Six-Speed Automatic Transmission 09D

Self-Study Program
Course Number 89K303

Volkswagen of America, Inc.
Service Training
Printed in U.S.A.
Printed 3/2003
Course Number 89K303

Always check Technical Bulletins and the Volkswagen Worldwide Repair Information System for information that may supersede any information included in this booklet.

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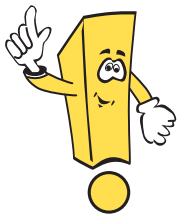
New!



Important/Note!

The Self-Study Program provides you with information regarding designs and functions.

The Self-Study Program is not a Repair Manual

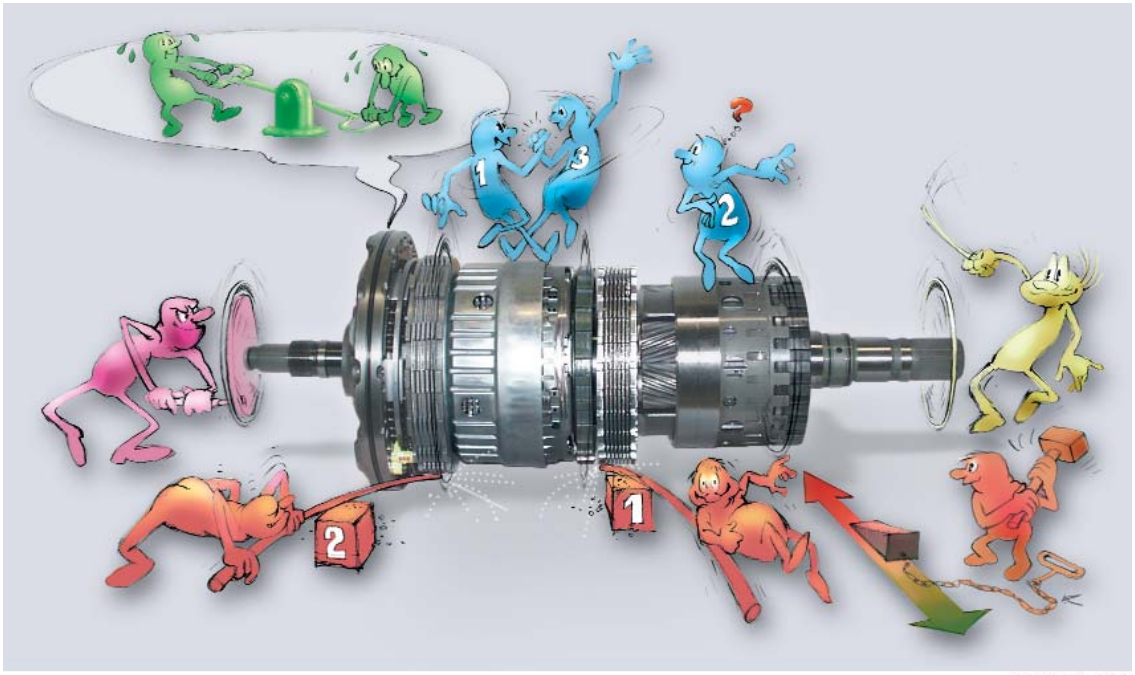
For maintenance and repair work, always refer to the current technical literature

Introduction

This Self-Study Program provides you with the design and function of the new 6-speed automatic transmission, which is installed in the Touareg.

The 09D 6-speed automatic transmission provides:

- six forward speeds to help lower fuel consumption
- excellent acceleration values and low noise output.



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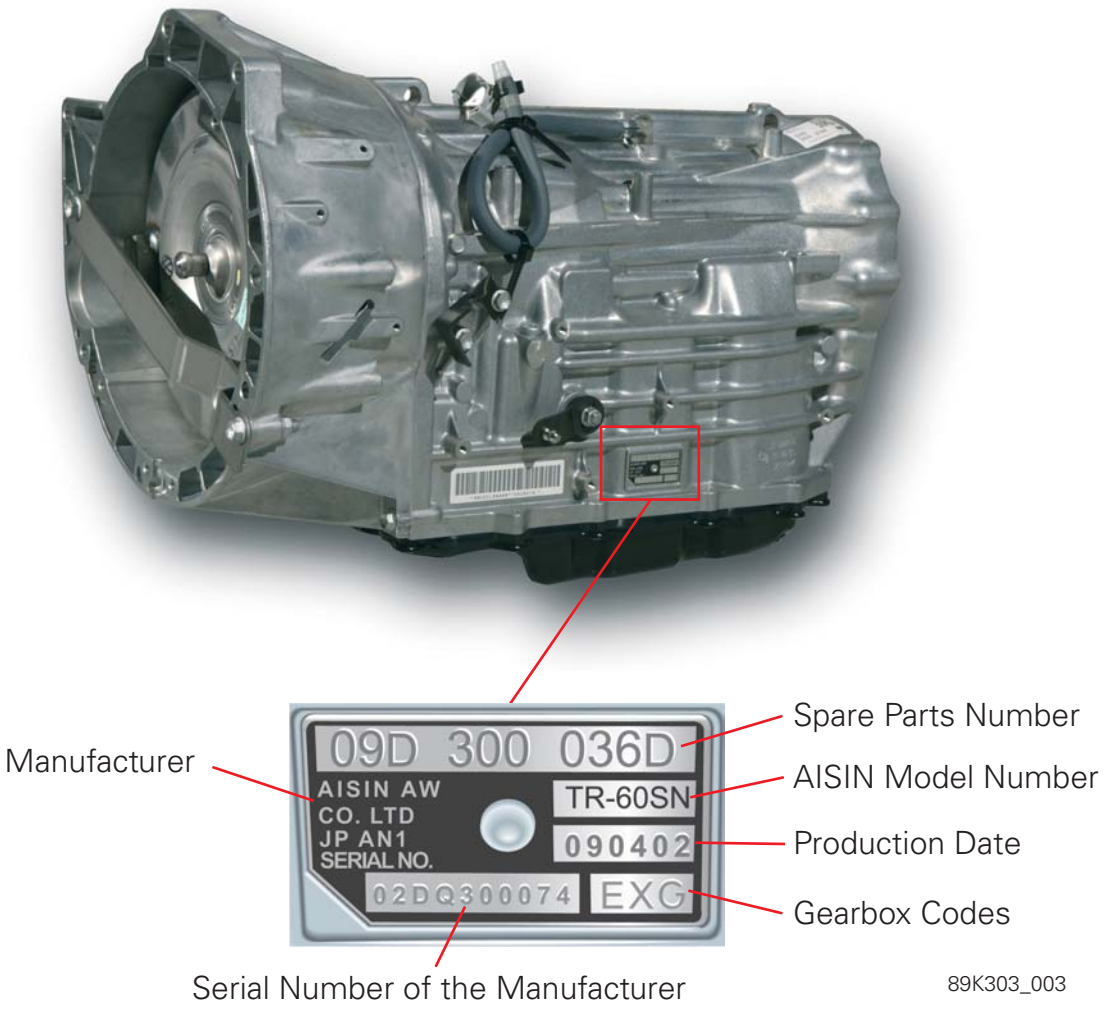
Introduction

The 09D 6-Speed Automatic Transmission

The 09D 6-speed automatic transmission was developed at the famous Japanese manufacturer of automatic transmissions, AISIN Co., LTD, where it is manufactured.

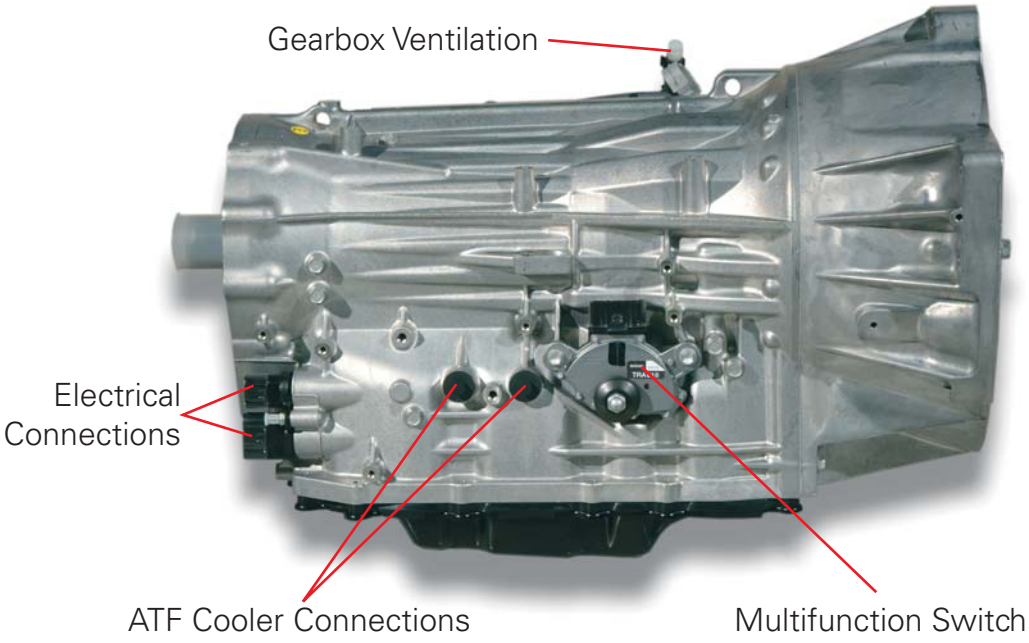
In the development of the control module software, the Volkswagen engineers have used their years of experience regarding fuzzy logic-controlled driving programs which rely on driving situations and driver input.

This 6-speed automatic transmission, which has a very compact construction, is being used for the first time in the Volkswagen Touareg.



Special transmission features include:

- fuzzy logic-controlled shifting programs that depend on driver and driving situations as well as shifting programs that depend on vehicle inputs
- a controlled torque converter clutch
- lifetime ATF filling
- The hill-holder function secures the vehicle from rolling back and permits hills to be approached comfortably.
- selector lever and steering wheel Tiptronic switches



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Technical Data

Volkswagen designation		AG6-09D
Gearbox codes	With V10-TDI Engine	EXG
	With V6 Engine	EXL
ATF		Lifetime filling
ATF filling amount	With V10-TDI Engine	12 liters
	With V6 Engine	9.6 liters
Maximum torque transmission		750 Nm
Weight	depending on engine	97 to 110 kg
	including ATF	
Emergency run	in case of defective control module	3rd gear and R gear

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The Self-Study Program is not a Repair Manual
For maintenance and repair work, always refer to the current technical literature

Selector Lever

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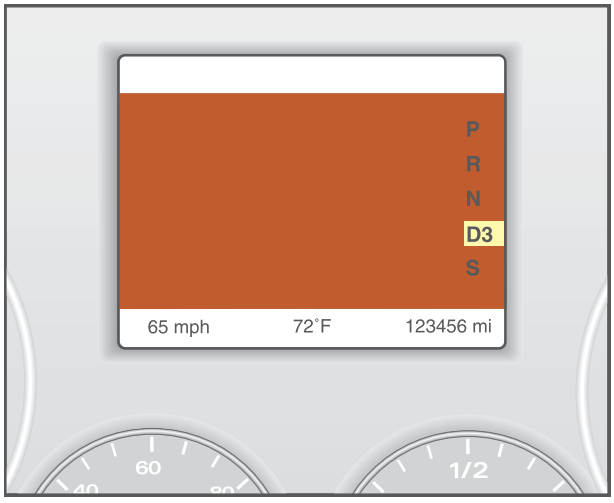

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The Selector Lever Positions

P - Park
Before the selector lever can be moved out of the Park position, the ignition must be switched on.

In addition, the foot brake and the locking button on the selector lever must be pressed.

R - Reverse
The locking button on the selector lever must be pressed to shift into reverse.

N - Neutral
The transmission is idling in this position. No power is being transmitted to the wheels.

If the selector lever is in this position for a long time, the foot brake must be pressed again to activate the lever.

D - Drive
In the Drive position, the forwards gears are switched automatically.

S - Sport
The control module selects gears automatically according to a "sporty" switching characteristic curve.

The individual gears are held longer.

Selector lever position and gear display in instrument panel insert

After the ignition is switched on, the current selector lever position is displayed in the instrument panel insert.

In positions "D" and "S", the gear selected in the transmission is also displayed.

Tiptronic

The Tiptronic function in the Touareg allows for greater driver control. It is actuated through the selector lever and displayed in the instrument panel insert.

Selector lever Tiptronic

The Tiptronic channel is selected by moving the selector lever to the right out of the "D" position.

This allows the Transmission Control Module to enter the Tiptronic mode. The driver can now actively select gears.

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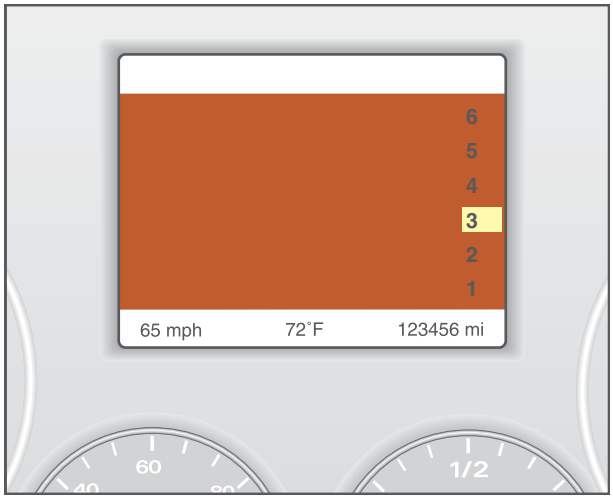
Gear display in the instrument panel insert

The current gear is displayed in Tiptronic mode.



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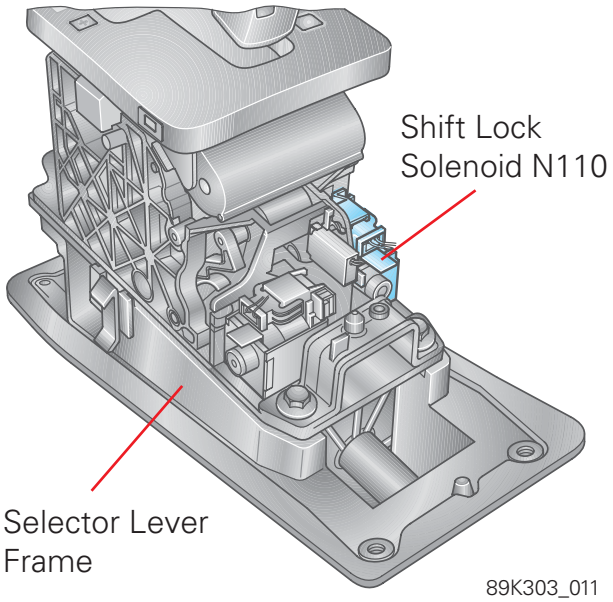
Selector Lever



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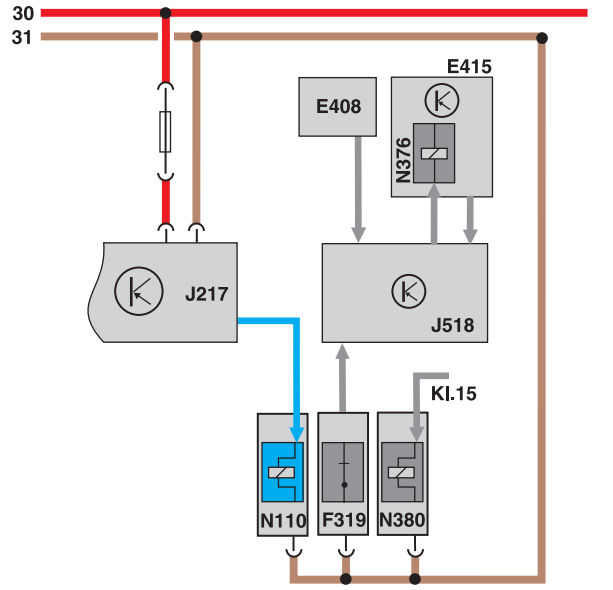

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Components:

E408	Access/Start Authorization Button
E415	Access/Start Authorization Switch
F319	Selector Lever Park Position Lock Switch
J217	Transmission Control Module
J518	Access/Start Control Module
N110	Shift Lock Solenoid
N376	Ignition Switch Key Lock Solenoid
N380	Selector Lever Park Position Solenoid

Selector Lever Lock and Ignition Key Removal Lock

Shift Lock Solenoid N110

This is located in the front on the selector lever frame. It prevents the selector lever from moving out of the positions "P" and "N" when the brake is not being applied.

How it works

Once the ignition has been switched on, the magnet for the selector lever lock is energized by the Transmission Control Module, locking the selector lever.

If the Transmission Control Module receives the signal "brake applied" via the CAN data bus, it cuts off current to the magnet and the selector lever can be moved.

Effects of a signal drop-out

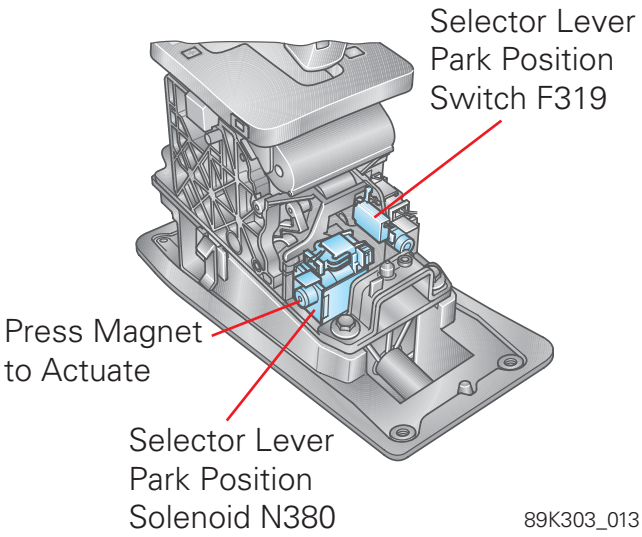
If one of the two signals fails or if the magnet is faulty, the selector lever can be moved out of "P" and "N" without applying the brake if the ignition is switched on.

Selector Lever Park Position Solenoid N380

This is located on the selector lever frame, as is the magnet for the selector lever lock.

It prevents the selector lever from moving out of the "P" position when the ignition is switched off.

The ignition must be switched on to activate the lock button.



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How it works

The Selector Lever Park Position Solenoid N380 is without power when the ignition is switched off, locking the selector lever in the "P" position.

After the ignition is switched on, the magnet N380 receives power from terminal 15 and the lock is lifted.

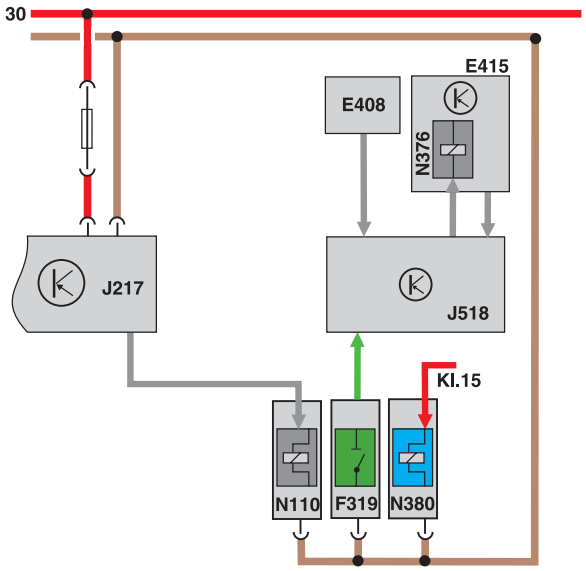
F319 signals to the access and start authorization control device that the selector lever is in the "P" position.

Effects of a signal drop-out

If one of the signals fails or the magnet for selector lever lock "P" is defective, then the selector lever cannot be moved out of the "P" position.

N380 has to be manually unlocked before moving the vehicle. To disable N380, the center console covering must be removed and the magnet actuated by hand.

The selector lever has to be simultaneously moved out of the "P" position.



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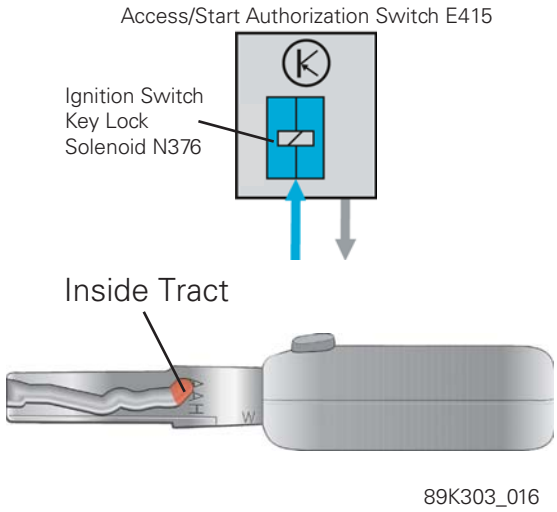
Components:

E408	Access/Start Authorization Button
E415	Access/Start Authorization Switch
F319	Selector Lever Park Position Lock Switch
J217	Transmission Control Module
J518	Access/Start Control Module
N110	Shift Lock Solenoid
N376	Ignition Switch Key Lock Solenoid
N380	Selector Lever Park Position Solenoid

Selector Lever



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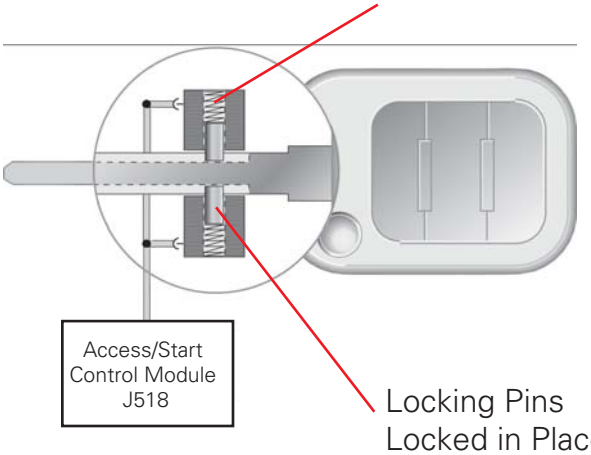
Ignition Switch Key Lock Solenoid N376 Without Power



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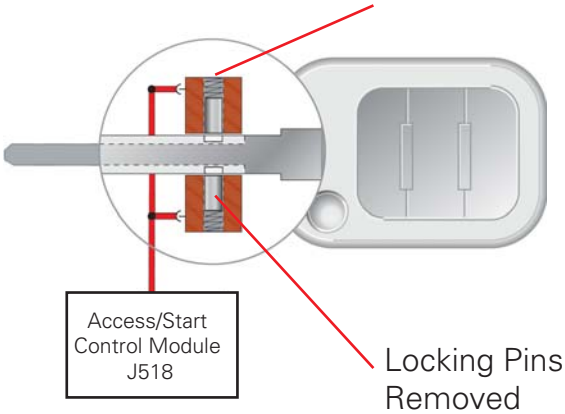
Ignition Switch Key Lock Solenoid N376 With Power



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Ignition Switch Key Lock Solenoid N376

The Ignition Switch Key Lock Solenoid N376 is located inside the Access/Start Authorization Switch E415 and prevents the ignition key from being removed when the selector lever is in a driving position. The ignition key removal lock works electro-mechanically.

How it works

Ignition Switch Key Lock Solenoid N376 contains two spring-loaded locking pins which engage into the inside tract of the inserted ignition key whenever the selector lever is not in the "P" position (N376 without power).

The ignition key cannot be withdrawn.

When the selector lever is in the "P" position, a signal travels from the Selector Lever Park Position Lock Switch F319 to the Access/Start Control Module J518.

The control module then sends current to the Ignition Switch Key Lock Solenoid N376. This causes the magnets to retract the locking pins from the inside tract of the ignition key.

The ignition key can be withdrawn.

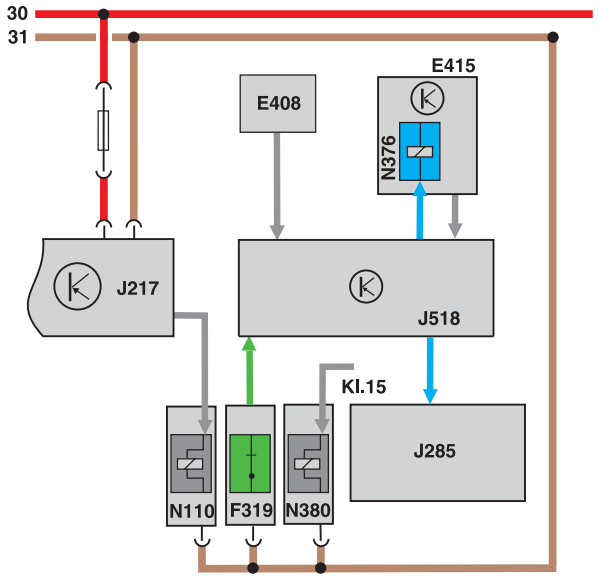
Electrical Circuit

If the ignition is switched off and the selector lever is in the "P" position, a signal travels from the Selector Lever Park Position Lock Switch F319 to the Access/Start Control Module J518.

The control module then sends current to the magnet for the ignition key removal lock N376. The locking pins are removed, and the ignition key can be withdrawn.

If the selector lever is not in the "P" position when the engine of a vehicle with start/stop buttons is switched off, the instrument panel insert emits an optical and acoustical warning.

This informs the driver that the selector lever is not in the "P" position.



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Components:

E408	Access/Start Authorization Button
E415	Access/Start Authorization Switch
F319	Selector Lever Park Position Lock Switch
J217	Transmission Control Module
J285	Control Module with Indicator Unit in Instrument Panel Insert
J518	Access/Start Control Module
N110	Shift Lock Solenoid
N376	Ignition Switch Key Lock Solenoid
N380	Selector Lever Park Position Solenoid

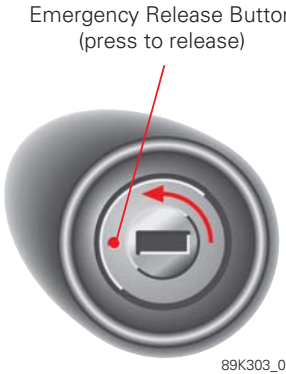
Effects of signal drop-out

The electro-mechanical lock cannot be released if either the signal from the selector lever to the Access/Start Control Module J518 or the signal from the control module to the Access/Start Authorization Switch E415 fails. The key cannot be withdrawn.

In these circumstances, the ignition lock has an emergency release for the ignition key.

Press the emergency release button with a pen or similar object to activate the emergency release for the ignition key.

While keeping the button pressed, turn the ignition key to the left and remove it.



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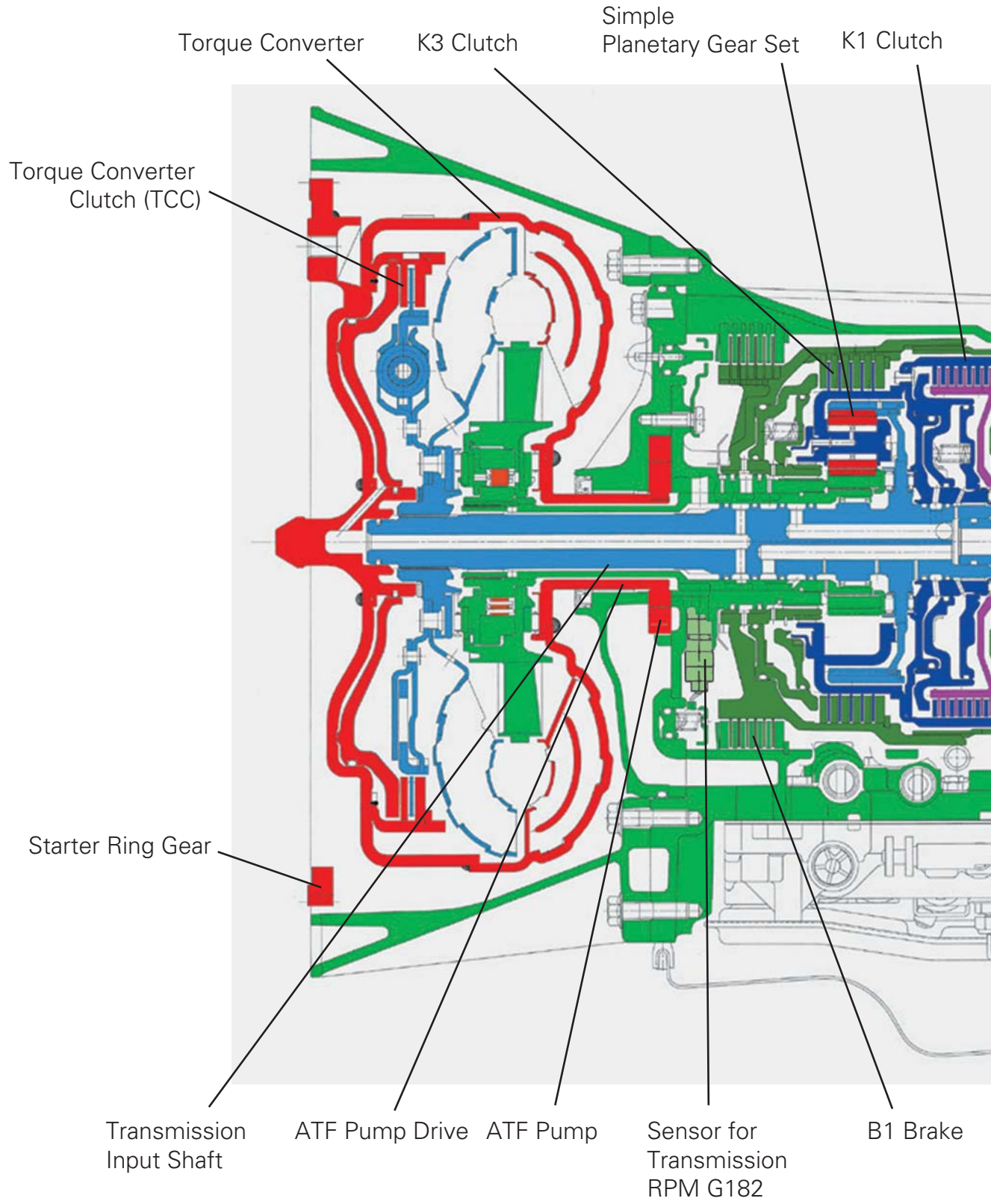
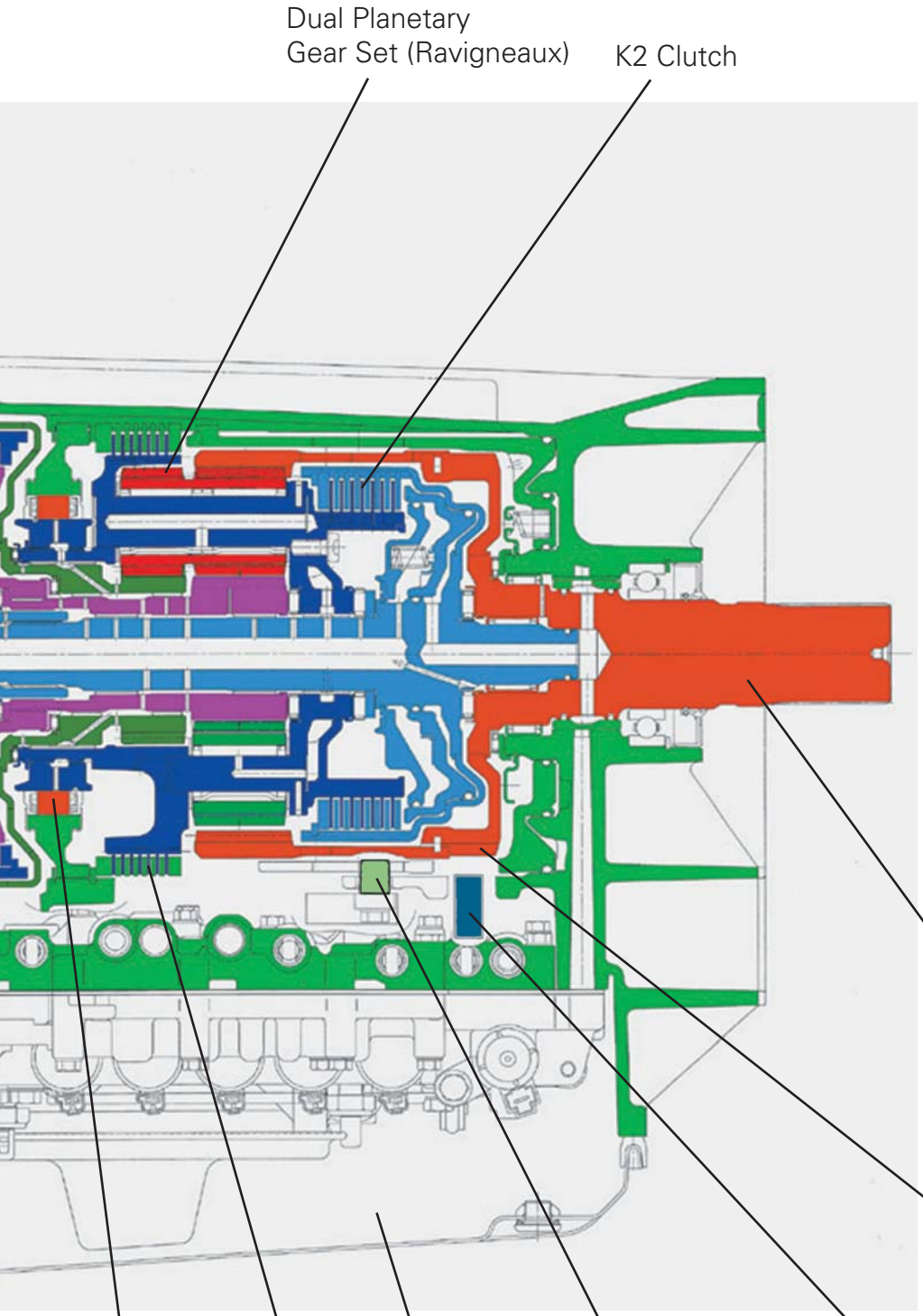
Automatic Transmission Design

Component Overview




Dual Planetary
Gear Set (Ravigneaux)
K2 Clutch
Drive Shaft
Parking Lock Wheel
Free-wheel
B2 Brake
Oil Pan
Sender for
Transmission
Output RPM G195
Parking Lock

89K303_019

Automatic Transmission Design

Component Functions

The transmission housing is made of an aluminum alloy.

The six forward gears and the reverse gear are switched using a Lepelletier arrangement of the planetary gear sets.

To switch the gears,

- three multi-disc clutches,
- two multiple disc brakes

are switched on or off using the electro-mechanic-hydraulic control module in the valve body.

The Transmission Control Module initiates gear changes and monitors the process for problems.

Signals from the various sensors are used to control actuator activation.

Activation takes place depending on driver, driving situation and the shift program.

Torque converter with lockup clutch and ATF pump

The torque converter uses transmission fluid to allow the vehicle to start and for torque multiplication. This converter is also equipped with a Torque Converter Clutch (TCC).

This TCC can be used from an engine speed of 1000 rpm or higher. The Transmission Control Module closes this clutch, allowing engine torque to transfer directly to the transmission input shaft.

The transmission is adapted for use with different engines in the Touareg by varying

- the number of installed disc pairs for the brakes and the clutches
- the size of the torque converter and
- the geometric shape of the torque converter housing.

The individual gears remain the same for all engines.

A transfer transmission flanged onto the transmission distributes the torque to the axle drives.

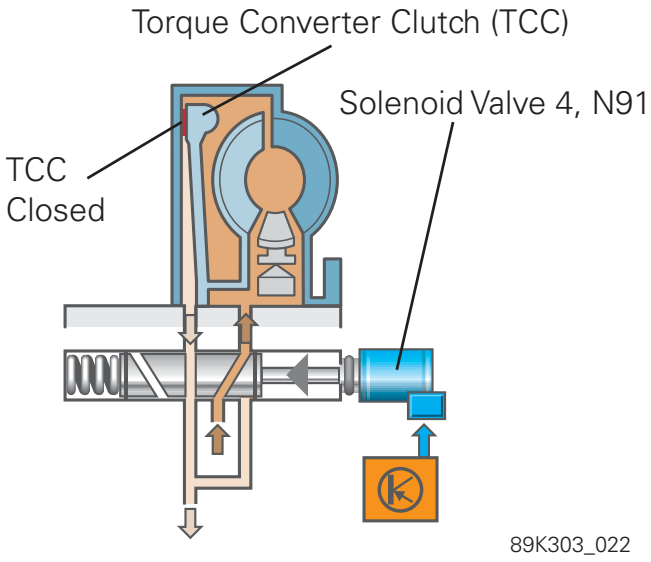
Torque Converter Clutch (TCC)

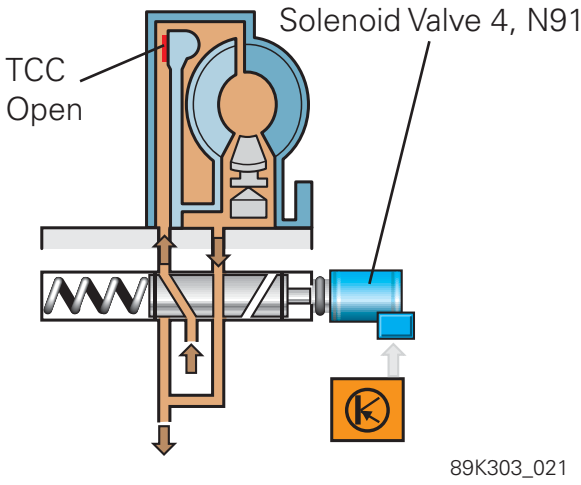
The Transmission Control Module controls the TCC Solenoid Valve N91. This solenoid valve either opens or closes the TCC, depending on the engine speed and torque.

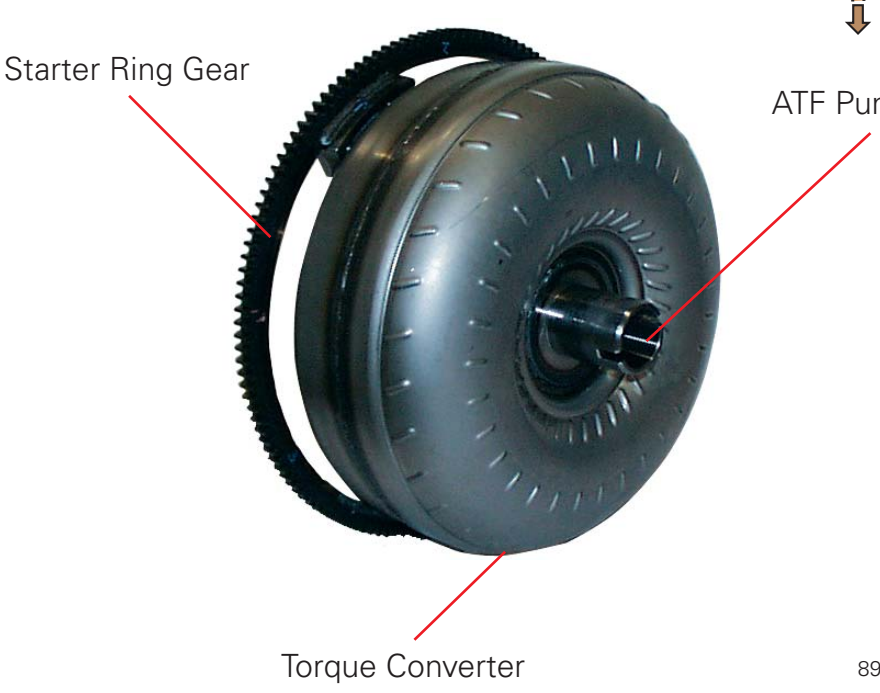
When the TCC is closed, engine torque is transmitted directly through to the transmission without any slip.

To close the TCC, N91 opens the oil reservoir upstream of the TCC. This decreases the pressure in the oil reservoir, allowing the TCC to close.

When N91 closes the oil flow again, allowing pressure to increase upstream of the TCC, the TCC will open.







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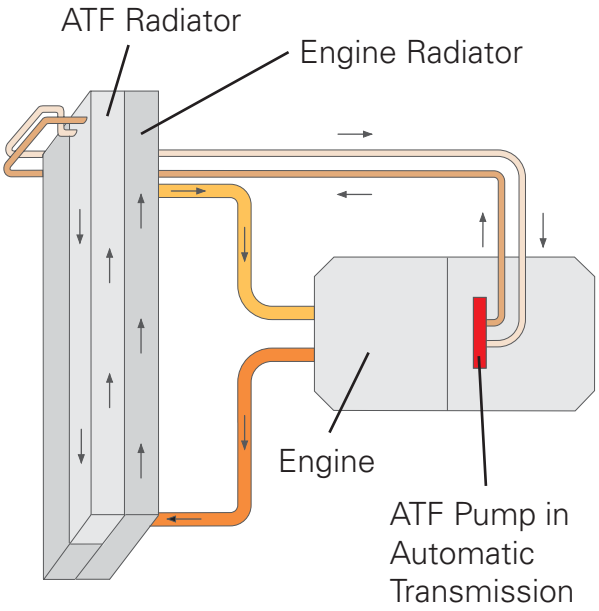
The ATF pump

The ATF pump is a gear pump and is driven by the ATF pump drive of the torque converter. It pulls the ATF from the oil pan of the transmission through the oil sieve.

The ATF pump generates the working pressure for:

- the application of the multi-disc clutches and multiple disc brakes,
- the lubrication circulation system and
- the coolant circulation system.

The ATF is cooled by a separate radiator. This radiator is located in front of the engine radiator (as seen in the driving direction).



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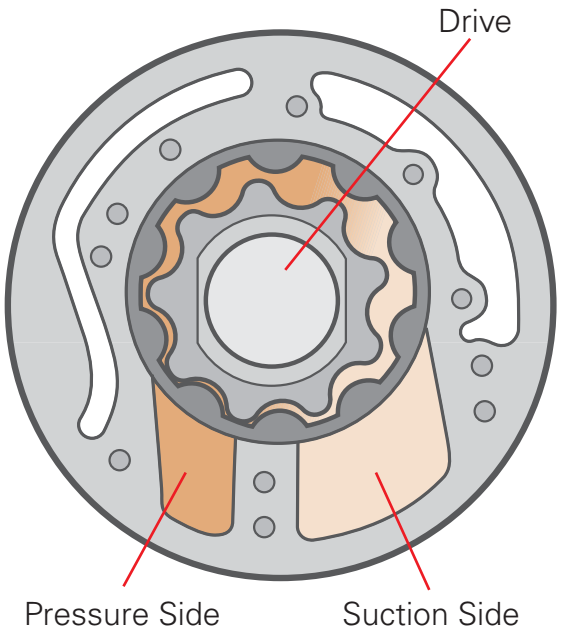

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The Lepelletier Arrangement

The Lepelletier arrangement is based on the Ravigneaux design - a simple planetary gear set and a subsequent dual planetary gear set.

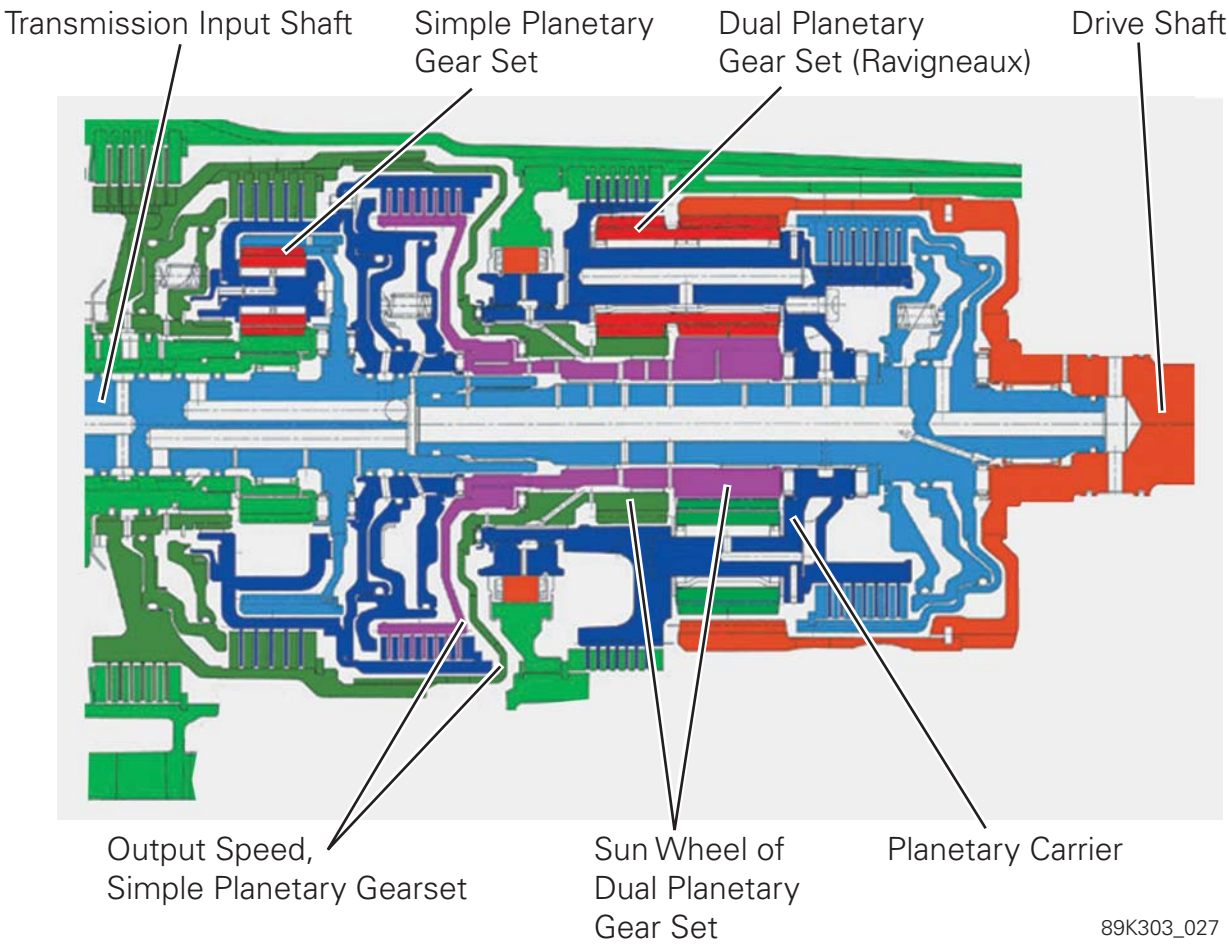
Lepelletier's brilliant idea was to drive the sun wheels and the planetary carriers of the dual planetary gear set at different speeds.

Due to the different input speeds in the dual planetary gear set, the potential number of gear ratios almost doubles, from five to nine.

The sun wheels of the dual planetary gear set are driven with the output speed of the simple planetary gear set.

The planetary carriers of the dual planetary gear set are driven with the transmission input speed. As a result, the sun wheels and the planetary carriers have different speeds.

In this automatic transmission, six forward and one reverse gear bring Lepelletier's idea to life.



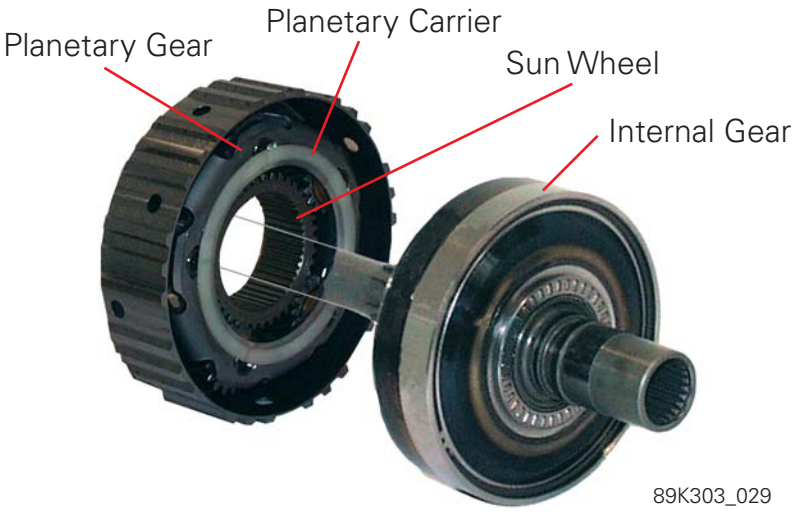
The Simple Planetary Gear Set

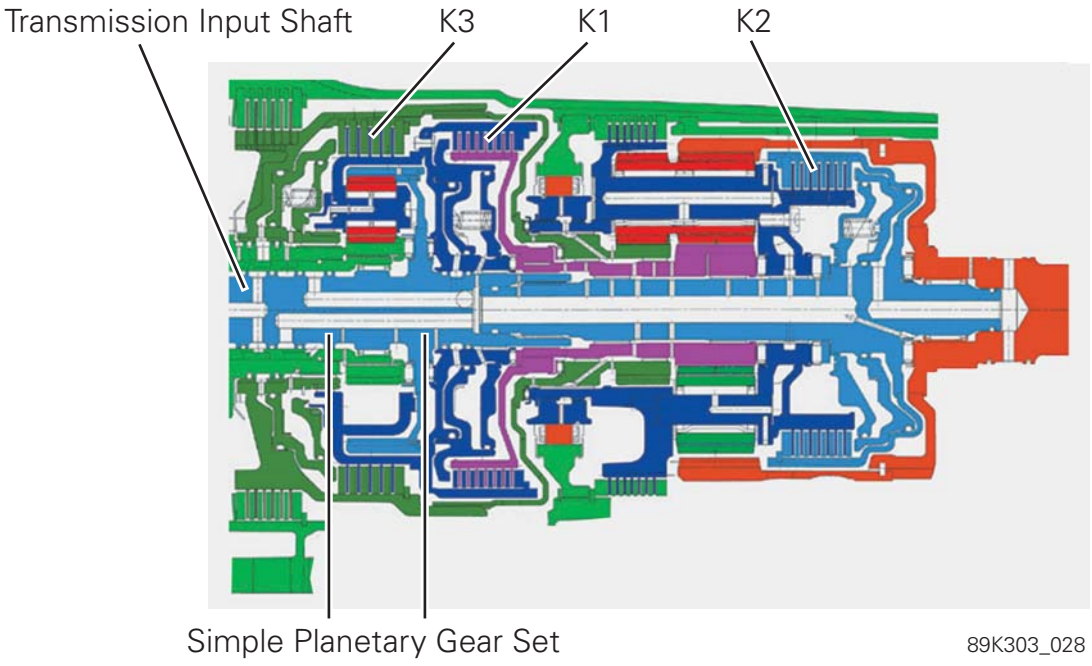
The simple planetary gear set consists of:

- a sun wheel,
- an internal gear and
- 3 planetary wheels, which are guided by the planetary carriers.

The input torque is guided through the simple planetary gear set on two paths:

- from the transmission input shaft without transmission via the clutch K2 on the planetary carrier of the dual planetary gear set and
- through the simple planetary gear set with transmission to clutches K1 and K3





The Dual Planetary Gear Set

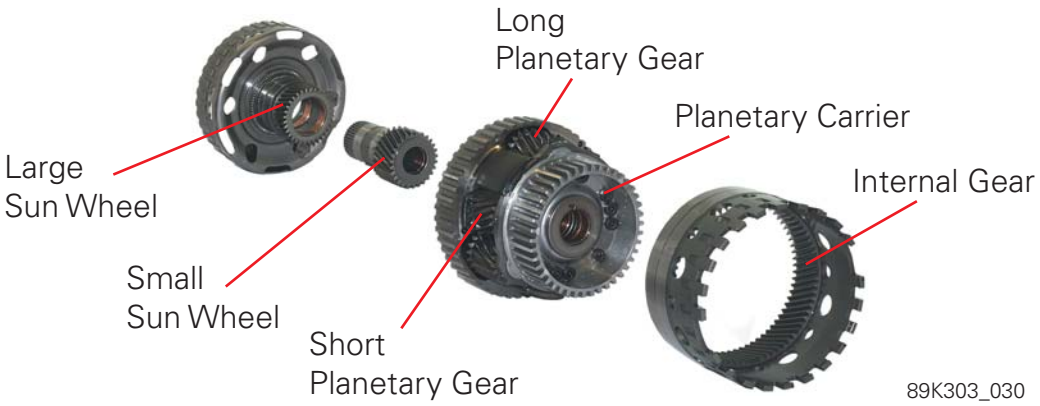
The dual planetary gear set, also known as the Ravigneaux planetary gear set, consists of:

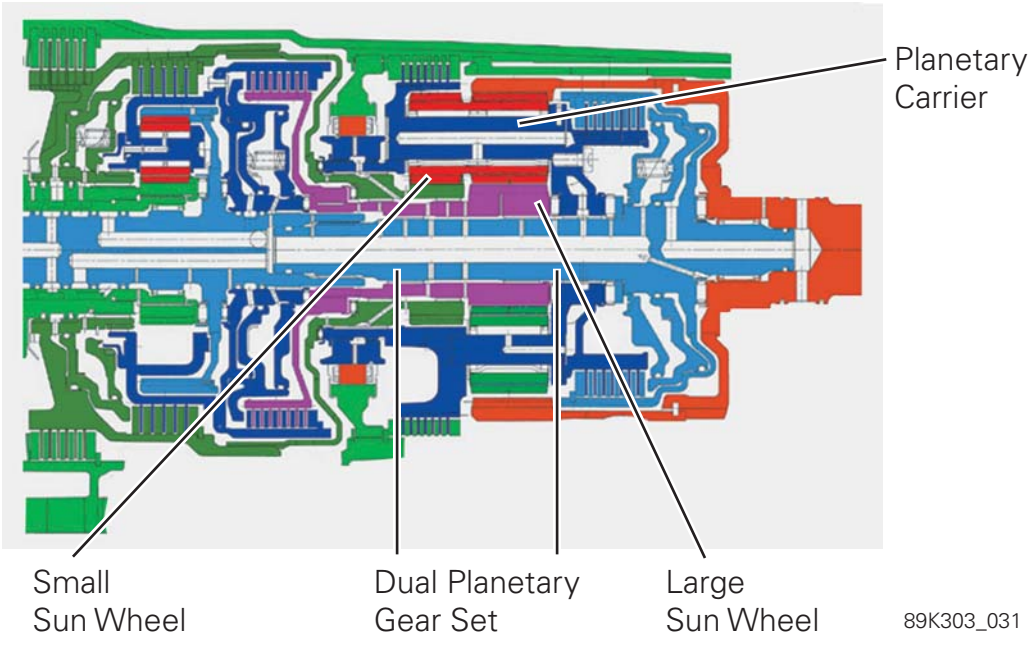
- an internal gear
- a planetary carrier
- two sun wheels with different diameters
- short and long planetary wheels.

The multi-disc clutch K1 connects the internal gear of the simple planetary gear set and the large sun wheel of the dual planetary gear set.

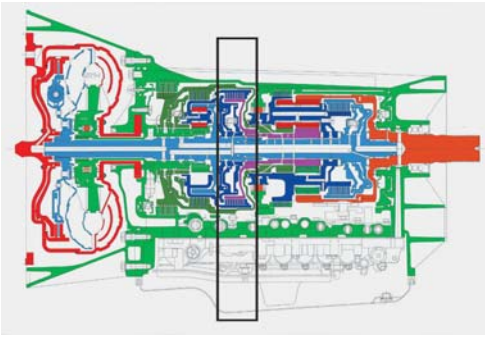
The multi-disc clutch K3 connects the planetary carrier of the simple planetary gear set and the small sun wheel of the dual planetary gear set.

The multi-disc clutch K2 connects the transmission input shaft and the planetary carriers of the dual planetary gear set.





The Multi-Disc Clutches



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The multi-disc clutches drive the two sun wheels and the planetary carriers of the dual planetary gear set when they are closed.

Depending on the gear to be switched, they are placed under ATF pressure by the Transmission Control Module via a solenoid valve in the valve body; this closes them.

Each multi-disc clutch is supplied with ATF pressure by another solenoid valve.

The number of installed disc pairs per clutch varies with the maximum torque that can be transmitted.

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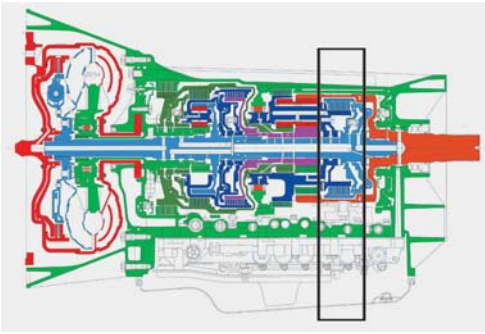
The multi-disc clutch K1

K1 is closed in gears 1 to 4 and is controlled by the Solenoid Valve 3, N90.



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The multi-disc clutch K2

K2 is closed in gears 4 to 6. It is controlled by the Solenoid Valve 9, N282.

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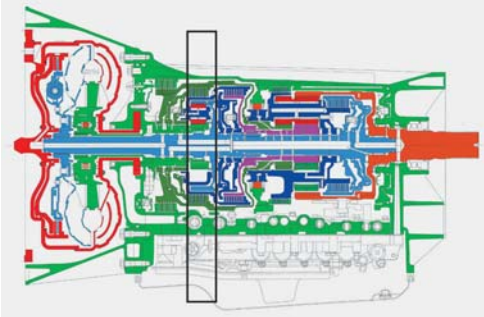
The multi-disc clutch K3

K3 is controlled by the Solenoid Valve 5, N92, and is closed in gears 3, 5 and R.



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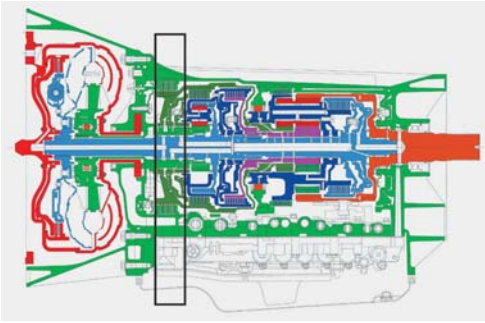

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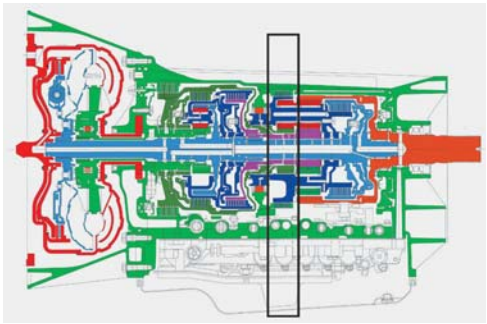

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The Multiple Disc Brakes

The multiple disc brakes secure parts of the planetary gear sets when they are closed.

To do this, they are submitted to ATF pressure by the Transmission Control Module via a solenoid valve or via the manual slider.

The multiple disc brakes are locked into the transmission housing by the notches in their exterior discs.

The multiple disc brake B1

B1 brakes the small sun wheel of the dual planetary gear set. It is closed in gears 2 to 6 and is controlled by the Solenoid Valve 10, N283.

The multiple disc brake B2

B2 brakes the planetary carriers of the dual planetary gear set. It is controlled without a solenoid valve using the selector lever via the manual slider. It is closed in Reverse and, in the Tiptronic mode, in 1st gear.

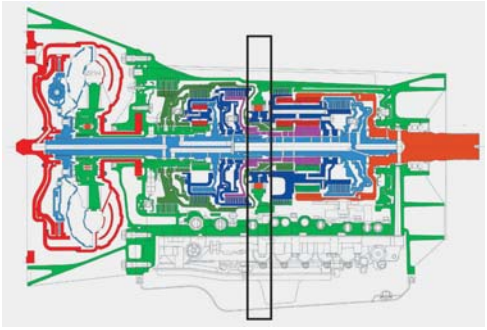
The Free-Wheel

The free-wheel connects the planetary carriers of the dual planetary gear set with the transmission housing.

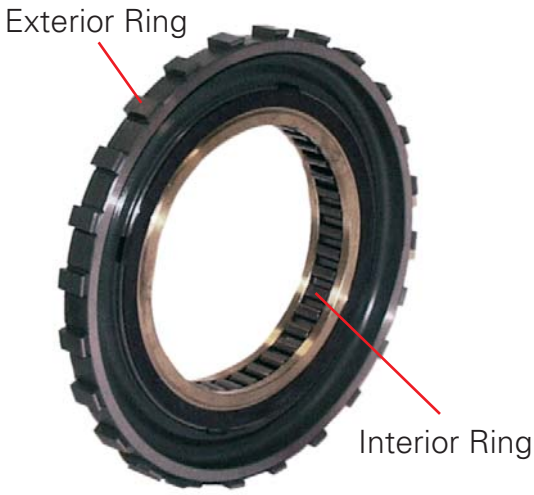
Free-wheeling works in "D"- 1st gear and "S" - 1st gear, "tension" in the locking direction. In Tiptronic mode, 1st gear "thrust" secures free-wheeling of the multiple disc brake B2. This permits "engine braking".

If the exterior ring turns clockwise when the interior ring is braked, the bodies stand up and form a torsion-free connection between the interior and exterior rings.

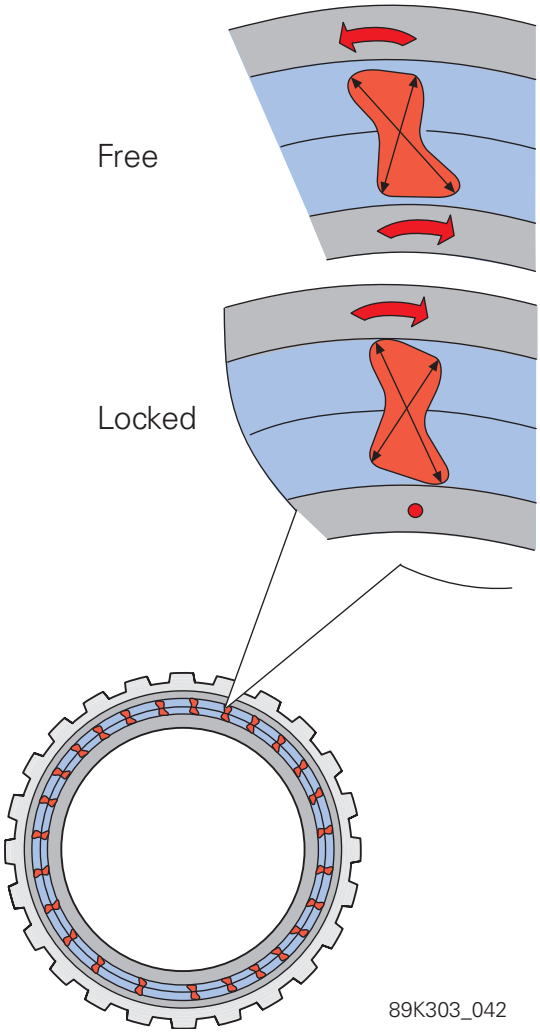
Free-wheeling is "locked". If the turning direction switches to counterclockwise, this connection breaks down.



89K303_044



89K303_043



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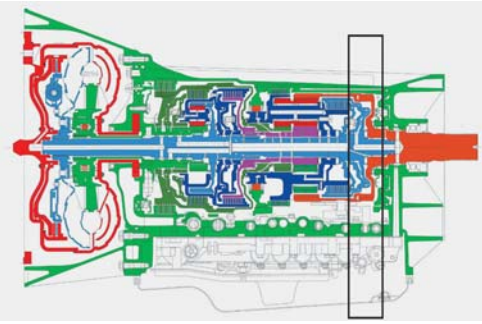


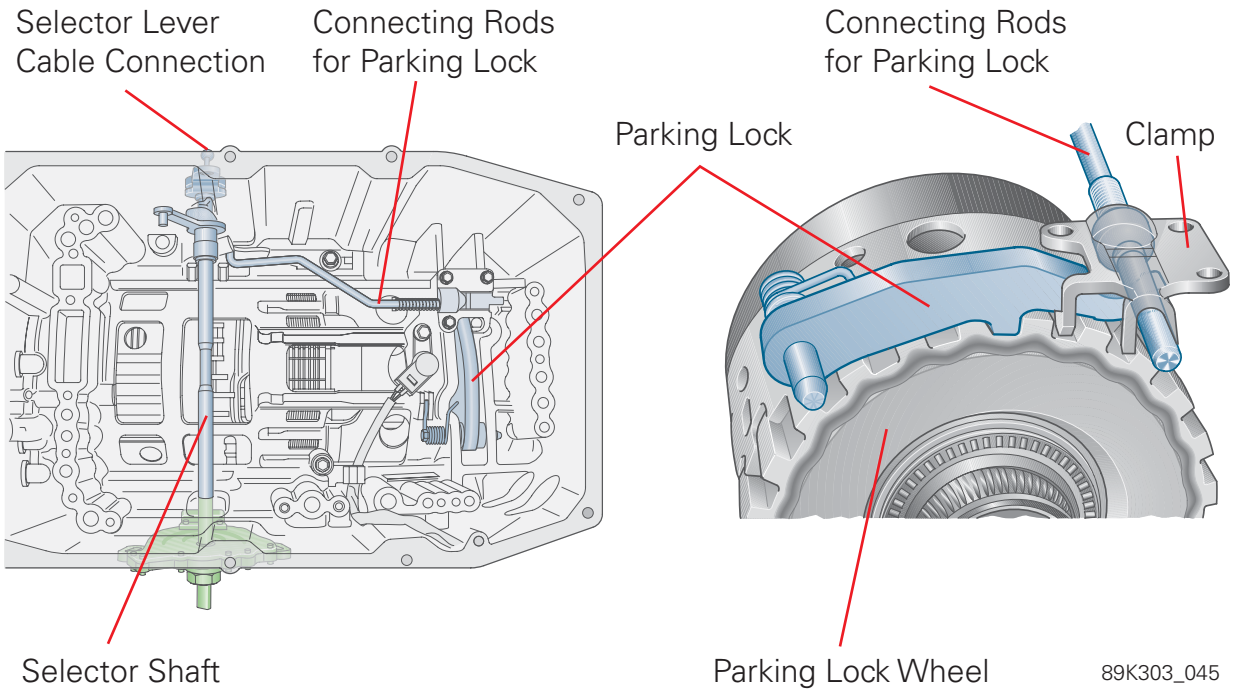
89K303_046

The Parking Lock

The parking lock mechanically secures the vehicle from rolling away. It is activated purely mechanically using the selector lever cable when the vehicle is at a standstill.

It engages in the parking lock wheel on the driveshaft and prevents turning of the driveshaft and the vehicle wheels.

The clamp pushes the parking lock in the gear teeth of the parking lock wheel and secures it.



Hillholder Function

The hill-holder function secures the vehicle from rolling back and permits hills to be approached comfortably.

How it works

If the Transmission Control Module detects an incline due to the driving resistance while simultaneously detecting a driving speed of "zero", it switches into 2nd gear.

In 2nd gear, the vehicle cannot roll back because the internal gear of the dual planetary gear set would have to turn in reverse against the locking free-wheel.

Free-wheeling is released and the vehicle starts comfortably only after the starting torque is greater than the slope descending force.

Assignment table

The following table shows in which gear the individual multi-disc clutches and multiple disc brakes are closed.

	Component					
Gear	K1	K2	K3	B1	B2	F
1st gear	X				*	X
2nd gear	X			X		
3rd gear	X		X			
4th gear	X	X				
5th gear		X	X			
6th gear		X		X		
R gear			X		X	

89K303_047

*Engine braking

The braking force of the engine in particular driving situations - such as steep downhills - can be taken advantage of by applying the 1st gear in Tiptronic mode.

The multiple disc brake B2 is closed in 1st gear only in Tiptronic mode.

Emergency Running Mode

If normal operation of the automatic transmission is no longer possible, the automatic transmission operates in emergency running mode.

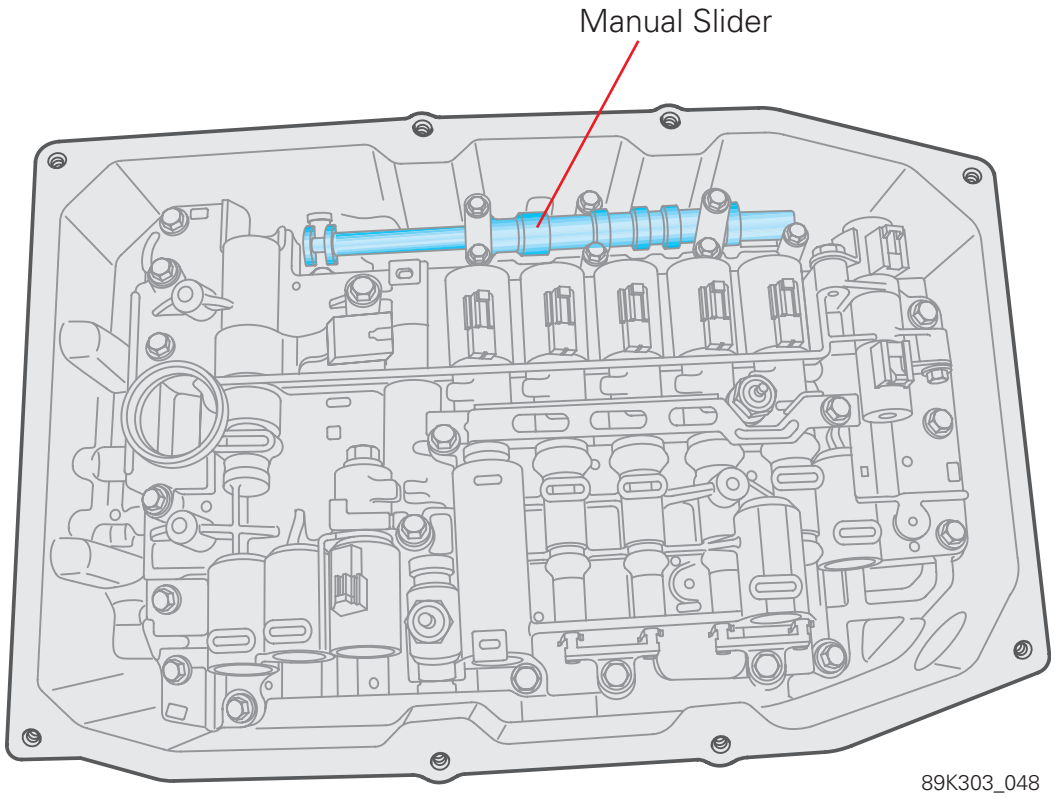
In emergency mode, the Torque Converter Clutch (TCC) is no longer closed and the transmission is in 3rd gear for all forward driving conditions.

When the selector lever is switched to the "R" position, the manual slider is shifted, and Reverse gear is applied.

The emergency running mode is indicated by the display in the dash panel insert.

The failure of certain components will not lead to emergency running mode activation. For example, if the Tiptronic Switch fails, the Tiptronic functions will simply be unavailable.

However, if a solenoid valve fails, the transmission may enter emergency running mode to protect its internal parts.



89K303_048

Power Flow in the Touareg

The torque of the engine is transferred to the automatic transmission by the torque converter.

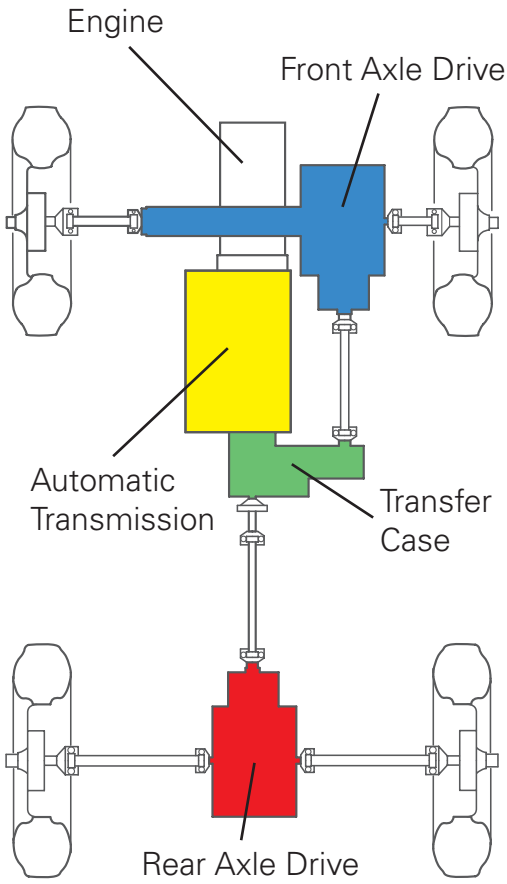
The engine torque is transferred from the driveshaft of the transmission to the transfer case. In the transfer case, the torque is distributed between the front and rear axles, depending on the load.

The transfer case can be locked. This fixes the torque distribution between the front and rear axles. Each axle receives 50% of the torque.

In addition, there is a switchable reduction in the transfer case. If this is activated, the drive speed of the wheels is reduced by a factor of 2.7, increasing the drive torque.

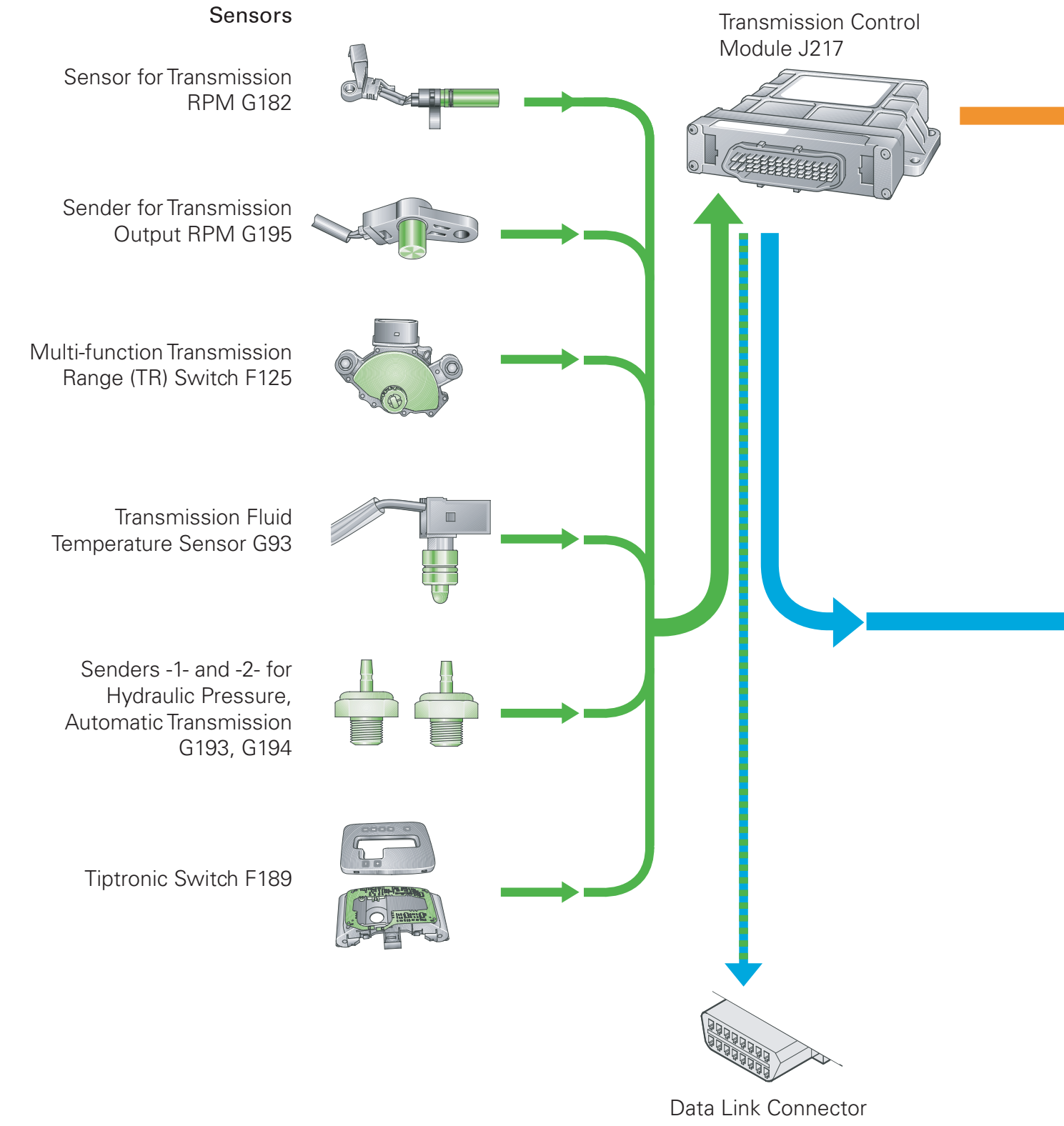
From the transfer case, the torque is transferred between the front and rear axles using drive shafts.

An electro-mechanical multi-disc clutch in the transfer case can be activated, locking the rear axle differential to the transfer case.



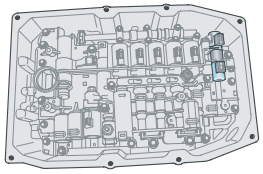
89K303_049

System Overview

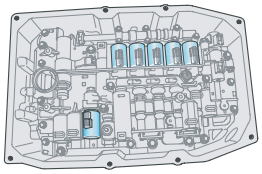


CAN Data Bus

Actuators



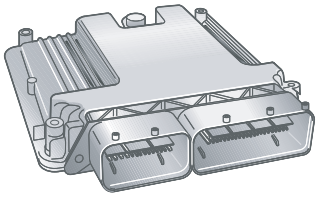
Solenoid Valves
N88, N89



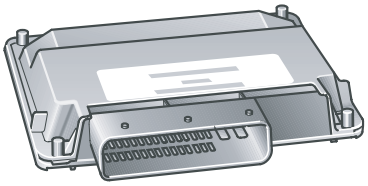
Solenoid Valves
N90, N91, N92,
N93, N282, N283

Shift Lock
Solenoid N110

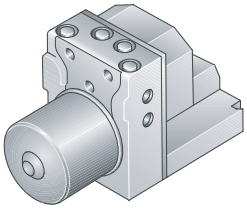
Control Modules



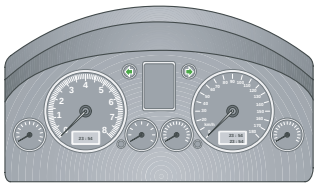
Engine Control Module J623



Differential Lock Control Module J647



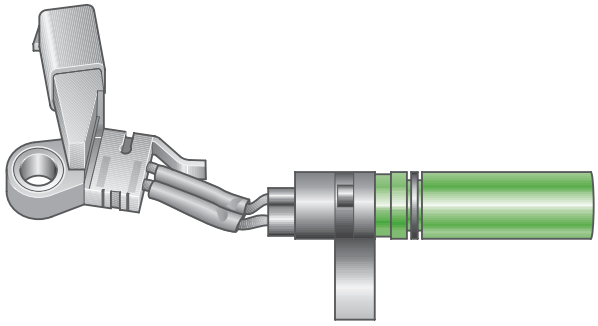
ABS Control Module (w/EDL) J104



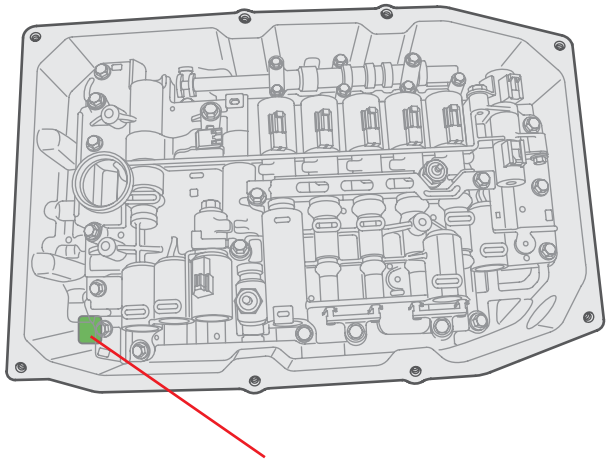
Control Module with Indicator Unit
in Instrument Panel Insert J285

89K303_050

Sensors



89K303_052



Sensor for Transmission RPM G182

89K303_051

The Sensor for Transmission RPM G182

The Sensor for Transmission RPM G182 is located within the transmission. It is inserted in the housing of the ATF pump and uses a ring gear on the turbine shaft to determine the transmission input speed. It works according to the Hall principle.

Signal Utilization

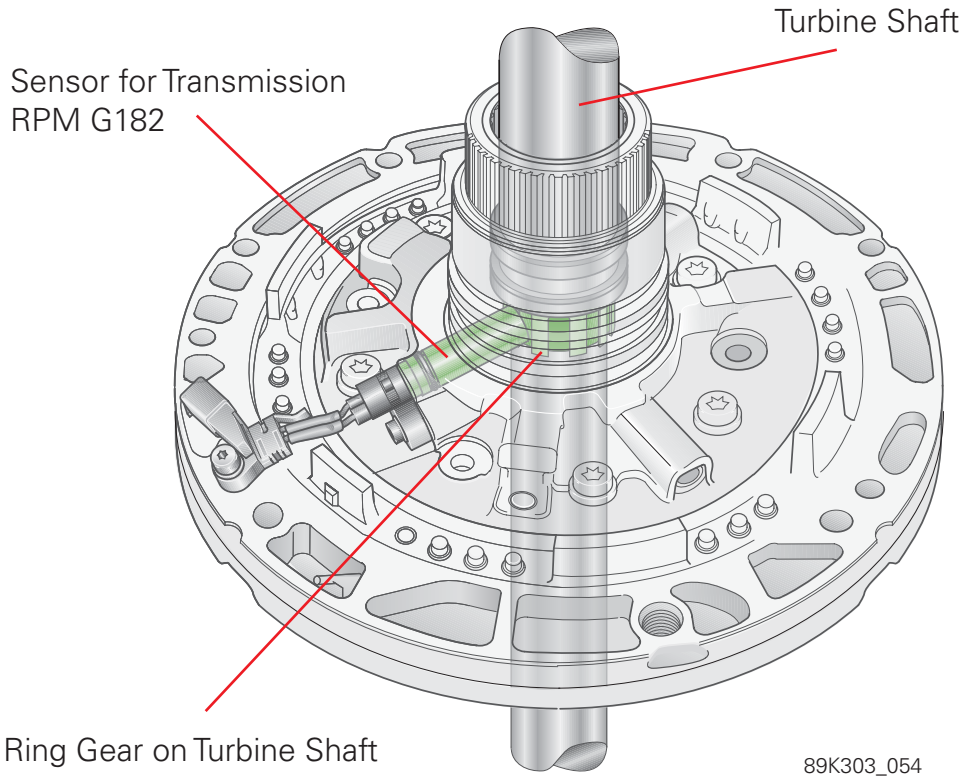
The Transmission Control Module uses the signal to detect the difference between the engine speed and the transmission input speed.

Using this speed difference, the slip of the converter bypass coupling is controlled up to a speed of 2000 rpm by the Solenoid Valve N91.

Effect of Signal Failure

The Torque Converter Clutch (TCC) is closed without slip.

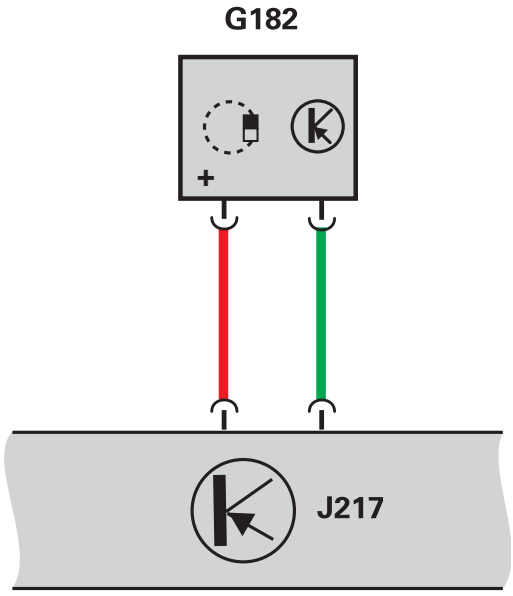
The engine speed is used as the replacement speed.

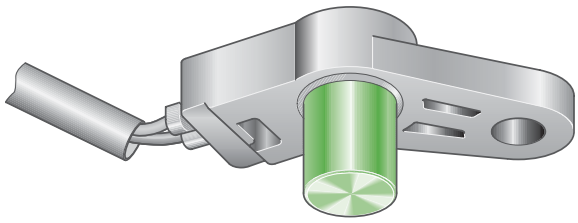


Electric Circuit

G182 - Sensor for Transmission RPM

J217 - Transmission Control Module





89K303_055

The Sender for Transmission Output RPM G195

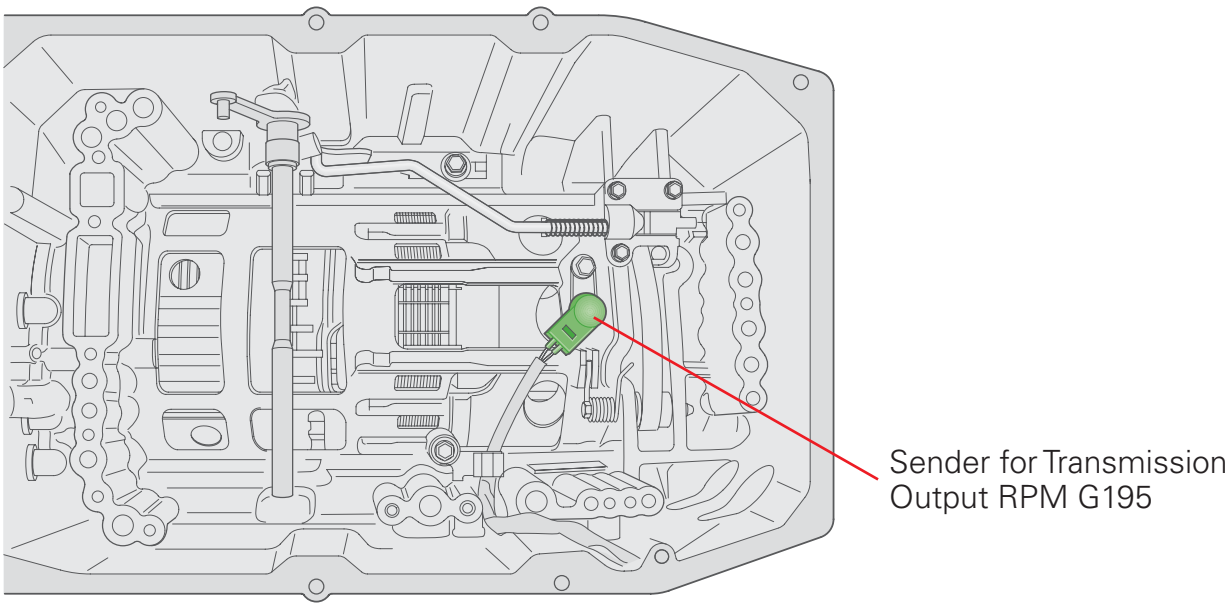
The Sender for Transmission Output RPM, G195 is located above the valve body and is screwed onto the transmission housing. It determines the working speed of the automatic transmission by scanning the outer teeth of the internal gear on the rear planetary gear set. It works according to the Hall principle.

Signal Utilization

The Transmission Control Module uses the transmission output speed and a shift program to determine when gear shifts occur.

Effect of Signal Failure

The speed signal of the ABS control module is used as the replacement speed.

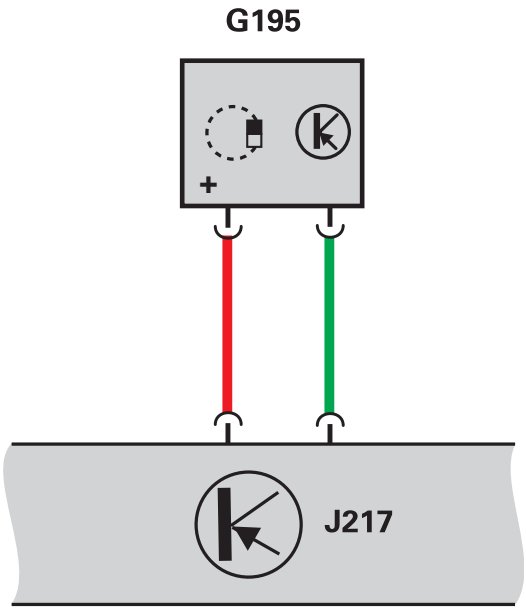


89K303_057

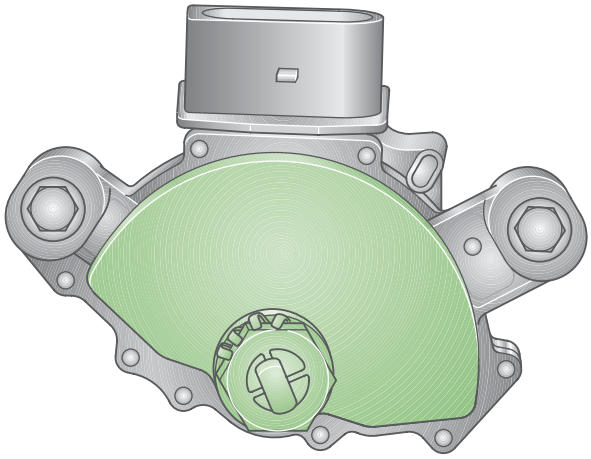
Electric Circuit

G195 - Sender for Transmission Output RPM G195

J217 - Transmission Control Module



89K303_056



89K303_058

The Multifunction Transmission Range (TR) Switch F125

The Multifunction Transmission Range (TR) Switch F125 is mounted on the exterior of the transmission. Its duty is to transfer the selector lever settings to the Transmission Control Module.

The multifunction switch is connected with the selector shaft and the selector lever cable. If the multifunction switch is replaced, it must be indexed to the selector shaft. If the switch is incorrectly set, the engine cannot be started.

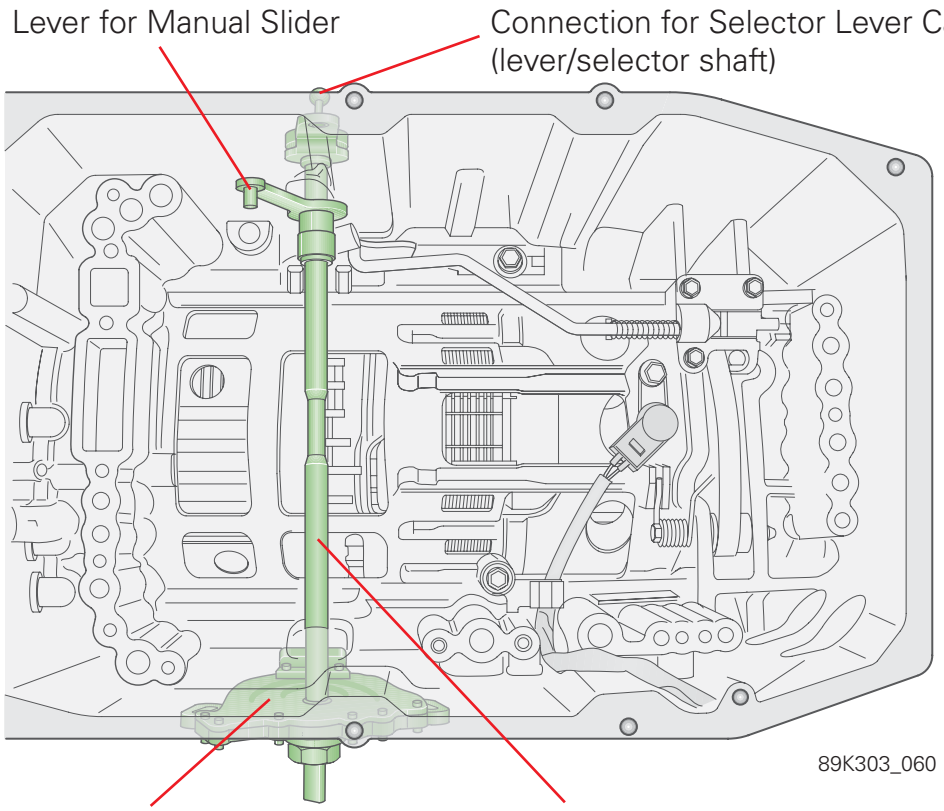
Signal Utilization

The Transmission Control Module will use a shift program depending on the position of the multifunction switch.

Effect of Signal Failure

As long as the difference between forward and reverse gears can be determined, there are no effects on the shift programs.

If the Reverse gear signal is defective, the transmission enters the emergency running mode.



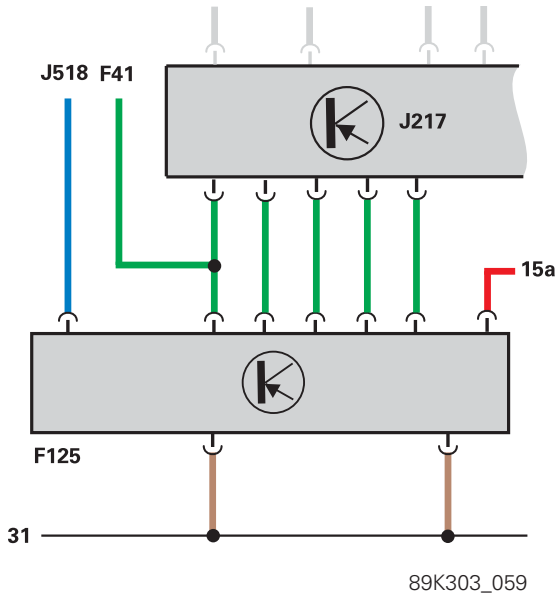
Electric Circuit

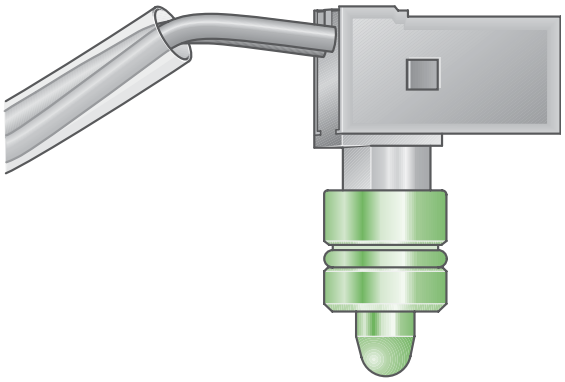
F41 - Back-Up Switch

F125 - Multifunction Transmission Range (TR) Switch

J217 - Transmission Control Module

J518 - Access/Start Control Module





89K303_062

Transmission Fluid Temperature Sensor G93

G93 is located in the valve body within the ATF. It checks the ATF temperature and reports this to the Transmission Control Module.

It is an NTC thermistor (NTC - negative temperature coefficient), i.e. the electrical resistance of the sender drops with increasing temperature.

Signal Utilization

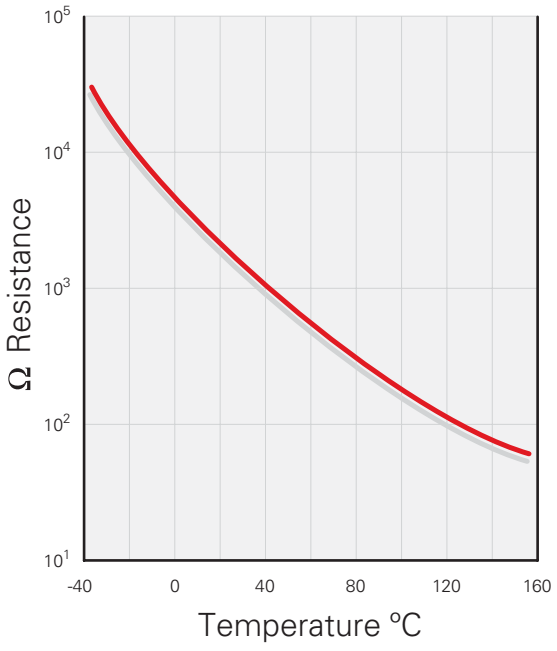
Starting at an ATF temperature of 302 °F (150 °C), the Torque Converter Clutch (TCC) is closed more frequently.

If this does not result in cooling of the ATF, reduction of the engine torque is initiated starting at 338 °F (170 °C).

Effect of Signal Failure

Harder gear shifts may occur.

Example of an NTC Thermistor Characteristic Curve



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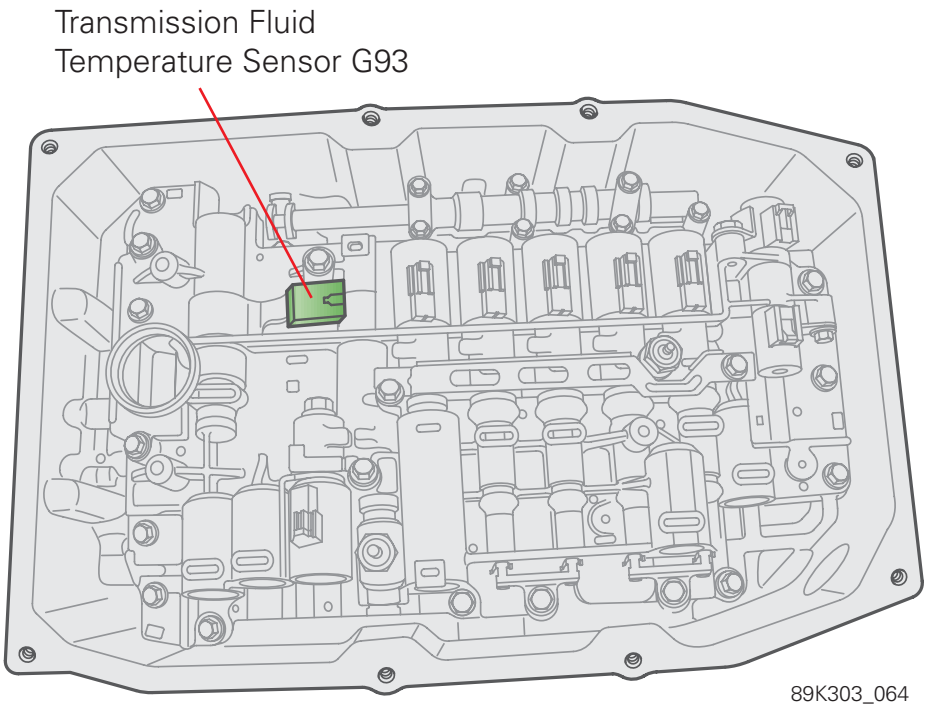
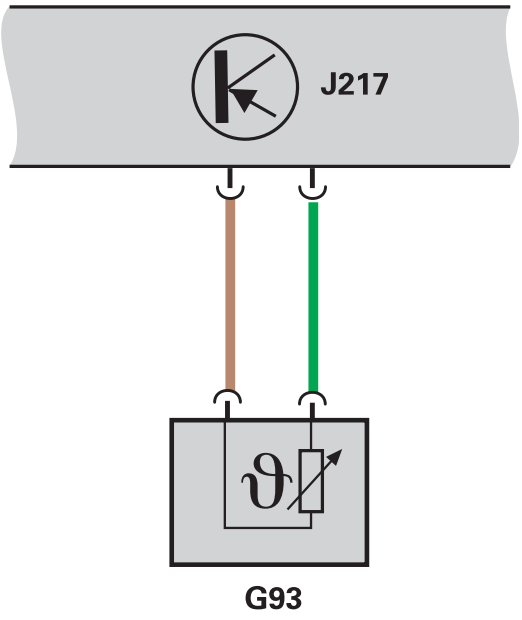
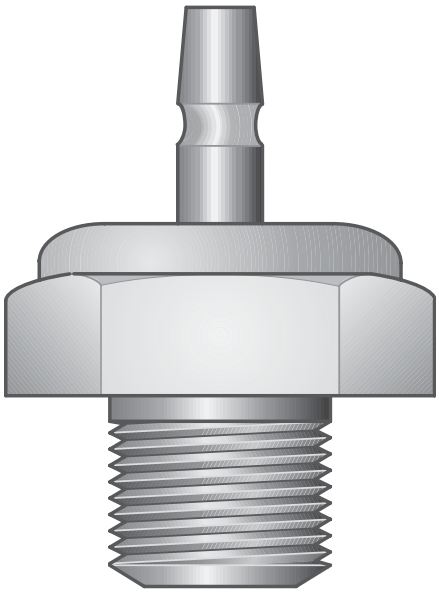


Electric Circuit

G93 - Transmission Fluid Temperature Sensor

J217 - Transmission Control Module





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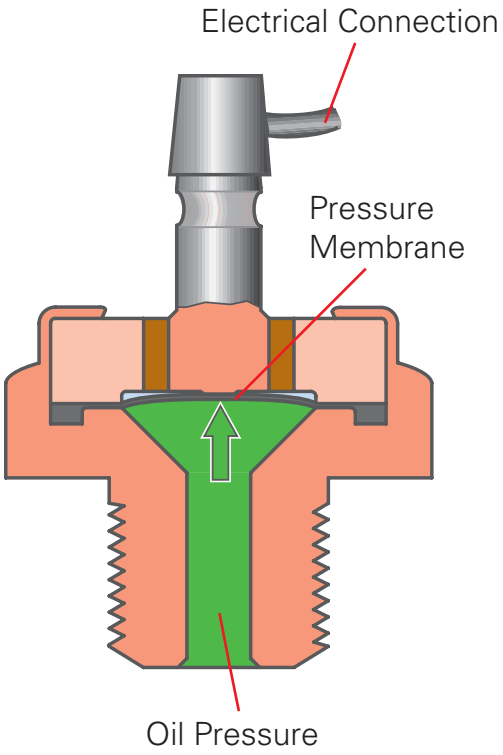


89K303_065

Sender -1- G193 and Sender -2- G194 for Hydraulic Pressure, Automatic Transmission

G193 and G194 have the same design and are located in the valve body. They monitor the ATF pressure behind the safety slides in the valve body. This prevents brakes and clutches from applying incorrectly, possibly binding the internal transmission components. They function as diaphragm pressure senders.

If the ATF pressure reaches a critical value, the pressure membranes are bent, closing the electrical circuit.

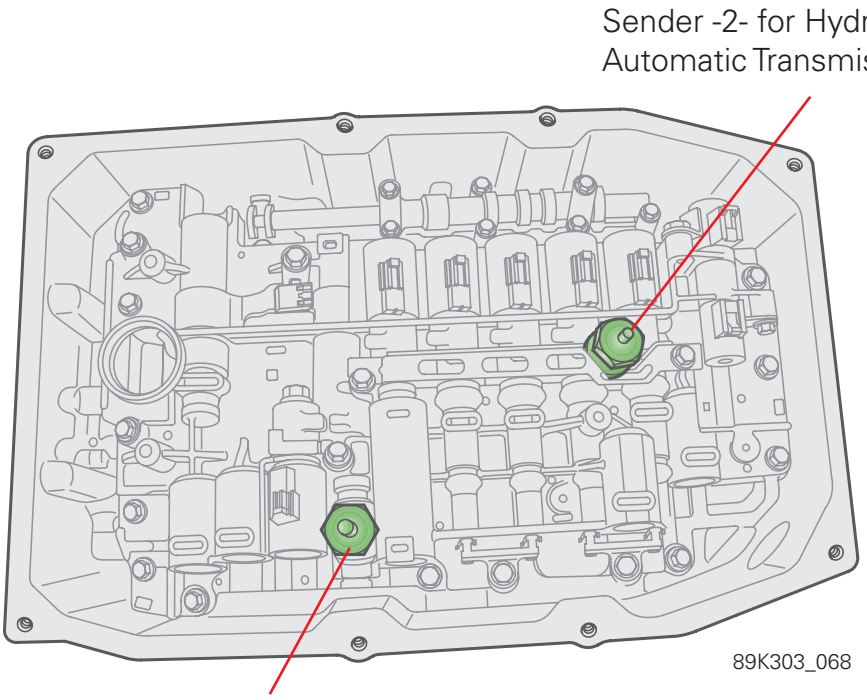
Signal Utilization

The signals are used to monitor the ATF pressure being delivered throughout the transmission.

If the ATF pressure is incorrect, the clutches are not activated.

Effect of Signal Failure

Incorrect pressure signals can affect the shift programs of the Transmission Control Module.

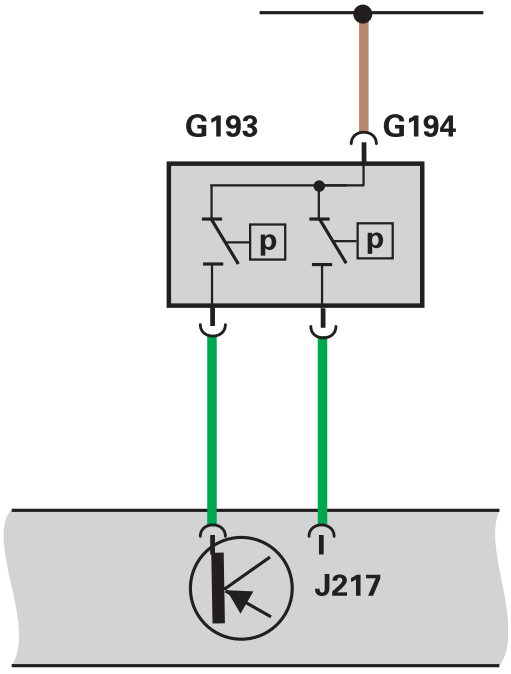


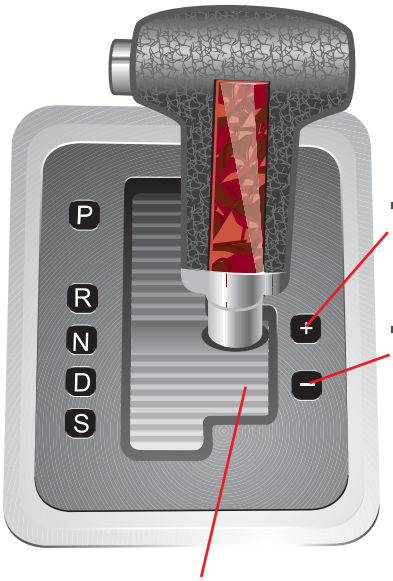
Electric Circuit

G193 - Sender -1- for Hydraulic Pressure, Automatic Transmission

G194 - Sender -2- for Hydraulic Pressure, Automatic Transmission

J217 - Transmission Control Module





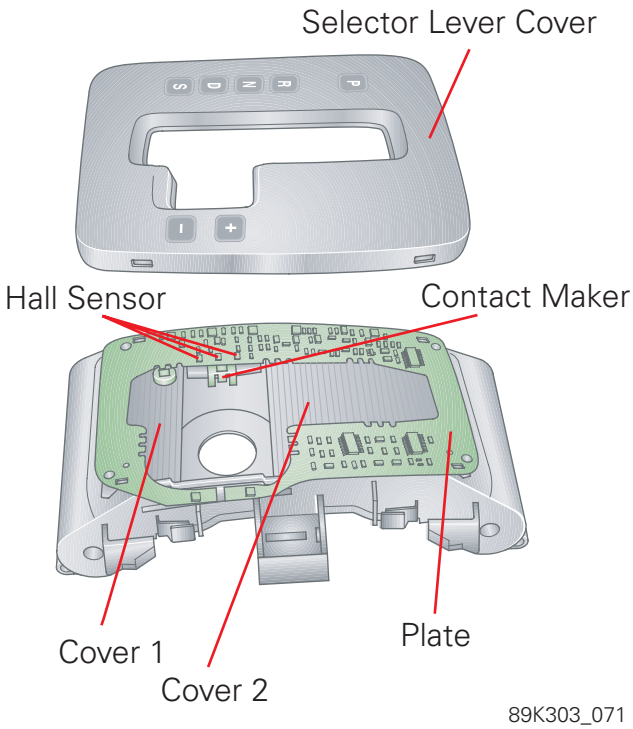
Tiptronic Switch F189

The Tiptronic Switch F189 is located under the selector lever covering on the plate. A ferromagnetic "contact maker" is attached to each cover of the selector lever.

The combination of the contact maker on blind 2 and the three Hall sensors on the plate form the Tiptronic Switch F189. When Covers 1 and 2 are moved, the contact makers change their position under the plate. In this way, a different Hall sensor is always activated - "switched" - and sends a signal to the Transmission Control Module.

Signal Utilization

In the Tiptronic channel, tipping "to the front" results in moving up a gear and tipping "to the back" results in moving down a gear by the control module for the automatic transmission.



Effect of Signal Failure

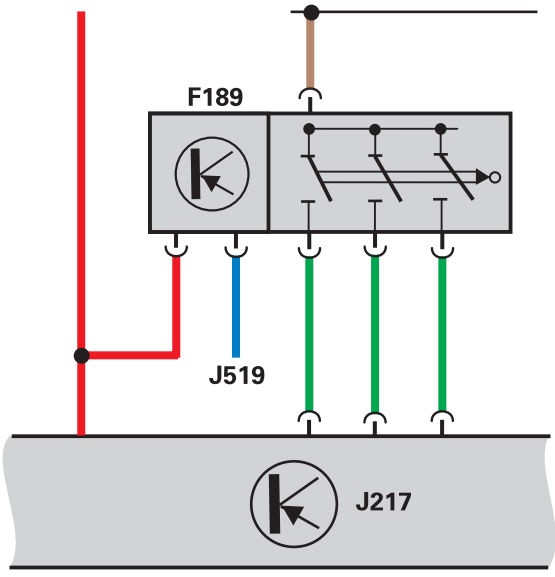
If the signal drops out, the Tiptronic function using the selector lever can no longer be used.

Electric Circuit

F189 - Tiptronic Switch

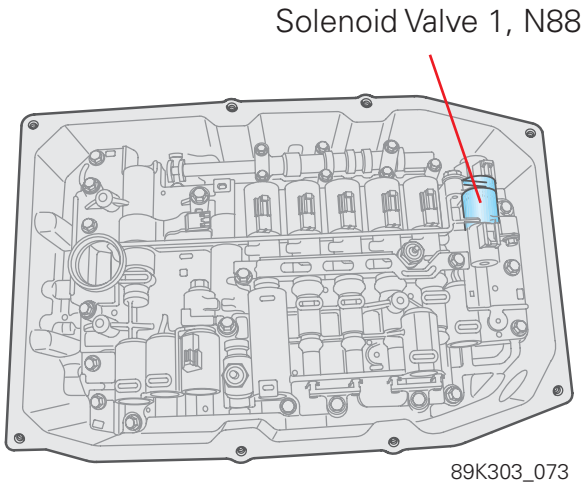
J217 - Transmission Control Module

J519 - Vehicle Electrical System Control Module

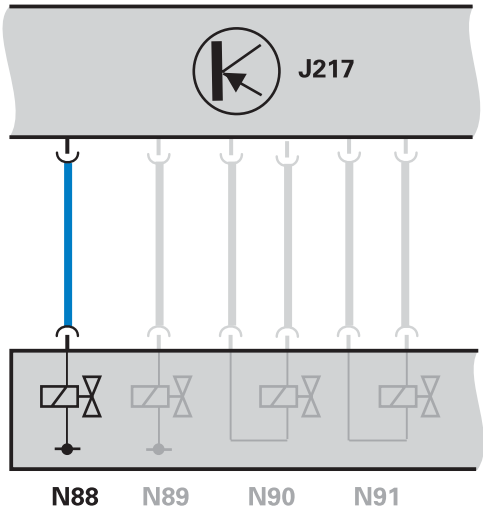


Electrical Components

Actuators



89K303_073



89K303_072

Solenoid Valves

Solenoid valves are used as electrohydraulic switching elements in the electronically controlled automatic transmission.

There are switching solenoid valves (yes/no valves) and control solenoid valves (modulation valves).

Solenoid Valve 1, N88

The Solenoid Valve 1, N88, works as a yes/no solenoid valve, opening or closing an ATF channel. If the solenoid valve is open, the gears 4 to 6 can be activated.

The solenoid valve also improves the switching transition from 5th to 6th gear.

If no current is supplied, the solenoid valve is closed.

Effect of Signal Failure

The gears 4 to 6 can no longer be activated.

Electric Circuit

J217 - Transmission Control Module

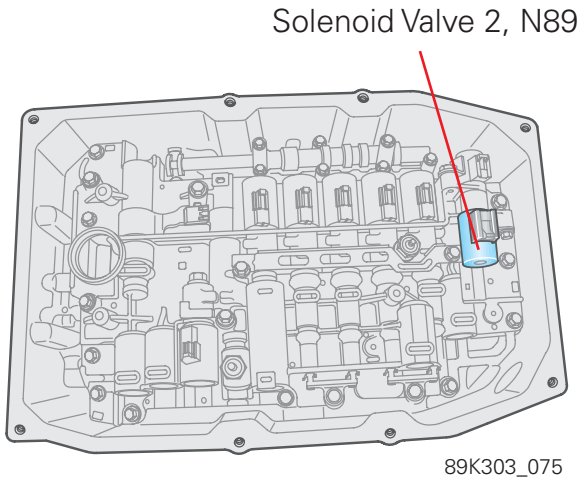
N88 - Solenoid Valve 1

Solenoid Valve 2, N89

The Solenoid Valve 2, N89, is located in the valve body. It works as a yes/no solenoid valve, opening or closing an ATF channel. When the solenoid valve is opened, the ATF pressure on the TCC is increased.

If the Solenoid Valves N88 and N89 are opened simultaneously, the brake B2 closes so that the "engine brake" is effective in Tiptronic mode, 1st gear.

If no current is supplied, the valve is closed.



89K303_075

Effect of Signal Failure

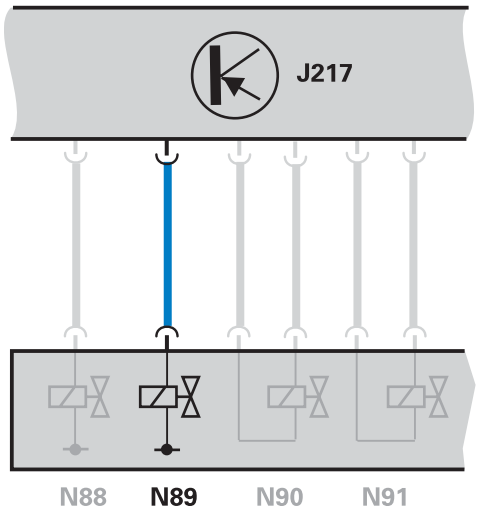
If the signal to the Solenoid Valve 2 N89 drops out, the maximum ATF pressure cannot be applied to the Torque Converter Clutch (TCC).

The "engine brake" feature will not function.

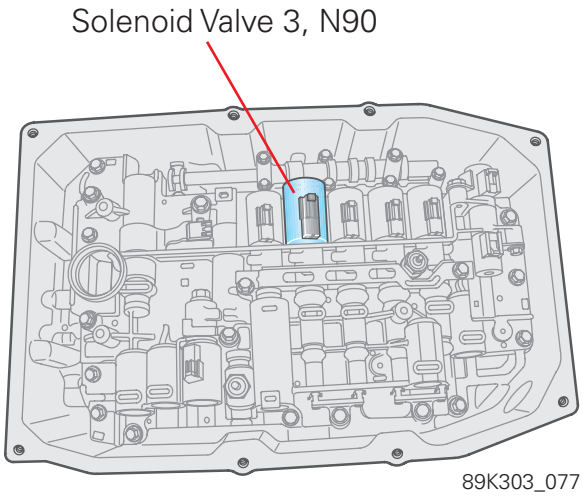
Electric Circuit

J217 - Transmission Control Module

N89 - Solenoid Valve 2



89K303_074



89K303_077

Solenoid Valve 3, N90

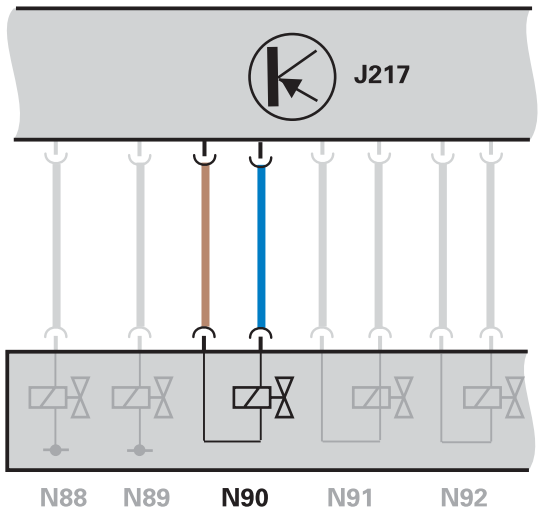
The Solenoid Valve 3, N90, is located in the valve body. It is a modulation valve that controls the ATF pressure to the multi-disc clutch K1.

If no current is applied, the solenoid valve is closed.

In this switching state, the maximum ATF pressure is applied to the clutch.

Effect of Signal Failure

If the solenoid valve is defective or if it cannot be activated, shifting of gears 1 to 4 may be harsh.



89K303_076

Electric Circuit

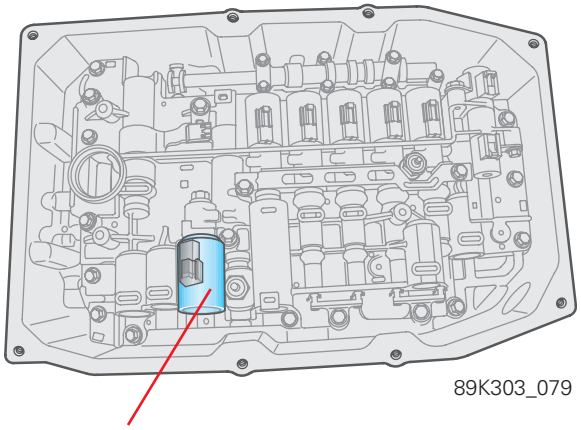
J217 - Transmission Control Module

N90 - Solenoid Valve 3

Solenoid Valve 4, N91

The Solenoid Valve 4, N91 is located in the valve body. It is a modulation valve that controls the ATF pressure on the Torque Converter Clutch (TCC).

If no current is applied, the Torque Converter Clutch (TCC) is open.



89K303_079

Solenoid Valve 4, N91

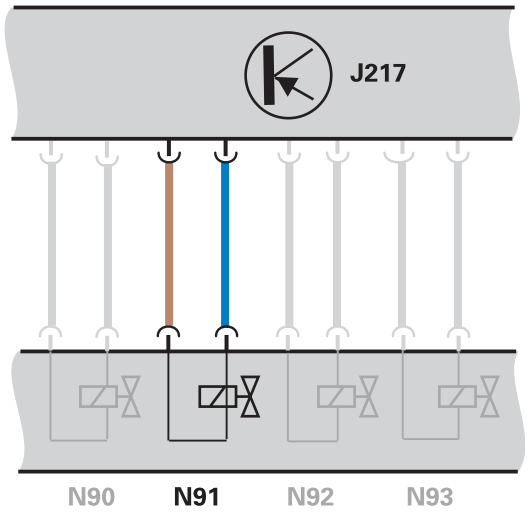
Effect of Signal Failure

The TCC is open.

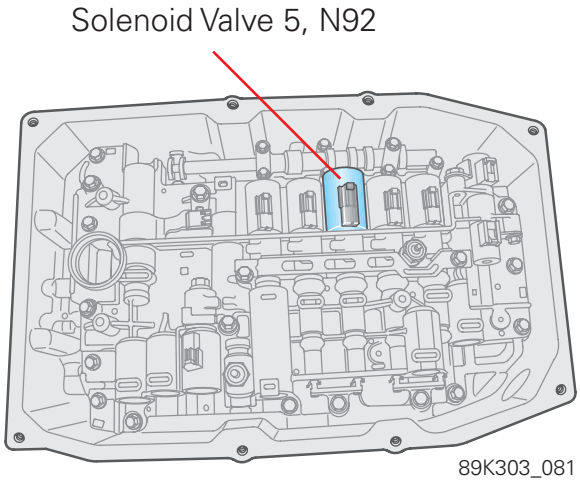
Electric Circuit

J217 - Transmission Control Module

N91 - Solenoid Valve 4



89K303_078



Solenoid Valve 5, N92

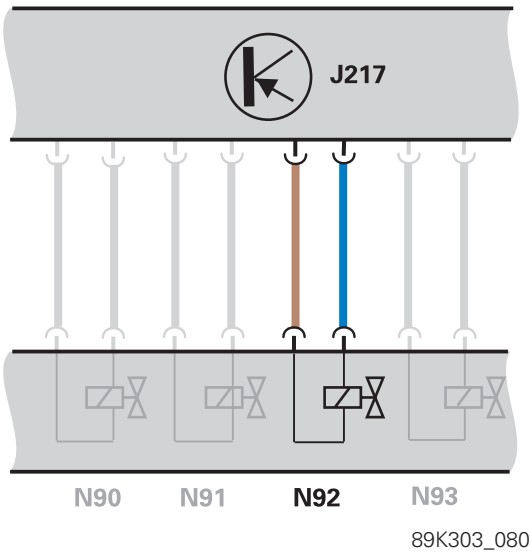
The Solenoid Valve 5, N92, is integrated in the valve body. It is a modulation valve that controls the ATF pressure to the multi-disc clutch K3.

If no current is applied, the solenoid valve is closed.

In this switching state, the maximum ATF pressure is applied to the clutch.

Effect of Signal Failure

If the solenoid valve is defective or if there is a fault in the circuit, shifting of gears 3, 5 and R may be harsh.



Electric Circuit

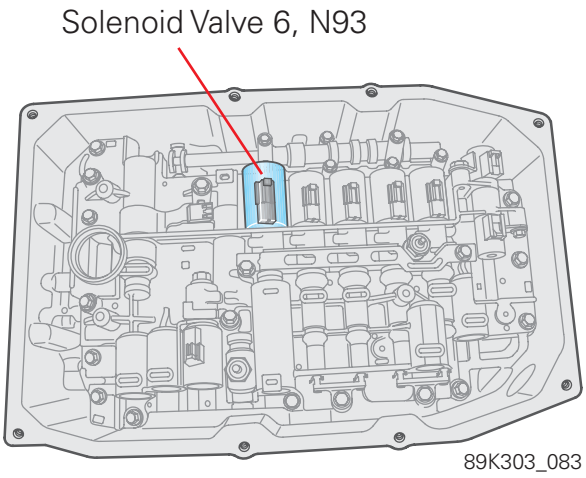
J217 - Transmission Control Module

N92 - Solenoid Valve 5

Solenoid Valve 6, N93

The Solenoid Valve 6, N93, is located in the valve body. It is a modulation valve that controls the main ATF pressure in the transmission, depending on the engine torque.

If no current is applied, the solenoid valve is closed. The transmission will operate with the maximum ATF pressure.



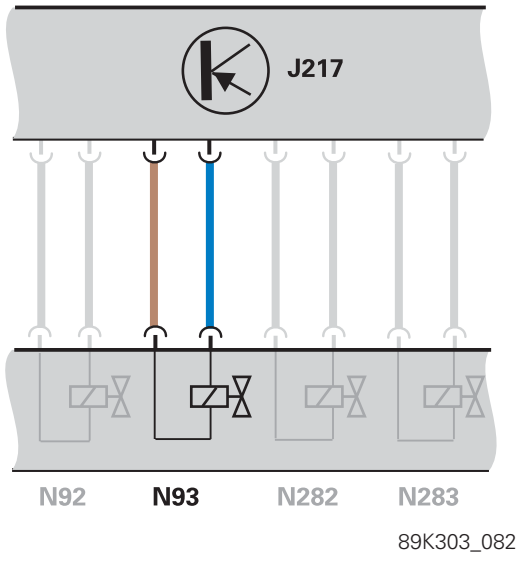
Effect of Signal Failure

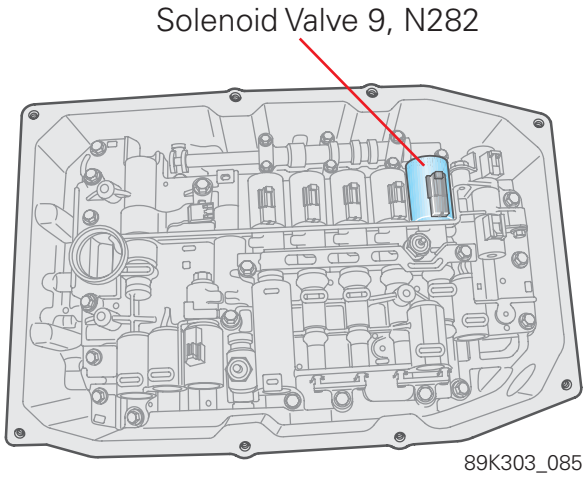
If the solenoid valve is defective or if there is a fault in the circuit, shifting of all gears may be harsh.

Electric Circuit

J217 - Transmission Control Module

N93 - Solenoid Valve 6





Solenoid Valve 9, N282

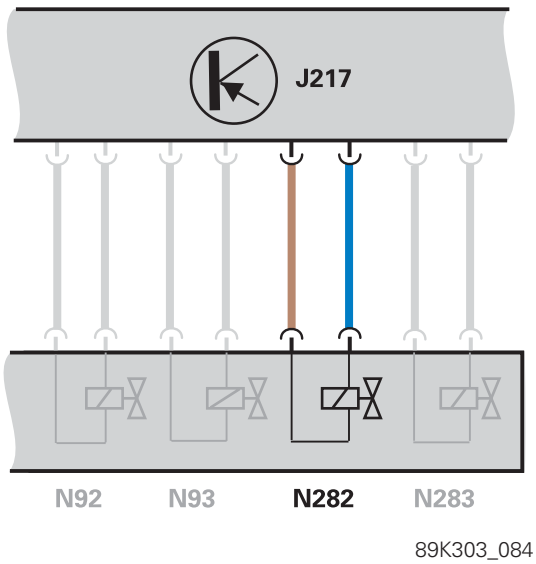
N282 is located in the valve body. It is a modulation valve that controls the ATF pressure to the multi-disc clutch K2.

If no current is applied, the solenoid valve is closed.

In this switching state, the clutch is closed with the maximum pressure.

Effect of Signal Failure

If the solenoid valve is defective or if there is a fault in the circuit, shifting of gears 4 to 6 may be harsh.



Electric Circuit

J217 - Transmission Control Module

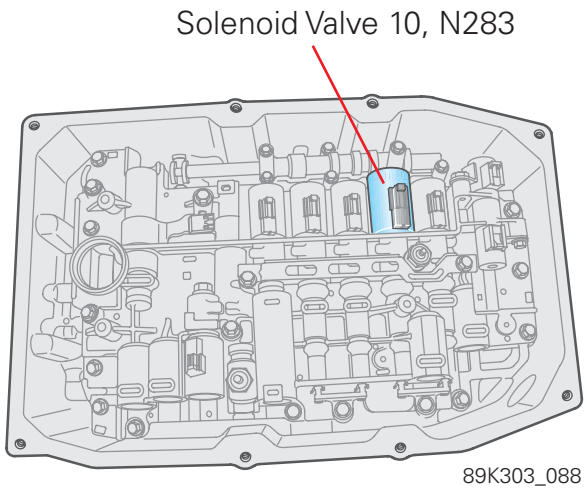
N282 - Solenoid Valve 9

Solenoid Valve 10, N283

The Solenoid Valve 10, N283, is located in the valve body. It is a modulation valve that controls the ATF pressure to the multiple-disc brake B1.

The solenoid valve closes depending on the current strength.

If no current is applied, the brake is closed with the maximum ATF pressure.



89K303_088

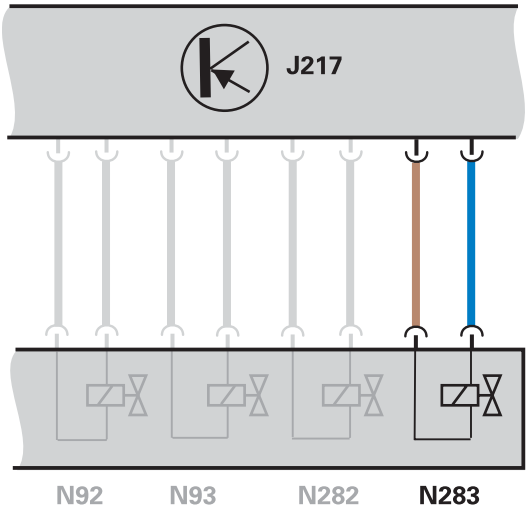
Effect of Signal Failure

If the solenoid valve is defective or if there is a fault in the circuit, shifting of gears 2 and 6 may be harsh.

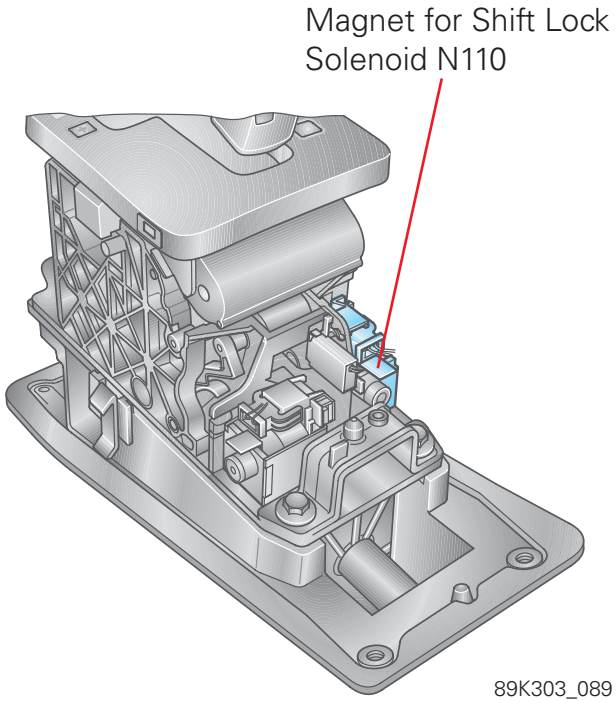
Electric Circuit

J217 - Transmission Control Module

N283 - Solenoid Valve 10



89K303_086



Shift Lock Solenoid, N110

The Shift Lock Solenoid N110 is located in the selector lever frame. It is an electromagnet that prevents the selector lever from moving out of the "P" position when the ignition is switched on.

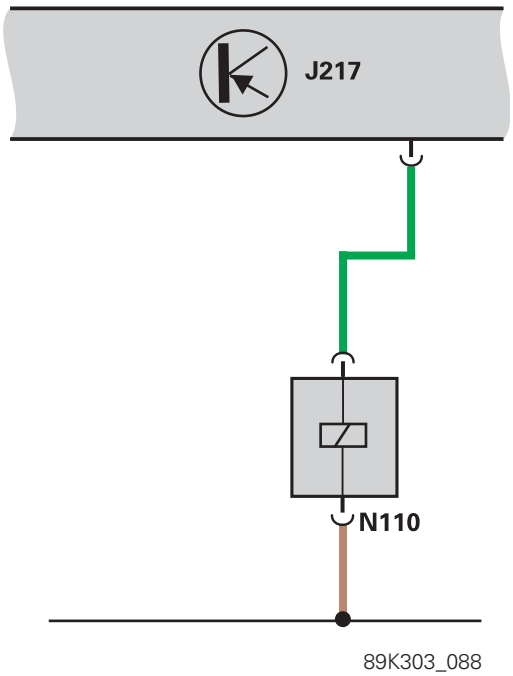
To move the selector lever, the foot brake must be pressed.

If the ignition is switched on, the Transmission Control Module supplies the magnet with power. The magnet blocks the selector lever from moving.

If the foot brake is pressed, the control unit switches off the power to the magnet so that the selector lever can be moved.

Effect of Signal Failure

If the solenoid valve is defective or if there is a fault in the circuit, the selector lever can be moved without having to press the foot brake.



Electric Circuit

J217 - Transmission Control Module

N110 - Shift Lock Solenoid

Diagnostics

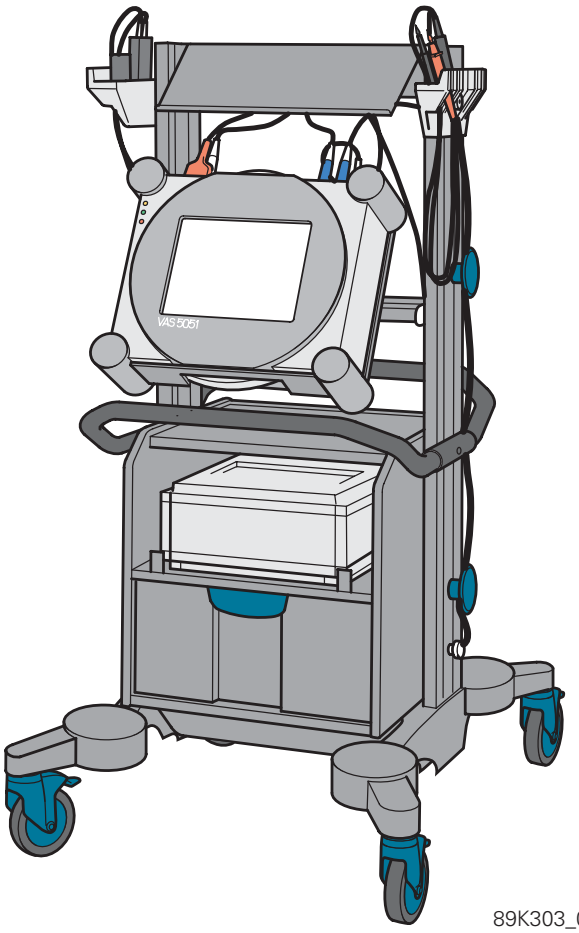
For vehicle diagnostics, measurement and information systems VAS 5051 and VAS 5052, the operating modes "Guided fault-finding" and "Vehicle self-diagnosis" are available

The operating mode Guided fault-finding" carries out a vehicle-specific check of all installed control units for trouble codes and automatically compiles an individual test plan from the results.

Together with the ELSA information, such as wiring diagrams or repair guidelines, this provides a specific target for trouble-shooting.

Independent of this, you can compile your own test plan.

The function and component selection incorporates the tests that you select into the test plan; these can be processed in the diagnostics procedure in any order.



89K303_091

VAS 5051

VAS 5052

89K303_090

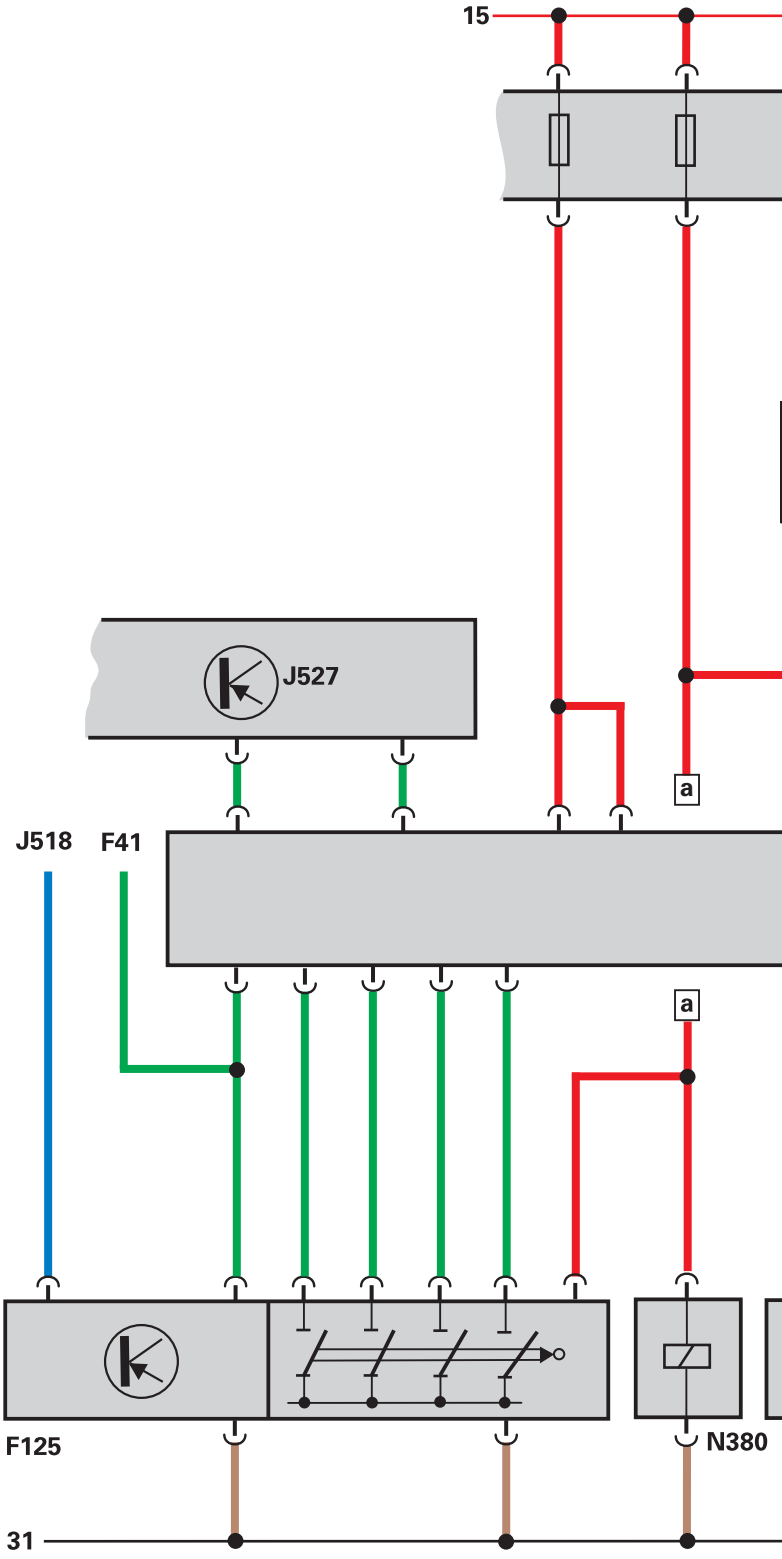
Functional Diagram

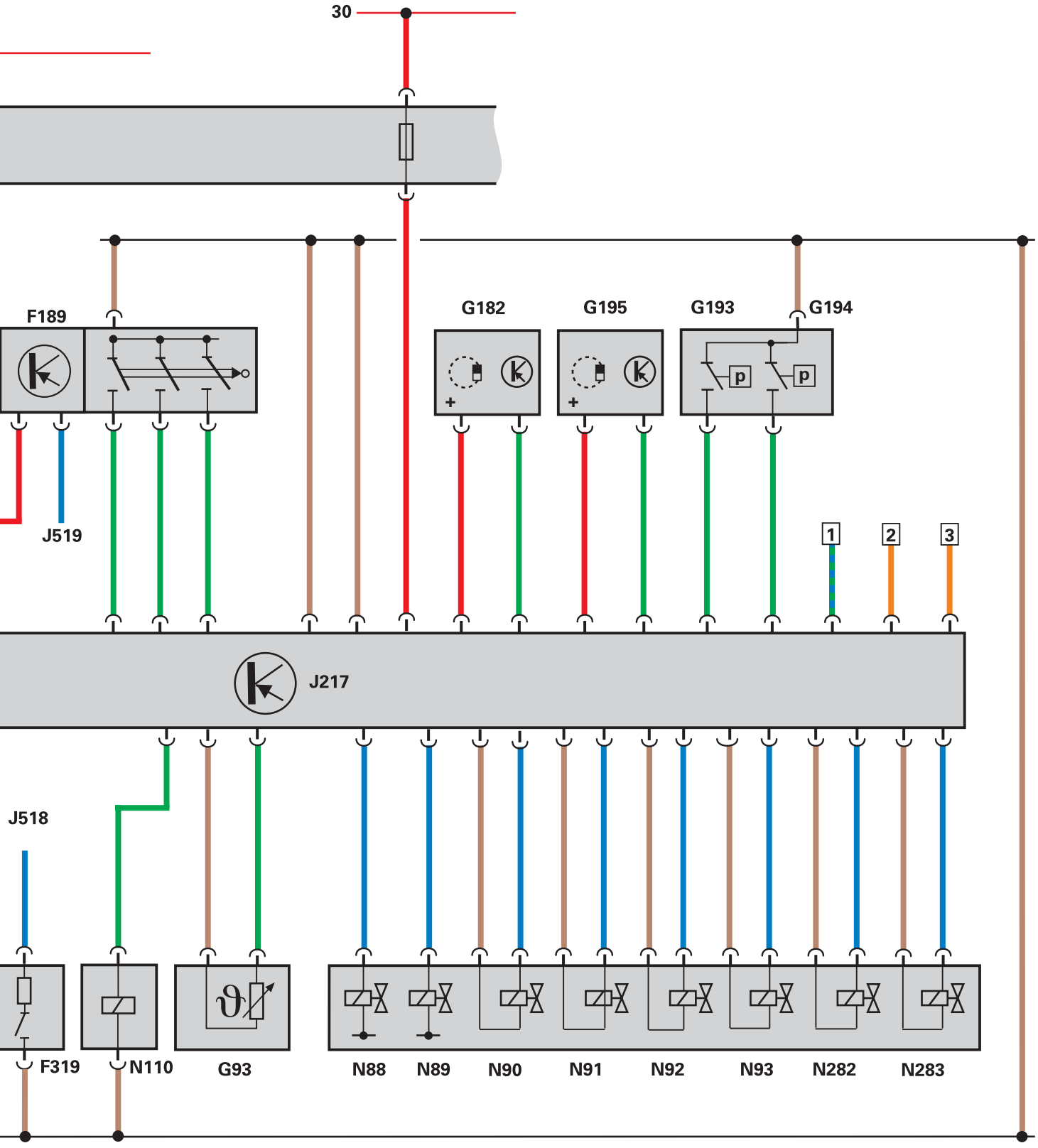
Components

F125 - Multi-Function Transmission Range (TR) Switch
F189 - Tiptronic Switch
F319 - Selector Lever Park Position Switch
G93 - Transmission Fluid Temperature Sensor
G182 - Sensor for Transmission RPM
G193 - Sender 1 for Hydraulic Pressure, Automatic Transmission
G194 - Sender 2 for Hydraulic Pressure, Automatic Transmission
G195 - Sender for Transmission Output RPM
J217 - Transmission Control Module
J527 - Steering Column Electronic Systems Control Module
N88 - Solenoid Valve 1
N89 - Solenoid Valve 2
N90 - Solenoid Valve 3
N91 - Solenoid Valve 4
N92 - Solenoid Valve 5
N93 - Solenoid Valve 6
N110 - Shift Lock Solenoid
N282 - Solenoid Valve 9
N283 - Solenoid Valve 10
N380 - Selector Lever Park Position Solenoid

Additional signals

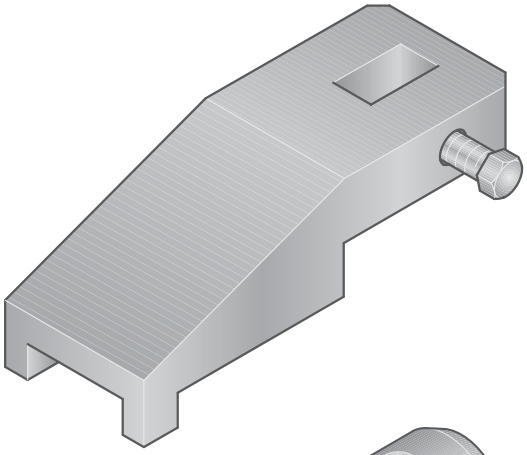
F41 - Back-Up Switch
J518 - Access/Start Control Module
J519 - Vehicle Electrical System Control Module
[1] Self-diagnosis
[2] CAN data bus high
[3] CAN data bus low




30
F189
J519
G182
G195
G193
G194
p
p
1
2
3
J217
J518
F319
N110
G93
N88
N89
N90
N91
N92
N93
N282
N283

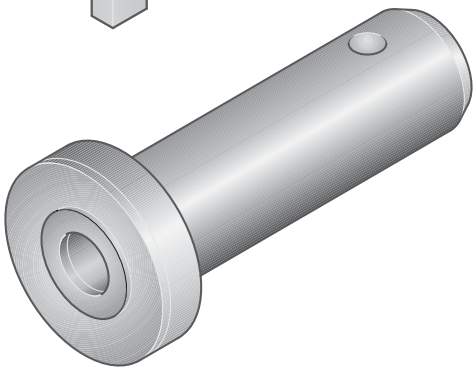
89K303_093

New Tools



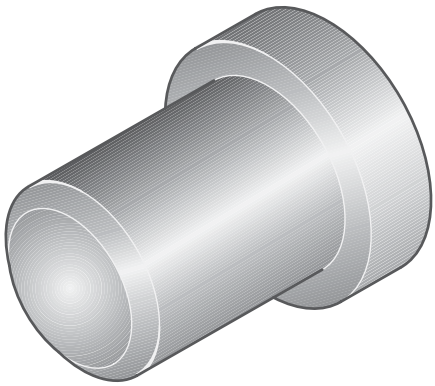
Setting gauge for multifunction switch T10173

This is required to set the multifunction switch when repairs are completed.



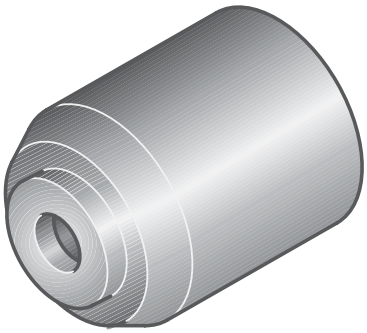
Pressure piece T10174

This is required to press a seal on the shaft for the multifunction switch.



Pressure piece T10180

This is required to press a seal on the drive shaft.



Sleeve T10186

This must be placed on the serration of the drive shaft before the gasket is installed to prevent damage during installation of the gasket.

89K303_092

Notes

Knowledge Assessment

An on-line Knowledge Assessment (exam) is available for this Self-Study Program.

The Knowledge Assessment may or may not be required for Certification. You can find this Knowledge Assessment in the Learning Management Center at:

www.vwwebsource.com

For assistance, please call:

Certification Program Headquarters

1-877-CU4-CERT (1-877-284-2378)

(8:00 a.m. to 8:00 p.m. EST)

Or email: Comments@VWCertification.com

Volkswagen of America, Inc.
3800 Hamlin Road
Auburn Hills, MI 48326
Printed in U.S.A.
March 2003