VW/AUDI/MINI 09G/09M/TF60-SN
PRELIMINARY INFORMATION

The Japanese automatic transmission manufacturer AISIN Co., LTD is the developer of the FWD TF60-SN Transmission, a 6 speed fully automatic and computer controlled transmission. Vehicle applications known at the time of printing is as follows:

AUDI	A2	2006-On	2.0L	09G (TF-60SN)
AUDI	A4	2006-On	2.0L	09G (TF-60SN)
AUDI	TT	2003-04	1.8L	09G (TF-60SN)
BMW	Mini Clubman	2008-On	1.6L	09G (TF-60SN)
BMW	Mini Cooper	2002-On	1.6L	09G (TF-60SN)
SEAT	Altea	2004-On		09G (TF-60SN)
SEAT	Leon	2005-On	"1.4, 1.6, 2.0L"	09G (TF-60SN)
SEAT	Toledo	2004-On	"1.6, 1.9, 2.0L"	09G (TF-60SN)
VW	Beetle	2005-On	"1.8, 1.9, 2.0, 2.5L"	09G (TF-60SN)
VW	Eos	2007-On	"2.0, 3.2L"	09G (TF-60SN)
VW	Jetta	2005-On	"1.9, 2.0, 2.5L"	09G (TF-60SN)
VW	Passat	2006-On	2.0L	09G (TF-60SN)
VW	Tiguan	2008-On	"1.4, 2.0L"	09G (TF-60SN)
VW	Touran (Non US)	2003-On	"1.6, 1.9, 2.0L"	09G (TF-60SN)
VW	Passat	2006-On	3.6L	09M (TF-60SN)

When Volkswagen engineers developed the transmission in conjunction with Aisin and adapted it to Volkswagen vehicles they gave it the 09G/09M designation.

This transmission is very similar to the AF40-6 transmission but with two very significant differences. One is the B1 brake band has been eliminated and replaced with a B1 Clutch Pack. The other is the rear cover that gave access to the C/K2 clutch has been eliminated.

As a result of this transmission being used in a variety of applications, the number of friction plates in a clutch pack will vary depending upon torque load.

It uses the Lepelletier planetary system and is gear ratio sensitive requiring correct transmission interchange.

The advantage of this Lepelletier arrangement is its simple, space-saving and lightweight design. lt combines a simple planetary gearset with a subsequent Ravigneaux arrangement. This makes six speeds possible with only five shifting elements.

The computer controls both shift timing and shift feel with the use of solenoids. The computer monitors gear ratio through the Input and Output shaft Hall Affect Speed Sensors. It also can determine the rate of change and adapt the shifts as friction elements wear.

Selector Lever

The appearance of the selector lever may vary for different vehicles however, the operation and the function remains the same with the use of the TF60-SN.

The steering wheel paddles are available as options and it too can vary in appearance with different vehicles.

Selector Lever Positions and Operation

P - Park

Before the selector lever can be moved out of this position, the ignition must be switched on and the foot brake must be pressed. Additionally, the locking button on the selector lever must be pressed.

R - Reverse

To shift into this gear, the locking button must be pressed.

N - Neutral

The transmission is in idle in this position. If the selector lever is in this position for a long time and the vehicle is driven at less than 3 mph (5 km/h), the foot brake must be pressed again to leave this position.

D - Drive

In this position, the forward gears are shifted automatically.

S - Sport

The locking button must be pressed to shift into the selection range "S." The control module selects gears automatically according to a "sporty" characteristic curve.

+ and -

The Tiptronic functions are performed in the right selector gate and at the steering wheel paddles.

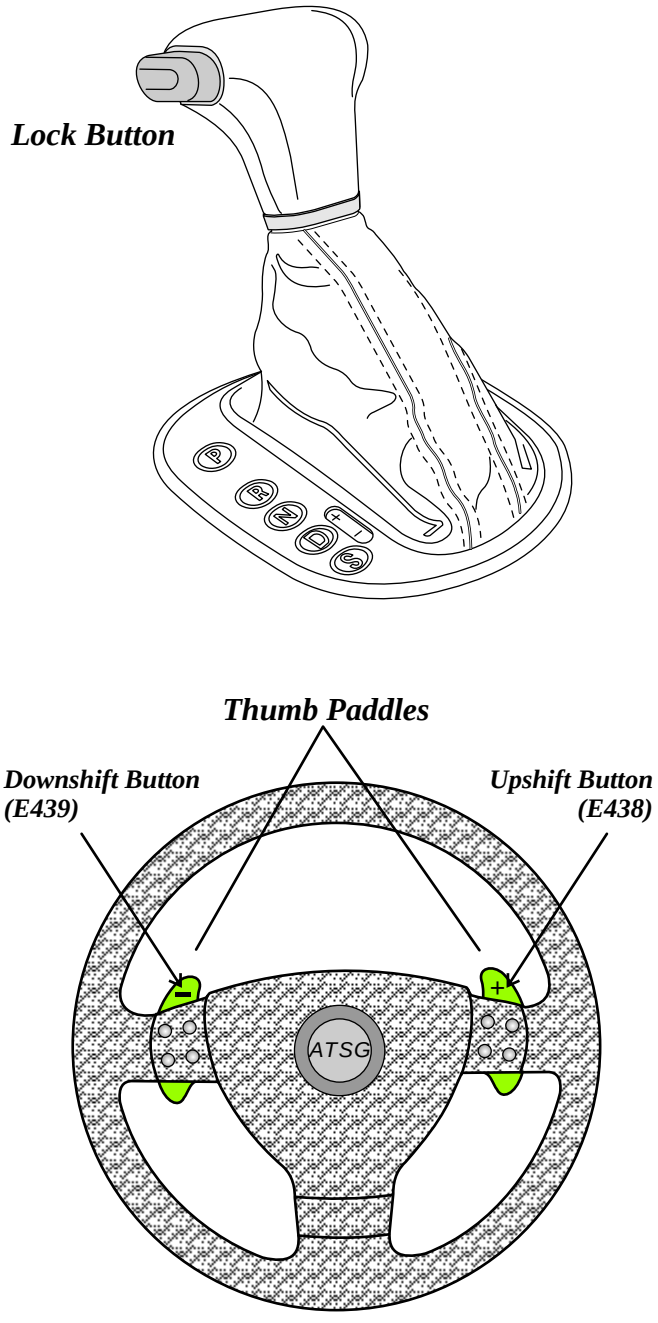


Figure 1

Tiptronic Upshift (E438) and Downshift (E439) Buttons on Steering Wheel

These operational buttons are found in the steering wheel on the left and right side.

Upshifting and downshifting occurs by operating these buttons. The shift signals are an input to the Transmission Control Module (TCM - J217) which in turn controls the shifting of the transmission.

Signal Utilization

If the Tiptronic buttons in the steering wheel are operated in automatic mode, the transmission control enters Tiptronic mode. If the buttons are not operated, the transmission control returns to automatic mode after a predetermined amount of time.

Effect of Signal Failure

In case of a signal failure, no Tiptronic functions are possible using the steering wheel buttons.

Tiptronic Shifting Strategy

- Automatic upshifting when maximum RPM is reached.
- Automatic downshifting when the RPM's fall below the minimum RPM.
- Kick down downshifting
- Acceleration from standstill in second gear by selecting 2nd before accelerating.
- Upshift prevention or downshift prevention.

Dynamic Shifting Program (DSP)

This automatic transmission has the latest generation Dynamic Shifting Program DSP.

The driving conditions, as well as driving resistance such as climbing hills, or road profile as in curves and the driver type meaning the manner in which the driver is driving the car are all evaluated by the TCM and adapts accordingly.

The basic parameters for the calculation of gear selection have not fundamentally changed compared to previous automatic transmissions. Due to constantly increasing integration of the transmission control with other vehicle systems such as the engine, ESP, or the steering angle, a large amount of information is available to better define the current driving conditions and the driving manner.

Sport Mode "S"

A performance oriented shifting program is available to the driver in selector lever position "S".

If the TCM recognizes the selector lever in the "S" position, the shifting characteristic curves are reallocated to higher engine speeds. This increases the driving dynamic.

The DSP also adapts to driver input (driver type evaluation) and driving situations in the "S" position.

The "S" mode contains the following characteristics:

- If the selector is placed in "S" while driving with an unchanging accelerator pedal position, a downshift occurs within defined limitations.
- To achieve a more direct reaction to the movements of the accelerator pedal, the torque converter lock-up clutch applies as soon as possible.

Figure 2

Emergency Mode

In mechanical emergency running mode, 3rd gear is always engaged.

If the transmission is already in 4th, 5th or 6th gear, the current gear is maintained until the selector lever is placed into the neutral position or immediately after an ignition cycle.

When starting off, 3rd gear is always engaged whether the selector lever is in the D or S position.

Reverse gear is available (R-gear locking is not active).

System pressure is controlled to the maximum value; the shifting elements are pressurized to maximum shifting pressure. This results in a hard shift when engaging the driving mode.

The torque converter lock-up clutch remains off.

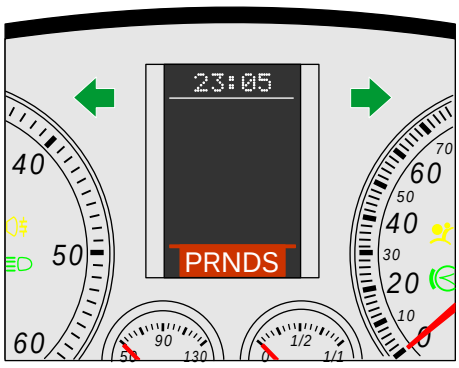
Towing

When towing, the ATF pump is not operated, and therefore rotating components are not lubricated.

To avoid severe damage to the transmission, the following conditions must be met:

- The selector lever must be in the “N” Neutral position.
- Towing speed must not exceed 31 mph (50 km/h).
- Vehicle must not be towed further than 31 miles (50 km).

For Jetta and Passat, if the battery is disconnected or discharged, the selector lever emergency release must be operated to shift the selector lever out of “P” into “N”.



Operating Ranges of the Torque Converter Lock-Up Clutch

Depending on driving mode, engine load and vehicle speed, the torque converter lock-up clutch is first regulated with a minimal slip and subsequently completely applied.

During regulated operation, fuel consumption is reduced compared to a released torque converter lock-up clutch and drive comfort is improved compared to a fully applied clutch.

Using Tiptronic in “S” mode, the torque converter lock-up clutch is applied as soon as possible. The direct power connection between engine and transmission improves sporty driving feel.

In a climbing mode, the torque converter lock-up clutch applies in 2nd gear.

When ATF temperature is above 130° C, the regulated apply feature is prohibited and an immediate apply occurs. This helps the ATF maintain a lower thermal load and cools it down.

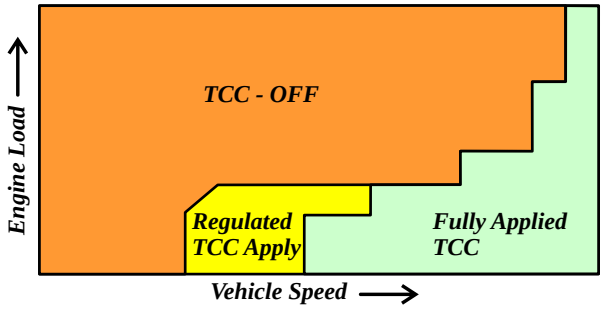
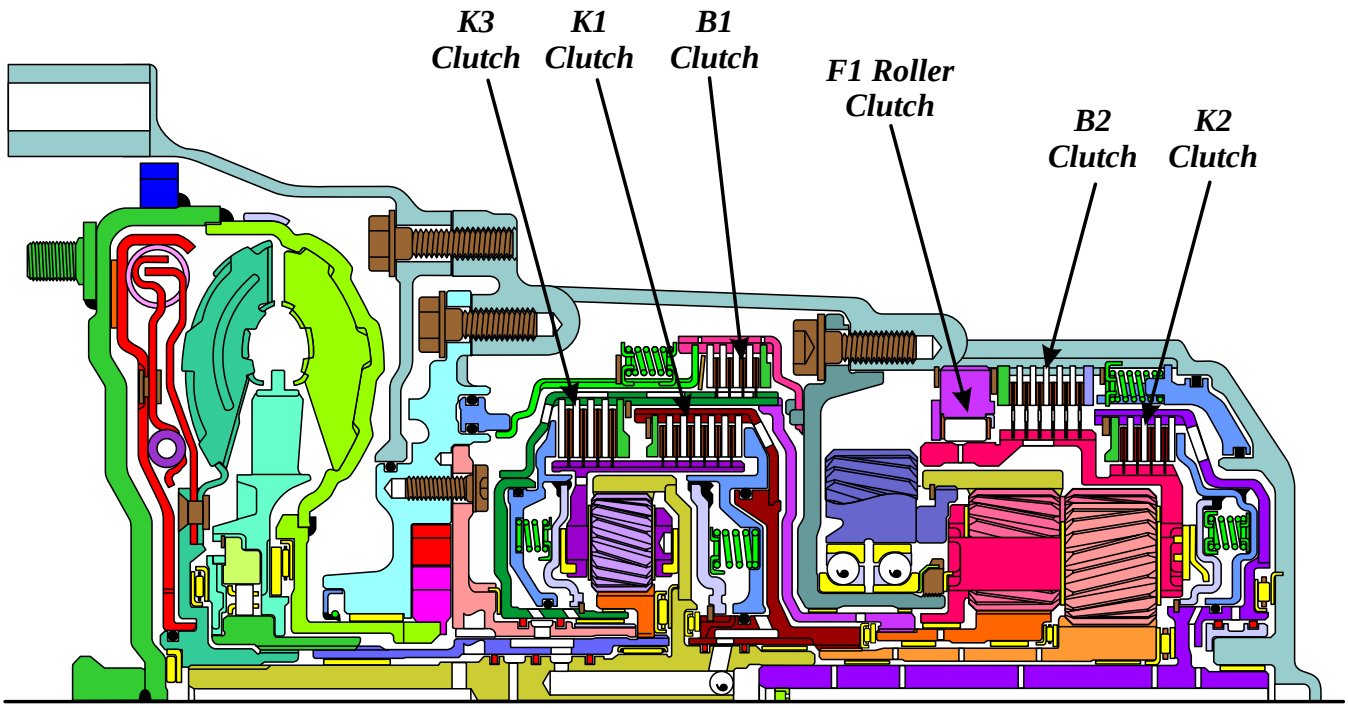


Figure 3

COMPONENT APPLICATION CHART



CLUTCH APPLICATION CHART

Gear	K-1 Clutch	K-2 Clutch	K-3 Clutch	B-1 Clutch	B-2 Clutch	F-1 Roller Clutch	Torque Conv. Clutch	Engine 1.6L, 2.0L Ratio***	Engine 1.8L, Ratio****
1st Gear	On				On*	Hold		4.148	4.044
2nd Gear	On			On			On**	2.370	2.371
3rd Gear	On		On				On**	1.556	1.556
4th Gear	On	On					On**	1.155	1.159
5th Gear		On	On				On**	0.859	0.852
6th Gear		On		On			On**	0.686	0.676
Rev Gear			On		On			3.394	3.193

* The B-2 Clutch is applied in "Tiptronic Mode" 1st gear, only for engine braking.
** During normal driving operation, the Torque Converter Clutch can be applied in each gear.
*** Transaxle Codes (GSY 1.6L) and (GJZ 2.0L).
**** Transaxle Code (FXA 1.8L).

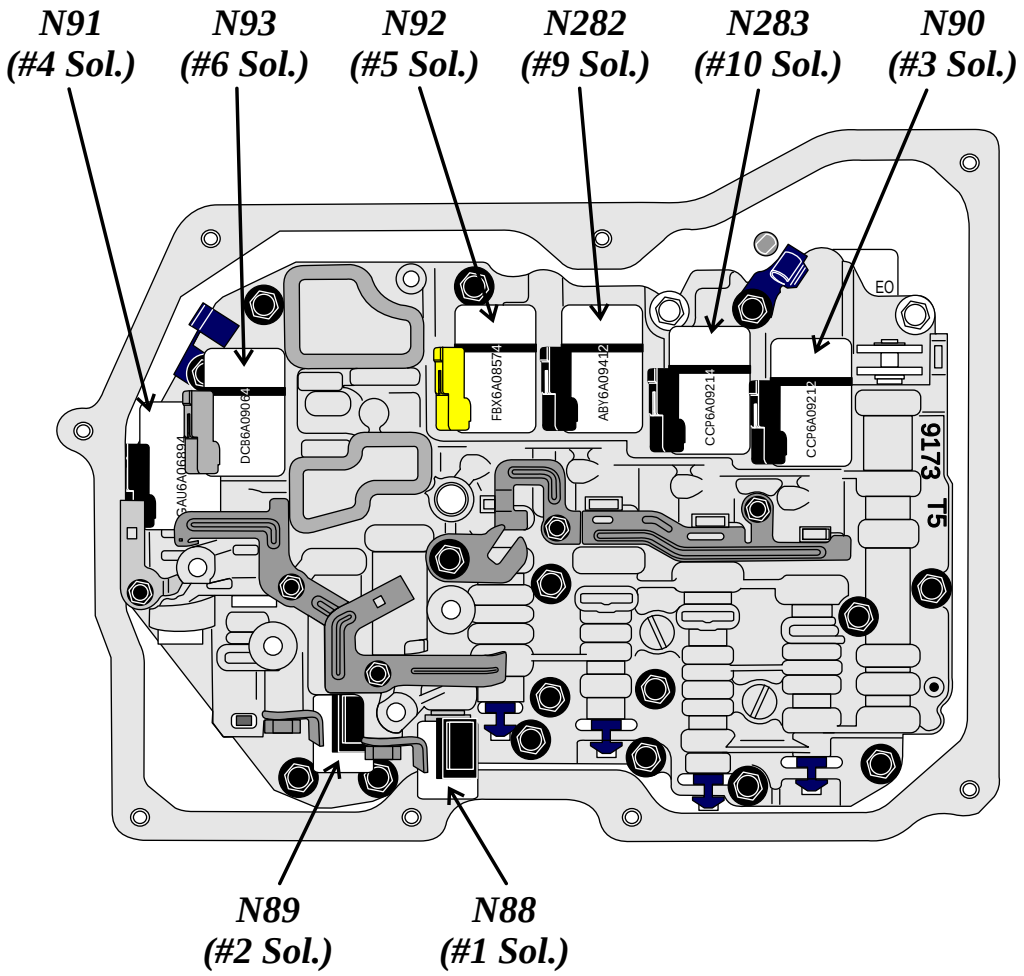
Transfer Gear Ratio, Codes GSY, GJZ, FXA, (Driven=52T/Drive=49T) Ratio = 1.061

Final Drive Gear Ratio, Codes GSY, FXA, (15T/61T) Ratio = 4.067

Final Drive Gear Ratio, Codes GJZ, (15T/58T) Ratio = 3.867

Figure 4

SOLENOID LOCATIONS



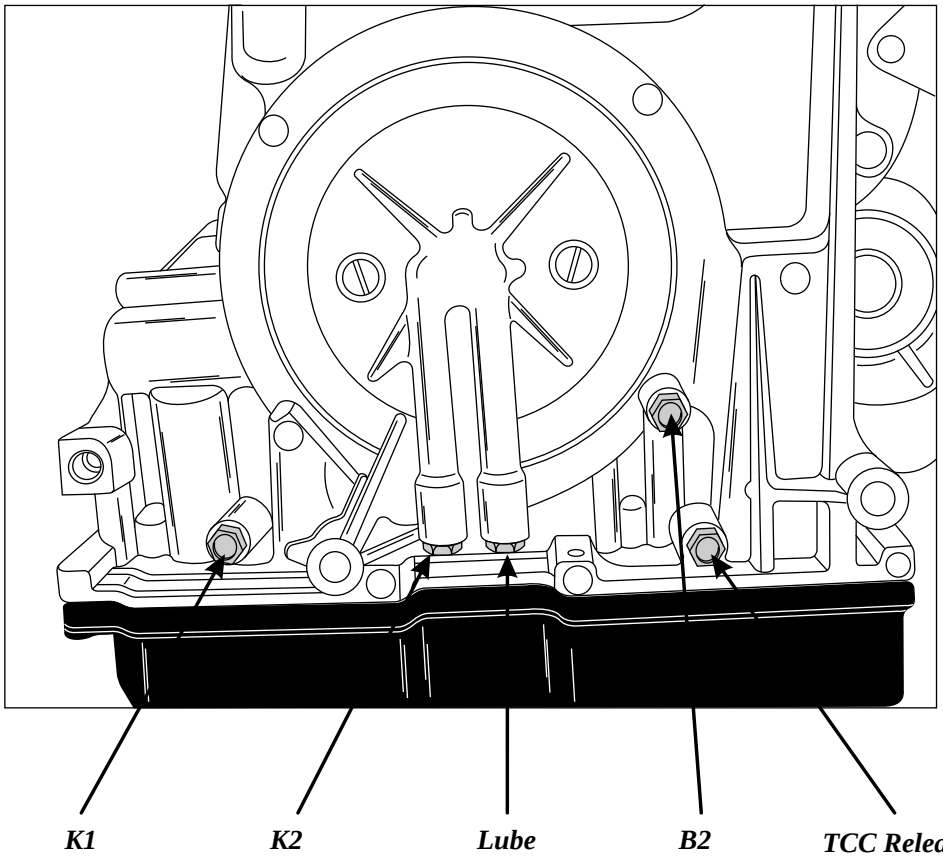
SOLENOID AND CLUTCH APPLICATION CHART

Gear Shift Position	Solenoid Shift Sequence								Clutch Application Chart					
	On/Off Solenoids		Pressure Control Solenoids						Clutch and Freewheel Components					
	N89 SV-2	N88 SV-1	N92 SV-5	N282 SV-9	N90 SV-3	N283 SV-10	N93 SV-6	N91 SV-4	K1	K2	K3	B1	B2	F1
Park			OFF	OFF	ON	ON	PWM							
Neutral			ON	ON	ON	ON	PWM							
Reverse			ON	ON	OFF	ON	PWM				ON		ON	
1st Gear	T	T	OFF	ON	ON	ON	PWM		ON					ON
2nd Gear			OFF	ON	ON	OFF	PWM	PWM	ON			ON		
3rd Gear	T/To	To	OFF	ON	OFF	ON	PWM	PWM	ON		ON			
4th Gear	T/To	To	OFF	OFF	ON	ON	PWM	PWM	ON	ON				
5th Gear	T/To	To	ON	OFF	OFF	ON	PWM	PWM		ON	ON			
6th Gear	ON	To	ON	OFF	ON	OFF	PWM	PWM		ON		ON		

T = On in Tiptronic Mode
To = Solenoid is toggled On to Off

Figure 5

Pressure Taps



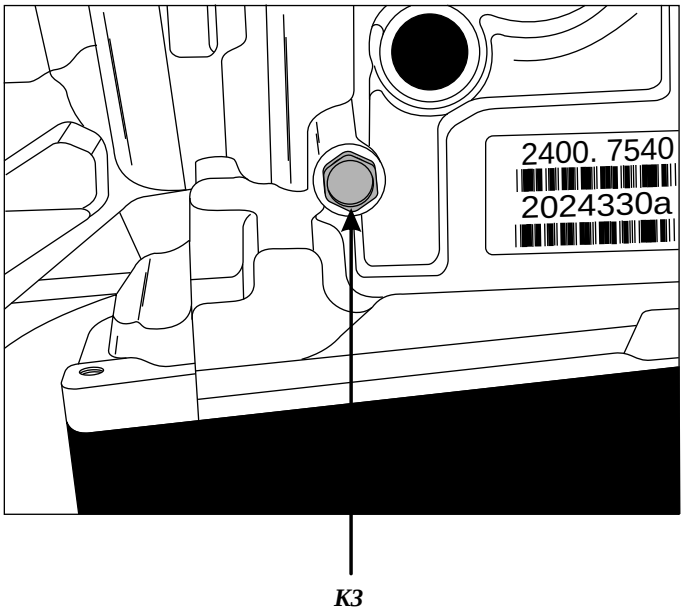
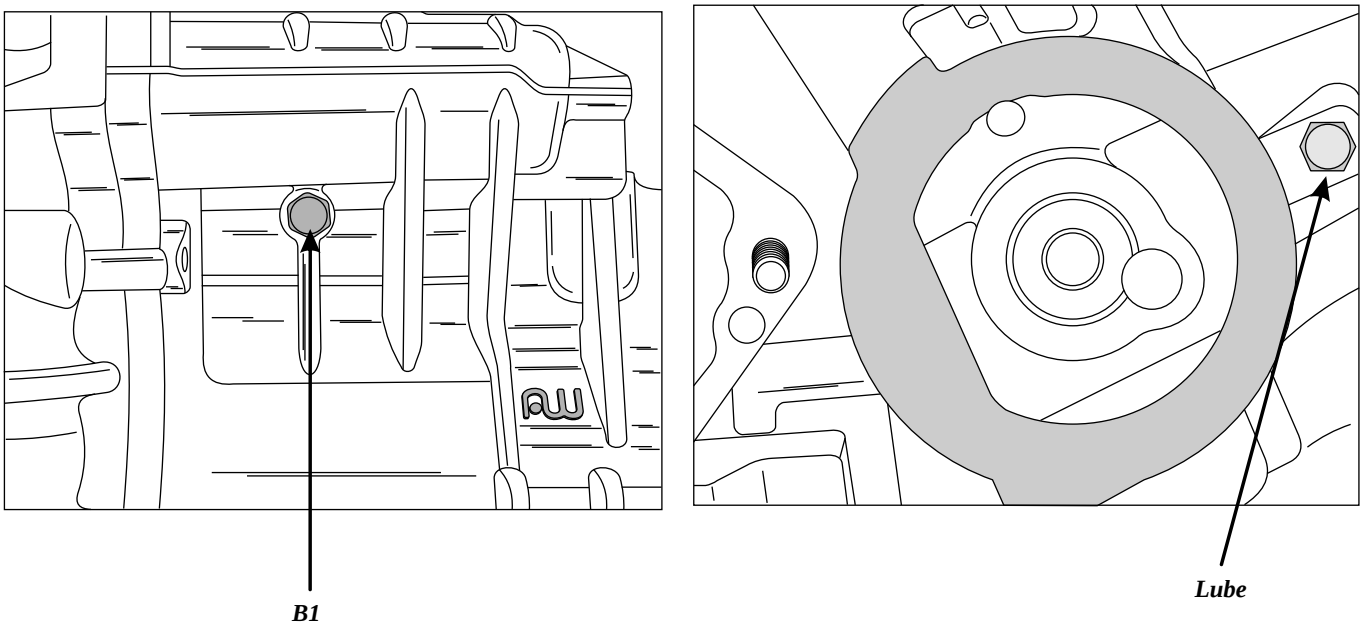


Figure 6

Pressure Taps



LINE PRESSURE SPECIFICATIONS

"Observed" Pressure Specifications

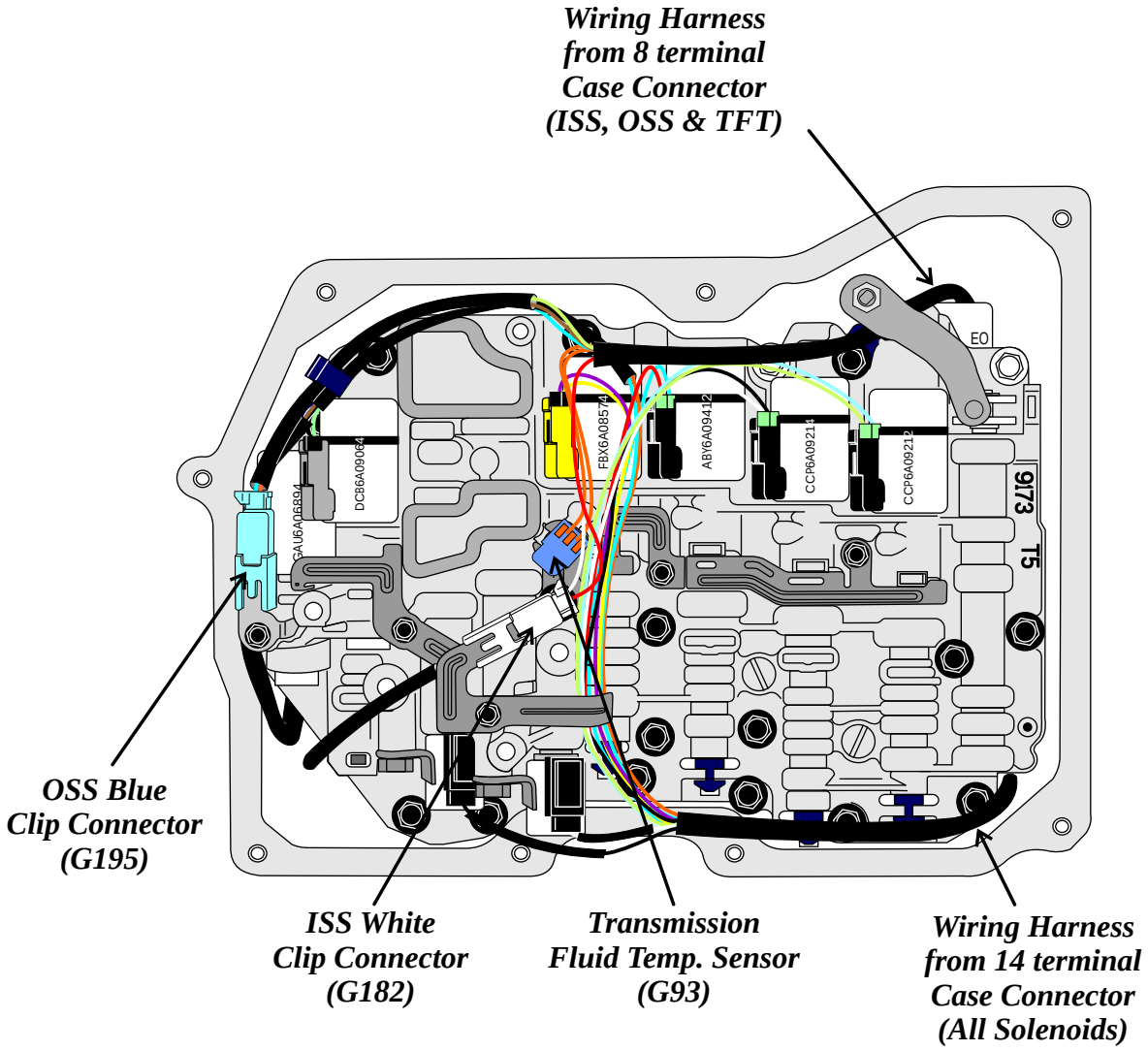
Selector Lever	*Taps Required*	*Specifications in psi* K1	K3	B2
"D" Idle	*K1 & B2*	*54-60*		*0.9*
"D" Idle (Tiptronic)	*K1 & B2*	*104-106*		*23-28*
*"D" Stall**	*K1 & B2*	*146-160*		*0.9*
*"D" Stall (Tiptronic)**	*K1 & B2*	*187-190*		*53-55*
"R" Idle	*K3 & B2*		*80-85*	*80-85*
*"R" Stall**	*K3 & B2*		*270-275*	*270-275*
** "D" & "R" Stall, at approx 2300 rpm, the PCM cuts fuel to engine.*				
Other "Observed" Pressures				
Lube Pressure 4-8 psi, 8-10 psi in 6th gear				
TCC Release 80-90 psi in Reverse				

Many Thanks To; Jesse Zacharias For Providing Us With These Specs To Share

"Observed" K1 and K2 Pressures, at operating temperature with a new valve body installed.
Initial engagement N to D; K1 pressure at idle is 56-60 psi.
Under acceleration in D; K1 pressure is 75-80 psi.
Before the 1-2 shift in D; K1 pressure raises to 140-150 psi.
When shift is completed; K1 pressure settles at 80-90 psi in 2nd gear.
Before the 2-3 shift in D; K1 pressure raises to 95-100 during 2-3 shift and settles at 70 psi in 3rd.
Before the 3-4 shift in D; K1 pressure raises to 140 psi, K2 pressure still under 4 psi. Then K1 pressure begins to drop and K2 pressure begins to rise with both settling at 85-90 psi in 4th gear.
During 4-5 shift in D; K2 pressure raises to 190-200 psi, K1 pressure raises to 155-160 psi, then K1 drops to 40 psi, (While K2 is 170), then drops gradually to less than 2 psi, and K2 settles at 140 psi in 5th gear.
During 5-6 shift in D; K2 pressure drops to 110-120 in 6th gear.

Figure 7

INTERNAL HARNESS



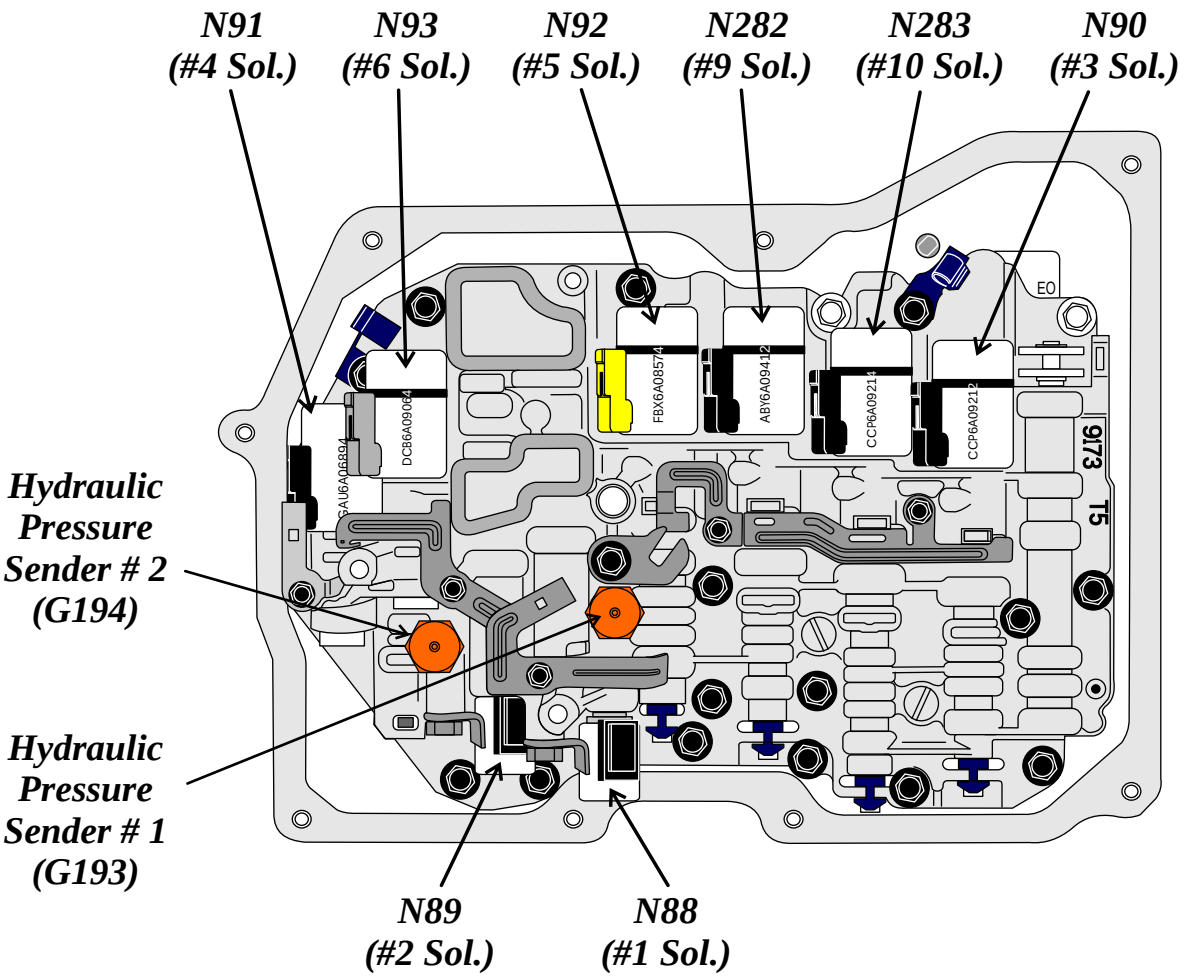
ISS G182
The Transmission Input Speed Sensor is a Hall Affect that produces a signal from the lugs of the K2 Clutch Drum. The TCM uses this information to control adaptation and gear monitoring. Should this sensor fail, the Engine RPM sensor is use as a back up. Lock-up clutch apply strategy may be affected.

OSS G195
The Transmission Output Speed Sensor is a Hall Affect that produces a signal from the lugs on the Parking Gear. The TCM uses this information for the Dynamic Shifting Program (driving condition evaluation), vehicle speed, shift points and gear monitoring. Should this sensor fail, the speed signal from the ABS Control Module is used as a back up.

TFT G93
Transmission fluid temperature is used to influence main line pressure and converter clutch strategies. A replacement value is taken from the ECT should this sensor fail. TCC and adaptations usually cease which typically leads to harder shifting.

Figure 8

SOLENOID IDENTIFICATION



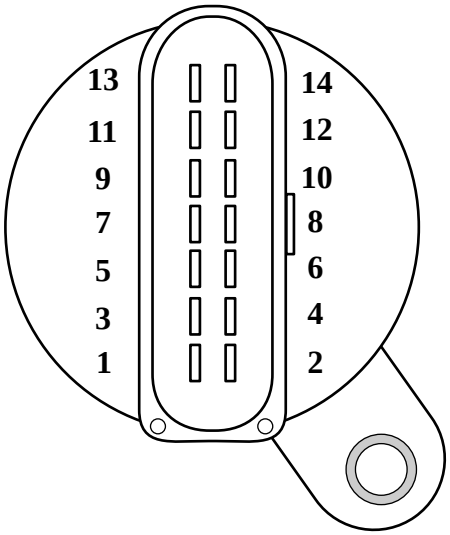
Hydraulic Pressure Senders G193 and G194
The G193 and G194 are Normally Open transducers which closes when the K1or the B2 clutch circuit is charged. The G193specifically monitors the K1 clutch while the G194 monitors the B2 clutch. The use of these switches were eliminated in June of 2004.

N88 and N89
Solenoid 1 (N88) and 2 (N89) are Normally Closed On/Off Solenoids and are used to control shifting of gears 4 through 6 and are sporadically and alternately activated during gear shifting. They are also used to control the B2 Brake apply in 1st gear Tiptronic mode for engine breaking.

N90, N91, N92, N93, N282 and N283
Solenoid N92 controls the K1 clutch, Solenoid N91 controls the lock-up clutch apply in the torque converter, Solenoid N90 controls K3 clutch apply, Solenoid N93 regulates main line pressure, N282 controls K2 clutch apply and N283 controls the B1brake clutch apply.

Figure 9

SOLENOID CASE CONNECTOR



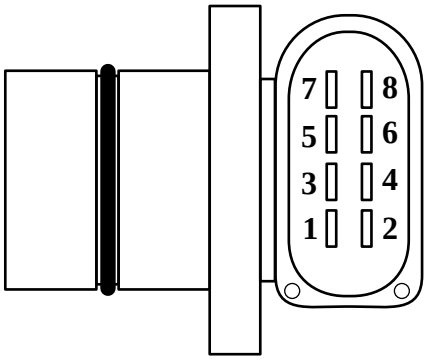
View looking into the 14 terminal transmission case connector

Solenoid Number (Name)	Positive Meter Lead Terminal # (Wire Color)	Negative Meter Lead Terminal # (Wire Color)	Resistance (Ω Ohms)
Solenoid # 1 (N88)	1 (White)	Case Ground	10.0 - 16.0
Solenoid # 2 (N89)	2 (Black)	Case Ground	10.0 - 16.0
Solenoid # 3 (N90)	7 (Lt. Blue)	8 (Lt. Green)	4.0 - 8.0
Solenoid # 4 (N91)	11 (Lt. Green)	12 (Brown)	4.0 - 8.0
Solenoid # 5 (N92)	3 (Yellow)	4 (Purple)	4.0 - 8.0
Solenoid # 6 (N93)	13 (Green)	14 (Grey)	4.0 - 8.0
Solenoid # 9 (N282)	5 (Red)	6 (Blue)	4.0 - 8.0
Solenoid # 10 (N283)	9 (White)	10 (Black)	4.0 - 8.0

The internal wire colors are provided in the chart above.

Figure 10

TFT AND RPM SENSOR CONNECTOR



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 (Ω Ohms)
TFT (G93)	1 (Orange)	2 (Orange)	37.0 - 51.0 K Ω @ -30° C
			5.0 - 8.0 K Ω @ 10° C
			3.0 - 5.0 K Ω @ 25° C
			230 - 265 Ω @ 110° C
			100 - 120 Ω @ 145° C
ISS (G182)	3 (White)	4 (Red)	5.0 M Ω*
OSS (G195)	5 (Tan)	6 (Blue)	5.0 M Ω*
PS1 (G193)	7 (N/A)**	Case Ground	Open
PS2 (G194)	8 (N/A)**	Case Ground	Open

The internal wire colors are provided in the chart above.

****The ISS and OSS are Hall Affect Sensors and should be checked using a scope under operating conditions. The resistance values provided in the chart above came from new sensors. Resistance checks of these type of sensors at best would inform you of either open or grounded circuits within the sensor itself.***

***** Pressure Switches 1 and 2 are not from June 2004 and up. These are normally open switches and close when their respective circuits are charged.***

Figure 11

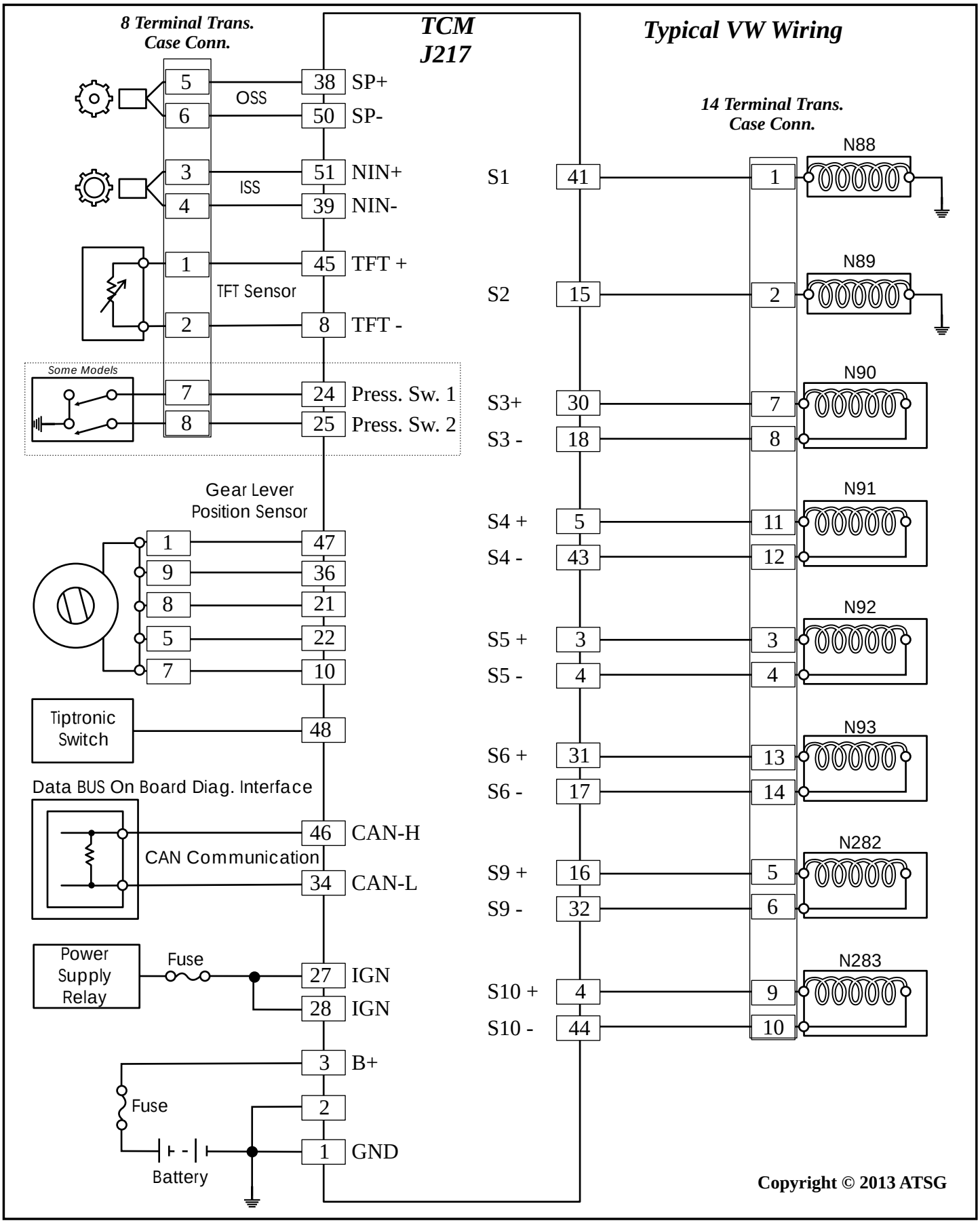

8 Terminal Trans.
Case Conn.
TCM
J217
Typical VW Wiring
14 Terminal Trans.
Case Conn.
5
6
OSS
38 SP+
50 SP-
3
4
ISS
51 NIN+
39 NIN-
1
2
TFT Sensor
45 TFT +
8 TFT -
Some Models
7
8
24 Press. Sw. 1
25 Press. Sw. 2
Gear Lever
Position Sensor
1
9
8
5
7
47
36
21
22
10
Tiptronic
Switch
48
Data BUS On Board Diag. Interface
46 CAN-H
CAN Communication
34 CAN-L
Power
Supply
Relay
Fuse
27 IGN
28 IGN
3 B+
Fuse
2
1 GND
Battery
S1
41
1
N88
S2
15
2
N89
S3+
30
7
S3 -
18
8
N90
S4 +
5
11
S4 -
43
12
N91
S5 +
3
3
S5 -
4
4
N92
S6 +
31
13
S6 -
17
14
N93
S9 +
16
5
S9 -
32
6
N282
S10 +
4
9
S10 -
44
10
N283
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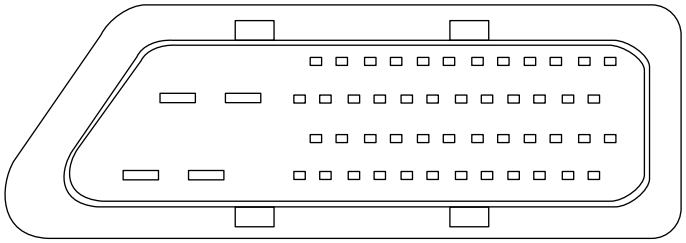
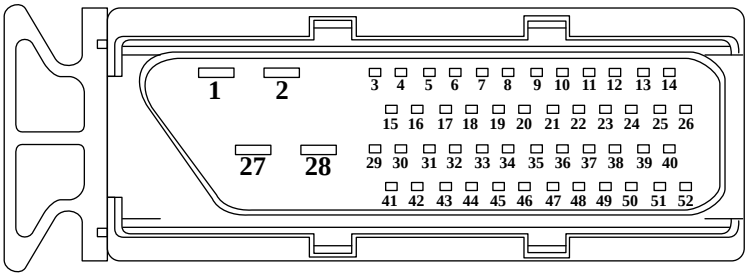
Figure 12

TCM J217 CONNECTOR ID



View looking into the TCM (J217)



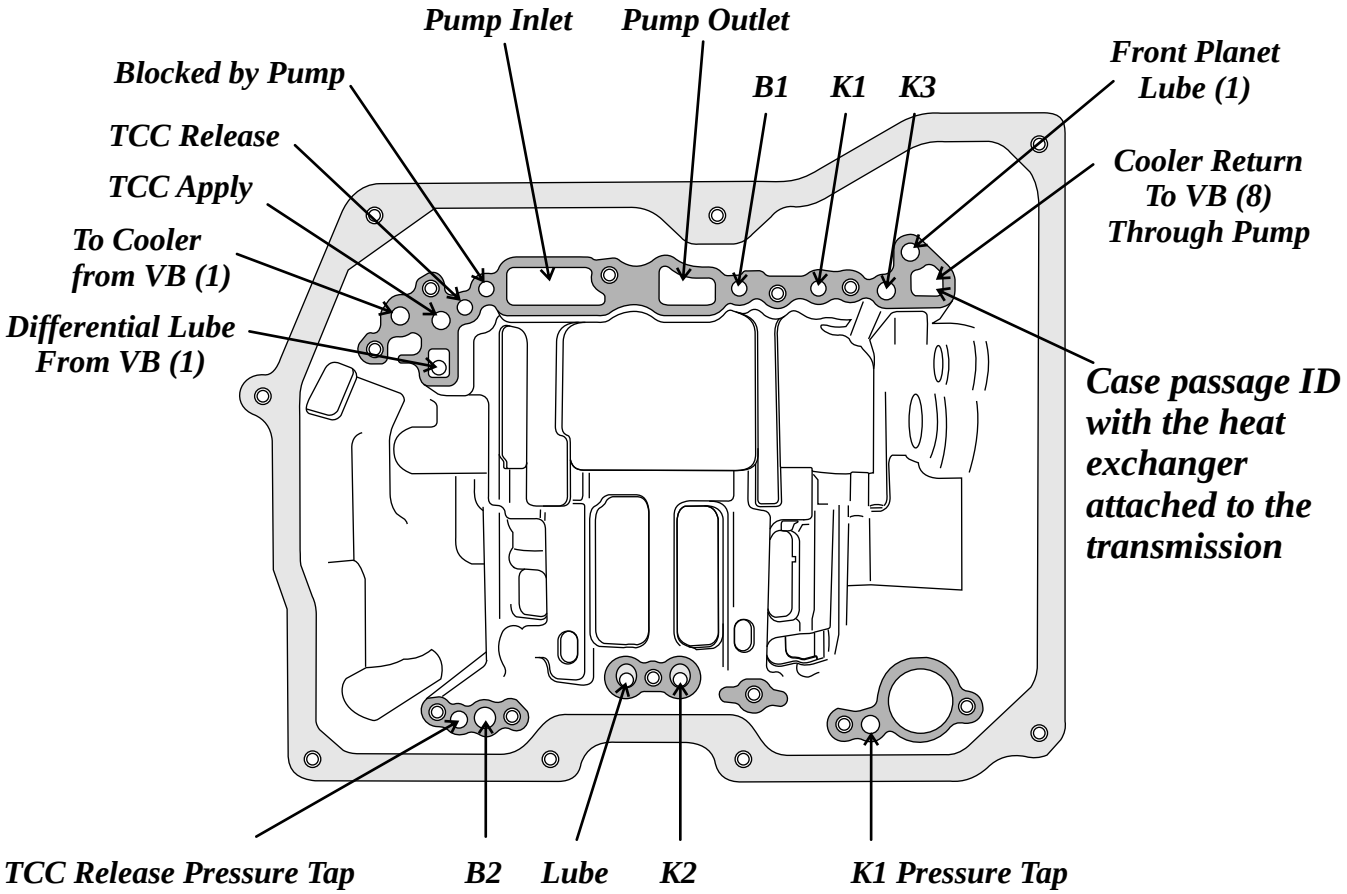
View looking into the 52 pin J217 connector

Solenoid Number (Name)	Positive Meter Lead Terminal # (Wire Color)	Negative Meter Lead Terminal # (Wire Color)	Resistance (WOhms)
Solenoid # 1 (N88)	41 (Black/Violet)	1or2 (Brown)	10.0 - 16.0
Solenoid # 2 (N89)	15 (Black/Grey)	1or2 (Brown)	10.0 - 16.0
Solenoid # 3 (N90)	30 (Yellow/Violet)	18 (Yellow/Green)	4.0 - 8.0
Solenoid # 4 (N91)	5 (Green/Violet)	43 (Yellow/Blue)	4.0 - 8.0
Solenoid # 5 (N92)	42 (White/Violet)	6 (Violet/Green)	4.0 - 8.0
Solenoid # 6 (N93)	31 (Grey)	17 (Green/Grey)	4.0 - 8.0
Solenoid # 9 (N282)	16 (Brown/Violet)	32 (Blue)	4.0 - 8.0
Solenoid # 10 (N283)	4 (Blue/Green)	44 (Violet/Yellow)	4.0 - 8.0
TFT (G93)	45 (Violet)	8 (Violet/White)	See chart P.12
ISS (G182)	51 (White)	39 (Brown)	5.0M
OSS (G195)	38 (White)	50 (Green)	5.0M
PS1 (G193)	24 (Violet/Grey)	1or2 (Brown)	Open
PS2 (G194)	25 (Green/Grey)	1or2 (Brown)	Open

External harness wire colors are provided in the chart above and may vary depending on year, make and model of vehicle.

Figure 13

PASSAGE ID- HEAT EXCHANGER ATTACHED TO THE TRANSMISSION CASE



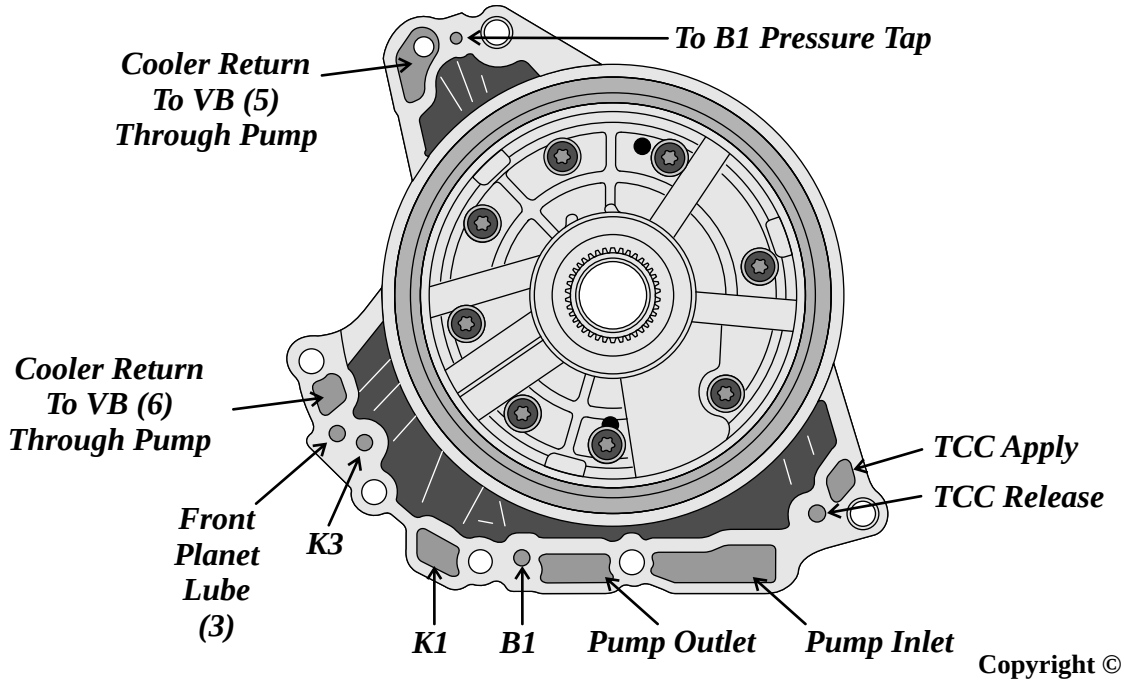
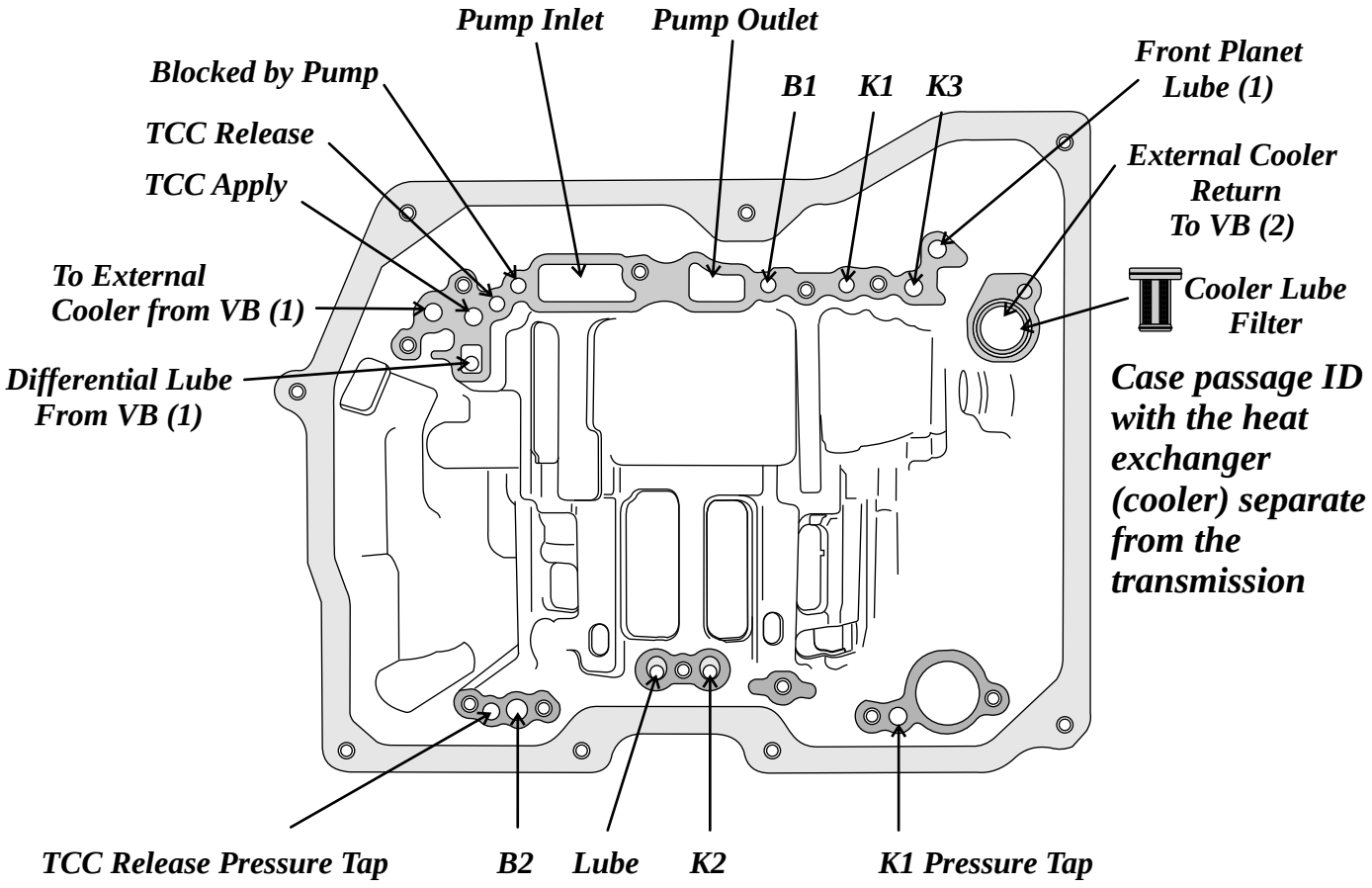


Figure 14

PASSAGE ID- COOLER SEPARATE FROM THE TRANSMISSION CASE



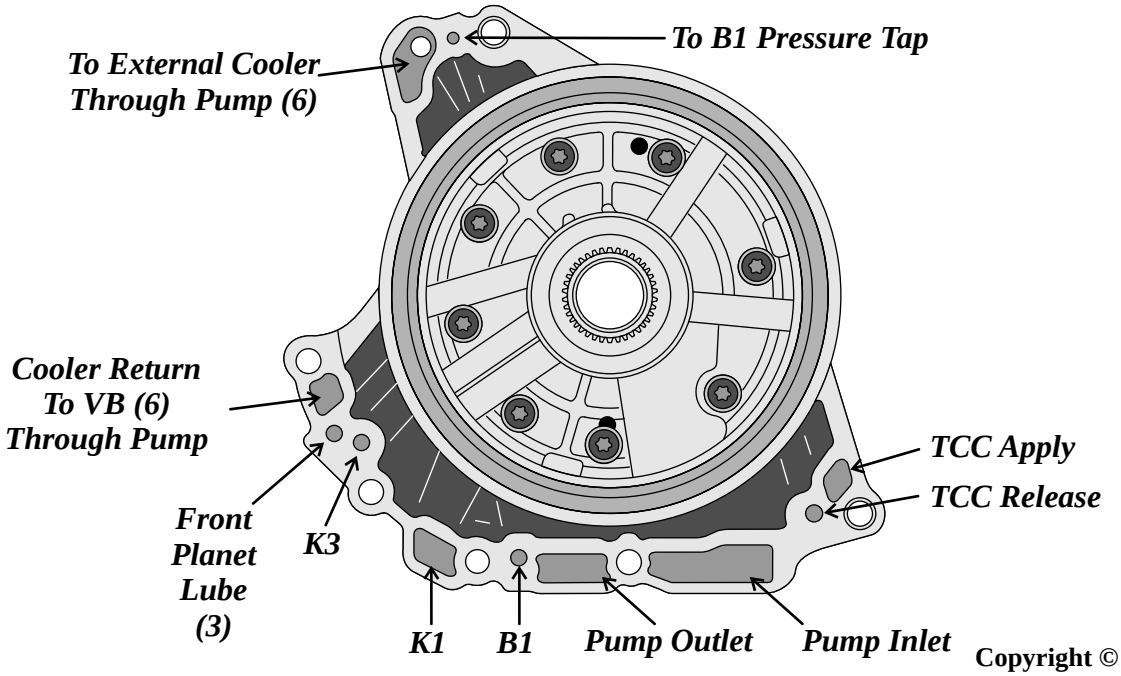


Figure 15

VW TECHNICAL DATA	
Manufacturer	AISIN Co., LTD. Japan
Transmission Type	Electro-hydraulically controlled 6-speed planetary gear with hydrodynamic torque converter and traction controlled torque converter lock-up clutch for front wheel drive and transverse installation.
Control	Hydraulic control module (Valve Body) in oil sump with an external electronic control module. Dynamic Shifting Program (DSP) with separate Sport program in "Position S" and the Tiptronic shifting program for manual gear change (optional with Tiptronic steering wheel)
Torque Performance	Up to 332 lbs-ft (450 Nm), depending on version
Intermediate drive for code letters GSY/GJZ	No. of teeth 52/49 = 1.061
Final Drive GSY	No. of teeth 61/15 = 4.067
Final Drive GJZ	No. of teeth 58/15 = 3.867
ATF Specification	G 052 025 A2
Filing amount	7.4 quarts (7.0 liters) [initial fill] lifetime filling
Weight	Approximately 182 lbs. (82.5 kg).
Length	Approximately 13.8 inches (350 mm)
Spread	6.05

Depending on engine type, overall ration is configured as 5+E transmission or as a 6 speed transmission

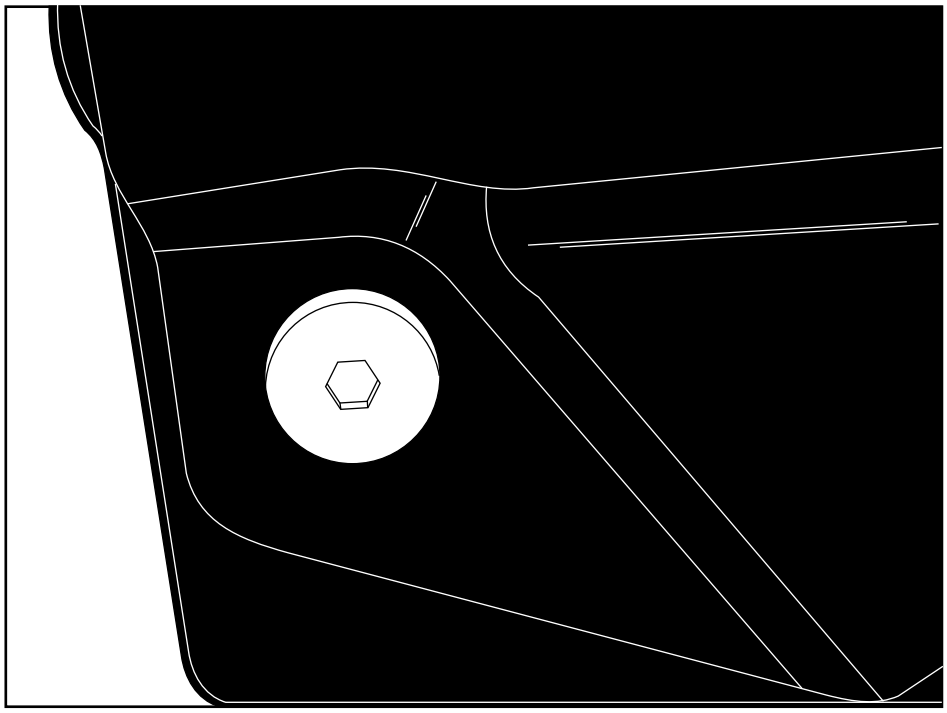
For the 5+E transmission, the highest speed is reached in 5th gear. The 6th gear reduces engine speed, improves driving comfort and reduces fuel consumption:

For the 6 speed transmission configuration, the higest speed is reached in 6th gear. The 6th gear lowers transmission gear ratio and increases driving dynamics.

Figure 16

FLUID LEVEL CHECKS

Check and Fill Plug



Fluid Level Stand Pipe

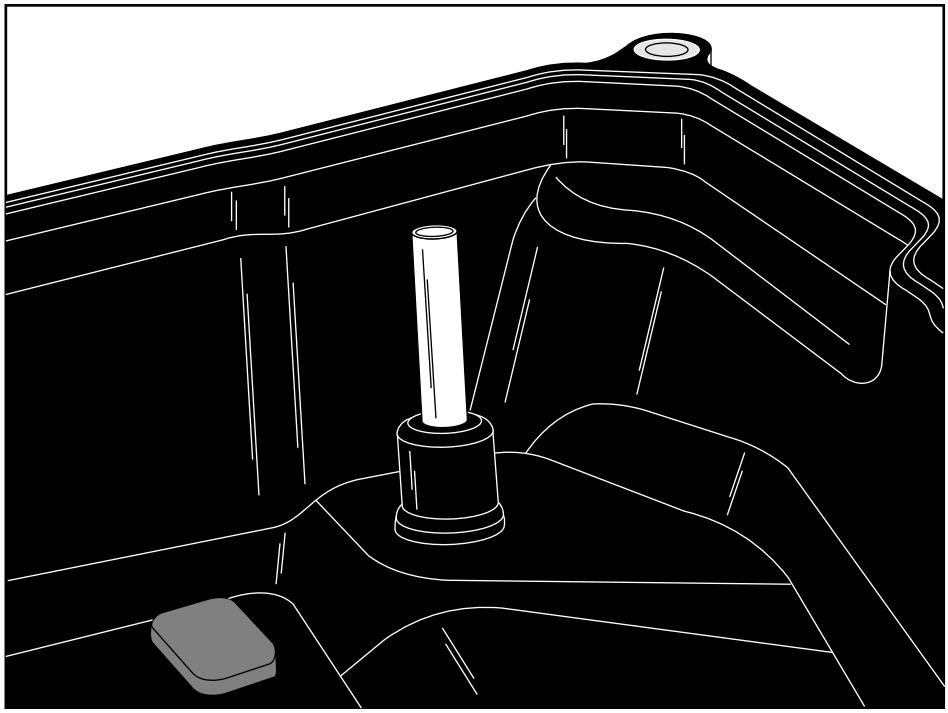
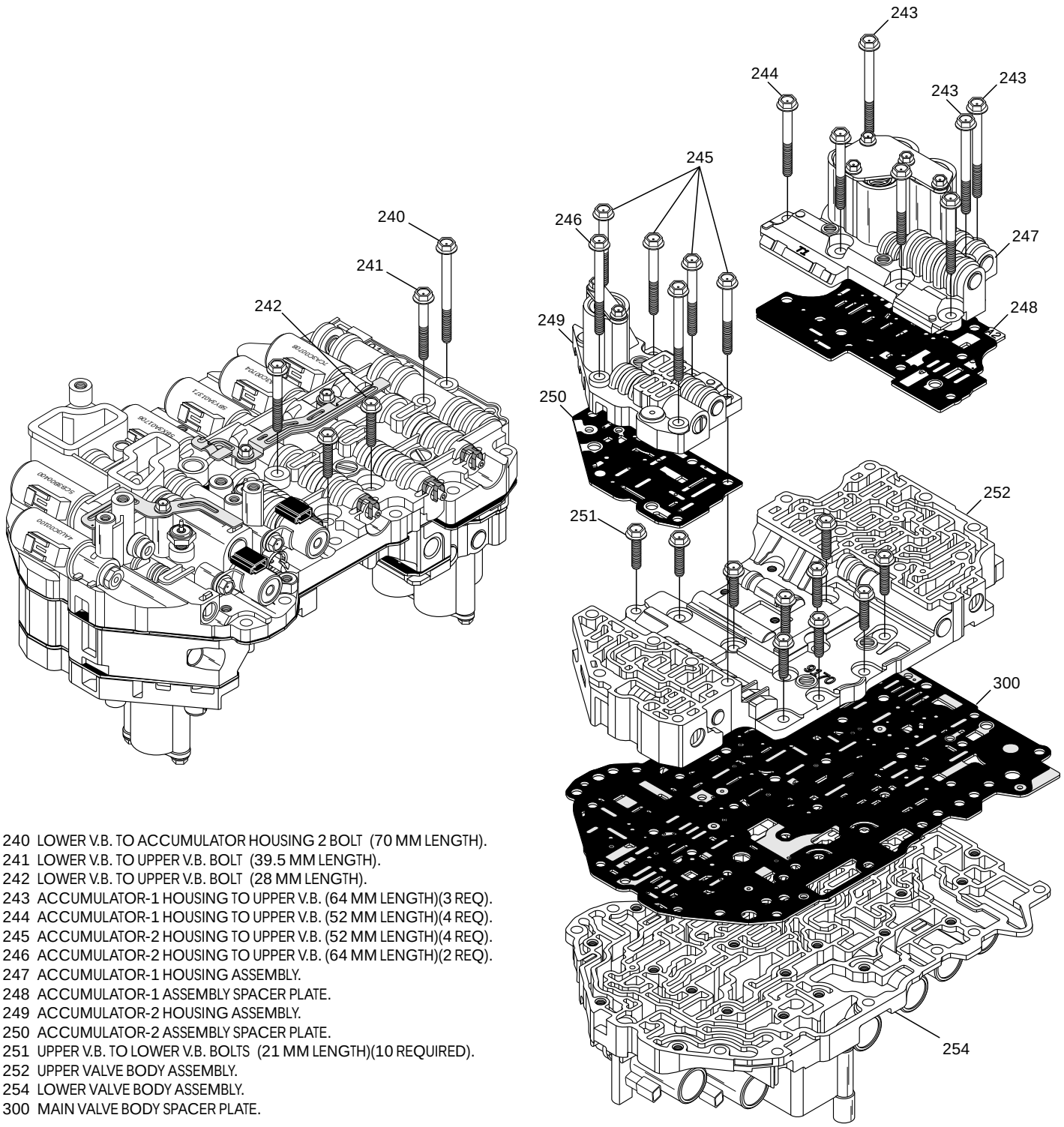


Figure 17

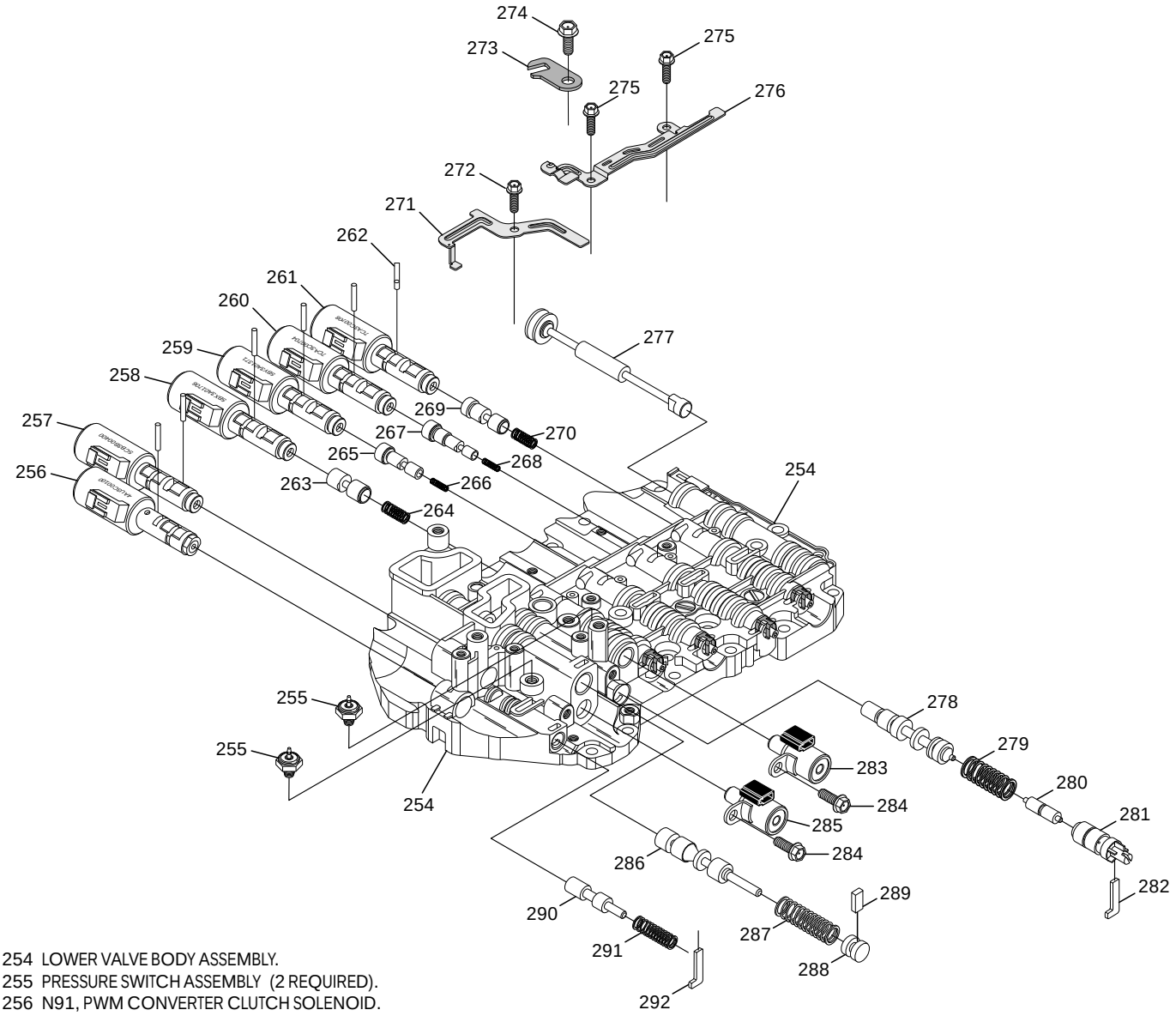
"09G" VALVE BODY EXPLODED VIEW



240 LOWER V.B. TO ACCUMULATOR HOUSING 2 BOLT (70 MM LENGTH).
241 LOWER V.B. TO UPPER V.B. BOLT (39.5 MM LENGTH).
242 LOWER V.B. TO UPPER V.B. BOLT (28 MM LENGTH).
243 ACCUMULATOR-1 HOUSING TO UPPER V.B. (64 MM LENGTH)(3 REQ).
244 ACCUMULATOR-1 HOUSING TO UPPER V.B. (52 MM LENGTH)(4 REQ).
245 ACCUMULATOR-2 HOUSING TO UPPER V.B. (52 MM LENGTH)(4 REQ).
246 ACCUMULATOR-2 HOUSING TO UPPER V.B. (64 MM LENGTH)(2 REQ).
247 ACCUMULATOR-1 HOUSING ASSEMBLY.
248 ACCUMULATOR-1 ASSEMBLY SPACER PLATE.
249 ACCUMULATOR-2 HOUSING ASSEMBLY.
250 ACCUMULATOR-2 ASSEMBLY SPACER PLATE.
251 UPPER V.B. TO LOWER V.B. BOLTS (21 MM LENGTH)(10 REQUIRED).
252 UPPER VALVE BODY ASSEMBLY.
254 LOWER VALVE BODY ASSEMBLY.
300 MAIN VALVE BODY SPACER PLATE.

Figure 18

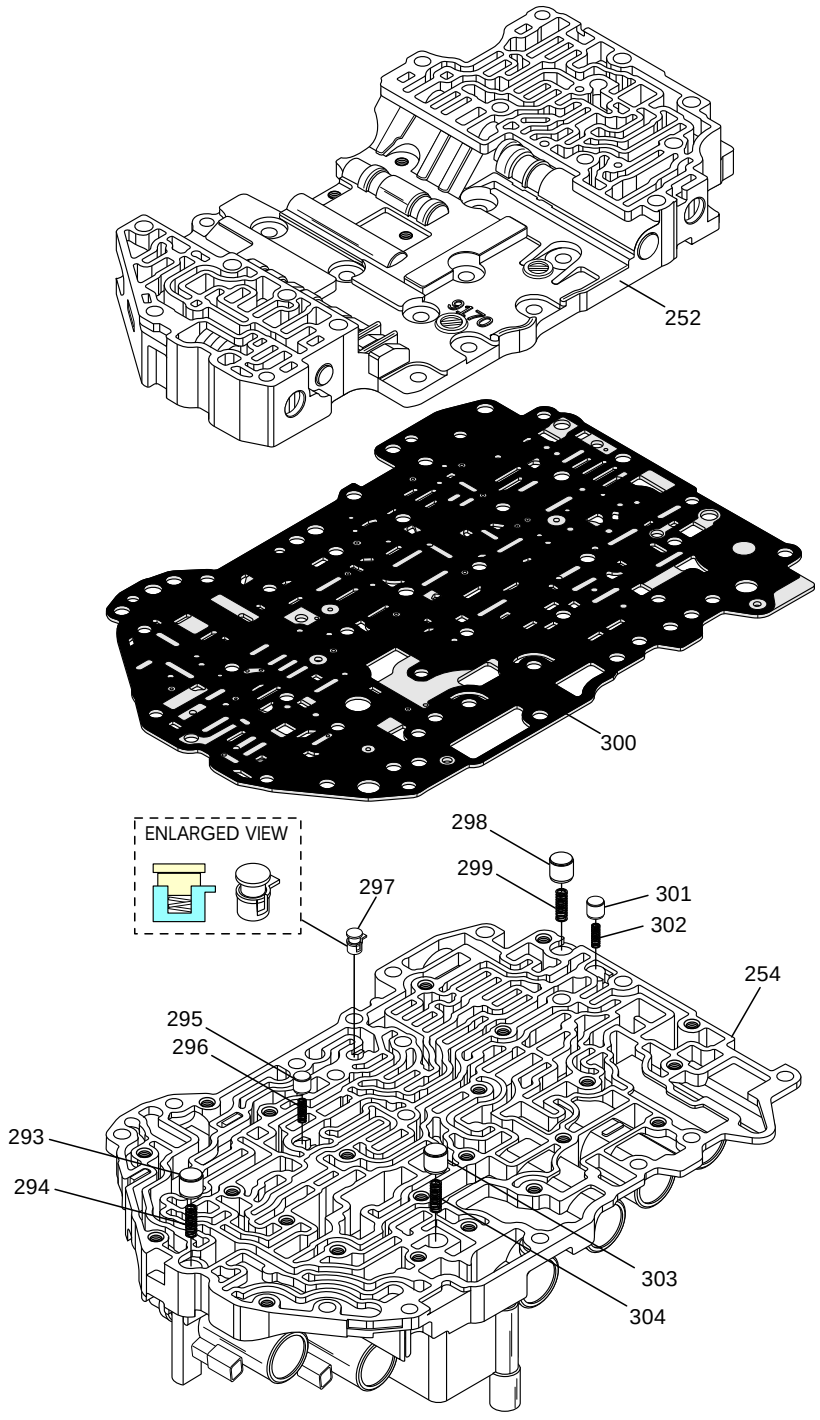
"09G" LOWER VALVE BODY ASSEMBLY, EXPLODED VIEW



254 LOWER VALVE BODY ASSEMBLY.
255 PRESSURE SWITCH ASSEMBLY (2 REQUIRED).
256 N91, PWM CONVERTER CLUTCH SOLENOID.
257 N93, PWM LINE PRESSURE CONTROL SOLENOID.
258 N92, PWM K1 CLUTCH CONTROL SOLENOID.
259 N282, PWM K2 CLUTCH CONTROL SOLENOID.
260 N283, PWM B1 CLUTCH CONTROL SOLENOID.
261 N90, PWM K3 CLUTCH CONTROL SOLENOID.
262 PWM SOLENOID RETAINING PINS (6 REQUIRED)
263 K1 CLUTCH REGULATOR VALVE.
264 K1 CLUTCH REGULATOR VALVE SPRING.
265 K2 CLUTCH REGULATOR VALVE.
266 K2 CLUTCH REGULATOR VALVE SPRING.
267 B1 CLUTCH REGULATOR VALVE.
268 B1 CLUTCH REGULATOR VALVE SPRING.
269 K3 CLUTCH REGULATOR VALVE.
270 K3 CLUTCH REGULATOR VALVE SPRING.
271 N91 AND N93 SOLENOID PIN RETAINING BRACKET.
272 SOLENOID PIN RETAING BRACKET BOLT.
273 TRANSAXLE FLUID TEMPERATURE SENSOR RETAINING BRACKET.
274 TFT SENSOR RETAINING BRACKET BOLT.
275 SOLENOID PIN RETAINING BRACKET BOLTS (2 REQUIRED).
276 N92, N282, N283, N90 SOLENOID PIN RETAINING BRACKET.
277 MANUAL VALVE.
278 PRIMARY PRESSURE REGULATOR VALVE.
279 PRIMARY PRESSURE REGULATOR VALVE SPRING.
280 PRIMARY PRESSURE REGULATOR BOOST VALVE.
281 PRIMARY PRESSURE REGULATOR BOOST VALVE SLEEVE.
282 PRIMARY REGULATOR BOOST SLEEVE RETAINER.
283 N88, ON/OFF SOLENOID.
284 SOLENOID RETAINING BOLT (2 REQUIRED).
285 N89, ON/OFF SOLENOID.
286 SECONDARY PRESSURE REGULATOR VALVE.
287 SECONDARY PRESSURE REGULATOR SPRING.
288 SECONDARY PRESSURE REGULATOR BORE PLUG.
289 SECONDARY PRESSURE REGULATOR BORE PLUG RETAINER.
290 SOLENOID MODULATING VALVE A FOR N88, N89, N90, N282, N283.
291 SOLENOID MODULATING VALVE A SPRING.
292 SOLENOID MODULATING VALVE A SPRING RETAINER.

Figure 19

"09G" LOWER VALVE BODY SMALL PARTS, EXPLODED VIEW



252 UPPER VALVE BODY ASSEMBLY.
254 LOWER VALVE BODY ASSEMBLY.
293 CHECK VALVE 2: LUBE (.392" DIAMETER).
294 CHECK VALVE 2 SPRING.
295 CHECK VALVE 3: FWD ENG./K1/K2 REG VALVE FEED (.313" DIAMETER).
296 CHECK VALVE 3 SPRING.
297 PLASTIC CHECK VALVE 1: K2
298 CHECK VALVE 4: FWD ENG. ACCUM. EXHAUST (.392" DIAMETER).
299 CHECK VALVE 4 SPRING.
300 MAIN VALVE BODY SPACER PLATE.
301 CHECK VALVE 5: B2 ORIFICE CONTROL- REVERSE (.313" DIAMETER).
302 CHECK VALVE 5 SPRING.
303 CHECK VALVE 1: LUBE & COOLER (.392" DIAMETER).
304 CHECK VALVE 1 SPRING.

Figure 20

LOWER VALVE BODY CHECK VALVE AND VALVE SPRING SPECS

264. K1 Regulator Valve Spring

No. Coils-10
Overall Length-.710"
Outside Diameter- .325"
Coil Diameter- .035"
Color- Lt. Pink

266. K2 Regulator Valve Spring

No. Coils-11
Overall Length-.740"
Outside Diameter- .260"
Coil Diameter- .040"
Color- White

268. B1 Regulator Valve Spring

No. Coils-9
Overall Length-.745"
Outside Diameter- .252"
Coil Diameter- .038"
Color- Red

270. K3 Regulator Valve Spring

No. Coils-10
Overall Length-.815"
Outside Diameter- .325"
Coil Diameter- .040”
Color- none

279. Primary Pressure Regulator Valve Spring

No. Coils-9
Overall Length-1.440"
Outside Diameter- .524"
Coil Diameter- .045"
Color- Pink

287. Secondary Pressure Regulator Valve Spring

No. Coils-13
Overall Length-1.500"
Outside Diameter- .424"
Coil Diameter- .045"
Color- White

291. Solenoid Modulator Valve A Spring

No. Coils-10
Overall Length-1.000"
Outside Diameter- .315"
Coil Diameter- .040”
Color- White

294. Check Valve 2 Spring

No. Coils-8
Overall Length-.560"
Outside Diameter- .250"
Coil Diameter- .040"
Color- Lt. Blue

296. Check Valve 3 Spring

No. Coils-10
Overall Length-.380"
Outside Diameter- .163"
Coil Diameter- .016”
Color- Red

299. Check Valve 4 Spring

No. Coils-8
Overall Length-.628"
Outside Diameter- .251”
Coil Diameter- .035"
Color- White

302. Check Valve 5 Spring

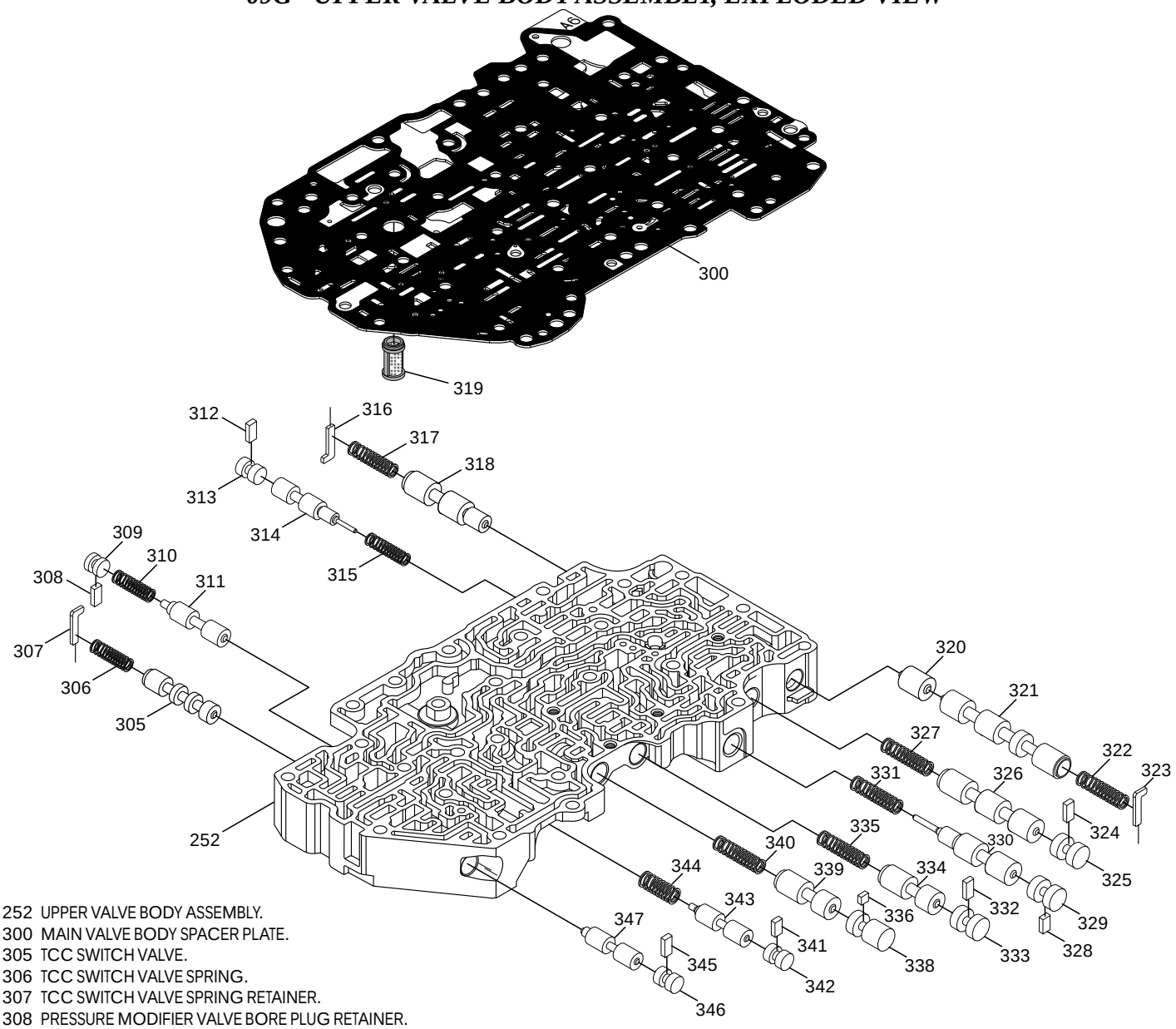
No. Coils-10
Overall Length-.380"
Outside Diameter- .163"
Coil Diameter- .016”
Color- Red

304. Check Valve 1 Spring

No. Coils-12
Overall Length-.595"
Outside Diameter- .250"
Coil Diameter- .025”
Color- Orange

Figure 21

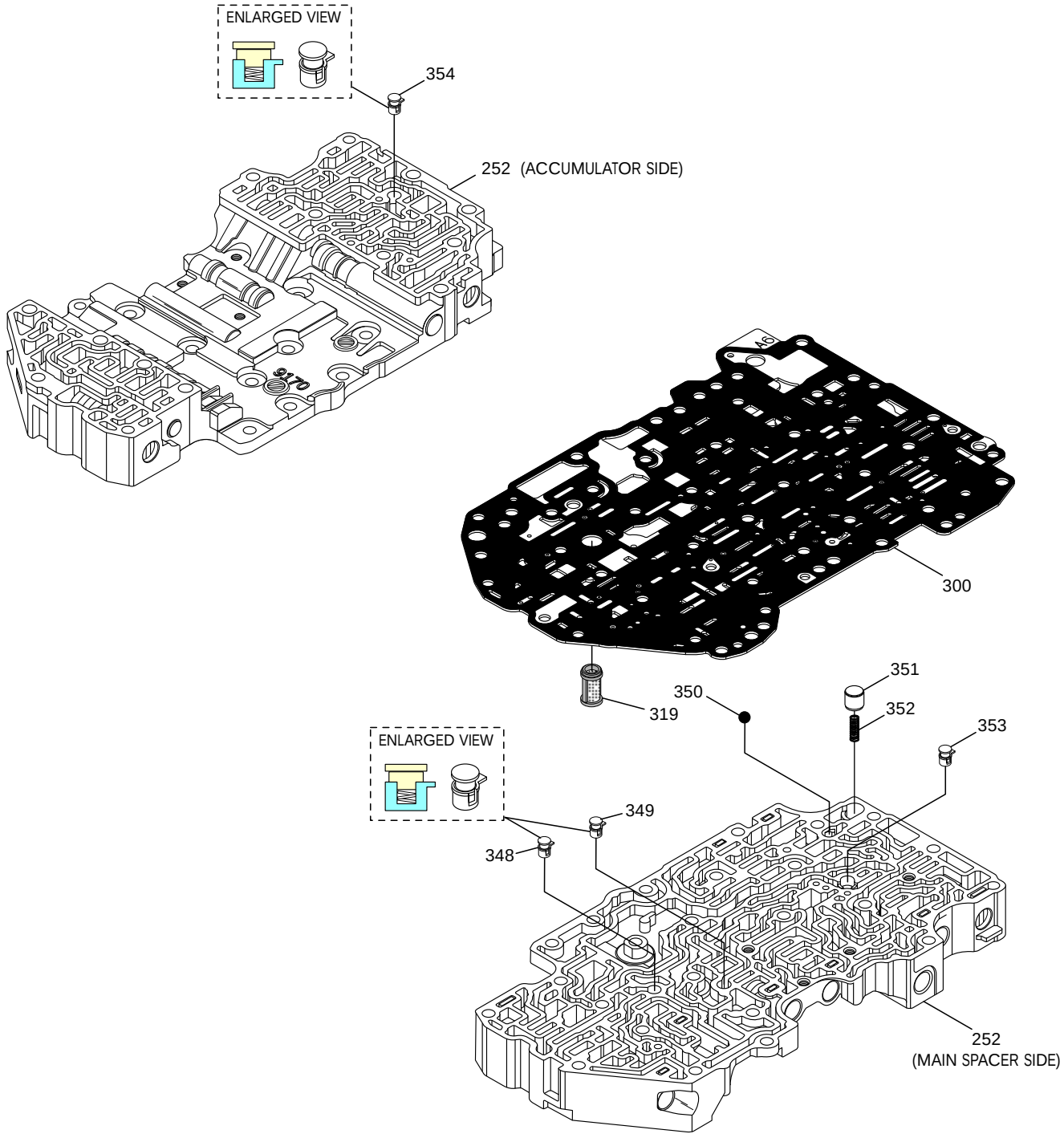
"09G" UPPER VALVE BODY ASSEMBLY, EXPLODED VIEW



252 UPPER VALVE BODY ASSEMBLY.
300 MAIN VALVE BODY SPACER PLATE.
305 TCC SWITCH VALVE.
306 TCC SWITCH VALVE SPRING.
307 TCC SWITCH VALVE SPRING RETAINER.
308 PRESSURE MODIFIER VALVE BORE PLUG RETAINER.
309 PRESSURE MODIFIER VALVE STEEL BORE PLUG.
310 PRESSURE MODIFIER VALVE SPRING.
311 PRESSURE MODIFIER VALVE.
312 K3 RELAY VALVE BORE PLUG RETAINER.
313 K3 RELAY VALVE STEEL BORE PLUG.
314 K3 RELAY VALVE.
315 K3 RELAY VALVE SPRING.
316 B2 RELAY VALVE (M1) SPRING RETAINER.
317 B2 RELAY VALVE (M1) SPRING.
318 Br YELAY VALVE (M1).
319 SCREEN FOR MODULATING VALVES A & B.
320 RELAY VALVE PLUG.
321 RELAY VALVE.
322 RELAY VALVE SPRING.
323 RELAY VALVE SPRING RETAINER.
324 B1 SWITCH VALVE BORE PLUG RETAINER.
325 B1 SWITCH VALVE BORE PLUG.
326 B1 SWITCH VALVE.
327 B1 SWITCH VALVE SPRING.
328 4-5 TIMING VALVE BORE PLUG RETAINER.
329 4-5 TIMING VALVE STEEL BORE PLUG.
330 4-5 TIMING VALVE.
331 4-5 TIMING VALVE SPRING.
332 K2 RELAY VALVE RETAINER.
333 K2 RELAY VALVE BORE PLUG.
334 K2 RELAY VALVE.
335 K2 RELAY VALVE SPRING.
336 K1 RELAY VALVE RETAINER.
338 K1 RELAY VALVE BORE PLUG.
339 K1 RELAY VALVE.
340 K1 RELAY VALVE SPRING.
341 B2 SWITCH VALVE BORE PLUG RETAINER.
342 B2 SWITCH VALVE STEEL BORE PLUG.
343 B2 SWITCH VALVE.
344 B2 SWITCH VALVE SPRING.
345 B2 SWITCH VALVE TIPTRONIC M1 BORE PLUG RETAINER.
346 B2 SWITCH VALVE TIPTRONIC M1 BORE PLUG.
347 B2 TIPTRONIC M1 VALVE.

Figure 22

"09G" UPPER VALVE BODY SMALL PARTS, EXPLODED VIEW



252 UPPER VALVE BODY ASSEMBLY.
300 MAIN VALVE BODY SPACER PLATE (MODEL SENSITIVE).
319 PLASTIC FILTER FOR SOLENOID MODULATING VALVES A & B.
348 PLASTIC VALVE CHECK VALVE 2: SECONDARY PR VALVE.
349 PLASTIC CHECK VALVE 4: K1
350 CHECK BALL 1, 5.3 MM (.210") DIAMETER.
351 CHECK VALVE 6: MANUAL VALVE (.392" DIAMETER).
352 CHECK VALVE 6 SPRING.
353 PLASTIC CHECK VALVE 3: B.
354 PLASTIC CHECK VALVE 5: K3.

Figure 23

UPPER VALVE BODY VALVE SPRING SPECS

306. TCC Switch Valve Spring

No. Coils-9
Overall Length-1.160"
Outside Diameter- .275"
Coil Diameter- .022"
Color- Lt. Green

310. Pressure Modifier Valve Spring

No. Coils-9
Overall Length-1.010"
Outside Diameter- .325"
Coil Diameter- .027"
Color- Lt. Blue

315. K3 Relay Valve Spring

No. Coils-13
Overall Length-1.135"
Outside Diameter- .252"
Coil Diameter- .027”
Color- Red

317. B2 Relay (M1) Valve Spring

No. Coils-12
Overall Length-1.135"
Outside Diameter- .290"
Coil Diameter- .029”
Color- White

322. Relay Valve Spring

No. Coils-12
Overall Length-1.135"
Outside Diameter- .290"
Coil Diameter- .029"
Color- White

327. B1 Switch Valve Spring

No. Coils-10
Overall Length-1.080"
Outside Diameter- .278"
Coil Diameter- .027"
Color- Pink

331. 4-5 Timing Valve Spring

No. Coils-13
Overall Length-1.135"
Outside Diameter- .252"
Coil Diameter- .027”
Color- Red

335. K2 Relay Valve Spring

No. Coils-11
Overall Length-1.060"
Outside Diameter- .273"
Coil Diameter- .025”
Color- Red

340. K1 Relay Valve Spring

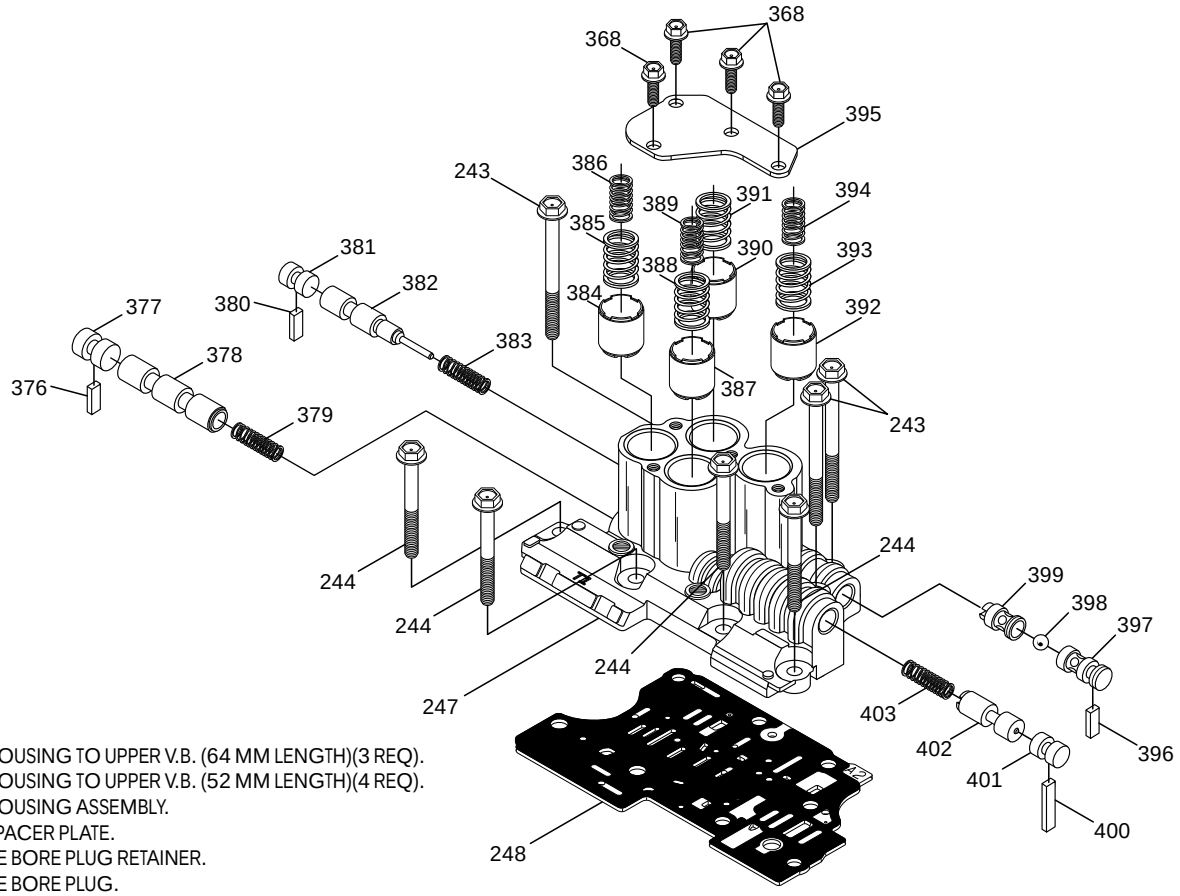
No. Coils-11
Overall Length-1.060"
Outside Diameter- .273"
Coil Diameter- .025"
Color- Pink

344. B2 Switch Valve Spring

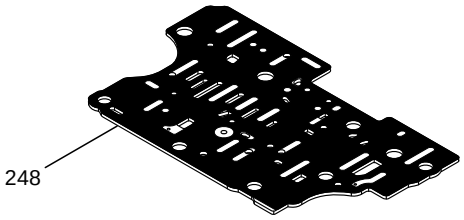
No. Coils-9
Overall Length-1.010"
Outside Diameter- .325"
Coil Diameter- .027”
Color- Lt. Blue

Figure 24

"09G" ACCUMULATOR BODY 1, EXPLODED VIEW



243 ACCUM. BODY 1 HOUSING TO UPPER V.B. (64 MM LENGTH)(3 REQ).
244 ACCUM. BODY 1 HOUSING TO UPPER V.B. (52 MM LENGTH)(4 REQ).
247 ACCUM. BODY 1 HOUSING ASSEMBLY.
248 ACCUM. BODY 1 SPACER PLATE.
376 K3 CONTROL VALVE BORE PLUG RETAINER.
377 K3 CONTROL VALVE BORE PLUG.
378 K3 CONTROL VALVE.
379 K3 CONTROL VALVE SPRING.
380 3-4 TRANSITION VALVE BORE PLUG RETAINER.
381 3-4 TRANSITION VALVE BORE PLUG.
382 3-4 TRANSITION VALVE.
383 3-4 TRANSITION VALVE SPRING.
384 B1 CLUTCH ACCUMULATOR PISTON.
385 B1 CLUTCH ACCUMULATOR PISTON OUTER SPRING.
386 B1 CLUTCH ACCUMULATOR PISTON INNER SPRING.
387 K3 CLUTCH ACCUMULATOR PISTON.
388 K3 CLUTCH ACCUMULATOR PISTON OUTER SPRING.
389 K3 CLUTCH ACCUMULATOR PISTON INNER SPRING.
390 K1 CLUTCH ACCUMULATOR PISTON.
391 K1 CLUTCH ACCUMULATOR PISTON SPRING.
392 K2 CLUTCH ACCUMULATOR PISTON.
393 K2 CLUTCH ACCUMULATOR PISTON OUTER SPRING.
394 K2 CLUTCH ACCUMULATOR PISTON INNER SPRING.
395 ACCUMULATOR PISTON AND SPRING RETAINER PLATE.
396 B1/K3 3-WAY CHECK VALVE BORE PLUG RETAINER.
397 B1/K3 3-WAY CHECK VALVE BORE PLUG.
398 B1/K3 3-WAY CHECK VALVE (.250" STEEL BALL).
399 B1/K3 3-WAY CHECK VALVE SEAT.
400 B1 RELAY VALVE BORE PLUG RETAINER.
401 B1 RELAY VALVE BORE PLUG.
402 B1 RELAY VALVE.
403 B1 RELAY VALVE SPRING.
404 CHECK VALVE 11: MAIN LINE PRESSURE LIMIT VALVE.
405 CHECK VALVE 11 SPRING.
406 CHECK VALVE 10: REGULATED EXHAUST (.392" DIAMETER).
407 CHECK VALVE10 SPRING.



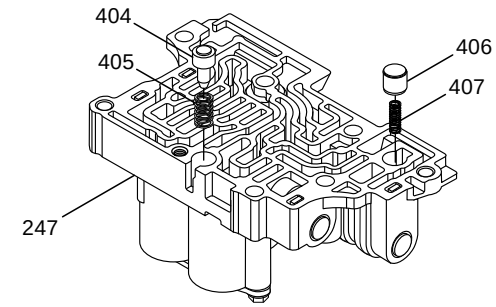


Figure 25

ACCUMULATOR BODY 1 CHECK VALVE, VALVE AND ACCUMULATOR SPRING SPECS

379. K3 Control Valve Spring

No. Coils-10
Overall Length-1.080"
Outside Diameter- .278"
Coil Diameter- .027"
Color- Pink

383. 3-4 Transition Valve Spring

No. Coils-13
Overall Length-1.135"
Outside Diameter- .252"
Coil Diameter- .027"
Color- None

403. B1 Relay Valve Spring

No. Coils-11
Overall Length-1.054"
Outside Diameter- .278"
Coil Diameter- .027”
Color- Pink

385. B1 Accum. Outer Spring

No. Coils-6
Overall Length-1.000"
Outside Diameter- .620"
Coil Diameter- .080"
Color- Green

386. B1 Accum. Inner Spring

No. Coils-9
Overall Length-1.038"
Outside Diameter- .400"
Coil Diameter- .065”
Color- Pink

388. K3 Accum. Outer Spring

No. Coils-6
Overall Length-1.050"
Outside Diameter- .620"
Coil Diameter- .080”
Color- Green

389. K3 Accum. Inner Spring

No. Coils-9
Overall Length-1.070"
Outside Diameter- .412"
Coil Diameter- .055”
Color- Green

391. K1 Accum. Outer Spring

No. Coils-6
Overall Length-1.060"
Outside Diameter- .620"
Coil Diameter- .080"
Color- Green

393. K2 Accum. Outer Spring

No. Coils-6
Overall Length-1.050"
Outside Diameter- .620"
Coil Diameter- .080”
Color- Green

389. K2 Accum. Inner Spring

No. Coils-9
Overall Length-1.060"
Outside Diameter- .412"
Coil Diameter- .055”
Color- Green

405. Check Valve 11 Spring

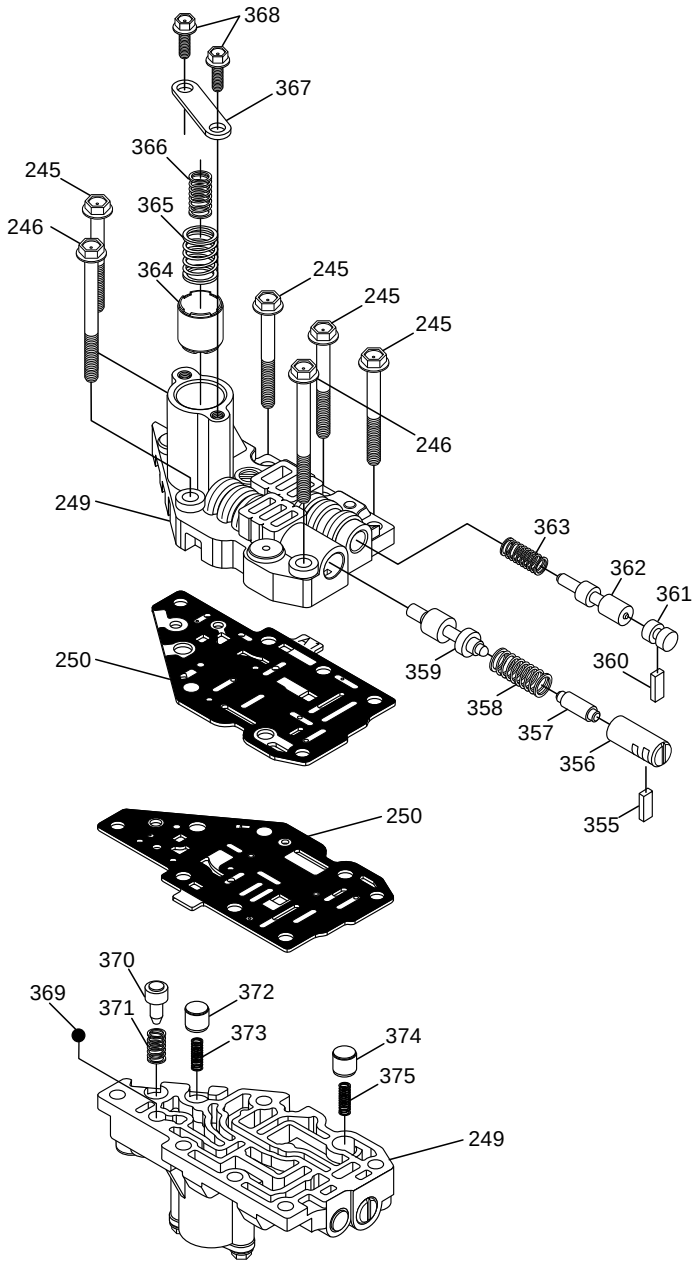
No. Coils-4
Overall Length-.425"
Outside Diameter- .370"
Coil Diameter- .055"
Color- Pink or none

407. Check Valve 10 Spring

No. Coils-12
Overall Length-.595"
Outside Diameter- .250"
Coil Diameter- .025”
Color- White

Figure 26

"09G" ACCUMULATOR BODY 2, EXPLODED VIEW



245 ACCUM. BODY 2 HOUSING TO UPPER V.B. (52 MM LENGTH)(4 REQ).
246 ACCUM. BODY 2 HOUSING TO UPPER V.B. (64 MM LENGTH)(2 REQ).
249 ACCUM. BODY 2 HOUSING ASSEMBLY.
250 ACCUM. BODY 2 SPACER PLATE.
355 TCC APPLY CONTROL VALVE SLEEVE RETAINER.
356 TCC APPLY CONTROL VALVE SLEEVE.
357 TCC APPLY CONTROL VALVE.
358 TCC APPLY CONTROL VALVE SPRING.
359 TCC APPLY CONTROL VALVE.
360 SOLENOID MODULATOR VALVE B BORE PLUG RETAINER.
361 SOLENOID MODULATOR VALVE B BORE PLUG.
362 SOLENOID MODULATOR VALVE B FOR N91, N92, N93.
363 SOLENOID MODULATOR VALVE B SPRING.
364 N93 LINE PRESSURE ACCUMULATOR PISTON.
365 N93 LINE PRESSURE ACCUMULATOR PISTON OUTER SPRING.
366 N93 LINE PRESSURE ACCUMULATOR PISTON INNER SPRING.
367 N93 LINE PRESSURE ACCUMULATOR SPRING RETAINER PLATE.
368 N93 ACCUMULATOR RETAINER BOLTS (11 MM LENGTH).
369 CHECK BALL 2, 5.3 MM (.210") DIAMETER.
370 PRESSURE CONTROL SOLENOID (N93) LIMIT CHECK VALVE 7.
371 PRESSURE CONTROL SOLENOID (N93) LIMIT CHECK VALVE 7 SPRING.
372 CHECK VALVE 8: REGULATED EXHAUST.
373 CHECK VALVE 8 SPRING.
374 COOLER PRESSURE LIMIT CHECK VALVE 9 (.392" DIAMETER).
375 COOLER PRESSURE LIMIT CHECK VALVE 9 SPRING.

Figure 27

ACCUMULATOR BODY 2 CHECK VALVE, VALVE AND ACCUMULATOR SPRING SPECS

358. TCC Apply Control Valve Spring

No. Coils-9
Overall Length-1.200"
Outside Diameter- .380"
Coil Diameter- .025"
Color- None

363. Solenoid Modulator Valve B Spring

No. Coils-10
Overall Length-1.000"
Outside Diameter- .322"
Coil Diameter- .041”
Color- None

365. N93Accum. Outer Spring

No. Coils-6
Overall Length-1.064”
Outside Diameter- .620"
Coil Diameter- .080"
Color- Green

386. N93 Accum. Inner Spring

No. Coils-9
Overall Length-1.070"
Outside Diameter- .412"
Coil Diameter- .055”
Color- Green

371. Check Valve 7 Spring

No. Coils-7
Overall Length-.800"
Outside Diameter- .335"
Coil Diameter- .030"
Color- Dk. Green

373. Check Valve 8 Spring

No. Coils-12
Overall Length-.595"
Outside Diameter- .250"
Coil Diameter- .025”
Color- White

375. Check Valve 9 Spring

No. Coils-12
Overall Length-.595"
Outside Diameter- .250"
Coil Diameter- .025”
Color- White

Figure 28