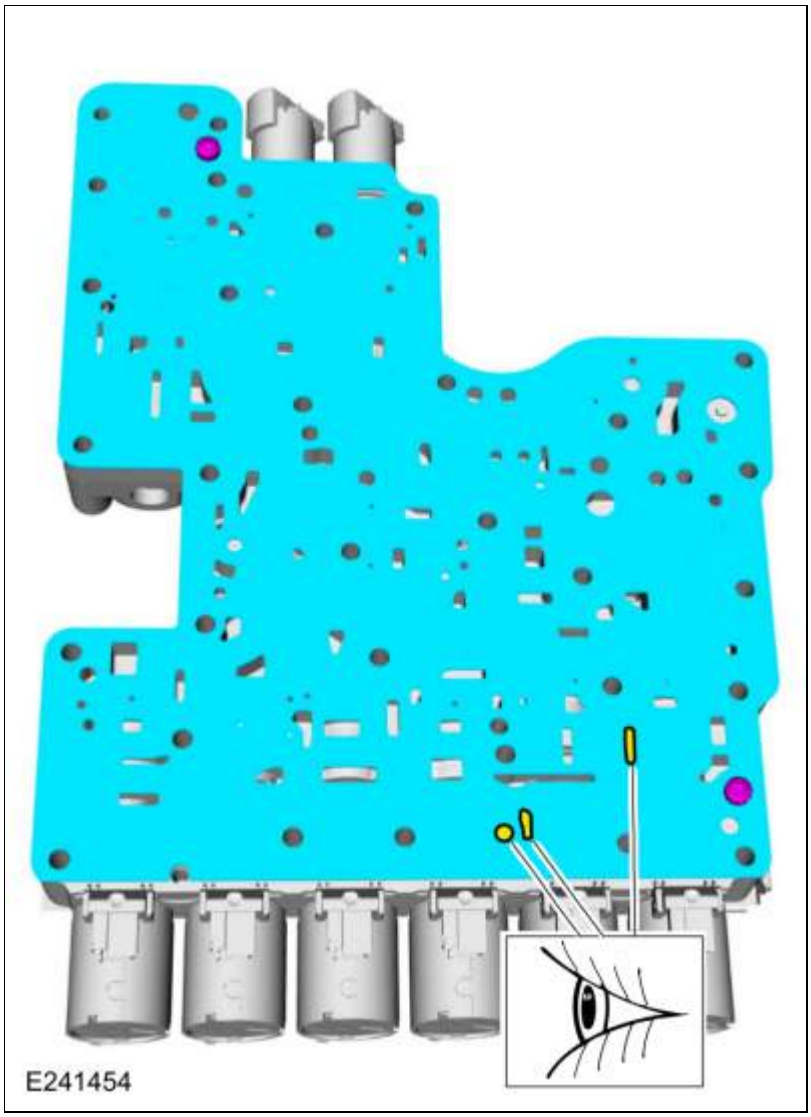
E Clutch Hydraulic Operation 2nd-3rd, 4th-5th, and 9th-10th Shifts

Line pressure is supplied to the E clutch control valve. LPC pressure is supplied to the gain control valve. The LPC pressure is low and the gain control valve stays in the default position at the left end of the valve bore. As SSE turns on, it moves the D clutch control valve allowing regulated line pressure to flow to the mechanical E clutch.

E Clutch Hydraulic Passages

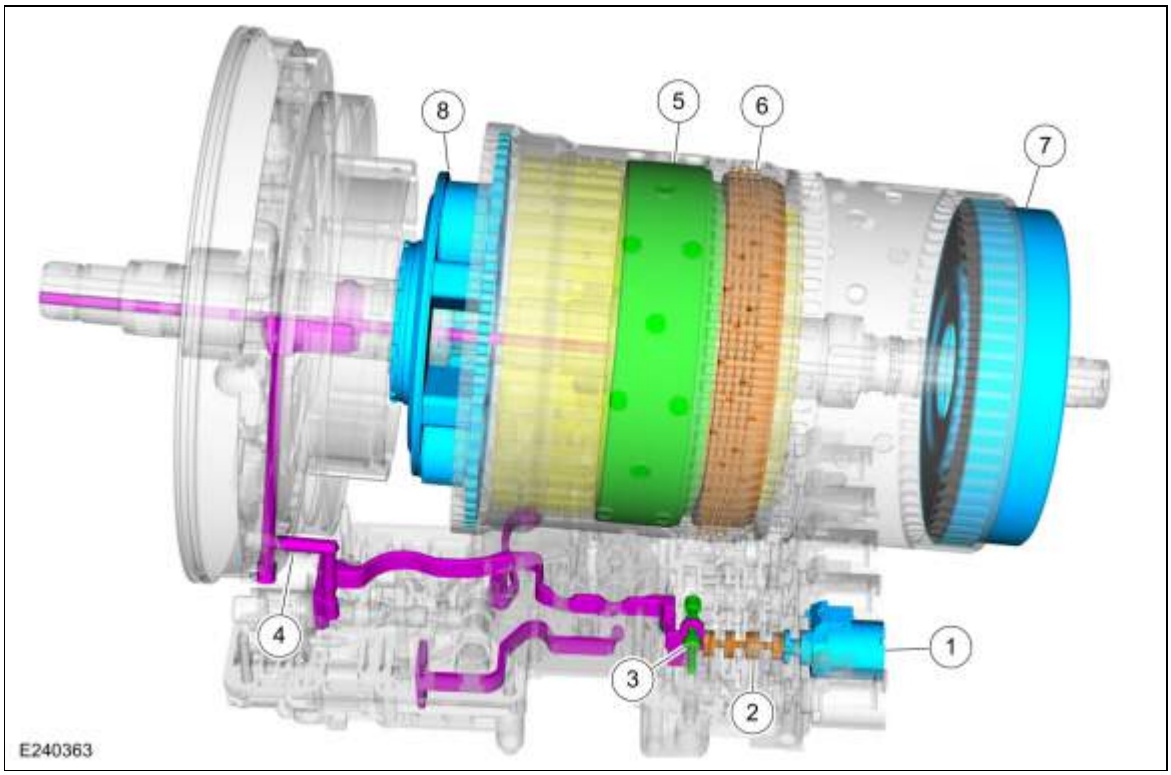






F Clutch

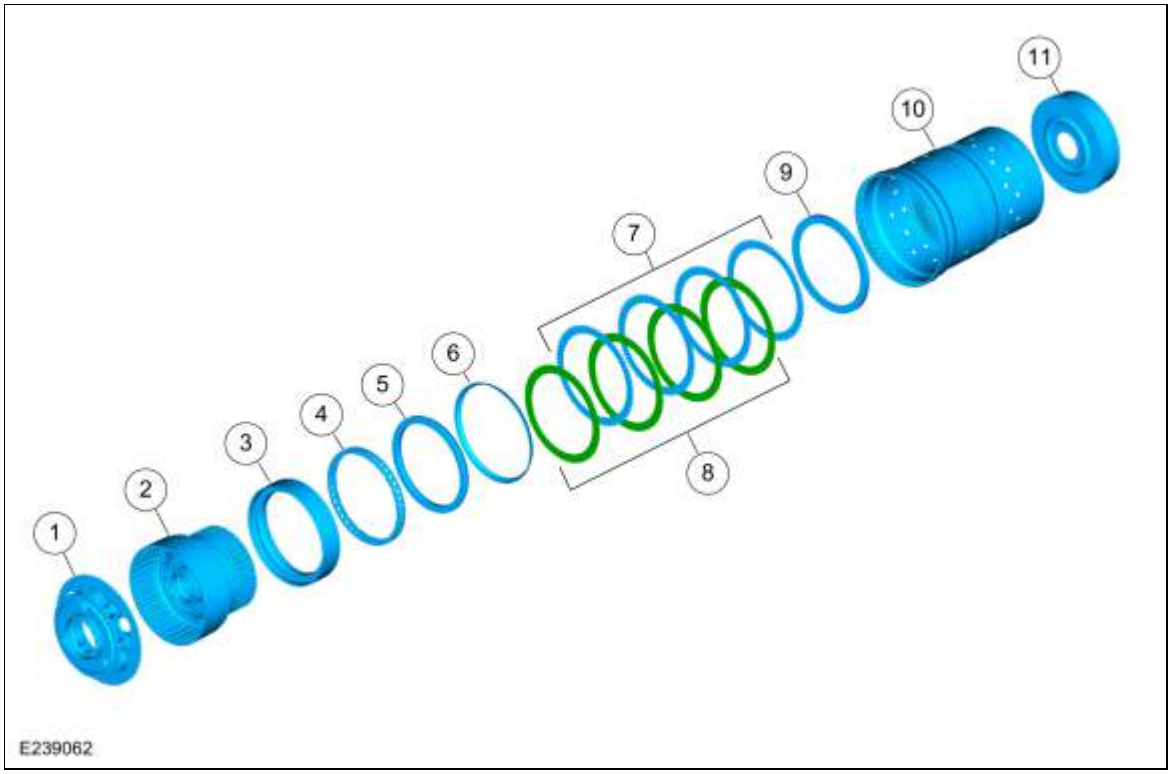
Overview



Item	Description
1	SSF
2	F clutch control valve
3	F clutch latch valve
4	F clutch apply circuit
5	F clutch piston
6	F clutch assembly
7	Ring gear No. 4
8	Planetary carrier No. 1

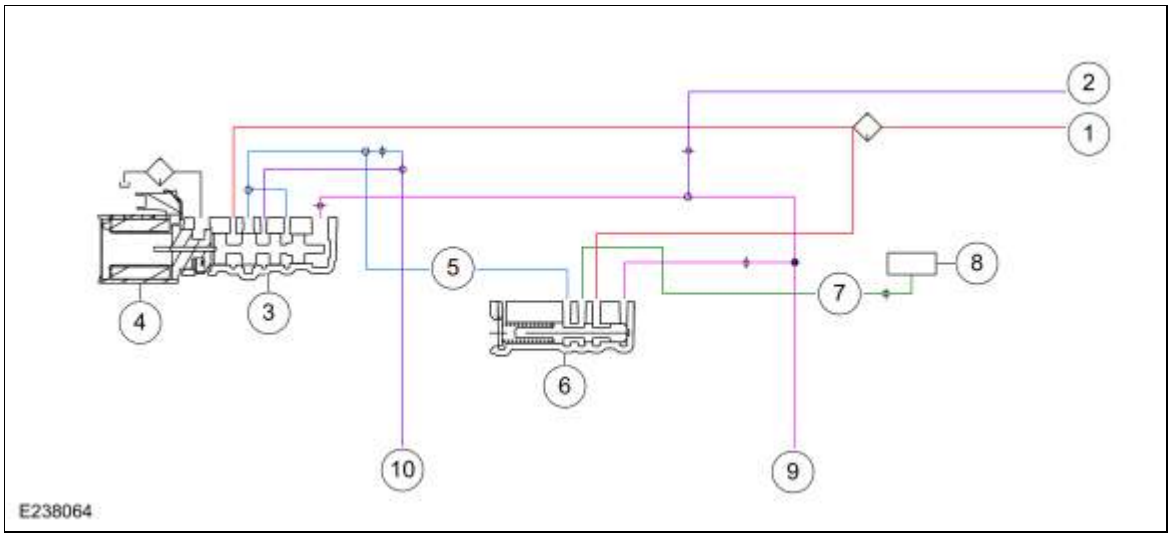
Ring gear No. 4 is mechanically connected to planetary carrier No. 1 and connected to the F clutch. When the F clutch applies, the ring gear No. 4 may be connected to ring gear No. 2 through the C clutch. Ring gear No. 4 may also connect to planetary carrier No. 3 through the D clutch.

F Clutch Exploded View



Item	Description
1	Planetary carrier No. 1
2	CDF clutch cylinder
3	F clutch piston
4	F clutch piston return spring
5	F clutch balance dam
6	F clutch apply ring
7	F clutch friction plates
8	F clutch steel plates
9	F Clutch pressure plate
10	Cylinder (clutch and planetary container)
11	Ring gear No. 4

F Clutch Hydraulic Circuits

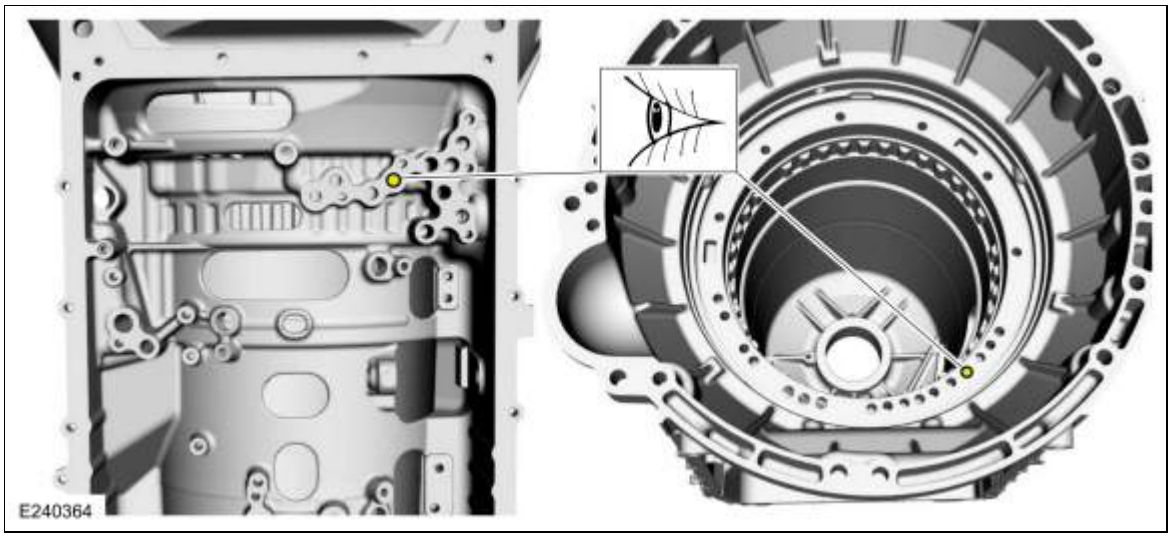


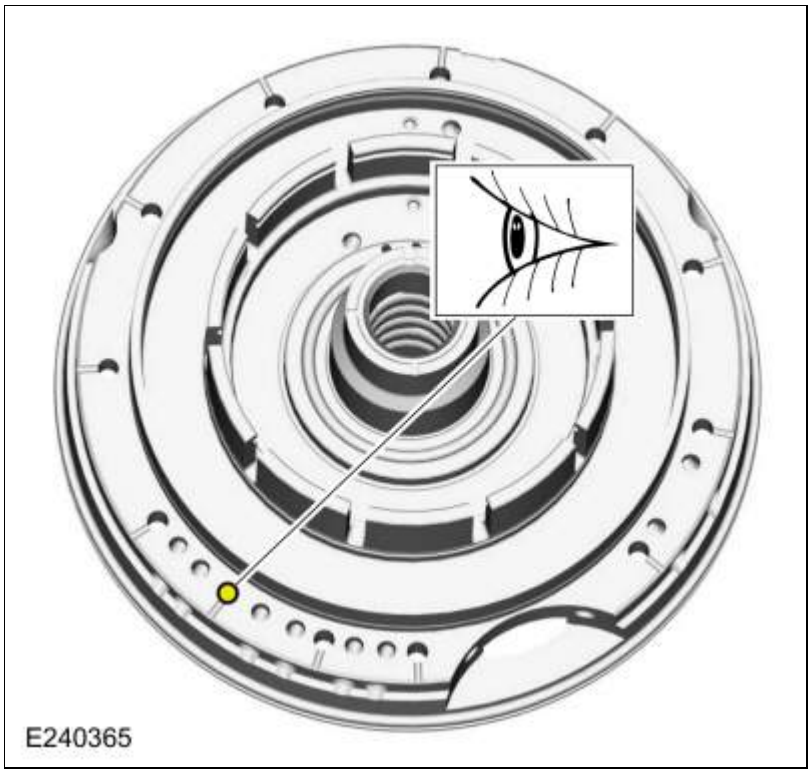
Item	Description
1	Line pressure
2	Pump output
3	F clutch control valve
4	SSF
5	Control pressure to latch valve
6	F clutch latch valve
7	Apply pressure to mechanical F clutch
8	Mechanical F clutch
9	Elevated exhaust pressure
10	Clutch exhaust

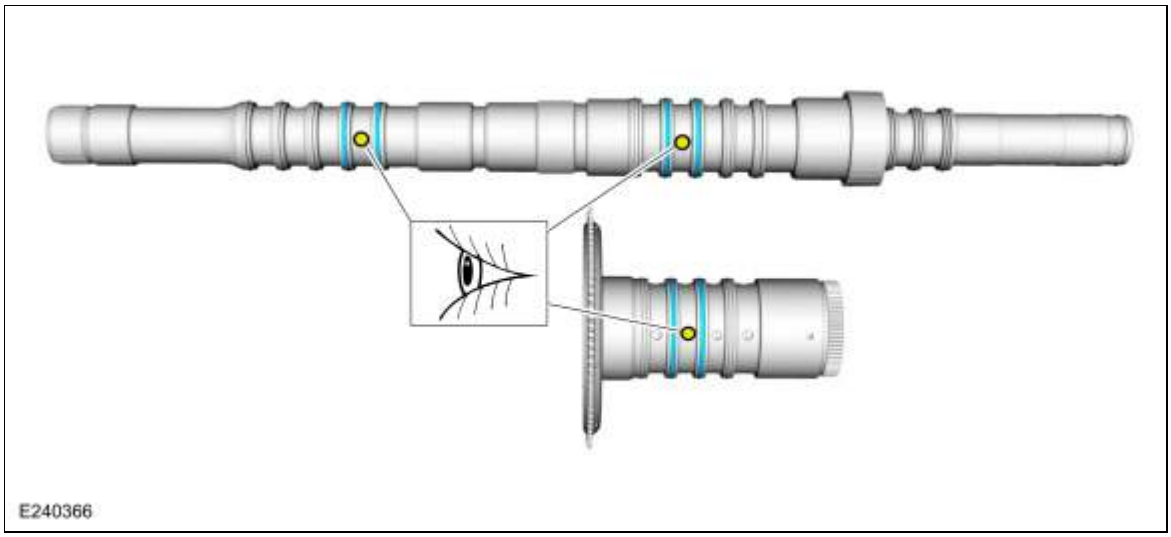
F Clutch Hydraulic Operation

Line pressure is supplied to the F clutch control valve and the F clutch latch valve. As SSF turns on, it moves the control valve allowing regulated line pressure to flow to the F clutch latch valve and than to the mechanical F clutch. When the regulated line pressure in the F clutch control circuit reaches approximately 100 psi, the mechanical F clutch is fully applied. The pressure in the F clutch control circuit moves the F clutch latch valve to the left which allows line pressure to hold the mechanical F clutch applied.

F Clutch Hydraulic Passages







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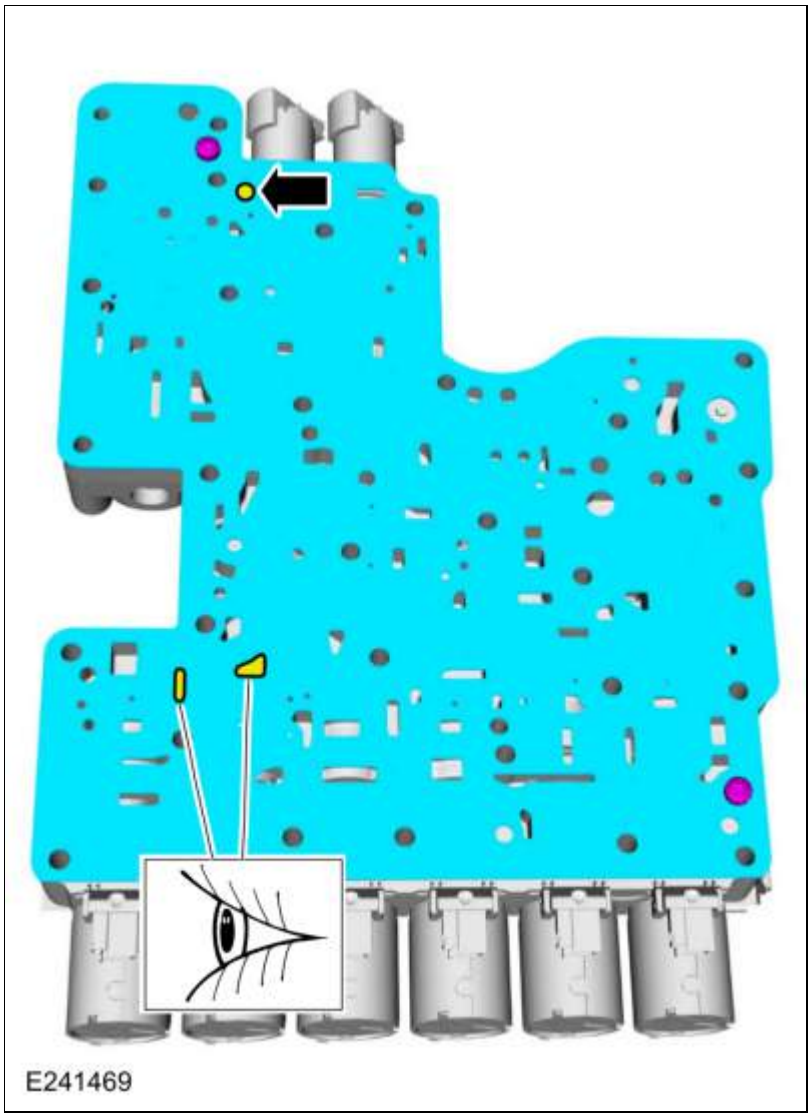

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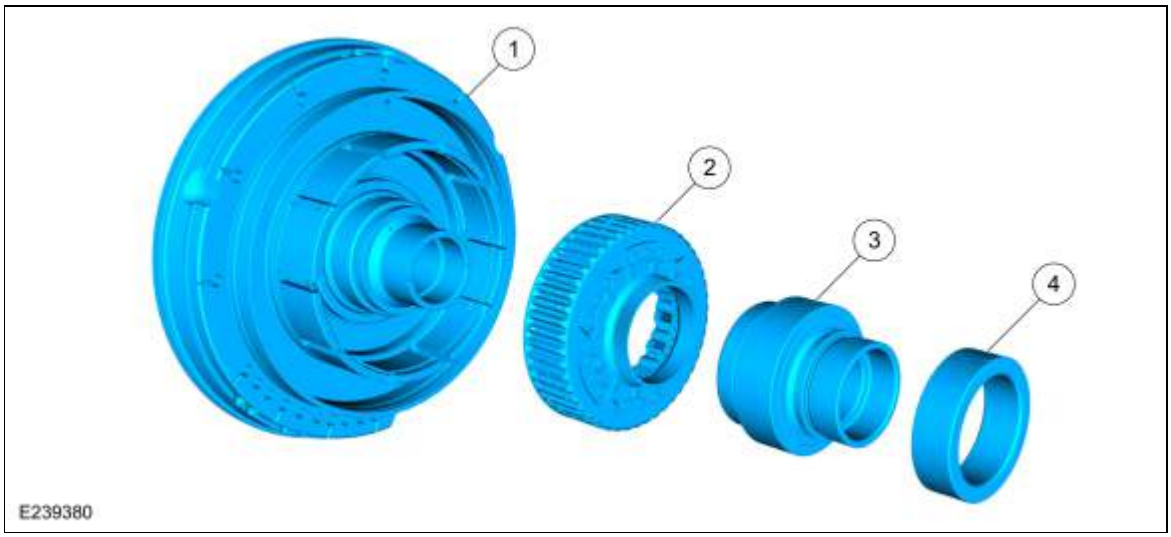
Low One-Way Clutch Assembly

One-Way Clutch (OWC) Exploded View



Item	Description
1	Front support assembly
2	One-Way Clutch (OWC)
3	Sun gear No. 1
4	Sun gear No. 2

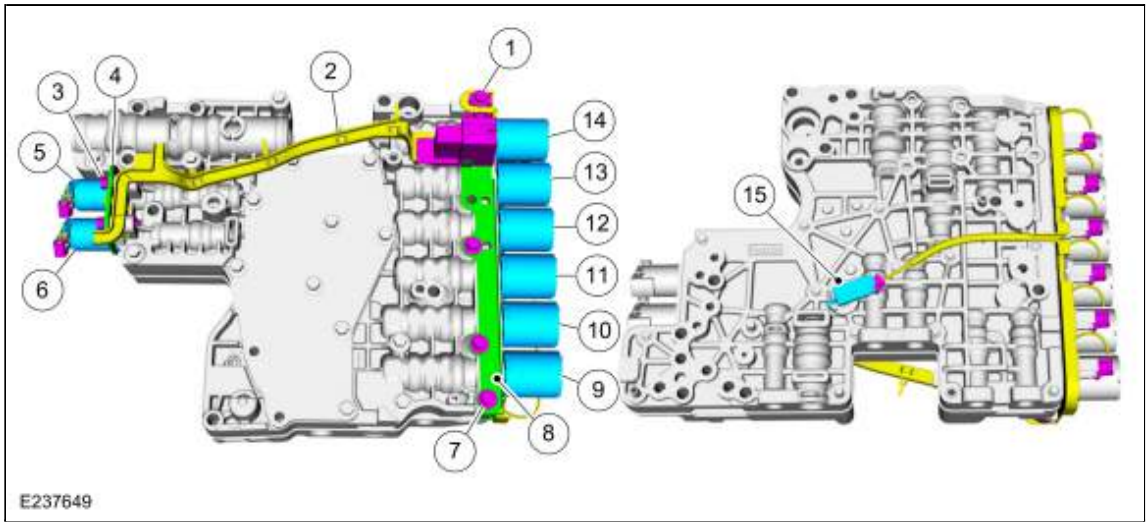
One-Way Clutch (OWC) Mechanical Operation

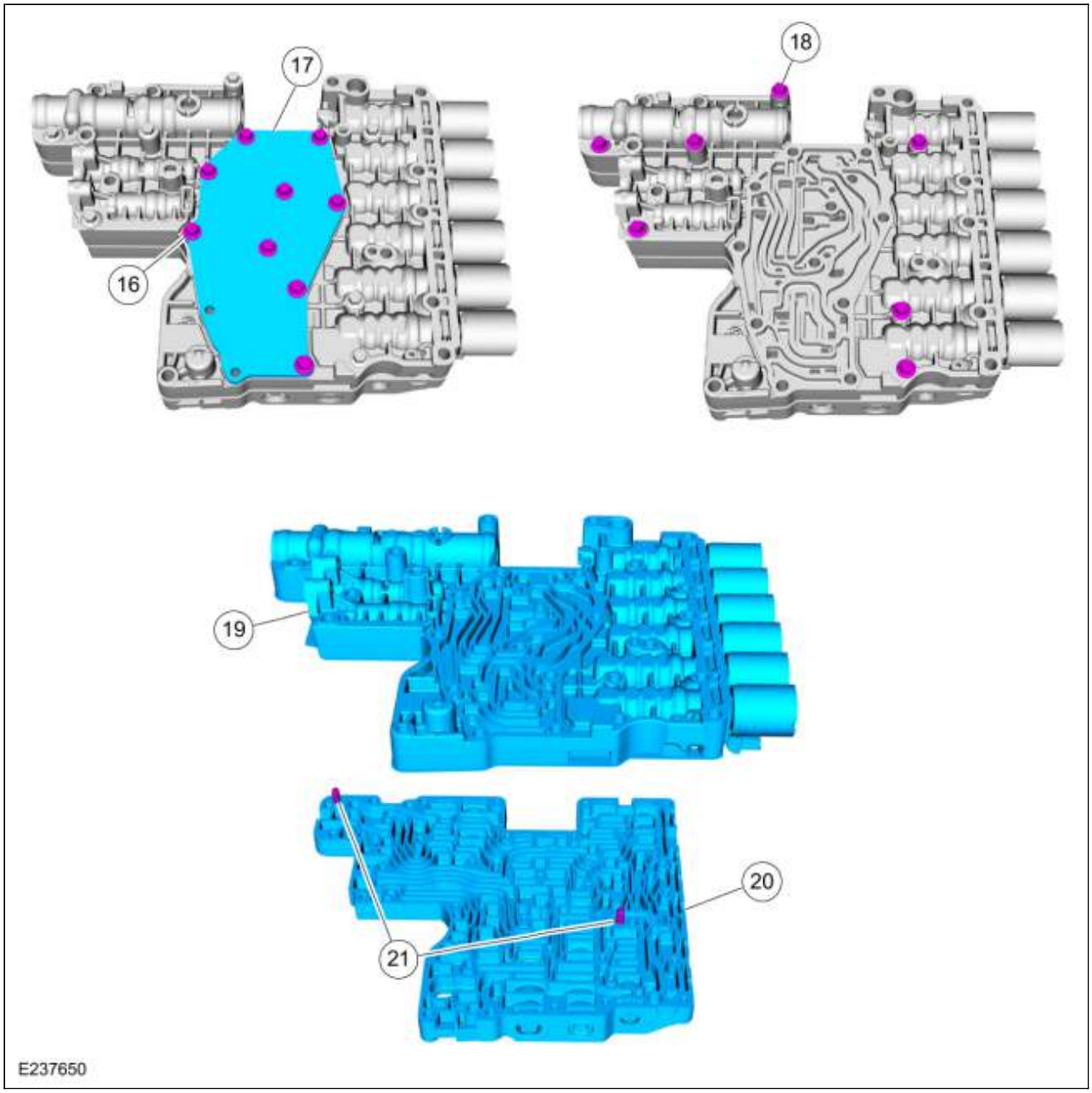
The One-Way Clutch (OWC) is a brake clutch that holds the sun gears No. 1&2 in one direction and allows it to freewheel in the opposite direction eliminating engine braking in 1st gear when the transmission is in drive. The rollers of the One-Way Clutch (OWC) lock to a inner race that is part of the front support assembly.

1. One-Way Clutch (OWC) rollers
2. One-Way Clutch (OWC) inner race

Main Control Valve Body

Base Part Number: 7A100

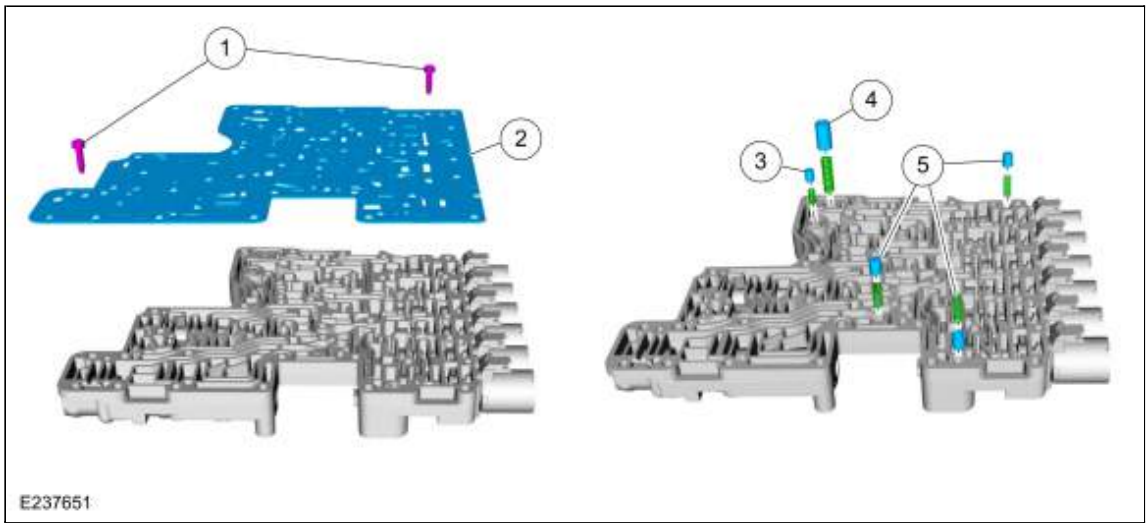


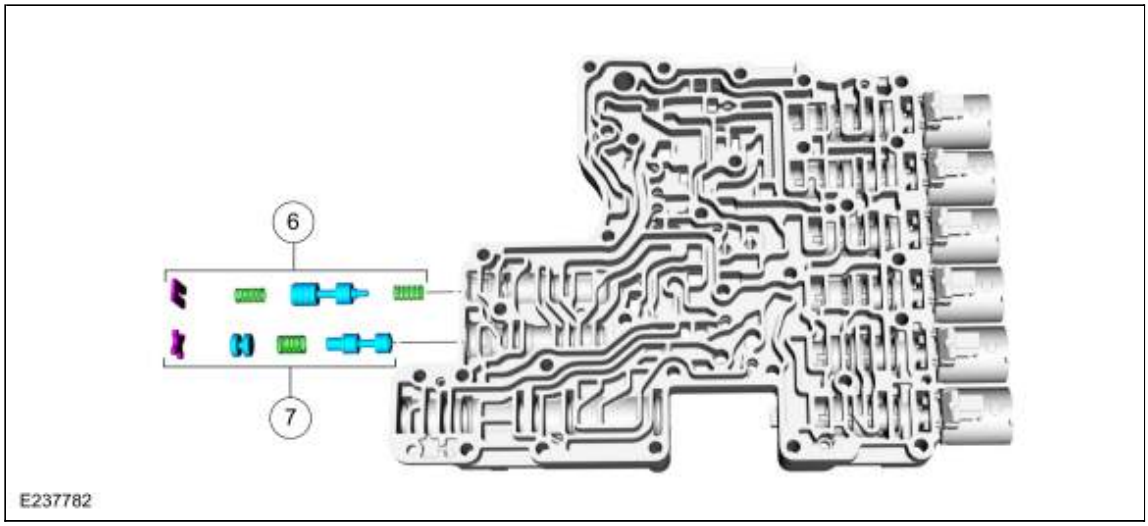


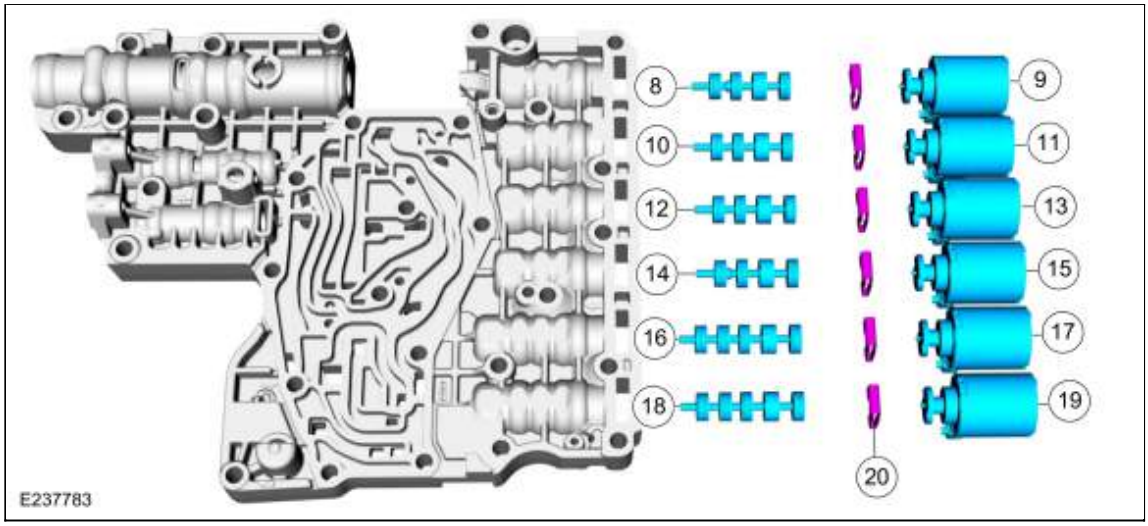
Item	Description
1	Internal wiring harness retaining bolt
2	Internal wiring harness
3	Solenoid retaining plate bolts
4	Solenoid retaining plate
5	TCC solenoid
6	LPC solenoid
7	Shift solenoid retaining plate bolts
8	Shift solenoid retaining plate

9	SSD
10	SSE
11	SSB
12	SSC
13	SSF
14	SSA
15	TFT
16	Valve channel plate bolts
17	Valve channel plate
18	Lower-to-upper valve body bolts
19	Lower valve body
20	Upper valve body
21	Valve body dowel pins

Lower Valve Body



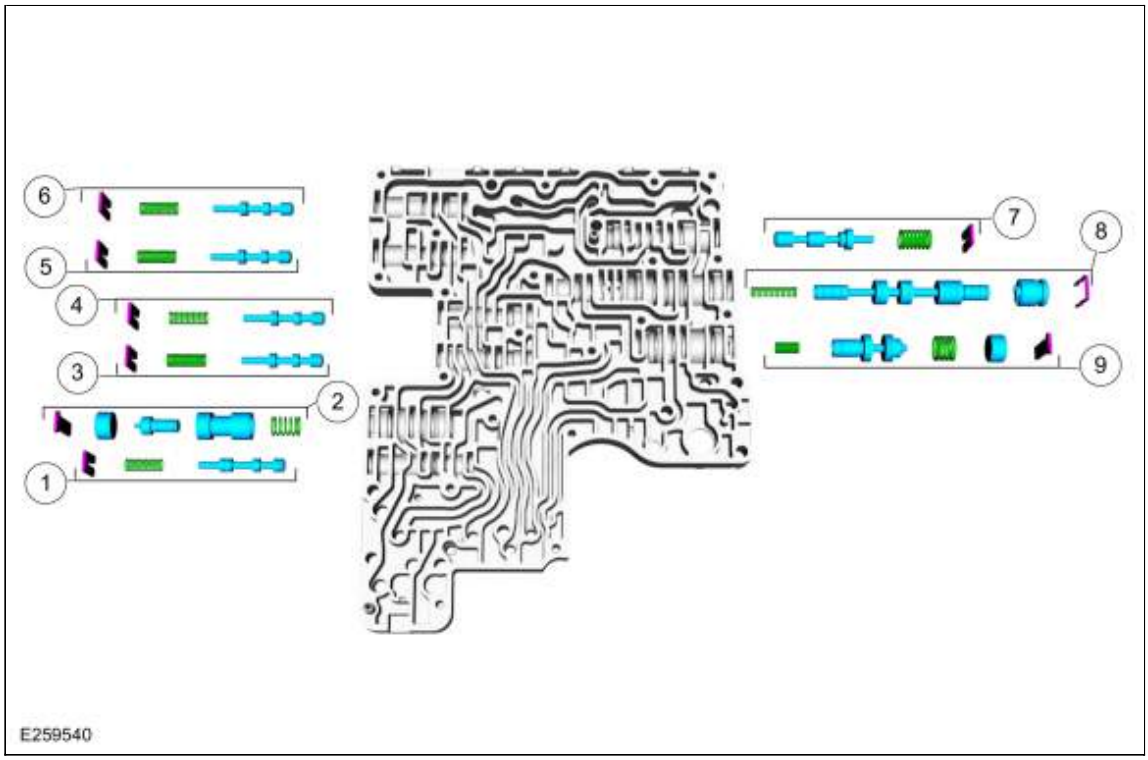




1	Valve body separator plate bolts
2	Valve body separator plate
3	TCC damper assembly
4	LPC damper assembly
5	Check valve assemblies
6	LPC anti-backflow valve assembly
7	TCC priority valve assembly
8	A clutch control valve
9	SSA
10	F clutch control valve
11	SSF
12	C clutch control valve
13	SSC
14	B clutch control valve

15	SSB
16	E clutch control valve
17	SSE
18	D clutch control valve
19	SSD
20	Shift solenoid retainers

Upper Valve Body



1	Lube control valve assembly
2	Cooler thermal bypass valve assembly
3	C clutch latch valve assembly
4	B clutch latch valve assembly
5	F clutch latch valve assembly
6	A clutch latch valve assembly
7	Clutch gain control valve assembly
8	TCC regulator valve assembly
9	Main regulator valve assembly

The main control consists of a upper and lower valve body with solenoids that are controlled by a TCM. The TCM operates the electrical components to provide refined engagement feel, shift feel, and shift scheduling.

Clutch Control Valves

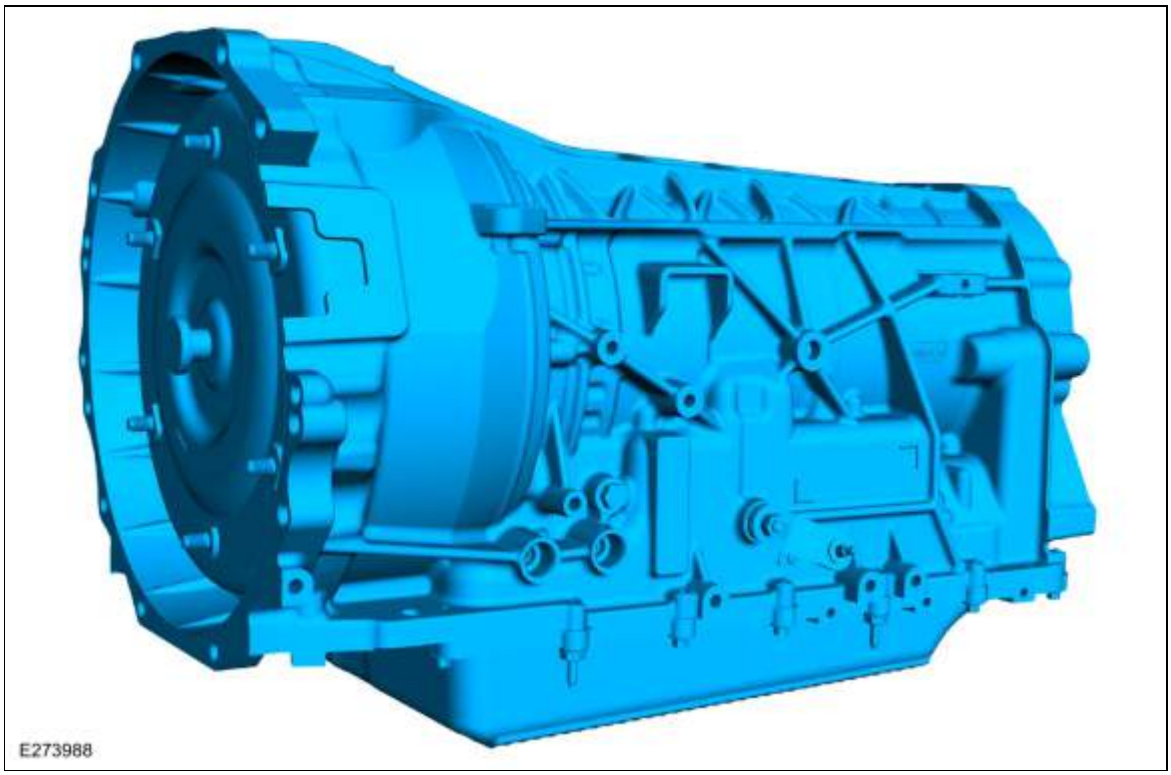
The A, B, C, and F clutch control valves are used to regulate line pressure for smooth clutch application. The clutch control valve design includes a slightly smaller land at the right end of the valve. The adjacent different diameter lands creates a differential chamber. Fluid under pressure in this chamber will apply more force to the larger diameter land than to the smaller diameter land.

- The clutch control valve moves to open or close a passage between line pressure and the clutch control circuit. With the valve at the left of the bore, the passage between line pressure and X clutch control is restricted (closed) and the clutch is released. With the valve at the right of the bore, the passage between line pressure and X clutch control is not restricted (open) and the clutch is applied.
- The clutch control valve is positioned in the bore by balancing two opposing forces. On the left side of the valve is the shift solenoid that pushes the valve to the right and thereby opening the passage and increasing pressure in the clutch control circuit.
- Clutch control pressure in the differential chamber applies more force to the land on the left pushing the valve towards the solenoid and thereby lowering pressure in the clutch control circuit.
- When the shift solenoid is de-energized, the weight of the fluid in the elevated exhaust circuit acts on the clutch control valve to keep it positioned against the solenoid pintle. The passage from line pressure to X clutch control is closed.
- To apply the clutch, the TCM applies current to the shift solenoid and hydraulic pressure in the X clutch control circuit increases proportionally.
- As the solenoid force increases, the clutch control valve moves and connects line pressure to X clutch control.
- X clutch control fluid begins to fill the clutch. X clutch control also acts on the clutch control valve via the differential chamber.
- The clutch control valve cycles rapidly as the X clutch control pressure increases and the clutch applies.

The D and E clutch control valves are used to regulate line pressure for smooth clutch application. The clutch control valve design is similar to the A, B, C, and F clutch control valves, except there are 2 progressively smaller diameter lands at the right end of the valve. The different diameter lands create two differential chambers. Valve operation is identical to the other clutch control valves except the D and E clutch control valve can use 2 different forces to balance the valve against the solenoid. Under low load conditions, the X clutch control circuit feeds both differential chambers resulting more force acting against the solenoid. The clutch control valve is positioned relatively close to the solenoid and about 100 PSI of regulated line pressure applies or holds the clutch. Under high load conditions, the X clutch control circuit feeds only 1 differential chamber resulting less force acting against the solenoid. The clutch control valve is positioned relatively further away from the solenoid and about 200 PSI of regulated line pressure applies or holds the clutch

Transmission Description - Overview

Overview



This transmission is a 10-speed electronically controlled transmission which uses planetary gears. Gear selection is achieved by the electronic control of transmission fluid flow to operate various internal clutches.

This transmission includes:

- Torque converter with an integral converter clutch
- Electronic shift and pressure controls
- Four planetary gearsets
- Two multi-disc holding clutches
- Four multi-plate drive clutches
- One one way holding clutch
- Main control valve body unit

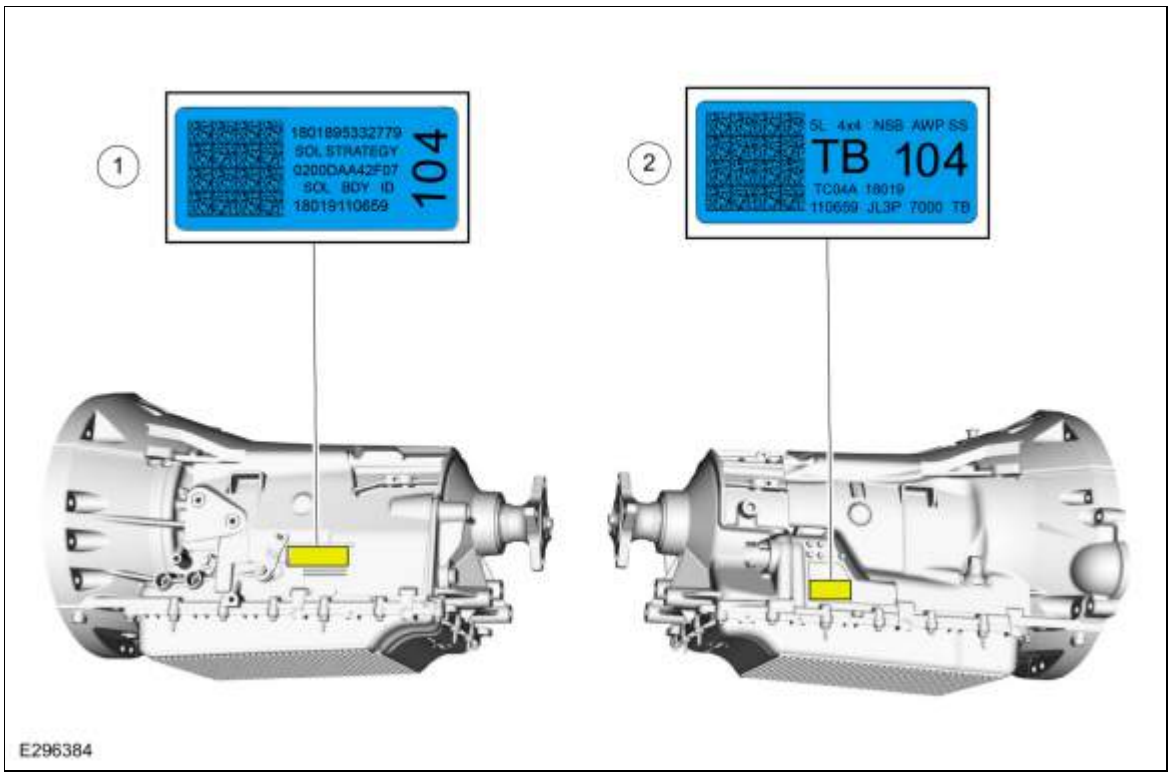
The main control consists of a valve body assembly with solenoids inside the transmission and is controlled by a PCM for gas engine applications and a TCM for diesel engine applications. The PCM or TCM operates the electrical components to provide refined engagement feel, shift feel, and shift scheduling.

Engine power reaches the transmission by a torque converter with an integral clutch. The 10 forward gears and one reverse gear are obtained from 4 planetary gearsets.

This automatic transmission is a 10-speed electronically controlled transmission with a main control valve body unit with 8 solenoids and a torque converter. Gear selection is achieved by the control of transmission fluid to operate various internal clutches. The PCM or TCM operates the electrical components and provides control of gear selection, shift pressure and torque converter slip.

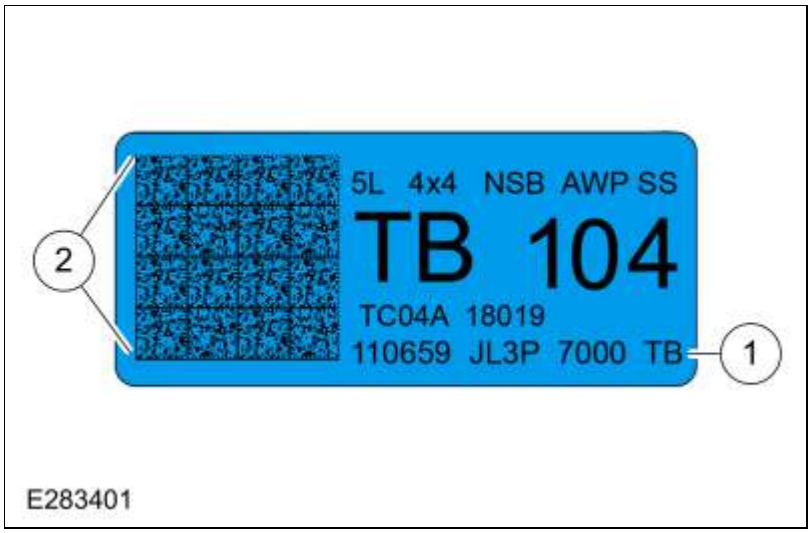
Identification Tags

Identification Tag Location



Item	Description
1	Solenoid body identification tag
2	Transmission identification tag

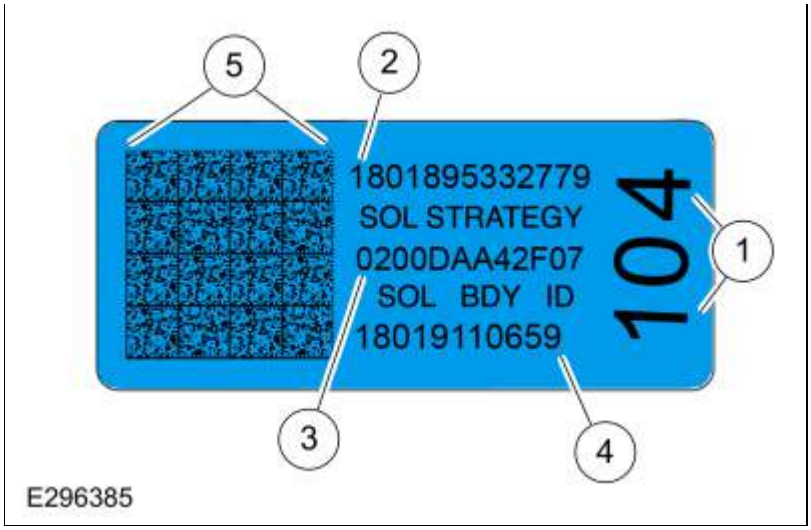
Transmission identification tag



Item	Description
1	Transmission part number
2	Two-dimensional matrix barcode

When servicing the transmission, use the transmission identification tag located on the right side of the transmission case.

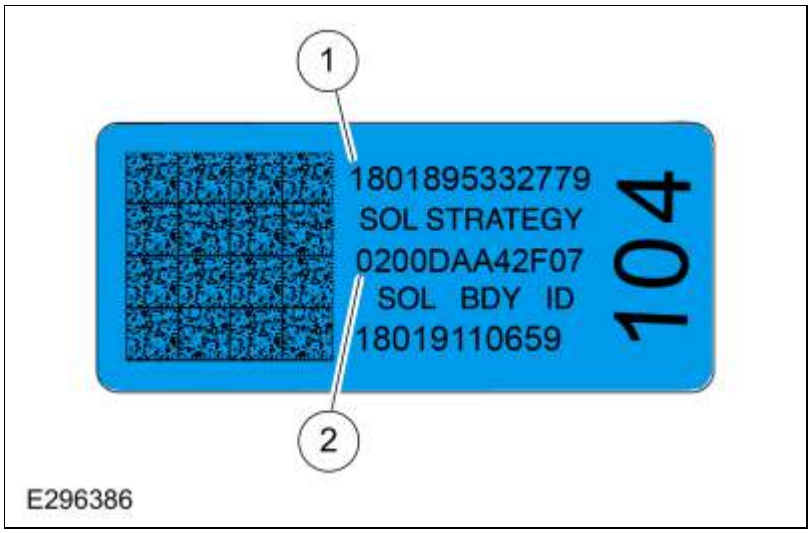
Original Solenoid Body Tag



Item	Description
1	Three-digit transmission model code
2	Thirteen-digit solenoid body strategy
3	Twelve-digit solenoid body identification
4	Eleven-digit transmission unique running number
5	Two-dimensional matrix barcode with TRID transmission characterization data

The solenoid body strategy is a file programmed into the PCM or TCM to control the shift, LPC and TCC solenoids to improve shift quality. The solenoid body tag on the transmission case contains the 13-digit solenoid body strategy and the 12-digit solenoid body identification.

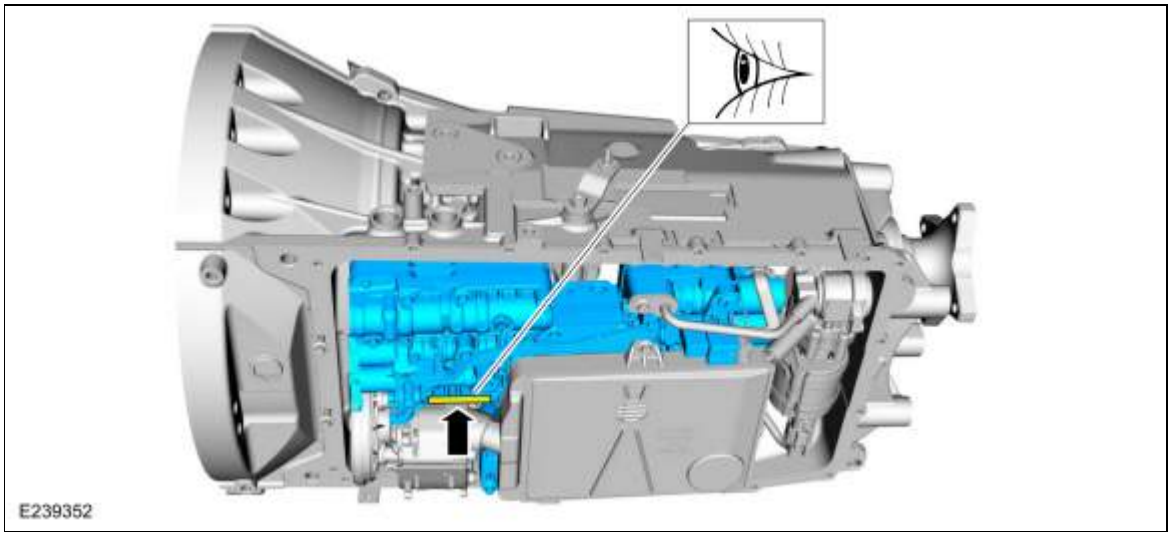
Replacement Solenoid Body Tag



Item	Description
1	Thirteen-digit solenoid body strategy
2	Twelve-digit solenoid body identification

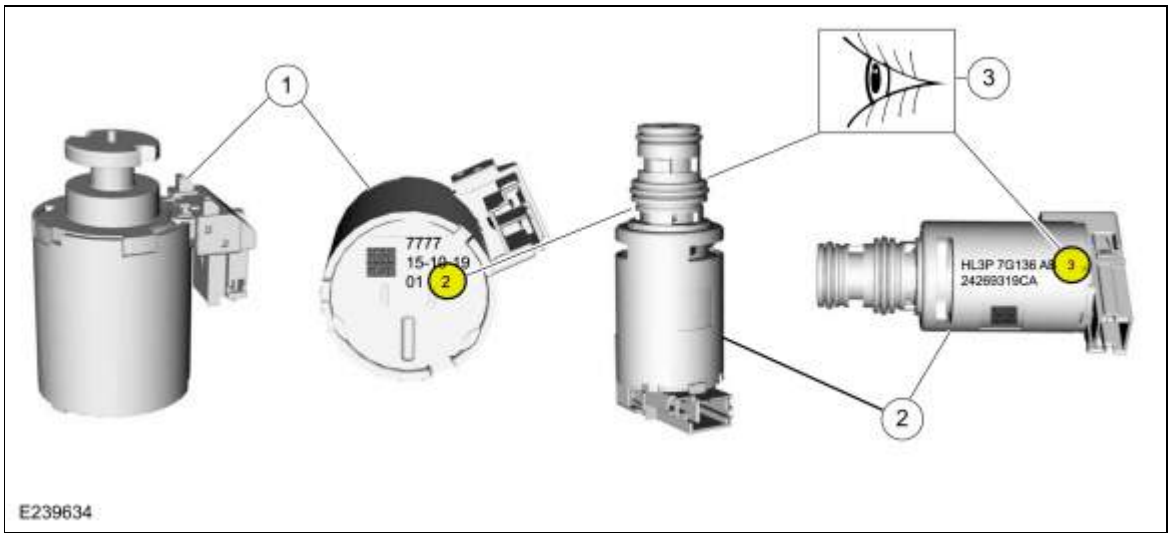
Anytime a new main control is installed, a new solenoid body strategy file is downloaded into the PCM or TCM using the scan tool. A replacement solenoid body tag is supplied with the new solenoid body which contains the 13-digit solenoid body strategy and the 12-digit solenoid body identification. The new tag is placed over the original solenoid body tag.

Solenoid Body Identification and Strategy



If the solenoid body strategy etched on the main control does not match what the scan tool displays, the solenoid body strategy must be downloaded into the PCM or TCM or harsh shifts will result.

Solenoid Band Number

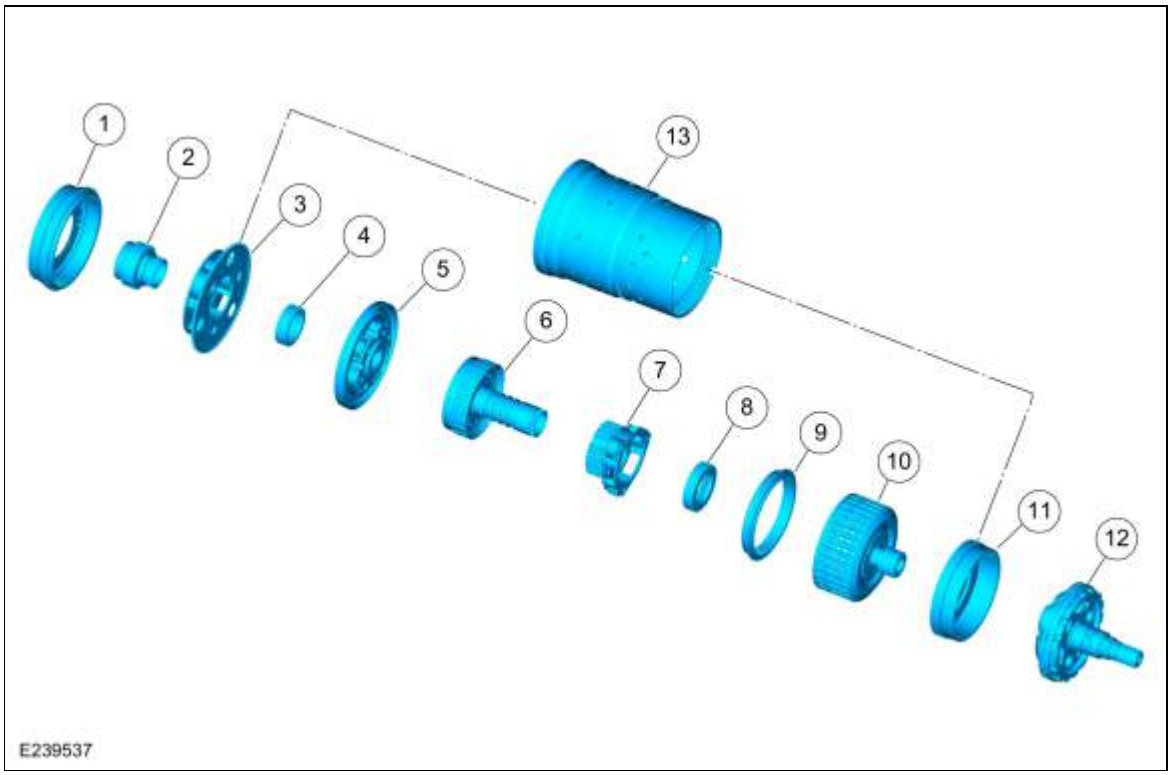


Item	Description
1	CIDAS (casting integrated direct acting solenoid)
2	VFS (variable force solenoids)
3	Band number

The solenoids are calibrated from the factory and are not all the same. There are 2 types of VFS (variable force solenoids), normally high and normally low solenoids. The CIDASs are all normally low solenoids. The solenoids can be replaced separately, but only with the same type of solenoid. The replacement solenoid band number must match the band number of the solenoid being replaced. The band number is printed on the solenoids in the location shown and will be a 1, 2, 3, 4 or 5.

Planetary Assembly

Planetary Gearset Exploded View



Item	Description
1	Ring gear No. 1
2	Sun gear No. 1
3	Planetary carrier No. 1
4	Sun gear No. 2
5	Planetary carrier No. 2
6	Ring gear No. 2
7	Planetary carrier No. 3
8	Sun gear No. 3
9	Ring gear No. 3
10	Shell and sun gear No. 4
11	Ring gear No. 4
12	Output shaft and planetary carrier No. 4 assembly

13	Cylinder (clutch and planetary container)

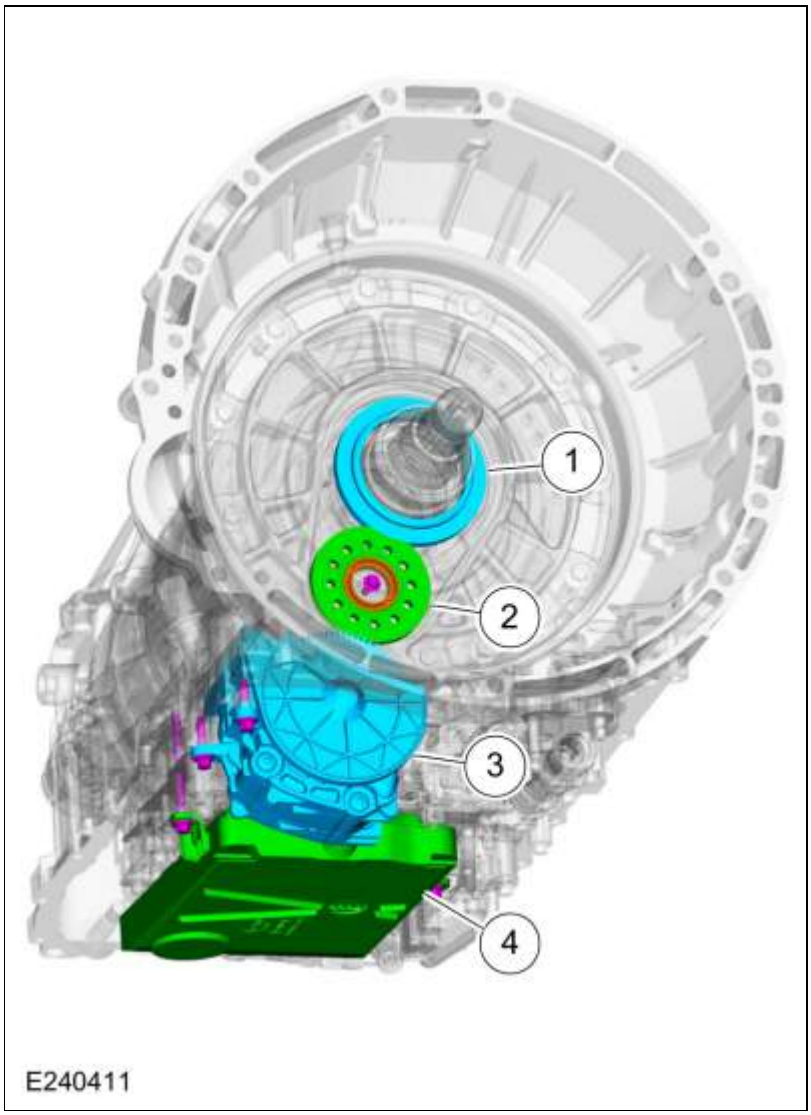
The 10R80 transmission has 4 planetary gear sets. Each gear set consists of a ring gear, a sun gear and a carrier. The gear sets are numbered 1 thru 4, from the front to the back of the transmission. There are several direct connections between the gear sets:

- Sun gears No. 1&2 are directly connected together with gear splines.
- Planetary carrier No. 1 and ring gear No. 4 are directly connected together with the cylinder (clutch and planetary container).
- Ring gear No. 2 and sun gear No. 3 are directly connected together with a shaft.
- Ring gear No. 3 and shell and sun gear No. 4 are directly connected together through the shell of the shell and sun gear No. 4.

Pump Assembly

Base Part Number: 7A103

Overview

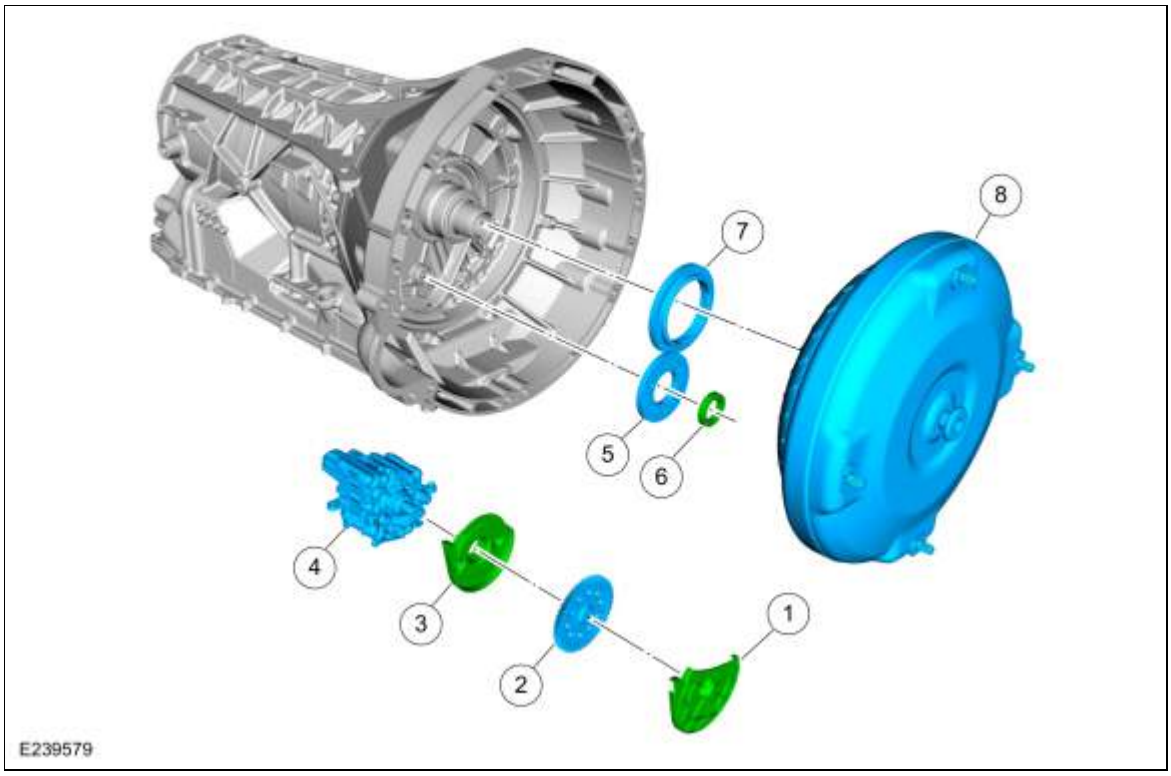


Item	Description
1	Transmission fluid pump drive gear
2	Transmission fluid pump idler gear
3	Transmission fluid pump assembly

4	Transmission fluid filter

The transmission fluid in the sump area at the bottom of the transmission case flows through a transmission fluid filter to the pump assembly. The pump is bolted to the bottom of the case and is driven by a set of gears mounted on the stator support and turned by the torque converter.

Pump Assembly Exploded View

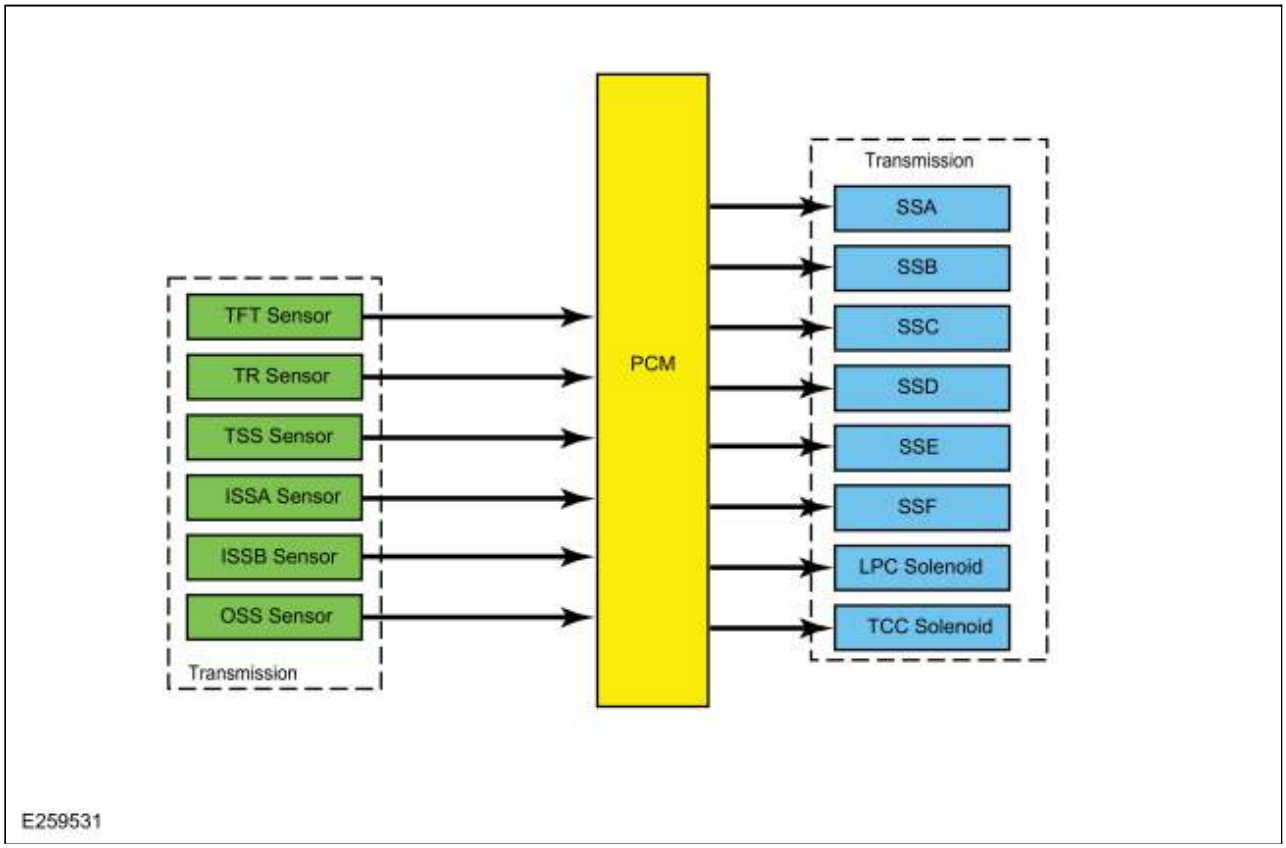


Item	Description
1	Transmission fluid pump driven gear outer cover
2	Transmission fluid pump driven gear
3	Transmission fluid pump driven gear inner cover
4	Transmission fluid pump
5	Transmission fluid pump idler gear
6	Transmission fluid pump idler gear bearing
7	Transmission fluid pump drive gear
8	Torque converter

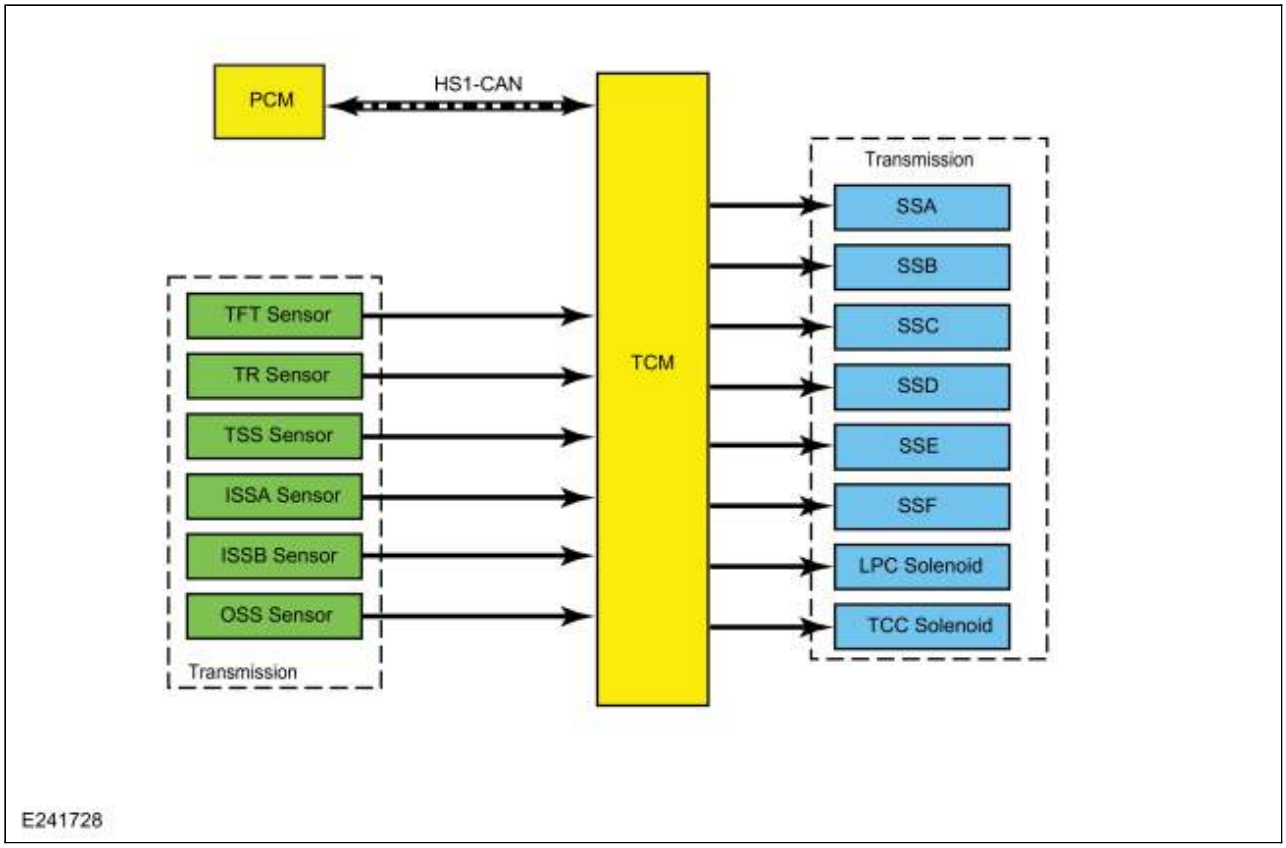
Transmission Description - System Operation and Component Description

System Diagram

2.3L EcoBoost Engines



2.0L TDCi Diesel Engines



Network Message Chart

Broadcast Message	Originating Module	Message Purpose
Engine Speed	TCM	Directly affects shift scheduling, TCC control, line pressure and transmission diagnostics. Indirectly affects shift pressure control.
Engine torque estimate	TCM	Directly affects shift pressure control, TCC control and transmission diagnostics. Indirectly affects shift scheduling and TCC scheduling.
APP	PCM	Directly affects shift scheduling, TCC scheduling and transmission diagnostics. Indirectly affects TCC control and shift control.
Commanded engine torque	PCM	Directly affects shift scheduling, TCC scheduling and transmission diagnostics. Indirectly affects shift control.

System Operation

The 10R80 transmission is a 10-speed, step ratio rear wheel drive transmission that is controlled by a PCM for gas engine applications or a TCM for diesel engine applications. The 10R80 has ten forward speeds, one reverse speed, four planetary gear sets, one mechanical One-Way Clutch or OWC, six friction clutches, an upper valve body, a lower valve body with eight solenoids, and PCM or TCM controlled electronics. The 10R80 utilizes six shift (A-F) solenoids that are linear force solenoids. Unlike previous shift solenoids they are mechanical in nature in that no transmission fluid passes through them. CIDASs use a armature/pin assembly that moves a control valve in the main control valve body to control and apply hydraulic fluid pressure. Each clutch (A-F) is controlled by a corresponding shift solenoid (A-F). These solenoids are directly proportional in that zero current equals zero pressure and maximum current equals maximum pressure. If the power circuit to the transmission solenoids fails open, then all solenoids are failed electrically OFF, none of the clutch packs are able to engage and there is no fail safe operation.

Upshift Gear Sequence

At times the 10-speed transmission may **skip** gears when the vehicle starts from a complete stop. This is **normal** and desired **behavior**.

At part pedal when acceleration is brisk, single step upshifts would result in very frequent shift events (very short time in gear). Double step upshifts results when a longer time is spent in gear.

However, at light pedal or road load, single step upshifts **will** occur. The small 10-speed gear steps allow the engine speed to drop to lower values than it would in the 6-speed transmission; providing for the best fuel economy. In contrast, when the 10-speed transmission is at heavy or max pedal, the small steps keep the engine closer to the horsepower peak for best performance.

Down shift Gear Sequence

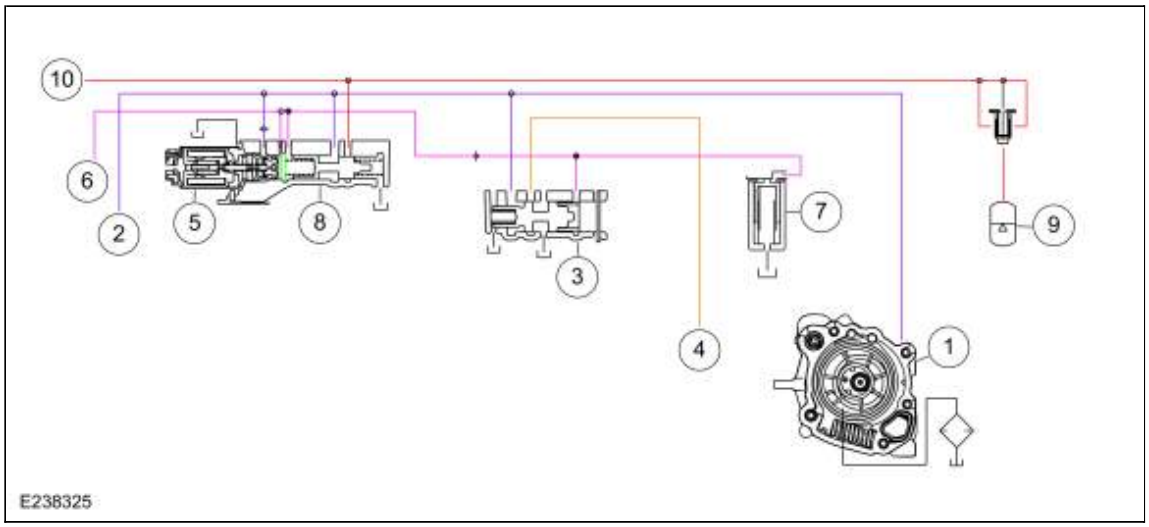
At times the 10-speed transmission may **skip** gears when the vehicle down shifts to a complete stop. This is **normal** and desired **behavior**.

The same **skip** shift strategy that is used for the upshift may be applied during down shift.

Component Description

Hydraulic Circuits

Line Pressure Hydraulic Circuits



Item	Description
1	Mechanical pump
2	Pump output
3	Main regulator valve
4	Pump output decreased
5	LPC solenoid
6	LPC pressure
7	Isolator valve
8	Anti-backflow valve

9	Transmission fluid auxiliary pump (model dependent)
10	Line pressure

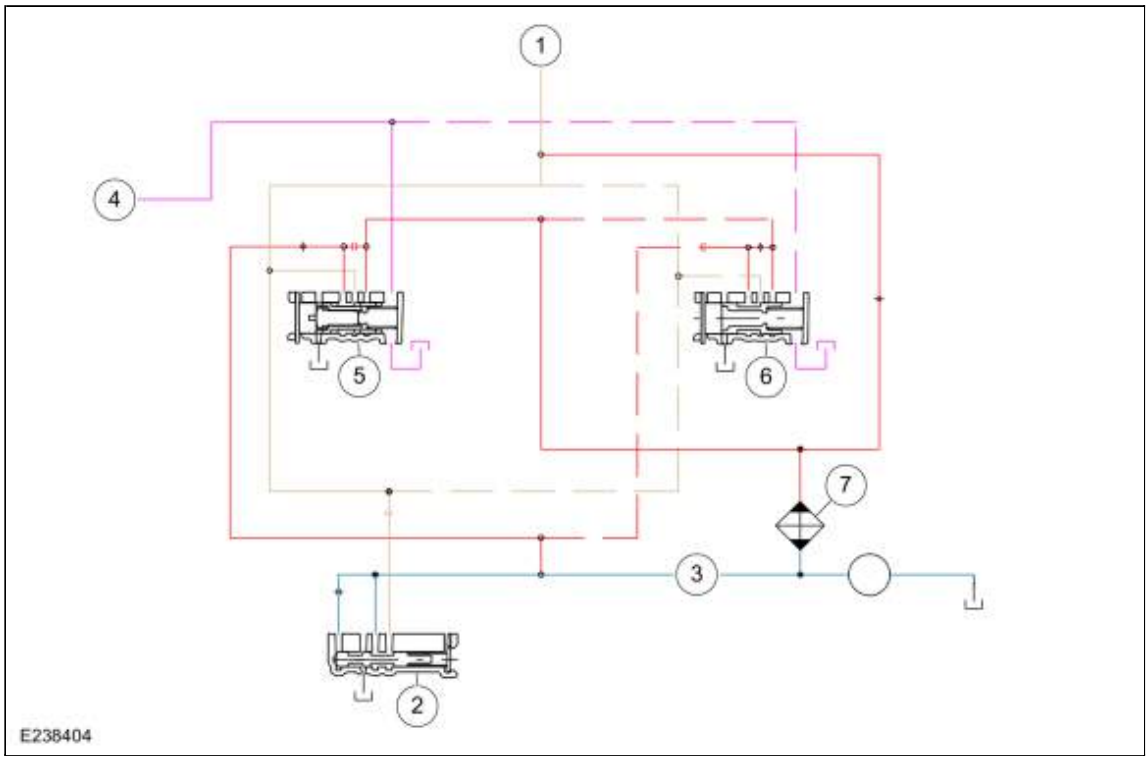
The PCM or TCM controls line pressure with the LPC solenoid. Varying pressure from the LPC solenoid effects shift feel while allowing sufficient pressure for clutch application.

When the engine is running, the pump supplies pressure to the main regulator valve through the pump output circuit. Pressure from the LPC solenoid through the LPC pressure circuit controls the position of the main regulator valve.

The main regulator valve varies pressure in the pump output circuit.

If equipped, the transmission fluid auxiliary pump, an electronic pump is turned on before an engine stop event to maintain line pressure, allowing the transmission to stay engaged during the stop event. This allows quick response on the engine restart because the transmission is already in gear.

Lubrication Hydraulic Circuits



Item	Description
1	Fluid from torque converter
2	Lube control valve
3	Lube fluid circuit
4	Elevated exhaust pressure
5	Thermal bypass valve without active warm up
6	Bypass valve with active warm up

7	Fluid cooler

A small amount of hot fluid from the torque converter is routed through a small orifice in the separator plate to the transmission fluid cooler or transmission fluid warmer/cooler. This fluid purges the cooler or warmer/cooler of air and keeps the cooler or warmer/cooler full of fluid when the vehicle is running.

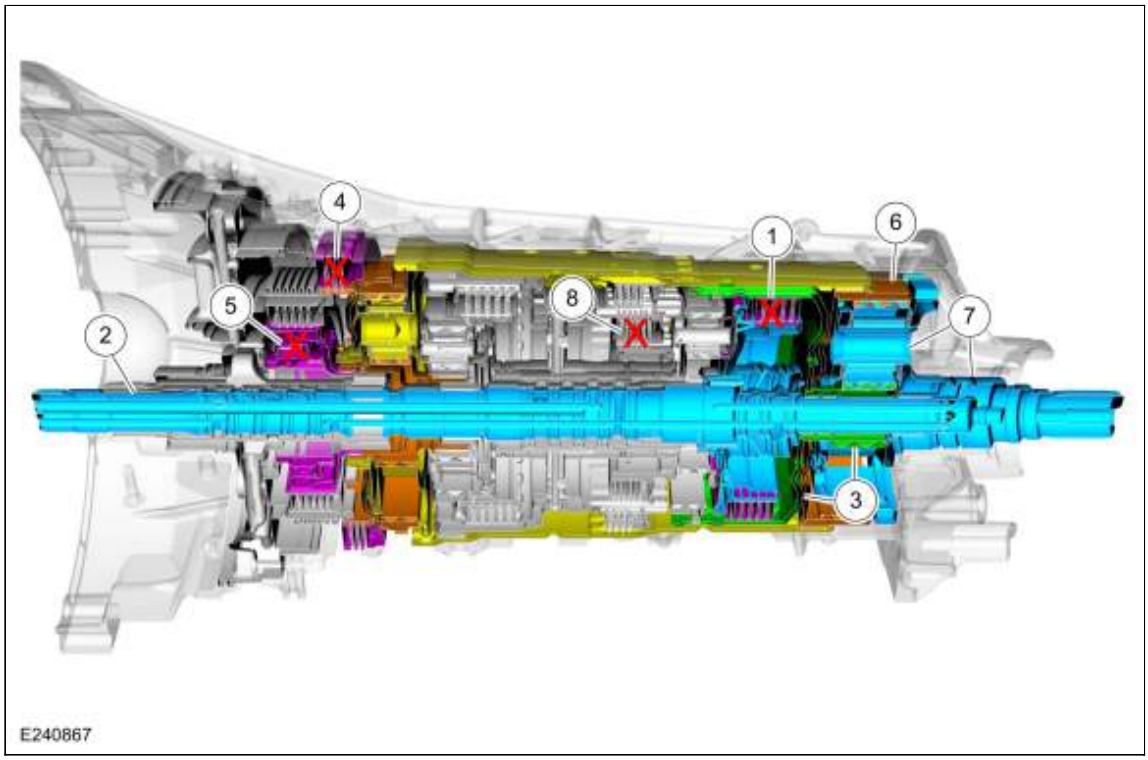
On vehicles without active warm up, most of the hot fluid from the torque converter is routed to the thermal bypass valve. When TFT is below a specified temperature, the thermal bypass valve directs the fluid to the lube circuit. When TFT is above a specified temperature, the thermal bypass valve directs fluid to the transmission fluid cooler. Cold fluid from the transmission fluid cooler is routed to the lube circuit.

On vehicles with active warm up, most of the hot fluid from the torque converter is routed through the bypass valve to the transmission fluid warmer/cooler. Cold fluid from the transmission fluid cooler is routed to the lube circuit.

Fluid in the lube circuit enters the input shaft through the front support assembly and flows through passages in the input shaft and output shaft to provide lubrication for the transmission.

Powerflows

1st Gear

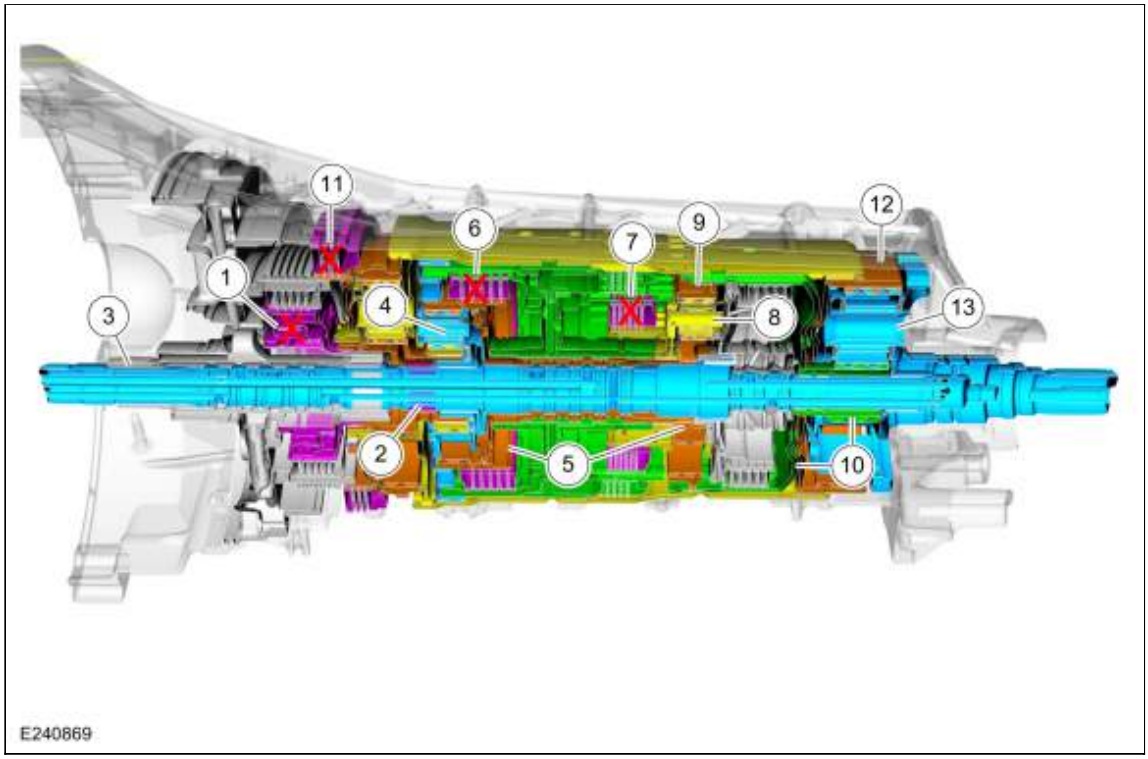


Item	Description
1	E clutch
2	Input shaft
3	Shell and sun gear No. 4

4	A clutch
5	One-Way Clutch (OWC)
6	Ring gear No. 4
7	Output shaft and planetary carrier No. 4
8	D clutch

The E clutch is applied allowing torque to be transferred from the input shaft to the shell and sun gear No. 4. The A clutch and the One-Way Clutch (OWC) are both applied to hold the ring gear No. 4 stationary on acceleration. The shell and sun gear No. 4 drives the pinions of the output shaft and planetary carrier No. 4 in a 4.69 reduction gear ratio. The D clutch is applied to reduce frictional losses from a released clutch, but does not contribute to powerflow.

2nd Gear

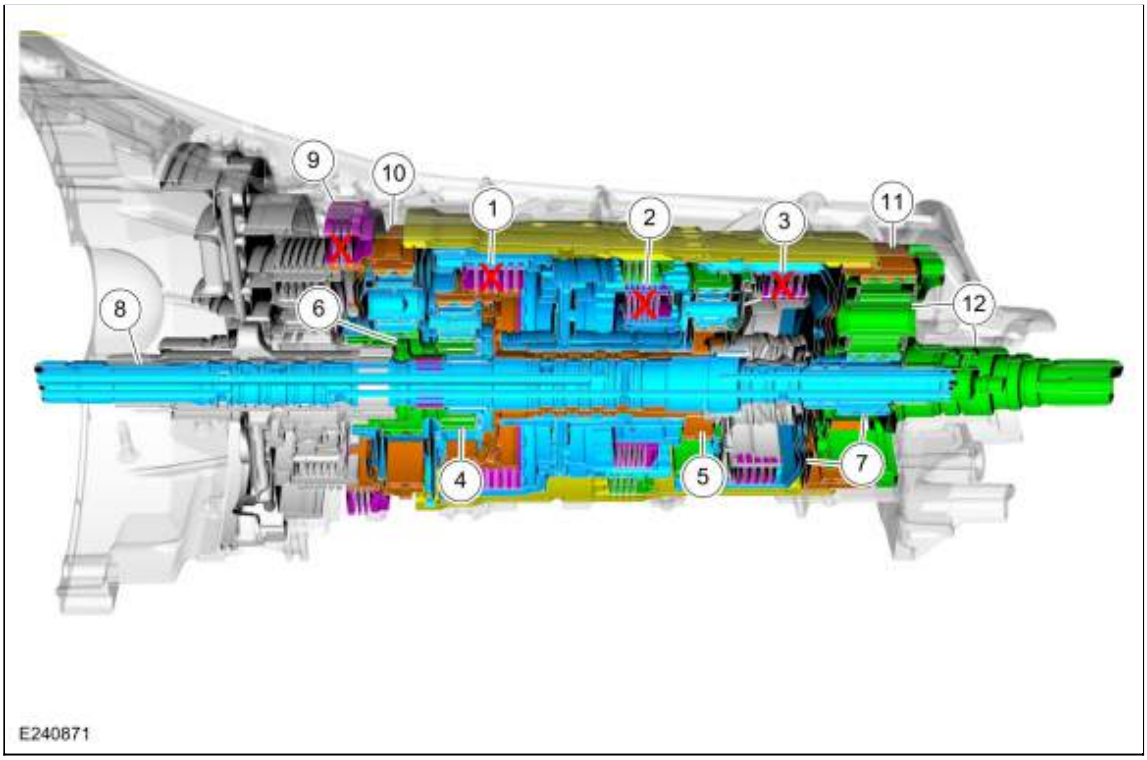


Item	Description
1	One-Way Clutch (OWC)
2	Sun gear No. 2
3	Input shaft
4	Planetary carrier No. 2
5	Ring gear No. 2 and sun gear No. 3
6	C clutch
7	D clutch
8	Planetary carrier No. 3

9	Ring gear No. 3
10	Shell and sun gear No. 4
11	A clutch
12	Ring gear No. 4
13	Output shaft and planetary carrier No. 4

The One-Way Clutch (OWC) holds the sun gear No. 2 stationary on acceleration. The input shaft turns the planetary carrier No. 2 and causes the ring gear No. 2 and sun gear No. 3 to rotate at a 0.63 overdrive ratio. The C clutch and the D clutch are applied allowing torque to be transferred from the ring gear No. 2 to the planetary carrier No. 3 at a 0.63 overdrive gear ratio. The 2 inputs to the 3rd planetary gear set cause the ring gear No. 3 and the planetary carrier No. to rotate at a 0.63 overdrive ratio. The A clutch and the One-Way Clutch (OWC) are both applied to hold the ring gear No. 4 stationary on acceleration. The shell and sun gear No. 4 drives the pinions of the output shaft and planetary carrier No. 4 in a 2.98 reduction gear ratio.

3rd Gear

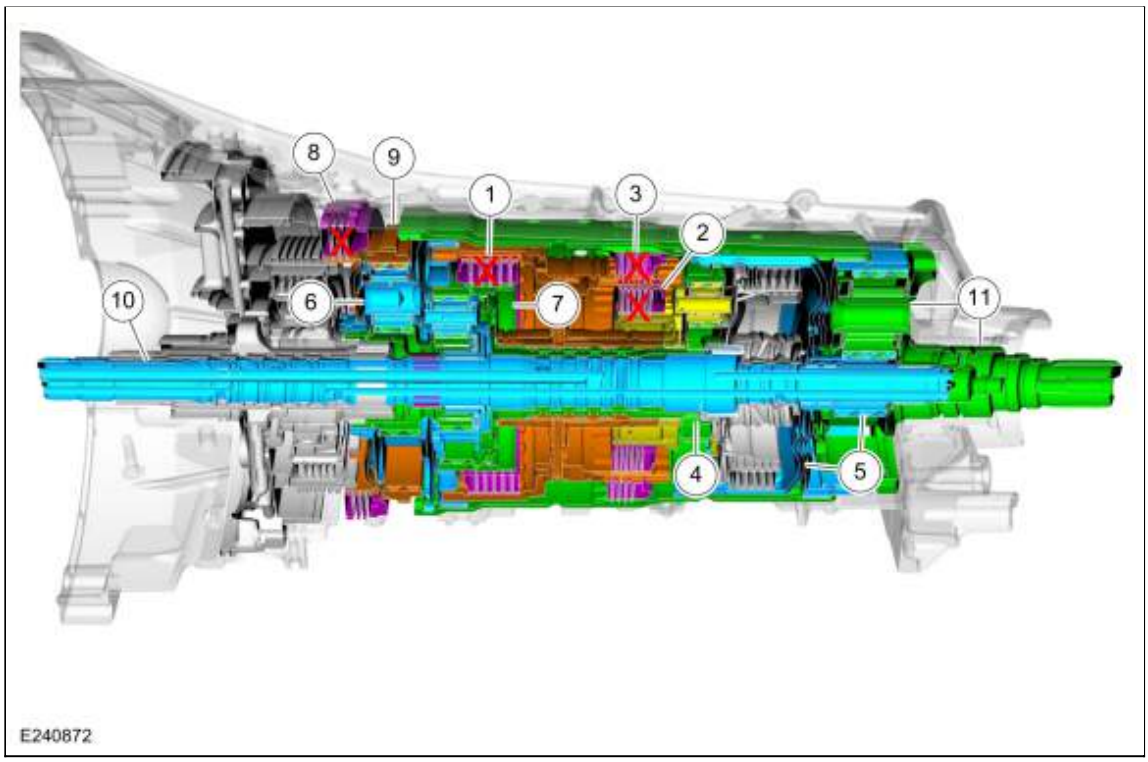


Item	Description
1	C clutch
2	D clutch
3	E clutch
4	Planetary gear set No. 2
5	Planetary gear set No. 3
6	Sun gear No. 1

7	Shell and sun gear No. 4
8	Input shaft
9	A clutch
10	Ring gear No. 1
11	Ring gear No. 4
12	Output shaft and planetary carrier No. 4

The C clutch, D clutch, and the E clutch are applied to provide multiple inputs at the same speed to the 2nd and 3rd planetary gears sets. These inputs effectively lock the 2nd and 3rd planetary gears sets and cause sun gear No. 1 and the shell and sun gear No. 4 to rotate at a 1:1 ratio with the input shaft. The A clutch is holding the ring gear No. 1 stationary causing the planetary carrier No. 1 and the ring gear No. 4 to rotate at a 3.11 reduction ratio. The 2 inputs to the 4th planetary gear set cause the output shaft and planetary carrier No. 4 to rotate at a 2.15 ratio.

4th Gear

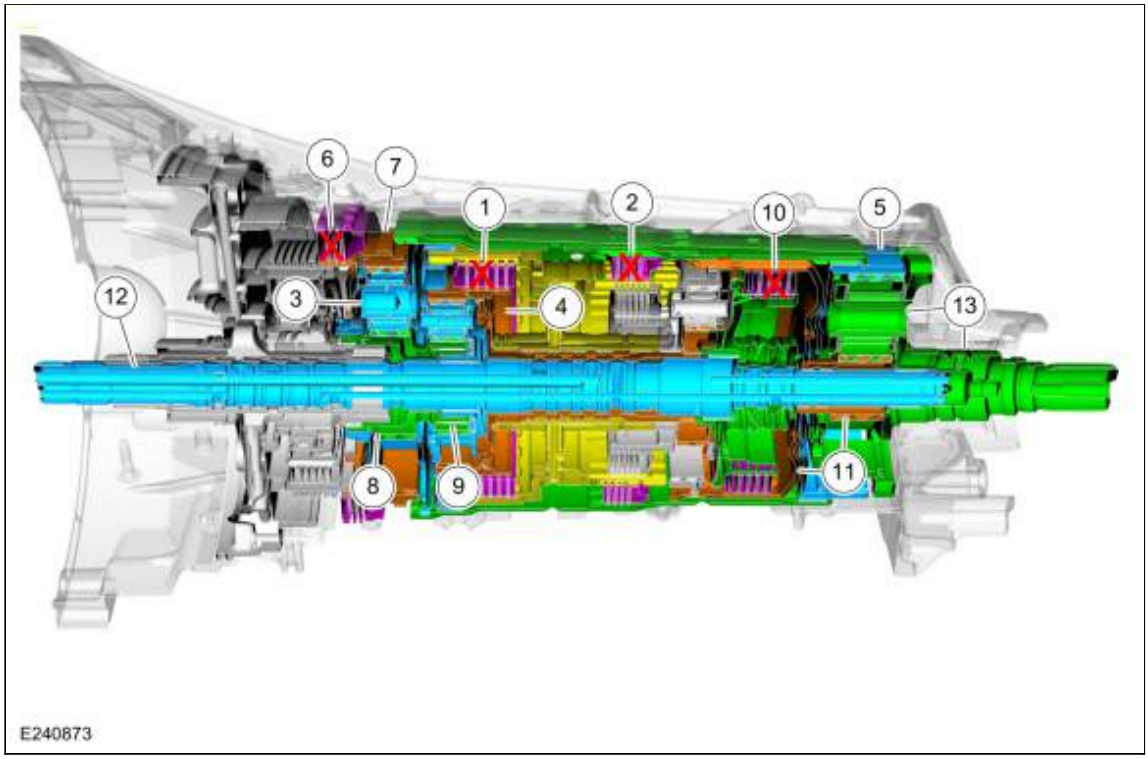


Item	Description
1	C clutch
2	D clutch
3	F clutch
4	Planetary gear set No. 3
5	Planetary gear set No. 4
6	Planetary carrier No. 1

7	Ring gear No. 2
8	A clutch
9	Ring gear No. 1
10	Input shaft
11	Output shaft and planetary carrier No. 4

The C clutch, D clutch, and F clutch are applied effectively locking the 3rd and 4th planetary gear sets, the planetary carrier No. 1, and the ring gear No. 2 together. The A clutch is holding the ring gear No. 1. The 2 inputs to the planetary gear set No. 1 cause the sun gear No. 1 and the sun gear No. 2 to rotate at a 0.56 overdrive ratio. The input shaft turns the planetary carrier No. 2 and causes the ring gear No. 2 and the 4th planetary gear set to rotate at a 1.77 ratio.

5th Gear

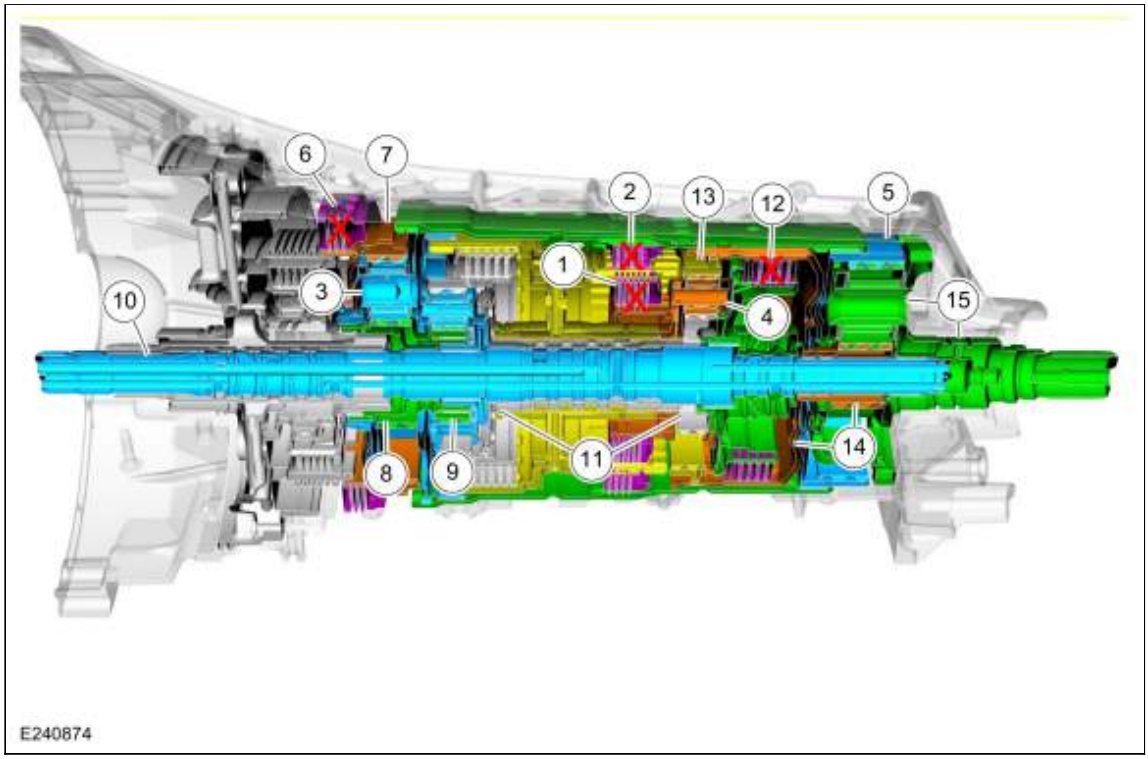


Item	Description
1	C clutch
2	F clutch
3	Planetary carrier No. 1
4	Ring gear No. 2
5	Ring gear No. 4
6	A clutch
7	Ring gear No. 1
8	Sun gear No. 1

9	Sun gear No. 2
10	E clutch
11	Shell and sun gear No. 4
12	Input shaft
13	Output shaft and planetary carrier No. 4

The C clutch and F clutch are applied effectively locking the planetary carrier No. 1, the ring gear No. 2, and ring gear No. 4 together at a 1.77 ratio. The A clutch is holding the ring gear No. 1. The 2 inputs to the planetary gear set No. 1 cause the sun gear No. 1 and the sun gear No. 2 to rotate at a 0.56 overdrive ratio. The E clutch is applied to transfer torque to the sun gear No. 4. The 2 inputs to the 4th planetary gear set cause the output shaft and planetary carrier No. 4 to rotate at a 1.52 ratio.

6th Gear

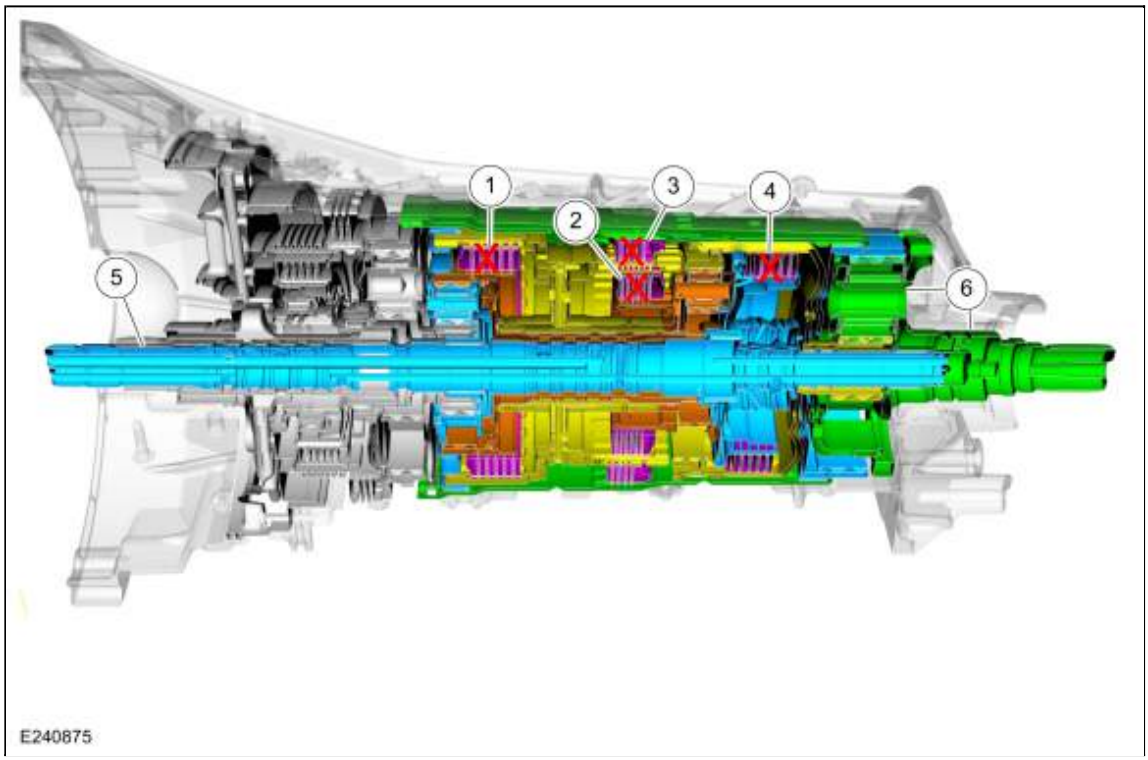


Item	Description
1	D clutch
2	F clutch
3	Planetary carrier No. 1
4	Planetary carrier No. 3
5	Ring gear No. 4
6	A clutch
7	Ring gear No. 1
8	Sun gear No. 1

9	Sun gear No. 2
10	Input shaft
11	Ring gear No. 2 and sun gear No. 3
12	E clutch
13	Ring gear No. 3
14	Shell and sun gear No. 4
15	Output shaft and planetary carrier No. 4

The D clutch and F clutch are applied effectively locking the planetary carrier No. 1, the planetary carrier No. 3, and the ring gear No. 4 together. The A clutch is holding the ring gear No. 1. The 2 inputs to the planetary gear set No. 1 cause the sun gear No. 1 and the sun gear No. 2 to rotate at a 0.44 overdrive ratio. The input shaft turns the planetary carrier No. 2 and causes the ring gear No. 2 and sun gear No. 3 to rotate at a 3.58 ratio. The E clutch is applied to transfer torque from the input shaft to the ring gear No. 3 and the shell and sun gear No. 4. The 2 inputs to the 3rd planetary gear set cause the planetary carrier No. 3 and ring gear No. 4 to rotate at a 1.38 ratio. The 2 inputs to the 4th planetary gear set cause the output shaft and planetary carrier No. 4 to rotate at a 1.28 ratio.

7th Gear

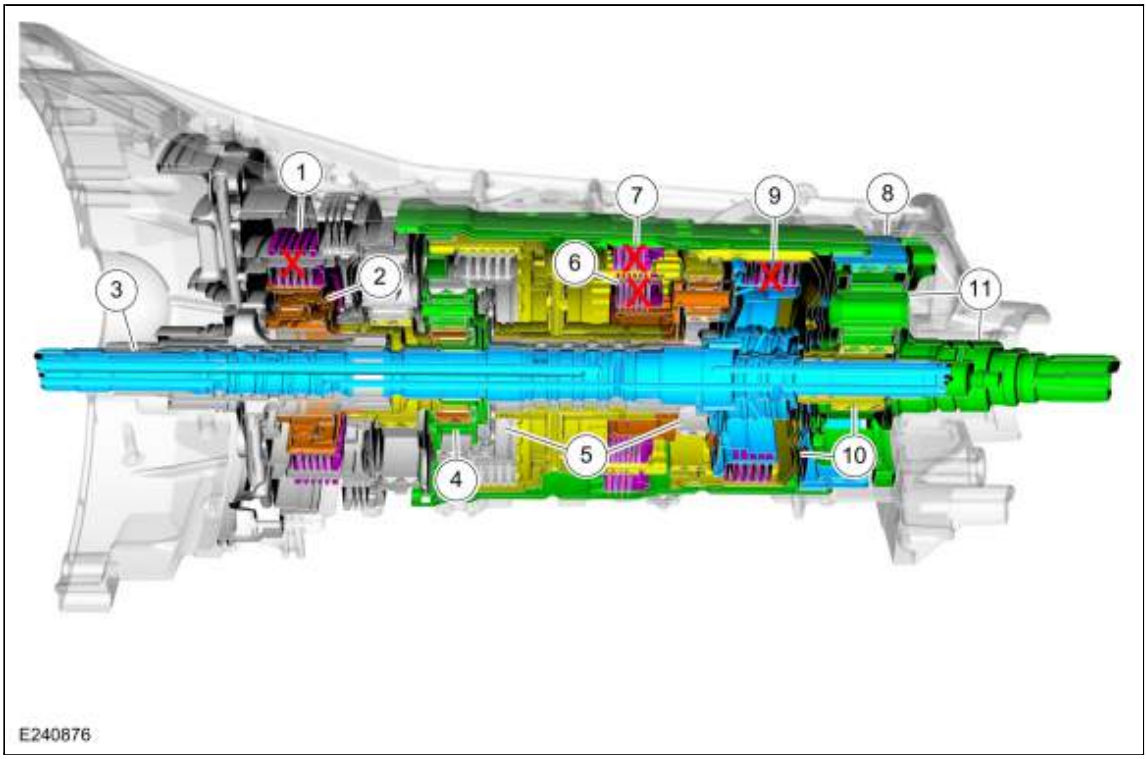


Item	Description
1	C clutch
2	D clutch
3	F clutch
4	E clutch

5	Input shaft
6	Output shaft and planetary carrier No. 4

The C clutch, D clutch, F clutch and the E clutch are applied to provide multiple inputs at the same speed to all four planetary gears sets. These inputs effectively lock all four planetary gears sets causing the output shaft and planetary carrier No. 4 to rotate at a 1:1 ratio with the input shaft.

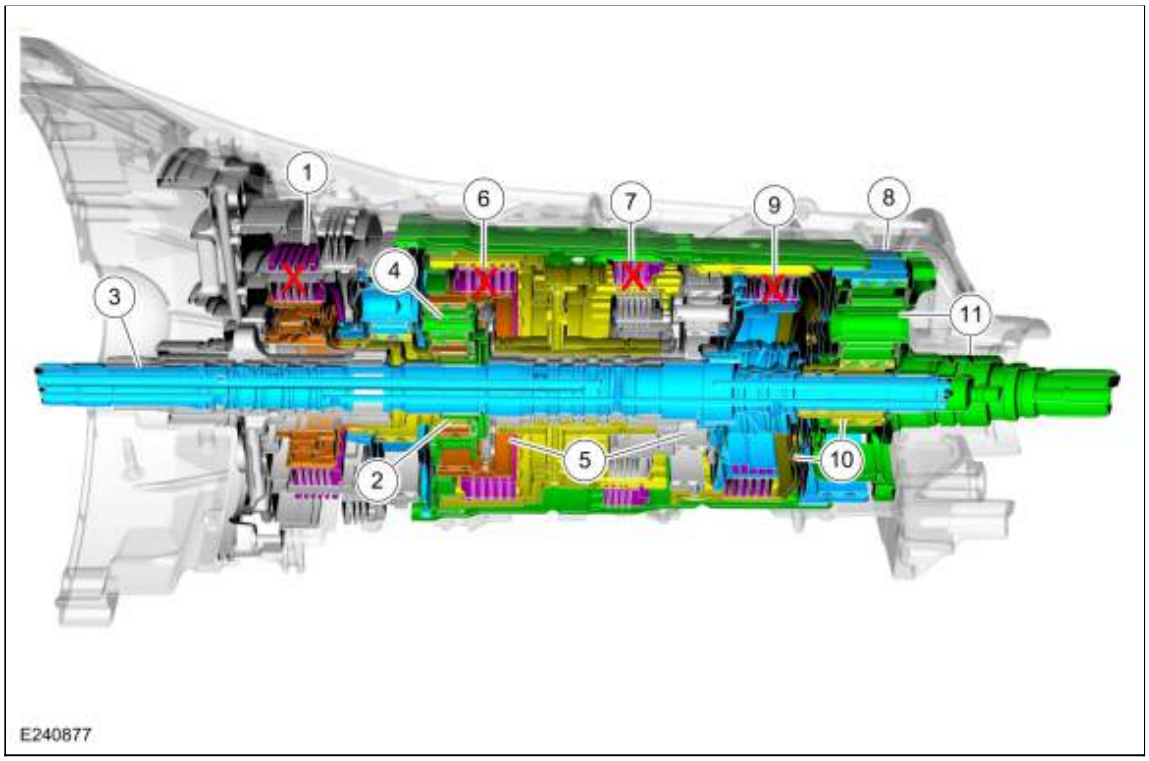
8th Gear



Item	Description
1	A clutch
2	One-Way Clutch (OWC)
3	Input shaft
4	Sun gear No. 2
5	Ring gear No. 2 and sun gear No. 3
6	D clutch
7	F clutch
8	Ring gear No. 4
9	E clutch
10	Shell and sun gear No. 4
11	Output shaft and planetary carrier No. 4

The B clutch is holding the sun gear No. 2 stationary. The input shaft turns the planetary carrier No. 2 and causes the ring gear No. 2 and sun gear No. 3 to rotate at a 0.63 overdrive ratio. The D clutch and F clutch are applied allowing torque to be transferred from the planetary No. 3 to the ring gear No. 4 at a 0.82 overdrive gear ratio. The E clutch is applied allowing torque to be transferred from the input shaft to the shell and sun gear No. 4 at a 1:1 ratio. The 2 inputs to the 4th planetary gear set cause the output shaft and planetary carrier No. 4 to rotate at a 0.85 ratio.

9th Gear

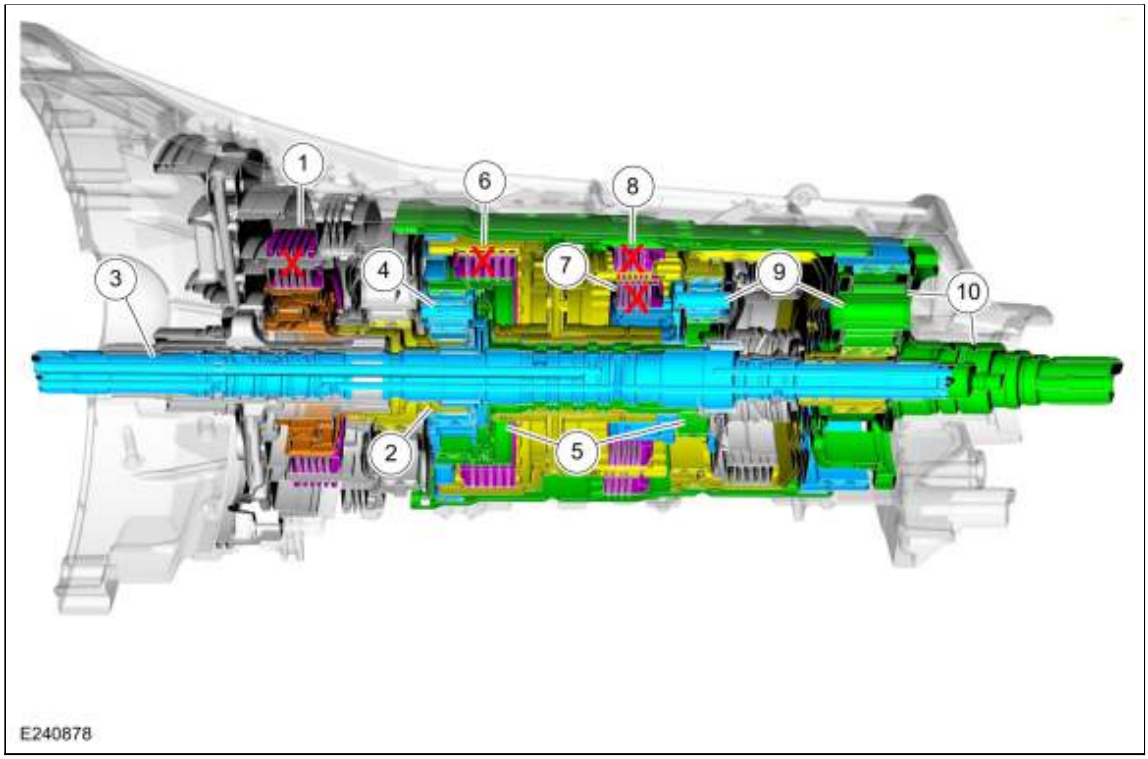


Item	Description
1	B clutch
2	Sun gear No. 2
3	Input shaft
4	Planetary carrier No. 2
5	Ring gear No. 2 and sun gear No. 3
6	C clutch
7	F clutch
8	Ring gear No. 4
9	E clutch
10	Shell and sun gear No. 4
11	Output shaft and planetary carrier No. 4

The B clutch is holding the sun gear No. 2 stationary. The input shaft turns the planetary carrier No. 2 and causes the ring gear No. 2 to rotate. The C clutch and F clutch are applied allowing torque to be transferred

from the ring gear No. 2 to the ring gear No. 4 at a 0.63 overdrive gear ratio. The E clutch is applied allowing torque to be transferred from the input shaft to the shell and sun gear No. 4 at 1:1 ratio. The 2 inputs to the 4th planetary gear set cause the output shaft and planetary carrier No. 4 to rotate at a 0.69 ratio.

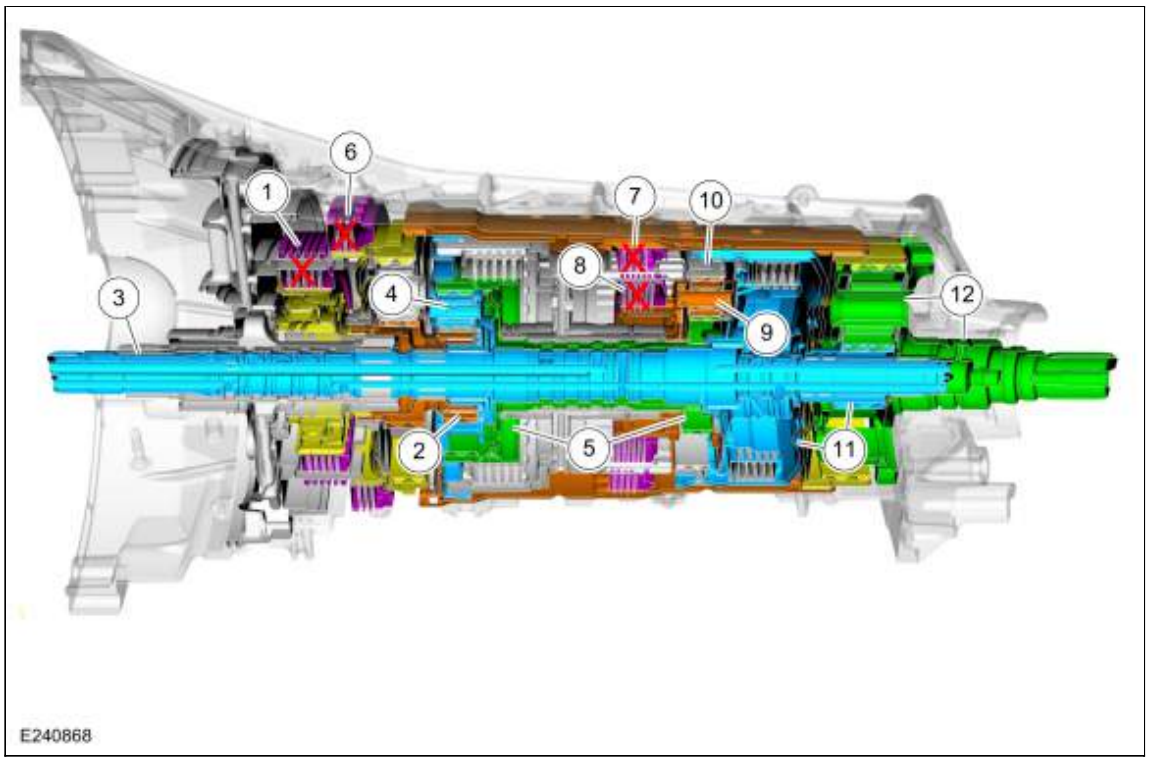
10th Gear



Item	Description
1	B clutch
2	Sun gear No. 2
3	Input shaft
4	Planetary carrier No. 2
5	Ring gear No. 2 and sun gear No. 3
6	C clutch
7	D clutch
8	F clutch
9	Planetary gear set No. 3 and planetary gear set No. 4
10	Output shaft and planetary carrier No. 4

The B clutch is holding the sun gear No. 2 stationary. The input shaft turns the planetary carrier No. 2 and causes the ring gear No. 2 and sun gear No. 3 to rotate. The C clutch, D clutch, and the F clutch are applied to provide torque input from the ring gear No. 2 at an overdrive ratio of 0.56. This torque input effectively locks the 3rd and 4th planetary gears sets causing the output shaft and planetary carrier No. 4 to rotate at a 0.64 ratio.

Reverse

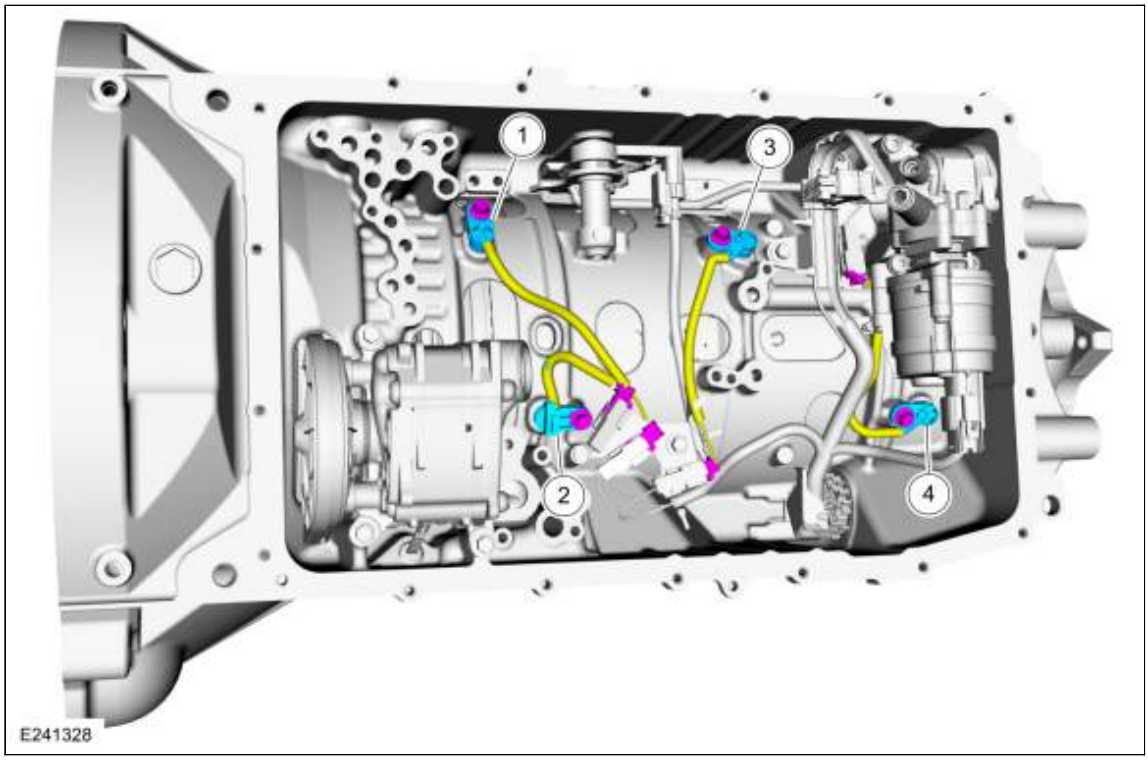


Item	Description
1	B clutch
2	Sun gear No. 2
3	Input shaft
4	Planetary carrier No. 2
5	Ring gear No. 2 and sun gear No. 3
6	A clutch
7	F clutch
8	D clutch
9	Planetary carrier No. 3
10	Ring gear No. 3
11	Shell and sun gear No. 4
12	Output shaft and planetary carrier No. 4

The B clutch is applied to hold the sun gear No. 2 stationary. The input shaft turns the planetary carrier No. 2 and causes the ring gear No. 2 and the sun gear No. 3 to rotate at a 0.63 overdrive ratio. The A clutch, F clutch, and the D clutchs are applied to hold the planetary carrier No. 3 stationary. The 2 inputs to the 3rd planetary gearset cause the ring gear No. 3 and the planetary carrier No. 4 to rotate at a 1.03 ratio in the reverse direction. The A clutch and F clutch are applied to hold the ring gear No. 4 stationary. The 2 inputs to the 4th planetary gearset cause the output shaft and planetary carrier No. 4 to rotate at a 4.85 reduction ratio in the reverse direction.

Component Description

Transmission Sensors



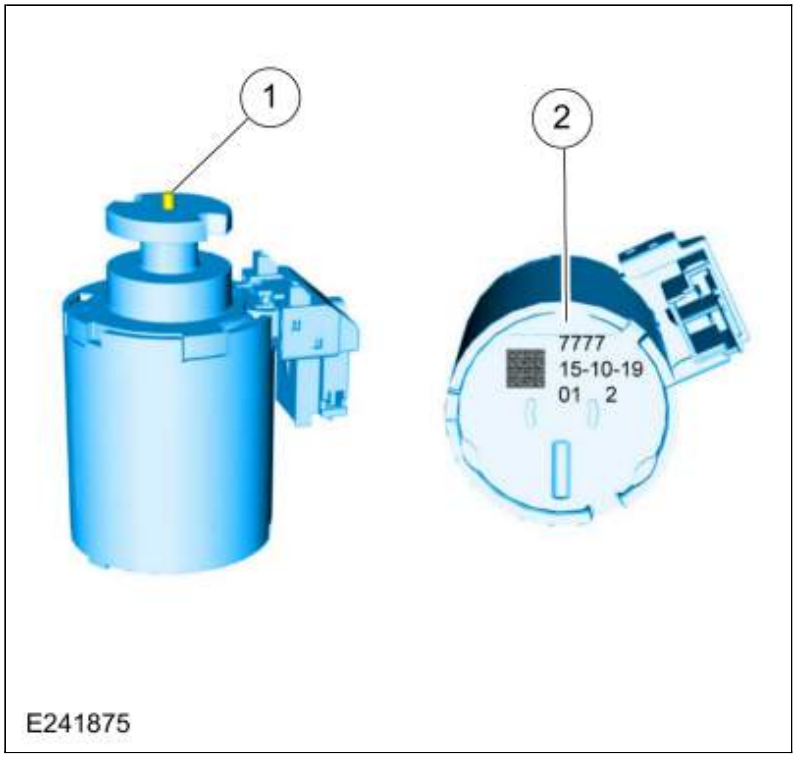
Item	Description
1	Intermediate speed sensor A
2	TSS sensor
3	Intermediate speed sensor B
4	OSS sensor

The PCM for gas engine applications or a TCM for diesel engine applications control the electronic functions of this transmission. The PCM or TCM receives input signals from engine and transmission sensors and uses these inputs to control line pressure, shift time, TCC and shift solenoids.

Item	Description
TFT Sensor	The TFT sensor is located in the transmission main control valve body. It is a temperature-sensitive device called a thermistor. The resistance value of the TFT sensor will vary with temperature change. The PCM or TCM monitors the voltage across the TFT sensor to determine the temperature of the transmission fluid. The PCM or TCM uses this initial signal to determine whether a cold start shift schedule is necessary. The cold start shift schedule allows delayed shifts when the transmission fluid is cold to help warm the transmission fluid. The PCM or TCM also inhibits TCC operation at low transmission fluid temperatures and adjusts line pressure for temperature.
TR Sensor	The TR sensor is composed of a dual set of TR sensors. The manual shifter engages and disengages Park and the shifter position is detected by reading TR sensors A and B. There is

	no manual valve, the PCM or TCM provides forward or reverse based on the dual TR sensor inputs. The 10R80 transmission uses a dual PWM output (at 125 Hz) TR sensors where: TR sensor A increases as the shifter is moved from Park to Sport and TR sensor B decreases as the shifter is moved from Park to Sport, together the sum of the two signals should add up to 100%. The 10R80 transmission mechanical shifter variant is range by wire with mechanical Park. The dual TR sensor's signals are used to determine customer selected range (P, R, N, D, S). PIDs, TR_A_DC and TR_B_DC may be utilized to monitor the TR sensor duty cycles.
TSS Sensor	The TSS sensor is a 2-Wire Hall-effect type sensor that provides a TSS signal to the PCM or TCM that changes in frequency as the magnetic trigger wheel part of the planearty carrier No. 2 varies in speed or direction. The TSS information is compared to engine rpm to determine TSS performance. TSS is also compared to OSS to determine shift quality and clutch performance. The TSS sensor is mounted to the transmission case.
OSS Sensor	The OSS sensor is a 2-Wire Hall-effect type sensor that provides a OSS signal to the PCM or TCM that changes in frequency as the trigger wheel part of the output shaft and planearty carrier No. 4 varies in speed or direction. The OSS is used for shift scheduling. OSS is also compared to TSS to determine shift quality and clutch performance. The OSS sensor is mounted to the transmission case.
Intermediate Speed Sensor A	The intermediate speed sensor A (ISSA), is a 2-Wire Hall-effect type sensor that provides a intermediate speed sensor A (ISSA) signal to the PCM or TCM that changes in frequency as the trigger wheel part of the No. 1 ring gear varies in speed or direction. The intermediate speed sensor A (ISSA) is used to monitor clutch states for transmission fault detection and diagnostics. The intermediate speed sensor A (ISSA) is mounted to the transmission case.
Intermediate Speed Sensor B	The intermediate speed sensor B (ISSB), is a 2-Wire Hall-effect type sensor that provides a intermediate speed sensor B (ISSB) signal to the PCM or TCM that changes in frequency as the trigger wheel part of the clutch and planetary container cylinder varies in speed or direction. The intermediate speed sensor B (ISSB) is used to monitor clutch states for transmission fault detection and diagnostics. The intermediate speed sensor B (ISSB) is mounted to the transmission case.

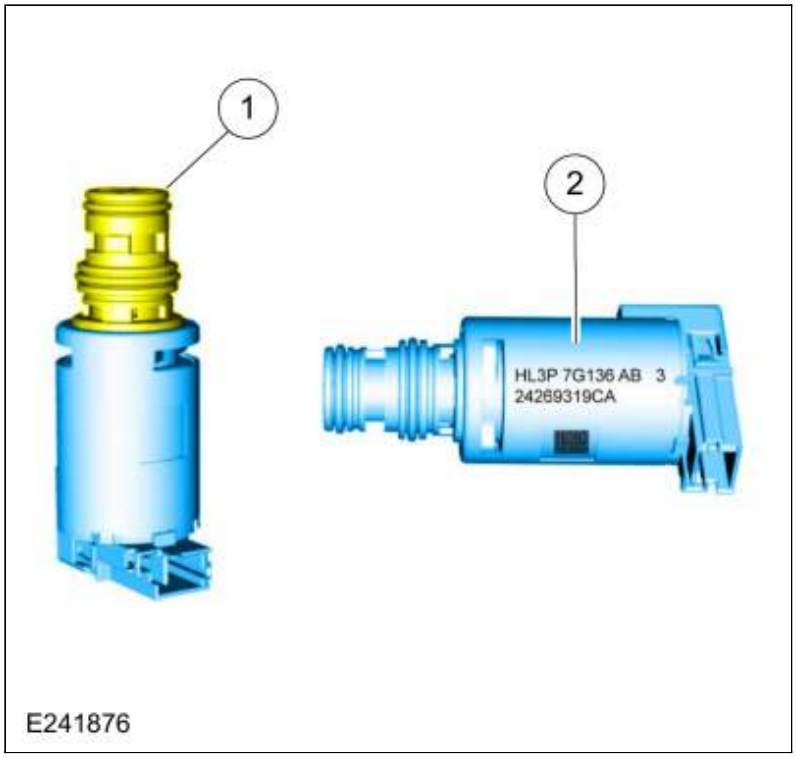
Shift Solenoids



Item	Description
1	Armature/pin assembly
2	Part information

The 10R80 utilizes six shift (A-F) solenoids that are linear force solenoids. Unlike previous shift solenoids they are mechanical in nature in that no transmission fluid passes through them. CIDASs use a armature/pin assembly that moves a control valve in the main control valve body to control and apply hydraulic fluid pressure. Each clutch (A-F) has a corresponding shift solenoid (A-F) that is directly proportional in that zero current equals zero pressure and maximum current equals maximum pressure. Since there is no pressure with zero current if the power is interrupted to the shift solenoids none of the clutch packs are able to engage.

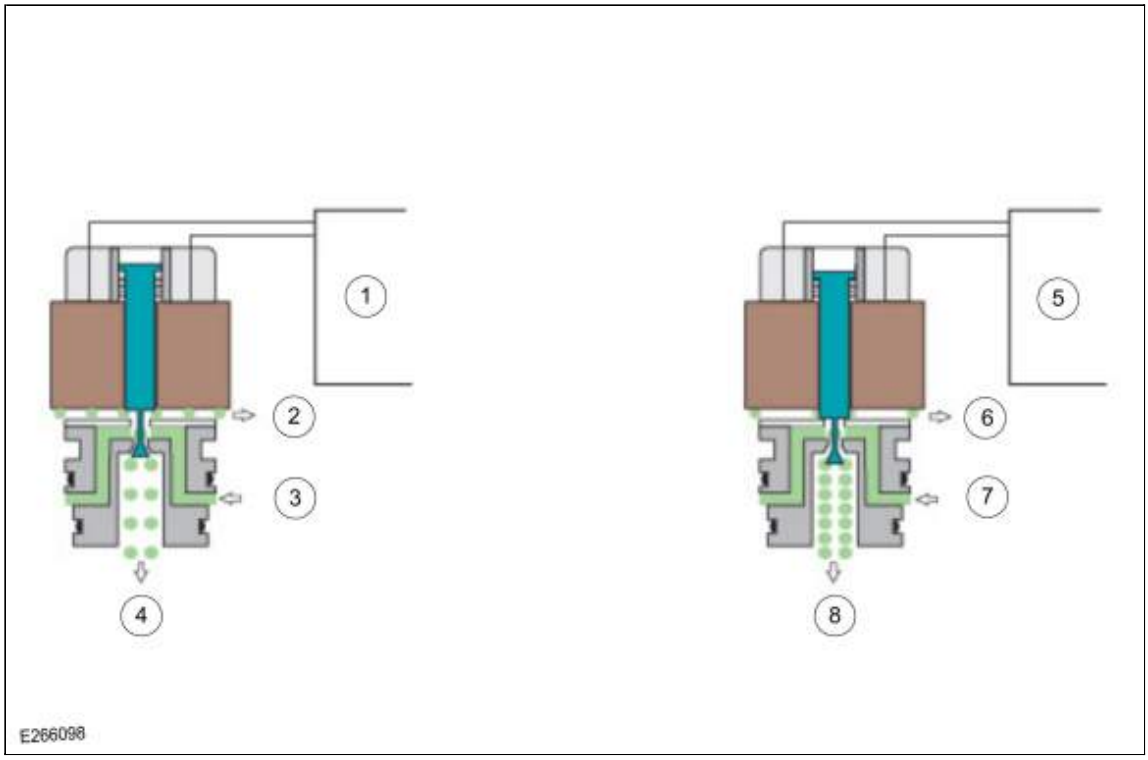
Torque Converter Clutch (TCC) Proportional (VFS) and Line Pressure Control (LPC) Solenoid (Inversely-Proportional (VFS)



Item	Description
1	Solenoid nozzle
2	Part information

Torque Converter Clutch (TCC) Proportional (VFS)

Normally Low Solenoid

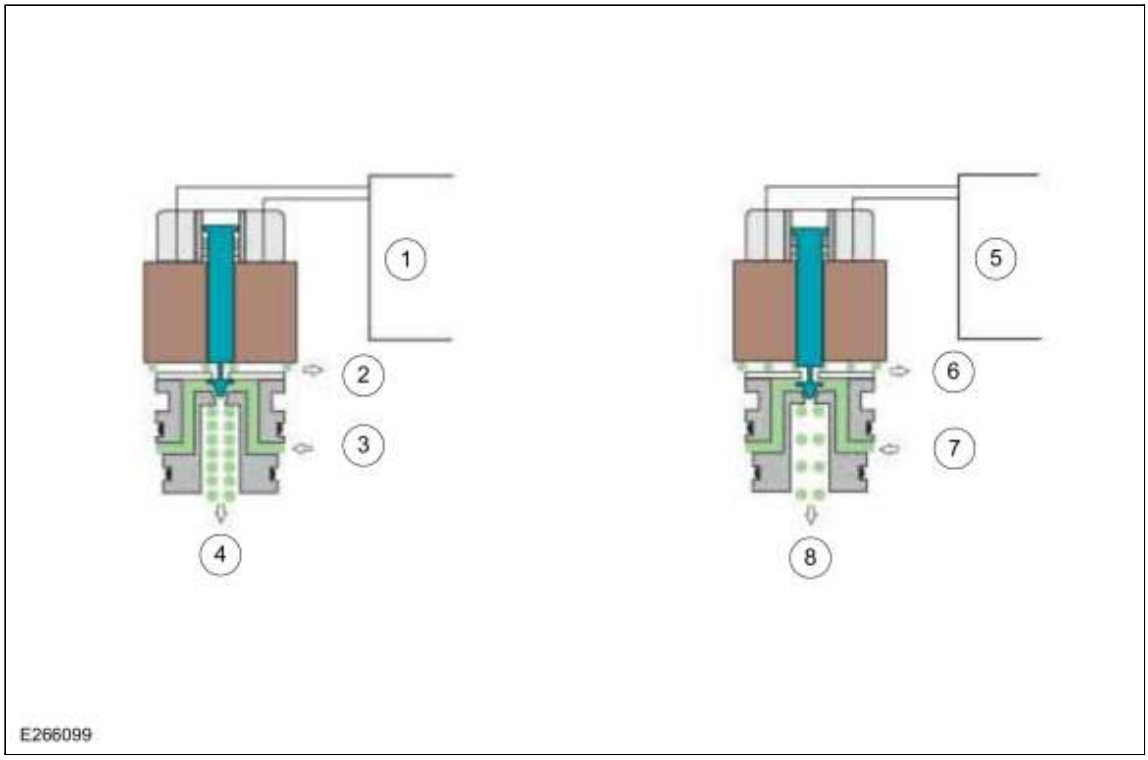


Item	Description
1.	Low Current
2.	High Exhaust
3.	SF Circuit Fluid (Supply)
4.	Low Pressure Output
5.	High Current
6.	Low Exhaust
7.	SF Circuit Fluid (Supply)
8.	High Pressure Output

The TCC solenoid is a variable force solenoid that varies hydraulic pressure by actuating a hydraulic valve. The TCC solenoid uses proportional operation. Normally low solenoids provide hydraulic pressure proportional to supplied current. A normally low solenoid will output very low pressure with low (50 mA) or no current, while it will supply high pressure with high current (850 mA).

Line Pressure Control (LPC) Solenoid (Inversely-Proportional (VFS)

Normally High Solenoid



Item	Description
1.	Low Current
2.	Low Exhaust
3.	SF Circuit Fluid (Supply)
4.	High Pressure Output
5.	High Current
6.	High Exhaust
7.	SF Circuit Fluid (Supply)
8.	Low Pressure Output

The LPC solenoid is a variable force solenoid that varies hydraulic pressure by actuating a hydraulic valve. The LPC solenoid uses inversely proportional operation. Normally high solenoids provide full output of pressure with low or no current (50 mA) and very low pressure with high current (850 mA).

Transmission External Sealing

The front support cover and seal assembly has a bonded rubber seal around the outside that seals to the front support housing. A removable rubber seal on the inside of the front support cover seals the area around the front support cover bolt. A torque converter hub seal is held into the front support cover with a snap ring and is serviced as an assembly.

The front support assembly uses a large rubber seal that seals the support housing to the transmission case.

The transmission fluid cooler tubes use 2 rubber seals with plastic backing rings to seal the tubes to the transmission case.

On the left side of the transmission case, there is a line pressure tap plug.

The manual control shaft has a lip seal that is pressed in the transmission case.

The transmission fluid pan has a reusable gasket.

The output shaft uses a lip-type seal that seals to the transmission case and output shaft nut. The output shaft nut has a bonded rubber O-ring on the inside that seals to the shaft threads.

The large transmission case housing plug provides access to the park pawl shaft and has an O-ring seal.

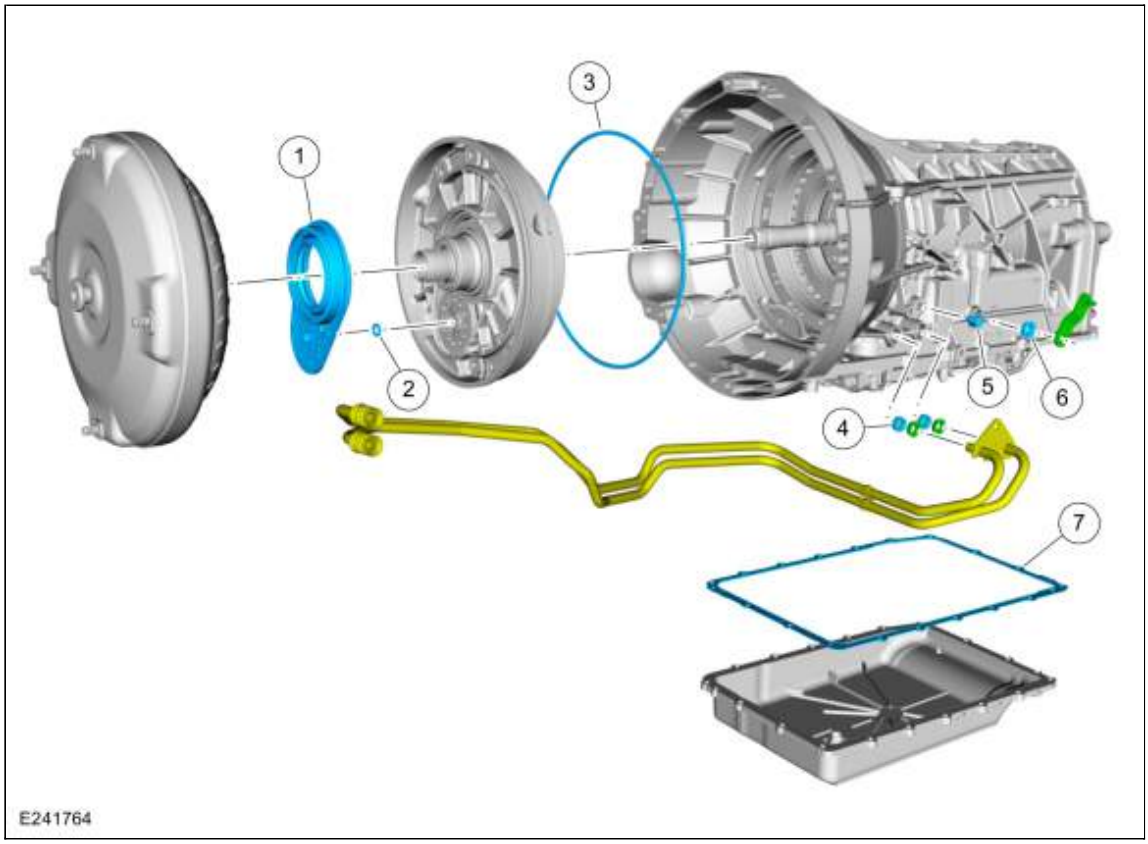
The park pawl actuator sleeve has 2 O-ring seals that seal to the transmission case.

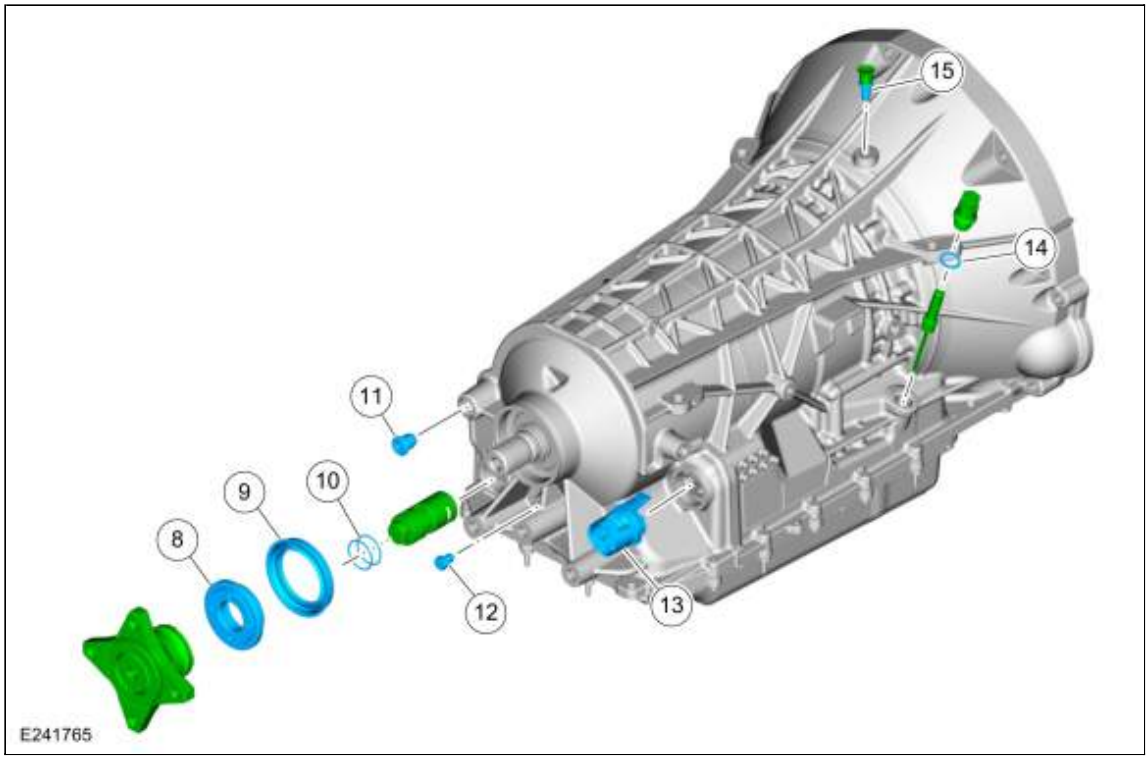
A plug seals the E clutch fluid passage in the rear of the transmission case.

The internal wiring harness bulkhead connector has 2 O-ring seals for the transmission case bore.

The transmission fluid level indicator plug uses an O-ring seal.

The transmission vent tube is pressed into the transmission case.



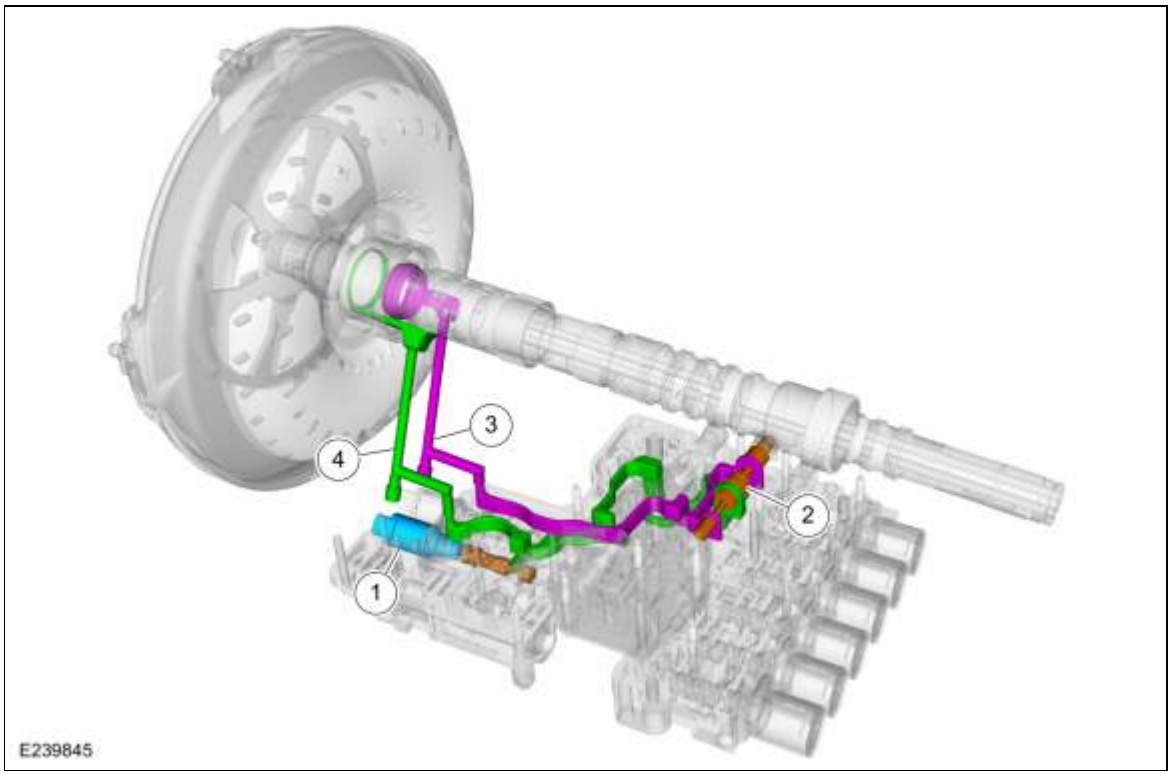


Item	Description
1	Front support cover and seal assembly
2	Seal part of front support cover and seal assembly
3	Front support-to-case seal
4	Transmission fluid cooler tube seals (2 required)
5	Line pressure tap plug
6	Manual control shaft seal
7	Transmission fluid pan gasket
8	Output shaft nut
9	Output shaft seal
10	Park pawl actuator rod sleeve seals (2 required)
11	Park pawl shaft plug
12	Transmission case plug
13	Internal wiring harness bulkhead connector O-rings
14	Transmission fluid level indicator plug O-ring
15	Transmission vent tube

Torque Converter

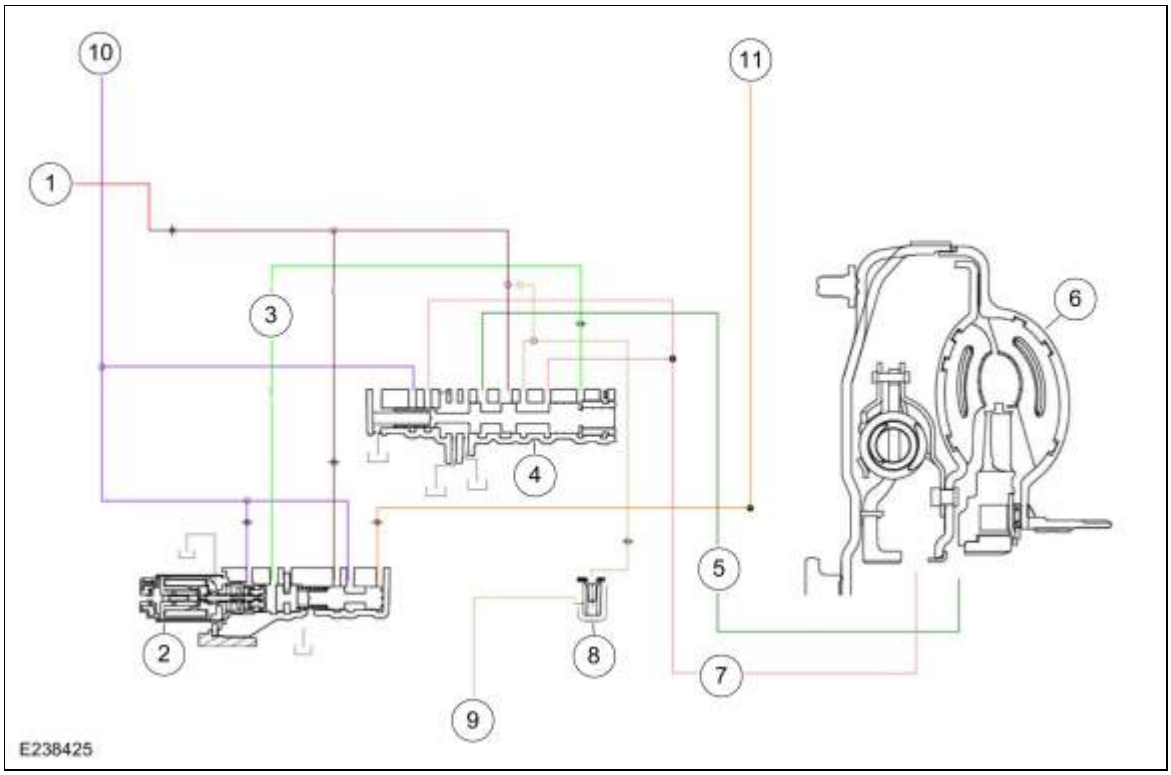
Base Part Number: 7902

Overview



Item	Description
1	TCC solenoid
2	TCC regulator valve assembly
3	TCC apply circuit
4	TCC release circuit

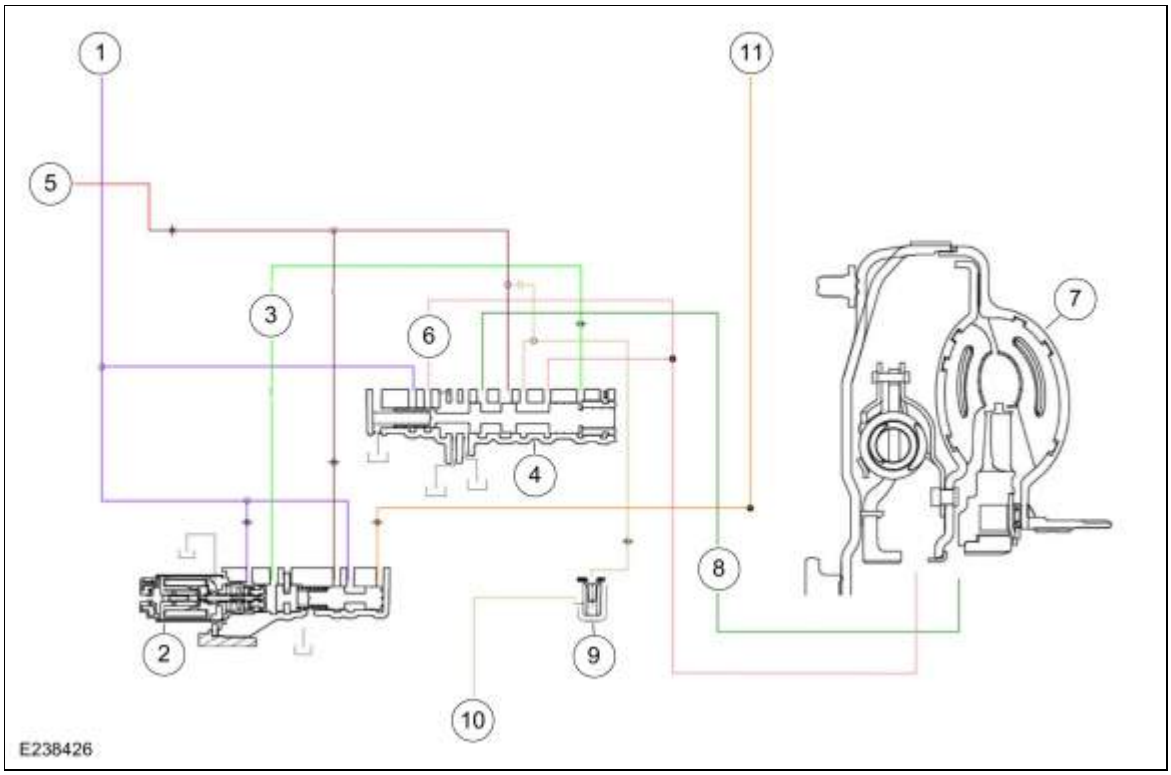
Torque Converter Hydraulic Circuits (TCC Released)



Item	Description
1	LPC pressure
2	TCC solenoid
3	TCC control pressure
4	TCC regulator valve
5	TCC release pressure
6	TCC
7	TCC exhaust to TCC regulator valve
8	Torque converter anti-drainback valve
9	TCC exhaust
10	Pump output
11	Decreased pressure from main requlator valve

Line pressure fills the converter feed circuit with fluid up to 160 PSI. The converter feed blow off valve prevents excessive pressure from reaching the torque converter. When the TCC solenoid is commanded off, the TCC regulator valve connects the converter feed circuit to the converter release circuit and fluid flows into the torque converter. Fluid exits the torque converter in the converter apply circuit. The TCC regulator valve connects the converter apply circuit and the from converter circuit. The from converter circuit flows past the converter anti-drainback valve and on to the cooler bypass valve.

Torque Converter Hydraulic Circuits (TCC Applied)

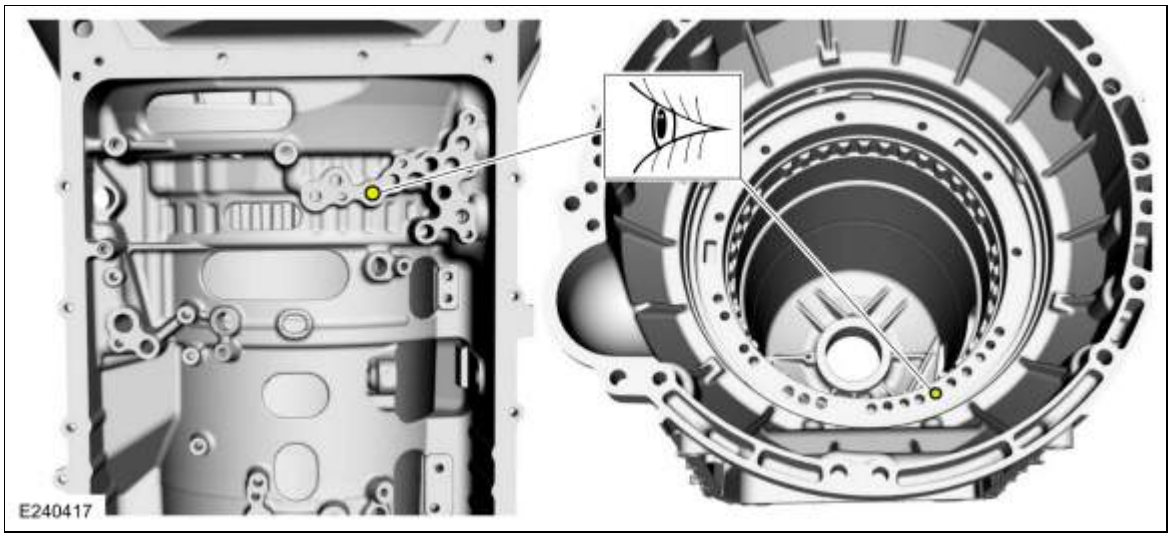


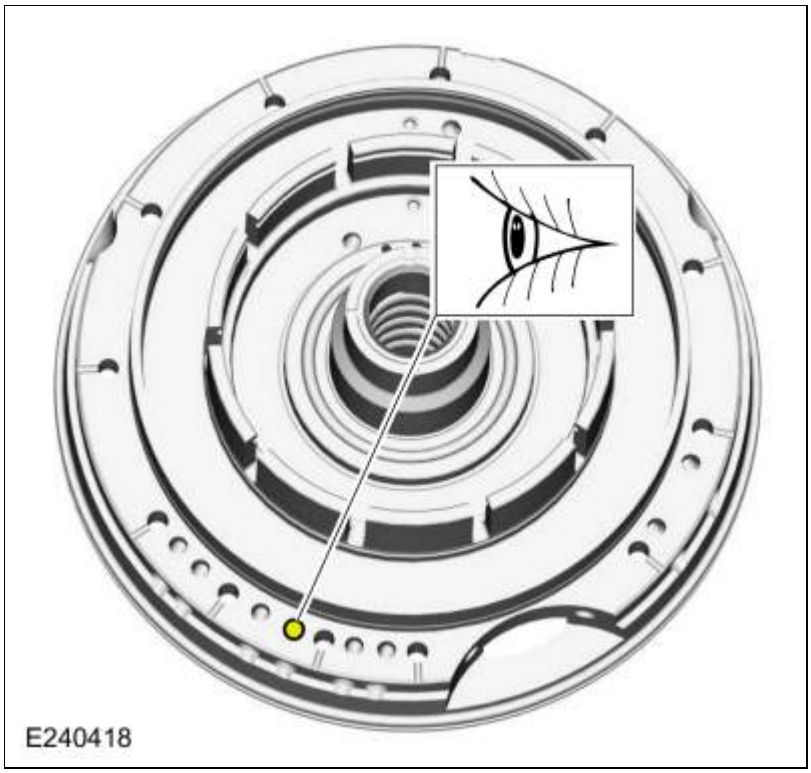
Item	Description
1	Pump output
2	TCC solenoid
3	TCC control pressure
4	TCC regulator valve
5	LPC pressure
6	TCC apply pressure
7	TCC
8	TCC exhaust to TCC regulator valve
9	Torque converter anti-drainback valve
10	TCC exhaust
11	Decreased pressure from main requlator valve

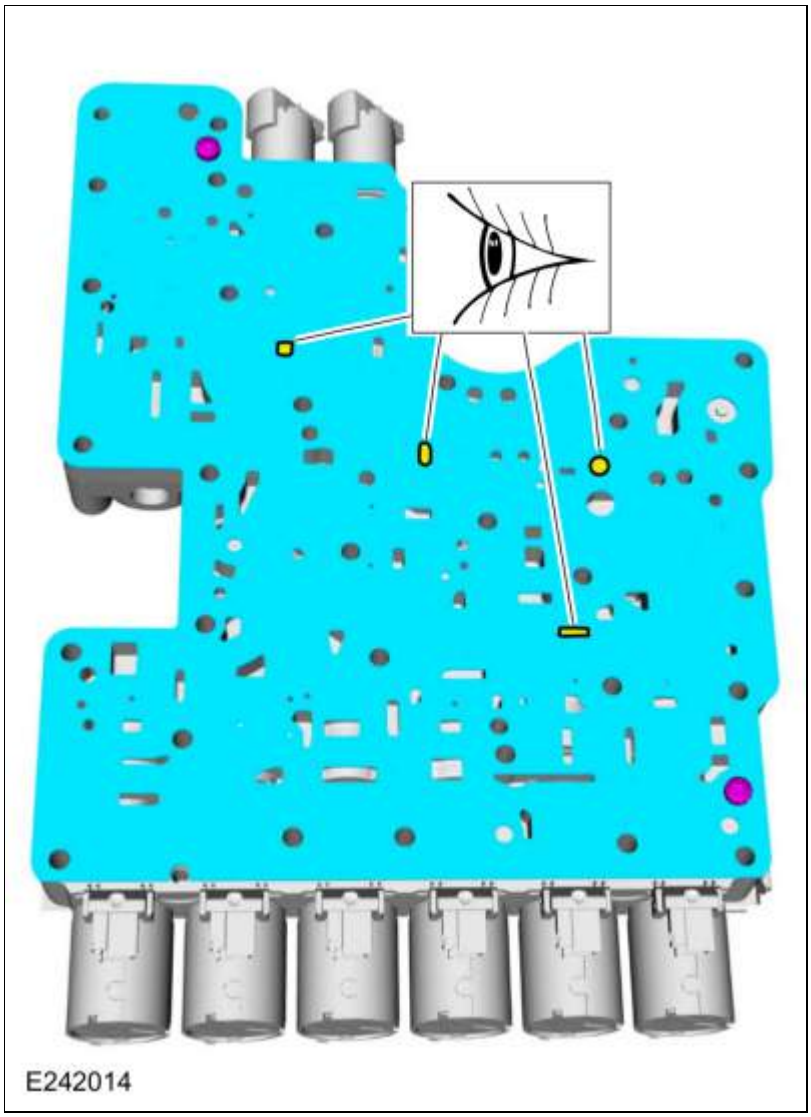
To apply to TCC, the TCC solenoid directs TCC control pressure to the TCC regulator valve, moving the valve to the left against the spring pressure. The TCC regulator valve is positioned to connect pump output to the converter apply circuit. Fluid in the apply circuit is routed to the converter and applies the TCC. Fluid exits the torque converter in the converter release circuit. The TCC regulator valve connects the converter release to exhaust and fluid returns to the sump.

When the TCC regulator valve is in the TCC applied position, the converter feed circuit is connected to the from converter circuit allowing continued fluid flow to the cooler bypass valve.

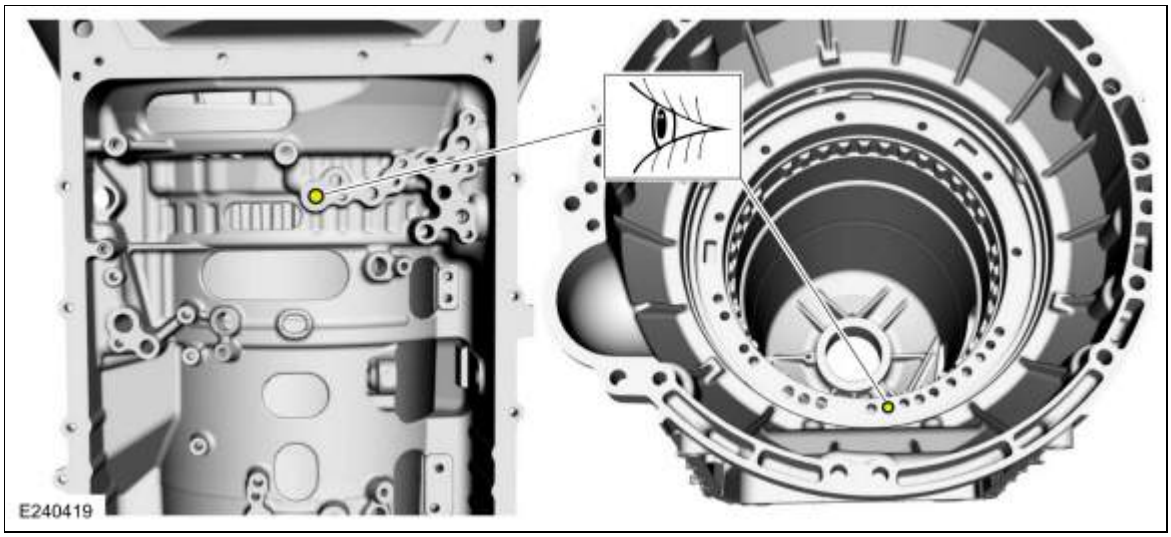
Torque Converter Hydraulic Passages (TCC Released)

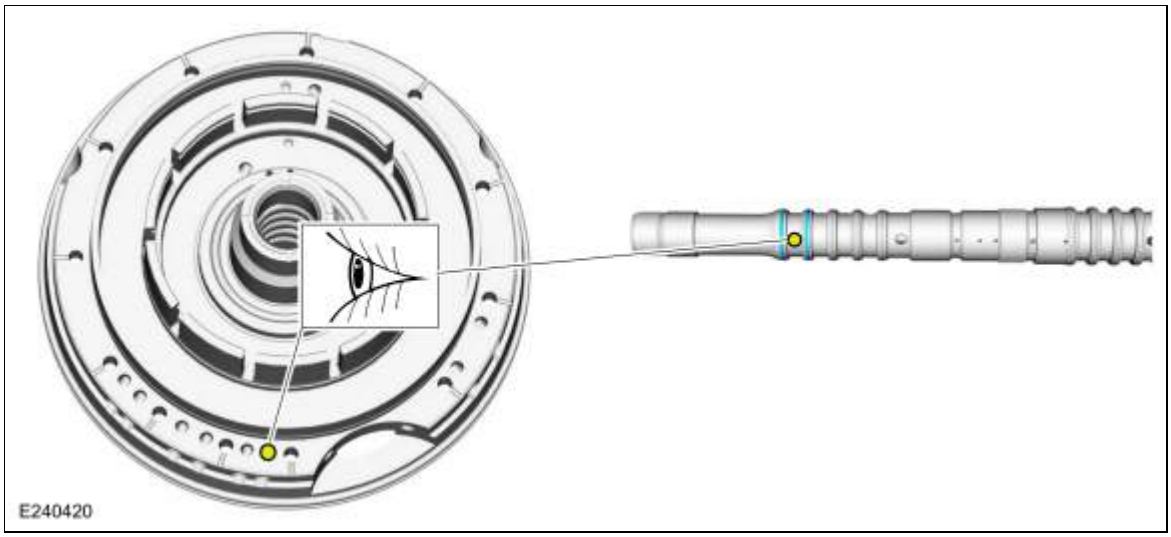


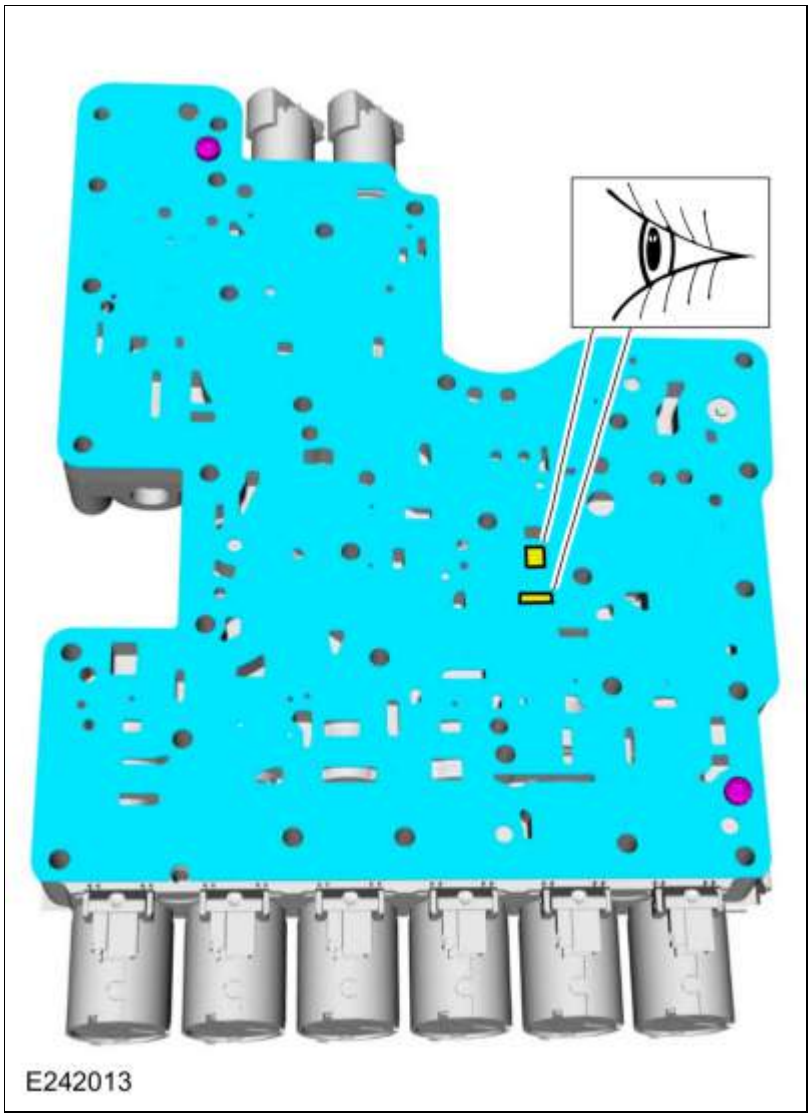




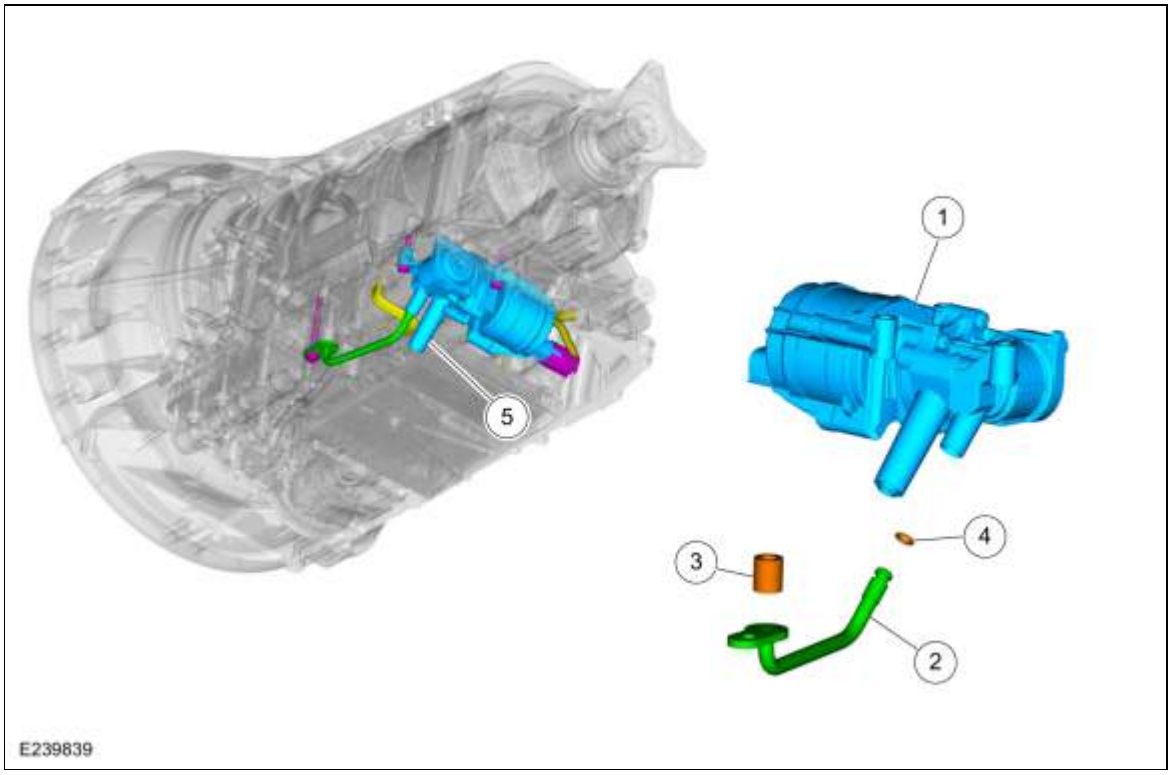
Torque Converter Hydraulic Passages (TCC Applied)







Transmission Fluid Auxiliary Pump



Item	Description
1	Transmission fluid auxiliary pump
2	Transmission fluid auxiliary pump tube
3	Transmission fluid auxiliary pump tube seal
4	Transmission fluid auxiliary pump tube O-ring
5	Transmission fluid auxiliary pump fluid inlet

10R80 transmissions with the auto-start stop feature are equipped with a transmission fluid auxiliary pump. This electronic pump is turned on before an engine stop event; allowing the transmission to remain engaged during the stop event. This allows quick response on the engine restart because the transmission is already in gear. The transmission fluid auxiliary pump does not have sufficient flow to apply clutches, but can keep clutches on when the engine stops and the main hydraulic pump stops providing pressure.

A Clutch

Symptom Chart

A Clutch Assembly

A Clutch

For A clutch operation,
REFER to: A Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Description and Operation).

A Clutch

Condition	Possible Sources	Action
A clutch does not apply	SSA is mechanically stuck OFF	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	A clutch regulator valve stuck OFF	DISASSEMBLE, CLEAN and INSPECT the regulator valve. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	A CL CONTR, hydraulic circuit blocked/leaking	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal

		and Installation).
	A clutch hub	INSPECT components wear and damage. CLEAN and/or INSTALL new components necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	A clutch friction plates	INSPECT components wear and damage. CLEAN and/or INSTALL new components necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	A clutch piston seals	INSPECT components wear and damage. CLEAN and/or INSTALL new components necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
A clutch always applied	SSA mechanically stuck	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	A clutch regulator valve or CL A latch valve stuck ON	DISASSEMBLE, CLEAN and INSPECT the regulator valve. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	A CL CONTR, hydraulic circuit cross leaks	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	A clutch hub, clutch and planetary carrier, No. 4 ring gear	INSPECT components wear and damage. CLEAN and/or INSTALL new components necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	A clutch friction plates	INSPECT components wear and damage. CLEAN and/or INSTALL new components necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	A clutch piston seals	INSPECT components wear and damage. CLEAN and/or INSTALL new components necessary. REFER to: Transmission (307-01 Automatic

		Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
A clutch delayed/soft/slipping apply	Incorrect transmission strategy programmed into PCM/ TCM.	PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	Low line pressure	PERFORM line pressure test. REFER to: Special Testing Procedures (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	SSA mechanically sticking	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	A clutch regulator valve sticking	DISASSEMBLE, CLEAN and INSPECT the valves. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	A CL CONTR, hydraulic circuits blocked/leaking	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	A clutch friction plates	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	A clutch piston seals	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
A clutch harsh apply	Incorrect transmission	PERFORM the Transmission Strategy Download,

	strategy programmed into PCM/ TCM.	REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	High line pressure	PERFORM line pressure test. REFER to: Special Testing Procedures (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	SSA mechanically sticking	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	A Clutch regulator valve sticking	DISASSEMBLE, CLEAN and INSPECT the valves. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	A CL CONTR hydraulic circuit blocked/leaking	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	A clutch friction plates	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	A clutch piston return springs	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).

B Clutch

Symptom Chart

B Clutch

For B clutch operation,
REFER to: B Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Description and Operation).

B Clutch

Condition	Possible Sources	Action
B clutch does not apply	SSB is mechanically stuck OFF	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	B Clutch regulator valve stuck OFF	DISASSEMBLE, CLEAN and INSPECT the regulator valve. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	B CL CONTR, hydraulic circuit blocked/leaking	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-

		Speed Automatic Transmission - 10R80, Removal and Installation).
	B clutch hub	INSPECT components wear and damage. CLEAN and/or INSTALL new components necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	B clutch friction plates	INSPECT components wear and damage. CLEAN and/or INSTALL new components necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	B clutch piston seals	INSPECT components wear and damage. CLEAN and/or INSTALL new components necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
B clutch always applied	SSB mechanically stuck	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	B Clutch regulator valve or CL B latch valve stuck ON	DISASSEMBLE, CLEAN and INSPECT the regulator valve. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	B CL CONTR, hydraulic circuit cross leaks	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	B clutch hub, clutch and	INSPECT components wear and damage. CLEAN

	planetary carrier, No. 4 ring gear	and/or INSTALL new components necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	B clutch friction plates	INSPECT components wear and damage. CLEAN and/or INSTALL new components necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	B clutch piston seals	INSPECT components wear and damage. CLEAN and/or INSTALL new components necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
B clutch delayed/soft/slipping apply	Incorrect transmission strategy programmed into PCM/ TCM.	PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	Low line pressure	PERFORM line pressure test. REFER to: Special Testing Procedures (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	SSB mechanically sticking	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	B Clutch regulator valve sticking	DISASSEMBLE, CLEAN and INSPECT the valves. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	B CL CONTR, hydraulic circuits blocked/leaking	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

	B clutch friction plates	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	B clutch piston seals	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
B clutch harsh apply	Incorrect transmission strategy programmed into PCM/ TCM.	PERFORM the Transmission Strategy Download, REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	High line pressure	PERFORM line pressure test. REFER to: Special Testing Procedures (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	SSB mechanically sticking	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	B Clutch regulator valve sticking	DISASSEMBLE, CLEAN and INSPECT the valves. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	B CL CONTR hydraulic circuit blocked/leaking	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

	B clutch friction plates	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	B clutch piston return springs	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).

C Clutch

Symptom Chart

C Clutch

For C clutch operation,
REFER to: C Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Description and Operation).

C Clutch

Condition	Possible Sources	Action
C clutch does not apply	SSC is mechanically stuck OFF	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	C Clutch regulator valve stuck OFF	DISASSEMBLE, CLEAN and INSPECT the regulator valve. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	C CL CONTR, hydraulic circuit blocked/leaking	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-

		Speed Automatic Transmission - 10R80, Removal and Installation).
	C clutch hub	INSPECT components wear and damage. CLEAN and/or INSTALL new components necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	C clutch friction plates	INSPECT components wear and damage. CLEAN and/or INSTALL new components necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	C clutch piston seals	INSPECT components wear and damage. CLEAN and/or INSTALL new components necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
C clutch always applied	SSC mechanically stuck	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	C Clutch regulator valve or CL C latch valve stuck ON	DISASSEMBLE, CLEAN and INSPECT the regulator valve. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	C CL CONTR, hydraulic circuit cross leaks	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	C clutch hub, clutch and planetary carrier, No.4	INSPECT components wear and damage. CLEAN and/or INSTALL new components necessary.

	ring gear	REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	C clutch friction plates	INSPECT components wear and damage. CLEAN and/or INSTALL new components necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	C clutch piston seals	INSPECT components wear and damage. CLEAN and/or INSTALL new components necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
C clutch delayed/soft/slipping apply	Incorrect transmission strategy programmed into PCM/ TCM.	PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	Low line pressure	PERFORM line pressure test. REFER to: Special Testing Procedures (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	SSC mechanically sticking	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	C Clutch regulator valve sticking	DISASSEMBLE, CLEAN and INSPECT the valves. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the transmission stratedgy download. REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	C CL CONTR, hydraulic circuits blocked/leaking	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With:

		Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	C clutch friction plates	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	C clutch piston seals	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
C clutch harsh apply	Incorrect transmission strategy programmed into PCM/ TCM.	PERFORM the Transmission Strategy Download, REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	High line pressure	PERFORM line pressure test. REFER to: Special Testing Procedures (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	SSC mechanically sticking	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	C Clutch regulator valve sticking	DISASSEMBLE, CLEAN and INSPECT the valves. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	C CL CONTR hydraulic circuit blocked/leaking	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With:

		Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	C clutch friction plates	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	C clutch piston return springs	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).

D Clutch

Symptom Chart

D Clutch

For D clutch operation,
REFER to: D Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Description and Operation).

D Clutch

Condition	Possible Sources	Action
D clutch does not apply	SSD is mechanically stuck OFF	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	D Clutch regulator valve stuck OFF	DISASSEMBLE, CLEAN and INSPECT the regulator valve. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	D CL CONTR, hydraulic circuit blocked/leaking	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-

		Speed Automatic Transmission - 10R80, Removal and Installation).
	D clutch hub	INSPECT components wear and damage. CLEAN and/or INSTALL new components as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	D clutch friction plates	INSPECT components wear and damage. CLEAN and/or INSTALL new components as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	D clutch piston seals	INSPECT components wear and damage. CLEAN and/or INSTALL new components as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
D clutch always applied	SSD mechanically stuck	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	D Clutch regulator valve or CL D latch valve stuck ON	DISASSEMBLE, CLEAN and INSPECT the regulator valve. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	D CL CONTR, hydraulic circuit cross leaks	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	D clutch hub, clutch and	INSPECT components wear and damage. CLEAN

	planetary carrier, No.4 ring gear	and/or INSTALL new components as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	D clutch friction plates	INSPECT components wear and damage. CLEAN and/or INSTALL new components as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	D clutch piston seals	INSPECT components wear and damage. CLEAN and/or INSTALL new components as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
D clutch delayed/soft/slipping apply	Incorrect transmission strategy programmed into PCM/ TCM.	PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	Low line pressure	PERFORM line pressure test. REFER to: Special Testing Procedures (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	SSD mechanically sticking	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	D Clutch regulator valve sticking	DISASSEMBLE, CLEAN and INSPECT the valve. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	Gain control valve stuck in default position.	DISASSEMBLE, CLEAN and INSPECT the valve. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

		REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	D CL CONTR, D CL-FB2 hydraulic circuits blocked/leaking	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	D clutch friction plates	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	D clutch piston seals	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
D clutch harsh apply	Incorrect transmission strategy programmed into PCM/ TCM.	PERFORM the Transmission Strategy Download, REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	High line pressure	PERFORM line pressure test. REFER to: Special Testing Procedures (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	SSD mechanically sticking	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	D Clutch regulator valve sticking	DISASSEMBLE, CLEAN and INSPECT the valves. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

		REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	Gain control valve stuck in applied position	DISASSEMBLE, CLEAN and INSPECT the valve. If bore or valve is damaged, INSTALL a new main control valve body. PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	D CL CONTR, D CL-FB2 hydraulic circuit blocked/leaking	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	D clutch friction plates	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	D clutch piston return springs	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).

Diagnosis By Symptom

Symptom Chart(s)

Symptom Chart: Automatic Transmission

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. REFER to: Diagnostic Methods (100-00 General Information, Description and Operation).

In most circumstances the PCM/ TCM sets a DTC to help guide with diagnostics. Refer to the DTC Chart before using the Symptom Chart. The Condition column lists the vehicle condition. The Possible Sources column lists a detailed vehicle condition. The Action column lists the action to be performed to determine the cause of the condition. Each action lists the components that can cause the symptom and the individual components in that system. The components are listed in order of disassembly. Use the list of components and the required action to focus on disassembly inspections for the root cause of the concern.

Symptom	Possible Sources	Action
• Engagement concerns	• No forward	• CHECK E clutch for No Apply. REFER to: E Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • CHECK A clutch for No Apply. REFER to: A Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • CHECK the low one way clutch for damage. REFER to: Low One-Way Clutch Assembly (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• No reverse	• CHECK F clutch for No Apply. REFER to: F Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • CHECK B clutch for No Apply. REFER to: B Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • CHECK D clutch for No Apply. REFER to: D Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).

	• Harsh reverse	• Corrupt or incorrect adaptive learn tables. PERFORM an adaptive learing drive cycle. REFER to: Adaptive Learning Drive Cycle (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures). • CHECK F clutch for Harsh Apply. REFER to: F Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • CHECK B clutch for Delayed Apply. REFER to: B Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • CHECK D clutch for Delayed Apply. REFER to: D Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• Harsh forward	• Corrupt or incorrect adaptive learn tables. PERFORM an adaptive learing drive cycle. REFER to: Adaptive Learning Drive Cycle (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures). • CHECK E clutch for Harsh Apply. REFER to: E Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • CHECK A clutch for Delayed Apply. REFER to: A Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• Delayed/soft reverse	• CHECK the transmission fluid level. REFER to: Transmission Fluid Level Check (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures). • CHECK line pressure. REFER to: Special Testing Procedures (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • CHECK F clutch for Delayed Apply. REFER to: F Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • CHECK B clutch for Delayed Apply. REFER to: B Clutch (307-01 Automatic

		Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • CHECK D clutch for Delayed Apply. REFER to: D Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• Delayed soft/forward	• CHECK the transmission fluid level. REFER to: Transmission Fluid Level Check (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures). • CHECK line pressure. REFER to: Special Testing Procedures (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • CHECK E clutch for damage. REFER to: E Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • CHECK A clutch for Delayed Apply. REFER to: A Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• No forward and no reverse	• CHECK the transmission fluid level. REFER to: Transmission Fluid Level Check (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures). • INSPECT the filter and filter to pump seal/gasket. REFER to: Transmission Fluid Pan, Gasket and Filter (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). • INSPECT the pump assembly. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul). • INSPECT main pressure regulator valve for damage, scoring, or sticking. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

		• INSPECT turbine shaft splines on transmission input shaft and in the torque converter turbine. REPLACE damaged components as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	• Delayed/soft forward and reverse	• CHECK the transmission fluid level. REFER to: Transmission Fluid Level Check (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures). • CHECK line pressure. REFER to: Special Testing Procedures (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • INSPECT the filter and filter to pump seal/gasket. REFER to: Transmission Fluid Pan, Gasket and Filter (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). • INSPECT main pressure regulator valve for damage, scoring, or sticking. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). • INSPECT the pump assembly. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	• Neutral after launch	• The Low One way clutch is not holding on acceleration. REFER to: Low One-Way Clutch Assembly (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• Harsh/soft/delayed engagement after stop/start restart.	• CHECK auxiliary transmission oil pump, pick up tube. Pump tube to case seal missing or damaged. Pump output tube blocked/restricted. REFER to: Transmission Fluid Auxiliary Pump (307-01 Automatic Transmission - 10-Speed Automatic Transmission -

		10R80, Removal and Installation).
• Shift concerns	• Slip on hard acceleration in 1st or 2nd	• One way clutch (roller type slipping). REFER to: Low One-Way Clutch Assembly (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• No 1-2 shift/harsh/soft/slipping	• C, D clutch may be damaged or worn. See condition C or D clutch does not apply. REFER to: C Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). REFER to: D Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The A clutch may be slipping during the shift. See condition A clutch delayed/soft/slipping apply. REFER to: A Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The E clutch may be seized Stuck on. REFER to: E Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• No 2-3 shift/harsh/soft/slipping	• The E clutch may be damaged or worn. REFER to: E Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • One Way clutch seized/stuck holding. REFER to: Low One-Way Clutch Assembly (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The A, C, or D clutch may be slipping during the shift. See condition A, C, or D clutch delayed/soft/slipping apply. REFER to: A Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). REFER to: C Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). REFER to: D Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).

	• No 3-4 shift/harsh/soft/slipping	• The E clutch may be damaged or worn. See condition E clutch does not apply. REFER to: E Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The A, C, or D clutch may be slipping during the shift. See condition A, C, or D clutch delayed/soft/slipping apply. REFER to: A Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). REFER to: C Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). REFER to: D Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The E clutch may not be releasing properly. See condition E clutch always applied. REFER to: E Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• No 4-5 shift/harsh/soft/slipping	• The E clutch may be damaged or worn. See condition, E clutch does not apply. REFER to: E Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The A, C, F clutch may be slipping during the shift. See condition A, C, F clutch delayed/soft/slipping apply. REFER to: A Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). REFER to: C Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). REFER to: F Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The D clutch may not be releasing properly. See condition D clutch always applied. REFER to: D Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).

	• No 5-6 shift/harsh/soft/slipping	• The D clutch may be damaged or worn. See condition D clutch does not apply. REFER to: D Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The A, E, F clutch may be slipping during the shift. See condition A, E, F clutch delayed/soft/slipping apply. REFER to: A Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). REFER to: E Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). REFER to: F Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The C clutch may not be releasing properly. See condition C clutch always applied. REFER to: C Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• No 6-7 shift/harsh/soft/slipping	• The C clutch may be damaged or worn. See condition C clutch does not apply. REFER to: C Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The D, E, F clutch may be slipping during the shift. See condition D, E, F clutch delayed/soft/slipping apply. REFER to: D Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). REFER to: E Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). REFER to: F Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The A clutch may not be releasing properly. See condition A clutch always applied. REFER to: A Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).

	• No 7-8 shift/harsh/soft/slipping	• CHECK B clutch for damage. REFER to: B Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The D, E, F clutch may be slipping during the shift. See condition D, E, F clutch delayed/soft/slipping apply. REFER to: D Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). REFER to: E Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). REFER to: F Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The C clutch may not be releasing properly. See condition C clutch always applied. REFER to: C Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• No 8-9 shift/harsh/soft/slipping	• The C clutch may be damaged or worn. See condition C clutch does not apply. REFER to: C Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The B, E, F clutch may be slipping during the shift. See condition B, E, F clutch delayed/soft/slipping apply. REFER to: B Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). REFER to: E Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). REFER to: F Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The D clutch may not be releasing properly. See condition D clutch always applied. REFER to: D Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• No 9-10	• CHECK D clutch for damage.

	shift/harsh/soft/slipping	REFER to: D Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The B, C, F clutch may be slipping during the shift. See condition B, C, F clutch delayed/soft/slipping apply. REFER to: B Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). REFER to: C Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). REFER to: F Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The E clutch may not be releasing properly. See condition E clutch always applied. REFER to: E Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• Only gears R, 1, 2, 3, 4, 5, 6 available • Only gears 7, 8, 9, 10 available	• The A clutch may not be releasing properly. See condition A clutch always applied. REFER to: A Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The A clutch assembly may be damaged or worn. See condition A clutch does not apply. REFER to: A Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• Only gears R, 8, 9, 10, M1, and M2 available • Only gears 1, 2, 3, 4, 5, 6, 7 available	• The B clutch may not be releasing properly. See condition Direct clutch always applied. REFER to: B Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The B clutch assembly may be damaged or worn. See condition Direct clutch does not apply. REFER to: B Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• Only gears 2, 3, 4, 5, 7, 9,	• The C clutch may not be releasing

	10 available • Only gears R, 1, 6, 8 available	properly. See condition C clutch always applied. REFER to: C Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The C clutch assembly may be damaged or worn. See condition C clutch does not apply. REFER to: C Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• Only gears R, 3, 4, 6, 7, 8, 10 available • Only gears 1, 5, 9 available	• The F clutch may not be releasing properly. See condition Low reverse clutch always applied. REFER to: F Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The E clutch assembly may be damaged or worn. See condition E clutch does not apply. REFER to: E Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• Only gears 1, 3, 5, 6, 7, 8, 9, available • Only gears R, 2, 4, 10 available	• The E clutch may not be releasing properly. See condition E clutch always applied. REFER to: E Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The E clutch assembly may be damaged or worn. See condition E clutch does not apply.
	• Only gears R, 4, 5, 6, 7, 8, 9, 10 available • Only gears 1, 2, 3 available	• The F clutch may not be releasing properly. See condition F clutch always applied. REFER to: F Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). • The F clutch assembly may be damaged or worn. See condition F clutch does not apply. REFER to: F Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• No engine braking in M1 or M2	• The B clutch assembly may be damaged or worn. See condition B clutch does not apply. REFER to: B Clutch (307-01 Automatic

		Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
• Torque converter operation concerns	• No apply	• CHECK for DTCs related to torque converter concerns. • INSPECT the torque converter hydraulic circuits and regulator valve for damage or wear. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Torque Converter Clutch (TCC) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• Always applied (engine stalls)	• CHECK for DTCs related to torque converter concerns. • INSPECT the torque converter hydraulic circuits and regulator valve for damage or wear. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Torque Converter Clutch (TCC) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• Cycling/shutter/chatter	• CHECK for DTCs related to torque converter concerns. • CHECK the transmission fluid level. REFER to: Transmission Fluid Level Check (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures). • INSPECT the torque converter hydraulic circuits and regulator valve for damage or wear. REFER to: Torque Converter Clutch (TCC) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
• Other concerns	• Selector lever high effort	• Selector lever cable routed wrong, binding or damaged.

		REFER to: Selector Lever Cable Adjustment (307-05 Automatic Transmission External Controls, General Procedures).
	• No start TR indicates R when selector lever is in P	• Selector lever cable routed wrong, binding or damaged. REFER to: Selector Lever Cable Adjustment (307-05 Automatic Transmission External Controls, General Procedures).
	• External leaks	• Damaged or worn seals. REFER to: Leakage Inspection (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	• Noise	• Engine drive accessories, suspension, CV joints, REFER to: Noise, Vibration and Harshness (NVH) (100-04 Noise, Vibration and Harshness, Diagnosis and Testing).
	• Vibration	• Engine drive accessories, suspension, CV joints, transmission fluid cooler tubes, REFER to: Noise, Vibration and Harshness (NVH) (100-04 Noise, Vibration and Harshness, Diagnosis and Testing).
	• No park range	• INSPECT the selector lever cable for correct adjustment. REFER to: Selector Lever Cable Adjustment (307-05 Automatic Transmission External Controls, General Procedures).
		• INSPECT the manual control lever for damage, wear or correct installation. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
		• INSPECT the park pawl, park pawl actuator, for damage or wear. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	• Overheating	• Transmission fluid cooling system damaged. REFER to: Transmission Cooling (307-02 Transmission Cooling - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).

Diagnostic Trouble Code (DTC) Charts and Pinpoint Tests - 2.3L EcoBoost (201kW/273PS)

DTC Chart: PCM

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. REFER to: Diagnostic Methods (100-00 General Information, Description and Operation).

DTC Chart

DTC	Description	Warning Light/DTC Type	Action
P0657	Actuator Supply Voltage "A" Circuit Open	MIL, Wrench/Continuous	If the power circuit to the transmission solenoids is interrupted then all solenoids are failed electrically off. CHECK for an open, short to ground or the transmission connector disconnected. REPAIR as required. CLEAR the DTC. GO to Pinpoint Test A
P0702	Transmission Control System Electrical	Wrench/Continuous	INSPECT the PCM power and ground circuits for opens or short to ground. INSPECT the PCM connector for damaged or pushed-out terminals, corrosion or loose wires. CLEAR the DTC. RERUN the KOEO and KOER self-test. If DTC P0702 returns, REFER to: Charging System (414-00 Charging System - General Information, Diagnosis and Testing).
P0706	Transmission Range Sensor "A" Circuit Range/Performance	Wrench/KOEO, Continuous	The TR sensor outputs a duty cycle indicating manual lever position. This DTC sets when the frequency is greater or less than the expected duty cycle by 25Hz or more. Engine may not crank. CLEAR the DTC. If DTC P0706 returns, GO to Pinpoint Test C
P0707	Transmission Range Sensor "A" Circuit Low	Wrench/KOEO, Continuous	Engine may not crank, CLEAR the DTC. If DTC P0707 returns, GO to Pinpoint Test C
P0708	Transmission Range Sensor "A" Circuit High	Wrench/KOEO, Continuous	Engine may not crank, CLEAR the DTC. If DTC P0708 returns, GO to Pinpoint Test C
P0709	Transmission Range Sensor "A" Circuit Intermittent	Wrench/Continuous	The TR sensor outputs a duty cycle indicating manual lever position. This DTC sets when the duty cycle is within range but is in the dead band between the design position, and an in-range but invalid duty cycle. GO to Pinpoint Test C
P0710	Transmission Fluid Temperature Sensor "A" Circuit	Wrench/Continuous	CLEAR the DTC. If DTC P0710 returns, GO to Pinpoint Test B

P0711	Transmission Fluid Temperature Sensor "A" Circuit Range/Performance	MIL/Continuous	CLEAR the DTC. Road test the vehicle at least 5 minutes. If DTC P0711 returns, GO to Pinpoint Test B
P0712	Transmission Fluid Temperature Sensor "A" Circuit Low	MIL/KOEO, Continuous	DTC P0710 may set. CLEAR the DTC. If DTC P0712 returns, GO to Pinpoint Test B
P0713	Transmission Fluid Temperature Sensor "A" Circuit High	MIL/KOEO, Continuous	DTC P0710 may set. CLEAR the DTC. If DTC P0713 returns, GO to Pinpoint Test B
P0715	TSS Sensor "A" Circuit	MIL/KOEO, Continuous	CLEAR DTC. If DTC P0715 returns during KOEO, GO to Pinpoint Test D
P0716	TSS Sensor "A" Circuit Range/Performance	MIL/Continuous	GO to Pinpoint Test H
P0717	TSS Sensor "A" Circuit No Signal	Wrench/Continuous	P0717 illuminates the wrench light in conjunction with P0715, P07BF, and/or P07C0. Service the more specific DTC first. GO to Pinpoint Test D
P0718	TSS Sensor "A" Circuit Intermittent	MIL/Continuous	The PCM detected TSS sensor fault, but the fault did not last long enough for the PCM to set a more specific TSS sensor DTC. Inspect TSS sensor wiring and connectors for damage.
P0720	Output Shaft Speed Sensor Circuit	MIL/KOEO, Continuous	CLEAR the DTC. If DTC P0720 returns during KOEO, GO to Pinpoint Test D
P0721	Output Shaft Speed Sensor Circuit Range/Performance	MIL/Continuous	GO to Pinpoint Test H
P0722	Output Shaft Speed Sensor Circuit No Signal	Wrench/Continuous	DTC P0722 illuminates the wrench light in conjunction with P0720, P077C, and/or P077D. Service the more specific DTC first. GO to Pinpoint Test D
P0723	Output Shaft Speed Sensor Circuit Intermittent	MIL/Continuous	The PCM detected OSS sensor fault, but the fault did not last long enough for the PCM to set a more specific OSS sensor DTC. Inspect OSS sensor wiring and connectors for damage.
P0729	Gear 6 Incorrect Ratio	Wrench/Continuous	The PCM detected multiple ratio errors either in or while shifting to 6th gear. The ratio error did not last long enough for the PCM to isolate the fault to a specific clutch. REFER to: Diagnosis By Symptom (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P0731	Gear 1 Incorrect Ratio	Wrench/Continuous	The PCM detected multiple ratio error either in or while shifting to 1st gear. The ratio error did not last long enough for the PCM to isolate the fault to a specific clutch. REFER to: Diagnosis By Symptom (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P0732	Gear 2 Incorrect Ratio	Wrench/Continuous	The PCM detected multiple ratio error either in

			or while shifting to 2nd gear. The ratio error did not last long enough for the PCM to isolate the fault to a specific clutch. REFER to: Diagnosis By Symptom (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P0733	Gear 3 Incorrect Ratio	Wrench/Continuous	The PCM detected multiple ratio error either in or while shifting to 3rd gear. The ratio error did not last long enough for the PCM to isolate the fault to a specific clutch. REFER to: Diagnosis By Symptom (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P0734	Gear 4 Incorrect Ratio	Wrench/Continuous	The PCM detected multiple ratio errors either in or while shifting to 4th gear. The ratio error did not last long enough for the PCM to isolate the fault to a specific clutch. REFER to: Diagnosis By Symptom (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P0735	Gear 5 Incorrect Ratio	Wrench/Continuous	The PCM detected multiple ratio errors either in or while shifting to 5th gear. The ratio error did not last long enough for the PCM to isolate the fault to a specific clutch. REFER to: Diagnosis By Symptom (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P0736	Reverse Incorrect Ratio	Wrench/Continuous	The PCM detected multiple ratio error either in or while shifting to Reverse. The ratio error did not last long enough for the PCM to isolate the fault to a specific clutch. REFER to: Diagnosis By Symptom (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P0740	Torque Converter Clutch Solenoid Circuit/Open	Wrench/KOEO, Continuous	CLEAR DTC. If DTC P0740 returns during KOER, GO to Pinpoint Test G
P0741	Torque Converter Clutch Solenoid Circuit Performance/Stuck Off	Wrench/Continuous	DTC P0741 is a non-electrical failure that caused the TCC to fail to apply. For TCC Does Not Apply Symptom, REFER to: Torque Converter Clutch (TCC) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P0743	Torque Converter Clutch Solenoid Circuit Electrical	Wrench/KOEO, Continuous	DTC P0743 illuminates the wrench light in conjunction with P0740, P2769, and/or P2770. Service the more specific DTC first. GO to Pinpoint Test G
P0748	Pressure Control Solenoid Electrical	Wrench/KOEO, Continuous	DTC P0748 illuminates the wrench light in conjunction with P0960, P0962, and/or P0963. Service the more specific DTC first. GO to Pinpoint Test G
P0751	Shift Solenoid "A" Performance/Stuck Off	MIL/KOEO, Continuous	DTC P0751 is a non-electrical failure indicating the A clutch failed to apply. For A clutch Does

			Not Apply symptom, REFER to: A Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P0752	Shift Solenoid "A" Stuck On	MIL/Continuous	DTC P0752 is a non-electrical failure indicating the A clutch stayed applied when SSA was de-energized. For A clutch Always Applied symptom, REFER to: A Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P0753	Shift Solenoid "A" Electrical	Wrench/KOEO, Continuous	DTC P0753 illuminates the wrench light in conjunction with P0973, P0974, and/or P097A. Service the more specific DTC first. GO to Pinpoint Test A
P0754	Shift Solenoid "A" Intermittent	MIL/Continuous	The PCM detected a SSA fault, but the fault did not last long enough for the PCM to set a more specific SSA DTC. Inspect SSA wiring and connectors for damage.
P0756	Shift Solenoid "B" Performance/Stuck Off	MIL/Continuous	DTC P0756 is a non-electrical failure indicating the B clutch failed to apply. For B clutch Does Not Apply symptom, REFER to: B Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P0757	Shift Solenoid "B" Stuck On	MIL/Continuous	DTC P0757 is a non-electrical failure indicating B clutch stayed applied when SSB was de-energized. For B clutch Always Applied symptom, REFER to: B Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P0758	Shift Solenoid "B" Electrical	Wrench, KOEO, Continuous	DTC P0758 illuminates the wrench light in conjunction with P0976, P0977, and/or P097B. Service the more specific DTC first. GO to Pinpoint Test A
P0759	Shift Solenoid "B" Intermittent	MIL/Continuous	The PCM detected SSB fault, but the fault did not last long enough for the PCM to set a more specific SSB DTC. Inspect SSB wiring and connectors for damage.
P0761	Shift Solenoid "C" Performance/Stuck Off	MIL/Continuous	DTC P0761 is a non-electrical failure indicating the C clutch failed to apply. For C clutch Does Not Apply symptom, REFER to: C Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P0762	Shift Solenoid "C" Stuck On	MIL/Continuous	DTC P0762 is a non-electrical failure indicating the C clutch stayed applied when SSC was de-energized. For C clutch Always Applied symptom, REFER to: C Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).

P0763	Shift Solenoid "C" Electrical	Wrench, KOEO, Continuous	DTC P0763 illuminates the wrench light in conjunction with P0779, P097C, and/or P0980. Service the more specific DTC first. GO to Pinpoint Test A
P0764	Shift Solenoid "C" Intermittent	MIL/Continuous	The PCM detected SSC fault, but the fault did not last long enough for the PCM to set a more specific SSC DTC. Inspect SSC wiring and connectors for damage.
P0766	Shift Solenoid "D" Performance/Stuck Off	MIL/Continuous	DTC P0761 is a non-electrical failure indicating D clutch failed to apply. For D clutch Does Not Apply symptom, REFER to: D Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P0767	Shift Solenoid "D" Stuck On	MIL/Continuous	DTC P0757 is a non-electrical failure indicating the D clutch stayed applied when SSD was de-energized. For D clutch Always Applied symptom, REFER to: D Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P0768	Shift Solenoid "D" Electrical	Wrench, KOEO, Continuous	DTC P0768 illuminates the wrench light in conjunction with P097D, P0982, P0982 illuminates the Wrench light. Service the more specific DTC first. GO to Pinpoint Test A
P0769	Shift Solenoid "D" Intermittent	MIL/Continuous	The PCM detected SSD fault, but the fault did not last long enough for the PCM to set a more specific SSD DTC. Inspect SSD wiring and connectors for damage.
P076F	Gear 7 Incorrect Ratio	Wrench/Continuous	The PCM detected multiple ratio error either in or while shifting to 7th gear. The ratio error did not last long enough for the PCM to isolate the fault to a specific clutch. REFER to: Diagnosis By Symptom (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P0771	Shift Solenoid "E" Performance/Stuck Off	MIL/Continuous	DTC P0761 is a non-electrical failure indicating the E clutch failed to apply. For E clutch Does Not Apply symptom, REFER to: E Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P0772	Shift Solenoid "E" Stuck On	MIL/Continuous	DTC P0772 is a non-electrical failure indicating the E clutch stayed applied when SSE was de-energized. For E clutch Always Applied symptom, REFER to: E Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P0773	Shift Solenoid "E" Electrical	Wrench/Continuous	DTC P0773 illuminates the wrench light in conjunction with P097E, P0985, P0986. Service the more specific DTC first. GO to Pinpoint Test A

P0774	Shift Solenoid "E" Intermittent	MIL/Continuous	The PCM detected SSE fault, but the fault did not last long enough for the PCM to set a more specific SSE DTC. Inspect SSE wiring and connectors for damage.
P077D	Output Shaft Speed Sensor Circuit High	MIL/KOEO, Continuous	GO to Pinpoint Test D
P0791	Intermediate Shaft Speed Sensor "A" Circuit	MIL/Continuous	GO to Pinpoint Test D
P0792	Intermediate Shaft Speed Sensor "A" Circuit Range/Performance	MIL/Continuous	GO to Pinpoint Test H
P0793	Intermediate Shaft Speed Sensor "A" Circuit No Signal	Wrench	GO to Pinpoint Test D
P0794	Intermediate Shaft Speed Sensor "A" Circuit Intermittent	MIL/Continuous	GO to Pinpoint Test D
P07A9	Transmission Friction Element "D" Stuck On	None/Continuous	The PCM detected that D clutch failed to release multiple times and determined the SSD is not stuck on. For D clutch Always Applied symptom, REFER to: D Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P07AB	Transmission Friction Element "E" Stuck On	None/Continuous	The PCM detected that E clutch failed to release multiple times and determined the SSE is not stuck on. For E clutch Always Applied symptom, REFER to: E Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P07AD	Transmission Friction Element "F" Stuck On	None/Continuous	The PCM detected that F clutch failed to release multiple times and determined the SSF is not stuck on. For F clutch Always Applied symptom, REFER to: F Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P07C0	TSS Sensor "A" Circuit High	MIL/KOEO, Continuous	GO to Pinpoint Test D
P07C6	Intermediate Shaft Speed Sensor "A" Circuit High	MIL/Continuous	GO to Pinpoint Test D
P07C8	Intermediate Shaft Speed Sensor "B" Circuit High	MIL/KOEO, Continuous	GO to Pinpoint Test D
P07D9	Gear 8 Incorrect Ratio	Wrench/Continuous	The PCM detected multiple ratio error either in or while shifting to 8th gear. The ratio error did not last long enough for the PCM to isolate the fault to a specific clutch. REFER to: Diagnosis By Symptom (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).

P07F6	Gear 9 Incorrect Ratio	Wrench/Continuous	The PCM detected multiple ratio error either in or while shifting to 9th gear. The ratio error did not last long enough for the PCM to isolate the fault to a specific clutch. REFER to: Diagnosis By Symptom (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P07F7	Gear 10 Incorrect Ratio	Wrench/Continuous	The PCM detected multiple ratio error either in or while shifting to 10th gear. The ratio error did not last long enough for the PCM to isolate the fault to a specific clutch. REFER to: Diagnosis By Symptom (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P0868	Transmission Fluid Pressure Low	Wrench/Continuous	CLEAR the DTC. Road test vehicle, if DTC P0868 returns, or if DTCs P0751, P0756, P0761, P0766, P0771 or P2707 are set, TEST for low pump pressure or fluid contamination. PERFORM the line pressure test. REFER to: Special Testing Procedures (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P0882	TCM Power Input Signal Low	MIL/KOEO, Continuous	INSPECT the PCM power and ground circuits for opens or short to ground. INSPECT the PCM connector for damaged or pushed-out terminals, corrosion or loose wires. CLEAR the DTC. If DTC P0882 returns, REFER to: Charging System (414-00 Charging System - General Information, Diagnosis and Testing).
P0883	TCM Power Input Signal High	MIL/KOEO, Continuous	CLEAR the DTC. If DTC P0883 returns, REFER to: Charging System (414-00 Charging System - General Information, Diagnosis and Testing).
P0884	TCM Power Input Signal Intermittent	MIL/Continuous	REFER to: Electronic Engine Controls (303-14 Electronic Engine Controls - 2.3L EcoBoost (201kW/273PS), Diagnosis and Testing).
P0960	Pressure Control Solenoid Control Circuit/Open	MIL/KOEO, Continuous	The LPC solenoid failed to max pressure indicating wiring or connector issues, or a solenoid electrical issue. INSPECT the LPC solenoid wiring, connectors and pins. GO to Pinpoint Test G
P0961	Pressure Control Solenoid Control Circuit Range/Performance	MIL/Continuous	The LPC solenoid failed to max pressure indicating wiring or connector issues, or a solenoid electrical issue. INSPECT the LPC solenoid wiring, connectors and pins. GO to Pinpoint Test G
P0962	Pressure Control Solenoid Control Circuit Low	MIL/KOEO, Continuous	The LPC solenoid failed to max pressure indicating wiring or connector issues, or a solenoid electrical issue. INSPECT the LPC solenoid wiring, connectors and pins. GO to

			Pinpoint Test G
P0963	Pressure Control Solenoid Control Circuit High	MIL/KOEO, Continuous	The LPC solenoid failed to high current which is maximum pressure indicating short to ground, wiring or solenoid issue. INSPECT the LPC solenoid wiring, connectors and pins. GO to Pinpoint Test G
P0973	Shift Solenoid "A" Control Circuit Low	MIL/KOEO, Continuous	This DTC indicates a short to ground in the SSA electrical. Since SSA shorted to ground causes SSA to be failed to high current (maximum pressure since SSA is directly proportional). A clutch is failed on. GO to Pinpoint Test A
P0974	Shift Solenoid "A" Control Circuit High	MIL/KOEO, Continuous	This DTC indicates a short to power in the SSA electrical. Since SSA shorted to power causes SSA to be failed to low current (minimum pressure since SSA is directly proportional). A clutch is failed off. GO to Pinpoint Test A
P0976	Shift Solenoid "B" Control Circuit Low	MIL/KOEO, Continuous	This DTC indicates a short to ground in the SSB electrical. Since SSB shorted to ground causes SSB to be failed to high current (maximum pressure since SSB is directly proportional). B clutch is failed on. GO to Pinpoint Test A
P0977	Shift Solenoid "B" Control Circuit High	MIL/KOEO, Continuous	This DTC indicates a short to power in the SSB electrical. Since SSB shorted to power causes SSB to be failed to low current (minimum pressure since SSB is directly proportional). B clutch is failed off. GO to Pinpoint Test A
P0979	Shift Solenoid "C" Control Circuit Low	MIL/KOEO, Continuous	This DTC indicates a short to ground in the SSC electrical. Since SSC shorted to ground causes SSC to be failed to high current (maximum pressure since SSC is directly proportional). C clutch is failed on. GO to Pinpoint Test A
P097A	Shift Solenoid "A" Control Circuit/Open	MIL/KOEO, Continuous	This DTC indicates a short to power in the SSA electrical. Since SSA shorted to power causes SSA to be failed to low current (minimum pressure since SSA is directly proportional). A clutch is failed off. GO to Pinpoint Test A
P097B	Shift Solenoid "B" Control Circuit/Open	MIL/KOEO, Continuous	This DTC indicates an open circuit in the SSB electrical. Since SSB shorted to power causes SSB to be failed to low current (minimum pressure since SSB is directly proportional). B clutch is failed off. GO to Pinpoint Test A
P097C	Shift Solenoid "C" Control Circuit/Open	MIL/KOEO, Continuous	This DTC indicates a short to power in the SSC electrical. Since SSC shorted to power causes SSC to be failed to low current (minimum pressure since SSC is directly proportional). C clutch is failed off. GO to Pinpoint Test A
P097D	Shift Solenoid "D" Control Circuit/Open	MIL/KOEO, Continuous	This DTC indicates a short to power in the SSD electrical. Since SSD shorted to power causes SSD to be failed to low current (minimum

			pressure since SSD is directly proportional). D clutch is failed off. GO to Pinpoint Test A
P097E	Shift Solenoid "E" Control Circuit/Open	MIL/KOEO, Continuous	This DTC indicates a short to power in the SSE electrical. Since SSE shorted to power causes SSE to be failed to low current (minimum pressure since SSE is directly proportional). E clutch is failed off. GO to Pinpoint Test A
P097F	Shift Solenoid "F" Control Circuit/Open	MIL/KOEO, Continuous	This DTC indicates a short to power in the SSF electrical. Since SSF shorted to power causes SSF to be failed to low current (minimum pressure since SSF is directly proportional). F clutch is failed off. GO to Pinpoint Test A
P0980	Shift Solenoid "C" Control Circuit High	MIL/KOEO, Continuous	This DTC indicates a short to power in the SSC electrical. Since SSC shorted to power causes SSC to be failed to low current (minimum pressure since SSC is directly proportional). C clutch is failed off. GO to Pinpoint Test A
P0982	Shift Solenoid "D" Control Circuit Low	MIL/KOEO, Continuous	This DTC indicates a short to ground in the SSD electrical. Since SSD shorted to ground causes SSD to be failed to high current (maximum pressure since SSD is directly proportional). D clutch is failed on. GO to Pinpoint Test A
P0983	Shift Solenoid "D" Control Circuit High	MIL/KOEO, Continuous	This DTC indicates a short to power in the SSD electrical. Since SSD shorted to power causes SSD to be failed to low current (minimum pressure since SSD is directly proportional). D clutch is failed off. GO to Pinpoint Test A
P0985	Shift Solenoid "E" Control Circuit Low	MIL/KOEO, Continuous	This DTC indicates a short to ground in the SSE electrical. Since SSE shorted to ground causes SSE to be failed to high current (maximum pressure since SSE is directly proportional). E clutch is failed on. GO to Pinpoint Test A
P0986	Shift Solenoid "E" Control Circuit High	MIL/KOEO, Continuous	This DTC indicates a short to power in the SSE electrical. Since SSE shorted to power causes SSE to be failed to low current (minimum pressure since SSE is directly proportional). E clutch is failed off. GO to Pinpoint Test A
P0998	Shift Solenoid "F" Control Circuit Low	MIL/KOEO, Continuous	This DTC indicates a short to ground in the SSF electrical. Since SSF shorted to ground causes SSF to be failed to high current (maximum pressure since SSE is directly proportional). F clutch is failed on. GO to Pinpoint Test A
P0999	Shift Solenoid "F" Control Circuit High	MIL/KOEO, Continuous	This DTC indicates a short to power in the SSF electrical. Since SSF shorted to power causes SSF to be failed to low current (minimum pressure since SSF is directly proportional). E clutch is failed off. GO to Pinpoint Test A
P0B0D	Electric Transmission Fluid Pump Motor Control	None/Continuous	CLEAR the DTC. If the DTC returns, INSTALL a new electric transmission fluid pump.

	Module		REFER to: Transmission Fluid Auxiliary Pump (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
P0C27	Electric Transmission Fluid Pump Motor Current Low	None/Continuous	This DTC applies to auto-start-stop vehicles only. This DTC sets when the PCM detects low current (10% to 15% duty cycle). Auto-Start-Stop unavailable and the engine will only stop when the operator turns the ignition off. The engine may restart unexpectedly when the vehicle is stopped. CLEAR the DTC. If the DTC returns, GO to Pinpoint Test F
P0C28	Electric Transmission Fluid Pump Motor Current Low	None/Continuous	GO to Pinpoint Test F
P0C29	Electric Transmission Fluid Pump Motor Current High	None/Continuous	GO to Pinpoint Test F
P0C2A	Electric Transmission Fluid Pump Motor Stalled	None/Continuous	GO to Pinpoint Test E
P0C2C	Electric Transmission Fluid Pump Control Module Feedback Signal Range/Performance	Wrench/Continuous	GO to Pinpoint Test E
P0C2D	Electric Transmission Fluid Pump Control Module Feedback Signal Low	Wrench/Continuous	GO to Pinpoint Test E
P0C2E	Electric Transmission Fluid Pump Control Module Feedback Signal High	Wrench/Continuous	GO to Pinpoint Test E
P1001	The KOER Not Able to Complete, KOER Aborted	None/KOER	RETRIEVE and RECORD all DTCs. REPAIR any self-test or CMDTCs first. CLEAR the DTC. RERUN the KOER self-test. If the DTC returns, REPROGRAM the PCM to the latest software. RERUN the KOER self-test. If the DTC returns,  Click here to access Guided Routine (PCM).
P1397	System Voltage Out Of Self Test Range	None/KOEO	INSPECT the PCM power and ground circuits for opens or short to ground. INSPECT the PCM connector for damaged or pushed-out terminals, corrosion or loose wires. CLEAR the DTC. RUN the KOEO self-test. If DTC P1397 returns, REFER to: Charging System (414-00 Charging System - General Information, Diagnosis and Testing).
P1636	Inductive Signature Chip Communication Error	MIL/KOEO, Continuous	CLEAR the DTC. If DTC P1636 returns,  Click here to access Guided Routine (PCM).
P163E	Transmission Control Module Programming Error	MIL/KOEO, Continuous	CLEAR the DTC. REPROGRAM the original PCM with the latest software. If DTC P163E

			returns,   Click here to access Guided Routine (PCM).
P163F	Transmission ID Block Corrupted, Not Programmed	MIL/KOEO, Continuous	CLEAR the DTC. REPROGRAM the original PCM with the latest software. If DTC P163F returns,   Click here to access Guided Routine (PCM).
P1705	Transmission Range Circuit Not Indicating Park/Neutral During Self Test	None/KOEO	CLEAR the DTC. RERUN the KOEO and KOER self-test. If DTC P1705 returns, GO to Pinpoint Test C
P1711	Transmission Fluid Temperature Sensor Out Of Self Test Range	None/KOEO	CLEAR the DTC and RERUN the KOEO and KOER self-test. If the DTC returns, GO to Pinpoint Test B
P1744	Torque Converter Clutch Solenoid Circuit Performance	Wrench/Continuous	DTC P1744 is a non-electrical DTC. CLEAR the DTC. If DTC P1744 returns, REFER to: Diagnosis By Symptom (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P175A	Transmission Fluid Over Temperature Condition - Electric Transmission Fluid Pump Disabled	None/Continuous	The temperature sensor in the electric transmission fluid pump detected an overheat condition. CLEAR the DTC and road test the vehicle. If the DTC returns, INSTALL a new electric transmission fluid pump. REFER to: Transmission Fluid Auxiliary Pump (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
P1783	Transmission Over Temperature Condition	Wrench/Continuous	CLEAR the DTC. If DTC P1783 returns, determine if this DTC was set in conjunction with any TFT sensor circuit DTCs and RESOLVE them first, otherwise REFER to: Transmission Cooling (307-02 Transmission Cooling - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P1A02	Transmission One Way Clutch Performance	Wrench/Continuous	This DTC sets when the PCM detects 3 failures of the one-way clutch to lock in 1st or 2nd gear allowing sun gear 1 to rotate backwards. CLEAR the DTC, road test the vehicle. If DTC P1A02 returns, it may indicate a one way clutch failure. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
P2669	Actuator Supply Voltage "B" Circuit/Open	MIL/Continuous	GO to Pinpoint Test A
P26C3	Internal Control Module Transmission Range Sensor Performance	MIL, Wrench/KOEO, Continuous	CLEAR the DTC. If DTC P26C3 returns, INSTALL a new TR sensor. REFER to: Transmission Range (TR) Sensor (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

P2700	Transmission Friction Element "A" Apply Time Range/Performance	Wrench/Continuous	This DTC sets with either P0751 (A clutch stuck off) and P0752 (A clutch stuck on), service the more specific DTC first. See DTCs P0751 and P0752 for potential causes. If P0751 and P0752 are not set refer to the associated symptoms, REFER to: A Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P2701	Transmission Friction Element "B" Apply Time Range/Performance	Wrench/Continuous	This DTC sets with either P0756 (B clutch stuck off) and P0757 (B clutch stuck on), service the more specific DTC first. See DTCs P0756 and P0757 for potential causes. If these DTCs are not set refer to the associated symptoms, REFER to: B Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P2702	Transmission Friction Element "C" Apply Time Range/Performance	Wrench/Continuous	This DTC set with either P0761 (C clutch stuck off) and P0762 (C clutch stuck on) - service the more specific DTC first (if present). See P0761 and P0762 for potential causes first. If these DTCs are not set refer to the associated symptoms, REFER to: C Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P2703	Transmission Friction Element "D" Apply Time Range/Performance	Wrench/Continuous	This DTC set with either P0766 (D clutch stuck off) and P0767 (D clutch stuck on) service the more specific DTC first (if present). See P0766 and P0767 for potential causes first. If these DTCs are not set, refer to the associated symptoms, REFER to: D Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P2704	Transmission Friction Element "E" Apply Time Range/Performance	Wrench/Continuous	This DTC sets with either P0771 (E clutch stuck off) and P0772 (E clutch stuck on) service the more specific DTC first (if present). See P0771 and P0772 for potential causes. If these DTCs are not set, refer to the associated symptoms, REFER to: E Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P2705	Transmission Friction Element "F" Apply Time Range/Performance	Wrench/Continuous	This DTC sets with either P2707 (clutch F stuck off) and P2708 (clutch F stuck on), service the more specific DTC first. See DTCs P2707 and P2708 for potential causes. If these DTCs are not set, refer to the associated symptoms, REFER to: F Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).

P2707	Shift Solenoid "F" Performance/Stuck Off	MIL/Continuous	F clutch stuck off due to a non-electrical fault. Multiple attempts to apply F clutch failed. GO to Pinpoint Test A
P2708	Shift Solenoid "F" Stuck On	MIL/Continuous	F clutch stuck on due to a non-electrical fault. Multiple attempts to apply F clutch failed. GO to Pinpoint Test A
P2709	Shift Solenoid "F" Electrical	MIL/KOEO, Continuous	SSF (controls F clutch) VFS circuit failure non-MIL "sister" DTCs of P097F, P0998, P0999 used to illuminate the Wrench Light. If one of the more specific circuit codes is set, follow repair procedures for that code. GO to Pinpoint Test A
P2710	Shift Solenoid "F" Intermittent	MIL/Continuous	The PCM detected SSF fault, but the fault did not last long enough for the PCM to set a more specific SSF DTC. Inspect SSF wiring and connectors for damage.
P2745	Intermediate Shaft Speed Sensor "B" Circuit	MIL/KOEO, Continuous	An open circuit fault was detected by the PCM smart driver. GO to Pinpoint Test D
P2746	Intermediate Shaft Speed Sensor "B" Circuit Range/Performance	MIL/Continuous	GO to Pinpoint Test H
P2747	Intermediate Shaft Speed Sensor "B" Circuit No Signal	Wrench/Continuous	GO to Pinpoint Test D
P2748	Intermediate Shaft Speed Sensor "B" Circuit Intermittent	MIL/Continuous	GO to Pinpoint Test D
P2758	Torque Converter Clutch Pressure Control Solenoid Stuck On	MIL/Continuous	TCC stuck on when commanded off due to non-electrical failure. CLEAR the DTC. If DTC P2758 returns, REFER to: Diagnosis By Symptom (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P2760	Torque Converter Clutch Pressure Control Solenoid Intermittent	MIL/Continuous	The PCM detected TCC fault, but the fault did not last long enough for the PCM to set a more specific TCC DTC. Inspect TCC solenoid wiring and connectors for damage.
P2769	Torque Converter Clutch Circuit Low	MIL/Continuous	This DTC indicates a short to ground in the TCC electrical. Since TCC shorted to ground causes TCC to be failed to high current (maximum pressure since TCC is directly proportional). TCC is failed on. GO to Pinpoint Test G
P2770	Torque Converter Clutch Circuit High	MIL/Continuous	This DTC indicates a short to power in the TCC electrical. Since TCC shorted to power causes TCC to be failed to low current (minimum pressure since TCC is directly proportional). TCC is failed off. CLEAR the DTC. If DTC P2783 returns, INSPECT TCC control valve for sticking. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic

			Transmission - 10R80, Overhaul).
P2783	Torque Converter Temperature Too High	None/Continuous	The TCC control valve is stuck in a position that provides no flow when the TCC is commanded off. The TCC pumps down when commanded off, causing loss of torque multiplication through the TCC.
P2796	Electric Transmission Fluid Pump Control Circuit	None/Continuous	This DTC sets when the transmission electric fluid pump reports to the PCM that it is not receiving a PWM from the PCM. CLEAR the DTC. If the DTC returns, GO to Pinpoint Test E
P27B4	Internal Control Module Transmission Gear Direction Control Performance	None/Continuous	May be caused by clutch faults that cause R in foward range or a foward gear in R, or a speed sensor error, CLEAR the DTC. If DTC P27B4 returns, REFER to: Diagnosis By Symptom (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
P27B5	Internal Control Module Transmission Gear Ratio Control Performance	None/Continuous	CLEAR the DTC. If DTC P27B5 returns or if any TR DTCs are set RESOLVE them first. If DTC P27B5 returns,  Click here to access Guided Routine (PCM).
P27B6	Internal Control Module Transmission Speed Sensor Performance	MIL, Wrench/Continuous	This DTC can set when the PCM detects a TSS, ISSA, or ISSB calculation mismatch. CLEAR the DTC. Road test the vehicle, if any shift concerns exist, diagnose them first. REFER to: Diagnosis By Symptom (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing). If no shift concerns exist RESOLVE any speed sensor DTCs that set. If only DTC P27B6 returns,  Click here to access Guided Routine (PCM).
P2801	Transmission Range Sensor "B" Circuit Range/Performance	MIL/KOEO, Continuous	GO to Pinpoint Test C
P2802	Transmission Range Sensor "B" Circuit Low	MIL/KOEO, Continuous	GO to Pinpoint Test C
P2803	Transmission Range Sensor "B" Circuit High	MIL/KOEO, Continuous	GO to Pinpoint Test C
P2804	Transmission Range Sensor "B" Circuit Intermittent	Wrench/KOEO, Continuous	GO to Pinpoint Test C
P2805	Transmission Range Sensor "A"/"B" Correlation	MIL/KOEO, Continuous	GO to Pinpoint Test C

Pinpoint Tests

- **PINPOINT TEST A : TRANSMISSION CONTROL SOLENOIDS**

- PINPOINT TEST B : TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR
- PINPOINT TEST C : TRANSMISSION RANGE (TR) SENSOR
- PINPOINT TEST D : OSS (OUTPUT SHAFT SPEED) SENSOR, TSS (TURBINE SHAFT SPEED) SENSOR, ISSA SENSOR AND ISSB SENSOR
- PINPOINT TEST E : DTCS P0B0D P0C27, P0C28, P0C29, P0C2A, P175A, P0C2D
- PINPOINT TEST F : DTCS P0B0D, P0C27, P0C28, P0C29, P0C2A, P175A
- PINPOINT TEST G : TCC, LPC SOLENOIDS
- PINPOINT TEST H : OSS SENSOR, TSS SENSOR, ISSA SENSOR AND ISSB SENSOR PERFORMANCE DTC FAULTS

E Clutch

Symptom Chart

E Clutch

For E clutch operation,
REFER to: E Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Description and Operation).

E Clutch

Condition	Possible Sources	Action
E clutch does not apply	SSE is mechanically stuck OFF	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	E Clutch regulator valve stuck OFF	DISASSEMBLE, CLEAN and INSPECT the regulator valve. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	E CL CONTR, hydraulic circuit blocked/leaking	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-

		Speed Automatic Transmission - 10R80, Removal and Installation).
	E clutch hub	INSPECT components wear and damage. CLEAN and/or INSTALL new components as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	E clutch friction plates	INSPECT components wear and damage. CLEAN and/or INSTALL new components as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	E clutch piston seals	INSPECT components wear and damage. CLEAN and/or INSTALL new components as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
E clutch always applied	SSE mechanically stuck	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	E Clutch regulator valve or CL E latch valve stuck ON	DISASSEMBLE, CLEAN and INSPECT the regulator valve. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	E CL CONTR, hydraulic circuit cross leaks	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	E clutch hub, clutch and	INSPECT components wear and damage. CLEAN

	planetary carrier, No. 4 ring gear	and/or INSTALL new components as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	E clutch friction plates	INSPECT components wear and damage. CLEAN and/or INSTALL new components as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	E clutch piston seals	INSPECT components wear and damage. CLEAN and/or INSTALL new components as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
E clutch delayed/soft/slipping apply	Incorrect transmission strategy programmed into PCM/ TCM.	PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	Low line pressure	PERFORM line pressure test. REFER to: Special Testing Procedures (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	SSE mechanically sticking	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	E Clutch regulator valve sticking	DISASSEMBLE, CLEAN and INSPECT the valve. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	Gain control valve stuck in default position.	DISASSEMBLE, CLEAN and INSPECT the valve. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

		REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	E CL CONTR, E CL-FB2 hydraulic circuits blocked/leaking	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	E clutch friction plates	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	E clutch piston seals	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
E clutch harsh apply	Incorrect transmission strategy programmed into PCM/ TCM.	PERFORM the Transmission Strategy Download, REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	High line pressure	PERFORM line pressure test. REFER to: Special Testing Procedures (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	SSE mechanically sticking	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	E Clutch regulator valve sticking	DISASSEMBLE, CLEAN and INSPECT the valves. If bore or valve is damaged or worn, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

		REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	Gain control valve stuck in applied position	DISASSEMBLE, CLEAN and INSPECT the valve. If bore or valve is damaged, INSTALL a new main control valve body. PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	E CL CONTR, E CL-FB2 hydraulic circuit blocked/leaking	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	E clutch friction plates	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	E clutch piston return springs	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).

F Clutch

Principles of Operation

Symptom Chart

F Clutch

For F clutch operation,
REFER to: F Clutch (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Description and Operation).

F Clutch

Condition	Possible Sources	Action
F clutch does not apply	SSF is mechanically stuck OFF	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	F Clutch regulator valve stuck OFF	DISASSEMBLE, CLEAN and INSPECT the regulator valve. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	F CL CONTR, hydraulic circuit blocked/leaking	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and

		Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	F clutch hub	INSPECT components wear and damage. CLEAN and/or INSTALL new components as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	F clutch friction plates	INSPECT components wear and damage. CLEAN and/or INSTALL new components as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	F clutch piston seals	INSPECT components wear and damage. CLEAN and/or INSTALL new components as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
F clutch always applied	SSF mechanically stuck	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	F Clutch regulator valve or CL F latch valve stuck ON	DISASSEMBLE, CLEAN and INSPECT the regulator valve. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	F CL CONTR, hydraulic circuit cross leaks	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-

		Speed Automatic Transmission - 10R80, Removal and Installation).
	F clutch hub, clutch and planetary carrier, No.4 ring gear	INSPECT components wear and damage. CLEAN and/or INSTALL new components necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	F clutch friction plates	INSPECT components wear and damage. CLEAN and/or INSTALL new components necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	F clutch piston seals	INSPECT components wear and damage. CLEAN and/or INSTALL new components necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
F clutch delayed/soft/slipping apply	Incorrect transmission strategy programmed into PCM/ TCM.	PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	Low line pressure	PERFORM the line pressure test. REFER to: Special Testing Procedures (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	SSF mechanically sticking	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	F Clutch regulator valve sticking	DISASSEMBLE, CLEAN and INSPECT the valves. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	F CL CONTR, hydraulic circuits blocked/leaking	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

		REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	F clutch friction plates	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	F clutch piston seals	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
F clutch harsh apply	Incorrect transmission strategy programmed into PCM/ TCM.	PERFORM the Transmission Strategy Download, REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	High line pressure	PERFORM line pressure test. REFER to: Special Testing Procedures (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
	SSF mechanically sticking	INSTALL a new solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	F Clutch regulator valve sticking	DISASSEMBLE, CLEAN and INSPECT the valves. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	F CL CONTR hydraulic circuit blocked/leaking	DISASSEMBLE and INSPECT the main control valve body and separator plate passages for debris/blockage. CLEAN as necessary. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

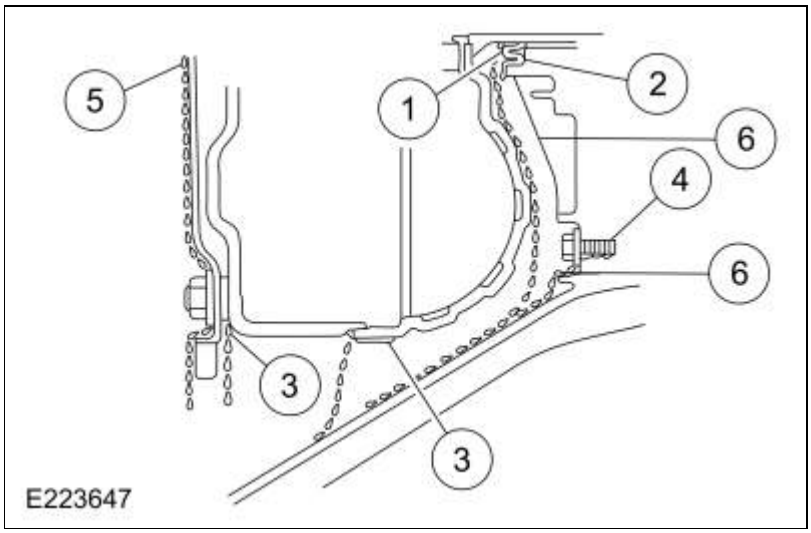
		REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	F clutch friction plates	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).
	F clutch piston return springs	DISASSEMBLE and INSPECT the transmission passages for debris/blockage. CLEAN as necessary. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).

Leakage Inspection

Leak Check Test

1. With the vehicle in NEUTRAL, position the vehicle on a hoist.
   REFER to: Jacking and Lifting (100-02 Jacking and Lifting, Description and Operation).
2. Inspect the gasket and sealing areas for evidence of leakage.
3. Trace the transmission fluid leak to the highest point.
4. Clean area of suspected leak.
5. Lower vehicle.
6. Remove the transmission fluid fill plug or fluid level indicator.
7. Add leak detection dye to the transmission fluid. Use 1 fl oz (30 ml) of dye solution for every 4 qt (3.8 L) of transmission fluid.
8. With the transmission fluid at normal operating temperature, road test the vehicle for at least 1 mile with at least 1 application of the TCC.
9. With the vehicle in NEUTRAL, position the vehicle on a hoist.
   REFER to: Jacking and Lifting (100-02 Jacking and Lifting, Description and Operation).
10. If the source of the leak is obvious, repair as required.
11. After the repair, clean the affected area.

Leakage From Torque Converter Housing



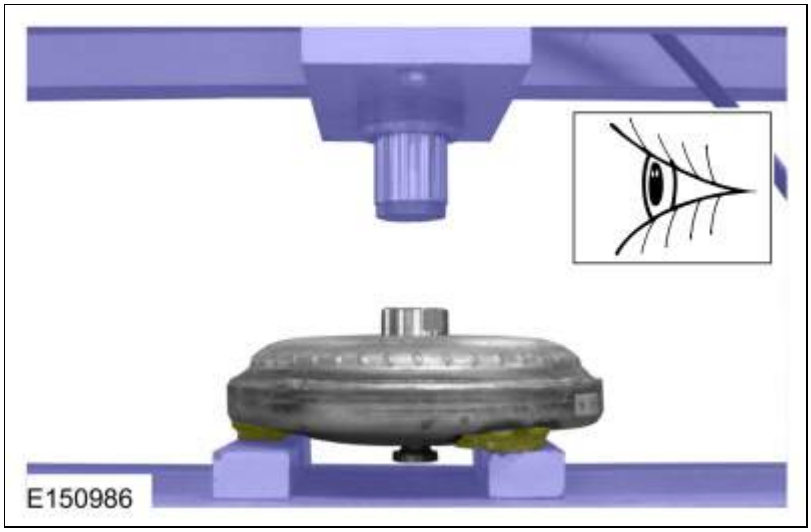
12. Leaks from the torque converter housing can originate from several locations. The paths which the transmission fluid takes to reach the bottom of the torque converter housing is shown in the illustration. The following 6 steps correspond with the numbers in the illustration.
    1. Transmission fluid leaking by the converter hub seal lip will tend to move along the drive hub and onto the back of the torque converter. Except in the case of a total seal failure, transmission fluid leakage by the lip of the seal will be deposited on the inside of the torque converter housing only, near the outside diameter of the housing.
    2. Transmission fluid leakage by the outside diameter of the torque converter impeller hub seal and the case will follow the same path that leaks by the inside diameter of the converter hub seal follow.
    3. Transmission fluid leakage from the converter cover weld or the converter-to-flexplate stud weld will appear at outside diameter of torque converter on the back face of the flexplate and in the converter housing only near the flexplate. If a converter-to-flexplate lug, lug weld or converter cover weld leak is suspected, remove the converter and pressure check.
    4. Transmission fluid leakage from the bolts inside the converter housing will flow down the back of the torque converter housing. Leakage may be from loose or missing bolts.
    5. Engine oil leaks from the rear main oil.
    6. Transmission fluid leak from front support cover and seal assembly.

13. Remove the torque converter.

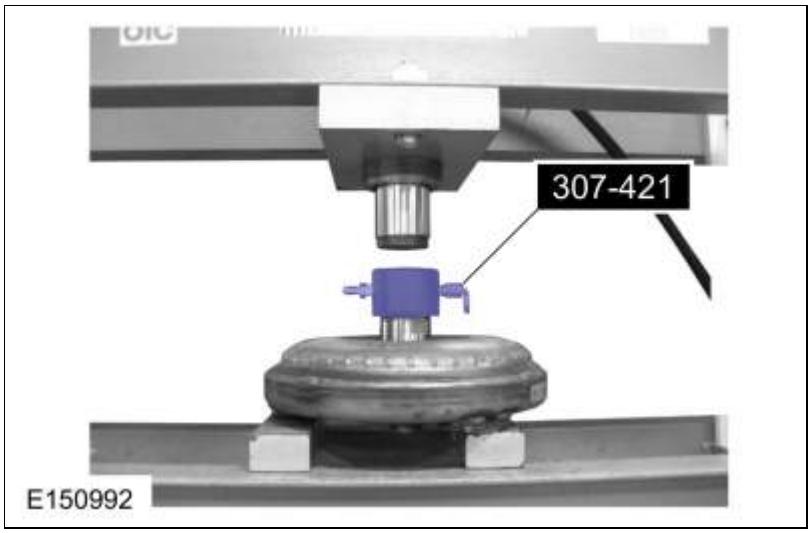
14. Using a black light, observe the torque converter housing. Inspect for evidence of dye from the pump bolts, front support cover and seal assembly, and torque converter hub seal. Repair as required.

15. If the source of the leak is not evident, continue with this procedure to leak test the torque converter.

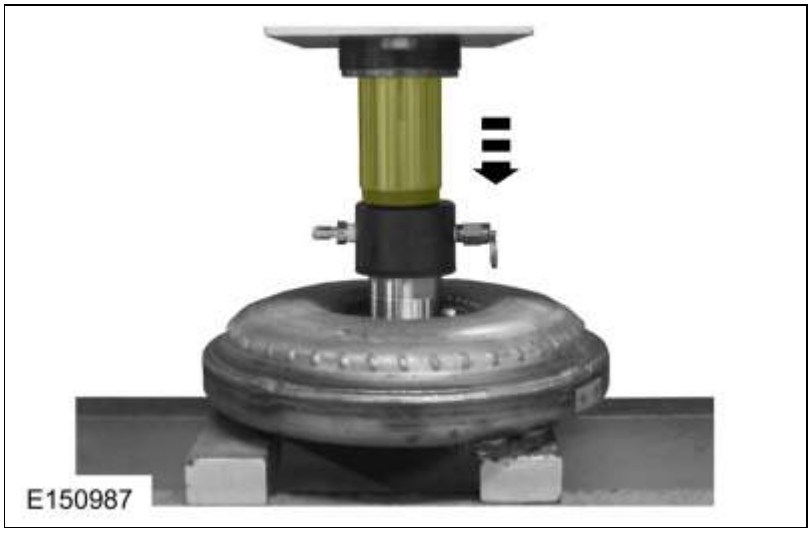
16. Place the torque converter in an arbor press. Support the torque converter on the mounting pads.



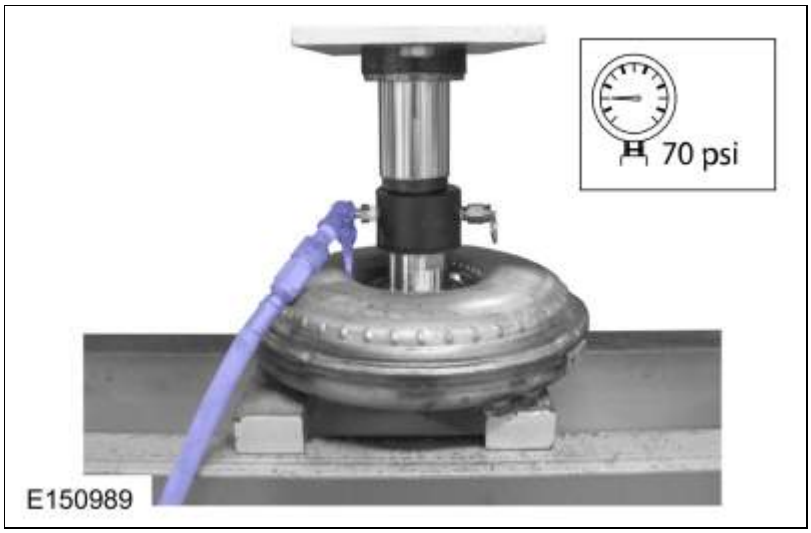
17. Install the torque converter leak tester (307-421) into the torque converter hub.



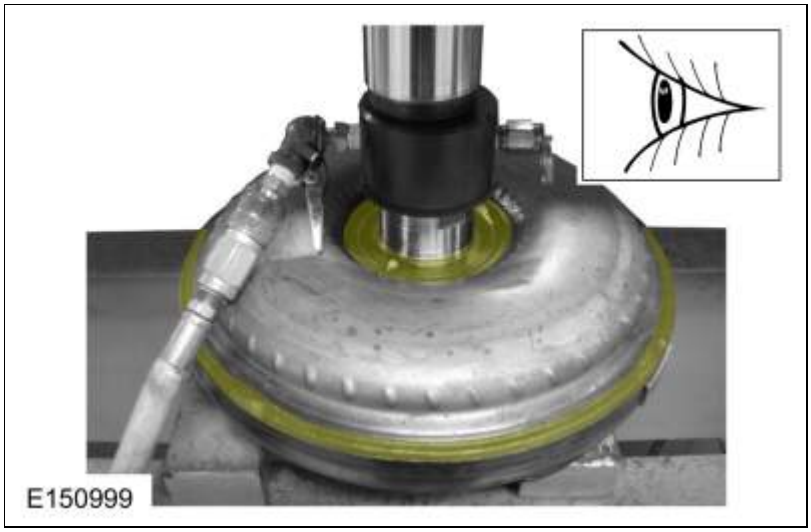
18. Secure the press. Apply enough force from the press to seal the torque converter leak tester (307-421) into the torque converter hub.



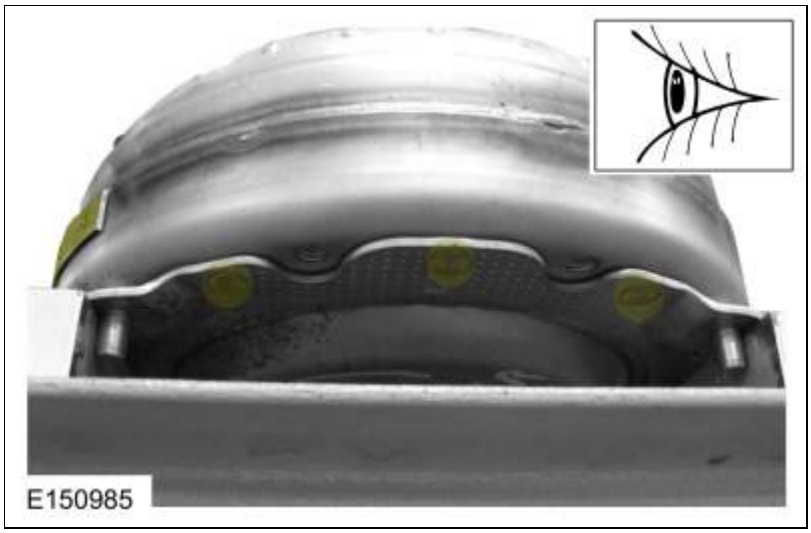
19. Connect a compressed air supply to the torque converter leak tester (307-421).



20. Inspect for leaks at the torque converter hub weld and seams with air pressure applied to the valve. A soap bubble solution can be applied around those areas to aid in the diagnosis. If any leaks are present, install a new torque converter.



21. Inspect for leaks at the stud or mounting pad and balance weight welds. A soap bubble solution can be applied around those areas to aid in the diagnosis. If any leaks are present, install a new torque converter.



22. After leaks are repaired, clean the remaining transmission fluid dye from serviced areas.

Low One-Way Clutch Assembly

Low One Way Clutch

For low one way clutch operation,
REFER to: Low One-Way Clutch Assembly (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Description and Operation).

NOTICE: Do not clean with water or with water-based solvents. Damage to the component may occur.

Remove and inspect the low one way clutch for cracks and damaged splines. The splined section should lock in the direction of the number 1 arrow and rotate freely and smoothly when rotated in the direction of the number 2 arrow. Check for burned or excessively worn surfaces. If any damage is found or the clutch does not rotate or lock, install a new low one-way clutch and front support and race assembly.

Parameter Identification (PID) Chart

Diagnostic PID Chart

PID Acronym	PID Name	Description
APP	APP sensor	APP
APP1	APP sensor 1	APP 1
AST	Time Since Start	Time (in seconds) since the vehicle was started
CLRDIST	Distance since DTC cleared	Distance driven since PCM DTCs were cleared
ECT TCM	ECT TCM	Engine coolant temperature data provided to the TCM
ENGLOAD	Engine Load	Engine load calculated by PCM
ETC_ACT	Electronic Throttle Control Actual	Electronic Throttle Control Actual calculated by PCM
FOOT_BRAKE	Foot Brake - Foot brake state used by strategy	Foot brake state used by strategy calculated by PCM
GEAR_CMD	Gear Commanded by Module	PCM commanded transmission gear
GEAR_ENGAGED	Transmission Gear Engaged	Transmission Gear Engaged
GEAR_OSC#	Gear Commanded by Output State Control	Output state control commanded gear
ISS_A_QF	Transmission Input Shaft Speed Sensor -A- Quality Factor	Transmission Input Shaft Speed Sensor -A- Quality Factor
ISS_A_RAW	Intermediate Speed -A- Raw	Intermediate Speed -A- Raw
ISS_B_RAW	Intermediate Shaft Speed -B- Raw	Intermediate Shaft Speed -B- Raw
ISS_B_QF	Transmission Input Shaft Speed Sensor -B- Quality Factor	Transmission Input Shaft Speed Sensor -B- Quality Factor
LINEDSD#	Line Pressure Control Desired	Commanded line pressure
MIL_DIS	The distance travelled since the (MIL) was activated	The distance travelled since the MIL was activated
OSS_QF	Transmission Output Shaft Speed Sensor Quality Factor	Fault status for the OSS sensor
OSS_RAW	Output Shaft Speed - Raw	Actual speed of the OSS sensor (rpm)
PCA	Pressure Control Solenoid A	LPC
PCA AMP#	Pressure Control Solenoid A	LPC
PCA_F	Pressure Control Solenoid A Status	LPC
PWRT_FUNCMON_A	Powertrain Secondary Monitor/Performance Fault A	Powertrain Secondary Monitor/Performance Fault A

PWRT_FUNCMON_B	Powertrain Secondary Monitor/Performance Fault A	Powertrain Secondary Monitor/Performance Fault A
REALTIME	Total time (ECU) has been active	ECU Time running
RPM_TCM	Engine Revolutions Per Minute	Engine rpm input to TCM
SHFT_DROP	Shift RPM Drop in Input Shaft Speed Below Expected	Shift rpm drop in input shaft speed below expected
SHFT_FLRE	Shift RPM Rise in Input Shaft Speed Above Expected	Shift rpm rise in input shaft speed above expected
SHFT_ID	Shift Identification of Shift (PID)s Lag, Time, Flare and Drop	Shift identification of shift PIDs lag, time, flare and drop
SHFT_LAG	Shift Time Elapsed From 10% to 90% of Complete	Actual time during shift between 10% and 90% complete
SHFT_TIME	Shift Time Elapsed From Commanded to 10% Complete	Shift time 0% to 10% complete
SNOWPLW_CFG	Snowplow as configured in the (PCM).	Snowplow as configured in the (PCM).
SS_ABS_TC_IN	(Stop-Start) Antilock Brake And Traction Control Summary	(Stop-Start) Antilock Brake And Traction Control Summary
SS_CONTROL_STATE	(Stop-Start) Main Control State Machine	(Stop-Start) Main Control State Machine
SS_CTRL_CRANK_CMD	(Stop-Start) Main Control Crank Command And Hardware Feedback	(Stop-Start) Main Control Crank Command And Hardware Feedback
SS_HUMAN_INPUT	(Stop-Start) Monitor Human Input Summary Including Accelerator, Brake, Clutch, Shift Input, Or Cruise Control	(Stop-Start) Monitor Human Input Summary Including Accelerator, Brake, Clutch, Shift Input, Or Cruise Control
SS_MON_STATE_TIMER	(Stop-Start) Monitor State Machine Transition Timer	(Stop-Start) Monitor State Machine Transition Timer
SS_MONITOR_STATE	(Stop-Start) Monitor State Machine	(Stop-Start) Monitor State Machine
SS_SHIFTER_IN	(Stop-Start) Shift Lever Position Input	(Stop-Start) Vehicle Speed and Powertrain Shaft Speeds Summary
SS_SPEED_INPUT	(Stop-Start) Vehicle Speed and Powertrain Shaft Speeds Summary	(Stop-Start) Vehicle Speed and Powertrain Shaft Speeds Summary
SS_STRTR_HEAT	(Start-Stop) Starter Motor Heat State	(Start-Stop) Starter Motor Heat State
SSPCA	Shift Solenoid Pressure Control A	Commanded pressure for the Shift Solenoid Pressure Control A (SSPCA)/CB1234
SSA_AMP #	Shift Solenoid Pressure Control A	Commanded current for the Shift Solenoid Pressure Control A (SSPCA)/CB1234
SSPCA_F	(SSPCA) Status	Fault status for the Shift Solenoid Pressure Control A (SSPCA)/CB1234
SSPCB	Shift Solenoid Pressure Control B	Commanded pressure for the Shift Solenoid Pressure Control B (SSPCB)/C35R
SSB_AMP	Shift Solenoid Pressure Control B	Commanded current for the Shift Solenoid Pressure Control B

		(SSPCB)/C35R
SSPCB_F	(SSPCB) Status	Fault status for the Shift Solenoid Pressure Control B (SSPCB)/C35R
SSPCC	Shift Solenoid Pressure Control C	Commanded pressure for the Shift Solenoid Pressure Control C (SSPCC)/CB26
SSC_AMP	Shift Solenoid Pressure Control C	Commanded current for the Shift Solenoid Pressure Control C (SSPCC)/CB26
SSPCC_F	(SSPCC) Status	Fault status for the Shift Solenoid Pressure Control C (SSPCC)/CB26
SSPCD	Shift Solenoid Pressure Control D	Commanded pressure for the Shift Solenoid Pressure Control D (SSPCD)/CBLR, C456
SSD_AMP	Shift Solenoid Pressure Control D	Commanded current for the Shift Solenoid Pressure Control D (SSPCD)/CBLR, C456
SSPCD_F	(SSPCD) Status	Fault status for the Shift Solenoid Pressure Control D (SSPCD)/CBLR, C456
SSPCE	Shift Solenoid Pressure Control E	Commanded pressure for the Shift Solenoid Pressure Control E (SSPCE)/CBLR, C456
SSE_AMP	Shift Solenoid Pressure Control E	Commanded current for the Shift Solenoid Pressure Control E (SSPCE)/CBLR, C456
SSPCE_F	(SSPCE) Status	Fault status for the Shift Solenoid Pressure Control E (SSPCE)/CBLR, C456
SST_D	SelectShift™ Transmission - Down Switch Input	SelectShift™ transmission-down switch input
SST_U	SelectShift™ Transmission - Up Switch Input	SelectShift™ transmission-up switch input
TCC AMP	Converter Pressure Control	Commanded current for the TCC
TC_SLIPACT	Torque Converter Slip Actual	Actual difference between engine speed and turbine speed, measured in rpm
TC_SLIPDSD	Torque Converter Slip Desired	PCM commanded difference between engine speed and turbine speed, measured in rpm
TCC	Torque Converter Clutch Solenoid	Commanded pressure for the TCC
TCC_F	Torque Converter Clutch Pressure Control Fault	Fault status for the TCC
TCC_OSC	Output State Control of Torque Converter	Output state control commanded pressure to the TCC
TCC_RAT	Torque Slip Ratio	Actual speed ratio of torque converter (1.0 = fully engaged)

TCS_DEPRES	Transmission Control Switch Pressed	TCS status
TCS_STATE	Transmission Control Switch Requested State	TCS status
TFT	Transmission Fluid Temperature	TFT
TFT_F	Transmission Fluid Temperature Status	Fault status for TFT sensor
TFTV	Transmission Fluid Temperature	TFT voltage
TR	Transmission Range	TR
TR_CRANK	Transmission Range Input Allowing Engine Start	TR
TR_F	Transmission Range Status	Fault status for TR sensor
TRAN_RAT	Gear Ratio Measured	Actual transmission gear ratio
TRANS_VOLT_A	Transmission Supply Voltage Control State	Transmission supply voltage
TRO_N_F	Neutral Output Status	Transmission neutral output status
TRO_P_F	Park Output Status	Transmission park output status
TSS_F	Turbine Shaft Speed Reliable	Fault status of the TSS sensor (rpm)
TSS_RAW	Unfiltered Turbine Shaft Speed	Actual speed of the TSS sensor (rpm)
VPWR_PCM	Module supply voltage	PCM supply voltage
VSS	Vehicle Speed	Vehicle Speed
VSS_HR	Vehicle Speed High Resolution	Vehicle Speed High Resolution
WARMUPS	Number Of Warm-ups Since (DTCs) Cleared	Number Of Warm-ups Since (DTCs) Cleared counter

Preliminary Inspection

Overview

The preliminary inspection is part of Automatic Transmission Diagnosis. The preliminary inspection is used to find obvious causes for transmission concern.

Underhood Inspection

To correctly diagnose a concern, first understand the customer concern or condition. Customer contact may be required to understand the conditions, including when the concern occurs. For example:

1. Look for missing or damaged air induction components.
2. Inspect the wire harness for proper routing, especially near the rear of the cylinder heads. Make sure the harness is not chafed or pinched.
3. Inspect transmission fluid cooler for proper mounting and check for any missing air deflectors.

Under Vehicle Inspection

1. Place the selector lever in D.
2. With the vehicle in NEUTRAL, position it on a hoist.
   REFER to: Jacking and Lifting (100-02 Jacking and Lifting, Description and Operation).
3. Inspect transmission case for evidence of leaks.
4. Inspect transmission fluid cooler lines for proper routing, pinches, or kinks.
5. Inspect transmission fluid cooler mounting and check for any missing air deflectors.
6. Adjust the selector lever cable. (If equipped)
   REFER to: Selector Lever Cable Adjustment (307-05 Automatic Transmission External Controls, General Procedures).
   REFER to: Selector Lever Cable Adjustment (307-05 Automatic Transmission External Controls) .

Transmission Fluid Inspection

Transmission fluid condition can provide many clues to the nature of the transmission concern. Proper transmission fluid level can only be determined with the transmission fluid at a specified temperature range. It is not necessary to verify exact transmission fluid level at this time. If the transmission fluid is below operating temperature, it is expected to be low on the transmission fluid level indicator. Transmission fluid temperatures below 30.2°F (-1°C) may not show up on a transmission fluid level indicator.

1. With the vehicle in NEUTRAL, position it on a hoist.
   REFER to: Jacking and Lifting (100-02 Jacking and Lifting, Description and Operation).
   Remove the transmission fluid fill plug and transmission fluid level indicator.

2. Allow the transmission fluid to drip onto a facial tissue or white sheet of paper.
3. Examine the stain.
4. Small black particles are typically burnt friction material.
5. Small shiny metallic particles indicate excessive hard part wear.
6. Foamy pink color indicates either water or engine coolant in the transmission.

Water in Transmission Fluid

To correctly repair an automatic transmission that has had water or coolant introduced into the system, completely disassemble, clean, and replace the following parts:

- All internal and external seals
- All friction material
- Torque converter
- All parts with bonded seals
- All solenoids
- All transmission fluid filters

Prior to installing the transmission, flush and clean the transmission fluid cooler(s) and the transmission fluid cooler tubes and hoses.

Road Testing Vehicle

Shift Point Road Test

NOTE: *Always drive the vehicle in a safe manner according to driving conditions and obey all traffic laws.*

Upshift Gear Sequence

At times the 10-speed transmission may **skip** gears when the vehicle starts from a complete stop. This is **normal** and desired **behavior**.

At part pedal when acceleration is brisk, single step upshifts would result in very frequent shift events (very short time in gear). Double step upshifts results when a longer time is spent in gear.

However, at light pedal or road load, single step upshifts **will** occur. The small 10-speed gear steps allow the engine speed to drop to lower values than it would in the 6-speed transmission; providing for the best fuel economy. In contrast, when the 10-speed transmission is at heavy or max pedal, the small steps keep the engine closer to the horsepower peak for best performance.

Downshift Gear Sequence

At times the 10-speed transmission may **skip** gears when the vehicle down shifts to a complete stop. This is **normal** and desired **behavior**.

The same **skip** shift strategy that is used for the upshift may be applied during down shift.

Most performance based automatic transmission DTCs require the fault to be detected multiple times before setting a DTC. In many instances the faults musts be detected consecutively a predetermined number of times (up to five). Performing the shift point road test as detailed below increases the likelihood that a DTC sets if a fault is present in the system.

Shift Point Road Test

1. Bring engine and transmission up to normal operating temperature.

2. Operate the vehicle with the selector lever in the D position.

3. From a stop, accelerate the vehicle to 80 km/h (50 mph) with the shifts occurring at approximately 2000 rpm. Stay in 10th gear for 30 seconds or until the TCC applies. Repeat this two times.

4. From a stop, accelerate the vehicle to 80 km/h (50 mph) with the shifts occurring at approximately 3000 rpm. Stay in 10th gear for 30 seconds or until the TCC applies. Repeat this two times.

5. If the transmission fails to upshift/downshift,
   REFER to: Diagnosis By Symptom (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).

Shift Speed Chart

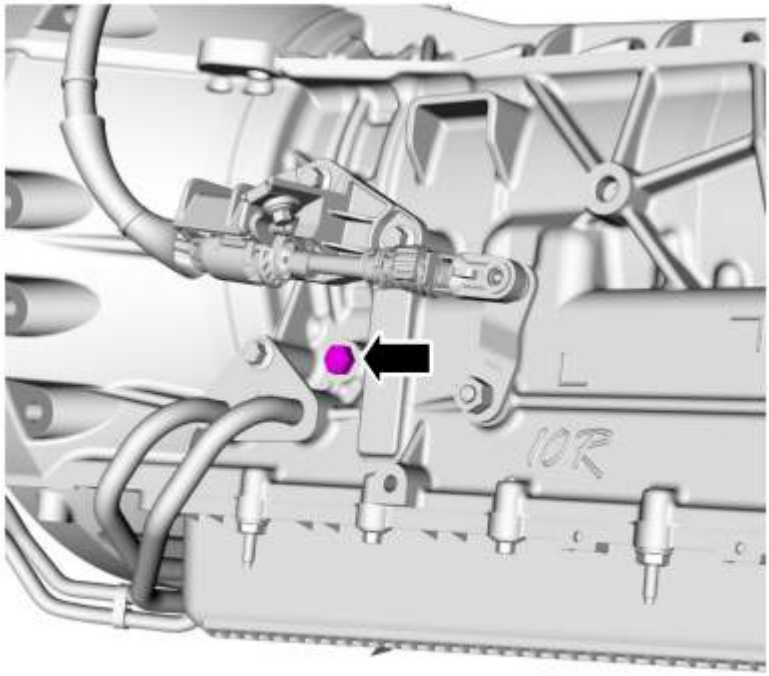
Shift	Speed
1-2	15 mph (24 km/h)
2-3	20 mph (32 km/h)
3-4	27 mph (43 km/h)
4-5	32 mph (51 km/h)
5-6	37 mph (60 km/h)
6-7	42 mph (68 km/h)
7-8	48 mph (77 km/h)
8-9	52 mph (84 km/h)
9-10	60 mph (97 km/h)

Special Testing Procedures

Line Pressure Test

NOTE: *Carry out the Line Pressure test prior to carrying out the Stall Speed Test. If the line pressure is low at stall, do not carry out the Stall Speed Test or further transmission damage will occur. Do not maintain Wide Open Throttle (WOT) in any transmission range for more than 5 seconds.*

This test verifies that the line pressure is within specification.



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1. **NOTE:** *The line pressure tap is an M10 X 1.00 thread. Do not use a National Pipe Thread (NPT) fitting when installing a pressure gauge. If a NPT fitting is used, damage to the transmission case will occur.*

   Connect the Transmission Fluid Pressure Gauge to the line pressure tap using an M10 X 1.00 fitting.

2. Start the engine and check the line pressures. Refer to the Line Pressure Chart to determine if the line pressure is within specification.

Line Pressure Chart

NOTE: *Actual and commanded pressures vary based on calibration and transmission adaptive strategies. All pressures listed are approximate.*

Gear	Line Pressure — kPa (psi)		Commanded — LPC pressure kPa (psi) a	
	Idle	WOT Stall	Idle	WOT Stall
P, N	619 (90)	-	94 (14)	-
R	619 (90)	1,675 (240)	94 (14)	410 (60)
(D)	619 (90)	1,600 (230)	94 (14)	375 (55)
3	619 (90)	1,230 (180)	94 (14)	275 (40)
2	619 (90)	1,675 (240)	94 (14)	410 (60)
1	619 (90)	1,600 (230)	94 (14)	375 (55)

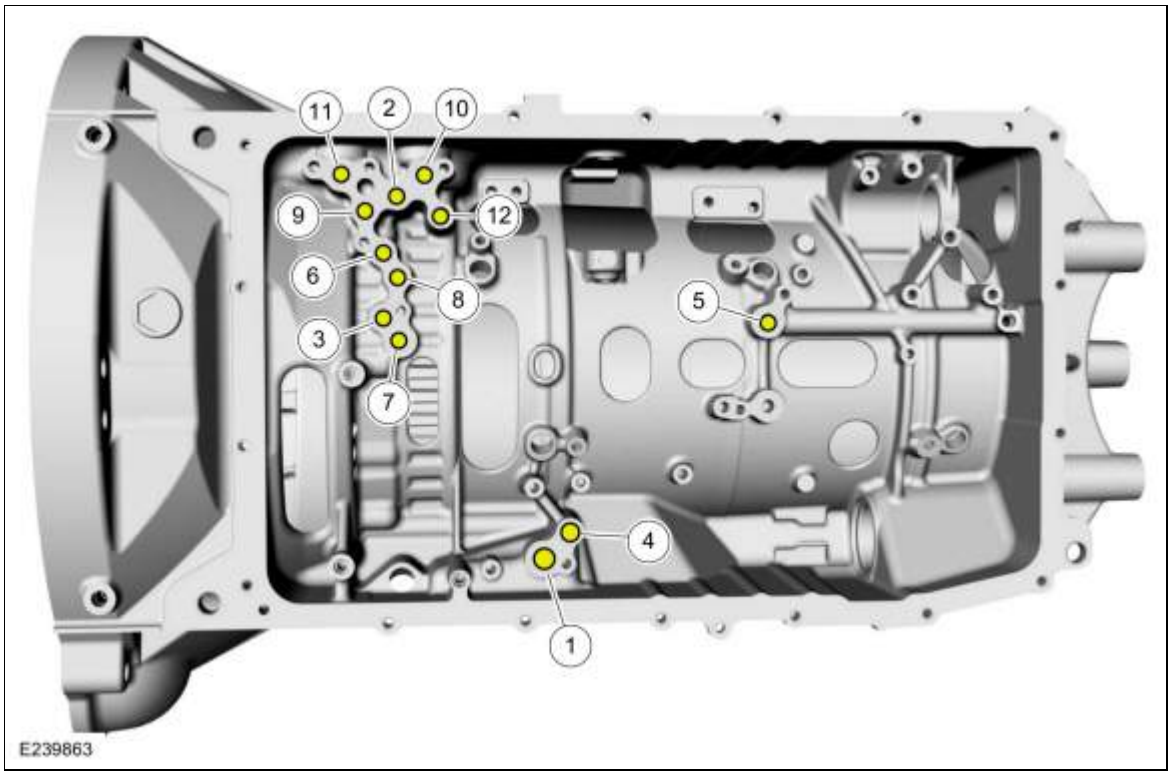
Commanded pressure as viewed on diagnostic equipment.

3. If the line pressure is not within specification, refer to the Line Pressure Diagnosis Chart.

4. When the pressure tests are complete, install the line pressure tap plug.
    1. Tighten to 13.5 Nm (120 lb-in).

Test Results	Possible Source
HIGH at IDLE - ALL RANGES	• Wiring harnesses • LPC solenoid • LPC valve
LOW at IDLE - ALL RANGES	• Low fluid level • Fluid inlet filter/seal • Main control • Cross leaks • Gaskets • Pump • Separator plate

Air Pressure Test



10R80 Air Ports

Item	Description
1	A clutch
2	B clutch
3	C clutch
4	D clutch
5	E clutch
6	F clutch
7	TCC apply
8	TCC release
9	Lube
10	To cooler
11	From cooler
12	Line pressure tap

NOTE: *When applying air pressure to the clutches using the indicated ports, restrict air pressure to no more than 276 kPa (40psi).*

A no-drive condition can exist even with correct transmission fluid pressure because of inoperative clutches. Refer to the Clutch Application Chart to determine which clutch is applied in each gear range. A clutch concern can be located through a series of checks by substituting air pressure for fluid pressure to determine the location of the conce

Stall Speed Test

NOTE: *Carry out the Line Pressure Test prior to the Stall Speed Test. If line pressure is low, do not carry out the stall test or additional transmission damage will occur. Do not maintain Wide Open Throttle (WOT) in any gear range for more than 5 seconds.*

NOTE: *After testing each of the ranges, move the selector lever into the NEUTRAL position and run the engine at 1,000 rpm for about 15 seconds to allow the torque converter to cool off before continuing onto the next range.*

NOTE: *If the engine speed exceeds maximum specified rpm, release the accelerator pedal immediately.*

NOTE: *Only perform the stall speed test with the engine and transmission at normal operating temperatures.*

The Stall Speed Test checks the operation of the following items:

- Torque converter clutch stator
- A clutch
- B clutch
- C clutch
- D clutch
- E clutch
- F clutch

1. Connect a scan tool.

2. Press the accelerator pedal to WOT in each range. Record the rpm reached in each range. Stall speeds should be in the appropriate range.

Stall Speed

Engine	Drive	Reverse
3.5L	3478-3845 rpm	3478-3845 rpm

Test Results Possible Source	Possible Source
Stall speed high — R only	• General line pressure concerns • F clutch
Stall speed high — 1st and 3rd gears	• E clutch
Stall speed high — Both 2nd and 3rd gears	• C clutch
Stall speed high — 2nd, 3rd and R gears	• D clutch
Stall speed high — All ranges	• A clutch
Stall speed low — R and 1st, 2nd	• Engine driveability concern • TCC stator

Torque Converter Clutch (TCC)

Torque Converter Clutch (TCC)

For torque converter operation,
REFER to: Torque Converter (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Description and Operation).

Condition	Possible Sources	Action
TCC does not apply	TCC solenoid mechanically stuck OFF	INSTALL a new TCC solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	TCC Regulator Valve stuck OFF	DISASSEMBLE, CLEAN and INSPECT the regulator valve. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	CONV FD, MDA-TCC, APPLY, REL hydraulic circuit blocked or leaking	DISASSEMBLE, CLEAN and INSPECT the valves. If bore or valve is damaged, INSTALL a new main control. REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	TCC friction material worn or damaged	INSTALL a new TCC. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	TCC solenoid dampner missing or damaged.	DISASSEMBLE, CLEAN and INSPECT the TCC solenoid dampner. If dampner is missing or damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic

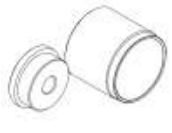
		Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	Converter feed blow-off valve missing.	DISASSEMBLE, CLEAN and INSPECT the converter feed blow-off valve, if missing INSTALL a new main control. REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
TCC always applied/stalls vehicle	TCC solenoid mechanically stuck ON, TCC regulator valve spring broken or spring stuck in the compressed position.	INSTALL a new TCC solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). TCC solenoid mechanically stuck OFF REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures). If TCC regulator valve spring is broken, stuck or missing, INSTALL a new main control. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	TCC Regulator Valve stuck ON	DISASSEMBLE, CLEAN and INSPECT the regulator valve. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	TCC friction material worn or damaged	INSTALL a new TCC. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	CONV FD, MDA-TCC, APPLY, REL hydraulic circuit blocked or leaking	DISASSEMBLE, CLEAN and INSPECT the valves. If bore or valve is damaged, INSTALL a new main control. REFER to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).

		REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
TCC cycles, shudders or chatters	Incorrect transmission strategy programmed into the TCM	PERFORM the Transmission Strategy Download, REFER to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
	TCC solenoid mechanically sticking	INSTALL a new TCC solenoid. REFER to: Shift Solenoids (SS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	TCC Regulator Valve stuck ON	DISASSEMBLE, CLEAN and INSPECT the regulator valve. If bore or valve is damaged, INSTALL a new main control valve body. REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	CONV FD, MDA-TCC, APPLY, REL hydraulic circuit blocked or leaking	DISASSEMBLE, CLEAN and INSPECT the valves. If bore or valve is damaged, INSTALL a new main control. REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). REFER to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
	TCC friction material worn or damaged	INSTALL a new TCC. REFER to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

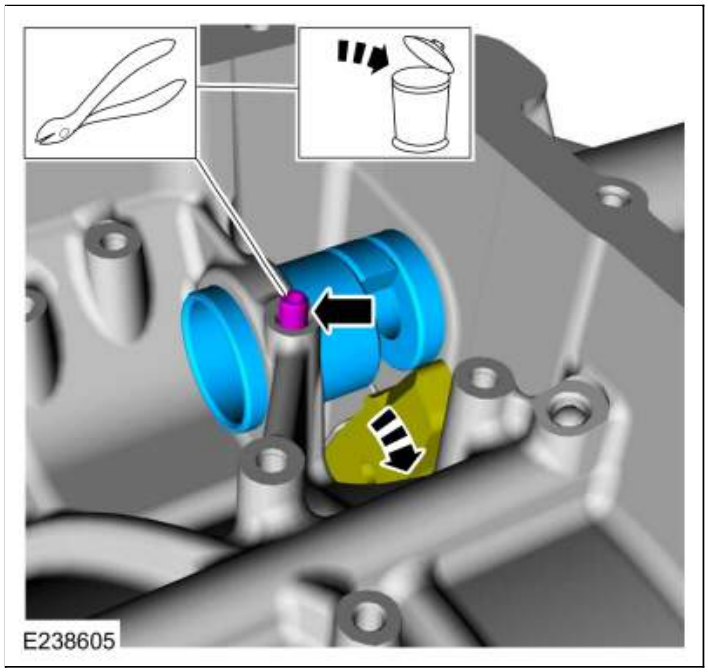
Transmission Case

Base Part Number: 7005

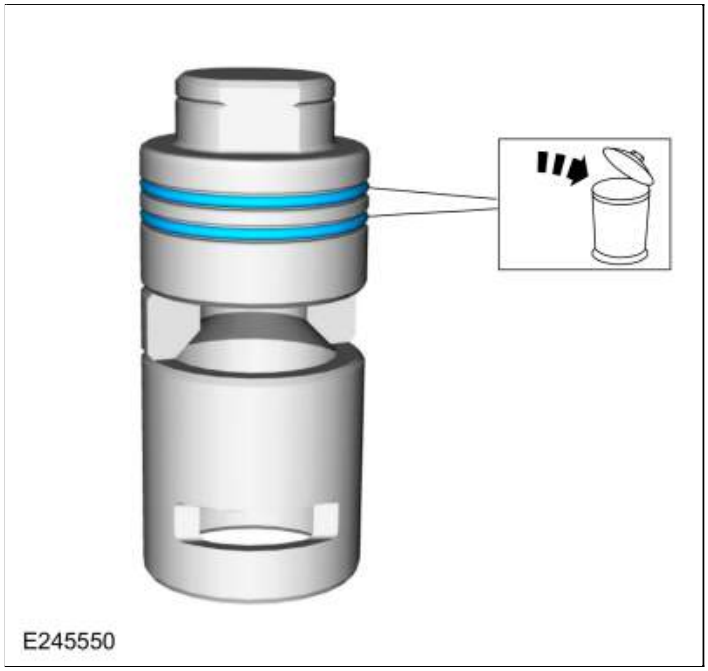
Special Tool(s) / General Equipment

 E131850	204-594 Forcing screw
 E234930	307-744 Remover, Output Shaft Bearing

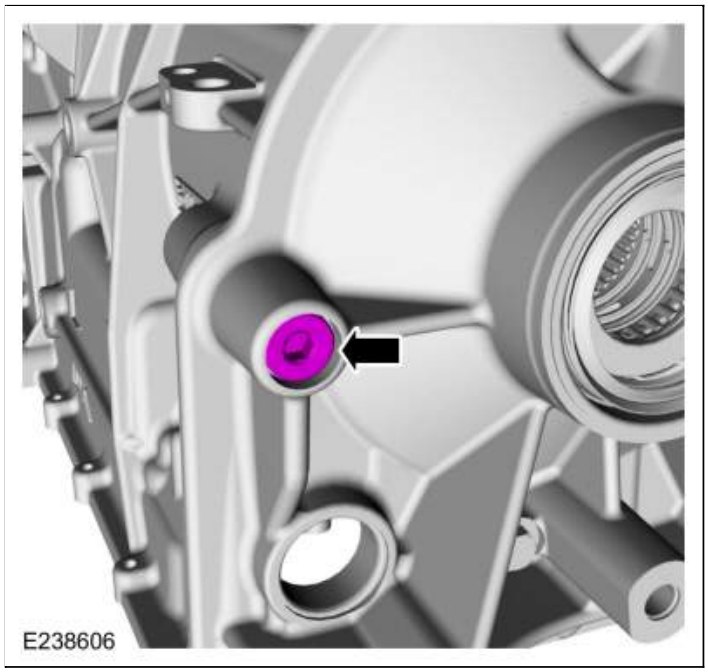
1. Remove and discard the park pawl actuator rod sleeve roll pin (7G100), move the park pawl out of the park pawl actuator rod sleeve and remove the park pawl actuator rod sleeve.



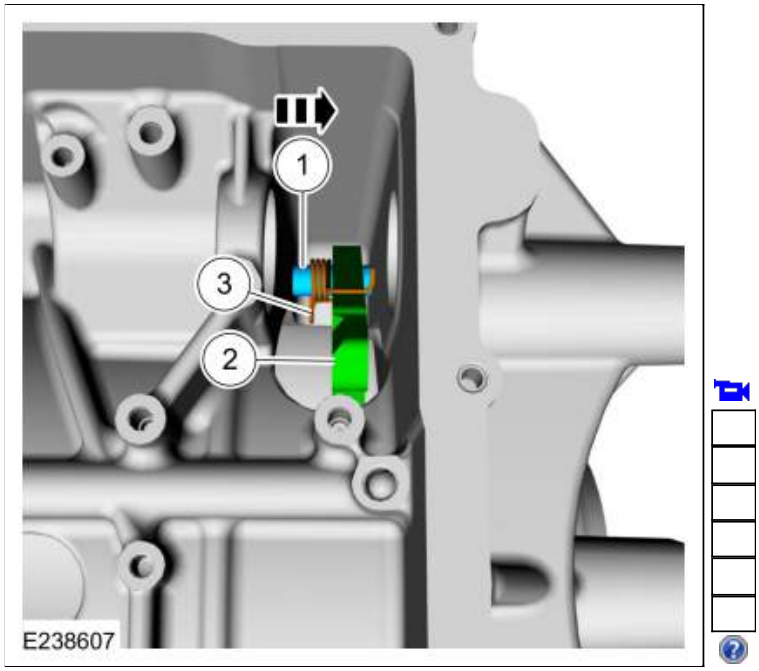
2. Remove and discard the park pawl actuator rod sleeve seals (2D330).



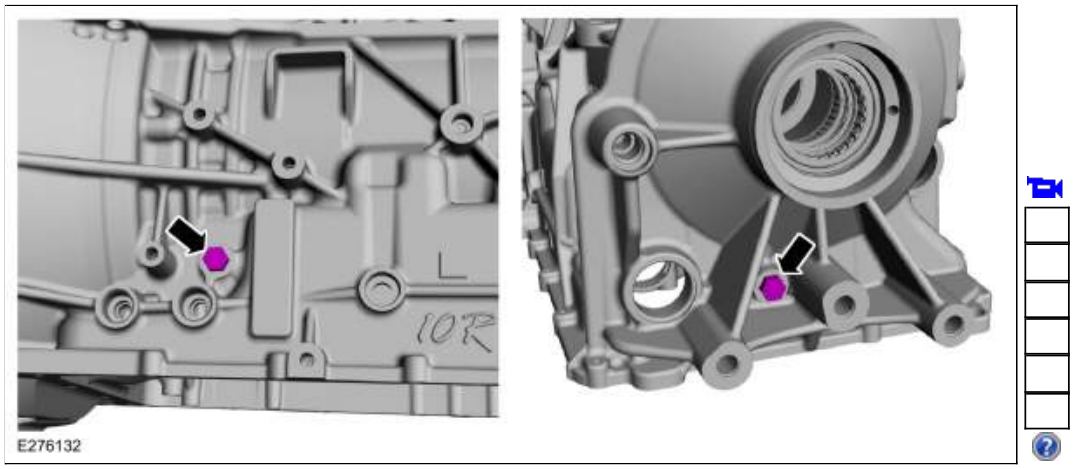
3. Remove the park pawl shaft plug.



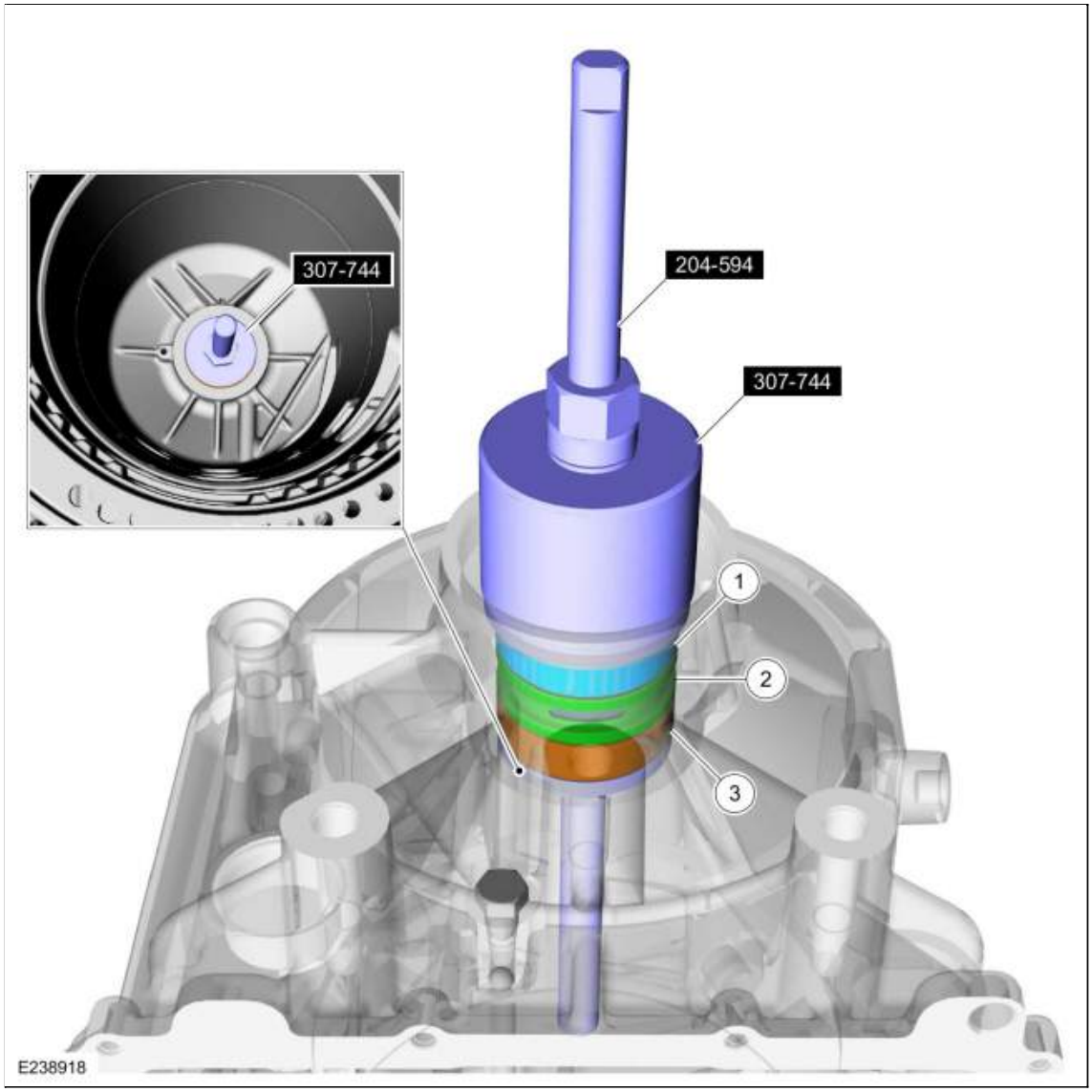
4.
   1. Disconnect the park pawl return spring to remove tension from the park pawl shaft and remove the park pawl shaft.
   2. Remove the park pawl.
   3. Remove the park pawl return spring.



5. Remove the line pressure port and rear case plugs.



6. Using the special tools, remove the bearings and the fluid passage sleeve.
    1. Outer output shaft bearing
       Use Special Service Tool: 204-594 Forcing screw. , 307-744 Remover, Output Shaft Bearing.
    2. Fluid passage sleeve
    3. Inner output shaft bearing



Adaptive Learning Drive Cycle

Activation

NOTE: *Perform the adaptive learning drive cycle on a level road surface.*

1. Record then clear the DTCs (Diagnostic Trouble Codes).
2. Drive the vehicle until the engine and transmission reach normal operating temperature.
3. Accelerate from a stop with light throttle (15%) ensuring that upshifts 1st through 8th occur at engine speeds between 1300-1600 rpm.
4. Continue to accelerate (may apply slightly more throttle after 7-8 upshift at 32-38 mph (51-61 km/h) until you achieve 55 mph (88 km/h) and the 8-9 and 9-10 shifts complete.
5. Brake very gently to a complete stop and hold foot on brake for five (5) seconds.
6. Shift the transmission to Neutral. Wait 1 second.
7. Shift the transmission to Reverse. Wait 2 seconds.
8. Shift the transmission to Neutral. Wait 1 second.
9. Shift the transmission to Drive. Wait 2 seconds.
10. Repeat Steps 3 through 9 six additional times.

Transmission Fluid Drain and Refill

Special Tool(s) / General Equipment

	307-570 Tube, Transmission Fill TKIT-2006U-F/FM TKIT-2006U-FLM/LM TKIT-2006U-ROW1 TKIT-2006U-ROW2
Fluid Suction Gun	

Materials

Name	Specification
Motorcraft® MERCON® ULV Automatic Transmission Fluid XT-12-QULV	WSS-M2C949-A MERCON® ULV

Draining

1. **NOTE:** *It is not necessary to remove the transmission fluid filter to drain the transmission fluid.*

   Remove the transmission fluid pan to drain the transmission fluid.
   Refer to: Transmission Fluid Pan, Gasket and Filter (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

Filling

NOTICE: This procedure is NOT intended for use with the transmission fluid level check.

NOTICE: The vehicle should not be driven if the transmission fluid level is low, internal failure could result.

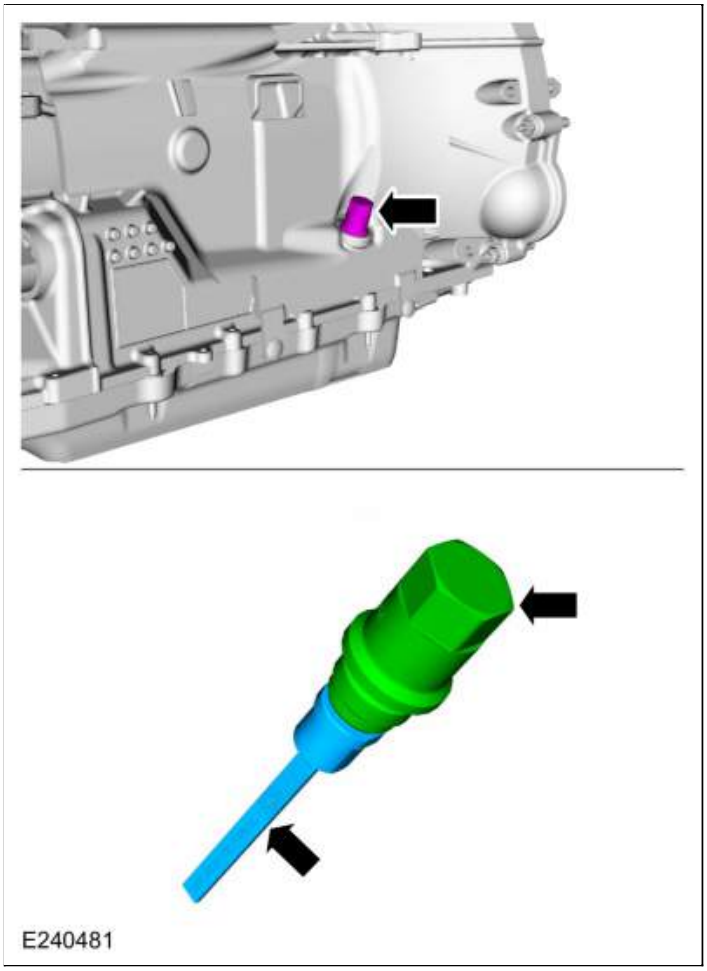
NOTICE: Using any transmission fluid other than what is specified can result in the transmission not operating normally or premature transmission failure.

NOTE: *Check the transmission fluid level if the transmission starts to slip, shifts slowly or shows signs of transmission fluid leaking.*

NOTE:

- *Adding 4.8L (5 qt) of transmission fluid is an initial fill enabling the engine to be started.*
- *Filling the transmission to the transmission fluid level indicator area below the crosshatch mark allows the vehicle to be driven.*
- *Drive the vehicle to allow the transmission fluid temperature to reach 96ºC - 101ºC (206ºF - 215ºF) in order to purge the air from the transmission fluid cooling system.*
- *Fill the transmission fluid to the fill range on the transmission fluid level indicator at the normal operating temperature 96ºC - 101ºC (206ºF - 215ºF).*

1. Remove the transmission fluid fill plug and remove the transmission fluid level indicator from the plug.

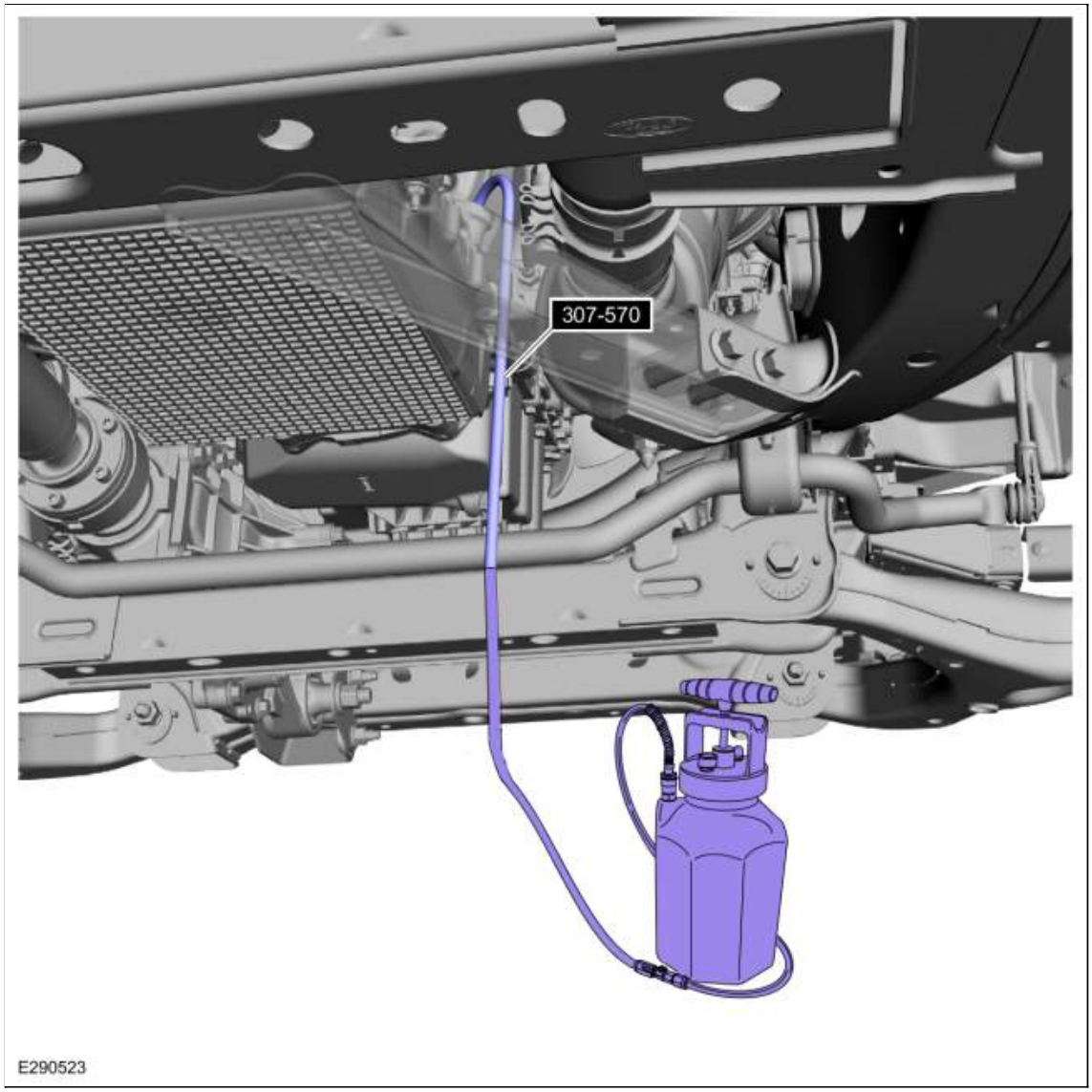


2. **NOTE:** *Add 4.8L (5 qt) of transmission fluid to the transmission as an initial fill if:*
   - *a new main control has been installed.*
   - *the transmission fluid pan or transmission fluid filter have been removed.*

   NOTE: *Add 5.7L (6 qt) of transmission fluid to the transmission as an initial fill if the transmission has been overhauled.*

   NOTE: *The use of a pressurized fluid dispenser with 8-12 qt capacity, such as the Mityvac MITMV6412, is recommended for this procedure.*

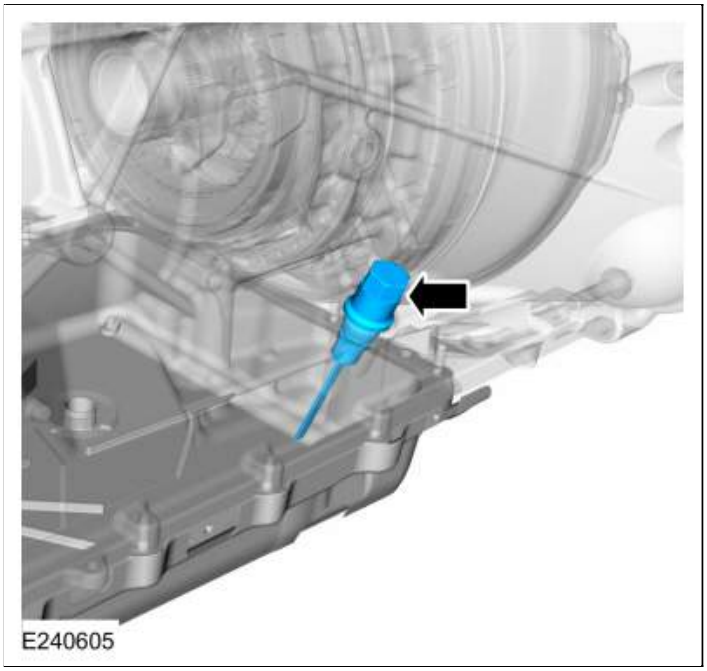
   Using the special tool and the fluid dispenser, add the transmission fluid through the transmission fluid fill hole.
   - Use Special Service Tool: 307-570 Tube, Transmission Fill.
   - General Equipment: Universal Fluid Dispenser
     Material: Motorcraft® MERCON® ULV Automatic Transmission Fluid / XT-12-QULV (WSS-M2C949-A) (MERCON® ULV)



3.

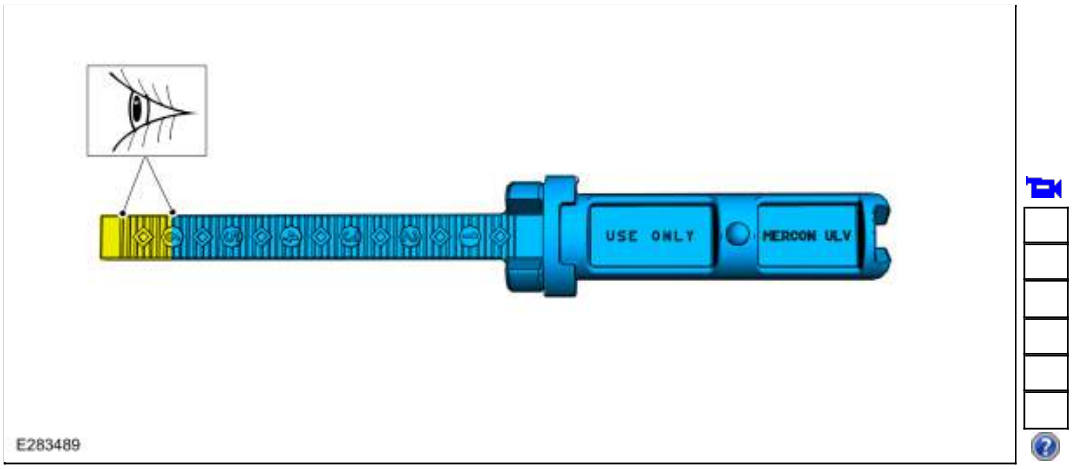
1. Connect the diagnostic scan tool and monitor the transmission fluid temperature.
2. Start the engine.
3. Place the selector lever in each gear position, holding approximately 5 seconds in each position. Place the selector lever in PARK and allow the engine to idle at 600-750 rpm.

- Check the transmission fluid level using the transmission fluid level indicator.

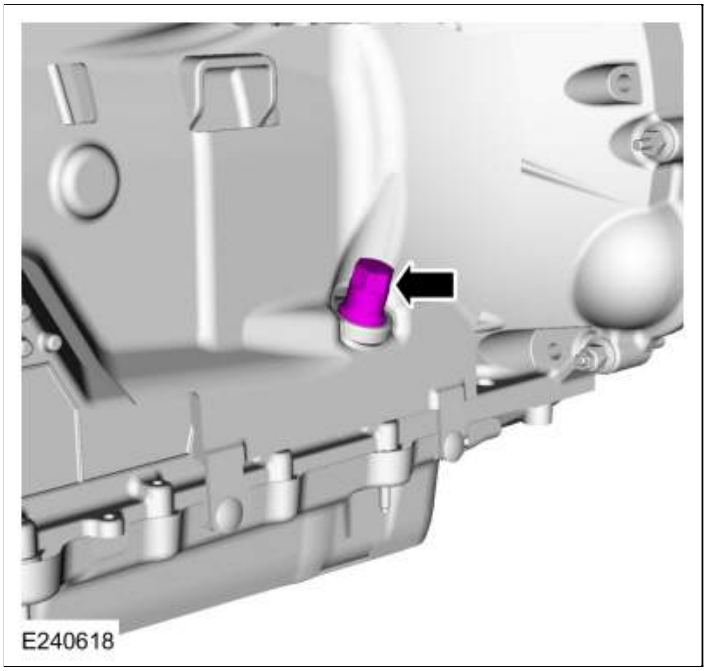


4. **NOTICE: The vehicle can be driven when the transmission is cold provided the transmission fluid level is between the first hatch mark and 6 on the transmission fluid level indiator. Failure to add transmission fluid to this level can result in damage to the transmission.**

   Add transmission fluid until it reaches between the first hatch mark and 6 on the transmission fluid indicator.

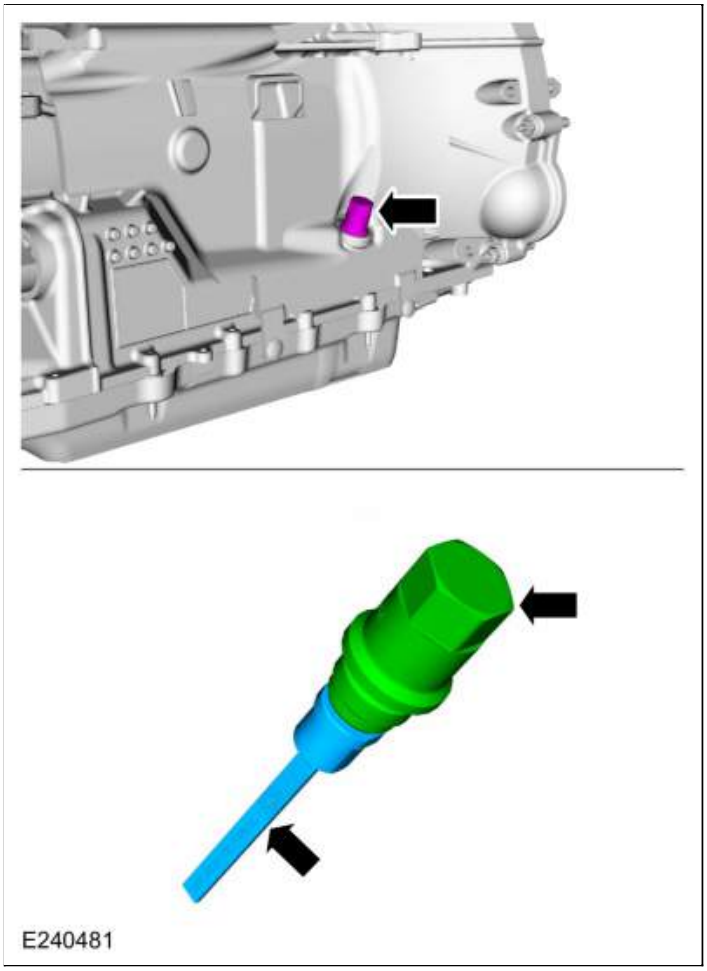


5. Install the transmission fluid fill plug.
   Torque: 52 lb.ft (70 Nm)

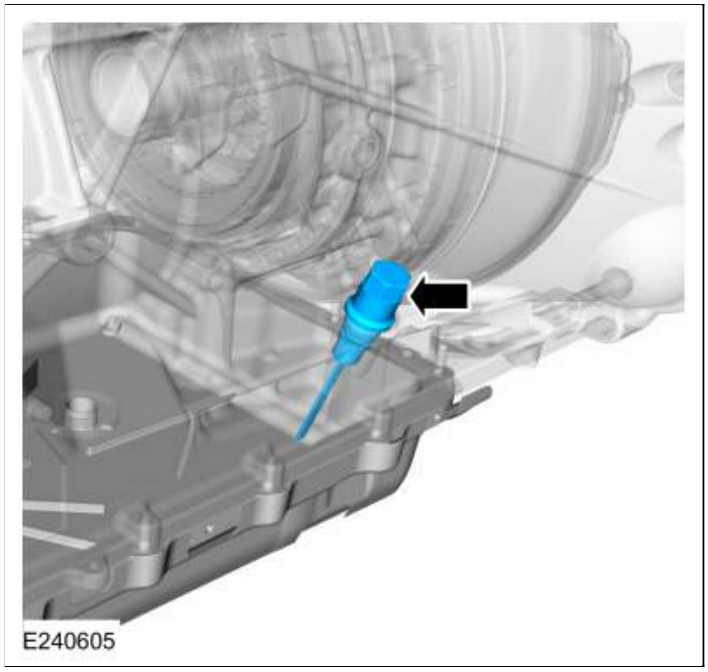


6. Test drive the vehicle. While driving the vehicle, use the scan tool to verify the transmission fluid has reached an operating temperature of 96ºC - 101ºC (206ºF - 215ºF). This circulates the transmission fluid through the torque converter and the transmission fluid cooling system, eliminating any trapped air in the transmission fluid cooling system. Place the vehicle in PARK and allow the engine to idle at 600-750 rpm. Verify the transmission fluid temperature is between 96ºC - 101ºC (206ºF - 215ºF) and lift the vehicle on a hoist.
Refer to: Jacking and Lifting (100-02 Jacking and Lifting, Description and Operation).

7. 
Remove the transmission fluid fill plug and remove the transmission fluid level indicator from the plug.



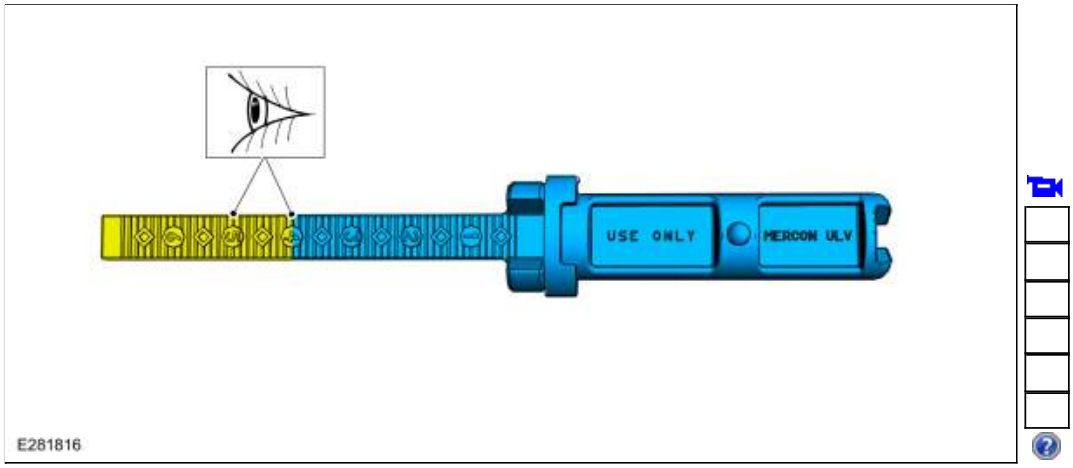
8. Check the transmission fluid level using the transmission fluid level indicator.



9. **NOTE:** *The transmission fluid level indicator uses 1 through 6 to indicate the fluid level. The different numbers are for different vehicle models. Use the area between 4 and 5 when checking the transmission fluid level. The correct transmission fluid level is between 4 and 5 on the transmission fluid level indicator.*

   NOTE: *Do not overfill the transmission.*

   Using the scan tool verify the transmission fluid temperature is between 96ºC - 101ºC (206ºF - 215ºF). The transmission fluid level must be between 4 and 5 on the transmission fluid level indicator.

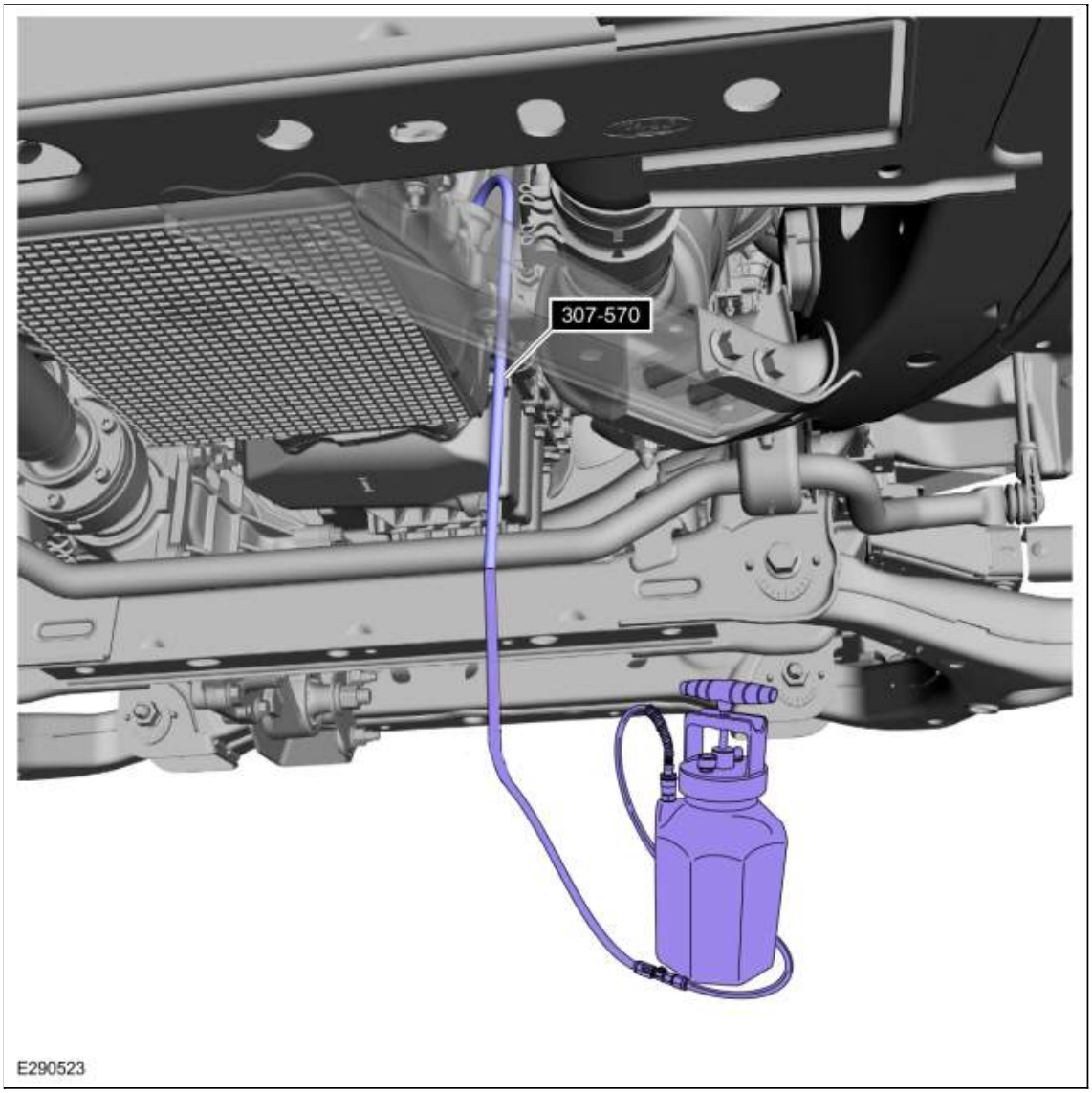


10. 

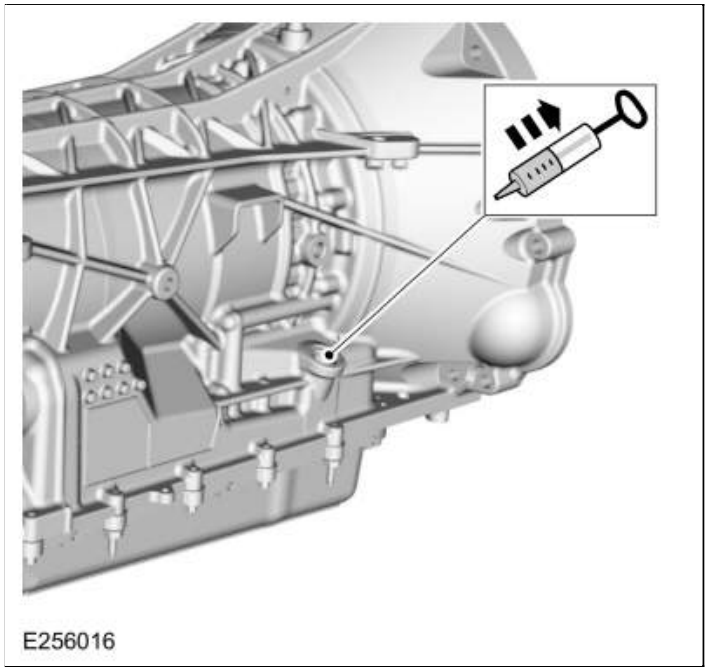
    NOTE: *The use of a pressurized fluid dispenser with 8-12 qt capacity, such as the Mityvac MITMV6412, is recommended for this procedure.*

    If the transmission fluid level is low, add transmission fluid using the special tool and the fluid dispenser.
    - Use Special Service Tool: 307-570 Tube, Transmission Fill.
    - General Equipment: Universal Fluid Dispenser
      Material: Motorcraft® MERCON® ULV Automatic Transmission Fluid / XT-12-QULV (WSS-M2C949-A)

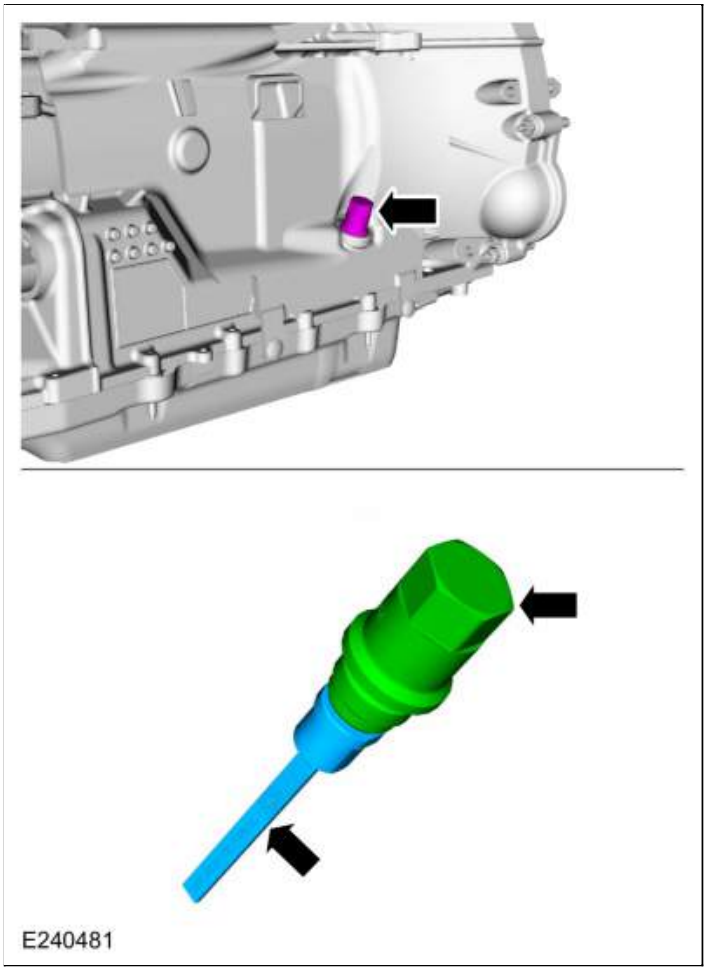
(MERCON® ULV)



11. If the transmission fluid is overfilled, remove the excess transmission fluid with a fluid suction gun.
Use the General Equipment: Fluid Suction Gun



12. Install the transmission fluid level indicator in the plug and install the transmission fluid fill plug into the transmission.
Torque: 52 lb.ft (70 Nm)



Transmission Fluid Exchange

Special Tool(s) / General Equipment

Fluid Exchanger

Materials

Name	Specification
Motorcraft® MERCON® ULV Automatic Transmission Fluid XT-12-QULV	WSS-M2C949-A MERCON® ULV

Activation

NOTICE: Use transmission fluid specific for this transmission. Do not use any supplemental transmission fluid additives or cleaning agents. The use of these products can cause internal transmission components to fail, which will affect the operation of the transmission.

1. With the vehicle in NEUTRAL, position it on a hoist.
   Refer to: Jacking and Lifting (100-02 Jacking and Lifting, Description and Operation).

2. Connect the Fluid Exchanger to the transmission fluid cooler tube after the transmission fluid cooler on the return tube. This helps remove any foreign material trapped in the transmission fluid coolers.
   Use the General Equipment: Fluid Exchanger

3. Perform the transmission fluid exchange using the Fluid Exchanger.
   - Follow the manufacturer's instructions included with the machine.
     Use the General Equipment: Fluid Exchanger
     Material: Motorcraft® MERCON® ULV Automatic Transmission Fluid / XT-12-QULV (WSS-M2C949-A) (MERCON® ULV)
   - Refer here for current material specs

   Material

4. Once the transmission fluid exchange is completed, disconnect the Fluid Exchanger. Reconnect any disconnected transmission fluid cooler tubes.
   Use the General Equipment: Fluid Exchanger

5. Check the transmission fluid level.
   Refer to: Transmission Fluid Level Check (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).

Transmission Fluid Level Check

Inspection

NOTICE: The vehicle should not be driven if the transmission fluid level is low. Internal failure could result.

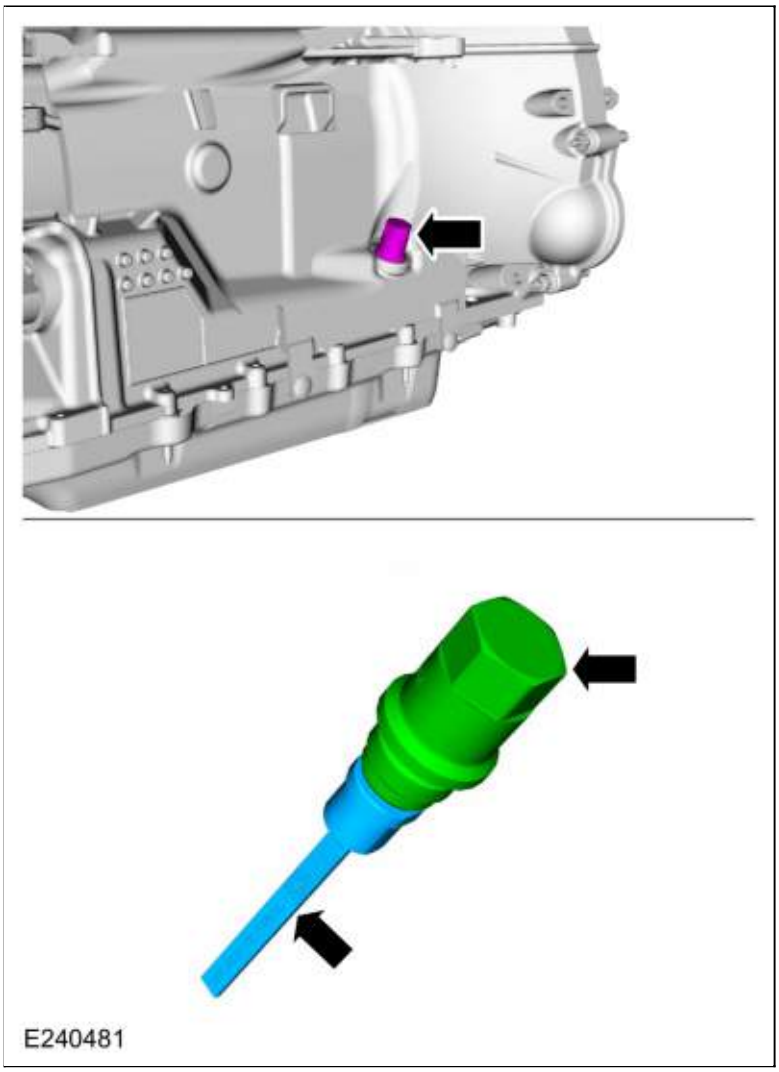
NOTE: *If the vehicle has been operated for an extended period at high highway speeds, in city traffic, during hot weather or while pulling a trailer, the transmission fluid must cool down to obtain an accurate reading.*

NOTE: *If a new transmission fluid cooler or new fluid cooler tubes have been installed, drive the vehicle to warm the transmission fluid to 96ºC-101ºC (206ºF-215ºF) in order to purge the air from the transmission fluid cooling system.*

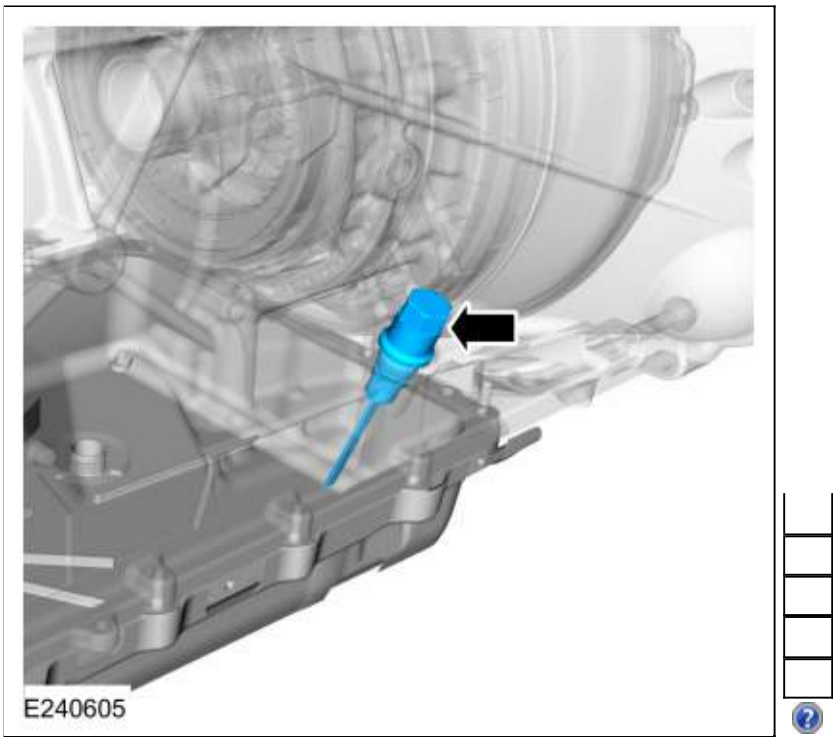
1. Connect the diagnostic scan tool and position the vehicle on a hoist.
   Refer to: Jacking and Lifting (100-02 Jacking and Lifting, Description and Operation).

2. With the engine running, place the transmission selector lever in each gear position, holding approximately 5 seconds in each position. Place the transmission selector lever in PARK.

3.  the transmission fluid fill plug and remove the transmission fluid level indicator from the plug.



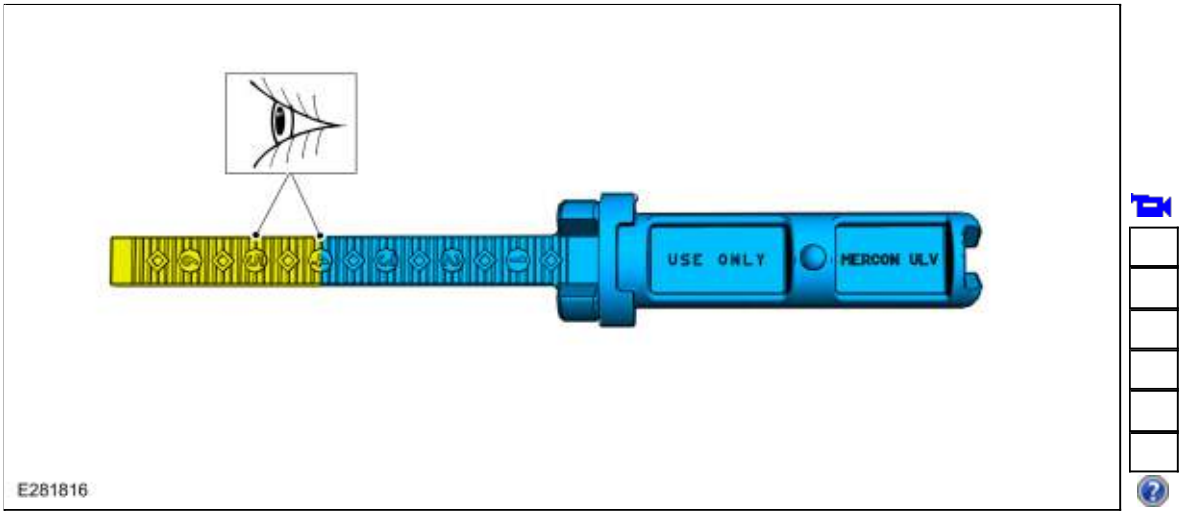
4. Check the transmission fluid level using the transmission fluid level indicator.



5. **NOTE:** *The transmission fluid level indicator uses 1 through 6 to indicate the fluid level. The different numbers are for different vehicle models. Use the area between 4 and 5 when checking the transmission fluid level. The correct transmission fluid level is between 4 and 5 on the transmission fluid level indicator.*

   NOTE: *Do not overfill the transmission.*

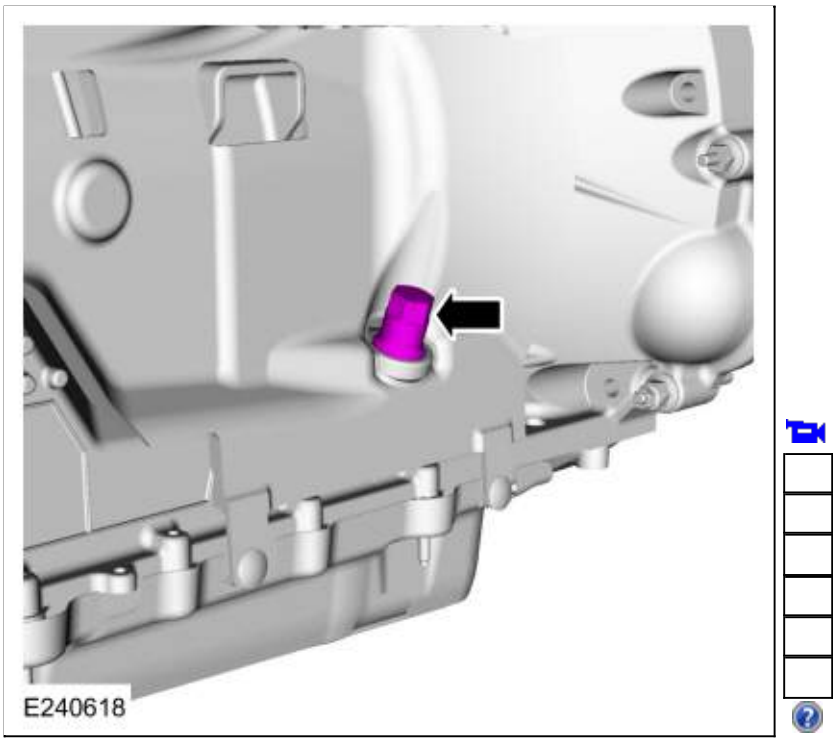
   Using the scan tool verify the transmission fluid temperature is between 96ºC - 101ºC (206ºF - 215ºF). The transmission fluid level must be between 4 and 5 on the transmission fluid level indicator.



6. If the transmission fluid is not at the correct level, follow the steps for adding or removing transmission fluid.
   Refer to: Transmission Fluid Drain and Refill (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).

7. 

Install the transmission fluid fill plug.
Torque: 52 lb.ft (70 Nm)



Transmission Identification

Check

1. Using the scan tool, select Powertrain, Transmission and Transmission Characterization / Solenoid IDN from the toolbox icon and follow the instructions displayed on the scan tool. The Transmission Characterization / Solenoid IDN screen displays solenoid body identification information:
   - Solenoid body identification is a 12-digit number
   - Solenoid body strategy is a 13-digit number. If the solenoid body strategy field is blank, the module contains a partial transmission solenoid body strategy. This is due to a corrupt or missing file at the time the programmable parameters were completed.

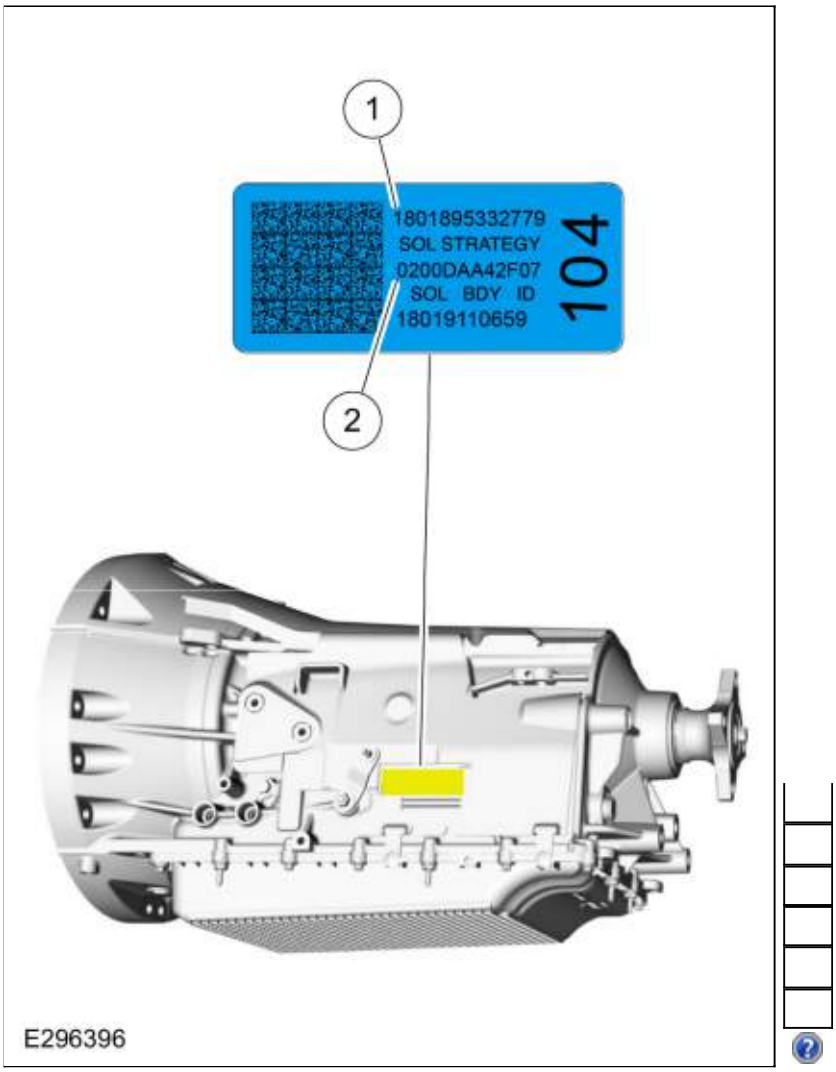
2. **NOTE:** *The 13-digit solenoid body strategy number consists of only numbers. Letters are not used.*

   Compare the solenoid body identification and strategy to the solenoid body identification tag located on the left side of the transmission case.

NOTE:

- ***Original Solenoid Body Service Tag***

3.
   1. 13 - digit solenoid body strategy
   2. 12 - digit solenoid body identification

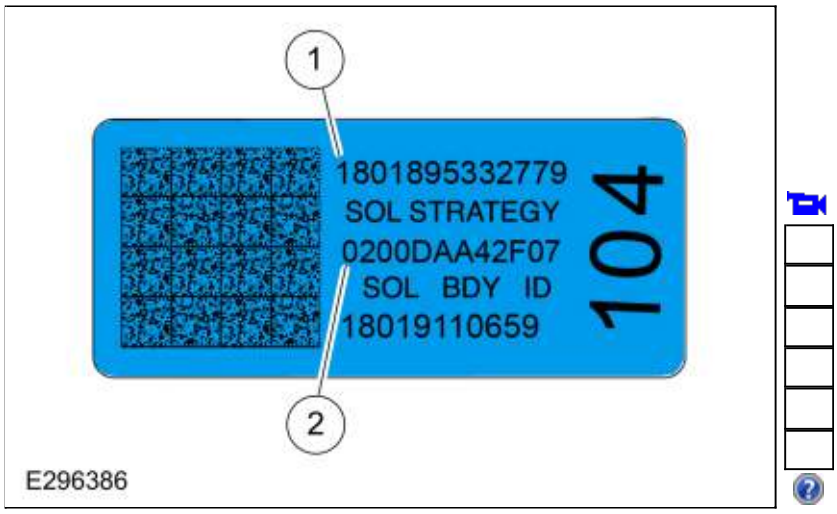


4. If the solenoid body identification and strategy displayed on the scan tool match the solenoid body identification tag or replacement tag, then the solenoid body identification and strategy are correct for this transmission and a solenoid body strategy data download is not required. If the solenoid body identification tag or replacement tag is missing or damaged so it is not readable or does not match the identification or strategy displayed on the scan tool, remove the transmission fluid pan and filter and locate the 13-digit solenoid body strategy etched on the main control casting.
   Refer to: Transmission Fluid Pan, Gasket and Filter (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

NOTE:

- ***Replacement Solenoid Body Service Tag***

5.
   1. 13 - digit solenoid body strategy
   2. 12 - digit solenoid body identification



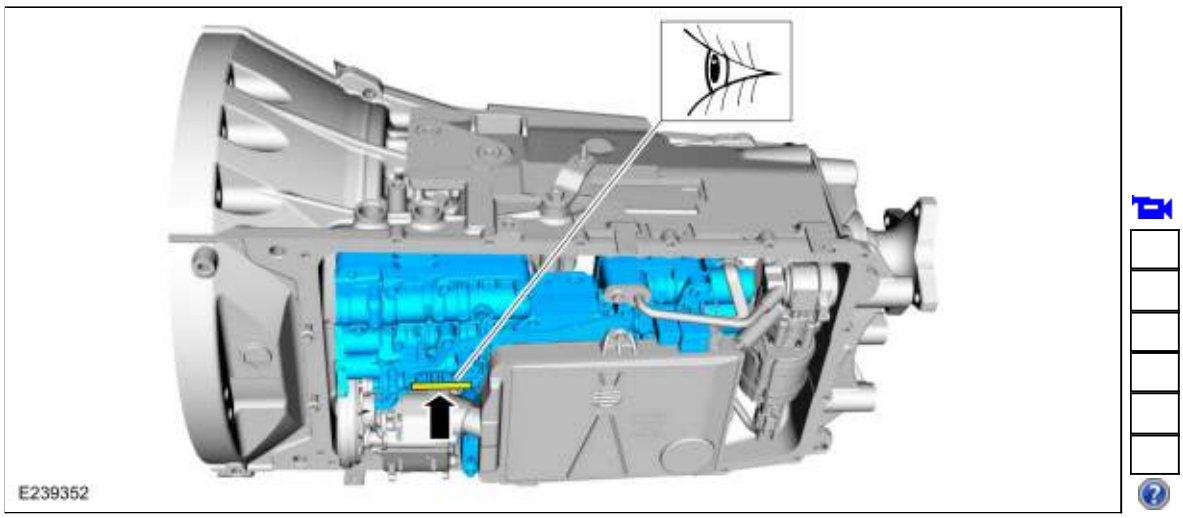
NOTE:

- ***Main Control Solenoid Body Strategy***

6. **NOTICE: The 13-digit solenoid body strategy number displayed on the scan tool must match the solenoid body strategy number etched on the main control. If the numbers do not match, damage to the transmission or driveability concerns can occur.**

   NOTICE: If the new main control was not supplied with a replacement solenoid strategy identification tag, DO NOT INSTALL the main control as all required programming information is missing.

   Compare the solenoid body strategy identification etched on the main control to the solenoid strategy identification tag on the transmission case. If the solenoid body strategy identification etched on the main control does not match the solenoid strategy identification tag then a solenoid body strategy data download is required. If the solenoid body strategy etched on the main control does match the solenoid strategy identification tag on the transmission case but does not match the solenoid body identification and strategy displayed on the scan tool, then a solenoid body strategy data download is also required.



Transmission Line Pressure Test

Materials

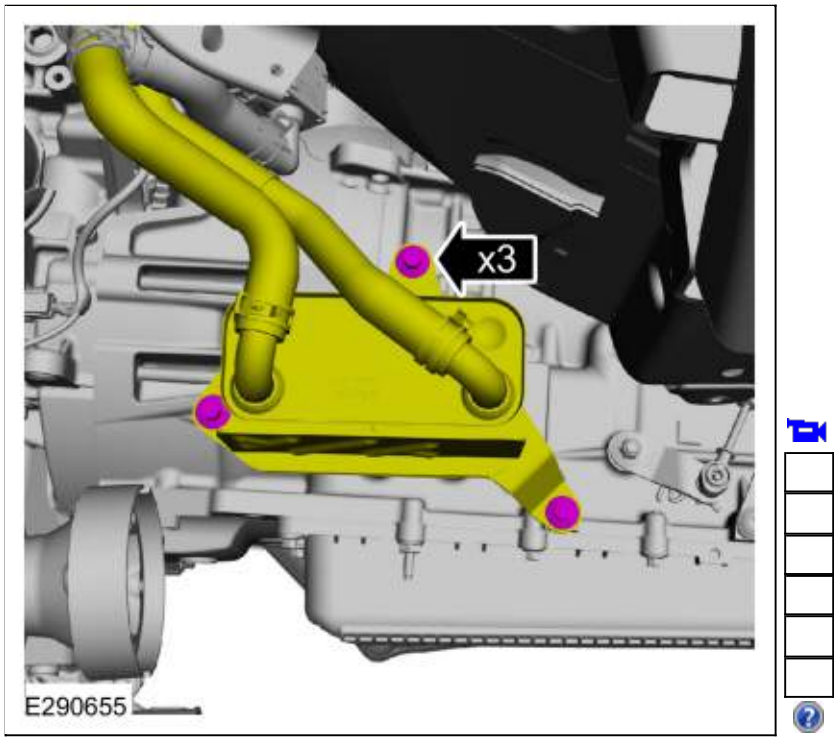
Name	Specification
Motorcraft® MERCON® ULV Automatic Transmission Fluid XT-12-QULV	WSS-M2C949-A MERCON® ULV

Disconnect

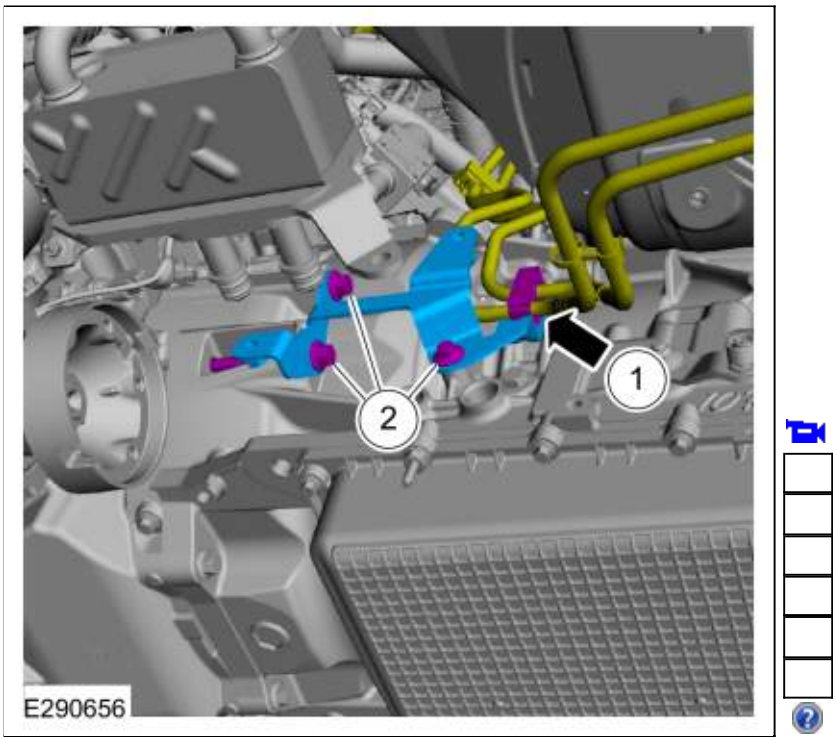
1. With the vehicle in NEUTRAL, position it on a hoist.
   Refer to: Jacking and Lifting (100-02 Jacking and Lifting, Description and Operation).

2. If equipped with 4WD, remove the front driveshaft.
   Refer to: Front Driveshaft (205-01 Driveshaft, Removal and Installation).

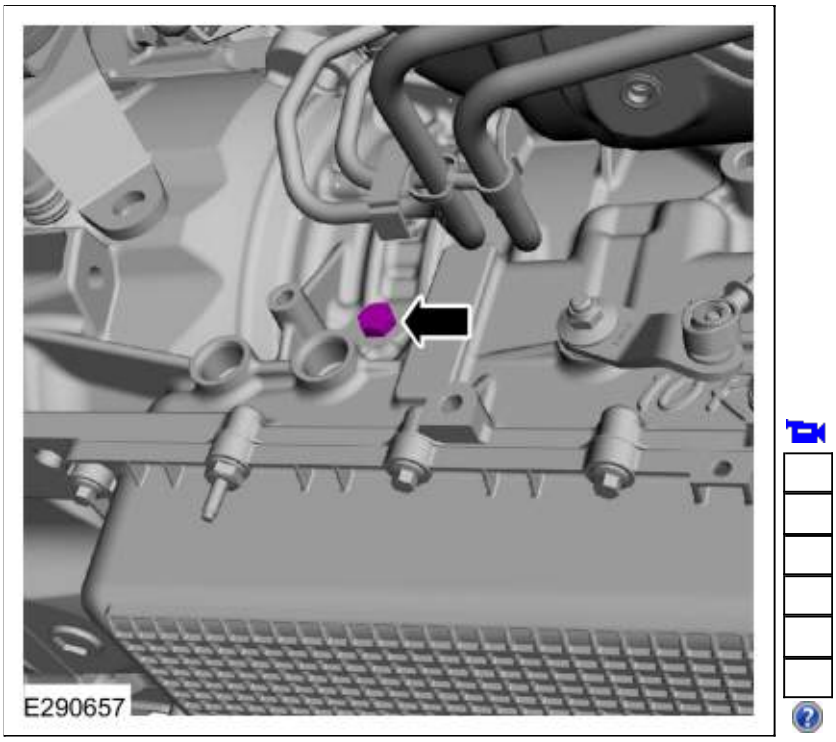
3. Remove the bolts and position aside the transmission fluid cooler.



4.
   1. Disconnect the fuel line retainer.
   2. Remove the bolts and the transmission fluid cooler bracket.

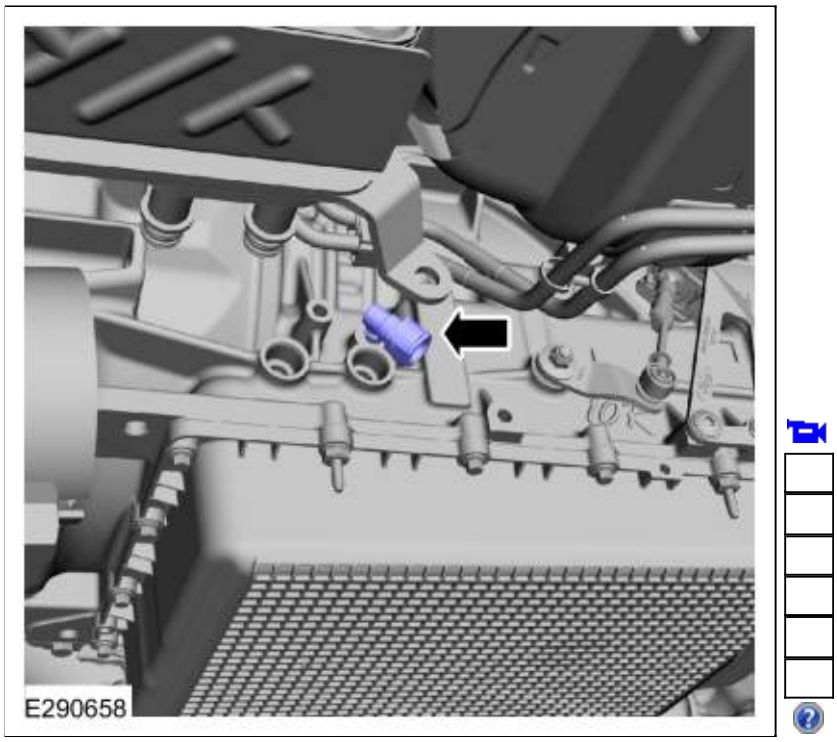


5. Remove the line pressure plug.

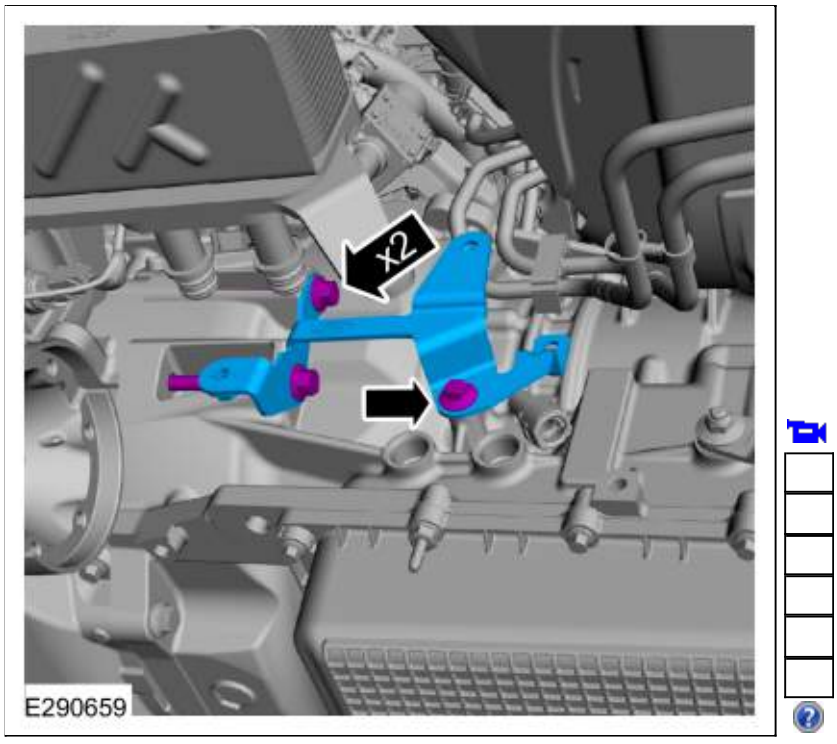


6. **NOTICE: The line pressure tap is an M10 X 1.00 thread. Do not use a National Pipe Thread (NPT) fitting when installing a pressure gauge. If a NPT fitting is used, damage to the transmission case will occur.**

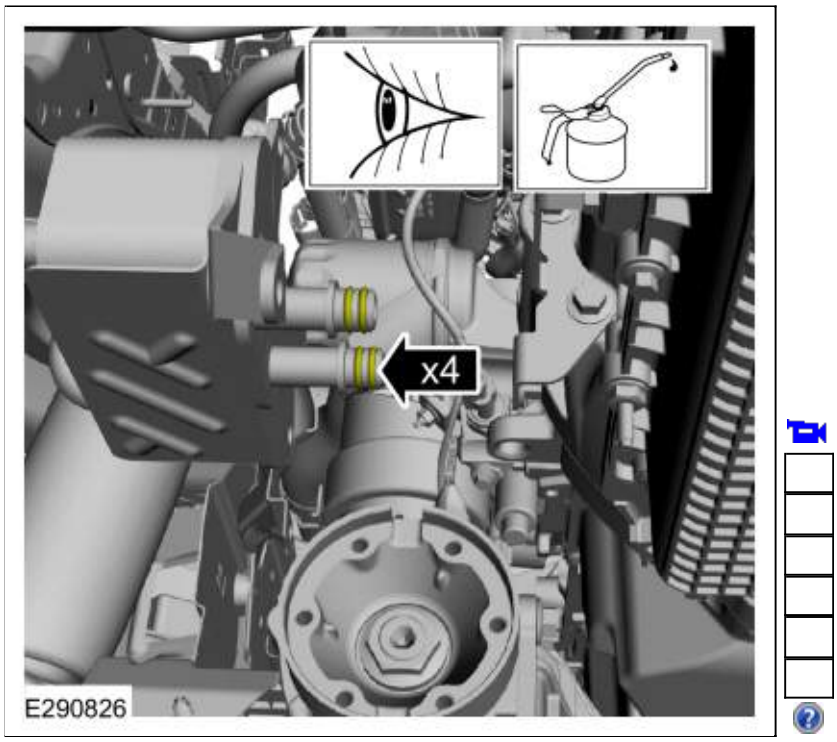
   Install a 90° M10 X 1.00 fitting into the transmission line pressure port.



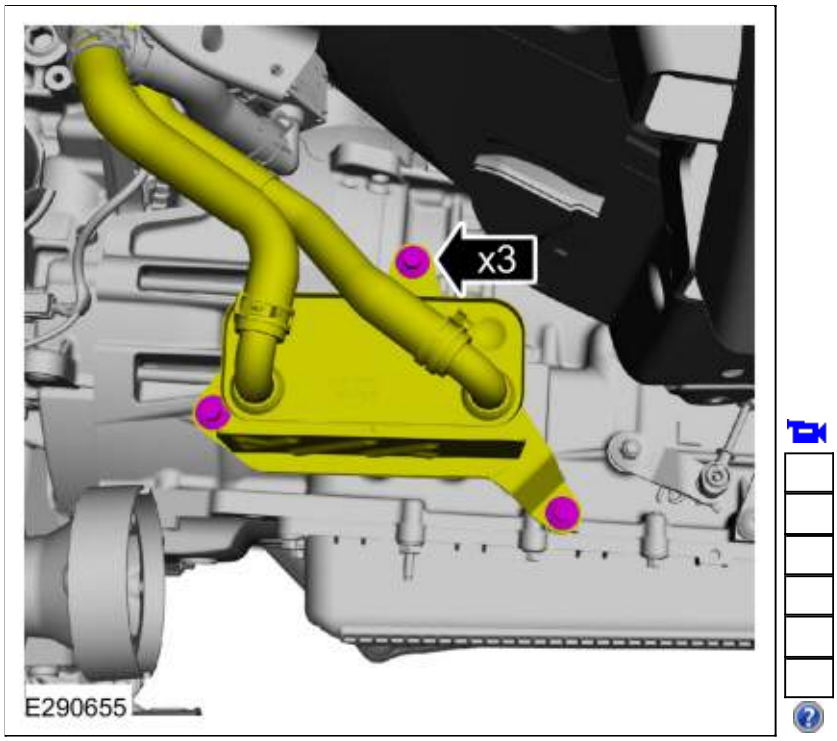
7. Install the transmission fluid cooler bracket and loosley install the bolts.



8. Inspect the transmission fluid cooler O-ring seals and install new O-ring seals if necessary. Lubricate the O-ring seals.
Material: Motorcraft® MERCON® ULV Automatic Transmission Fluid / XT-12-QULV (WSS-M2C949-A) (MERCON® ULV)



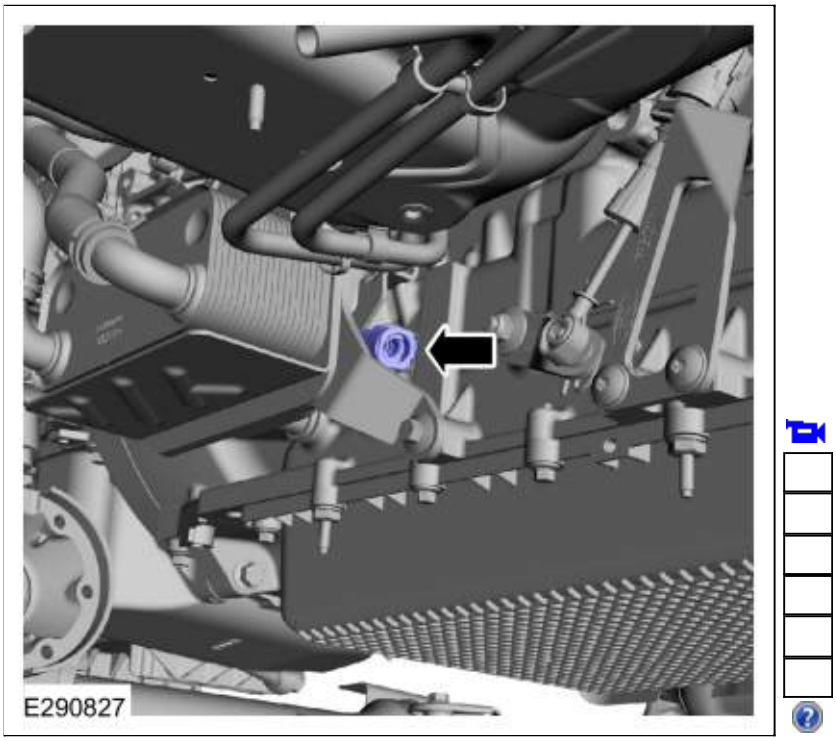
9. Install the transmission fluid cooler and loosley install the bolts.



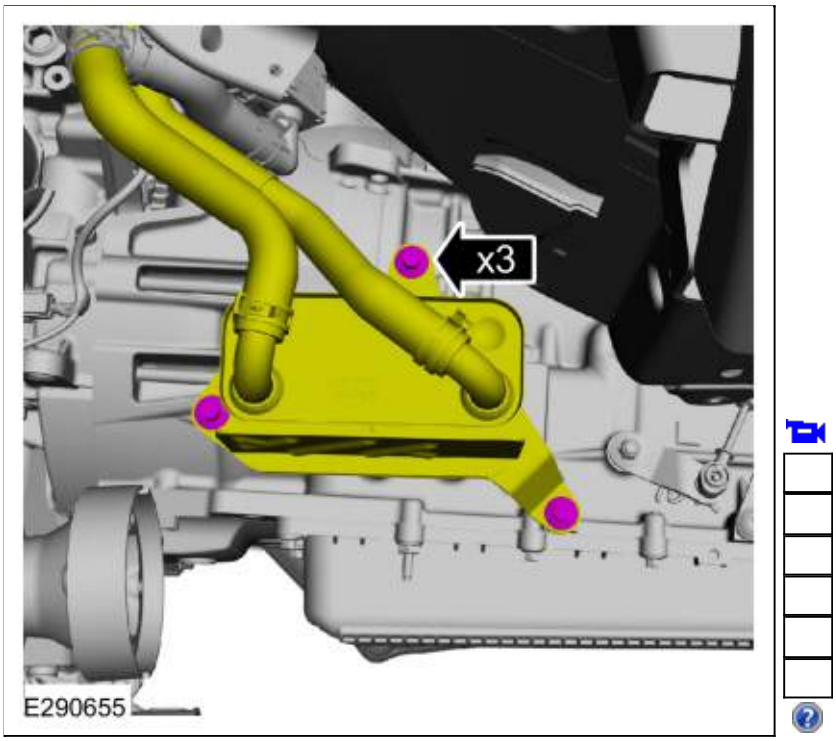
10.

1. Connect the Transmission Fluid Pressure Gauge to the 90° M10 X 1.00 fitting.
2. Start the engine and check the line pressures. Refer to the Line Pressure Chart to determine if the line pressure is within specification.
   Refer to: Special Testing Procedures (307-01 Automatic Transmission - 10-Speed Automatic

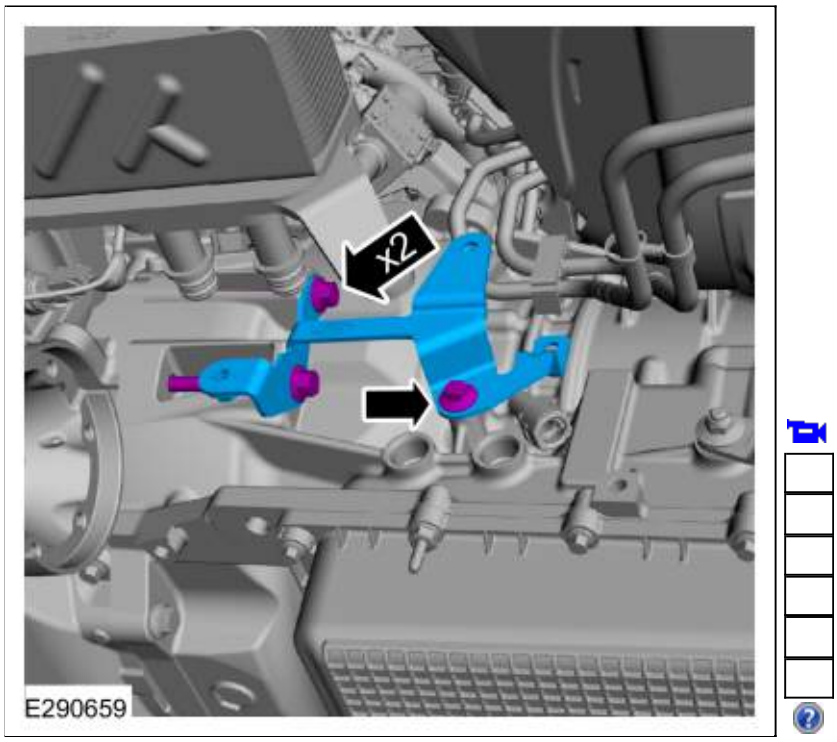
Transmission - 10R80, Diagnosis and Testing).



11. Remove the bolts and position aside the transmission fluid cooler.

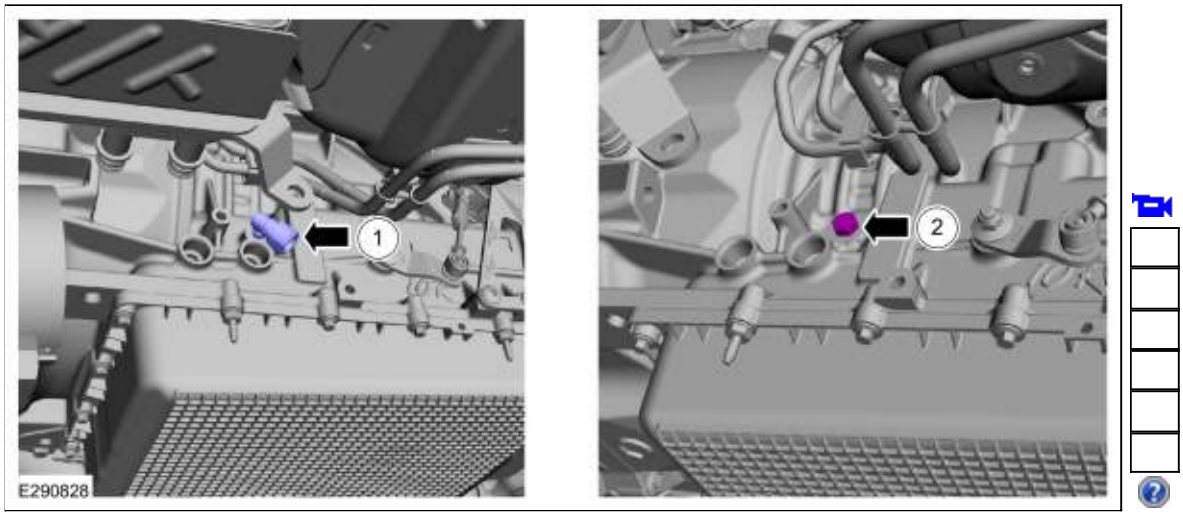


12. Remove the bolts and the transmission fluid cooler bracket.



13.

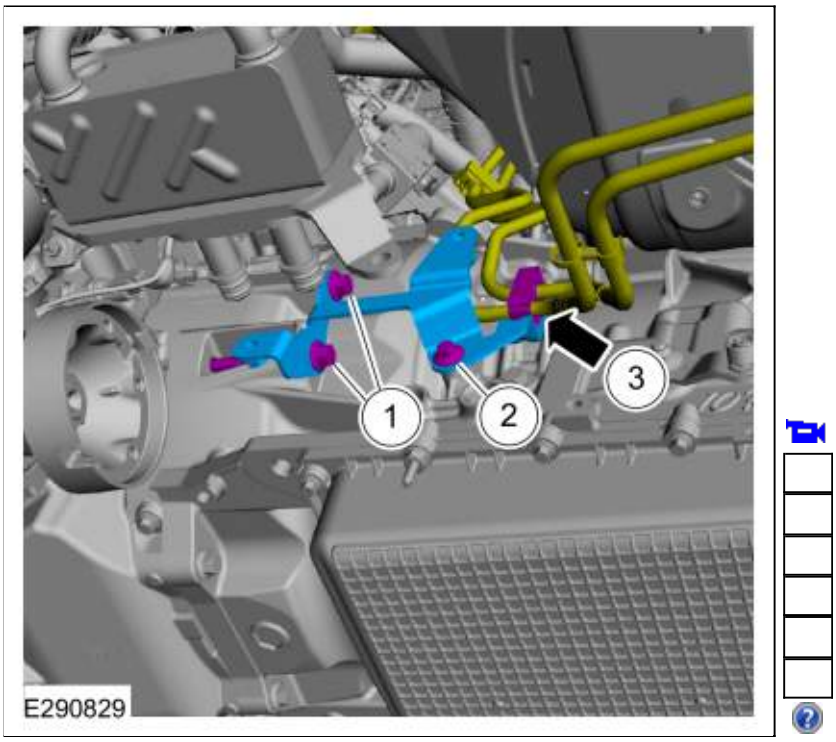
1. Remove the Transmission Fluid Pressure Gauge and the 90° M10 X 1.00 fitting.
2. Install the line pressure plug.
   Torque: 97 lb.in (11 Nm)



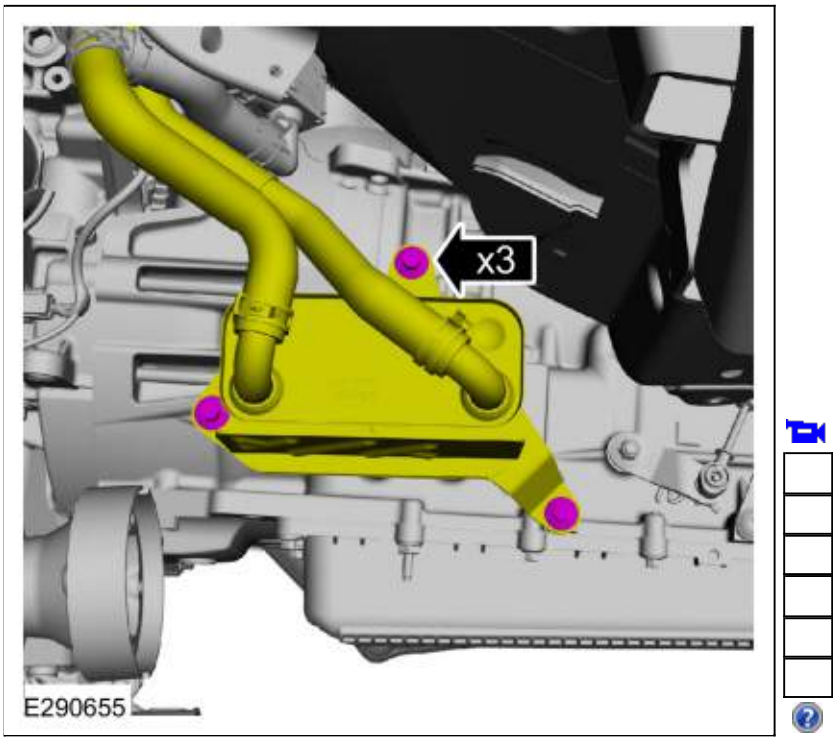
14.

Install the transmission fluid cooler bracket.

1. *Torque*: 35 lb.ft (48 Nm)
2. *Torque*: 177 lb.in (20 Nm)
3. Connect the fuel line retainer.



15. Install the transmission fluid cooler and the bolts.
Torque: 177 lb.in (20 Nm)

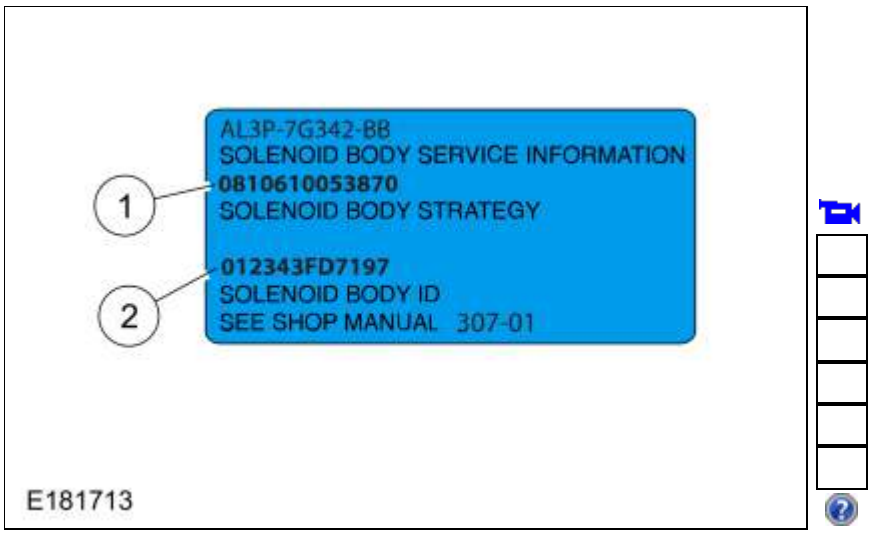


16. If equipped with 4WD, install the front driveshaft.
Refer to: Front Driveshaft (205-01 Driveshaft, Removal and Installation).

Transmission Strategy Download

Activation

1. If a new main control was installed, record the 12-digit solenoid body identification and 13-digit solenoid body strategy from the replacement solenoid body tag provided with the main control service kit. Place the replacement tag over the existing identification tag.
   - 13 - digit solenoid body strategy
   - 12 - digit solenoid body identification



2. Using the scan tool, select module Programming and Programmable Parameters under the toolbox icon and select transmission. Follow the instructions displayed on the scan tool. There are fields to enter the solenoid body 12-digit identification and 13-digit strategy recorded from the solenoid body.

3. Compare the transmission strategy label to the codes displayed on the scan tool. The codes displayed on the scan tool should match the lable. If not, select the update option on the tool. Once the update option is selected the tool will ask the user what best describes the repair operation that was performed on the transmission. The scan tool will only allow the user to select 1 of the five options. Once the selection is made, the user can enter the transmission code from the label into the entry box.

4. **NOTICE: If the solenoid body information is not correct, transmission damage or driveability concerns can occur.**

   NOTICE: It is critical that only 13-digit strategy be entered into the scan tool. Entering the 12-digit solenoid body identification will result in partial file download to the module. The 12-digit solenoid body identification option should only be used when directed by engineering in a case where a full 13-digit strategy cannot be obtained.

   Enter the solenoid body 13-digit strategy. The scan tool verifies the numbers entered are valid and displays a message if the information is not valid. The scan tool will check to verify the file is present

on the scan tool. If the file is present, the technician may proceed with downloading the file to the module. If the file is NOT present, the scan tool will promt the user for permission to retrieve the file from the Professional Technician Society (PTS) server. Internet access will be required to download the file from the server to the scan tool.

5. Follow the instructions on the network to download the strategy file to the scan tool.

6. Follow the instructions displayed on the scan tool.

7. The scan tool automatically downloads the strategy file. The scan tool displays a message when it is finished downloading the data that states that the file was downloaded successfully.

8. **NOTICE: If a drive cycle is not completed, erratic shifts and driveability concerns may occur.**

   Road test the vehicle following the Adaptive Learning Drive Cycle.
   Refer to: Adaptive Learning Drive Cycle (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).

Transmission

Base Part Number: 7000

1. To install the transmission assembly.
   Refer to: Transmission (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
   Refer to: Transmission - Raptor (307-01B) .

Main Control Valve Body

Base Part Number: 7A100

Special Tool(s) / General Equipment

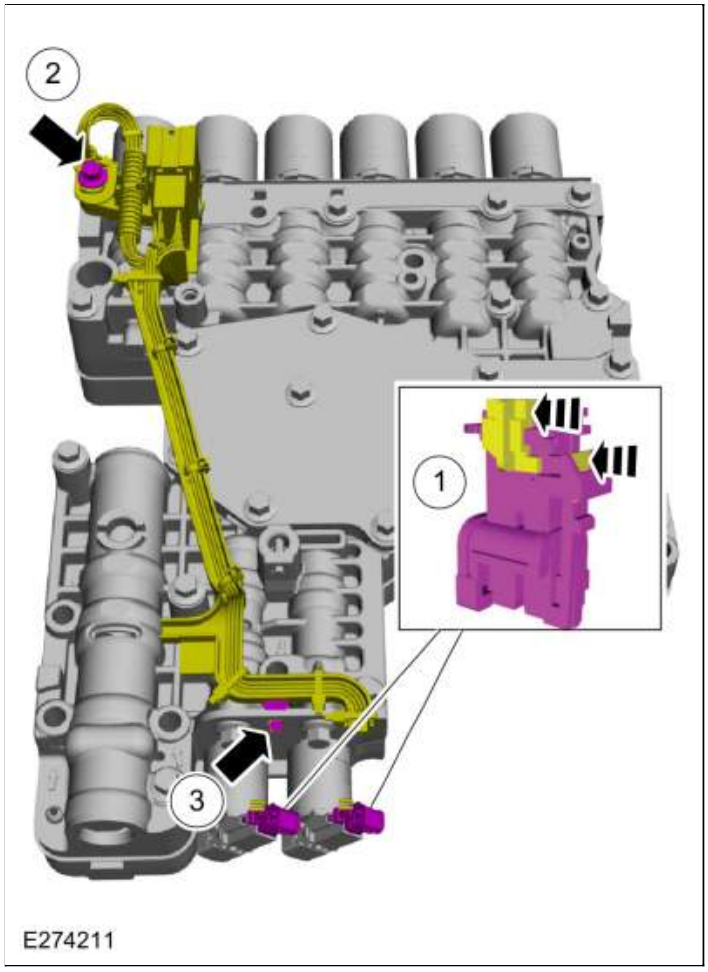
 17054	307-299 Alignment Pins, Valve Body TKIT-1994-LMH/MH2 TKIT-1994-F TKIT-1994-FLM/FM

Materials

Name	Specification
Motorcraft® MERCON® ULV Automatic Transmission Fluid XT-12-QULV	WSS-M2C949-A MERCON® ULV

1. For solenoid and valve identification.
   Refer to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Description and Operation).

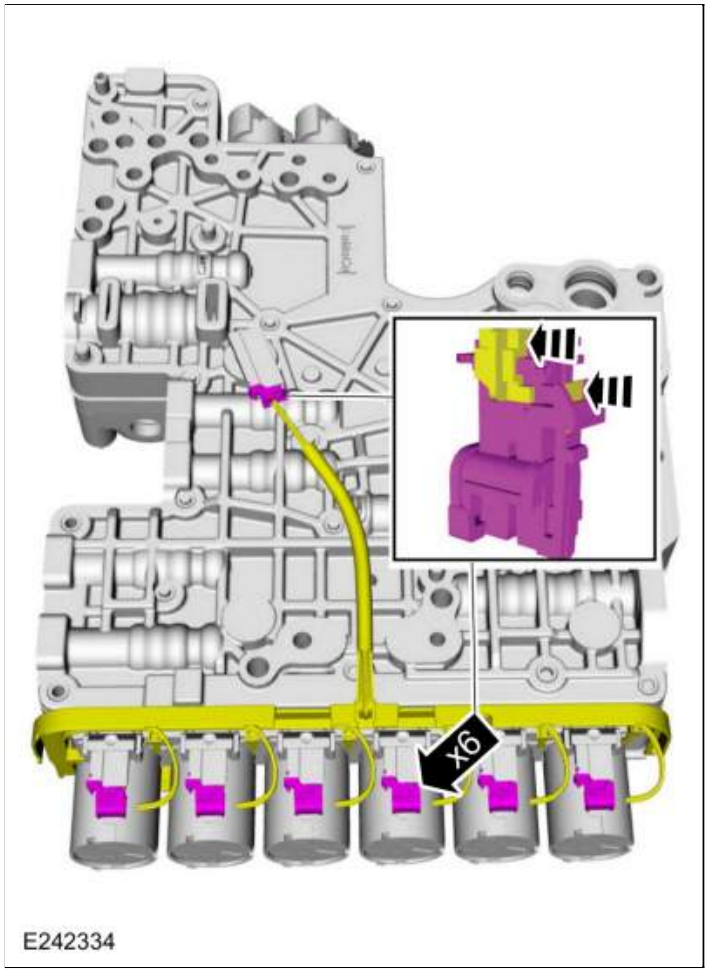
2. Disconnect the internal wiring harness.
   1. Slide the plastic lock to the unlock position. While pressing the plastic tab, disconnect the electrical connector.
   2. Remove internal wiring harness retaining bolt.
   3. Disconnect the internal wiring harness retainer.



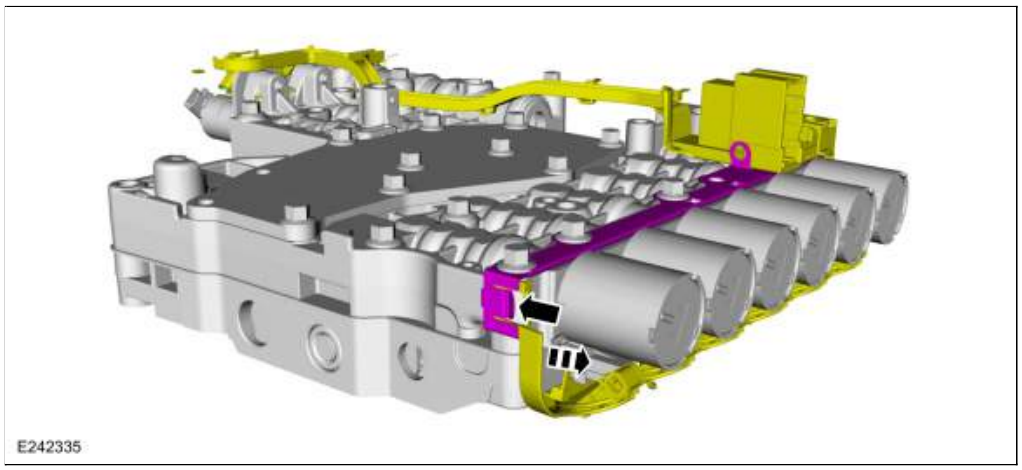
3.

Disconnect the internal wiring harness electrical connectors.

- Slide the plastic lock to the unlock position. While pressing the plastic tab, disconnect the electrical connector.



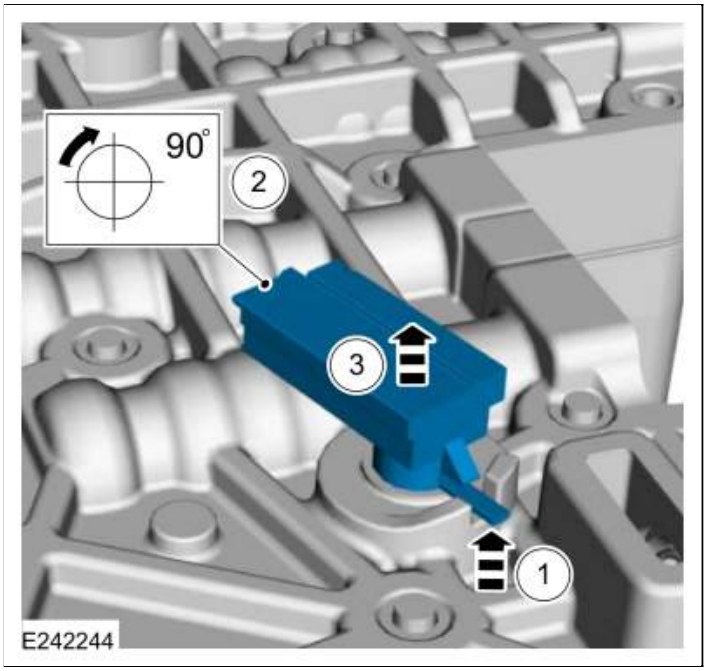
4. Release the retainer and remove the internal wiring harness assembly.



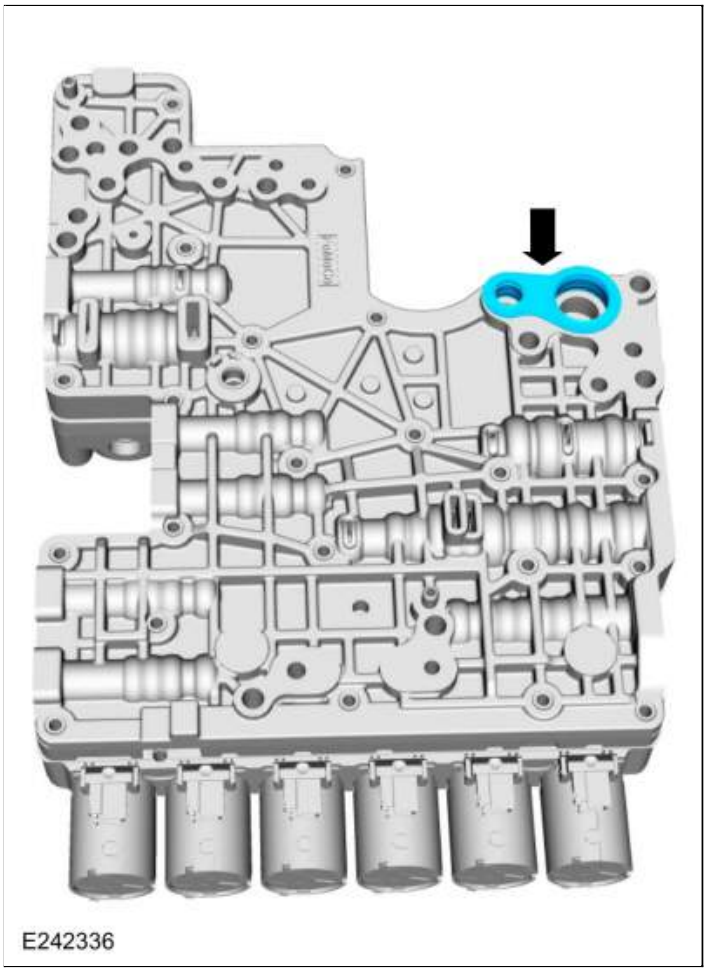
5.

Remove the TFT sensor.

1. Lift plastic tab.
2. Rotate the TFT sensor clockwise.
3. Remove the TFT sensor.

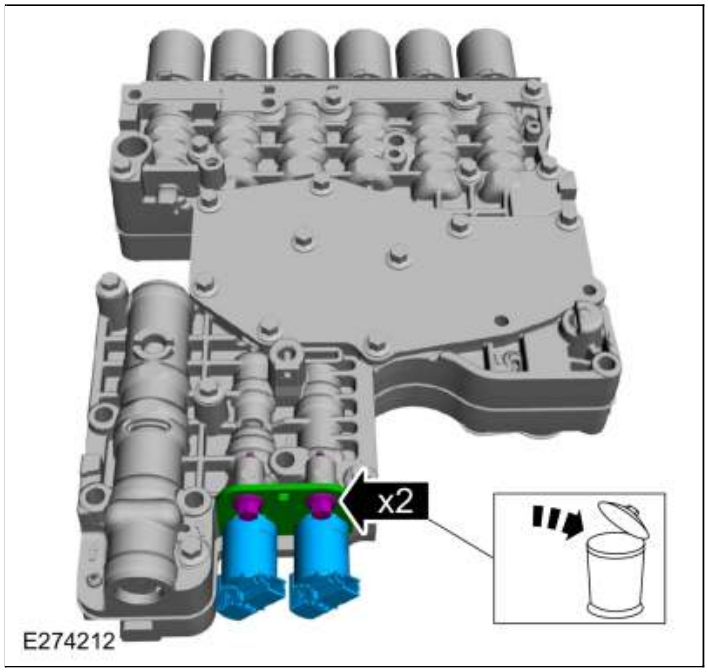


6. Remove the main control assembly to transmission fluid pump seal.

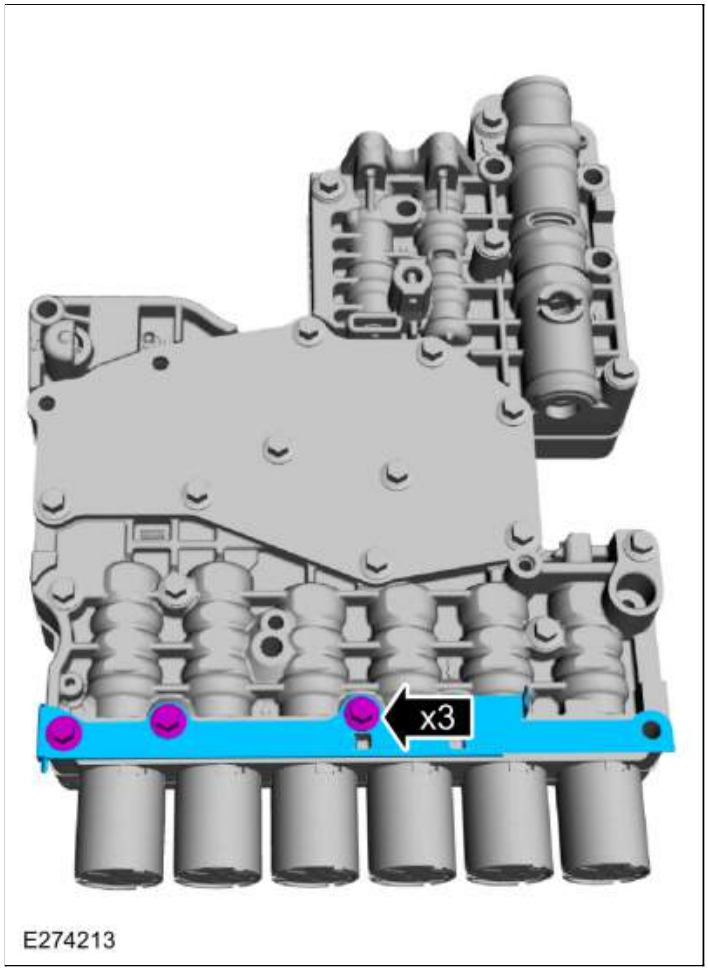


7. **NOTE:** *The orientation of the solenoids before removal.*

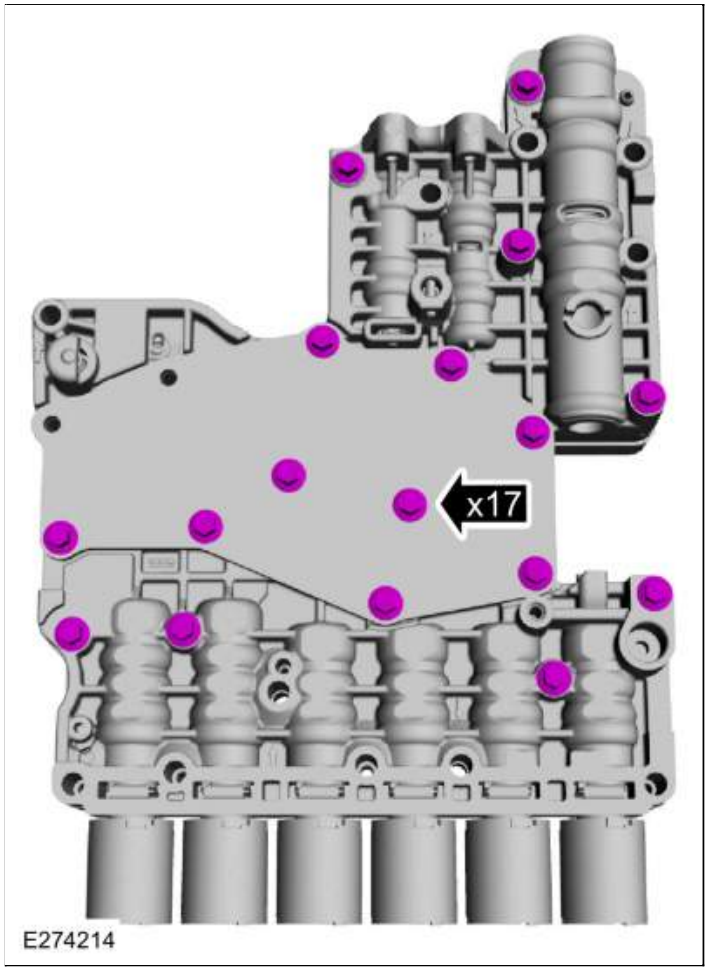
   Remove and discard the bolts. Remove the solenoid retaining plate, TCC solenoid and the LPC solenoid.



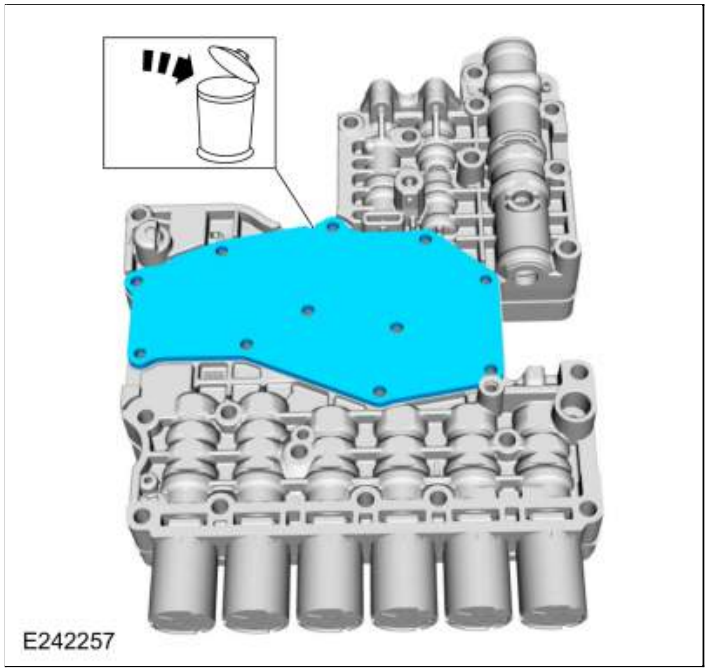
8. Remove bolts and the shift solenoid retaining plate.



9. Remove the valve body bolts.

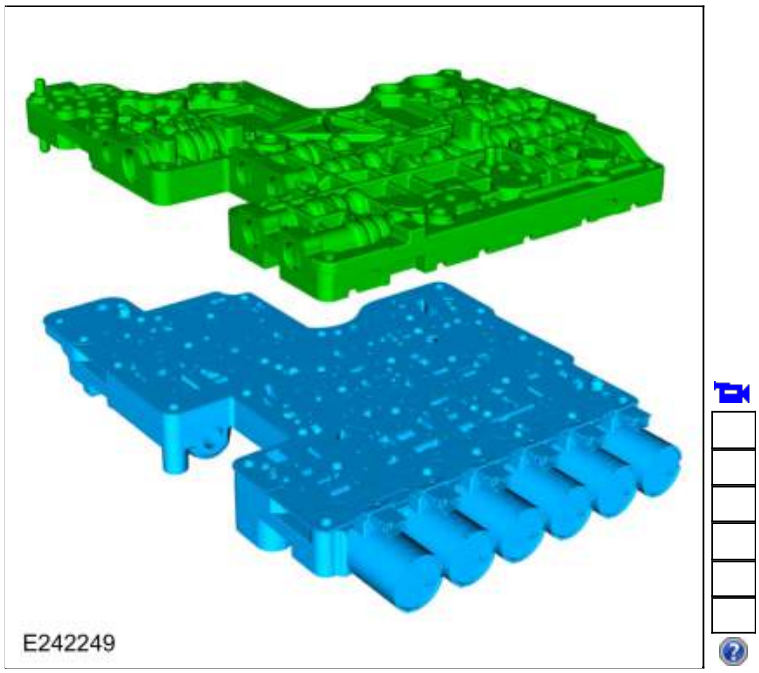


10. Remove and discard the valve channel plate.



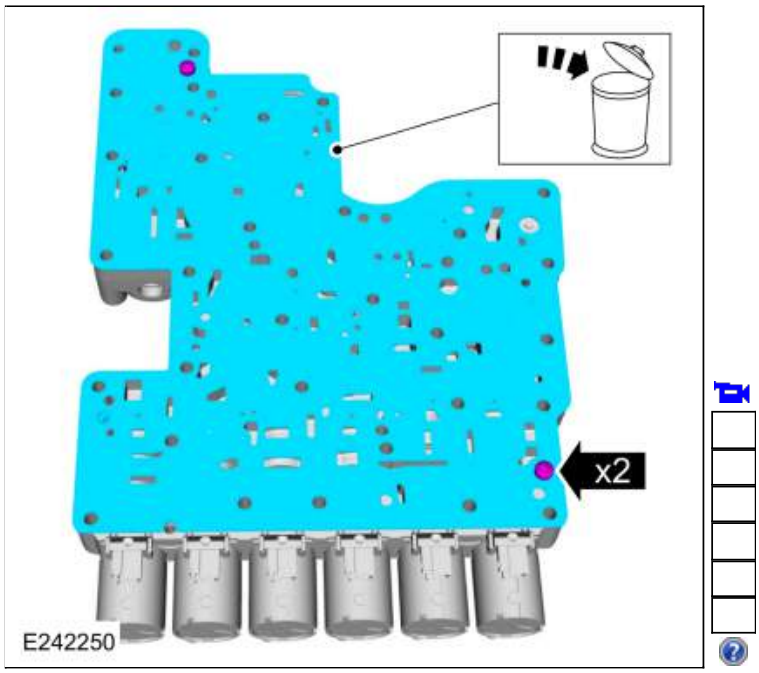
11. **NOTICE: Many components and surfaces in the main control valve body are precision machined. Use care when handling the upper and lower valve body or damage can occur to the machined surfaces.**

    Separate the upper valve body from the lower valve body.



Lower Valve Body

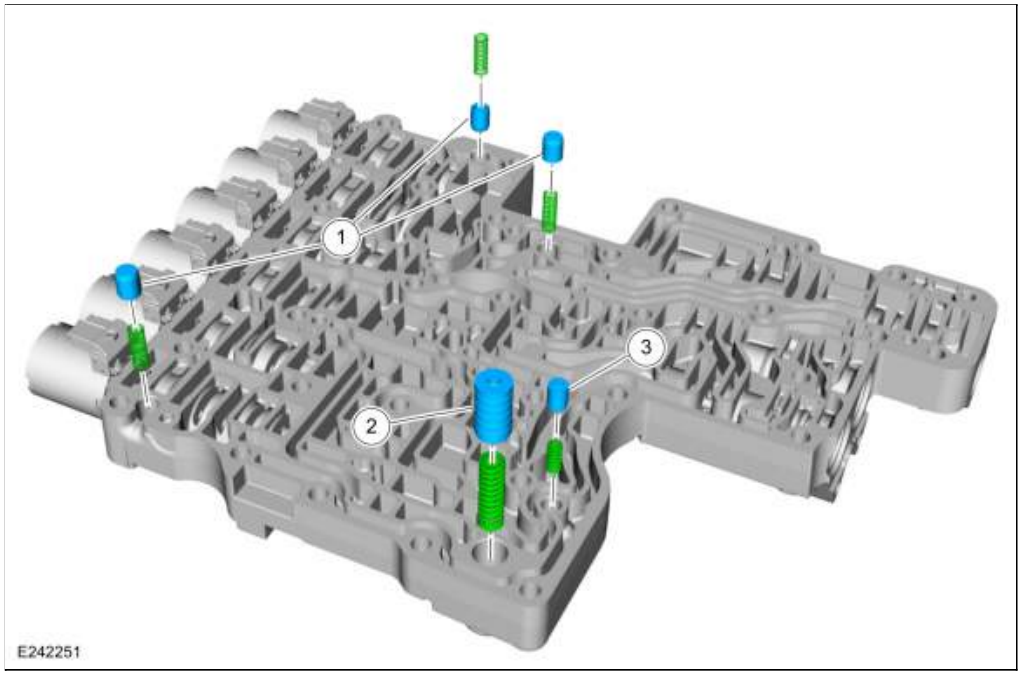
12. Remove bolts and discard the valve body separator plate.



13. **NOTE:** *The orientation of the valves and springs.*

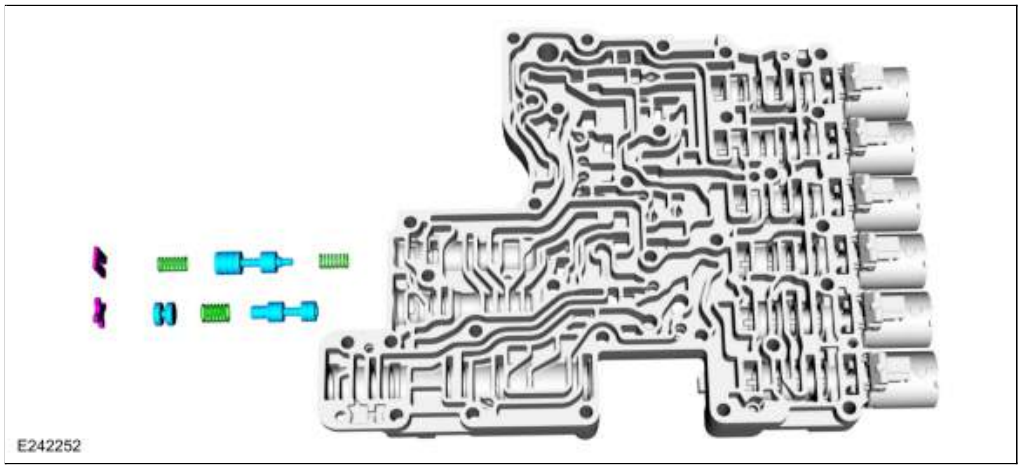
Remove the following items:

1. Check valve assemblies
2. LPC damper assembly
3. TCC damper assembly



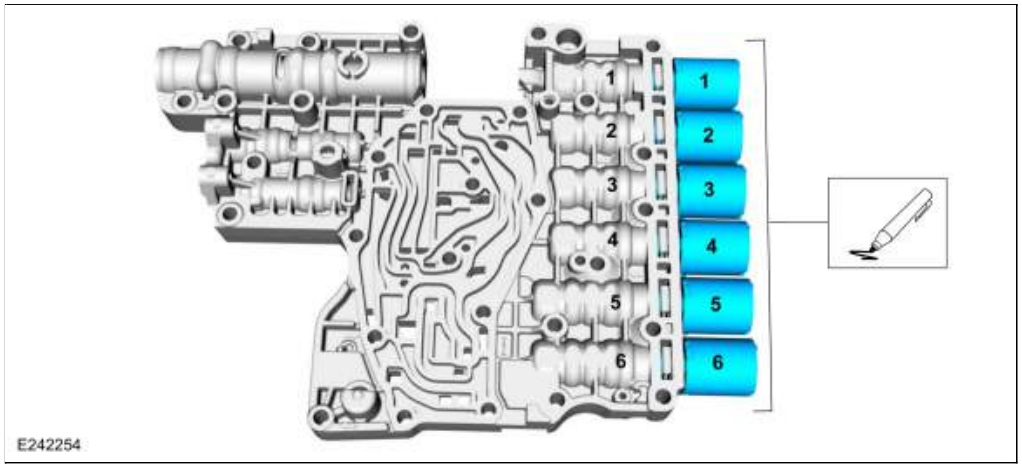
14. **NOTICE: Note the location of the retaining clips, caps, valves and valve springs for assembly. Failure to install the components in the correct location will result in harsh/soft or no shifts or damage to the transmission.**

    Remove the retaining clips, cap, valves and valve springs from each bore of the valve body assembly.



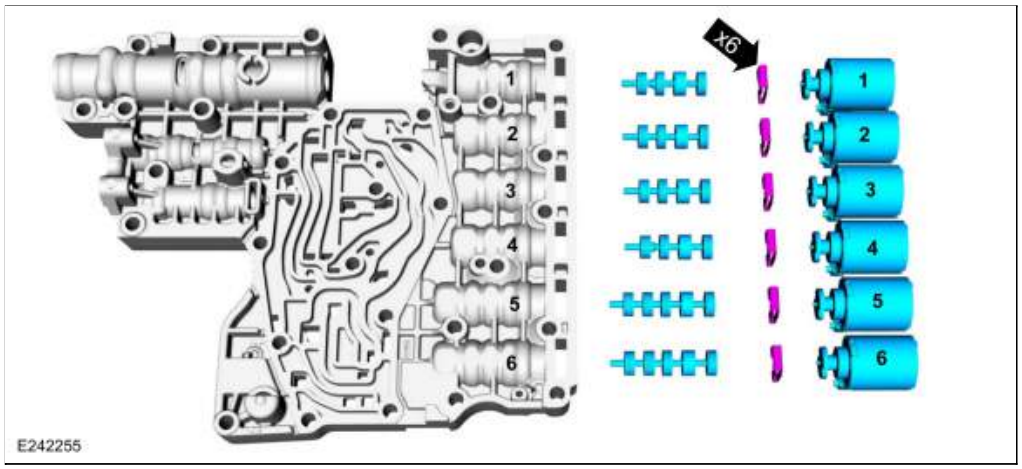
15. **NOTICE: Solenoids and clutch control valves may visually appear the same but they are calibrated from the factory and are not all the same. Use care not to assemble the main control assembly incorrectly. Incorrect solenoid and clutch control valve installation results in poor transmission shift quality.**

    Number the solenoids 1 through 6 and number the main control solenoid ports 1 through 6 to correspond to the solenoids.



16. **NOTE:** *Note the location of the clutch control valves and solenoids for assembly.*

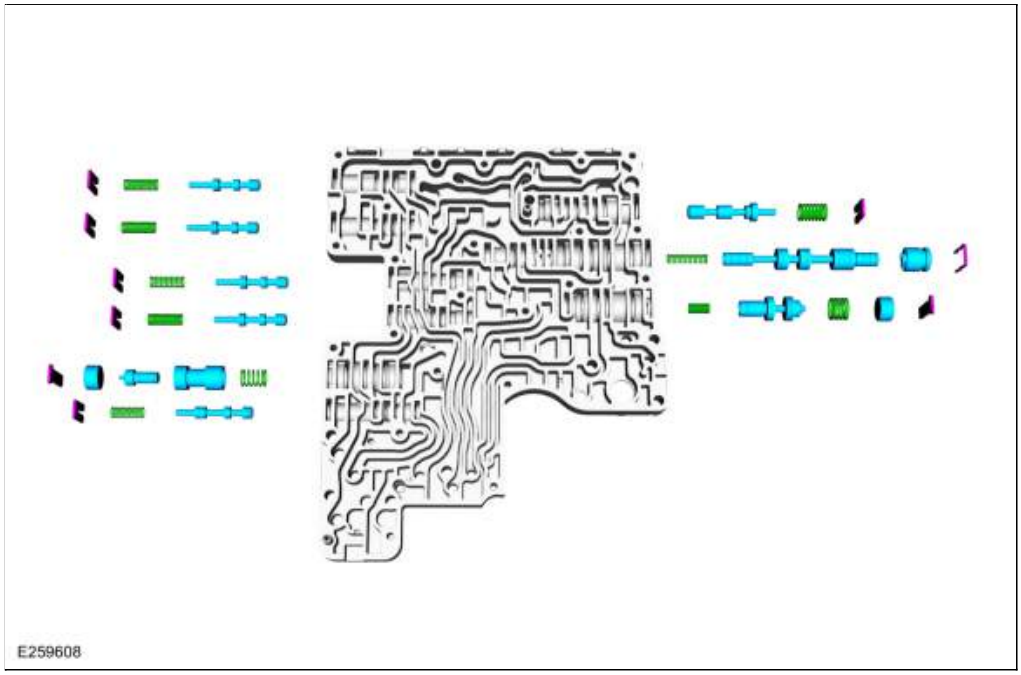
    Remove the shift solenoid retainers, shift solenoids, and clutch control valves.



Upper Valve Body

17. **NOTICE: Note the location of the retaining clips, caps, valves and valve springs for assembly. Failure to install the components in the correct location will result in harsh/soft or no shifts or damage to the transmission.**

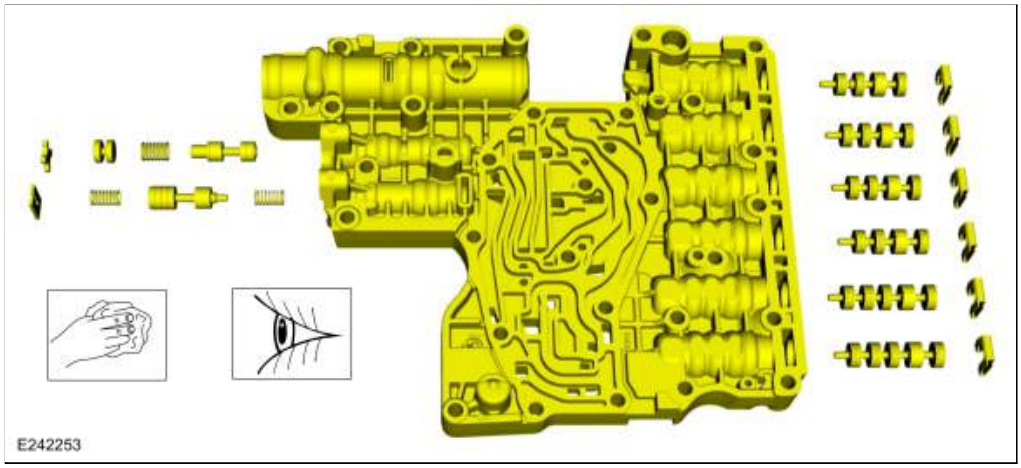
    Remove the retaining clips, cap, valves and valve springs from each bore of the valve body assembly.



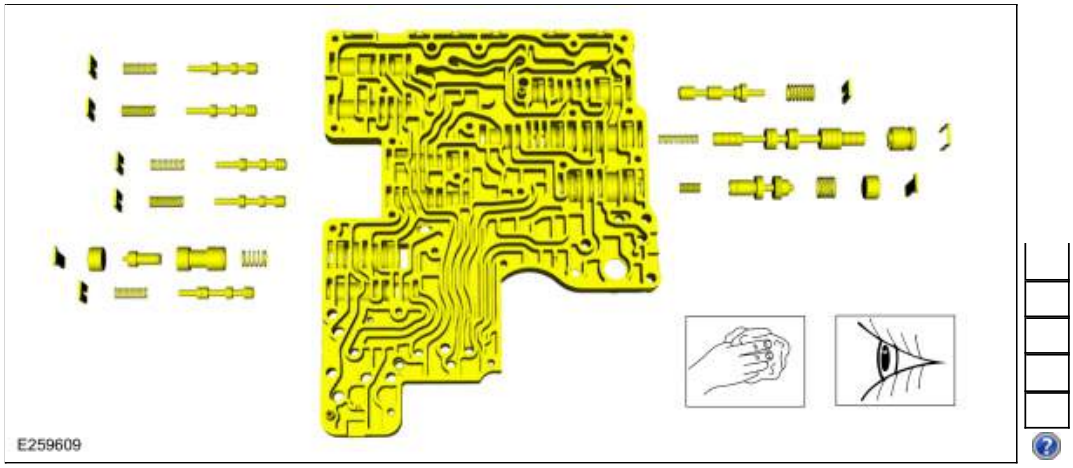
Upper and Lower Valve Body

18. **NOTICE: Many components and surfaces in the main control valve body are precision machined. Use care when cleaning the lower valve body or damage can occur to the machined surfaces.**

    Clean and inspect the lower valve body for damage. Inspect the passages and valves for damage and clean any excessive debris. Install a new component if necessary.



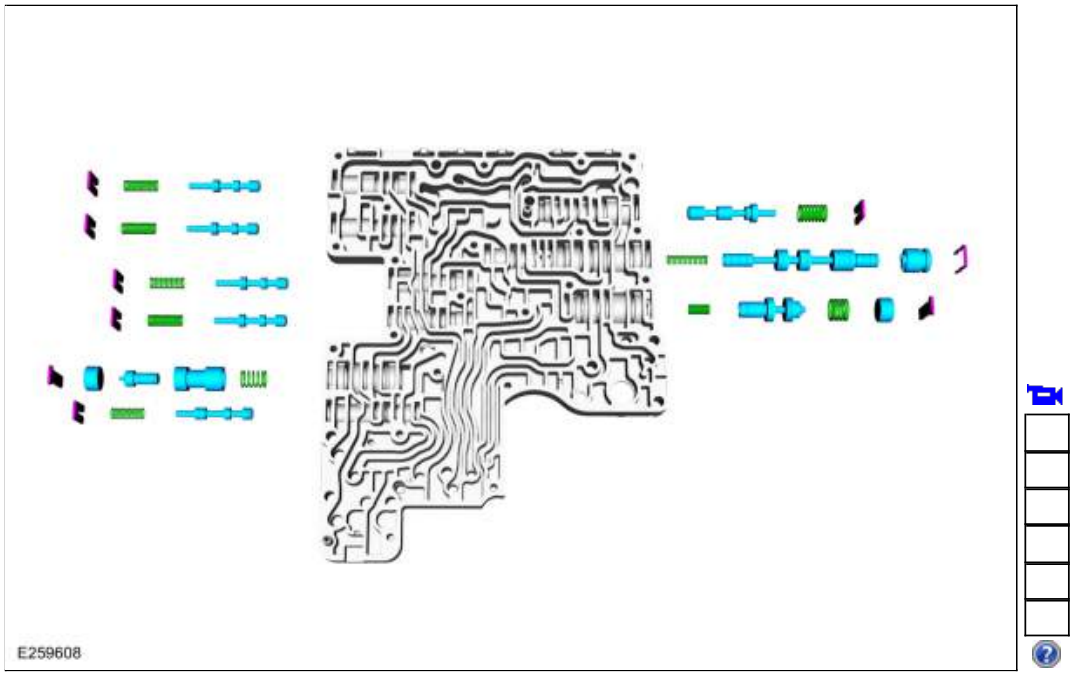
19. Clean and inspect the upper valve body for damage. Inspect the passages and valves for damage and clean any excessive debris. Install a new component if necessary.



Upper Valve Body

20. **NOTICE: Failure to install the components in the correct location will result in harsh/soft or no shifts or damage to the transmission.**

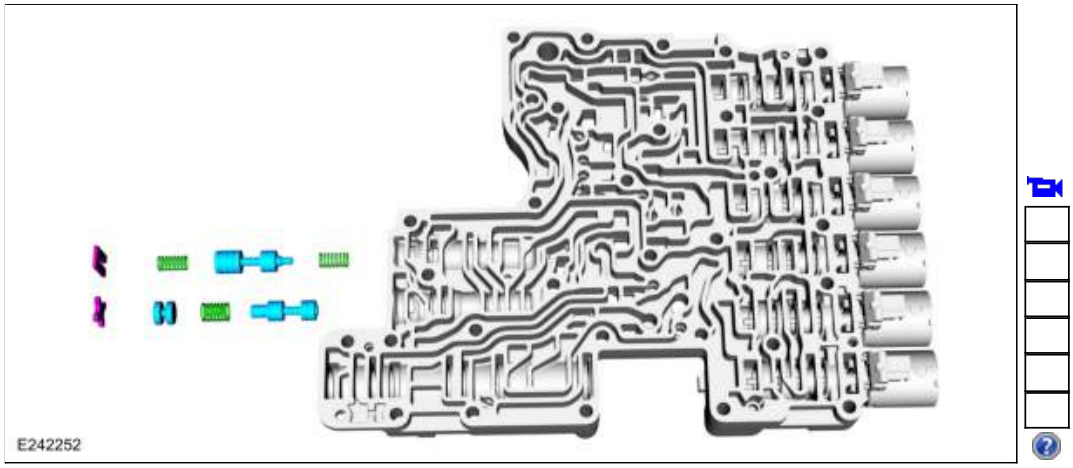
    Install the valves, valve springs, caps and the retaining clips into the correct valve body valve bore.



Lower Valve Body

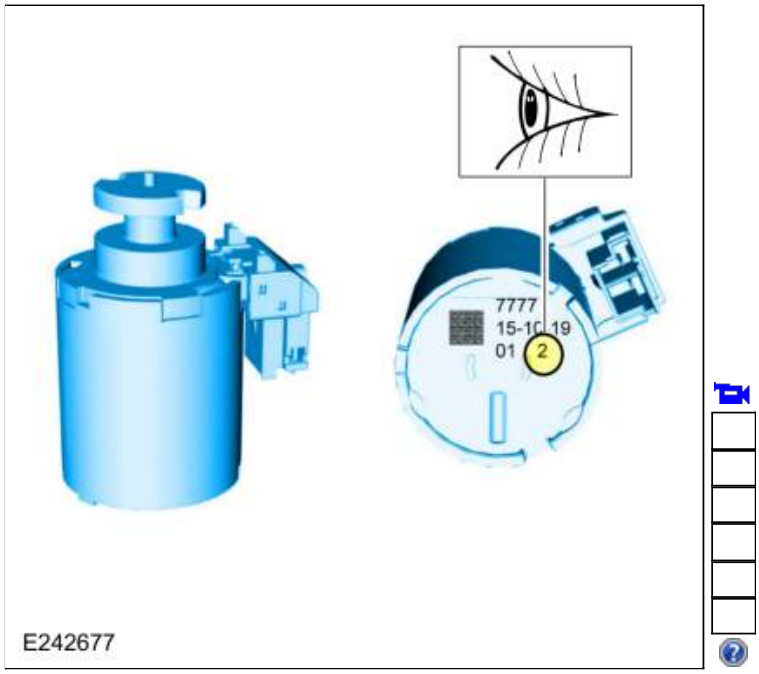
21. **NOTICE: Failure to install the components in the correct location will result in harsh/soft or no shifts or damage to the transmission.**

    Install the valves, valve springs, cap and the retaining clips into the correct valve body valve bore.



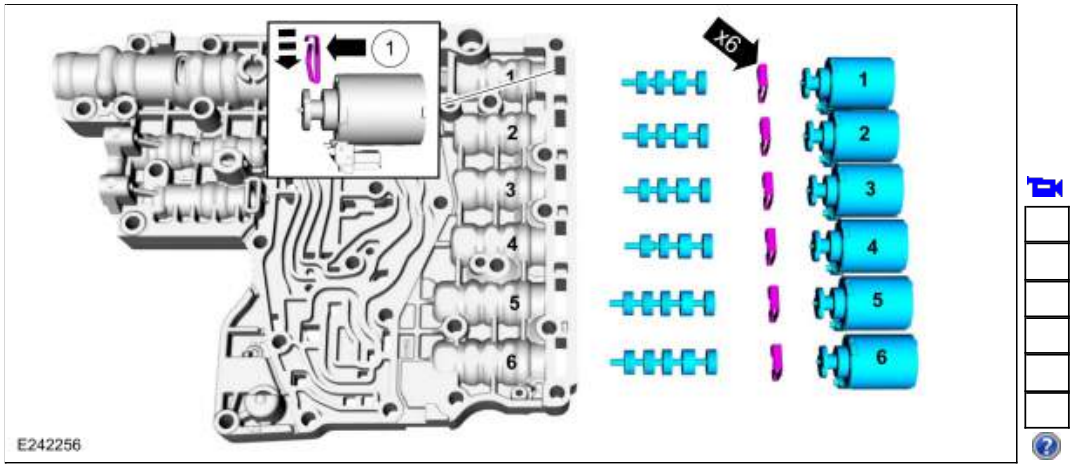
22. **NOTICE: Solenoids are calibrated from the factory and are not all the same. To replace a solenoid, match the band number with the original solenoid or harsh shifts or damage to the transmission can occur.**

    If new solenoids are needed, identify the solenoid band number.



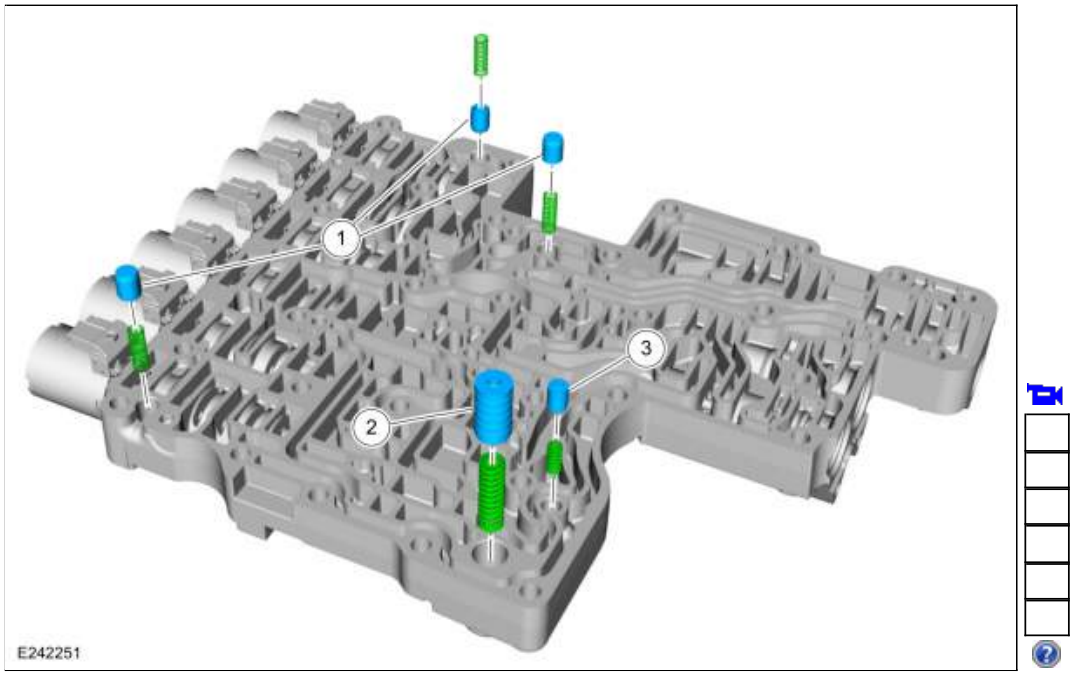
23. **NOTICE: Failure to install the components in the correct location will result in harsh/soft or no shifts or damage to the transmission.**

    Install the clutch control valves, and the shift solenoids in the corresponding marked location. Install the shift solenoid retainers with the flat side towards the solenoids.
    1. Retainer flat side

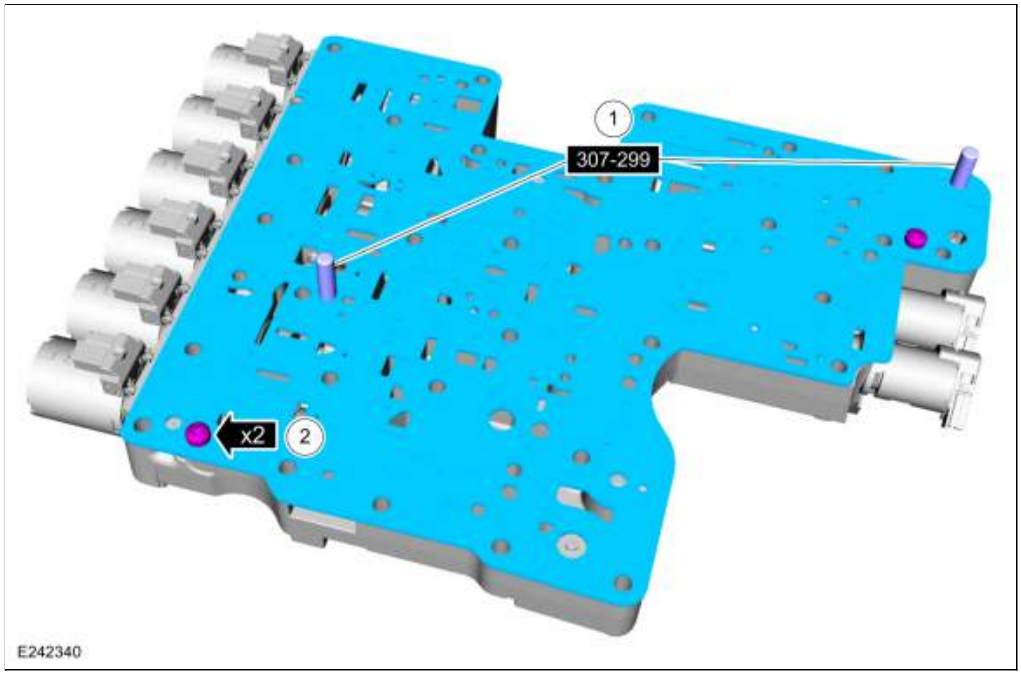


24. **NOTE:** *The orientation of the valves and springs.*

Install the following items:
1. Check valve assemblies
2. LPC damper assembly
3. TCC damper assembly

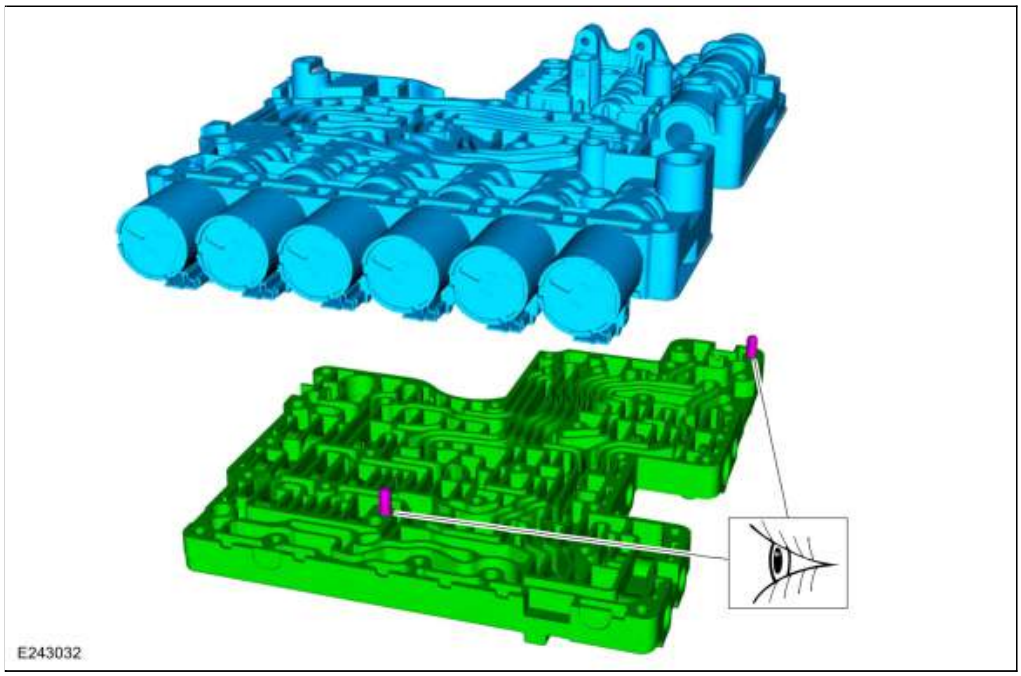


25. Using the special tools align the new valve body spacer plate onto the lower valve body and install the bolts.
Use Special Service Tool: 307-299 Alignment Pins, Valve Body.
Torque: 71 lb.in (8 Nm)

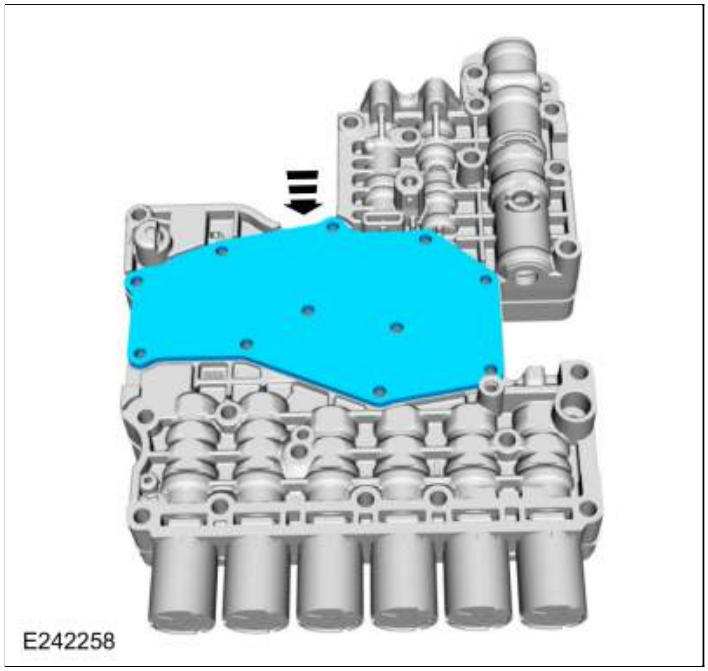


Upper and Lower Valve Body

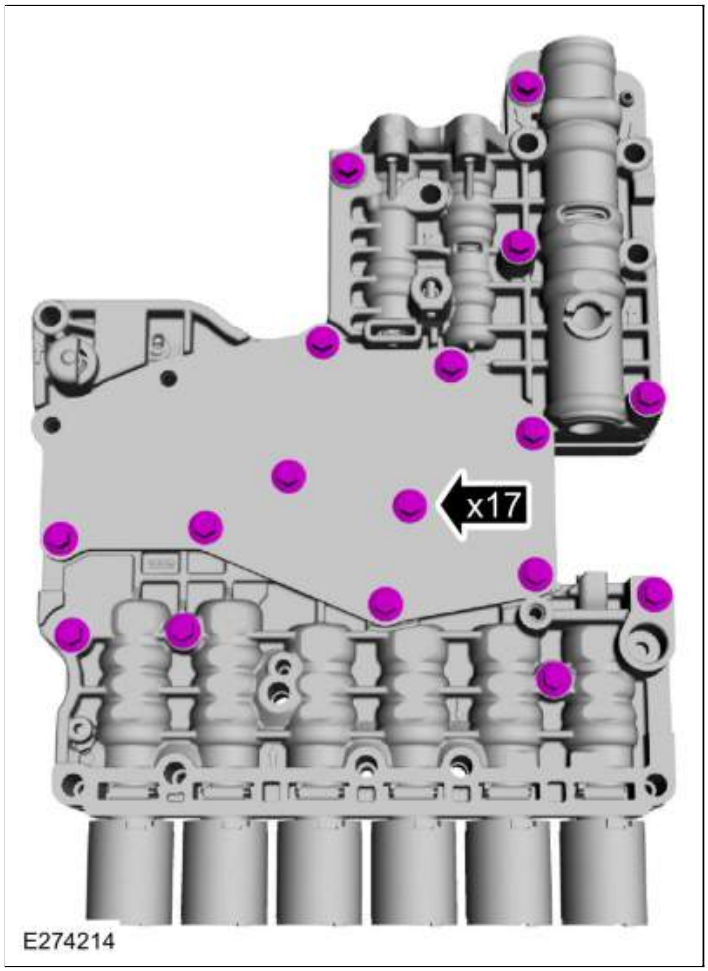
26. Align the guide pins on the upper valve body with the alignment holes in the lower valve body.



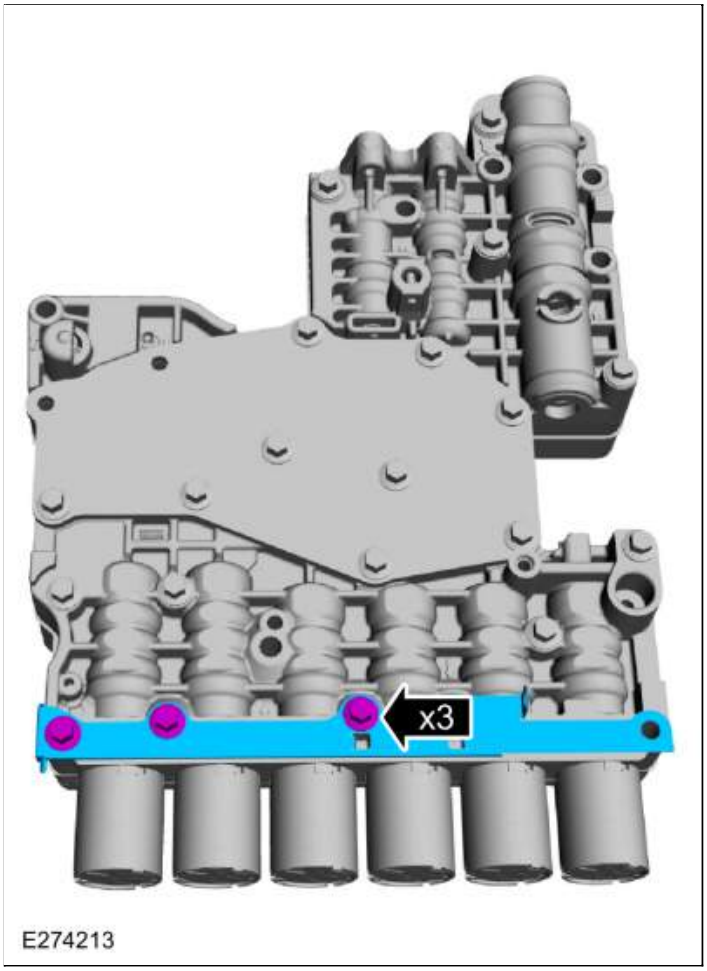
27. Install the new valve body channel plate.



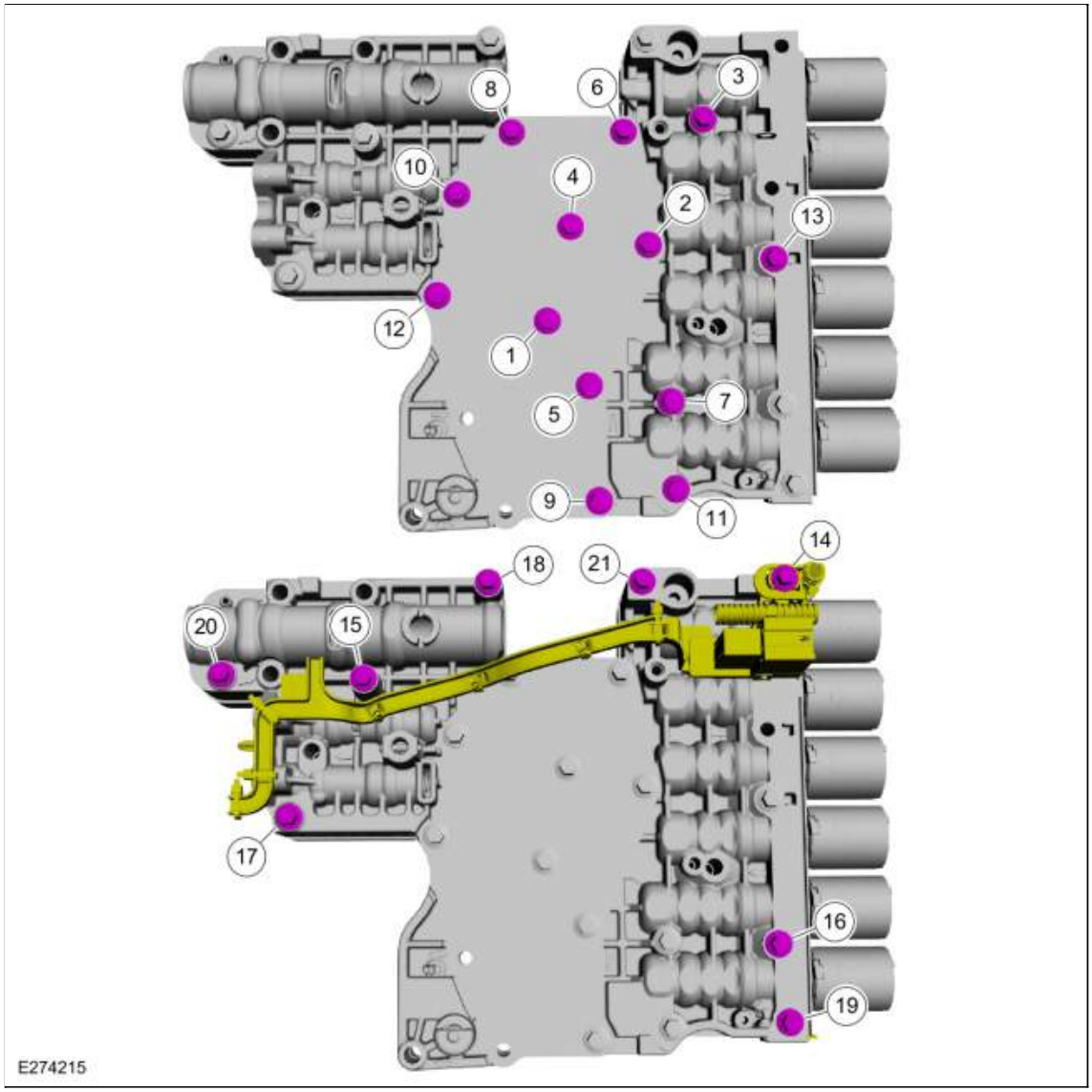
28. Loosely install the valve body bolts.



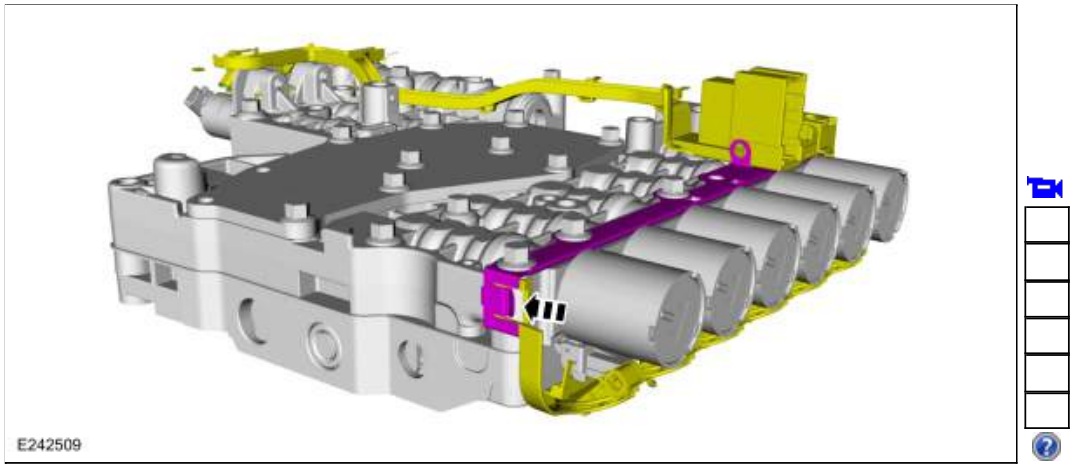
29. Install the shift solenoid retaining plate and loosely install the bolts.



30. Tighten the bolts in the sequence shown.
Torque: 106 lb.in (12 Nm)



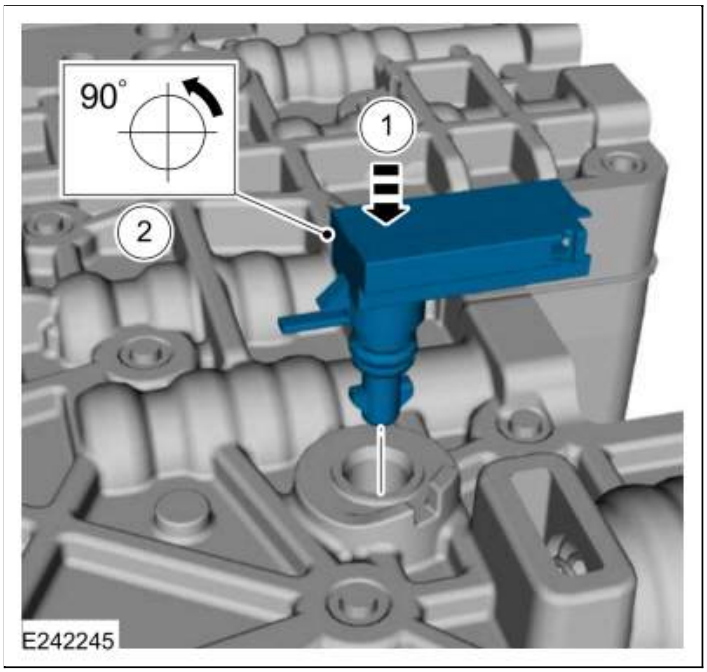
31. Push the internal wiring harness into the retainer.



32.

Install the TFT sensor.

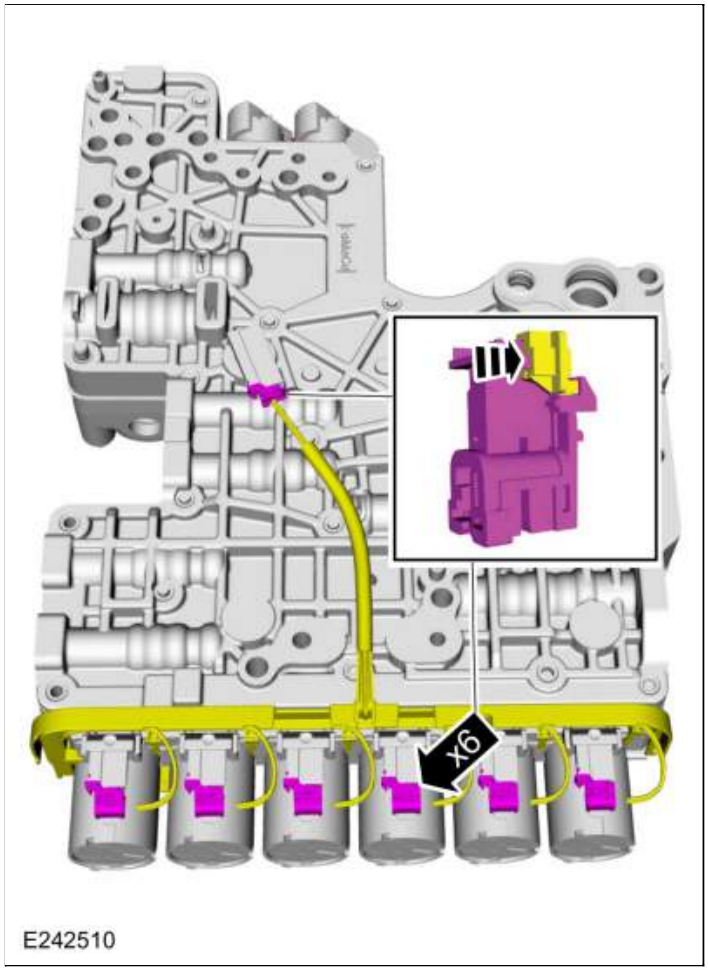
1. Position the TFT sensor in the main control valve body.
2. Rotate the TFT sensor counter clockwise until the plastic tab locks into place.



33.

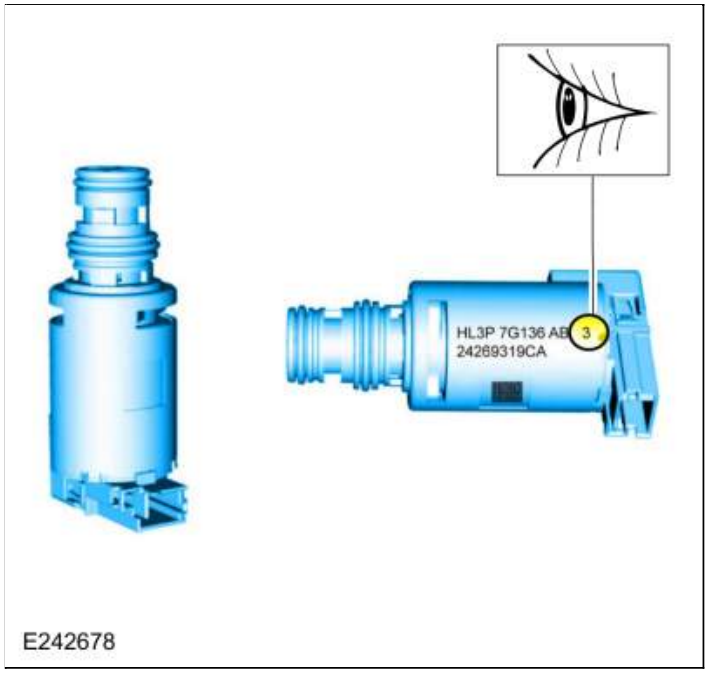
Connect the internal wiring harness electrical connectors.

- Slide the plastic lock to the locked position.



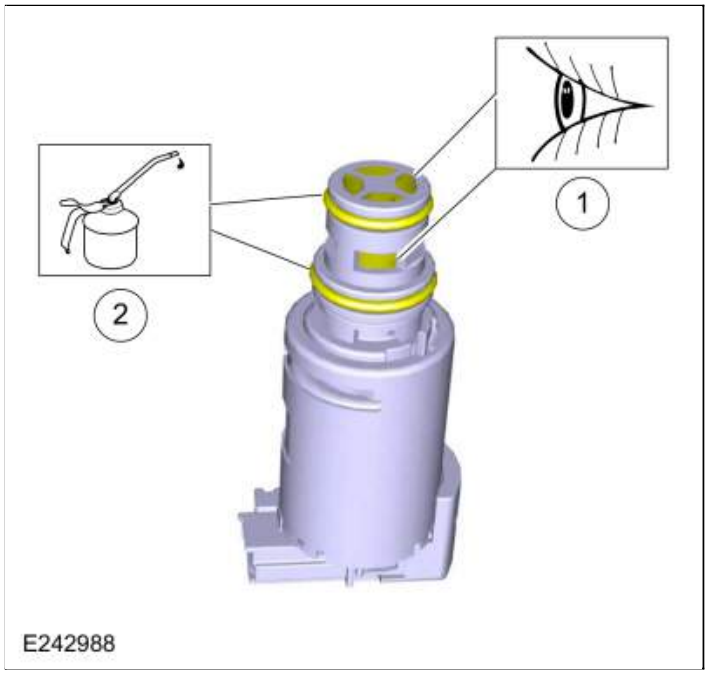
34. **NOTICE: Solenoids are calibrated from the factory and are not all the same. To replace a solenoid, match the replacement solenoid type (normally high/normally low) and the band number with the original solenoid or harsh shifts or damage to the transmission can occur.**

    If new solenoids are needed, identify which type (normally high/normally low) of solenoid it is and the solenoid band number.

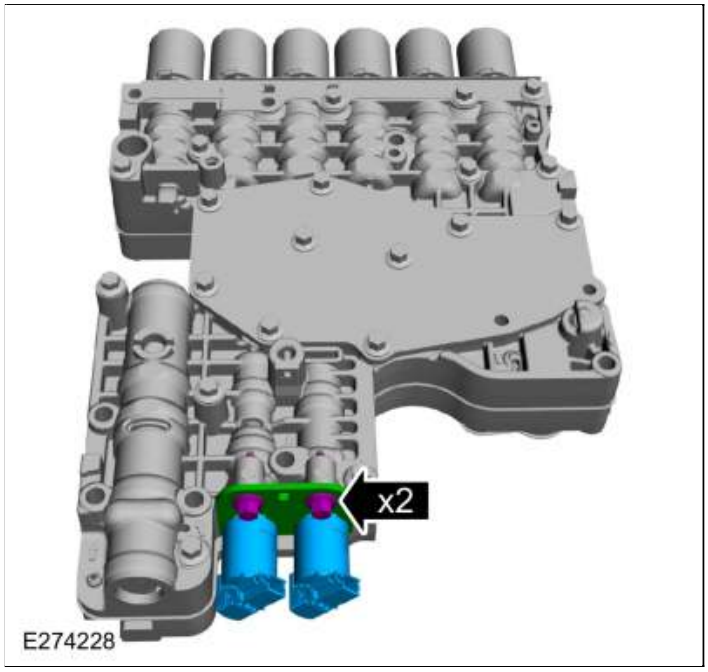


35.

1. Inspect the solenoid screens for debris that may restrict fluid flow
2. Lubricate the solenoid O-ring seals.
   Material: Motorcraft® MERCON® ULV Automatic Transmission Fluid / XT-12-QULV (WSS-M2C949-A) (MERCON® ULV)



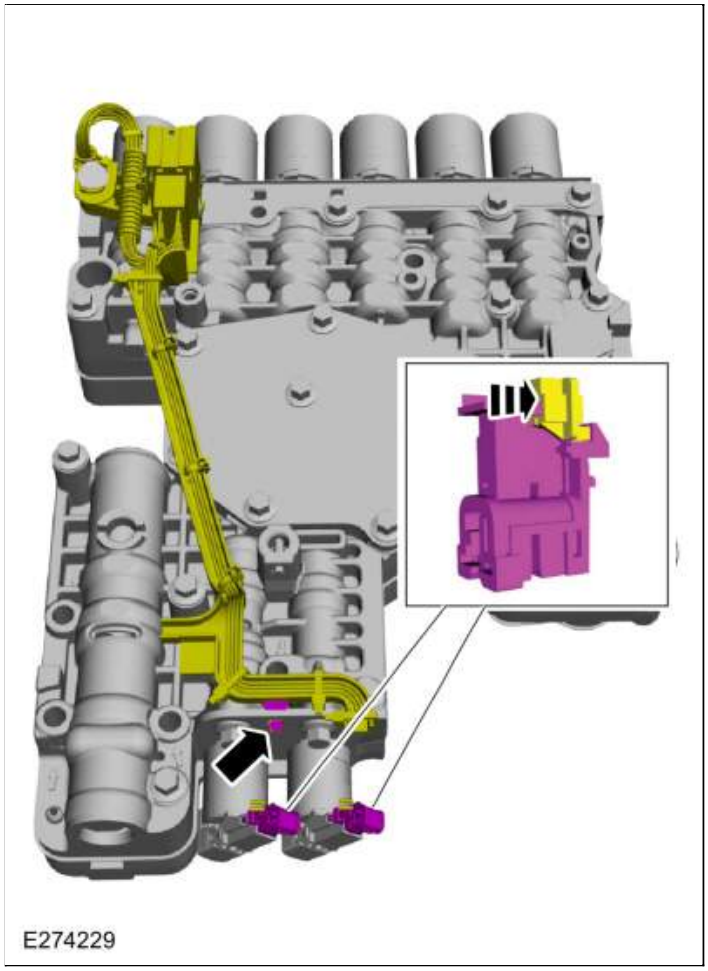
36. Install the TCC solenoid, LPC solenoid, solenoid retaining plate and the new bolts.
   Torque: 80 lb.in (9 Nm)



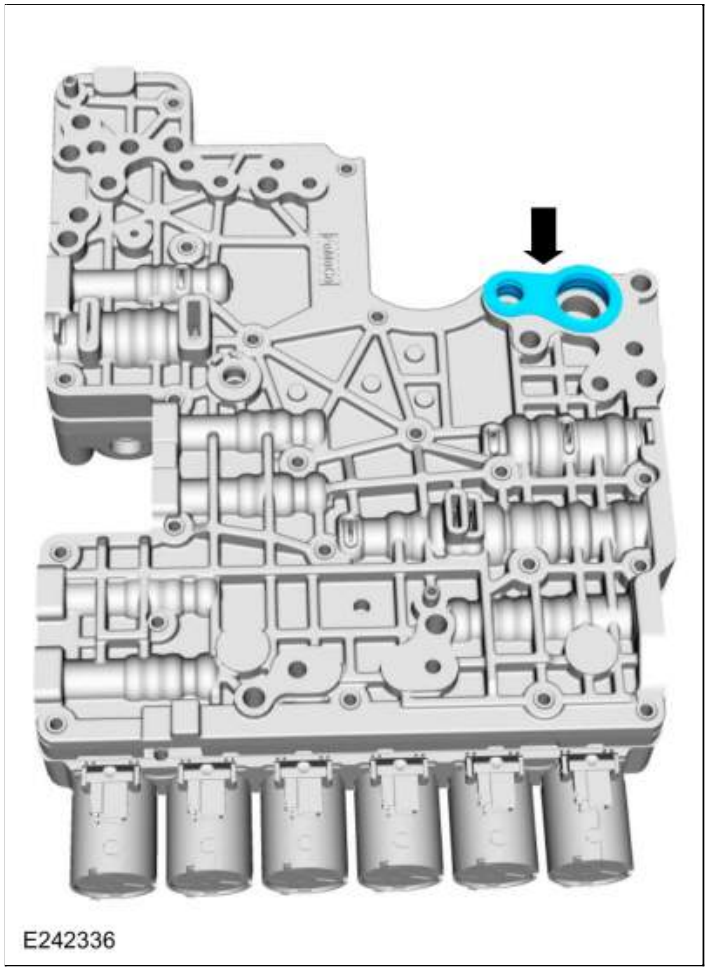
37.

Connect the internal wiring harness.

1. Slide the plastic lock to the locked position.
2. Connect the internal wiring harness retainer.



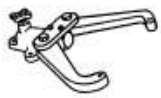
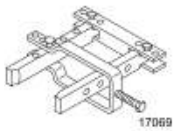
38. Install the main control assembly to transmission fluid pump seal.

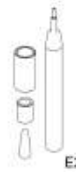


Transmission

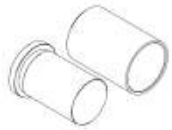
Base Part Number: 7000

Special Tool(s) / General Equipment

 E129694	100-001 (T50T-100-A) Slide Hammer
 E139373	100-002 (TOOL-4201-C) Holding Fixture with Dial Indicator Gauge
 E232969	205-1018 Installation Tube
 307-003	307-003 (T57L-500-B) Holding Fixture, Transmission
 E142010	307-091 Handle, Torque Converter TKIT-2009TC-F
 17069	307-309 Remover, Torque Converter Seal TKIT-1994-FMH/FLMH TKIT-1994-LMH/MH TKIT-1994-FH
 307-346	307-346 (T97T-7902-A) Retainer, Torque Converter TKIT-1998-LM (NavigatoR) TKIT-1997-F/FLM/LT
	307-458 Socket, Output Shaft Locknut TKIT-2003N-F

 E270042	
 E270043	307-549 Installer, Shift Shaft Fluid Seal TKIT-2005D1-F1
 E216419	307-584 2-6 Spring Compressor TKIT-2006UF-FLM TKIT-2006UF-ROW
 E216420	307-589 Overdrive clutch and balance piston service set TKIT-2006UF-FLM TKIT-2006UF-ROW
 E270044	307-651 Bracket, Pump Remover/Installer
 E234933	307-651-01 Adapter for 307-651 (Super Sub Assembly Lifting)
 E270045	307-653 Sizer, Input Shaft Teflon Seal
 E270046	307-660 Installer, Front Pump Seal TKIT-2009C-F TKIT-2009C-ROW
 E270047	307-661 Gauge, End Play TKIT-2009C-F TKIT-2009C-ROW
	307-662

 E270048	Gauge, Clutch Pack Endplay TKIT-2009C-F TKIT-2009C-ROW
 E239703	307-691 Tester, Torque Convertor Leak
 E233333	307-732 Tool Kit, Torque Converter Flusher
 E234902	307-733 Compressor, Clutch Piston
 E234903	307-734 Tool, OWC Alignment
 E234908	307-736 Installer, Pump Drive Gear Bearing
 E234909	307-737 Press Tool, Oil Pump Drive Idler Gear
 E234921	307-741 Spring Compressor, F Clutch
 E234924	307-743 Remover, Pump Drive Gear
	307-746

 E234932	Remover, Transmission Wiring Harness Connector
 E248128	307-747 Installer/ Sizer , Input Shaft Solid Sealing Rings; Large
 E248129	307-748 Installer/Sizer, Input Shaft Solid Sealing Rings; Small
 E248130	307-749 Installer/Sizer, R2-S3 Shaft Solid Seal
 E248131	307-750 Installer, Converter Seal
Feeler Gauge	
Hydraulic Press	
Punch	
Wooden Block	
Magnet	

Materials

Name	Specification
Motorcraft® MERCON® ULV Automatic Transmission Fluid XT-12-QULV	WSS-M2C949-A MERCON® ULV

All vehicles

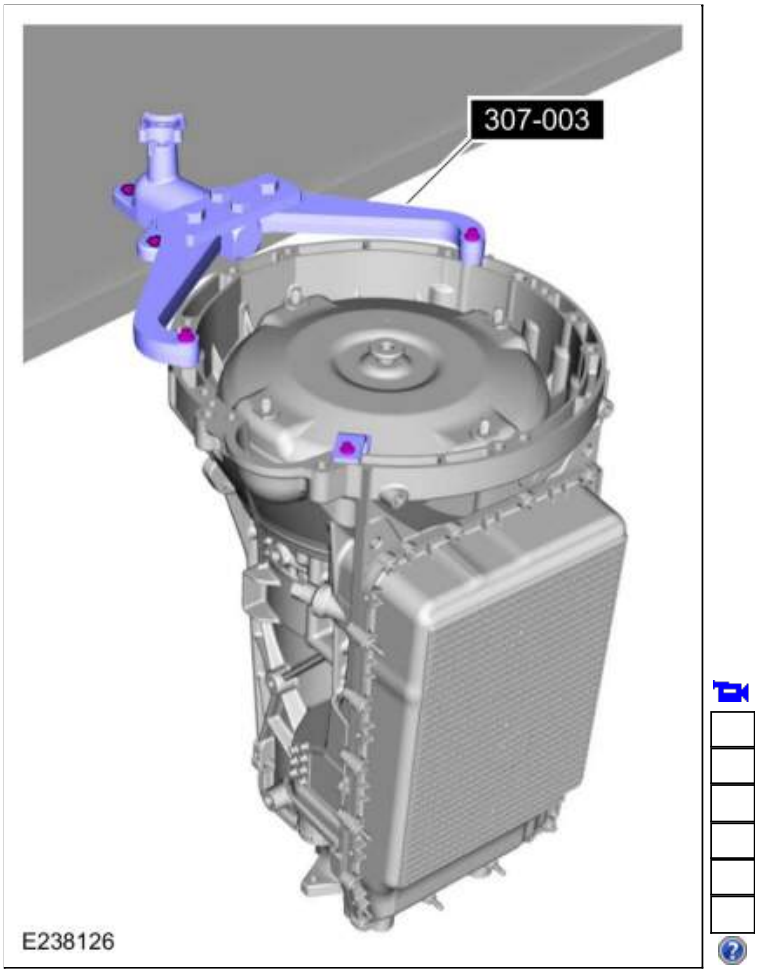
1. The following components are discarded during disassembly and must be replaced:

Description	Part Number
Gasket and oil seal kit	7153
Transmission fluid auxiliary pump tube seal	7J135
Output shaft flange bolt (RWD only)	7N134

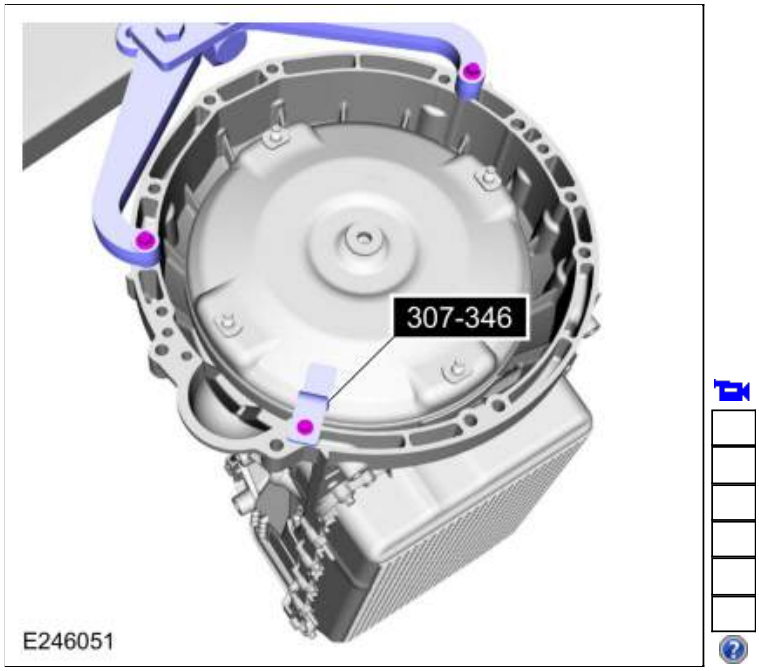
Output shaft nut (RWD only)	7085
Manual control shaft-to-TR sensor roll pin	7G100
Front support assembly bolts	7N134
D clutch balance dam	7D343
E clutch piston	7A262

2. For information on component views and base part numbers.
   Refer to: Transmission Description (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Description and Operation).

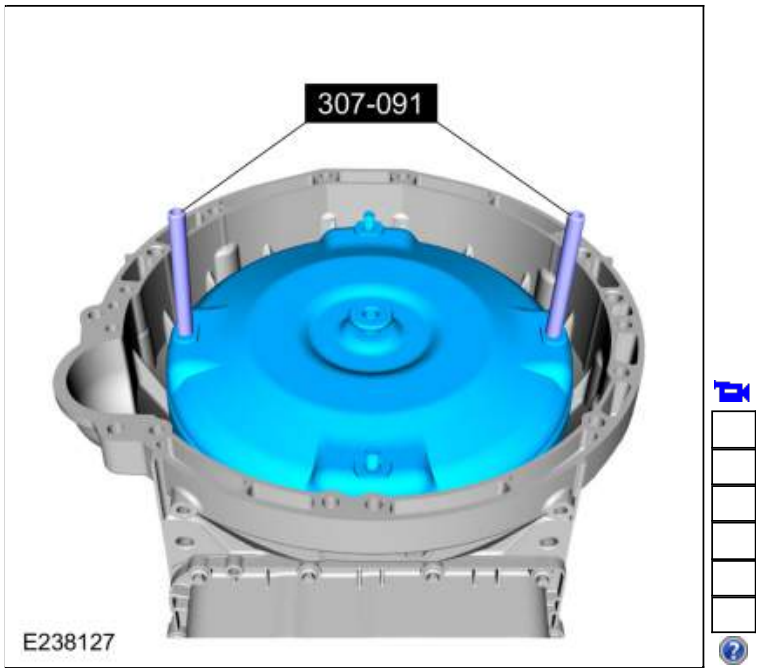
3. Using the special tool, install the transmission on a bench.
   Use Special Service Tool: 307-003 (T57L-500-B) Holding Fixture, Transmission.



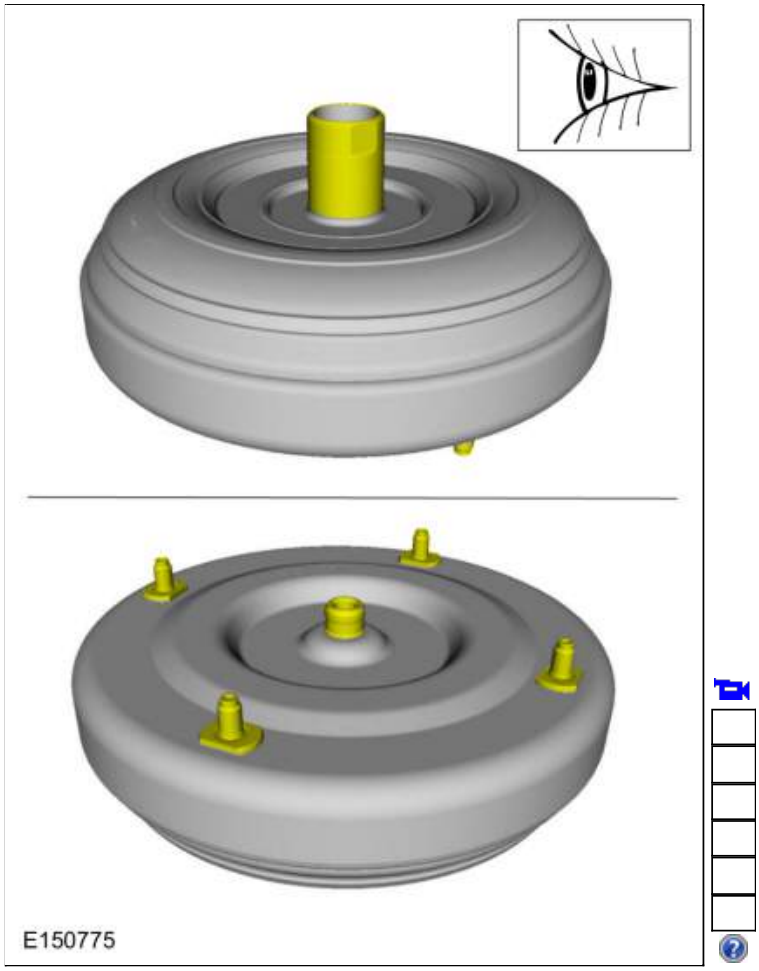
4. Remove the special tool.
   Use Special Service Tool: 307-346 (T97T-7902-A) Retainer, Torque Converter.



5. Using the special tool, remove the torque converter.
   Use Special Service Tool: 307-091 Handle, Torque Converter.



6. A new or remanufactured torque converter must be installed if one or more of the following statements are true:
   - The sealing surface has a groove worn from the seal.
   - A torque converter malfunction has been determined based on complete diagnostic procedures.
   - The torque converter stud or studs, threaded pads, impeller hub or bushing are damaged.
   - The torque converter exhibits external discoloration (due to overheating).
   - There is evidence of water or antifreeze contamination.



Flush The Torque Converter With The Transmission Cooling System Heated Flusher

7. **NOTE:** *Use transmission fluid specified for this transmission. Do not use any supplemental transmission fluid additives or cleaning agents. The use of these products could cause internal transmission components to fail, which will affect the operation of the transmission.*

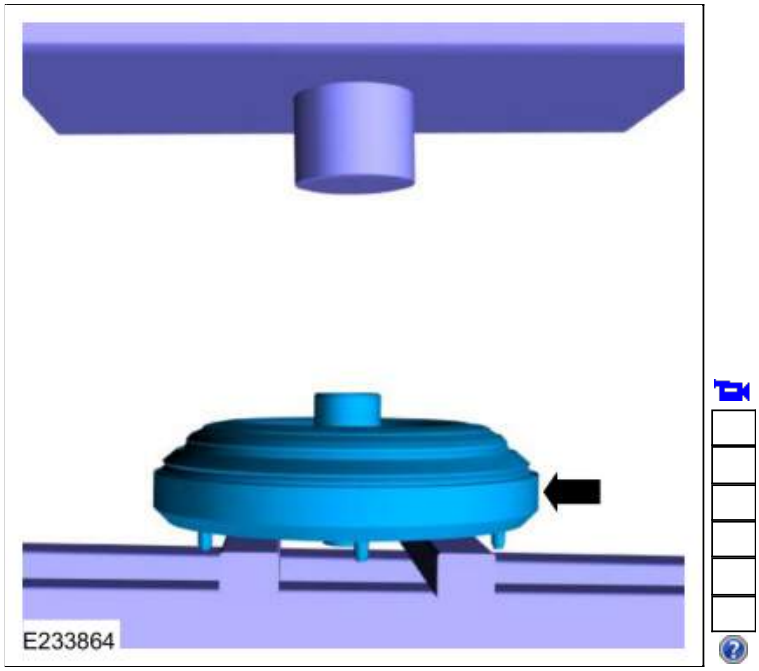
   The torque converter must be flushed every time the transmission is overhauled. It is mandatory that proper equipment and procedures be followed when flushing the torque converter. The flushing equipment used MUST:
   - Maintain the transmission fluid at 140°F or above
   - Pulsate the transmission fluid during cleaning
   - Have a GPM flow meter
   - Have a filter with a rating of 100 micron or less
   - Have air purge capability before and after flushing

8. If equipment meeting the specifications above is not available, the torque converter must be flushed by hand. Go to Flush The Torque Converter By Hand steps later in this procedure.

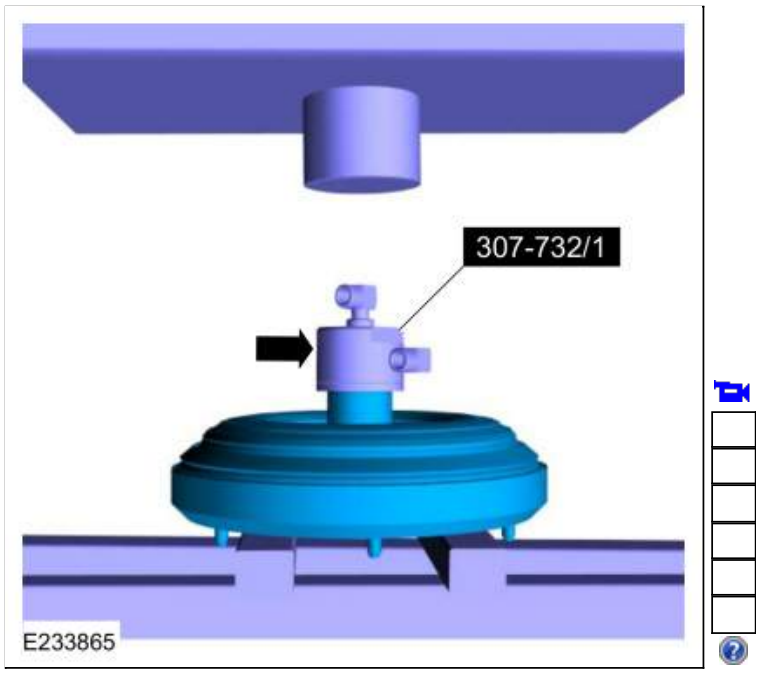
9. Check and top off the transmission fluid level of the transmission cooling system heated flusher with transmission fluid.

10. Turn on the heater and allow the transmission fluid in the transmission cooling system heated flusher 15-30 minutes to heat up to 60°C (140°F) before using.

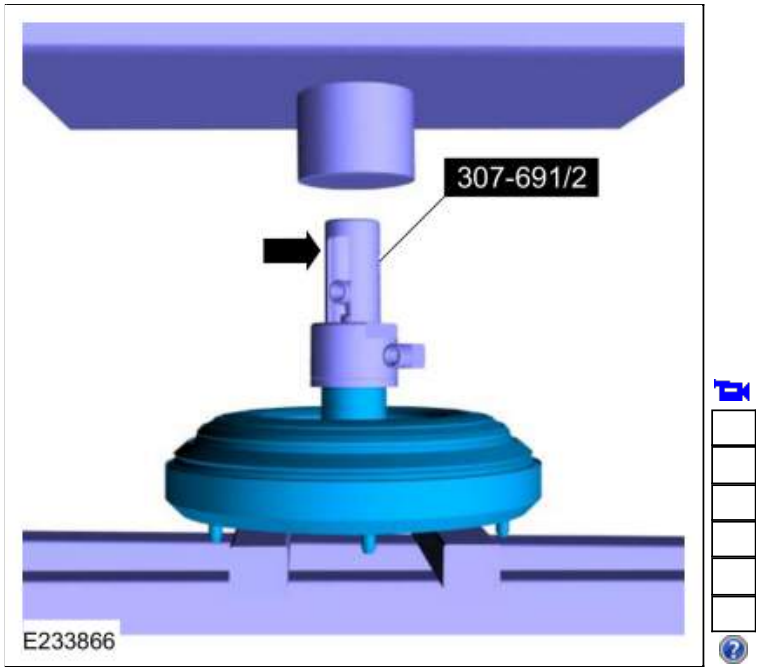
11. Place the torque converter in an arbor press. Support the torque converter on the mounting pads.



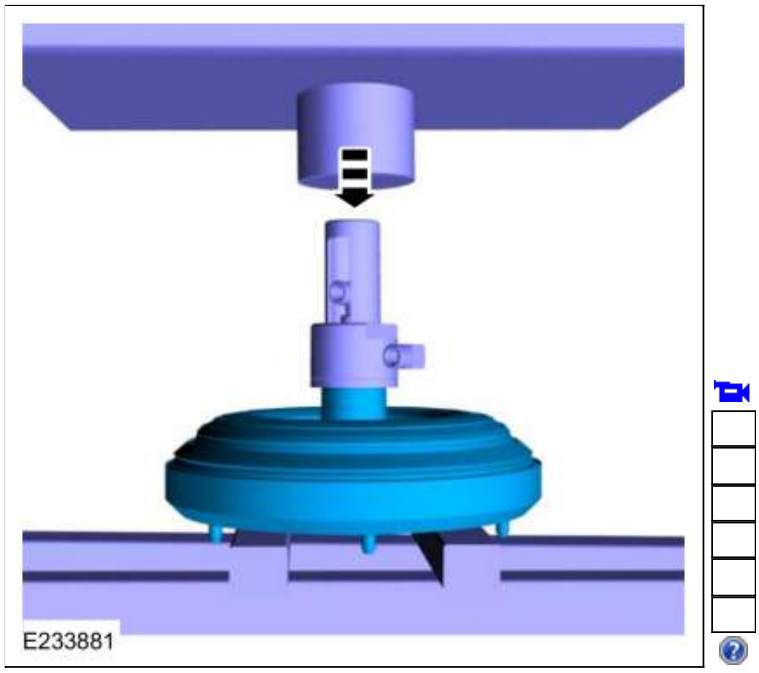
12. Using the special tools, assemble the correct turbine shaft simulator to the torque converter flush main hub and place it on the torque converter hub.
Use Special Service Tool: 307-732 Tool Kit, Torque Converter Flusher.



13. Using the special tool, install the slotted cap.
Use Special Service Tool: 307-691 Tester, Torque Convertor Leak.



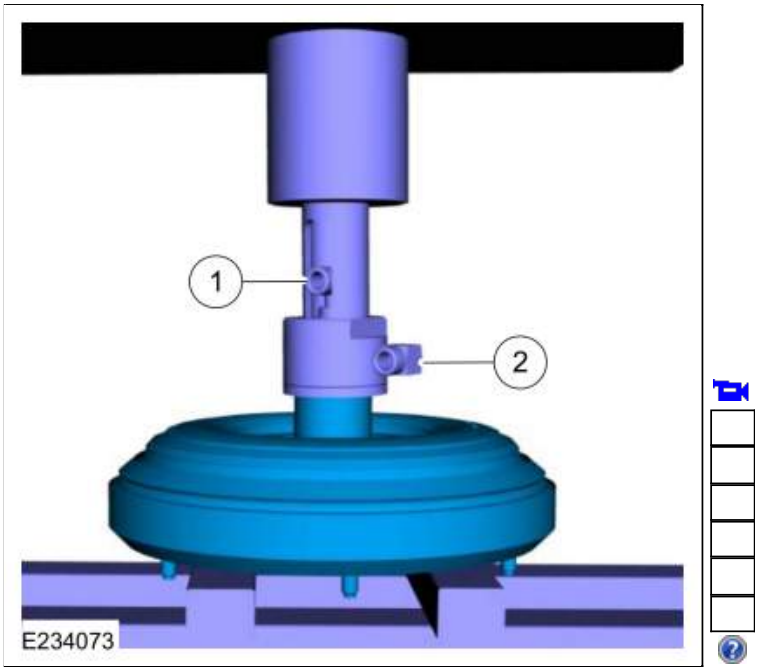
14. Apply enough force from the press to seal the torque converter flush main hub to the torque converter hub.



15.

Connect the flush machine to the main hub.

1. Red hose on top.
2. Blue hose on bottom.



16. Follow the equipment instructions to purge transmission fluid from the torque converter prior to starting the flushing procedure.

17. **WARNING: The torque converter, adaptor 307-732, and the hoses will be hot.**

    NOTE: *Maintain visual contact with torque converter during the entire flush procedure. Immediately stop the flush machine if a leak develops. Repeat set up steps to reseal the tool to the converter hub and continue flushing.*

    Forward flush the converter for 15 minutes.

18. Monitor GPM flow meter periodically during the flush procedure. Flow rate above 2.0 gallons per minute is required to break up and dislodge any contamination trapped behind the TCC plate. Service flush machine filter(s) if flow rate drops below 2 GPM.

19. Follow the equipment instructions to purge the torque converter.

20. **WARNING: The torque converter, adaptor 307-732, and the hoses will be hot.**

    Allow torque converter and equipment to cool for 30 minutes before handling.

21. Disconnect the hoses and remove the special tools.

Flush The Torque Converter By Hand

NOTICE: Do not use water-based cleaners or mineral spirits to clean or flush the torque converter or transmission damage will occur. Use only clean transmission fluid designated for the transmission and torque converter being serviced.

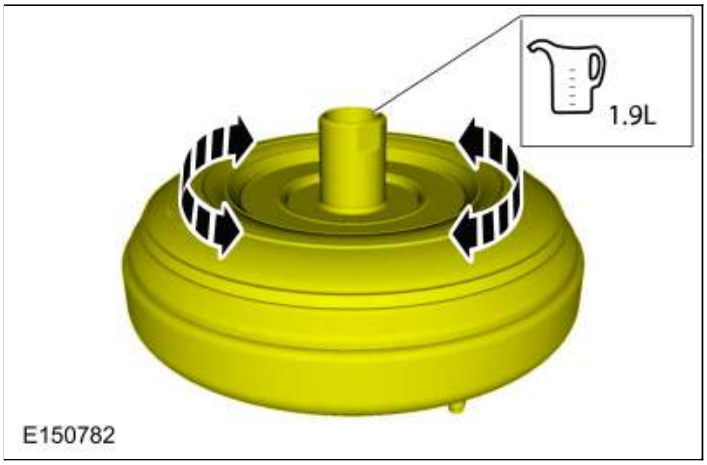
NOTE: *Only flush the torque converter by hand when the transmission cooling system heated flusher is not available.*

22. Pour a small amount of transmission fluid from the torque converter onto an absorbent white tissue or through a paper filter.

23. Examine the transmission fluid for contaminants. The transmission fluid must be free of metallic contaminants. If metallic contaminants are present, do not continue with hand flushing. The torque converter must be flushed with the transmission cooling system heated flusher.

24. Drain the remaining transmission fluid from the torque converter.

25. Using only the recommended transmission fluid, add 1.9L (2 qt) of clean transmission fluid into the converter and agitate by hand.
Material: Motorcraft® MERCON® ULV Automatic Transmission Fluid / XT-12-QULV (WSS-M2C949-A) (MERCON® ULV)

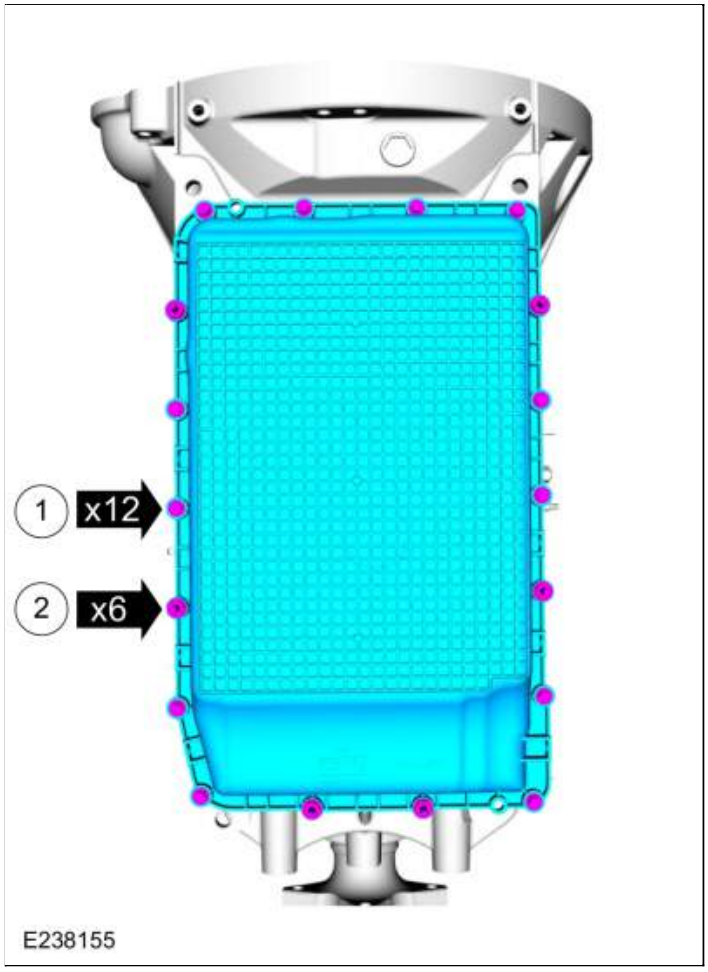


26. Thoroughly drain the transmission fluid.

All vehicles

27. **NOTE:** *Note the location of the bolts and studbolts for assembly.*

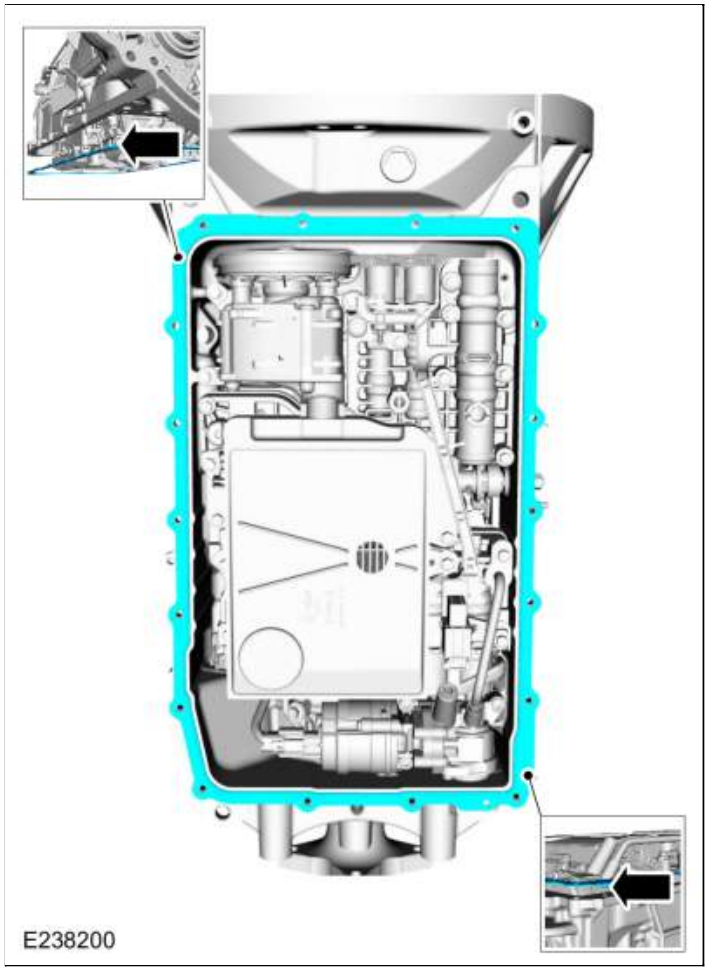
Remove the bolts and studbolts and the transmission fluid pan.
1. Bolts
2. Studbolts



28. **NOTE:** *The transmission fluid pan gasket can be reused if not damaged.*

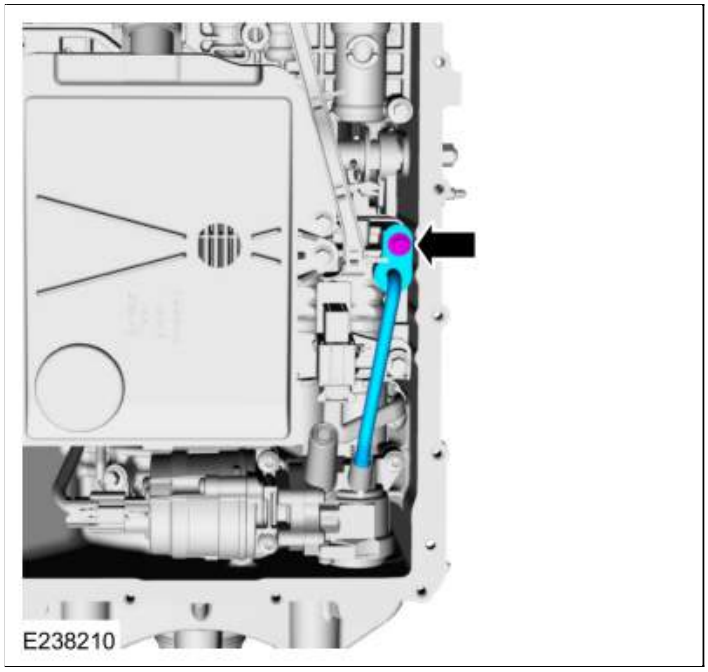
NOTE: *Note the location of the alignment tabs.*

Remove the transmission fluid pan gasket.

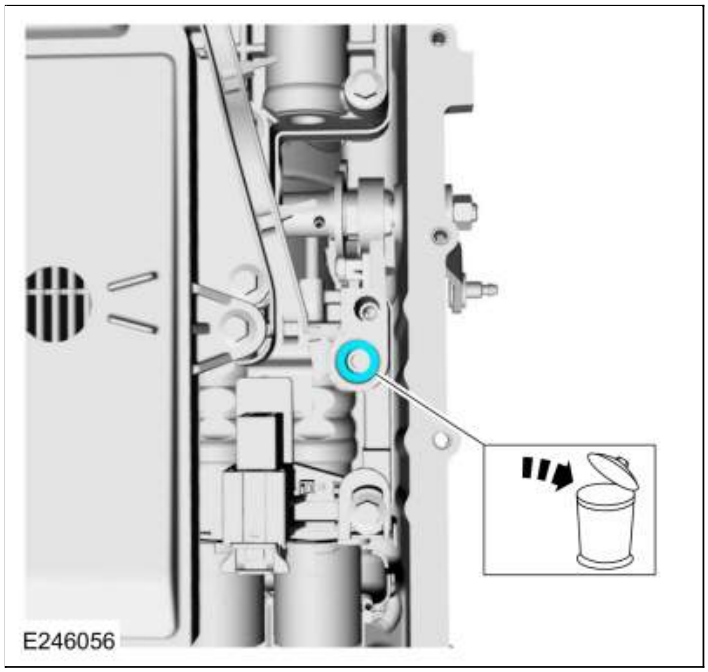


Auto-Start-Stop vehicles

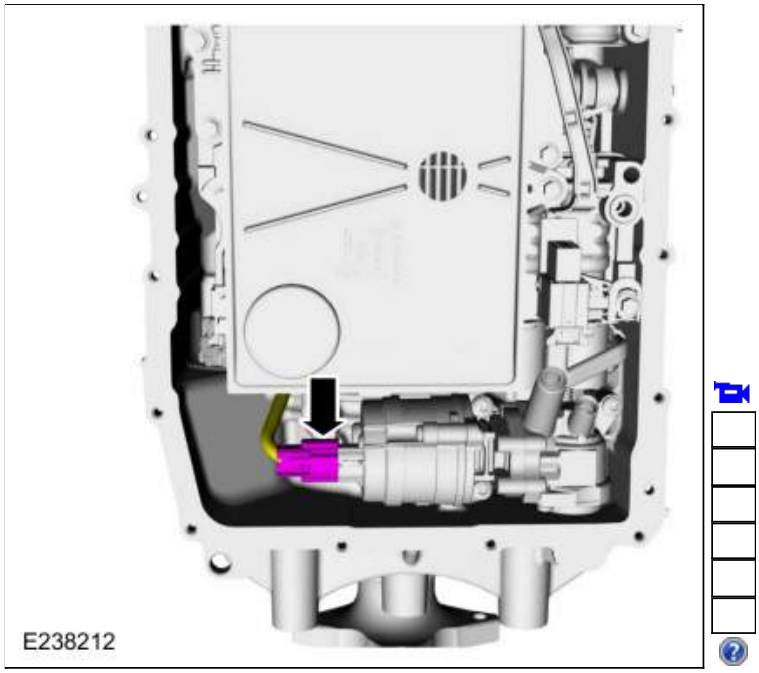
29. Remove the bolt and the transmission fluid auxiliary pump tube.



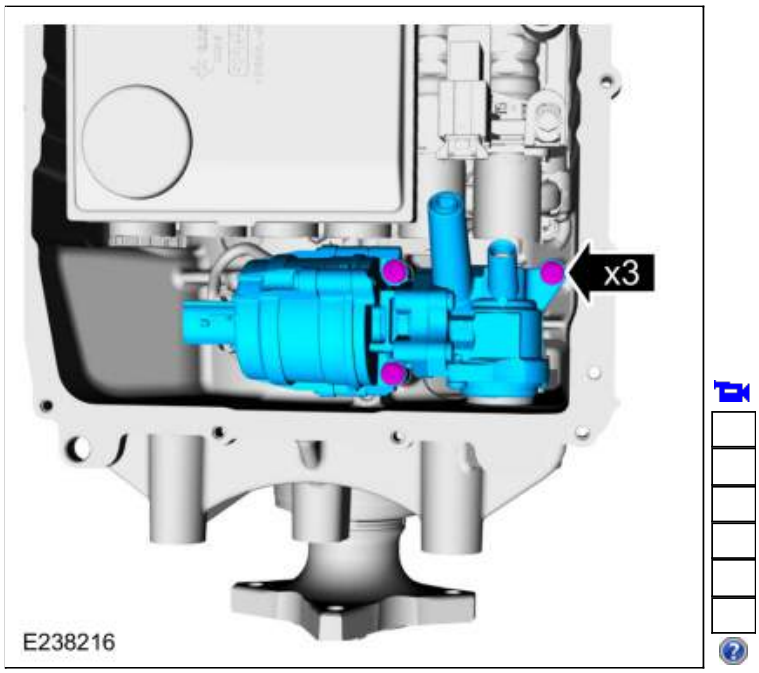
30. Remove and discard the transmission fluid auxiliary pump tube seal.



31. Disconnect the transmission fluid auxiliary pump electrical connector.



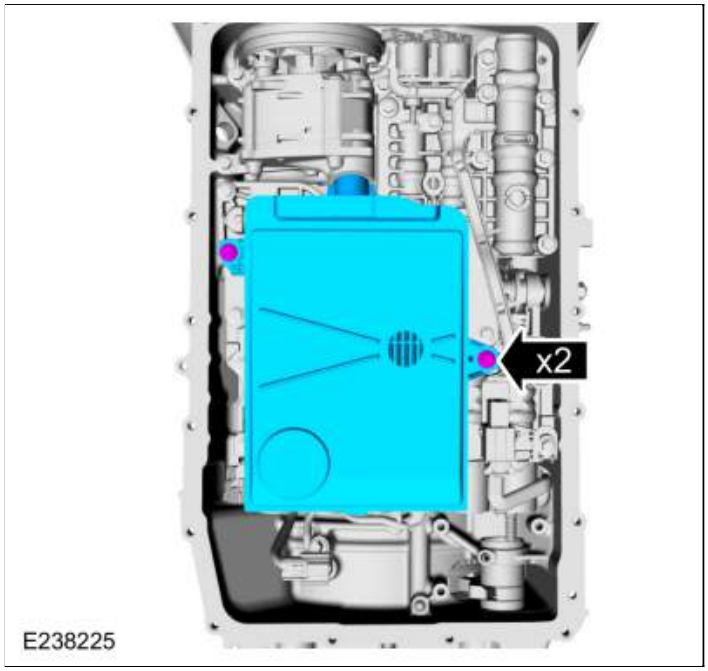
32. Remove the bolts and the transmission fluid auxiliary pump.



All vehicles

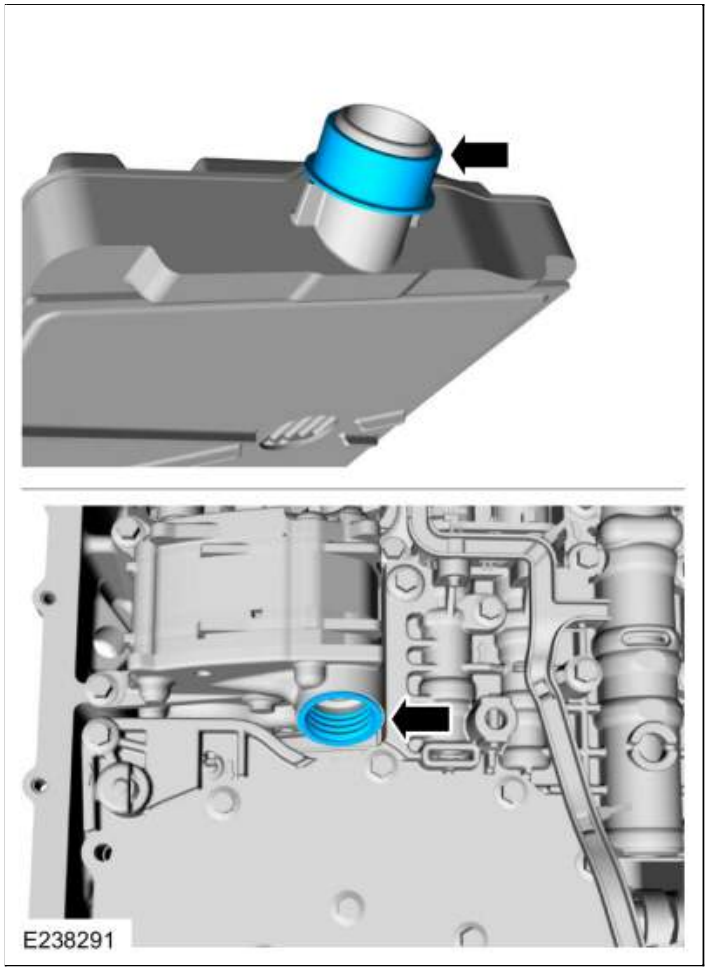
33. **NOTE:** *The transmission fluid filter may be reused if no excessive contamination is indicated.*

    Remove the 71 mm and 20 mm bolts and the transmission fluid filter.

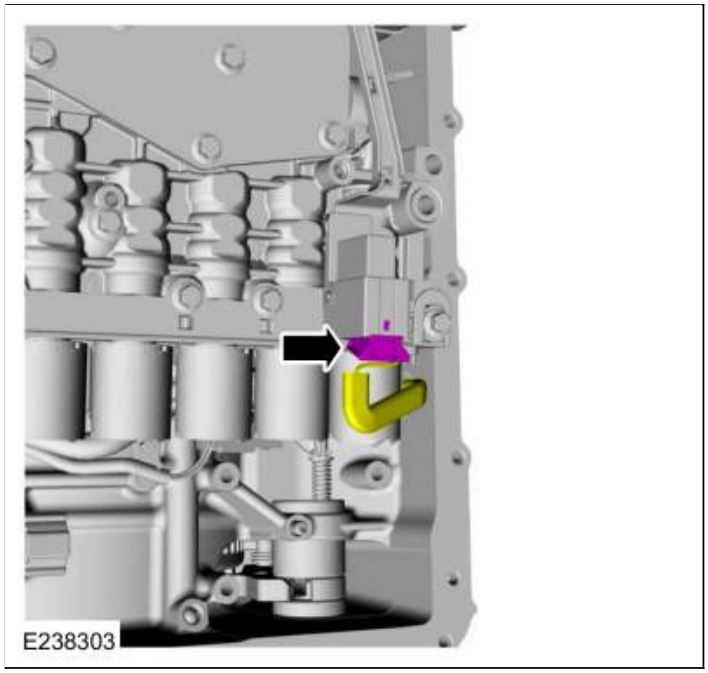


34. **NOTE:** *The transmission fluid filter seal will either come off with the transmission fluid filter or it will be stuck in the pump.*

    Remove the transmission fluid filter seal.

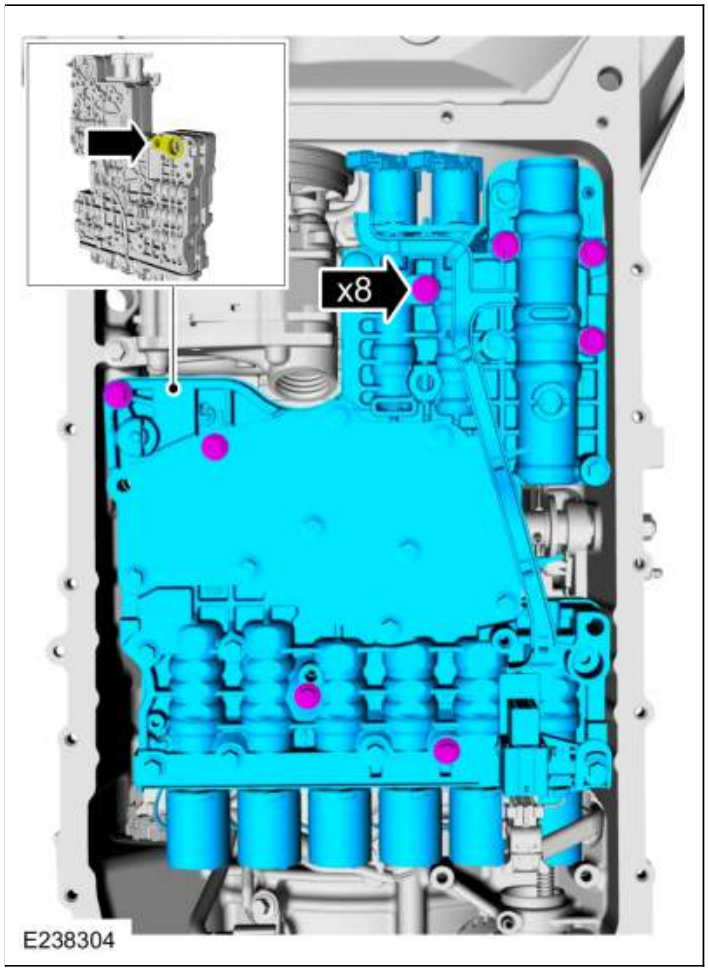


35. Disconnect the main control main electrical connector.



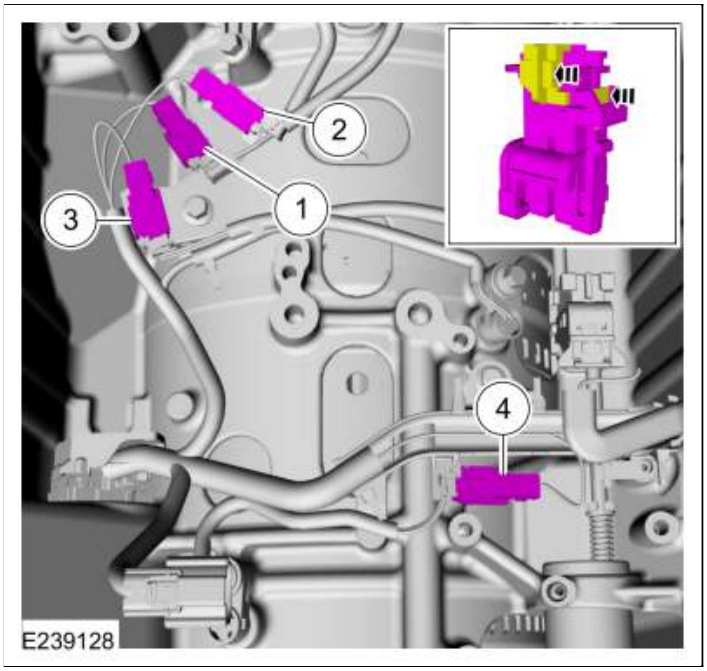
36. **NOTE:** *Check to see if the main control-to-transmission fluid pump seal is attached to the main control.*

    Remove the 68 mm bolts and the main control assembly.

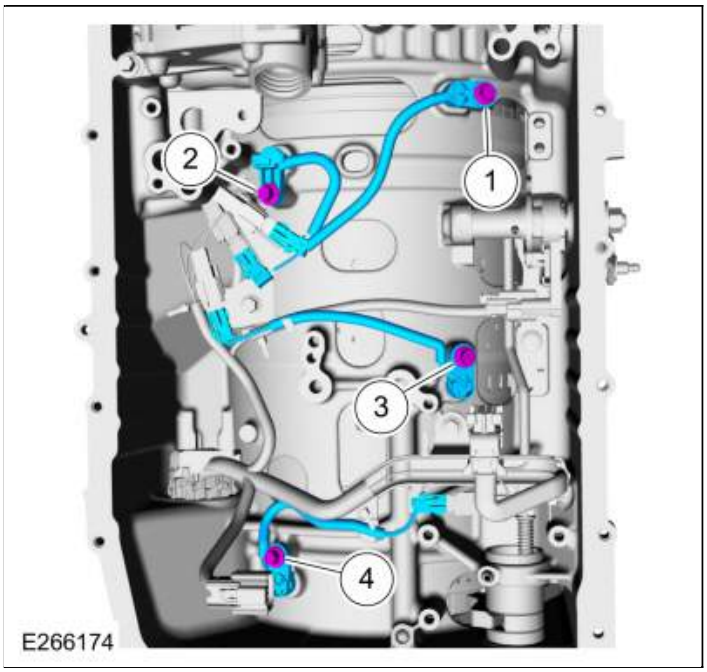


37. Clean and inspect the main control for damage.
    Refer to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Overhaul).

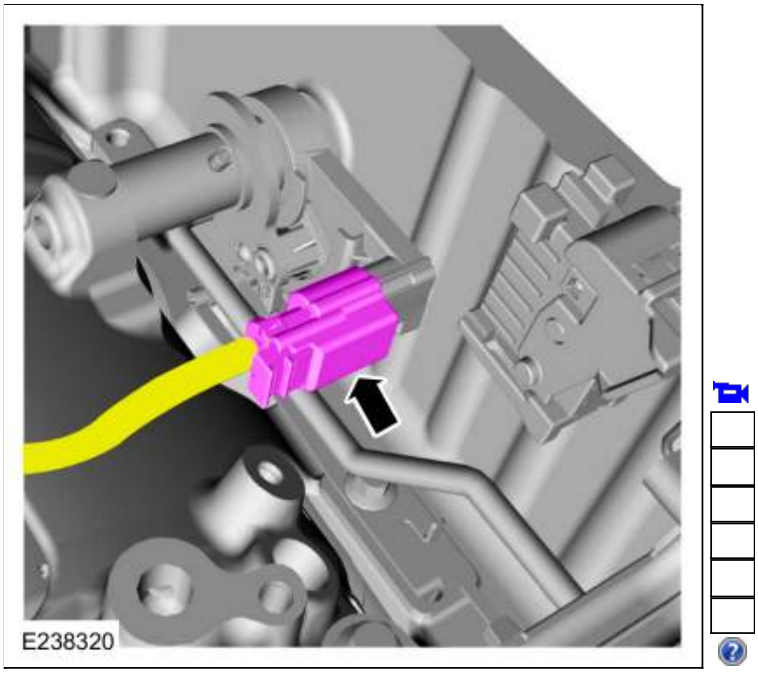
38. Unlock and disconnect the speed sensors.
    1. Intermediate Speed Sensor A (ISSA)
    2. TSS sensor
    3. Intermediate Speed Sensor B (ISSB)
    4. OSS sensor



39. Remove the speed sensors.
    1. Intermediate Speed Sensor A (ISSA)
    2. TSS sensor
    3. Intermediate Speed Sensor B (ISSB)
    4. OSS sensor



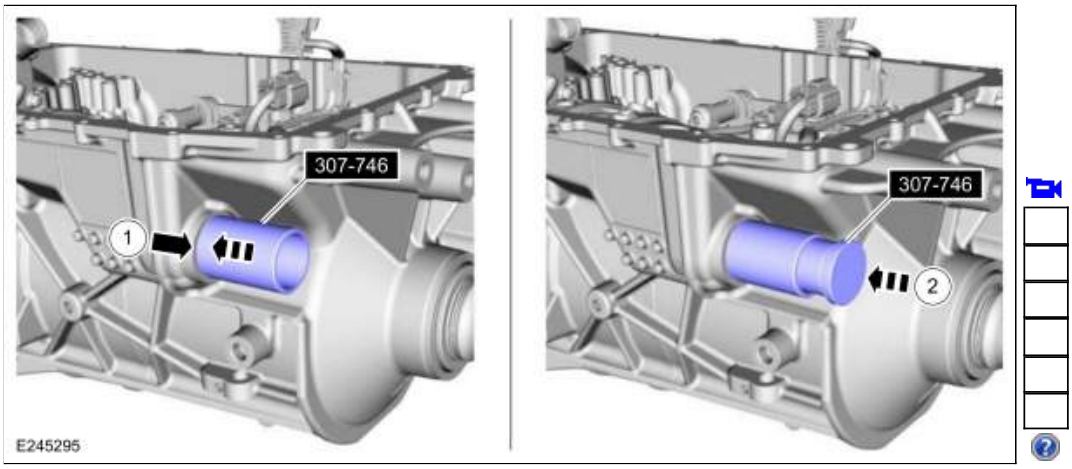
40. Disconnect the TR sensor electrical connector.



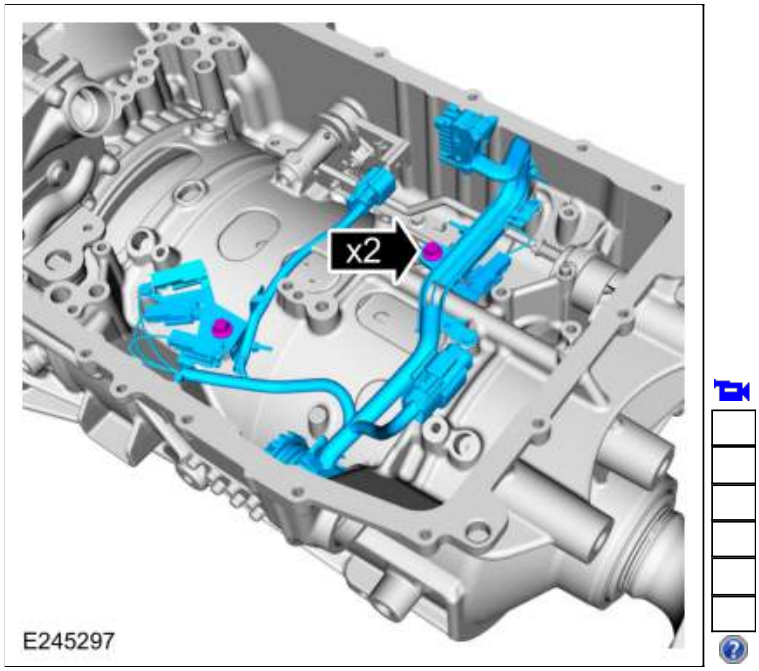
41.

Using the special tool, disconnect the transmission internal wiring harness connector from the transmission case.

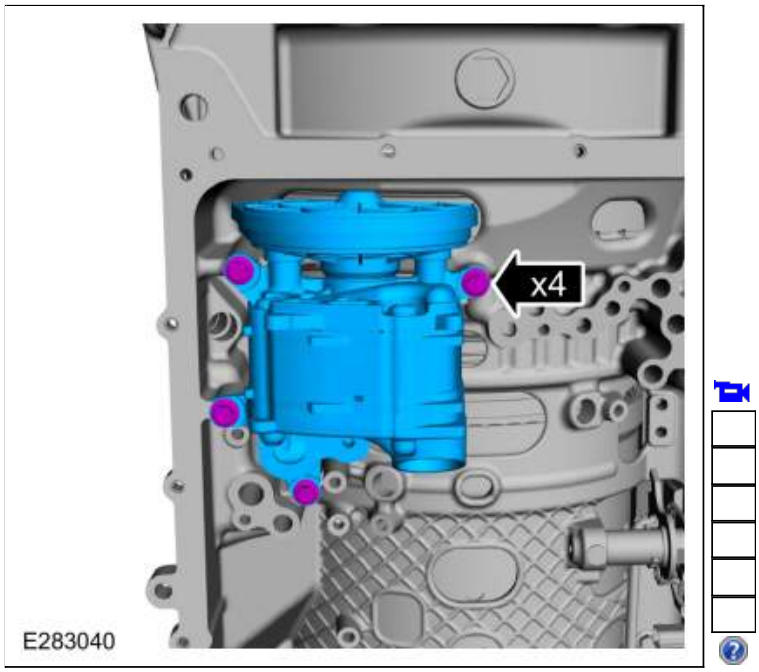
1. Slide the special tool over the connector flush with the transmission case.
   Use Special Service Tool: 307-746 Remover, Transmission Wiring Harness Connector.
2. Use the special tool to push the connector through the case.



42. Remove the bolts and the transmission internal wiring harness.

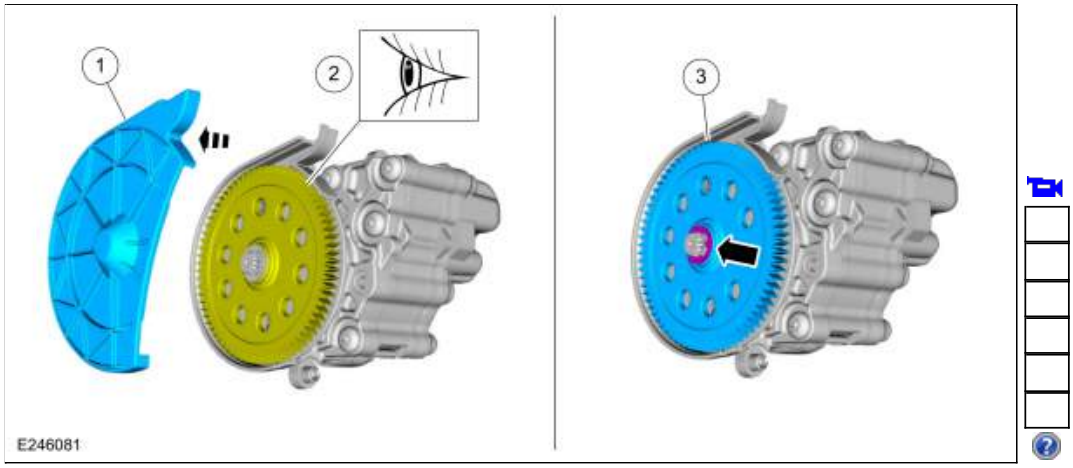


43. Remove the bolts and the transmission fluid pump.

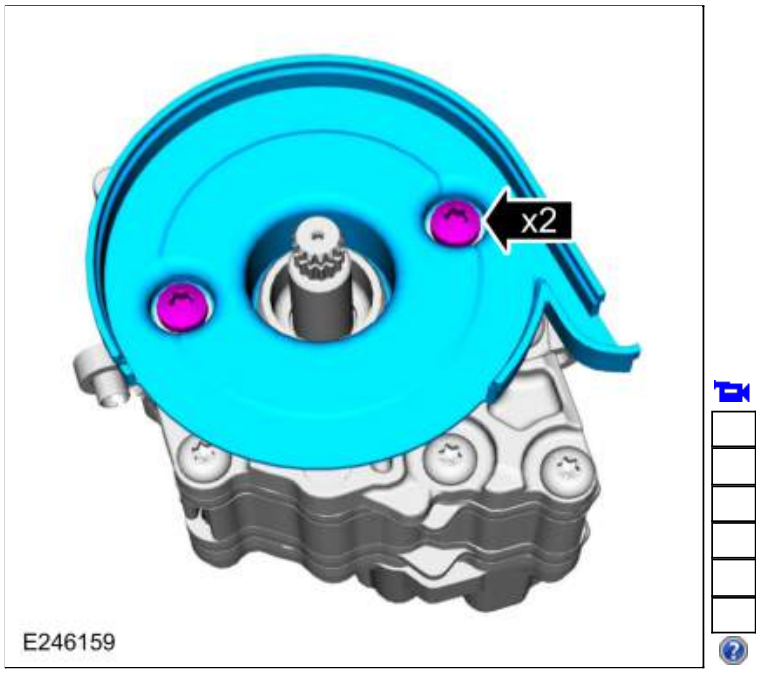


44.

1. Remove the transmission fluid pump driven gear outer cover.
2. Clean and inspect the transmission fluid pump driven gear.
3. If replacing the transmission fluid pump driven gear or transmission fluid pump driven gear inner cover, remove the retaining ring and the transmission fluid pump driven gear.

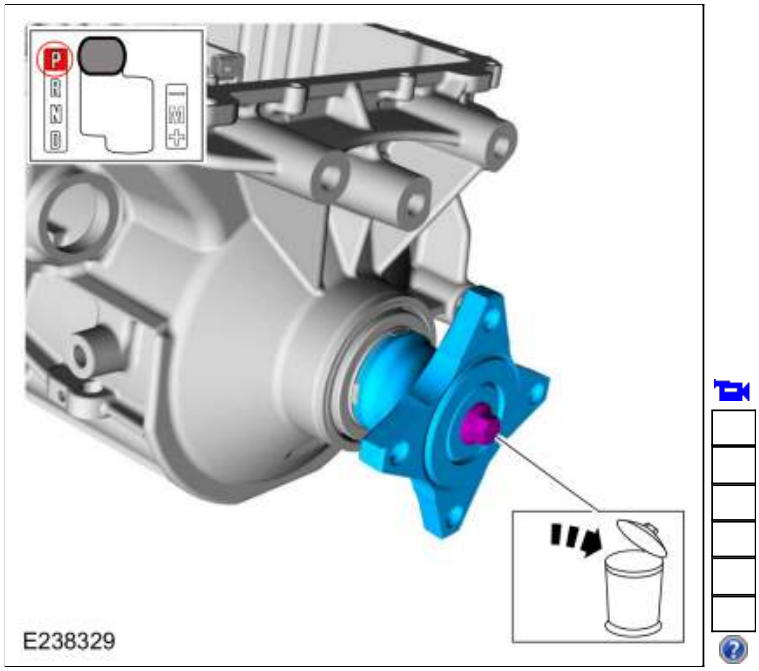


45. If necessary, remove the bolts and the transmission fluid pump driven gear inner cover.

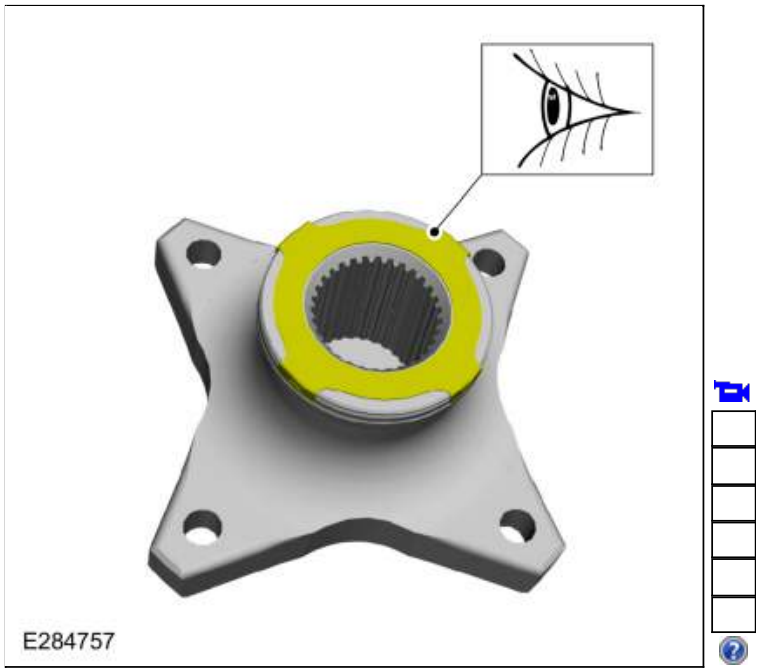


Rear Wheel Drive (RWD) vehicles

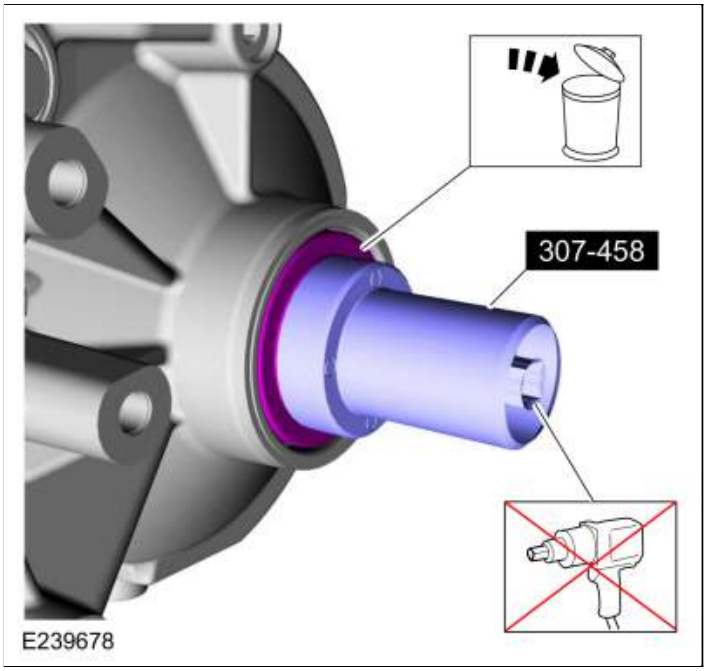
46. Rotate the manual control lever to P. Remove and discard the output shaft flange bolt. Remove the output shaft flange and anti-ting ring assembly.



47. Clean and inspect the anti-ting ring.

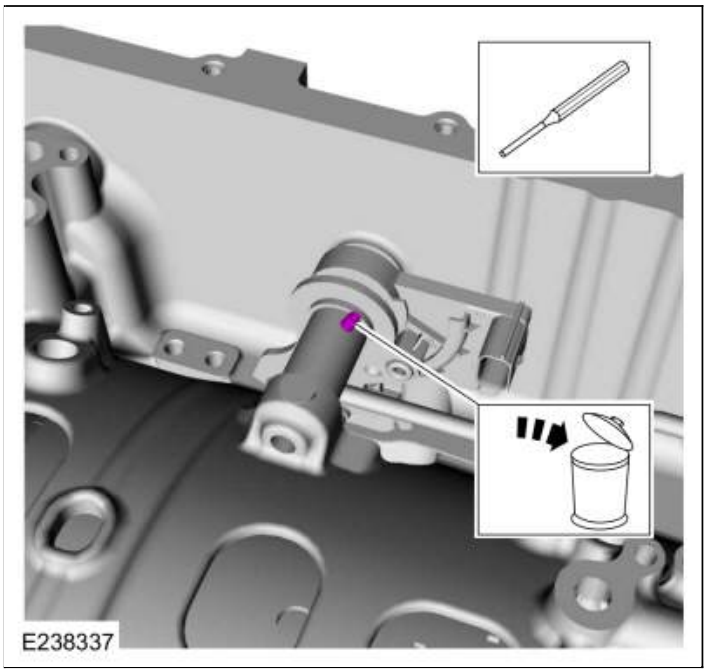


48. Using the special tool, remove and discard the output shaft nut.
Use Special Service Tool: 307-458 Socket, Output Shaft Locknut.

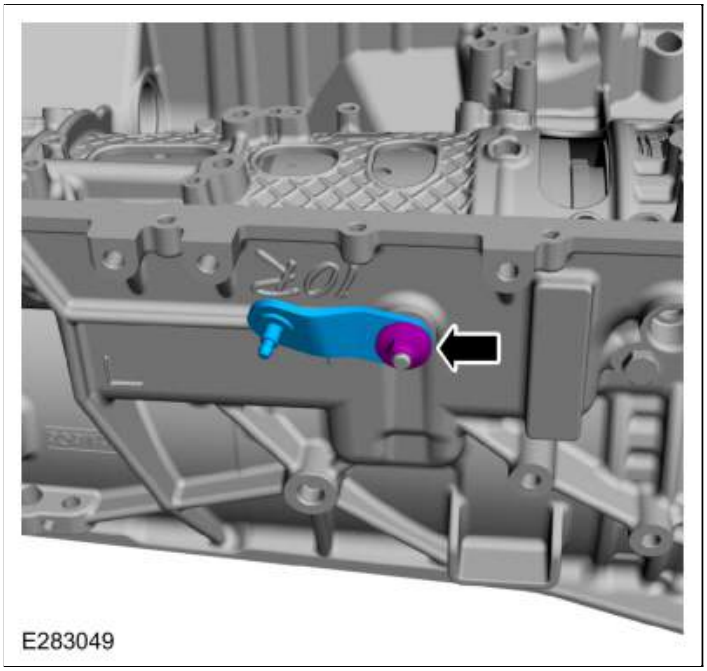


All vehicles

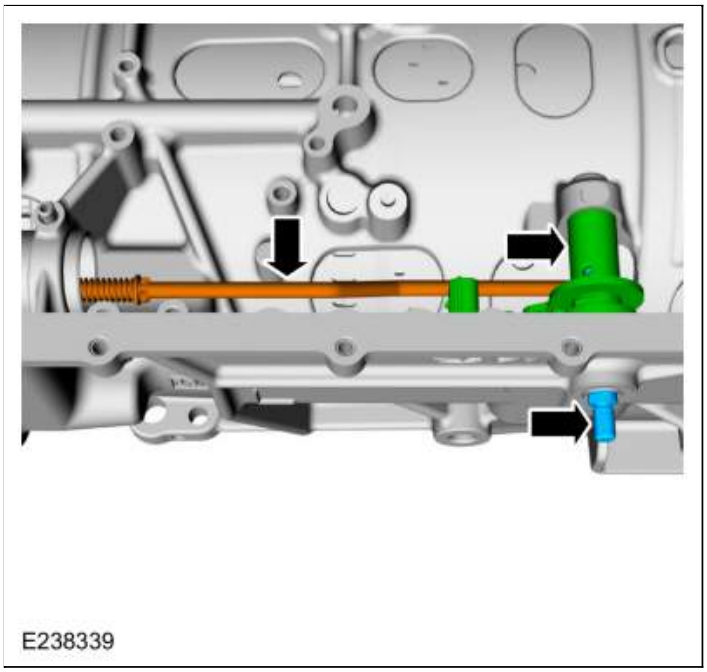
49. Remove and discard the manual control shaft-to-TR sensor roll pin.
Use the General Equipment: Punch



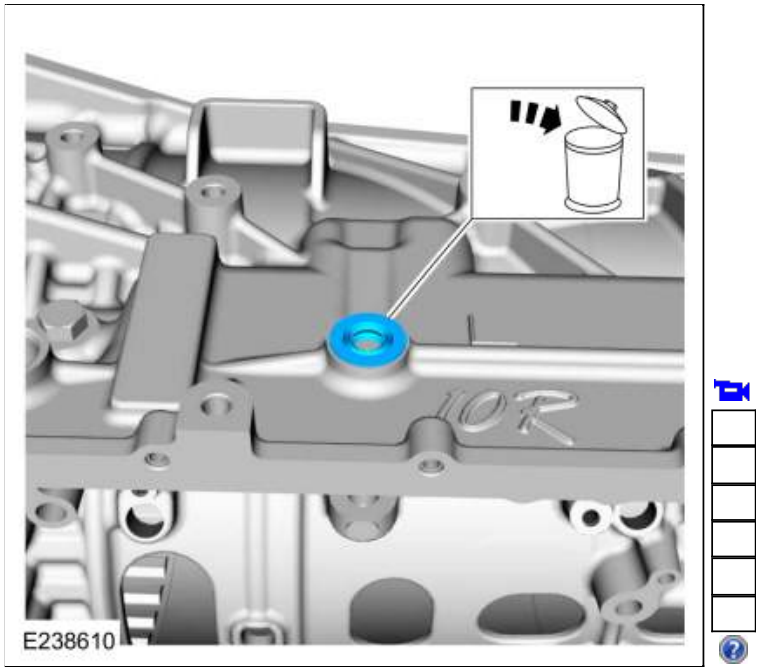
50. Remove the nut and the manual control lever.



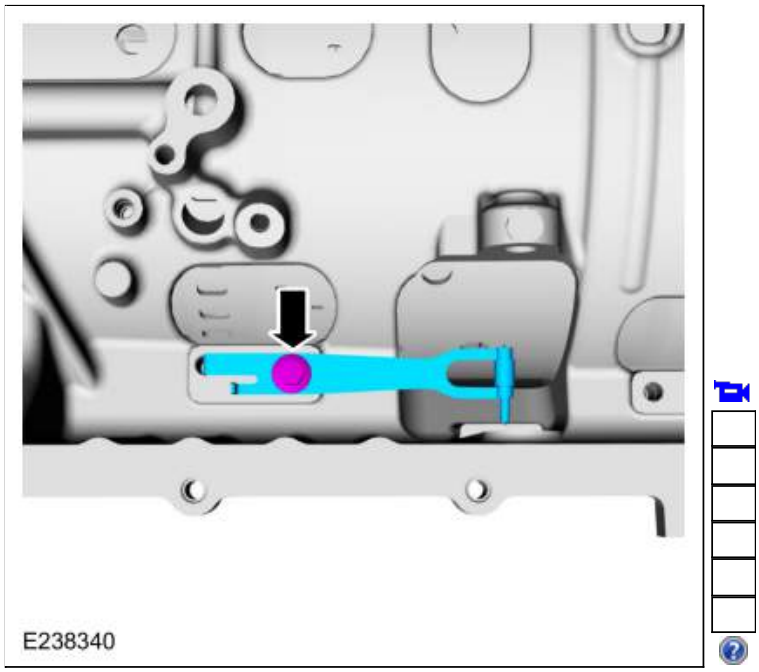
51. Remove the manual control shaft, the TR sensor and the park pawl actuator rod.



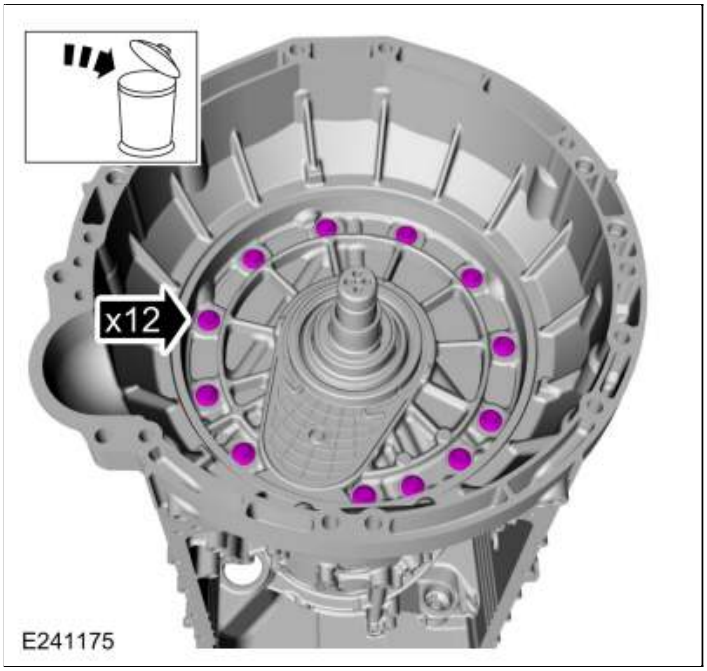
52. Remove and discard the manual control shaft seal.



53. Remove the bolt and the TR sensor detent spring.

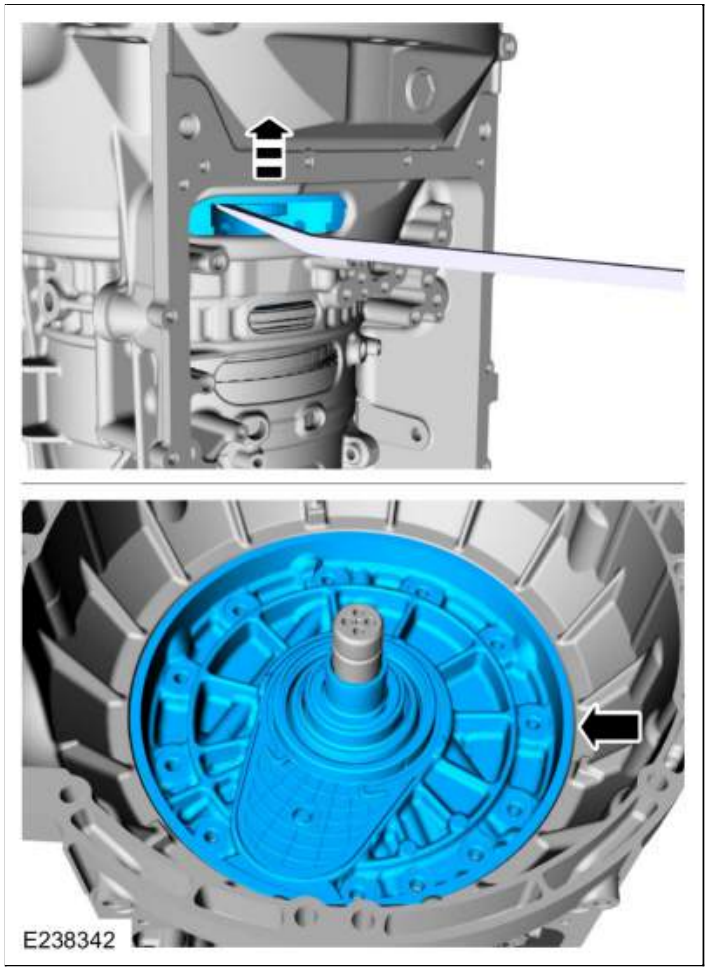


54. Rotate the transmission to a vertical position. Remove and discard the front support assembly bolts.

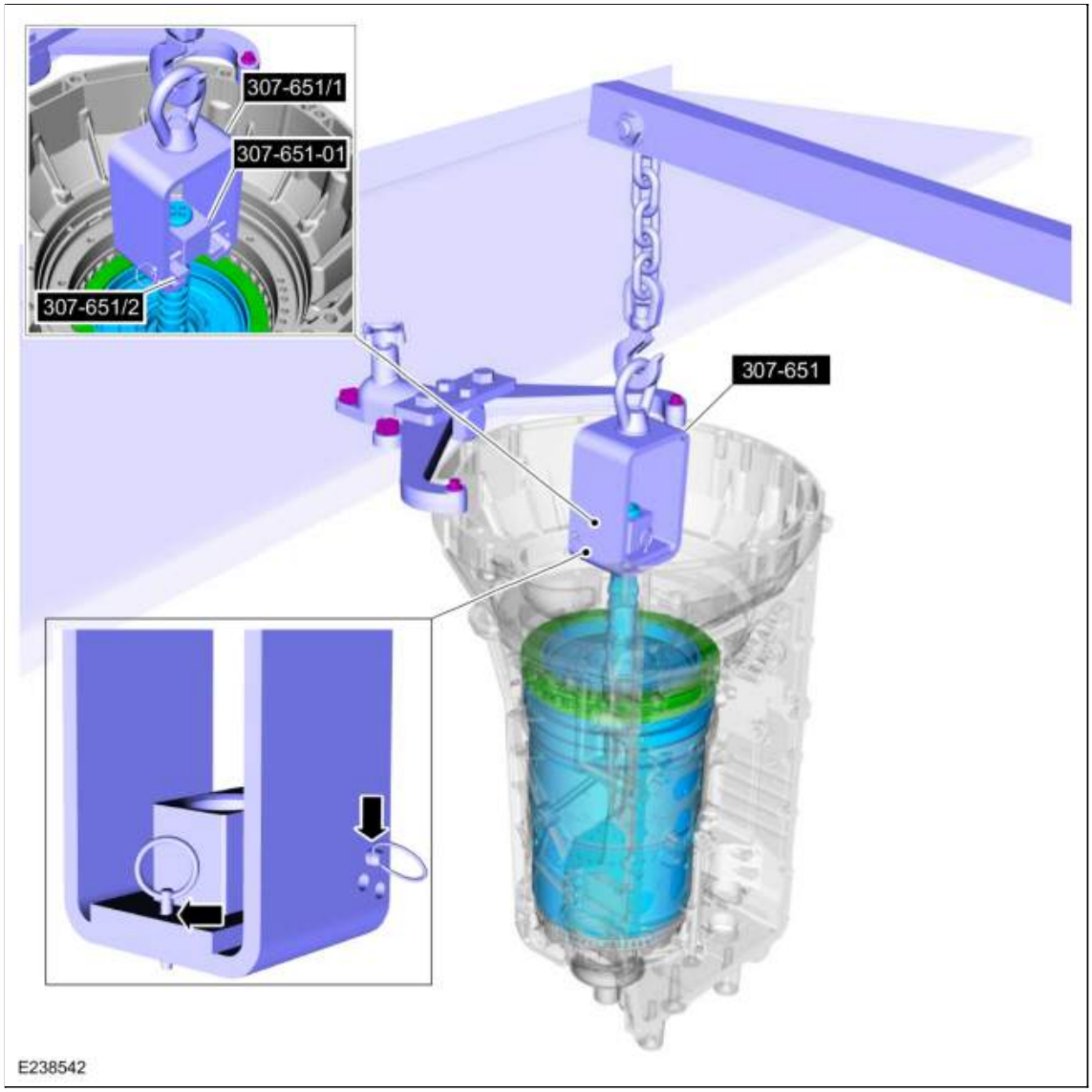


55. **NOTICE: Be careful not to contact the transmission fluid pump drive gear, or damage to the gear can occur.**

Using a prybar, pry the front support assembly out of the transmission case and remove the front support assembly.

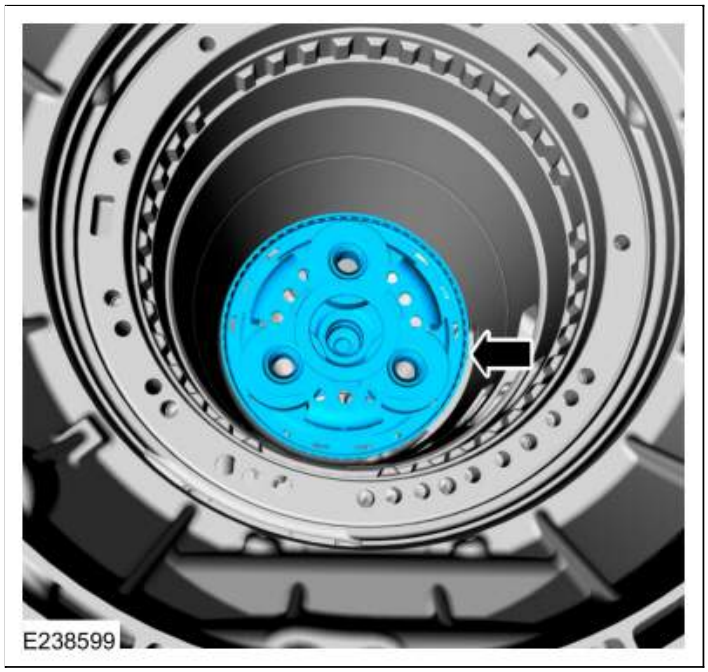


56. Using the special tools and a floor crane, remove the clutch and planetary assembly.
Use Special Service Tool: 307-651 Bracket, Pump Remover/Installer. , 307-651-01 Adapter for 307-651 (Super Sub Assembly Lifting).



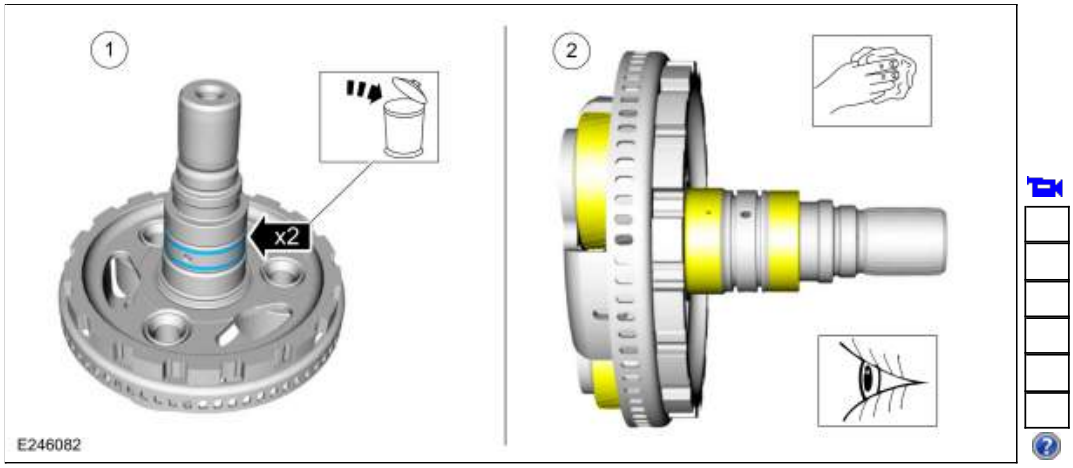
57. Remove the (T9) thrust bearing.

58. Remove the output shaft and planetary carrier No. 4 assembly.

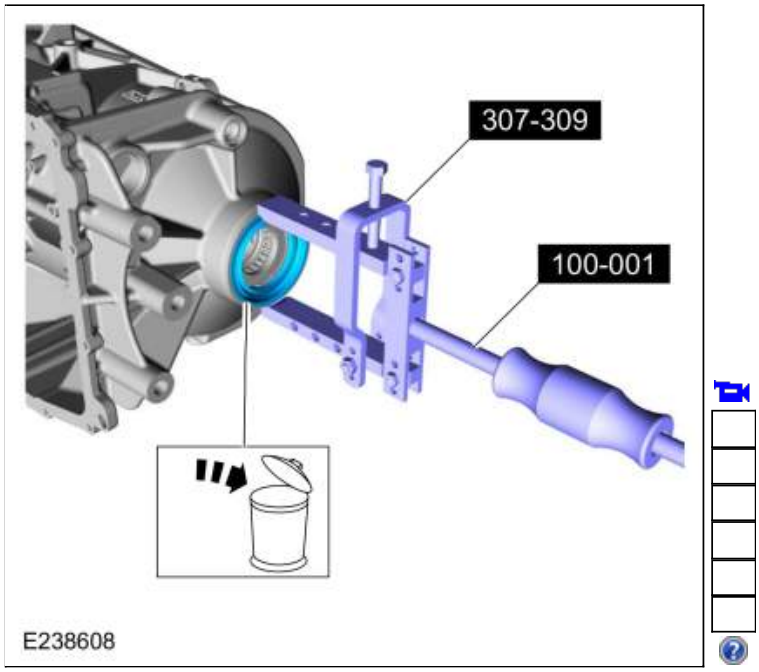


59.

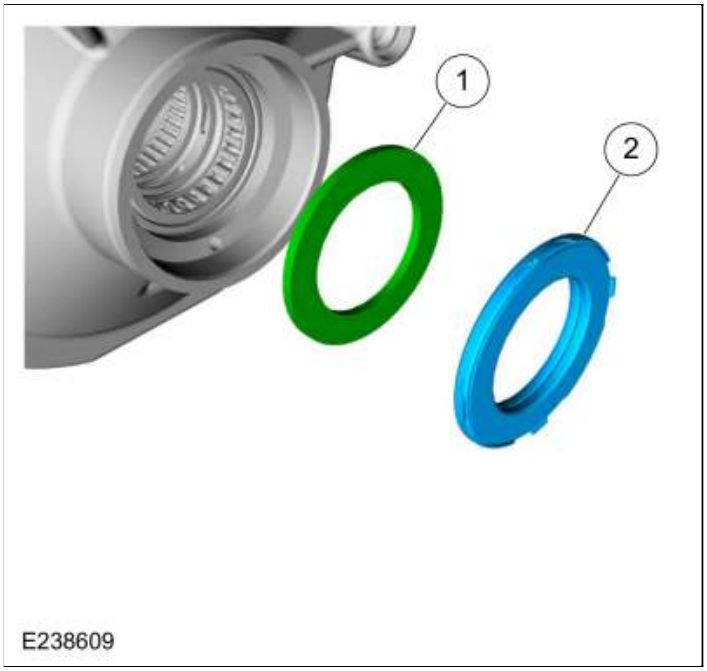
1. Remove and discard the output shaft seals.
2. Clean and inspect the output shaft and planetary carrier No. 4 assembly.



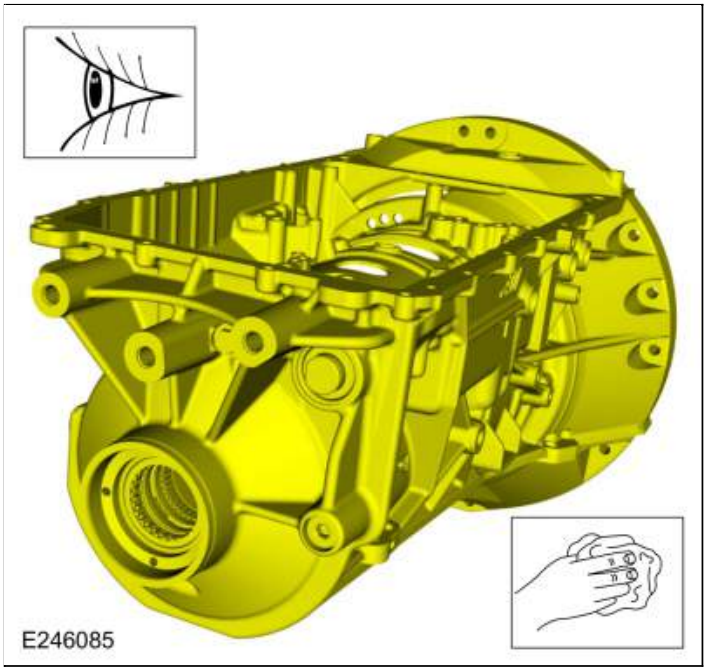
60. Using the special tools, remove and discard the output shaft seal.
Use Special Service Tool: 100-001 (T50T-100-A) Slide Hammer. , 307-309 Remover, Torque Converter Seal.



61. If equipped with 2WD, remove the (T11) thrust bearing and the thrust washer.
    1. Thrust washer
    2. Thrust bearing (T11)

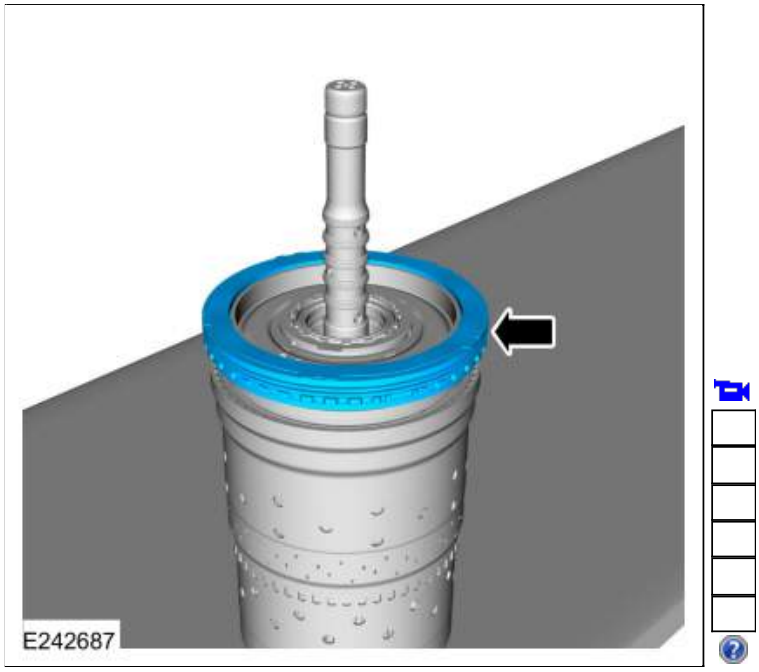


62. Clean and inspect the transmission case and bearings. Check for leaks from plugs and park pawl actuator rod sleeve. Repair or replace as necessary.
Refer to: Transmission Case (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Disassembly).

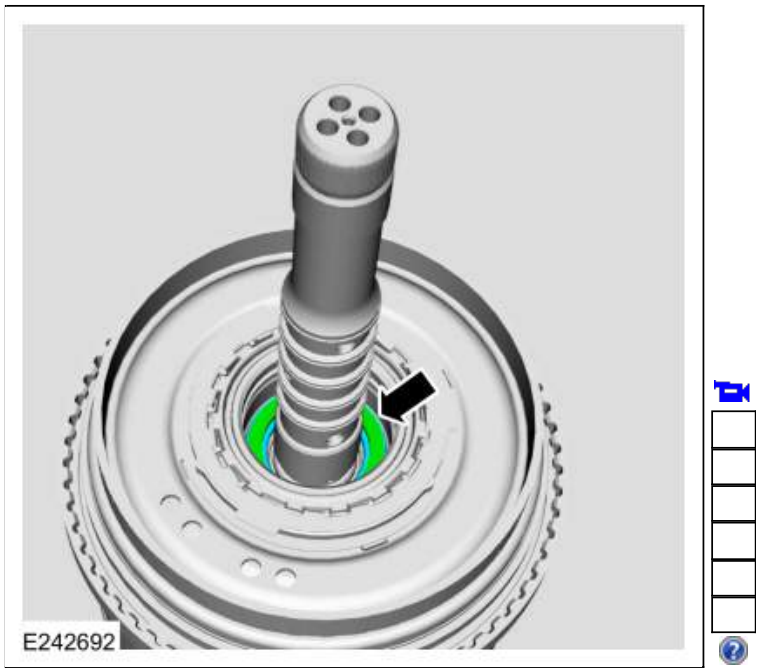


63. **NOTICE: If replacing A clutch separating springs, all separating springs must be replaced as a matching set or damage can occur.**

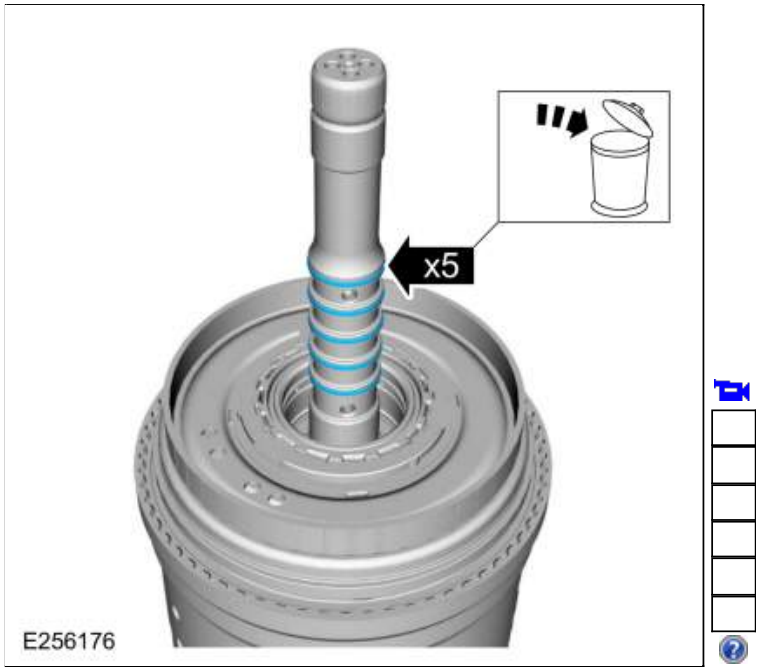
Remove the A clutch assembly. Inspect the clutch plates for excessive wear or damage. If the clutch plates are excessively worn or damaged replace as necessary. If the clutch plates are not excessively worn or damaged, they can be reused.



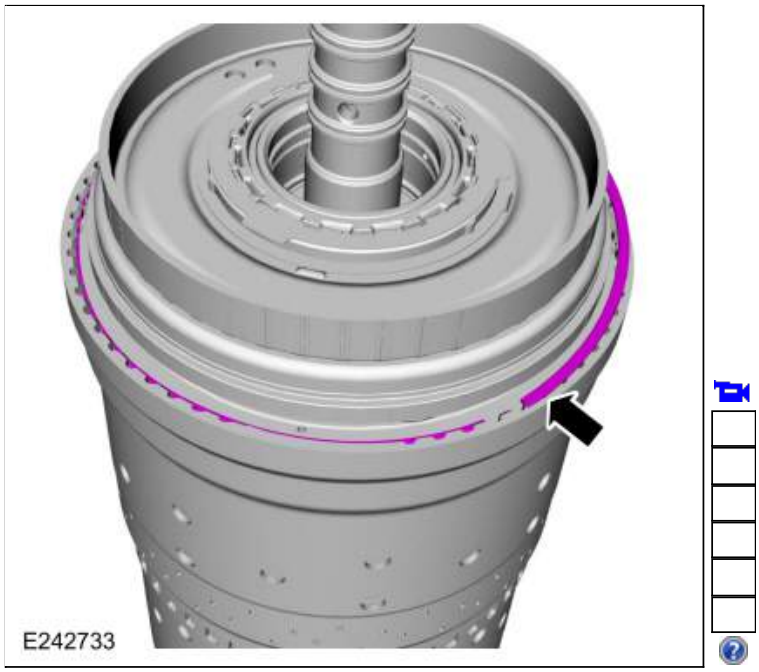
64. Using a magnet, remove the selective shim and the (T3) thrust bearing.
Use the General Equipment: Magnet



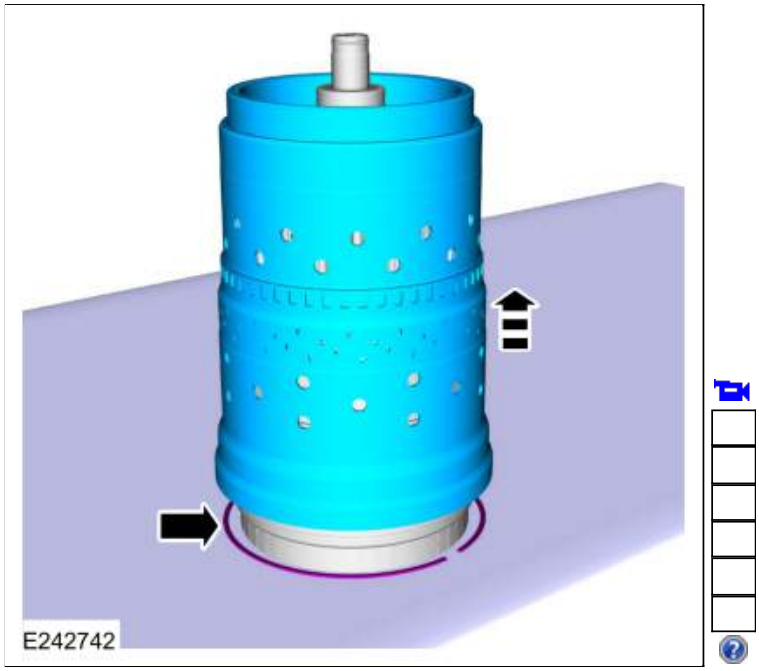
65. Remove and discard the input shaft front Teflon® seals.



66. Remove one side of the No. 1 planetary carrier snap ring.



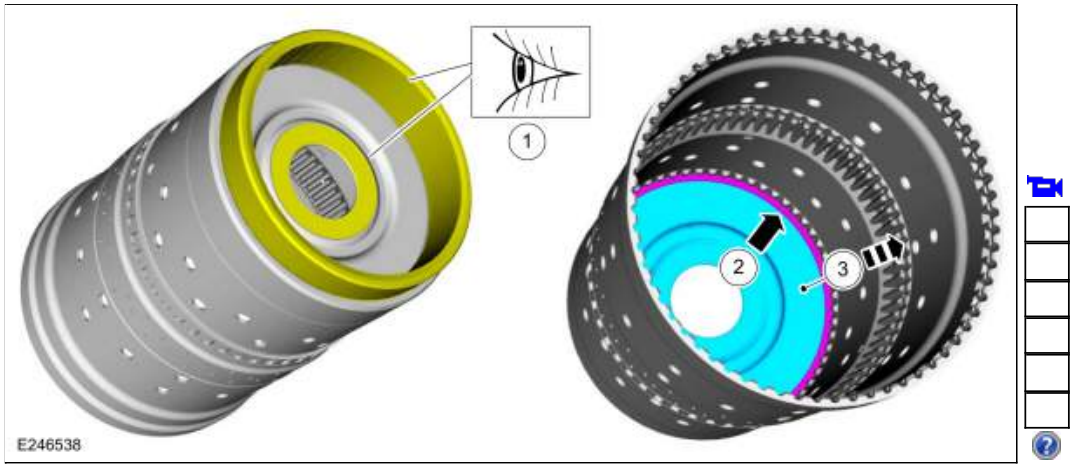
67. Flip the clutch and planetary assembly over with the input shaft through a hole in the bench. Remove the No. 1 planetary carrier snap ring and remove the clutch and planetary container cylinder.



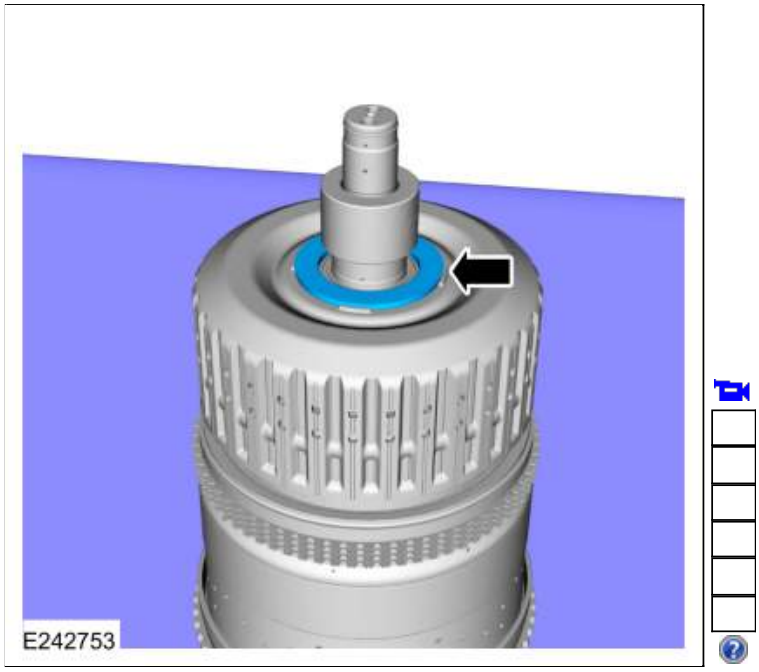
68.

1. Inspect the No. 4 ring gear.
2. **NOTE:** *Remove the ring gear when replacement is necessary.*

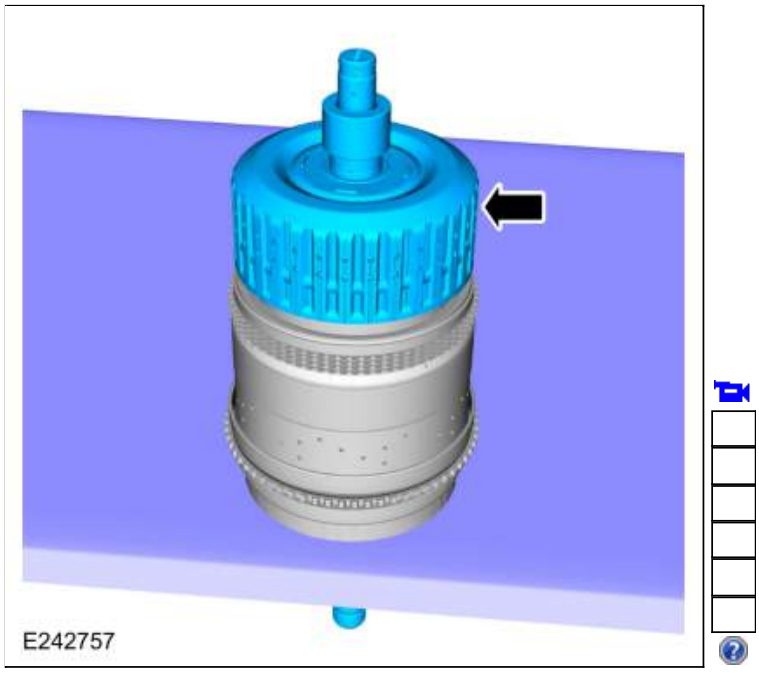
   If necessary, remove the ring gear snap ring.
3. If necessary, remove the ring gear fron the inside of the clutch and planetary container cylinder.



69. Remove the (T8) thrust bearing.

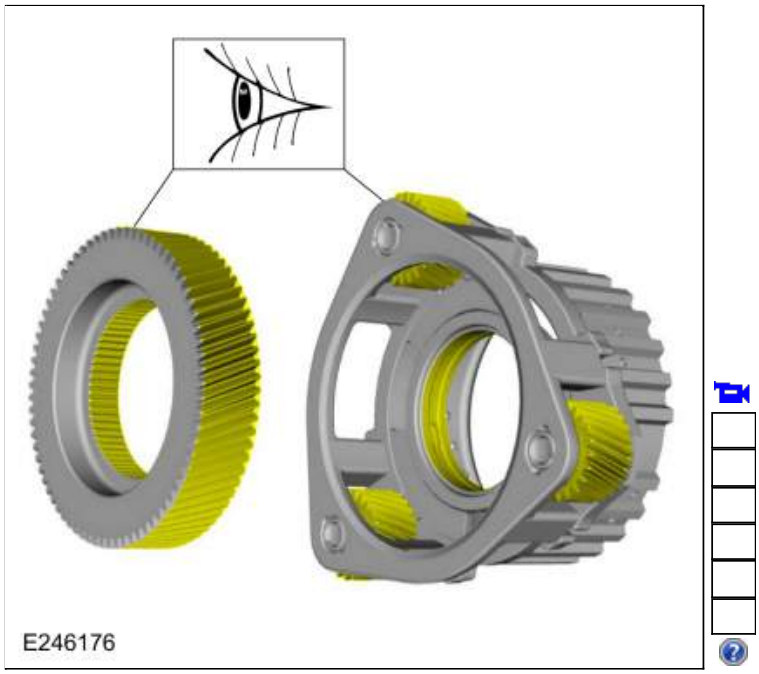


70. Remove the E clutch and input shaft assembly.

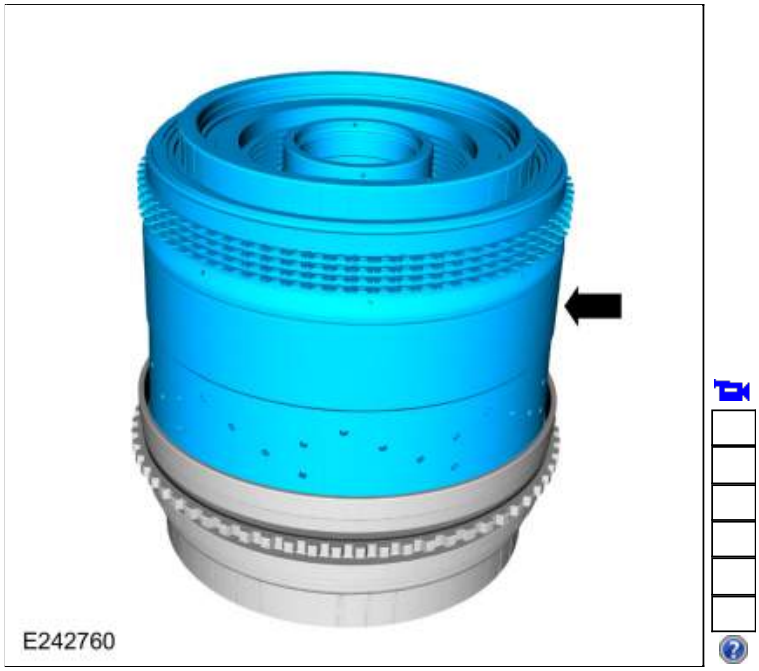


71. Remove the No. 3 planetary carrier and the No. 3 sun gear.

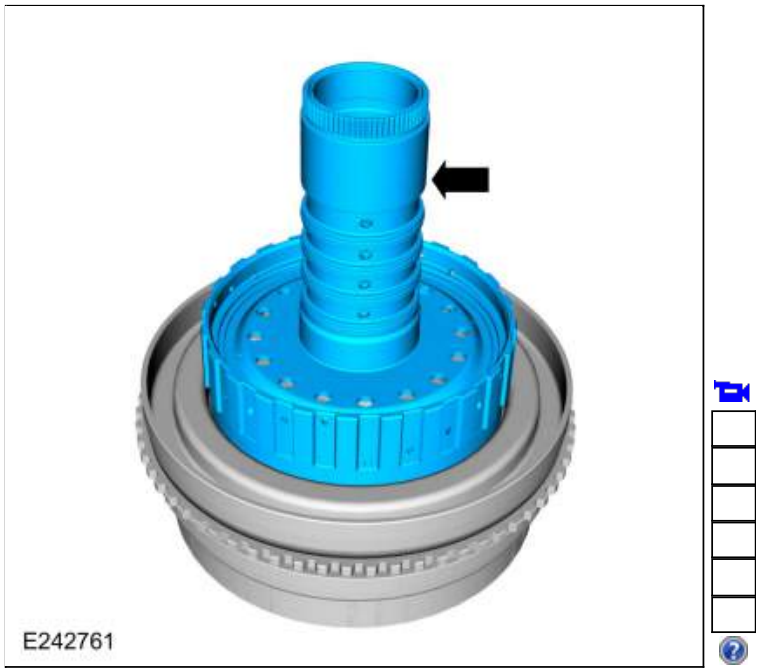
72. Inspect the No. 3 planetary carrier and the No. 3 sun gear.



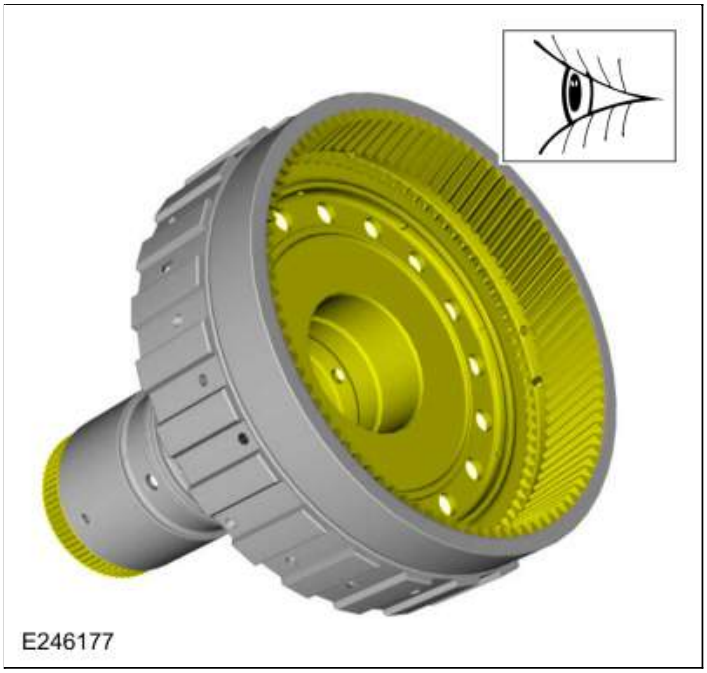
73. Remove the CDF clutch assembly from the planetary carrier assembly.



74. Remove the No. 3 sun gear shaft and No. 2 ring gear assembly.

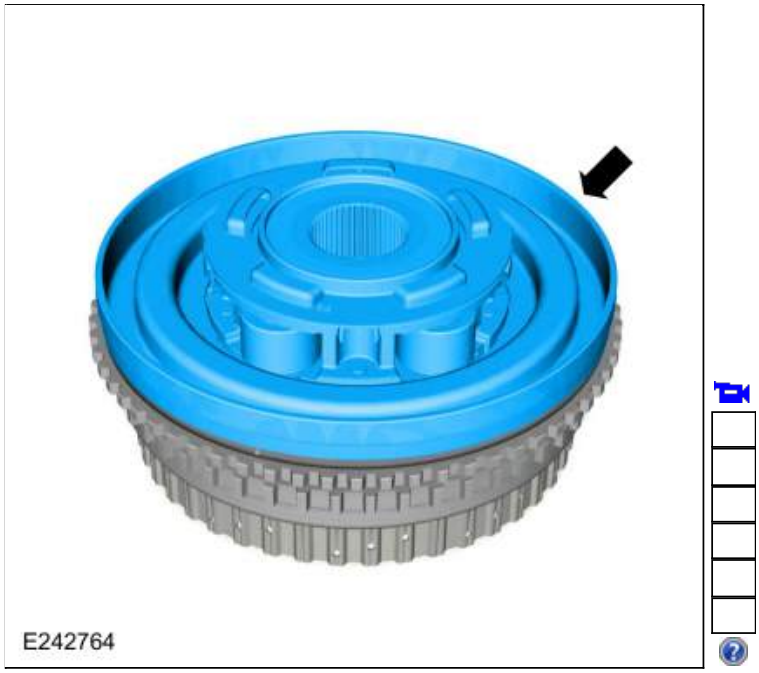


75. Inspect the No. 3 sun gear shaft and No. 2 ring gear assembly.



76. Remove the (T5) thrust bearing.

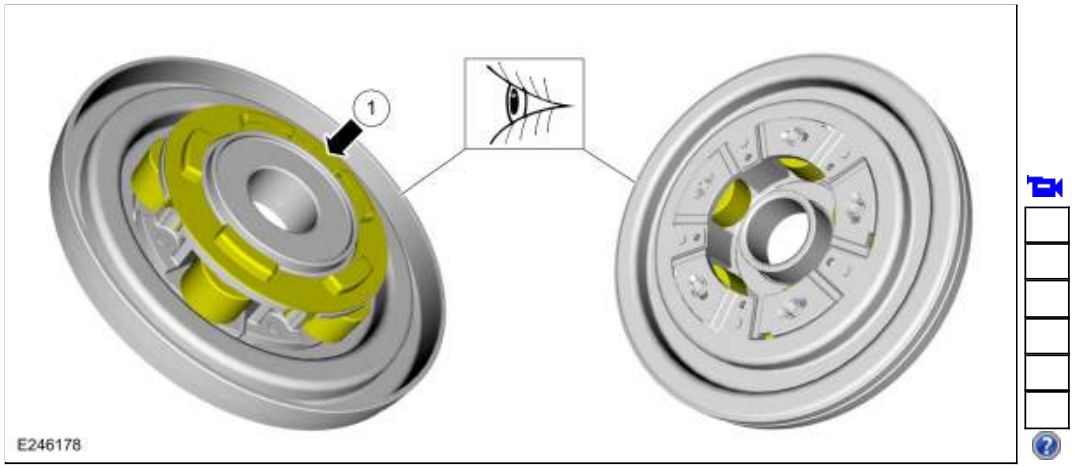
77. Remove the No. 2 planetary carrier.



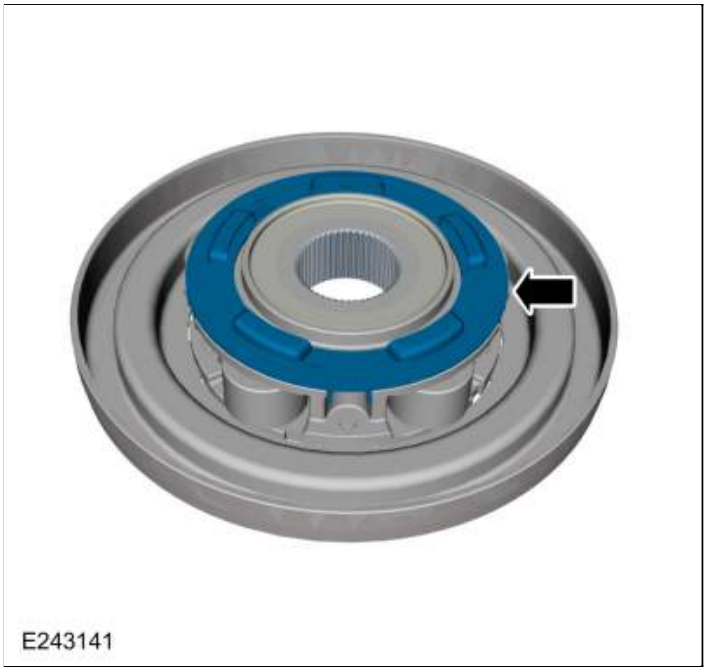
78. **NOTE:** *It is not nessary to remove the fluid collector from the No. 2 planetary carrier.*

Inspect the No. 2 planetary carrier and the fluid collector.

1. If the fluid collector is broken remove and discard.

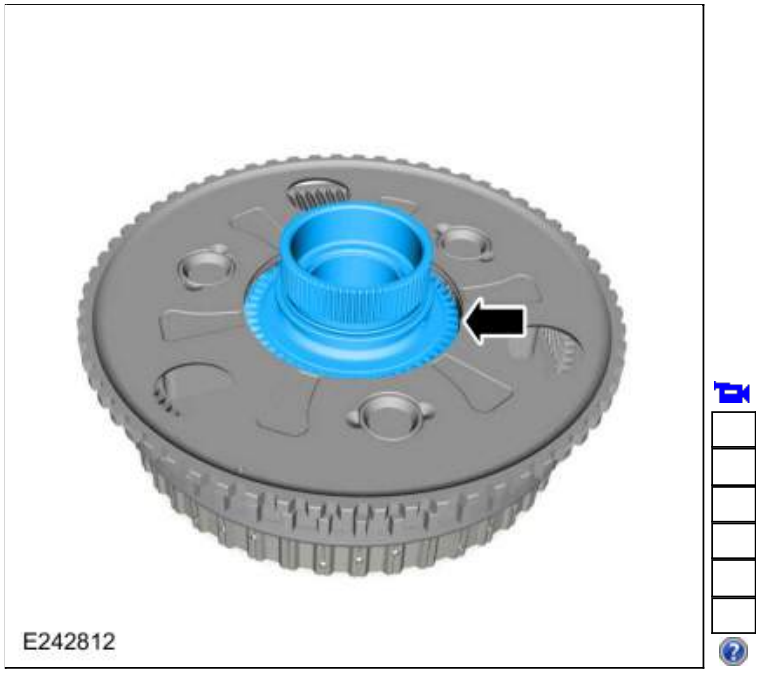


79. If necessary, install the new the fluid collector.

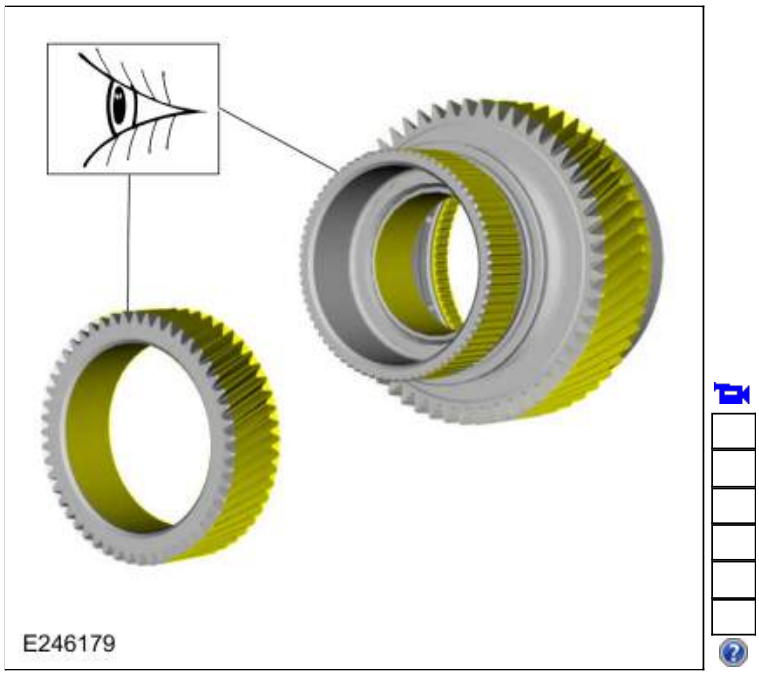


80. Remove the No. 2 sun gear.

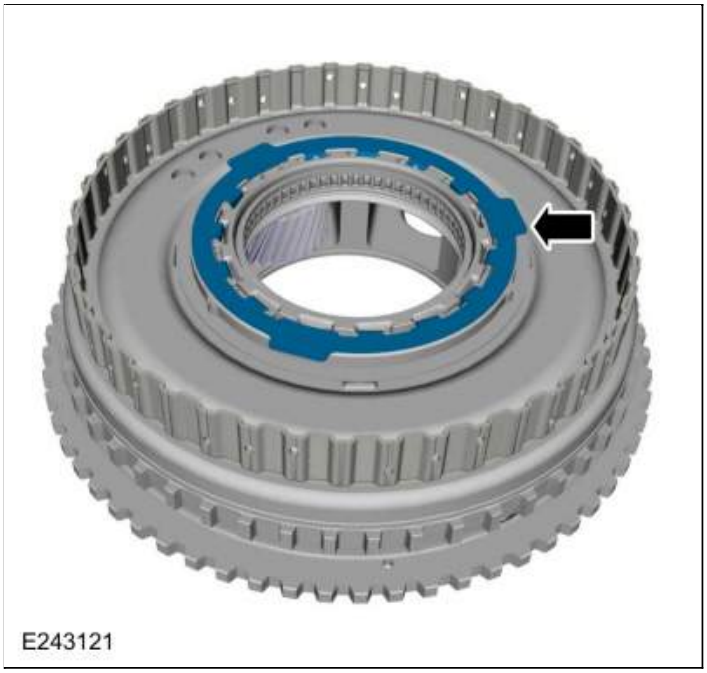
81. Remove the No. 1 sun gear.



82. Inspect the No. 1 and No. 2 sun gears.

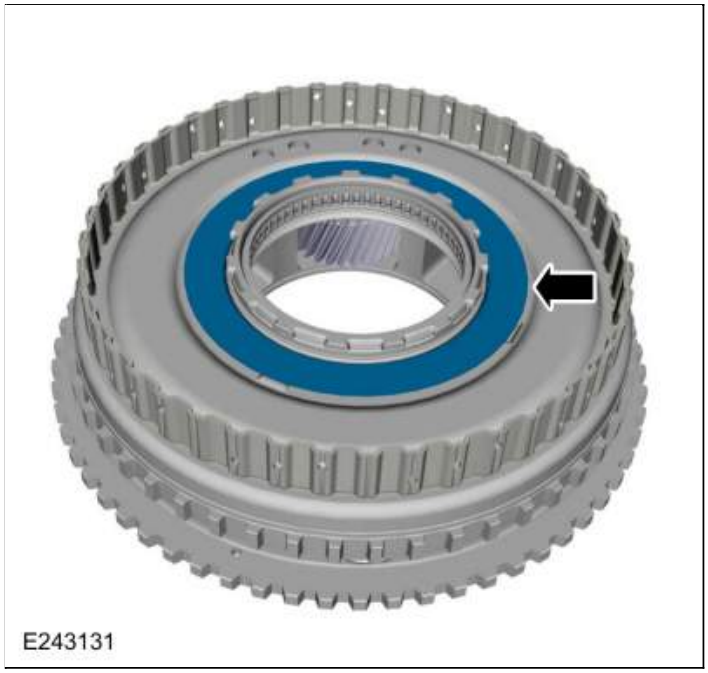


83. Gently pry up on the 3 tabs and remove the No. 1 bearing support locking ring.

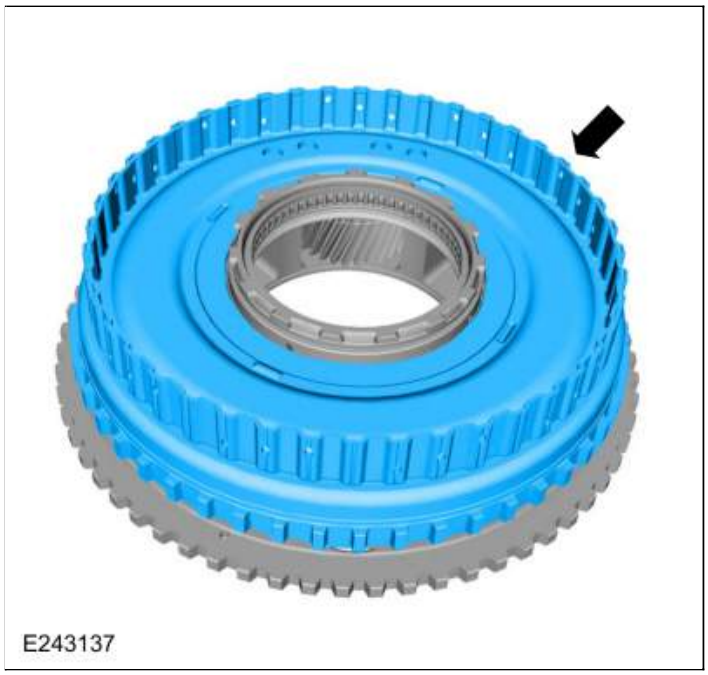


84. Rotate the No. 1 bearing support clockwise and remove the bearing support.

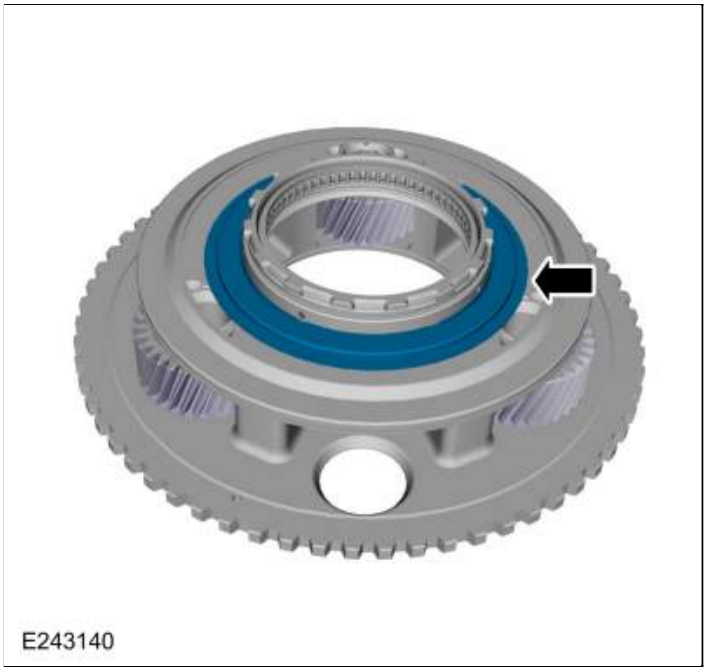
85. Remove the No. 1 ring gear bearing.



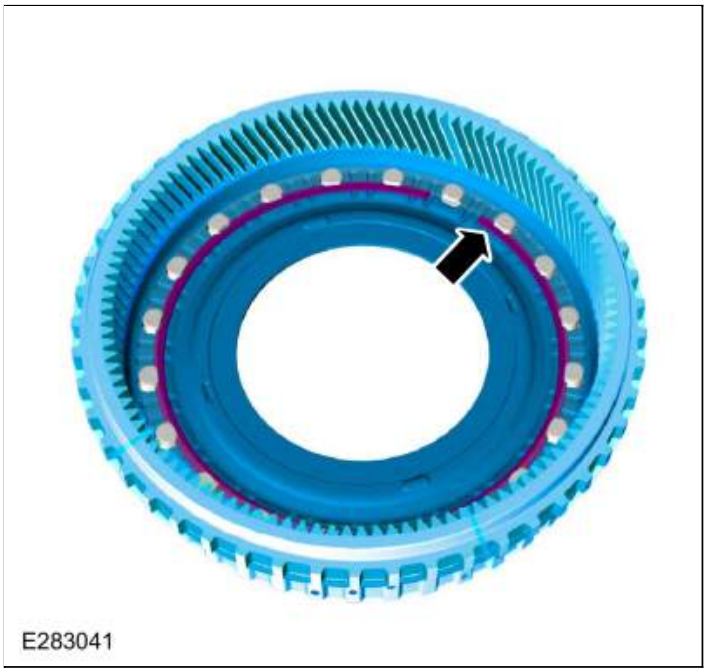
86. Remove the No. 1 ring gear.



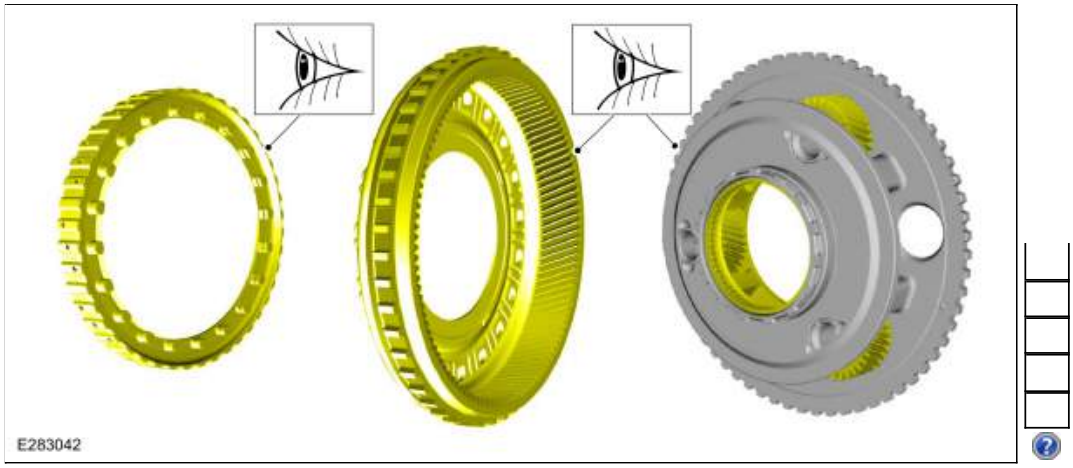
87. Remove the ring gear No 1 bearing.



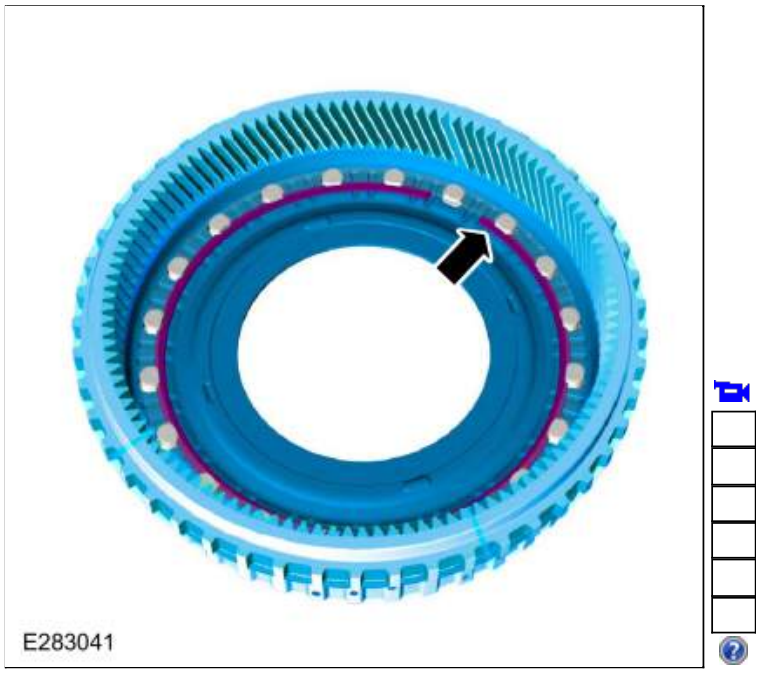
88. Remove the ring gear No 1 snap ring.



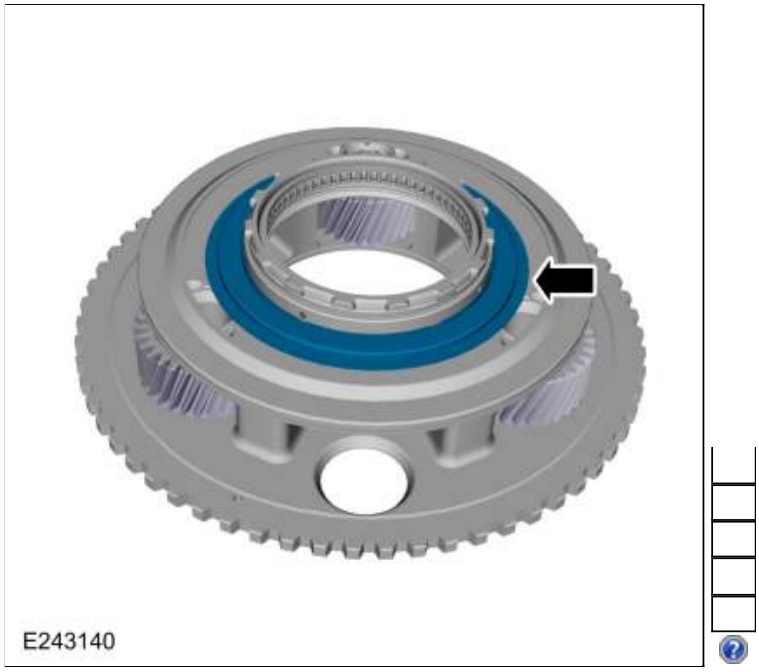
89. Inspect the A clutch hub, No. 1 ring gear and the No. 1 planetary carrier.



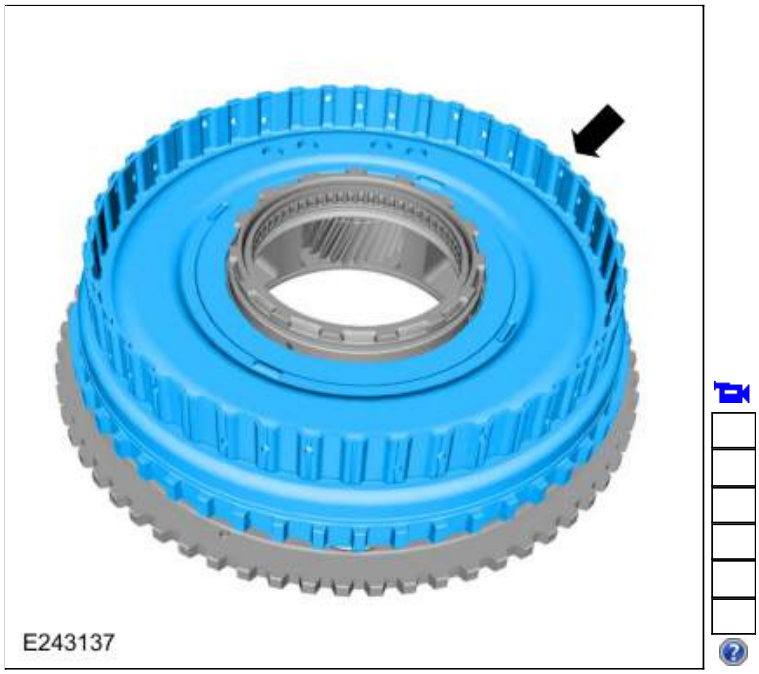
90. Install the ring gear No 1 snap ring.



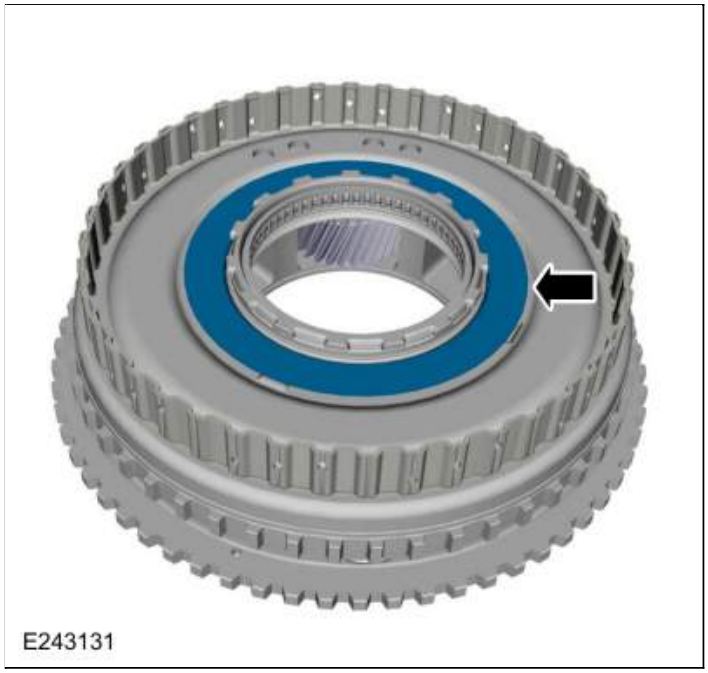
91. Install the ring gear No. 1 bearing.



92. Install the No. 1 ring gear.

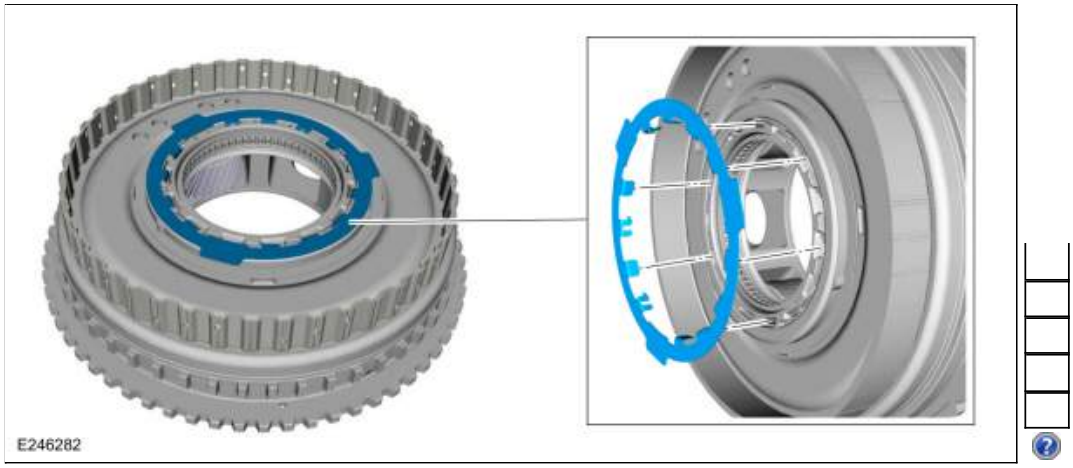


93. Install the No. 1 ring gear bearing.

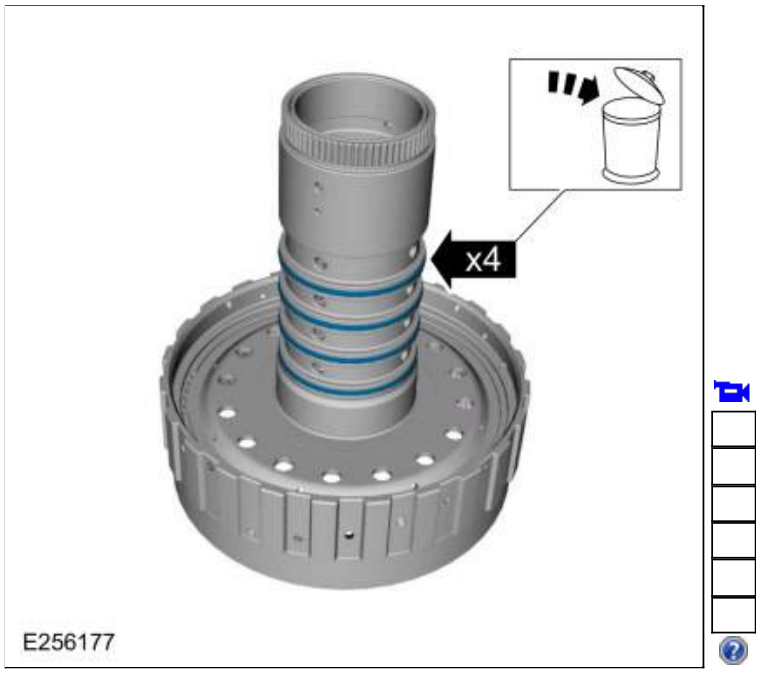


94. Install the ring gear No. 1 bearing support and rotate it counter clockwise to lock it.

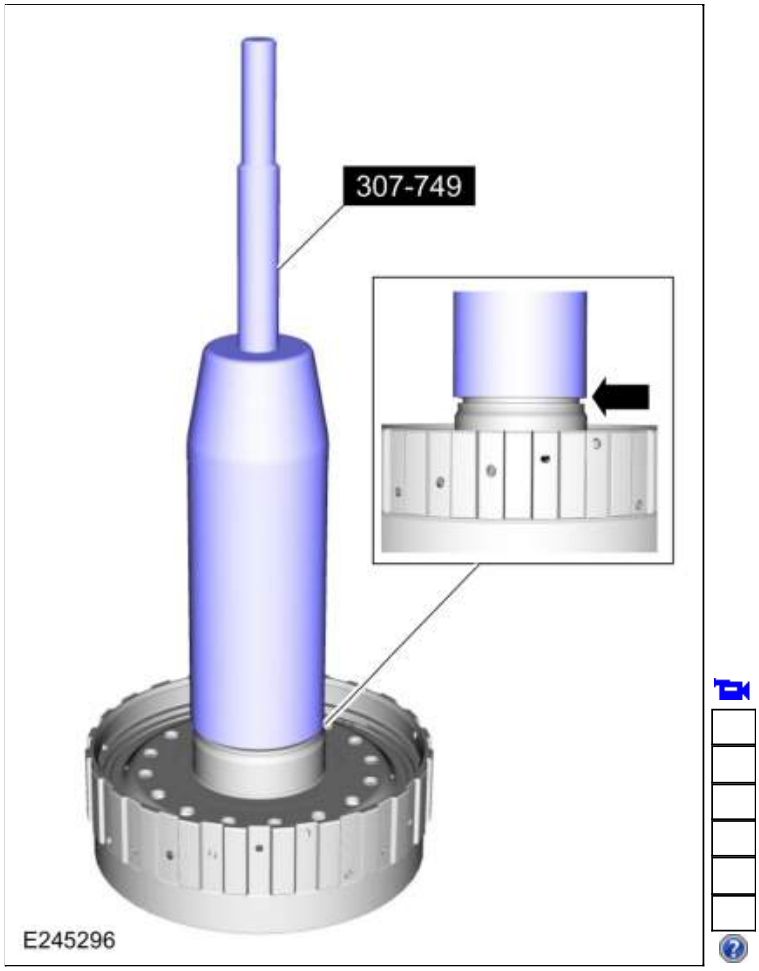
95. Align the tabs with the slots and install the No. 1 bearing support locking ring.



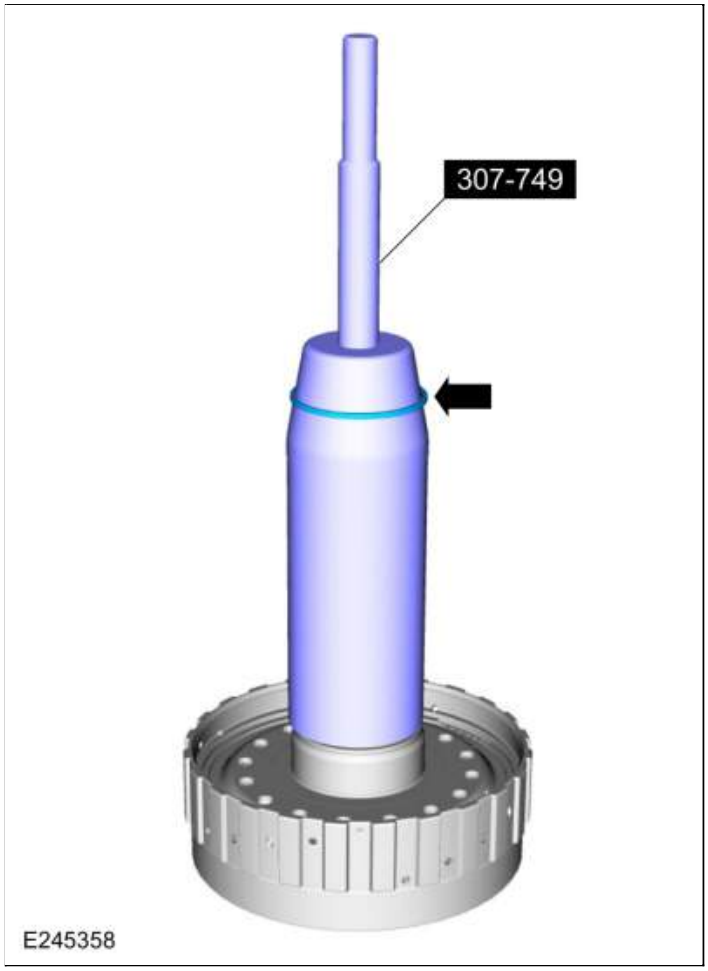
96. Remove and discard the sun gear No. 3 shaft Teflon® seals.



97. Install the special tool and adjust the special tool to align the bottom edge of the tool with the top edge of the bottom Teflon® seal groove.
Use Special Service Tool: 307-749 Installer/Sizer, R2-S3 Shaft Solid Seal.

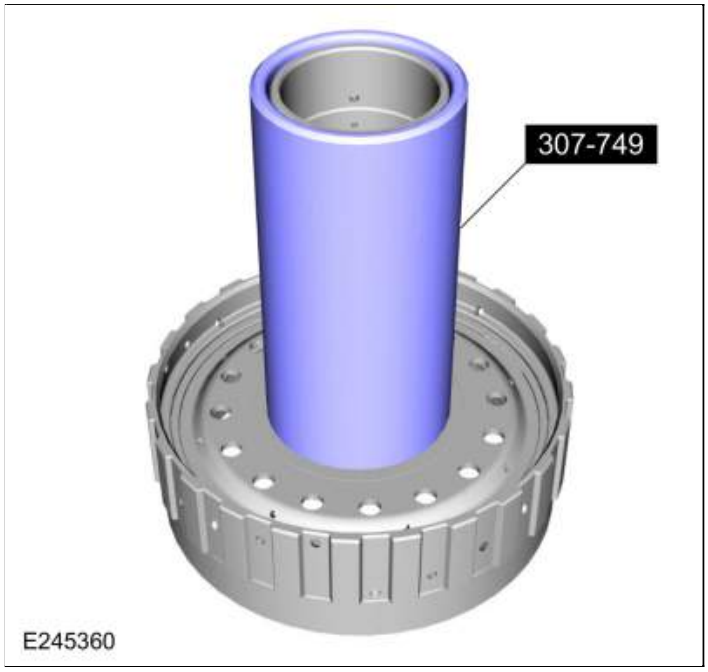


98. Install a new Teflon® seal on the special tool.
Use Special Service Tool: 307-749 Installer/Sizer, R2-S3 Shaft Solid Seal.

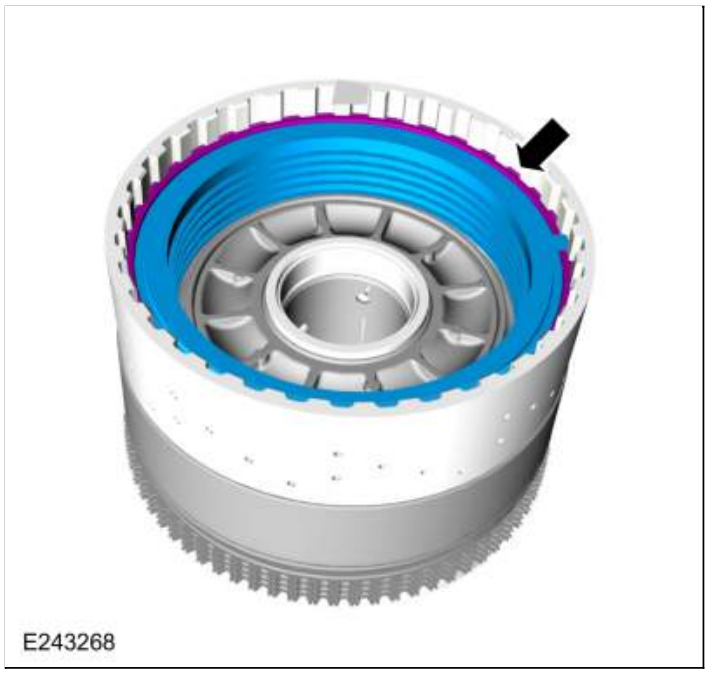


99. Using the top half of the special tool, slide the Teflon® seal into the groove. Remove the special tools and repeat the steps for the other 3 Teflon® seals.
Use Special Service Tool: 307-749 Installer/Sizer, R2-S3 Shaft Solid Seal.

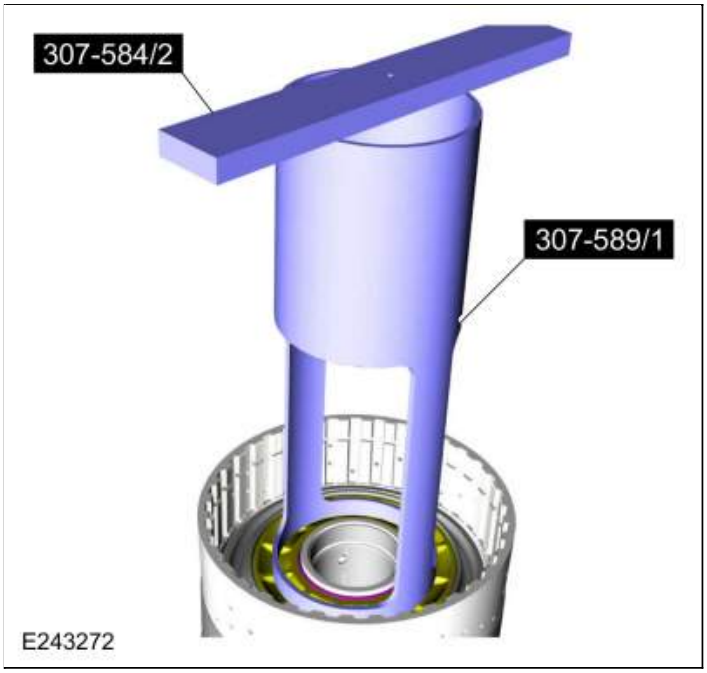
100. Install the special tool to size the 4 Teflon® seals. Allow the special tool to stay on the No 3 sun gear shaft for 5 minutes prior to final assembly.
Use Special Service Tool: 307-749 Installer/Sizer, R2-S3 Shaft Solid Seal.



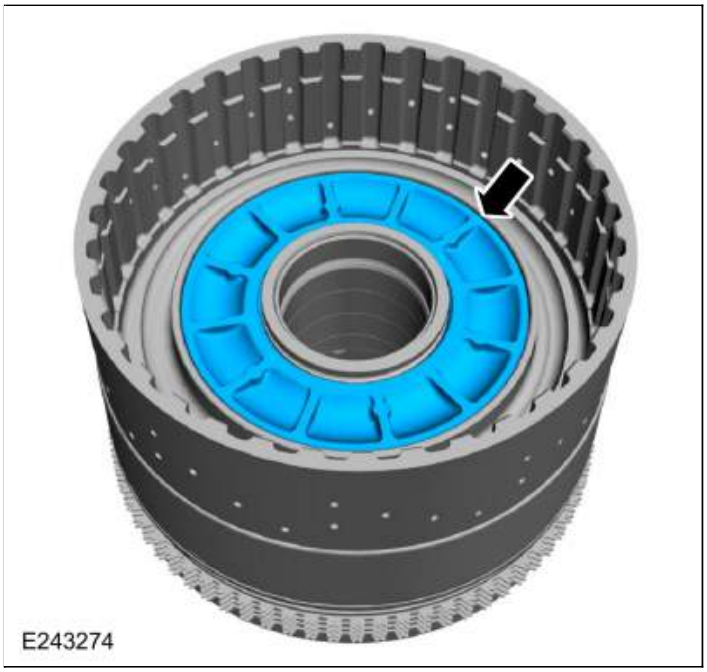
101. Remove the snap ring and the C clutch assembly. Inspect the clutch plates for excessive wear or damage. If the clutch plates are excessively worn or damaged replace as necessary. If the clutch plates are not excessively worn or damaged, they can be reused.



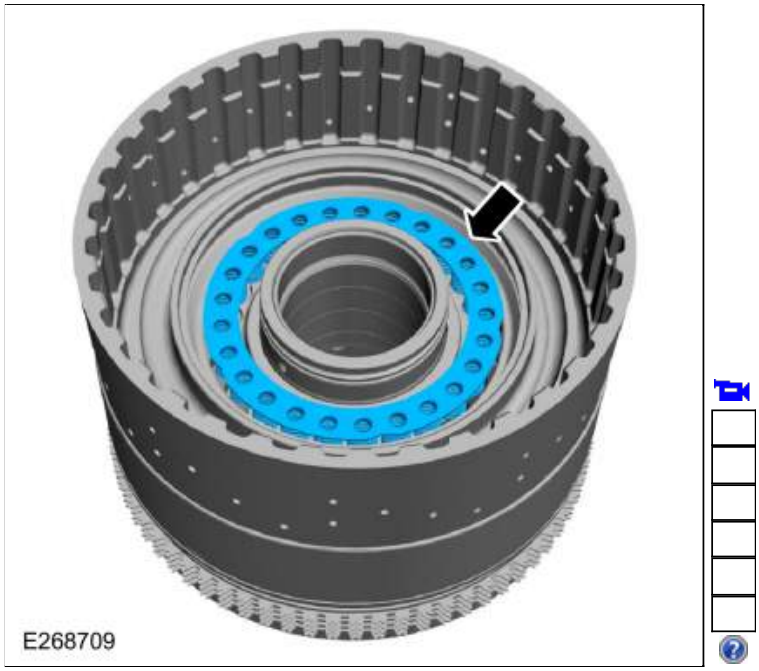
102. Using the special tools and a press, remove the C clutch balance dam retainer.
Use Special Service Tool: 307-584 2-6 Spring Compressor. , 307-589 Overdrive clutch and balance piston service set.
Use the General Equipment: Hydraulic Press



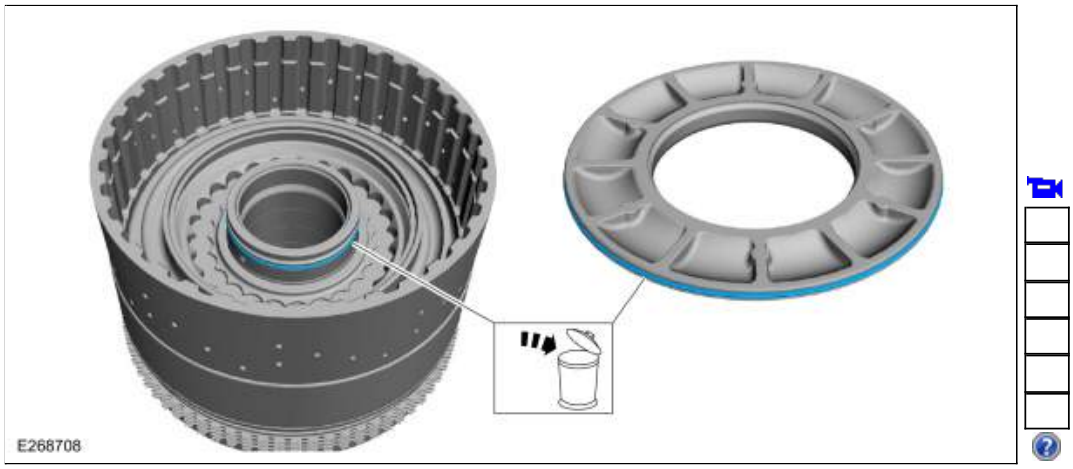
103. Remove the C clutch balance dam.



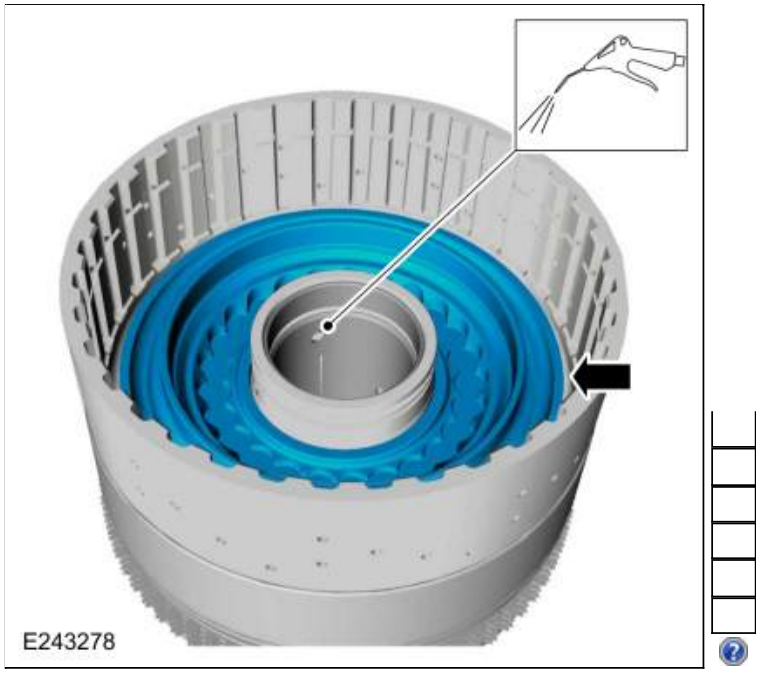
104. Remove the C clutch piston return spring.



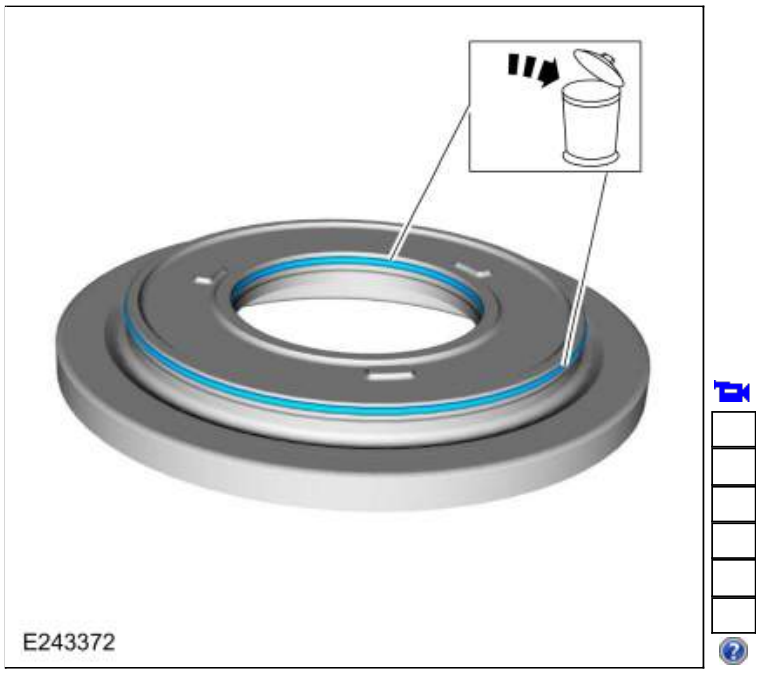
105. Remove and discard the C clutch balance dam inner and outer seals.



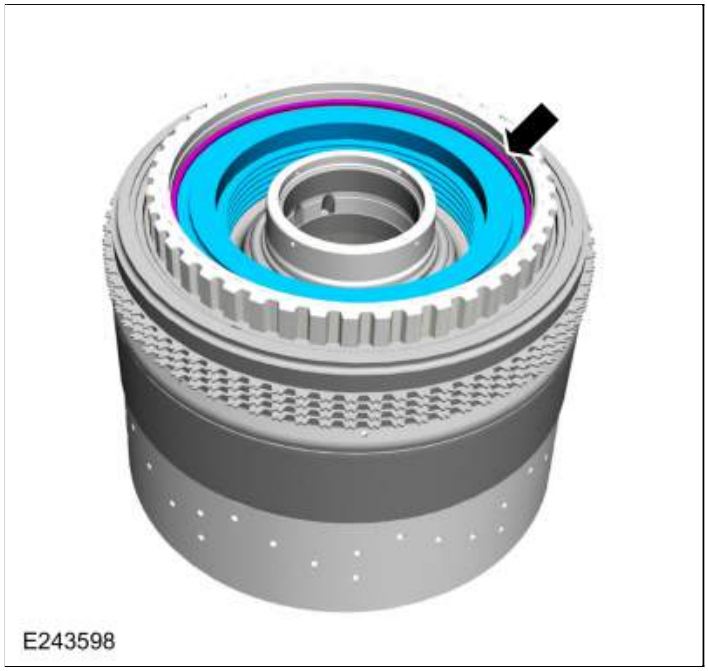
106. Remove the C clutch piston. Use compressed air into one oil passage hole while plugging the hole on the opposite side.



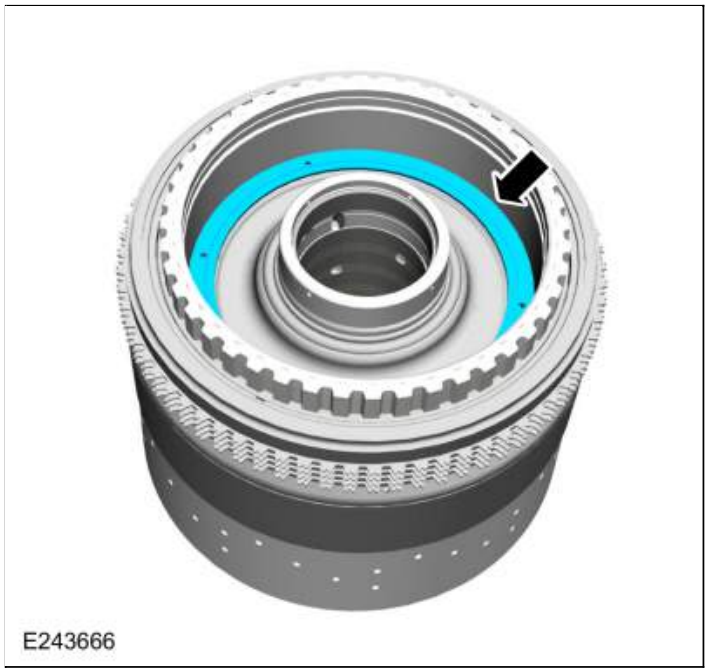
107. Remove and discard the C clutch piston inner and outer seals.



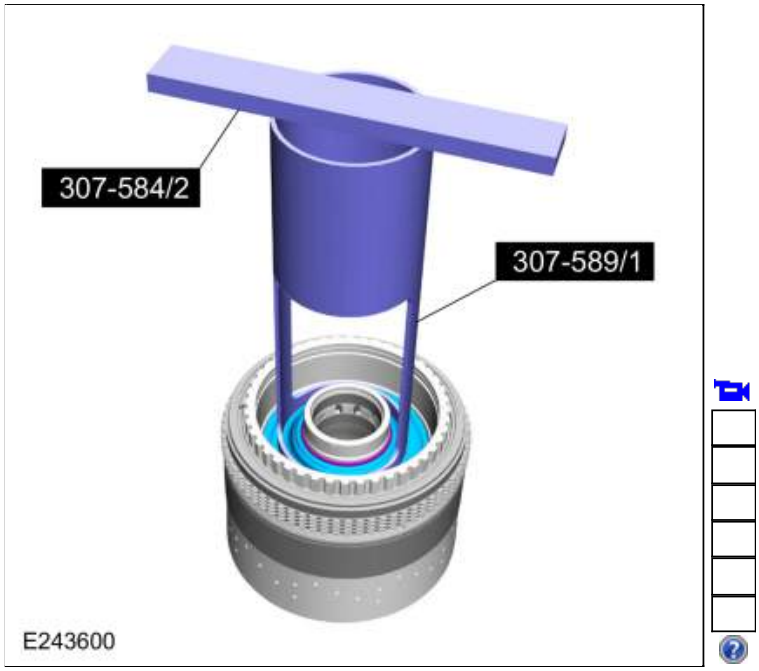
108. Remove the snap ring and the D clutch assembly. Inspect the clutch plates for excessive wear or damage. If the clutch plates are excessively worn or damaged replace as necessary. If the clutch plates are not excessively worn or damaged, they can be reused.



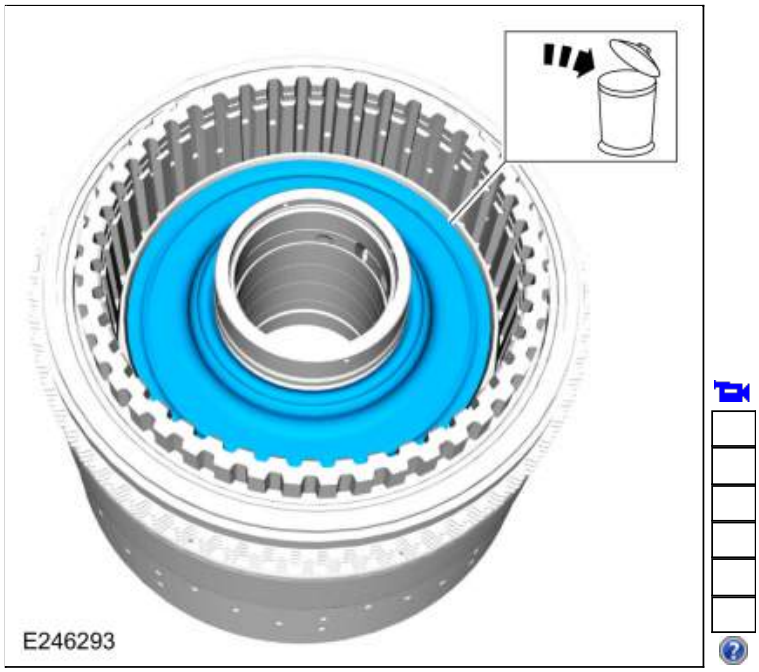
109. Remove the D clutch apply ring.



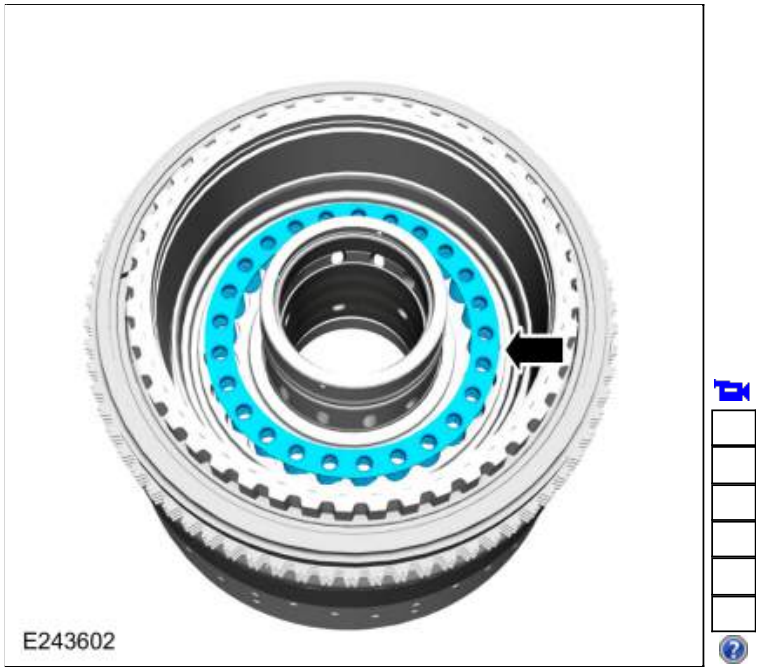
110. Using the special tools and a press, remove the D clutch balance dam retainer.
Use Special Service Tool: 307-584 2-6 Spring Compressor. , 307-589 Overdrive clutch and balance piston service set.
Use the General Equipment: Hydraulic Press



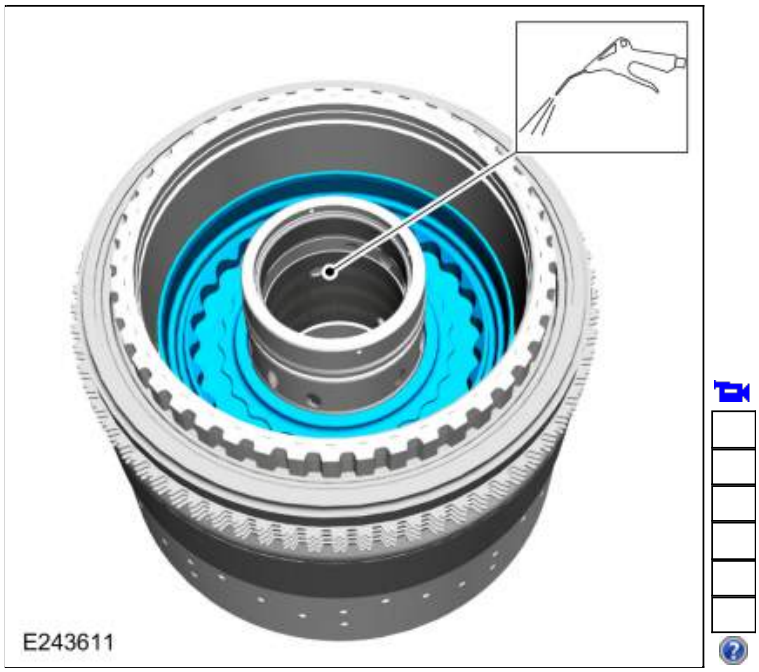
111. Remove and discard the balance dam.



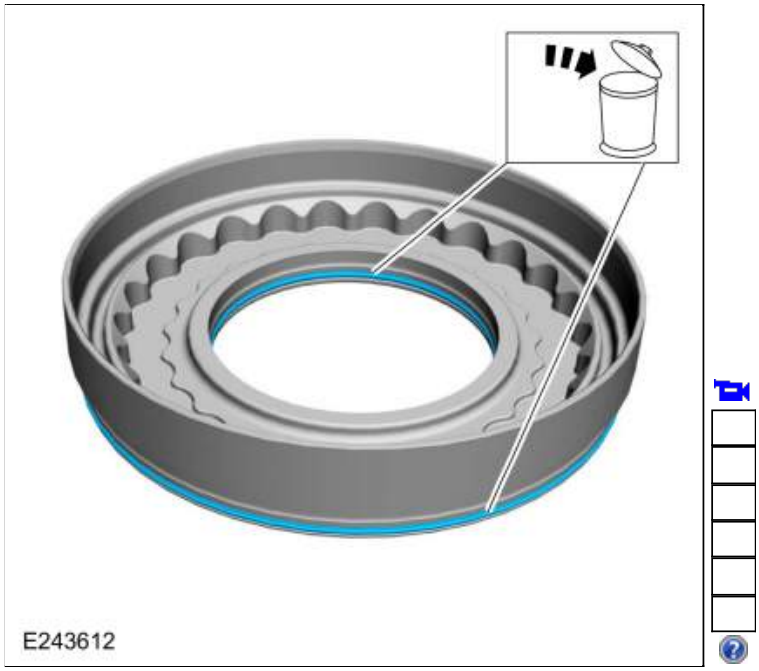
112. Remove the D clutch piston return spring.



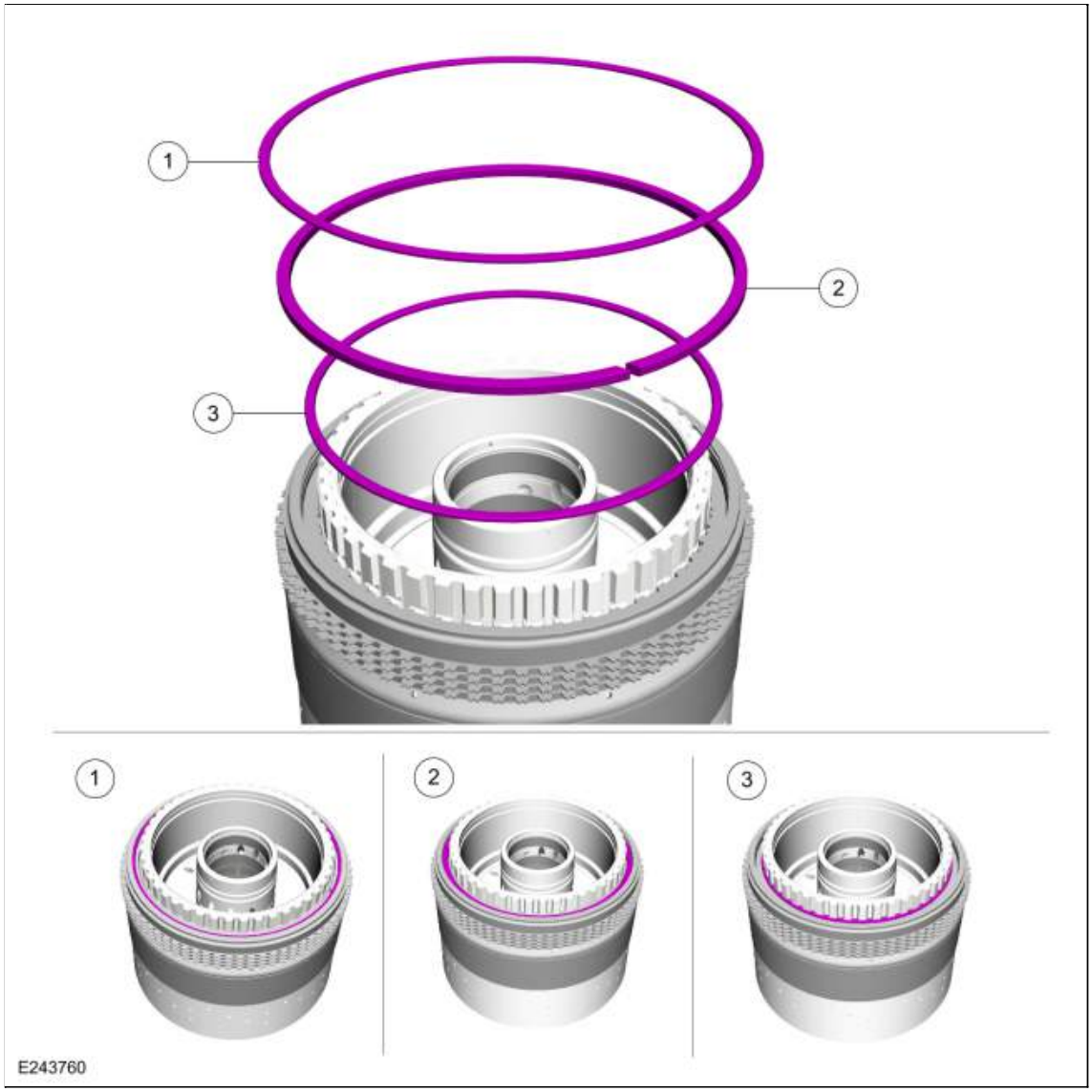
113. Remove the D clutch piston. Use compressed air into one oil passage hole while plugging the hole on the opposite side.



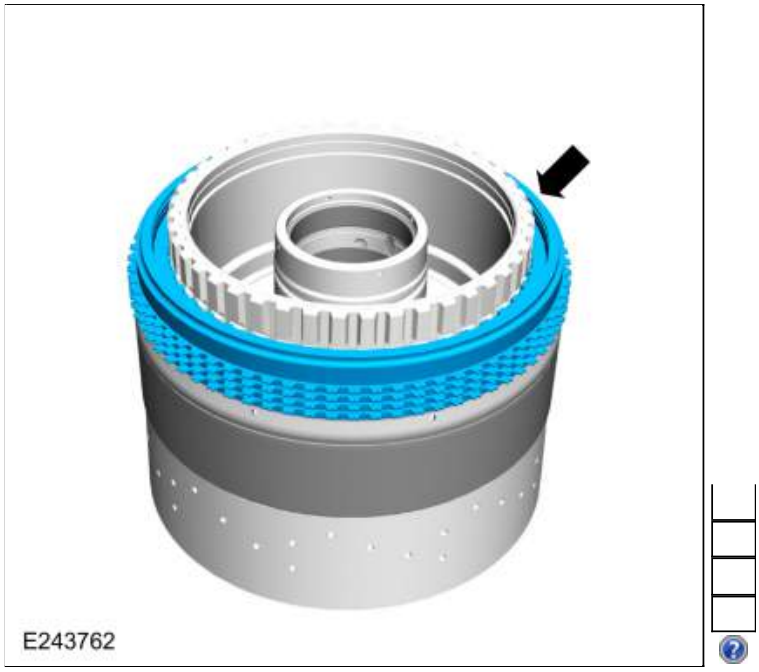
114. Remove and discard the D clutch piston inner and outer seals.



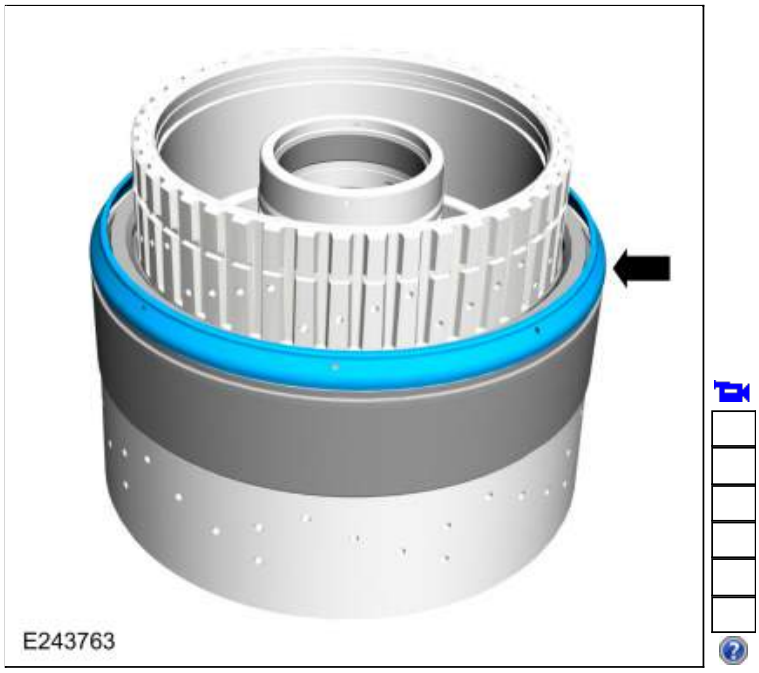
115. Remove the F clutch keeper snap ring, F clutch snap ring keeper and the F clutch snap ring.
    1. F clutch keeper snap ring
    2. F clutch snap ring keeper
    3. F clutch snap ring



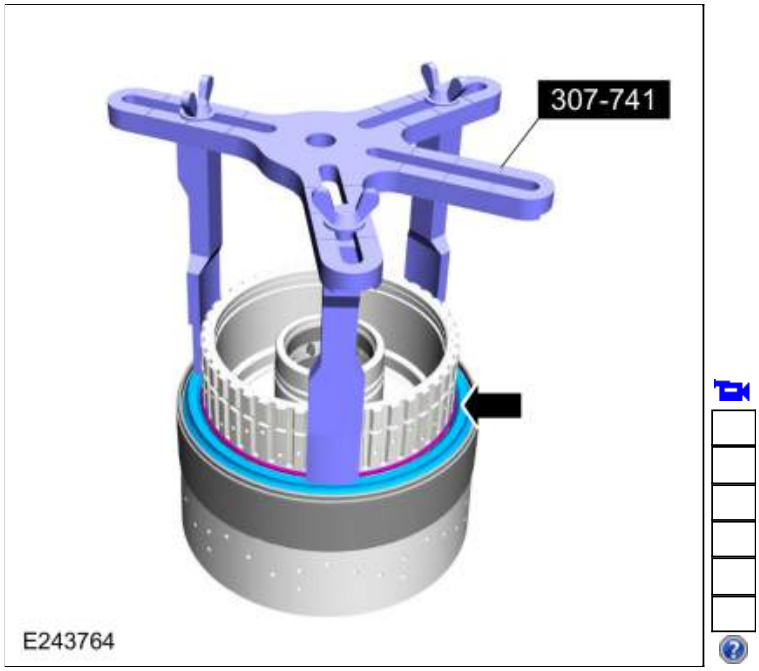
116. Remove the F clutch assembly. Inspect the clutch plates for excessive wear or damage. If the clutch plates are excessively worn or damaged replace as necessary. If the clutch plates are not excessively worn or damaged, they can be reused.



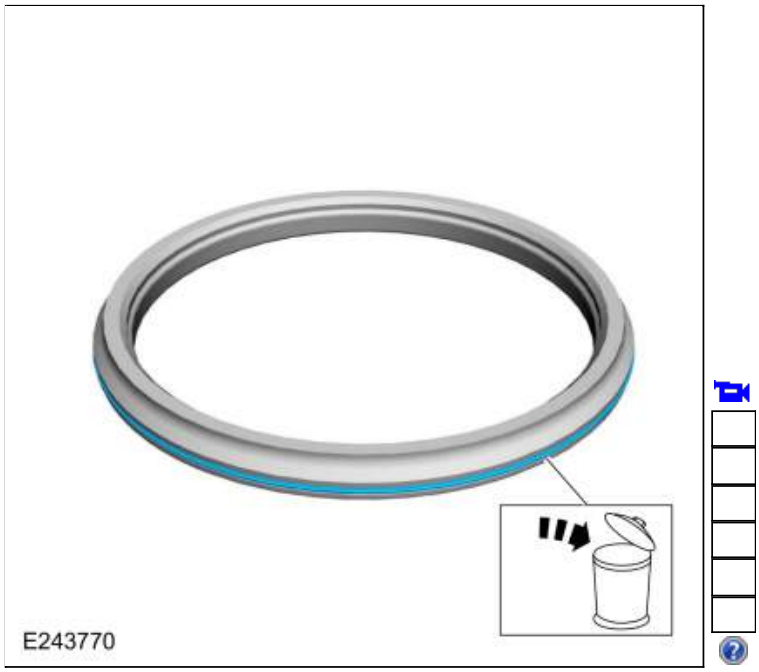
117. Remove the F clutch apply ring.



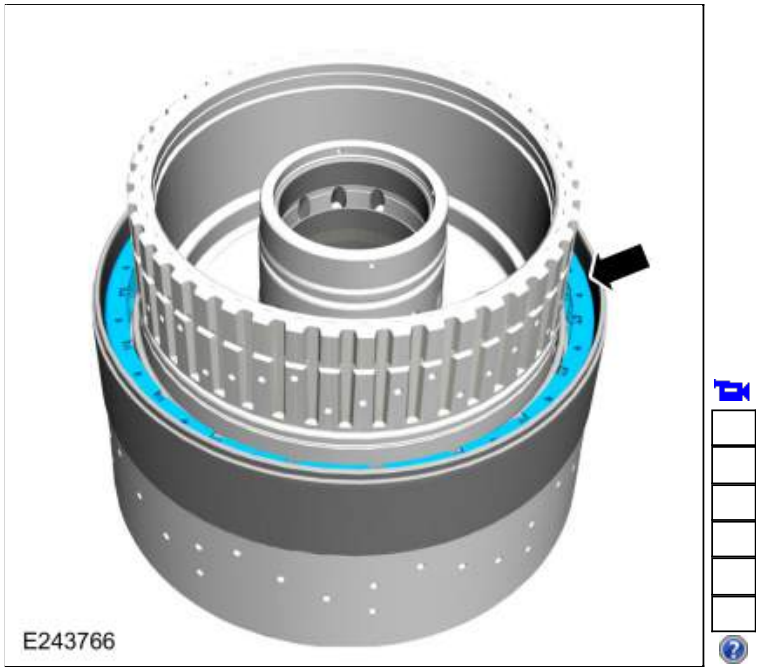
118. Using the special tools and a press, compress the F clutch balance dam and remove the retainer. Remove the F clutch balance dam.
Use Special Service Tool: 307-741 Spring Compressor, F Clutch.
Use the General Equipment: Hydraulic Press



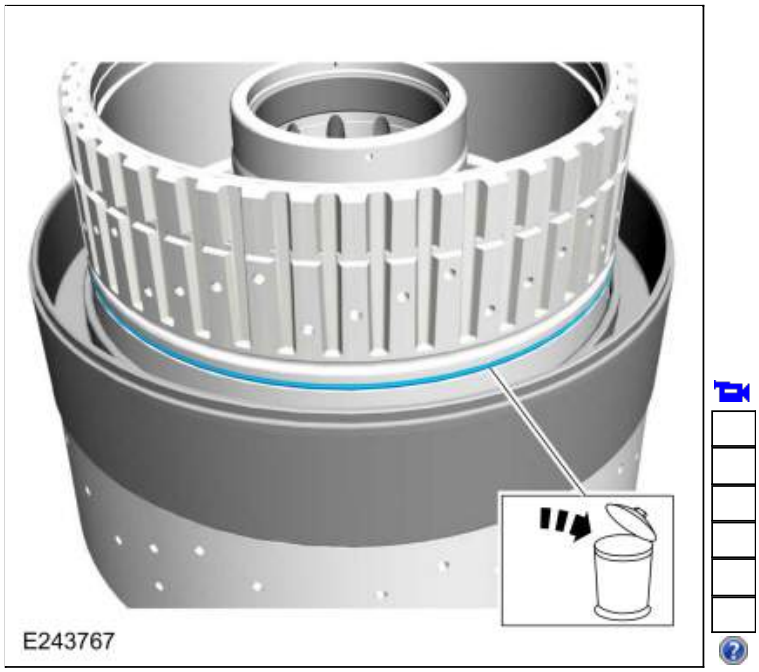
119. Remove and discard the F clutch balance dam outer seal.



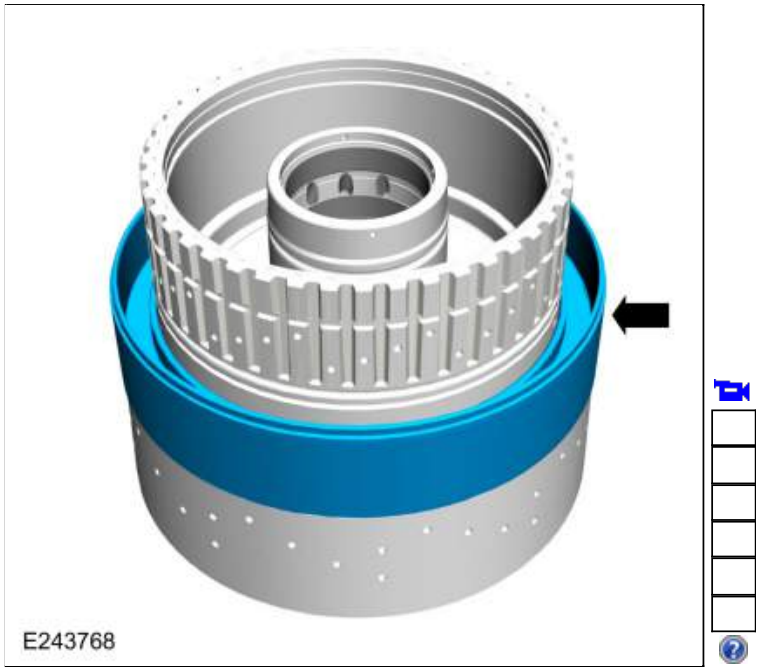
120. Remove the F clutch piston return spring.



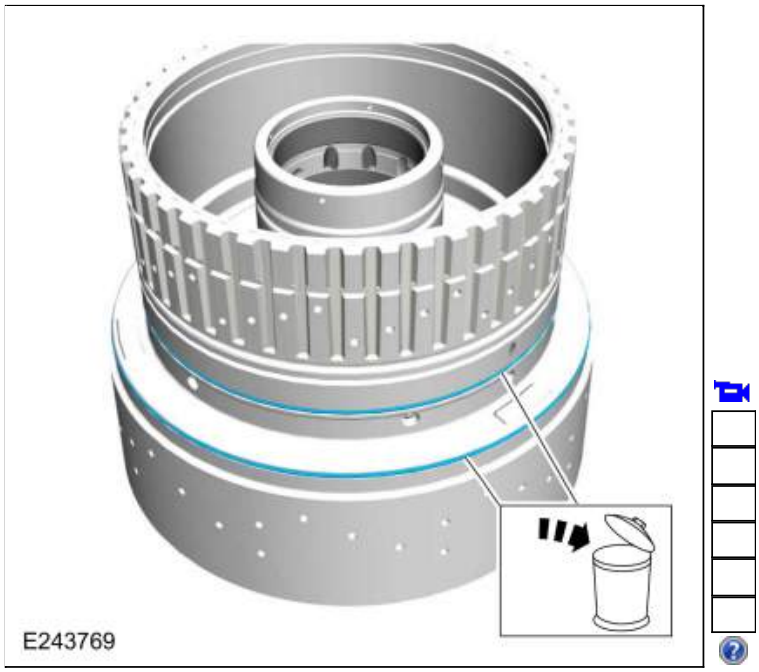
121. Remove and discard the F clutch balance dam inner seal.



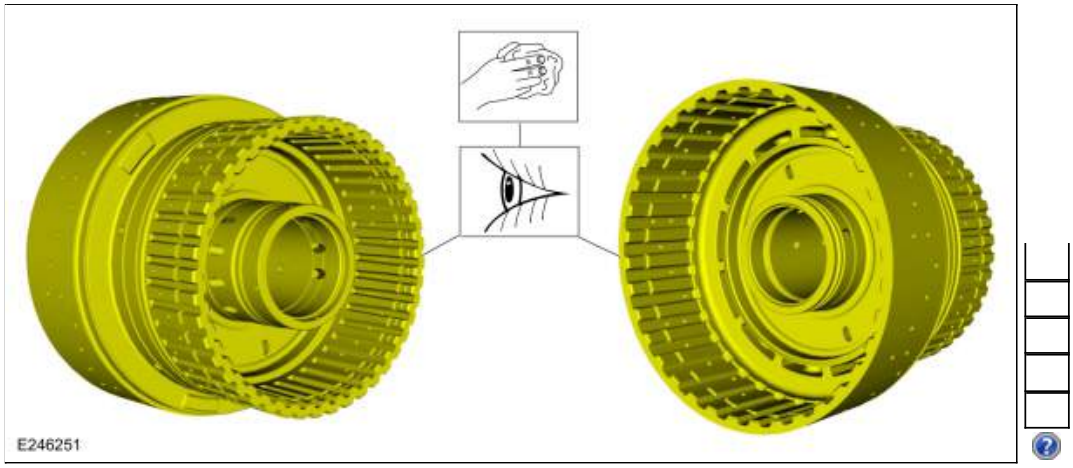
122. Remove the F clutch piston.



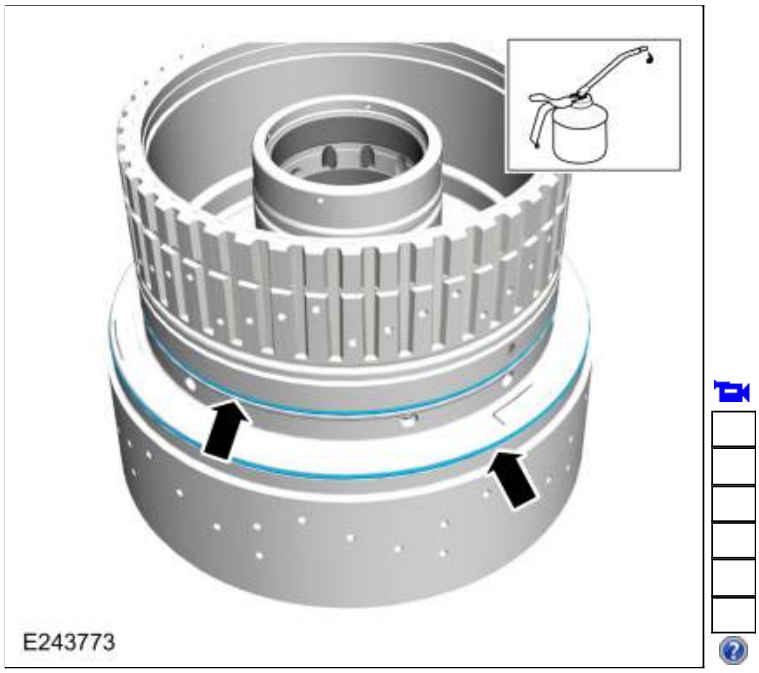
123. Remove and discard the F clutch piston seals.



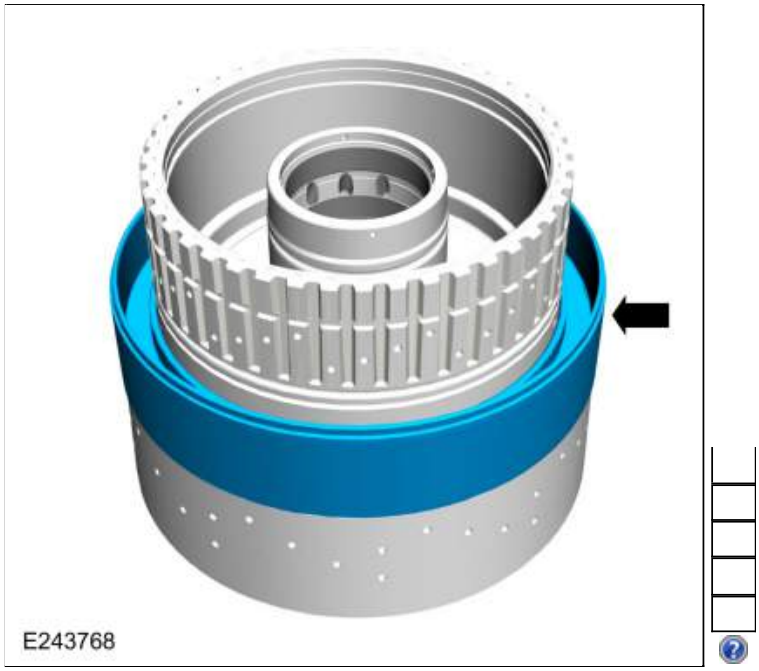
124. Clean and inspect the CDF clutch cylinder.



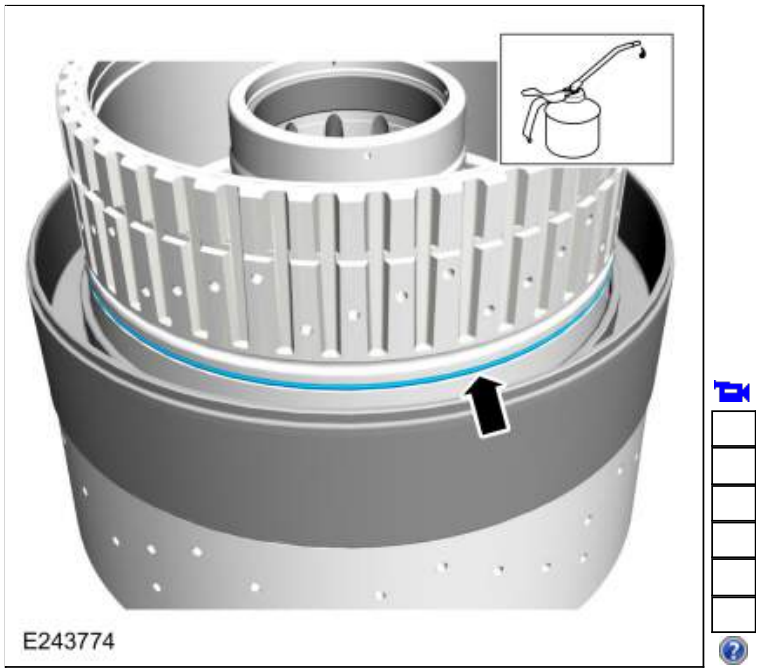
125. Install the new F clutch piston seals. Lubricate the seals with petroleum jelly.



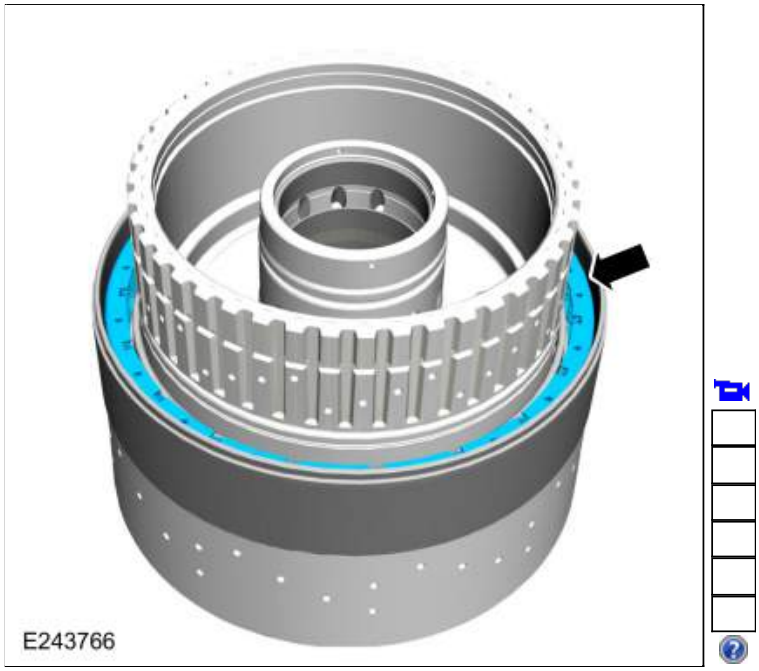
126. Install the F clutch piston.



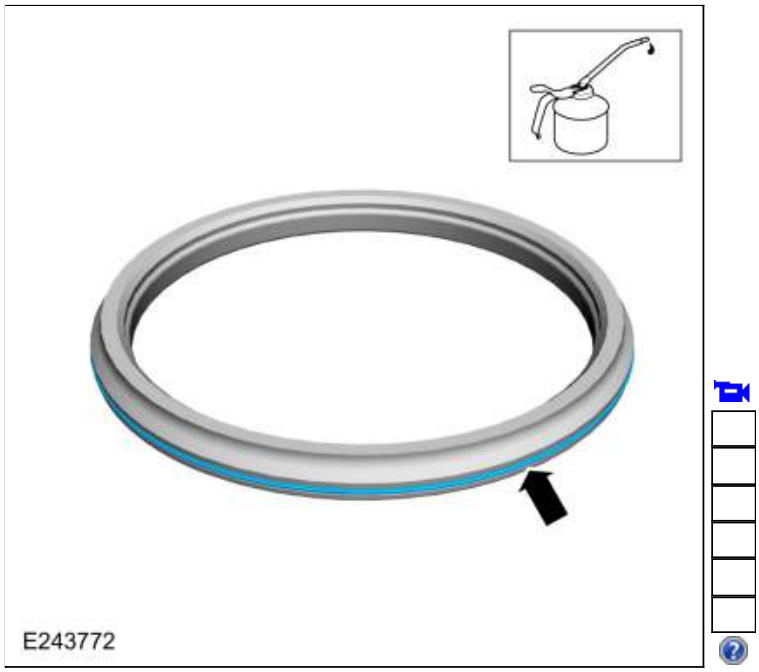
127. Install the new F clutch balance dam inner seal. Lubricate the seal with petroleum jelly.



128. Install the F clutch piston return spring.

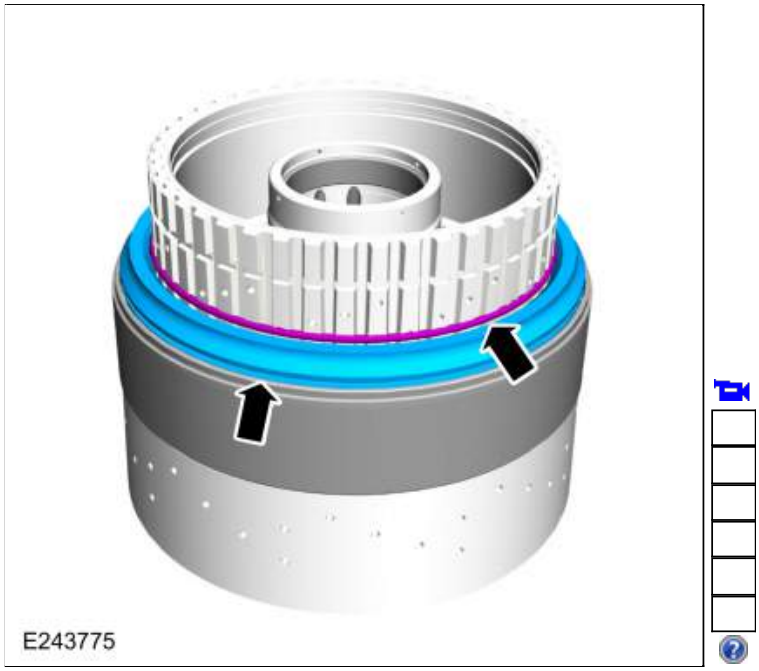


129. Install the new F clutch balance dam outer seal. Lubricate the seal with petroleum jelly.

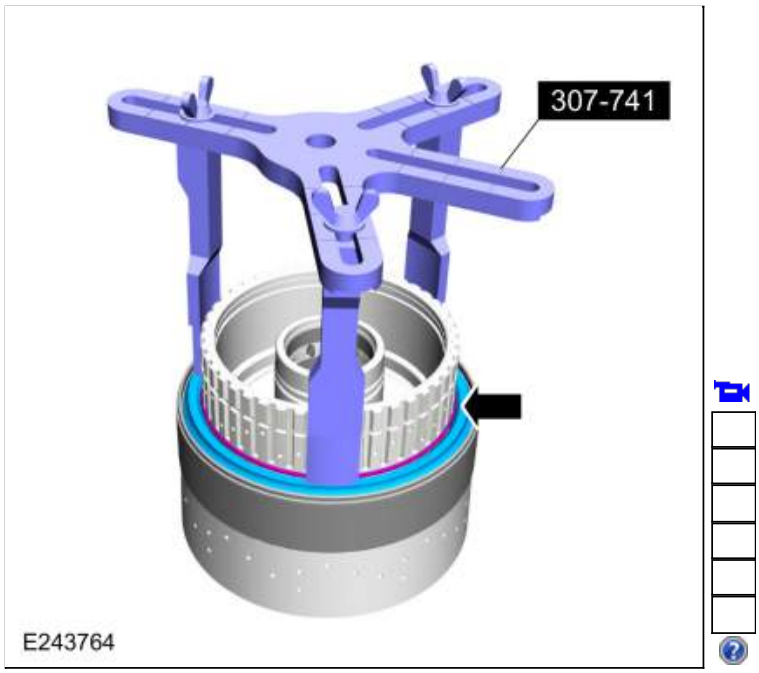


130. **NOTE:** *The F clutch balance dam retainer will not be in the groove at this time.*

Install the F clutch balance dam and retainer on the CDF clutch cylinder.

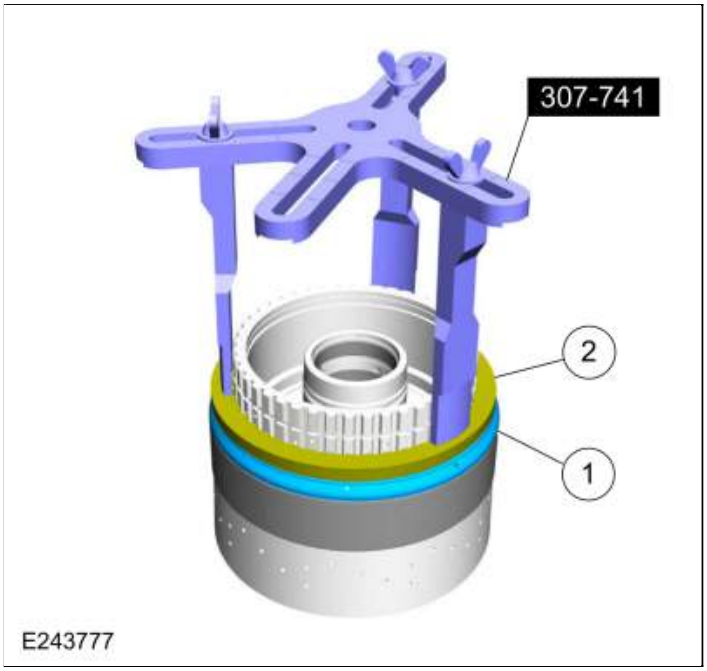


131. Using the special tools and a press, compress the F clutch balance dam and install the retainer into the groove.
Use Special Service Tool: 307-741 Spring Compressor, F Clutch.
Use the General Equipment: Hydraulic Press



132.

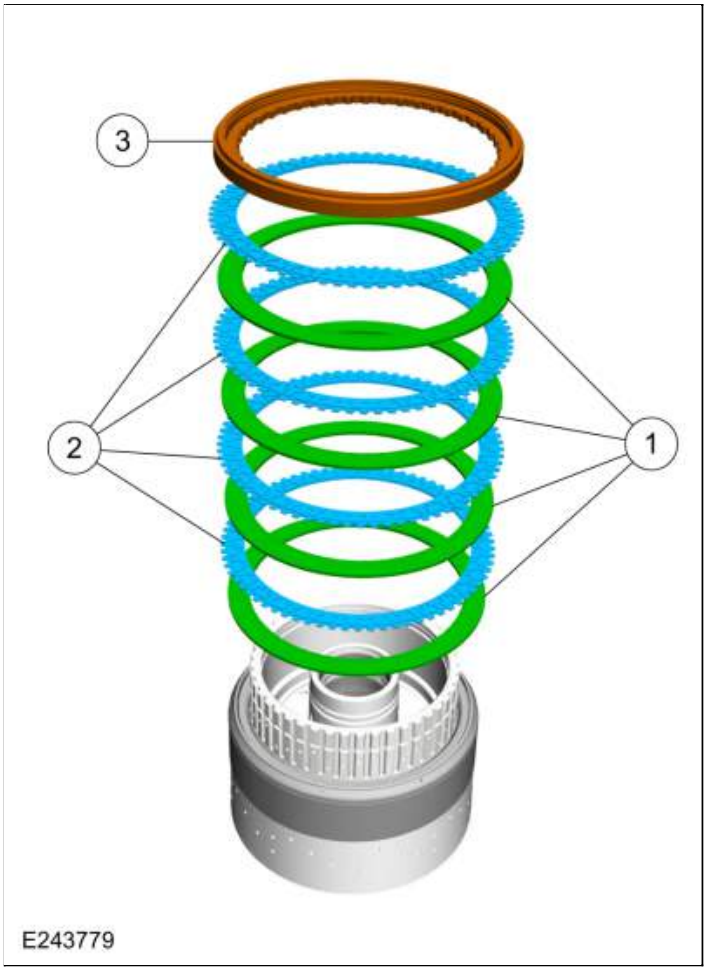
1. Position the F clutch apply ring onto the F clutch piston.
2. Position the F clutch pressure plate upside-down onto the apply ring. Using the special tools and a press, press the apply ring onto the F clutch piston.
Use Special Service Tool: 307-741 Spring Compressor, F Clutch.
Use the General Equipment: Hydraulic Press



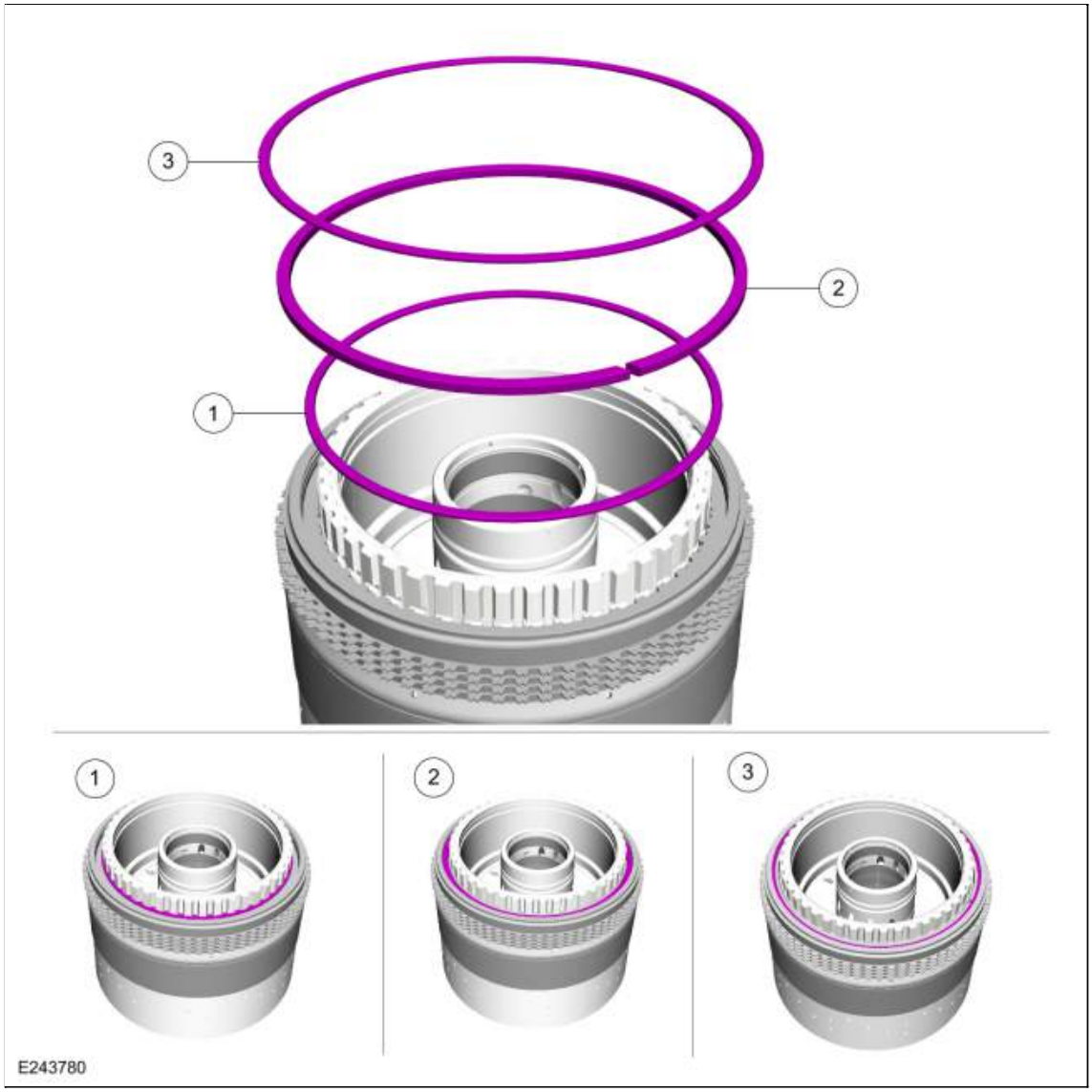
133. **NOTE:** *Clutch plate quantity is model dependant based on engine displacement.*

Soak the F clutch plates in clean transmission fluid. Install the F clutch assembly.

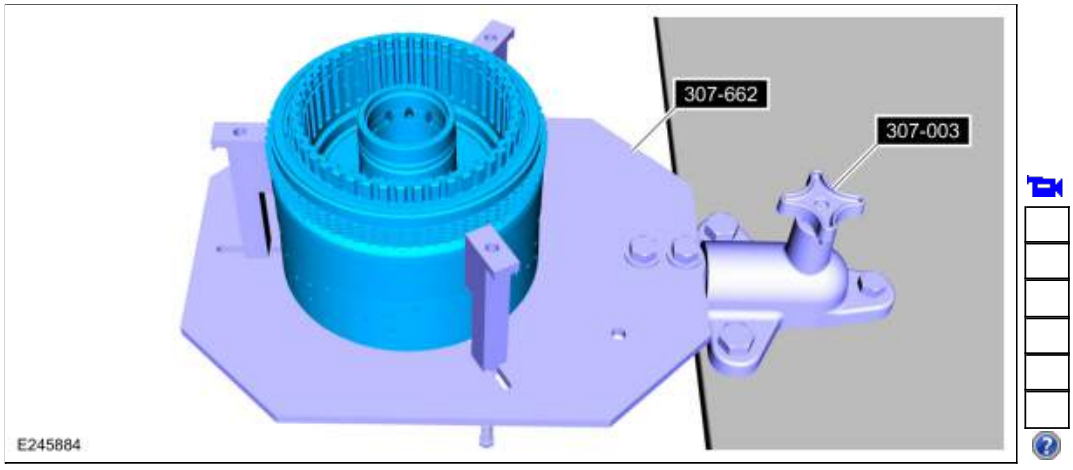
1. Steel plates
2. Friction plates
   Material: Motorcraft® MERCON® ULV Automatic Transmission Fluid / XT-12-QULV (WSS-M2C949-A) (MERCON® ULV)
3. Pressure plate



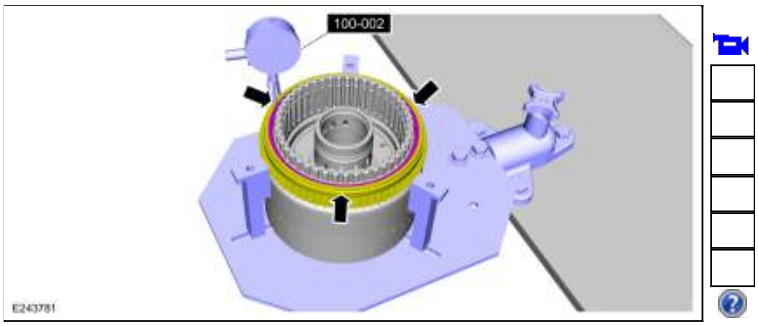
134. Install the F clutch snap ring, F clutch snap ring keeper and the F clutch keeper snap ring .
    1. F clutch snap ring
    2. F clutch snap ring keeper
    3. F clutch keeper snap ring



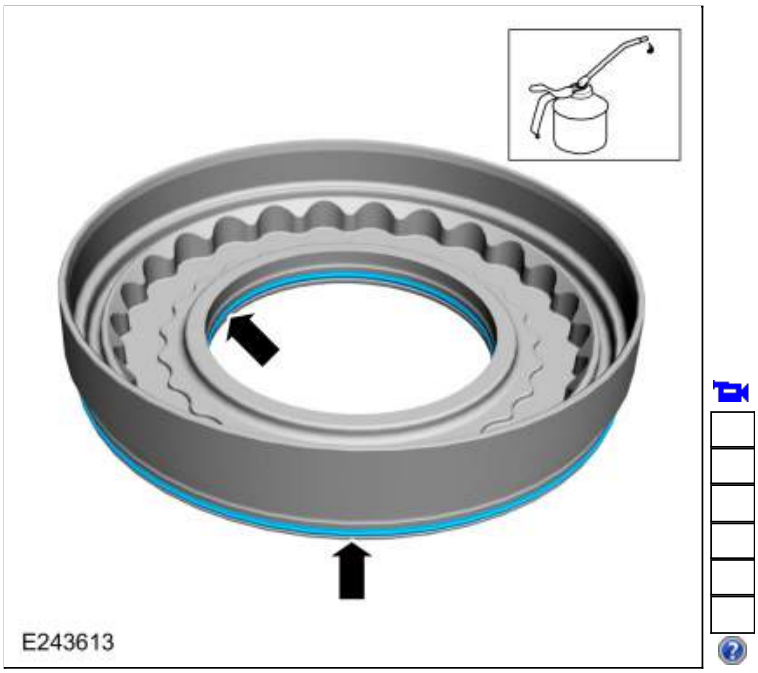
135. Assemble the special tools and position the CDF clutch cylinder with the F clutch facing up.
Use Special Service Tool: 307-662 Gauge, Clutch Pack Endplay. , 307-003 (T57L-500-B) Holding Fixture, Transmission.



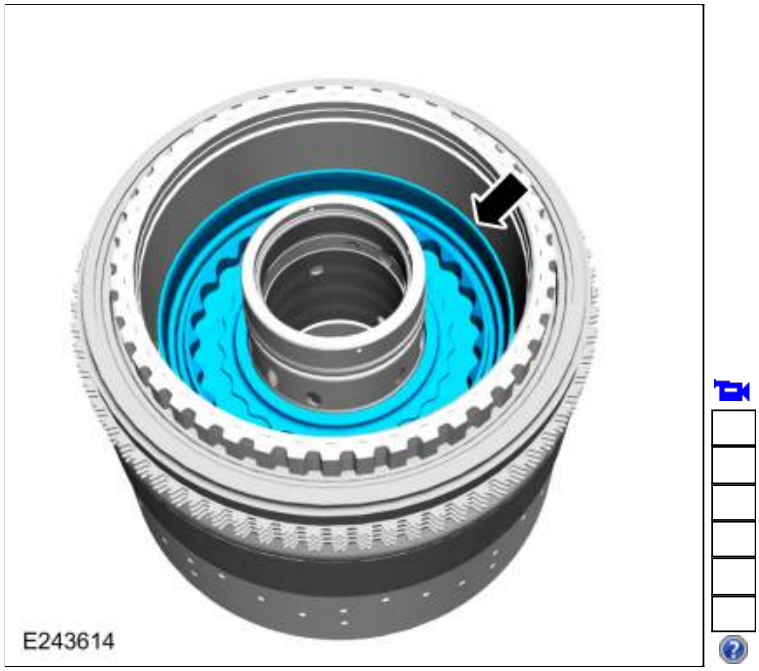
136. Using the special tool, measure the F clutch clearance. Position the plunger so it rests on the top surface of the pressure plate. Zero the dial indicator. Pull up on the pressure plate and measure and record the clutch clearance in 3 different places. Average the 3 recorded clutch clearance measurements and compare the measurement to the clutch clearance chart in specifications to determine the correct size snap ring. Install the correct F clutch snap ring.
Refer to: Specifications (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Specifications).
Use Special Service Tool: 100-002 (TOOL-4201-C) Holding Fixture with Dial Indicator Gauge.



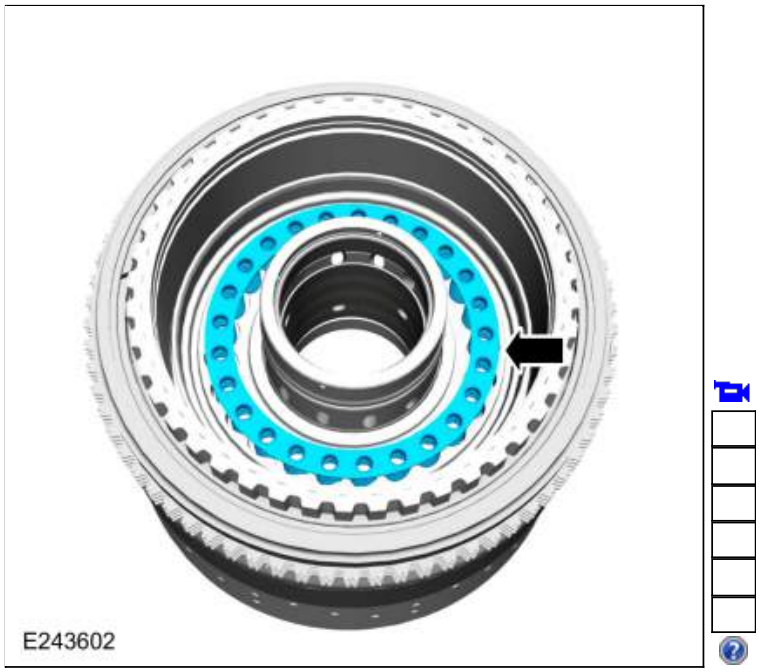
137. Install the new D clutch piston inner and outer seals. Lubricate the seals with petroleum jelly.



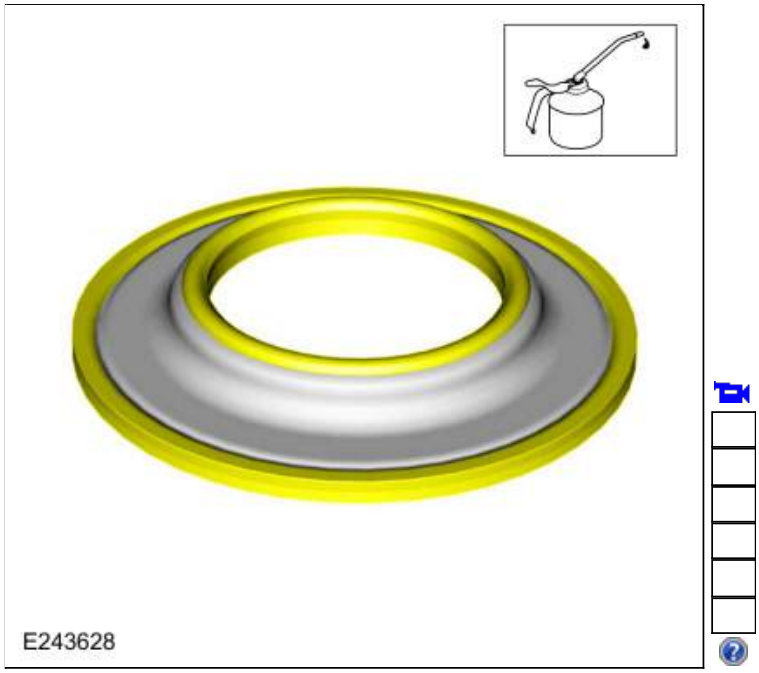
138. Install the D clutch piston.



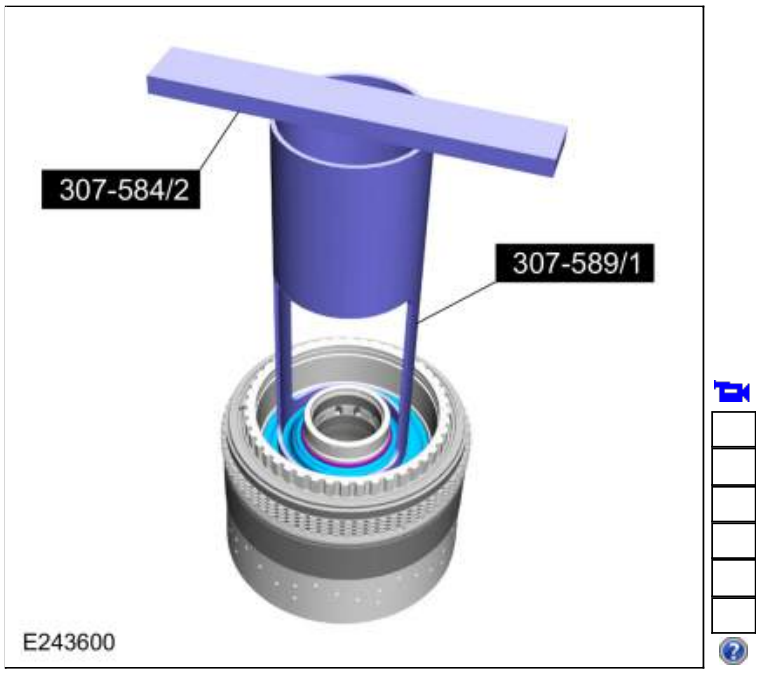
139. Install the D clutch piston return spring.



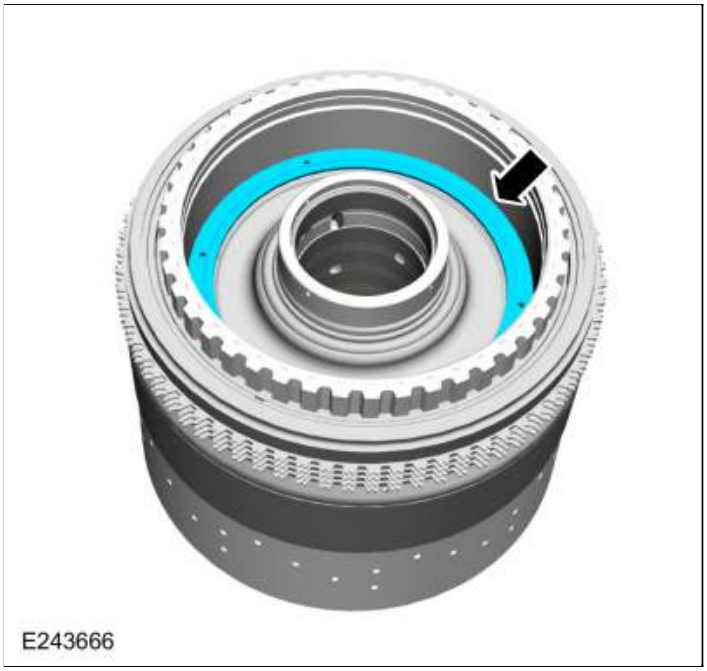
140. Lubricate the new D clutch balance dam seals with petroleum jelly.



141. Using the special tools and a press, Install the D clutch balance dam and install the retainer.
Use Special Service Tool: 307-584 2-6 Spring Compressor. , 307-589 Overdrive clutch and balance piston service set.
Use the General Equipment: Hydraulic Press



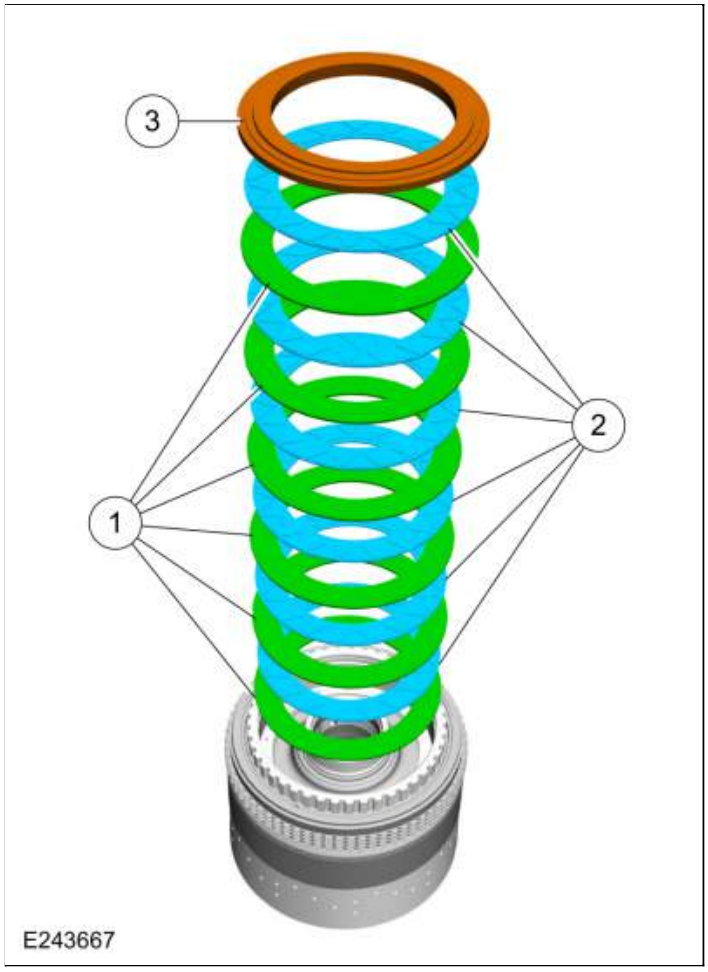
142. Install the D clutch apply ring.



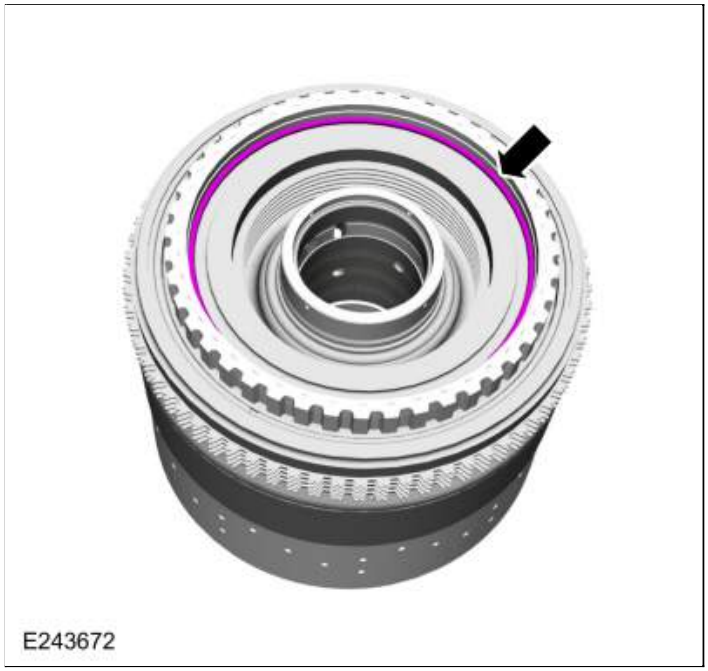
143. **NOTE:** *Clutch plate quantity is model dependant based on engine displacement.*

Soak the D clutch plates in clean transmission fluid. Install the D clutch assembly.

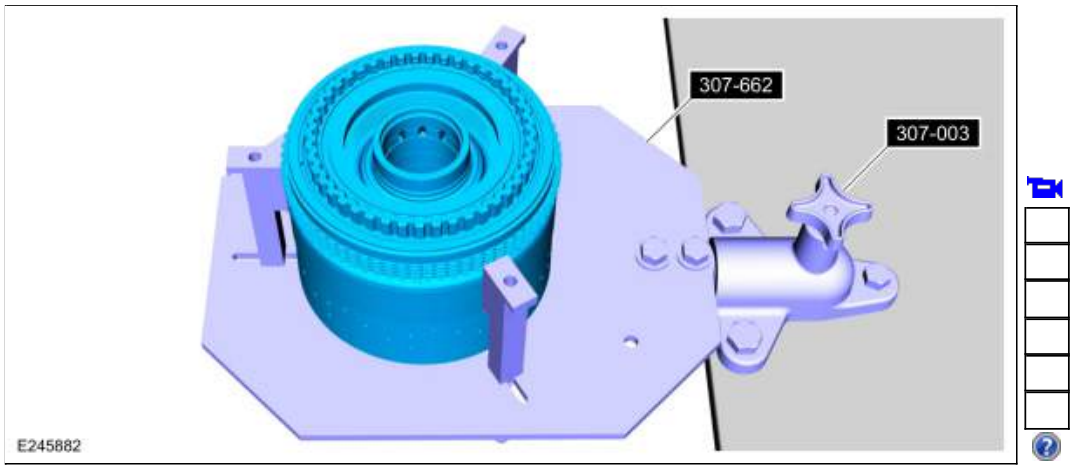
1. Steel plates
2. Friction plates
   Material: Motorcraft® MERCON® ULV Automatic Transmission Fluid / XT-12-QULV (WSS-M2C949-A) (MERCON® ULV)
3. Pressure plate



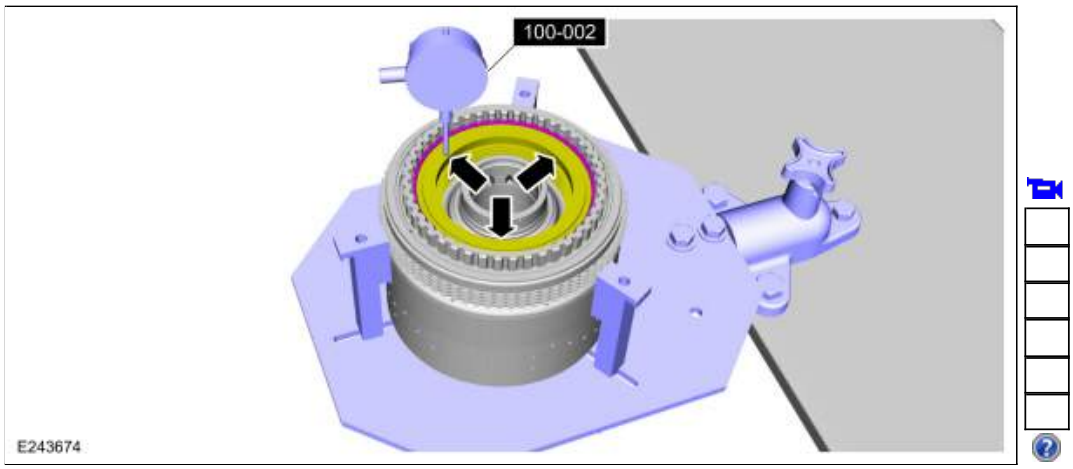
144. Install the D clutch snap ring.



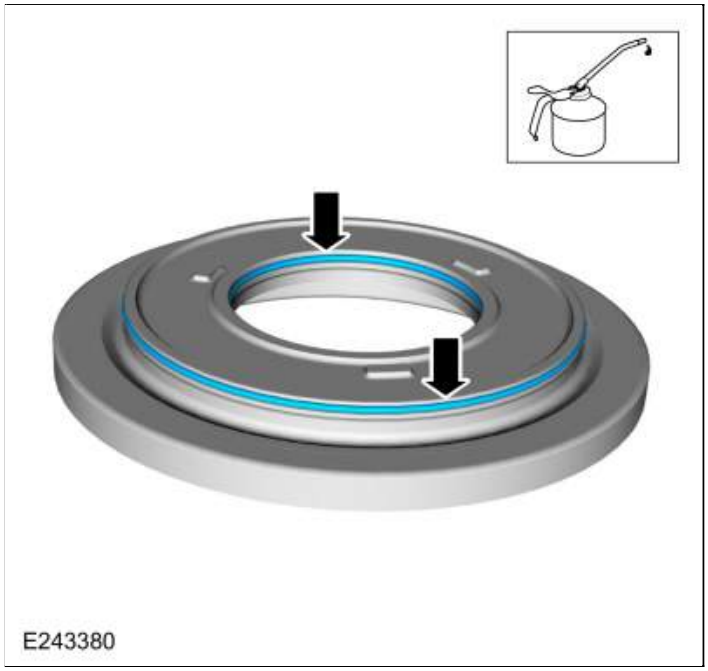
145. Assemble the special tools and position the CDF clutch cylinder with the D clutch facing up.
Use Special Service Tool: 307-662 Gauge, Clutch Pack Endplay. , 307-003 (T57L-500-B) Holding Fixture, Transmission.



146. Using the special tool, measure the D clutch clearance. Position the plunger so it rests on the top surface of the pressure plate. Zero the dial indicator. Pull up on the pressure plate and measure and record the clutch clearance in 3 different places. Average the 3 recorded clutch clearance measurements and compare the measurement to the clutch clearance chart in specifications to determine the correct size snap ring. Install the correct D clutch snap ring.
Refer to: Specifications (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Specifications).
Use Special Service Tool: 100-002 (TOOL-4201-C) Holding Fixture with Dial Indicator Gauge.

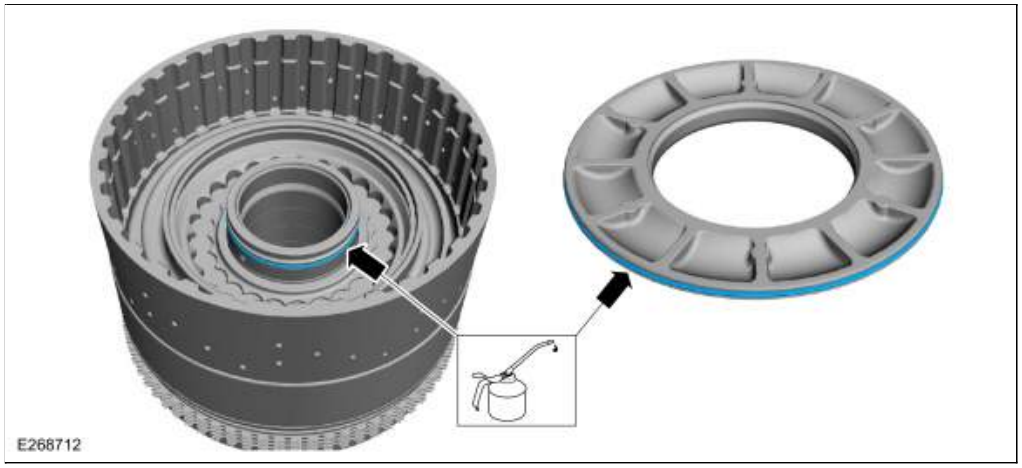


147. Install the new C clutch piston inner and outer seals. Lubricate the seals with petroleum jelly.

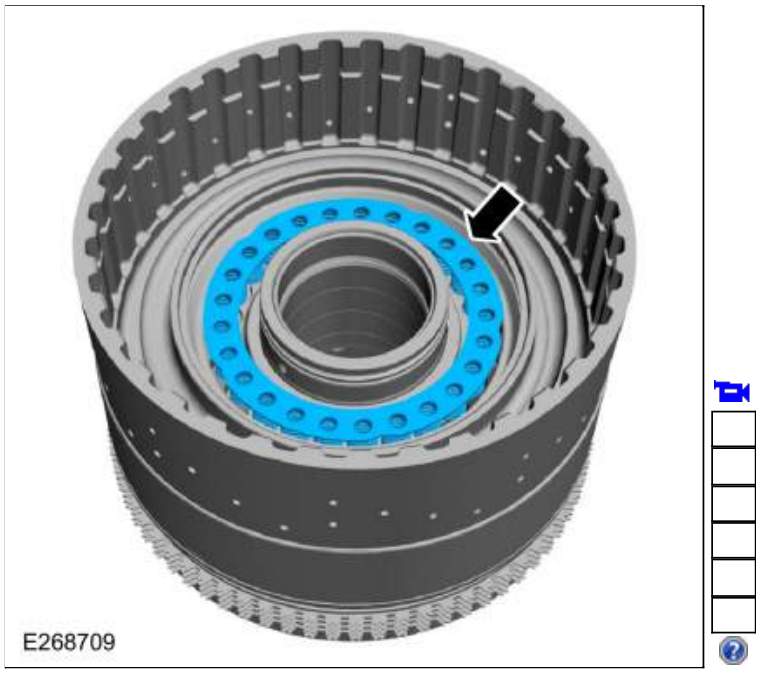


148. Install the C clutch piston.

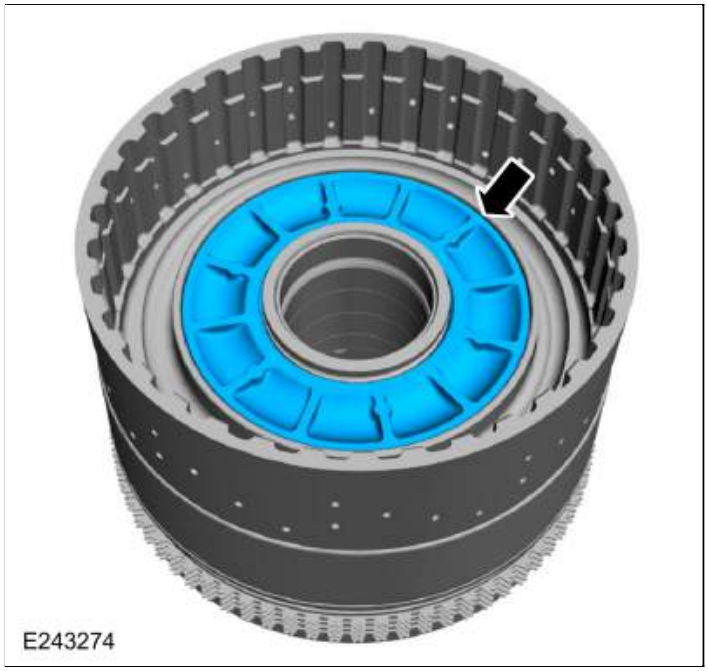
149. Install the new C clutch balance dam seals. Lubricate the seals with petroleum jelly.



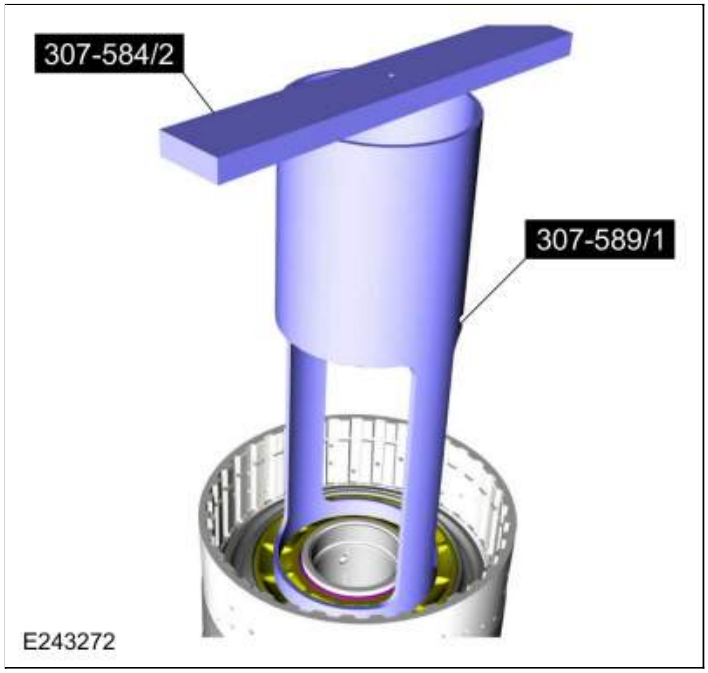
150. Install the C clutch piston return spring.



151. Install the C clutch balance dam.

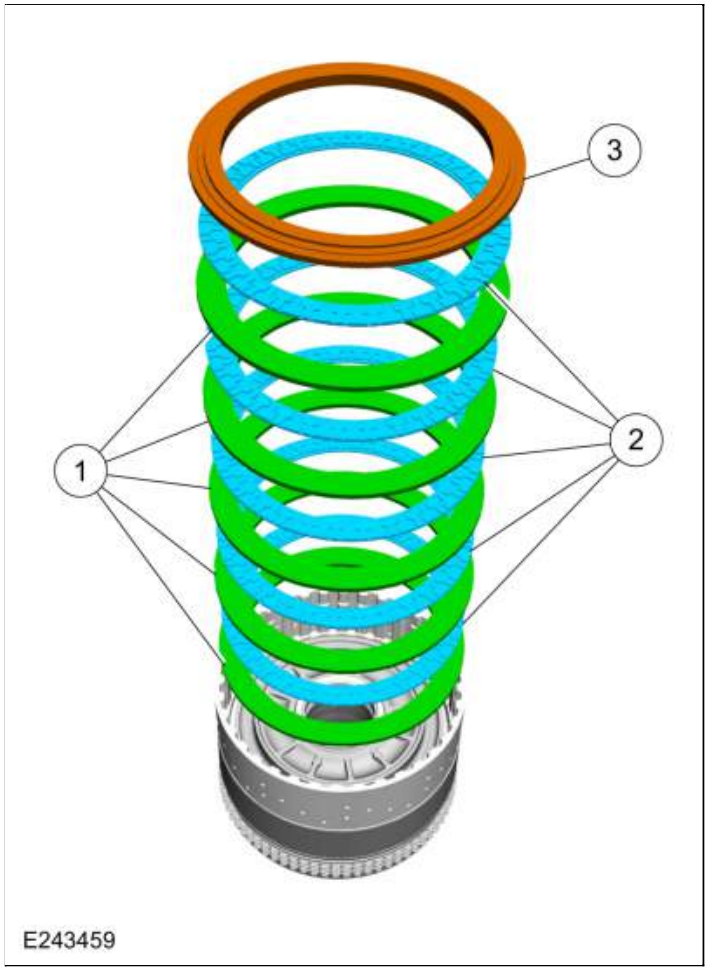


152. Using the special tools and a press, compress the C clutch balance dam and install the retainer.
Use Special Service Tool: 307-584 2-6 Spring Compressor. , 307-589 Overdrive clutch and balance piston service set.
Use the General Equipment: Hydraulic Press

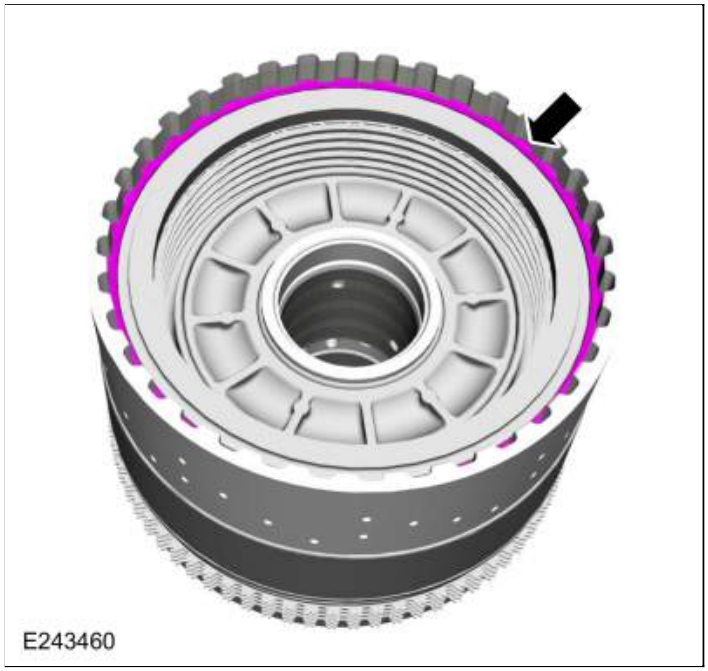


153. **NOTE:** *Clutch plate quantity is model dependant based on engine displacement.*

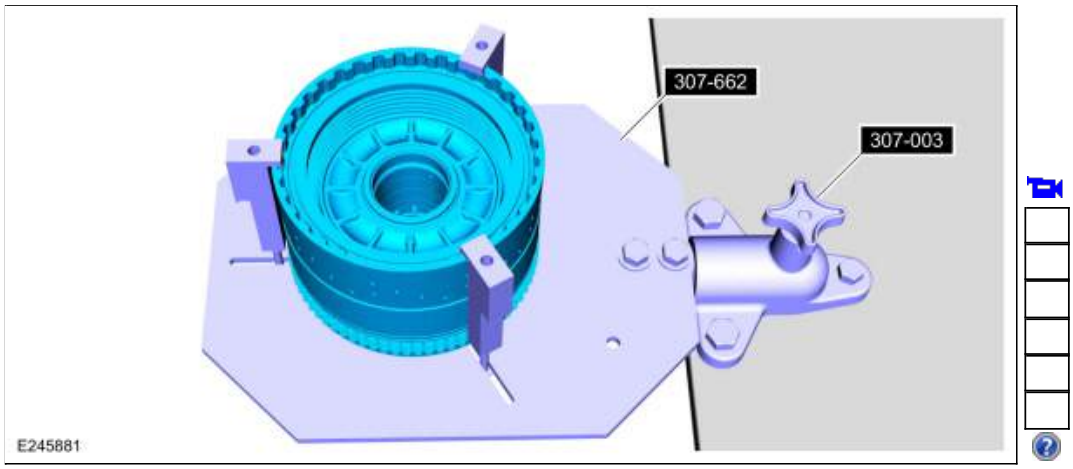
Soak the C clutch plates in clean transmission fluid. Install the C clutch assembly.
1. Steel plates
2. Friction plates
Material: Motorcraft® MERCON® ULV Automatic Transmission Fluid / XT-12-QULV (WSS-M2C949-A) (MERCON® ULV)
3. Pressure plate



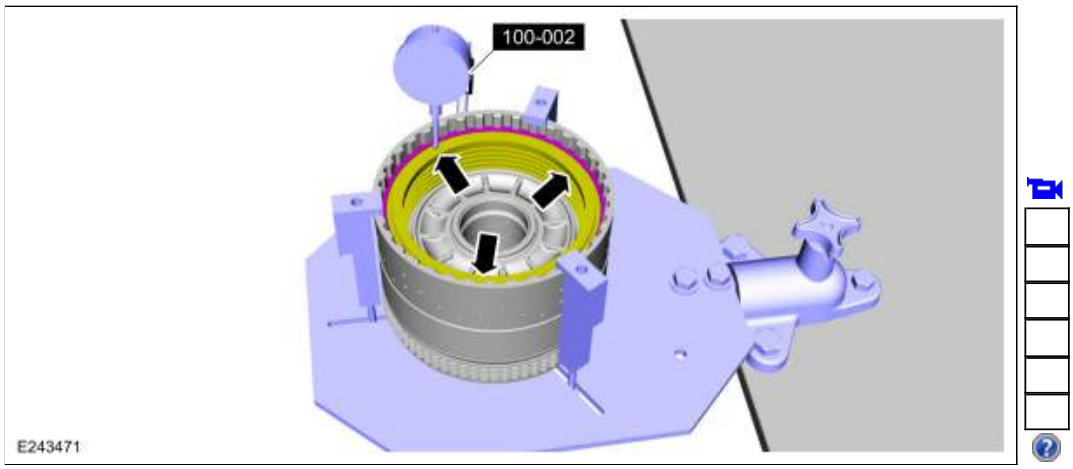
154. Install the C clutch snap ring.



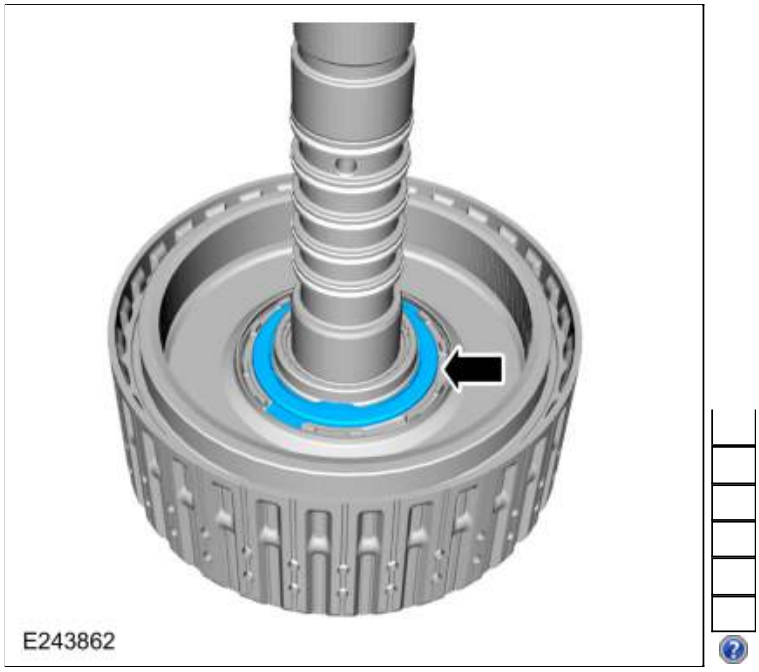
155. Assemble the special tools and position the CDF clutch cylinder with the C clutch facing up.
Use Special Service Tool: 307-662 Gauge, Clutch Pack Endplay. , 307-003 (T57L-500-B) Holding Fixture, Transmission.



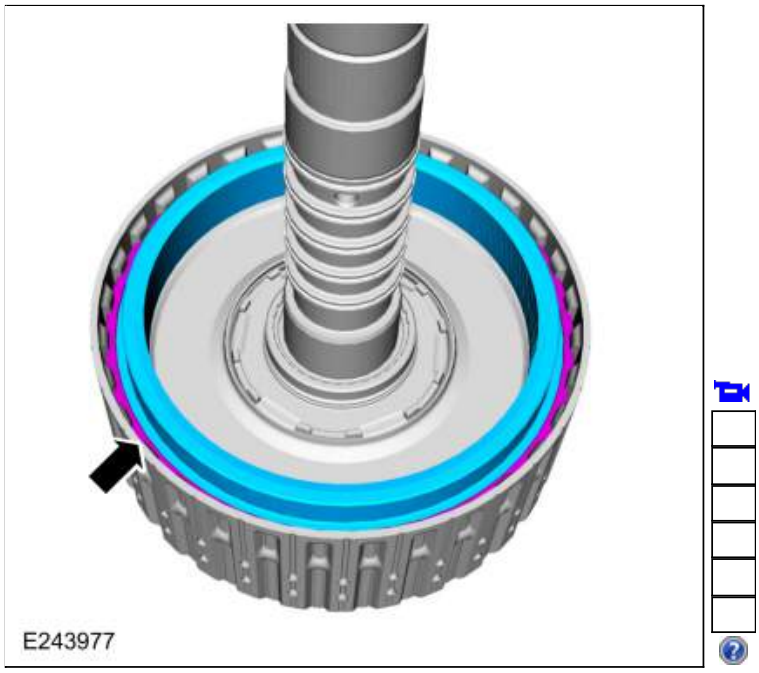
156. Using the special tool, measure the C clutch clearance. Position the plunger so it rests on the top surface of the pressure plate. Zero the dial indicator. Pull up on the pressure plate and measure and record the clutch clearance in 3 different places. Average the 3 recorded clutch clearance measurements and compare the measurement to the clutch clearance chart in specifications to determine the correct size snap ring. Install the correct C clutch snap ring.
Refer to: Specifications (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Specifications).
Use Special Service Tool: 100-002 (TOOL-4201-C) Holding Fixture with Dial Indicator Gauge.



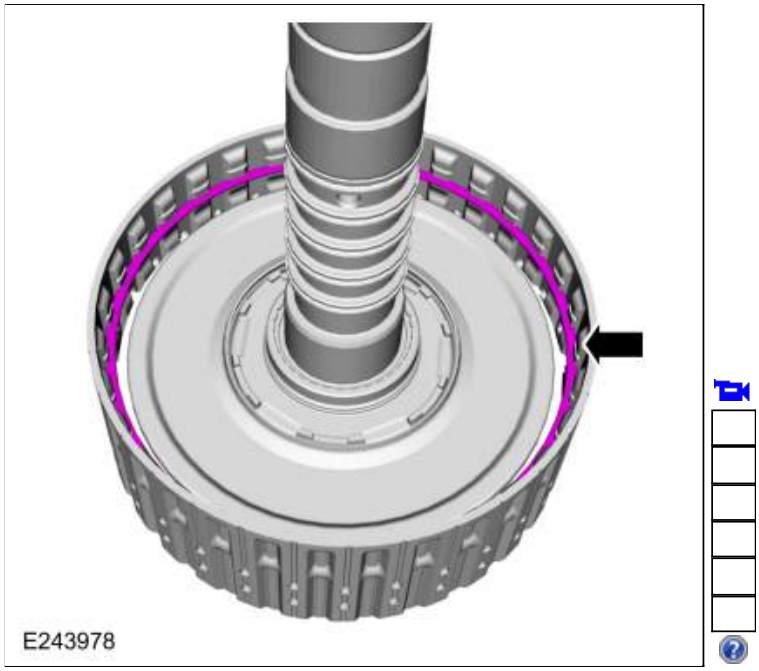
157. Remove the (T6) thrust bearing.



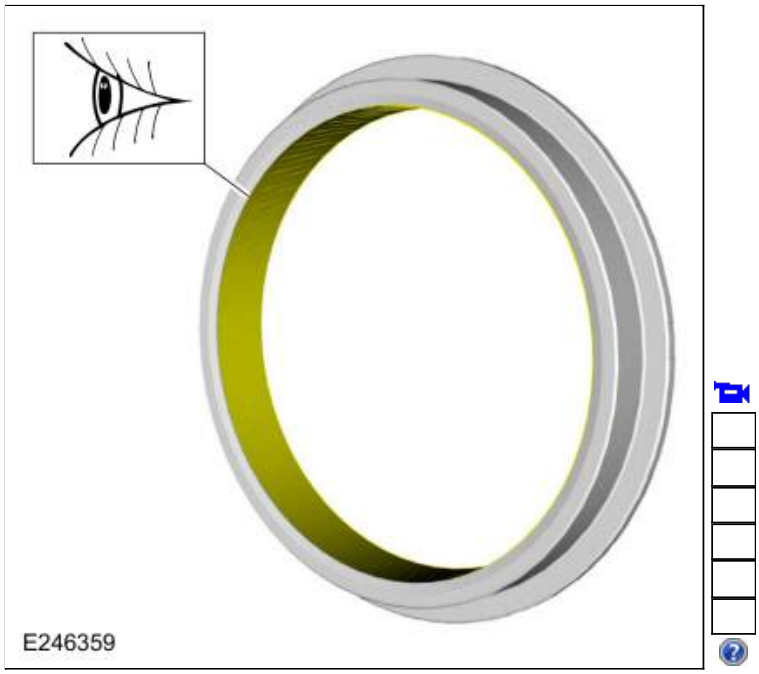
158. Remove the snap ring and the No. 3 ring gear.



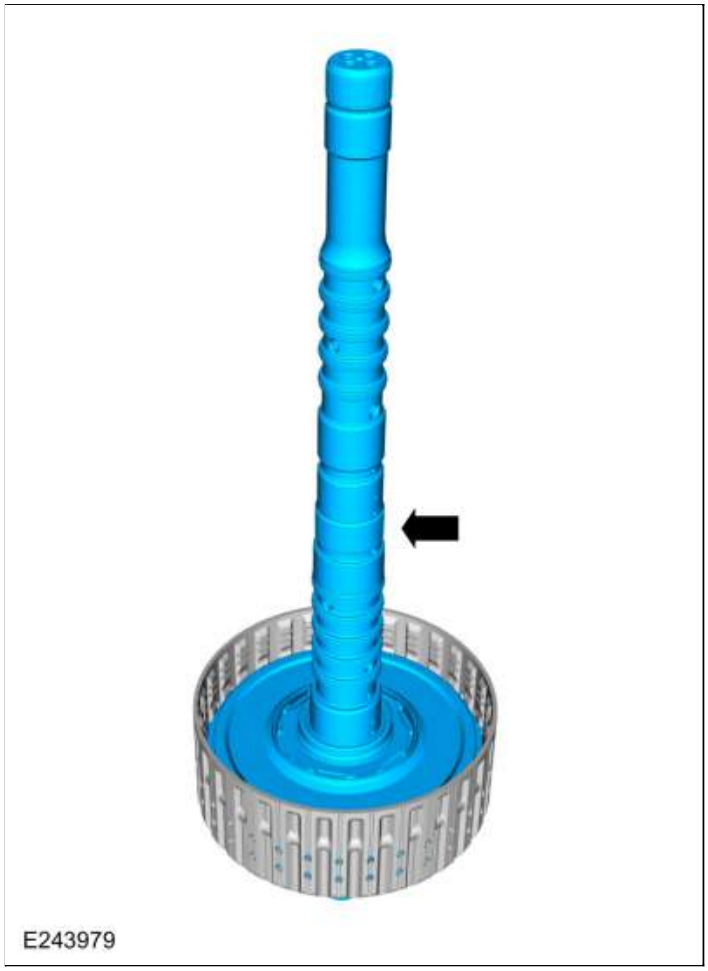
159. Remove the rear No. 3 ring gear snap ring.



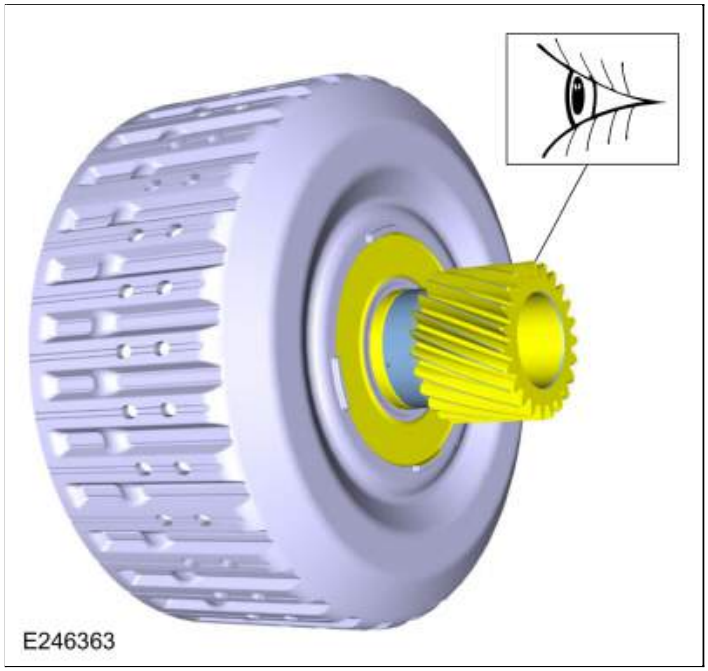
160. Inspect the No. 3 ring gear.



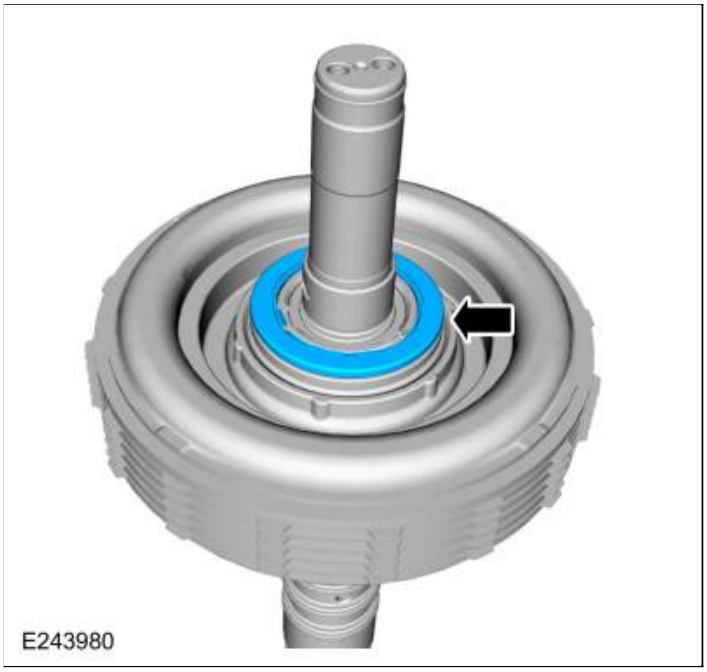
161. Remove the input shaft and the E clutch from No. 4 shell and sun gear.



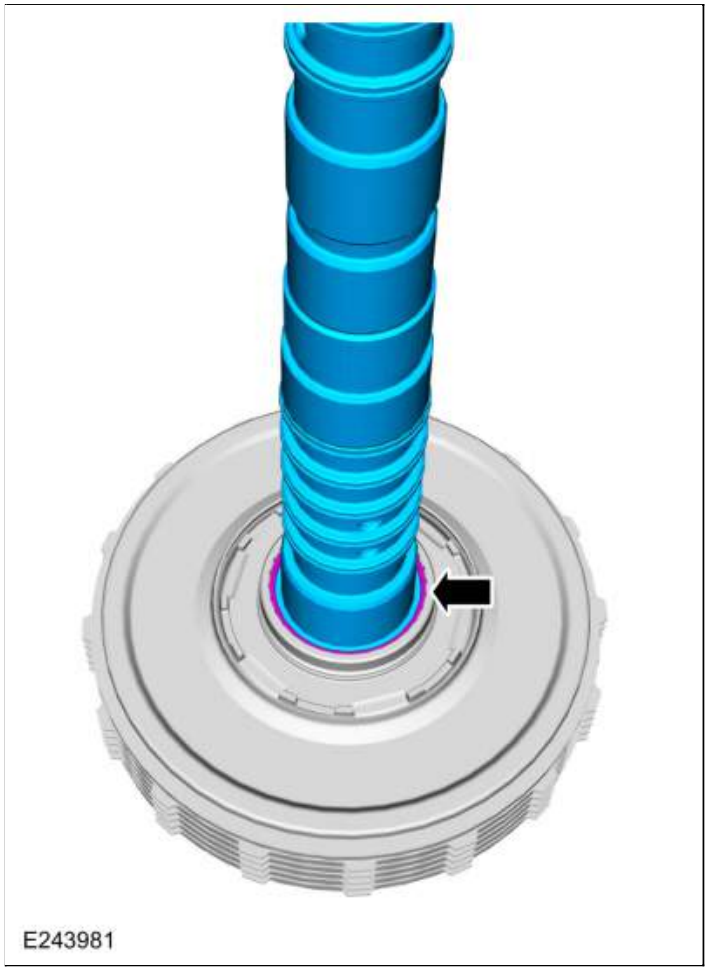
162. Inspect the No. 4 shell and sun gear.



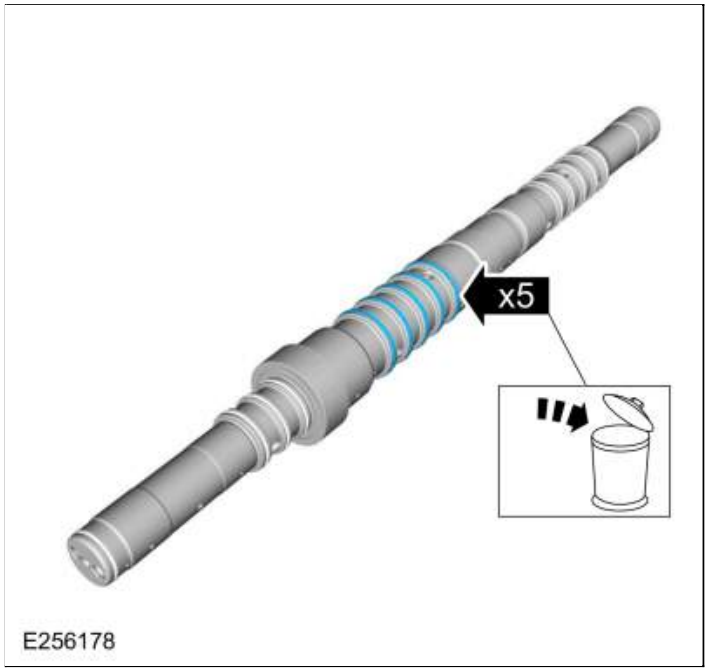
163. Remove the (T7) thrust bearing.



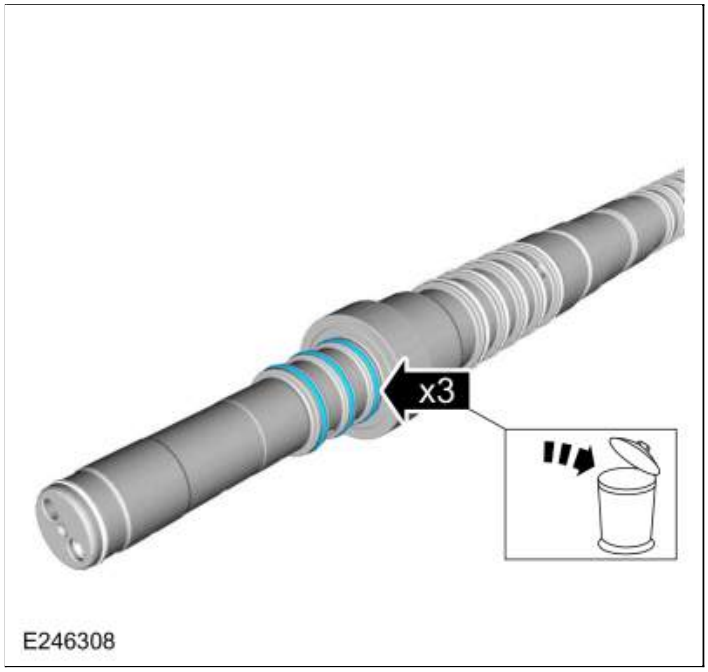
164. Remove the snap ring and remove the input shaft from the E clutch assembly.



165. Remove and discard the input shaft-to-sun gear No. 3 shaft Teflon® seals.

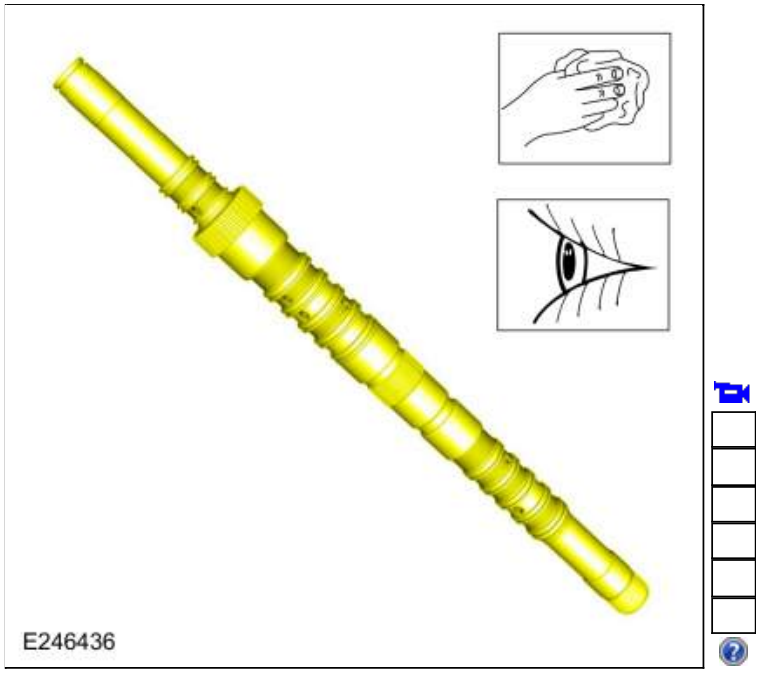


166. Remove and discard the input shaft D-ring seals.



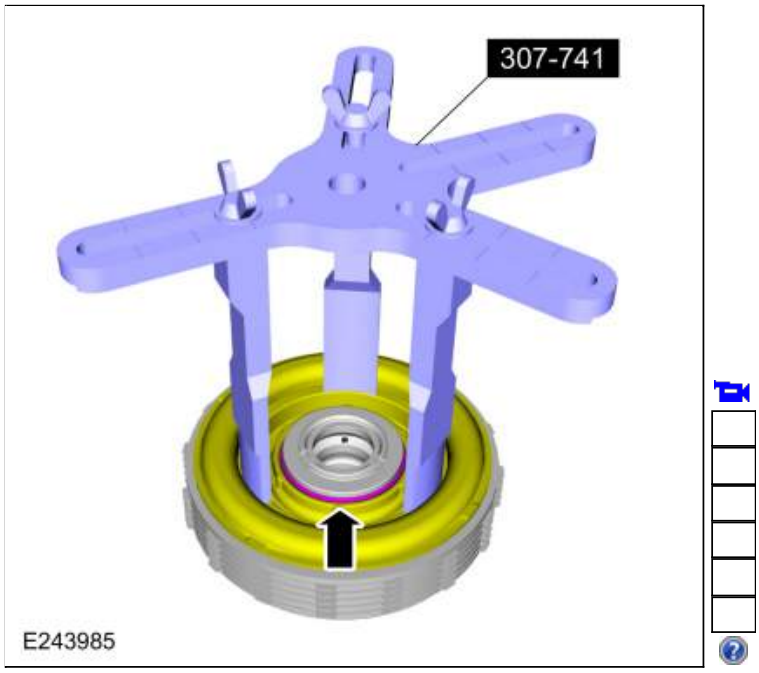
167. Remove and discard the input shaft Teflon® seal.

168. Clean and inspect the input shaft.

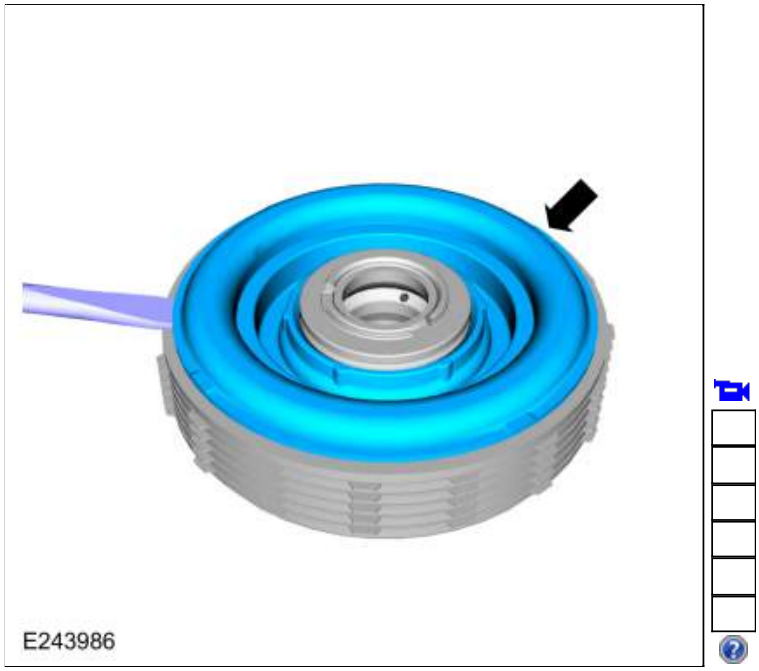


169. **NOTICE: Do not compress the balance dam too far or damage to the E clutch hub can occur. Only compress the E clutch hub far enough to remove the retainer.**

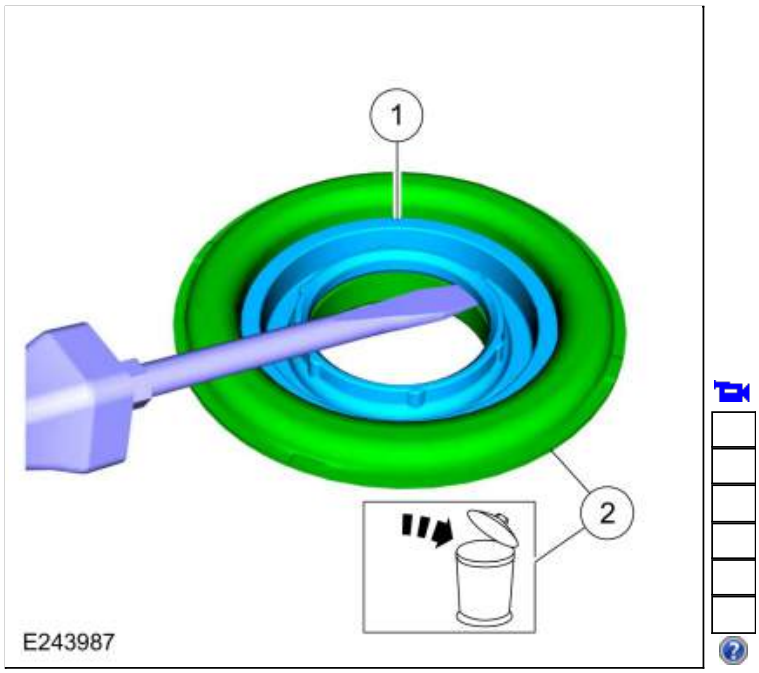
Using the special tool and a press, compress the E clutch balance dam and remove the retainer.
Use Special Service Tool: 307-741 Spring Compressor, F Clutch.
Use the General Equipment: Hydraulic Press



170. Pry the E clutch piston and balance dam upward and remove the piston and balance dam from the E clutch hub.

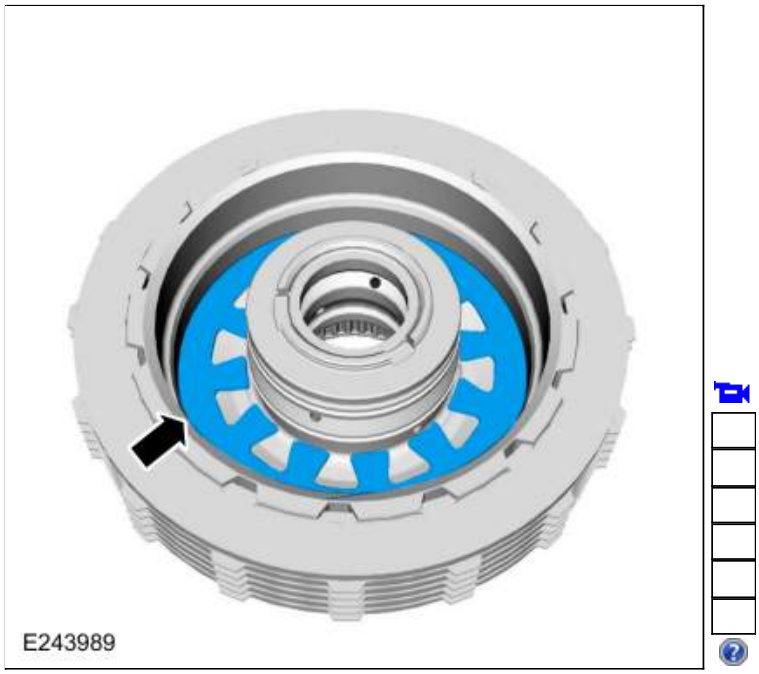


171. Remove the E clutch balance dam and discard the E clutch piston.
    1. E clutch balance dam
    2. E clutch piston

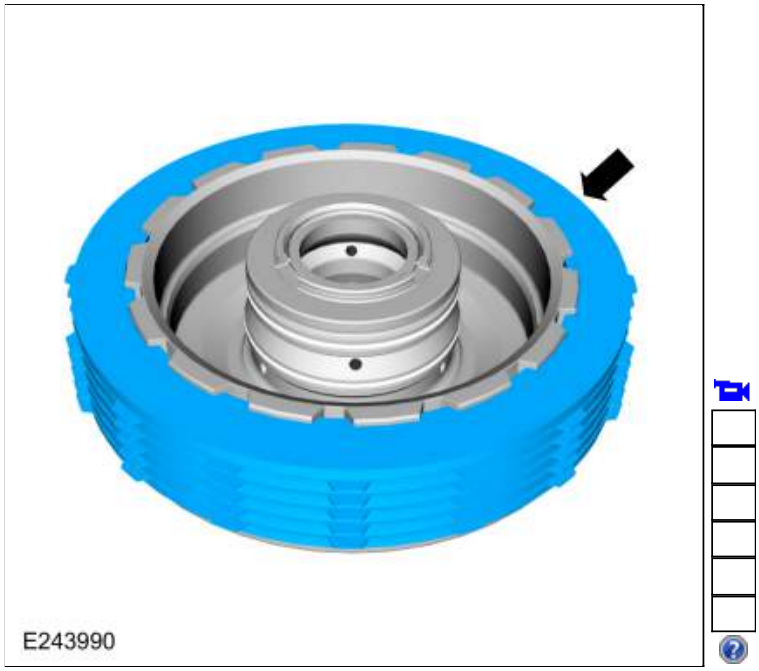


172. Remove and discard the E clutch balance dam outer seal.

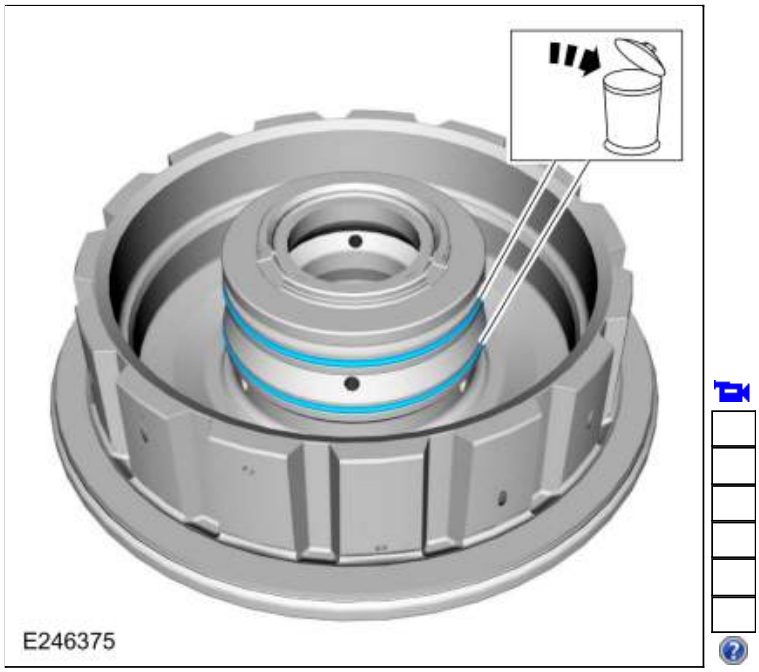
173. Remove the E clutch piston return spring.



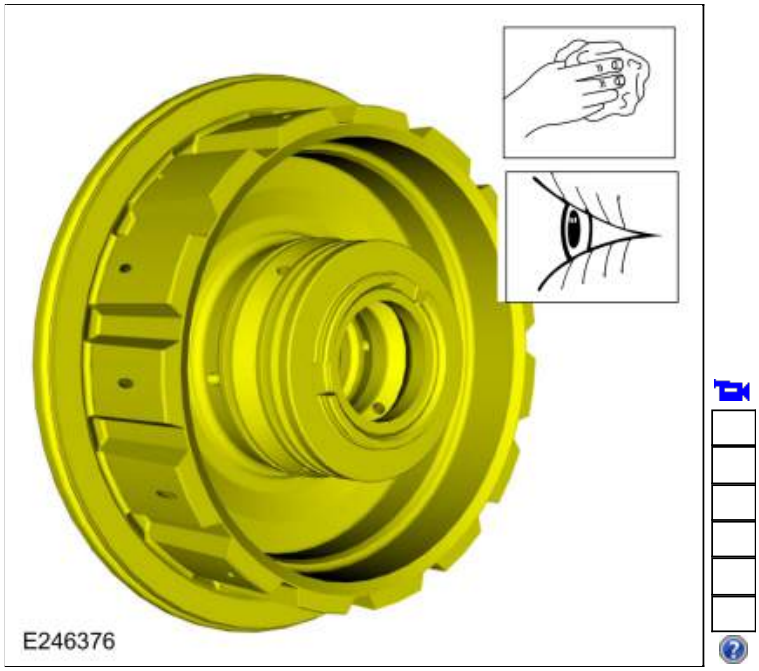
174. Remove the E clutch assembly. Inspect the clutch plates for excessive wear or damage. If the clutch plates are excessively worn or damaged replace as necessary. If the clutch plates are not excessively worn or damaged, they can be reused.



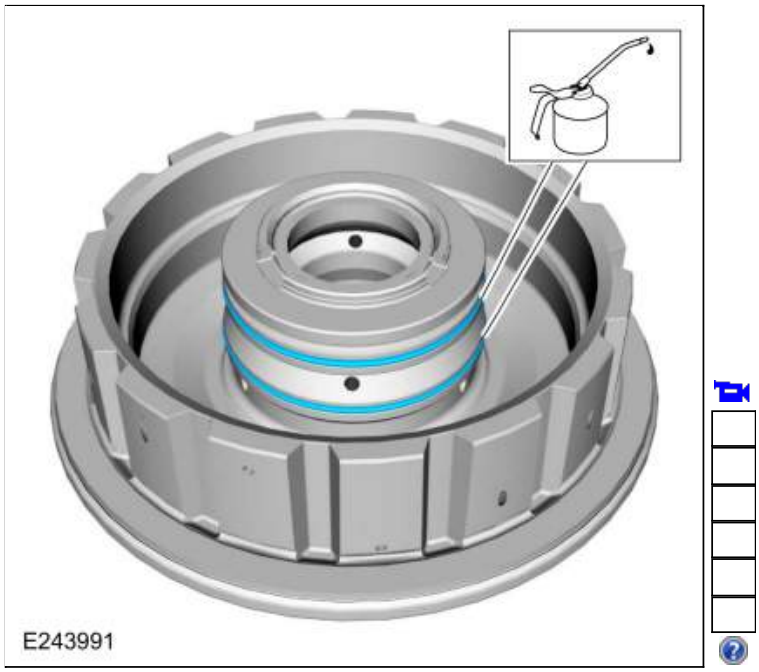
175. Remove and discard the E clutch piston and balance dam inner seals.



176. Clean and inspect the E clutch hub.



177. Install the new E clutch piston and balance dam inner seals. Lubricate the seals with petroleum jelly.

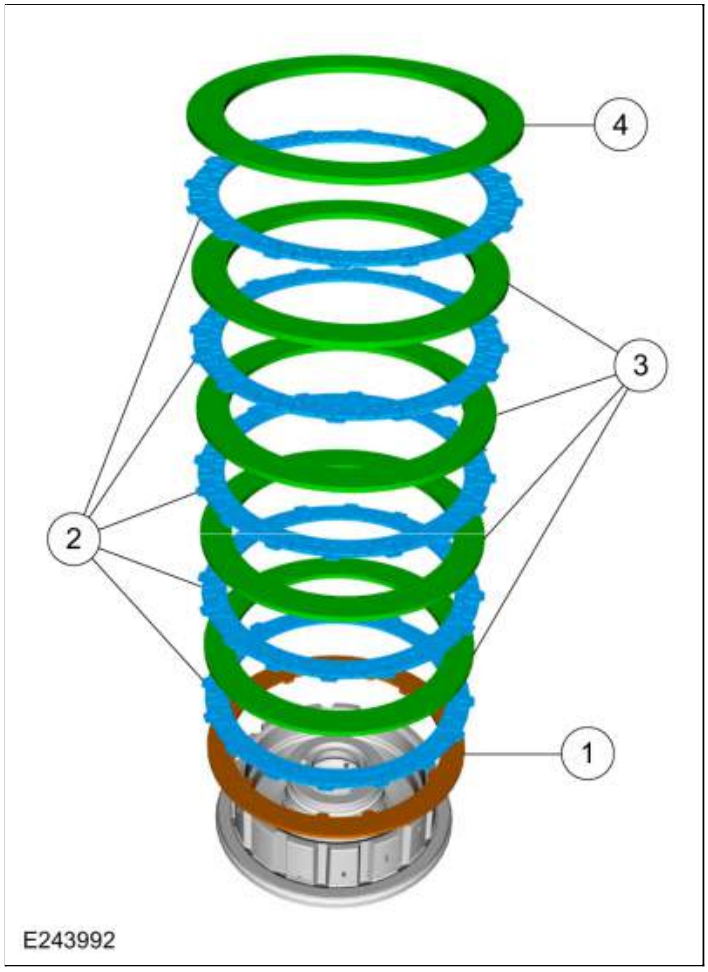


178. **NOTE:** *Clutch plate quantity is model dependant based on engine displacement.*

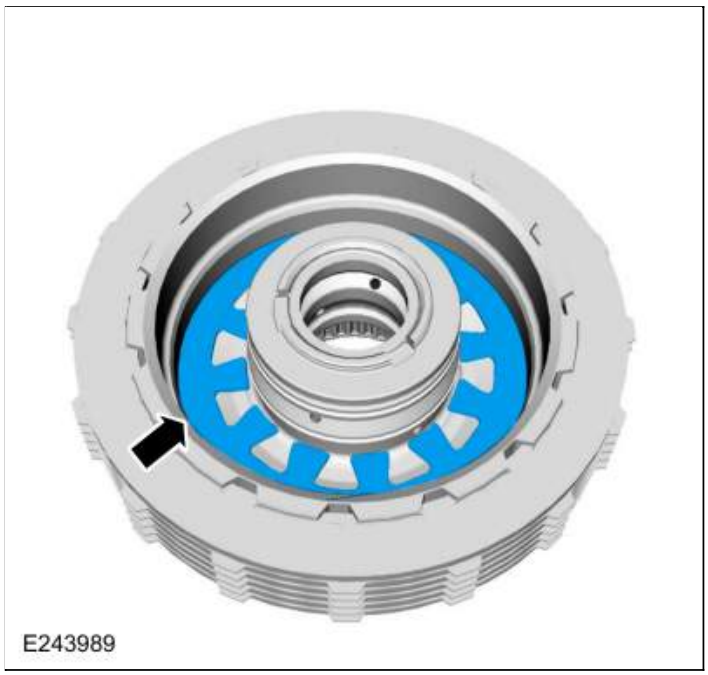
Soak the E clutch plates in clean transmission fluid. Install the E clutch assembly.

1. Pressure plate (select fit)
2. Friction plates
   Material: Motorcraft® MERCON® ULV Automatic Transmission Fluid / XT-12-QULV (WSS-M2C949-A) (MERCON® ULV)
3. **NOTE:** *Align the inner splines of the steel plates with the pressure plate internal splines.*

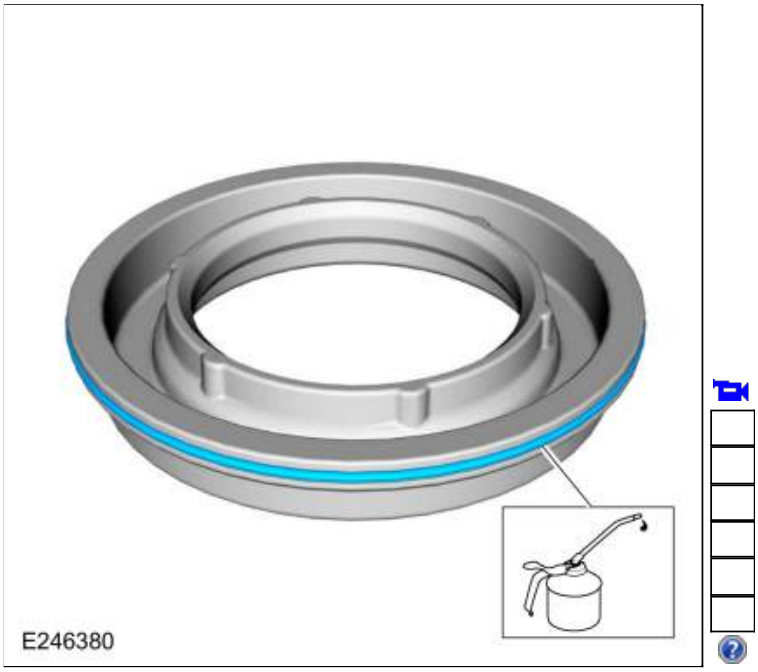
   Steel plates
4. Apply plate (2.9-3.0 mm)



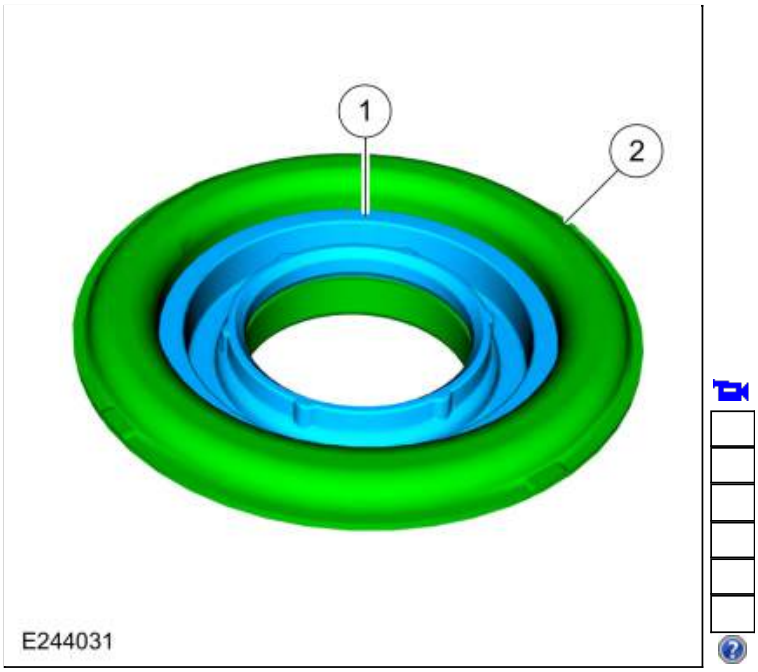
179. Install the E clutch piston return spring.



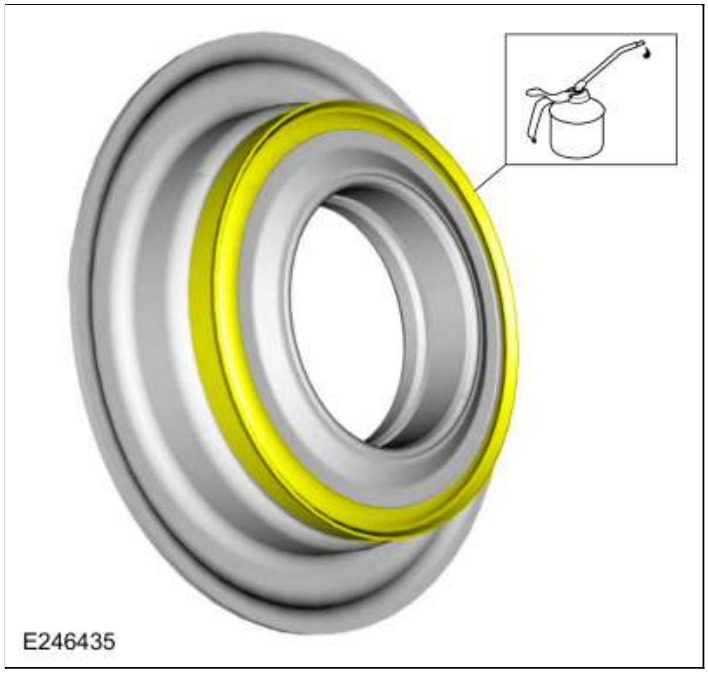
180. Install a new E clutch balance dam outer seal. Lubricate the seal with petroleum jelly.



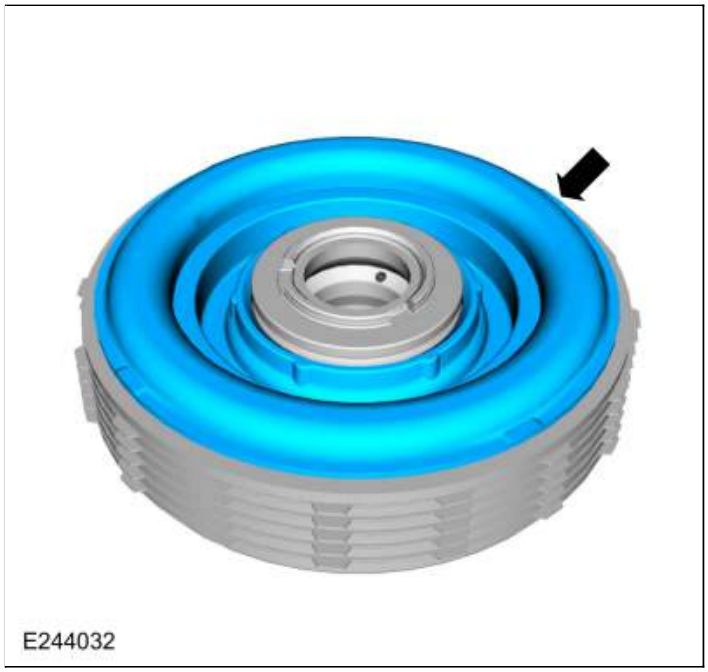
181. Install the E clutch balance dam in the new E clutch piston.
    1. E clutch balance dam
    2. E clutch piston



182. Lubricate the new E clutch piston seal with petroleum jelly.

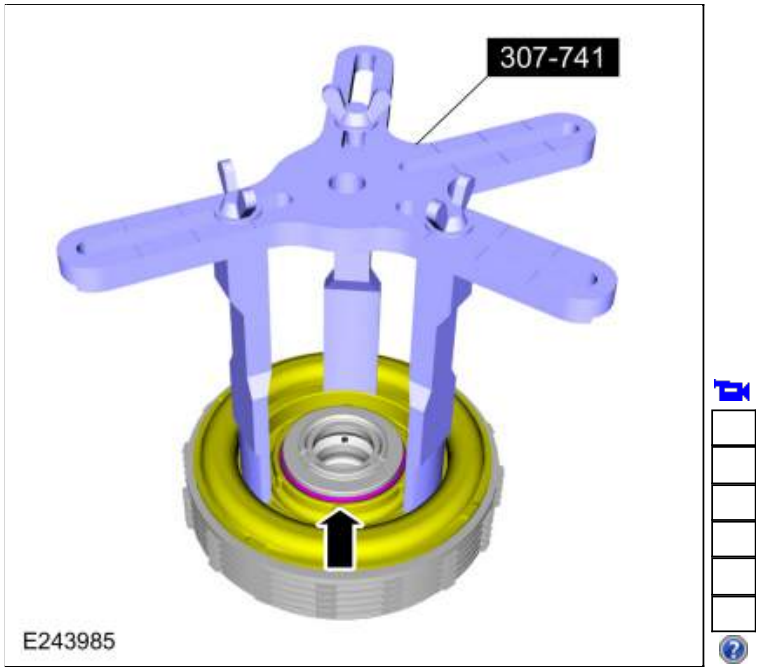


183. Install the new E clutch piston and balance dam in the E clutch hub.

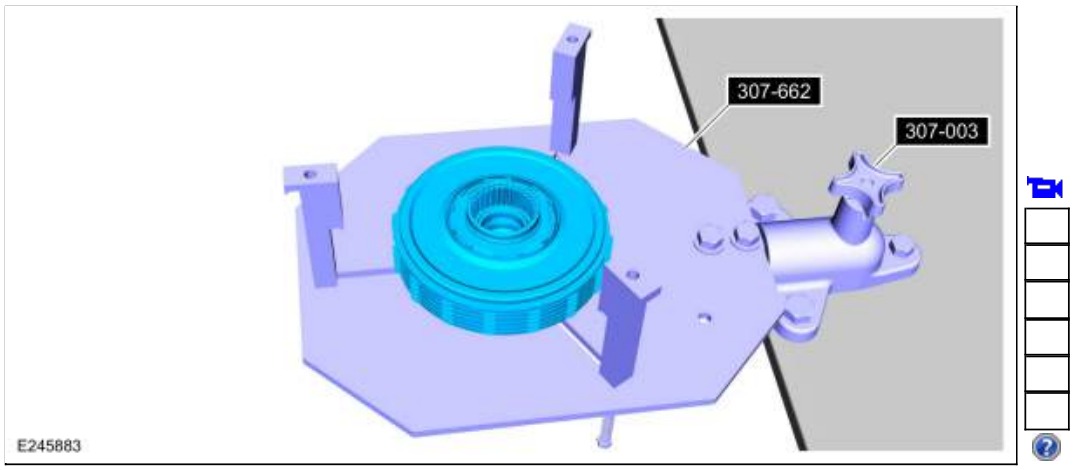


184. **NOTICE: Do not compress the balance dam too far or damage to the E clutch hub can occur. Only compress the E clutch hub far enough to install the retainer.**

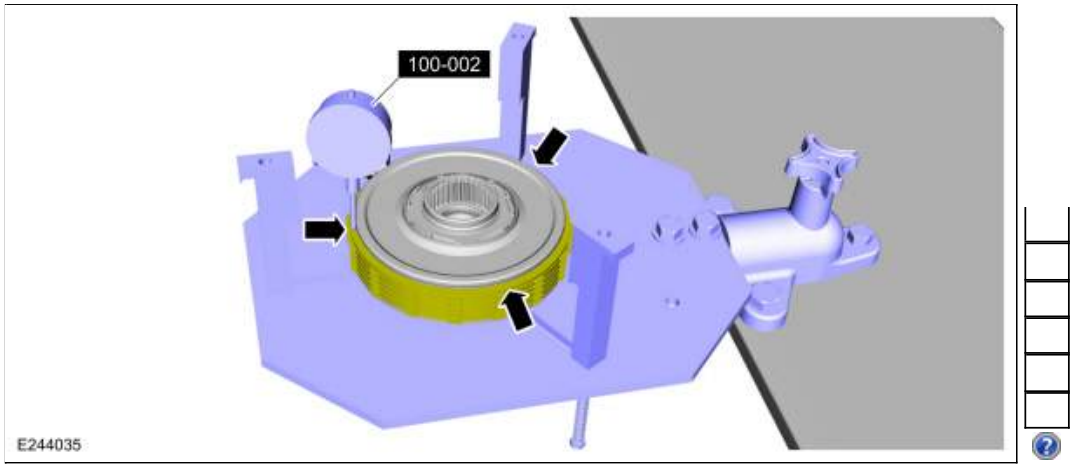
Using the special tool and a press, compress the E clutch balance dam and install the retainer.
Use Special Service Tool: 307-741 Spring Compressor, F Clutch.
Use the General Equipment: Hydraulic Press



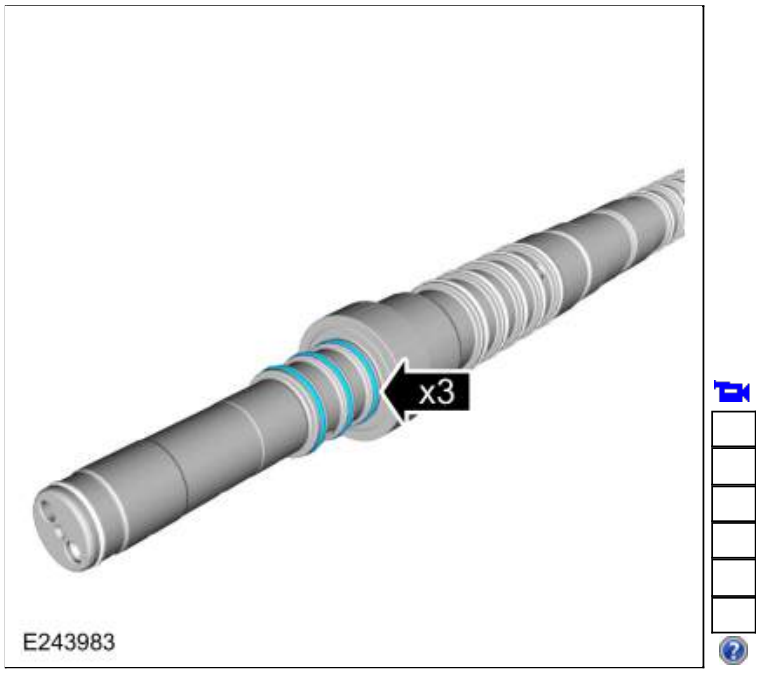
185. Assemble the special tools and position the E clutch assembly on the special tool.
Use Special Service Tool: 307-662 Gauge, Clutch Pack Endplay. , 307-003 (T57L-500-B) Holding Fixture, Transmission.



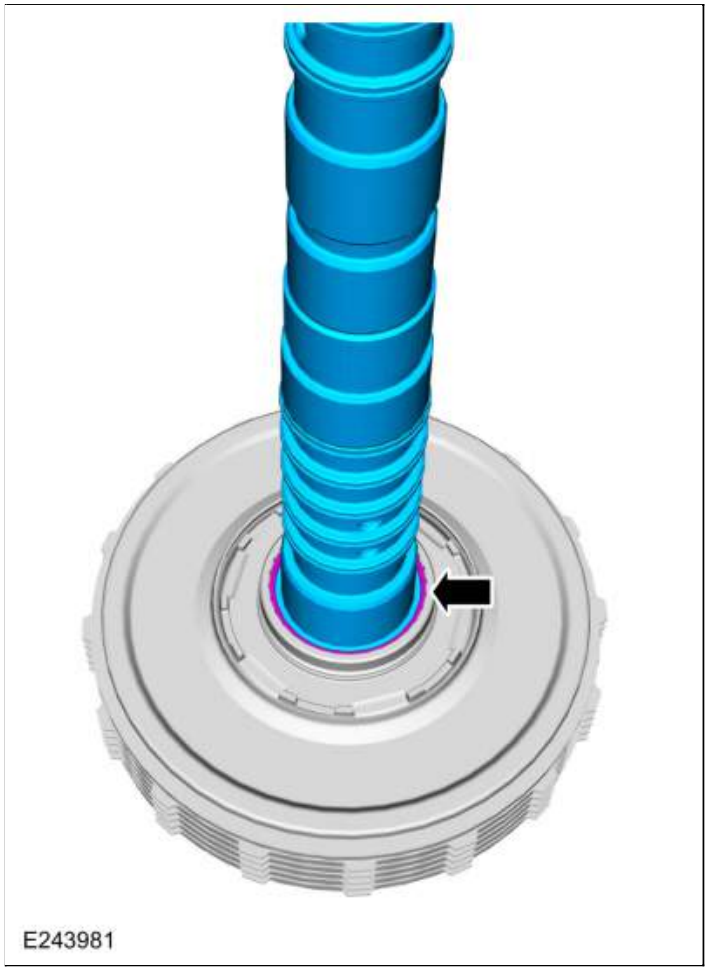
186. Using the special tool, measure the E clutch clearance. Position the plunger so it rests on the top surface of the pressure plate. Zero the dial indicator. Pull up on the pressure plate and measure and record the clutch clearance in 3 different places. Average the 3 recorded clutch clearance measurements and compare the measurement to the clutch clearance chart in specifications to determine the correct size pressure plate. Install the correct E clutch pressure plate.
Refer to: Specifications (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Specifications).
Use Special Service Tool: 100-002 (TOOL-4201-C) Holding Fixture with Dial Indicator Gauge.



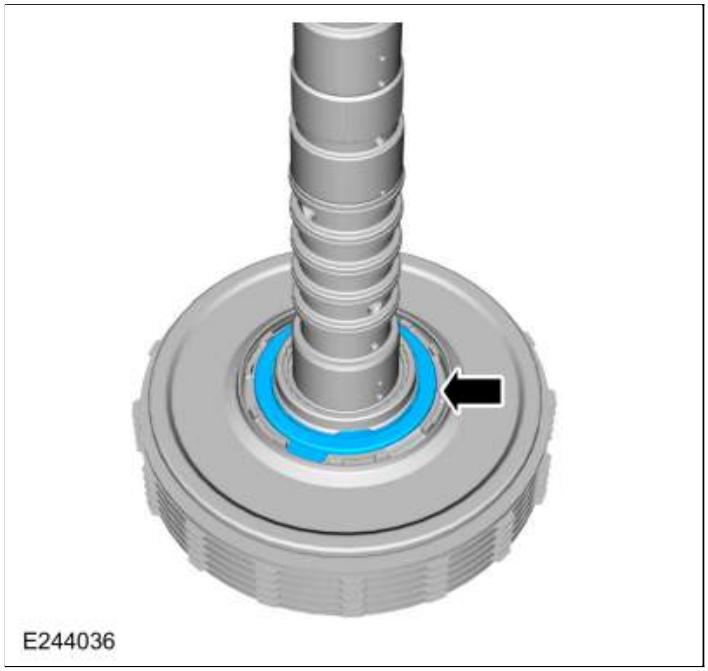
187. Install the new input shaft D-ring seals.



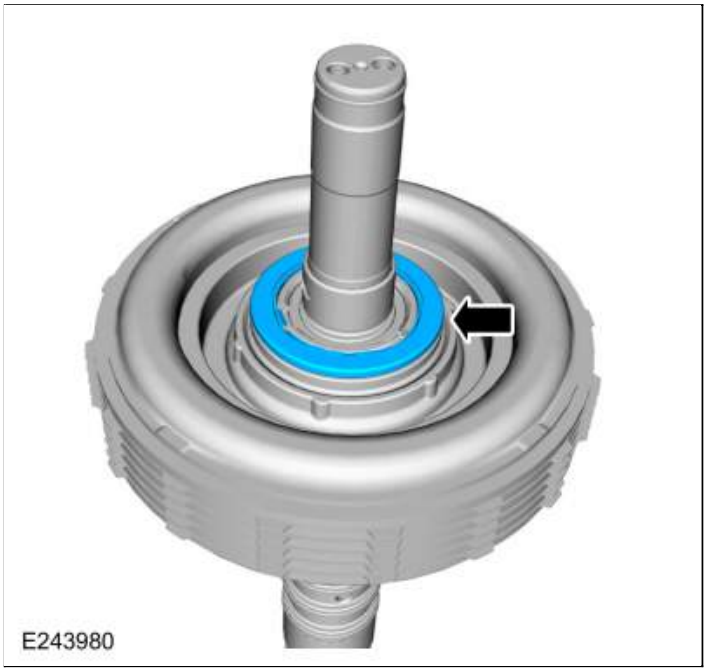
188. Install the input shaft in the E clutch and install the snap ring.



189. Install the (T6) thrust bearing onto the E clutch with the tab locators down. Snap the bearing into place.

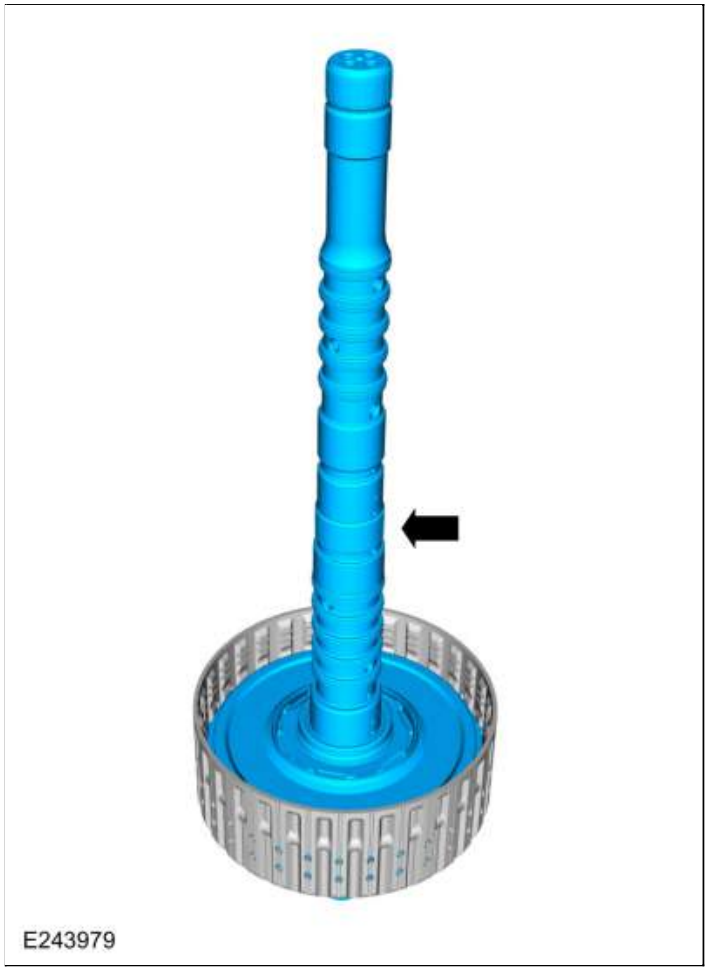


190. Install the (T7) thrust bearing onto the E clutch with the tab locators up. Snap the bearing into place.

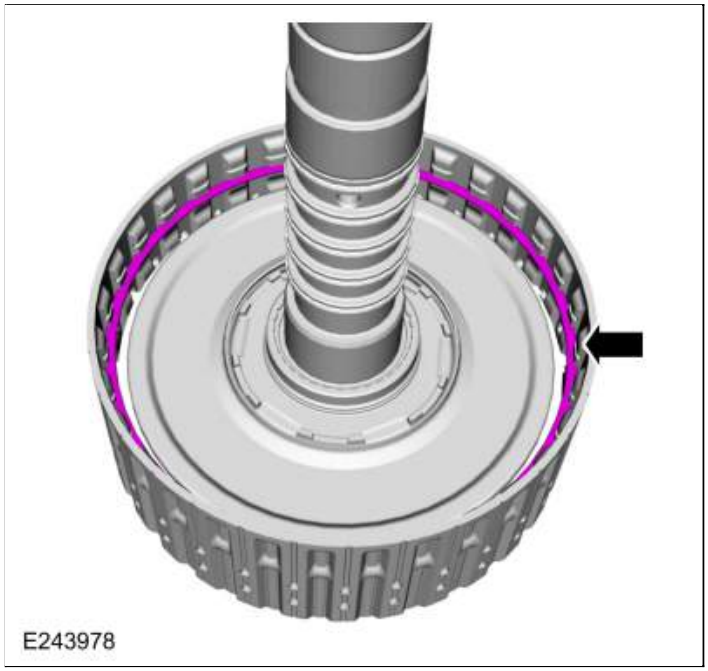


191. **NOTE:** *Align the outer splines on the friction plates.*

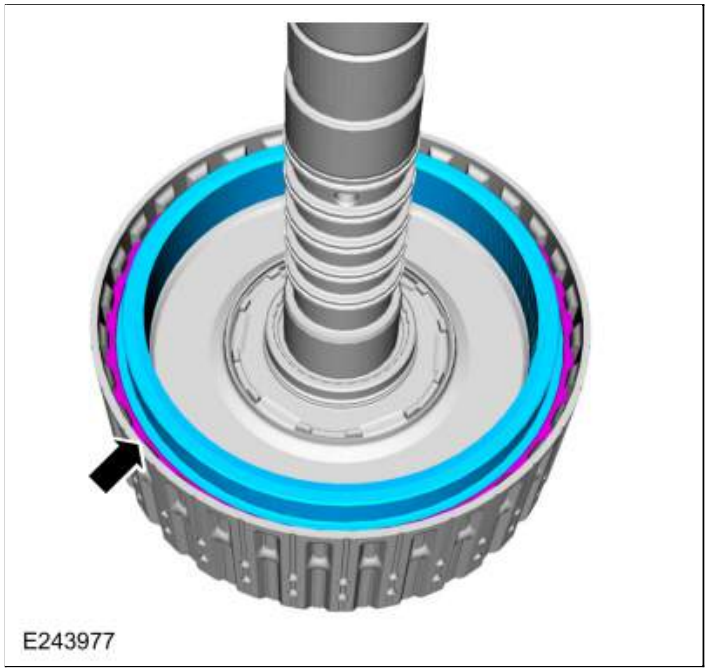
Install the input shaft and the E clutch into the No. 4 shell and sun gear.



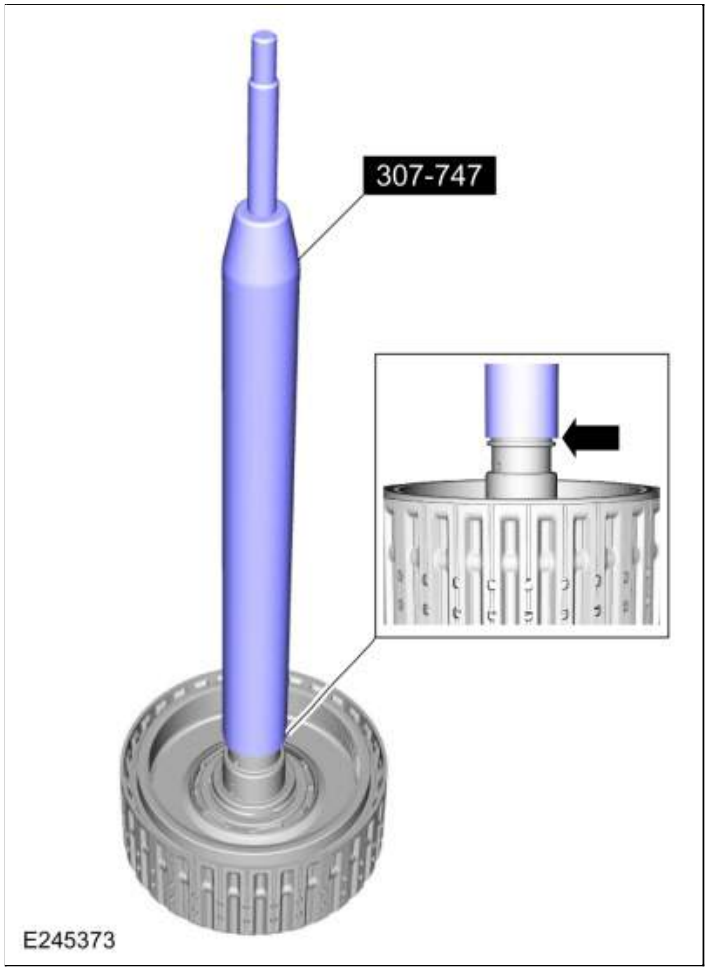
192. Install the lower rear No. 3 ring gear snap ring.



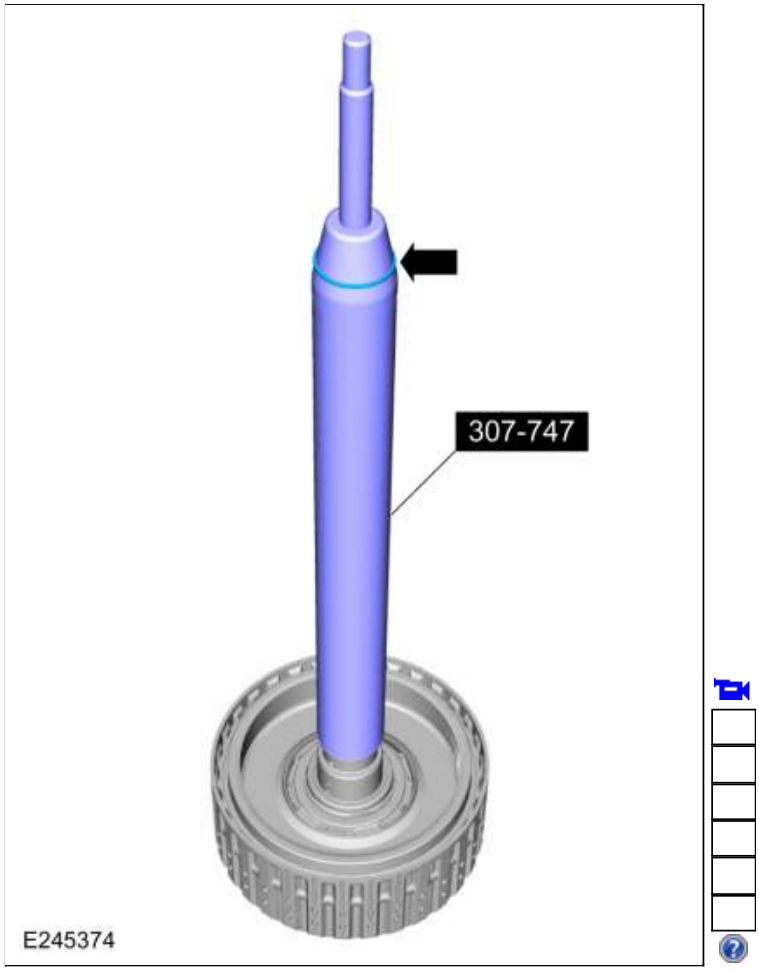
193. Install the No. 3 ring gear and the snap ring. Align the snap ring gap 180° from the bottom snap ring gap.



194. Install the special tool and adjust the special tool to align the bottom edge of the tool with the top edge of the bottom Teflon® seal groove.
Use Special Service Tool: 307-747 Installer/ Sizer , Input Shaft Solid Sealing Rings; Large.

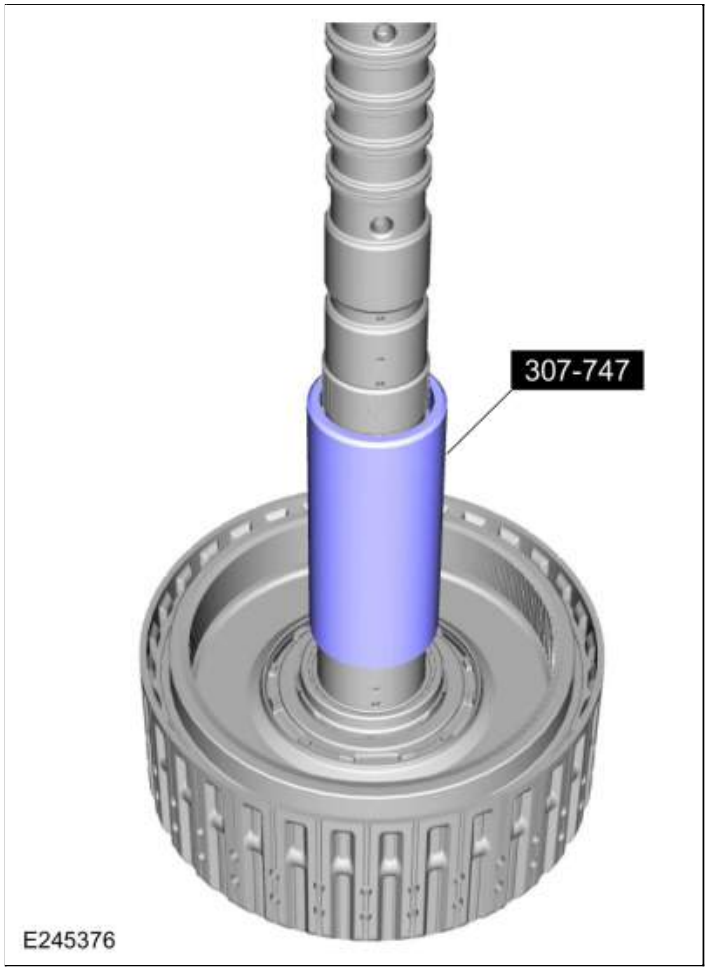


195. Install a new Teflon® seal on the special tool.
Use Special Service Tool: 307-747 Installer/ Sizer , Input Shaft Solid Sealing Rings; Large.

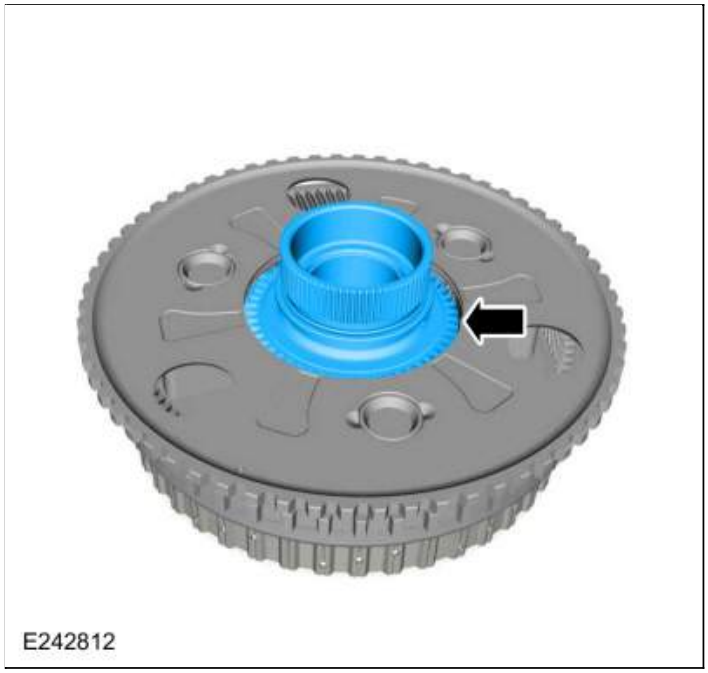


196. Using the top half of the special tool, slide the Teflon® seal into the groove. Remove the special tools and repeat the steps for the other 4 Teflon® seals.
Use Special Service Tool: 307-747 Installer/ Sizer , Input Shaft Solid Sealing Rings; Large.

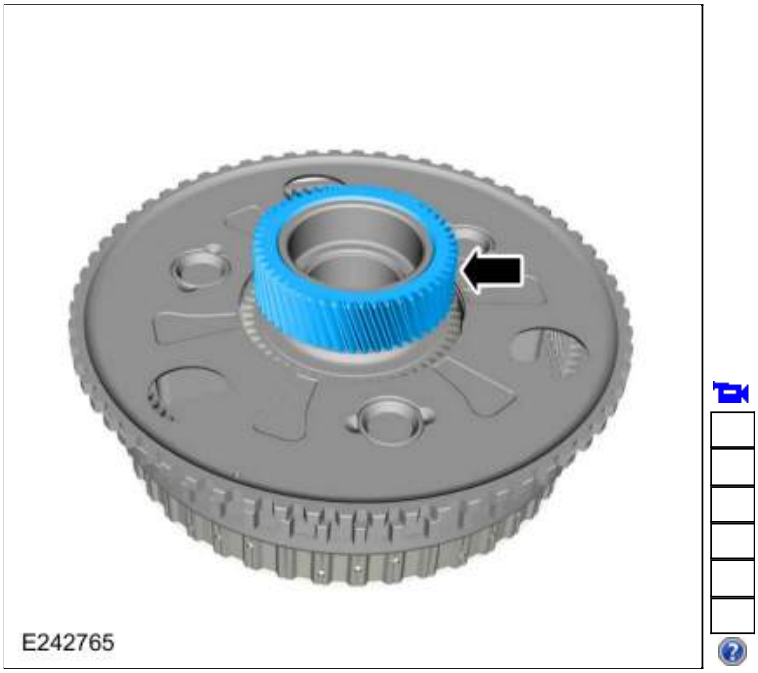
197. Install the special tool to size the 5 Teflon® seals. Allow the special tool to stay on the input shaft for 5 minutes prior to final assembly.
Use Special Service Tool: 307-747 Installer/ Sizer , Input Shaft Solid Sealing Rings; Large.



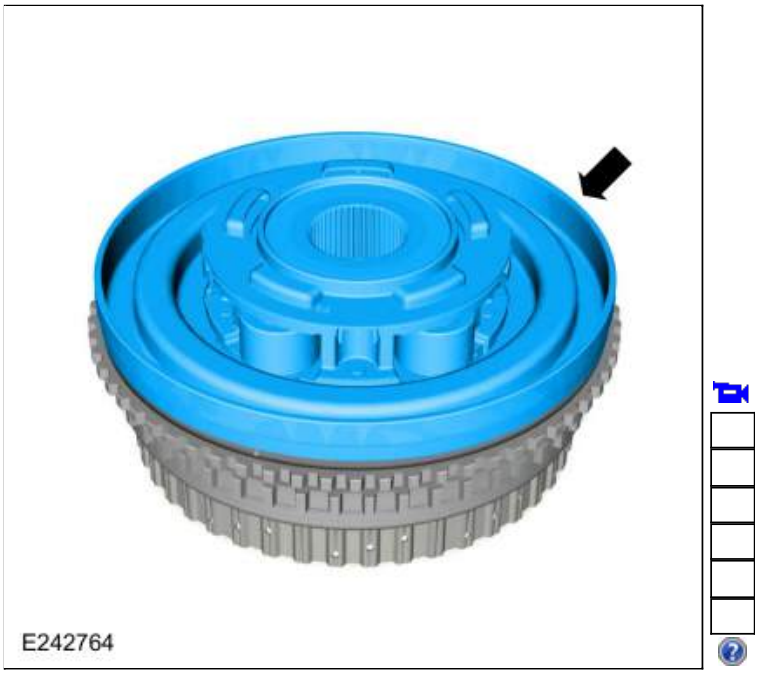
198. Install the No. 1 sun gear in the No. 1 planetary carrier.



199. Install the No. 2 sun gear.

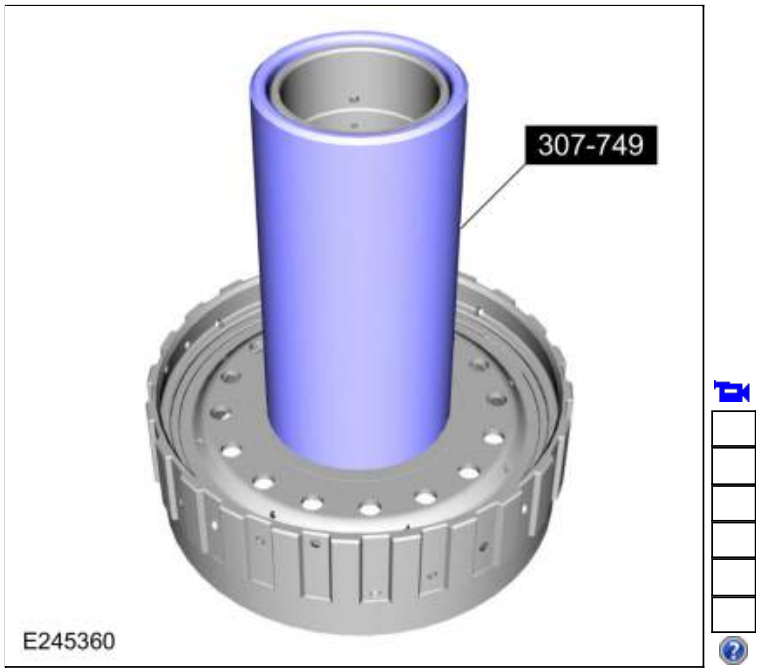


200. Install the No. 2 planetary carrier.



201. Install the (T5) bearing.

202. Remove Special Service Tool: 307-749 Installer/Sizer, R2-S3 Shaft Solid Seal.



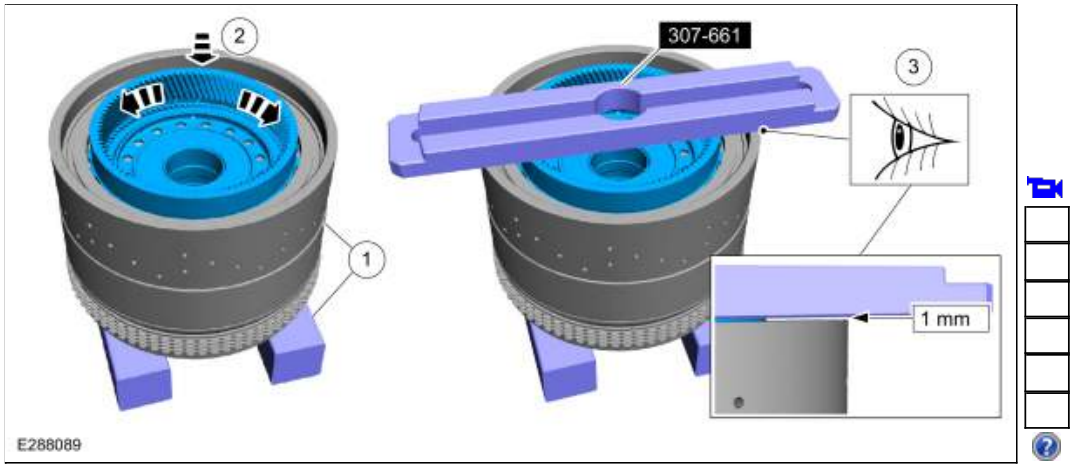
203.

Install the No. 3 sun gear shaft into the CDF clutch assembly.

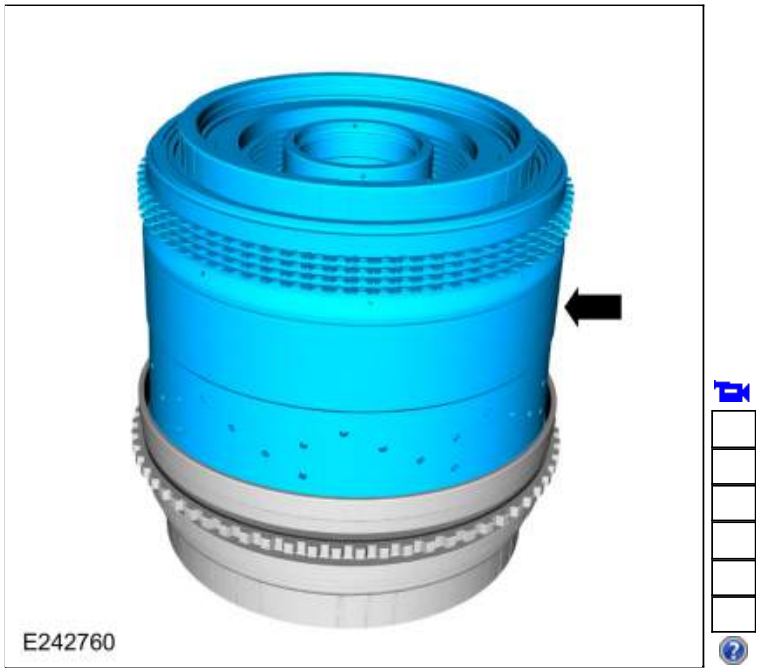
1. Position the CDF clutch assembly on 2 blocks of wood.
   Use the General Equipment: Wooden Block
2. Rotate the No. 3 sun gear shaft back and forth to install.
3. **NOTE:** *When the No. 3 sun gear shaft is correctly installed the clearance between CDF clutch assembly and the special tool is approximately 1 mm.*

   Using the special tool and a feeler gauge, check the clearance between the CDF clutch assembly and the special tool.
   Use Special Service Tool: 307-661 Gauge, End Play.

Use the General Equipment: Feeler Gauge



204. While holding the sun gear No. 3 shaft, flip the CDF clutch assembly over and install it on to the No. 2 planetary carrier.



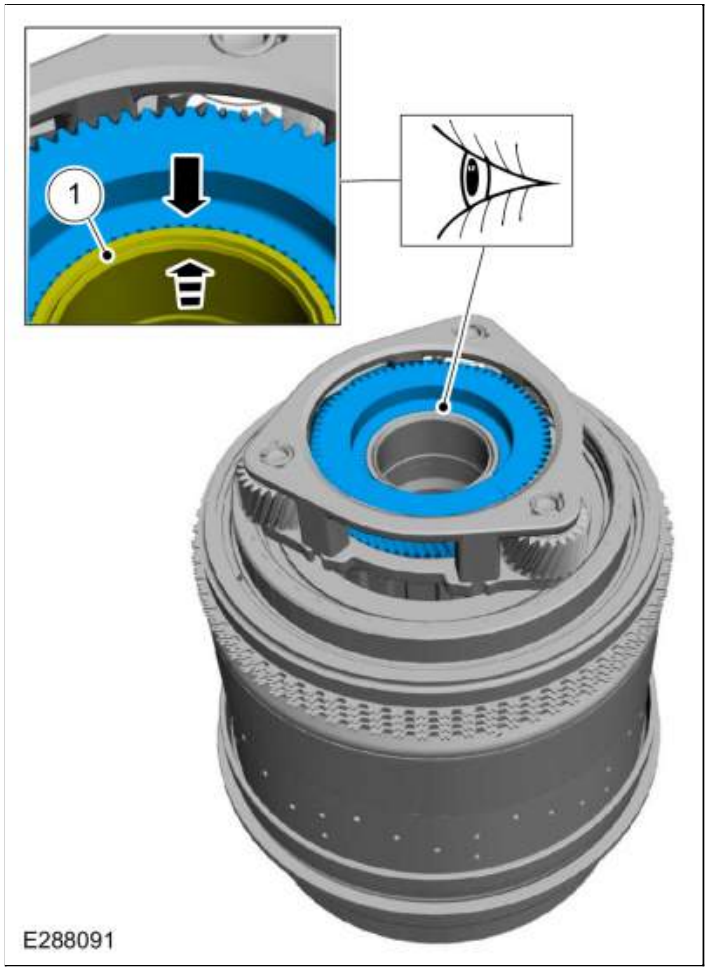
205. Install the No. 3 planetary carrier.

206.

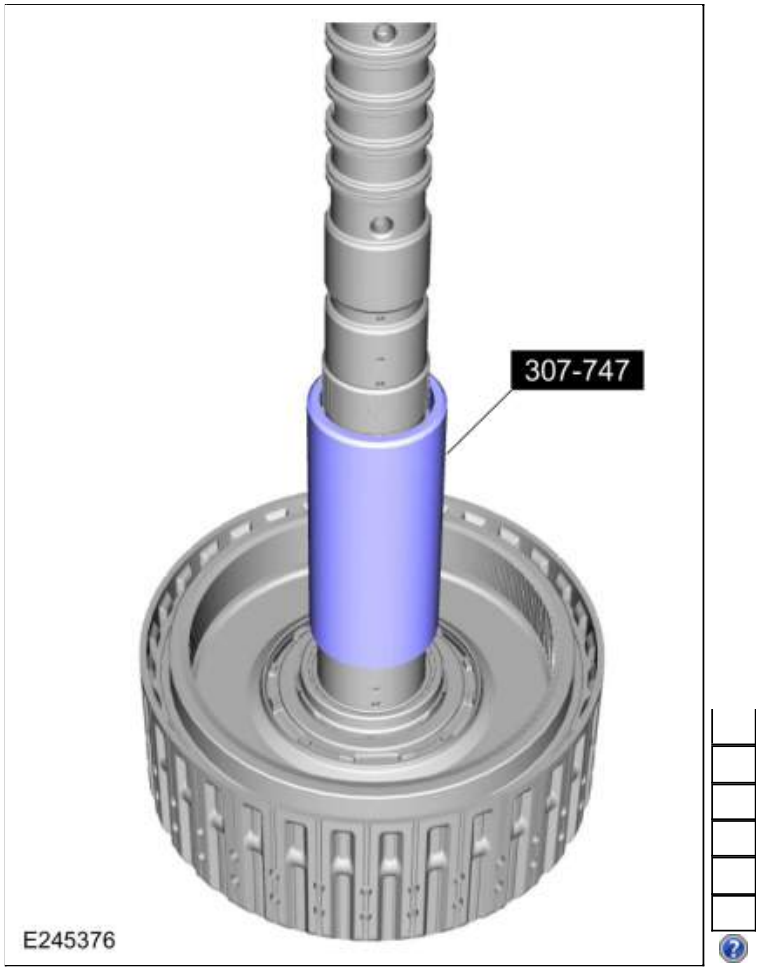
Install the No. 3 sun gear.

1. **NOTE:** *The No. 3 sun gear shaft splines will be flush with the No. 3 sun gear splines when correctly installed.*

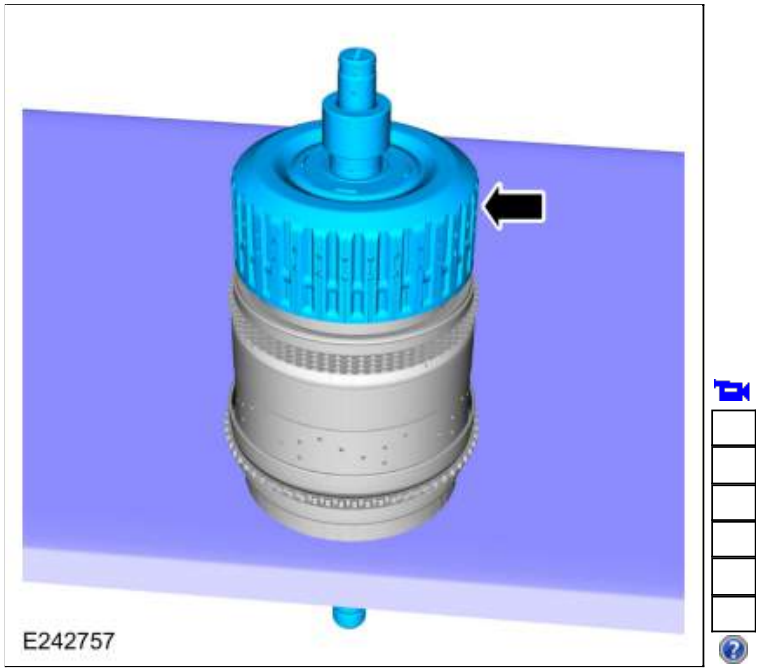
   Check the No. 3 sun gear shaft for correct installation.



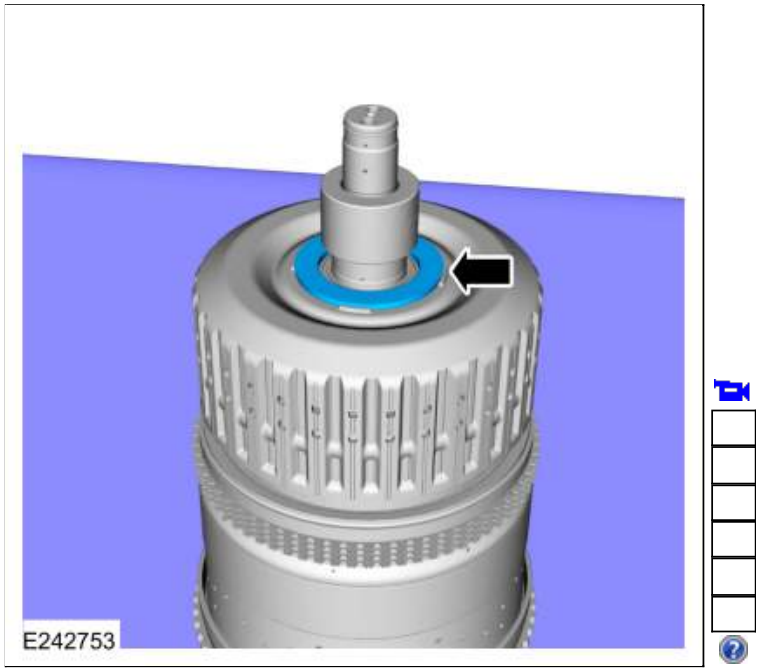
207. Remove Special Service Tool: 307-747 Installer/ Sizer , Input Shaft Solid Sealing Rings; Large.



208. Install the E clutch and input shaft assembly.



209. Install the (T8) thrust bearing.

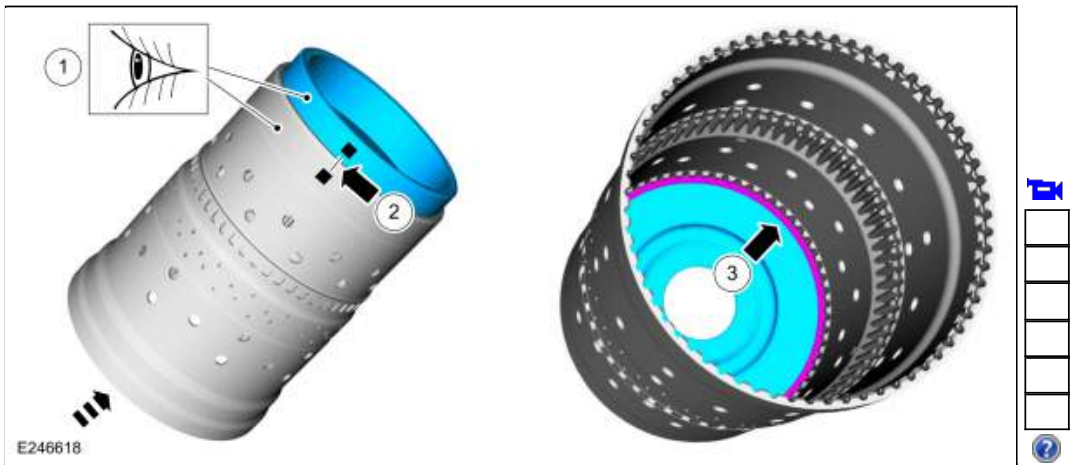


210.

1. **NOTE:** *Some early build transmissions are not equipped with lazer applied ink marks.*

   If the No. 4 ring gear was removed, inspect the ring gear and the clutch and planetary container cylinder for lazer applied ink marks.
2. **NOTICE: If ink marks are present the marks must be aligned or a transmission vibration can occur.**

   If ink marks are present align the marks and install the No. 4 ring gear on the clutch and planetary container cylinder.
3. Install the No. 4 ring gear snap ring.



211.

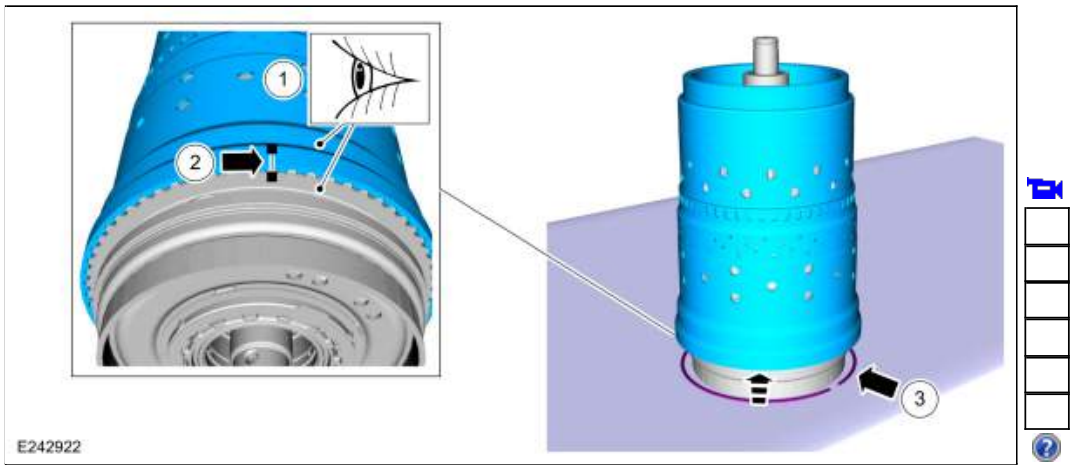
1. **NOTE:** *Some early build transmissions are not equipped with lazer applied ink marks.*

   Inspect the No. 1 planetary carrier and the clutch and planetary container cylinder for lazer applied ink marks.
2. **NOTICE: If ink marks are present the marks must be aligned or a transmission vibration can occur.**

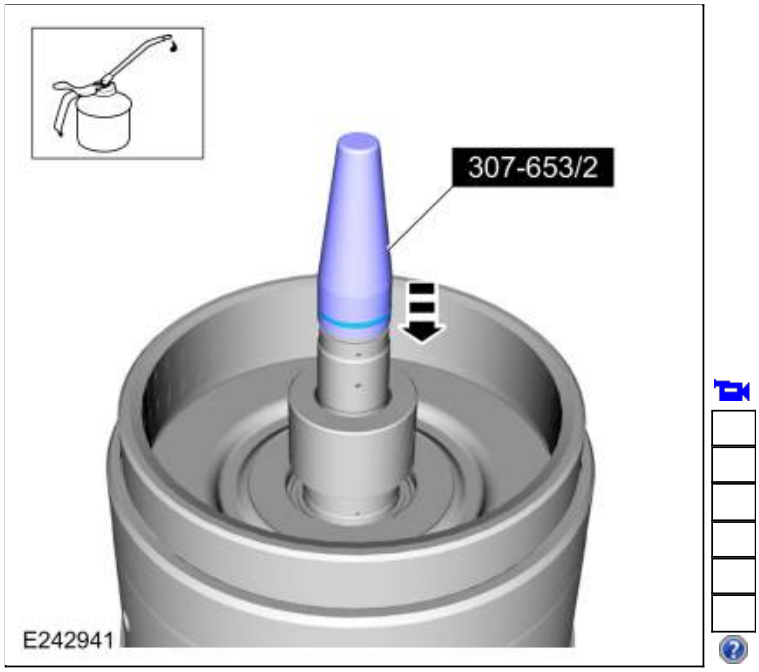
   If ink marks are present align the marks and install the clutch and planetary container cylinder onto the No. 1

planetary carrier and install the snap ring. Make sure the snap ring is seated.

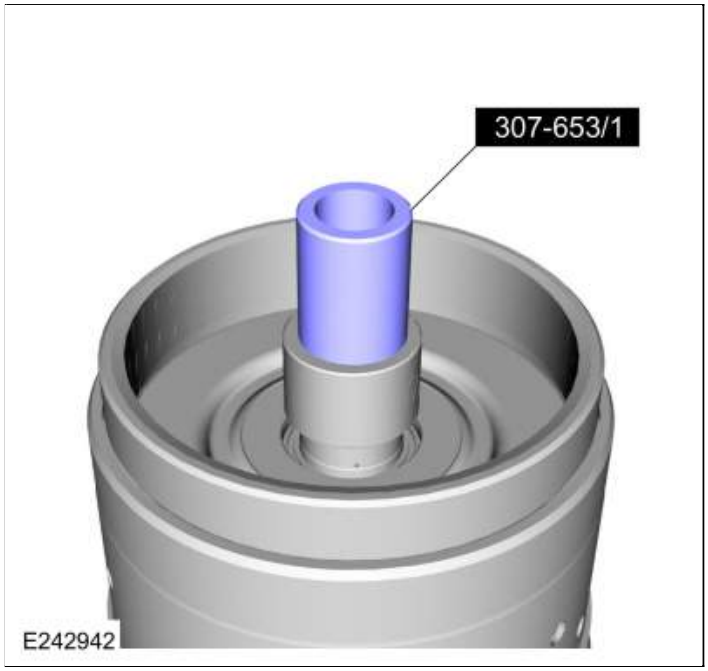
3. Install the No. 1 planetary carrier snap ring. Make sure the snap ring is seated.



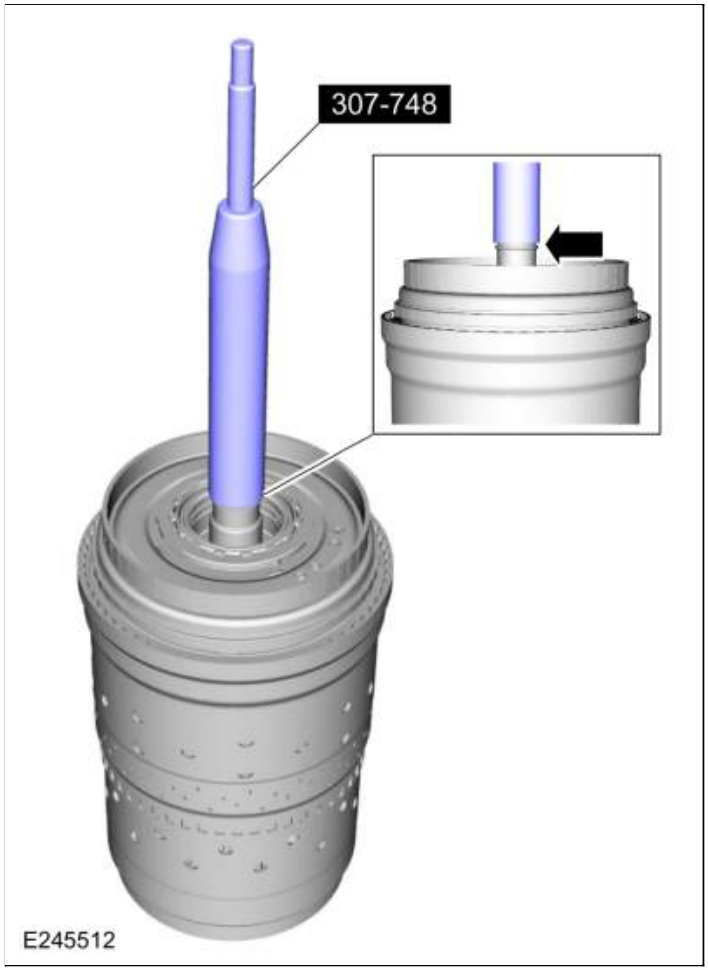
212. Using the special tool, install a new Teflon® seal in the groove on the input shaft.
Use Special Service Tool: 307-653 Sizer, Input Shaft Teflon Seal.



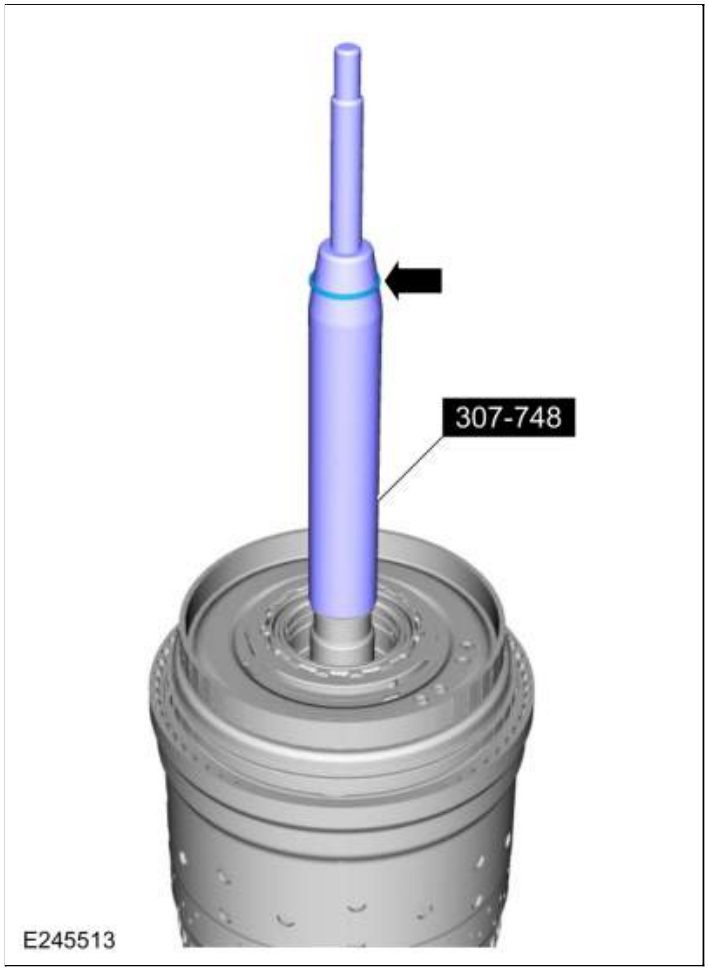
213. Using the special tool, size the Teflon® seal. Allow the special tool to stay on the input shaft for 5 minutes prior to final assembly.
Use Special Service Tool: 307-653 Sizer, Input Shaft Teflon Seal.



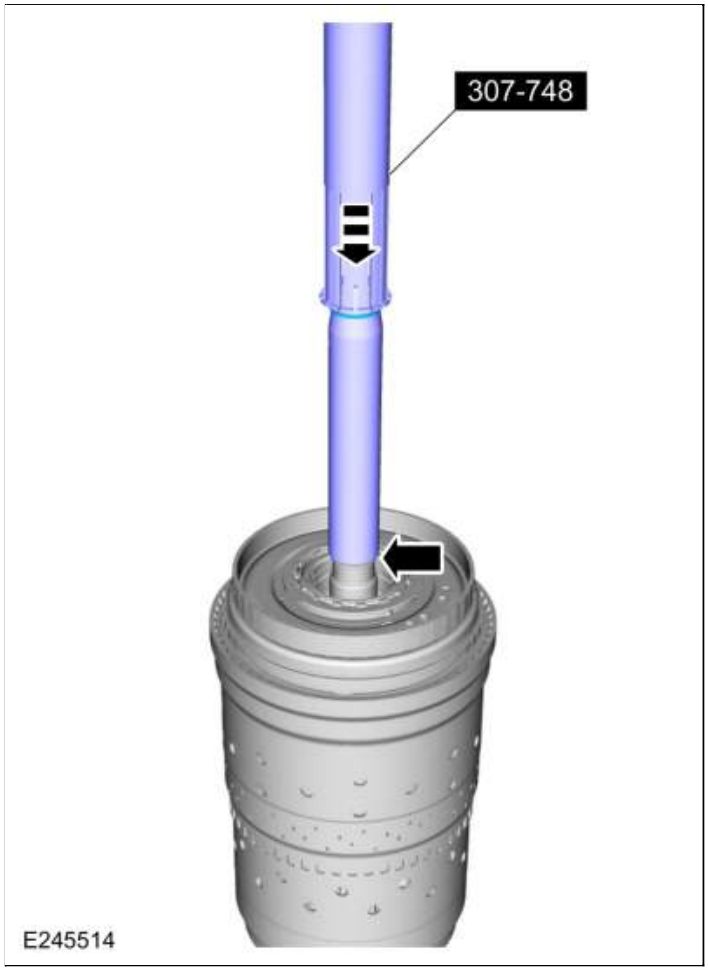
214. Install the special tool and adjust the special tool to align the bottom edge of the tool with the top edge of the bottom Teflon® seal groove.
Use Special Service Tool: 307-748 Installer/Sizer, Input Shaft Solid Sealing Rings; Small.



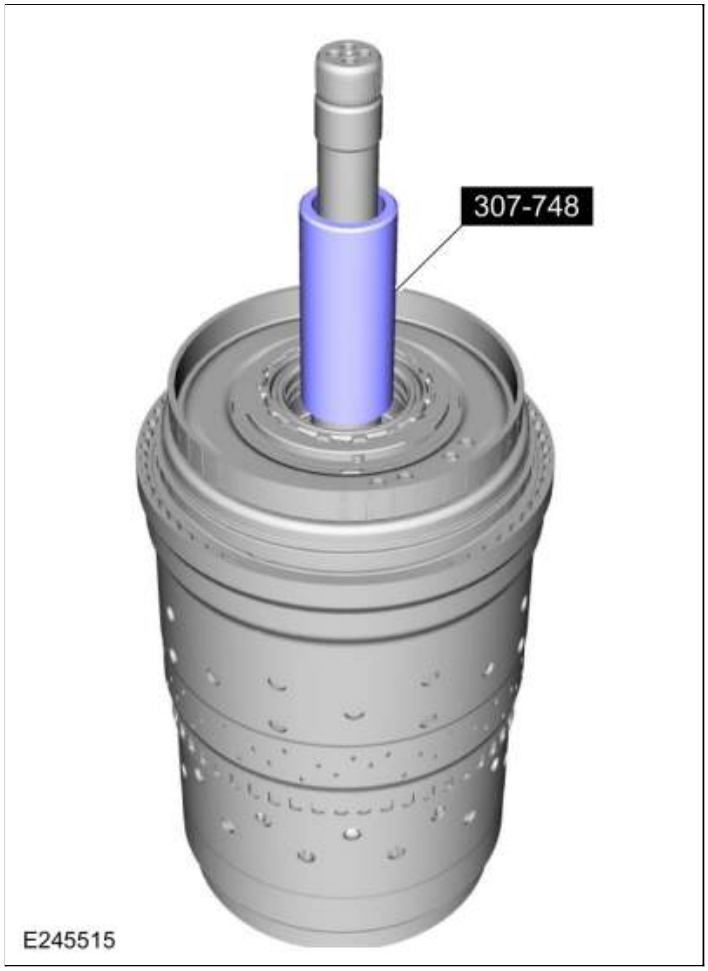
215. Install a new Teflon® seal on the special tool.
Use Special Service Tool: 307-748 Installer/Sizer, Input Shaft Solid Sealing Rings; Small.



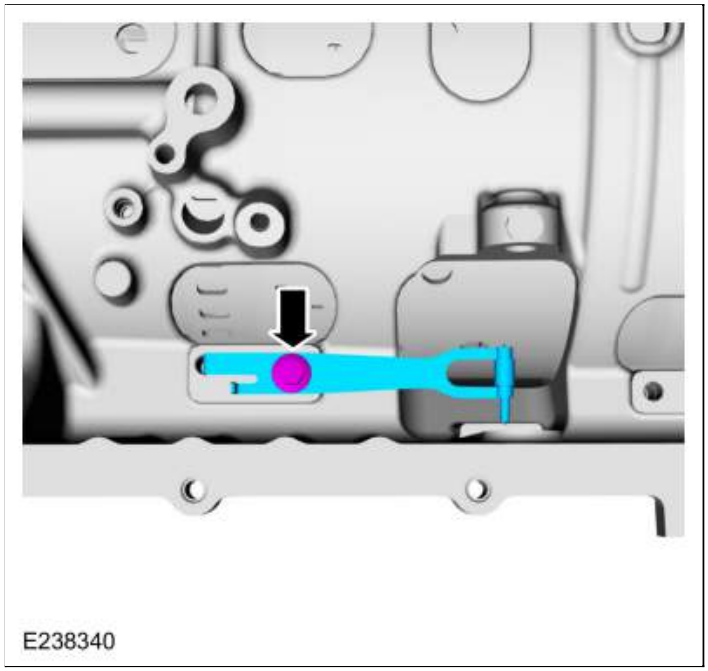
216. Using the top half of the special tool, slide the Teflon® seal into the groove. Remove the special tools and repeat the steps for the other 4 Teflon® seals.
Use Special Service Tool: 307-748 Installer/Sizer, Input Shaft Solid Sealing Rings; Small.



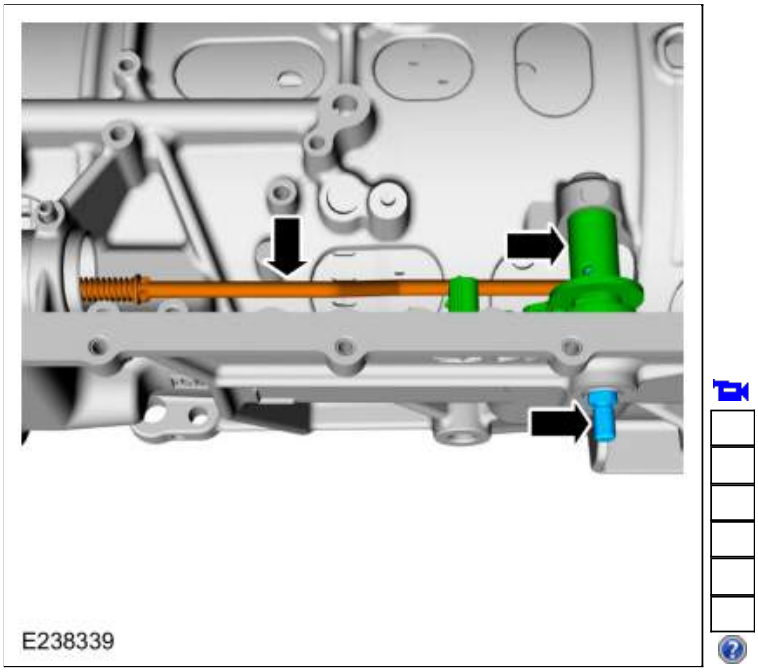
217. Install the special tool to size the 5 Teflon® seals. Allow the special tool to stay on the input shaft for 5 minutes prior to final assembly.
Use Special Service Tool: 307-748 Installer/Sizer, Input Shaft Solid Sealing Rings; Small.



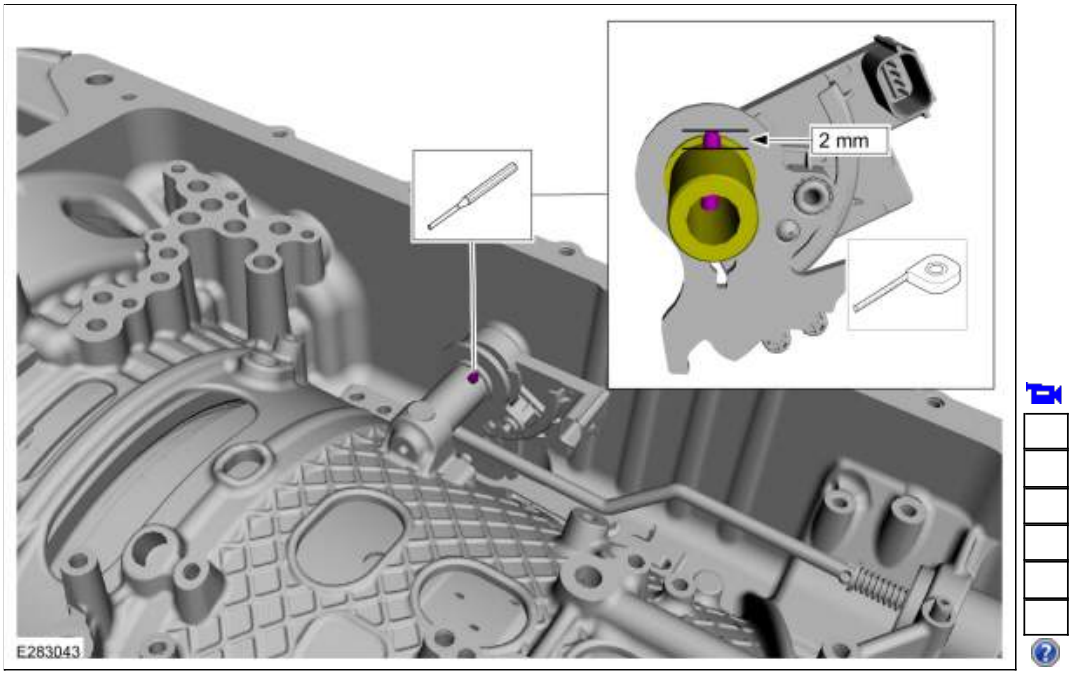
218. Install the TR sensor detent spring and loosely install the bolt.



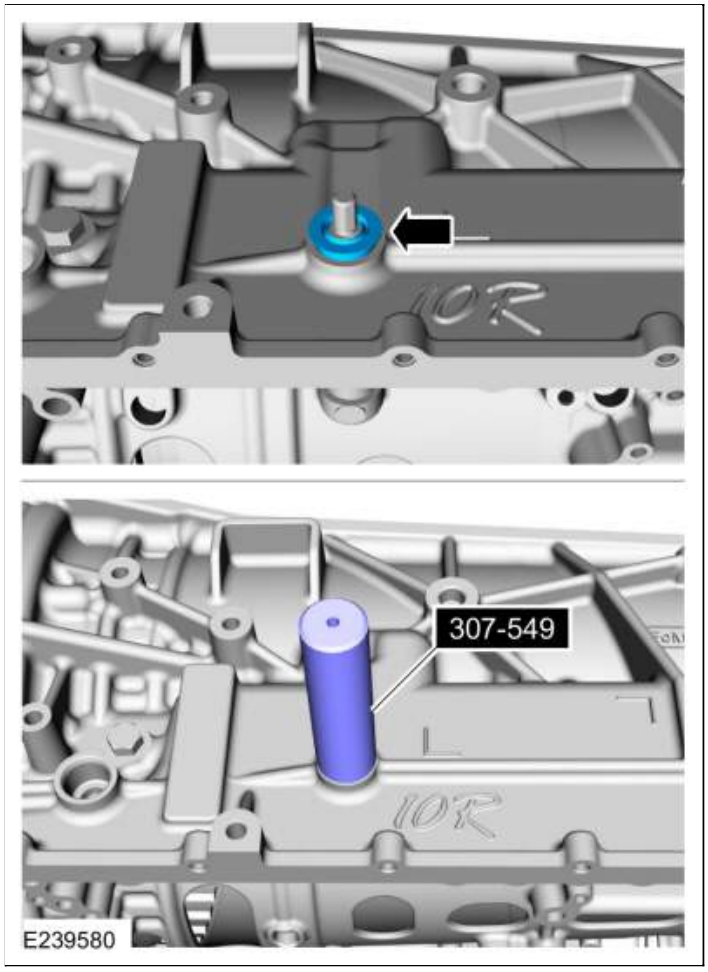
219. Install the park pawl actuator rod, manual shaft and the TR sensor.



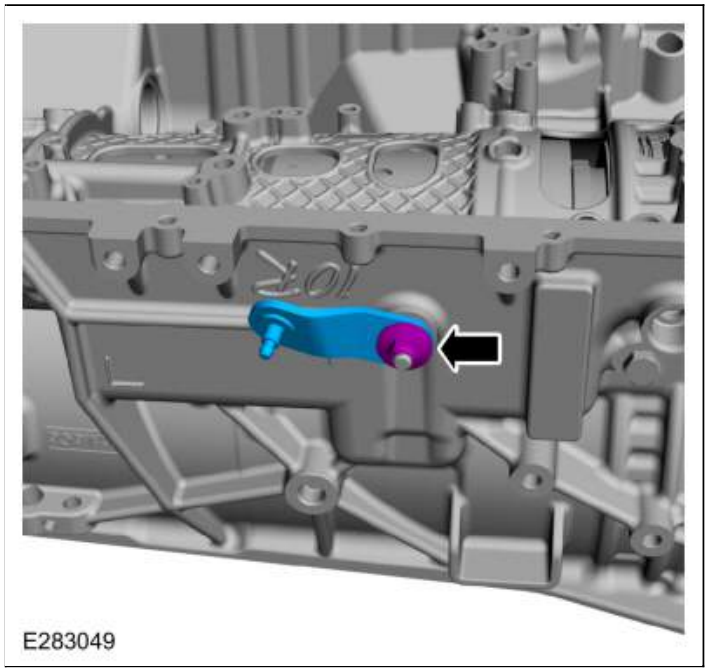
220. Install the new manual control shaft-to-TR sensor roll pin to the specified height.



221. Install the manual shaft seal on the manual shaft. Using the special tool install the manual shaft seal in the transmission case.
Use Special Service Tool: 307-549 Installer, Shift Shaft Fluid Seal.

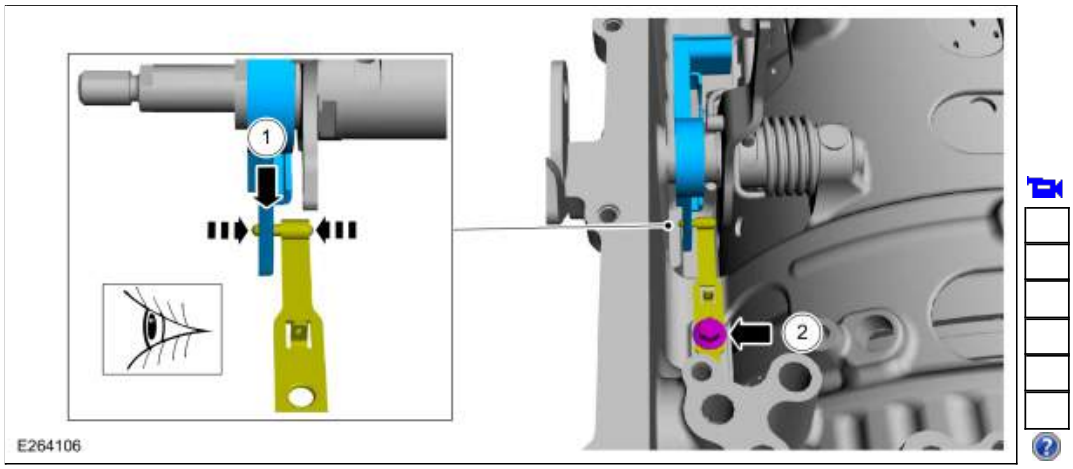


222. Install the selector lever and the nut.
Torque: 106 lb.in (12 Nm)



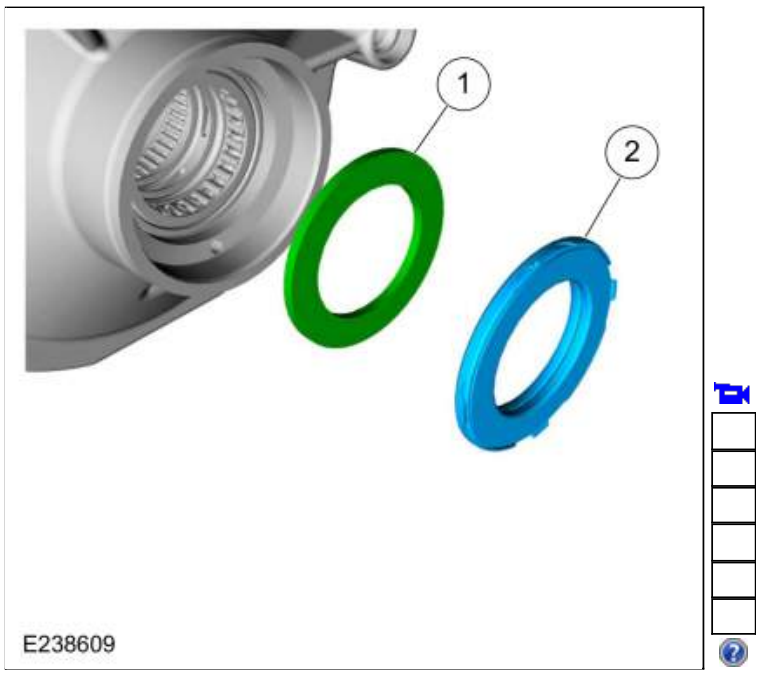
223.

1. Align the detent spring in the center of the TR sensor.
2. *Torque*: 97 lb.in (11 Nm)

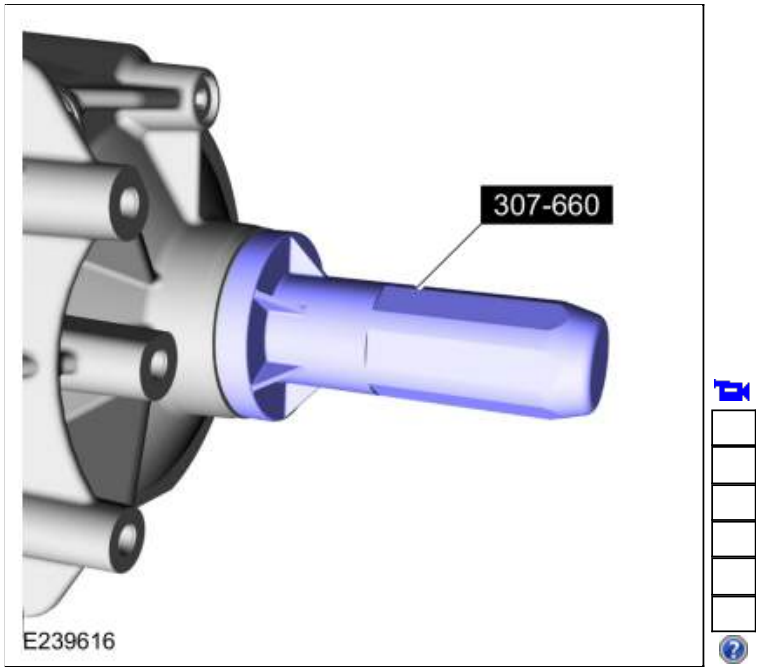


224. If equipped with 2WD, install the (T11) thrust bearing and thrust washer.

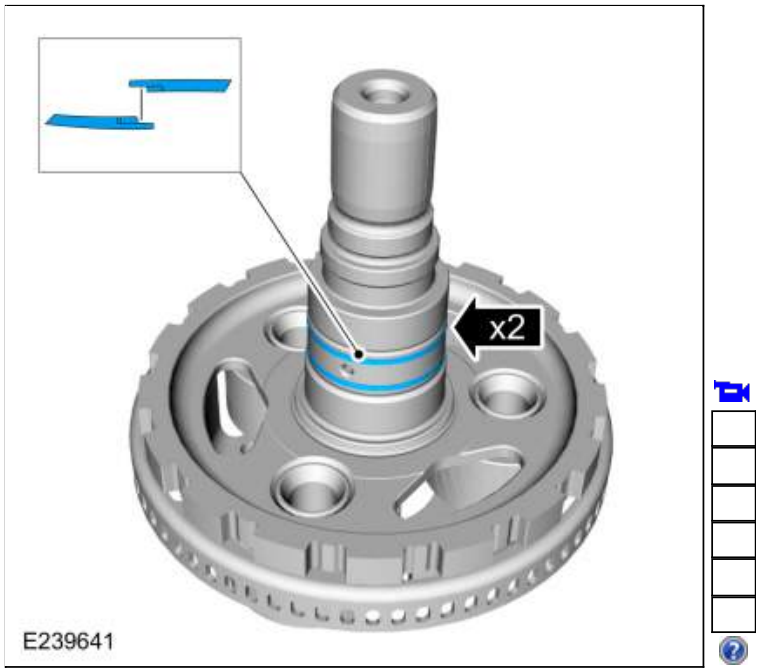
1. Thrust washer
2. Thrust bearing (T11)



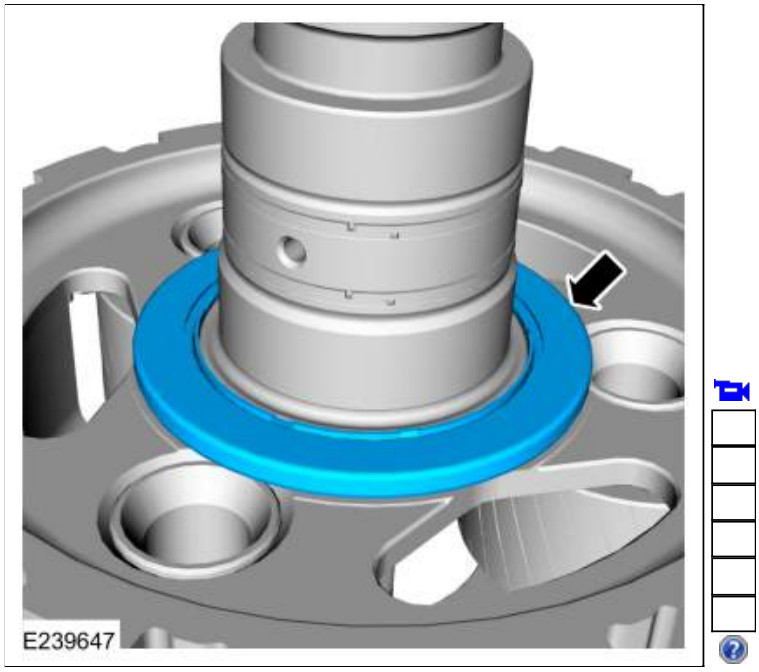
225. Using the special tool, install the output shaft seal.
Use Special Service Tool: 307-660 Installer, Front Pump Seal.



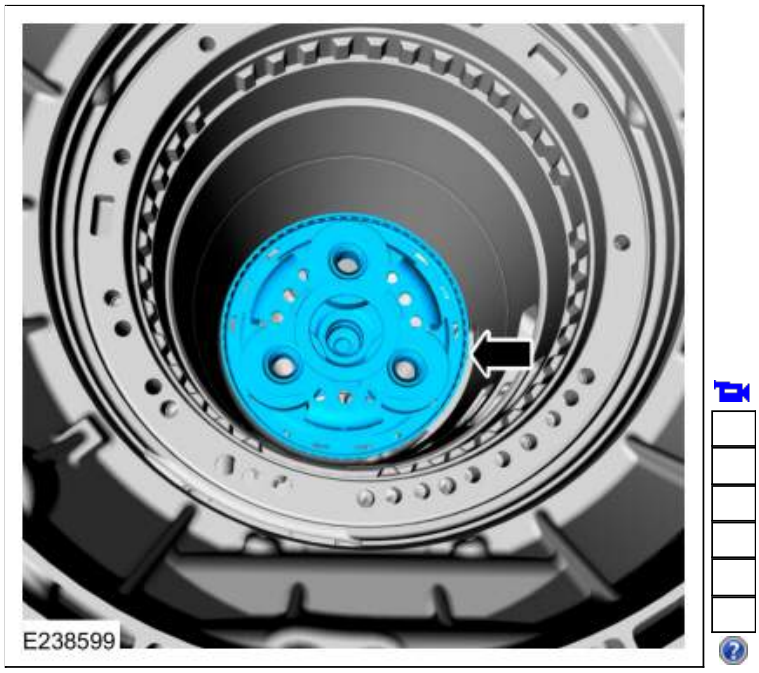
226. Install new seals on the output shaft.



227. Install the (T10) thrust bearing on the output shaft.

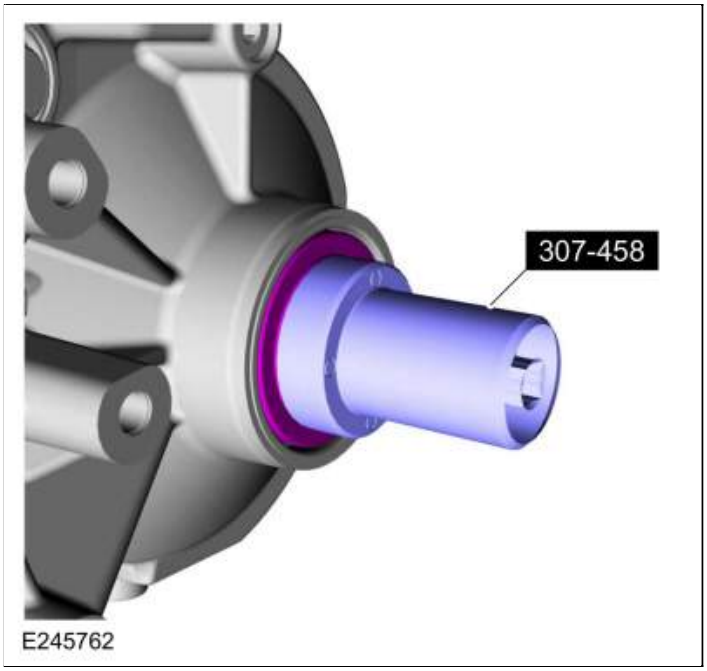


228. Rotate the manual lever to N. Install the output shaft and planetary carrier assembly No. 4.



Rear Wheel Drive (RWD) vehicles

229. Rotate the manual lever to P. Using the special tool, install the new output shaft nut. Hold the output shaft and planetary carrier assembly No. 4 to the back of the transmission case while tightening.
Use Special Service Tool: 307-458 Socket, Output Shaft Locknut.
Torque: 148 lb.ft (200 Nm)



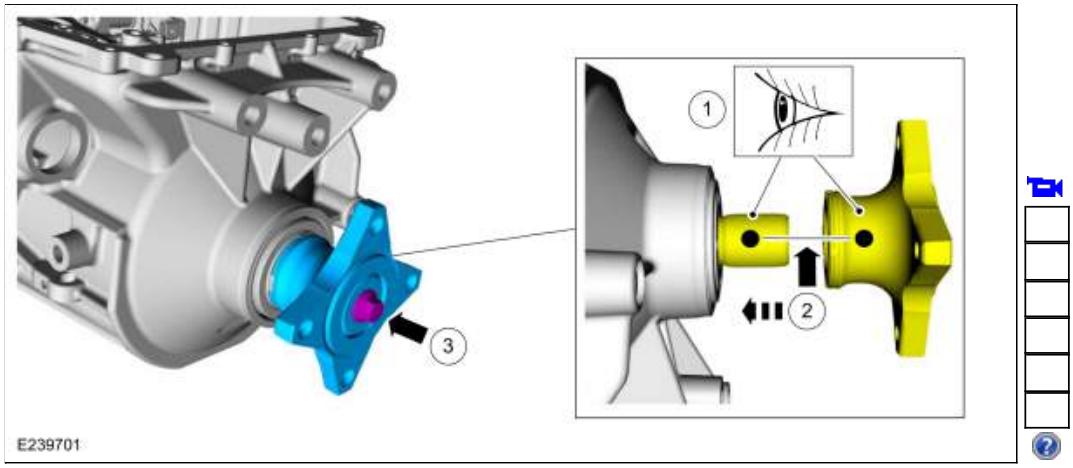
230. If removed, install the anti-ting ring.

231.

1. **NOTE:** *Some early build transmissions are not equipped with lazer applied ink marks.*

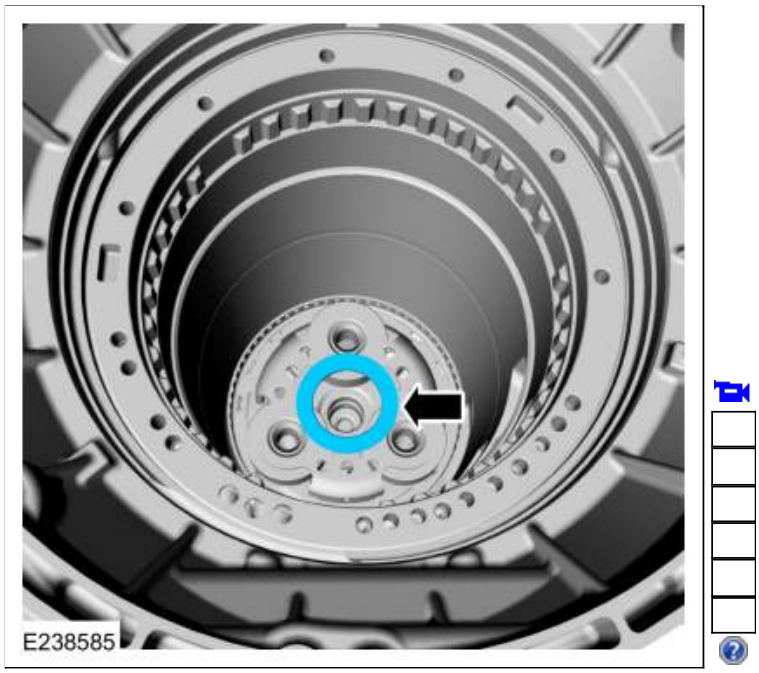
   Inspect the output shaft and the output shaft flange for lazer applied ink marks.
2. **NOTICE: If ink marks are present the marks must be aligned or a transmission vibration can occur.**

   If ink marks are present align the marks and install the output shaft flange on the output shaft.
3. Install a new output shaft flange bolt.
   Torque: 81 lb.ft (110 Nm)



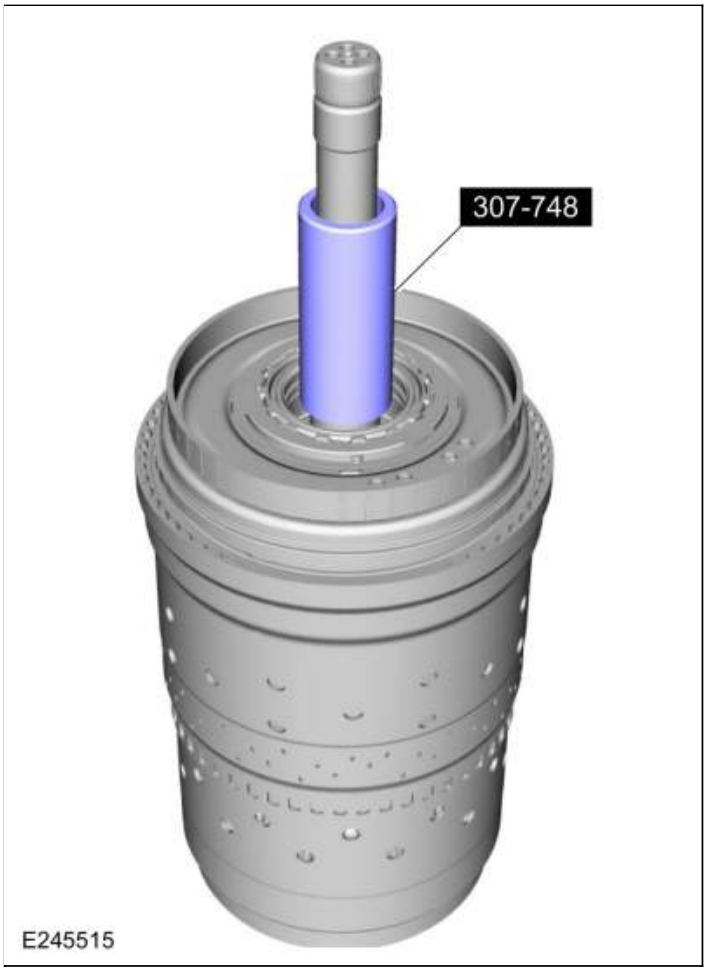
All vehicles

232. Install the (T9) thrust bearing.

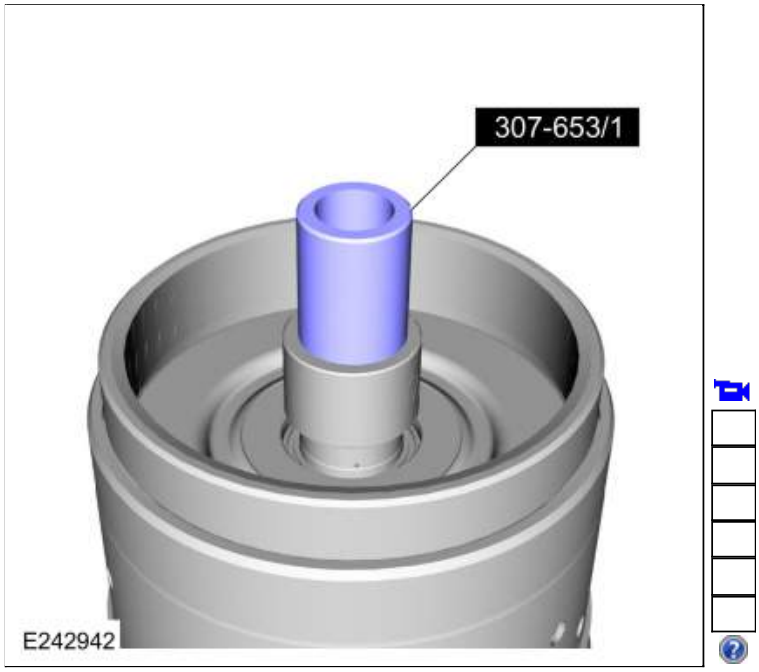


233. Lubricate the output shaft bushing with petroleum jelly.

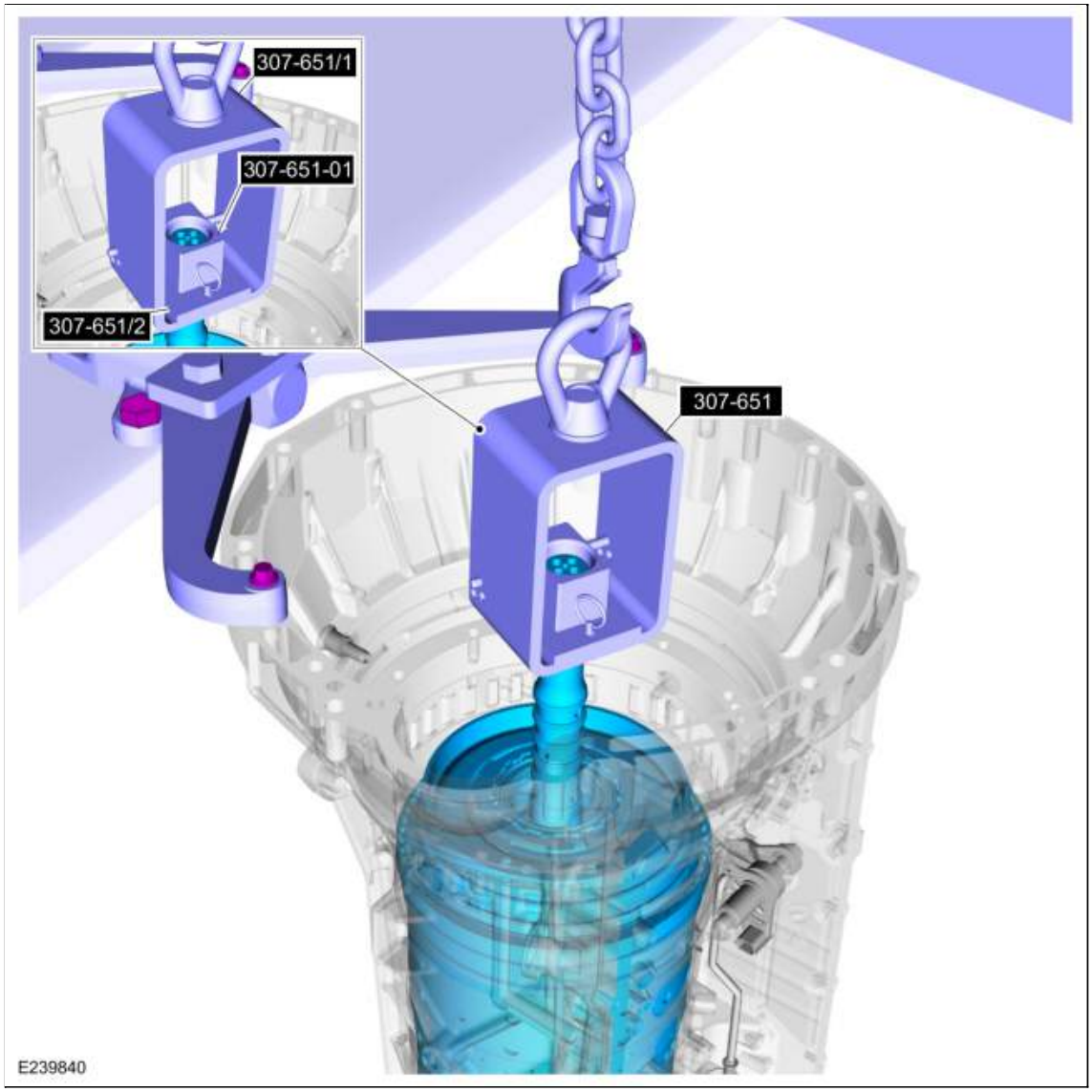
234. Remove Special Service Tool: 307-748 Installer/Sizer, Input Shaft Solid Sealing Rings; Small.



235. Remove Special Service Tool: 307-653 Sizer, Input Shaft Teflon Seal.



236. Using the special tools and a floor crane, install the clutch and planetary assembly.
Use Special Service Tool: 307-651 Bracket, Pump Remover/Installer. , 307-651-01 Adapter for 307-651 (Super Sub Assembly Lifting).

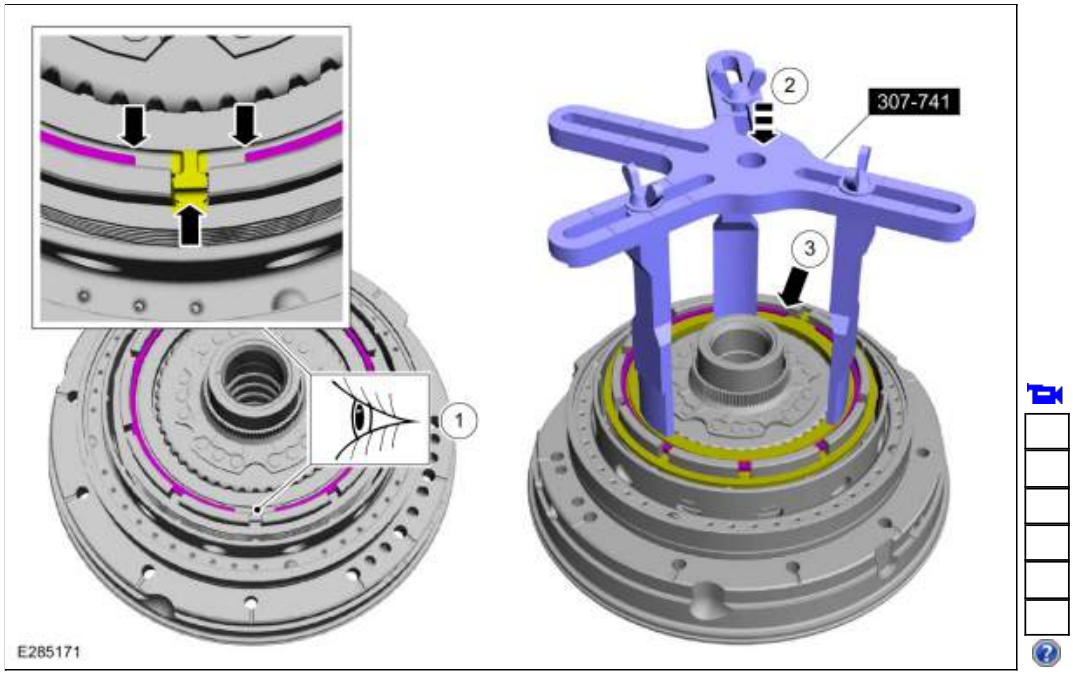


237.

Using the special tool, remove the B clutch snap ring.

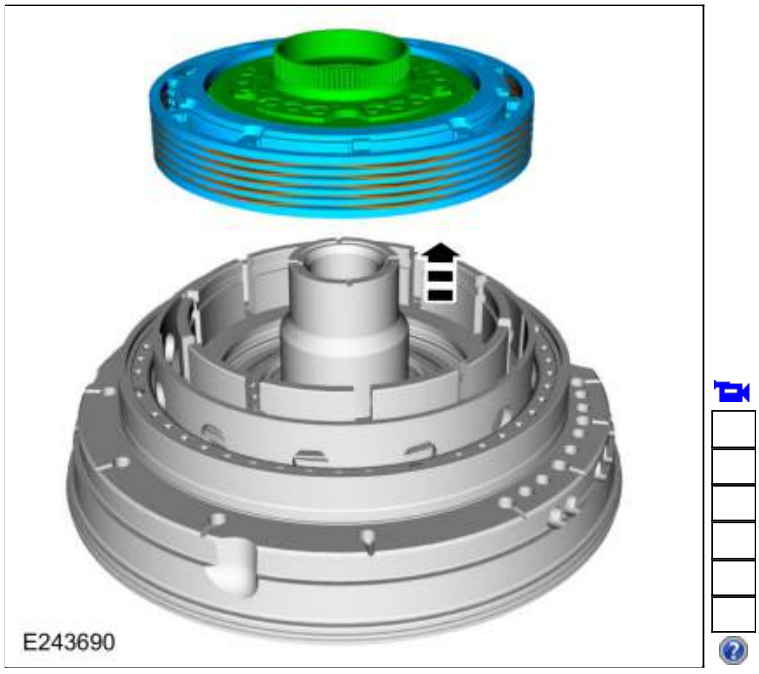
1. **NOTE:** *The B clutch snap ring ends are positioned in the opening of the B clutch pressure plate with a raised notch.*

   Note the position of the B clutch snap ring ends for assembly.
2. Using the special tools and a press, compress the B clutch assembly.
   Use Special Service Tool: 307-741 Spring Compressor, F Clutch.
   Use the General Equipment: Hydraulic Press
3. Remove the B clutch snap ring.



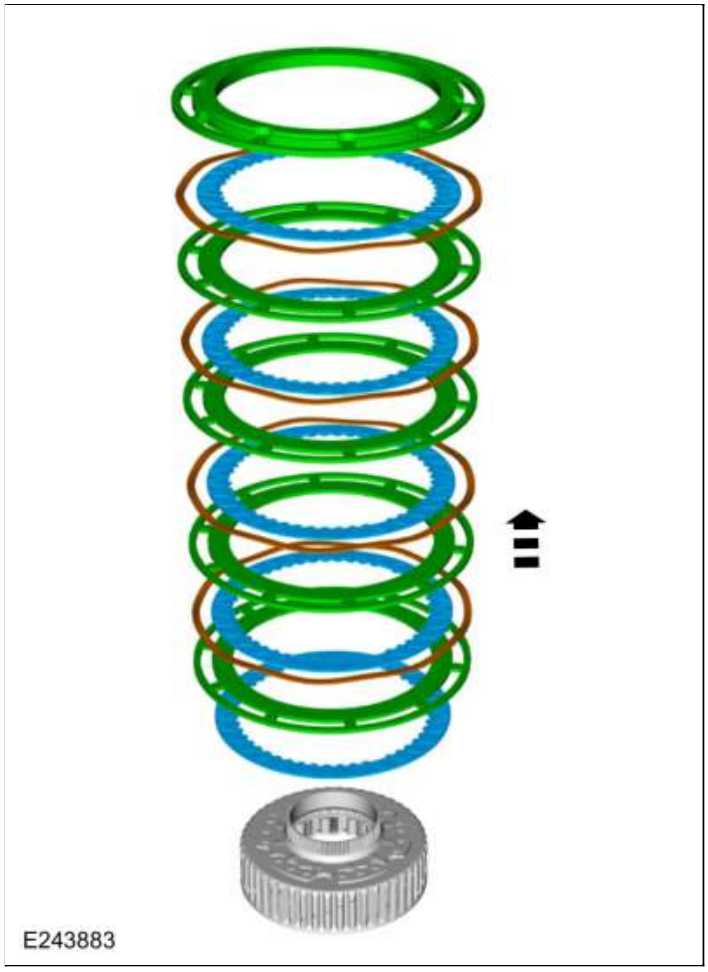
238. **NOTICE: Remove the One-Way Clutch (OWC) and B clutch assembly gently, as the One-Way Clutch (OWC) rollers and springs could become dislodged.**

Gently remove the One-Way Clutch (OWC) and B clutch assembly.



239. **NOTICE: If replacing B clutch separating springs, all separating springs must be replaced as a matching set or damage can occur.**

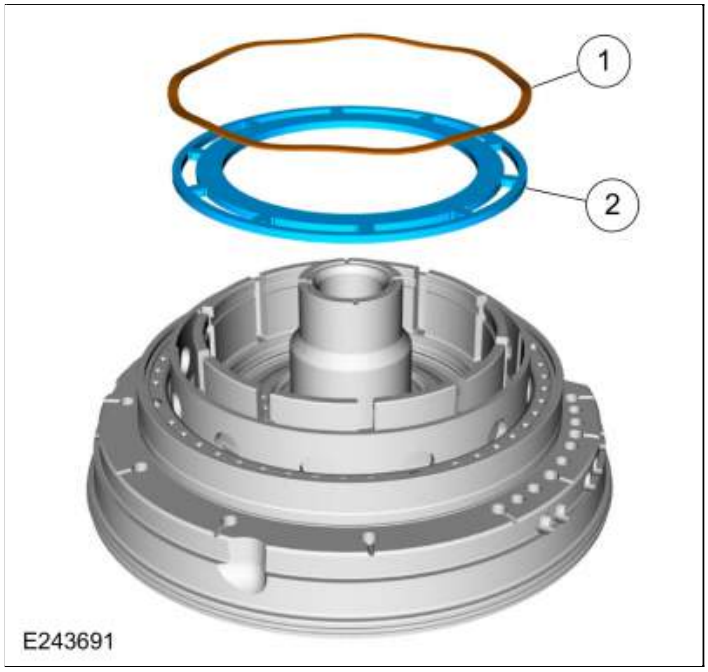
Remove the B clutch assembly from the One-Way Clutch (OWC). Inspect the clutch plates for excessive wear or damage. If the clutch plates are excessively worn or damaged replace as necessary. If the clutch plates are not excessively worn or damaged, they can be reused.



240.

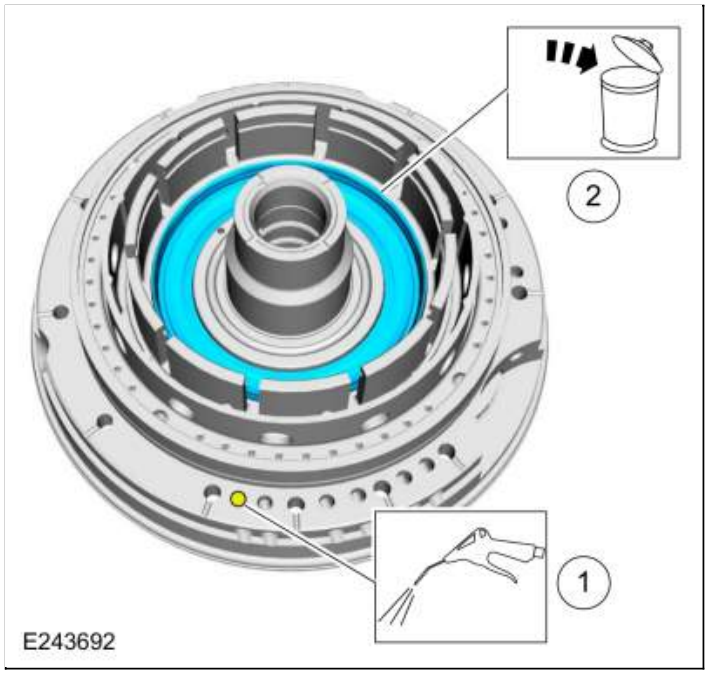
Remove the B clutch apply plate and the one remaining B clutch separating spring.

1. B clutch separating spring
2. B clutch apply plate



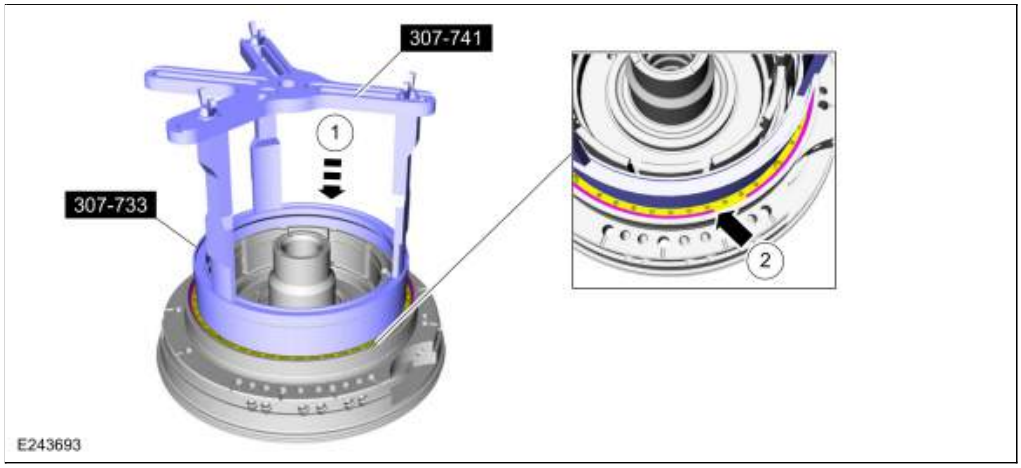
241.

1. Use compressed air into the oil passage hole.
2. Remove and discard the B clutch piston.

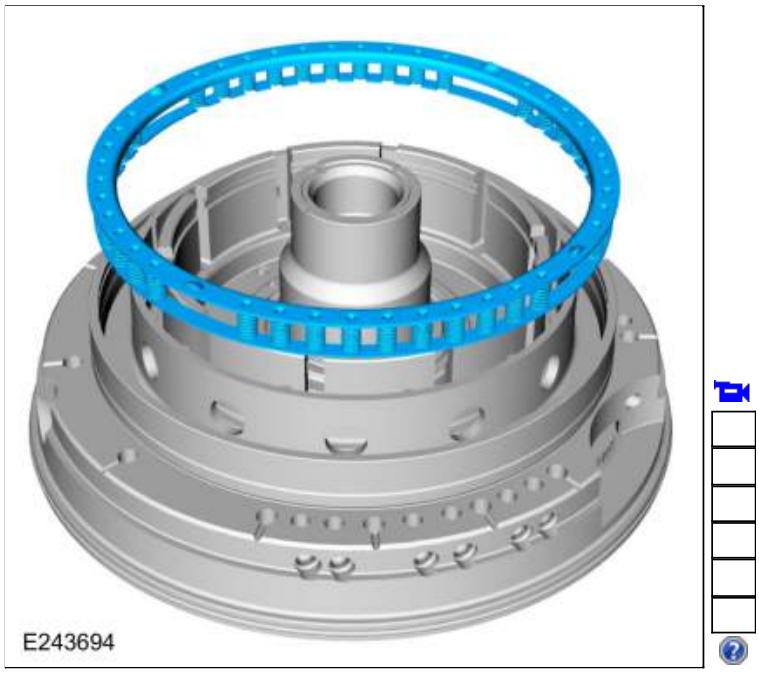


242.

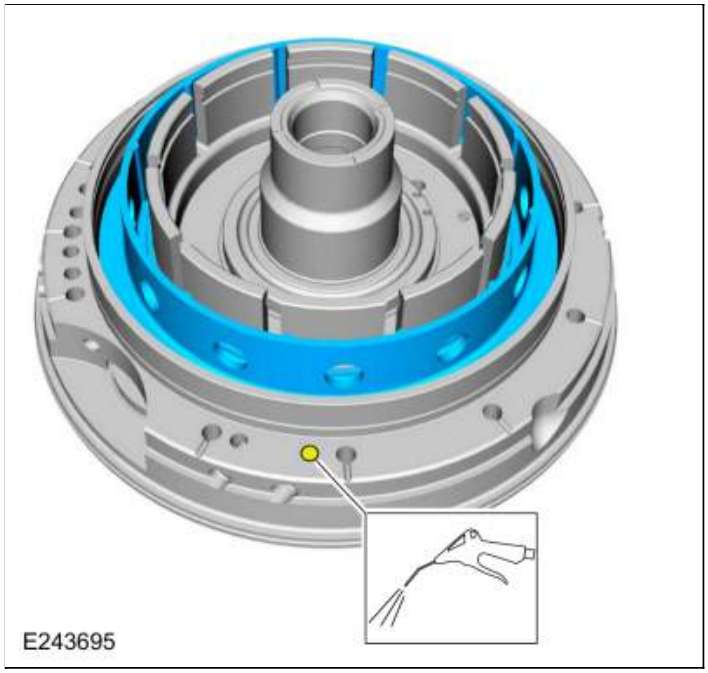
1. Using the special tools and a press, compress the A clutch piston return spring.
   Use Special Service Tool: 307-741 Spring Compressor, F Clutch. , 307-733 Compressor, Clutch Piston.
   Use the General Equipment: Hydraulic Press
2. Remove the A clutch piston return spring snap ring.



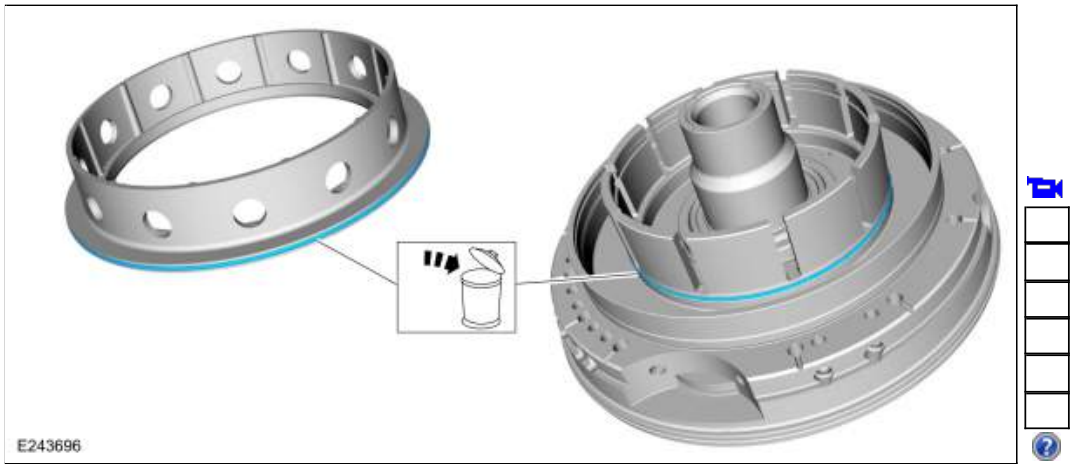
243. Remove the A clutch piston return spring.



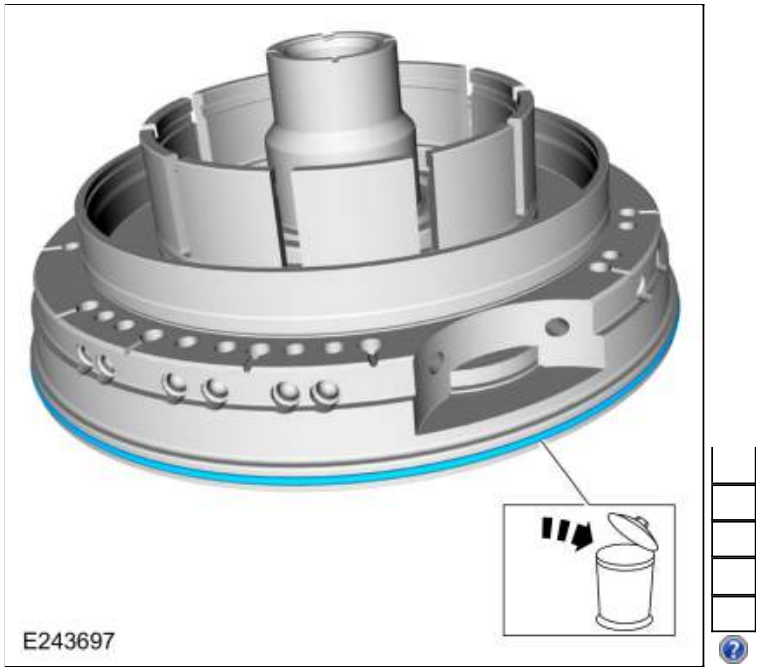
244. Use compressed air into the oil passage hole and remove the A clutch piston.



245. Remove and discard the A clutch piston outer seal and the A clutch piston inner seal.



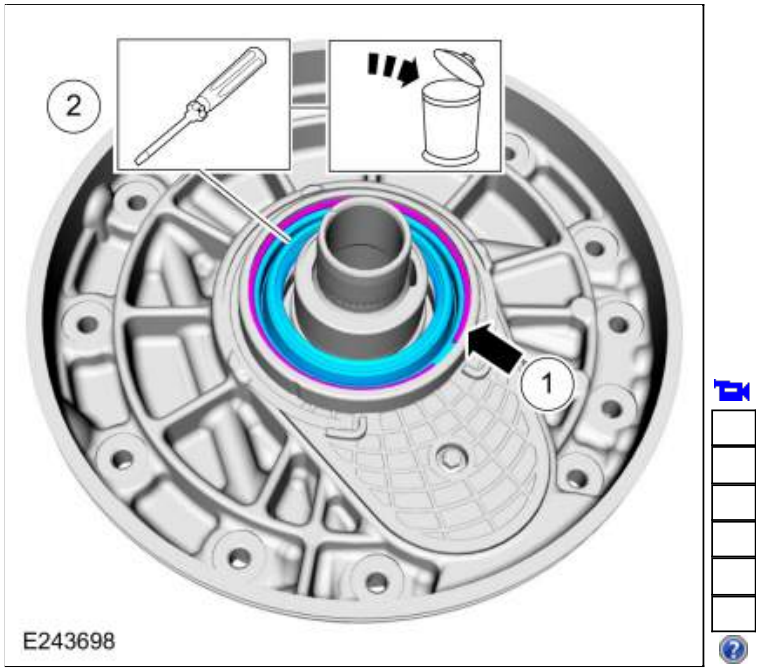
246. Remove and discard the front support-to-case seal.



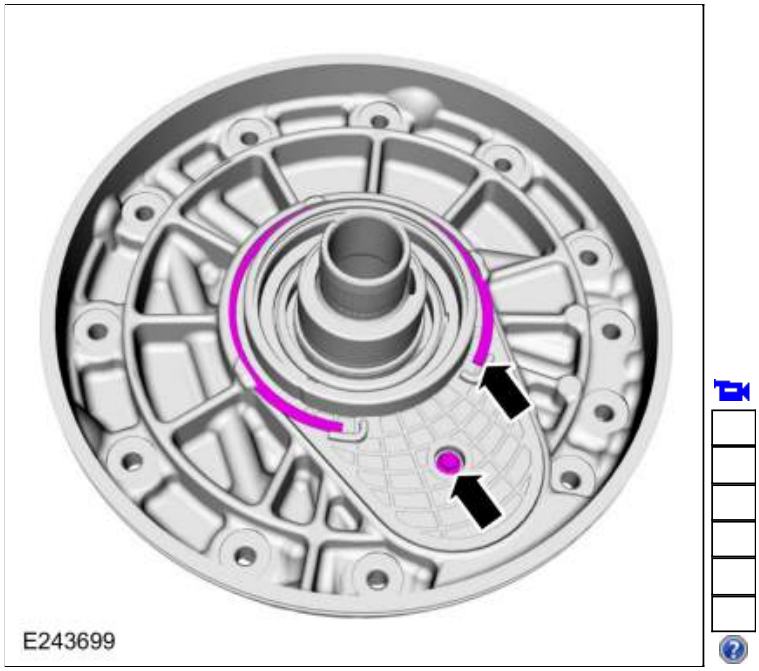
247.

1. Remove the torque converter hub seal snap ring.
2. **NOTE:** *When removing the torque converter hub seal use care not to scratch the front support cover sealing surface.*

   Remove and discard the torque converter hub seal.



248. Remove the front support cover bolt and the front support cover snap ring.

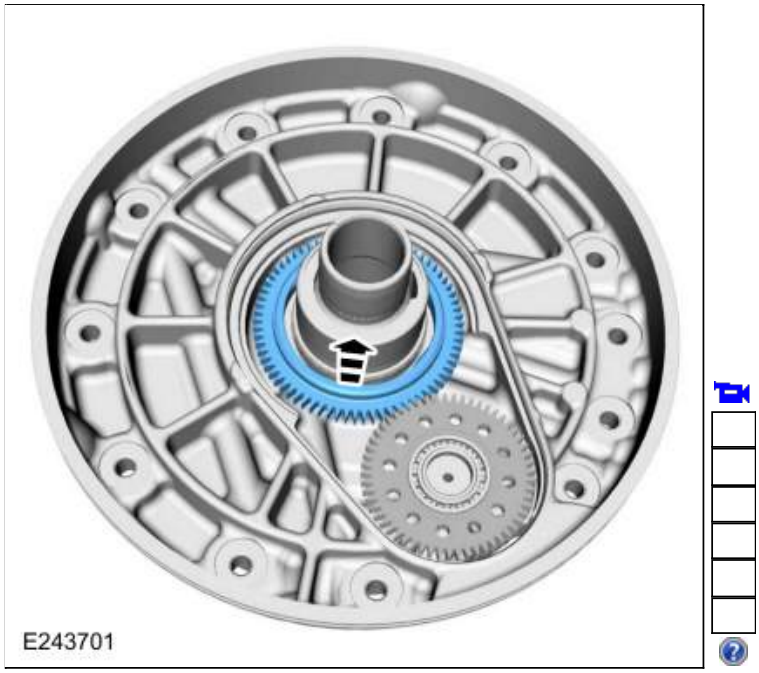


249.

1. **NOTICE: Do not pry on the transmission fluid pump drive gear to remove the front support cover or damage to the transmission fluid pump drive gear can occur.**

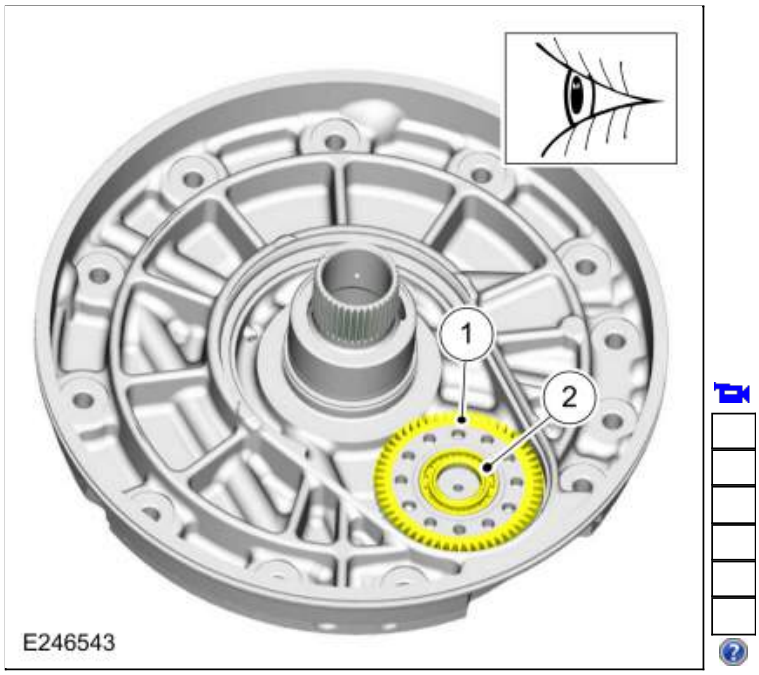
2. Push up on the back of the front support cover and remove the front support cover from the front support.

250. Remove the transmission fluid pump drive gear.



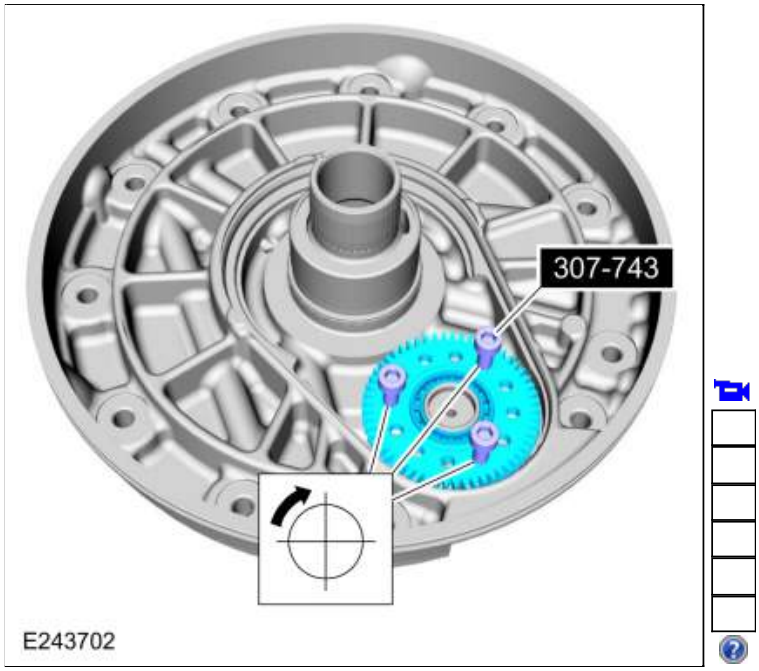
251.

1. Inspect the transmission fluid pump idler gear for damage.
2. Make sure the transmission fluid pump idler gear bearing spins freely and has no excessive end play.

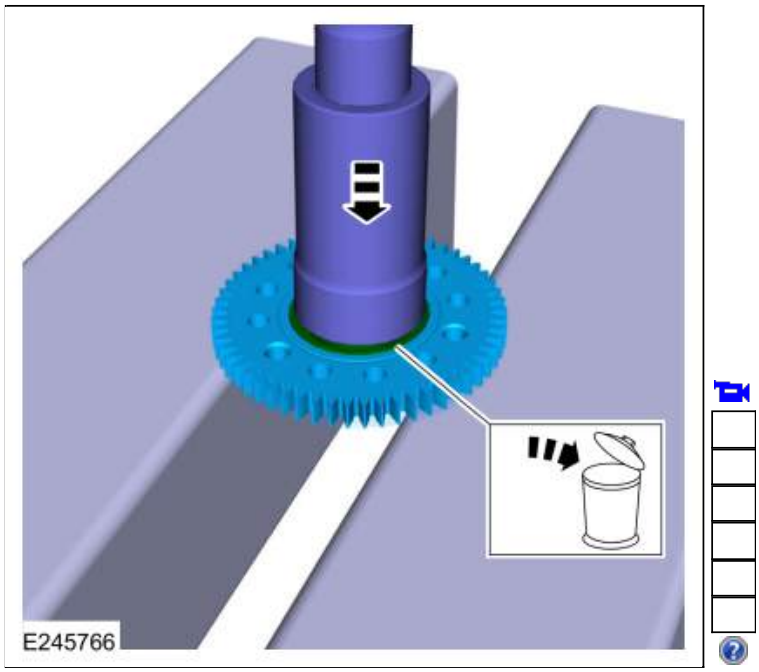


252. **NOTE:** *Tighten the special tools evenly to remove the transmission fluid pump idler gear.*

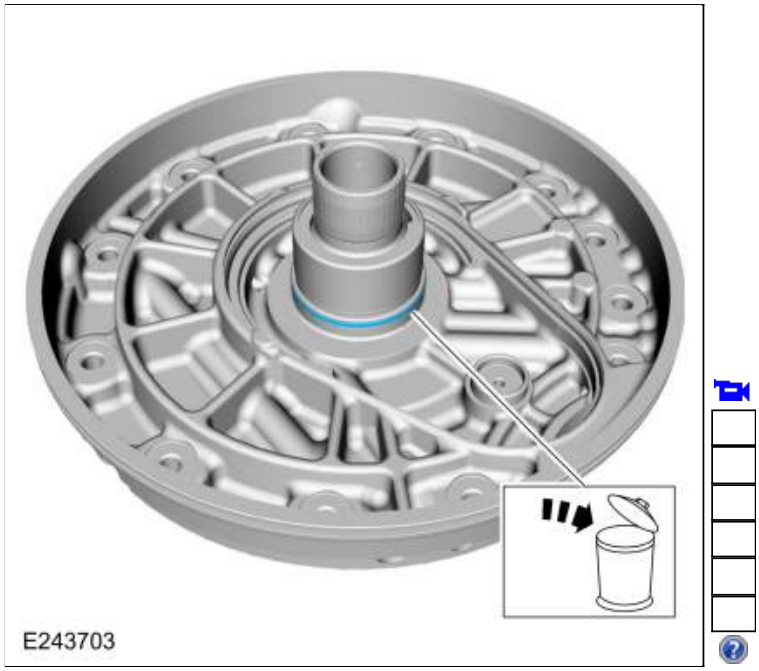
If necessary, use the special tools, to remove the transmission fluid pump idler gear and bearing.
Use Special Service Tool: 307-743 Remover, Pump Drive Gear.



253. Using a press, to remove and discard the transmission fluid pump idler gear bearing.
Use the General Equipment: Hydraulic Press

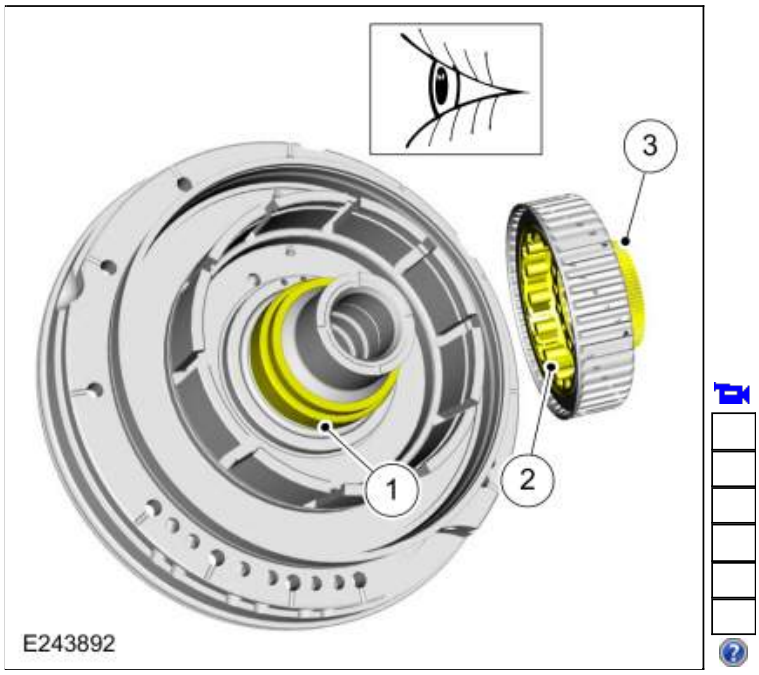


254. Remove and discard the stator support seal.

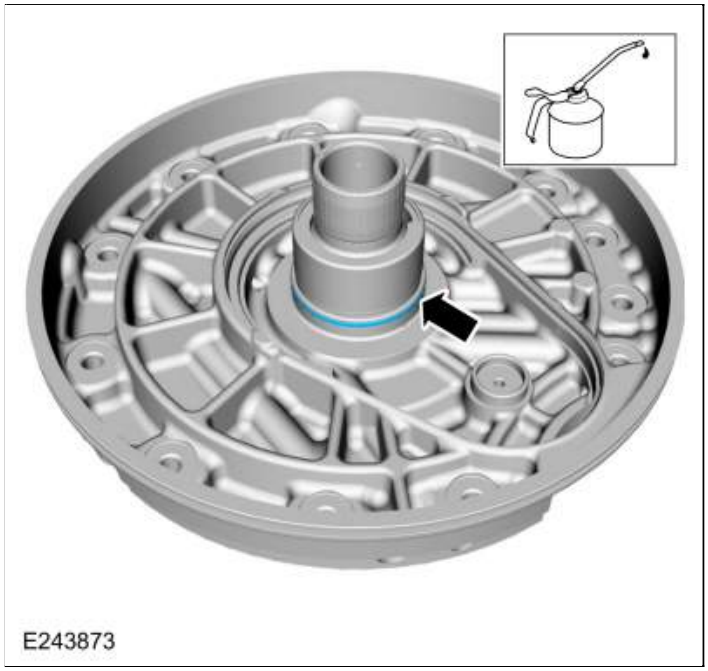


255. **NOTE:** *If the One-Way Clutch (OWC) needs to be replaced the front support must be replaced.*

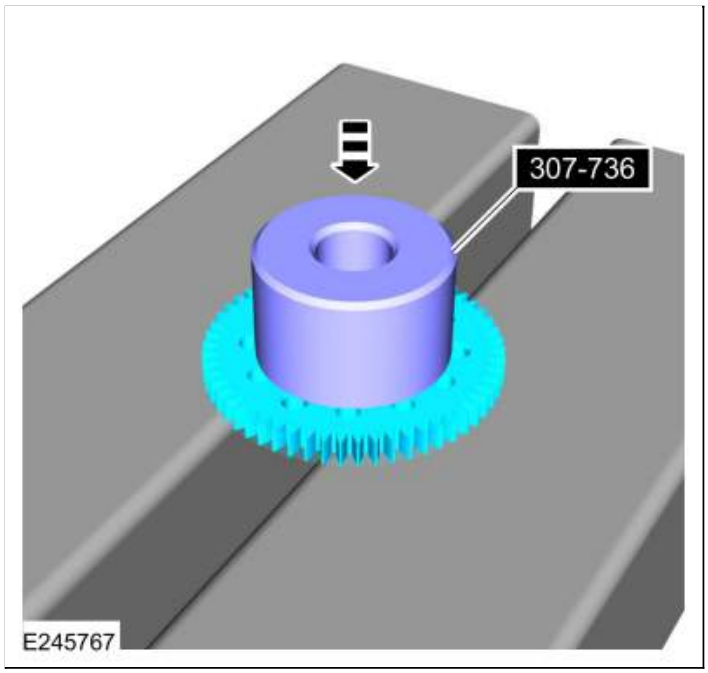
Clean and inspect the components for damage or excessive ware.
1. One-Way Clutch (OWC) inner race
2. One-Way Clutch (OWC) rollers
3. Gear splines



256. Install the new stator support seal on the front support. Lubricate the stator support seal with petroleum jelly.

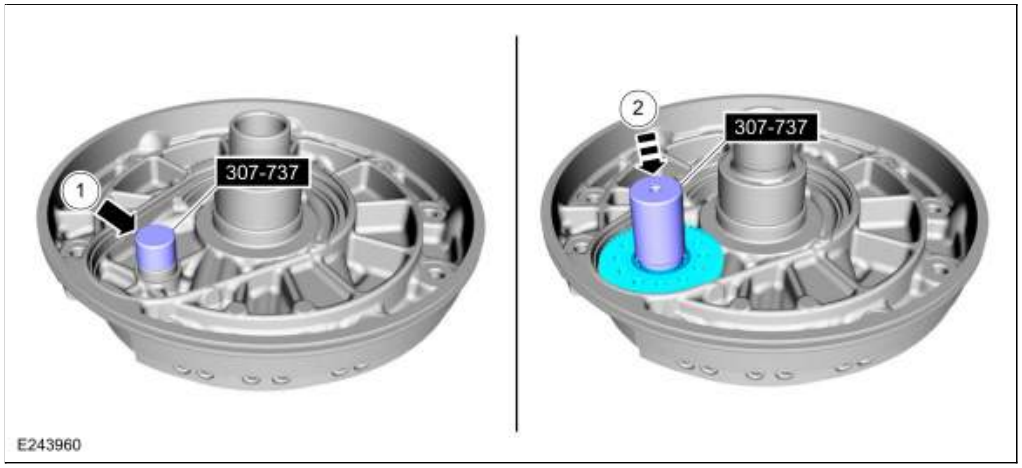


257. If removed, using the special tool and a press, install the new transmission fluid pump idler gear bearing.
Use Special Service Tool: 307-736 Installer, Pump Drive Gear Bearing.
Use the General Equipment: Hydraulic Press

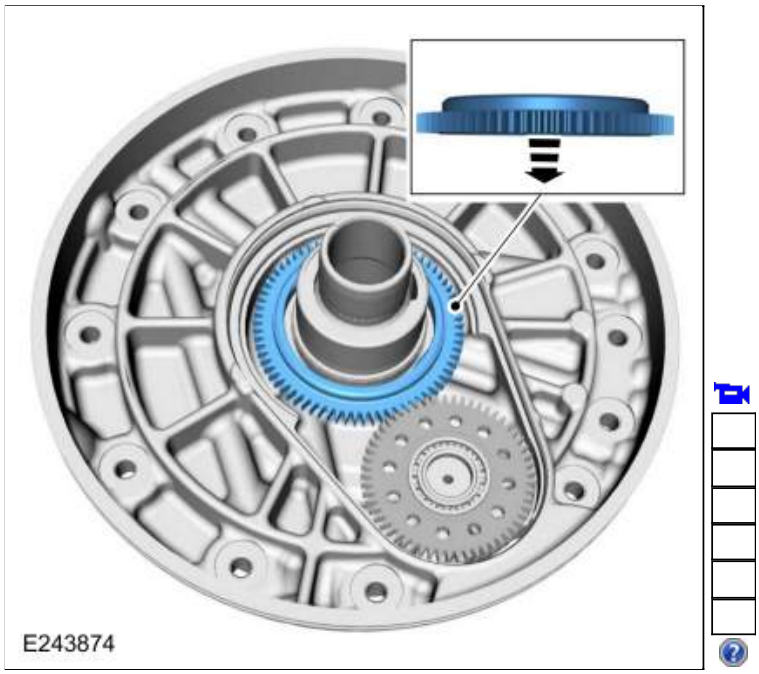


258.

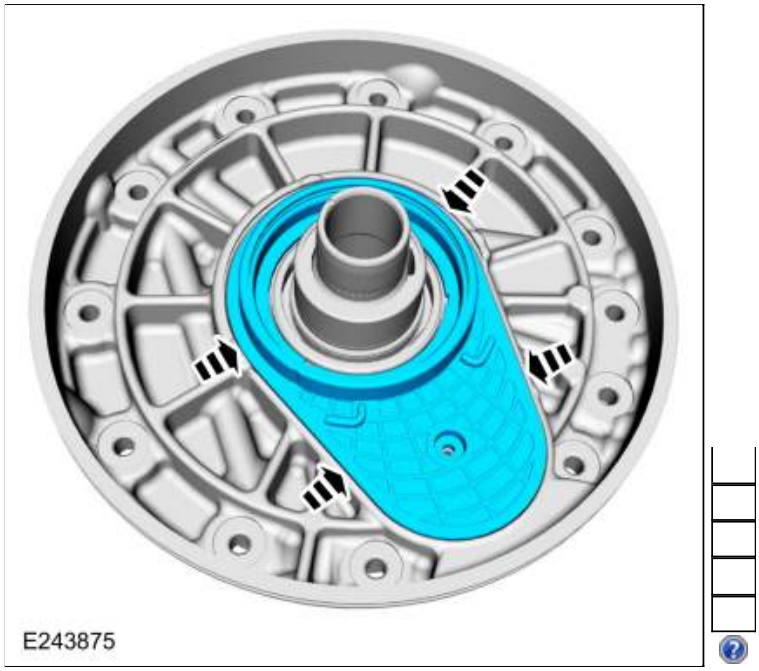
1. Position the special tool on the front support.
Use Special Service Tool: 307-737 Press Tool, Oil Pump Drive Idler Gear.
2. Using the special tools and a press, install the transmission fluid pump idler gear and bearing.
Use the General Equipment: Hydraulic Press



259. Install the transmission fluid pump drive gear with the flat side down.

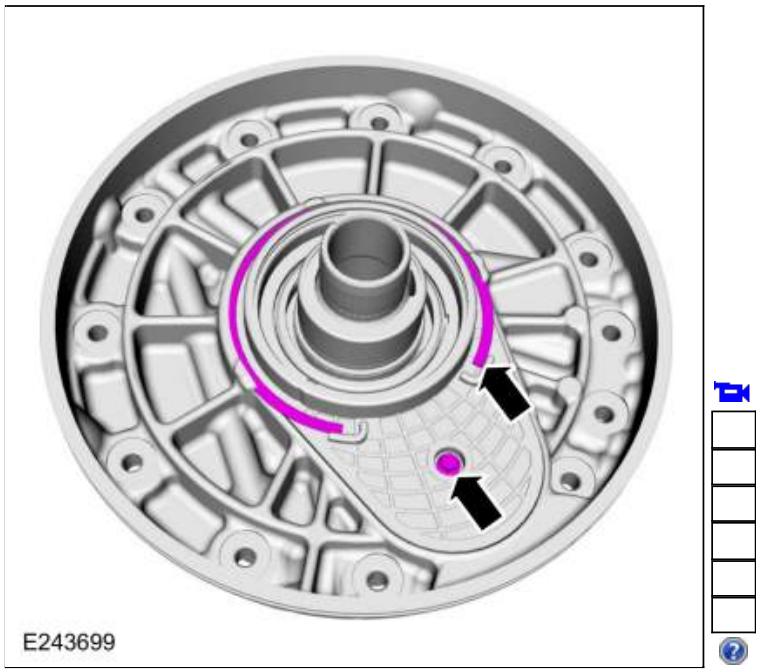


260. Install the front support cover by pressing down evenly by hand.

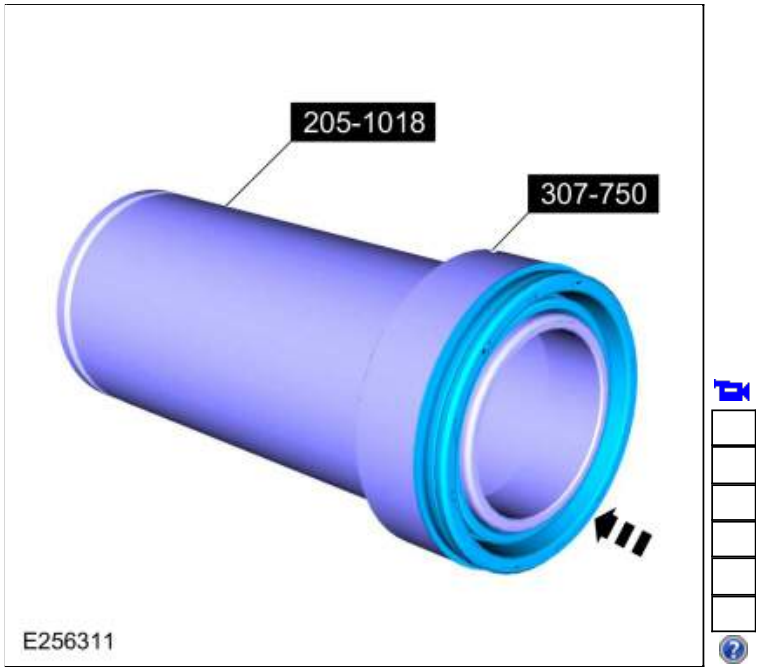


261. **NOTE:** *The front support cover snap ring ends are located in the cover alignment features.*

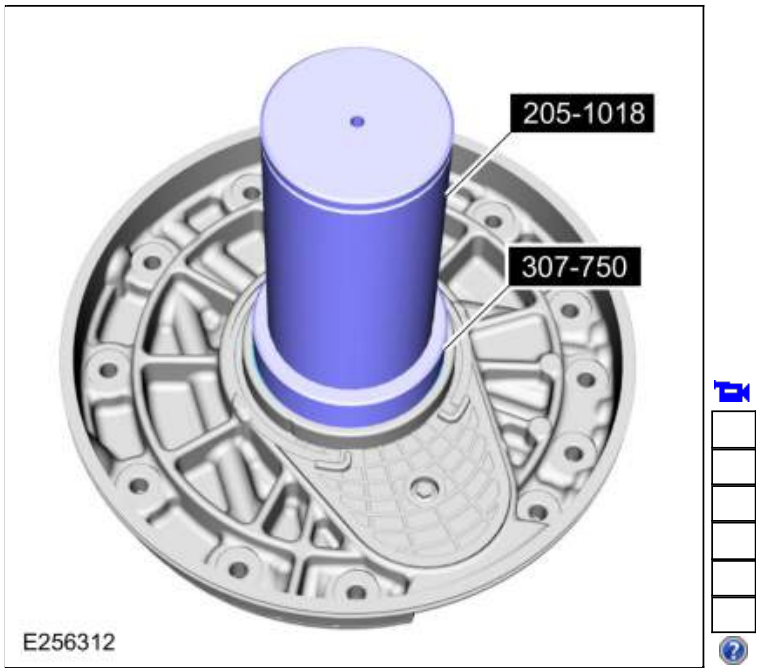
Install the front support cover bolt and the front support cover snap ring.
Torque: 62 lb.in (7 Nm)



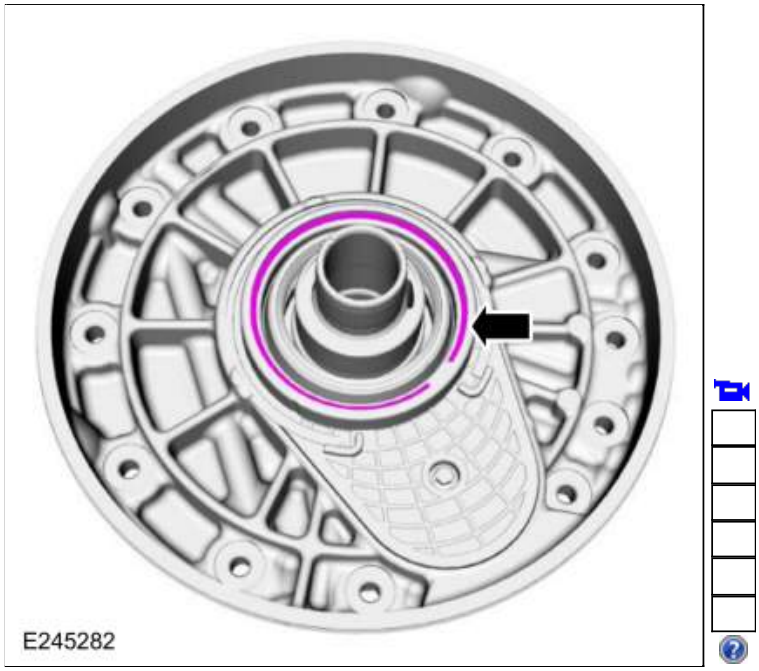
262. Install the new torque converter hub seal on the special tools.
Use Special Service Tool: 307-750 Installer, Converter Seal. , 205-1018 Installation Tube.



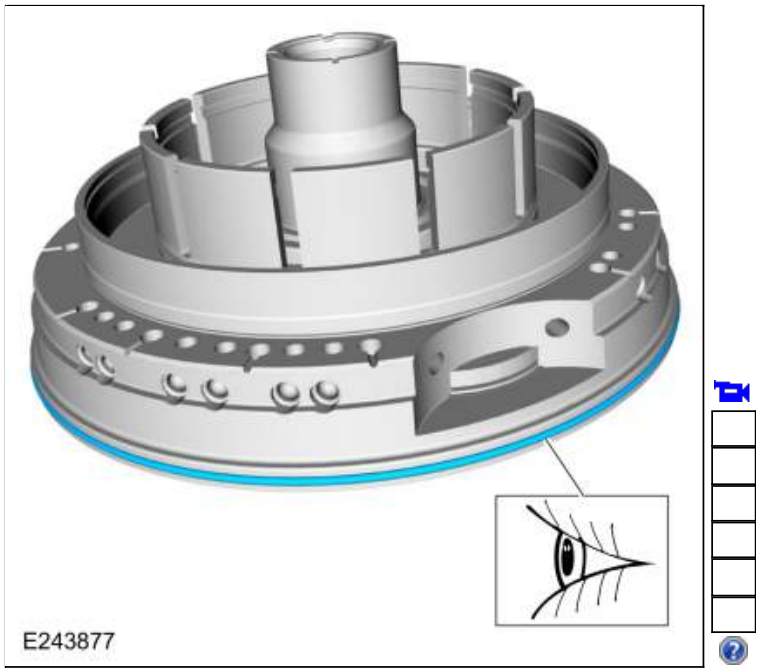
263. Using the special tools, install the new torque converter hub seal.
Use Special Service Tool: 307-750 Installer, Converter Seal. , 205-1018 Installation Tube.



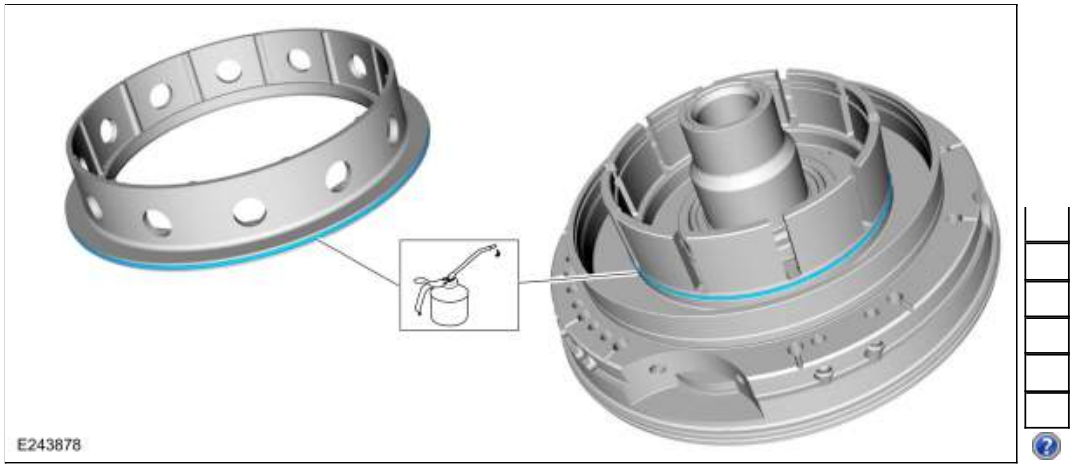
264. Install the torque converter hub seal snap ring.



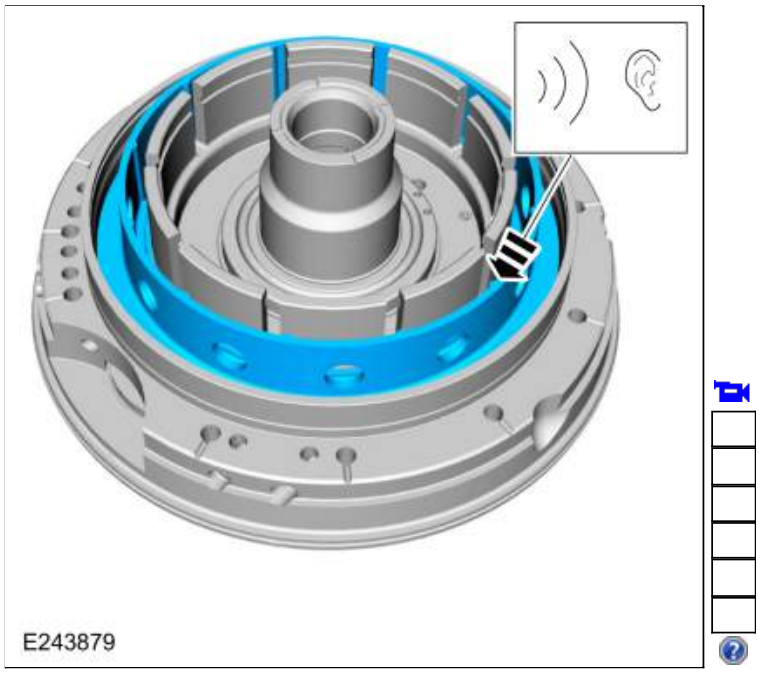
265. Install the new front support-to-case seal with the seal color visible from the outside.



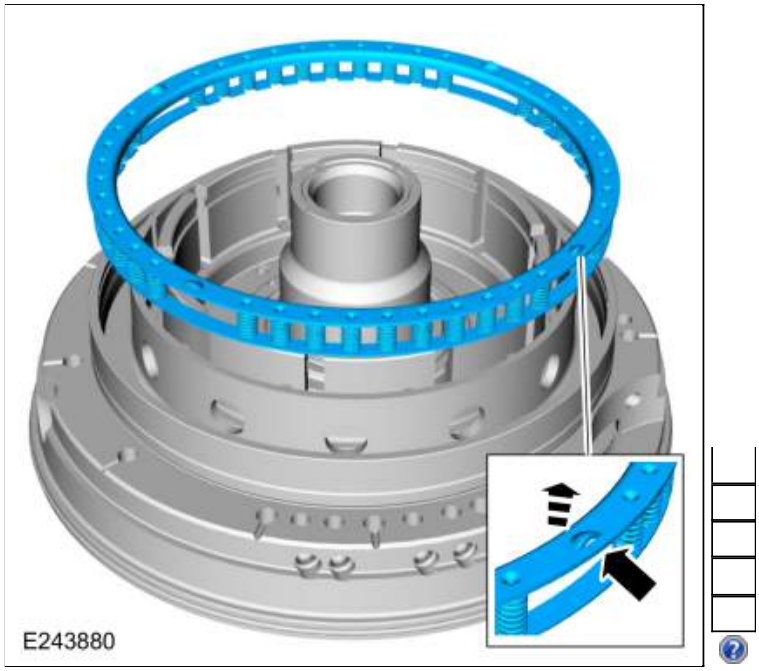
266. Install the new A clutch piston outer seal and the new A clutch piston inner seal. Lubricate the A clutch piston seals with petroleum jelly.



267. Install the A clutch piston by pushing down on the piston until an audible click is heard.



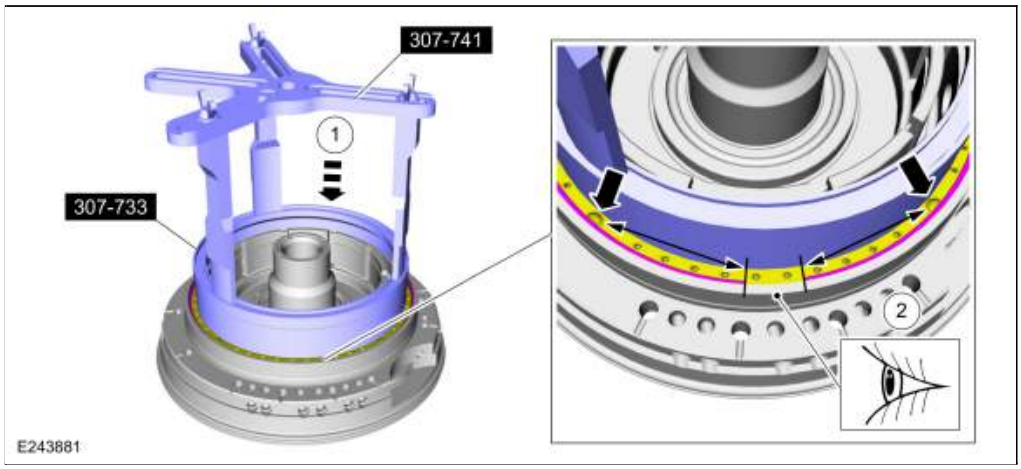
268. Install the A clutch piston return spring with the retaining tabs facing upward.



269.

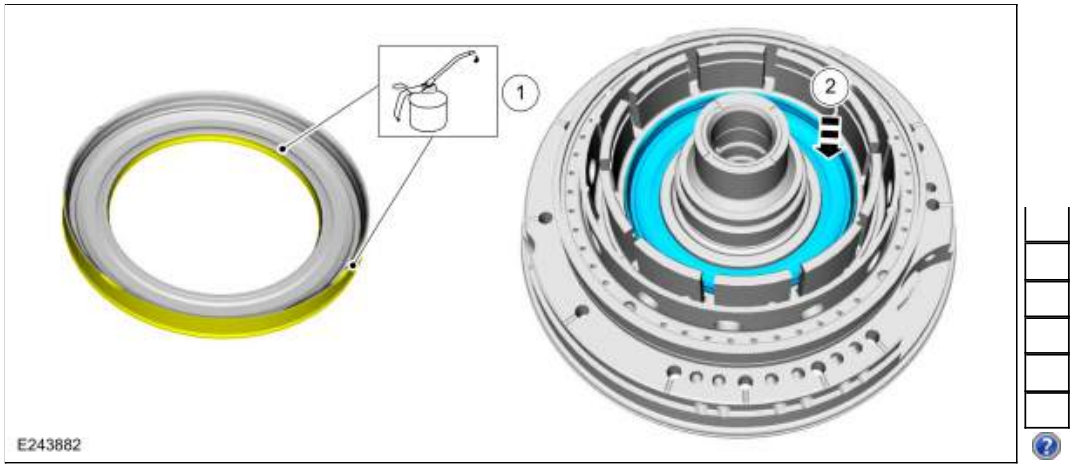
1. Using the special tools and a press, compress the A clutch piston return spring.
   Use Special Service Tool: 307-741 Spring Compressor, F Clutch. , 307-733 Compressor, Clutch Piston.
   Use the General Equipment: Hydraulic Press
2. **NOTE:** *Be sure snap ring ends are not located on the A clutch piston return spring retaining tabs.*

   Install the A clutch piston return spring snap ring ends in the center of the return spring retaining tabs.

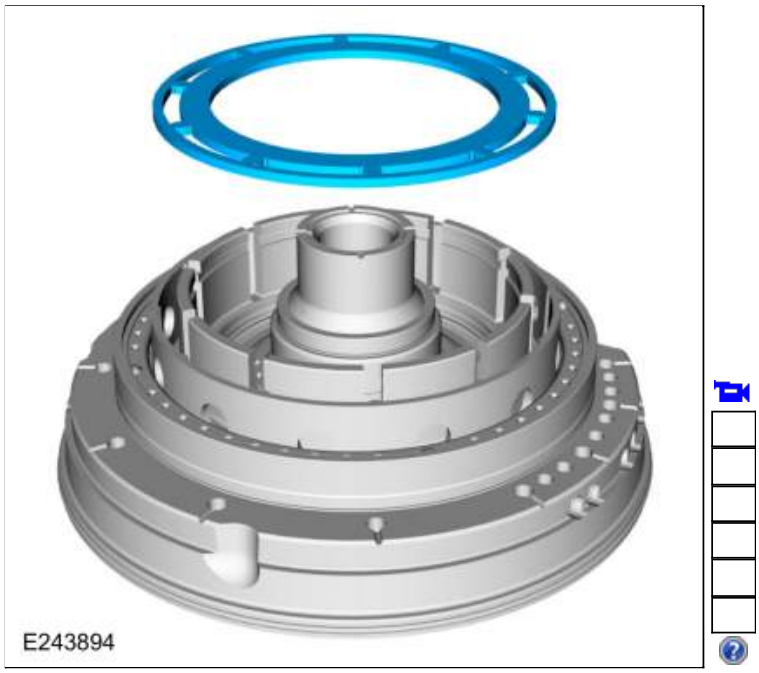


270.

1. Lubricate the B clutch piston seals with petroleum jelly.
2. Install the new B clutch piston.

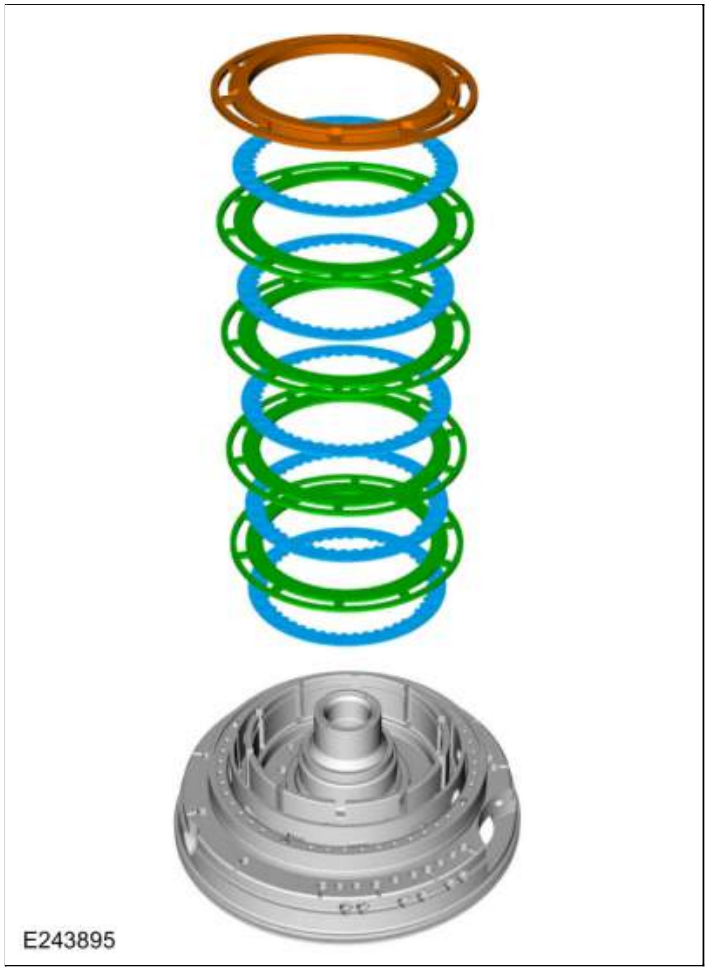


271. Install the B clutch apply plate.



272. **NOTE:** *The B clutch separating springs are not installed when measuring the B clutch clearance.*

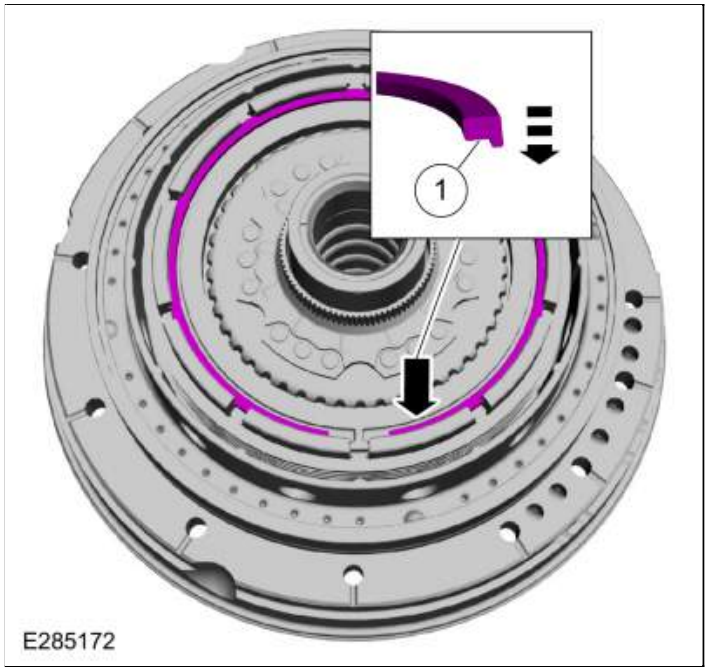
Temporarily install the B clutch friction plates, B clutch steel plates and the B clutch pressure plate to measure the B clutch clearance.



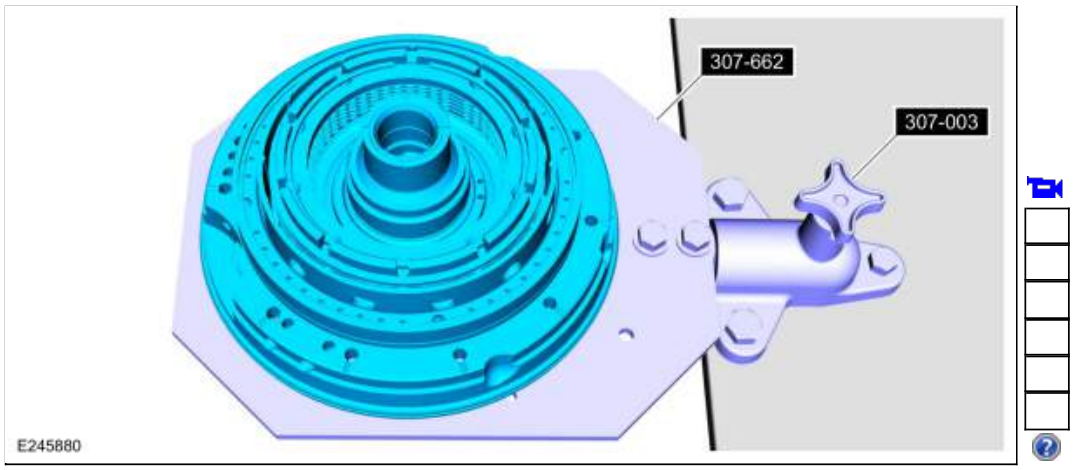
273.

Install the B clutch snap ring with the grooved side down.

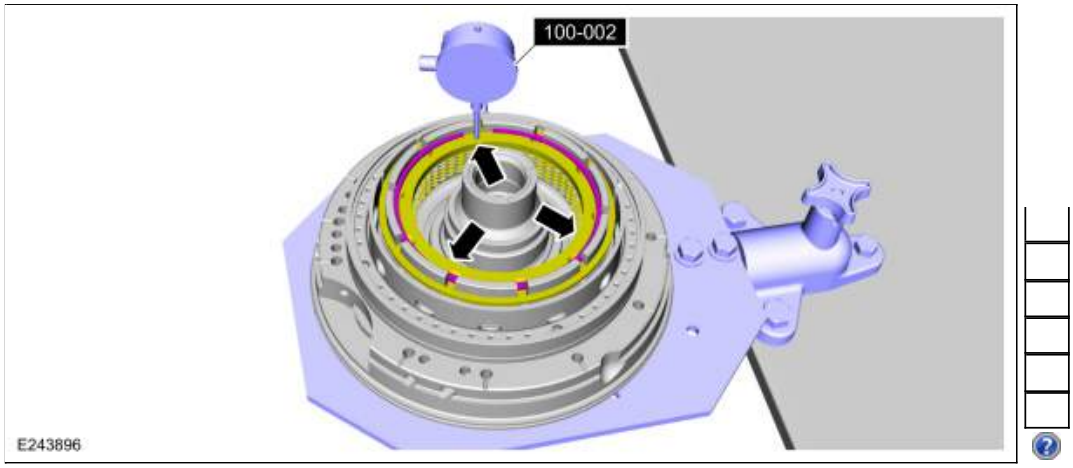
1. B clutch snap ring grooved side



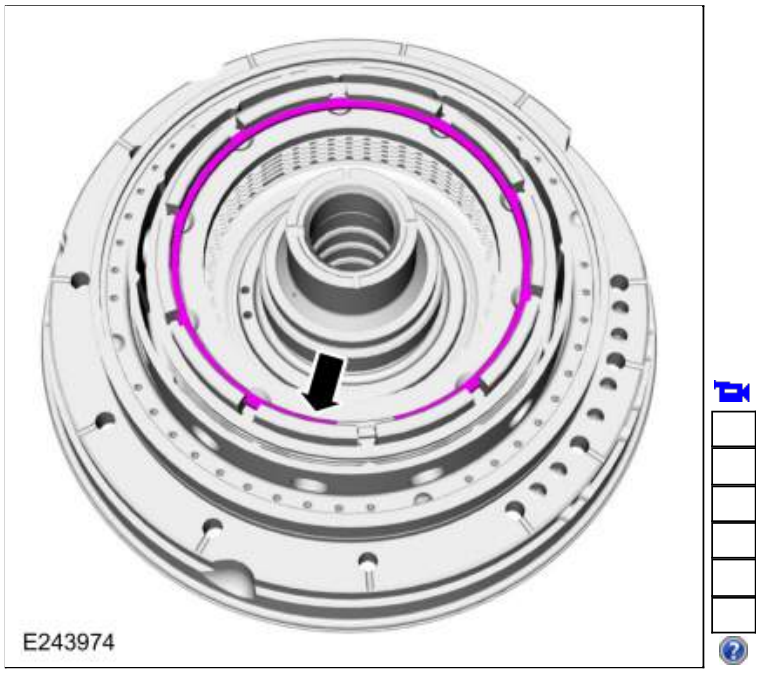
274. Assemble the special tools and position the front support assembly on the special tool.
Use Special Service Tool: 307-662 Gauge, Clutch Pack Endplay. , 307-003 (T57L-500-B) Holding Fixture, Transmission.



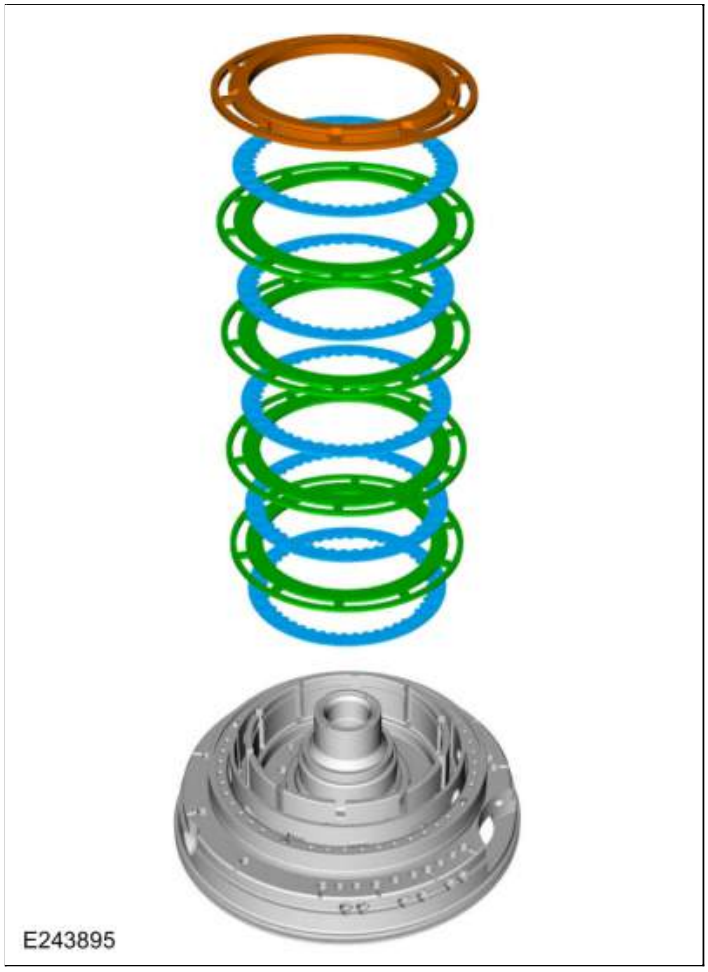
275. Using the special tool, measure the B clutch clearance. Position the plunger so it rests on the top surface of the pressure plate. Gently push down on the pressure plate to zero the dial indicator. Pull up on the pressure plate and measure and record the clutch clearance in 3 different places. Average the 3 recorded clutch clearance measurements and compare the measurement to the clutch clearance chart in specifications to determine the correct size snap ring. Install the correct B clutch snap ring.
Refer to: Specifications (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Specifications).
Use Special Service Tool: 100-002 (TOOL-4201-C) Holding Fixture with Dial Indicator Gauge.



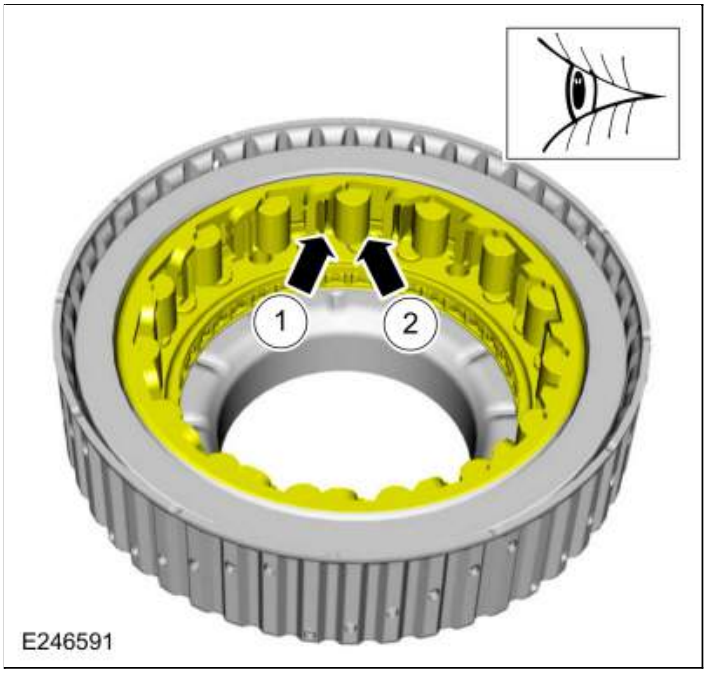
276. Remove the B clutch snap ring.



277. Remove the B clutch assembly.

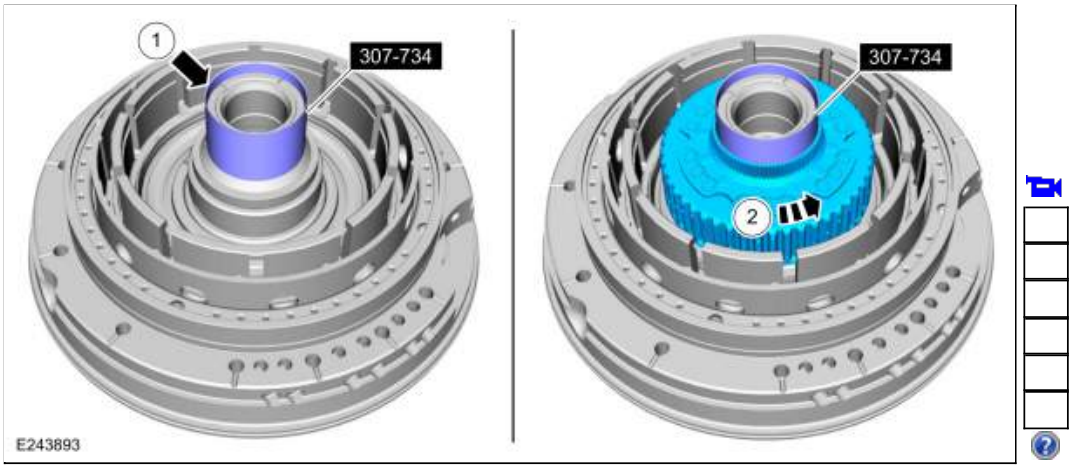


278. Verify that all the One-Way Clutch (OWC) rollers and springs are seated.
    1. Springs
    2. Rollers



279. **NOTE:** *The One-Way Clutch (OWC) hub should rotate counter-clockwise freely when installed correctly.*

1. Position the special tool on the front support.
   Use Special Service Tool: 307-734 Tool, OWC Alignment.
2. With a counter-clockwise rotation gently install the One-Way Clutch (OWC) onto the front support.

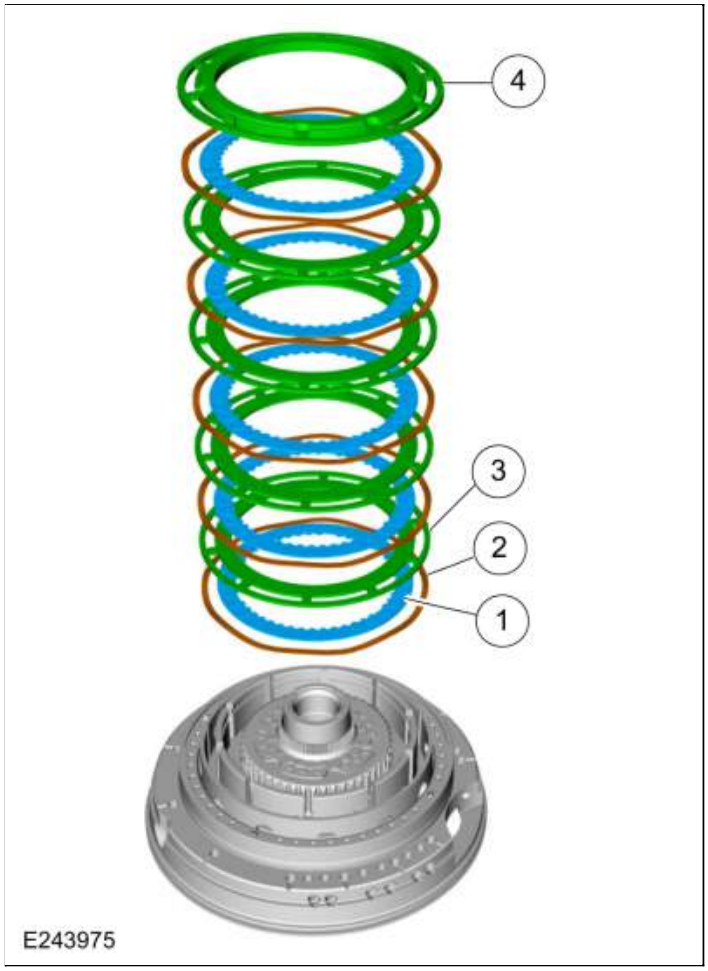


280. **NOTICE: If replacing B clutch separating springs, all separating springs must be replaced as a matching set or damage can occur.**

NOTE: *Clutch plate quantity is model dependant based on engine displacement.*

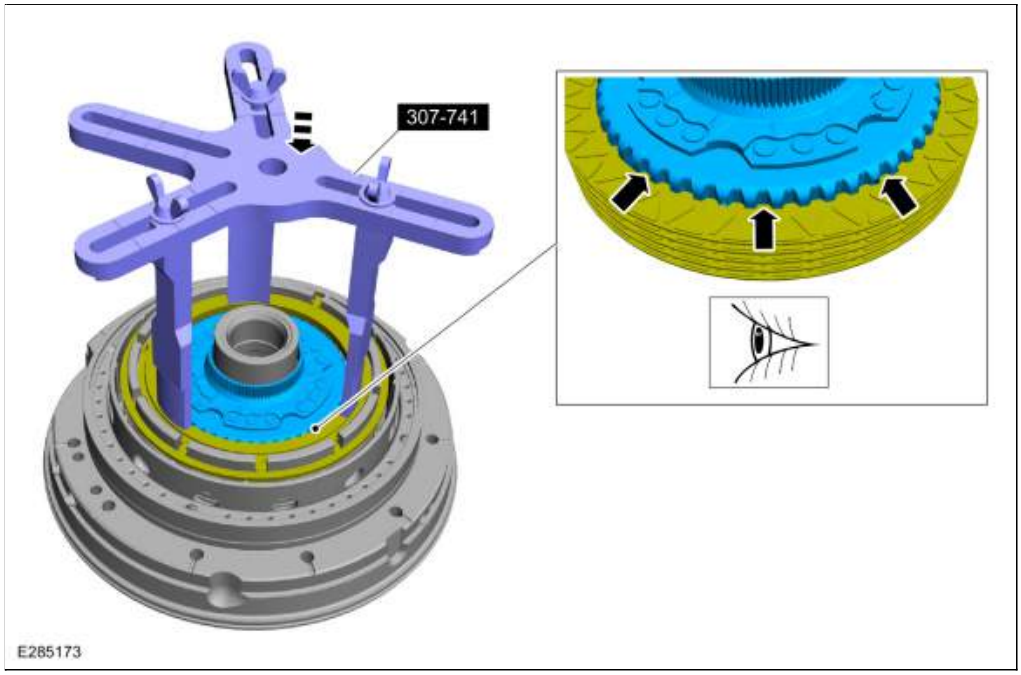
Soak the B clutch plates in clean transmission fluid. With the B clutch apply plate installed, correctly install the B clutch plates and springs.

1. B clutch friction plates
   Material: Motorcraft® MERCON® ULV Automatic Transmission Fluid / XT-12-QULV (WSS-M2C949-A) (MERCON® ULV)
2. B clutch separating springs
3. B clutch steel plates
4. B clutch pressure plate



281. **NOTICE: Be sure to align the top B clutch friction to the One-Way Clutch (OWC) hub or damage can occur.**

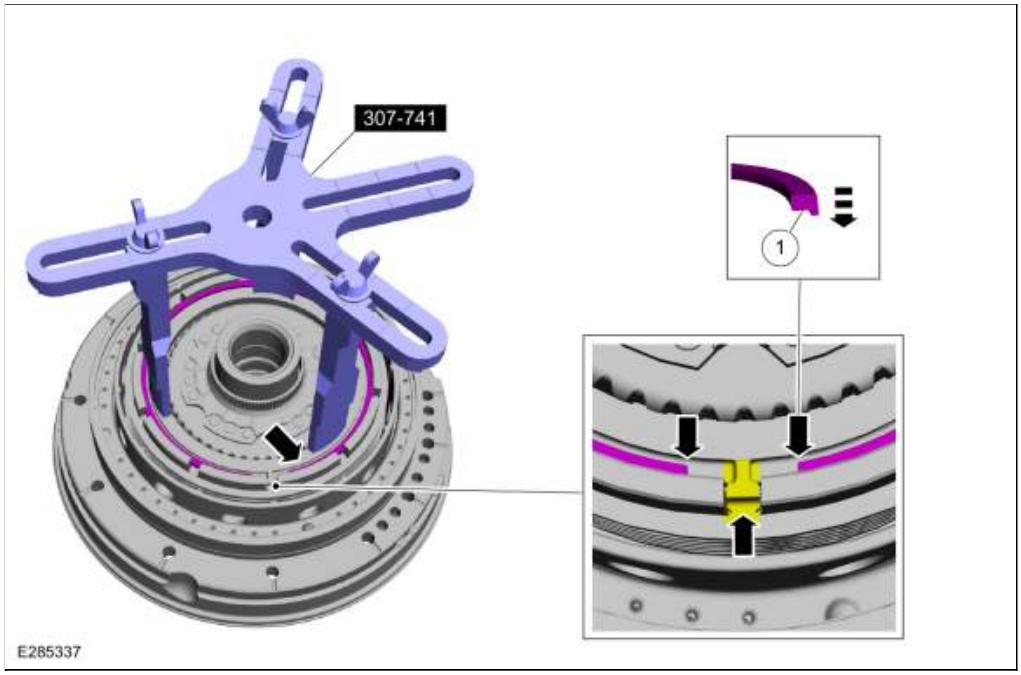
Use the special tools to compress the B clutch assembly.
Use Special Service Tool: 307-741 Spring Compressor, F Clutch.
Use the General Equipment: Hydraulic Press



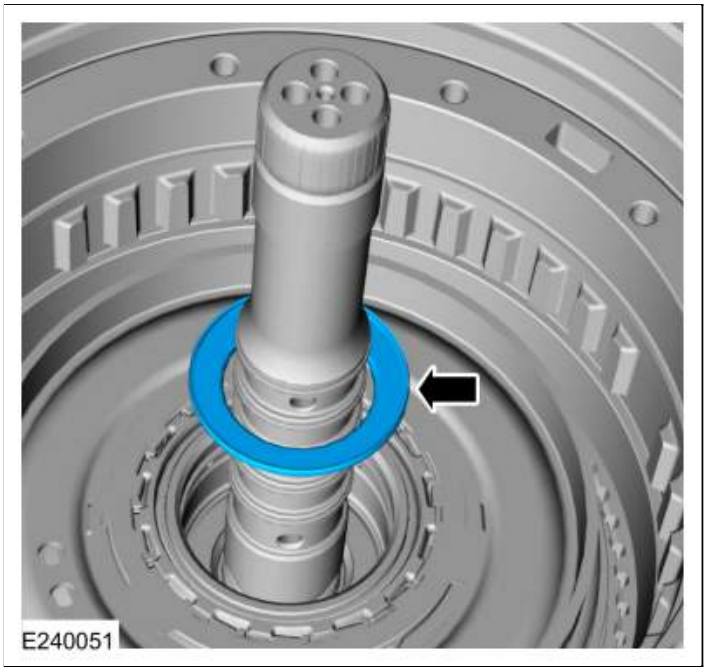
282.

Install the B clutch snap ring in the correct location with the grooved side down.

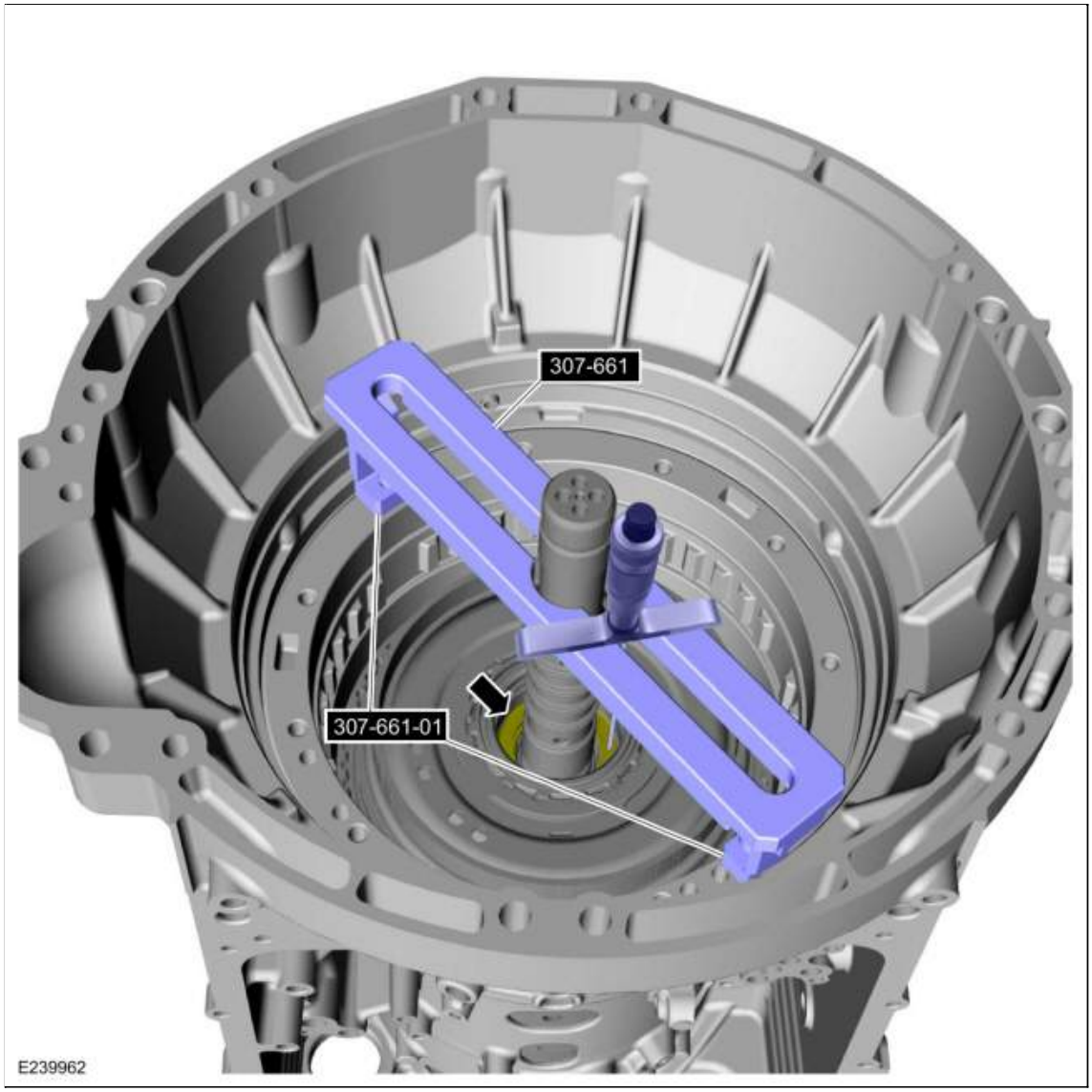
1. B clutch snap ring grooved side



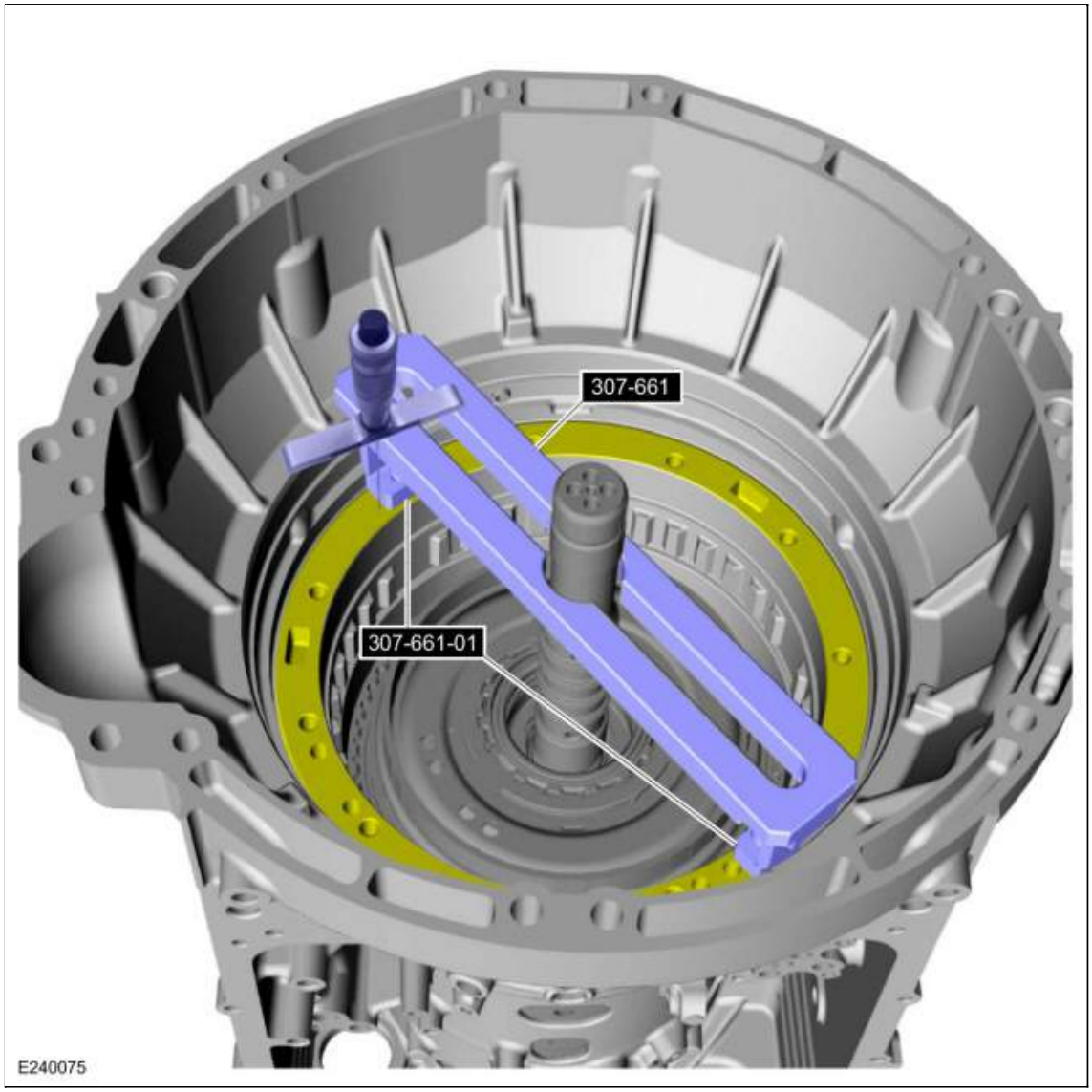
283. Install the (T3) thrust bearing.



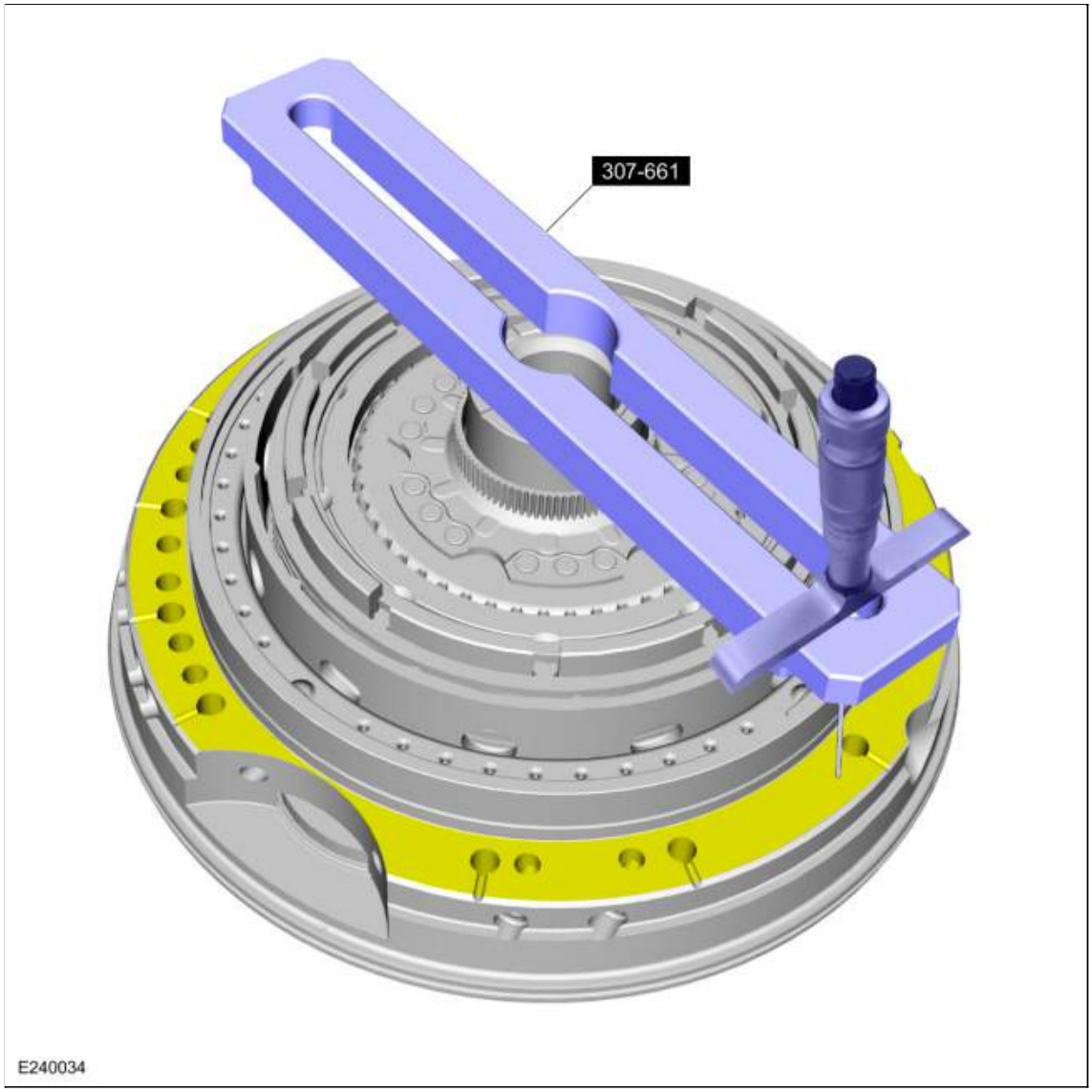
284. Using the special tools and a depth gauge, measure the distance from the top of the special tool to top of the (T3) thrust bearing in 2 different places. Average the measurements. Record this as measurement A.
Use Special Service Tool: 307-661 Gauge, End Play.



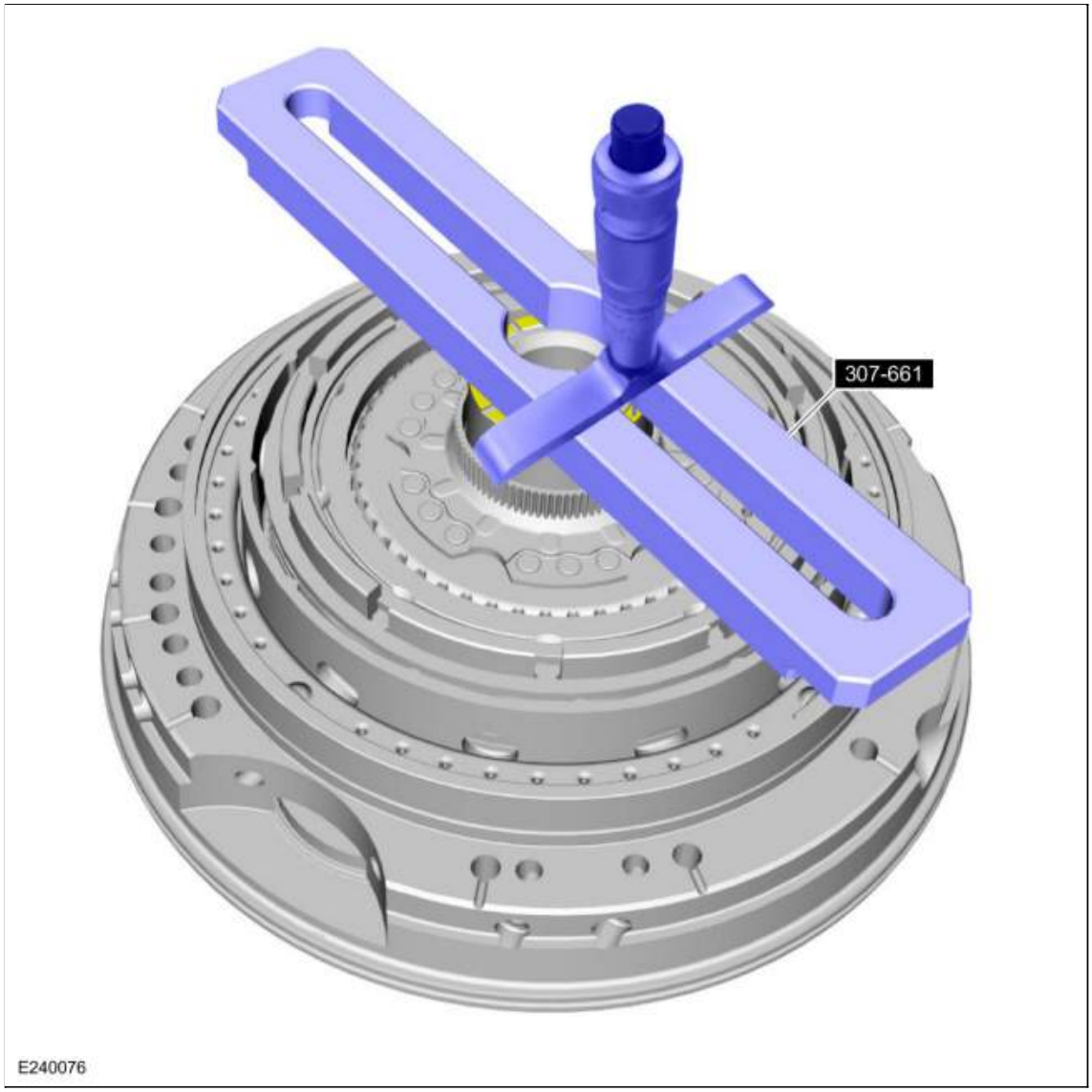
285. Using the special tools and a depth gauge, measure the distance from the top of the special tool to front support mating surface in 2 different places. Average the measurements. Record this as measurement B.
Use Special Service Tool: 307-661 Gauge, End Play.



286. Using the special tool and a depth gauge, measure the distance from the top of the special tool to the transmission deck mating surface in 2 different places. Average the measurements. Record this measurement as measurement D. Use Special Service Tool: 307-661 Gauge, End Play.

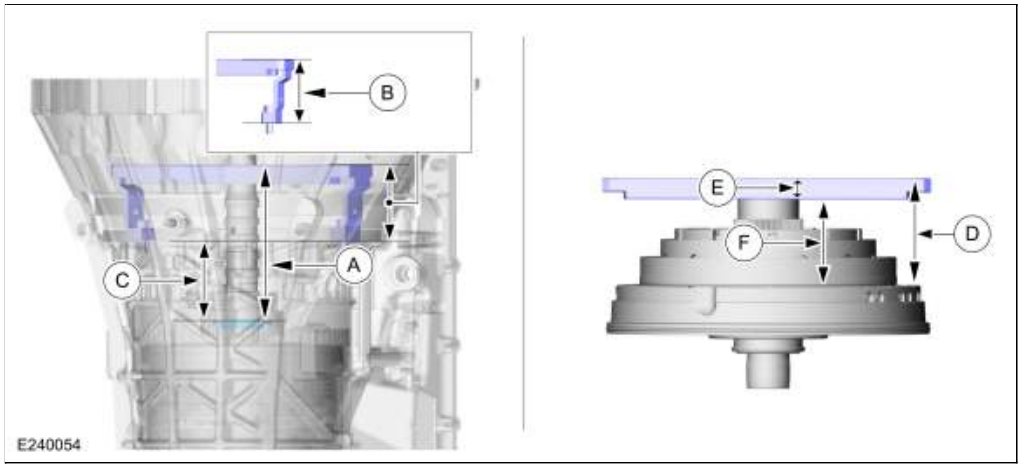


287. Using the special tool and a depth gauge, measure the distance from the top of the special tool to (T3) thrust bearing surface in 2 different places. Average the measurements. Record this as measurement E.
Use Special Service Tool: 307-661 Gauge, End Play.

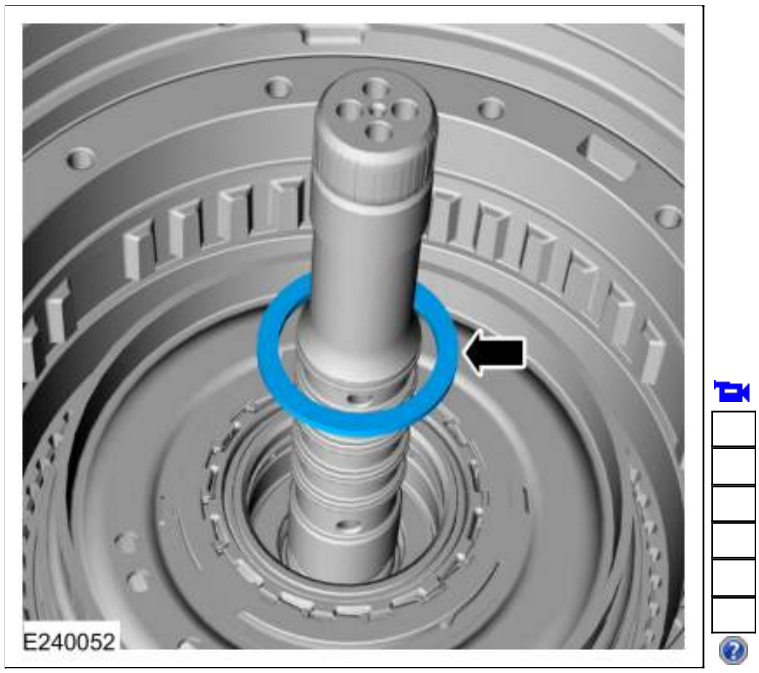


288. **NOTE:** *Recorded measurements B and E are included to compensate for the difference in height of the special tool.*

Calculate the correct shim thickness. Subtract measurement B from measurement A and record this as measurement C. Subtract measurement E from measurement D and record this as measurement F. Subtract measurement F from measurement C to get the clearance between the front support and the (T3) thrust bearing. Using the Selective Fit Shim Charts in specifications, select the correct shim.
Refer to: Specifications (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Specifications).



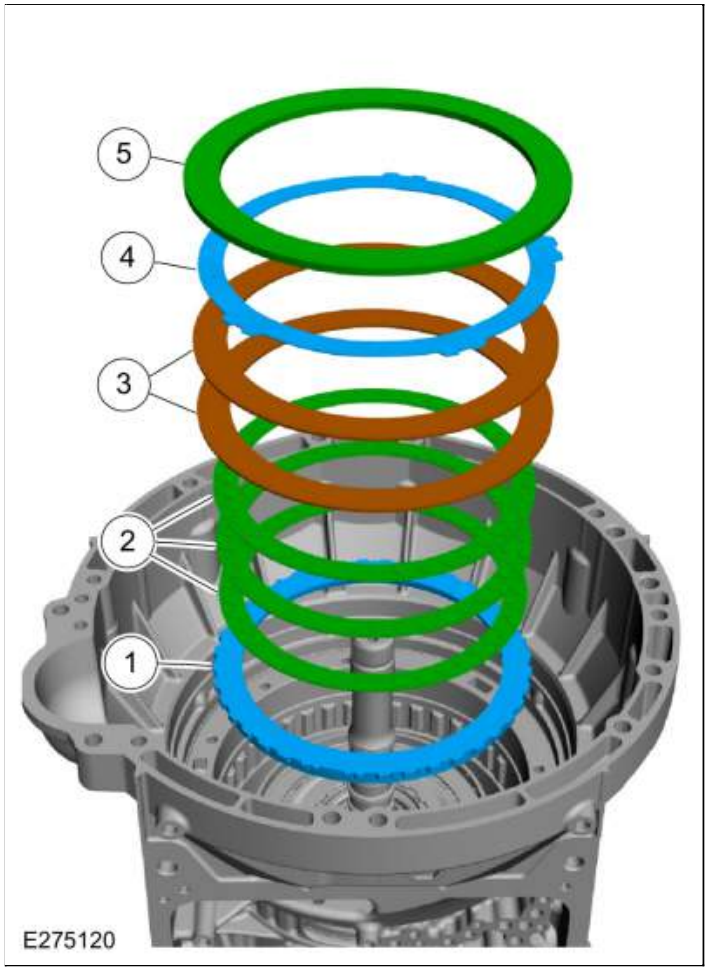
289. Install the selective shim.



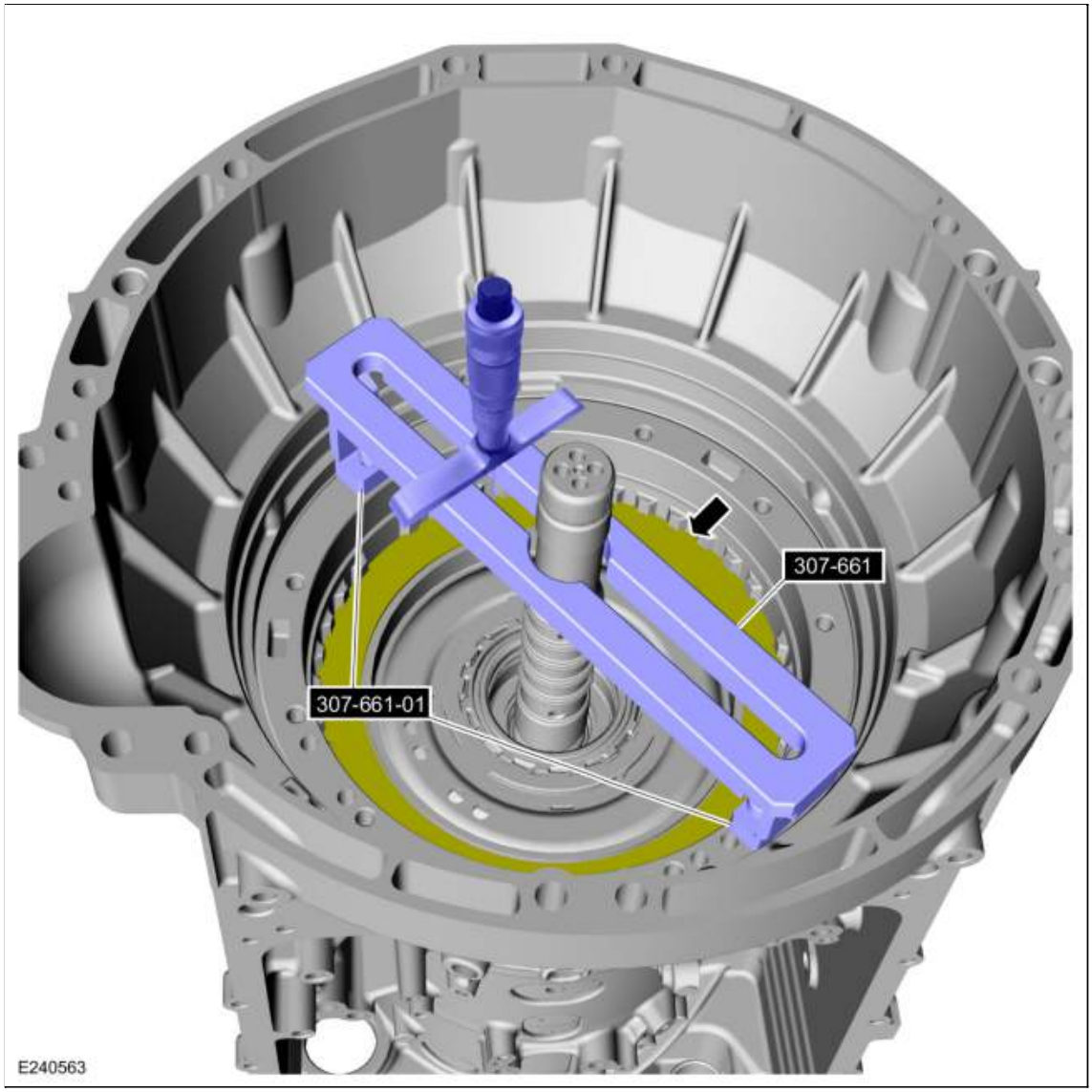
290. **NOTE:** *The A clutch separating springs are not installed when measuring the A clutch clearance.*

Temporarily install the A clutch into the transmission out of order to measure the A clutch clearance.

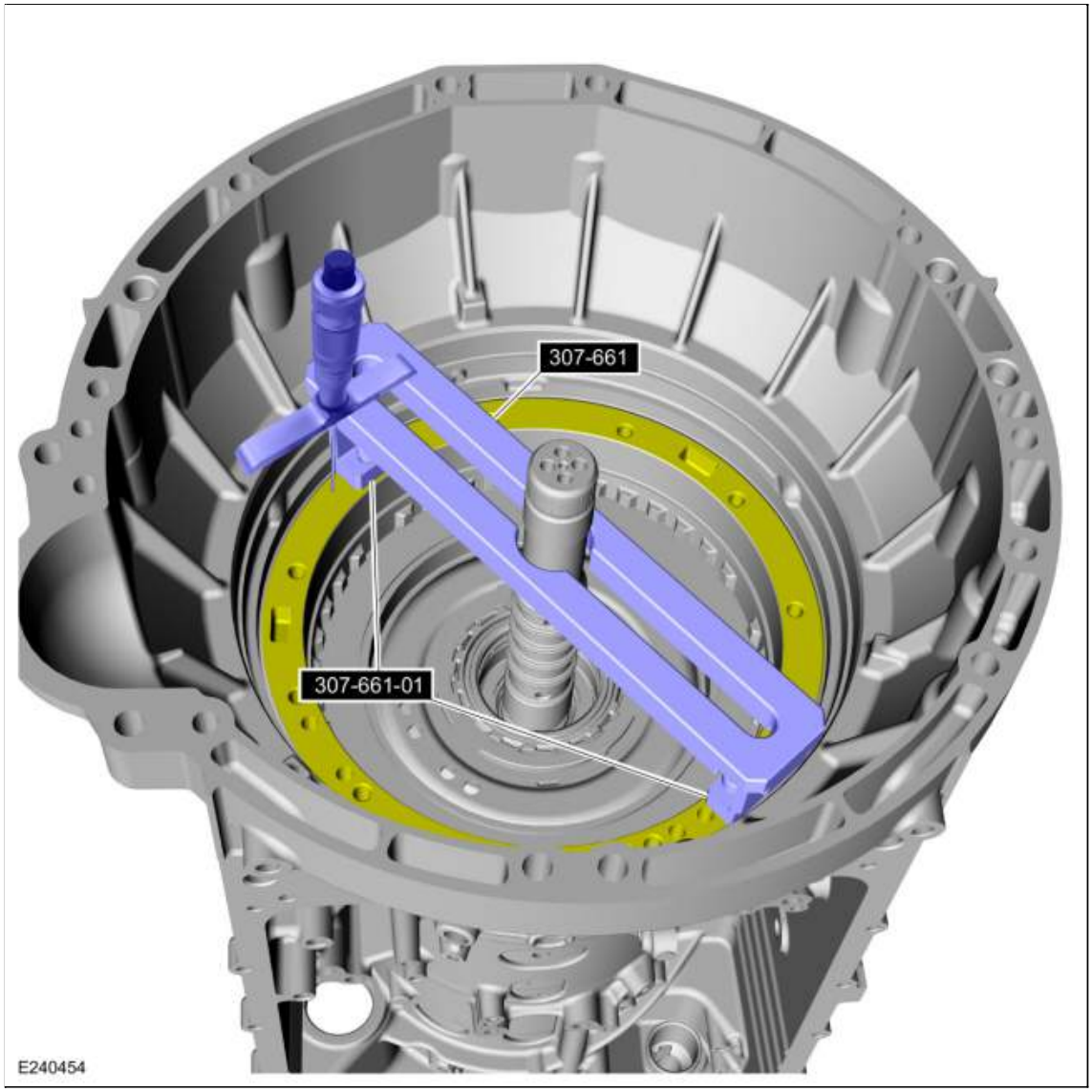
1. Install the pressure plate.
2. Install the friction plates.
3. Install the steel plates.
4. Install the wave spring.
5. Install the apply plate.



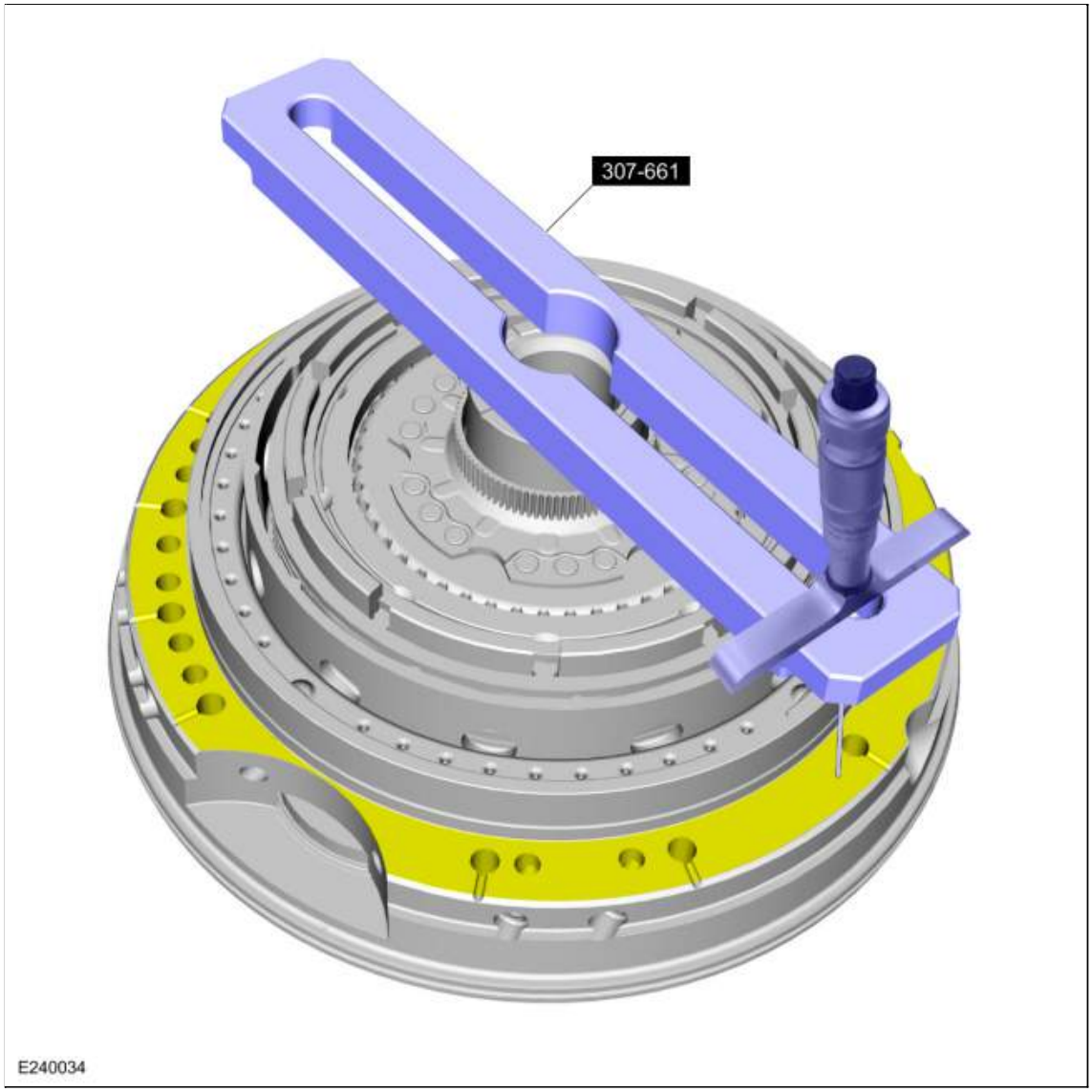
291. Using the special tools and a depth gauge, measure the distance from the top of the special tool to the top of the A clutch apply plate in 2 different places. Average the measurements. Record this as measurement A.
Use Special Service Tool: 307-661 Gauge, End Play.



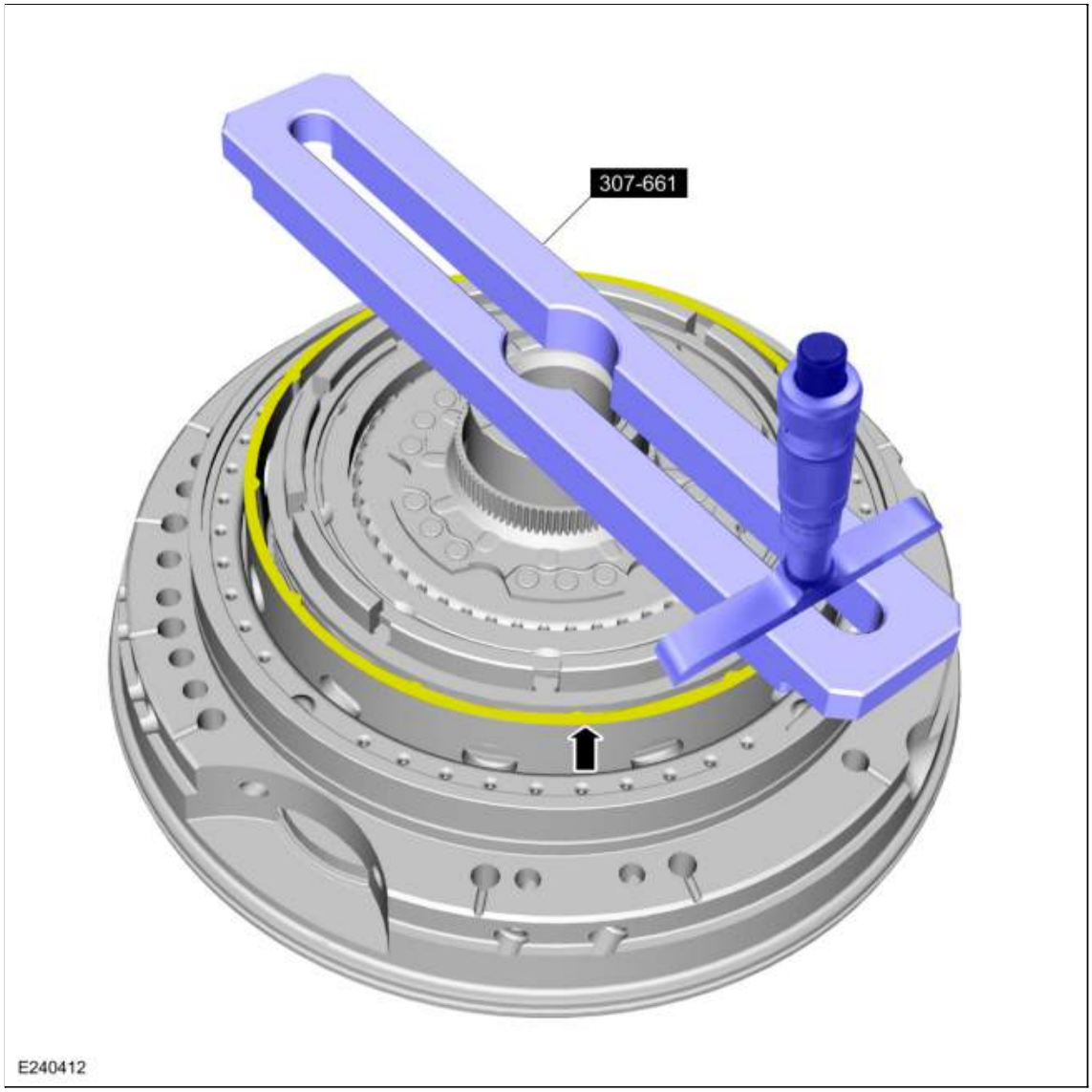
292. Using the special tools and a depth gauge, measure the distance from the top of the special tool to the front support mating surface in 2 different places. Average the measurements. Record this as measurement B.
Use Special Service Tool: 307-661 Gauge, End Play.



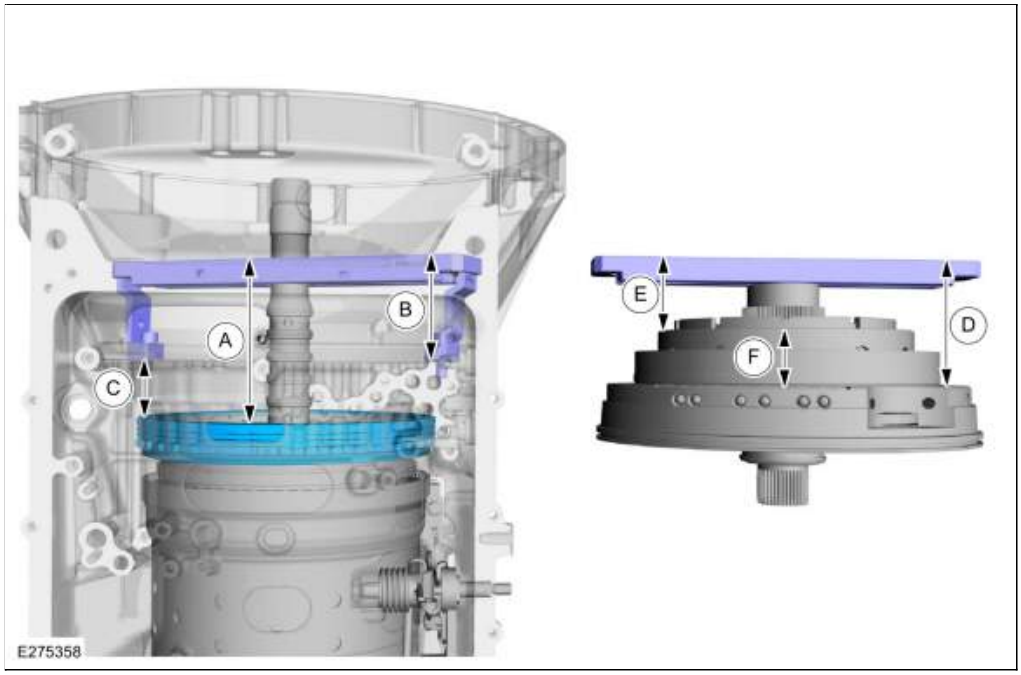
293. Using the special tool and a depth gauge, measure the distance from the top of the special tool to the transmission deck mating surface in 2 different places. Average the measurements. Record this as measurement D.
Use Special Service Tool: 307-661 Gauge, End Play.



294. Using the special tool and a depth gauge, measure the distance from the top of the special tool to the A clutch piston surface in 2 different places. Average the measurements. Record this as measurement E.
Use Special Service Tool: 307-661 Gauge, End Play.



295. Subtract measurement B from measurement A and record this as measurement C. Subtract measurement E from measurement D and record this as measurement F. Subtract measurement F from measurement C to get the A clutch clearance. Compare the A clutch clearance to the clutch specifications chart. If the A clutch clearance is not with in the specification range select the correct A clutch apply plate.
Refer to: Specifications (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Specifications).

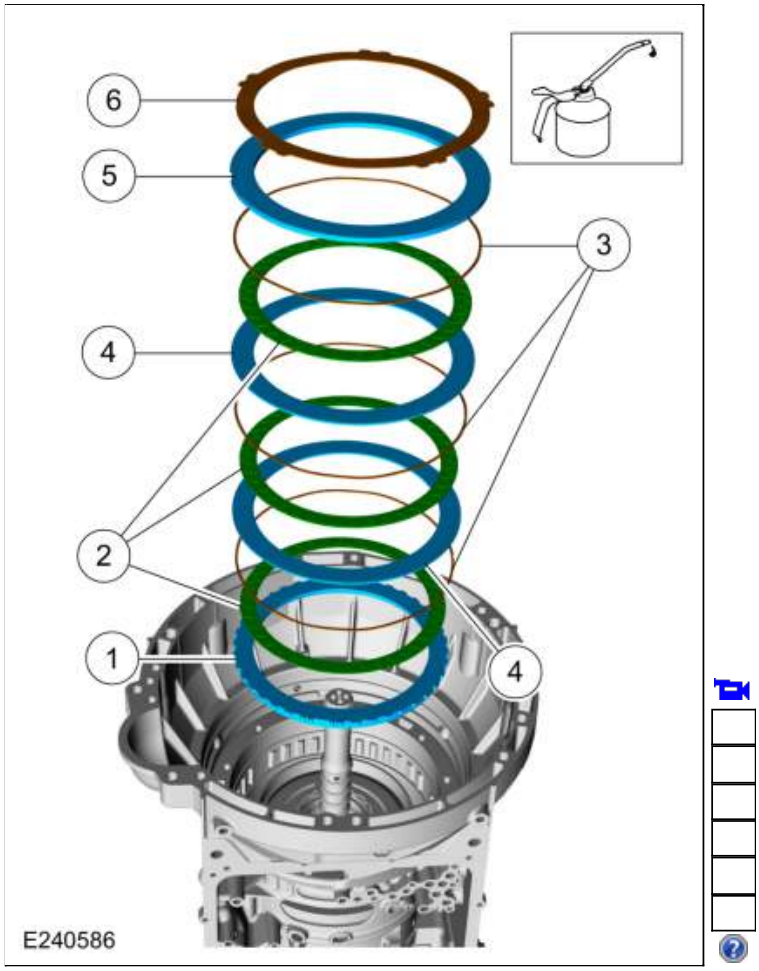


296. **NOTICE: If replacing A clutch separating springs, all separating springs must be replaced as a matching set or damage can occur.**

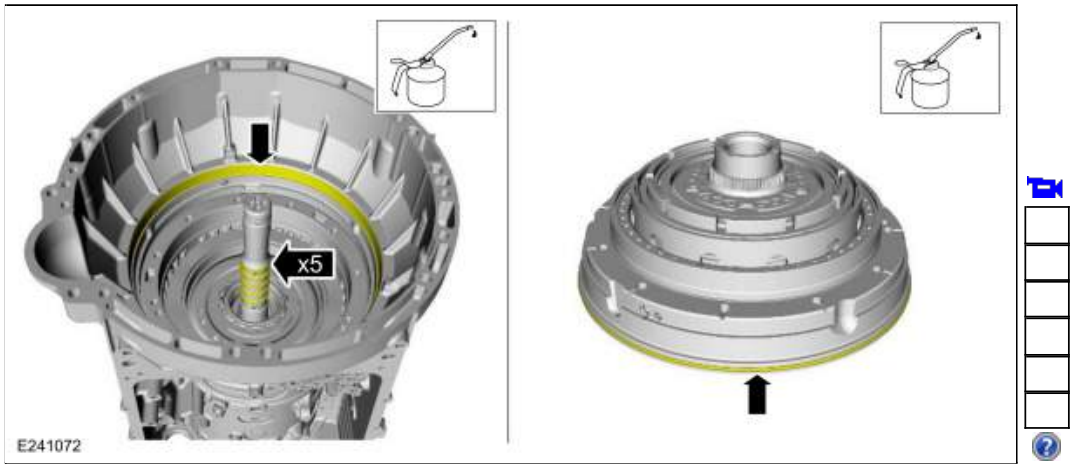
NOTE: *Clutch plate quantity is model dependant based on engine displacement.*

Soak the A clutch plates in clean transmission fluid. Install the A clutch assembly.

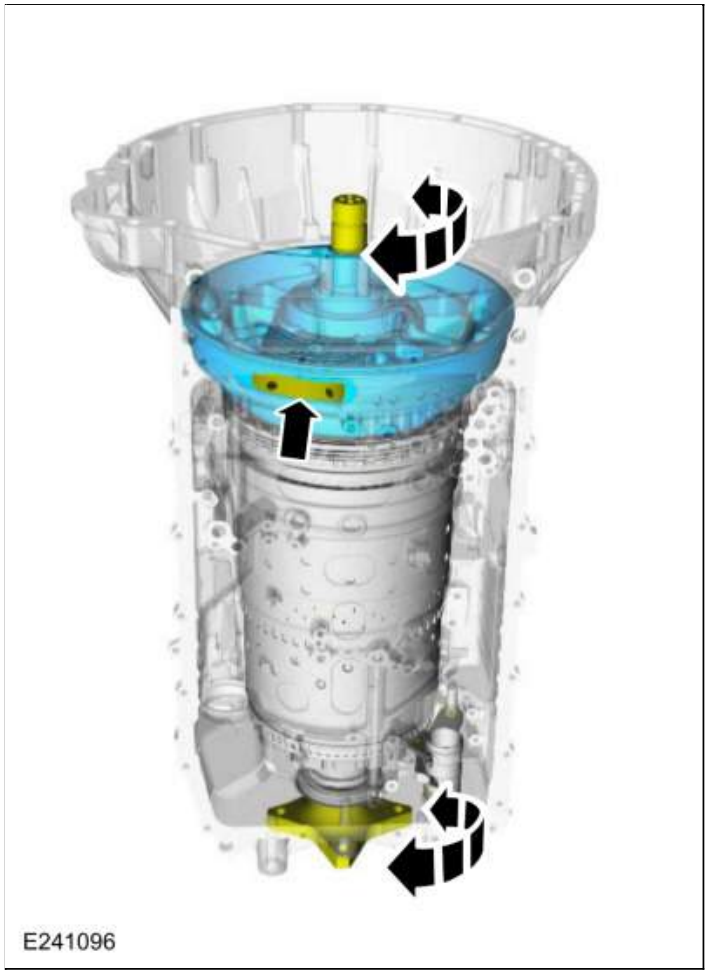
1. Pressure plate
2. Friction plates
   Material: Motorcraft® MERCON® ULV Automatic Transmission Fluid / XT-12-QULV (WSS-M2C949-A) (MERCON® ULV)
3. Separator springs
4. Steel plates
5. Apply plate (select fit)
6. Wave spring



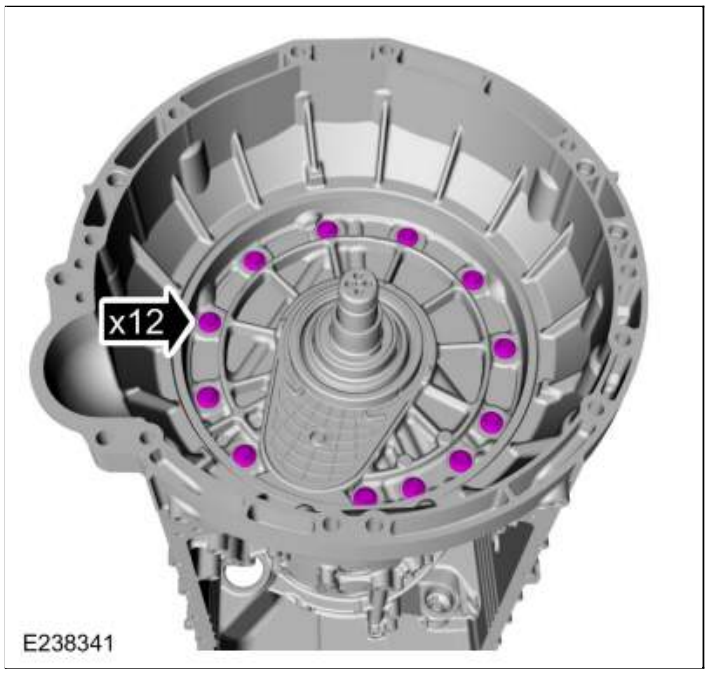
297. Lubricate the transmission case-to-front support sealing surface, the Teflon seals and the front support O-ring with petroleum jelly.



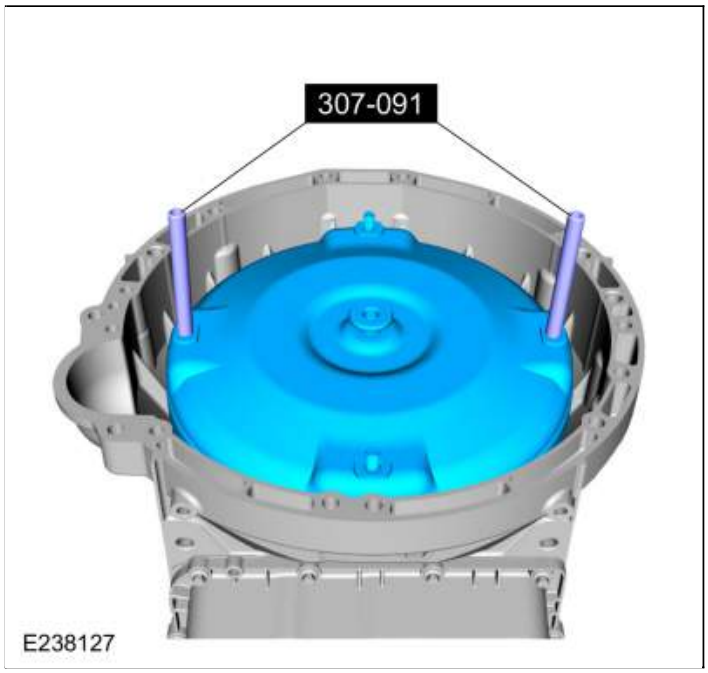
298. Install the front support into the transmission case. Align the pump gear to the pump drive gear pocket area. Rotate the input and output shafts to align the one-way clutch splines with the No. 1 sun gear.



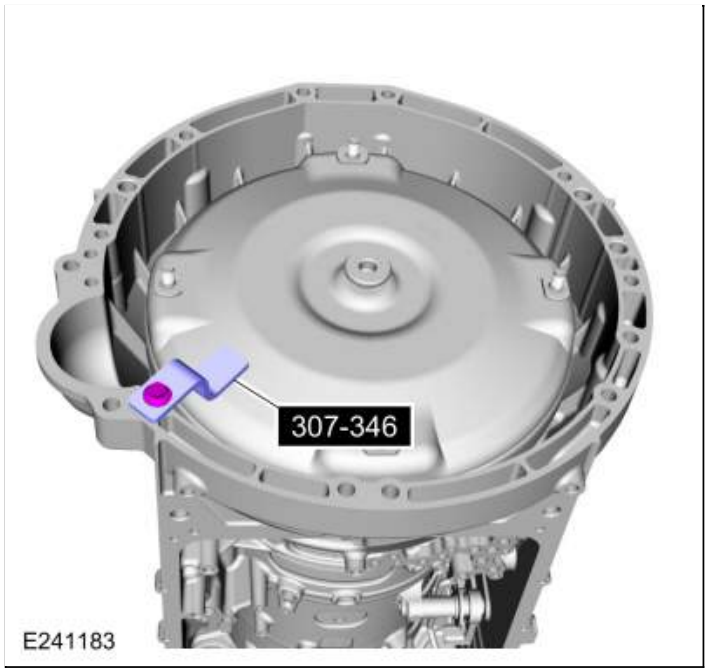
299. Install the new front support bolts. Tighten the bolts in a crisscross pattern.
Torque: 20 lb.ft (27 Nm)



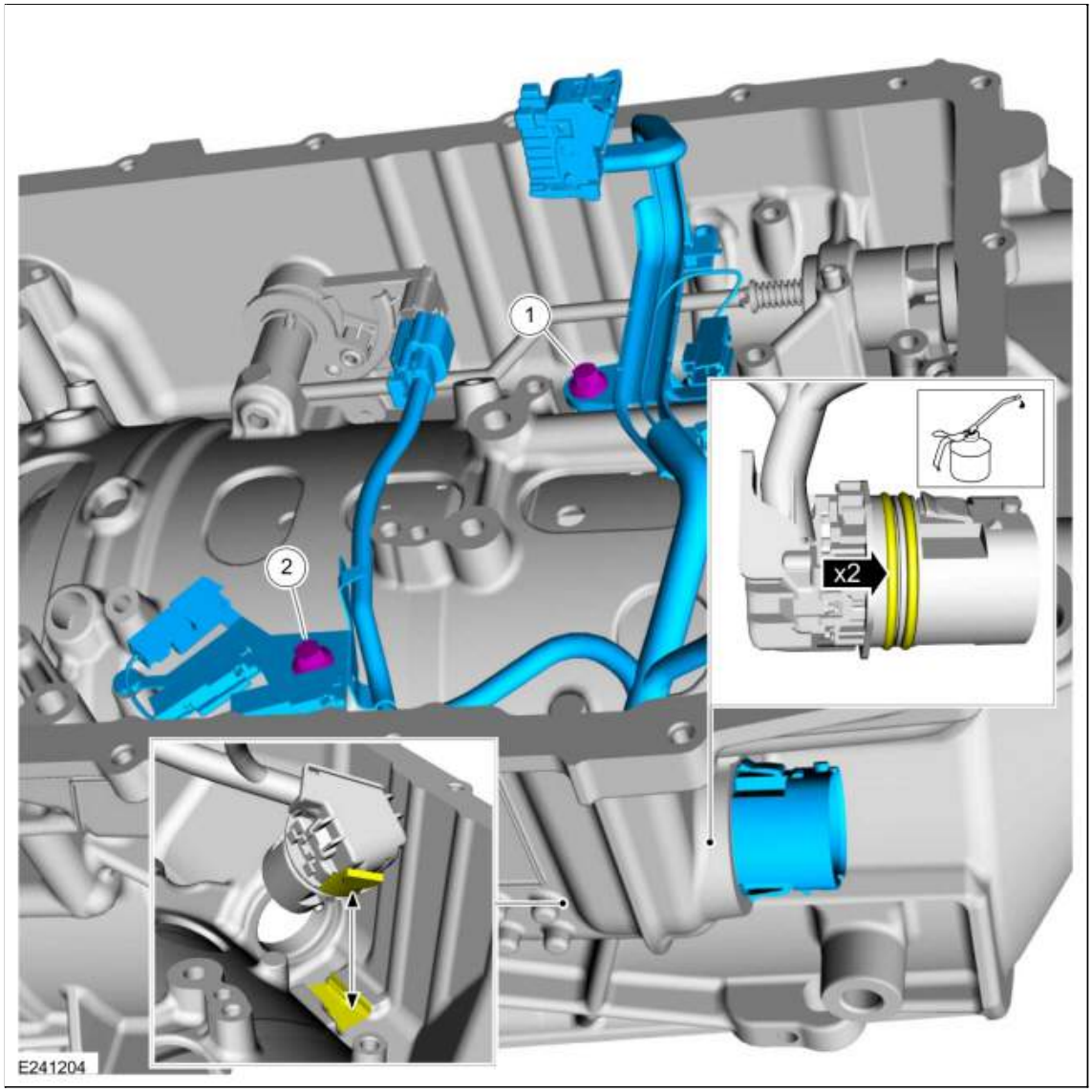
300. Using the special tool, install the torque converter.
Use Special Service Tool: 307-091 Handle, Torque Converter.



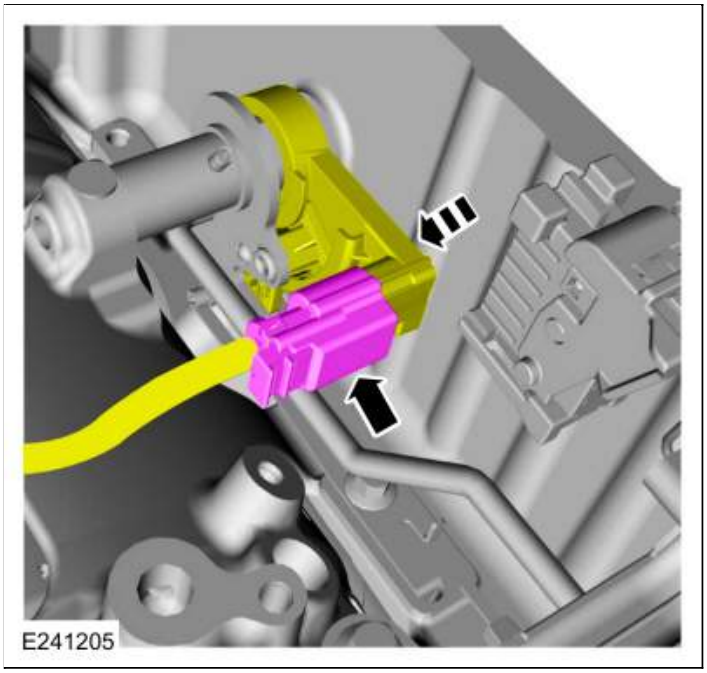
301. Install the special tool to hold the torque converter.
Use Special Service Tool: 307-346 (T97T-7902-A) Retainer, Torque Converter.



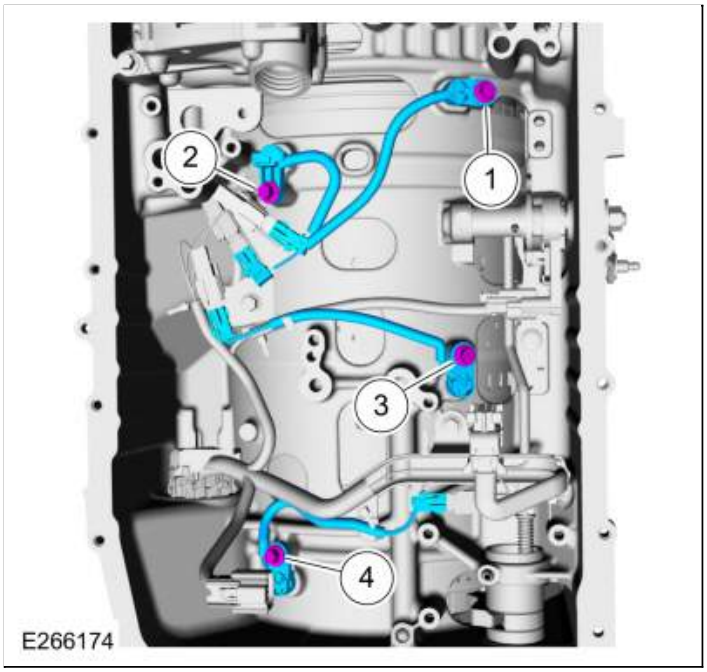
302. Install the wiring harness. Lubricate the O-ring seals with petroleum jelly. Align the tab on the electrical connector with the indention in the transmission case and install the main electrical connector in the transmission case. Align the wiring harness and install the bolts.
    1. *Torque*: 97 lb.in (11 Nm)
    2. *Torque*: 106 lb.in (12 Nm)



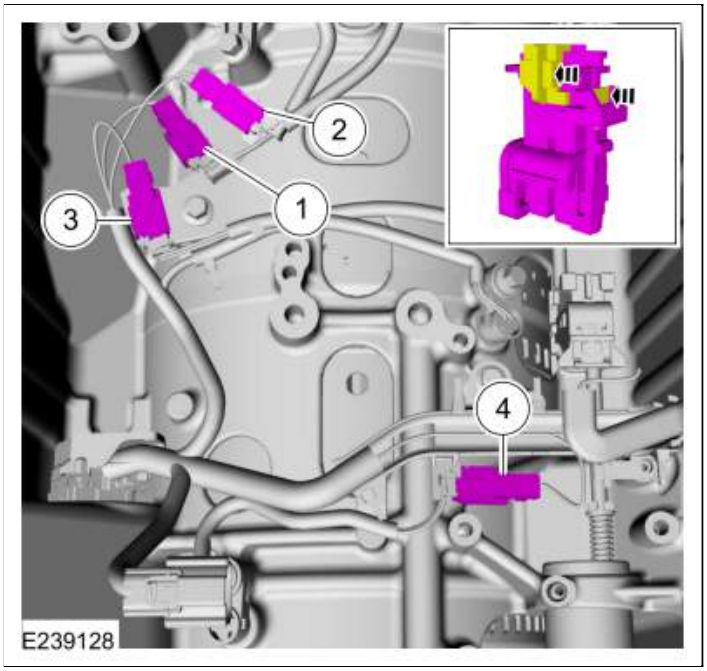
303. Support the opposite side of the TR sensor and connect the electrical connector.



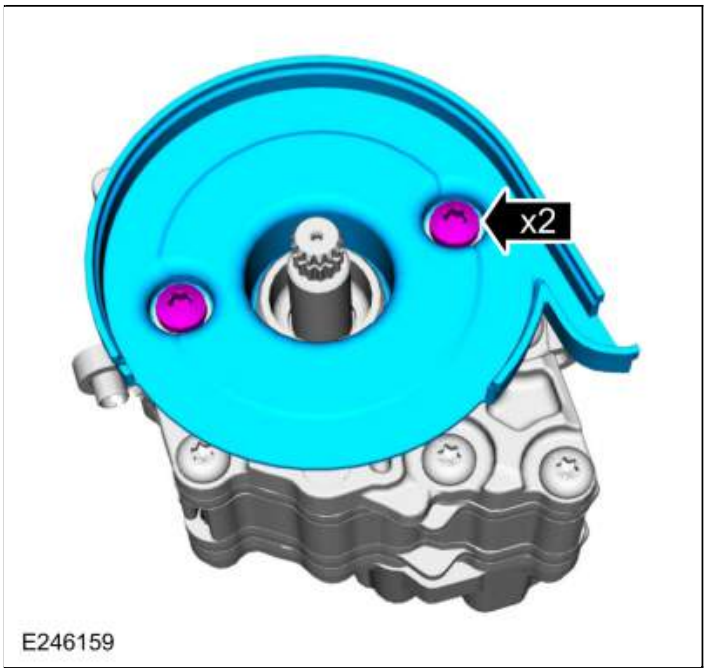
304. Install the speed sensors.
    1. Intermediate Speed Sensor A (ISSA)
    2. TSS sensor
    3. Intermediate Speed Sensor B (ISSB)
    4. OSS sensor
    - *Torque*: 62 lb.in (7 Nm)



305. Connect and lock the speed sensors.
    1. Intermediate Speed Sensor A (ISSA)
    2. TSS sensor
    3. Intermediate Speed Sensor B (ISSB)
    4. OSS sensor

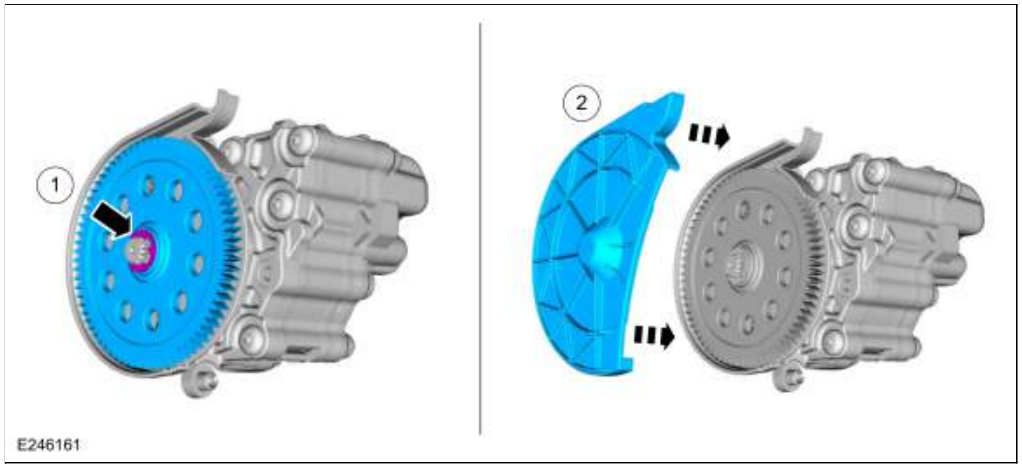


306. If removed, install the transmission fluid pump driven gear inner cover and the bolts.
Torque: 115 lb.in (13 Nm)

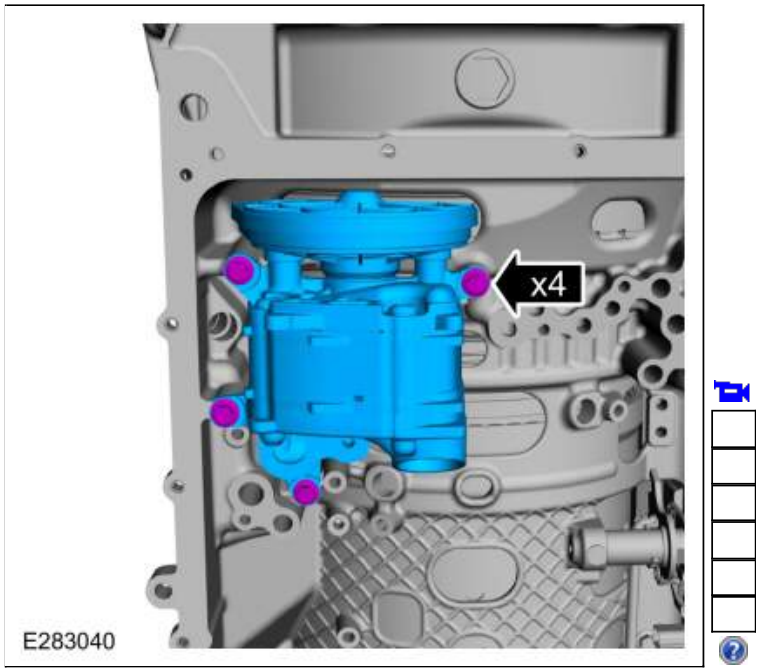


307.

1. If removed, install the transmission fluid pump driven gear and the retaining ring.
2. Install the transmission fluid pump driven gear outer cover.



308. Install the transmission fluid pump and the bolts.
Torque: 71 lb.in (8 Nm)

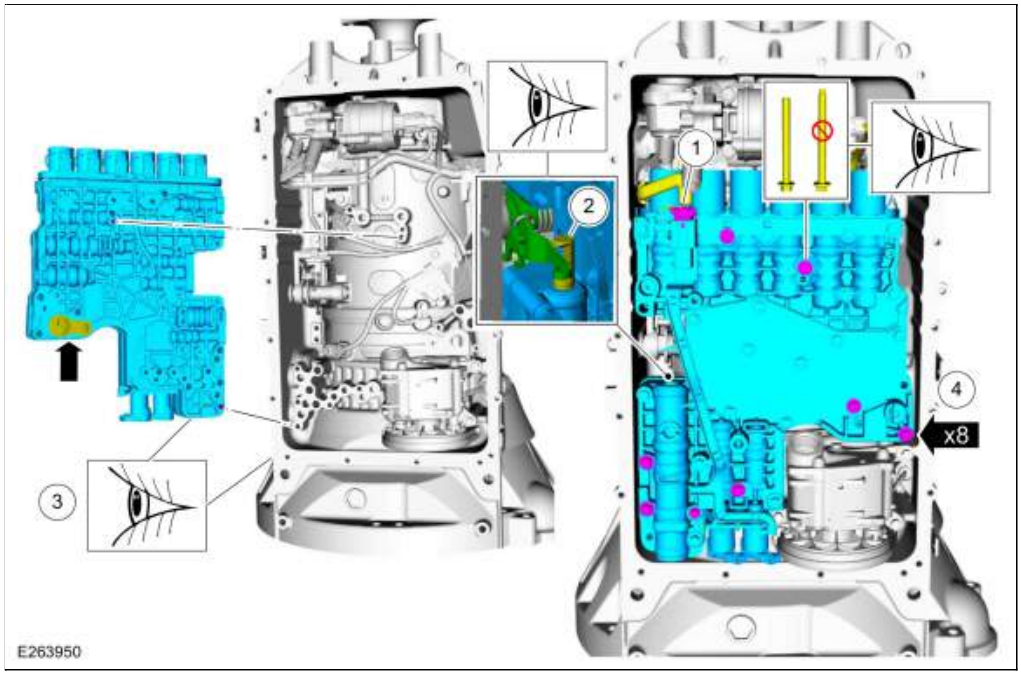


309. **NOTICE: Do not install a 71 mm length bolt in the location shown or the transmission clutch and planetary container will be damaged and result in transmission failure.**

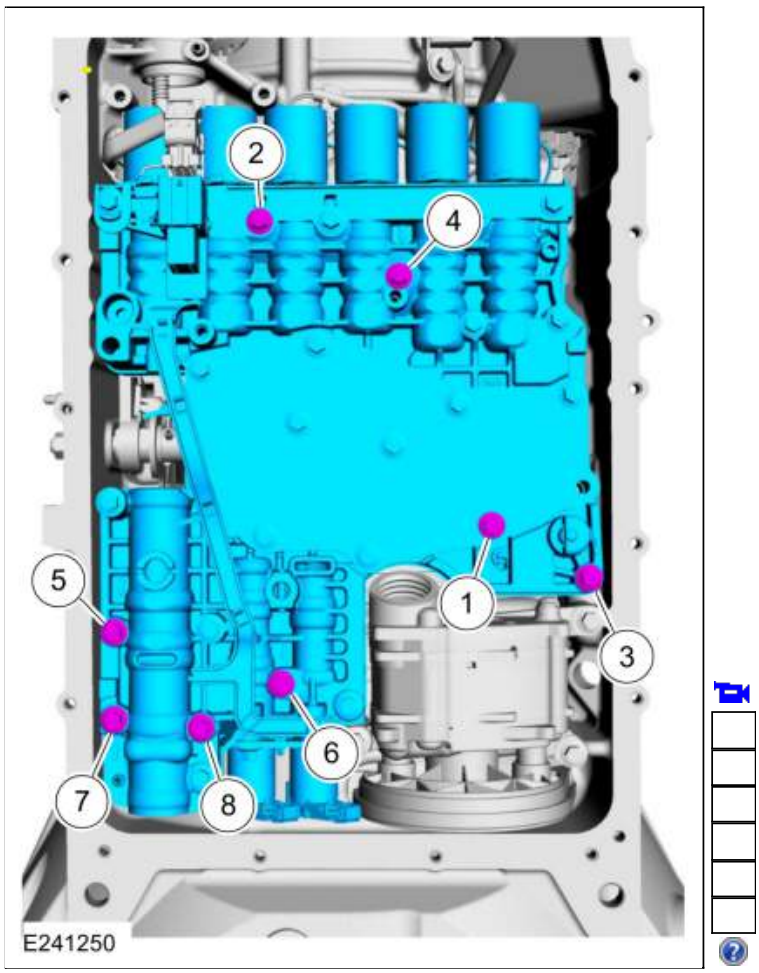
Loosely install the main control valve body.

1. **NOTE:** *Be sure the main control-to-case seal is attached to the main control.*

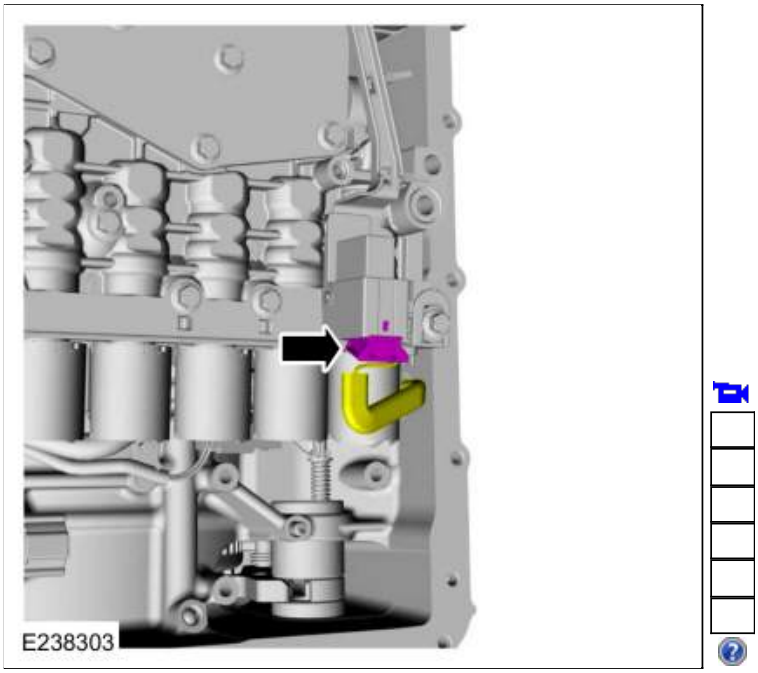
   Connect the internal wiring harness electrical connector while installing the main control valve body.
2. If equipped with a park pawl lock valve, align the TR sensor with the park pawl lock valve.
3. Align the guide pins on the main control valve body with the alignment holes in the transmission case.
4. Loosely install the 68 mm length main control-to-transmission case bolts.



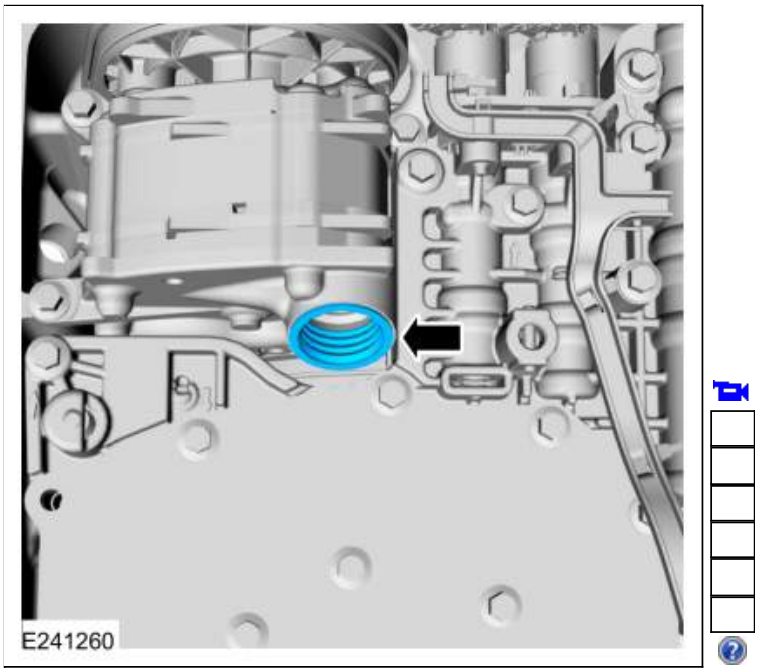
310. Tighten the bolts in the sequence shown.
Torque: 89 lb.in (10 Nm)



311. Lock the main control main electrical connector.



312. Install the filter seal in the pump.

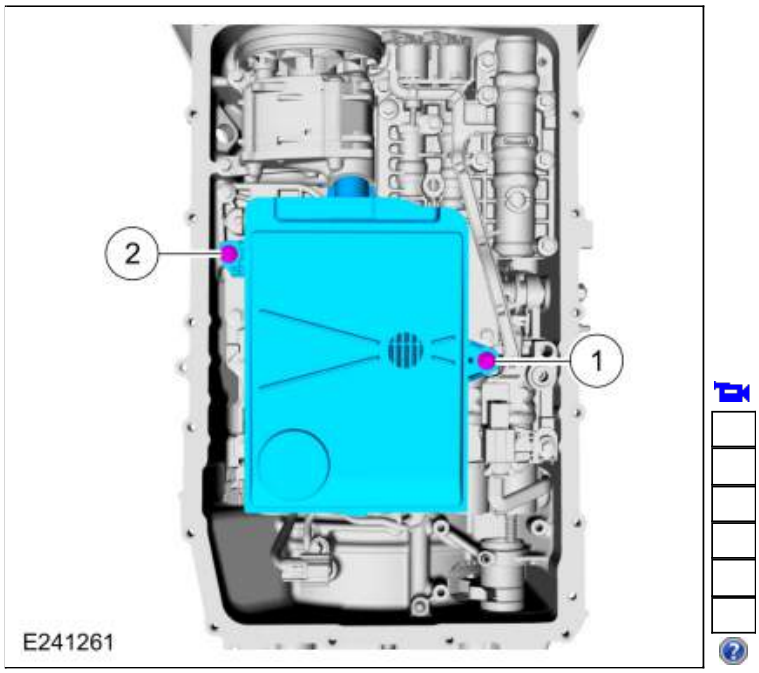


313. **NOTICE: If the bolts are installed in the wrong locations, transmission damage will occur.**

NOTE: *The transmission fluid filter may be reused if no excessive contamination is indicated.*

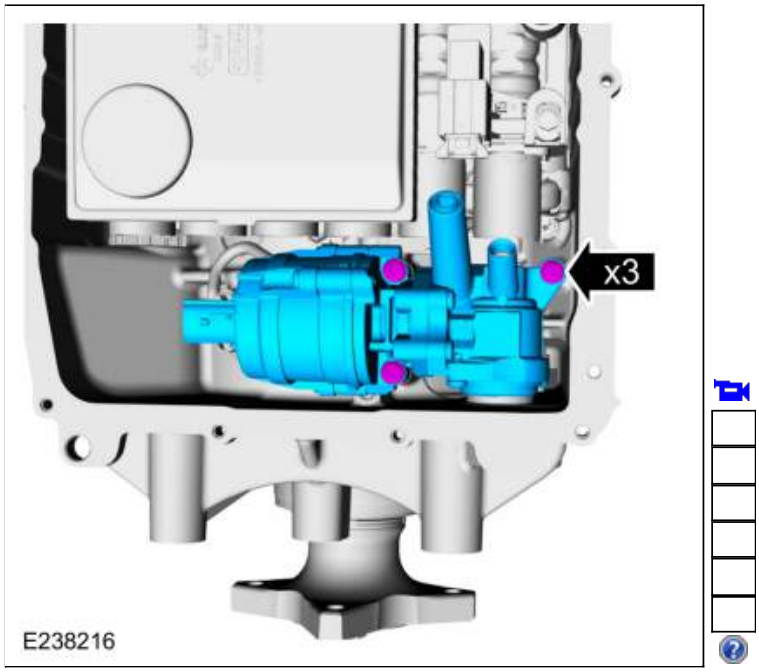
Install the filter and the bolts in the correct locations.
1. Short bolt 20 mm
2. Long bolt 71 mm

- *Torque*: 93 lb.in (10.5 Nm)

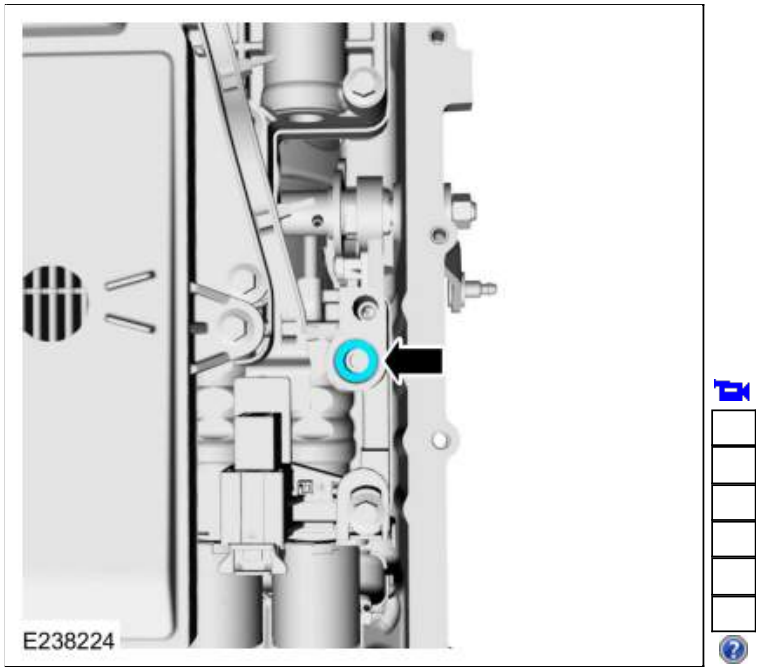


Auto-Start-Stop vehicles

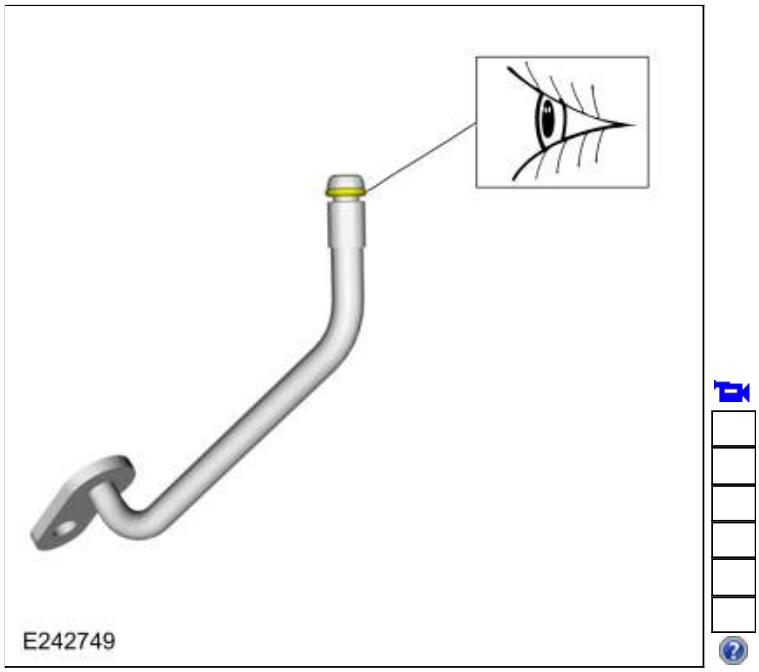
314. Install the transmission fluid auxiliary pump and loosely install the bolts.



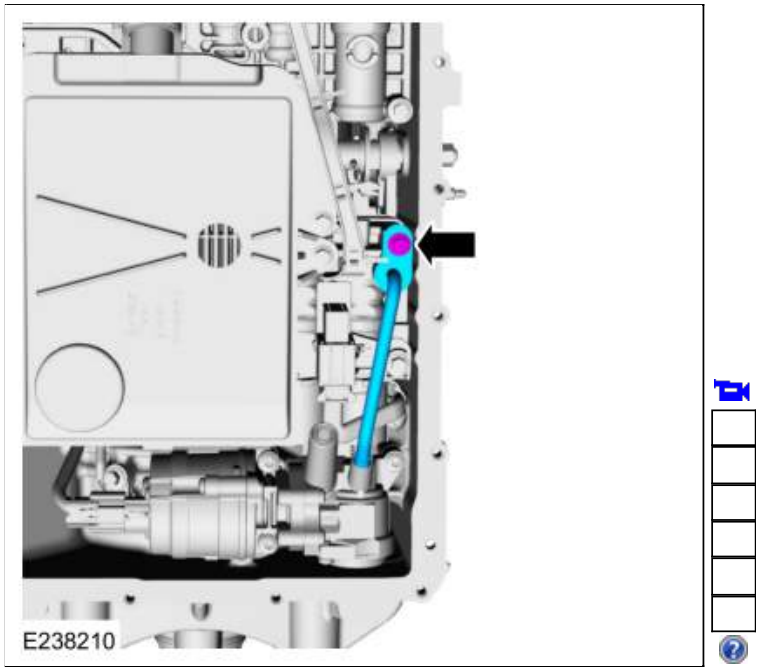
315. Install the new transmission fluid auxiliary pump tube seal.



316. Inspect the transmission fluid auxiliary pump tube O-ring.

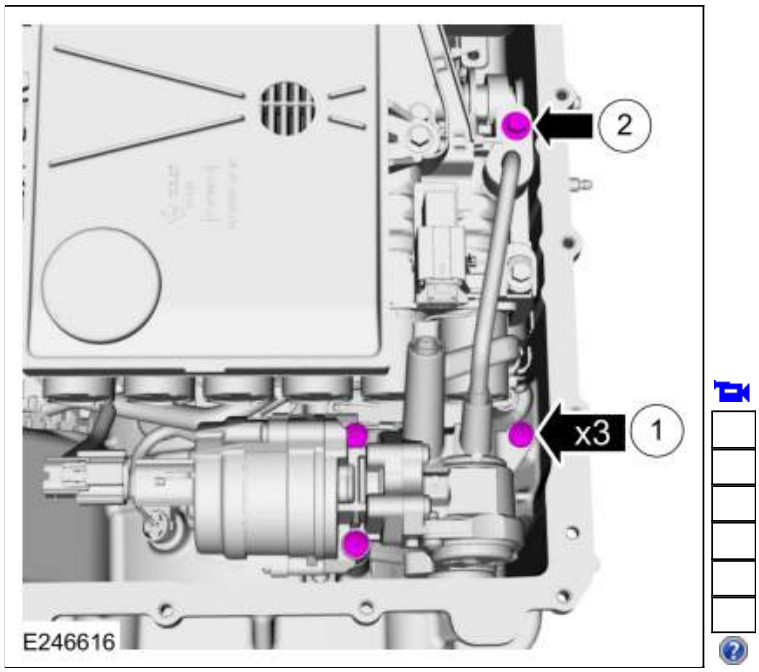


317. Install the transmission fluid auxiliary pump tube and loosely install the bolt.

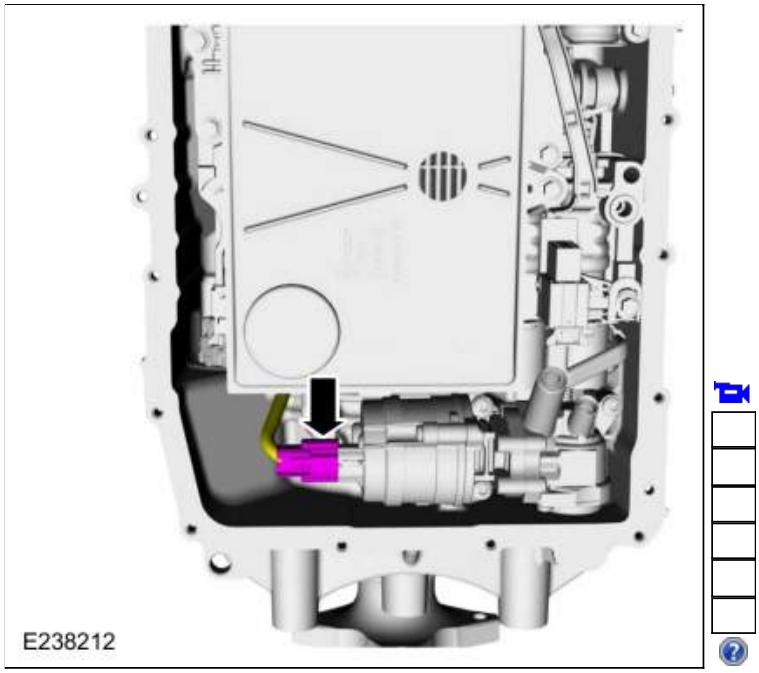


318.

1. Transmission fluid auxiliary pump bolts
   Torque: 97 lb.in (11 Nm)
2. Transmission fluid auxiliary pump tube bolt
   Torque: 106 lb.in (12 Nm)

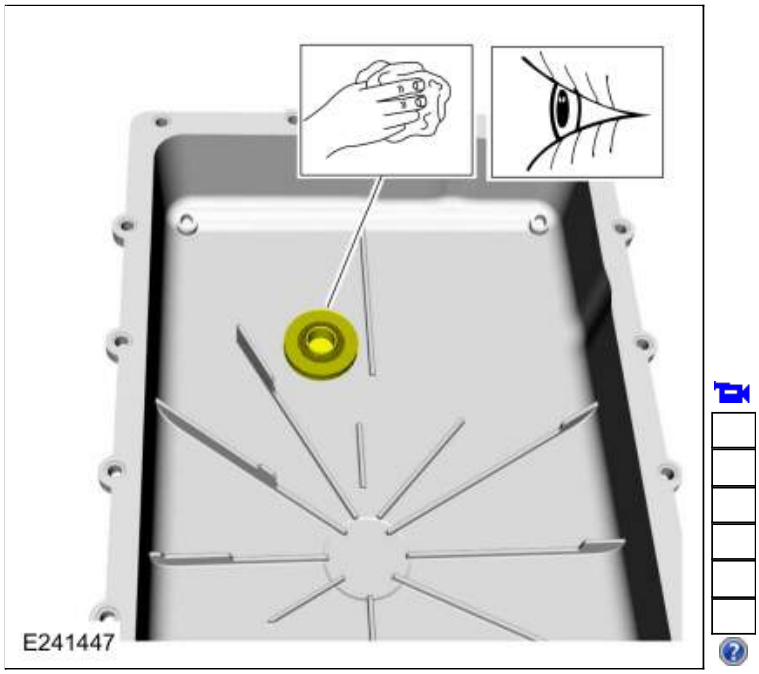


319. Connect the transmission fluid auxiliary pump electrical connector.



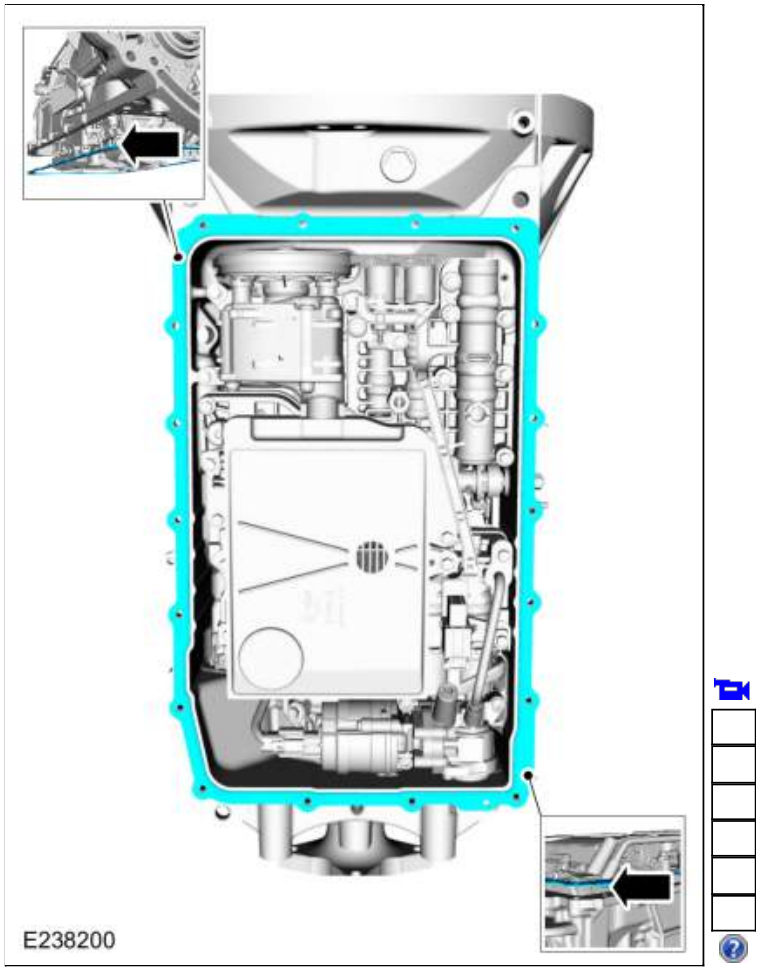
All vehicles

320. Clean and inspect the magnet and the retainer.

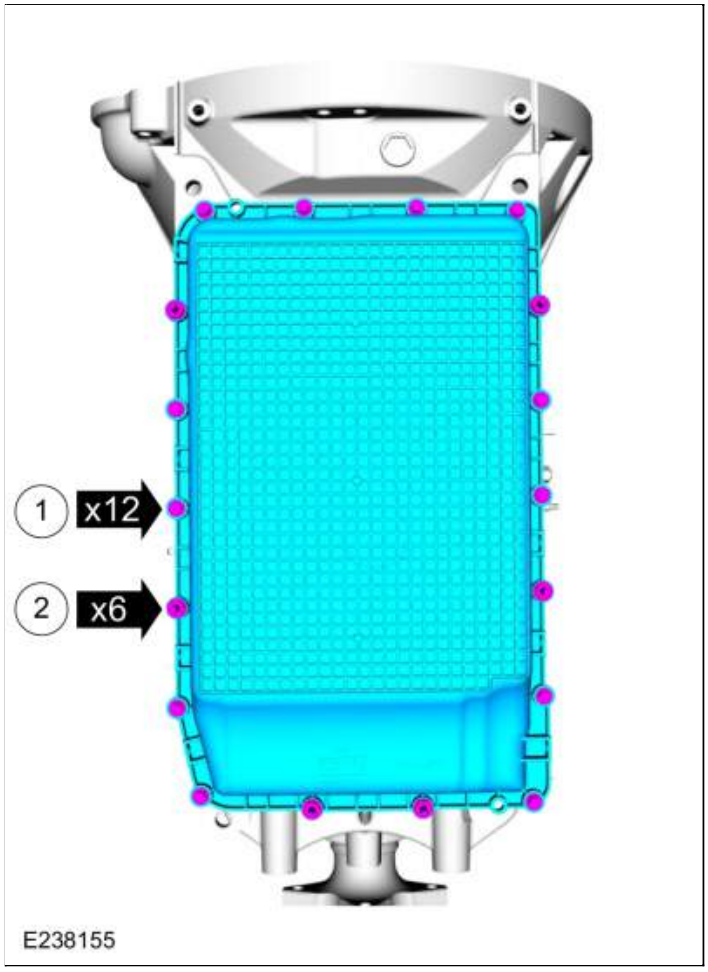


321. **NOTE:** *The transmission fluid pan gasket can be reused if not damaged.*

Align the tabs in the noted location and install the transmission fluid pan gasket.



322. Install the transmission fluid pan and tighten the bolts in a crisscross pattern.
    1. Bolts
       Torque: 89 lb.in (10 Nm)
    2. Studbolts
       Torque: 106 lb.in (12 Nm)



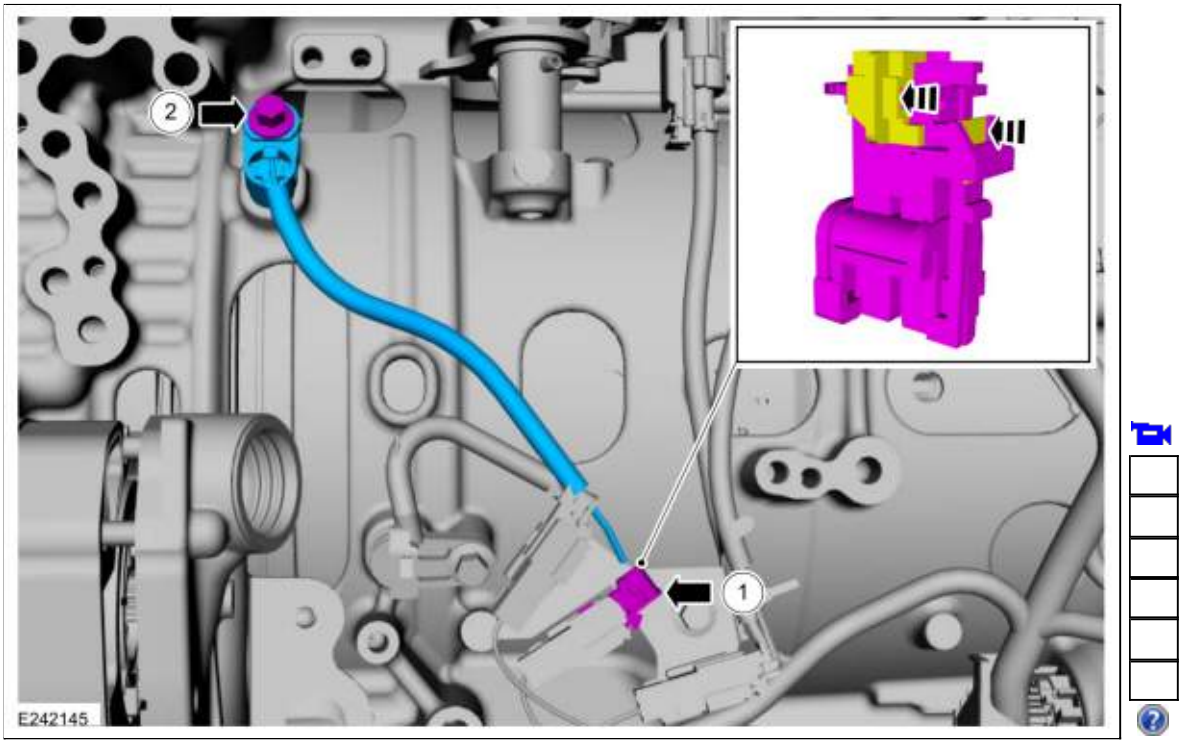
Intermediate Speed Sensor A (ISSA)

Base Part Number: 7M183

Removal

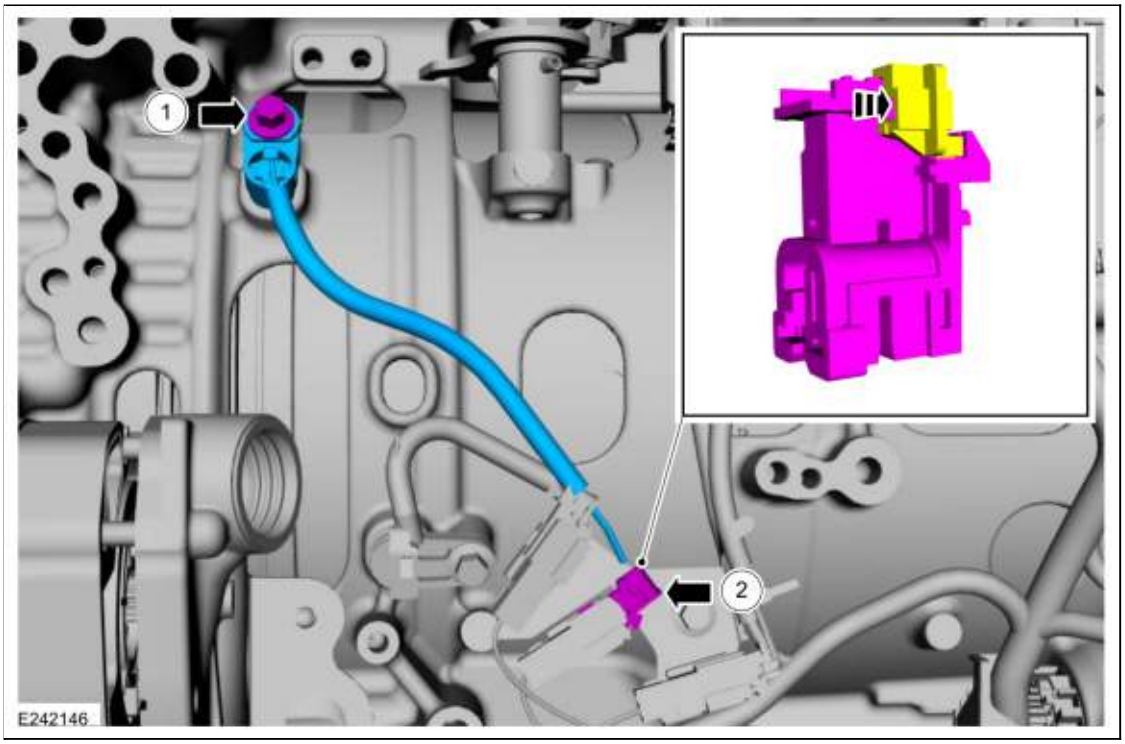
1. Remove the main control valve body.
   Refer to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
   Refer to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

2. Remove the intermediate speed sensor A.
   1. Slide the plastic lock to the unlocked position. While pressing the plastic tab, disconnect the electrical connector.
   2. Remove the bolt and the intermediate speed sensor A.



Installation

1. Install the intermediate speed sensor A.
   1. Install the intermediate speed sensor A bolt.
      Torque: 62 lb.in (7 Nm)
   2. Connect the electrical connector. Slide the plastic lock to the locked position.



2. Install the main control valve body.
   Refer to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
   Refer to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

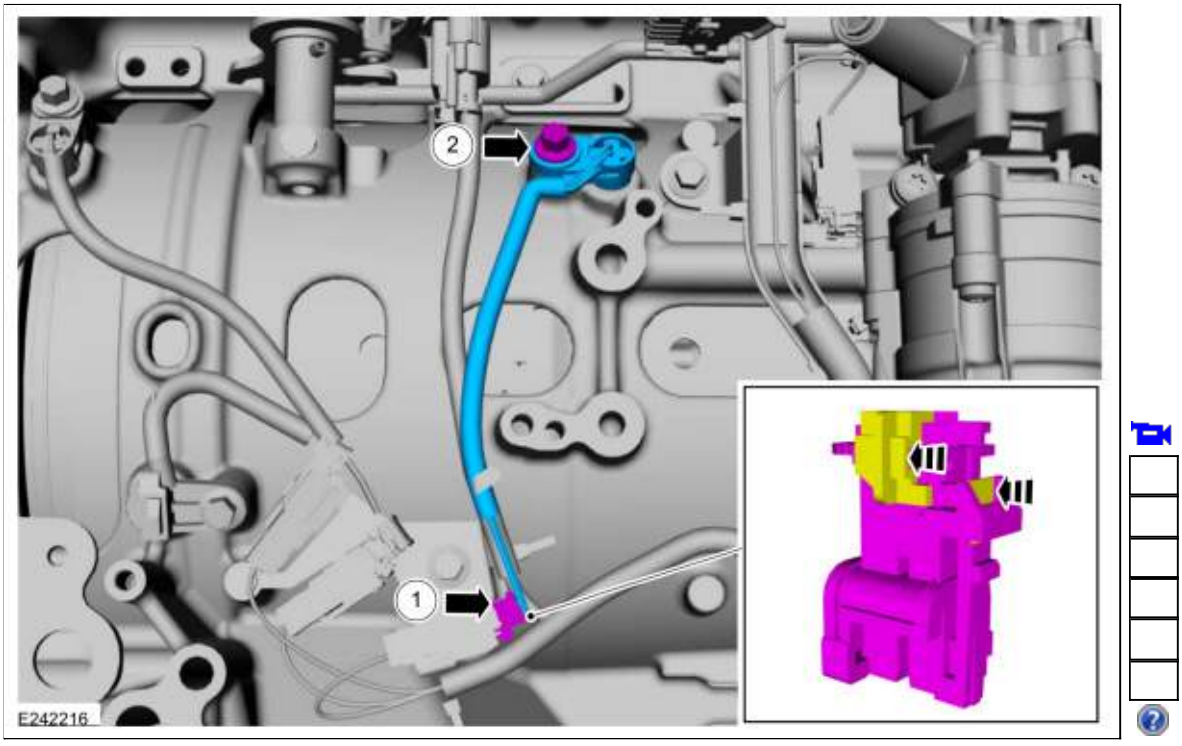
Intermediate Speed Sensor B (ISSB)

Base Part Number: 7H103

Removal

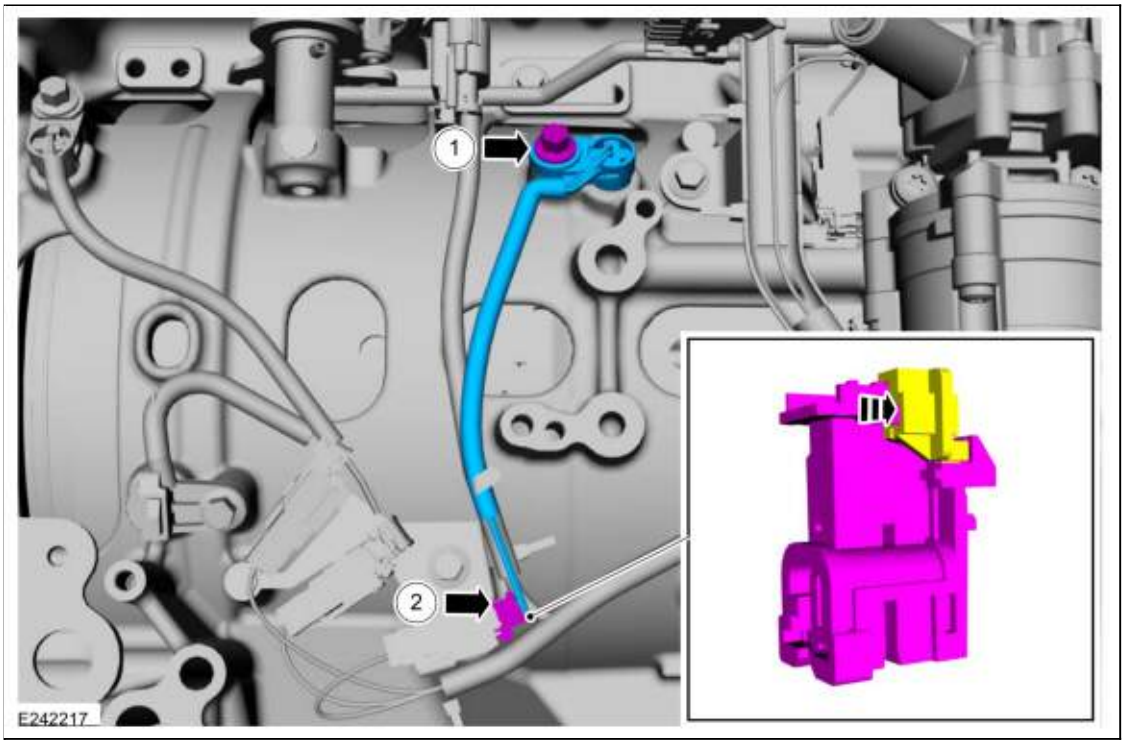
1. Remove the main control valve body.
   Refer to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
   Refer to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

2. Remove the intermediate speed sensor B.
   1. Slide the plastic lock to the unlocked position. While pressing the plastic tab, disconnect the electrical connector.
   2. Remove the bolt and the intermediate speed sensor B.



Installation

1. Install the intermediate speed sensor B.
   1. Install the intermediate speed sensor B bolt.
      Torque: 62 lb.in (7 Nm)
   2. Connect the electrical connector. Slide the plastic lock to the locked position.



2. Install the main control valve body.
   Refer to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
   Refer to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

Main Control Valve Body - Vehicles With: Auto-Start-Stop

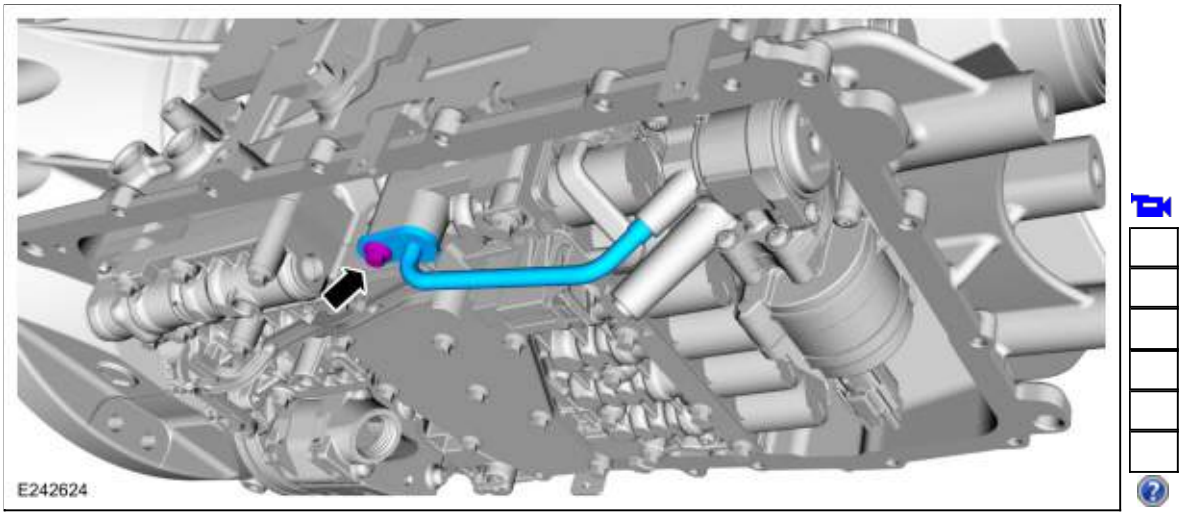
Base Part Number: 7A100

Removal

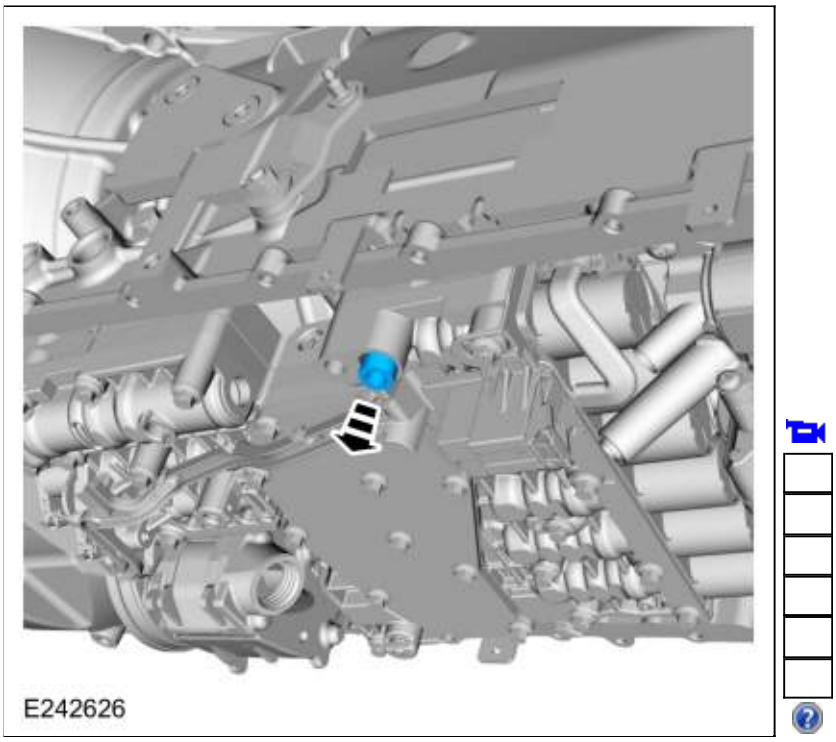
NOTE: *The Solenoid Body Strategy Data Download procedure must be performed if a new main control valve body is installed.*

1. Remove the transmission fluid pan gasket and filter.
   Refer to: Transmission Fluid Pan, Gasket and Filter - Raptor (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80) .
   Refer to: Transmission Fluid Pan, Gasket and Filter - Raptor (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80) .
   Refer to: Transmission Fluid Pan, Gasket and Filter (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

2. Remove the bolt and the transmission fluid auxiliary pump tube.

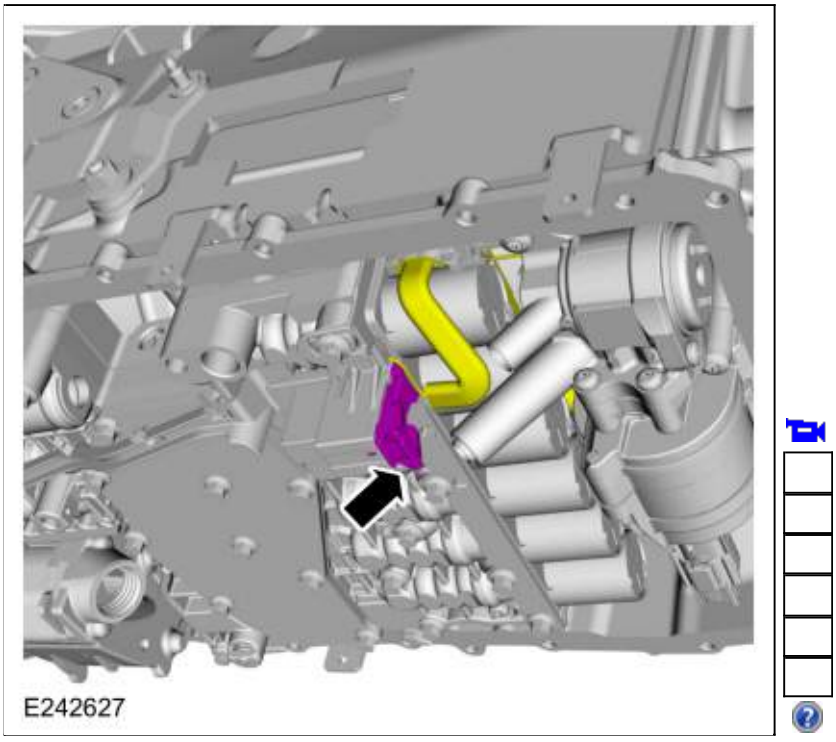


3. Remove the transmission fluid auxiliary pump tube seal.



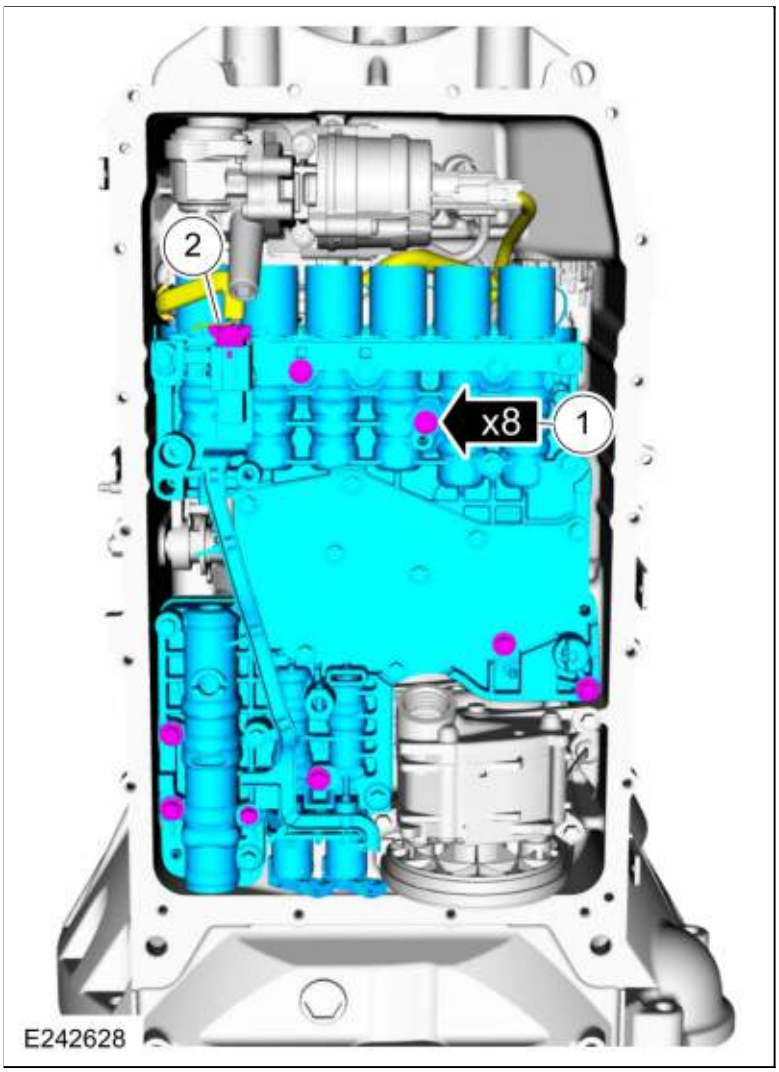
4. **NOTE:** *The internal wiring harness electrical connector can not be fully disconnected until lowering the main control valve body.*

   Unlock the internal wiring harness electrical connector.

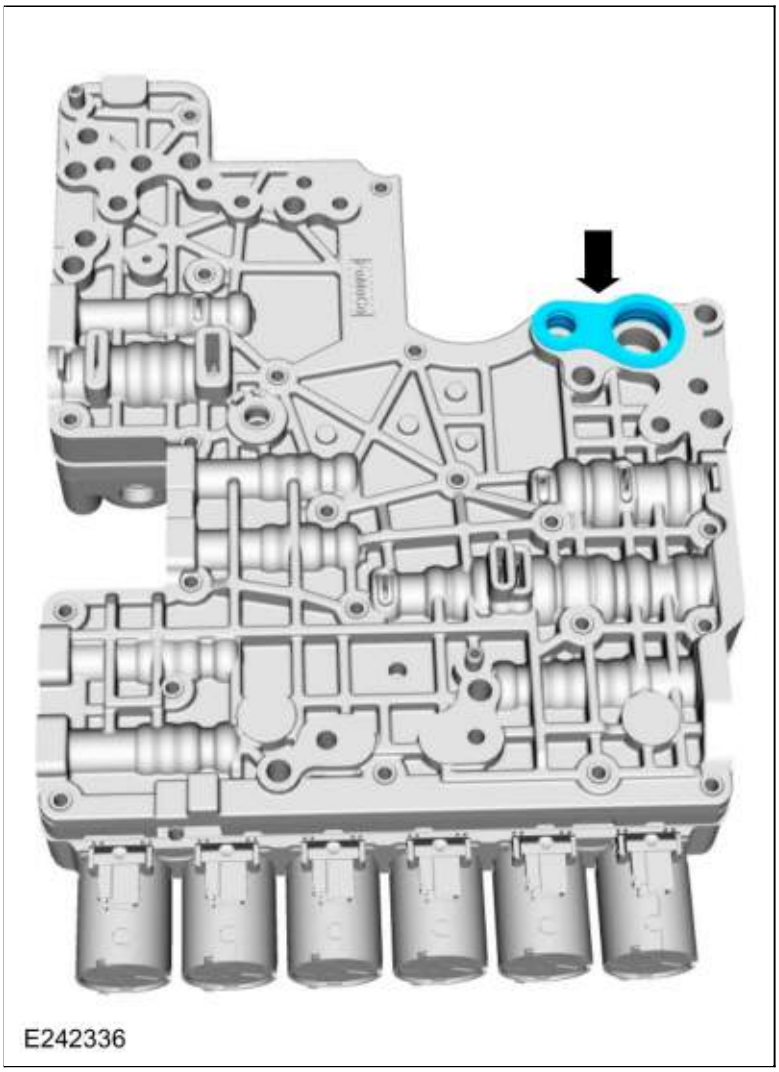


5. Remove the main control valve body.

1. While supporting the main control valve body, remove the main control-to-transmission case bolts.
2. Disconnect the internal wiring harness electrical connector while removing the main control valve body.

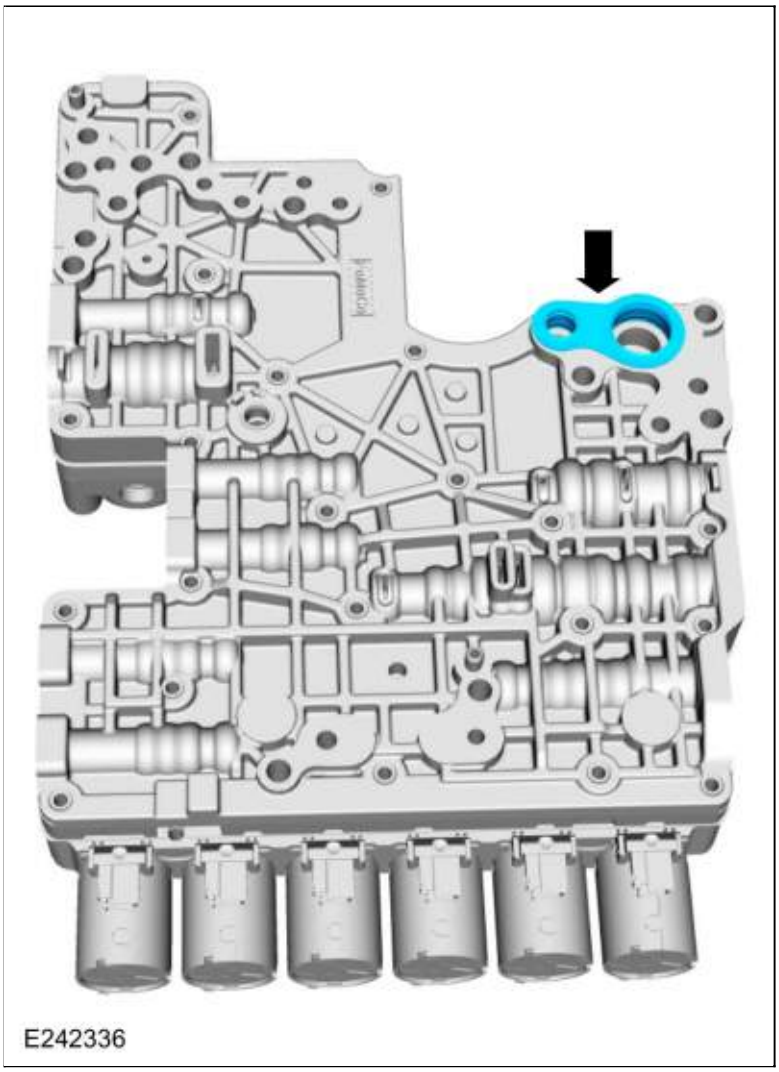


6. Remove the main control assembly to transmission fluid pump seal.



Installation

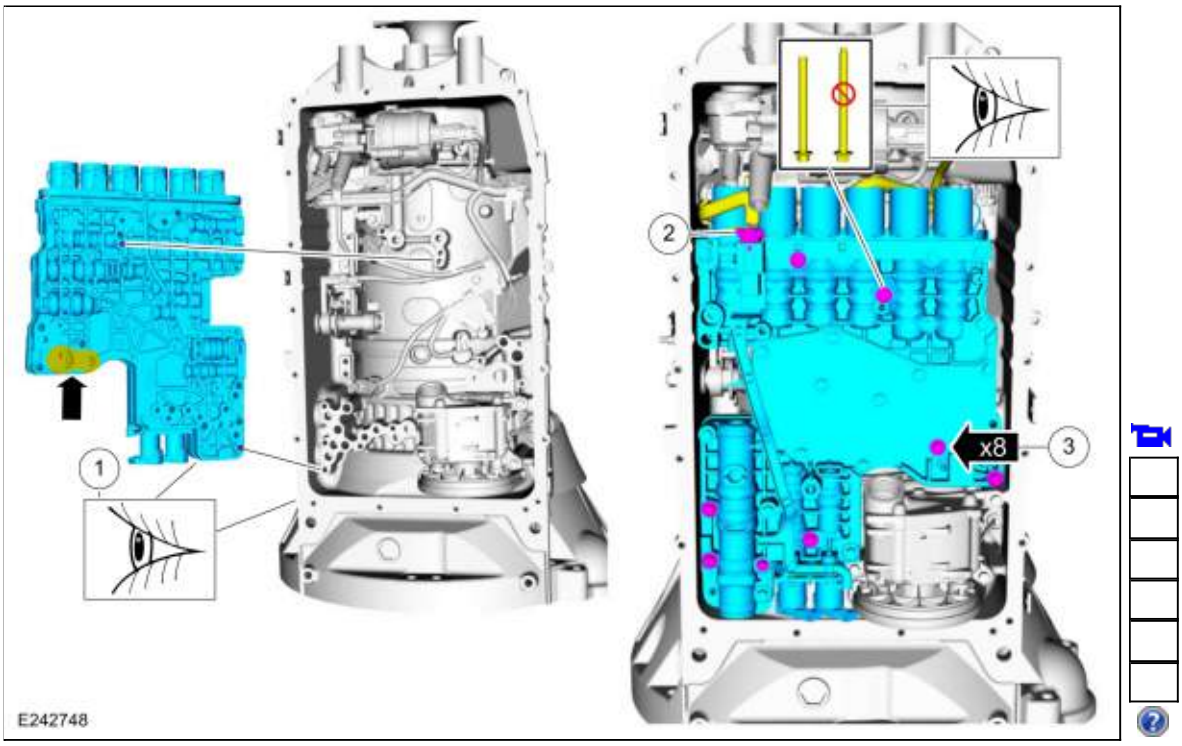
1. Install the main control assembly to transmission fluid pump seal.



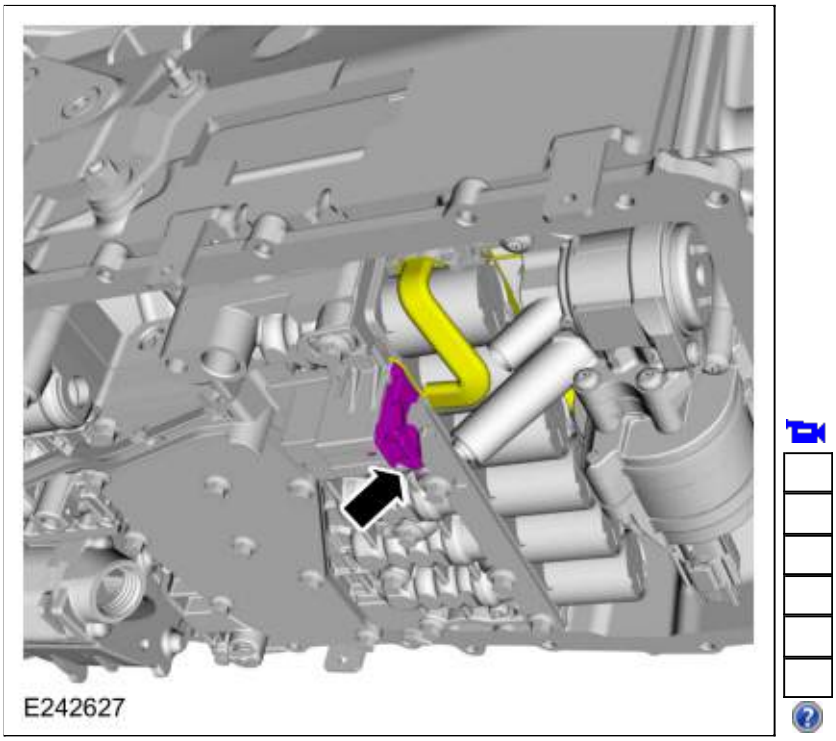
2. **NOTICE: Do not install a 71 mm length bolt in the location shown or the transmission clutch and planetary container will be damaged and result in transmission failure.**

Loosely install the main control valve body.

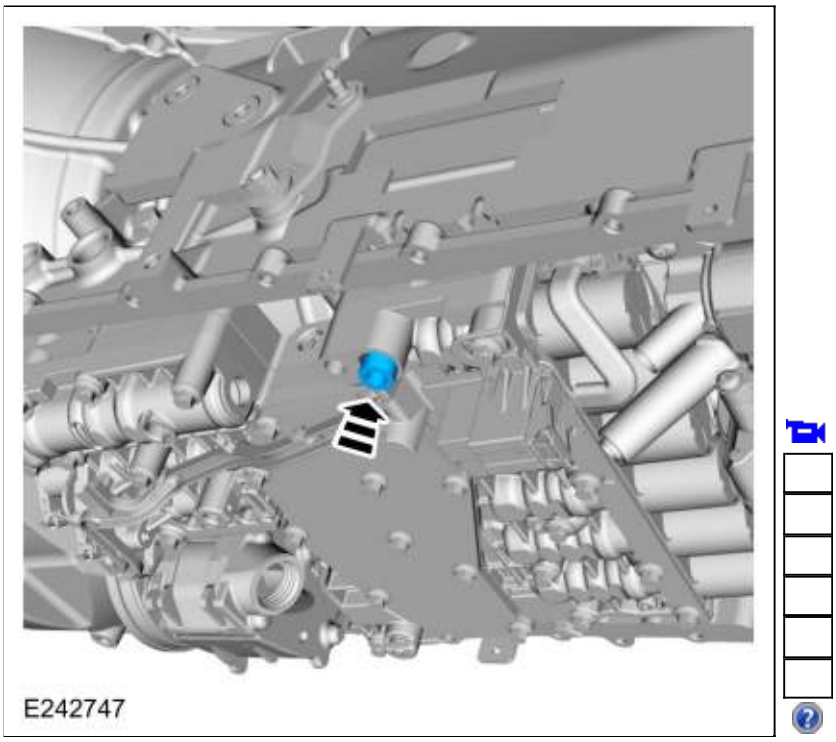
1. Align the guide pins on the main control valve body with the alignment holes in the transmission case.
2. Connect the internal wiring harness electrical connector while installing the main control valve body.
3. Loosely install the 68 mm length main control-to-transmission case bolts.



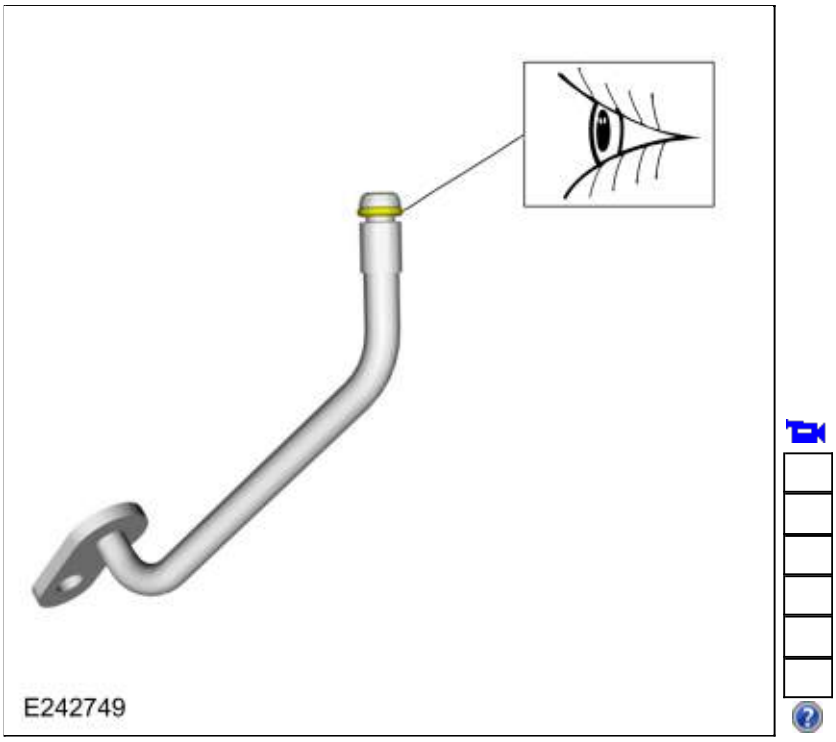
3. Lock the internal wiring harness electrical connector.



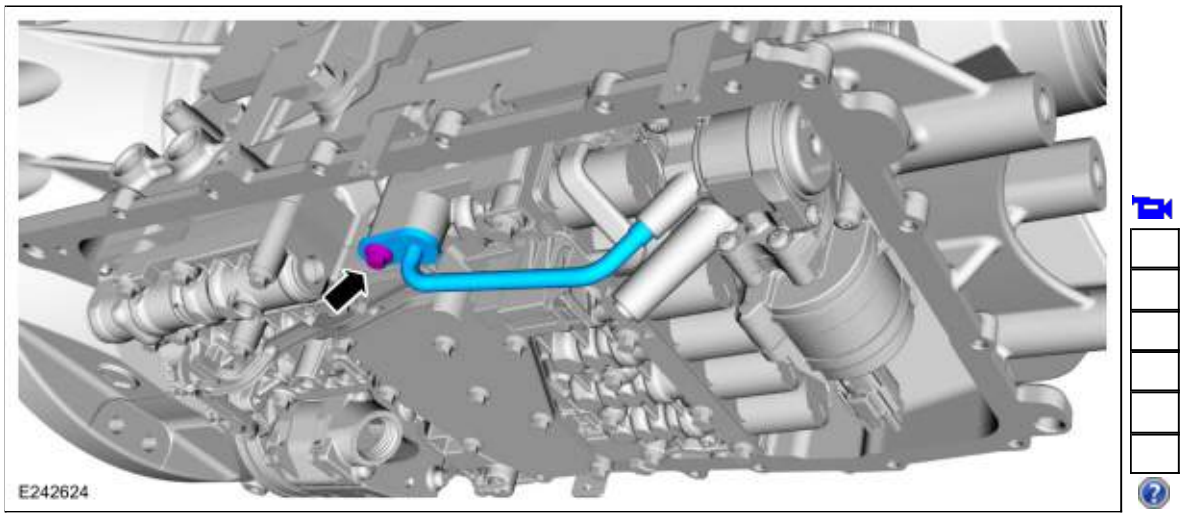
4. Install the transmission fluid auxiliary pump tube seal.



5. Inspect the transmission fluid auxiliary pump tube O-ring.

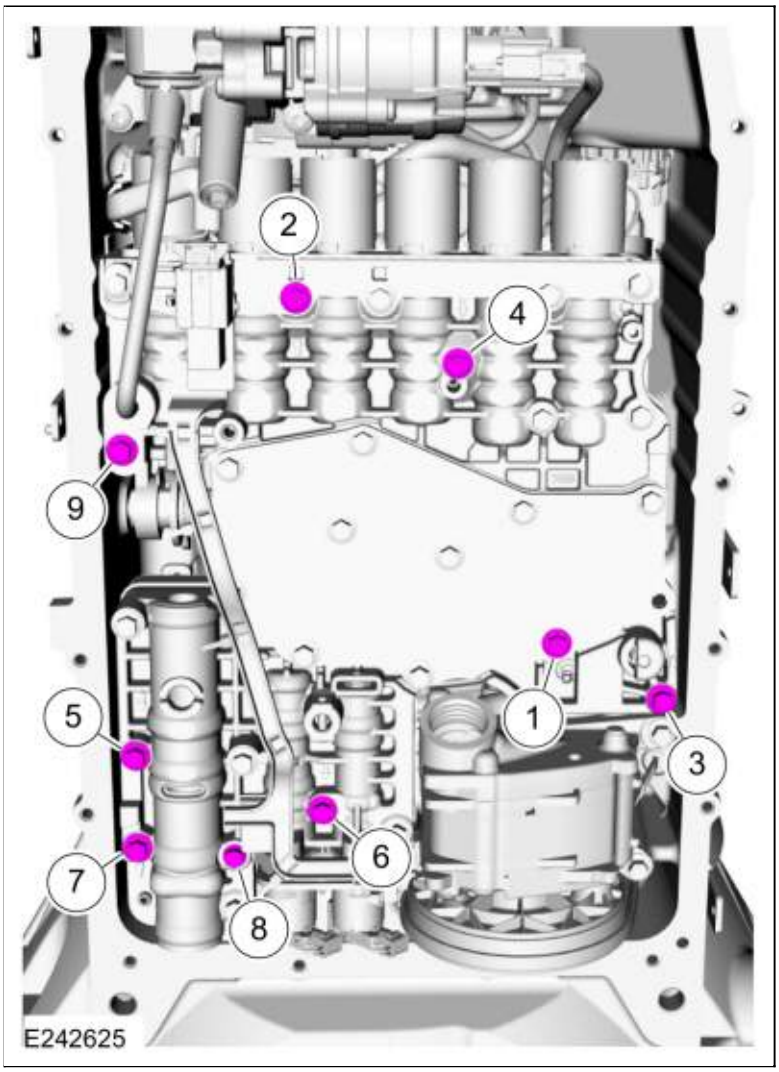


6. Install the transmission fluid auxiliary pump tube and loosely install the bolt.



7.

1. Tighten the bolts No. 1-8 in the sequence shown.
   Torque: 89 lb.in (10 Nm)
2. Tighten bolt No. 9
   Torque: 106 lb.in (12 Nm)



8. Install the transmission fluid pan gasket and filter.
   Refer to: Transmission Fluid Pan, Gasket and Filter - Raptor (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80) .
   Refer to: Transmission Fluid Pan, Gasket and Filter - Raptor (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80) .
   Refer to: Transmission Fluid Pan, Gasket and Filter (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

9. **NOTE:** *The solenoid body strategy data file and solenoid body identification must be updated anytime a new main control valve body is installed. A new main control valve body service tag must be installed over the current main control valve body service tag on the transmission case.*

   If a new main control valve body was installed, download a new transmission strategy.
   Refer to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).

Main Control Valve Body

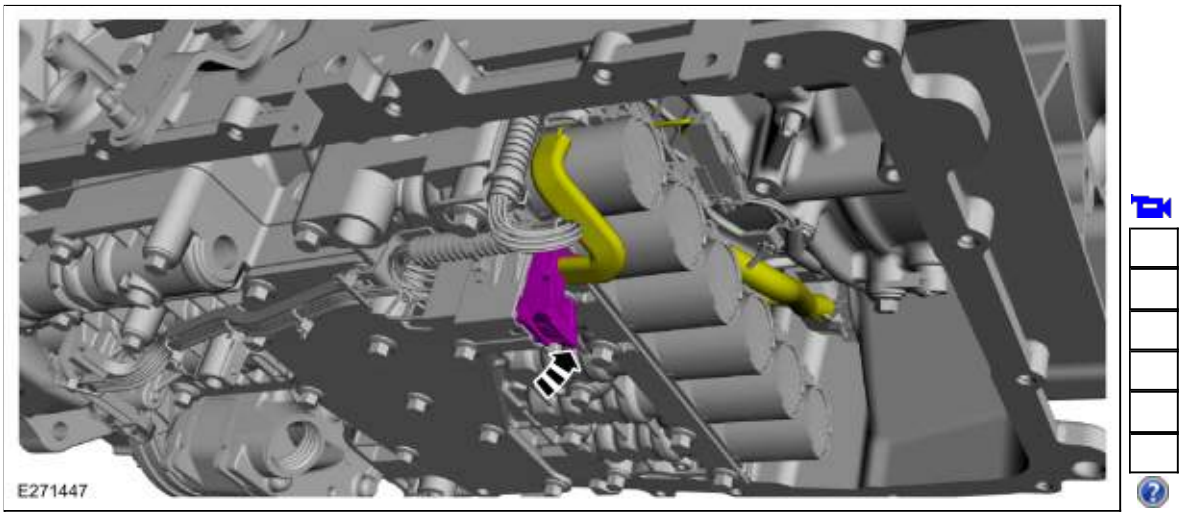
Base Part Number: 7A100

Removal

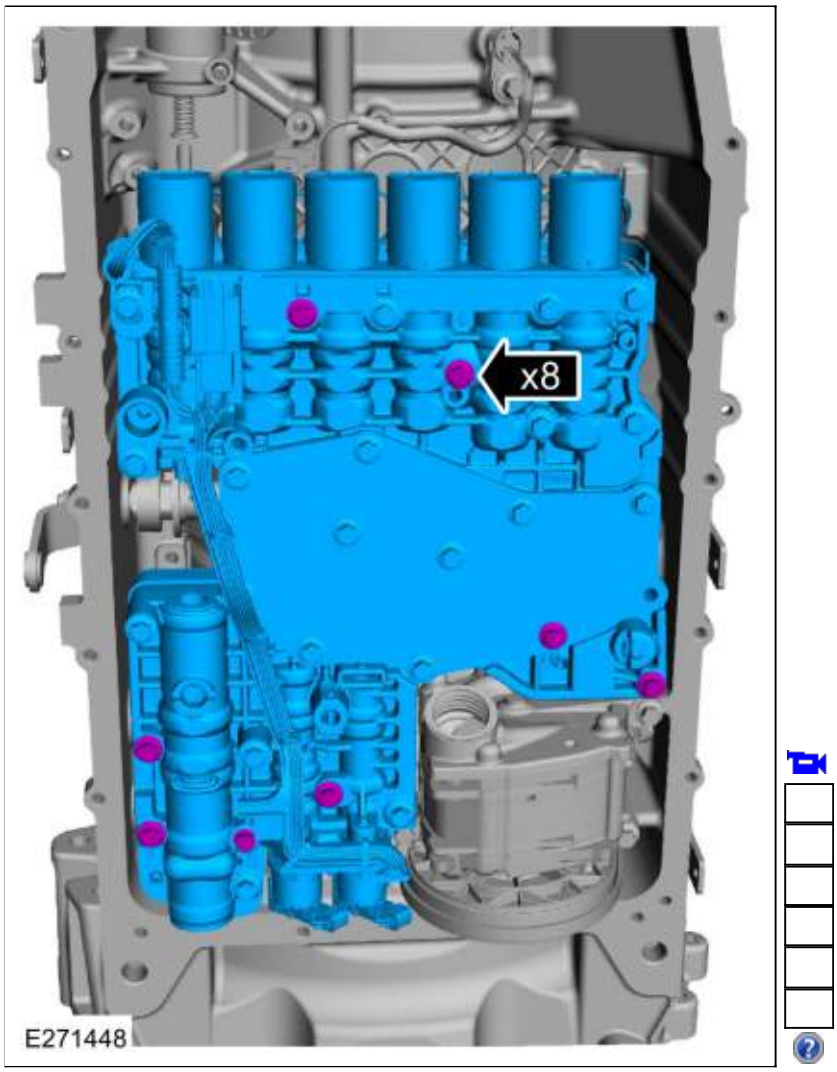
NOTE: *The Solenoid Body Strategy Data Download procedure must be performed if a new main control valve body is installed.*

1. Remove the transmission fluid pan gasket and filter.
   Refer to: Transmission Fluid Pan, Gasket and Filter (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
   Refer to: Transmission Fluid Pan, Gasket and Filter - 5.0L 32V Ti-VCT/5.0L Ti-VCT V8 (308kW/418PS) (307-01A) .

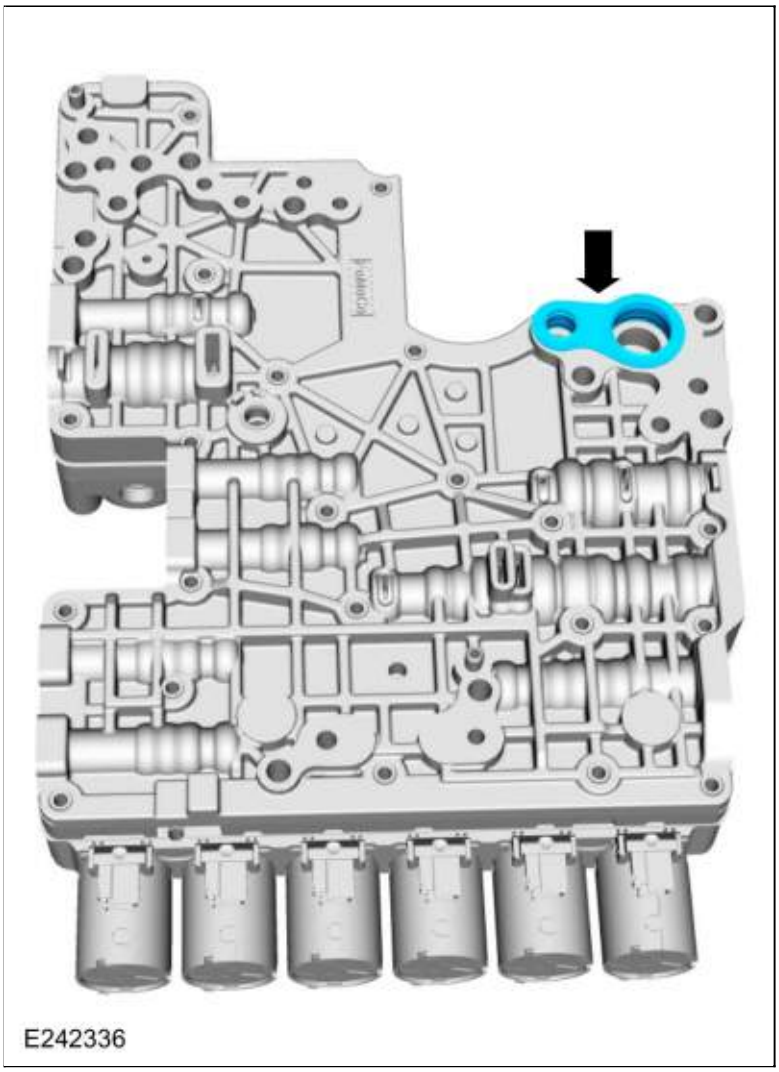
2. Unlock and disconnect the internal wiring harness electrical connector.



3. Remove the bolts and the main control valve body.

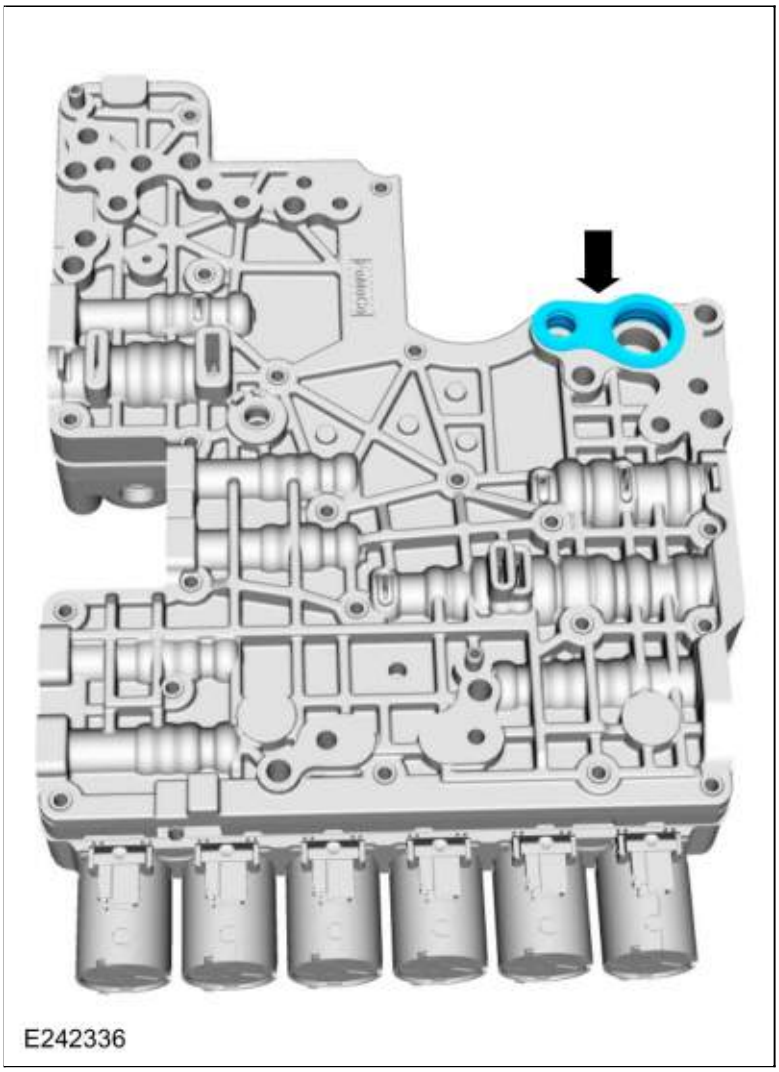


4. Remove the main control assembly to transmission fluid pump seal.



Installation

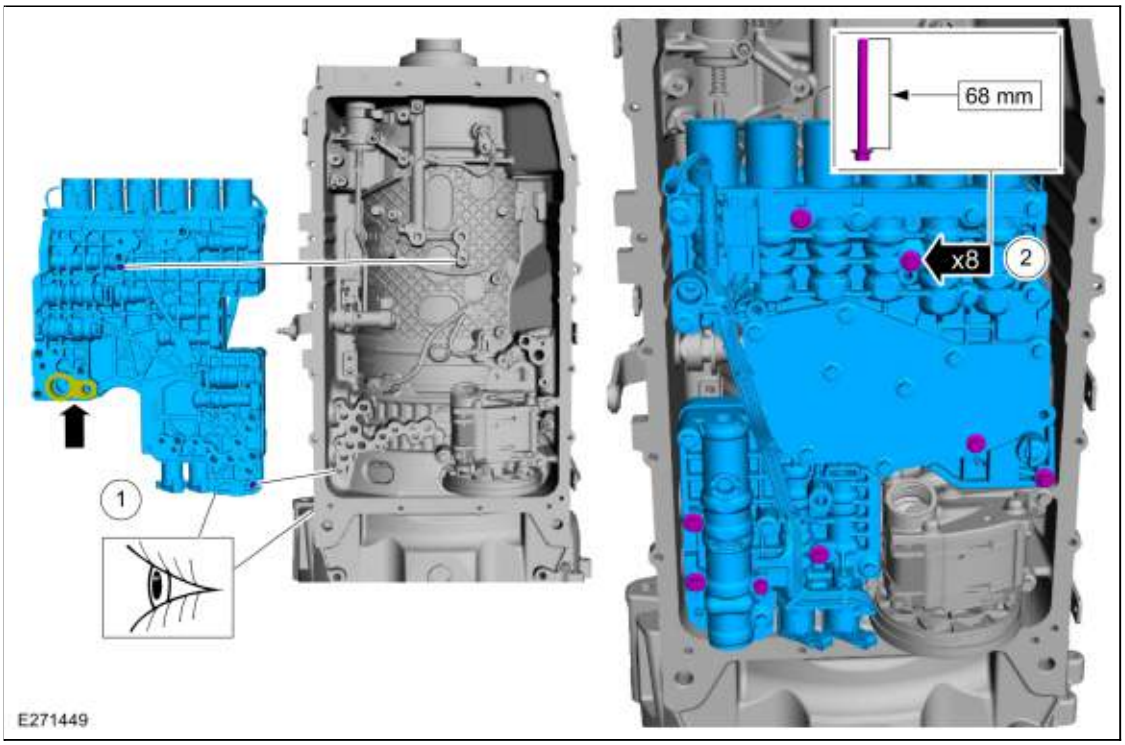
1. Install the main control assembly to transmission fluid pump seal.



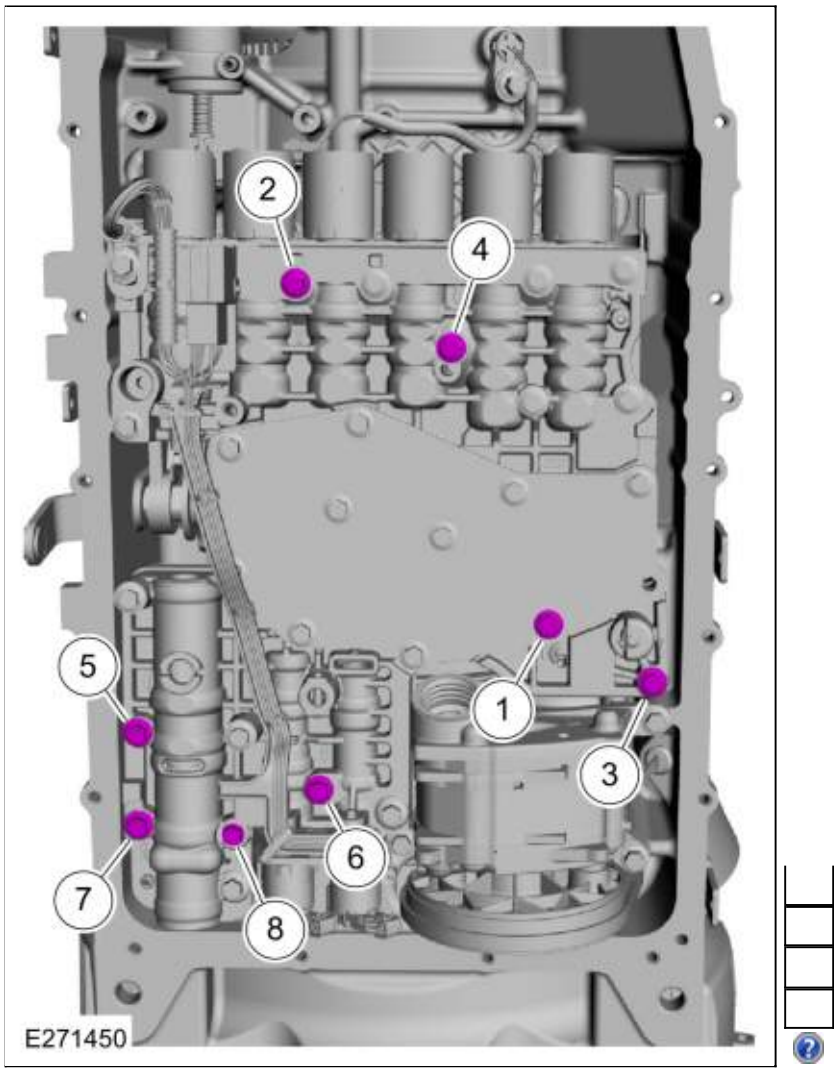
2. **NOTICE: Do not install a 71 mm length bolt in the location shown or the transmission clutch and planetary container will be damaged and result in transmission failure.**

Loosely install the main control valve body.

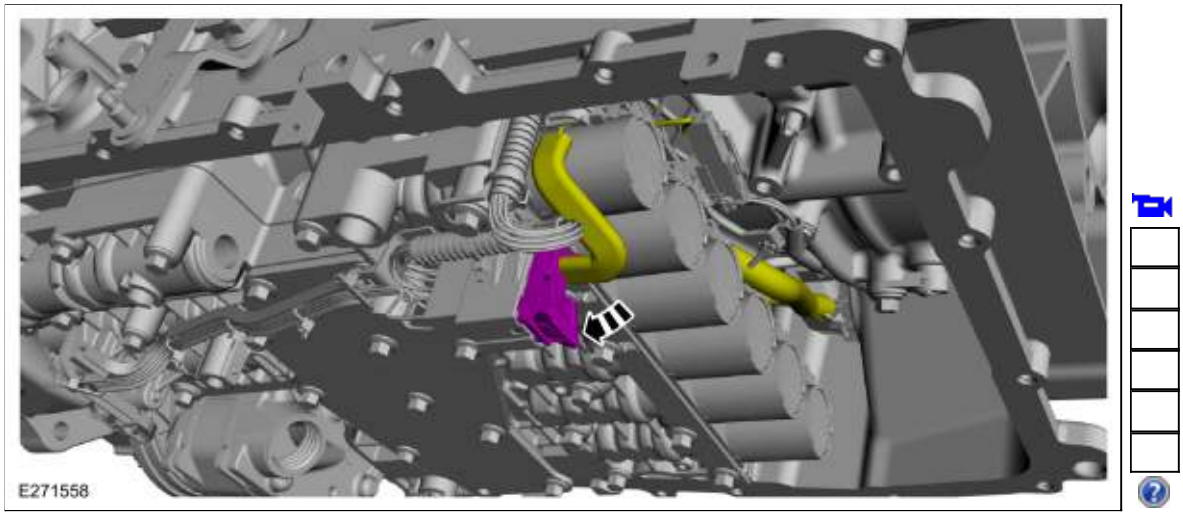
1. Align the guide pins on the main control valve body with the alignment holes in the transmission case.
2. Loosely install the 68 mm length main control-to-transmission case bolts.



3. Tighten the bolts in the sequence shown.
   Torque: 89 lb.in (10 Nm)



4. Connect the internal wiring harness electrical connector.



5. Install the transmission fluid pan gasket and filter.

Refer to: Transmission Fluid Pan, Gasket and Filter (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
Refer to: Transmission Fluid Pan, Gasket and Filter - 5.0L 32V Ti-VCT/5.0L Ti-VCT V8 (308kW/418PS) (307-01A) .

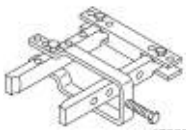
6. **NOTE:** *The solenoid body strategy data file and solenoid body identification must be updated anytime a new main control valve body is installed. A new main control valve body service tag must be installed over the current main control valve body service tag on the transmission case.*

   If a new main control valve body was installed, download a new transmission strategy.
   Refer to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).

Output Shaft Seal

Base Part Number: 7B215

Special Tool(s) / General Equipment

 E129694	100-001 (T50T-100-A) Slide Hammer
 17069	307-309 Remover, Torque Converter Seal TKIT-1994-FMH/FLMH TKIT-1994-LMH/MH TKIT-1994-FH
 E270042	307-458 Socket, Output Shaft Locknut TKIT-2003N-F
 E270046	307-660 Installer, Front Pump Seal TKIT-2009C-F TKIT-2009C-ROW

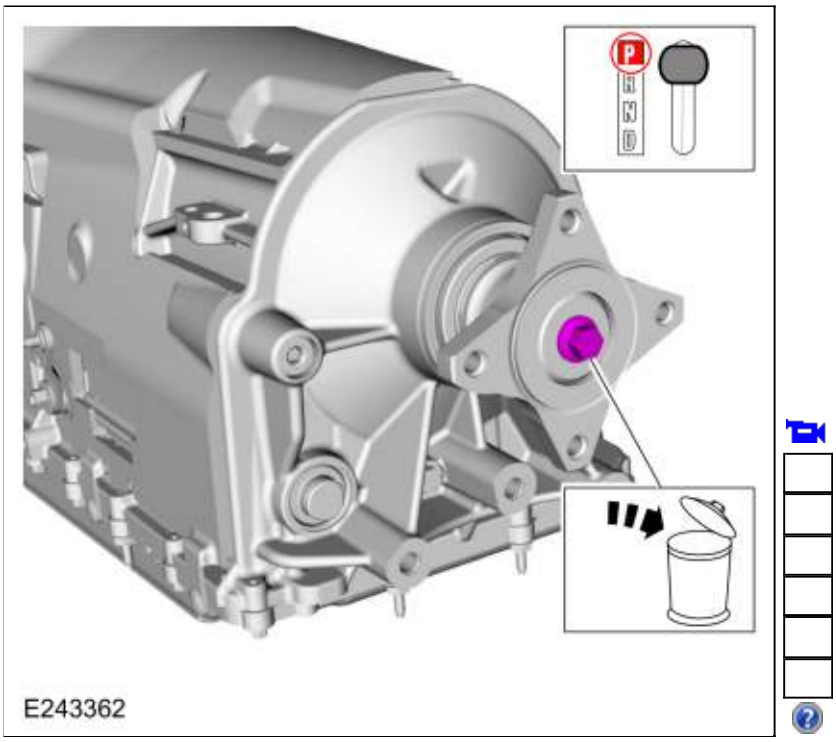
Removal

1. With the vehicle in NEUTRAL, position it on a hoist.
   Refer to: Jacking and Lifting (100-02 Jacking and Lifting, Description and Operation).

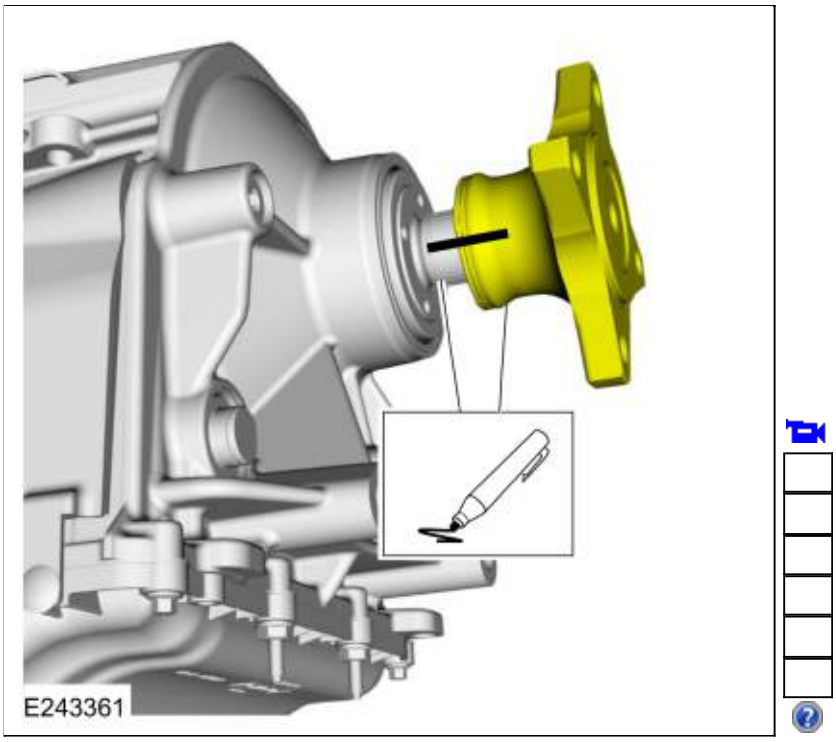
Rear Wheel Drive (RWD) vehicles

2. Remove the driveshaft assembly.
   Refer to: Rear Driveshaft (205-01 Driveshaft, Removal and Installation).

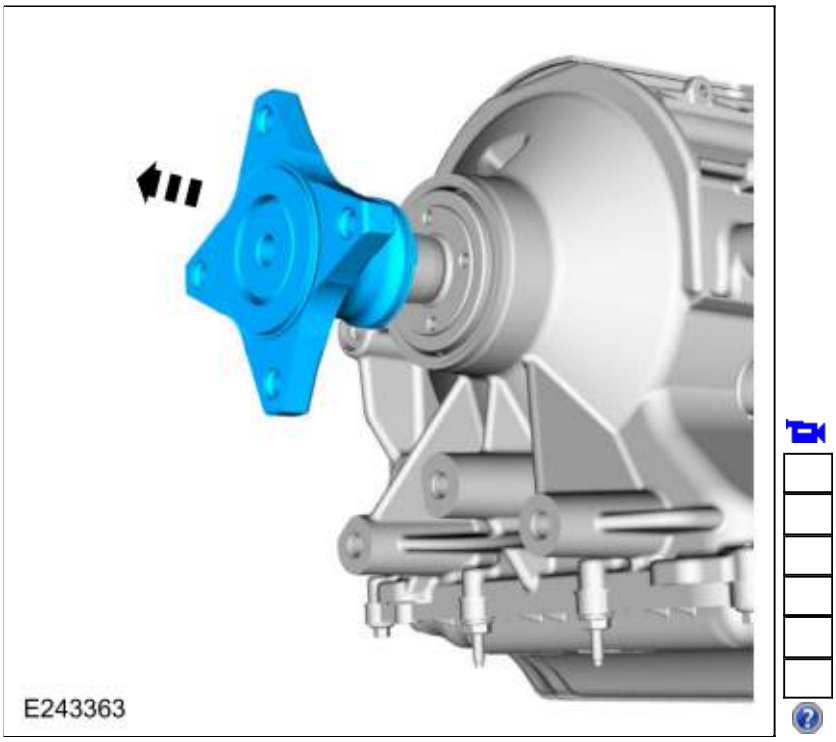
3. Remove and discard the output shaft flange bolt (7N134).



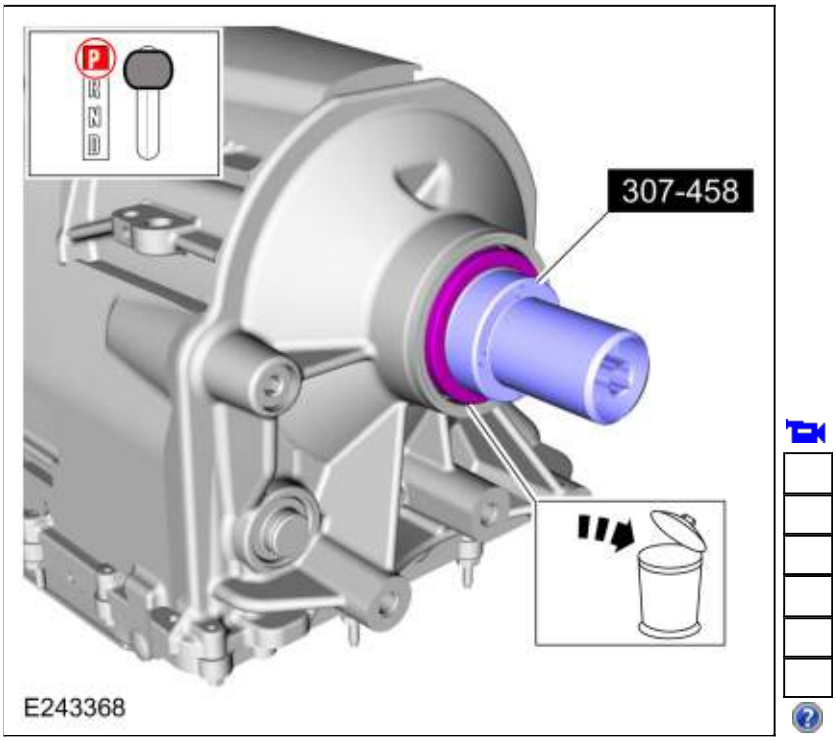
4. Slide the output shaft flange back to index mark the output shaft to the flange.



5. Remove the output shaft flange.



6. Using the special tool, remove and discard the output shaft nut (7085).
   Use Special Service Tool: 307-458 Socket, Output Shaft Locknut.

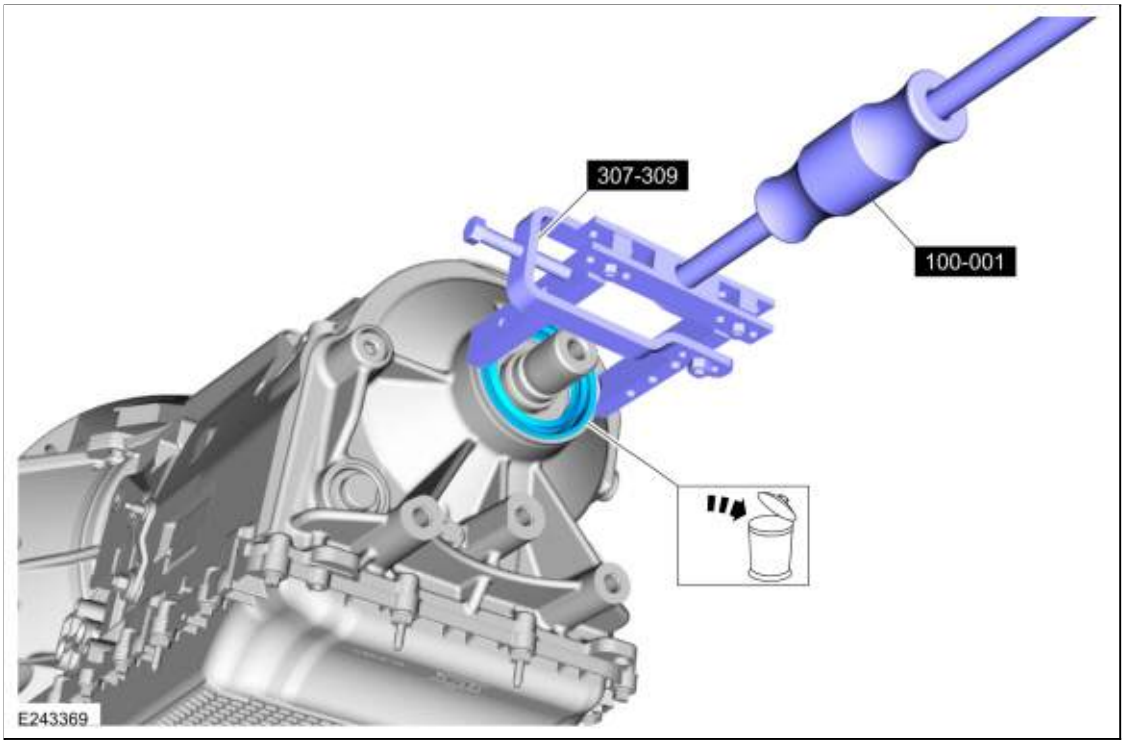


Four-Wheel Drive (4WD) vehicles

7. Remove the transfer case assembly.
   Refer to: Transfer Case (308-07 Transfer Case - 10-Speed Automatic Transmission - 10R80) .

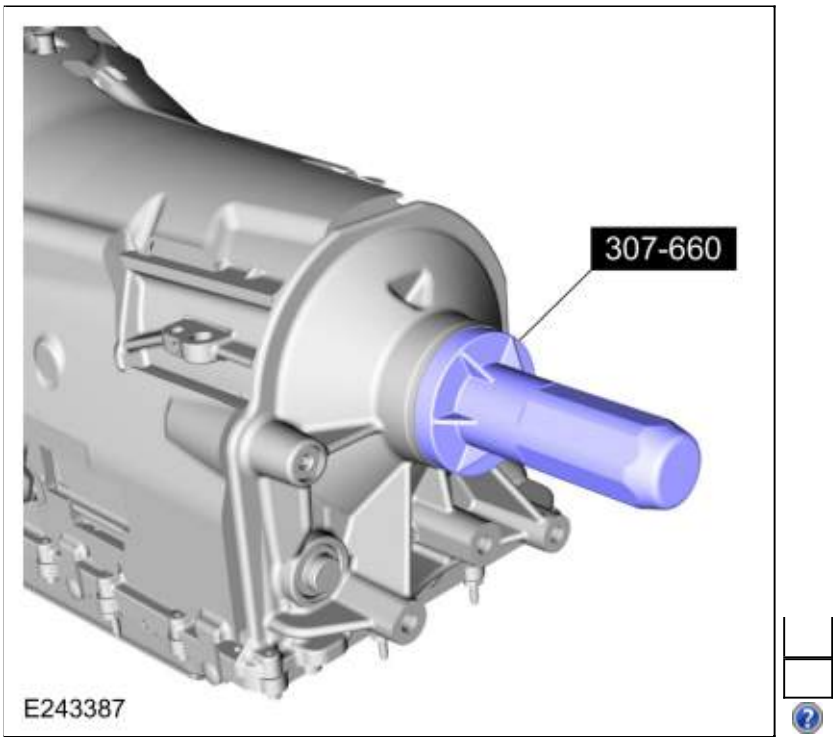
All vehicles

8. Using the special tools, remove and discard the output shaft seal (7052).
   Use Special Service Tool: 307-309 Remover, Torque Converter Seal. , 100-001 (T50T-100-A) Slide Hammer.



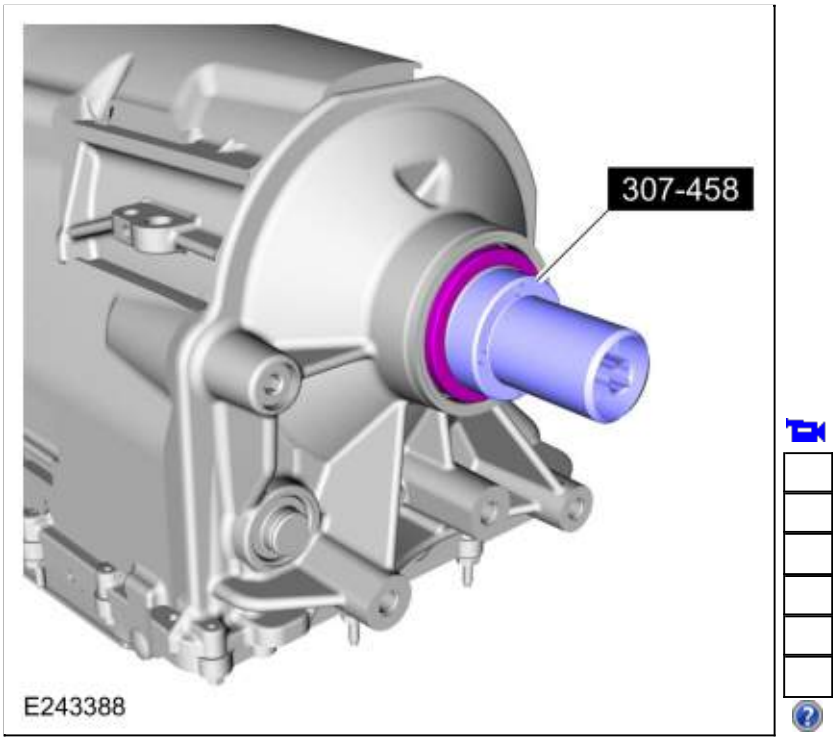
Installation

1. Using the special tool, install the new output shaft seal.
   Use Special Service Tool: 307-660 Installer, Front Pump Seal.

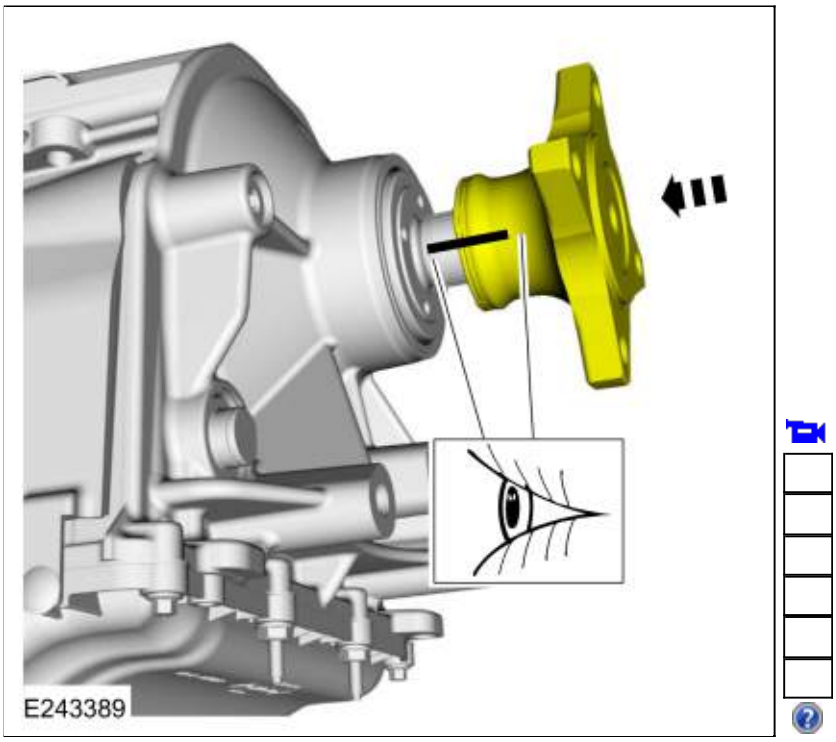


Rear Wheel Drive (RWD) vehicles

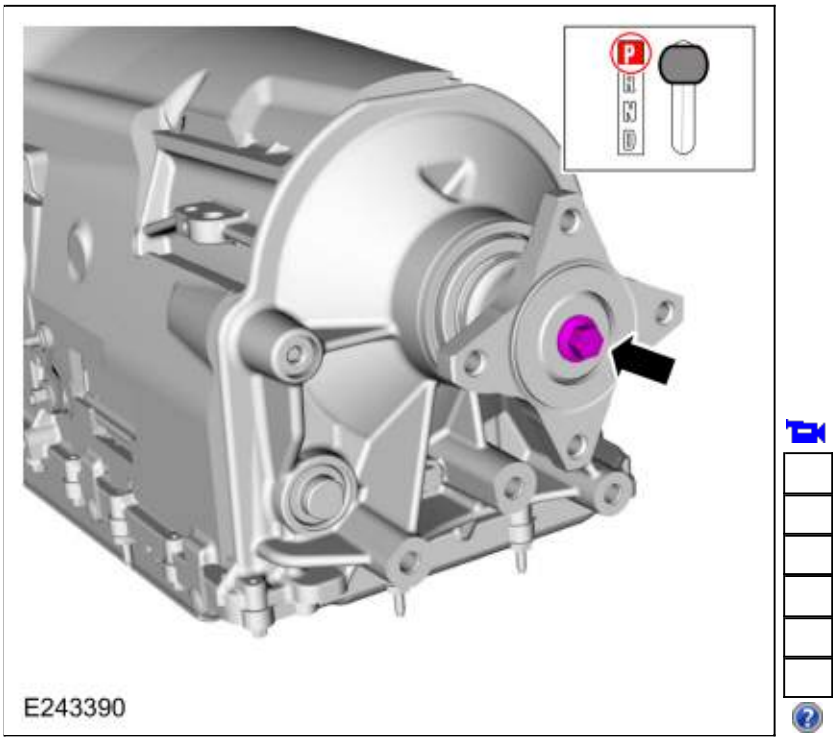
2. Using the special tool, install the new output shaft nut.
   Use Special Service Tool: 307-458 Socket, Output Shaft Locknut.
   Torque: 148 lb.ft (200 Nm)



3. Align the index marks on the output shaft and the output shaft flange made during removal.



4. Install the new output shaft flange bolt.
   Torque: 81 lb.ft (110 Nm)



5. Install the driveshaft assembly.
   Refer to: Rear Driveshaft (205-01 Driveshaft, Removal and Installation).

Four-Wheel Drive (4WD) vehicles

6. Install the transfer case assembly.
   Refer to: Transfer Case (308-07B Transfer Case - 10-Speed Automatic Transmission - 10R80, Installation).

All vehicles

7. Check the transmission fluid level
   Refer to: Transmission Fluid Level Check (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).

Output Shaft Speed (OSS) Sensor

Base Part Number: 7H103

Removal

All vehicles

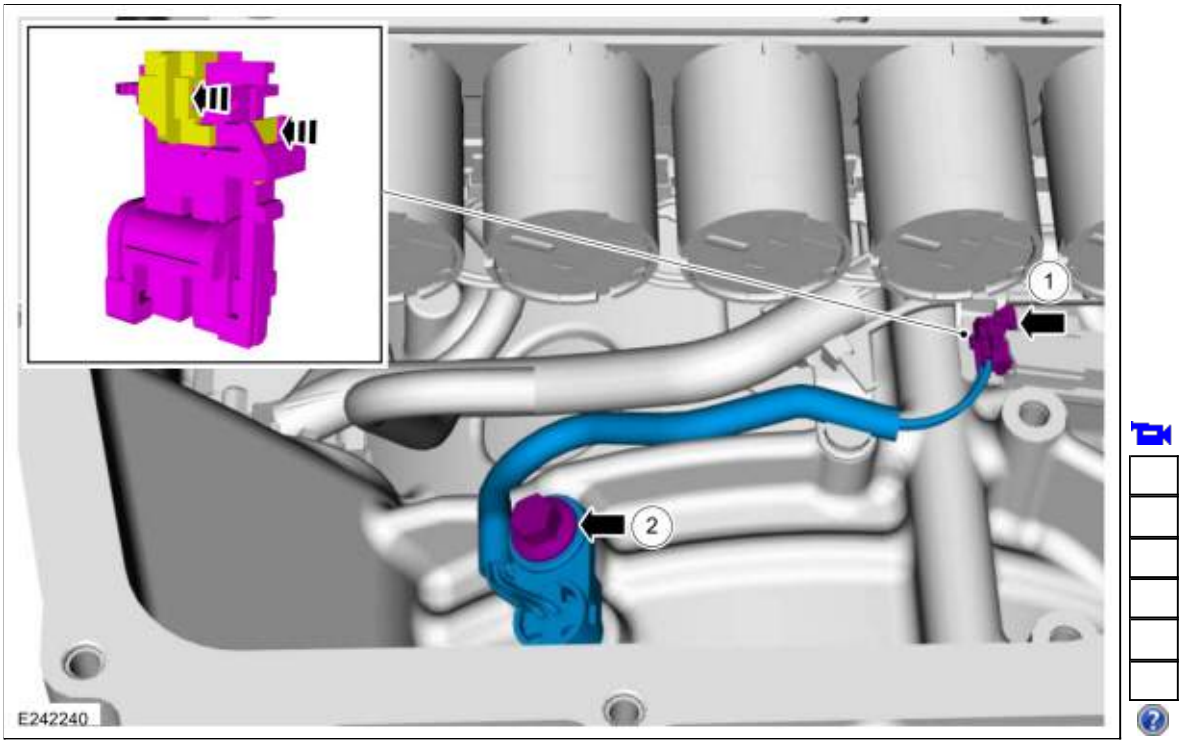
1. Remove the transmission fluid pan gasket and filter.
   Refer to: Transmission Fluid Pan, Gasket and Filter (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

Vehicles equipped with Auto Stop-Start

2. Remove the transmission fluid auxiliary pump.
   Refer to: Transmission Fluid Auxiliary Pump (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

All vehicles

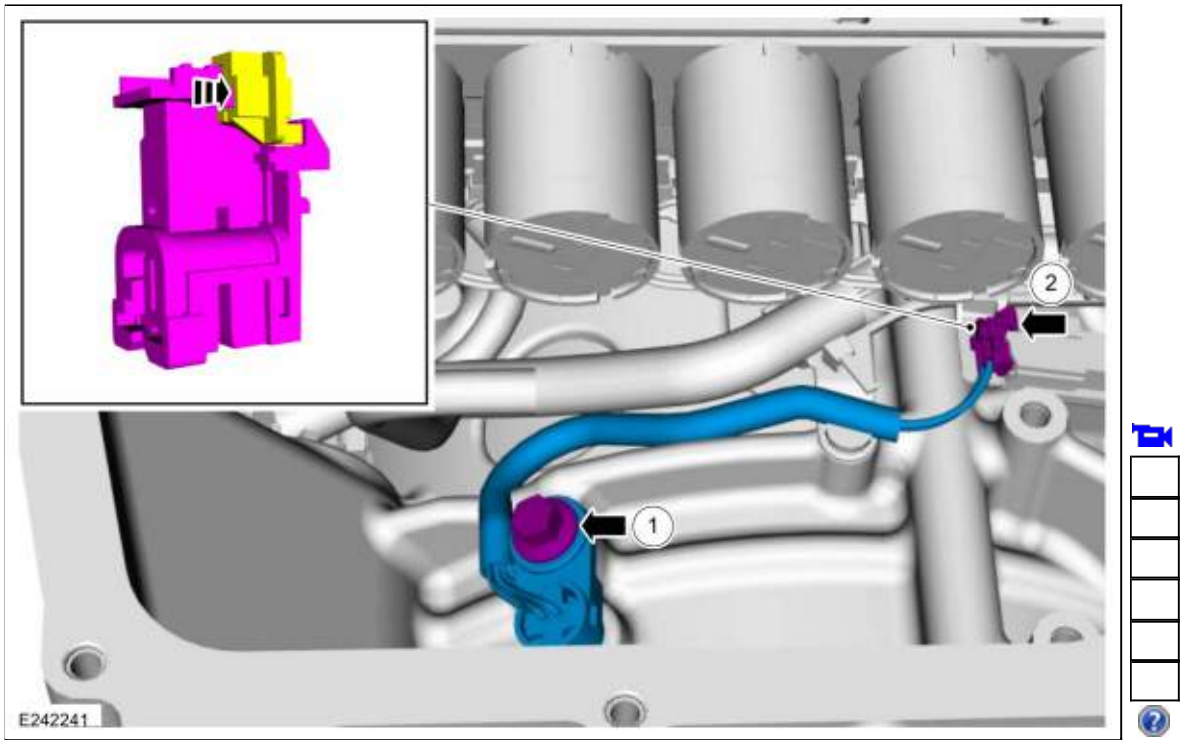
3. Remove the OSS sensor.
   1. Slide the plastic lock to the unlocked position. While pressing the plastic tab, disconnect the electrical connector.
   2. Remove the bolt and the OSS sensor.



Installation

All vehicles

1.
Install the OSS sensor.
   1. Install the OSS sensor bolt.
      Torque: 62 lb.in (7 Nm)
   2. Connect the electrical connector. Slide the plastic lock to the locked position.



Vehicles equipped with Auto Stop-Start

2. Install the transmission fluid auxiliary pump.
Refer to: Transmission Fluid Auxiliary Pump (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

All vehicles

3. Install the transmission fluid pan gasket and filter.
Refer to: Transmission Fluid Pan, Gasket and Filter (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

Selector Shaft Seal

Base Part Number: 7F337

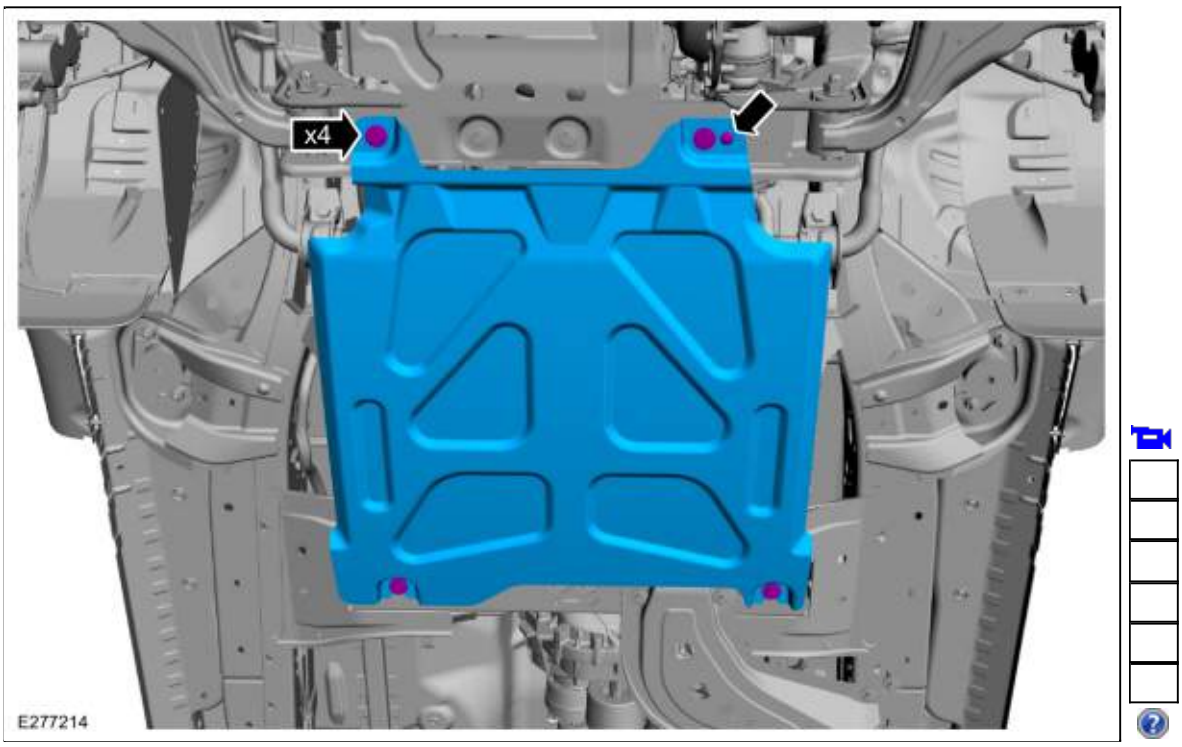
Special Tool(s) / General Equipment

 E270043	307-549 Installer, Shift Shaft Fluid Seal TKIT-2005D1-F1

Removal

1. With the vehicle in NEUTRAL, position it on a hoist.
   Refer to: Jacking and Lifting (100-02 Jacking and Lifting, Description and Operation).

2. If equipped, remove the bolts, release the retainer and remove the splash shield.



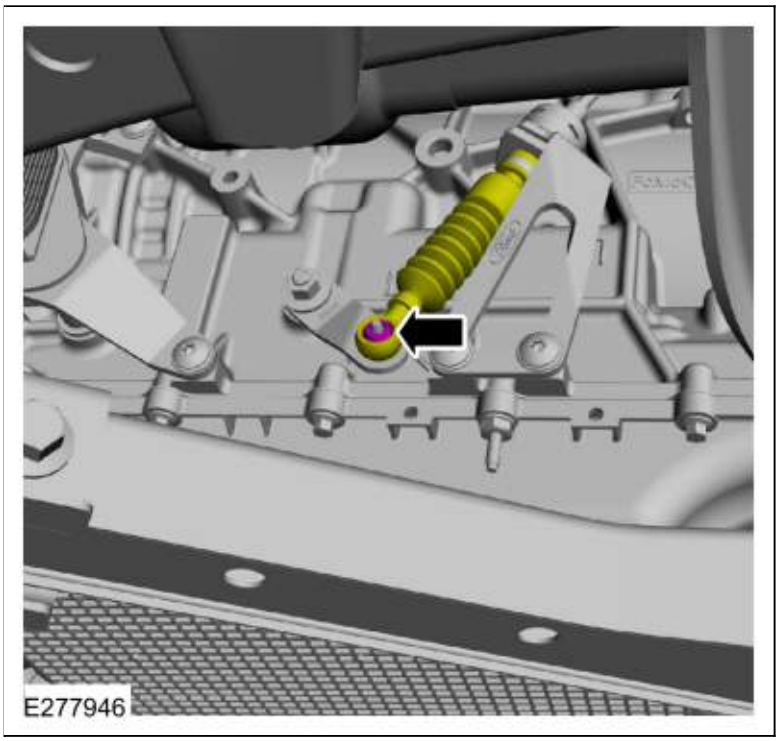
Four-Wheel Drive (4WD) vehicles

3. Remove the front driveshaft assembly.
   Refer to: Front Driveshaft (205-01 Driveshaft, Removal and Installation).

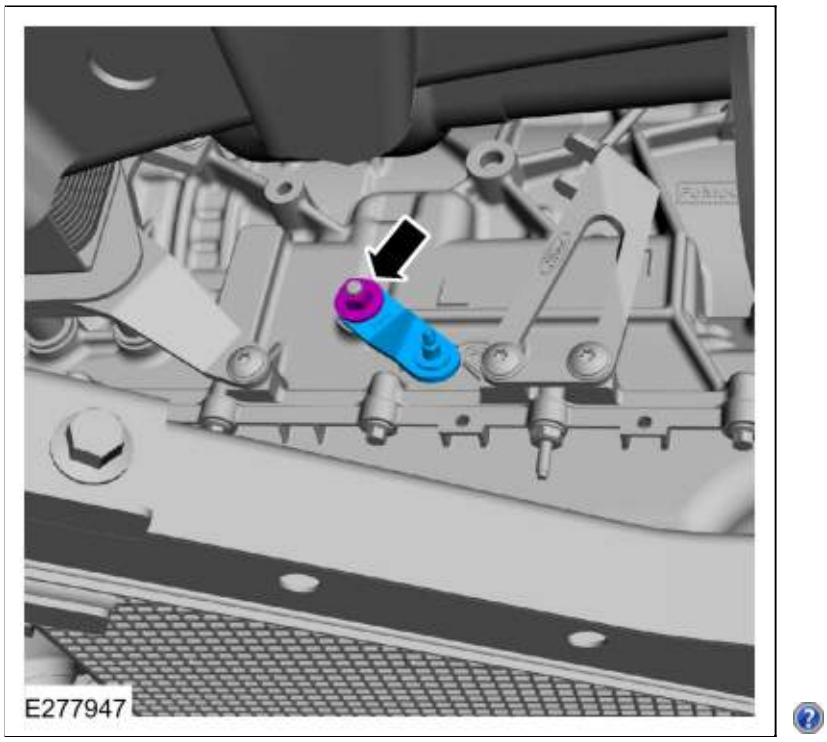
All vehicles

4. **NOTICE: Take extra care when handling selector lever cable.**

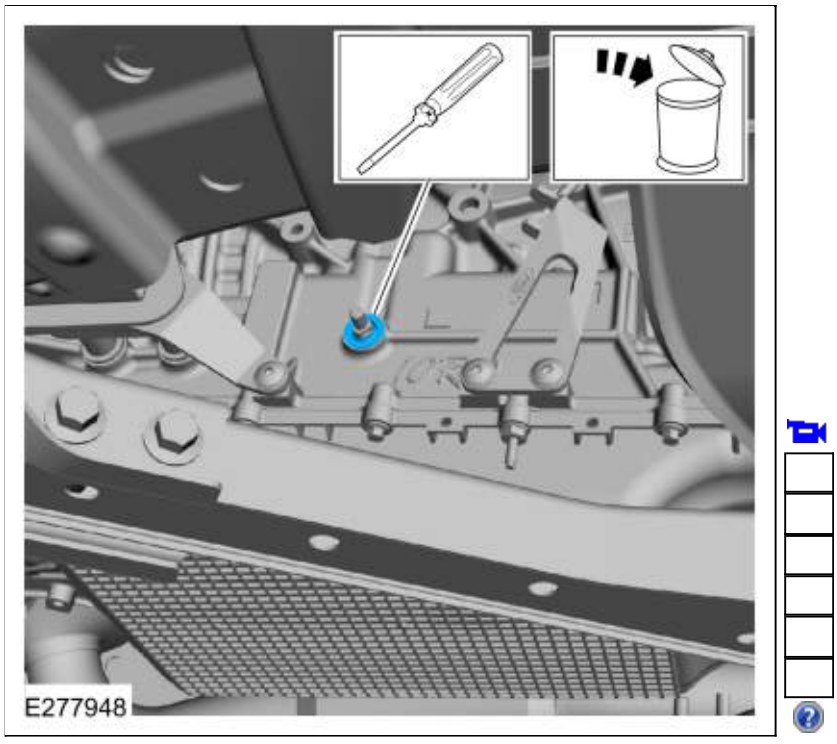
   Disconnect the selector lever cable from the manual control lever.



5. Remove the nut and the manual control lever.

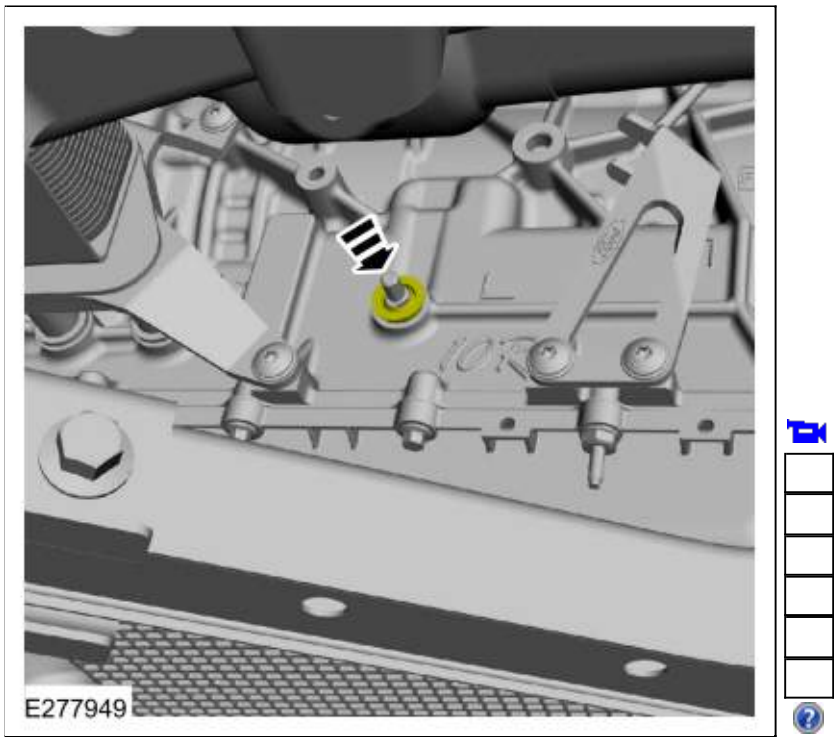


6. Remove and discard the selector shaft seal (7F337).

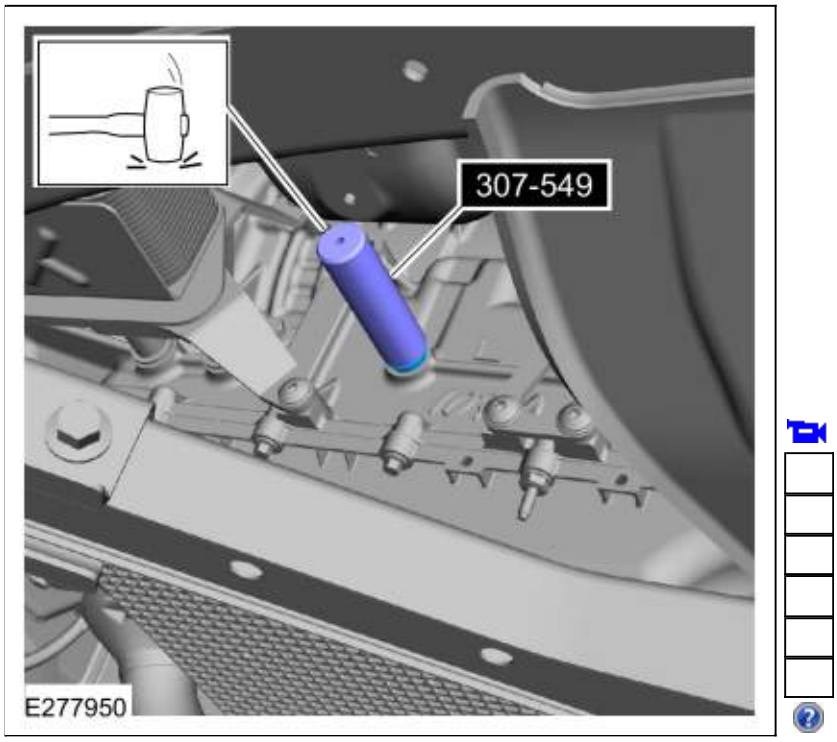


Installation

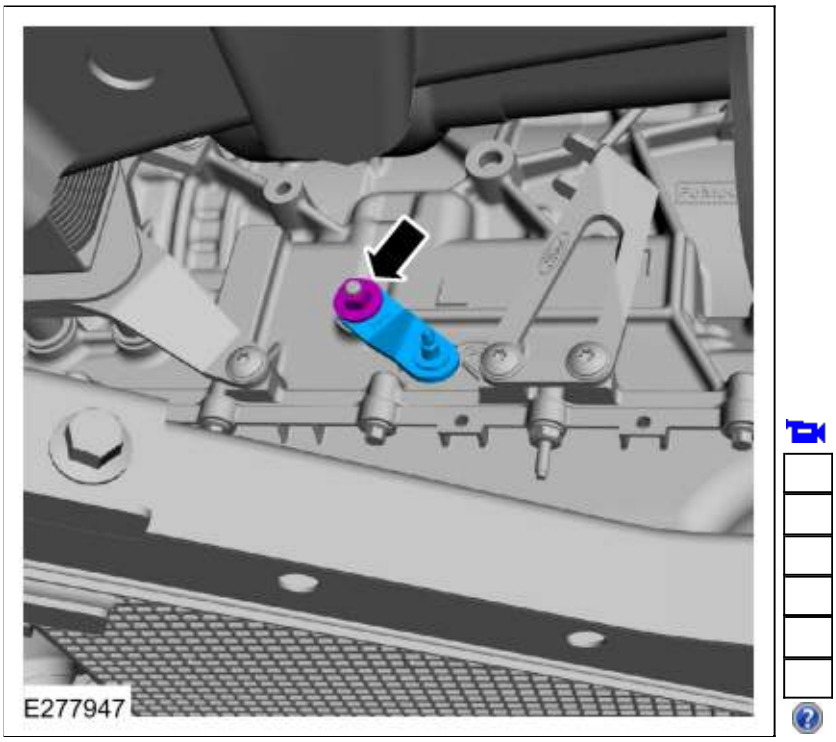
1. Slide the selector shaft seal onto the manual shaft.



2. Using the special tool, install the selector shaft seal.
   Use Special Service Tool: 307-549 Installer, Shift Shaft Fluid Seal.

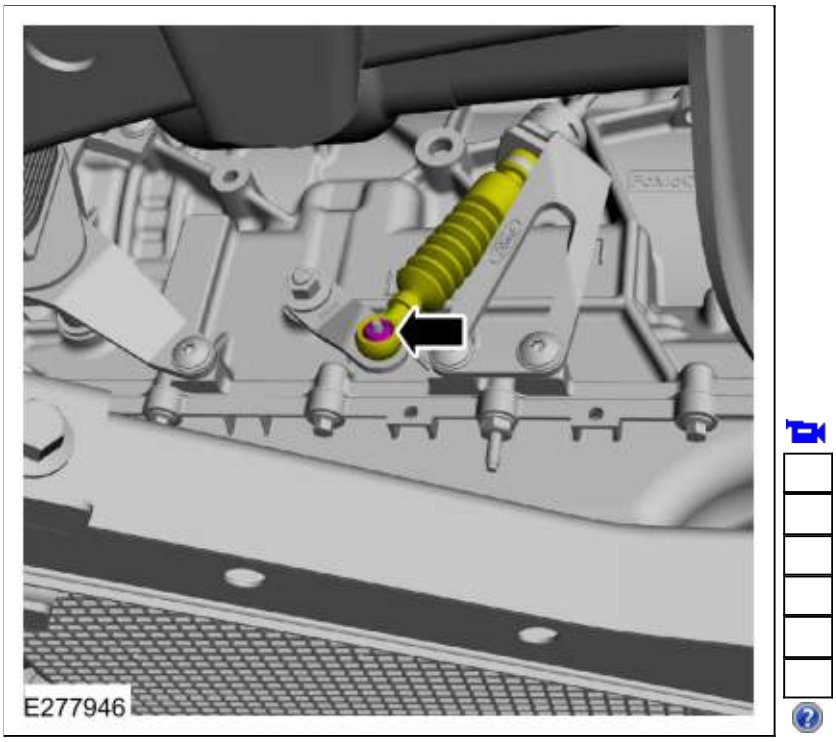


3. Install the manual control lever and nut.
   Torque: 106 lb.in (12 Nm)



4. **NOTICE: Take extra care when handling selector lever cable.**

   Connect the selector lever cable to the manual control lever.

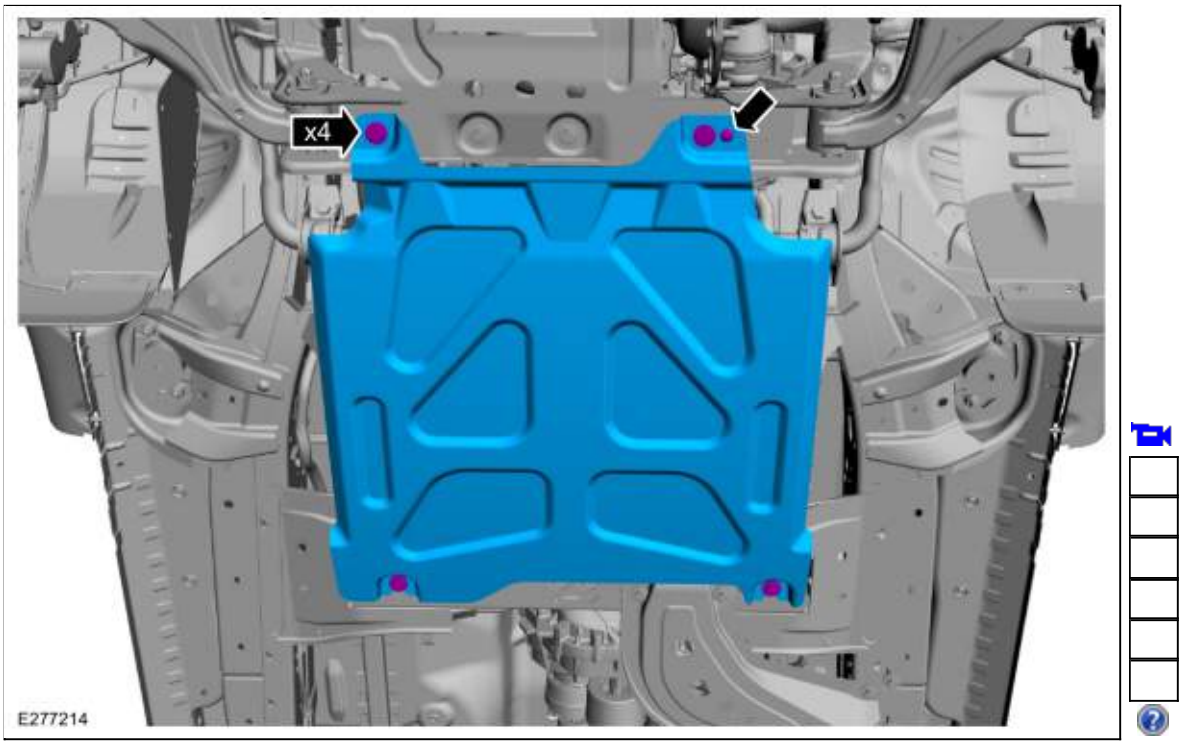


Four-Wheel Drive (4WD) vehicles

5. Install the front driveshaft assembly.
   Refer to: Front Driveshaft (205-01 Driveshaft, Removal and Installation).

All vehicles

6. If equipped, install the splash shield, bolts and the retainer.
   Torque: 22 lb.ft (30 Nm)



7. Adjust the selector lever cable.
   Refer to: Selector Lever Cable Adjustment (307-05 Automatic Transmission External Controls, General Procedures).

Shift Solenoids (SS)

Materials

Name	Specification
Motorcraft® MERCON® ULV Automatic Transmission Fluid XT-12-QULV	WSS-M2C949-A MERCON® ULV

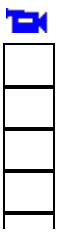
Removal

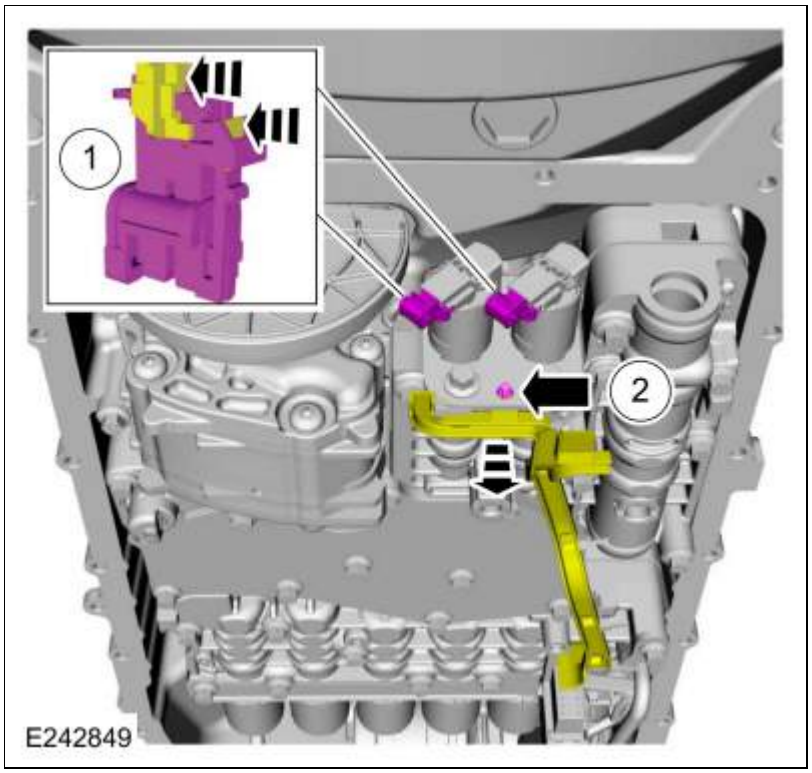
All Solenoids

1. Remove the transmission fluid pan gasket and filter.
   Refer to: Transmission Fluid Pan, Gasket and Filter - Raptor (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80) .
   Refer to: Transmission Fluid Pan, Gasket and Filter - Raptor (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80) .
   Refer to: Transmission Fluid Pan, Gasket and Filter (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

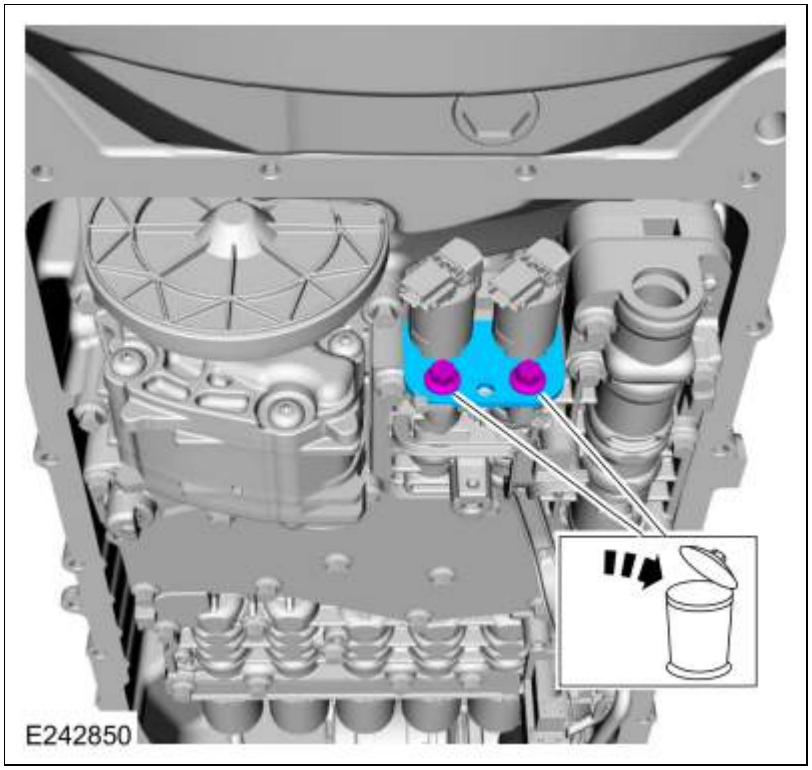
LPC (line pressure control) and TCC (torque converter clutch) Solenoids

2.
   1. Slide the plastic lock to the unlock position. While pressing the plastic tab, disconnect the electrical connector.
   2. Disconnect the internal wiring harness retainer.



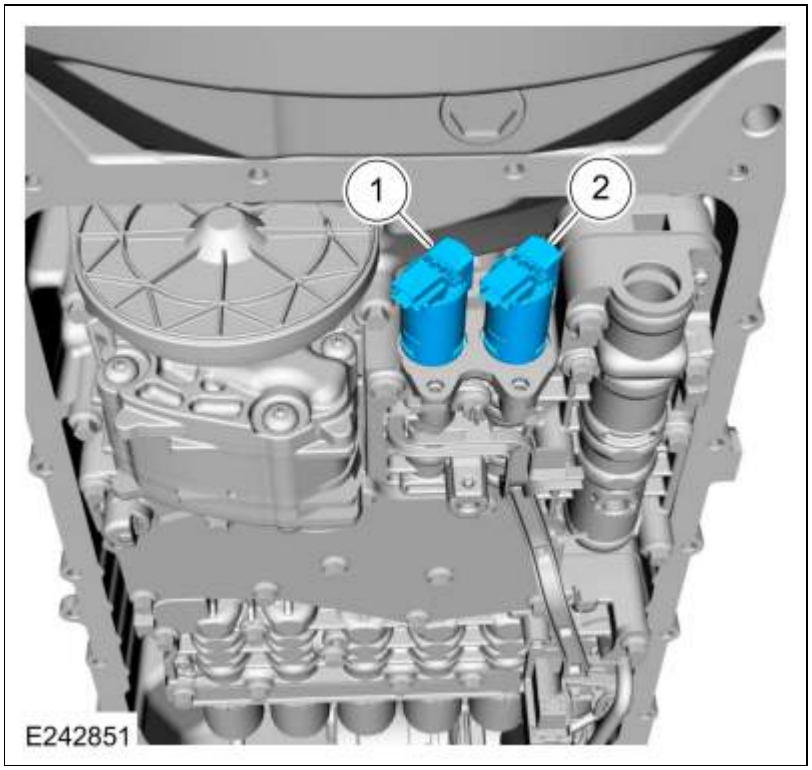


3. Remove and discard the bolts and remove the solenoid retaining plate.



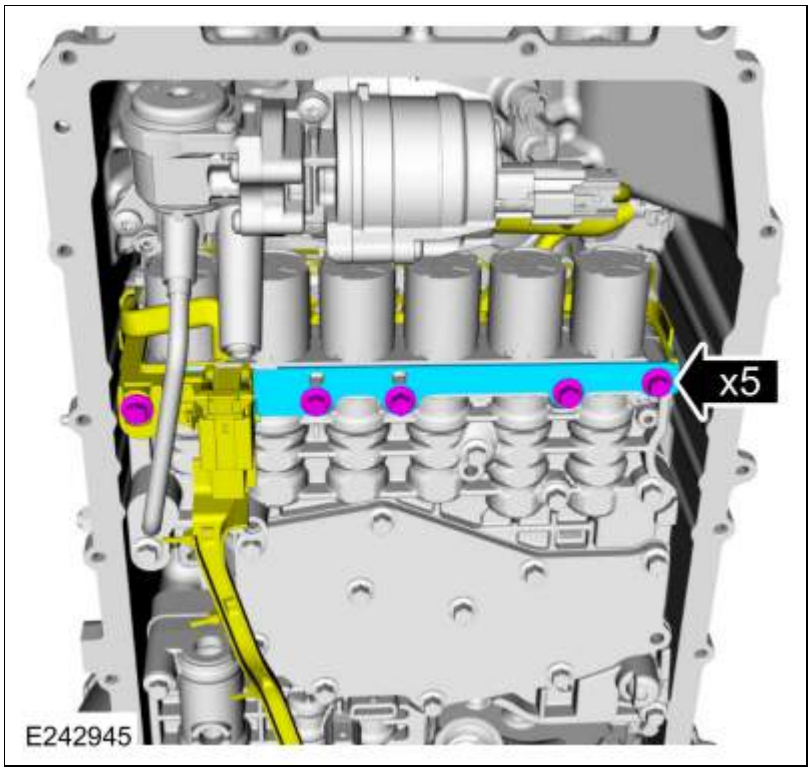
4. Remove the solenoid(s) from the main control valve body.

1. LPC solenoid (7G383)
2. TCC solenoid (7G136)

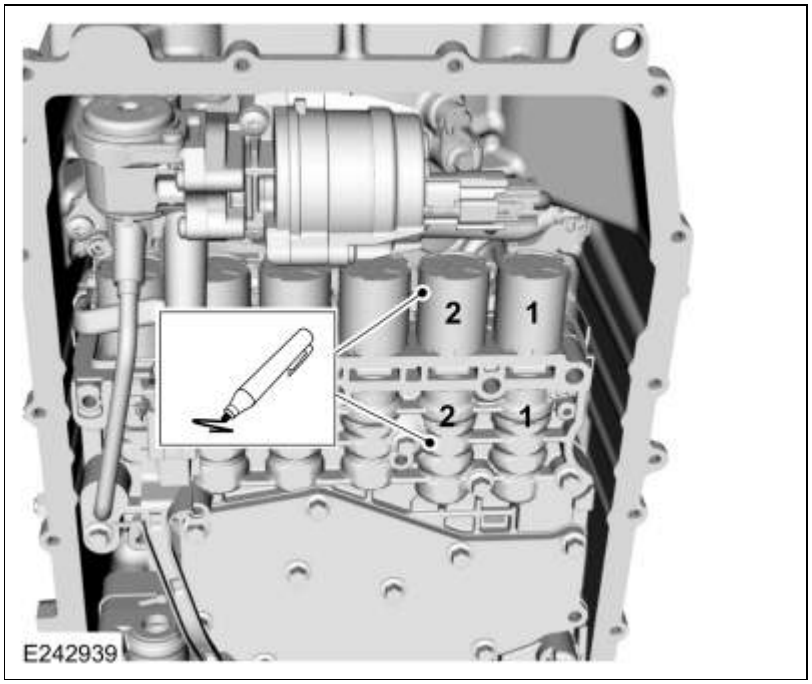


Solenoids D and E

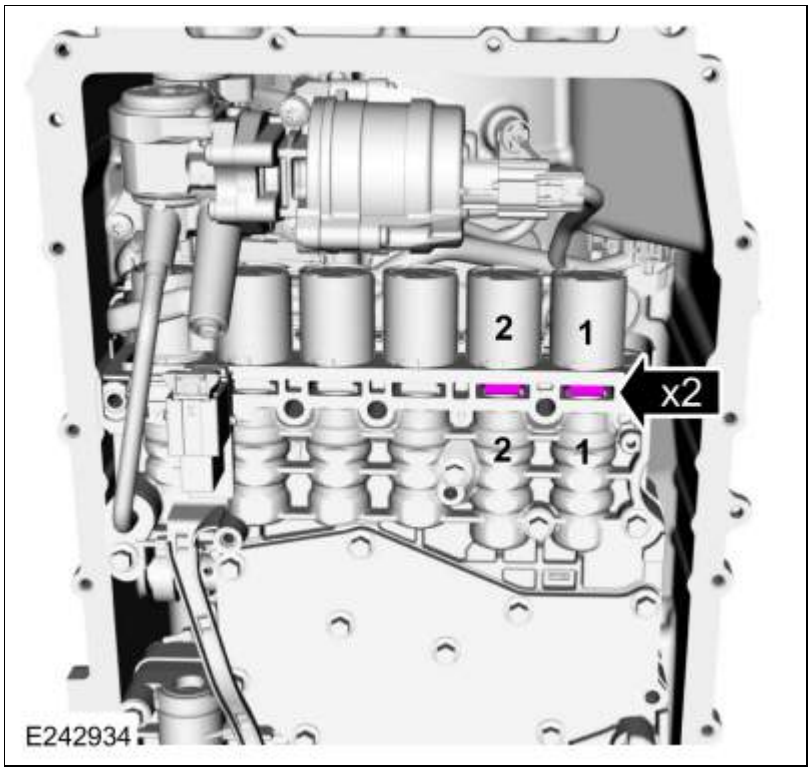
5. Remove the bolts and the shift solenoid retaining plate.



6. If replacing more then one solenoid, number the solenoids and number the main control valve body solenoid ports to correspond to the solenoid.

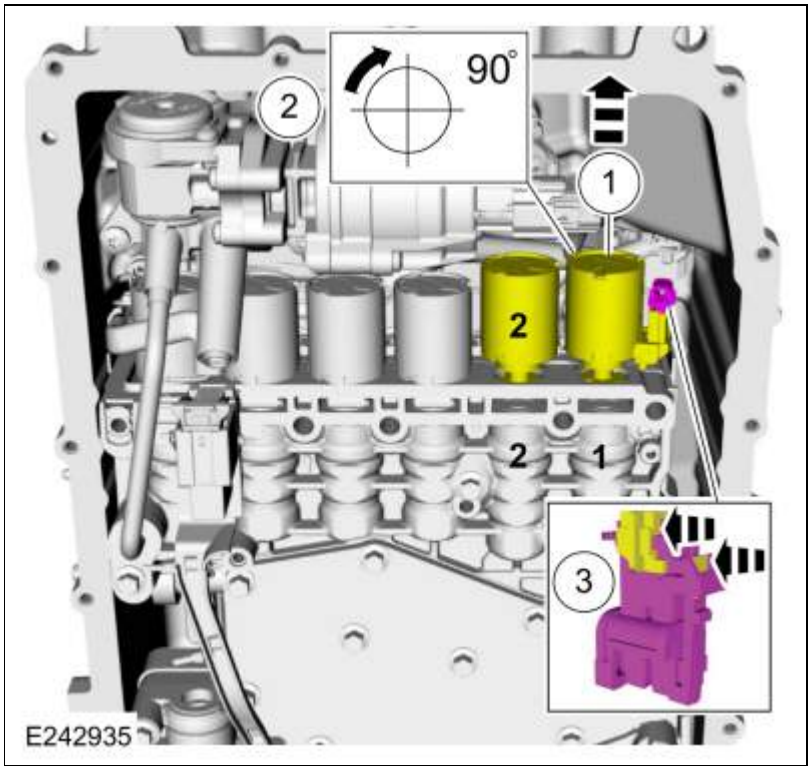


7. Remove the shift solenoid retainer(s).



8.

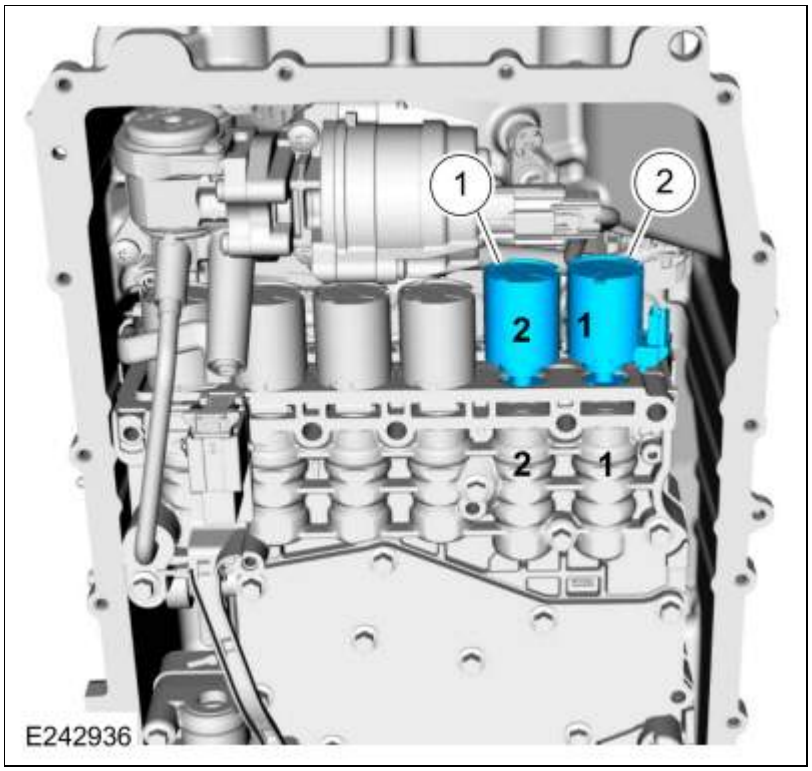
1. Slide the solenoid(s) out of the main control valve body bore.
2. Rotate the solenoid(s) in a clockwise direction.
3. Slide the plastic lock to the unlock position. While pressing the plastic tab, disconnect the electrical connector.



9.

Remove the solenoid(s) from the main control valve body.

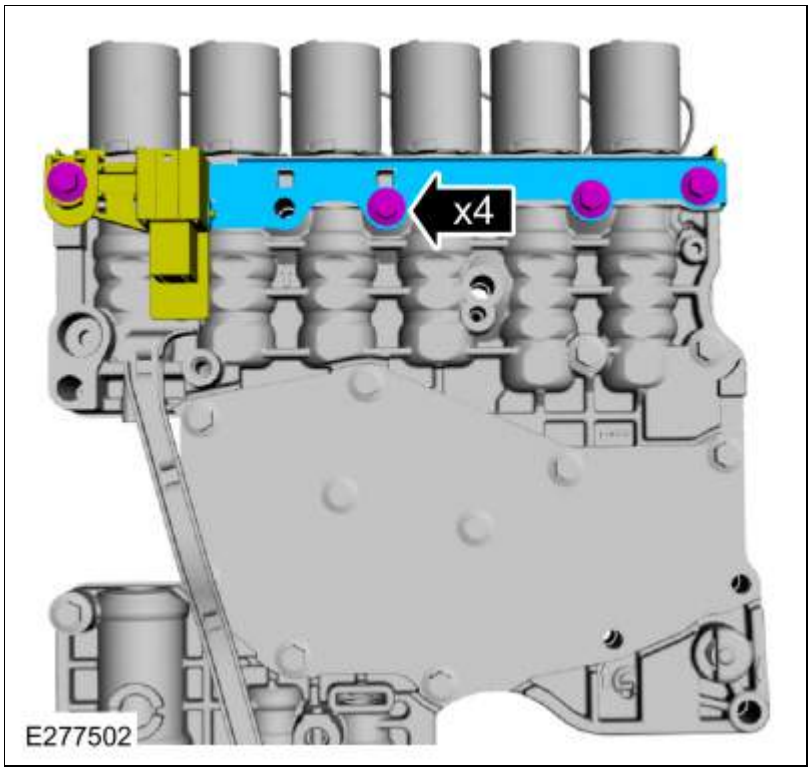
1. SSE (7J136)
2. SSD (7J136)



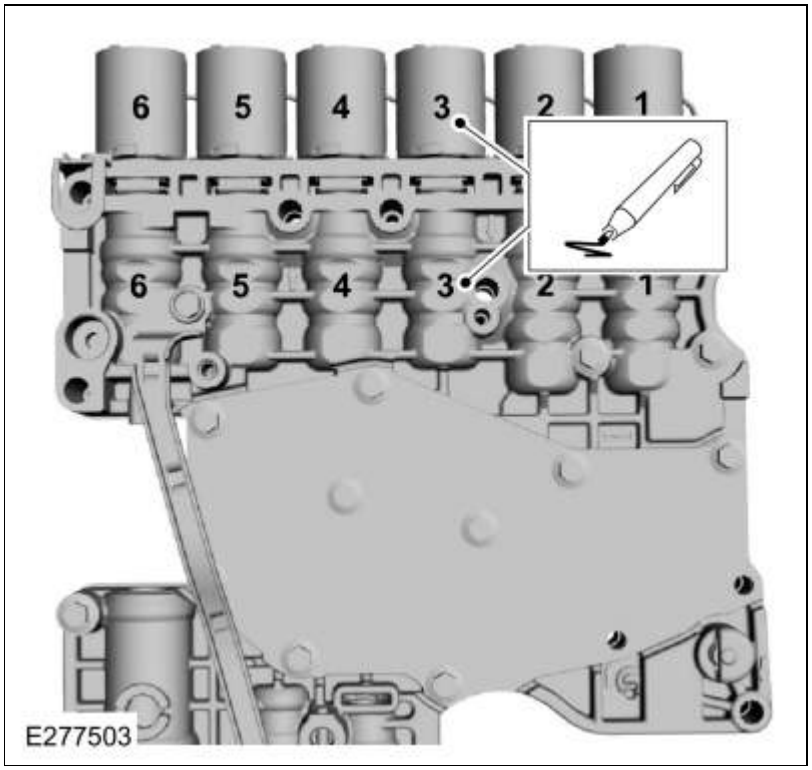
Solenoids A, B, C, and F

10. Remove the main control valve body.
Refer to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
Refer to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

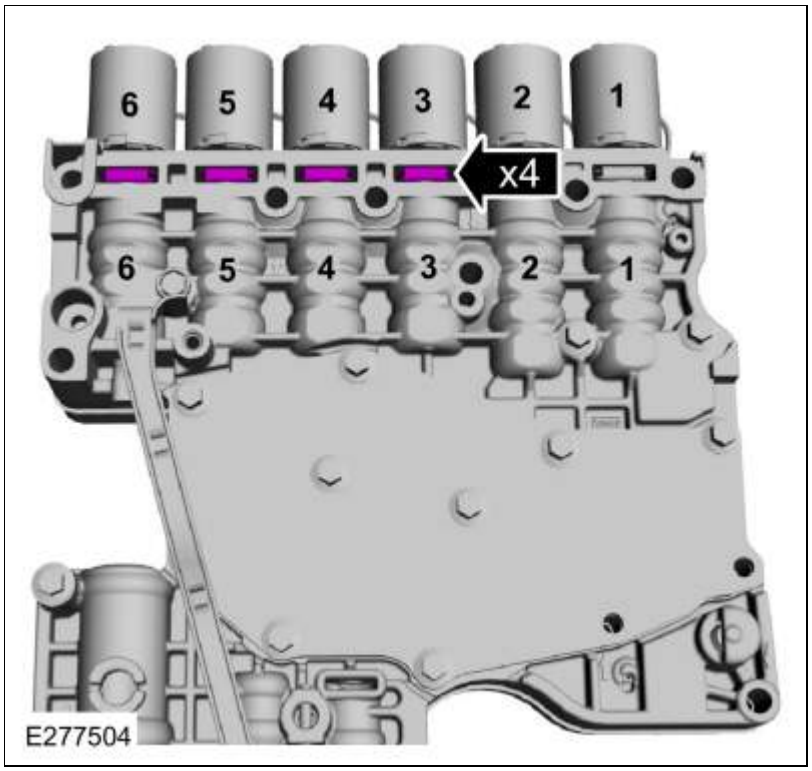
11. Remove the bolts and the shift solenoid retaining plate.



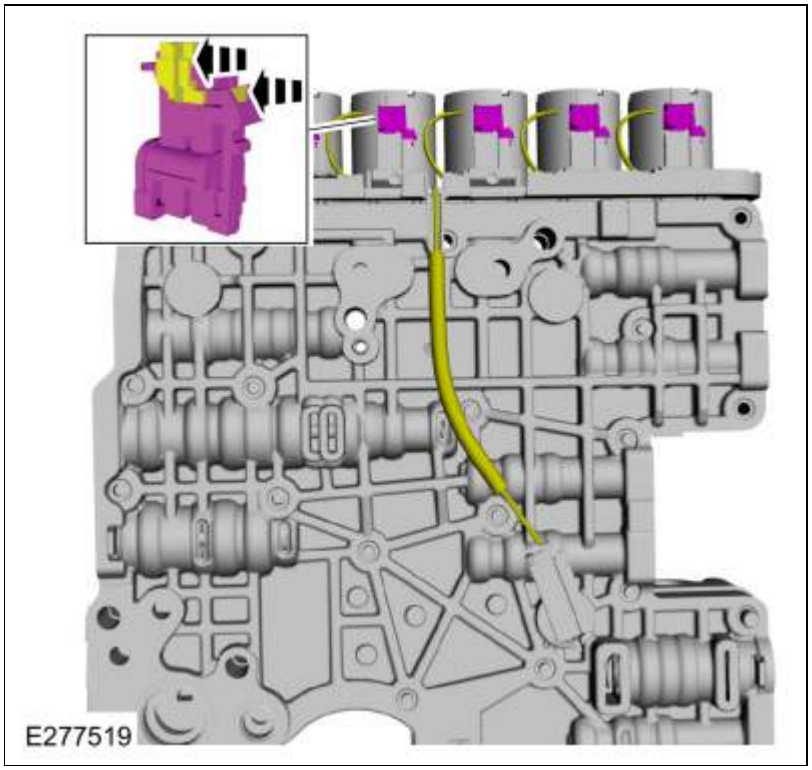
12. If replacing more then one solenoid, number the solenoids and number the main control valve body solenoid ports to correspond to the solenoid.



13. Remove the shift solenoid retainer(s).



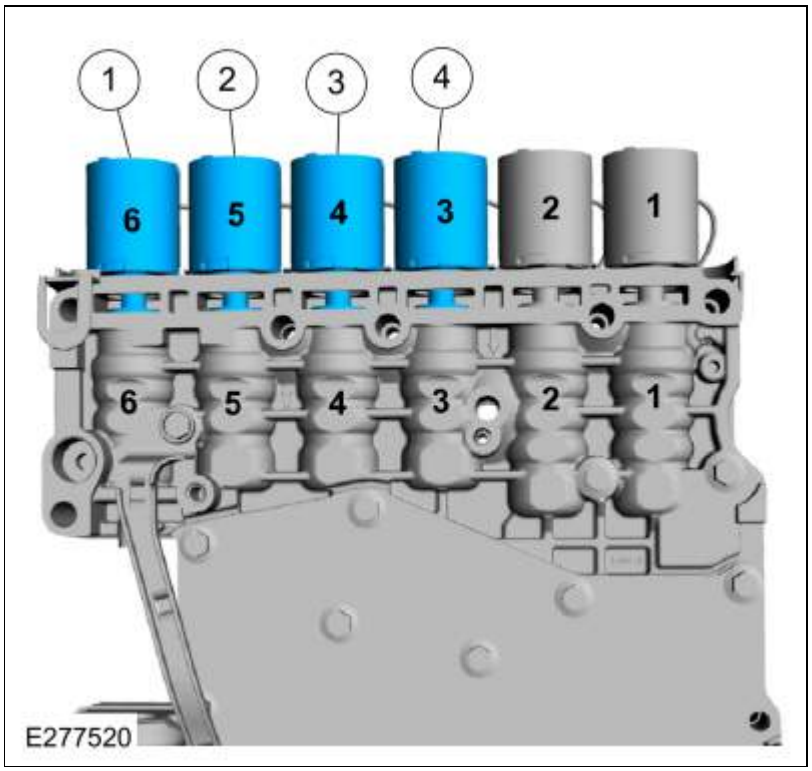
14. Slide the plastic lock to the unlock position. While pressing the plastic tab, disconnect the electrical connector(s).



15.

Remove the solenoid(s) from the main control valve body.

1. SSA (7J136)
2. SSF (7J136)
3. SSC (7J136)
4. SSB (7J136)

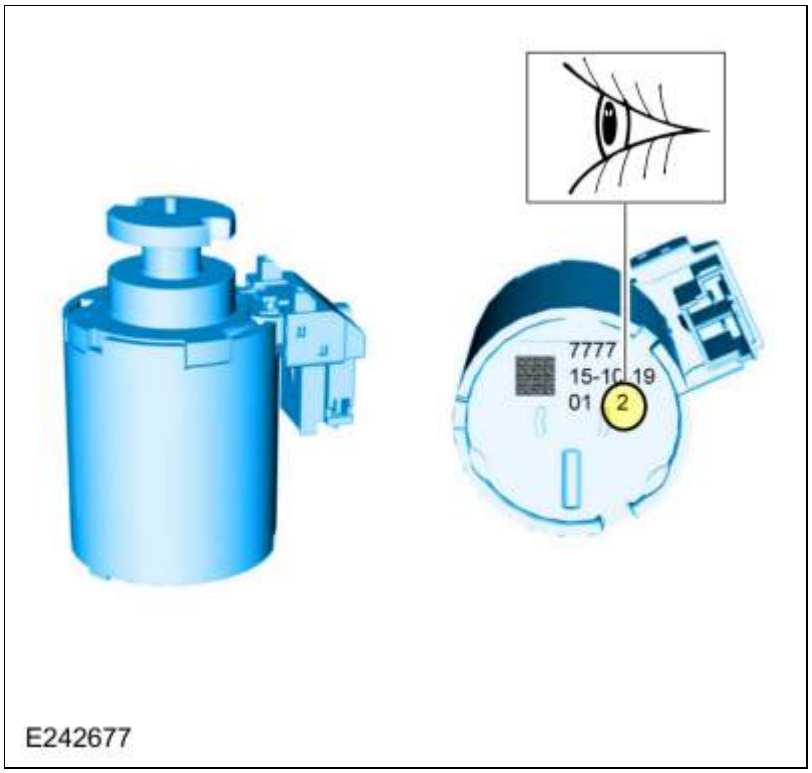


Installation

Solenoids A, B, C, and F

1. **NOTICE: Solenoids are calibrated from the factory and are not all the same. To replace a solenoid, match the band number with the original solenoid or harsh shifts or damage to the transmission can occur.**

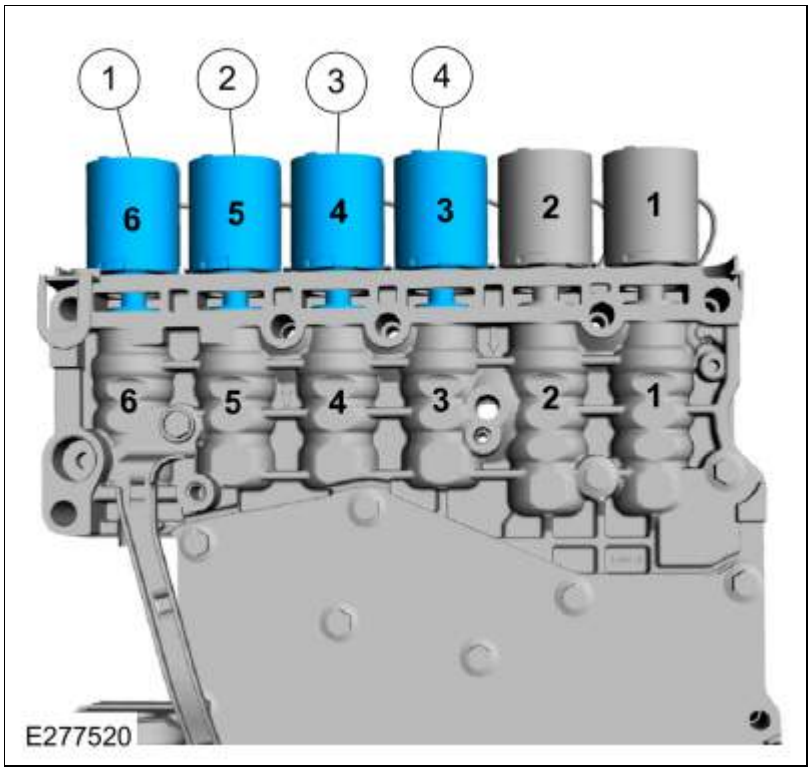
   If new solenoids are needed, identify the solenoid band number.



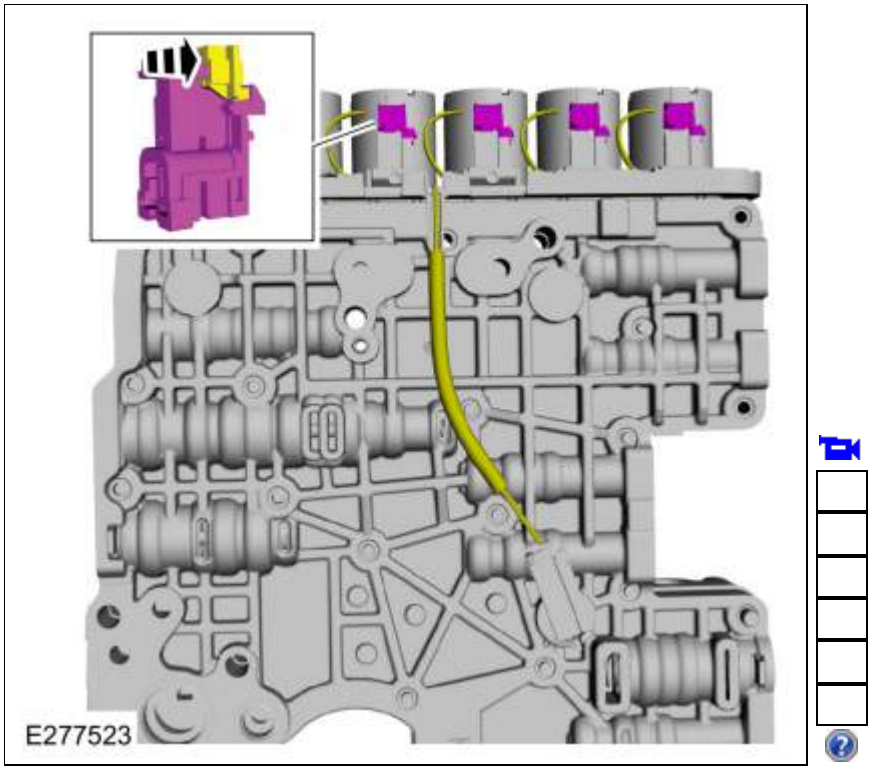
2.

Install the solenoid(s) in the main control valve body in the correct port(s) as marked during removal.

1. SSA (7J136)
2. SSF (7J136)
3. SSC (7J136)
4. SSB (7J136)

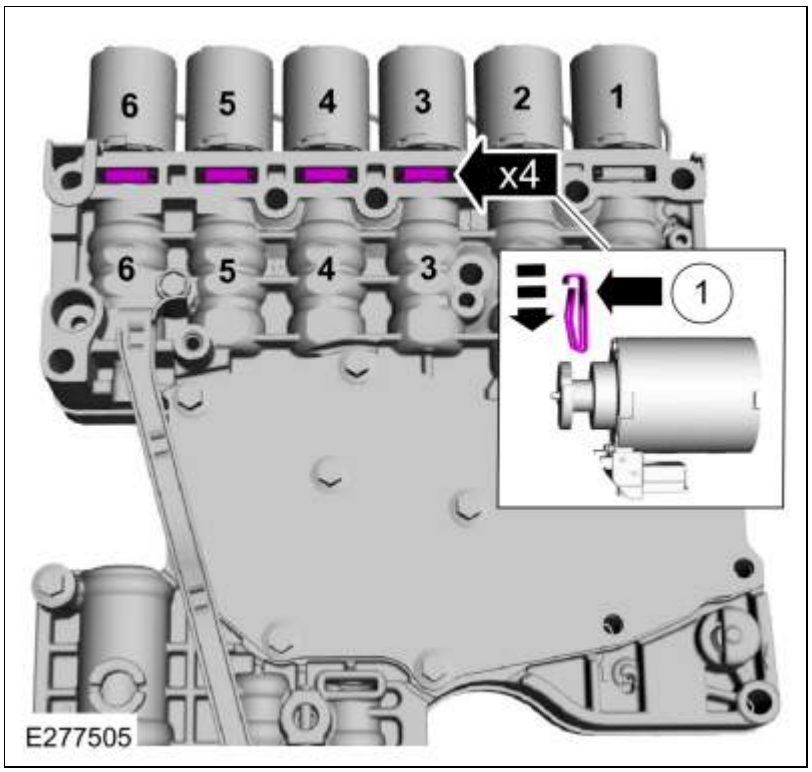


3. Connect the electrical connectors and slide the plastic lock to the locked position.

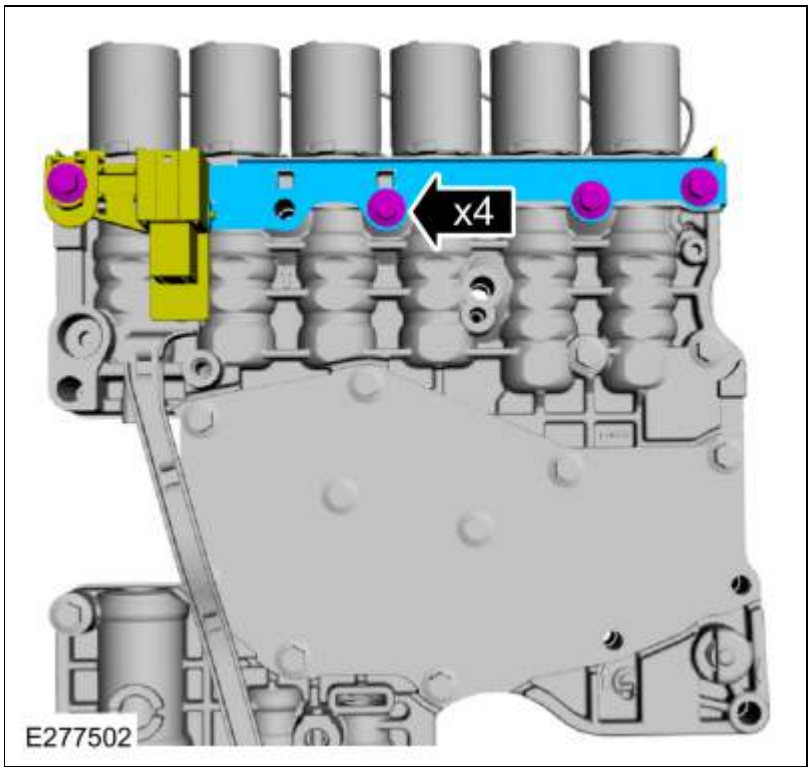


4. Install the shift solenoid retainer(s) with the flat side towards the solenoids.

1. Retainer flat side



5. Install and the shift solenoid retaining plate and the bolts.
Torque: 106 lb.in (12 Nm)

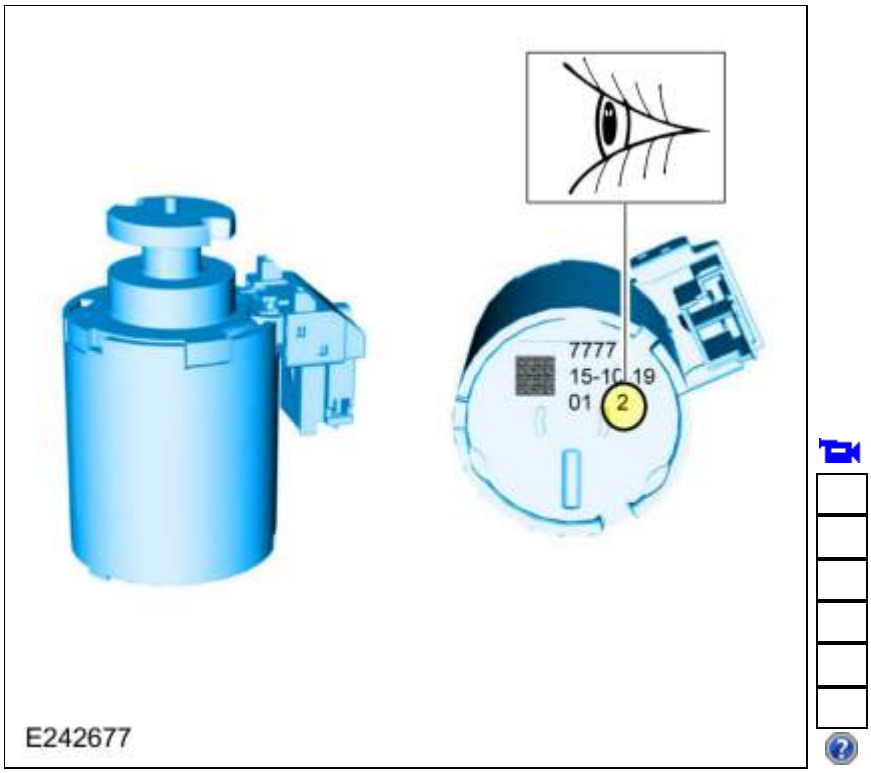


6. Install the main control valve body.
   Refer to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
   Refer to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

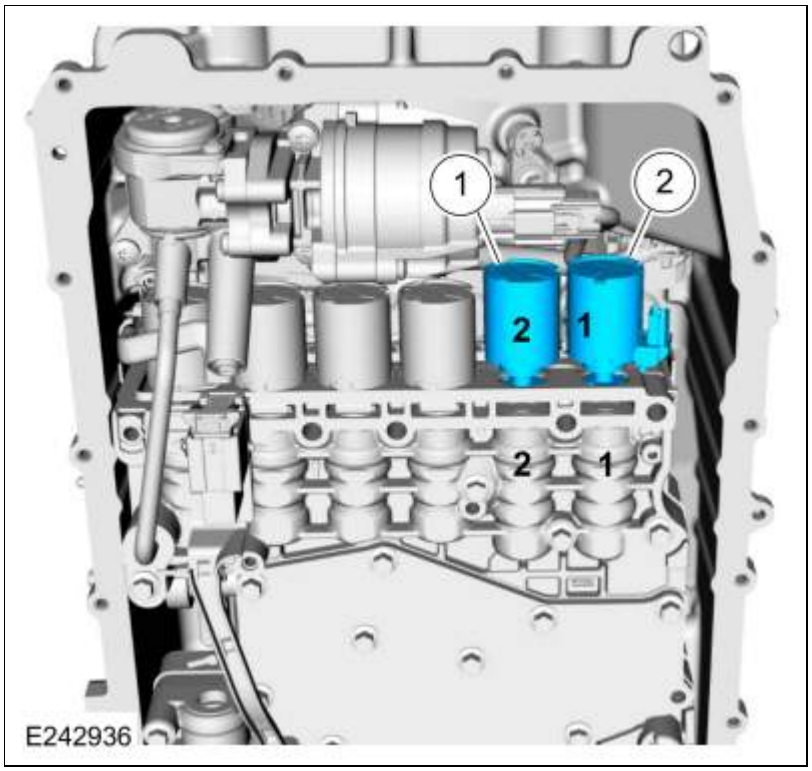
Solenoids D and E

7. **NOTICE: Solenoids are calibrated from the factory and are not all the same. To replace a solenoid, match the band number with the original solenoid or harsh shifts or damage to the transmission can occur.**

   If new solenoids are needed, identify the solenoid band number.

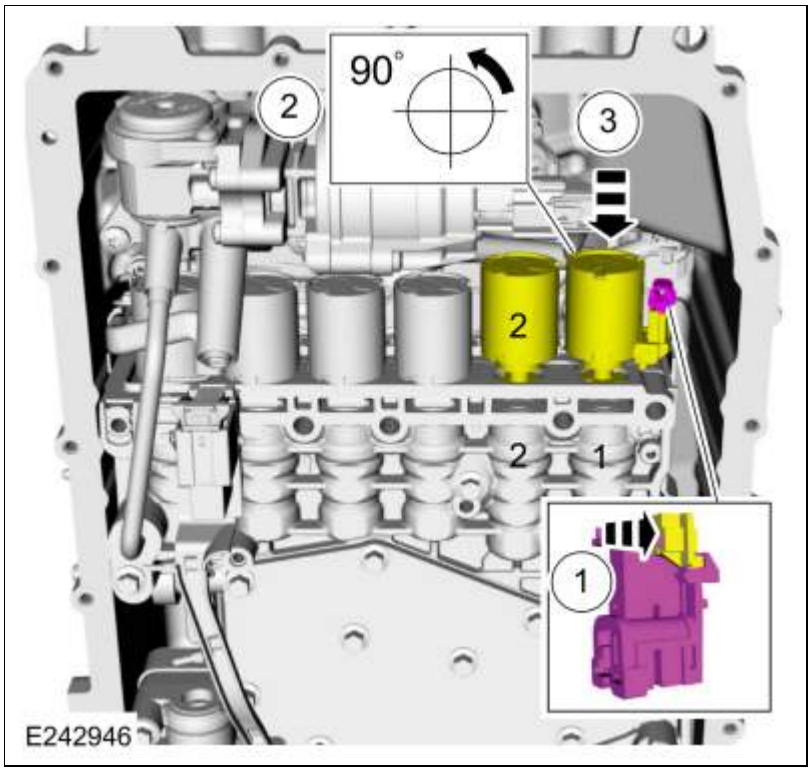


8. Install the solenoid(s) in the main control valve body in the correct port(s) as marked during removal.
   1. SSE (7J136)
   2. SSD (7J136)



9.

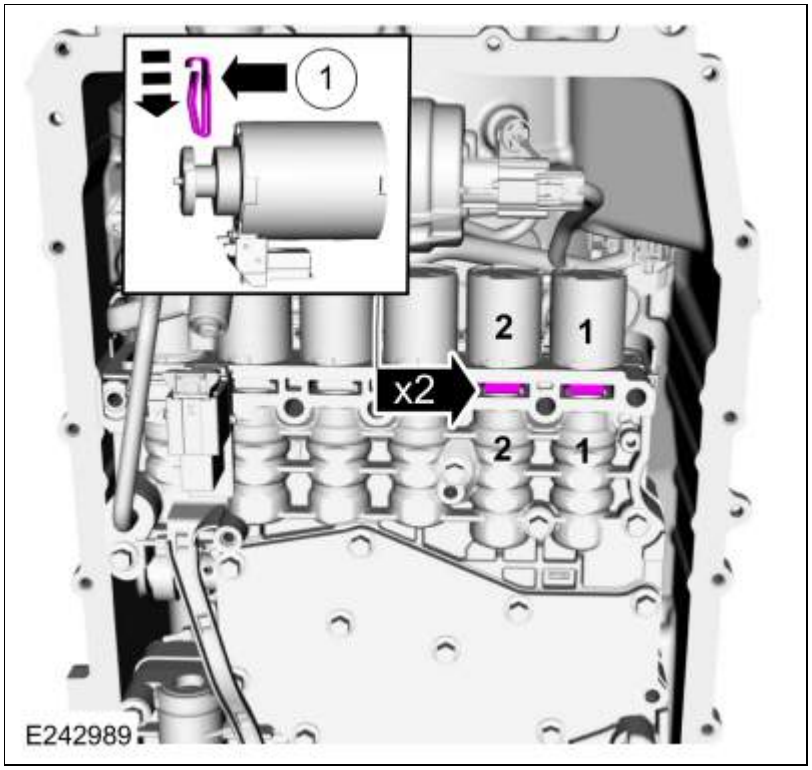
1. Connect the electrical connectors and slide the plastic lock to the locked position.
2. Rotate the solenoid(s) in a counter-clockwise direction.
3. Slide the solenoid(s) into the main control valve body bore.



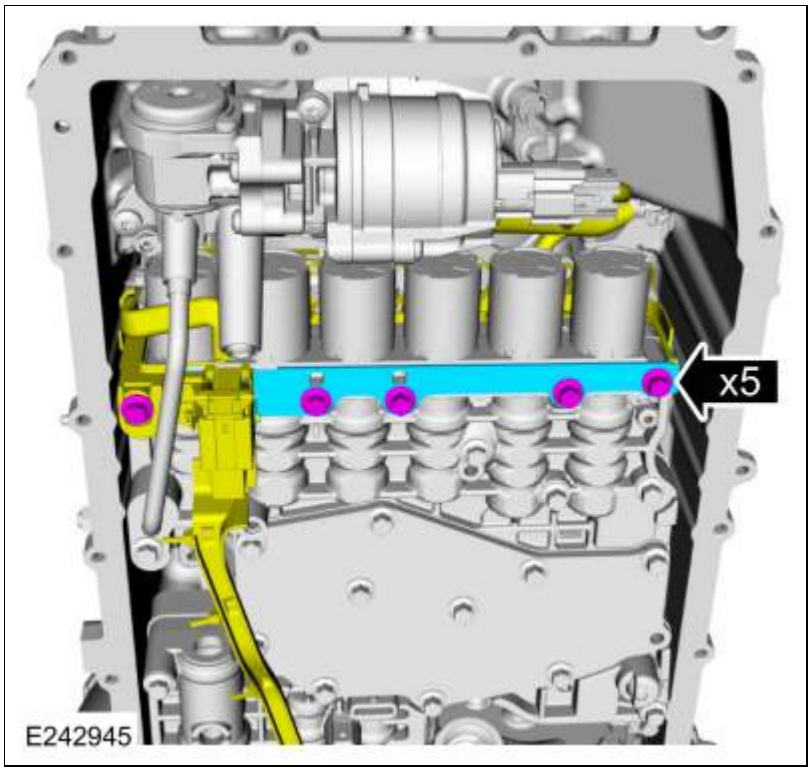
10.

Install the shift solenoid retainer(s) with the flat side towards the solenoids.

1. Retainer flat side



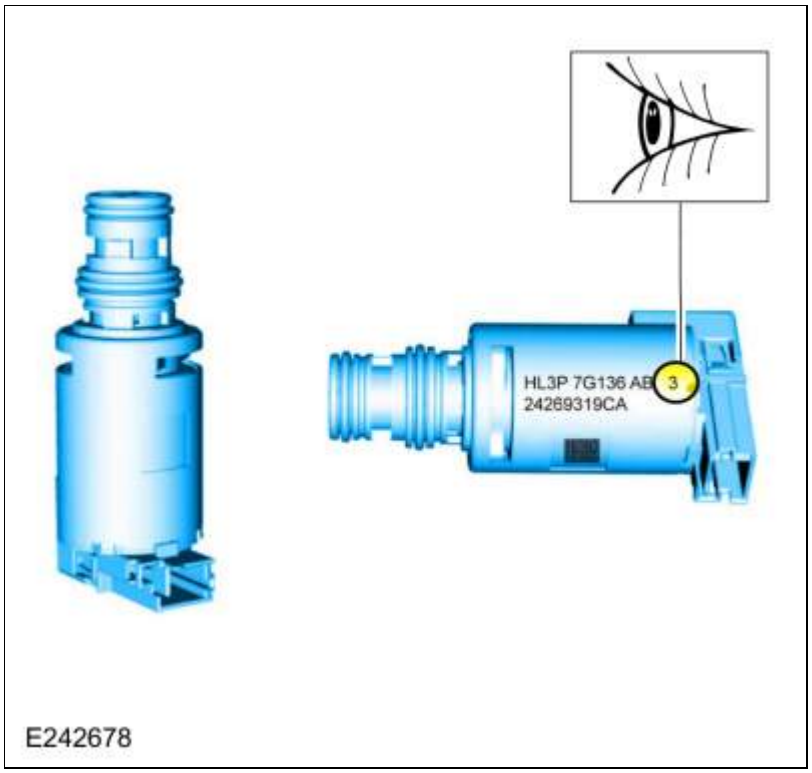
11. Install and the shift solenoid retaining plate and the bolts.
Torque: 106 lb.in (12 Nm)



LPC (line pressure control) and TCC (torque converter clutch) Solenoids

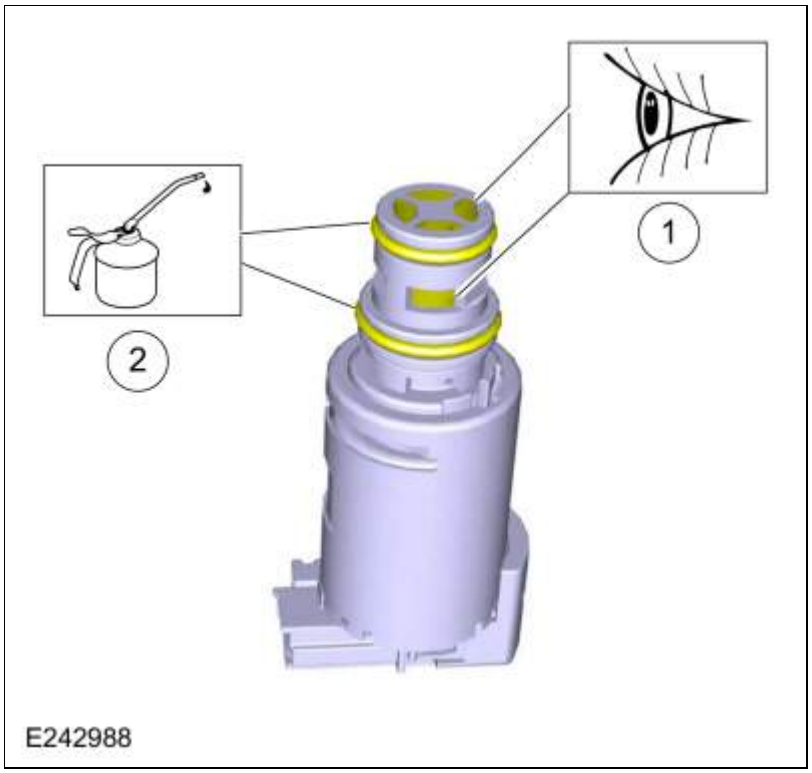
12. **NOTICE: Solenoids are calibrated from the factory and are not all the same. To replace a solenoid, match the replacement solenoid type (normally high/normally low) and the band number with the original solenoid or harsh shifts or damage to the transmission can occur.**

    If new solenoids are needed, identify which type (normally high/normally low) of solenoid it is and the solenoid band number.



13.

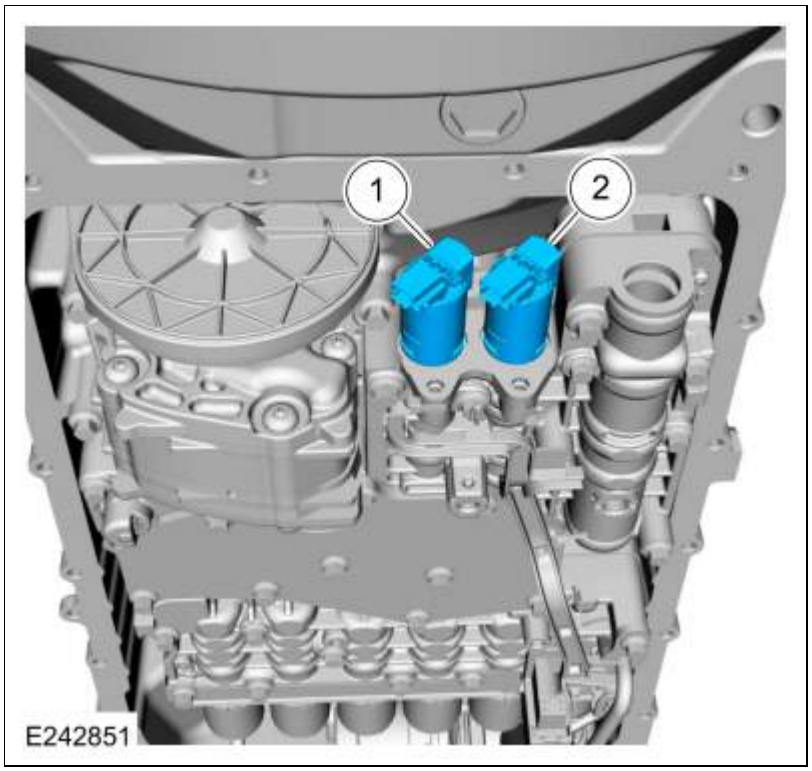
1. Inspect the solenoid screens for debris that may restrict fluid flow.
2. Lubricate the solenoid O-ring seals.
   Material: Motorcraft® MERCON® ULV Automatic Transmission Fluid / XT-12-QULV (WSS-M2C949-A) (MERCON® ULV)



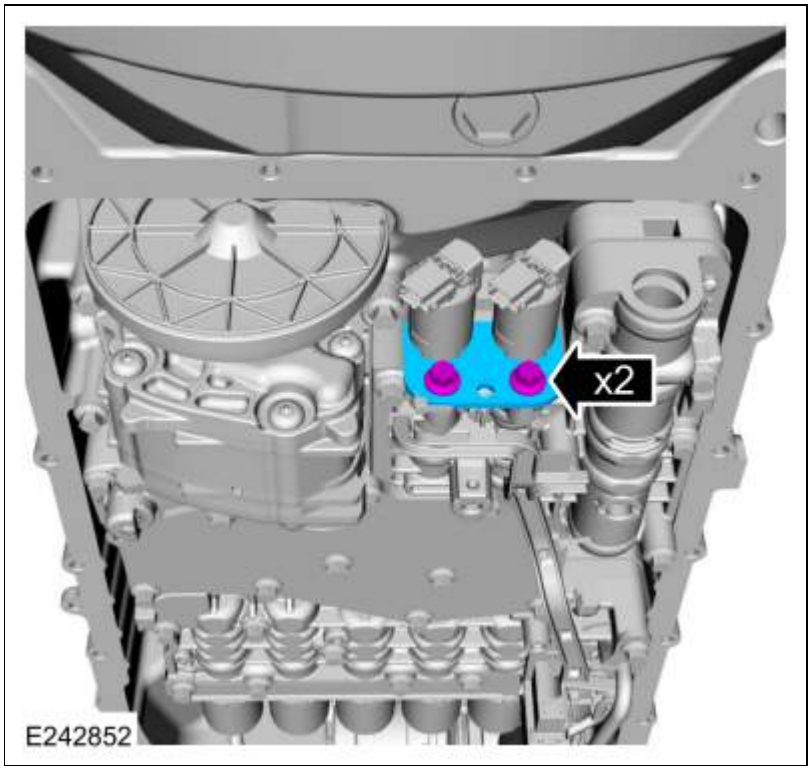
14.

Install the solenoid(s) in the main control valve body.

1. LPC solenoid (7G383)
2. TCC solenoid (7G136)

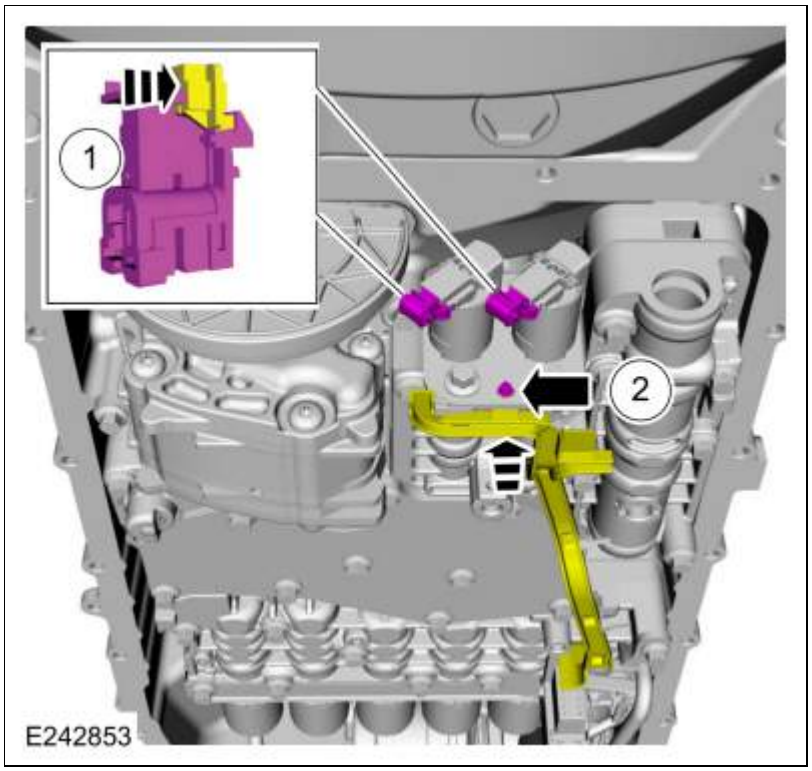


15. Install the solenoid retaining plate and the new bolts.
Torque: 80 lb.in (9 Nm)



16.

1. Connect the electrical connectors and slide the plastic lock to the locked position.
2. Connect the internal wiring harness retainer.



All Solenoids

17. Install the transmission fluid pan gasket and filter.
    Refer to: Transmission Fluid Pan, Gasket and Filter - Raptor (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80) .
    Refer to: Transmission Fluid Pan, Gasket and Filter - Raptor (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80) .
    Refer to: Transmission Fluid Pan, Gasket and Filter (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

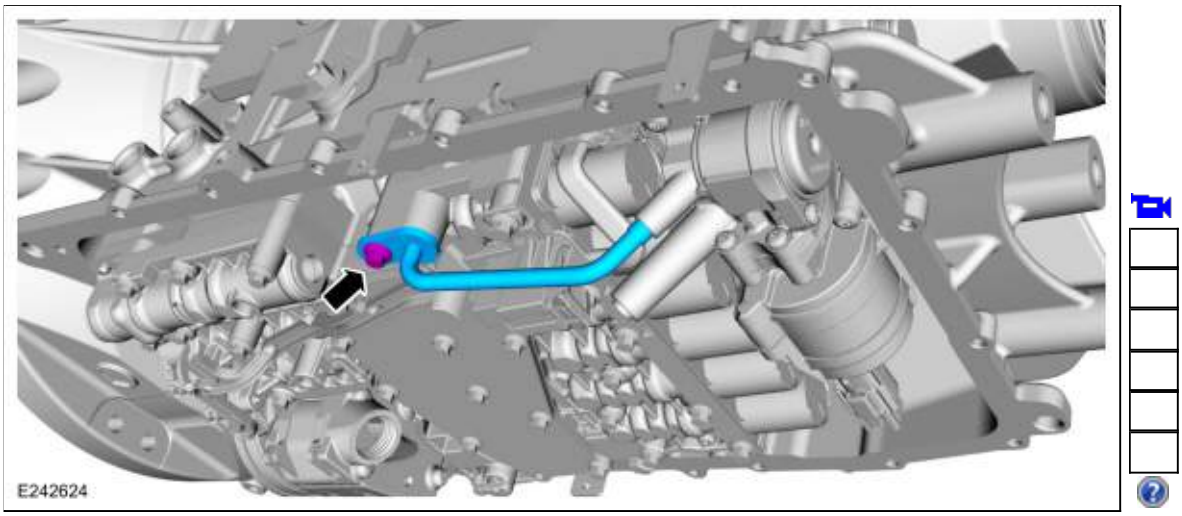
Transmission Fluid Auxiliary Pump

Removal

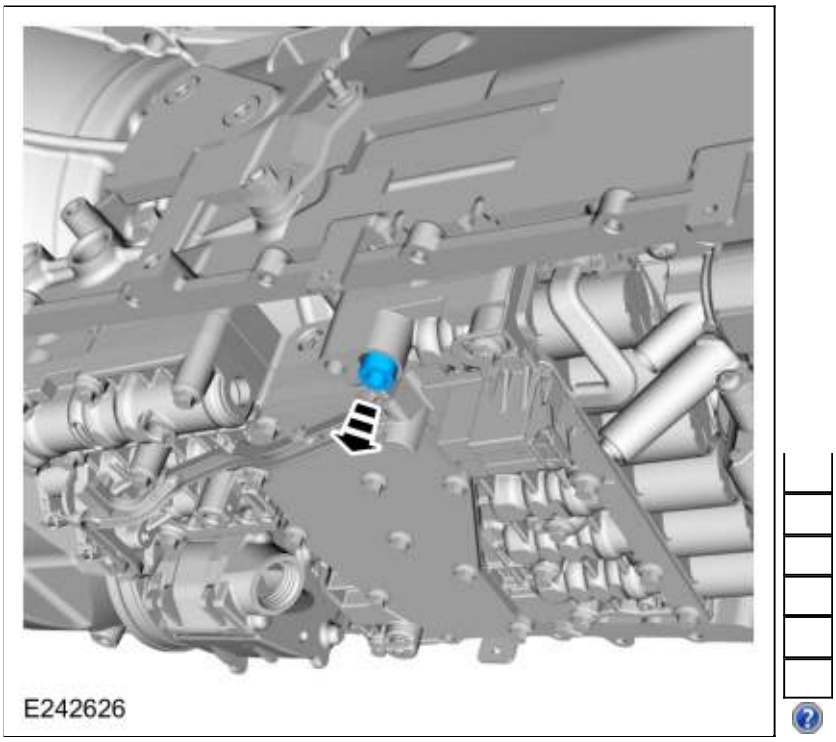
1. **NOTE:** *It is not necessary to remove the transmission fluid filter to remove the transmission fluid auxiliary pump.*

   Remove the transmission fluid pan and gasket.
   Refer to: Transmission Fluid Pan, Gasket and Filter (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
   Refer to: Transmission Fluid Pan, Gasket and Filter - Raptor (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80) .
   Refer to: Transmission Fluid Pan, Gasket and Filter - 3.0L Power Stroke Diesel (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80) .

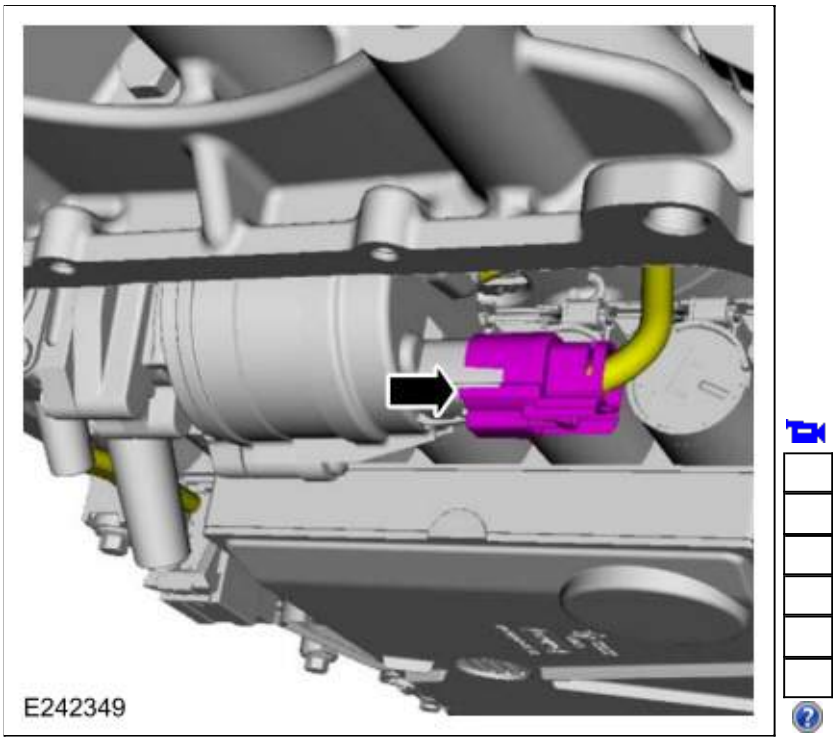
2. Remove the bolt and the transmission fluid auxiliary pump tube.



3. Remove the transmission fluid auxiliary pump tube seal.



4. Disconnect the transmission fluid auxiliary pump.

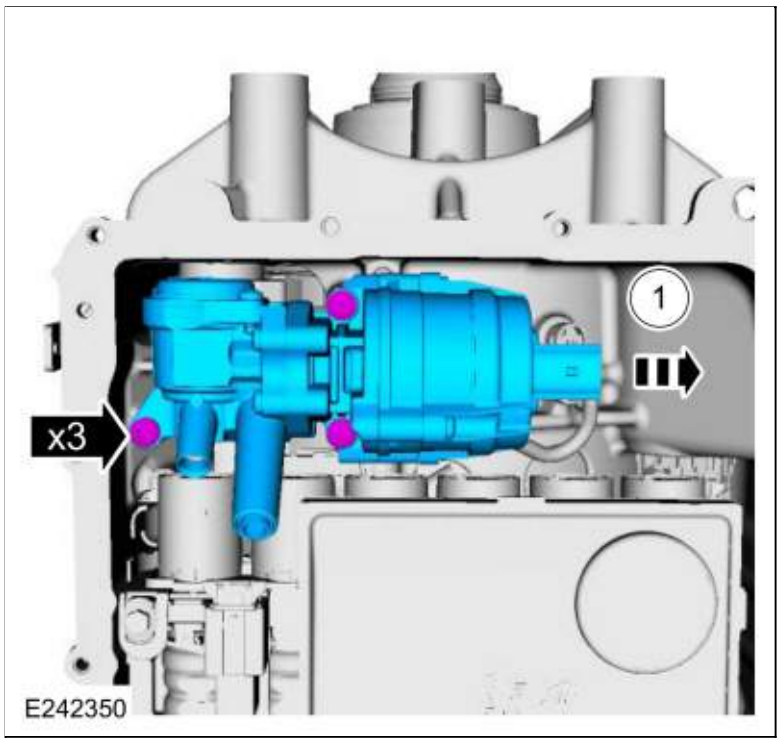


5. **NOTE:** *A short 1/4" drive T-30 socket is required to remove the rear pump bolt.*

   NOTE: *The fluid auxiliary pump may need to be removed from the RH side of the vehicle to clear the exhaust system and fluid filter.*

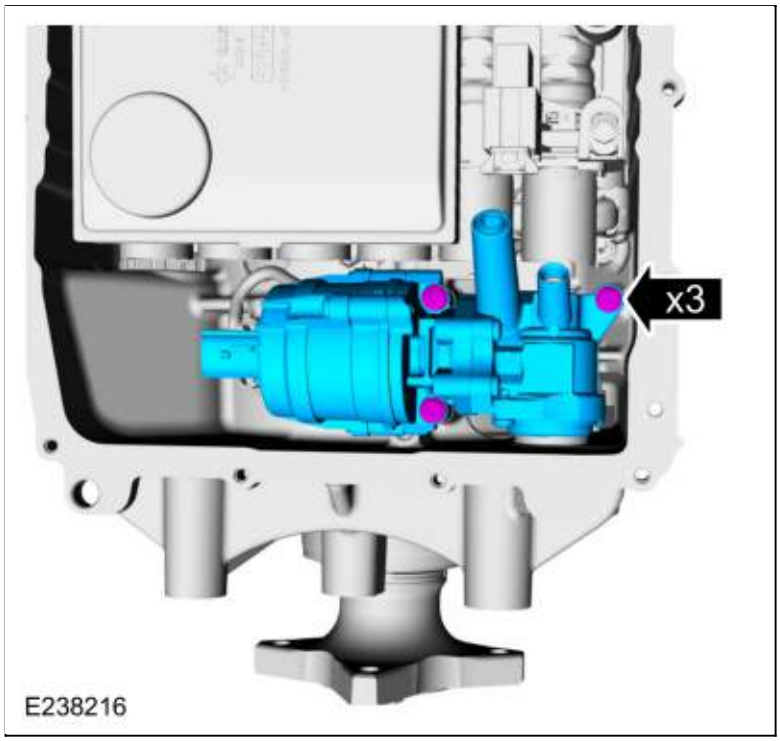
Remove the bolts and the transmission fluid auxiliary pump.

1. If necessary, remove the fluid auxiliary pump towards the RH side.

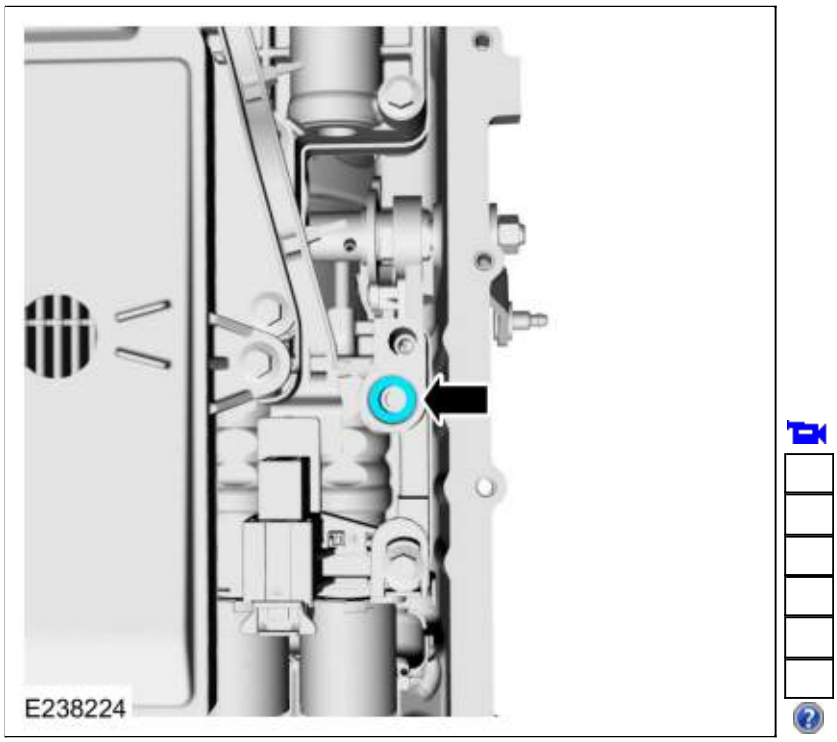


Installation

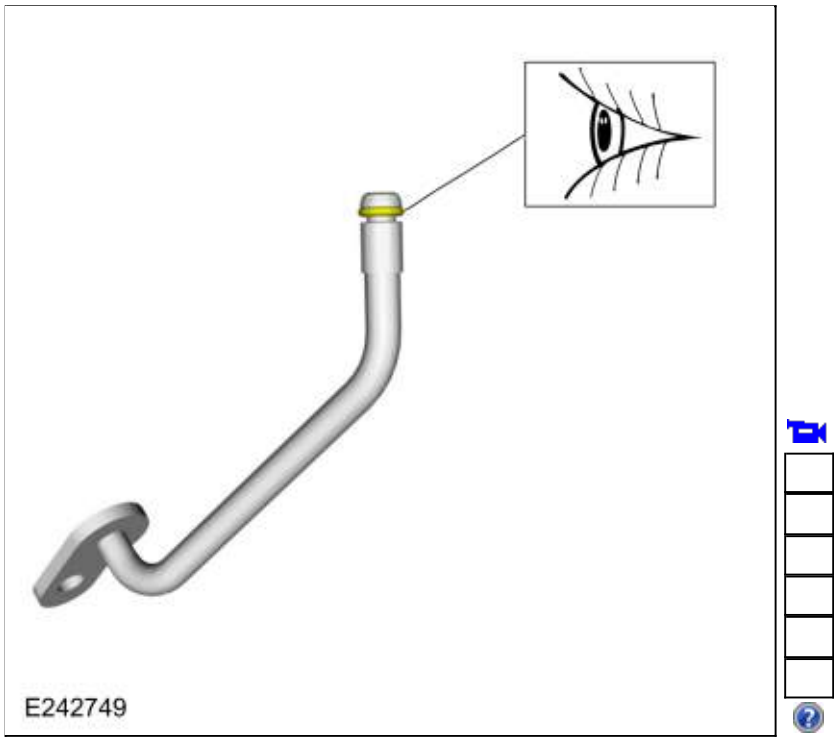
1. Install the transmission fluid auxiliary pump and loosely install the bolts.



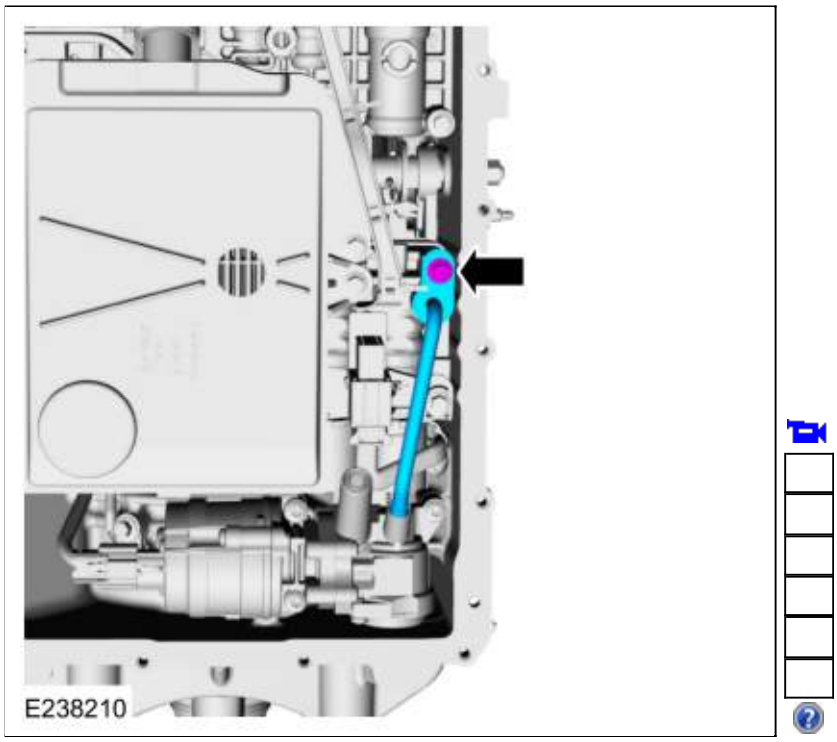
2. Install the transmission fluid auxiliary pump tube seal.



3. Inspect the transmission fluid auxiliary pump tube O-ring.

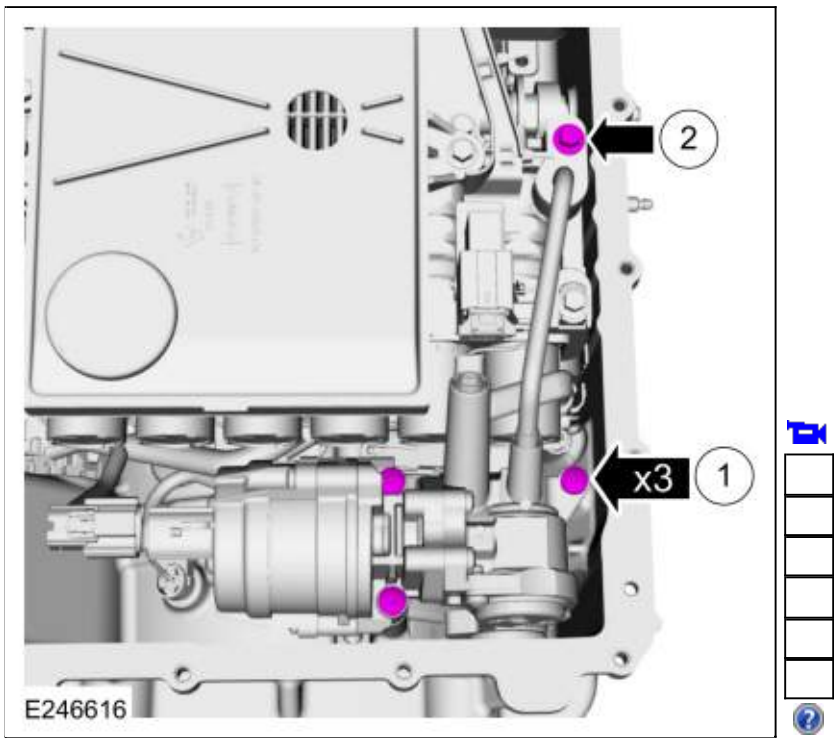


4. Install the transmission fluid auxiliary pump tube and loosely install the bolt.

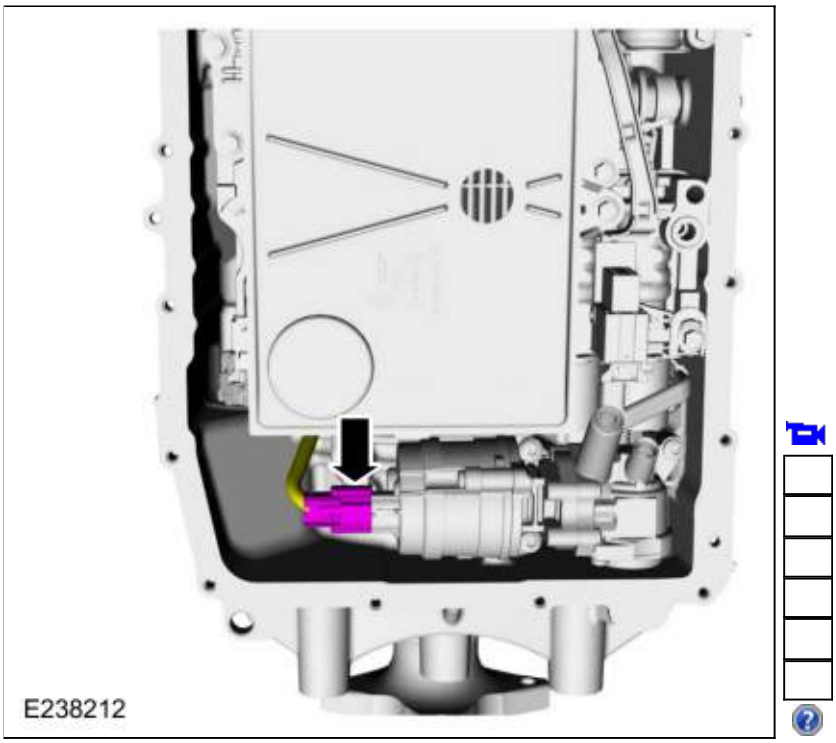


5.

1. Transmission fluid auxiliary pump bolts
   Torque: 97 lb.in (11 Nm)
2. Transmission fluid auxiliary pump tube bolt
   Torque: 106 lb.in (12 Nm)



6. Connect the transmission fluid auxiliary pump electrical connector.



7. Install the transmission fluid pan and gasket.
   Refer to: Transmission Fluid Pan, Gasket and Filter (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
   Refer to: Transmission Fluid Pan, Gasket and Filter - Raptor (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80) .
   Refer to: Transmission Fluid Pan, Gasket and Filter - 3.0L Power Stroke Diesel (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80) .

Transmission Fluid Pan, Gasket and Filter

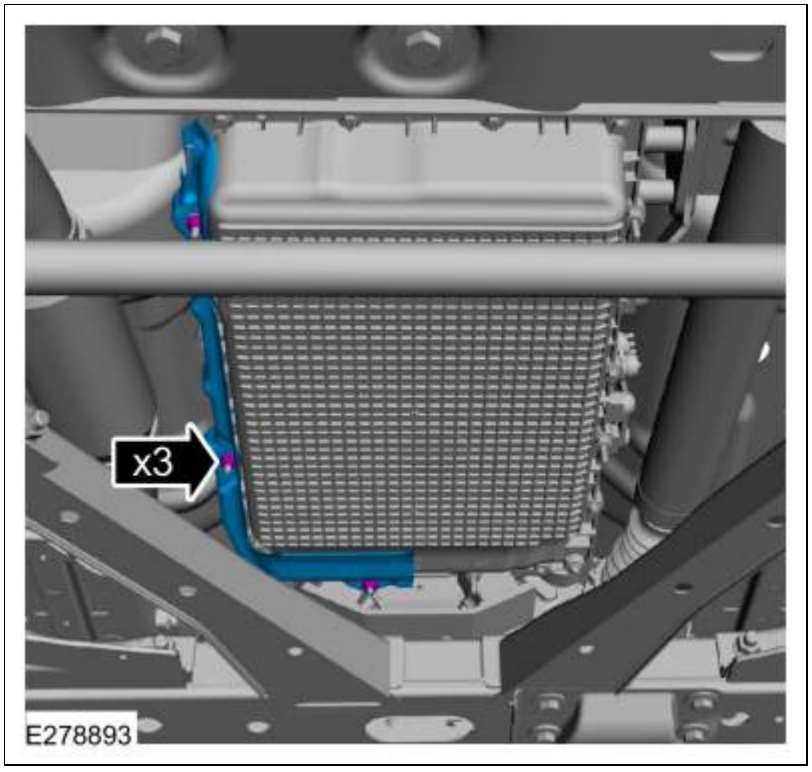
Materials

Name	Specification
Motorcraft® MERCON® ULV Automatic Transmission Fluid XT-12-QULV	WSS-M2C949-A MERCON® ULV

Removal

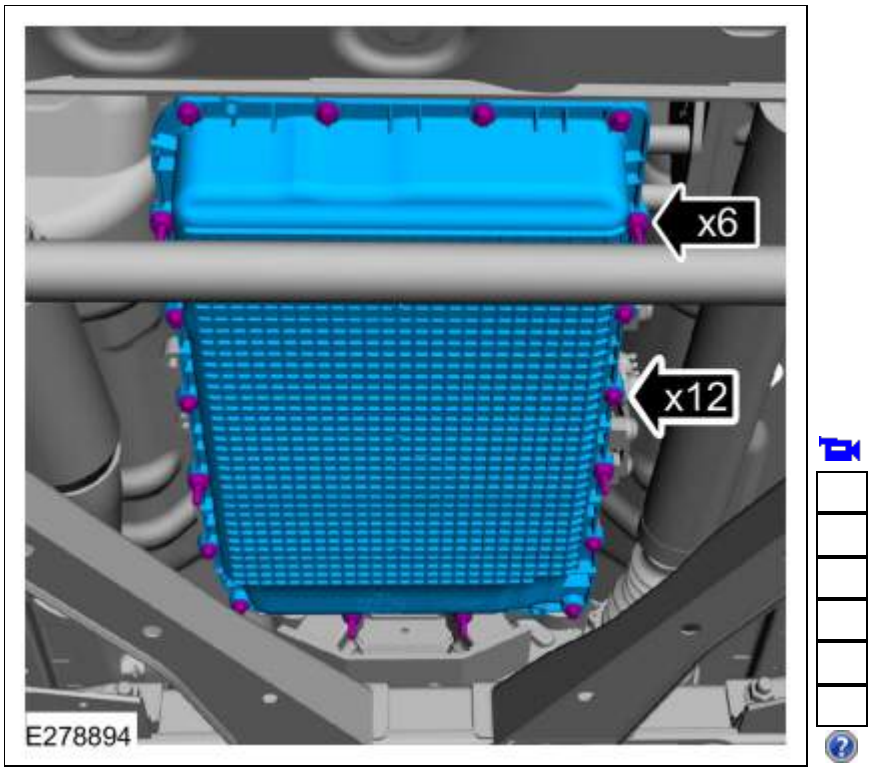
1. With the vehicle in NEUTRAL, position it on a hoist.
   Refer to: Jacking and Lifting (100-02 Jacking and Lifting, Description and Operation).

2. Remove the retainers and heatshield.



3. **NOTE:** *Note the location of the bolts and studbolts for assembly.*

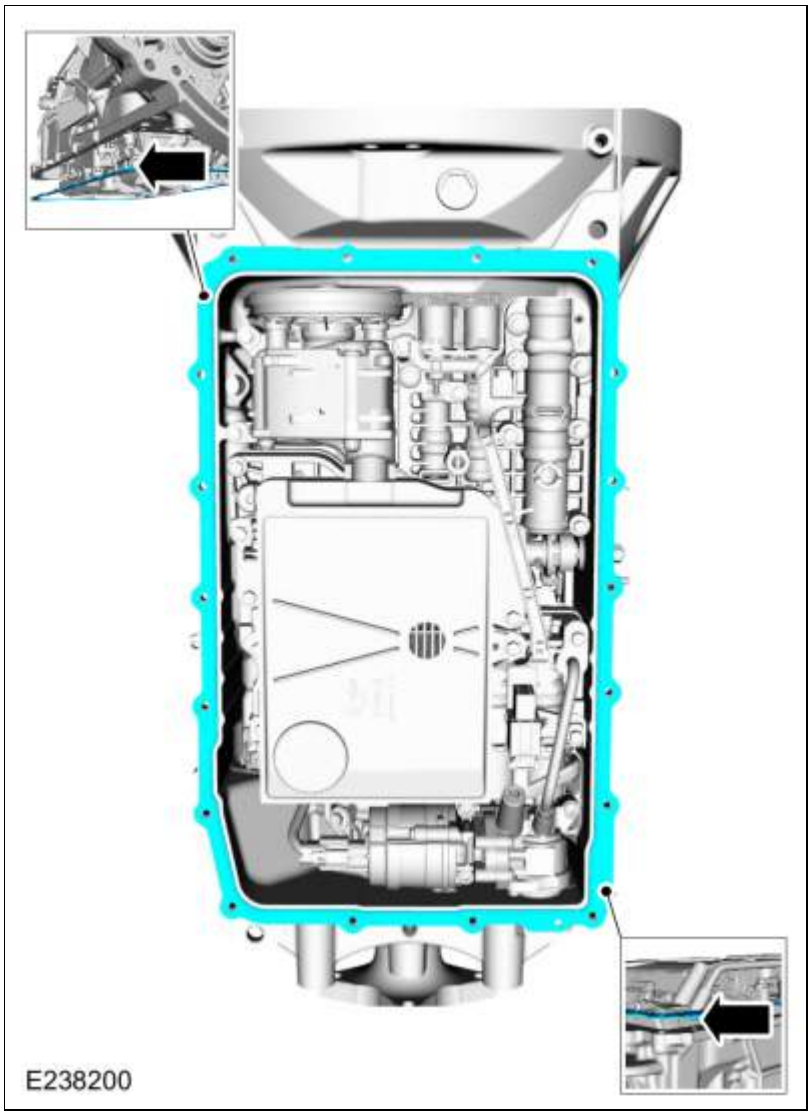
   Remove the transmission fluid pan bolts and the transmission fluid pan and allow the transmission fluid to drain.



4. **NOTE:** *The transmission fluid pan gasket can be reused if not damaged.*

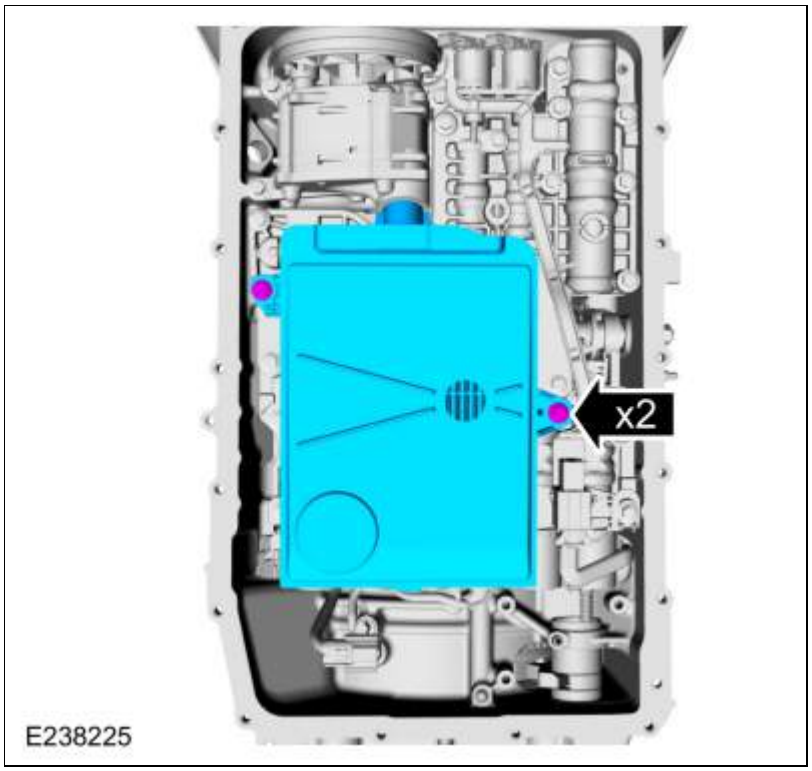
   NOTE: *Note the location of the alignment tabs.*

   Remove the transmission fluid pan gasket.

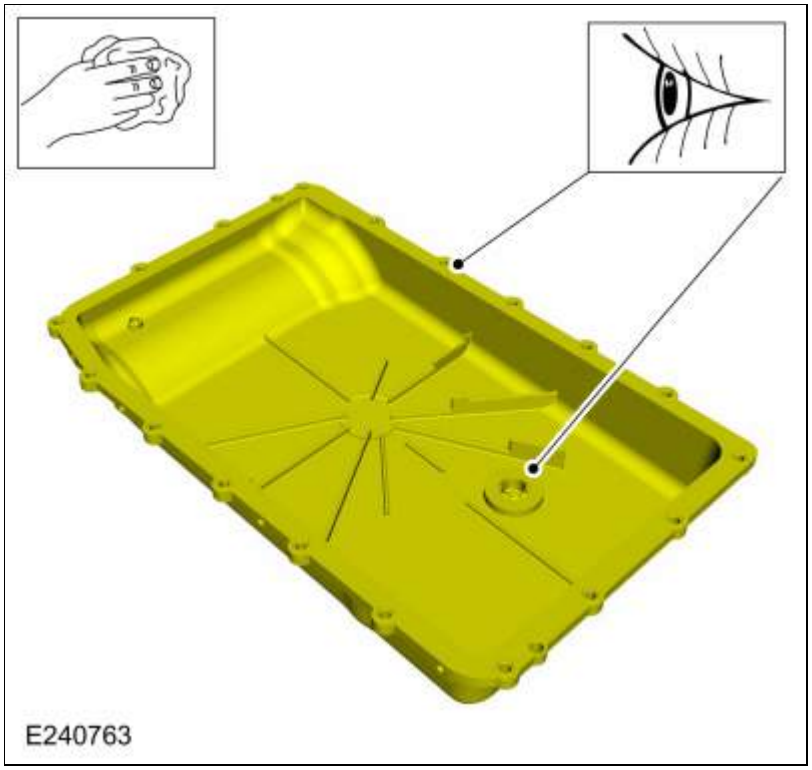


5. **NOTE:** *The transmission fluid filter may be reused if no excessive contamination is indicated.*

   Remove the bolts and the transmission fluid filter.



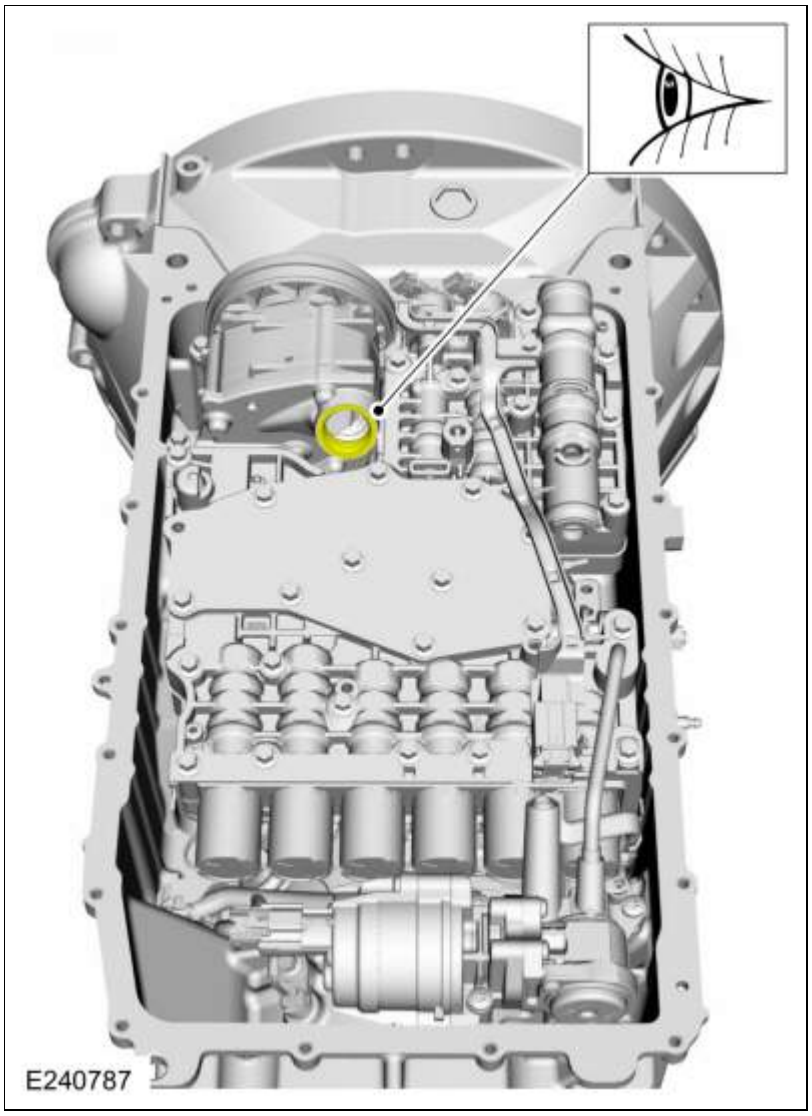
6. Clean and inspect the transmission fluid pan and magnet.



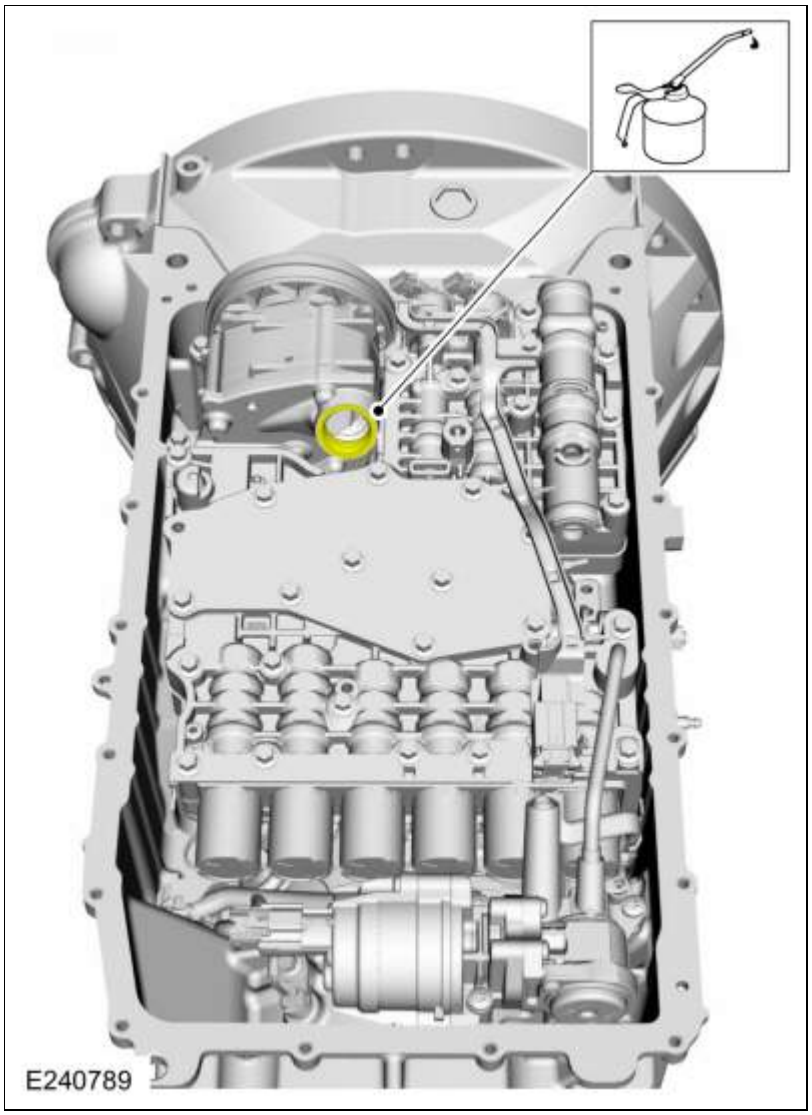
Installation

1. **NOTE:** *If the transmission is being repaired for a contamination-related failure, install a new transmission fluid filter and seal assembly. The transmission fluid filter may be reused if no excessive contamination is indicated.*

   Inspect the transmission fluid filter seal. If necessary, replace the transmission fluid filter seal.



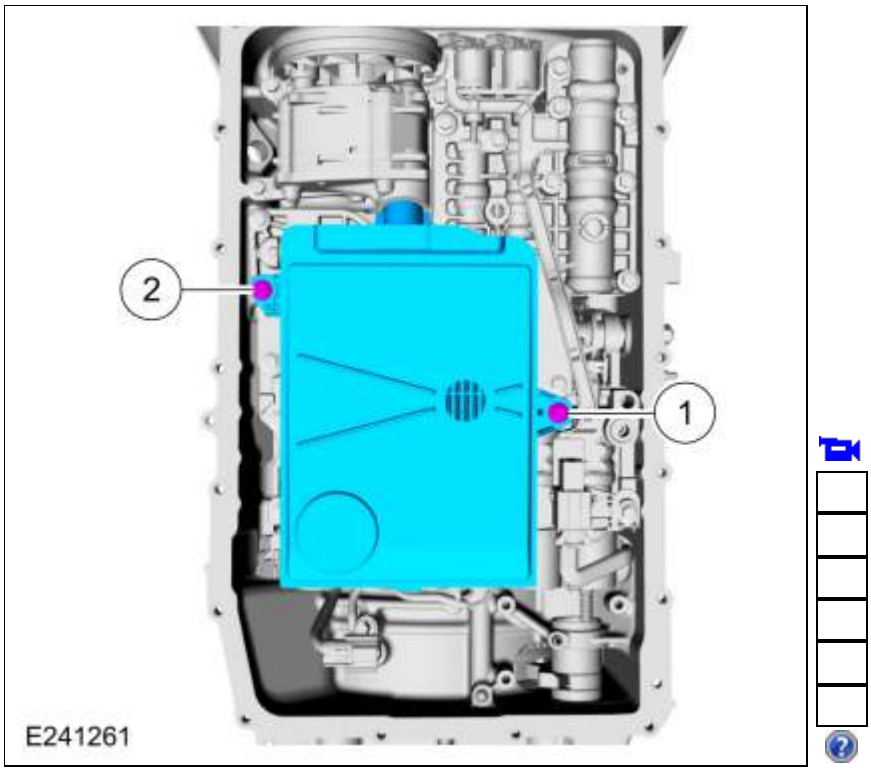
2. Lubricate the transmission fluid filter seal with automatic transmission fluid.
   Material: Motorcraft® MERCON® ULV Automatic Transmission Fluid / XT-12-QULV (WSS-M2C949-A) (MERCON® ULV)



3. **NOTICE: If the bolts are installed in the wrong locations, transmission damage will occur.**

   NOTE: *The transmission fluid filter may be reused if no excessive contamination is indicated.*

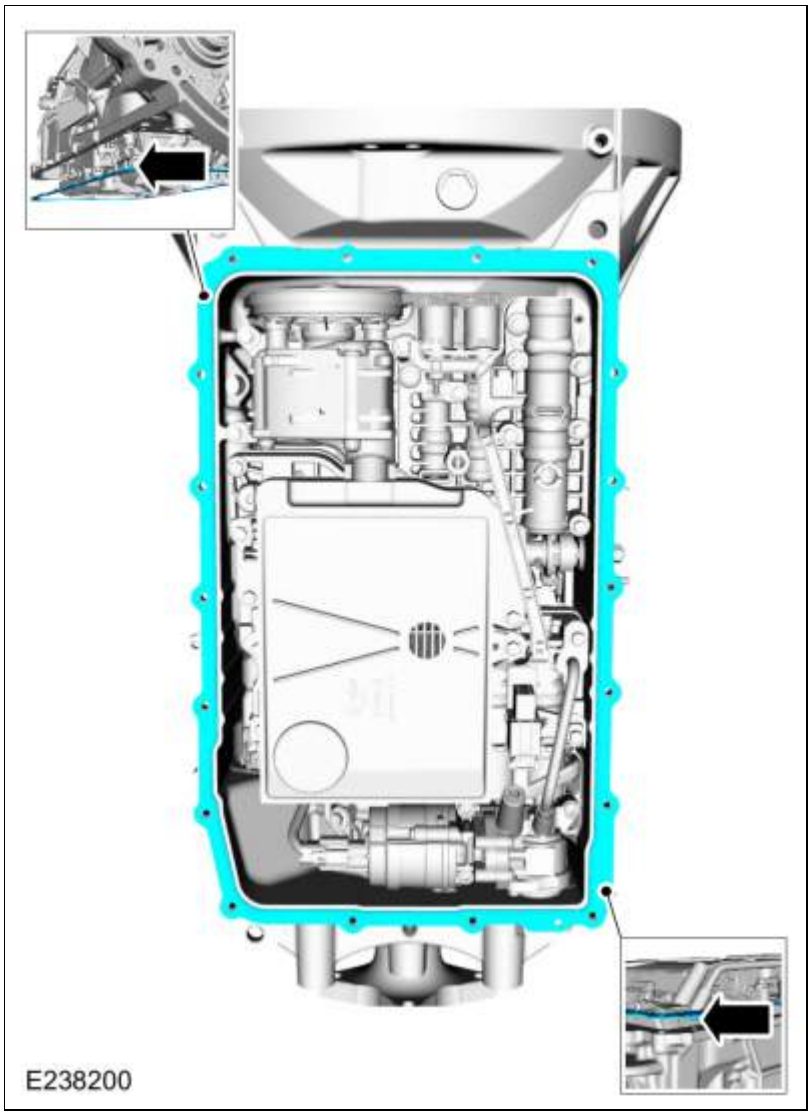
   Install the filter and the bolts in the correct locations.
   1. Short bolt
   2. Long bolt
      - *Torque*: 93 lb.in (10.5 Nm)



4. **NOTE:** *The transmission fluid pan gasket can be reused if not damaged.*

   NOTE: *Align the transmission fluid pan gasket tabs in the correct locations.*

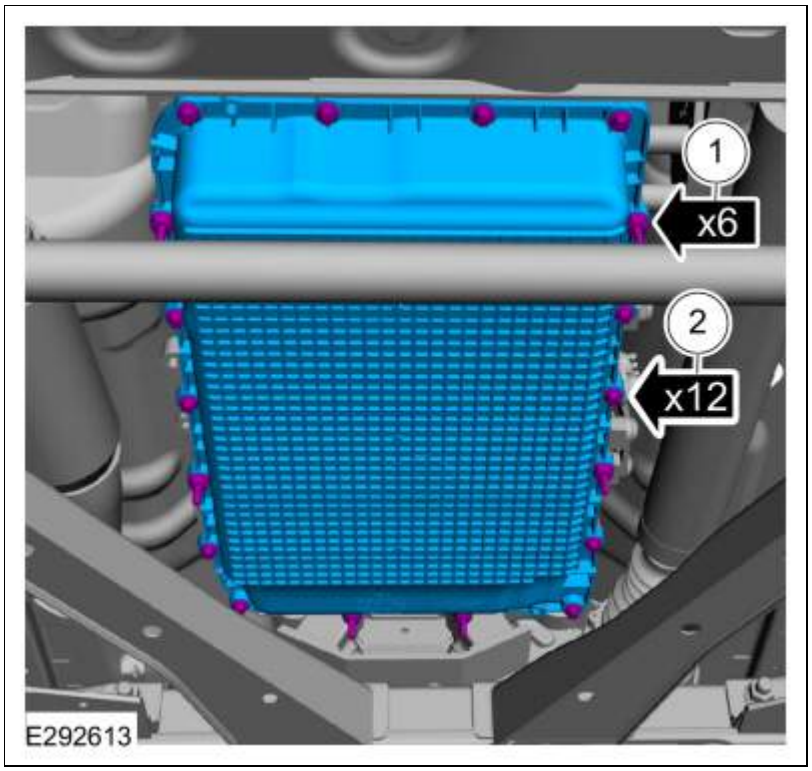
   Install a new transmission fluid pan gasket if required.



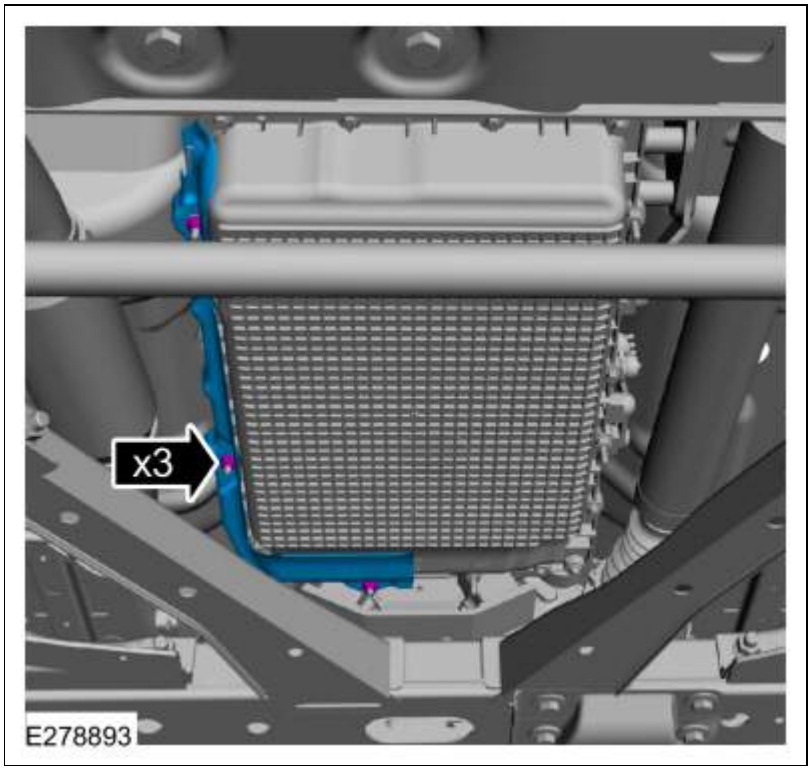
5. **NOTE:** *Install the bolts and studbolts in the correct locations noted during removal.*

Install the transmission fluid pan and loosely install the bolts and studbolts.

1. Tighten the studbolts in a crisscross pattern.
   Torque: 106 lb.in (12 Nm)
2. Tighten the bolts in a crisscross pattern.
   Torque: 89 lb.in (10 Nm)



6. Install the heatshield and retainers.
   Torque: 80 lb.in (9 Nm)



7. Fill and check the transmission fluid.

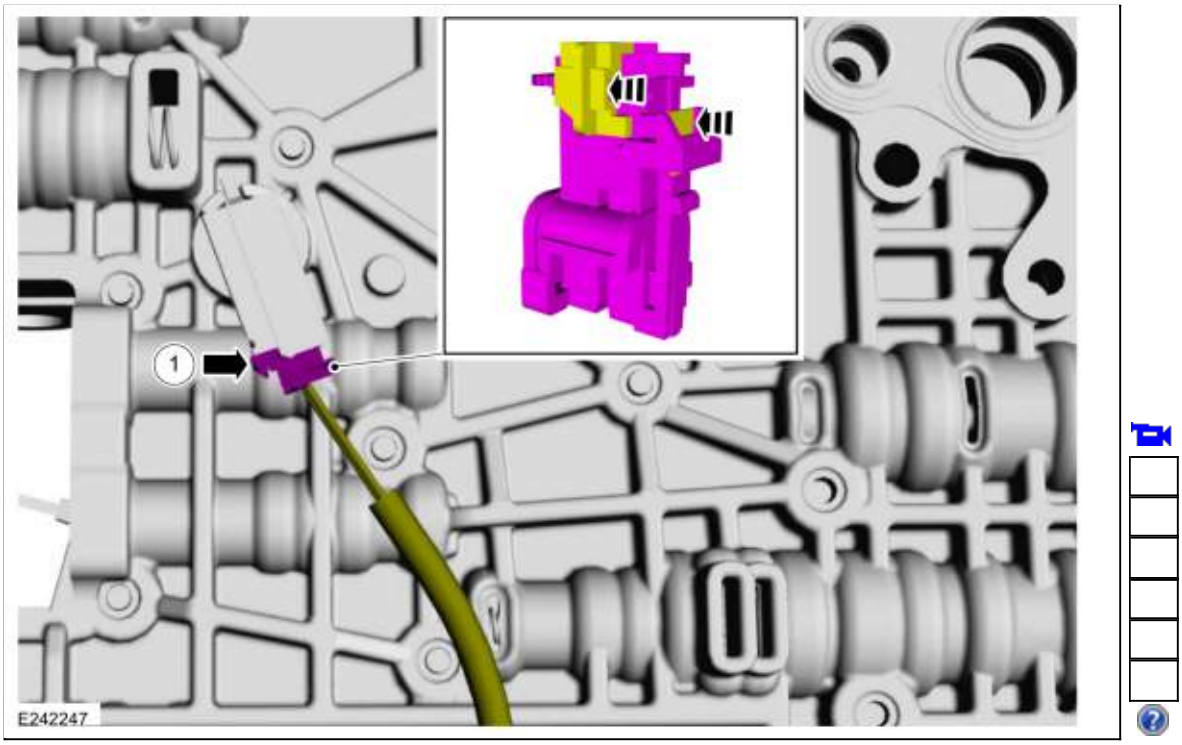
Refer to: Transmission Fluid Drain and Refill (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).

Transmission Fluid Temperature (TFT) Sensor

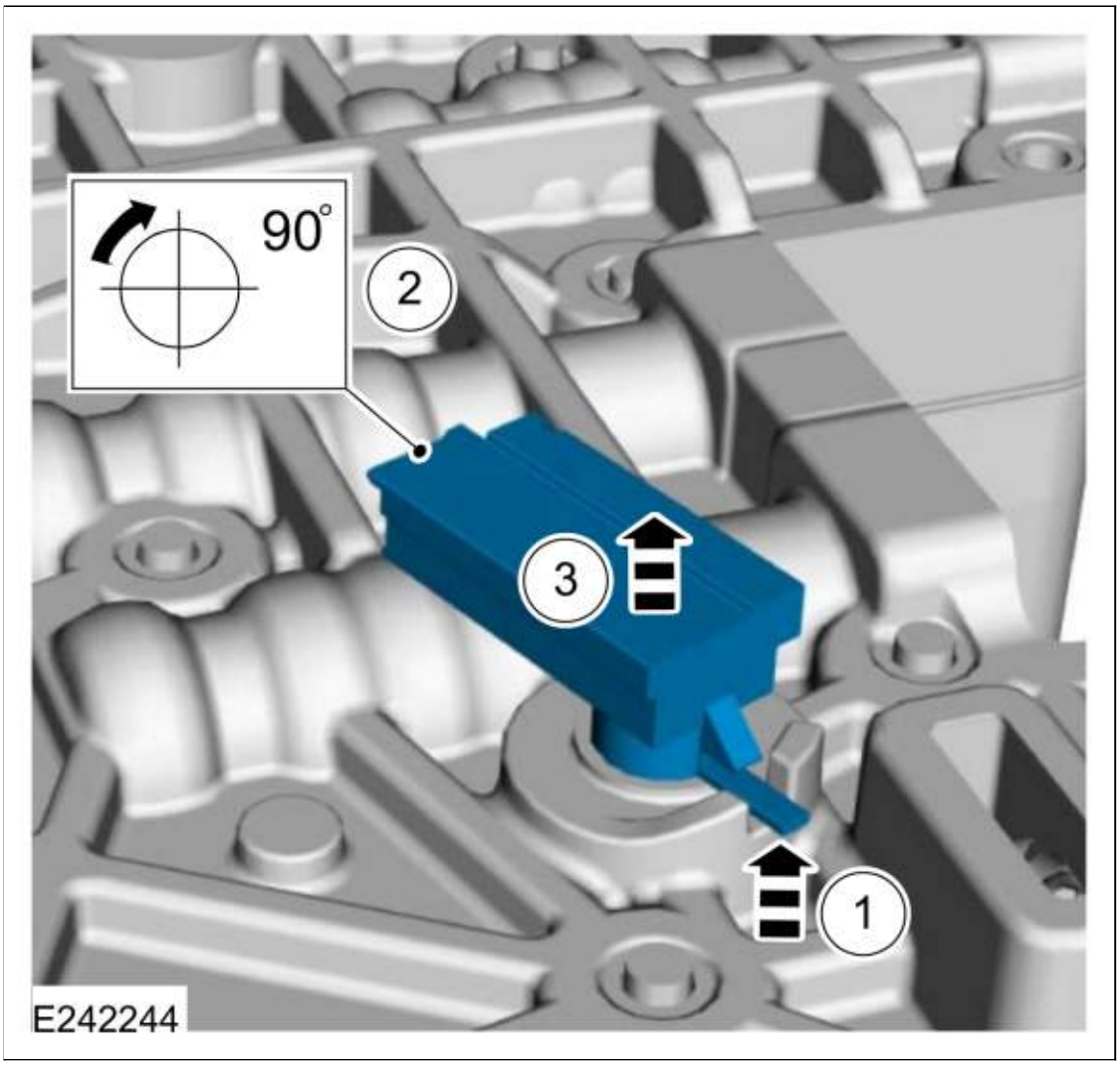
Removal

1. Remove the main control valve body.
   Refer to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
   Refer to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

2. Disconnect the TFT sensor.
   1. Slide the plastic lock to the unlocked position. While pressing the plastic tab, disconnect the electrical connector.

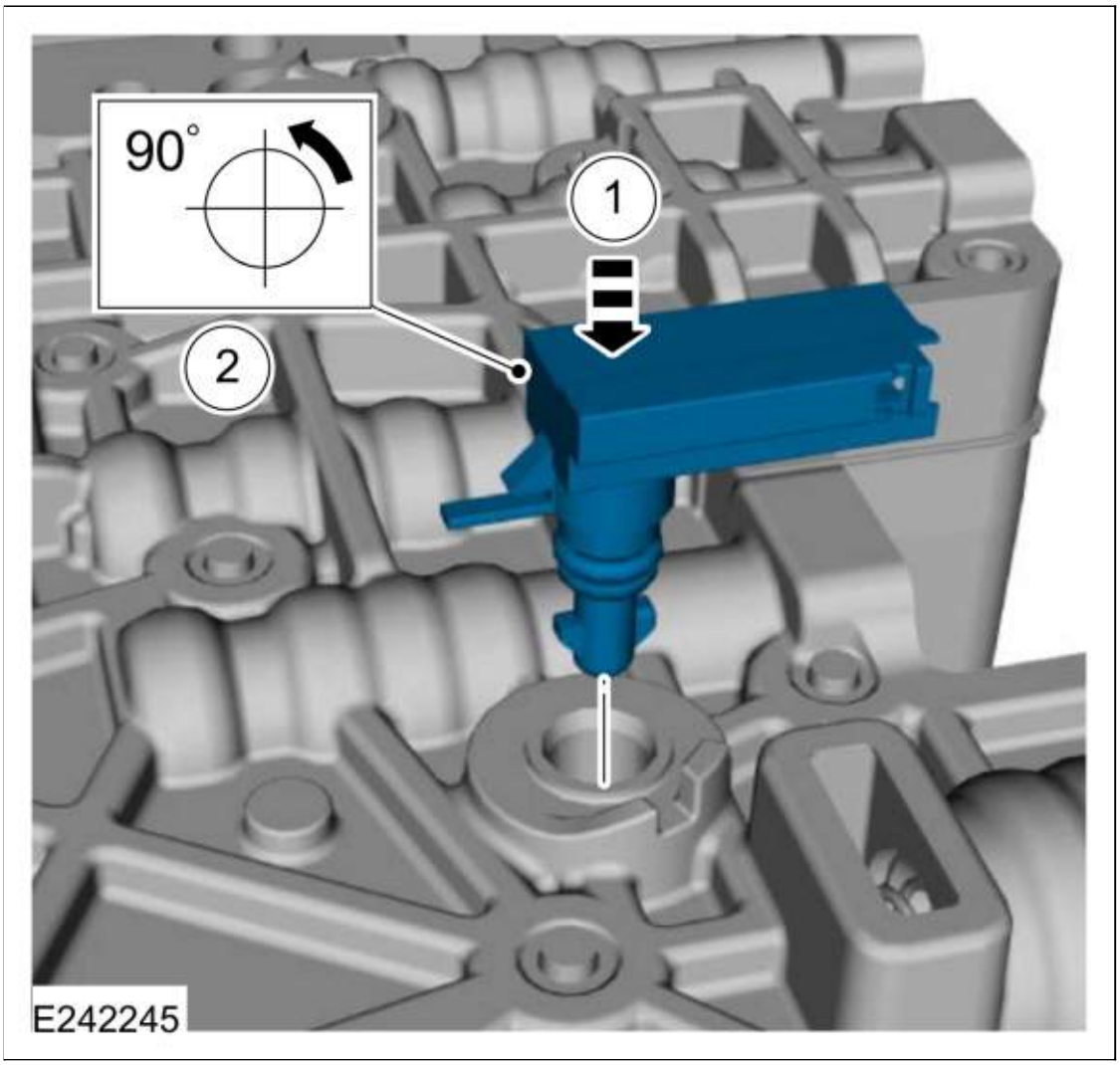


3. Remove the TFT sensor.
   1. Lift plastic tab.
   2. Rotate the TFT sensor clockwise.
   3. Remove the TFT sensor.



Installation

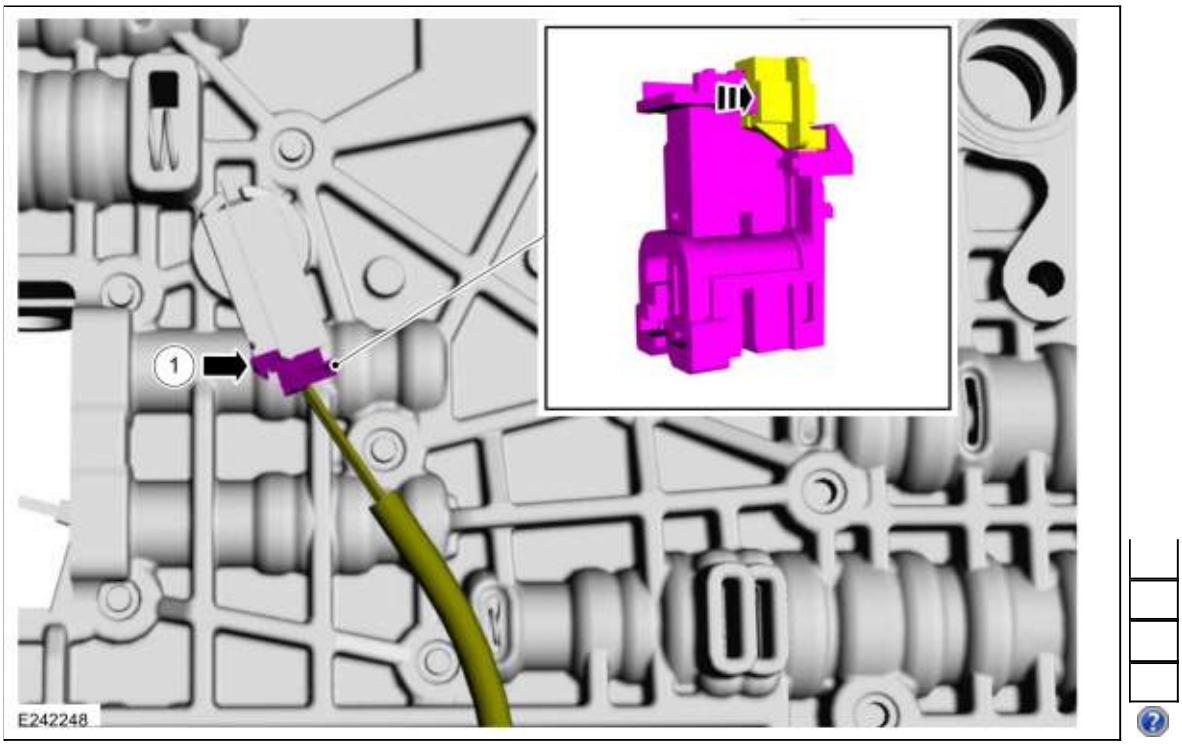
1.
Install the TFT sensor.
   1. Position the TFT sensor in the main control valve body.
   2. Rotate the TFT sensor counter clockwise until the plastic tab locks into place.



2.

Connect the TFT sensor.

1. Slide the plastic lock to the locked position.



3. Install the main control valve body.
   Refer to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
   Refer to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

Transmission Internal Wiring Harness

Special Tool(s) / General Equipment

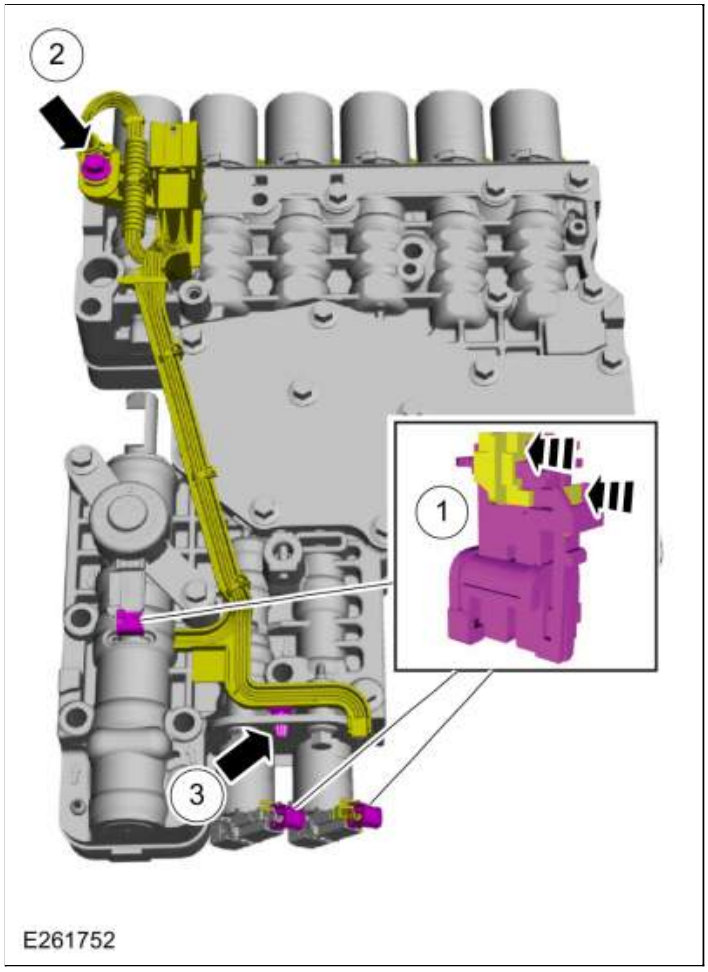
 E234932	307-746 Remover, Transmission Wiring Harness Connector

Removal

1. Remove the main control valve body.
   Refer to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
   Refer to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

Main Control Valve Body Harness

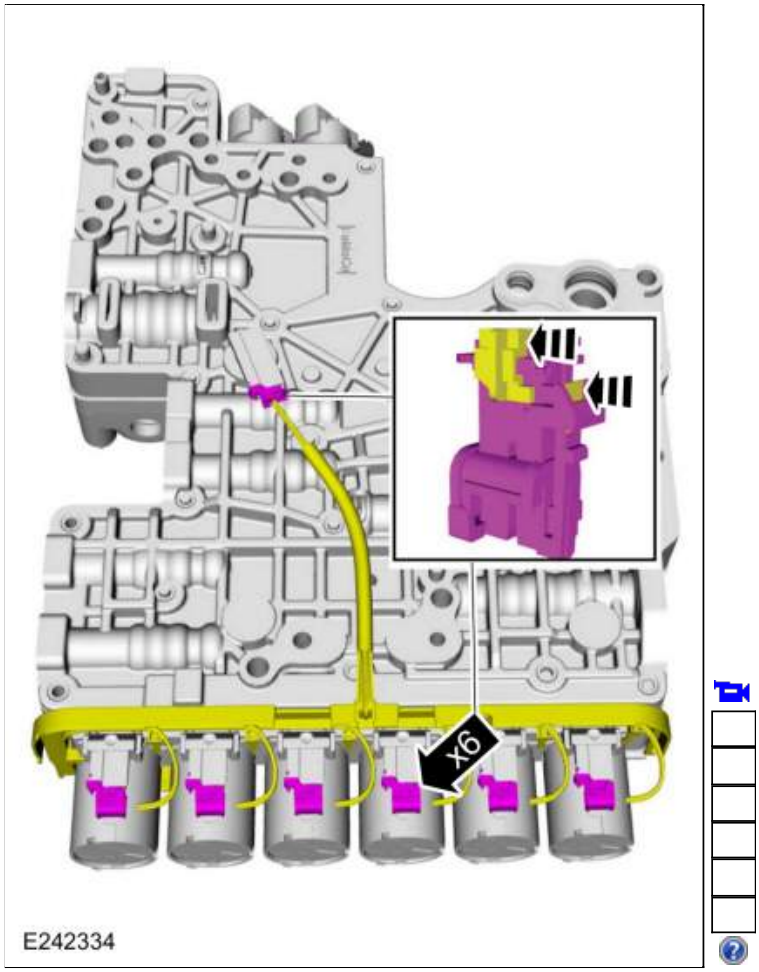
2.
   Disconnect the internal wiring harness.
   1. Slide the plastic lock to the unlock position. Disconnect the TCC solenoid and the LPC solenoid electrical connectors. If equipped, disconnect the park lock pawl solenoid electrical connector.
   2. Remove internal wiring harness retaining bolt.
   3. Disconnect the internal wiring harness retainer.



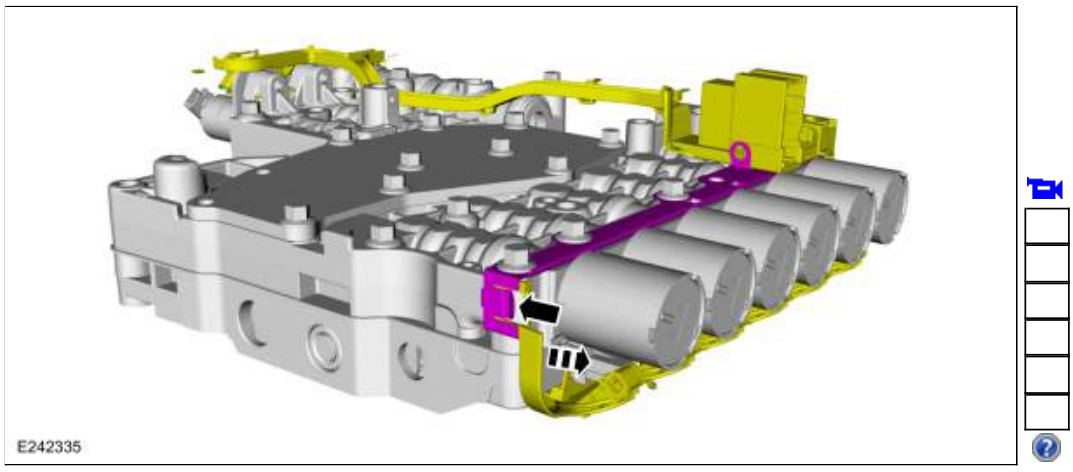
3.

Disconnect the internal wiring harness electrical connectors.

- Slide the plastic lock to the unlock position. While pressing the plastic tab, disconnect the electrical connector.

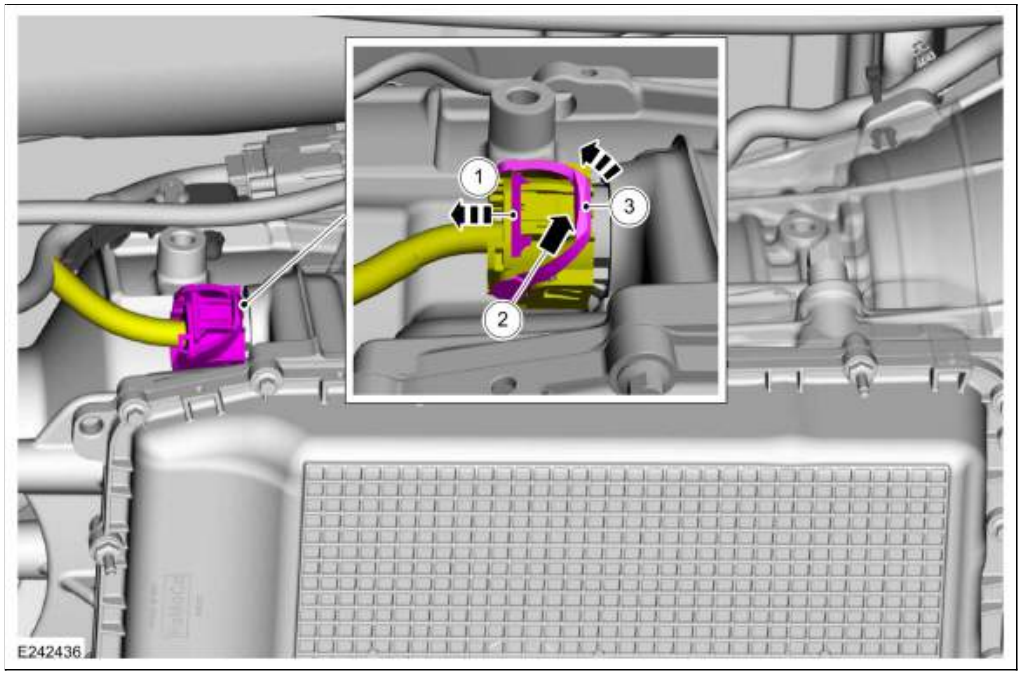


4. Release the retainer and remove the internal wiring harness assembly.



Transmission Case Harness

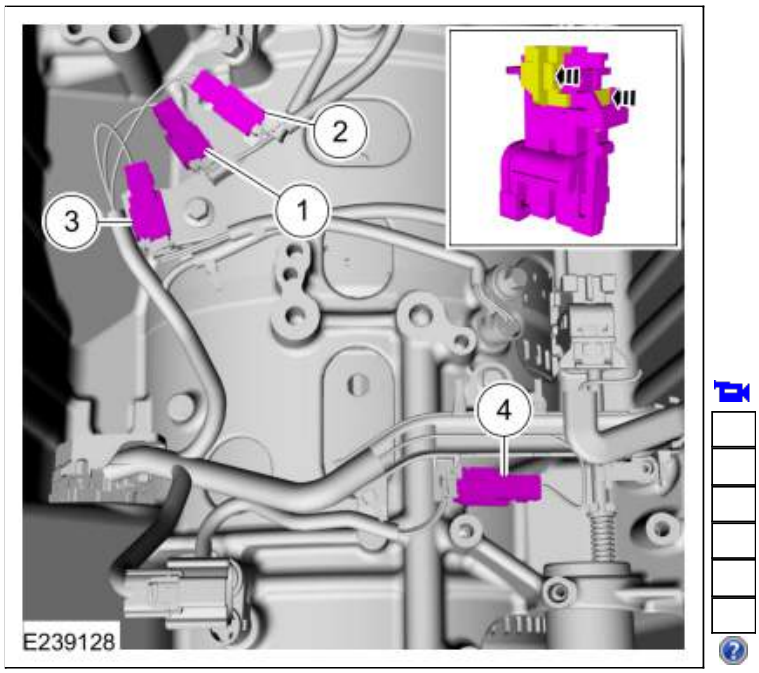
5.
   1. Slide the safety lock out.
   2. Press the connector tab in.
   3. Rotate the locking arm up and disconnect the transmission electrical connector.



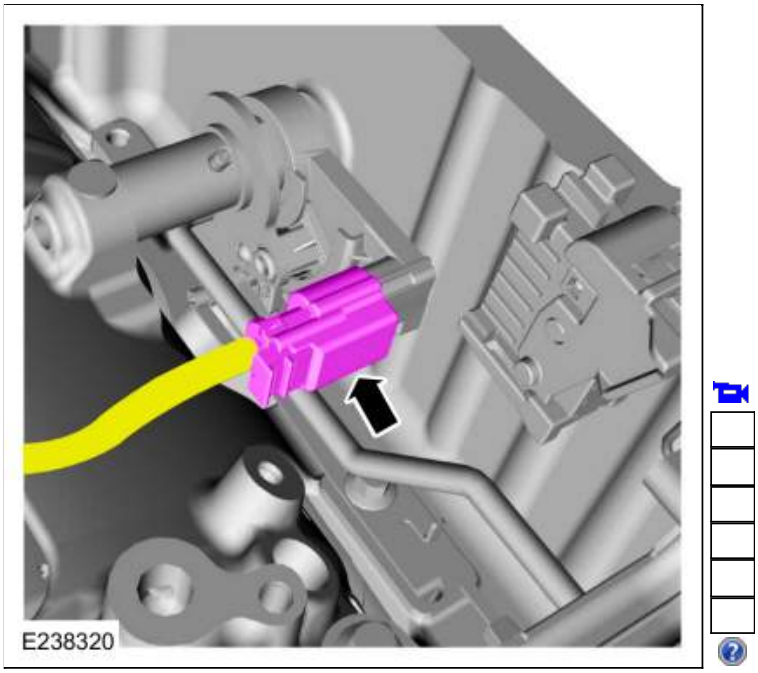
6. **NOTE:** *To disconnect the electrical connectors, slide the plastic lock to the unlocked position. While pressing the plastic tab, disconnect the electrical connector.*

Unlock and disconnect the speed sensors.

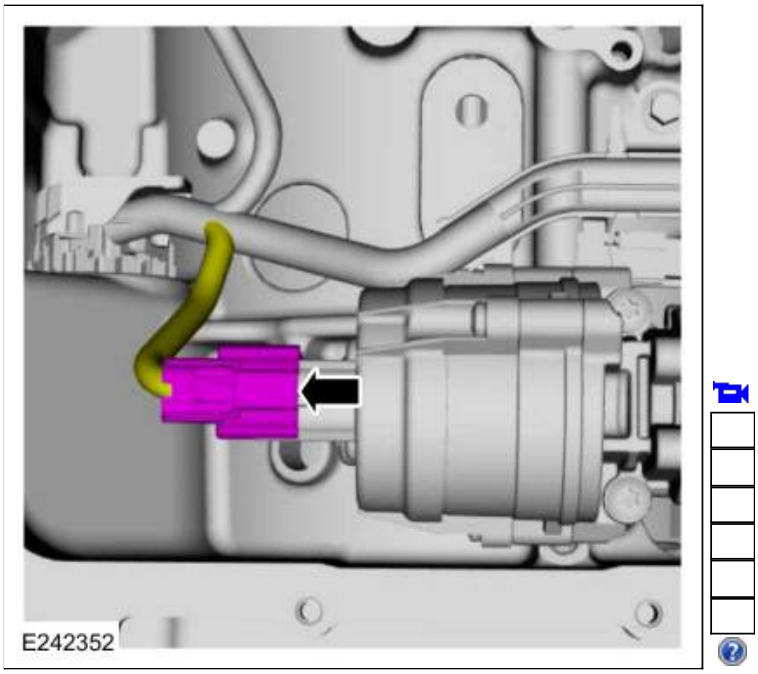
1. TSS sensor
2. Intermediate speed A sensor
3. Intermediate speed B sensor
4. OSS sensor



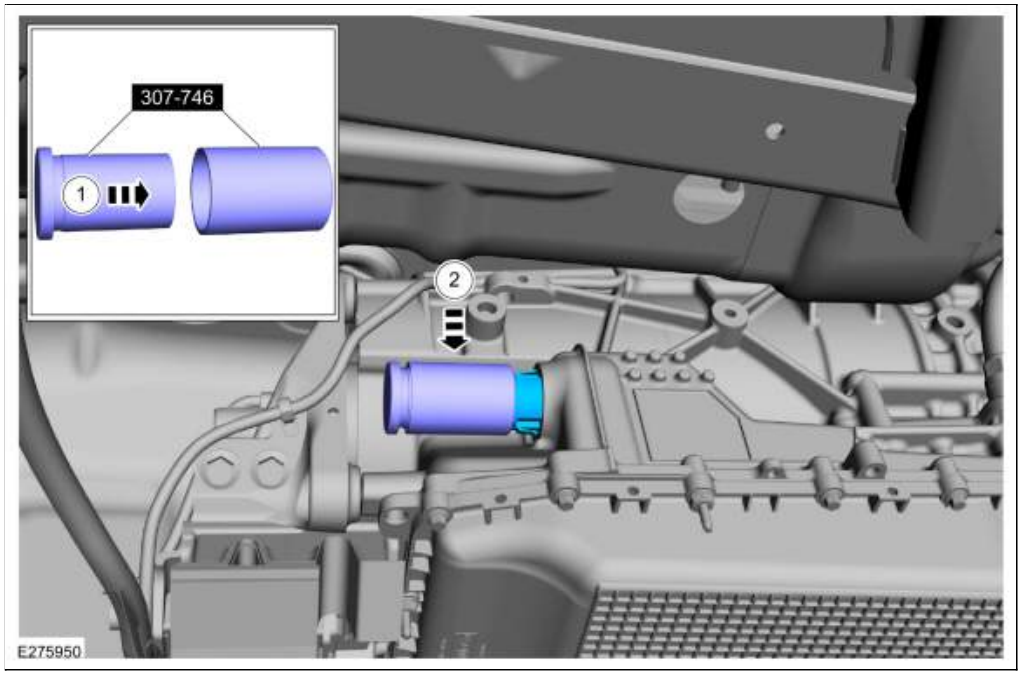
7. Disconnect the TR sensor electrical connector.



8. If equipped, disconnect the transmission fluid auxiliary pump electrical connector.



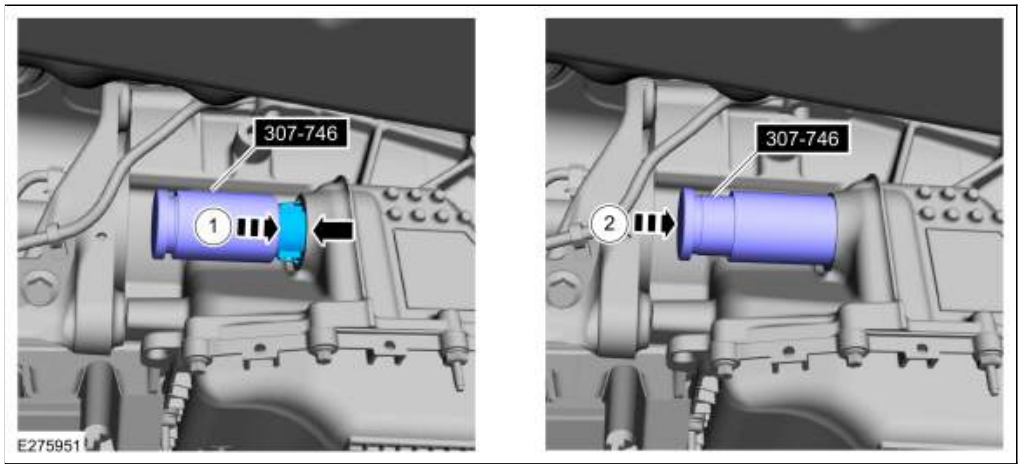
9.
   1. Assemble the special tool.
      Use Special Service Tool: 307-746 Remover, Transmission Wiring Harness Connector.
   2. Position the special tool onto the transmission internal wiring harness connector.



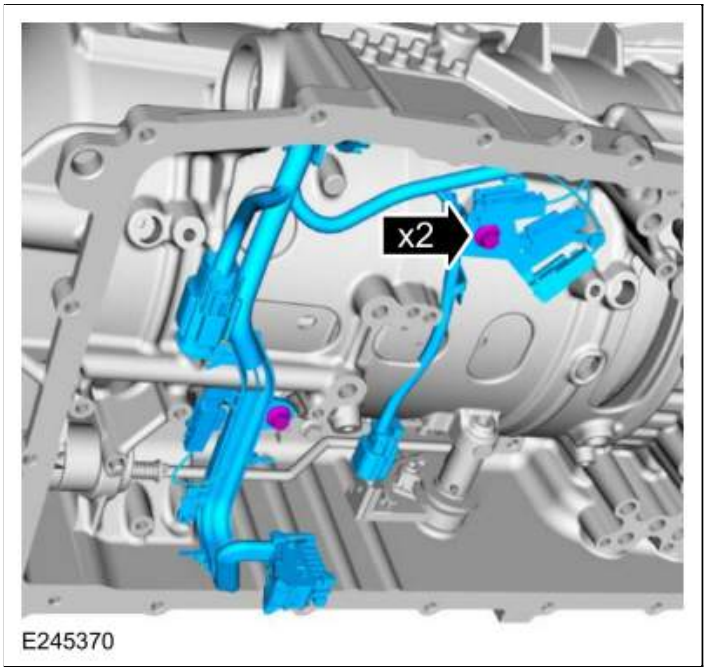
10.

Using the special tool, disconnect the transmission internal wiring harness connector from the transmission case.

1. Slide the special tool over the connector flush with the transmission case.
   Use Special Service Tool: 307-746 Remover, Transmission Wiring Harness Connector.
2. Use the special tool to push the connector through the transmission case.



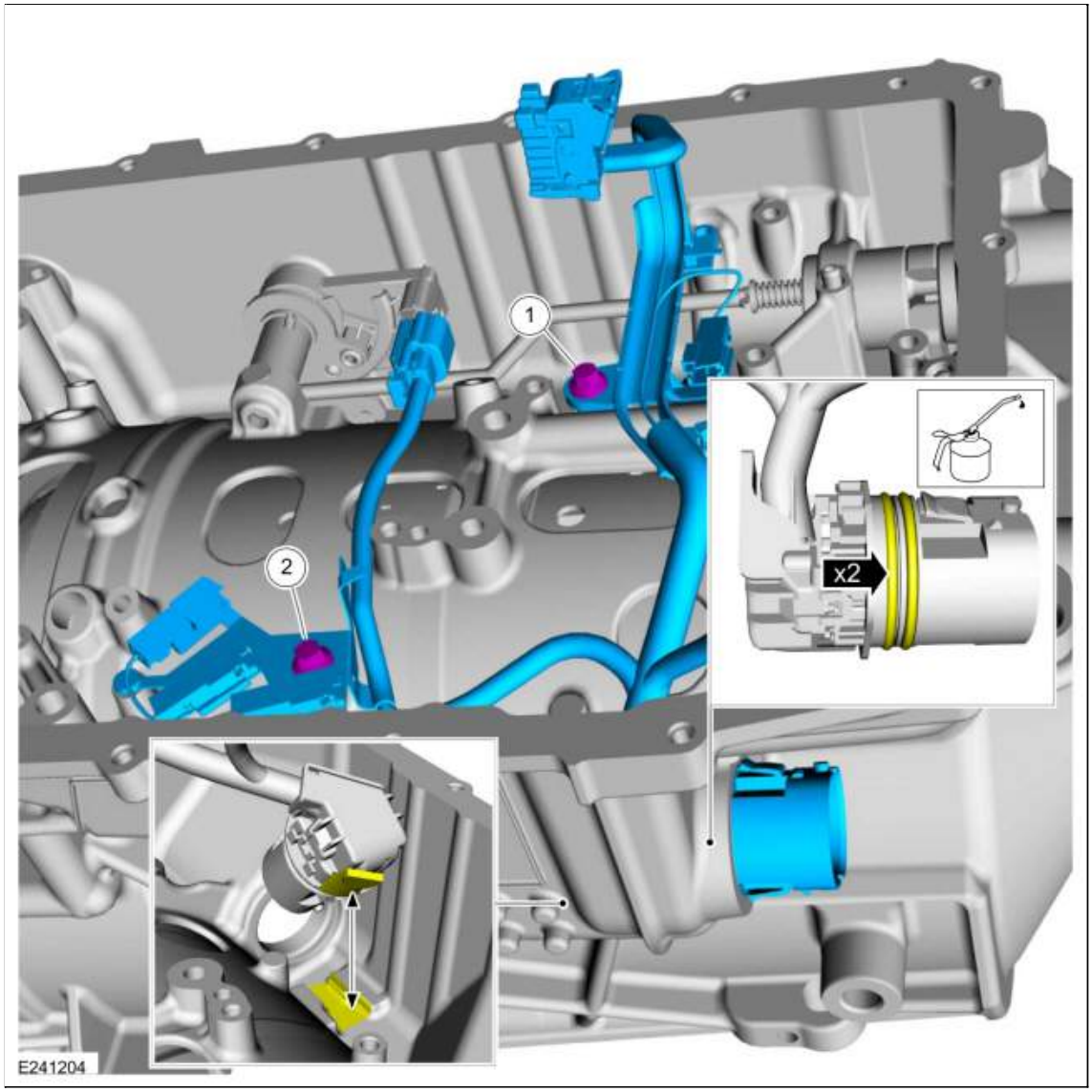
11. Remove the bolts and the transmission internal wiring harness.



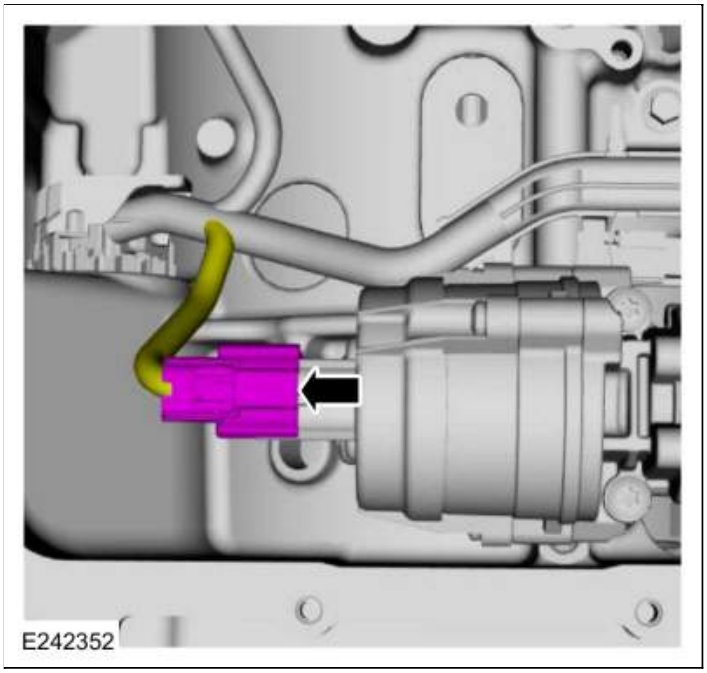
Installation

Transmission Case Harness

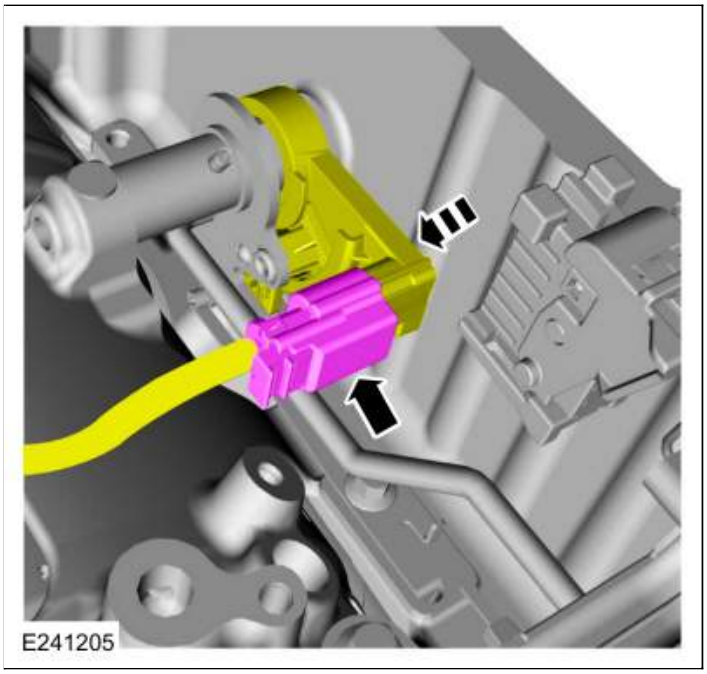
1. Install the wiring harness. Lubricate the O-ring seals with petroleum jelly. Align the tab on the electrical connector with the indention in the transmission case and install the main electrical connector in the transmission case. Align the wiring harness and install the bolts.
    1. *Torque*: 97 lb.in (11 Nm)
    2. *Torque*: 106 lb.in (12 Nm)



2. If equipped, connect the transmission fluid auxiliary pump electrical connector.



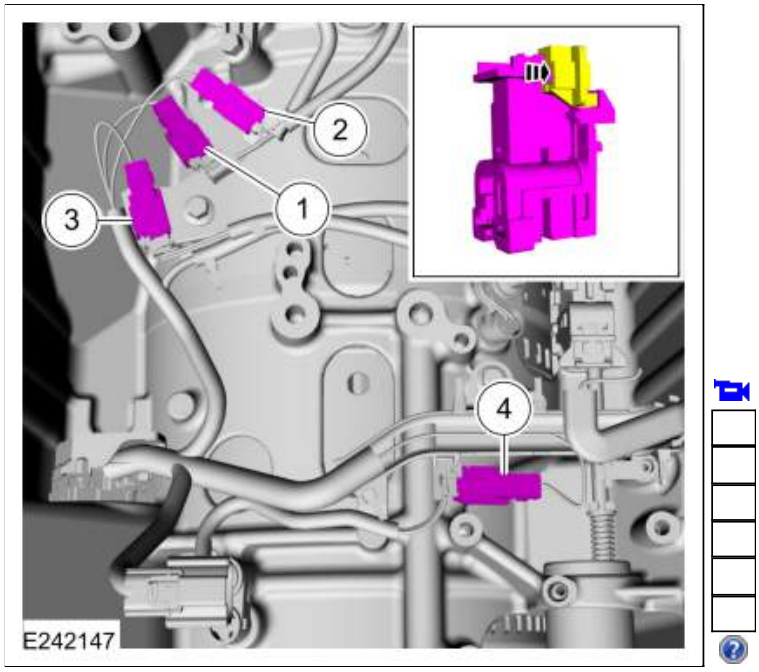
3. Support the opposite side of the TR sensor and connect the electrical connector.



4. **NOTE:** *After connecting the electrical connectors, slide the plastic lock to the locked position.*

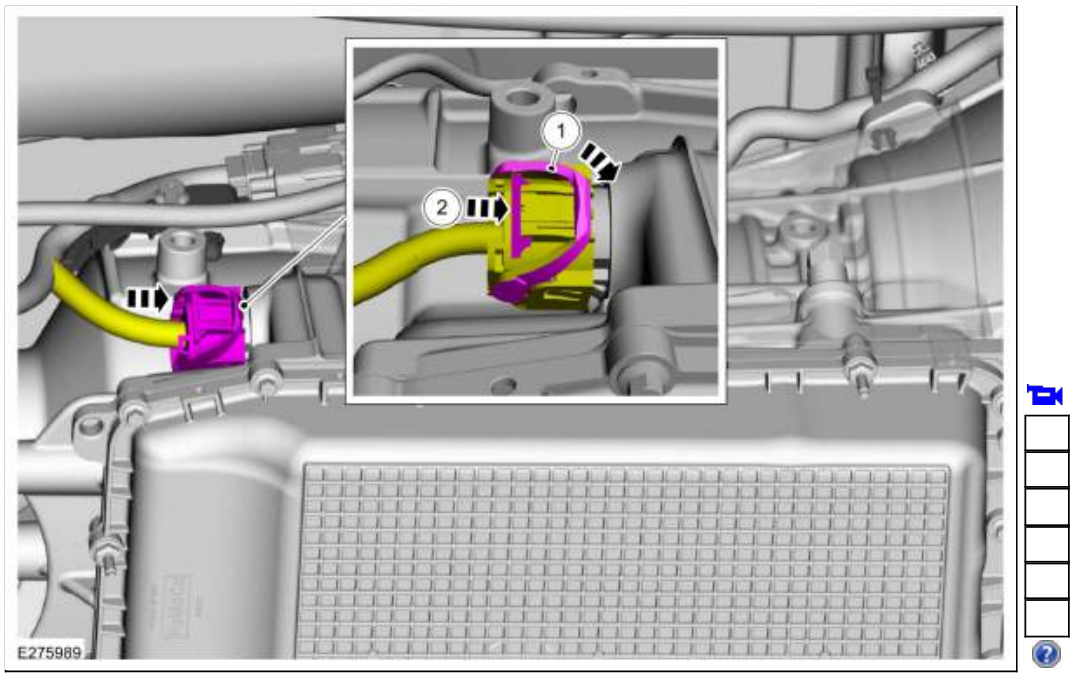
Connect and lock the speed sensors.

1. TSS sensor
2. Intermediate speed A sensor
3. Intermediate speed B sensor
4. OSS sensor



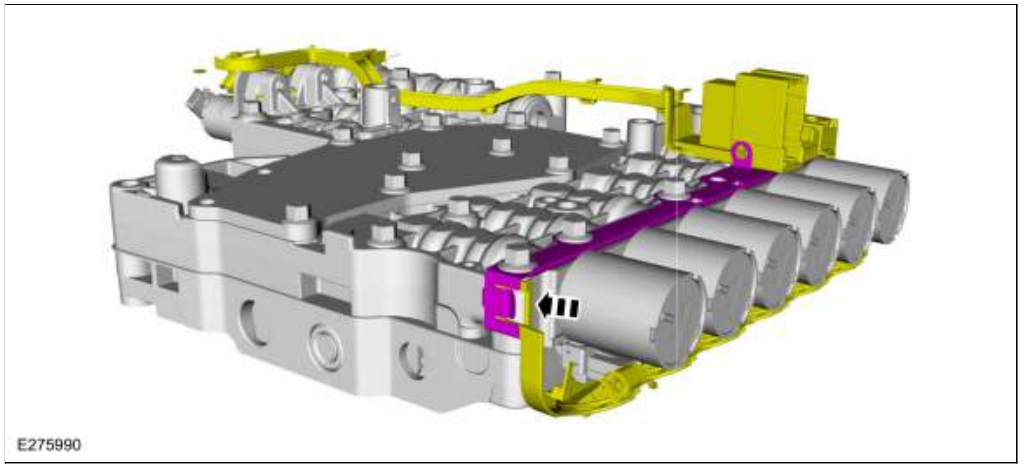
5.

1. Rotate the locking arm down and connect the transmission electrical connector.
2. Slide the safety lock in.



Main Control Valve Body Harness

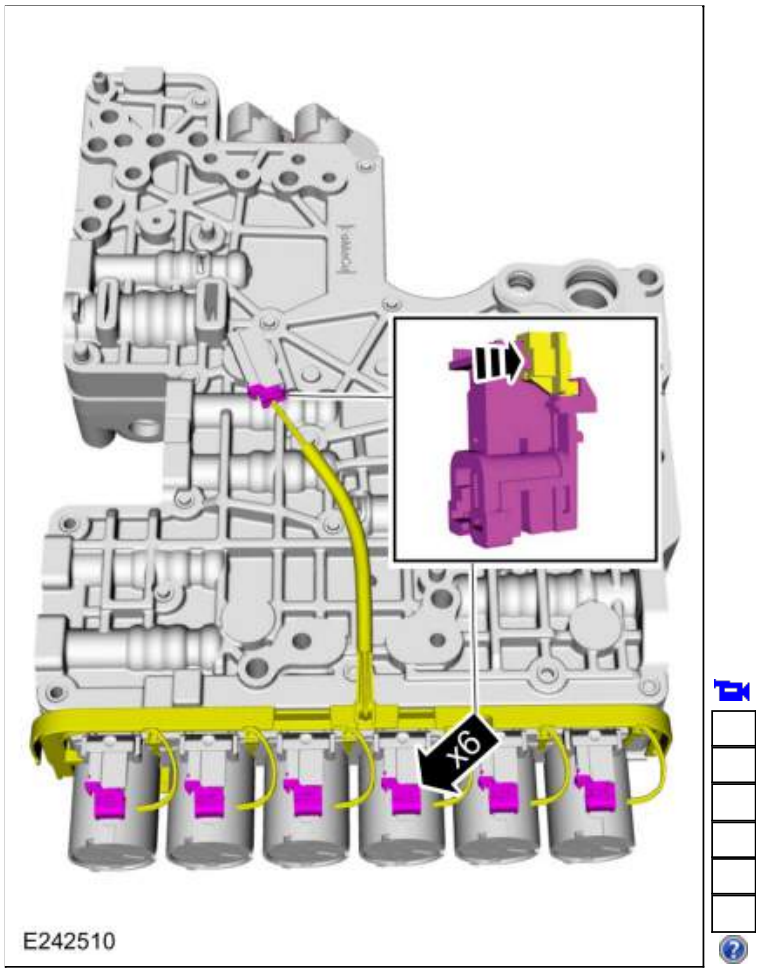
6. Install the internal wiring harness assembly and attach the retainer.



7.

Connect the internal wiring harness electrical connectors.

- Slide the plastic lock to the locked position.

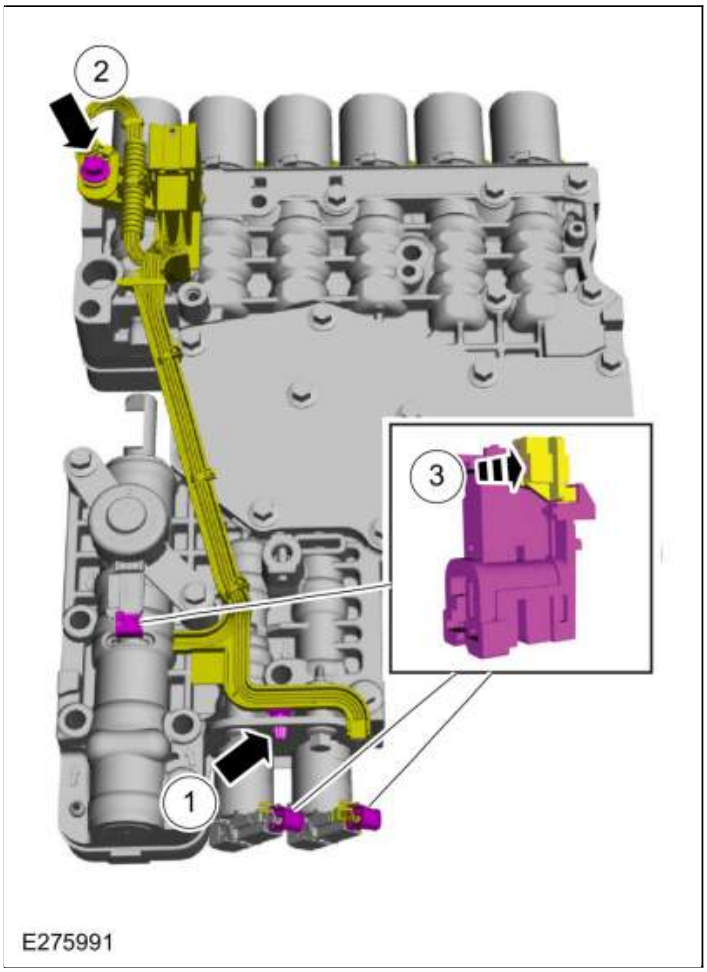


8.

Connect the internal wiring harness.

1. Connect the internal wiring harness retainer.
2. Install the internal wiring harness retaining bolt.
   Torque: 106 lb.in (12 Nm)

3. Connect the TCC solenoid and the LPC solenoid electrical connectors. If equipped, connect the park lock pawl solenoid electrical connector. Slide the plastic lock to the locked position.



All Harnesses

9. Install the main control valve body.
   Refer to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
   Refer to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

Transmission Range (TR) Sensor

Base Part Number: 7F293

Special Tool(s) / General Equipment

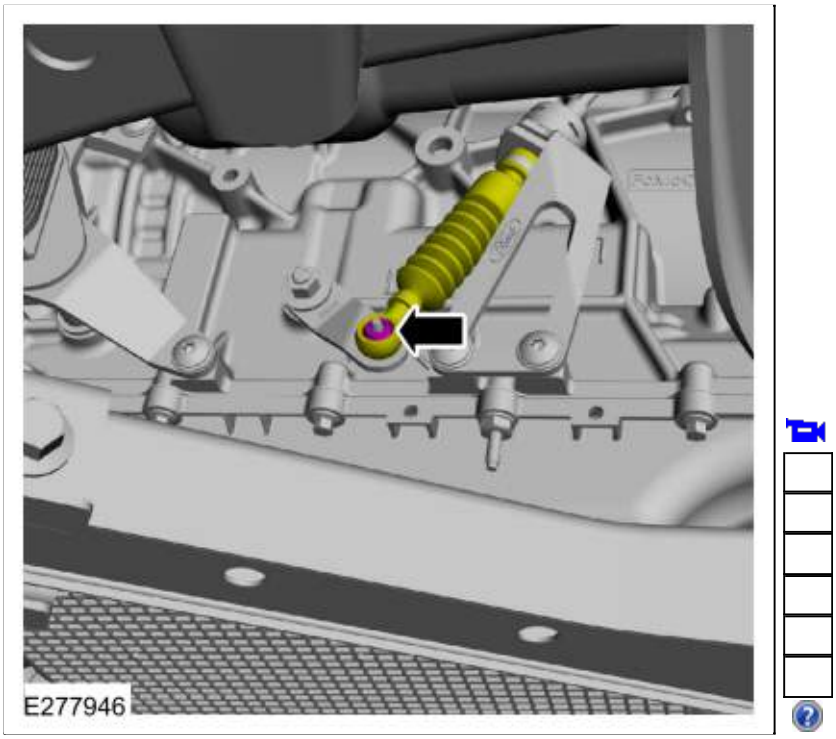
Punch

Removal

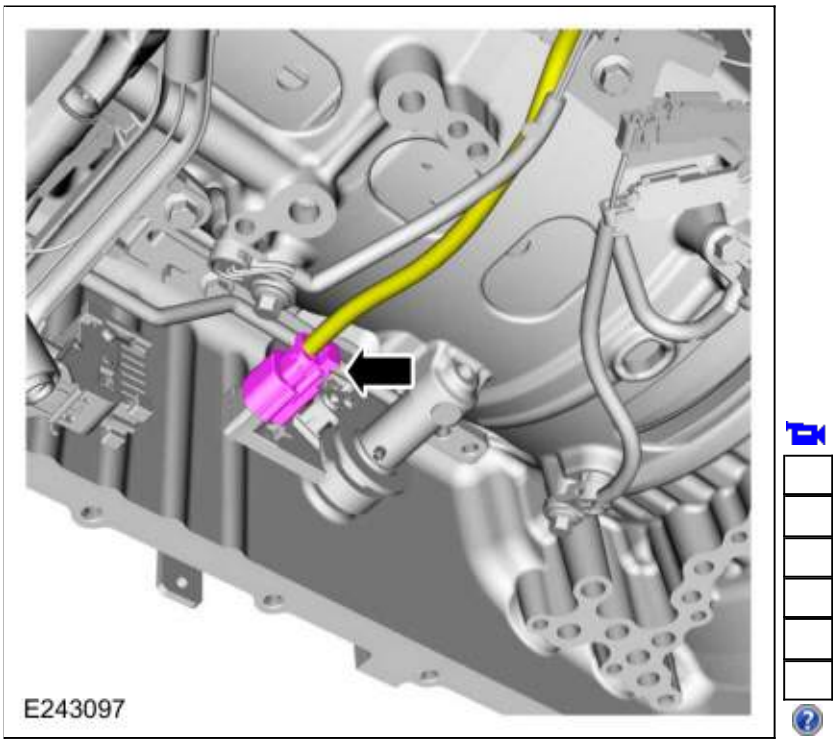
1. Remove the main control valve body.
   Refer to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
   Refer to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

2. **NOTICE: Take extra care when handling selector lever cable.**

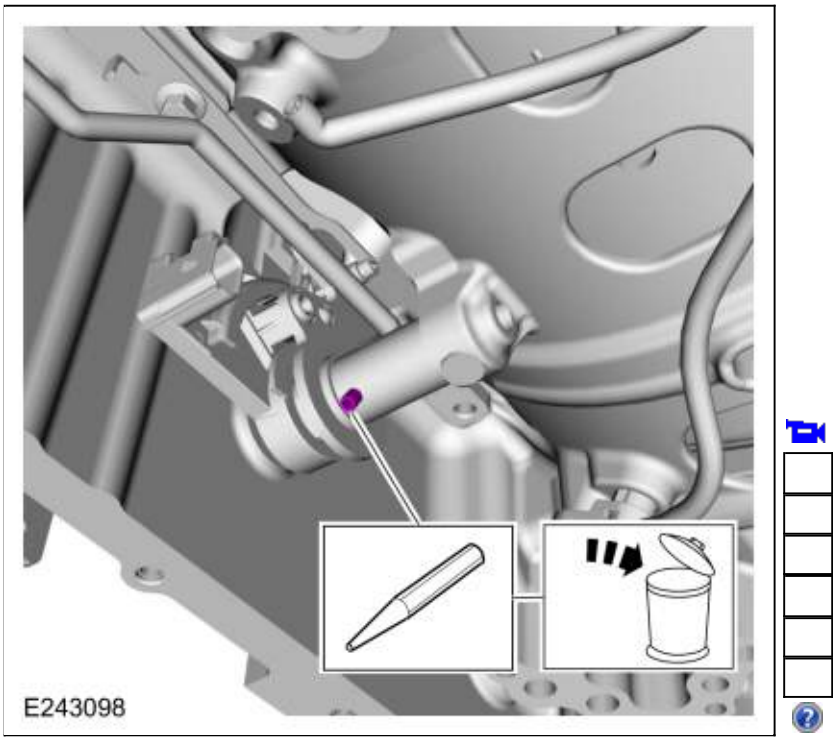
   Disconnect the selector lever cable from the manual control lever.



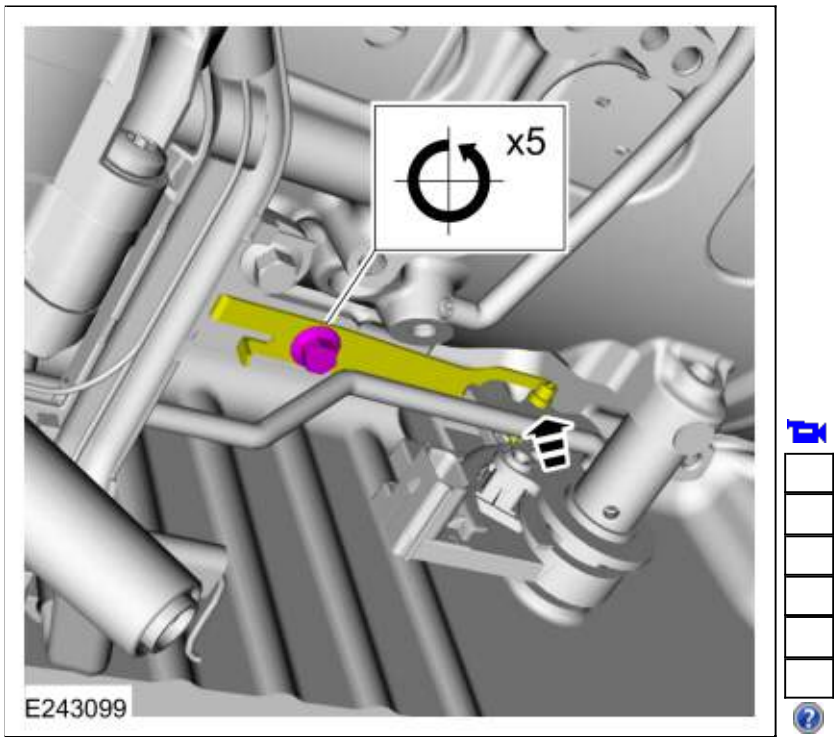
3. Disconnect the TR sensor electrical connector and position the transmission wiring harness aside.



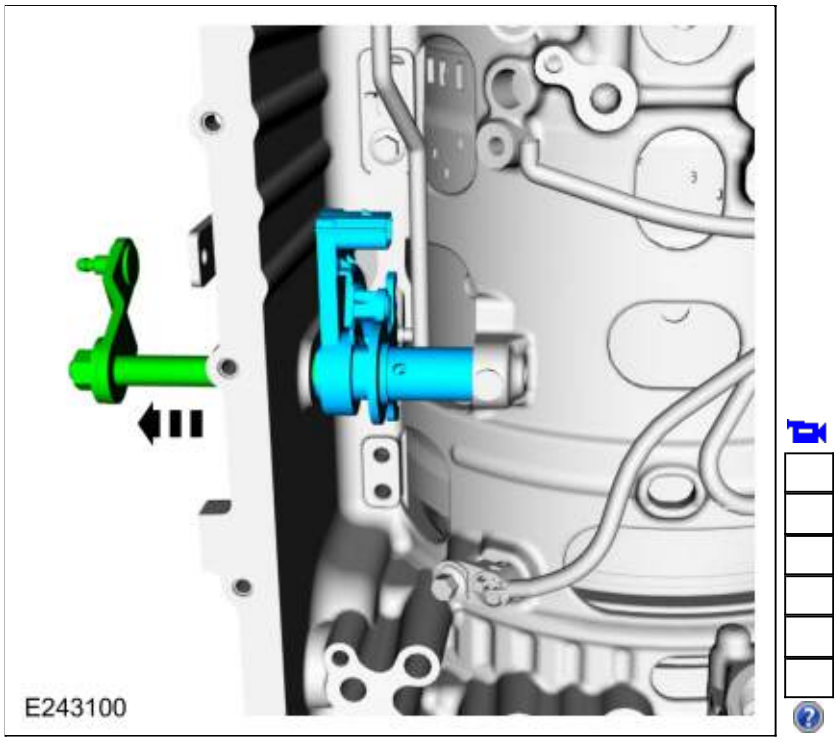
4. Using a punch, remove and discard the manual shaft-to-TR sensor roll pin (7G100).
Use the General Equipment: Punch



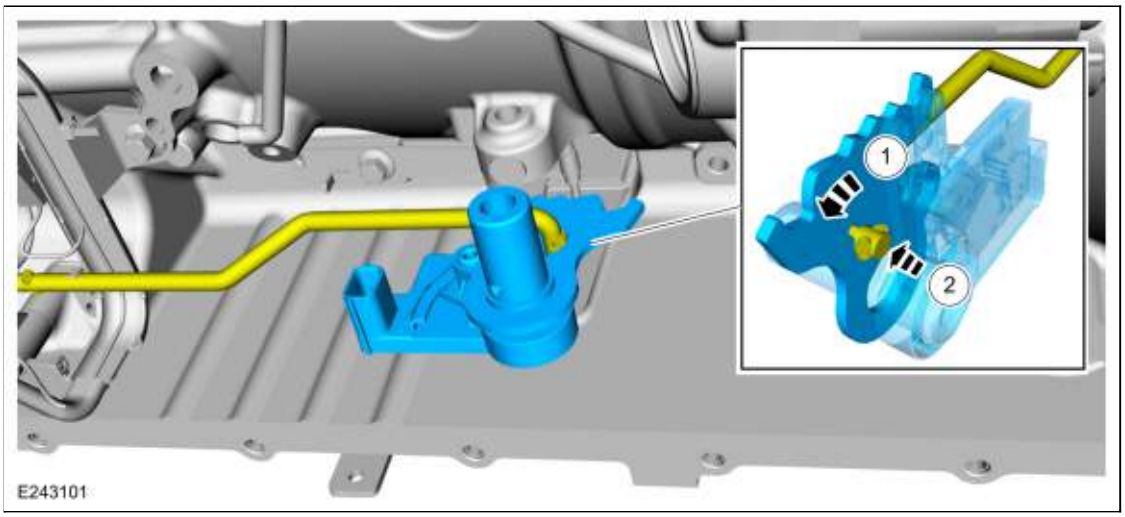
5. Loosen the detent spring bolt and the detent spring enough to remove the tension from the TR sensor.



6. Remove the manual shaft and selector lever from the TR sensor.

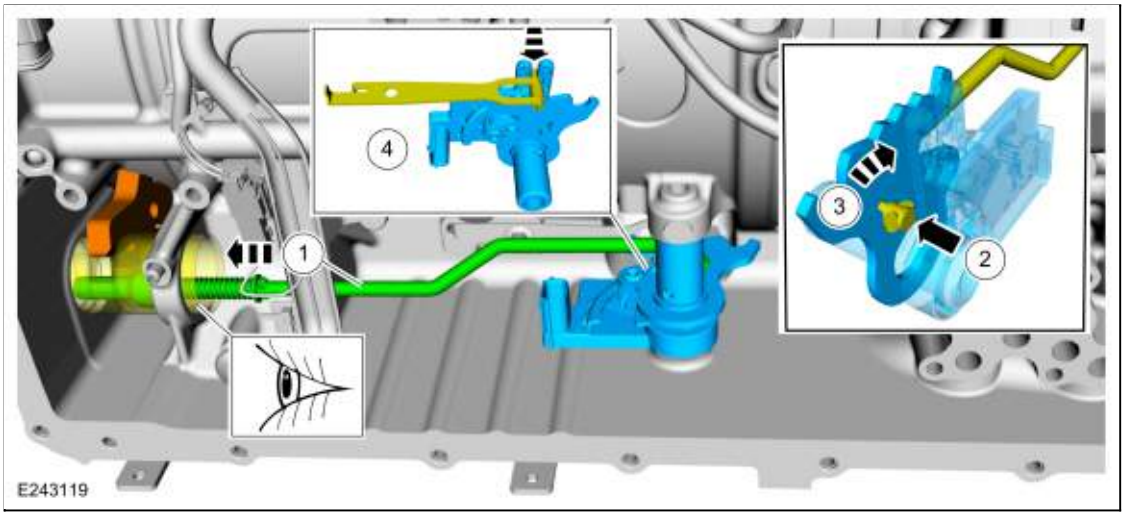


7. Remove the TR sensor (7H557).
   1. Rotate the TR sensor.
   2. Disconnect the park pawl actuator rod and remove the TR sensor.

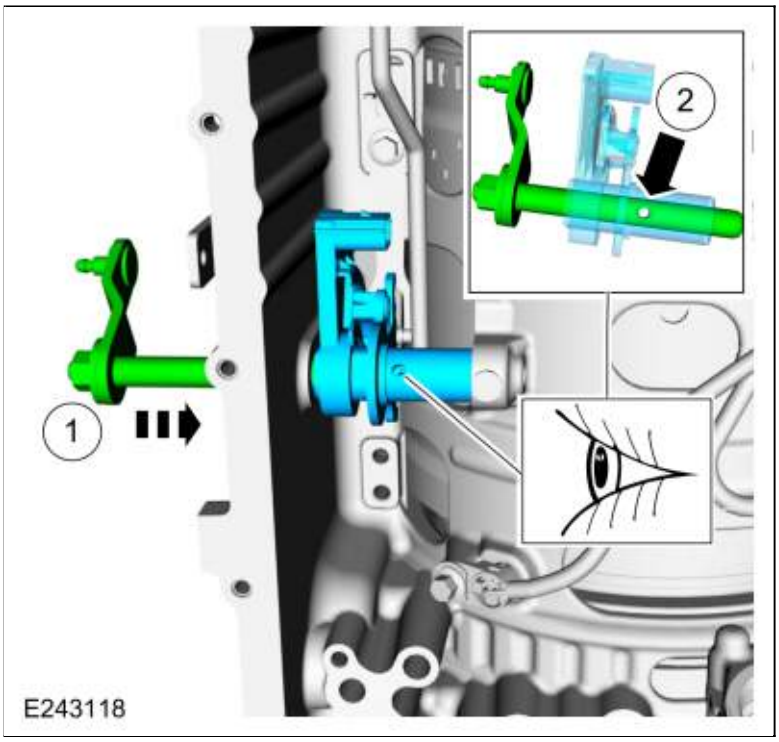


Installation

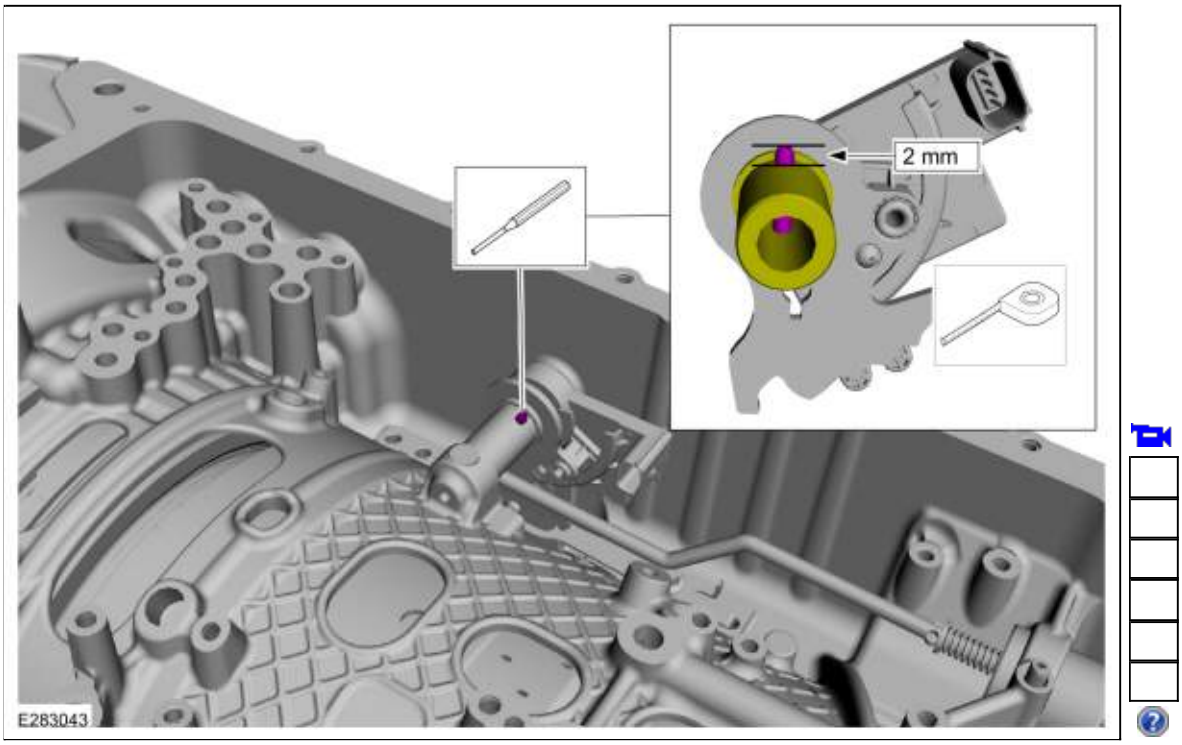
1.
Install the TR sensor (7H557).
1. Position the park pawl actuator rod into the park pawl sleeve.
2. Connect the park pawl actuator rod to the TR sensor.
3. Rotate the TR sensor.
4. Align the TR sensor to the detent spring.



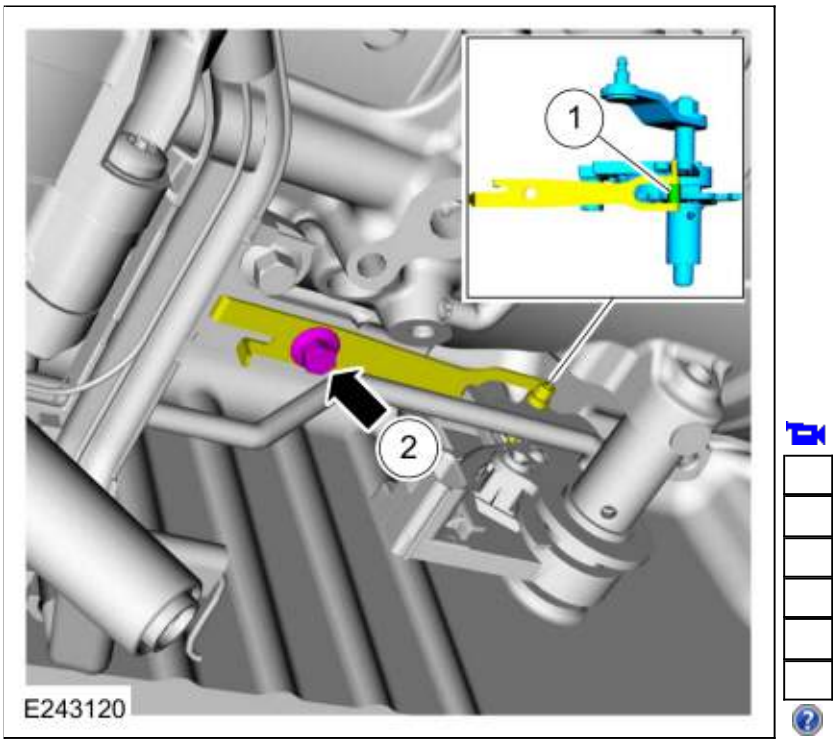
2.
1. Slide the manual shaft and selector lever into the TR sensor.
2. Align the TR sensor roll pin hole.



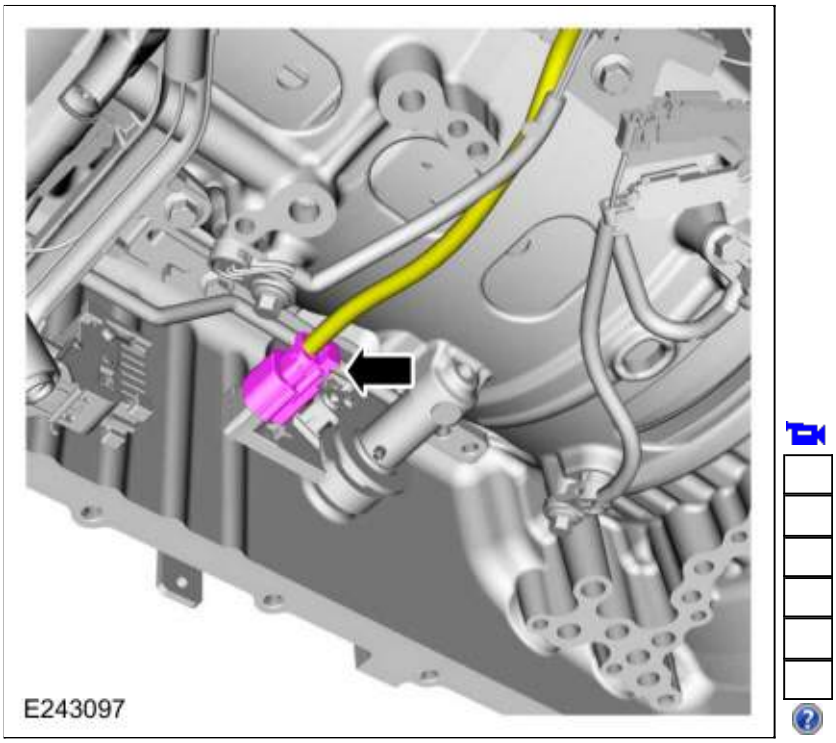
3. Install the new manual shaft-to-TR sensor roll pin to the specified height.
   Use the General Equipment: Punch



4.
   1. Align the detent spring in the center of the TR sensor.
   2. *Torque*: 97 lb.in (11 Nm)

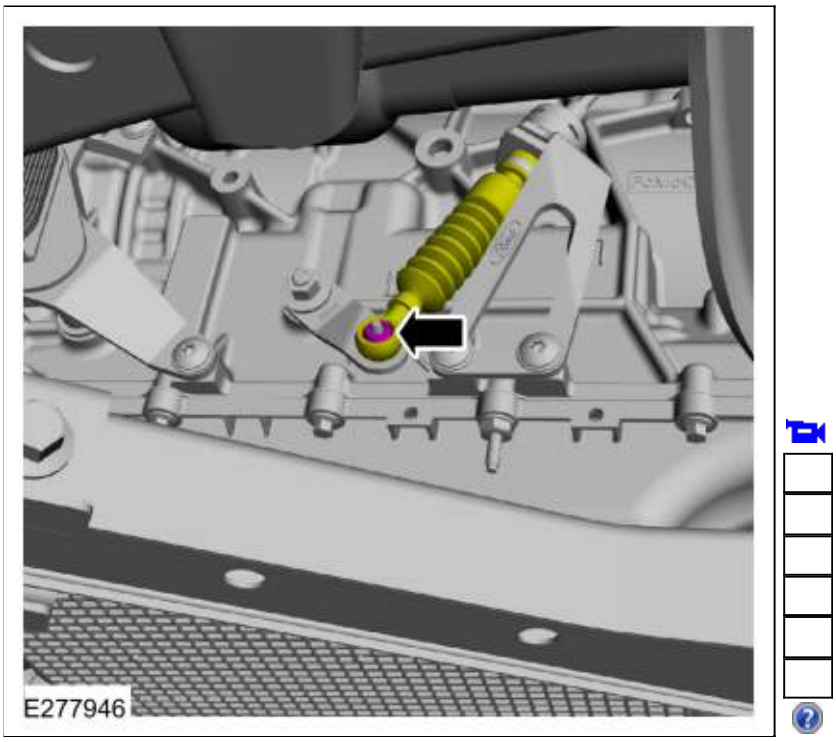


5. Connect the TR sensor electrical connector.



6. **NOTICE: Take extra care when handling selector lever cable.**

   Connect the selector lever cable to the manual control lever.



7. Install the main control valve body.
   Refer to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
   Refer to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

Transmission Support Insulator

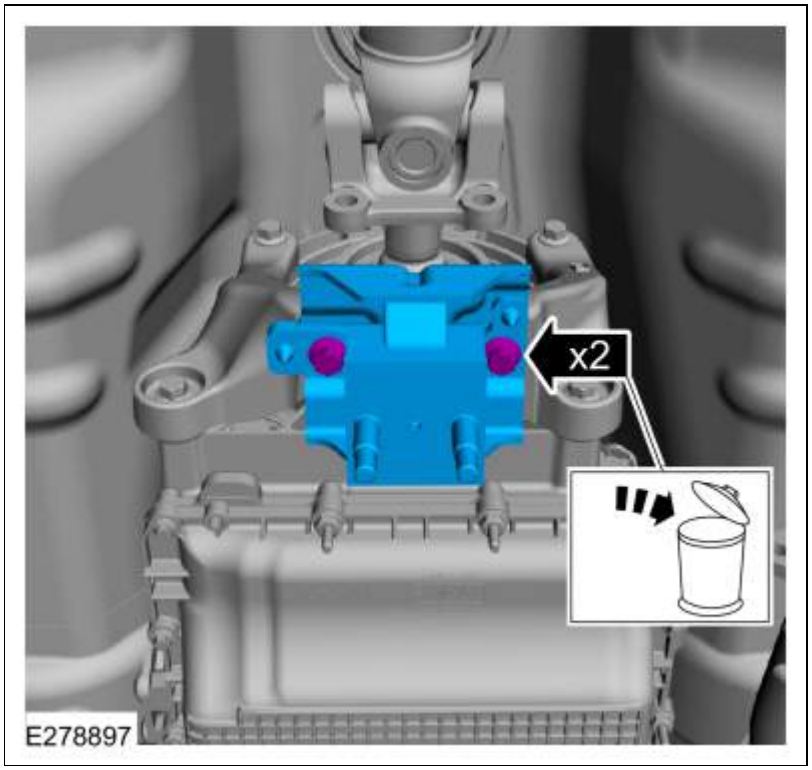
Base Part Number: 7M121

Removal

1. Remove the transmission support crossmember.
   Refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).
   Refer to: Transmission Support Crossmember - Raptor (502-02) .

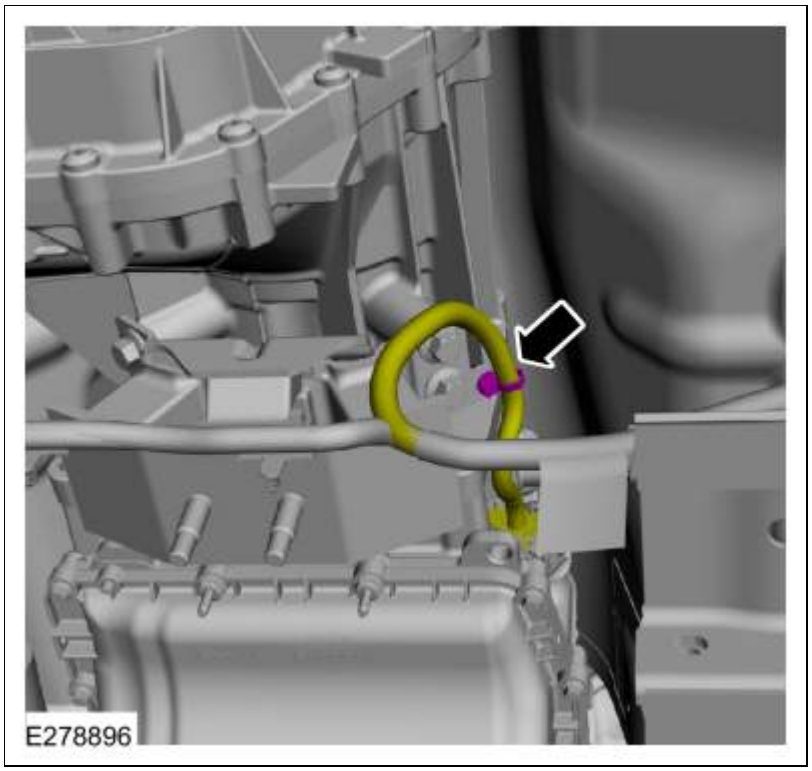
Rear Wheel Drive (RWD) vehicles

2. Remove and discard the bolts (W505276) and remove the transmission support insulator.

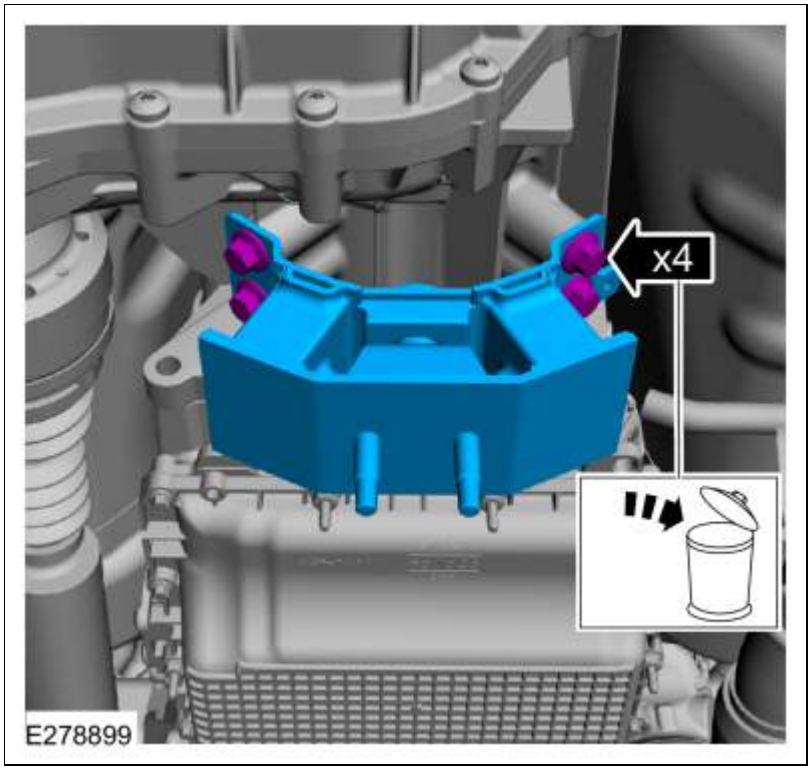


Four-Wheel Drive (4WD) vehicles

3. Disconnect the harness retainer.

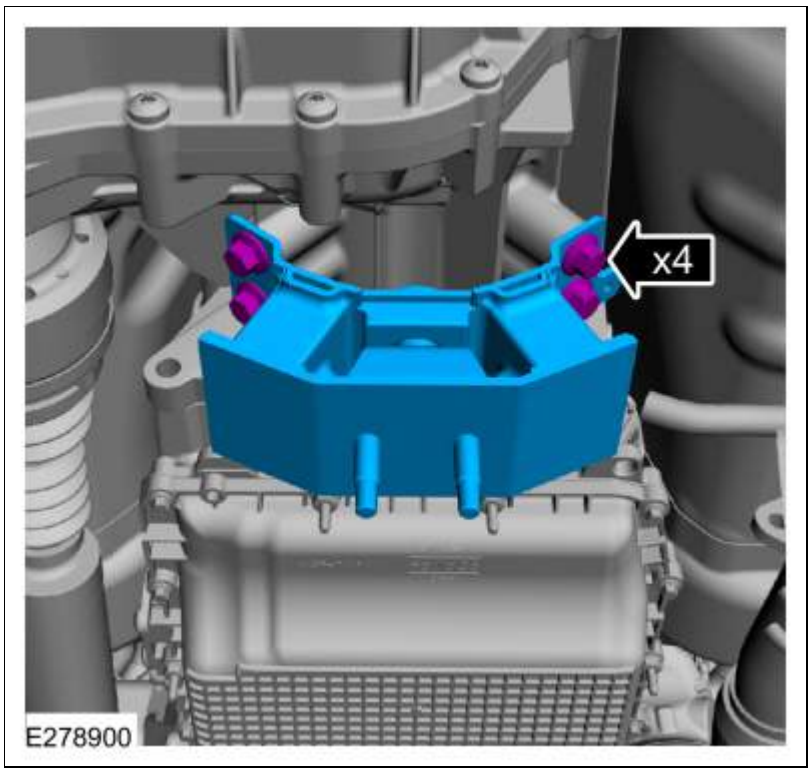


4. Remove and discard the bolts (W500642) and remove the transmission support insulator.

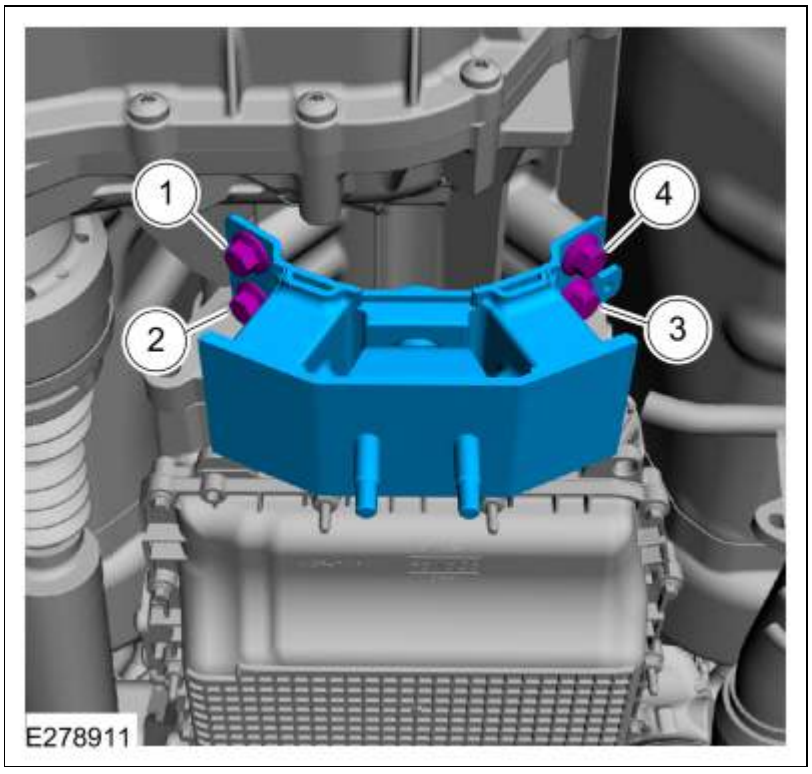


Installation

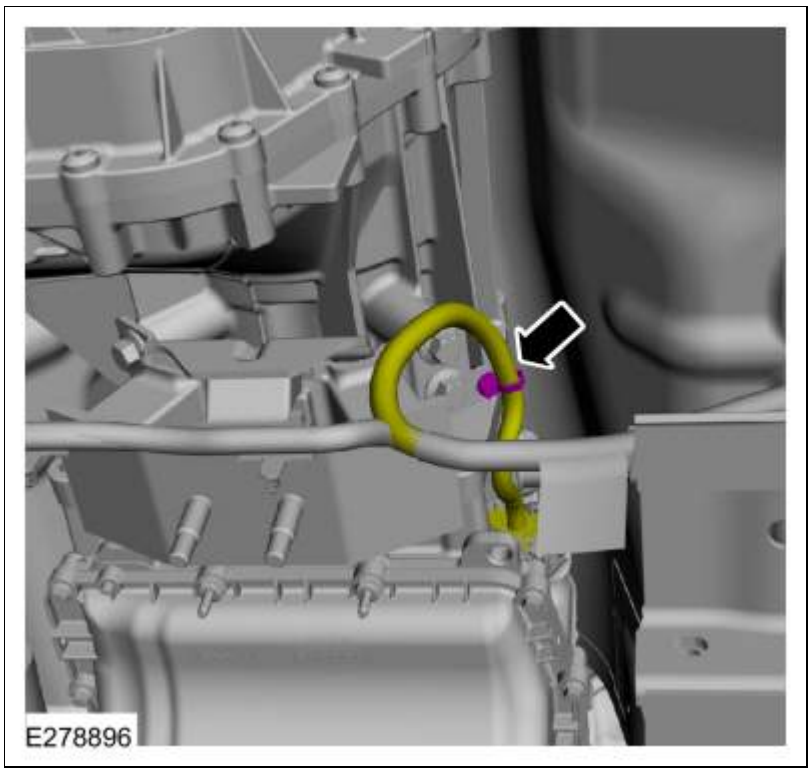
1. Loosely install the new transmission support insulator bolts.



2. Tighten the transmission support insulator bolts in the sequence shown.
Torque: 66 lb.ft (90 Nm)

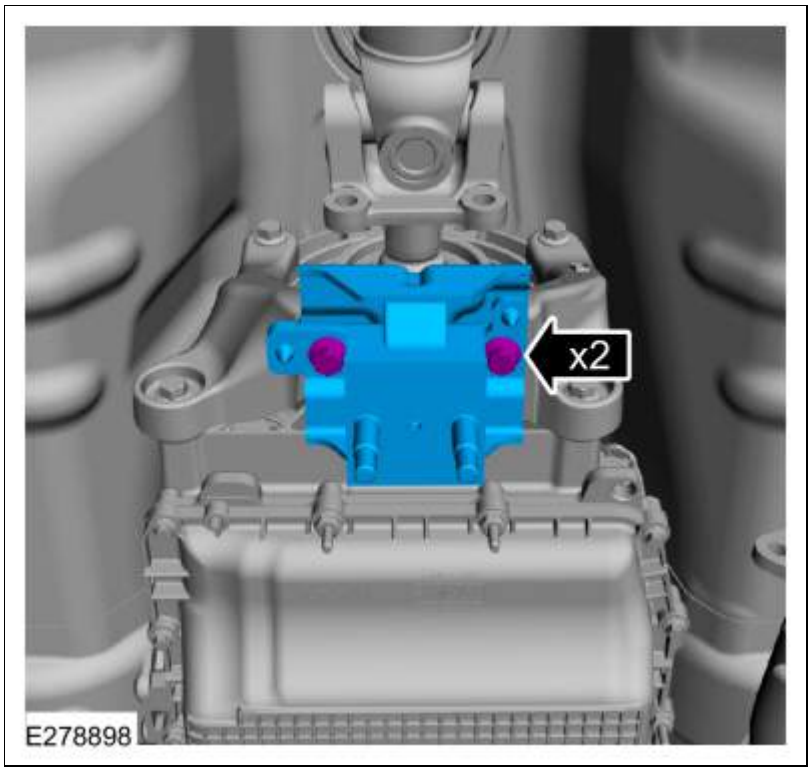


3. Connect the harness retainer.



Rear Wheel Drive (RWD) vehicles

4. Install the transmission support insulator and the new bolts.
   Torque: 41 lb.ft (55 Nm)



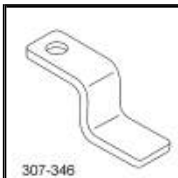
All vehicles

5. Install the transmission support crossmember.
   Refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).
   Refer to: Transmission Support Crossmember - Raptor (502-02) .

Transmission

Base Part Number: 7000

Special Tool(s) / General Equipment

 307-346	307-346 (T97T-7902-A) Retainer, Torque Converter TKIT-1998-LM (NavigatoR) TKIT-1997-F/FLM/LT
Magnetic Socket	
Transmission Jack	
Retaining Strap	

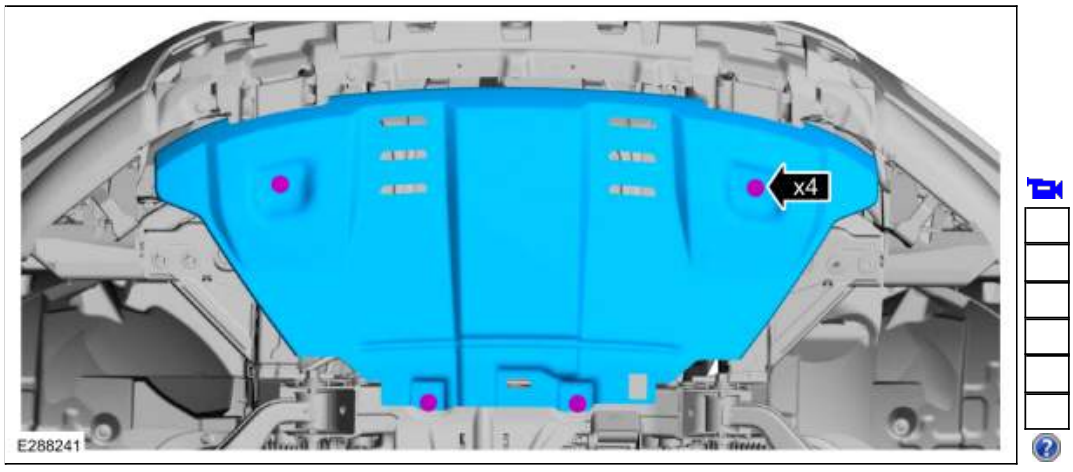
Materials

Name	Specification
Motorcraft® Multi-Purpose Grease Spray XL-5-A	ESB-M1C93-B
Motorcraft® MERCON® ULV Automatic Transmission Fluid XT-12-QULV	WSS-M2C949-A MERCON® ULV

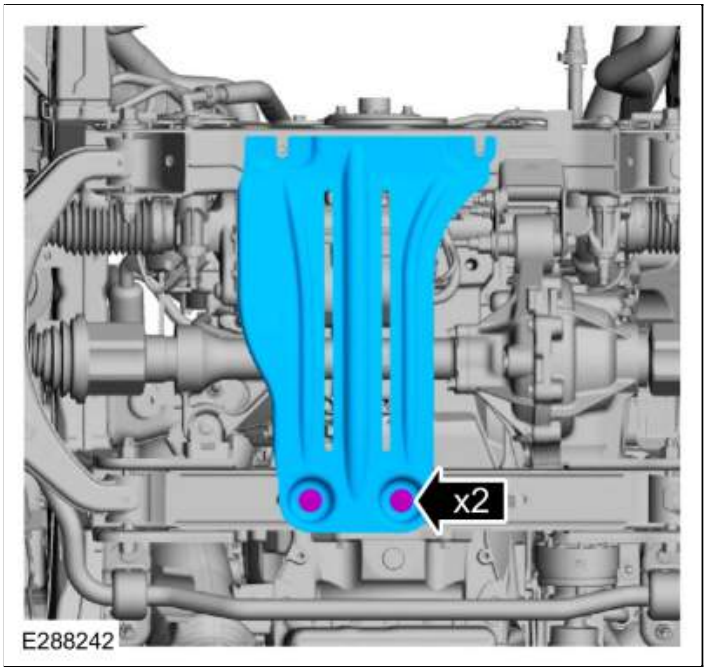
Removal

1. With the vehicle in NEUTRAL, position it on a hoist.
   Refer to: Jacking and Lifting (100-02 Jacking and Lifting, Description and Operation).

2. Remove the bolts and the skid plate.

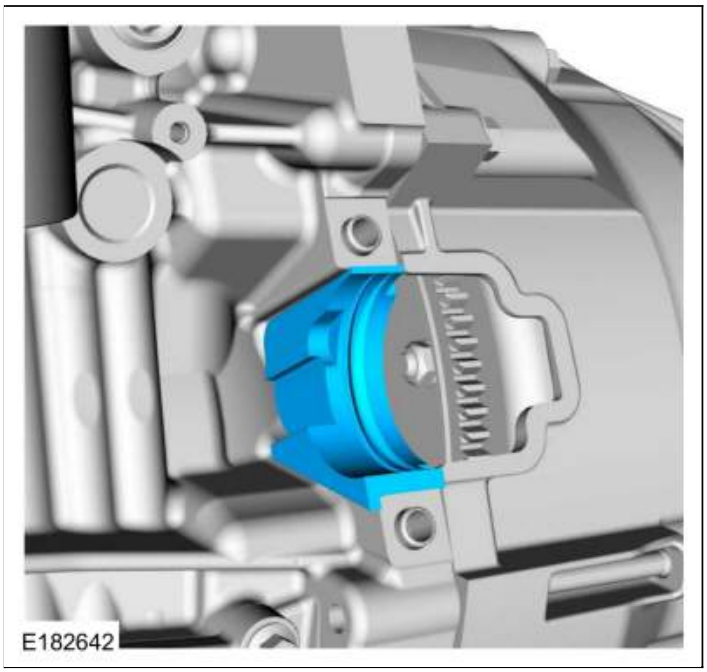


3. Remove the bolts and the rear skid plate.



4. Remove the starter motor assembly.
   Refer to: Starter Motor (303-06 Starting System - 2.3L EcoBoost (201kW/273PS), Removal and Installation).

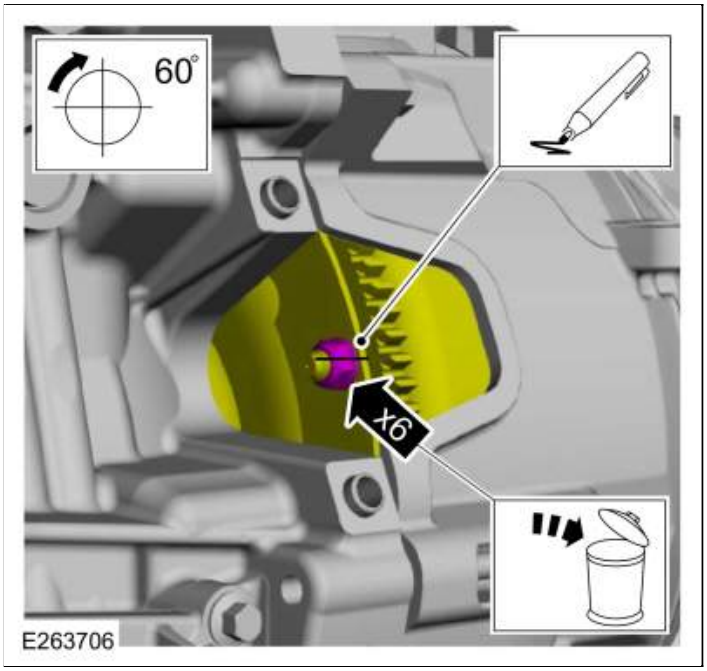
5. Remove the starter motor insulator.



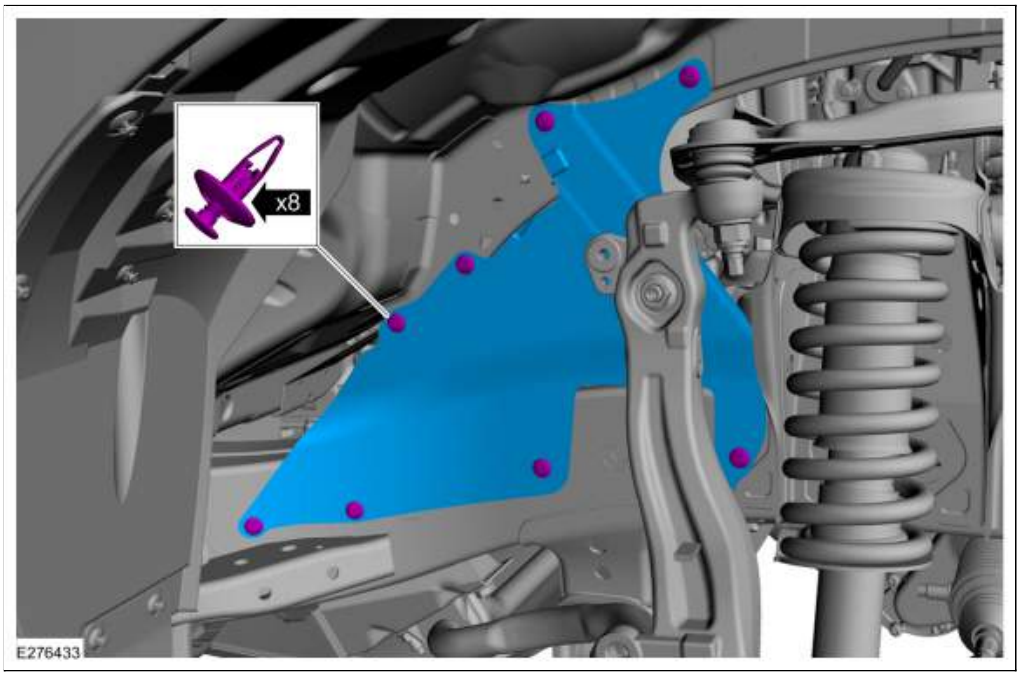
6. **NOTE:** *Only rotate the crankshaft in a clockwise direction.*

   NOTE: *Index mark one stud and the flexplate for assembly reference.*

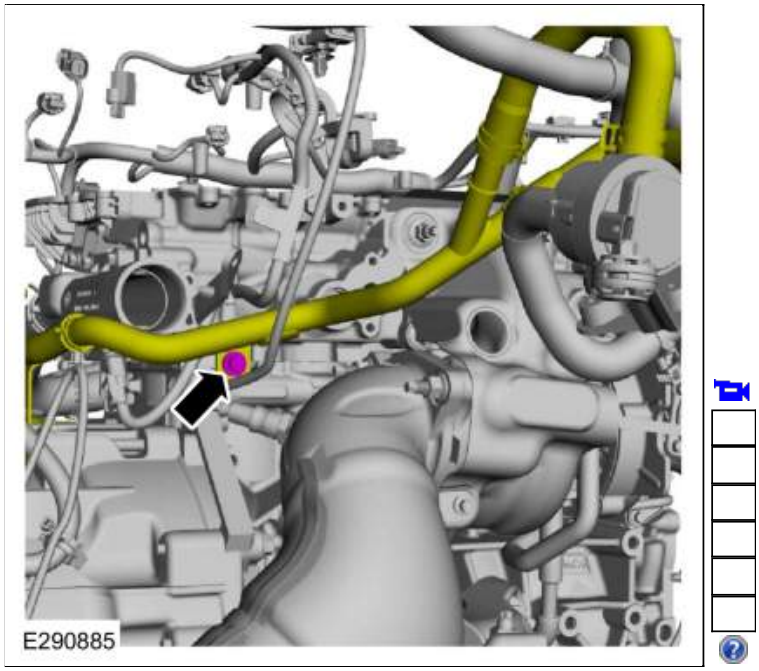
   Using a magnetic socket, remove and discard the torque converter nuts.
   Use the General Equipment: Magnetic Socket



7. Remove the retainers and the RH side splash shield.



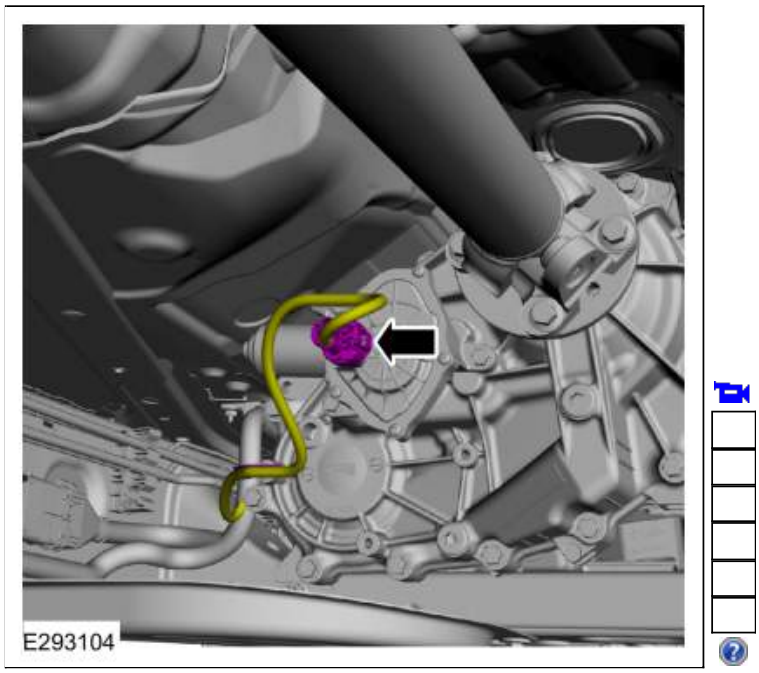
8. Remove the coolant tube bolt from the cylinder head.



Four-Wheel Drive (4WD) vehicles

9. Remove the front driveshaft assembly.
   Refer to: Front Driveshaft (205-01 Driveshaft, Removal and Installation).

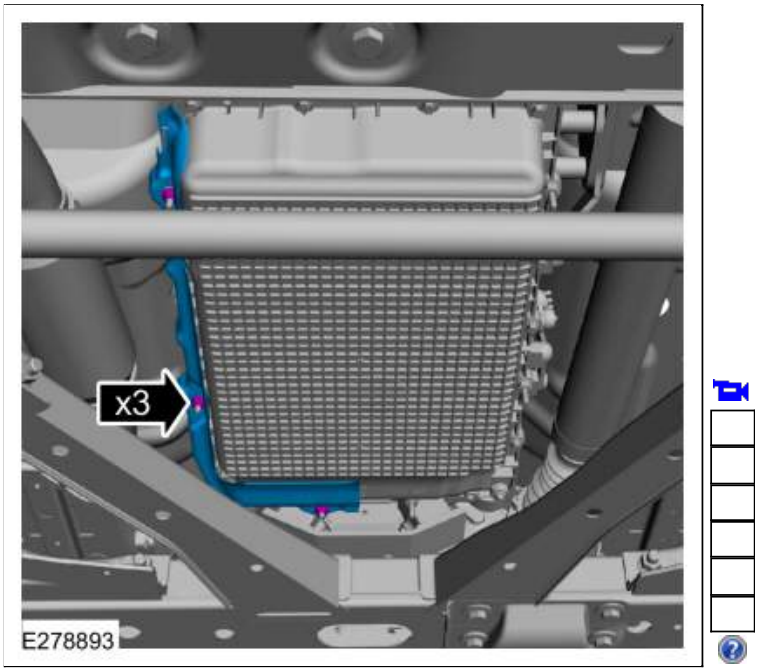
10. Disconnect the transfer case electrical connector.



All vehicles

11. Remove the rear driveshaft assembly.
    Refer to: Rear Driveshaft (205-01 Driveshaft, Removal and Installation).

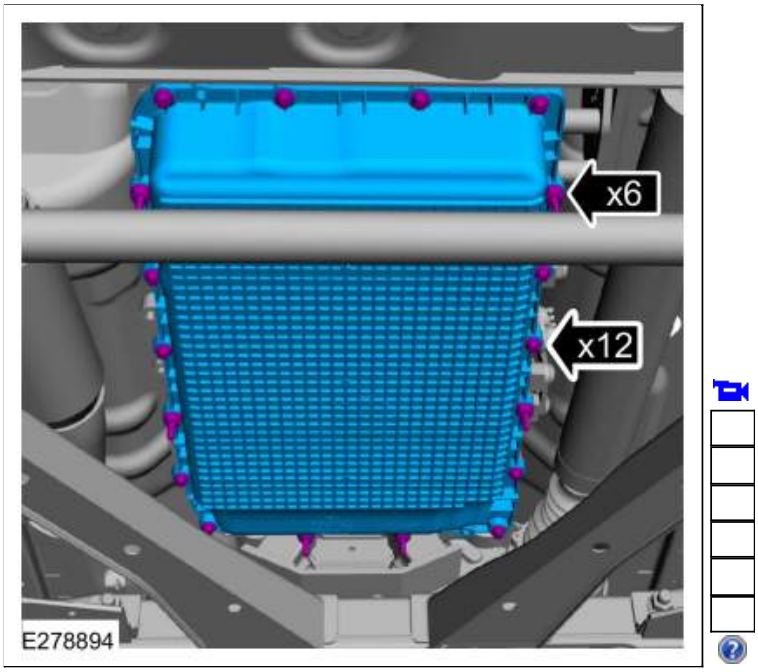
12. Remove the retainers and heatshield.



13. **NOTE:** *If transmission disassembly or installation of a new transmission is necessary, drain the transmission fluid.*

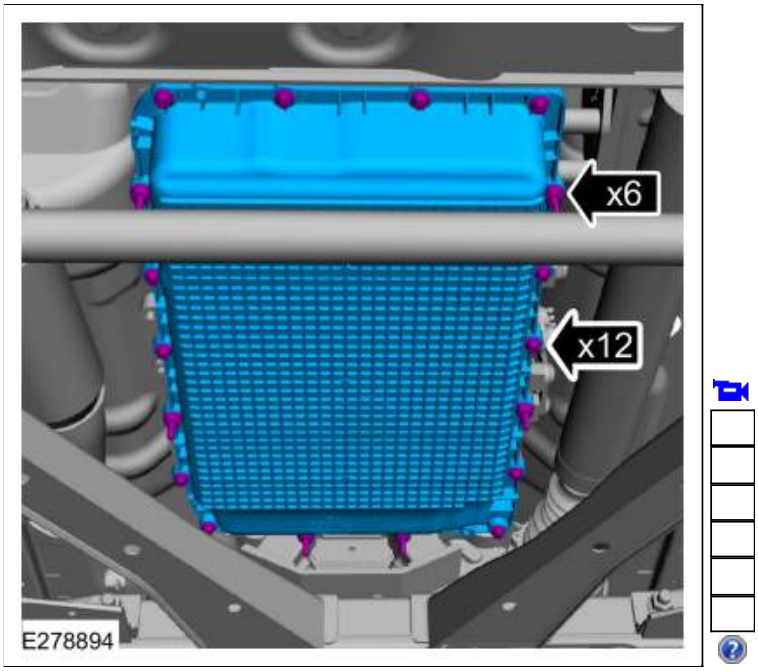
    NOTE: *Note the location of the bolts and studbolts for assembly.*

    Remove the bolts, studbolts and the transmission fluid pan.



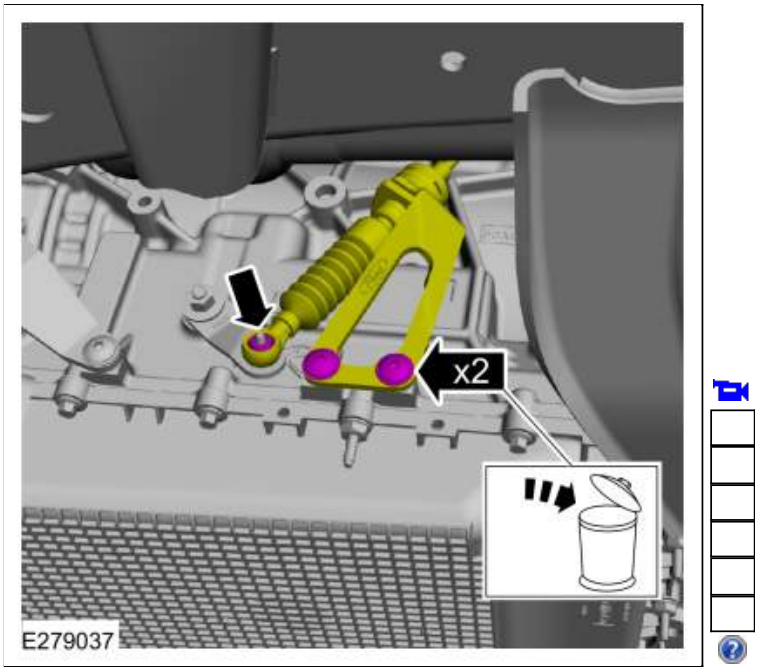
14. **NOTE:** *It is not necessary to torque transmission fluid pan bolts at this time.*

    Install the transmission fluid pan and the bolts.

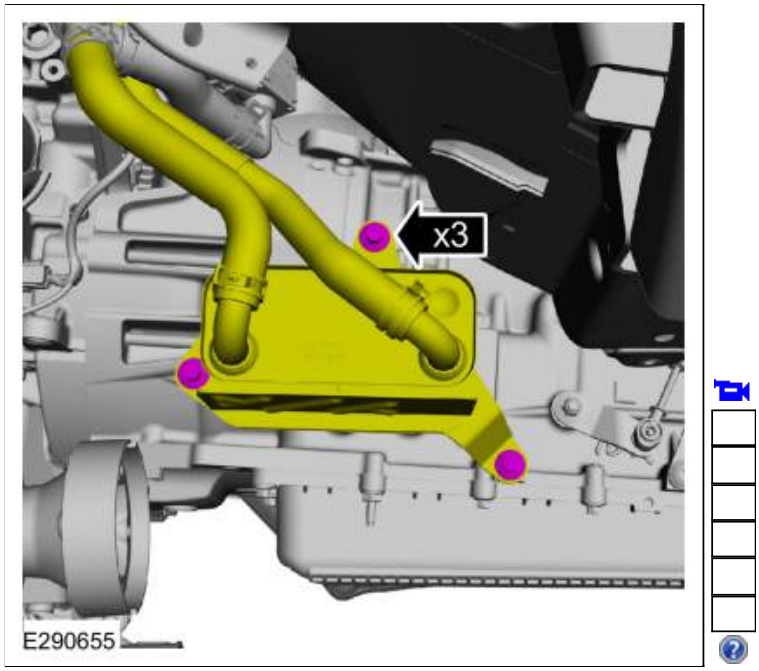


15. **NOTICE: Take extra care when handling selector lever cable.**

    Remove and discard the bolts, disconnect the selector lever cable and position aside.

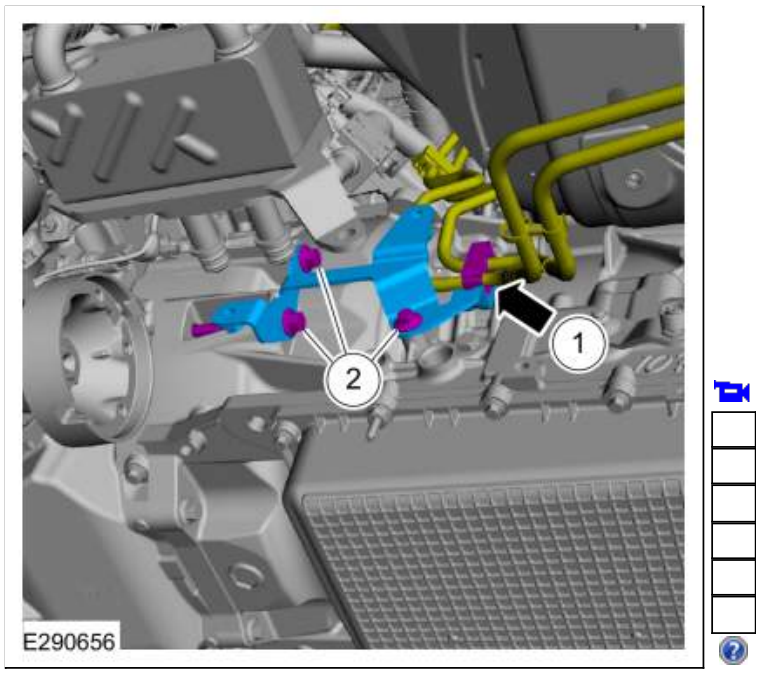


16. Remove the bolts and position aside the transmission fluid cooler.

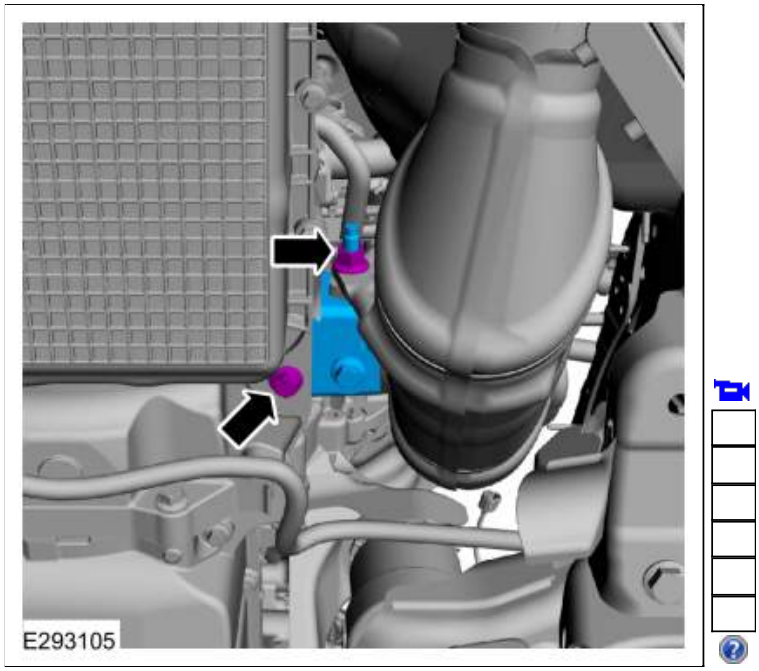


17.

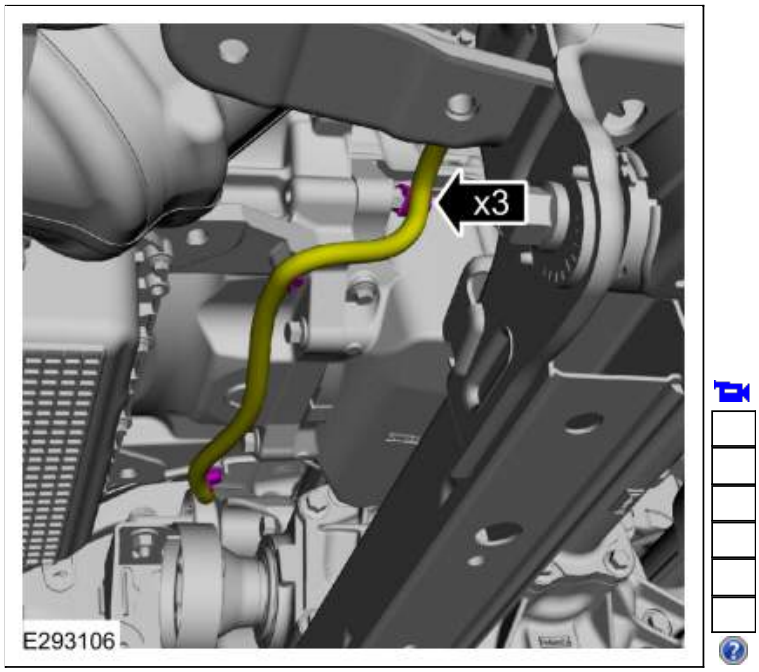
1. Disconnect the fuel line retainer.
2. Remove the bolts and the transmission fluid cooler bracket.



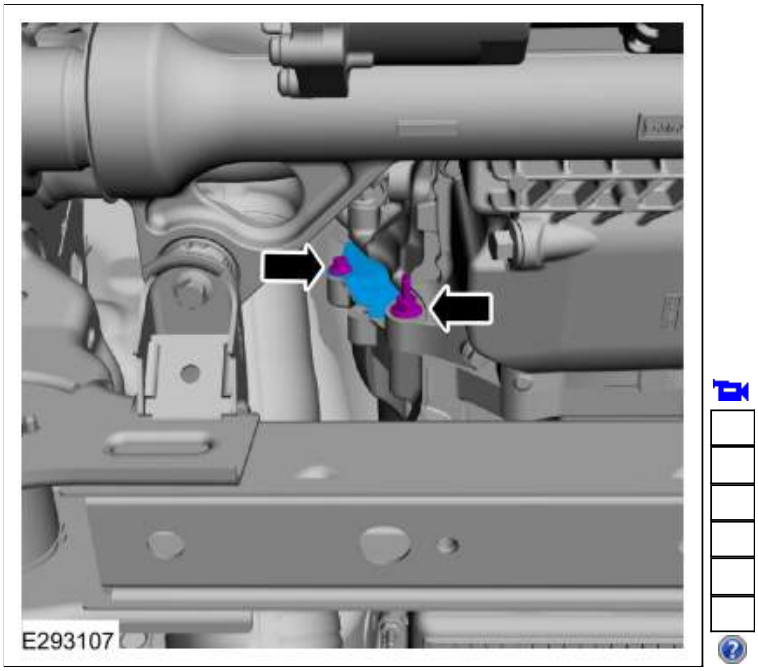
18. Remove the nut, bolt and the catalytic converter bracket.



19. If equipped , position aside the engine block heater cable.

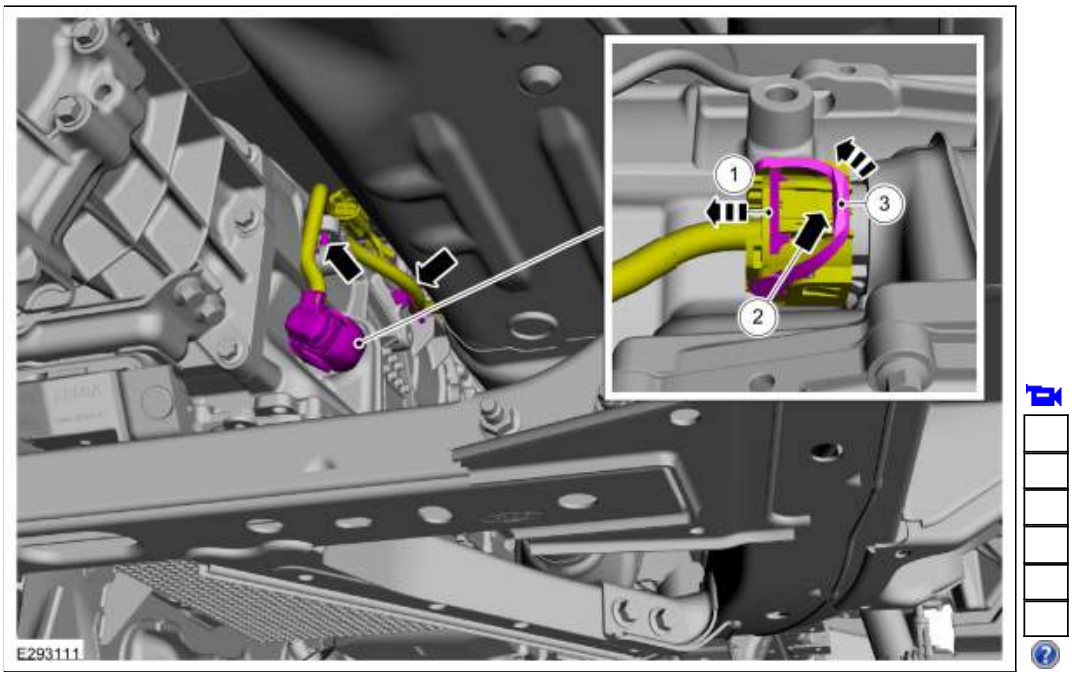


20. Remove the bolt, inspection shield and the oil pan bolt.



21. **NOTICE: Do not pull on the wire harness to disconnect the electrical connector or damage to the electrical connector will occur.**

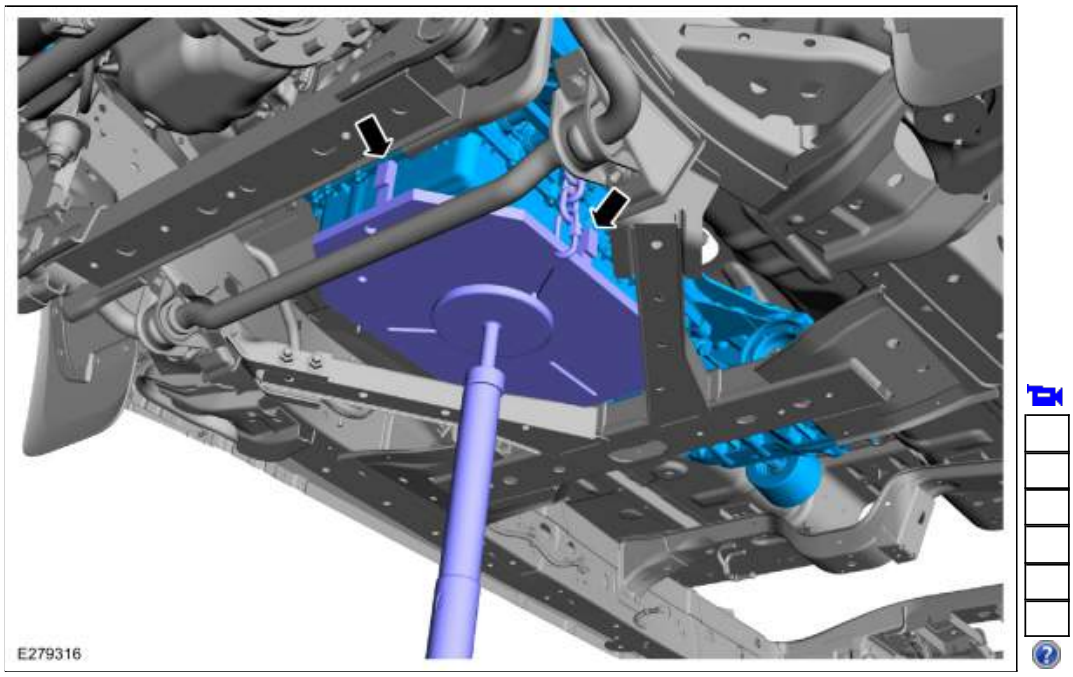
    1. Slide the safety lock out.
    2. Press the connector tab in.
    3. Rotate the locking arm up and disconnect the transmission electrical connector.
    - Disconnect the wire harness retainer.



22. **NOTICE: Secure the transmission to the transmission jack with a safety strap.**

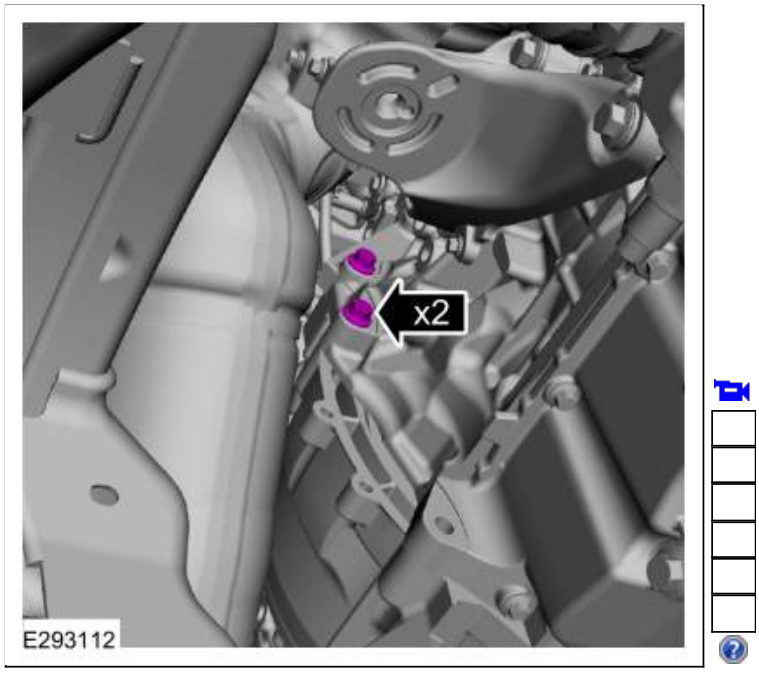
    NOTICE: Make sure the transmission jack makes contact on the outer ribs of the transmission fluid pan.

Using a high-lift transmission jack, support the transmission.
Use the General Equipment: Transmission Jack

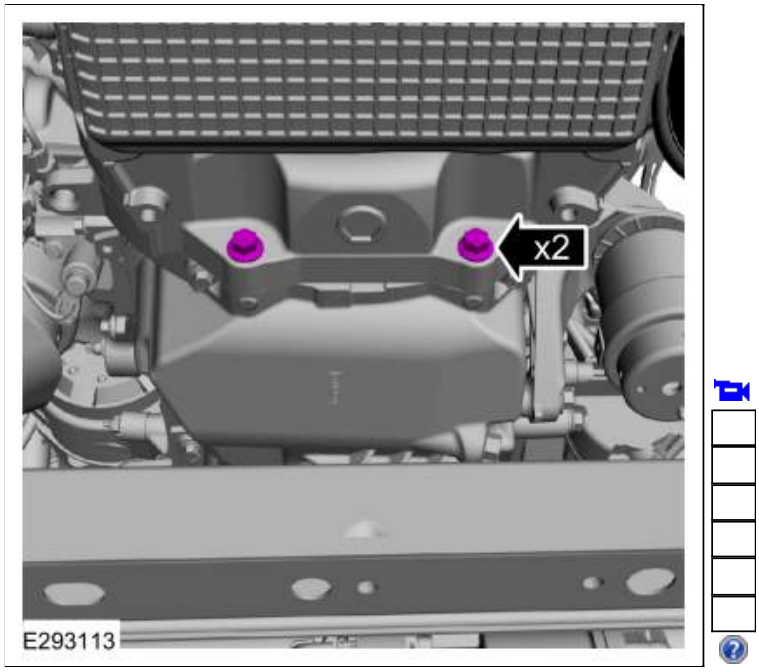


23. Remove the transmission support crossmember.
Refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

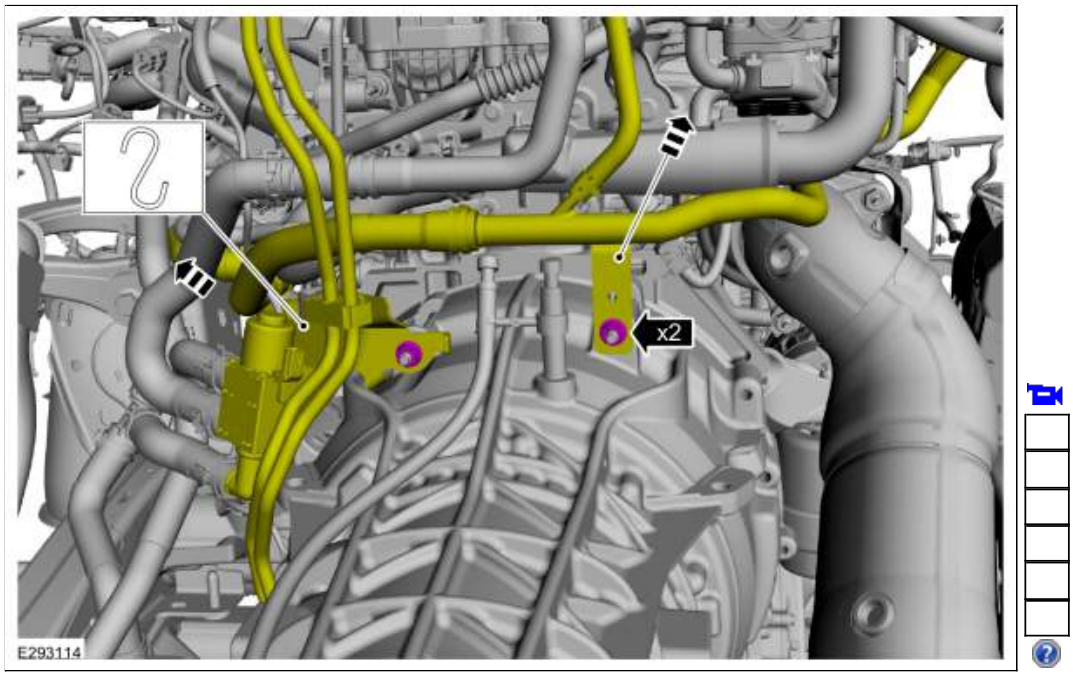
24. Remove the RH bellhousing bolts.



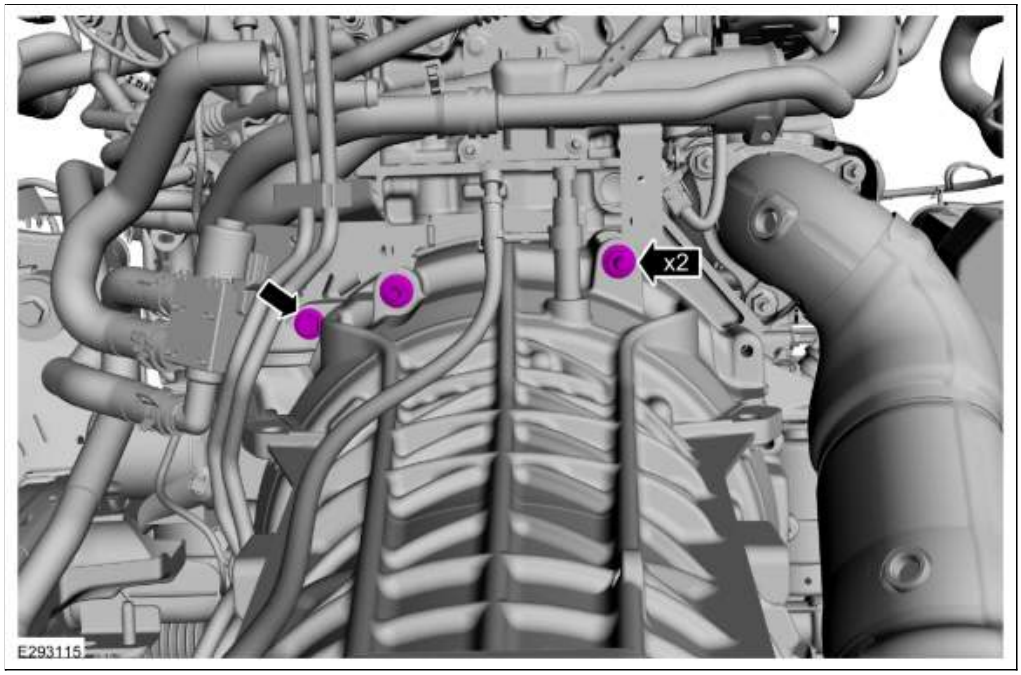
25. Remove the lower bellhousing bolts.



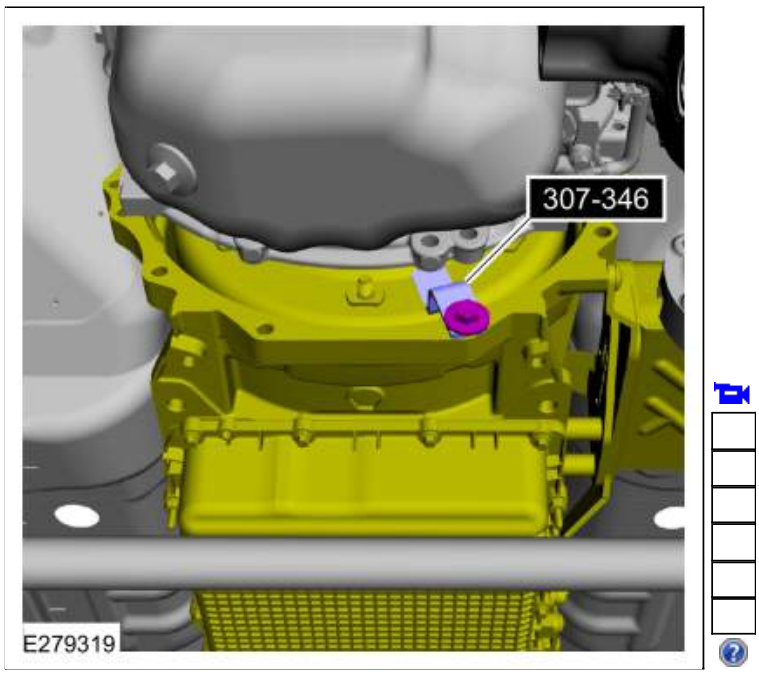
26. Remove the nuts and position aside the brackets.



27. Remove the upper bellhousing bolt and studbolts.



28. Slide the transmission back enough to install the special tool and remove the transmission from the vehicle.
Use Special Service Tool: 307-346 (T97T-7902-A) Retainer, Torque Converter.



Rear Wheel Drive (RWD) vehicles

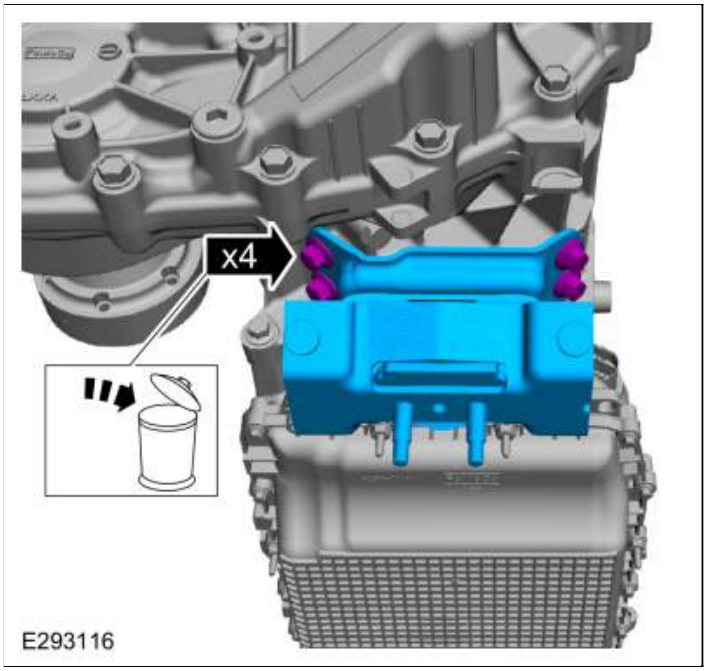
29. **NOTE:** *If installing a new or re-manufactured transmission, remove the transmission support bracket.*

If necessary, remove the bolts and the transmission support bracket.

Four-Wheel Drive (4WD) vehicles

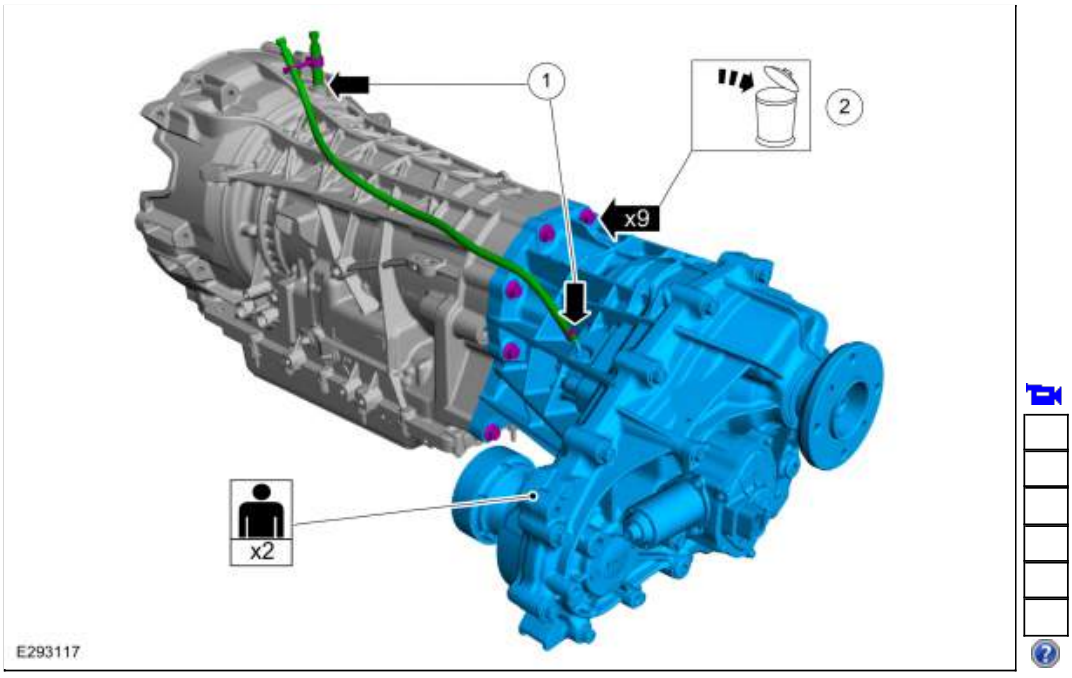
30. **NOTE:** *If installing a new or re-manufactured transmission, remove the transmission support insulator.*

    If necessary, remove and discard the bolts and remove the transmission support insulator.



31. **NOTE:** *If the transmission is to be overhauled or if installing a new or re-manufactured transmission, remove the transfer case.*

    1. Remove the vent tubes.
    2. If necessary, remove and discard the bolts and separate the transfer case from the transmission.



All vehicles

32. **NOTICE: Failure to clean the transmission fluid cooler tubes can result in transmission failure.**

    If the transmission is to be overhauled or if installing a new or re-manufactured transmission, carry out the transmission fluid cooler backflushing and cleaning procedure.

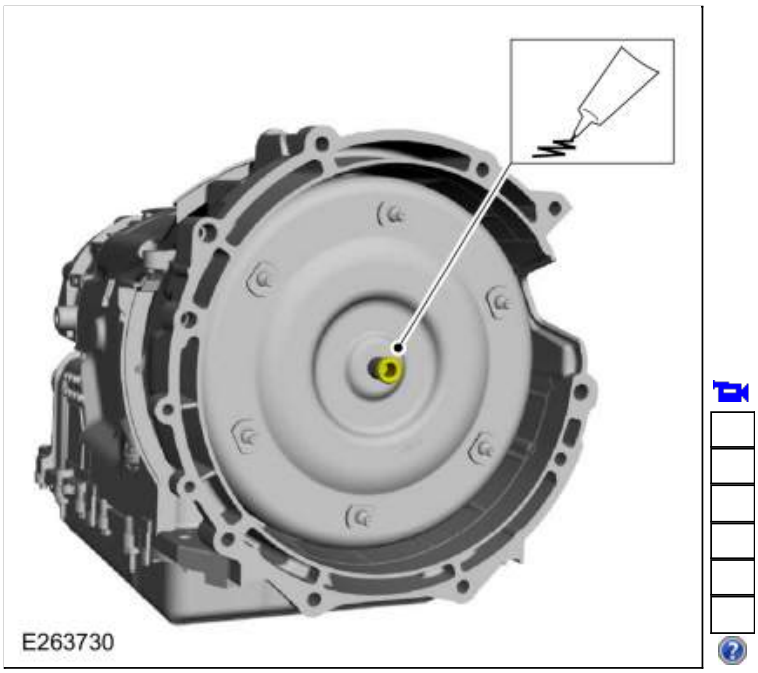
Refer to: Transmission Fluid Cooler - Backflushing and Cleaning (307-02 Transmission Cooling - 10-Speed Automatic Transmission - 10R80, General Procedures).

Installation

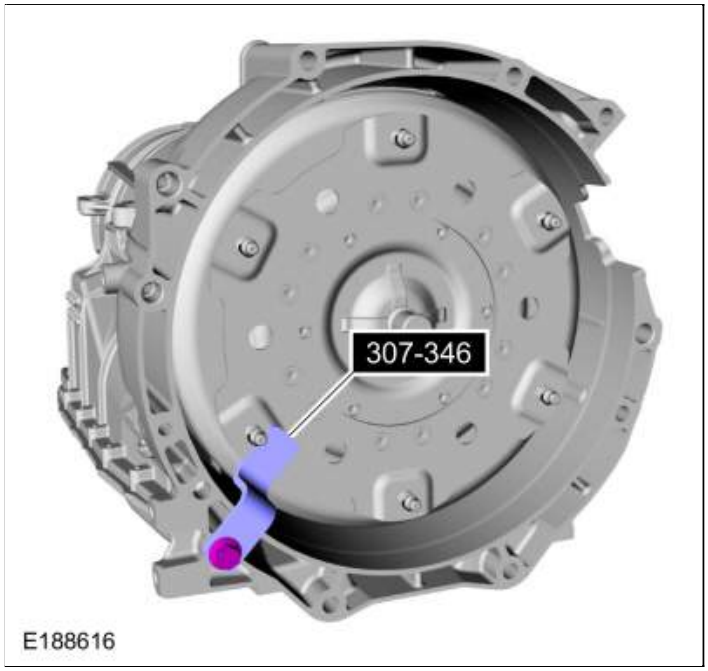
NOTE: *Prior to installing a new transmission or an overhauled transmission with a new main control, record the solenoid strategy identification tag. If a new main control was installed, install the replacement solenoid body tag over the original identification tag.*

1. **NOTICE: Prior to installation of the transmission, lubricate the torque converter pilot hub or damage to the torque converter or the engine crankshaft can occur.**

   Lubricate the torque converter pilot hub with multi-purpose grease.
   Material: Motorcraft® Multi-Purpose Grease Spray / XL-5-A (ESB-M1C93-B)



2. Install the special tool.
   Use Special Service Tool: 307-346 (T97T-7902-A) Retainer, Torque Converter.

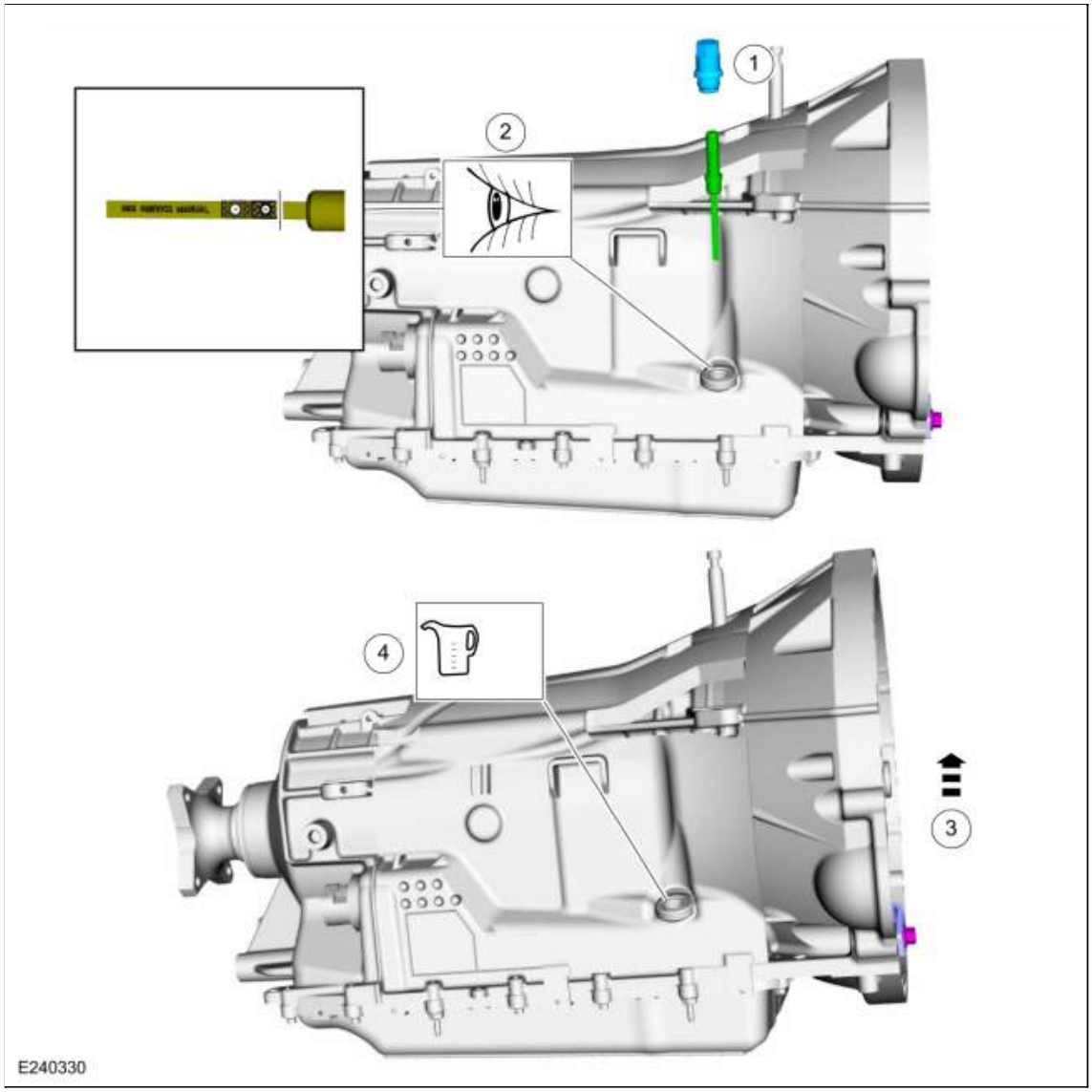


3. **NOTE:** *If transmission is being replaced, remove the transmission fluid fill plug and verify that the transmission is filled with transmission fluid.*

   NOTE: *If transmission was disassembled, add transmission fluid to the transmission.*

   NOTE: *Rear Wheel Drive (RWD) shown, Four-Wheel Drive (4WD) similar.*

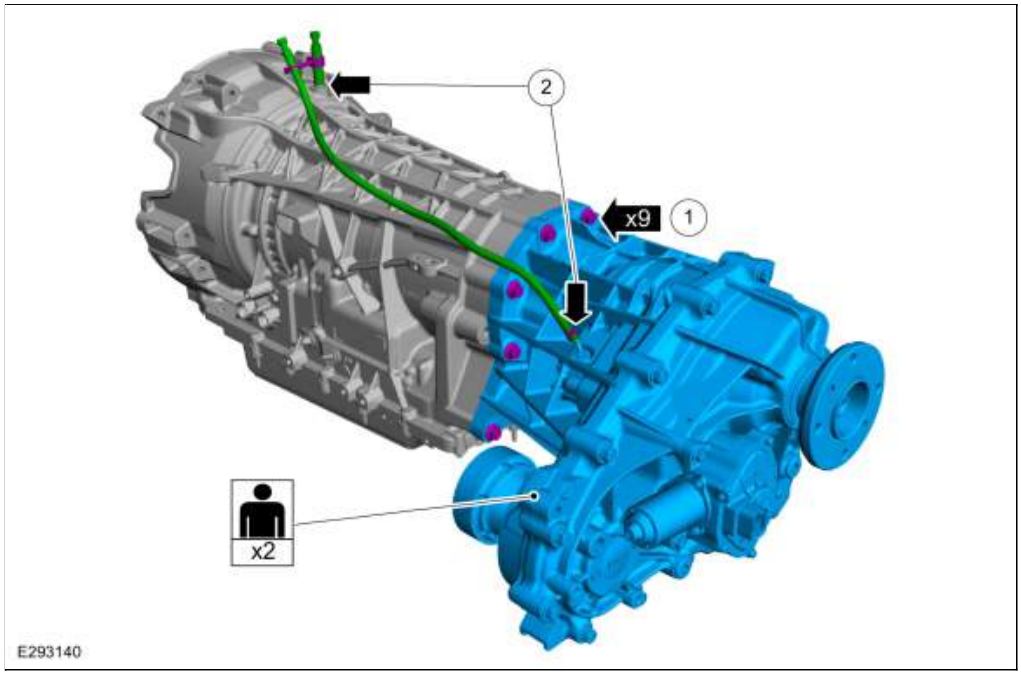
   1. Remove the transmission fluid fill plug transmission fluid level indicator assembly.
   2. Verify transmission is filled with transmission fluid.
   3. Slightly tilt the transmission rearward.
   4. If the transmission was disassembled, add 11.8 L (12.5 qt) of transmission fluid to the transmission through the transmission fluid fill hole.
      Material: Motorcraft® MERCON® ULV Automatic Transmission Fluid / XT-12-QULV (WSS-M2C949-A) (MERCON® ULV)
   - Loosely install the transmission fluid fill plug when finished.



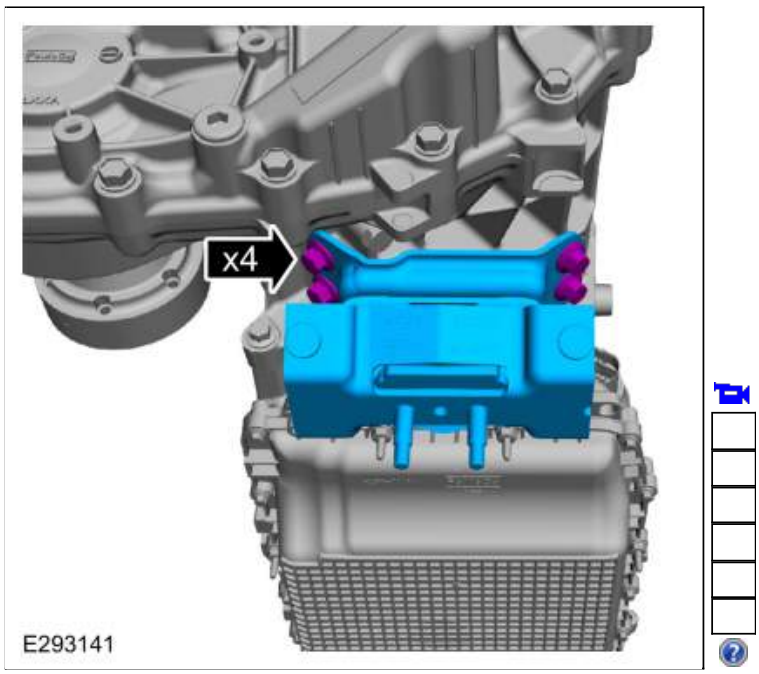
Four-Wheel Drive (4WD) vehicles

4.

1. If removed, install the transfer case and the new bolts evenly in a star pattern..
   Torque: 35 lb.ft (48 Nm)
2. Install the vent tubes.



5. Install the transmission support insulator and the new bolts.
Torque: 41 lb.ft (55 Nm)



Rear Wheel Drive (RWD) vehicles

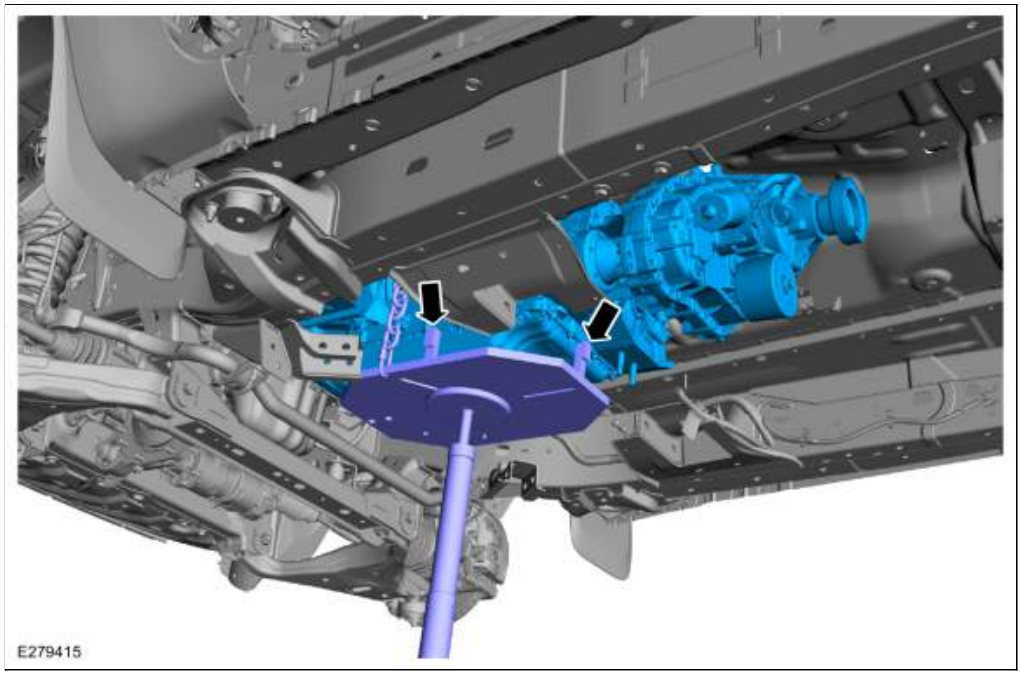
6. If removed, install the transmission support bracket and the bolts.
Torque: 52 lb.ft (70 Nm)

All vehicles

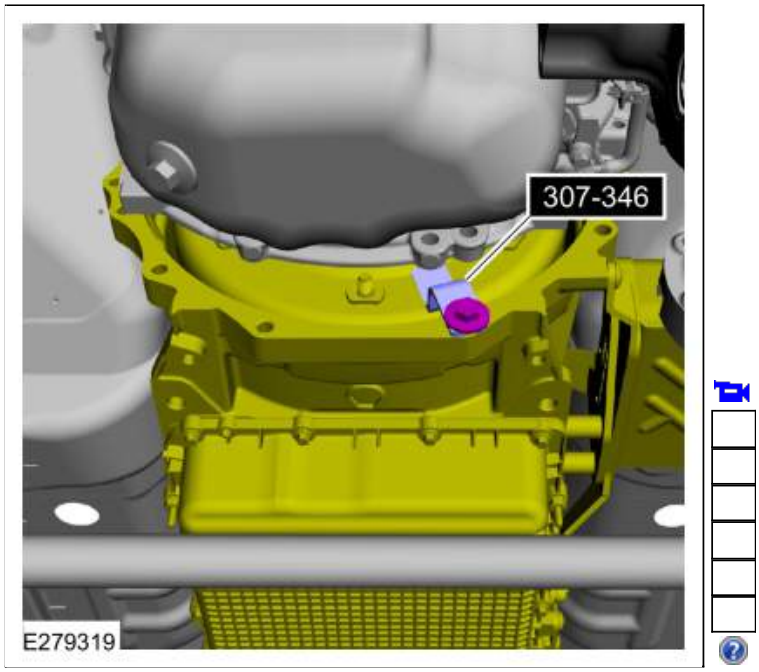
7. **NOTICE: Secure the transmission to the transmission jack with a safety strap.**

   NOTICE: Make sure the transmission jack makes contact on the outer ribs of the transmission fluid pan.

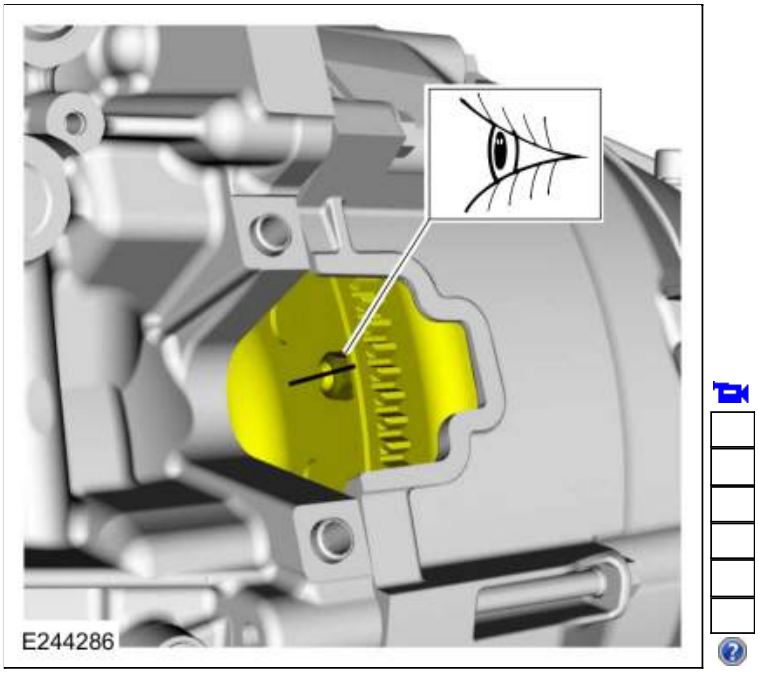
   Using a high-lift transmission jack, position the transmission in the vehicle.
   Use the General Equipment: Transmission Jack
   Use the General Equipment: Retaining Strap



8. Remove the special tool.
   Use Special Service Tool: 307-346 (T97T-7902-A) Retainer, Torque Converter.



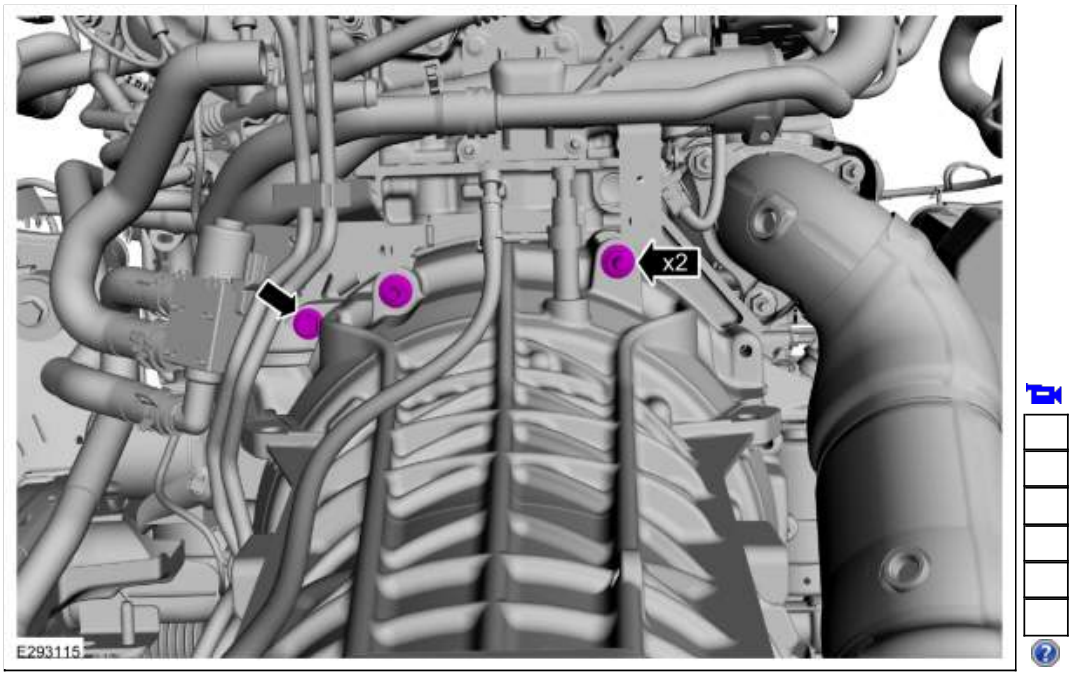
9. Align the index-mark made during removal.



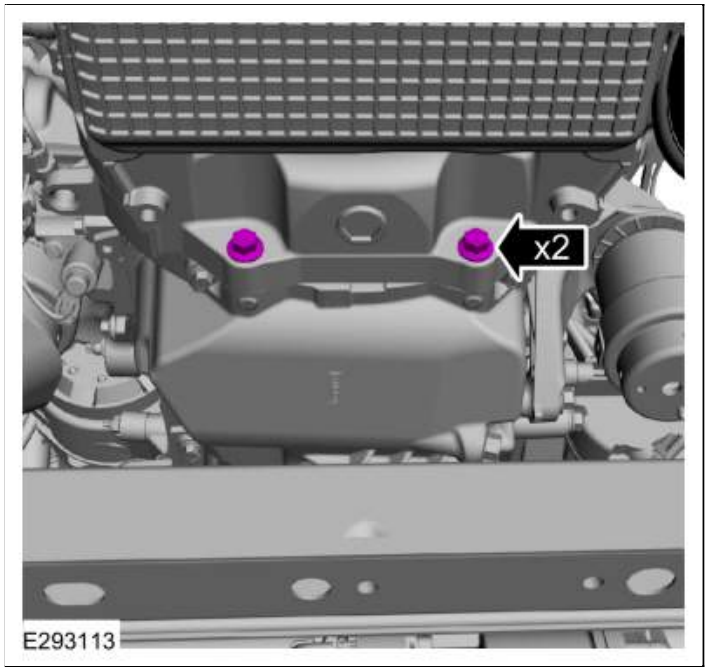
10. **NOTE:** *Make sure the torque converter is fully seated in the transmission before aligning the transmission to the engine.*

    NOTE: *With the transmission in a horizontal position, move it toward the engine and position it on the dowel pins.*

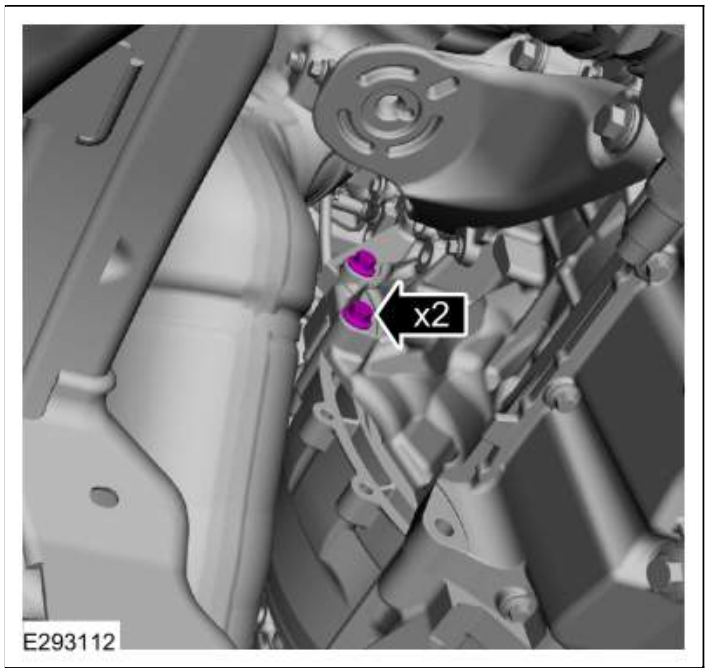
    Install the upper bellhousing bolts.
    Torque: 35 lb.ft (48 Nm)



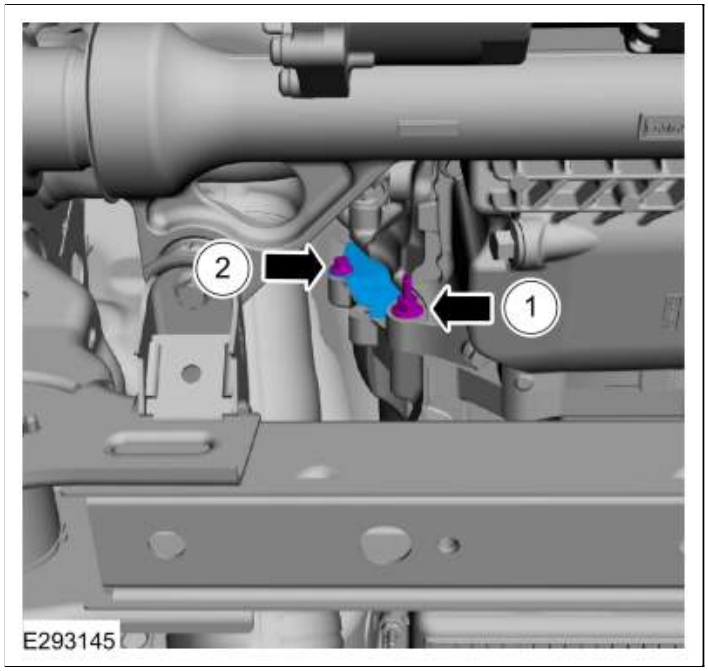
11. Install the lower bellhousing bolts.
    Torque: 35 lb.ft (48 Nm)



12. Install the RH bellhousing bolts.
Torque: 35 lb.ft (48 Nm)



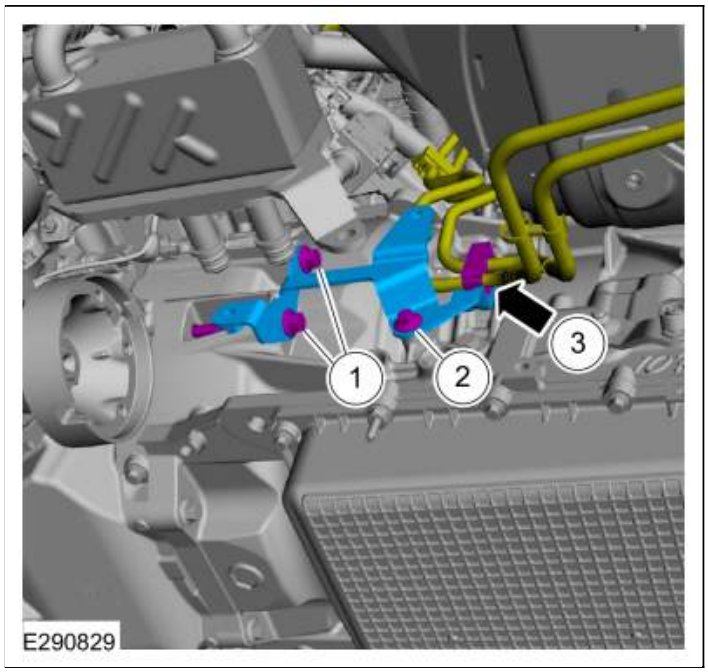
13.
1. Install the oil pan bolt.
Torque: 35 lb.ft (48 Nm)
2. Install the inspection shield and bolt.
Torque: 18 lb.ft (25 Nm)



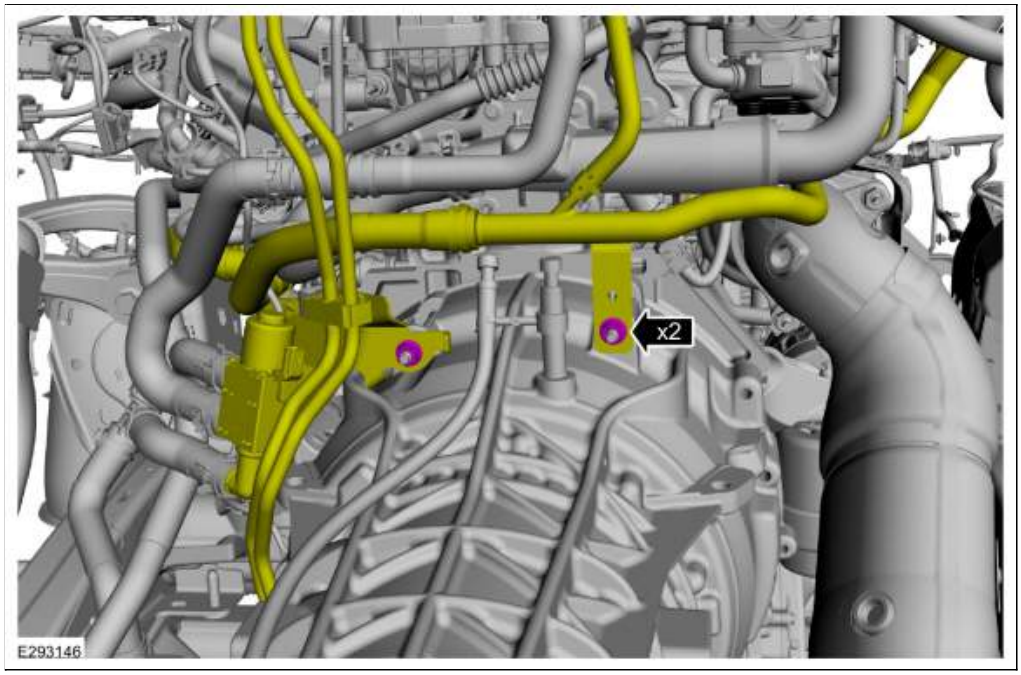
14.

Install the transmission fluid cooler bracket.

1. *Torque*: 35 lb.ft (48 Nm)
2. *Torque*: 177 lb.in (20 Nm)
3. Connect the fuel line retainer.



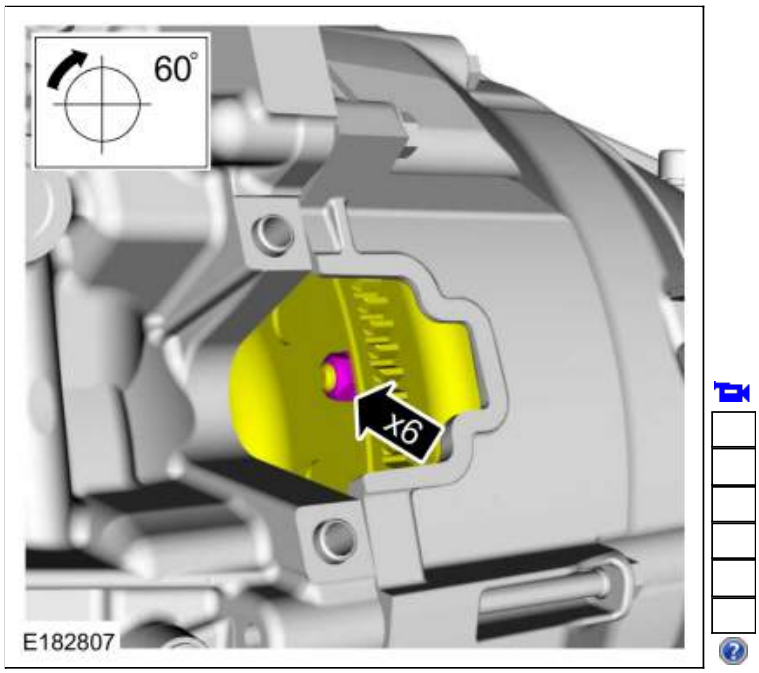
15. Install the upper bracket nuts.
Torque: 106 lb.in (12 Nm)



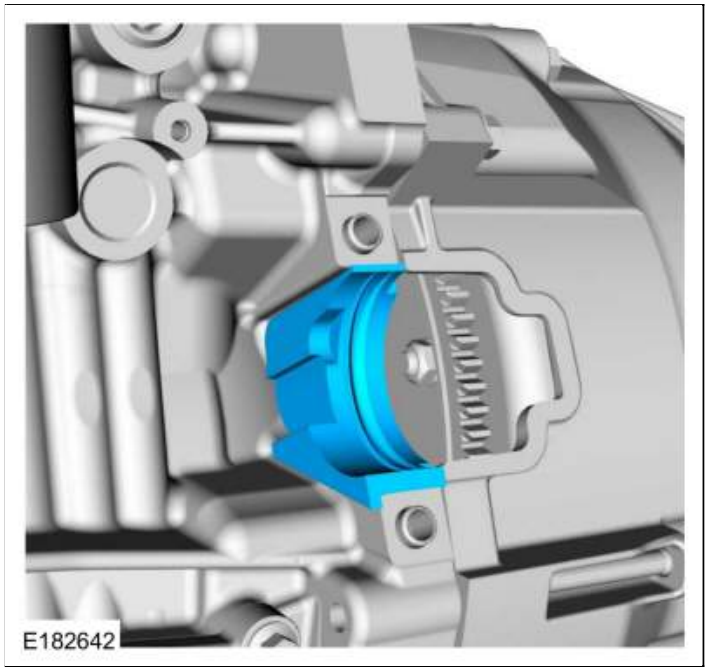
16. Install the transmission support crossmember.
Refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

17. **NOTE:** *Only rotate the crankshaft in a clockwise direction.*

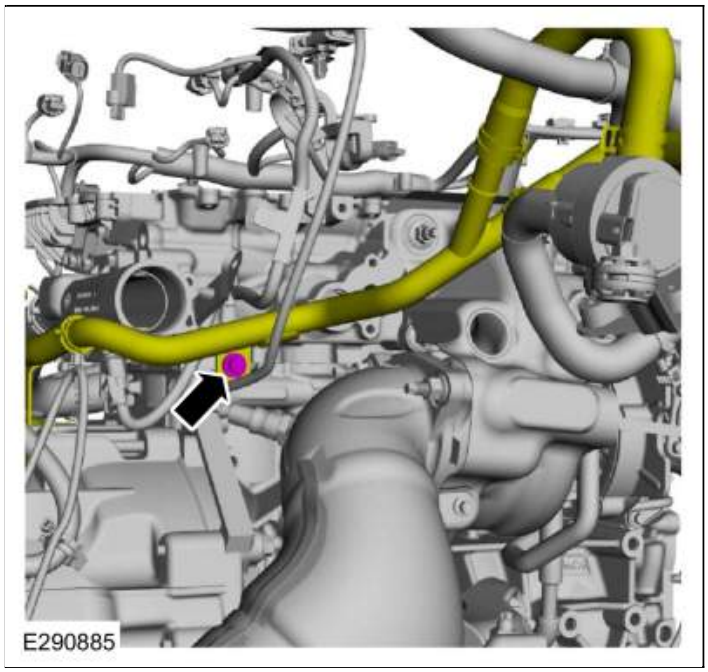
Using a magnetic socket , install the new torque converter nuts.
Use the General Equipment: Magnetic Socket
Torque: 35 lb.ft (48 Nm)



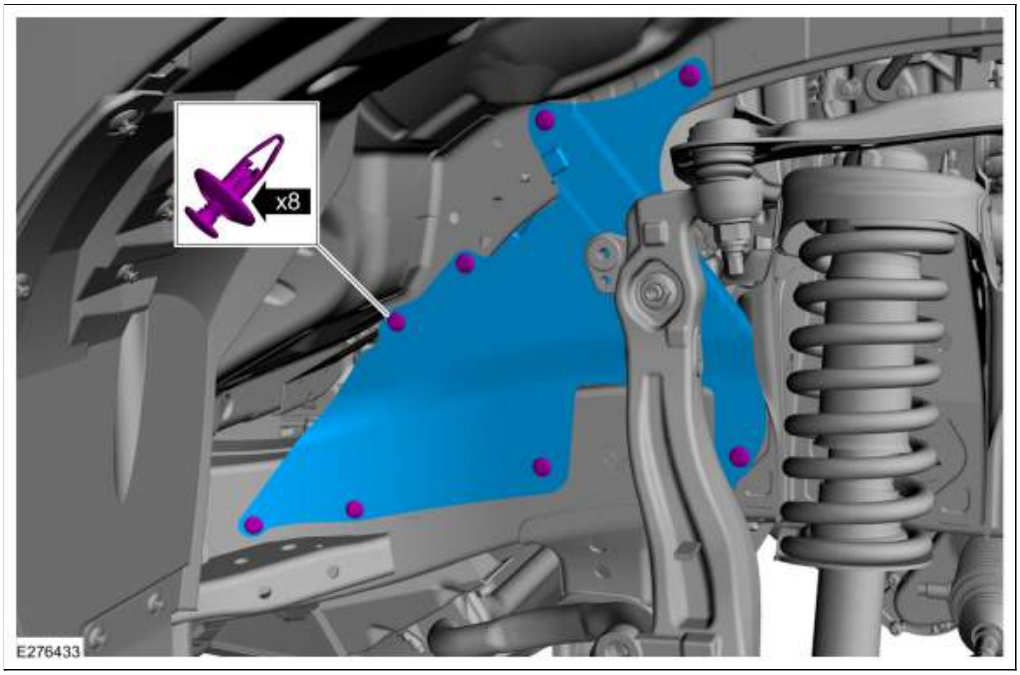
18. Install the starter motor insulator.



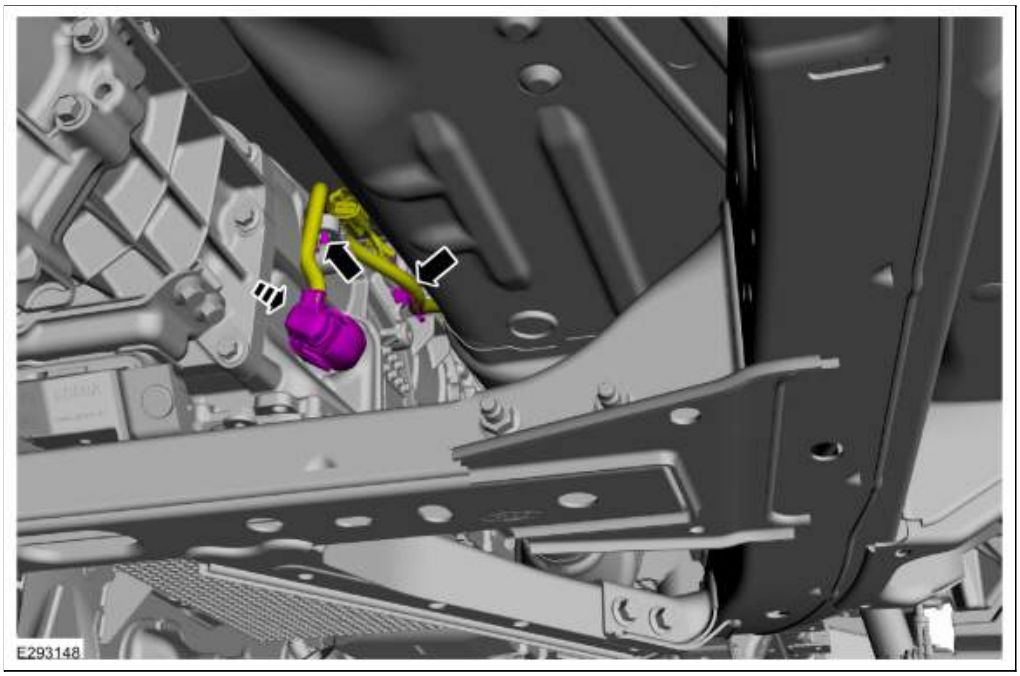
19. Install the coolant tube bolt.
Torque: 97 lb.in (11 Nm)



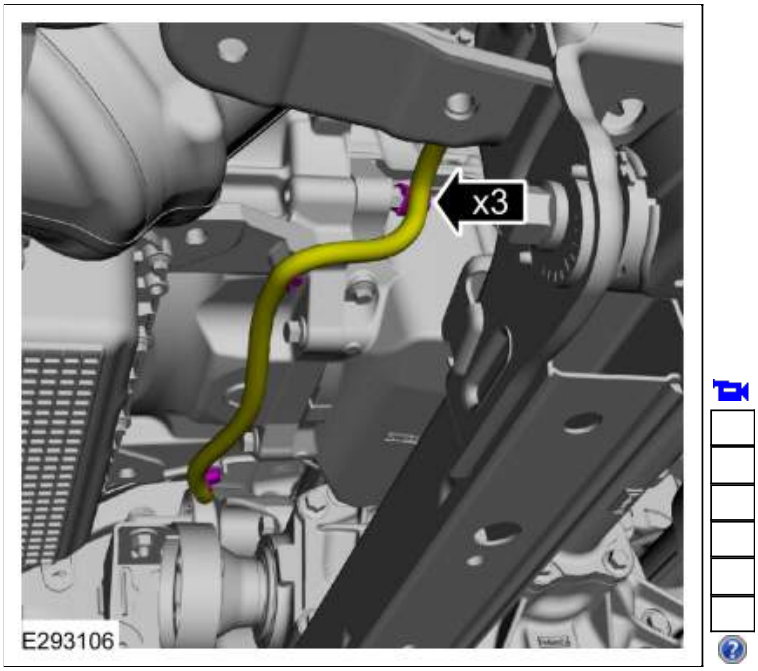
20. Install the RH side splash shield and retainers.



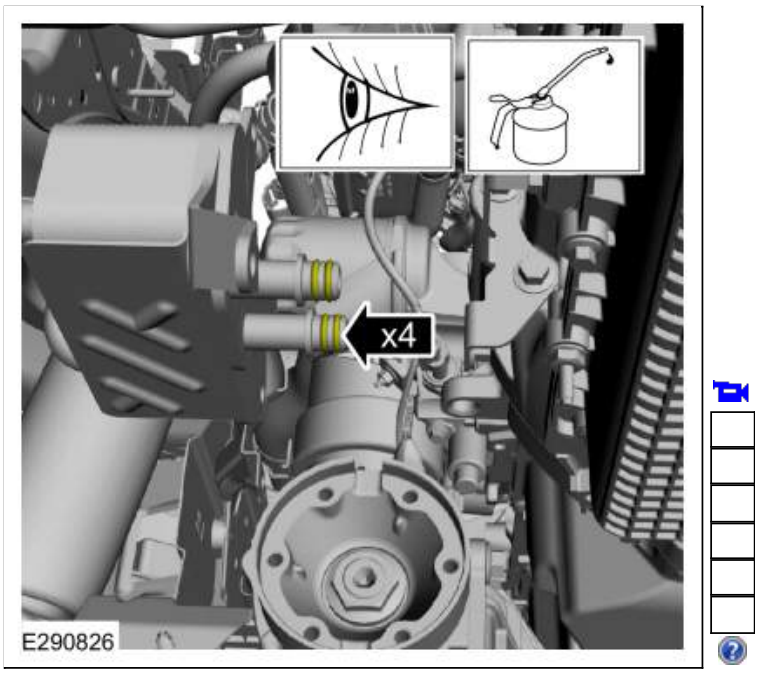
21. Connect the transmission electrical connector and attach the retainers.



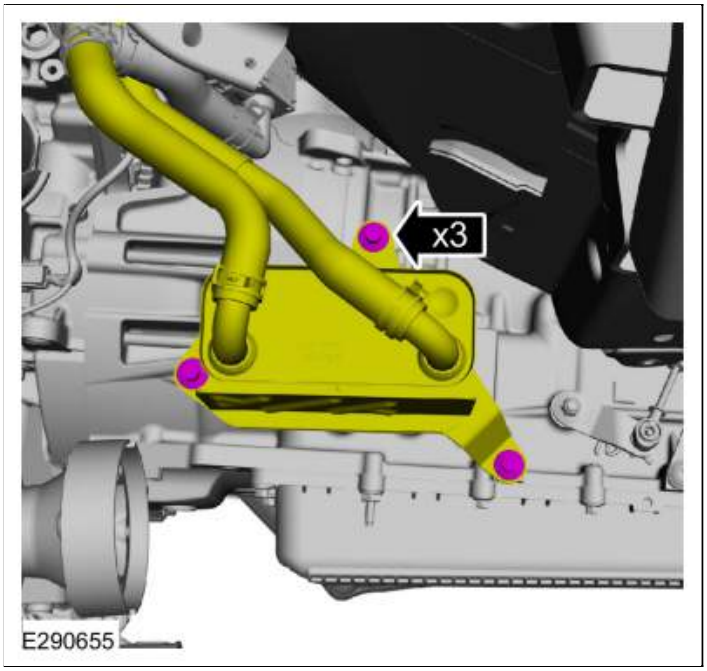
22. If equipped, attach the engine block heater cable.



23. Inspect the transmission fluid cooler O-ring seals and install new O-ring seals if necessary. Lubricate the O-ring seals.
Material: Motorcraft® MERCON® ULV Automatic Transmission Fluid / XT-12-QULV (WSS-M2C949-A) (MERCON® ULV)

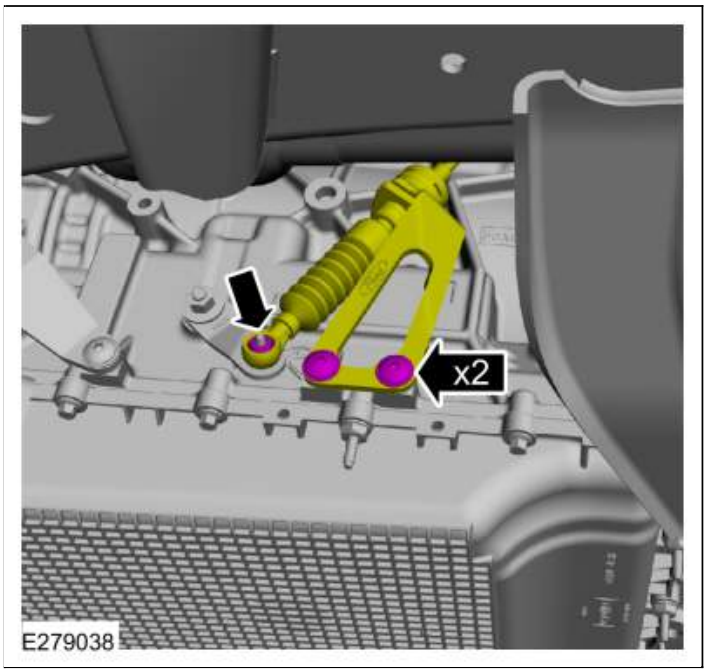


24. Install the transmission fluid cooler and the bolts.
Torque: 177 lb.in (20 Nm)

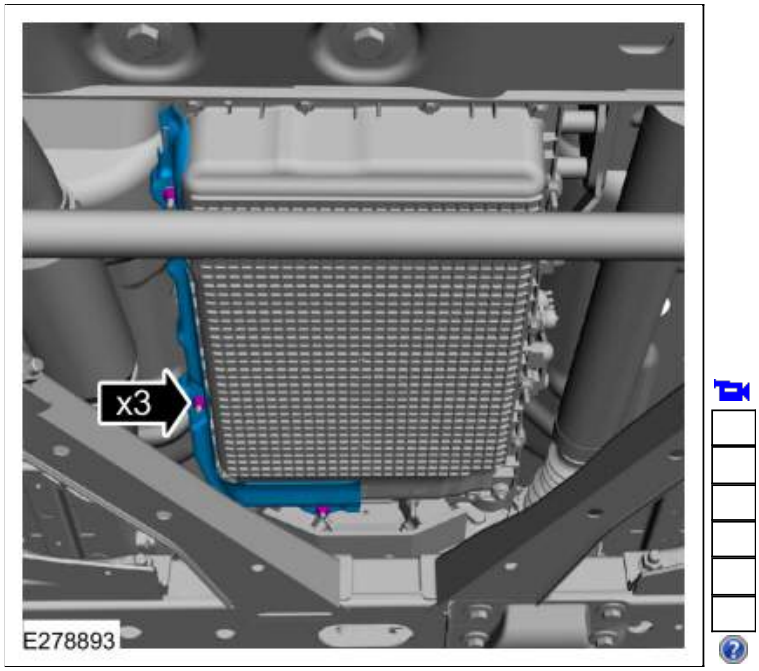


25. **NOTICE: Take extra care when handling selector lever cable.**

    Install the new bolts and connect the selector lever cable to the manual control lever.
    Torque: 18 lb.ft (25 Nm)



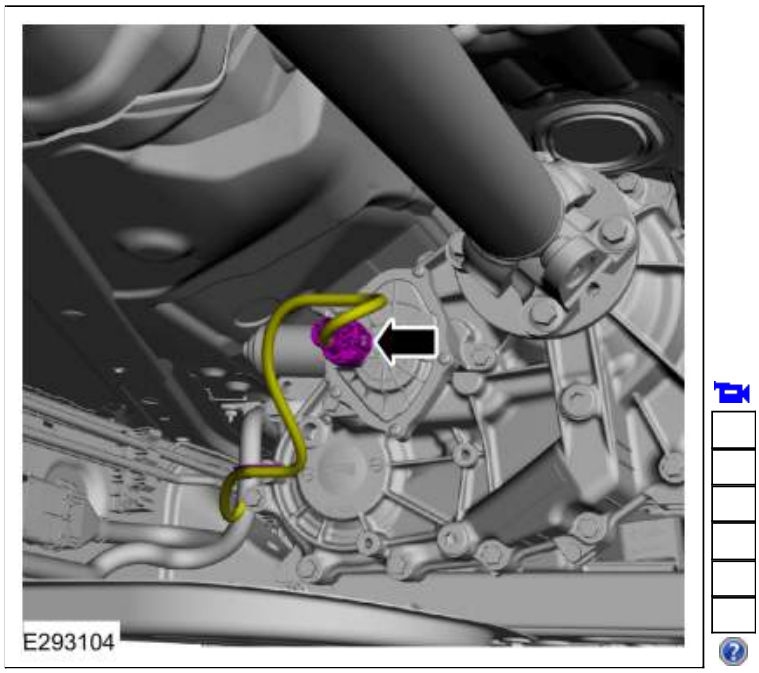
26. Install the heatshield and the retainers.
    Torque: 80 lb.in (9 Nm)



27. Install the rear driveshaft assembly.
Refer to: Rear Driveshaft (205-01 Driveshaft, Removal and Installation).

Four-Wheel Drive (4WD) vehicles

28. Connect the transfer case electrical connector.



29. Install the front driveshaft assembly.
Refer to: Front Driveshaft (205-01 Driveshaft, Removal and Installation).

30. Check the transfer case fluid level.
Refer to: Transfer Case Fluid Level Check (308-07B Transfer Case - 10-Speed Automatic Transmission - 10R80, General Procedures).

All vehicles

31. Install the starter motor assembly.
Refer to: Starter Motor (303-06 Starting System - 2.3L EcoBoost (201kW/273PS), Removal and Installation).

32. Verify that the selector lever cable is correctly adjusted.
Refer to: Selector Lever Cable Adjustment (307-05 Automatic Transmission External Controls, General Procedures).

33. After completing the repairs, perform the Misfire Monitor Neutral Profile Correction procedure using a diagnostic scan tool.

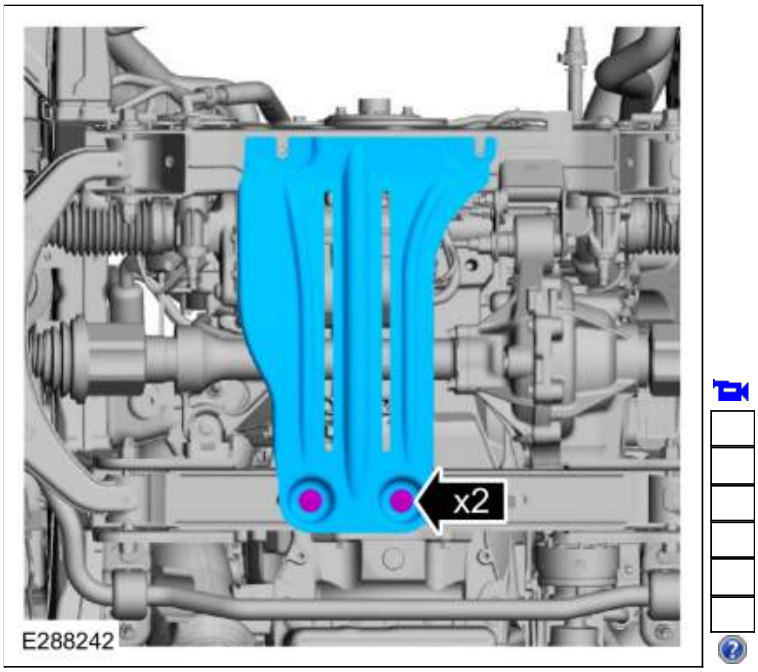
34. If a new transmission or a new main control was installed, the solenoid body strategy must be updated.
Refer to: Transmission Strategy Download (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).

35. If the transmission was overhauled, the adaptive drive cycle must be updated.
Refer to: Adaptive Learning Drive Cycle (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).

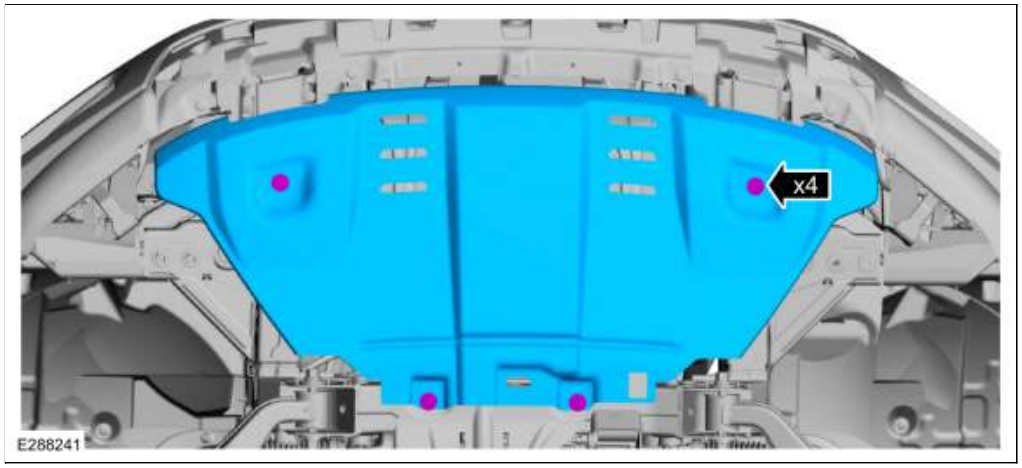
36. While driving the vehicle, use the scan tool to verify that the TFT has reached a temperature of 96°-101°C (206°-215° F). This will circulate the transmission fluid through the torque converter and the transmission fluid cooling system, eliminating any trapped air in the transmission fluid cooling system.

37. Check the transmission fluid level
Refer to: Transmission Fluid Level Check (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).

38. Install the rear skid plate and the bolts.
Torque: 22 lb.ft (30 Nm)



39. Install the skid plate and the bolts.
Torque: 22 lb.ft (30 Nm)



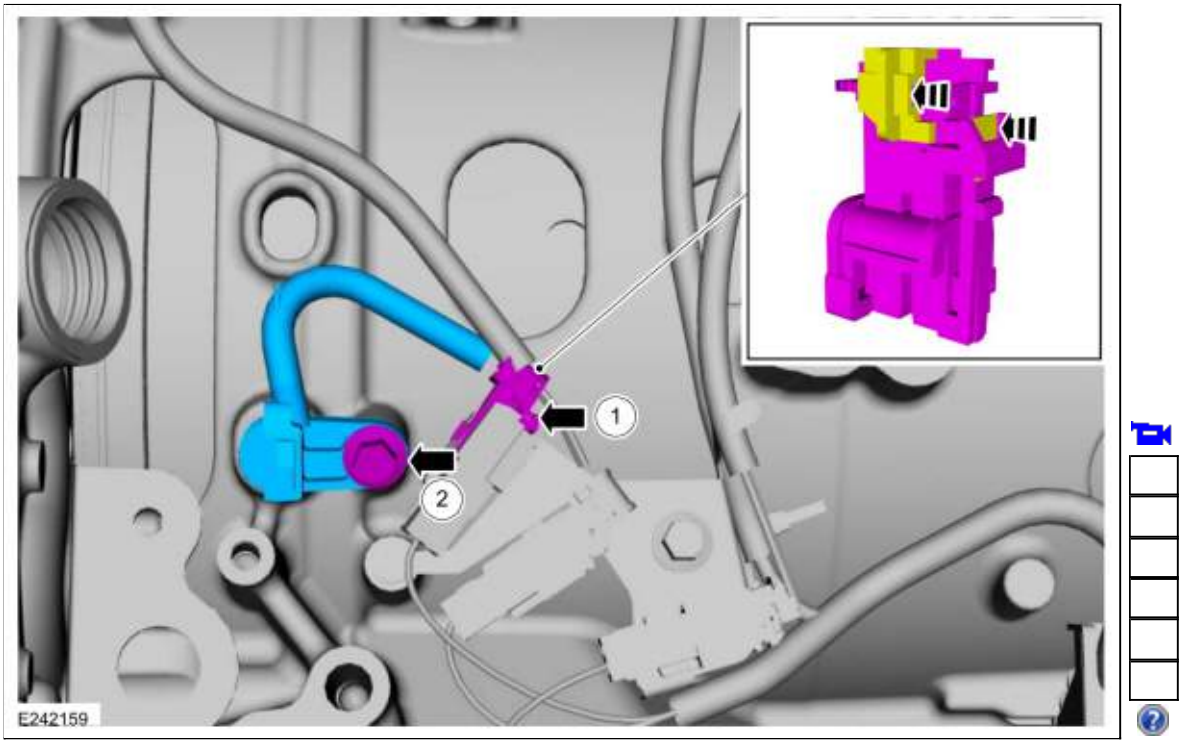
Turbine Shaft Speed (TSS) Sensor

Base Part Number: 7M101

Removal

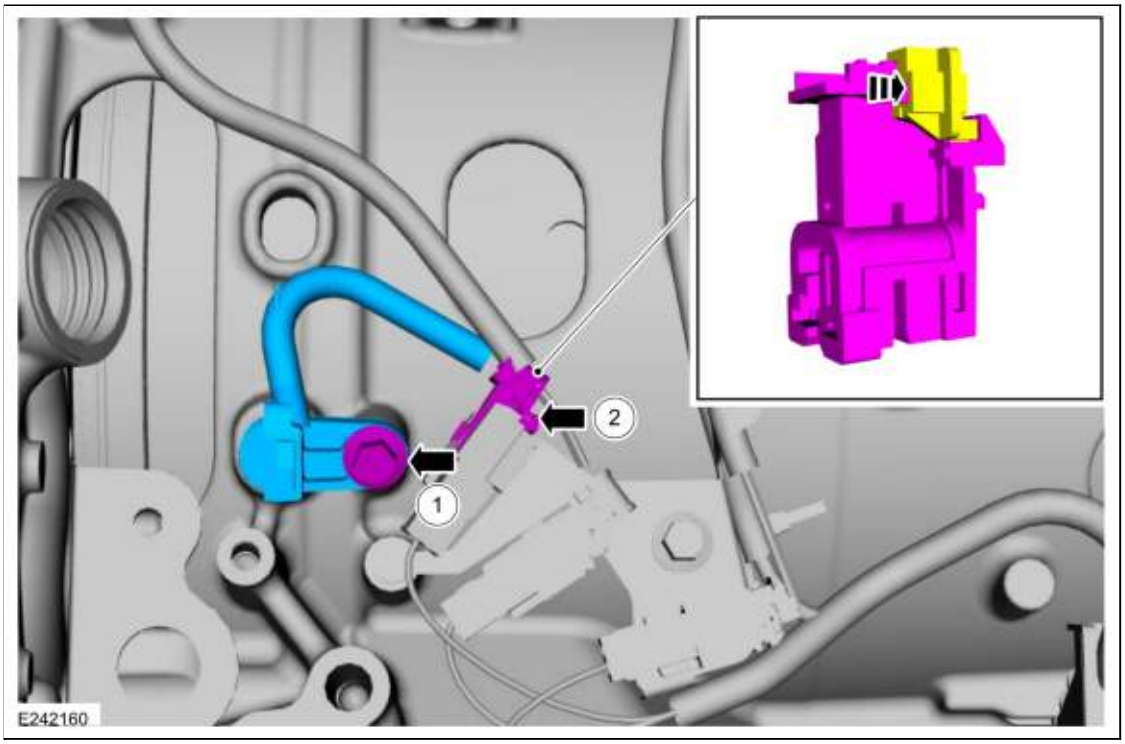
1. Remove the main control valve body.
   Refer to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
   Refer to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

2. Remove the TSS sensor.
   1. Slide the plastic lock to the unlocked position. While pressing the plastic tab, disconnect the electrical connector.
   2. Remove the bolt and the TSS sensor.



Installation

1. Install the TSS sensor.
   1. Install the TSS sensor bolt.
      Torque: 62 lb.in (7 Nm)
   2. Connect the electrical connector. Slide the plastic lock to the locked position.



2. Install the main control valve body.
   Refer to: Main Control Valve Body (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).
   Refer to: Main Control Valve Body - Vehicles With: Auto-Start-Stop (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

Specifications

Lubricants, Fluids, Sealers and Adhesives

	Specifications
Motorcraft® MERCON® ULV Automatic Transmission Fluid / XT-12-QULV	MERCON® ULV / WSS-M2C949-A

Capacities

NOTE: *The transmission fluid amount listed is for a completely dry transmission and torque converter. When draining the transmission fluid from the transmission for maintance or repairs, the fluid fill amounts will vary.*

	Liters
Transmission fluid	12.5 qt (11.8 L)

General Specification

NOTICE: Transmission fluids are not interchangeable. The use of any other fluid or cleaning agents will cause internal transmission damage.

Item	Specification
Transmission fluid	Transmission fluid should be checked with the vehicle on a level surface and at normal operating temperature. (Normal operating temperature 96°C (206°F) to 101°C (215°F)).
Fluid Filter	Internal to the transmission

General Specification

Transmission Weight	Specification
RWD vehicle	234.06 lb (106.17 kg)
4X4 vehicle	230.87 lb (104.72 kg)

Clutch Application Chart

Gear	A Clutch (1, 2, 3, 4, 5, 6, M1, M2, R)	B Clutch (2, 8, 9, 10, M1, M2, R)	C Clutch (2, 3, 4, 5, 7, 9, 10, M2)	D Clutch (2, 3, 4, 6, 7, 8, 10, M2, R)	E Clutch (1, 3, 5, 6, 7, 8, 9, M1)	F Clutch (4, 5, 6, 7, 8, 9, 10, R)	Low - OWC
Park	H	H	-	H	-	-	-
Reverse	H	H	-	D	-	D	-
Neutral	H	H	-	H	-	-	-
1st Gear D	H	-	-	-[a]	D	-	H
2nd Gear D	H	-	D	D	-	-	H
3rd Gear D	H	-	D	D	D	-	O/R
4th Gear D	H	-	D	D	-	D	O/R
5th Gear D	H	-	D	-	D	D	O/R
6th Gear D	H	-	-	D	D	D	O/R
7th Gear D	-	-	D	D	D	D	O/R
8th Gear D	-	H	-	D	D	D	-
9th Gear D	-	H	D	-	D	D	-
10th Gear D	-	H	D	D	-	D	-
1st Gear Manual	H	H	-	-[a]	D	-	H
2nd Gear Manual	H	H	D	D	-	-	H
Planetary Component	Ring Gear No. 1	Sun Gear No. 1 and Sun Gear No. 2	Ring Gear No. 2 and Sun Gear No. 3	Planeatary No. 3	Ring Gear No. 3 and Sun Gear No. 4	Ring Gear No. 4 and Planeatary No. 1	Sun Gear No. 1 and Sun Gear No. 2 in CW direction

- H = Holding
- D = Driven
- O/R = Overrunning

a. Applied to reduce frictional losses from a released clutch, but does not contribute to powerflow.

Solenoid Operation Chart

Selector Lever Position	Commanded Gear	SSA (1, 2, 3, 4, 5, 6, M1, M2, R)	SSB (2, 8, 9, 10, M1, M2, R)	SSC (2, 3, 4, 5, 7, 9, 10, M2)	SSD (2, 3, 4, 6, 7, 8, 10, M2, R)	SSE (1, 3, 5, 6, 7, 8, 9, M1)	SSF (4, 5, 6, 7, 8, 9, 10, R)	TCC Solenoid

P	P	On	On	Off	On	Off	Off	Off
R	R	On	On	Off	On	Off	On	Off
N	N	On	On	Off	On	Off	Off	Off
D	1	On	Off	Off	On[a]	On	Off	Off
	2	On	Off	On	On	Off	Off	On/Off
	3	On	Off	On	On	On	Off	On/Off
	4	On	Off	On	On	Off	On	On/Off
	5	On	Off	On	Off	On	On	On/Off
	6	On	Off	Off	On	On	On	On/Off
	7	Off	Off	On	On	On	On	On/Off
	8	Off	On	Off	On	On	On	On/Off
	9	Off	On	On	Off	On	On	On/Off
	10	Off	On	On	On	Off	On	On/Off
M1	1	On	On	Off	On[a]	On	Off	Off
M2	2	On	On	On	On	Off	Off	Off

a. On to reduce frictional losses from a released clutch, but does not contribute to powerflow.

Clutch Plate Quantity

Clutch	Number of Friction Plates	Number of Steel Plates	Number of Separating Springs	Number of Apply Plates	Number of Pressure Plates
A clutch (1, 2, 3, 4, 5, 6, M1, M2, R)	3	2	3	1	1
B clutch (2, 8, 9, 10, M1, M2, R)	4	3	4	1	1
C clutch (2, 3, 4, 5, 7, 9, 10, M2)	4	4	-	-	1
D clutch (2, 3, 4, 6, 7, 8, 10, M2, R)	5	5	-	-	1
E clutch (1, 3, 5, 6, 7, 8, 9, M1)	4	3	-	1	1
F clutch (4, 5, 6, 7, 8, 9, 10, R)	3	3	-	-	1

Clutch Clearance

Clutch	Specifications
A clutch	0.029–0.048 in (.73–1.23 mm)
B clutch	0.052–0.069 in (1.31–1.74 mm)
C clutch	0.050–0.062 in (1.27–1.57 mm)
D clutch	0.057–0.069 in (1.46–1.76 mm)
E clutch	0.044–0.068 in (1.12–1.72 mm)
F clutch	0.039–0.050 in (.98–1.28 mm)

Transmission Front End Clearance

Transmission	Specifications
RWD Vehicle	0.007–0.016 in (.17–.41 mm)
4X4 Vehicle	0.002–0.011 in (.05–.29 mm)

A Clutch Selective Apply Plate Chart

Part Number	Apply Plate Thickness
7B066A	0.161–0.169 in (4.1–4.3 mm)
7B066A	0.173–0.181 in (4.4–4.6 mm)
7B066A	0.185–0.193 in (4.7–4.9 mm)
7B066A	0.197–0.205 in (5–5.2 mm)
7B066A	0.209–0.217 in (5.3–5.5 mm)

B Clutch Selective Snap Ring Chart

Part Number	Snap Ring Thickness
HL3P-7M157-AA	0.089–0.093 in (2.25–2.35 mm)
HL3P-7M157-BA	0.100–0.104 in (2.55–2.65 mm)
HL3P-7M157-CA	0.112–0.116 in (2.85–2.95 mm)
HL3P-7M157-DA	0.124–0.128 in (3.15–3.25 mm)
HL3P-7M157-EA	0.136–0.140 in (3.45–3.55 mm)
HL3P-7M157-FA	0.148–0.152 in (3.75–3.85 mm)

C Clutch Selective Snap Ring Chart

Part Number	Snap Ring Thickness
HL3P-7H076-AA	0.059 in (1.5 mm)
HL3P-7H076-BA	0.067 in (1.7 mm)
HL3P-7H076-CA	0.075 in (1.9 mm)
HL3P-7H076-DA	0.083 in (2.1 mm)
HL3P-7H076-EA	0.091 in (2.3 mm)

D Clutch Selective Snap Ring Chart

Part Number	Snap Ring Thickness
HL3P-7B421-AA	0.071 in (1.8 mm)
HL3P-7B421-BA	0.079 in (2 mm)
HL3P-7B421-CA	0.087 in (2.2 mm)
HL3P-7B421-DA	0.094 in (2.4 mm)
HL3P-7B421-EA	0.102 in (2.6 mm)
HL3P-7B421-FA	0.110 in (2.8 mm)

E Clutch Selective Pressure Plate Chart

Part Number	Pressure Plate Thickness
HL3P-7B066-AB	0.083–0.087 in (2.1–2.2 mm)
HL3P-7B066-BB	0.091–0.094 in (2.3–2.4 mm)
HL3P-7B066-CB	0.098–0.102 in (2.5–2.6 mm)
HL3P-7B066-DB	0.106–0.110 in (2.7–2.8 mm)
HL3P-7B066-EB [a]	0.114–0.118 in (2.9–3 mm)
HL3P-7B066-FB	0.122–0.126 in (3.1–3.2 mm)
HL3P-7B066-GB	0.130–0.134 in (3.3–3.4 mm)
HL3P-7B066-HB	0.138–0.142 in (3.5–3.6 mm)

a. Also used for the E clutch apply plate

F Clutch Selective Snap Ring Chart

Part Number	Snap Ring Thickness
HL3P-7P174-AA	0.059 in (1.5 mm)
HL3P-7P174-BA	0.067 in (1.7 mm)
HL3P-7P174-CA	0.075 in (1.9 mm)
HL3P-7P174-DA	0.083 in (2.1 mm)
HL3P-7P174-EA	0.091 in (2.3 mm)
HL3P-7P174-FA	0.098 in (2.5 mm)

Selective Fit Shim Chart RWD Vehicles

Selective Fit Shim Part Number	Selective Fit Shim Thickness
7A527	0.120–0.124 in (3.05–3.15 mm)
7A527	0.126–0.130 in (3.2–3.3 mm)
7A527	0.132–0.136 in (3.35–3.45 mm)
7A527	0.138–0.142 in (3.5–3.6 mm)
7A527	0.144–0.148 in (3.65–3.75 mm)
7A527	0.150–0.154 in (3.8–3.9 mm)
7A527	0.156–0.159 in (3.95–4.05 mm)
7A527	0.161–0.165 in (4.1–4.2 mm)
7A527	0.167–0.171 in (4.25–4.35 mm)

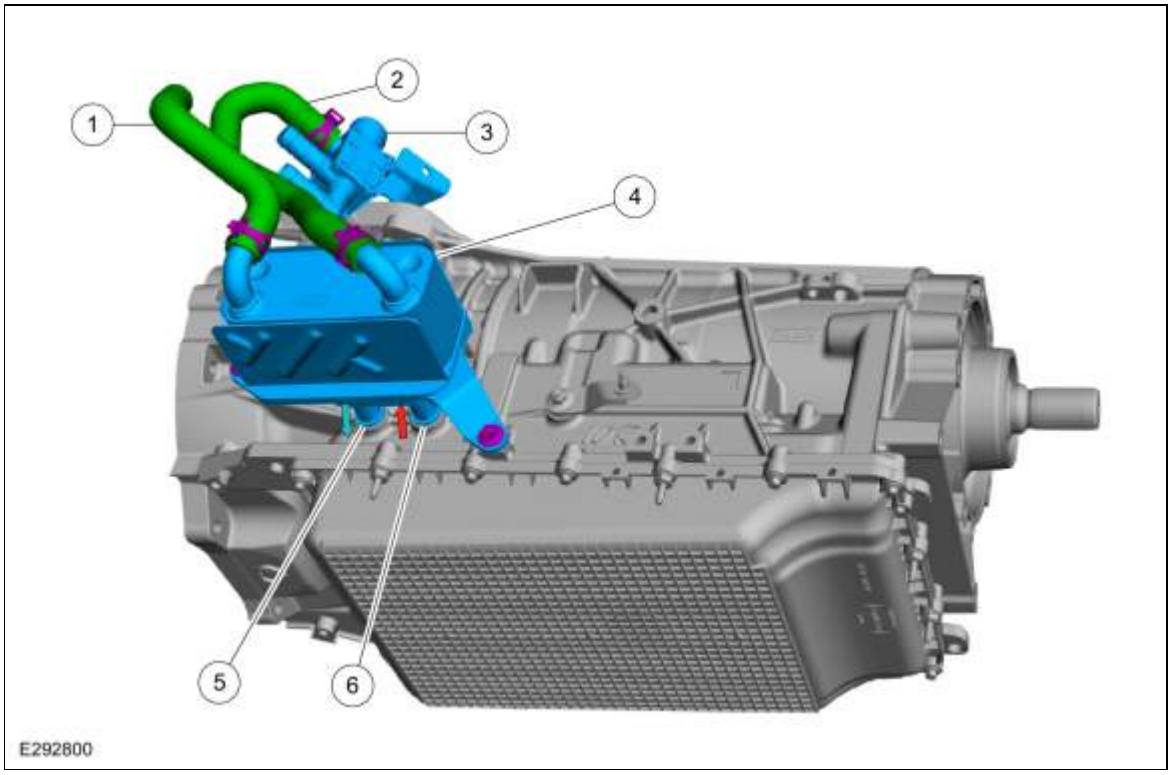
Selective Fit Shim Chart 4X4 Vehicles

Selective Fit Shim Part Number	Selective Fit Shim Thickness
7A527	0.132–0.136 in (3.35–3.45 mm)
7A527	0.138–0.142 in (3.5–3.6 mm)
7A527	0.144–0.148 in (3.65–3.75 mm)
7A527	0.150–0.154 in (3.8–3.9 mm)
7A527	0.156–0.159 in (3.95–4.05 mm)
7A527	0.161–0.165 in (4.1–4.2 mm)
7A527	0.167–0.171 in (4.25–4.35 mm)

Gear Ratio Chart

Gear	Ratio
1st	4.69:1
2nd	2.98:1
3rd	2.14:1
4th	1.76:1
5th	1.52:1
6th	1.27:1
7th	1:1
8th	0.85:1
9th	0.68:1
10th	0.63:1
Reverse	4.86:1

Transmission Cooling - Component Location



Item	Description
1	Transmission fluid cooler coolant outlet tube
2	Transmission fluid cooler coolant inlet tube
3	Transmission fluid cooler coolant control valve
4	Transmission fluid cooler
5	Transmission fluid cooler outlet tube
6	Transmission fluid cooler inlet tube

Transmission Cooling

Inspection and Verification

1. Verify the customer concern by operating the vehicle to duplicate the condition.
2. If the inspection reveals obvious concern(s) that can be readily identified, repair as necessary.
3. Install new components if a transmission fluid leak is found in any of the transmission cooling components.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart — Transmission Cooling

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. REFER to: Diagnostic Methods (100-00 General Information, Description and Operation).

Symptom	Possible Sources	Action
• Transmission overheating	• Clogged transmission fluid cooler or transmission fluid cooler tubes • Bent or crushed transmission fluid cooler tubes	• INSPECT the transmission fluid cooler and the transmission fluid cooler tubes for damage or plugging. INSTALL new components as necessary.
	• System leaks	• INSPECT transmission fluid cooler and transmission fluid cooler tubes for leaks. SERVICE as required.
	• Transmission fluid level is too high	• REFER to: Transmission Fluid Level Check (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).
• Engine coolant in the transmission fluid or transmission fluid in the engine coolant.	• Transmission fluid cooler internal leak	• INSTALL a new transmission fluid cooler. REFER to: Transmission Fluid Cooler (307-02 Transmission Cooling - 10-Speed Automatic Transmission - 10R80, Removal and Installation).

Check Transmission Fluid Level and Condition

Transmission Fluid Level Check

To check the transmission fluid level,
REFER to: Transmission Fluid Level Check (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).

High Transmission Fluid Level

A transmission fluid level that is too high may cause the transmission fluid to become aerated due to the churning action of the rotating internal parts. This will cause erratic control pressure, foaming, loss of transmission fluid from the vent tube and possible transmission malfunction and/or damage.

Low Transmission Fluid Level

A low transmission fluid level could result in poor transmission engagement, slipping, malfunction and/or damage. This could also indicate a leak in one of the transmission seals or gaskets.

Transmission Fluid Condition Check

1. Check the transmission fluid level,
   REFER to: Transmission Fluid Level Check (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, General Procedures).

2. Place a drop of transmission fluid on a facial tissue and examine the stain.

3. If evidence of solid material is found, the transmission fluid pan should be removed for further inspection.

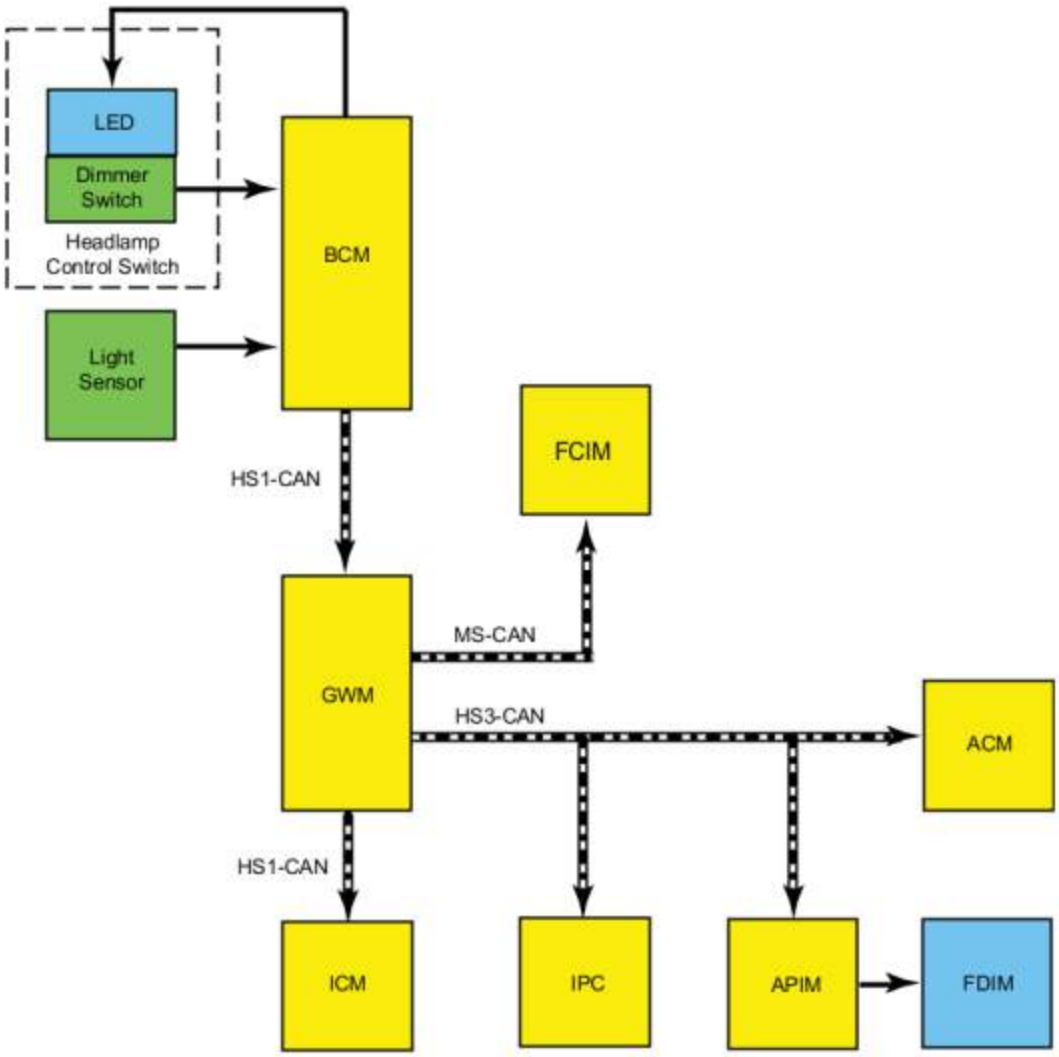
4. If transmission fluid contamination or transmission failure is confirmed by the sediment in the bottom of the transmission fluid pan, repair the transmission and clean the transmission fluid cooler tubes and the transmission fluid cooler.

5. If the transmission is to be overhauled or if installing a new transmission, the transmission fluid cooler must be backflushed.
   REFER to: Transmission Fluid Cooler - Backflushing and Cleaning (307-02 Transmission Cooling - 10-Speed Automatic Transmission - 10R80, General Procedures).

Instrument Panel and Interior Switches Illumination - System Operation and Component Description

System Operation

System Diagram - Networked Illumination



Network Message Chart

Module Network Input Messages - APIM, FCIM, GWM and IPC .

Broadcast Message	Originating Module	Message Purpose
Illumination Dimming Level	BCM	Used to command the illumination dimming level for networked modules and outputs that are hardwired to networked modules.

Networked Illumination Operation

The dimmable switches and components are illuminated when the parking lamps are on. The system-wide illumination dimming level is determined by the BCM. Based on the ambient light level input from the light sensor and the requested illumination dimming level input from the dimmer switch, the BCM calculates the correct dimming level. The BCM sends the illumination dimming level message to the GWM on the HS-CAN1.

The GWM distributes the message to the following components:

HS-CAN1

- ICM

MS-CAN

- FCIM

HS-CAN3

- IPC
- APIM

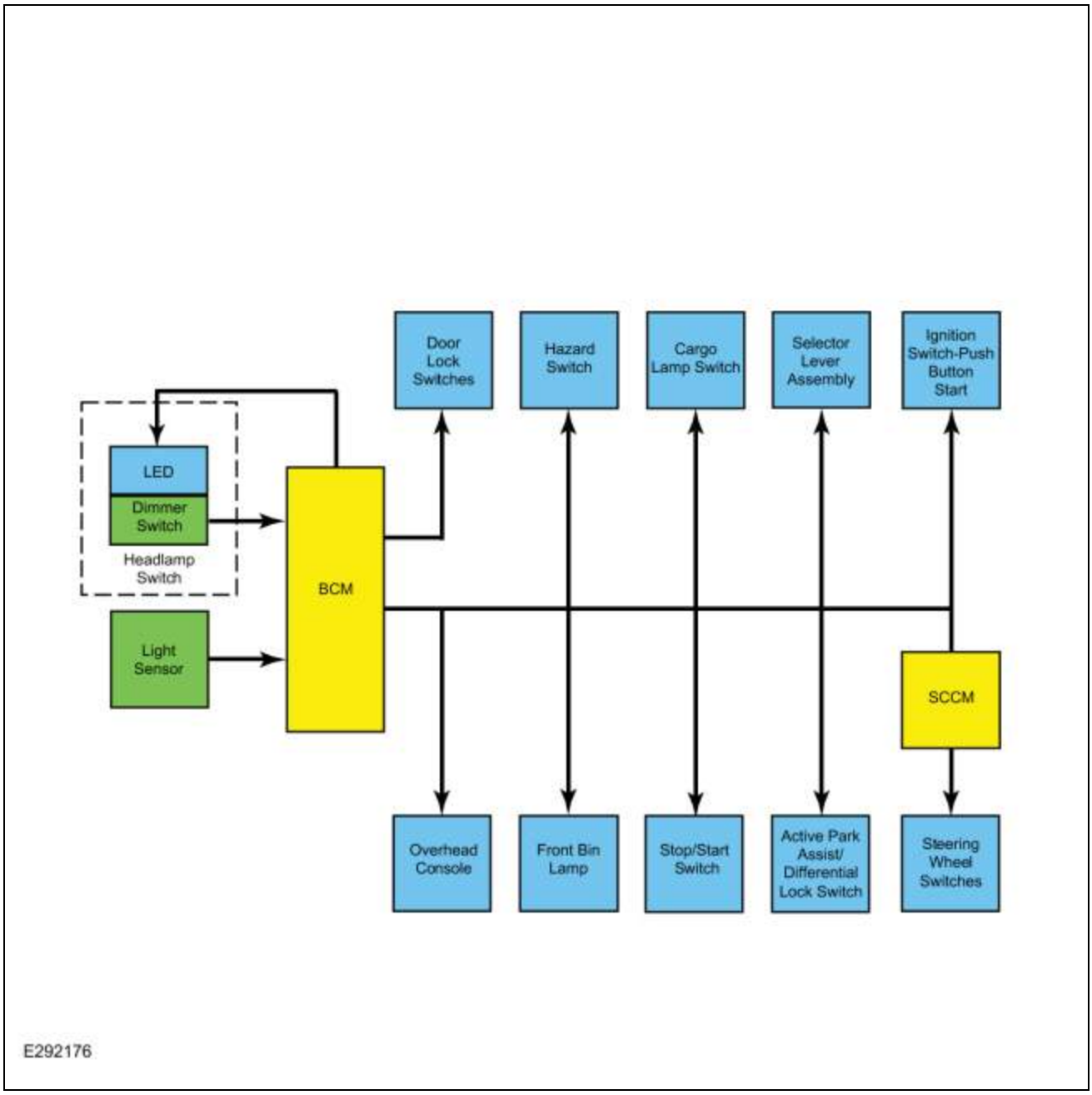
The receiving modules use the illumination dimming level message to determine the backlighting intensity of internal and external non-networked illumination sources. If a module does not receive the illumination dimming level message or the data received is deemed invalid, the module sets a DTC in continuous memory and defaults to full nighttime intensity.

If the IPC does not receive the dimming level or ambient light level network messages from the BCM for up to 5 seconds, the IPC illumination remains at the last level based on the last message received. If the IPC receives invalid or no signals for more than 5 seconds, the IPC defaults to full night illumination level.

On vehicles equipped with autolamps, if the exterior lamps are activated during the daytime, the message center illumination remains at full intensity and does not dim from the illumination dimmer switch. If the vehicle travels under a bridge or through a tunnel, the low level of ambient light causes the illumination level of the message center to change to the level set by the illumination panel dimmer switch. The message center illumination changes back to full intensity when the intense ambient light is restored.

The hazard switch is integral to the FCIM and cannot be serviced separately.

System Diagram - Non-Networked Illumination



Non-Networked Illumination Operation

Based on the ambient light level input from the light sensor and the requested illumination dimming level input from the dimmer switch, the BCM calculates the correct dimming level for the non-networked illumination sources. The BCM provides a pulse-width modulated voltage to all non-networked illumination sources.

Field-Effect Transistor (FET) Protection

Field-Effect Transistor (FET) protection is used to protect the BCM output drivers from damage in the event an excessive current draw is detected on a BCM output. Each illumination circuit connected to the BCM is separately protected. Refer to the System Diagram in this section to view the different groups of BCM non-networked illumination outputs. For a full description of Field-Effect Transistor (FET) protection,
Refer to: Module Controlled Functions - System Operation and Component Description (419-10 Multifunction Electronic Modules, Description and Operation).

Component Description

Dimmer Switch

The illumination dimmer switch is a momentary contact switch that is integral to the headlamp switch. The headlamp switch is non-networked to the BCM. When the illumination dimmer switch is pressed up or down, the switch completes a ground circuit to the BCM corresponding to the desired action (increase or decrease illumination brightness).

Instrument Panel and Interior Switches Illumination

DTC Chart: Body Control Module (BCM)

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. REFER to: Diagnostic Methods (100-00 General Information, Description and Operation).

BCM DTC Fault Trigger Conditions

DTC	Description	Action
B1315:11	Backlighting (Non Reflective Controls) Illumination Output: Circuit Short To Ground	GO to Pinpoint Test C
B1315:15	Backlighting (Non Reflective Controls) Illumination Output: Circuit Short To Battery or Open	If all non-networked illumination sources are inoperative, GO to Pinpoint Test C If all non-networked illumination sources are always on, GO to Pinpoint Test E
B1436:01	Digital Dimmer Switch Input: General Electrical Failure	GO to Pinpoint Test A
U1000:00	Solid State Driver Protection Active- Driver Disabled: No Sub Type Information	REFER to: Body Control Module (BCM) (419-10 Multifunction Electronic Modules, Diagnosis and Testing).
U3000:49	Control Module: Internal Electronic Failure	REFER to: Body Control Module (BCM) (419-10 Multifunction Electronic Modules, Diagnosis and Testing).
All other BCM Diagnostic Trouble Codes (DTCs)	-	REFER to: Body Control Module (BCM) (419-10 Multifunction Electronic Modules, Diagnosis and Testing).

Symptom Chart

Symptom Chart: Instrument Panel and Interior Switches Illumination

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. REFER to: Diagnostic Methods (100-00 General Information, Description and Operation).

Condition	Possible Sources	Action
A module does not respond to the diagnostic scan tool	• Fuse	REFER to: Communications Network (418-

	• Wiring, terminals or connectors • Module	00 Module Communications Network, Diagnosis and Testing).
All illumination (networked and non-networked) does not dim or increase brightness	Refer to the Pinpoint Test	GO to Pinpoint Test A
All networked illumination is inoperative (non-networked illumination functions correctly)	Refer to the Pinpoint Test	GO to Pinpoint Test B
All non-networked illumination sources are inoperative (networked illumination functions correctly)	Refer to the Pinpoint Test	GO to Pinpoint Test C
All non-networked illumination sources are always on (networked illumination functions correctly)	Refer to the Pinpoint Test	GO to Pinpoint Test E
One or more non-networked illumination source is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test D
A single non-network illuminated switch or component is always on	Illuminated switch or component	INSTALL a new illuminated switch or component.
Steering wheel switch(es) illumination is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test I
The window control switch illumination is inoperative or always on	Refer to the Pinpoint Test	GO to Pinpoint Test F
The front door lock switch illumination is inoperative or always on	Refer to the Pinpoint Test	GO to Pinpoint Test G
The rear door lock switch illumination is inoperative or always on	Refer to the Pinpoint Test	GO to Pinpoint Test H
The IPC illumination is inoperative or does not dim	Refer to the Pinpoint Test	GO to Pinpoint Test J
The FCIM illumination is inoperative or does not dim	Refer to the Pinpoint Test	GO to Pinpoint Test K
The FDIM illumination is inoperative or does not dim	Refer to the Pinpoint Test	GO to Pinpoint Test L

Pinpoint Test

PINPOINT TEST A : ALL ILLUMINATION (NETWORKED AND NON-NETWORKED SOURCES) DOES NOT DIM OR INCREASE BRIGHTNESS

PINPOINT TEST B : ALL NETWORKED ILLUMINATION IS INOPERATIVE (NON-NETWORKED ILLUMINATION FUNCTIONS CORRECTLY)

PINPOINT TEST C : ALL NON-NETWORKED ILLUMINATION SOURCES ARE INOPERATIVE; NETWORKED ILLUMINATION FUNCTIONS CORRECTLY

- PINPOINT TEST D : ONE OR MORE NON-NETWORKED ILLUMINATION SOURCE IS INOPERATIVE
- PINPOINT TEST E : ALL NON-NETWORKED ILLUMINATION IS ALWAYS ON; NETWORKED ILLUMINATION FUNCTIONS CORRECTLY
- PINPOINT TEST F : THE WINDOW CONTROL SWITCH ILLUMINATION IS INOPERATIVE OR DOES NOT DIM
- PINPOINT TEST G : THE FRONT DOOR LOCK SWITCH ILLUMINATION IS INOPERATIVE OR ALWAYS ON
- PINPOINT TEST H : THE REAR DOOR LOCK SWITCH ILLUMINATION IS INOPERATIVE OR ALWAYS ON
- PINPOINT TEST I : THE STEERING WHEEL SWITCH ILLUMINATION IS INOPERATIVE
- PINPOINT TEST J : THE IPC (INSTRUMENT PANEL CLUSTER) ILLUMINATION IS INOPERATIVE OR DOES NOT DIM
- PINPOINT TEST K : THE FCIM (FRONT CONTROLS INTERFACE MODULE) ILLUMINATION IS INOPERATIVE OR DOES NOT DIM
- PINPOINT TEST L : THE FDIM (FRONT DISPLAY INTERFACE MODULE) ILLUMINATION IS INOPERATIVE OR DOES NOT DIM

Warning Chimes - Overview

Overview

The warning chimes provide the driver with audible warnings that act as reminders and supplemental alerts to visual IPC indications such as gauges, indicators and message center warnings. The IPC controls all warning chimes based on messages received from external modules. The IPC prioritizes the chimes according to a preset hierarchy programmed into the IPC software. When more than one chime request is received by the IPC, the most important chime sounds. If a lower priority chime is currently sounding, the higher priority request takes over and replaces or delays the lower priority chime.

The warning chimes are sounded through the audio system speakers and the IPC. The turn signal/hazard on (tick-tock) is the only individual chime that sounds through the IPC, not the audio system. The parking aid, lift gate warning, and Blind Spot Information System (BLIS®®)/Cross Traffic Alert (CTA) warning chimes are sounded through the rear speakers. All other warning chimes are sounded through the front audio system speakers.

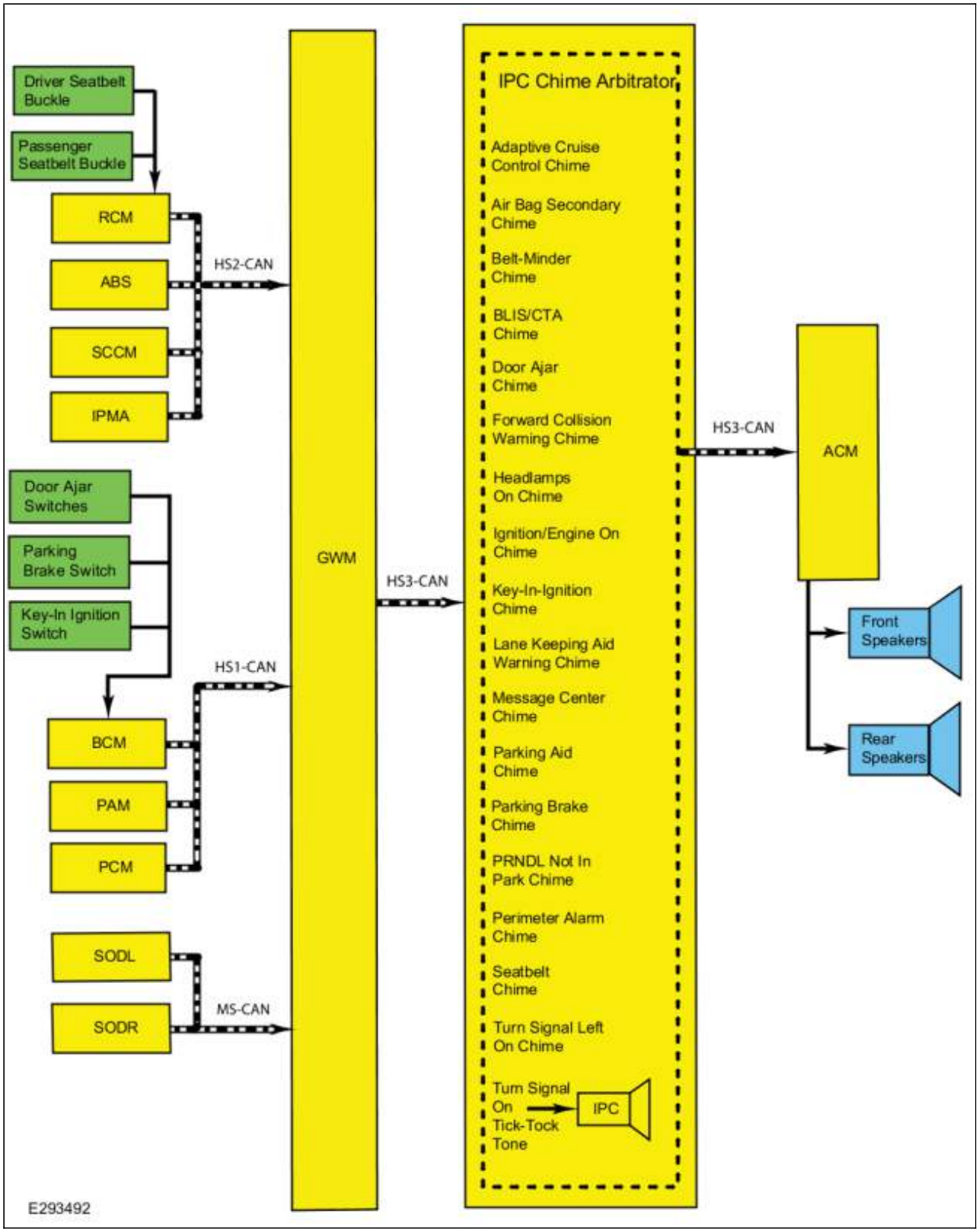
The IPC also acts as a backup. In the event of an audio system chime failure, the IPC sounds all chimes that are required.

NOTE: *There are instances where some chimes may sound through the IPC and should not be interpreted as a fault in the audio system. An example might be when the ignition is off, with the key in the igntion and the driver door ajar. In this instance, the audio system is offline and the key-in-igntion chime defaults to the IPC.*

Warning Chimes - System Operation and Component Description

System Operation

System Diagram



Network Message Chart

Module Network Input Messages - IPC

Broadcast Message	Originating Module	Message Purpose
Accessory delay	BCM	Input used to control the overall chime function.
ACC warning request	IPMA	Input used to control the ACC warning chime.
Audio chime status	ACM	Input used to control the source of the chime based on ACM chime status.
Battery shed level request	BCM	Input used for the PRNDL not in park warning chime.
Cruise control status	PCM	Input used to control the ACC warning chime.
CTA left status	SODL	Input used to control the Blind Spot Information System (BLIS®)/ (CTA) chime.
CTA right status	SODR	Input used to control the Blind Spot Information System (BLIS®)/ (CTA) chime.
Driver door ajar status	BCM	• Input used for module wake up to initiate the chime. • Input used for the ignition-engine on warning chime. • Input used for the PRNDL not in park warning chime.
Driver seatbelt buckle status	RCM	Input used to control the Belt-Minder® and seatbelt warning chime.
Engine rpm data	PCM	Input used to control the chime volume.
Forward collision chime request	IPMA	Input used for the forward collision warning chime.
Front passenger detect status	RCM	Input used to control the Belt-Minder® chime.
Gear lever position	PCM	Input used to control the Belt-Minder® chime.
Headlamp on warning chime	BCM	Input used to control the headlamps on warning chime.
Ignition status	BCM	Ignition RUN, START and accessory states required for the IPC operating modes and fault reporting. Also used to control the PRNDL not in park warning chime.
Key-in-ignition status	BCM	Input used to control the key-in-ignition chime status.
Lane keeping system hands off display	IPMA	Input used to control the lane keeping system hands off the steering wheel warning chime.
Left turn lamp on request	BCM	Input used for the turn signal-hazard (tick-tock) chime.
Parking aid chime request	PAM	Input used to control the parking aid chime status.
Parking brake chime request	BCM	Input used to control the parking brake chime status.
Passenger seatbelt buckle status	RCM	Input used to control the Belt-Minder® chime.
Perimeter alarm chime request	BCM	Input used to control the perimeter alarm chime status.
Power pack status	PCM	Input used for the ignition-engine on warning chime.
Right turn lamp on request	BCM	Input used for the turn signal-hazard (tick-tock) chime.

Side obstacle sensor status-left	SODL	Input used to control the Blind Spot Information System (BLIS®)/ (CTA) chime.
Side obstacle sensor status-right	SODR	Input used to control the Blind Spot Information System (BLIS®)/ (CTA) chime.
Transmission gear display	PCM	Input used for the ignition-engine on warning chime and the PRNDL not in park warning chime.
Transmission gear display mode	PCM	Input used for the PRNDL not in park warning chime.
Transport mode	BCM	Input used to control the PRNDL not in park warning chime.
Turn signal switch status	SCCM	Input used for the turn signal left on chime.
Vehicle speed	PCM	Input used to control the Belt-Minder® chime, ignition-engine on warning chime, and the PRNDL not in park warning chime.

Module Network Input Messages - ACM

Broadcast Message	Originating Module	Message Purpose
Belt-Minder audio mute	IPC	Input from the IPC to control the Belt-Minder audio chime output.
Chime controls	IPC	• Input used to control the following chime operations: – chime priority. – chime volume level. – how long a chime tone sounds and how long a tone is off. – how often the chime tones. – which chime to sound. – which speakers (front/rear) sound specific chimes.
Chime power up	IPC	Input used to initiate the audio system as the chime source.
Chime source	IPC	Input used to configure the chime source (IPC or the audio system).
IPC chime request	IPC	Input from the IPC used to control the audio chime output.

Warning Chime Characteristics

The warning chimes use volume, chime frequency, length of time the chime sounds, decay of the chime tone and the number of chime tones to identify which chime is sounding. Most warning chimes have unique characteristics, however, there are chimes that do sound the same. The chime characteristics are defined by the different chime types:

- Information
- Soft-warning
- Hard-warning
- Tick-tock (on-off)

ACC Warning Chime

The ACC warning chime supplements the message center displays to draw the driver's attention to the need to intervene and take control of the vehicle. There are 2 levels of chime output (high priority and low priority) based upon the nature and urgency of the warning. The ACC warning chime sounds through the front speakers. The audio system sounds the appropriate warning chime when it receives the ACC warning request (high priority chime) or cruise control status (low priority chime) message from the CCM.

The low priority ACC warning chime is a single-tone, 1-second chime that sounds to alert the driver the ACC system has shut itself off due to low vehicle speed (approximately 32 km/h [20 mph]) and the driver needs to intervene if further braking is required or to resume the ACC operation.

The high priority ACC warning chime is a 0.25-second chime that sounds 12 times. The chime alerts the driver the vehicle is approaching the vehicle ahead at a faster rate than the ACC system can brake the vehicle and the driver needs to apply the brakes to slow the vehicle down.

The IPC receives the cruise control status and the ACC warning request messages from the GWM over the HS-CAN3.

The GWM receives the cruise control status message from the PCM over the HS-CAN1.

The GWM receives the ACC warning request message from the IPMA over the HS-CAN2.

When a chime request is received, the IPC sends the IPC chime request message to the ACM to sound the chime.

Airbag Secondary Warning Chime

The airbag secondary warning chime warns the airbag warning indicator LED is inoperative. The airbag secondary warning chime sounds through the front speakers. If the IPC detects a fault with the airbag warning indicator LED during the bulb prove out, the airbag secondary warning chime sounds. If the IPC detects a fault in the airbag warning indicator when a SRS fault condition exists and the RCM has sent the IPC the airbag indicator request, the airbag secondary warning chime sounds. The airbag chime is a 0.5-second chime that sounds 5 times.

When a fault condition is detected, the IPC sends the IPC chime request message to the ACM to sound the chime.

Belt-Minder® Feature

NOTE: *Whenever the vehicle is operated using MyKey®, the IPC enables the Belt-Minder®.*

The Belt-Minder® is configurable on or off.
Refer to: Seatbelt Minder Deactivating/Activating (413-01 Instrumentation, Message Center and Warning Chimes, General Procedures).

The Belt-Minder® feature supplements the current seatbelt warning function and is enabled after the current seatbelt warning is complete. The Belt-Minder® reminds the driver that the driver or front passenger seatbelt is unbuckled by intermittently sounding a chime and simultaneously illuminating the seatbelt warning indicator through the front speakers. The Belt-Minder® begins once the current seatbelt warning has ended and the vehicle speed has exceeded 10 km/h (6 mph) with the driver or front passenger seatbelt unbuckled. While activated, the Belt-Minder® chime provides a series of chimes/seatbelt warning indicator flash sequences.

If the vehicle speed drops below 5 km/h (3 mph) once the Belt-Minder® chime has activated, the chime turns off and the seatbelt warning indicator remains on. When the vehicle speed exceeds 10 km/h (6 mph) again, the Belt-Minder® chime resumes.

When MyKey® is in use, the driver cannot configure the Belt-Minder® off. Once the Belt-Minder® is activated,

the Belt-Minder® continues to chime periodically (does not time out after 5 minutes) and the audio system is muted until the driver and passenger seatbelts are fastened.

To control the Belt-Minder®, the IPC receives the vehicle speed, gear lever position, driver and passenger seatbelt buckle status messages from the GWM over the HS-CAN3.

The GWM receives the vehicle speed and gear lever position messages from the PCM over the HS-CAN1.

The IPC receives the driver and passenger seatbelt status messages from the RCM over the HS-CAN2.

When the conditions require the Belt-Minder® chime, the IPC sends the IPC chime request message to the ACM to sound the chime.

Blind Spot Information System (BLIS®)/ CTA Warning Chime

The Blind Spot Information System (BLIS®)/ CTA warning chime sounds to alert the driver that a vehicle has been detected or that there is a system fault. The Blind Spot Information System (BLIS®)/ CTA warning chime sounds a 0.25-second chime continuously until the request is ended. The chime sounds through the rear speakers.

The IPC receives the CTA left status, CTA right status, side obstacle sensor status-left and the side obstacle sensor status-right request messages from the GWM over the HS-CAN3.

The GWM receives the CTA left status, CTA right status, side obstacle sensor status-left and the side obstacle sensor status-right request messages from the SODL and SODR over the MS-CAN.

When a chime request is received, the IPC sends the IPC chime request message to the ACM to sound the chime.

Door Ajar Warning Chime

The door ajar warning chime warns that a door is ajar and sounds the chime through the front speakers. When a door becomes ajar while the ignition is in RUN with vehicle speed greater than 5 km/h (3 mph), the IPC displays the appropriate door ajar warning message and sounds a single chime tone for each door opened. The door ajar chime only sounds once for each time the door is opened, and only repeats the chime if the door is closed then reopened.

The IPC receives the driver door ajar status, passenger door ajar status, left rear door ajar status or right rear door ajar status message from the GWM over the HS-CAN3. The GWM receives the driver door ajar status, passenger door ajar status, left rear door ajar status or right rear door ajar status messages from the BCM over the HS-CAN1.

When a chime request is received, the IPC sends the IPC chime request message to the ACM and to sound the chime.

Forward Collision Warning Chime

The forward collision warning chime warns that a forward collision potential has been detected or the CCM detects a forward collision warning system concern. Once the forward collision system detects a possible forward collision, the CCM sends a message to the IPMA over a private CAN. The IPMA sends a message to the IPC through the GWM to flash the forward collision warning. The IPMA sends a forward collision warning chime request to the IPC through the GWM to sound a 0.25-second chime tone 12 times.

The forward collision warning system and chime can be disabled or turned off using the message center. When MyKey® is in use, the driver cannot configure the forward collision warning system or chime off. When the driver disables the forward collision warning chime, the IPMA sends the IPC the forward collision chime

request through the GWM to sound a 0.25-second chime tone 12 times at 50% volume. The forward collision warning chime and confirmation chime are both sounded through the front speakers.

The IPC receives the forward collision warning message request and the forward collision chime request from the GWM over the HS-CAN3.

The GWM receives the forward collision warning message request and the forward collision chime request from the IPMA over the HS-CAN2.

When a chime request is received, the IPC sends the IPC chime request message to the ACM to sound the chime.

Headlamps On Warning Chime

The headlamps on warning chime warns the headlamps are on when exiting the vehicle. When the driver exits the vehicle with the driver door ajar, the headlamp switch is in the PARK or HEADLAMP position and the ignition is OFF, the BCM sends the headlamp switch status message to the IPC through the GWM to sound the headlamps on chime. The headlamps on chime sounds a 1-second chime tone continuously.

The IPC receives the headlamp on warning chime request from the GWM over the HS-CAN3.

The GWM receives the headlamp on warning chime request from the BCM over the HS-CAN1.

When a chime request is received, the IPC sends the IPC chime request message to the ACM to sound the chime.

Ignition-Engine On Warning Chime

The ignition-engine on chime informs the driver they are exiting the vehicle when the ignition has been left on (engine off) or the engine is running. When the driver exits the vehicle with the ignition on or with the engine running, the ignition-engine on warning chime sounds five 1-second chime tones. The ignition-engine on warning chime sounds through the front speakers. The IPC uses driver door ajar status, transmission gear display and vehicle speed messaged inputs to control the ignition-engine on warning chime.

The IPC receives all required messages from the GWM over the HS-CAN3.

The GWM receives the driver door ajar status message from the BCM over the HS-CAN1.

The GWM receives the transmission gear display and vehicle speed messages from the PCM over the HS-CAN1.

When a chime request is received, the IPC sends the IPC chime request message to the ACM to sound the chime.

Key-In-Ignition Warning Chime

The key-in-ignition warning chime warns the key is still in the ignition lock cylinder or the ignition is in ACC when the driver door is ajar. The key-in-ignition warning chime sounds repetitive 0.5-second chime tones from the front speakers until either the key is removed from the lock cylinder, the ignition is in RUN or the driver door is closed.

The IPC receives the key-in-ignition status from the GWM over the HS-CAN3.

The GWM receives the key-in-ignition status from the BCM over the HS-CAN1.

When a chime request is received, the IPC sends the IPC chime request message to the ACM to sound the chime.

Lane Keeping Alert Warning System Chime

The lane keeping alert warning chime alerts the driver they have removed their hands from the steering wheel. The lane keeping alert warning chime sounds three 0.25-second chime tones through the front speakers.

The IPC receives the lane keeping system hands off display request from the GWM over the HS-CAN3.

The GWM receives the lane keeping system hands off display request from the IPMA over the HS-CAN2.

When a chime request is received, the IPC sends the IPC chime request message to the ACM to sound the chime.

Message Center Warning Chime

The message center warning chime feature draws the driver's attention to the message center display to view new warning messages. There are 3 different message center warning chime types that are defined by the length of the chime tone, which are designed to create a greater sense of urgency based on the nature of the condition and message displayed in the message center.

- Informational (1-second chime)
- Soft warning (0.5-second chime)
- Hard warning (0.25-second chime)

When a new message request is received, the IPC sends the IPC chime request message to the ACM to sound the chime.

Parking Aid Chime

The parking aid system uses a visual display in the centerstack infotainment display and a chime to alert the driver objects are close to the vehicle. The parking aid chime sounds a repetitive chime tone that decreases the time off between chime tones as objects get closer to the sensor until a continuous tone is heard through the rear speakers.

The IPC receives the parking aid chime request from the GWM over the HS-CAN3.

The GWM receives the parking aid chime request from the PAM over the HS-CAN1.

When a chime request is received, the IPC sends the IPC chime request message to the ACM to sound the chime.

Parking Brake Warning Chime

The parking brake warning chime warns the parking brake is engaged when the vehicle is in motion. The parking brake warning chime sounds if the ignition is in RUN, the parking brake is engaged, and the vehicle speed is greater than 5 km/h (3 mph). The parking brake warning chime stops sounding and resets if the parking brake is released, the ignition is not in RUN, the vehicle speed is less than 5 km/h (3 mph), or after 90 seconds from the time the chime is activated. The parking brake warning chime sounds a repetitive 0.5 second chime tone through the front speakers.

The IPC receives the parking brake chime request from the GWM over the HS-CAN3.

The GWM receives the parking brake chime request from the BCM over the HS-CAN1.

When a chime request is received, the IPC sends the IPC chime request message to the ACM to sound the chime.

Perimeter Alarm Warning Chime

The perimeter alarm warning chime alerts the driver the perimeter alarm is armed when the driver door is unlocked before disarming the alarm. The IPC displays a perimeter alarm message in the message center and the perimeter alarm warning chime sounds for 12 1-second chime tones when the driver door is opened. The perimeter alarm warning chime turns off when the perimeter alarm is disarmed (either by using the key fob or turning the key to the ON position). After the twelve second warning chime duration, the warning chime stops sounding and the perimeter alarm activates, sounding the horn and flashing the turn signal lamps.

The IPC receives the perimeter alarm warning chime request from the GWM over the HS-CAN3.

The GWM receives the perimeter alarm warning chime request from the BCM over the HS-CAN1.

When a chime request is received, the IPC sends the IPC chime request message to the ACM to sound the chime.

PRNDL Not In Park Warning Chime

The IPC provides a PRNDL not in park warning chime that sounds along with the transmission not in park message center warning message to inform the driver the vehicle is not in PARK (P). The IPC displays the shift to park message and the PRNDL not in park warning chime sounds three 0.5-second chime tones if the selector lever is not in PARK (P), the ignition is OFF and the driver door is open or ajar. The IPC requires the transmission gear display mode, transport mode, vehicle speed, driver door ajar and ignition status to control the PRNDL not in park warning chime.

Refer to Shift To Park Message Display for message details.
Refer to: Message Center - System Operation and Component Description (413-01 Instrumentation, Message Center and Warning Chimes, Description and Operation).

When a chime request is received, the IPC sends the IPC chime request message to the ACM to sound the chime.

Seatbelt Warning Chime

The seatbelt warning chime warns the seatbelt is not fastened. The seatbelt warning chime sounds a repetitive 1-second chime tone for 6 seconds through the front speakers when the driver seatbelt is not fastened and the ignition is transitioned from OFF or ACC to ON or START. The seatbelt warning chime stops sounding when the seatbelt is fastened, when the ignition is transitioned from ON or START to OFF or ACC, or when the chime has sounded for 6 seconds.

The IPC receives the driver seatbelt buckle status and passenger seatbelt buckle messages from the GWM over the HS-CAN3.

The GWM receives the driver seatbelt buckle status and passenger seatbelt buckle status messages from the RCM over the HS-CAN2.

When the conditions require the seatbelt warning chime, the IPC sends the IPC chime request message to the ACM to sound the chime.

Turn Signal On Chime Tone

The IPC provides a repetitive 1-second on/off tick-tock chime tone along with visual RH or LH turn indicators to inform the driver the turn signal or hazard lamp function is on.

The IPC receives the left turn lamp on request and right turn lamp on request messages from the GWM over the HS-CAN3.

The GWM receives the left turn lamp on request and right turn lamp on request messages from the BCM over the HS-CAN1.

Turn Signal Left On Chime

The turn signal left on or turn signal minder chime uses both odometer and turn signal status messages. The turn signal left on chime sounds a repetitive 1-second chime through the front speakers when the vehicle is driven with the turn signal on for more than 3.2 km (2.0 miles).

The IPC receives the turn signal switch status and odometer count from the GWM over the HS-CAN3.

The GWM receives the turn signal switch status from the BCM over the HS-CAN1.

The GWM receives the odometer count from the PCM over the HS-CAN1.

When a chime request is received, the IPC sends the IPC chime request message to the ACM to sound the chime.

Instrument Panel Cluster (IPC) - Overview

Base Part Number: 10849

Overview

The IPC uses the following methods and functionality to alert the driver of vehicle conditions:

- gauges
- informational indicators
- warning indicators
- warning messages
- warning chimes

The base IPC uses a dot matrix message center display to display driver information.

The mid-level IPC uses a single centered 4.2" screen to display driver information.

The high-level IPC uses dual RH and LH 4.2" thin film transistor screens to display driver information.

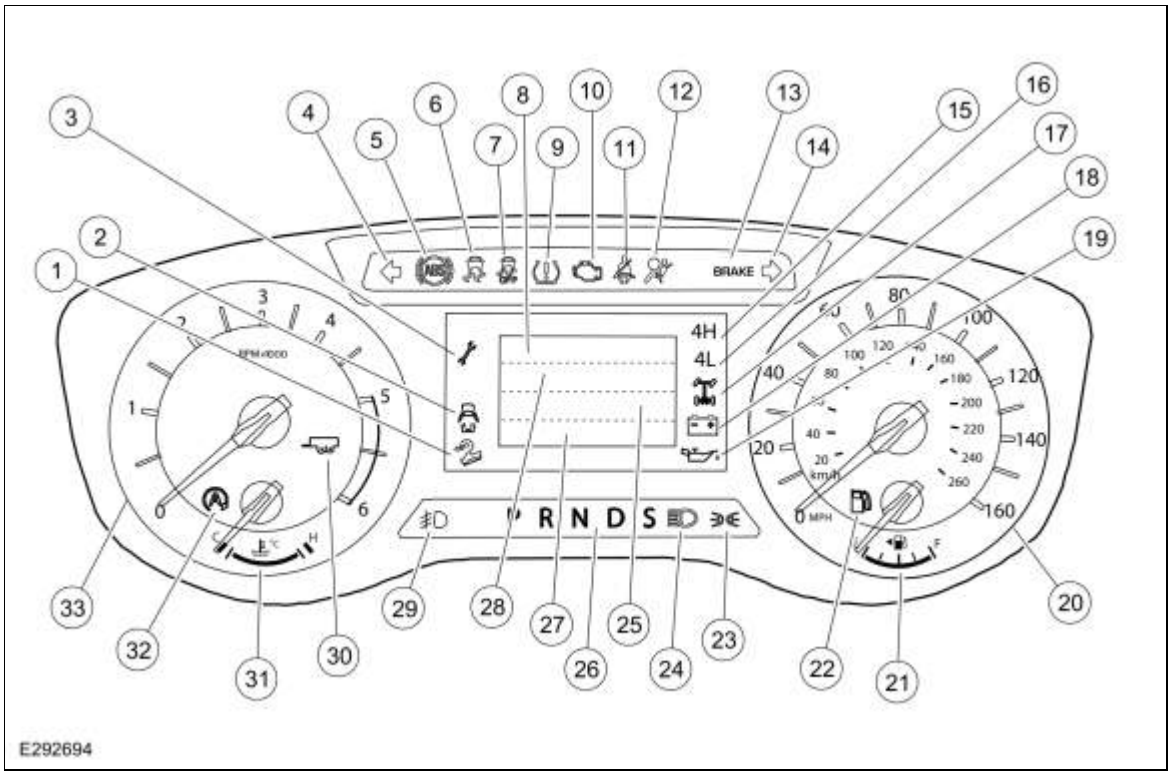
The LH display screen contains the virtual gauge displays and message center information. The RH display screen displays multimedia information (audio, phone and navigation), as well as items such as vehicle direction, outside air temperature and time.

The dual screen message center IPC utilizes mostly virtual gauges. Virtual gauges are video displays that provide information in a unique format. The exception is the speedometer, which is still an analog-type gauge. Each virtual gauge is somewhat different in how it is displayed.

Informational indicators inform the driver of conditions that exist in the vehicle. Warning indicators provide information to the driver of conditions that could potentially cause personal injury or alter vehicle performance.

IPC RTT indicators illuminate in the message center and replace the typical informational or warning indicator, using the same graphical representation. The message center displays RTT indicators in both fixed locations and in a rotating display where they are turned on in the order the request was received by the IPC.

Base IPC

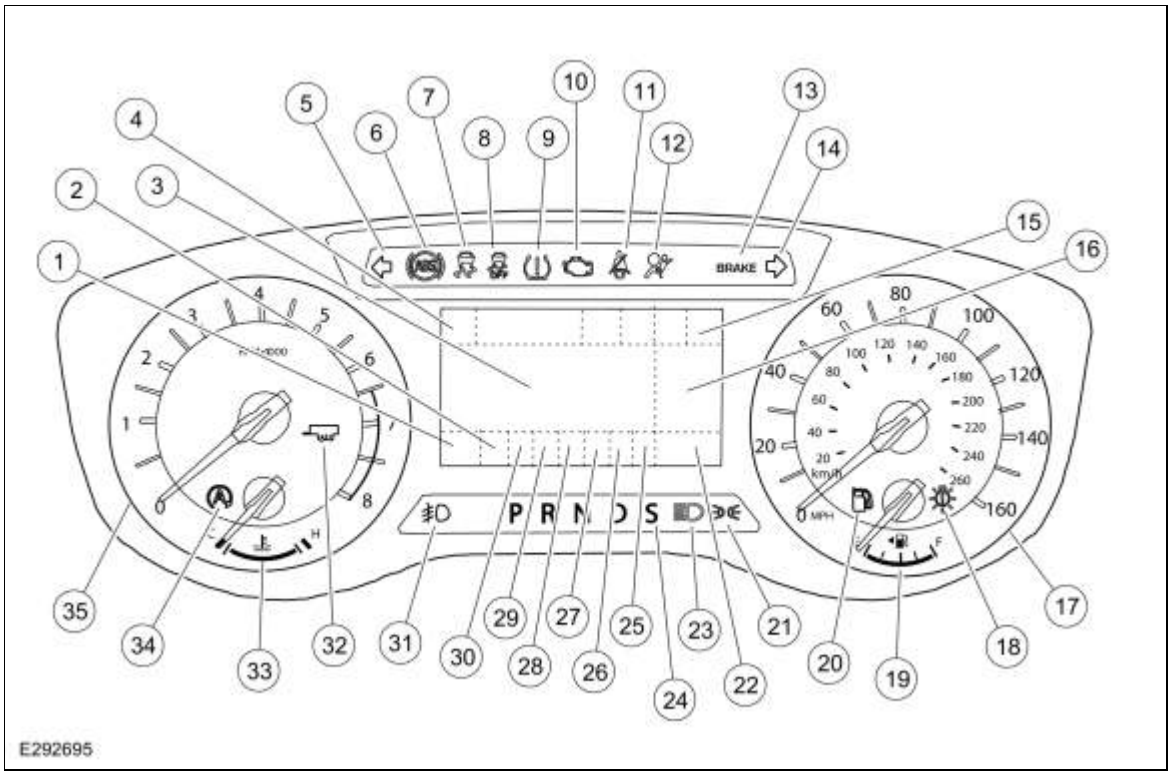


Base IPC

Item	Description
1	HDC indicator
2	Door ajar indicator
3	Powertrain malfunction (wrench) indicator
4	LH turn indicator
5	ABS warning indicator
6	Stability-traction control (sliding car icon) warning indicator
7	Stability-traction control disabled (sliding car off icon) warning indicator
8	• Rotating RTT indicators: – SelectShift – Cruise control – Compass – Outside air temperature – Rear differential lock
9	TPMS indicator
10	MIL
11	Seatbelt warning indicator/BeltMinder®
12	Airbag warning indicator
13	Brake warning indicator
14	RH turn signal indicator
15	4WD High

16	4WD Low
17	Rear differential lock indicator
18	Charging system warning indicator
19	Low engine oil pressure warning indicator
20	Speedometer
21	Fuel gauge
22	Low fuel warning indicator
23	Lights on indicator
24	High beam indicator
25	Trip odometer display
26	PRNDS display
27	Odometer display
28	Cruise control set speed display
29	Front fog lamp indicator
30	Tow/haul indicator
31	Temperature gauge
32	Auto stop-start indicator
33	Tachometer

Mid-Level IPC

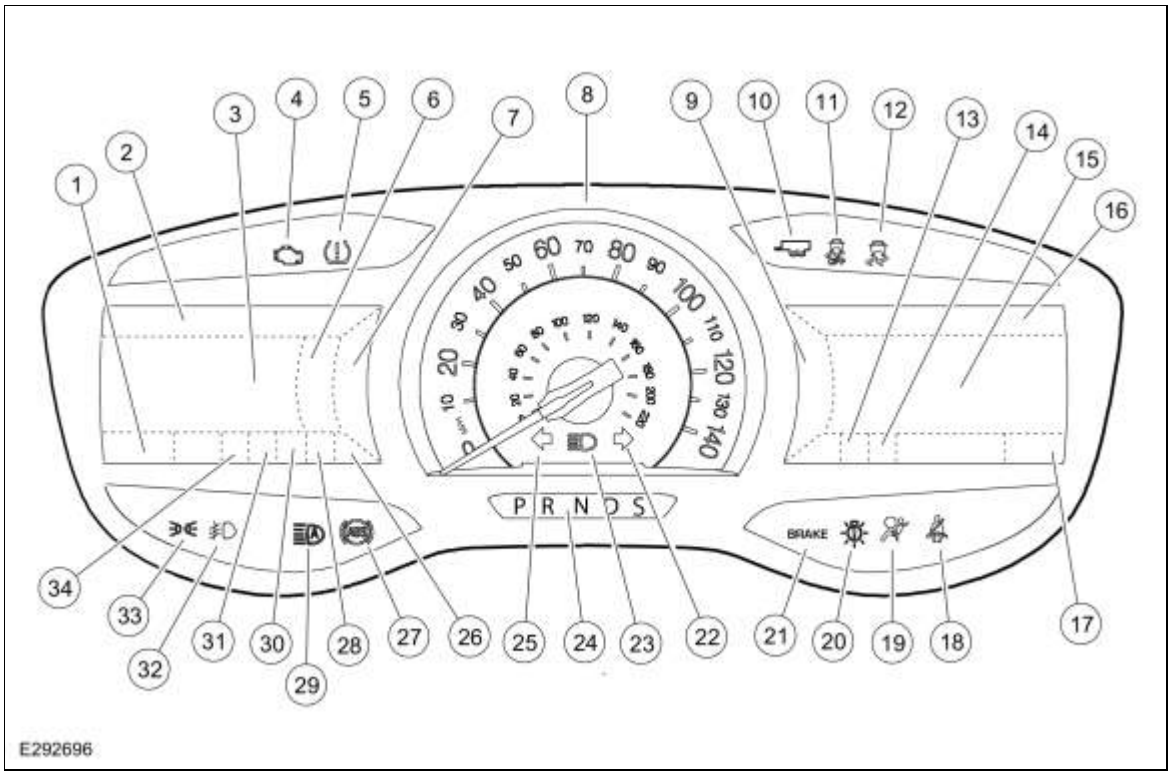


Mid-Level IPC

Item	Description
1	• SelectShift RTT indicators • Auto stop-start disabled RTT indicator
2	SelectShift gear position
3	Message center display
4	Terrain management drive mode RTT indicators
5	LH turn signal indicator
6	ABS warning indicator
7	Stability-traction control (sliding car icon) warning indicator
8	Stability-traction control disabled (sliding car off icon) warning indicator
9	TPMS indicator
10	MIL
11	Seatbelt warning indicator /BeltMinder®
12	Airbag warning indicator
13	Brake warning indicator
14	RH turn signal indicator
15	• Rotating RTT indicators: – Cruise control set speed display – Hill descent control – Trail control
16	• Rotating RTT indicators: – Driver assist information – Lane keep assist – Distance indication – Pre-collision assist distance alert
17	Speedometer
18	LED low beam headlamp out
19	Fuel gauge
20	Low fuel warning indicator
21	Parklamps/headlamps on
22	Odometer display
23	High beam indicator
24	PRNDS display
25	• Rotating RTT indicators: – Lane departure warning – Lane keeping assist on – Forward collision warning alert – Distance alert
26	• Rotating RTT indicators: – 4WD Low – 4WD High

	– Rear locking differential
27	• Rotating RTT indicators: – BLIS off – Rear seatbelt warning
28	• Rotating RTT indicators: – Engine over-temperature – Powertrain malfunction (wrench) – Low washer fluid
29	• Rotating RTT indicators: – Door ajar – Hood ajar
30	• Rotating RTT indicators: – Auto high beam – Low engine oil pressure – Charging system – Low fuel
31	Front fog lamp indicator
32	Tow/haul indicator
33	Temperature gauge
34	Auto stop-start indicator
35	Tachometer

High-Level IPC



High-Level IPC

Item	Description
1	Odometer display
2	• Rotating RTT indicators: – Terrain management drive modes – 4WD low – 4WD high – Auto stop-start
3	Message center menu display
4	MIL indicator
5	TPMS indicator
6	Virtual fuel gauge
7	Virtual tachometer
8	Speedometer
9	• Audio settings display • Navigation display • Phone settings display • Progressive range select display
10	Tow/haul indicator
11	Stability-traction control disabled (sliding car off icon) warning indicator
12	Stability-traction control (sliding car icon) warning indicator
13	Outside temperature display
14	Compass display
15	Message center audio display
16	Audio/Navigation/phone selection display
17	Clock display
18	Seatbelt warning indicator/BeltMinder®
19	Airbag warning indicator
20	LED low beam out indicator
21	Brake warning indicator
22	RH turn indicator
23	High beam indicator
24	PRNDS display
25	LH turn indicator
26	SelectShift gear indicator
27	ABS warning indicator
28	SelectShift up/down indicators
29	Auto high beam indicator
30	• Rotating RTT indicators: – Rear locking differential – BLIS off – Engine oil pressure

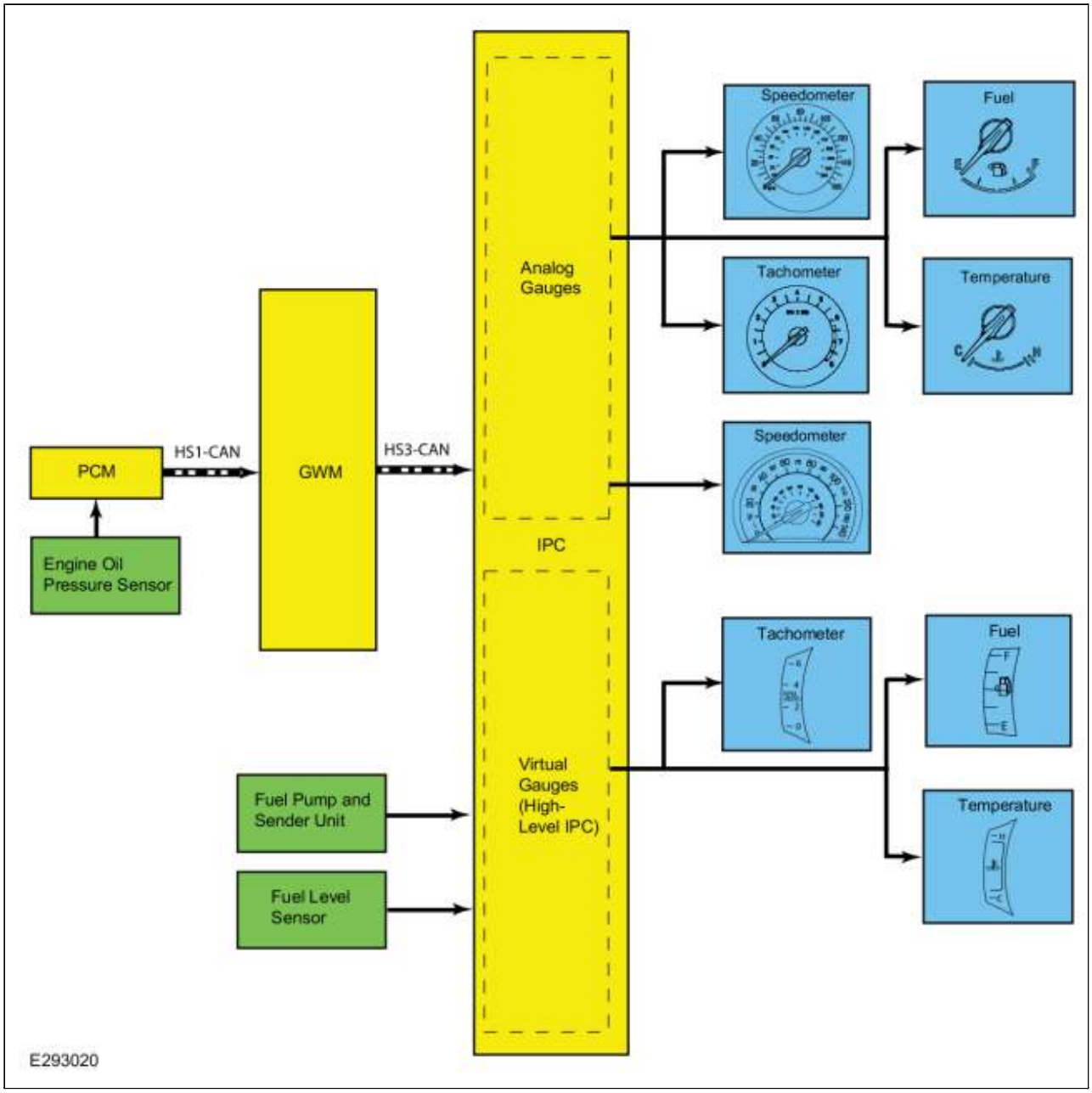
	– Charging system – Low fuel – Engine over-temperature – Powertrain malfunction (wrench) – Door ajar – Hood ajar
31	• Rotating RTT indicators: – Low washer fluid – Rear seatbelt
32	Front fog lamp indicator
33	Lights on indicator
34	• Rotating RTT indicators: – Cruise control/adaptive cruise control – Hill descent control – Trail control

Instrument Panel Cluster (IPC) - System Operation and Component Description

Base Part Number: 10849

System Operation

System Diagram - Gauges

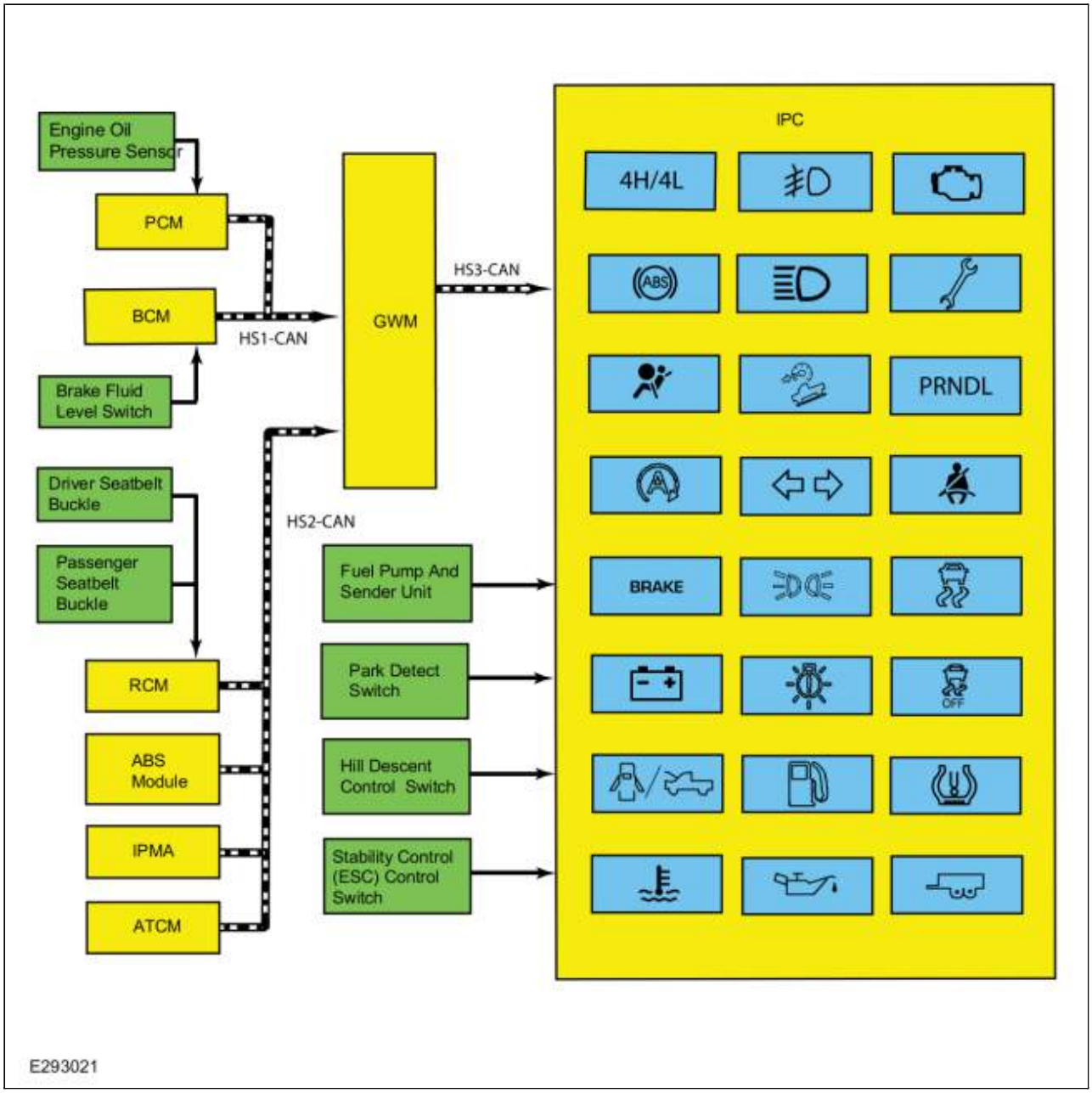


Network Message Chart - Gauges

Module Network Input Messages - IPC

Broadcast Message	Originating Module	Message Purpose
Engine coolant temperature data	PCM	Input used for the analog and virtual temperature gauge indication.
Engine overheat indication request	PCM	Input used to send the analog and virtual temperature gauge pointer to full hot.
Engine rpm data	PCM	Input used for analog and virtual tachometer indication.
Ignition status	BCM	Ignition RUN, START and accessory states required for the IPC operating modes and fault reporting.
Vehicle speed	PCM	Vehicle speed data used for the speedometer indication.

System Diagram - Indicators



Network Message Chart - Indicators

Module Network Input Messages - IPC

Broadcast Message	Originating Module	Message Purpose
AWD mode request	ATCM	Input used to control the 4WD high (4H) and 4WD low (4L) indicators.
ABS warning indicator request	ABS module	Input used to control the ABS warning indicator.
Airbag warning indicator request	RCM	Input used to control the airbag warning indicator.

Battery low state of charge	BCM	Input used to control the charging system warning indicator.
Body service required request	BCM	Input used to control the powertrain malfunction (wrench) warning indicator.
Brake warning indicator request	BCM	Brake fluid level input used to control the brake warning indicator.
Brake (red) warning indicator request	ABS module	ABS input used to control the brake warning indicator.
Driver door ajar status	BCM	Input used to control the door ajar indicator.
Driver seatbelt buckle status	RCM	Input used to control the seatbelt warning indicator.
Engine coolant temperature data	PCM	Input used to control the engine over-temperature warning indicator.
Engine oil pressure warning indicator request	PCM	Input used to control the engine oil pressure warning indicator.
Engine overheat indication request	PCM	Input used to control the engine over-temperature warning indicator.
Engine rpm data	PCM	Input used to control the low engine oil pressure warning indicator.
Engine service required request	PCM	Input used to control the powertrain malfunction (wrench) warning indicator.
Front fog lamp indicator request	BCM	Input used to control the front fog lamp indicator.
Headlamp low beam out	BCM	Input used to control the LED low beam headlamp malfunction indicator.
High beam status	BCM	Input used to control the high beam indicator.
Hill descent control indicator request	ABS module	Input used to control the hill descent control indicator.
Hood ajar status	BCM	Input used to control the door ajar indicator.
Ignition status	BCM	Ignition RUN, START and accessory states required for the IPC operating modes and fault reporting.
Left rear door ajar status	BCM	Input used to control the door ajar indicator.
Left turn lamp on request	BCM	Input used to control the LH turn indicator.
MIL request	PCM	Input used to control the MIL.
Passenger door ajar status	BCM	Input used to control the door ajar indicator.
Parking brake (red) indicator request	ABS module	Input from the ABS for the parking brake input used to control the brake warning indicator.
Parklamp status	BCM	Input used to control the lights on indicator.
Passenger seatbelt buckle status	RCM	Input used to control the seatbelt warning indicator.
Powertrain drive mode status	PCM	Input used to control the tow haul indicator.
Right rear door ajar status	BCM	Input used to control the door ajar indicator.
Right turn lamp on request	BCM	Input used to control the RH turn indicator request.
Stability-traction control	ABS module	Input used to control the stability/traction control (sliding car

indicator request		icon) indicator.
Stop-start standby indicator request	PCM	Input used to control the auto stop-start indicator.
Tire pressure warning indicator	BCM	Input used to control the TPMS indicator.
Traction control off indicator request	ABS module	Input used to control the stability/traction control disabled (sliding car OFF icon) indicator.
Transmission gear display	PCM	Input used to control the PRNDS display.
Transmission gear display mode	PCM	Input used to control the PRNDS display.
Transmission service required	PCM	Input used to control the powertrain malfunction (wrench) warning indicator.
Transport mode	BCM	Input used to control the PRNDS state upon vehicle entry and at key off to conserve battery voltage when in transport mode.
Vehicle speed	PCM	Input used to confirm a park detect input concern for PRNDS indication.

Hardwired Inputs

The IPC requires hardwired inputs from components that are not on the CAN. These components are required for specific IPC functions.

The hardwired inputs are provided by the following components:

- CAN
- Fuel pump and sender unit
- Hill descent control switch
- Park detect switch (part of the gearshift lever)
- Low washer fluid switch
- Stability control (ESC) disable switch

Networked Input Messages and Default States

NOTE: *Whenever a network message is suspected as missing and confirmed by a missing message DTC (U-code), it is important to look for other symptoms that can also be present in the IPC and throughout the vehicle. Once a DTC sets in the IPC, it is helpful to review the complete message list to determine which other modules also rely on the same message and run the self-test for those modules. If the message is missing from other modules, the same or similar lost communication DTC can also be set in those modules. Confirmation of missing messages common to multiple modules can indicate the originating module is the source of the concern or the communication network may be faulted.*

For a list of all the network messages,
Refer to: Communications Network - System Operation and Component Description (418-00 Module Communications Network, Description and Operation).

The IPC uses input messages from other modules to control the gauges, informational indicators, warning indicators and message center message displays over the communication networks. The IPC receives all networked data over the HS-CAN3.

The vehicle uses 4 communication networks to transmit the data used by the IPC.

- HS-CAN1
- HS-CAN2
- HS-CAN3
- MS-CAN

For overview information,
Refer to: Communications Network - Overview (418-00 Module Communications Network, Description and Operation).

For system operation information,
Refer to: Communications Network - System Operation and Component Description (418-00 Module Communications Network, Description and Operation).

All messaged inputs to the IPC from other networks are received from the GWM over the HS-CAN3. The GWM, as the name implies, acts as a gateway to convert messages from one of the other 3 networks to the HS-CAN3, which is recognized by the IPC.

Network messages can drop out or be missing for a variety of reasons, such as high network traffic on the bus. The IPC incorporates a defined strategy for handling missing network messages based on time. The required time for a network message to be missing differs between the various gauges, indicators and message center displays. The strategy is basically the same for all indication outputs (gauges, indicators or chimes), but differs in the length of time required for the network message to be missing. If a required network message is missing or invalid for less than the programmed length of time, the gauge, indicator or message center display that requires the network message remains at the last commanded state based upon the last network message received. If the messaged input is missing for longer than the programmed length of time, the IPC output (gauge, indicator etc.) reacts according to a pre-defined default action.

For example, if the stability-traction control indicator request network message is missing for less than 5 seconds, and the stability-traction control indicator (sliding car icon) was on, the indicator remains in the on state until the next network message is received. If the network message remains missing or invalid for more than 5 seconds, the IPC sets a U-code DTC and the IPC output becomes a default action for the indicator or gauge. The indicator may default on/off or the gauge may default to the rest position.

Each indicator or gauge utilizes a different default strategy depending on the nature of the indication. Refer to the diagnostic overview descriptions located before each pinpoint test for further descriptions of the default action specific to each indicator or gauge. If the missing messaged input to the IPC returns at any time, the normal function of the gauge, indicator or message center display resumes.

It is very important to understand:

- where the input originates.
- all the information necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- which module controls the output of the feature.
- whether the module that receives the input controls the output of the feature, or whether it outputs a message over the communication network to another module.

Startup-Shutdown

The IPC provides a startup/shutdown sequence also known as a welcome/goodbye strategy. The IPC initiates and follows a progressive strategy providing increasing IPC functionality from IPC wake up to ready to drive status. This sequence begins at RKE unlock or driver door open through the ignition RUN state. During this period, the IPC provides increasing functionality from backlighting or illuminating gauge rings, gauge pointers, illuminating the PRNDS, backlighting of the message center display, displaying a message center splash screen, gauge and LED prove out, gauge sweep and finally normal IPC operation.

MyKey®

The MyKey® feature allows the customer to program a restricted driving mode that is tied to one or more keys known as a MyKey® key. The following features are provided by the IPC when a MyKey® key is being used:

- At the beginning of vehicle start up, as part of the welcome strategy, the message center greets the MyKey® driver with MYKEY ACTIVE DRIVE SAFELY displayed in the message center. If the MyKey® speed limiter feature is turned on, the message center also displays the MyKey® administrator selected top speed setting message. The MyKey® top speed selections are; 105, 110, 120 or 130 km/h (65, 70, 75, or 80 mph) or to the administrator desired setpoint.
- The IPC provides a periodic Belt-Minder® warning chime until the driver and passenger seatbelts are buckled. When the Belt-Minder® is issued, the ACM is muted and the message center displays BUCKLE UP TO UNMUTE AUDIO.
- If the MyKey® speed limiter feature is turned on and the vehicle speed approaches the selected top speed (100, 110, 120 or 130 km/h [60, 70, 75, or 80 mph]), the message center displays NEAR VEHICLE TOP SPEED along with a chime.
- If the MyKey® speed limiter feature is turned on and the vehicle speed reaches the selected top speed (105, 110, 120 or 130 km/h [65, 70, 75, or 80 mph]), the message center displays TOP SPEED MYKEY SETTING along with a chime.
- If the speed warning is selected at one of the preset values (75, 90, 105 km/h [45, 55, 65 mph]) and the vehicle approaches the preset speed, the message center displays CHECK SPEED DRIVE SAFELY along with a chime.
- At approximately 1/8 tank of remaining fuel, the IPC illuminates the low fuel message center indicator and the message center displays FUEL LEVEL LOW along with a chime.
- Traction control, Emergency Assist feature and the Do Not Disturb feature can be set to always on or user selectable in the MyKey® menu.
- If the traction control always on feature is turned on and the MyKey® driver attempts to disable the traction control, the message center displays ADVANCETRAC ON MYKEY SETTING.
- MyKey® miles driven by the MyKey® user can be found in the information display.
- The number of MyKey® programmed and administrator keys can be found in the MyKey® menu.
- The parking aid, Blind Spot Monitoring System/Cross Traffic Alert (BLIS®/CTA), lane departure alert and collision avoidance warning menus are disabled in the message center to force these features always on.

When an administrator key is in use, the IPC provides:

- a menu in the message center guiding the user to create a MyKey®. When the maximum MyKey® limit is reached, the MyKey® creation menu is no longer available.
- a menu in the message center with options for setting 6 MyKey® features:
  - MyKey® speed limiter.
  - MyKey® pre-selected speed warning.
  - MyKey® radio volume limiter.
  - traction control always on or user selectable.
  - emergency assist feature always on or user selectable.
  - do not disturb feature always on or user selectable.
- a menu in the message center with the option to clear all MyKey® programmed keys at once.
- MyKey® mileage driven by the MyKey® user can be found in system check function of the message center.
- the number of MyKey® programmed keys and administrator keys can be found in the system check function of the message center.

For information on the MyKey® features, refer to the Owner's Literature.

Configuration

The IPC contains items that are configurable. Most of the configurable items (configurable parameters) are customer preference items, which can be set with a diagnostic scan tool. The remaining configurable items can only be set through the vehicle configuration parameters.
Refer to: Module Programming (418-01 Module Configuration, General Procedures).

Prove-Out

The IPC carries out a display prove-out to verify the gauges function and all module controlled warning indicator lamps and monitored systems are functioning correctly within the IPC. The IPC provides a timed prove-out of some indicators while other indicators illuminate upon engine start up or have no prove-out. When the ignition is cycled on, the indicators illuminate to prove-out according to the following table.

Indicator	Indicator Type	Prove-Out Duration
4WD indication	Informational	3 seconds
Airbag	Warning	6 seconds
ABS	Warning	3 seconds
Brake	Informational	3 seconds
Engine oil pressure	Warning	3 seconds
Engine over-temperature	Warning	3 seconds
Low fuel	Warning	3 seconds
MIL	Informational	Engine start up
Powertrain malfunction (wrench)	Warning	3 seconds
Seatbelt	Informational	6 seconds if the seatbelt is unbuckled, turns off when the seatbelt is buckled
Stability – traction control ESC	Warning	3 seconds
Stability – traction control OFFESC OFF	Informational	3 seconds
TPMS	Warning	3 seconds

Dealer Test Mode

To enter the IPC engineering test mode or dealer test mode, begin with the ignition OFF. Press and hold the RH steering wheel switch OK button. Place the ignition ON and continue to hold the button for 5-8 seconds until the display indicates Test or Gauge Sweep. Press the up or down arrow buttons to navigate through each of the display windows. To exit the IPC dealer test mode, press and hold the OK button for 5-8 seconds or place the ignition in OFF. Each down arrow button press advances the viewing window to the next set of items.

Analog Gauges

Fuel Gauge

The IPC sends a reference voltage to the fuel level sender(s). As the fuel level changes, a float actuates the variable resistor fuel level sender, raising or lowering the fuel level signal voltage. The IPC monitors the changes in voltage from both senders and commands the fuel gauge with a corresponding movement of the pointer.

After a fuel fill up, the time for the fuel gauge to move from empty (E) to full (F) ranges from 2 seconds to 55 minutes depending on which operating mode the fuel gauge is in.

The IPC uses 4 different operating modes to calculate the fuel level:

- Anti-slosh (default mode).
- Key OFF fueling.
- Key ON fueling.
- Recovery.

The default fuel gauge mode is called the anti-slosh mode. To prevent fuel gauge changes from fuel slosh (gauge instability due to changes in fuel sensor readings caused by fuel moving around in the tank), the fuel gauge takes approximately 40 minutes to go from empty (E) to full (F).

The key OFF fueling mode (2 seconds to read empty [E] to full [F]) requires 3 conditions to be met:

- The ignition must be in the OFF mode when refueling the vehicle.
- At least 6% of the vehicle's fuel capacity must be added to the fuel tank.
- The IPC must receive a valid ignition ON fuel sensor reading within one second of the ignition being put into the RUN mode. The key ON sample readings are considered valid if the fuel sensor reading is between 10 ohms ± 2 ohms and 180 ohms ± 4 ohms.

If these conditions are not met, the fuel gauge stays in the anti-slosh mode, which results in a slow to read full (F) event.

The key ON fueling mode (approximately 60 seconds to read empty [E] to full [F]) requires the following conditions be met:

- The transmission is in PARK (P) or NEUTRAL (N).
- The ignition is in the RUN mode.
- At least 6% of the vehicle's fuel capacity must be added to the fuel tank.

In key ON fueling mode, a 30-second timer activates after the transmission is put into the PARK (P) or NEUTRAL (N) position. When the 30-second time has elapsed and at least 9% of the vehicle's fuel capacity has been added, the fuel gauge response time is 60 seconds to read from empty (E) to full (F). When the transmission is shifted out of PARK (P) or NEUTRAL (N), the fuel gauge strategy reverts to the anti-slosh mode. The key ON fueling mode prevents slow to read full events from happening if the customer refuels the vehicle with the ignition in the RUN mode.

Recovery mode is incorporated into the IPC strategy to recover from a missing fuel level input after a refueling event. Missing fuel level inputs result from intermittent opens in the fuel sensor or its circuits. Recovery mode (empty [E] to full [F] approximately 17 minutes) is initiated when the following 2 conditions are met:

- The IPC is in the anti-slosh (default) mode.
- The actual fuel level in the tank is 5% different from what is being displayed by the fuel gauge.

Speedometer

The IPC receives the vehicle speed data from the GWM over the HS-CAN3. The GWM receives the vehicle speed message from the PCM over the HS-CAN1. The PCM receives the wheel speed data from the ABS module. The PCM uses tire size stored in the vehicle configuration file along with wheel speed inputs to generate a vehicle speed signal.

Tachometer

The IPC receives the engine RPM data message from the GWM over the HS-CAN3. The GWM receives the engine RPM data message from the PCM over the HS-CAN1.

Temperature Gauge

The IPC uses 2 messages to control the temperature gauge. The first is the engine coolant temperature data, which provides the current engine temperature input to the PCM. The second message is the engine overheat indication request, which is sent by the PCM to the IPC when an overheating condition exists. When the IPC receives the engine overheat indication request message, the IPC sends the temperature gauge to full hot and turns on the over-temperature warning indicator.

The IPC receives all the temperature gauge inputs from the GWM over the HS-CAN3. The GWM receives the engine coolant temperature data and the engine overheat indication request messages from the PCM over the HS-CAN1.

Virtual Gauges

Fuel Gauge

The IPC sends a reference voltage to the fuel level sender(s). As the fuel level changes, a float actuates the variable resistor fuel level sender, raising or lowering the fuel level signal voltage. The IPC monitors the changes in voltage from both senders and commands the fuel gauge with a corresponding movement of the pointer.

After a fuel fill up, the time for the fuel gauge to move from empty (E) to full (F) ranges from 2 seconds to 55 minutes depending on which operating mode the fuel gauge is in.

The IPC uses 4 different operating modes to calculate the fuel level:

- Anti-slosh (default mode).
- Key OFF fueling.
- Key ON fueling.
- Recovery.

The default fuel gauge mode is called the anti-slosh mode. To prevent fuel gauge changes from fuel slosh (gauge instability due to changes in fuel sensor readings caused by fuel moving around in the tank), the fuel gauge takes approximately 40 minutes to go from empty (E) to full (F).

The key OFF fueling mode (2 seconds to read empty [E] to full [F]) requires 3 conditions to be met:

- The ignition must be in the OFF mode when refueling the vehicle.
- At least 6% of the vehicle's fuel capacity must be added to the fuel tank.
- The IPC must receive a valid ignition ON fuel sensor reading within one second of the ignition being put into the RUN mode. The key ON sample readings are considered valid if the fuel sensor reading is between 10 ohms ± 2 ohms and 180 ohms ± 4 ohms (gas engine).

If these conditions are not met, the fuel gauge stays in the anti-slosh mode, which results in a slow to read full (F) event.

The key ON fueling mode (approximately 60 seconds to read empty [E] to full [F]) requires the following conditions be met:

- The transmission is in PARK (P) or NEUTRAL (N).
- The ignition is in the RUN mode.

- At least 6% of the vehicle's fuel capacity must be added to the fuel tank.

In key ON fueling mode, a 30-second timer activates after the transmission is put into the PARK (P) or NEUTRAL (N) position. When the 30-second time has elapsed and at least 9% of the vehicle's fuel capacity has been added, the fuel gauge response time is 60 seconds to read from empty (E) to full (F). When the transmission is shifted out of PARK (P) or NEUTRAL (N), the fuel gauge strategy reverts to the anti-slosh mode. The key ON fueling mode prevents slow to read full events from happening if the customer refuels the vehicle with the ignition in the RUN mode.

Recovery mode is incorporated into the IPC strategy to recover from a missing fuel level input after a refueling event. Missing fuel level inputs result from intermittent opens in the fuel sensor or its circuits. Recovery mode (empty [E] to full [F] approximately 17 minutes) is initiated when the following 2 conditions are met:

- The IPC is in the anti-slosh (default) mode.
- The actual fuel level in the tank is 5% different from what is being displayed by the fuel gauge.

Speedometer

The IPC provides a tolerance that allows the speed indication to display between actual vehicle speed and 10% above vehicle speed. This means that with an actual vehicle speed of 100 km/h (54 mph), the speedometer can indicate between 100 and 110. Incorrect axle ratio, tire size or tire size configuration can potentially affect the speedometer accuracy.

Tachometer

The IPC receives the engine RPM data message from the GWM over the HS-CAN3. The GWM receives the engine RPM data message from the PCM over the HS-CAN1.

Temperature Gauge

The IPC uses 2 messages to control the temperature gauge. The first is the engine coolant temperature data, which provides the current engine temperature input to the PCM. The second message is the engine overheat indication request, which is sent by the PCM to the IPC when an overheating condition exists. When the IPC receives the engine overheat indication request message, the IPC sends the temperature gauge to full hot and turns on the over-temperature warning indicator.

The IPC receives all the temperature gauge inputs from the GWM over the HS-CAN3. The GWM receives the engine coolant temperature data and the engine overheat indication request messages from the PCM over the HS-CAN1.

Indicators

4x4 Indicators

The IPC provides 4WD Low and 4WD High indicators to indicate transmission status, including shift in progress information. It uses 4WD status display message to set the indicators. The IPC receives all the required messages from the GWM over the HS-CAN3 . The GWM receives the AWD mode request from ATCM over the HS-CAN2.

ABS Warning Indicator

The IPC receives the ABS warning indicator request message from the GWM over the HS-CAN3. The GWM receives the ABS warning indicator request message from the ABS module over the HS-CAN2. If a fault condition exists in the ABS, the ABS module sends the ABS warning indicator request message to either flash or illuminate the ABS warning indicator.

Refer to ABS/Brake/Stability-Traction Control System Indication description for information on the conditions when the ABS warning indicator is turned on.

ABS/Brake/Stability-Traction Control System Indication

The brake/stability-traction control system indication is controlled almost entirely by the ABS module. The ABS module can illuminate multiple indicators for various fault conditions. The following table provides a summary of the basic fault conditions and the indicators that are illuminated for each condition.

NOTE: *Refer to the Normal Operation and Fault Condition description before each brake/stability-traction control system indicator Pinpoint Test (PPT) for the IPC default action for network/missing message conditions.*

Event/Fault Condition	ABS Warning Indicator Status	Brake Warning Indicator Status	Stability-Traction Control Indicator Status	Stability-Traction Control Disabled Indicator Status
Parking brake applied	Off	• Flashing while applying • On when applied	Off	Off
Low brake fluid level or brake fluid level input concern	Off	On	Off	Off
Stability-traction control event	Off	Off	Flashing	Off
Stability-traction control disabled by driver	Off	Off	Off	On
Single wheel speed sensor faults	On	On	On	On
2 wheel speed sensor faults on the same axle or 3 wheel speed sensor faults	On	Flashing or on	On	On
HCU valve fault	On	On	On	On
ABS module fault	On	Flashing or on	On	On
HCU pressure sensor fault (master cylinder pressure input)	Off	On	On	On
ABS battery voltage faults	On	Flashing or on	On	On
ABS pump motor fault	On	On	On	On
ABS low brake booster vacuum or vacuum sensor fault	Off	On	Off	Off
Steering wheel angle sensor center not found fault	Off	On	On	On
ABS to CAN total failure	• Off (4x2) • On (4x4)	Off	On	On

Thermal shutdown to brake over-temperature condition	Off	Off	Off	Off
Parking brake switch fault	Off	Flashing	Off	Off
Configuration mismatch	Off	Off	Off	Off
VIN mismatch	On	On	On	On
ACC and ABS both active	Off	Off	Flashing	Off

Airbag Warning Indicator

The IPC receives the airbag warning indicator request from the GWM over the HS-CAN3. The GWM receives the airbag indicator request from the RCM over the HS-CAN2. If a SRS concern is detected, the RCM sets a DTC and the IPC illuminates the airbag warning indicator.

Auto Stop-Start Indicator

The auto stop-start indicator informs the driver of the following states:

Indicator State	System Status
Solid green	The auto stop-start feature has temporarily turned off the engine.
Solid amber	A stop-start system concern exists.
Flash in either green or amber	A system state as determined by the PCM.

The IPC receives the stop-start standby indicator message from the GWM over the HS-CAN3. The GWM receives the stop-start standby indicator message from the PCM over the HS-CAN1.

Brake Warning Indicator

The brake warning indicator informs the driver the brake fluid level is low, there is a failure in the base brake system or the park brake is applied. The IPC uses messaged inputs to control the brake warning indicator.

- Brake (red) warning indicator request
- Brake warning indicator request

The IPC receives the brake (red) warning indicator request and the brake warning indicator request messages from the GWM over the HS-CAN3.

The GWM receives the brake (red) warning indicator request from the ABS module over the HS-CAN2.

The GWM receives the brake warning indicator request from the BCM over the HS-CAN1.

Refer to ABS/Brake/Stability-Traction Control System Indication description for information on the conditions when the brake warning indicator is turned on.

Charge Warning Indicator

The IPC provides a charging system indicator along with message displays indicating the status of the

charging system. When a fault is present in the charging system, the BCM sends the battery low state of charge message to display message center warning messages and the charging system indicator. The IPC receives the battery low state of charge message from the GWM over the HS-CAN3. The GWM receives the battery low state of charge message from the BCM over the HS-CAN1.

Door-Hood Ajar Indicator

The IPC provides a door ajar or hood ajar indicator along with message displays to indicate the status of the doors and hood. The BCM monitors each of the ajar inputs (driver, passenger, left rear, right rear and hood) and sends a door ajar status or hood ajar status message to the GWM over the HS-CAN1. The IPC receives the driver door ajar status or hood ajar status messages from the GWM over the HS-CAN3 to display the door ajar indicator or hood ajar indicator and corresponding warning message.

Engine Over-Temperature Warning Indicator

The IPC provides an indicator to alert the driver the engine is over temperature. The IPC receives the engine overheat indication request and the engine coolant temperature data from the GWM over the HS-CAN3. The GWM receives the engine overheat indication request and the engine coolant temperature data message from the PCM over the HS-CAN1.

Fog Lamp Indicator - Front

The IPC provides a front fog lamp indicator request to indicate when the front fog lamps are on. The IPC receives the front fog lamp indicator request message from the GWM over the HS-CAN3. The GWM receives the front fog lamp indicator request message from BCM over HS-CAN1.

High Beam Indicator

The high beam indicator informs the driver that the high beams are on. The IPC receives the high beam status message from the GWM over the HS-CAN3. The GWM receives the high beam status message from the BCM module over the HS-CAN1.

Hill Descent Control

The IPC provides a hill descent control indicator to indicate when the HDC is in ready mode, active control mode, or in an over- temperature mode with the system cooling. The IPC receives the hill descent control indicator request message from the GWM over the HS-CAN3. The GWM receives the hill descent control indicator request message from ABS module over HS-CAN2.

LH/ RH Turn Signal/Hazard Indicator

When the multifunction switch is in the LH or RH turn position or if the hazard switch is on, the BCM sends the left turn lamp on request or the right turn lamp on request to the GWM over the HS-CAN1. The GWM sends the left turn lamp on request or the right turn lamp on request to the IPC over the HS-CAN3. Upon receipt of the applicable turn signal on/off message, the IPC flashes the turn signal indicator on and off.

Lights On Indicator

When the parking lamps are turned on, the BCM sends the park lamp status message to the GWM over the HS-CAN1. The IPC receives the park lamp status message from the GWM over the HS-CAN3 to illuminate the lights on indicator.

LED Low Beam Malfunction Indicator

The LED low beam malfunction indicator illuminates when the LED bulb in the headlamp is not functioning correctly. The IPC receives the headlamp low beam out message from the GWM over the HS-CAN3. The

GWM receives the headlamp low beam message from the BCM over the HS-CAN1.

Low Engine Oil Pressure Warning Indicator

The IPC uses the engine oil pressure warning indicator request and engine RPM data to control the low engine oil pressure indicator. The engine oil pressure sensor is hardwired to the PCM. The PCM provides the engine oil pressure warning indicator status request and the engine RPM data to the GWM over the HS-CAN1. The GWM provides the engine oil pressure warning indicator status request and engine RPM data to the IPC over the HS-CAN3. The IPC requires engine RPM above 400 RPM before the message center displays the low engine oil pressure warning.

MIL

The IPC receives the MIL request from the GWM over the HS-CAN3. The GWM receives the MIL request from the PCM over the HS-CAN1.

Powertrain Malfunction (Wrench) Warning Indicator

The IPC provides a powertrain malfunction (wrench) warning indicator to indicate:

- a BCM concern.
- a gearshift concern.
- a powertrain concern (Electronic Throttle Control [ETC]).
- a transmission concern.

The IPC receives all applicable messages from the GWM over the HS-CAN3.

The GWM receives the body service required message from the BCM over the HS-CAN1.

The GWM receives the engine service required and the transmission service required messages from the PCM over the HS-CAN1.

PRNDS Indicator

The IPC uses the following messages to control the PRNDS:

- Battery shed level request
- Ignition status
- Transmission gear display
- Transmission gear display mode
- Transport mode
- Vehicle speed

The IPC receives all messaged inputs from the GWM over the HS-CAN3.

The GWM receives the transmission gear display, transmission gear display mode and vehicle speed messages from the PCM over the HS-CAN1.

The GWM receives the ignition status, transport mode and battery shed level request messages from the BCM over the HS-CAN1.

When the vehicle is in transport mode or during battery load shed operation, the PRNDS is not displayed upon entry or exit from the vehicle to prevent battery drain during longer periods of time when the vehicle is not in

use, such as those experienced during vehicle transport.

The IPC also uses a park position detect switch (part of the selector lever) input to signal the IPC the shift lever is fully seated in the PARK (P) position. The IPC compares the park position detect switch input with the transmission gear display message sent from the PCM.

Seatbelt Warning Indicator

The RCM monitors the driver seatbelt position through the seatbelt buckle switch. The RCM provides the driver seatbelt buckle status message to the GWM over the HS-CAN2. The GWM provides the driver seatbelt buckle status message to the IPC over the HS-CAN3 to either turn on or turn off the seatbelt warning indicator.

Stability-Traction Control Indicator (Sliding Car Icon) ESC

The stability-traction control indicator (sliding car icon) informs the driver of the current status of the stability and traction control systems. The stability-traction control indicator illuminates when a fault condition exists or when an active traction control or stability control event is occuring. The IPC receives the stability-traction control indicator request message from the GWM over the HS-CAN3. The GWM receives the stability-traction control indicator request message from the ABS over the HS-CAN2.

Refer to ABS/Brake/Stability-Traction Control System Indication description for information on the conditions when the stability-traction control indicator (sliding car icon) is turned on.

Traction Control Disabled Indicator (Sliding Car OFF Icon) ESC OFF

The stability-traction control is configured on/off from the console mounted switch. When the driver enables or disables the stability-traction control system, the ABS module sends the traction control off indicator request message to the GWM over the HS-CAN2. The GWM sends the traction control off indicator request message to the IPC over the HS-CAN3 to illuminate or turn off the stability-traction control disabled indicator (sliding car OFF icon) based upon the system state.

Refer to ABS/Brake/Stability-Traction Control System Indication description for information on the conditions when the stability-traction control disabled indicator (sliding car OFF icon) is turned on.

When a MyKey® administrator has set the AdvanceTrac® feature to always on and a MyKey® programmed key is in use, the stability-traction control system cannot be disabled. The menu selection in the message center used to disable the stability-traction control system does not display when a MyKey® is in use, but remains active for the MyKey® administrator to select the AdvanceTrac® always on feature off. The stability-traction control indicator still functions normally to indicate a stability-traction control system fault and a stability-traction control active event.

TPMS Warning Indicator

The IPC receives the tire pressure warning indicator message from the GWM over the HS-CAN3. The GWM receives the tire pressure warning indicator message from the BCM over the HS-CAN1.

If the BCM determines the tire pressure has exceeded the low tire pressure limits, the tire pressure warning indicator request message is sent to the IPC to illuminate the TPMS warning indicator.

If a TPMS monitor or sensor fault condition exists, the BCM sends the tire pressure warning indicator request message to the IPC to flash the TPMS warning indicator. The IPC flashes the TPMS warning indicator for 75 seconds then turns the indicator on solid.

Tow Haul Indicator

The tow haul indicator illuminates to indicate the tow haul feature has been switched on. The IPC receives the

powertrain drive mode status message from the GWM over the HS-CAN3. The GWM receives the powertrain drive mode status message from the PCM over the HS-CAN1.

Component Description

Brake Fluid Level Switch

The brake fluid level switch is mounted in the master cylinder reservoir and is hardwired to the BCM through a signal circuit. The brake fluid level switch is grounded through a separate body ground circuit. The BCM provides a reference voltage to the brake fluid level switch. When the brake fluid level is low the switch closes, pulling the reference voltage low. When the brake fluid level is high, the switch opens, sending the reference voltage high on the signal circuit to the BCM.

Fuel Level Sender

The fuel level sender is mounted to the fuel pump and sender unit or the fuel level sensor. The fuel level sender is a dual sweep potentiometer style resistor connected to a float mechanism. The dual sweep design provides a second resistance measurement that reduces the intermittent loss of data due to corrosion between the resistor wires and the sweep arm. As the fuel level changes, the float rises or falls with the fuel level moving the sweep arm across the resistor wires. This movement either increases or decreases the resistance through the unit. The fuel level sensor for gasoline engines resistance ranges from 180 ohms +/- 4 ohms at empty (E) and 10 ohms +/- 2 ohms at full (F). The fuel level sensor for Flex fuel (E100) resistance ranges from 500 ohms ± 4 ohms at empty (E) to 50 ohms ± 2 ohms at full (F). When the fuel level is low, the fuel level sensor resistance is high. When the fuel level is high, the fuel level sensor resistance is low. The fuel level sensor is hardwired to the IPC through separate signal and return circuits.

Both the fuel pump and sender unit and fuel level sensor are hardwired to the IPC through separate signal and return circuits. The fuel level return circuits are grounded internally in the IPC. The IPC provides a reference voltage on the fuel level signal circuit. As the fuel level changes, the change in resistance raises or lowers the fuel level signal voltage depending on the resistance of the fuel level sender.

IPC

The IPC provides the driver with a system status and alerts the driver when certain conditions exist in the vehicle. The IPC receives the ignition status from the BCM through the GWM over the HS-CAN3.

The IPC requires PMI when the IPC is replaced. The IPC lens and mask assembly are replaceable as an assembly.

Engine Oil Pressure Sensor

The engine oil pressure sensor is hardwired to the PCM through voltage reference (VREF), signal and return circuits. The PCM provides the sensor voltage supply on the VREF circuit and monitors the change in voltage through the signal and return circuits as the engine oil pressure changes.

Park Position Detect Switch

The park position detect switch is hardwired to the IPC through a single signal circuit and is grounded by a separate circuit through the selector lever. The IPC provides a reference voltage to the park position detect switch. When the selector lever is in PARK (P), the park position detect switch closes to ground, pulling the reference voltage low. When the selector lever is moved out of PARK (P), the park position detect switch opens to ground, sending the reference voltage high to the IPC.

Seatbelt Buckle Sensor

The seatbelt buckles contain integrated sensors that are Hall-effect switches. The seatbelt buckle sensors are

serviced as one component with the seatbelt buckle.

Message Center - Overview

Overview

The message center is an integral part of the IPC that receives and acts upon much of the same information that is input and used to operate the IPC (gauges, informational indicators, and warning indicators). The message center uses both hardwired and network-based inputs to receive information. The message center functionality is controlled through the message center switch (part of the LH steering wheel switch.

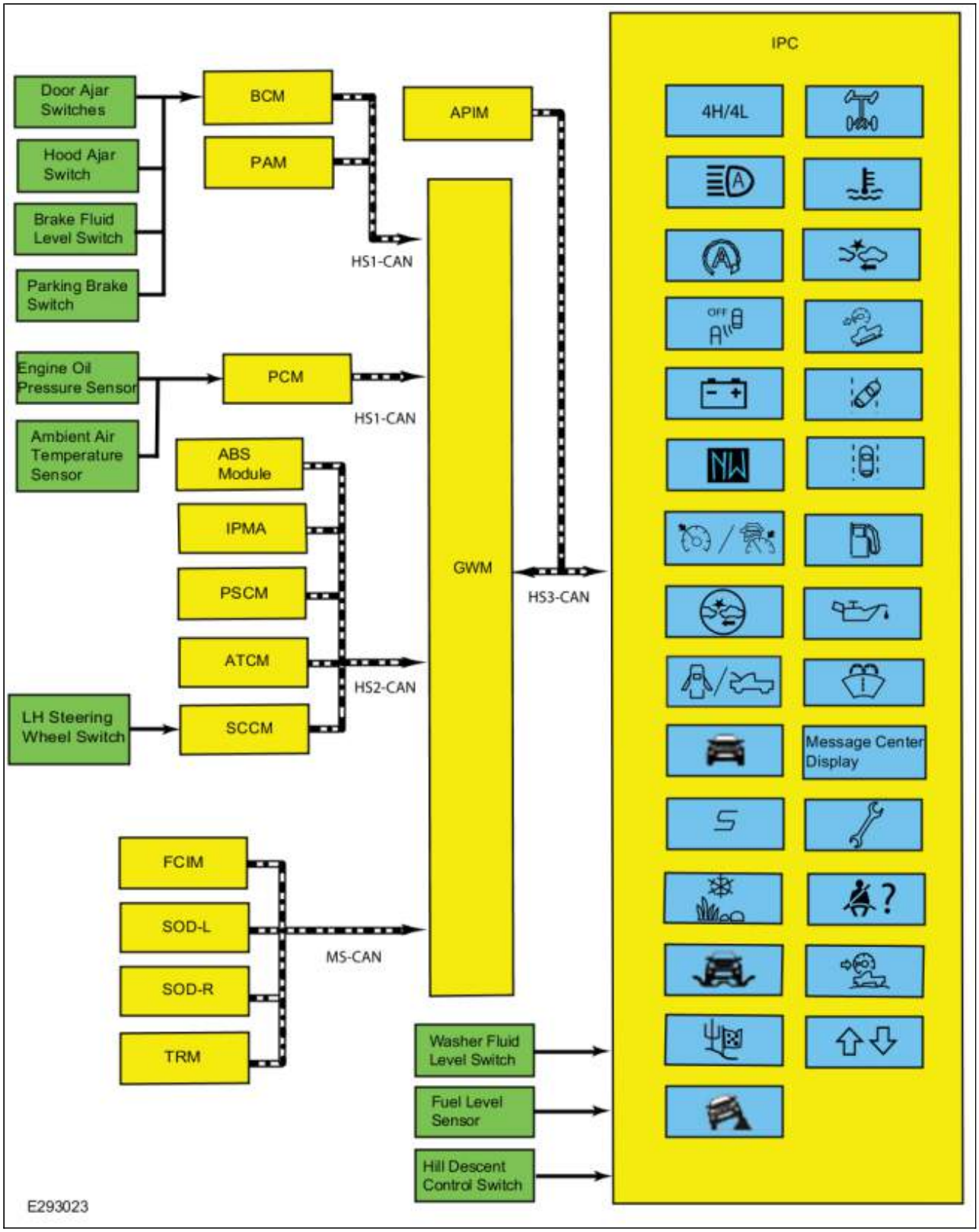
Whenever conditions are present that require a warning message, the message center replaces the last selected display with the new warning display. Once the message is reset or cleared, the message center returns to the last selected display. If multiple warnings are present, the message center rotates through the messages, displaying each warning for approximately 4 seconds. Warning messages are also generally associated with other observable outputs of the IPC (gauges, informational indicators and RTT (message center) indicators). For example, when the BCM detects a low brake fluid condition, the BCM sends the IPC a request through the GWM to illuminate the brake warning indicator and a request to display the LOW BRAKE FLUID message in the message center. This allows the message center to be a more informative supplement to the IPC gauges and indicators.

The system warning messages alert the operator to possible concerns or malfunctions in the vehicle operating systems. System warning messages can be stand-alone messages, but are often associated with another form of indication, such as a gauge or an indicator. The message center displays the last selected feature if there are no additional warning messages. Once a warning message has been displayed, the message must be acknowledged to allow full functionality of the message center by pressing the OK button to acknowledge and clear the warning message. For a complete list of warning messages displayed, refer to the message center section of the Owner's Literature.

Message Center - System Operation and Component Description

System Operation

System Diagram



Network Message Chart

Module Network Input Messages - IPC

Broadcast Message	Originating Module	Message Purpose
AWD mode request	ATCM	Input used to display the 4WD high (4H) and 4WD low (4L) RTT indicators.
Adaptive cruise control gap distance display	IPMA	Input used to display the adaptive cruise control gap distance.
Adaptive cruise control warning request	IPMA	Input used to display the adaptive cruise control warning messages.
Ambient air temperature	PCM	Input used to display the outside air temperature.
Ambient air temperature filtered	FCIM	Filtered input used to display the outside air temperature.
Auto high beam indication request	IPMA	Input used to control the auto high beam RTT indicator.
Battery low state of charge	BCM	Input used to control the charging system RTT indicator, check charging system warning message and load shed messages.
Body service required request	BCM	Input used for the BCM controlled system faults input to control the powertrain malfunction (wrench) RTT indicator.
Brake fluid level low message request	BCM	Input used to display the low brake fluid level message center message and the parking brake fault message.
Brake (red) warning indicator request	ABS module	Input used to display the message center brake system messages and to display the parking brake message center warning messages.
Camera status	IPMA	Input used to display the lane keeping system camera malfunction message.
Check fuel fill inlet message request	PCM	Input used to display the check fuel fill inlet message.
Child lock message display request	BCM	Input used to display the child lock system fault message.
Compass direction	APIM	Input used to display the current compass heading.
Cross traffic alert left sensor status	SODL	Input used to control the blind spot information system RTT indicator and message center messages.
Cross traffic alert left status	SODL	Input used to control the blind spot information system RTT indicator and message center messages.
Cross traffic alert right sensor status	SODR	Input used to control the blind spot information system RTT indicator and message center messages.
Cross traffic alert right status	SODR	Input used to control the blind spot information system RTT indicator and message center messages.
Cruise control set speed display	PCM	Input used to indicate the cruise control set speed displayed in the message center.
Cruise control override	PCM	Input used to control the adaptive cruise control set speed display when the cruise control is overridden by the driver.
Cruise control status	PCM	Input used to control the cruise control RTT indicator and message display based on the system status.
Driver alert warning display	IPMA	Input used to control the driver alert warning display.

Driver door ajar status	BCM	• Input used for the door ajar RTT indicator and warning message. • Input used for the engine on warning message (push button start). • Input used to control the PRNDL not in park warning message.
Driver rear seat buckle status	RCM	Input used to control the rear seatbelt monitor RTT indicator.
EPAS failure	PSCM	Input used to control the service power steering message display.
Engine coolant temperature data	PCM	Input used to control the over-temperature RTT indicator and engine over-temperature warning message.
Engine oil life	PCM	Input used for the engine oil life display and oil change messages.
Engine oil pressure warning indicator request	PCM	Input used to control the low engine oil pressure RTT indicator and the low engine oil pressure message center warning.
Engine overheat indication request	PCM	Input used to control the engine over-temperature RTT indicator and engine over-temperature warning message.
Engine rpm data	PCM	• Input used to control the low engine oil pressure RTT indicator and warning message. • Input used to calculate the Average Fuel Economy (AFE) and DTE.
Engine service required request	PCM	Input used for the powertrain Electronic Throttle Control (ETC) component to control the powertrain malfunction (wrench) RTT indicator.
EPAS failure	PSCM	Input used to display the steering system warning messages.
Factory mode	BCM	Input used to indicate whether the vehicle is set in factory mode or transport mode, display the PRNDL not in park warning message and to display the appropriate message and power down items such as the PRNDL at key off to conserve the battery.
Forward collision warning indicator request	IPMA	Input used to display the forward collision alert warning indicator and malfunction messages.
Forward distance alert warning indicator request	IPMA	Input used to control the distance alert warning indicator.
Fuel alcohol percent	PCM	Input used to calculate the Average Fuel Economy (AFE) and DTE.
Fuel flow volume display	PCM	Input used to calculate the Average Fuel Economy (AFE) and DTE.
Hill descent control indicator request	ABS module	Input used to control the hill descent control RTT indicator and message center messages.
Hill start assist status	ABS module	Input used to display the hill start status messages.
Hood ajar status	BCM	Input used to control door ajar RTT indicator and the hood ajar warning message.
Ignition key type	BCM	Input used to calculate the Average Fuel Economy (AFE) and DTE for MyKey® settings.
Ignition status	BCM	• Ignition RUN, START and accessory states required for the IPC operating modes and fault reporting. • Input used to display the PRNDL not in park warning message. • Input used to control the odometer display.

Immobilizer message request	BCM	Input used to display the passive entry (no key detected, place key in backup slot, restart now, key programming and accessory power active).
Lane keeping system active display	IPMA	Input used to control the lane keeping aid on RTT indicator and lane keeping aid display.
Lane keeping system status display	IPMA	Input used to control the lane keeping system off RTT indicator and the lane keeping system fault messages.
Lane keeping system hands off display	IPMA	Input used to display the lane keeping system keep hands on the steering wheel warning message.
Left rear door ajar status	BCM	Input used for the door ajar RTT indicator and the left rear door ajar warning message.
Lock system message request	BCM	Input used for the switch inhibit and child lock malfunction warning messages.
Manual shift indicator display	PCM	Input used to control the SelectShift RTT indicators.
Odometer count	PCM	• Input used to control the odometer display. • Input used to calculate the Average Fuel Economy (AFE) and DTE.
Parking aid rear status	PAM	Input used to display the parking aid malfunction message.
Parking brake chime request	BCM	Input used to display the message center brake system messages.
Parking brake message request	ABS module	Input used to display the parking brake status messages.
Parking brake (red) indicator request	ABS module	Input used to display the parking brake status messages.
Passenger door ajar status	BCM	Input used for the door ajar RTT indicator and the passenger door ajar warning message.
Passenger rear seatbelt buckle status	RCM	Input used to control the rear seatbelt monitor RTT indicator.
Perimeter alarm chime request	BCM	Input used to display the perimeter alarm message when the vehicle is entered before deactivating the perimeter alarm.
Power pack status	PCM	• Input used for the engine on warning message (push button start) • Input used to calculate the Average Fuel Economy (AFE) and DTE.
Rear belt monitor	RCM	Input used to display rear belt monitor status.
Rear differential fault status	PCM	Input used to control the check locking differential warning message.
Rear differential lock indicator request	PCM	Input used to control the electronic locking differential RTT indicator and warning message.
Remote start status	BCM	Input used to control the remote start informational message display.
Right rear door ajar status	BCM	Input used for the door ajar RTT indicator and the right rear door ajar warning message.

Side obstacle detect status-left	SODL	Input used to control the blind spot information system RTT indicator and message center messages.
Side obstacle detect status-right	SODR	Input used to control the blind spot information system RTT indicator and message center messages.
Starting system message request	PCM	Input used to display starting system messages.
Stability-traction control chime request	ABS module	Input used to control the service AdvanceTrac® and traction control off warning displays. Also used to control the traction control on/off status messages.
Starting system message request	PCM	Input used to display the starting system message center messages.
Steering wheel angle	ABS module	Input used to control the terrain management off road display.
Steering wheel lock message request	BCM	Input used to control the steering wheel lock system messages.
Steering wheel message center switch data	SCCM	Input used to control the message center navigation and functions.
Stop-start message request	PCM	Input used to control the auto stop-start warning messages.
Stop-start standby indicator	PCM	Input used to control the auto stop-start RTT indicator.
Terrain mode status display request (Raptor only)	ATCM	Input used to control the terrain management drive mode RTT indicators (normal, sport, grass/gravel/snow, mud/sand, Baja, rock) and warning messages.
Terrain mode indicator display (Raptor only)	ATCM	Input used to control the terrain management drive mode RTT indicators (normal, sport, grass/gravel/snow, mud/sand, Baja, rock) and warning messages.
Tire pressure placard data	BCM	Input used for the tire pressure displays by tire location.
Tire pressure system status	BCM	Input used to display specific tire training instructional messages and TPMS fault messages.
Trail control message request	ABS module	Input used to display the trail control warning messages.
Trail control set speed display	ABS module	Input used to display the trail control set speed RTT indicator.
Trail control status	ABS module	Input used to display the trail control RTT indicator.
Trailer sway event status	ABS module	Input used to display the trailer sway event in progress message.
Transmission service required	PCM	Input used for the transmission component to control the powertrain malfunction (wrench) RTT indicator and transmission warning messages.
Transmission gear display	PCM	• Transmission gear selection input used for the PRNDL display. • Input used for the engine on (push button start) warning message.
Transmission gear lever position	PCM	Input used to display the manual (M) in the PRNDL.
Transport mode	BCM	• Input used to indicate whether the vehicle is set in factory mode or transport mode, display the PRNDL not in park warning

		message and to display the appropriate message and power down items such as the PRNDL at key off to conserve the battery. • Input used to control the odometer display.
Trip odometer verify	PCM	Input used to control the trip odometer display.
Vehicle configuration data	BCM	Input used to control the odometer display.
Vehicle dynamics SOS	ABS module	Input used to control the spin-out detected message.
Vehicle pitch angle display	ABS module	Input used to control the terrain management off road display.
Vehicle roll angle display	ABS module	Input used to control the terrain management off road display.
Vehicle speed	PCM	• Input used to control the PRNDL not in park warning message. • Input used to display the digital speedometer. • Input used to control the engine on warning message (push button start). • Input used to calculate the Average Fuel Economy (AFE) and DTE.

Module Network Input Messages - PCM

Broadcast Message	Originating Module	Message Purpose
Engine oil life reset request	IPC	Input used to reset the engine oil life.

Message Center Displays

Adaptive Cruise Control

When the adaptive cruise control system is active, the IPC provides a message center lead vehicle image display that indicates that the adaptive cruise control system detects a lead vehicle. The IPC receives the adaptive cruise control gap distance display message from the GWM over the HS-CAN3. The GWM receives the adaptive cruise control gap distance display message from the IPMA over the HS-CAN2.

Compass Display

On the IPC, the compass is displayed as a 1 or 2 character display in the message center that indicates the current direction of the vehicle (N, NE, E, SE, S, SW, W, or NW). The IPC receives the compass direction from the APIM over the HS-CAN3.

Digital Speedometer

NOTE: *The digital speed displayed can differ slightly from the analog speedometer due to stepper motor-pointer movement, indication tolerances and gauge bias.*

The IPC provides a redundant digital speedometer display in the message center. The digital speedometer display operates using the same vehicle speed inputs used to control the analog speedometer. See Speedometer.

Refer to: Instrument Panel Cluster (IPC) - System Operation and Component Description (413-01 Instrumentation, Message Center and Warning Chimes, Description and Operation).
The IPC utilizes software that modifies the display to account for differences between the speedometer gauge indication and the digital display resulting from built in biasing of the indication and tolerances in speedometer stepper motor/needle movement.

DTE/Average Fuel Economy (AFE)

The DTE is calculated in the IPC using the Running Average Fuel Economy (RAFE), which is the fuel economy over the last 480 km (300 miles), and the fuel level input from the fuel sender(s) to determine how many miles the vehicle can be driven based on the remaining fuel in the tank. The DTE can vary in the short term by up to 80 km (50 miles), but is usually within 16 km (10 miles). Even if the fuel economy is relatively constant, the DTE can be off over an 80 km (50 mile) range by -24% to +38%. The DTE display and the fuel gauge both use the fuel level input from the fuel tank to provide their respective functions. If the fuel gauge doesn't function correctly, both the fuel gauge and the DTE display are affected.

The IPC defaults to a preset baseline mpg (English) or liters/100 km (metric) when the battery is initially connected and changes based on driving habits and conditions.

NOTE: *The actual DTE can be higher or lower than the DTE displayed in the message center due to changes in driving conditions. It is important to understand how the DTE is calculated and the factors that impact the DTE display when determining how to address any DTE concerns.*

Since the DTE is calculated and averaged over a longer period of time (480 km [300 miles]), varying driving conditions can have a significant impact on the current or short term DTE as opposed to the displayed DTE. This difference often leads to customer complaints of incorrect or invalid DTE. The following list provides some (not all) of the driving conditions that may lead to an incorrect or fluctuating DTE concern:

- Changing between towing/not towing.
- Changing driving between city and highway.
- Allowing the vehicle to idle for long periods of time.
- Using the remote start feature frequently to allow the vehicle to warm up, particularly when parked on a grade.
- Parking or driving on grades.
- Inconsistent use of gasoline or E85 fuels.
- Over-fueling or not filling the tank completely (partial refueling).

To better illustrate the affects of how driving conditions can affect DTE, refer to the following 2 examples. The first example below illustrates how the following observations are normal and expected since the low fuel reminder is triggered from a fuel volume and not from a fixed distance to empty.

- If while driving, the low fuel reminder (low fuel indicator and low fuel warning message) displays when the DTE equals 94.4 km (59 miles) and the driver adds 11.36 L (3 gallons) of fuel, the new DTE may become 124.8 km (78 miles). After continued driving, the low fuel reminder may now display when the DTE equals 83.2 km (52 miles).

The second example (below) illustrates what occurs when idling on an incline. In this example, the customer should be made aware of how the condition will correct after a few minutes of idling on a level surface.

- If the customer stops and parks the vehicle on an incline in a driveway, then in the morning remote starts the vehicle, allowing the engine to idle, the DTE may now equal 184 km (115 miles). As the customer drives, the low fuel reminder displays when the DTE equals 148.8 km (93 miles). Finally, after 5 more minutes of driving, the DTE is back to 80 km (50 miles).

Engine Oil Life Message Center Display

The IPC provides message center messages to inform the driver about the engine oil life status and when an engine oil change is required. The duration of the interval between engine oil changes is calculated in the PCM and varies due to driving conditions. The PCM assumes a base mileage of 16,090 km (10,000 mi) or 1 year for normal driving. However, this number is adjusted down for conditions such as high engine temperature, high engine rpm, use of flex fuel and possibly low engine oil level. The PCM calculates and provides the engine oil life percent message to the IPC. The engine oil change minder can be reset at any time by the driver.

The PCM receives the engine oil life data reset request from the GWM over the HS-CAN1. The GWM receives the engine oil life data reset request from the IPC over the HS-CAN3.

The IPC receives the engine oil life message from the GWM over the HS-CAN3.

The GWM receives the engine oil life message from the PCM over the HS-CAN1.

Factory-Transport Mode Display

During vehicle build, some modules, such as the IPC and the BCM, are set in factory mode. While in the factory mode the IPC displays FACTORY MODE CONTACT DEALER in the message center. If the vehicle is set in factory mode, the system does not automatically exit the mode and must be manually set to either the transport or normal operation mode.

When the vehicle build is complete, the vehicle is set to transport mode. While in transport mode, the IPC displays TRANSPORT MODE CONTACT DEALER in the message center. Transport mode is used to reduce the drain on the battery during longer periods where the vehicle is not used. Various systems may be altered or are disabled when in the transport mode. The vehicle automatically reverts to normal operation mode after being driven 80 km (50 mi).

The IPC receives the transport mode message from the GWM over the HS-CAN3. The GWM receives the transport mode message from the BCM over the HS-CAN1.

Lane Keeping System

The lane keeping system combines the lane keeping alert and lane keeping aid systems. The lane keeping alert system alerts the driver of unintentional drifting outside of the lane and the lane keeping aid system corrects the vehicle steering to keep the vehicle in the center of the lane. The IPC provides a lane keeping display as an overhead view of the vehicle in the middle of a lane with right and left lane markers to indicate the vehicle position with relation to the lane markings as well as overlay or popup messages to alert the driver when they are drifting out of their lane. The lane markers change color to indicate the condition associated with a specific condition and action or warning as controlled by the lane keeping system. The IPC also provides a lane keeping system message center off indicator to inform the driver that the lane keeping system is turned off. When the lane keeping system is turned off, the IPC turns on the lane keeping system RTT and turns off the lane keeping system display.

The IPC receives the camera status, lane keeping system status display and the lane keeping system hands off display messages from the GWM over the HS-CAN3.

The GWM receives the lane keeping system status display, the lane keeping system hands off display and camera status messages from the IPMA over the HS-CAN2.

MyKey® Function Displays

The IPC provides message center displays for the MyKey® feature. MyKey® displays are controlled through the IPC software based on the MyKey® settings configured through the message center and the type of key in use (MyKey® or administrator key). The MyKey® function also uses other messages received by the IPC for other indications such as vehicle speed for speed limiter displays.

Odometer

The IPC receives the odometer count message from the GWM over the HS-CAN3. The GWM receives the odometer count from the PCM over the HS-CAN1. The IPC monitors the odometer count input from the GWM and commands the odometer with a digital display in the message center.

Off Road Display

The off road display shows the vehicle pitch, vehicle roll, front wheel turning angle, 4x4 system status and rear differential lock status. The IPC uses the steering wheel angle, vehicle pitch angle display and vehicle roll angle display messages from the GWM over the HS-CAN3. The GWM receives the steering wheel angle, vehicle pitch angle display and vehicle roll angle display messages from the ABS module over the HS-CAN2.

Outside Air Temperature

The Ambient Air Temperature (AAT) sensor is hardwired to the PCM through separate input and return circuits. The PCM provides a reference voltage to the Ambient Air Temperature (AAT) sensor and monitors the change in voltage resulting from changes in resistance as determined by outside air temperature.

The PCM sends the ambient air temperature data to the GWM through the HS-CAN1. The GWM sends the ambient air temperature message to the HVAC (part of the FCIM) over the MS-CAN. The FCIM filters the data and sends the ambient air temperature filtered data back to the GWM over the MS-CAN. The GWM sends the ambient air temperature filtered message to the IPC over the HS-CAN3.

The FCIM is programmed to update the messaged outside temperature data at different rates depending on several criteria to prevent false temperature displays due to a condition known as heat soaking. Heat soaking is where the outside air temperature is hotter in the location of the Ambient Air Temperature (AAT) sensor than the actual outside air temperature.

The outside air temperature display update strategy requires a starting temperature to update from. This starting temperature is controlled based on the length of time the engine is off and the engine temperature. When the engine has been off for longer than 4 hours, the update strategy begins with the unfiltered ambient air temperature input to the PCM. If the engine has been off for less than 4 hours, and the engine coolant temperature is less than 30° C (86° F), the update strategy begins with the filtered ambient air temperature equal to the unfiltered ambient air temperature. If the engine has been off for less than 4 hours, and the engine coolant temperature is greater than 30° C (86° F), the update strategy begins at the stored previous outside air temperature value.

When the sensed outside temperature rises and the vehicle speed is above 32 km/h (21 mph), the outside air temperature display updates after approximately 90 seconds. As the vehicle speed increases, the outside air temperature display updates at a faster rate that is proportional to the increase in vehicle speed. Once the vehicle speed exceeds 80 km/h (50 mph), the display updates without any delay. If the vehicle speed drops below 32 km/h (21 mph), the update delays reset. When the sensed outside temperature drops, the display updates more quickly following the drop experienced by the Ambient Air Temperature (AAT) sensor.

TPMS

The IPC provides a message center display showing each tire on vehicle image to indicate specific tire pressures. The IPC receives the tire pressure placard data message from the GWM over the HS-CAN3. The GWM receives the tire pressure placard data message from the BCM over the HS-CAN1.

RTT Indicators

4WD High and 4WD Low

The IPC provides a 4WD Low and High RTT indicator to indicate transfer case status, including shift in

progress information. It uses the AWD mode request message to set the RTT indicator. The IPC receives the required message from the GWM over the HS-CAN3. The GWM receives the AWD mode request message from the ATCM over the HS-CAN2.

Auto High Beam

The IPC provides the auto high beam RTT indicator to indicate the auto high beam is active. The IPC receives the auto high beam indication request message from the GWM over the HS-CAN3. The GWM receives the auto high beam indication request message from the IPMA over the HS-CAN2.

Auto Stop-Start

The IPC provides the auto stop-start RTT indicator along with multiple messages displayed at various times throughout the auto stop-start system operation to inform the driver of the system status and to provide direction when driver intervention is required. The IPC receives the stop-start standby indicator request from the GWM over the HS-CAN3. The GWM receives the stop-start standby indicator request from the PCM over the HS-CAN1.

Blind Spot Monitoring System (BLIS®) Off

The IPC provides a RTT indicator to inform the driver that the BLIS is turned off. The IPC receives the cross traffic alert left status, cross traffic alert right status, side obstacle detect status-left and side obstacle detect status-right messages from the GWM over the HS-CAN3. The GWM receives the cross traffic alert left status, cross traffic alert right status, side obstacle detect status-left and side obstacle detect status-right messages from the SODL and SODR over the MS-CAN.

Charging System

The IPC provides a charging system RTT indicator along with message displays indicating the status of the charging system. When a fault is present in the charging system, the BCM sends the battery low state of charge message to display message center warning messages and the charging system RTT indicator.

The IPC receives the battery low state of charge message from the GWM over the HS-CAN3. The GWM receives the battery low state of charge message from the BCM over the HS-CAN1.

Cruise Control

The IPC uses the following messaged inputs to control the cruise control RTT indicator and set speed display:

- cruise control status
- cruise control set speed display
- cruise control override

The IPC receives the cruise control messages from the GWM over the HS-CAN3. The GWM receives the cruise control messages from the PCM over the HS-CAN1.

Distance Alert

The IPC provides a graphical display in the message center of the time gap to the vehicle traveling in the same direction, when the cruise control or adaptive cruise control is switched off. The IPC receives the forward distance alert warning indicator request message from the GWM over the HS-CAN3. The GWM receives the forward distance alert warning indicator request message from the IPMA over the HS-CAN2.

Door and Hood Ajar

The IPC provides a door ajar or hood ajar RTT indicator along with message displays to indicate the status of the doors and hood. The BCM monitors each of the ajar inputs (driver, passenger, left rear, right rear and hood) and sends a door ajar status (driver door ajar status, passenger door ajar status, left rear door ajar status, right rear door ajar status and hood ajar status) message to the GWM over the HS-CAN1. The IPC receives the driver door ajar status, passenger door ajar status, left rear door ajar status, right rear door ajar status and hood ajar status messages from the GWM over the HS-CAN3 to display the specific ajar RTT and corresponding warning message.

Drive Mode - Normal, Sport, Grass/Gravel/Snow, Mud/Sand, Baja, Rock (Raptor)

The IPC provides a drive mode RTT indicator when a terrain drive mode is selected. The IPC receives the terrain mode status display request and the terrain mode indicator display messages from the GWM over the HS-CAN3. The GWM receives the terrain mode status display request and the terrain mode indicator display messages from the ATCM over the HS-CAN2.

Engine Over-Temperature

The IPC provides a message center warning indicator to alert the driver the engine is over temperature. The IPC receives the engine overheat indication request and the engine coolant temperature data from the GWM over the HS-CAN3. The GWM receives the engine overheat indication request and the engine over-temperature message from the PCM over the HS-CAN1.

Forward Collision Warning

The IPC provides a forward collision warning system indicator and message center message to warn the driver the vehicle is rapidly approaching another vehicle, and a collision event is possible. The IPC receives the forward collision warning indicator request from the GWM over the HS-CAN3. The GWM receives the forward collision warning indicator request from the IPMA over the HS-CAN2.

Hill Descent Control

The IPC provides a RTT indicator to indicate the hill descent control is active. The IPC receives the hill descent control indicator request from the GWM over the HS-CAN3. The GWM receives the hill descent control indicator request from the ABS module over the HS-CAN2.

Lane Keeping Aid

The IPC provides the lane keeping aid on RTT indicator to indicate the lane keeping system has been turned on or is active, and a lane keep assist RTT indicator to indicate the vehicle is drifting outside the traffic lane. The IPC receives the lane keeping system active display and the lane keeping system status display messages from the GWM over the HS-CAN3. The GWM receives the lane keeping system active display and lane keeping system status display messages from the IPMA over the HS-CAN2.

Low Fuel

To supplement the fuel gauge indication, the IPC provides the low fuel message center warning RTT indicator. When the DTE reaches approximately 80 km (50 miles) or 100 km (62 miles) for MyKey® users, the IPC turns on the low fuel message center warning indicator.

Low Engine Oil Pressure

The IPC uses the engine oil pressure warning indicator request and engine rpm data to control the low engine oil pressure RTT warning indicator. The engine oil pressure sensor is hardwired to the PCM. The PCM provides the engine oil pressure warning indicator status request and the engine rpm data to the GWM over the HS-CAN1. The GWM provides the engine oil pressure warning indicator status request and engine rpm data to the IPC over the HS-CAN3. The IPC requires engine rpm above 400 rpm before the message center

displays the low engine oil pressure RTT indicator.

Low Washer Fluid Level

The low washer fluid level switch is hardwired to the IPC through a single signal circuit and is grounded through a separate ground circuit. The IPC provides a reference voltage to the washer fluid level switch. When the washer fluid is low, the washer fluid level switch opens, pulling the reference voltage high. When the IPC detects the washer fluid input is an open circuit, it illuminates the low washer fluid level RTT indicator.

Powertrain Malfunction (Wrench)

The IPC provides a powertrain malfunction (wrench) RTT indicator to indicate transmission, Electronic Throttle Control (ETC), AWD and BCM concerns.

The IPC receives all the required messages from the GWM over the HS-CAN3.

The GWM receives the body service required message from the BCM over the HS-CAN1.

The GWM receives the engine service required and transmission service required messages from the PCM over the HS-CAN1.

Rear Locking Differential

The IPC provides a RTT indicator to indicate current status of the locking differential. The IPC receives the rear differential indicator request message from the GWM over the HS-CAN3. The GWM receives the rear differential indicator request message from the PCM over the HS-CAN1.

Rear Seatbelt Monitor

The IPC provides a RTT indicator to indicate a rear seatbelt is not fastened. The IPC receives the driver rear seatbelt buckle status and passenger rear seatbelt buckle status messages from the GWM over the HS-CAN3. The GWM receives the driver rear seatbelt buckle status and passenger rear seatbelt buckle status messages from the RCM over the HS-CAN2.

SelectShift Gear Position

The IPC provides a suggested upshift and downshift RTT indicator along with a gear position RTT indicator when SelectShift is activated. The IPC receives the manual shift indicator display message from the GWM over the HS-CAN3. The GWM receives the manual shift indicator display message from the PCM over the HS-CAN1.

Trail Control (Raptor)

The IPC provides a RTT indicator when the trail control feature is activated. The IPC receives the trail control status and trail control set speed display messages from the GWM over the HS-CAN3. The GWM receives the trail control status and trail control set speed display messages from the ABS module over the HS-CAN2.

Warning Messages

4WD

The message center provides warning messages and shifting instructions for the driver when using the 4WD system. The IPC receives the AWD status display request message from the GWM over the HS-CAN3. The GWM receives the AWD status display request message from the PCM over the HS-CAN1.

Adaptive Cruise Control

The message center provides messages explaining the need for driver intervention and system status. The adaptive cruise control messages are supplemental to the cruise control RTT indicator and the adaptive cruise control warning chime. The IPC receives the adaptive cruise control warning request message from the GWM over the HS-CAN3. The GWM receives the adaptive cruise control warning request message from the IPMA over the HS-CAN2.

Blind Spot Monitoring System (BLIS®)/Cross Traffic Alert (CTA)

The message center provides messages indicating the reason for the Blind Spot Monitoring System (BLIS®)/Cross Traffic Alert (CTA) fault. The IPC receives the cross traffic alert left sensor status, cross traffic alert right sensor status, side obstacle sensor status-left and side obstacle sensor status-right messages from the GWM over the HS-CAN3. The GWM receives the cross traffic alert left sensor status, side obstacle sensor status-left, cross traffic alert right sensor status and side obstacle sensor status-right messages from the SODL and SODR, respectively, over the MS-CAN.

Brake System

The IPC provides brake system messages for the following concerns and status:

- Low brake fluid level.
- Parking brake status and faults.
- ABS concerns that display along with the brake warning indicator operation.

When the parking brake is applied, the BCM sends the parking brake chime request to the GWM over the HS-CAN1. The GWM sends the message to the IPC over the HS-CAN3 to illuminate the brake warning indicator and turn on the parking brake applied message in the message center.

When a low brake fluid level condition exists, the BCM sends the brake fluid level low message request to the GWM over the HS-CAN1. The GWM sends the message to the IPC over the HS-CAN3 to illuminate the brake warning indicator and turn on the brake fluid level low message in the message center.

When an ABS or parking brake system concern exists, the ABS module sends the brake (red) warning indicator request message to the GWM over the HS-CAN2. The GWM sends the brake (red) warning indicator request message to the IPC over the HS-CAN3 to illuminate the ABS warning indictor and to turn on the check brake system message center warning display.

Charging System

The message center provides a warning message indicating the status of the charging system. When a fault is present in the charging system, the BCM sends the battery low state of charge message to the GWM over the HS-CAN1. The IPC receives the battery low state of charge message from the GWM over the HS-CAN3.

Check Fuel Fill Inlet

The message center provides a check fuel fill inlet message to warn the driver there is a problem with the fuel fill inlet pipe resulting in a significant evaporative emission leak following vehicle refueling. The IPC receives the check fuel fill inlet message request from the GWM over the HS-CAN3. The GWM receives the check fuel fill inlet message request from the PCM over the HS-CAN1.

Check Locking Differential

The IPC provides warnings to indicate an issue with the electronic locking differential. When a fault is present, the PCM sends the rear differential fault status message to the GWM over HS-CAN1. The IPC receives the

required message from the GWM over the HS-CAN3 to display the message.

Dimming Scroll Bar

The IPC displays a dimming scroll bar warning to provide customers feedback on the current dimming status. This warning will be displayed for every dimming button press regardless of a dimming level change. When there is a dimming button press the BCM sends an updated dimming level message to the GWM over HS-CAN1. The IPC receives the required message from the GWM over the HS-CAN3.

Door-Hood Ajar

The IPC provides door and hood ajar warnings to indicate the status of the doors and hood. The IPC receives the driver door ajar, passenger door ajar, left rear door ajar, the right rear door ajar status and hood ajar status messages from the GWM over the HS-CAN3. The GWM receives the driver door ajar, passenger door ajar, left rear door ajar, the right rear door ajar status and hood ajar status messages from the BCM over the HS-CAN1. The BCM monitors each of the ajar inputs and sends the specific door ajar status message to the IPC to display the ajar warning indicator and corresponding warning message.

Driver Alert

The message center provides driver alert warning messages to alert the driver that rest is suggested or required due to detected erratic vehicle movement. The IPC receives the driver alert warning display message from the GWM over the HS-CAN3. The GWM receives the driver alert warning display message from the IPMA over the HS-CAN2.

EPAS

The IPC provides a message center message to indicate there is an EPAS system concern. When a fault exists in the EPAS, the PSCM sends a request to the IPC through the GWM.

The IPC receives the EPAS failure message from the GWM over the HS-CAN3.

The GWM receives the EPAS failure message from the PSCM over the HS-CAN2.

Engine On

The message center provides the engine on warning message to inform the driver they are exiting the vehicle when the engine is running. The IPC uses multiple inputs to determine the vehicle is stopped and the driver is preparing to exit the vehicle. The messages required to control the engine on warning message are as follows:

- Driver door ajar status
- Power pack status
- Transmission gear display mode
- Vehicle speed

The IPC receives all required messages from the GWM over the HS-CAN3.

The GWM receives the driver door ajar status from the BCM over the HS-CAN1.

The GWM receives the power pack status, transmission gear display mode and the vehicle speed messages from the PCM over the HS-CAN1.

Engine Over-Temperature

The message center provides the engine coolant over-temperature warning message to supplement the engine over-temperature RTT indicator and alert the driver the engine is over temperature. The IPC receives the engine overheat indication request and the engine coolant temperature data from the GWM over the HS-CAN3. The GWM receives the engine overheat indication request and the engine over-temperature data message from the PCM over the HS-CAN1.

Factory-Transport Mode

The message center provides the factory mode or transport mode warning message to inform the driver the vehicle is still operating in factory or transport mode. The IPC receives the factory mode or transport mode message from the GWM over the HS-CAN3. The GWM receives the factory mode or transport mode message from the BCM over the HS-CAN1.

Forward Collision

If a fault is detected with the forward collision system, the message center provides the forward collision warning messages to inform the driver of the system status. The IPC receives the forward collision warning message request from the GWM over the HS-CAN3. The GWM receives the forward collision warning message request from the IPMA over the HS-CAN2.

Front Camera Malfunction

When a fault is present with the front camera the IPMA sends the front camera malfunction message to the GWM over HS-CAN2. The IPC receives the required message from the GWM over the HS-CAN3.

Hill Descent Control

The IPC provides hill descent control warnings to inform the driver of the system status and when driver intervention is required. The ABS sends the HDC indicator request message to GWM over HS-CAN2. The IPC receives the required message from the GWM over the HS-CAN3.

Hill Start Assist

The message center provides a message indicating the hill start assist feature is not available due to a fault in the ABS. When a fault is detected and the hill start assist is disabled, the ABS module sends the hill start assist status message to the GWM over the HS-CAN2. The GWM sends the hill start assist status message to the IPC over the HS-CAN3.

Lane Keeping System

The message center provides a warning message for the lane keeping alert and system fault messages for the over all lane keeping system. The IPC receives all required messages from the GWM over the HS-CAN3. The GWM receives the lane keeping system status display, camera status and lane keeping system hands off display messages from the IPMA over the HS-CAN2.

Load Shed

The message center provides load shed messages to inform the driver to use less options to conserve battery voltage. The IPC receives the battery low state of charge message from the GWM over the HS-CAN3. The GWM receives the battery low state of charge message from the BCM over the HS-CAN1.

Low Engine Oil Pressure

The message center provides a low engine oil pressure warning message to inform the driver the engine oil pressure is low. The message supplements the IPC warning indicator and RTT warning indicator. The IPC receives the engine oil pressure warning indicator request message from the GWM over the HS-CAN3. The

GWM receives the engine oil pressure warning indicator request message from the PCM over the HS-CAN1.

Engine Oil Life

The instrument cluster provides messages to inform the driver about the engine oil life status, engine oil life reset status and when an engine oil change is required. The duration of the interval between engine oil changes is calculated in the PCM and varies due to driving conditions. The PCM assumes a base mileage of 16,090 km (10,000 mi) or 1 year for normal driving. However, this number is adjusted down for conditions such as high engine temperature, high engine rpm, use of flex fuel and possibly low engine oil level. The PCM calculates and provides the engine oil life percent message to the IPC. The engine oil change minder can be reset at any time by the driver.

The IPC receives the engine oil life message from the GWM over the HS-CAN3. The GWM receives the engine oil life message from the PCM over the HS-CAN1.

The PCM receives the engine oil life data reset message from the GWM over the HS-CAN1. The GWM receives the engine oil life data reset message from the IPC over the HS-CAN3.

MyKey®

The IPC provides a number of MyKey® related warnings and status messages to indicate restrictions imposed on the MyKey® user. These include MyKey® active, park aid, speed limits, and buckle up warnings among others. MyKey® displays are controlled through the IPC software based on the MyKey® settings configured through the message center and the type of key in use (MyKey® or administrator key). The MyKey® function also uses other messages received by the IPC for other indications such as vehicle speed for speed limiter displays.

Parking Aid System

The IPC provides messages to indicate the status of the parking aid system. The IPC receives the parking aid front status and parking aid rear status messages from the GWM over the HS-CAN3. The GWM receives the parking aid front status and parking aid rear status messages from the PAM over the HS-CAN1.

PATS And Passive Key And Immobilizer System

The message center provides the starting system fault message to indicate there is a concern with the PATS. The message center provides passive key and immobilizer system messages to indicate the key program is successful, key battery is low, key could not be programmed or failed or maximum number of keys have been programmed. The IPC uses the immobilizer message display messaged input from the BCM to display the applicable message center message.

The IPC receives the immobilizer message request from the GWM over the HS-CAN3.

The GWM receives the immobilizer message request from the BCM over the HS-CAN1.

Perimeter Alarm Message Display

The IPC provides a display to indicate the perimeter alarm has been activated and to start the vehicle to stop the alarm. The IPC receives the perimeter alarm chime request message from the GWM over the HS-CAN3. The GWM receives the perimeter alarm chime request from the BCM over the HS-CAN1.

Power Child Lock-Switch Inhibit And Low Key Fob

The IPC provides a power child lock warning to inform the driver the child lock feature did not function properly. The power child lock feature is activated through the rear window lockout switch on the driver side master window control switch.

The IPC provides a switch inhibit warning to notify the driver that some switches have been purposely inhibited and are inoperative. For security purposes, interior switches are inhibited by the BCM 20 seconds after the vehicle is electronically locked and prevents someone from using a stick (or other object) through an open window and activating the switch.

The IPC provides a low key fob battery warning to alert the driver the key fob battery needs to be replaced. The low key fob battery warning is not displayed in RUN or START modes if the power child lock warning is active to prevent the BCM from cycling between the two warnings, causing the chime associated with the power child lock warning to repeatedly sound every 4 seconds.

The IPC receives the lock system message request from the GWM over the HS-CAN3. The GWM receives the lock system message request from the BCM over the HS-CAN1.

Starting System

The message center provides starting system messages to inform the driver of the starting system status and when driver intervention is required in order to start the engine. The IPC receives the starting system message request and the stop-start message request messages from the GWM over the HS-CAN3. The GWM receives the starting system message request and the stop-start message request messages from the PCM over the HS-CAN1.

TPMS

The IPC provides message center displays to indicate the TPMS sensor training status or a malfunction in the TPMS. The IPC receives the tire pressure system status message from the GWM over the HS-CAN3. The GWM receives the tire pressure system status message from the BCM over the HS-CAN1.

Trailer Sway

The message center provides a message to inform the driver to slow the vehicle to reduce trailer sway and bring the trailer under control. The IPC receives the trailer sway event status message from the GWM over the HS-CAN3. The GWM receives the trailer sway event status message from the ABS module over the HS-CAN2.

Transmission Not In Park (Shift To Park)

The message center provides a shift to park message to inform the driver the vehicle is not in PARK (P) under 2 sets of conditions. First, the IPC displays the shift to park message if the selector lever is not in PARK (P), the ignition is OFF and the driver door is open or ajar. Second, the message center displays the shift to park message if the selector lever is not in PARK (P), the ignition is ON or in ACC, the driver door is open or ajar and the brake pedal is not applied with vehicle speed less than 5 km/h (3 mph). The IPC uses multiple messages to control the shift to park message.

The IPC receives all required messages from the GWM over the HS-CAN3.

The GWM receives the transmission gear display mode and vehicle speed messages from the PCM over the HS-CAN1.

The GWM receives the driver door ajar status, transport mode and ignition status message from the BCM over the HS-CAN1.

The IPC also uses the park position detect input to determine whether the vehicle is in PARK (P) along with the transmission gear display mode message.

See Park Position Detect Switch component description.
Refer to: Instrument Panel Cluster (IPC) - System Operation and Component Description (413-01

Instrumentation, Message Center and Warning Chimes, Description and Operation).

Component Description

Low Washer Fluid Level Switch

The low washer fluid switch is hardwired to the IPC through a single signal wire and is grounded to a body ground through a separate circuit. The IPC provides a reference voltage to the low washer fluid level switch. When the washer fluid level is low, the float drops closing the switch and pulling the reference voltage low. When the washer fluid level is high, the float lifts opening the circuit to the IPC and sending the reference voltage high.

Engine Oil Pressure Sensor

The engine oil pressure sensor is hardwired to the PCM through voltage reference (VREF), signal and return circuits. The PCM provides the sensor voltage supply on the VREF circuit and monitors the change in voltage through the signal and return circuits as the engine oil pressure changes.

Steering Wheel Switch - Message Center

The message center switch is the 5-way portion of the LH steering wheel switch. The message center switch uses different resistance values associated with each specific button (up, down, left, right and OK). The SCCM sends out a reference voltage to the upper LH steering wheel switch on the input circuit and monitors the voltage drops. The voltage drop varies depending upon the resistance of the specific button pressed, providing indication to the SCCM which button is pressed.

Instrumentation, Message Center and Warning Chimes

DTC Chart: Instrument Panel Cluster (IPC)

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices.
REFER to: Diagnostic Methods (100-00 General Information, Description and Operation).

DTC Chart - IPC

DTC	Description	Action
P0460:11	Fuel Level Sensor "A" Circuit: Circuit Short To Ground	GO to Pinpoint Test C
P0460:13	Fuel Level Sensor "A" Circuit: Circuit Open	GO to Pinpoint Test C
P1534:01	Restraint Deployment Indicator Circuit: General Electrical Failure	DIAGNOSE the IPC.   Click here to access Guided Routine (IPC). DIAGNOSE all RCM Diagnostic Trouble Codes (DTCs). REFER to: Airbag Supplemental Restraint System (SRS) (501-20B Supplemental Restraint System, Diagnosis and Testing).
P1706:00	High Vehicle Speed Observed in Park: No Sub Type Information	GO to Pinpoint Test AB
U0100:00	Lost Communication With ECM/PCM "A": No Sub Type Information	GO to Pinpoint Test BP
U0104:00	Lost Communication With Cruise Control Module: No Sub Type Information	GO to Pinpoint Test BQ
U0121:00	Lost Communication With Anti-Lock Brake System (ABS) Control Module "A": No Sub Type Information	GO to Pinpoint Test BS
U0131:00	Lost Communication With Power Steering Control Module "A": No Sub Type Information	GO to Pinpoint Test BT
U0138:82	Lost Communication With All Terrain Control Module: Alive/Sequence Counter Incorrect/Not Updated	GO to Pinpoint Test BU
U0140:00	Lost Communication With Body Control Module: No Sub Type Information	GO to Pinpoint Test BV
U0146:00	Lost Communication With Gateway "A": No Sub Type Information	GO to Pinpoint Test BW

U0151:00	Lost Communication With Restraints Control Module: No Sub Type Information	GO to Pinpoint Test BX
U0159:00	Lost Communication With Parking Assist Control Module "A": No Sub Type Information	GO to Pinpoint Test BY
U0184:00	Lost Communication With Radio: No Sub Type Information	GO to Pinpoint Test BZ
U0212:00	Lost Communication With Steering Column Control Module No Sub Type Information	GO to Pinpoint Test CA
U0232:00	Lost Communication With Side Obstacle Detection Control Module - Left: No Sub Type Information	GO to Pinpoint Test CB
U0233:00	Lost Communication With Side Obstacle Detection Control Module - Right: No Sub Type Information	GO to Pinpoint Test CB
U023A:00	Lost Communication With Image Processing Module A: No Sub Type Information	GO to Pinpoint Test CC
U0256:00	Lost Communication With Front Controls Interface Module "A": No Sub Type Information	GO to Pinpoint Test CD
U0401:00	Invalid Data Received from ECM/PCM A: No Sub Type Information	GO to Pinpoint Test BP
U0401:81	Invalid Data Received from ECM/PCM A: Invalid Serial Data Received	GO to Pinpoint Test BP
U0401:82	Invalid Data Received from ECM/PCM A: Alive/Sequence Counter Incorrect/Not Updated	GO to Pinpoint Test BP
U0405:56	Invalid Data Received From Cruise Control Module: Invalid/Incompatible Configuration	GO to Pinpoint Test BR
U0415:00	Invalid Data Received From Anti-Lock Brake System (ABS) Control Module: No Sub Type Information	GO to Pinpoint Test BS
U0415:82	Invalid Data Received From Anti-Lock Brake System (ABS) Control Module: Alive/Sequence Counter Incorrect/Not Updated	GO to Pinpoint Test BS
U0420:00	Invalid Data Received From Power Steering Control Module: No Sub Type Information	GO to Pinpoint Test BT
U0420:82	Invalid Data Received From Power Steering Control Module: Alive/Sequence Counter Incorrect/Not Updated	GO to Pinpoint Test BT

U0422:00	Invalid Data Received From Body Control Module: No Sub Type Information	GO to Pinpoint Test BV
U0422:82	Invalid Data Received From Body Control Module: Alive/Sequence Counter Incorrect/Not Updated	GO to Pinpoint Test BV
U0431:82	Invalid Data Received From Body Control Module "A": Alive/Sequence Counter Incorrect/Not Updated	GO to Pinpoint Test BV
U0452:81	Invalid Data Received From Restraints Control Module: Invalid Serial Data Received	GO to Pinpoint Test BX
U045A:82	Invalid Data Received From Parking Assist Control Module "A": Alive/Sequence Counter Incorrect/Not Updated	GO to Pinpoint Test BY
U0533:00	Invalid Data Received From Side Obstacle Detection Control Module-Left: No Sub Type Information	GO to Pinpoint Test CB
U0533:56	Invalid Data Received From Side Obstacle Detection Control Module-Left: Invalid/Incompatible Configuration	GO to Pinpoint Test CE
U0533:82	Invalid Data Received From Side Obstacle Detection Control Module-Left: Alive/Sequence Counter Incorrect/Not Updated	GO to Pinpoint Test CB
U0534:00	Invalid Data Received From Side Obstacle Detection Control Module-Right: No Sub Type Information	GO to Pinpoint Test CB
U0534:56	Invalid Data Received From Side Obstacle Detection Control Module-Right: Invalid/Incompatible Configuration	GO to Pinpoint Test CE
U0534:82	Invalid Data Received From Side Obstacle Detection Control Module-Right: Alive/Sequence Counter Incorrect/Not Updated	GO to Pinpoint Test CB
U0557:00	Invalid Data Received From Front Controls Interface Module "A": No Sub Type Information	GO to Pinpoint Test CD
U0557:81	Invalid Data Received From Front Controls Interface Module "A": Invalid Serial Data Received	GO to Pinpoint Test CD
U0557:82	Invalid Data Received From Front Controls Interface Module "A": Alive/Sequence Counter Incorrect/Not Updated	GO to Pinpoint Test CD
U2100:00	Initial Configuration Not Complete: No Sub Type Information	GO to Pinpoint Test CF

U3000:41	Control Module: General Checksum Failure	GO to Pinpoint Test CG
U3000:42	Control Module: General Memory Failure	GO to Pinpoint Test CG
U3000:43	Control Module: Special Memory Failure	GO to Pinpoint Test CG
U3000:44	Control Module: Data Memory Failure	GO to Pinpoint Test CG
U3000:46	Control Module: Calibration/Parameter Memory Failure	GO to Pinpoint Test CG
U3000:54	Control Module: Missing Calibration	GO to Pinpoint Test CG
U3003:16	Battery Voltage: Circuit Voltage Below Threshold	GO to Pinpoint Test CH
U3003:17	Battery Voltage: Circuit Voltage Above Threshold	GO to Pinpoint Test CI
U300A:64	Ignition Switch: Signal Plausibility Failure	DTC U300A:64 sets in continuous memory when the IPC detects a messaged START input for 15 seconds or longer. Once the fault condition is detected, the IPC operates with limited functionality for 15 seconds then returns to full functionality. DIAGNOSE any ignition or starting system concerns.

DTC Chart: Body Control Module (BCM)

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. REFER to: Diagnostic Methods (100-00 General Information, Description and Operation).

DTC Chart - BCM

DTC	Description	Action
B1048:01	Brake Fluid Level Switch: General Electrical Failure	GO to Pinpoint Test P
B1048:7B	Brake Fluid Level Switch: Low Fluid Level	GO to Pinpoint Test P
B10F1:14	Key In Switch: Circuit Short To Ground or Open	• If the key in ignition warning chime is inoperative, GO to Pinpoint Test BJ • If the key in ignition warning chime always sounds, GO to Pinpoint Test BF
C1D00:11	Park Brake Apply Switch: Circuit Short To Ground	GO to Pinpoint Test P
All other DTCs	-	REFER to: Body Control Module (BCM) (419-10 Multifunction Electronic Modules, Diagnosis and Testing).

DTC Chart: PCM

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. REFER to: Diagnostic Methods (100-00 General Information, Description and Operation).

DTC Chart - PCM

DTC	Description	Action
P0461	Fuel Level Sensor "A" Circuit Range/Performance	GO to Pinpoint Test C
P0462	Fuel Level Sensor "A" Circuit Low	GO to Pinpoint Test C
P0463	Fuel Level Sensor "A" Circuit High	GO to Pinpoint Test C
P0521	Engine Oil Pressure Sensor/Switch "A" Circuit Range/Performance	GO to Pinpoint Test X
P0522	Engine Oil Pressure Sensor/Switch "A" Circuit Low	GO to Pinpoint Test X
P0523	Engine Oil Pressure Sensor/Switch "A" Circuit High	GO to Pinpoint Test X
P0524	Engine Oil Pressure Too Low	GO to Pinpoint Test X
P25B0	Fuel Level Sensor "A" Stuck	GO to Pinpoint Test C
All other DTCs	-	REFER to: Electronic Engine Controls (303-14 Electronic Engine Controls - 2.3L EcoBoost (201kW/273PS), Diagnosis and Testing).

DTC Chart: Steering Column Control Module (SCCM)

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. REFER to: Diagnostic Methods (100-00 General Information, Description and Operation).

DTC Chart - SCCM

DTC	Description	Action
B137F:11	Steering Wheel Left Switch Pack: Circuit Short To Ground	GO to Pinpoint Test AI
B137F:13	Steering Wheel Left Switch Pack: Circuit Open	GO to Pinpoint Test AI
B137F:96	Steering Wheel Left Switch Pack: Component Internal Failure	GO to Pinpoint Test AI
B137F:9E	Steering Wheel Left Switch Pack:: Stuck On	GO to Pinpoint Test AI
All other	-	

DTCs		REFER to: Steering Wheel and Column Electrical Components (211-05 Steering Wheel and Column Electrical Components, Diagnosis and Testing).

Symptom Chart(s)

Symptom Chart: Instrument Panel Cluster (IPC)

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. REFER to: Diagnostic Methods (100-00 General Information, Description and Operation).

Symptom Chart

Condition	Possible Sources	Actions
A module does not respond to the diagnostic scan tool	• Fuse • Wiring, terminals or connectors • Communication concern • Module	REFER to: Communications Network (418-00 Module Communications Network, Diagnosis and Testing).
The IPC is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test A
Multiple gauges, indicators, RTT indicators, warnings and chimes are inoperative or always on	Refer to the Pinpoint Test	GO to Pinpoint Test A
Incorrect fuel gauge indication	Refer to the Pinpoint Test	GO to Pinpoint Test C
The speedometer is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test D
Incorrect speedometer indication	Refer to the Pinpoint Test	GO to Pinpoint Test E
The odometer is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test F
The analog tachometer is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test G
Incorrect analog tachometer indication	Refer to the Pinpoint Test	GO to Pinpoint Test H
The analog temperature gauge is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test I
Incorrect analog temperature gauge indication	Refer to the Pinpoint Test	GO to Pinpoint Test J
A virtual gauge (fuel, tachometer or temperature) is inoperative (high level IPC)	Refer to the Pinpoint Test	GO to Pinpoint Test B
The 4WD High/Low indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test K
The ABS warning indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test L
The airbag warning indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test M

The auto stop-start indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test N
The brake warning indicator is never on	Refer to the Pinpoint Test	GO to Pinpoint Test O
The brake warning indicator is always on	Refer to the Pinpoint Test	GO to Pinpoint Test P
The charging system warning indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test Q
The door ajar indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test R
The ESC indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test AF
The engine over-temperature warning indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test S
The front fog lamp indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test U
The hill descent control indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test T
The LH- RH turn signal or high beam indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test U
The lights on indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test V
The LED low beam malfunction indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test W
The low engine oil pressure warning indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test X
The low fuel warning indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test Y
The MIL is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test Z
The PRNDL indicator is never on or never displays P	Refer to the Pinpoint Test	GO to Pinpoint Test AB
The powertrain malfunction (wrench) indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test AA
The seatbelt warning indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test AC
The stability-traction control indicator (sliding car icon) is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test AD
The stability-traction control disabled indicator (sliding car OFF icon) is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test AE
The TPMS warning indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test AG

The tow haul indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test AH

Symptom Chart: Information And Message Center -Displays

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. REFER to: Diagnostic Methods (100-00 General Information, Description and Operation).

Symptom Chart

Condition	Possible Sources	Actions
The message center is not operating correctly	Refer to the Pinpoint Test	GO to Pinpoint Test AI
The LH or RH message center display is blank (high level IPC)	Refer to the Pinpoint Test	GO to Pinpoint Test AI
A virtual display is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test AI
The adaptive cruise control distance display is inoperative	Refer to the Pinpoint Test	DIAGNOSE the adaptive cruise control indications. GO to Pinpoint Test AP
The compass is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test AJ
The digital speedometer displays the incorrect speed	Refer to the Pinpoint Test	DIAGNOSE the speedometer. GO to Pinpoint Test E
The DTE-Average Fuel Economy (AFE) display is inoperative	IPC	• CHECK the operation of the fuel gauge, the speedometer and the odometer. – If the fuel gauge does not operate correctly, GO to Pinpoint Test C – If the speedometer does not operate correctly, GO to Pinpoint Test D – If the odometer does not operate correctly, GO to Pinpoint Test F – If the speedometer, the fuel gauge and the odometer operate correctly,  Click here to access Guided Routine (IPC).
The DTE display is incorrect or fluctuates	Refer to the Pinpoint Test	GO to Pinpoint Test AK
The lane keeping alert display is inoperative	Lane keeping alert system concern	DIAGNOSE the lane keeping aid or lane keeping alert doesn't turn on or activate. REFER to: Lane Keeping System (419-07 Lane Keeping System, Diagnosis and Testing).
The off road display is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test AL

The outside air temperature display is inoperative or incorrect	Refer to the Pinpoint Test	GO to Pinpoint Test AM

Symptom Chart: Information And Message Center - RTT Indicators

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. REFER to: Diagnostic Methods (100-00 General Information, Description and Operation).

Symptom Chart

Condition	Possible Sources	Actions
The 4WD high/low RTT indicator is never or always displayed	Refer to the Pinpoint Test	GO to Pinpoint Test K
The auto stop-start RTT indicator is never or always displayed	Refer to the Pinpoint Test	GO to Pinpoint Test N
The auto high beam RTT indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test AN
The Blind Spot Information System (BLIS®) off RTT indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test AO
The charging system RTT warning indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test Q
The compass RTT indicator is inoperative or never on	Refer to the Pinpoint Test	GO to Pinpoint Test AJ
The cruise control RTT indicator is never on	Refer to the Pinpoint Test	GO to Pinpoint Test AP
The distance alert RTT is never on.	Refer to the Pinpoint Test	GO to Pinpoint Test AQ
The door ajar RTT warning indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test R
The engine over-temperature RTT warning indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test S
The forward collision RTT warning indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test AR
The hill descent RTT is never or always on	Refer to the Pinpoint Test	• OPEN then CLOSE the driver door and VERIFY the driver door ajar message displays correctly with the door open and closed. • If the driver door ajar message does not function correctly, GO to Pinpoint Test R • If the driver door ajar message functions correctly, DIAGNOSE the hill descent switch. GO to Pinpoint Test T
The lane keeping system RTT	Refer to the	GO to Pinpoint Test AS

indicator is never or always on	Pinpoint Test	
The low engine oil pressure RTT warning indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test X
The low fuel RTT warning indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test Y
The low washer fluid level RTT warning indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test AT
The powertrain malfunction (wrench) RTT indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test AA
The rear differential lock RTT indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test AU
The rear seatbelt RTT warning indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test AV
The SelectShift RTT indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test AW
The terrain management drive mode RTT indicators are never on	Refer to the Pinpoint Test	GO to Pinpoint Test AX
The trail control RTT indicator is never or always on	Refer to the Pinpoint Test	GO to Pinpoint Test AY

Symptom Chart: Information And Message Center - Warnings

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. REFER to: Diagnostic Methods (100-00 General Information, Description and Operation).

Symptom Chart

Condition	Possible Sources	Actions
The 4WD message is always displayed	4WD concern	DIAGNOSE the 4WD system. REFER to: Four-Wheel Drive Systems (308-07A Four-Wheel Drive Systems, Diagnosis and Testing).
The adaptive cruise control message is always displayed	Adaptive cruise control concern	DIAGNOSE the adaptive cruise control system. REFER to: Cruise Control (419-03B Cruise Control - Vehicles With: Adaptive Cruise Control, Diagnosis and Testing).
A Blind Spot Information System (BLIS®)/Cross Traffic Alert (CTA) fault message is always displayed	Blind Spot Information System (BLIS®)/Cross Traffic Alert (CTA) system concern	DIAGNOSE the Blind Spot System (BLIS®)/Cross Traffic Alert (CTA) system. REFER to: Blind Spot Information System (419-04 Side and Rear Vision, Diagnosis and Testing).
A brake warning (brake	• Message center	• OPEN then CLOSE the driver door

fluid level low, parking brake applied or brake system malfunction) message is never or always displayed	concern • Brake warning indication concern	and VERIFY the driver door ajar message displays correctly with the door open and closed. • If the driver door ajar message does not function correctly, GO to Pinpoint Test R • If the driver door ajar message functions correctly and the brake warning indicator is never on, GO to Pinpoint Test O • If the driver door ajar message functions correctly and the brake warning indicator is always on, GO to Pinpoint Test P
The charging system warning message is always displayed	Charging system concern	DIAGNOSE the charging system. REFER to: Charging System - 2.3L EcoBoost (201kW/273PS) (414-00 Charging System - General Information, Diagnosis and Testing).
The check fuel fill inlet message is always displayed	Refer to the Pinpoint Test	GO to Pinpoint Test AZ
A door or hood ajar warning message is never or always displayed	• Message center concern • Door ajar RTT indication concern	DIAGNOSE the door ajar RTT. GO to Pinpoint Test R
A driver alert warning message is never or always displayed	• Message center concern • Driver alert system concern	• OPEN then CLOSE the driver door and VERIFY the driver door ajar message displays correctly with the door open and closed. • If the driver door ajar message does not function correctly, GO to Pinpoint Test R • If the driver door ajar message functions correctly, DIAGNOSE the driver alert system. REFER to: Lane Keeping System (419-07 Lane Keeping System, Diagnosis and Testing).
The EPAS (steering system) malfunction message is always on	• Message center concern • EPAS system concern	• OPEN then CLOSE the driver door and VERIFY the driver door ajar message displays correctly with the door open and closed. • If the driver door ajar message does not function correctly, GO to Pinpoint Test R • If the driver door ajar message functions correctly, DIAGNOSE the EPAS. REFER to: Power Steering (211-02 Power Steering, Diagnosis and Testing).
The engine oil life message is never displayed	• Message center concern	**NOTE:** *Using the system check in the message center, verify the oil life is between*

	• The PCM has not reached the programmed mileage/time based on the criteria required to display the message.	*1 and 5% for the CHANGE ENGINE OIL SOON message or at 0% for the OIL CHANGE REQUIRED message.* • OPEN then CLOSE the driver door and VERIFY the driver door ajar message functions correctly. • If the driver door ajar message does not function correctly, GO to Pinpoint Test R • If the driver door ajar message functions correctly with the oil life between 0-5%,  Click here to access Guided Routine (IPC). • If the driver door ajar message functions correctly with the oil life **not** at the specified value, INFORM the customer how the message center functions and how the oil life messages are set.
The engine oil change message is always displayed	Refer to the Pinpoint Test	GO to Pinpoint Test BA
The engine on warning message is always displayed	Refer to the Pinpoint Test	GO to Pinpoint Test BB
The engine over-temperature warning message is never or always displayed	• Message center concern • Engine over-temperature indication concern	• OPEN then CLOSE the driver door and VERIFY the driver door ajar message displays correctly with the door open and closed. • If the driver door ajar message does not function correctly, GO to Pinpoint Test R • If the driver door ajar message functions correctly, DIAGNOSE the engine over-temperature warning indicator. GO to Pinpoint Test S
The factory or transport mode message is always displayed	Vehicle is in factory or transport mode	PLACE the vehicle in normal operation mode. REFER to: Factory Mode Deactivation (419-10 Multifunction Electronic Modules, General Procedures). or REFER to: Transport Mode Deactivation (419-10 Multifunction Electronic Modules, General Procedures).
A forward collision warning message is always displayed	Forward collision concern	DIAGNOSE the forward collision warning system. REFER to: Collision Warning and Collision Avoidance System (419-03C Collision Warning and Collision Avoidance System, Diagnosis and Testing).
A hill descent control message is always	Hill descent control feature concern	DIAGNOSE the hill descent control system. REFER to: Anti-Lock Brake System (ABS)

displayed		and Stability Control (206-09 Anti-Lock Brake System (ABS) and Stability Control, Diagnosis and Testing).
The hill start assist not available message is always displayed	Hill start assist feature concern	DIAGNOSE the hill start assist feature. REFER to: Anti-Lock Brake System (ABS) and Stability Control (206-09 Anti-Lock Brake System (ABS) and Stability Control, Diagnosis and Testing).
The lane keeping alert system warning message (keep hands on wheel) is never or always displayed	• Message center concern • Lane keeping alert warning chime concern	• OPEN then CLOSE the driver door and VERIFY the driver door ajar message displays correctly with the door open and closed. • If the driver door ajar message does not function correctly, GO to Pinpoint Test R • If the driver door ajar message functions correctly, DIAGNOSE the lane keeping alert warning chime. GO to Pinpoint Test BK
A lane keeping system fault message is always displayed	Lane departure warning system concern	DIAGNOSE the lane keeping system. REFER to: Lane Keeping System (419-07 Lane Keeping System, Diagnosis and Testing).
A load shed warning message is always displayed	• Message center concern • Charging system indication concern	• OPEN then CLOSE the driver door and VERIFY the driver door ajar message displays correctly with the door open and closed. • If the driver door ajar message does not function correctly, GO to Pinpoint Test R • If the driver door ajar message functions correctly, DIAGNOSE the charging system warning indicator or charging system RTT. GO to Pinpoint Test Q
A locking system (child lock malfunction, switches inhibited) warning message is always displayed	Locking system concern	DIAGNOSE the locking system. REFER to: Locks, Latches and Entry Systems (501-14 Handles, Locks, Latches and Entry Systems, Diagnosis and Testing).
The low fuel warning message is always displayed	Refer to the Pinpoint Test	DIAGNOSE the low fuel warning indicator. GO to Pinpoint Test Y
The low engine oil pressure warning message is always displayed	• Message center concern • Low engine oil pressure indication concern	• OPEN then CLOSE the driver door and VERIFY the driver door ajar message displays correctly with the door open and closed. • If the driver door ajar message does not function correctly, GO to Pinpoint Test R • If the driver door ajar message functions correctly, DIAGNOSE the low engine oil pressure indicator or RTT indicator. GO to Pinpoint Test X

A MyKey® menu is not available or incorrect	• MyKey® programmed key in use • Number of keys set to unlimited mode • Non-Ford approved remote start system installed	**NOTE:** *MyKey® may not be compatible with non-Ford approved remote start systems.* • REFER to the Owner's Literature.
The parking aid message is always displayed	Parking aid system concern	DIAGNOSE the parking aid system. REFER to: Parking Aid (413-13A Parking Aid, Diagnosis and Testing).
A passive entry-start message (key program failure, key battery low) is always displayed	PATS concern	DIAGNOSE the PATS. REFER to: Passive Anti-Theft System (PATS) (419-01B Passive Anti-Theft System (PATS), Diagnosis and Testing). or REFER to: Passive Anti-Theft System (PATS) (419-01C Passive Anti-Theft System (PATS) - Vehicles With: Keyless Vehicle System, Diagnosis and Testing).
The perimeter alarm message is always displayed	• Message center concern • Perimeter alarm concern	• OPEN then CLOSE the driver door and VERIFY the driver door ajar message displays correctly with the door open and closed. • If the driver door ajar message does not function correctly, GO to Pinpoint Test R • If the driver door ajar message functions correctly, REFER to: Perimeter Anti-Theft Alarm (419-01A Perimeter Anti-Theft Alarm, Diagnosis and Testing).
The PRNDL not in park (shift to park) message is always displayed	• Message center concern • PRNDL not in park warning chime concern	• OPEN then CLOSE the driver door and VERIFY the driver door ajar message displays correctly with the door open and closed. • If the driver door ajar message does not function correctly, GO to Pinpoint Test R • If the driver door ajar message functions correctly, DIAGNOSE the PRNDL. GO to Pinpoint Test AB
The rear differential lock message is always displayed	Rear locking differential concern	DIAGNOSE the rear locking differential. REFER to: Four-Wheel Drive Systems (308-07A Four-Wheel Drive Systems, Diagnosis and Testing).
A starting/ignition status message is always on	• Message center concern • Push button start concern	• OPEN then CLOSE the driver door and VERIFY the driver door ajar message displays correctly with the door open and closed. • If the driver door ajar message does not function correctly, GO to Pinpoint Test R • If the driver door ajar message functions correctly, DIAGNOSE the ignition/starting system concern.

		REFER to: Steering Wheel and Column Electrical Components (211-05 Steering Wheel and Column Electrical Components, Diagnosis and Testing).
A terrain management drive mode warning message is always displayed	Terrain management concern	DIAGNOSE the terrain management drive mode system. REFER to: Anti-Lock Brake System (ABS) and Stability Control (206-09 Anti-Lock Brake System (ABS) and Stability Control, Diagnosis and Testing).
A TPMS malfunction message is always displayed	• Message center concern • TPMS warning indication concern	• OPEN then CLOSE the driver door and VERIFY the driver door ajar message displays correctly with the door open and closed. • If the driver door ajar message does not function correctly, GO to Pinpoint Test R • If the driver door ajar message functions correctly, DIAGNOSE the TPMS warning indicator. GO to Pinpoint Test AG
The tire training complete message is never on	TPMS sensor training incomplete	**NOTE:** *This message only appears during the TPMS sensor training procedure.* • CARRY OUT the TPMS sensor training. REFER to: Tire Pressure Monitoring System (TPMS) (204-04B Tire Pressure Monitoring System (TPMS), Diagnosis and Testing).
A tire training message (train left front, right front, left rear or right rear tire) message is never on	• TPMS warning indicator concern • TPMS sensor training concern	**NOTE:** *These messages only appear during the TPMS sensor training procedure.* • VERIFY the TPMS warning indicator functions. • If the TPMS warning indicator does not operate, GO to Pinpoint Test AG • If the TPMS warning indicator operates, CARRY OUT the TPMS sensor training. REFER to: Tire Pressure Monitoring System (TPMS) (204-04B Tire Pressure Monitoring System (TPMS), Diagnosis and Testing).
The tires not trained message is always on	TPMS sensor training concern	• This message only appears during the TPMS sensor training procedure. • CARRY OUT the TPMS sensor training. REFER to: Tire Pressure Monitoring System (TPMS) (204-04B Tire Pressure Monitoring System (TPMS), Diagnosis and Testing).
A transmission warning	• Message center	• OPEN then CLOSE the driver door

message is always displayed	concern • Transmission concern	and VERIFY the driver door ajar message displays correctly with the door open and closed. • If the driver door ajar message does not function correctly, GO to Pinpoint Test R • If the driver door ajar message functions correctly, DIAGNOSE the transmission concern. REFER to: Diagnostic Trouble Code (DTC) Charts and Pinpoint Tests - 2.3L EcoBoost (201kW/273PS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).

Symptom Chart: Warning Chimes

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices.
REFER to: Diagnostic Methods (100-00 General Information, Description and Operation).

Symptom Chart

Condition	Possible Sources	Actions
All the chimes are inoperative	IPC	GO to Pinpoint Test A
The chime always sounds	Refer to the Pinpoint Test	GO to Pinpoint Test BF
The chime only sounds from the IPC	Refer to the Pinpoint Test	• Using a diagnostic scan tool, perform the IPC self-test. • If any Diagnostic Trouble Codes (DTCs) are present, REFER to the IPC DTC DTC Chart. • If no Diagnostic Trouble Codes (DTCs), DIAGNOSE the audio system. Without SYNC, REFER to: Information and Entertainment System (415-00A Information and Entertainment System - General Information - Vehicles With: AM/FM, Diagnosis and Testing). With SYNC, REFER to: Information and Entertainment System (415-00B Information and Entertainment System - General Information - Vehicles With: SYNC 3, Diagnosis and Testing).
The adaptive cruise control warning chime is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test BD
The airbag secondary warning chime is inoperative	• Normal condition • IPC	• Using a diagnostic scan tool, PERFORM the IPC self-test. • If DTC P1534:01 is present,  Click here to access Guided Routine (IPC)..

		• If DTC P1534:01 is **not** present, the system is operating correctly. The airbag secondary warning chime sounds only when a fault in the airbag warning indicator is present and DTC P1534:01 is recorded.
The airbag secondary warning chime has activated	IPC	 Click here to access Guided Routine (IPC).
The Belt-Minder® feature is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test BN
The Belt-Minder® cannot be deactivated	MyKey® progr! mmed key in use	The system is operating correctly. Use an administrator key to disable the Belt-Minder®.
The Blind Spot Information System (BLIS®)/Cross Traffic Alert (CTA) warning chime is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test BE
The door ajar warning chime is inoperative	• Door ajar indication concern • IPC	• With the ignition OFF, the headlamps in the PARKING LAMPS position and the doors closed, OPEN the driver door and VERIFY the headlamps on warning chime sounds. • If the headlamps on chime sounds, GO to Pinpoint Test R • If the headlamps on chime does not sound,  Click here to access Guided Routine (IPC).
The forward collision warning chime is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test BG
The headlamps on warning chime is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test BH
The ignition-engine on warning chime is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test BI
The key-in-ignition warning chime is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test BJ
The lane keeping aid warning chime is inoperative	Refer to the Pinpoint Test	**NOTE:** *The lane keeping aid warning chime only sounds to alert the driver they have their hands off the steering wheel. Normal alerting is done through steering wheel vibrations, which cannot be felt when the driver's hands are not on the steering wheel.* GO to Pinpoint Test BK
The lane keeping aid warning chime sounds with the hands on the steering wheel	Road conditions	Certain road conditions could lead to false activation of the chime. REFER to: Lane Keeping System (419-07 Lane Keeping System, Diagnosis and Testing).
The message center warning chime is	• No warnings	• With all the doors closed and the ignition OFF, PLACE the ignition ON. Once the IPC has

inoperative	present • IPC	completed the prove-out, OPEN the driver door and VERIFY the message center displays the door ajar RTT indicator and the chime sounds once. • If the chime sounds, the system is operating correctly. The message center warning chime only sounds when a new warning is displayed in the message center. • If the door ajar message does not display, GO to Pinpoint Test R • If the door ajar message displays and the chime does not sound,  Click here to access Guided Routine (IPC)..
The parking aid chime is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test BC
The parking brake warning chime is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test BL
The perimeter alarm chime is inoperative	• Perimeter alarm concern • IPC	GO to Pinpoint Test BM
The PRNDL not in park warning chime is inoperative	• PRNDL indication concern • IPC	• With the ignition OFF, the headlamps in the PARKING LAMPS position and the doors closed, OPEN the driver door and VERIFY the headlamps on warning chime sounds. • If the headlamps on chime sounds, DIAGNOSE the PRNDL indicator. GO to Pinpoint Test AB • If the headlamps on chime does not sound,  Click here to access Guided Routine (IPC)..
The seatbelt warning chime is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test BN
The turn signal-hazard on warning chime is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test BO
The turn signal left on chime is inoperative	Refer to the Pinpoint Test	GO to Pinpoint Test BO

Pinpoint Tests

PINPOINT TEST A : THE IPC (INSTRUMENT PANEL CLUSTER) IS INOPERATIVE/MULTIPLE GAUGES, INDICATORS, RTT (RECONFIGURABLE TELLTALE) INDICATORS, WARNINGS AND CHIMES ARE INOPERATIVE OR ALWAYS ON

PINPOINT TEST B : A VIRTUAL GAUGE (FUEL, TACHOMETER OR TEMPERATURE) IS INOPERATIVE (HIGH LEVEL IPC (INSTRUMENT PANEL CLUSTER))

PINPOINT TEST C : INCORRECT FUEL GAUGE INDICATION

- PINPOINT TEST D : THE SPEEDOMETER IS INOPERATIVE
- PINPOINT TEST E : INCORRECT SPEEDOMETER INDICATION
- PINPOINT TEST F : THE ODOMETER IS INOPERATIVE
- PINPOINT TEST G : THE ANALOG TACHOMETER IS INOPERATIVE
- PINPOINT TEST H : INCORRECT ANALOG TACHOMETER INDICATION
- PINPOINT TEST I : THE ANALOG TEMPERATURE GAUGE IS INOPERATIVE
- PINPOINT TEST J : INCORRECT ANALOG TEMPERATURE GAUGE INDICATION
- PINPOINT TEST K : A 4WD (FOUR-WHEEL DRIVE) INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST L : THE ABS (ANTI-LOCK BRAKE SYSTEM) WARNING INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST M : THE AIRBAG WARNING INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST N : THE AUTO STOP-START INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST O : THE BRAKE WARNING INDICATOR IS NEVER ON
- PINPOINT TEST P : THE BRAKE WARNING INDICATOR IS ALWAYS ON
- PINPOINT TEST Q : THE CHARGING SYSTEM WARNING INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST R : THE DOOR AJAR WARNING INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST S : THE ENGINE OVER-TEMPERATURE WARNING INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST T : THE HILL DESCENT INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST U : THE LH (LEFT-HAND) - RH (RIGHT-HAND) TURN SIGNAL, FRONT FOG LAMP OR HIGH BEAM INDICATOR IS NEVER OR ALWAYS ON

- PINPOINT TEST V : THE LIGHTS ON INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST W : THE LED (LIGHT EMITTING DIODE) LOW BEAM MALFUNCTION INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST X : THE LOW ENGINE OIL PRESSURE WARNING INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST Y : THE LOW FUEL WARNING INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST Z : THE MIL (MALFUNCTION INDICATOR LAMP) IS NEVER OR ALWAYS ON
- PINPOINT TEST AA : THE POWERTRAIN MALFUNCTION (WRENCH) WARNING INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST AB : THE PRNDL INDICATOR IS NEVER ON OR NEVER DISPLAYS P
- PINPOINT TEST AC : THE SEATBELT WARNING INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST AD : THE STABILITY-TRACTION CONTROL INDICATOR (SLIDING CAR ICON) IS NEVER OR ALWAYS ON
- PINPOINT TEST AE : THE STABILITY-TRACTION CONTROL DISABLED INDICATOR (SLIDING CAR OFF ICON) IS NEVER OR ALWAYS ON
- PINPOINT TEST AF : THE ESC (ELECTRONIC STABILITY CONTROL) INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST AG : THE TPMS (TIRE PRESSURE MONITORING SYSTEM) WARNING INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST AH : THE TOW HAUL MODE INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST AI : THE MESSAGE CENTER IS NOT OPERATING CORRECTLY
- PINPOINT TEST AJ : THE COMPASS IS INOPERATIVE
- PINPOINT TEST AK : THE DTE (DISTANCE TO EMPTY) DISPLAY IS INCORRECT OR FLUCTUATES

- PINPOINT TEST AL : THE OFF ROAD DISPLAY IS INOPERATIVE
- PINPOINT TEST AM : THE OUTSIDE AIR TEMPERATURE DISPLAY IS INOPERATIVE OR INCORRECT
- PINPOINT TEST AN : THE AUTO HIGH BEAM RTT (RECONFIGURABLE TELLTALE) INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST AO : THE BLIND SPOT INFORMATION SYSTEM (BLIS®) OFF RTT (RECONFIGURABLE TELLTALE) INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST AP : THE CRUISE CONTROL RTT (RECONFIGURABLE TELLTALE) INDICATOR IS NEVER ON
- PINPOINT TEST AQ : THE DISTANCE ALERT RTT (RECONFIGURABLE TELLTALE) WARNING INDICATOR IS NEVER ON
- PINPOINT TEST AR : THE FORWARD COLLISION RTT (RECONFIGURABLE TELLTALE) WARNING INDICATOR IS NEVER ON
- PINPOINT TEST AS : THE LANE KEEPING SYSTEM RTT (RECONFIGURABLE TELLTALE) INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST AT : THE LOW WASHER FLUID LEVEL RTT (RECONFIGURABLE TELLTALE) INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST AU : THE REAR DIFFERENTIAL LOCK RTT (RECONFIGURABLE TELLTALE) INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST AV : THE REAR SEATBELT RTT (RECONFIGURABLE TELLTALE) WARNING INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST AW : THE SELECTSHIFT RTT (RECONFIGURABLE TELLTALE) INDICATOR IS NEVER OR ALWAYS ON
- PINPOINT TEST AX : THE TERRAIN MANAGEMENT DRIVE MODE RTT (RECONFIGURABLE TELLTALE) INDICATOR IS INOPERATIVE
- PINPOINT TEST AY : THE TRAIL CONTROL RTT (RECONFIGURABLE TELLTALE) INDICATOR IS NEVER ON
- PINPOINT TEST AZ : THE CHECK FUEL FILL INLET MESSAGE IS ALWAYS DISPLAYED

- PINPOINT TEST BA : THE ENGINE OIL CHANGE MESSAGE ALWAYS DISPLAYED
- PINPOINT TEST BB : THE ENGINE ON WARNING MESSAGE IS NEVER OR ALWAYS DISPLAYED
- PINPOINT TEST BC : THE PARKING AID CHIME IS INOPERATIVE
- PINPOINT TEST BD : THE ADAPTIVE CRUISE CONTROL WARNING CHIME IS INOPERATIVE
- PINPOINT TEST BE : THE BLIND SPOT INFORMATION SYSTEM (BLIS®)/CROSS TRAFFIC ALERT (CTA) WARNING CHIME IS INOPERATIVE
- PINPOINT TEST BF : THE CHIME ALWAYS SOUNDS
- PINPOINT TEST BG : THE FORWARD COLLISION WARNING CHIME IS INOPERATIVE
- PINPOINT TEST BH : THE HEADLAMPS ON WARNING CHIME IS INOPERATIVE
- PINPOINT TEST BI : THE IGNITION-ENGINE ON WARNING CHIME IS INOPERATIVE
- PINPOINT TEST BJ : THE KEY-IN-IGNITION WARNING CHIME IS INOPERATIVE
- PINPOINT TEST BK : THE LANE KEEPING ALERT WARNING CHIME IS INOPERATIVE
- PINPOINT TEST BL : THE PARKING BRAKE WARNING CHIME IS INOPERATIVE
- PINPOINT TEST BM : THE PERIMETER ALARM CHIME IS INOPERATIVE
- PINPOINT TEST BN : THE SEATBELT WARNING CHIME OR THE BELT-MINDER® FEATURE IS INOPERATIVE
- PINPOINT TEST BO : THE TURN SIGNAL-HAZARD ON CHIME OR TURN SIGNAL LEFT ON CHIME IS INOPERATIVE
- PINPOINT TEST BP : U0100:00, U0401:00, U0401:81 OR U0401:82
- PINPOINT TEST BQ : U0104:00
- PINPOINT TEST BR : P0405:56

- PINPOINT TEST BS : U0121:00, U0415:00 OR U0415:82
- PINPOINT TEST BT : U0131:00, U0420:00 OR U0420:82
- PINPOINT TEST BU : U0138:82
- PINPOINT TEST BV : U0140:00, U0422:00, U0422:82 OR U0431:82
- PINPOINT TEST BW : U0146:00
- PINPOINT TEST BX : U0151:00 OR U0452:81
- PINPOINT TEST BY : U0159:00 OR U045A:82
- PINPOINT TEST BZ : U0184:00
- PINPOINT TEST CA : U0212:00
- PINPOINT TEST CB : U0232:00, U0233:00, U0533:00, U0533:82, U0534:00 OR U0534:82
- PINPOINT TEST CC : U023A:00
- PINPOINT TEST CD : U0256:00, U0242:00, U0424:81, U0424:82, U0557:00, U0557:81 OR U0557:82
- PINPOINT TEST CE : U0533:56 OR U0534:56
- PINPOINT TEST CF : U2100:00
- PINPOINT TEST CG : U3000:41, U3000:42, U3000:43, U3000:44, U3000:46 OR U3000:54
- PINPOINT TEST CH : U3003:16
- PINPOINT TEST CI : U3003:17

Seatbelt Minder Deactivating/Activating

Activation

NOTE: *If the Seatbelt Minder is deactivated, follow this procedure to activate.*

NOTE: *Deactivation/activation of the belt minder may also be carried out using IDS. Follow the instructions on the screen.*

NOTE: *The belt minder can be enabled or disabled independently for the driver and the front passenger by performing the following procedure.*

1. Apply the parking brake.
2. Place the transmission selector lever in P (Park) - vehicles with automatic transmission or the neutral position - vehicles with manual transmission.
3. Turn the ignition switch to the OFF position.
4. Close all the vehicle doors from the inside of the vehicle.
5. **Unbuckle** the driver's safety belt.
6. **Unbuckle** the front passenger's safety belt.
7. Turn the ignition switch to the ON position (do not start the engine).
8. **Wait until the safety belt warning indicator turns off.**
9. **NOTE:** *This step must be completed within 30 seconds or the procedure must be repeated.*

   Buckle then unbuckle the safety belt four times, ending with the safety belt unbuckled. Release the red unbuckle switch **completely** every cycle.
10. The safety belt warning indicator flashes momentarily to confirm the belt minder status change.
11. Turn the ignition switch to the OFF position. The deactivation/activation procedure is now complete.

Instrument Panel Cluster (IPC)

Base Part Number: 10849

Special Tool(s) / General Equipment

Interior Trim Remover

Removal

NOTE: *Removal steps in this procedure may contain installation details.*

1. **WARNING: Before beginning any service procedure in this section, refer to Safety Warnings in ion 100-00 General Information. Failure to follow this instruction may result in serious personal injury.**

   Refer to: Health and Safety Precautions (100-00 General Information, Description and Operation).

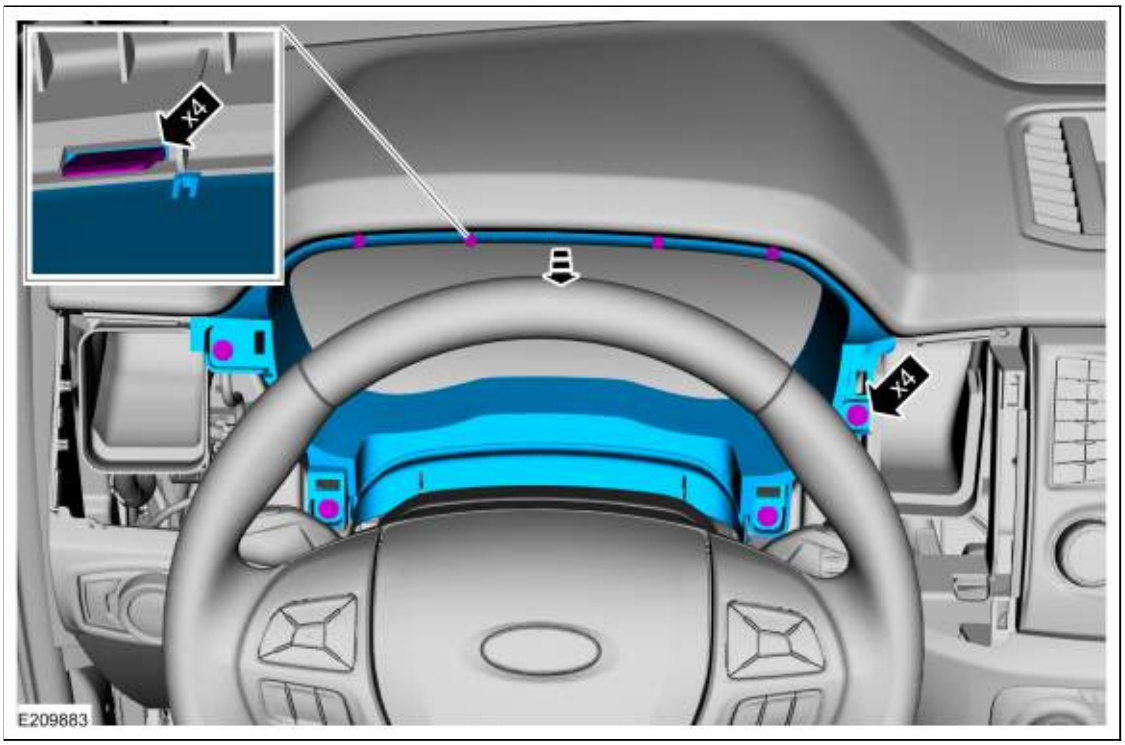
2. **NOTE:** *If installing a new module, it is necessary to upload the module configuration information to the scan tool prior to removing the module. This information must be downloaded into the new module after installation.*

   Using a diagnostic scan tool, begin the PMI process for the IPC following the on-screen instructions. Record the odometer value from the original IPC. If the odometer value cannot be obtained from the IPC (display failure), perform the diagnostic routine. If the value cannot be obtained after the diagnostic routine, the customer should supply the approximate odometer value.

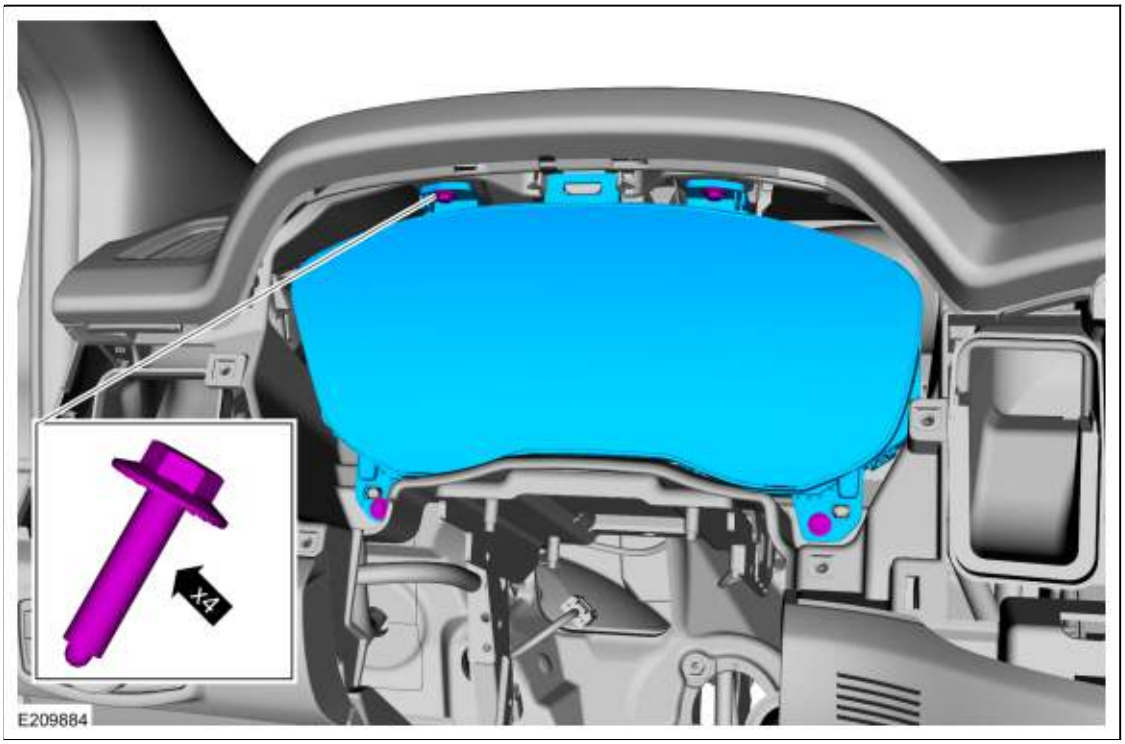
3. Disconnect the electrical connector.
   Use the General Equipment: Interior Trim Remover

4. Use the General Equipment: Interior Trim Remover

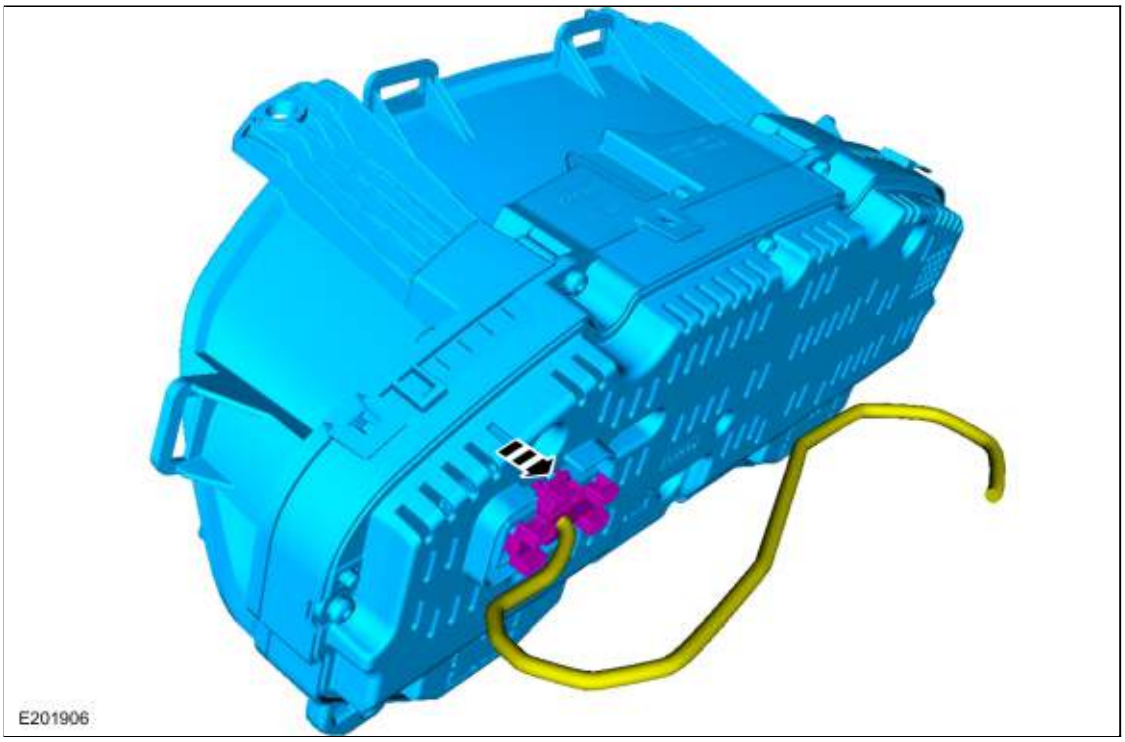
5. Remove bolts, release the clips and remove the IPC bezel.
   Torque: 27 lb.in (3 Nm)



6. Remove the bolts and the IPC
Torque: 27 lb.in (3 Nm)



7. Disconnect the electrical connector.



Installation

1. To install, reverse the removal procedure.
2. Using a diagnostic scan tool, complete the PMI process for the IPC following the on-screen instructions.