

MERCEDES BENZ 722.9 PRELIMINARY INFORMATION

Mercedes Benz has produced a new 5th generation electronically controlled gearbox with seven forward and two reverse speeds.

Vehicle Application/Transmission Designation

The W7A 700 is the only model size 722.9 being produced at the time of this written material, a smaller model the W7A 400 will be introduced at a later time.

This transmission is referred to as:

NAG 2 (Neues Automatische Getriebe 2)

New Automatic Gearbox 2 or 7G- Tronic

Vehicle Applications:

Select non 4MATIC (2WD) MY 2004 vehicles w/M113 engine.

S340, S/CL/E/SL500

Optional:

SLK (R171-09/04)

Standard Equipment:

CLS 350 (late 2004)

E350 (late 2004)

M Class (W164-2005)

R Class (W251-2005)

G Class (X164-2006)

End of production models that will unlikely receive the 722.9 would be W163, R170 & V463.

722.9 for W164/W251/X164 will be equipped with shift by wire (no shifter rod or cable). An electronic control module on the left rear side of the transmission just above the pan rail which operates a shift control valve and its position is monitored by a position sensor.

The 722.6 (NAG 1 or V) will continue production until approximately MY 2012 and installed in:

4 cyl models

Maybach

M275 vehicles

some select manufacturer's contract vehicles

Fluid Type

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 & Fuchs Europe oil suppliers in 1 liter bottles under Mercedes Benz part number **A001 989 45 03 10**.

Electronic Control Components

The Transmission Control Module (Y3/8n4) which is

flash capable, along with the following components:
Eight Solenoids:

Working Pressure Control Solenoid (Y3/8y1)

K1 Clutch Solenoid (Y3/8y2)

K2 Clutch Solenoid (Y3/8y3)

K3 Clutch Solenoid (Y3/8y4)

B1 Brake Clutch Solenoid (Y3/8y5)

B2 Brake Clutch Solenoid (Y3/8y6)

B3 Brake Clutch Solenoid (Y3/8y7)

Torque Converter Lock Up Solenoid

(Y3/8y8)

Two Oil Floats

Oil Control Float 1 (31)

Oil Control Float 2 (32)

Three Speed Sensors

Turbine RPM Sensor (Y3/8n1)

Internal RPM Sensor (Y3/8n2)

Output RPM Sensor (Y3/8n3)

Selection Range Sensor (Y3/8s1)

are all integrated into the valve body assembly.

Shift Strategy

The 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 Programing

Two basic shift programs can be varied by customer (same as 722.6) using the S/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)



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PRELIMINARY INFORMATION

Shift Optimal Gear (SOG)

Shift into Optimal Gear software as known in previous models.

Up shifts and downshifts based on driving style and engine load (similar to 722.6)

Shift interlock controlled by Electronic Shifter Module (ESM) same as previous models

Emergency function/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 operation valves and the transmission will now achieve 2nd in "D" and Reverse.

Gear Ratio

The gear ratios are achieved with four multi-disc brakes and three multi-disc clutches, no free wheels units (sprags)

There are three planetary gear sets:

Two simple

One Ravigneaux

Torque Converter (same used in some 722.6)

Torque converter operates in open or slip mode in all seven forward gears.

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 desired slip.

Open: High flow

Slip Control: Lower flow

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.

Vehicle Towing

If vehicle must be towed it should be transported by use of a flat bed trailer type of tow truck.

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.

Clutch Clearances	no. of disc	722.9 (mm)	722.93 (mm)	
B1 Brake	3	2.0-2.4		
	4	2.2-2.6	2.2-2.6	
	5		2.3-2.7	
B2 Brake (internal tooth)	4	1.7-2.1	1.7-2.1	
	5	1.8-2.2	1.8-2.2	
	(external tooth)	5	1.7-2.1	1.7-2.1
		6	1.8-2.2	1.8-2.2
B3 Brake	3	2.0-2.4	2.0-2.4	
	4	2.2-2.6	2.2-2.6	
	5	2.3-2.7	2.3-2.7	
Br Brake	N/A	1.0-1.4	1.0-1.4	
K1 Clutch	3	2.0-2.4		
	4	2.2-2.6		
	5	2.4-2.8	2.4-2.8	
	6	2.4-2.8		
	K2 Clutch	3	1.7-2.1	
		4	1.9-2.3	
5		2.1-2.5		
K3 Clutch	6	2.2-2.6	1.9-2.3	
	7		2.0-2.4	
	8		2.1-2.5	
	3		2.4-2.8	
		4	2.2-2.6	
5	2.4-2.8			

All clutch clearances are measured between the Flange and retainer ring, while applying the amount of hand pressure listed below.

B1 = N 600 B2 = N 1000 B3 = N 600

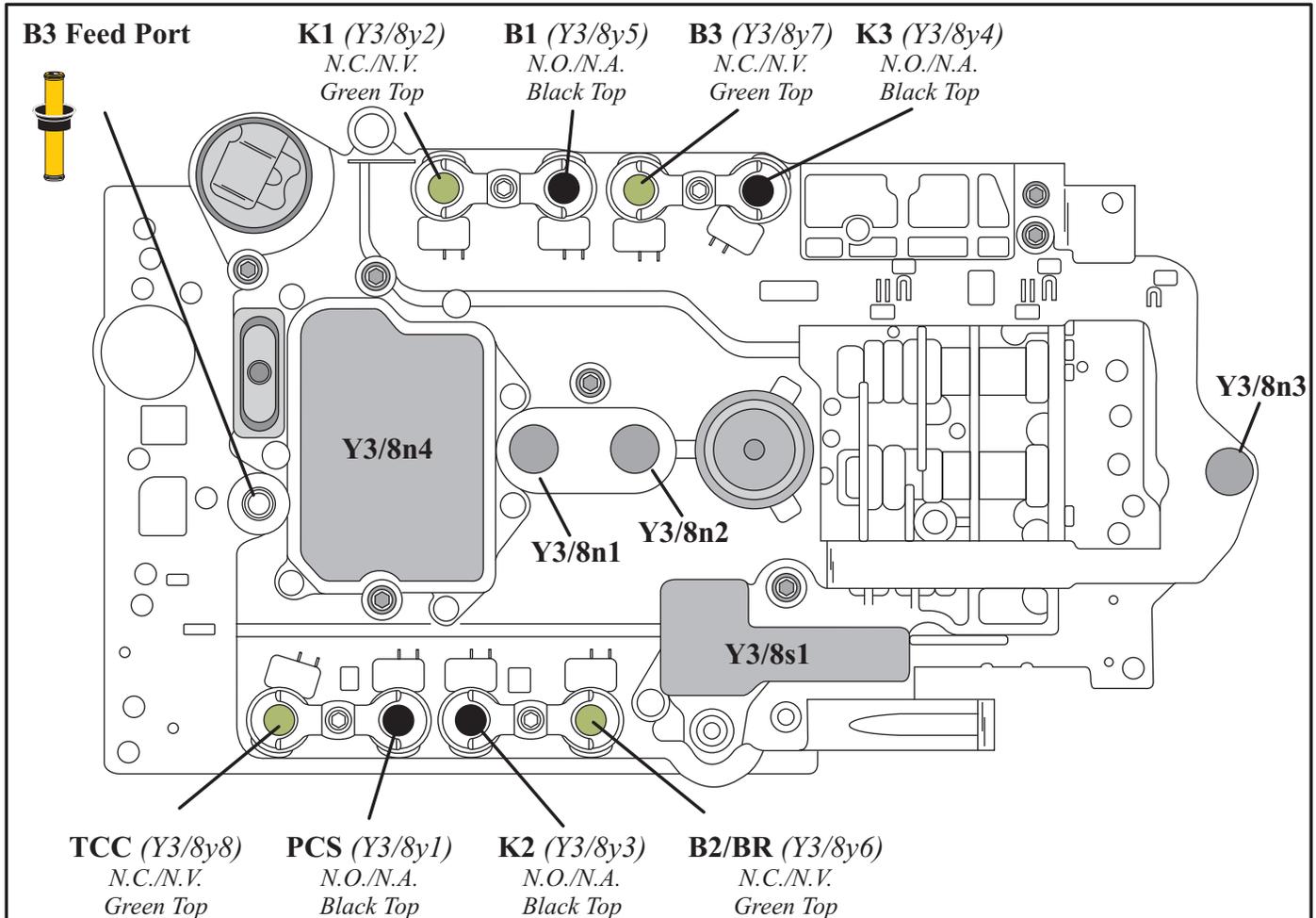
BR = N/A K1 = N 800 K2 = N1200

K3 = N 600

Note: B2 Brake multi disc clutches use single sided plates at this point in time other clutch members may use single sided plates at a future date.

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PRELIMINARY INFORMATION



- Y3/8n1 = Input speed sensor (front) - Reads Input Shaft Speed
- Y3/8n2 = Middle speed sensor (center) - Reads Ravigneaux Carrier/Rear Internal Ring Gear Speed
- Y3/8n3 = Output speed sensor (rear) - Reads Output Shaft Speed

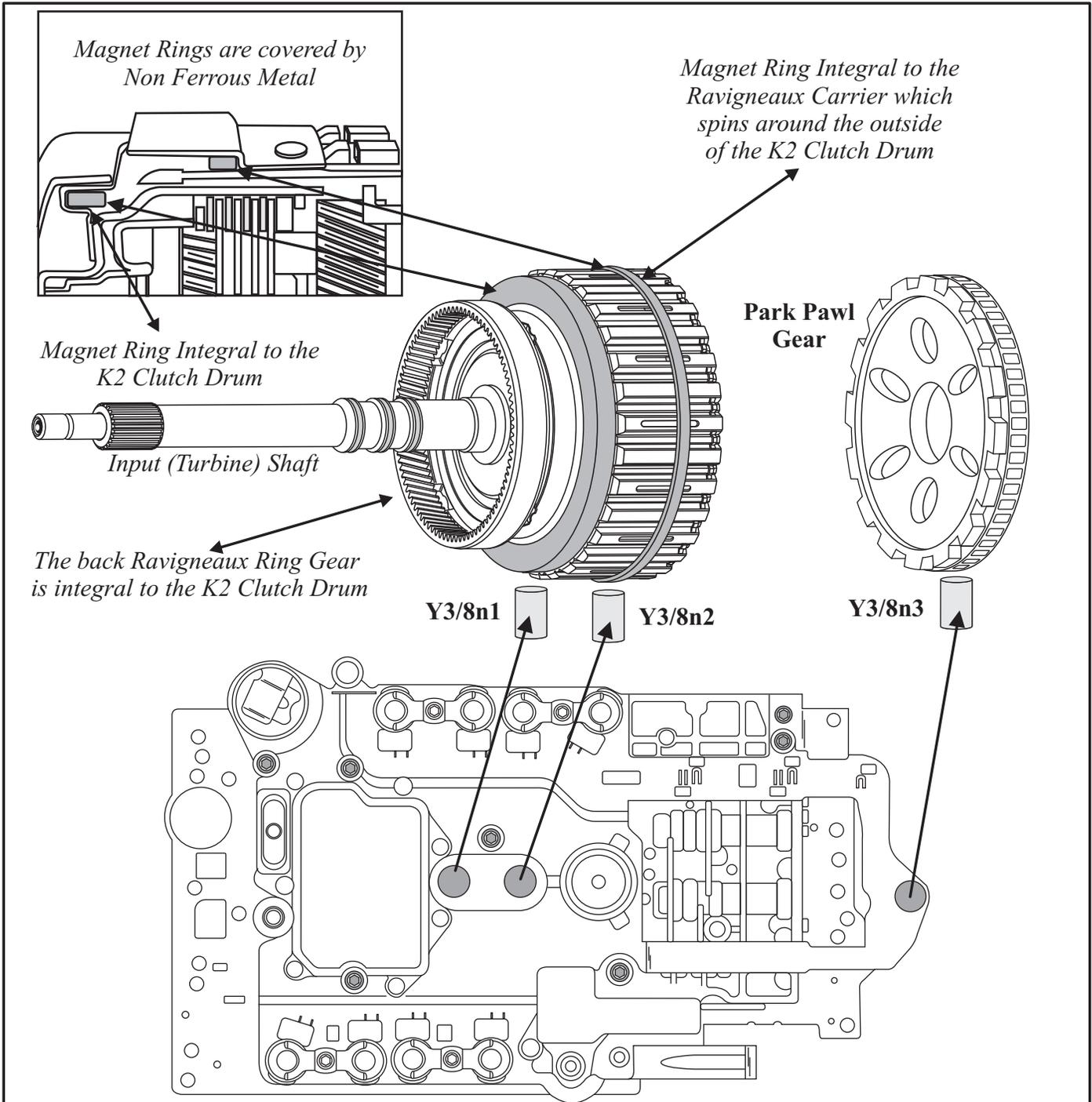
Y3/8n4 = Electrohydraulic Control Module (TCM) (w/internal transmission fluid temp sensor)

- Y3/8y1 = Working Pressure - (Normally Open/Normally Applied (Solenoid off = High Pressure)
- Y3/8y2 = K1 Clutch - Normally Closed/Normally Vented (Solenoid off = No Pressure)
- Y3/8y3 = K2 Clutch - (Normally Open/Normally Applied (Solenoid off = High Pressure)
- Y3/8y4 = K3 Clutch - (Normally Open/Normally Applied (Solenoid off = High Pressure)
- Y3/8y5 = B1 Brake - (Normally Open/Normally Applied (Solenoid off = High Pressure)
- Y3/8y6 = B2/BR Brake - Normally Closed.Normally Vented (Solenoid off = No Pressure)
- Y3/8y7 = B3 Brake - Normally Closed.Normally Vented (Solenoid off = No Pressure)
- Y3/8y8 = Lock-Up - Normally Closed.Normally Vented (Solenoid off = No Pressure)

Y3/8s1 = Range sensor

Note: Normally Open/Normally Applied solenoids are used when Limp Mode strategy has been initiated when all solenoids are turned off

MERCEDES BENZ 722.9
HALL AFFECT SPEED SENSORS

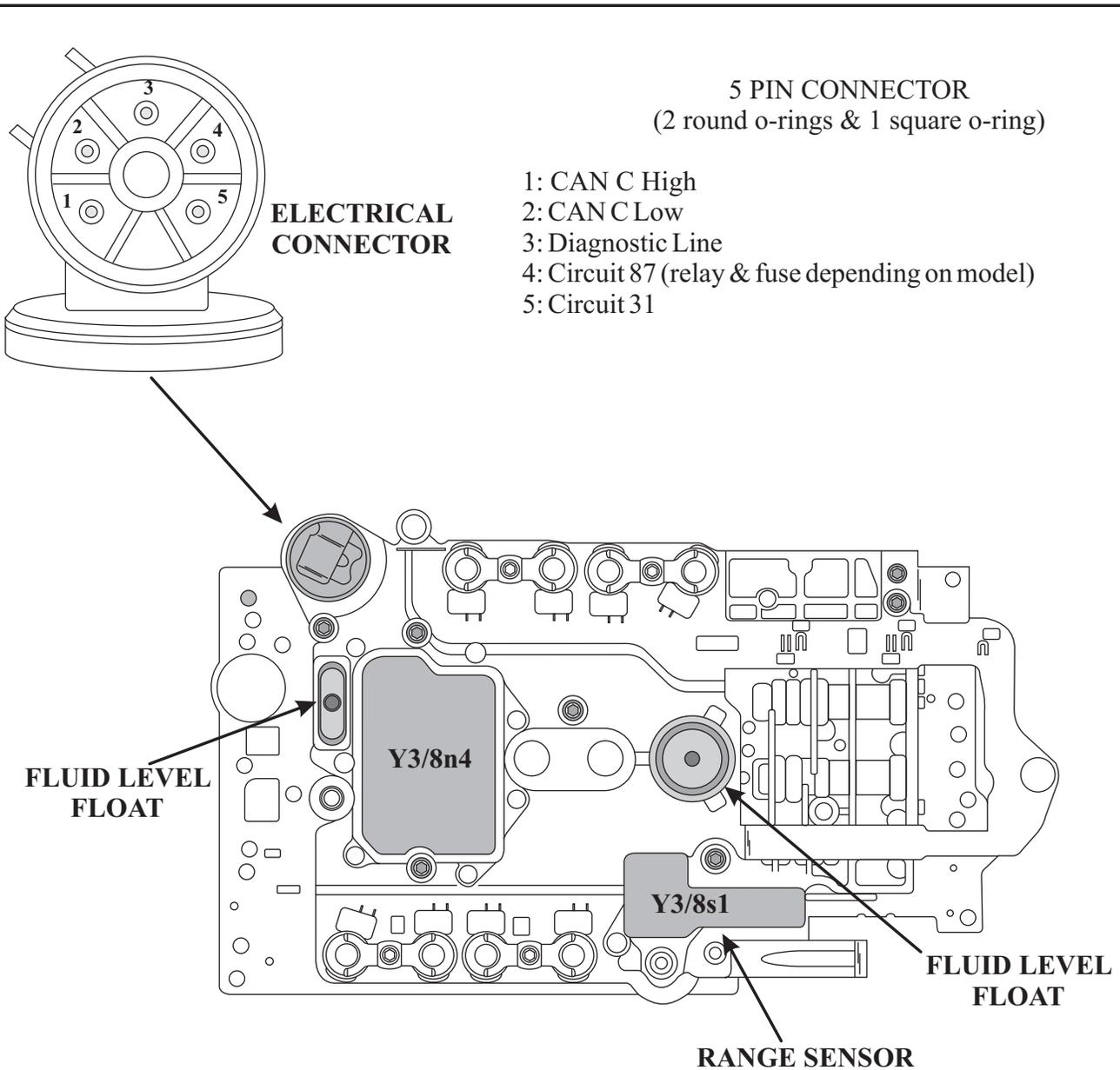


Front speed sensor (Y3/8n1): monitors Input (Turbine) Shaft and back Ravigneaux Ring Gear speed.
 Center speed sensor (Y3/8n2): monitors Ravigneaux carrier and rear Ring Gear speed.
 Rear speed sensor (Y3/8n3): monitors Output Shaft speed from exciter ring on the Park Pawl gear

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

MERCEDES BENZ 722.9

RANGE SENSOR & ELECTRICAL CONNECTOR



The Range sensor (*Y3/8s1*) is integral to the TCM conductor plate and is not replaced separately. A magnet located on the Manual Valve signals its position through sensor pick ups referred to as: Permanent Magnetic Linear Contact-less Displacement Sensor (PLCD). If this is a failsafe item should it become faulty or the signal is not learned.

Fluid Level Floats (2): To prevent oil foaming from gears running in fluid. The front one was added due to transmission extended length (41mm) causing oil to slosh during hard forward stops.



MERCEDES BENZ 722.9
SOLENOID APPLICATION

SOLENOID APPLICATION & SOLENOID FUNCTION													
CLUTCH/ BRAKE	<i>B1</i>		<i>B2/BR*</i>		<i>B3</i>		<i>K1</i>		<i>K2</i>		<i>K3</i>		
SOLENOID	Y3/8y5 N.O. (M) <i>Normally Applied</i>		Y3/8y6 N.C. (M) <i>Normally Vented</i>		Y3/8y7 N.C. (M) <i>Normally Vented</i>		Y3/8y2 N.C. (M) <i>Normally Vented</i>		Y3/8y3 N.O. (M) <i>Normally Applied</i>		Y3/8y4 N.O. (M) <i>Normally Applied</i>		
Gear Ratio	<i>Current to Solenoid</i>	<i>Psi from Solenoid</i>	<i>Current to Solenoid</i>	<i>Psi from Solenoid</i>	<i>Current to Solenoid</i>	<i>Psi from Solenoid</i>	<i>Current to Solenoid</i>	<i>Psi from Solenoid</i>	<i>Current to Solenoid</i>	<i>Psi from Solenoid</i>	<i>Current to Solenoid</i>	<i>Psi from Solenoid</i>	
1 4.377	High	Low	Varying	Varying	Varying	Varying	Low	Low	High	Low	Varying	Varying	
2 2.859	Varying	Varying	Varying	Varying	Low	Low	Low	Low	High	Low	Varying	Varying	
3 1.921	High	Low	Varying	Varying	Low	Low	Varying	Varying	High	Low	Varying	Varying	
4 1.368	High	Low	Varying	Varying	Low	Low	Varying	Varying	Varying	Varying	High	Low	
5 1.000	High	Low	Low	Low	Low	Low	Varying	Varying	Varying	Varying	Varying	Varying	
6 0.820	Varying	Varying	Low	Low	Low	Low	Low	Low	Varying	Varying	Varying	Varying	
7 0.728	High	Low	Low	Low	Varying	Varying	Low	Low	Varying	Varying	Varying	Varying	
N (1)	High	Low	Low	Low	Varying	Varying	Low	Low	High	Low	Varying	Varying	
N (2)	Varying	Varying	Low	Low	Low	Low	Low	Low	High	Low	Varying	Varying	
R (1) -3.416	High	Low	(BR) Varying	(BR) Varying	Varying	Varying	Low	Low	High	Low	Varying	Varying	
R (2) -2.231	Varying	Varying	(BR) Varying	(BR) Varying	Low	Low	Low	Low	High	Low	Varying	Varying	

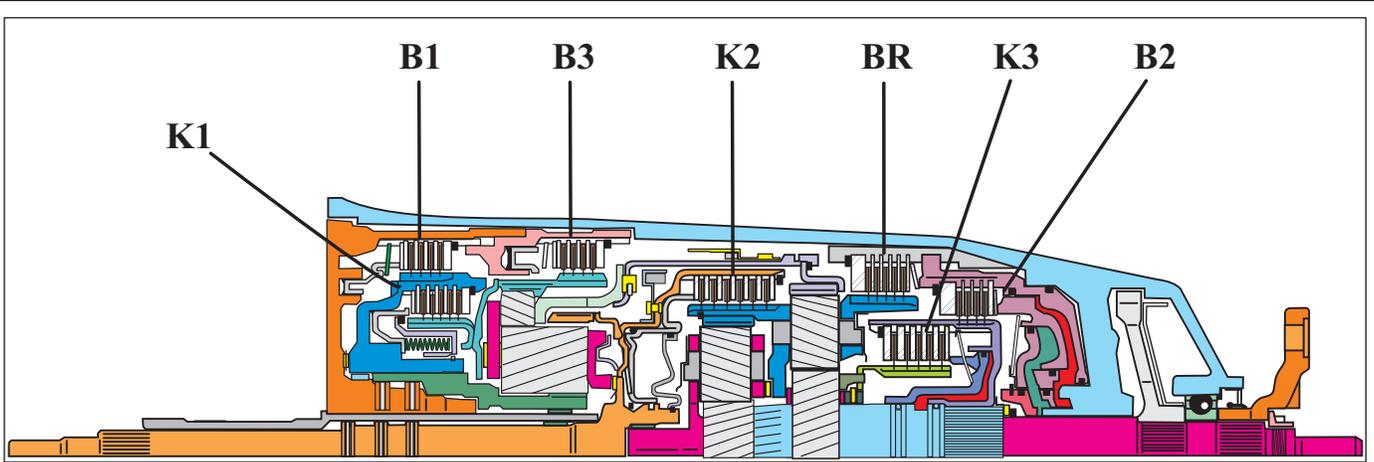
N.O. (M) = Mercedes nomenclature for Normally Open. This refers to the Solenoid feed connection to Solenoid output pressure. To Simplify, Normally Open = Solenoid feed is connected to Solenoid output when the Solenoid is OFF, ATSG refers to that as Normally Applied.

N.C. (M) = Mercedes nomenclature for Normally Closed. This refers to the Solenoid feed connection to Solenoid output pressure. To Simplify, Normally Closed = Solenoid feed is blocked to Solenoid output when the Solenoid is OFF, ATSG refers to that as Normally Vented.

***B2 & BR share the same solenoid the oil is directed to a different clutch members by the selector shift valve**

**Failsafe while driving all solenoids will be turned off, transmission will shift to 6th gear.
After engaging Park then Drive: only 2nd & Reverse gear are available.**

MERCEDES BENZ 722.9 CLUTCH POSITION & APPLICATION



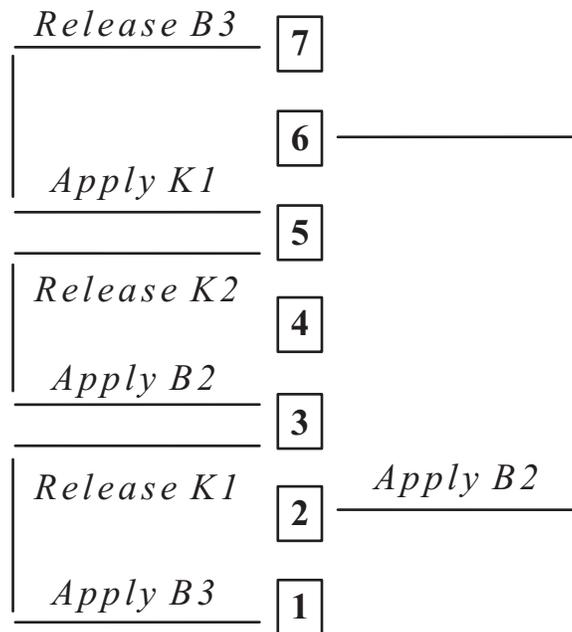
NO FREEWHEEL (SPRAG)

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

(1) S Mode (2) C Mode (X) Applied

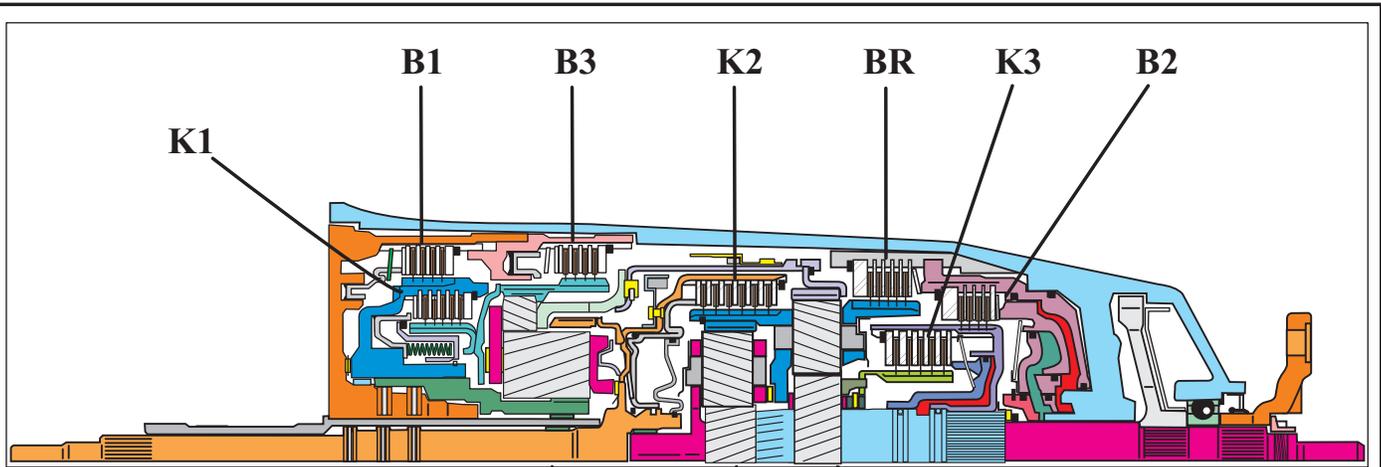
MERCEDES BENZ 722.9 SHIFT SEQUENCES

	B1	B2	B3	K1	K2	K3
7th Gear			X		X	X
6th Gear	X				X	X
5th Gear				X	X	X
4th Gear		X		X	X	
3rd Gear		X		X		X
2nd Gear	X	X				X
1st Gear		X	X			X



The 722.9 transmission has Sequential shifting (clutch on clutch) in addition to providing a down shift strategy that allows the transmission to skip gears during down shifts as long as one clutch member is released as another is applied.

MERCEDES BENZ 722.9 POWER FLOW



Gear	Ravigneaux <i>(Rear Internal Ring Gear)</i>	Center Planetary <i>(Output Shaft)</i>	Rear Planetary
First	2.25:1 Reduction	Reduction	Reduction
Second	1.50:1 Reduction	Reduction	Reduction
Third	1:1	Reduction	Reduction
Fourth	1:1	Reduction	-----
Fifth	1:1	1:1	1:1
Sixth	1.50:1 Reduction	Overdriven	Overdriven
Seventh	2.25:1 Reduction	Overdriven	Overdriven

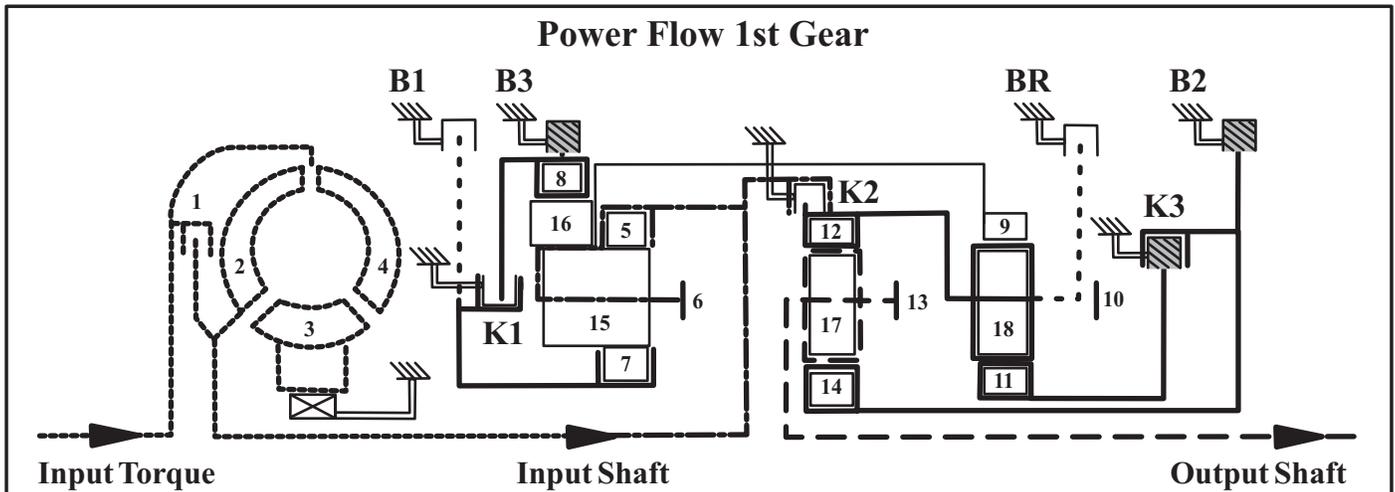
* The Ravigneaux gear set drives the rear internal ring gear. For every 1 revolution of the ring gear both the rear and middle sun gears are forced to rotate 2.5 times (when the K3 clutch is applied).

The rear carrier and middle internal ring gear are being driven at input speed via the K2 clutch.

The difference between the speed of the middle sun gear and the middle internal ring gear causes the middle carrier and output shaft to rotate at an overdrive speed of 0.820:1 in 6th and 0.728:1 in 7th.

MERCEDES BENZ 722.9

POWER FLOW



The Ravigneaux Planet Small Ring Gear (5) is driven by the Input Shaft. The Long Planet Gears (15) drive the Short Planet Gears (16) 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 (18) rotate around Sun Gear (11) held by the K3 Clutch and rotate 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 (17) 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 4.377.

Ravigneaux gear set:

- Short Planet Gears (16)
- Long Planet Gears (15)
- Small Ring Gear (5)
- Dual Planet Carrier (6)
- Sun Gear (7)
- Ring Gear (8)

Front Single Planet Gear Set:

- Planetary Gears (17)
- Ring Gear (12)
- Planet Carrier (13)
- Sun Gear (14)

Rear Single Planet Gear Set:

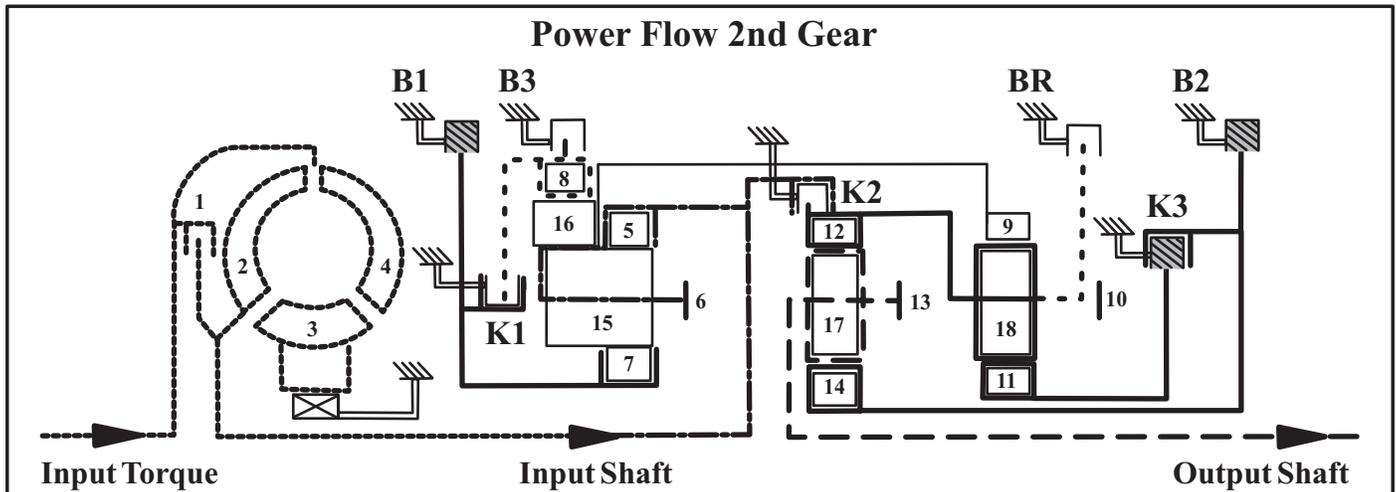
- Planetary Gears (18)
- Ring Gear (9)
- Planet Carrier (10)
- Sun Gear (11)

- 1 Torque Converter Lockup Clutch
- 2 Turbine Wheel
- 3 Stator
- 4 Impeller
- 5 Small Internal Geared Wheel
- 6 Dual Planet Carrier
- 7 Sun Gear
- 8 Large Internal Geared Wheel
- 9 Internal Geared Wheel
- 10 Single Planetary Carrier
- 11 Sun Gear
- 12 Internal Geared Wheel

- 13 Single Planetary Carrier
- 14 Sun Gear
- 15 Long Planet gears
- 16 Planet Gears
- 17 Planet Gears
- BR Multi-Disc Brake (BR)
- B1 Multi-Disc Brake (B1)
- B2 Multi-Disc Brake (B2)
- B3 Multi-Disc Brake (B3)
- K1 Multi-Disc Clutch (K1)
- K2 Multi-Disc Clutch (K2)
- K3 Multi-Disc Clutch (K3)

MERCEDES BENZ 722.9

POWER FLOW



The Ravigneaux Planet Small Ring Gear (5) is driven by the Input Shaft. The Long Planet Gears (15) 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 (18) 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 (17) 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.

Ravigneaux gear set:

- Short Planet Gears (16)
- Long Planet Gears (15)
- Small Ring Gear (5)
- Dual Planet Carrier (6)
- Sun Gear (7)
- Large Ring Gear (8)

Front Single Planet Gear Set:

- Planetary Gears (17)
- Ring Gear (12)
- Planet Carrier (13)
- Sun Gear (14)

Rear Single Planet Gear Set:

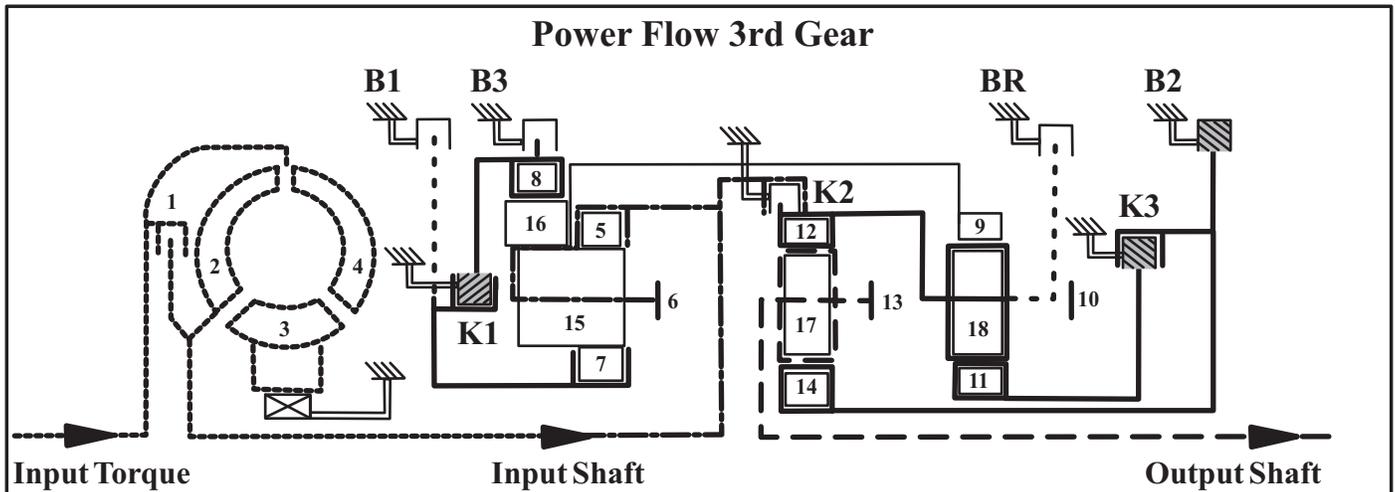
- Planetary Gears (18)
- Ring Gear (9)
- Planet Carrier (10)
- Sun Gear (11)

- 1 Torque Converter Lockup Clutch
- 2 Turbine Wheel
- 3 Stator
- 4 Impeller
- 5 Small Internal Geared Wheel
- 6 Dual Planet Carrier
- 7 Sun Gear
- 8 Large Internal Geared Wheel
- 9 Internal Geared Wheel
- 10 Single Planetary Carrier
- 11 Sun Gear
- 12 Internal Geared Wheel

- 13 Single Planetary Carrier
- 14 Sun Gear
- 15 Long Planet gears
- 16 Planet Gears
- 17 Planet Gears
- BR Multi-Disc Brake (BR)
- B1 Multi-Disc Brake (B1)
- B2 Multi-Disc Brake (B2)
- B3 Multi-Disc Brake (B3)
- K1 Multi-Disc Clutch (K1)
- K2 Multi-Disc Clutch (K2)
- K3 Multi-Disc Clutch (K3)

MERCEDES BENZ 722.9

POWER FLOW



With the K1 Clutch engaged, the Ravigneaux Planetary Gear set components (5, 6, 7, 8, 15 & 16) 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 Gears (18) 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 (17) 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.

Ravigneaux gear set:

- Short Planet Gears (16)
- Long Planet Gears (15)
- Small Ring Gear (5)
- Dual Planet Carrier (6)
- Sun Gear (7)
- Large Ring Gear (8)

Front Single Planet Gear Set:

- Planetary Gears (17)
- Ring Gear (12)
- Planet Carrier (13)
- Sun Gear (14)

Rear Single Planet Gear Set:

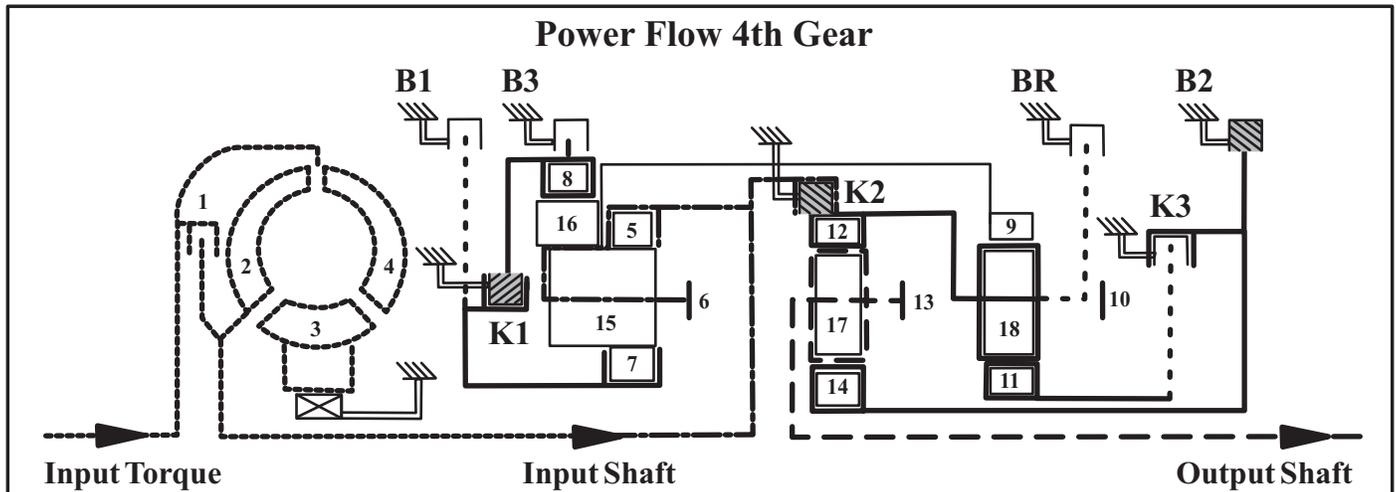
- Planetary Gears (18)
- Ring Gear (9)
- Planet Carrier (10)
- Sun Gear (11)

- 1 Torque Converter Lockup Clutch
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- 4 Impeller
- 5 Small Internal Geared Wheel
- 6 Dual Planet Carrier
- 7 Sun Gear
- 8 Large Internal Geared Wheel
- 9 Internal Geared Wheel
- 10 Single Planetary Carrier
- 11 Sun Gear
- 12 Internal Geared Wheel

- 13 Single Planetary Carrier
- 14 Sun Gear
- 15 Long Planet gears
- 16 Planet Gears
- 17 Planet Gears
- BR Multi-Disc Brake (BR)
- B1 Multi-Disc Brake (B1)
- B2 Multi-Disc Brake (B2)
- B3 Multi-Disc Brake (B3)
- K1 Multi-Disc Clutch (K1)
- K2 Multi-Disc Clutch (K2)
- K3 Multi-Disc Clutch (K3)

MERCEDES BENZ 722.9

POWER FLOW



With the K1 Clutch engaged, the Ravigneaux Planetary Gear set components (5, 6, 7, 8, 15 & 16) 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 (17) 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.

Ravigneaux gear set:

- Short Planet Gears (16)
- Long Planet Gears (15)
- Small Ring Gear (5)
- Dual Planet Carrier (6)
- Sun Gear (7)
- Large Ring Gear (8)

Front Single Planet Gear Set:

- Planetary Gears (17)
- Ring Gear (12)
- Planet Carrier (13)
- Sun Gear (14)

Rear Single Planet Gear Set:

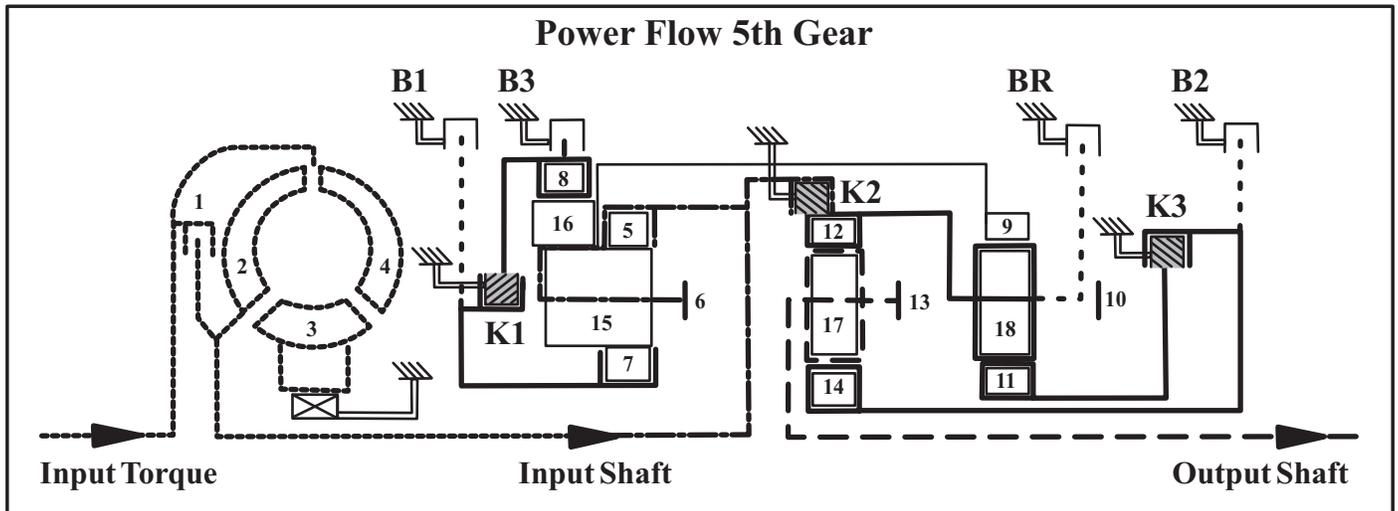
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- Ring Gear (9)
- Planet Carrier (10)
- Sun Gear (11)

- 1 Torque Converter Lockup Clutch
- 2 Turbine Wheel
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- 6 Dual Planet Carrier
- 7 Sun Gear
- 8 Large Internal Geared Wheel
- 9 Internal Geared Wheel
- 10 Single Planetary Carrier
- 11 Sun Gear
- 12 Internal Geared Wheel

- 13 Single Planetary Carrier
- 14 Sun Gear
- 15 Long Planet gears
- 16 Planet Gears
- 17 Planet Gears
- BR Multi-Disc Brake (BR)
- B1 Multi-Disc Brake (B1)
- B2 Multi-Disc Brake (B2)
- B3 Multi-Disc Brake (B3)
- K1 Multi-Disc Clutch (K1)
- K2 Multi-Disc Clutch (K2)
- K3 Multi-Disc Clutch (K3)

MERCEDES BENZ 722.9

POWER FLOW



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, 15 & 16) and the locked Front Single Planetary Gear set (12, 13, 14 & 17) 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.

Ravigneaux gear set:

- Short Planet Gears (16)
- Long Planet Gears (15)
- Small Ring Gear (5)
- Dual Planet Carrier (6)
- Sun Gear (7)
- Large Ring Gear (8)

Front Single Planet Gear Set:

- Planetary Gears (17)
- Ring Gear (12)
- Planet Carrier (13)
- Sun Gear (14)

Rear Single Planet Gear Set:

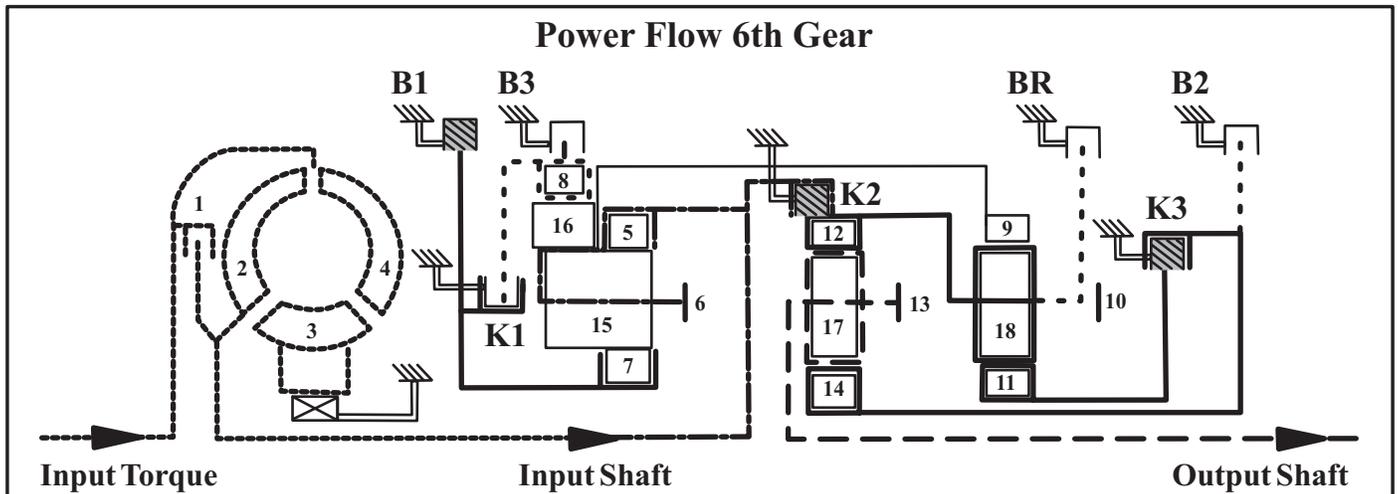
- Planetary Gears (18)
- Ring Gear (9)
- Planet Carrier (10)
- Sun Gear (11)

- 1 Torque Converter Lockup Clutch
- 2 Turbine Wheel
- 3 Stator
- 4 Impeller
- 5 Small Internal Geared Wheel
- 6 Dual Planet Carrier
- 7 Sun Gear
- 8 Large Internal Geared Wheel
- 9 Internal Geared Wheel
- 10 Single Planetary Carrier
- 11 Sun Gear
- 12 Internal Geared Wheel

- 13 Single Planetary Carrier
- 14 Sun Gear
- 15 Long Planet gears
- 16 Planet Gears
- 17 Planet Gears
- BR Multi-Disc Brake (BR)
- B1 Multi-Disc Brake (B1)
- B2 Multi-Disc Brake (B2)
- B3 Multi-Disc Brake (B3)
- K1 Multi-Disc Clutch (K1)
- K2 Multi-Disc Clutch (K2)
- K3 Multi-Disc Clutch (K3)

MERCEDES BENZ 722.9

POWER FLOW



The Ravigneaux Planet Small Ring Gear (5) is driven by the Input Shaft. The Long Planet Gears (15) 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 (18) 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.

Ravigneaux gear set:

- Short Planet Gears (16)
- Long Planet Gears (15)
- Small Ring Gear (5)
- Dual Planet Carrier (6)
- Sun Gear (7)
- Large Ring Gear (8)

Front Single Planet Gear Set:

- Planetary Gears (17)
- Ring Gear (12)
- Planet Carrier (13)
- Sun Gear (14)

Rear Single Planet Gear Set:

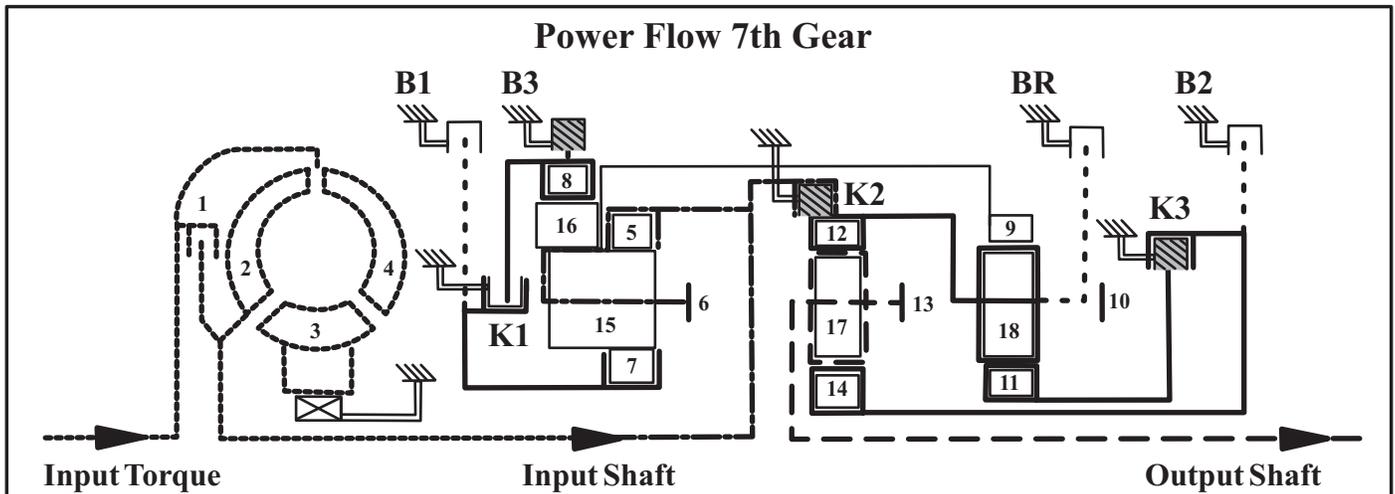
- Planetary Gears (18)
- Ring Gear (9)
- Planet Carrier (10)
- Sun Gear (11)

- 1 Torque Converter Lockup Clutch
- 2 Turbine Wheel
- 3 Stator
- 4 Impeller
- 5 Small Internal Geared Wheel
- 6 Dual Planet Carrier
- 7 Sun Gear
- 8 Large Internal Geared Wheel
- 9 Internal Geared Wheel
- 10 Single Planetary Carrier
- 11 Sun Gear
- 12 Internal Geared Wheel

- 13 Single Planetary Carrier
- 14 Sun Gear
- 15 Long Planet gears
- 16 Planet Gears
- 17 Planet Gears
- BR Multi-Disc Brake (BR)
- B1 Multi-Disc Brake (B1)
- B2 Multi-Disc Brake (B2)
- B3 Multi-Disc Brake (B3)
- K1 Multi-Disc Clutch (K1)
- K2 Multi-Disc Clutch (K2)
- K3 Multi-Disc Clutch (K3)

MERCEDES BENZ 722.9

POWER FLOW



The Ravigneaux Planet Small Ring Gear (5) is driven by the Input Shaft. The Long Planet Gears (15) drive the Short Planet Gears (16) to rotate inside the Large Ring Gear that is 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 (18) 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.

Ravigneaux gear set:

- Short Planet Gears (16)
- Long Planet Gears (15)
- Small Ring Gear (5)
- Dual Planet Carrier (6)
- Sun Gear (7)
- Large Ring Gear (8)

Front Single Planet Gear Set:

- Planetary Gears (17)
- Ring Gear (12)
- Planet Carrier (13)
- Sun Gear (14)

Rear Single Planet Gear Set:

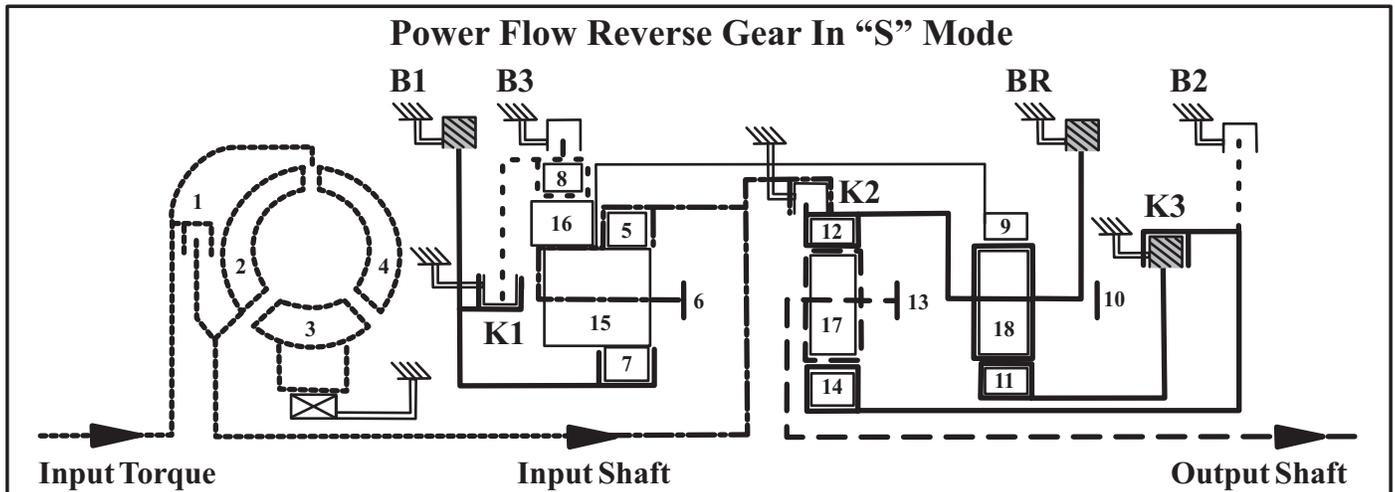
- Planetary Gears (18)
- Ring Gear (9)
- Planet Carrier (10)
- Sun Gear (11)

- 1 Torque Converter Lockup Clutch
- 2 Turbine Wheel
- 3 Stator
- 4 Impeller
- 5 Small Internal Geared Wheel
- 6 Dual Planet Carrier
- 7 Sun Gear
- 8 Large Internal Geared Wheel
- 9 Internal Geared Wheel
- 10 Single Planetary Carrier
- 11 Sun Gear
- 12 Internal Geared Wheel

- 13 Single Planetary Carrier
- 14 Sun Gear
- 15 Long Planet gears
- 16 Planet Gears
- 17 Planet Gears
- BR Multi-Disc Brake (BR)
- B1 Multi-Disc Brake (B1)
- B2 Multi-Disc Brake (B2)
- B3 Multi-Disc Brake (B3)
- K1 Multi-Disc Clutch (K1)
- K2 Multi-Disc Clutch (K2)
- K3 Multi-Disc Clutch (K3)

MERCEDES BENZ 722.9

POWER FLOW



The Ravigneaux Planet Small Ring Gear (5) is driven by the Input Shaft. The Long Planet Gears (15) 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 (18) 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 (17). 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 -3.416

Ravigneaux gear set:

- Short Planet Gears (16)
- Long Planet Gears (15)
- Small Ring Gear (5)
- Dual Planet Carrier (6)
- Sun Gear (7)
- Large Ring Gear (8)

Front Single Planet Gear Set:

- Planetary Gears (17)
- Ring Gear (12)
- Planet Carrier (13)
- Sun Gear (14)

Rear Single Planet Gear Set:

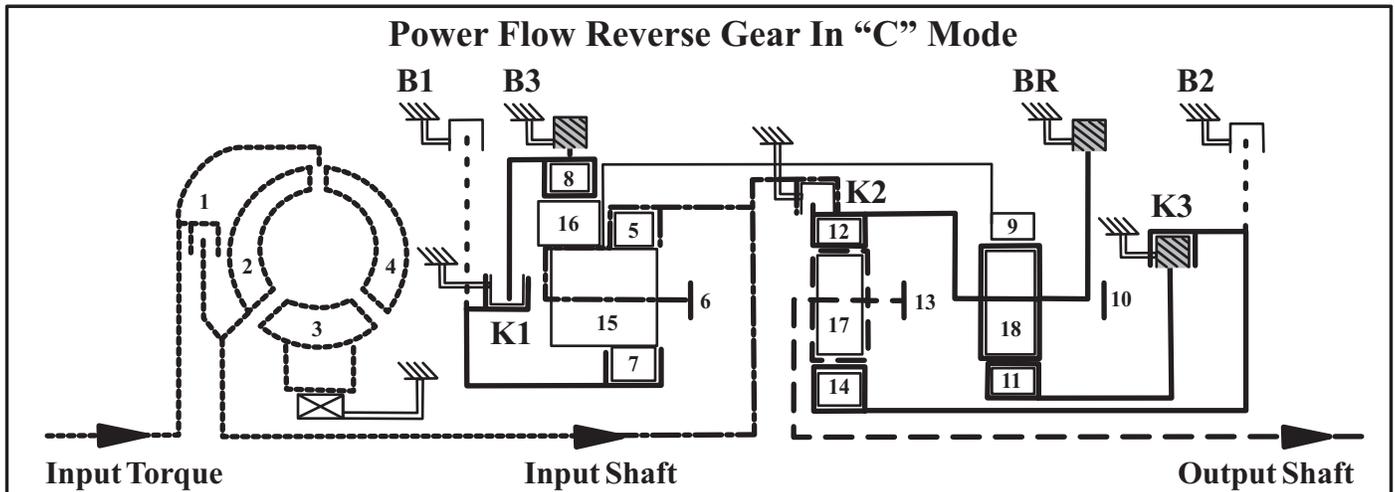
- Planetary Gears (18)
- Ring Gear (9)
- Planet Carrier (10)
- Sun Gear (11)

- 1 Torque Converter Lockup Clutch
- 2 Turbine Wheel
- 3 Stator
- 4 Impeller
- 5 Small Internal Geared Wheel
- 6 Dual Planet Carrier
- 7 Sun Gear
- 8 Large Internal Geared Wheel
- 9 Internal Geared Wheel
- 10 Single Planetary Carrier
- 11 Sun Gear
- 12 Internal Geared Wheel

- 13 Single Planetary Carrier
- 14 Sun Gear
- 15 Long Planet gears
- 16 Planet Gears
- 17 Planet Gears
- BR Multi-Disc Brake (BR)
- B1 Multi-Disc Brake (B1)
- B2 Multi-Disc Brake (B2)
- B3 Multi-Disc Brake (B3)
- K1 Multi-Disc Clutch (K1)
- K2 Multi-Disc Clutch (K2)
- K3 Multi-Disc Clutch (K3)

MERCEDES BENZ 722.9

POWER FLOW



The Ravigneaux Planet Small Ring Gear (5) is driven by the Input Shaft. The Long Planet Gears (15) drive the Short Planet Gears (16) 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 (18) 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 (17). 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

Ravigneaux gear set:

- Short Planet Gears (16)
- Long Planet Gears (15)
- Small Ring Gear (5)
- Dual Planet Carrier (6)
- Sun Gear (7)
- Large Ring Gear (8)

Front Single Planet Gear Set:

- Planetary Gears (17)
- Ring Gear (12)
- Planet Carrier (13)
- Sun Gear (14)

Rear Single Planet Gear Set:

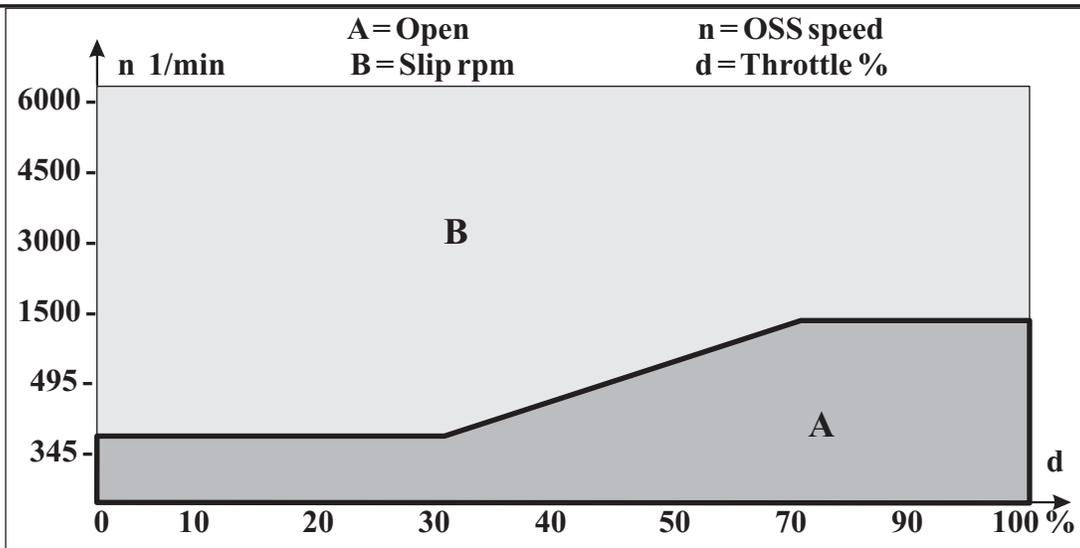
- Planetary Gears (18)
- Ring Gear (9)
- Planet Carrier (10)
- Sun Gear (11)

- 1 Torque Converter Lockup Clutch
- 2 Turbine Wheel
- 3 Stator
- 4 Impeller
- 5 Small Internal Geared Wheel
- 6 Dual Planet Carrier
- 7 Sun Gear
- 8 Large Internal Geared Wheel
- 9 Internal Geared Wheel
- 10 Single Planetary Carrier
- 11 Sun Gear
- 12 Internal Geared Wheel

- 13 Single Planetary Carrier
- 14 Sun Gear
- 15 Long Planet gears
- 16 Planet Gears
- 17 Planet Gears
- BR Multi-Disc Brake (BR)
- B1 Multi-Disc Brake (B1)
- B2 Multi-Disc Brake (B2)
- B3 Multi-Disc Brake (B3)
- K1 Multi-Disc Clutch (K1)
- K2 Multi-Disc Clutch (K2)
- K3 Multi-Disc Clutch (K3)

MERCEDES BENZ 722.9

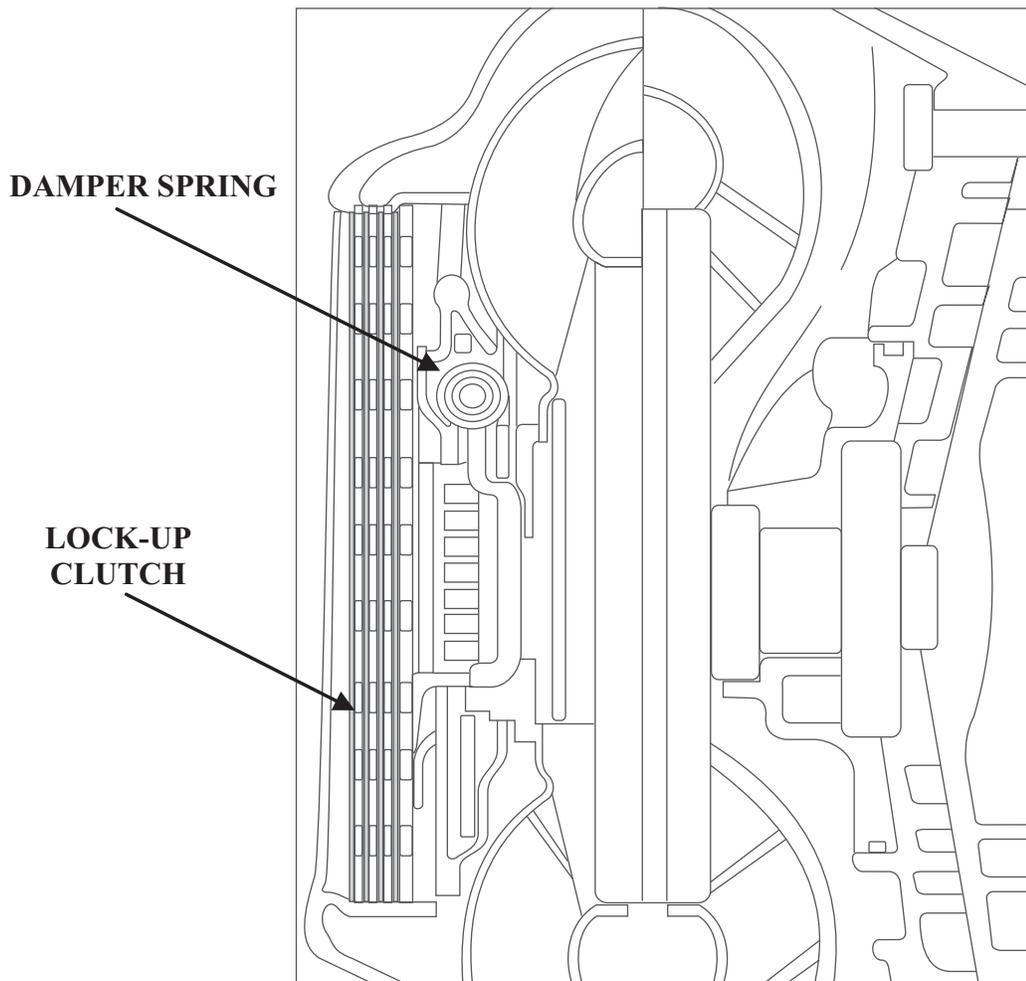
TORQUE CONVERTER CLUTCH STRATEGY



Torque converter slip values vary extremely from stall speed to negative values under deceleration. The Computer will calculate the most optimal slip based on the current driving conditions. The chart below illustrates some examples of converter slip taken with a manufacturer's scan tool in a vehicle at 45 mph.

Driving Condition	Throttle %	Current Gear	Engine Speed	Turbine Speed	Output Shaft Speed	Torque Converter Slip	Converter State
Cruise	24	6	1303	1258	1533	45	Slipping
½ Throttle	53	3	2859	2832	1471	27	Slipping
Kick-Down	100	2	4476	4338	1520	138	Open > Slipping
Deceleration	0	6	1169	1270	1524	-101	Slipping

Note: The converter slip figures stated in this chart are to be used as examples only and not as a guideline for diagnosis

**MERCEDES BENZ 722.9
TORQUE CONVERTER CLUTCH STRATEGY****TORQUE CONVERTER**

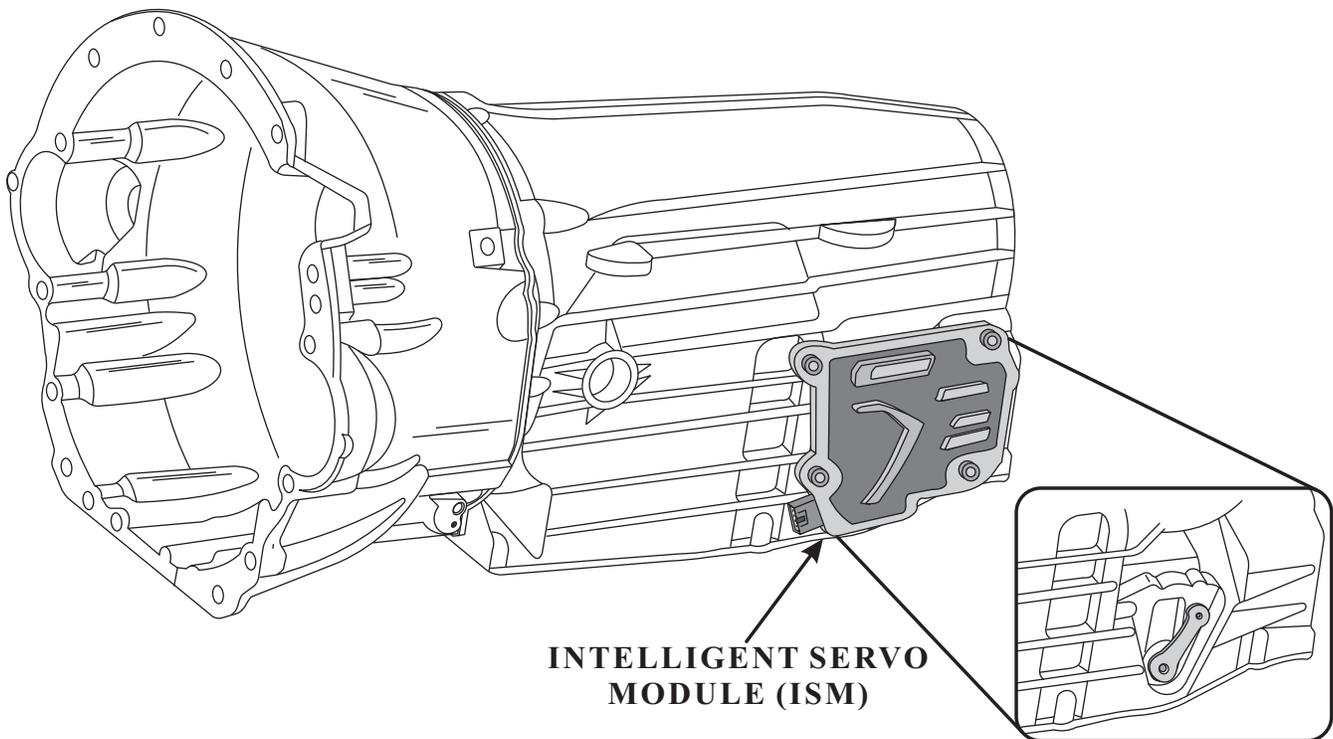
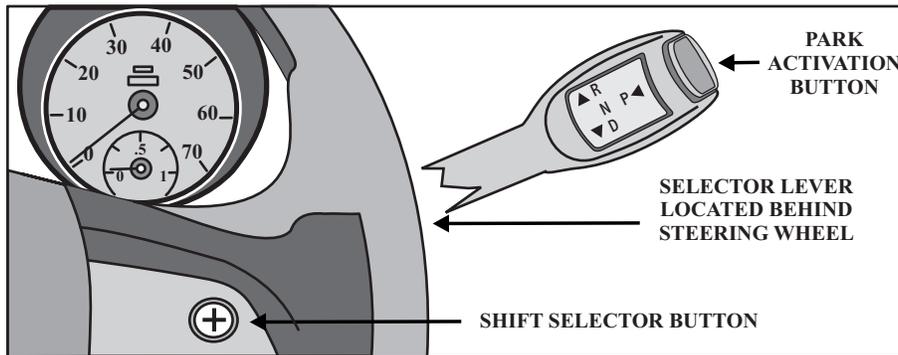
*The Torque Converter used is the same as the 722.6 and holds 4 liters of fluid.
Lock-up can be applied in all seven forward gears and incorporates damper springs integral to the lock-up clutch assembly to help prevent vibration or noise during clutch apply at low engine rpm.*

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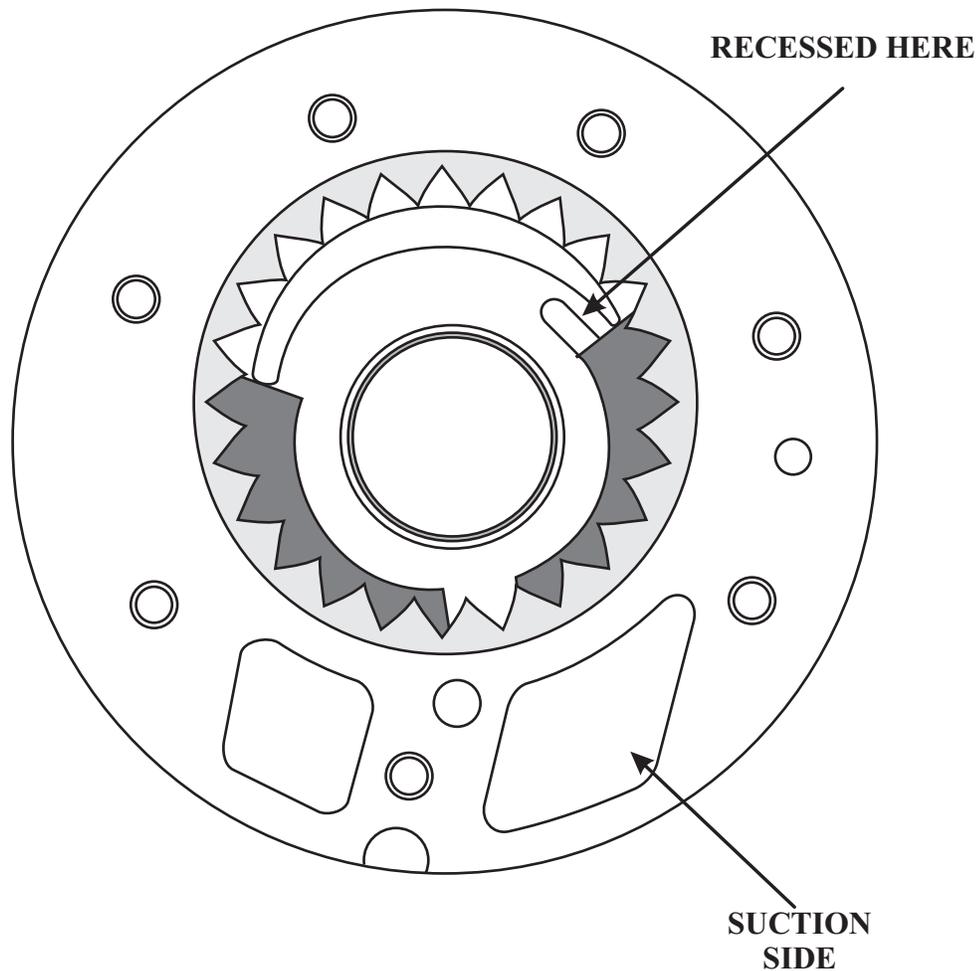
MERCEDES BENZ 722.9

SHIFT BY WIRE

Direct Select (no shift rod)

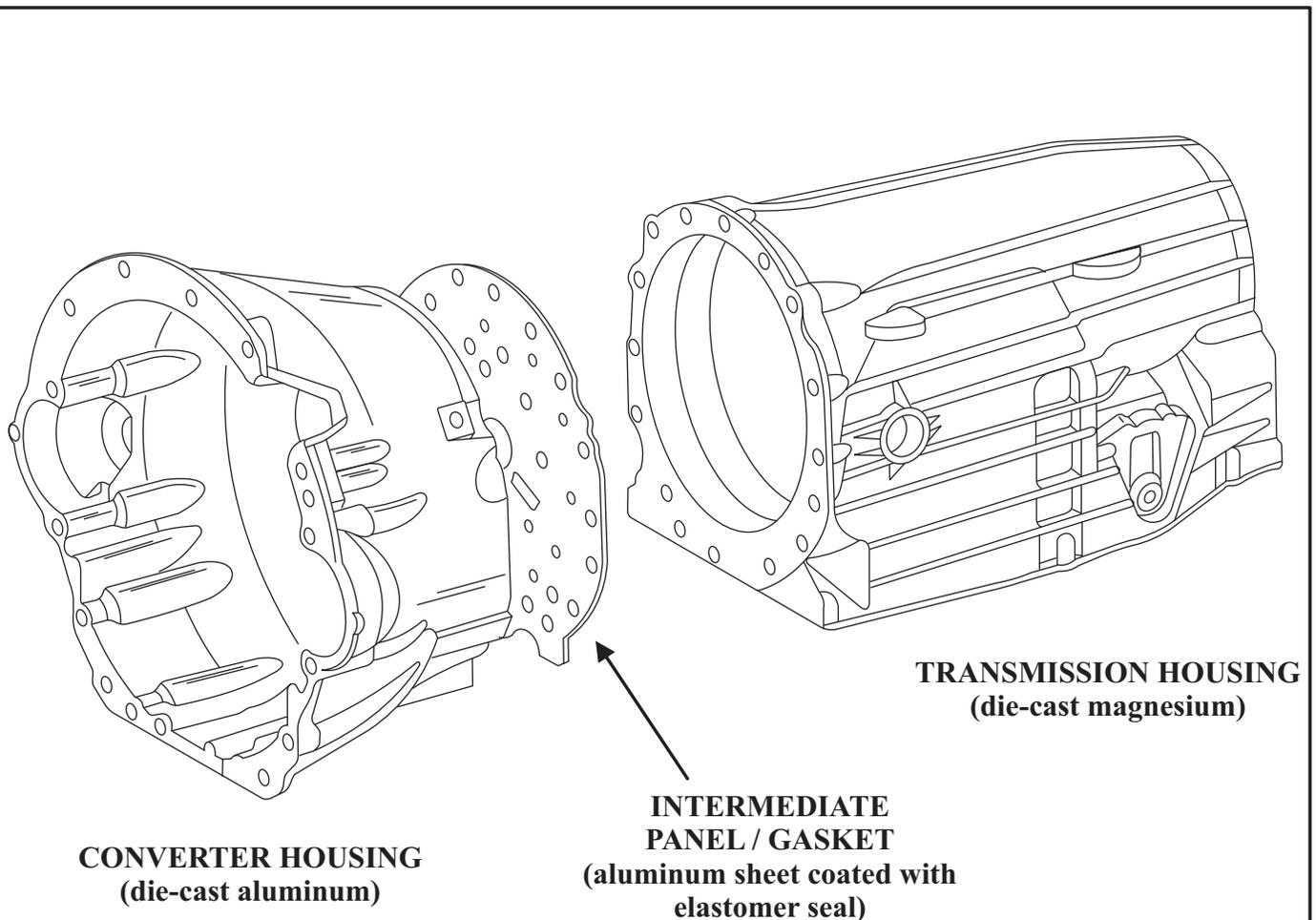


Some late model vehicles with the 722.9 will be equipped with shift by wire, called Direct Select. There is no mechanical connection to a shifter in the passenger compartment. An Intelligent Servo Module (ISM) will be attached to the left rear side of the case just above the pan rail. The module will control and monitor the shift valve lever position. If the vehicles electrical system fails there is a back up Emergency P-function to release the transmission from park. There is a spare battery found underneath the floor panel on the passenger side of the vehicle to energize to the module in the emergency mode.

MERCEDES BENZ 722.9**FRONT PUMP****CRESCENT TYPE PUMP
(SAME TYPE AS 722.6)**

The crescent type pump, although the same design as the 722.6, has an additional recess on the suction side of the pump to help reduce intake noise.

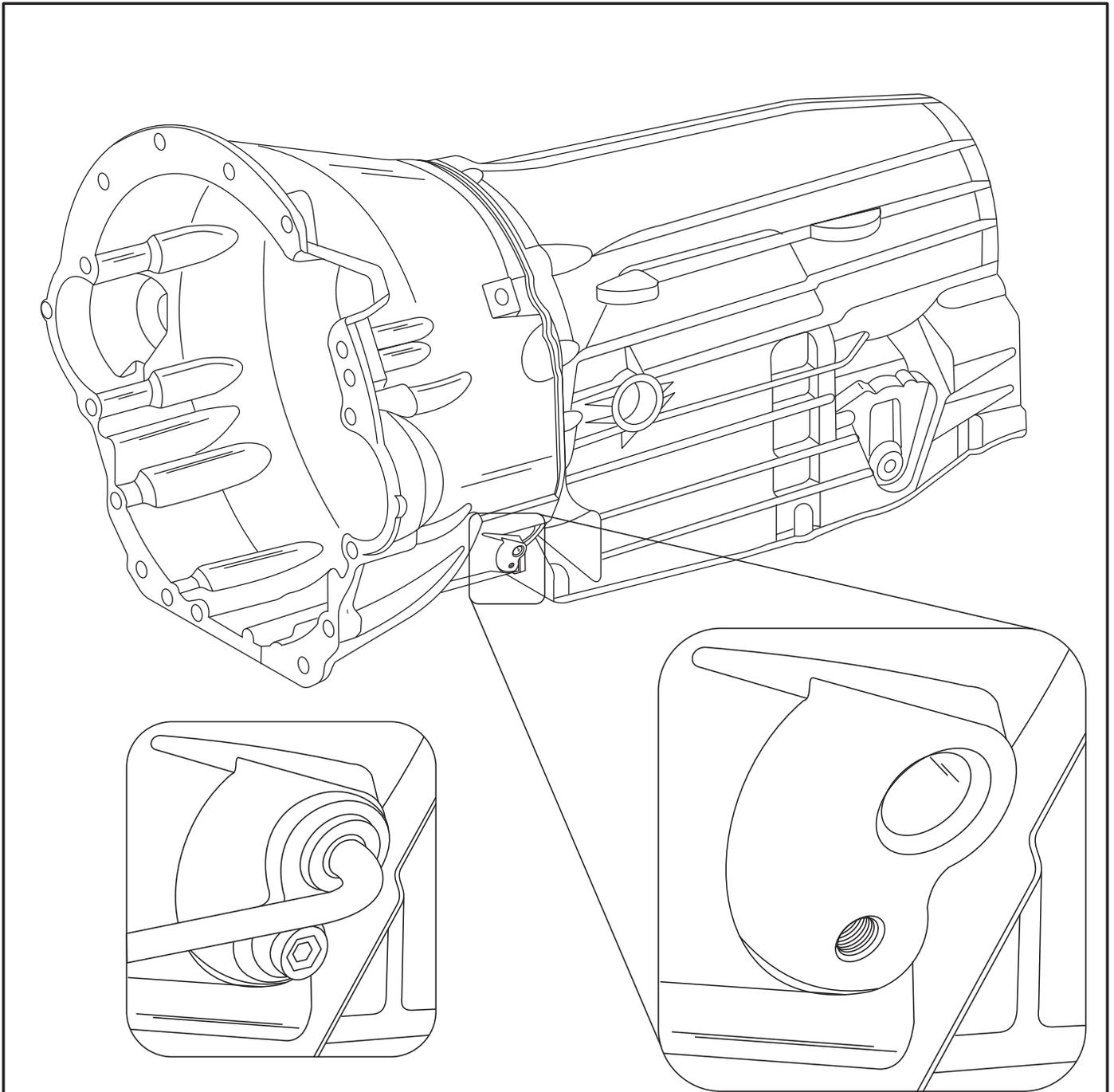
This modification is expected to be produced on later 722.6 transmissions. Future pump housing and gears may be made out of aluminum in an effort to reduce weight and high temperatures.

MERCEDES BENZ 722.9**CASE COMPONENTS**

Converter housing is die-cast aluminum. The transmission housing is die-cast magnesium (reduced weight compared to aluminum 2.5kg/5.5lb) which requires aluminum bolts due to steel bolts having a different expansion rate and corrosion concerns. All aluminum bolts must be replaced if removed.

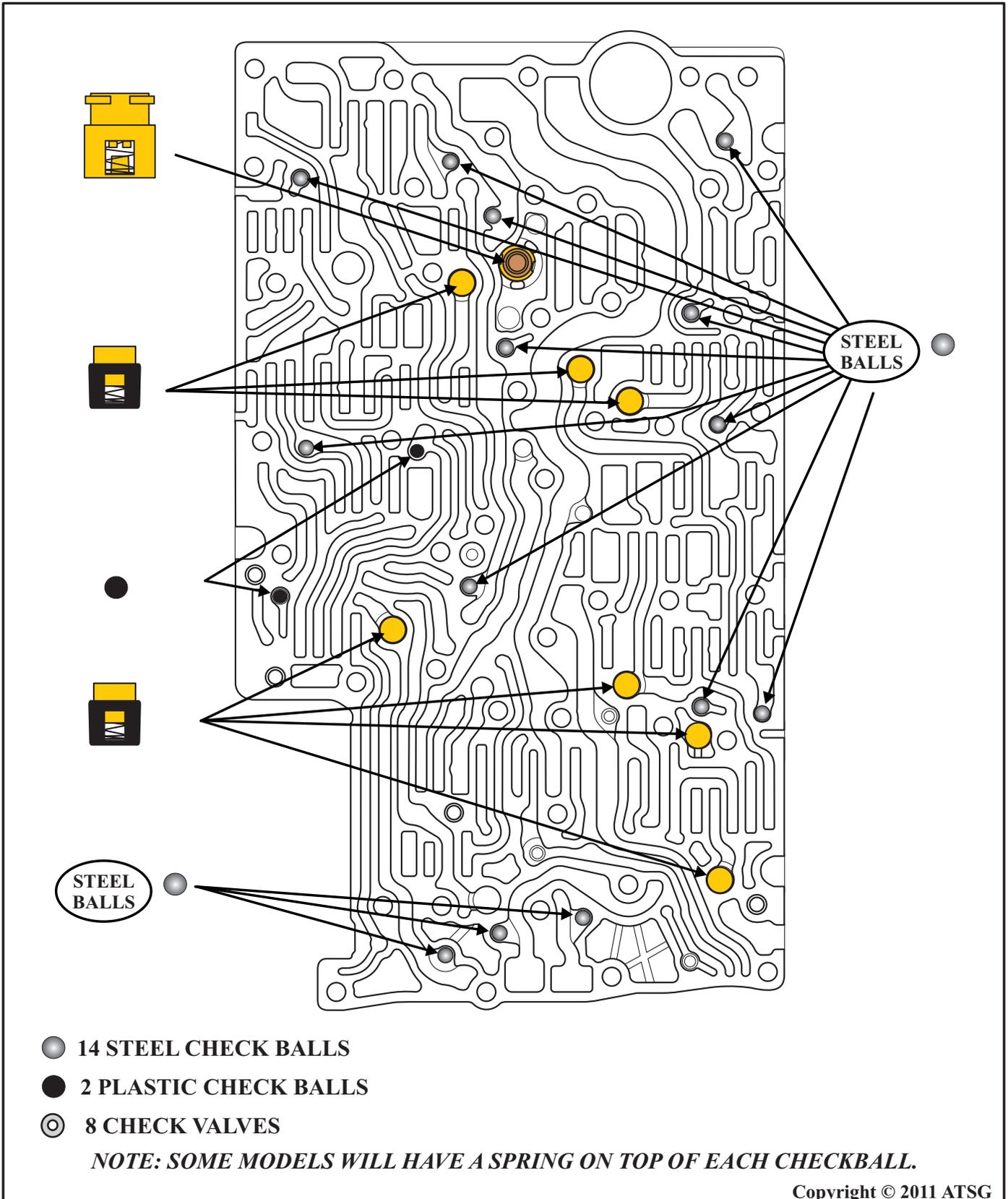
There is an intermediate panel or gasket made from an aluminum sheet with an elastomer coating between the converter housing and case. This gasket extends out beyond the sealing surfaces of the converter and transmission housing to prevent water from settling on the transmission housing.

This gasket can be reused if there are no signs of damage to the elastomer coating.

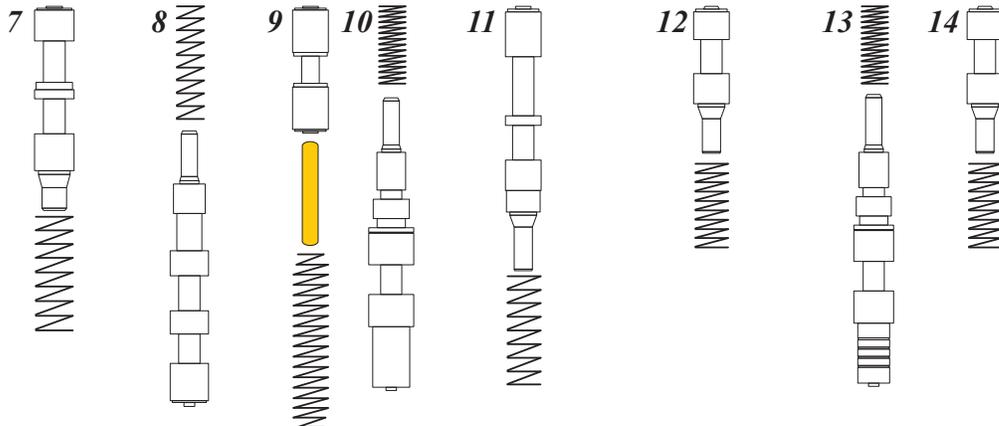
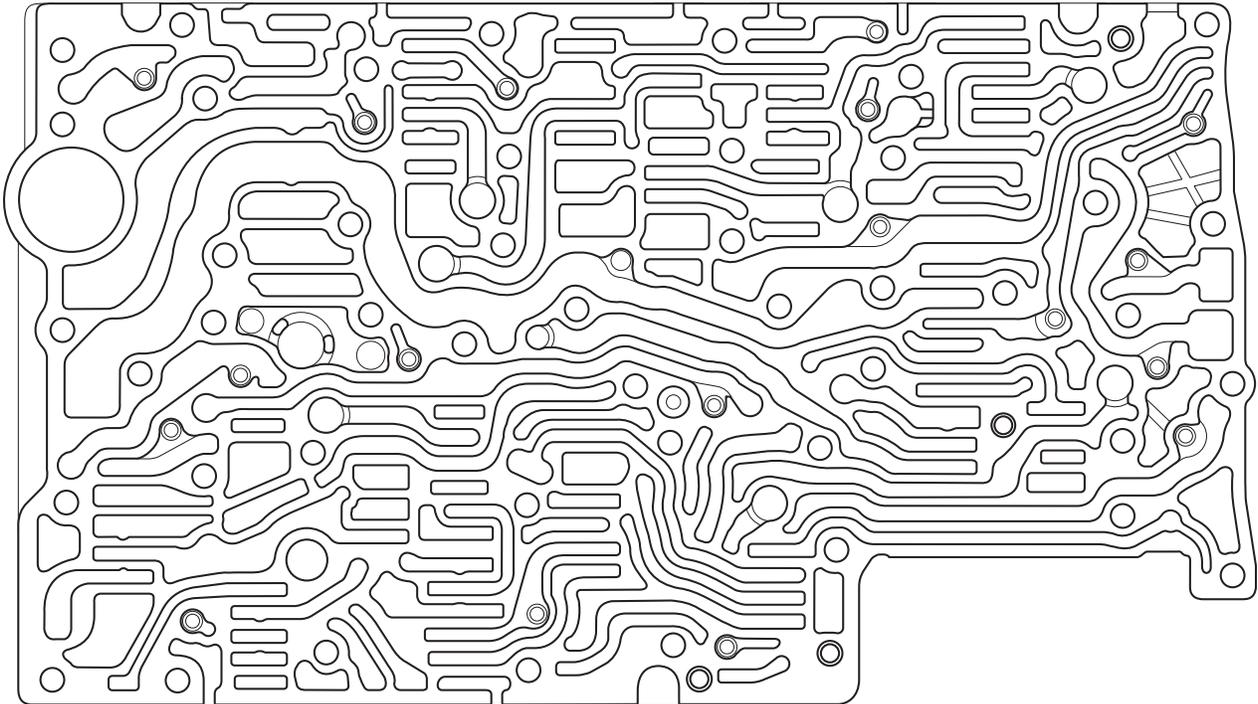
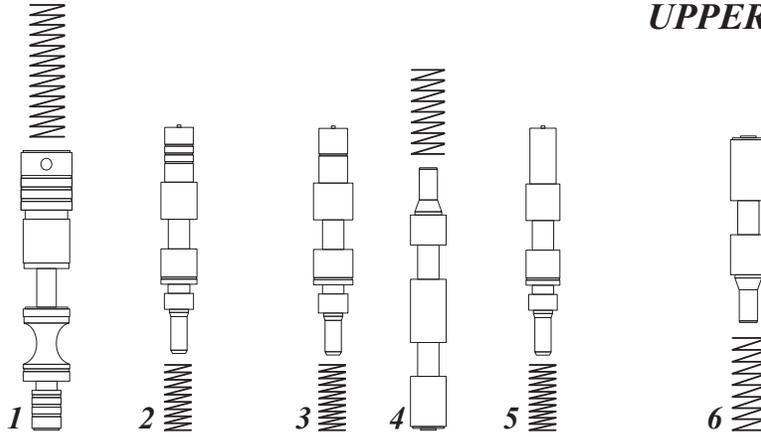
MERCEDES BENZ 722.9**COOLER LINE FITTINGS**

Transmission Cooler Ling Fittings do not have threads or Banjo type fittings. Cooler lines are sealed with rubber "O" rings on push-in type fittings secured with a retaining bolt.

**MERCEDES BENZ 722.9
CHECKBALL & SMALL PARTS LOCATIONS**



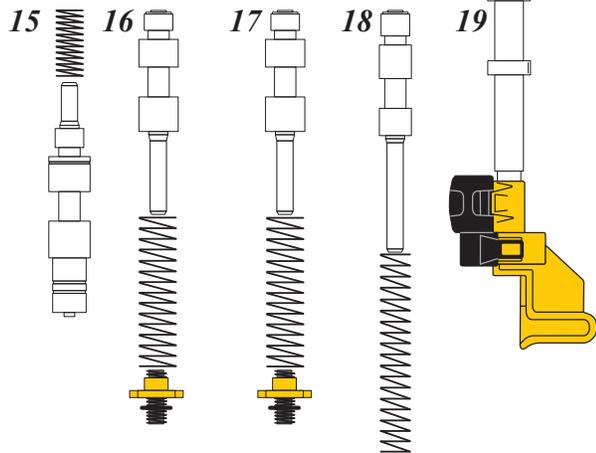
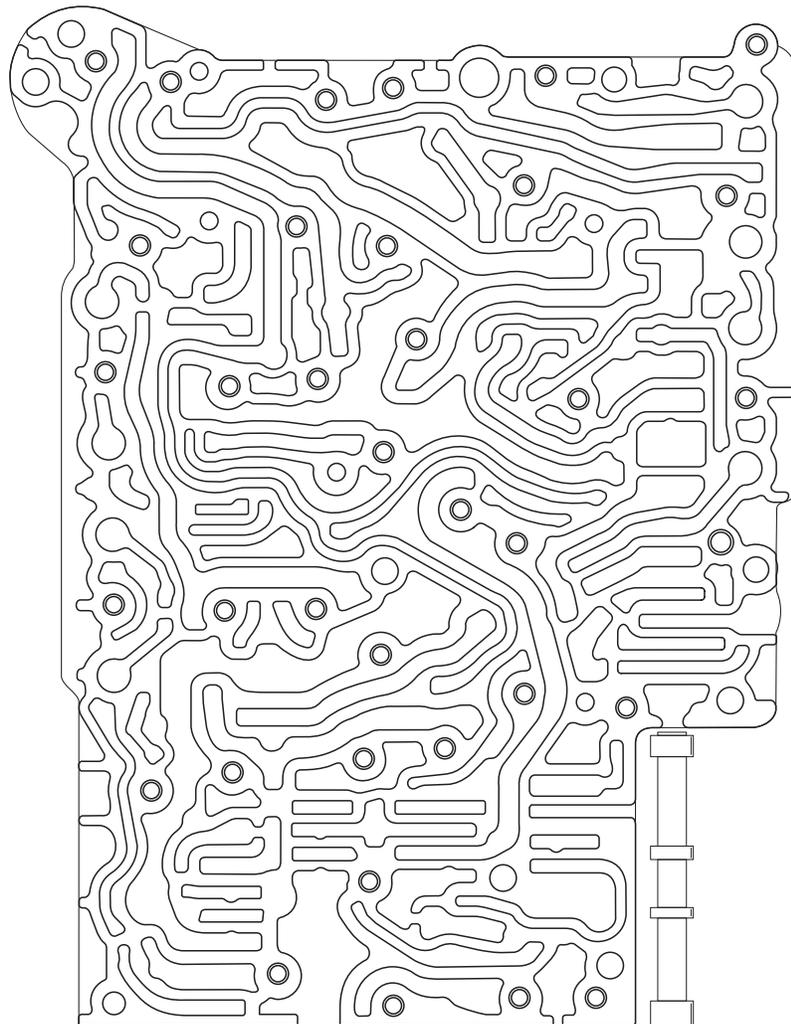
UPPER VALVE BODY



- 1. Working Pressure Regulator Valve
- 2. K1 Regulating Valve
- 3. B1 Regulating Valve
- 4. B1/B3 Shift Valve
- 5. B3 Regulating Valve
- 6. K3 Shift Valve
- 7. Converter Inlet Regulating Valve

- 8. Converter Clutch Shift Valve
- 9. Lubrication Pressure Regulator Valve
- 10. K2 Regulating Valve
- 11. Limp-home Mode Shift Valve
- 12. K2 Shift Valve
- 13. B2/BR Regulating Valve
- 14. B2 - 2 Shift Valve

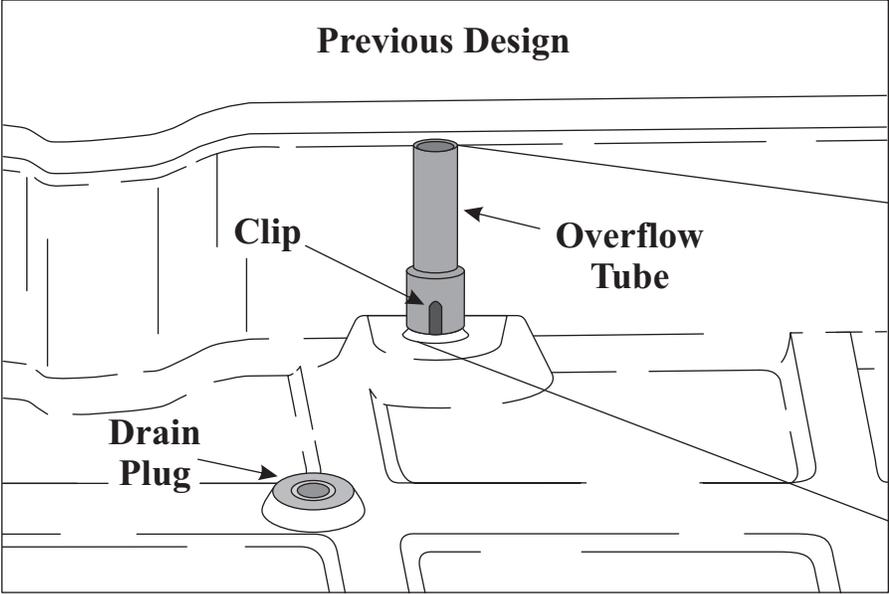
LOWER VALVE BODY



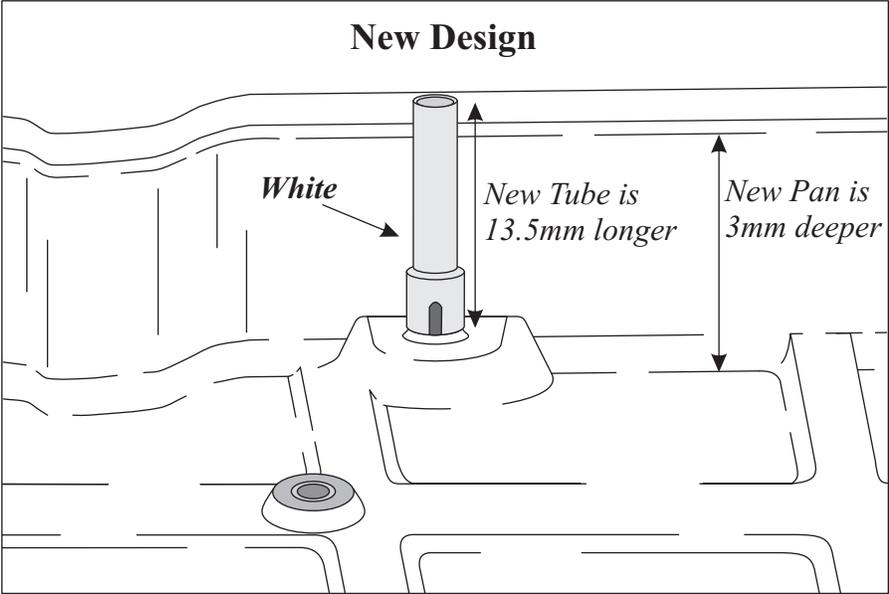
- 15. K3 Regulating Valve
- 16. Solenoid Regulating Valve 1 (*TCC, PCS, K2 & B2/BR*)
- 17. Solenoid Regulating Valve 2 (*B1, K1, K3 & B3*)
- 18. B2 - 1 Shift Valve
- 19. Manual Valve

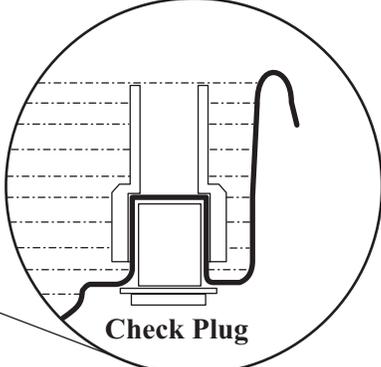
MERCEDES BENZ 722.9 TRANSMISSION OIL PAN & LEVEL CHECK

Previous Design



New Design





Clips onto pan

	Old Pan	New Pan
Initial Fill Check		
Celsius	30°	40°
Fahrenheit	86°	104°
Level Check		
Celsius	30-35°	40-45°
Fahrenheit	86-95°	104-113°
Total Fill	9.5 Liters	9.7 Liters

The oil pan has been redesigned and there is no longer a filler tube used on the transmission case. It is now filled and fluid level checked through an overflow tube (clips onto pan). This new design pan has also been updated. The overflow tube and overall pan depth have been increased. The updated pan is now 3mm deeper and the overflow tube is 13.5mm longer (can be identified by its white color) than the previous design. This update now allows an increase of 0.2 liters of fluid compared to the older pan. If the earlier design pan is removed for repairs it is suggested to update to the later design, **Part# 220-270-09-12**.