



Technical Bulletin # 1241

Transmission: Mercedes 722.9 Series

Subject: Preliminary Information

Application: Several C, E, G, M, R & L Class Mercedes

Issue Date: March, 2009

Mercedes 722.9 Preliminary Information

The 722.9 transmission can be found in the Mercedes 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 and 2007 & up CLK550, CLS550, CL600, CLS63 AMG, E550, E63 AMG, GL320, 450, ML350, 500, ML63 AMG, R63, and S550.

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 7 forward speeds this unit also has 2 reverse gears ratios (similar to the 722.6) depending on whether it's in the Sport or Comfort mode.

Shift Strategy

Shift strategy improvements include:

- Shorter computer reaction time by 0.1 second
- Downshifts shortened by up to 0.2 seconds
- Coasting downshifts shortened by 0.4/2.5 seconds
- 37-47 MPH acceleration times shortened by 23-28% (model dependant)
- Fuel consumption reduced by up to 4%
- Noise levels reduced, due to lower engine speed in 5th, 6th & 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)

“S” (Sport)

- 1st gear starts
- Normal shift points
- Reverse gear 1 (-3.416:1)

“C” (Comfort)

- 2nd gear starts
- Earlier up-shifts and later downshifts
- Reverse gear 2 (-2.231:1)

Note: Transmission will start in first gear if any of the following conditions apply:

- 1st gear is manually selected
- 3/4 to full throttle acceleration from start
- Cold engine temp (pre-catalytic warm up)

Emergency function or Limp-home mode:

There are a variety of failsafe modes;

- If a solenoid is defective the gear affected is blocked example: (solenoid Y3/8y7-B3 clutch is defective: no 1st, 7th or Reverse in “S” mode)
- If hydraulic fault prevents a gear from engaging then the previous gear will be applied.
- If the computer defaults while driving, all solenoids will be turned off. Solenoids that are normally open will allow full pressure to selected clutches and the transmission will be in 6th gear. After shifting to “P” oil pressure from K2 solenoid is redirected to B2/BR solenoid via emergency

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operation valves and the transmission will now achieve 2nd in “D” and Reverse. (shown in the solenoid apply chart in figure 1)

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 (1) = S mode
 ▲ No current = max. pressure (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

Shift Sequences

In addition to sequentially shifting through gears, the 722.9 downshift programming allow the transmission to skip gears. Provided that only one member is released and one member is applied. (figure 2)

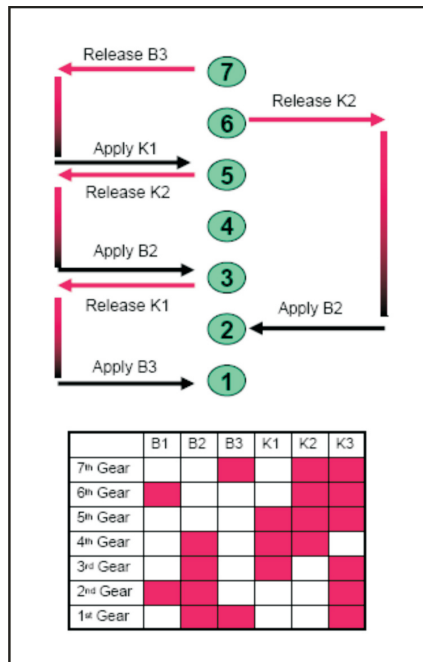


Figure 2

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Electronic Control Components (figure 3)

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 Lock Up Solenoid (Y3/8y8) (normally closed)

Note:

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 w/no current to transmission.

Two Oil Floats

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

Three Speed Sensors (3) (following components are integral to the valve body assembly)

- Turbine RPM Sensor (Y3/8n1) (front)
- Internal RPM Sensor (Y3/8n2) (center)
- Output RPM Sensor (Y3/8n3) (rear/hall affect)

Range Sensor

- Selection Range Sensor (Y3/8s1)

Y3/8s1 Range sensor: Soldered to ECM ribbon cable / not replaced separately / Permanent

Magnetic Linear Contactless Displacement (PLCD) sensor / Permanent magnet on manual valve changes magnetic field and output voltage / if not relearned or faulty will cause limp mode.

Transmission Fluid Temperature sensor is integral to the TCM.

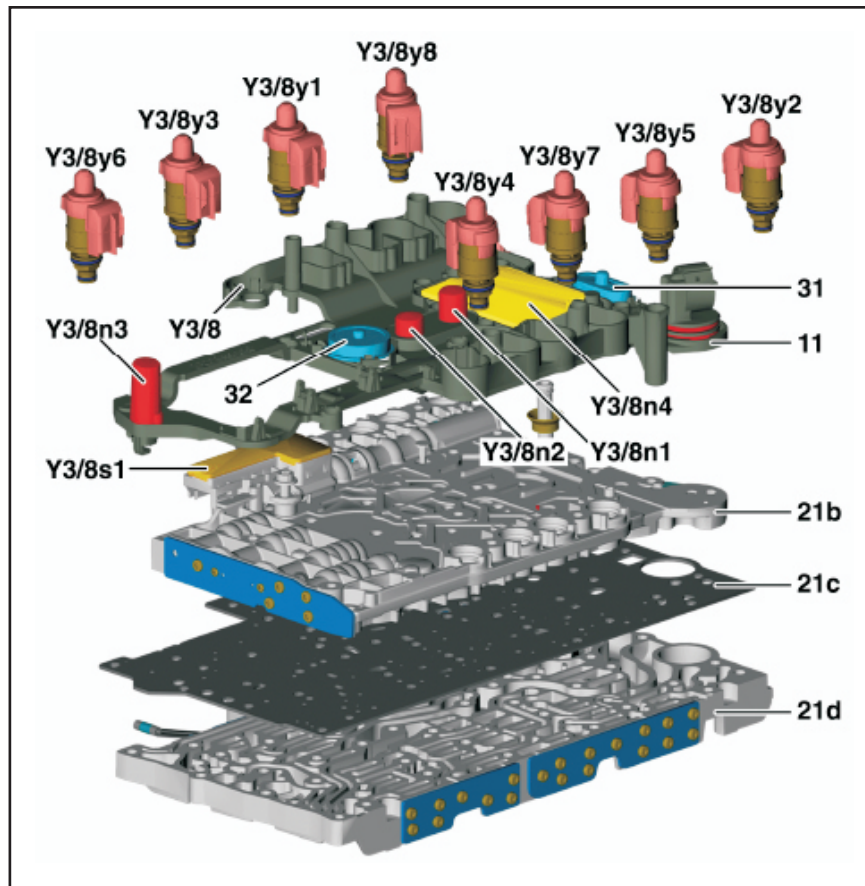


Figure 3

Fluid Level Float Function (2) (figure 4)

To prevent oil foaming from gears running in fluid / front one was added due to transmission extended length (41mm) oil sloshes forward during hard stops

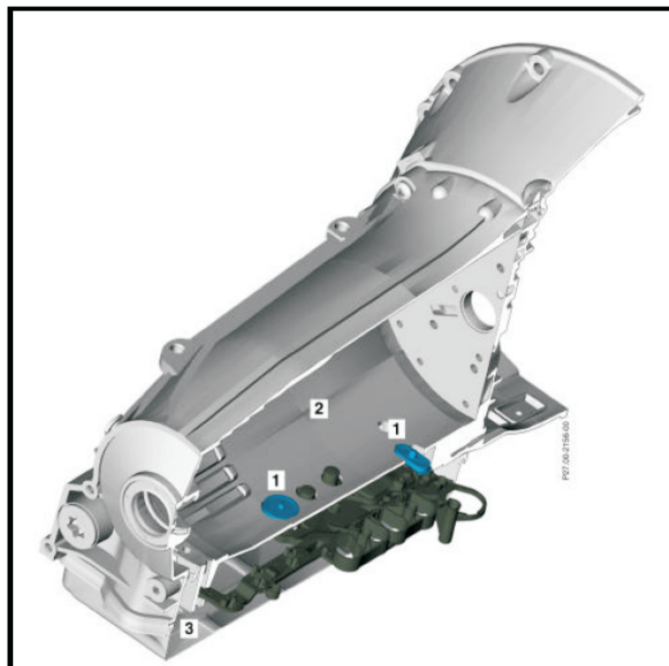


Figure 4

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Speed Sensor Function (figure 5)

Front speed sensor Y3/8n1; monitors Turbine speed (input shaft / small ring gear)

Center speed sensor Y3/8n2 monitors Ravigneaux carrier speed (ring gear of rear planet)

Rear speed sensor Y3/8n3 monitors Park Pawl gear (exciter ring/2 hall effect)

Note: Magnets are molded in a plastic ring and secured inside Non Ferrous flanges

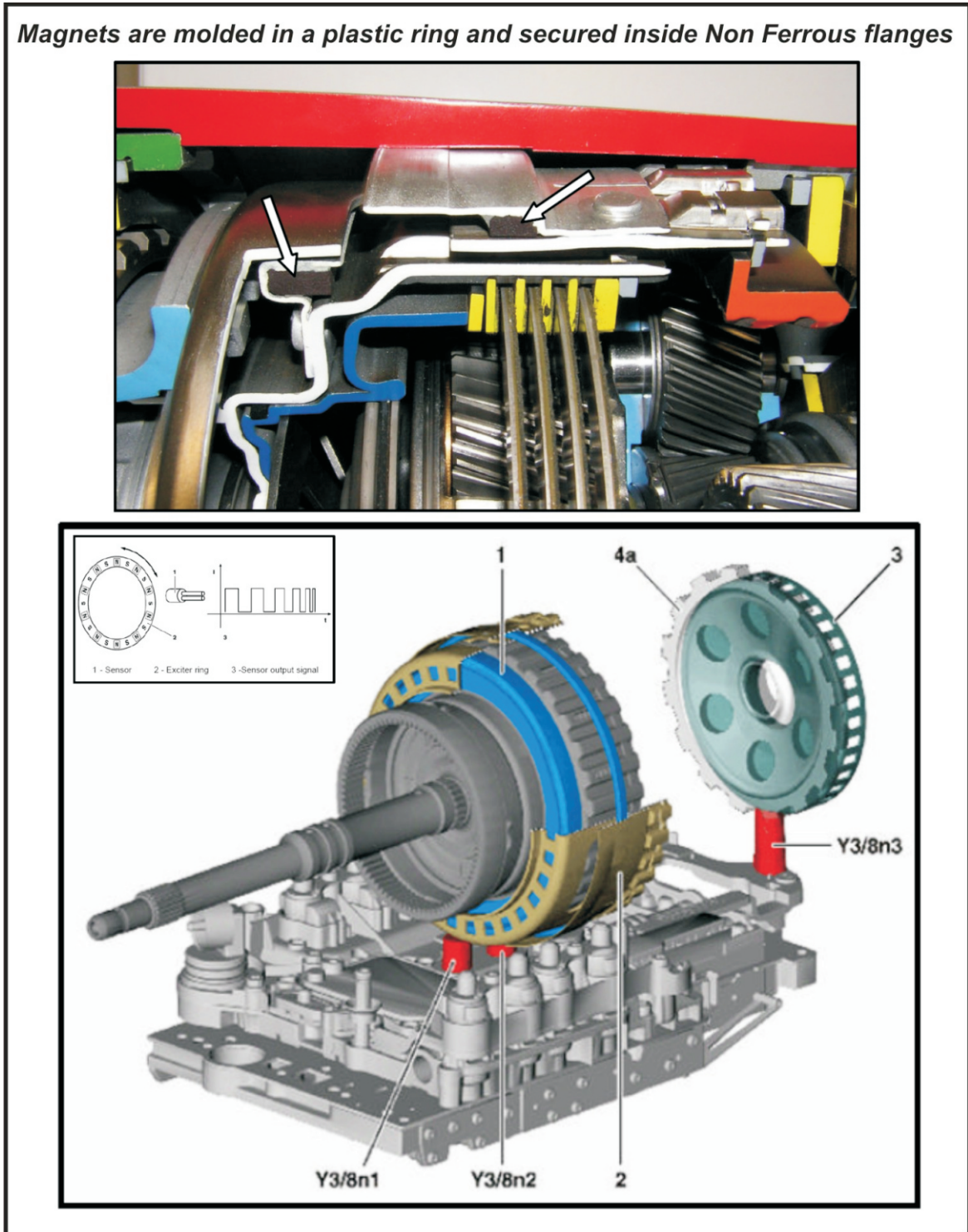


Figure 5

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Clutch Components (component location and apply chart shown in figure 6).

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

Gear ratios are achieved with one Ravigneaux and two Simple planetary assemblies shown in figure 7.

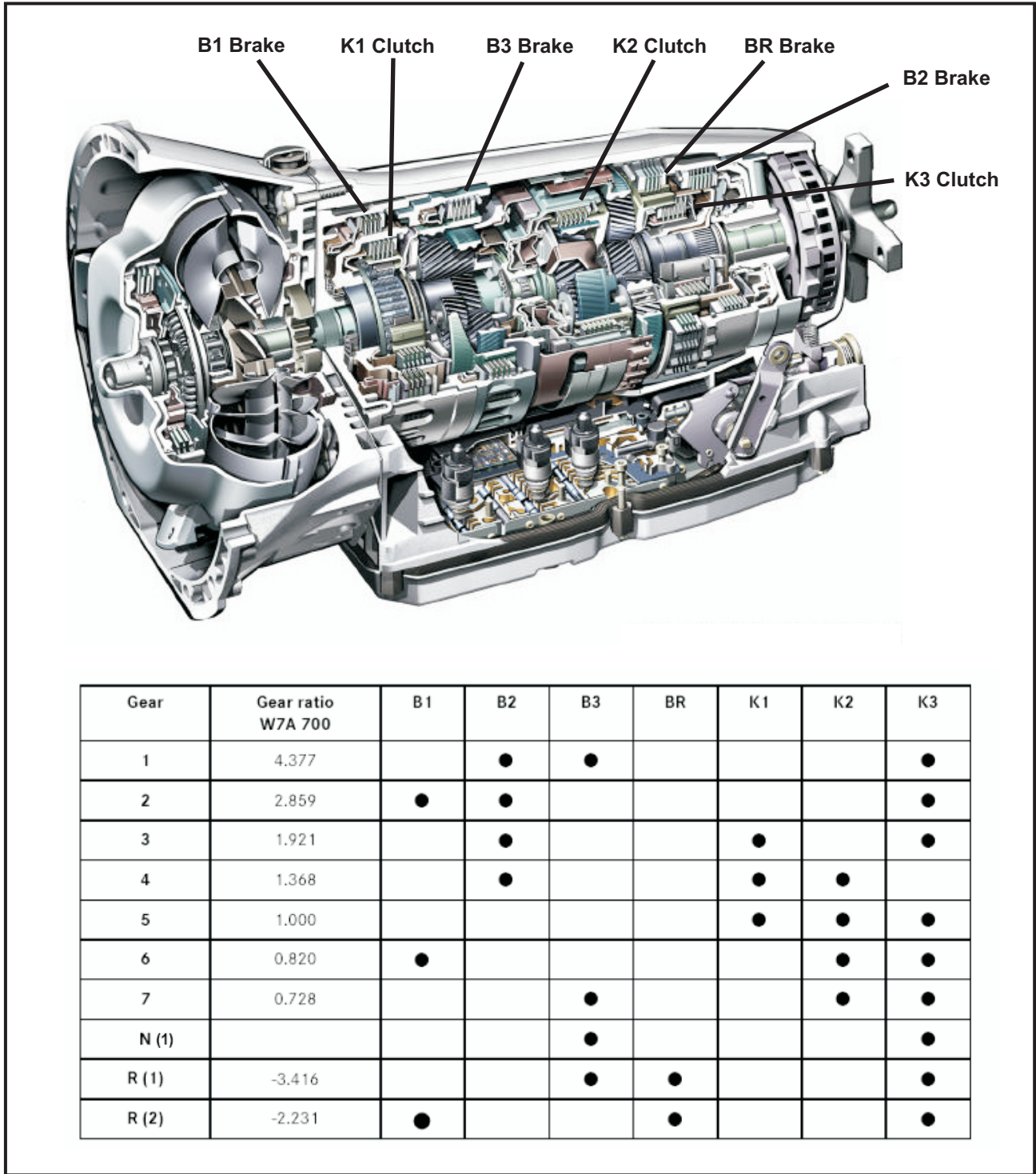


Figure 6

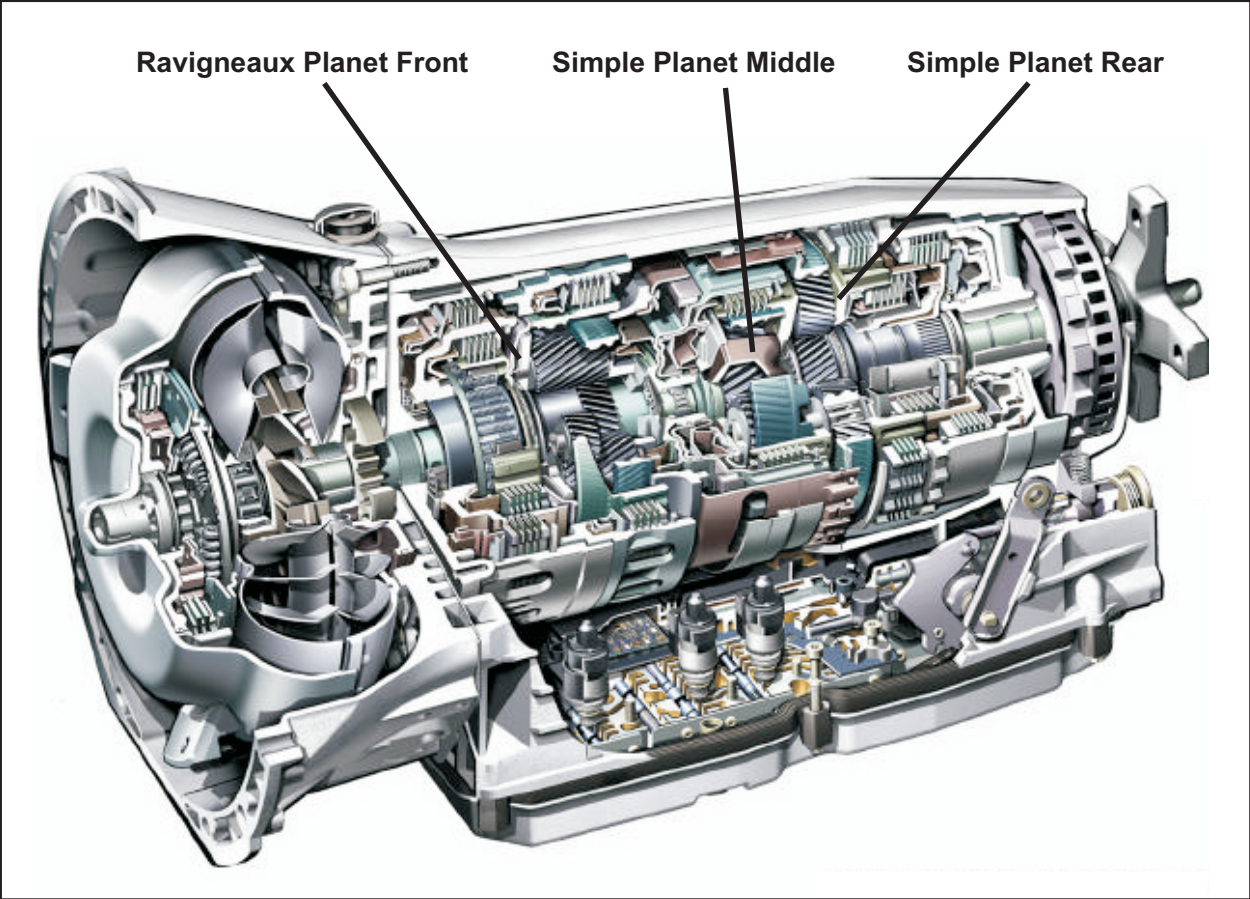


Figure 7

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Torque Converter

Torque converter operates in an open slip mode in all seven forward gear. Lock up converter is never fully locked. Converter is open in 1st & 2nd gear if throttle and output shaft speed are in “Zone A” Converter is in slip-control in all 7 forward gear if throttle and output shaft speed are in “Zone B”. Oil feed pressure to the converter is varied depending on the amount of slip (see figures 8)

Lock up clutch will turn off and transmission will shift to a lower gear at oil temperatures of 140C or higher.

Holds = 4 liters of fluid

Incorporates damper springs integral to lock up clutch to reduce vibration (figure 9)

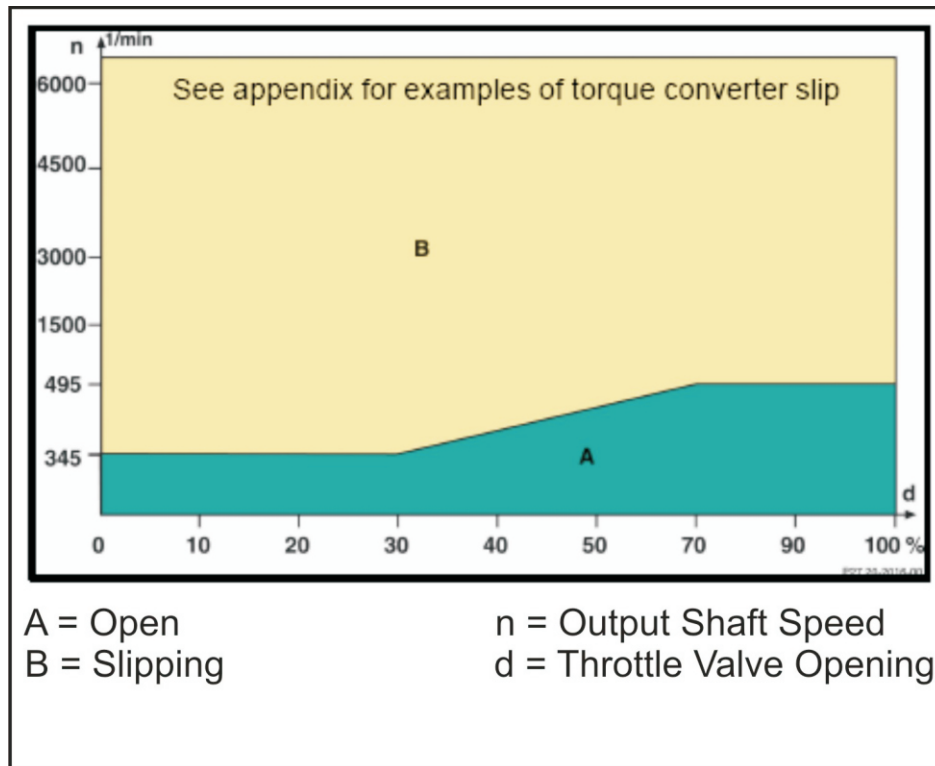


Figure 8

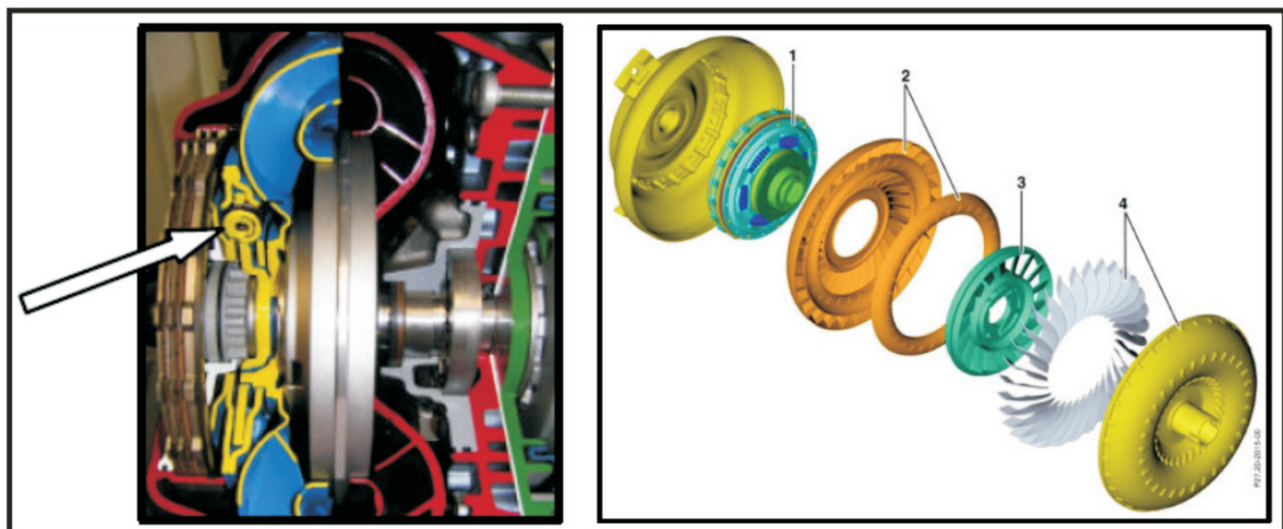


Figure 9

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Vehicle Towing

If vehicle must be towed it should be transported by use of a flat bed trailer or tow truck is preferred. Alternate towing with vehicle drive axle lifted. If either fore mentioned options are not available a tow bar (preferred) will suffice under the following conditions/limitations:

1. Turn key to position 2
2. Selector lever to "N" position
3. Max. towing speed 31 mph
4. Max. towing distance 31 miles

Note: If towing distance or speed exceeds pre mentioned values damage may occur to transmission.

Fluid Type

This is a newly developed suggested use "only" transmission fluid, referred to as "ATF 3353 with **higher** friction consistency, thermal stability and temperature rating. Can also be used on previous model 722.3/.4/.5/.6 transmissions. No scheduled maintenance required (fill for life) and available at Shell & OE oil suppliers in 1 liter bottles under Mercedes Benz part number A001 989 45 03 10.

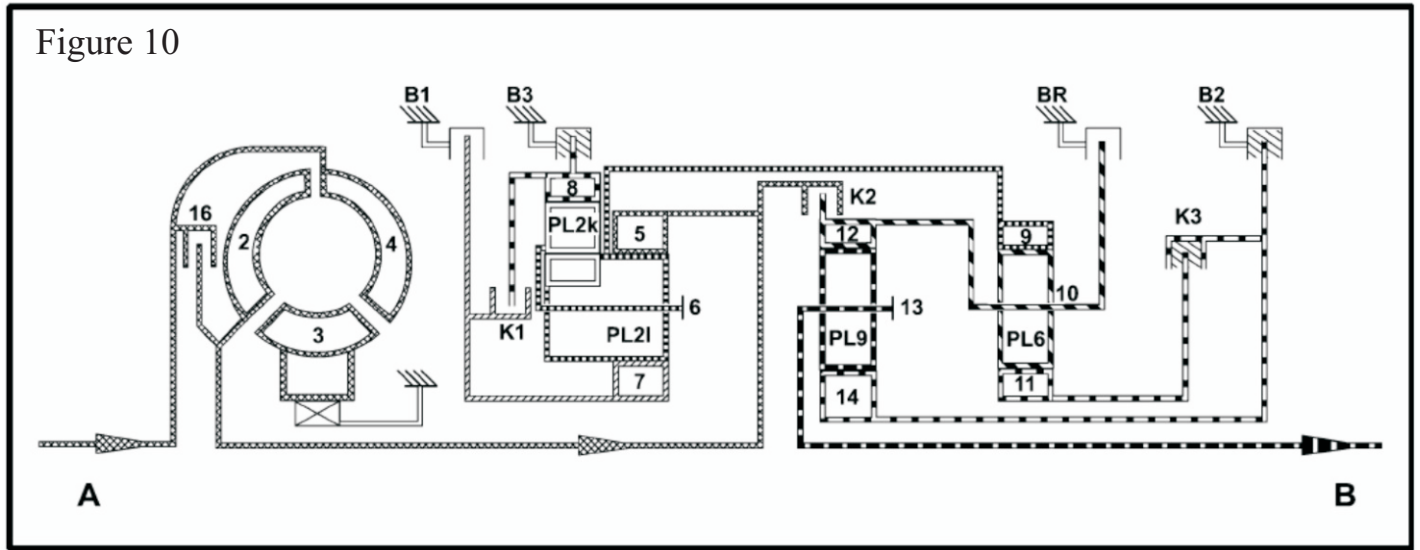


Power Flow

The power flow for each gear including the two reverse ratios is shown in figures 10 through 18.

Power Flow 1st Gear

Figure 10



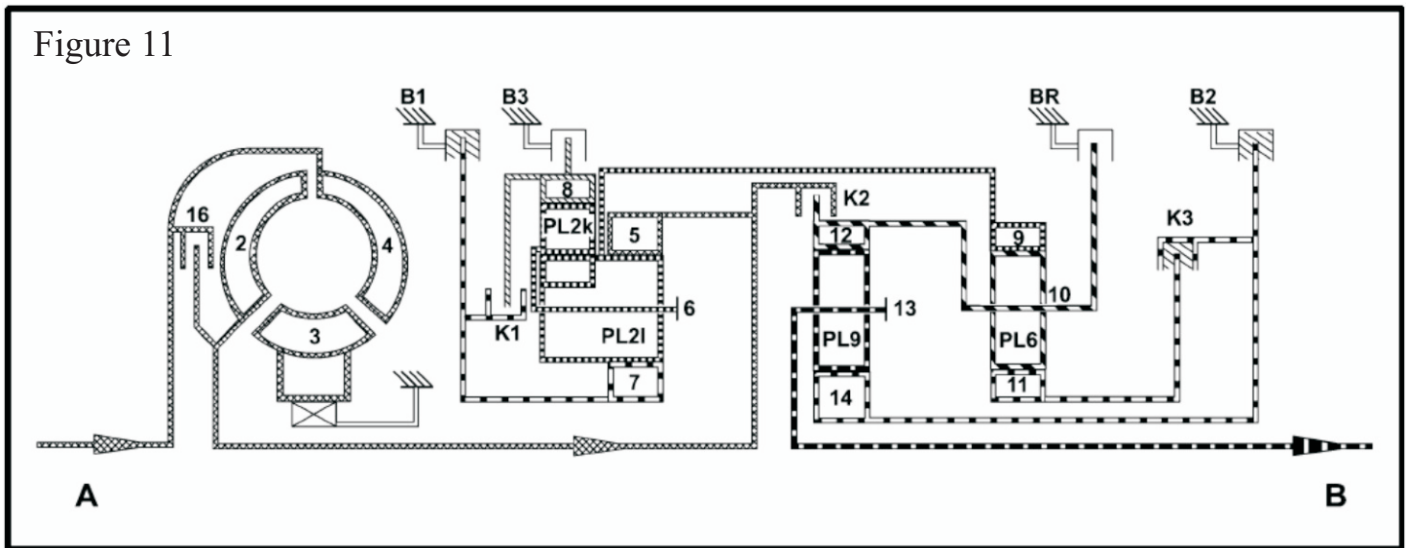
- 2 Turbine wheel
- 3 Stator
- 4 Impeller
- 5 Small internal-gear wheel
- 6 Dual planet carrier
- 7 Sun gear
- 8 Large internal-gear wheel
- 9 Internal-gear wheel
- 10 Planet carrier
- 11 Sun gear
- 12 Internal-gear wheel
- 13 Planet carrier
- 14 Sun gear
- 16 Torque converter lockup clutch

- A Input
- B Output
- BR Multi-disk brake BR
- B1 Multiple-disc brake B1
- B2 Multiple-disc brake B2**
- B3 Multiple-disc brake B3**
- K1 Multi-disk clutch K1
- K2 Multi-disk clutch K2
- K3 Multi-disk clutch K3**
- PL2k Short planet gears
- PL2l Long planet gears
- PL6 Planet gears
- PL9 Planet gears

The Ravigneaux Planet Small Ring Gear (5) is driven by the Input Shaft. The Long Planet Gears (PL2l) drive the Short Planet Gears (PL2k) to rotate inside the Large Ring Gear (8) held by the B3 Brake Clutch. An increase in torque and reduced rpm is transmitted to the Dual Planet Carrier (6). The Single Rear Planet Ring Gear (9) rotates at the same speed as it is mechanically connected to the Dual Planet Carrier. The Planet Gears (PL6) rotate around Sun Gear (11) held by the K3 Clutch and rotate the Planet Carrier (10). The Single Front Planet Ring Gear (12) is mechanically connected to the Planet Carrier (10) and rotates at the same speed. Planetary Gears (PL9) rotate around Sun Gear (14) which is held by the B2 Brake Clutch and transfers the increased torque and reduced rotational speed to the Output Shaft through the Planet Carrier (13). The Output Shaft rotates with reduced input speed in the direction of engine rotation at a ratio of 4.377:1.

Power Flow 2nd Gear

Figure 11

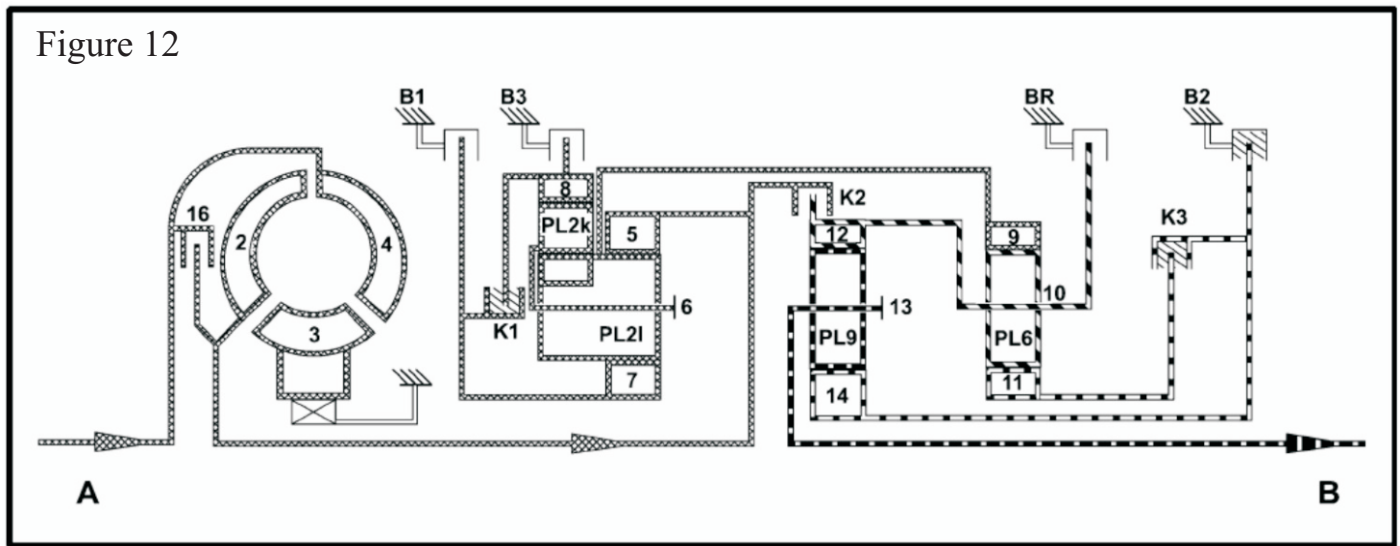


- 2 Turbine wheel
- 3 Stator
- 4 Impeller
- 5 Small internal-gear wheel
- 6 Dual planet carrier
- 7 Sun gear
- 8 Large internal-gear wheel
- 9 Internal-gear wheel
- 10 Planet carrier
- 11 Sun gear
- 12 Internal-gear wheel
- 13 Planet carrier
- 14 Sun gear
- 16 Torque converter lockup clutch

- A Input
- B Output
- BR Multi-disk brake BR
- B1 Multiple-disc brake B1**
- B2 Multiple-disc brake B2**
- B3 Multiple-disk brake B3
- K1 Multi-disk clutch K1
- K2 Multi-disk clutch K2
- K3 Multi-disk clutch K3**
- PL2k Short planet gears
- PL2l Long planet gears
- PL6 Planet gears
- PL9 Planet gears

The Ravigneaux Planet Small Ring Gear (5) is driven by the Input Shaft. The Long Planet Gears (PL2l) rotate around Sun Gear (7) which is held by the B1 Brake Clutch. An increase in torque and reduced rpm is transmitted to the Dual Planet Carrier (6). The Single Rear Planet Ring Gear (9) rotates at the same speed as it is mechanically connected to the Dual Planet Carrier. The Planet Gears (PL6) rotate around Sun Gear (11) held by the K3 Clutch and rotate the Planet Carrier (10). The Single Front Planet Ring Gear (12) is connected mechanically to the Planet Carrier (10) and rotates at the same speed. Planetary Gears (PL9) rotate around Sun Gear (14) which is held by the B2 Brake Clutch and transfers the increased torque and reduced rotational speed to the Output Shaft through Planet Carrier (13). The Output Shaft rotates with reduced input speed in the direction of engine rotation at a ratio of 2.859:1.

Power Flow 3rd Gear



- 2 Turbine wheel
- 3 Stator
- 4 Impeller
- 5 Small internal-gear wheel
- 6 Dual planet carrier
- 7 Sun gear
- 8 Large internal-gear wheel
- 9 Internal-gear wheel
- 10 Planet carrier
- 11 Sun gear
- 12 Internal-gear wheel
- 13 Planet carrier
- 14 Sun gear
- 16 Torque converter lockup clutch

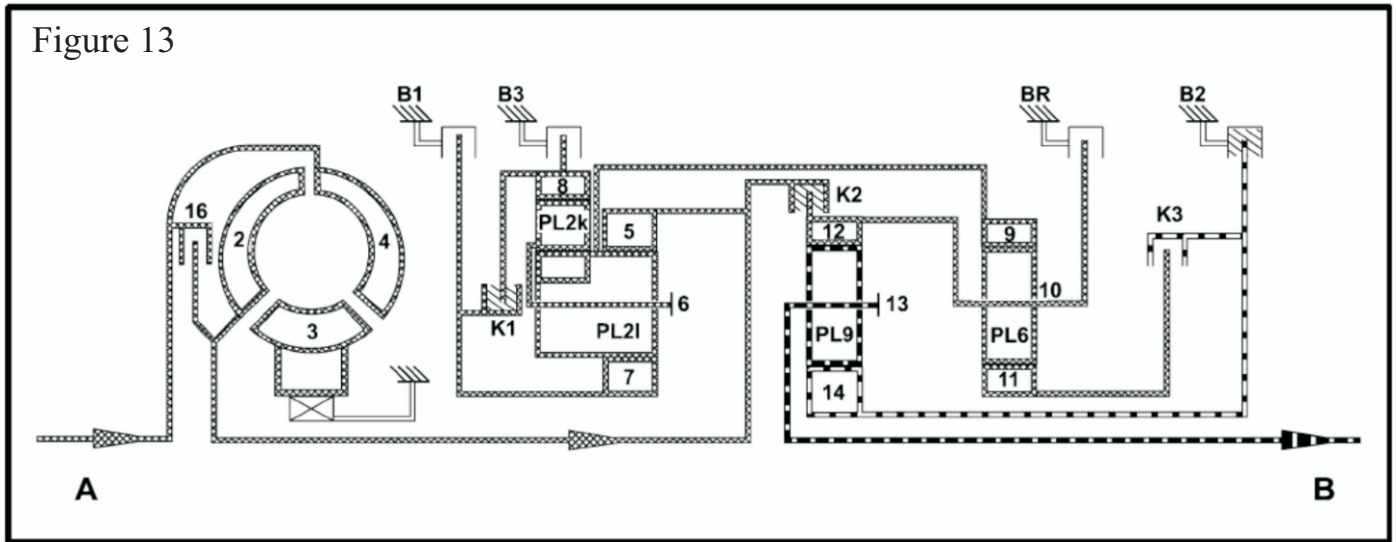
- A Input
- B Output
- BR Multi-disk brake BR
- B1 Multiple-disc brake B1
- B2 Multiple-disc brake B2**
- B3 Multiple-disc brake B3
- K1 Multi-disk clutch K1**
- K2 Multi-disk clutch K2
- K3 Multi-disk clutch K3**
- PL2k Short planet gears
- PL2l Long planet gears
- PL6 Planet gears
- PL9 Planet gears

With the K1 Clutch engaged, the Ravigneaux Planetary Gear set components (5, 6, 7, 8, PL2l & PL2k) are locked together and send Input Torque and Input Speed unchanged to Ring Gear (9). The Single Rear Planet Ring Gear (9) drives the Planet Gear (PL6) to rotate around Sun Gear (11) held by the K3 Clutch and rotate Planet Carrier (10). The Single Front Planet Ring Gear (12) is connected mechanically to the Planet Carrier (10) and rotates at the same speed. Planetary Gears (PL9) rotate around Sun Gear (14) which is held by the B2 Brake Clutch and transfers the increased torque and reduced rotational speed to the Output Shaft through Planet Carrier (13). The Output Shaft rotates with reduced input speed in the direction of engine rotation at a ratio of 1.921:1.

Note:

In 3rd gear the Ravigneaux gear set is locked as one. If a gear noise is being diagnosed and it goes away when in 3rd gear, then check front gear set.

Power Flow 4th Gear



- 2 Turbine wheel
- 3 Stator
- 4 Impeller
- 5 Small internal-gear wheel
- 6 Dual planet carrier
- 7 Sun gear
- 8 Large internal-gear wheel
- 9 Internal-gear wheel
- 10 Planet carrier
- 11 Sun gear
- 12 Internal-gear wheel
- 13 Planet carrier
- 14 Sun gear
- 16 Torque converter lockup clutch

- A Input
- B Output
- BR Multi-disk brake BR
- B1 Multiple-disc brake B1
- B2 Multiple-disc brake B2**
- B3 Multiple-disc brake B3
- K1 Multi-disk clutch K1**
- K2 Multi-disk clutch K2**
- K3 Multi-disk clutch K3
- PL2k Short planet gears
- PL2l Long planet gears
- PL6 Planet gears
- PL9 Planet gears

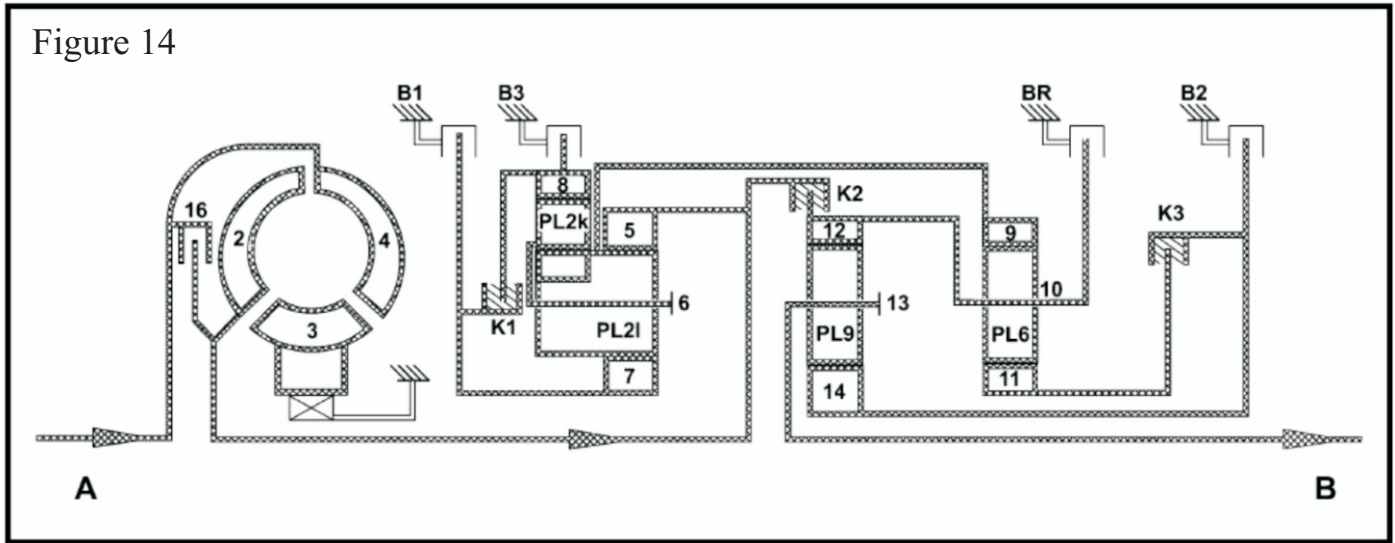
With the K1 Clutch engaged, the Ravigneaux Planetary Gear set components (5, 6, 7, 8, PL2l & PL2k) are locked together and send Input Torque and Input Speed unchanged to the Ring Gear (9). With the K2 Clutch engaged the Single Rear Planet Ring Gear (9) and Single Front Planet Ring Gear (12) rotate at the same speed. The Single Rear Planetary system is locked and not involved in the gear ratio. The engaged K2 Clutch drives the Single Front Planet Ring Gear (12) at Input Speed. The Planetary Gears (PL9) rotate around Sun Gear (14) which is held by the B2 Brake Clutch and transfers the increased torque and reduced rotational speed to the Output Shaft through Planet Carrier (13). The Output Shaft rotates with reduced input speed in the direction of engine rotation at a ratio of 1.368:1.

Note:

In 4th gear the Ravigneaux and rear gear sets are locked as one. If a gear noise is being diagnosed and it only goes away when in 4th gear, then check rear gear set.

Power Flow 5th Gear

Figure 14



- 2 Turbine wheel
- 3 Stator
- 4 Impeller
- 5 Small internal-gear wheel
- 6 Dual planet carrier
- 7 Sun gear
- 8 Large internal-gear wheel
- 9 Internal-gear wheel
- 10 Planet carrier
- 11 Sun gear
- 12 Internal-gear wheel
- 13 Planet carrier
- 14 Sun gear
- 16 Torque converter lockup clutch

- A Input
- B Output
- BR Multi-disk brake BR
- B1 Multiple-disc brake B1
- B2 Multiple-disc brake B2
- B3 Multiple-disc brake B3
- K1 Multi-disk clutch K1**
- K2 Multi-disk clutch K2**
- K3 Multi-disk clutch K3**
- PL2k Short planet gears
- PL2l Long planet gears
- PL6 Planet gears
- PL9 Planet gears

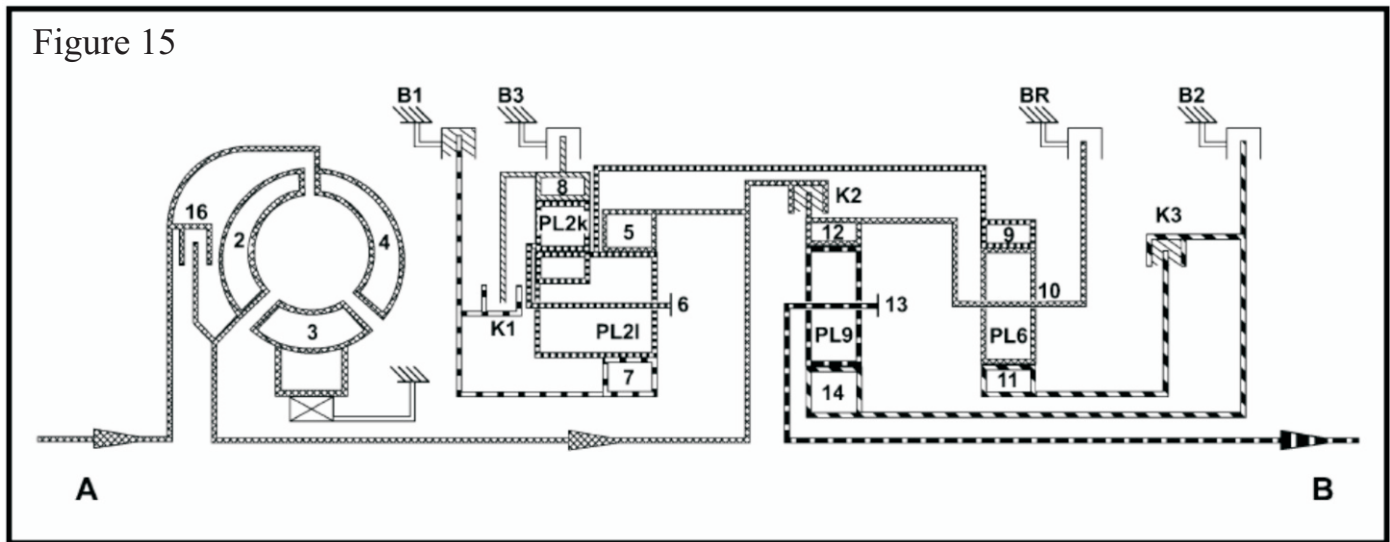
With the K1, K2 and K3 Clutch engaged, the Power Flow runs from the Input Shaft via the locked Ravigneaux Planetary Gear set components (5, 6, 7, 8, PL2l & PL2k) and the locked Front Single Planetary Gear set (12, 13, 14 & PL9) to the Output Shaft and rotate at the same speed as the Input shaft in the direction of engine rotation at a ratio of 1.000:1.

Note:

In 5rd gear, all gear sets are locked as one. If a gear noise is being diagnosed and it only goes away when in 5th gear, then check center gear set.

Power Flow 6th Gear

Figure 15



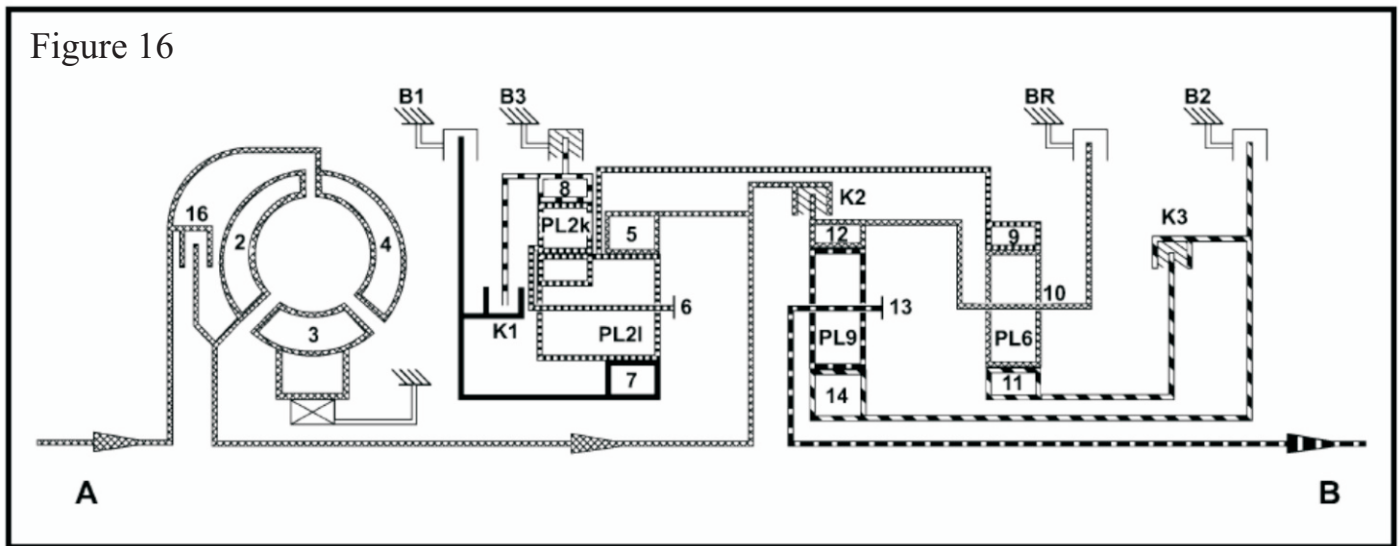
- 2 Turbine wheel
- 3 Stator
- 4 Impeller
- 5 Small internal-gear wheel
- 6 Dual planet carrier
- 7 Sun gear
- 8 Large internal-gear wheel
- 9 Internal-gear wheel
- 10 Planet carrier
- 11 Sun gear 12 Internal-gear wheel
- 13 Planet carrier
- 14 Sun gear
- 16 Torque converter lockup clutch

- A Input
- B Output
- BR Multi-disk brake BR
- B1 Multiple-disc brake B1**
- B2 Multiple-disc brake B2
- B3 Multiple-disc brake B3
- K1 Multi-disk clutch K1
- K2 Multi-disk clutch K2**
- K3 Multi-disk clutch K3**
- PL2k Short planet gears
- PL2l Long planet gears
- PL6 Planet gears
- PL9 Planet gears

The Ravigneaux Planet Small Ring Gear (5) is driven by the Input Shaft. The Long Planet Gears (PL2l) rotate around Sun Gear (7) which is held by the B1 Brake Clutch. An increase in torque and reduced rpm is transmitted to the Dual Planet Carrier (6). The Single Rear Planet Ring Gear (9) rotates at the same speed as it is mechanically connected to the Dual Planet Carrier. The Planet Gears (PL6) rotate Sun Gear (11) which rotates Sun Gear (14) by the engaged K3 Clutch. Input Torque and Input Speed are transmitted to the Single Front Planet Ring Gear (12) by the engaged K2 Clutch. The speed difference between the Sun Gear (14) and Ring Gear (12) produces an increased speed and reduced torque to the Output Shaft through Planet Carrier (13). The Output Shaft rotates with reduced input speed in the direction of engine rotation at a ratio of 0.820:1.

Power Flow 7th Gear

Figure 16



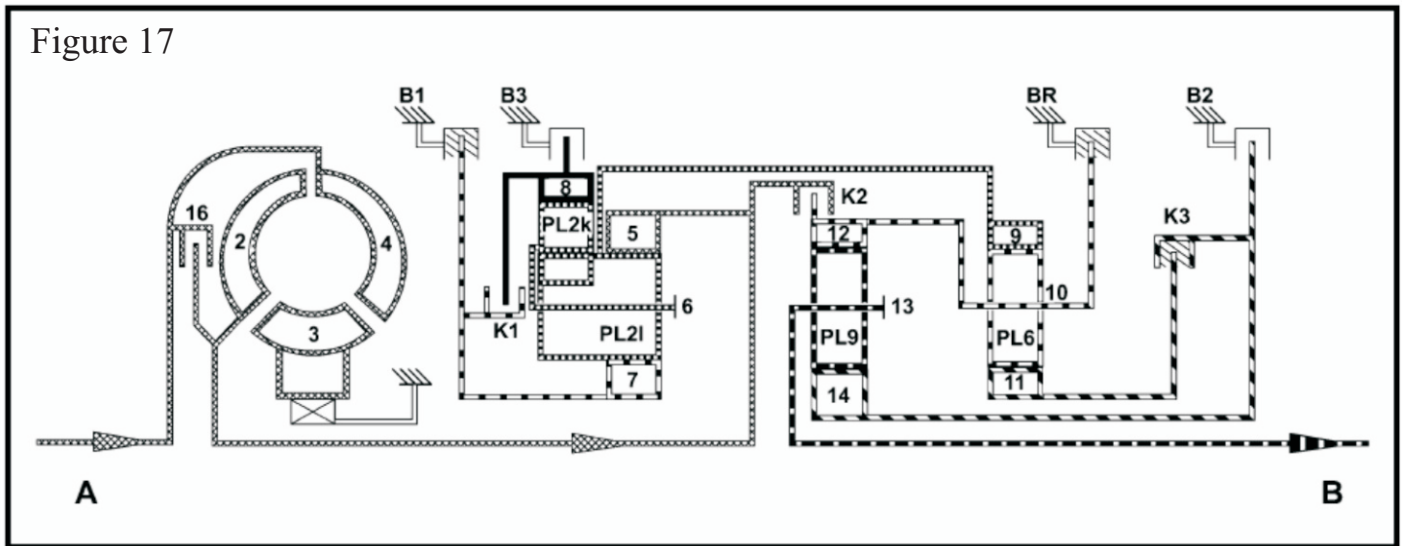
- 2 Turbine wheel
- 3 Stator
- 4 Impeller
- 5 Small internal-gear wheel
- 6 Dual planet carrier
- 7 Sun gear
- 8 Large internal-gear wheel
- 9 Internal-gear wheel
- 10 Planet carrier
- 11 Sun gear
- 12 Internal-gear wheel
- 13 Planet carrier
- 14 Sun gear
- 16 Torque converter lockup clutch

- A Input
- B Output
- BR Multi-disk brake BR
- B1 Multiple-disc brake B1
- B2 Multiple-disc brake B2
- B3 Multiple-disc brake B3**
- K1 Multi-disk clutch K1
- K2 Multi-disk clutch K2**
- K3 Multi-disk clutch K3**
- PL2k Short planet gears
- PL2l Long planet gears
- PL6 Planet gears
- PL9 Planet gears

The Ravigneaux Planet Small Ring Gear (5) is driven by the Input Shaft. The Long Planet Gears (PL2l) drive the Short Planet Gears (PL2k) to rotate inside the Large Ring Gear that is held by the B3 Brake. An increase in torque and reduced rpm is transmitted to the Dual Planet Carrier (6). The Single Rear Planet Ring Gear (9) rotates at the same speed as it is mechanically connected to the Dual Planet Carrier. The Planet Gears (PL6) rotate Sun Gear (11) which in turn rotates Sun Gear (14) by the engaged K3 Clutch. Input Torque and Input Speed are transmitted to the Single Front Planet Ring Gear (12) by the engaged K2 Clutch. The speed difference between the Sun Gear (14) and Ring Gear (12) produces an increased speed and reduced torque to the Output Shaft through Planet Carrier (13). The Output Shaft rotates with reduced input speed in the direction of engine rotation at a ratio of 0.728:1.

Power Flow Reverse Gear in 'S' Mode

Figure 17



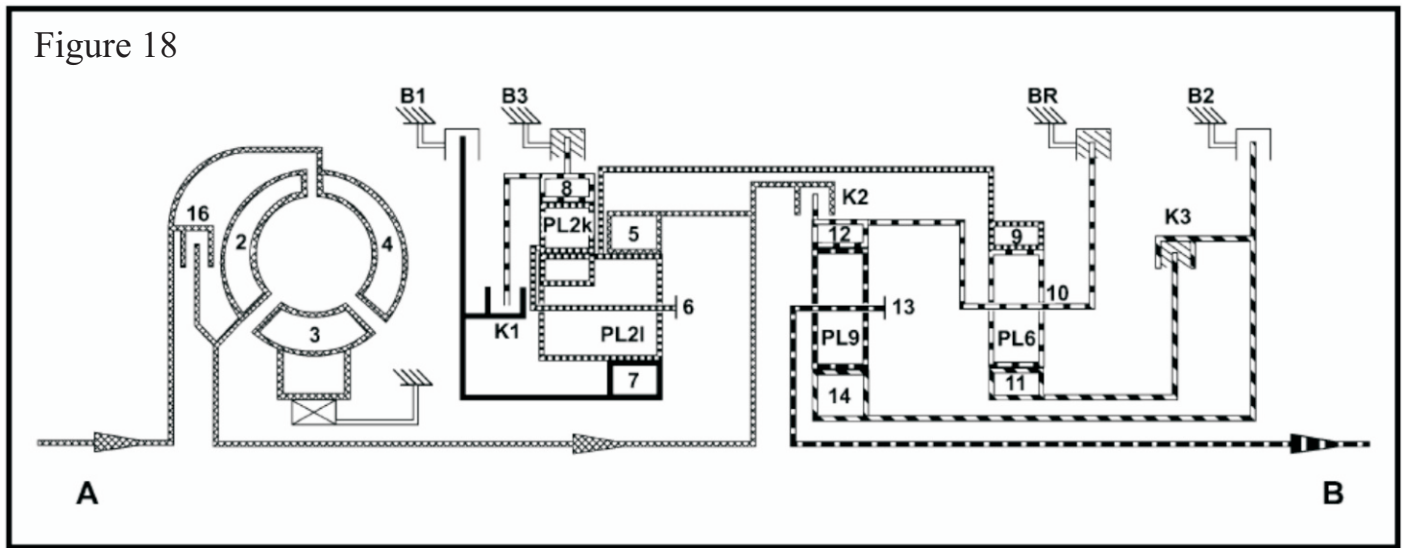
- 2 Turbine wheel
- 3 Stator
- 4 Impeller
- 5 Small internal-gear wheel
- 6 Dual planet carrier
- 7 Sun gear
- 8 Large internal-gear wheel
- 9 Internal-gear wheel
- 10 Planet carrier
- 11 Sun gear
- 12 Internal-gear wheel
- 13 Planet carrier
- 14 Sun gear
- 16 Torque converter lockup clutch

- A Input
- B Output
- BR Multi-disk brake BR**
- B1 Multiple-disc brake B1**
- B2 Multiple-disc brake B2
- B3 Multiple-disc brake B3
- K1 Multi-disk clutch K1
- K2 Multi-disk clutch K2
- K3 Multi-disk clutch K3**
- PL2k Short planet gears
- PL2l Long planet gears
- PL6 Planet gears
- PL9 Planet gears

The Ravigneaux Planet Small Ring Gear (5) is driven by the Input Shaft. The Long Planet Gears (PL2l) rotate around Sun Gear (7) held by the B1 Brake Clutch. An increase in torque and reduced rpm is transmitted to the Dual Planet Carrier (6). The Single Rear Planet Ring Gear (9) rotates at the same speed as it is mechanically connected to the Dual Planet Carrier. The Planet Gears (PL6) rotate around Sun Gear (11). The rotational direction of the Sun Gear is Reversed by Planet Carrier (10) which is held by the BR Brake Clutch. The applied K3 Clutch connects Sun Gear (14) to Sun Gear (11). This causing both Sun Gears to rotate at the same speed and direction and drive Planet Gears (PL9). This increases torque and reduces rotational to the Output Shaft through Planet Carrier (13). The Output Shaft rotates at a reduced input speed opposite to the direction of engine rotation at a ratio of -3.416:1.

Power Flow Reverse Gear in 'C' Mode

Figure 18



- 2 Turbine wheel
- 3 Stator
- 4 Impeller
- 5 Small internal-gear wheel
- 6 Dual planet carrier
- 7 Sun gear
- 8 Large internal-gear wheel
- 9 Internal-gear wheel
- 10 Planet carrier
- 11 Sun gear 12 Internal-gear wheel
- 13 Planet carrier
- 14 Sun gear
- 16 Torque converter lockup clutch

- A Input
- B Output
- BR Multi-disk brake BR**
- B1 Multiple-disc brake B1
- B2 Multiple-disc brake B2
- B3 Multiple-disk brake B3**
- K1 Multi-disk clutch K1
- K2 Multi-disk clutch K2
- K3 Multi-disk clutch K3**
- PL2k Short planet gears
- PL2l Long planet gears
- PL6 Planet gears
- PL9 Planet gears

The Ravigneaux Planet Small Ring Gear (5) is driven by the Input Shaft. The Long Planet Gears (PL2l) drive the Short Planet Gears (PL2k) which rotate inside the Large Ring Gear (8) held by the B3 Brake Clutch. A decrease in rotational speed is transmitted to the Dual Planet Carrier (6) The Single Rear Planet Ring Gear (9) rotates at the same speed as it is mechanically connected to the Dual Planet Carrier. The Planet Gears (PL6) rotate around Sun Gear (11) The rotational direction of the Sun Gear is Reversed by Planet Carrier (10) which is held by the BR Brake Clutch. The applied K3 Clutch connects Sun Gear(14) to Sun Gear (11). This causing both Sun Gears to rotate at the same speed and direction and drive Planet Gears (PL9). This increases torque and reduces rotational speed to the Output Shaft through Planet Carrier (13). The Output Shaft rotates at a reduced input speed opposite to the direction of engine rotation at a ratio of -2.231:1.