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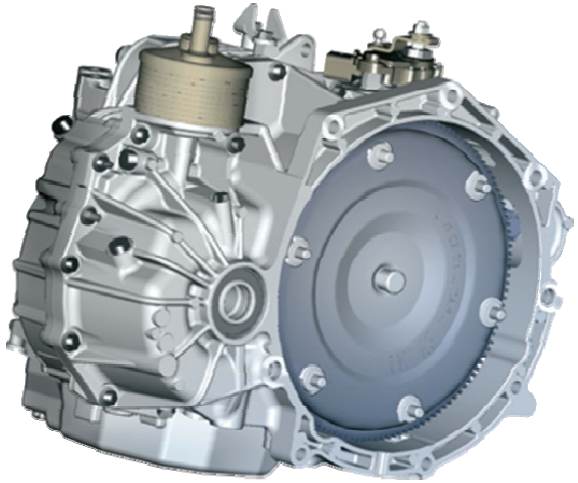
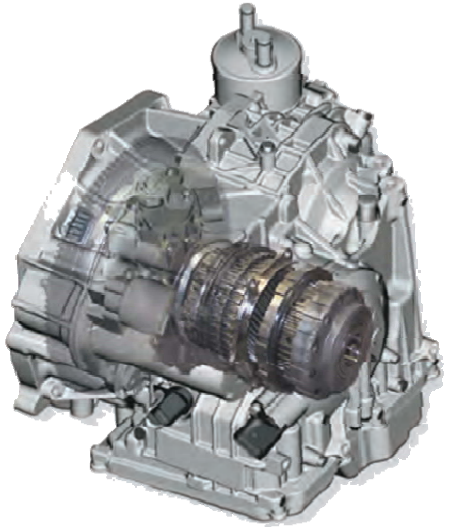
AISIN
Geared up for the future

Aisin front wheel drive
AF 40 TF 80



Aisin front wheel drive
TF 60
09G / K/M



BLUEREACH
Automation & Control Ltd

AutoLibrary

AISIN

| Aisin Warner | Model Designator | |
|---|---|---|
| TF60SN | 09G | VW |
| | 09M | |
| | 09K | |
| | 6F21WA | BMW Mini |
| TF81SC | | |
| | AF21 | Ford |
| | AW6A-EL | Mazda |
| TF80SC | AM6 | Volvo |
| | AF40 | GM/Opel |
| | TF-80 | Peugeot |
| | AF40/6 | Saab |
| | TF-80 | Land Rover |

## 09G & 09K Identification

| Vehicle | Transmission Code | TC Stamp | T/C Part No. | Valve Body No. |
|---|---|---|---|---|
| Polo | JUF, JGG | | 09G 323 571 C | 09G 325 039 A |
| Golf | JUG, KGH, HFR, HTM | | 09G 323 571 C | 09G 325 039 A |
| Golf | JTY, KGJ, HFS, HTN | QJAA | 09G 323 571 J | 09G 325 039 A |
| Golf | JUH, KGK, HTF, HTP, HXJ | QHAA | 09G 323 571 G | 09G 325 039 A |
| Golf | KBV, KGL | | 09G 323 571 A | 09G 325 039 A |
| Golf | HRM, HRN | QCAA | 09G 323 571 D | 09G 325 039 A |
| Jetta | HFS, HTN, JTY | QJAA | 09G 323 571 J | 09G 325 039 A |
| Jetta | HTF, HTP, JUH, JTC | QHAA | 09G 323 571 G | 09G 325 039 A |
| Passat | KGU | | 09G 323 571 A | 09G 325 039 A |
| Touran | HLP, JTV | | 09G 323 571 C | 09G 325 039 A |
| Transporter | HGD, JAD, JUL, KFF | TDCA | 09K 323 571 C | 09K 325 039 A |
| Transporter | HGC, JUK, KFH | TGAA | 09K 323 571 A | 09K 325 039 A |
| Transporter | HGE, JAC, JUM, KFG | TGCA | 09K 323 571 D | 09K 325 039 A |

## 09D Identification

| Vehicle | Transmission Code | TC Stamp | T/C Part No. | Valve Body No. |
|---|---|---|---|---|
| Touareg | HAM | | 09D 323 571 M | 09D 325 039 A |
| Touareg | JBR | | 09D 323 571 M | 09D 325 039 B |
| Touareg | HAU | | 09D 323 571 T | 09D 325 039 A |
| Touareg | HZV | | 09D 323 571 T | 09D 325 039 B |
| Touareg | HAQ | | 09D 323 571 | 09D 325 039 |
| Touareg | HZX | | 09D 323 571 E | 09D 325 039 C |
| Touareg | HAN | | 09D 323 571 B | 09D 325 039 A |
| Touareg | HZY | | 09D 323 571 B | 09D 325 039 B |
| Touareg | HAR | | 09D 323 571 Q | 09D 325 039 |
| Touareg | HZU | | 09D 323 571 F | 09D 325 039 C |
| Touareg | GVJ | | 09D 323 571 A | 09D 325 039 |
| Touareg | HZW | | 09D 323 571 C | 09D 325 039 B |
| Touareg | HPH | | 09D 323 571 D | 09D 325 039 B |
| Touareg | HXG | | 09D 323 571 J | 09D 325 039 C |

## 09D Identification

| Vehicle | Transmission Code | TC Stamp | T/C Part No. | Valve Body No. |
|---|---|---|---|---|
| Audi Q7 | HXG | | 09D 323 572 G | 09D 325 039 C |
| Audi Q7 | JXX | | 09D 323 572 G | 09D 325 039 F |
| Audi Q7 | KQZ | | 09D 323 572 P | 09D 325 039 K |
| Audi Q7 | KMB | | 09D 323 572 P | 09D 325 039 K |
| Audi Q7 | JVH | | 09D 323 572 J | 09D 325 039 F |
| Audi Q7 | KME | | 09D 323 572 J | 09D 325 039 K |
| Audi Q7 | HPH | | 09D 323 572 D | 09D 325 039 B |
| Audi Q7 | JXS | | 09D 323 572 D | 09D 325 039 G |
| Audi Q7 | KMF | | 09D 323 572 D | 09D 325 039 D |

## 09D Transmission Identification

| Trans Code | Engine | Kw | Date from | Date to |
|---|---|---|---|---|
| EXL | 3.2 V6 | 162 | 05.02 | 05.03 |
| EXN | 2.5 R5 TDI | 128 | 07.02 | 05.03 |
| EXQ | 4.9 V10 TDI | 230 | 07.02 | 05.03 |
| EXP | 3.2 V6 | 177 | 07.02 | 08.03 |
| GLK | 3.2 V6 | 177 | 07.02 | 02.04 |
| HAP | 3.2 V6 | 177 | 01.04 | |
| EXR | 6.0 W12 | 309 | 08.02 | |
| FCS | 4.2 V8 | 228 | 07.02 | 05.03 |
| GLC | 2.5 V6 | 128 | 07.02 | 08.03 |
| GLD | 4.9 V10 TDI | 230 | 07.02 | 08.03 |
| HAO | 4.9 V10 TDI | 230 | 11.04 | |
| HZX | 4.9 V10 TDI | 230 | 10.05 | |
| GLE | 6.1 | 309 & 331 | 07.02 | |
| GLH | 4.2 V8 | 228 | 07.02 | |
| GLJ | 3.2 V6 | 162 | 07.02 | |

## 09D Transmission Identification

| Trans Code | Engine | Kw | Date from | Date to |
|---|---|---|---|---|
| GTK | 4.9 V10 TDI | 230 | 01.03 | |
| GZH | 2.5 R5 TDI | 120 & 128 | 09.03 | |
| GVJ | 3.0 V6 | 165 | 11.04 | |
| HAM | 3.2 V6 | 162 & 177 | 01.04 | |
| HAN | 2.5 TDI | 120 & 128 | 08.03 | |
| HAR | 6.0 W12 | 331 | 08.04 | |
| HAU | 4.2 V8 | 228 | 01.04 | |
| HPG | 3.6 VR6 FSI | 206 | 08.05 | 11.05 |
| HPH | 4.2 V8 FSI | 257 | 11.05 | |
| HXG | 3.0 V6 TDI | 165 | 11.05 | |
| HZU | 6.0 W12 | 331 | 11.05 | |
| HZV | 4.2 V8 | 228 | 11.05 | |
| HZW | 3.6 VR6 | 206 | 11.05 | |
| HZY | 2.5 R5 TDI | 120 &128 | 11.05 | |
| JBR | 3.2 VR6 | 177 | 11.05 | |

AISIN

The transmission is adapted for use with different engines and vehicles by varying the following :

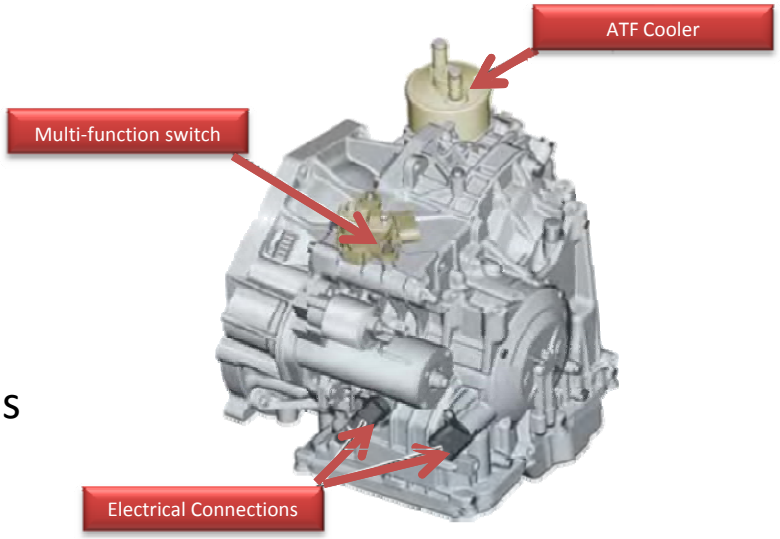
- Number of frictions for brakes and clutches
- The adaptation of pressure applied to the brakes and clutches
- By use of 4 planetary gear pairs, up rated from 3
- Reinforcement of housing components
- By change in final drive and intermediate drive ratio
- Size of the torque converter
- Change of torque converter characteristic curve and torque boost
- The Selector lever
- The ignition key removal lock

# AISIN AW CO., LTD.

The transmission sets new standards for dynamics and efficiency as a conventional front wheel drive unit.

Both the front wheel drive versions and the rear wheel drive 09D use the Lepelletier arrangement. They both combine a simple planetary gear set with a Ravigneaux arrangement.

This makes it vehicle specific.

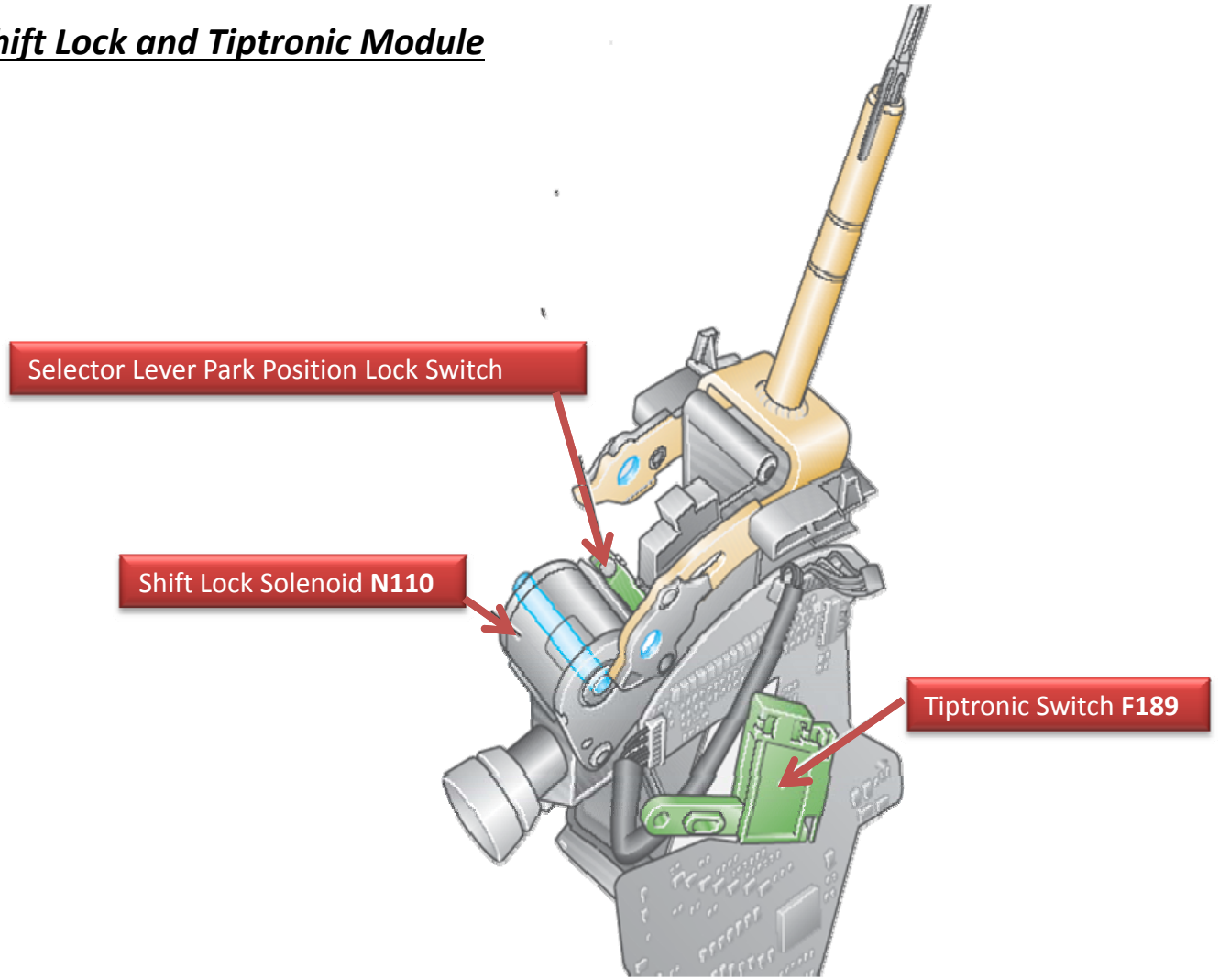



- Low weight
- High transmission ratio spread
- Compact transmission dimensions
- High speed of gear shifting
- High level of shifting comfort

## ***Technical Data***

| | |
|---|---|
| Manufacturer | AISIN Co., Ltd. Japan |
| Transmission Type | Electro-hydraulically controlled 6 speed planet gear with hydrodynamic torque converter and traction controlled torque converter lock-up clutch for transverse FWD installation |
| Control | Hydraulic control module in oil sump with electronic control module. Dynamic shifting program DSP with separate Sports program and Tiptronic mode for manual gear change |
| Torque Performance | Up to 332 Lbs-ft (450Nm) depending on version |
| Intermediate Drive | Number of teeth for codes GSY/GJZ = 52/49 (1.061) |
| Final Drive GSY | Number of teeth = 61/15 (4.067) |
| Final Drive GJZ | Number of teeth = 58/15 (3.867) |
| ATF Specification | G 052 025 A2 |
| Filling Amount | 7.4 Quarts (7.0 Litres) Initial fill |
| Weight | Approx. 182 Lbs (82.5Kg) |
| Length | Approx. 13.8 ins (350mm) |
| Spread | 6.05 |

## ***Shift Lock and Tiptronic Module***



## ***Shifting Elements***

The planetary gear set is a Lepelletier design. The engine torque first drives a simple planetary gear set. From the simple planetary gear set, it is transferred to a Ravigneaux double planetary gear set.

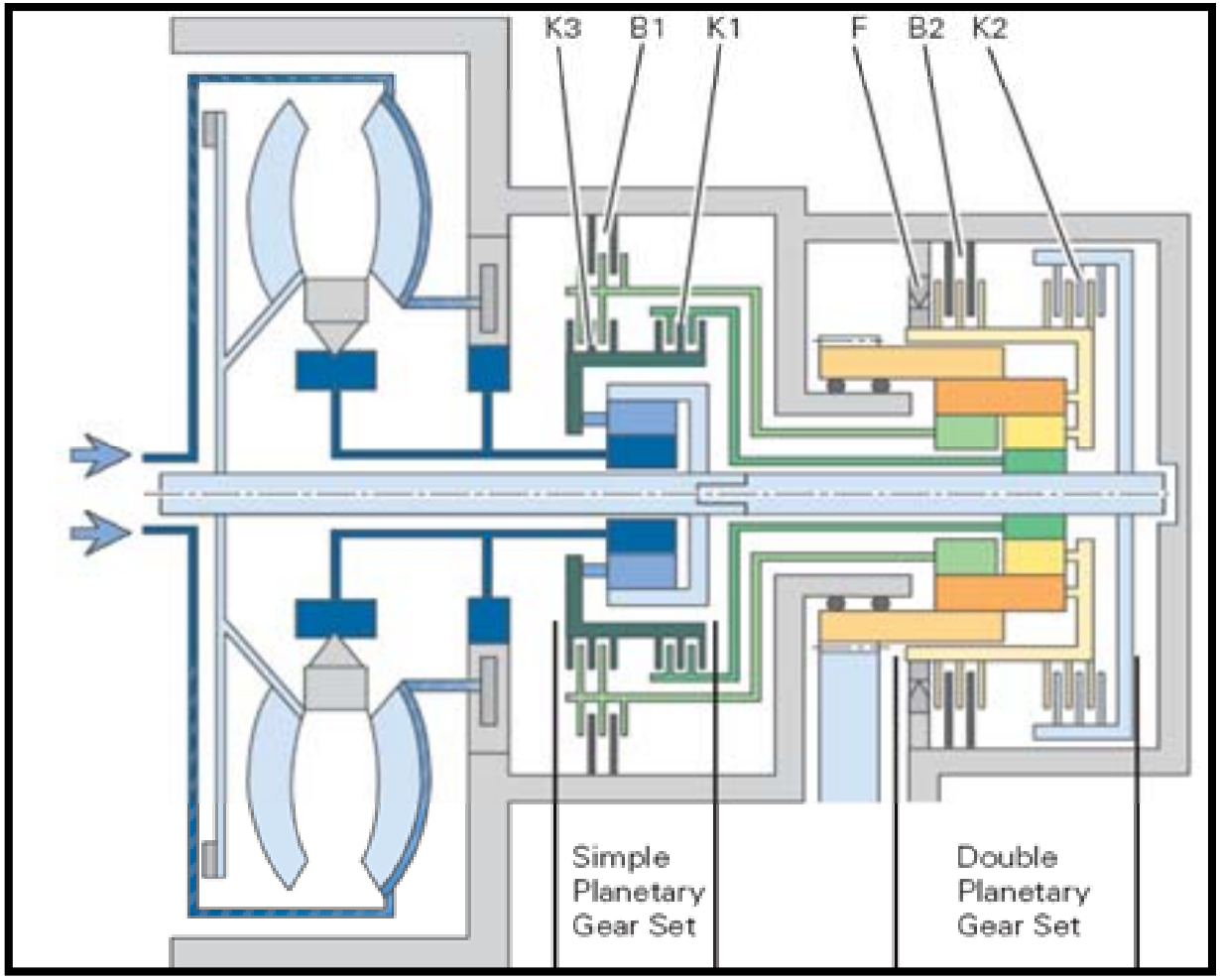
The K1 and K3 clutches along with the B1 brake are located on the simple planetary gear set. The number of planetary gears depends on the transmission's torque transfer.

The K2 clutch and the B2 brake along with the freewheel F, are located on the double planetary gear set.

The clutches achieve a control behaviour that is independent of engine speed through their dynamic pressure equalization. The K1,K2, and K3 clutches pass the engine torque into the planetary gear. The B1 and B2 brakes along with the Freewheel F support the engine torque at the transmission housing. All clutches and brakes are indirectly controlled by the electrical pressure control valves.

Freewheel F is a mechanical shifting element. It is arranged in parallel with the B2 brake.

## ***Shifting Elements***



## ***Transmission Design***

K – Multi-disc Clutch

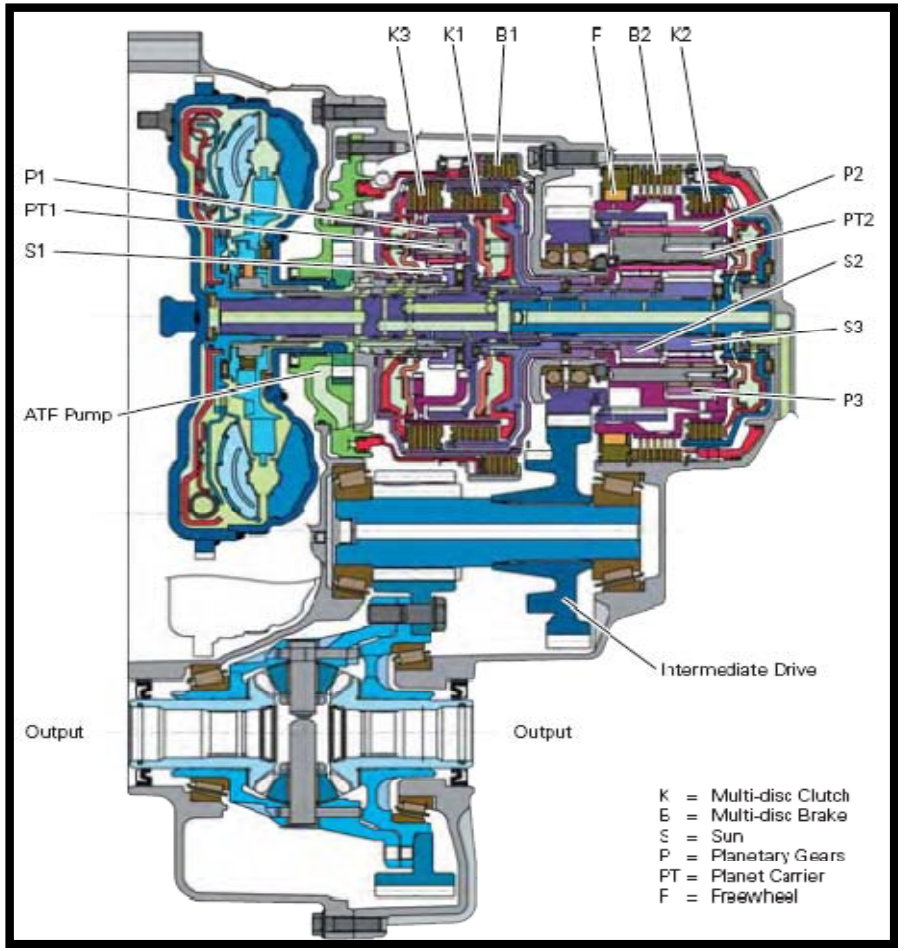
B – Multi-disc Brake

S – Sun Wheel

P – Planetary Gears

PT – Planetary Carrier

F – Freewheel Clutch



## ***Transmission Schematic***

K – Multi-disc Clutch

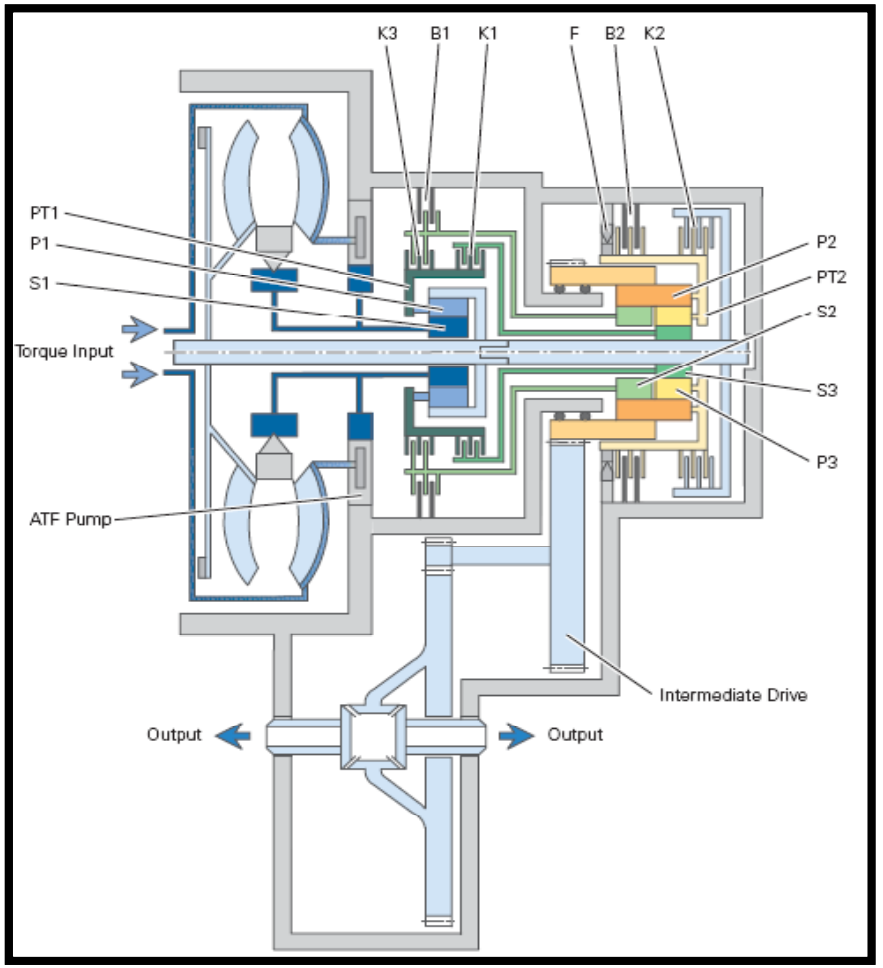
B – Multi-disc Brake

S – Sun Wheel

P – Planetary Gears

PT – Planetary Carrier

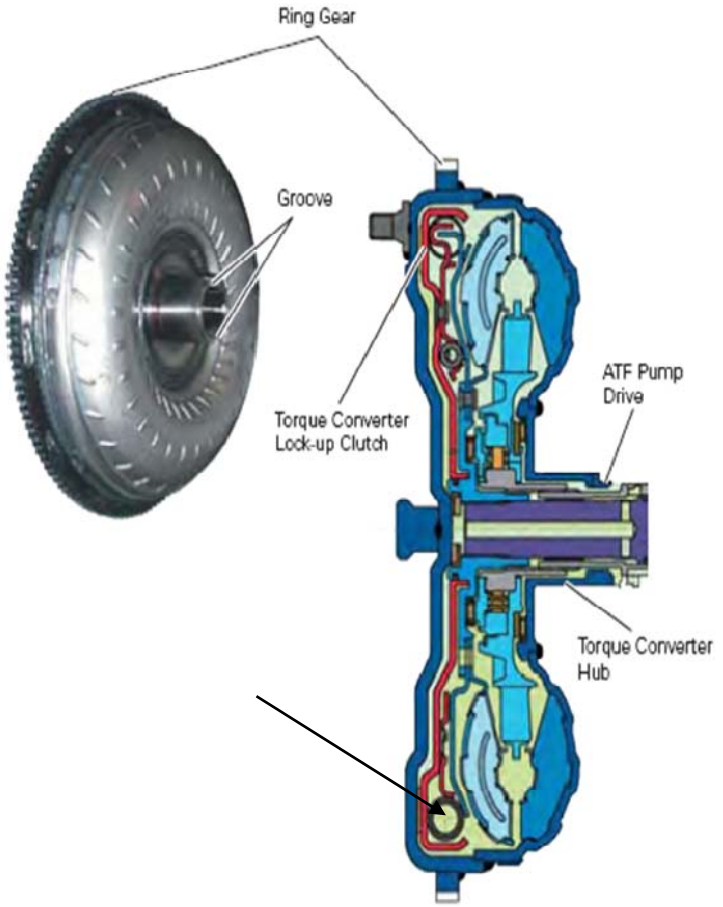
F – Freewheel Clutch



## ***Torque Converter***

The torque converter lock up clutch has integrated torsion dampers.

This greatly expands the range in which the lock-up can remain locked by reducing vibration.



***Torque Converter Lock-up Clutch***

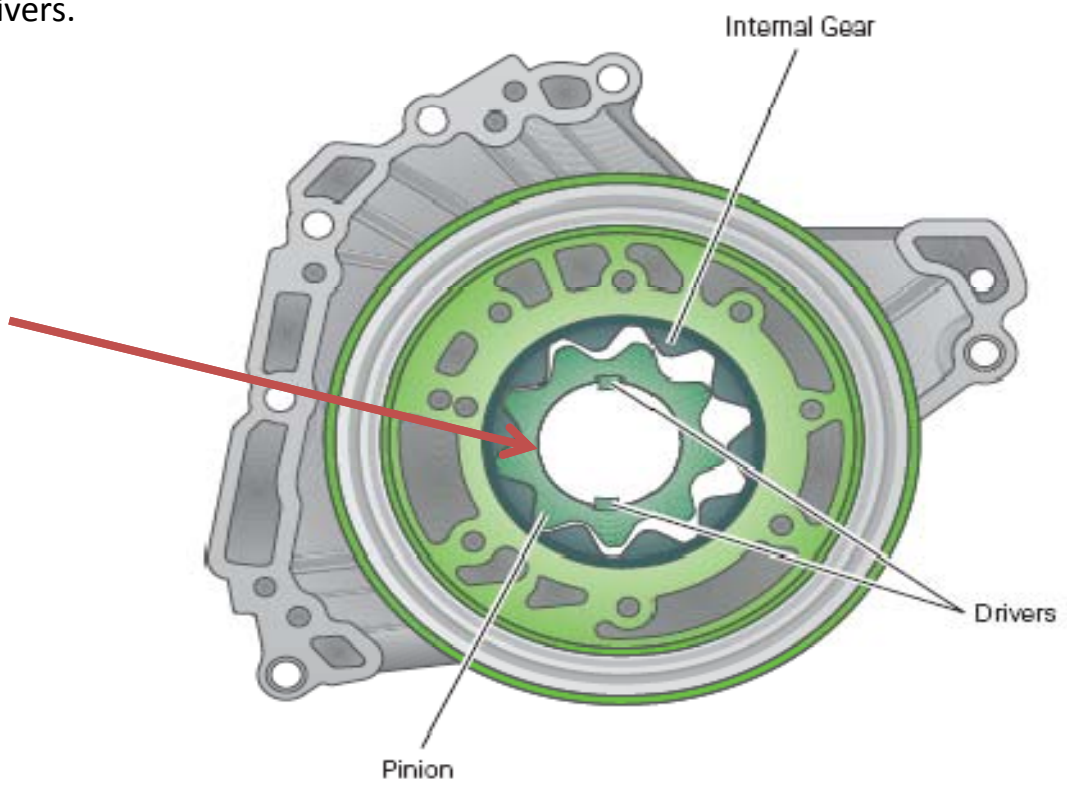
- Minimal slip to improve fuel consumption
- The Lock-up clutch engages without slip in “S” mode
- Lock-up is engaged if ATF temperature exceeds 130 C
- Lock-up is in operation in 2nd gear and above

## ***Oil Pump Design***

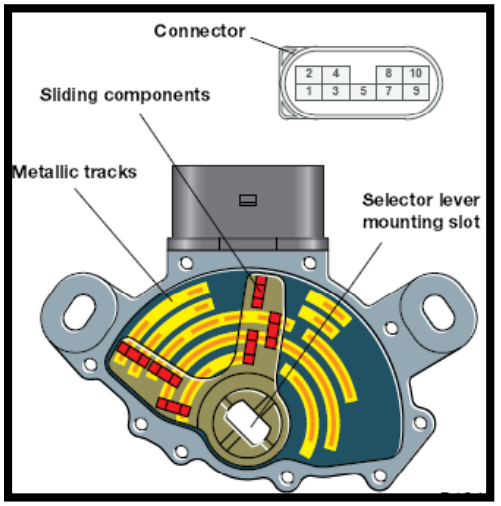
The oil pump is designed without a crescent. This makes it very unstable and easily broken.

When inserting the torque converter into the housing, do so vertically (input shaft facing up) to avoid damage to the drivers.

Inspect very carefully

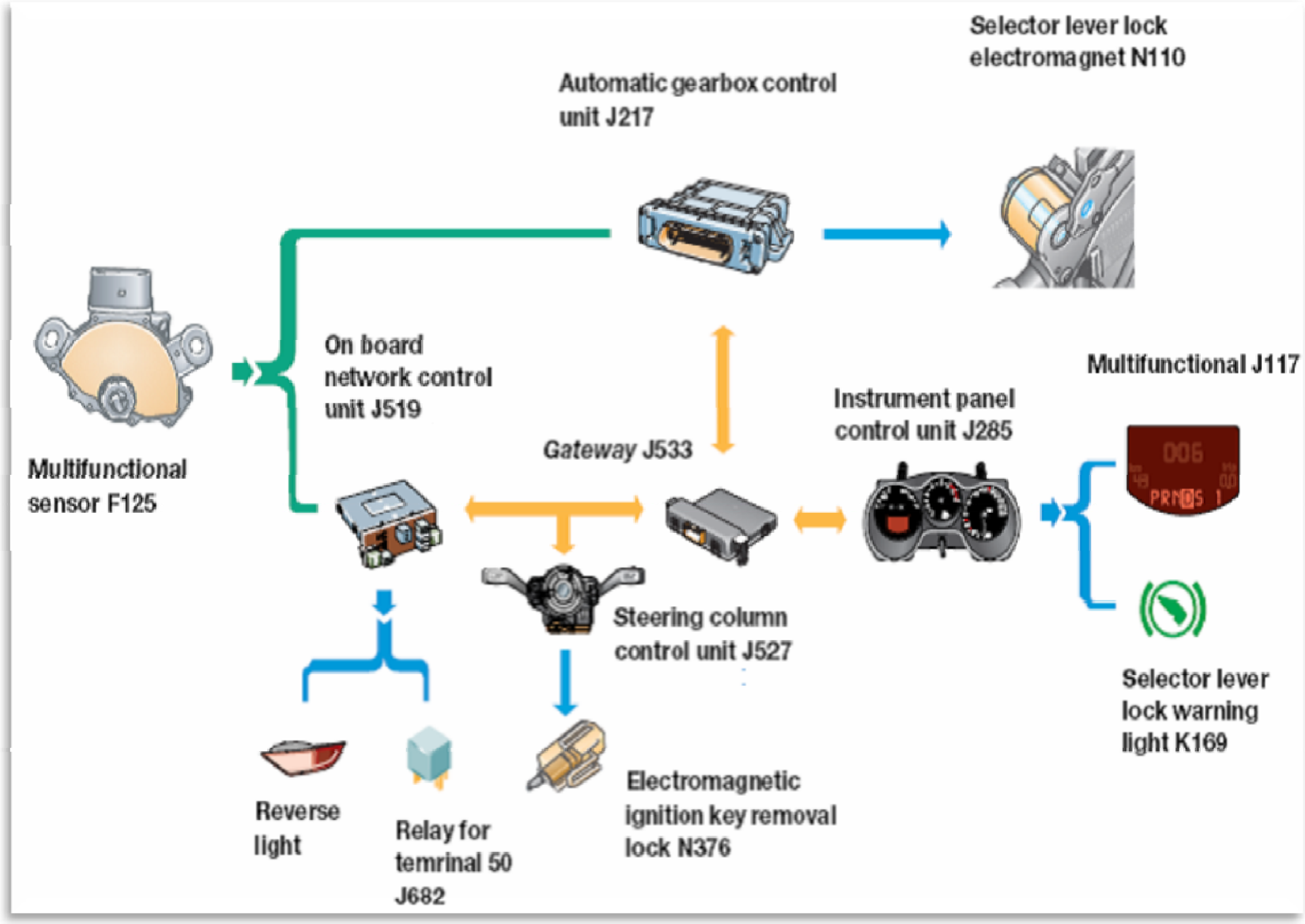


## TF60 Multifunction Switch F125




Signal emitted by the automatic gearbox control unit
Permanent signal
Signal emitted by the on board network control unit

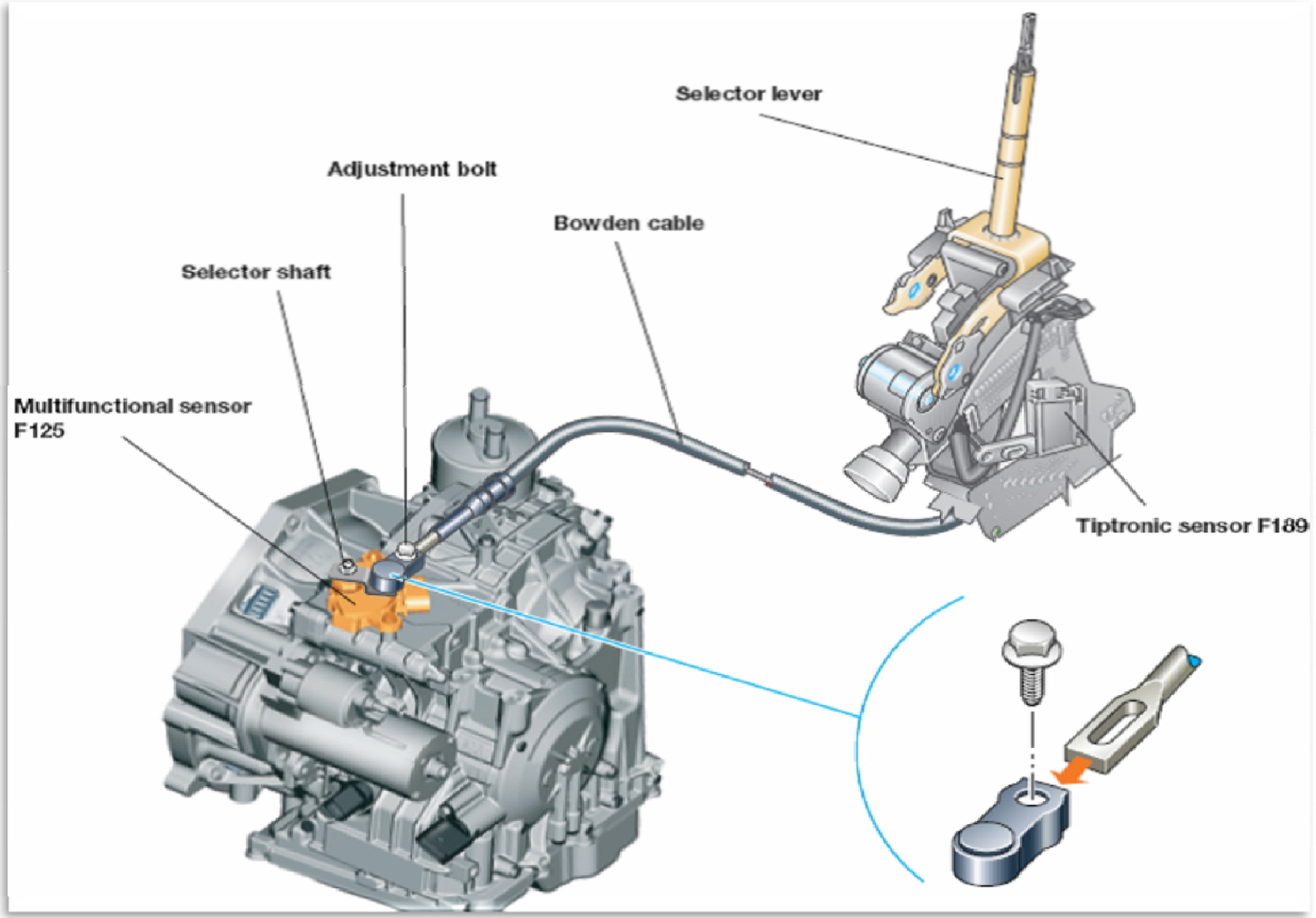
| POSITION | Signal P/N | | Reverse gear signal | | Position signal | | | | | Measurement values |
|---|---|---|---|---|---|---|---|---|---|---|
| | ⎍ | earth | B15 | - | earth | + | + | + | + | |
| | C2 | C4 | C10 | C8 | C3 | C1 | C7 | C9 | C5 | C1 C7 C9 C5 |
| P | ○ | ● | | | ● | ○ | | | ○ | 1 0 0 1 |
| R | | | ● | ○ | ● | ○ | ○ | | | 1 1 0 1<br>1 1 0 0 |
| N | ○ | ● | | | ● | | ○ | | ○ | 1 1 0 1<br>0 1 0 1 |
| D | | | | | ● | | ○ | ○ | | 0 1 1 1<br>0 1 1 0 |
| S | | | | | ● | ○ | ○ | ○ | ○ | 0 1 1 1<br>1 1 1 1 |



| | Solenoids activated | | | | | | Locked components | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | N92 | N282 | N90 | N283 | N93 | N91 | K1 | K2 | K3 | B1 | F |
| P | | | | | | | | | | | |
| N | | | | | | | | | | | |
| R | | | | | | | | | | | |
| 1ª | | | | | | | | | | | |
| 2ª | | | | | | | | | | | |
| 3ª | | | | | | | | | | | |
| 4ª | | | | | | | | | | | |
| 5° | | | | | | | | | | | |
| 6ª | | | | | | | | | | | |

| | Solenoids activated | | | | | | | | Locked components | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N88 | N89 | N92 | N282 | N90 | N283 | N93 | N91 | K1 | K2 | K3 | B1 | B2 | F |
| P | | | | | | | | | | | | | | |
| N | | | | | | | | | | | | | | |
| R | | | | | | | | | | | | | | |
| 1ª | T | T | | | | | | | | | | | T | |
| 2ª | W/T | W | | | | | | | | | | | | |
| 3ª | W/T | W | | | | | | | | | | | | |
| 4ª | W/T | W | | | | | | | | | | | | |
| 5° | W/T | W | | | | | | | | | | | | |
| 6ª | W/T | W | | | | | | | | | | | | |

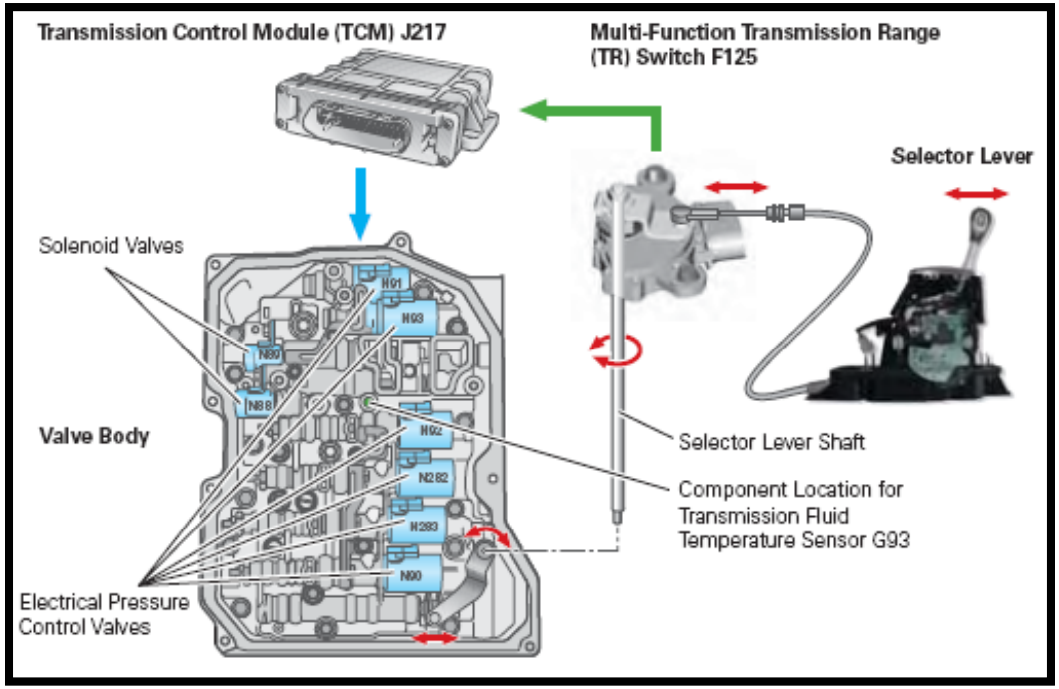
T only in tiptronic mode
W occasional alternate activation during gear changes



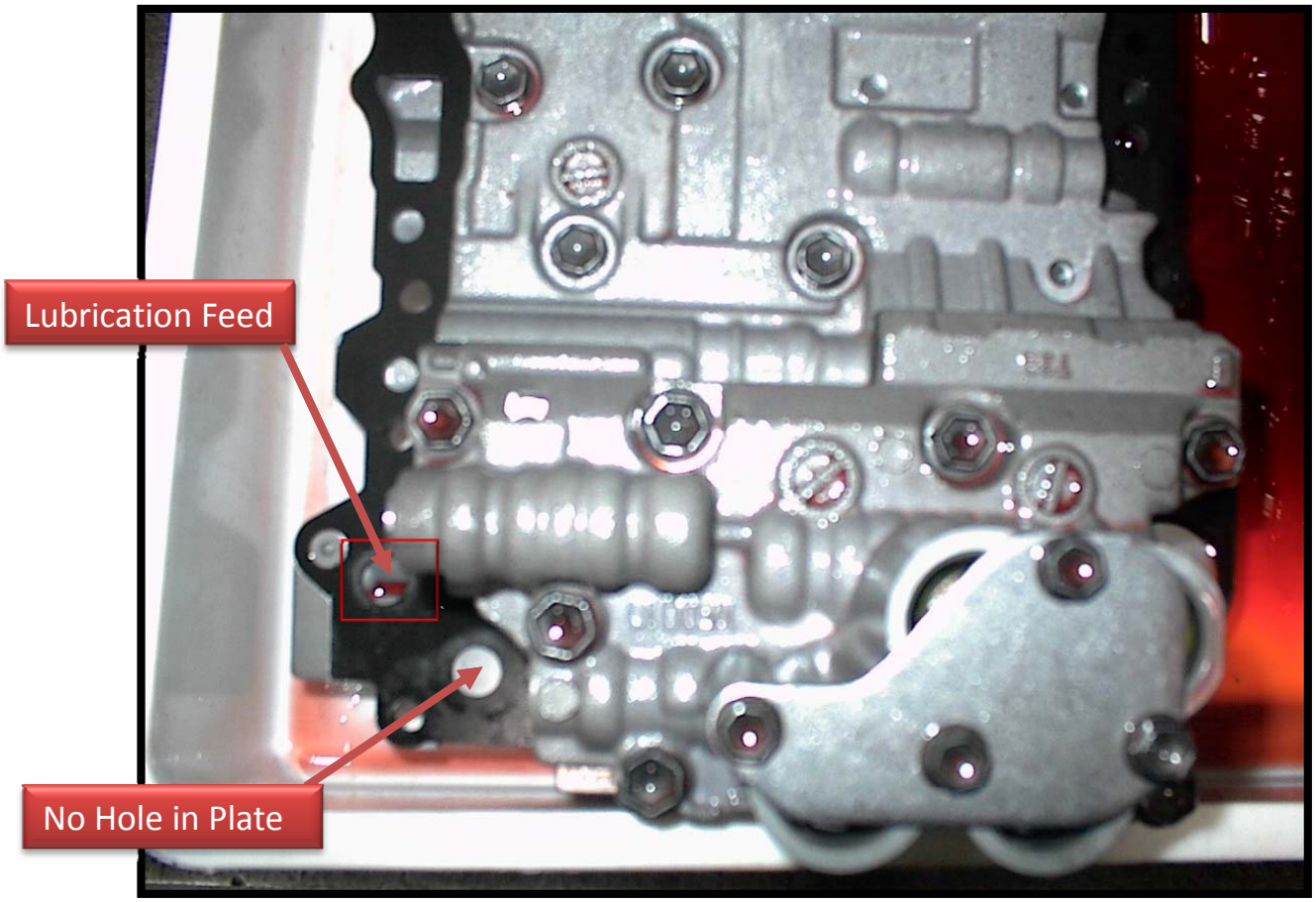
## ***Hydraulic Control***

The shifting elements are controlled by the valve body which are activated by the solenoids. The solenoids are in turn activated by the TCM (J217)

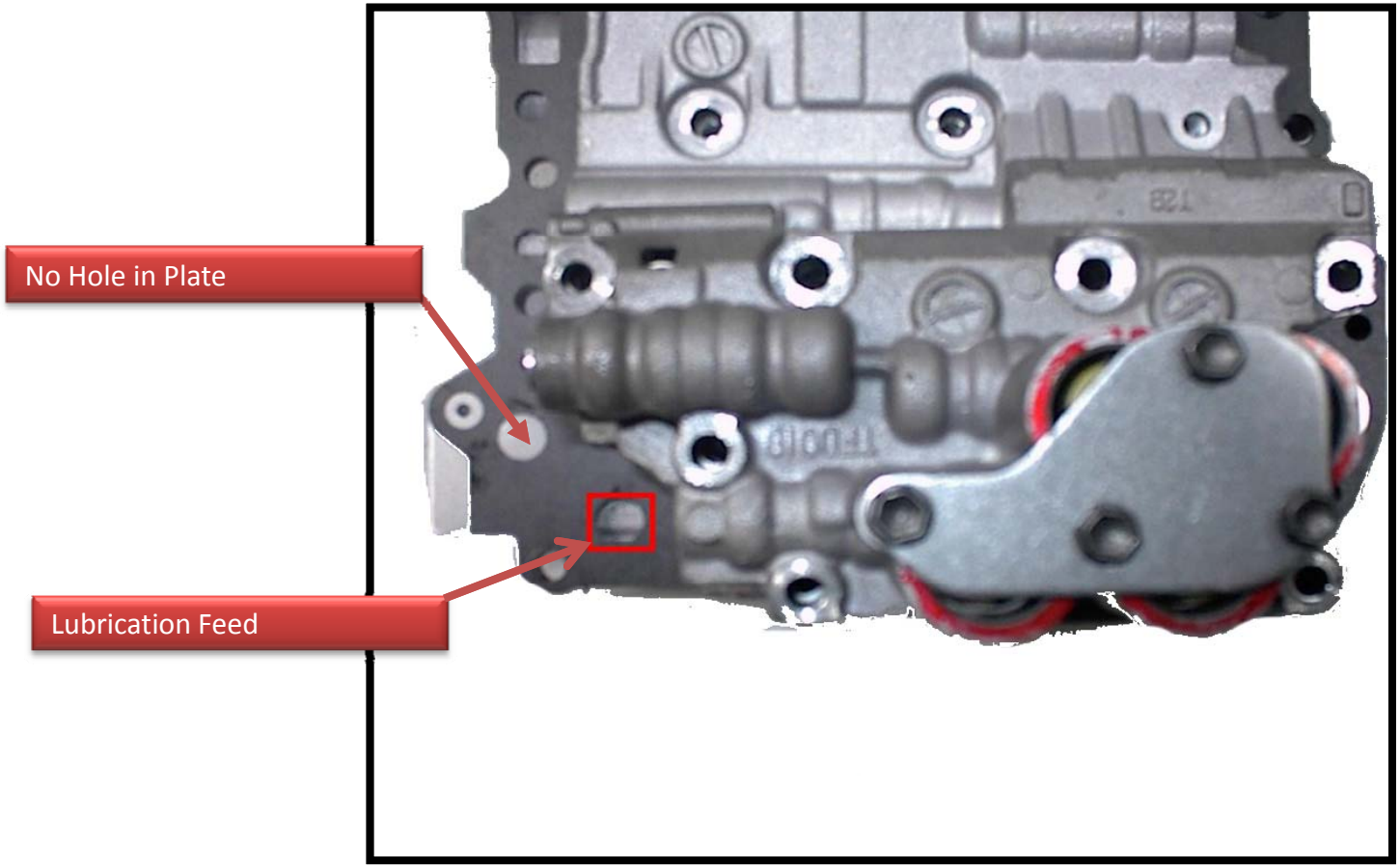
In addition to the shifting elements the valve body controls the TCC and the mainline pressure, control pressure, converter pressure and lubrication pressure.



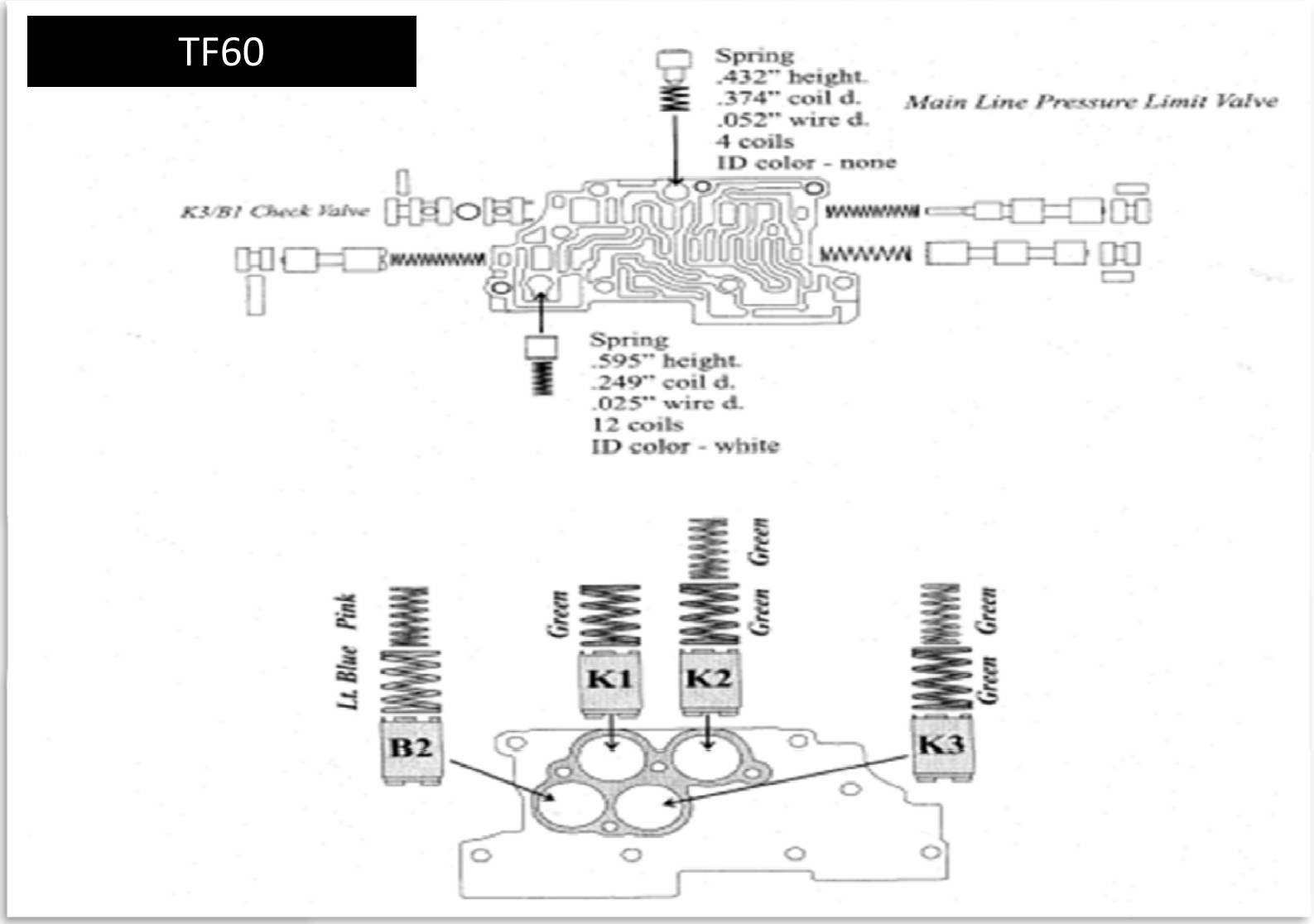
## 09G Valve Body Identification

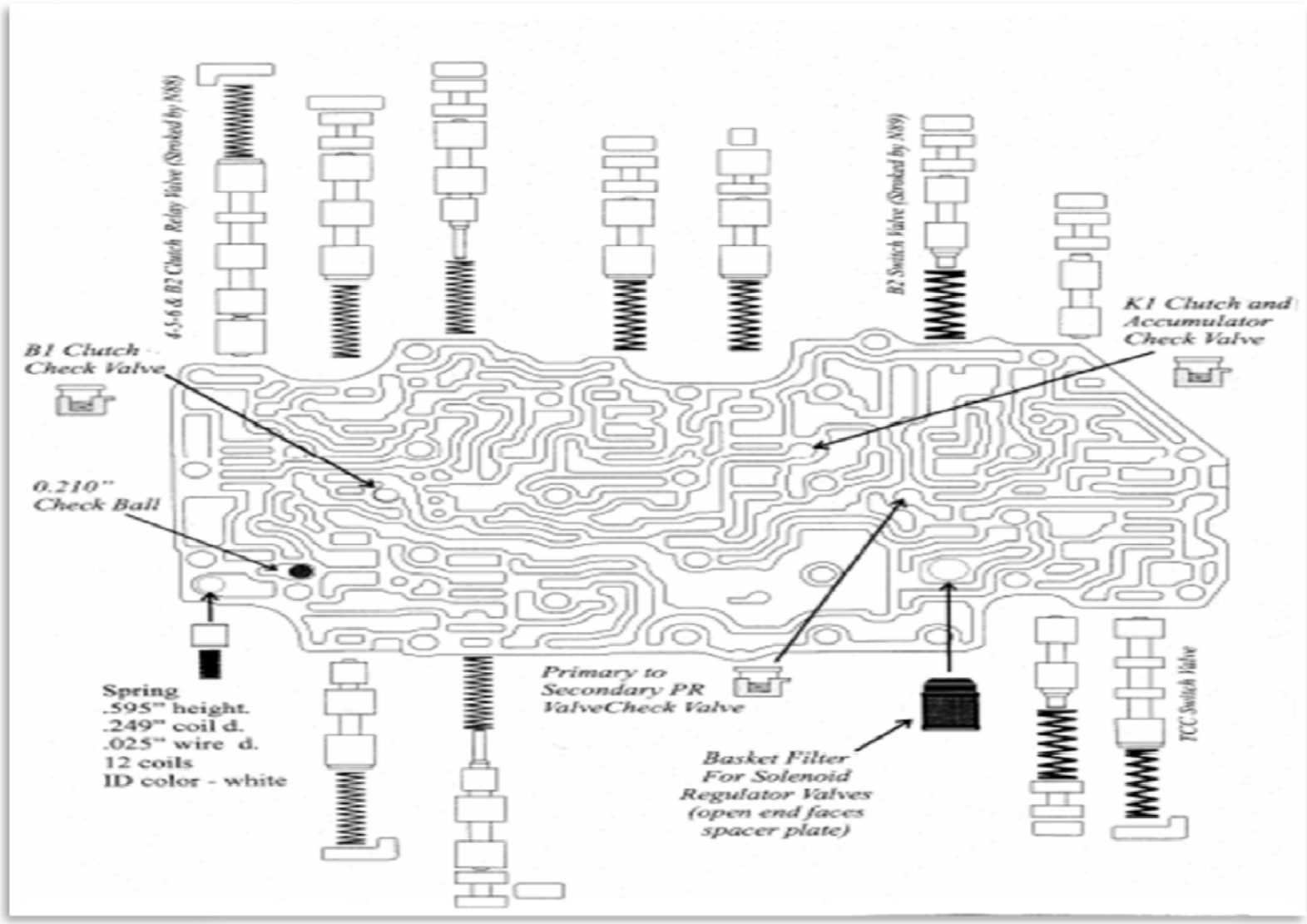


## 09K Valve Body Identification



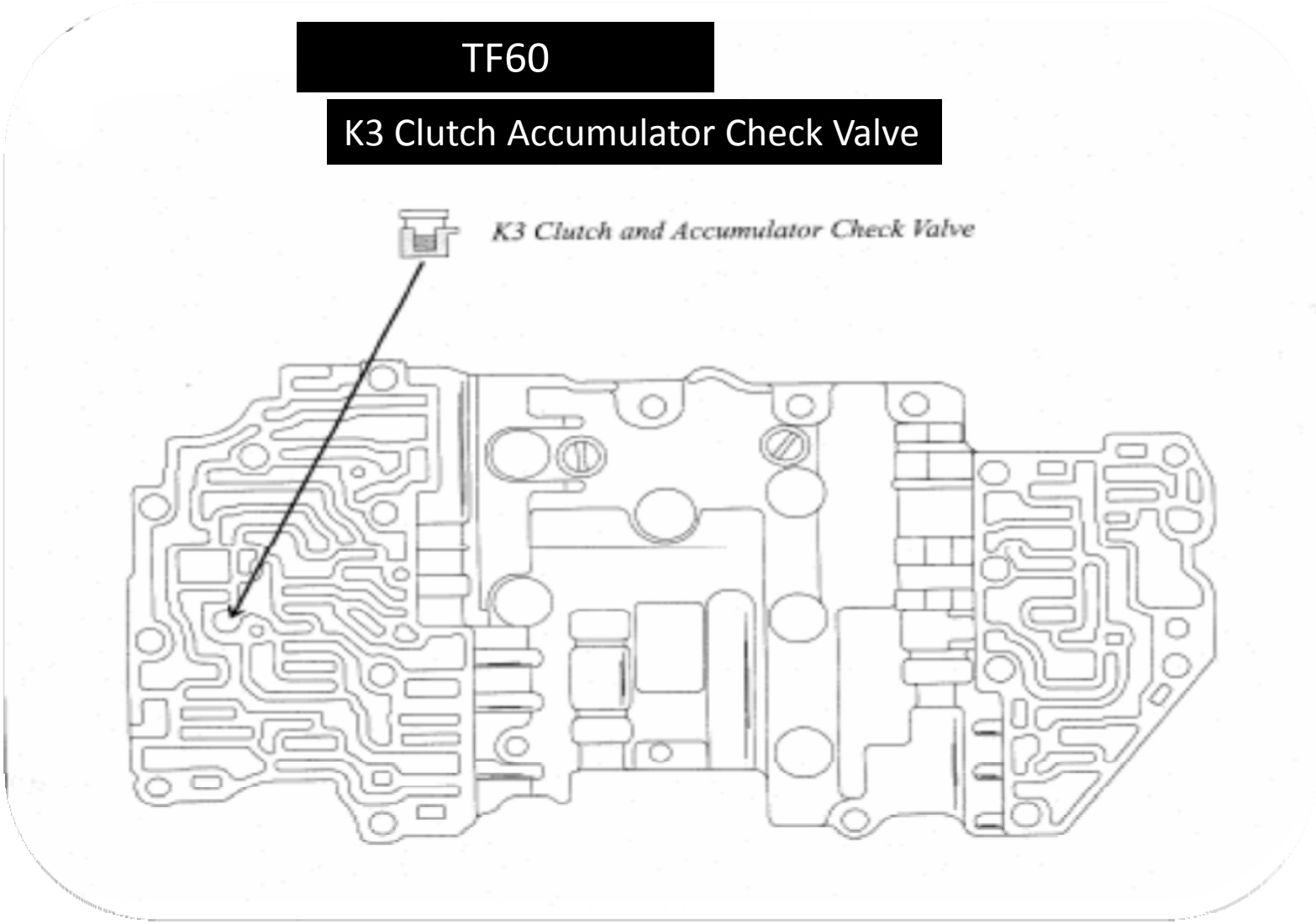
# TF60

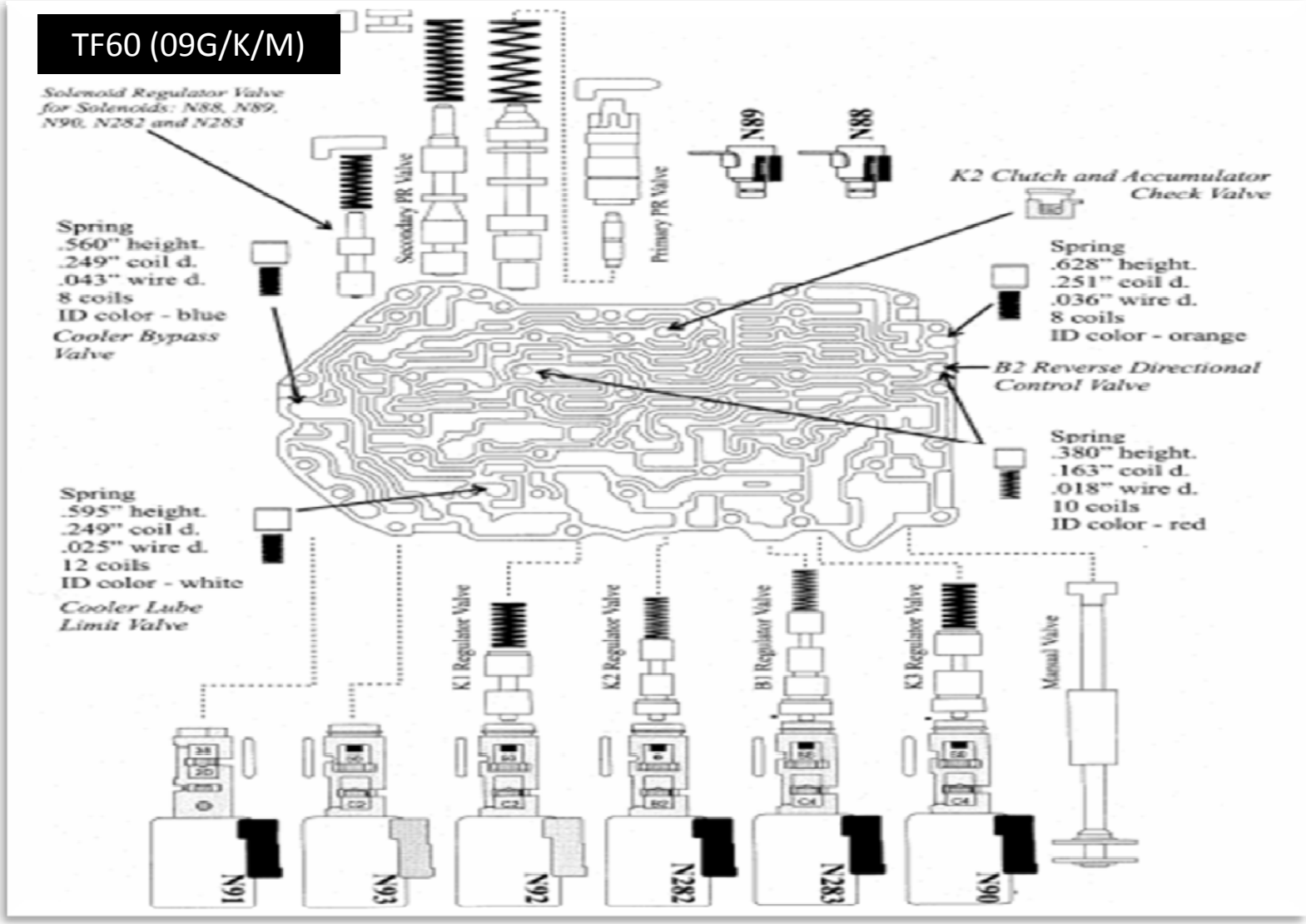




# TF60

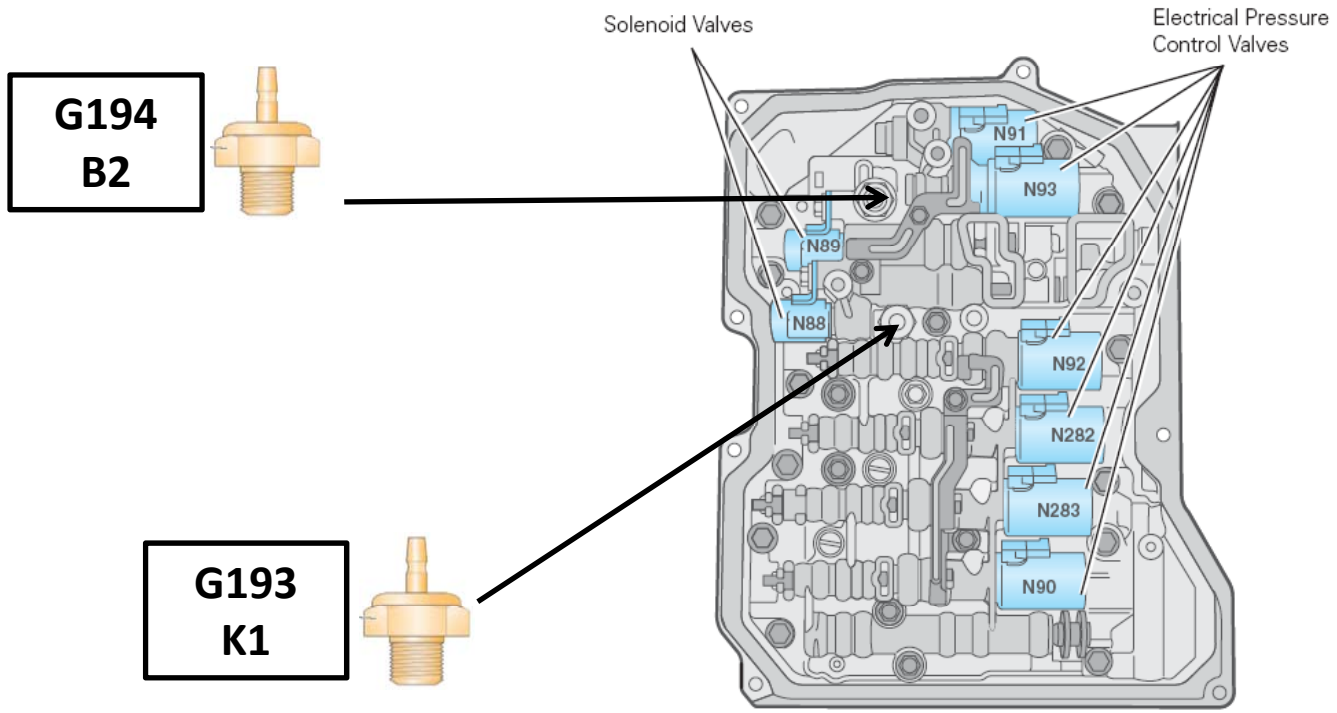
## K3 Clutch Accumulator Check Valve



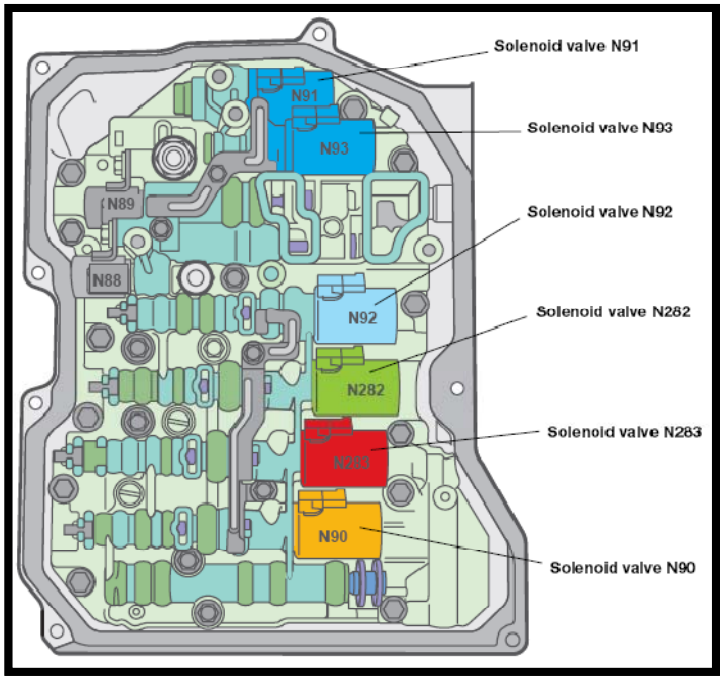


## ***Solenoid Valve Locations***

- G193 and G194 pressure switches are not fitted after build date – August 2004

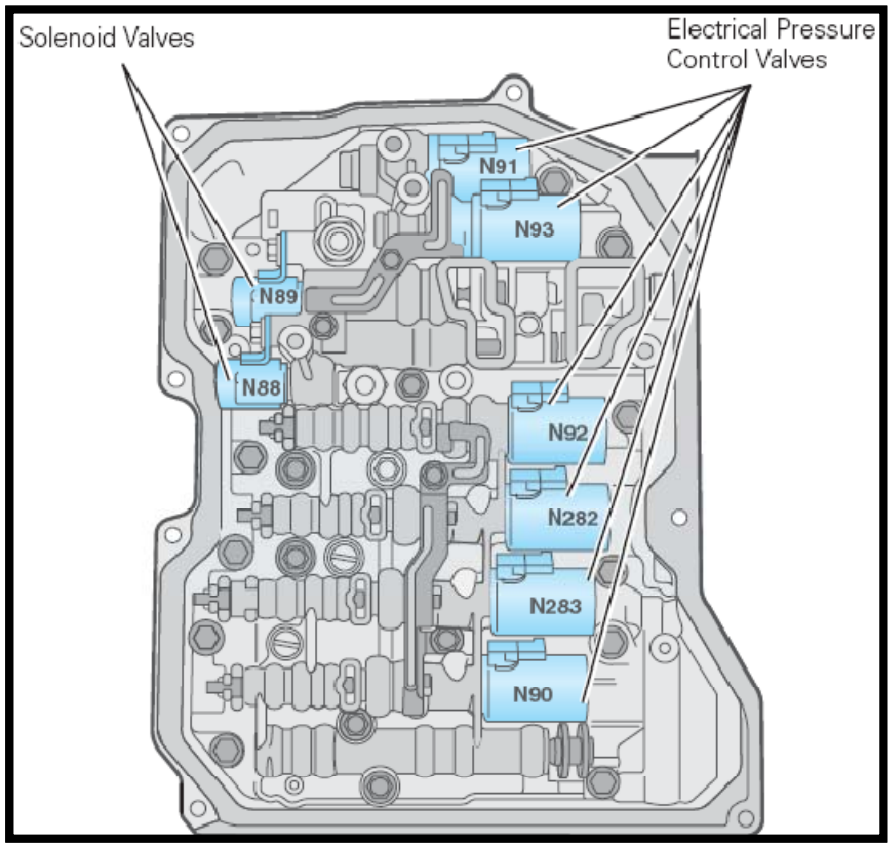


## Solenoid Valve Locations




## ***Function of Solenoid Valves***

- SV1 N90 controls K3 clutch
- SV4 N91 controls TCC
- SV5 N92 controls K1 clutch
- SV6 N93 mainline pressure
- SV9 N282 controls K2 clutch
- SV10 N283 controls B1 brake
- SV1 N88 and SV2 N89 control gears 4,5 & 6 and are sporadically and alternately activated during gear shifts.
- They are also used to apply the B2 brake for engine braking in 1st gear Tiptronic

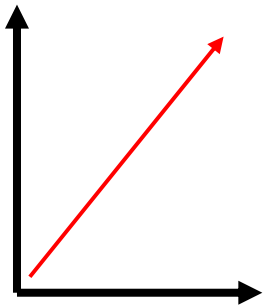


## ***Electrical Pressure Control Valves***

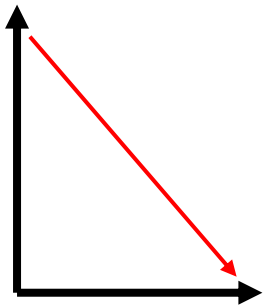
• EPC valves convert an electrical current into a proportional hydraulic control pressure. There are 2 types of pressure control valves fitted

• EPC valves with a rising characteristic curve increase the control pressure (P) as current (I) increases.  0mA = 0 bar

• EPC valves with a falling characteristic curve reduce the control pressure (P) as current (I) increases.  Maximum mA = 0 bar



EPC with rising characteristic curve
N90 and N91



EPC with falling characteristic curve
N92, N93, N282 & N283

***Electrical Pressure Control Valves***

- N88 & N89 are DC On/Off Solenoids

- N92,N93,N282 & N283 are all “Current Controlled” solenoids

- CAUTION DO NOT apply 12volts (B+) to these solenoids as damage will occur

***Solenoid Description and Failure Issues***

# N88

- **N88** is energised in 4th, 5th & 6th gears

- Failure in the OFF position will cause loss of 4th, 5th & 6th gears

- Failure in the ON position will cause 3rd gear starts

***Solenoid Description and Failure Issues***

# N89

- **N89** supplies ATF pressure to the Lock-up clutch
- This is NOT the Lock-up solenoid
- Failure to operate can cause Lock-up slip

***Solenoid Description and Failure Issues***

# N92

• **N92** Regulates ATF pressure to the **K1** clutch

• As this solenoid is directly related to the application of the K1 clutch, failure can cause symptoms similar to a faulty K1 clutch.

• K1 is applied in 1,2,3,4 gears. Therefore slip or harsh symptoms may occur during N-D shift or 5-4 shift.

***Solenoid Description and Failure Issues***

# N91

- **N91** regulates ATF pressure to the lock-up clutch

- As this solenoid is directly related to the application of the Lock-up clutch, failure can cause loss of apply pressure or a slip condition when full Lock-up is commanded.

***Solenoid Description and Failure Issues***

# N90

- **N90** regulates ATF pressure to the **K3** clutch

- As this solenoid is directly related to the application of the K3 clutch, failure can cause symptoms similar to a faulty K3 clutch.

- K3 is applied in 3rd,5$^{th}$ & Reverse gears. Therefore slip or harsh symptoms may occur during N-R shift or 2-3,4-3 & 4-5,6-5 shifts.

***Solenoid Description and Failure Issues***

# N93

- **N93** regulates line pressure relative to engine torque

- As this solenoid is directly related to line pressure, slip or harsh shifting can occur during all shifts.

***Solenoid Description and Failure Issues***

# N282

- **N282** regulates ATF pressure to the **K2** clutch

- As this solenoid is directly related to the application of the K2 clutch, failure can cause symptoms similar to a faulty K2 clutch.

- K2 is applied in 4th,5$^{th}$ & 6th gears. Therefore slip or harsh symptoms may occur during a 3-4 up shift.

***Solenoid Description and Failure Issues***

# N283

• **N283** regulates ATF pressure to the **B1** brake.

• As this solenoid is directly related to the application of the B1 brake, failure can cause symptoms similar to a faulty B1 brake.

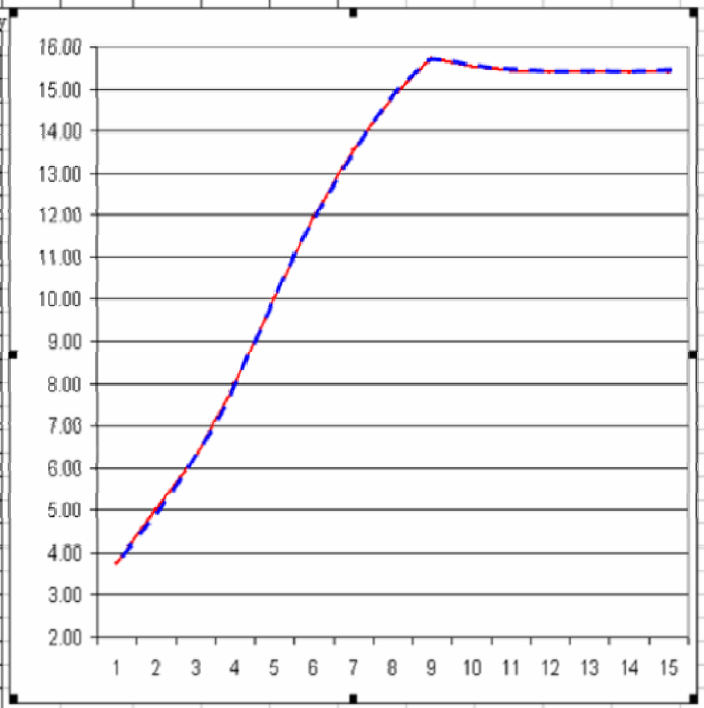
• B1 is applied in 2nd & 6th gears. Therefore slip or harsh symptoms may occur during a 1-2 & 5-6 up shifts or a 3-2 downshift.

Microsoft Excel - REPORT

File Edit View Insert Format Tools Chart Window Help

Chart Area

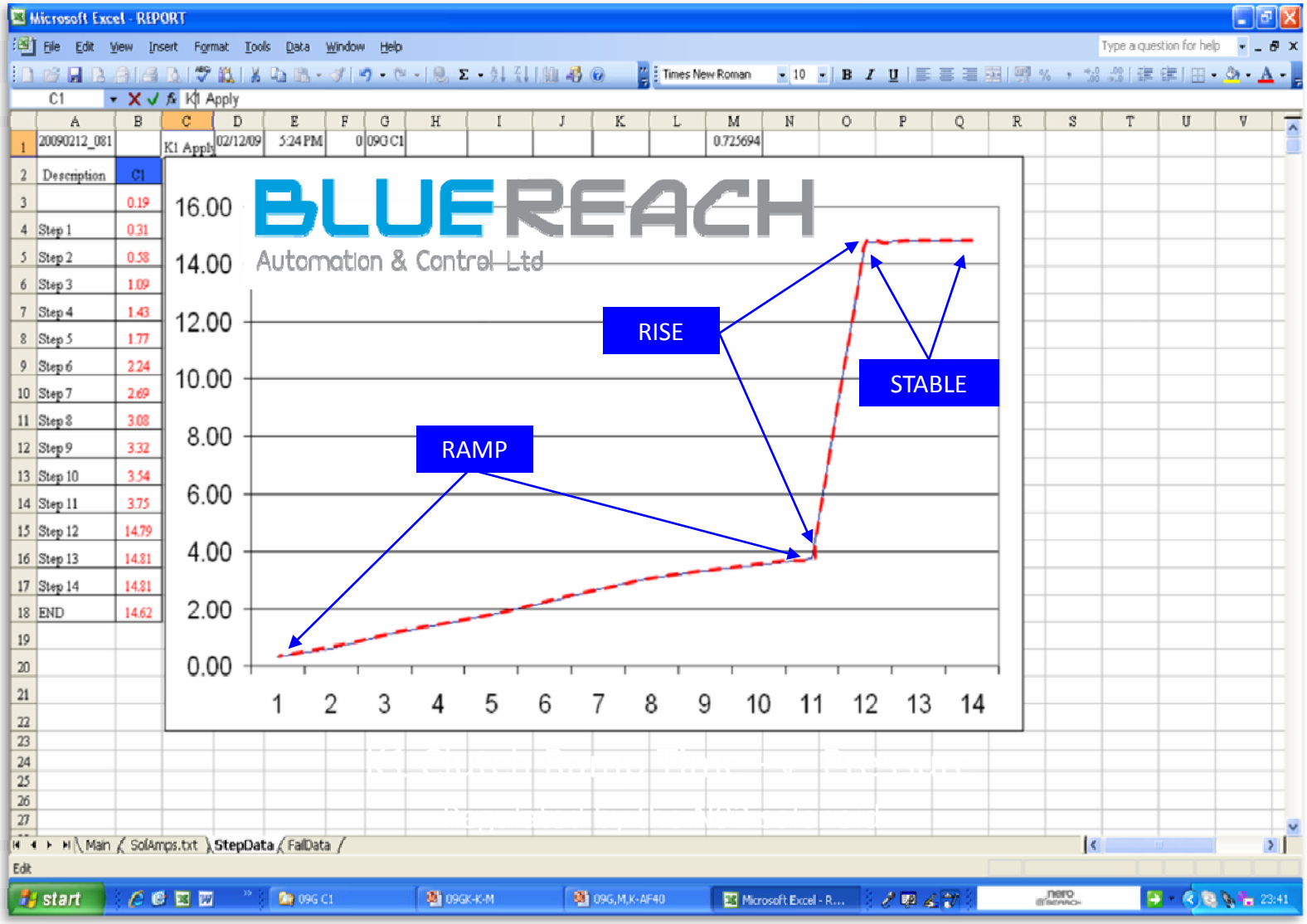
| | A | B | C | D | E | F | G | H | M |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 20090211_024 | AW | 09G | 02/11/09 | 3:45 PM | 0 | 09G | | 0.659028 |
| 2 | Description | C1 | B1 | C3 | C2 | B2 | C Relea | C Apply | |
| 3 | Engage D Tes | 3.78 | 0.13 | 0.14 | 0.14 | 0.16 | 3.73 | 3.66 | |
| 4 | EPC Min in D | 4.99 | 0.17 | 0.16 | 0.17 | 0.18 | 4.35 | 4.28 | |
| 5 | Ramp Test | 6.27 | 0.20 | 0.20 | 0.21 | 0.20 | 4.96 | 4.91 | |
| 6 | Step 1 | 8.00 | 0.21 | 0.21 | 0.21 | 0.22 | 5.76 | 5.70 | |
| 7 | Step 2 | 10.01 | 0.21 | 0.20 | 0.22 | 0.23 | 6.73 | 6.65 | |
| 8 | Step 3 | 11.95 | 0.22 | 0.22 | 0.24 | 0.22 | 7.64 | 7.55 | |
| 9 | Step 4 | 13.58 | 0.23 | 0.20 | 0.22 | 0.23 | 8.34 | 7.11 | |
| 10 | Step 5 | 14.83 | 0.23 | 0.21 | 0.22 | 0.23 | 8.92 | 7.20 | |
| 11 | Step 6 | 15.72 | 0.21 | 0.23 | 0.23 | 0.22 | 9.44 | 7.25 | |
| 12 | Step 7 | 15.53 | 0.23 | 0.23 | 0.22 | 0.24 | 9.18 | 7.11 | |
| 13 | Step 8 | 15.46 | 0.24 | 0.23 | 0.22 | 0.24 | 9.12 | 7.04 | |
| 14 | Step 9 | 15.42 | 0.24 | 0.21 | 0.23 | 0.23 | 9.10 | 7.03 | |
| 15 | Step 10 | 15.41 | 0.23 | 0.23 | 0.23 | 0.24 | 9.11 | 7.04 | |
| 16 | Step 11 | 15.42 | 0.23 | 0.23 | 0.23 | 0.25 | 9.10 | 7.03 | |
| 17 | Step 12 | 15.41 | 0.22 | 0.22 | 0.23 | 0.23 | 9.08 | 7.01 | |
| 18 | 1st Gear | 14.72 | 0.21 | 0.20 | 0.21 | 0.22 | 8.87 | 7.20 | |
| 19 | 2nd Gear | 14.80 | 15.01 | 0.21 | 0.21 | 0.22 | 8.90 | 7.17 | |
| 20 | 3rd Gear | 14.91 | 0.19 | 15.15 | 0.18 | 0.19 | 8.94 | 7.18 | |
| 21 | 4th Gear | 14.96 | 0.17 | 0.16 | 15.16 | 0.18 | 8.97 | 7.19 | |
| 22 | 5th Gear | 0.15 | 0.22 | 15.28 | 15.24 | 0.23 | 9.02 | 7.09 | |
| 23 | 6th Gear | 0.17 | 11.58 | 0.17 | 11.57 | 0.17 | 9.06 | 7.22 | |
| 24 | L-UP | 0 | 12 | 0.18 | 11.6 | 0.20 | 0.02 | 8.79 | |
| 25 | 6th Gear | 0 | 11 | 0.18 | 11.1 | 0.19 | 8.78 | 6.99 | |
| 26 | 5th Gear | 0 | 0 | 15.20 | 15.1 | 0.19 | 8.97 | 7.22 | |
| 27 | 4th Gear | 15 | 0 | 0.18 | 15.1 | 0.17 | 8.97 | 7.19902 | |
| 28 | 3rd Gear | 15 | 0 | 15.17 | 0.2 | 0.20 | 8.96 | 7.18 | |
| 29 | 2nd Gear | 15 | 15 | 0.18 | 0.2 | 0.19 | 8.98 | 7.22 | |
| 30 | 1st Gear | 15 | 0 | 0.18 | 0.2 | 0.19 | 8.98 | 7.20 | |
| 31 | 2nd Gear | 14 | 15 | 0.24 | 0.2 | 0.24 | 8.71 | 6.76 | |
| 32 | 3rd Gear | 15 | 0 | 15.03 | 0.2 | 0.20 | 8.88 | 6.96 | |
| 33 | 4th Gear | 15 | 0 | 0.18 | 15.1 | 0.17 | 8.98 | 7.18 | |
| 34 | 5th Gear | 0 | 0 | 15.29 | 15.3 | 0.21 | 9.03 | 7.21 | |
| 35 | 6th Gear | 0 | 12 | 0.19 | 11.6 | 0.18 | 9.10 | 7.22 | |
| 36 | L-UP | 0 | 12 | 0.20 | 11.6 | 0.20 | 0.03 | 8.76 | |




Main / SolAmps.txt / StepData / FailData /

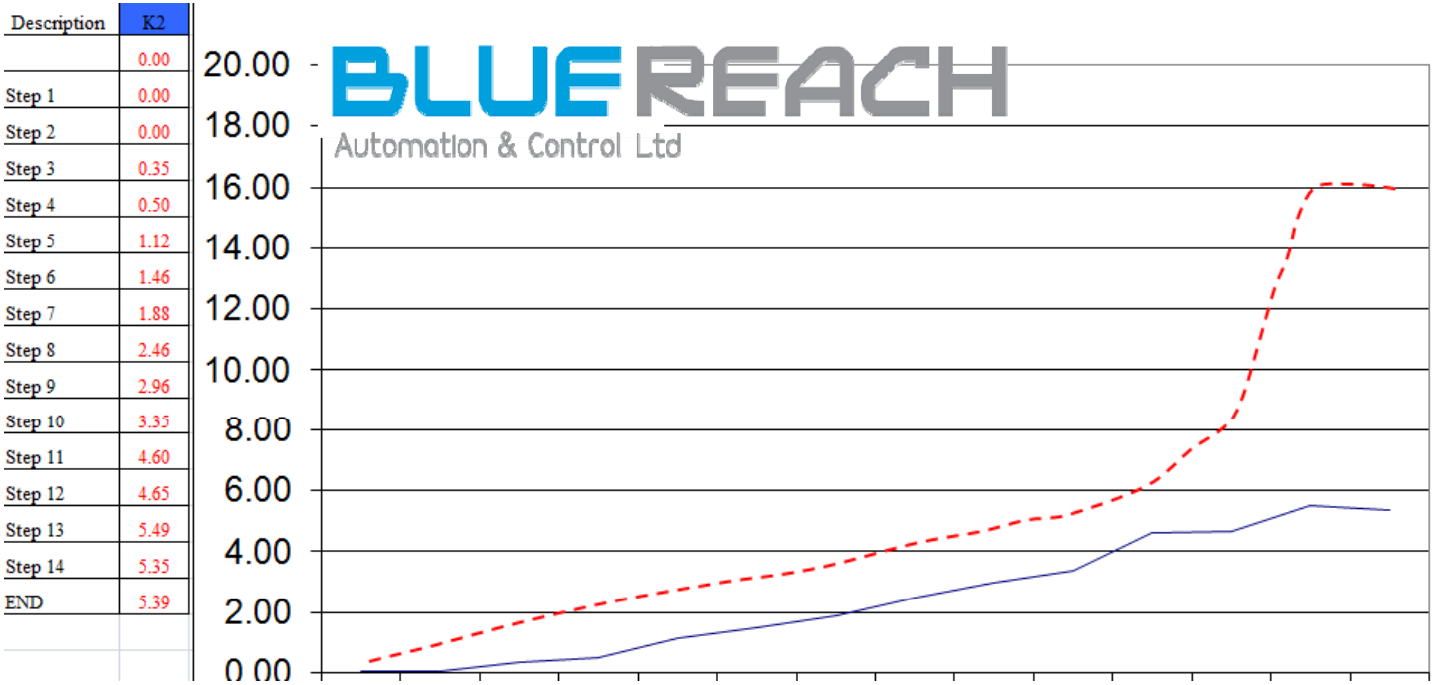
Ready CAPS

start 09G 09GK-K-M 09G,M,K-AF40 Microsoft Excel - R... 23:51



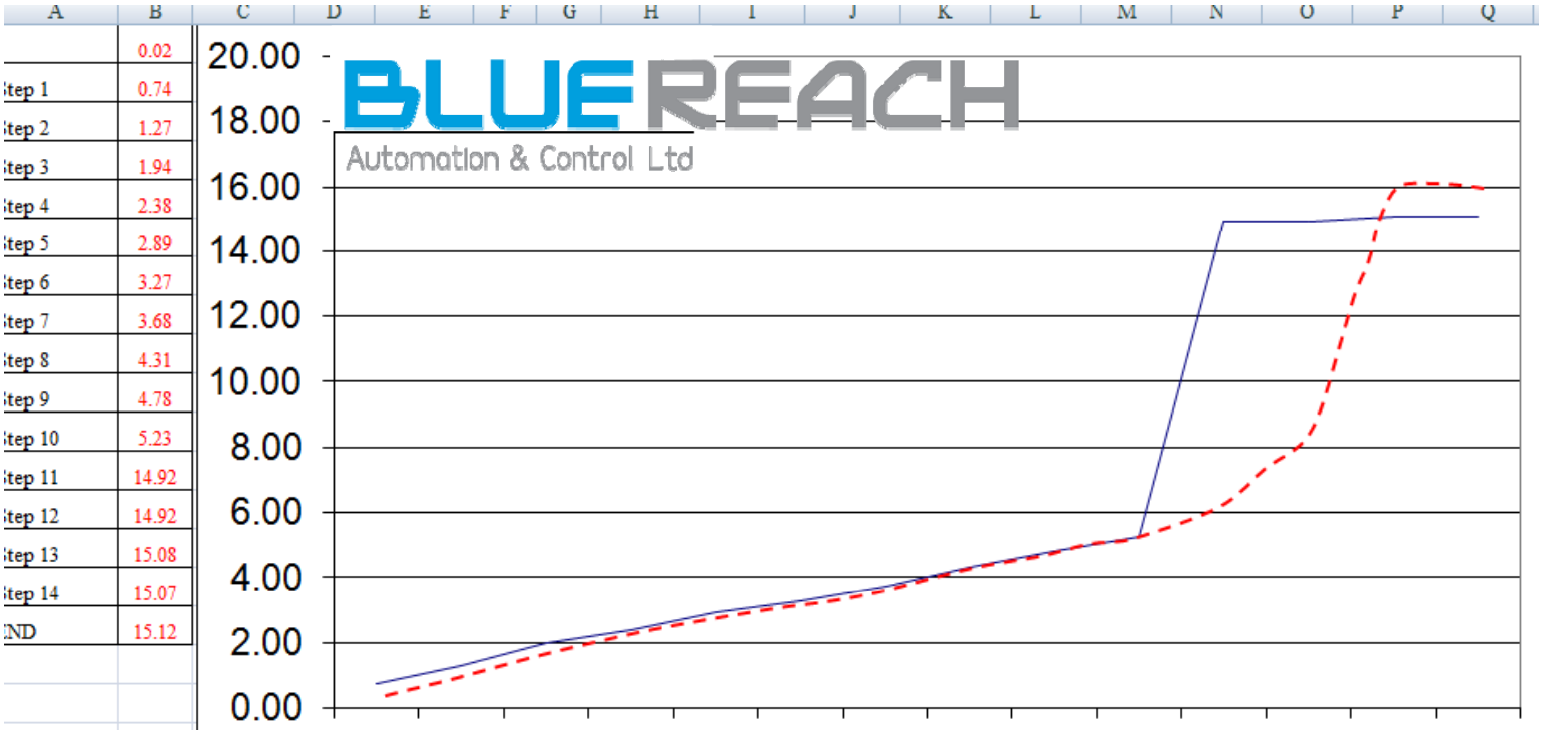

| | A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 20090212_081 | | K1 Apply | 02/12/09 | 5:24 PM | 0 | 09G C1 | | | | | | 0.725694 |
| 2 | Description | C1 | | | | | | | | | | | |
| 3 | | 0.19 | | | | | | | | | | | |
| 4 | Step 1 | 0.31 | | | | | | | | | | | |
| 5 | Step 2 | 0.58 | | | | | | | | | | | |
| 6 | Step 3 | 1.09 | | | | | | | | | | | |
| 7 | Step 4 | 1.43 | | | | | | | | | | | |
| 8 | Step 5 | 1.77 | | | | | | | | | | | |
| 9 | Step 6 | 2.24 | | | | | | | | | | | |
| 10 | Step 7 | 2.69 | | | | | | | | | | | |
| 11 | Step 8 | 3.08 | | | | | | | | | | | |
| 12 | Step 9 | 3.32 | | | | | | | | | | | |
| 13 | Step 10 | 3.54 | | | | | | | | | | | |
| 14 | Step 11 | 3.75 | | | | | | | | | | | |
| 15 | Step 12 | 14.79 | | | | | | | | | | | |
| 16 | Step 13 | 14.81 | | | | | | | | | | | |
| 17 | Step 14 | 14.81 | | | | | | | | | | | |
| 18 | END | 14.62 | | | | | | | | | | | |

| Description | K2 |
|---|---|
| | 0.00 |
| Step 1 | 0.00 |
| Step 2 | 0.00 |
| Step 3 | 0.35 |
| Step 4 | 0.50 |
| Step 5 | 1.12 |
| Step 6 | 1.46 |
| Step 7 | 1.88 |
| Step 8 | 2.46 |
| Step 9 | 2.96 |
| Step 10 | 3.35 |
| Step 11 | 4.60 |
| Step 12 | 4.65 |
| Step 13 | 5.49 |
| Step 14 | 5.35 |
| END | 5.39 |




K2 Clutch Bad Ramp

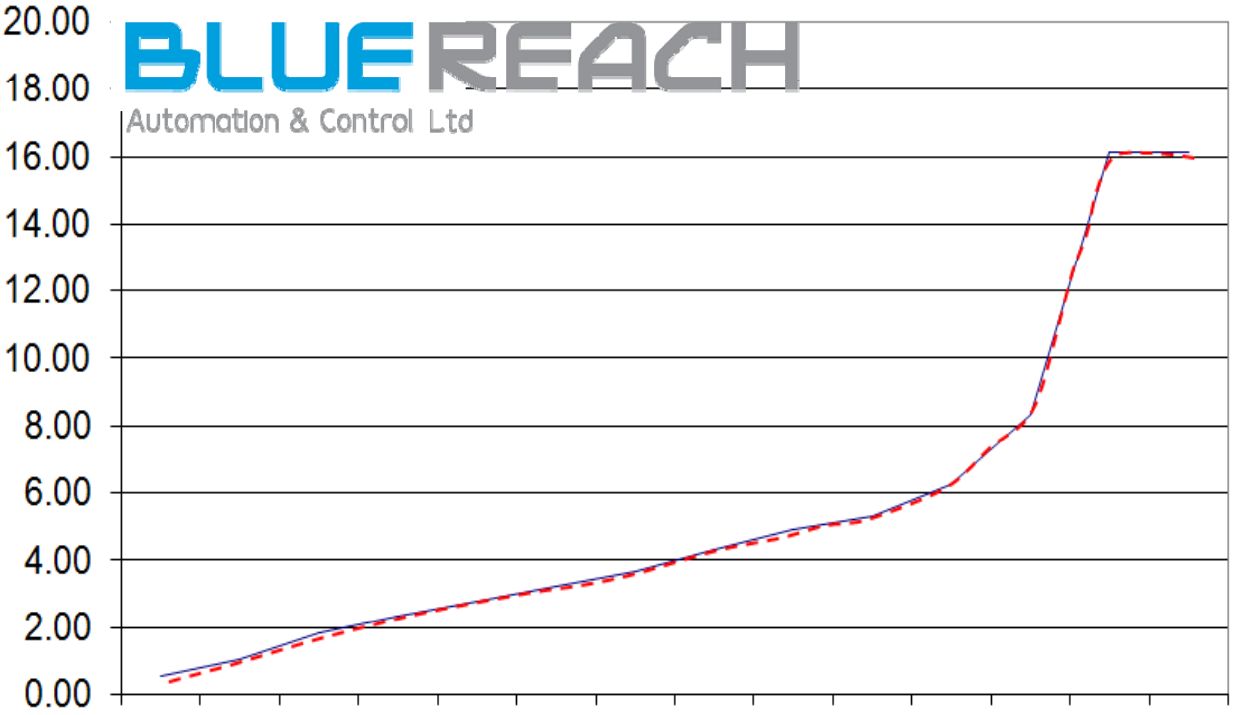
Regulated by the N282 solenoid




K2 Early Ramp. Valves fitted

Regulated by the N282 solenoid

| Description | K2 |
|---|---|
| | 0.00 |
| Step 1 | 0.50 |
| Step 2 | 1.04 |
| Step 3 | 1.80 |
| Step 4 | 2.30 |
| Step 5 | 2.77 |
| Step 6 | 3.21 |
| Step 7 | 3.67 |
| Step 8 | 4.31 |
| Step 9 | 4.87 |
| Step 10 | 5.31 |
| Step 11 | 6.21 |
| Step 12 | 8.29 |
| Step 13 | 16.08 |
| Step 14 | 16.08 |
| END | 16.11 |

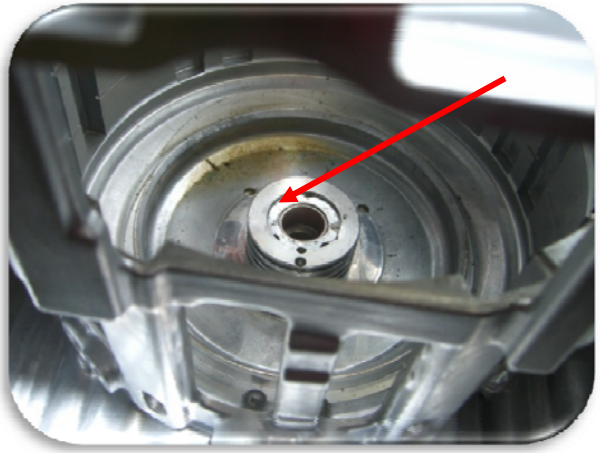



K2After Solenoid Repair

Regulated by the N282 solenoid

| VB data @70 Deg | | BAR | | Sonnax parts | | Tested good in car | |
|---|---|---|---|---|---|---|---|
| | Sample | A | | B | C | D | |
| | | New | Old | With 15741-29K | 29 & 18K | No Sonnax parts but rebuilt using old parts | |
| 1st Gear | K1 | 16.09 | 14.1 | 14.89 | 15.87 | 15.63 | |
| 1st Gear | B1 | 0 | 1.4 | 0.02 | 0 | 0 | |
| 1st Gear | K3 | 0 | 0 | 0.01 | 0.03 | 0.01 | |
| 1st Gear | K2 | 0 | 0 | 0.05 | 0.02 | 0.01 | |
| 1st Gear | B2 | 0 | 0 | 0 | 0 | 0 | |
| 1st Gear | TC Release | 9.21 | 6.6 | 8.95 | 9.27 | 9.03 | |
| 1st Gear | TC Apply | 8 | 6.6 | 8.72 | 8.85 | 7.84 | |
| 2nd Gear | K1 | 16.17 | 14.2 | 14.89 | 15.83 | 15.77 | |
| 2nd Gear | B1 | 16.24 | 1.55 | 15.05 | 15.98 | 15.95 | |
| 2nd Gear | K3 | 0 | 0 | 0.07 | 0.06 | 0.02 | |
| 2nd Gear | K2 | 0 | 0 | 0.09 | 0.08 | 0.02 | |
| 2nd Gear | B2 | 0 | 0 | 0.04 | 0.01 | 0.02 | |
| 2nd Gear | TC Release | 9.26 | 6.6 | 8.72 | 9.32 | 9.14 | |
| 2nd Gear | TC Apply | 8.03 | 6.6 | 8.6 | 8.91 | 7.92 | |
| 3rd Gear | K1 | 16.23 | 14 | 14.79 | 15.87 | 15.71 | |
| 3rd Gear | B1 | 0 | 1.7 | 0.13 | 0.14 | 0.07 | |
| 3rd Gear | K3 | 16.43 | 12.8 | 15.03 | 16.1 | 16 | |
| 3rd Gear | K2 | 0 | 0.8 | 0.17 | 0.16 | 0.13 | |
| 3rd Gear | B2 | 0.01 | 0 | 0.06 | 0.08 | 0.05 | |
| 3rd Gear | TC Release | 9.29 | 6.6 | 8.82 | 9.37 | 9.17 | |
| 3rd Gear | TC Apply | 7.93 | 6.7 | 8.67 | 9 | 7.83 | |
| 4th Gear | K1 | 16.1 | 14.2 | 15.47 | 15.8 | 15.76 | |
| 4th Gear | B1 | 0 | 6.23 | 0 | 0 | 0 | |
| 4th Gear | K3 | 0 | 0.6 | 0 | 0 | 0 | |

Comparison Chart.



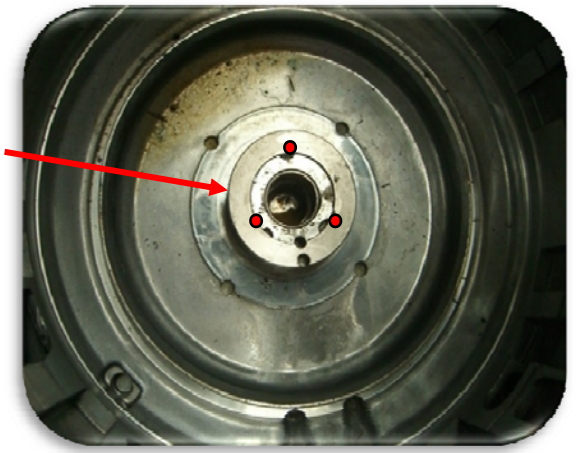
Sealing ring sleeve spins in the casing.

Sometimes so severe that the casing becomes badly damaged.

If the casing has not been damaged then using a strong Loctite may be sufficient. We recommend 602. Drill and pin the sleeve in 3 places would be a more permanent fix.

If the casing is damage, an oversize sleeve (internally) would need to be made and the casing would require machining to match the new sleeve.

Drill and pin in 3 places to prevent repeat failure.

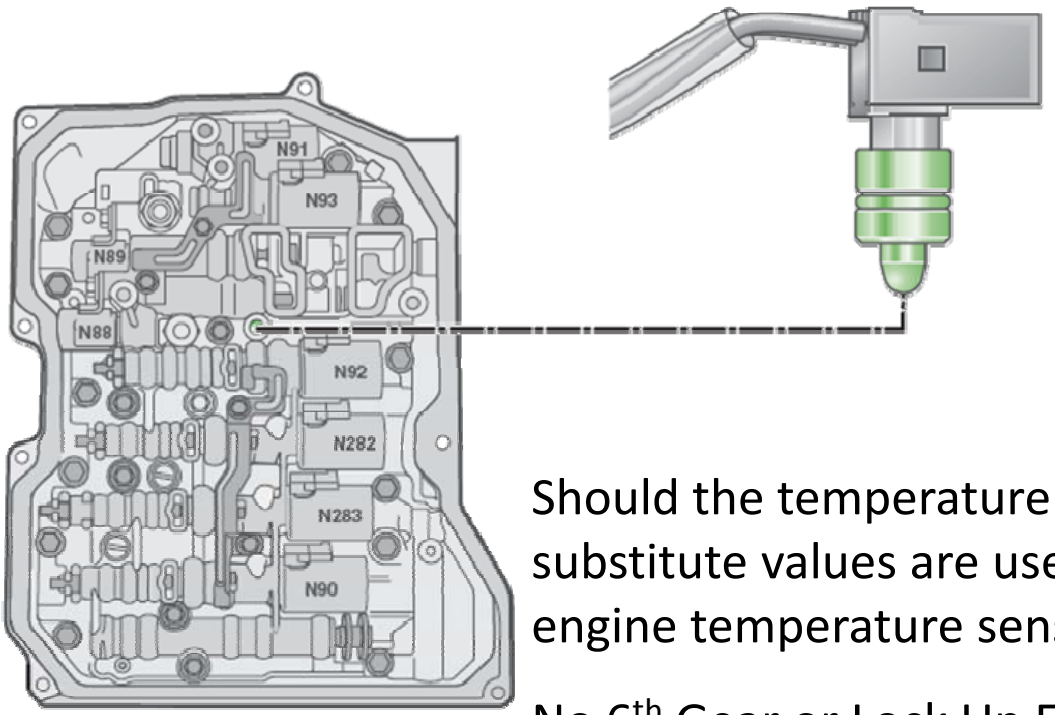


Normally the bush will also be damaged so machine a replacement and make a tool to insert it.

## ***Clutch and Brake Assignment Table***

| Assignment Table of Multi-disc Clutches and Brakes | | | | | | |
|---|---|---|---|---|---|---|
| | Components | | | | | |
| GEAR | K1 | K2 | K3 | B1 | B2 | OWC |
| 1st | X | | | | X* | X |
| 2nd | X | | | X | | |
| 3rd | X | | X | | | |
| 4th | X | X | | | | |
| 5th | | X | X | | | |
| 6th | | X | | X | | |
| Rev | | | X | | X | |

## ***G93 Temperature Sensor***



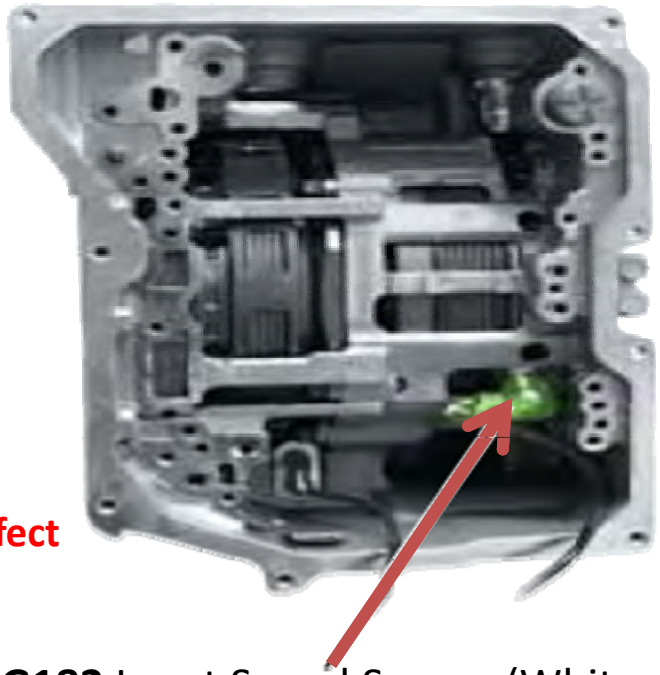

Should the temperature sensor fail, substitute values are used from the engine temperature sensor.

No 6th Gear or Lock Up Function

## ***G182 Input Speed Sensor***

Should the Input speed sensor fail, substitute values are used from the engine.

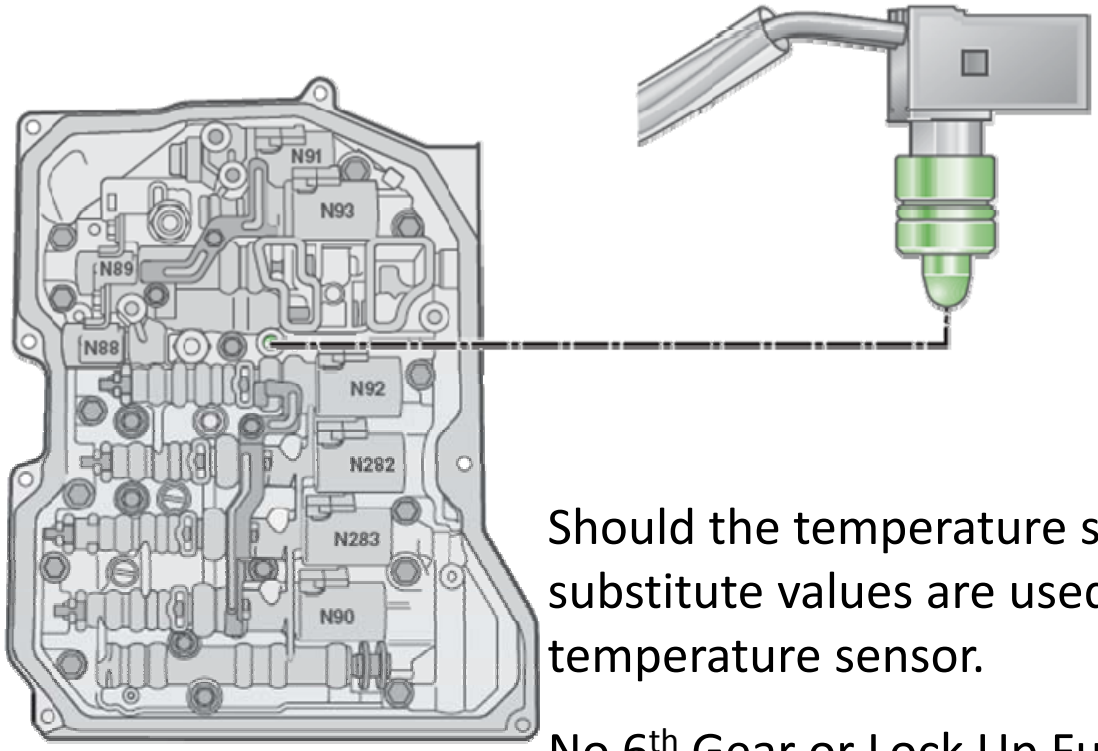
**How do I test them?**



**G182** Input Speed Sensor (White connector)

**Note:- These sensors are 2 wire Active Hall Effect**

## ***G93 Temperature Sensor***

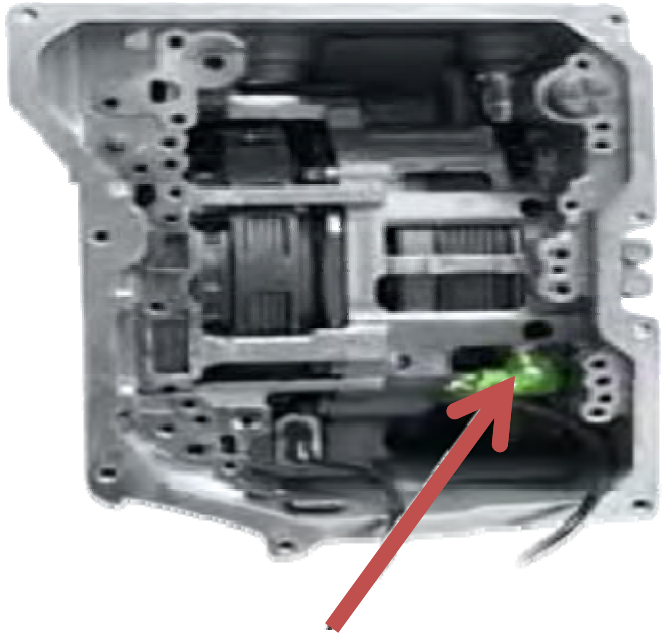



Should the temperature sensor fail, substitute values are used from the engine temperature sensor.

No 6th Gear or Lock Up Function

## ***G182 Input Speed Sensor***

Should the Input speed sensor fail, substitute values are used from the engine.



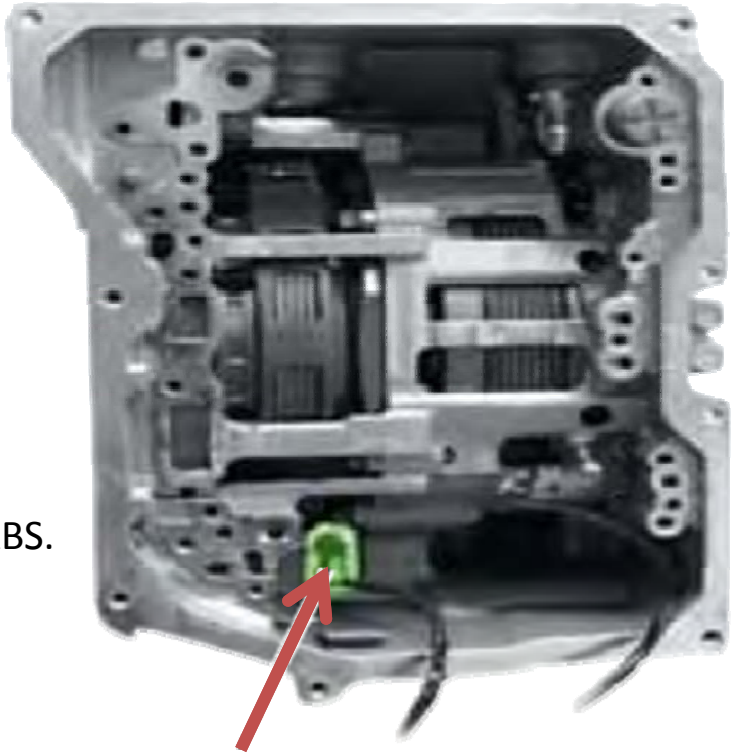
**How do I test them?**

**Note:- These sensors are 2 wire Active Hall Effect.**

**G182** Input Speed Sensor (White connector)

## ***G195 Output Speed Sensor***

Should the Output speed sensor fail, substitute values are used from the ABS.



**G195** Output Speed Sensor

## Resistance Checks

**14 way case connector**

| NAME | CONNECTOR | CONNECTOR | RESISTANCE |
|---|---|---|---|
| **N88** | 1 | B- Ground | 10-16 Ohms |
| **N89** | 2 | B- Ground | 10-16 Ohms |
| **N90** | 7 | 8 | 4-8 Ohms |
| **N91** | 11 | 12 | 4-8 Ohms |
| **N92** | 3 | 4 | 4-8 Ohms |
| **N93** | 13 | 14 | 4-8 Ohms |
| **N282** | 5 | 6 | 4-8 Ohms |
| **N283** | 9 | 10 | 4-8 Ohms |

**8 way case connector**

| NAME | CONNECTOR | CONNECTOR | RESISTANCE |
|---|---|---|---|
| **TFT** | 1 | 2 | Temperature dependant |
| **ISS** | 3 | 4 | 5m Ohms |
| **OSS** | 5 | 6 | 5m Ohms |
| **PS1*** | 7 | B- Ground | Open |
| **PS2*** | 8 | B- Ground | Open |

*** Only where PS1 & PS2 are fitted**

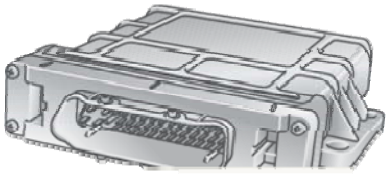
# ***Transmission Control Module***

**Transmission Control Module ( TCM) J217**

The control module is connected to the vehicle by a 52 pin connector the vas 1598/48 adapter cable is available for static and dynamic system measurements.

The manufacture of the control module is Aisin AW Japan

Update programming is possible using VAS 5051 / 5052



Component location in 06 Passat beneath the front left wheel housing cover



AutoLibrary

## ***Emergency Running Mode***

- In mechanical emergency running mode, 3rd gear is always engaged in driving operation up to 3rd gear

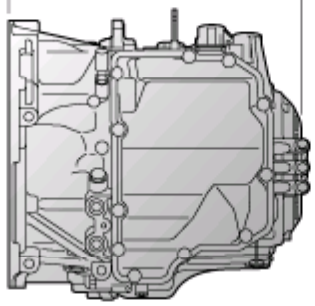
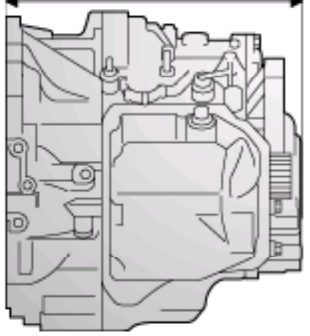
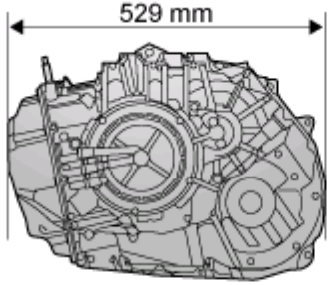
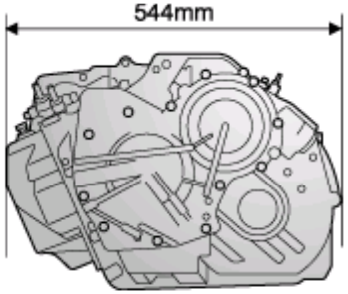
- If the transmission is already in 4th, 5th or 6th gear, the current gear is maintained until neutral is selected or the engine is stopped

- 3rd gear is always engaged when starting off in both “D” or “S” mode

- Reverse gear is available and lock-out is not active

- Pressure is raised to maximum and TCC is disabled

## AF40 (TF80SN) Dimension Changes

| Type | AF40-6<br>6-speed | AW conventional type A/T<br>5-speed |
|---|---|---|
| Appearance | 358 or 369.7 mm<br>  <br>The dimension differs according to the engine | 349mm<br>  |
| | 529 mm<br>  | 544mm<br>  |

| | | |
|---|---|---|
| Gear Ratio 1st | 4.148 | 4.769 |
| 2nd | 2.370 | 2.995 |
| 3rd | 1.556 | 1.957 |
| 4th | 1.155 | 1.324 |
| 5th | 0.859 | 1.018 |
| 6th | 0.686 | - |
| Rev | 3.394 | 3.234 |
| Planetary gear unit | 2 | 4 |
| Maximum torque capacity | Approximately 450 N·m | Approximately 350 N·m |
| Weight | Approximately 96 kg | Approximately 87 kg |
| ATF | AW-1 (09 253 574) | JWS-3309 |

***Adoption of Centrifugal Hydraulic Pressure Cancel Clutch.***

When the rotation of the clutch rises, centrifugal force operates on the oil inside the clutch. Hydraulic pressure then rises and the clutch is engaged at an earlier timing.

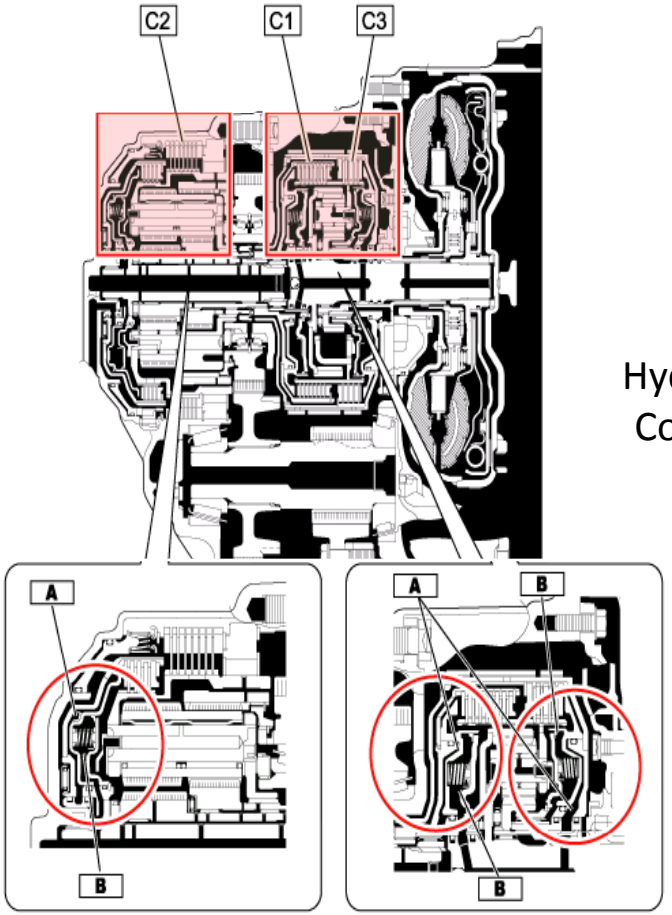
Because of this a difference arises in rotation between the input shaft and the output shaft. Shift shock may occur.

To solve this an additional chamber has been provided opposite the piston hydraulic pressure chamber.

This causes centrifugal hydraulic pressure to operate in the opposite direction with the same force as the piston, counteracting that pressure.

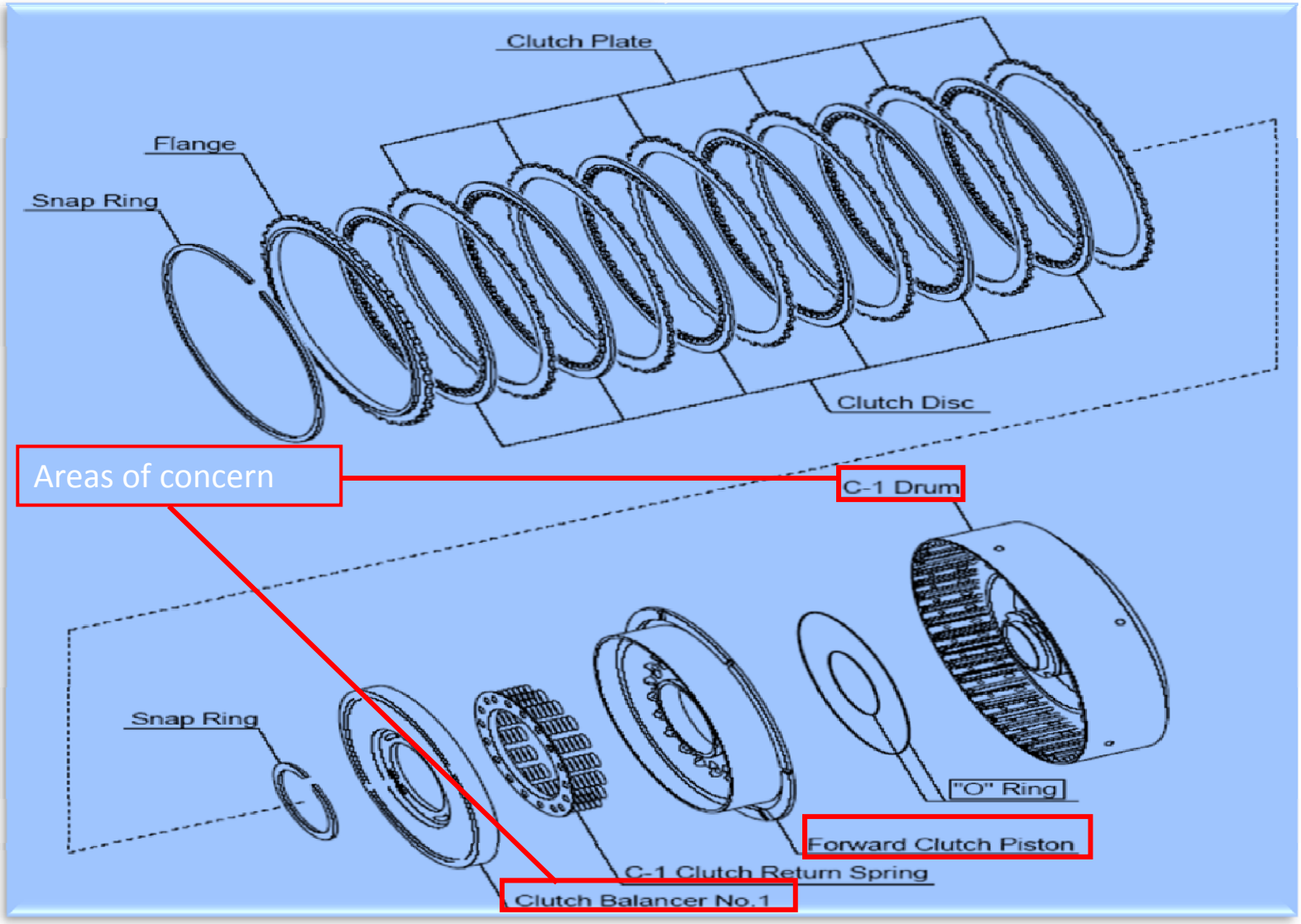
A :

Piston Hydraulic Pressure Chamber




B :

Centrifugal Hydraulic Pressure Control Chamber

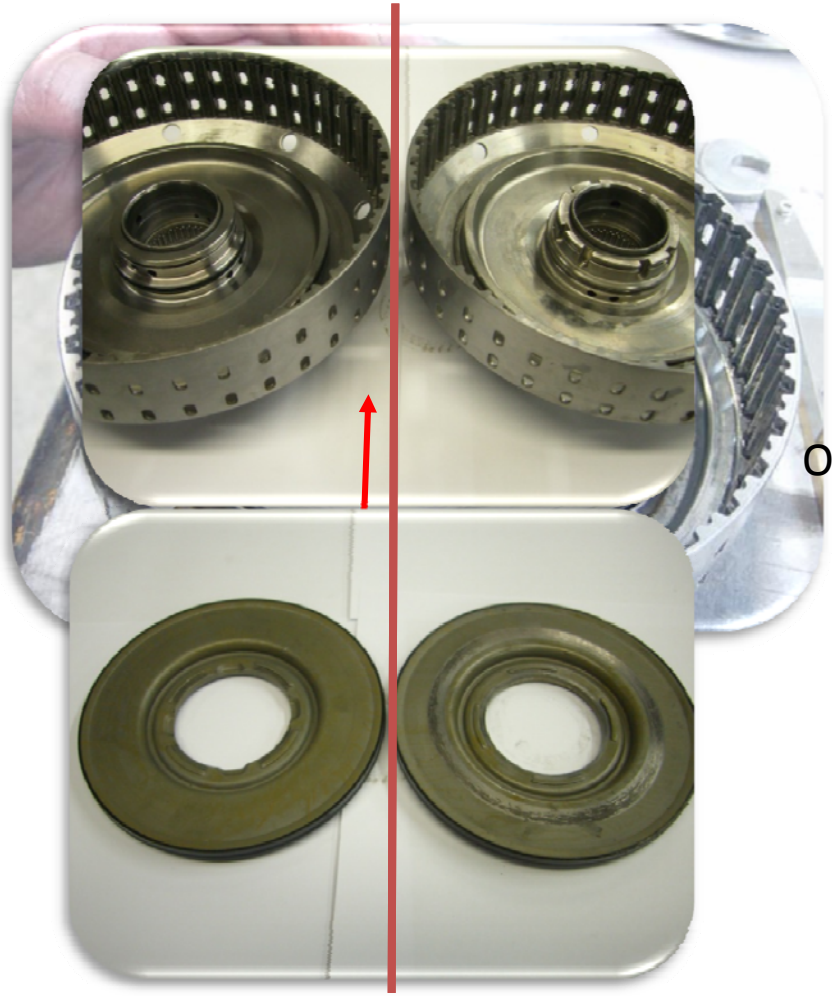


## ***C1 Clutch Problems***

Circlip wears in it's groove and allows the Balance piston to over travel

## ***C1 Clutch Problems***

New design



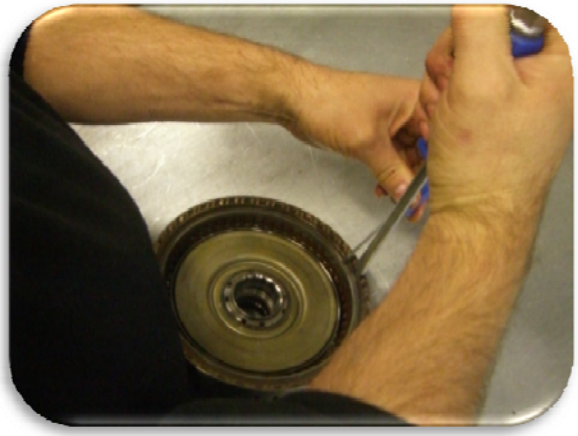
Old design

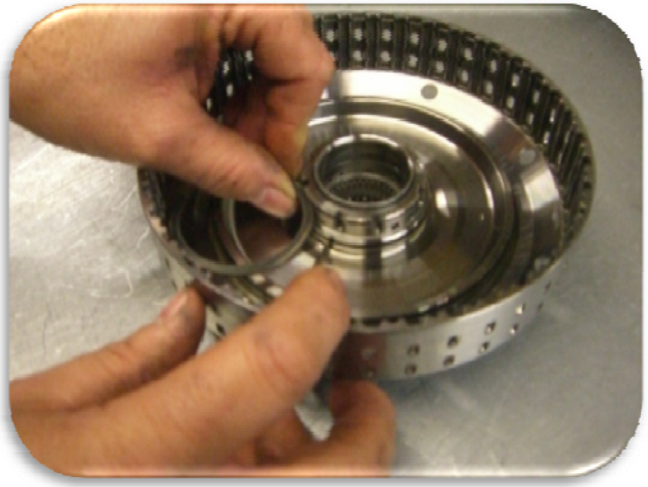
## ***C1 or K1 Clutch Overhaul Procedure***

- It is important to check the adjustment of this clutch by measuring the full travel of the piston and not just the plate clearance.
- Use the method as shown
- The excess travel of the piston can be as much as 1.2mm.

Piston Stroke
(6 Frictions)
1.2mm – 1.4mm

Piston Stroke
(7 Frictions)
1.6mm – 1.8mm

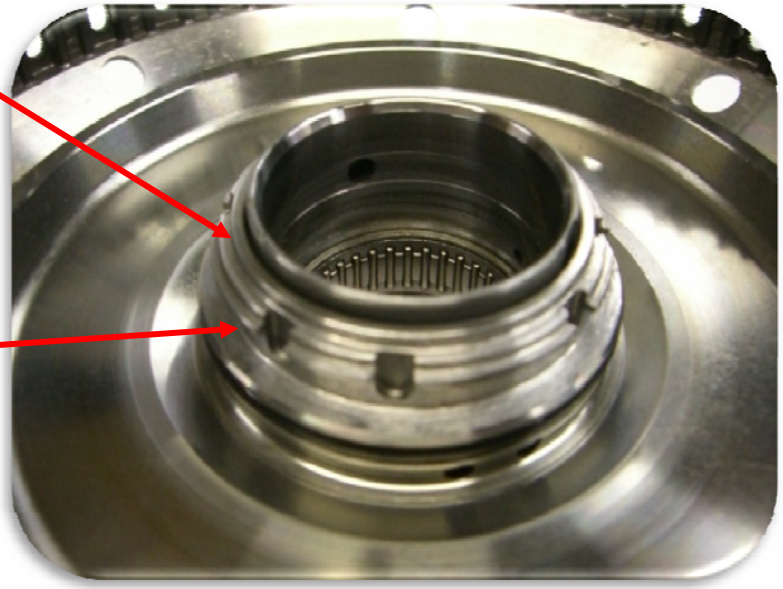




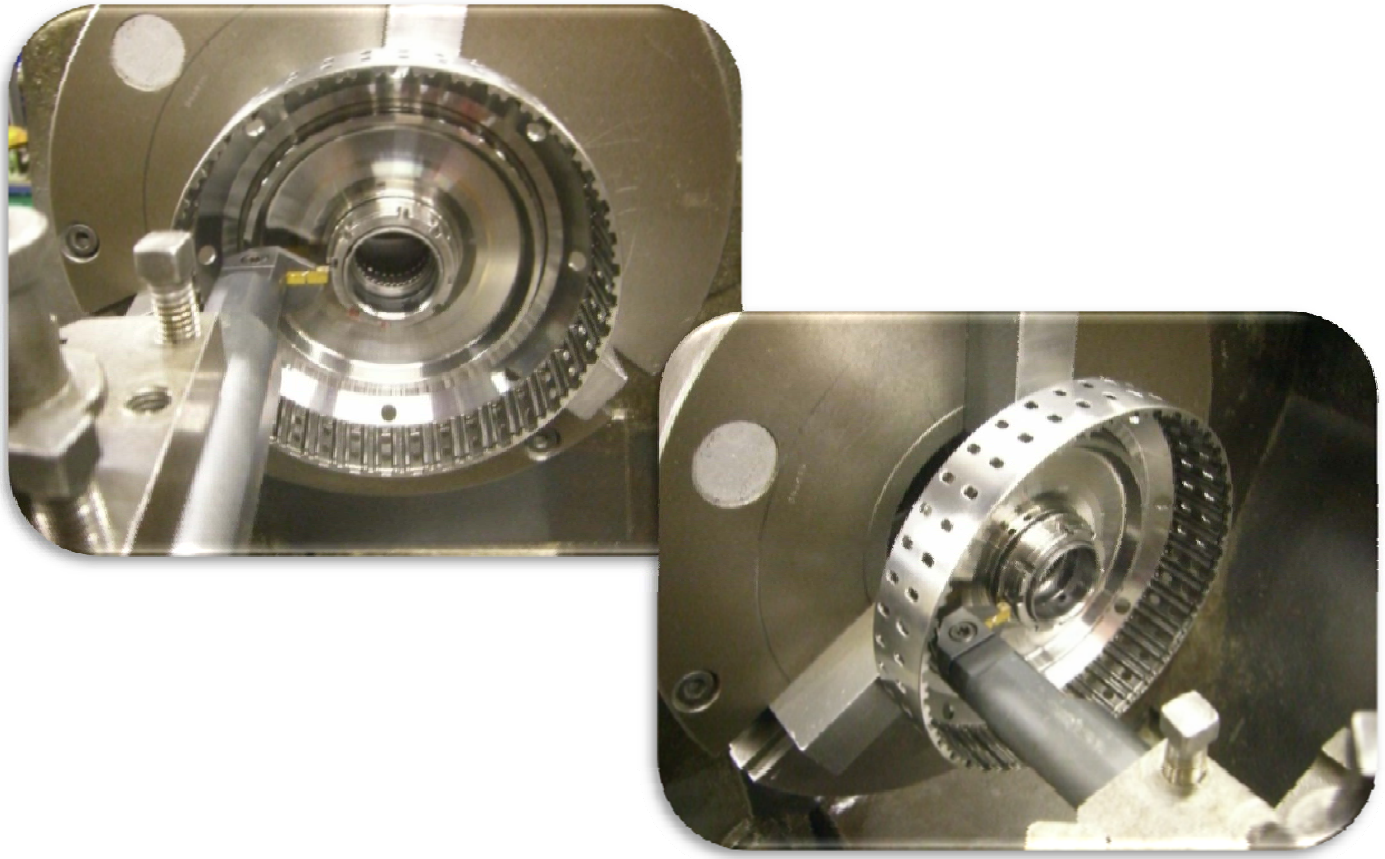
## ***Circlip Groove Repair***

The circlip groove repair requires the removal of the worn top part to allow for a new section to be welded into place.

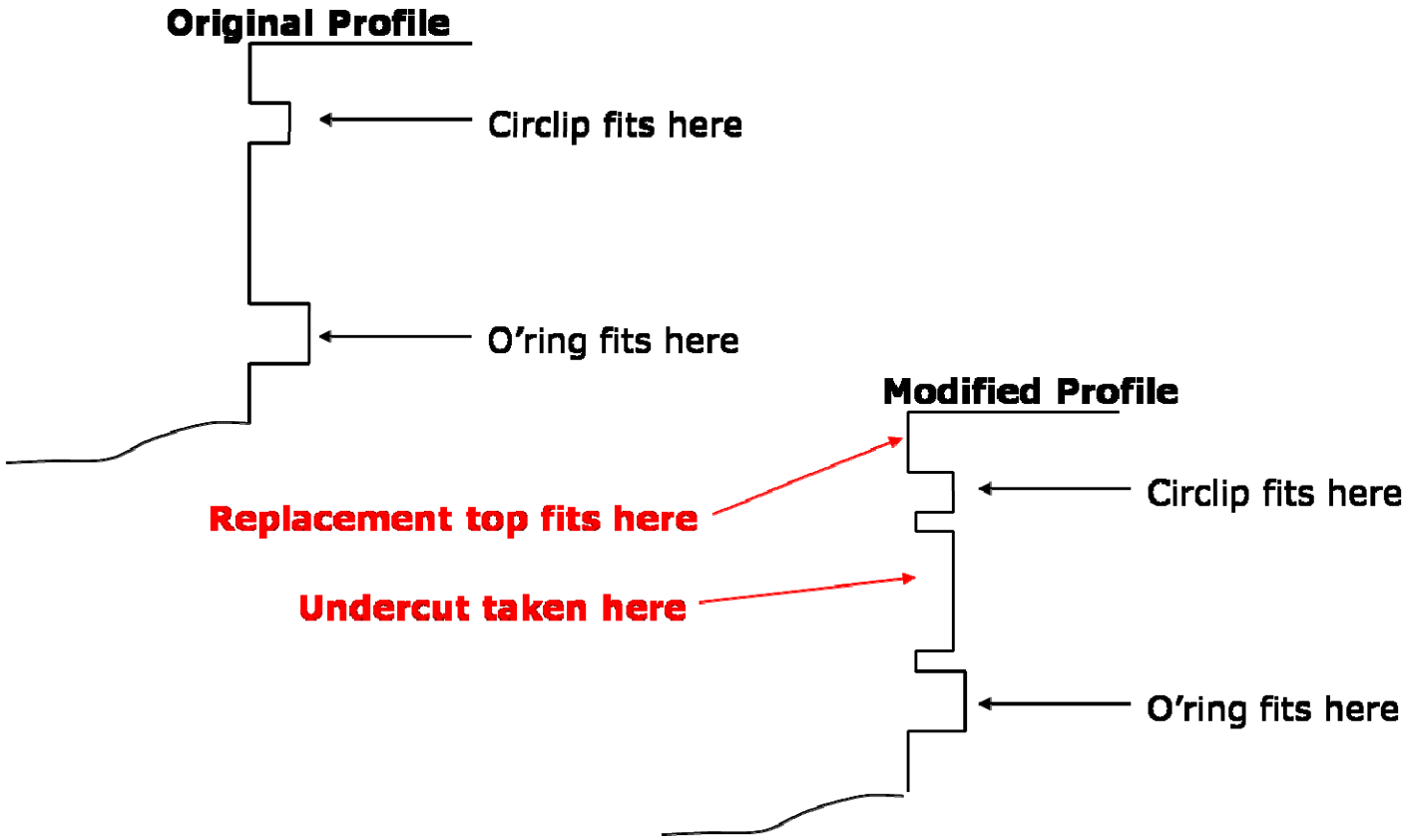
A further under cut needs to be taken to allow the oil to evacuate via the new slots in the balance piston



## Circlip Groove Repair



# Circlip Groove Repair



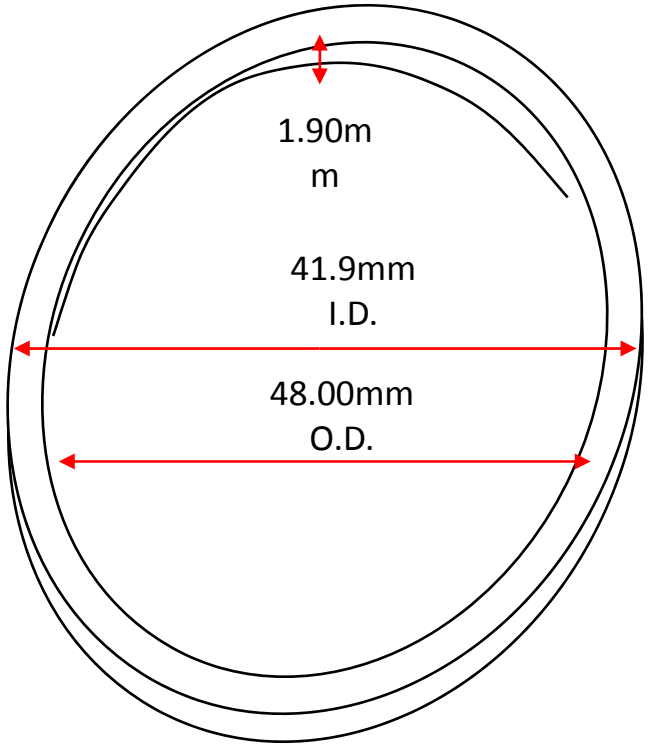
## ***New Ring Dimensions***

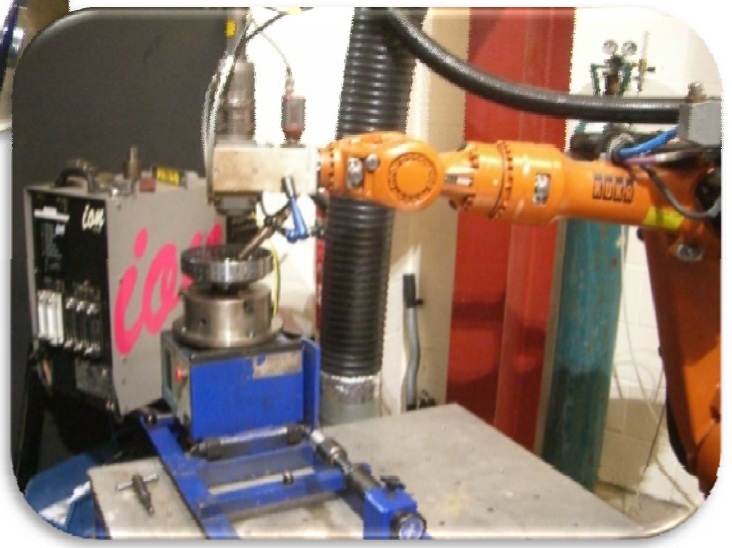
### Dimensions

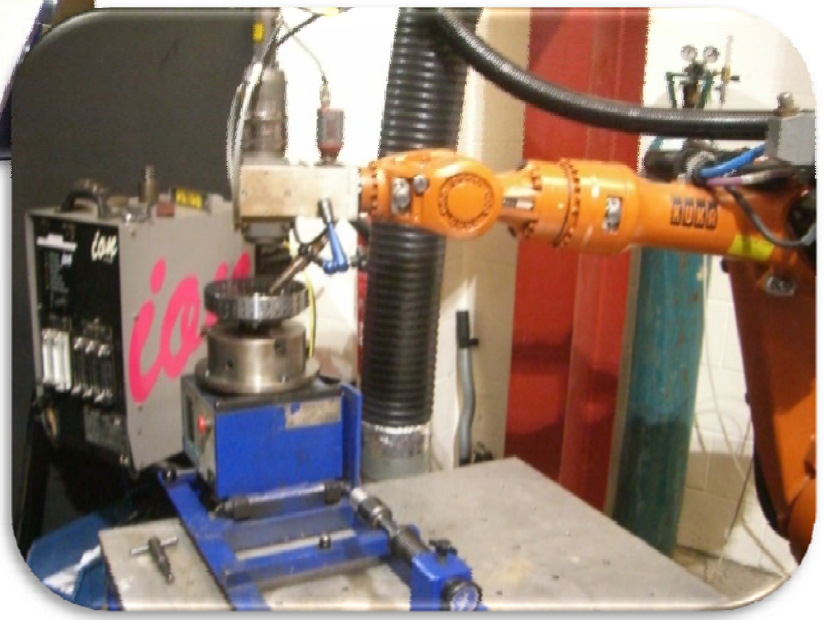
1.90mm Thick

41.90mm Inside diameter

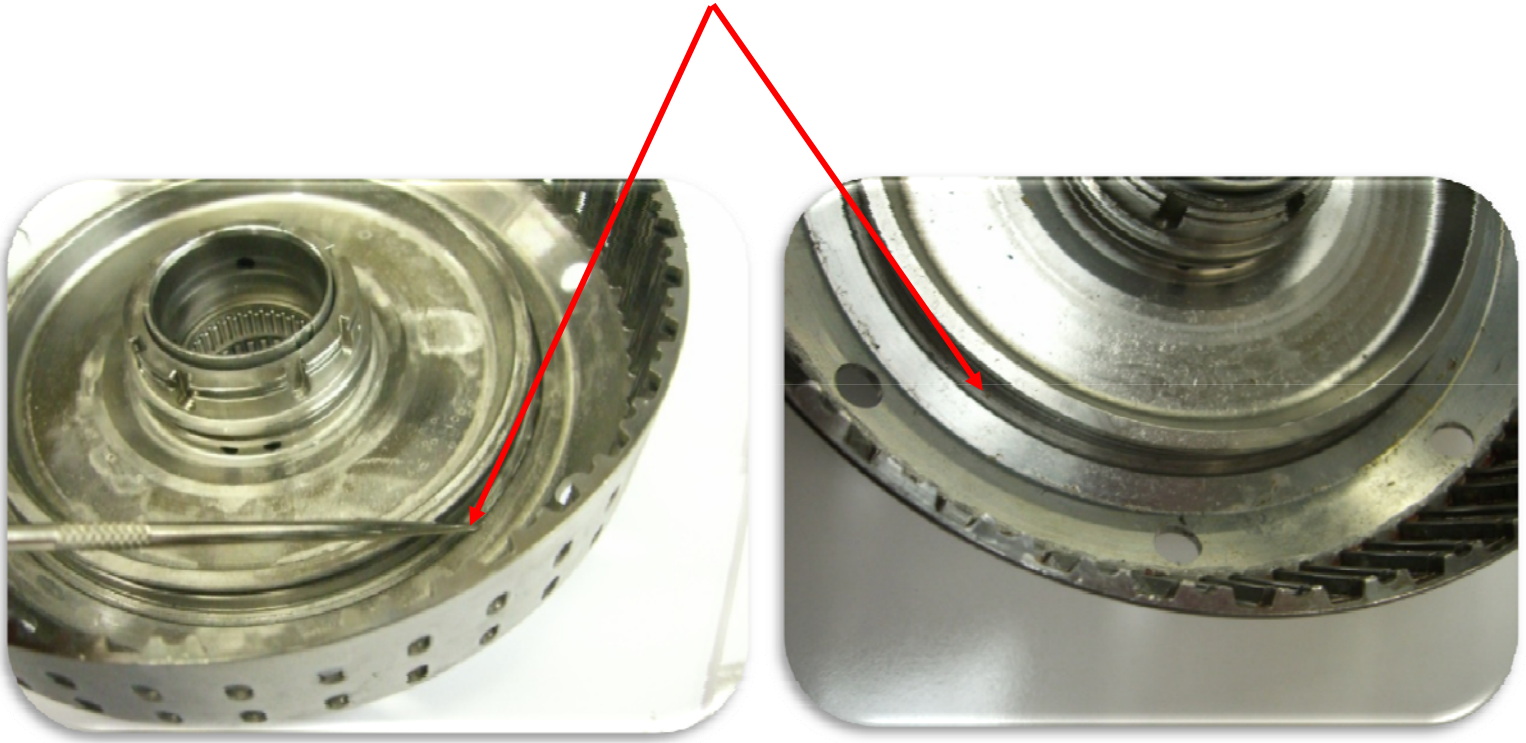
48.00mm Outside diameter







***Drum wear caused by the piston ridge on release of the clutch***





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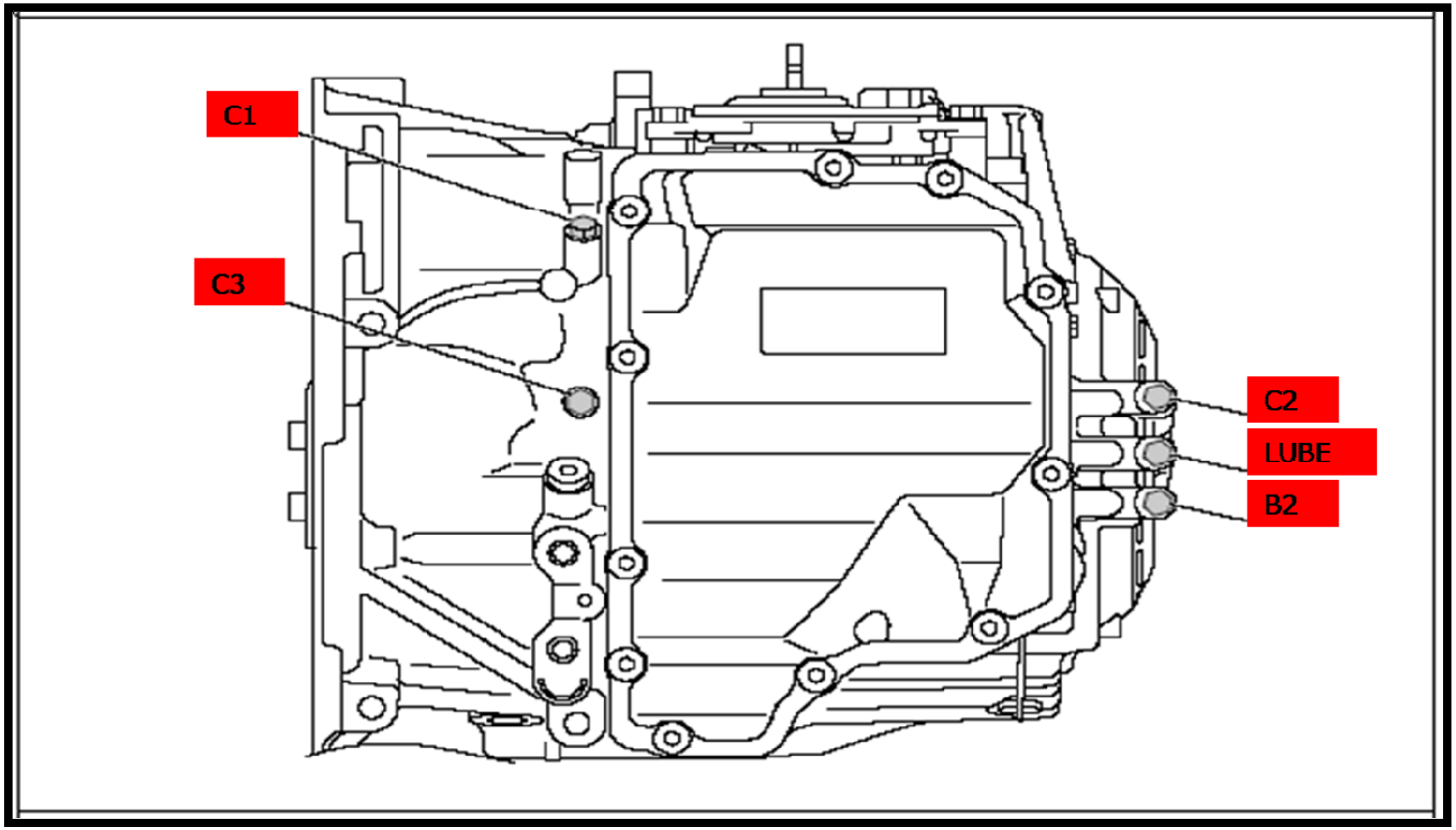
***Measuring the Piston Stroke of the C1 Clutch***

• It is important to check the adjustment of this clutch by measuring the full travel of the piston and not just the plate clearance.

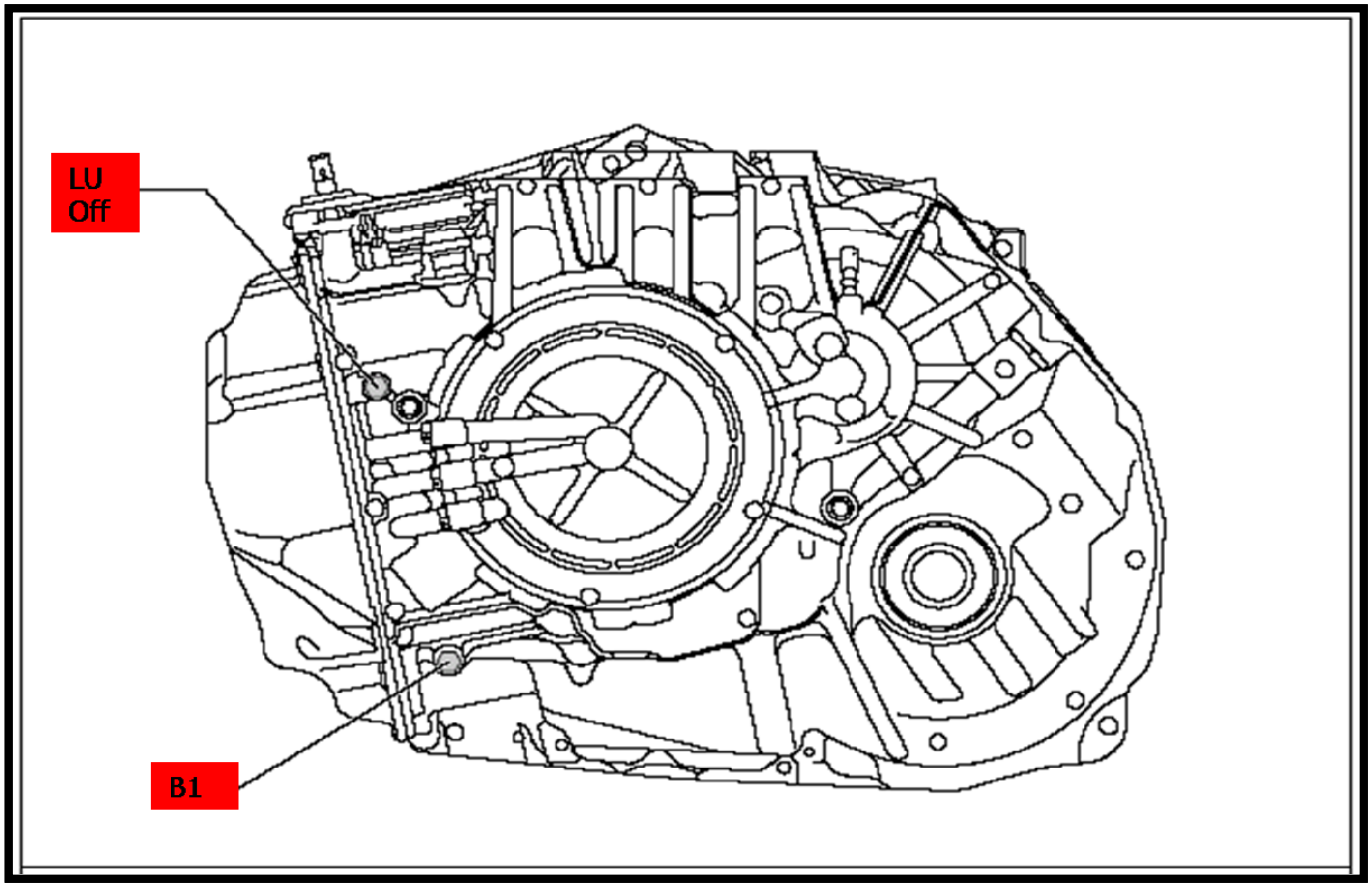
Piston Stroke
(6 Frictions)
1.2mm – 1.4mm

Piston Stroke
(7 Frictions)
1.6mm – 1.8mm

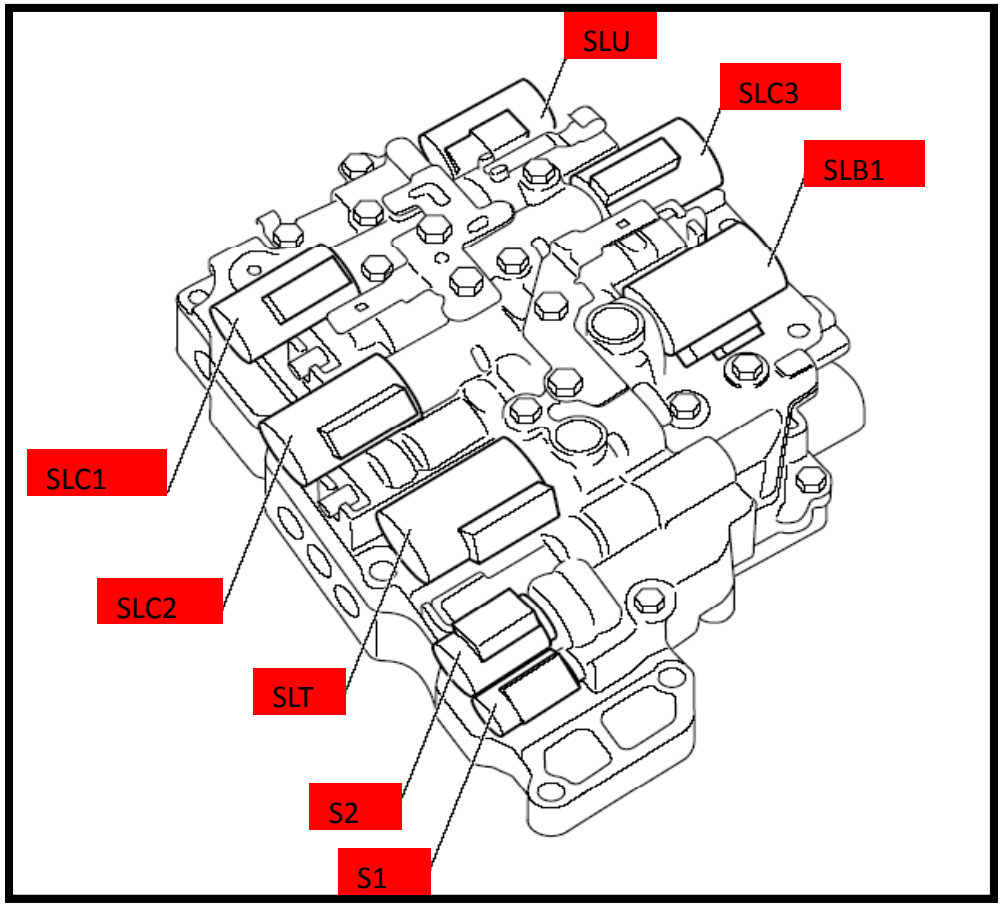
## ***Pressure Test Plug Locations***



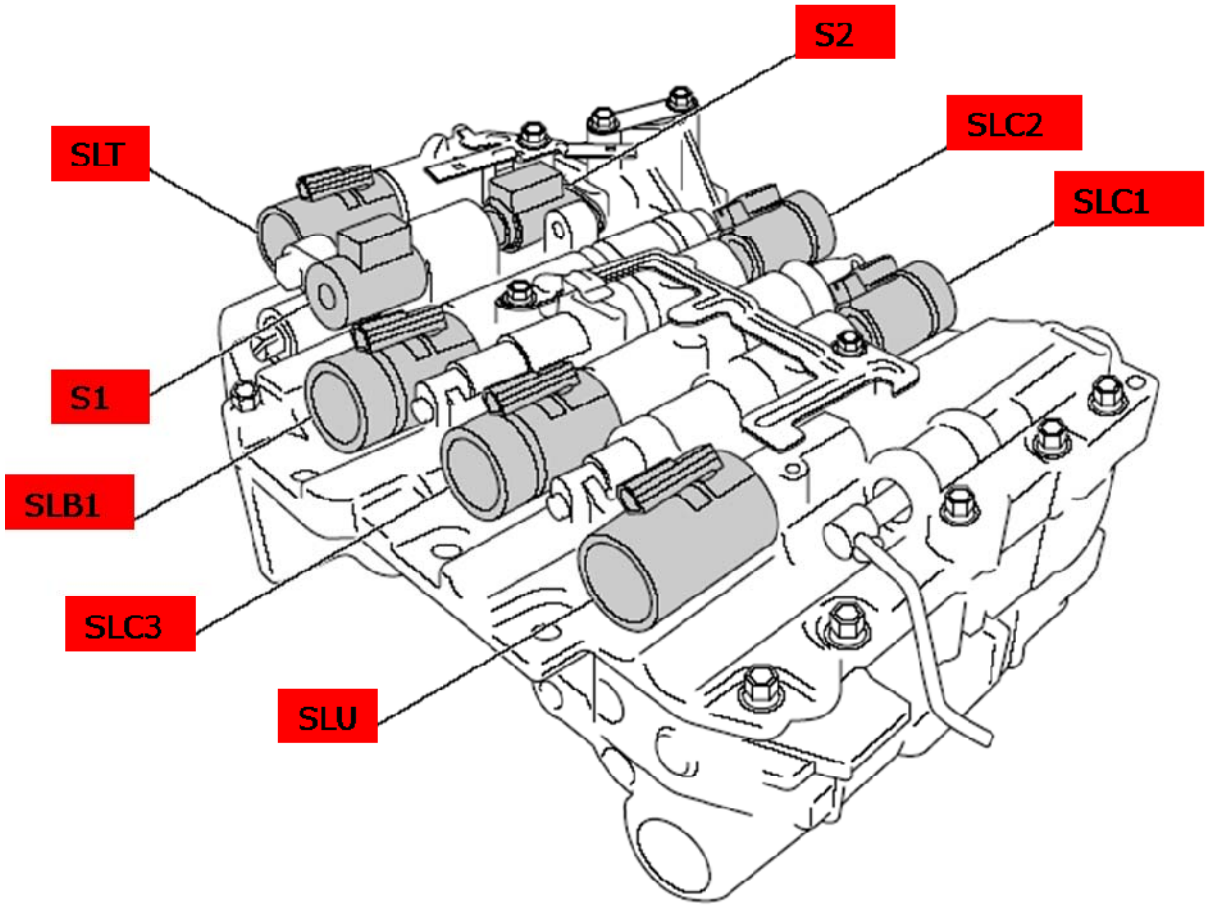
## Pressure Test Plug Locations



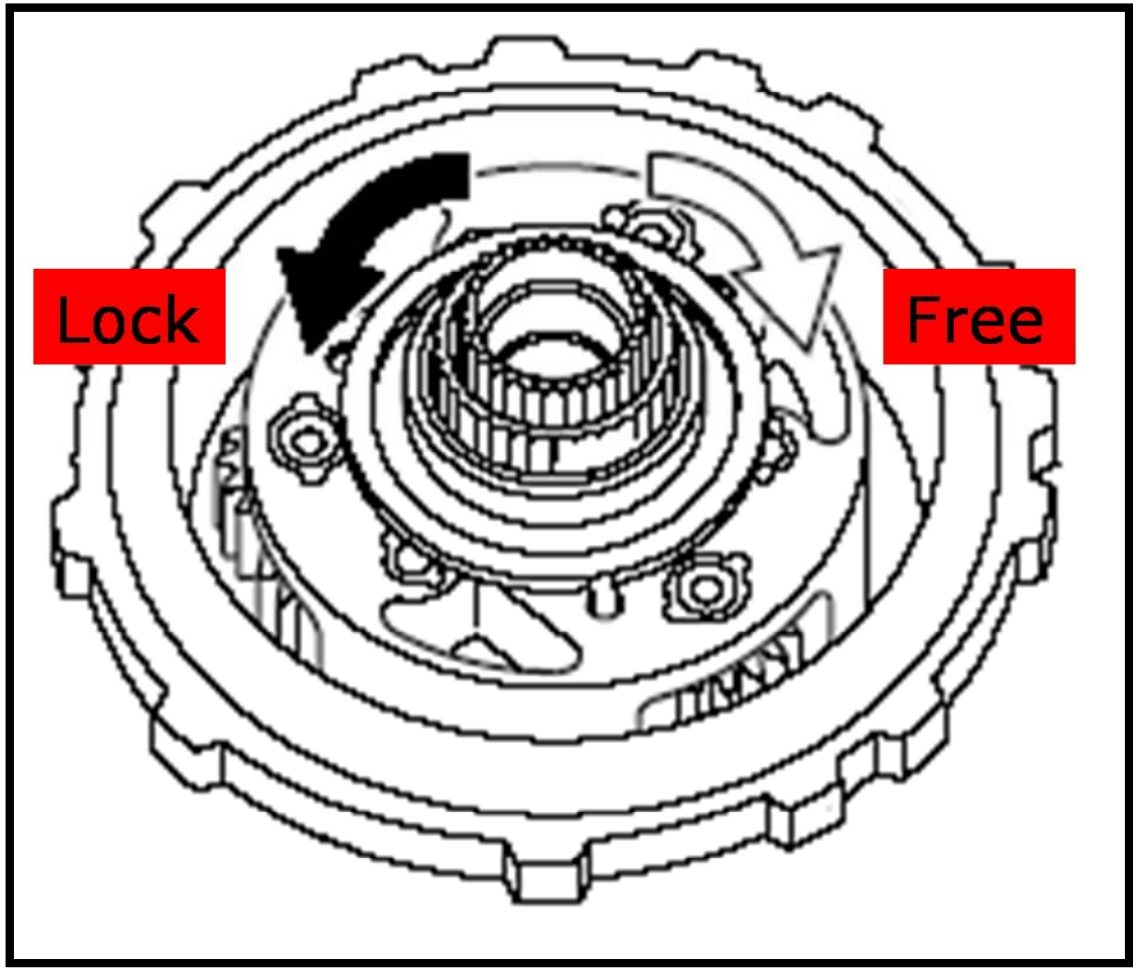
## PSA (TF80SC) Solenoid Identification and Locations



# Mazda (TF81SC) Solenoid Identification and Locations



## ***One Way Clutch Rotation***

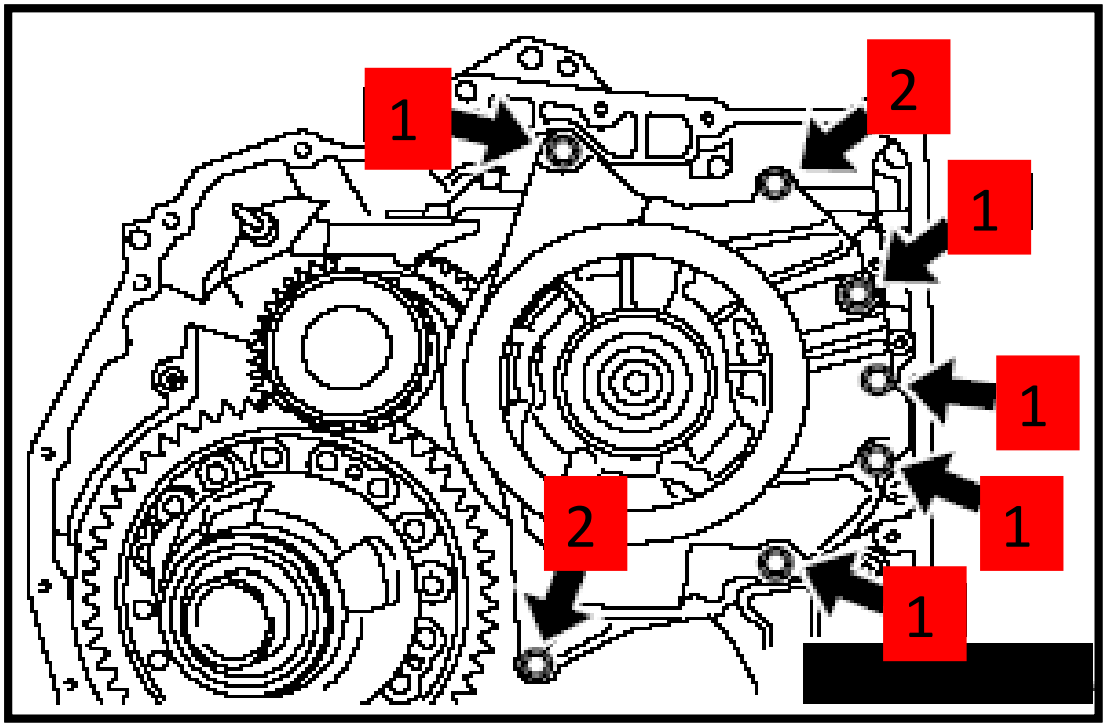


## ***Oil Pump***

**Caution :**

**No.1 Bolts = M8x1mm 22mm Long**

**No.2 Bolts = M8x1mm 35mm Long**



## ***AF40-6 Speed Initial Learning***

**If the Automatic Transmission or the TCM are replaced, it is essential to initialize the learned values and perform initial learning.**

**Initial learning can only be performed between 66-110 C**

**Garage Shift Learning :**

Vehicle stopped, depress the brake and keep lever in N for 3 seconds. Then shift from N to D and maintain for 3 seconds. Repeat this procedure 5 times. Then repeat the same procedure from N to R.

**Gear Shift Control Learning :**

In D, at a throttle opening of 25%-30% drive up to $6^{th}$ gear at a speed of above 65mph. Then coast to a stop within 60 seconds. Repeat this procedure 10 times.

**Check Learning Results :**

Check that variable speed shock and shift shock have decreased compared to the condition before learning.

## DTC's and Effects

**P0560 (1) Ignition voltage low**
No Lock up slip control - No Neutral control - No self learning control - Oil temp = 80 C

**P0560 (2) Ignition voltage high**
No Self learning control - No Adaptive shift control - Emergency mode 1

**P0602 TCM programming error**

**P0605 Flash ROM Internal Checksum**
Emergency mode 1

**P0703 CAN – Brake pedal**
Brake off

**P0705 (1) Selector position switch (No signal)**
No Self learning control - No Adaptive shift control - If out rpm = 0rpm,Range D, Gear = 2nd hold and emergency mode - Start lock locked (engine cannot start)

**P0710 (1) Oil Temp Sensor (gnd short)**
No Lock up slip control - No Neutral control - No self learning control - Oil temp = 80 C

**P0710 (2) Oil Temp Sensor (B+ short/open)**
No lock up slip control - No neutral control - No Self learning control - Oil temp = 80 C

**P0710 (3) Oil Temp Sensor (TFT stuck)**
No lock up slip control - No neutral control - No Self learning control - Oil temp = 80 C

## P0715 (1) Input revolution sensor (No pulse)

No Lock up slip control - No Neutral control - No self learning control – No adaptive shift control – To change the source for input rpm calculation – Emergency 1

## P0715 (2) Input revolution sensor (Wrong pulse)

No Lock up slip control - No Neutral control - No self learning control – No adaptive shift control – To change the source for input rpm calculation – Emergency 1

## P0720 (1) Output revolution sensor (No pulse)

No Lock up slip control - No Neutral control - No self learning control – No adaptive shift control – To change the source for Output rpm calculation – Emergency 1

## P0720 (2) Output revolution sensor (Wrong pulse)

No Lock up slip control - No Neutral control - No self learning control – No adaptive shift control – To change the source for Output rpm calculation – Emergency 1

## P0725 CAN (Engine speed signal unreliable )

Emergency 1 – Engine speed = 7000rpm

## P0729 Gear ratio ($6^{th}$)

No Neutral control - No self learning control – No adaptive shift control – Emergency 2

## P0731 (1) Gear ratio ($1^{st}$)

No Neutral control - No self learning control – No adaptive shift control – Emergency 2

## P0731 (2) Gear ratio ($1^{st}$ Engine braking)

No Neutral control - No self learning control – No adaptive shift control – Emergency 2

## P0732 Gear ratio ($2^{nd}$)

No Neutral control - No self learning control – No adaptive shift control – Emergency 2

## P0733 Gear ratio (3rd)

No Neutral control - No self learning control – No adaptive shift control – Emergency 2

## P0734 Gear ratio (4th)

No Neutral control - No self learning control – No adaptive shift control – Emergency 2

## P0735 Gear ratio (5th)

No Neutral control - No self learning control – No adaptive shift control – Emergency 2

## P0736 Gear ratio (Reverse)

No Neutral control - No self learning control – No adaptive shift control – Emergency 2

## P0743 (1) SLU Solenoid (B+ short)

Engine stall avoidance control – No lock up control – No lock up slip control - No Neutral control - No self learning control – No adaptive shift control

## P0743 (2) SLU Solenoid (Ground short/open)

No lock up control - No self learning control – No adaptive shift control – No lock up slip control

## P0743 (3) SLU Solenoid (Terminal short)

No lock up control - No self learning control – No adaptive shift control – No lock up slip control

## P0743 (4) SLU Solenoid feedback current stuck

No self learning control – Emergency 1

## P0748 (1) SLT Solenoid (B+ short)

No self learning control –Emergency 1

## P0748 (2) SLT Solenoid (Ground short/open)

No self learning control - Emergency 1

**P0748 (3) SLT Solenoid (Terminal short)**
No self learning control – Emergency 1

**P0748 (4) SLT Solenoid feedback current stuck**
No self learning control – Emergency 1

**P0753 (1) S2 Solenoid (B+ short/open)**
No self learning control – Emergency 1

**P0753 (2) S2 Solenoid (Ground short)**
No self learning control – Emergency 1

**P0773 (1) S1 Solenoid (B+ short/open)**
No self learning control – Emergency 1

**P0773 (2) S1 Solenoid (Ground short)**
No self learning control – Emergency 1

**P0780 Unusual shifting (valve stuck)**
No Neutral control - No self learning control – No adaptive shift control – Emergency 2

**P0826 (1) Manual shift switch (B+ short)**
Inhibit manual shift mode – revert to automatic mode

**P0826 (2) Manual shift switch (Ground short)**
Inhibit manual shift mode – revert to automatic mode

**P1120 CAN (Accel pedal position signal unreliable)**
Emergency 1 – Accelerator 0%

## P1704 (1) Neutral control (D range – C1 engagement)

No neutral control – No self learning control – No N-D shift control

## P1704 (2) Neutral control (D range – No control

No neutral control – No self learning control – No N-D shift control

## P1704 (3) Neutral control (D range – engine flare

Torque limitation – Emergency 1

## P1711 CAN (Wheel speed front left)

No self learning control – No adaptive shift control – inhibit cornering control – FLWS =195mph

## P1712 CAN (Wheel speed front right)

No self learning control – No adaptive shift control – inhibit cornering control – FRWS =195mph

## P1743 (1) Lock up control (stuck on)

No self learning control – No lock up control – No lock up slip control - No neutral control - No adaptive shift control – Engine stall avoidance control

## P1743 (2) Lock up control (stuck off)

No self learning control – No lock up control – No lock up slip control - No adaptive shift control – Engine stall avoidance control

## P1780 CAN (Engine torque reduction failed)

No self learning control – No torque reduction control

## P1792 CAN (Invalid engine coolant temp)

Engine coolant temperature = 80 C – Prohibit WUSP mode

## P1835 CAN (Kickdown signal unreliable)

**P1895 CAN (Invalid actual engine torque)**

Emergency 1 – Engine torque = maximum

**P1896 CAN (Invalid driver requested engine torque)**

Emergency 1 – Engine torque = maximum

**P1981 (1) SLC1 Solenoid (B+ short)**

Emergency 1 – No self learning control

**P1981 (2) SLC1 Solenoid (Ground short)/open)**

Emergency 1 – No self learning control

**P1981 (3) SLC1 Solenoid (Terminal short)**

Emergency 1 – No self learning control

**P1981 (4) SLC1 Solenoid feedback current stuck**

Emergency 1 – No self learning control

**P1982 (1) SLC2 Solenoid (B+ short)**

Emergency 1 – No self learning control

**P1982 (2) SLC1 Solenoid (Ground short/open)**

Emergency 1 – No self learning control

**P1982 (3) SLC1 Solenoid (Terminal short)**

Emergency 1 – No self learning control

**P1982 (4) SLC1 Solenoid feedback current stuck**

Emergency 1 – No self learning control

**P1983 (1) SLC3 Solenoid (B+ short)**
Emergency 1 – No self learning control

**P1983 (2) SLC3 Solenoid (ground short/open)**
Emergency 1 – No self learning control

**P1983 (3) SLC3 Solenoid (Terminal short)**
Emergency 1 – No self learning control

**P1983 (4) SLC3 Solenoid feedback current stuck**
Emergency 1 – No self learning control

**P1984 (1) SLB1 Solenoid (B+ short)**
Emergency 1 – No self learning control

**P1984 (2) SLB1 Solenoid (Ground short/open)**
Emergency 1 – No self learning control

**P1984 (3) SLB1 Solenoid (Terminal short)**
Emergency 1 – No self learning control

**P1984 (4) SLB1 Solenoid feedback current stuck**
Emergency 1 – No self learning control

**P1993 Neutral condition (D & R range) (valve stuck)**
Emergency 1 – No neutral control – No lock up control – No lock up slip control – No adaptive shift control

**P1997 Start lock (high side ground/short)**

## U2101 CAN (Vehicle configuration not listed)

## U2103 CAN (Can Bus off)

## U2104 CAN (Can Bus off Counter overrun)

No self learning control – No adaptive shift control – Emergency 1 – Engine speed 7000rpm – Accelerator 0% - Actual engine torque = maximum – Driver requested engine torque = maximum – Engine coolant temp = 80C – Idle = On – brake switch = Off – All wheel speeds = 195mph

## U2105 CAN (Lost communication with ECM)

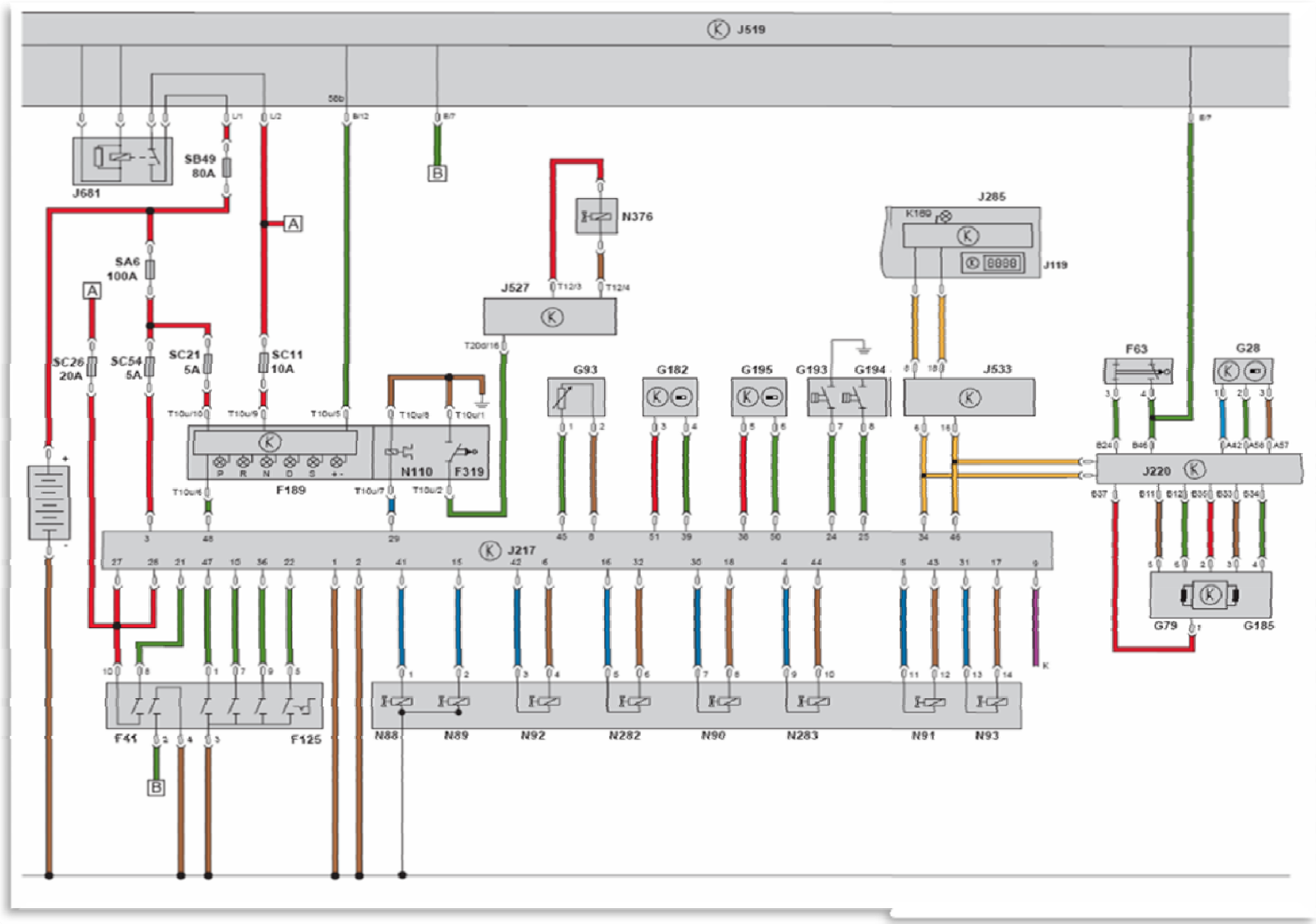
No self learning control – No adaptive shift control – Emergency 1 – Engine speed 7000rpm – Accelerator 0% - Actual engine torque = maximum – Driver requested engine torque = maximum – Engine coolant temp = 80C – Idle = On – brake switch = Off

## U2108 CAN (Lost communication with ABS)

No self learning control – No adaptive shift control– inhibit cornering control - All wheel speeds = 195mph

## U2139 CAN (Lost communication with CIM)

## U2144 CAN (Lost communication with ACC)



**COLOUR CODES**

- Input signal
- Output signal
- Positive supply
- Ground
- Bi-directional signal
- CanBus

| | | | |
|---|---|---|---|
| **F41** | Reverse switch | **J217** | Transmission control unit |
| **F63** | Brake switch | **J285** | Instrument panel control unit |
| **F125** | Multifunctional sensor | **J519** | On board network control unit |
| **F189** | Tiptronic sensor | **J527** | Steering column control unit |
| **F319** | Position switch P | **J533** | Gateway |
| **G28** | Engine RPM sensor | **J681** | Power supply relay, Terminal 15 |
| **G79/G185** | Throttle pedal position sensors | **K169** | Selector lever warning light |
| **G93** | Oil temperature sensor | **N110** | Selector lever lock |
| **G182** | Input speed sensor | **N376** | Ignition key removal lock |
| **G193/G194** | Pressure sensors 1 & 2 | **N88-N283** | Solenoid valves |
| **G195** | Output speed sensor | | |
| **J220** | Engine control unit | | |
| **J104** | ABS control unit | | |

# End Of

## Aisin 6 speed fwd Presentation