ATRA WEBINAR

O1J CVT Introduction

Sponsored By:

Presented by:
Steve Garrett
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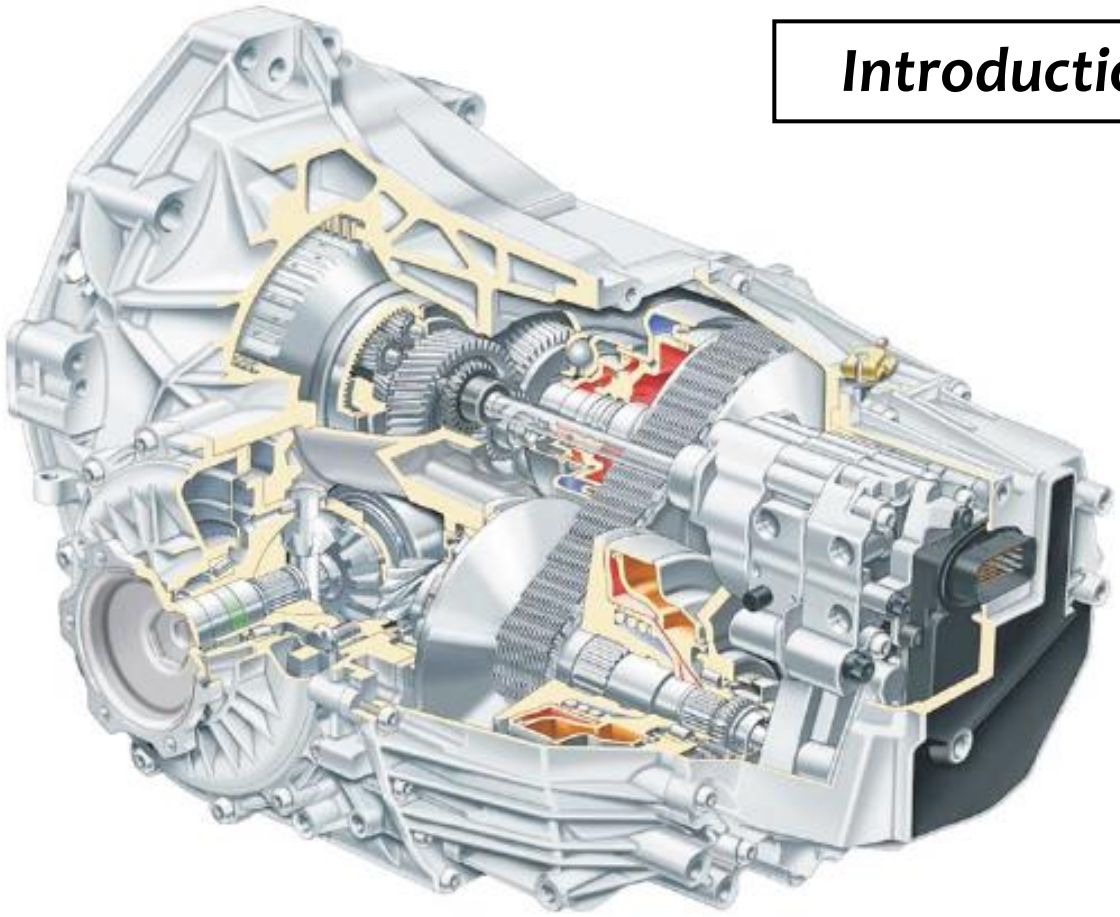
- **Connections**
- **Handout**
- **Questions**
- **Survey**

Thanks

* A special thanks to Mike Souza and to Audi for help with the information for this presentation

“Audi Multitronic 01J”

Introduction



Introduction

Variable Automatic Gearbox designed by Audi.
Commonly known as Continuously Variable Transmission "CVT".
Designated: Multitronic 01J
Vehicle application:

- 2004-09 A4 Cabriolet 1.8L / 2.0L L4 / 3.0L V6
- 2002-04 A6 3.0L V6
- 2005-09 3.2L V6

Features:

- No fluid coupling (torque converter) between engine and gearbox.
- Single flywheel damper unit (V6 engine).
- Dual-Mass flywheel damper (4 cylinder engine).
- One Forward multi-disc clutch (slipped @ standstill or hill hold).
- One Reverse multi-disc clutch (both act as starting clutches).
- Reverse rotation is created through a planetary gear train.
- Engine torque is transmitted to the final drive via a"variator" by an auxiliary reduction gear step.
- Steel chain instead of a belt driven.
- Electro-hydraulic control unit (valve body) and combined Electronic Control Module (located in the gearbox housing).
- Tiptronic function; provides 6 forward "speeds" for manual gear selection, performed by the driver through either the console shifter or steering wheel paddle buttons.
- Stepless ratio changes controlled by a "Variator" (two variable tapered pulleys and connecting chain) for optimal fuel utilization and driver comfort.
- Primary variable tapered drive pulley driven by engine torque.
- Secondary variable tapered driven pulley driven by steel chain.

Specifications

Designation: multitronic®01J
Factory designation: VL 30
Code: DZN
Max. transferable torque: max. 310 Nm
Range of ratios of the variator: 2.40 - 0.40
Spread: 6
Ratio of auxiliary reduction gear step: 51/46 = 1.109 : 1
Final drive ratio: 43/9 = 4.778 : 1
Operating pressure of oil pump: max. approx. 60 bar
Delivery rate of oil pump: 10 lpm @ 1000 rpm
ATF for multitronic®:G 052 180 A2
Axle oil for multitronic®:G 052 190 A2
Gear oil quantities:
ATF new filling (incl. ATF cooler and ATF filter) approx. 7.5 litres
ATF change approx. 4.5 litres
Axle oil approx. 1.3 litres
Gross weight (without flywheel): approx. 88 kg
Overall length: approx. 610 mm

Modes of Operation

- Tiptronic (6 speeds, manual control)
- Multitronic

Shift Modes.

AUTOMATIC: All 6 ratios are controlled by a preprogramed strategy of the vehicles onboard computer. The conditions that determine ratio change are controlled by driver input, such as accelerator pedal position in conjunction with traction resistance. The ratios are completed smoothly without any interruption.

Tiptronic Mode:

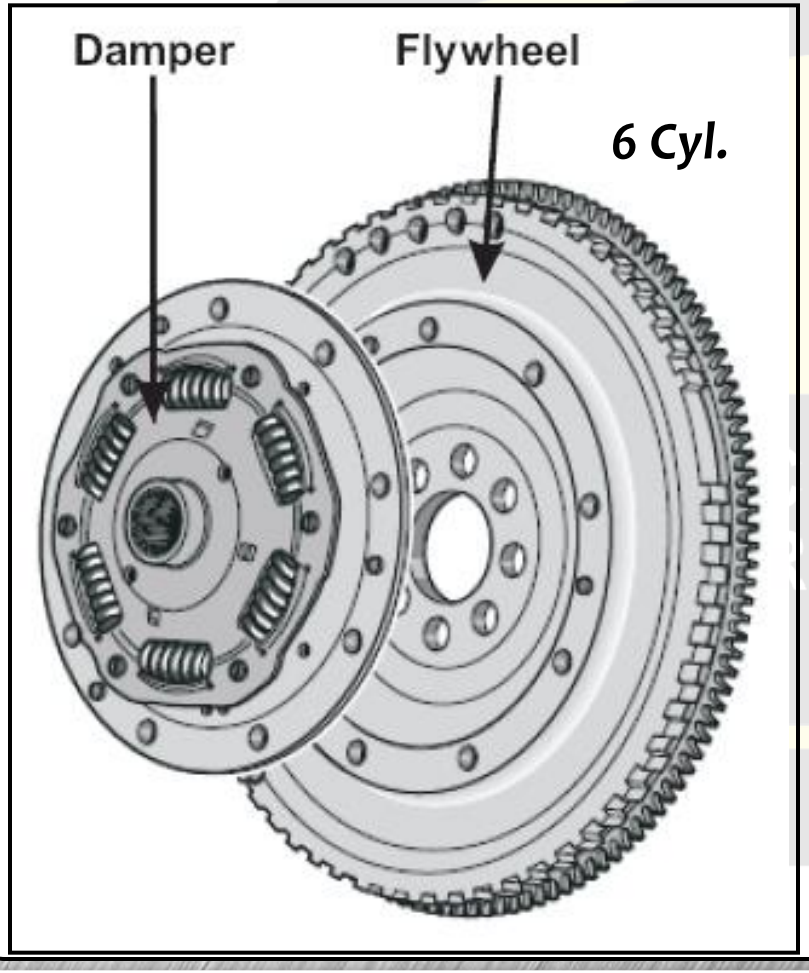
There are 6 defined shifting ratios for manual gear selection. The driver can choose handling dynamics to suit personal preference. This feature can be used on downhill grades, such as an engine braking effect controlled by selective down shifting. This feature will only allow a top speed in 5th gear. The 6th gear ratio is commanded for a more efficient fuel economy or overdrive. The "tiptronic mode" can be operated by the console shifter or shift paddles/buttons (optional) located on the steering wheel

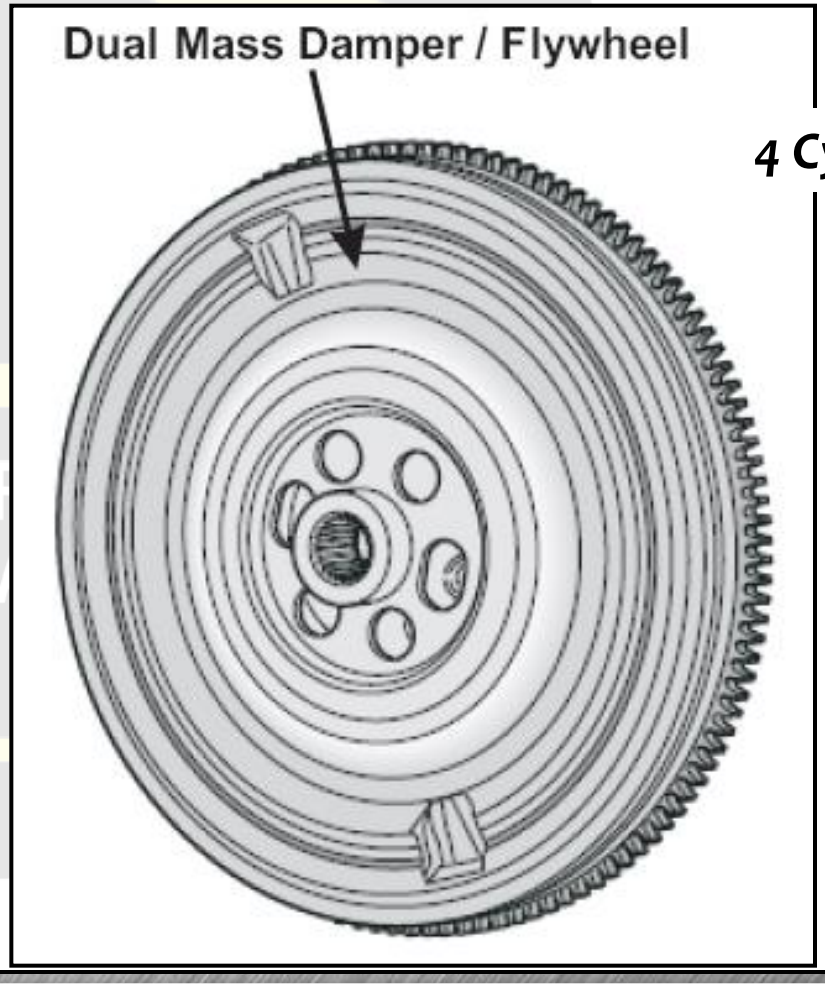
Shift Modes

Triptronic

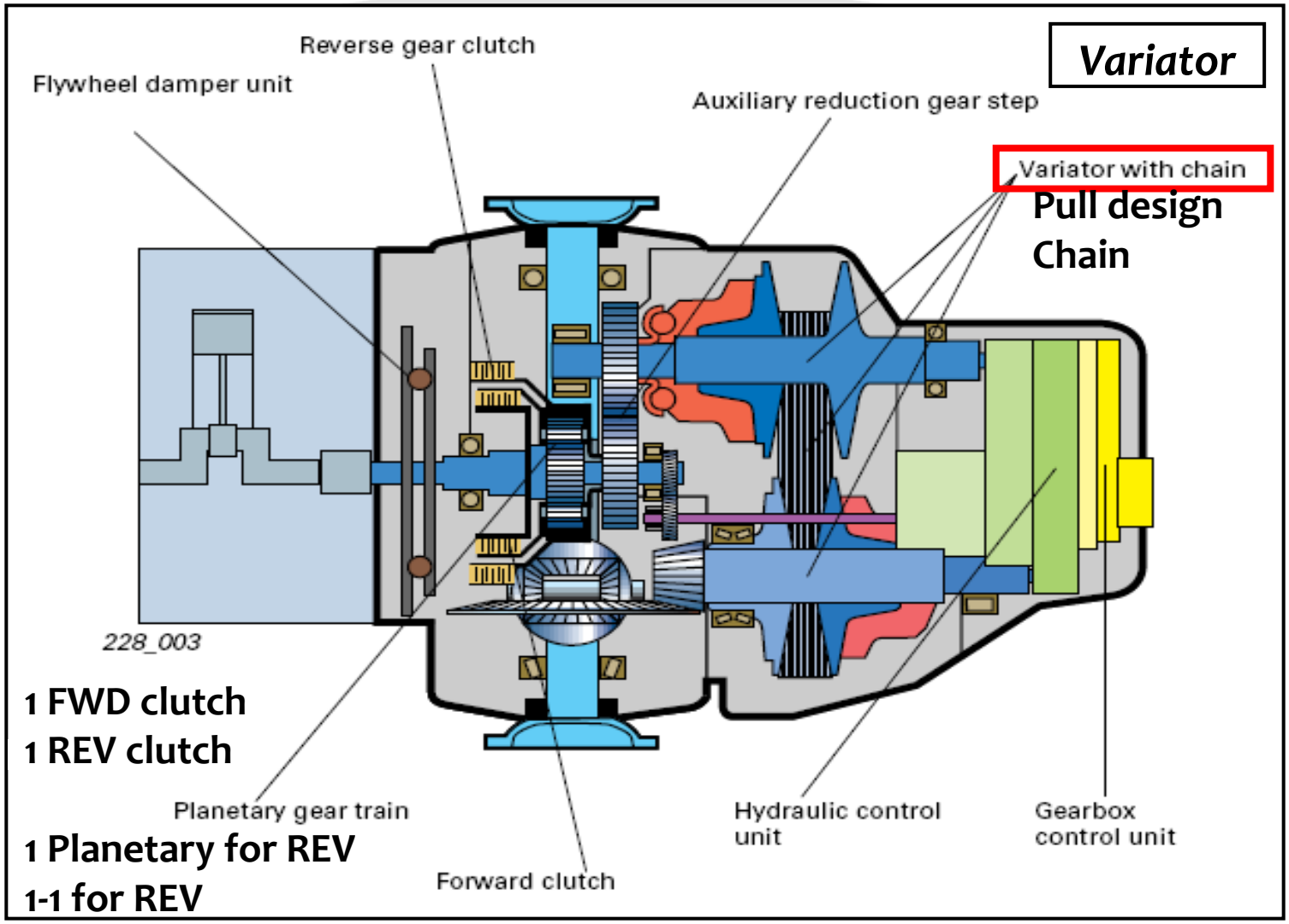
Flywheel Damper Assembly

No Torque Converter





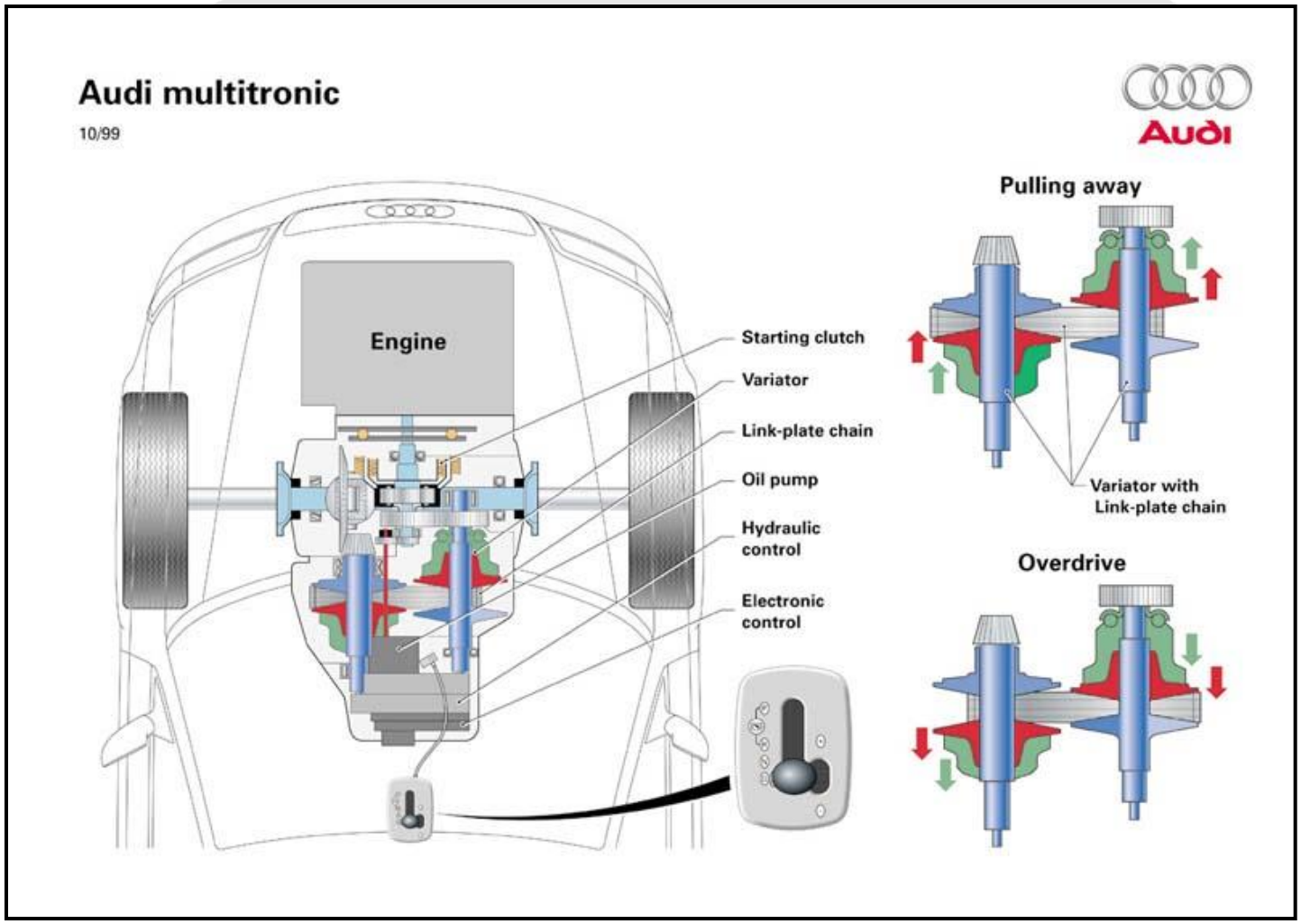
Drive -Train Layout



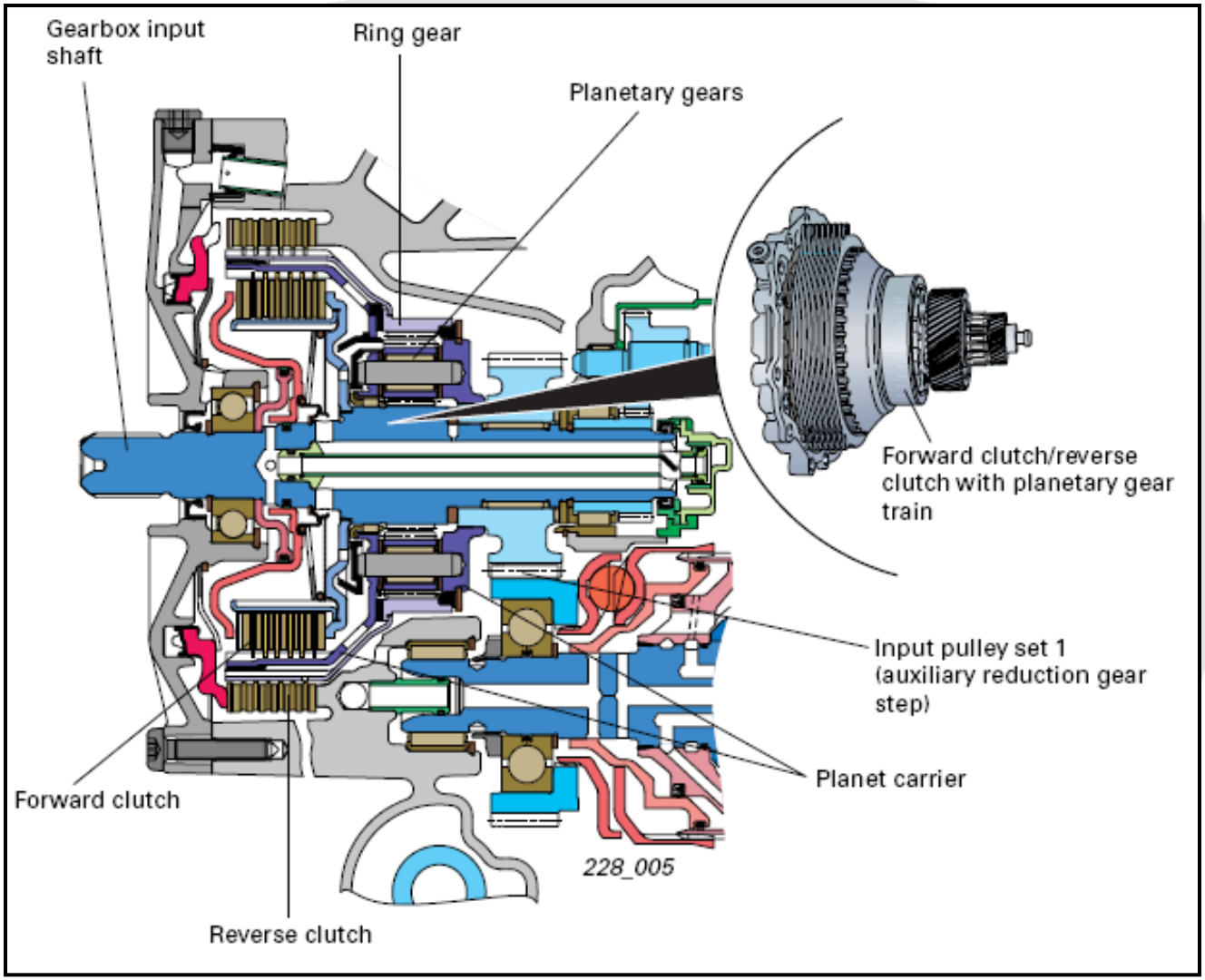
"Variator Function"

The variator allows for a smooth continuous reduction of ratio from standstill to maximum speed. The correct ratio is commanded for optimum speed range, engine performance and fuel economy. The variator consists of two pairs of tapered disc pulleys, one Primary pulley set (1) one Secondary pulley set (2) and a special chain that runs in the V-shaped gap between the two tapered pulley sets. The chain is the primary power element of the transmission. Primary pulley set (1) is driven by the engine via an auxiliary reduction gear step. Torque is transmitted through the chain to the secondary pulley set (2) and to the final drive. One of the tapered pulleys in each set is hydraulicaly controlled to variably adjust the chain track diameter and change the transmission ratio. Both pulleys sets must be controlled simultaneously so that the chain is always kept taut. The disc and chain contact pressure though all ratios must be in proportion to transmission torque in order to prevent slipping.

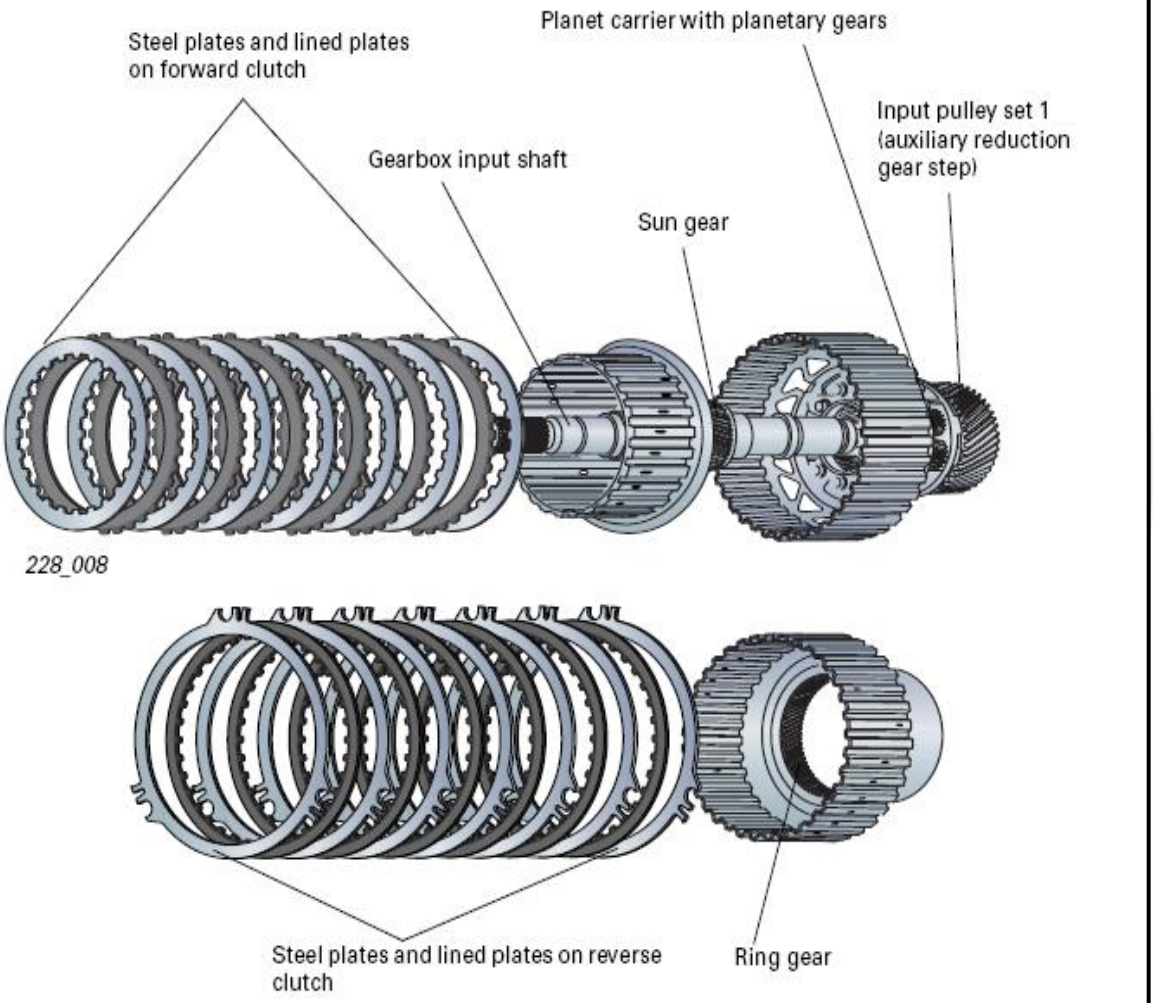
Variator Function

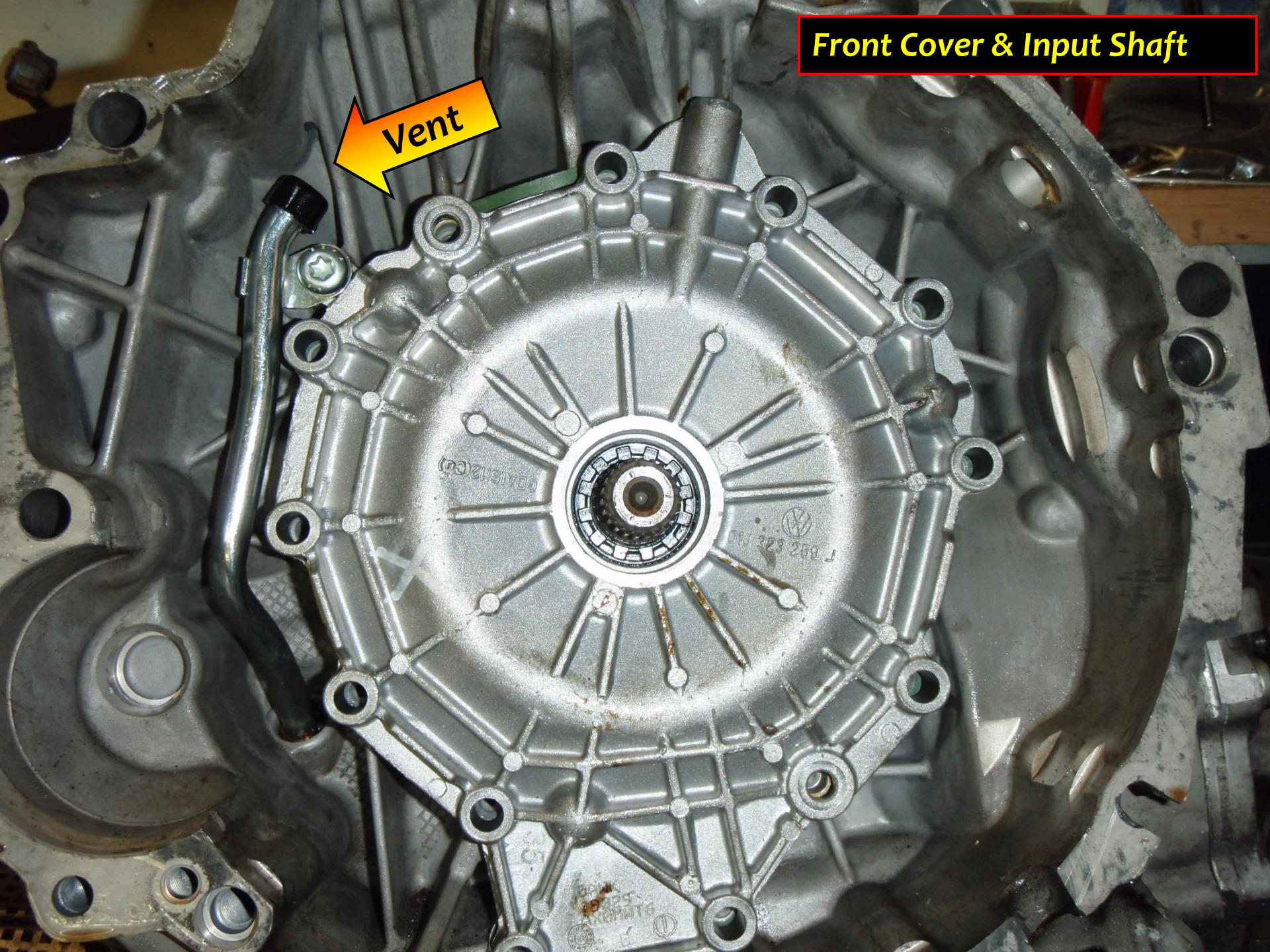


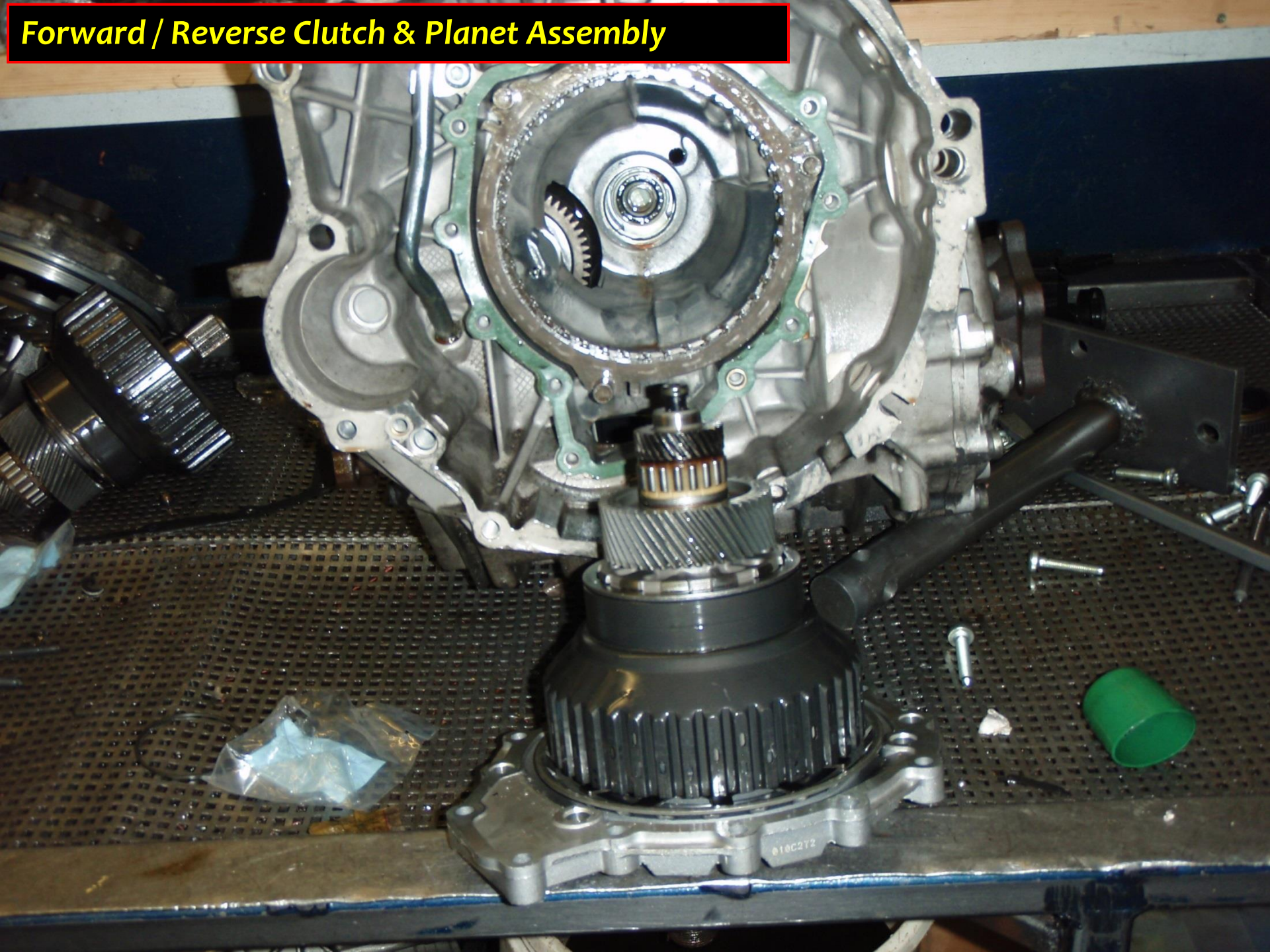
Forward / Reverse Clutch & Planet Assembly

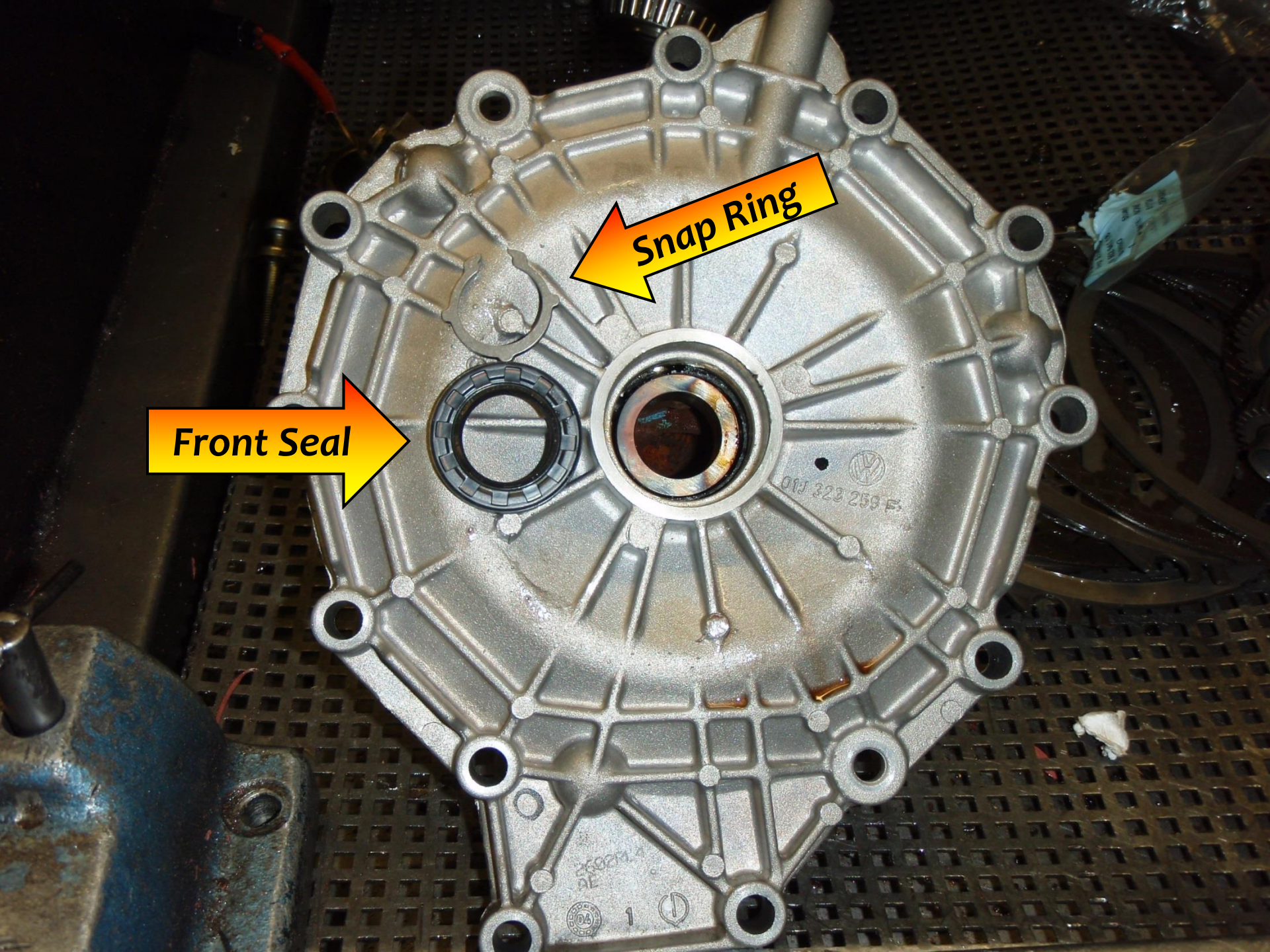


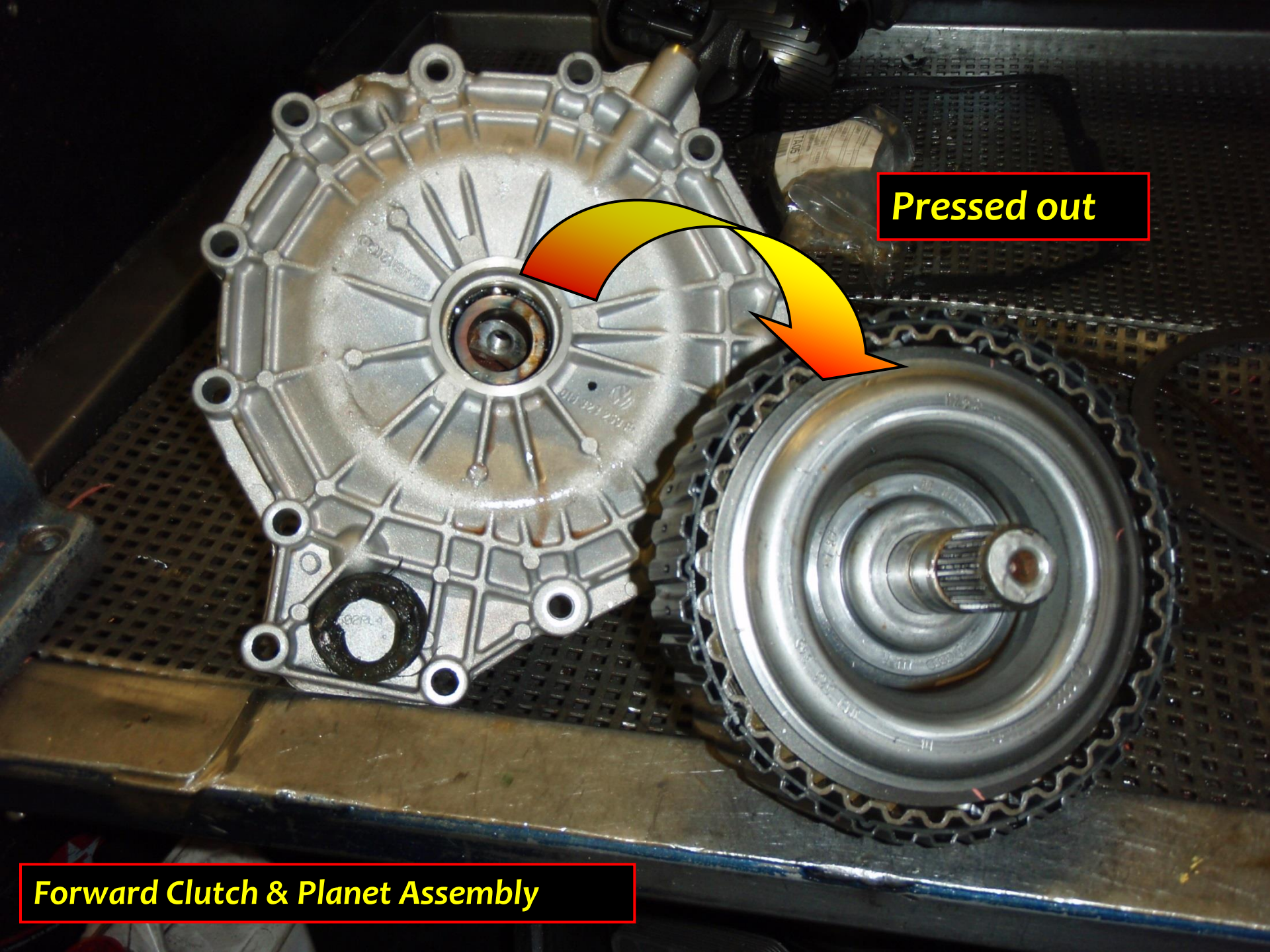
Forward / Reverse Clutch Assembly

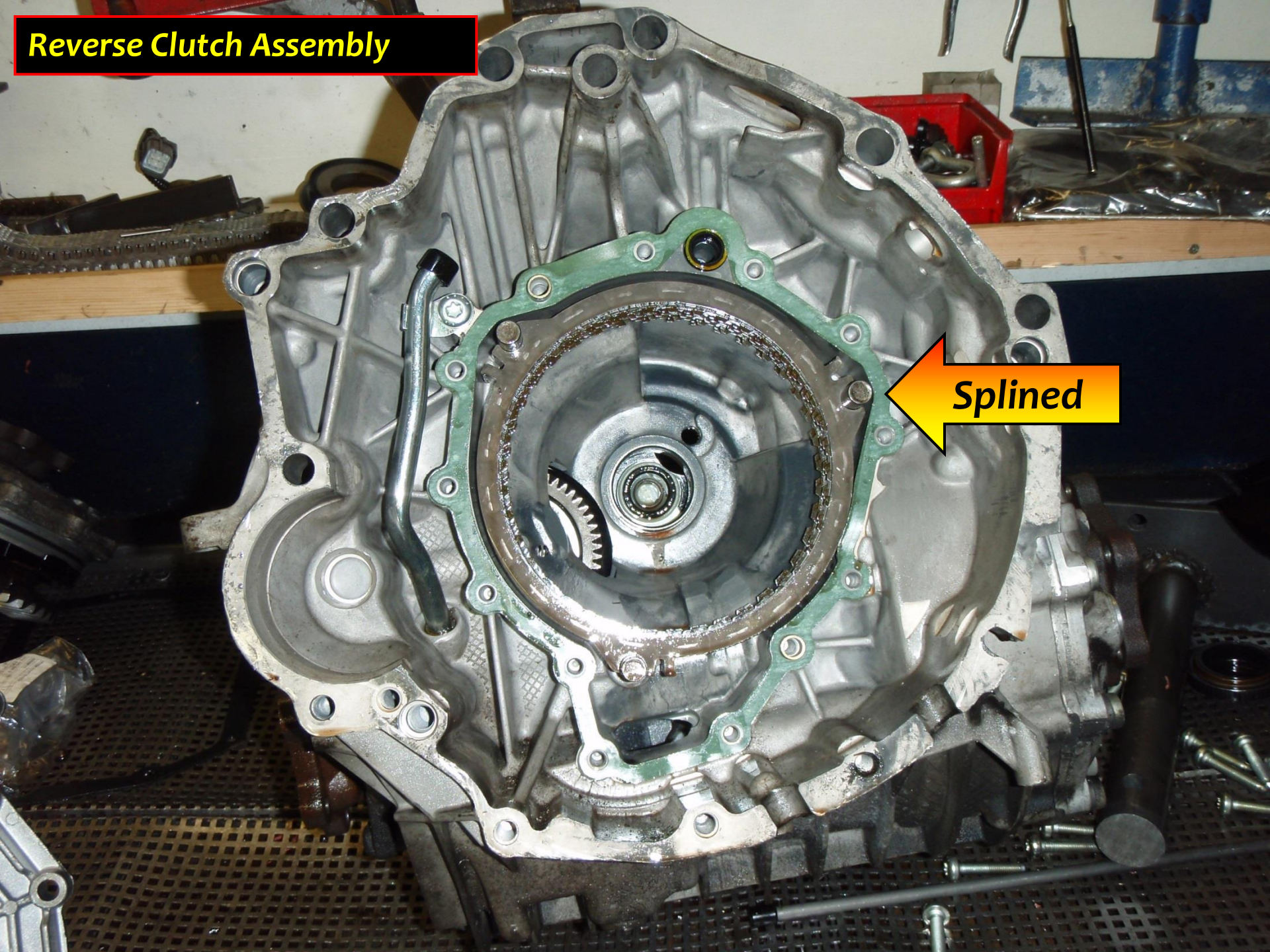



Front Cover & Input Shaft
Vent

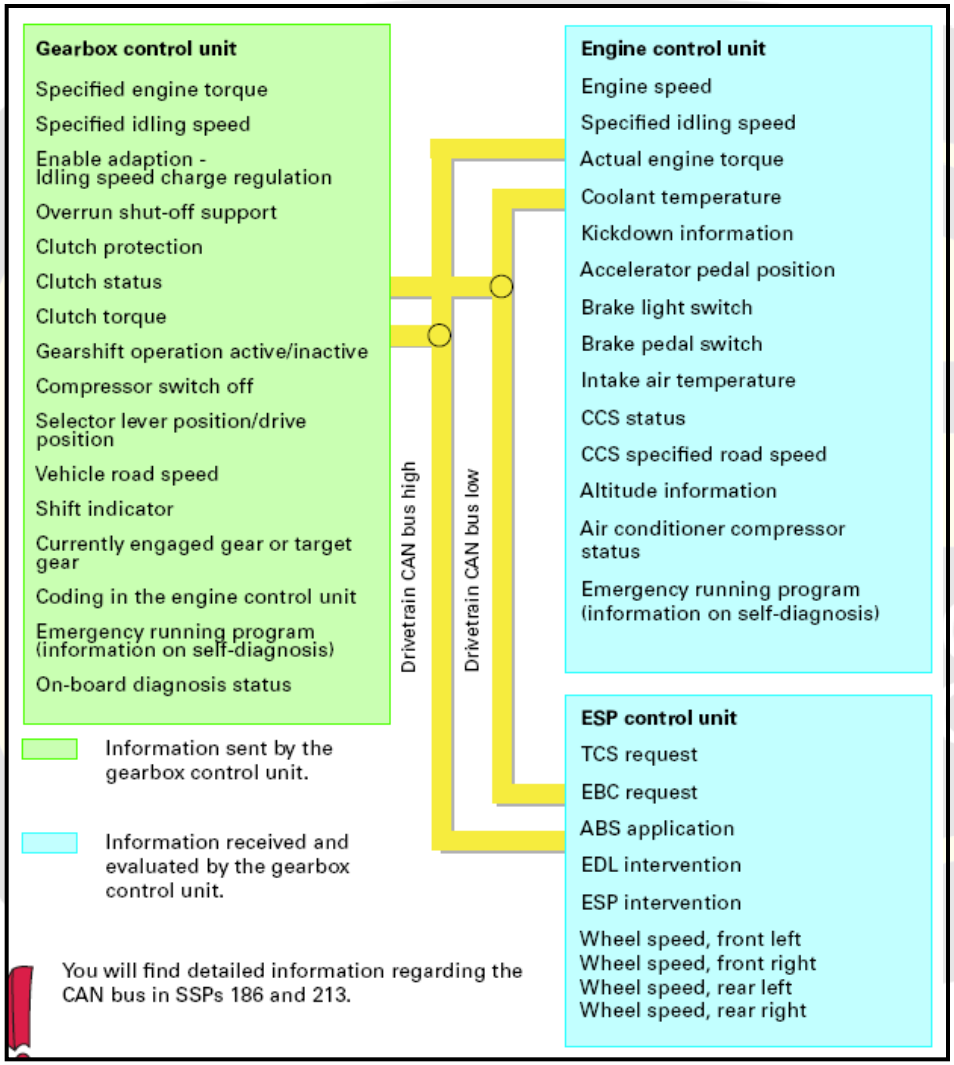

Forward / Reverse Clutch & Planet Assembly


Snap Ring
Front Seal


Pressed out
Forward Clutch & Planet Assembly

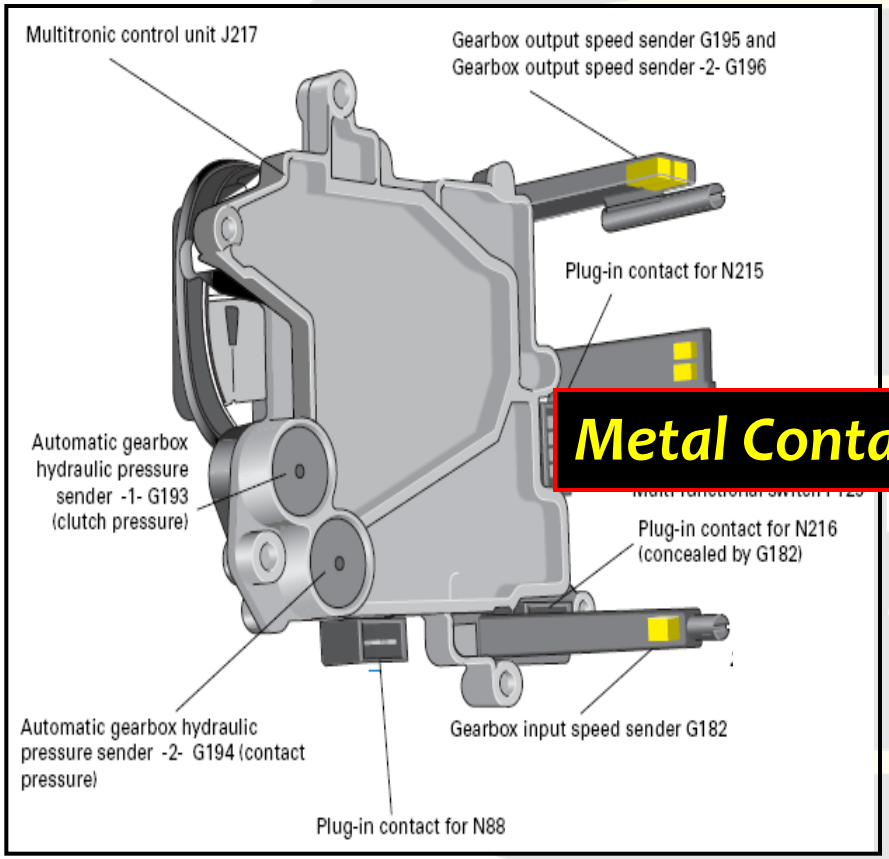

Reverse Clutch Assembly
Splined

Communication

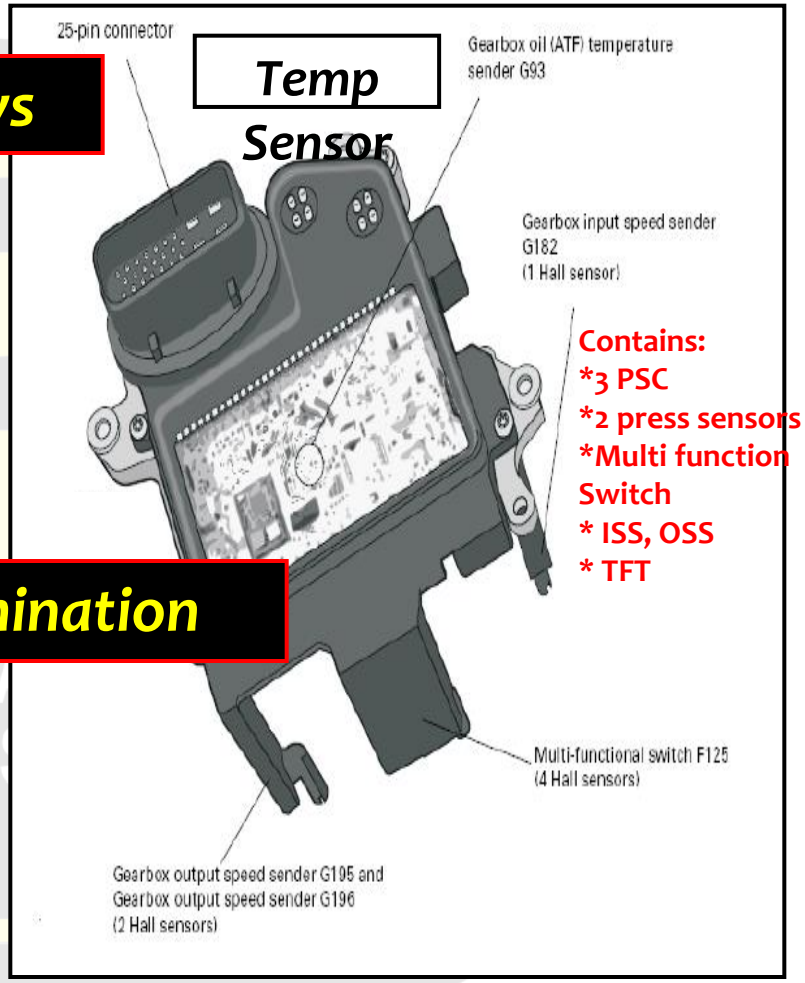


Multitronic Control Unit

No Movement / Delays

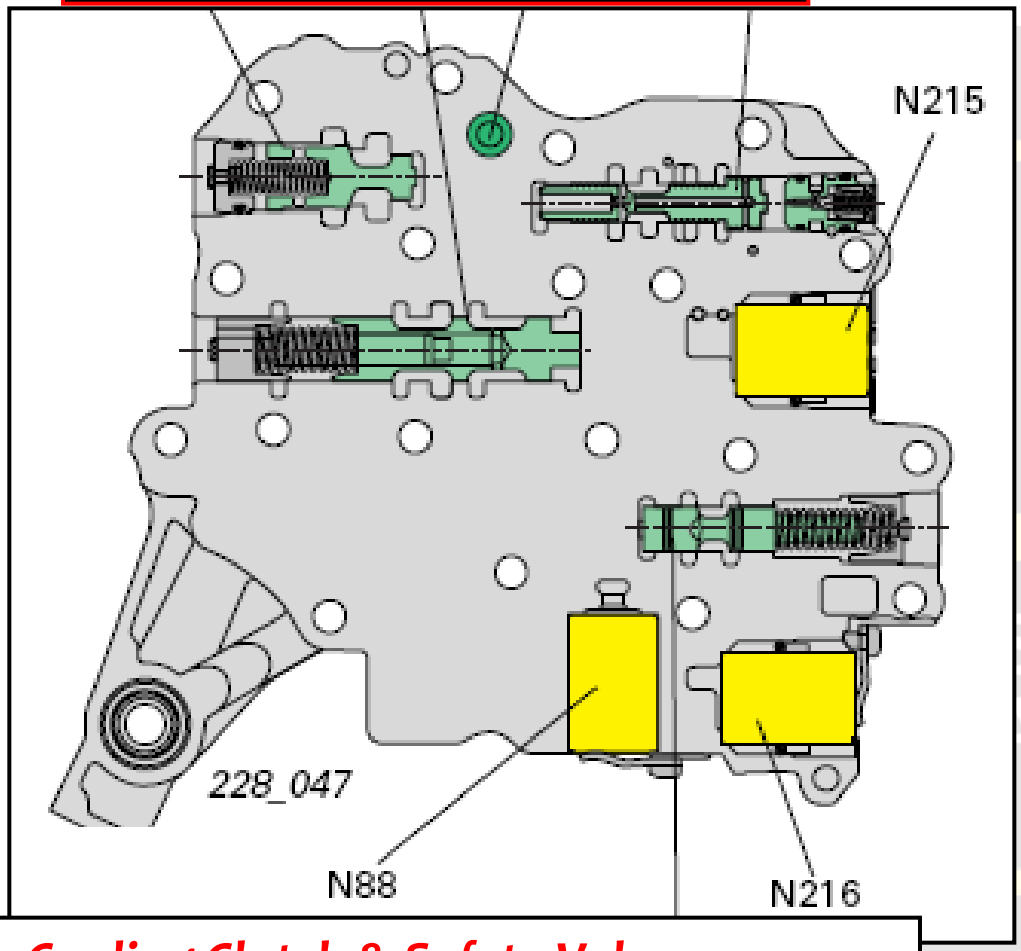


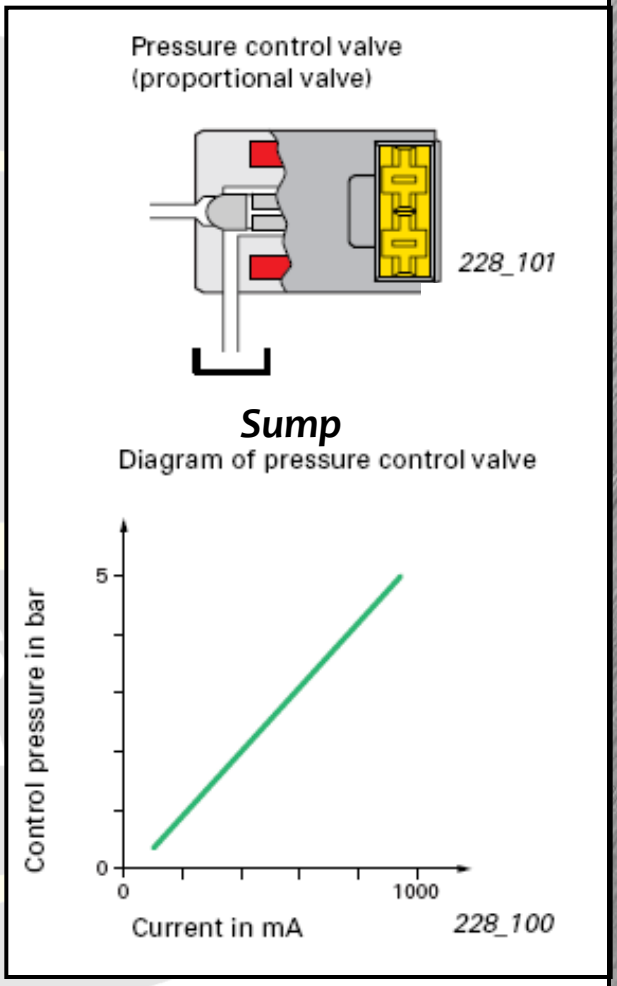
Metal Contamination



Contains:
*3 PSC
*2 press sensors
*Multi function Switch
* ISS, OSS
* TFT

Solenoid ID & Function

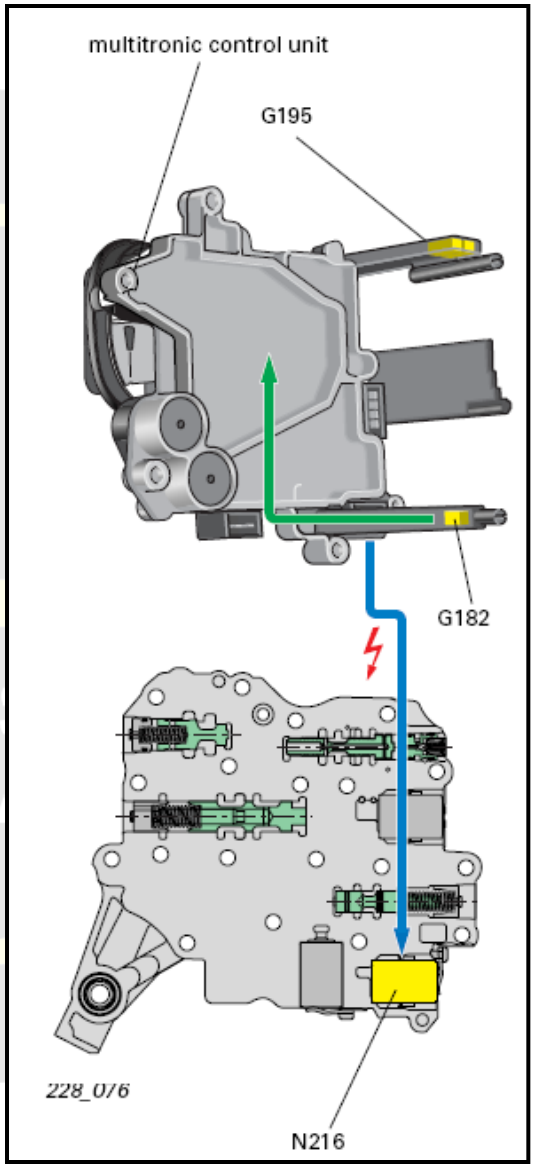




N88: Cooling Clutch & Safety Valve (Solenoid)
N215: Clutch Control Valve (Solenoid)
N216: Reduction Valve (Solenoid)

Speed Sensor (Input) G182

Multitronic Control Unit's Dynamic Control Program (DRP)
Monitors Input Speed Senor # 1 Signal From Pulley Set # 1 In Comparison To Output Speed & Engine RPM To Control The Amperage To The N216 Solenoid For Pulley Contact Pressure Control



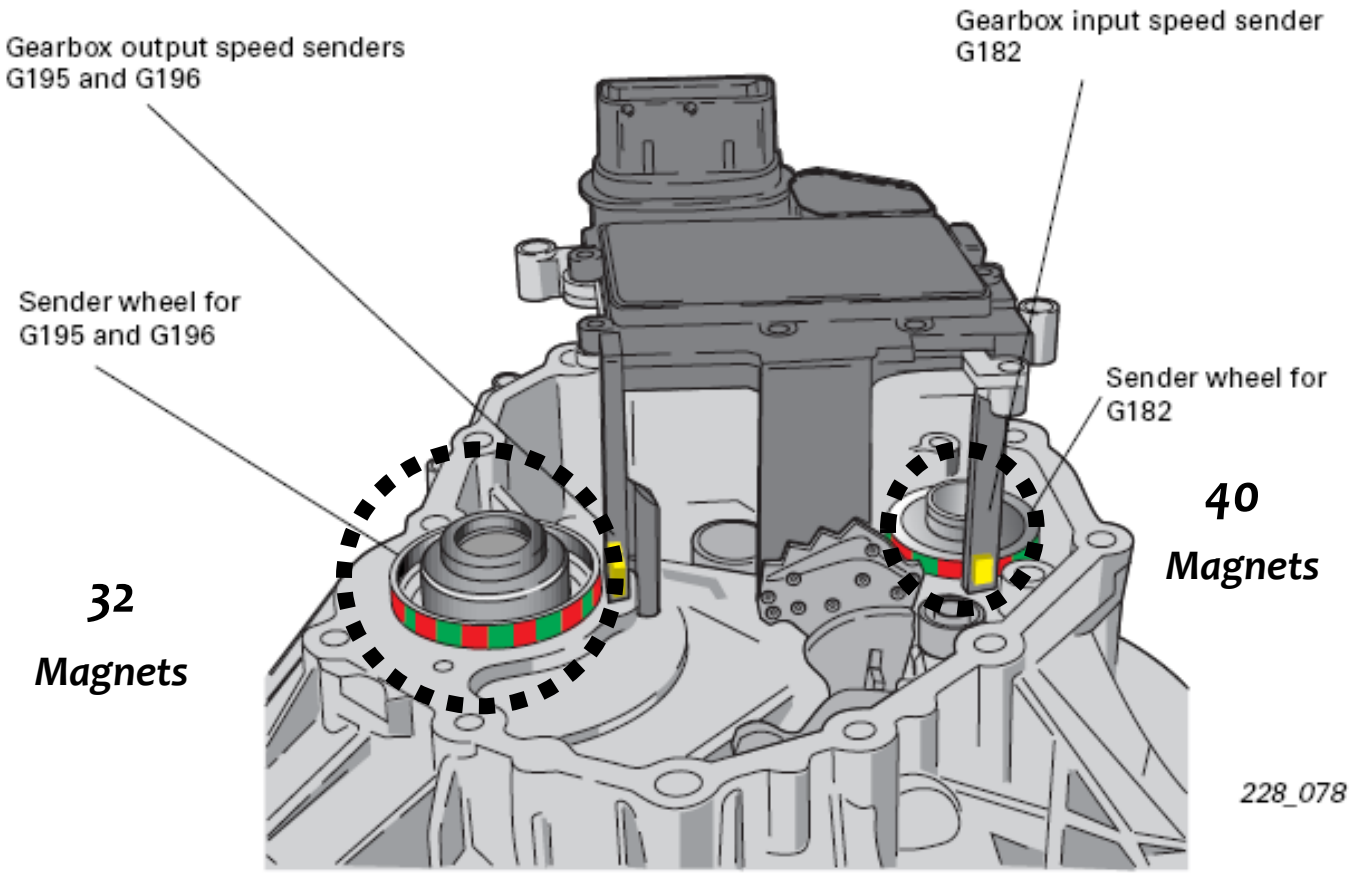
Gearbox input speed sender G182 and gearbox output speed senders G195 and G196

Speed Sensor (Output) G195 & G196

Must use a scan Tool to diagnose Sensors

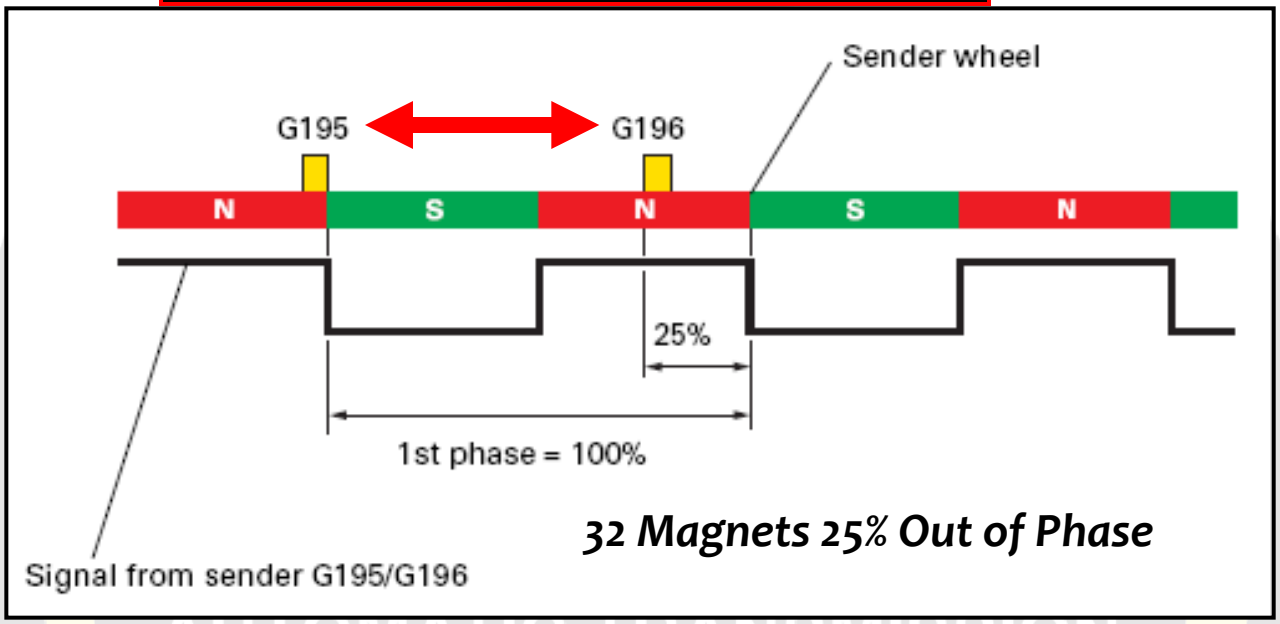
Do not Pry on Sensors Sometimes they Are mistaken For seals

G 182= ISS
G 195/196= OSS

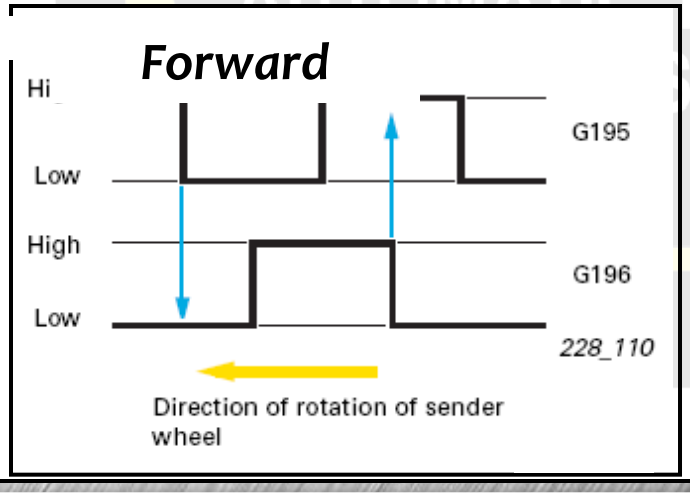


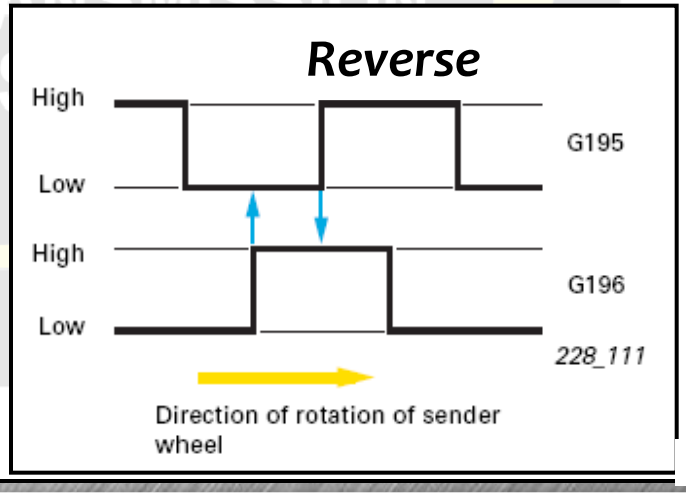
2 Speed Sensors (Output)

By having Them out Of phase The TCM Can Determine Direction



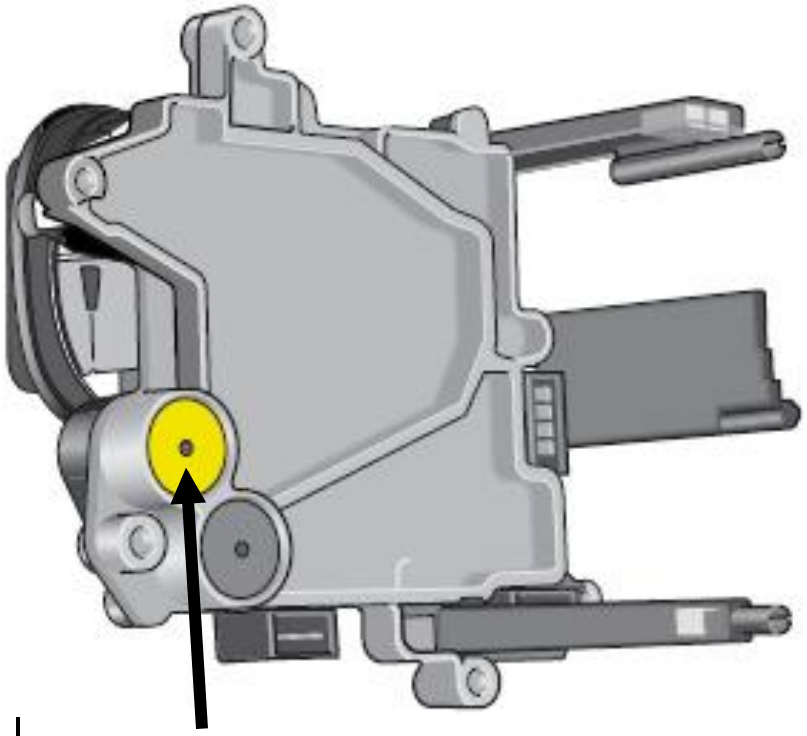
32 Magnets 25% Out of Phase





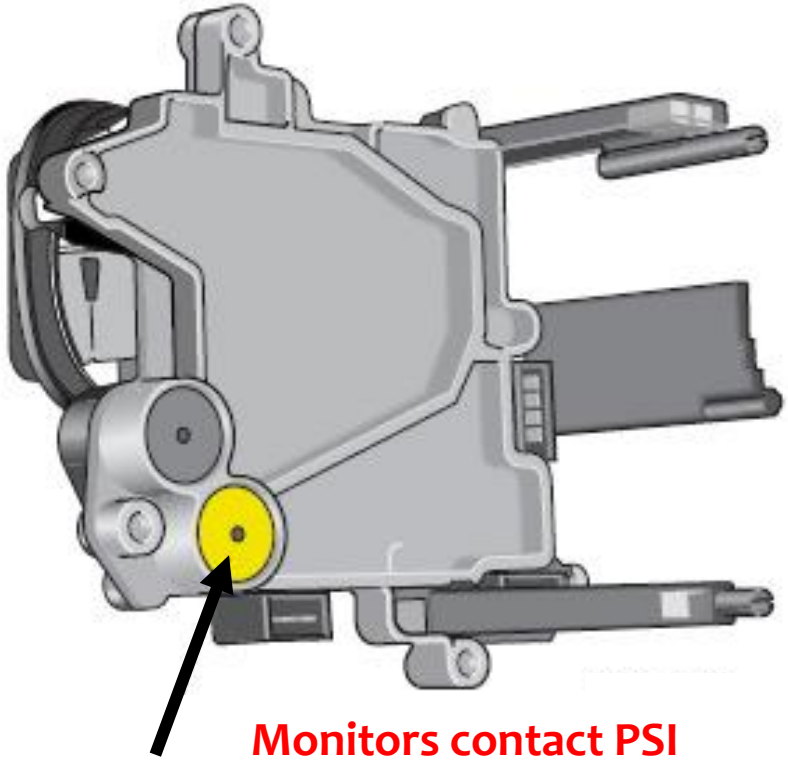
Sensors (Hydraulic Pressure) G193 & G194

Clutch Pressure



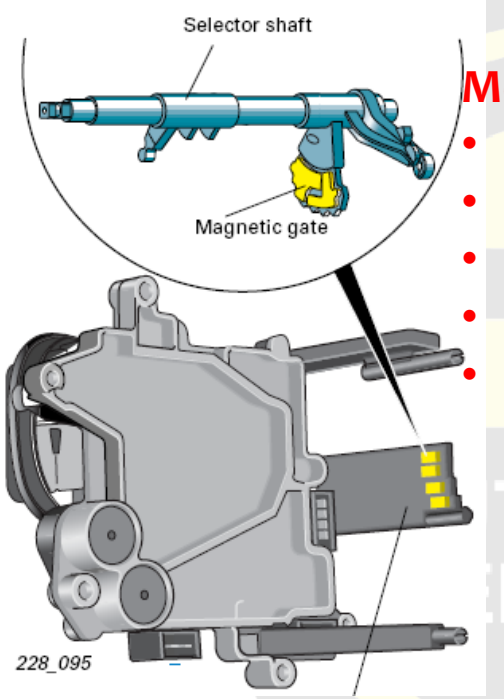
G193 Monitors FWD and REV Clutch PSI

Contact Pressure



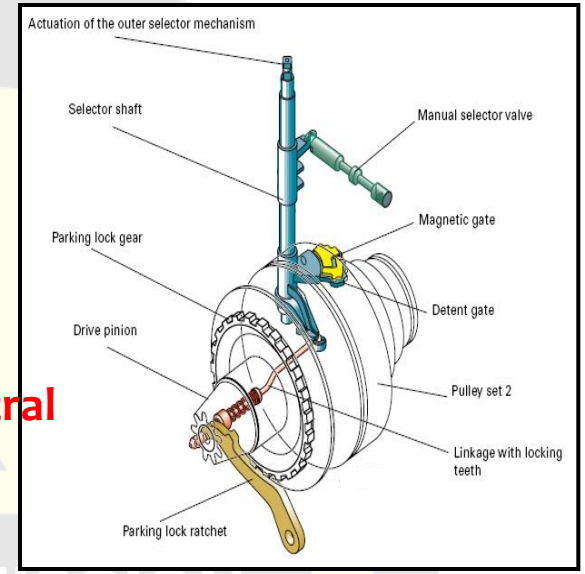
G194 Monitors contact PSI Regulated by the torque sensor

Switches (Multifunction) F125



Monitors Shifter Position for:

- Starter
- Reverse Lights
- P/N Shift Lock
- Clutch control Fwd/Rev/Neutral
- Locks ratio in REV



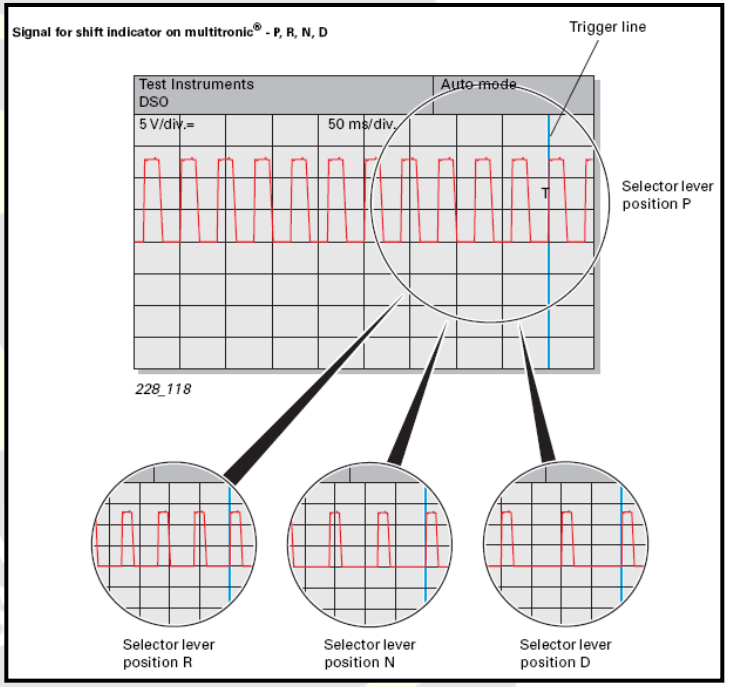
F125

(4 Hall Sensors (A B C D)

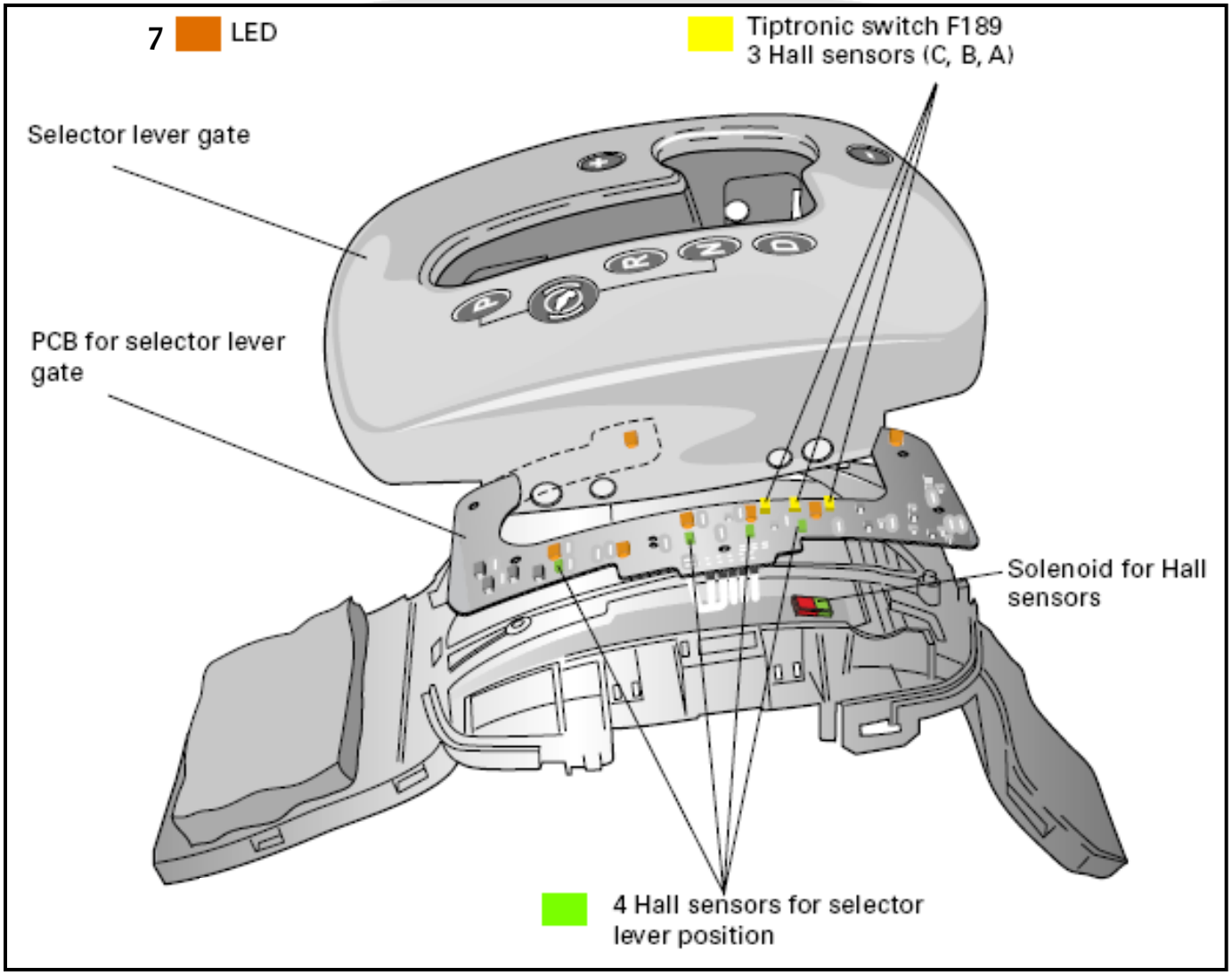
Switches (Multifunction) F125

Gearshift combinations

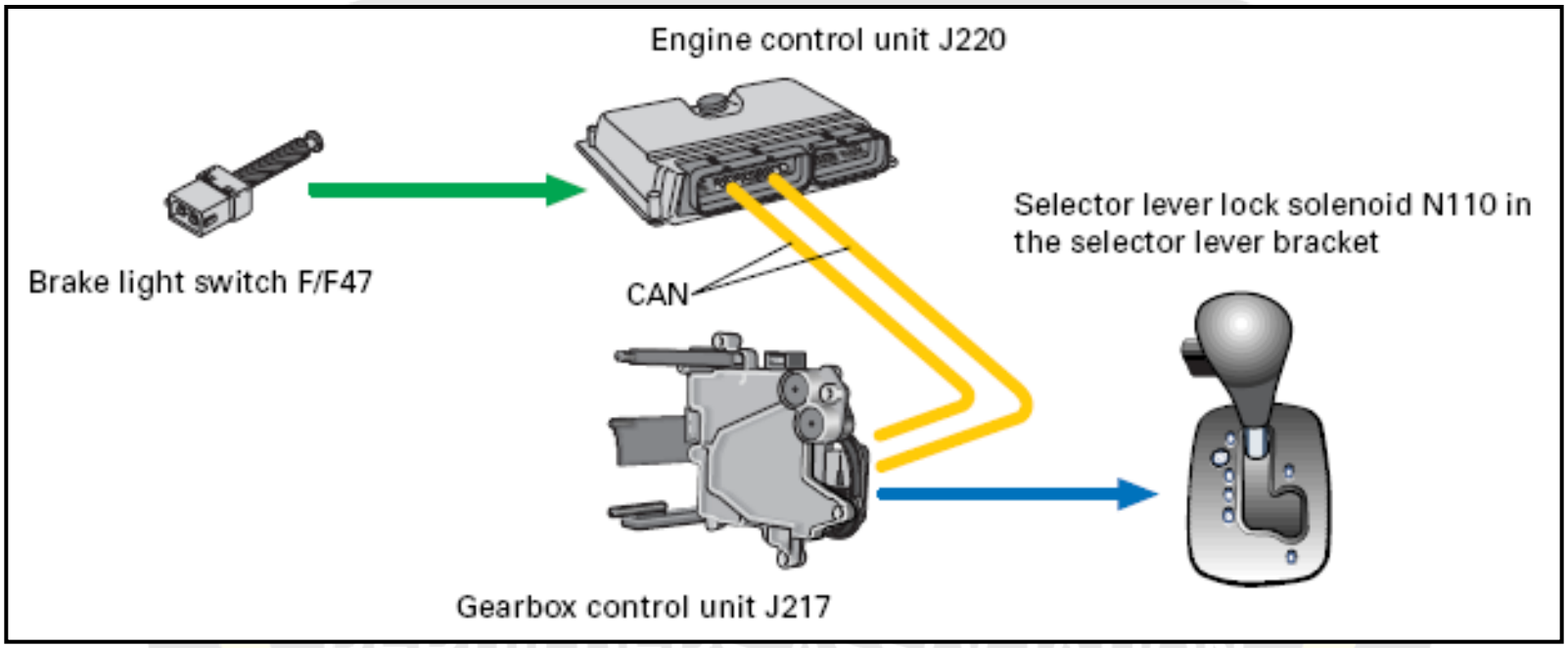
	Hall sensors			
	A	B	C	D
Selector lever position	Gearshift combinations			
P	0	1	0	1
between P-R	0	1	0	0
R	0	1	1	0
between R-N	0	0	1	0
N	0	0	1	1
between N-D	0	0	1	0
D	1	0	1	0
Fault	0	0	0	0
Fault	0	0	0	1
Fault	0	1	1	1
Fault	1	0	0	0
Fault	1	0	0	1
Fault	1	0	1	1
Fault	1	1	0	0
Fault	1	1	0	1
Fault	1	1	1	0
Fault	1	1	1	1



Switches (Multifunction) F125



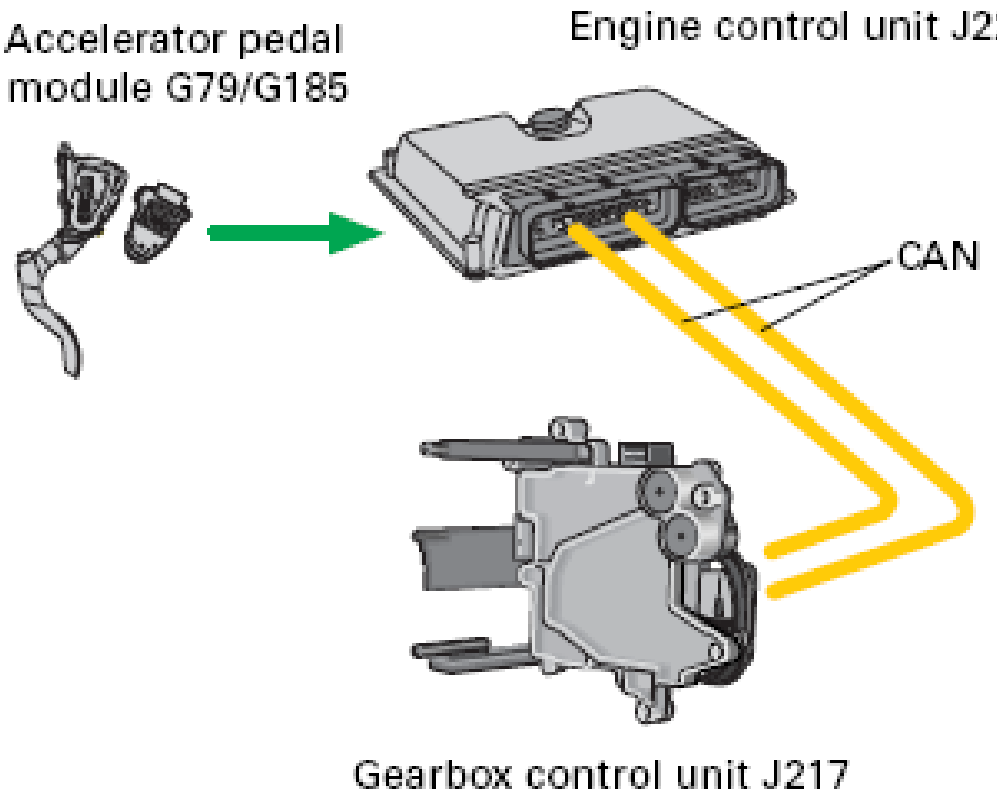
Switches (Brake) F47



Creep Control
Shifter Lock
Dynamic Control Program

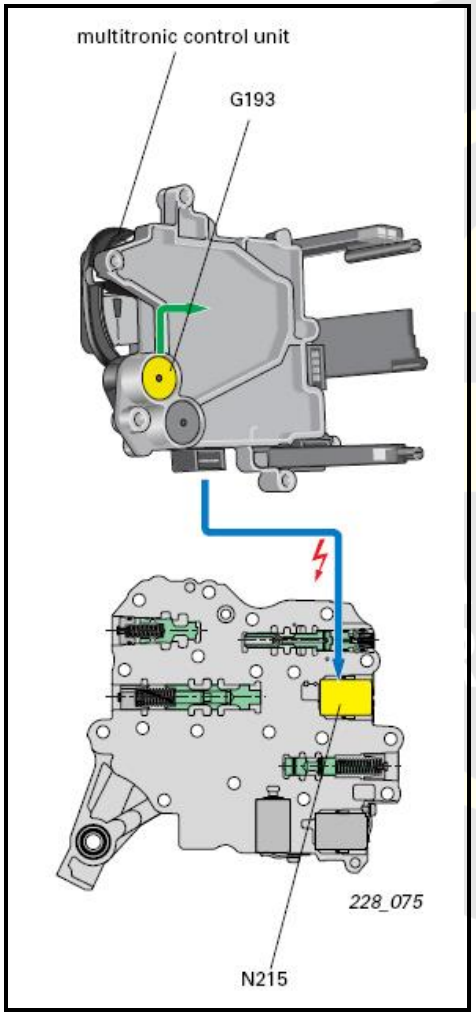
Switches (No Kickdown Switch)

If the accelerator pedal module is replaced, the "kickdown" shift point must be readapted using capable scan tool software

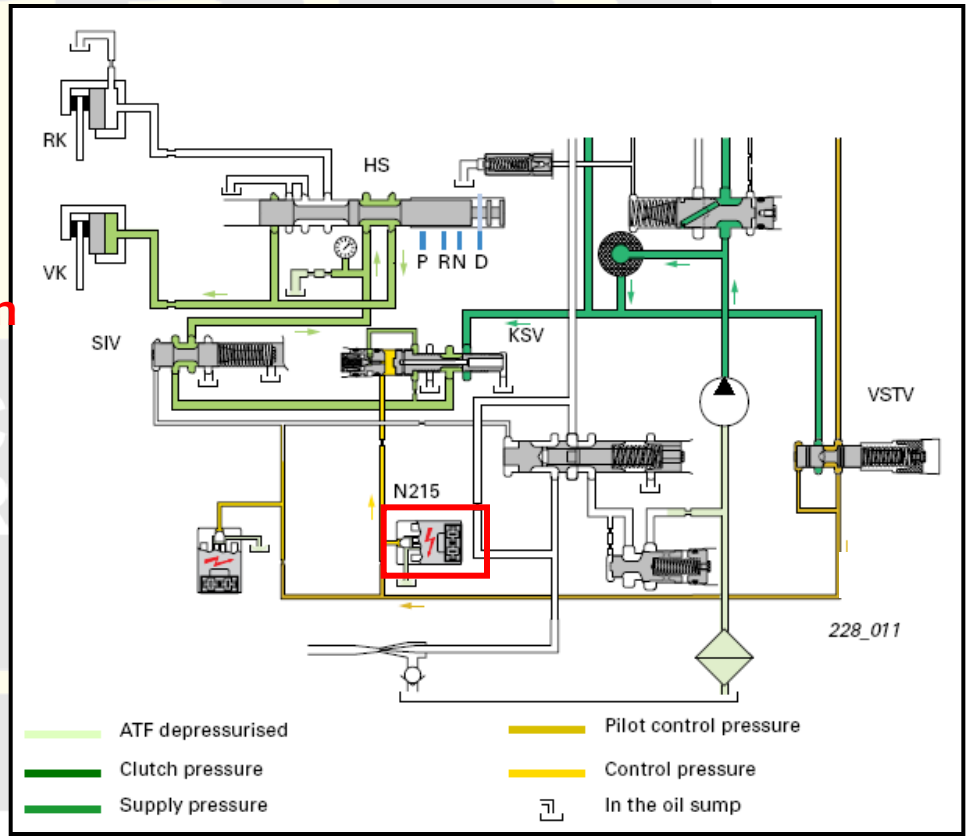


Spring Loaded Pressure Element (Kickdown Switch Feel) Monitors Pedal Position

Clutch Pressure Control



N215 solenoid
Command
Based on
Clutch pressure
Load Calculation
And ratio

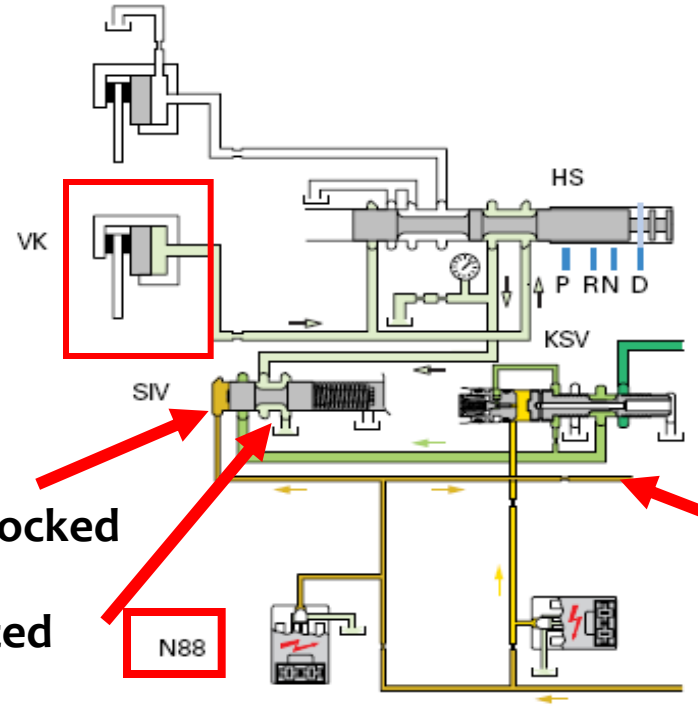


"Safety Shut Off" Activation

Position After "Safety Shut Off" Switched

Clutch Pressure Becomes Higher Than Control Pressure

"Overload Protection"
Trans Temperature Too High
Engine Will Be Forced
To Idle Until A Short Clutch
Cooling System Time Period



Feed Blocked

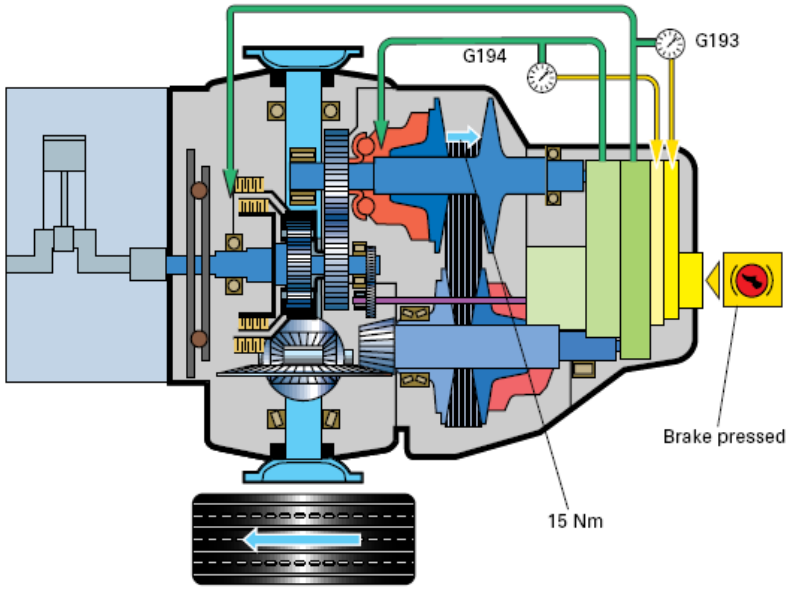
Exhausted

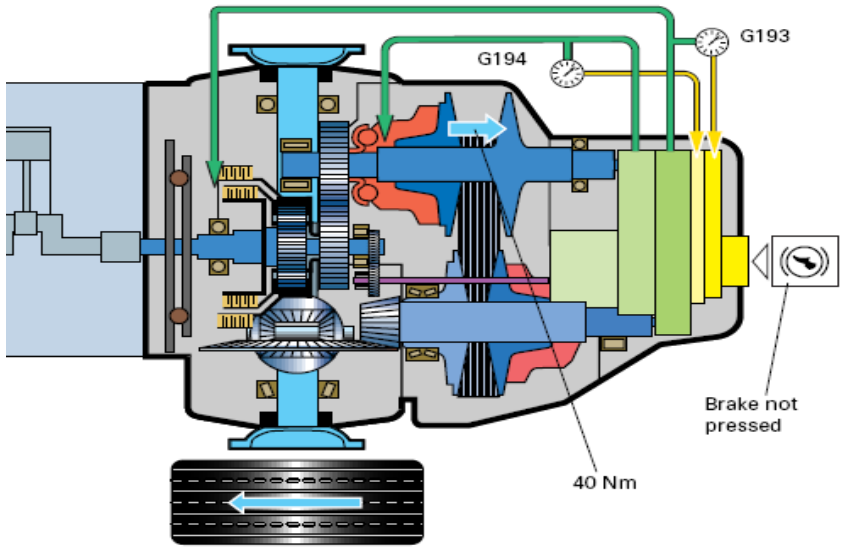
Solenoid Pressure

In the event that actual clutch pressure becomes higher than the control pressure (due to a malfunction), the safety shut off function will exhaust clutch pressure. No matter where the manual valve is positioned

Vented into oil sump/depressurised
Clutch pressure
Supply pressure
Pilot control pressure
Control pressure
In the oil sump

Creep Control

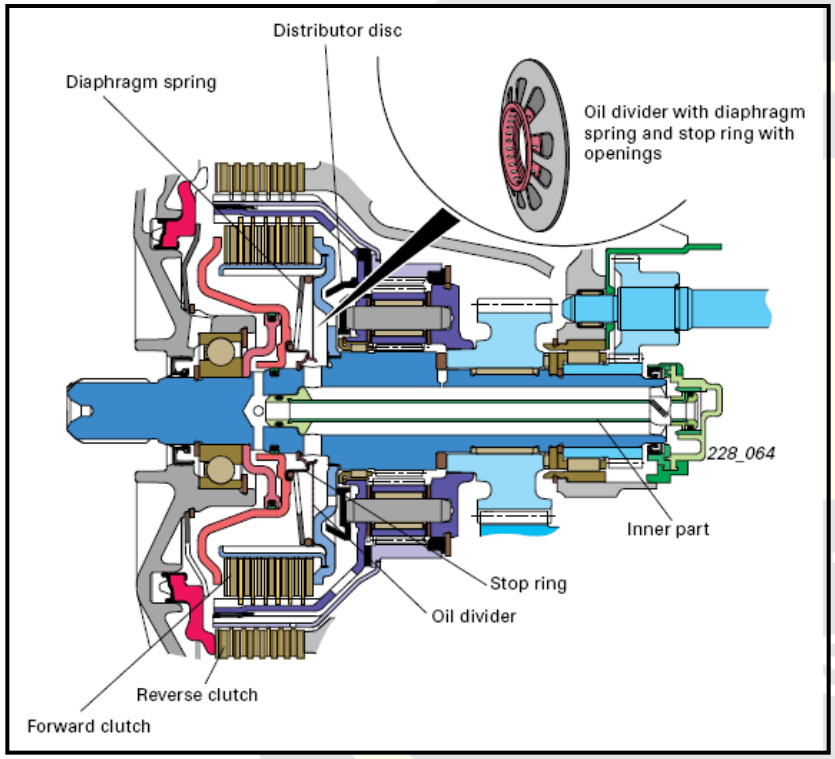


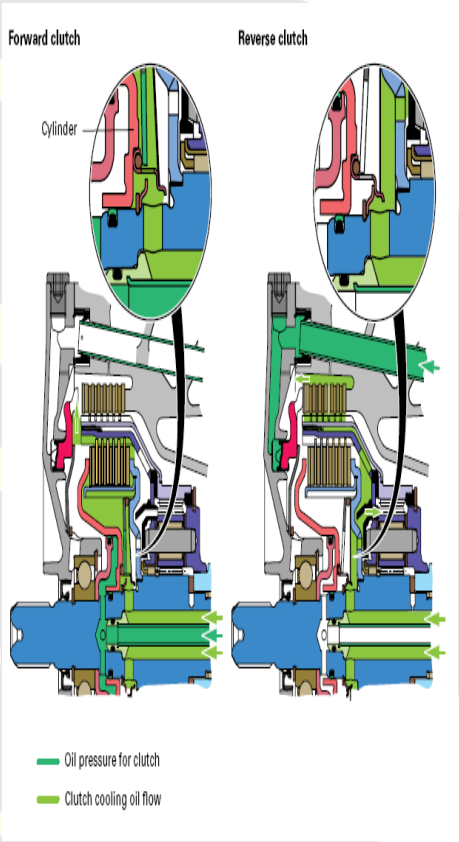


"Hill Hold" & "Micro Slip" Feature
Increased Clutch Pressure
Decrease In slip

When the vehicle is at a standstill the creep control function sets the clutch to a calibrated slip rate (torque). With the engine idling in drive (brakes released) the clutch slip functions the same as an automatic transmission torque converter.

Clutch Cooling System

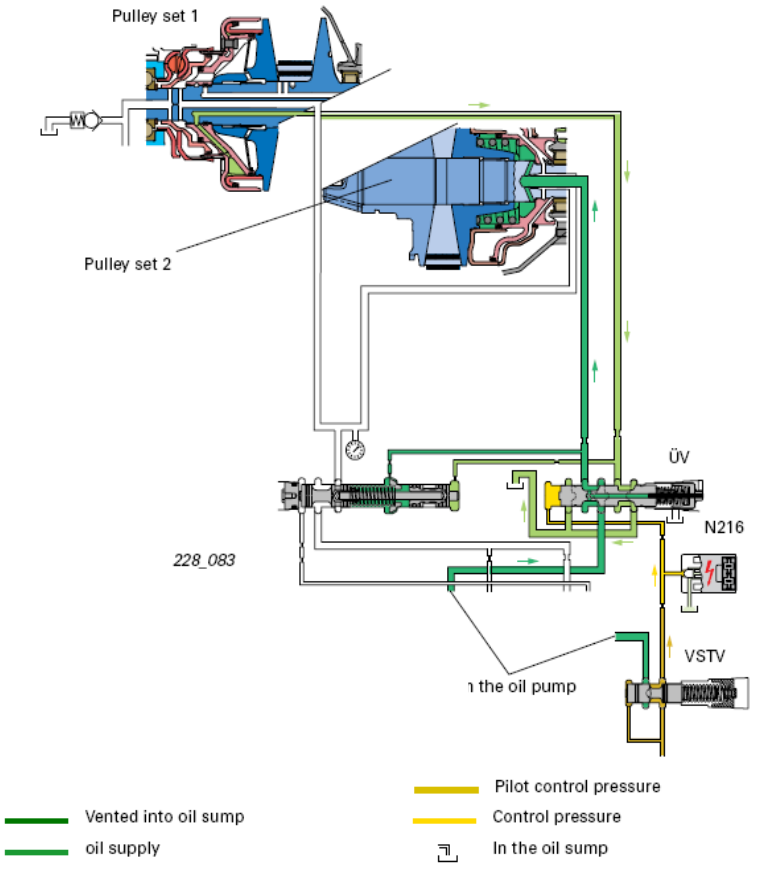




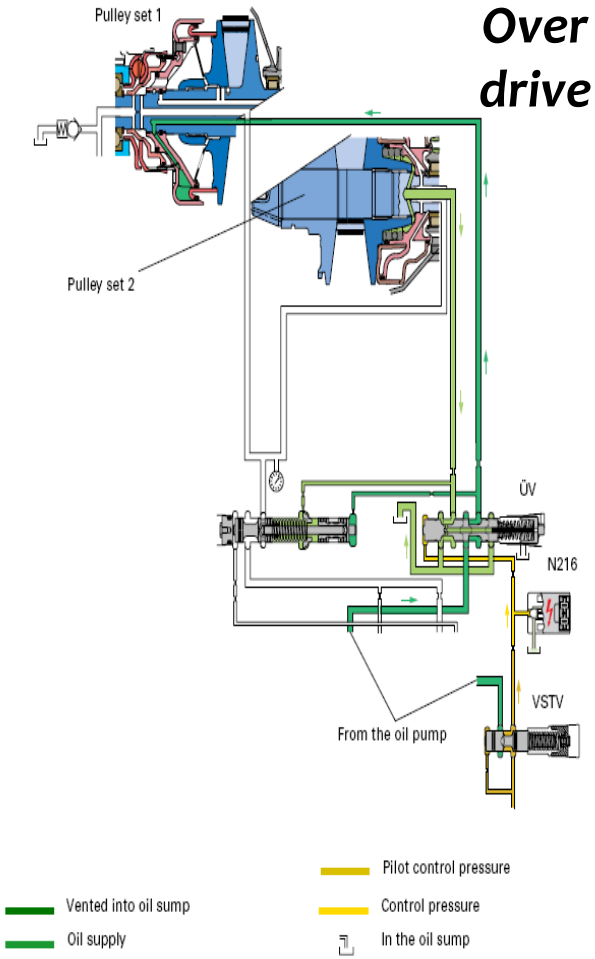
The cooling oil is only directed to the clutch in use.

Contact Pressure Control (N216)

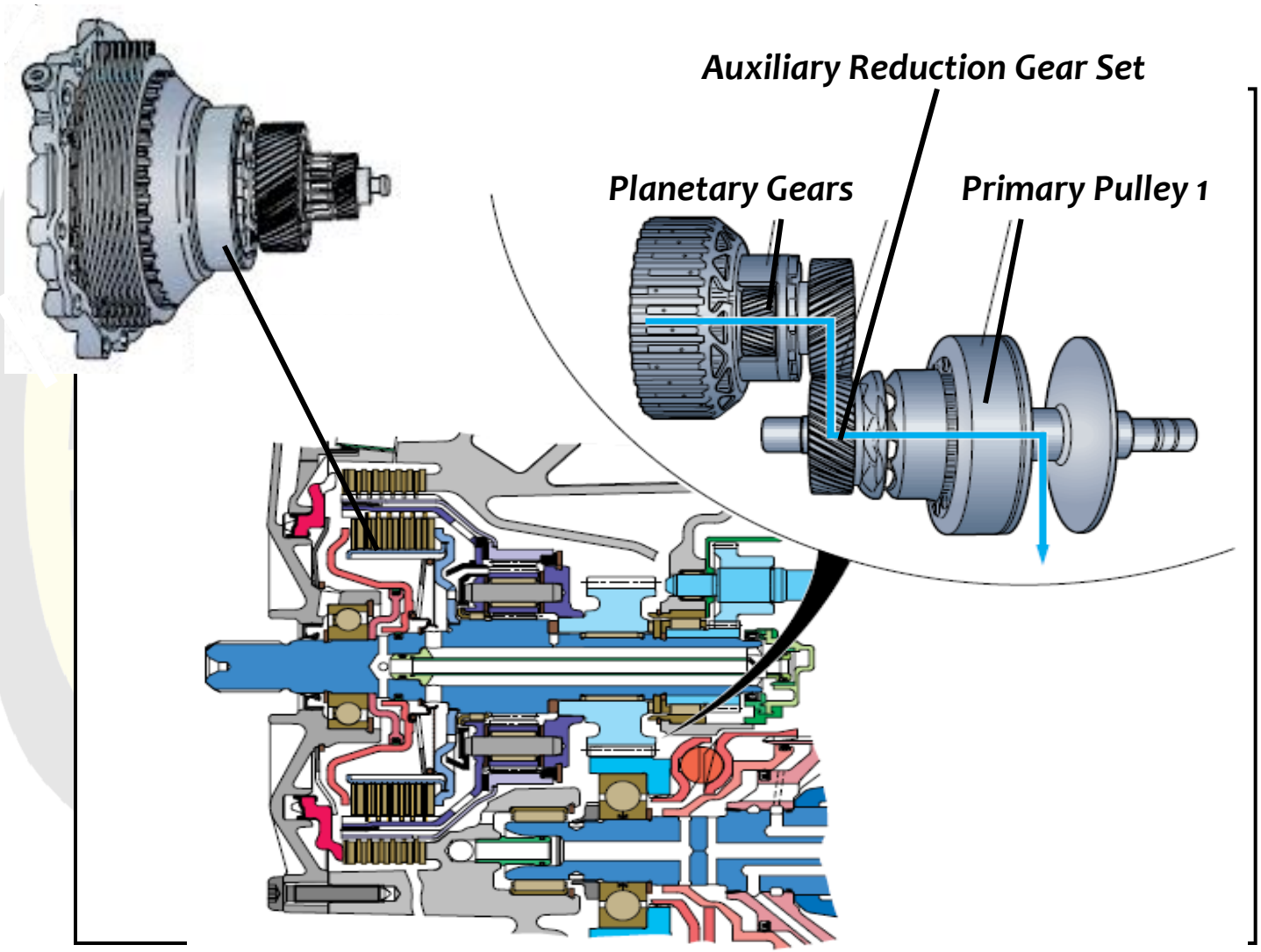
Underdrive



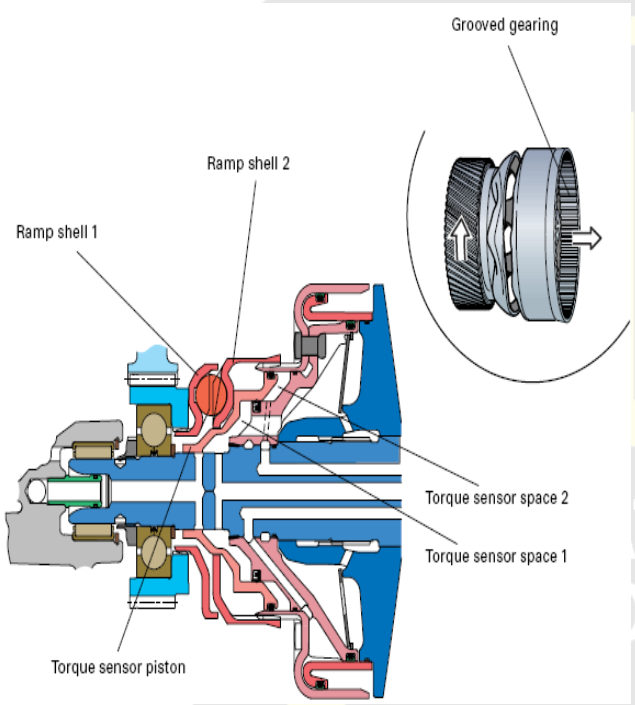
Over drive

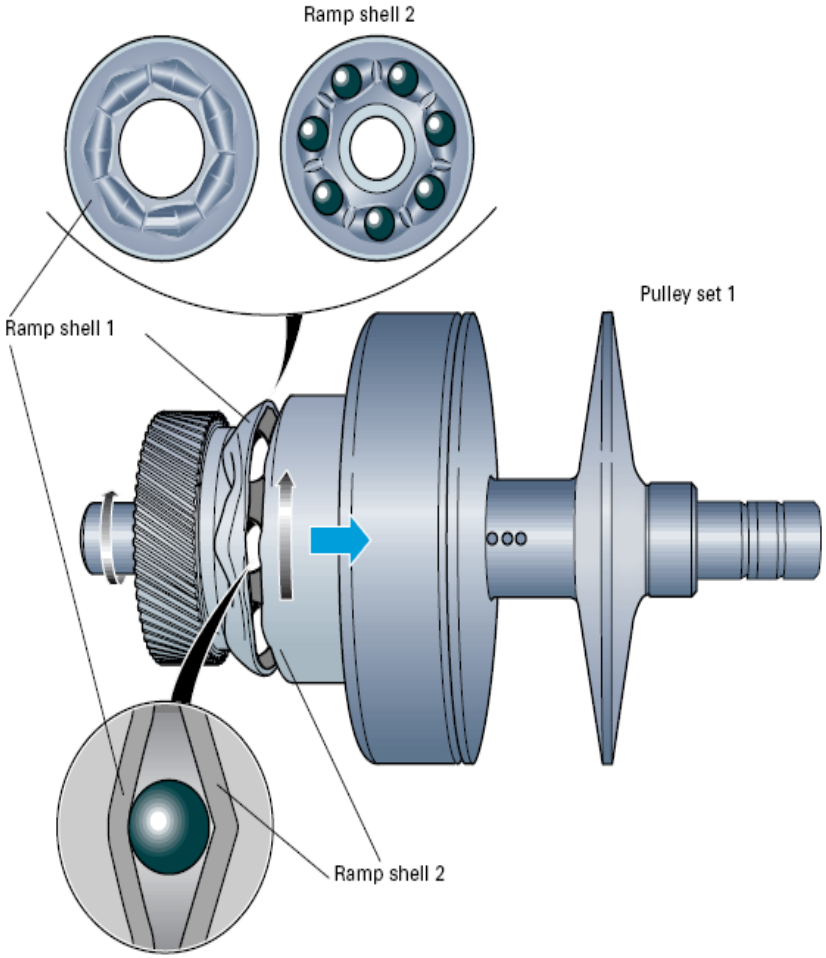


Auxiliary Reduction Gear Set



Torque Sensor

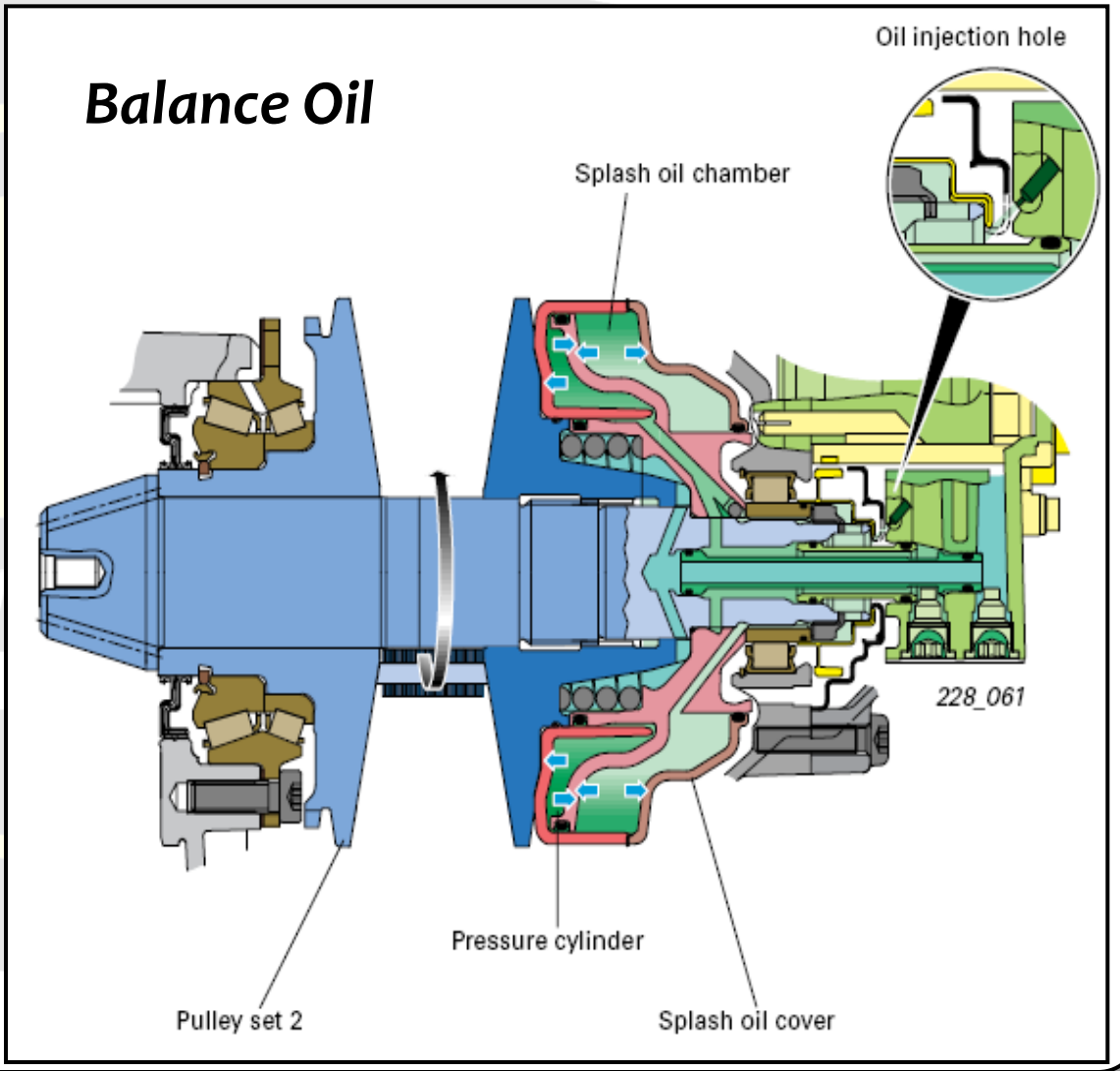




The torque sensor is a hydromechanical sensor located on pulley set 1. The sensor is compiled of 2 shells and 7 steel balls. One ramp shell is connected to the output gear the other splined onto the torque sensor piston attached to pulley set 1. This ramp shell and ball assembly statically and dynamically controls the contact pressure through torque sensor spaces. The 2 shells rotate towards each other. Forces from ramp shell 1 converts engine torque to ramp shell 2, pushing the torque sensor piston. This movement opens and closes the outlets to sensor space 1.

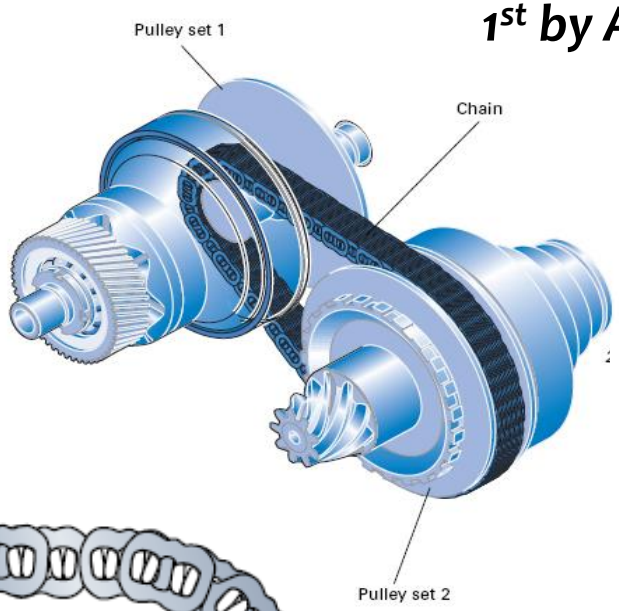
Splash Oil Cover

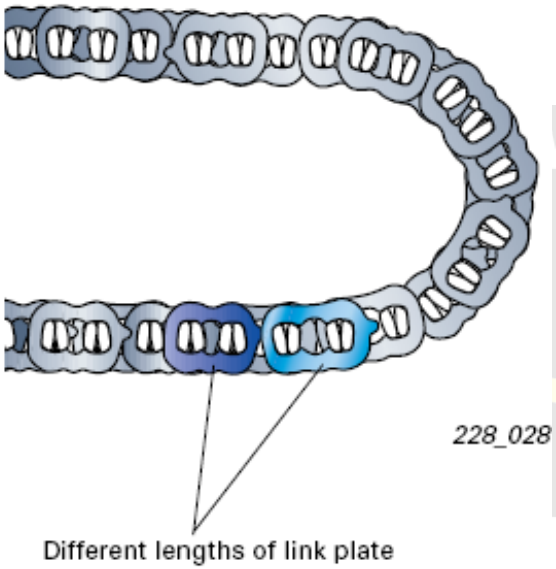
The “splash oil cover” is located on pulley set 2 to counteract the pressure build up in the pressure cylinder. At higher engine speeds

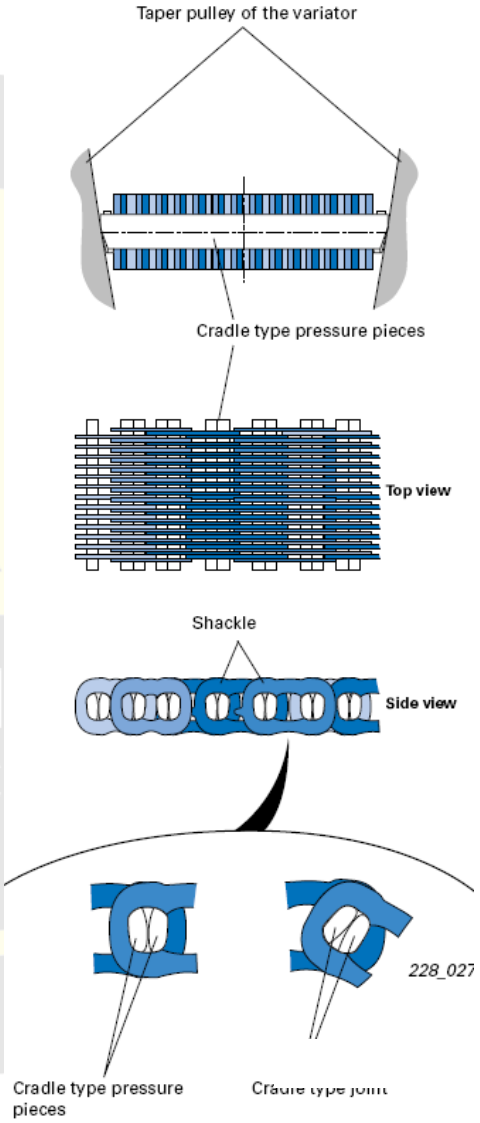


1st by Audi

Chain

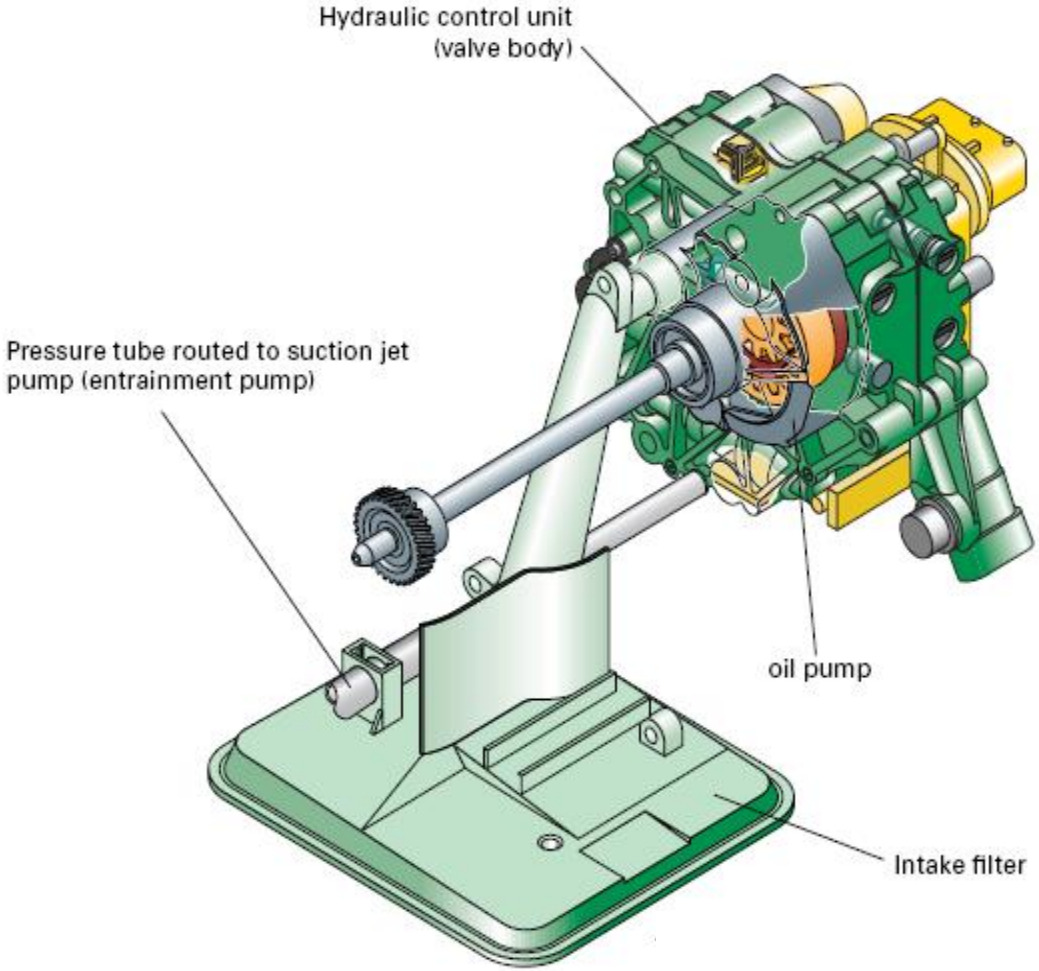






Suction Jet Pump (Entrainment Pump)

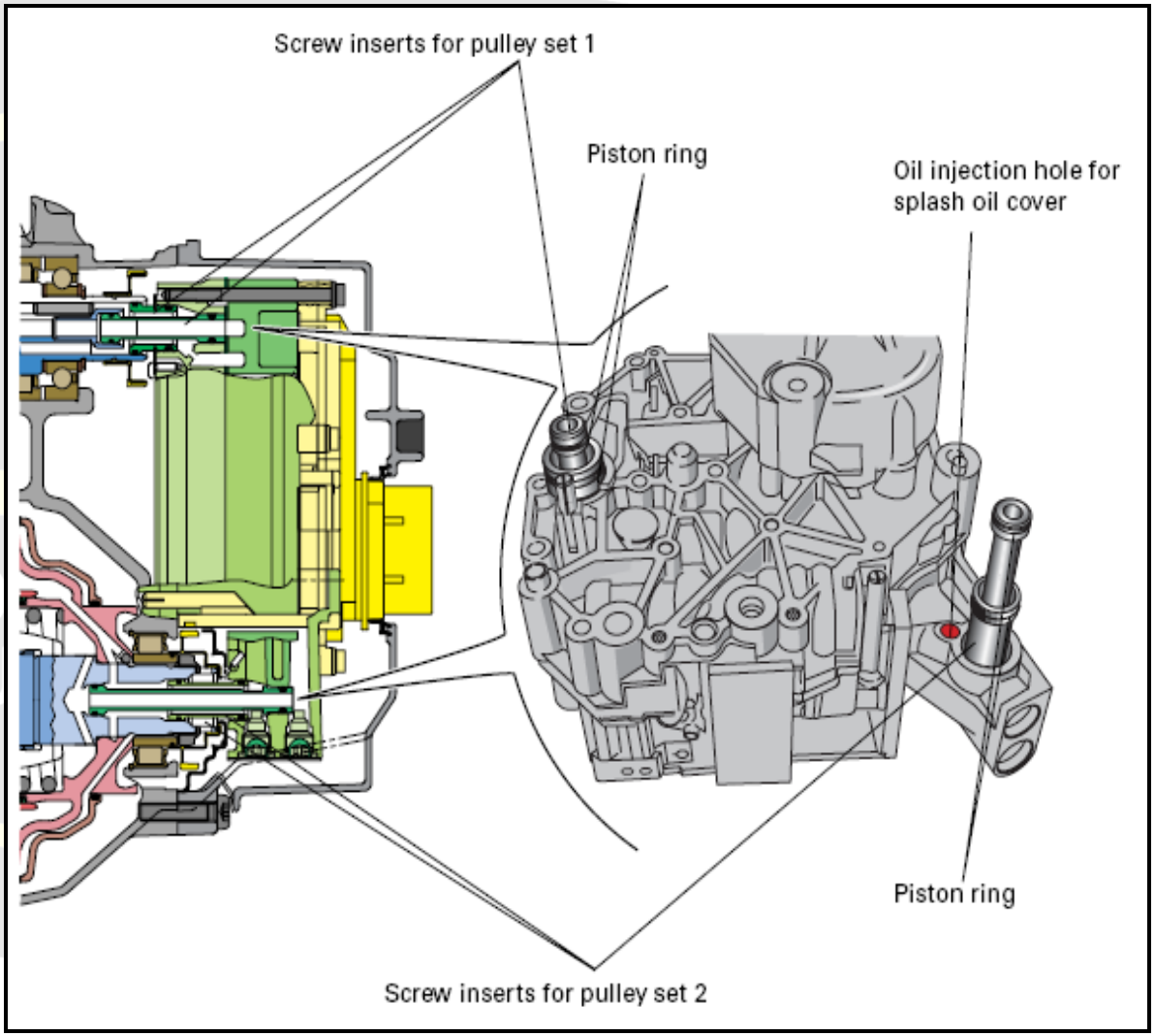
The suction jet pump (entrainment pump) is mounted directly on the valve body driven by the input shaft. This is a crescent type pump that produces high pressure and volume with a small amount of oil. The suction entrainment pump is designed to supply the oil volume required for the clutch cooling at low pressure



Hydraulic Control Unit (Valve Body)

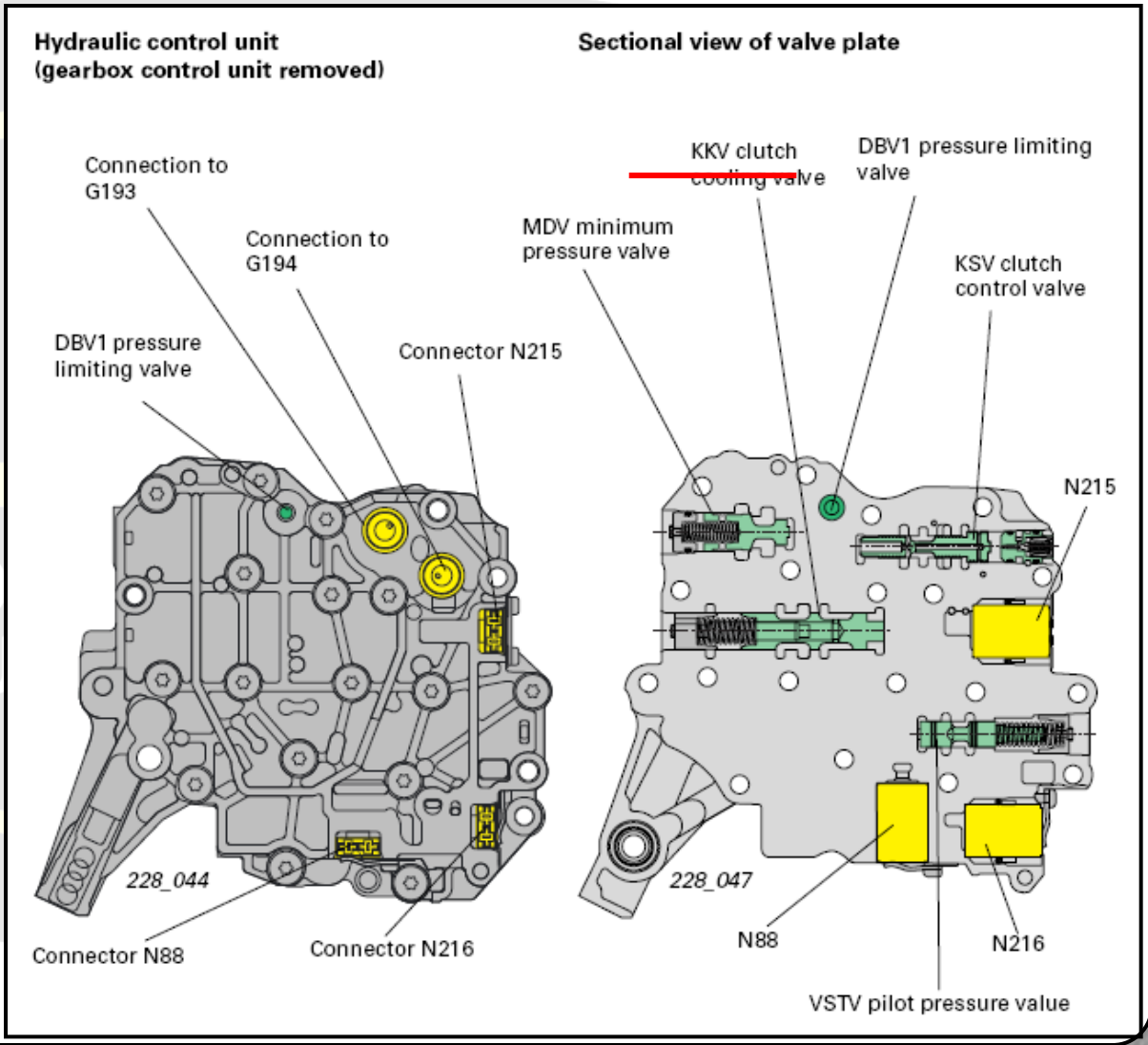
Valve body functions:

- *Forward/Reverse clutch control
- *Clutch pressure control (regulated)
- *Clutch cooling
- *Contact pressure control
- *Gearbox control
- *Splash oil

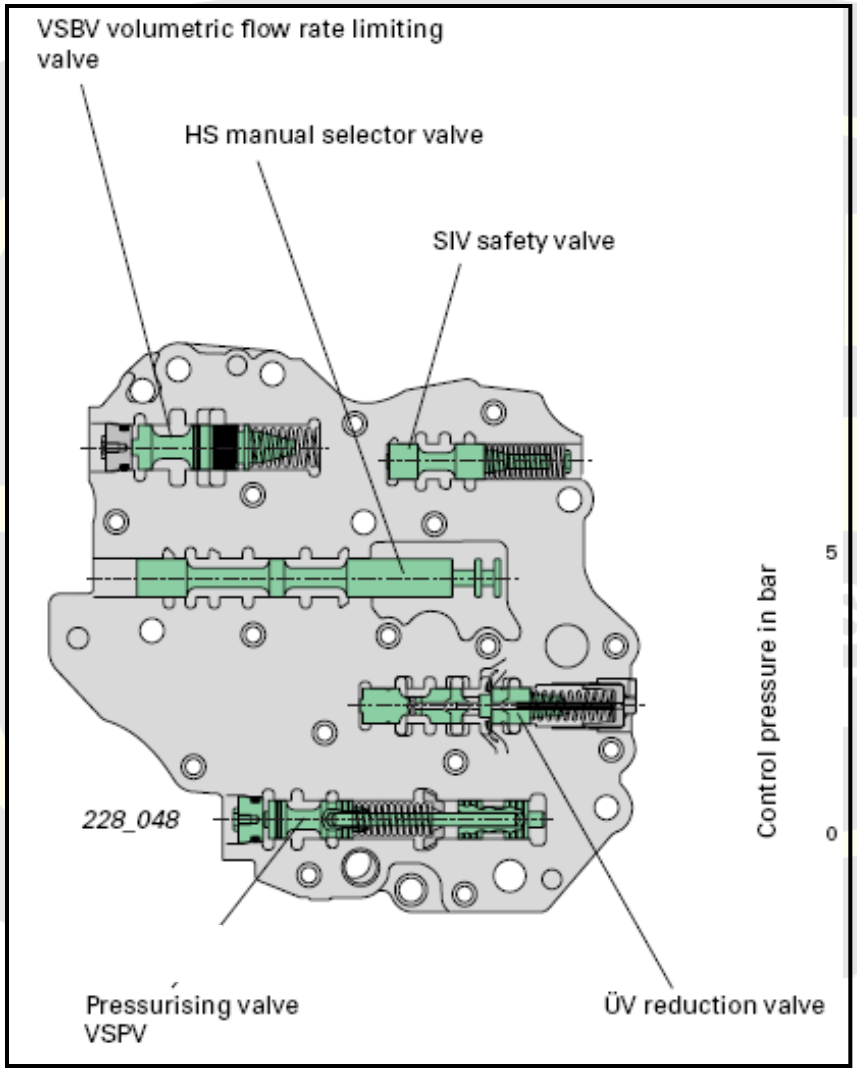


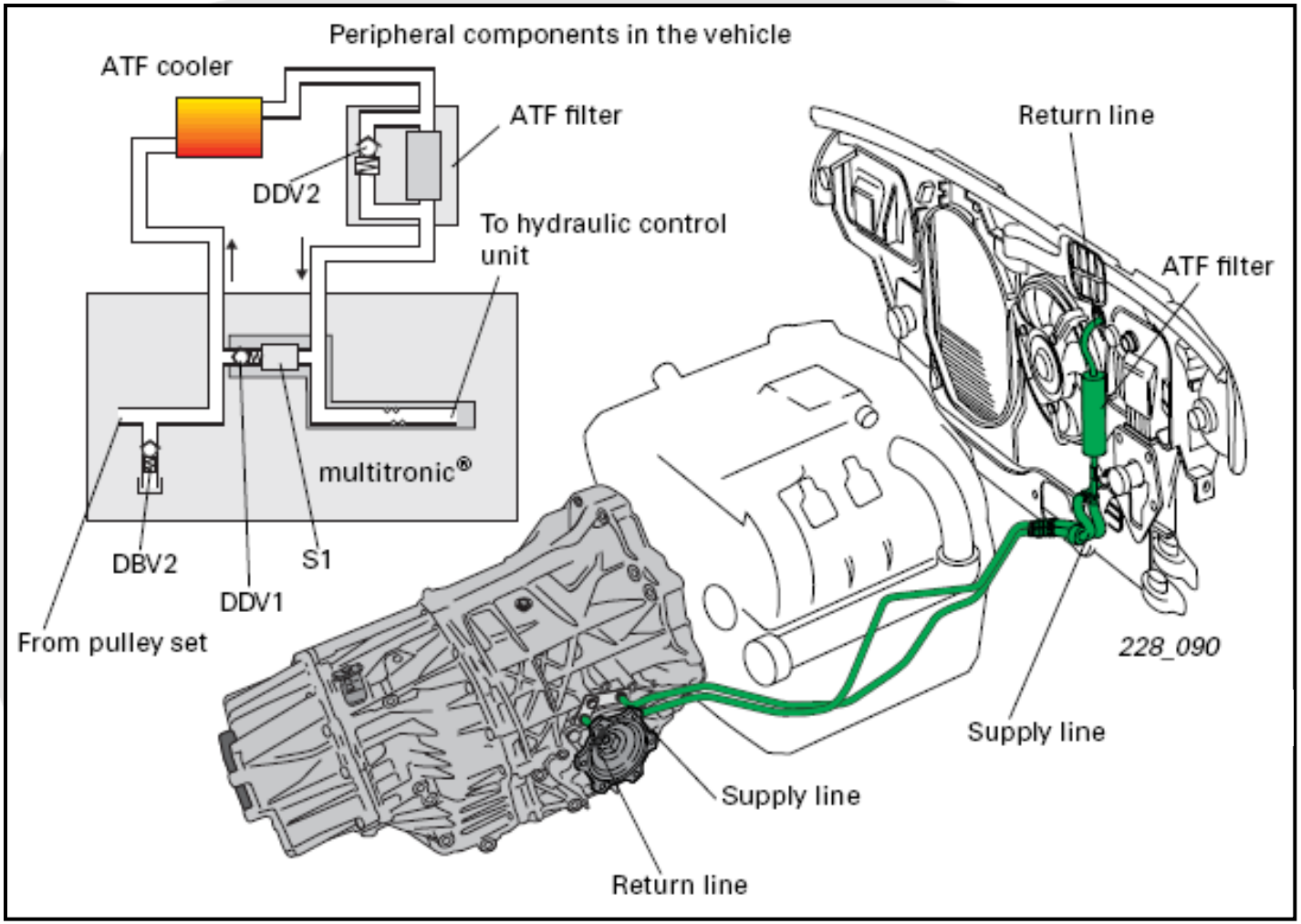
Hydraulic Control Unit (Valve Body)

* DBV1: Pressure Limiting valve (limits the pump pressure to max. 82 bar “blow off”)
*DBV2: Pressure Limiting valve 2
* Minimum Pressure valve (prevents air from being drawn into the oil pump during start up/when pump pressure is high valve opens and allows oil to flow from the oil return pipe to the suction side of the oil pump)
* VSTV: Pilot Pressure value (supplies pressure control valves constant pressure of 5 bar)
*VSPV: Pressure control valve (system pressure (control and contact pressure)
*KKV: Clutch cooling valve
*KSV: Clutch control valve



Hydraulic Control Unit (Valve Body)





Fault Indicator

PRND Display Normal "Non Critical" No Noticeable Drive Ability Issues

PRND Display Inverted Still "Non Critical" Should Be Corrected As Soon As Possible

PRND Display "FLASHING" Critical Should Be Corrected Immediately Will Stop Operating

No Movement

May Not Make Noise


Variator Assembly With
Chain $800.00


Piston &
Drum Wear

Replace TCM

Technical Service Bulletin

MIL on, and/or Multitronic Transmission in Emergency Running Mode (DTC P0706 or P1793 in TCM)

37 07 10 May 31, 2007 2012154/8. Supersedes Technical Service Bulletin Group 37 number 07-09 dated May 30, 2007 to add a transmission code to the header data within ElsaWeb.

Model(s)	Year	VIN Range	Vehicle-Specific Equipment
A4	2002 – 2007	All	Automatic CVT (01J)
A4 Cabriolet	2003 – 2007	All	
A6	2002 – 2004, 2006 – 2007	All	

Condition

MIL on and/or vehicle in emergency running mode with gear indicator illumination inverted. DTC **17090-P0706** (Transm. Range Sensor Circ. Range/Performance) or DTC **18201-P1793** (Output Speed Sensor 2 Circ. No Signal).

DTC 17090 / P0706 Range Sensor
18201 / P1793 OSS

Technical Background

Not applicable.

Production Solution

Not applicable.

Inverted

Service

It is *not* necessary to receive an authorization number from the Technical Assistance Center for the repair described in this bulletin.

Attach VAS scan tool printouts to the repair order. Warranty requested documents received without VAS scan tool printouts will be denied payment.

If either DTC **17090-P0706** or **18201-P1793** is stored in the fault memory, replace Transmission Control Module. Refer to *Group 38, Transmission Control Module (TCM) J217 Removing and Installing*.

Warranty

No Drive / Delay In Drive Or Reverse

Technical Service Bulletin

No drive or delayed drive in "D" or "R" (DTC P1743/18151 may be stored in TCM)

38 07 01 Jan 9, 2007, 2013280/1

Model(s)	Year	VIN Range	Vehicle-Specific Equipment
A6	2006-2007	All	With Automatic CVT (01J)
A4	2005	All	
A4 Cabriolet	2005-2006	All	

Condition

DTC 18151 / P1743

No drive, or delayed drive when either D or R is selected. DTC **P1743/18151** may be logged in TCM fault memory.

The vehicle does not start moving without accelerating. When accelerating, an increased engine speed is necessary to move the vehicle. In some cases there is no drive.

Technical Background

Increase Engine Speed For Movement

Some damaged seals installed in production.

The damaged seals may leak after a short operating period (less than 13,000 miles), causing a loss of transmission oil pressure.

This condition will not result in unintentional vehicle movement.

Affected vehicles: Vehicles with Multitronic transmissions produced between May 2005 and May 2006.

Production Solution

Improved production.

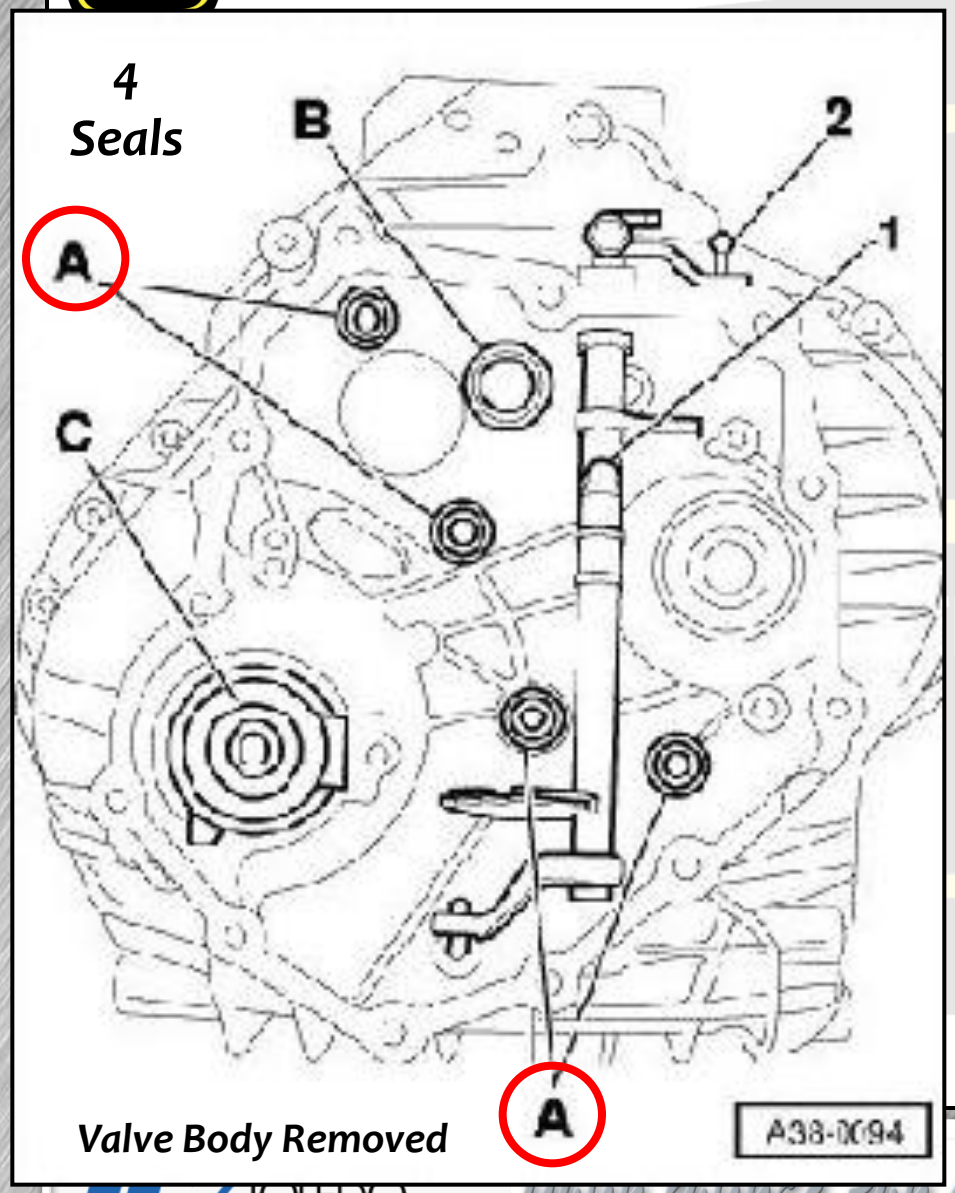
Service

It is *not* necessary to receive an authorization number from the Technical Assistance Center for the repair described in this bulletin.

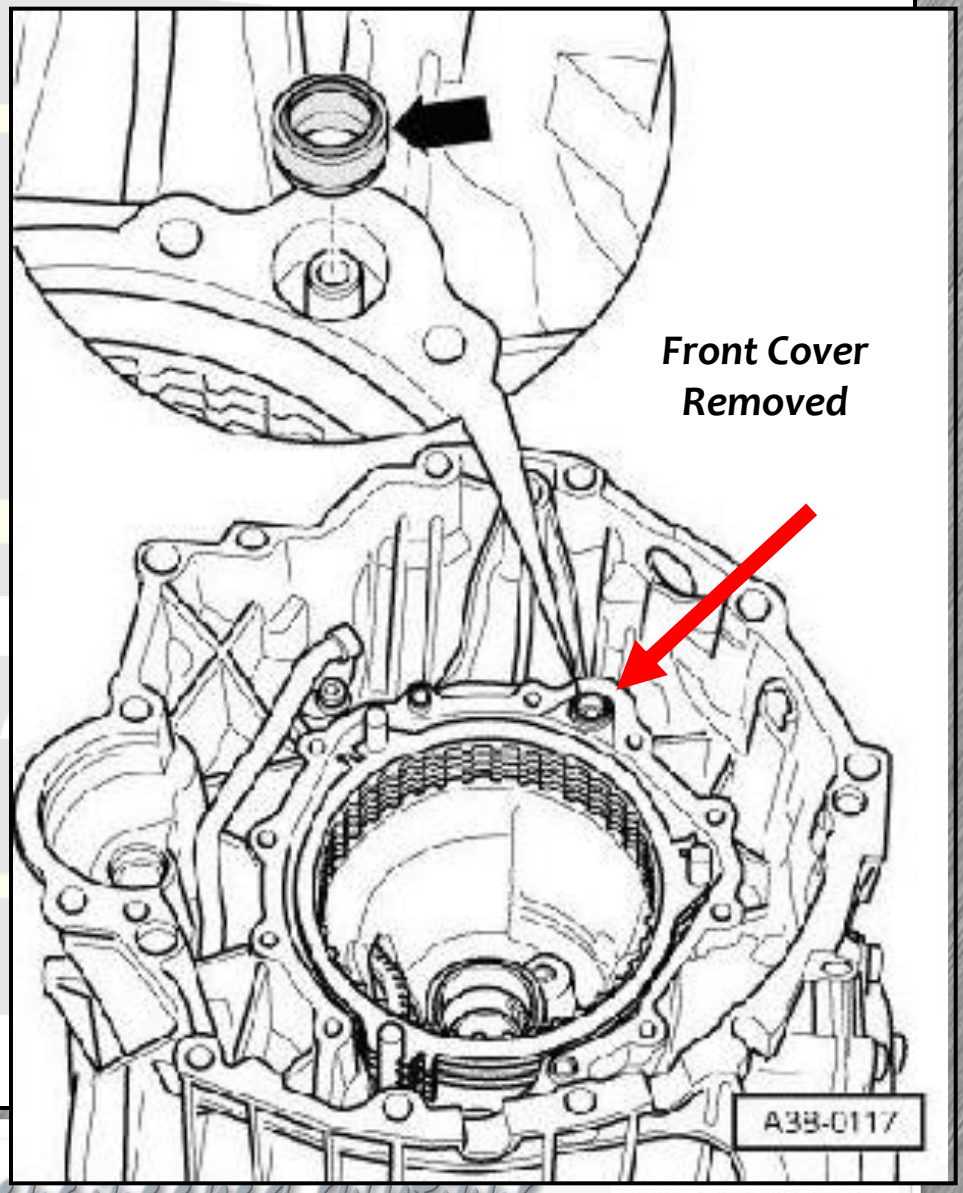
Attach VAS scan tool printouts to the repair order. Warranty requested documents received without VAS scan tool printouts will be denied payment.

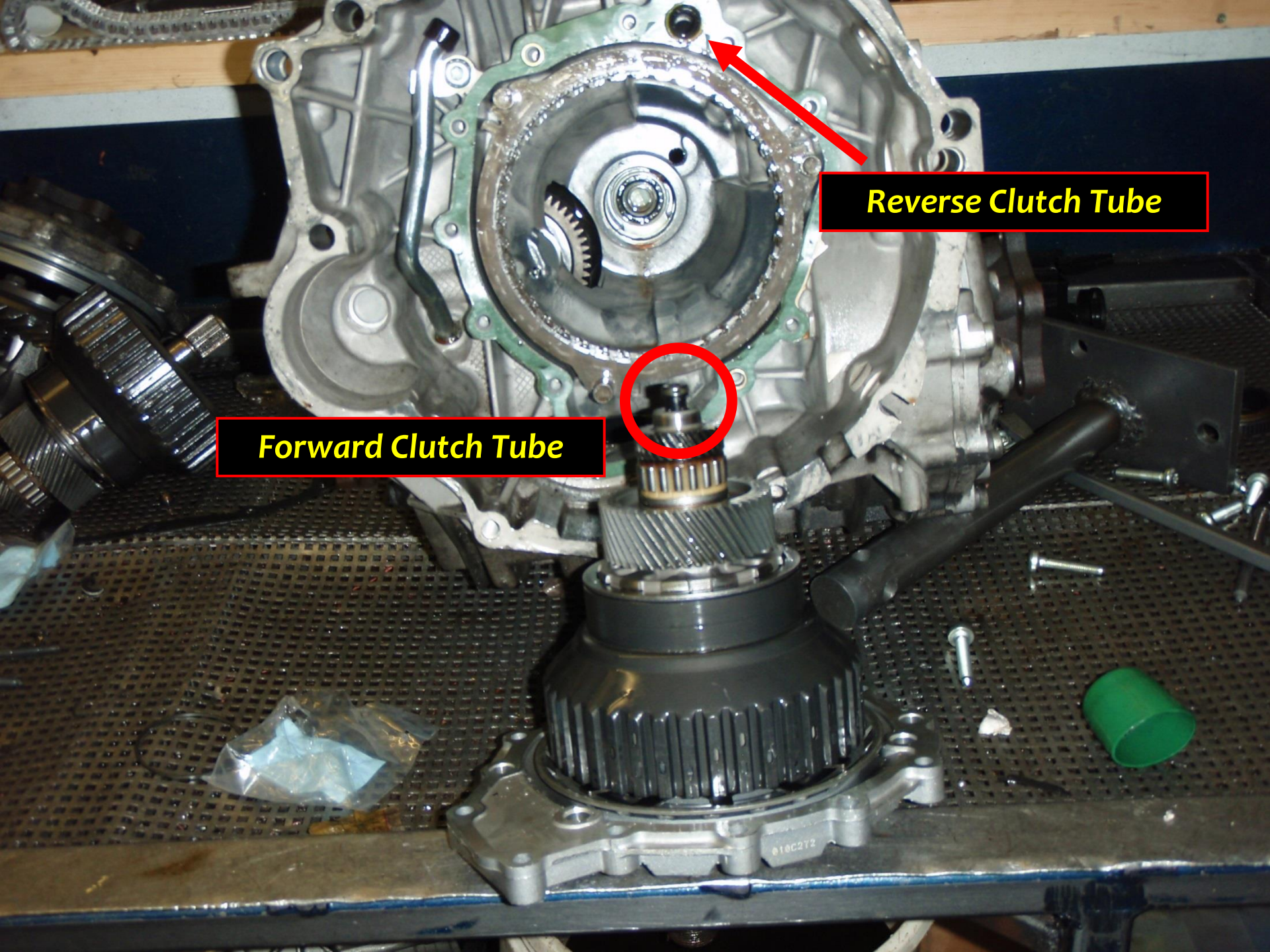
If fault **P1743/18151** (clutch slip monitoring signal too large) is stored in the transmission fault memory, read **MVB 44/1** and **45/1**. If **MVB 44/1** is 1000 mA and **MVB 45/1** is above 12 bar, there is a problem with the axial seals. If **MVB 45/1** is below 12 bar, this indicates a hydraulic problem. (See below for further analysis.)

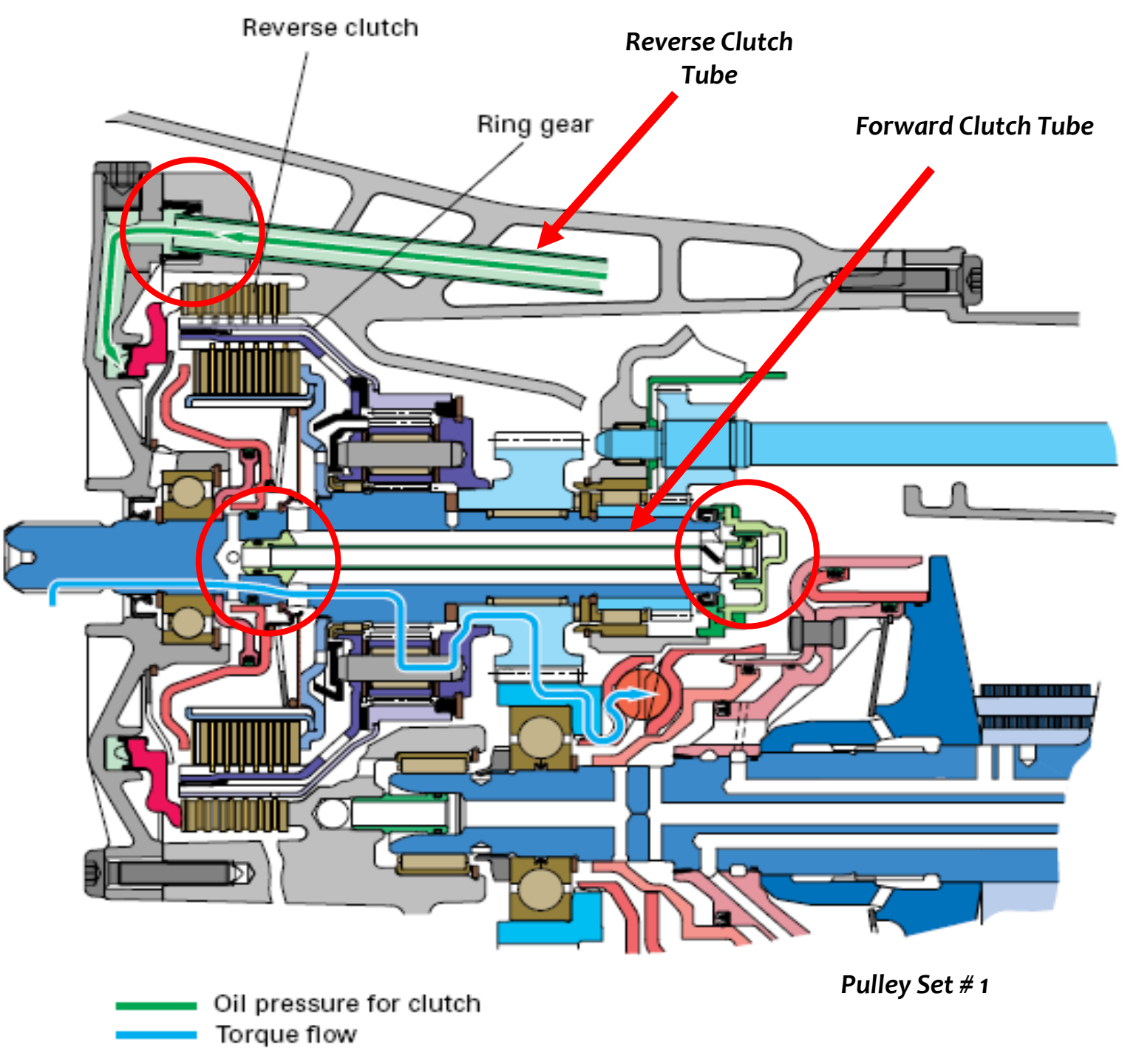
No Drive / Delay In Drive

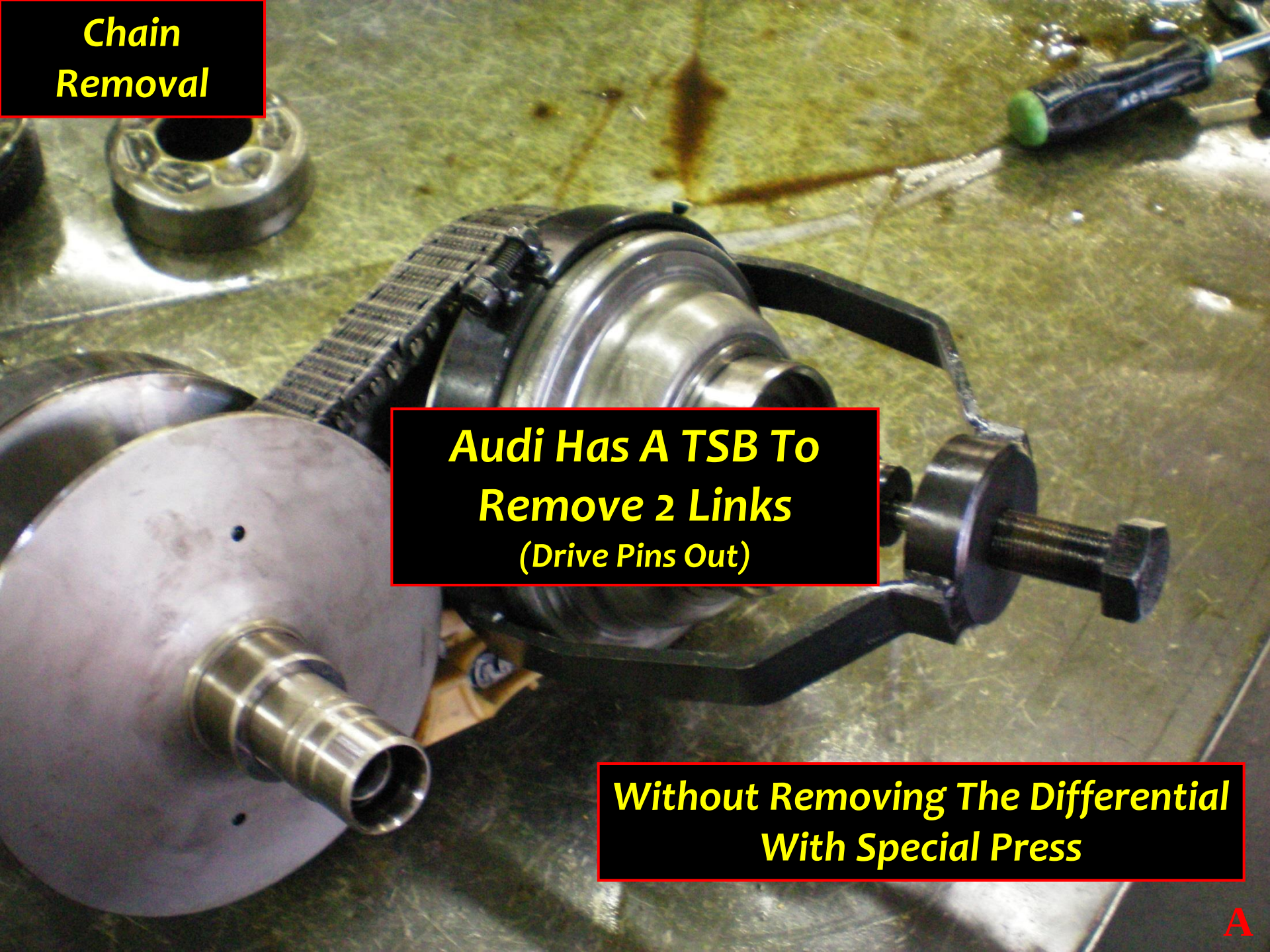


Delay In Reverse




Reverse Clutch Tube
Forward Clutch Tube


Reverse clutch
Reverse Clutch Tube
Ring gear
Forward Clutch Tube
Pulley Set # 1
Oil pressure for clutch
Torque flow


Chain Removal
Audi Has A TSB To Remove 2 Links
(Drive Pins Out)
Without Removing The Differential With Special Press
A

Replace TCM

65

Technical Service Bulletin

Audi

MIL on, and/or Multitronic Transmission in Emergency Running Mode (DTC P0706 or P1793 in TCM)

37 07 10 May 31, 2007 2012154/8. Supersedes Technical Service Bulletin Group 37 number 07-09 dated May 30, 2007 to add a transmission code to the header data within ElsaWeb.

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A4 Cabriolet	2003 – 2007	All	
A6	2002 – 2004, 2006 – 2007	All	

Condition

MIL on and/or vehicle in emergency running mode with gear indicator illumination inverted. DTC **17090-P0706** (Transm. Range Sensor Circ. Range/Performance) or DTC **18201-P1793** (Output Speed Sensor 2 Circ. No Signal).

Technical Background

Not applicable.

Production Solution

Not applicable.

Service

It is *not* necessary to receive an authorization number from the Technical Assistance Center for the repair described in this bulletin.

Attach VAS scan tool printouts to the repair order. Warranty requested documents received without VAS scan tool printouts will be denied payment.

If either DTC **17090-P0706** or **18201-P1793** is stored in the fault memory, replace Transmission Control Module. Refer to *Group 38, Transmission Control Module (TCM) J217 Removing and Installing*.

Warranty

DTC 17090 / P0706
Range Sensor
18201 / P1793 OSS

Inverted

No Drive / Delay In Drive Or Reverse

Increase Engine Speed For Movement

Technical Service Bulletin

Audi

No drive or delayed drive in "D" or "R" (DTC P1743/18151 may be stored in TCM)

38 07 01 Jan 9, 2007, 2013280/1

Model(s)	Year	VIN Range	Vehicle-Specific Equipment
A6	2006-2007	All	With Automatic CVT (01J)
A4	2005	All	
A4 Cabriolet	2005-2006	All	

Condition

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The vehicle does not start moving without accelerating. When accelerating, an increased engine speed is necessary to move the vehicle. In some cases there is no drive.

Technical Background

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DTC 18151 / P1743

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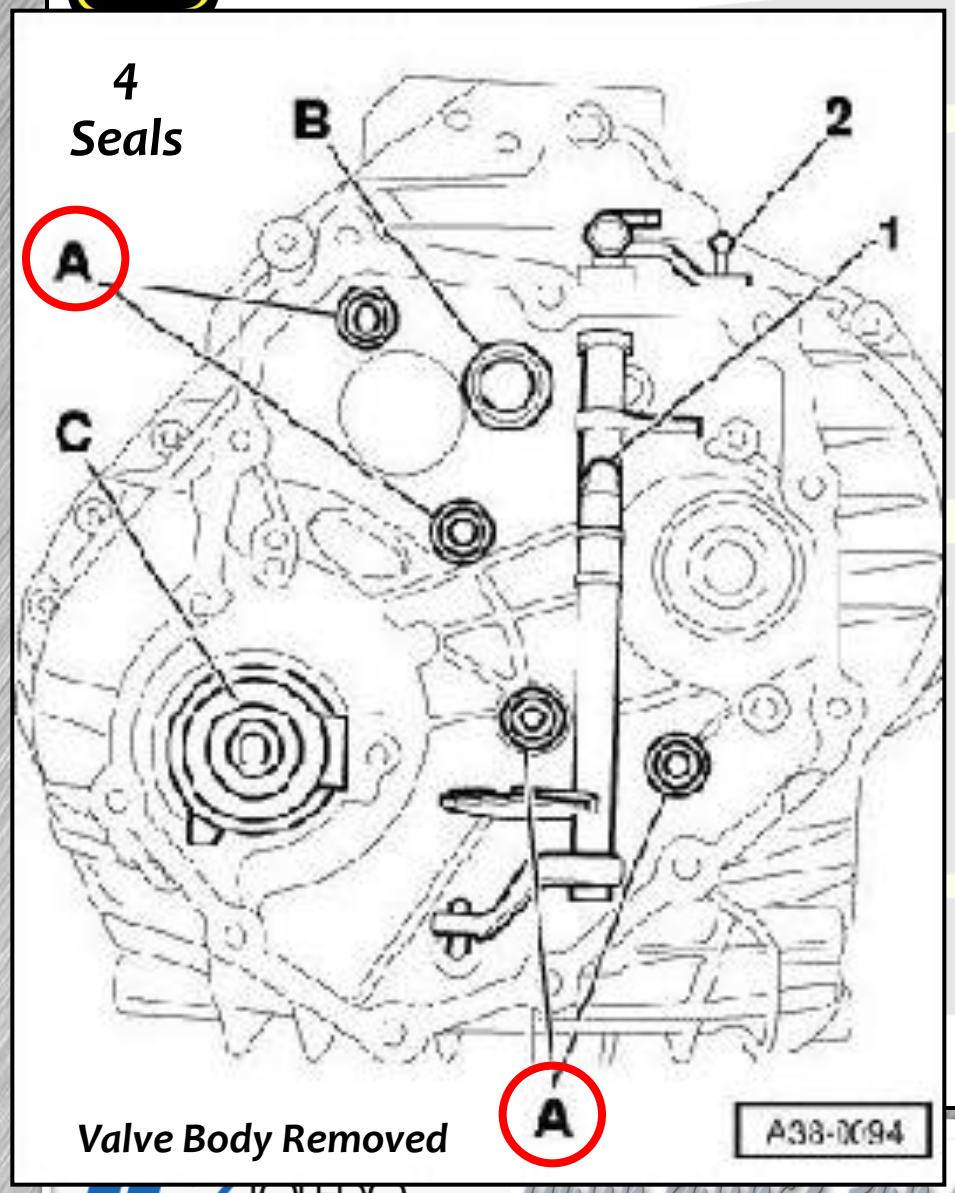
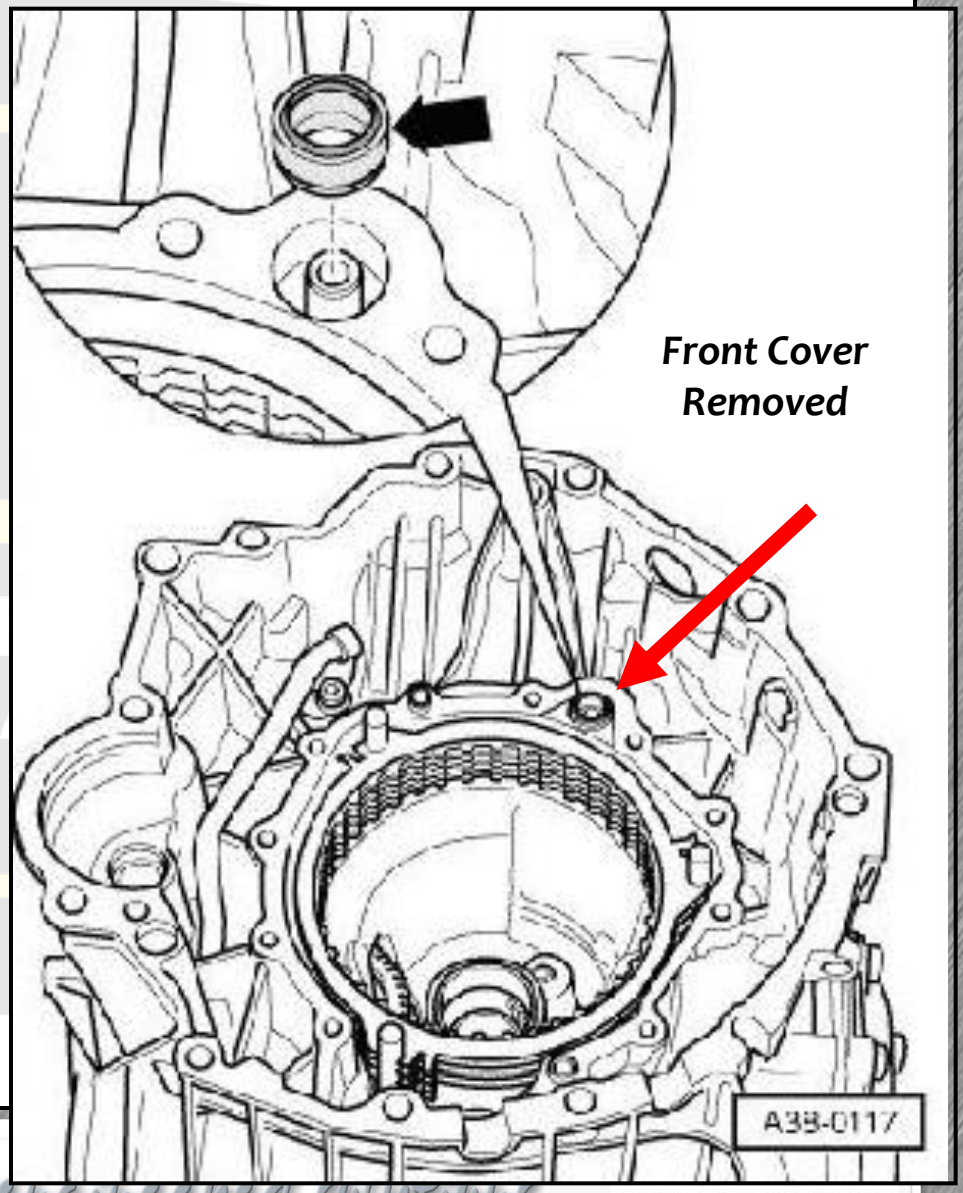


Delay In Reverse



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