"2009" SEMINAR INFORMATION

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HONDA/ACURA
BYBA/MGHA FAMILY
GEAR NOISE

COMPLAINT: Before or after overhaul, Honda and Acura vehicles equipped with the BYBA/MGHA family of five speed transaxles may exhibit a gear noise on or off the throttle. ***Note:*** This noise will commonly sound like a worn "Ring and Pinion."

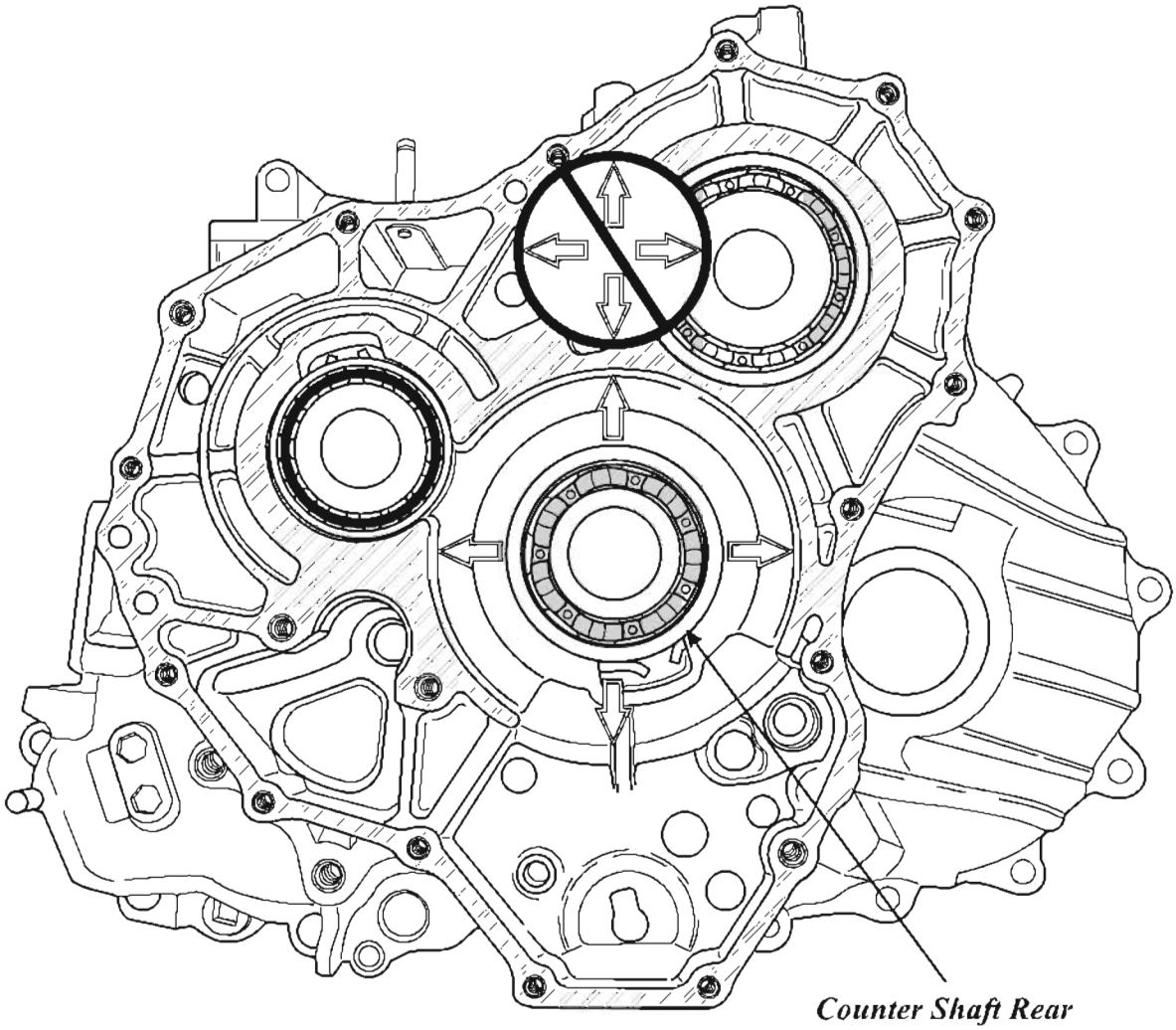
CAUSE: The cause may be wear in the mid-case where the counter shaft ball bearing outer race is supported. When the case wears in this area, the counter shaft, which is the pinion shaft for the differential, will be off center with the differential and idler geartrain, causing the noise.

CORRECTION: Refer to figure 1 and inspect the rear counter shaft ball bearing for wear and the area around the bearing in the mid-case. This ball bearing should be very snug in the case and there should be no side to side or up and down movement of the ball bearing outer race in the case. If there is movement, the mid case will have to be replaced.

SERVICE INFORMATION:

At the time of this printing there are no aftermarket repairs for the mid case. A good used or new mid case from the dealer will have to be purchased. ***Note:*** There are numerous versions of this family of transaxle. Consult your dealer for the correct part number for the application you are working on.

BYBA/MGHA FAMILY MID CASE



Note: This ball bearing should be very snug in the case and there should be no side to side or up and down movement of the ball bearing in the case. If there is movement, the mid case will have to be replaced.

Figure 1

HONDA/ACURA

MGHA FAMILY

NEUTRALIZING DOWNSHIFT TO 1ST

COMPLAINT: Before or after overhaul, Honda and Acura vehicles equipped with the MGHA family of transaxles may exhibit a neutralizing condition on a downshift into 1st gear, or a 3-1 passing gear neutral. This condition may be intermittent. This neutralizing condition can be cleared up simply by placing the selector in the Manual 1 position.

CAUSE: The cause may be, a worn low one-way clutch, or a worn inner race for the low one-way clutch, as shown in figure 1. Honda and Acura vehicles equipped with the MGHA family of transaxle utilize a low one-way clutch that locks in 1st gear for take-off. If the low one-way does not hold in 1st, there will be no engagement in 1st until the selector is placed in manual 1st. In this position the low hold clutch is engaged and 1st gear can be attained. The low hold clutch is used to provide engine braking in manual low as well as backing up the sprag by holding 1st gear should the sprag fail. This sprag failure is commonly overlooked, as the low hold clutch hub has to be driven out to inspect the sprag and races (See figure 2).

CORRECTION: Using a suitable bushing driver, remove the low-hold clutch hub from 1st gear, as shown in figure 2. Refer to figure 3 for an exploded view of the low one-way and 1st gear assembly. Replace as necessary. Note: The sprag can only be purchased as a complete assembly. If there is wear on the inner race for the low one-way, 1st gear will have to be replaced. Refer to figure 4 to verify proper freewheel rotation on the low one-way clutch.

SERVICE INFORMATION:

SECONDARY SHAFT LOW CLUTCH HUB (one-way clutch).....23420-RAY-005
SECONDARY SHAFT LOW GEAR.....23411-P7W-000

Note: Although the one-way-clutch is the same for both Honda and Acura, it is not purchasable separately. You must buy it assembled onto the low gear. The part numbers above are for an Acura MDX. You could purchase the MDX assembly and if the teeth count is the same for the vehicle being worked on, the assembly can be installed. If the teeth count is different, remove the one-way clutch and install it onto the original low gear. Or, just order the entire assembly for the vehicle being worked on.

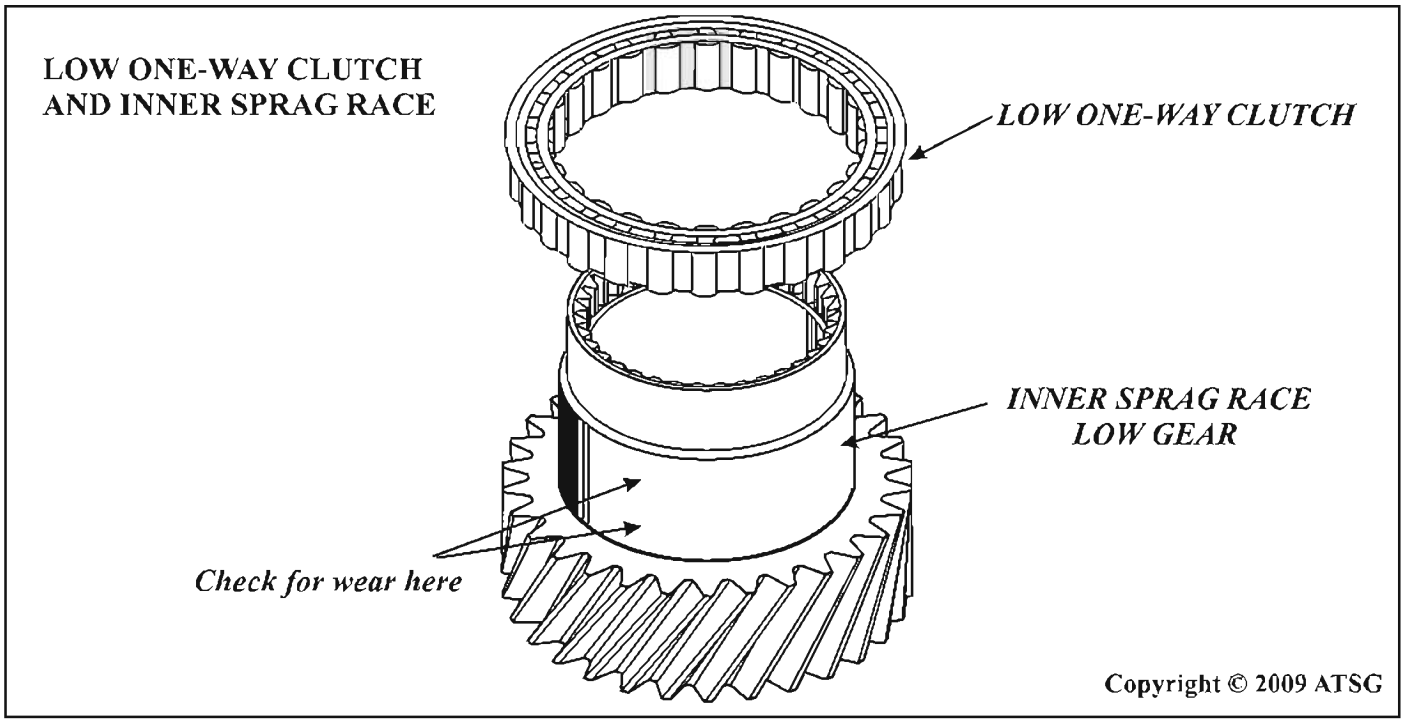


Figure 1

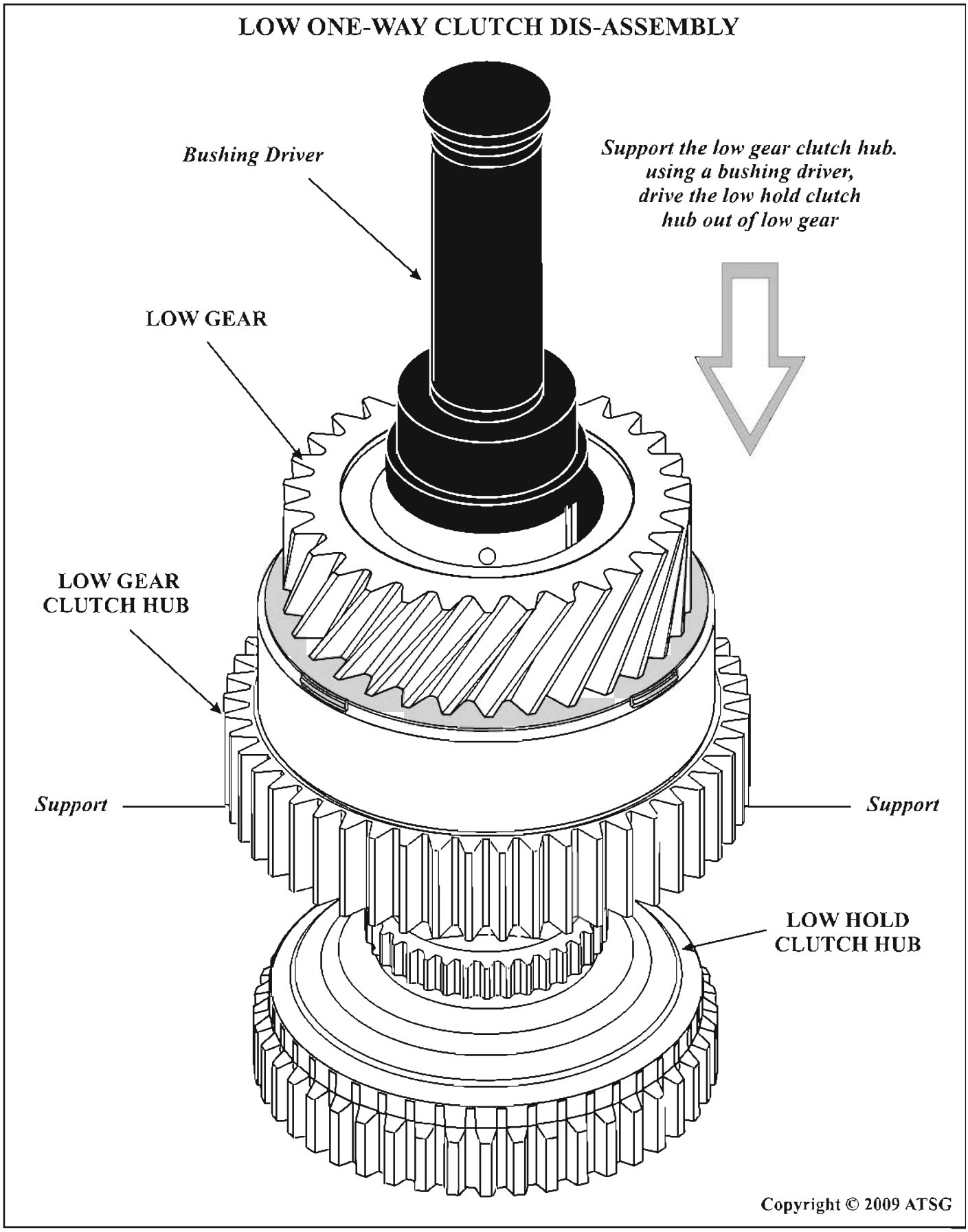

LOW ONE-WAY CLUTCH DIS-ASSEMBLY
Bushing Driver
Support the low gear clutch hub. using a bushing driver, drive the low hold clutch hub out of low gear
LOW GEAR
LOW GEAR CLUTCH HUB
Support
Support
LOW HOLD CLUTCH HUB
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Figure 2

LOW ONE-WAY CLUTCH ASSEMBLY EXPLODED VIEW

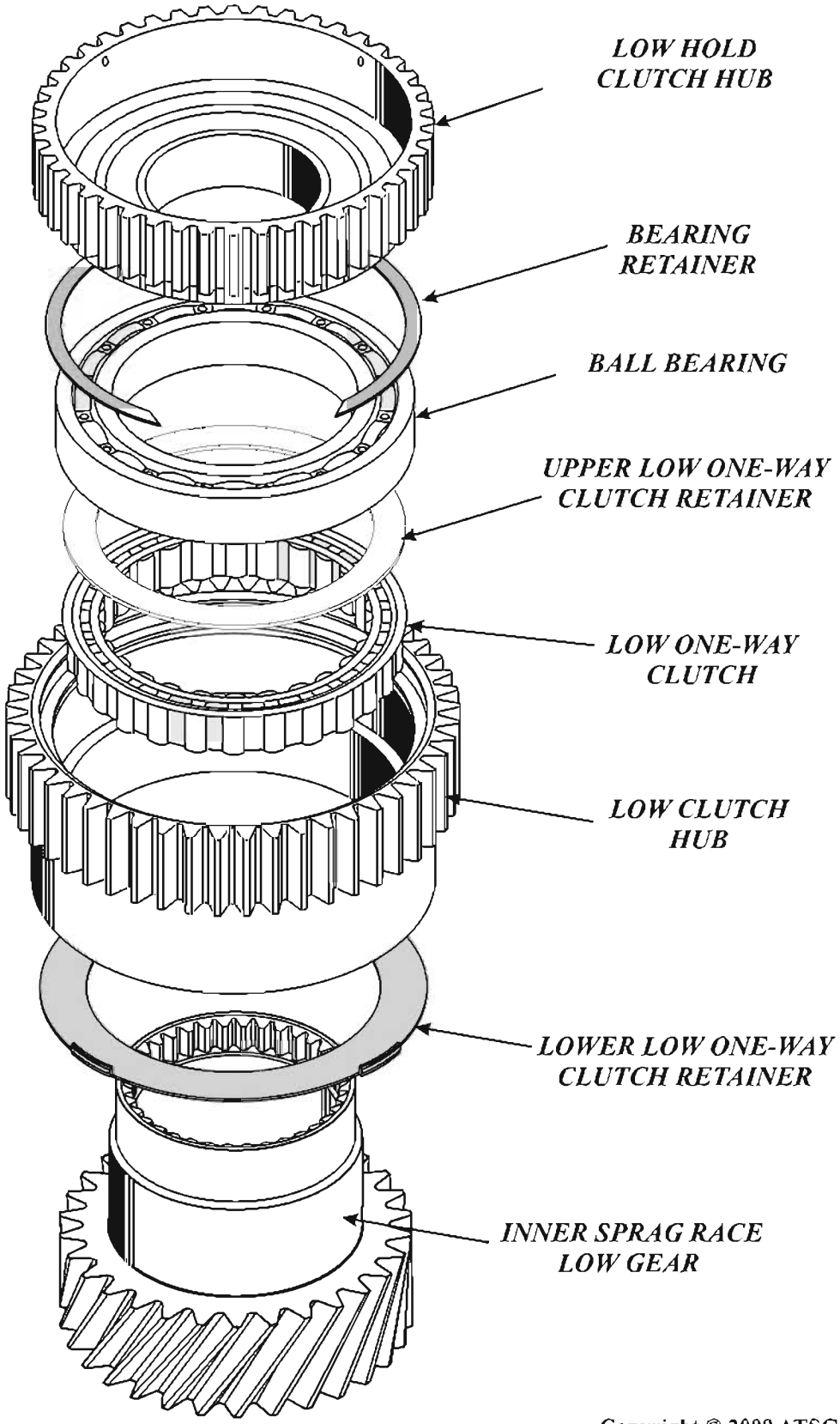


Figure 3

LOW ONE-WAY CLUTCH OPERATION

THE LOW CLUTCH HUB MUST FREEWHEEL CLOCKWISE AND LOCK COUNTER CLOCKWISE WHEN HOLDING LOW GEAR

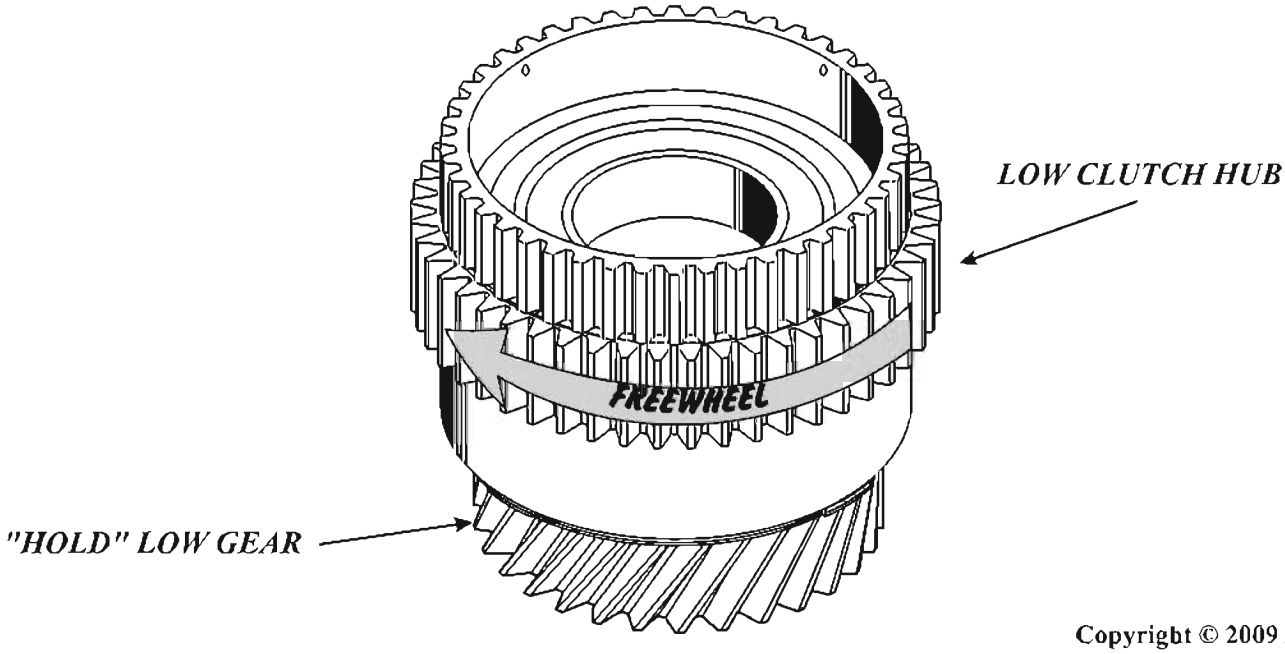


Figure 4

HONDA/ACURA BAXA/B7XA FAMILY
TIE UP IN REVERSE WHEN HOT

COMPLAINT: Before or after overhaul, HONDA/ACURA vehicles equipped with the BAXA/B7XA FAMILY transaxle may exhibit a complaint of a tie up in reverse when the vehicle is hot.

CAUSE: One cause may be a worn bushing in the main shaft, or a worn 3rd clutch feed tube in the back cover allowing 4th clutch oil to cross over into the 3rd clutch circuit partially applying the 3rd clutch and causing the tie-up.

The partial cutaway drawing in figure 1 shows the parts associated with the main shaft including the tubes, bushings, gears, and clutch drum. Refer to the partial cutaway drawing in figure 2. This diagram shows the area of concern within the mainshaft where the cross over leak may occur.

CORRECTION: The best way to check for this condition is to conduct a pressure test on the 3rd clutch pressure tap when the vehicle is "HOT" and the selector is placed into reverse. Refer to figure 3 for pressure tap locations on the transaxle rear cover.

If any pressure is present on the 3rd clutch tap when the selector is placed in the reverse position, it will be necessary to remove the transmission from the vehicle and disassemble so the mainshaft can be replaced. It will be necessary to also inspect the tubes located in the transaxle rear cover. If any wear is present on the 3rd or 4th clutch feed tubes, the rear cover will need to be replaced since the tubes are not serviced separately. Refer to figure 3 for illustration of the mainshaft and the location of the 3rd and 4th clutch feed tubes in the transaxle rear cover.

NOTE: At the time of this printing, there are no bushing replacements available for this transaxle, which is why mainshaft replacement would be necessary.

A special thanks to our good friend Billy Johnson

HONDA/ACURA BAXA/B7XA FAMILY
PARTIAL CUTAWAY
MAINSHAFT PARTS

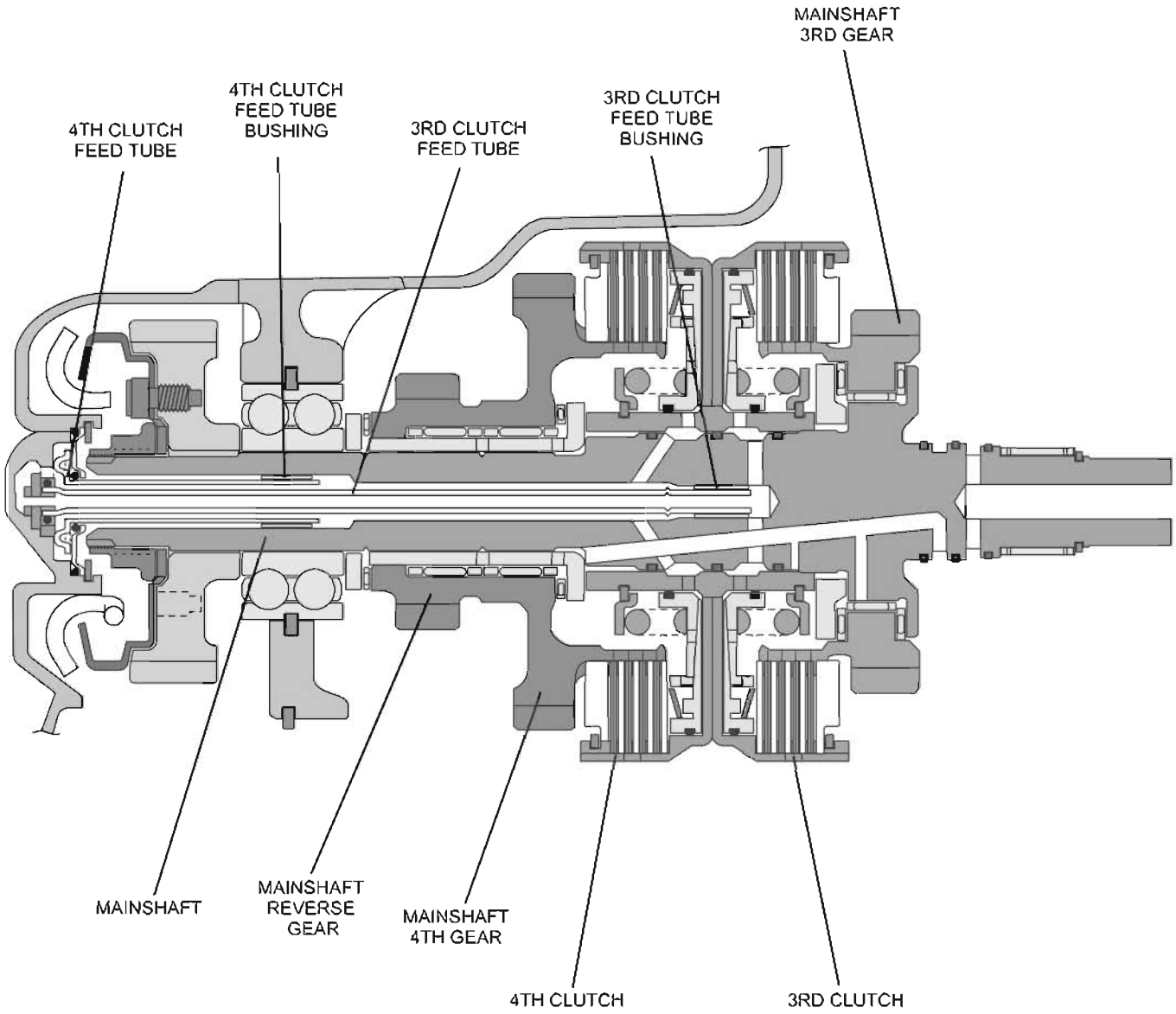
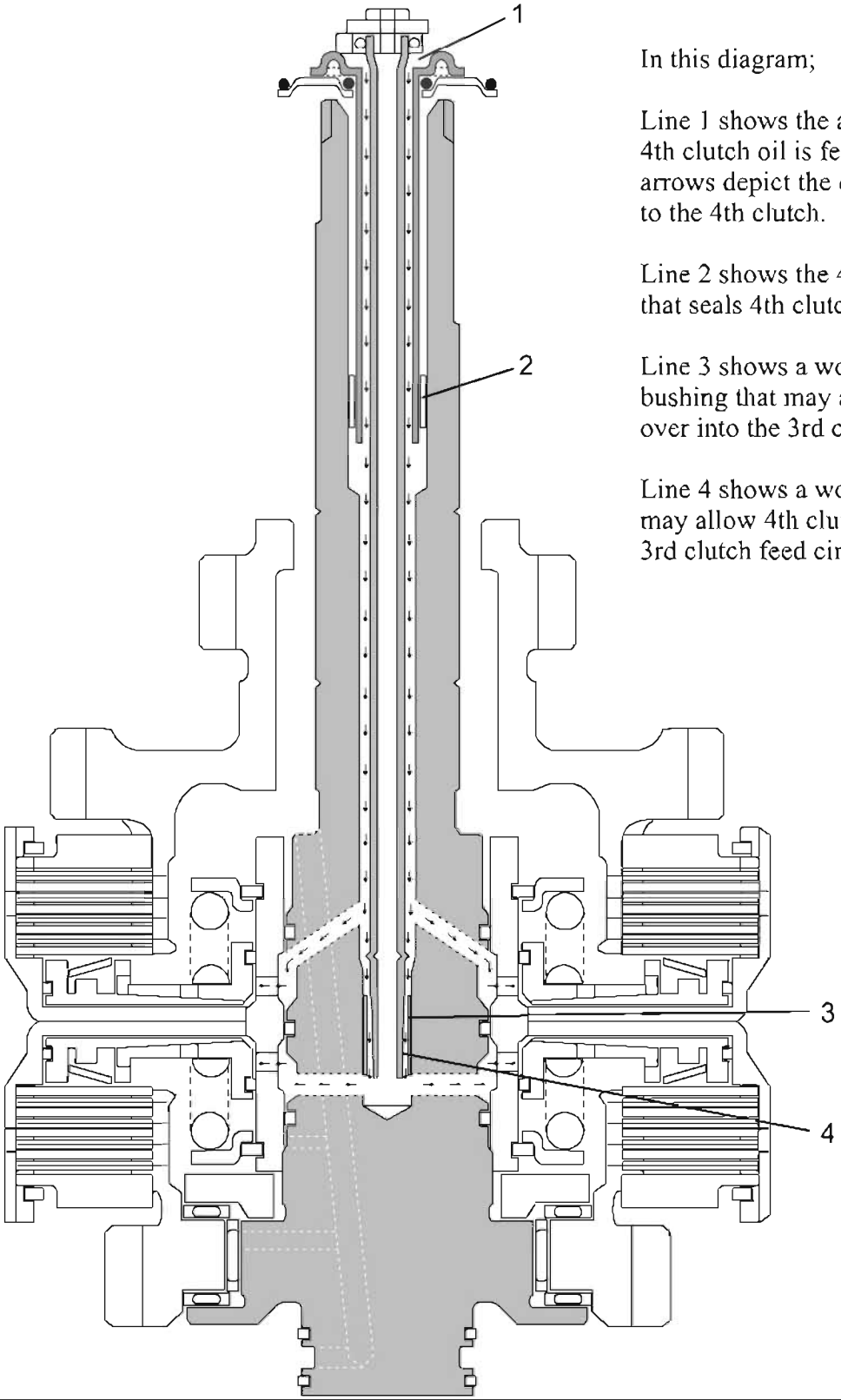


Figure 1

HONDA/ACURA BAXA/B7XA FAMILY
PARTIAL CUTAWAY CROSS LEAK AREAS



In this diagram;

Line 1 shows the area of the mainshaft where 4th clutch oil is fed into the mainshaft. The arrows depict the direction in which oil flows to the 4th clutch.

Line 2 shows the 4th clutch feed tube bushing that seals 4th clutch oil.

Line 3 shows a worn 3rd clutch feed tube bushing that may allow 4th clutch oil to cross over into the 3rd clutch feed circuit.

Line 4 shows a worn 3rd clutch feed tube that may allow 4th clutch oil to cross over into the 3rd clutch feed circuit.

Figure 2

HONDA/ACURA BAXA/B7XA FAMILY
REAR COVER/MAINSHAFT ILLUSTRATION AND
PRESSURE TAP LOCATIONS

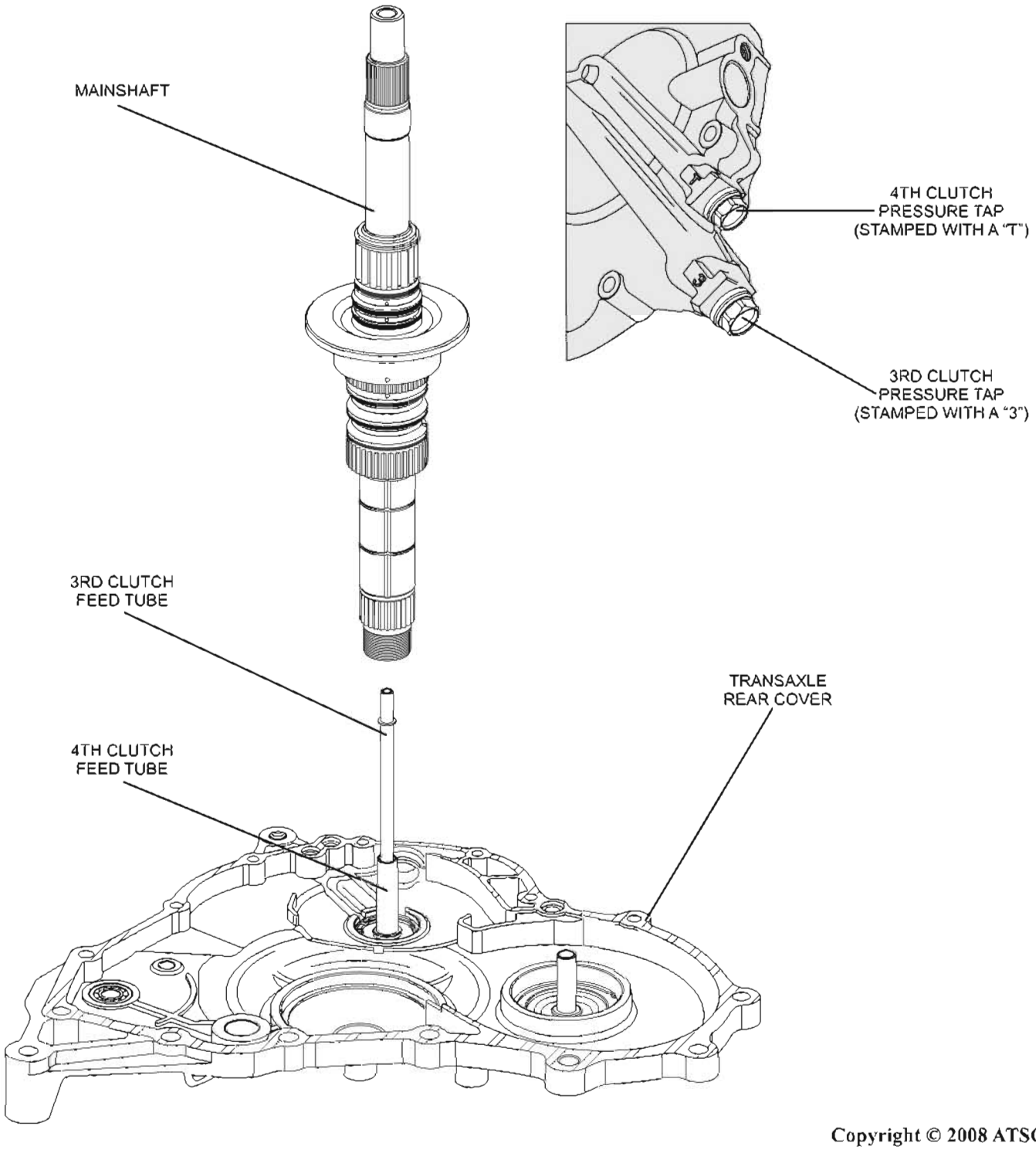


Figure 3

HONDA CR-V & ELEMENT

SEVERE BODY DAMAGE

COMPLAINT: During transmission removal or installation the front fenders sustain severe damage.

CAUSE: An engine support fixture was set on the fender rails. When the transmission was removed and the engine was suspended from the holding fixture, the weight of the engine places additional stress on the fender support brackets than they are designed to handle resulting in severe body damage, (Refer to figure 1).

CORRECTION: Do not put an engine support fixture on the fender rails of these vehicles. If the proper holding fixture is not available perhaps a sub-frame from one of these vehicles can be acquired from the local wrecking yard and altered to support the engine during transmission removal and installation.

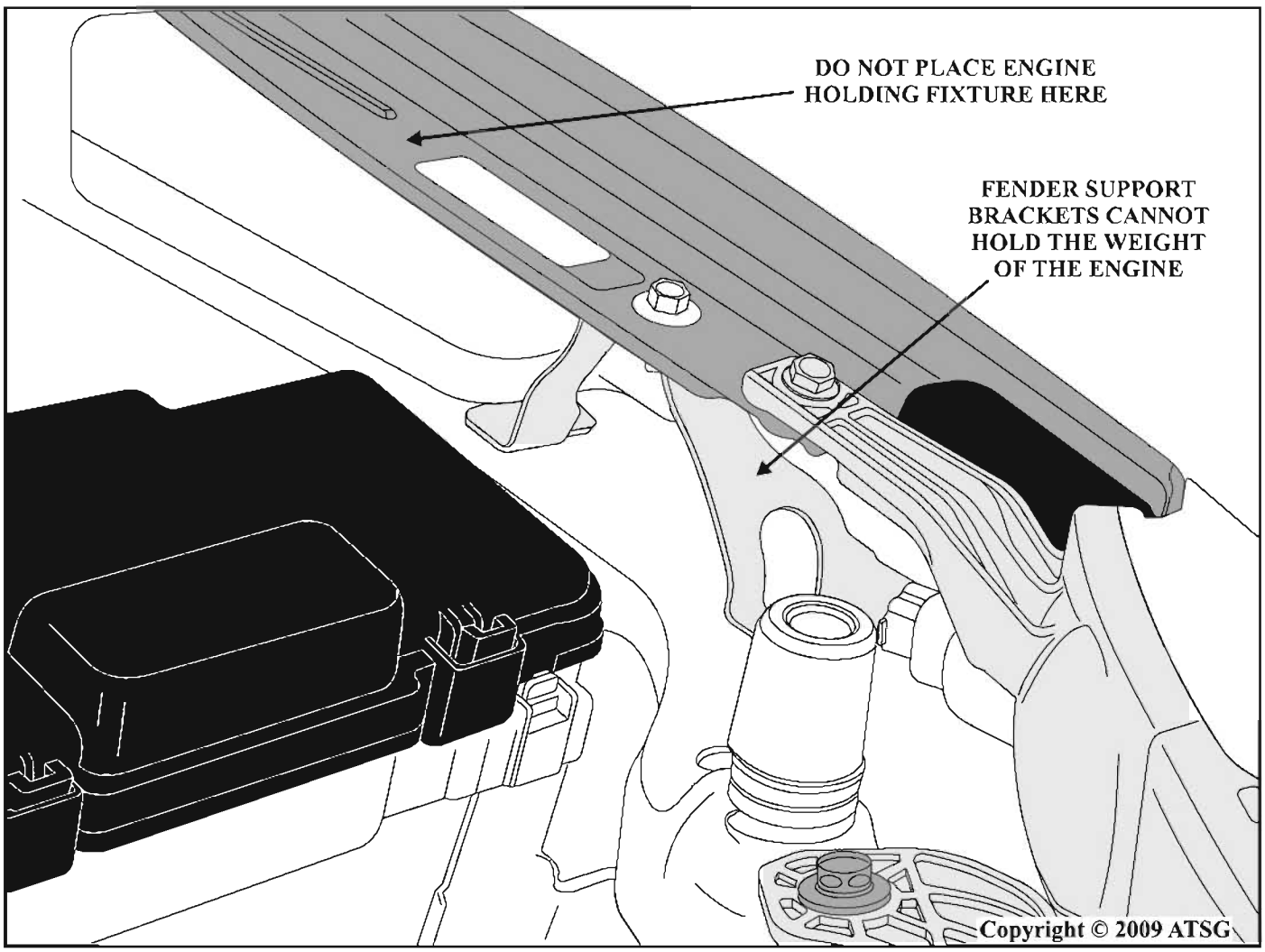


Figure 1

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. US and Overseas Vehicle applications known at the time of printing are 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. It 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 effect speed sensors. It also can determine the rate of change and adapt the shifts as friction elements wear.

Another very significant difference between the AF40-6 and this TF60-SN is that the TCM is independent from the transmission making available typical electrical diagnostics.

TF60-SN

PRELIMINARY INFORMATION

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 disengaged 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

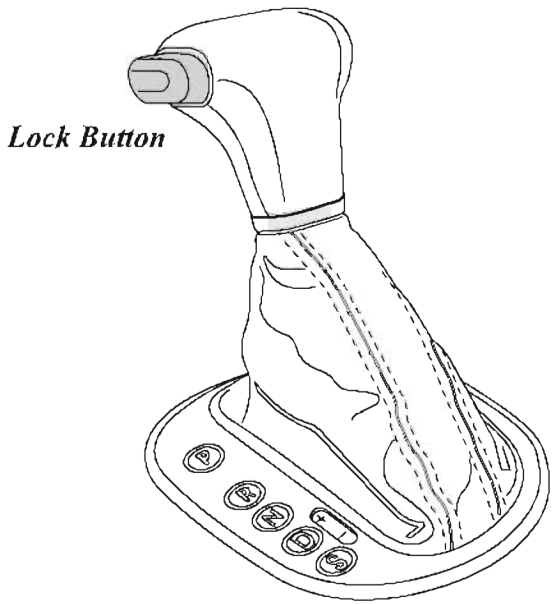
In this position, the forward gears are shifted automatically.

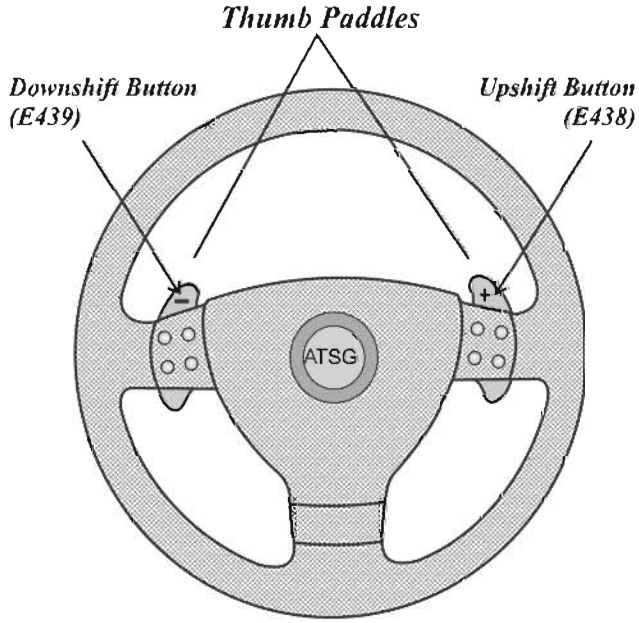
S - Sport

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.





TF60-SN

PRELIMINARY INFORMATION

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.

TF60-SN

PRELIMINARY INFORMATION

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 the engine is stopped.

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.

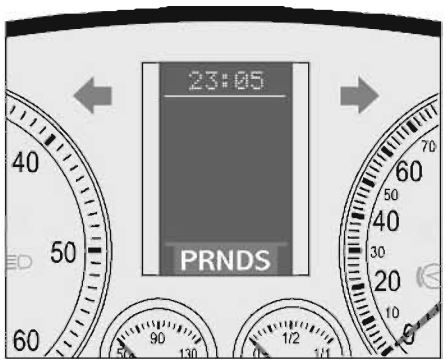
Towing

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

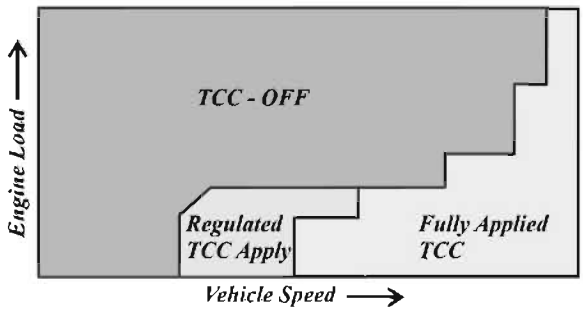
Depending on driving mode, engine load and vehicle speed, the torque converter lock-up clutch is first regulated with a minimal slip and subsequently completely applied.

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.

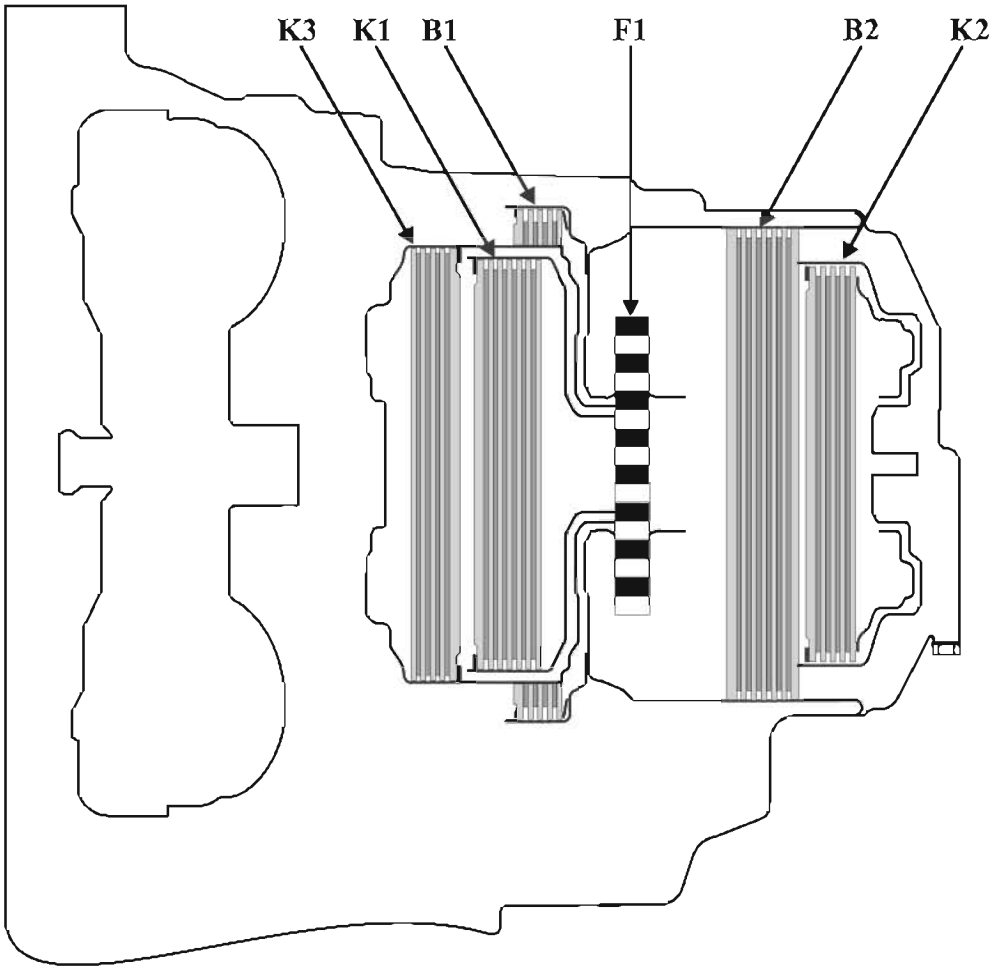
When ATF temperature is above 130° C, the regulated apply feature is prohibited and an immediate apply occurs. This helps the ATF maintain a lower thermal load and cools it down.



TF60-SN

PRELIMINARY INFORMATION

APPLICATION CHART



CLUTCH APPLICATION CHART						
	Component					
Gear	K1	K2	K3	B1	B2	F1
1st Gear	X				X*	X
2nd Gear	X			X		
3rd Gear	X		X			
4th Gear	X	X				
5th Gear		X	X			
6th Gear		X		X		
Rev Gear			X		X	

* The B2 clutch is applied in Tiptronic Mode 1st gear only for engine braking.

Figure 1

TF60-SN

PRELIMINARY INFORMATION

SHIFT SOLENOID & CLUTCH APPLICATION

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		

N90 controls the K3 clutch apply
N91 controls converter clutch apply
N92 controls the K1 clutch apply
N93 controls main line pressure
N282 controls the K2 clutch apply
N283 controls the B1 clutch apply

N88 and N89 are alternately toggled On and Off to control the 4th through 6th shifts and TCC operation.

N88 and N89 also controls B2 clutch apply in Tiptronic first gear for engine breaking.

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

Figure 2

TF60-SN

PRELIMINARY INFORMATION

SOLENOID AMP CHART

SOLENOID	RANGE				GEAR					
	Park	Reverse	Neutral	Drive 1H	Manual 1H	2H	3H 3M	4H 4M	5H 5H	6H 6M
SV5-N92 (K1)	.100A	.980A	.980A	.100A	.100A	.100A	.100A	.100A	.980A	.980A
SV9-N282 (K2)	.100A	.980A	.980A	.980A	.980A	.980A	.980A	.100A	.100A	.100A
SV3-N90 (K3)	.980A	.100A	.980A	.980A	.980A	.980A	.100A	.980A	.100A	.980A
SV10-N283 (B1)	.980A	.980A	.980A	.980A	.980A	.100A	.980A	.980A	.980A	.100A
SV6-N93 (LP)	.980A	.980A	.980A	.980A	.740A	.860A	.980A	.980A	.740A	.740A
SV4-N91 (TC-PWM)	.200A	.200A	.200A	.200A	.200A	.200A	.200A .990A	.200A .990A	.200A .990A	.200A .990A
SV2-N89	0	0	0	0	1	0	3H=0 3M=1	4H=0 4M=1	5H=0 5M=1	6H=0 6M=1
SV1-N88	0	0	0	0	1	0	0*-1	0*-1	0*-1	0*-1

Description of terms:

.100A= Very Low amperage Solenoid OFF

.980A= Very High amperage Solenoid ON

SV1&2-N88&89
0 =OFF
1=ON
0*-1= OFF or ON during shift transitions

3H = 3rd Gear TCC OFF
3M = 3rd Gear TCC ON
(This applies to gears 3-6)

1. Solenoid Valves 3,5,9 and 10 are Normally Applied which applies the component they are in charge of when they are Off. They are Energized (On) to turn the component they are in charge of Off. These Solenoids are also Modulated to control the apply and release rates. Consult the Clutch Application Chart on page 20 and compare the amperage to Clutch/Brake app.

Example:
Solenoid Valve 10 (N283) is pulsed Off during the 1H-2H transition and the Amperage will drop from .980A in 1H to .690A to .300A to .100A when the shift is finally completed into 2H to control the apply rate and shift feel of the B1 Brake.

2. Solenoid Valve 6 -N93 is modulated based on engine load. Low line pressure will indicate an amperage of 1.0 to .980A. Amperage will drop to increase line pressure.

3. Solenoid Valve 4-N91 is modulated to control Torque Converter Apply rate, but is dependant on Solenoid Valve 2-N89 to apply the TCC. There will be situations where during Manual shifts in Tiptronic mode, SV4-N91 amperage will indicate .500 to .700 and the TCC will be Off as Solenoid Valve 2-N89 is "0" which indicates Off.

Figure 3

TF60-SN

PRELIMINARY INFORMATION

ADDITIONAL SOLENOID DETAILS

N88 Solenoid (#1 Solenoid)
The N88 Solenoid is an On/Off solenoid and is On and Open in gears 4th through 6th. If this solenoid fails Closed (in the Off state), 4th through 6th will not be available.

N89 Solenoid (# 2 Solenoid)
The N89 Solenoid is also an On/Off solenoid and is On and Open to apply the converter clutch. When both the N88 and N89 solenoids are energized at the same time, the B2 brake clutch is applied in Tiptronic 1st Gear (Manual Low). If the N89 Solenoid fails in the Closed (in the off state) there will be no converter clutch apply and no engine breaking in Tiptronic 1st gear (manual Low).

N90 Solenoid (# 3 Solenoid)
The N90 Solenoid is a normally applied pulse/width modulated solenoid controlling the apply of the K3 Clutch. When this solenoid is fully off, the K3 clutch is fully applied. If this solenoid fails in the off (Normally Applied) position, 3rd, 5th and Reverse shifts may be firm.

N91 Solenoid (#4 Solenoid)
The N91 Solenoid is a normally applied pulse/width modulated solenoid controlling the apply and release of the Converter Clutch. When this solenoid is fully off, the converter clutch is fully released. If this solenoid fails in the off (Normally Applied) position, there will be no converter clutch application.

Solenoid N92 (#5 Solenoid)
The N92 Solenoid is a normally applied pulse/width modulated solenoid controlling the apply of the K1 Clutch. When this solenoid is fully off, the K1 clutch is fully applied. If this solenoid fails in the off (Normally Applied) position, 1st through 4th shifts may be firm.

Solenoid N93 (#6 Solenoid)
The N92 Solenoid is a normally applied pulse/width modulated solenoid controlling the main line pressure. When this solenoid is fully off maximum line pressure is observed. If this solenoid fails in the off (Normally Applied), all shifting may be harder.

Solenoid N282 (#9 Solenoid)
The N282 Solenoid is a normally applied pulse/width modulated solenoid controlling the apply of the K2 Clutch. When this solenoid is fully off, the K2 clutch is fully applied. If this solenoid fails in the off (Normally Applied) position, 4th, 5th and 6th shifts may be firm.

Solenoid N283 (#10 Solenoid)
The N283 Solenoid is a normally applied pulse/width modulated solenoid controlling the apply of the B1 Clutch. When this solenoid is fully off, the B1 clutch is fully applied. If this solenoid fails in the off (Normally Applied) position, 2nd and 6th shifts may be firm.

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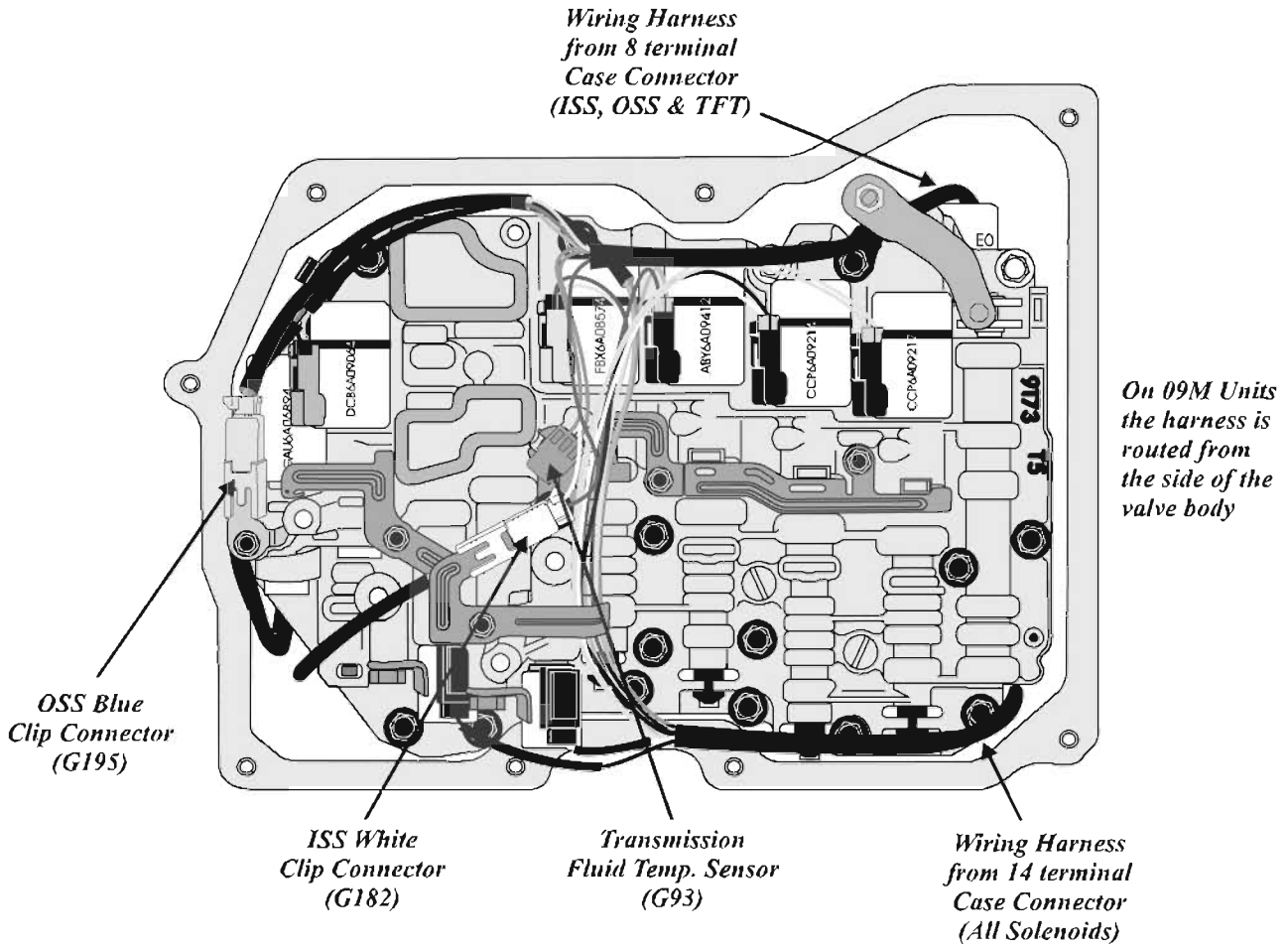
PRELIMINARY INFORMATION

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 effect 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.

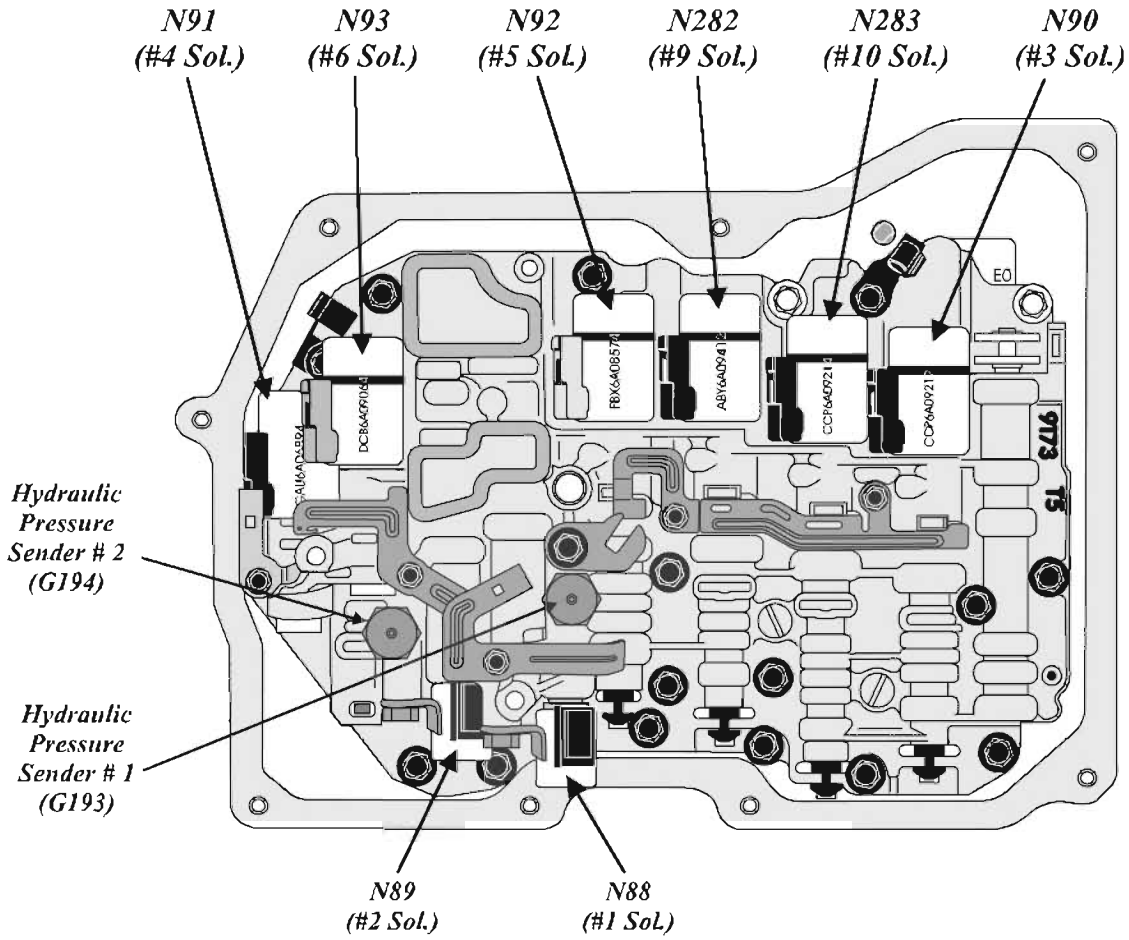
TFT G93
Transmission fluid temperature is used to influence main line pressure and converter clutch strategies. A replacement value is taken from the ECT should this sensor fail. TCC and adaptations usually cease which typically leads to harder shifting.

Figure 4

TF60-SN

PRELIMINARY INFORMATION

SOLENOID IDENTIFICATION



Hydraulic Pressure Senders G193 and G194
The G193 and G194 are Normally Open transducers which close when the K1or the B2 clutch circuit is charged. The G193 specifically 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.

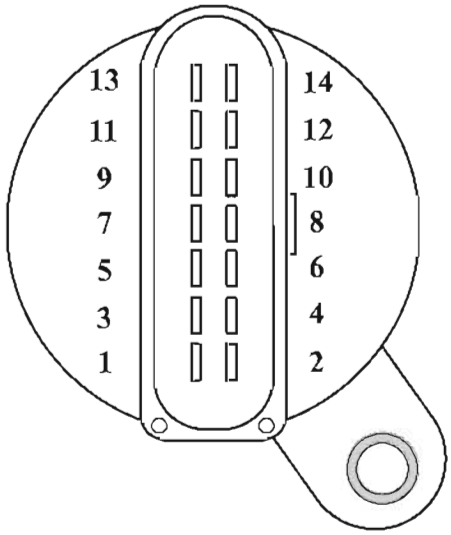
N90, N91, N92, N93, N282 and N283
Solenoid N92 controls the K1 clutch, Solenoid N91 controls the lock-up clutch apply in the torque converter, Solenoid N90 controls K3 clutch apply, Solenoid N93 regulates main line pressure, N282 controls K2 clutch apply and N283 controls the B1 brake clutch apply.

Figure 5

TF60-SN

PRELIMINARY INFORMATION

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 (ΩOhms)
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

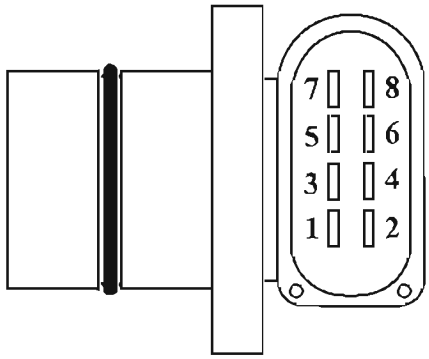
The internal wire colors are provided in the chart above.

Figure 6

TF60-SN

PRELIMINARY INFORMATION

TFT AND RPM SENSOR CASE 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 KΩ @ -30° C
			5.0 - 8.0 KΩ @ 10° C
			3.0 - 5.0 KΩ @ 25° C
			230 - 265Ω @ 110° C
			100 - 120Ω @ 145° C
ISS (G182)	3 (White)	4 (Red)	5.0 MΩ*
OSS (G195)	5 (Tan)	6 (Blue)	5.0 MΩ*
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 used in all models. These are normally open switches and close when their respective circuits are charged.*

Figure 7

TF60-SN

PRELIMINARY INFORMATION

TYPICAL VW WIRING

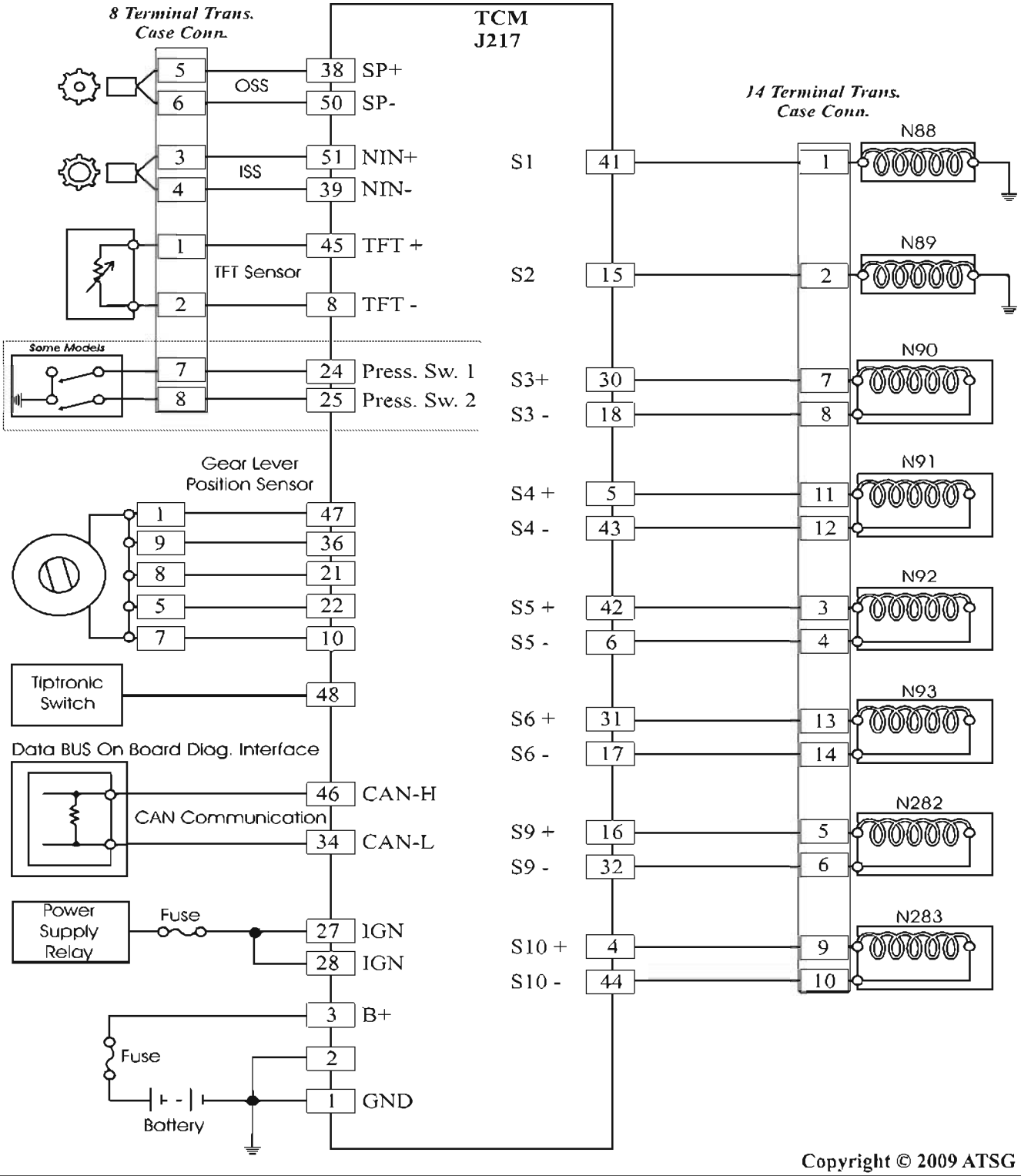
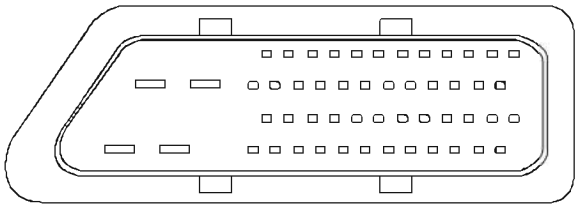


Figure 8

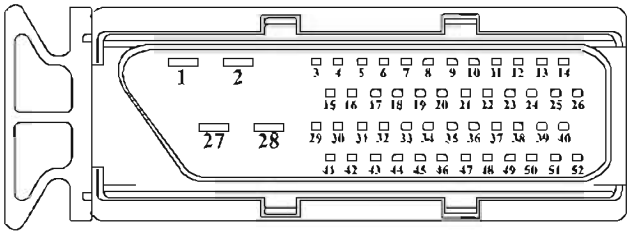
TF60-SN

PRELIMINARY INFORMATION

TCM J217 CONNECTOR



VIEW LOOKING INTO THE TCM (J217)



VIEW LOOKING INTO THE FACE OF THE 52 PIN J217 CONNECTOR

Solenoid Number (Name)	Positive Meter Lead Terminal # (Wire Color)	Negative Meter Lead Terminal # (Wire Color)	Resistance (Ω Ohms)
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 in fig 7
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 9

TF60-SN

PRELIMINARY INFORMATION

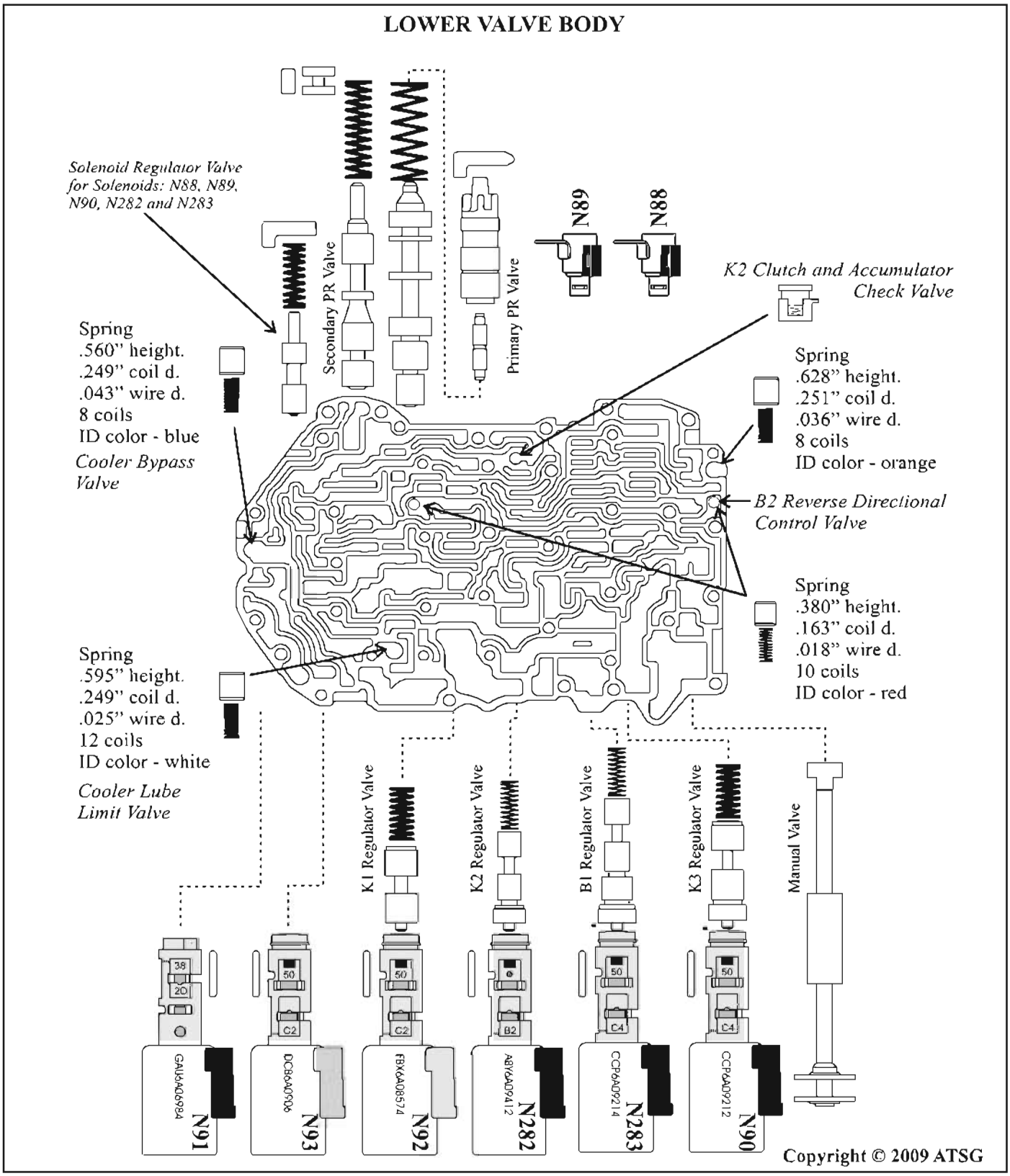


Figure 10

Automatic Transmission Service Group

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PRELIMINARY INFORMATION

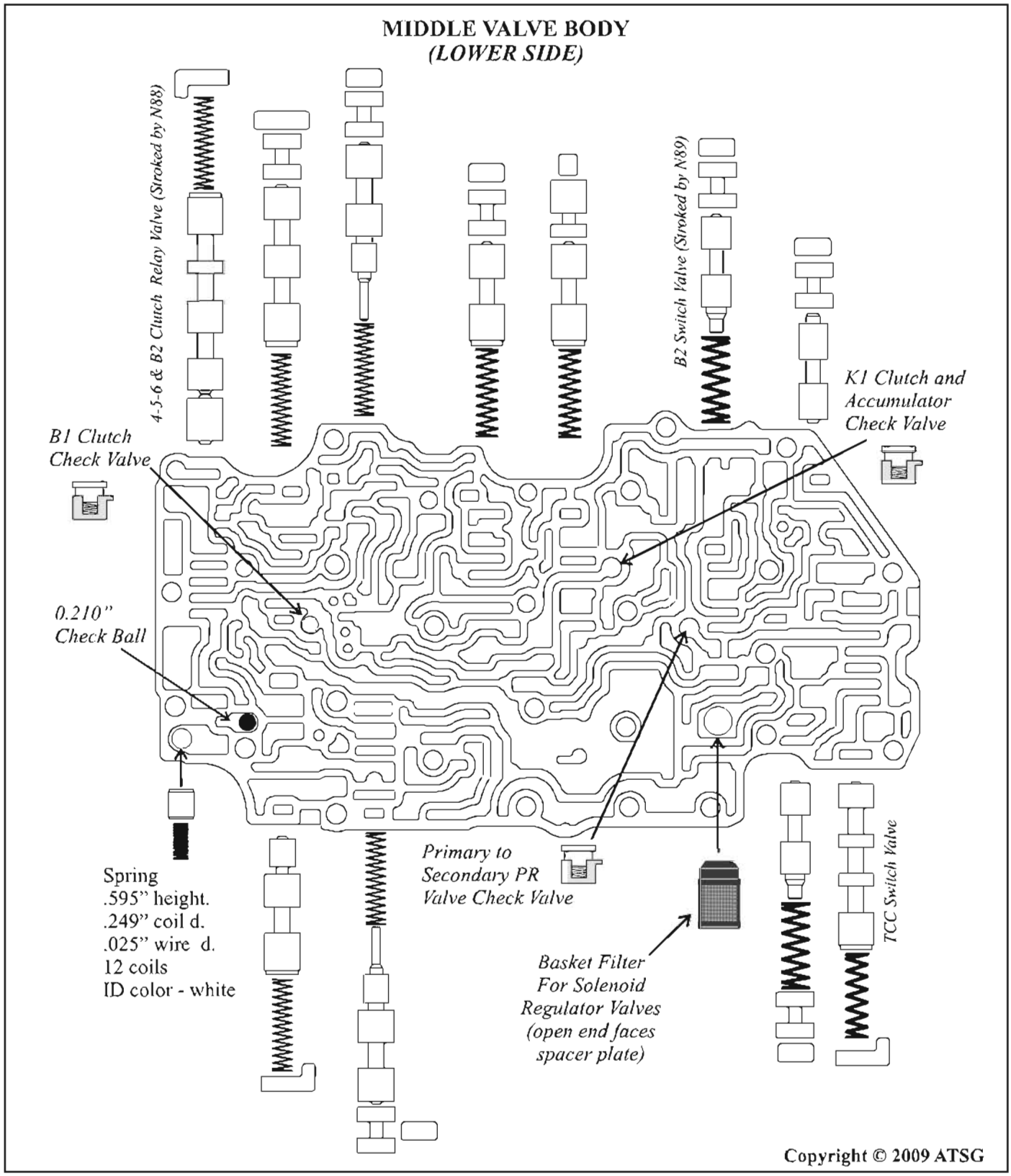

Figure 11

TF60-SN

PRELIMINARY INFORMATION

MIDDLE VALVE BODY
(UPPER SIDE)

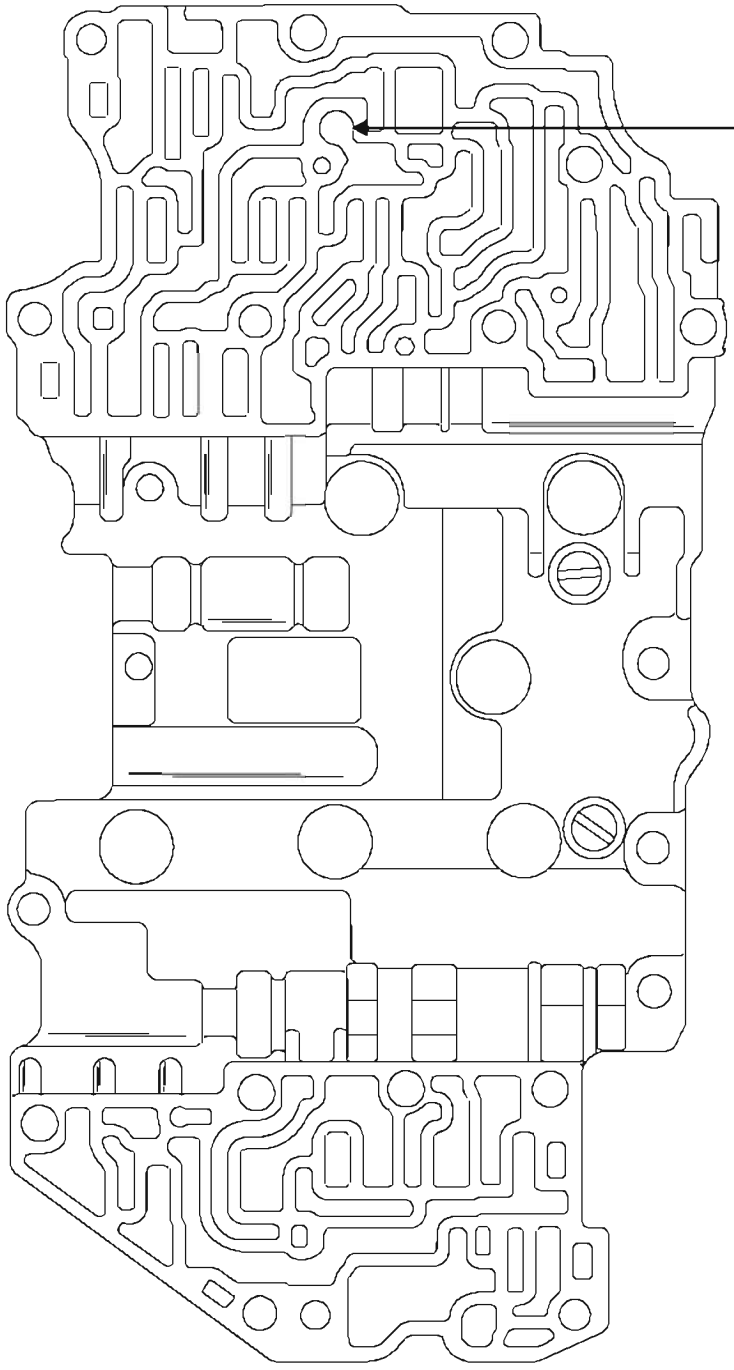

Figure 12

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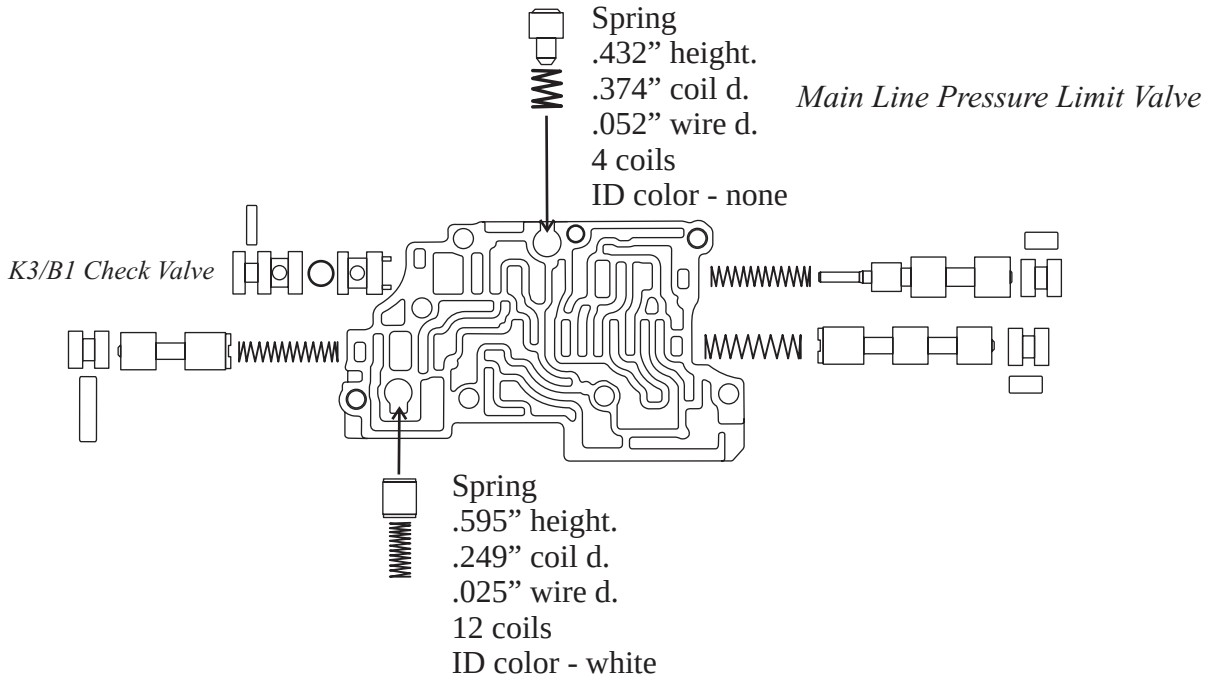
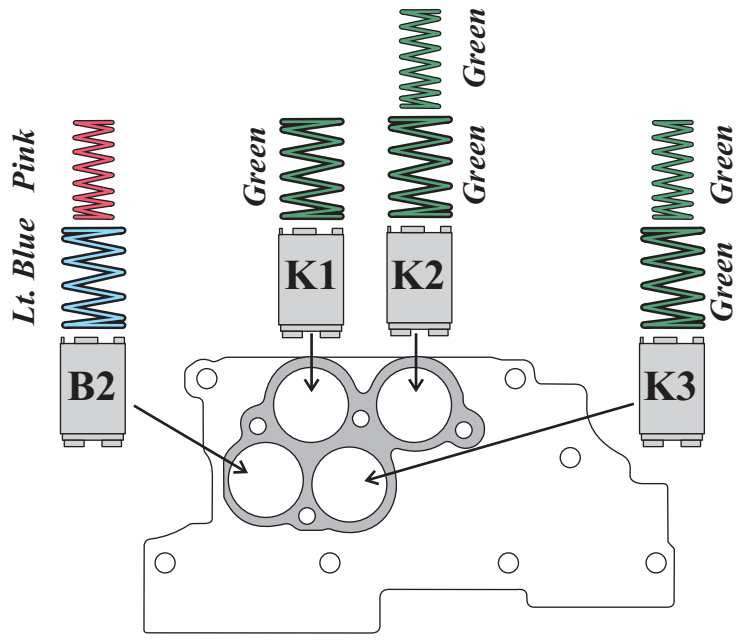
PRELIMINARY INFORMATION

UPPER VALVE BODY #1
(TOP AND BOTTOM)



Pink Inner Spring
1.040" height.
.398" coil d.
.060" wire d.
9 coils

Blue Outer Spring
1.000" height.
.620" coil d.
.090" wire d.
6 coils



Green Inner Spring
1.074" height.
.415" coil d.
.056" wire d.
10 coils

Green Outer Spring
1.040" height.
.620" coil d.
.080" wire d.
6 coils

Figure 13

TF60-SN

PRELIMINARY INFORMATION

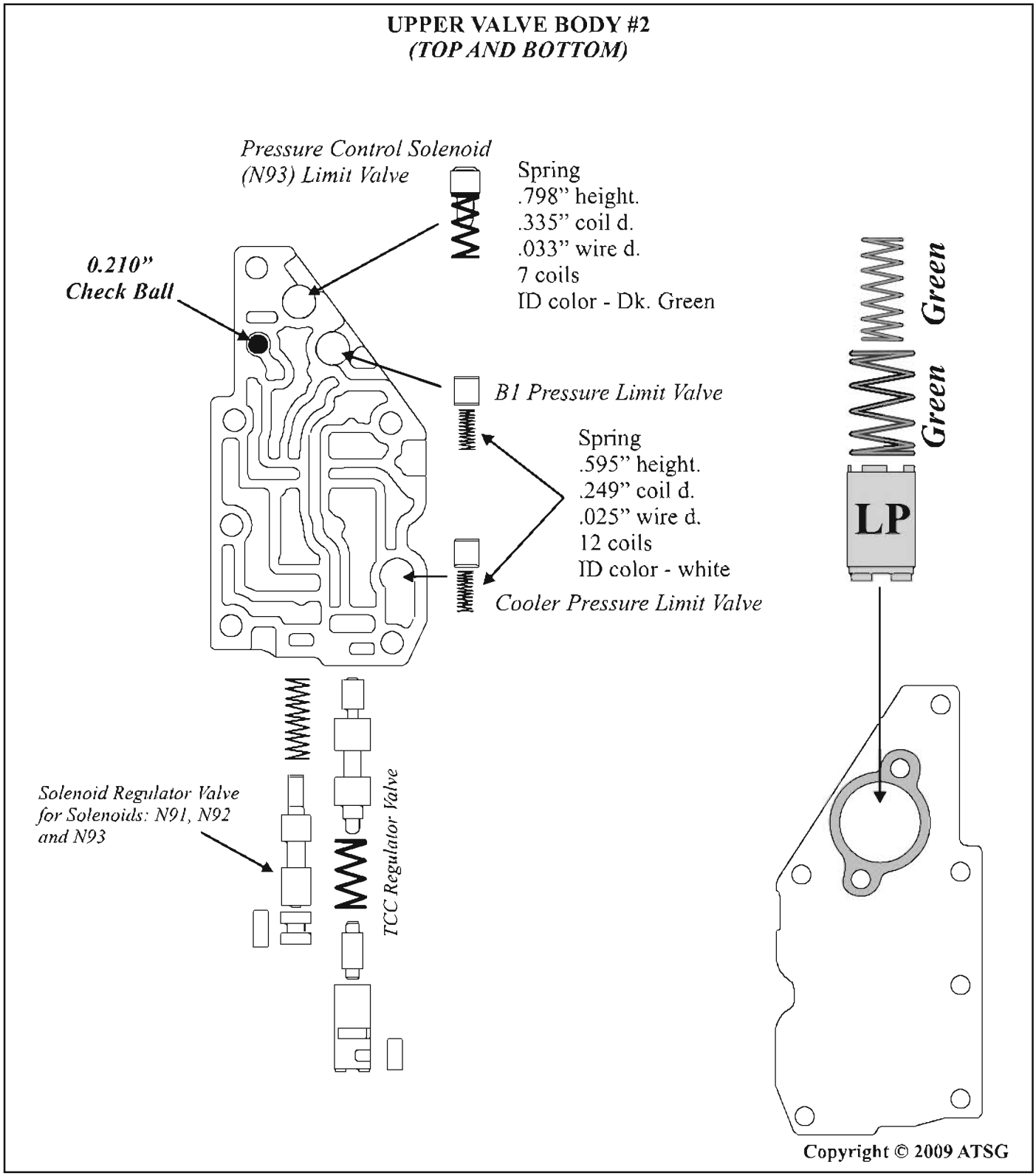


Figure 14

TF60-SN

PRELIMINARY INFORMATION

CASE PASSAGE IDENTIFICATION *(WITH INTEGRAL COOLER)*

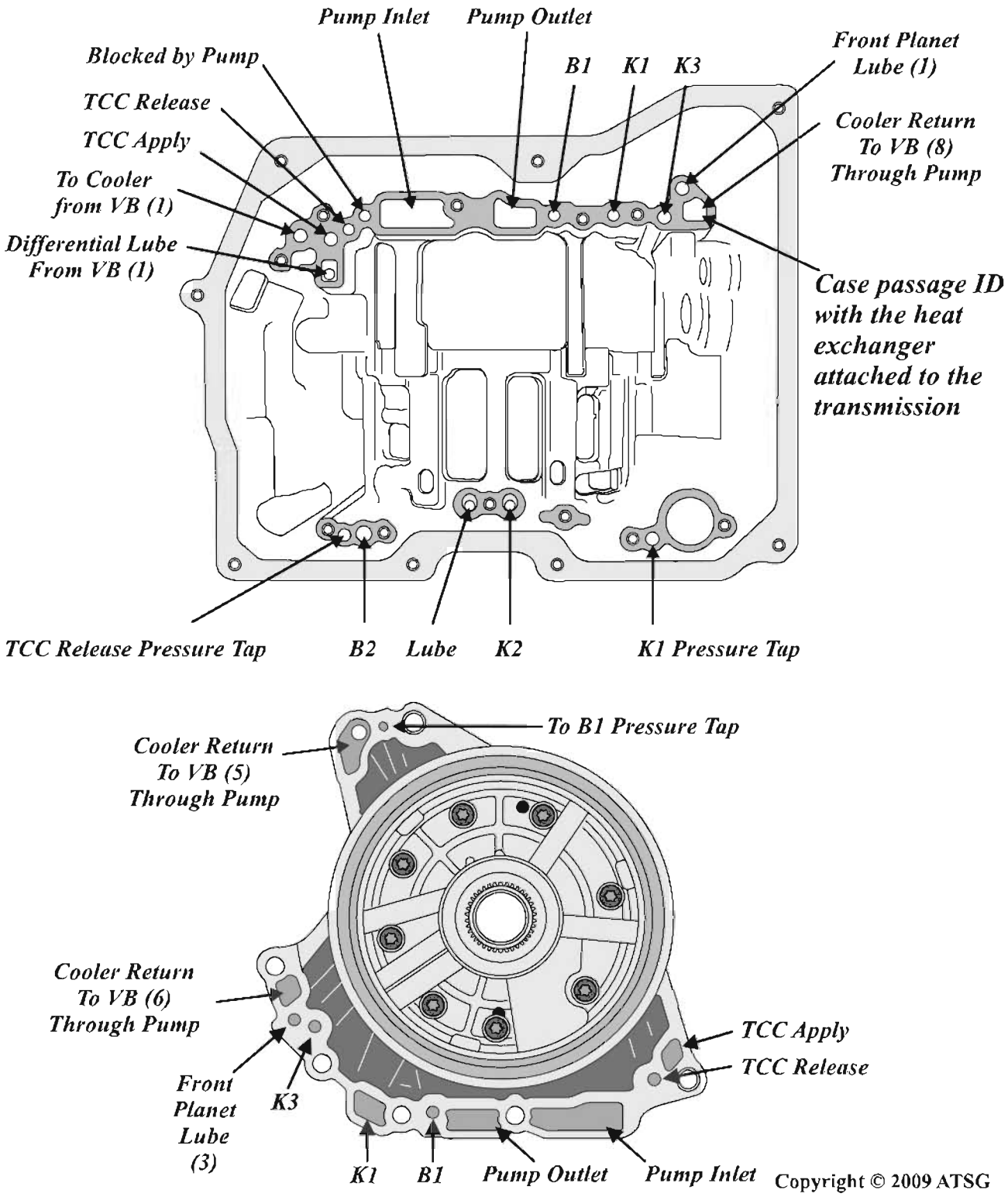


Figure 15

TF60-SN

PRELIMINARY INFORMATION

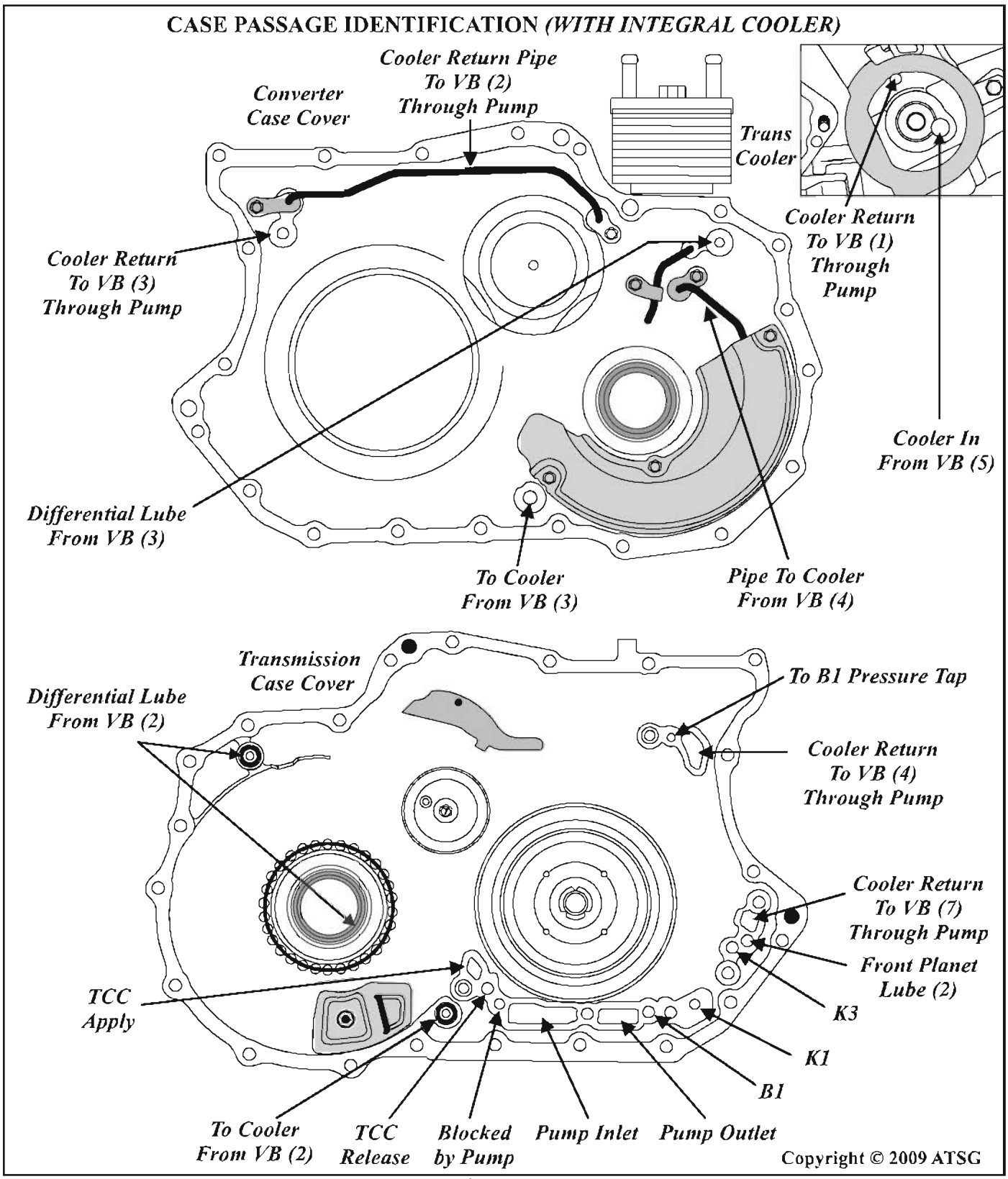
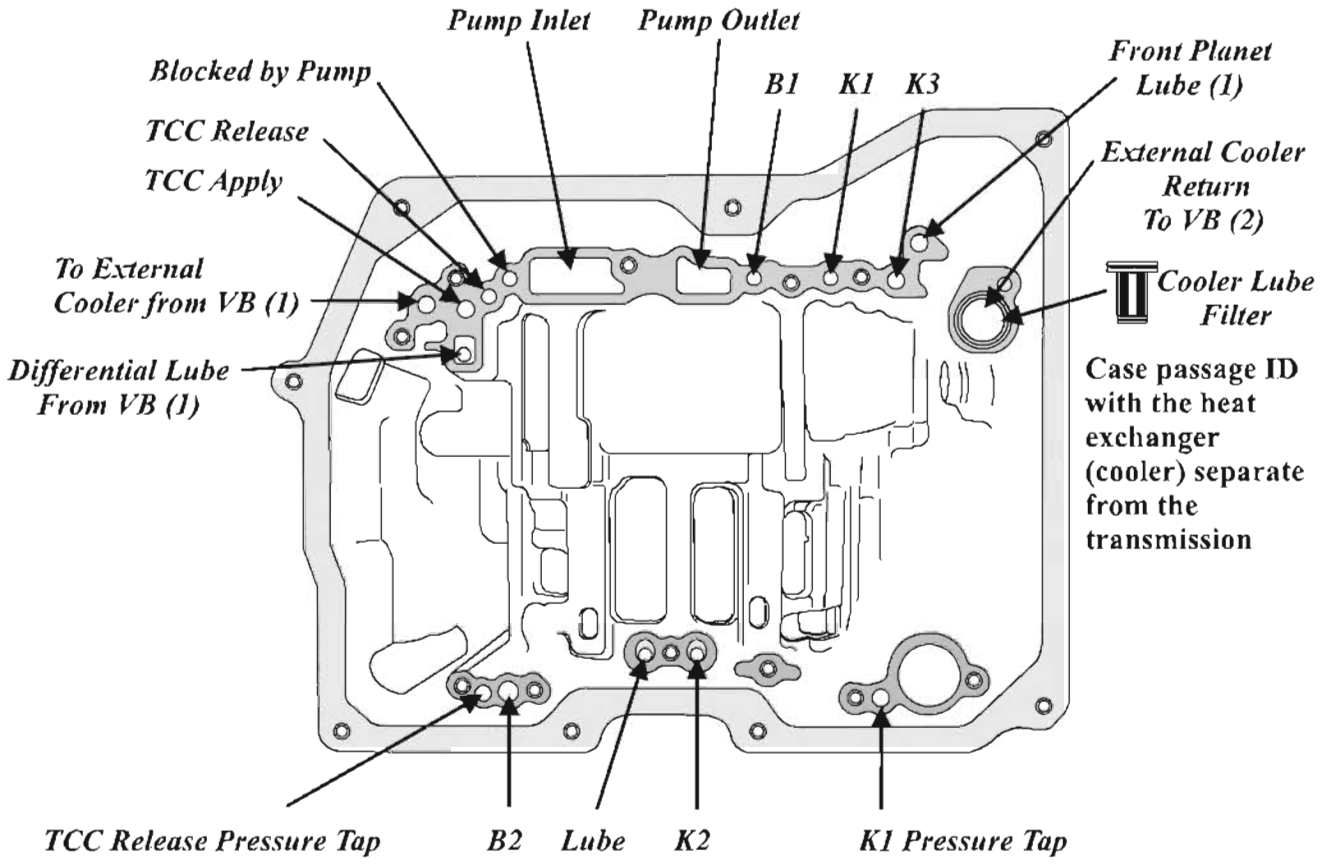


Figure 16

TF60-SN

PRELIMINARY INFORMATION

CASE PASSAGE IDENTIFICATION *(WITH SEPARATE COOLER)*



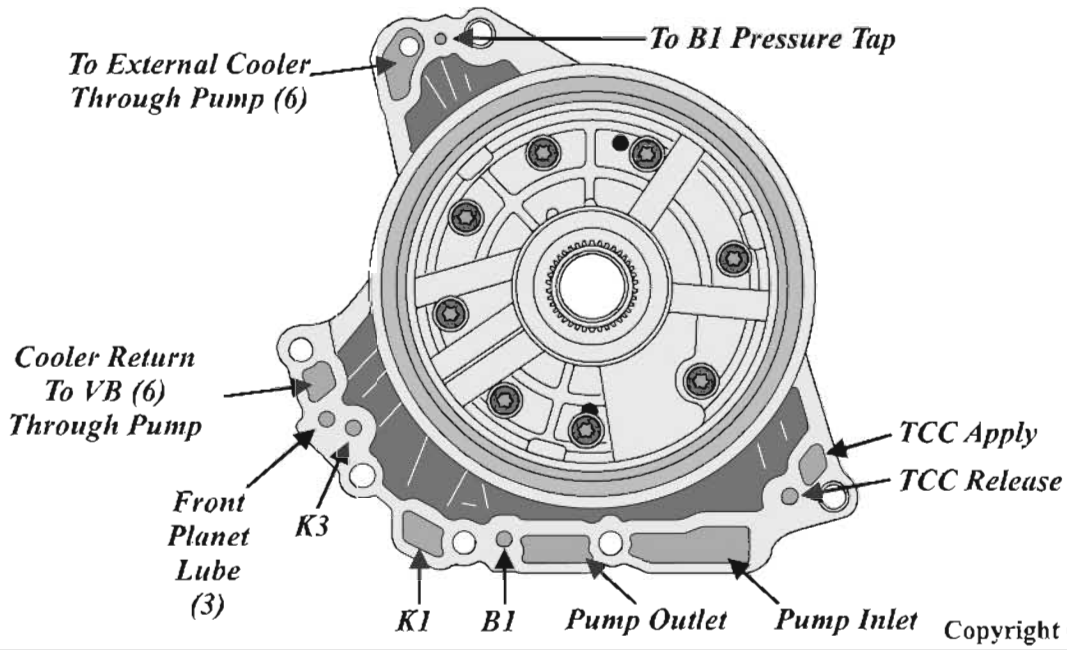


Figure 17

TF60-SN

PRELIMINARY INFORMATION

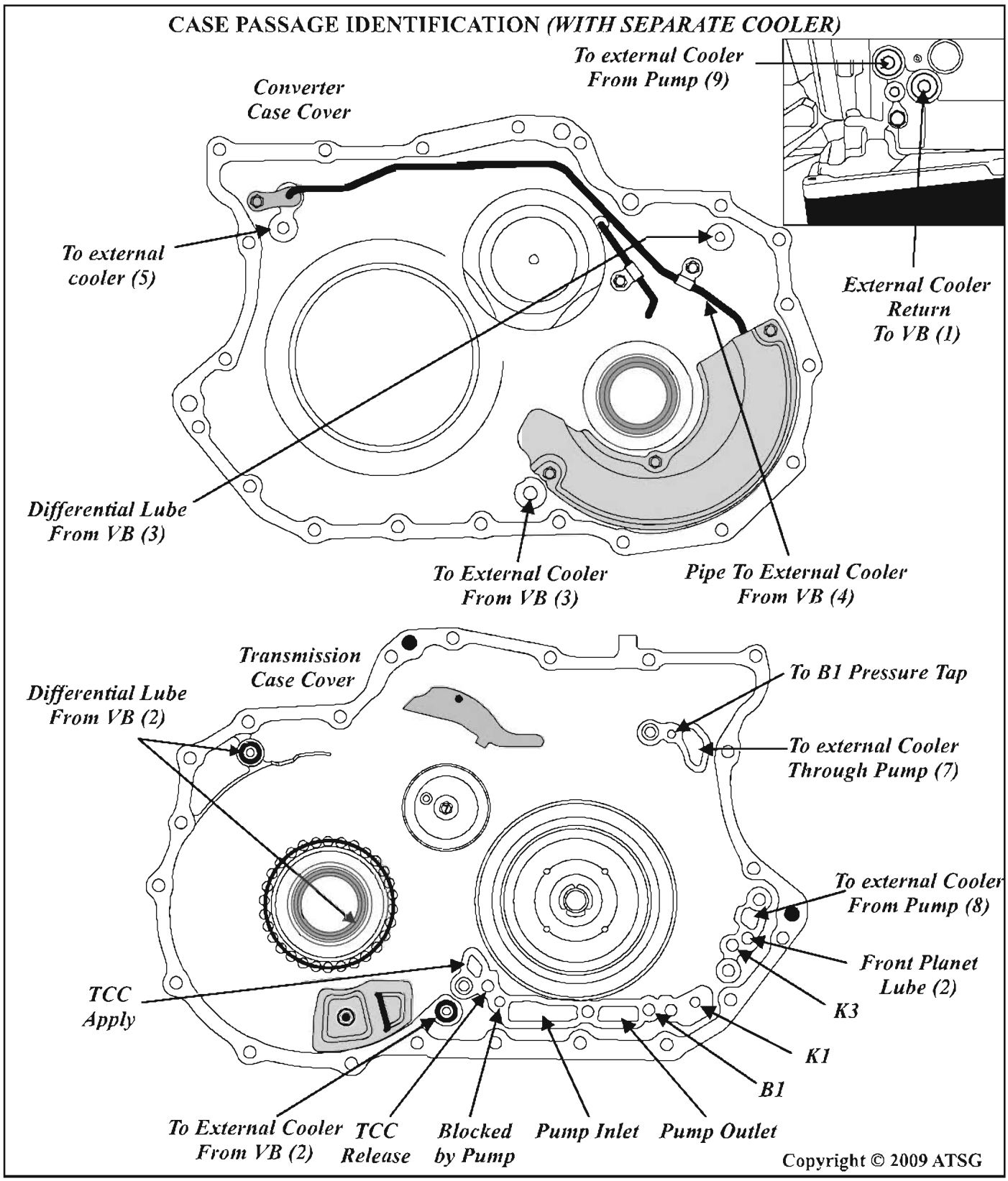
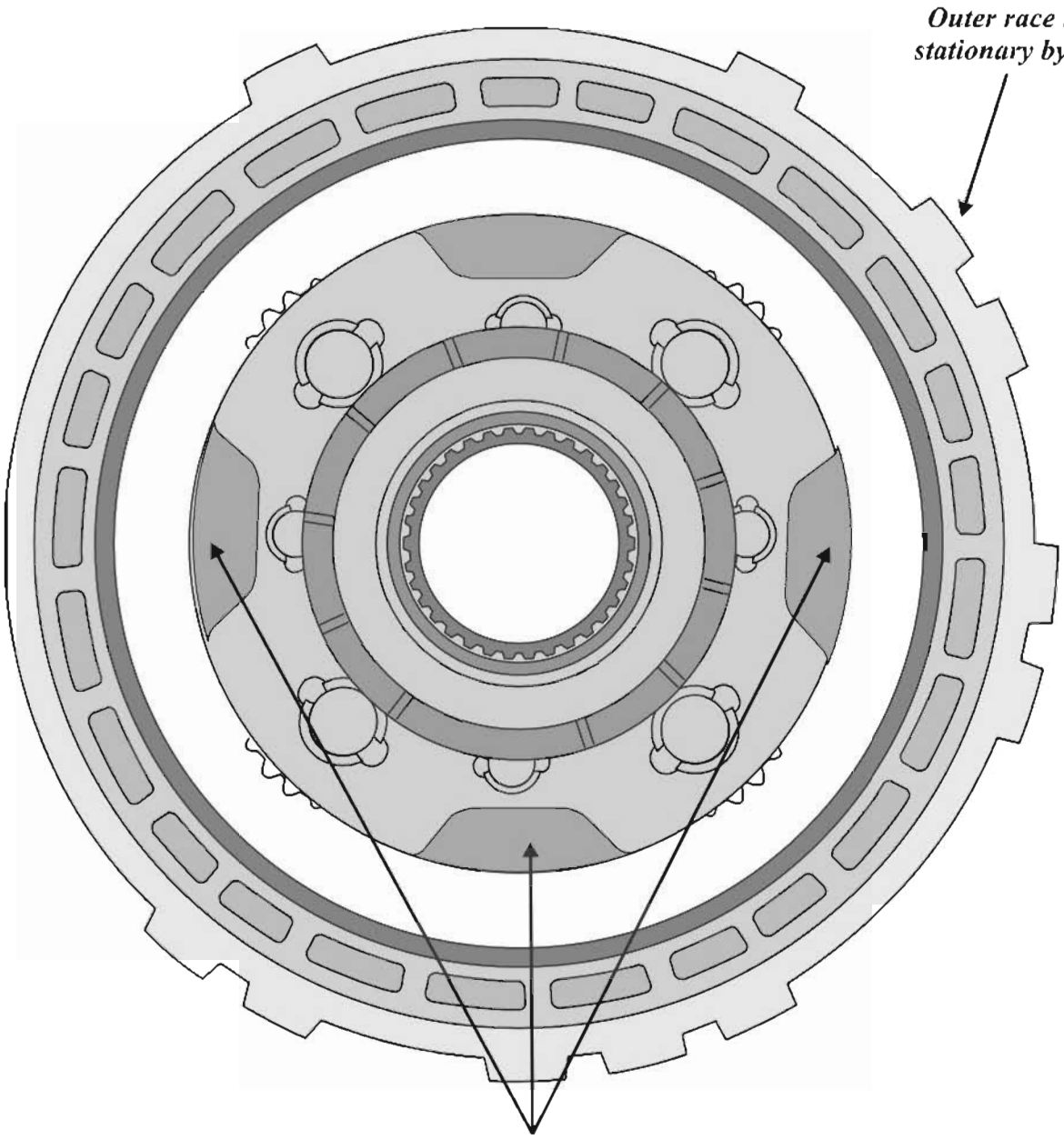


Figure 18

TF60-SN

PRELIMINARY INFORMATION

F1 LOW ONE-WAY CLUTCH



Inner race should rotate in a clockwise direction
(The front planetary is integral to the sprag's inner race. Using the carrier's pockets as shown, the inner race rotation can be easily checked by hand)

Figure 19

TF60-SN

PRELIMINARY INFORMATION

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
Filling 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 ratio 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 highest speed is reached in 6th gear. The 6th gear lowers transmission gear ratio and increases driving dynamics.

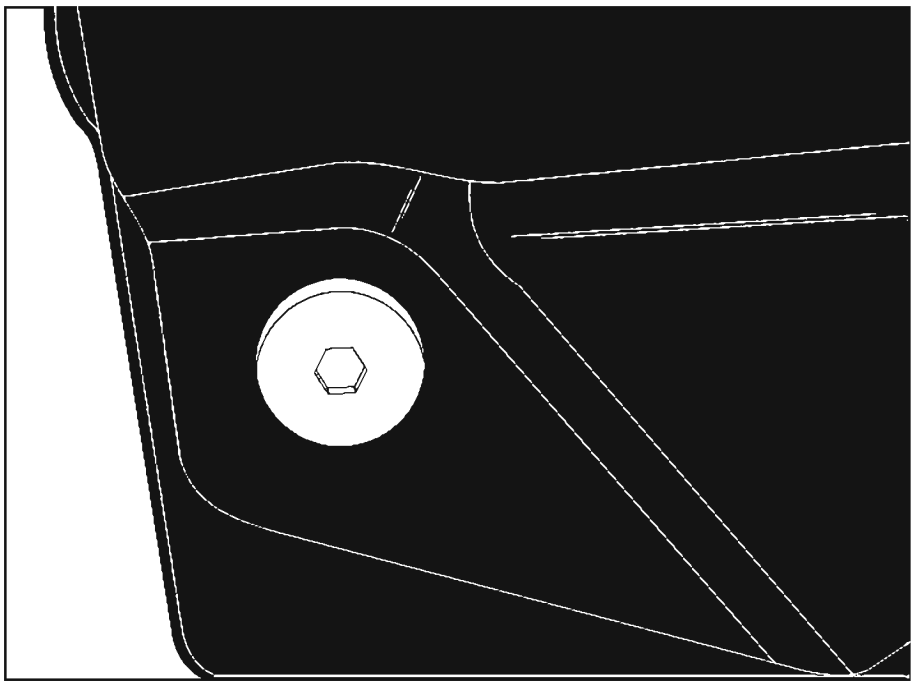
Figure 20

TF60-SN

PRELIMINARY INFORMATION

FLUID LEVEL

CHECK AND FILL PLUG



FLUID LEVEL STAND PIPE

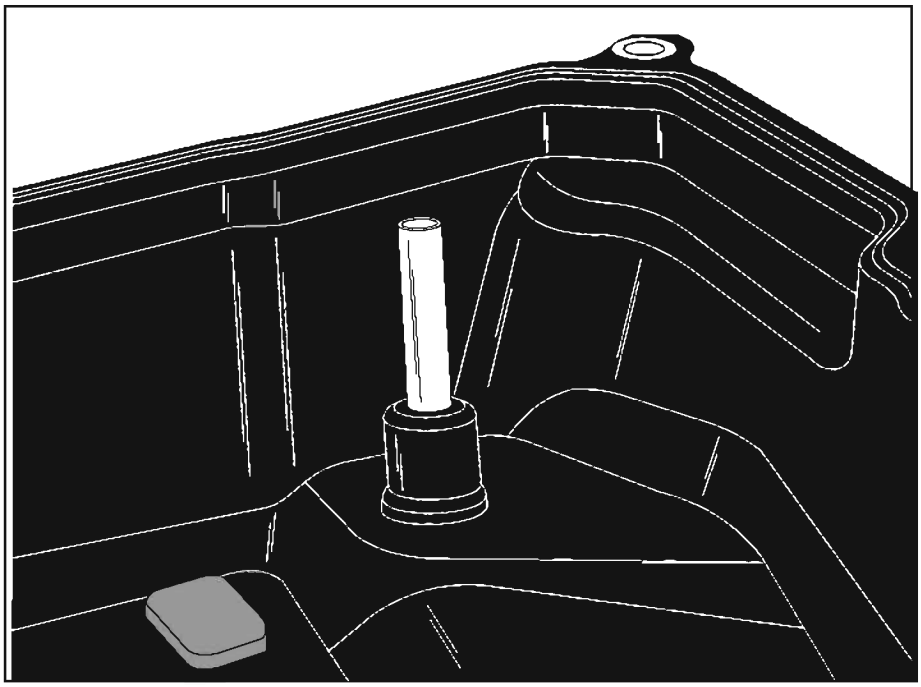


Figure 21

TF60-SN

PRELIMINARY INFORMATION

PRESSURE TAPS
(End Cover Side)

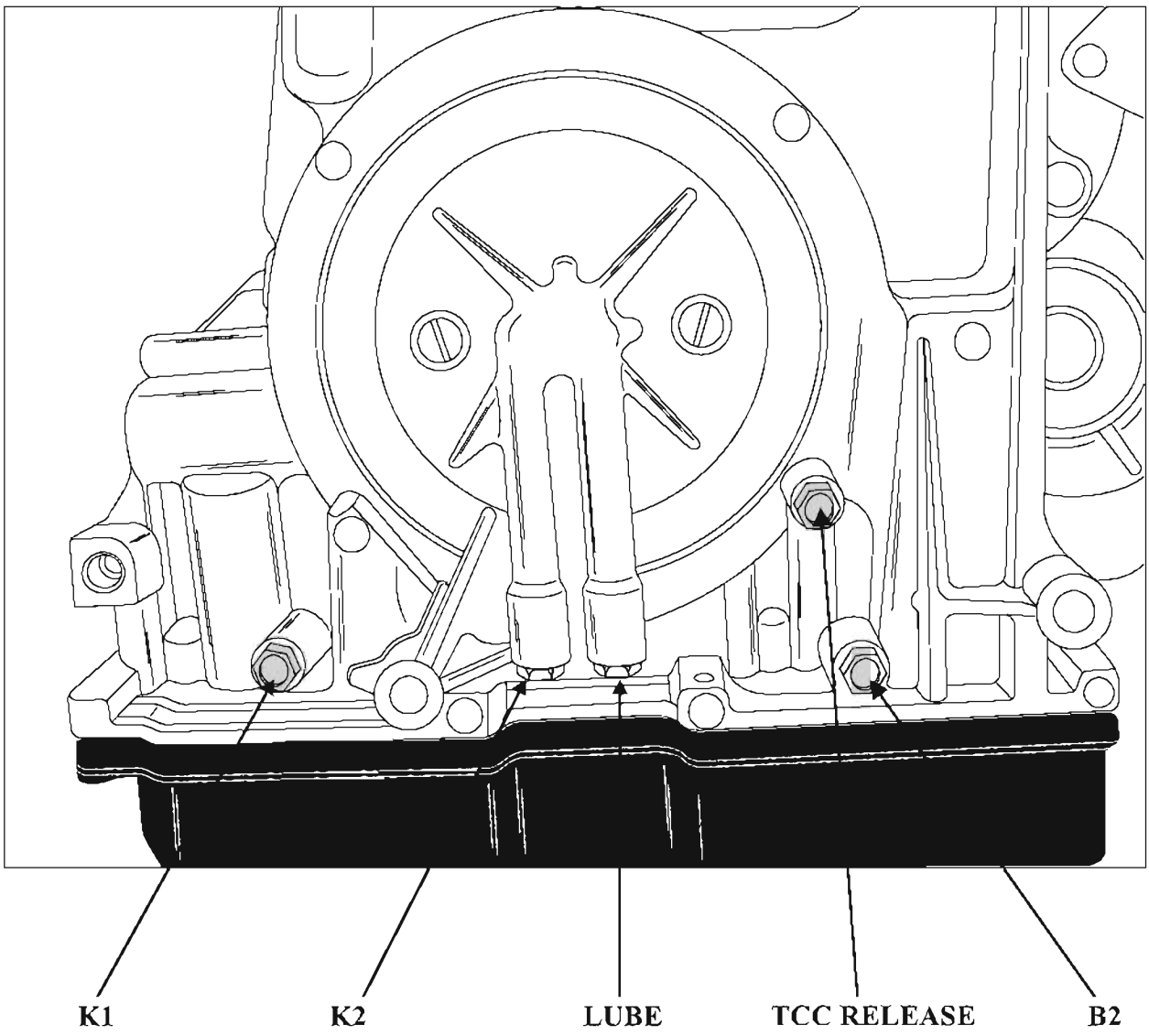
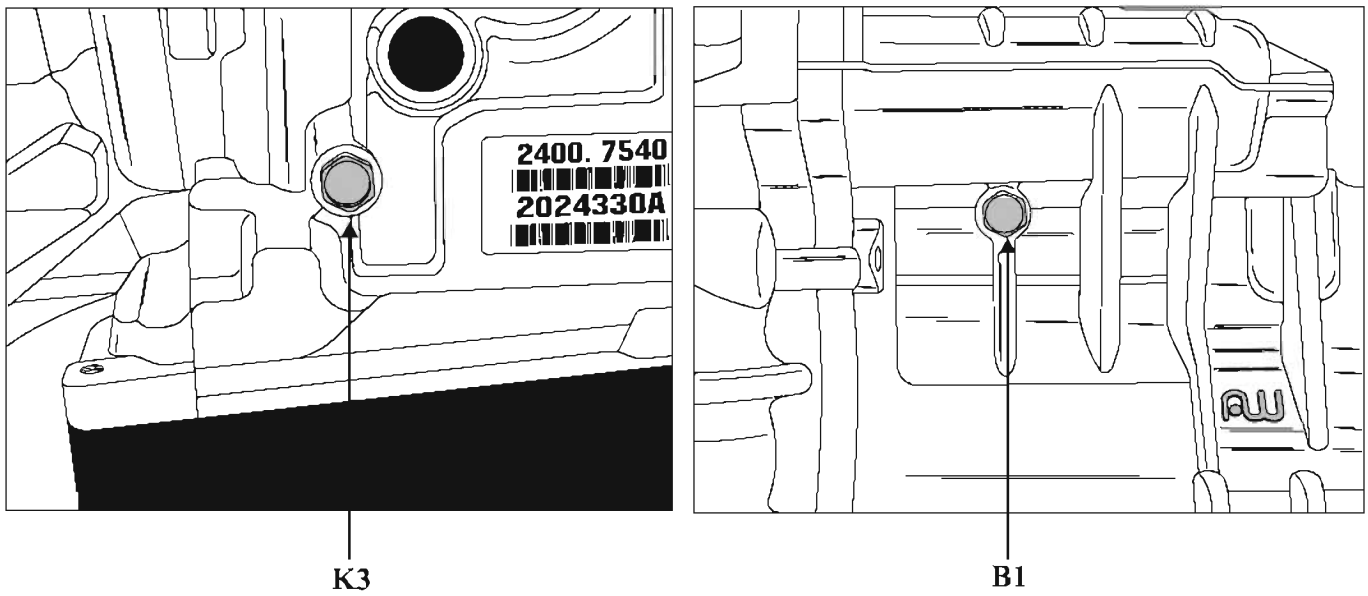


Figure 22

TF60-SN

PRELIMINARY INFORMATION

PRESSURE TAPS
(Case Connector Side)



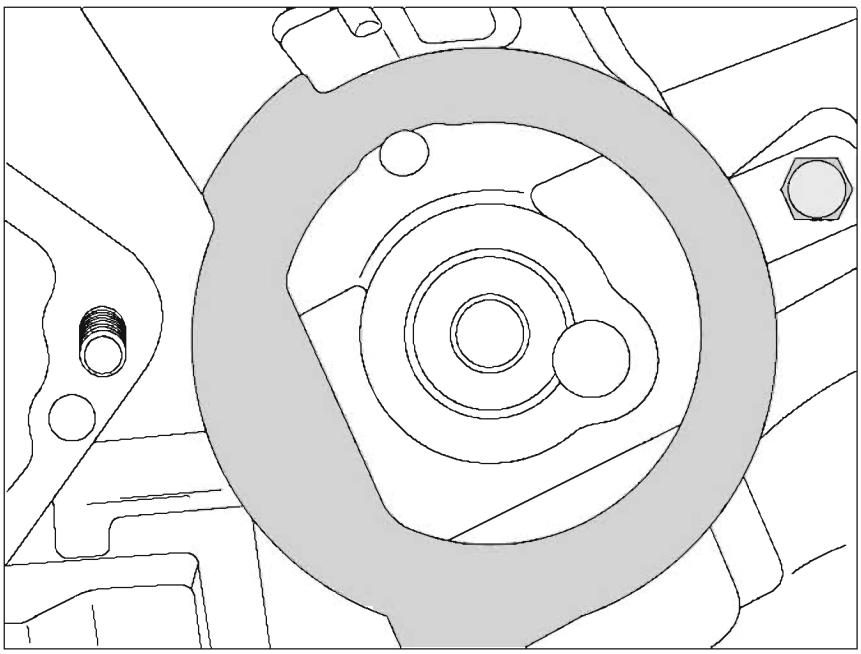


Figure 23

TF60-SN

LOSS OF LUBRICATION

COMPLAINT: An apparent loss of lubrication fluid causing premature failure of the transmission's drivetrain immediately after a main case or valve body exchange.

CAUSE: There are two different style lubrication systems with the TF60-SN (09G/09M) transmissions. One has the cooler known as the heat exchanger mounted on the converter housing case while the other has a remote cooler with push in cooler pockets in the main case as seen in figure 1. As a result, there are two different main case and valve body to case spacer plate configurations due to the re-routing of the cooler circuit. Figure 2 shows the matching spacer plate to case with the heat exchanger attached to the transmission. Figure 3 shows the match set for a remote heat exchanger. If a mismatch of valve body to main case occurs lubrication fluid is lost causing immediate failure to the drive train.

CORRECTION: Make the necessary repairs to the drivetrain and use a matched main case and valve body for the style lubrication system being worked on.

TF60-SN

LOSS OF LUBRICATION

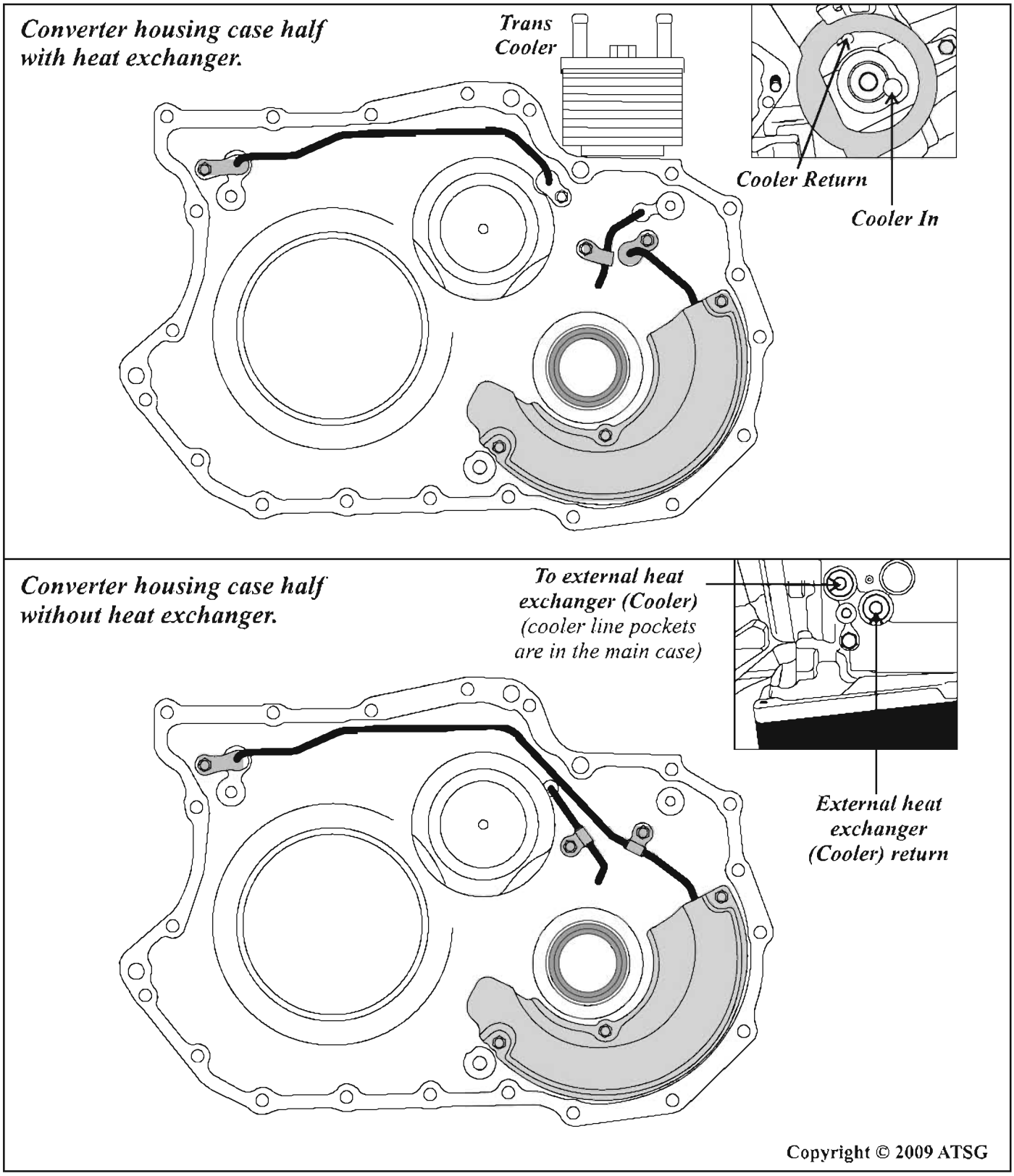
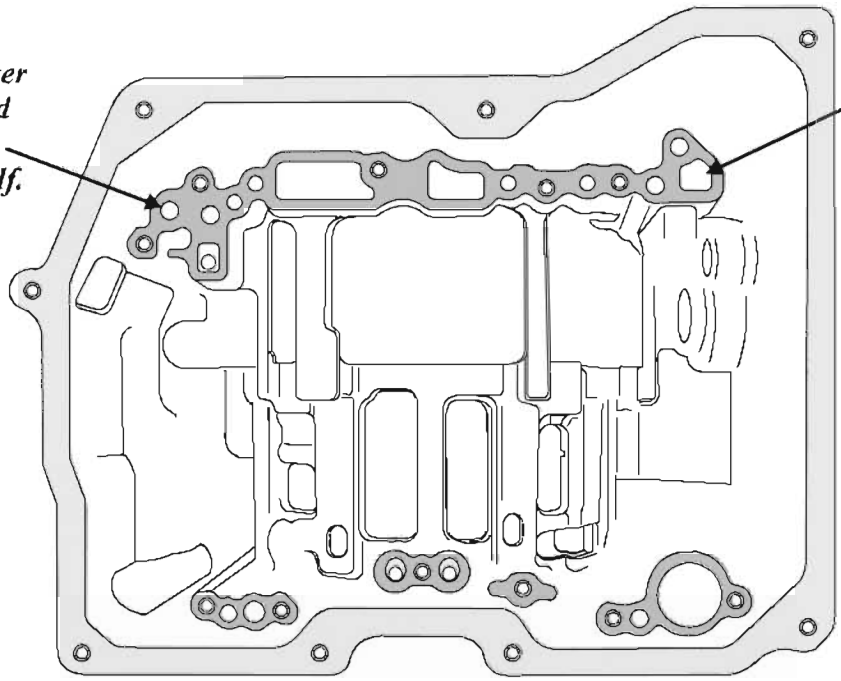


Figure 1

TF60-SN

LOSS OF LUBRICATION

Main case half for a heat exchanger mounted on the converter housing.



Main spacer plate to case for a case which has an attached heat exchanger

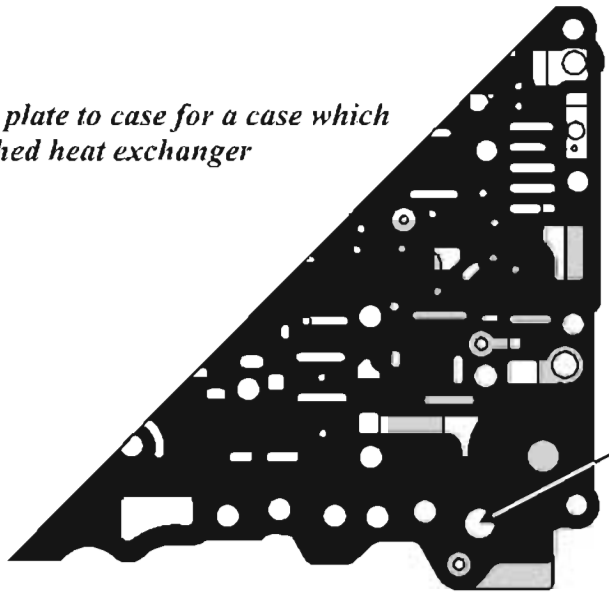
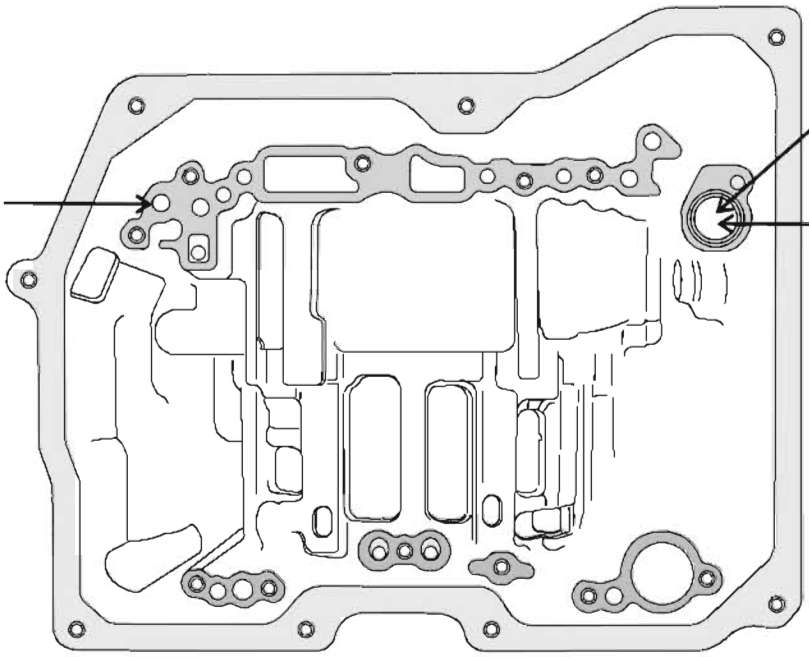


Figure 2

TF60-SN

LOSS OF LUBRICATION

Main case half for a remote heat exchanger.



Main spacer plate to case for a case which has a remote heat exchanger

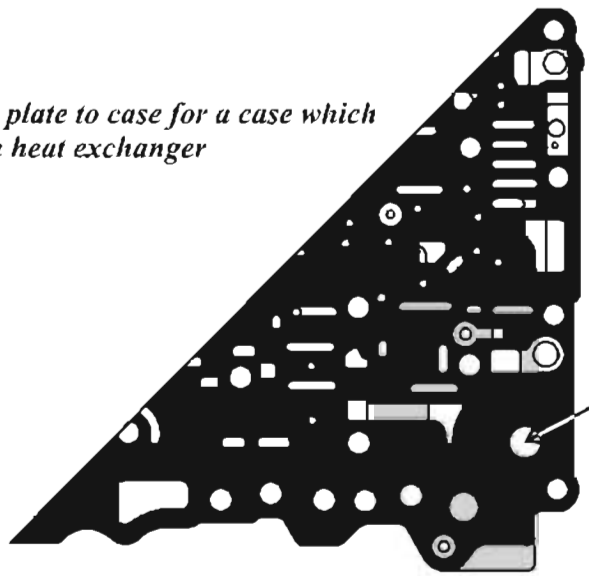


Figure 3

TF60-SN

SLIPPING 3-4 OR NEUTRAL 3-4

COMPLAINT: Before or after a transmission rebuild, the transmission exhibits a slipping or flared 3-4 shift or a neutral shift into 4th followed up by going into a failsafe condition.

CAUSE: At the bottom of the case, there is a steel ring sleeve that is pressed on to the aluminum case (See figure 1). This ring sleeve contains K2 clutch apply pressure. The K2 clutch is applied for 4th, 5th and 6th gears. This sleeve with the K2 clutch sealing rings becomes loose and can spin. Depending upon how loose or how much it has spun determines the severity of the 3-4 shift complaint.

CORRECTION: If the case has not been severely damaged by the sleeve spinning around, there are aftermarket companies that manufacture these sleeves which have a slightly tighter fit as well as K2 clutch drum pilot bushings. The repair is to dress up the case, heat up the sleeve and carefully place it into position and let it have a cool contracting fit to the case.

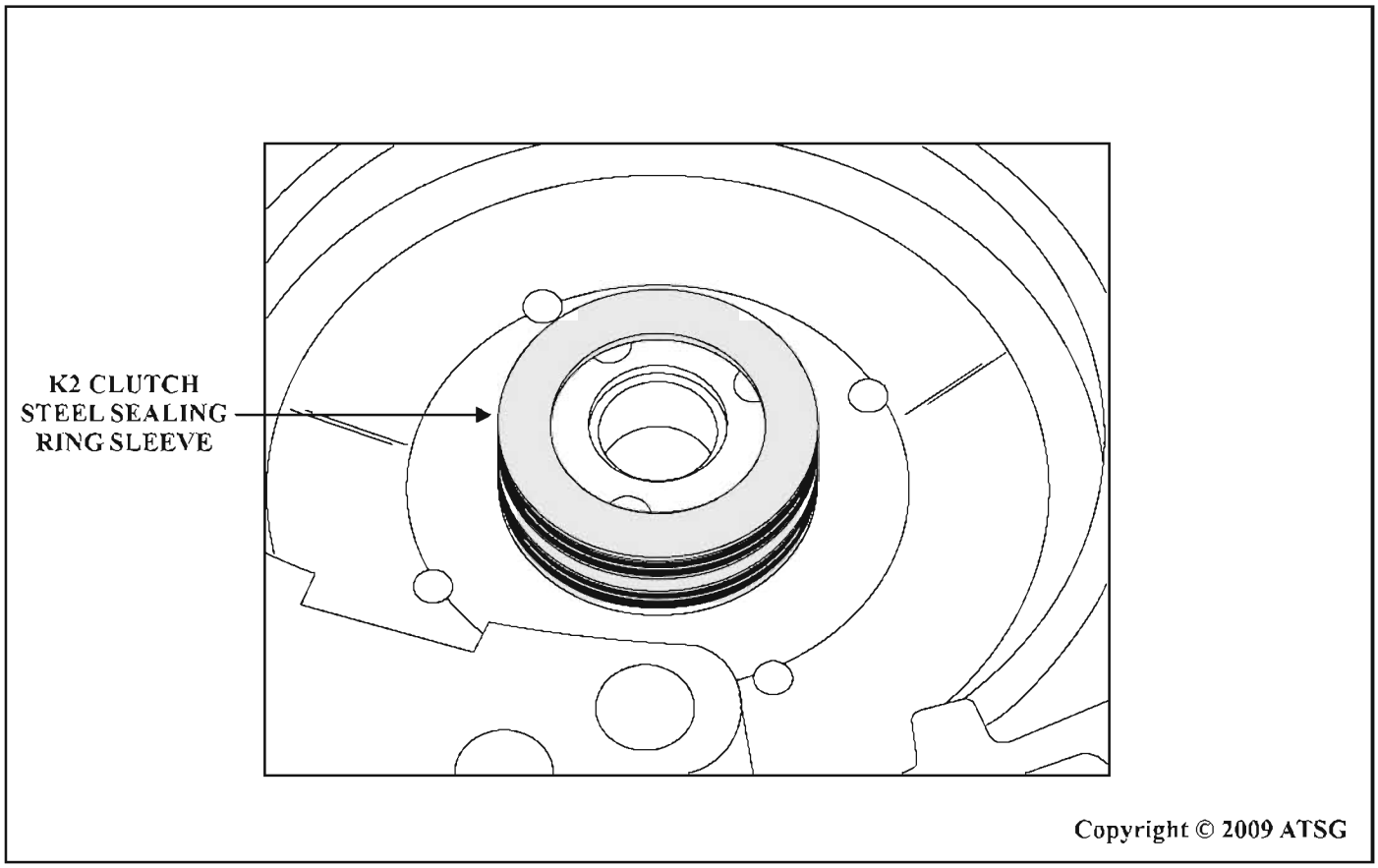


Figure 1

TF60-SN

NO 4TH, 5TH, 6TH OR REVERSE

COMPLAINT: After transmission service which required solenoid harness removal, the vehicle no longer has 4th, 5th, 6th or Reverse. When the external wiring harness is unplugged from the transmission, reverse gear is obtainable.

CAUSE: Solenoid N88 and N89 were accidently cross connected.

CORRECTION: Switch the connectors to their appropriate positions. The white wire connector goes to solenoid N88 and the black wire connector goes to the N89 solenoid (See figure 1).

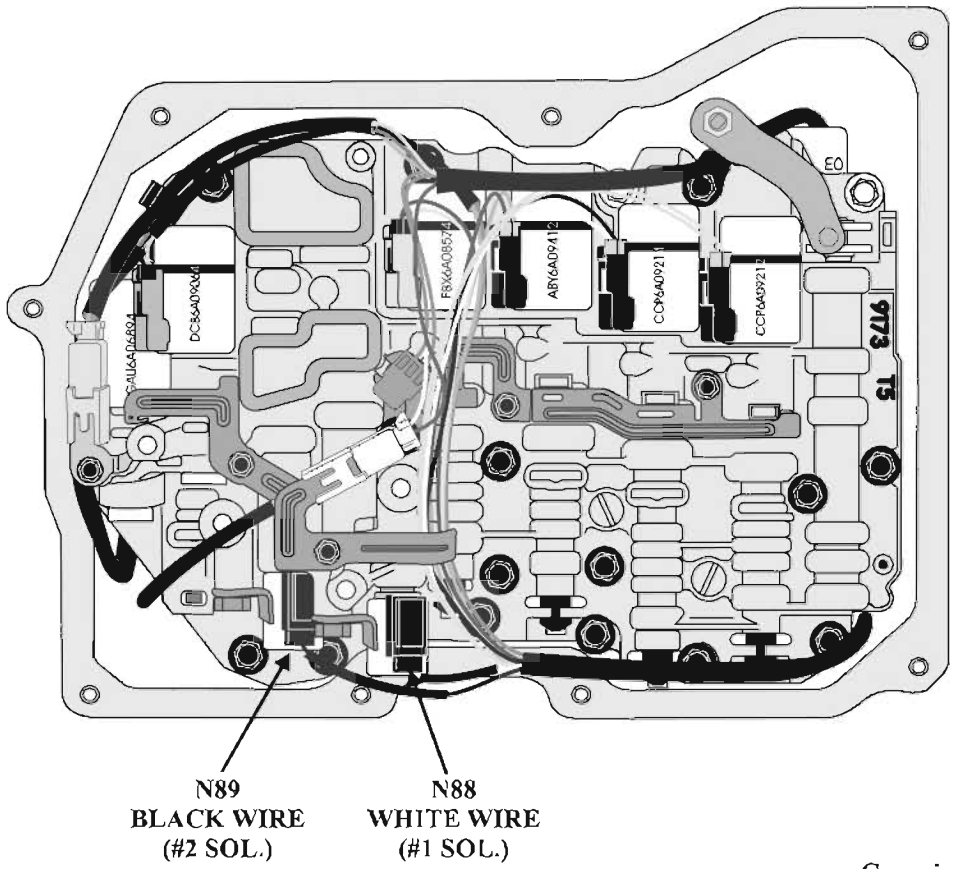


Figure 1

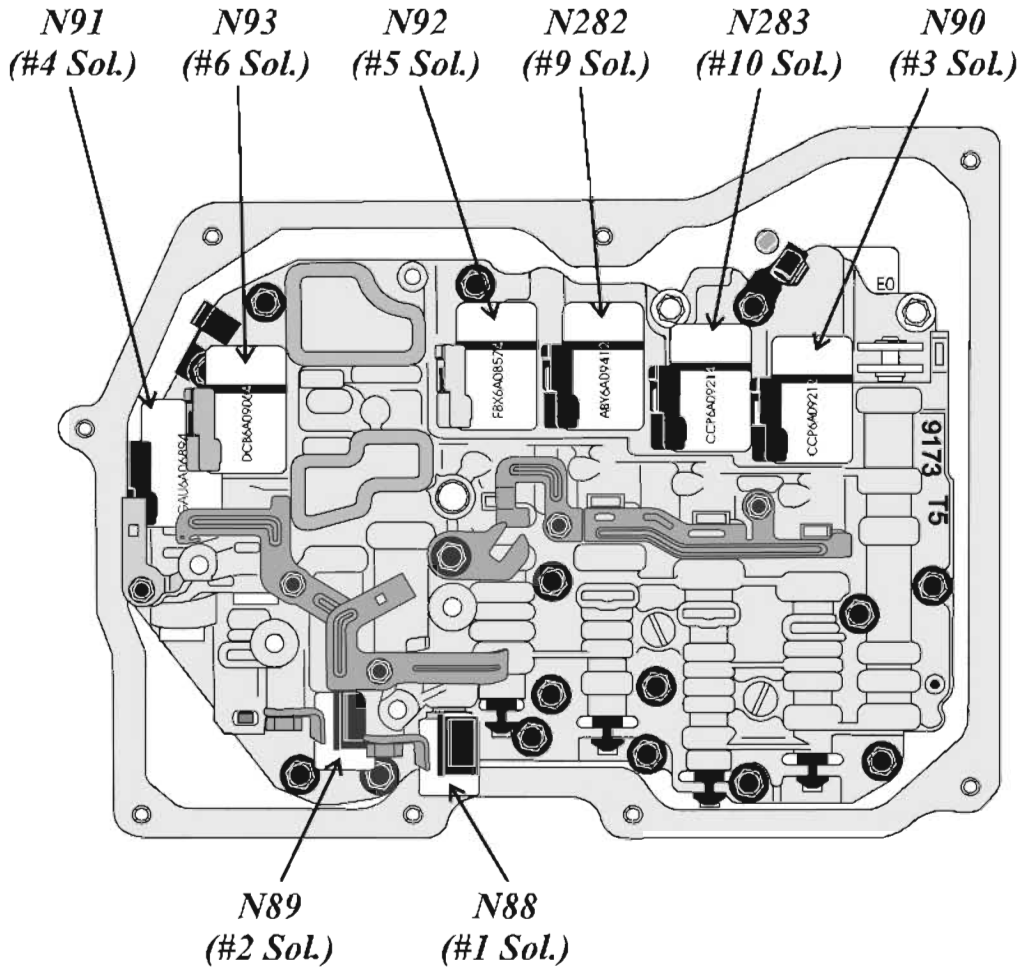
VW/AUDI
09G-TF60-SN
NO REVERSE NEUTRALS IN THIRD

COMPLAINT: After overhaul, VW and Audi vehicles equipped with the 09G/TF60-SN transaxle may exhibit a complaint of no reverse and a neutral on the upshift to third gear.

CAUSE: The cause may be, that during overhaul the internal harness for the solenoids was routed incorrectly allowing the Red and Blue wires, which are supposed to be connected to N282, to be easily connected to N90, and the Lt. Green and Lt. Blue wires, for N90 to be connected to N282 (See figures 2 and 3). Refer to figure 1 to see the solenoid and clutch application chart. Notice that N90 is Off when the K3 Clutch is On, also notice that N282 is On in both reverse and third gear which causes the no reverse and the neutral in third.

CORRECTION: To correct this condition, refer to figure 3 and ensure that the internal harness for the solenoids is routed like shown. See page 26 which shows the terminal layout for all the solenoids and also gives all the wire colors for each individual solenoid. The chart can also aid in terminal identification if the wire colors are different than what is listed.

SOLENOID LOCATIONS



SOLENOID & CLUTCH APPLICATION CHART												
	Pressure Control Solenoids						Component					
Gear	N92 S-5	N282 S-9	N90 S-3	N283 S-10	N93 S-6	N91 S-4	K1	K2	K3	B1	B2	F1
1st Gear	Off	On	On	On	PWM		On				On*	On
2nd Gear	Off	On	On	Off	PWM		On			On		
3rd Gear	Off	On	Off	On	PWM	PWM	On		On			
4th Gear	Off	Off	On	On	PWM	PWM	On	On				
5th Gear	On	Off	Off	On	PWM	PWM		On	On			
6th Gear	On	Off	On	Off	PWM	PWM		On		On		
Rev Gear	On	On	Off	On	PWM	PWM			On		On	

* The B2 clutch is applied in Tiptronic Mode 1st gear only for engine braking.

Figure 1

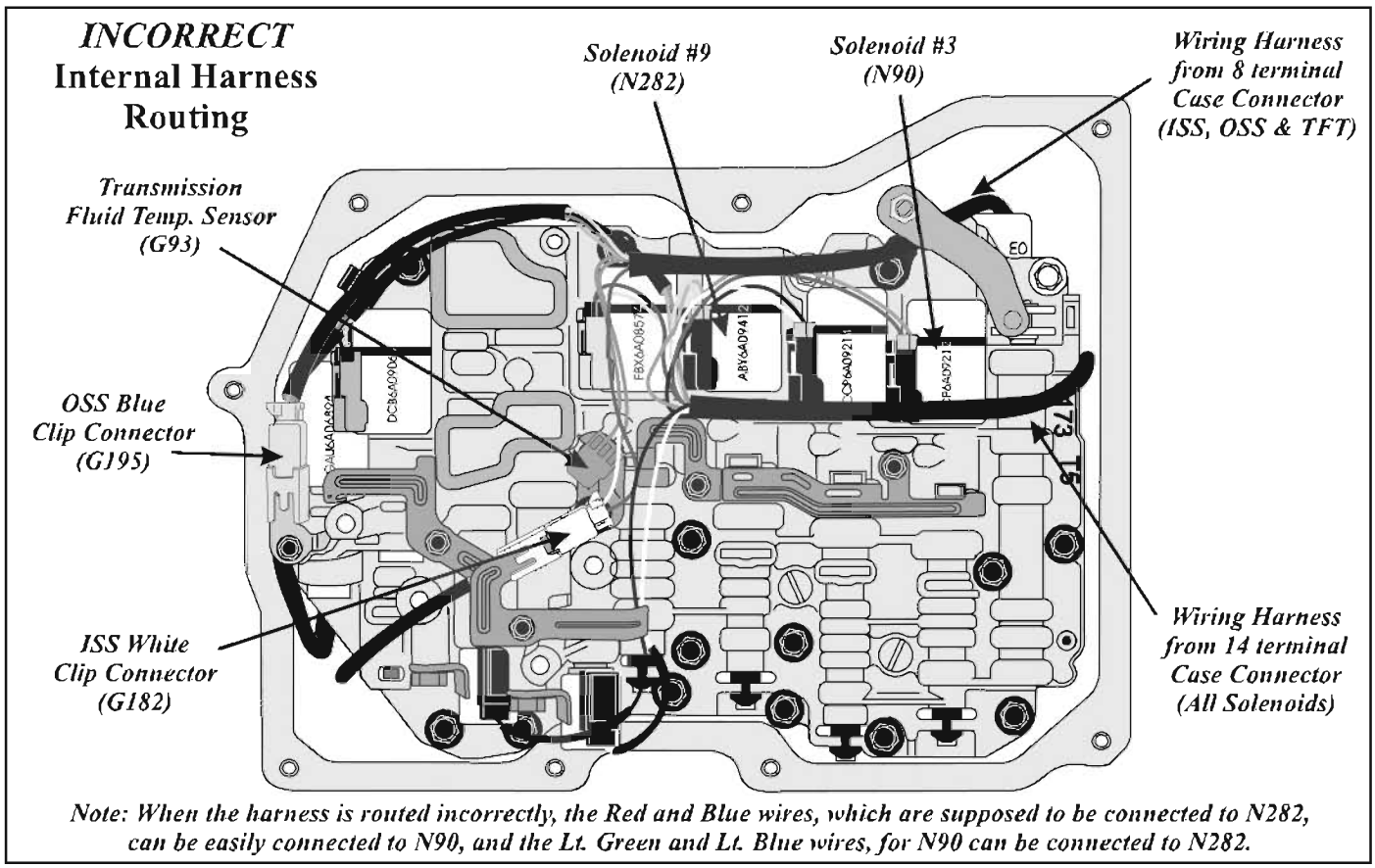


Figure 2

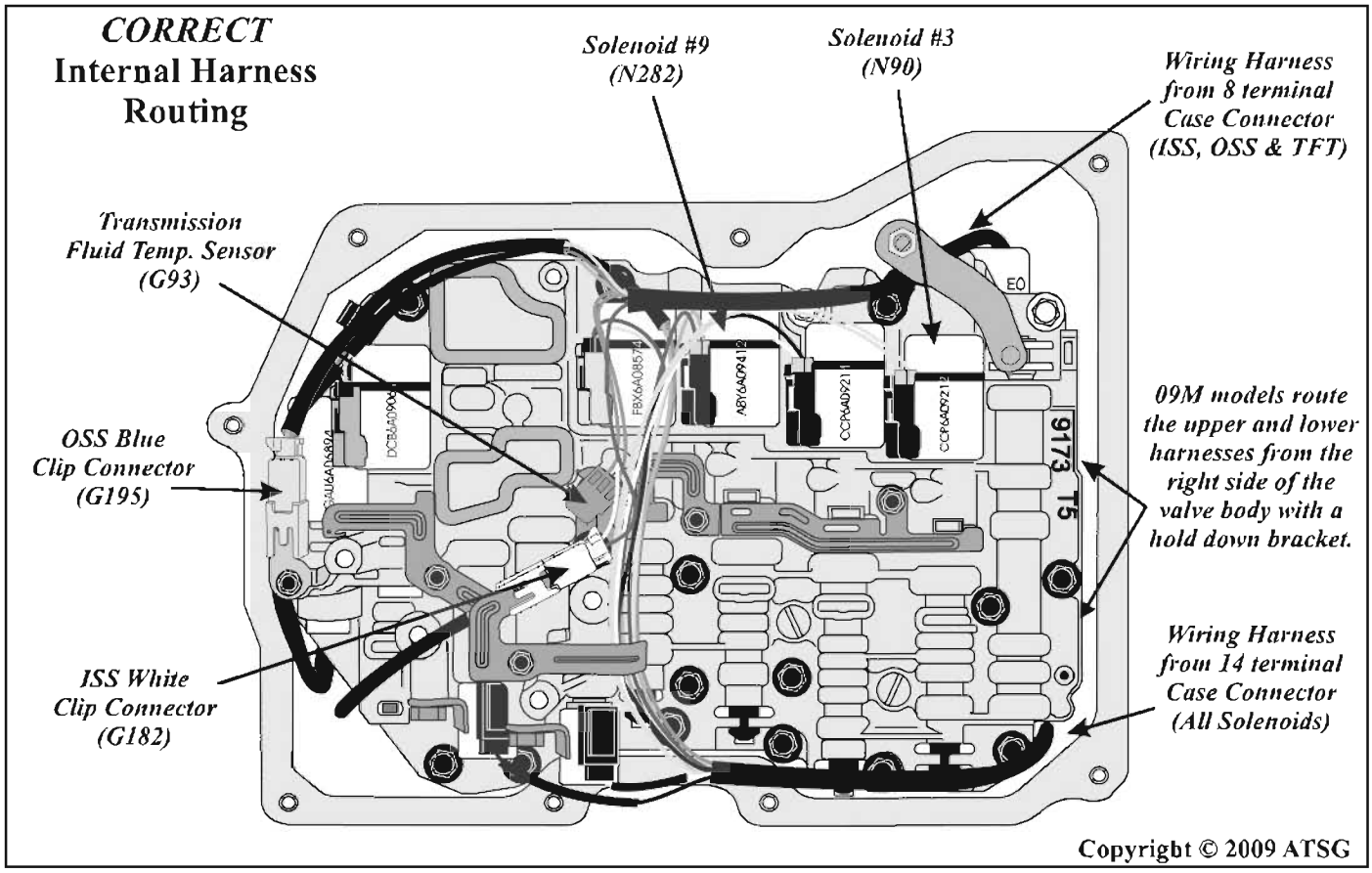


Figure 3

VW/AUDI
09M/09G/TF60-SN
HARSH REVERSE THIRD &FIFTH GEAR

COMPLAINT: Before or after overhaul, vehicles equipped with the 09M/09G-TF60-SN transmission may exhibit a complaint of harsh reverse, third and fifth gear when hot.

CAUSE: The cause may be, a worn bonded balance piston located in the K3 clutch drum. See the cross-sectional view in figure 1.
Explanation: The balance piston function is to hold "counter" or "back" pressure on the K3 apply piston. The balance piston is fed from the lube circuit, and its purpose is to provide a small amount of pressure to assist the release of the K3 clutch. It also acts as an accumulator during application of the K3 clutch. See figures 2 and 3. The bonded piston has three notches where the retaining snap ring is located allowing a controlled leak of this pressure, and when the bonded rubber is worn this will allow a larger volume of pressure loss which can cause the harsh applications.

CORRECTION: Refer to figure 4 and replace the bonded K3 balance piston. ***Note:*** At the time of this printing, there are "No" aftermarket replacement pistons available and the dealer only sell parts for this transmission as an assembly.

K3 CLUTCH CROSS-SECTIONAL VIEW

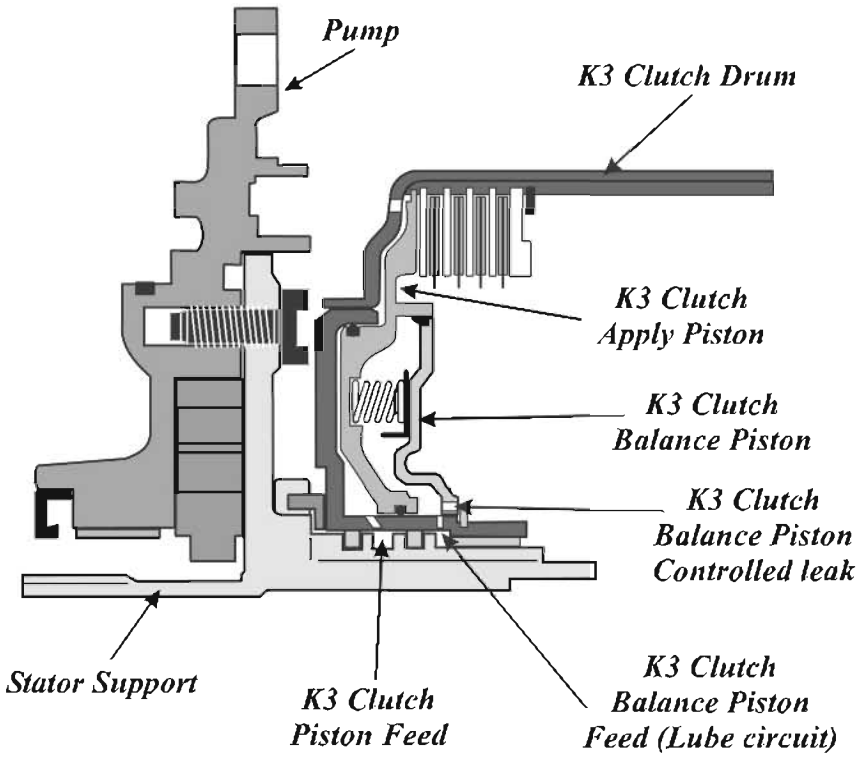


Figure 1

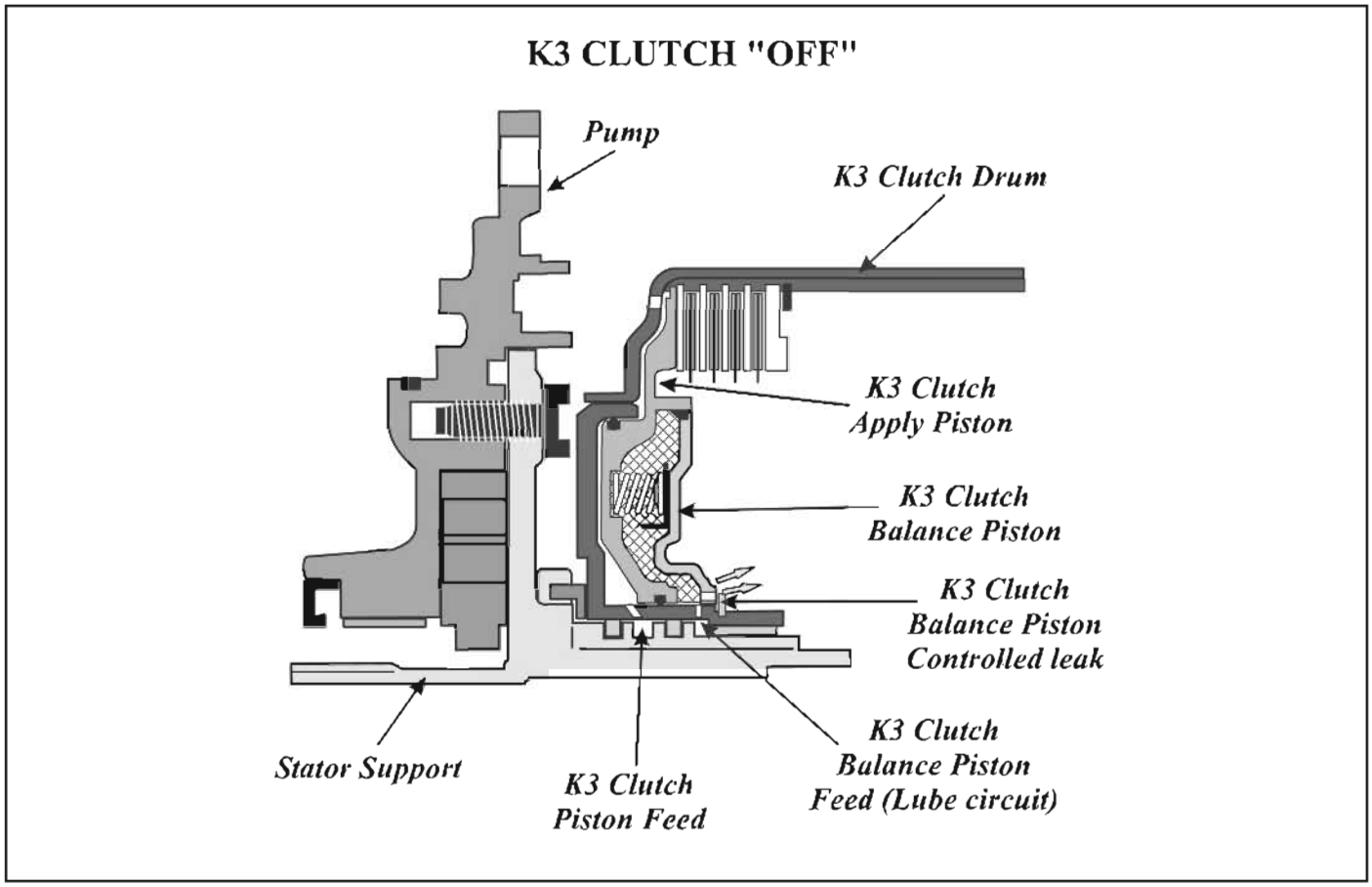


Figure 2

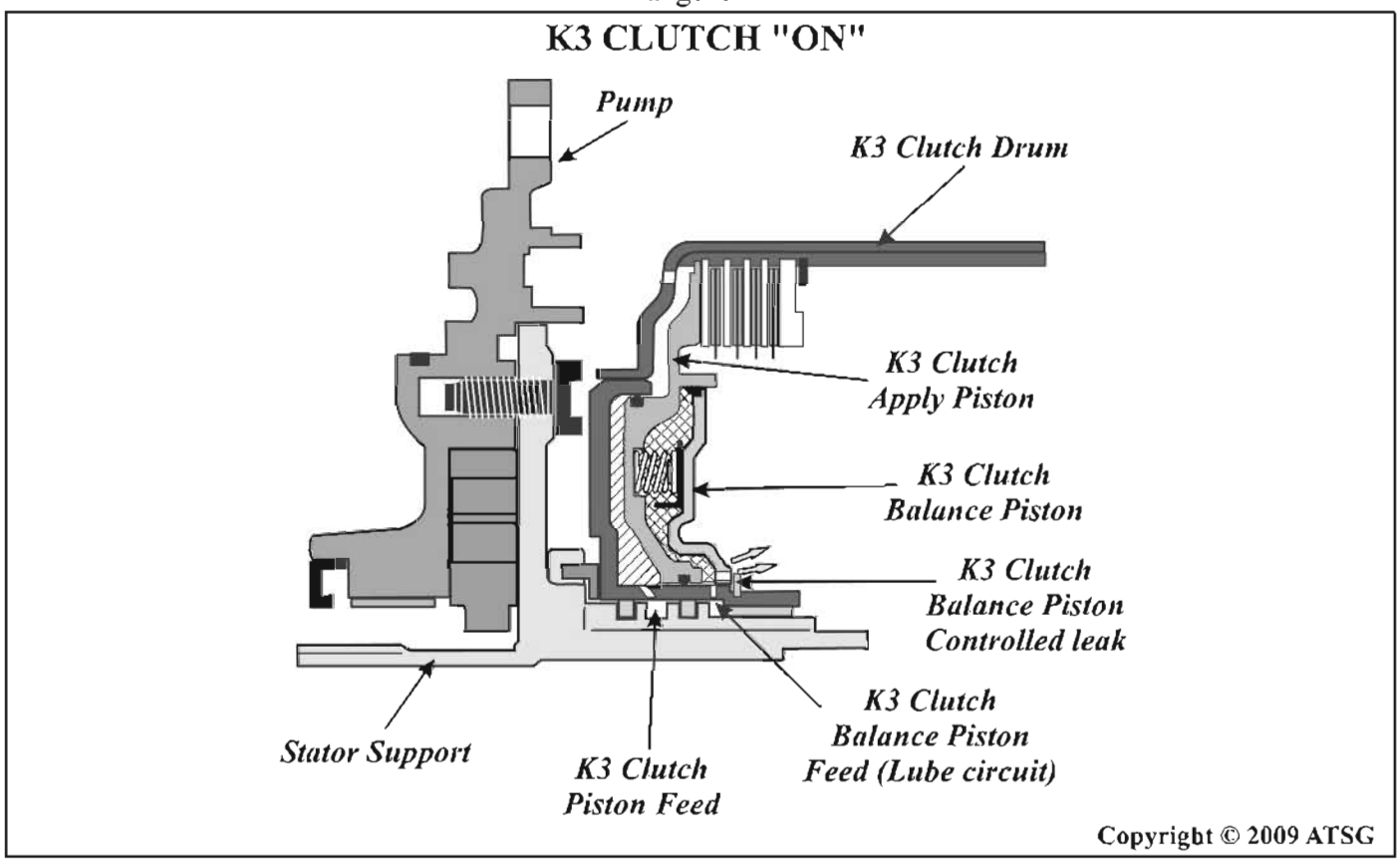


Figure 3

K3 CLUTCH DRUM EXPLODED VIEW

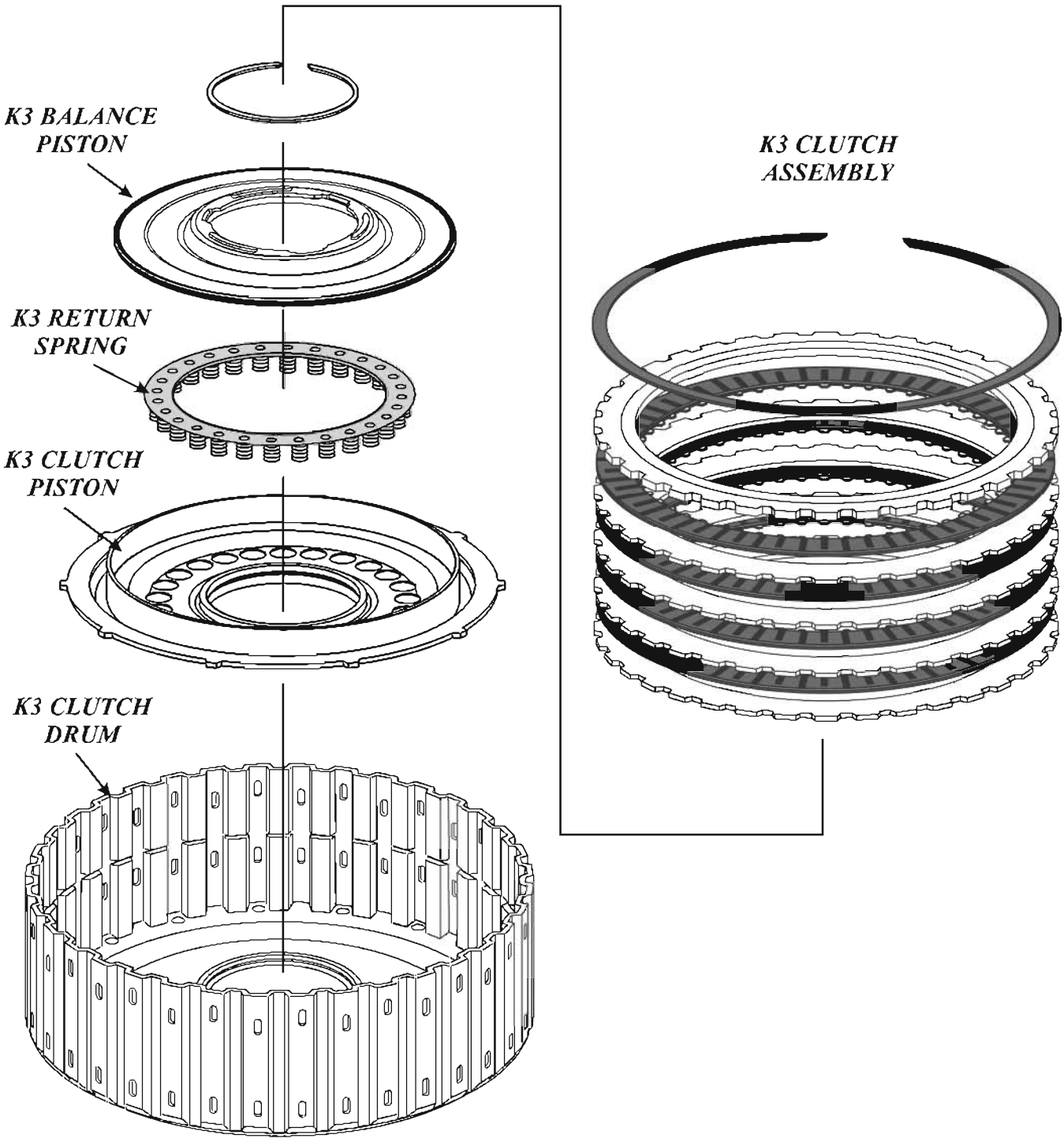


Figure 4

VW/AUDI
TF60-SN/09-G 09-M
DESCRIPTION OF DATA BLOCKS

CONTROL MODULE SELECTION

02 Auto Trans

GROUP SELECTION

08 Measured Blocks

Data Block				
001	Engine Speed: xxxx	Trans RPM G182 (Input): xxxx	Trans RPM G195 (Output): xxxx	Driving Mode: Park = 0, Reverse = R, Neutral = 0, Drive = 1H-6H, 3M-6M (Tcc)
002	Trans RPM G182 (Input): xxxx	G182 (Input) Voltage: 1.440v (.50v-1.440v)	Trans RPM G195 (Output): xxxx	G195 (Output) Voltage: 1.440v (.50v-1.440v)
003	Driving Manner: DS= Drive, TT= Manual	Accelerator Pedal Position%: 0-100%	VSS km/h: xxxx	Driving Mode: Park = 0, Reverse = R, Neutral = 0, Drive = 1H-6H, 3M-6M (Tcc)
004	Selector Lever: P-R-D, S or Manual	Accelerator Pedal Position%: 0-100%	Declination Recognition: Level, DW (downhill), UP (uphill)	Driving Mode: Park = 0, Reverse = R, Neutral = 0, Drive = 1H-6H, 3M-6M (Tcc)

**Note= There are many duplications of information listed in the data blocks this is to aid the technician when monitoring specific groups*

MEASURED BLOCKS CONTINUED

08 Measured Blocks

Data Block				
	Hill Driving Factor	Throttle Valve Factor	Throttle Dynamic Index	Accelerator Pedal Position%
005	0.0%	0.0%	⇩ Changes based on snap of Throttle	0-100%
	ATF Temp G93	Specified Current (TCC) Solenoid Valve 4 (N91)	Lock-up Clutch Slip	Lock-up Clutch Slip
006	84.0°C	.200A	xxxx	xxxx
	Solenoid Valve 5 (N92)	Solenoid Valve 9 (N282)	Solenoid Valve 3 (N90)	Solenoid Valve 10 (N283)
007	⇩ .100A Fully "Off" .980A Fully "On" See Note*	⇩ .100A Fully "Off" .980A Fully "On" See Note*	⇩ .100A Fully "Off" .980A Fully "On" See Note*	⇩ .100A Fully "Off" .980A Fully "On" See Note*
	(LP) Solenoid Valve 6 (N93)	(TC) Solenoid Valve 4 (N91)	Solenoid Valve 1 Solenoid Valve 2	Battery Voltage
008	⇩ .200A to .940A Based on engine load	⇩ .200A to 1.0A Based on load and PCM TCC strategy	00000000 ⇩ N89 N88 00000000 0= Off 1= On 11- for M1 10- for Tcc On	13.6V
	Brake Pedal Switch	Kick-down Switch	Selector Lever	Multifunction Switch
009	00000000 ⇩ 00000000=Off 00000011=On	00000010 ⇩ May be model dependant no state change	⇩ P-R-N-D Manual	00000000 ⇩ P=00001001 R=00001100 N=00000101 D=00000110 S=00001111

**Note= Amperage changes during shift transitions*

MEASURED BLOCKS CONTINUED

08 Measured Blocks

Data Block				
010	ATF Temp G93 94.0°C	ATF Temp Voltage .60V	Trans Condition Blank	Voltage Supply 13.50V
011	Brake Switch Condition (F47) OFF or ON	Locking SL P/N =Locked Press Brake = --	Speed 0.0km/h	Selector Lever P-R-N-D Manual
012	Selector Lever P-R-N-D Manual	Tiptronic Recognition P-R-N-D= Blank Manual= M	Driving Mode Park = 0 Reverse = R Neutral = 0 Drive = 1H-6H 3M-6M (Tcc)	Transferrable Torque 100.0%
013	Selector Lever P-R-N-D Manual	Multifunction Switch 00000000 P=00001001 R=00001100 N=00000101 D=00000110 S=00001111	Tiptronic Recognition P-R-N-D= Blank Manual= M UP Button =UP DN Button = Down	Tiptronic Recognition 00000000 D=00000000 M=00001000 UP=00011000 DN=00001100
014	Accelerator Pedal Position% 0-100%	N/A	Idle Switch Condition Off Idle=00000000 At Idle=00000001	APP Condition 00000000

VW 09A & 09G

2-3 FLARE -HARSH 3-4
DOUBLE BUMP 2-3 / DOWNSHIFT CLUNKS

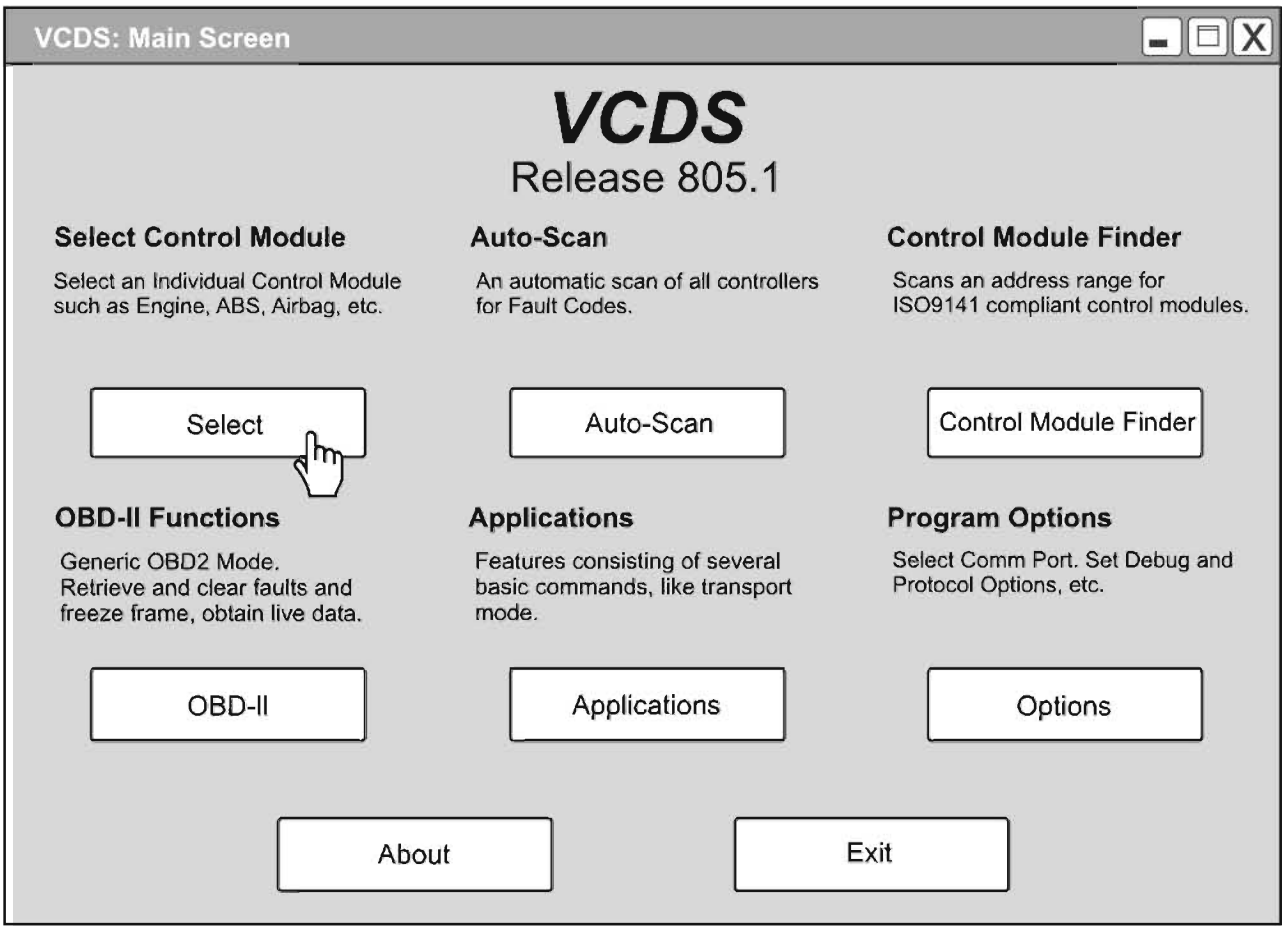
COMPLAINT: After overhaul, vehicles equipped with the 09A (JF506E) may exhibit a 2-3 flare and a harsh application into 4th. On vehicles equipped with the 09G (TF60-SN) the complaint may be, a double bump on the 2-3 and or downshift clunks.

CAUSE: The cause may be that the clutch adaptives were not reset.

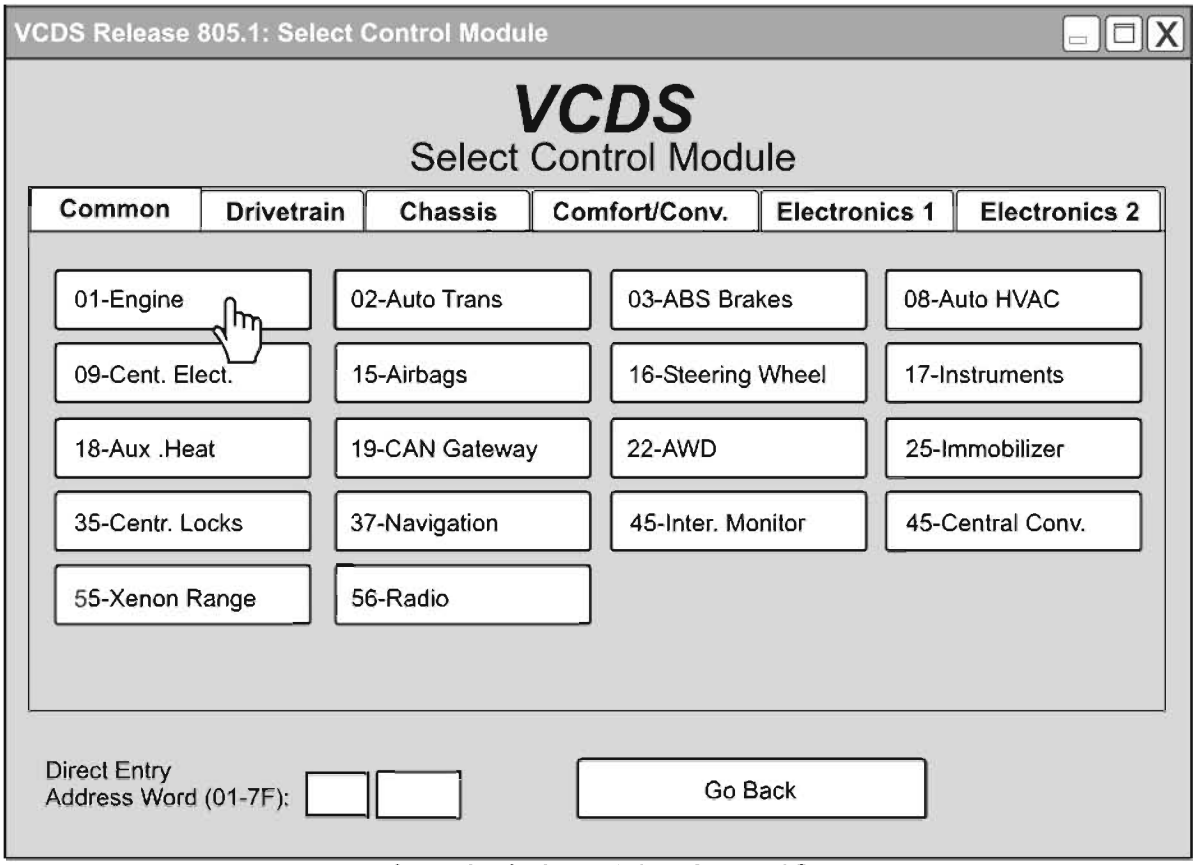
CORRECTION: Using a capable scan tool go into the engine side and reset all the adapts. The following steps will show how to reset the adaptives thru the lap top based Vag Com Diagnostic System. It will be necessary to take a 15 shift cycle road test after performing this reset to fine tune the adapts. ***Note:*** Early model 09A require a capable scan tool to reset adapts. You can not drive them out! ATSG Highly recommends resetting adapts on all the above mentioned vehicles.

Step 1

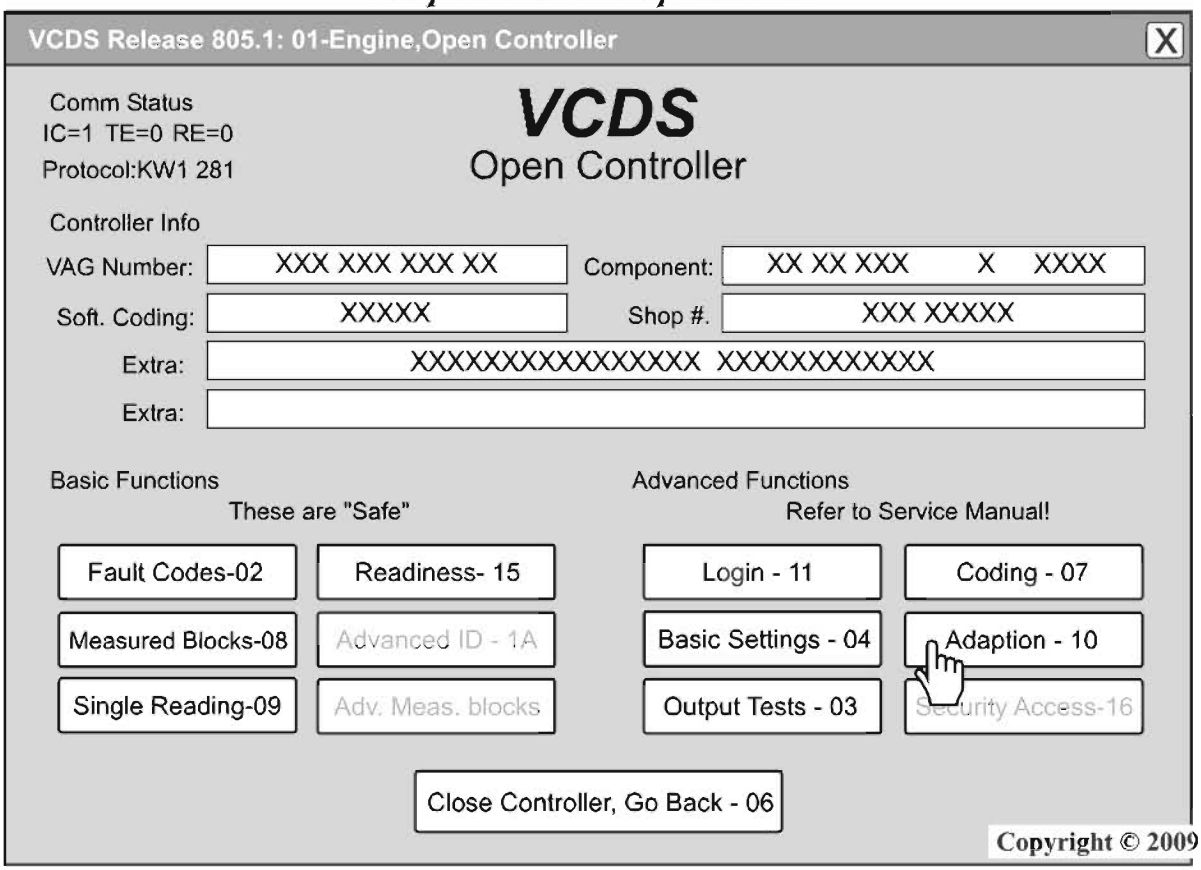
This is the first screen that will appear after the vehicle is plugged into the Lap-top. Press Select to select control module



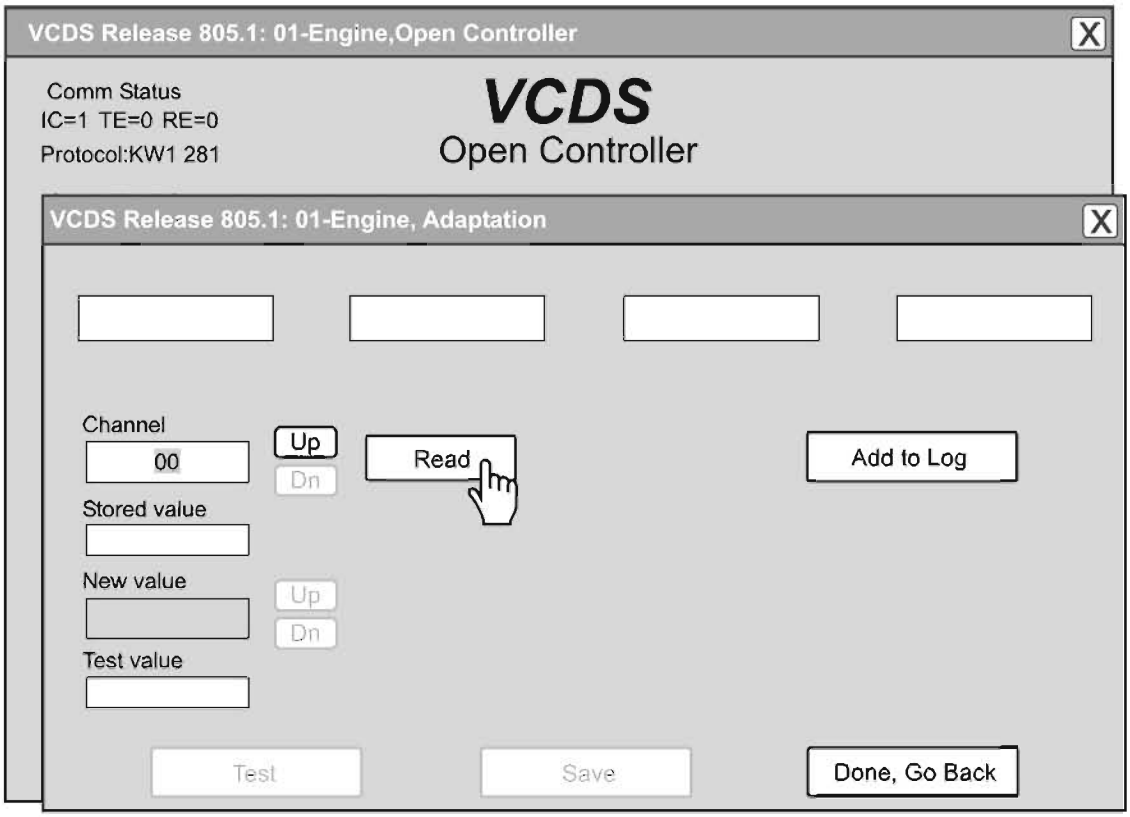
Step 2- Select 01-Engine



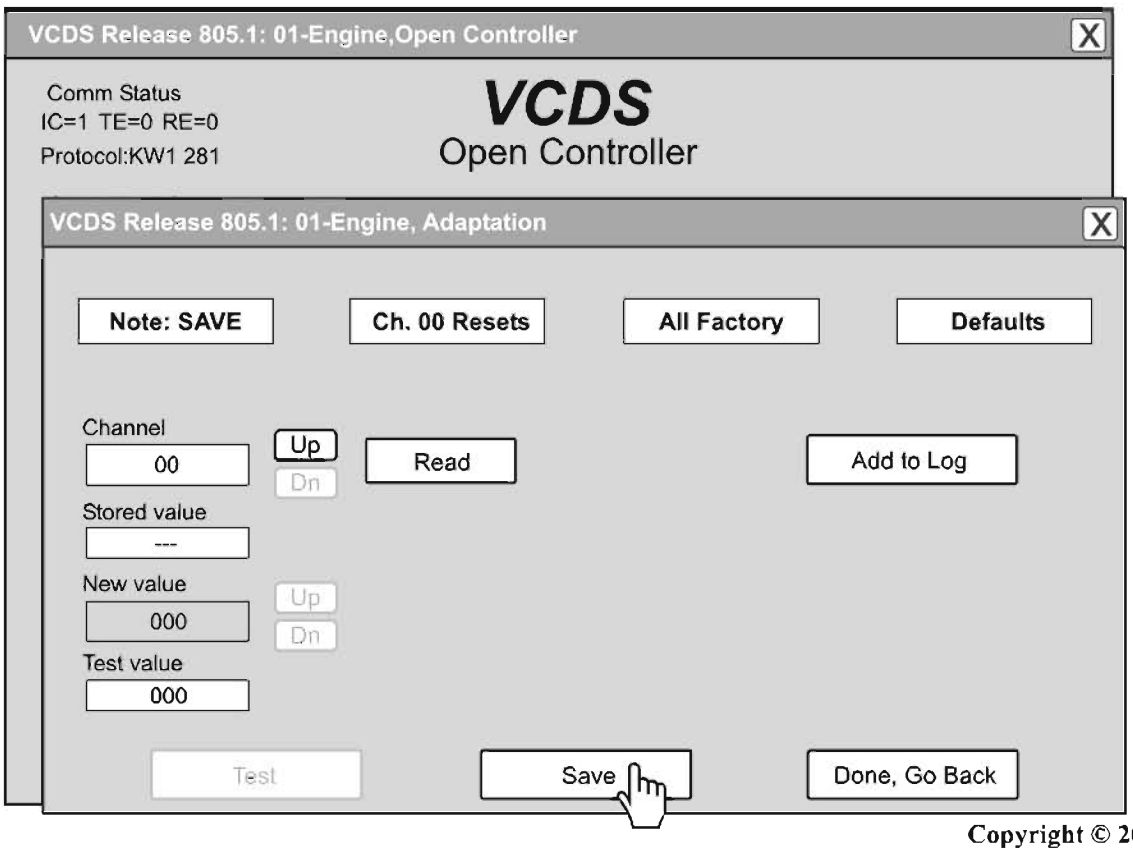
Step 3- Select Adaption - 10



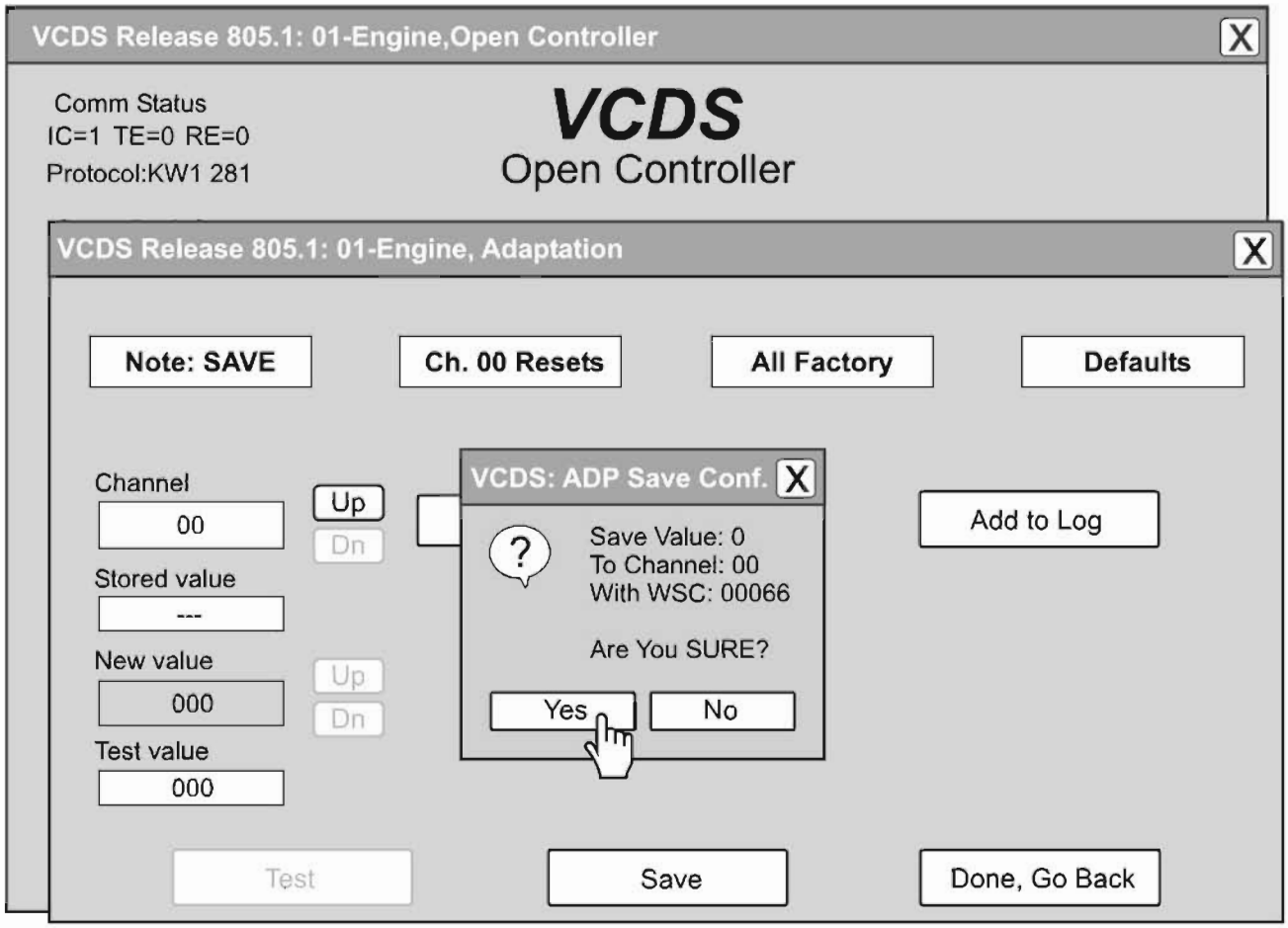
Step 4- 00 will show up in the Channel window. Press the Read button



Step 5- 000 will show up in the New and Test value windows. Channel 00 resets ALL Factory Defaults Press Save



Step 6- Press Yes to save All Factory Defaults



Note: It will be necessary to perform a 15 shift cycle road test after Factory Defaults are reset. This will fine tune the adapts.

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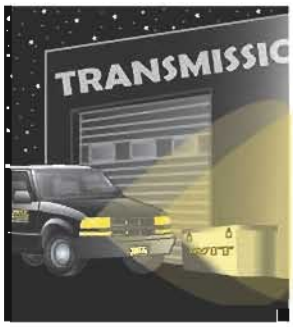

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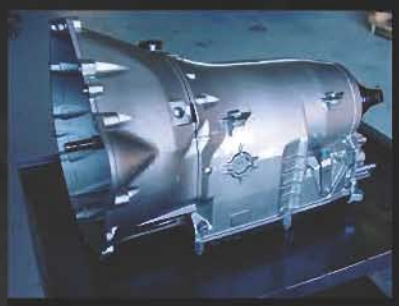

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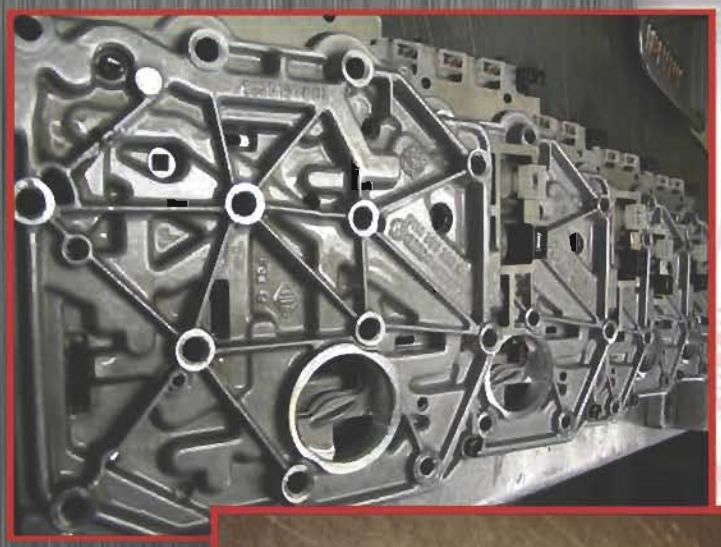

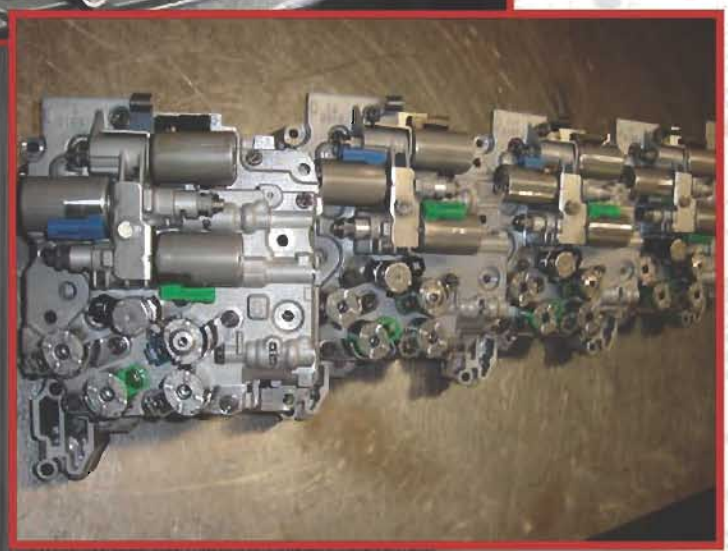

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ZF5HP24

CHRONIC FRONT SEAL LEAK

COMPLAINT: After overhaul and road testing, the vehicle is put on the lift for a final leak check. A leak is discovered coming from the front seal area.
The transmission is removed in order to get a better look at the front seal. Upon inspection, the seal looked good and the snap ring that keeps the seal in was in place, (Refer to figure 1). A new seal is installed and the transmission is installed back into the vehicle. Within a few minutes of starting the engine, the leak in the front seal area begins again.

CAUSE: The front seal oil dam that is located directly behind the front seal was left out. The oil dam prevents ATF from flooding the front seal area and causing it to leak.

CORRECTION: Install the oil dam a shown in figure 2, make certain the entire area has been cleaned and that the oil dam floats freely.

SERVICE INFORMATION:

Front Seal Oil Dam, ZF Part Number.....0501-316-234

ZF5HP24

CHRONIC FRONT SEAL LEAK

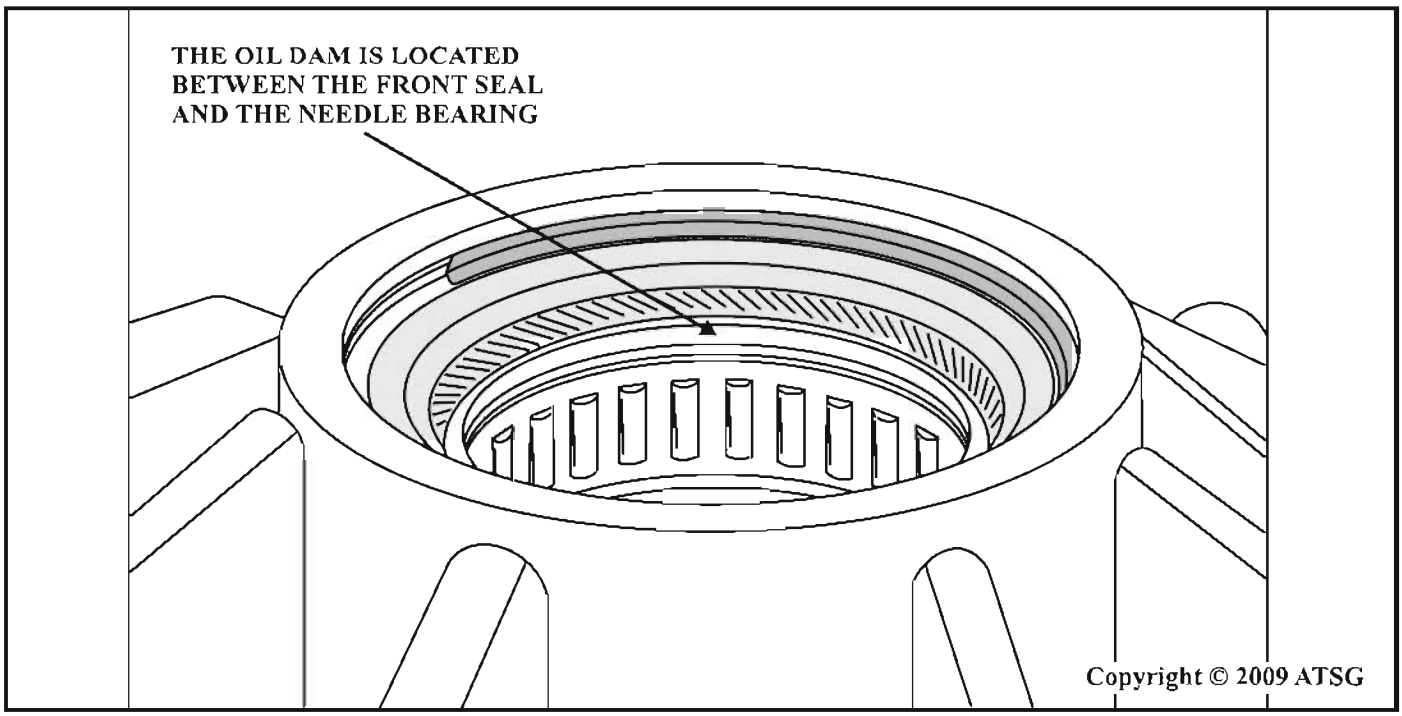


Figure 1

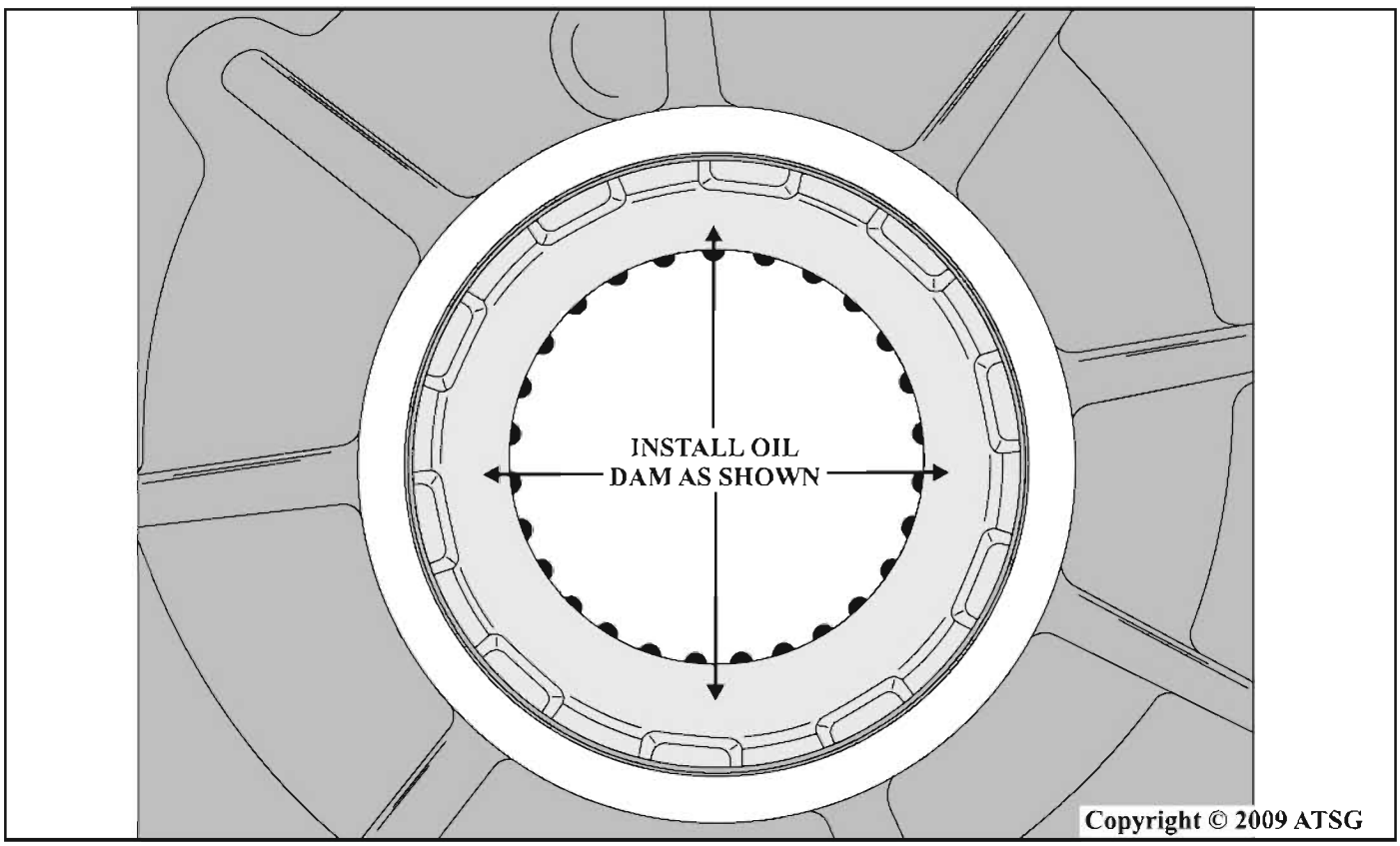


Figure 2

ZF5HP24
NEUTRALIZATION WHEN HOT
FORWARD CHATTER ON TAKE OFF

COMPLAINT: A BMW or Jaguar may come into the shop with a complaint of a neutral condition coming to a stop when hot or a chatter forward on take off. Codes P0731 or Jaguar code P1722 may be stored for a "Gear Ratio Error In First".

CAUSE: A crack develops in the upper valve body (Refer to figure 1) in the "F" clutch circuit as seen in figure 2 which results in a loss of "F" clutch oil. The "F" clutch is on in park, reverse and neutral as well as manual low as shown in the clutch application chart in figure 3.
Since the complaint of neutral at a stop affects forward movement, yet it does not affect reverse is due to the "F" clutch being fed in park and neutral by the "F" clutch valve but in reverse it is fed line pressure through the reverse valve as shown in Figure 2.
The reason first gear is affected is because oil pressure is being supplied to the closed "F" clutch valve through the hydraulic circuit that is affected by the crack from shift valve 1 as seen in figure 2. This circuit is connected to the "A" clutch in first gear only.
So the loss of pressure going to the "F" clutch valve is enough to cause the "A" clutch to release at engine idle RPMS when hot and slip the clutch on initial take-off, hence the first gear ratio codes and the remaining forward gears will not be affected.

CORRECTION: Replace the upper valve body or the complete valve body assembly.

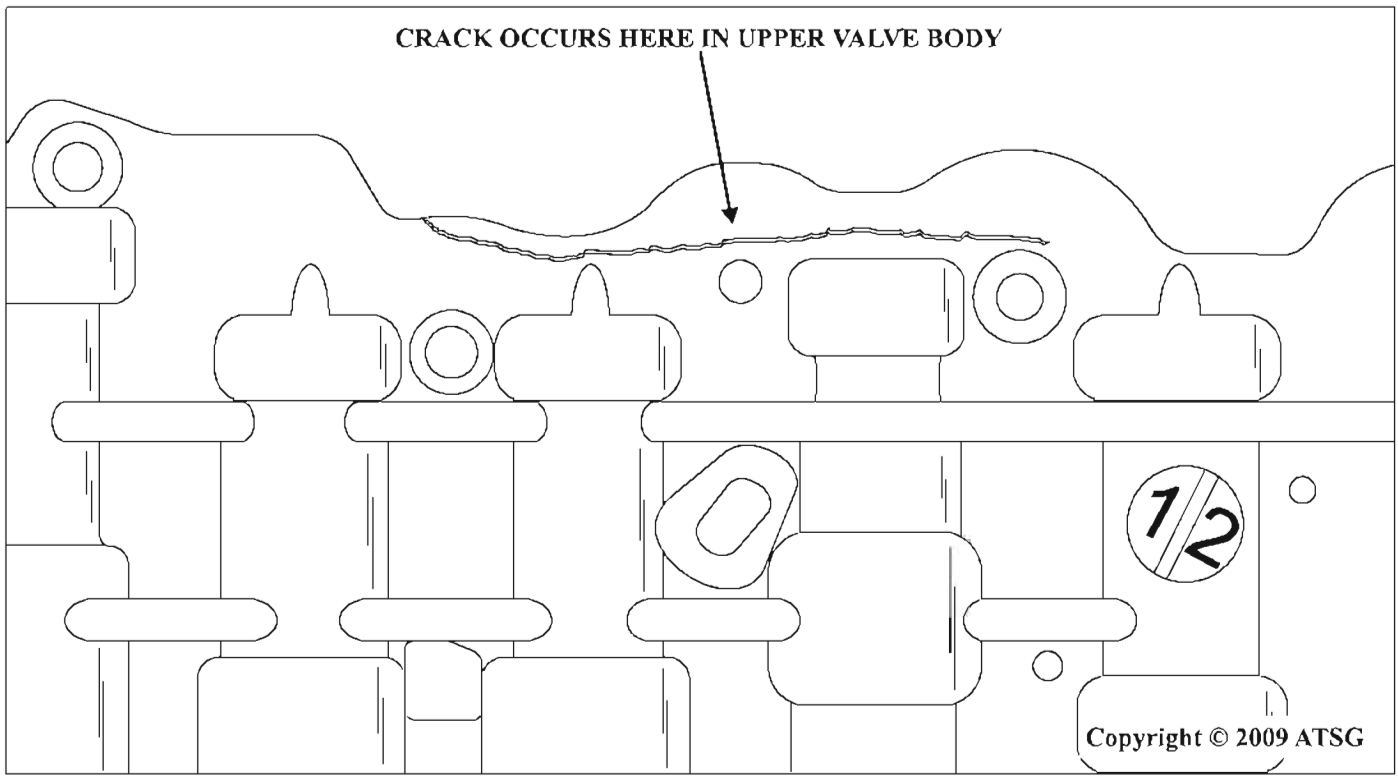


Figure 1

ZF5HP24

NEUTRALIZATION WHEN HOT

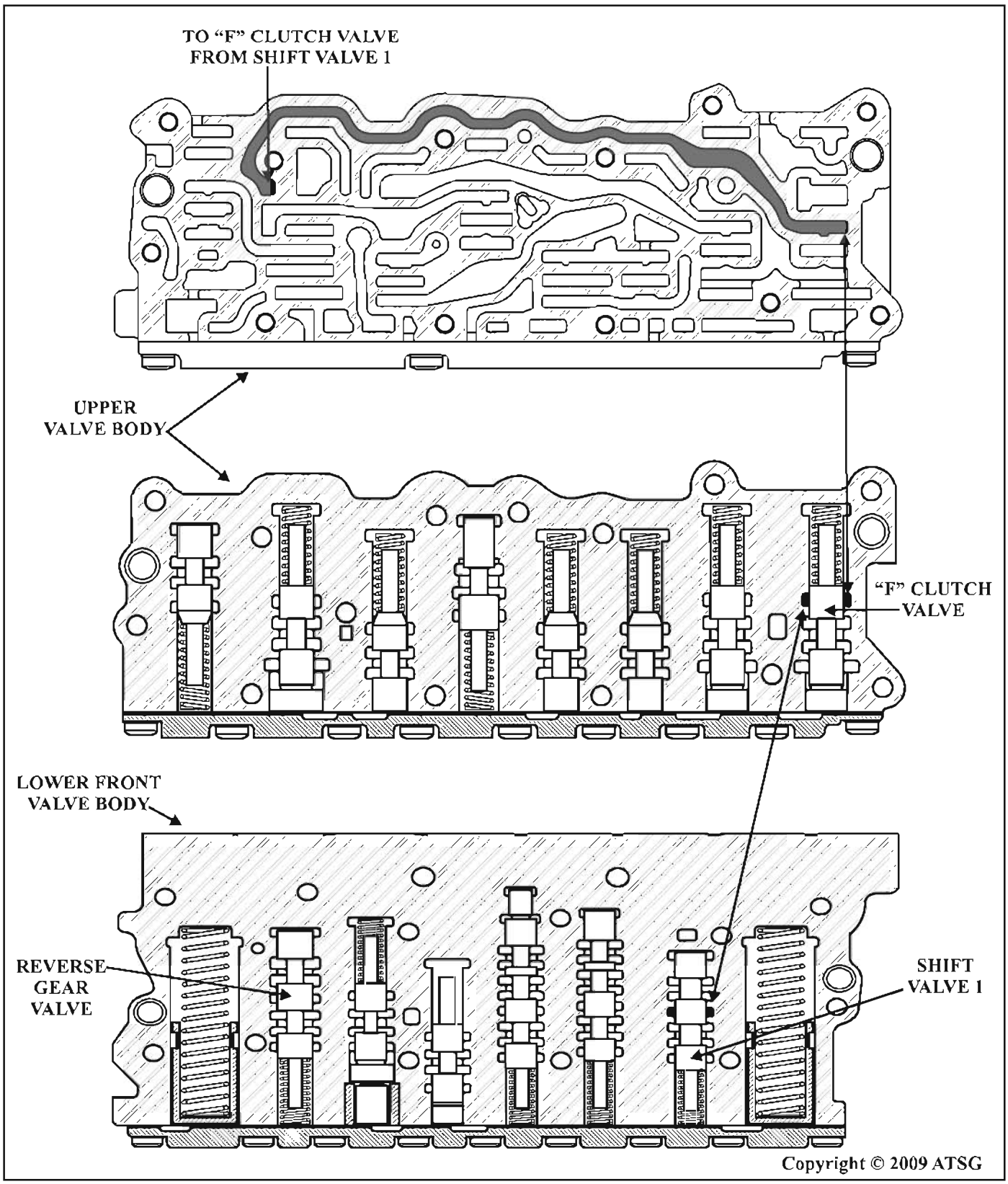
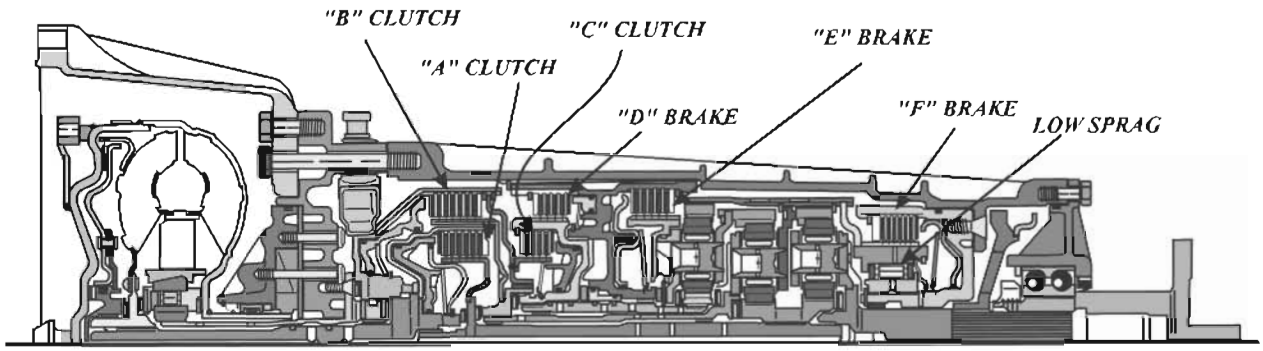


Figure 2

ZF5HP24

NEUTRALIZATION WHEN HOT



APPLICATION CHART

GEAR	"A" CLUT	"B" CLUT	"C" CLUT	"D" BRAK	"E" BRAK	"F" BRAK	LOW SPRAG	GEAR RATIO
PARK						ON		
REV			ON			ON		4.10:1
NEUT						ON		
D-1ST	ON						HOLD	3.57:1
D-2ND	ON				ON			2.20:1
D-3RD	ON			ON				1.51:1
D-4TH	ON	ON						1.00:1
D-5TH		ON		ON				0.80:1
M-1	ON					ON	HOLD	3.57:1

Figure 3

2003-2004 RANGE ROVER ZF5HP24
LATE SHIFTS OR NEUTRALS ON HIGHWAY

COMPLAINT: Before or after overhaul, a 2003-2004 Range Rover equipped with the ZF5HP24 transmission may exhibit a complaint of late shifting or neutralizing while driving on the highway. The driver may notice the "Transmission Overheat" message being displayed on the instrument cluster.

CAUSE: One cause may be restricted cooling channels in the radiator, in particular, the "lower eight tubes that supply coolant to the transmission cooler."

There is a Technical Service Bulletin TSB No. LTB00080 Issue: 1 from Land Rover concerning this condition. The bulletin states that due to "Depletion of the coolant corrosion inhibitor", a cooler restriction may result causing the transmission to overheat.

If the Transmission Control Module TCM detects ATF fluid temperature above a preprogrammed threshold on this vehicle, the TCM will utilize a shift strategy designed to cool the transmission to a level that is within normal operating temperatures. The TCM does this by significantly increasing the speed of the shifting points in order to keep engine rpm and cooling to an optimum. As a result of these increased shifting points, the technician may notice very late up shifts when starting off, or may feel the transmission downshift to 4th, 3rd, or even 2nd gear *(2nd gear at hwy speeds will be overrun, and may feel like a neutral condition),* depending upon the TCM's interpretation of transmission temperature.

Since the TCM detects ATF fluid temperature through input from the ATF fluid temperature sensor, it is plausible that a faulty ATF temperature sensor or shorted wiring of the sensor could be responsible for the condition.

CORRECTION: If the "Transmission Overheat" message is being displayed on the instrument cluster, it will be necessary to check the radiator for sufficient flow/drain rate. Use the **"COOLANT FLOW RATE TEST"** on the following page to check for sufficient flow/drain rate.

Note: Refer to factory bulletin TSB No. LTB00080 for diagram assistance.

If transmission does not appear to be overheated, check the ATF Temperature Sensor using the chart provided in figure 1. If the resistance is not correct according to the chart in figure 1, replace internal harness as necessary.

COOLANT FLOW RATE TEST:

1. Set the heater control to warmest setting.

2. Raise vehicle on a suitable lift.

3. Disconnect the negative battery cable

4. After cooling system has cooled to a workable temperature, remove the cap from the coolant expansion tank reservoir.

NOTE: DO NOT REMOVE THE CAP FROM THE COOLANT EXPANSION TANK RESERVOIR WHILE THE COOLANT IS HOT, BURN INJURY MAY RESULT.

5. Remove the lower shield (front undertray) from the vehicle.

6. Use a suitable clamp to close off the lower sub cooler hose.

7. Install a rubber tube to the radiator drain plug and place a catch container underneath the radiator below the tube to collect the coolant.

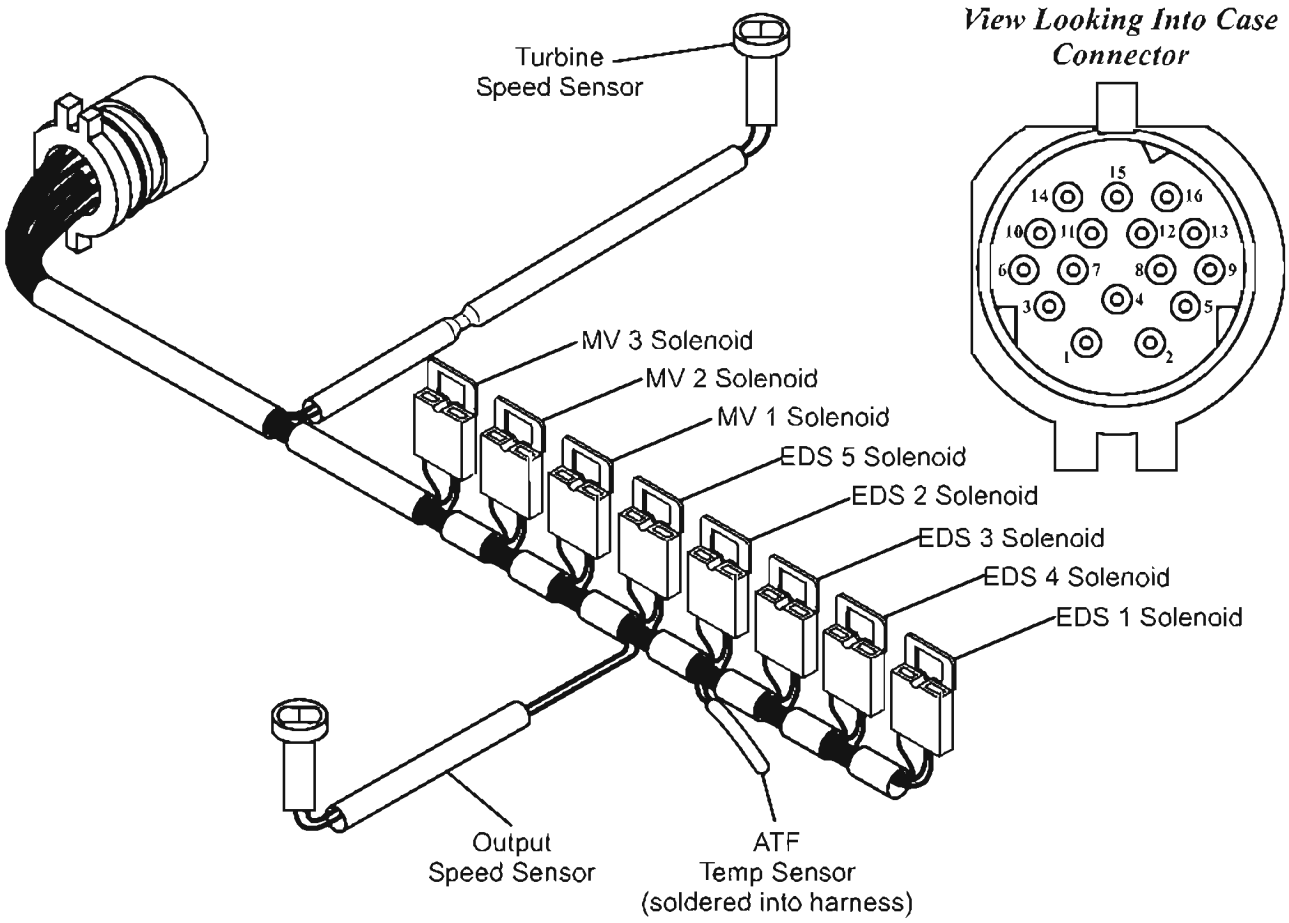
8. Open the radiator drain plug all the way and collect approximately 8.5 ounces (250 ml) of coolant. Close radiator drain plug when the coolant has been collected. *(Measure the amount of time needed to drain the coolant into the catch container).*

According to the factory TSB No. LTB00080, elapsed drain time for a new "unblocked" radiator is approximately 10 seconds. drain time for a radiator with "confirmed blockage" that exhibits overheating symptoms is approximately 1 minute 40 seconds.

9. If evidence of blockage is apparent, replace radiator as necessary.

10. If no evidence of blockage is apparent, add appropriate amount of coolant to top off the system, and replace the coolant expansion tank reservoir cap. Further diagnostics of cooling system overheating will be necessary.

ZF-5HP-24 INTERNAL WIRE SCHEMATIC



RESISTANCE OHM VALUE	TEMPERATURE DEGREES	RESISTANCE OHM VALUE	TEMPERATURE DEGREES
0.987 k ohms	75 f (23.8 c)	1.580 k ohms	195 f (90.5 c)
1.070 k ohms	90 f (32.2 c)	1.670 k ohms	210 f (98.8 c)
1.126 k ohms	105 f (40.5 c)	1.760 k ohms	225 f (107.2 c)
1.190 k ohms	120 f (48.8 c)	1.845 k ohms	240 f (115.5 c)
1.260 k ohms	135 f (57.2 c)	1.950 k ohms	255 f (123.8 c)
1.340 k ohms	150 f (65.5 c)	2.026 k ohms	270 f (132.2 c)
1.420 k ohms	165 f (73.8 c)	2.191 k ohms	285 f (140.5 c)
1.490 k ohms	180 f (82.2 c)	2.300 k ohms	300 f (148.8 c)

CONNECT OHM METER ACROSS TERMINALS 13 AND 14

Figure 1

ZF6HP26

TORQUE CONVERTER OVERTEMP & DECEL SURGE

COMPLAINT: The vehicle (a BMW X5 in this case) originally came in with a "no move" condition. The torque converter was blue and a cooler line was leaking. The transmission was rebuilt and installed with a new torque converter. On the road test, a rattling noise was heard coming from the converter.

CAUSE: Upon inspection of the valve body, a plastic relief valve was severely melted, refer to figure 1. A good relief valve was installed into the valve body and the transmission was reassembled and taken for a road test. The converter rattling noise was gone and the SUV drove fine.
The SUV came back a few days later with a complaint of surging when coming to a stop.
Once again the transmission was disassembled. When the pump was disassembled, a piece of the melted plastic check valve was lodged in the lube/TCC circuit as seen in figure 2.

CORRECTION: Once the piece of melted plastic was removed, the SUV drove fine and did not come back with any complaints, refer to figure 3.
Since this piece of plastic was stuck in a place that is easy to miss, another pump was disassembled, and when the two were compared, that was when it was found.

Note: The radiator in this SUV was considerably restricted by road debris, there is a very good chance that this contributed to the overtemp situation and the resulting blue converter.

Many thanks to Sean O'Connor from AC/A&M Gearbox Center in Dublin, Ireland for sharing his experience with us.

ZF6HP26

TORQUE CONVERTER OVERTEMP & DECEL SURGE

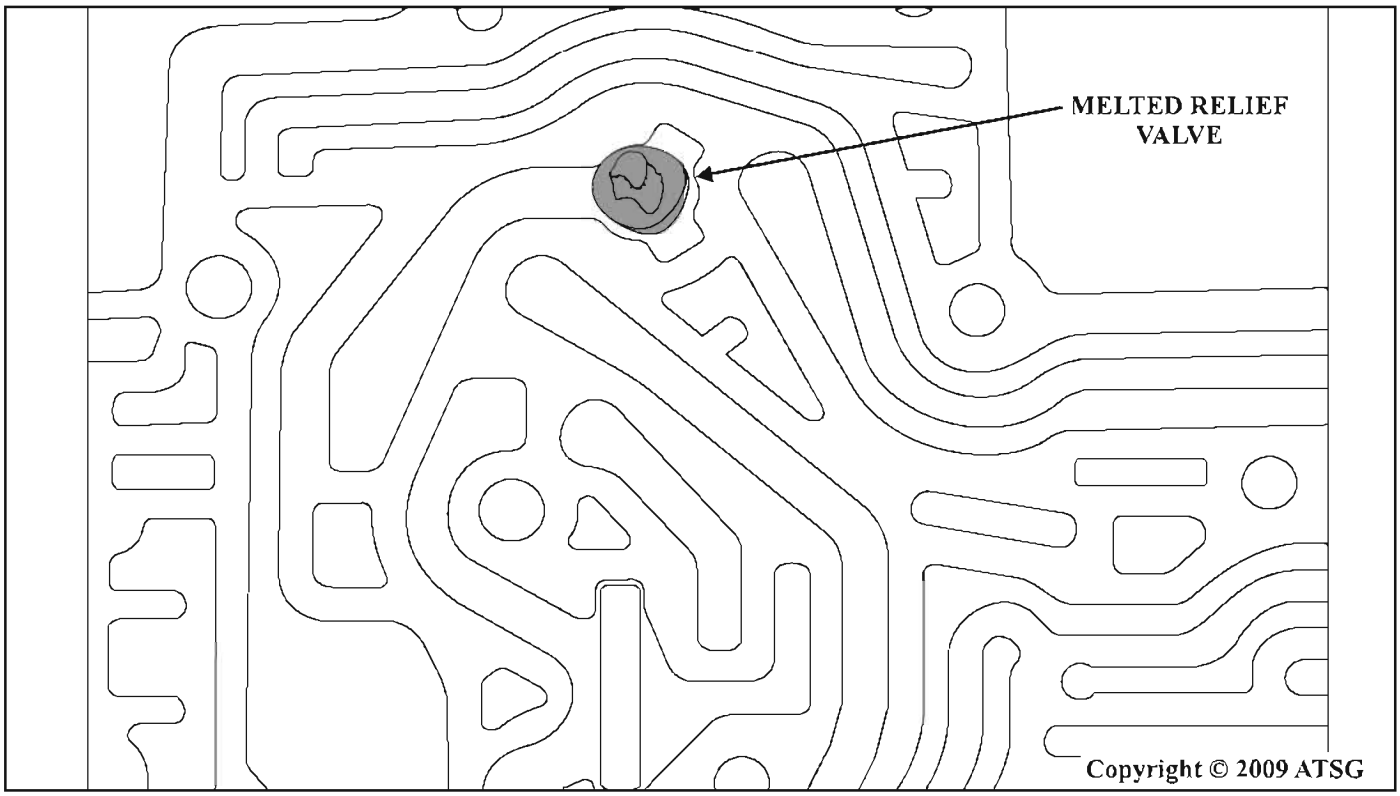


Figure 1

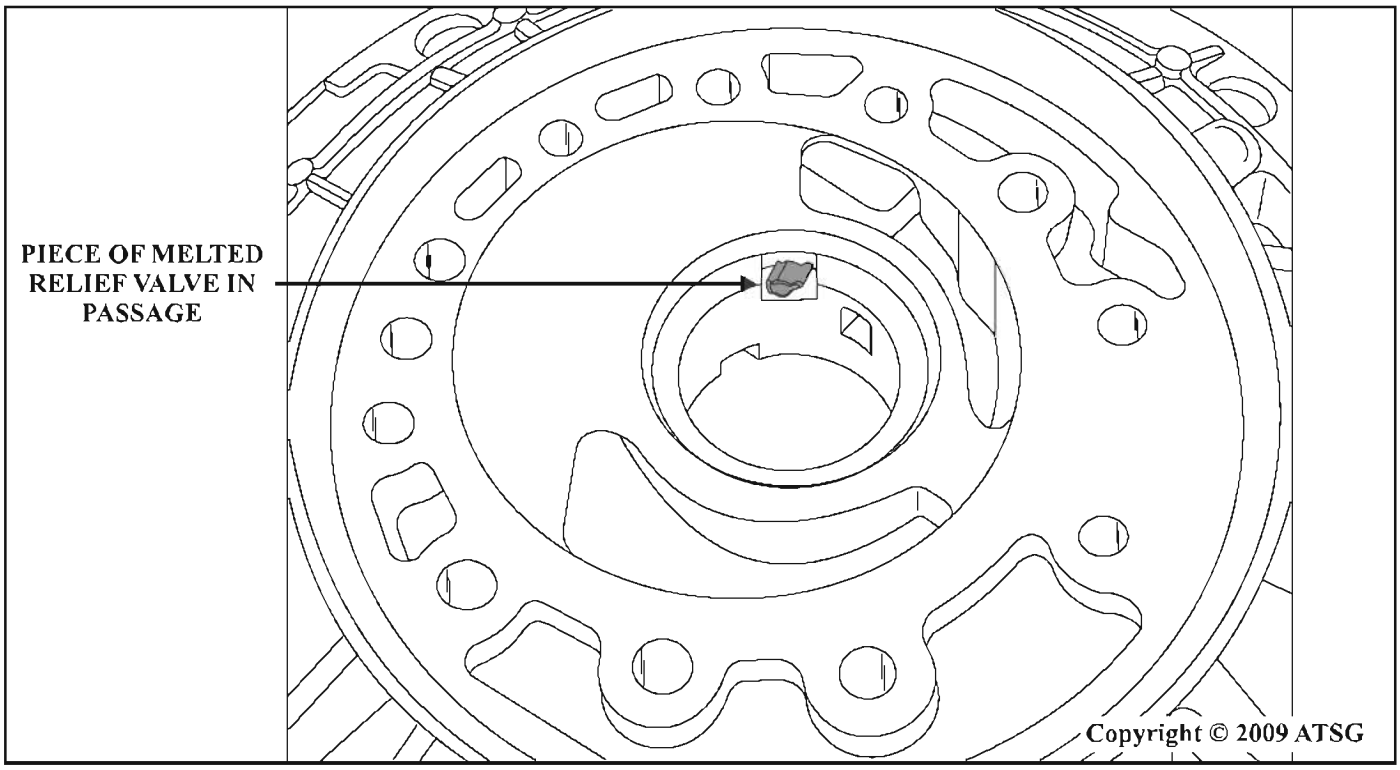


Figure 2

ZF6HP26

TORQUE CONVERTER OVERTEMP & DECEL SURGE

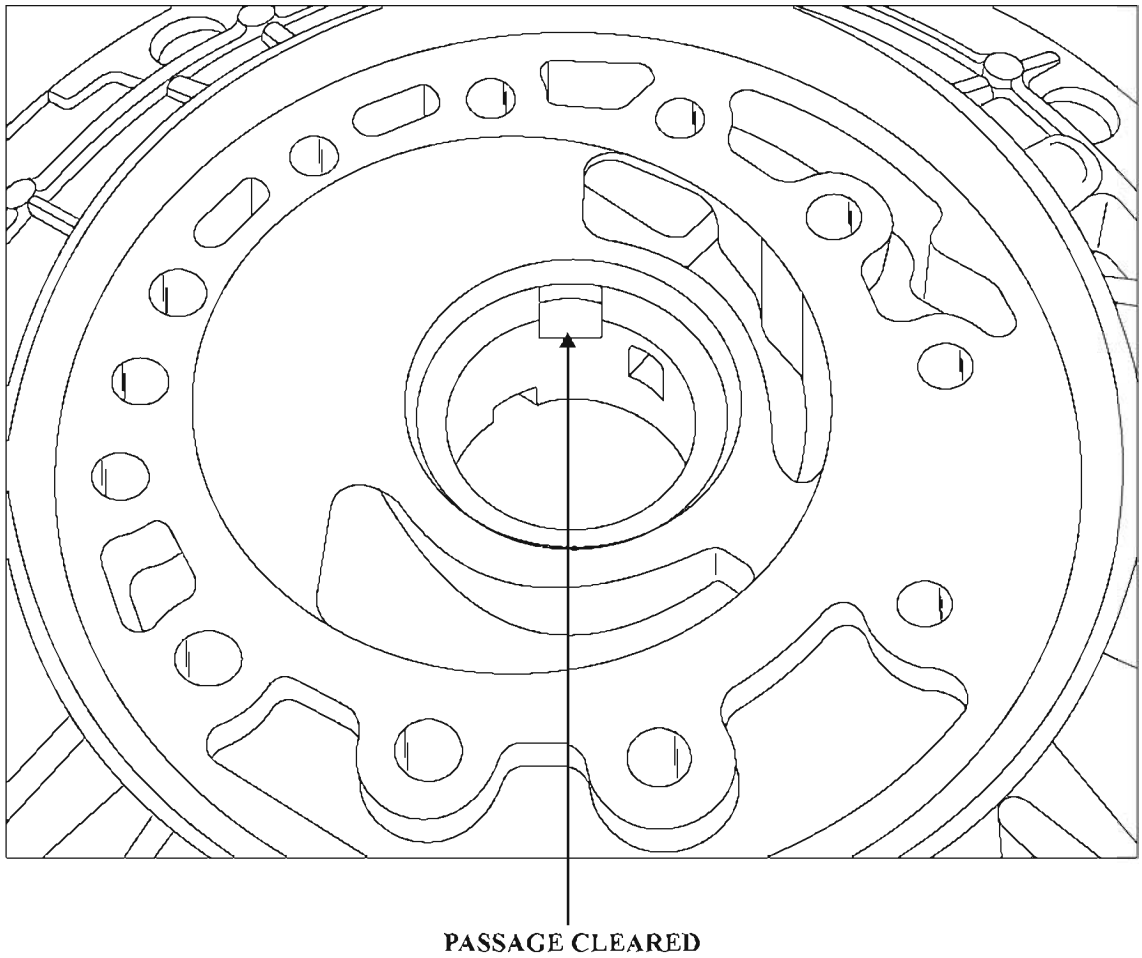


Figure 3

ISUZU 4L30E

STUCK IN FIRST GEAR

COMPLAINT: A Trooper or Rodeo vehicle comes into the shop with a complaint of stuck in first gear. There may be no codes stored, however the speedometer does function. Further diagnosis indicates that the shift solenoid command given by the TCM is for first gear only.
In some instances the Mode Switch *(P/N Switch)* is replaced as the culprit causing the no upshift condition. When the condition does not improve, the VSS is replaced also to no avail.

CAUSE: The unnecessary replacement of these components was caused by a number of reasons. One reason is no codes are stored to offer a diagnostic direction. Another reason would be the fact that no diagnostics were performed on the Mode Switch and VSS which would have checked good. A third reason could be a lack of understanding on what components and computer strategy is required to upshift the transmission.
The actual cause of the no upshift condition was due to the failure of the Transmission Speed Sensor (TSS). The TSS is not to be confused with a turbine speed sensor, the 4L30E does not use one. The TSS can also be referred to as the output shaft Speed Sensor (OSS).
One point that must be understood is the VSS does not have anything to do with shifting the transmission in these vehicles, it is the TSS that does that. Conditions that allow the TSS to go unnoticed are the facts that it is hard to see because it is mounted on top of the transmission, especially if it is a four wheel drive application (Refer to figure 1) and the criteria that's required to store a code for the TSS. The engine has to maintain at least 3000 rpm with zero rpm from the TSS for a prolonged period of time, technicians usually will not put that degree of stress on an engine. Another point is the VSS is what provides the signal for the speedometer and is wired to the speedometer cluster where it is distributed to other modules requiring a VSS signal such as the ECM and Cruise Control modules. In addition the VSS is a three wire Hall Effect sensor while the TSS is a two wire AC generator. The TSS is hard wired to the TCM and does not even send a signal to the ECM. Prior to the 1996 model year these vehicles were equipped with a separate TCM and ECM. 1996 and later vehicles combined transmission operation and engine performance into one module, a PCM. In either case computer strategy provided no correlation between VSS and TSS signals. In figure 2 the two module VSS system is illustrated and in figure 3 the 1996 and later PCM VSS system is shown. In figures 4 and 5 both the early and late TSS systems are shown.

CORRECTION: The TSS circuits resistance is 3000 ohms, the DVOM can also be set to Hertz (Hz) and connected across the two wires of the TSS. The hertz signal should rise in proportion to output shaft speed without erratic operation or signal dropout.
Be careful of the connector end for the TSS, the wires have been known to break at the connector end.

SERVICE INFORMATION:
Should the TSS store a code, it would be as follows:
1990 - 1993.....Code 39
1994 - 1995.....Code 11
1996 & Later.....Codes P0722/P0723

VSS codes from 1990 to 1995 would be Code 24, and 1996 and Later would be P0502.

ISUZU 4L30E

STUCK IN FIRST GEAR

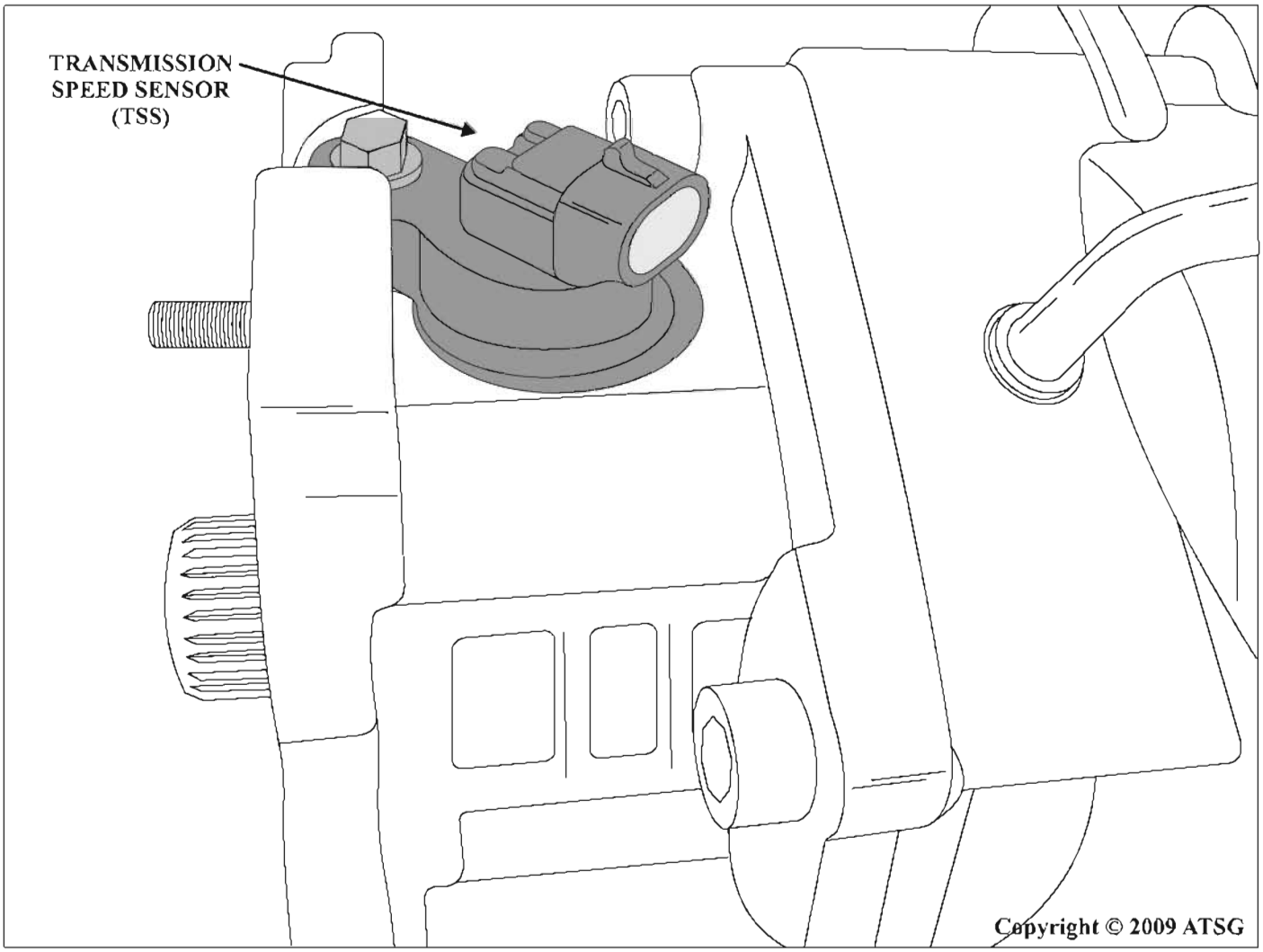


Figure 1

ISUZU 4L30E

STUCK IN FIRST GEAR

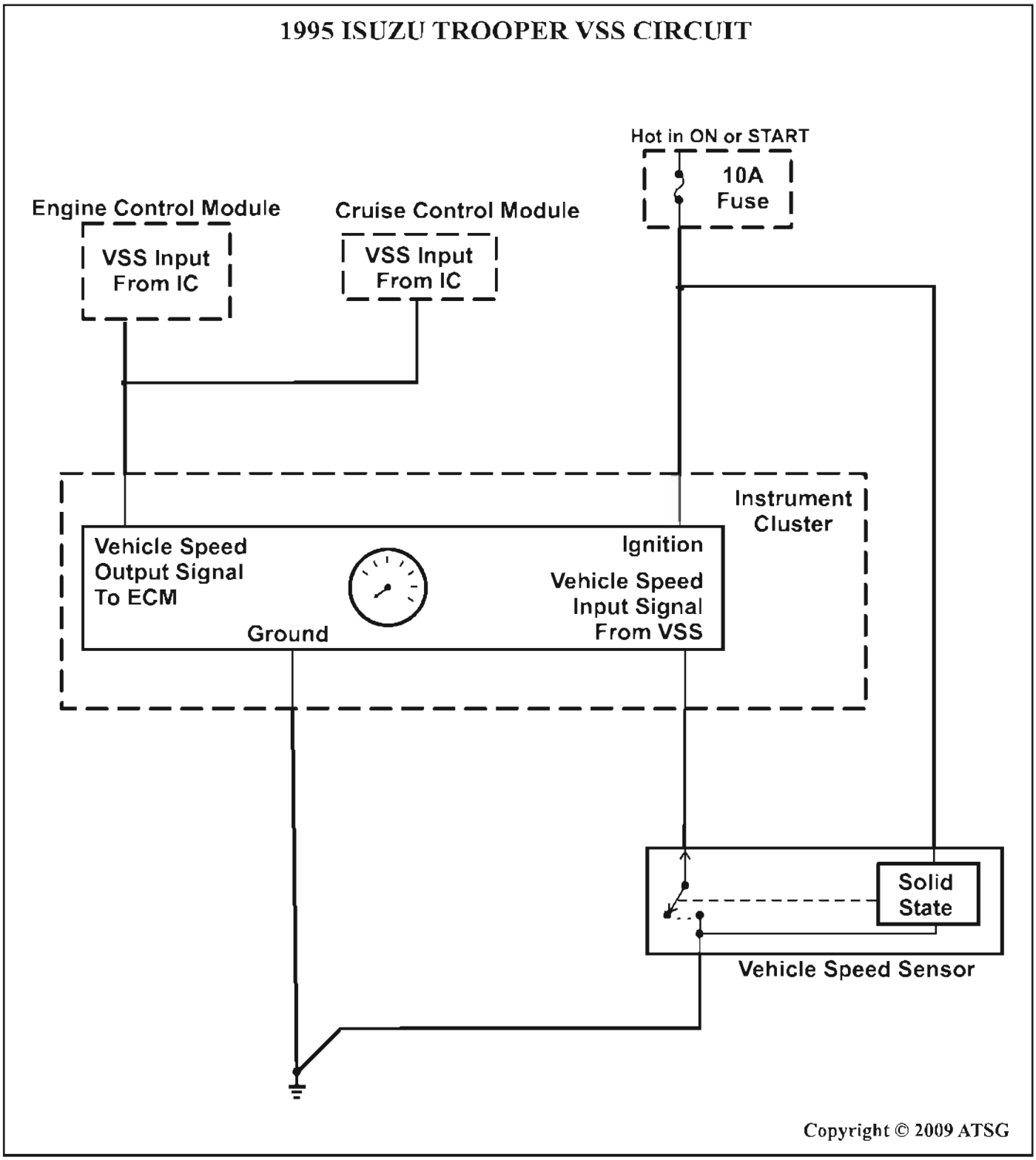


Figure 2

ISUZU 4L30E

STUCK IN FIRST GEAR

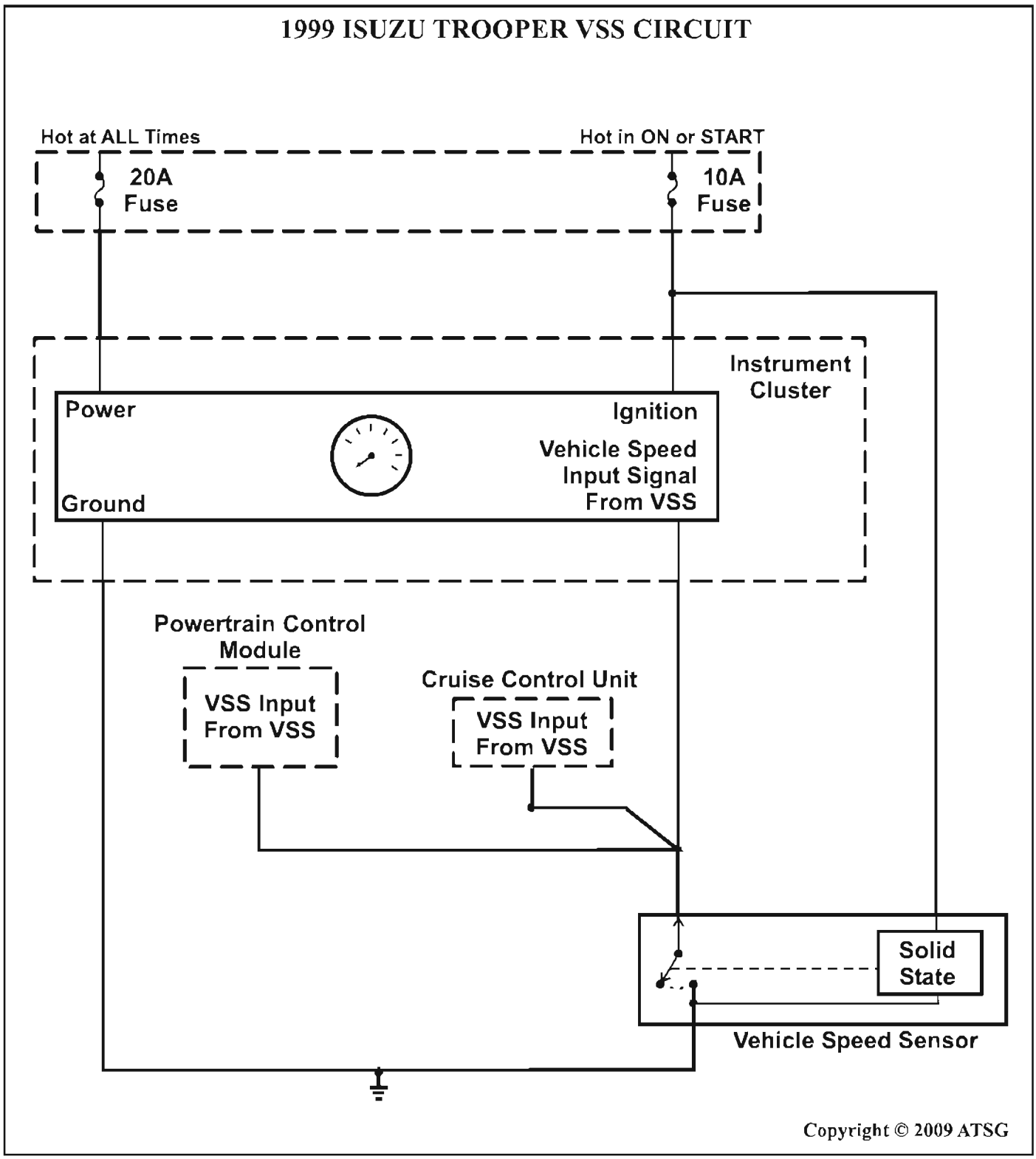


Figure 3

ISUZU 4L30E

STUCK IN FIRST GEAR

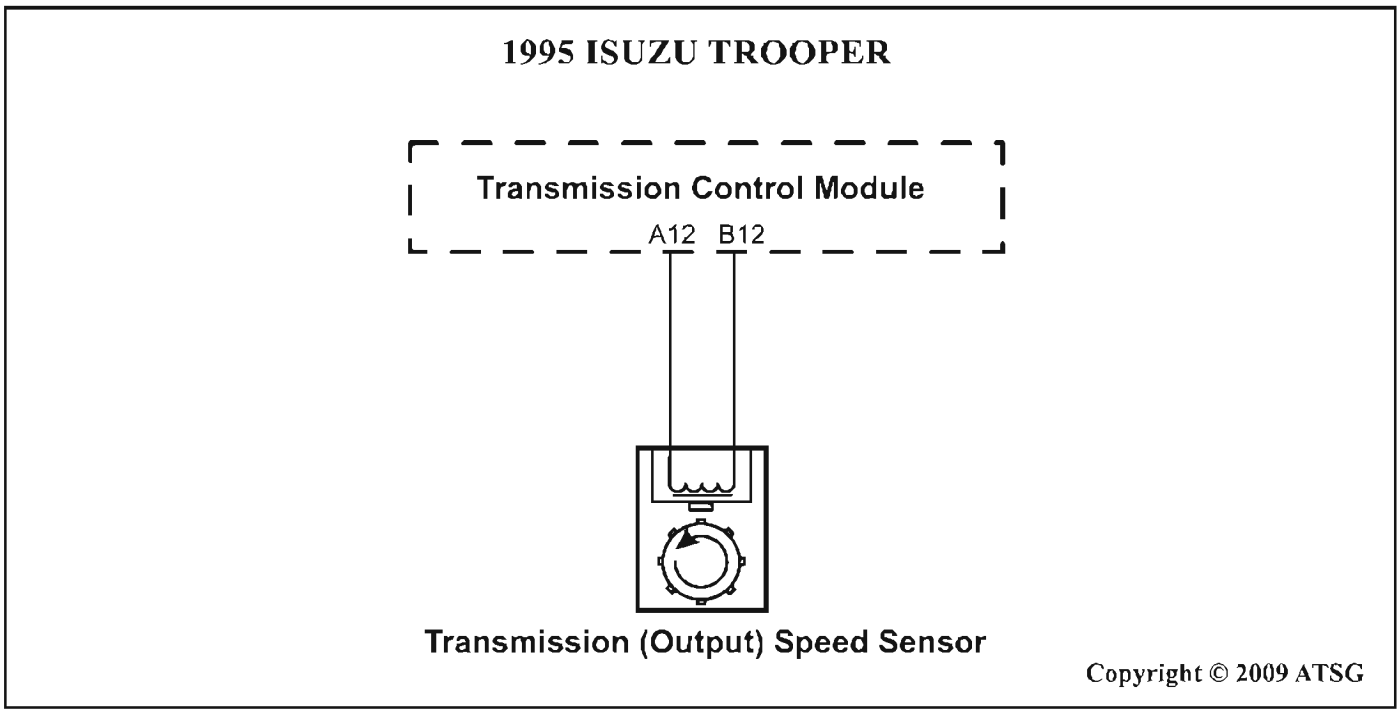


Figure 4

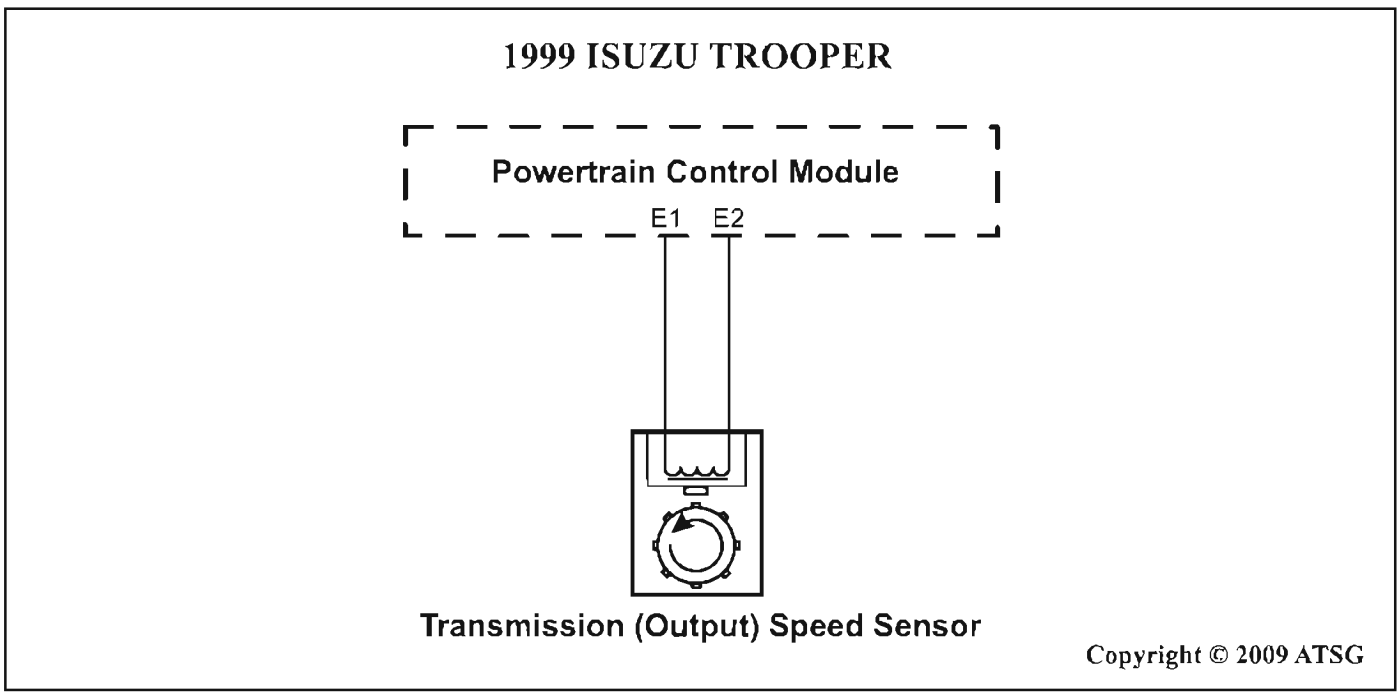


Figure 5

VOLKSWAGEN 09A/MAZDA JA5A-EL
JAGUAR & LAND ROVER JF506E

SOLENOID CODE IDENTIFICATION

COMPLAINT: When scanning for codes in a Volkswagen equipped with an 09A (JF506E), with a scan tool that displays VAG style codes, a code 00349 is displayed. The code definition that's displayed reads, "Electrical Fault in Solenoid 10 Circuit". With the scan tool data base enabled a further explanation of code 00349 reads "Open Or Short, Solenoid Valve 10 - N283 Faulty".
When the technician consults solenoid location information, it is noticed that there are only NINE solenoids in the transmission.
So how can there be a Solenoid 10 fault and what does the N283 designation indicate?

CAUSE: Without information to explain the N283 designation coupled with the little known fact that there is no #7 solenoid, the confusion as to which is solenoid 10 would be great.
Another cause for confusion is the fact that this transmission is used in other vehicle manufacturers such as Land Rover, Mazda and Jaguar. A solenoid mounted in the same location may be called something entirely different and also have a completely different function.

CORRECTION: The chart in figure 1 illustrates the Volkswagen VAG code numbers as well as the solenoids numerical designation and the VAG solenoid designation, notice it is numbered one through six, skips number seven, then continues with eight through ten.
The chart in figure 3 shows the Mazda OBD-II codes as well as solenoid nomenclature.
In figures 3 and 4 the charts indicate the codes and solenoid nomenclature for Jaguar and Land Rover.
Figures 5 and 6 show the actual location of the solenoids and the resistance values that should be seen in the solenoid circuits.

09A/JA5A-EL/ JF506E SOLENOID IDENTIFICATION

VOLKSWAGEN 09A SOLENOID CODE DISPLAY IDENTIFICATION			
VAG SOLENOID DTC	NUMERICAL SOLENOID NUMBER	VAG SOLENOID DESIGNATION	CODE DEFINITION
00258	1	N88	SV 1 Shift Solenoid A Circuit Error
00260	2	N89	SV 2 Shift Solenoid B Circuit Error
00262	3	N90	SV 3 Low Clutch Timing Solenoid Circuit Error
00264	4	N91	SV 4 TCC Solenoid Circuit Error
00266	5	N92	SV 5 Shift Solenoid C Circuit Error
00268	6	N93	SV 6 Pressure Control Solenoid Circuit Error
00347	8	N281	SV 8 Reduction Timing Solenoid Circuit Error
00348	9	N282	SV 9 2-4 Brake Timing Solenoid Circuit Error
00349	10	N283	SV 10 2-4 Brake Solenoid Circuit Error

Figure 1

MAZDA JA5A-EL SOLENOID CODE DISPLAY IDENTIFICATION		
DTC	SOLENOID DESIGNATION	CODE DEFINITION
P0743	TCC SOLENOID	Solenoid Valve Circuit Malfunction
P0748	LINE PRESSURE CONTROL SOLENOID	Electrical Circuit Malfunction
P0753	SHIFT SOLENOID A	Open or Short Circuit Malfunction
P0758	SHIFT SOLENOID B	Open or Short Circuit Malfunction
P0763	SHIFT SOLENOID C	Open or Short Circuit Malfunction
P0768	REDUCTION TIMING SOLENOID	Open or Short Circuit Malfunction
P0773	NEUTRAL SHIFT SOLENOID	Open or Short Circuit Malfunction
P0778	2-4 BRAKE SOLENOID	Open or Short Circuit Malfunction
P0798	HIGH CLUTCH SOLENOID	Open or Short Circuit Malfunction

Figure 2

09A/JA5A-EL/ JF506E SOLENOID IDENTIFICATION

JAGUAR JF506E SOLENOID CODE DISPLAY IDENTIFICATION		
DTC	SOLENOID DESIGNATION	CODE DEFINITION
P0743	TCC SOLENOID	Solenoid Valve Circuit Malfunction
P0748	LINE PRESSURE CONTROL SOLENOID	Electrical Circuit Malfunction
P0753	SHIFT SOLENOID A	Open or Short Circuit Malfunction
P0758	SHIFT SOLENOID B	Open or Short Circuit Malfunction
P0763	SHIFT SOLENOID C	Open or Short Circuit Malfunction
P0778	2-4 DUTY SOLENOID	Open or Short Circuit Malfunction
P1745	LOW CLUTCH TIMING SOLENOID	Open or Short Circuit Malfunction
P1746	REDUCTION TIMING SOLENOID	Open or Short Circuit Malfunction
P1747	2-4 BRAKE TIMING SOLENOID	Open or Short Circuit Malfunction

Figure 3

LAND ROVER JF506E SOLENOID CODE DISPLAY IDENTIFICATION		
DTC	SOLENOID DESIGNATION	CODE DEFINITION
P0743	LOCKUP SOLENOID	Solenoid Valve Circuit Malfunction
P0748	LINE PRESSURE CONTROL SOLENOID	Electrical Circuit Malfunction
P0753	SHIFT SOLENOID A	Open or Short Circuit Malfunction
P0758	SHIFT SOLENOID B	Open or Short Circuit Malfunction
P0763	SHIFT SOLENOID C	Open or Short Circuit Malfunction
P1748	2-4 BRAKE SOLENOID	Open or Short Circuit Malfunction
P1785	LOW CLUTCH TIMING SOLENOID	Open or Short Circuit Malfunction
P1786	REDUCTION TIMING SOLENOID	Open or Short Circuit Malfunction
P1787	2-4 BRAKE TIMING SOLENOID	Open or Short Circuit Malfunction

Figure 4

09A/JA5A-EL/ JF506E SOLENOID IDENTIFICATION

MAZDA

ON/OFF Solenoids
Shift Solenoid A - 14 to 18 ohms
Shift Solenoid B- 14 to 18 ohms
Shift Solenoid C- 14 to 18 ohms
Reduction Timing Solenoid- 14 to 18 ohms
Neutral Shift - 14 to 18 ohms

Duty Cycle Solenoids
Line Pressure Solenoid - 2.6 to 3.2 ohms
2/4 Solenoid - 2.6 to 3.2 ohms
High Clutch - 2.6 to 3.2 ohms
TCC Solenoid - 12 to 13.2 ohms

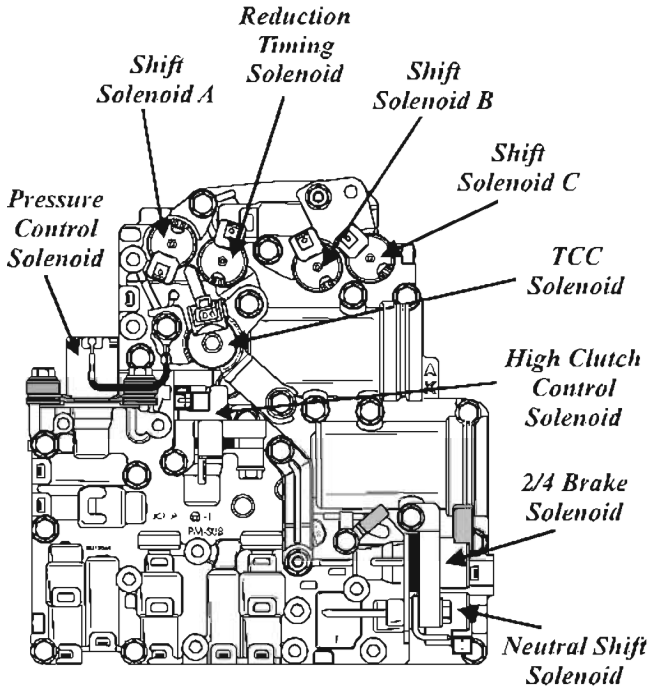


Figure 5

VW/JAGUAR/LAND ROVER

ON/OFF Solenoids
Shift Solenoid A - 14 to 18 ohms
Shift Solenoid B- 14 to 18 ohms
Shift Solenoid C- 14 to 18 ohms
Reduction Timing Solenoid- 14 to 18ohms
Low Clutch Timing Solenoid - 14 to 18 ohms
2/4 Brake Timing Solenoid - 14 to 18 ohms

Duty Cycle Solenoids
Line Pressure Solenoid - 2.6 to 3.2 ohms
2/4 Brake Duty Solenoid - 2.6 to 3.2 ohms
TCC Solenoid - 12 to 13.2 ohms

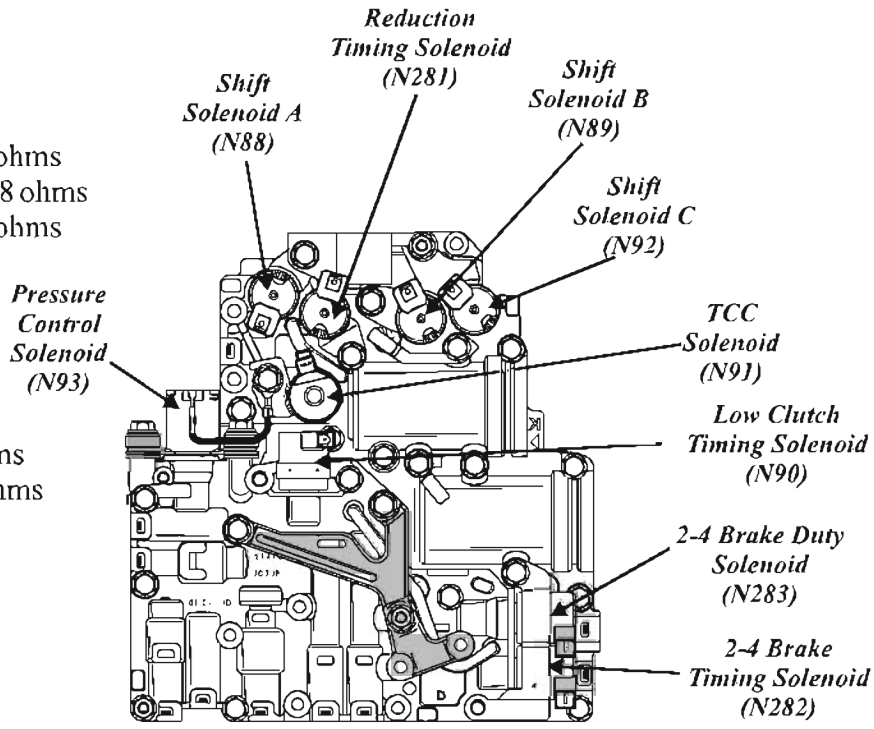


Figure 6

MITSUBISHI
F4A40/50 F5A50 SERIES
HARSH 3rd AND HARSH DOWNSHIFTS

COMPLAINT: After overhaul, some 2004 and up Mitsubishi vehicles equipped with the F4A40/50 series or F5A50 series transaxles, may exhibit a harsh up-shift into third gear and or harsh downshifts as in the transmission re-learn process has not been performed, even after extensive road tests.

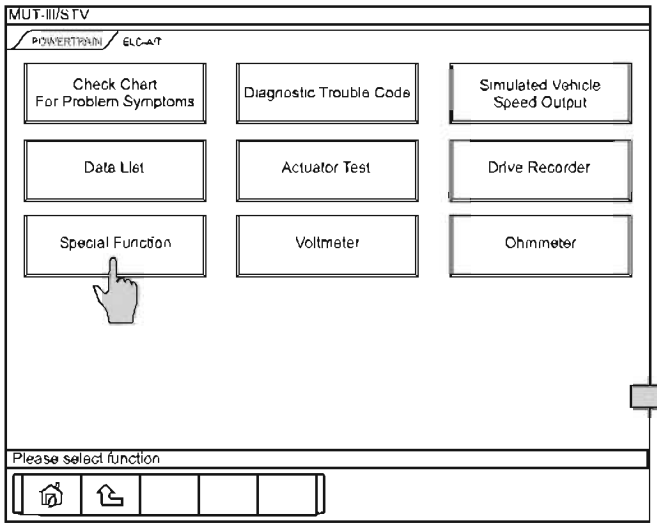
CAUSE: The cause may be that, A/T learned value was not reset with a scan tool. Note: Previous vehicles 2003 and earlier were capable of resetting themselves with a road test consisting of 25 to 30 up-shift cycles, with a small number of full throttle downshifts at the end of the road test. Some 2004 and up Mitsubishi Transmission Control Modules have revised internal memory that will not allow a reset by disconnecting the battery. This prevents an A/T learned value reset with out the use of capable scan tool.

CORRECTION: Using a capable scan tool or Mitsubishi MUT lll/STV software, place the selector in Park and connect scan tool to the OBD-11 connector and refer to steps 1-4 in figure 1 to reset the A/T learned value. This will reset all of the clutch pack adaptives so the Transmission Control Module can modulate the solenoids for smoother applications.
Reference - Mitsubishi TSB 04-23-002.

Special thanks to
Bob Nutall

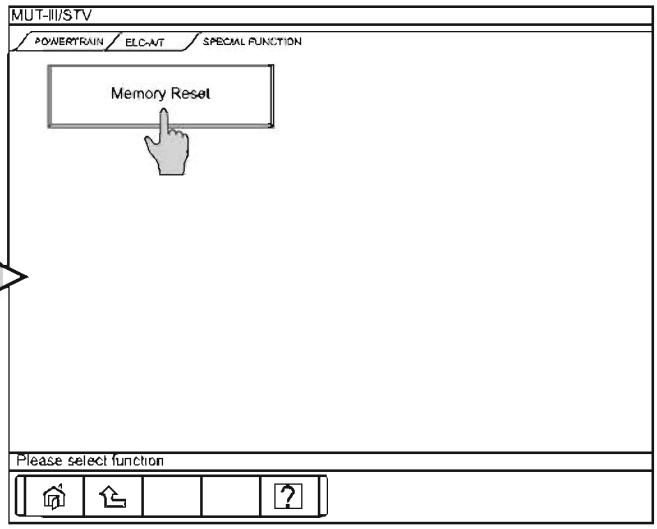
RESETTING THE A/T LEARNED VALUE

STEP 1



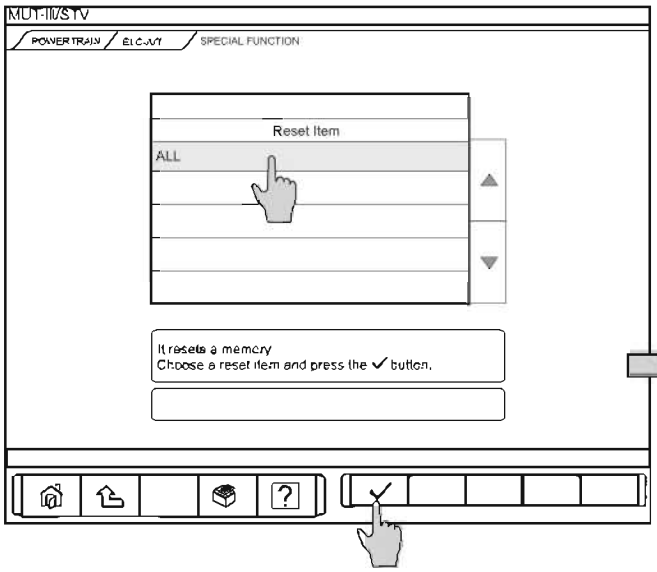
Select "Special Function"

STEP 2



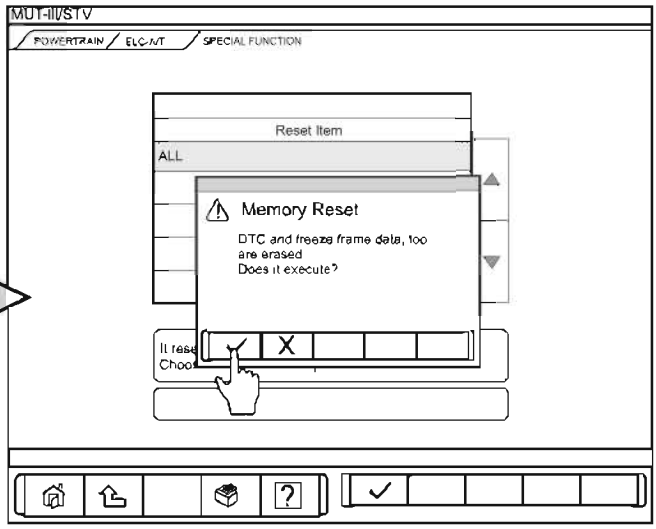
Select "Memory reset"

STEP 3



Select "All" under Reset Item and click the check button

STEP 4



Click the check button. This will reset the A/T learned value. All DTC and freeze frame data will be erased. Note: this will reset all learned values.

Figure 1

MITSUBISHI F4/5A42/51

GEAR RATIO ERRORS

COMPLAINT: After hard parts replacement such as the final drive components or planetary gear sets, the vehicle may store codes P0731, P0732, P0733, P0734 or P0735 for a gear ratio error in 1st, 2nd, 3rd, 4th or 5th gear.

CAUSE: The final drive components and/or the planetary gear sets have the incorrect tooth count. When the PCM/TCM checks the gearbox RPMS and does not see the target values, one of the above mentioned codes will be stored.

CORRECTION: If any final drive component or planetary gear set requires replacement, count the teeth on the original part and replace it exactly. If this is an original complaint, then the transmission may have been worked on before and the incorrect tooth count was installed at that time.
The transaxle codes are located on the side of the case as seen in figure 1. Use the charts in figures 2, 3 and 4 to determine which transaxle and drive components are correct.

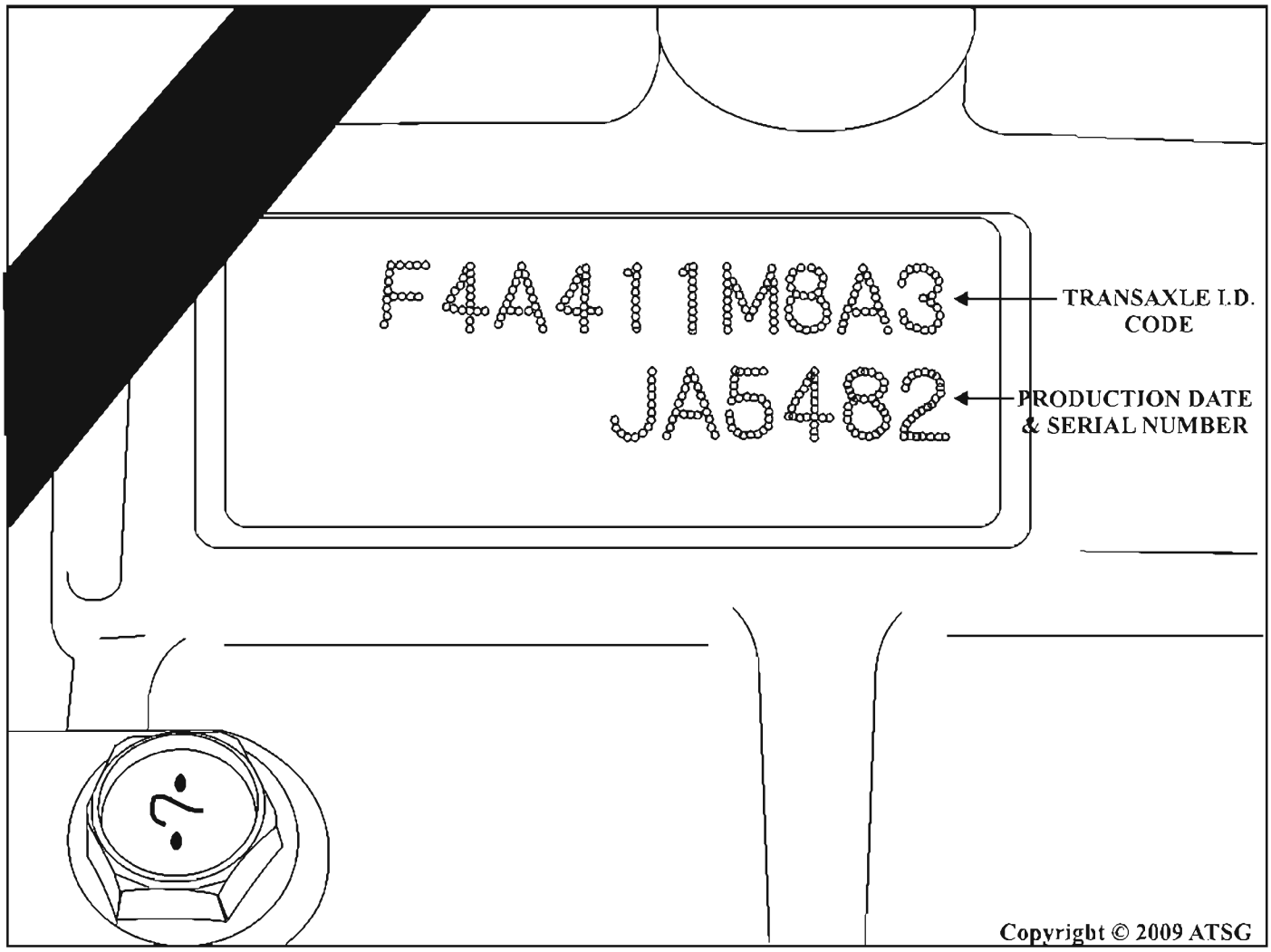


Figure 1

MITSUBISHI F4/5A42/51

GEAR RATIO ERRORS

TRANSAXLE I.D. CODES

F 4 A 42 K 1 M 8 A 5

Drive Axle
F - Front Wheel Drive
R - Rear Wheel Drive

Forward Speeds
4 - Four Speeds
5 - Five Speeds

Transmission Type
A - Automatic
M - Manual

Capacity
41/4A - Light Duty
42/4B - Standard Duty
51/5A - Heavy Duty

Manufacturing Plant
K - Kyoto Works

Manufacturing Use Only

One-Way Clutch & Plant. Ratio (4 Speed only)
A - No Sprag
B - Sprag
See Chart Below

Speedometer Gear Ratio
See Chart Below

Final Drive Ratio
See Chart Below

Design Level
1 - 1st Design
2 - 2nd Design

Figure 2

TRANSAXLE I.D. CODES

FINAL DRIVE RATIO

F4A41/42	F4A51
A - N/A	A - 3.269
B - N/A	B - 3.274
C - N/A	C - 3.491
D - N/A	D - 3.497
E - 3.770	E - 3.735
F - 3.769	F - 3.728
J - 4.041	J - N/A
L - 4.212	L - 4.011
M - 4.042	M - 4.018
N -4.406	N - N/A
R - 4.625	R - 4.520
U - 4.407	T - 4.316
W - 4.626	U - 4.324
	W - N/A

PLANETARY RATIO A&B

F4A41/42	F4A51
1st - 2.842	2.842
2nd - 1.529	1.495
3rd - 1.000	1.000
4th - 0.712	0.731
Rev - 2.480	Rev - 2.720

F5A Gear Ratios

1st - 3.789
2nd - 2.057
3rd - 1.421
4th - 1.000
5th - 0.731
Rev - 3.865

SPEEDO GEAR RATIO

F4A41/42	F4A51
4&M - 27/36	4&M - 27/36
6&P - 29/36	6&P - 29/36
8&R - 31/36	8&R - 31/36

**Z- No vehicle speed sensor, vehicle speed is calculated using the Output Speed Sensor.*

**The numbers represent the speedo drive gear, and the letters represent final drive ratio code.*

Figure 3

MITSUBISHI F4/5A42/51

GEAR RATIO ERRORS

MITSUBISHI F4/F5A42/51 VEHICLE & TRANSAXLE APPLICATION					
YEAR	MODEL	ENGINE	TRANSMISSION	SPRAG	COMPUTER
1997 - 99	MIRAGE	1.5L SOHC	F4A41-1-M8A	NO	TCM
2000	MIRAGE	1.5L SOHC	F4A41-1-M8B	YES	PCM
2001	MIRAGE	1.5L SOHC	F4A41-1-J8B	YES	PCM
1997 - 99	MIRAGE	1.8L SOHC	F4A42-1-M8A	NO	TCM
2000 - 01	MIRAGE	1.8L SOHC	F4A42-1-M8B	YES	PCM
2001 - 03	MIRAGE	1.8L SOHC	F4A42-1-J8B	YES	PCM
2003	LANCER	2.0L SOHC	F4A42-1-JZB	YES	PCM
2004	LANCER	2.0L SOHC	F4A4B-1-J1Z	YES	PCM
2004	LANCER	2.4L SOHC (MIVEC)	F4A4B-4-L2Z	YES	PCM
2003	OUTLANDER	2.4L SOHC	F4A42-2-NZB	YES	PCM
2003	OUTLANDER	2.4L SOHC	W4A42-2-RZD	YES	PCM
2004 - 05	OUTLANDER	2.4L SOHC (MIVEC)	F4A4B-4-N1Z	YES	PCM
2004 - 05	OUTLANDER	2.4L SOHC (MIVEC)	W4A4B-4-R1Z	YES	PCM
1997	DIAMANTE	3.5L SOHC	F4A51-2-D5A	NO	TCM
1998 - 99	DIAMANTE	3.5L SOHC	F4A51-2-D5B	YES	TCM
2000 - 04	DIAMANTE	3.5L SOHC	F4A51-2-CZB	YES	PCM
2000	ECLIPSE	2.4L SOHC	F4A42-2-M6B	YES	PCM
2001	ECLIPSE	2.4L SOHC	F4A42-2-J6B	YES	PCM
2002 - 05	ECLIPSE	2.4L SOHC	F4A51-2-JZB	YES	PCM
2000 - 01	ECLIPSE	3.0L SOHC	F4A51-2-E5B	YES	PCM
2002 - 05	ECLIPSE	3.0L SOHC	F4A51-2-FZB	YES	PCM
2004 - 05	ECLIPSE	3.0L SOHC (VIC)	F4A51-2-LZP	YES	PCM
2006	ECLIPSE	2.4L SOHC (MIVEC)	F4A4B-4-L3Z	YES	PCM
2006	ECLIPSE	3.8L SOHC (MIVEC)	F5A5A-4-C1Z	YES	PCM
2004 - 05	ENDEAVOR	3.8L SOHC	F4A5A-4-L1Z	YES	PCM
2004 - 05	ENDEAVOR	3.8L SOHC	W4A5A-4-C1Z	YES	PCM
1999 - 00	GALANT	2.4L SOHC	F4A42-2-M6B	YES	PCM
2001	GALANT	2.4L SOHC	F4A42-2-J6B	YES	PCM
2002 - 03	GALANT	2.4L SOHC	F4A42-2-JZB	YES	PCM
1999	GALANT	3.0L SOHC	F4A51-2-D6B	YES	PCM
2000 - 01	GALANT	3.0L SOHC	F4A51-2-E6B	YES	PCM
2002 - 03	GALANT	3.0L SOHC	F4A51-2-FZB	YES	PCM
2004 - 05	GALANT	2.4L SOHC (MIVEC)	F4A4B-4-L1Z	YES	PCM
2004	GALANT	3.8L SOHC	F4A5A-4-F2Z	YES	PCM
2005	GALANT	3.8L SOHC	F4A5A-4-F1Z	YES	PCM

NISSAN RE5R05A
TCM FUSE BLOWS

COMPLAINT: Late 04 and up Nissan vehicles equipped with the RE5R05A transmission may exhibit a complaint of a Transmission Control Module fuse that blows continuously after overhaul or TCM/valve body replacement. When the fuse is blown the TCM is inoperable. No communication to the computer can occur with a scanner to acquire codes and the transmission will be stuck in 4th gear.

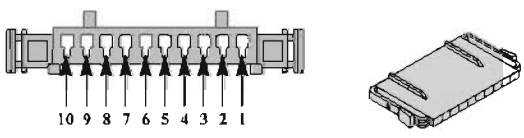
CAUSE: The cause may be that connector F-502 was cross-connected with F-505. When this happens, terminal 10 in the F-502 will be connected to vehicle speed sensor ground circuit causing the fuse to blow. See figure 1 for a face view of the F-502 and F-505 connectors

CORRECTION: To correct this condition, refer to figure 2 to locate the F-502 connector, which is connected to internal harness 1 that leads to the green F-9 connector, which is connected the Transmission Control Module. Connector F-505 connects to internal harness 2, which connects to the Park/Neutral position switch. ***Note:*** both of these connectors are gray and have the exact same configuration so cross-connecting them is very easy. Refer to figure 3 for connector I.D. and configuration. Refer to Figure 4 for a wire schematic of the TCM, internal harness 1 and 2 and the case connector.

Special Note: In the 2008 Seminar we provided information on Solenoid Identification that was unfortunately incorrect, please refer to figure 5 for the correct solenoid locations for the RE5R05A.

F-502 AND F-505 CONNECTORS

Internal TCM Harness
"Female" Coupler Face View
Connector Number F-502 (Gray)



Internal Park/Neutral Position Switch Harness
"Female" Coupler Face View
Connector Number F-505 (Gray)

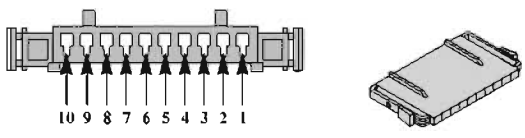


Figure 1

NISSAN RE5RO5A WITH INTERNAL TCM

Internal Harness 1
- 10 pin "Gray" connector to TCM.
- 2 pin "White" connector to TCM.
- 10 pin "Green" connector to pass-thru case connector.
- 2 pin "White" connector to TFT Sensor 2 connector.

Internal Harness 2
- 10 pin "Gray" connector to Park/Neutral Position Switch.
- 10 pin "Green" connector to TCM.

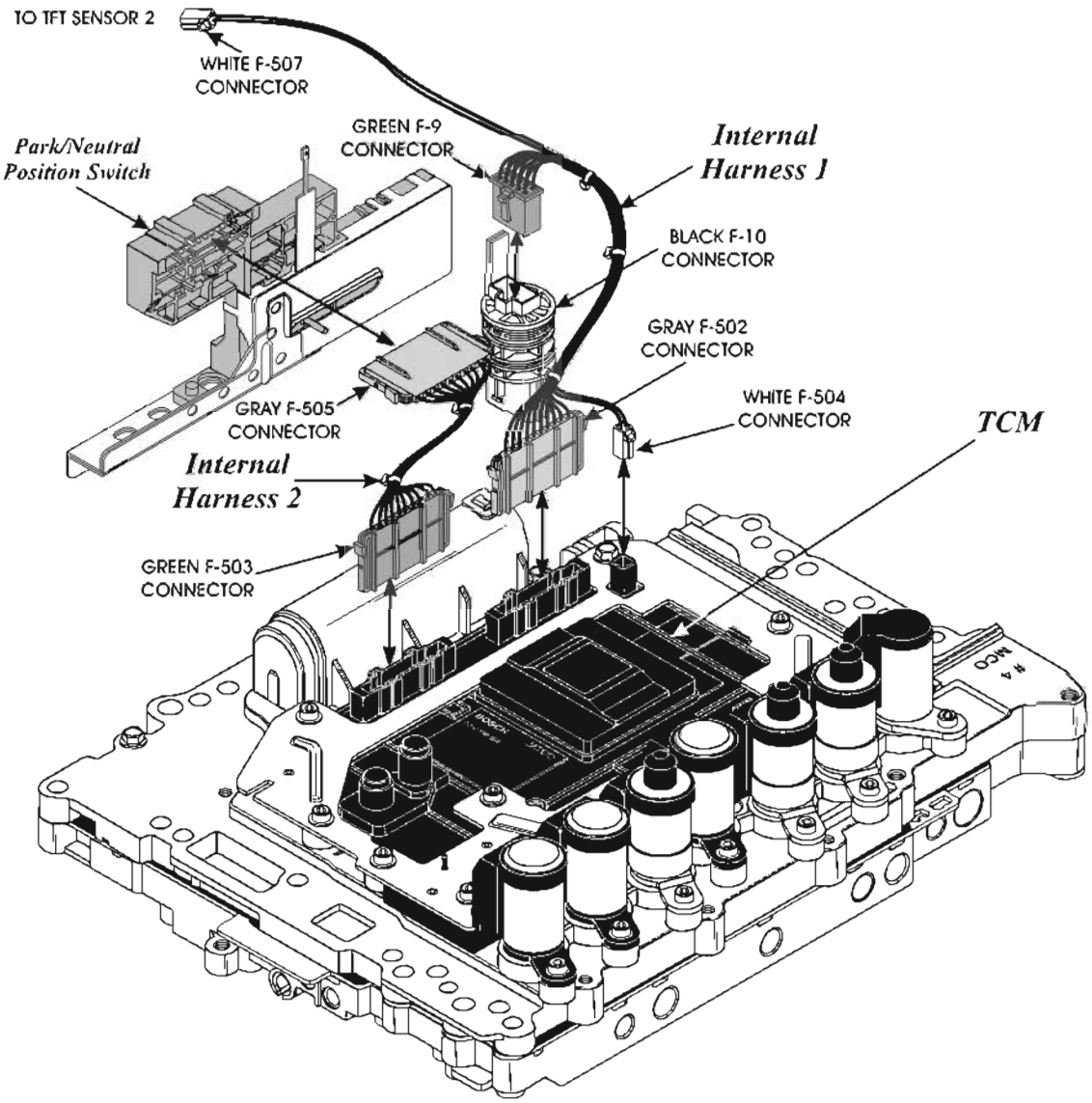
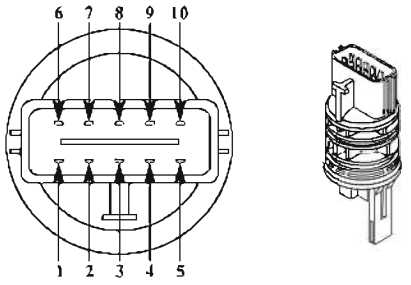
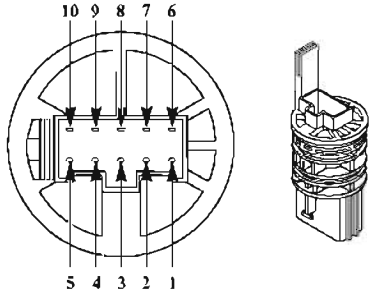


Figure 2

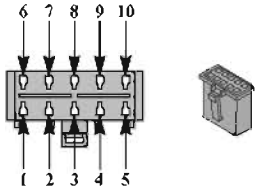
NISSAN RE5RO5A CONNECTOR AND TERMINAL IDENTIFICATION



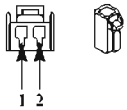
External Transmission Connector
"Top Side" Face View
Connector Number F-10 (Black)



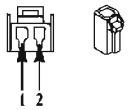
External Transmission Connector
"Bottom Side" Face View
Connector Number F-10 (Black)



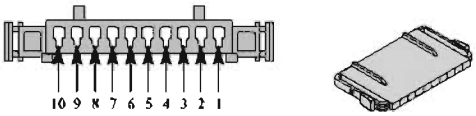
Internal Transmission Harness
"Female" Coupler Face View
Connector Number F-9 (Green)



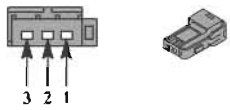
Internal TFT Harness
"Female" Coupler Face View
Connector Number F-507 (White)



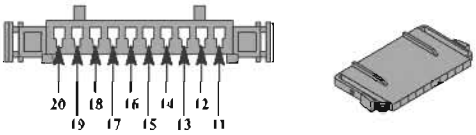
Internal TCM Harness
"Female" Coupler Face View
Connector Number F-504 (White)



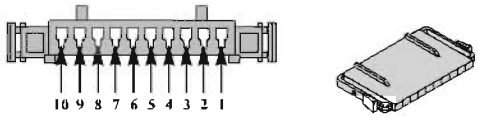
Internal TCM Harness
"Female" Coupler Face View
Connector Number F-502 (Gray)



Internal Revolution/Output Sensor Harness
"Female" Coupler Face View
Connector Number F-506 (Green)



Internal TCM Harness
"Female" Coupler Face View
Connector Number F-503 (Green)



Internal Park/Neutral Position Switch Harness
"Female" Coupler Face View
Connector Number F-505 (Gray)

Figure 3

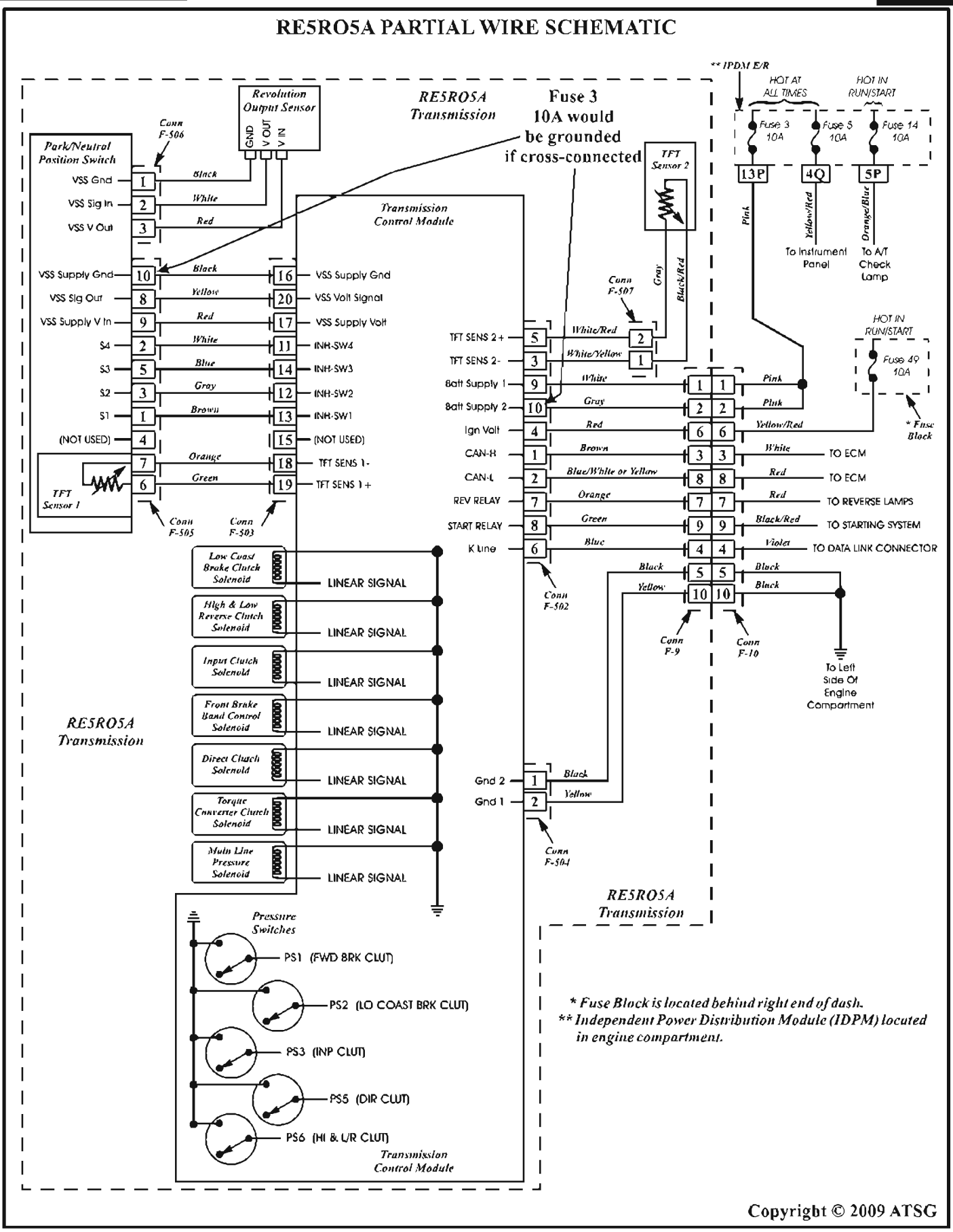

RE5RO5A PARTIAL WIRE SCHEMATIC
** IPDM E/R
HOT AT ALL TIMES
HOT IN RUN/START
Fuse 3 10A
Fuse 5 10A
Fuse 14 10A
13P
4Q
5P
Pink
Yellow/Red
Orange/Blue
To Instrument Panel
To A/T Check Lamp
HOT IN RUN/START
Fuse 49 10A
* Fuse Block
Revolution Output Sensor
GND
V OUT
V IN
RE5RO5A Transmission
Fuse 3 10A would be grounded if cross-connected
TFT Sensor 2
Conn F-506
Park/Neutral Position Switch
VSS Gnd
VSS Sig In
VSS V Out
Black
White
Red
Transmission Control Module
VSS Supply Gnd
VSS Sig Out
VSS Supply V In
S4
S3
S2
S1
(NOT USED)
TFT Sensor 1
Yellow
Brown
Blue
Gray
Orange
Green
VSS Supply Gnd
VSS Volt Signal
VSS Supply Volt
INH-SW4
INH-SW3
INH-SW2
INH-SW1
(NOT USED)
TFT SENS 1-
TFT SENS 1+
Conn F-505
Conn F-503
Conn F-507
Gray
Black/Red
TFT SENS 2+
TFT SENS 2-
Batt Supply 1
Batt Supply 2
Ign Volt
CAN-H
CAN-L
REV RELAY
START RELAY
K Line
White/Red
White/Yellow
White
Gray
Red
Brown
Blue/White or Yellow
Orange
Green
Blue
Pink
Pink
Yellow/Red
White
Red
Red
Black/Red
Violet
TO ECM
TO ECM
TO REVERSE LAMPS
TO STARTING SYSTEM
TO DATA LINK CONNECTOR
Conn F-502
Black
Yellow
Black
Black
Conn F-9
Conn F-10
To Left Side Of Engine Compartment
Low Coast Brake Clutch Solenoid
High & Low Reverse Clutch Solenoid
Input Clutch Solenoid
Front Brake Band Control Solenoid
Direct Clutch Solenoid
Torque Converter Clutch Solenoid
Multi Line Pressure Solenoid
LINEAR SIGNAL
RE5RO5A Transmission
Gnd 2
Gnd 1
Black
Yellow
Conn F-504
Pressure Switches
PS1 (FWD BRK CLUT)
PS2 (LO COAST BRK CLUT)
PS3 (INP CLUT)
PS5 (DIR CLUT)
PS6 (HI & L/R CLUT)
Transmission Control Module
RE5RO5A Transmission
* Fuse Block is located behind right end of dash.
** Independent Power Distribution Module (IDPM) located in engine compartment.
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Figure 4

NISSAN RE5RO5A SOLENOID LOCATIONS

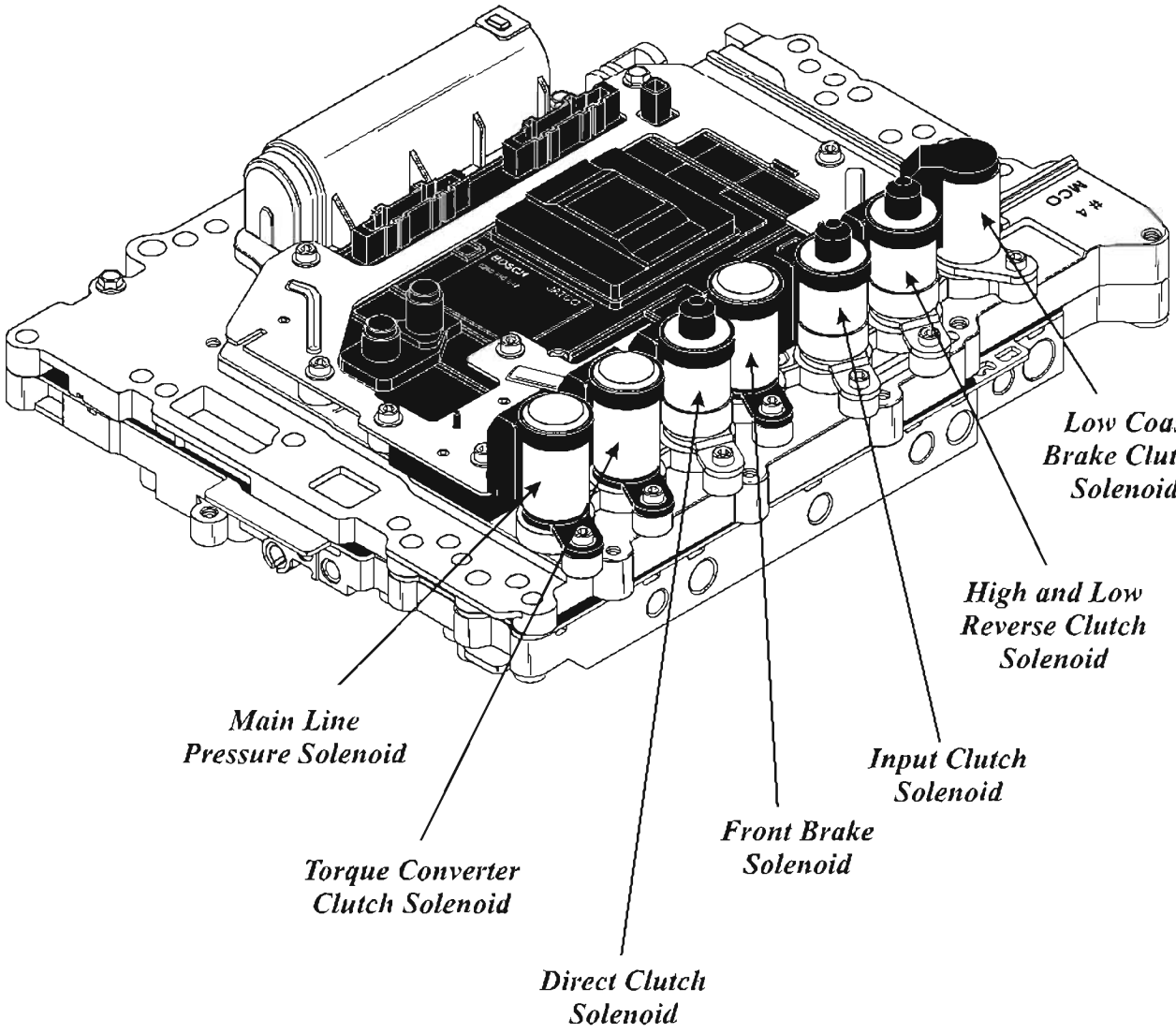


Figure 5

A special thanks to the good folks at Raybestos for providing to ATSG RE5RO5A Valve Bodies.

TOYOTA/LEXUS U140/240 SERIES
NO 4TH GEAR AND ENGINE RELATED DTC'S

COMPLAINT: Toyota and Lexus vehicles equipped with the U140/240 series of transaxles may exhibit a no 4th condition before or after overhaul, accompanied with diagnostic trouble codes related to Oxygen Sensor, Knock Sensor and or numerous other engine performance related faults.

CAUSE: The cause may be that the diagnostic trouble codes listed above are causing the Powertrain Control Module to inhibit 4th gear. ***Note:*** Most of the transmission related codes will also cause no 4th gear as well.

CORRECTION: To verify whether the problem is inside or outside of the trans, refer to figures 1 and 2 for the terminal I.D. and solenoid firing order for 4th gear. Notice that once in 3rd gear, the S4 solenoid has to come on to achieve 4th gear. Probe a volt meter into terminal 8 at the case connector, with the positive lead and connect the negative lead to a good engine ground. Bring the vehicle up to 50-55 mph and look for battery voltage on the volt meter. If there is "No" voltage, and the vehicle has engine performance related codes, they will need to be fixed first. If there is battery voltage at 50-55mph, this would indicate that the problem is inside of the transmission, as the PCM is commanding 4th gear, repair as necessary.

SOLENOID FIRING ORDER

	S1	S2	S4	DSL/TCC	SLT
1st	*ON*	*ON*	*Off*	*ON/M1**	*Modulates based on engine load*
2nd	*Off*	*ON*	*Off*		
3rd	*+Off*	*Off*	*Off*		
4th	*Off*	*Off*	*ON*	*ON**	
4th/TCC	*Off*	*Off*	*ON*	*ON**	

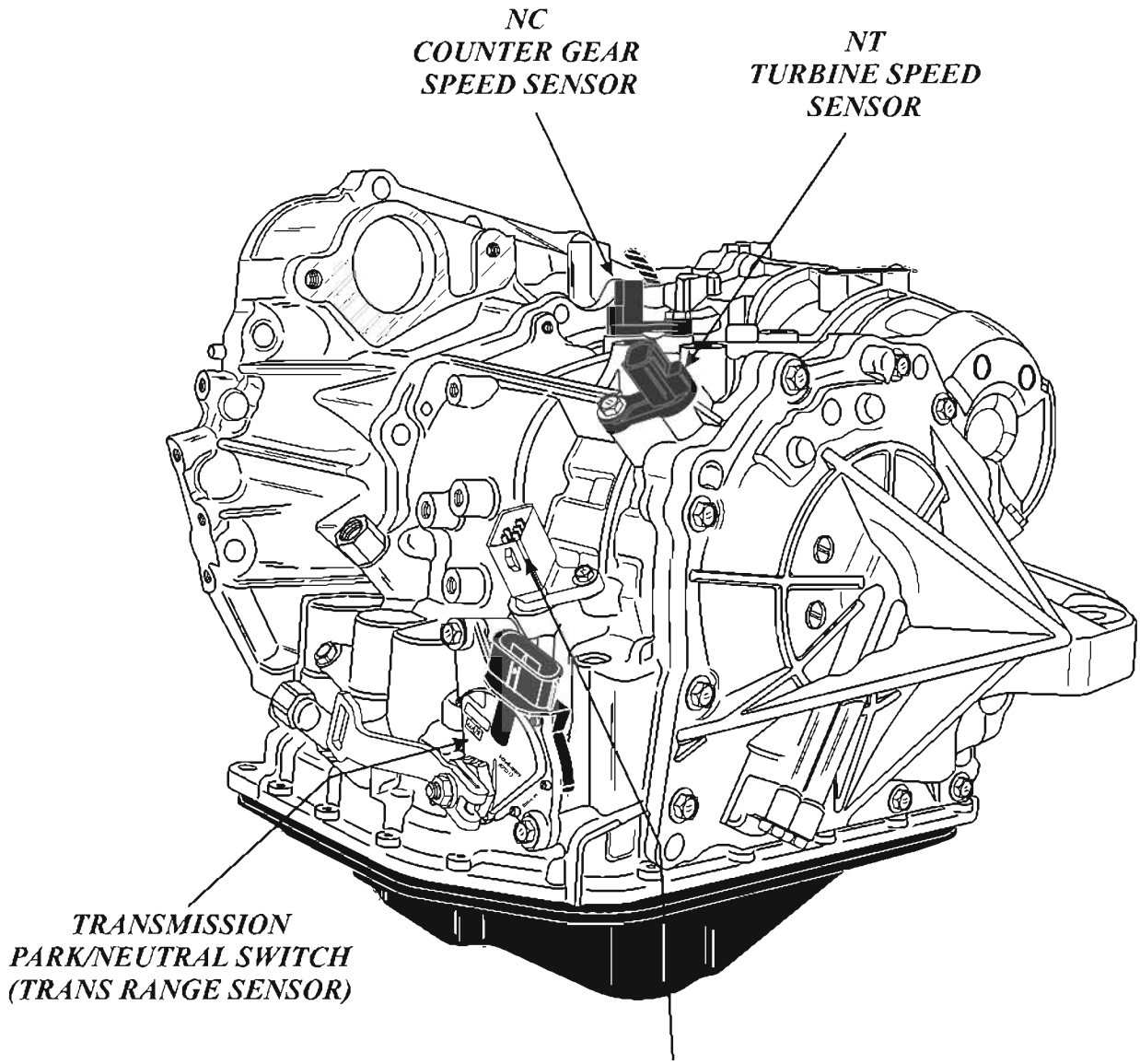
NOTE: A failsafe condition will provide reverse and third gear for all forward ranges

+Off = Pulsed on then Off to control shift overlap on the 2-3 upshift

**DSL - has 3 functions in Manual Low controls B2 brake to provide engine braking in Manual 1, in 3rd and 4th gear controls TCC, and if turned on in Reverse will inhibit Reverse application.*

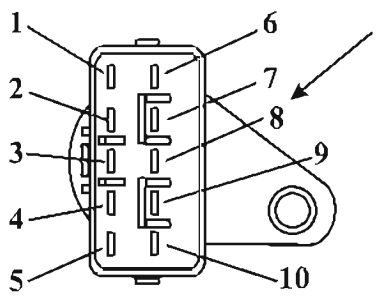
Figure 1

TOYOTA/LEXUS U140/U240
SENSOR AND CONNECTOR LOCATIONS



SOLENOID CONNECTOR I.D.

10 PIN
CONNECTOR



Back-probe terminal 8 to ground

Terminal	Function
1	THO (temp +)
2	SLT +
3	DSL +
4	SL2 +
5	SL1 +
6	E2 (temp -)
7	SLT -
8	S4 +
9	SL2 -
10	SL1 -

Note: Terminal 8 will have battery voltage when 4th gear is commanded

Figure 2

TOYOTA/LEXUS U140/U240 SERIES
ENGAGEMENT ISSUES IN REVERSE OR 4TH GEAR

COMPLAINT #1: Before or after overhaul, a Toyota/Lexus vehicle equipped with the U140/U240 series transaxle may exhibit a complaint of no application, or, a chatter/bucking sensation in reverse. The condition may be more prevalent and/or violent when the vehicle is hot.

COMPLAINT #2: Before or after overhaul, a Toyota/Lexus vehicle equipped with the U140/U240 series transaxle may exhibit a complaint of no application, or, a slip into 4th gear while driving. The condition may be more prevalent when the vehicle is hot.

CAUSE #1: One cause may be the oil transfer tube in the case feeding the Underdrive Brake (B3) leaking because it is cracked or worn where it goes into the case.

The Underdrive Brake (B3) is located in the case in the underdrive section of the U240/U140 transaxles. The brake is applied in reverse and drive (1st thru 3rd) gears. When the Underdrive Brake (B3) is applied, it keeps the underdrive sun gear stationary. With the sun gear stationary, the underdrive planetary pinion gears also remain stationary which causes the counter driven gear along with the differential drive pinion gear to be driven either clockwise or counter clockwise to provide movement in reverse or forward (1st thru 3rd) gears. In reverse, if the Underdrive Brake (B3) can not hold the sun gear stationary, the underdrive planetary will be allowed to rotate and there will be no power flow through the counter driven gear and differential drive pinion gear. The result will be a neutral condition in reverse gear. In forward, if the Underdrive Brake (B3) can not hold the sun gear stationary, the underdrive planetary will be held by the Underdrive (F2) One Way Clutch, and the sun gear will remain stationary.

Refer to the diagram in figure 1 for a brief explanation of power flow in reverse. Refer to the diagram in figure 2 for a brief explanation of power flow in drive (1st thru 3rd) gear.

CAUSE #2: One cause may be the oil transfer tube in the case feeding the Underdrive Clutch (C3) leaking because it is cracked or worn where it goes into the case.

The Underdrive Clutch (C3) is located in the underdrive section of the transaxle. The Underdrive Clutch (C3) is applied to obtain 4th gear while driving. When the clutch is applied, the sun gear *(which is welded to the Underdrive Clutch (C3) drum)* is connected to the planetary, and the whole planetary assembly rotates as a complete unit. The result is a direct drive condition. If the Underdrive Clutch (C3) drum can not hold the planetary carrier, the result will either be a slip into 4th, or no ratio change at all and the transmission will remain in 3rd gear.

Refer to the diagram in figure 3 for a brief explanation of power flow in 4th gear.

TOYOTA/LEXUS U140/U240 SERIES
ENGAGEMENT ISSUES IN REVERSE OR 4TH GEAR

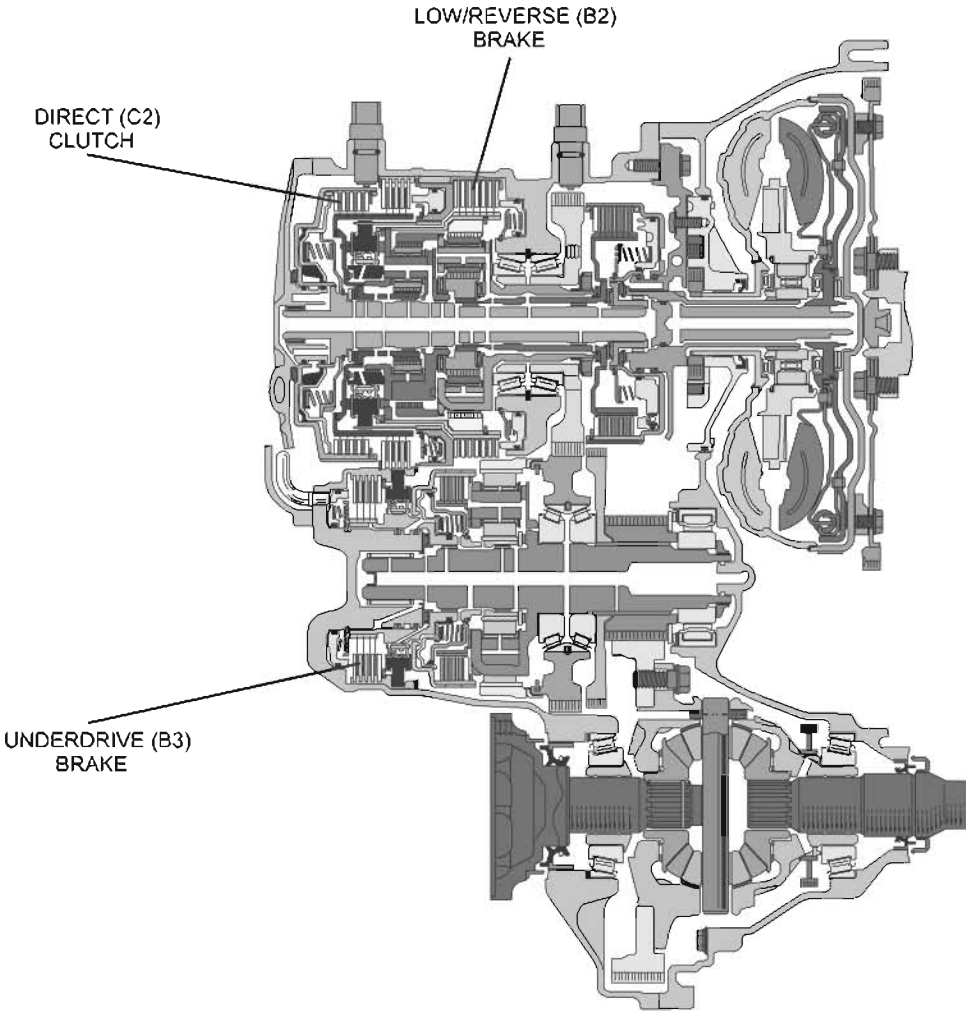
CORRECTION #1: Using a pressure gauge, check pressure on the Direct Clutch (C2) in reverse. Clutch pressure should be the same as line pressure. Refer to figure 4 for both tap locations and line pressure specifications.

If pressure is within specification on the Direct Clutch (C2) tap, remove the transaxle rear cover and using the diagram in figure 5, check the Underdrive Brake (B3) oil transfer tube for wear or cracks. If no cracks are present, see if the tube fits loosely in the case. A repair can be made to the tube by slightly flaring the end with a flaring tool, or by installing a small o-ring onto the tube and installing back into the case. Check the sealing ability of the tube by adding some ATF into the B3 pressure port in the case and apply approximately 40 - 50 psi of compressed air pressure into the port. Use the diagram in figure 6 as a reference. When no more leaks are detected, reassemble the transmission.

CORRECTION #2: Using a pressure gauge, check pressure on the Underdrive Clutch (C3) pressure port and verify proper pressures using the diagram and pressure specifications chart in figure 4.

If pressures are not within specification, remove the transaxle rear cover and using the diagram in figure 5, check the Underdrive Clutch (C3) oil transfer tube for wear or cracks. If no cracks are present, see if the tube fits loosely in the case. A repair can be made to the tube by slightly flaring the end with a flaring tool, or by installing a small o-ring onto the tube and installing back into the case. Check the sealing ability of the tube by adding some ATF into the C3 pressure port in the case and apply approximately 40 - 50 psi of compressed air pressure into the port. Use the diagram in figure 6 as a reference. When no more leaks are detected, reassemble the transmission.

U240/U140
POWER FLOW IN REVERSE

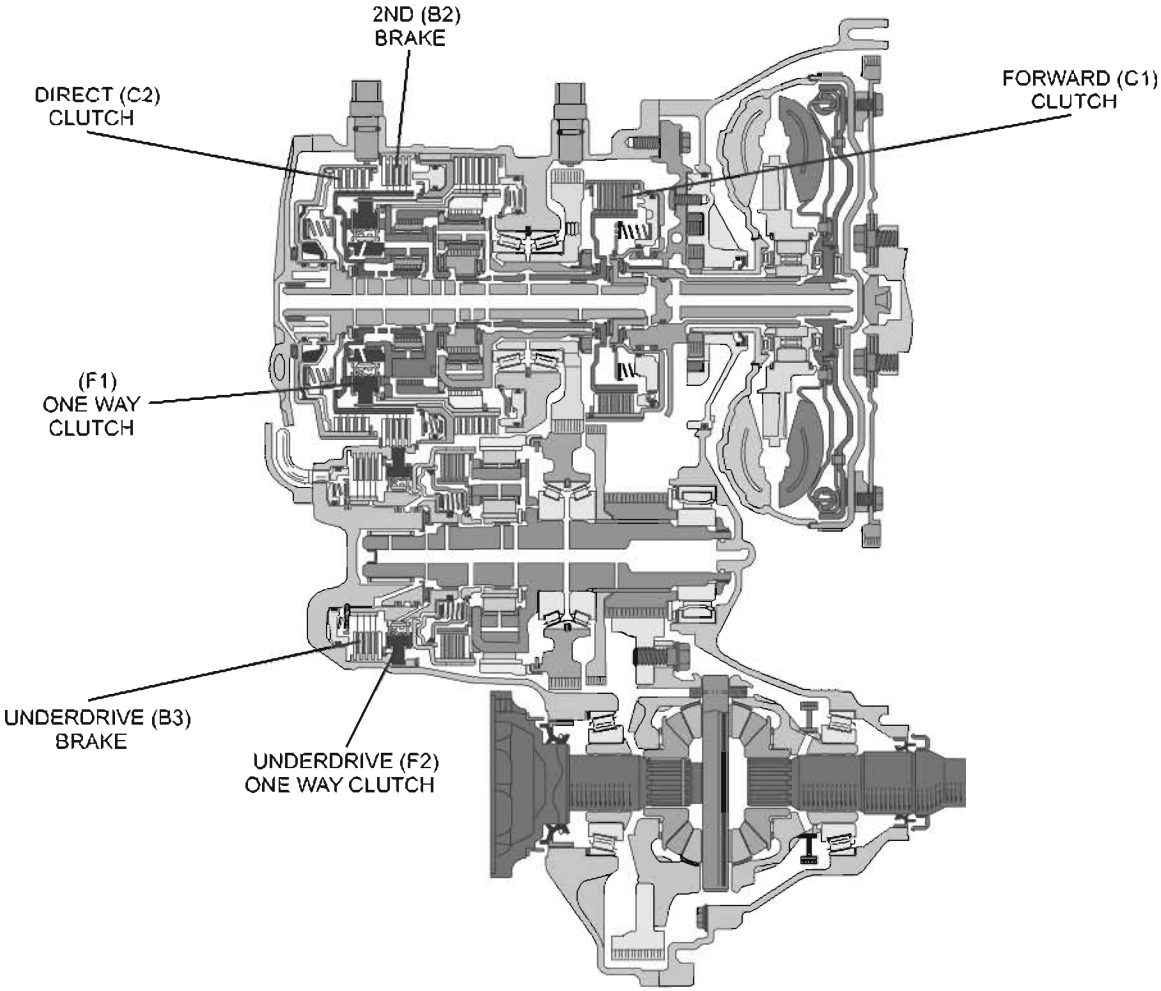


Gear Range	Fwd Clutch C1	Dir Clutch C2	U/D Clutch C3	2nd Brake B1	L/R Brake B2	U/D Brake B3	No. 1 One Way Clutch F1	UD One Way Clutch F2
Reverse		ON			ON	ON		

The direct (C2) clutch is applied and drives the rear planetary sun gear clockwise. The lo/rev (B2) brake is applied and holds the rear planetary carrier stationary. This forces the front planetary and counter drive gear to rotate counter clockwise. The underdrive (B3) brake is applied and locks the underdrive sun gear. This drives the underdrive planetary and differential drive pinion clockwise which drives the differential ring gear counter clockwise providing movement in reverse.

Figure 1

U140/U240
POWER FLOW IN DRIVE 1ST THRU 3RD GEARS

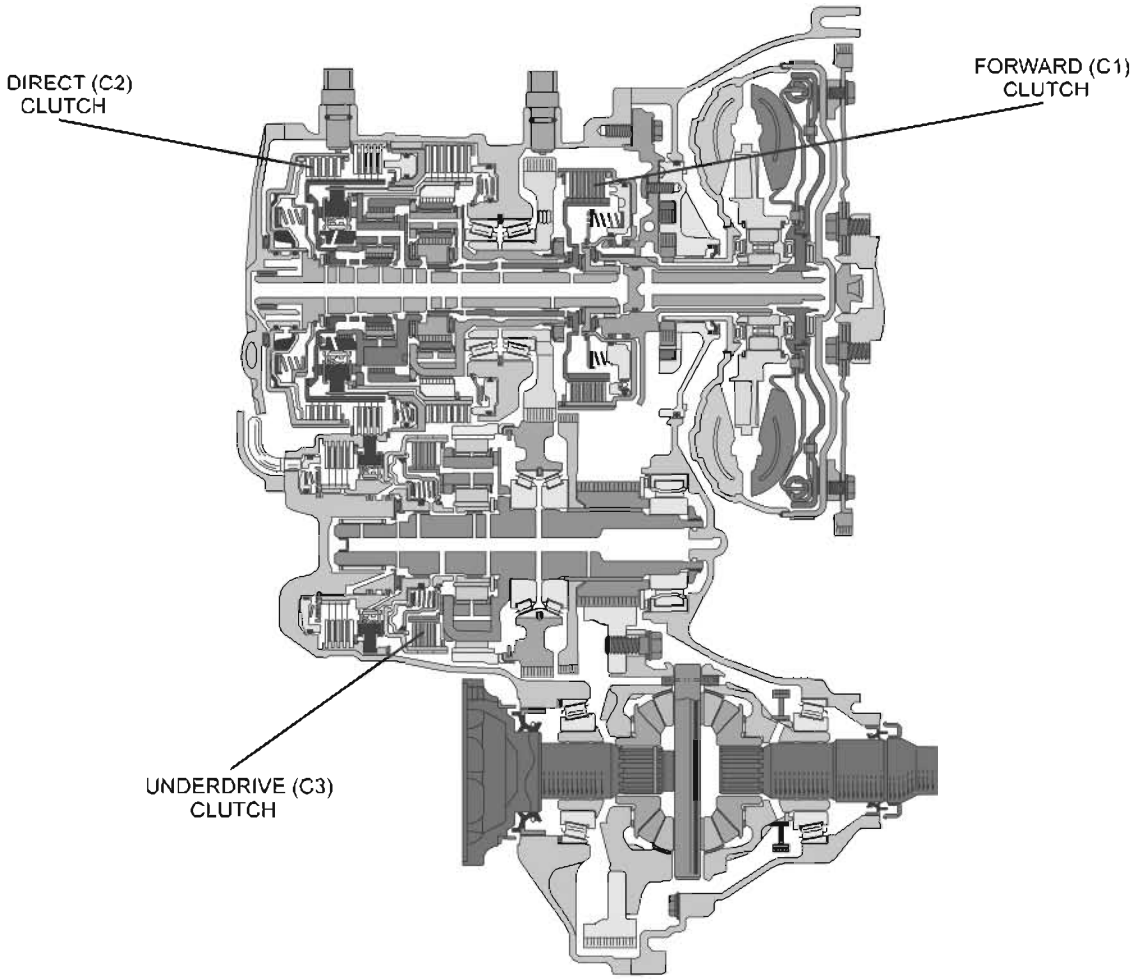


Gear Range	Fwd Clutch C1	Dir Clutch C2	U/D Clutch C3	2nd Brake B1	L/R Brake B2	U/D Brake B3	No. 1 One Way Clutch F1	U/D One Way Clutch F2
D-1st. Gear	ON					ON	ON	ON
D-2nd. Gear	ON			ON		ON		ON
D-3rd. Gear	ON	ON				ON		ON

The forward (C1) clutch is applied and drives the front sun gear and the counter drive gear clockwise. The underdrive (F2) one way clutch is locked and the underdrive (B3) brake is applied and they lock the underdrive sun gear. This drives the underdrive planetary and differential drive pinion counter clockwise which drives the differential ring gear clockwise providing movement forward in drive.

Figure 2

U140/U240
POWER FLOW IN DRIVE 4TH GEAR

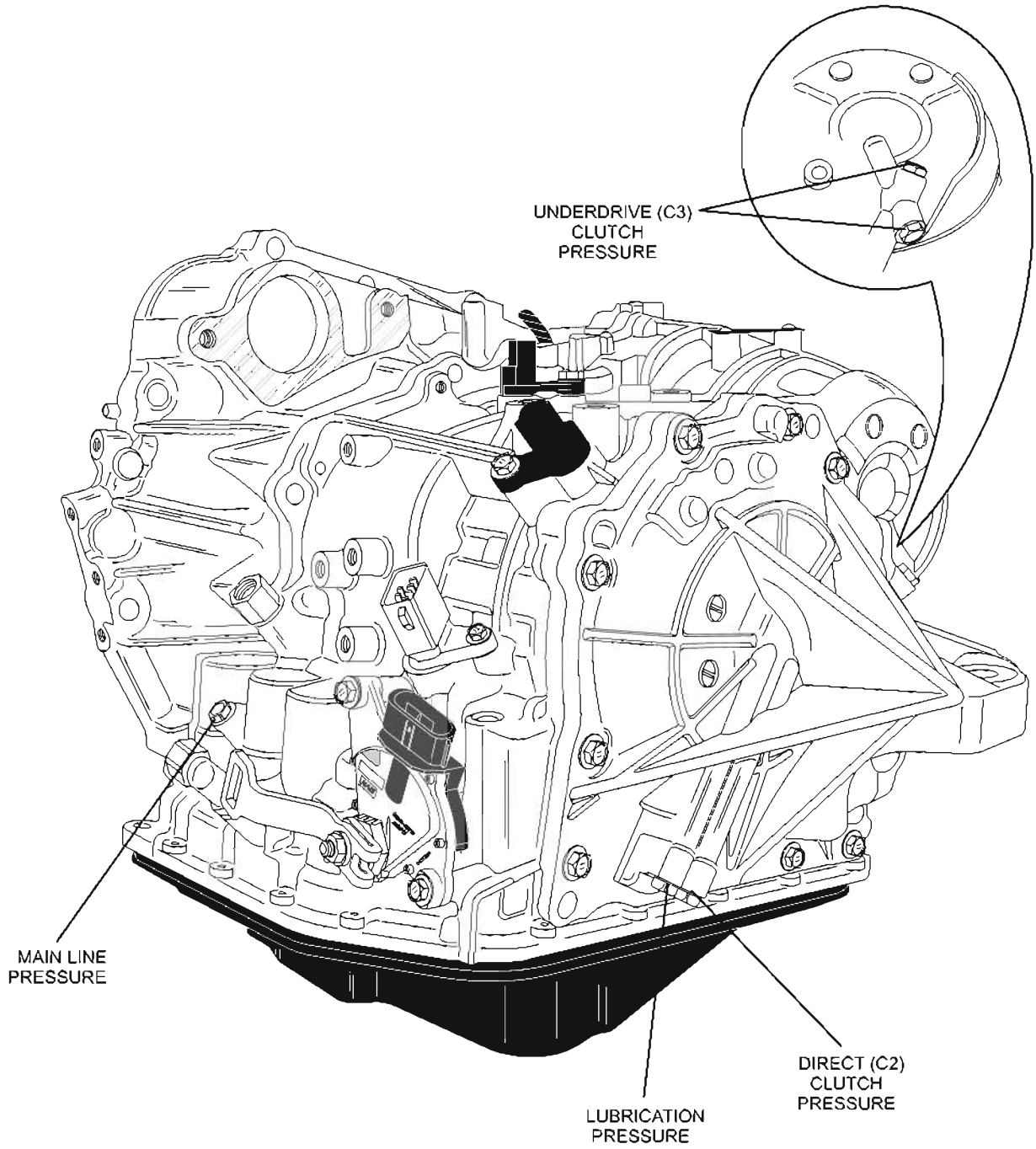


Gear Range	Fwd Clutch C1	Dir Clutch C2	U/D Clutch C3	2nd Brake B1	L/R Brake B2	U/D Brake B3	No. 1 One Way Clutch F1	U/D One Way Clutch F2
D-4th. Gear	ON	ON	ON					

The forward (C1) clutch is applied and drives the front sun gear and the counter drive gear clockwise. The direct (C2) clutch is applied and locks the rear planetary sun gear so the front and rear planetary gear sets turn in the same direction as a unit. The underdrive (C3) clutch is applied and locks the underdrive sun gear to the underdrive planetary gear set so the gear train rotates as a unit, creating a direct drive. The counter driven gear and differential drive pinion rotate counter clockwise which drives the differential ring gear clockwise providing 4th gear ratio in drive.

Figure 3

PRESSURE TAP LOCATIONS AND SPECIFICATIONS



LINE PRESSURE SPECIFICATIONS		
GEAR RANGE	IDLE PRESSURE	STALL PRESSURE
REVERSE	95-110 PSI	250-300 PSI
DRIVE	52-62 PSI	135-150 PSI

Figure 4

UNDERDRIVE BRAKE (B3) AND UNDERDRIVE CLUTCH (C3)
FEED TUBE LOCATIONS

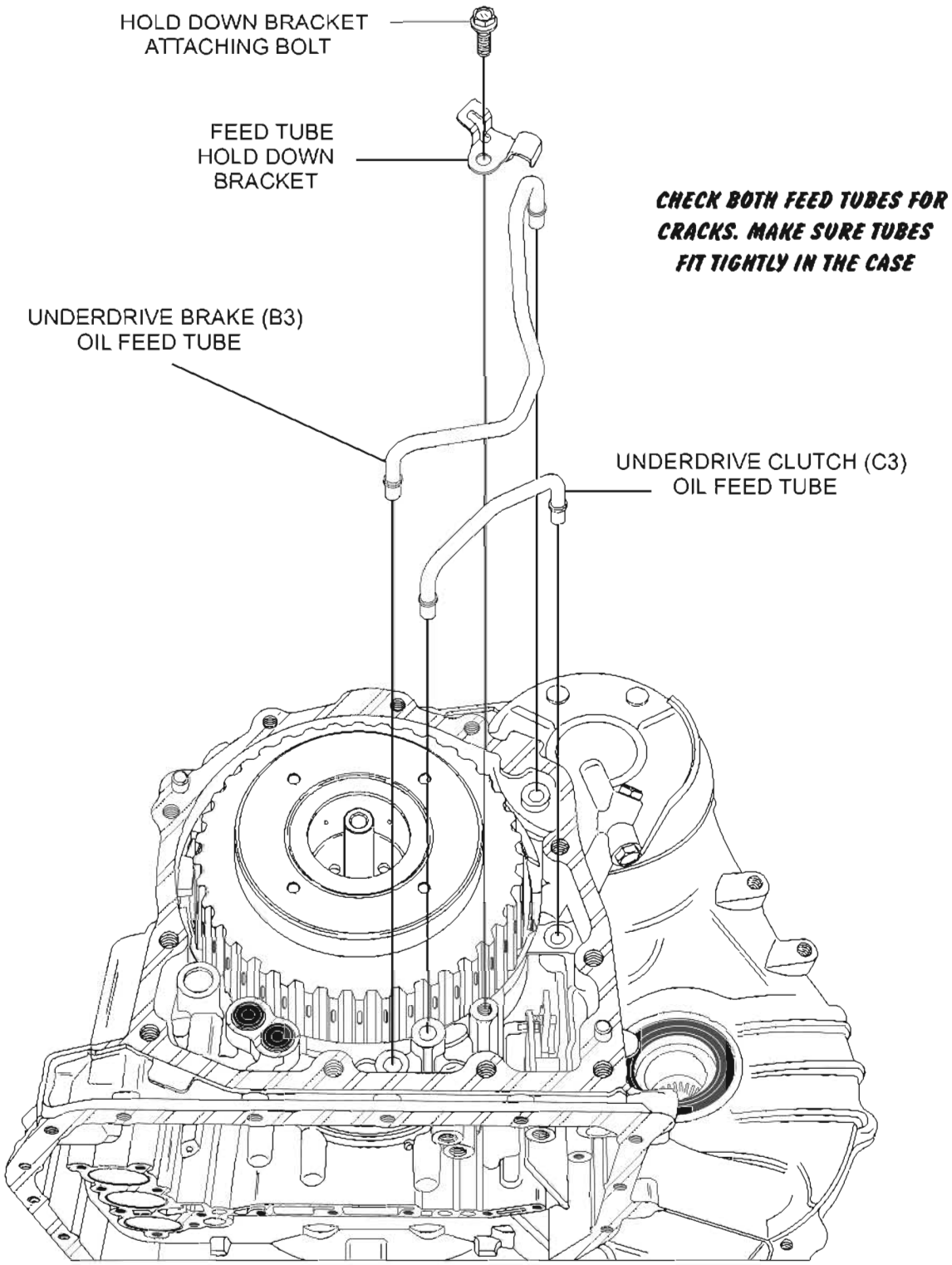
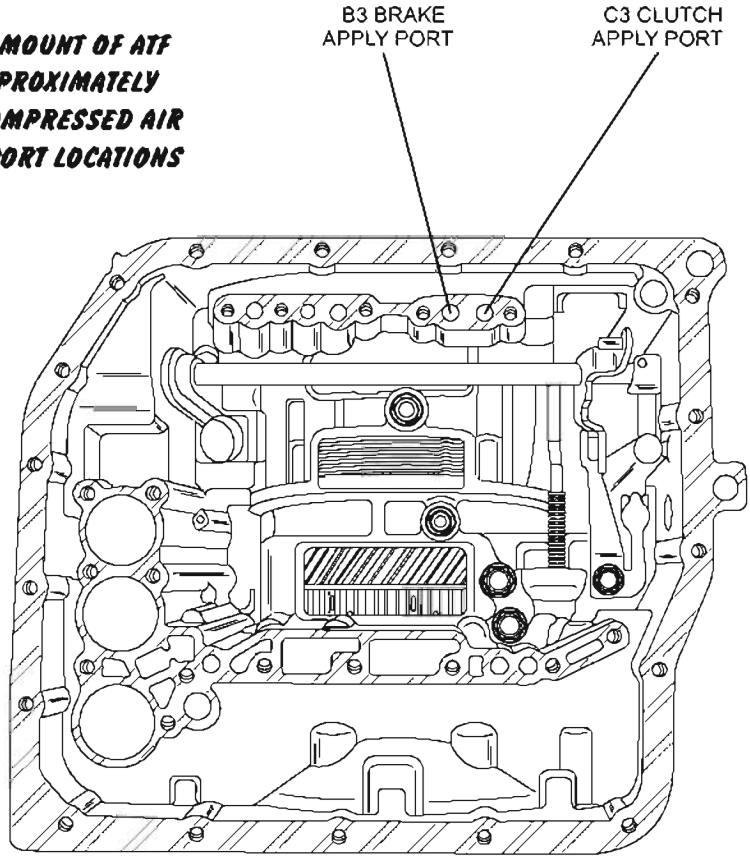


Figure 5

UNDERDRIVE BRAKE (B3) AND UNDERDRIVE CLUTCH (C3) APPLY PORT LOCATIONS

ADD A SMALL AMOUNT OF ATF THEN APPLY APPROXIMATELY 40 - 50 PSI OF COMPRESSED AIR INTO PRESSURE PORT LOCATIONS



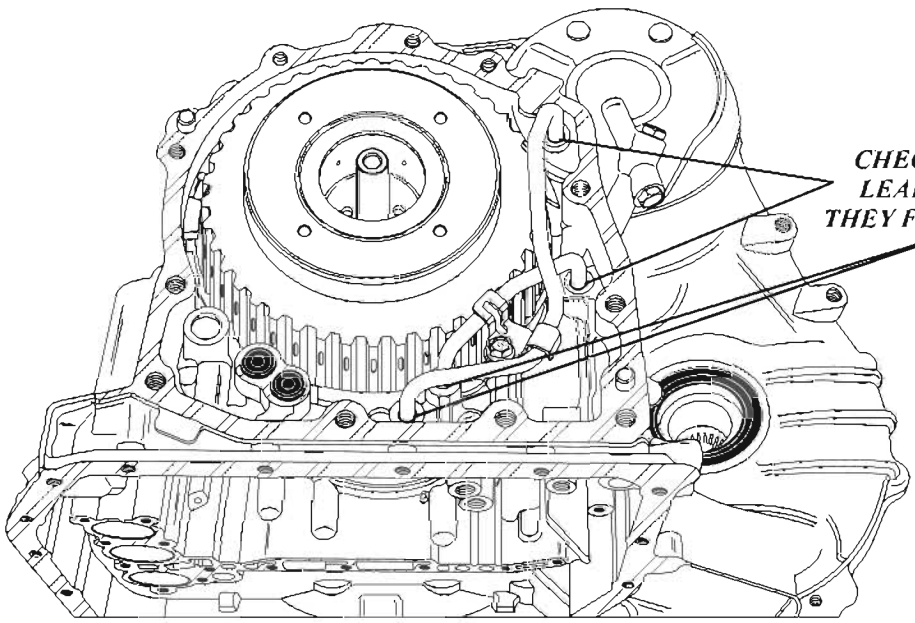


Figure 6

TOYOTA A245/246E

CODE P2716 AND HARSH SHIFTS

COMPLAINT: A 2005 to 2007 Toyota Corolla or Matrix with the 1ZZ-FE engine and A245E or A246E transaxle may come in with a harsh shift complaint and the "MIL" Lamp illuminated and Code P2716 stored, indicating an electrical circuit fault in the Pressure Control Solenoid "D" (SLT) circuit.

CAUSE: The Powertrain Control Module (PCM) is defective.

CORRECTION: Replace the Powertrain Control Module.

NOTES: **(1)** ***The PCM for these vehicles must be programmed to function and the vehicle "VIN" must also be installed into replacement PCM.***
(2) ***The PCM is covered under Toyota Federal Emissions Warranty free of charge if it is less than 96 months old with up to 80,000 miles on the odometer.***

SERVICE INFORMATION:
Toyota Technical Service Bulletin.....TC015-07

PCM LOCATION & REMOVAL

THE NEW PCM MUST BE PROGRAMMED TO FUNCTION

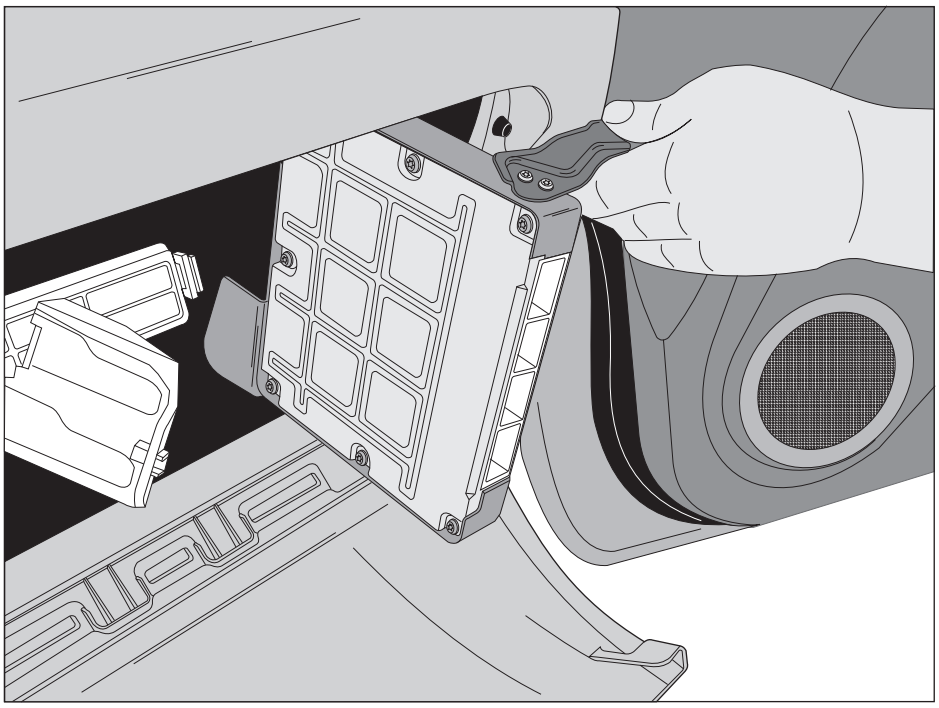


Figure 1

AW55-50/SN SERIES
OPERATING MODES

COMPLAINT: Vehicles equipped with the AW55-50SN series transaxles may exhibit what is perceived to be erratic shift operation such as delayed shifts, sudden downshifts, wrong gear starts or high gear starts with no automatic shifting at all.

CAUSE: A cause of 5th gear starts in D range with only 2nd gear available when Low range is manually selected may be due to a fault condition being detected and the TCM is in a Protection Mode. This may also be referred to as a Fail Safe or Limp In Mode.

Other shift characteristics such as 2nd gear starts, delayed shifts or sudden downshifts may be normal operation dependant upon factors related to temperature or current driving conditions.

CORRECTION: To correct the cause of a vehicle determined to be in Protection Mode, the fault code(s) must be retrieved with a capable scan tool and the related failure that caused the fault to be stored must be successfully repaired before the transaxle will resume normal operation.

Delayed shifts, sudden downshifts when pulling a load, climbing or descending a grade and a 2nd gear start at times while driving in heavy stop and go city traffic may all be perceived as erratic shifting if you or your customer are not aware of the various special operating modes. Your customer may be used to Normal Mode and they may have noticed Cold Mode operation, however other special operating modes don't always show up very often and may seem to be an intermittent problem. These special modes can vary with the manufacturer. Refer to the following charts for a description of operational characteristics while driving with certain special operating mode strategies.

AW55-50/SN SERIES
OPERATING MODES

GM/SATURN VEHICLE SHIFT MODES

Normal Mode	The control module provides earliest possible up shifts and lock up for best fuel economy. Oil pressures are adjusted electronically for engagement and shift quality.
Protection Mode	May also be referred to as Fail Safe or Limp Mode. When fault codes are set, this mode will only allow limited ratio function. Usually 5th gear in D or I ranges and 2nd gear in L range. If the key is cycled and the fault code is no longer current, normal operation will be resumed. If a code is current after ignition cycle, then Protection Mode is maintained.
Hot Mode	Hot Mode is initiated when the transaxle oil temperature exceeds 280 degrees (F). Shift points are raised to a higher vehicle speed and the converter clutch will apply at a lower vehicle speed to aid in cooling the unit. Once the transaxle has cooled to less than 270 degrees (F) then Hot Mode will be turned off.
Cold Mode	Cold Mode is initiated when the engine coolant temperature is less than 120 degrees (F). Shift points will be raised to a higher shift point to provide for a quicker engine warm up and to compensate for reduced engine power.
Uphill Mode	If the engine torque is high and the vehicle speed is decreasing, shift points will be raised to compensate for the increase in load. Towing or a heavily loaded vehicle can cause an Uphill Mode operating strategy to be in use as well.
Downhill Mode	If the accelerator pedal position angle is less than 3% and the vehicle speed is increasing, shift points will be raised to a higher speed to provide for engine braking. A downshift may be noticed in some vehicles when the brake pedal is depressed under this condition.
High Altitude Mode	If the barometric pressure is less than 12.76 PSI absolute, then the control module will raise shift points slightly to compensate for reduced engine power.
Traffic Jam Mode	If the vehicle stops and starts with less than 10% accelerator angle then 1st gear will be inhibited. A rolling 2nd gear start is commanded in an effort to increase fuel economy and make shifting less busy. Traffic Jam Mode is turned off with the accelerator angle greater than 30% or if the vehicle slows to less than 1 MPH or exceeds 18 MPH.

AW55-50/SN SERIES
OPERATING MODES

VOLVO VEHICLE SHIFT MODES

Economy Mode	The control module provides earliest possible up shifts and lock up for best fuel economy under normal driving conditions. Oil pressures are adjusted electronically to provide for smooth shifting and garage shift engagements.
Sport Mode	The control module changes from Economy to Sport Mode if the accelerator is depressed quickly and the vehicle exceeds 31 MPH. In Sport Mode shift points are raised to provide the best performance and downshifting occurs at a lower engine RPM. Economy Mode will resume when accelerator is moved less quickly.
Extreme Mode	Extreme Mode is another way of saying wide open throttle or kick down. The control module will select the lowest possible gear for the vehicle speed at full throttle.
Winter Mode	Winter Mode is obtained by using the "W" button on the top panel of the gear selector assembly. An indicator lamp in the instrument cluster will be lit when Winter Mode is selected. In D range, the transaxle starts in 3rd gear to provide maximum traction on slippery surfaces and automatically shifts between 3rd, 4th and 5th gears. In 4 range, the transaxle starts in 3rd and automatically shifts to 4th gear earlier than Economy Mode in D range and 5th gear is locked out. In 3 range, the transaxle starts in 3rd and stays in 3rd. In L range, the transaxle starts in 2nd gear and stays in 2nd gear. At wide open throttle in Winter Mode, the transaxle uses all gears for maximum performance.
Catalytic Converter Start	This function allows the engine to reach proper operating temperature more quickly by preventing converter clutch lock up and significantly delaying the 1-2 and the 2-3 up shifts when the engine is cold. This is a normal function.
Temperature Controlled Lock Up	If the transmission oil temperature rises excessively as a result of a heavy load with high ambient temperature conditions, the converter clutch will be applied to reduce the heat generated through torque multiplication. Lock up is inhibited below 68 degrees (F).
Driving Uphill	When ascending a grade or driving uphill the control module will alter the shift pattern to reduce busy shifting. Towing or driving with a heavy load can have the same result.
Neutral Control	(This function is not available on all models) The control module will release the forward clutch (C1) at a stop with the brake applied to reduce engine load, vibration and improve fuel economy. When the brake is released the forward clutch engages. (This operating strategy will make a 2 footed driver crazy.) The following conditions must be met to allow Neutral Control function. Manual shifter must be in D, 4 or 3. Neutral Control will not work if Winter Mode or Geartronic operation is selected. Trans oil temp must be over 50 degrees (F). Throttle position must be less than 3%. Brake pedal must be depressed. Vehicle speed must be 0 MPH. Engine RPM less than 1500. There is a 2 second delay to neutral when the vehicle is stopped in the D position and a 5 second delay to neutral when shifted from N to D range.

AW55-50/SN SERIES
OPERATING MODES

VOLVO SHIFTING USING GEARTRONIC

When the shifter is placed into the Geartronic position, the transmission remains in the hydraulic D range. When the shifter is moved to the + or - positions, the gear selector module sends a signal to the TCM to shift the transmission up or down. The driver information module will change the symbol on the instrument cluster from D to the gear that has been selected. A signal is sent to the gear selector to illuminate the M and turn off the other LEDs on the shifter console. The TCM will over ride the driver's selection under certain operating conditions.

The following factors apply during Geartronic shifting:

(1) Only 1st, 2nd or 3rd gears can be selected from a stop. The transmission will not up shift to 4th gear until a minimum speed of at least 19 MPH has been attained. The transmission will not up shift to 5th gear until a minimum speed of 25 MPH has been attained.
(2) Automatic downshifts will occur below certain speeds if the driver forgets to manually down shift the transaxle. Manual up shifting is still necessary after automatic down shifting has occurred.
(3) Kick down is not available when using Geartronic shifting mode.
(4) The TCM will not allow the transaxle to be manually down shifted if the engine speed would exceed 6000 RPM.
(5) If the transmission oil temperature gets too high, the TCM will select an appropriate gear so that lock up function can be utilized.
(6) Torque converter clutch lock up is only possible in 3rd, 4th and 5th gears.

VOLVO SLIPPING LOCK UP

Slipping lock up allows for a smoother converter clutch engagement while reducing torsional vibrations and noise. The control module maintains a ***50 - 200 RPM*** torque converter clutch slip while operating in this mode.

The following conditions must be met for this mode to function:

(1) The gear shifter must be in the D, 4 or 3 position.
(2) The transaxle must be operating in 3rd, 4th or 5th gear.
(3) The transmission input speed must be 1100 RPM or greater and the throttle opening must be 35 % or less.
(4) Engine coolant must reach a minimum temperature requirement.
(5) Transmission oil temperature must be at least 104 degrees (F) but is not to exceed 248 degrees (F).

NOTE: The friction properties of this transmission fluid ***(Type T-IV)*** are different from other fluids and will affect converter clutch operation and shift quality. The manufacturer states that failure to use the correct fluid can cause damage and fault codes to be stored.

AW55-50/SN SERIES
OPERATING MODES

NISSAN VEHICLE SHIFT MODES

Upslope Mode	When the TCM detects an upslope because of an increase in engine load and decrease of acceleration, this mode will raise shift points to prevent busy shifting of transaxle.
Downslope Mode	When the TCM detects a downslope because of an increase in acceleration with the throttle fully closed, this mode provides moderate engine braking by raising shift points.
Hot Mode Control	This mode lowers the ATF temperature by altering shift points when the temperature is extremely high.
Down Shift Permission	In order to prevent an engine over speed condition, down shifts are allowed only under a predetermined minimal vehicle speed.
Fail-Safe Mode	The TCM has an electrical fail-safe mode. This mode makes it possible to operate even if there is a malfunction in a main electronic control input or output signal circuit. In fail-safe mode, the driving condition is determined according to the area of the malfunction and line pressure is set at maximum. (See Nissan fail safe charts to follow) Diagnosis and repair is made according to the type of fault code stored.

UP/DOWN SHIFT LEARNING CONTROL

This control learns the pressure to each clutch or brake to reduce shift shock for all up , down and coast down shifting.

N-D SHIFT CONTROL

This control improves N-D shift quality by controlling the line pressure solenoid on forward engagements including the L range.

N-D SHIFT LEARNING CONTROL

This control learns the forward clutch piston stroke and apply pressure by monitoring the forward clutch engagement time based on a rotational change rate.

N-R SHIFT CONTROL

This control improves N-R shift quality by controlling the shift pressure solenoid during reverse engagements.

N-R SHIFT LEARNING CONTROL

This control learns the direct clutch piston stroke and apply pressure by monitoring the direct clutch engagement time based on a rotational change rate.

TORQUE REDUCTION CONTROL

This control improves shift quality by sending a torque reduction request signal form the TCM to the ECM to cut engine torque increase at N-D, N-R and 1-2-3-4-5 or 5-4-3-2-1.
If the accelerator is depressed rapidly, this control establishes the upper limit value of engine torque and avoids engine flare at 2-3, 3-2, 3-4, 4-3 and 4-2 of a clutch to clutch shift.

AW55-50/SN SERIES
OPERATING MODES

SMOOTH LOCK UP CONTROL

When shifting from the lock up released state to the lock up applied state, current output to pressure control solenoid C is controlled by the TCM. When shifting to the lock up applied state the converter clutch is temporarily set to the half clutched state to reduce the shock.

Half Clutched State: Current output from the TCM to pressure control solenoid C is varied to steadily increase pressure control solenoid C pressure. The lock up pressure gradually rises and while the converter clutch piston is put into half clutched status, the converter clutch piston operating pressure is increased and the coupling is completed smoothly.

Slip Lock Up Control: In the slip mode, the pressure control solenoid C current is controlled by the TCM to put it into the half clutched state. This absorbs engine torque fluctuation and lock up operates at low speed. This raises fuel efficiency for 4th and 5th gears at both low speed and when the accelerator has a low degree of throttle opening.

NISSAN FAIL SAFE MODES

Fail Safe Mode	*Shift Lever Position*	*Actual Gear Range Obtained (1)*	*Shift Solenoid Status*					*Pressure Control Solenoid Status*		
			A	*B*	*C*	*D*	*E*	*A*	*B*	*C*
Fail Safe Mode 1	*D*	*4th*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*
	L	*2nd*	*Off*	*Off*	*On*	*Off*	*Off*	*Off*	*Off*	*Off*
	R	*Reverse*	*Off*	*Off*	*Off*	*Off*	*On*	*Off*	*Off*	*Off*
Fail Safe Mode 2 *Consult-II displays "8"*	*D*	*3rd*	*Off*	*Off*	*On*	*On*	*Off*	*Off*	*Off*	*Off*
	L	*2nd*	*Off*	*Off*	*On*	*Off*	*Off*	*Off*	*Off*	*Off*
	R	*Reverse*	*Off*	*Off*	*On*	*Off*	*On*	*Off*	*Off*	*Off*
Fail Safe Mode 3	*D*	*4th*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*
	L	*2nd*	*Off*	*Off*	*On*	*Off*	*On*	*Off*	*Off*	*Off*
	R	*Reverse*	*Off*	*Off*	*Off*	*Off*	*On*	*Off*	*Off*	*Off*
Fail Safe Mode 4	*D*	*4th*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*
	L	*4th*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*
	R	*Reverse*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*
Fail Safe Mode 5	*D*	*4th*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*
	L	*4th*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*	*Off*
	R	*Reverse*	*Off*	*Off*	*Off*	*Off*	*On*	*Off*	*Off*	*Off*

AW55-50/SN SERIES
OPERATING MODES

NISSAN FAIL SAFE MODES continued

Fail Safe Mode	Shift Lever Position	Actual Gear Range Obtained	Shift Solenoid Status					Pressure Control Solenoid Status		
			A	B	C	D	E	A	B	C
Fail Safe Mode 6	D	4th	Off	Off	Off	Off	Off	Off	Off	Off
	L	2nd	Off	Off	On	Off	Off	Off	Off	Off
	R	Reverse	Off	Off	On	Off	Off	Off	Off	Off
Fail Safe Mode 7	D	4th	On	Off	Off	Off	Off	Off	Off	Off
	L	2nd	On	Off	On	Off	Off	Off	Off	Off
	R	Reverse (2)	On	Off	On	On	Off	Off	Off	Off
Fail Safe Mode 8 Consult-II displays "1"	D	5th	Off	On	Off	Off	Off	Off	Off	Off
	L	2nd (3)	Off	On	On	Off	Off	Off	Off	Off
	R	Reverse	Off	On	Off	Off	On	Off	Off	Off
Fail Safe Mode 9 Consult-II displays "8"	D	4th	Off	Off	Off	On	Off	Off	Off	Off
	L	4th	Off	Off	Off	Off	Off	Off	Off	Off
	R	Reverse	Off	Off	Off	Off	On	Off	Off	Off
Fail Safe Mode 10 Consult-II displays "6"	D	4th	Off	Off	Off	On	Off	Off	Off	Off
	L	3rd	Off	Off	On	On	Off	Off	Off	Off
	R	Reverse (2)	Off	Off	On	On	Off	Off	Off	Off

Note: (1) = CONSULT-II indicates "5th"
(2) = Reverse gear ratio difference (Gear ratio: 3.342)
(3) = 3rd gear ratio difference (Gear ratio: 2.301)

AW55-50/SN SERIES
VALVE BODY and SOLENOID I.D. FOR SERVICE

COMPLAINT: Vehicles equipped with the AW55-50SN series transaxles may exhibit various erratic shifting problems, bind up conditions and/or complete transmission failure on initial road test after a valve body or solenoid repair or replacement.

CAUSE: The cause of any one or combination of the above complaints may be due to mis matching the valve body, using an incorrect solenoid, cross connecting internal harness connectors to the wrong solenoid or mis positioning the SLS/SLT solenoid retaining bracket.

CORRECTION: To properly identify your valve body assembly you must first check the casting next to the S4 solenoid for the presence of a capital letter ***A***, ***B*** or ***C***.
Valve bodies that have ***no*** letter or show the letter ***A*** are early design assemblies, first and second generation. These valve bodies will also have the SLT and SLS solenoid connectors facing up. (Figure 1)
Valve bodies with either letter ***B*** or ***C*** are late design assemblies, third and fourth generation and will have the redesigned 3rd version SLT and SLS solenoids with the connectors facing down. The S1 solenoid was also changed at this time with the connector relocated to the left and the mounting bracket to the right to allow clearance for the SLS solenoid connector now facing downward. These changes also made a new internal harness necessary so that the wires will reach the relocated solenoid connectors. (Figure 2)

The S1 through S5 solenoids are all ON/OFF type solenoids that typically measure 11-16 ohms resistance. The S1 and S4 solenoids are normally open while the S3 and S5 solenoids are normally closed for all versions. The ***S2 solenoid*** however, may be either normally open or normally closed dependant upon the vehicle manufacturer.
A GM, Saab or Saturn valve body will use a ***normally open*** S2 solenoid that can be identified by the ***raised domed top***. (Figure 3)
The Nissan/Volvo valve bodies use a ***normally closed*** S2 solenoid that can be identified by the ***flat top with 4 raised lines*** radiating from the hole in the center of the solenoid. (Figure 4)
Nissan and Volvo vehicles have the S2 solenoid firing sequence opposite to the GM, Saab, Saturn vehicles. (Figure 5)
The SLU solenoid, also referred to as the lock up or TCC solenoid, is located at the top of the valve body with a black connector turned upwards. This is a PWM type solenoid that typically measures 5.0-5.6 ohms resistance and has remained the same through all versions.
The SLS (Shift Pressure Solenoid) and the SLT (Line Pressure Solenoid) have been redesigned twice for a total of 3 versions of each solenoid. Both of these solenoids are of the PWM type and will typically measure 5.0-5.6 ohms resistance.
The SLS and SLT solenoids are retained to the valve body by the same retaining bracket. There are three different versions of this bracket. The original version proved to be a bit weak so as a result the second version is basically the same as the first design in appearance but has more metal added for extra strength and now measures approximately 0.065" in thickness. Both the 1st and 2nd design brackets are used to retain the first version shorter design SLS and SLT solenoids to the body. (Figure 6)

AW55-50/SN SERIES
VALVE BODY and SOLENOID I.D. FOR SERVICE

CORRECTION ***continued:*** The first version SLS and SLT solenoids have their electrical connectors turned up with the SLS connector being green and the SLT connector being blue. The first version SLS and SLT solenoids can be identified by the round hole in the valve portion of the solenoid that is next to the can portion that contains the winding.
The second design SLS and SLT solenoids are longer than the first design and still have the electrical connectors facing upwards.
The second design solenoids require the 3rd design retaining bracket which can be identified by a protrusion at the bottom left that looks a bit like a backwards "L". (Figure 6)
The third design SLS and SLT solenoids are the same length as the second design solenoids and use the same 3rd design retaining bracket, but the electrical connectors are now facing downward. The third design SLS and SLT solenoids are used in the ***B*** and ***C*** (3rd and 4th generation) valve bodies only. (Figure 7)
Using an incorrect retaining bracket or rotating the 1st or 2nd design retaining bracket 180 degrees will position the solenoids so that the passages are misaligned or blocked, rendering the solenoids useless causing harsh engagements and shifting. (Figures 8 and 9) This is much more difficult to do with the 3rd design bracket, but is possible with some extra effort.

It is not uncommon for the internal wire connectors to be cross connected on to an incorrect solenoid. This seems to happen most often with the S1 and S3 solenoids. The internal harness connector colors do not necessarily match the solenoid connector colors. It is best to note wire colors and/or tag the internal harness connectors at their correct location upon initial dis assembly for future reference. If this is not possible then we would recommended to use the wire color and refer to the chart provided. (Figure 10)

SERVICE INFORMATION:

INTERCHANGE: Late valve bodies can be used in earlier units provided a new internal electrical harness is installed. Installation of an early valve body in place of a later design valve body is not recommended.

This transaxle may also be referred to as:
AF23-5 or an ***AF33-5*** when found in GM and Saturn built vehicles dependant upon relative torque capacity.
RE5F22A when found in Nissan or Infiniti manufactured vehicles.
FA57 when found in Saab-Scania vehicles.

A very special "Thank You!" to Tim LaCerra and Jeff Parlee from VBX for sharing their knowledge and findings with us. The compilation of this information would not have been possible without their research efforts and continuing dedication to our industry.

AW55-50/SN SERIES
VALVE BODY and SOLENOID I.D. FOR SERVICE

EARLY VALVE BODY I.D.

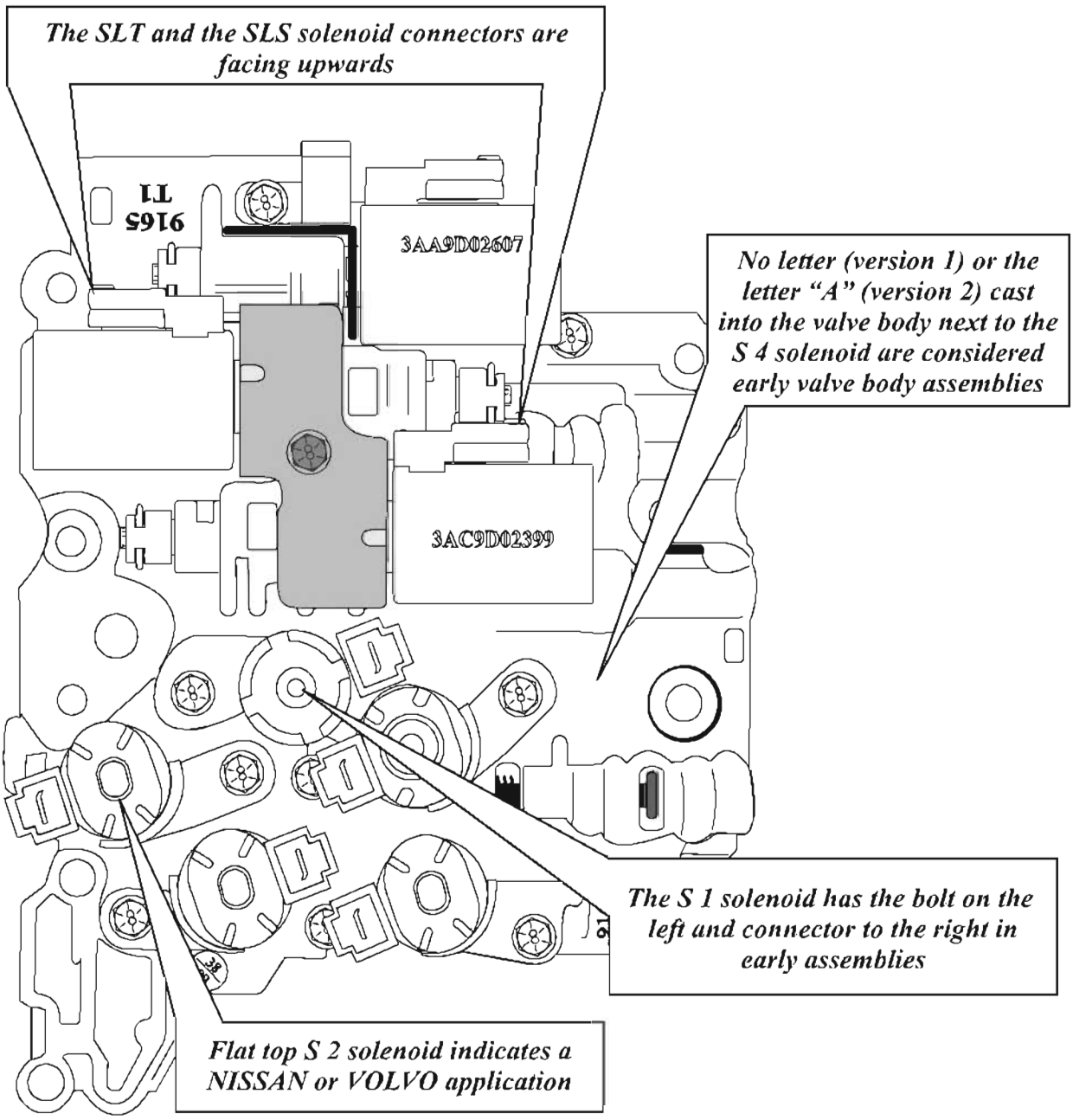


Figure 1

AW55-50/SN SERIES
VALVE BODY and SOLENOID I.D. FOR SERVICE

LATE VALVE BODY I.D.

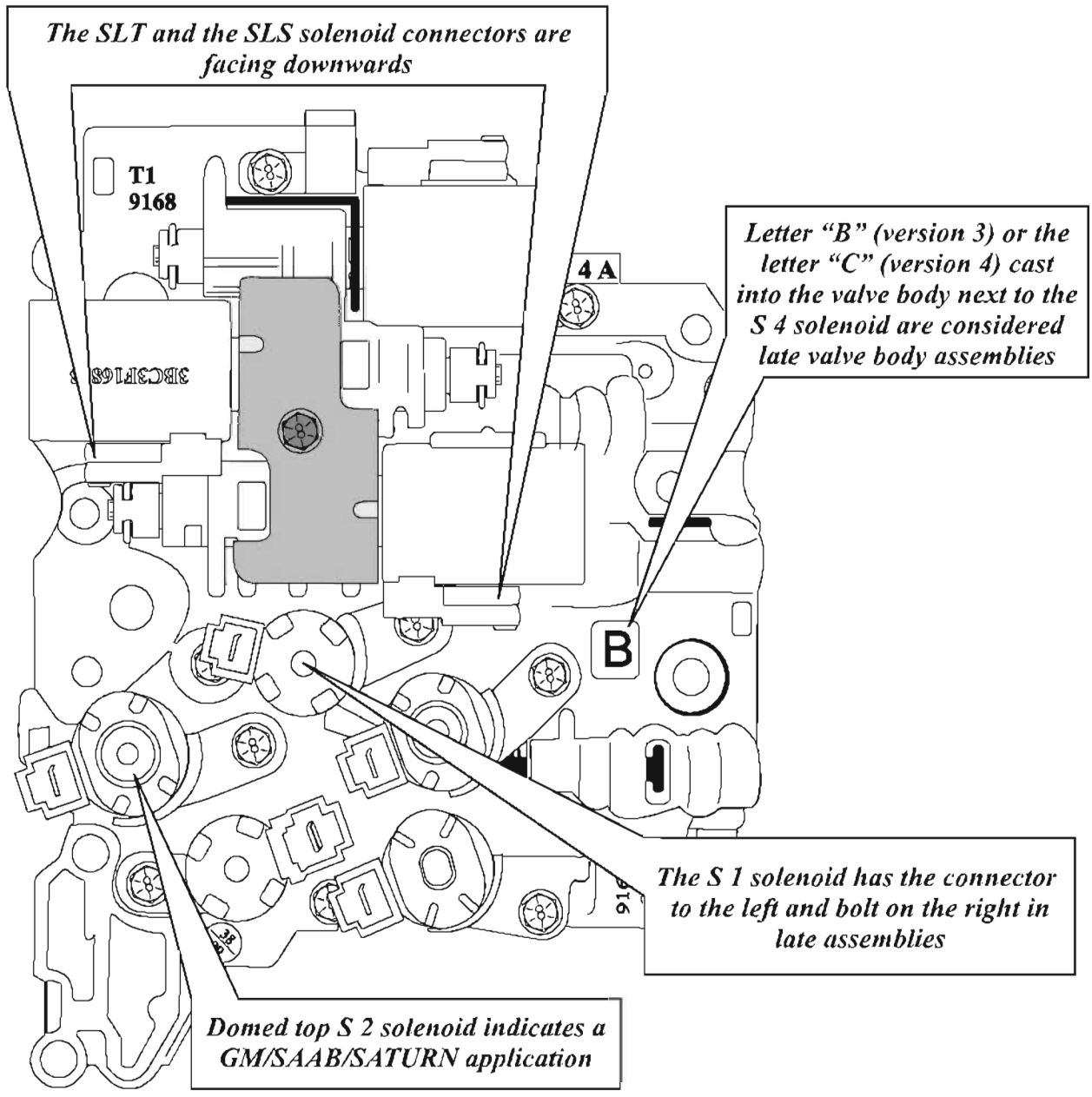


Figure 2

AW55-50/SN SERIES
VALVE BODY and SOLENOID I.D. FOR SERVICE

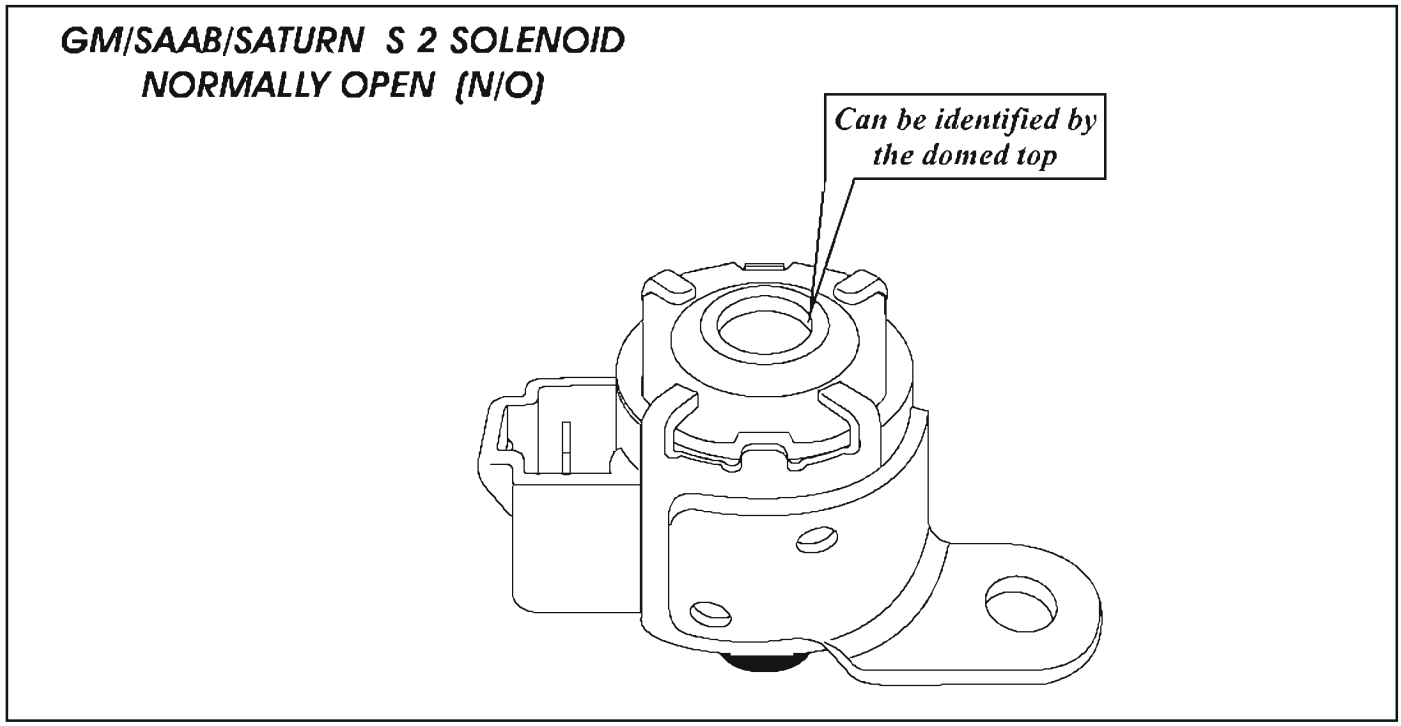


Figure 3

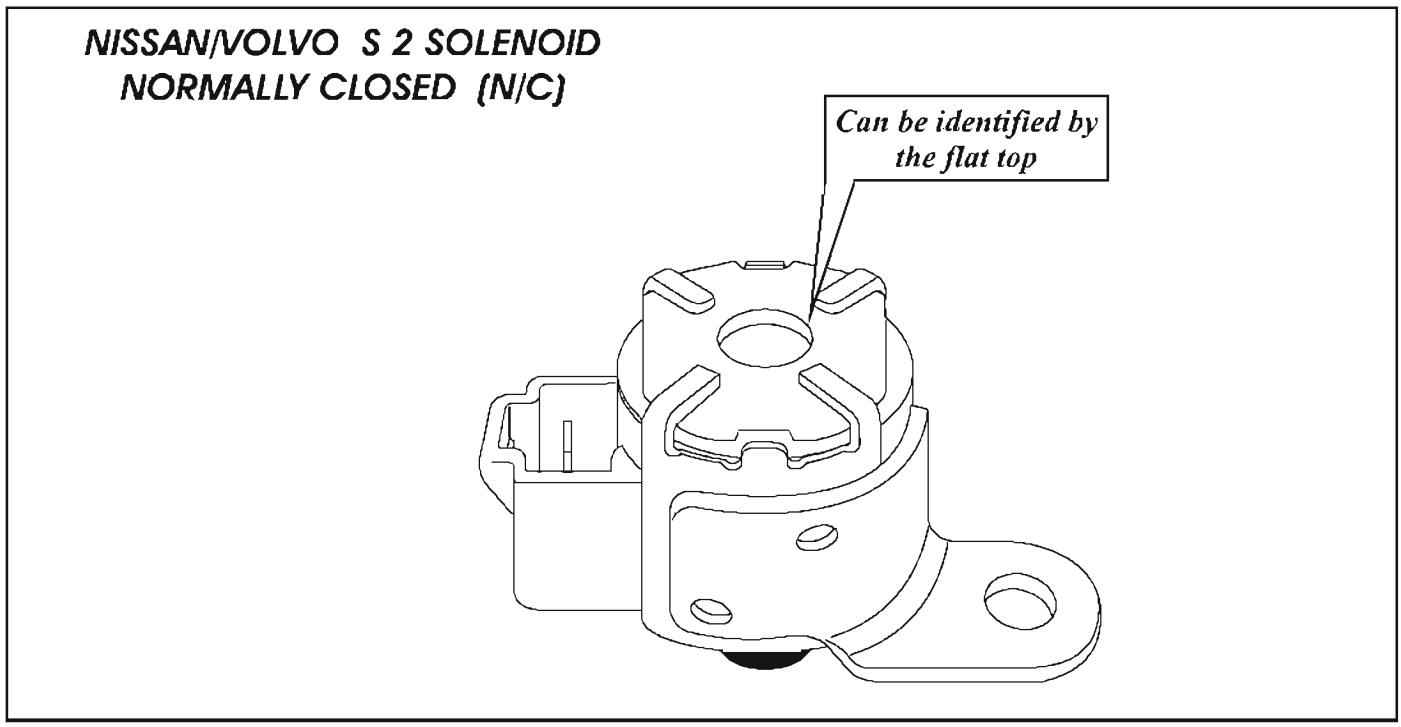


Figure 4

AW55-50/SN SERIES
VALVE BODY and SOLENOID I.D. FOR SERVICE

SHIFT SOLENOID SEQUENCE CHART

GM - SAAB - SATURN

RANGE	GEAR	(S 1)	(S 2)	(S 3)	(S 4)	(S 5)
Park	P	Off	Off	Off	Off	Off
Reverse	R	Off	Off	On	Off	On
Neutral	N	Off	Off	Off	Off	Off
D	1	On	Off	On	Off	Off
	2	Off	On	On	Off	Off
	3	Off	On	On	On	Off
	4	Off	On	Off	On	Off
	5	Off	Off	Off	On	Off

NISSAN - VOLVO

RANGE	GEAR	(A) (S 1)	(B) (S 2)	(C) (S 3)	(D) (S 4)	(E) (S 5)
Park	P	Off	Off	Off	Off	Off
Reverse	R	Off	Off	On	Off	On
Neutral	N	Off	Off	Off	Off	Off
D	1	On	On	On	Off	Off
	2	Off	Off	On	Off	Off
	3	Off	Off	On	On	Off
	4	Off	Off	Off	On	Off
	5	Off	On	Off	On	Off

Figure 5

AW55-50/SN SERIES
VALVE BODY and SOLENOID I.D. FOR SERVICE

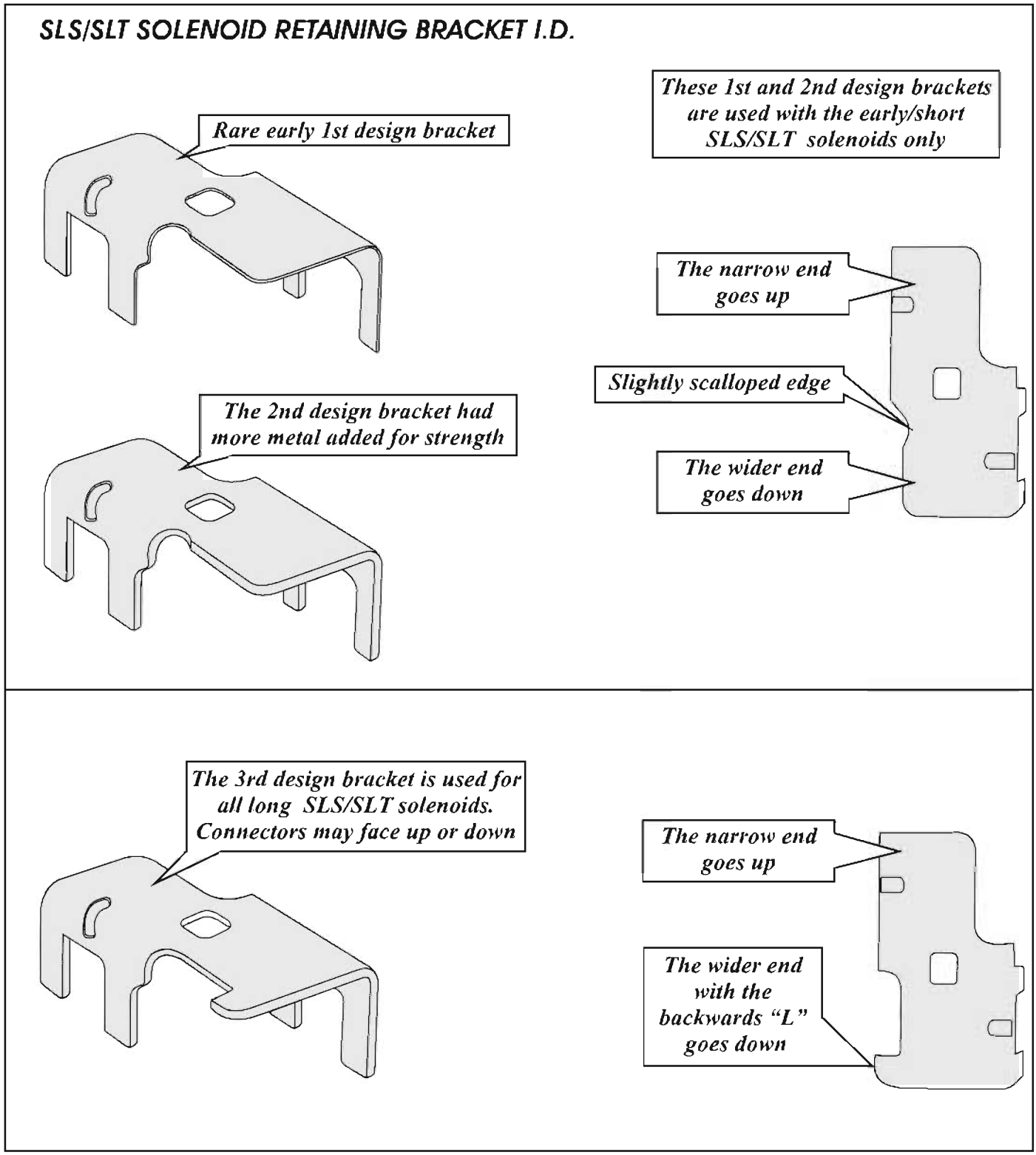


Figure 6

AW55-50/SN SERIES
VALVE BODY and SOLENOID I.D. FOR SERVICE

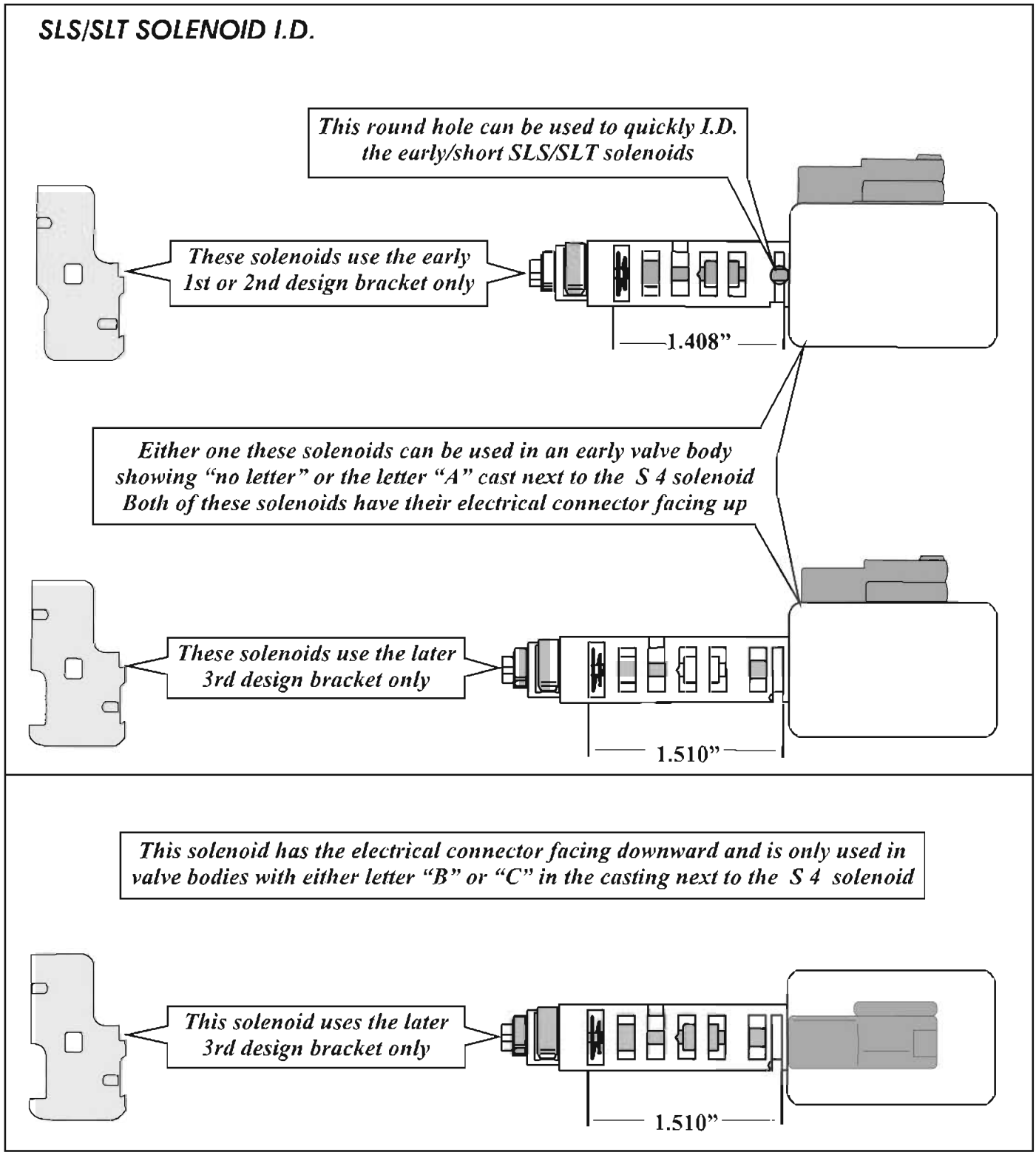


Figure 7

AW55-50/SN SERIES
VALVE BODY and SOLENOID I.D. FOR SERVICE

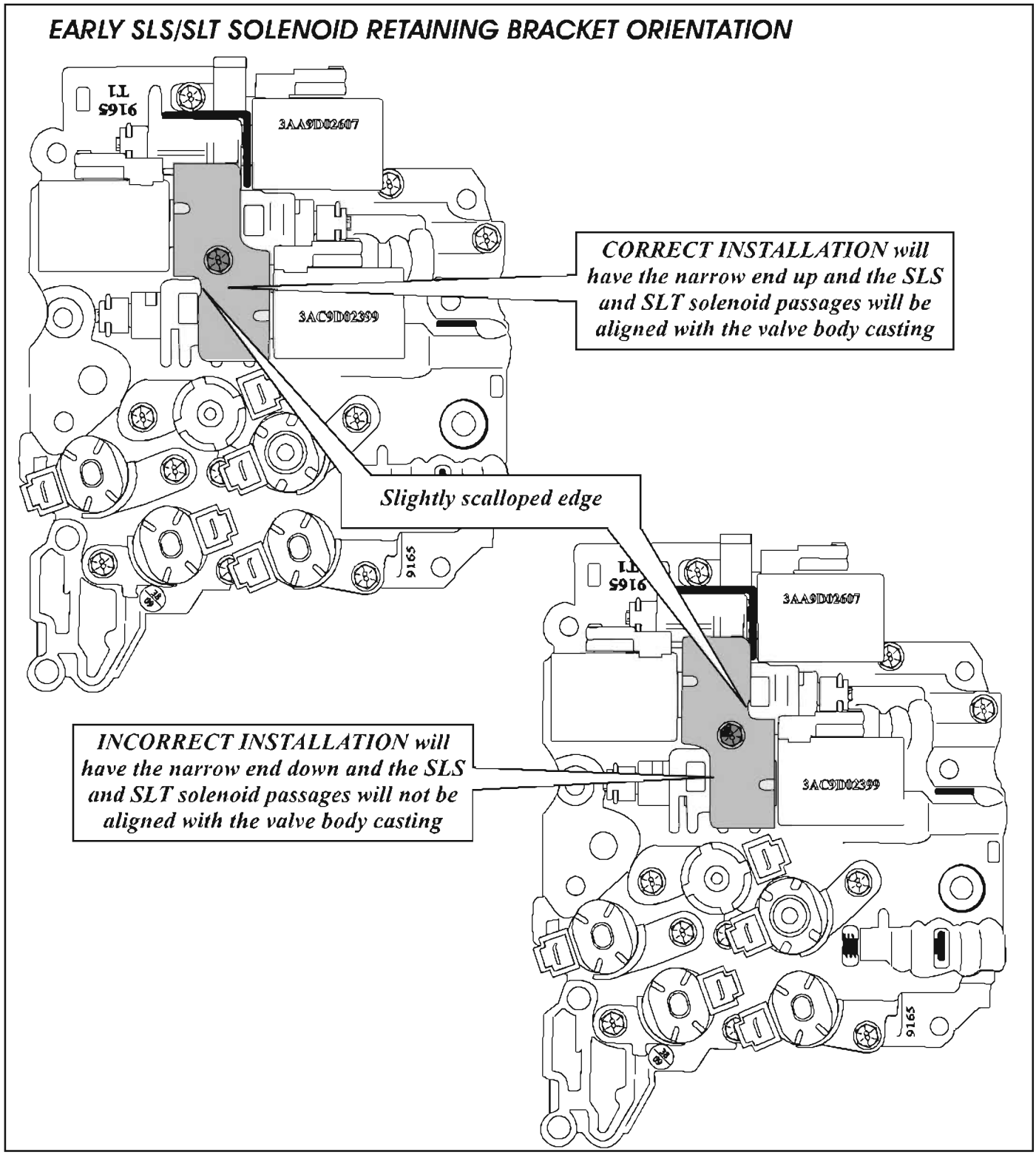


Figure 8

AW55-50/SN SERIES
VALVE BODY and SOLENOID I.D. FOR SERVICE

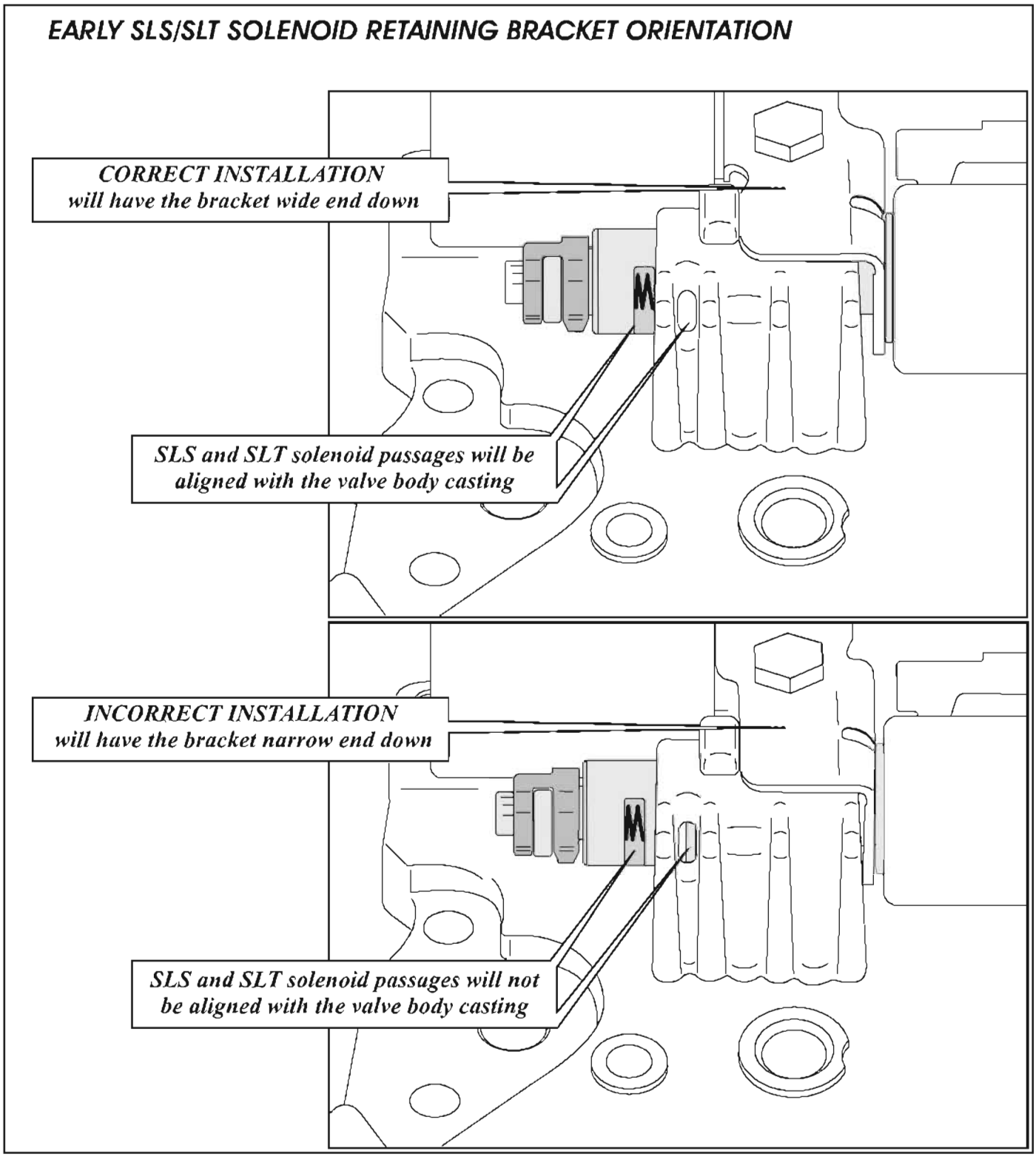
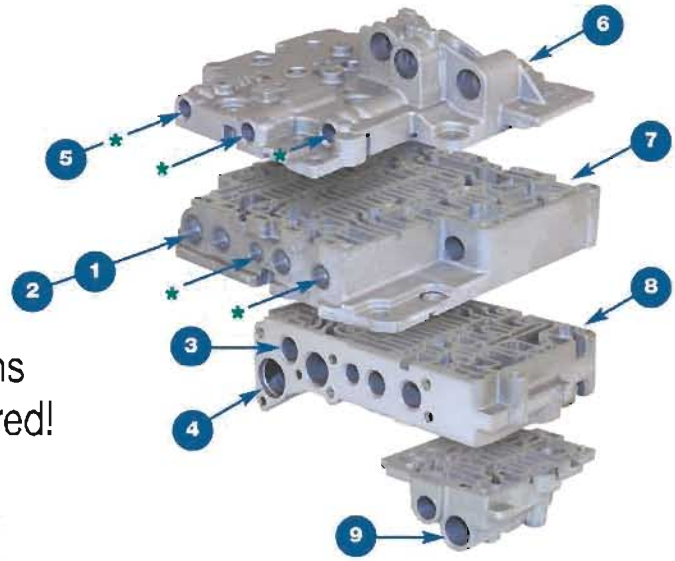


Figure 9

Sonnax Delivers 9 Solutions for Aisin Warner 55-50SN



You asked us to help you solve these problems with the AW 55-50SN valve body & we delivered!

PROBLEM	SOLUTION	
• Delayed engagements • Harsh reverse • TCC slip or engine stall	1	Oversized Pressure Regulator Valve & Boost Valve Kit **59947-12K** F-59947-TL12 Tool Kit & VB-FIX Fixture Required
• Slip in reverse • Poor upshift	2	Main Boost Valve & Sleeve Kit **59947-07K**
• Overheading of fluid, bushings and converter • Harsh reverse engagement	3	Secondary Regulator Valve & Spring Kit **59947-16K** F-59947-TL16 Tool Kit & VB-FIX Fixture Required
• Delayed forward engagements • Low line, lube and converter pressure	4	LPC Accumulator Piston Kit **59947-LPC**
• Delayed forward engagements • 2-3 upshift flare • Low SLT pressure	5	O-Ringed End Plug Kit **59947-21K**
• TCC slip or RPM surge • Low SLT pressure • Delayed engagements	6	Solenoid Modulator Valve Capsule Kit **59947-09K**
• No TCC apply • Loss of solenoid modulator oil pressure	7	Solenoid Relay Valve & Sleeve Kit **59947-05K**
• No TCC apply • TCC cycle or RPM fluctuation	8	Lockup Relay Control Valve & Sleeve Kit **59947-01K**
• Excess TCC slippage • Harsh downshifts or converter does not release	9	Lockup Control Valve & Sleeve Kit **59947-03K**

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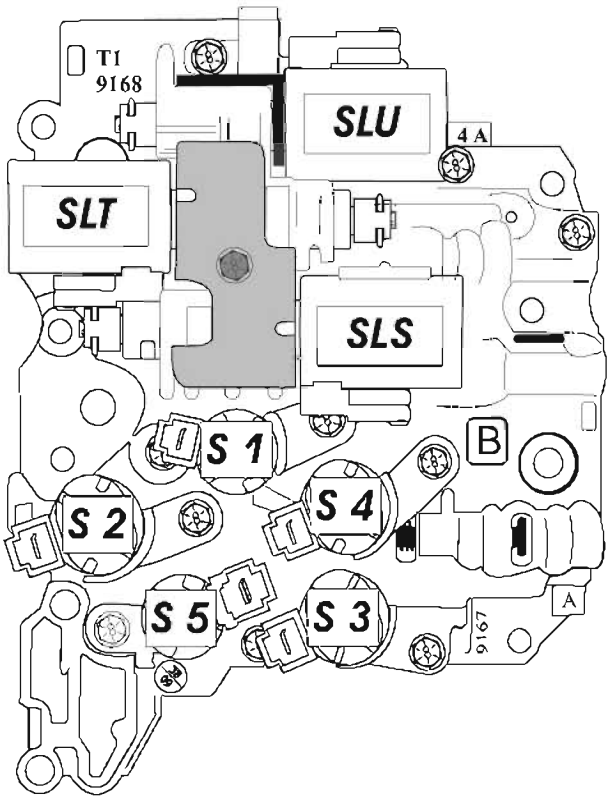
AW55-50/SN SERIES
VALVE BODY and SOLENOID I.D. FOR SERVICE

SOLENOID WIRE COLOR CHART

SOLENOID I.D.	SOLENOID CONNECTOR COLOR	WIRE COLOR
SLU	BLACK	1 GREEN 1 BROWN
SLT	BLUE	1 GREEN 1 GRAY
SLS	GREEN	1 BLUE 1 RED
S 1	BLACK	WHITE
S 2	BLACK or GRAY	BLACK
S 3	GRAY	YELLOW
S 4	BLUE or GREEN	PURPLE or RED
S 5	GREEN or RED or GRAY	BLUE or BLACK

SOLENOID LOCATION



For Nissan Units:

PCA = SLT
PCB = SLS
PCC = SLU
A = S 1
B = S 2
C = S 3
D = S 4
E = S 5

Figure 10

Get MORE from Rostra.

More performance reliability options

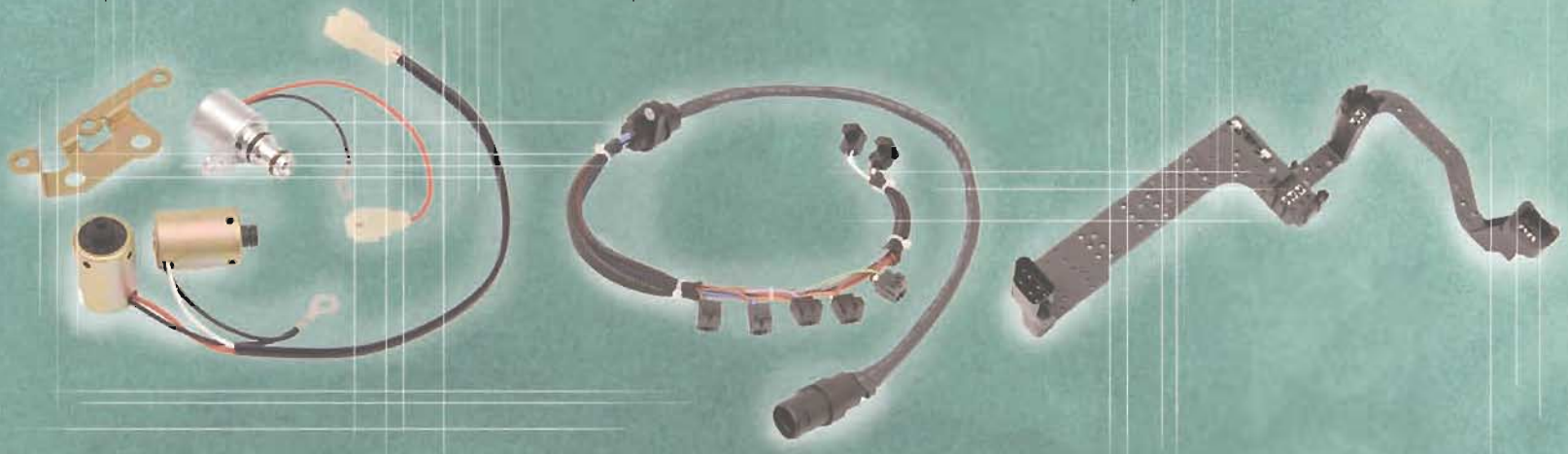
With the most complete, innovative line of aftermarket solenoids, sensors, and harnesses for foreign and domestic applications, we give you more options from a single source. Our exclusive OEM mating connectors speed installation and offer a more reliable, robust connection. Every part is manufactured, calibrated, and fully tested in a ISO9001/QS9000 certified facility, so you get more reliable performance, from every part, every time.

Rostra Precision Controls, Inc.

- Toyota A541E Shift & Lock-up Solenoid Kit. (52-9022)
- OEM Style Mating Connectors

- Volkswagen Universal Internal Wire Harness. (350-0070)
- 096(01M)/097(01N)/098(01P)

- 1998-on Ford 4R70W Internal Hard Wire Harness. (350-0060)



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TOYOTA
U1 50E, U1 51 E, U1 51 F
2002-On

- **TF167002B**, OHK without Pistons
- **TF167002BP**, OHK with Pistons
- **TF167004BP**, Master without Steels Kit
- **TF167006BP**, Master with Steels Kit
- **We also offer pistons individually**

MITSUBISHI
F4A51
1996-On

- **TF41002B**, 4 Speed
- **T41004B**, Master Less Steels Kit
- **T41006B**, Master Kit with Steels Kit

JAGUAR, MAZDA, LAND ROVER, VW
JF506E/5F31J
2002-On

REBUILDING KITS

- **8465**, OHK for Mazda
- **8466**, OHK for Volkswagen
- **8467**, OHK for Land Rover and Jaguar
- **8465B**, Master Less Steels for Mazda
- **8466B**, Master Less Steels for Volkswagen
- **8467B**, Master Less Steels for Jaguar Only
- **8467BA**, Master Less Steels for Land Rover Only
- **8465M**, Master with Steels for Mazda
- **8466M**, Master with Steels for Volkswagen
- **8667M**, Master with Steels for Jaguar
- **8467MA**, Master with Steels for Land Rover

COMPONENTS

- **183555A**, OE Reverse Piston, 2002-On
- **D183420A**, OE Solenoid Pack (9 Pcs.) for Jaguar, VW and Land Rover, 2002-On
- **D183420B**, OE Solenoid Pack (9 Pcs.) for Mazda, 2002-On
- **D183436A*** OE Sensor, 2002-On

*** We strongly recommend the replacement of all 3 internal speed sensors at the time of overhaul because these parts can only be serviced when the transmission is removed from the vehicle and on the bench.**

MERCEDES BENZ
722.6, W5A580, 5 Speed with Lock-Up
1997-On

- **T78002A**, Overhaul Kit without Pistons
- **T78004A**, Master Less Steels Kit
- **T78006A**, Master with Steels Kit
- **31431**, Bushing, Pump Body (1.690"ID) 1997-On
- Included in Our Kits is the New Design Vespel® Style Rings and the Bulk Head Electrical Connector O-Rings
- Ask for our Shift Lock (Parking Pawl Bellows)

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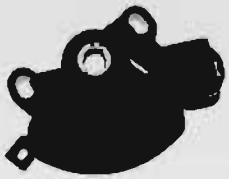
Electronic Solutions

LATE KM SOLENOID
K41954
Fits: 98-08 F4A41/42/51, F5A51, A5HF1, R4A51, R5A51, V4A51, V5A51

LATE KM VFS SOLENOID
T41435A
Fits: 05 up F4A41/42/4B/51, F5A51, A5HF1



KM INHIBITOR SWITCH
K42954 SW
Fits: 98-08 F4A41/42/51, R4A51, V4A51
Also known as PRNDL or Neutral Safety Switch

LATE KM OUTPUT PULSE GENERATOR
T41436
Fits: 98-08 F4A41/42/51, F5A51

LATE KM INPUT PULSE GENERATOR
T41438
Fits: 98-08 F4A41/42/51, F5A51

EARLY KM PULSE GENERATOR
T42436G
Fits: 92-98 F4A23, KM-178

EARLY KM PULSE GENERATOR
T42436LB
Fits: 96-02 A4AF1/F2, A4BF1/F2, F4A32

EARLY KM PULSE GENERATOR
T42436M
Fits: 95-98 F4A33

EARLY KM PULSE GENERATOR
T42436P
Fits: 90-98 F4A21/22, KM-175/176/177

KM HARNESS
K41954 HE
Fits: 96-04 F4A41/42/51
For Four Speed Units

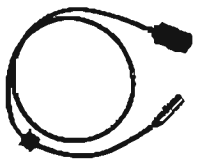
KM HARNESS
K41954 HL
Fits: 00-04 F5A51
For Five Speed Units

KM HARNESS
T41446AC
Fits: 05 up F4A41/42/51, F4A4B
For Four Speed Units

KM HARNESS
T41446CA
Fits: 05 up F5A51, A5HF1
For Five Speed Units

KM TEMPERATURE SENSOR
41437A
Fits: 96-04 F4A41/42/51, 00-04 F5A51

KM TEMPERATURE SENSOR
42437L
Fits: 93-02 A4AF1/F2, A4BF1/F2, F4A32



KM TEMPERATURE SENSOR
42437J
Fits: 85-98 F4A21/22, KM-175/176

KM TEMPERATURE SENSOR
42437M
Fits: 95-98 F4A33

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