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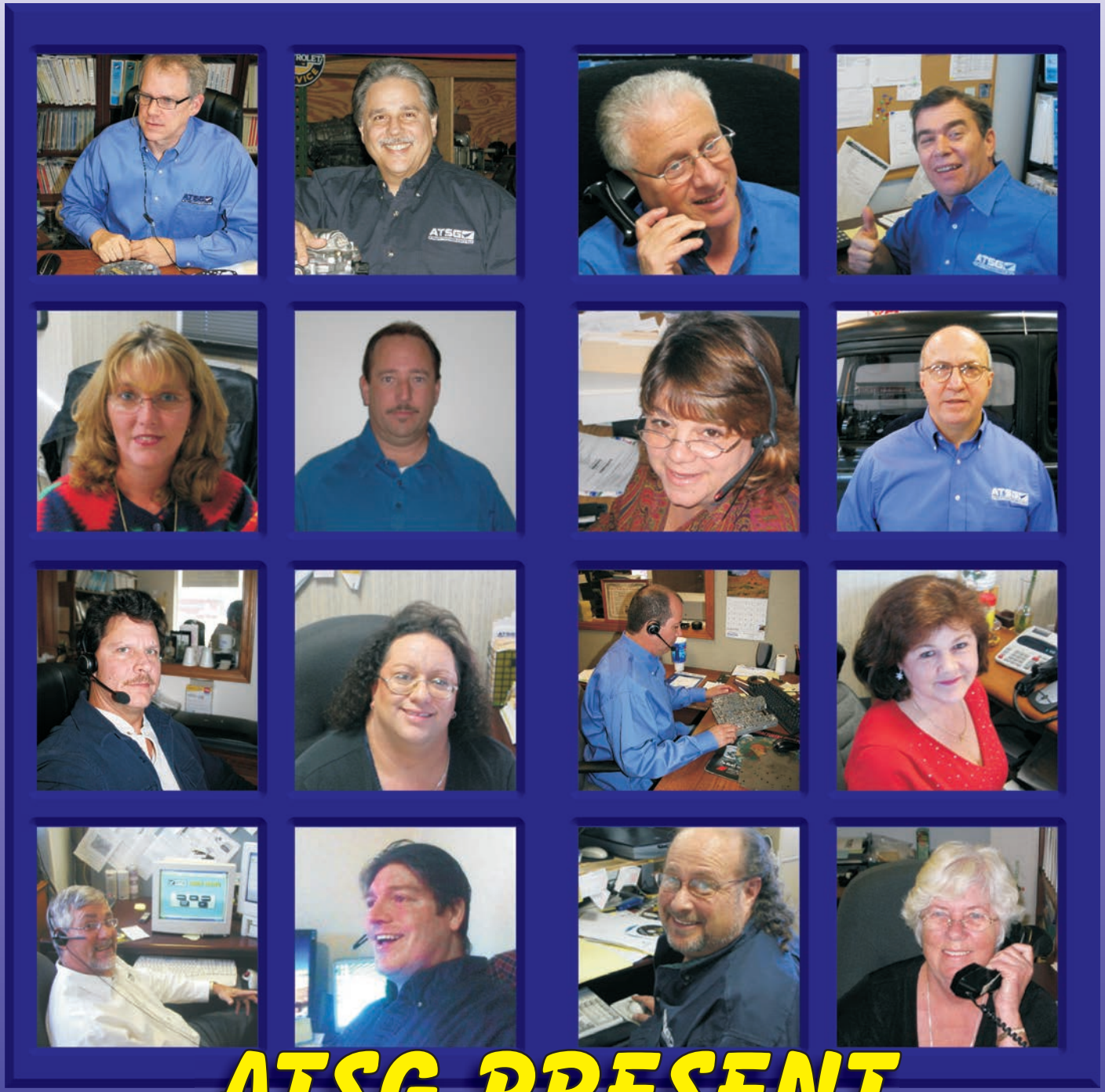
AUTOMATIC TRANSMISSION SERVICE GROUP

25 YEARS OF TECHNICAL SERVICE



ATSG PRESENT

"2011" TRANSMISSION SEMINAR

SERVICE INFORMATION

Borg Warner - IFC

"25th Seminar Anniversary Silver Edition"

ATSG Seminars

ATSG is today an employee owned company that is staffed with men and women who are not just satisfied at maintaining the premier status ATSG is known for, but to constantly be improving. We are producing information that can not be found anywhere else in the industry. Our tear down and reassembly manuals are bar none the best in the industry. We are producing hydraulics and valve body information that the manufacturers decided to no longer make available. In this manual for example, there is information for the RE5R05A, the 09D and the Subaru Phase 2 Version 2 that is not originated by any other company other than ATSG. Some have settled for information out there that copy us but those of you who are here in this seminar have decided to not settle for bread crumbs when you can have the whole loaf with ATSG. As Bob Cherrnay would say, It helps to belong to a tech service but belong to a tech service that helps. We at ATSG are committed at being that tech service producing the information you need to be a success in your business. ATSG would like to thank all of you who have supported us over the years and we would like for you to join in with us as we celebrate our 25 years of service to you.

The information and part numbers contained in this booklet have been carefully compiled from industry sources known for their reliability, but ATSG does not guarantee its accuracy.

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HYUNDAI A4CF2

SOLENOID CODES

COMPLAINT: A Hyundai equipped with an A4CF2 may come into the shop in third gear failsafe with the "Check Engine" Lamp illuminated. Code retrieval may produce a number of solenoid or ATF Temperature Sensor codes, See chart in Figure 1.

CAUSE: The internal wire harness commonly referred to as the "Ribbon" has failed. Faulty solenoids or temp sensor could also cause any of the codes listed below as well, Figure 2. External wiring and the TCM are also included in the equation since any component in the circuit could generate a code. In addition there have been reports of the vehicle harness connector end creating these complaints.

CORRECTION: Diagnose the solenoid circuits for which there are codes bearing in mind that the "Ribbon" is a common failure item as well as the vehicle harness connector.

SERVICE INFORMATION:

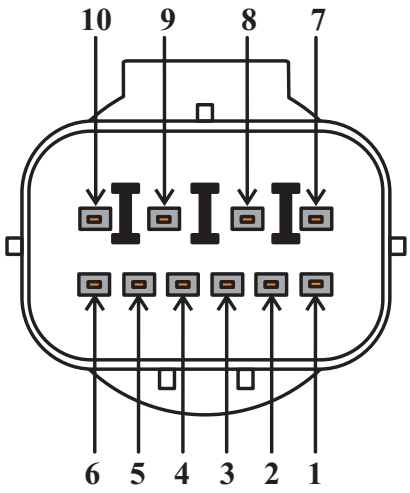
Solenoid Internal Wire Harness (Ribbon).....46308-23000
VFS Solenoid (1).....46313-23010
ATF Temperature Internal Wire Harness.....46307-23010

DTC	CODE DEFINITION
P0711	Transaxle Fluid Temperature Sensor Rationality
P0712	Transaxle Fluid Temperature Sensor Circuit Low Input
P0713	Transaxle Fluid Temperature Sensor Circuit High Input
P0743	Pressure Control Solenoid Valve D (PCSV D)/TCC Circuit Open or Shorted
P0748	Variable Force Solenoid (VFS) Solenoid Open or Shorted
P0750	Shift Control Solenoid A (SCSV A or ON-OFF)/OD/LR Switch Valve Open or Shorted
P0755	Shift Control Solenoid B (SCSV B or PCSV A)/OD/LR Clutch Open or Shorted
P0760	Shift Control Solenoid C (SCSV C or PCSV B)/2-4 Clutch Open or Shorted
P0765	Shift Control Solenoid D (SCSV D or PCSV C)/ UD Clutch Open or Shorted

Figure 1

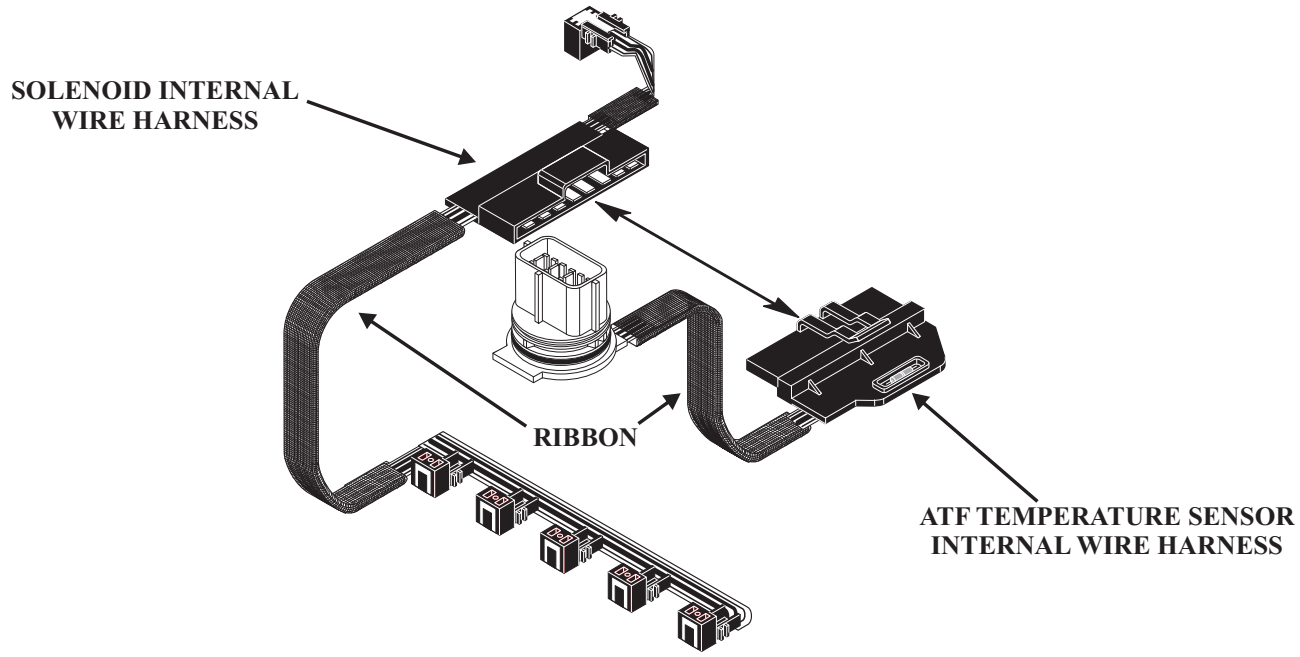
HYUNDAI A4CF2 SOLENOID CODES

TRANSMISSION CASE CONNECTOR



1 - PCSV A - (OD-L/R Clutch)
2 - PCSV B - (2/4 Clutch)
3 - On-Off - (OD-L/R Switch Valve)
4 - PCSV D (TCC)
5 - TFT Signal
6 - TFT Ground
7 - Solenoid Ground
8 - PCSV C - (UD Clutch)
9 - VFS (Line) Low
10 - VFS (Line) High

INTERNAL WIRE HARNESS (RIBBON)



ALL SOLENOIDS HAVE A RESISTANCE VALUE OF 2.5 TO 4.5 OHMS

Figure 2

Transtec - 6

EZ Driver - 7

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)
K1Clutch Solenoid (Y3/8y2)
K2 Clutch Solenoid (Y3/8y3)
K3 Clutch Solenoid (Y3/8y4)
B1Brake 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)

MERCEDES BENZ 722.9

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	
	6	2.2-2.6	1.9-2.3
	7		2.0-2.4
	8		2.1-2.5
K3 Clutch	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

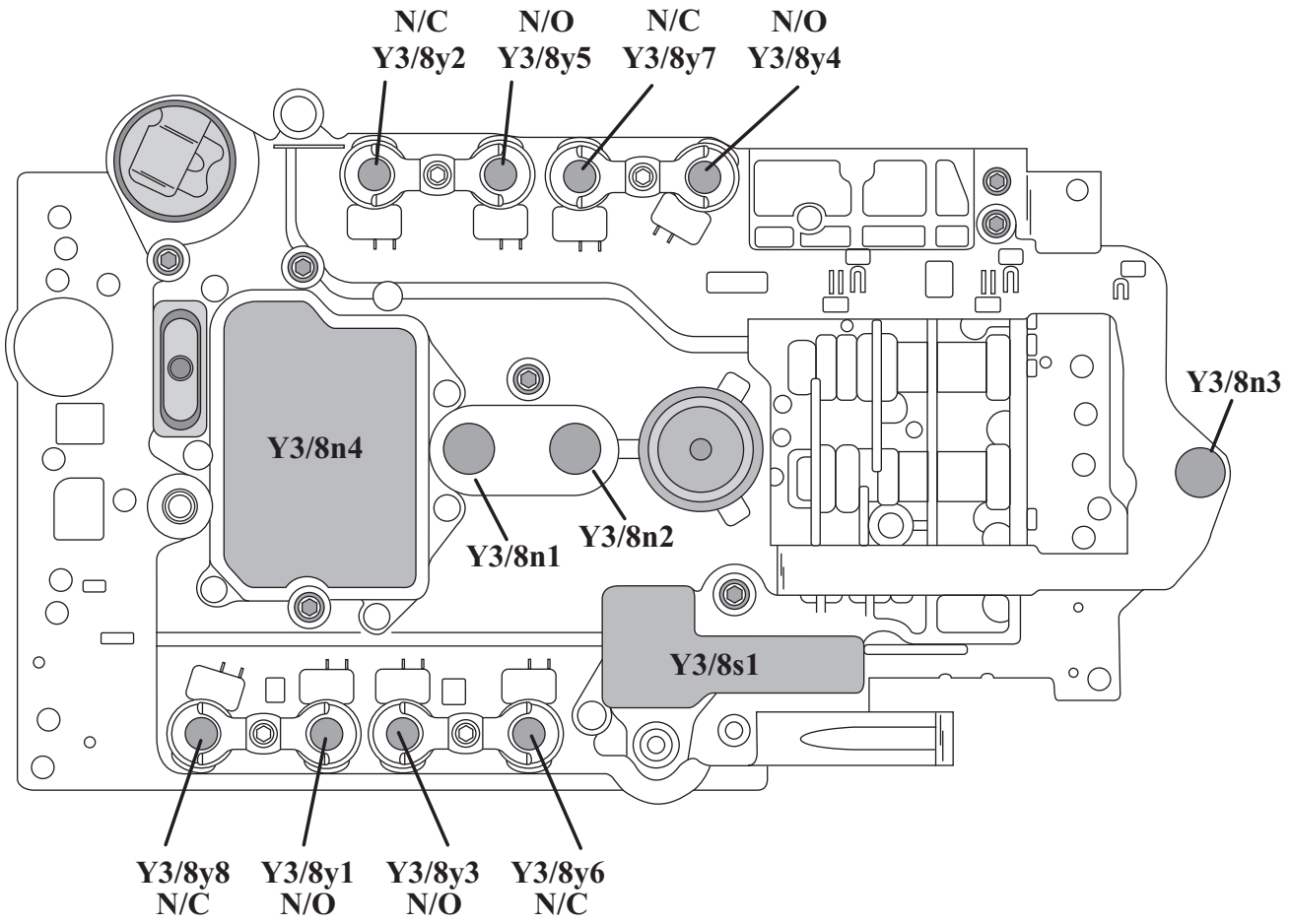
Note: B2 Brake multi disc clutches use single sided plates at this point in time other clutch members may use single sided plates at a future date.

AVI - 10

Exedy - 11

MERCEDES BENZ 722.9

PRELIMINARY INFORMATION

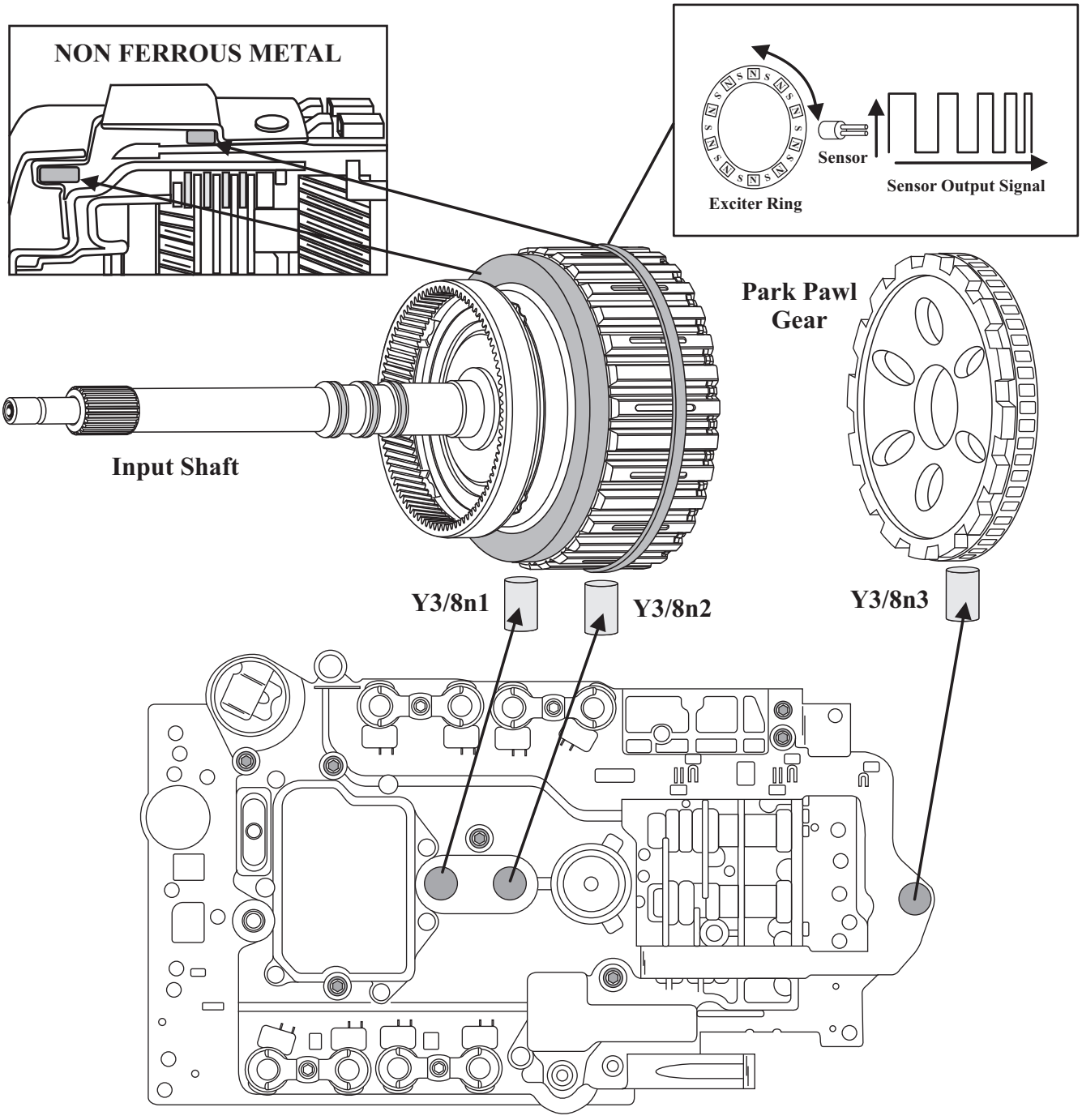


Y3/8n1 = Input speed sensor (front)
Y3/8n2 = Internal speed sensor (center)
Y3/8n3 = Output speed sensor (rear - Hall Effect)
Y3/8n4 = Electrohydraulic Control Module (TCM) (w/internal transmission fluid temp sensor)
Y3/8y1 = Working Pressure (line/normally open: no current max. pressure/high current low pressure)
Y3/8y2 = K1 clutch (normally closed: high current high pressure/no current no pressure)
Y3/8y3 = K2 clutch (normally open: no current max. pressure/high current low pressure)
Y3/8y4 = K3 clutch (normally open: no current max. pressure/high current low pressure)
Y3/8y5 = B1 brake (normally open: no current max. pressure/high current low pressure)
Y3/8y6 = B2 brake (normally closed: high current high pressure/no current no pressure)
Y3/8y7 = B3 brake (normally closed: high current high pressure/no current no pressure)
Y3/8y8 = Lock-up (normally closed: high current high pressure/no current no pressure)
Y3/8s1 = Range sensor

Note: Normally open solenoids are used for Limp Mode w/no current to transmission.

MERCEDES BENZ 722.9

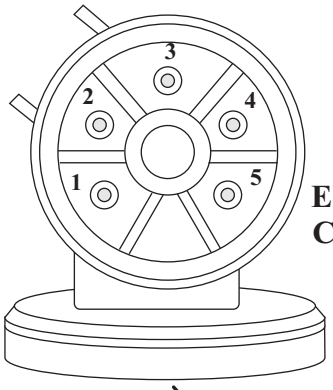
SPEED SENSORS



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

MERCEDES BENZ 722.9

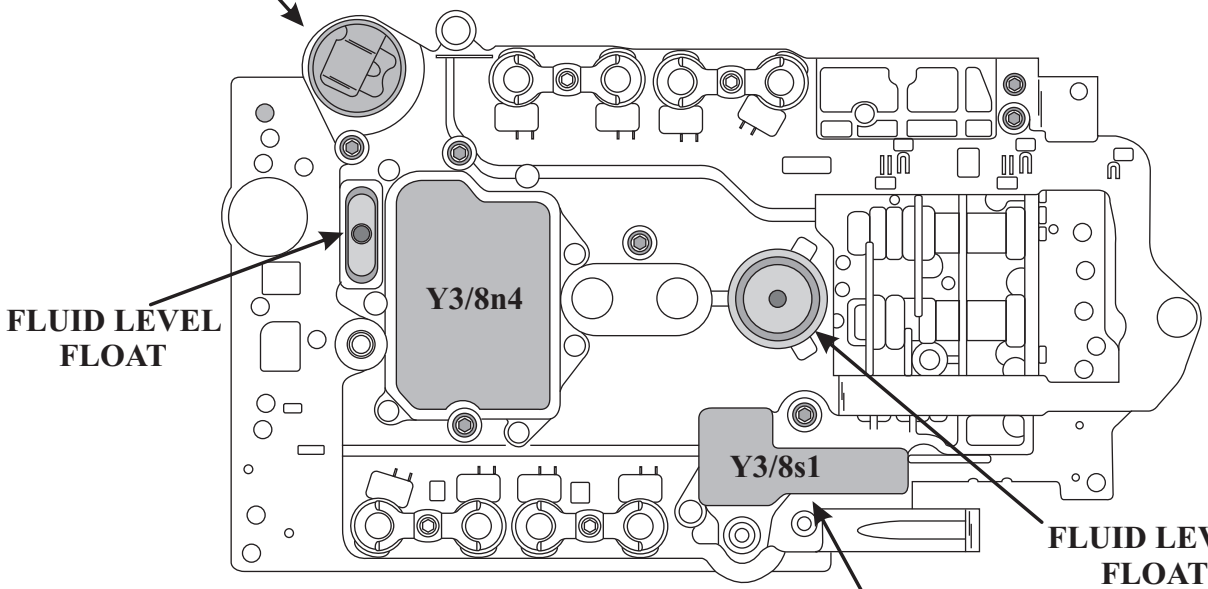
RANGE SENSOR & ELECTRICAL CONNECTOR



ELECTRICAL CONNECTOR

ONLY 5 PINS
(2 round o-rings & 1 square o-ring)

1:CAN C High
2:CAN C Low
3:According to wire diagram for diagnostics not known yet
4:Circuit 87 (relay & fuse depending on model)
5:Circuit 31
Note: SDS communicates to CGW via CAN-D then to ECM over CAN -C



Y3/8s1 Range sensor: Soldered to TCM 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 learned or faulty will cause limp mode.
Fluid Level Floats (2):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

Slauson - 15

MERCEDES BENZ 722.9

COMPONENT APPLICATION

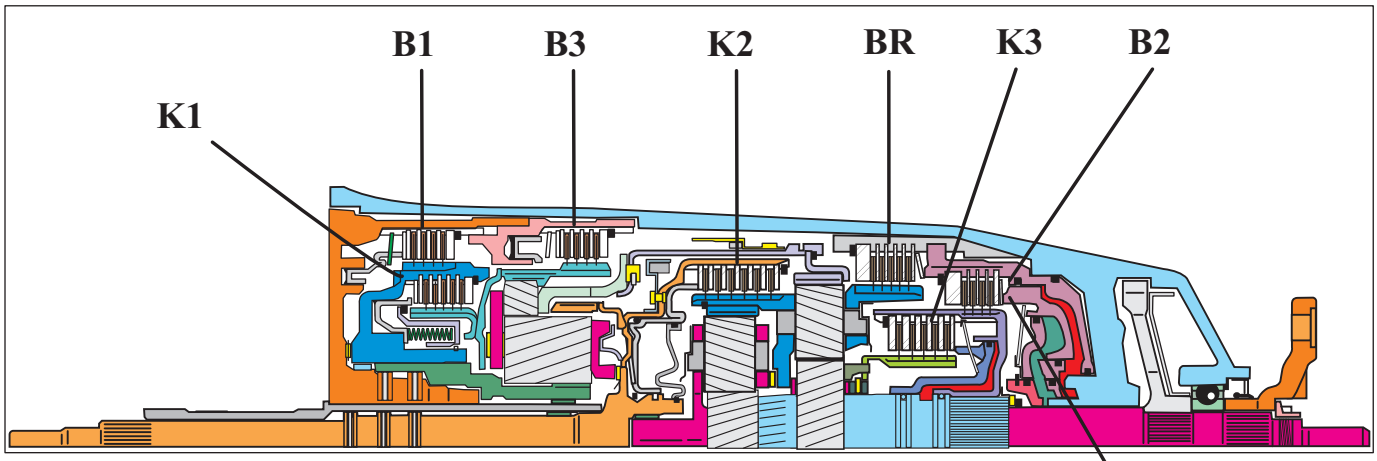
SHIFT MEMBER APPLICATION & SOLENOID FUNCTION

Shift Member		B1	B2*	B3	BR*	K1	K2	K3
Solenoid		Y3/8y5	Y3/8y6	Y3/8y7	Y3/8y6	Y3/8y2	Y3/8y3	Y3/8y4
Solenoid State		Press/Curr	Press/Curr	Press/Curr	Press/Curr	Press/Curr	Press/Curr	Press/Curr
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	1.000	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	0.820	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

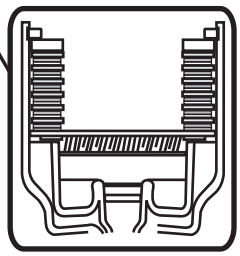
X = Shift member applied C = Current applied to solenoid P = Pressure from solenoid 0 = Zero
V = Variable M = Maximum
***B2 & BR share the same solenoid. The oil is directed to different clutch members by the selector shift valve**
◢ No Current: Zero Pressure (1): "S"Mode (sport)
◣ No Current: Maximum Pressure (2): "C" Mode (comfort)
Failsafe while driving all solenoids will be turned off, transmission will shift to 6th gear.
 # Solenoids for B1, K2 & K3 clutch provide maximum pressure w/o current.
 # After engaging Park then Drive: only 2nd & Reverse gear are available.

MERCEDES BENZ 722.9

CLUTCH POSITION & APPLICATION



NO FREEWHEEL (SPRAG)



Note: During each shift one clutch is applied as another is released.
B2 Multi Disc Brake use Single Side Plates.
B3 & K3 are applied in "N" only one clutch is needed in any drive gear.

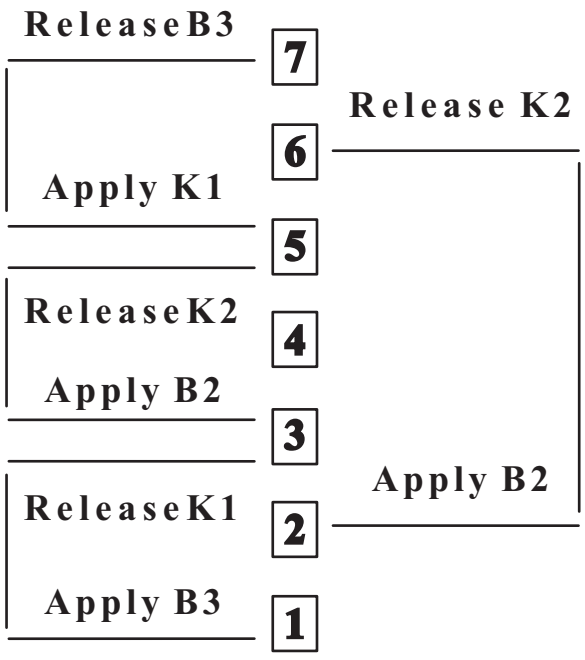
Gear	Gear Ratio W7A 700	B1	B2	B3	BR	K1	K2	K3
1	4.377		X	X				X
2	2.859	X	X					X
3	1.921		X			X		X
4	1.368		X			X	X	
5	1.000					X	X	X
6	0.820	X					X	X
7	0.728			X			X	X
N (1)				X				X
R (1)	-3.416	X			X			X
R (2)	-2.231			X	X			X

(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



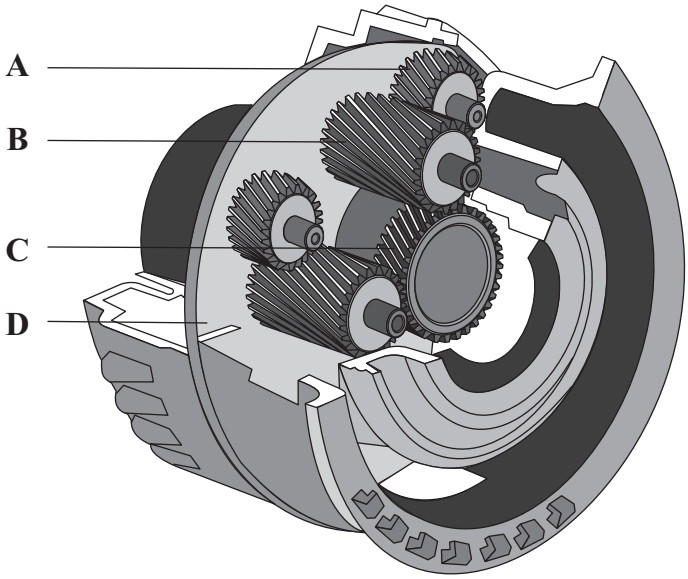
The 722.9 transmission has Sequential shifting (clutch on clutch) in addition to providing a down shift strategy that allows the transmission to skip gears during down shifts as long as one clutch member is released as another is applied.

MERCEDES BENZ 722.9

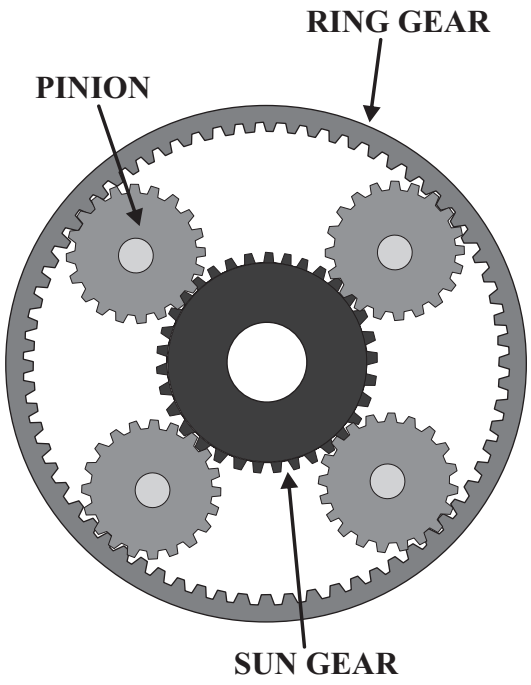
POWER FLOW

1 RAVIGNEAUX TYPE & 2 SIMPLE TYPE PLANETARY GEAR SET

RAVIGNEAUX TYPE



SIMPLE TYPE

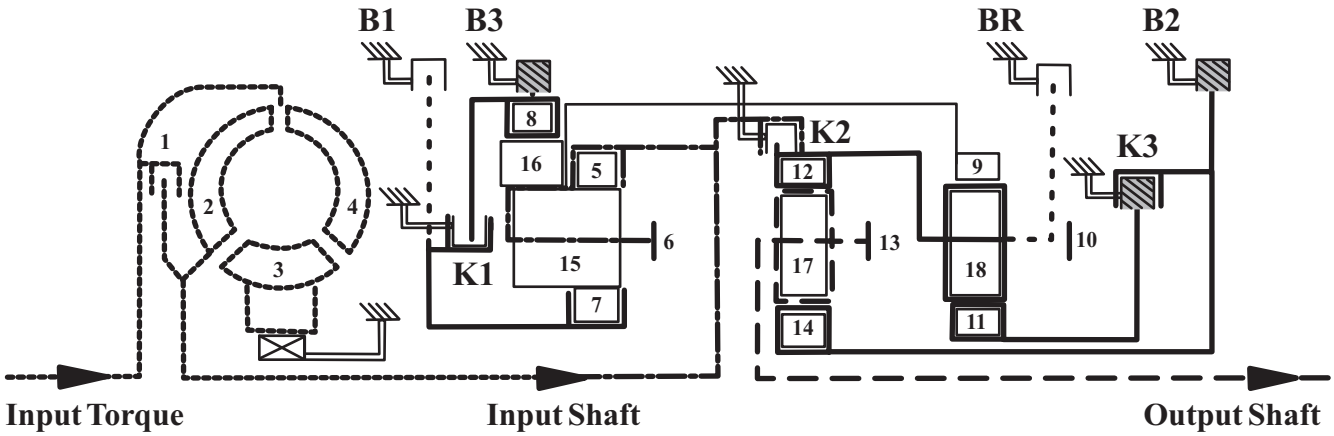


A: Short Planetary Gear (running on larger ring gear)
B: Long Planetary Gear (running on smaller ring gear)
C: Sun Gear
D: Planetary Gear Carrier

MERCEDES BENZ 722.9

POWER FLOW

Power Flow 1st Gear



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)
Large Ring Gear (8)

Front Single Planet Gear Set:
Planetary Gears (17)
Ring Gear (12)
Planet Carrier (13)
Sun Gear (14)

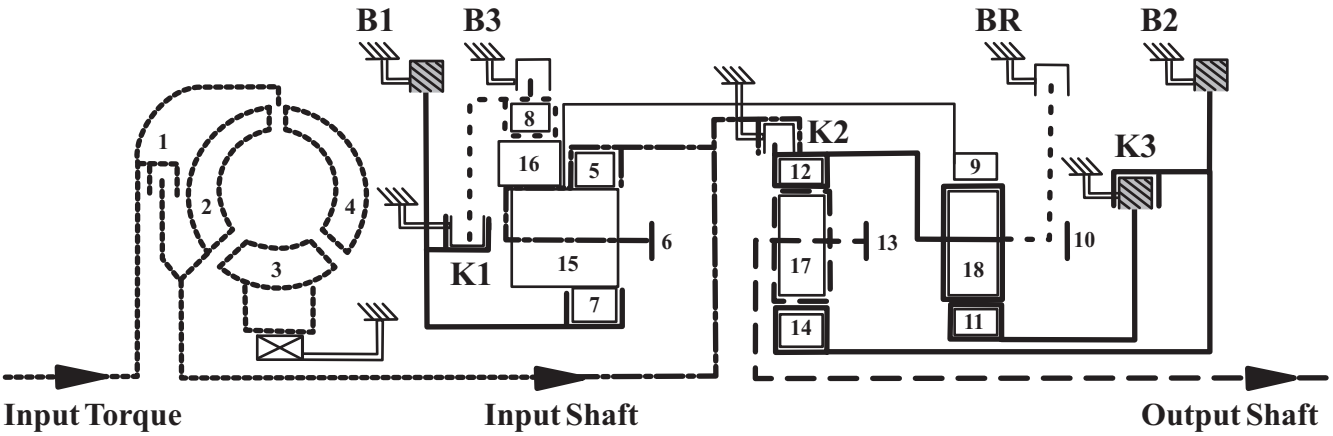
Rear Single Planet Gear Set:
Planetary Gears (18)
Ring Gear (9)
Planet Carrier (10)
Sun Gear (11)

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

Power Flow 2nd Gear



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)

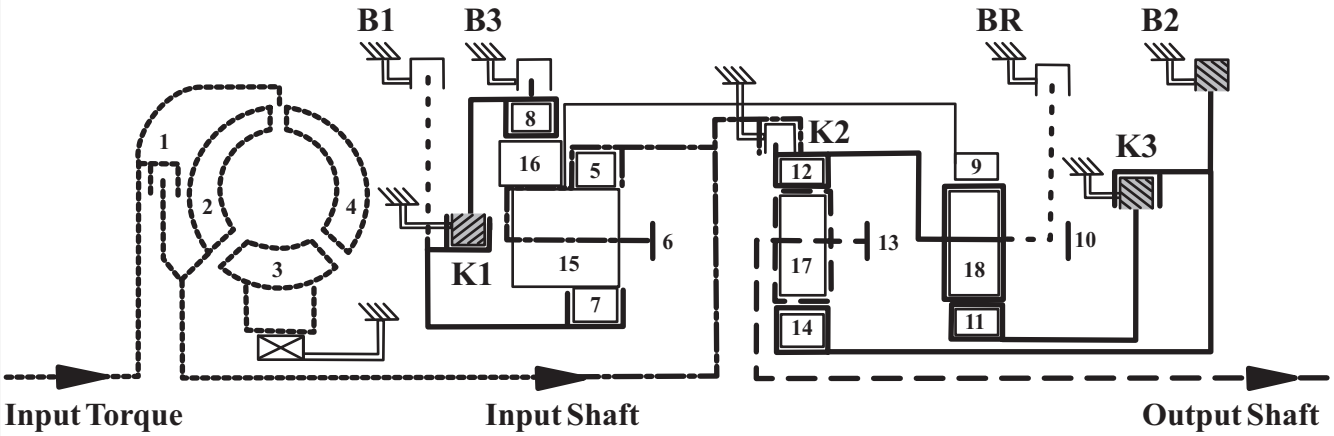
Rear Single Planet Gear Set:
Planetary Gears (18)
Ring Gear (9)
Planet Carrier (10)
Sun Gear (11)

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

Power Flow 3rd Gear



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)

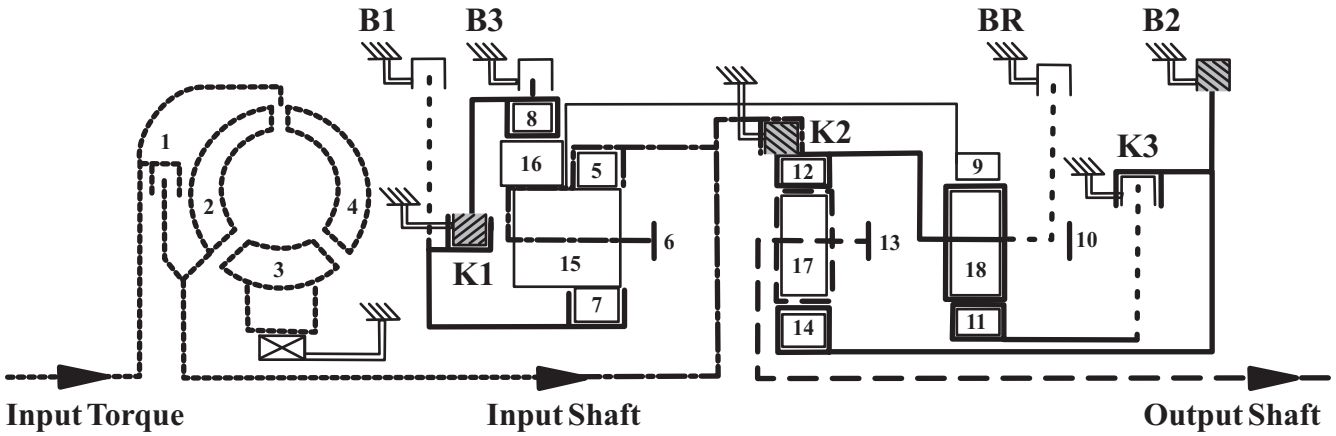
Rear Single Planet Gear Set:
Planetary Gears (18)
Ring Gear (9)
Planet Carrier (10)
Sun Gear (11)

1 Torque Converter Lockup Clutch
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

Power Flow 4th Gear



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)

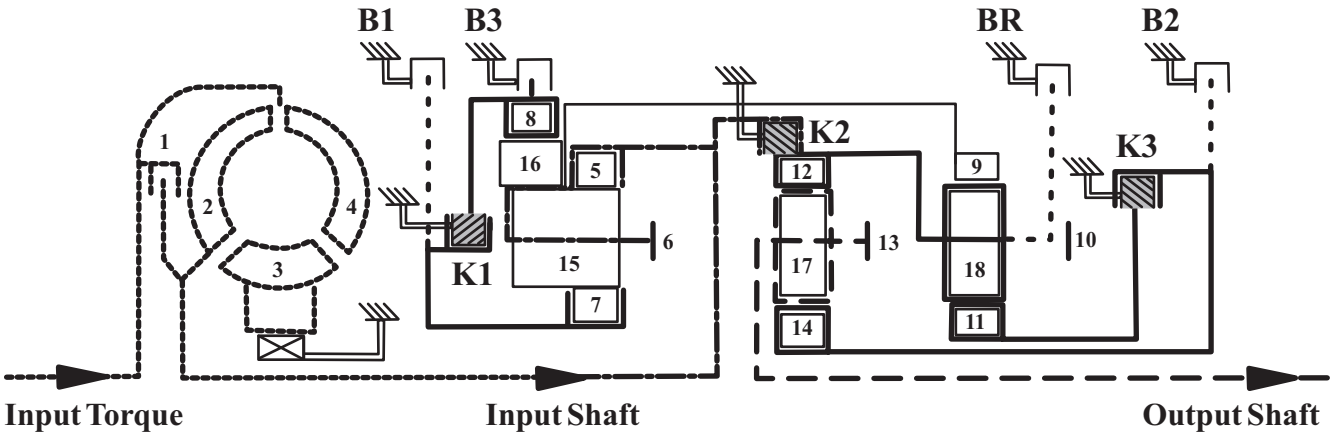
Rear Single Planet Gear Set:
Planetary Gears (18)
Ring Gear (9)
Planet Carrier (10)
Sun Gear (11)

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

Power Flow 5th Gear



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)

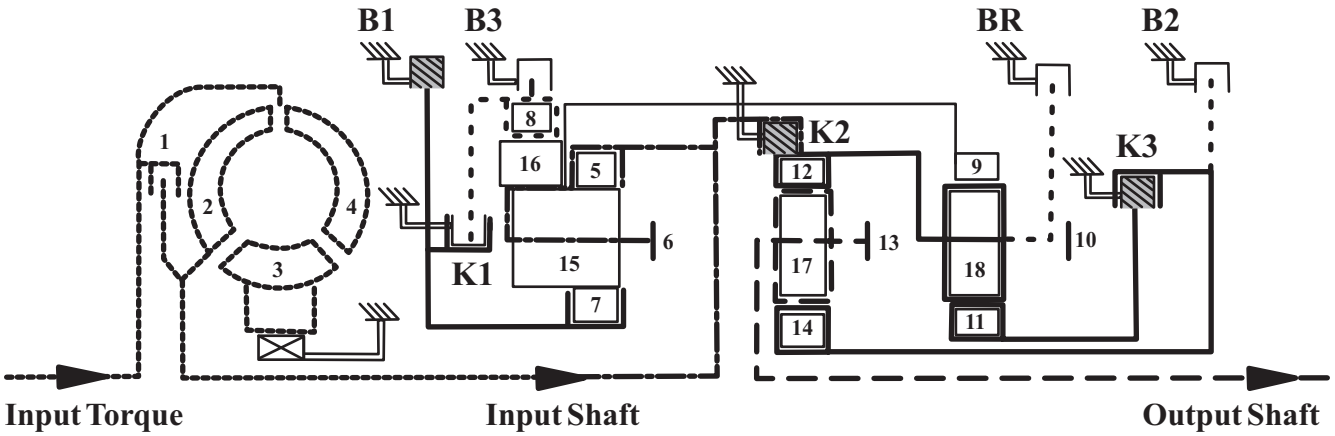
Rear Single Planet Gear Set:
Planetary Gears (18)
Ring Gear (9)
Planet Carrier (10)
Sun Gear (11)

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

Power Flow 6th Gear



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)

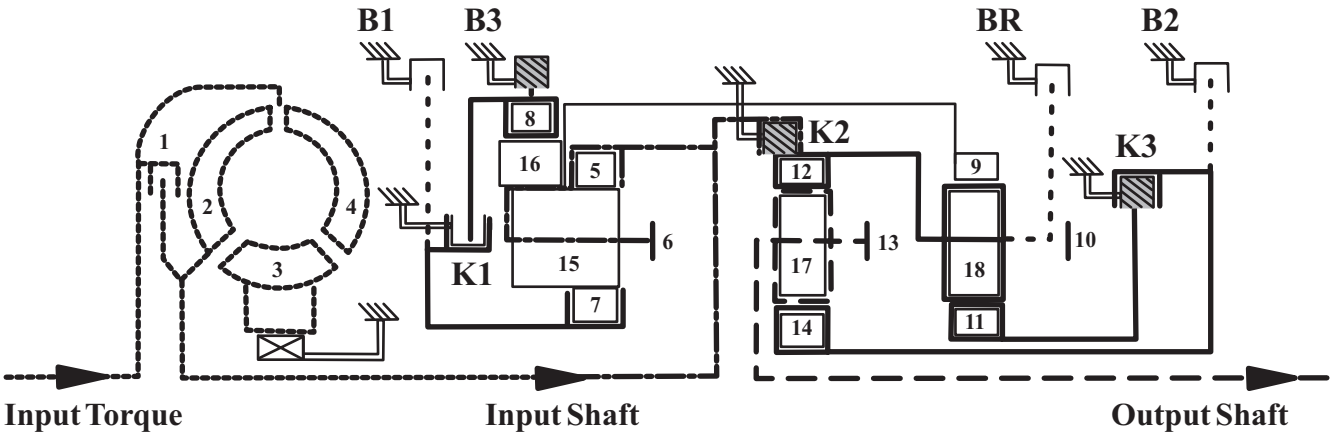
Rear Single Planet Gear Set:
Planetary Gears (18)
Ring Gear (9)
Planet Carrier (10)
Sun Gear (11)

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

Power Flow 7th Gear



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)

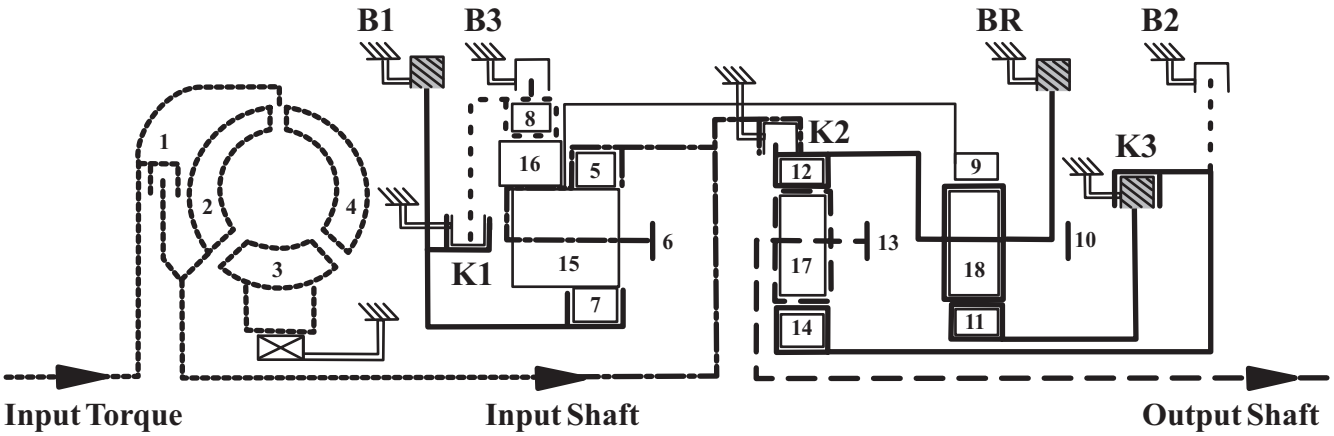
Rear Single Planet Gear Set:
Planetary Gears (18)
Ring Gear (9)
Planet Carrier (10)
Sun Gear (11)

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

Power Flow Reverse Gear In "S" Mode



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)

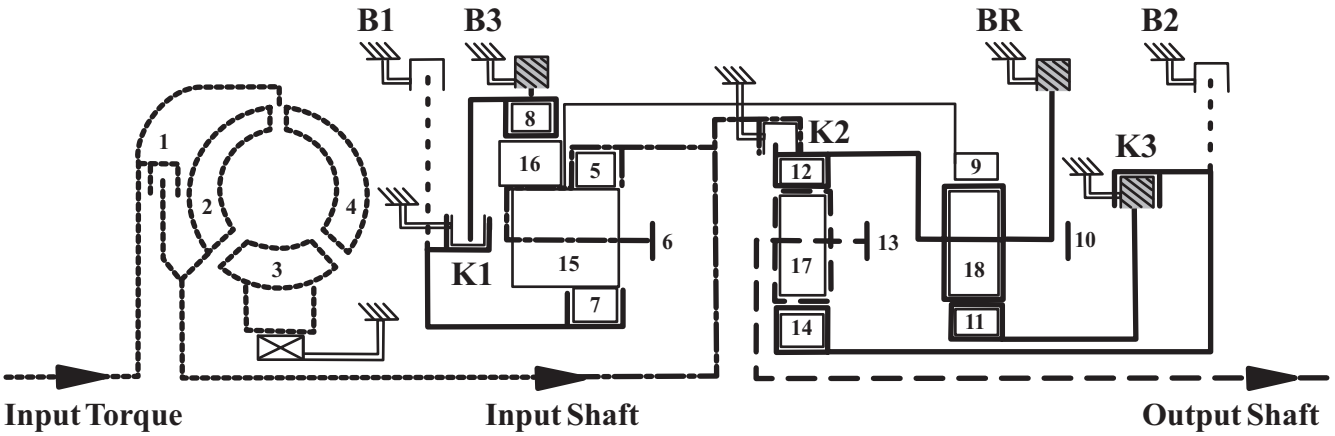
Rear Single Planet Gear Set:
Planetary Gears (18)
Ring Gear (9)
Planet Carrier (10)
Sun Gear (11)

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

Power Flow Reverse Gear In "C" Mode



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)

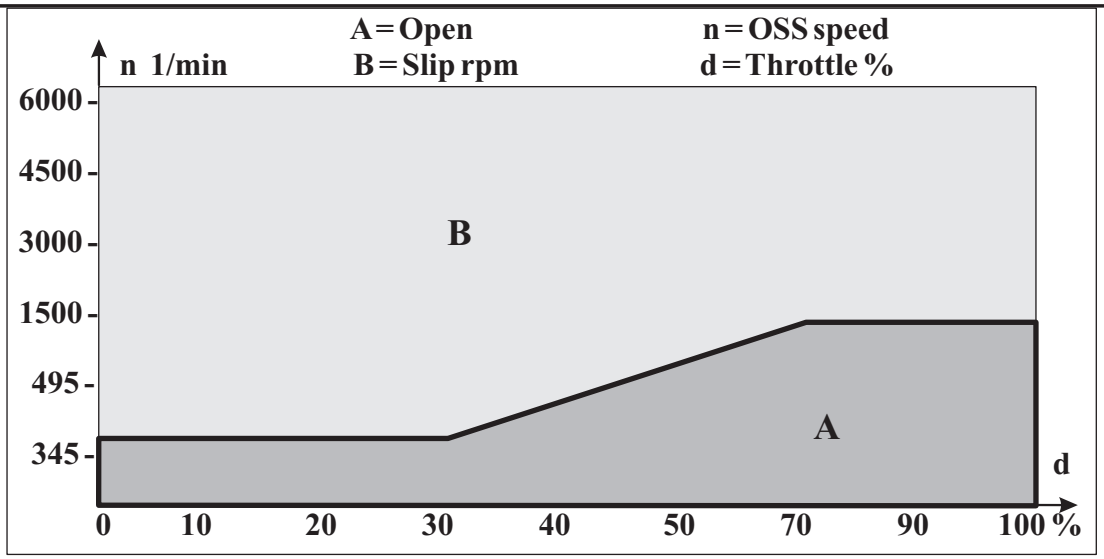
Front Single Planet Gear Set:
Planetary Gears (17)
Ring Gear (12)
Planet Carrier (13)
Sun Gear (14)

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 manufacturers scan tool in a vehicle at 45 mph.

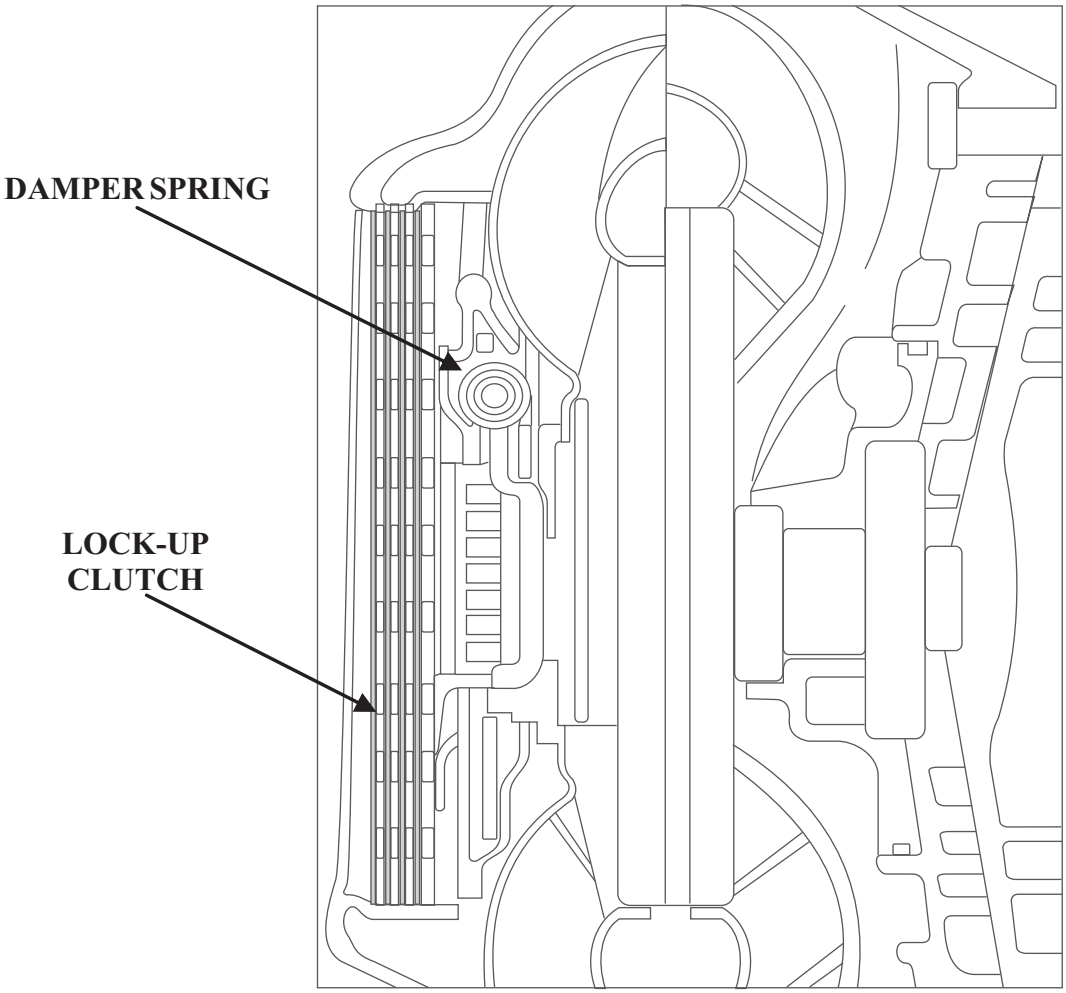
Driving Condition	Throttle %	Current Gear	Engine Speed	Turbine Speed	Output Shaft Speed	Torque Converter Slip	Converter State
Cruise	24	6	1303	1258	1533	45	Slipping
½ Throttle	53	3	2859	2832	1471	27	Slipping
Kick-Down	100	2	4476	4338	1520	138	Open > Slipping
Deceleration	0	6	1169	1270	1524	-101	Slipping

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

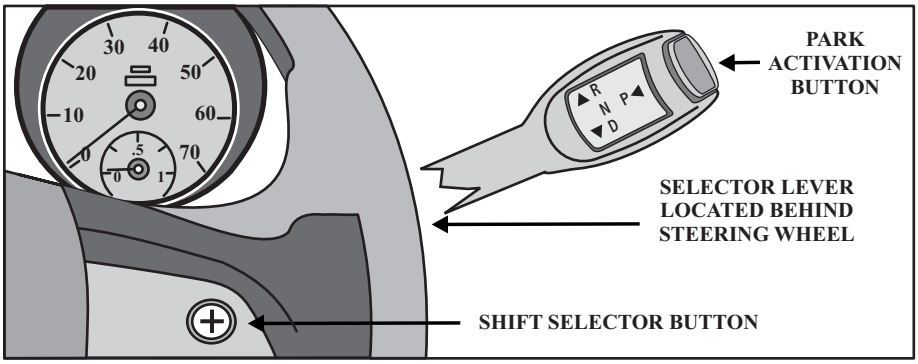


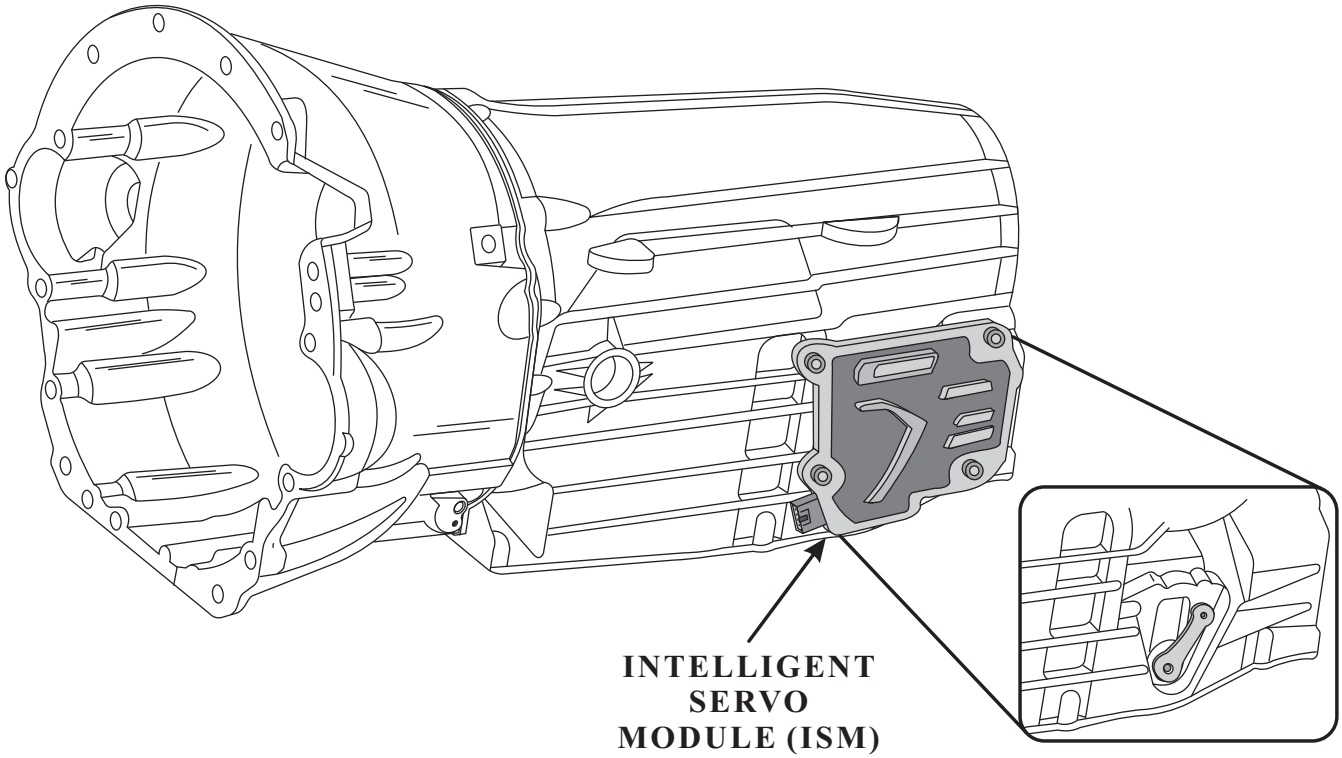
The Torque Converter used is the same as the 722.6 and holds 4 liters of fluid.
Lock-up can be applied in all seven forward gears and incorporates damper springs integral to the lock-up clutch assembly to help prevent vibration or noise during clutch apply at low engine rpm.

MERCEDES BENZ 722.9

SHIFT BY WIRE

Direct Select
(no shift rod)



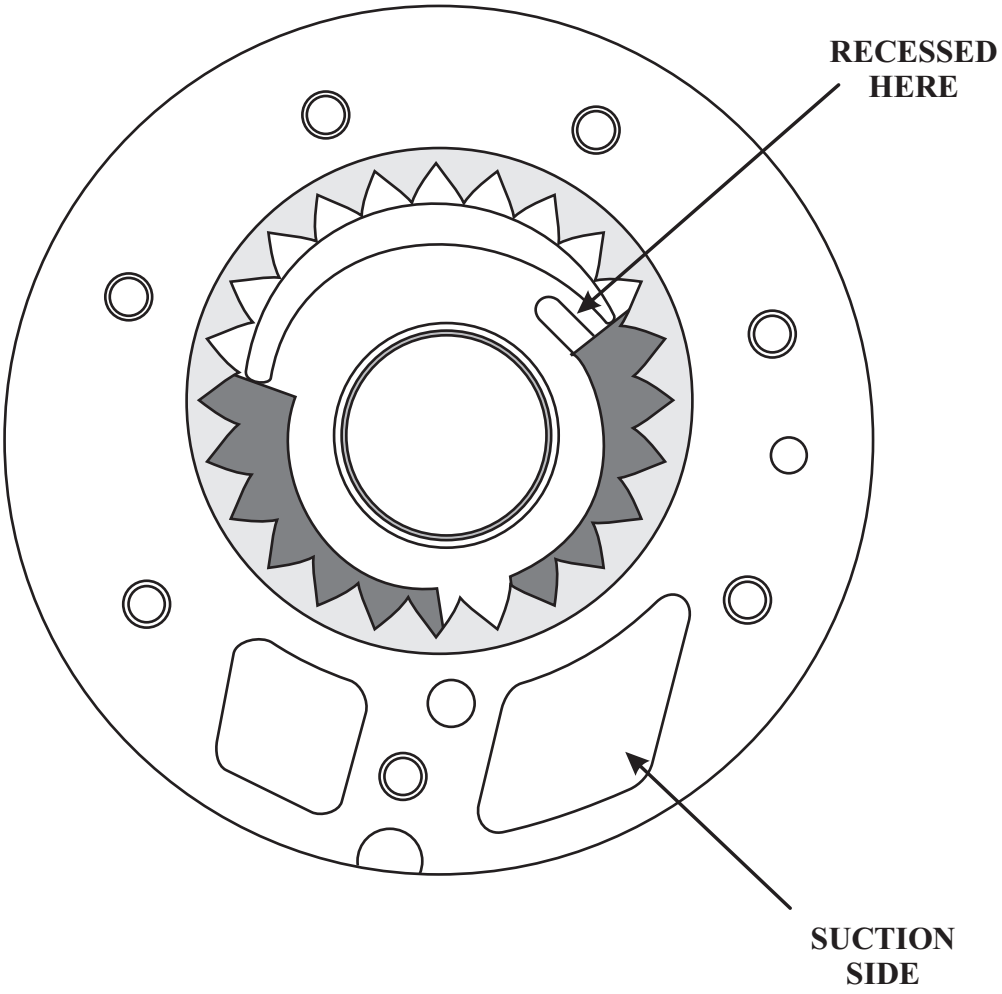


Some late model vehicles with the 722.9 will be equipped with shift by wire, called Direct Select. There is no mechanical connection to a shifter in the passenger compartment. An Intelligent Servo Module (ISM) will be attached to the left rear side of the case just above the pan rail. The module will 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.

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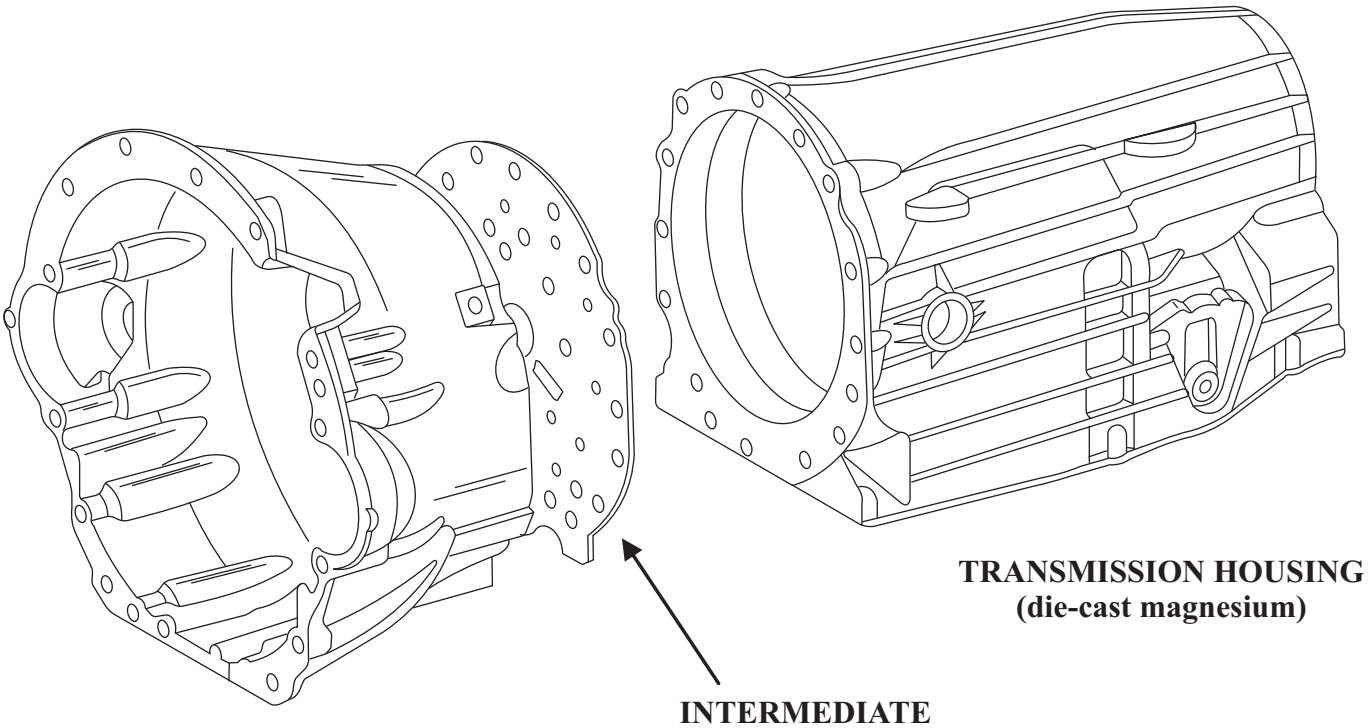
MERCEDES BENZ 722.9

CASE COMPONENTS



TRANSMISSION HOUSING
(die-cast magnesium)

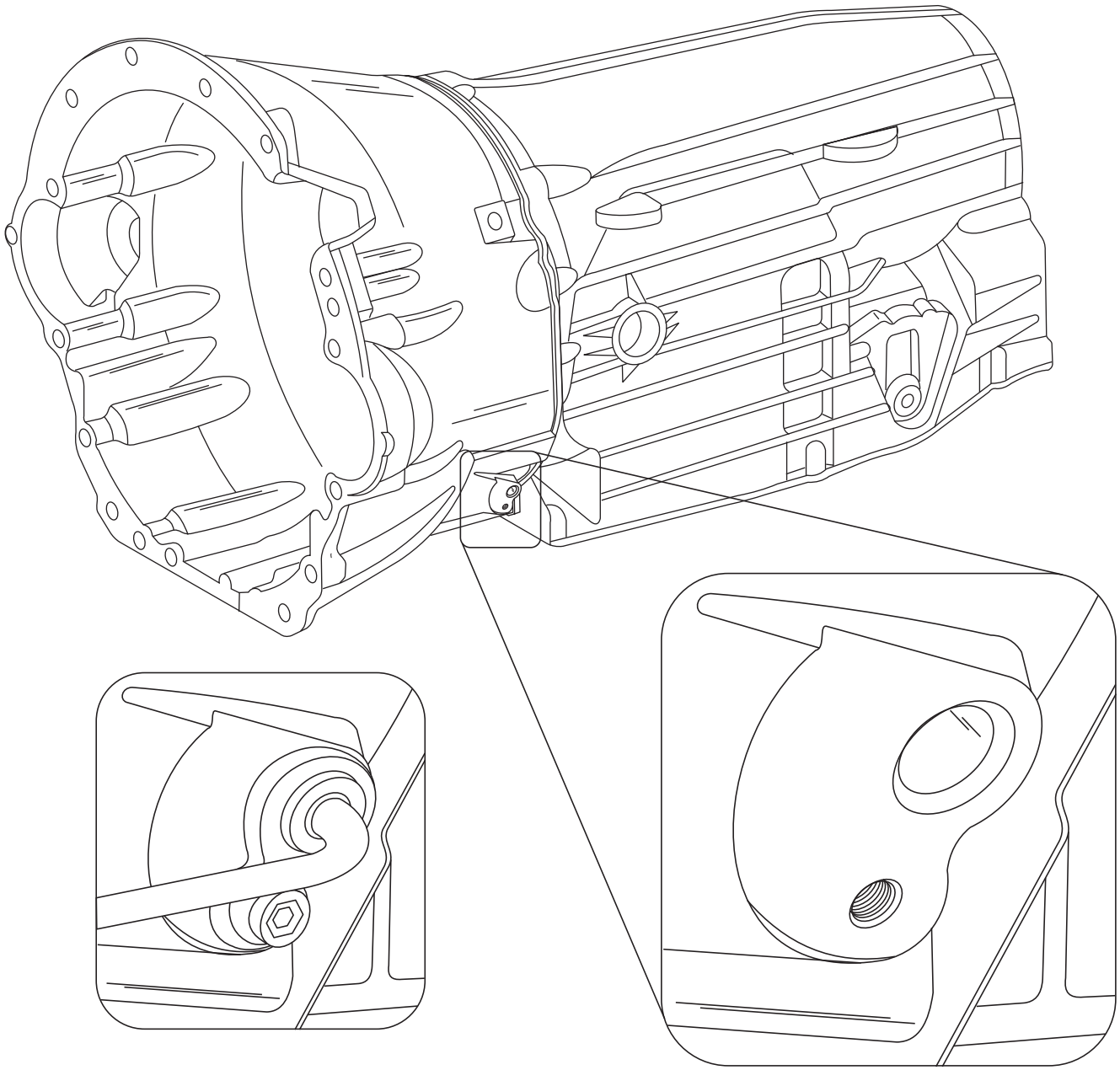
INTERMEDIATE
PANEL / GASKET
(aluminum sheet coated
w/elastomer/lip faces forward)

CONVERTER HOUSING
(die-cast aluminum)

Converter housing is die-cast aluminum. The transmission housing is die-cast magnesium (reduced weight compared to aluminum 2.5kg/5.5lb). Requires aluminum bolts due to steel bolts having a different expansion rate and corrosion concerns. All aluminum bolts must be replaced if removed. Intermediate panel or gasket made from an aluminum sheet with an elastomer coating. This gasket extends out beyond the sealing surfaces of the converter and transmission housing to prevent water from settling on the transmission housing. Standing water (especially salt water) can corrode magnesium in as little as eight weeks. Gasket lip faces forward and can be reused if there are no signs of damage to the elastomer coating.

MERCEDES BENZ 722.9

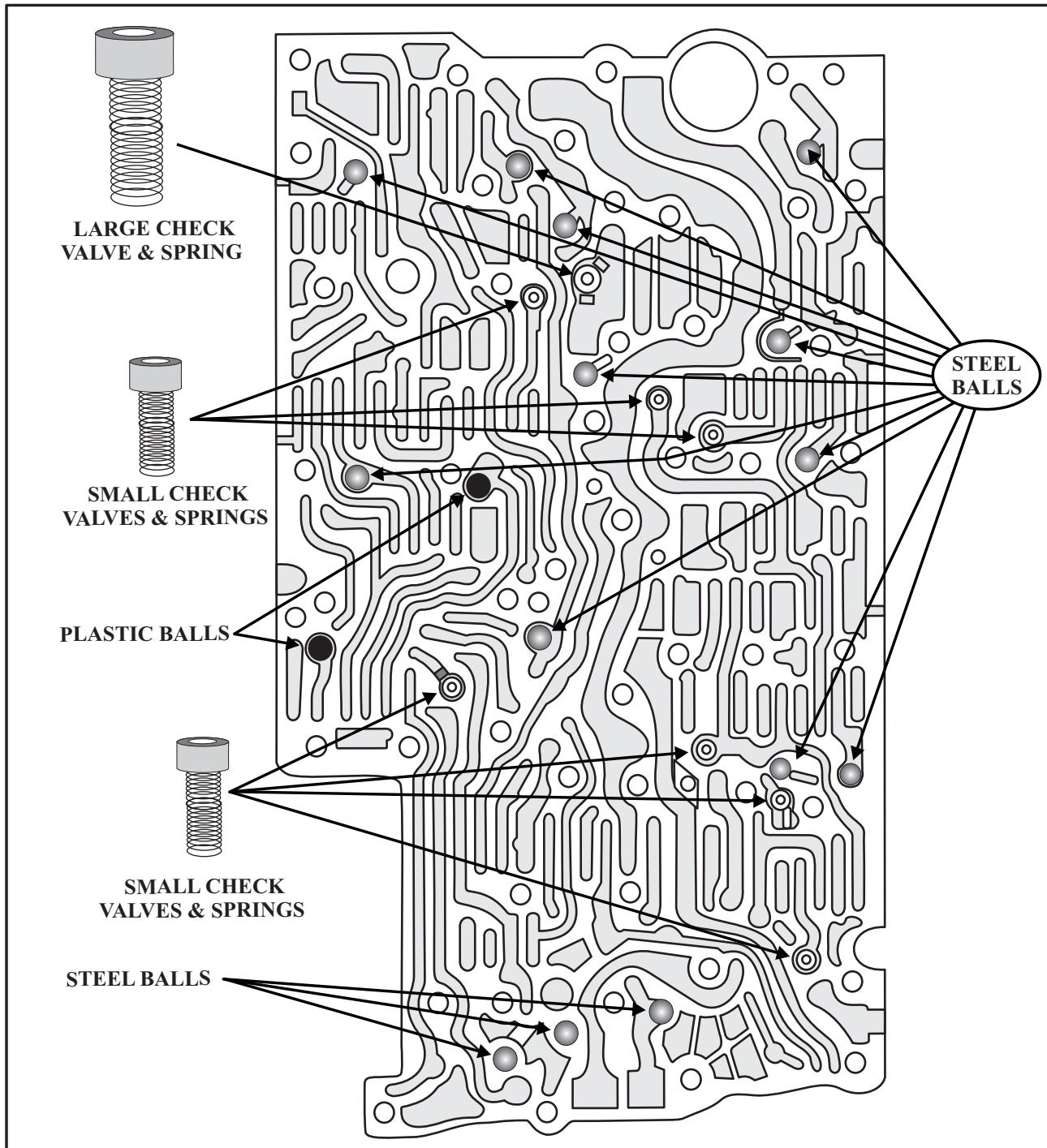
COOLER LINE FITTINGS



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



- 14 STEEL CHECK BALLS
- 2 PLASTIC CHECK BALLS
- 8 CHECK VALVES

NOTE: SOME MODELS WILL HAVE A SPRING ON TOP OF EACH CHECKBALL.

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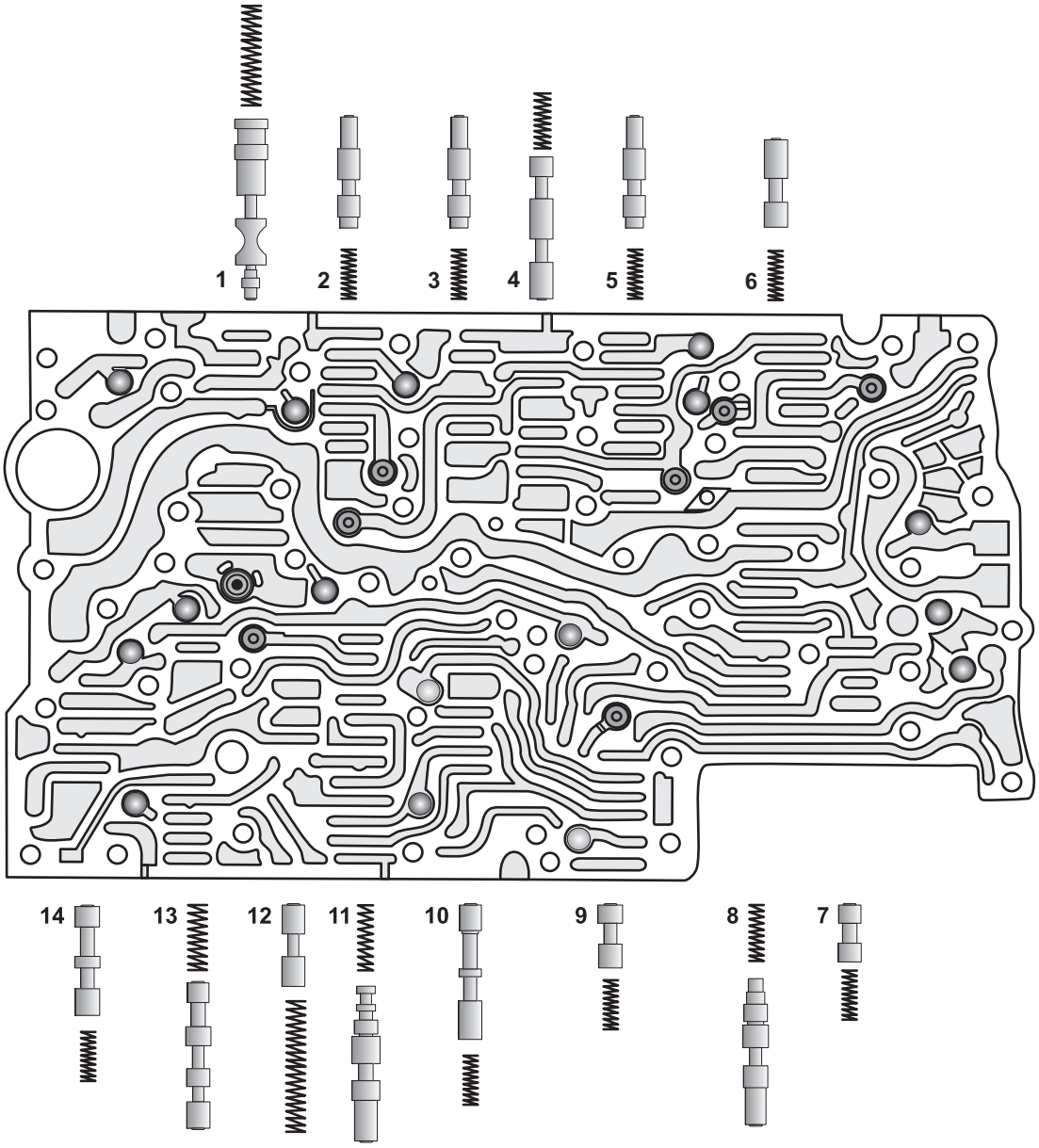
MERCEDES BENZ 722.9

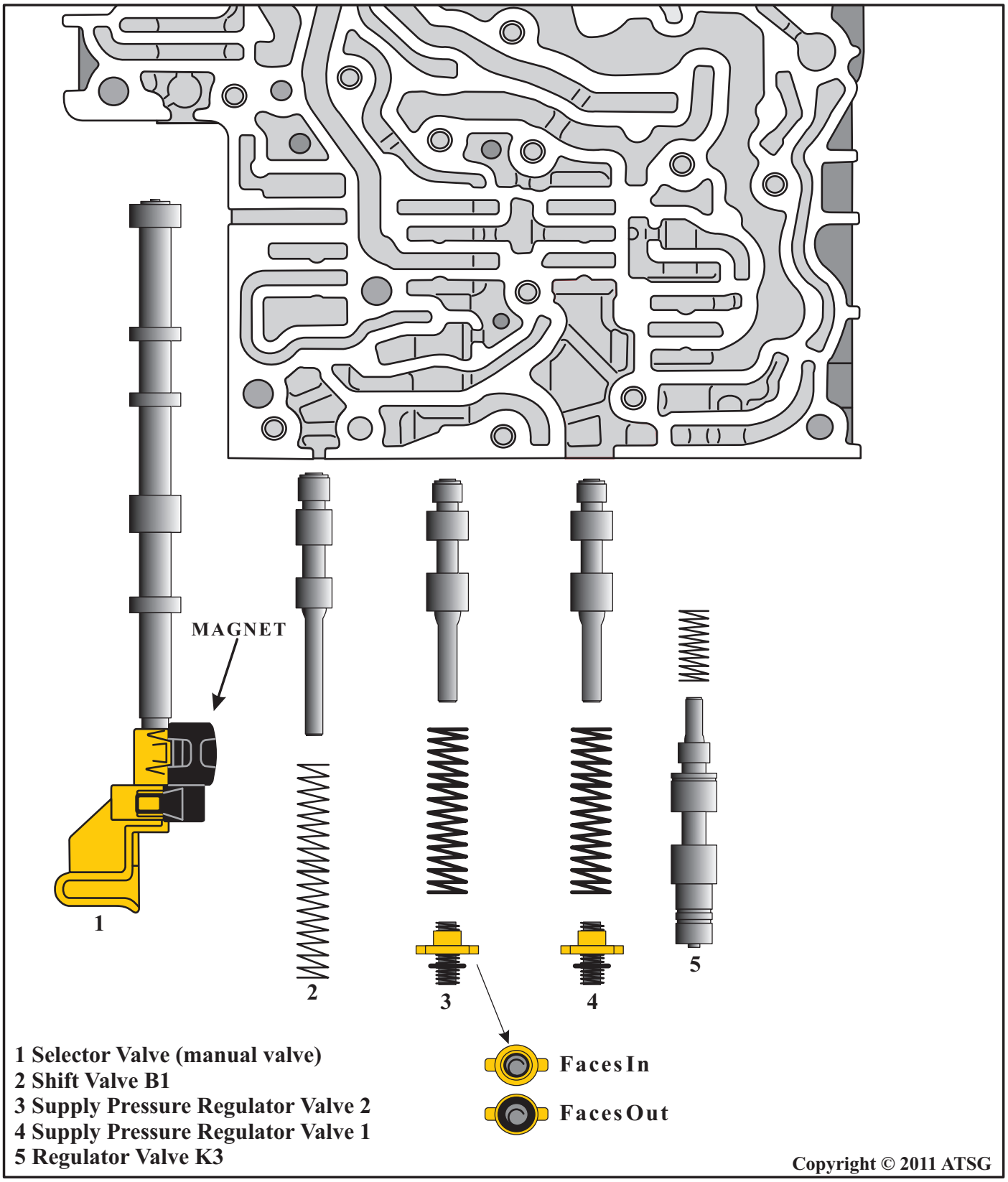
UPPER VALVE BODY



1 Working pressure regulating valve
2 Regulating valve K1
3 Regulating valve B1
4 Shift valve B1/B3
5 Regulating valve B3
6 Shift valve K3
7 Shift valve B2-2
8 Regulating valve B2/BR
9 Shift valve K2
10 Limp-home mode shift valve
11 Regulating valve K2
12 Lubricating pressure regulating valve
13 Torque converter lockup valve
14 Converter inner pressure regulating valve in torque converter lock up clutch mode

MERCEDES BENZ 722.9

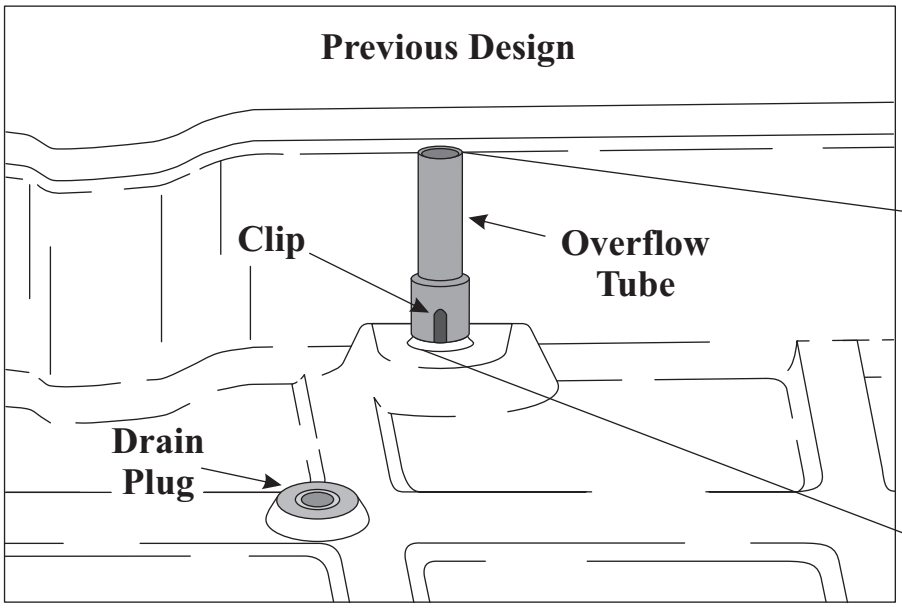
LOWER VALVE BODY

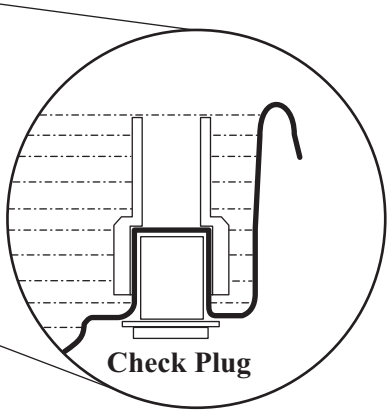


1 Selector Valve (manual valve)
2 Shift Valve B1
3 Supply Pressure Regulator Valve 2
4 Supply Pressure Regulator Valve 1
5 Regulator Valve K3

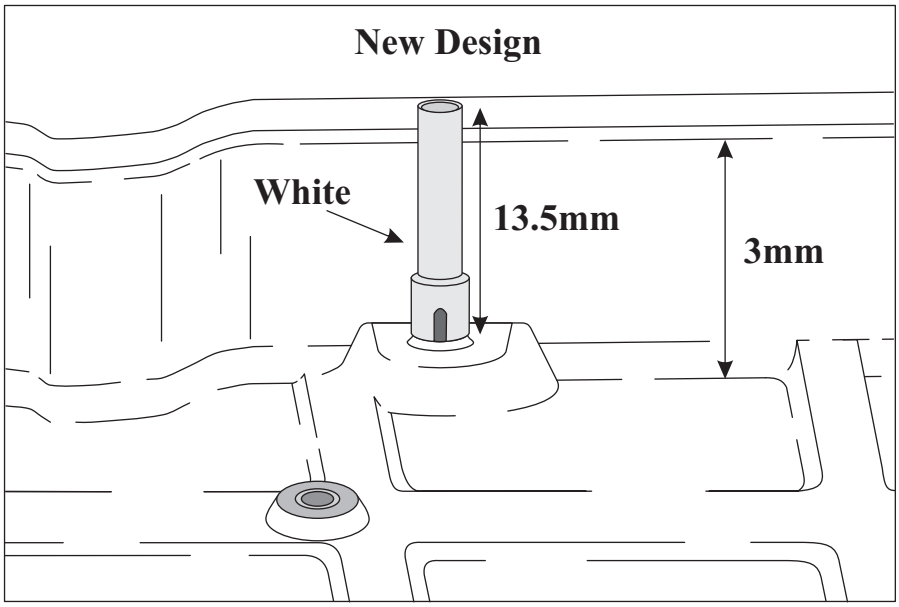
MERCEDES BENZ 722.9

TRANSMISSION OIL PAN & LEVEL CHECK





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.***

Transtar - 41

NISSAN/INFINITI RE4F04B

NO TURBINE SENSOR READING

COMPLAINT: After an overhaul, a Nissan/Infiniti vehicle equipped with the RE4F04B may exhibit a complaint of no Turbine Sensor reading on a hand held scan-tool.

CAUSE: One cause may be the wrong Forward/Coast Clutch Housing installed in the transmission during the overhaul.

Unlike the RE4F04A, the RE4F04B transmission additionally uses a Turbine Sensor along with the Output RPM (Revolution) Sensor. The combination of the two sensors helps the computer to more accurately recognize input and output rpms which results in improved shifting characteristics and optimum shift timing during deceleration. Refer to Figure 1 for Turbine Speed Sensor location.

With the addition of the Turbine Sensor it was necessary to change the Forward/Coast Clutch Housing. The Forward/Coast Clutch Housing for the RE4F04A and RE4F04B look very similar, however, the lugs on the outside of the drum were increased in length to provide a surface for the Turbine Sensor to obtain its reading. Look at the diagrams in Figure 2. These partial cut-away diagrams show how the Turbine Sensor can read the Forward/Coast Clutch Housing with the RE4F04B drum installed, and how the Turbine Sensor is unable to read the Forward/Coast Clutch Housing with the RE4F04A drum installed.

CORRECTION: Use the correct Forward/Coast Clutch Housing for the application you are working on. Refer to the diagram in Figure 3. The two illustrations show the differences between the Forward/Coast Clutch Housing. The RE4F04B that is equipped with a turbine sensor has lugs that measure approximately 3.187" in length. The RE4F04B that IS NOT equipped with a Turbine Sensor has lugs that measure approximately 2.863" in length.

NISSAN/INFINITI RE4F04B

NO TURBINE SENSOR READING

TURBINE AND OUTPUT SENSOR LOCATIONS

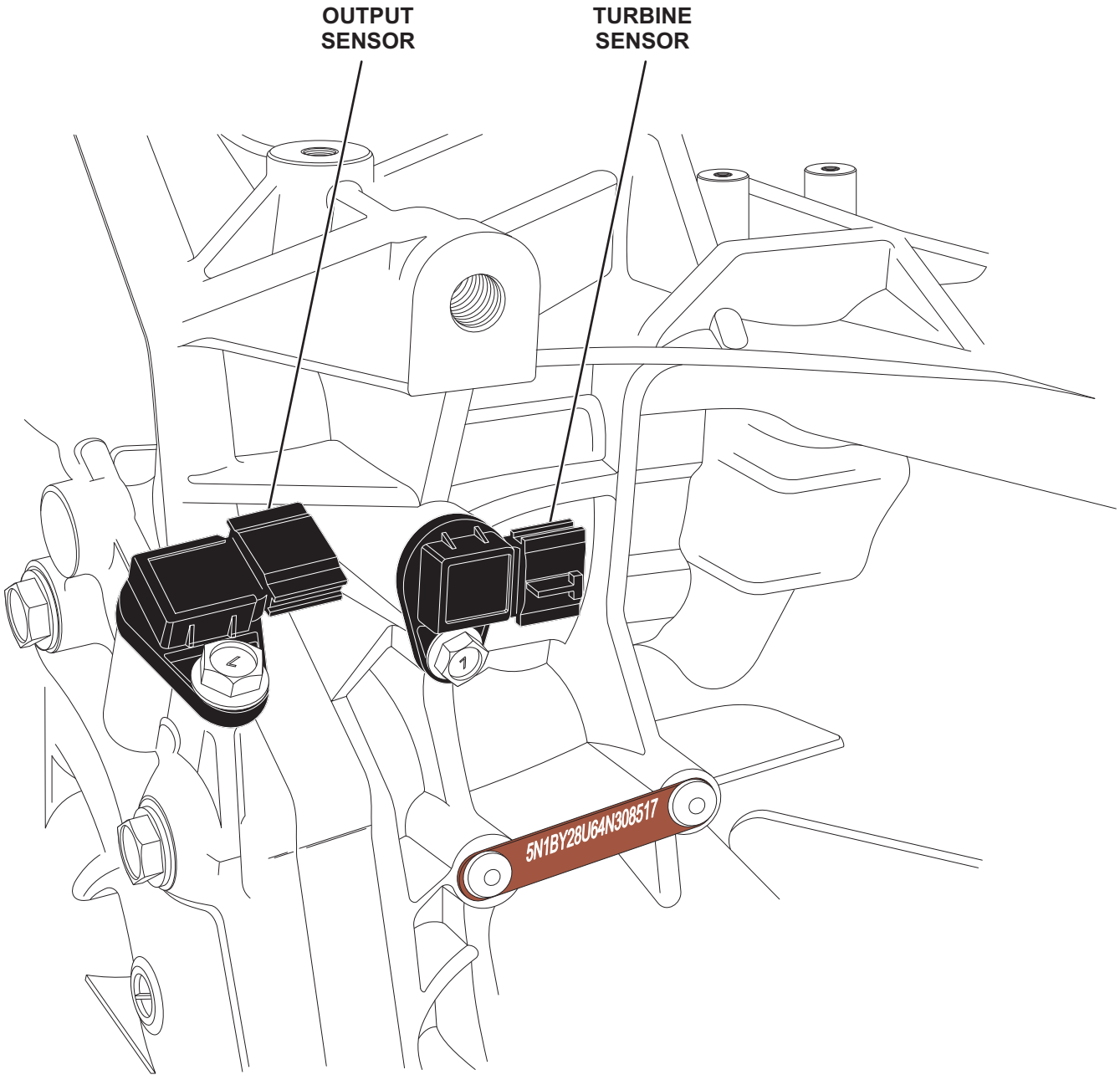


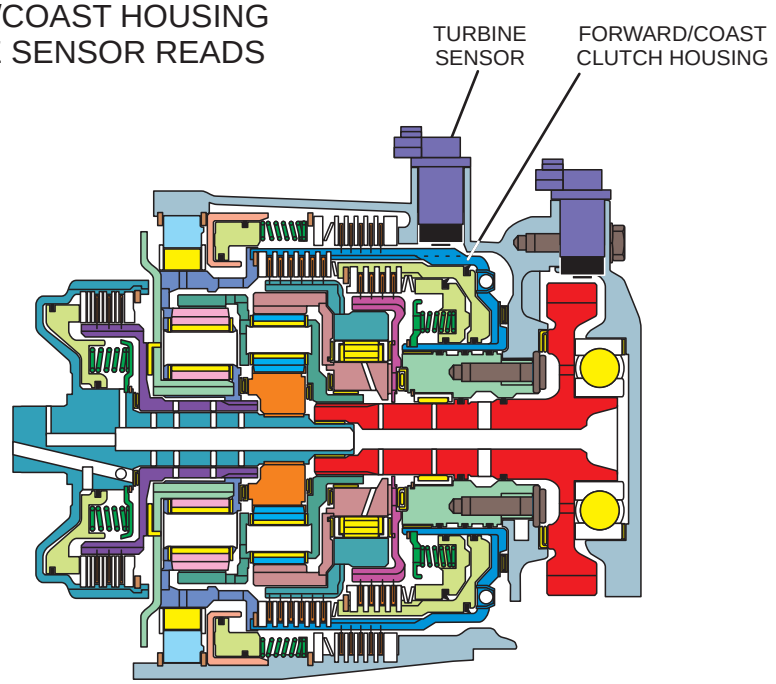
Figure 1

Moose - 44

NISSAN/INFINITI RE4F04B

NO TURBINE SENSOR READING

RE4F04B FORWARD/COAST HOUSING INSTALLED TURBINE SENSOR READS DRUM SPEED



RE4F04A FORWARD/COAST HOUSING INSTALLED TURBINE SENSOR CAN NOT READ DRUM SPEED

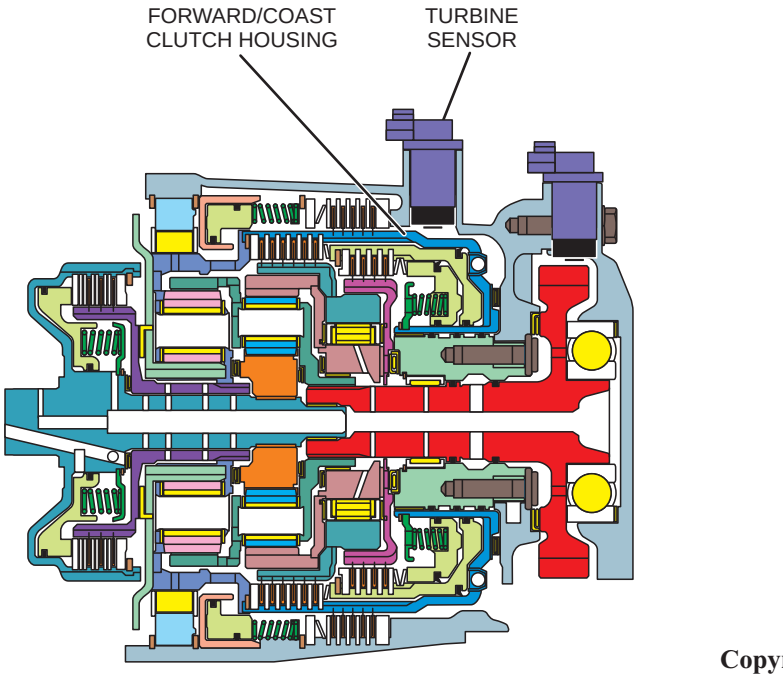
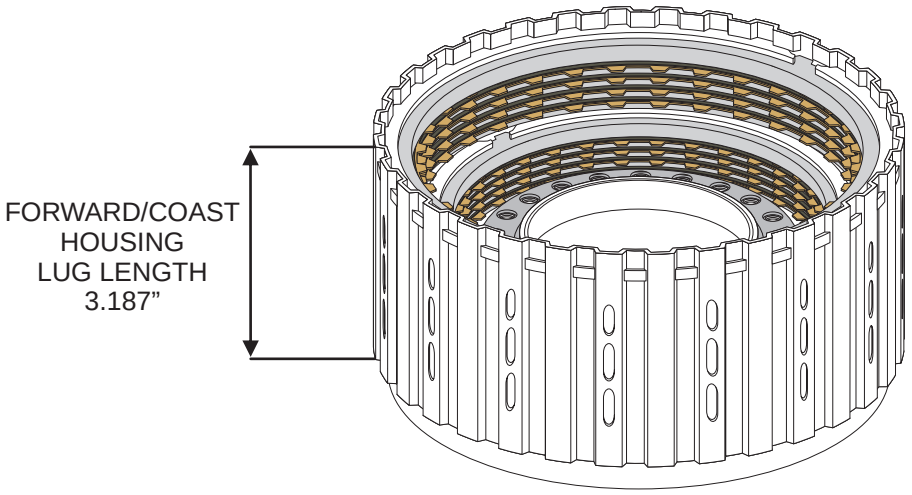


Figure 2

NISSAN/INFINITI RE4F04B

NO TURBINE SENSOR READING

RE4F04B
(WITH TURBINE SENSOR)
FORWARD/COAST CLUTCH HOUSING



RE4F04A
(WITHOUT TURBINE SENSOR)
FORWARD/COAST CLUTCH HOUSING

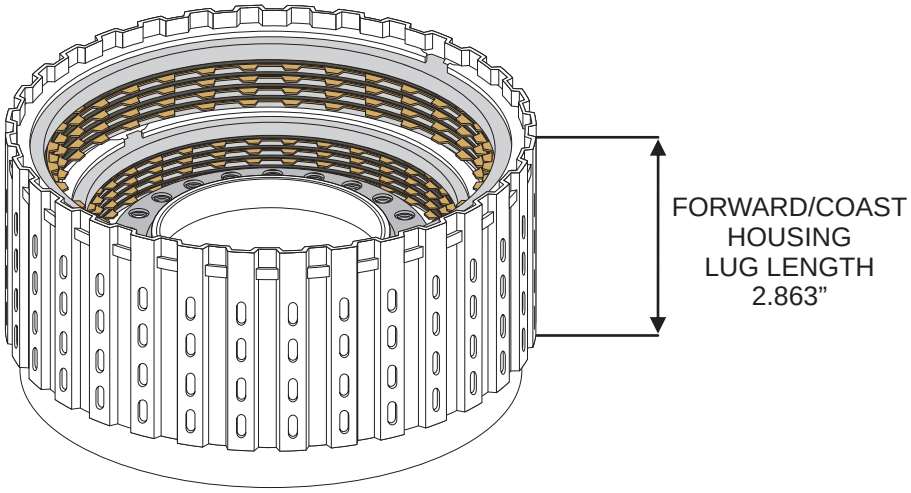


Figure 3

NISSAN/INFINITI RE5F22A

FAILSAFE WITH DTC P0726

COMPLAINT: Before or after an overhaul, a Nissan/Infiniti vehicle equipped with the RE5F22A exhibits a failsafe condition consisting of 5th gear starts with DTC P0726, "Engine speed signal fault", stored in TCM memory.

CAUSE: The cause may be a faulty Crank Position Sensor or faulty Cam Position Sensor. The Engine RPM Signal on these vehicles is a calculated value based on input from the Crank Position Sensor (POS) and Cam Position Sensor (PHASE) Bank 1 and Cam Position Sensor (PHASE) Bank 2. The Engine RPM Signal is computed by the ECM and sent via the CAN system to the Transmission Control Module (TCM). A quick look at the chart in Figure 1 will show the different input/output signals for TCM function, and as shown by the chart, if the Engine Speed Signal input is problematic, the TCM will default the vehicle into Failsafe Mode 5th gear.

CORRECTION: To correct this issue it will be necessary to determine which sensor or combination of the sensors may be contributing to the problem. Hook a capable scan tool up to read the ECM fault codes. See if any of the following DTC's are stored.

Crank Position Sensor; P0335 CKP Sensor (POS)
Cam Position Sensor; P0340 CMP Sensor (PHASE)
Cam Position Sensor; P0345 CMP Sensor (PHASE)

Typically if a DTC is stored for one of these components, replacement of the offending sensor usually corrects the issue. However it may be necessary to check the individual sensors using a DVOM and/or a Graphing Meter or Scope to monitor the signal in the event that the sensor hasn't failed completely.

For DTC P0335 CKP Sensor (POS) proceed to ***DTC P0335 Check.***
For DTC P0340 CMP Sensor (PHASE) proceed to ***DTC P0340 Check.***
For DTC P0345 CMP Sensor (PHASE) proceed to ***DTC P0345 Check.***

DTC: P0335 CHECK:

The Crankshaft Position Sensor CKP (POS) is used to detect engine revolution. When the engine is running, the sensor magnet detects the peaks and valleys of the reluctor then inputs a digital signal to the ECM. This signal can be seen on a hand held scanner in the form of an RPM reading that should be very similar to the Tachometer reading. A DTC for the CKP (POS) may be detected under the following conditions:

1. Crankshaft Position Sensor Signal is not detected by the ECM during the first few seconds of engine cranking.
2. The proper pulse signal from the Crankshaft Position Sensor is not detected by the ECM while the engine is running.
3. The Crankshaft Position Sensor Signal pattern detected is abnormal while the engine is running.

NISSAN/INFINITI RE5F22A

FAILSAFE WITH DTC P0726

INPUT AND OUTPUT SIGNAL OF TCM								
Control Item		Line Pressure Control	Vehicle Speed Control	Shift Control	Lock-Up Control	Engine Brake Control	Fail-Safe Function (*3)	Self Diagnostics Funtion
Input	Throttle Angle Signal (*5)	X	X	X	X	X	X	X
	Throttle Position Signal (*5)	X(*2)	X(*2)		X	X(*2)		X(*4)
	Revolution Sensor	X	X	X	X	X	X	X
	Turbine Revolution Sensor	X	X	X		X	X	X
	Vehicle Speed Signal MTR (*1)(*5)	X	X	X	X		X	X
	Engine Speed Signals (*5)		X	X	X		X	X
	Engine Torque Signals (*5)	X	X	X	X	X		X
	PNP Switch	X	X	X	X	X	X	X(*4)
	Manual Mode Switch		X	X		X	X	X
	Stop Lamp Switch Signal (*5)		X		X	X		X (*4)
	A/T Fluid Temperature Sensor		X	X	X	X	X	X
	ASCD Operation Signal (*5)		X		X	X		X
	ASCD Overdrive Cancel Signal (*5)		X			X		X
	TCM Power Supply Voltage Signal	X	X	X	X	X	X	X
Output	Shift Solenoid Valve A/B/C/D/E		X	X			X	X
	Pressure Control Solenoid Valve A	X	X	X	X	X	X	X
	Pressure Control Solenoid Valve B		X	X		X	X	X
	Pressure Control Solenoid Valve C			X	X		X	X
	Self-Diagnostics Table (*5)							X

*1: Additional Signal For Revolution Sensor
*2: Additional Signal For Throttle Angle Sensor
*3: If These Input and Output Signals are Different, the TCM Triggers the Fail-Safe Function.
*4: Used as a Condition for Starting Self-Diagnostics; if Self-Diagnostics are not Started, Assumption is a Signal Error.
*5: Signals Via CAN Communications

Figure 1

DTC: P0335 CHECK CONT'D:

The diagram in Figure 2 illustrates the wiring and pin configurations for the CKP (POS) in a 2005 Nissan Maxima, and is typical. For correct wire color and pin numbers, refer to the appropriate factory manual for the vehicle you are working on. Verify correct voltage input to the CKP (POS) sensor *(system voltage with key on/engine running at pin 3)* of the sensor and verify sensor has a good ground *(less than .1 volts DC key on /engine running at pin 1)*. Once this has been verified, hook up an appropriate graphing meter or oscilloscope and verify the pulsed signal output to the ECM. Refer to Figure 3 for a sample pattern of the pulsed signal.
NOTE: *This signal is representative of a sample only, and should not be used for comparison. Refer to the appropriate factory manual or take a sample pattern from a known good source, such as a good working vehicle.*

Continued on next page.

NISSAN/INFINITI RE5F22A

FAILSAFE WITH DTC P0726

CKP (POS) WIRING DIAGRAM AND CONNECTOR VIEWS

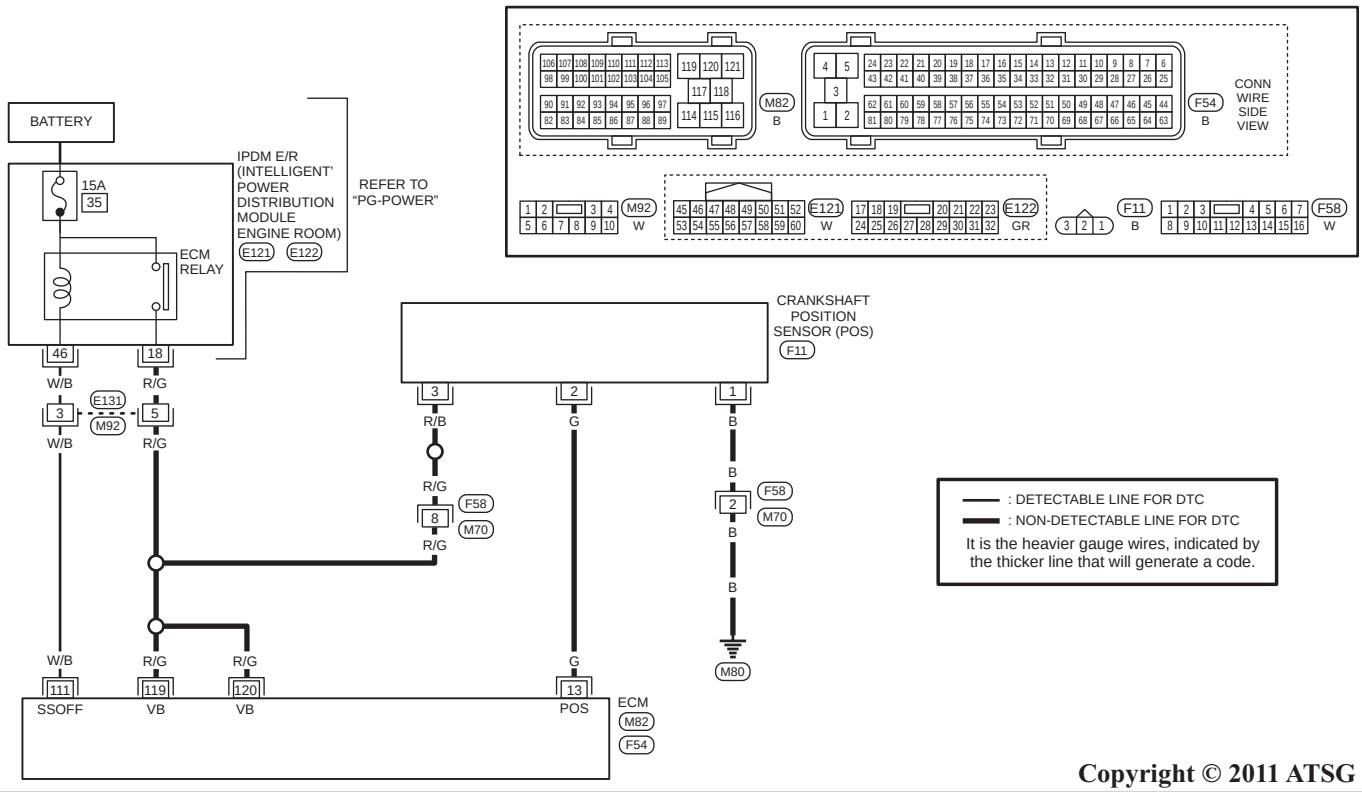
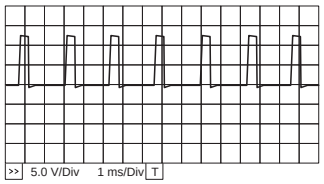
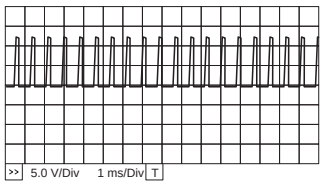


Figure 2

PIN NO.	WIRE COLOR	ITEM TESTED	TESTING CONDITION	OUTPUT (DC Volltage)
13	GRN	Crankshaft Position Sensor (POS)	ENGINE RUNNING ENGINE AT OPERATING TEMPERATURE IDLE SPEED NOTE: The pulse frequency changes depending on rpm at idle.	Approximately 10V ✱ 
			ENGINE RUNNING ENGINE RPM Approximately 2000 rpm.	Approximately 10V ✱ 

✱ Average voltage of pulsed signal (Actual pulsed signal to be confirmed by graphing meter or oscilloscope.)

Figure 3

Continued on next page.

NISSAN/INFINITI RE5F22A

FAILSAFE WITH DTC P0726

DTC: P0340
DTC: P0345 CHECK:

The Camshaft Position Sensor CMP 1 and CMP 2 (PHASE) are used to detect the rotation of the camshaft to identify a particular cylinder, and to recognize piston position. When the engine is running, the sensor magnet detects the peaks and valleys of the reluctor then inputs a digital signal to the ECM. If the Crankshaft Position Sensor (POS) system fails or is determined to be inoperative, the Camshaft Position Sensor (PHASE) signal is used to provide various controls of engine function instead, utilizing the timing of cylinder identification symbols. A DTC for the CMP 1 and CMP 2 (PHASE) may be detected under the following conditions:

1. The Cylinder Identification Signal is not detected by the ECM during the first few seconds of engine cranking.
2. The proper Cylinder Identification Signal is not detected by the ECM while the engine is running.
3. The Cylinder Identification Signal pattern detected is abnormal while the engine is running.

The diagram in Figure 4 illustrates the wiring and pin configurations for the CMP (PHASE) in a 2005 Nissan Maxima, and is typical. For correct wire color and pin numbers, refer to the appropriate factory manual for the vehicle you are working on. Verify correct voltage input to CMP (PHASE) BANK 1 and CMP (PHASE) BANK 2 *(system voltage with key on/engine running at pin 3)* of sensor CMP (PHASE) BANK 1 and CMP (PHASE) BANK 2 and verify the sensors each have a good ground *(less than .1 volts DC key on /engine running at pin 1)* of sensor CMP (PHASE) BANK 1 and CMP (PHASE) BANK 2. Once this has been verified, hook up an appropriate graphing meter or oscilloscope and verify the pulsed signal output to the ECM from the related sensor terminal. Refer to Figure 5 for a sample pattern of the pulsed signal.

NOTE: *This signal is representative of a sample only, and should not be used for comparison. Refer to the appropriate factory manual or take a sample pattern from a known good source, such as a good working vehicle.*

Continued on next page.

NISSAN/INFINITI RE5F22A

FAILSAFE WITH DTC P0726

CMP (PHASE) BANK 1/BANK 2
WIRING DIAGRAM AND CONNECTOR VIEWS

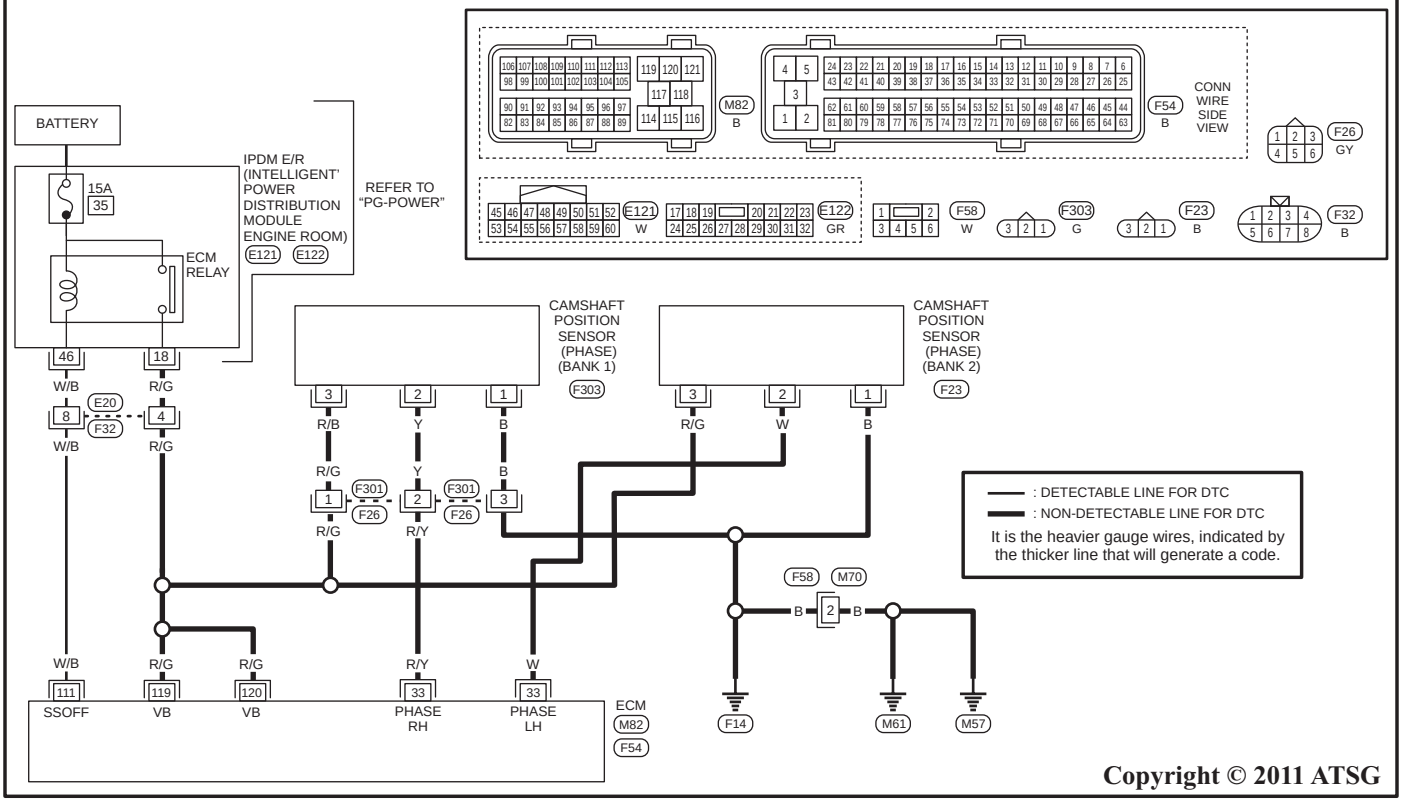
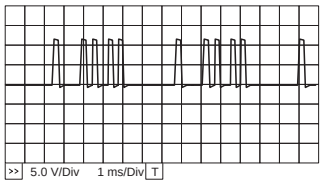
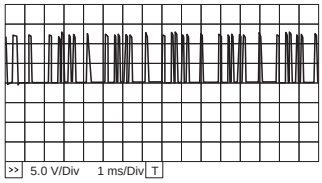


Figure 4

PIN NO.	WIRE COLOR	ITEM TESTED	TESTING CONDITION	OUTPUT (DC Volltage)
33	R/Y	Camshaft Position Sensor (PHASE) (Bank 1)	ENGINE RUNNING ENGINE AT OPERATING TEMPERATURE IDLE SPEED NOTE: The pulse frequency changes depending on rpm at idle.	Approximately 1.0 - 4.0 V* 
14	W	Camshaft Position Sensor (PHASE) (Bank 2)	ENGINE RUNNING ENGINE RPM Approximately 200 rpm.	Approximately 1.0 - 4.0 V* 

* Average voltage of pulsed signal (Actual pulsed signal to be confirmed by graphing meter or oscilloscope.)

Figure 5

NISSAN/INFINITI RE5R05A

GEAR RATIO ERROR CODES AND OR TCM INCOMPATIBILITY CODES

COMPLAINT: Nissan/Infinity vehicles equipped with the RE5R05A may exhibit a complaint of gear ratio error codes and or Transmission incompatibility issues, as in a trouble code for a missing Manual shift switch, when the vehicle you are working on does not utilize a Manual shift switch, after transmission replacement.

CAUSE: The cause may be, that when the transmission was exchanged, the TCM, which is internal to the transmission on most models, was not compatible with the vehicles shifter assembly that it was installed into. Refer to Figures 2 thru 4 to see that there are three different gear ratio charts and planetary tooth counts available, and Figures 5 and 6 for locations. Care must be taken to ensure the correct planetary assemblies are used in the vehicle that is being repaired.

CORRECTION: To correct this condition, identify the original transmission that you are repairing by the tag shown in Figure 1. Use this information to I.D. a core that you may be dis-assembling for used planetaries and or a used TCM, and ensure that is compatible. Refer to Figures 7, 8 and 9 for Model I.D. that will include a planetary ratio chart and vehicle application for 2 and 4 wheel drive. ATSG highly recommends counting all planetary assemblies being replaced to verify the same ratios are going back in the transmission.

RE5R05A Identification Tag Location

Special thanks to Paul at Carlyn

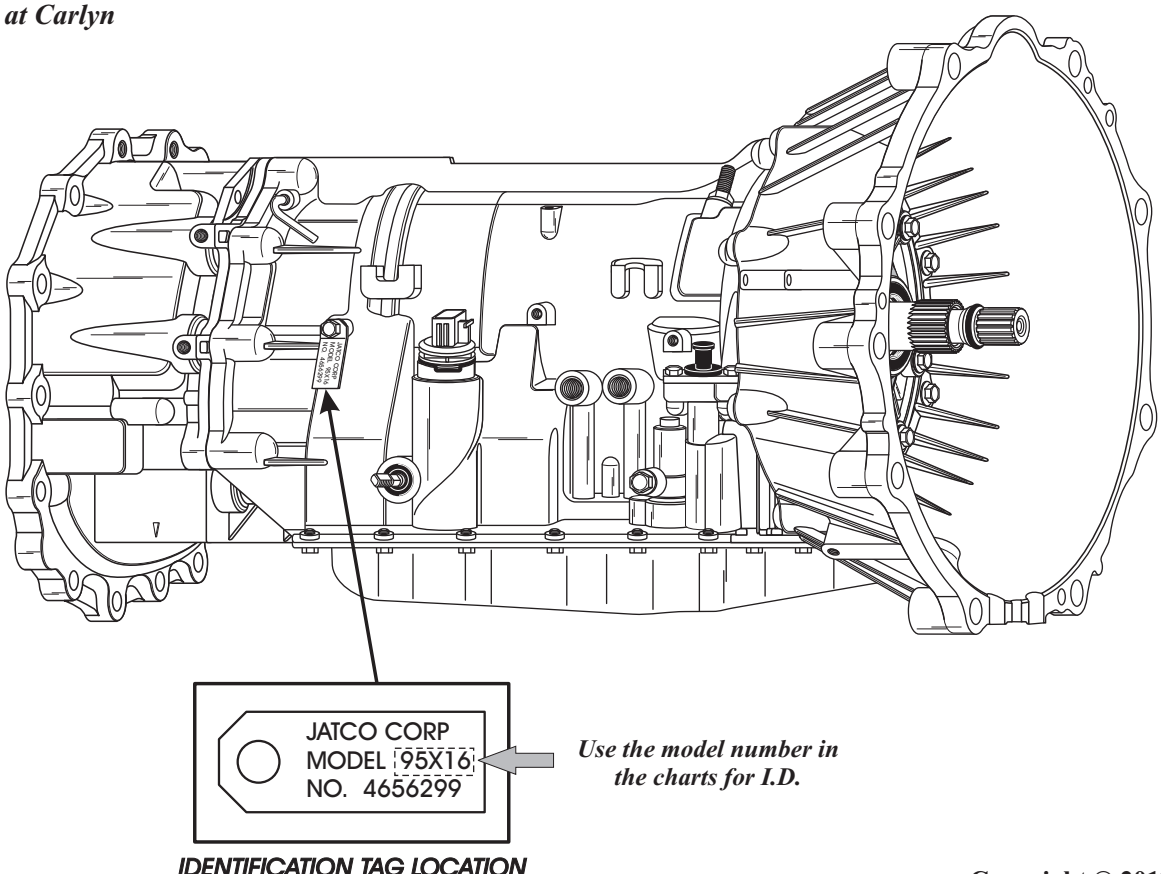
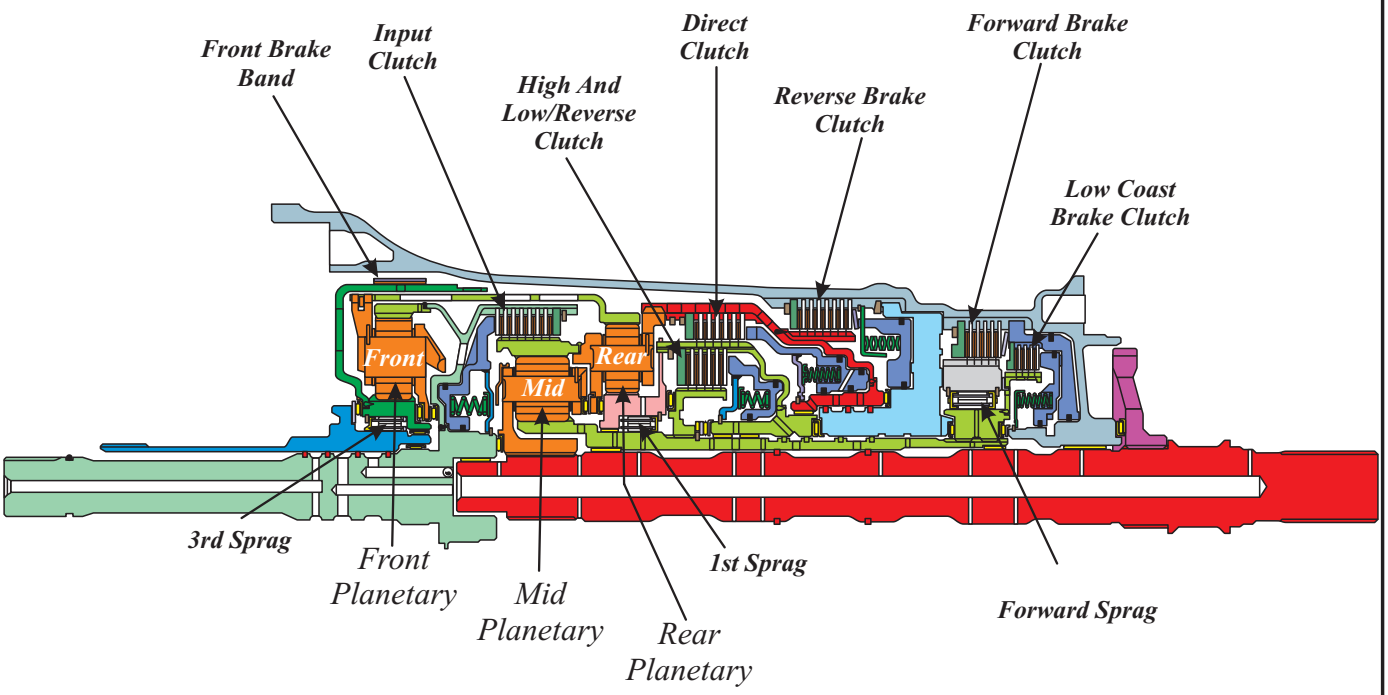


Figure 1

NISSAN/INFINITI RE5R05A

GEAR RATIO ERROR CODES AND OR TCM INCOMPATIBILITY CODES

Internal Components Location



Note: Tooth counts must match when replacing Planetary assemblies

Figure 2

3 Planetary Assembly Tooth Counts/Ratios

	CHART "A"	CHART "B"	CHART "C"
Front Ring gear	*102*	*102*	*106*
Front planetary pinion	*24*	*25*	*28*
Front Sun gear	*54*	*53*	*50*
Mid Ring gear	*78*	*77*	*78*
Mid planetary pinion	*18*	*17*	*18*
Mid Sun gear	*42*	*43*	*42*
Rear Ring gear	*98*	*99*	*110*
Rear planetary pinion	*18*	*19*	*24*
Rear Sun gear	*62*	*61*	*62*

Figure 3

NISSAN/INFINITI RE5R05A

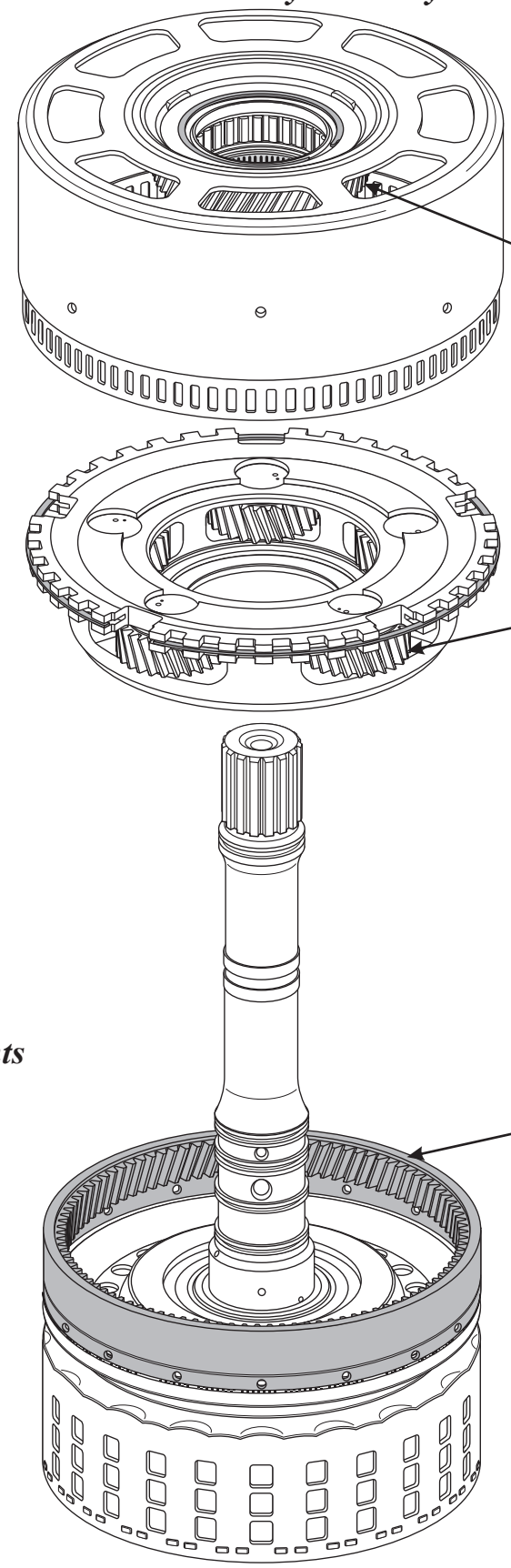
GEAR RATIO ERROR CODES AND OR TCM INCOMPATIBILITY CODES

3 Gear Ratios

CHART "A"	CHART "B"	CHART "C"
1st - 3.842	*1st - 3.827*	*1st - 3.540*
2nd - 2.353	*2nd - 2.368*	*2nd - 2.264*
3rd - 1.529	*3rd - 1.520*	*3rd - 1.417*
4th - 1.000	*4th - 1.000*	*4th - 1.000*
5th - .839	*5th - .834*	*5th - .834*
Reverse - 2.765	*Reverse - 2.613*	*Reverse - 2.370*

Figure 4

Front Planetary Assembly



CAUTION:
2 Turbine shaft lenghts
8.250"
7.375"

Figure 5

Mid And Rear Planetary Assembly

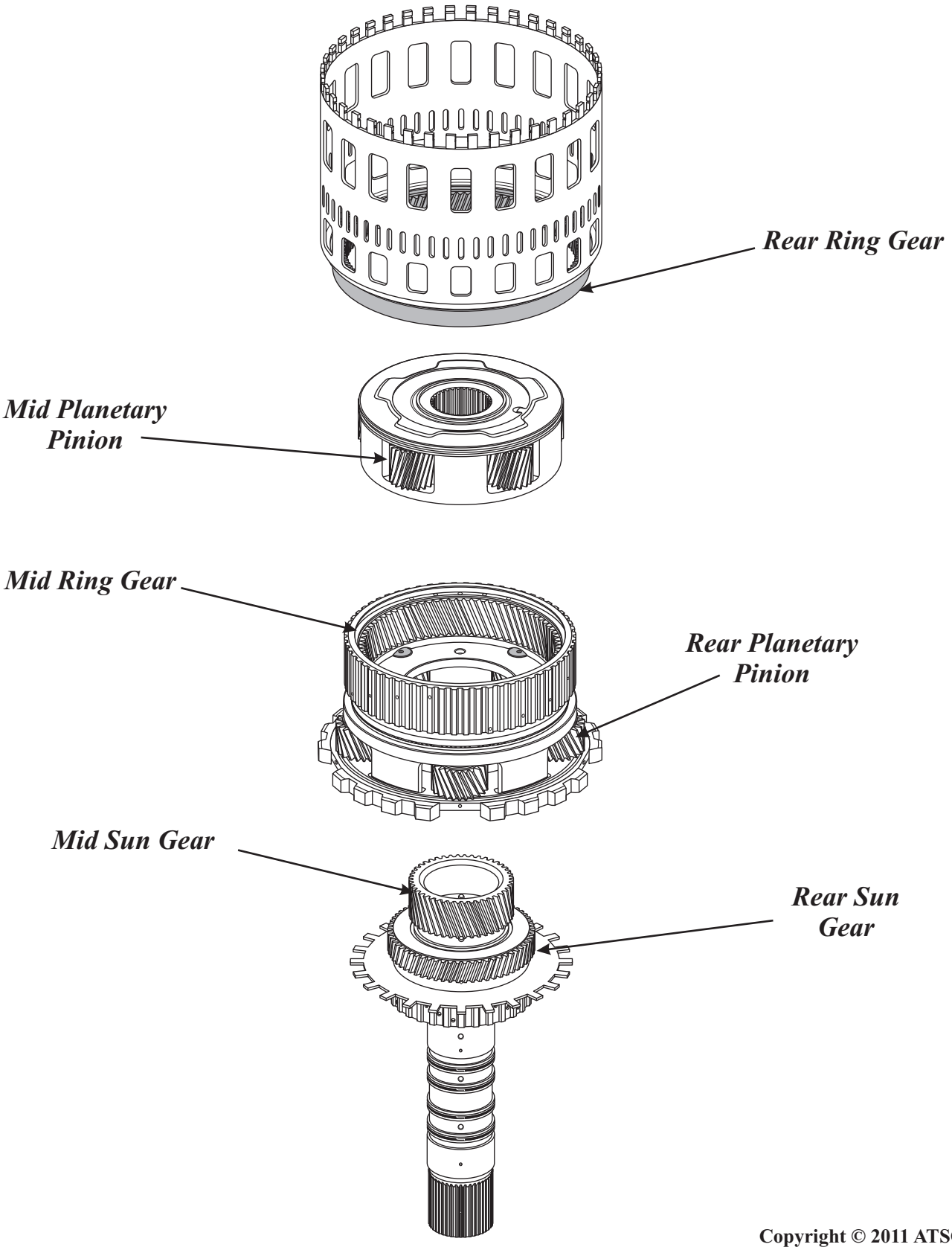


Figure 6

VEHICLE APPLICATION	4X2 MODEL NUMBERS	RATIO CHART	4X4 MODEL NUMBERS	RATIO CHART
03 Nissan 350Z	90X72, 91X05, 91X22	C		
04 Nissan 350Z	92X06	C		
05 Nissan 350Z	92X60	C		
06 Nissan 350Z	90X5C	C		
07 Nissan 350Z	98X5B	A		
08 Nissan 350Z	99X5B	A		
09 Nissan 350Z	99X5B	A		
05 Nissan Frontier	97X00	A	97X01	A
06 Nissan Frontier	97X06, 97X0A	A	97X0B	A
07 Nissan Frontier	97X9E, 98X0A	A	98X0B	A
08 Nissan Frontier	97X08, 97X0A	A	97X0B	A
09 Nissan Frontier	(2.5L)3EX3D,(4.0L) 99X9E	A	(4.0L) 3EX0A	A
05 Nissan Pathfinder	97X00	A	97X01	A
06 Nissan Pathfinder	97X4A	A	97X4B	A
07 Nissan Pathfinder	98X0A	A	97X0B	A
08 Nissan Pathfinder 4.0L	98X3E	A	98X4A	A
09 Nissan Pathfinder 4.0L	99X9E	A	3EX0A,3EX0B	A
08 Nissan Pathfinder 5.6L	96X0A	B	96X0B	B
09 Nissan Pathfinder 5.6L	96X0A	B	96X5B	B
05,06 Nissan Xterra	97X0A	A	97X0B	A
07 Nissan Xterra	98X0A	A	98X0B	A
08 Nissan Xterra	99X1B	A	99X1C	A
09 Nissan Xterra	99X9E	A	3EX0A	A
04 Armada/ Titan	95X13, 95X14	B	95X16	B
05 Armada/ Titan	95X17	B	95X18	B
06 Armada/ Titan	95X1C	B	95X1D	B
07 Armada/ Titan	95X5B	B	95X5C	B
08 Armada/ Titan	95X8D	B	95X8E	B
09 Armada/ Titan	96X2E,96X3C	B	96X3A,96X3D	B

Figure 7

VEHICLE APPLICATION	4X2 MODEL NUMBERS	RATIO CHART	4X4 MODEL NUMBERS	RATIO CHART
05-09 Kia Sorento	A5SR1 (no tag)	B	A5SR1 (no tag)	B
03 Infinity G35 Coupe	90X17	C		
03 Infinity G35 Sedan	90X09	C		
04 Infinity G35 Coupe	91X18	C		
04 Infinity G35 Sedan	91X17	C		
05 Infinity G35 Coupe	92X62	C		
05 Infinity G35 Sedan	92X18	C	92X19	C
06 Infinity G35 Coupe	97X3E	A		
06 Infinity G35 Sedan	97X3D	A	90X6D	C
07 Infinity G35 Coupe	90X4C	A		
07 Infinity G35 Sedan	97X2E	A	97X3A	A
08 Infinity G35 Coupe	97X3C	A		
08 Infinity G35 Sedan	99X6A	A	99X6B	A
03,04 Infinity FX35/45	91X07, 91X08	C	(FX45)91X09	C
05 Infinity FX35/45	92X20, 92X21	C	(FX45)92X22	C
06 Infinity FX35/45	90X4B, 90X4C	C	(FX45)95X2B	B
07 Infinity FX35/45	91X0E, 91X1A	C	(FX45)95X8C	B
08 Infinity FX35/45	91X3A, 91X3B	C	(FX45)96X1C	B
08 Infinity EX35	98X6E	A	98X7A	A
09 Infinity EX35	3EX4C	A	3EX4D	A
03 Infinity M45	90X69, 91X14	C		
04,05 Infinity M45	91X78	C		
06 Infinity M35/45	97X06,(M45) 95X12	A, (M45) B	97X07	A
07 Infinity M35	98X1D	A	98X1C	A
07 Infinity M45	95X7A	B		
08 Infinity M35	99X1E	A	99X2A	A
08 Infinity M45	96X2A	B	96X2B	B
09 Infinity M35			3EX1A	A
09 Infinity M45	96X6A	B	96X6B	B

Figure 8

VEHICLE APPLICATION	4X2 MODEL NUMBERS	RATIO CHART	4X4 MODEL NUMBERS	RATIO CHART
03 Infinity Q45	90X69	C		
04 Infinity Q45	91X78	C		
05 Infinity Q45	92X12	C		
04 Infinity QX56	95X13	B	95X14	B
05 Infinity QX56	95X17	B	95X18	B
06 Infinity QX56	95X1C	B	95X1D	B
07 Infinity QX56	95X5B	B	95X5C	B
08 Infinity QX56	95X5B	B	95X5C	B
09 Infinity QX56	96X2E,96X3C	B	96X3A,96X3D	B

Figure 9

Note: The information compiled was only available to 2009 and was courtesy of Alldata

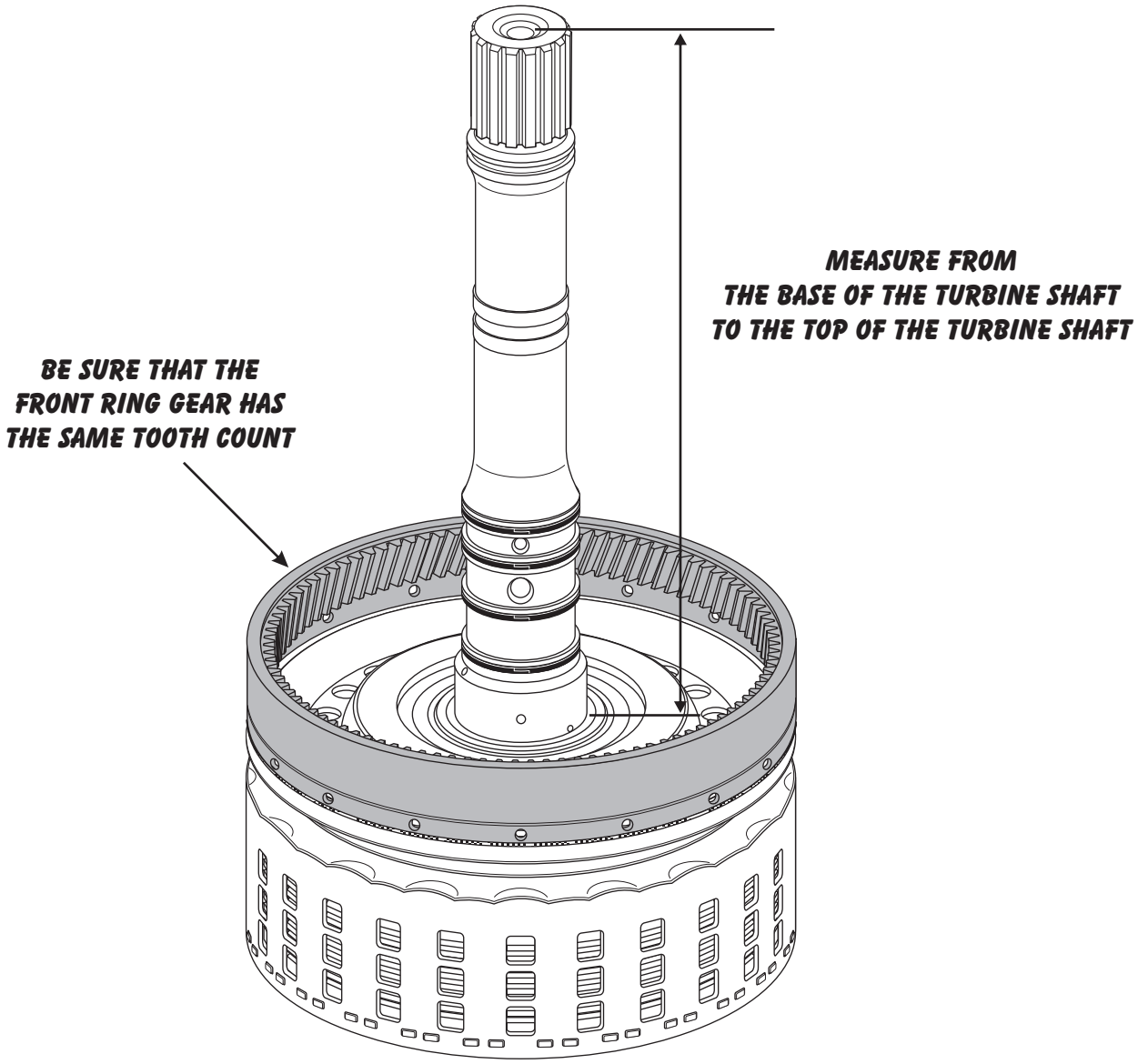
NISSAN/INFINITI RE5R05A

TURBINE SHAFT PUMP STATOR AND TORQUE CONVERTER COMPATIBILITY

The RE5R05A is behind many different engine sizes, and there are components that are matched to the engine size as shown in the following figures. The Turbine shaft length, Pump Stator length, and Torque Converter Build Height are matched together. Any mis-assembly of these pieces can cause numerous complaints. Refer to Figures 1-3 to verify correct component application.

Refer to Figure 1 for Turbine shaft dimensions and application.
Refer to Figure 2 for Stator shaft dimensions and application.
Refer to Figure 3 for Torque Converter build height dimensions and application.

CHECKING TURBINE SHAFT LENGTH

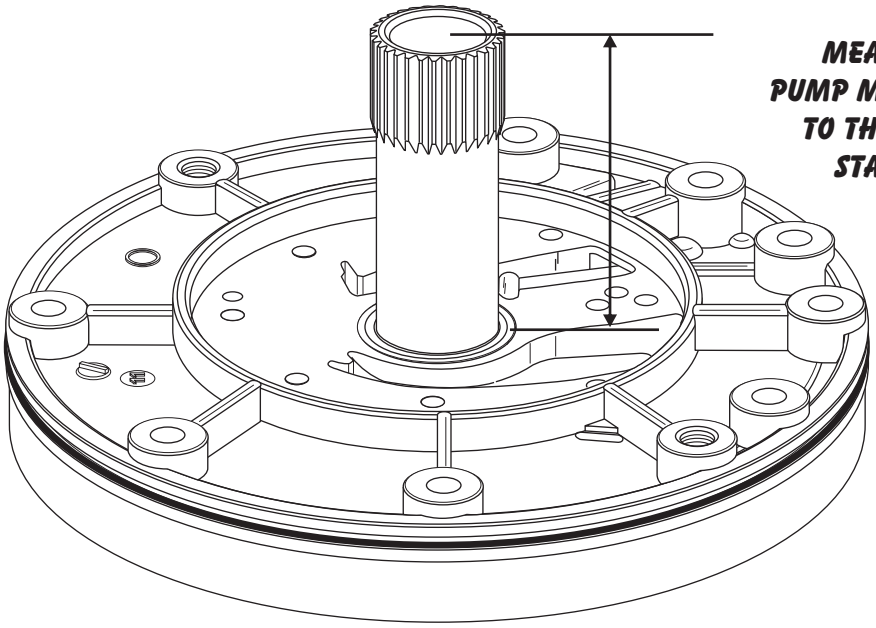


8.250 is commonly used in V-8 Applications
7.375 is commonly used in V-6 Applications

Figure 1

NISSAN/INFINITI RE5R05A
TURBINE SHAFT PUMP STATOR AND TORQUE CONVERTER COMPATIBILITY

CHECKING STATOR SHAFT LENGTH



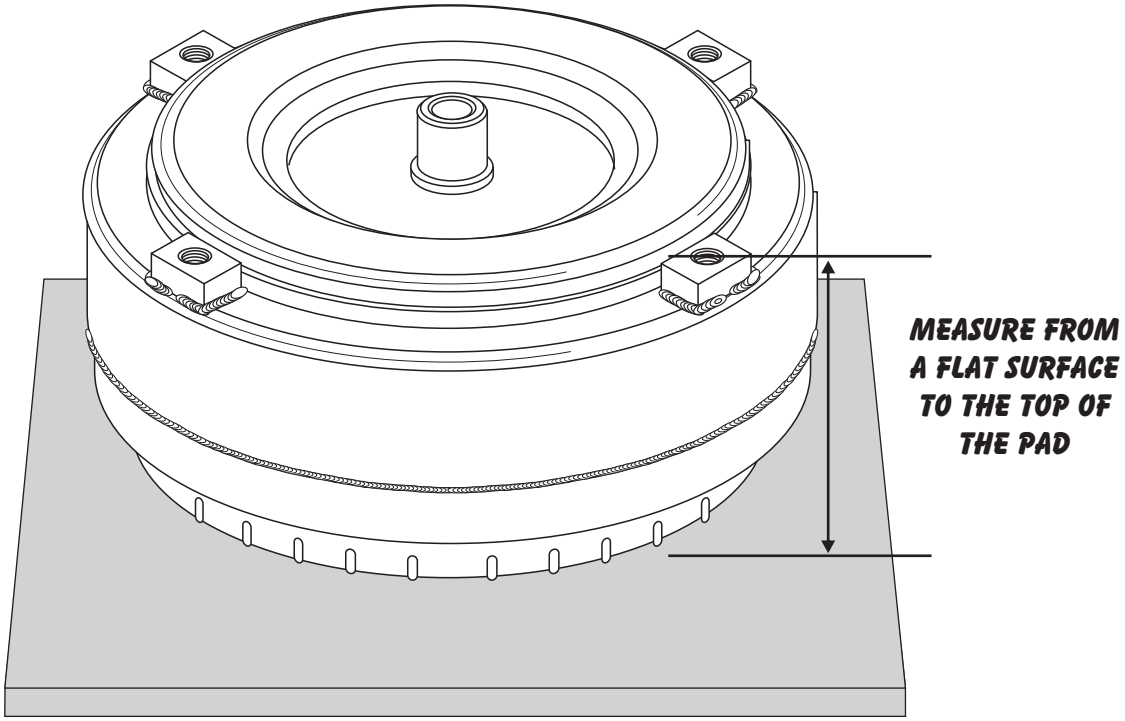
3.500 is commonly used in V-8 Applications

3.125 is commonly used in V-6 Applications

Figure 2

NISSAN/INFINITI RE5R05A
TURBINE SHAFT PUMP STATOR AND TORQUE CONVERTER COMPATIBILITY

CHECKING OVERALL BUILD HEIGHT



Place Torque Converter on a flat surface neck side down and measure from that surface to the top of the pad as shown above. Refer to the chart below for application.

COMMON TORQUE CONVERTER APPLICATION & I.D.

TC-ID	ID STAMP	DIAMETER	BOLT CIRCLE	OVERALL HEIGHT	PADS
DA-57	P2	10.750"	9.750"	5.250"	4
DA-60	O64	10.920"	9.725"	5.760"	4
DA-65	40B	11.250"	9.750"	6.350"	4
DA-67	RA	10.875"	9.100"	5.645"	6

DA-57- Used on most V-6 applications
DA-60- Used on most 4.5 V-8 applications
DA-65- Used on most 5.6 V-8 applications
DA-67- Used on Kia Sorento applications
Torque converter I.D. and dimensions courtesy of DAACO

Figure 3

RE5R05A 2ND TO 3RD DESIGN VALVE

VALVE BODY COMPARISON

Sometime in 2006, some RE4R05A models received a new design valve body assembly. The new design is referred to as the 3rd design in the illustrations following. There were numerous casting changes and spacer plate changes, and spring calibration changes on the 3rd design.

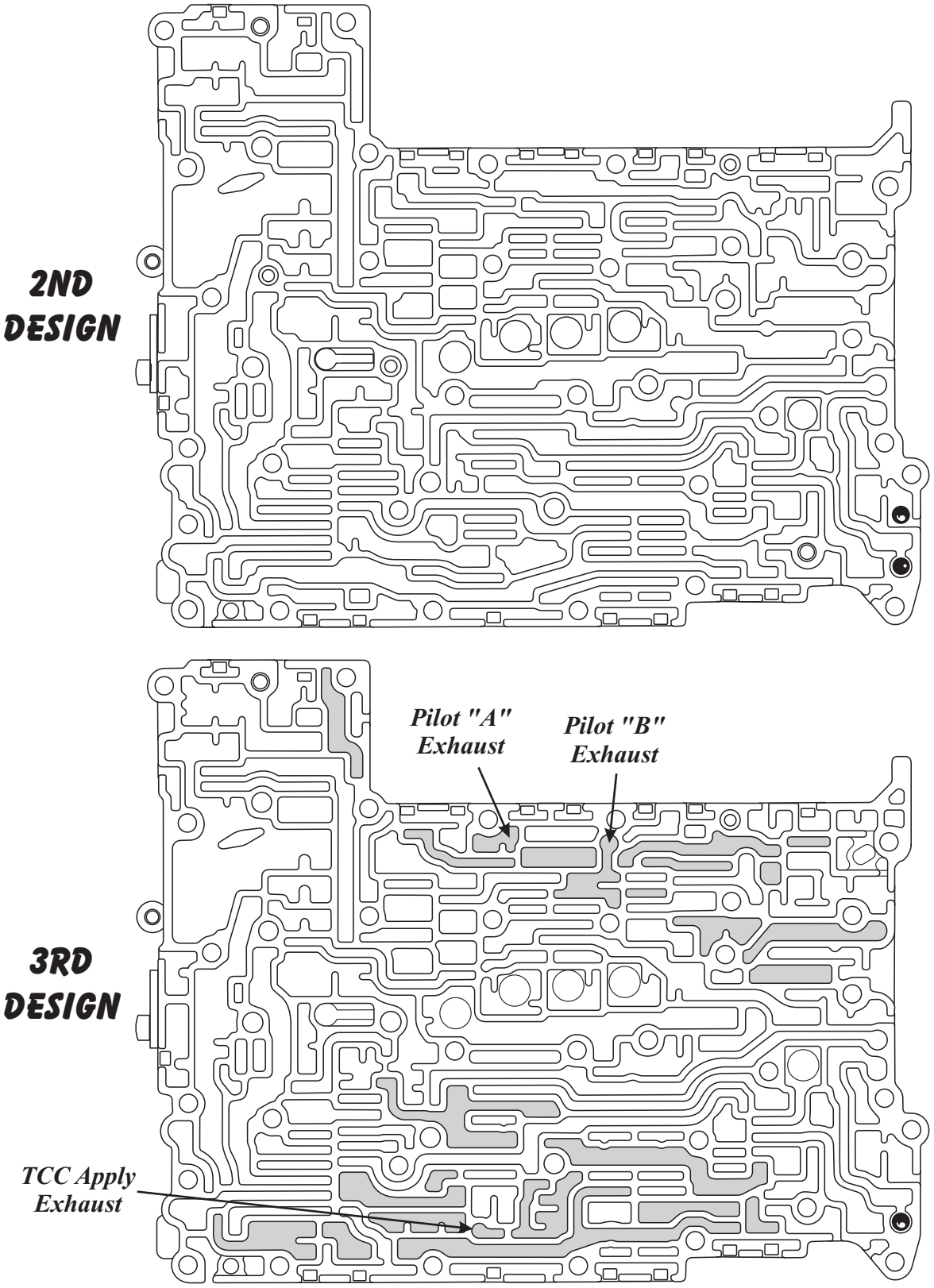
Changes:

1. The 3rd Design TCC Solenoid is now fed with Pilot "B" pressure.
2. The 3rd Design now utilizes one N-R accumulator piston.
3. The TCC Apply Exhaust, Pilot Valve "A" and Pilot Valve "B" Exhaust ports are now moved out of the Pump Suction passage.

Refer to the figures listed below to see the main differences and changes between the 2nd and 3rd design.

- ***Refer to Figure 1 to see the differences in the Lower Valve Body worm tracks.***
- ***Refer to Figure 2 to see the differences in the Spacer Plate.***
- ***Refer to Figure 3 to see the differences in the Upper Valve Body worm tracks.***
- ***Refer to Figure 4 to see the differences in the Lower Valve body worm tracks, filter side, which identifies the Exhaust port changes and locations for TCC Apply Exhaust, Pilot "A" and Pilot "B."***
- ***Refer to Figure 5 to see a partial Hydraulic Circuit diagram of the TCC Solenoid connection to Pilot "B" pressure.***
- ***Refer to Figure 6 to see a partial Hydraulic Circuit diagram of the N-R accumulator.***
- ***Refer to Figure 7 to see a partial Hydraulic Circuit diagram of the Torque Converter Clutch Control Valve.***
- ***Refer to Figure 8 to see a partial Hydraulic Circuit diagram of Pilot Valve "A" and Pilot Valve "B."***

LOWER VALVE BODY WORM TRACK DIFFERENCES

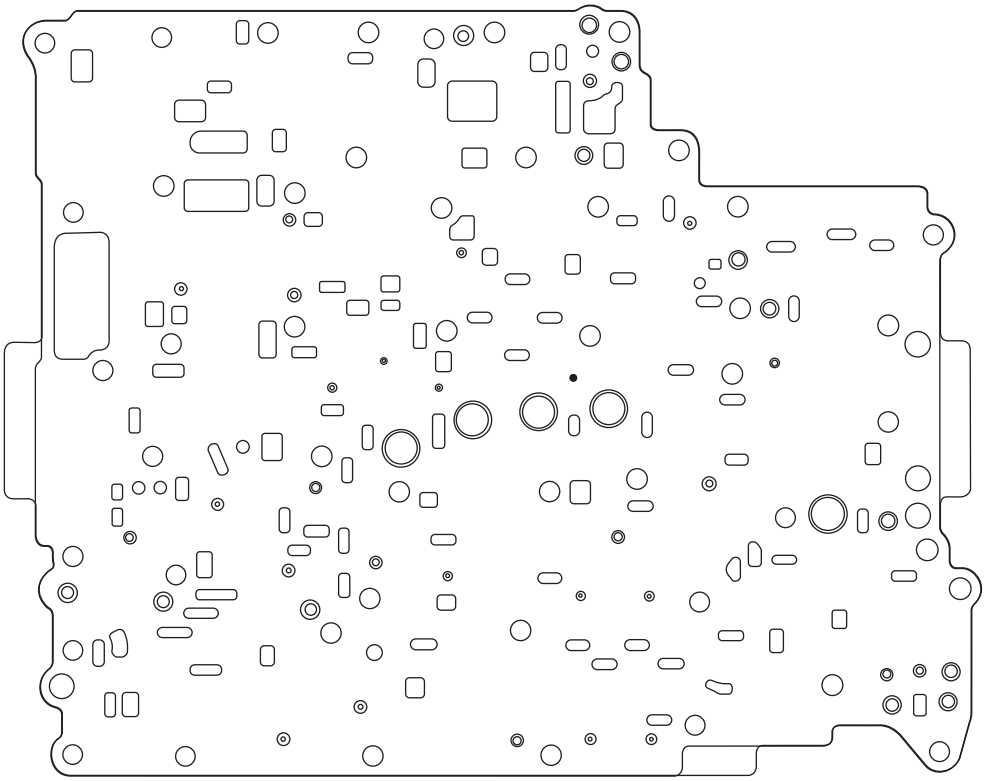


Areas highlighted in grey identify the main changes.

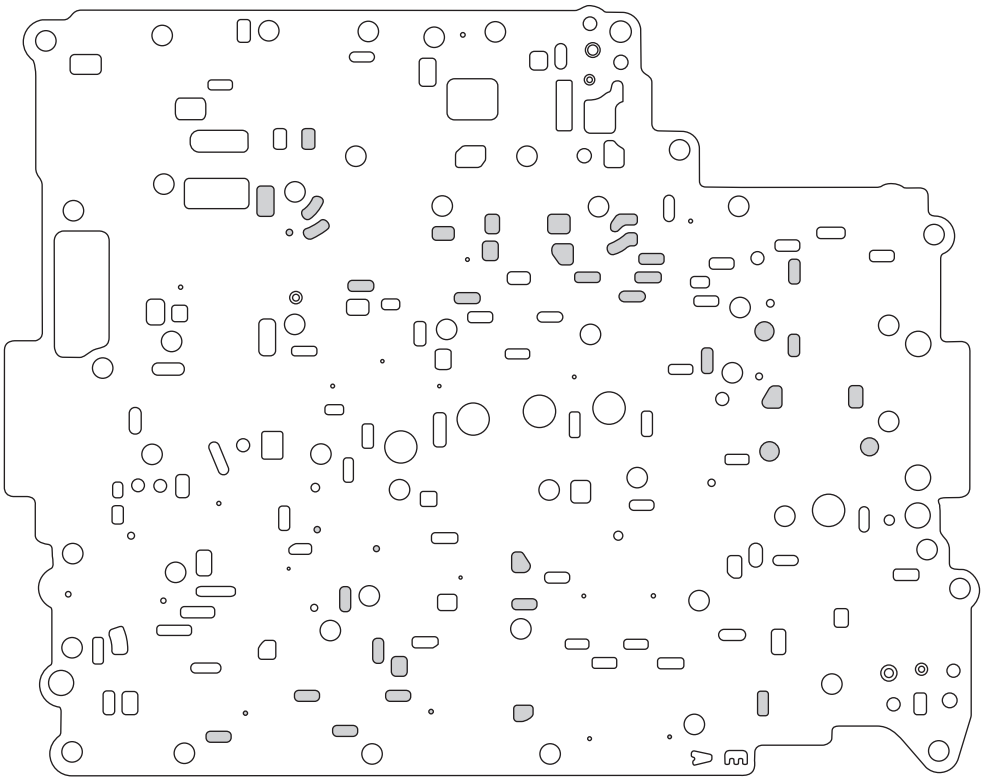
Figure 1

SPACER PLATE DIFFERENCES

2ND DESIGN



3RD DESIGN



Areas highlighted in grey identify the main changes.

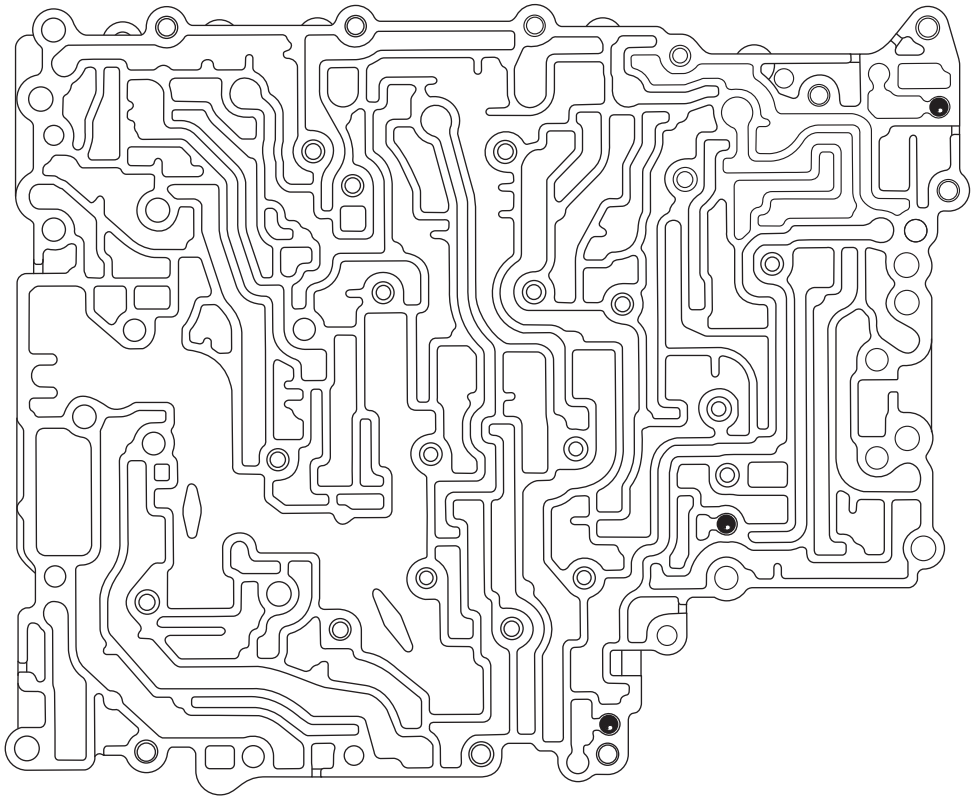
Figure 2

European - 66

European - 67

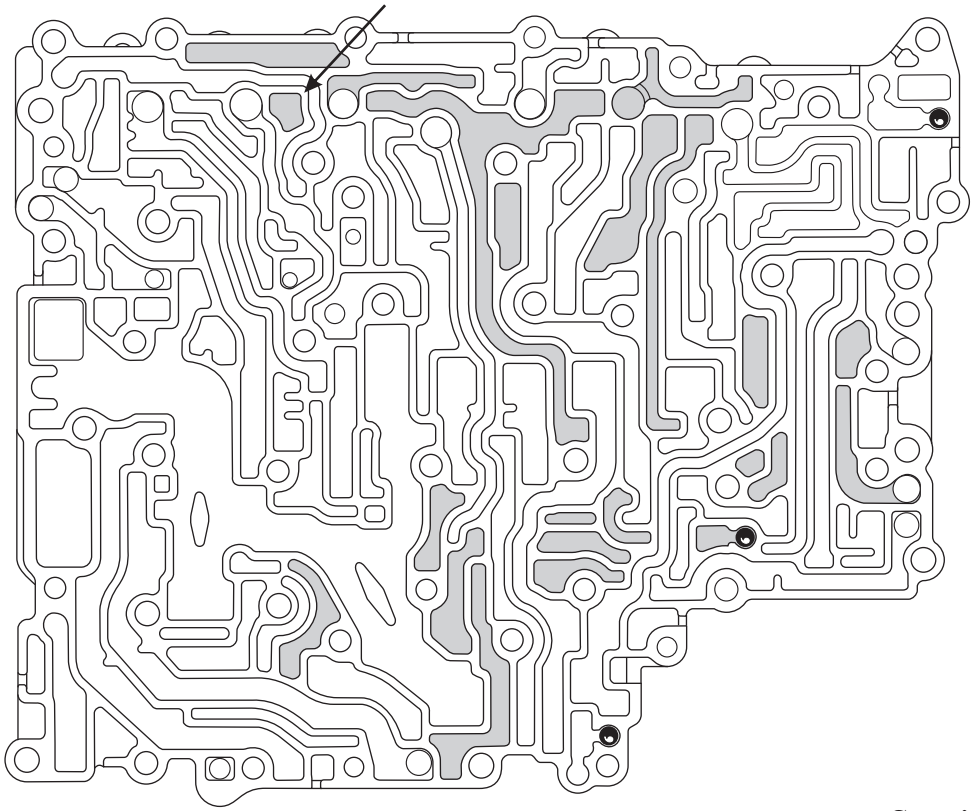
UPPER VALVE BODY WORM TRACK DIFFERENCES

2ND DESIGN



Pilot "B" connection to TCC Solenoid

3RD DESIGN

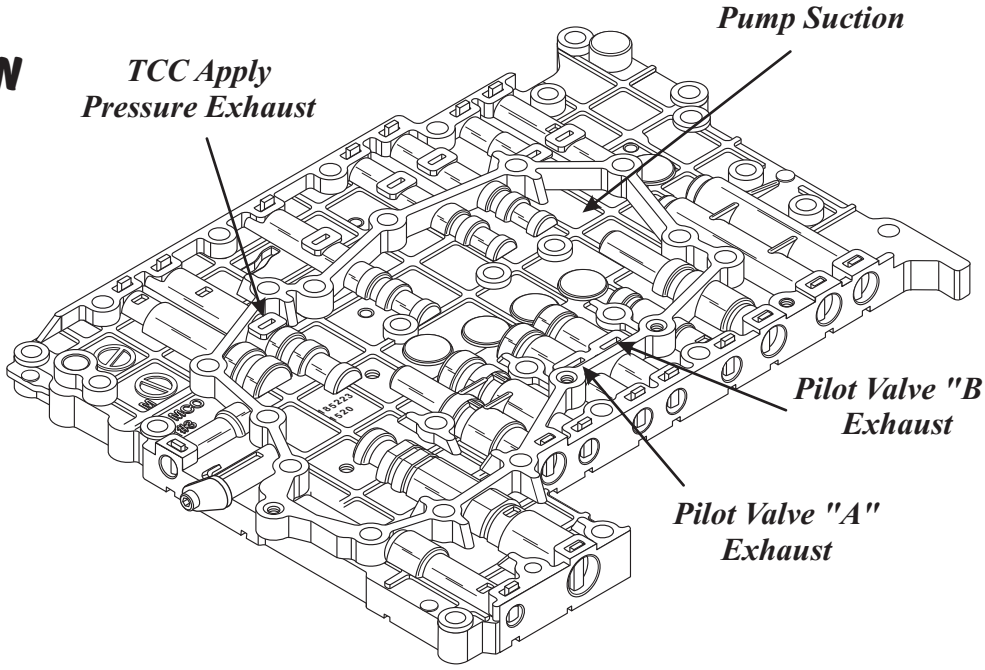


Areas highlighted in grey identify the main changes.

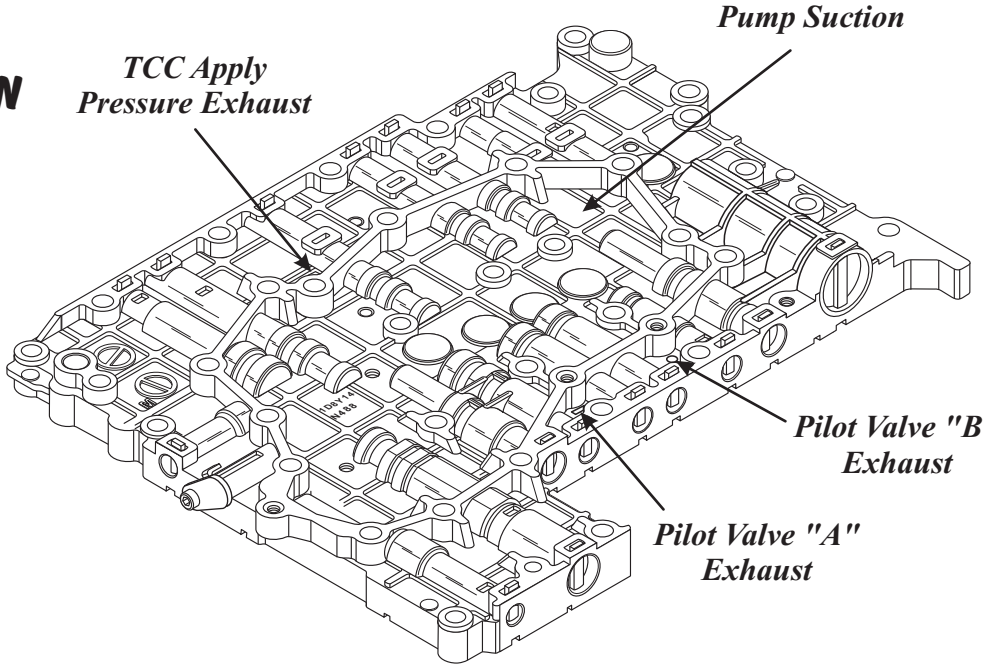
Figure 3

LOWER VALVE BODY FILTER SIDE DIFFERENCES

2ND DESIGN



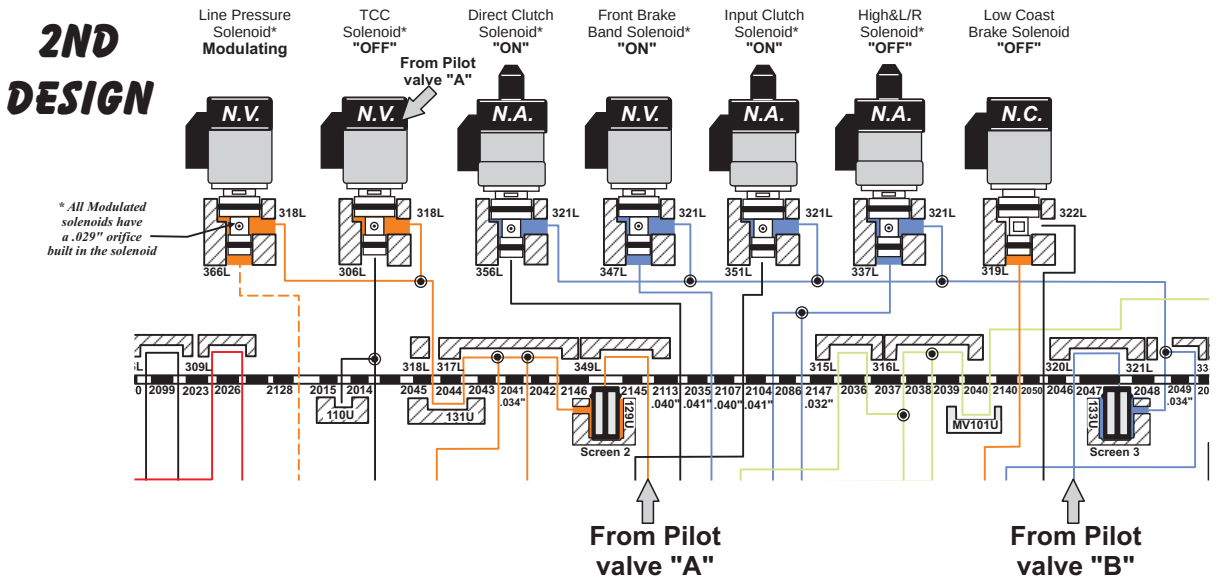
3RD DESIGN



Note: TCC Apply Exhaust, and Pilot Valve "A" and "B" Exhaust ports were moved outside of the Pump Suction area of the 3rd Design Lower Valve Body.

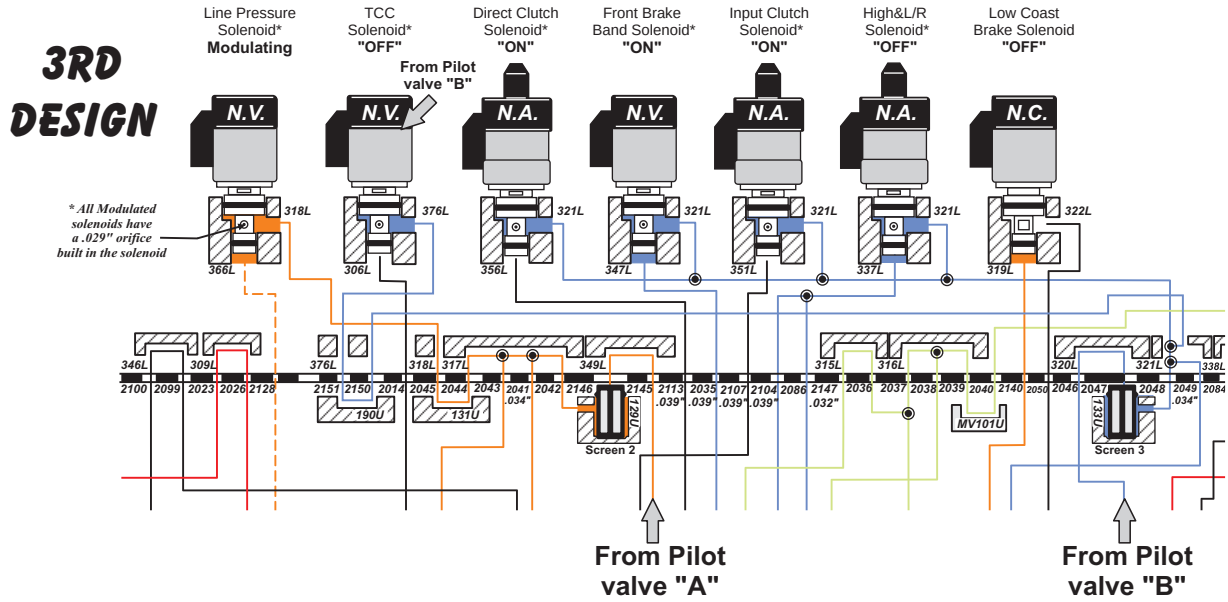
Figure 4

2nd AND 3rd DESIGN SOLENOID HYDRAULIC DIFFERENCES



2nd Design

The Line Pressure , TCC and Low Coast Brake Solenoids are fed by Pilot Valve "A." The Direct Clutch, Front Brake Band, Input Clutch and High & L/R Solenoids are fed by Pilot Valve "B."



3rd Design

The Line Pressure and Low Coast Brake Solenoids are fed by Pilot Valve "A." The TCC, Direct Clutch, Front Brake Band, Input Clutch and High & L/R Solenoids are fed by Pilot Valve "B." The Solenoid Orifices leading to the valve trains were also reduced.

Figure 5

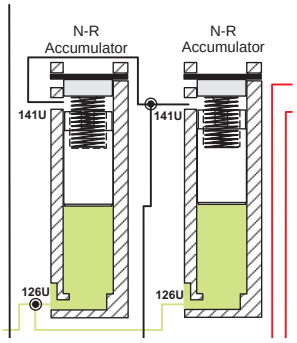
Hayden - 71

RE5R05A 2ND TO 3RD DESIGN

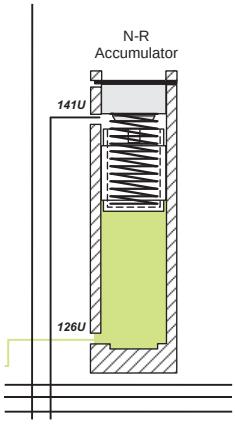
VALVE BODY COMPARISON

2nd AND 3rd DESIGN N-R ACCUMULATOR HYDRAULIC DIFFERENCES

2ND DESIGN



3RD DESIGN

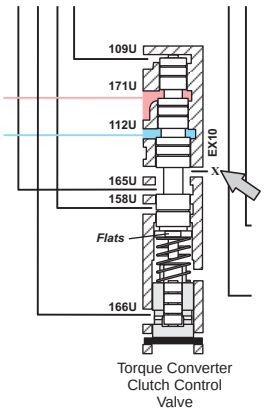


The 3rd Design Neutral - Reverse Accumulator was redesigned to utilize one Piston instead of two.

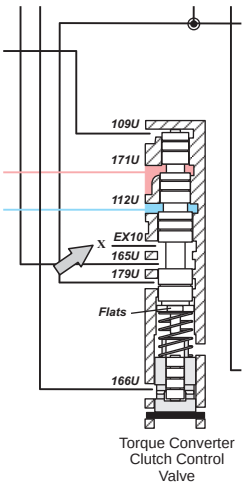
Figure 6

2nd AND 3rd DESIGN TCC CONTROL VALVE HYDRAULIC DIFFERENCES

2ND DESIGN



3RD DESIGN



The 3rd Design Torque Converter Clutch Control Valve was redesigned , to move the TCC Apply Exhaust out of the Suction side of the pump. Also See Figure 4 for a location of the Exhaust port.

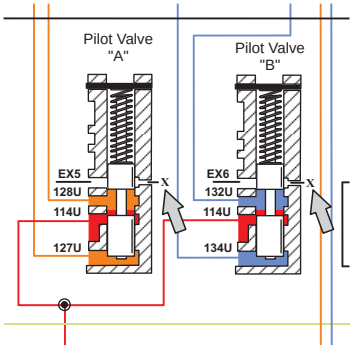
Figure 7

RE5R05A 2ND TO 3RD DESIGN

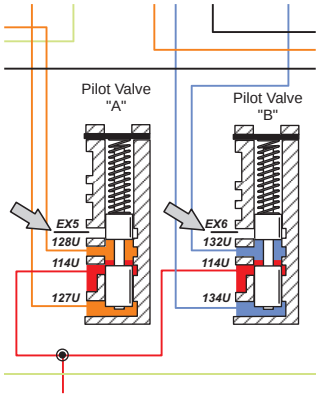
VALVE BODY COMPARISON

2nd AND 3rd DESIGN PILOT VALVE A & B HYDRAULIC DIFFERENCES

2ND DESIGN



3RD DESIGN



The 3rd Design Pilot Valve A & B were redesigned , to move their exhaust passages out of the Suction side of the pump. Also See Figure 4 for the locations of the Exhaust ports.

Figure 8

G-Cor Automotive - 74

Exedy - 75

NISSAN RE5R05A

SOLENOID GASKET

COMPLAINT: As the rebuild technician removes the solenoids from the valve body, a rubber gasket falls on the bench. The technician did not see where this gasket came from and therefore does not know where it goes.

CAUSE: The technician did not have knowledge of the gaskets existence and was not expecting it to appear.

CORRECTION: The rubber gasket is installed under the Front Brake Band Solenoid connector, Figure 1. The location of the gasket is shown in Figure 2.
None of the other solenoids have a gasket under them. One reason the gasket is placed where it is may be because the Front Brake Band Solenoid is on in every gear except fourth. Because it spends so much time on, there may be a possibility that oil may find its way past the solenoid connector and into the TCM.

NISSAN RE5R05A

SOLENOID GASKET

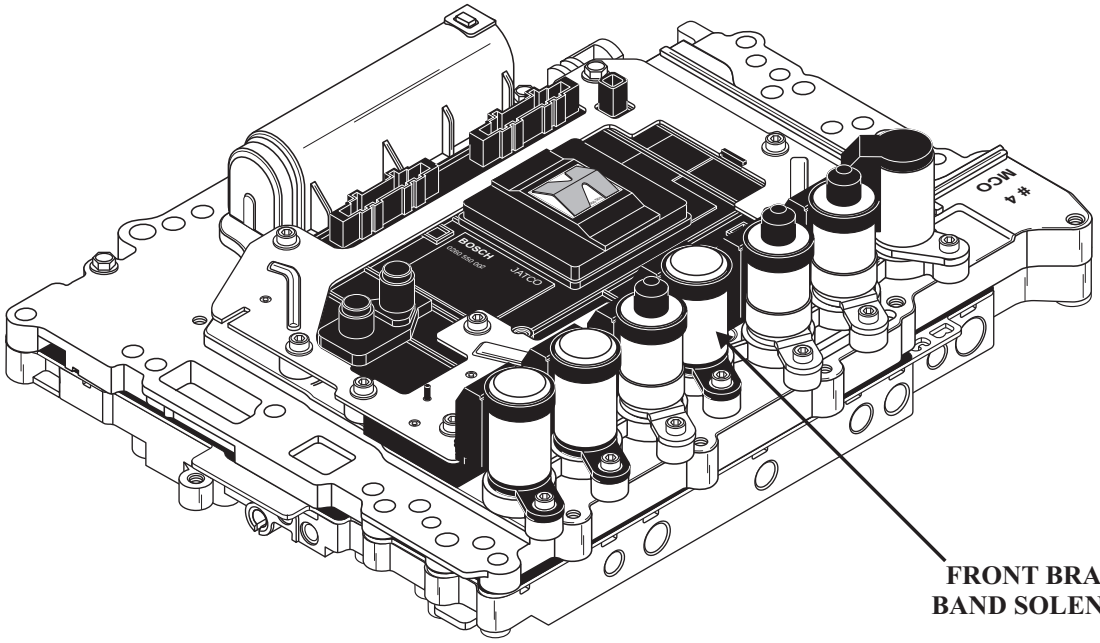


Figure 1

FRONT BRAKE BAND SOLENOID GASKET LOCATION

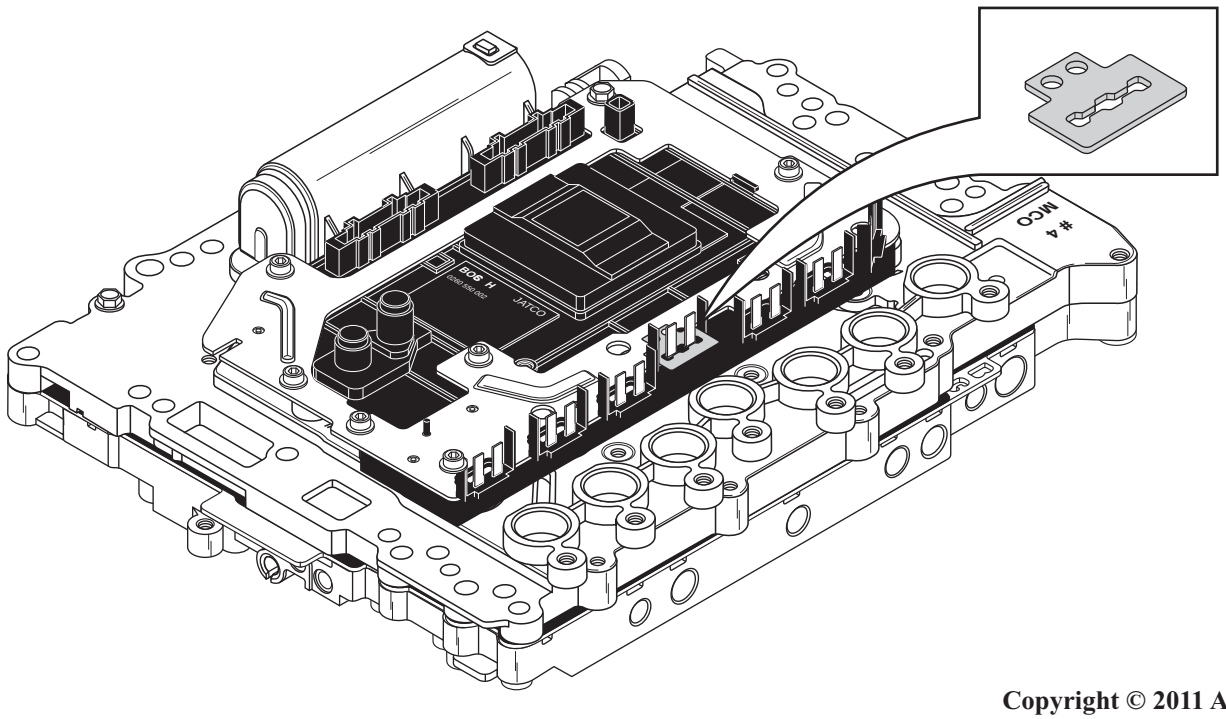


Figure 2

NISSAN RE5R05A

FALSE CODE P1774 IS STORED

COMPLAINT: A 2004 Nissan Armada or Titan may come into the shop with the MIL illuminated and code P1774 for the Low/Coast Brake Solenoid Function is retrieved. The technician may also retrieve code P1730 for Transmission Interlock (Not Shiftlock) fault or P1731 for First Gear Engine Braking fault.

CAUSE: Incorrect TCM programming.

CORRECTION: Reprogram the TCM based on the part number of the TCM found in the vehicle and compare it to the TCM part numbers found in the chart in Figure 1. If the TCM part number is not in the chart, proceed with diagnostics in order to locate the cause of the faults.

SERVICE INFORMATION:

Reflash the TCM as per TSB.....AT04-010

TCM PART NUMBER* & APPLICATION		
VEHICLE	**VEHICLE CONFIGURATION**	**CURRENT TCM PART NUMBER**
TITAN	2WD WITH FLOOR SHIFT	3102-8S502
	2WD WITH FLOOR SHIFT & TOW PACKAGE	3102-8S702
	2WD WITH COLUMN SHIFT	3102-7S204
	2WD WITH COLUMN SHIFT & TOW PACKAGE	3102-8S104
	4WD WITH FLOOR SHIFT	3102-7S305
	4WD WITH FLOOR SHIFT & TOW PACKAGE	3102-8S205
	4WD WITH COLUMN SHIFT	3102-8S005
	4WD WITH COLUMN SHIFT & TOW PACKAGE	3102-8S605
ARMADA	2WD WITH FLOOR SHIFT	3102-7S004
	2WD WITH FLOOR SHIFT & TOW PACKAGE	3102-7S504
	4WD WITH FLOOR SHIFT	3102-7S104
	4WD WITH FLOOR SHIFT & TOW PACKAGE	3102-7S604
The TCM part number has to be retrieved with a capable scan tool.		

Figure 1

SUBARU 4AT PHASE ll VERSION ll

CONTROL AND VALVE BODY CHANGES

CHANGE: Sometime at the beginning of the 2004 model year, (see Figure 1 for model I.D.), Subaru re-designed the 4AT Phase ll Control system, while still using the same Clutch and Brake application, as shown in Figure 2. This required some component changes to accommodate this new design.

REASON: For improved function with fewer electronic components.

PARTS AFFECTED:

1. SOLENOID CONTROL-
The Solenoid firing order changed, as solenoid function has been redesigned. See Figure 3.

2. ALL SOLENOIDS-
- Line Pressure control Solenoid: Refer to Figure 4 for a description and operation .
- High Clutch, Low/Reverse and TCC Duty Solenoids: Refer to Figure 5 for a description and operation .
- 2-4 Brake and Low Clutch Duty Solenoids: Refer to Figure 6 for a description and operation .
- Transfer Clutch Duty Solenoid: Refer to Figure 7 for a description and operation .

3. INTERNAL WIRING HARNESS-
The Internal wiring harness changed with the newly designed Solenoids, refer to Figure 8.

4. VALVE BODY ASSEMBLY-
- Refer to Figure 9 for Sump Filter and harness location.
- Refer to Figures 10 and 11 for Lower Valve Body exploded view, legend and spring specs.
- Refer to Figures 12-14 for Upper Valve Body exploded view, legend and spring specs.
- Refer to Figure 15 for Upper Valve Body small parts and check ball function and locations.
- Refer to Figure 16 for Valve Body Bolt locations.

Note: The Valve names are provided by ATSG and are based on valve function.

5. CASE PASSAGES-
The Case passages changed to accommodate the Valve Body changes. See Figure 17.

INTERCHANGEABILITY:

None of the parts listed above are interchangeable with previous design.

Special Thanks to Best Transmission Springfield, MA

4AT PHASE ll VERSION ll MODEL I.D.
2004 and Later Subaru Forester Turbo
2005 and Later Subaru Forester Non-Turbo
2005 and Later Subaru Impreza Non-Turbo
2006 and Later Subaru Impreza Turbo
2005 and Later Subaru Legacy/Outback

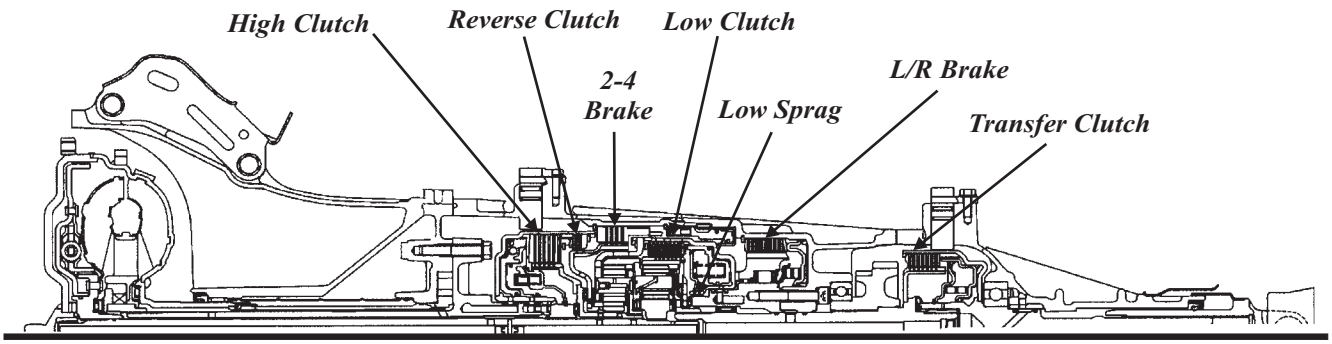
Figure 1

SUBARU 4AT PHASE II VERSION II

CONTROL AND VALVE BODY CHANGES

SUBARU 4AT PHASE II VERSION I AND VERSION II

COMPONENT APPLICATION CHART



SELECTOR POSITION		REVERSE CLUTCH	2-4 BRAKE	HIGH CLUTCH	LOW CLUTCH	LOW/REVERSE BRAKE	LOW-ONE WAY CLUTCH	TRANSFER CLUTCH
P								
R		ON				ON		Mod.
N								
(D)	1				ON		ON	Mod.
	2		ON		ON			Mod.
	3			ON	ON			Mod.
	4		ON	ON				Mod.
Manual Mode	1*				ON	ON*	ON	Mod.
	1				ON		ON	Mod.
	2		ON		ON			Mod.
	3			ON	ON			Mod.
	4		ON	ON				Mod.

***= Low Reverse Clutch ON at Low speed determined by PCM**
Mod. = Transfer Clutch Apply is Modulated which is determined by the PCM/ABS

Figure 2

SUBARU 4AT PHASE II VERSION II

CONTROL AND VALVE BODY CHANGES

SUBARU 4AT PHASE II VERSION II
SOLENOID APPLICATION CHART

SELECTOR POSITION		2-4 BRAKE DUTY %	HIGH CLUTCH DUTY %	LOW CLUTCH DUTY %	LOW/REVERSE BRAKE DUTY %	TCC DUTY %	TRANSFER CLUTCH DUTY %
P		H	H	H	H	L	Mod.
R		H	H	H	H to L	L	Mod.
N		H	H	H	H	L	Mod.
Ⓓ	1	H	H	L	H	L	Mod.
	2	L	H	L	H	L	Mod.
	3	L**	L	L	H	H	Mod.
	4	L	L	H	H	H	Mod.
Manual Mode	1*	H	H	H to L	L	L	Mod.
	1	H	H	L	H	L	Mod.
	2	L	H	L	H	L	Mod.
	3	L**	L	L	H	H	Mod.
	4	L	L	H	H	H	Mod.

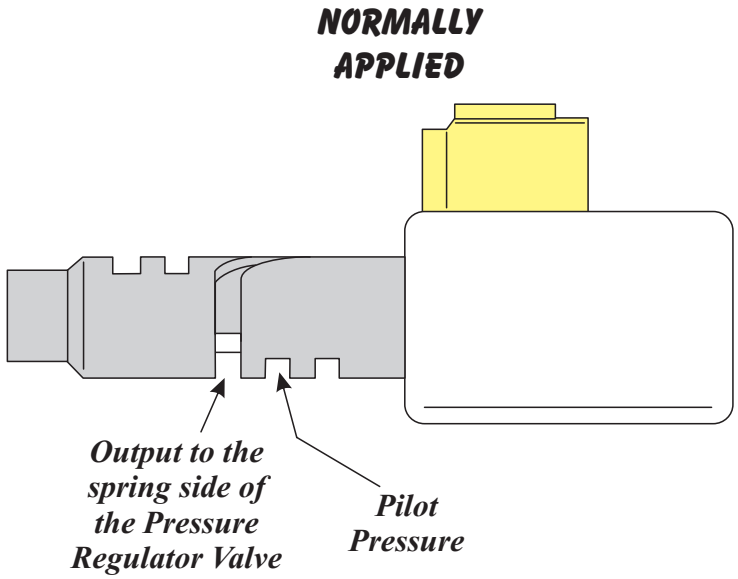
*= Low Reverse Clutch ON at Low speed determined by PCM

H to L=Ramps from High to Low during engagement

L** = The 2-4 duty solenoid may be at Low duty cycle in 3rd gear depending on PCM strategy. 2-4 Brake application is prevented by the 2-4 sequence valve.

Figure 3

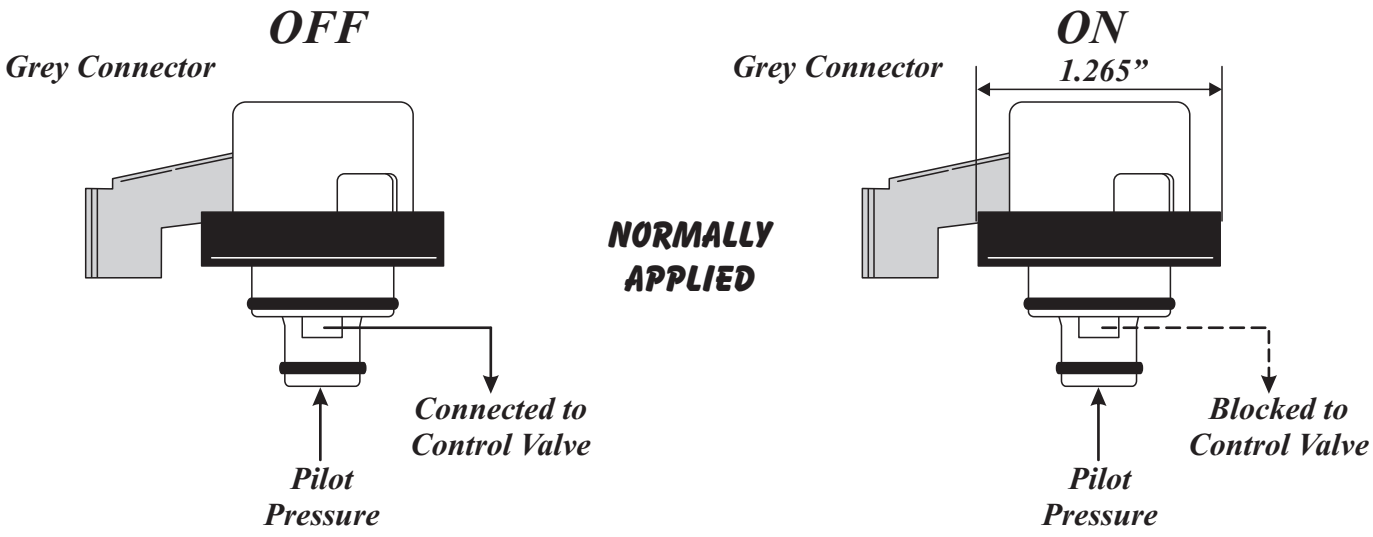
LINE PRESSURE CONTROL SOLENOID FUNCTIONAL CHECK



Summary: The Pressure Control Solenoid is Normally Applied. When the Solenoid duty cycle is Low, pressure to the spring side of the Pressure Regulator Valve is high, resulting in Higher Line Pressure. When the Solenoid duty cycle is High, pressure to the spring side of the Pressure Regulator Valve is Low, resulting in Lower line pressure.

Figure 4

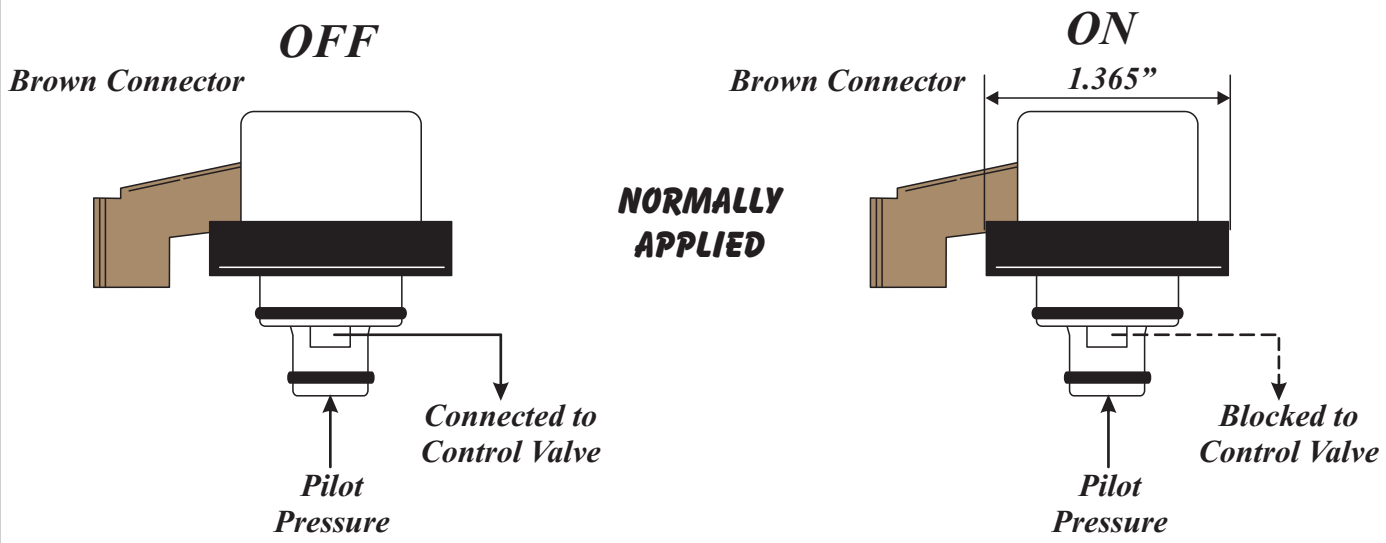
HIGH CLUTCH, LOW/REVERSE AND TCC DUTY SOLENOID FUNCTIONAL CHECK



Summary: The High, Low/Reverse and TCC Duty Solenoids are Normally Applied. When the Solenoid duty cycle is Low, Pilot pressure to the Control valve is high, opening the valves for the High Clutch and Low/Reverse. Note: The TCC Duty solenoid feeds the spring side of the TCC Control Valve preventing TCC apply. When the Solenoid duty cycle is High, Pilot pressure to the Control valve is blocked, allowing the spring to close the High and Low/Reverse Control valves. Note: The TCC Duty Solenoid at high duty cycle blocks the pressure to the spring side of the valve, allowing the TCC Control Valve to open applying the TCC.

Figure 5

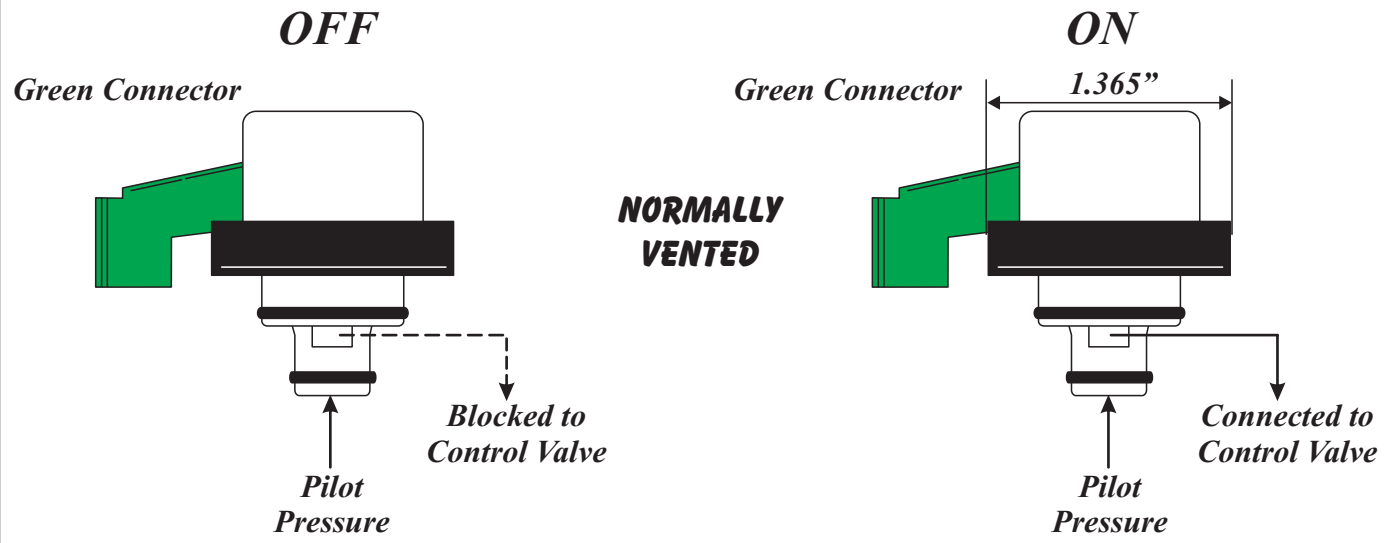
2-4 BRAKE AND LOW CLUTCH DUTY SOLENOID FUNCTIONAL CHECK



Summary: The 2-4 Brake and Low Clutch Duty Solenoids are Normally Applied. When the Solenoid duty cycle is Low, Pilot pressure to the Control valve is high, opening the valves for the 2-4 Brake and Low Clutch. When the Solenoid duty cycle is High, Pilot pressure to the Control valve is blocked, allowing the spring to close the 2-4 Brake and Low Clutch Control valves.

Figure 6

TRANSFER CLUTCH DUTY SOLENOID FUNCTIONAL CHECK



Summary: The Transfer Clutch Duty Solenoid is Normally Vented. When the Solenoid duty cycle is Low, Pilot pressure to the Control valve is blocked, closing the Transfer Clutch Control Valve. When the Solenoid duty cycle is High, Pilot pressure to the Control valve is High, opening the Transfer Clutch Control valve.

Figure 7

SUBARU 4AT PHASE II VERSION II

CONTROL AND VALVE BODY CHANGES

INTERNAL WIRING HARNESS

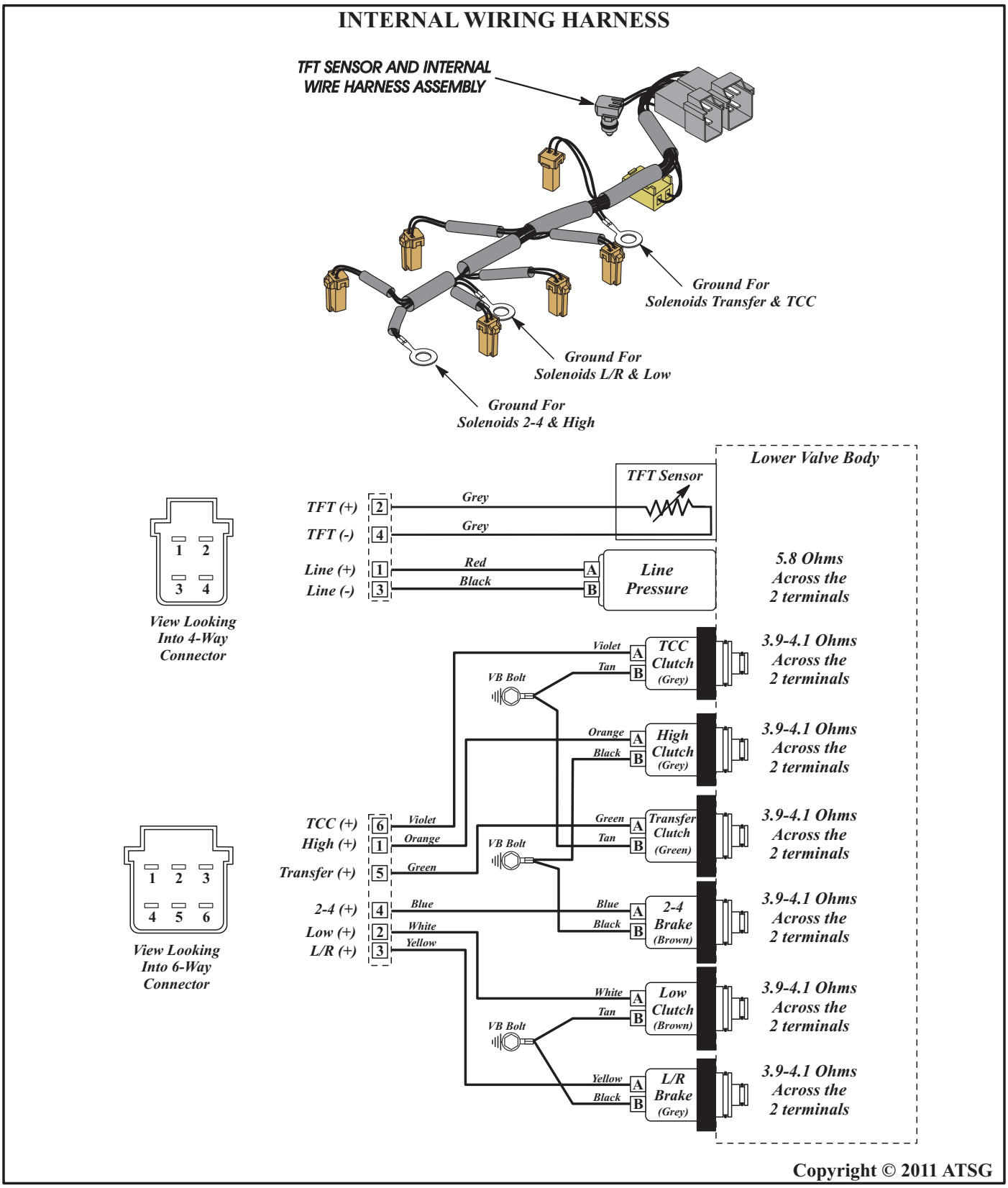
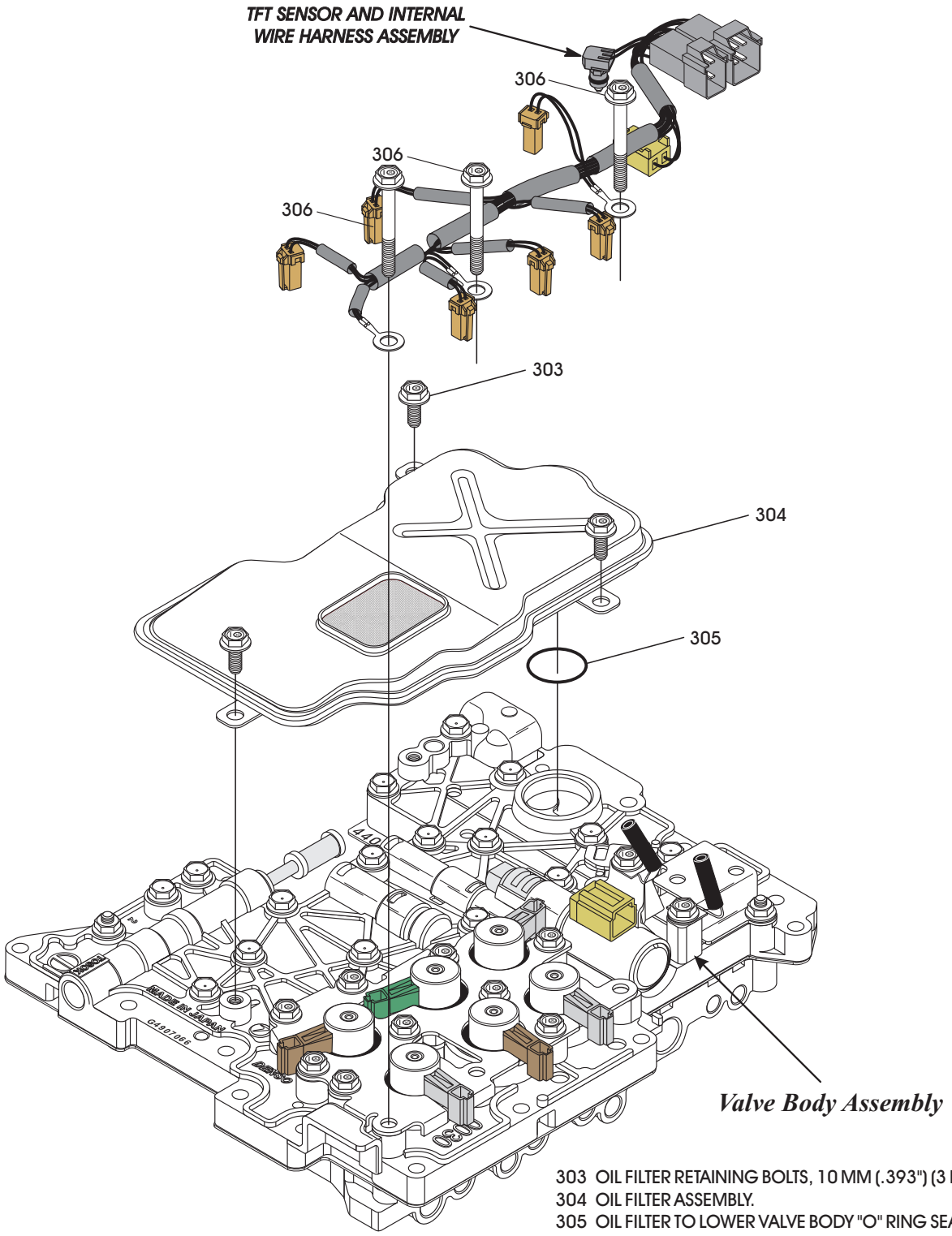


Figure 8

SUBARU 4AT PHASE II VERSION II

CONTROL AND VALVE BODY CHANGES

SUMP FILTER AND INTERNAL WIRING HARNESS LOCATION



303 OIL FILTER RETAINING BOLTS, 10 MM (.393") (3 REQUIRED).
304 OIL FILTER ASSEMBLY.
305 OIL FILTER TO LOWER VALVE BODY "O" RING SEAL.
306 VALVE BODY BOLT, 45 MM (1.771") (13 REQUIRED).

Figure 9

SUBARU 4AT PHASE II VERSION II

CONTROL AND VALVE BODY CHANGES

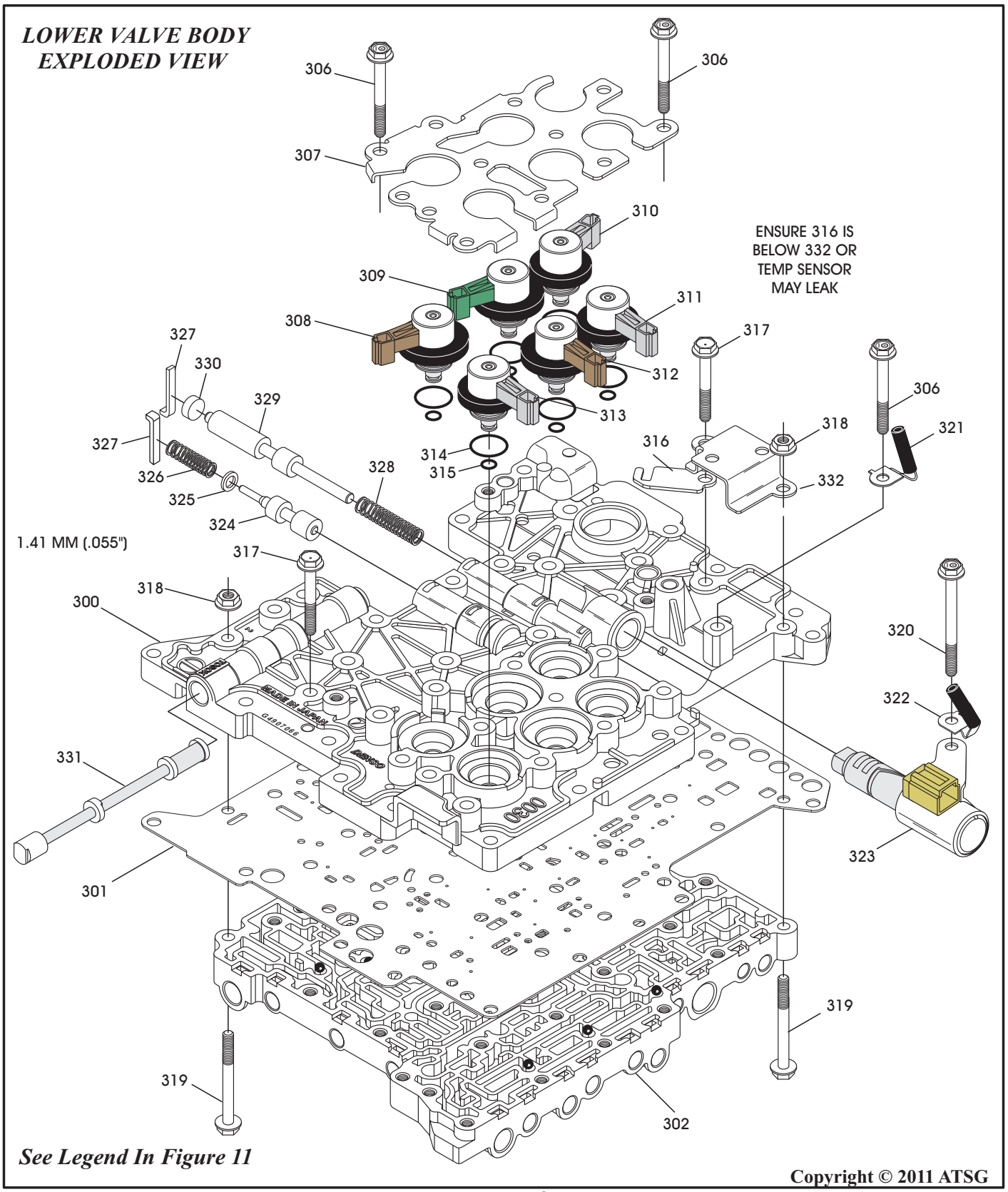


Figure 10

SUBARU 4AT PHASE II VERSION II

CONTROL AND VALVE BODY CHANGES

FIGURE 10 LEGEND

300 LOWER VALVE BODY CASTING.
301 VALVE BODY SPACER PLATE.
302 UPPER VALVE BODY CASTING.
306 VALVE BODY BOLT, 45 MM (1.771") (13 REQUIRED).
307 SOLENOID RETAINING BRACKET.
308 LOW CLUTCH DUTY SOLENOID.
309 TRANSFER CLUTCH DUTY SOLENOID.
310 TORQUE CONVERTER CLUTCH DUTY SOLENOID.
311 HIGH CLUTCH DUTY SOLENOID.
312 2-4 BRAKE DUTY SOLENOID.
313 LOW REVERSE BRAKE DUTY SOLENOID.
314 SOLENOID LARGE "O" RING SEAL (6 REQUIRED).
315 SOLENOID SMALL "O" RING SEAL (6 REQUIRED).
316 TRANS TEMP SENSOR RETAINING BRACKET.
317 VALVE BODY BOLT, 40 MM (1.575") (16 REQUIRED).
318 NUT FOR 52 MM VALVE BODY BOLT.
319 VALVE BODY BOLT, 52 MM (2.047") (2 REQUIRED).
320 VALVE BODY BOLT, 60 MM (2.362") (1 REQUIRED).
321 INTERNAL WIRE HARNESS RETAINER.
322 INTERNAL WIRE HARNESS RETAINER.
323 LINE PRESSURE CONTROL SOLENOID.
324 PILOT VALVE.
325 SPRING SHIM, 1.41 MM (.055") THICK.
326 SPRING.
327 RETAINER.
328 SPRING.
329 REVERSE BOOST VALVE.
330 BORE PLUG.
331 MANUAL VALVE.
332 INTERNAL HARNESS CONNECTOR RETAINER BRACKET.

LOWER VALVE BODY SPRING SPECIFICATIONS

SPRING NUMBER 326	SPRING NUMBER 328
Free Length = 1.150"	Free Length = 1.900"
Spring Diameter = .351"	Spring Diameter = .359"
Wire Diameter = .046"	Wire Diameter = .043"
Approx Coils = 13 (NONE)	Approx Coils = 16 (NONE)

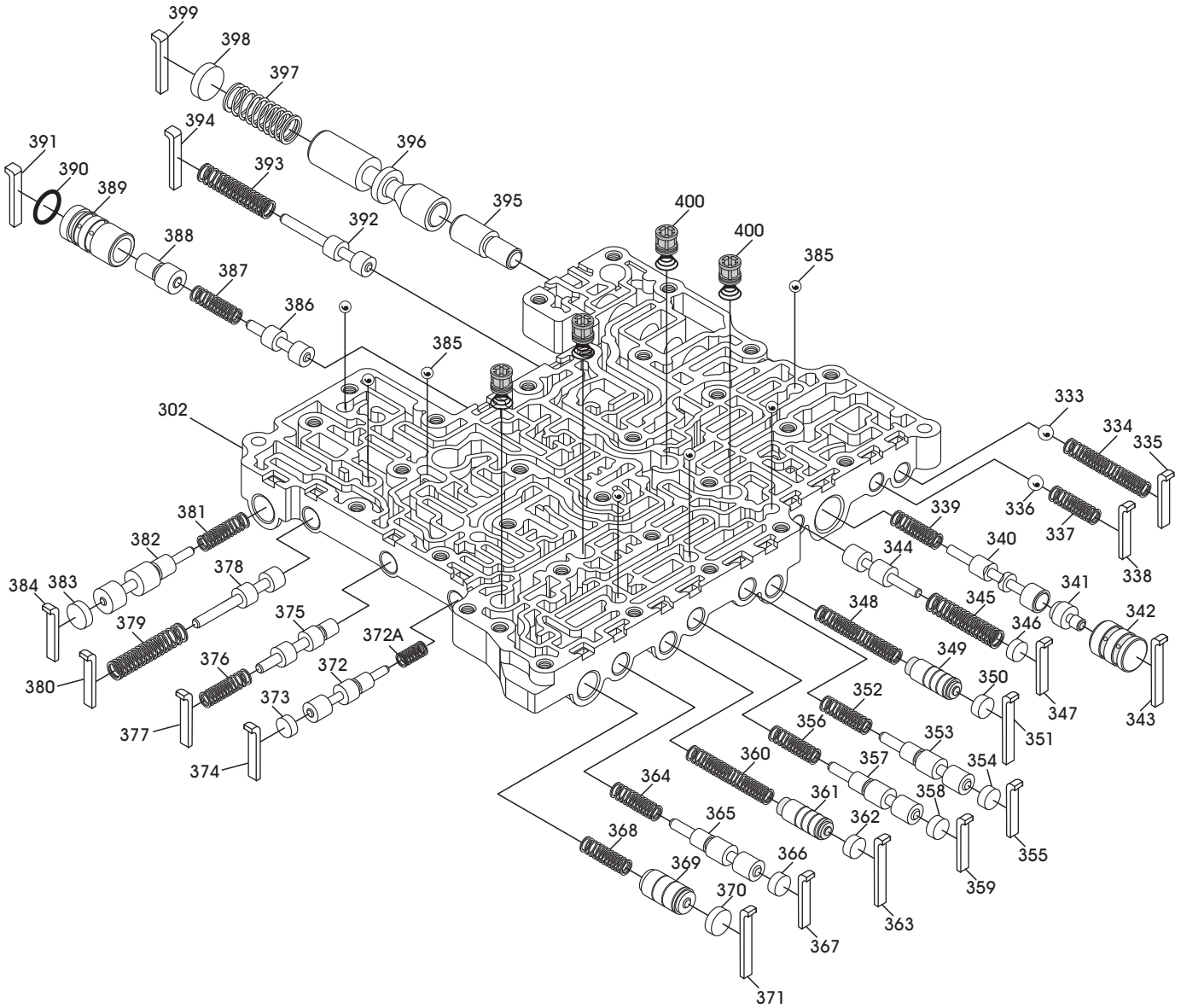
Note: The Valve names are provided by ATSG and are based on valve function.

Figure 11

SUBARU 4AT PHASE II VERSION II

CONTROL AND VALVE BODY CHANGES

UPPER VALVE BODY EXPLODED VIEW



See Legend In Figure 13

Figure 12

SUBARU 4AT PHASE II VERSION II

CONTROL AND VALVE BODY CHANGES

FIGURE 12 LEGEND

302 UPPER VALVE BODY CASTING.
333 LINE PRESSURE BLOW-OFF BALL, 8.72 MM (.343") DIAMETER.
334 LINE PRESSURE BLOW-OFF BALL SPRING.
335 BLOW-OFF BALL SPRING RETAINER.
336 REAR LUBE CHECK BALL, 8.72 MM (.343") DIAMETER.
337 REAR LUBE SPRING.
338 REAR LUBE SPRING RETAINER.
339 LOCK-UP CONTROL VALVE SPRING.
340 LOCK-UP CONTROL VALVE.
341 LOCK-UP CONTROL BOOST VALVE.
342 LOCK-UP CONTROL BOOST VALVE SLEEVE.
343 LOCK-UP CONTROL BOOST VALVE SLEEVE RETAINER.
344 TCC REGULATOR VALVE 2. (APPLY)
345 TCC REGULATOR VALVE 2 SPRING.
346 TCC REGULATOR VALVE 2 BORE PLUG.
347 TCC REGULATOR VALVE 2 BORE PLUG RETAINER.
348 HIGH CLUTCH DUTY SOLENOID ACCUMULATOR SPRING.
349 HIGH CLUTCH DUTY SOLENOID ACCUMULATOR VALVE.
350 HIGH CLUTCH DUTY SOLENOID ACCUMULATOR BORE PLUG.
351 HIGH CLUTCH DUTY SOLENOID ACCUMULATOR RETAINER.
352 HIGH CLUTCH CONTROL VALVE SPRING.
353 HIGH CLUTCH CONTROL VALVE.
354 HIGH CLUTCH CONTROL BORE PLUG.
355 HIGH CLUTCH CONTROL BORE PLUG RETAINER.
356 2-4 BRAKE CONTROL VALVE SPRING.
357 2-4 BRAKE CONTROL VALVE.
358 2-4 BRAKE CONTROL BORE PLUG.
359 2-4 BRAKE CONTROL BORE PLUG RETAINER.
360 2-4 BRAKE DUTY SOLENOID ACCUMULATOR SPRING.
361 2-4 BRAKE DUTY SOLENOID ACCUMULATOR VALVE.
362 2-4 BRAKE DUTY SOLENOID ACCUMULATOR BORE PLUG.
363 2-4 BRAKE DUTY SOLENOID ACCUMULATOR RETAINER.
364 LOW CLUTCH CONTROL VALVE SPRING.
365 LOW CLUTCH CONTROL VALVE.
366 LOW CLUTCH CONTROL VALVE BORE PLUG.
367 LOW CLUTCH CONTROL VALVE RETAINER.
368 LOW CLUTCH DUTY SOLENOID ACCUMULATOR SPRING.
369 LOW CLUTCH DUTY SOLENOID ACCUMULATOR VALVE.
370 LOW CLUTCH DUTY SOLENOID ACCUMULATOR.
371 LOW CLUTCH DUTY SOLENOID ACCUMULATOR RETAINER.
372A TRANSFER CLUTCH CONTROL VALVE SPRING
372 TRANSFER CLUTCH CONTROL VALVE.
373 TRANSFER CLUTCH CONTROL VALVE BORE PLUG.
374 TRANSFER CLUTCH CONTROL VALVE BORE PLUG RETAINER.
375 LOW/REVERSE BRAKE SEQUENCE VALVE.
376 LOW/REVERSE BRAKE SEQUENCE SPRING.
377 LOW/REVERSE BRAKE SEQUENCE SPRING RETAINER.
378 LOW/2-4 RELAY VALVE.
379 LOW/2-4 RELAY VALVE SPRING.
380 LOW/2-4 RELAY VALVE SPRING RETAINER.
381 LOW/REVERSE BRAKE CONTROL VALVE SPRING.
382 LOW/REVERSE BRAKE CONTROL VALVE.
383 LOW/REVERSE BRAKE CONTROL VALVE BORE PLUG.
384 LOW/REVERSE BRAKE CONTROL VALVE BORE PLUG RETAINER.
385 STEEL CHECK BALLS, 5.53 MM (.217") DIAMETER (7 REQUIRED).
386 2-4 BRAKE SEQUENCE VALVE.
387 2-4 BRAKE SEQUENCE VALVE SPRING.
388 2-4 BRAKE SEQUENCE BOOST VALVE.
389 2-4 BRAKE SEQUENCE BOOST VALVE SLEEVE.
390 2-4 BRAKE SEQUENCE BOOST VALE SLEEVE "O" RING SEAL.
391 2-4 BRAKE SEQUENCE BOOST VALVE SLEEVE RETAINER.
392 TORQUE CONVERTER/LUBE REGULATOR VALVE 1.
393 TORQUE CONVERTER/LUBE REGULATOR VALVE 1 SPRING.
394 TORQUE CONVERTER/LUBE REG. VALVE 1 SPRING RETAINER.
395 LINE PRESSURE REGULATOR INNER VALVE.
396 LINE PRESSURE REGULATOR VALVE.
397 LINE PRESSURE REGULATOR VALVE SPRING.
398 LINE PRESSURE REGULATOR VALVE BORE PLUG.
399 LINE PRESSURE REGULATOR VALVE BORE PLUG RETAINER.
400 PLASTIC SCREENS (4 REQUIRED).

Note: The Valve names are provided by ATSG and are based on valve function.

Figure 13

UPPER VALVE BODY SPRING SPECIFICATIONS

SPRING NUMBER 334
Free Length = 2.700"
Spring Diameter = .375"
Wire Diameter = .062"
Approx Coils = 24 (NONE)

SPRING NUMBER 337
Free Length = 1.500"
Spring Diameter = .353"
Wire Diameter = .038"
Approx Coils = 12 (NONE)

SPRING NUMBER 339
Free Length = 1.205"
Spring Diameter = .353"
Wire Diameter = .031"
Approx Coils = 10 (NONE)

SPRING NUMBER 345
Free Length = 1.435"
Spring Diameter = .332"
Wire Diameter = .035"
Approx Coils = 14 (NONE)

SPRING NUMBER 348,360
Free Length = 1.640"
Spring Diameter = .322"
Wire Diameter = .054"
Approx Coils = 23 (NONE)

SPRING NUMBER 352
Free Length = 1.430"
Spring Diameter = .331"
Wire Diameter = .021"
Approx Coils = 11 (NONE)

SPRING NUMBER 356
Free Length = 1.255"
Spring Diameter = .331"
Wire Diameter = .021"
Approx Coils = 11 (NONE)

SPRING NUMBER 364
Free Length = 1.335"
Spring Diameter = .331"
Wire Diameter = .021"
Approx Coils = 11 (NONE)

SPRING NUMBER 368
Free Length = 1.140"
Spring Diameter = .390"
Wire Diameter = .062"
Approx Coils = 12 (NONE)

SPRING NUMBER 372A
Free Length = .600"
Spring Diameter = .305"
Wire Diameter = .027"
Approx Coils = 12 (NONE)

SPRING NUMBER 376
Free Length = 1.272"
Spring Diameter = .352"
Wire Diameter = .030"
Approx Coils = 10 (NONE)

SPRING NUMBER 379
Free Length = 1.448"
Spring Diameter = .359"
Wire Diameter = .046"
Approx Coils = 18 (NONE)

SPRING NUMBER 381
Free Length = 1.425"
Spring Diameter = .328"
Wire Diameter = .020"
Approx Coils = 12 (NONE)

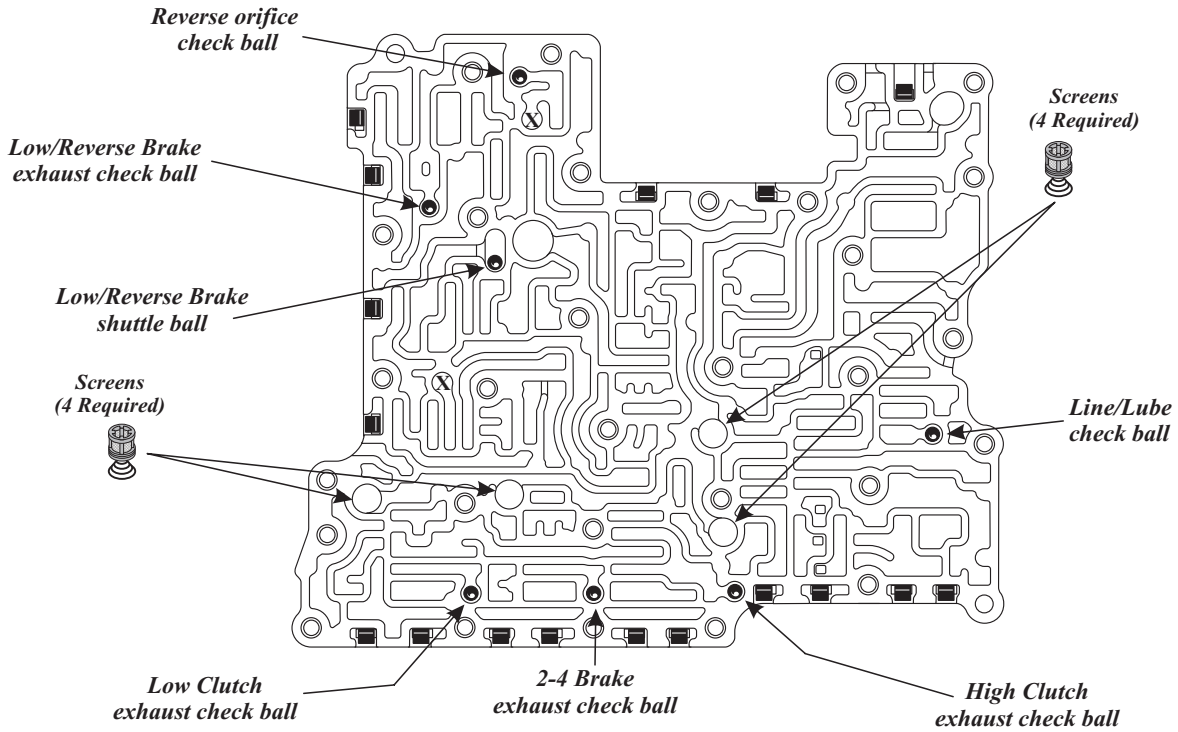
SPRING NUMBER 387
Free Length = 1.027"
Spring Diameter = .352"
Wire Diameter = .030"
Approx Coils = 9 (NONE)

SPRING NUMBER 393
Free Length = 1.673"
Spring Diameter = .355"
Wire Diameter = .054"
Approx Coils = 17 (NONE)

SPRING NUMBER 397
Free Length = 1.362"
Spring Diameter = .431"
Wire Diameter = .046"
Approx Coils = 10 (NONE)

Figure 14

UPPER VALVE BODY, SMALL PARTS LOCATIONS



● = Steel Check Balls, 5.53 MM (.217") Diameter (7 Required)
X = No Check Ball
▬ = Valve Retainer Locations

Figure 15

SUBARU 4AT PHASE II VERSION II

CONTROL AND VALVE BODY CHANGES

VALVE BODY, BOLT LOCATIONS

1 = 60 MM (2.362") (1 Required)
2 = 45 MM (1.771") (13 Required)
3 = 40 MM (1.575") (16 Required)
4 = 52 MM (2.047"), W/Nut (2 Required)

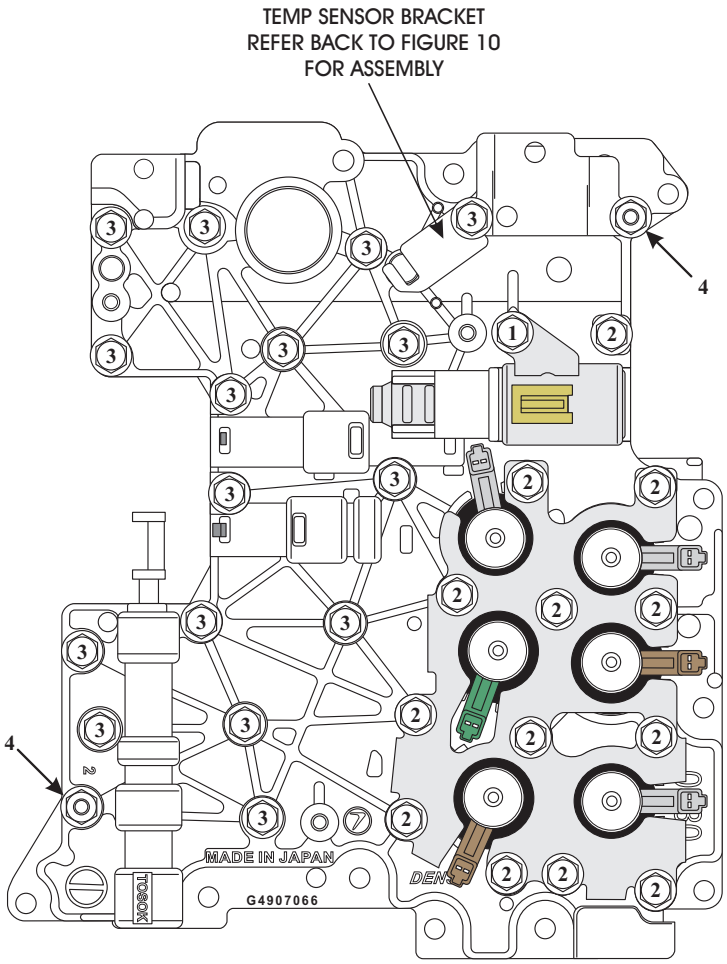


Figure 16

SUBARU 4AT PHASE ll VERSION ll

CONTROL AND VALVE BODY CHANGES

CASE AIR CHECK/OIL PASSAGE IDENTIFICATION

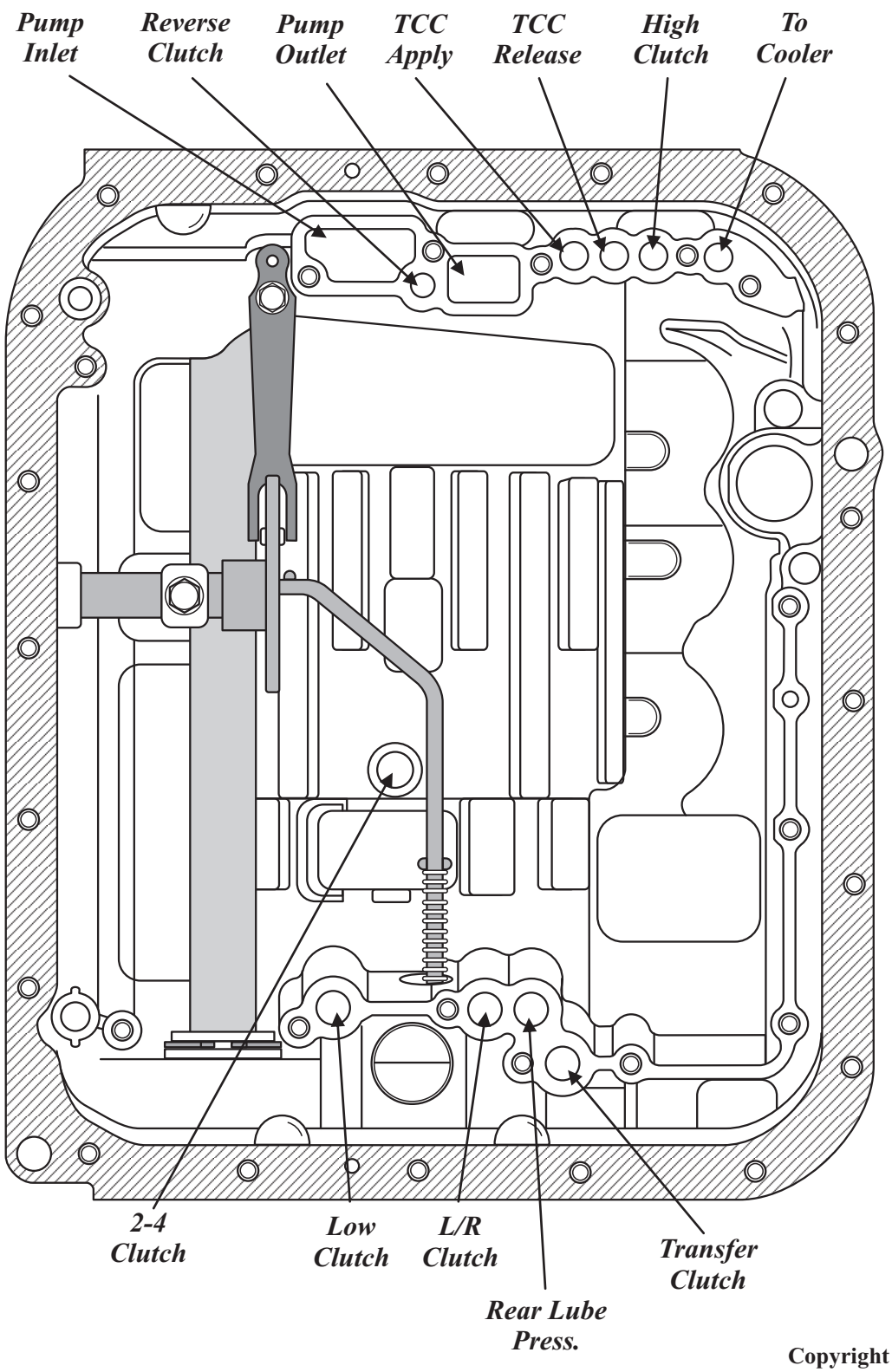


Figure 17

2004&UP SUBARU 4AT AND 5AT

2-3 FLARE AND OR HARSH DOWNSHIFTS

COMPLAINT: 2004 and up Subaru models equipped with the 4AT or 5AT transmission may exhibit a complaint of a 2-3 upshift flare and/or harsh downshifts after overhaul.

CAUSE: The cause may be that, the transmission adaptives were not reset after overhaul.

CORRECTION: To correct this condition, the vehicle will need to be reset with a factory scan tool. Subaru TSB #16-72-07 explains how to preform the A/T Learning Control Procedure with the SSMlll scan tool. This learn control must be preformed when the TCM is reprogrammed, the transmission has been overhauled or the valve body has been replaced. This can not be driven out, and must be reset by the factory scan tool. See Figure 1 for a list of vehicles that require the A/T Learning Control Procedure.

A/T LEARNING CONTROL MODEL I.D.
2004 and Later Subaru Forester Turbo 4AT
2005 and Later Subaru Forester Non-Turbo 4AT
2005 and Later Subaru Impreza Non-Turbo 4AT
2006 and Later Subaru Impreza Turbo 4AT
2005 and Later Subaru Legacy/Outback 4AT
2008 and Later Subaru Legacy/Outback 3.0 5AT
2008 and Later Subaru Legacy/Outback Turbo 5AT
2008 and Later Subaru Tribeca 3.6 5AT

Figure 1

2001-03 TOYOTA RAV4

PCM WARRANTY ENHANCEMENT

COMPLAINT: A 2001 - 2003 RAV4 may come into the shop exhibiting improper transmission operation such as a 2-3 bind-up, harsh shifts, direct clutch failure or storage of shift solenoid A or B electrical or performance codes.

CAUSE: A defective Powertrain Control Module.

CORRECTION: This can be diagnosed by simply disconnecting the TPS and driving the vehicle, if the transmission functions correctly, then the PCM is most likely at fault.
NOTE: *If the direct clutch is damaged the 2-3 shift or 3rd gear may slip, but the other complaints will be gone.*

SERVICE INFORMATION:

Originally Toyota would warranty the PCM under emissions coverage for 80,000 miles or 96 months, whichever came first.

This warranty has now been extended to 150,00 miles or 10 years from the vehicles "in service" date.

The warranty enhancement stipulates that once the Toyota dealer verifies the cause of the complaint, the PCM and/or the transaxle will be replaced at no charge.

TOYOTA

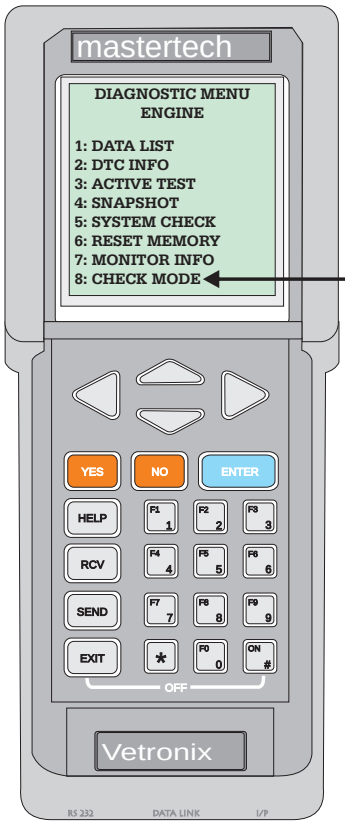
CHECK MODE

COMPLAINT: In some instances a mechanical problems exists with the transmission but a code for this problem stores intermittently. When the vehicle is brought to the shop and scanned for codes there may be none even though the vehicle exhibits symptoms.

CAUSE: Toyota uses two trip logic for code detection. Therefore, it may take two or more days for the code criteria to be met and the code is stored.

CORRECTION: Using a capable scan tool put the ECM into "Check Mode", Figure 1, which will allow the code to set after one trip, the vehicle will have to driven for a short while. These codes can be tcc slip such as P0770 or solenoid performance such as P0756 or a gear ratio error such as P0734. Once the code is retrieved be sure to take the ECM out of "Check Mode" using the scan tool to do so.

There are two reasons for stored codes to be erased, one is if the scan tool is used to switch from normal mode to check mode or vice-versa. Two is when in check mode the ignition is turned to "ACC" or" LOCK" positions, therefore it would be a good practice to record any codes that may exist.



SELECT "CHECK MODE"

Figure 1

TOYOTA U150/250

SHIFT COMPLAINTS

COMPLAINT: Before and after overhaul the transmission may experience delayed engagements, coast down shift bumps, flared shifts and/or a falling out of gear into neutral. Depending upon the severity and consistency of the problem, diagnostic service codes for gear ratio errors or solenoid performance codes may set as well.

CAUSE: There are several bore plugs in the upper valve body that must retain pressure. The type of complaint experienced is determined by which bore plug has lost its ability to retain pressure. For example, the partial hydraulic schematic in figure 1 shows the SL1 solenoid energized while in first gear. This blocks SL1 pressure from stroking the B1 control valve. When a 1-2 shift takes place (figure 2), the computer controls the rate in which the solenoid is pulsed off which in turn controls the rate in which it will stroke the B1 control valve. The B1 control valve then regulates pressure for a controlled apply of the B1 clutch. The same process occurs when making a 3-4 shift and then the solenoid needs to stay off to hold the clutch for both 4th and 5th gears.

Notice how SL1 solenoid pressure acts on the end of the B1 control valve between the valve and the bore plug. If this bore plug develops enough of a leak, SL1 signal oil will have difficulty stroking the valve causing a flare or slide 1-2, 3-4 shift or not make a shift at all. Or, the bore plug retention may be sufficient enough to allow for a decent shift yet during a cruise in 5th gear, pressure could leak past the plug un-stroking the valve and the transmission will suddenly neutralize.

In addition to the B1 Control Valve Bore Plug (figure 3 # 62), there are 3 more control valves in the U150/250 valve body which rely on good bore plug retention. They are:

The C0 Control Valve Bore Plug (figure 3 # 45) - Controls the apply of the C0 Direct Clutch during a 2-3 Shift and must hold the clutch on in 3rd, 4th and 5th.

The C1 Control Valve Bore Plug (figure 3 # 54) - Controls the apply of the C1 Forward Clutch during a garage shift into Drive and must hold the clutch on for 1st, 2nd and 3rd.

The B2 Control Valve Bore Plug (figure 3 # 34) - Controls the apply of the B2 Low-Reverse Break in Manual Low for Engine Breaking and must hold the clutch on in 1st.

With the exception of the B2 Control Valve Bore Plug, solenoid performance codes and gear ratio codes may be the result of poor bore plug pressure retention.
An indication that one or more of these plugs are beginning to leak would be bumpy shifts up and down due to the adapts adjusting for the leak. It is also recommended to inspect the secondary regulator valve bore plug as it is known to crack in the spool area of the plug (figure 3 # 58).

CORRECTION: Replace or modify the leaking bore plugs.

SERVICE INFORMATION:

U150/U250.....Superior K096
U140/U240.....Superior K097

TOYOTA U150/250

SHIFT COMPLAINTS

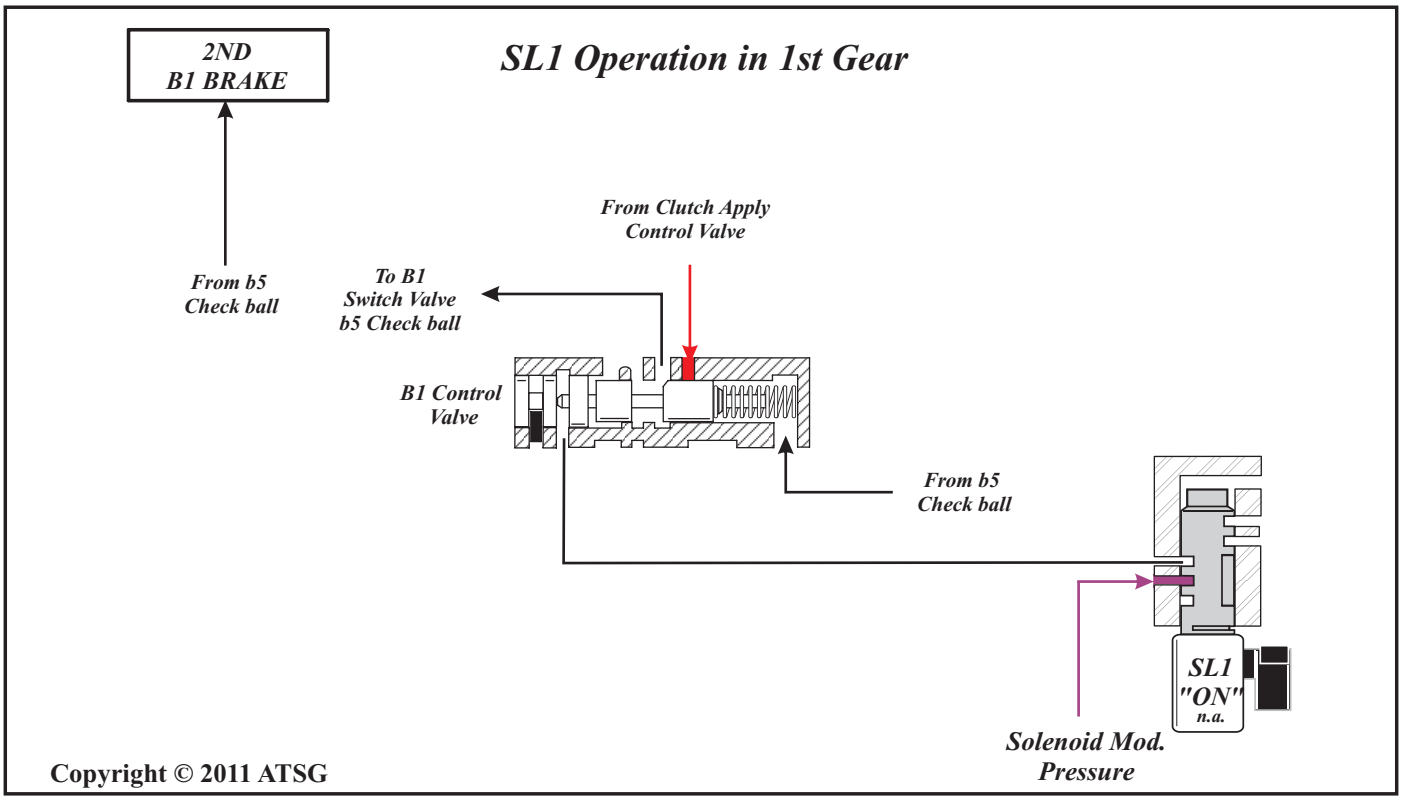


Figure 1

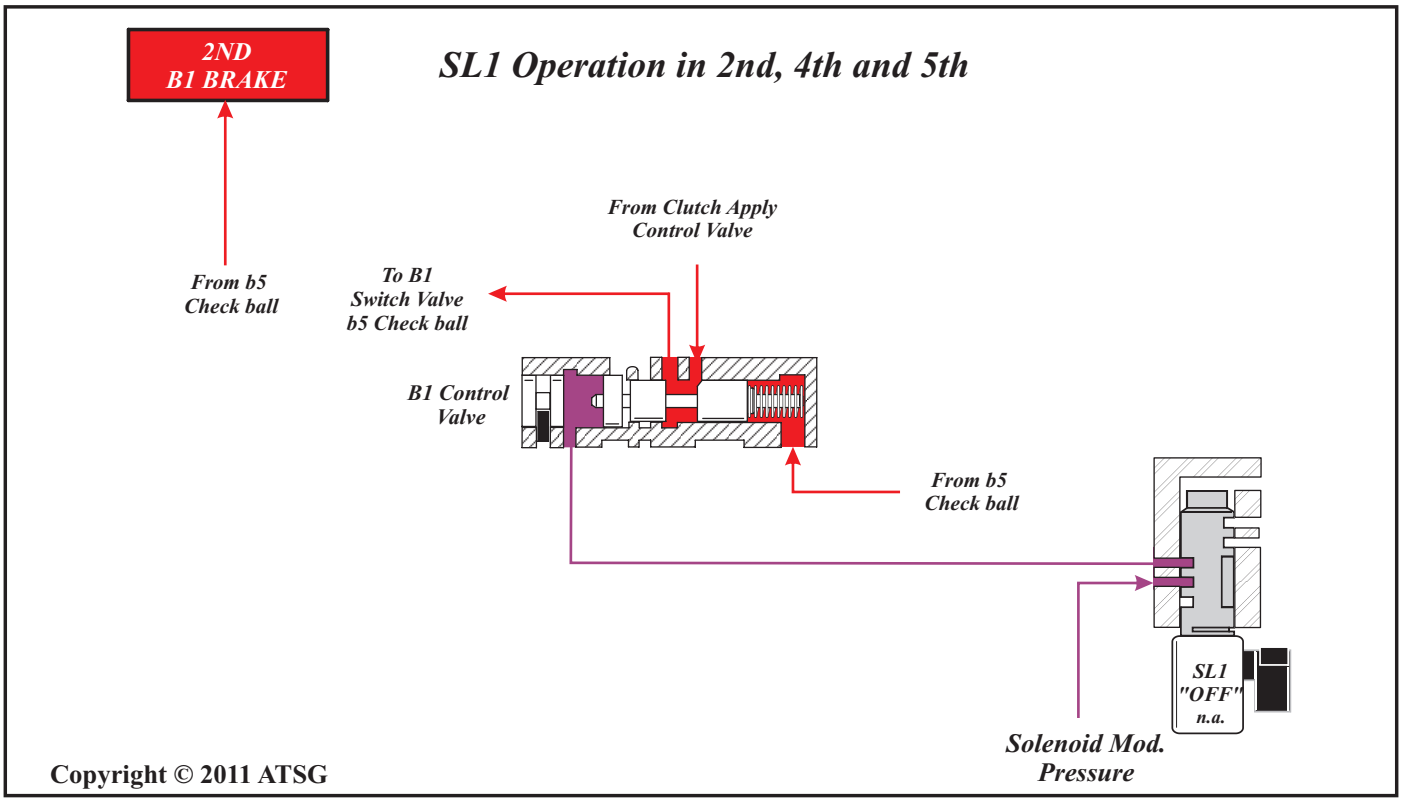
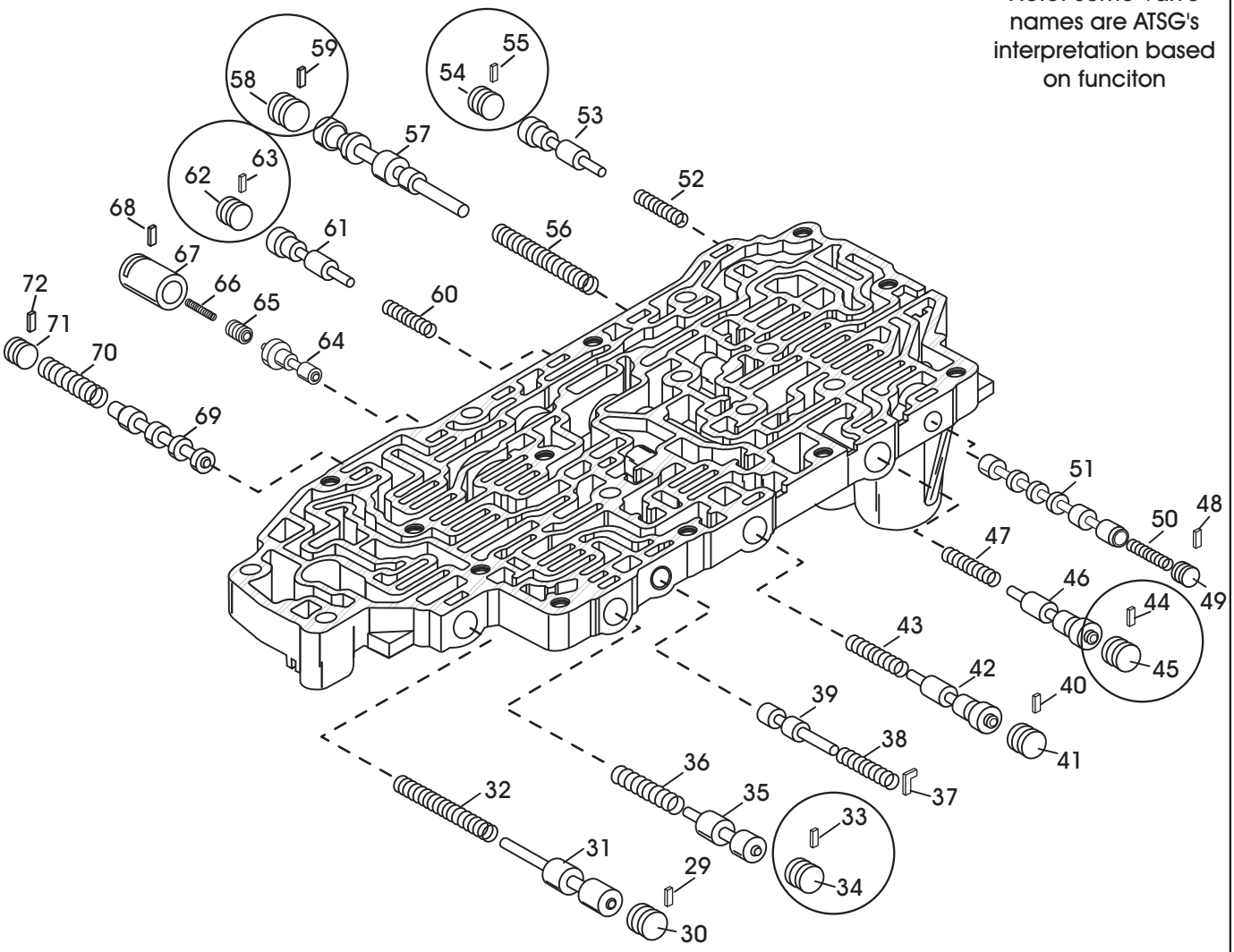


Figure 2

UPPER VALVE BODY VALVE DESCRIPTIONS

Note: Some Valve names are ATSG's interpretation based on funciton



UPPER VALVE BODY LEGEND

29. Solenoid Modulating Valve retainer
30. Solenoid Modulating Valve Bore Plug
31. Solenoid Modulating Valve
32. Solenoid Modulating Valve Spring
33. B2 Control Valve retainer
34. B2 Control Valve Bore Plug
35. B2 Control Valve
36. B2 Control Valve Spring
37. B3 Orifice Control Valve retainer
38. B3 Orifice Control Spring
39. B3 Orifice Control Valve
40. Accumulator Control Valve retainer
41. Accumulator Control Valve Bore plug
42. Accumulator Control Valve
43. Accumulator Control Valve Spring
44. C0 Control Valve retainer
45. C0 Control Valve Bore Plug
46. C0 Control Valve
47. C0 Control Valve Spring
48. Solenoid Relay Valve retainer
49. Solenoid Relay Valve Bore Plug
50. Solenoid Relay Valve Spring
51. Solenoid Relay Valve
52. C1 Control Valve Spring
53. C1 Control Valve
54. C1 Control Valve Bore Plug
55. C1 Control Valve retainer
56. Secondary Regulator Valve Spring
57. Secondary Regulator Valve
58. Secondary Regulator Valve Bore Plug
59. Secondary Regulator Valve retainer
60. B1 Control Valve Spring
61. B1 Control Valve
62. B1 Control Valve Bore Plug
63. B1 Control Valve retainer
64. Lock-up Control Valve
65. Lock-up Control Valve Plunger
66. Lock-up Control Valve Spring
67. Lock-up Control Valve Sleeve
68. Lock-up Control Valve retainer
69. Lock-up Relay Valve
70. Lock-up Relay Valve Spring
71. Lock-up Relay Valve Bore Plug
72. Lock-up Relay Valve retainer

Figure 3

TOYOTA A540/541E SERIES TRANSMISSIONS

ENGINE CHUGS COMING TO A STOP

COMPLAINT: Before or after overhaul, a Toyota equipped with the A540/541E automatic transmission exhibits a complaint of the engine lugging or chugging when braking and coming to a stop. Additionally it may be noticed that one of the Brake Lamps or Reverse Back Up Lamps are not working.

CAUSE: One cause may be a broken Brake Lamp and/or Reverse Back Up Lamp ground wire in the harness which is routed through the luggage compartment of the vehicle. The harness that includes the Brake and Reverse Back Up Lamp ground wires runs very close to the deck lid hinge. Through repeated opening and closing of the deck lid, the wire harness is stretched and/or rubs on the hinge until finally one of the wires in the harness breaks. See Figure 1 for wire harness location in the luggage compartment. If the ground wire for the Brake and/or Back Up lamps is one of the broken wires, it may cause a PCM logic issue allowing the TCC Solenoid to inadvertently be activated when the brake pedal is depressed causing the engine to chug or lug as the vehicle is braking to a stop because the Torque Converter Clutch is applied. As the vehicle is approaching a complete stop and the downshift into first gear is achieved, TCC application is uncoupled because there is no oil pressure fed to the TCC solenoid in first gear.

CORRECTION: If one of the Brake Lamps or Reverse Back Up Lamps will not illuminate, open the harness and check for broken ground wires. See Figure 2 for a typical wiring diagram that illustrates the wiring ground circuits for the Brake and Reverse Back Up Lamps.
NOTE: *1999 Toyota Avalon XLS wiring information used for the sample diagram. Since wiring diagrams, connector, splice, and ground information may vary from year to year and model to model, consult the appropriate factory manual for the vehicle you are working on.*
Repair the harness as necessary, and move or tie the harness away from the deck lid hinge to reduce possibility of future contact.

TOYOTA A540/541E SERIES TRANSMISSIONS

ENGINE CHUGS COMING TO A STOP

PARTIAL VIEW OF TYPICAL
TOYOTA LUGGAGE COMPARTMENT
NO MODEL OR YEAR SPECIFIED

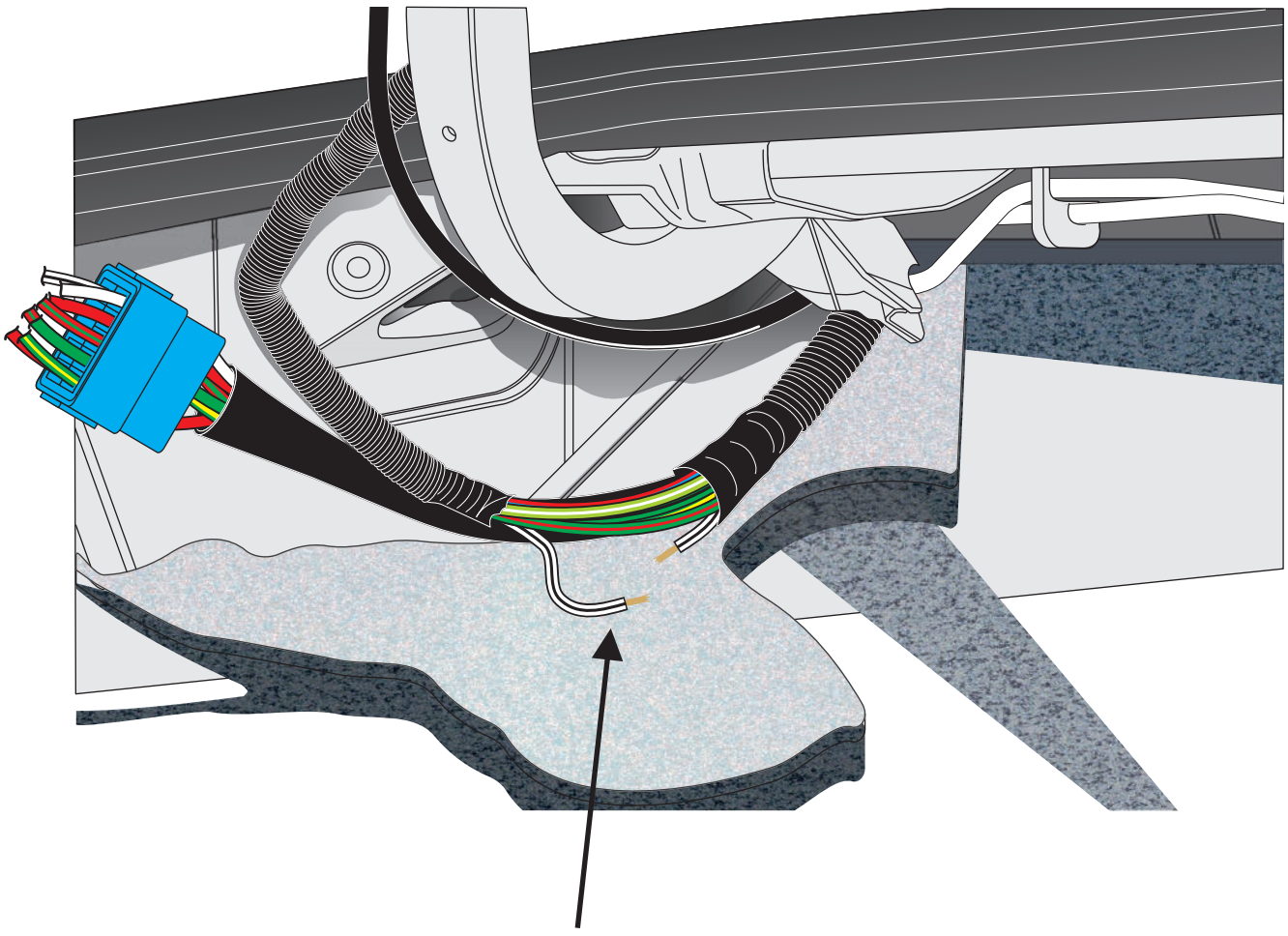
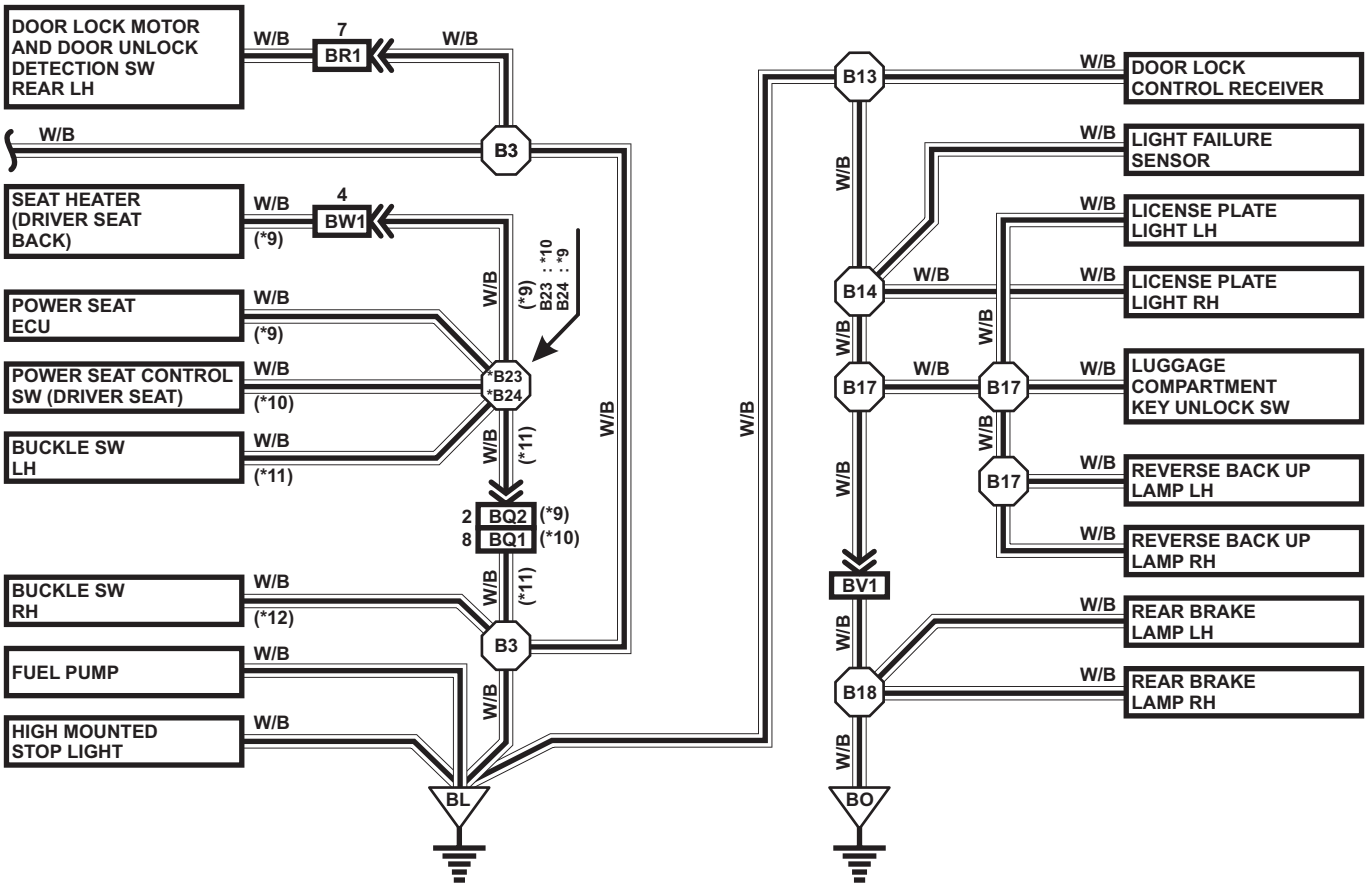


Figure 1

TYPICAL GROUND WIRING DIAGRAM
1999 TOYOTA AVALON XLS
USED FOR SAMPLE



*4 : AUTOMATIC A/C
*5 : MANUAL A/C
*6 : W/MOON ROOF
*7 : COLUMN SHIFT
*8 : FLOOR SHIFT
*9 : W/POWER SEAT W/DRIVING POSITION MEMORY
*10 : W/POWER SEAT W/O DRIVING POSITION MEMORY
*11 : W/POWER SEAT
*12 : W/O POWER SEAT

: HARNESS JOINING CONNECTOR LOCATIONS:

CONNECTOR:	LOCATION:
BR1: (White 10 Pin)	At Left Center Pillar
BQ1: (White 5 Pin)	Under Driver Front Seat
BQ2: (White 10 Pin)	Under Driver Front Seat
BV1: (White 8 Pin)	Left Side of Luggage Compartment
BW1: (White 4 Pin)	Under Driver Front Seat

: HARNESS SPLICE LOCATIONS:

CONNECTOR:	LOCATION:
B3:	In Body Harness, Left Front Door Sill
B13:	In Body Harness, Upper Left Quarter Panel
B14:	In Body Harness, Upper Left Quarter Panel
B17:	In Body Harness, Top Center of Trunk Lid
B18:	In Body Harness, Behind Left Taillight
B23:	In Body Harness, Under Driver Front Seat
B24:	In Body Harness, Under Driver Front Seat

: GROUND LOCATIONS:

GROUND:	LOCATION:
BL:	Under Driver Side Rear Pillar
BO:	Rear Center of Luggage Compartment

Figure 2

VW JETTA 09A/JF506E

NO START WITH TCM CODES

COMPLAINT: After installation of the transmission, the vehicle will not start, TCM codes P0743 for a TCC Solenoid Circuit Fault, P0753 for a Shift Solenoid "A" Circuit Fault and a P0748 for a Pressure Control Solenoid Circuit Fault.

CAUSE: The Number 2 ground wire from the battery to the transmission bell housing was not attached.

CORRECTION: Attached the Number 2 ground wire to the transmission bell housing as seen in Figure 1 and tighten to 11 ft. lbs. (15Nm).

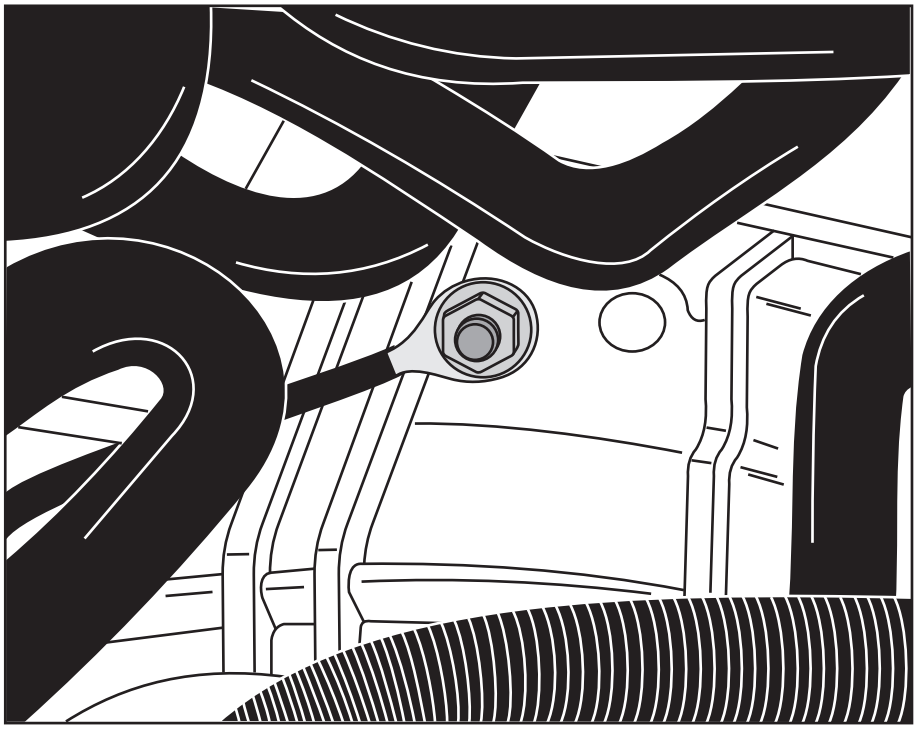


Figure 1

VOLKSWAGEN 09A/JF506E

NO UP-SHIFT COLD ONLY

COMPLAINT: Before or after an overhaul, a Volkswagen equipped with the JF506E Transmission may exhibit a complaint of no up-shift at all when cold. Vehicle takes off in 1st gear and stays in first gear until vehicle warms up for a little bit.

CAUSE: One cause may be a faulty 2-4 Brake Solenoid N283 or 2-4 Brake Timing Solenoid N282. The solenoid valves have a tendency to stick or hang up when cold. Refer to the diagram in Figure 1 for Solenoid locations for the 2-4 Brake Solenoid N283 and 2-4 Brake Timing Solenoid N282.

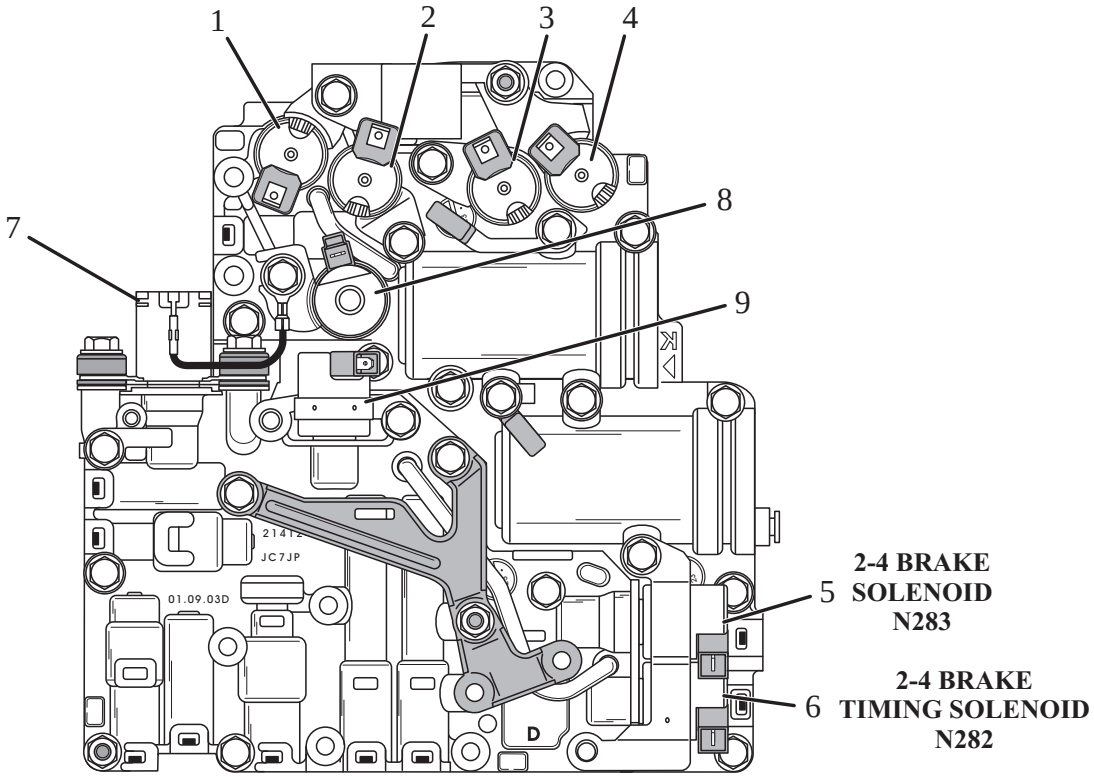
CORRECTION: Replace the 2-4 Brake Solenoid N283 and the 2-4 Brake Timing Solenoid N282.

NOTE: There has been some confusion about the internal wire colors for the Volkswagen version of the JF506E. We have included internal wire colors and their position within the internal harness connector to assist the technician in assembly and reduce the possibility of cross connecting wires. Please refer to the diagram in Figure 2 for the internal harness wire and connector colors.

VOLKSWAGEN 09A/JF506E

NO UP-SHIFT COLD ONLY

VOLKSWAGEN SOLENOID IDENTIFICATION AND LOCATIONS



Shift Solenoid Application Chart					
Solenoid	***1st***	***2nd***	***3rd***	***4th***	***5th***
N88 = SSA		***ON***			***ON***
N89 = SSB	***ON***	***ON***	***ON***		
N92 = SSC	***ON***			***ON***	***ON***

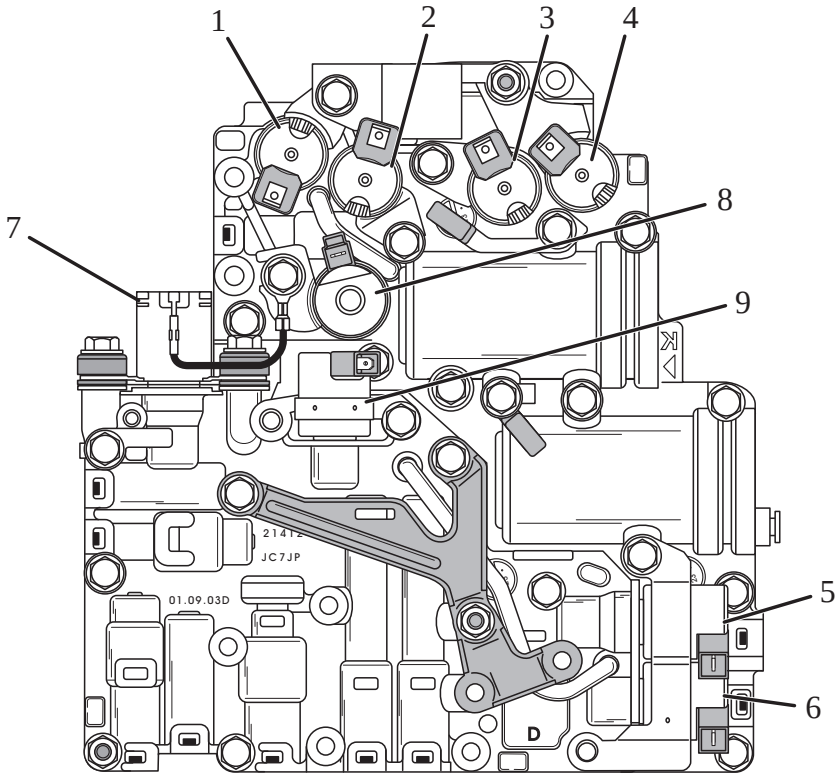
Manufacturer	**Volkswagen Solenoid Identification And Location**								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
VW Golf, GTI and Jetta	**N88 - SV1**	**N281-SV8**	**N89-SV2**	**N92-SV5**	**N283-SV10**	**N282-SV9**	**N93-SV6**	**N91-SV4**	**N90-SV3**
Description	**Shift Solenoid "A"**	**Reduction Timing Solenoid**	**Shift Solenoid "B"**	**Shift Solenoid "C"**	**2-4 Brake Solenoid**	**2-4 Brake Timing Solenoid**	**Line Pressure Solenoid**	**TCC Solenoid**	**Low Clutch Timing Solenoid**

Figure 1

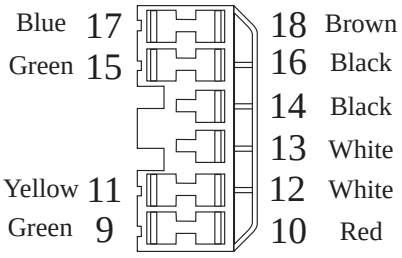
VOLKSWAGEN 09A/JF506E

NO UP-SHIFT COLD ONLY

VOLKSWAGEN INTERNAL WIRE HARNESS
SOLENOID WIRE AND CONNECTOR COLORS



View Looking Into The Internal Transaxle Harness From The Wire Side Connector Number "T10"



ITEM NUMBER	SOLENOID ID	WIRE COLOR	CONNECTOR COLOR
1	Solenoid A N88	Blue	Brown
2	Reduction Timing Sol N281	White	Brown
3	Solenoid B N89	Brown	Brown
4	Solenoid C N92	Green	Green
5	2-4 Brake Solenoid N283	White	Brown
6	2-4 Brake Timing Sol N282	Black	Black
7	Line Pressure Sol N93	Yellow	Green
8	TCC Solenoid N91	Green	Black
9	Low Clutch Timing Sol N90	Black	Black

Manufacturer	Volkswagen Solenoid Identification And Location								
	1	2	3	4	5	6	7	8	9
VW Golf, GTI and Jetta	N88 - SV1	N281-SV8	N89-SV2	N92-SV5	N283-SV10	N282-SV9	N93-SV6	N91-SV4	N90-SV3
Description	Shift Solenoid "A"	Reduction Timing Solenoid	Shift Solenoid "B"	Shift Solenoid "C"	2-4 Brake Solenoid	2-4 Brake Timing Solenoid	Line Pressure Solenoid	TCC Solenoid	Low Clutch Timing Solenoid

Figure 2

VW/AUDI/PORSCHE 09D

TORQUE CONVERTER AND VALVE BODY DIFFERENCES

There are two different types of torque converters used in the "09D" transmission that changes some of the internal parts. One is a "2 Port" design and the other is a "3 Port" design, and refers to the number of fluid passages in the Torque Converter. This difference required changes in the Pump, Turbine Shaft and Valve body. Refer to the Figures below as each difference is identified.

- ***Refer to Figures 1and 2 to see the differences between the 2 Port and 3 Port Torque Converters and a description of their function.***
- ***Refer to Figure 3 to see the differences between the Pump body and Pump cover and how to Identify the 2 Port and 3 Port types.***
- ***Refer to Figure 4 to see the differences between the turbine shaft and how to Identify the 2 Port and 3 Port types.***
- ***Refer to Figure 5 to see the Early Lower Valve Body Breakdown for both the 2 Port and 3 Port Torque Converters and note that they are the same casting number 8860 1 as shown.***
- ***Refer to Figure 6 to see the Early Lower Valve Body Breakdown Legend and spring specifications.***
- ***Refer to Figure 7 to see the Early Lower Valve Body Small parts.***
- ***Refer to Figure 8 to see the Early Upper Valve Body Breakdown. Note: Solenoid Modulating Valves A and B are known for bore wear out, can cause downshift clunk hot and/or a falling out of 5th or 6th. (Items 725 and 733)***
- ***Refer to Figure 9 to see the Early Upper Valve Body Breakdown Legend.***
- ***Refer to Figure 10 to see the Early Upper Valve Body Small parts.***
- ***Refer to Figure 11 to see the Early Upper Valve Body spring specifications.***
- ***Refer to Figure 12 to see the Early Valve Body spacer plate differences between the 2 Port and 3 Port design, and how to identify them. This is where the main difference is between the two Torque Converters.***
- ***Refer to Figure 13 to see the Early Upper Valve Body 2 Port TCC Apply circuit diagram.***
- ***Refer to Figure 14 to see the Early Upper Valve Body 3 Port TCC Apply circuit diagram.***

TORQUE CONVERTER DIFFERENCES

TCC "2 PORT" HYDRAULIC OPERATION

The "2 Port" Torque Converter functions like the traditional lock-up converter and has a single floating clutch plate.

The illustration below shows how the clutch and damper are riveted to the converter turbine. Converter fill fluid is fed into the release circuit from the TCC valve in the valve body through the center of the turbine shaft where it is routed between the converter cover and pressure plate. This fluid pressure keeps the converter clutch released and fills the converter. When the clutch is commanded on, fill fluid (release oil) is exhausted at the TCC apply valve and converter pressure applies the clutch against the converter cover.

Note: The Oil Pump, Turbine Shaft and Spacer Plate are unique to the 2 Port Converter.

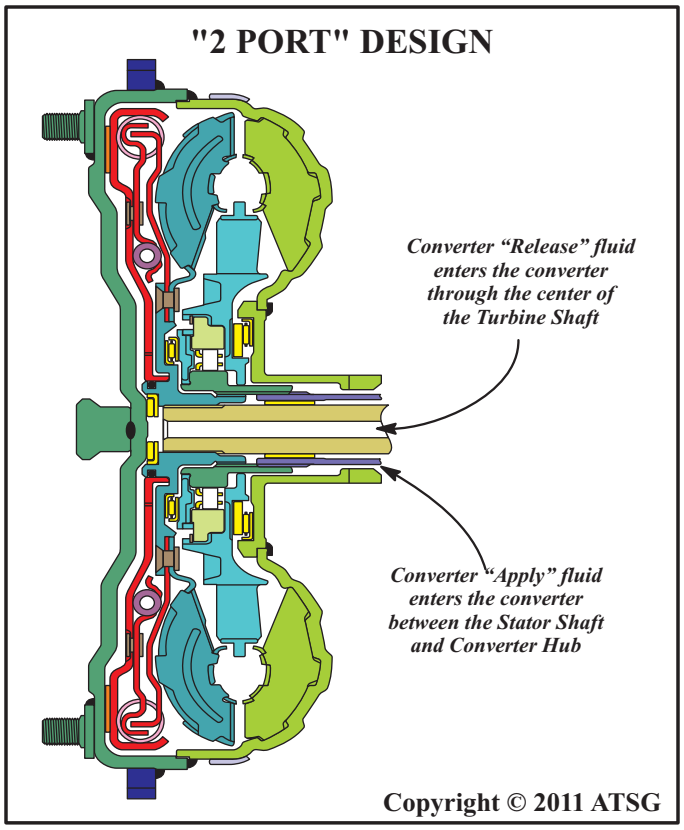


Figure 1

TCC "3 PORT" HYDRAULIC OPERATION

The "3 Port" Torque Converter is uniquely constructed in that the converter clutch apply circuit is independent to the converter in and out fluid. The converter may also contain either 1 or 2 friction plates depending on engine size.

The illustration below shows how the converter clutch apply piston contours to the flywheel side of the torque converter cover. The friction plates lug to a hub splined to the turbine shaft while the steel plates lug to the converter cover. When the clutch is commanded on, apply fluid is fed through the center of the turbine shaft and fills the area between the converter cover and piston. The piston applies the friction plates to the steel plates locking the turbine shaft to the cover.

Converter fill is fed into the converter between the converter hub that drives the pump gears and the stator shaft. The fluid's return path is between the stator shaft and turbine shaft.

Note: The Oil Pump, Turbine Shaft and Spacer Plate are unique to the 3 Port Converter.

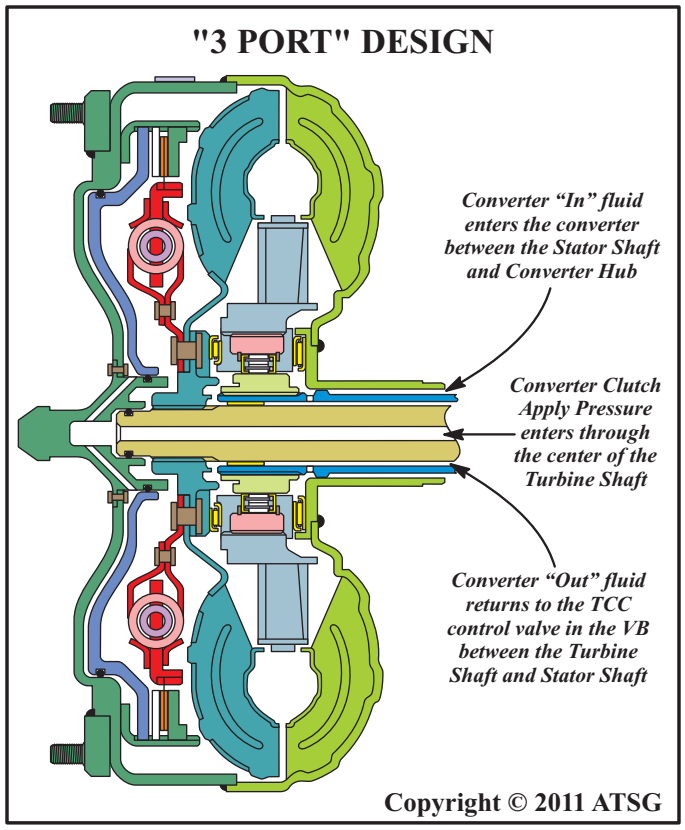


Figure 2

OIL PUMP ASSEMBLY AND TURBINE SHAFT DIFFERENCES

Oil Pump Body

The oil pump body for the 2-port converter is equipped with a caged needle bearing to support the torque converter hub and is retained with a snap ring, as shown in Figure 3. The 3-port design is equipped with the traditional bushing, and is also shown in Figure 3. Notice also that the bore diameters are different between the two.

The easiest means of visual identification is caged needle bearing, or bushing.

Note: The oil pump bodies will not interchange.

Oil Pump Cover (Stator)

The passages in the oil pump cover (stator) are different between the 2-Port version and the 3-Port version. The oil pump cover for the 2-port converter is equipped with a much shorter stator shaft than the 3-port design and has a smaller diameter spline area on the stator shaft splines, as shown in Figure 3. Notice also the holes below the spline area on the 3-port design stator shaft, which is the easiest means of visual identification.

Note: The oil pump covers will not interchange.

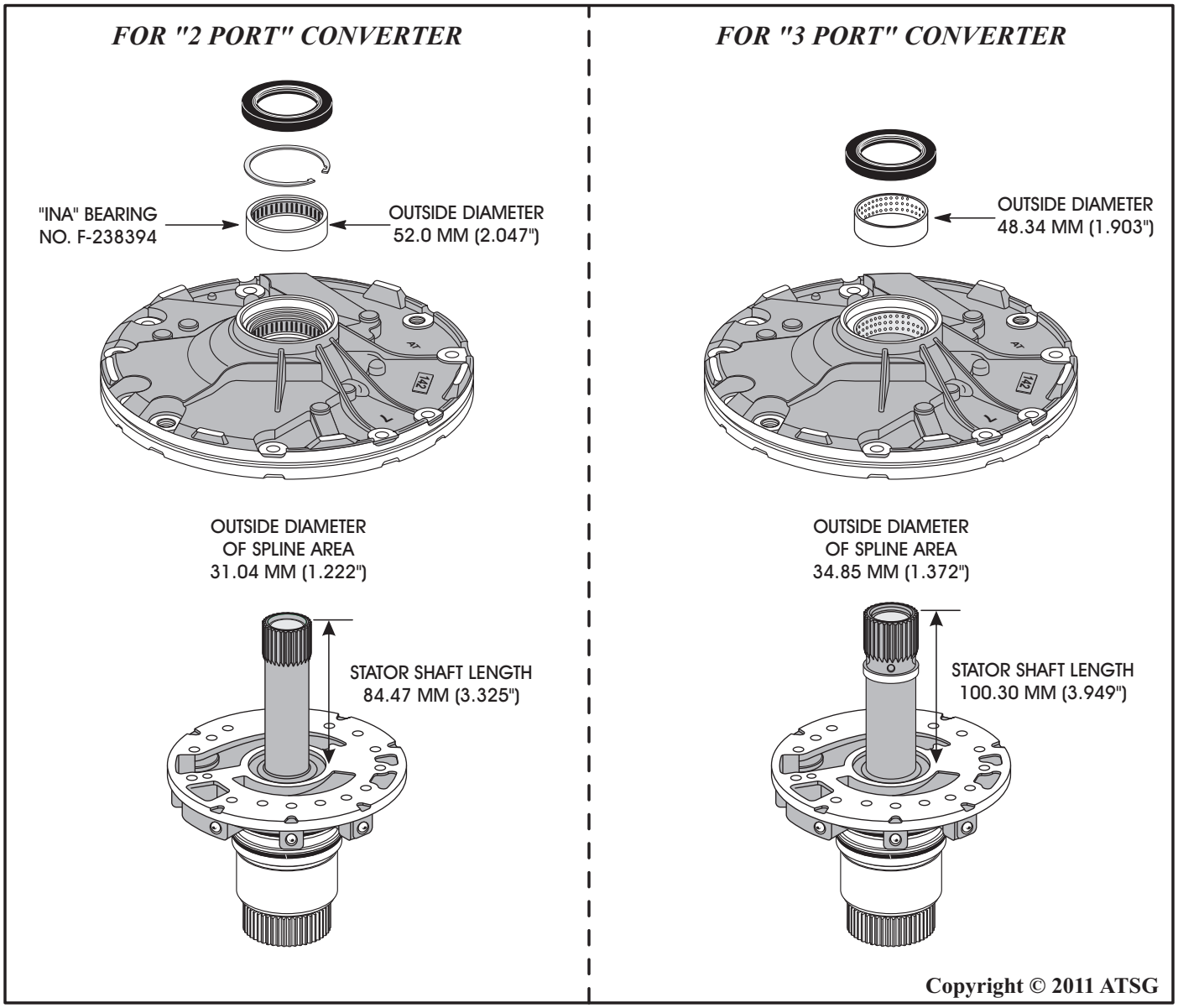


Figure 3

OIL PUMP ASSEMBLY AND TURBINE SHAFT DIFFERENCES

Turbine Shaft

There are many dimensional differences in length and diameters between the two turbine shafts, as shown in Figure 4. The easiest means of visual identification is the "2-port" design turbine shaft is equipped with 3 sealing rings with no "O" ring on pilot, and the "3-port" design turbine shaft is equipped with 4 sealing rings and an "O" ring on the pilot, as shown in Figure 4.

Note: Turbine shafts will not interchange.

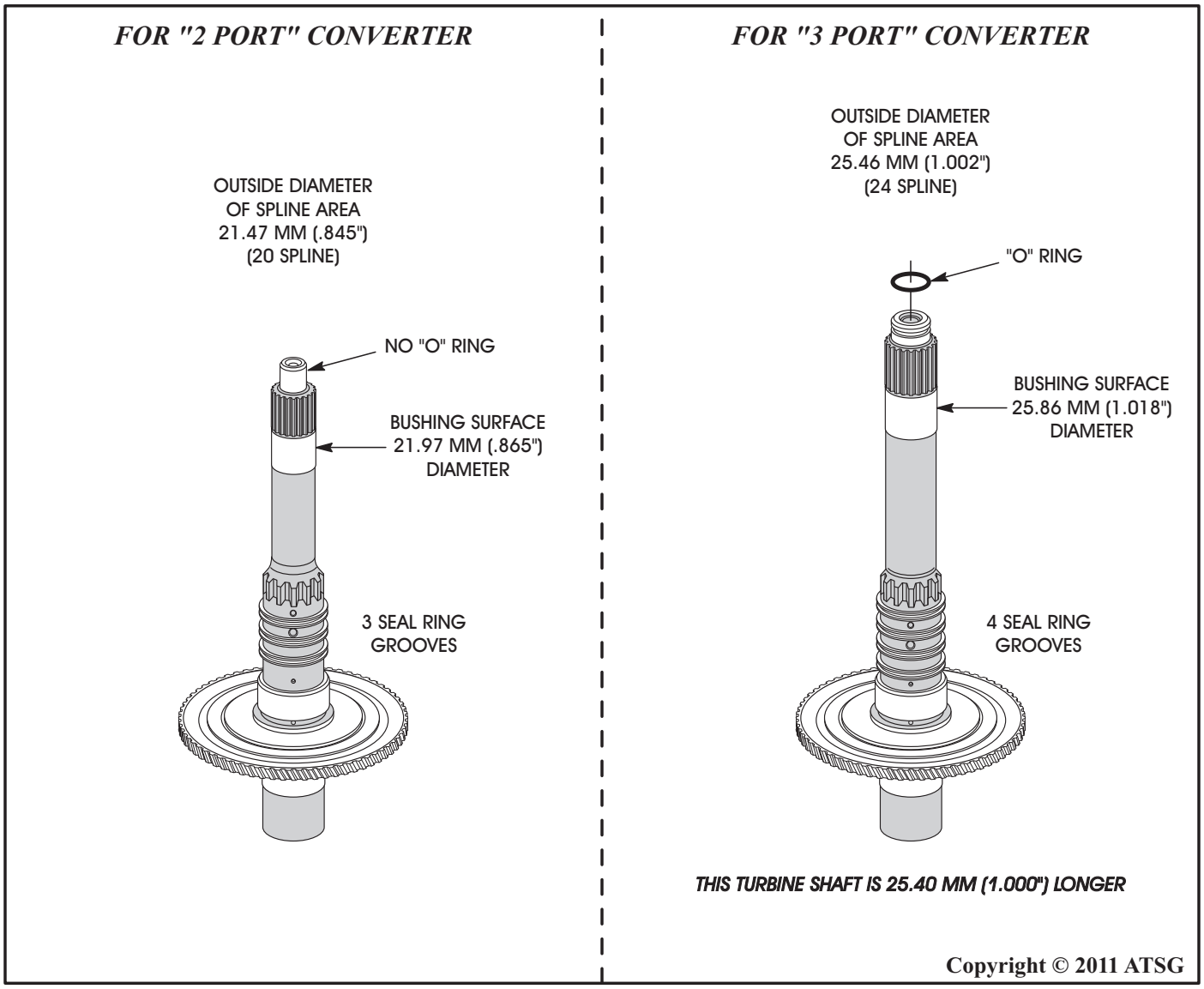


Figure 4

VW/AUDI/PORSCHE 09D

TORQUE CONVERTER AND VALVE BODY DIFFERENCES

EARLY CASTING 8860 1 "09D" LOWER VALVE BODY, EXPLODED VIEW

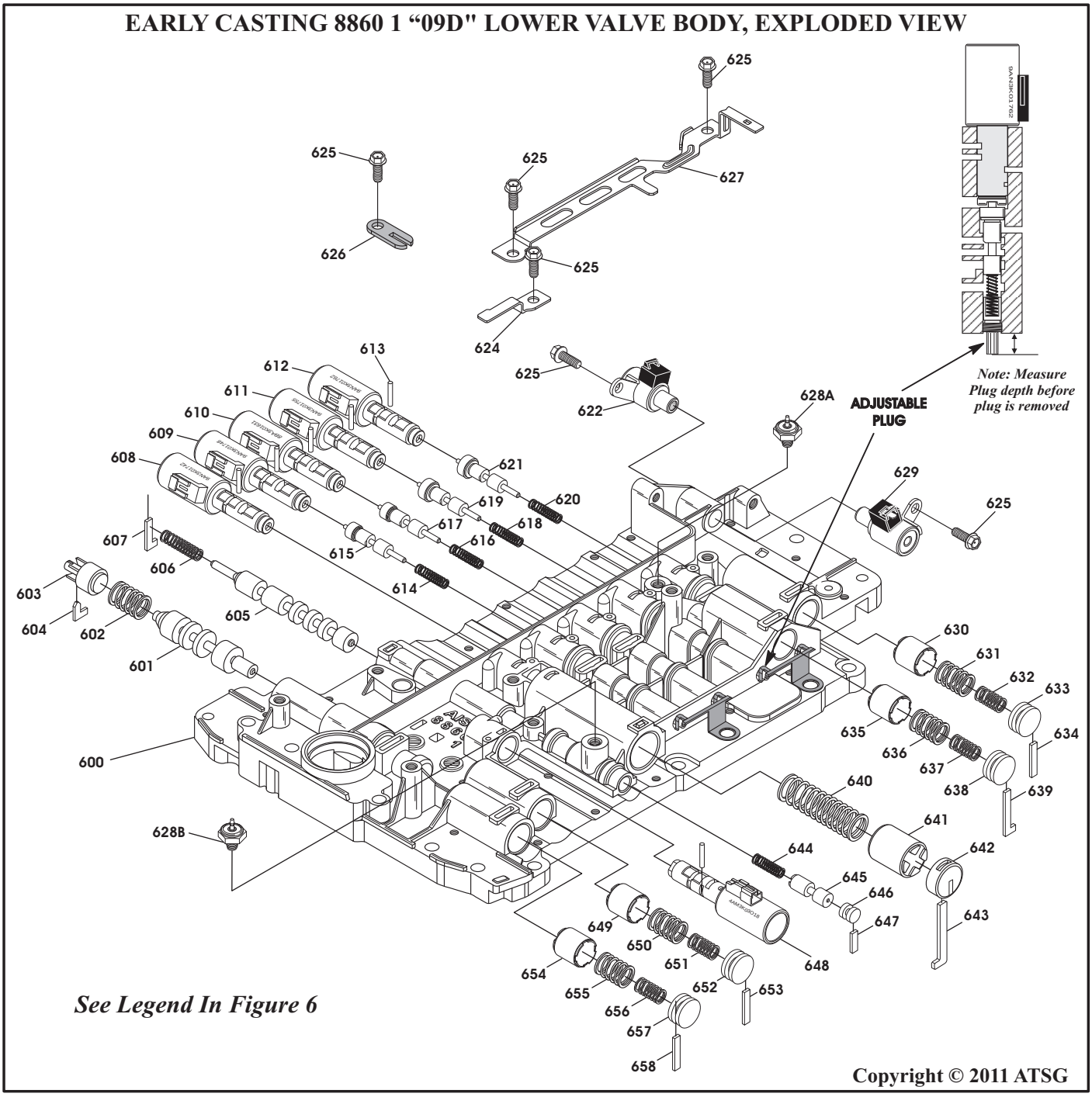


Figure 5

VW/AUDI/PORSCHE 09D

TORQUE CONVERTER AND VALVE BODY DIFFERENCES

LOWER VALVE BODY LEGEND

600 LOWER VALVE BODY CASTING.
601 SECONDARY PRESSURE REGULATOR VALVE.
602 SECONDARY PRESSURE REGULATOR VALVE SPRING (RED).
603 SECONDARY PRESSURE REGULATOR VALVE ADJUSTMENT PLUG.
604 SECONDARY PRESSURE REGULATOR VALVE ADJUSTMENT RETAINER.
605 NUMBER 1 RELAY VALVE.
606 NUMBER 1 RELAY VALVE SPRING (NONE).
607 NUMBER 1 RELAY VALVE RETAINER.
608 N93 PWM LINE PRESSURE CONTROL SOLENOID.
609 N92 PWM K1 CLUTCH CONTROL SOLENOID.
610 N90 PWM K3 CLUTCH CONTROL SOLENOID.
611 N283 PWM B1 CLUTCH CONTROL SOLENOID.
612 N282 PWM K2 CLUTCH CONTROL SOLENOID).
613 PWM SOLENOID RETAINER PINS (6 REQUIRED).
614 K1 CLUTCH REGULATOR VALVE SPRING (RED).
615 K1 CLUTCH REGULATOR VALVE.
616 K3 CLUTCH REGULATOR VALVE SPRING (NONE).
617 K3 CLUTCH REGULATOR VALVE.
618 B1 CLUTCH REGULATOR VALVE SPRING (NONE).
619 B1 CLUTCH REGULATOR VALVE.
620 K2 CLUTCH REGULATOR VALVE SPRING (NONE).
621 K2 CLUTCH REGULATOR VALVE.
622 N89 ON/OFF SOLENOID.
624 N91 PWM TCC CONTROL SOLENOID PIN RETAINER.
625 RETAINING BOLTS, 12 MM (0.472") LONG (6 REQUIRED).
626 TRANSMISSION TEMP SENSOR RETAINING BRACKET.
627 N93, N90, N92, N283, N282 SOLENOID PIN RETAINER.
628A B2 PRESSURE SWITCH (NOT USED IN ALL MODELS).
628B K1 PRESSURE SWITCH (NOT USED IN ALL MODELS).
629 N88 ON/OFF SOLENOID.
630 K2 ACCUMULATOR PISTON.
631 K2 ACCUMULATOR PISTON OUTER SPRING (NONE).
632 K2 ACCUMULATOR PISTON INNER SPRING (GRAY).
633 K2 ACCUMULATOR PISTON BORE PLUG.
634 K2 ACCUMULATOR PISTON BORE PLUG RETAINER.
635 B1 ACCUMULATOR PISTON.
636 B1 ACCUMULATOR PISTON OUTER SPRING (NONE).
637 B1 ACCUMULATOR PISTON INNER SPRING (GRAY).
638 B1 ACCUMULATOR PISTON BORE PLUG.
639 B1 ACCUMULATOR PISTON BORE PLUG RETAINER.
640 FORWARD ENGAGEMENT ACCUMULATOR SPRING (NONE).
641 FORWARD ENGAGEMENT ACCUMULATOR PISTON.
642 FORWARD ENGAGEMENT ACCUMULATOR BORE PLUG.
643 FORWARD ENGAGEMENT ACCUMULATOR BORE PLUG RETAINER.
644 K1 SWITCH VALVE SPRING (PINK).
645 K1 SWITCH VALVE.
646 K1 SWITCH VALVE BORE PLUG.
647 K1 SWITCH VALVE BORE PLUG RETAINER.
648 N91 PWM TCC CONTROL SOLENOID.
649 N93/LINE PRESSURE SOLENOID ACCUMULATOR PISTON.
650 N93 ACCUMULATOR PISTON OUTER SPRING (NONE).
651 N93 ACCUMULATOR PISTON INNER SPRING (GRAY).
652 N93 ACCUMULATOR PISTON BORE PLUG.
653 N93 ACCUMULATOR PISTON BORE PLUG RETAINER.
654 K3 ACCUMULATOR PISTON.
655 K3 ACCUMULATOR PISTON OUTER SPRING (NONE).
656 K3 ACCUMULATOR PISTON INNER SPRING (GRAY).
657 K3 ACCUMULATOR PISTON BORE PLUG.
658 K3 ACCUMULATOR PISTON BORE PLUG RETAINER.

See Legend In Figure 7

659 ROUND SCREENS (OPEN SIDE FACES SPACER PLATE) (2 REQ).
660 VALVE BODY SPACER PLATE.
661 OVAL SCREEN (OPEN SIDE FACES SPACER PLATE).
662 K3 EXHAUST CHECK VALVE, 9.96 MM (.392") DIAMETER.
663 K3 EXHAUST CHECK VALVE SPRING (WHITE).
664 REGULATED EXHAUST CHECK VALVE, 9.96 MM (.392") DIA.
665 REGULATED EXHAUST CHECK VALVE SPRING (WHITE).
666 B2 CLUTCH PLASTIC CHECK VALVE ASSEMBLY.
667 FORWARD/K2 PLASTIC CHECK VALVE ASSEMBLY.

SPECIAL NOTE: VALVE NAMES SHOWN WERE ASSIGNED BY ATSG BASED ON THEIR FUNCTION.

LOWER VALVE BODY SPRING SPECIFICATIONS

SPRING NUMBER 602 Free Length = 1.043" Spring Diameter = .623" Wire Diameter = .052" Approx Coils = 6 (RED)	SPRING NUMBER 620 Free Length = .860" Spring Diameter = .235" Wire Diameter = .032" Approx Coils = 13 (NONE)
SPRING NUMBER 606 Free Length = 1.560" Spring Diameter = .355" Wire Diameter = .025" Approx Coils = 13 (NONE)	SPRINGS 631, 636, 650, 655, Free Length = 1.085" Spring Diameter = .628" Wire Diameter = .082" Approx Coils = 6.5 (NONE)
SPRING NUMBER 614 Free Length = 1.018" Spring Diameter = .235" Wire Diameter = .025" Approx Coils = 14 (RED)	SPRINGS 632, 637, 651, 656, Free Length = 1.093" Spring Diameter = .430" Wire Diameter = .062" Approx Coils = 8.5 (GRAY)
SPRING NUMBER 616 Free Length = .860" Spring Diameter = .235" Wire Diameter = .032" Approx Coils = 13 (NONE)	SPRING NUMBER 640 Free Length = 2.456" Spring Diameter = .775" Wire Diameter = .075" Approx Coils = 10 (NONE)
SPRING NUMBER 618 Free Length = .860" Spring Diameter = .235" Wire Diameter = .032" Approx Coils = 13 (NONE)	SPRING NUMBER 644 Free Length = 1.090" Spring Diameter = .280" Wire Diameter = .025" Approx Coils = 11 (PINK)

LOWER VALVE BODY SPRING SPECIFICATIONS SMALL PARTS, WORM TRACK SIDE

SPRING NO. 663 Free Length = .600" Spring Diameter = .248" Wire Diameter = .023" Approx Coils = 11 (WHITE)	SPRING NO. 665 Free Length = .600" Spring Diameter = .248" Wire Diameter = .023" Approx Coils = 11 (WHITE)

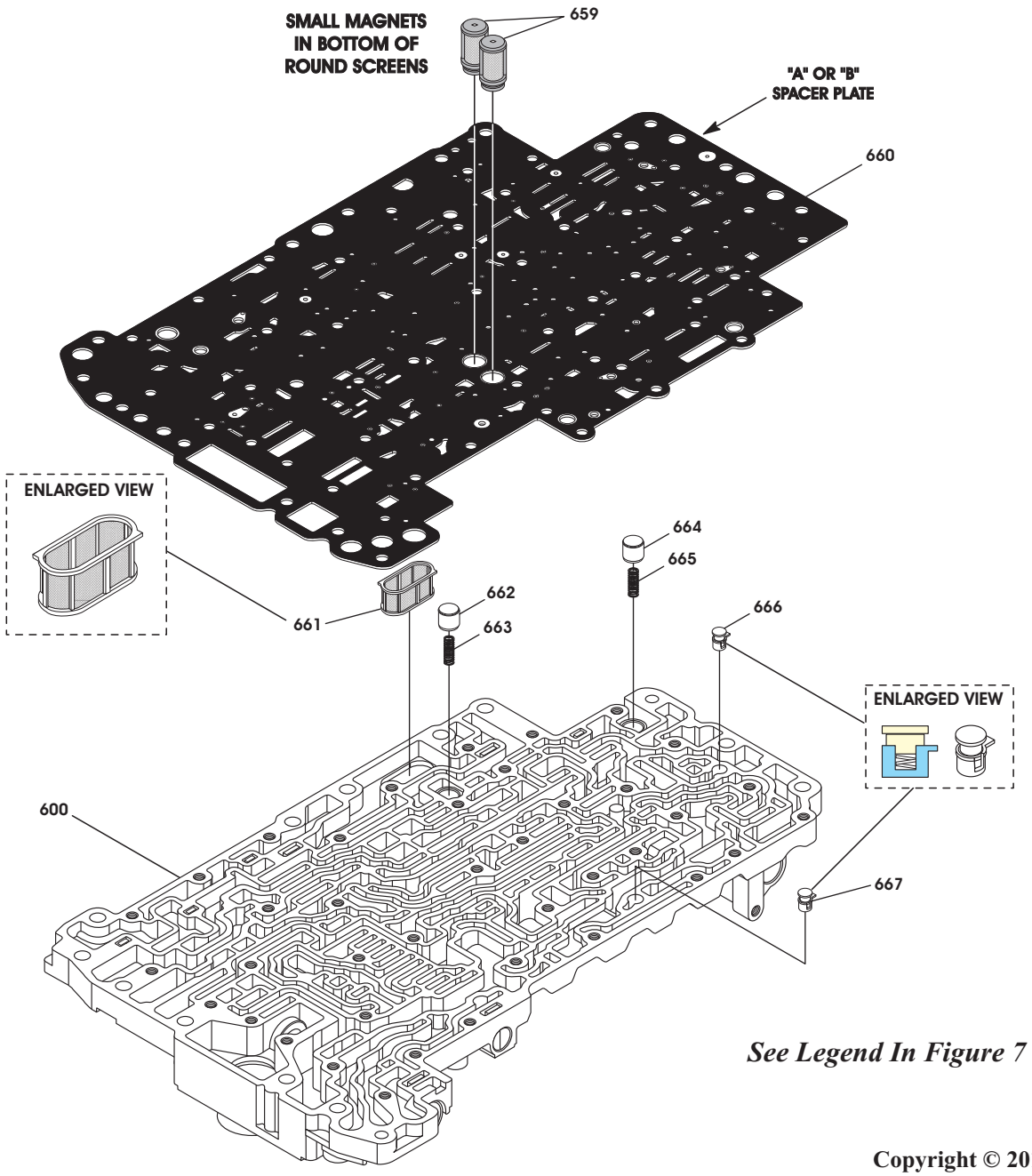
NONE = Spring Not Colored

Figure 6

VW/AUDI/PORSCHE 09D

TORQUE CONVERTER AND VALVE BODY DIFFERENCES

EARLY CASTING 8860 1 "09D" LOWER VALVE BODY SMALL PARTS, EXPLODED VIEW



See Legend In Figure 7

Figure 7

EARLY CASTING 8860 1 "09D" UPPER VALVE BODY EXPLODED VIEW

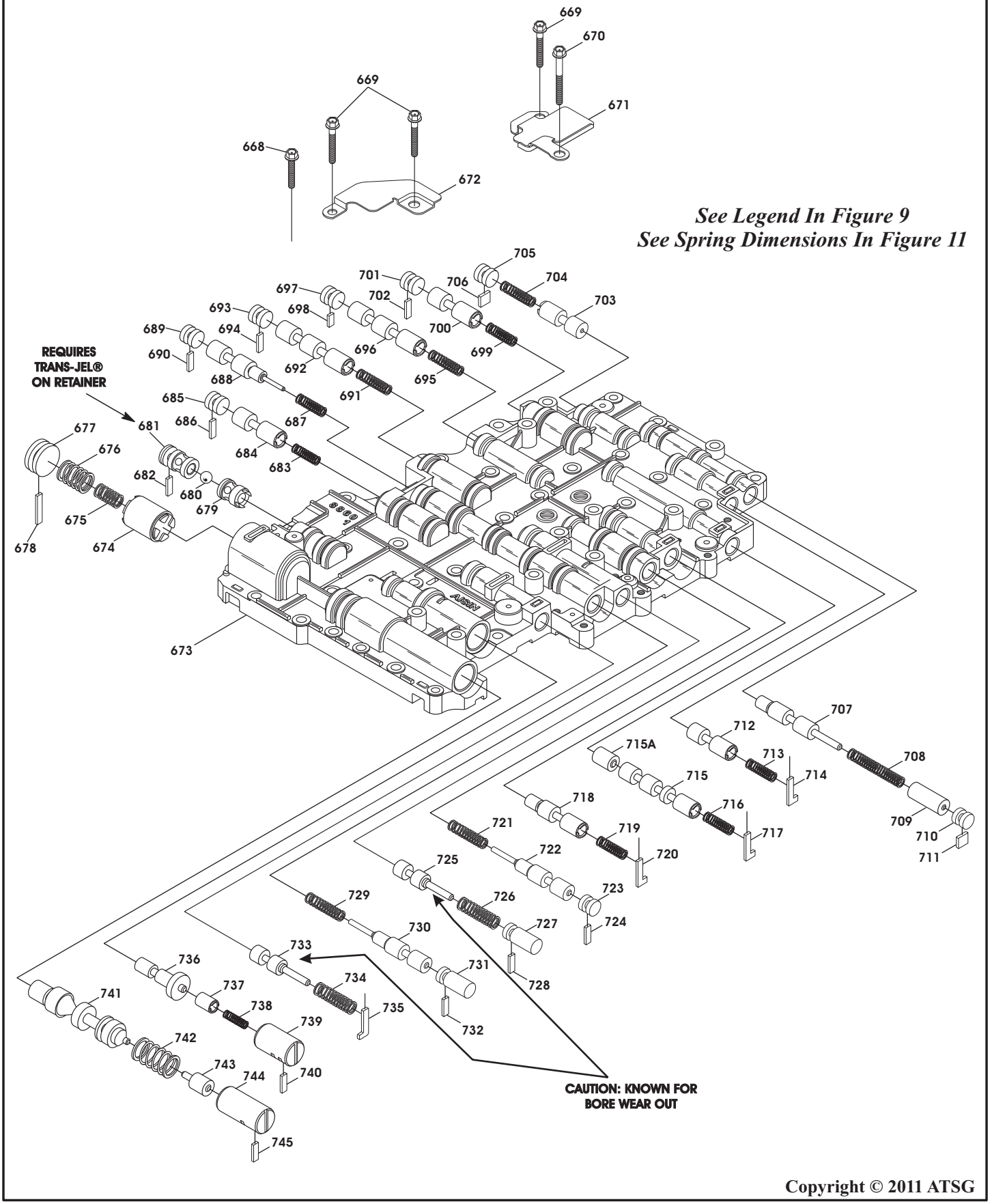


Figure 8

VW/AUDI/PORSCHE 09D

TORQUE CONVERTER AND VALVE BODY DIFFERENCES

UPPER VALVE BODY LEGEND

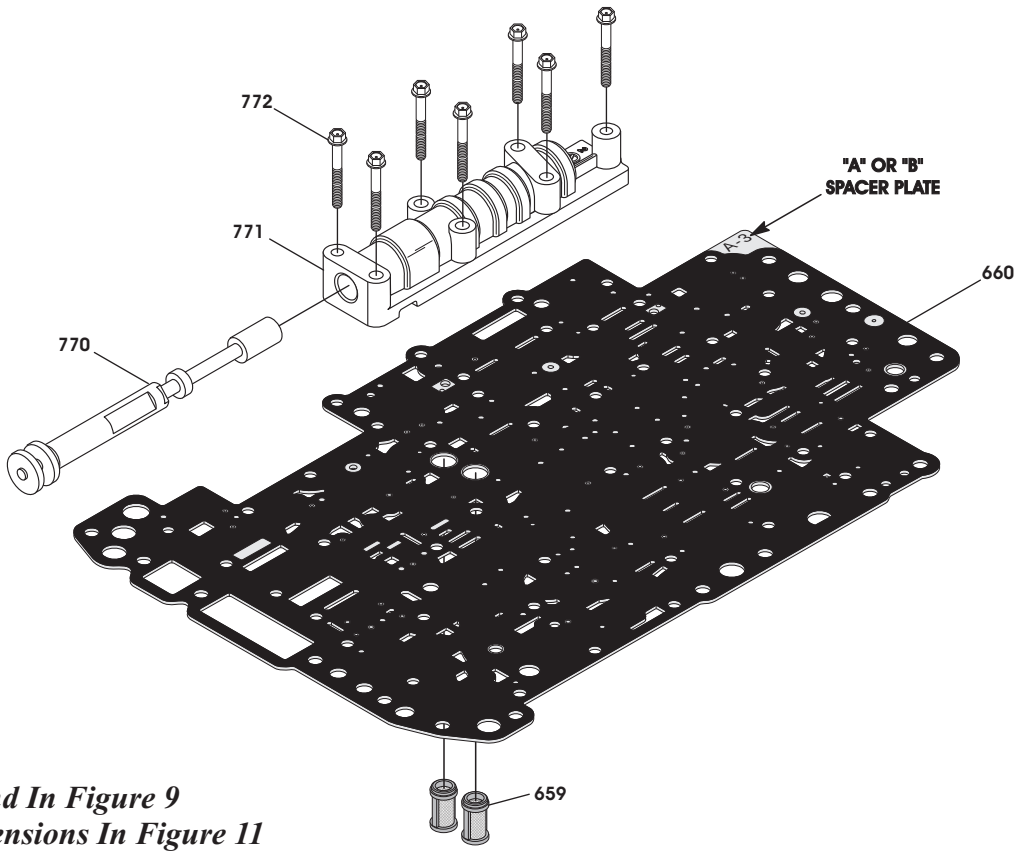
659 ROUND SCREENS (2 REQUIRED).
660 VALVE BODY SPACER PLATE.
668 UPPER VB TO LOWER VB BOLT, 22 MM (.866") (4 REQUIRED).
669 UPPER VB TO LOWER VB BOLT, 28 MM (1.102") (25 REQUIRED).
670 UPPER VB TO LOWER VB BOLT, 40 MM (1.574") (10 REQUIRED).
671 OIL BAFFLE NUMBER 2.
672 OIL BAFFLE NUMBER 1.
673 UPPER VALVE BODY CASTING.
674 K1 ACCUMULATOR PISTON.
675 K1 ACCUMULATOR PISTON INNER SPRING (LT BLUE).
676 K1 ACCUMULATOR PISTON OUTER SPRING (NONE).
677 K1 ACCUMULATOR PISTON BORE PLUG.
678 K1 ACCUMULATOR PISTON BORE PLUG RETAINER.
679 K3/B1 THREE WAY INNER SHUTTLE BALL SEAT.
680 SHUTTLE BALL (.250" DIAMETER STEEL).
681 K3/B1 THREE WAY OUTER SHUTTLE BALL SEAT.
682 K3/B1 THREE WAY OUTER SHUTTLE BALL SEAT RETAINER.
683 N283 SWITCH VALVE SPRING (PINK).
684 N283 SWITCH VALVE.
685 N283 SWITCH VALVE BORE PLUG.
686 N283 SWITCH VALVE BORE PLUG RETAINER.
687 N90 SWITCH VALVE SPRING (ORANGE).
688 N90 SWITCH VALVE.
689 N90 SWITCH VALVE BORE PLUG.
690 N90 SWITCH VALVE BORE PLUG RETAINER.
691 K3 CONTROL VALVE SPRING (PINK).
692 K3 CONTROL VALVE.
693 K3 CONTROL VALVE BORE PLUG.
694 K3 CONTROL VALVE BORE PLUG RETAINER.
695 B1 CONTROL VALVE SPRING (PINK).
696 B1 CONTROL VALVE.
697 B1 CONTROL VALVE BORE PLUG.
698 B1 CONTROL VALVE BORE PLUG RETAINER.
699 K2 CONTROL VALVE SPRING (PINK).
700 K2 CONTROL VALVE.
701 K2 CONTROL VALVE BORE PLUG.
702 K2 CONTROL VALVE BORE PLUG RETAINER.
703 B2 SWITCH VALVE (MANUAL "1") VALVE.
704 B2 SWITCH VALVE (MANUAL "1") SPRING (WHITE).
705 B2 SWITCH VALVE (MANUAL "1") BORE PLUG.
706 B2 SWITCH VALVE (MANUAL "1") BORE PLUG RETAINER.
707 B2 REGULATOR VALVE.
708 B2 REGULATOR VALVE SPRING (VIOLET).
709 B2 REGULATOR PLUNGER.
710 B2 REGULATOR VALVE BORE PLUG.
711 B2 REGULATOR VALVE BORE PLUG RETAINER.
712 PRESSURE MODIFIER VALVE.
713 PRESSURE MODIFIER SPRING (WHITE).
714 PRESSURE MODIFIER RETAINER.
715A NUMBER 2 RELAY VALVE PLUG.
715 NUMBER 2 RELAY VALVE.
716 NUMBER 2 RELAY VALVE SPRING (WHITE).
717 NUMBER 2 RELAY VALVE RETAINER.
718 B2 PORT CONTROL VALVE.
719 B2 PORT CONTROL VALVE SPRING (WHITE).
720 B2 PORT CONTROL VALVE RETAINER.
721 B1 RELAY VALVE SPRING (ORANGE).
722 B1 RELAY VALVE.
723 B1 RELAY VALVE BORE PLUG.
724 B1 RELAY VALVE BORE PLUG RETAINER.
725 SOLENOID MODULATOR VALVE B VALVE.**
726 SOLENOID MODULATOR VALVE B VALVE SPRING (LT BLUE).
727 SOLENOID MODULATOR VALVE B VALVE BORE PLUG.
728 SOLENOID MODULATOR VALVE B VALVE BORE PLUG RETAINER.
729 K3 RELAY VALVE SPRING (ORANGE).
730 K3 RELAY VALVE.
731 K3 RELAY VALVE BORE PLUG.
732 K3 RELAY VALVE BORE PLUG RETAINER.
733 SOLENOID MODULATOR VALVE A VALVE.**
734 SOLENOID MODULATOR VALVE A SPRING (LT BLUE).
735 SOLENOID MODULATOR VALVE A RETAINER.
736 TCC APPLY CONTROL VALVE.
737 TCC APPLY CONTROL BOOST VALVE.
738 TCC APPLY CONTROL BOOST VALVE SPRING (TAN).
739 TCC APPLY CONTROL BOOST VALVE SLEEVE.
740 TCC APPLY CONTROL BOOST VALVE SLEEVE RETAINER.
741 PRIMARY PRESSURE REGULATOR VALVE.
742 PRIMARY PRESSURE REGULATOR VALVE SPRING (PINK).
743 LINE PRESSURE BOOST VALVE.
744 LINE PRESSURE BOOST VALVE SLEEVE.
745 LINE PRESSURE BOOST VALVE SLEEVE RETAINER.
746 LUBE CHECK VALVE SPRING (PINK).
747 LUBE CHECK VALVE, 9.98 MM (.392") DIAMETER.
748 SECONDARY REG. VALVE PLASTIC CHECK VALVE ASSEMBLY.
749 TCC APPLY LIMIT CHECK VALVE SPRING (VIOLET).
750 TCC APPLY LIMIT CHECK VALVE, 9.98 MM (.392") DIAMETER.
751 N93 SOLENOID LIMIT CHECK VALVE SPRING (LT. BLUE).
752 N93 SOLENOID LIMIT CHECK VALVE, 11.98 MM (.471") DIAMETER.
753 REVERSE LIMIT CHECK VALVE SPRING (WHITE).
754 REVERSE LIMIT CHECK VALVE, 9.98 MM (.392") DIAMETER.
755 REVERSE ORIFICE PLASTIC CHECK BALL, 5.5 MM (.217") DIA.
756 LINE PRESSURE LIMIT CHECK VALVE SPRING (NONE).
757 LINE PRESSURE LIMIT CHECK VALVE, 9.98 MM (.392") DIAMETER.
758 REGULATED EXHAUST CHECK VALVE SPRING (WHITE).
759 REGULATED EXHAUST CHECK VALVE, 9.98 MM (.392") DIAMETER.
760 B2 "SMALL" CAVITY PLASTIC CHECK BALL, 5.5 MM (.217") DIA.
761 LUBE RELIEF CHECK VALVE, 9.98 MM (.392") DIAMETER.
762 LUBE RELIEF CHECK VALVE SPRING (RED).
763 K2 CLUTCH PLASTIC CHECK VALVE ASSEMBLY.
764 B1 CLUTCH PLASTIC CHECK VALVE ASSEMBLY.
765 K3 CLUTCH PLASTIC CHECK VALVE ASSEMBLY.
766 K1 CLUTCH PLASTIC CHECK VALVE ASSEMBLY.
767 DRIVE RANGE ORIFICE PLASTIC CHECK BALL, 6.35 MM (.250") DIA.
768 COOLER CHECK VALVE.
769 COOLER CHECK VALVE SPRING (TAN).
770 MANUAL VALVE.
771 MANUAL VALVE BODY CASTING.
772 MANUAL VALVE BODY RETAINING BOLT, 38 MM (1.496") (7 REQ).

NONE = Spring Not Colored

SPECIAL NOTE: VALVE NAMES SHOWN WERE ASSIGNED BY ATSG BASED ON THEIR FUNCTION.
***** = These Valves are known for bore wear out.***

Figure 9

EARLY CASTING 8860 1 "09D" UPPER VALVE BODY SMALL PARTS, EXPLODED VIEW



See Legend In Figure 9
See Spring Dimensions In Figure 11

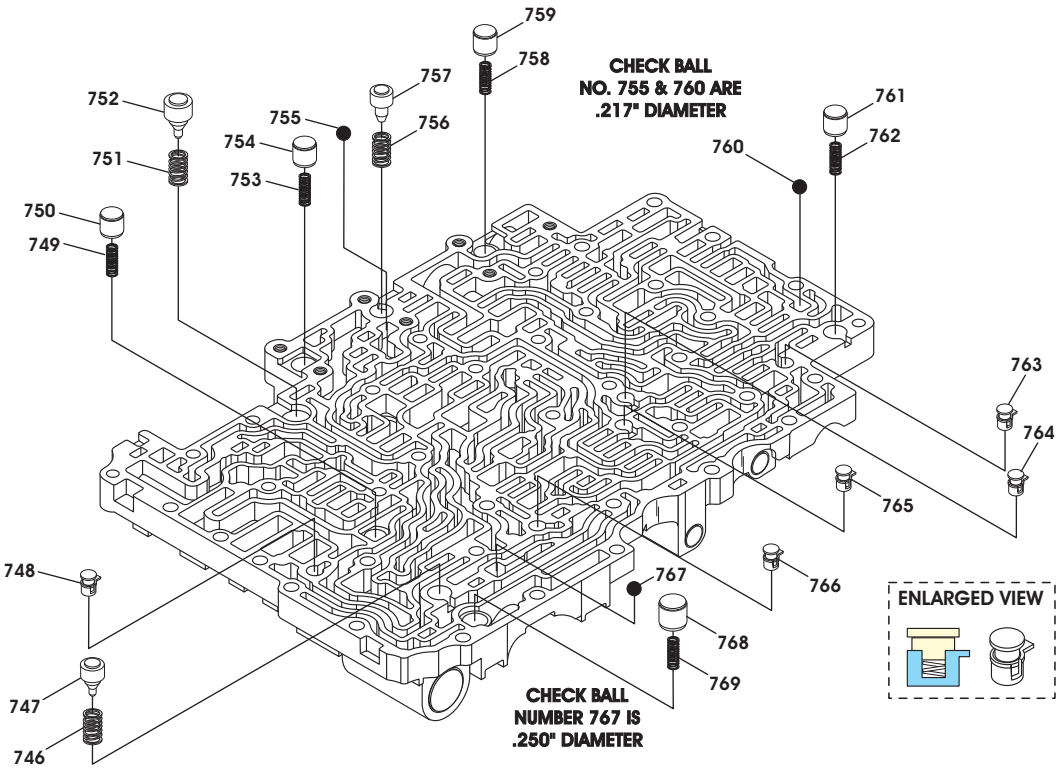


Figure 10

VW/AUDI/PORSCHE 09D

TORQUE CONVERTER AND VALVE BODY DIFFERENCES

Spring Specifications For Figure 8

UPPER VALVE BODY SPRING SPECIFICATIONS

SPRING NUMBER 675
Free Length = 1.070"
Spring Diameter = .425"
Wire Diameter = .062"
Approx Coils = 9 (LT BLUE)

SPRING NUMBER 676
Free Length = 1.090"
Spring Diameter = .625"
Wire Diameter = .080"
Approx Coils = 6 (NONE)

SPRING NUMBER 683, 691, 695, AND 699.
Free Length = 1.080"
Spring Diameter = .279"
Wire Diameter = .024"
Approx Coils = 10 (PINK)

SPRING NUMBER 687, 721, 729,
Free Length = 1.130"
Spring Diameter = .255"
Wire Diameter = .027"
Approx Coils = 13 (ORANGE)

SPRING NUMBER 704, 713, 716, AND 719.
Free Length = 1.130"
Spring Diameter = .297"
Wire Diameter = .030"
Approx Coils = 12 (WHITE)

SPRING NUMBER 708
Free Length = 1.280"
Spring Diameter = .275"
Wire Diameter = .027"
Approx Coils = 21 (VIOLET)

SPRING NUMBER 738
Free Length = .750"
Spring Diameter = .220"
Wire Diameter = .028"
Approx Coils = 12 (TAN)

SPRING NUMBER 726, 734,
Free Length = 1.425"
Spring Diameter = .386"
Wire Diameter = .055"
Approx Coils = 13 (LT BLUE)

SPRING NUMBER 742
Free Length = 1.235"
Spring Diameter = .545"
Wire Diameter = .048"
Approx Coils = 6 (PINK)

Spring Specifications For Figure 10

UPPER VALVE BODY SPRING SPECIFICATIONS
SMALL PARTS, WORM TRACK SIDE

SPRING NO. 746
Free Length = .685"
Spring Diameter = .346"
Wire Diameter = .042"
Approx Coils = 6 (PINK)

SPRING NO. 749
Free Length = .610"
Spring Diameter = .249"
Wire Diameter = .029"
Approx Coils = 7 (VIOLET)

SPRING NO. 751
Free Length = .700"
Spring Diameter = .407"
Wire Diameter = .035"
Approx Coils = 6 (LT. BLUE)

SPRING NO. 753
Free Length = .600"
Spring Diameter = .248"
Wire Diameter = .023"
Approx Coils = 11 (WHITE)

SPRING NO. 756
Free Length = .430"
Spring Diameter = .373"
Wire Diameter = .050"
Approx Coils = 4 (NONE)

SPRING NO. 758
Free Length = .600"
Spring Diameter = .248"
Wire Diameter = .023"
Approx Coils = 11 (WHITE)

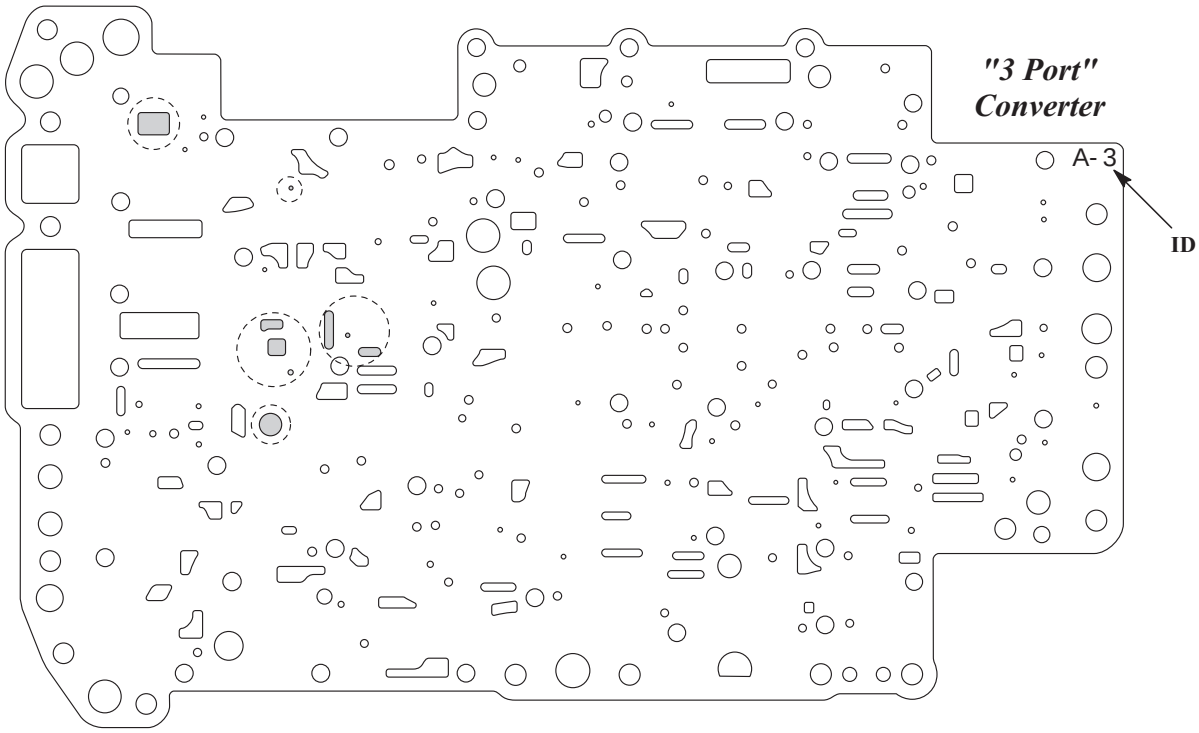
SPRING NO. 762
Free Length = .625"
Spring Diameter = .250"
Wire Diameter = .033"
Approx Coils = 8 (RED)

SPRING NO. 769
Free Length = .672"
Spring Diameter = .274"
Wire Diameter = .019"
Approx Coils = 10 (TAN)

NONE = Spring Not Colored

Figure 11

EARLY CASTING 8860 1 "09D" SPACER PLATE DIFFERENCES



These Spacer Plates DO NOT interchange

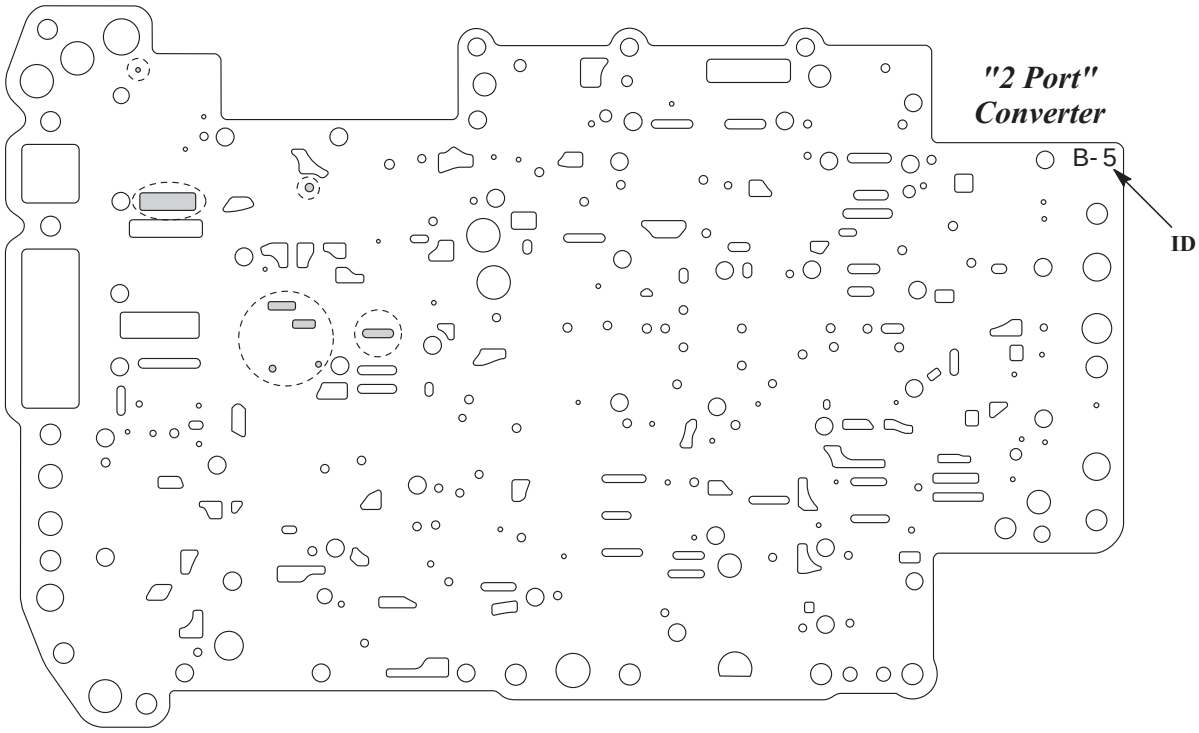
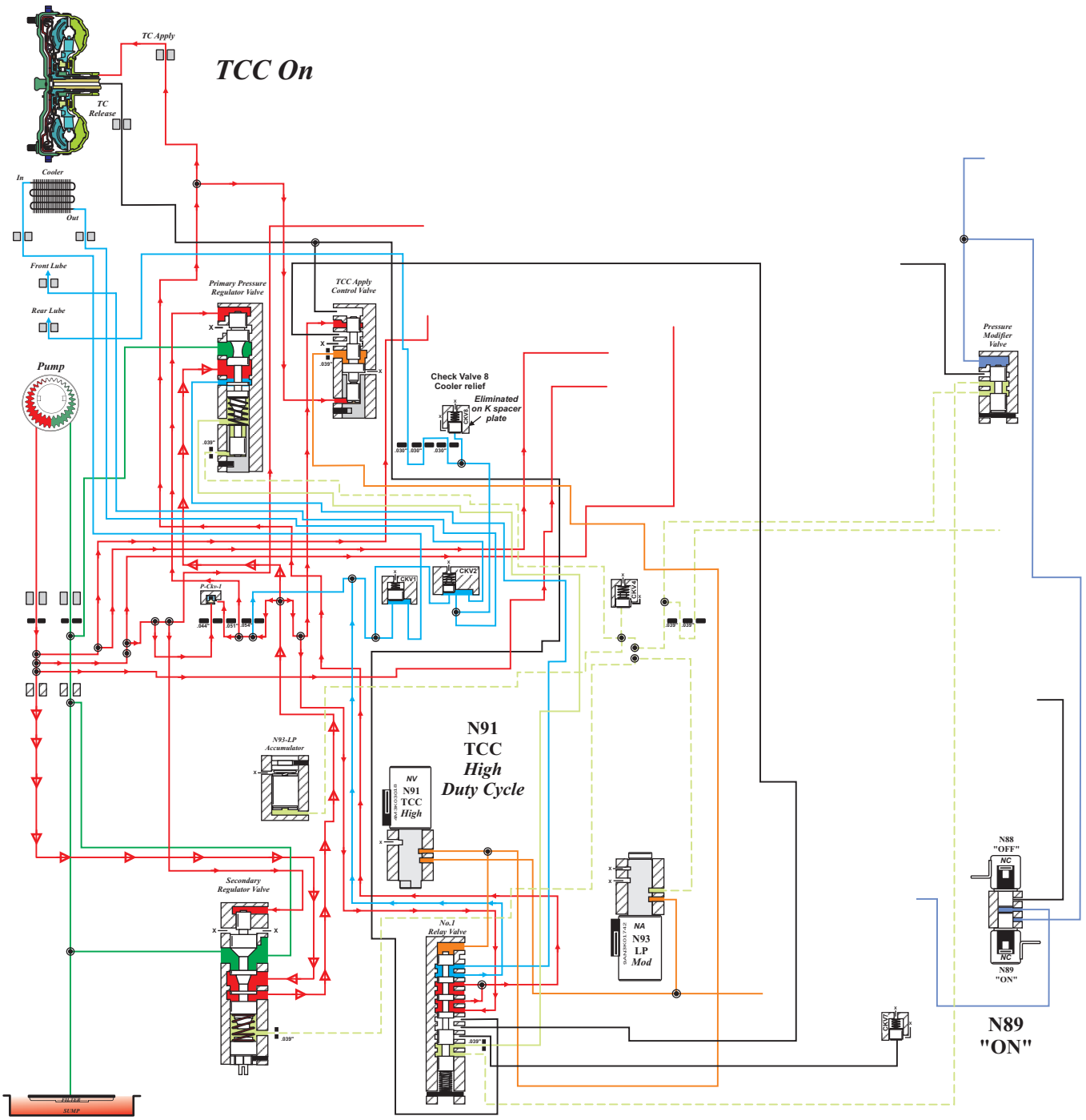


Figure 12

N91 TCC SOLENOID THEORY OF OPERATION

2 Port Torque Converter



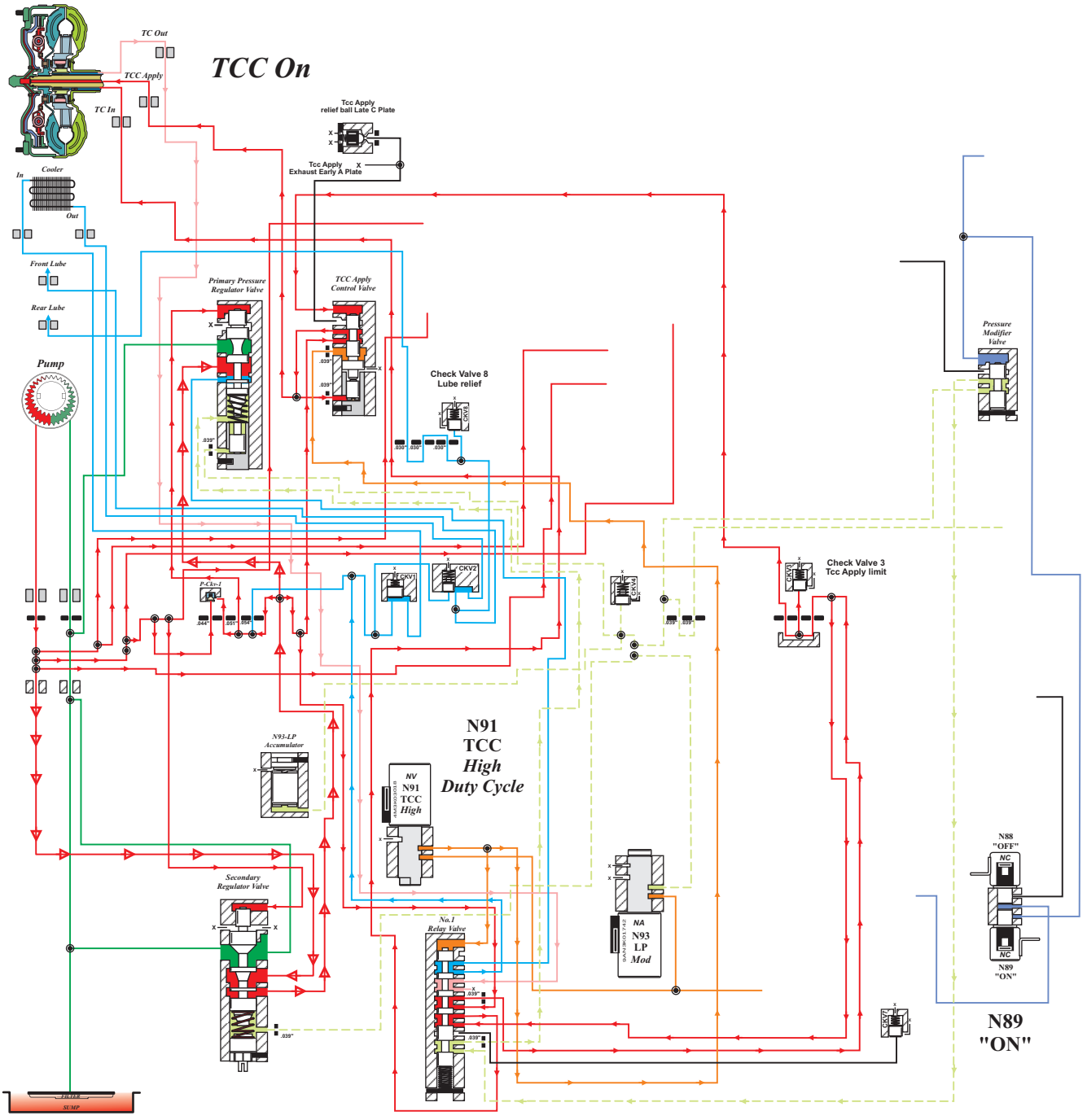
N91 TCC Solenoid is at aHigh Duty Cycle which strokes :

1. The TCC Apply Control Valve which connects TCC release pressure to an exhaust.
2. The No.1 Relay Valve which connects Regulated Line Pressure from the Primary Reg. Valve to the Cooler/Lube Circuit The No.1 Relay Valve also connects regulated line pressure to the TCC Apply Circuit .The No. 1 Relay Valve also makes a connection to TCC Apply Control Valve exhaust .The No. 1 Relay Valve also connects N93 pressure from the Pressure Modifier Valve to the spring side of the Primary Pressure Regulator Valve to increase line pressure when the TCC is ON.

Figure 13

N91 TCC SOLENOID THEORY OF OPERATION

3 Port Torque Converter



N91 TCC Solenoid is at a High Duty Cycle which strokes :

1. The TCC Apply Control Valve which connects regulated Secondary Regulator pressure to the Apply circuit of the Torque Converter.

2. The No.1 Relay Valve which connects Regulated Line Pressure from the Primary Reg. Valve to the Cooler/Lube Circuit. The No.1 Relay Valve also connects Torque Converter Out pressure to the sump. The No. 1 Relay Valve also makes connections from Regulated Line to the TCC Apply Control Valve. The No. 1 Relay Valve also connects N93 pressure from the Pressure Modifier Valve to the spring side of the Primary Pressure Regulator Valve to increase line pressure when the TCC is ON. The N89 Solenoid is ON which Strokes the Pressure Modifier Valve, which connects N93 pressure to the No.1 Relay Valve. This provides a line pressure increase when the TCC is ON

Figure 14

09G, 09K, 09M

NO MOVEMENT

COMPLAINT: An 09G, 09K or 09M in a Volkswagen or Audi may experience a no move condition and the PRNDL lights are flashing.

CAUSE: One cause may be that the brake pedal was released before the selector lever was fully engaged into the desired range, Figure 1.

CORRECTION: The brake pedal must remain depressed until the selector lever has been placed into the desired range and the transmission has fully engaged. If the brake pedal is released prematurely activating this safety strategy, with the selector in the desired range, depress the brake. The PRNDL lights should stop flashing and the transmission should engage immediately afterwards.

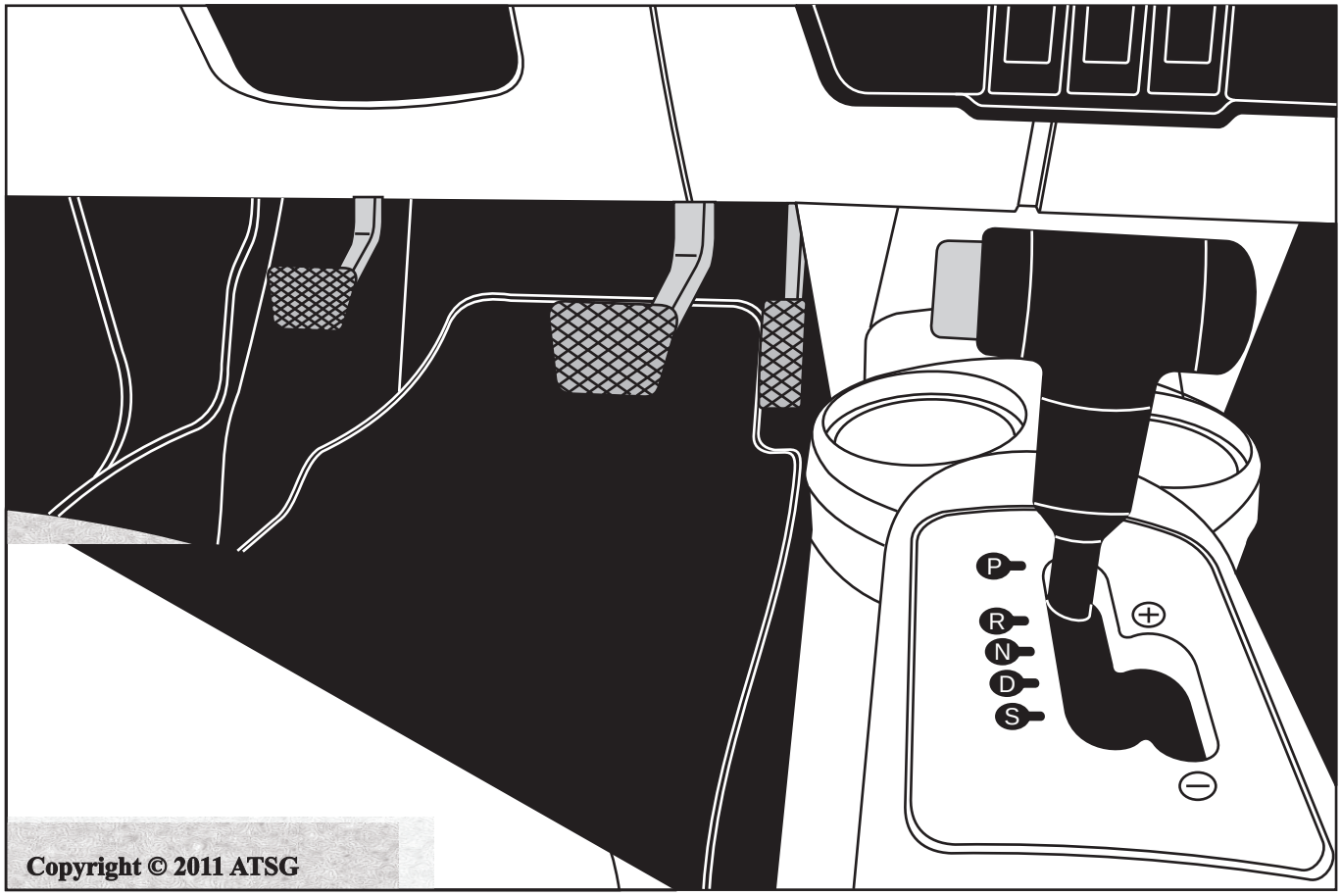


Figure 1

TF60-SN, 09G, 09K, 09M

ISS - OSS CODES

COMPLAINT: Works fine cold but goes to default intermittently when warm or goes to default regularly when warm with one or more speed sensor codes before and/or after rebuild.

CAUSE: One cause may be a bad connection where the internal harness connects to the pig tail lead of each of the sensors (Figures 1 & 2). The ISS connector is white and the OSS connector is Blue (Figure 3). These connectors snap on to a metal bracket securing them in place. In time, with heat, these connectors get brittle and can easily break the lock/snap feature of the connector during the removal of the valve body. When re-connected, a compromised connection may occur causing intermittent setting of codes.

Another cause is the sensor itself has failed or is defective or cracked. This may be overlooked as a possibility thinking that the temperature related condition for setting the code eliminates the sensor as a possibility. The ISS and the OSS are Hall Effect Sensors and can operate well when cold but fail when hot. Depending on the failure, an internal short or open can easily occur with temperature.

CORRECTION: A resistance check of the ISS or OSS may discover a problem when there is a permanent hard open or a short in the sensor. For example, in figures 1 and 2 the ISS and OSS measure 5 Mega ohms each. If you had 1 ohm you discovered a short. If you had nothing, either its open or you meter is not set properly. However, due to the design of a Hall Effect Sensor it is best to check them with the use of an oscilloscope. Especially when there is an intermittent sensor problem.

Both the ISS and OSS each receive approximate system voltage and send back to the computer a 1 volt pulse from an approximate 0.5 volts to 1.5 volts DC (Figure 4).

A two channel scope could check one sensor at a time while a 4 channel scope could check both simultaneously.

Figure 4 provides an example of good sensor signals. Both the ISS and the OSS maintain a steady voltage supply (Channels 1 & 3) and the signal patterns are clean 1 volt pulses with a pulse count that increases and decreases with speed (Channels 2 & 4). A close look at the signal also reveals a solid 1 volt pulse from an approximate 0.5 volts to 1.5 volts DC.

If there is a signal drop out, check connections and repair accordingly. If the power supply remains steady yet the signal suddenly drops out, change the sensor.

Note: Most Aisin transmissions ISS and OSS signals are checked in this fashion.

TF60-SN, 09G, 09K, 09M

ISS - OSS CODES

INPUT SPEED SENSOR

5.0M Ohms Resistance
at room temperature

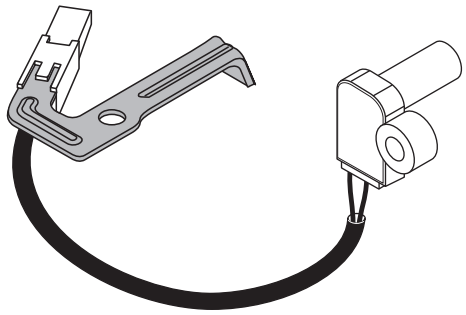


Figure 1

OUTPUT SPEED SENSOR

5.0M Ohms Resistance
at room temperature

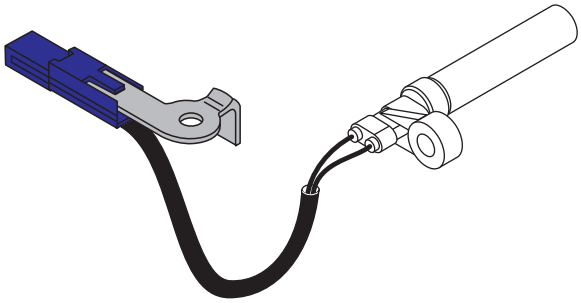


Figure 2

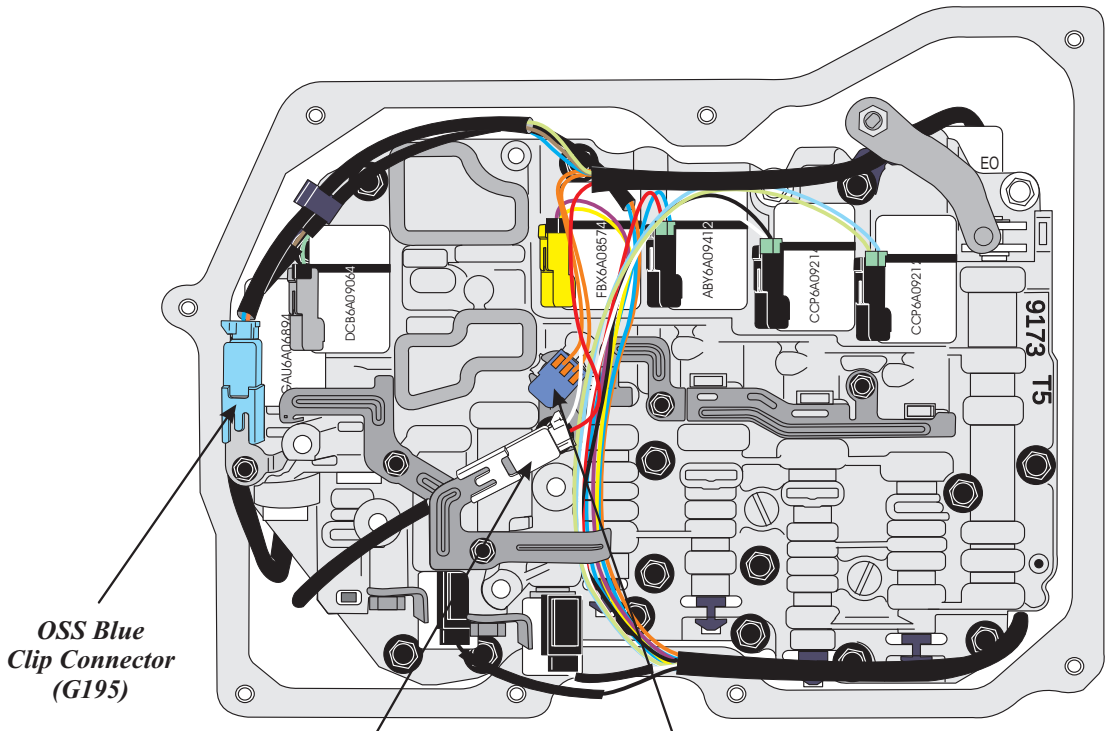


Figure 3

TF60-SN, 09G, 09K, 09M

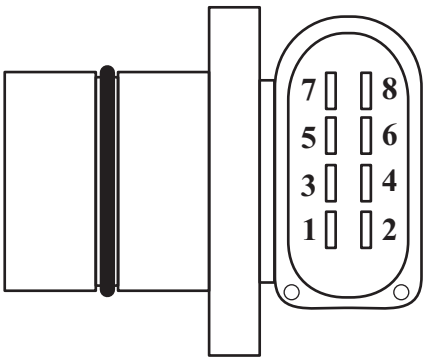
ISS - OSS CODES

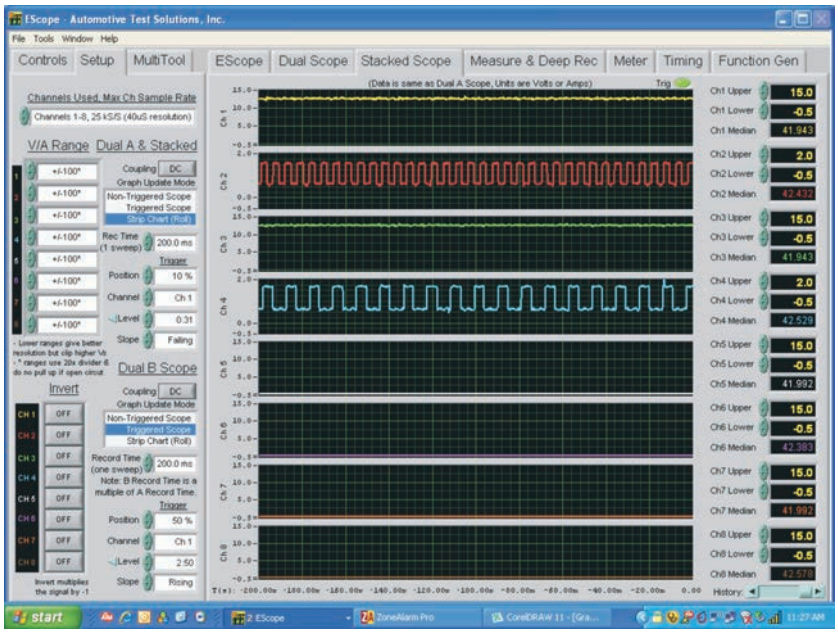
Terminal 3 = ISS Power (Channel 1)

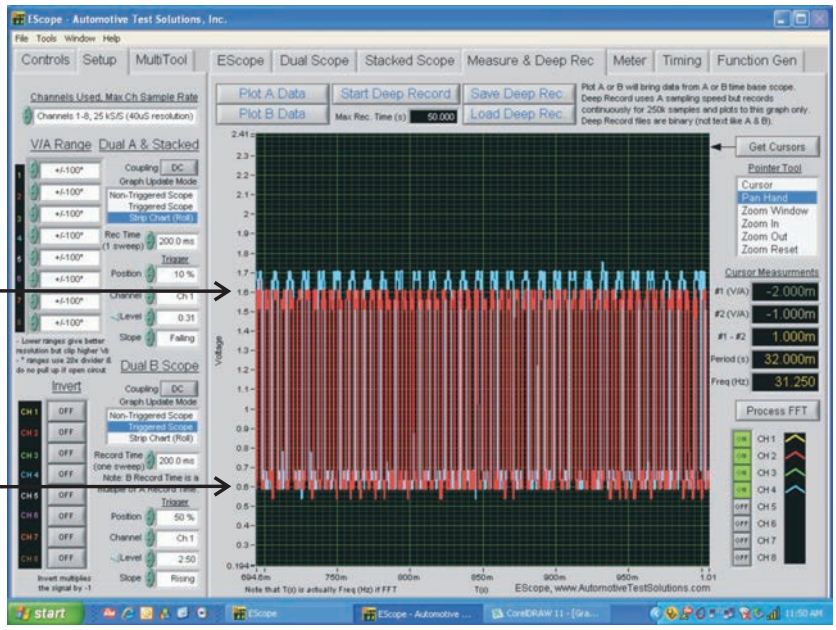
Terminal 4 = ISS Signal (Channel 2)

Terminal 5 = OSS Power (Channel 3)

Terminal 6 = OSS Signal (Channel 4)







1 Volt Pulse
(.5 to 1.5)

Figure 4

TF60-SN, 09G, 09K, 09M

FLARED OR HARSH SHIFTS

COMPLAINT: Before and after rebuild the transmission may experience intermittent flared or harsh shifts when warm.

CAUSE: Defective solenoids, valve body bore wear, compromised counter balance molded pistons, bushing wear, loose end play and a loss of internal transmission cooler pressures are some of the more common reasons for this type of complaint not to mention the need to reset shift adapts. Another possible cause that often time goes unnoticed is a malfunctioning Transmission Fluid Temperature Sensor (Figure 1). This sensor influences line pressure and may cause line pressure to act irrationally. Also, the o'ring must seal as the sensor is directly inputted in the main line pressure circuit next to the pressure regulator valve (Figure 2). If the o'ring leaks, a stream of oil will pass by the o'ring and possibly cause aeration of the fluid also causing line pressure instability.

CORRECTION: Repair or replace as necessary. A resistance check chart is provided in figure 3.

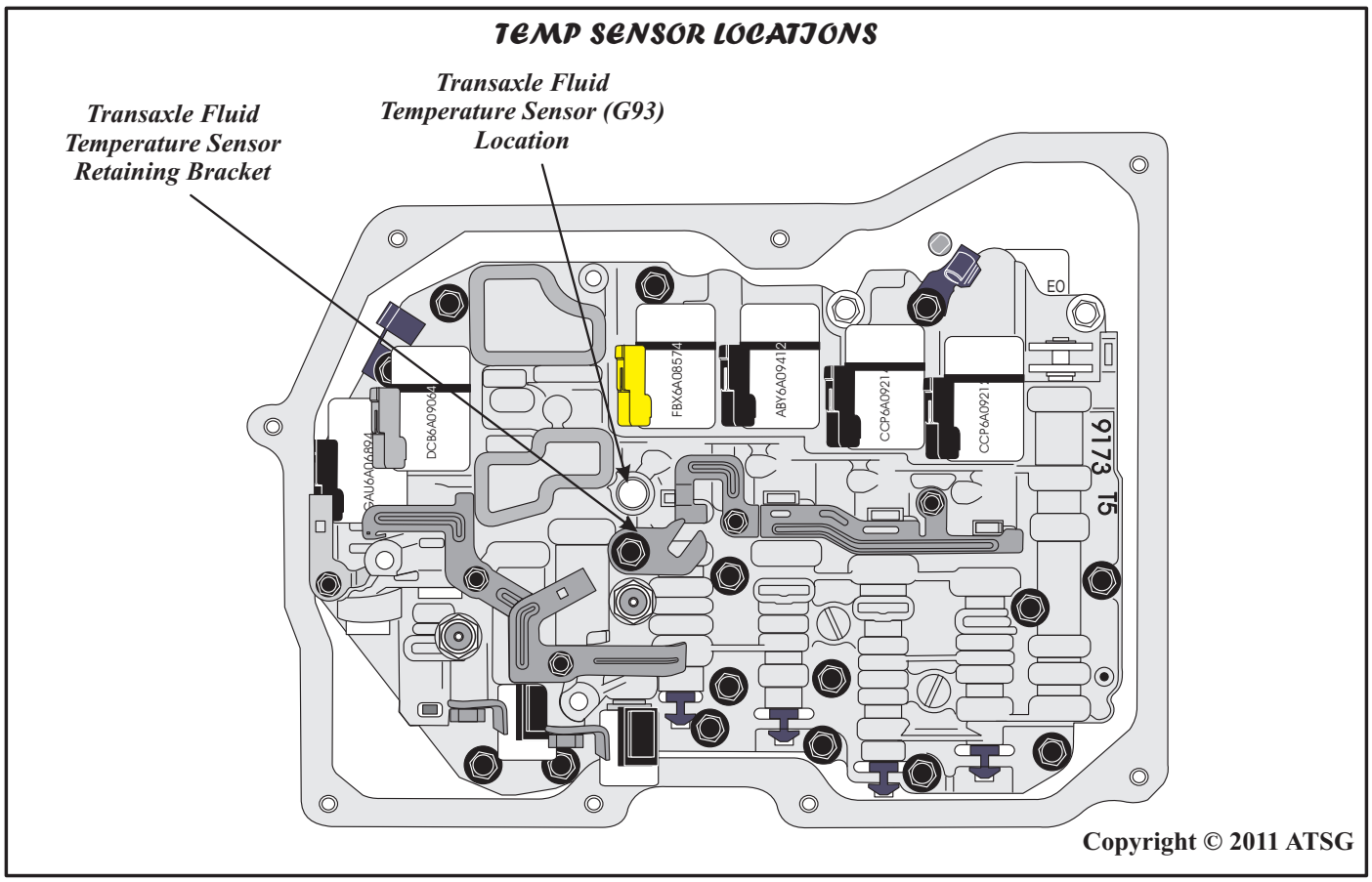


Figure 1

TF60-SN, 09G, 09K, 09M

FLARED OR HARSH SHIFTS

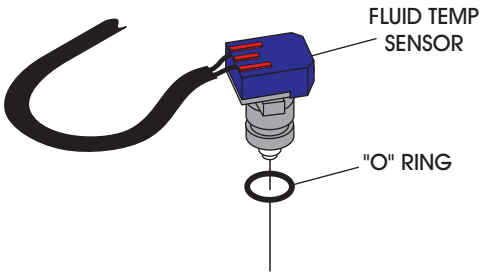
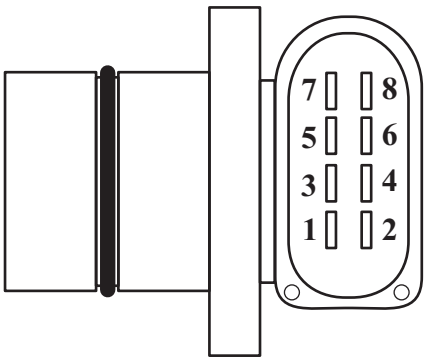


Figure 2



View looking into the 8 terminal transmission case connector

Sensor ID (Name)	Positive Meter Lead Terminal # (Wire Color)	Negative Meter Lead Terminal # (Wire Color)	Resistance (Ohms)
TFT (G93)	1 (Orange)	2 (Orange)	37.0 - 51.0 K @ -30º C
			5.0 - 8.0 K @ 10º C
			3.0 - 5.0 K @ 25º C
			230 - 265 @ 110º C
			100 - 120 @ 145º C

Figure 3

BMW/FORD ZF6HP26/6R60

3-4 OR 4-5 FLARE

COMPLAINT: BMW or Ford Vehicles equipped with the ZF6HP26/6R60 may exhibit a flared shift on the 3-4 or 4-5 upshift and may also set a P0734 or P0735 Diagnostic Trouble Code.

CAUSE: The cause may be, that the bushing in the back of the pump stator, as shown in Figure 1, is worn causing a leak of "E" Clutch apply pressure. Refer to Figure 2 for a component application chart.

CORRECTION: To correct this condition, replace the bushing in the back of the pump stator as shown in Figure 1 and refer to Figure 3 to make sure that the ring lands on the drum are not worn. Replace as necessary.

SERVICE INFORMATION:

This bushing is not sold separately than the Pump from ZF at this time. Erickson Industries has a bushing available, call 800-388-4418, or call your local Transmission parts distributer.

Special thanks to Dino at Lee Myles

BUSHING LOCATION

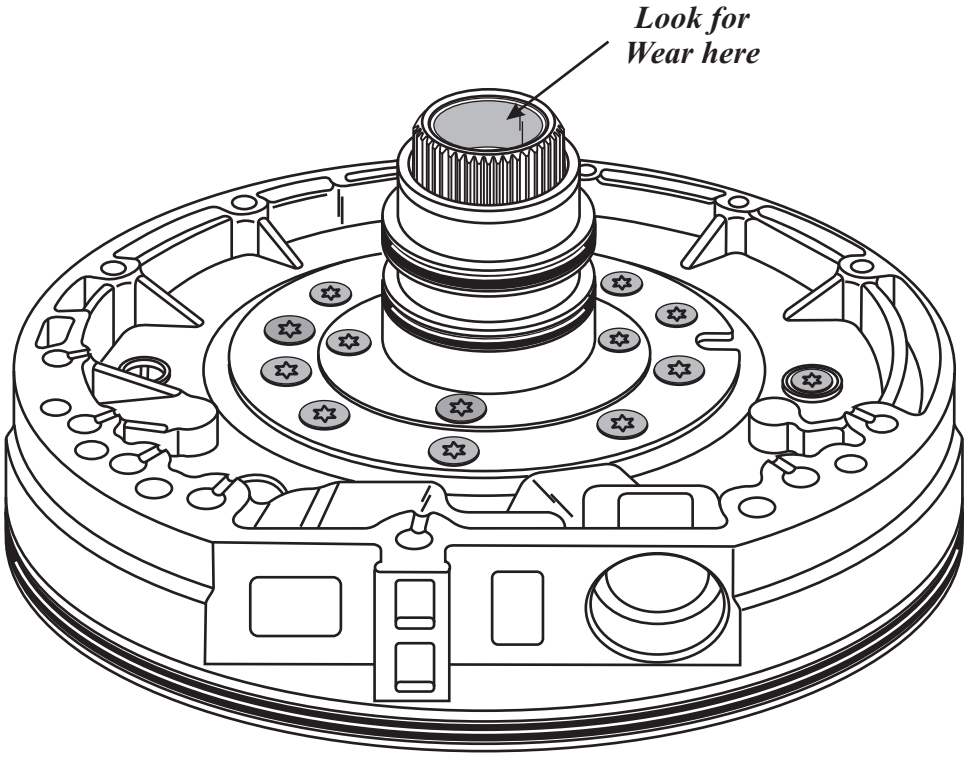
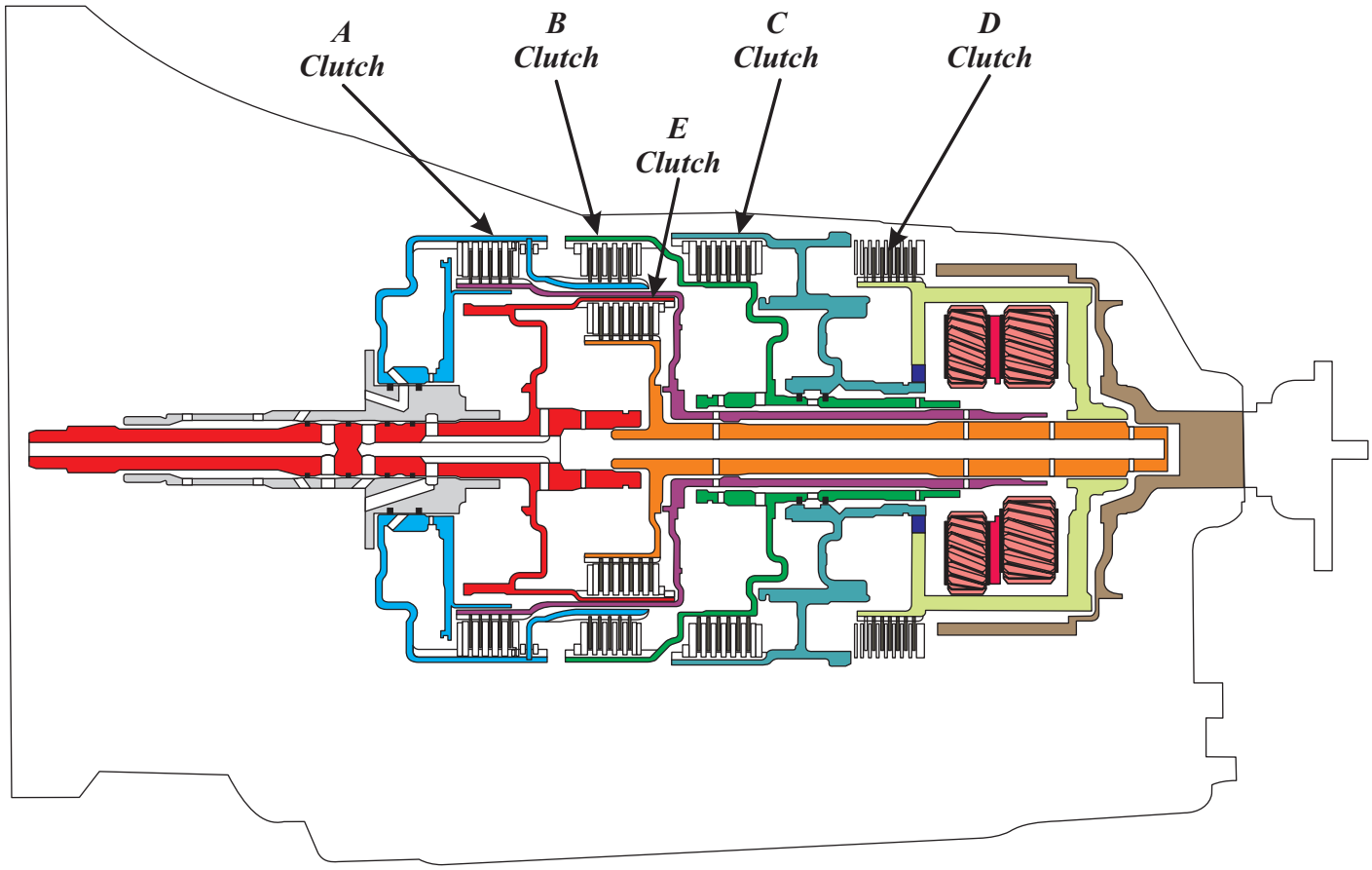


Figure 1

6HP26-6R60
INTERNAL COMPONENT IDENTIFICATION AND LOCATION



COMPONENT APPLICATION CHART

RANGE	A Clutch	B Clutch	E Clutch	C Clutch	D Clutch	Torq Conv Clutch	GEAR RATIO	
Park					Applied			
Reverse		Applied			Applied		3.40	
Neutral					Applied			
"D"-1st	Applied				Applied		4.17	
"D"-2nd	Applied			Applied		Applied*	2.34	
"D"-3rd	Applied	Applied				Applied*	1.52	
"D"-4th	Applied		Applied			Applied*	1.14	
"D"-5th		Applied	Applied			Applied*	0.87	
"D"-6th			Applied	Applied		Applied*	0.69	

* TCC IS AVAILABLE IN 2ND THRU 6TH GEAR, BASED ON THROTTLE POSITION, FLUID TEMP AND VEHICLE SPEED.

Figure 2

BMW/FORD ZF6HP26/6R60

3-4 OR 4-5 FLARE

E CLUTCH DRUM

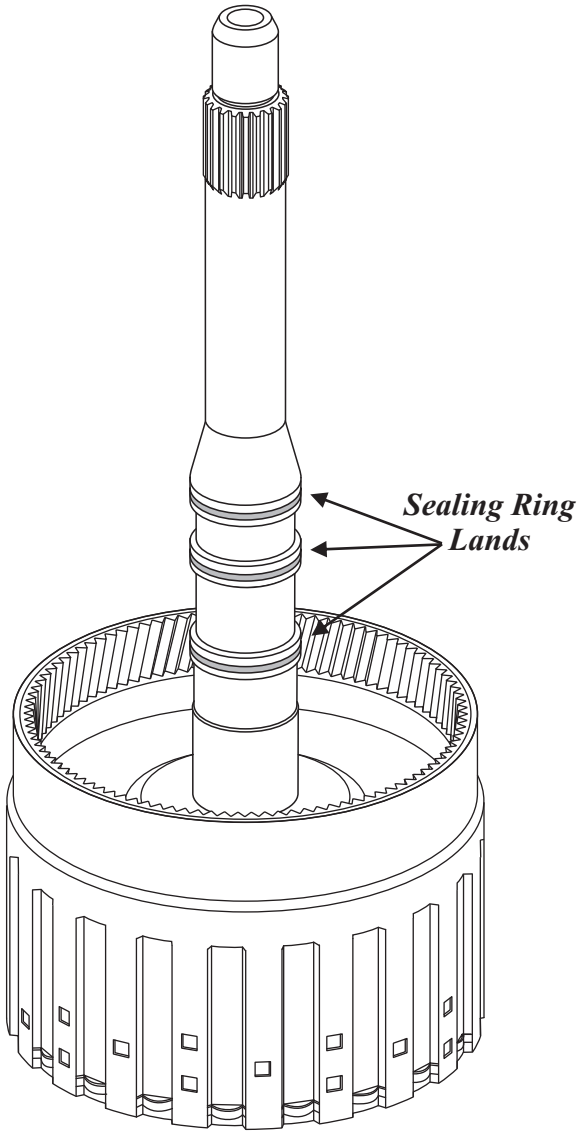


Figure 3

TD - 129

ZF6HP26/6R60

SHIFT COMPLAINTS

COMPLAINT: Before and after overhaul the transmission may experience a variety of different shift complaints such as a 6-4 and/or 5-3 downshift bang as well as a 4-5 clunk.

CAUSE: Similar to the U150/250 on page 96, bore plugs leaking off pressure needed to properly stroke a valve can cause a variety of shift complaints depending upon which and how many bore plugs are leaking.

CORRECTION: Inspect bore plugs 1, 2, 4 & 5 using figure 1, and 3, 4 and 5 in figure 2. Repair as needed.

SERVICE INFORMATION:

6R60 6R75 AND 6R80 & ZF6HP19 THRU 32 .....Superior K095

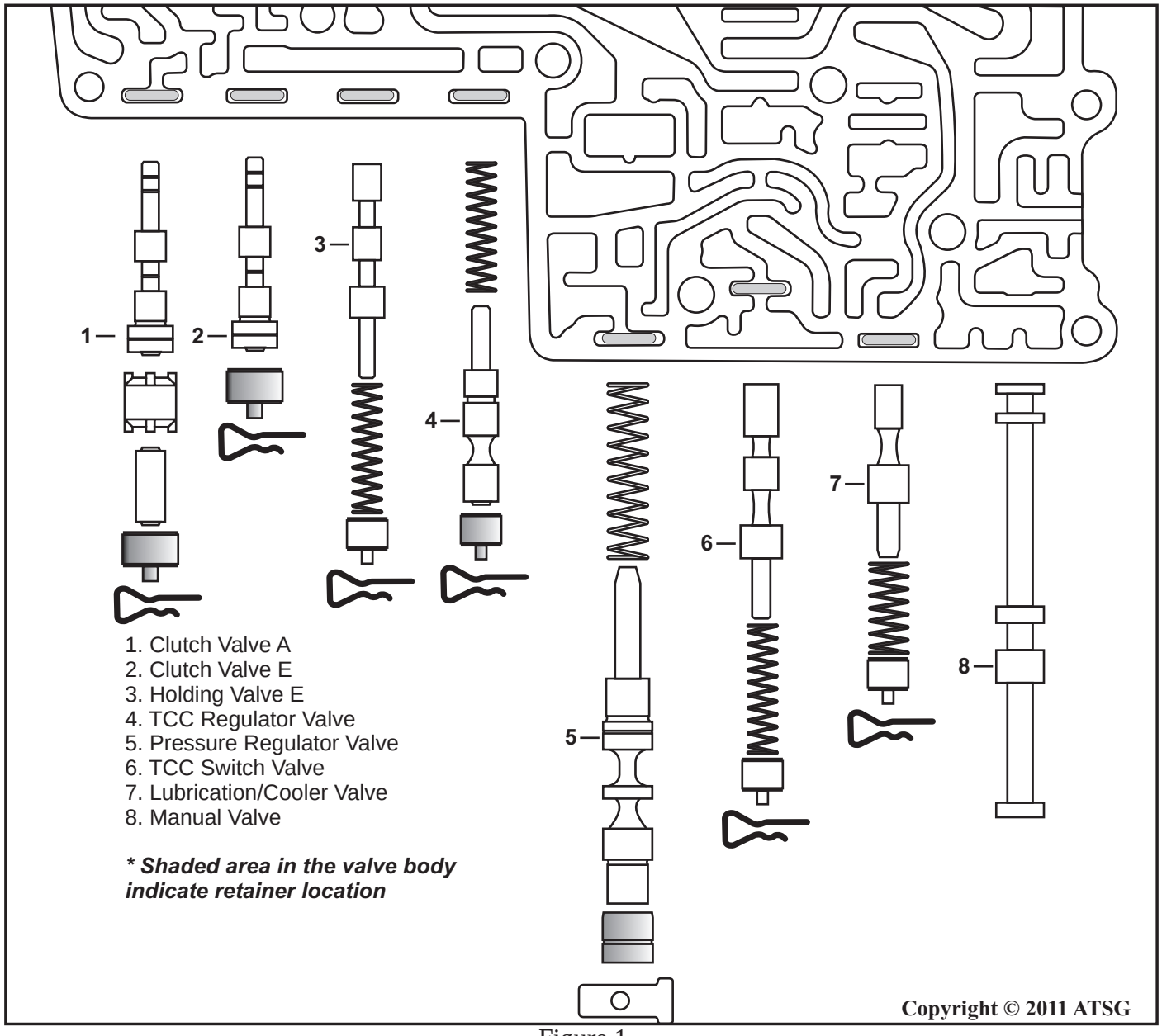


Figure 1

SHIFT COMPLAINTS

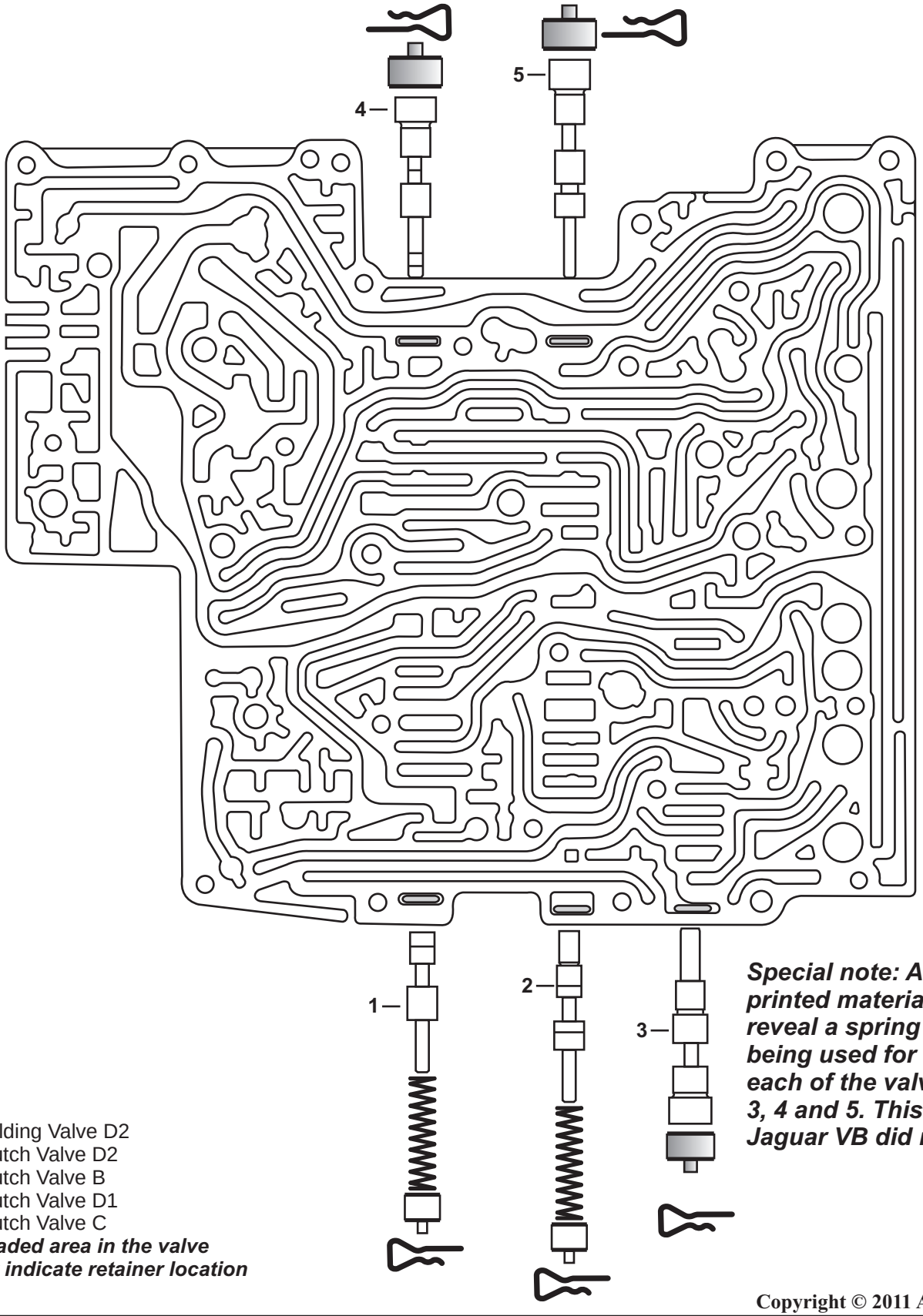


Figure 2

Rostra - 132

Parker - IBC

Teckpak/Fitzall - BC