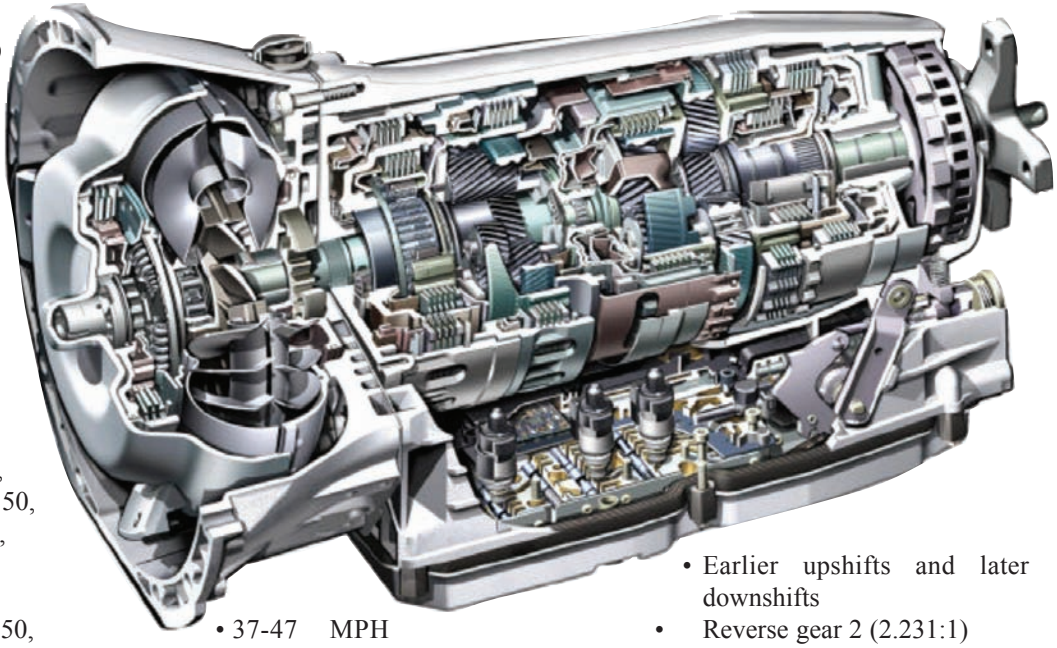
Mercedes 722.9 Preliminary Information, Part 1

by Mike Souza



The Mercedes 722.9 transmission has been around since the later part of 2004, but there still isn't a lot written about it. The 722.9 can be found in these Mercedes vehicles:

2004-06 – SL500

2005-up – CL500, E500, S430, 500, SLK350, 55 AMG

2006-up – C230, 280, 350, CLK350, CLS500, E350, E63 AMG, R350, 500, SLK280

2007-up – CLK550, CLS550, CL600, CLS63 AMG, E550, E63 AMG, GL320, 450, ML350, 500, ML63 AMG, R63, and S550

That's a lot of vehicles! This 5th generation transmission is the first 7-speed automatic produced by Mercedes Benz. The Mercedes designation for this transmission is New Automatic Gearbox 2 (NAG2) or 7G–Tronic. Along with seven forward speeds this unit also has two reverse gears ratios (similar to the 722.6) depending on whether it's in Sport or Comfort mode.

Shift Strategy

Shift strategy improvements include:

- Computer reaction time is 0.1 second shorter.
- Downshifts are shortened by up to 0.2 seconds.
- Coasting downshifts are shortened by 0.4/2.5 seconds.
- 37-47 MPH acceleration times are shortened by 23-28% (model dependant).
- Fuel consumption is reduced by up to 4%.
- Noise levels are reduced due to lower engine speed in 5th, 6th and 7th gear at constant vehicle speed.
- Flexible adaptation to vehicle and engine.

Variable Shift Programming

There are two basic shift programs that can be varied by the customer (similar to the 722.6) using the S or C button on the Electronic Shifter Module (ESM):

1. S (Sport)
   - 1st gear starts
   - Normal shift points
   - Reverse gear 1 (3.416:1)
2. C (Comfort)
   - 2nd gear starts
   - Earlier upshifts and later downshifts
   - Reverse gear 2 (2.231:1)

The transmission will start in first gear if any of these conditions apply:

- 1st gear is selected manually.
- ¾-throttle to full-throttle acceleration from start.
- Cold engine temperature (pre-catalytic warmup).

Emergency Function or Limp-Home Mode

There are a variety of failsafe modes:

- If a solenoid doesn't work the affected gear is blocked. For example: if solenoid Y3/8y7 or the B3 clutch is defective, you won't have 1st, 7th or reverse in S mode.
- If a hydraulic fault prevents a gear from engaging, the previous gear will remain applied.
- If the computer defaults to limp mode while driving, it'll turn all solenoids off.

Shift Member		B1	B2 *	B3	BR *	K1	K2	K3
Shift Valve		Y3/8y5	Y3/8y6	Y3/8y7	Y3/8y6	Y3/8y2	Y3/8y3	Y3/8y4
Valve State		Pressure / Current	Pressure / Current	Pressure / Current	Pressure / Current	Pressure / Current	Pressure / Current	Pressure / Current
Gear	Ratio	◣	◢	◢		◢	◣	◣
1	4.377	C=Max / P=0	X / C=V / P=V	X / C=V / P=V		C=0 / P=0	C=Max / P=0	X / C=V / P=V
2	2.859	X / C=V / P=V	X / C=V / P=V	C=0 / P=0		C=0 / P=0	C=Max / P=0	X / C=V / P=V
3	1.921	C=Max / P=0	X / C=V / P=V	C=0 / P=0		X / C=V / P=V	C=Max / P=0	X / C=V / P=V
4	1.368	C=Max / P=0	X / C=V / P=V	C=0 / P=0		X / C=V / P=V	X / C=V / P=V	C=Max / P=0
5	1	C=Max / P=0	C=0 / P=0	C=0 / P=0		X / C=V / P=V	X / C=V / P=V	X / C=V / P=V
6	0.82	X / C=V / P=V	C=0 / P=0	C=0 / P=0		C=0 / P=0	X / C=V / P=V	X / C=V / P=V
7	0.728	C=Max / P=0	C=0 / P=0	X / C=V / P=V		C=0 / P=0	X / C=V / P=V	X / C=V / P=V
N (1)		C=Max / P=0	C=0 / P=0	X / C=V / P=V	C=0 / P=0	C=0 / P=0	C=Max / P=0	X / C=V / P=V
N (2)		X / C=V / P=V	C=0 / P=0	C=0 / P=0	C=0 / P=0	C=0 / P=0	C=Max / P=0	X / C=V / P=V
R (1)	-3.416	C=Max / P=0	see BR	X / C=V / P=V	X / C=V / P=V	C=0 / P=0	C=Max / P=0	X / C=V / P=V
R (2)	-2.231	X / C=V / P=V	see BR	C=0 / P=0	X / C=V / P=V	C=0 / P=0	C=Max / P=0	X / C=V / P=V

X = Shift member applied C = Current applied to solenoid valve P = Pressure from solenoid valve to shift member (0 = zero / V = variable / Max = maximum)

* B2 and BR share the same solenoid valve, the oil is directed to a different member via the selector shift valve.

◢ No current = no pressure
◣ No current = max. pressure

(1) = S mode
(2) = C mode

If transmission enters emergency mode while driving, all solenoid valves are switched off. Trans will shift into 6th gear.
? This is because the solenoid valves for B1, K2 & K3 deliver max pressure with no current applied.
? After engaging P position, then D position; only 2nd and R gear is available.

Figure 1

Solenoids that are normally open will allow full pressure to selected clutches and the transmission will be in 6th gear. After shifting to park, oil pressure from K2 solenoid is redirected to the B2/BR solenoid by emergency operation valves, and the transmission

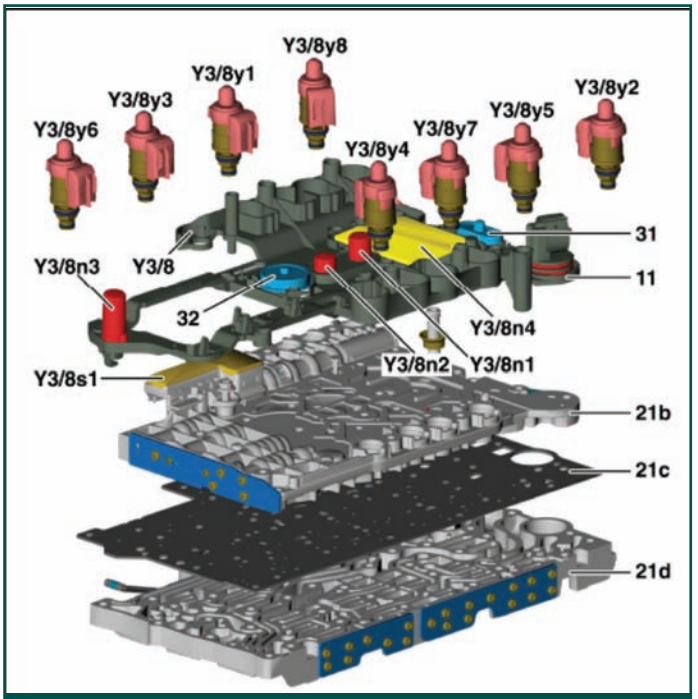


Figure 2

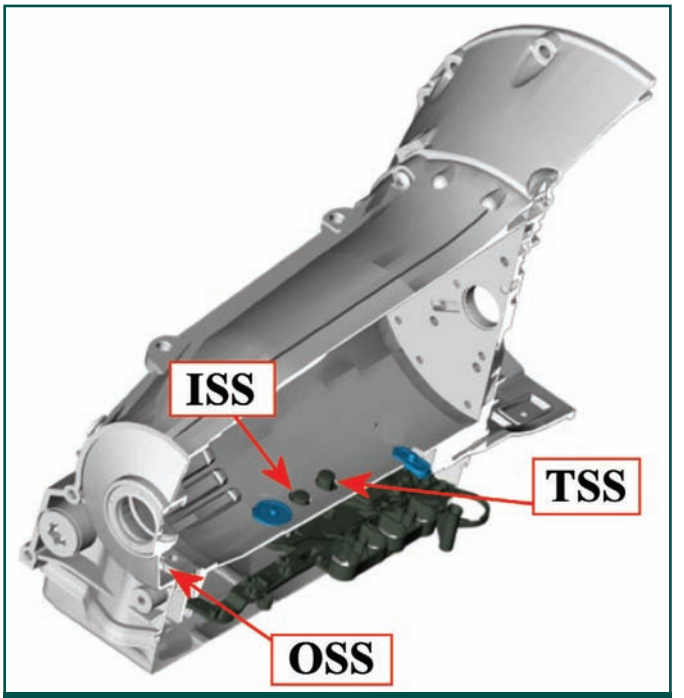


Figure 3

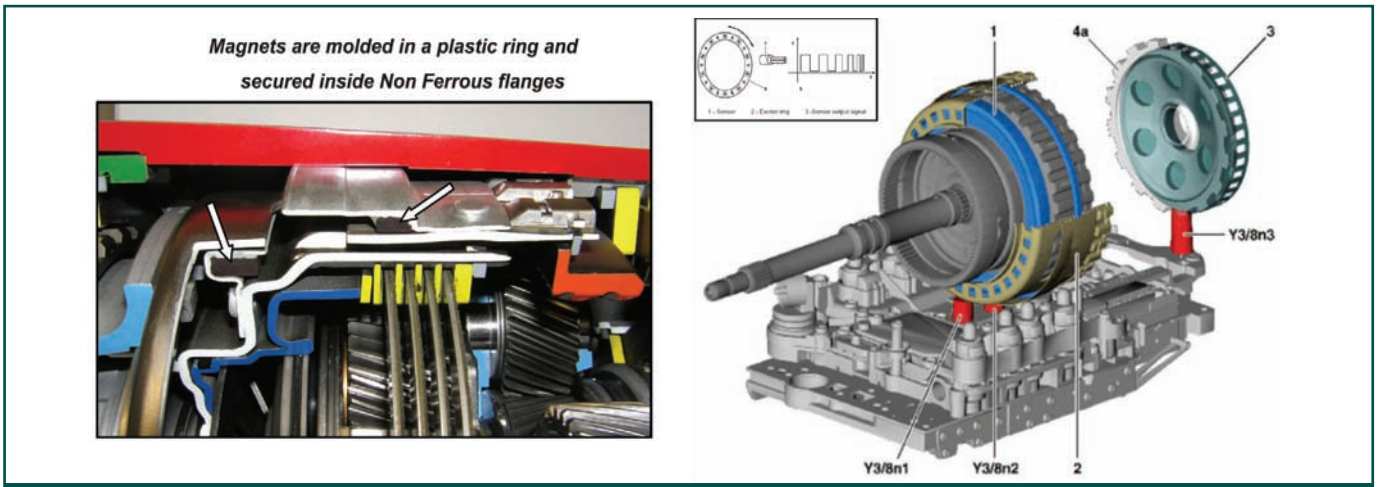


Figure 4

will now provide reverse, and 2nd gear with the selector in drive (figure 1).

Electronic Control Components

Here's a diagram of the components that make up the electronic control system (figure 2).

- Transmission Control Module (Y3/8n4) (flash capable)
- Working Pressure Control Solenoid (Y3/8y1) (line/normally open)
- K1 Clutch Solenoid (Y3/8y2) (normally closed)
- K2 Clutch Solenoid (Y3/8y3) (normally open)
- K3 Clutch Solenoid (Y3/8y4) (normally open)
- B1 Brake Clutch Solenoid (Y3/8y5) (normally open)
- B2 Brake Clutch Solenoid (Y3/8y6) (normally closed)
- B3 Brake Clutch Solenoid (Y3/8y7) (normally closed)
- Torque Converter Lockup Solenoid (Y3/8y8) (normally closed)

Normally Closed: high current, high pressure; no current, no pressure.

Normally Open: no current, high pressure; high current, low pressure. Normally open solenoids are used for limp mode with no current to the transmission.

Two Oil Floats

- Oil Control Float 1 (31)
- Oil Control Float 2 (32)

Fluid Level Float Function 2

The extended length of the transmission (41mm) allows oil to slosh forward during hard stops. To prevent oil foaming from gears running in fluid, Mercedes added a front float.

Three Speed Sensors

These components are built into the valve body assembly (figure 3):

- Turbine RPM Sensor (Y3/8n1) (Front)
- Internal RPM Sensor (Y3/8n2) (Center)
- Output RPM Sensor (Y3/8n3) (Rear / Hall Effect)
- Selection Range Sensor (Y3/8s1)

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___ = extra income/wk.

___ × 52 weeks

___ = Total Annual Income

* For comparison purposes only. $60 profit per rebuilt torque converter based on average price charged by major rebuilders for typical rebuilt converter, less average cost of rebuild (parts & labor, as determined by surveyed TCRS customers). Average profit per converter may vary based on local labor rates, market area pricing of rebuild components and equipment operator experience levels.

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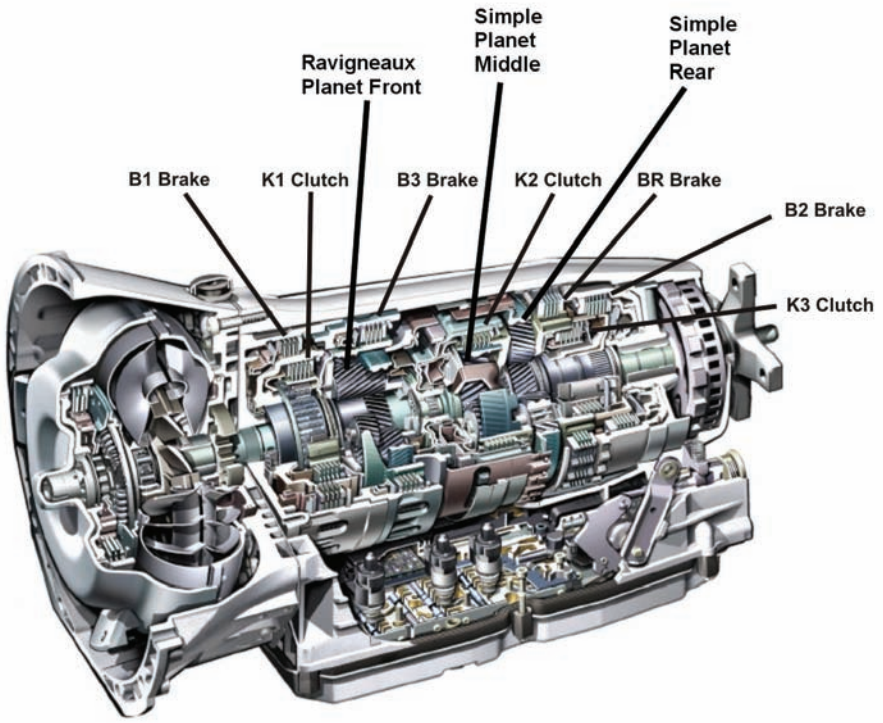

Gear	Gear ratio W7A 700	B1	B2	B3	BR	K1	K2	K3
1	4.377		●	●				●
2	2.859	●	●					●
3	1.921		●			●		●
4	1.368		●			●	●	
5	1.000					●	●	●
6	0.820	●					●	●
7	0.728			●			●	●
N (1)				●				●
R (1)	-3.416			●	●			●
R (2)	-2.231	●			●			●

Figure 5

Range Sensor Function

The Y3/8s1 range sensor is built into the ECM ribbon cable, and can't be replaced individually. It's a Permanent Magnetic Linear Contactless Displacement (PLCD) sensor; it has a permanent magnet mounted to the manual valve, which changes the magnetic field and output voltage as you move the selector. If the sensor signal doesn't register properly with the computer, it'll put the system into limp mode.

Speed Sensor Function

The 722.9 uses three speed sensors to monitor transmission operation (figure 4):

1. The front speed sensor (Y3/8n1) monitors turbine speed (input shaft / small ring gear).
2. The center speed sensor (Y3/8n2) monitors the Ravigneaux carrier speed (ring gear of rear planet).
3. The rear speed sensor (Y3/8n3) monitors the park pawl gear (exciter ring/2 Hall Effect).

The magnets for these sensors are molded in a plastic ring and secured inside nonferrous flanges.

Transmission Fluid Temperature

The transmission fluid temperature sensor is built into the TCM, and isn't replaceable separately.

Clutch Components

The 722.9 uses four brakes and three clutch packs to provide seven forward gear ranges and two reverse ranges.

- 4 Multi-Disc Brakes
- 3 Multi-Disc Clutches
- No Sprag

Unlike the Lepelletier geartrain, the 722.9 geartrain has the sun gear fixed to the K1 clutch assembly, located in the front of the unit (figure 6).

Gear ratios are achieved with one Ravigneaux and two simple planetary assemblies shown in figure 5. Unlike the Lepelletier geartrain, the 722.9 geartrain has the sun gear fixed to the K1 clutch assembly, located in the front of the unit (figure 6). The Ravigneaux planetary assembly is also located in the front section of the transmission (figure 7). There are two simple planets located toward the back of the transmission, one in front of the other (figure 8).

Fluid Type

The 722.9 uses a newly-developed, suggested-use-only transmission fluid, referred to as *ATF 3353* (figure 9). It promises a higher friction consistency, thermal stability, and temperature rating. ATF 3353 can also be used on previous model 722.3/.4/.5/.6 transmissions. This special ATF is available from Shell & Fuchs Europe oil suppliers in 1 liter bottles under Mercedes Benz part number A001 989 45 03 10.

No scheduled maintenance is required for the 722.9 (fill for life).

In the next issue we'll go into sequential shifting, powerflow, and some unusual features associated with the Mercedes 722.9.

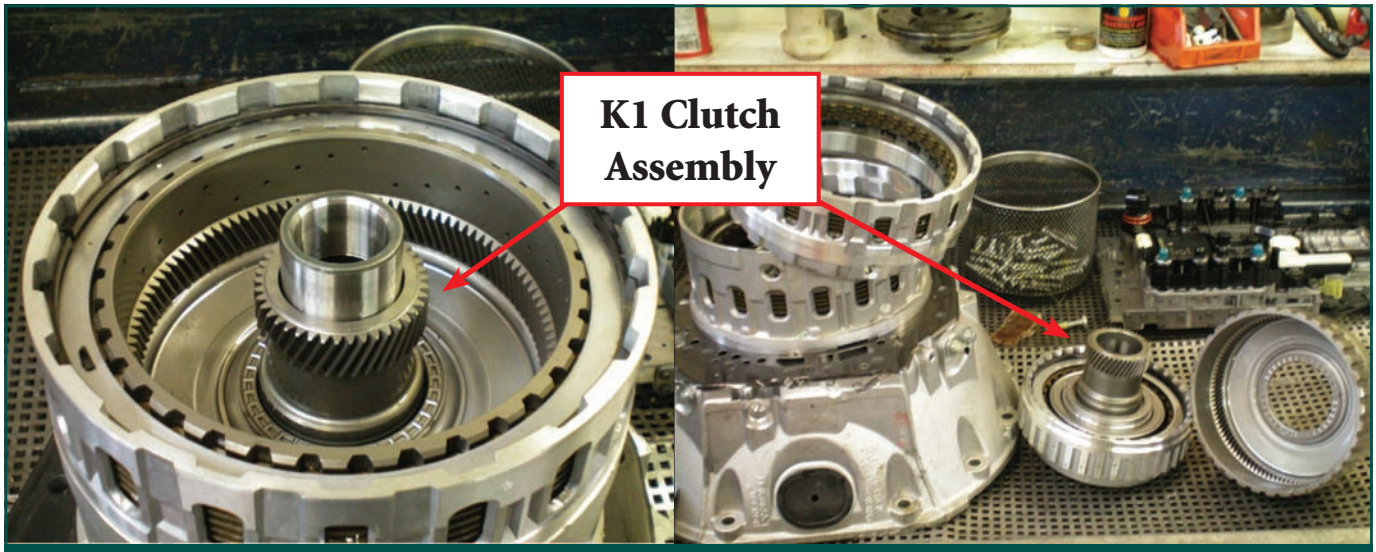

Figure 6

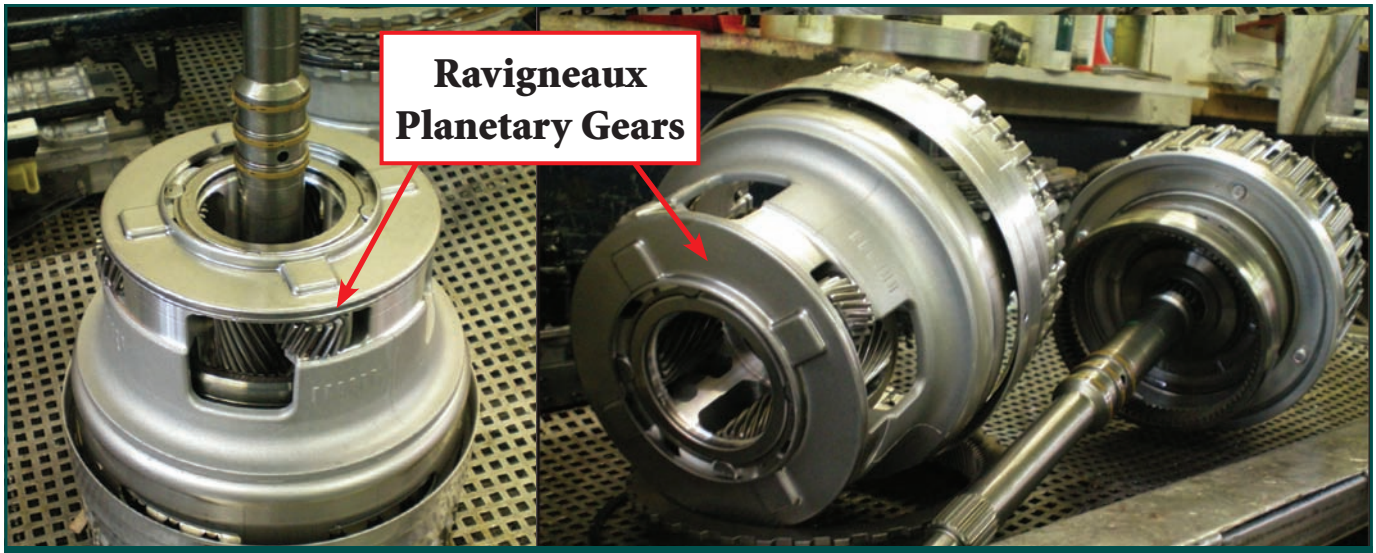

Figure 7

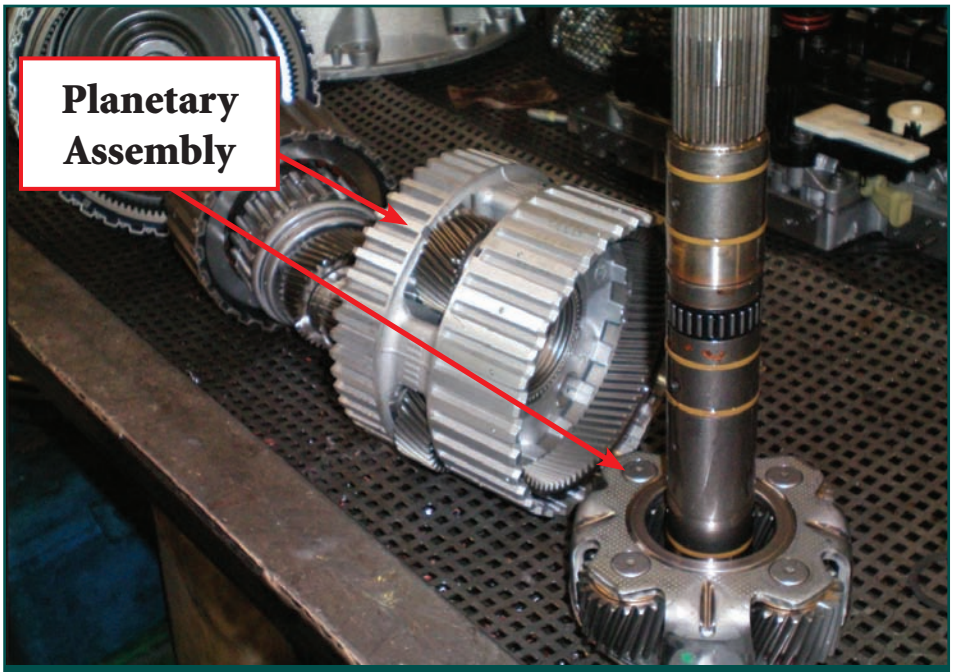

Figure 8


Figure 9