AUTOMATIC TRANSMISSION

Overview - All Models

STANDARD/AUTOMATIC TRANSMISSION

In today's modern vehicles, the automatic transmission has become a vital part of the powertrain. Automatic transmissions provide overall better fuel economy and efficiency while adapting to changing road conditions and driving habits. Standard transmissions offer more driver interaction with the vehicle, however automatic transmissions reduce driver fatigue and increase safety by shifting automatically. Automatic transmissions also offer improved driveability in stop and go traffic. If there is a disadvantage to an automatic transmission, it would be complexity and cost of manufacturing. See Fig. 1.

Standard Transmission



- Drive torque must be interrupted to change gears.
- Higher loads on driveline from abrupt clutch application.
- Clutch must be disengaged when vehicle is stopped to prevent stalling.
- High radial loads on housing.
- Gear set design requires more space than planetary type.
- Requires some Maintenance (clutch).
- Requires driver intervention for shifting.

Automatic Transmission



- Geär teeth are in constant mesh due to planetary design.
- Smoother application of drive torque reduces loads on driveline.
- Due to fluid coupling in the torque converter, transmission can stay in gear when vehicle is stopped.
- Minimal radial loads on housing.
- Compact design of gear set. Space requirement is minimized.
- Maintenance free operation. (Lifetime fluid and no clutch).
- Automatic shifting reduces driver fatigue and increases safety.

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Fig. 1: Standard & Automatic Transmission Comparison Courtesy of BMW OF NORTH AMERICA, INC.

HYDRAULIC TRANSMISSION VS. ELECTRO-HYDRAULIC TRANSMISSION

Since the introduction of the automatic transmission there have been numerous refinements to improve shift 3450 of 4036

comfort as well as fuel economy. Early automatic transmissions used only hydraulic control, there was no electronic intervention. In 1986 BMW introduced their first EH (Electro-Hydraulic) transmission into production vehicles. The acronym EGS is used by BMW for its electronic transmission control system. EGS stands for "Electronic Transmission Control" which comes from the German words "Elektronisch Getriebe Steurung". In order to comply with SAE terminology we will refer to the EGS control module as the TCM "Transmission Control Module". EH controlled transmissions allow for optimized shift points by closely monitoring changing conditions. Engine speed, road speed and throttle angle are some of the inputs that are monitored by the TCM to determine optimal shift points. The TCM will then process this information and control shift point via electronic solenoids mounted on the valve body. With the introduction of Adaptive Transmission Control, shift comfort and fuel economy was further improved. The TCM now monitors throttle angle deviations, wheel speeds and CAN Bus information to fine tune shift points. See Fig. 2.

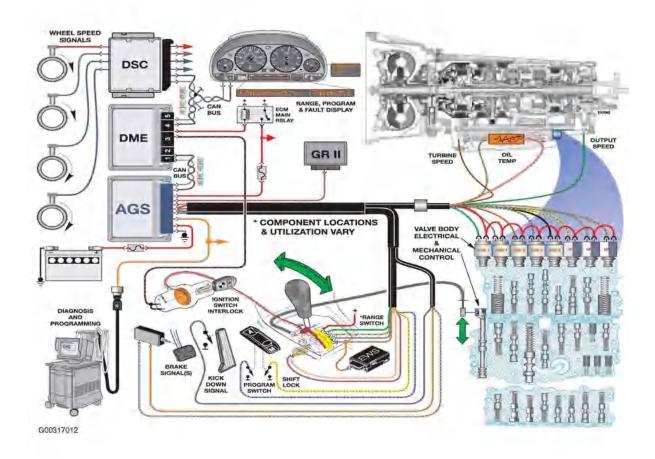


Fig. 2: Electronic Transmission Control System Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION IDENTIFICATION

BMW automatic transmissions are manufactured by two suppliers for the US market:

- Zahnradfabrik Friedrichshafen: Commonly referred to as ZF. ZF manufactures both manual and automatic transmissions.
- GM Powertrain Hydramatic: Hydramatic is a manufacturing division of General Motors located in Strasbourg France. Hydramatic supplies automatic transmissions to BMW for four and six-cylinder vehicles.

BMW has developed an internal numbering system for their transmissions for parts ordering, information research and identification. Also, each manufacturer uses their own internal identification system. Here is a breakdown of these identification codes. See <u>Fig. 3</u>.

BMW Identification Code Breakdown

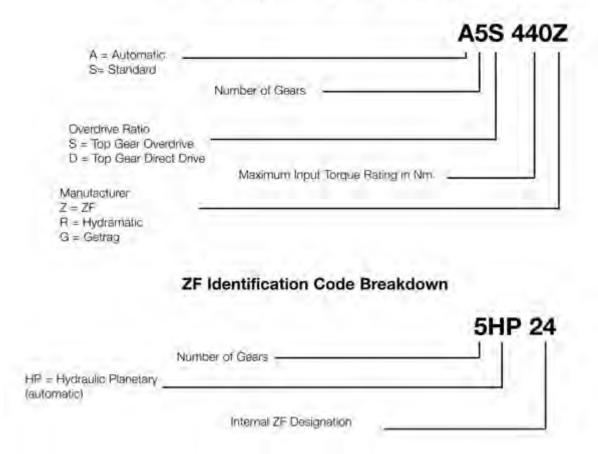


Fig. 3: Transmission Code Breakdown
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION HYDRAULICS

TRANSMISSION FLUID (OIL)

The automatic transmission provides pressure regulated hydraulic fluid which is filtered for all of the transmissions functional requirements. See <u>Fig. 4</u>. All BMW automatic transmissions are designed to operate with specific fluids. Use of non-approved oil will cause malfunctions and irreparable transmission damage which is not covered by BMW warranty. The transmission fluid provides the following functions:

- Lubricates mechanical components (planetary gears, bearings etc.).
- Removes heat and transfers heat to transmission cooling system. (heat exchanger).
- Removes debris and contaminants to sump and filter when circulated.
- Provides a transfer of kinetic energy in the torque converter.
- Allows hydraulic operation of mechanical components (clutches, brakes) via control of the valve body.

Also, transmission fluid has various properties to prevent oxidation and breakdown from heat and friction. Each type of transmission fluid has properties specific for each transmission application. Fluid level is crucial in the proper operation of an automatic transmission. Improper fluid levels will cause improper operation and eventually irreparable transmission damage. Improper fluid level can cause:

- A low fluid level can cause an interruption in oil flow during fast acceleration or hard braking which can cause gear shift malfunctions.
- An excessively high fluid level can cause the rotating mechanical components to paddle in the oil. This produces foam which introduces air into the hydraulic system.

• A low fluid level can also cause transmission overheating causing premature transmission failure.

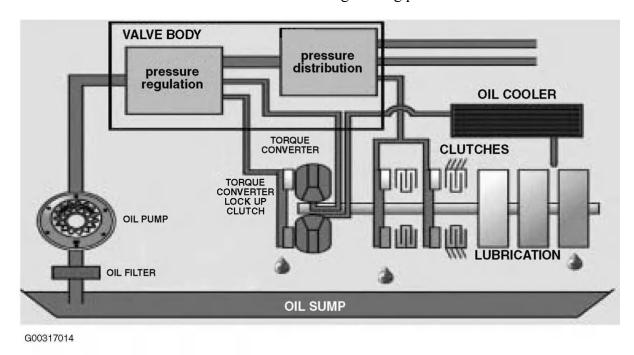


Fig. 4: Identifying Transmission Hydraulics Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION FLUID APPLICATION

There are numerous types of transmission fluid used in BMW transmissions. With the exception of the early transmissions (4HP22/24, A4S310/270R and the A5S310Z) all current BMW transmissions use "Lifetime Fill" transmission fluid. There is no maintenance required for these transmissions. It is important to use the correct fluid. Incorrect use of the transmission fluid can cause non-warrantable transmission damage.

When performing repairs on transmissions with lifetime fluid, it is important to drain the transmission fluid in to a clean container for re-use. New fluid should only be used for transmission replacement and for topping off after repairs.

Also, transmission fluid level is vital to the proper operation of the transmission. See Fig. 5.

| Transmission | Fluid Type | BMW Part # | Container | SIB Ref. |
|--|----------------------|--|--------------------|------------|
| 4HP22 4HP24 | Dexron III Mercon | Available Commercially (Castrol or Texaco) | N/A | |
| A5S310Z 530i/IT (E34) | Dexron III | Available Commercially (Castrol or Texaco) | N/A | |
| M3 (E36) | ESSO LT 71141 | 83 22 9 407 807 | 20 liter container | B 24 03 95 |
| A5S325Z | ESSO LT 71141 | 83 22 9 407 807 | 20 liter container | |
| A5S440Z | ESSO LT 71141 | 83 22 9 407 807 | 20 liter container | |
| A5S560Z 740 (E32), 540 (E34) 840Ci (E31- 6/93-12/94) 740i/iL-750iL (E38) | Shell LA2634 | 83 22 9 407 765 | 5 liter container | B 24 11 92 |
| 540i (3/96-12/96) 850Ci (10/94-6/97) | ESSO LT 71141 | 83 22 9 407 807 | 20 liter container | B 24 02 94 |
| A4S310R A4S270R (THM-R1) | Dexron III Mercon | Available Commercially (Castrol or Texaco) | N/A | |
| A5S360R | Texaco ETL 7045E | 83 22 0 026 922 | 25 liter container | |
| A5S390R | Texaco ETL 8072B | 83 22 0 024 359 | 25 liter container | |
| GA6HP26Z | Shell M1375.4 | 83 22 0 142 516 | | |

Fig. 5: Transmission Fluid Application

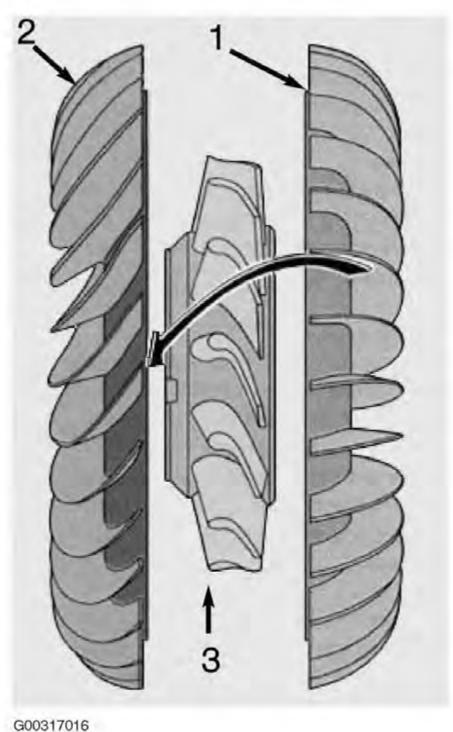
Courtesy of BMW OF NORTH AMERICA, INC.

TORQUE CONVERTER

In standard transmissions the crankshaft is linked to the transmission input shaft via the clutch assembly. Power flows from the crankshaft through the flywheel. The pressure plate transfers power to the clutch disc which is splined to the transmission input shaft. The pressure plate is used to disconnect (or interrupt) power flow to the transmission input shaft. Because the engine is mechanically connected to the driveline, power flow must be interrupted when the vehicle is stationary. Otherwise the engine would stall. In automatic transmissions, there is a fluid coupling between the engine and transmission. This fluid coupling is more commonly referred to as the torque converter. In the torque converter there is no rigid connection between the engine and transmission (except for lock up clutch). In order to understand the operation of the torque converter, we must first start with the components. The breakdown of the components are as follows:

- The Impeller, which is rigidly connected to the torque converter housing.
- The Turbine, which is splined to the input shaft (turbine shaft) of the transmission.
- The Stator, which has a one-way clutch. The inner race of the one-way clutch is splined to a stationary shaft attached to the transmission. See <u>Fig. 6</u>.

The addition of the stator allows the fluid coupling to be referred to as a torque converter. The stator provides for a multiplication of torque at low speeds. Without the stator there would be no multiplication of torque.



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Fig. 6: Identifying Impeller, Turbine & Stator Courtesy of BMW OF NORTH AMERICA, INC.

When the engine is running, the impeller which is directly connected to the converter housing, rotates at engine speed. Fluid is directed from the impeller blades to the turbine blades. The fluid drives the turbine which is splined to the input (turbine) shaft of the transmission. This functions the same way as a waterfall acting on a paddle wheel. The ratio of the impeller speed to turbine speed is approximately 1.1 to 1. This ratio is improved to 1:1 with the addition of the torque converter clutch which is discussed later.

Torque Converter Operation At Low Speeds

1. At low engine speeds there is a large difference in rotational speed between the impeller and the turbine

- 2. Fluid flow is directed from the impeller to the turbine. Fluid strikes the vanes of the turbine. The turbine is driven forward in the direction of engine rotation.
- 3. Fluid flow is then directed back towards the impeller.
- 4. Before the fluid reaches the impeller, the fluid strikes the vanes of the stator.
- 5. When the fluid strikes the stator, the one way clutch prevents the stator from rotating.
- 6. The fluid is then re-directed by the curved vanes of the stator. The fluid is now flowing in the same direction as the impeller.
- 7. The fluid that is acting on the impeller increases the force on the impeller which multiplies torque. See <u>Fig. 7</u>.

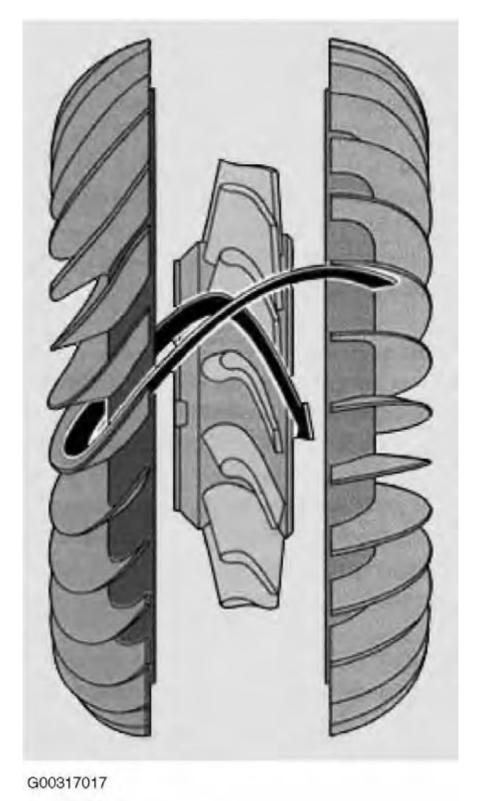


Fig. 7: Torque Converter Operation At Low Speed

Courtesy of BMW OF NORTH AMERICA, INC.

Torque Converter Operation at High Speed

- 1. As engine speed increases, the turbine speed approaches the speed of the impeller.
- 2. The fluid flow is directed from the turbine to the back side of the impeller blades.
- 3. The one-way clutch in the stator unlocks and the stator blades turn in the direction of engine rotation.
- 4. Fluid is no longer re-directed and torque multiplication no longer takes place.
- 5. This is referred to as "Coupling Speed". The turbine never reaches the same speed as the impeller as fluid flow would come to a halt. Ratio is approximately 1.1 to 1. See Fig. 8.

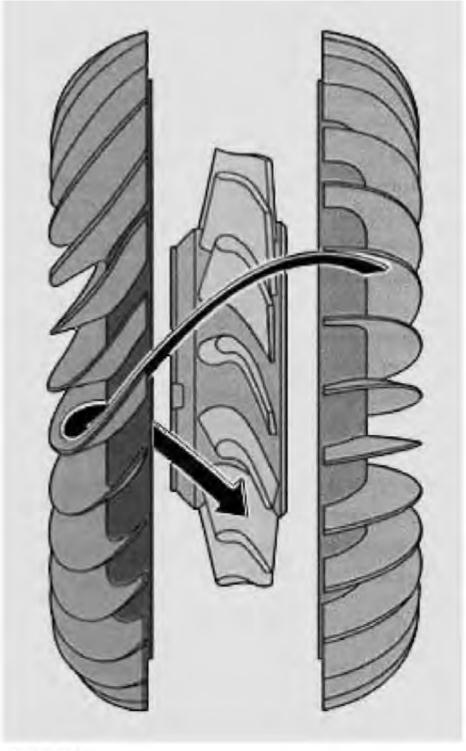


Fig. 8: Torque Converter Operation At High Speed

Courtesy of BMW OF NORTH AMERICA, INC.

Torque Converter Clutch

Since the efficiency of the torque converter at coupling speed is approximately 1.1 to 1, fuel economy is compromised. To offset this a torque converter clutch was added on EH controlled transmissions. The torque converter clutch locks the turbine to the converter housing. This creates a mechanical coupling with a ratio of 1:1. This can only be achieved at higher engine speeds. The torque converter clutch must be disengaged at low engine speeds to prevent stalling. There are two methods for controlling the torque converter clutch on BMW transmissions:

- A4S310/270R, 4HP22/24 EH, A5S310Z These transmission use an on/off control method to lock and unlock the torque converter. The TCC is either completely engaged or completely disengaged. This method of engagement provides an abrupt sensation when the TCC is locking and unlocking. This abrupt sensation can be unpleasant and undesirable to some drivers.
- A5S560Z, A5S440Z, A5S325Z, GA6HP26Z, A5S360/390R These transmissions use a gradual approach to TCC control. The TCC is gradually applied and released, this method reduces the abrupt feel of the on/off type TCC. The TCC solenoid is controlled by pulse width modulation. This allows fluid to be gradually introduced and released to the TCC.

The TCC is spring loaded to the engaged position. Pressurized fluid releases the TCC, when the pressurized fluid is released, the TCC is engaged. Depending on transmission application, the TCC can be engaged in 3rd, 4th or 5th gear. The TCC must be disengaged at low speeds to prevent stalling. See Fig. 9 and Fig. 10.

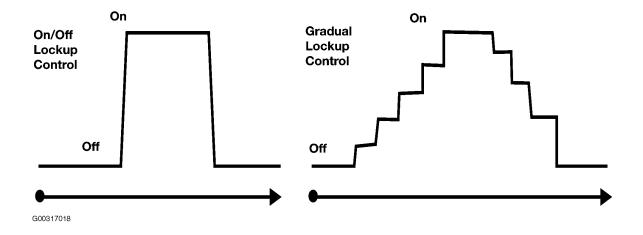


Fig. 9: Identifying TCC Operation
Courtesy of BMW OF NORTH AMERICA, INC.

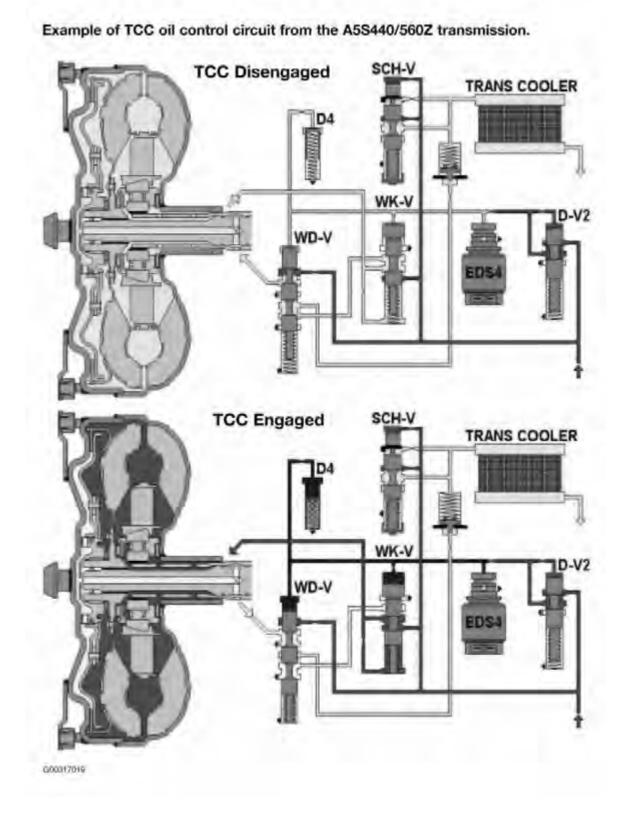


Fig. 10: TCC Oil Control Circuit
Courtesy of BMW OF NORTH AMERICA, INC.

OIL PUMP

The transmission oil pump is used to circulate oil and provide pressure for hydraulic operation. The pump is driven by the torque converter shell and rotates with engine. Fluid is drawn from the sump through the filter and distributed to the various transmission hydraulic systems. The output pressure is regulated to an operating pressure of approximately 25 bar. Currently there are two types of oil pumps used in BMW transmissions: Crescent type and Vane type. See <u>Fig. 11</u>.

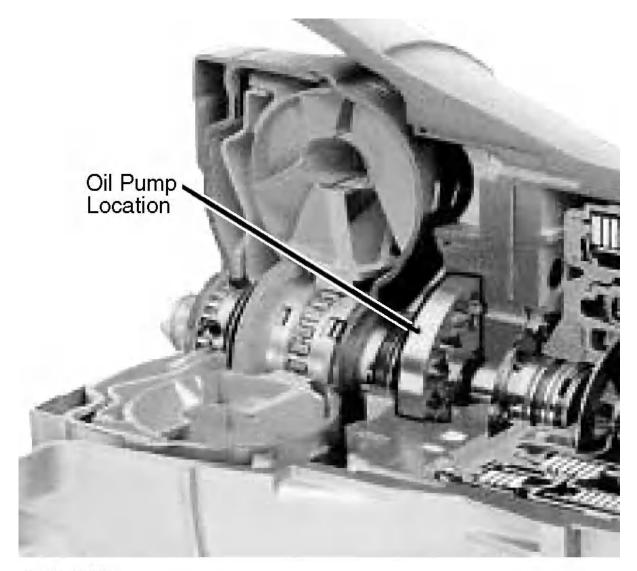


Fig. 11: Locating Oil Pump Courtesy of BMW OF NORTH AMERICA, INC.

Crescent Type Oil Pump (All except A5S360/390R)

The crescent type is an internal gear pump containing a drive gear and a driven gear. The inner gear is driven by the torque converter and acts as the impeller. The outer gear is driven by the inner gear. The gap between the teeth varies from the input, through the crescent and to the output of the pump. A low pressure area is created on the input side of the pump by the widening gap between the gear teeth. The oil is drawn to the crescent and transferred to the output side of the pump, where the pressure is increased by the narrowing gap between the gear teeth. The output pressure of the pump is controlled by spring loaded pressure regulator. See <u>Fig. 12</u>.

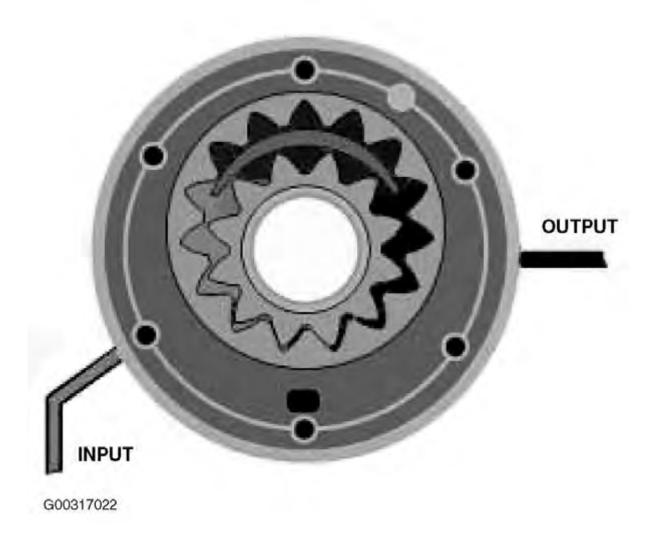


Fig. 12: Identifying Crescent Type Oil Pump Courtesy of BMW OF NORTH AMERICA, INC.

Oil Volume Control

On the A5S440Z transmission, oil pump output volume is controlled based on engine RPM. High oil volume is initially required at start up to quickly fill the transmission requirements. As engine RPM increases, the volume is greater than is required. The Oil Volume Control Damper regulates the pump output volume based on engine RPM. This helps improve fuel economy by reducing the load on the engine at high RPM.

Vane Type Pump (A5S360/390R)

The new A5S360/390R (GM5) transmission uses a vane type pump. See Fig. 13. The torque converter drives the pump rotor and 13 vanes. The rotor and vanes are placed inside a slide mechanism. As the rotor spins, the vanes sweep oil from the pump intake to the output along the mating surface on the vane ends and the interior surface of the slide. The slide is mounted on a pivot pin. As it pivots, it changes the eccentricity of the rotor to slide mating surface. This in turn will alter the output oil volume. This provides the same function as the Oil Control Volume Damper on the A5S440Z. The slide's position is influenced by a calibrated spring and hydraulic control pressure from the main pressure regulator solenoid on the valve body. See Fig. 14. The benefit of changing the slide position is to optimize pump output volume to meet the following operating conditions:

- Provide maximum volume during engine start-up. This condition provides a fast priming action of the pump for immediate lubrication and for hydraulic pressure operation.
- Regulated output volume at higher engine speeds. Maximum pump volume is not required at all times.

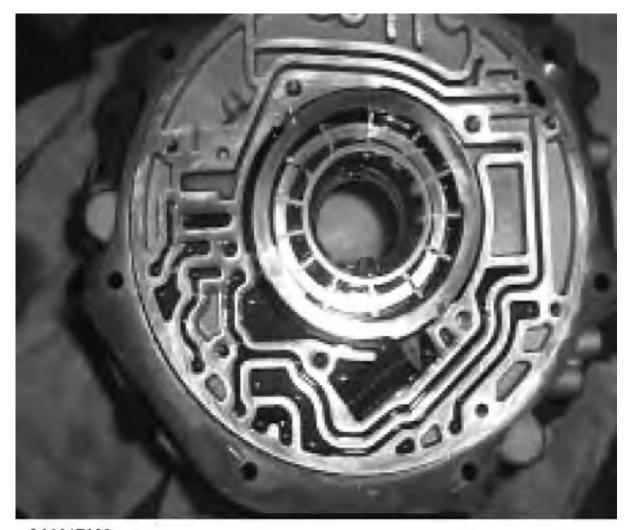


Fig. 13: Identifying Vane-Type Pump Courtesy of BMW OF NORTH AMERICA, INC.

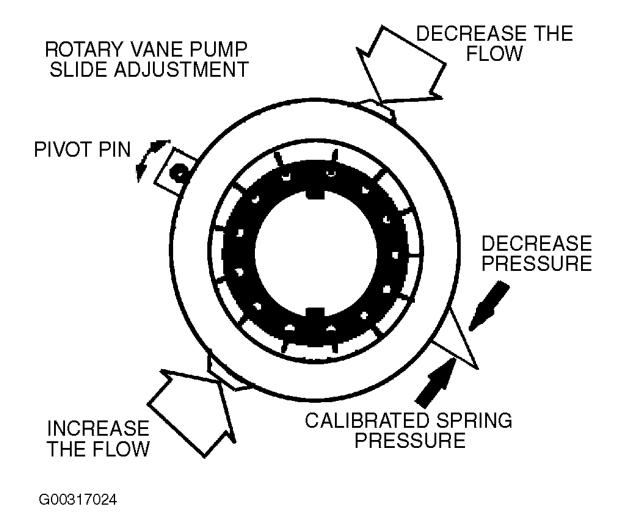


Fig. 14: Rotary Vane Pump Slide Adjustment Courtesy of BMW OF NORTH AMERICA, INC.

HYDRAULIC CONTROL COMPONENTS

Electro/Hydraulic Valve Body

The valve body assembly is the main shift control element in the transmission. In non-EH transmissions the valve body was only hydraulically controlled. In the current EH (electrohydraulic) transmissions the valve body is similar in design, but now also housing a number of shift solenoids which are controlled by the TCM. The valve body consists of a number of sub-assemblies. Each sub-assembly contains a number of spool valves which are hydraulically controlled. Most spool valves are opposed by spring pressure. The spool valves are used to direct hydraulic fluid flow to the various shift elements in the transmission. There is also a manual valve which is connected to the shift assembly by a cable. The manual valve allows the drivers to select the basic operating mode (or ratio). See Fig. 15. The valve body is responsible for the following:

- Regulating main pressure.
- Controlling fluid flow to shift elements for Upshifts and Downshifts.
- Providing for manual operation by driver via manual valve.
- Reverse Lockout.
- Failsafe Operation.
- Shift Comfort through: Overlap Shift Control (ZF) Pressure Accumulators (GM).
- Torque Converter Control.
- Distribution of lubrication.

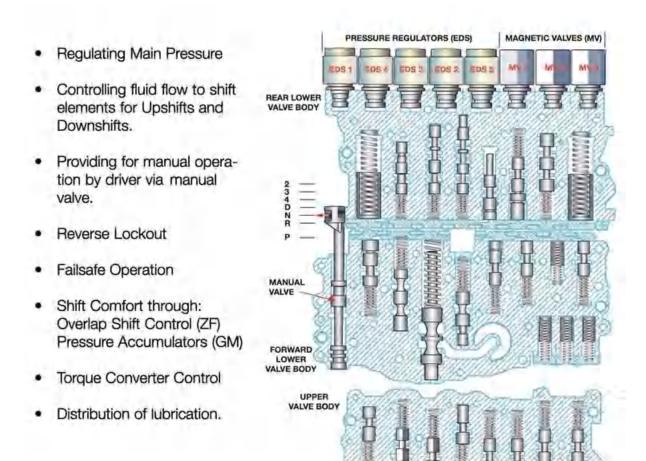


Fig. 15: Identifying Electro/Hydraulic Valve Body Components Courtesy of BMW OF NORTH AMERICA, INC.

Shift Valves

Shift valves are used to direct application pressure to the various shift elements. Shift valves are regulated by spring pressure and control pressure for the shift solenoids. Shift valves come in various configurations depending upon application and transmission type. The most basic is the 3/2 shift valve. The 3/2 shift valve has 2 positions which are switched through one or two control pressures.

With no control pressure from shift solenoid present, the shift valve is moved to its end travel (left) by spring pressure. Operating pressure is blocked to the shift component. Also in this position any application pressure is drained from the shift component. See <u>Fig. 16</u>.

Once the control pressure is applied to the 3/2 shift valve, the shift valve moves to the right. This allows operating pressure to reach the shift component. When the control pressure is again reduced, spring pressure returns the 3/2 shift valve to the rest position. This drains and operating pressure from the shift component. See Fig. 17.

Operating Pressure to Shift Component. The example shown is a 4/2 shift valve. The operation is similar to the 3/2 valve. The primary difference is that the 4/2 shift valve affects 2 shift components. See Fig. 18.

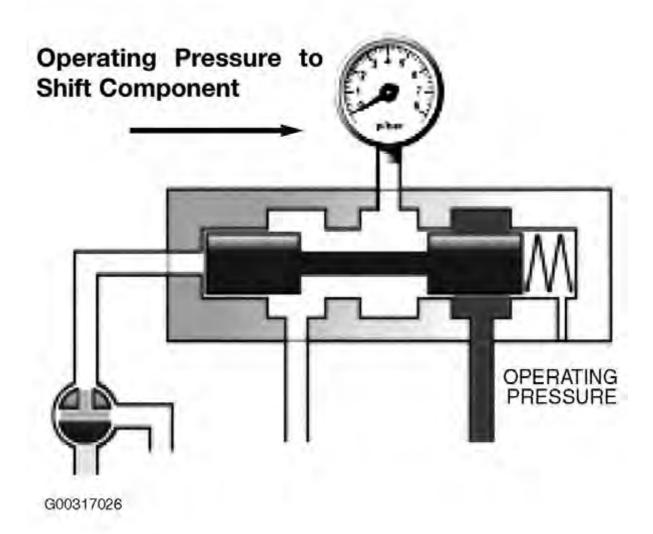


Fig. 16: Shift Valve Operation (1 Of 3)
Courtesy of BMW OF NORTH AMERICA, INC.

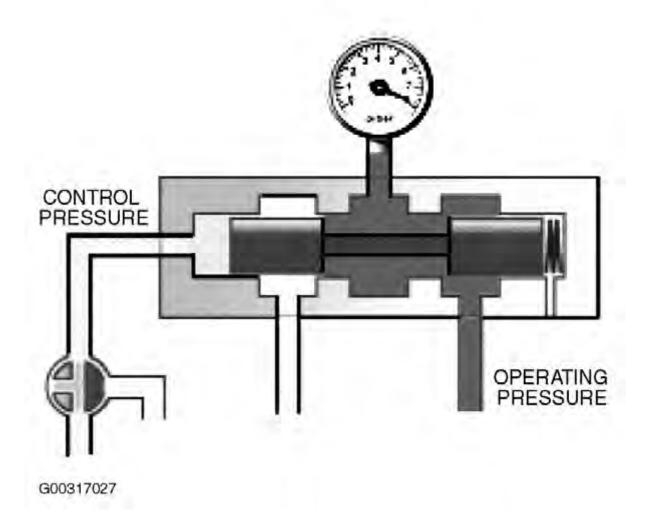


Fig. 17: Shift Valve Operation (2 Of 3) Courtesy of BMW OF NORTH AMERICA, INC.

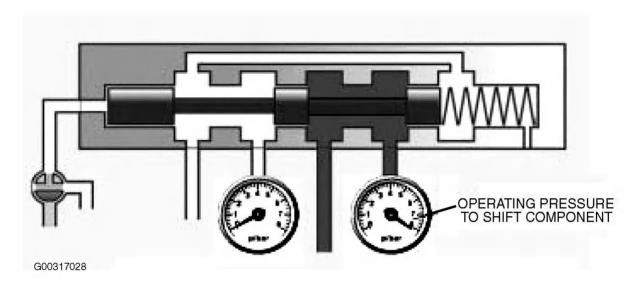


Fig. 18: Shift Valve Operation (3 Of 3)
Courtesy of BMW OF NORTH AMERICA, INC.

Pressure Regulation

Pressurized oil from the pump must be regulated for use within the transmission. Otherwise, the high pressure directly from the pump would influence shift quality. The shifts would be more abrupt and harsh. In order to

"fine tune" the pressures within the transmission, there is a pressure regulating valve and a pressure regulating solenoid. The pressure regulating valve is located in the oil pump housing or the valve body dependent upon transmission type. The pressure regulating solenoid is a pulse width modulated (PWM) solenoid. Current is controlled by the TCM. The pressure regulating solenoid is normally closed, there is maximum line pressure available when minimum (or no) current is applied to the pressure regulating solenoid. Depending upon application, pressure regulating solenoid can be PWM with B- or B+ control. GM transmissions use B+ control with a constant ground supply. ZF transmissions uses B- control with a constant B+ supply.

There are also pressure regulators used in ZF transmissions that are used to control shift pressures. The A5S440Z and A5S560Z both use EDS solenoids for "Overlap Shift Control" this will be explained later in this text. There are a few different names for pressure regulating solenoids depending upon the transmission type and manufacturer:

- ZF transmissions use the following terms EDS solenoid (valve), or MV (magnetic valve).
- Hydramatic (GM) transmissions use the following terms: DR solenoid, Force Motor Solenoid or Variable Bleed Solenoid.

Transmission operating pressures are regulated based on engine speed, throttle angle and engine load. The regulated pressure from the pressure regulating solenoid is referred to as throttle pressure. This pressure is fed to the main pressure regulating valve. See <u>Fig. 19</u>.

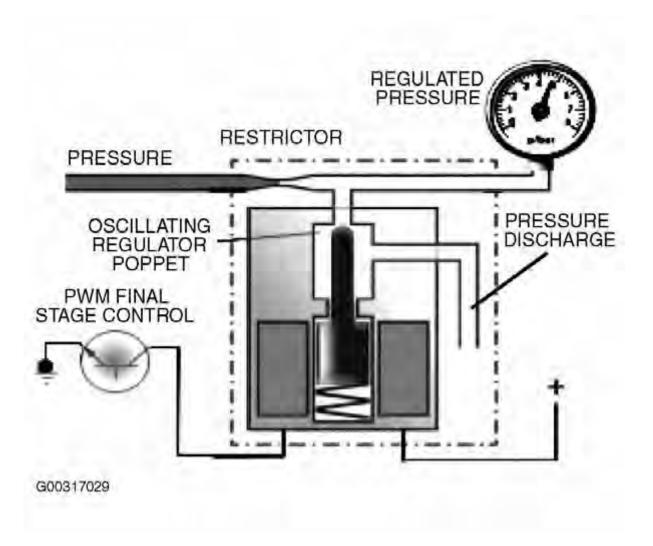
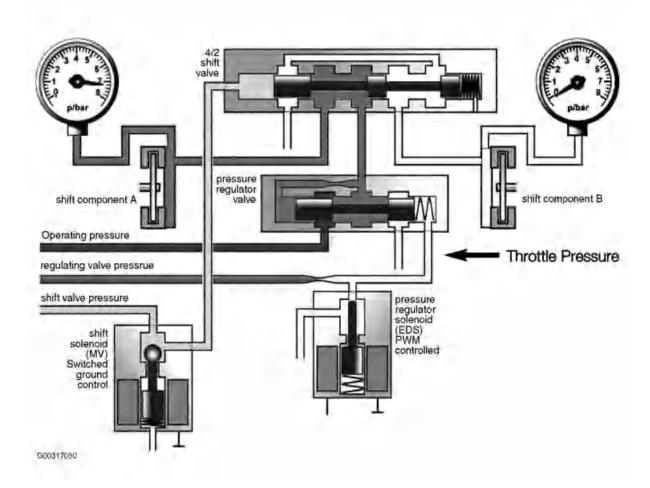


Fig. 19: Identifying Transmission Operating Pressure Courtesy of BMW OF NORTH AMERICA, INC.

Pressure Regulation

As the diagram shows, regulating valve pressure is fed to the pressure regulating solenoid. See <u>Fig. 20</u>. This pressure is then regulated to create throttle pressure. Throttle pressure is modified based on throttle angle,

engine speed and engine load. Throttle pressure is then fed to the pressure regulating valve. As throttle pressure increases, the regulating valve piston is moved to the left (with respect to the diagram). As the regulating valve piston is moved to the left, operating pressure is increased to the 4/2 shift valve. The operating pressure to the 4/2 shift valve will be fed to Shift Component A or Shift Component B depending the position on the 4/2 shift valve. The operating pressure to the shift components will be increased or decreased depending upon the throttle valve pressure. As engine speed and load are increased, the operating pressure will be increased to provide higher clamping forces on the shift components. When there is no electrical power present to the pressure regulator solenoid, throttle pressure will be a maximum. Therefore maximum operating pressure will be available at the 4/2 shift valve. This condition would exist if the transmission was operating in failsafe mode.



<u>Fig. 20: Identifying Transmission Regulation Pressure</u> Courtesy of BMW OF NORTH AMERICA, INC.

APPLY COMPONENTS

Multi - Plate Clutches and Brakes

Multi Plate Clutches and Brakes are used to drive or hold members of the planetary gear set. See Fig. 21. As a general rule, Multi Plate Clutches connect one planetary member to another. Multi Plate Brakes connect a planetary member to the case to hold it stationary. The clutches and brakes consist of a number of friction discs and steel discs. The friction discs are coated with a friction material and have engaging lugs (splines) on the inner perimeter. The steel discs are steel on both sides and have engaging lugs located on the outer perimeter. The engaging lugs on the friction discs are usually engaged with a planetary member. The engaging lugs on the steel discs are usually engaged with the clutch piston housing. In addition to the friction and steel discs, there is also an apply piston, housing and return spring. Once hydraulic fluid is applied to the clutch assembly, the friction discs and steel discs will be locked together. Once hydraulic pressure is released, the return spring will cause the clutch piston to return to its rest position which will unlock the clutch assembly. See Fig. 22.

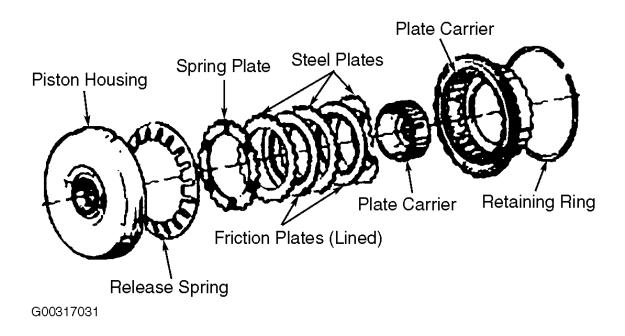


Fig. 21: Identifying Multi-Plate Clutches & Brakes Courtesy of BMW OF NORTH AMERICA, INC.

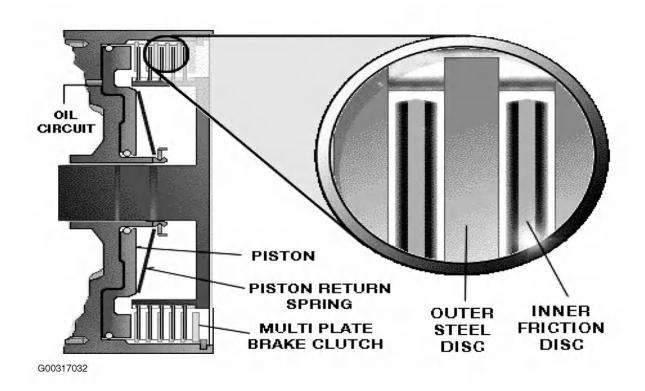


Fig. 22: Multi-Plate Clutch Identification Courtesy of BMW OF NORTH AMERICA, INC.

Multi - Plate Clutch Operation

In order to carry out a shift in ratio, fluid needs to be applied or released from the Multi - Plate Clutch (or Brake). As shown in the example at the right, the following sequence occurs:

- 1. Fluid from a shift valve in the valve body is applied to the clutch assembly.
- 2. Fluid pressure builds behind the apply piston and overcomes the resistance from the diaphragm spring.

- 3. The friction and steel discs are compressed together and become locked, preventing any slippage between them.
- 4. Two planetary members are now locked together.
- 5. When fluid pressure is released, the steel and friction discs are allowed to unlock.
- 6. The diaphragm spring pushes against the apply piston and returns the piston back to the rest position.
- 7. The check ball in the apply piston is unseated by centrifugal force which allows the clutch to drain completely. See <u>Fig. 23</u>.

Fig. 23: Multi-Plate Clutch Operation Courtesy of BMW OF NORTH AMERICA, INC.

BAND BRAKES

On some BMW transmissions there is a band type brake used for some applications. The A4S270/310R and the A5S310Z use a band type brake. The brake band is a circular band with friction material bonded to the inner surface. The band wraps around a particular planetary component (clutch drum) and locks that component to the transmission case. The brake band is applied and released by the clutch apply piston. The brake band is not adjustable on the A5S310Z, however there is some adjustment allowed when needed on the A4S270/310R. The brake band functions in the following manner on BMW transmissions:

- A4S270/310R The brake band is active (applied) in first and second gear. The brake band holds the reaction sun drum stationary. The reaction sun drum is splined to the reaction sun gear.
- A5S310Z The brake band is active (applied) in second, third and fifth gear. The brake band holds the forward sun gear to the case. See <u>Fig. 24</u>.

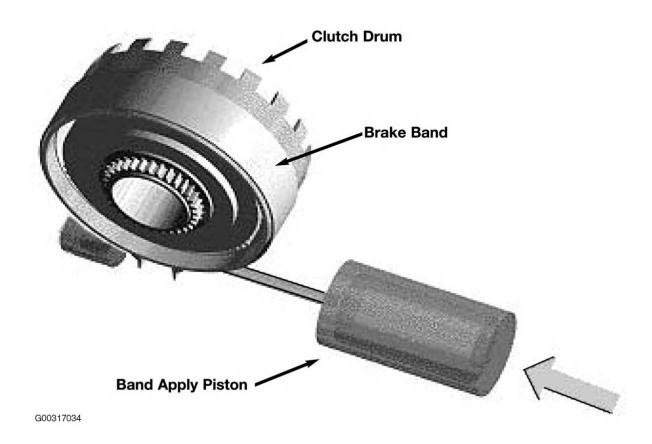


Fig. 24: Identifying Band Brake Operation
Courtesy of BMW OF NORTH AMERICA, INC.

ONE-WAY CLUTCHES (FREEWHEEL)

The one way clutch consists of an inner and outer ring with a locking device between the two. The one way 3470 of 4036

clutch is designed to lock in one direction and to allow free rotation in the other direction. See <u>Fig. 25</u>. Currently there are two types of one way clutches used in BMW transmissions:

- Roller type which consists of spring loaded rollers between the inner and outer race of the one way clutch. (Roller type is also used without springs on some applications).
- Sprag type which consists of asymmetrical shaped wedges located between the inner and outer race of the one way clutch.

In both versions of the one way clutch (freewheel), rotation is only allowed in one direction. Using the diagrams above, imagine that the inner races were locked stationary. The outer race would only be allowed to turn counter clock wise. In the clock wise direction, the outer race of both versions would be locked. In the roller type, the helper springs would push the rollers up the ramp on the outer race. This would force the rollers in to the smaller area which would cause the outer race to lock, In the sprag type, the asymmetrical wedges would lock between the inner and outer race. The one way clutches are used in the transmission to prevent an interruption of drive torque during certain gear shifts and to allow engine braking during coasting. Also there is a one way clutch in the stator of the torque converter.

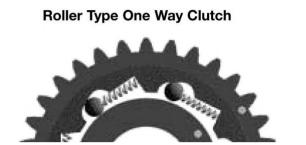




Fig. 25: Identifying One-Way Clutches
Courtesy of BMW OF NORTH AMERICA, INC.

PLANETARY GEAR SET

Planetary gear seats are compact gear units that receive input drive torque and provide the required output ratios for all forward gears and reverse gear. The planetary gear set consists of four main components:

- 1. Internal ring gear.
- 2. Planetary gears (pinions).
- 3. Sun gear.
- 4. Planetary gear carrier.

Various ratios are obtained by driving or holding different components in the planetary gear set. The example shown is a simple planetary gear set. See <u>Fig. 26</u>. Today's modern transmissions use a combination of multiple planetary gear sets referred to as a compound planetary gear set.

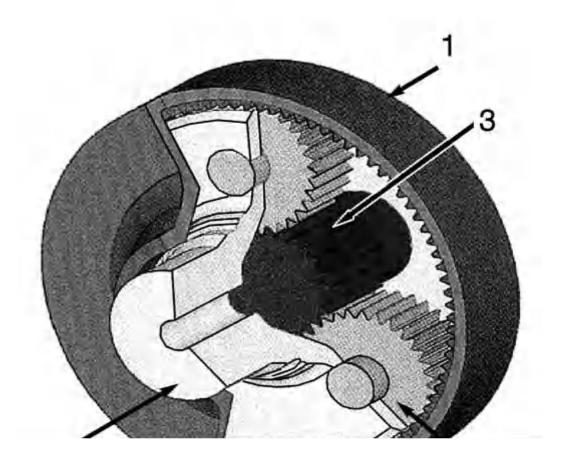


Fig. 26: Identifying Planetary Gear Set Courtesy of BMW OF NORTH AMERICA, INC.

Advantages of Planetary Design

There are distinct advantages to the planetary gear set in comparison with a standard transmission gear set. Primarily, drive torque does not need to be interrupted to change gears. The planetary members are in constant mesh and there are more teeth engaged in any given ratio. This allows more torque to be transferred through the transmission.

Basic Power Flow Example

As an example of power flow in reverse gear, planetary gear carrier (4) is held stationary. The sun gear (3) is driven in a clockwise direction. The planetary pinions (2) are driven counterclockwise, which in turn drives the internal ring gear (1) counter clockwise as well. See <u>Fig. 27</u>.

Fig. 27: Identifying Basic Power Flow Courtesy of BMW OF NORTH AMERICA, INC.

Compound Planetary Gear Sets

Compound planetary gear sets use multiple planetary components which are a variation on the simple planetary gear set. Since the inception of the simple planetary gear set, there have been numerous compound gear sets introduced. BMW transmissions use the following gear sets:

- Simpson Gear Set used on 4HP22 and 4HP24.
- Ravigneax Gear Set used on A4S270R, A4S310R, A5S310Z, A5S325Z, A5S360R and A5S390R.
- Wilson Gear Set used on A5S440Z and A5S560Z.
- Lepelletier Gear Set used on the GA6HP26Z.

Simpson Gear Set

The Simpson Gear Set is one of the early variations on the simple set. It is capable of 3 forward gears and one reverse. On BMW transmissions, the Simpson Gear set is used in the 4HP transmission which is a four speed automatic. See <u>Fig. 28</u>. Fourth gear (overdrive) is obtained by the addition of an auxiliary gear set (simple). Characteristics of the Simpson Gear set are as follows:

- Two Internal Ring Gears, one rear input ring and one attached to the rear planetary carrier.
- Two Planetary carriers, each containing three planetary pinions.
- One common Sun gear, which meshes with both sets of planetary pinions.

Fig. 28: Identifying Simpson Gear Set

Courtesy of BMW OF NORTH AMERICA, INC.

Ravigneaux Gear Set

A new version on the planetary design is the Ravigneaux gear set. See <u>Fig. 29</u>. This gear set is capable of 4 forward gears and one reverse. However, depending upon application it may be used with an auxiliary gear set. Here are some examples:

- The A4S310/270R uses the Ravigneax set for 3 forward gears and one reverse. Overdrive is obtained by the auxiliary gear set.
- The A5S310Z uses a combination of the Ravigneaux gear set and the auxiliary gear set to obtain 5 forward gear and one reverse. First, second and reverse gears are achieved by using a combination of both gear sets.
- The A5S360/390R uses a modified version of the Ravigneaux set that provides five forward gears and one reverse. There is no auxiliary gear set used.

<u>Fig. 29: Identifying Ravigneaux Gear Set</u> Courtesy of BMW OF NORTH AMERICA, INC.

Characteristics of the Ravigneaux Gear Set are:

- One planetary carrier which is common to both sets of planetary pinions.
- Two sets of planetary pinions, one long set with small diameter and one short set with large diameter.
- Two sun gears, one input sun gear and one reaction sun gear.
- One common ring gear.

NOTE: The Ravigneaux Gear Set shown in the figure is a typical representation. There are a few variations of this arrangement used on BMW transmissions.

Wilson Gear Set

On BMW transmissions, the Wilson gear set is only used on the A5S440Z and A5S560Z. See <u>Fig. 30</u>. The Wilson Gear Set consists of three planetary gear sets. The ring gear of the first gear set, the planetary carrier of the second gear set and the ring gear of the third planetary gear set and directly connected to the "Pot". The "Pot" is a cylindrical device that slides over all of the components to unitize the individual gear sets into an assembly. The characteristics of the Wilson Gear Set are:

- Three planetary carriers.
- Three ring gears, with ring gear 1 and 3 meshed to "Pot" assembly.
- Three sun gears, sun gear 2 and 3 are common (attached). Sun gears 2 and 3 are also referred to as the "Double Sun Gear".

Fig. 30: Identifying Wilson Gear Set Courtesy of BMW OF NORTH AMERICA, INC.

Lepelletier Gear Set

The Lepelletier Gear Set was introduced to BMW on the ZF GA6HP26Z. See <u>Fig. 31</u>. This gear set allows for 6 forward speeds and one reverse gear using a light weight design. The planetary gear train consists of a single carrier planetary gear train and a downstream double planetary gear train.

Fig. 31: Identifying Lepelletier Gear Set Courtesy of BMW OF NORTH AMERICA, INC.

Planetary Gear Set Operation

In order to understand planetary gear set operation, it is important to understand some basic rules of operation:

- It is assumed that engine rotation is clockwise when referring to power flow charts and diagrams.
- Planetary pinions will always rotate in the same direction as the internal ring gear.
- When the sun gear is driven clockwise and the planetary carrier is held stationary the internal ring gear will rotate counter clockwise (reverse gear).
- When two or more planetary members are locked together, the assembly will rotate together. The ratio from input to output is 1:1.
- When the sun gear is held stationary and the planetary carrier is driven clockwise, the ring gear will be driven clockwise in an overdrive ratio (.75:1)

When trying to understand power flow schematics, it is important to be able to draw a comparison between the actual planetary components and the schematic symbols. The diagram below outlines the relationship between these components and the power flow schematic. The schematic is a representation of a cross section of the transmission, but you only see the top half of the cross section. The transmission is shown as though it has been quartered lengthwise. See <u>Fig. 32</u>.

Fig. 32: Identifying Gear Set Operation

Courtesy of BMW OF NORTH AMERICA, INC.

POWER FLOW SCHEMATIC

In order to understand power flow schematics, a relationship must be drawn between the actual components and the schematic representation. This example uses the 4HP22/24 power flow schematic. The 4HP22/24 transmission uses a Simpson Planetary Gearset and an auxiliary gearset. The auxiliary gear set is a simple planetary gearset. See <u>Fig. 33</u>.

Fig. 33: Identifying Power Flow Schematic Courtesy of BMW OF NORTH AMERICA, INC.

Power Flow In First Gear

Drive torque is applied to the torque converter impeller and transferred to the turbine. The turbine shaft rotates clockwise (CW). The "A" clutch locks the turbine shaft to the rear input ring gear. The rear input ring gear rotates CW driving the rear planet pinions CW. The planetary pinions drive the common sun gear CCW, which

in turn drive the front planet pinions CW. The front planetary carrier is held from rotating CCW by one way clutch "J". The front planetary pinions which are rotating CW drive the front ring gear/rear carrier CW. The rear planetary carrier is rotating CW and is driving the planetary carrier from the auxiliary gear set. The "E" clutch in the auxiliary gear set is holding the Sun gear and the ring gear together. Therefore the auxiliary gear set is locked in a 1:1 ratio. See Fig. 34.

One Way Clutch "J" is locked to prevent the front planetary carrier from rotating CCW. One Way Clutch "H" is not used and One Way Clutch "K" is locked. One way clutch "K" is used to prevent an interruption in power flow before the "E" clutch is locked during the 4-3 shift. See Fig. 35.

Fig. 34: Power Flow Schematic In First Gear

Courtesy of BMW OF NORTH AMERICA, INC.

Fig. 35: Power Flow In First Gear

Courtesy of BMW OF NORTH AMERICA, INC.

Second Gear

Drive torque is applied to the torque converter impeller and transferred to the turbine. See Fig. 36. The turbine shaft rotates clockwise (CW). The "A" clutch locks the turbine shaft to the rear input ring gear. The rear input ring gear rotates CW driving the rear planet pinions CW. The sun gear is held stationary by the C' clutch. The rear planet pinions rotate around the fixed sun gear CW. The rear planetary carrier will rotate CW. The rear planetary carrier will drive the auxiliary gear set and will rotate as a complete unit. The auxiliary gear set is locked in a 1:1 ratio due to the "E" clutch locking the sun and ring gear together. The "C" clutch is locking the outer race of the "H" freewheel to the case. This is used for the 3/2 downshift. Freewheel "J" is not active and Freewheel "K" is locked.

Fig. 36: Power Flow Schematic In Second Gear

Courtesy of BMW OF NORTH AMERICA, INC.

Third Gear

Drive torque is applied to the torque converter impeller and transferred to the turbine. See Fig. 37. The turbine shaft rotates clockwise (CW). The "A" clutch and the "B" clutch are locked, this causes the rear input ring gear to be locked to the sun gear in the Simpson Gear set. The Simpson gear set is locked in a 1:1 ratio. The "E" clutch is locked which locks the ring gear to the sun gear in the Simpson gear set. The entire transmission planetary system is now locked in a 1:1 ratio. Freewheel "H" is overrun and freewheel "J" is not used. Freewheel "K" continues to be locked.

Fig. 37: Power Flow Schematic In Third Gear Courtesy of BMW OF NORTH AMERICA, INC.

Fourth Gear

Drive torque is applied to the torque converter impeller and transferred to the turbine. See Fig. 38. The turbine shaft rotates clockwise (CW). (The turbine shaft can also be driven by the lock up clutch when engaged). The "A" clutch and the "B" clutch are locked, this causes the rear input ring gear to be locked to the sun gear in the Simpson Gear set. The Simpson gear set is locked in a 1:1 ratio. The "F" clutch is locked which locks the sun gear in the auxiliary gear set to the case. The Simpson gear set drives the planetary carrier CW. The planet pinions walk around the fixed sun gear in a CW direction. This causes the ring gear to rotate CW as well. The ring gear, which is the output of the transmission is driven in an overdrive ratio. Freewheel "H" and "K" are overrun. Freewheel "J" is not used.

Fig. 38: Power Flow Schematic In Fourth Gear Courtesy of BMW OF NORTH AMERICA, INC.

Drive torque is applied to the torque converter impeller and transferred to the turbine. See <u>Fig. 39</u>. The turbine shaft rotates clockwise (CW). The "B" clutch is locked which drives the sun gear in the Simpson gear set CW. The sun gear drives the planet pinions CCW. The planetary carrier is held stationary by the "D" clutch. The planet pinions cause the front ring gear to rotate CCW. The front ring gear (and rear carrier) drive the auxiliary gear set CCW which rotates at a ratio of 1:1 due to the "E" clutch locking the sun and ring gear of the auxiliary gear set. Freewheel "H" and "J" are not used. Freewheel "K" is locked.

Fig. 39: Power Flow Schematic In Reverse Gear Courtesy of BMW OF NORTH AMERICA, INC.

SHIFT CONTROL

Freewheel Shifting

In order to prevent an interruption in power flow, freewheel (One Way Clutches) are used to lock members of the planetary gear set. Certain transmissions such as the 4HP22/24, A4S270/310R and the A5S360R use freewheel shifting on all gear shifts. Transmissions such as A5S310Z, A5S440Z, A5S560Z and GA6HP26Z use freewheel shifting for only specific shifts. Other shifts in these transmissions use overlap shifting technology. To demonstrate how the freewheel is used, the freewheel "H" in the 4HP22/24 transmission will be examined.

In third gear, the sun gear is rotating clockwise. Freewheel "H" is overrun (unlocked) allowing the sun gear to rotate. Clutch "C" is active which locks the outer race of freewheel "H" to the case. During a 3/2 downshift, clutch "B" is released. The sun gear is held from rotating counter clockwise by freewheel "H" and the "C" clutch. Freewheel "H" is used to stop the counter clockwise rotation of the sun gear before the "C" clutch can engage. This prevents an interruption of power flow during the 3/2 downshift. If freewheel "H" fails to operate, there would be an increase in engine RPM from 3rd to 2nd gear. See Fig. 40 and Fig. 41.

Fig. 40: Freewheel Shifting (Second Gear)

Courtesy of BMW OF NORTH AMERICA, INC.

Fig. 41: Freewheel Shifting (Third Gear)

Courtesy of BMW OF NORTH AMERICA, INC.

Overlap Shift Control

Overlap shift technology is currently used on ZF transmissions. The A5S310Z, A5S440Z, A5S560Z and the GA6HP26Z use overlap shift technology on most gear changes. The advantages of this design allows for the reduction of the use of One Way Clutches (freewheel) and a significant improvement in shift quality. During an overlap shift, the releasing clutch pressure is reduced at the same rate that the engaging clutch pressure is increased. The result is a smooth transfer or torque between gear ratios.

As shown in the diagram, clutch 1 is fully engaged with maximum pressure. Clutch 2 is fully released. During overlap shifting, the TCM closely monitors the rotational speeds of the turbine (input) shaft and output shaft. The TCM then uses the EDS solenoids to control pressures during shifting to provide the optimum shift timing and overlap control. See <u>Fig. 42</u>.

Fig. 42: Identifying Overlap Shift Control

Courtesy of BMW OF NORTH AMERICA, INC.

Overlap Shifting

During the transition of overlap, the clutches run through a slip zone. The torque is gradually transferred from the clutch that is releasing to the clutch that is engaging. The new gear engages the moment the torque level exceeds that of the first clutch. This is described as overlap. If the overlap is correct, (zero overlap) the

engaging clutch takes over as much torque as the disengaging clutch releases. The result is a seemingly unnoticed shift of the best quality. See $\underline{\text{Fig. 43}}$ and $\underline{\text{Fig. 44}}$.

Fig. 43: Identifying Overlap Shifting (Clutch 1 Engaged)

Courtesy of BMW OF NORTH AMERICA, INC.

Fig. 44: Identifying Overlap Shifting (Clutch 1 Disengaged)

Courtesy of BMW OF NORTH AMERICA, INC.

Negative Overlap

Negative overlap occurs when the engaging clutch takes over too late or the releasing clutch drops pressure too early. The result is that the drive torque is briefly interrupted. When the engine is operating under load, the engine speed increases due to the interruption. When coasting the engine speed drops. See <u>Fig. 45</u>.

Fig. 45: Identifying Negative Overlap

Courtesy of BMW OF NORTH AMERICA, INC.

Positive Overlap

If positive overlap occurs, the engaging clutch takes over too early or the releasing clutch pressure drops too late. The gear set would become momentarily blocked if this condition occurs during an upshift. When this occurs the ratio of the gear set becomes 1:1 momentarily. The result is a loss in drive torque during a gear shift. See <u>Fig. 46</u>.

Fig. 46: Identifying Positive Overlap

Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION CONTROL MODULE

The TCM receives inputs, processes information and actuates the output elements to provide optimal shift points. The TCM is programmed for maximum shift comfort and fuel economy. The TCM on most BMW vehicles is located in the E-Box next to the ECM (DME). There are several types of TCM housings:

- 35 Pin TCM (TCU) used on the 4HP transmissions.
- 55 Pin TCM used on the A4S310R (THM-R1).
- 88 Pin TCM used on all others up to 98.
- 134 Pin TCM used on all BMW transmission from the 99 model year. (Note- the 134 pin TCM was introduced on the 98 Models equipped with the A5S440Z).

The 134 Pin TCM is also referred to as SKE (Standard Shell Construction). The SKE housing uses 5 separate connectors. On transmission applications only three connectors (1, 3 and 4) are used. Connectors 2 and 5 are blank and are NOT used. The connectors are Blue in color to avoid confusion with the ECM (DME) connectors which are Black. See Fig. 47.

Fig. 47: Identifying Transmission Control Modules & Connectors

Courtesy of BMW OF NORTH AMERICA, INC.

Article GUID: A00169238

2001-02 AUTOMATIC TRANSMISSION

Removal & Installation - Z3 (A5S 360R/390R)

IDENTIFICATION

NOTE: For more information, see <u>AUTOMATIC TRANSMISSION</u> article.

VEHICLE IDENTIFICATION

| Model (Chassis Code) | Engine Size (Code | |
|----------------------|-------------------|--|
| 2001-2002 | | |
| Z3 (E36) | 2.5 L (M54) | |
| Z3 (E36) | 3.0 (M54) | |

REMOVAL & INSTALLATION

CAUTION:

Disconnecting vehicle battery will cancel fault codes of control units. On vehicles with radio codes, after disconnecting battery, radio codes must be reentered. Obtain radio code card from customer. Note stored stations and restore then after connecting battery. Also, where applicable, initialize sunroof and set steering angle.

CAUTION:

Use only the approved transmission fluid in this automatic transmission. Failure to comply with this requirement will result in serious damage to the automatic transmission. For more information, see $\underline{\mathsf{SERVICING-A/T}}$

REMOVAL

- 1. Disconnect battery. See INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY.
- 2. Remove intake hood (1). See Fig. 1.
- 3. Release fan cowl (1) and pull a little upwards. See Fig. 2.
- 4. Remove microfilter housing (1) and heater bulkhead behind it. See Fig. 3.
- 5. If necessary, remove reinforcement plate. Remove engine underguard (1). See Fig. 4.
- 6. Release screws. Remove front end reinforcement. See Fig. 5.
- 7. Remove complete exhaust system. See REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM (Z3 M54).
- 8. Remove first heat shield (1). See Fig. 6.
- 9. Remove second heat shield (1). See Fig. 7.
- 10. Grip clamping sleeve (1). Release nut (2). See Fig. 8.
- 11. Grip Bowden cable (1) at hexagon (2). Release nut (3). Pull cable (1) out of holder. See Fig. 9.
- 12. Support transmission with Special Tools (00 2 030 / 24 5 301 / 24 5 305). See Fig. 10.
- 13. Release screws. Remove cross-member (1). See Fig. 11.
- 14. Release screws of flexible disk-to-propeller shaft and transmission output flange. See Fig. 12.
- 15. Grip propeller shaft. Release nuts. Bend propeller shaft downwards at center bearing (1). See <u>Fig. 13</u>. Detach propeller shaft from transmission output flange and tie back to side on vehicle underbody.
- 16. Lower transmission until cylinder head touches bulkhead. Suspend Special Tool (11 8 022) from left and right control arms. See <u>Fig. 14</u>. Position special tool so that engine oil sump is securely resting on special tool. Tighten down knurled screws until special tool rests against engine oil sump.
- 17. Unlock and remove cable connector (1). Unclip cable from transmission housing. See Fig. 15.
- 18. Release screw (1). Withdraw hydraulic lines (2) to oil cooler from transmission housing. See Fig. 16.
- 19. Remove cover. See Fig. 17.

- 20. Release retaining screws of torque converter (3 x) with Special Tool (24 1 110). See Fig. 18.
- 21. Protect torque converter from slipping out. To do so, insert Special Tool (24 4 131 / 24 4 135) in opening in transmission housing. See <u>Fig. 19</u>. Clamp torque converter.
- 22. Release screws. See Fig. 20. Pull off transmission from engine towards rear and lower it.

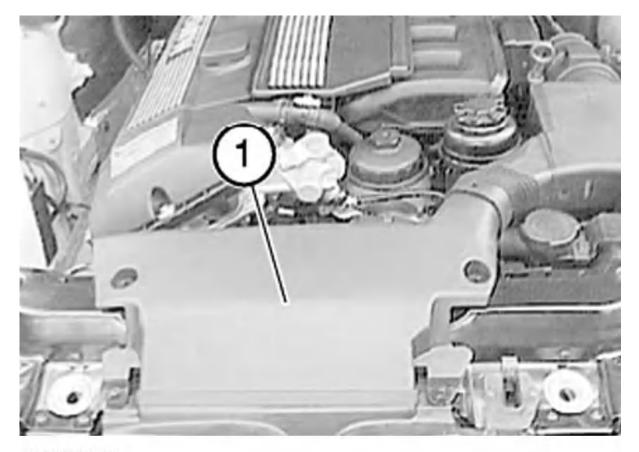


Fig. 1: Removing Intake Hood Courtesy of BMW OF NORTH AMERICA, INC.

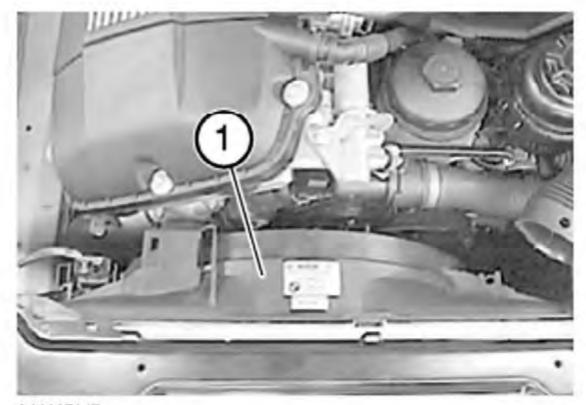


Fig. 2: Releasing Fan Cowl Courtesy of BMW OF NORTH AMERICA, INC.

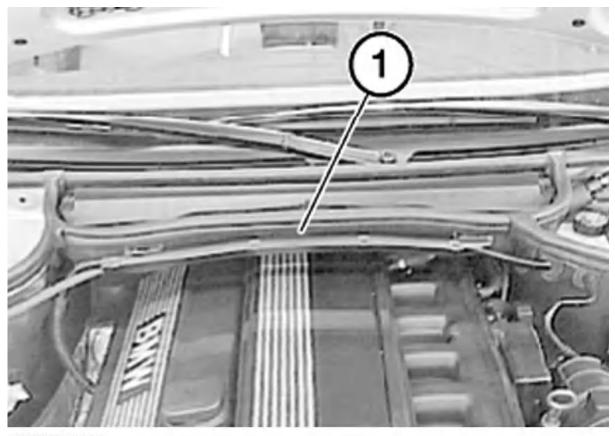


Fig. 3: Removing Microfilter housing

Courtesy of BMW OF NORTH AMERICA, INC.

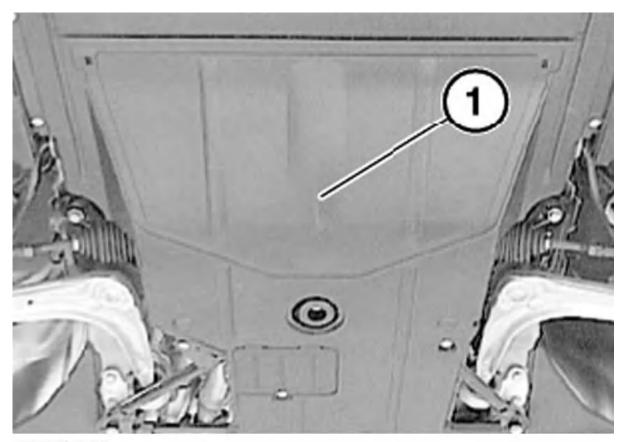


Fig. 4: Removing Engine Underguard Courtesy of BMW OF NORTH AMERICA, INC.

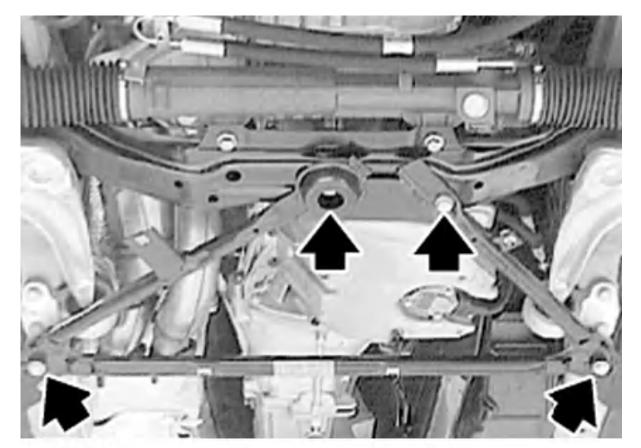


Fig. 5: Removing Front End Reinforcement Courtesy of BMW OF NORTH AMERICA, INC.

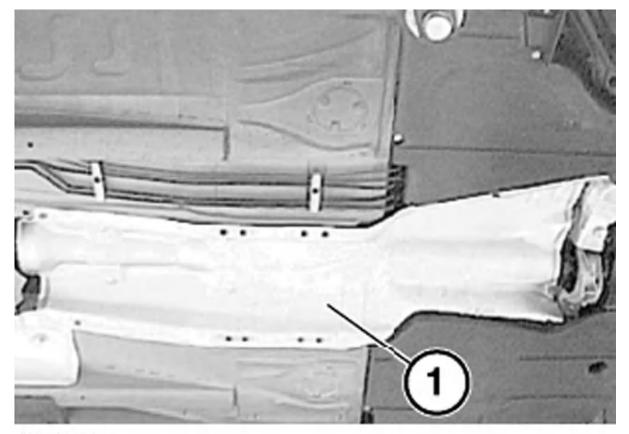


Fig. 6: Removing First Heat Shield Courtesy of BMW OF NORTH AMERICA, INC.

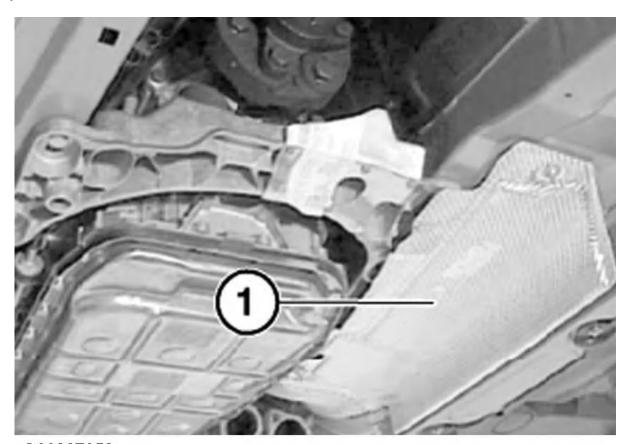


Fig. 7: Removing Second Heat Shield Courtesy of BMW OF NORTH AMERICA, INC.

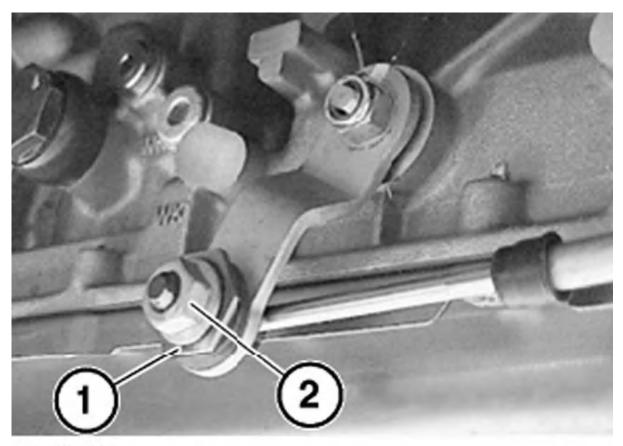


Fig. 8: Releasing Selector Lever Nut
Courtesy of BMW OF NORTH AMERICA, INC.

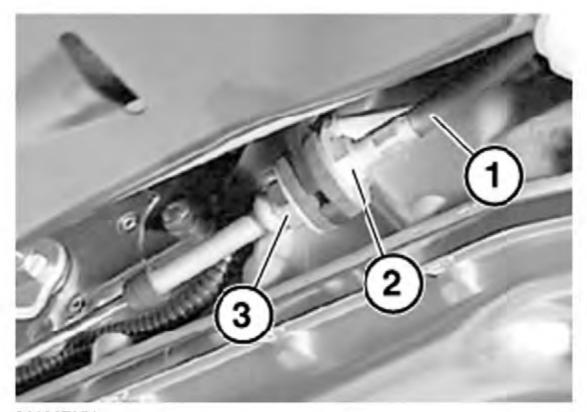


Fig. 9: Pulling Bowden Cable Out
Courtesy of BMW OF NORTH AMERICA, INC.

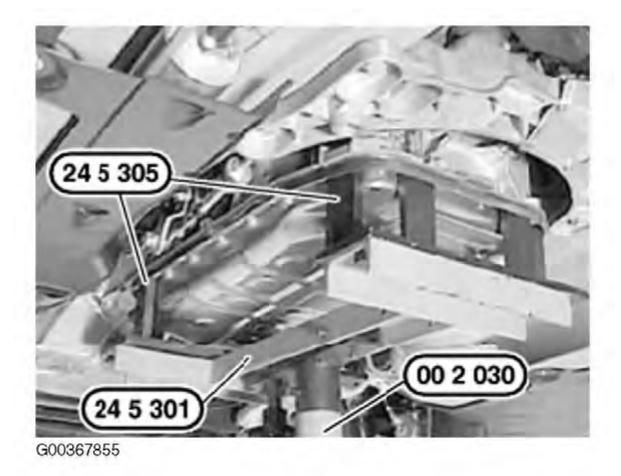
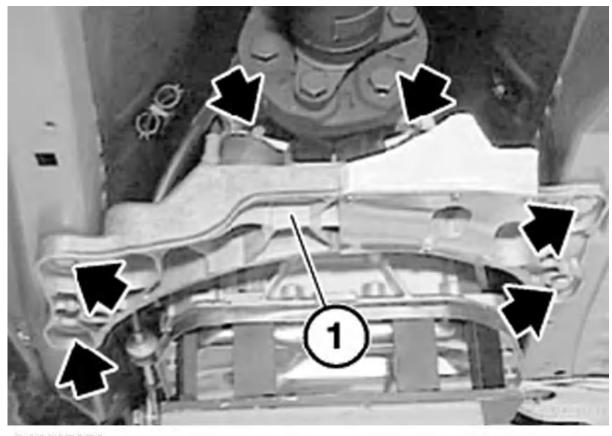


Fig. 10: Supporting Transmission
Courtesy of BMW OF NORTH AMERICA, INC.



<u>Fig. 11: Removing Cross-Member</u> Courtesy of BMW OF NORTH AMERICA, INC.

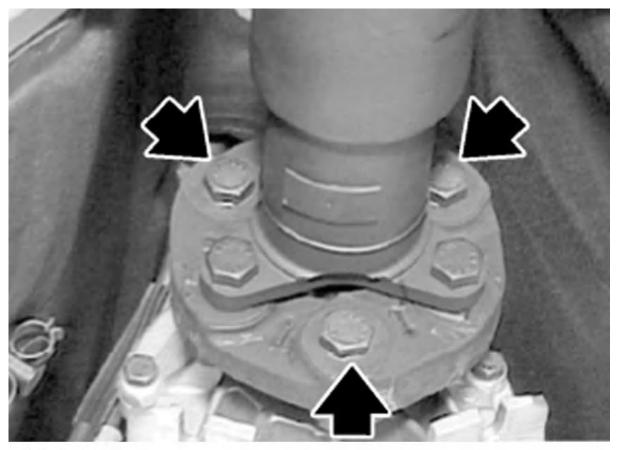


Fig. 12: Locating Flexible Disk To Propeller Shaft Screws Courtesy of BMW OF NORTH AMERICA, INC.

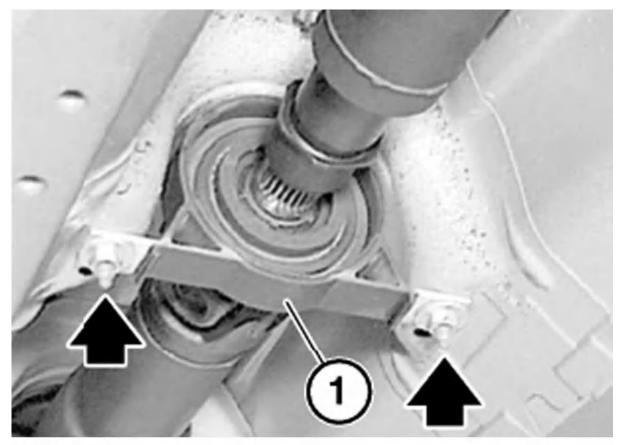


Fig. 13: Detaching Propeller Shaft From Transmission Output Flange Courtesy of BMW OF NORTH AMERICA, INC.

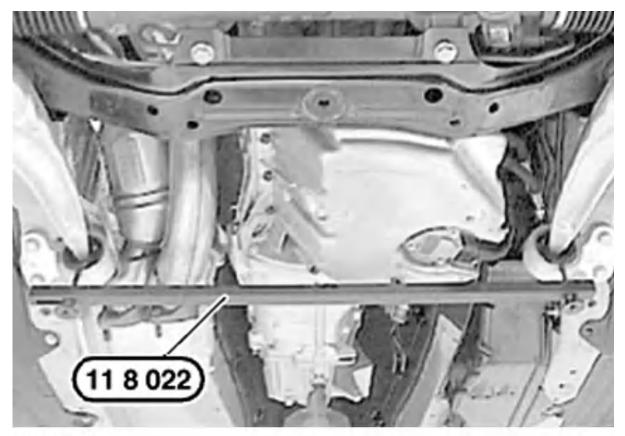
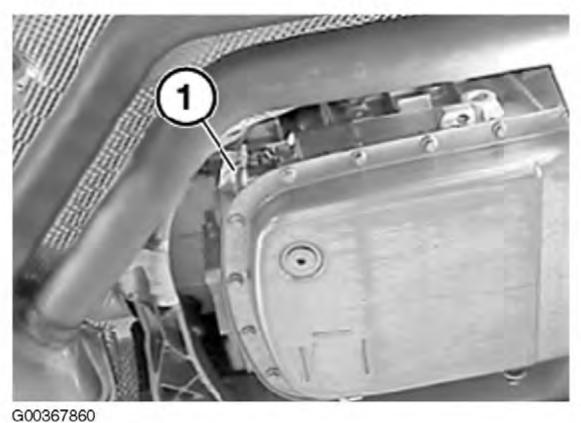
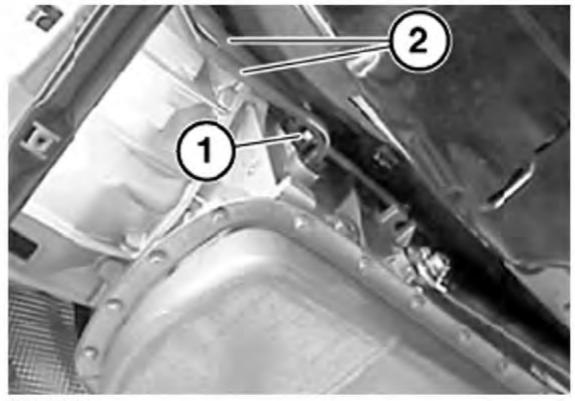


Fig. 14: Lowering Transmission
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 15: Removing Cable Connector
Courtesy of BMW OF NORTH AMERICA, INC.



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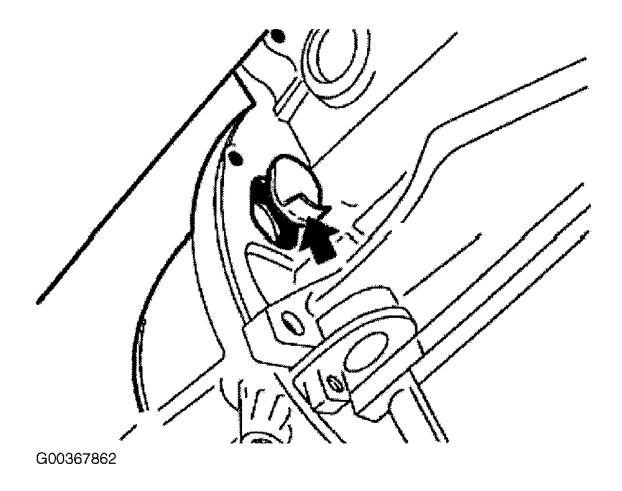


Fig. 17: Removing Cover
Courtesy of BMW OF NORTH AMERICA, INC.

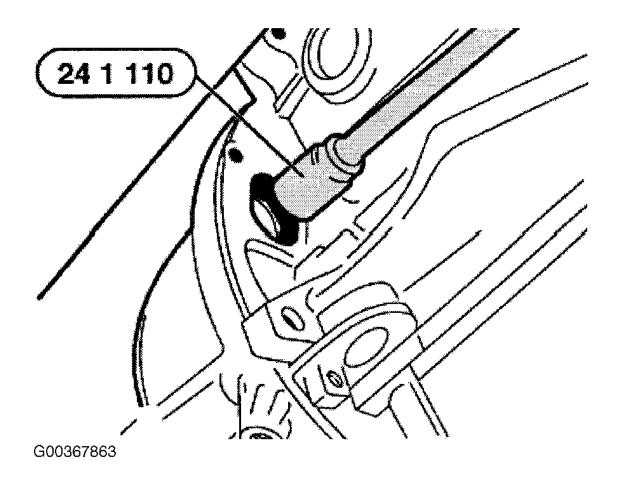


Fig. 18: Releasing Retaining Screws
Courtesy of BMW OF NORTH AMERICA, INC.

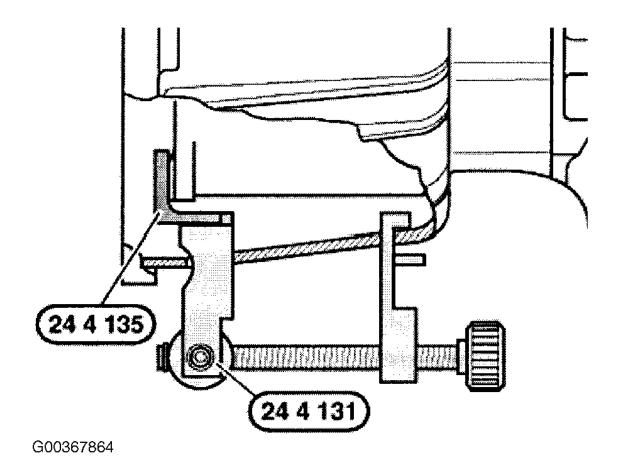


Fig. 19: Protecting Torque Converter From Slipping Out Courtesy of BMW OF NORTH AMERICA, INC.

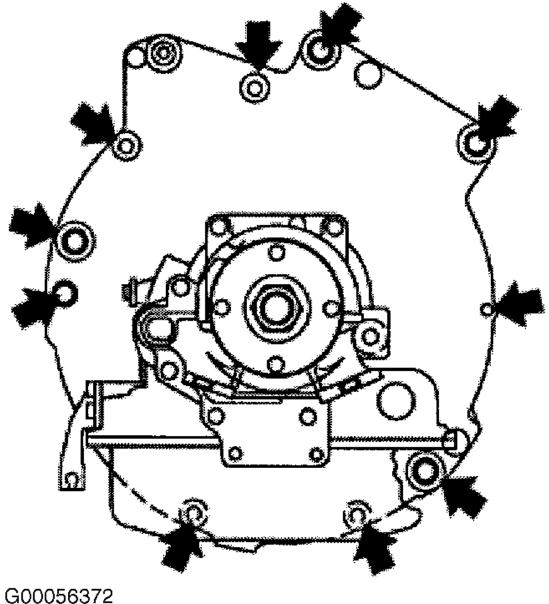


Fig. 20: Removing/Installing Transmission-To-Engine Screws Courtesy of BMW OF NORTH AMERICA, INC.

INSTALLATION

CAUTION:

When joining up engine and transmission, ensure ease of movement of torque converter.

- 1. Pay attention to adapter sleeves (1 and 2). See Fig. 21. If necessary, withdraw adapter sleeves from transmission housing. Insert new adapter sleeves into engine block.
- 2. The sheet metal flywheel is equipped with three recesses for the torque converter retaining lugs. When joining together engine and transmission, the three retaining lugs on the torque converter must be aligned with the three recesses in the sheet metal flywheel. See Fig. 22. Failure to comply with this requirement leads to secondary damage on the automatic transmission. The torque converter or engine is not able to spin and would cause damage.
- 3. Bore on driver must point to center of aperture in cover plate. See Fig. 23.

- 4. Twist torque converter on transmission until bores on lugs point to center of bore on flywheel. Screw Special Tool (24 2 300) into lug. See <u>Fig. 24</u>.
- 5. Raise automatic transmission until bore on driver is reached. Carefully insert transmission into bore on driver with Special Tool (24 2 300). See <u>Fig. 25</u>. Flange transmission housing to engine. Remove special tool 24 2 300 from lug towards front.
- 6. Pay attention to adapter sleeves (1 and 2). See Fig. 21.
- 7. Tighten transmission-to-engine screws to specification. See <u>Fig. 20</u>. See <u>TORQUE SPECIFICATIONS</u>
- 8. Use only original screws. Tighten torque converter-to-flywheel screws to specification. See <u>Fig. 18</u>. See TORQUE SPECIFICATIONS.
- 9. To complete installation, reverse removal procedure. Replace sealing rings on hydraulic lines (2) to oil cooler. See <u>Fig. 16</u>.
- 10. Pull off cover tape from butylene tape on both sides. Stick butylene tape (1) to outside of center bearing (2). See <u>Fig. 26</u>. Remove butylene tape already attached to center bearing. Clean adhesive area on center bearing and on body. Then coat adhesive area on body with mineral oil. This coating with oil is necessary to facilitate insertion of the sticky butylene tape in the propeller shaft tunnel. This prevents the butylene tape from being deformed. Press center bearing (2) into transmission tunnel. See <u>Fig. 27</u>.
- 11. Tighten nuts of center mount-to-body to specification. See $\underline{\text{Fig. }13}$. See $\underline{\text{TORQUE SPECIFICATIONS}}$.
- 12. Tighten nuts of flexible disk-to-propeller shaft and transmission output flange to specification. See <u>Fig. 12</u>. See <u>TORQUE SPECIFICATIONS</u>.
- 13. Tighten screws of cross member-to-body and rubber mounts-to-cross member or transmission to specification. See <u>Fig. 11</u>. See <u>TORQUE SPECIFICATIONS</u>.
- 14. Tighten Bowden cable on shift tower/transmission to specification. See <u>Fig. 9</u>. See <u>TORQUE</u> SPECIFICATIONS.
- 15. Check cable for ease of movement. Move selector lever to Park. Grip clamping sleeve (1). See <u>Fig. 28</u>. Slacken nut (2). Press selector lever (3) forwards into park position. Press cable (4) in direction of arrow and release again. Grip clamping sleeve (1). Tighten down nut (2) to specification. See <u>TORQUE</u> <u>SPECIFICATIONS</u>. Move selector lever to park position. Check whether parking gear is engaged by turning propeller shaft.
- 16. Tighten screws of front end reinforcement on front axle carrier/engine carrier to specification. See <u>Fig. 5</u>. See <u>TORQUE SPECIFICATIONS</u>.
- 17. If necessary, install reinforcement plate and tighten to specification. See <u>TORQUE SPECIFICATIONS</u>.
- 18. After completion of work, check transmission fluid level. Connect battery.

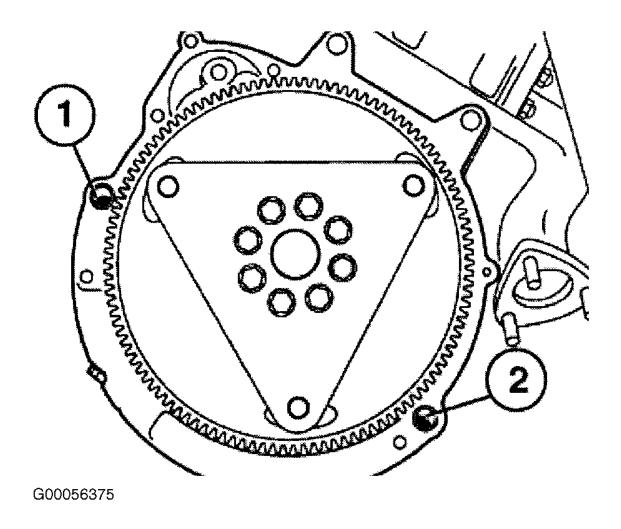


Fig. 21: Locating Adapter Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

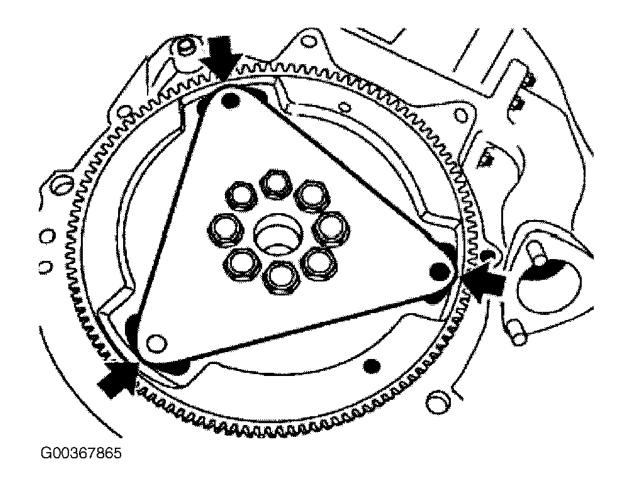


Fig. 22: Aligning Recesses In Sheet Metal Flywheel Courtesy of BMW OF NORTH AMERICA, INC.

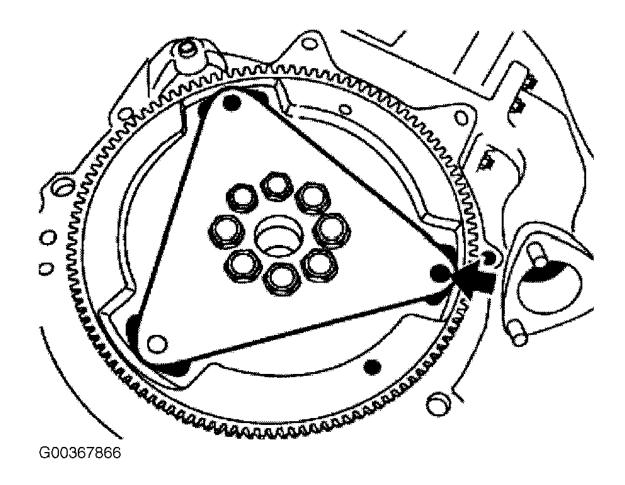


Fig. 23: Pointing Bore To Center Of Aperture In Cover Plate Courtesy of BMW OF NORTH AMERICA, INC.

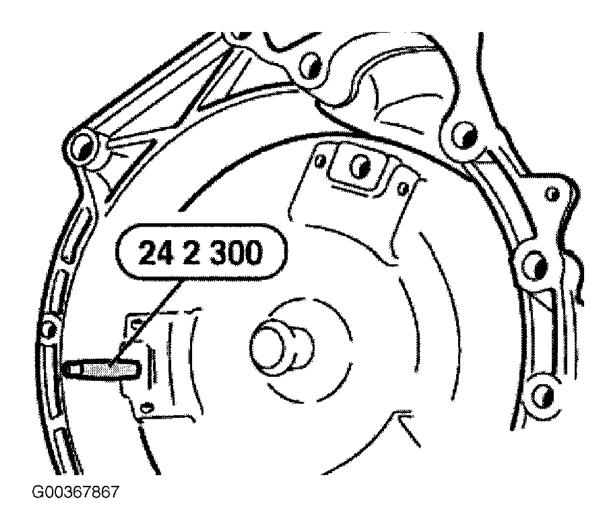


Fig. 24: Screwing Special Tool Into Lug Courtesy of BMW OF NORTH AMERICA, INC.

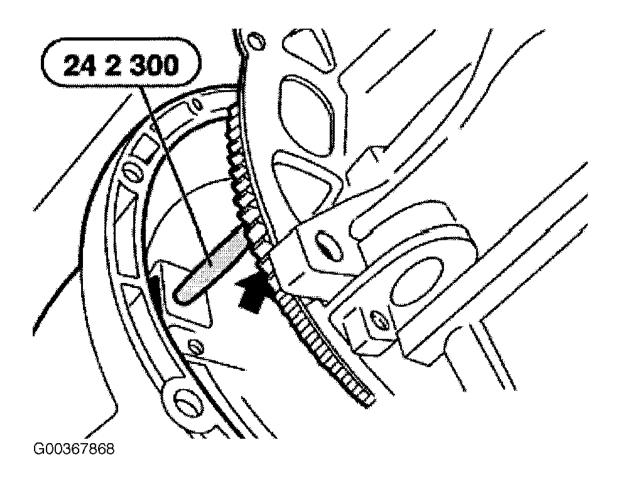


Fig. 25: Raising Automatic Transmission Courtesy of BMW OF NORTH AMERICA, INC.

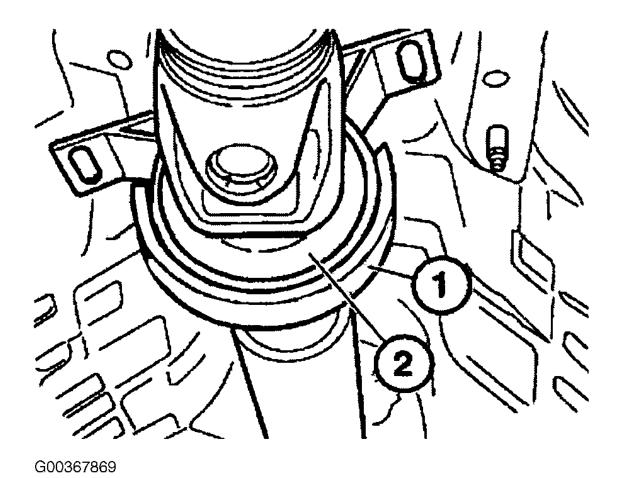


Fig. 26: Sticking Butylene Tape To Center Bearing Courtesy of BMW OF NORTH AMERICA, INC.

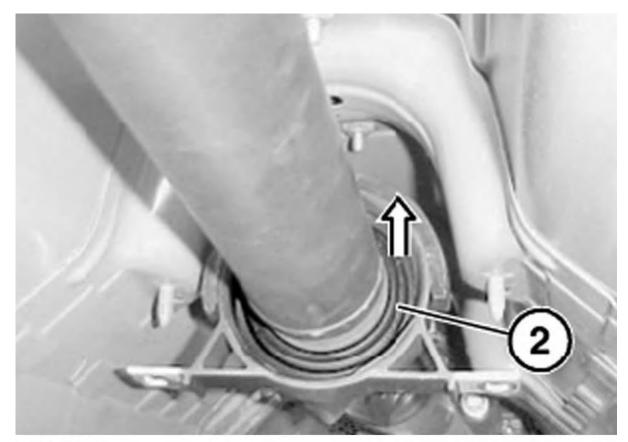


Fig. 27: Pressing Center Bearing Into Transmission Tunnel Courtesy of BMW OF NORTH AMERICA, INC.

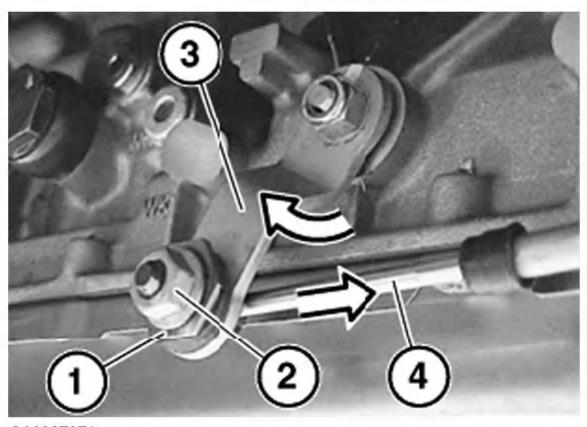


Fig. 28: Adjusting Selector Lever
Courtesy of BMW OF NORTH AMERICA, INC.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

| Application | Ft. Lbs. (N.m) |
|---|-----------------|
| Bowden Cable On Shift Tower/Transmission | 11 (15) |
| Center Mount-To-Body | 15 (21) |
| Cross Member-To-Body | 15 (21) |
| Flexible Disk-To-Propeller Shaft & Transmission Output Flange | 60 (81) |
| Front End Reinforcement On Front Axle Carrier/Engine Carrier | |
| Step 1 | 44 (59) |
| Step 2 | Additional 90Â |
| Step 3 | Additional 30Â |
| Reinforcement Plate-To-Front Axle Carrier/Engine Carrier | |
| Step 1 | 41 (56) |
| Step 2 | Additional 90Â |
| Step 3 | Additional 15Â |
| Rubber Mounts-To-Cross Member Or Transmission | 15 (21) |
| Torque Converter-To-Flywheel | 33 (45) |
| Transmission-To-Engine | • |
| Hex Screws | |
| M8 Thread | 18 (24) |
| M10 Thread | 33 (45) |
| M12 Thread | 60 (82) |
| Torx Bolts | |
| M8 Thread | 15 (21) |
| M10 Thread | 31 (42) |
| M12 Thread | 53 (72) |
| | INCH Lbs. (N.m) |
| Clamping Screw On Shift Lever | 89 (10) |

Article GUID: A00169247

1996-2004 AUTOMATIC TRANSMISSIONS

Diagnostics - BMW

DESCRIPTION & OPERATION

BMW models since 1996 are capable of setting transmission "P" diagnostic codes in addition to BMW diagnostic codes. Codes can be accessed through BMW connector or OBD-II connector.

DIAGNOSIS & TESTING

NOTE: A BMW scan tool (MoDiC, Group Tester One (GT1) or Displus) is necessary to

diagnose and test these systems.

RETRIEVING DIAGNOSTIC TROUBLE CODES

Use BMW tool (MoDiC, Group Tester One (GT1) or Displus) or generic scan tool to pull code. Connect scan tool to BMW connector or OBD-II diagnostic connector. Follow scan tool manufacturer's instructions. See <u>Fig. 1-Fig. 3</u>.

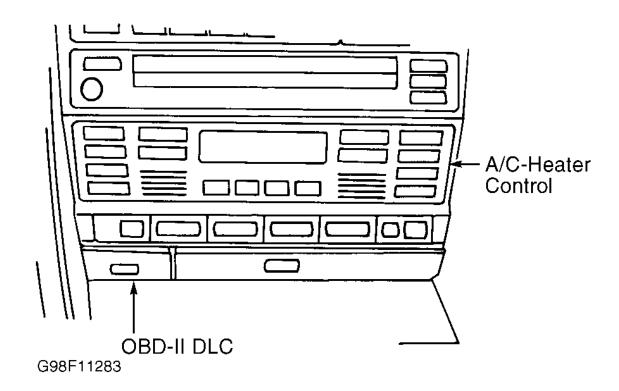


Fig. 1: Locating OBD-II Data Link Connector (1996-2001 7-Series) Courtesy of BMW OF NORTH AMERICA, INC.

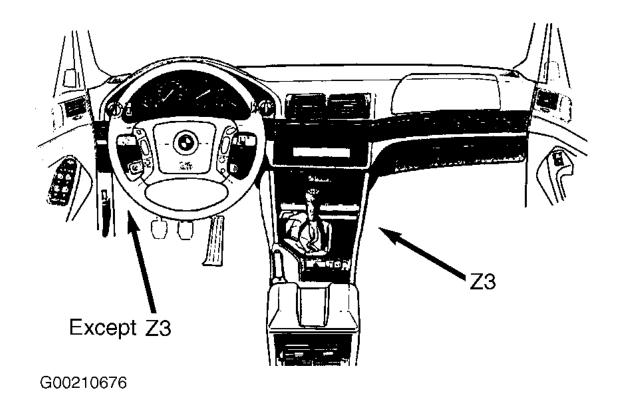


Fig. 2: Locating OBD-II Connector (All Models, Except 1996-2001 7-Series) Courtesy of BMW OF NORTH AMERICA, INC.

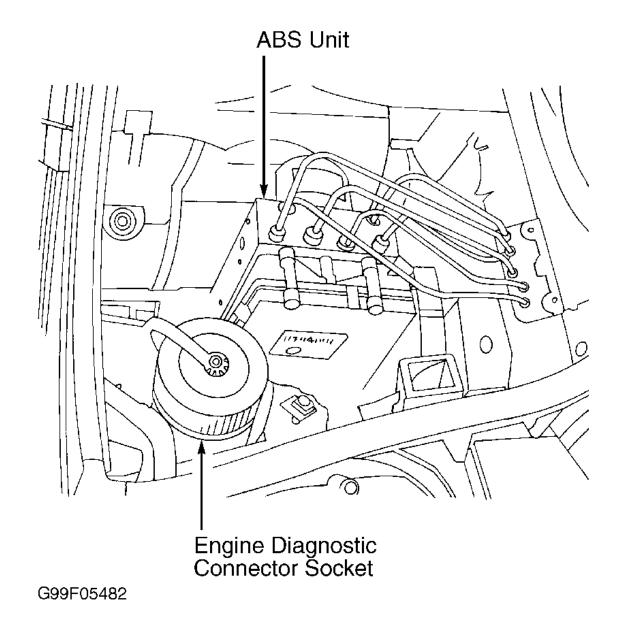


Fig. 3: Locating BMW Engine Diagnostic Connector (Typical) Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES

To identify DTCs, see <u>TABLE 1: DIAGNOSTIC TROUBLE CODE INDEX</u> table.

TABLE 1: DIAGNOSTIC TROUBLE CODE INDEX

| Application | Table |
|--|--------------------------|
| 4-Cylinder | |
| DIAGNOSTIC TROUBLE CODES Z3, 318i & 318ti (1/96-8/96). | |
| DIAGNOSTIC TROUBLE CODES Z3, 318i & 318ti (9/96-8/97). | |
| DIAGNOSTIC TROUBLE CODES Z3 (10/97-8/98), 318i (9/97-6/98) | & 318ti (9/97-6/98). |
| DIAGNOSTIC TROUBLE CODES 318ti (9/98-12/98). | |
| 6-Cylinder | |
| DIAGNOSTIC TROUBLE CODES 6-CYLINDER : M52 - 2.8L (11/9 | 9 <u>5-8/96)</u> . |
| DIAGNOSTIC TROUBLE CODES 6-CYLINDER (3-SERIES - 9/96 | -8/97) & 5-SERIES (3/96- |
| <u>8/97)</u> . | |
| | |

| DIAGNOSTIC TROUBLE CODES 6-CYLINDER (M3 - 4/96-8/97). |
|---|
| DIAGNOSTIC TROUBLE CODES 6-CYLINDER (9/97-8/98). |
| DIAGNOSTIC TROUBLE CODES 6-CYLINDER (323i, 328i & 528i - 9/98-5/99). |
| DIAGNOSTIC TROUBLE CODES 6-CYLINDER (M COUPE, M ROADSTER, M3, Z3, |
| <u>328IS, 528i - 9/98-5/99)</u> . |
| DIAGNOSTIC TROUBLE CODES 6-CYLINDER (Z3 - 6/99-5/00). |
| DIAGNOSTIC TROUBLE CODES 6-CYLINDER (323i, 328i & 528i - 6/99-8/00). |
| DIAGNOSTIC TROUBLE CODES 6-CYLINDER (4/00-9/01). |
| DIAGNOSTIC TROUBLE CODES 6-CYLINDER: ZF TRANSMISSION (9/01-8/02). |
| See DIAGNOSTIC TROUBLE CODES 6-CYLINDER: GM TRANSMISSION (9/01 TO 8/02). |
| DIAGNOSTIC TROUBLE CODES 6-CYLINDER: 5HP19 TRANSMISSION (9/02-2003). |
| DIAGNOSTIC TROUBLE CODES 6-CYLINDER: GM5 TRANSMISSION (9/02-2003). |
| DIAGNOSTIC TROUBLE CODES 6-CYLINDER: SMG TRANSMISSION (3/03-2003). |
| DIAGNOSTIC TROUBLE CODES 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION |
| <u>(2004)</u> . |
| DIAGNOSTIC TROUBLE CODES 6-CYLINDER: 5HP19 (5-SPEED) - AWD |
| TRANSMISSION (2004). |
| DIAGNOSTIC TROUBLE CODES 6-CYLINDER: 6HP19 (6-SPEED) - AWD |
| TRANSMISSION (2004). |
| <u>DIAGNOSTIC TROUBLE CODES 6-CYLINDER: NON-AWD TRANSMISSION (2004)</u> . |
| <u>DIAGNOSTIC TROUBLE CODES 6-CYLINDER: GM5 - AWD (2004)</u> . |
| <u>DIAGNOSTIC TROUBLE CODES 6-CYLINDER: SMG TRANSMISSION (2004)</u> . |
| V8 |
| DIAGNOSTIC TROUBLE CODES V8: TRANSMISSION (1/96-8/97). |
| DIAGNOSTIC TROUBLE CODES V8 TRANSMISSION (9/97-8/00). |
| DIAGNOSTIC TROUBLE CODES V8 TRANSMISSION (9/00-8/01). |
| DIAGNOSTIC TROUBLE CODES V8 TRANSMISSION (9/01-8/02). |
| DIAGNOSTIC TROUBLE CODES V8 TRANSMISSION (5-SPEED - 9/02-2003). |
| DIAGNOSTIC TROUBLE CODES V8: TRANSMISSION (SMG - 2004). |
| V8 & V12 |
| DIAGNOSTIC TROUBLE CODES V8 & V12 TRANSMISSION (6-SPEED - 2003). |
| DIAGNOSTIC TROUBLE CODES V8 & V12 TRANSMISSION (6-SPEED - 2004). |
| V12 |
| DIAGNOSTIC TROUBLE CODES V12 TRANSMISSION (1996). |
| DIAGNOSTIC TROUBLE CODES V12 TRANSMISSION (1997). |
| DIAGNOSTIC TROUBLE CODES V12 TRANSMISSION (1998-2000). |
| |

DIAGNOSTIC TROUBLE CODES Z3, 318i & 318ti (1/96-8/96)

Â

DIAGNOSTIC TROUBLE CODES Z3, 318i & 318ti (1/96-8/96)

DIAGNOSTIC TROUBLE CODES V12 TRANSMISSION (2001).

| PCode | BMW Code | Possible Problem | Diagnostic Parameters |
|-------|----------|--|--|
| P0705 | 8 | Transmission Range Sensor "A" Circuit Malfunction (PRNDL Input) | See <u>1996 4-CYLINDER</u> <u>DIAGNOSIS: Z3, 318i &</u> <u>318ti (1/96-8/96)</u> . |
| P0720 | 42 | Output Speed Sensor Circuit | See <u>1996 4-CYLINDER</u> <u>DIAGNOSIS: Z3, 318i &</u> <u>318ti (1/96-8/96)</u> . |
| P0730 | 100 | Incorrect Gear Ratio | See <u>1996 4-CYLINDER</u> <u>DIAGNOSIS: Z3, 318i &</u> <u>318ti (1/96-8/96)</u> . |

| D0740 | 111 | T C | C. 1006 A CWI INDED |
|-------|-----|---|--|
| P0740 | 111 | Torque Converter Clutch Circuit/Open | See <u>1996 4-CYLINDER</u> DIAGNOSIS: Z3, 318i & |
| | | | 318ti (1/96-8/96). |
| P0743 | 32 | Torque Converter Clutch Circuit Electrical | See 1996 4-CYLINDER |
| 10743 | 32 | Torque Converter Claten Cheun Electrical | DIAGNOSIS: Z3, 318i & |
| | | | 318ti (1/96-8/96). |
| P0748 | 5 | Pressure Control Solenoid "A" Electrical | See 1996 4-CYLINDER |
| | | | DIAGNOSIS: Z3, 318i & |
| | | | 318ti (1/96-8/96). |
| P0753 | 30 | Shift Solenoid "A" Electrical | See <u>1996 4-CYLINDER</u> |
| | | | DIAGNOSIS: Z3, 318i & |
| D0750 | 22 | G1'6 G 1 '1 D E1 1 | 318ti (1/96-8/96). |
| P0758 | 33 | Shift Solenoid "B" Electrical | See <u>1996 4-CYLINDER</u> DIAGNOSIS: Z3, 318i & |
| | | | 318ti (1/96-8/96). |
| P1743 | 4 | Pressure Control Solenoid "E" Electrical | See <u>1996 4-CYLINDER</u> |
| 11713 | ' | (M44/M52: Brake Band Electrical) | DIAGNOSIS: Z3, 318i & |
| | | , | 318ti (1/96-8/96). |
| P1746 | 104 | Transmission Control Module Output Stage | See 1996 4-CYLINDER |
| | | | DIAGNOSIS: Z3, 318i & |
| | | | 318ti (1/96-8/96). |
| P1747 | 150 | CAN-Bus Monitoring | See <u>1996 4-CYLINDER</u> |
| | | | <u>DIAGNOSIS: Z3, 318i & 318ti (1/96-8/96)</u> . |
| P1747 | 151 | CAN-Bus Monitoring | See 1996 4-CYLINDER |
| F1/4/ | 131 | CAN-Bus Monitoring | DIAGNOSIS: Z3, 318i & |
| | | | 318ti (1/96-8/96). |
| P1747 | 156 | CAN-Bus Monitoring | See 1996 4-CYLINDER |
| | | | DIAGNOSIS: Z3, 318i & |
| | | | 318ti (1/96-8/96). |
| P1748 | 103 | Transmission Control Module Self-Test | See <u>1996 4-CYLINDER</u> |
| | | | DIAGNOSIS: Z3, 318i & |
| D1740 | 105 | To a source of the Control Montrol Colf To at | 318ti (1/96-8/96). |
| P1748 | 105 | Transmission Control Module Self-Test | See <u>1996 4-CYLINDER</u> DIAGNOSIS: Z3, 318i & |
| | | | 318ti (1/96-8/96). |
| P1748 | 110 | Transmission Control Module Self-Test | See 1996 4-CYLINDER |
| | | | DIAGNOSIS: Z3, 318i & |
| | | | 318ti (1/96-8/96). |
| P1749 | 108 | Secondary Pressure Solenoid | No Diagnosis Available |
| | | Communication Error (M52: Internal | |
| | | Transmission Control Module Memory Error) | |
| P1750 | 54 | Secondary Pressure Solenoid Circuit | No Diagnosis Available |
| 11750 | | Range/Performance | 140 Diagnosis Avanable |
| | | (M44/M52/S52/M62/M73: System Voltage | |
| | | Input Low) | |
| P1761 | 2 | Shiftlock Solenoid | No Diagnosis Available |
| P1765 | 154 | CAN Throttle Valve | No Diagnosis Available |
| P1765 | 158 | CAN Throttle Valve | No Diagnosis Available |
| P1780 | 152 | CAN Torque Reduction | No Diagnosis Available |
| P1780 | 163 | CAN Torque Reduction | No Diagnosis Available |

| | _ | DOING. | Description Criteria value Parameter |
|-------------------------|---|--|---|
| signal | no signal/multiple signal | voltage no signat/multiple signal for P and N | circuit continuity voltage no signal/multiple signal for P and N |
| peeds Ind | speed is calculated> [output speed i | ved, therefore input speed is calculated> [output speed r | no input speed sensor involved, therefore input speed is calculated> (output speed multiplied by gear ratios) |
| | d no signal | | |
| er 1) er 2) er 3) | output > 320 rpm (gear 1) > 480 rpm (gear 2) > 736 rpm (gear 3) > 992 rpm (gear 4) | actual - cakoulated output > 320 rpm (gear 1) | |
| | | voltage | |
| _ | ip > 288 rpm | calculated slip > 288 rpm | |
| | | voltage | circuit continuity voltage |
| | | voltage | circuit continuity voltage |
| | | - abettov | circuit continuity voltage |
| | V 6 > 801 | battery voltage < 9 V | |
| E SE | me out > 500 ms check Invalid check-sum on delay time | CAN massages/lime out. > 500 ms RAM and ROM check.sum watchdog on timing (response) delay time | |

Fig. 4: 1996 4-Cylinder Diagnosis: Z3, 318i & 318ti (1/96-8/96) Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES Z3, 318i & 318ti (9/96-8/97)

DIAGNOSTIC TROUBLE CODES Z3, 318i & 318ti (9/96-8/97)

| BILITOTICOSTIC | TROODED COL | 25, 5101 & 510th (5750 6757) | |
|----------------|-------------|---|---|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
| P0705 | 8 | Transmission Range Sensor "A" Circuit Malfunction (PRNDL Input) | See <u>1997 4-CYLINDER</u> <u>DIAGNOSIS: Z3, 318i & 318ti (9/96-8/97)</u> . |
| P0720 | 42 | Output Speed Sensor Circuit | See 1997 4-CYLINDER DIAGNOSIS: Z3, 318i & |

| P0731 10 P0732 | 0 | Gear 1 Incorrect Ratio | 0 1007 4 037 1375 |
|----------------|----|---|--|
| D0722 | | Gear 1 meditect Ratio | See <u>1997 4-CYLINDER</u> <u>DIAGNOSIS: Z3, 318i & 318ti (9/96-8/97).</u> |
| | •• | Gear 2 Incorrect Ratio | See <u>1997 4-CYLINDER</u> <u>DIAGNOSIS: Z3, 318i &</u> <u>318ti (9/96-8/97)</u> . |
| P0733 | •• | Gear 3 Incorrect Ratio | See <u>1997 4-CYLINDER</u> <u>DIAGNOSIS: Z3, 318i &</u> <u>318ti (9/96-8/97).</u> |
| P0734 | | Gear 4 Incorrect Ratio | See <u>1997 4-CYLINDER</u> <u>DIAGNOSIS: Z3, 318i &</u> <u>318ti (9/96-8/97).</u> |
| P0740 11 | 1 | Torque Converter Clutch Circuit/Open | See <u>1997 4-CYLINDER</u> <u>DIAGNOSIS: Z3, 318i &</u> <u>318ti (9/96-8/97).</u> |
| P0743 3 | 2 | Torque Converter Clutch Circuit Electrical | ` / |
| P0748 5 | | Pressure Control Solenoid "A" Electrical | See <u>1997 4-CYLINDER</u> <u>DIAGNOSIS: Z3, 318i &</u> <u>318ti (9/96-8/97)</u> . |
| P0753 3 |) | Shift Solenoid "A" Electrical | See <u>1997 4-CYLINDER</u> <u>DIAGNOSIS: Z3, 318i &</u> <u>318ti (9/96-8/97).</u> |
| P0758 3 | 3 | Shift Solenoid "B" Electrical | See <u>1997 4-CYLINDER</u> <u>DIAGNOSIS: Z3, 318i &</u> <u>318ti (9/96-8/97)</u> . |
| P1743 | | Pressure Control Solenoid "E" Electrical (M44/M52: Brake Band Electrical) | See <u>1997 4-CYLINDER</u> <u>DIAGNOSIS: Z3, 318i &</u> <u>318ti (9/96-8/97)</u> . |
| P1746 10 | 4 | Transmission Control Module Output Stage | See <u>1997 4-CYLINDER</u> <u>DIAGNOSIS: Z3, 318i &</u> <u>318ti (9/96-8/97).</u> |
| P1747 15 | 0 | CAN-Bus Monitoring | See <u>1997 4-CYLINDER</u> <u>DIAGNOSIS: Z3, 318i &</u> <u>318ti (9/96-8/97).</u> |
| P1747 15 | 1 | CAN-Bus Monitoring | See <u>1997 4-CYLINDER</u> <u>DIAGNOSIS: Z3, 318i &</u> <u>318ti (9/96-8/97).</u> |
| P1747 15 | 6 | CAN-Bus Monitoring | See <u>1997 4-CYLINDER</u> <u>DIAGNOSIS: Z3, 318i &</u> <u>318ti (9/96-8/97).</u> |
| P1748 10 |)3 | Transmission Control Module Self-Test | See 1997 4-CYLINDER DIAGNOSIS: Z3, 318i & 318ti (9/96-8/97). |
| P1748 10 | 5 | Transmission Control Module Self-Test | See 1997 4-CYLINDER DIAGNOSIS: Z3, 318i & 318ti (9/96-8/97). |
| P1748 11 | 0 | Transmission Control Module Self-Test | See <u>1997 4-CYLINDER</u> <u>DIAGNOSIS: Z3, 318i &</u> <u>318ti (9/96-8/97)</u> . |
| P1749 10 | 8 | Secondary Pressure Solenoid Communication Error (M52: Internal | No Diagnosis Available |

| | | Transmission Control Module Memory Error) | |
|-------|-----|---|------------------------|
| P1750 | 54 | Secondary Pressure Solenoid Circuit Range/Performance (M44/M52/S52/M62/M73: System Voltage Input Low) | No Diagnosis Available |
| P1761 | 2 | Shiftlock Solenoid | No Diagnosis Available |
| P1765 | 154 | CAN Throttle Valve | No Diagnosis Available |
| P1765 | 158 | CAN Throttle Valve | No Diagnosis Available |
| P1780 | 152 | CAN Torque Reduction | No Diagnosis Available |
| P1780 | 163 | CAN Torque Reduction | No Diagnosis Available |

1997 4-Cylinder Diagnosis: Z3, 318i & 318ti (9/96-8/97)

| tary Enable/Disable Time Mil. | 200 - 440 rpm on | | gear 1, 2, 3 or 4 500 msec/ hwo driving | > 3000 rpm 2.5 sec/ IN | 100 msec/ confinuous two driving | 3 or 4 2,5 sec/ | 200 msec/ two driving continuous cycles | ž | 100 msec/ two driving confinuous cycles | > 1500 rpm | immediately/cont. two driving at power up 90 sec. cycles |
|---------------------------------|--|---|---|--|-------------------------------------|------------------|---|--------------------|---|-----------------|--|
| Secondary | peeds euifiue | multiplied by | selected gear engine speed | peeds euigue | | selected gear | | | | peeds eußue | |
| Threshold | no signaVmutiple signal | calculated> (output speed | no signal | > 320 rpm (gear 1) > 480 rpm (gear 2) > 736 rpm (gear 3) > 992 rpm (gear 4) | | > 288 rpm | | | | > 6 v | > 500 ms invalid check-sum |
| Malfunction | voltage unvalid code for P and N | no input speed sensor involved, therefore input speed is calculated> (output speed multiplied by gear ratios) | belibut speed | actual - calculated output gear ratio | voltage | calculated slip | voltage | voltage | voltage | battery voltage | CAN massages/lime out RAM and ROM check |
| Monitor Strategy Description | citcuit conlinuity rationality | no Input speed sensor invol | rationality | rationality | circuit continuity | functional check | circuit continuity | circuit continuity | circuit continuity | rationality | bus chack self check |
| Fault | P0705 | | P0720 | P0731 P0732 P0733 P0734 | P0743 | P0740 | P0748 | P0753 | P1743 | P1746 | P1747 |
| Component/ System | A/T Range Switch | peeds Indul | Output Speed | Gear Ratio | Torque Converter | | Pressure Control Solenoid | Shift Solenoid A | Force Motor/Pressure Control Valve | Power Supply | Transmission Control Modul |

Fig. 5: 1997 4-Cylinder Diagnosis: Z3, 318i & 318ti (9/96-8/97) Courtesy of BMW OF NORTH AMERICA, INC.

TABLE 3: Z3 (10/97-8/98), 318i (9/97-6/98) & 318ti (9/97-6/98)

TABLE 3: Z3 (10/97-8/98), 318i (9/97-6/98) & 318ti (9/97-6/98)

| | (| 2.3.1 0.30) 00 0 1001 (3.3.1 0.30) | |
|-------|----------|---|---|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
| P0705 | 8 | Transmission Range Sensor "A" Circuit Malfunction (PRNDL Input) | See <u>1998 4-CYLINDER</u> DIAGNOSIS: Z3 (10/97- |
| | | manufaction (11th 32 mput) | 8/98), 318i (9/97-6/98) & 318ti (9/97-6/98). |
| P0720 | 42 | Output Speed Sensor Circuit | See 1998 4-CYLINDER |

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| ı | ı | 1 | DIAGNOSIS: Z3 (10/97- |
|---------|-----|--|---|
| | | | 8/98), 318i (9/97-6/98) & |
| | | | 318ti (9/97-6/98). |
| P0731 | 100 | Gear 1 Incorrect Ratio | See 1998 4-CYLINDER |
| 10731 | 100 | Timestreet reads | DIAGNOSIS: Z3 (10/97- |
| | | | 8/98), 318i (9/97-6/98) & |
| | | | 318ti (9/97-6/98). |
| P0732 | | Gear 2 Incorrect Ratio | See 1998 4-CYLINDER |
| | | | DIAGNOSIS: Z3 (10/97- |
| | | | 8/98), 318i (9/97-6/98) & |
| | | | 318ti (9/97-6/98). |
| P0733 | | Gear 3 Incorrect Ratio | See 1998 4-CYLINDER |
| | | | DIAGNOSIS: Z3 (10/97- |
| | | | 8/98), 318i (9/97-6/98) & |
| | | | 318ti (9/97-6/98). |
| P0734 | | Gear 4 Incorrect Ratio | See <u>1998 4-CYLINDER</u> |
| | | | DIAGNOSIS: Z3 (10/97- |
| | | | 8/98), 318i (9/97-6/98) & |
| | | | 318ti (9/97-6/98). |
| P0740 | 111 | Torque Converter Clutch Circuit/Open | See <u>1998 4-CYLINDER</u> |
| | | | DIAGNOSIS: Z3 (10/97- |
| | | | 8/98), 318i (9/97-6/98) & |
| | | | 318ti (9/97-6/98). |
| P0743 | 32 | Torque Converter Clutch Circuit Electrical | |
| | | | DIAGNOSIS: Z3 (10/97- |
| | | | 8/98), 318i (9/97-6/98) & |
| | _ | | 318ti (9/97-6/98). |
| P0748 | 5 | Pressure Control Solenoid "A" Electrical | See <u>1998 4-CYLINDER</u> |
| | | | DIAGNOSIS: Z3 (10/97- |
| | | | 8/98), 318i (9/97-6/98) & |
| D0552 | 20 | G110 G 1 1114 H F1 1 1 | 318ti (9/97-6/98). |
| P0753 | 30 | Shift Solenoid "A" Electrical | See <u>1998 4-CYLINDER</u> |
| | | | DIAGNOSIS: Z3 (10/97- |
| | | | 8/98), 318i (9/97-6/98) & 318ti (9/97-6/98). |
| P0758 | 33 | Shift Solenoid "B" Electrical | · / |
| P0/38 | 33 | Sniit Solenoid "B" Electrical | See <u>1998 4-CYLINDER</u> DIAGNOSIS: Z3 (10/97- |
| | | | 8/98), 318i (9/97-6/98) & |
| | | | 318ti (9/97-6/98). |
| P1743 | 4 | Pressure Control Solenoid "E" Electrical | See 1998 4-CYLINDER |
| 11/43 | | (M44/M52: Brake Band Electrical) | DIAGNOSIS: Z3 (10/97- |
| | | (1411)/1432. Brake Band Electrical) | 8/98), 318i (9/97-6/98) & |
| | | | 318ti (9/97-6/98). |
| P1746 | 104 | Transmission Control Module Output | See 1998 4-CYLINDER |
| 11740 | 104 | Stage | DIAGNOSIS: Z3 (10/97- |
| | | | 8/98), 318i (9/97-6/98) & |
| | | | 318ti (9/97-6/98). |
| P1747 | 150 | CAN-Bus Monitoring | See 1998 4-CYLINDER |
| [/ . / | | 2121 200 Homoning | DIAGNOSIS: Z3 (10/97- |
| | | | 8/98), 318i (9/97-6/98) & |
| | | | 318ti (9/97-6/98). |
| P1747 | 151 | CAN-Bus Monitoring | See 1998 4-CYLINDER |
| | | | DIAGNOSIS: Z3 (10/97- |
| | | | 8/98), 318i (9/97-6/98) & |
| | | | 318ti (9/97-6/98). |
| | | | |
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| P1747 | 156 | CAN-Bus Monitoring | See 1998 4-CYLINDER |
|-------|-----|---------------------------------------|------------------------------|
| | 150 | Crit's Bus Weintering | DIAGNOSIS: Z3 (10/97- |
| | | | 8/98), 318i (9/97-6/98) & |
| | | | 318ti (9/97-6/98). |
| P1748 | 103 | Transmission Control Module Self-Test | See 1998 4-CYLINDER |
| | | | DIAGNOSIS: Z3 (10/97- |
| | | | 8/98), 318i (9/97-6/98) & |
| | | | 318ti (9/97-6/98). |
| P1748 | 105 | Transmission Control Module Self-Test | See 1998 4-CYLINDER |
| | | | DIAGNOSIS: Z3 (10/97- |
| | | | 8/98), 318i (9/97-6/98) & |
| | | | 318ti (9/97-6/98). |
| P1748 | 110 | Transmission Control Module Self-Test | No Diagnosis Available |
| P1749 | 108 | Secondary Pressure Solenoid | No Diagnosis Available |
| | | Communication Error (M52: Internal | _ |
| | | Transmission Control Module Memory | |
| | | Error) | |
| P1750 | 54 | Secondary Pressure Solenoid Circuit | No Diagnosis Available |
| | | Range/Performance | _ |
| | | (M44/M52/S52/M62/M73: System | |
| | | Voltage Input Low) | |
| P1761 | 2 | Shiftlock Solenoid | No Diagnosis Available |
| P1765 | 154 | CAN Throttle Valve | No Diagnosis Available |
| P1765 | 158 | CAN Throttle Valve | No Diagnosis Available |
| P1780 | 152 | CAN Torque Reduction | No Diagnosis Available |
| P1780 | 163 | CAN Torque Reduction | No Diagnosis Available |

1998 4-Cylinder Diagnosis: Z3 (10/97-8/98), 318i (9/97-6/98) & 318ti (9/97-6/98)

| MIL. | two driving cycles | | two driving cycles | two driving cycles | two driving | cycles | two driving cycles | two driving cycles | two driving cycles | two driving cycles | two driving cycles |
|---------------------------------|--|---|-------------------------------|--|----------------------------|------------------------|------------------------------|-------------------------|---------------------------------------|-------------------------|--|
| Time | 200 msec/ once per engine start up | | 500 msec/ continuous | 2,5 sec/ continuous | 100 msec/ continuous | 2,5 sec/ continuous | 200 msec/ continuous | 100 msec/ continuous | 100 msec/ continuous | 300 msec/ continuous | immediately/cont. two driving 90 sec. cycles 100 msec/once after system start |
| Enable | 200 - 440 rpm | [so | 1, 2, 3 or 4 > 3000 rpm | - 3000 rpm | | 3 or 4 | | | | > 1500 rpm | al power up |
| Secondary | peads audine | multiplied by gear rati | selected gear engine speed | engine speed | | selected gear | | | | peeds euglie | |
| Threshold | no signa/multiple signal | calculated> foutput speed | no signal | > 320 rpm (gear 1) > 480 rpm (gear 2) > 736 rpm (gear 3) > 892 rpm (gear 4) | | > 288 rpm | | | | 76> | > 500 ms invalid check-sum delay time |
| Malfunction Criteria | voltage unvalid code for P and N | no input speed sensor involved, therefore input speed is calculated> (output speed multiplied by geer ratios) | pads indino | actual - calculated output gear ratio | ogellov | calculated slip | voltage | voltage | voltage | battery voltage | CAN massages/time out RAM and ROM check timing (response) |
| Monitor Strategy Description | circuit continuity rationality | o input speed sensor invol | rationality | rationality | circuit continuity | functional check | circuit continuity | circuit continuity | circuit continuity | rationality | bus check self check (watchdog) functional check |
| Fault | Po705 | ĭ | P0720 | P0731 P0732 P0733 | P0743 | P0740 | P0748 | P0753 | P1743 | P1746 | P1747 P1748 P1746 |
| Component | A/T Range Switch | Input Speed | Output Speed | Gear Ratio | Torque Converter Clutch | | Pressure Control Solenoid | Shift Solenoid A | Force Motor/Pressure Control Valve | Power Supply | Transmission Control Modul (TCM) Relay |

Fig. 6: 1998 4-Cylinder Diagnosis: Z3 (10/97-8/98), 318i (9/97-6/98) & 318ti (9/97-6/98) Courtesy of BMW OF NORTH AMERICA, INC.

TABLE 4: DIAGNOSTIC TROUBLE CODES 318ti (9/98-12/98)

TABLE 4: DIAGNOSTIC TROUBLE CODES 318ti (9/98-12/98)

| TIBLE WENTERVESTIE THE OBER CORES STON (5750 12750) | | | | | | | |
|---|----------|---|--|--|--|--|--|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters | | | | |
| P0705 | 8 | Transmission Range Sensor "A" Circuit Malfunction (PRNDL Input) | See <u>1999 4-CYLINDER</u> <u>DIAGNOSIS: 318ti</u> <u>(9/98-12/98)</u> . | | | | |
| P0720 | 42 | Output Speed Sensor Circuit | See 1999 4-CYLINDER DIAGNOSIS: 318ti | | | | |

| | 1 | | <u>(9/98-12/98)</u> . |
|-------|-------|--|---|
| P0731 | 100 | Gear 1 Incorrect Ratio | See 1999 4-CYLINDER |
| | | | DIAGNOSIS: 318ti |
| | | | <u>(9/98-12/98)</u> . |
| P0732 | | Gear 2 Incorrect Ratio | See <u>1999 4-CYLINDER</u> |
| | | | DIAGNOSIS: 318ti |
| | | | <u>(9/98-12/98)</u> . |
| P0733 | •••• | Gear 3 Incorrect Ratio | See <u>1999 4-CYLINDER</u> |
| | | | DIAGNOSIS: 318ti |
| | | | <u>(9/98-12/98)</u> . |
| P0734 | | Gear 4 Incorrect Ratio | See <u>1999 4-CYLINDER</u> |
| | | | DIAGNOSIS: 318ti |
| | | | <u>(9/98-12/98)</u> . |
| P0740 | 111 | Torque Converter Clutch Circuit/Open | See <u>1999 4-CYLINDER</u> |
| | | | DIAGNOSIS: 318ti |
| | | | <u>(9/98-12/98)</u> . |
| P0743 | 32 | Torque Converter Clutch Circuit Electrical | See <u>1999 4-CYLINDER</u> |
| | | | DIAGNOSIS: 318ti |
| | | | <u>(9/98-12/98)</u> . |
| P0748 | 5 | Pressure Control Solenoid "A" Electrical | See 1999 4-CYLINDER |
| | | | DIAGNOSIS: 318ti |
| | | | <u>(9/98-12/98)</u> . |
| P0753 | 30 | Shift Solenoid "A" Electrical | See 1999 4-CYLINDER |
| | | | DIAGNOSIS: 318ti |
| | | | <u>(9/98-12/98)</u> . |
| P0758 | 33 | Shift Solenoid "B" Electrical | See 1999 4-CYLINDER |
| | | | <u>DIAGNOSIS: 318ti</u> |
| | | | <u>(9/98-12/98)</u> . |
| P1743 | 4 | Pressure Control Solenoid "E" Electrical | See 1999 4-CYLINDER |
| | | (M44/M52: Brake Band Electrical) | <u>DIAGNOSIS: 318ti</u> |
| D1546 | 104 | T | (9/98-12/98). |
| P1746 | 104 | Transmission Control Module Output Stage | See 1999 4-CYLINDER |
| | | | DIAGNOSIS: 318ti |
| D1747 | 1.50 | CAN D. M. S. S. | (9/98-12/98). |
| P1747 | 150 | CAN-Bus Monitoring | See 1999 4-CYLINDER |
| | | | <u>DIAGNOSIS: 318ti</u> |
| D1747 | 1.5.1 | CAND M '4 ' | (9/98-12/98). |
| P1747 | 151 | CAN-Bus Monitoring | See <u>1999 4-CYLINDER</u> |
| | | | <u>DIAGNOSIS: 318ti</u> (9/98-12/98). |
| D1747 | 15.6 | CAN Described | |
| P1747 | 156 | CAN-Bus Monitoring | See <u>1999 4-CYLINDER</u> <u>DIAGNOSIS: 318ti</u> |
| | | | <u>(9/98-12/98)</u> . |
| P1748 | 103 | Transmission Control Module Self-Test | ` ′ |
| P1/48 | 103 | Transmission Control Module Self-Test | See <u>1999 4-CYLINDER</u> DIAGNOSIS: 318ti |
| | | | (9/98-12/98). |
| P1748 | 105 | Transmission Control Module Self-Test | See 1999 4-CYLINDER |
| 11/40 | 103 | Transmission Control Wiodule Sen-Test | DIAGNOSIS: 318ti |
| | | | (9/98-12/98). |
| P1748 | 110 | Transmission Control Module Self-Test | See 1999 4-CYLINDER |
| 11/70 | 110 | Transmission Condo Wiodule Sen-Test | DIAGNOSIS: 318ti |
| | | | (9/98-12/98). |
| P1749 | 108 | Secondary Pressure Solenoid | No Diagnosis Available |
| 1 | 100 | Communication Error (M52: Internal | INO Diagnosis Avanable |
| | | Transmission Control Module Memory | |
| I | I | Transmission Control Module Memory | |

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| | | Error) | |
|-------|-----|---|------------------------|
| P1750 | 54 | Secondary Pressure Solenoid Circuit Range/Performance (M44/M52/S52/M62/M73: System Voltage Input Low) | No Diagnosis Available |
| P1761 | 2 | Shiftlock Solenoid | No Diagnosis Available |
| P1765 | 154 | CAN Throttle Valve | No Diagnosis Available |
| P1765 | 158 | CAN Throttle Valve | No Diagnosis Available |
| P1780 | 152 | CAN Torque Reduction | No Diagnosis Available |
| P1780 | 163 | CAN Torque Reduction | No Diagnosis Available |

1999 4-Cylinder Diagnosis: 318ti (9/98-12/98)

| Dum. | two driving cycles | | two driving cycles | two driving cycles | two driving | cycles | two driving | two driving cycles | two driving cycles | two driving cycles | two driving cycles |
|---------------------------------|--|--|-------------------------------|--|-------------------------|------------------------|------------------------------|-------------------------|---------------------------------------|-------------------------|---|
| Time Required | 200 msec/ once per engine start up | | 500 msec/ continuous | 2,5 sec/ | 100 msec/ continuous | 2,5 sec/ continuous | 200 msec/ continuous | 100 msec/ continuous | 100 msec/ continuous | 300 msec/ continuous | Immediately/conf. 90 sec. 100 mssc/once |
| Enable | 200 - 440 rpm | [so | 1, 2, 3 or 4 > 3000 rpm | , 3000 rpm | | 3 or 4 | | | | > 1500 rpm | al power up |
| Secondary | peeds eußue | multiplied by gear rafi | selected gear engine speed | pedd eugline | | selected gear | | | | engine speed | |
| Threshold | no signat/multiple signal | calculated> (output speed | no algnal | > 320 rpm (gear 1) > 460 rpm (gear 2) > 736 rpm (gear 3) > 982 rpm (gear 4) | | > 288 rpm | | | | 18 | > 500 ms invalid check-sum delay time |
| Malfunction | voltage unvalid code for P and N | no input speed sensor involved, therefore input speed is calculated> joutput speed multiplied by gear retios | peeds inding | actual - calculated output gear ratio | voltage | calculated slip | voltage | voltage | vollage | battery voltage | CAN messages/lime out RAM and ROM check timing (response) |
| Monitor Strategy Description | circuit continuity rationality | o input speed sensor invol | rationality | rationality | circuit continuity | functional chack | circuit continuity | effeuit continuity | circuit continuity | rationality | bus check sall check (watchdog) functional check |
| Fault | P0705 | = | P0720 | P0731 P0732 P0733 | P0743 | P0740 | P0748 | P0753 | P1743 | P1746 | P1747 P1748 |
| Component | A/T Range Switch | peeds Indul | Output Speed | Gear Relbo | Torque Converter | | Pressure Control Solenoid | Shift Solenoid A | Force Motor/Pressure Control Valve | Power Supply | Transmission Control Modul (TCM) |

<u>Fig. 7: 1999 4-Cylinder Diagnosis: 318ti (9/98-12/98)</u> Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: M52 - 2.8L (11/95-8/96)

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: M52 - 2.8L (11/95-8/96)

| BITGITOSTIC TROOBLE CODES O CTEITOER: M32 2:0E (11/75 0/70) | | | | | | | |
|---|----------|---|--|--|--|--|--|
| PCode | BMW Code | Possible Cause | Diagnosis Parameters | | | | |
| P0412 | | Secondary Air System Solenoid Valve | No Diagnosis Available | | | | |
| P0705 | 8 | Transmission Range Sensor "A" Circuit Malfunction (PRNDL Input) | See <u>6-CYLINDER</u> <u>DIAGNOSIS: M52 -</u> <u>2.8L (11/95-8/96)</u> . | | | | |
| P0715 | | Input Speed Sensor | No Diagnosis Available | | | | |

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| l | 1 | 1 | |
|-----------|------|--|---|
| P0720 | 42 | Output Speed Sensor Circuit | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: M52 - |
| | | | 2.8L (11/95-8/96). |
| P0730 | 100 | Incorrect Gear Ratio | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: M52 - |
| | | | 2.8L (11/95-8/96). |
| P0740 | 111 | Torque Converter Clutch Circuit/Open | See <u>6-CYLINDER</u> |
| | | | <u>DIAGNOSIS: M52 -</u> |
| D07.42 | 22 | T. G. (1 1 C) 1 TI (1 1 1 | 2.8L (11/95-8/96). |
| P0743 | 32 | Torque Converter Clutch Circuit Electrical | See <u>6-CYLINDER</u> |
| | | | <u>DIAGNOSIS: M52 -</u> 2.8L (11/95-8/96). |
| P0748 | 5 | Pressure Control Solenoid "A" Electrical | See 6-CYLINDER |
| 10740 | 3 | Pressure Control Solenoid A Electrical | DIAGNOSIS: M52 - |
| | | | 2.8L (11/95-8/96). |
| P0753 | 30 | Shift Solenoid "A" Electrical | See 6-CYLINDER |
| 1 0 7 3 3 | | Simil Solehold 11 Electrical | DIAGNOSIS: M52 - |
| | | | 2.8L (11/95-8/96). |
| P0758 | 33 | Shift Solenoid "B" Electrical | See 6-CYLINDER |
| | | | DIAGNOSIS: M52 - |
| | | | 2.8L (11/95-8/96). |
| P1453 | •••• | Secondary Air System Relay | No Diagnosis Available |
| P1743 | 4 | Pressure Control Solenoid "E" Electrical | See 6-CYLINDER |
| | | (M44/M52: Brake Band Electrical) | DIAGNOSIS: M52 - |
| | | | 2.8L (11/95-8/96). |
| P1746 | 104 | Transmission Control Module Output | See <u>6-CYLINDER</u> |
| | | Stage | DIAGNOSIS: M52 - |
| | | | 2.8L (11/95-8/96). |
| P1747 | 150 | CAN-Bus Monitoring | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: M52 - |
| | | | 2.8L (11/95-8/96). |
| P1747 | 151 | CAN-Bus Monitoring | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: M52 - |
| | | | 2.8L (11/95-8/96). |
| P1747 | 156 | CAN-Bus Monitoring | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: M52 - |
| D1740 | 102 | T ' C (1M 1 1 C 1CT) | 2.8L (11/95-8/96). |
| P1748 | 103 | Transmission Control Module Self-Test | See <u>6-CYLINDER</u> |
| | | | <u>DIAGNOSIS: M52 -</u> 2.8L (11/95-8/96). |
| P1748 | 105 | Transmission Control Module Self-Test | See <u>6-CYLINDER</u> |
| P1/48 | 103 | Transmission Control Module Sen-Test | DIAGNOSIS: M52 - |
| | | | 2.8L (11/95-8/96). |
| P1748 | 110 | Transmission Control Module Self-Test | See 6-CYLINDER |
| 11740 | 110 | Transmission Control Woddle Sen-Test | DIAGNOSIS: M52 - |
| | | | 2.8L (11/95-8/96). |
| P1749 | 108 | Secondary Pressure Solenoid | No Diagnosis Available |
| | | Communication Error (M52: Internal | |
| | | Transmission Control Module Memory | |
| | | Error) | |
| P1750 | 54 | Secondary Pressure Solenoid Circuit | See <u>6-CYLINDER</u> |
| | | Range/Performance | DIAGNOSIS: M52 - |
| | | (M44/M52/S52/M62/M73: System | 2.8L (11/95-8/96). |
| | | Voltage Input Low) | |
| 1 | | | |

| P1761 | 2 | Shiftlock Solenoid | No Diagnosis Available |
|-------|-----|----------------------|------------------------|
| P1765 | 154 | CAN Throttle Valve | No Diagnosis Available |
| P1765 | 158 | CAN Throttle Valve | No Diagnosis Available |
| P1780 | 152 | CAN Torque Reduction | No Diagnosis Available |
| P1780 | 163 | CAN Torque Reduction | No Diagnosis Available |

6-Cylinder Diagnosis: M52 - 2.8L (11/95-8/96)

| System/Component | Fault Cod | le Man | agem | ent | Monitoring | Type of | |
|---|--|------------------|------------------|-------------|-------------|----------------------------------|--------|
| | Fault Code | pl | sg | mn | mx | Method | Signal |
| Transmission Control Modul (EGS) | | | | | | | |
| CAN EGS | P 1747 P 1748 | x x | x | | | CAN Bus-check EPROM check-sum | E |
| EGS Relay Power Supply Voltage | P 1746 P 1750 | | x x | | | final stage check | В |
| Transmission Range Sensor Output Speed Sensor Input Speed Sensor Incorrect Gear Ratio 1-4 Torque Converter Clutch | P 0705 P 0720 P 0715 P 0730 P 0743 P 0740 | x x x x | x x x x | × | x | plausibility/ | E |
| Pressure Control Solenoid Shift Solenoid A B Pressure Control Valve 4 | P 0748 P 0753 P 0758 P 1743 | | x x x | x x x | x x x | voltage range check | С |

pl = plausibility Abbreviations:

sg = signal

mn = minimum threshold mx = maximum threshold

A = pulsating rectangular wave on/off-cycles with constant or varying on/off-times Type of signals:

B = non-pulsating signal C = on/off switching signal

D = pulsating signal

E = ECM internal signal/value computation or comparison

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<u>Fig. 8: 6-Cylinder Diagnosis: M52 - 2.8L (11/95-8/96)</u> Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES 6-CYLINDER (3-SERIES - 9/96-8/97) & 5-SERIES (3/96-8/97)

DIAGNOSTIC TROUBLE CODES 6-CYLINDER (3-SERIES - 9/96-8/97) & 5-SERIES (3/96-8/97)

| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
|-------|----------|---------------------------------------|-----------------------------|
| P0705 | 8 | Transmission Range Sensor "A" Circuit | See <u>6-CYLINDER</u> |
| | | Malfunction (PRNDL Input) | DIAGNOSIS: M52 - 2.8L |
| | | | 3-SERIES (9/96-8/97) & 5- |
| | | | <u>SERIES (3/96-8/97)</u> . |
| P0720 | 42 | Output Speed Sensor Circuit | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: M52 - 2.8L |
| | | | 3-SERIES (9/96-8/97) & 5- |
| | | | <u>SERIES (3/96-8/97)</u> . |
| P0731 | 100 | Gear 1 Incorrect Ratio | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: M52 - 2.8L |
| | | | 3-SERIES (9/96-8/97) & 5- |
| | | | |

| | | | <u>SERIES (3/96-8/97)</u> . |
|-----------|-----|---|--|
| P0732 | | Gear 2 Incorrect Ratio | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: M52 - 2.8L |
| | | | 3-SERIES (9/96-8/97) & 5- |
| | | | <u>SERIES (3/96-8/97)</u> . |
| P0733 | | Gear 3 Incorrect Ratio | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: M52 - 2.8L |
| | | | 3-SERIES (9/96-8/97) & 5- |
| | | | <u>SERIES (3/96-8/97)</u> . |
| P0734 | | Gear 4 Incorrect Ratio | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: M52 - 2.8L |
| | | | 3-SERIES (9/96-8/97) & 5- |
| | | | <u>SERIES (3/96-8/97)</u> . |
| P0740 | 111 | Torque Converter Clutch Circuit/Open | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: M52 - 2.8L |
| | | | 3-SERIES (9/96-8/97) & 5- |
| | | | <u>SERIES (3/96-8/97)</u> . |
| P0743 | 32 | Torque Converter Clutch Circuit Electrical | |
| | | | <u>DIAGNOSIS: M52 - 2.8L</u> |
| | | | 3-SERIES (9/96-8/97) & 5- |
| | | | <u>SERIES (3/96-8/97)</u> . |
| P0748 | 5 | Pressure Control Solenoid "A" Electrical | See <u>6-CYLINDER</u> |
| | | | <u>DIAGNOSIS: M52 - 2.8L</u> |
| | | | 3-SERIES (9/96-8/97) & 5- |
| | | 2110 2 1 1111 11 21 | <u>SERIES (3/96-8/97)</u> . |
| P0753 | 30 | Shift Solenoid "A" Electrical | See <u>6-CYLINDER</u> |
| | | | <u>DIAGNOSIS: M52 - 2.8L</u> |
| | | | 3-SERIES (9/96-8/97) & 5- |
| D0750 | 22 | g110 g 1 11 11 11 11 11 11 11 | <u>SERIES (3/96-8/97)</u> . |
| P0758 | 33 | Shift Solenoid "B" Electrical | See <u>6-CYLINDER</u> |
| | | | <u>DIAGNOSIS: M52 - 2.8L</u> |
| | | | 3-SERIES (9/96-8/97) & 5- |
| D1742 | 4 | D C + 1C1 '1HFH F1 + '1 | <u>SERIES (3/96-8/97)</u> . |
| P1743 | 4 | Pressure Control Solenoid "E" Electrical | See <u>6-CYLINDER</u> |
| | | (M44/M52: Brake Band Electrical) | DIAGNOSIS: M52 - 2.8L 3-SERIES (9/96-8/97) & 5- |
| | | | <u>SERIES (3/96-8/97)</u> . |
| P1746 | 104 | Transmission Control Madula Output | , , |
| P1/40 | 104 | Transmission Control Module Output Stage | See <u>6-CYLINDER</u> DIAGNOSIS: M52 - 2.8L |
| | | Stage | 3-SERIES (9/96-8/97) & 5- |
| | | | <u>SERIES (3/96-8/97).</u> |
| P1747 | 150 | CAN-Bus Monitoring | See 6-CYLINDER |
| 1 1 / 4 / | 150 | CAN-Dus Wollitoring | DIAGNOSIS: M52 - 2.8L |
| | | | 3-SERIES (9/96-8/97) & 5- |
| | | | <u>SERIES (3/96-8/97).</u> |
| P1747 | 151 | CAN-Bus Monitoring | See 6-CYLINDER |
| 1 1 / 4 / | 131 | CAN-Dus Wollitoring | DIAGNOSIS: M52 - 2.8L |
| | | | 3-SERIES (9/96-8/97) & 5- |
| | | | SERIES (3/96-8/97). |
| P1747 | 156 | CAN-Bus Monitoring | See 6-CYLINDER |
| 1/1/ | 150 | Of It Bus Womtoning | DIAGNOSIS: M52 - 2.8L |
| | | | 3-SERIES (9/96-8/97) & 5- |
| | | | SERIES (3/96-8/97). |
| P1748 | 103 | Transmission Control Module Self-Test | See 6-CYLINDER |
| [1, 10 | | Transmission Control Module Sen Test | DIAGNOSIS: M52 - 2.8L |
| | | | |
| | | | |

| | | | 3-SERIES (9/96-8/97) & 5- SERIES (3/96-8/97). |
|-------|-----|---|---|
| P1748 | 105 | Transmission Control Module Self-Test | See 6-CYLINDER DIAGNOSIS: M52 - 2.8L 3-SERIES (9/96-8/97) & 5- SERIES (3/96-8/97). |
| P1748 | 110 | Transmission Control Module Self-Test | See 6-CYLINDER DIAGNOSIS: M52 - 2.8L 3-SERIES (9/96-8/97) & 5- SERIES (3/96-8/97). |
| P1749 | 108 | Secondary Pressure Solenoid Communication Error (M52: Internal Transmission Control Module Memory Error) | No Diagnosis Available |
| P1750 | 54 | Secondary Pressure Solenoid Circuit Range/Performance (M44/M52/S52/M62/M73: System Voltage Input Low) | No Diagnosis Available |
| P1761 | 2 | Shiftlock Solenoid | No Diagnosis Available |
| P1765 | 154 | CAN Throttle Valve | No Diagnosis Available |
| P1765 | 158 | CAN Throttle Valve | No Diagnosis Available |
| P1780 | 152 | CAN Torque Reduction | No Diagnosis Available |
| P1780 | 163 | CAN Torque Reduction | No Diagnosis Available |

6-Cylinder Diagnosis: M52 - 2.8L 3-Series (9/96-8/97) & 5-Series (3/96-8/97)

| II's | two driving cycles | | two driving cycles | two driving cycles | No driving | cycles | two driving cycles | two driving cycles | two driving cycles | two driving cycles | cycles |
|---------------------------------|---------------------------------------|---|-------------------------------|--|----------------------------|------------------|------------------------------|-----------------------|---------------------------------------|--------------------|---|
| Time | 200 msec/ once per engine | | 500 msec/ continuous | 2,5 sec/ continuous | 100 msac/ condnuous | 2,5 sec/ | 200 msec/ | 100 msec/ | 100 msac/ | 300 msac/ | immediately/cont. 90 sec. 120 msec/cont. 100 msec/once after system start |
| Enable/Disable Conditions | 200 - 440 rpm | [so | 1, 2, 3 or 4 > 3000 rpm | - 3000 rpm | | 3 or 4 | | | | - 1500 rpm | at power up |
| Secondary | peeds euiline | multiplied by gear rad | selected gear engine speed | peeds euglie | | selected gear | | | | paeds euiline | |
| Threshold | no signal/multiple signal | calculated> [output speed | no signal | > 320 rpm (gear 1) > 480 rpm (gear 2) > 736 rpm (gear 3) > 992 rpm (gear 4) | | > 288 rpm | | | | > 6 × | > 500 ms invalid check-sum on delay time |
| Malfunction | ebalov eboo bilavnu N bye do ol | no Input speed sensor involved, therefore input speed is calculated> (output speed multiplied by gear ratios) | peeds indino | actual - calculated output * gear ratio | voltage | calculated slip | voltage | voltage | voltage | battery voltage | CAN massages/time out RAM and ROM check watchdog timing (response) |
| Monitor Strategy Description | circuit continuity rationality | no Input speed sensor Invo | rationality | rationality | circuit continuity | functional check | circuit continuity | circuit continuity | circuit continuity | rationality | bus check self check functional check |
| Fault | P0705 | L | P0720 | P0731 P0732 P0733 | P0743 | P0740 | P0748 | P0753 | P1743 | P1746 | P1747 P1748 P1746 |
| Component/ System | A/T Range Switch | peeds indui | Output Speed | Gear Ratio | Torque Converter Clutch | | Pressure Control Solenoid | Shift Sciencid A | Force Motor/Pressure Control Valve | Power Supply | Transmission Control Modul (TOM) Ralay |

Fig. 9: 6-Cylinder Diagnosis: M52 - 2.8L 3-Series (9/96-8/97) & 5-Series (3/96-8/97) Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES 6-CYLINDER (M3 - 4/96-8/97)

DIAGNOSTIC TROUBLE CODES 6-CYLINDER (M3 - 4/96-8/97)

| | | , | |
|-------|----------|--|---|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
| P0705 | 8 | Transmission Range Sensor "A" Circuit Malfunction (PRNDL Input) | See <u>6-CYLINDER</u> <u>DIAGNOSIS - M3, 3.2L (4/96-</u> <u>8/97)</u> |
| P0705 | 9 | Transmission Range Sensor "A" Circuit Malfunction (PRNDL Input) | See <u>6-CYLINDER</u> DIAGNOSIS - M3, 3.2L (4/96- |

| | | 1 | 8/97). |
|----------|------|--|--|
| P0705 | 36 | Transmission Range Sensor "A" Circuit | See 6-CYLINDER |
| | | Malfunction (PRNDL Input) | DIAGNOSIS - M3, 3.2L (4/96- |
| | | (111.22 mp.ss) | 8/97). |
| P0715 | 16 | Input/Turbine Speed Sensor "A" Circuit | See 6-CYLINDER |
| 10/13 | | input furome speed sensor. A circuit | DIAGNOSIS - M3, 3.2L (4/96- |
| | | | 8/97). |
| P0720 | 42 | Output Cased Casea Cinquit | |
| P0/20 | 42 | Output Speed Sensor Circuit | See <u>6-CYLINDER</u> DIAGNOSIS - M3, 3.2L (4/96- |
| | | | |
| | | | <u>8/97)</u> . |
| P0720 | 106 | Output Speed Sensor Circuit | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS - M3, 3.2L (4/96- |
| | | | <u>8/97</u>). |
| P0732 | 100 | Gear 2 Incorrect Ratio | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS - M3, 3.2L (4/96- |
| | | | <u>8/97)</u> . |
| P0733 | | Incorrect Gear Ratio | See <u>6-CYLINDER</u> |
| | | 1110011000 0 0012 11111110 | DIAGNOSIS - M3, 3.2L (4/96- |
| | | | 8/97). |
| P0734 | | Incorrect Gear Ratio | |
| P0/34 | •••• | incorrect Gear Ratio | See 6-CYLINDER |
| | | | <u>DIAGNOSIS - M3, 3.2L (4/96-</u> |
| | | | <u>8/97</u>). |
| P0735 | | Incorrect Gear Ratio | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS - M3, 3.2L (4/96- |
| | | | <u>8/97</u>). |
| P0740 | 111 | Torque Converter Clutch Circuit/Open | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS - M3, 3.2L (4/96- |
| | | | 8/97). |
| P0743 | 4 | Torque Converter Clutch Circuit | See 6-CYLINDER |
| 10743 | | Electrical | DIAGNOSIS - M3, 3.2L (4/96- |
| | | Electrical | 8/97). |
| D0740 | - | D C + 1C 1 111A11F1 + 1 | / |
| P0748 | 5 | Pressure Control Solenoid "A" Electrical | - |
| | | | DIAGNOSIS - M3, 3.2L (4/96- |
| | | | <u>8/97)</u> . |
| P0753 | 30 | Shift Solenoid "A" Electrical | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS - M3, 3.2L (4/96- |
| | | | <u>8/97</u>). |
| P0758 | 33 | Shift Solenoid "B" Electrical | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS - M3, 3.2L (4/96- |
| | | | 8/97). |
| P0763 | 32 | Shift Solenoid "C" Electrical | See <u>6-CYLINDER</u> |
| 1 0 7 03 | 32 | | DIAGNOSIS - M3, 3.2L (4/96- |
| | | | 8/97). |
| P0768 | 31 | Shift Solenoid "D" Electrical | See <u>6-CYLINDER</u> |
| PU/08 | 31 | Smit Solehold "D" Electrical | · · |
| | | | <u>DIAGNOSIS - M3, 3.2L (4/96-</u> |
| | | | <u>8/97)</u> . |
| P0773 | 3 | Shift Solenoid "E" Electrical | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS - M3, 3.2L (4/96- |
| | | | <u>8/97</u>). |
| P1746 | 104 | Transmission Control Module Output | See <u>6-CYLINDER</u> |
| | | Stage | DIAGNOSIS - M3, 3.2L (4/96- |
| | | 5 | 8/97). |
| P1747 | 150 | CAN-Bus Monitoring | See 6-CYLINDER |
| 1/7/ | 150 | CATY-Dus Monitoring | DIAGNOSIS - M3, 3.2L (4/96- |
| | | | |
| | | | <u>8/97</u>). |

| D1747 | 1.71 | CAND M '4 ' | C (CVI INDED |
|-------|------|---------------------------------------|-----------------------------|
| P1747 | 151 | CAN-Bus Monitoring | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS - M3, 3.2L (4/96- |
| | | | <u>8/97)</u> . |
| P1747 | 156 | CAN-Bus Monitoring | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS - M3, 3.2L (4/96- |
| | | | <u>8/97)</u> . |
| P1748 | 103 | Transmission Control Module Self-Test | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS - M3, 3.2L (4/96- |
| | | | <u>8/97)</u> . |
| P1748 | 105 | Transmission Control Module Self-Test | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS - M3, 3.2L (4/96- |
| | | | <u>8/97)</u> . |
| P1748 | 110 | Transmission Control Module Self-Test | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS - M3, 3.2L (4/96- |
| | | | <u>8/97)</u> . |
| P1750 | 54 | Secondary Pressure Solenoid Circuit | See <u>6-CYLINDER</u> |
| | | Range/Performance | DIAGNOSIS - M3, 3.2L (4/96- |
| | | (M44/M52/S52/M62/M73: System | 8/97). |
| | | Voltage Input Low) | |
| P1761 | 2 | Shiftlock Solenoid | No Diagnosis Available |
| P1765 | 154 | CAN Throttle Valve | No Diagnosis Available |
| P1765 | 158 | CAN Throttle Valve | No Diagnosis Available |
| P1780 | 152 | CAN Torque Reduction | No Diagnosis Available |

6-Cylinder Diagnosis - M3, 3.2L (4/96-8/97)

| MIL. | \$ | c/ two driving sycles | c/ two driving | £ | ont. two driving | - | ont. two dr cvc | | | c/ two driving | 2 | cont. Iwo driving cycles ont. |
|---------------------------------|--|---|-------------------------------|--|--------------------|-----------------------------|-----------------------|-------------------------|---------------|------------------------------------|-----------------|---|
| Time | 100 msec/ once per engine start up | 200 msec/ continuous | 200 msec/ | 200 msec/ continuous | 100 msec conf. | 2,5 sec once per lock-up | 100 msec cont. | 30 msec/ confinuous | | 100 msec/ | 300 msec/ | immediately/cont, 90 sec. 120 msec/cont. 100 msec/once |
| Enable/Disable Conditions | 200 - 440 rpm | 1, 2, 3, 4 or 5 > 600 rpm > 250 rpm | 1, 2, 3, 4 or 5 | 2, 3, 4 or 5 > 420 rpm > 250 rpm | | 3, 4 or 5 | | | 2.33 | | > 1600 rpm | at power up |
| Secondary | peeds euitius | selected gear angine speed output speed | selected gear engine speed | selected gear Input speed output speed | | selected gear | | | gear changing | | engine speed | |
| Threshold | no signal/multiple signal | no signal | no signal | > 350 rpm | | > 100 rpm | | | | | < 9 V | > 500 ms invalid check-sum on delay time |
| Malfunction | voltage unvalla code for P and N | peeds induj | peeds andano | Input - output speed f (gear ratio) | voltage | calculated slip | voltage | voltage | voltage | voltage | battery voltage | CAN massagestline out RAM and ROM check watchdog timing (response) |
| Monitor Strategy Description | circuit continuity rationality | rationality | rationality | | circuit continuity | functional check | circuit continuity | circuit continuity | rationality | circuit continuity | rationality | bus check self check functional check |
| Fault | P0705 | P0715 | P0720 | P0732 P0733 P0734 P0735 | P0743 | P0740 | P0748 | P0753 P0758 P0763 | P0773 | P1743 | P1750 | P1747 P1748 P1746 |
| Component/ System | A/T Range Switch | Input Speed | Output Speed | Gear Ratio | Torque Converter | | Pres. Contr. Solenoid | Shift Solenoid A | שים | Force Motor/Pres. Control Valve | Power Supply | Transmission Control Modul (TCM) Relay |

Fig. 10: 6-Cylinder Diagnosis - M3, 3.2L (4/96-8/97) Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES 6-CYLINDER (9/97-8/98)

DIAGNOSTIC TROUBLE CODES 6-CYLINDER (9/97-8/98)

| | | () | |
|-------|----------|---------------------------------------|-------------------------------|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
| P0705 | 8 | Transmission Range Sensor "A" Circuit | See <u>6-CYLINDER</u> |
| | | Malfunction (PRNDL Input) | DIAGNOSIS: 6- |
| | | | <u>CYLINDER (9/97-8/98)</u> . |
| P0715 | | Input Speed Signal | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: 6- |
| | | | |

| | | | CYLINDER (9/97-8/98). |
|-------|------|--|---|
| P0720 | 42 | Output Speed Sensor Circuit | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: 6- |
| | | | <u>CYLINDER (9/97-8/98)</u> . |
| P0731 | 100 | Gear 1 Incorrect Ratio | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: 6- |
| | | | <u>CYLINDER (9/97-8/98)</u> . |
| P0732 | | Gear 2 Incorrect Ratio | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: 6- |
| | | | <u>CYLINDER (9/97-8/98)</u> . |
| P0733 | •••• | Gear 3 Incorrect Ratio | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: 6- |
| D0724 | | G 41 P | <u>CYLINDER (9/97-8/98)</u> . |
| P0734 | | Gear 4 Incorrect Ratio | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: 6- |
| D0727 | | G. C.I. | <u>CYLINDER (9/97-8/98)</u> . |
| P0735 | •••• | Gear 5 Incorrect Ratio | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: 6- |
| D0740 | 111 | Toward Comment of Clothal Circuit/Our | <u>CYLINDER (9/97-8/98)</u> . |
| P0740 | 111 | Torque Converter Clutch Circuit/Open | See <u>6-CYLINDER</u> |
| | | | <u>DIAGNOSIS: 6-</u> <u>CYLINDER (9/97-8/98)</u> . |
| P0743 | 32 | Tangua Canyantan Chutah Cinavit Elastriaal | · · · · · · · · · · · · · · · · · · · |
| P0/43 | 32 | Torque Converter Clutch Circuit Electrical | See <u>6-CYLINDER</u> DIAGNOSIS: 6- |
| | | | <u>CYLINDER (9/97-8/98)</u> . |
| P0748 | 5 | Pressure Control Solenoid "A" Electrical | See 6-CYLINDER |
| FU/40 | 3 | Flessure Control Solelloid A Electrical | DIAGNOSIS: 6- |
| | | | <u>DIAGNOSIS. 0-</u> CYLINDER (9/97-8/98). |
| P0753 | 30 | Shift Solenoid "A" Electrical | See 6-CYLINDER |
| 10733 | 30 | Sinit Solenoid 11 Electrical | DIAGNOSIS: 6- |
| | | | <u>CYLINDER (9/97-8/98)</u> . |
| P0758 | 33 | Shift Solenoid "B" Electrical | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: 6- |
| | | | CYLINDER (9/97-8/98). |
| P1743 | 4 | Pressure Control Solenoid "E" Electrical | See <u>6-CYLINDER</u> |
| | | (M44/M52: Brake Band Electrical) | DIAGNOSIS: 6- |
| | | | CYLINDER (9/97-8/98). |
| P1746 | 104 | Transmission Control Module Output | See <u>6-CYLINDER</u> |
| | | Stage | DIAGNOSIS: 6- |
| | | | <u>CYLINDER (9/97-8/98)</u> . |
| P1747 | 150 | CAN-Bus Monitoring | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: 6- |
| | | | <u>CYLINDER (9/97-8/98)</u> . |
| P1747 | 151 | CAN-Bus Monitoring | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: 6- |
| | | | <u>CYLINDER (9/97-8/98)</u> . |
| P1747 | 156 | CAN-Bus Monitoring | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: 6- |
| D1540 | 40- | m | <u>CYLINDER (9/97-8/98)</u> . |
| P1748 | 103 | Transmission Control Module Self-Test | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: 6- |
| D1740 | 107 | T | <u>CYLINDER (9/97-8/98)</u> . |
| P1748 | 105 | Transmission Control Module Self-Test | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS: 6- |
| 1 | ĺ | | <u>CYLINDER (9/97-8/98)</u> . |

| P1748 | 110 | Transmission Control Module Self-Test | See <u>6-CYLINDER</u> |
|-------|-----|---------------------------------------|-------------------------------|
| | | | DIAGNOSIS: 6- |
| | | | <u>CYLINDER (9/97-8/98)</u> . |
| P1749 | 108 | Secondary Pressure Solenoid | No Diagnosis Available |
| | | Communication Error (M52: Internal | |
| | | Transmission Control Module Memory | |
| | | Error) | |
| P1750 | 54 | Secondary Pressure Solenoid Circuit | See <u>6-CYLINDER</u> |
| | | Range/Performance | DIAGNOSIS: 6- |
| | | (M44/M52/S52/M62/M73: System Voltage | CYLINDER (9/97-8/98). |
| | | Input Low) | |
| P1761 | 2 | Shiftlock Solenoid | No Diagnosis Available |
| P1765 | 154 | CAN Throttle Valve | No Diagnosis Available |
| P1765 | 158 | CAN Throttle Valve | No Diagnosis Available |
| P1780 | 152 | CAN Torque Reduction | No Diagnosis Available |
| P1780 | 163 | CAN Torque Reduction | No Diagnosis Available |

6-Cylinder Diagnosis: 6-Cylinder (9/97-8/98)

| Component | Fault | Monitor Strategy Description | Malfunction Criteria | Threshold | Secondary | Enable/Disable Conditions | Time | Z |
|---|-------------------------|---|---|---|---|---|---|-----------------------|
| Art Range Switch | P0705 | clrcuit continuity rationality | voltage unvalid code for P and N | no signa/muitiple signal | engine speed | 200 - 440 rpm | 100 msec/ once per engine | two driving cycles |
| Input Speed | P0715 | rationality | input speed | no signal | selected gear engine speed output speed | 1, 2, 3, 4 or 5 > 600 rpm > 260 rpm | 200 msec/ continuous | two driving cycles |
| Output Speed | P0720 | rationality | peeds Indino | no signal | selected gear | 1, 2, 3, 4 or 5 | 200 msec/ | two driving |
| Gear Ratio | P0732 P0733 P0734 | | Input - output speed (gear ratio) | > 350 rpm | selected gear Input speed output speed | 2, 3, 4 or 5 > 420 rpm > 250 rpm | 200 msec/ conlinuous | two driving cycles |
| Torque Converter Clutch | P0743 | circuit continuity functional check | voltage calculated slip | > 100 rpm | selected gear | 3,4 or 5 | 100 msec cont. 2,5 sec | two driving cycles |
| Pres. Contr. Solenoid | P0748 | circuit continuity | voltage | | | | dina per rock-up | |
| | | circuit continuity rationality rationality | voltage voltage | | gear changing | 2.53 | 30 msec/ continuous | two driving cycles |
| Force Motor/Pres. Control Valve | P1743 | circuit continuity | voltage | | | 2 | 100 msec/ | Two driving |
| Power Supply | P1750 | rationality | battery voltage | V 8 > | peeds euiline | > 1600 rpm | 300 msec/ | two driving cycles |
| Transmission Control Modul (TCM) Relay | P1747 P1748 | bus check self check functional check | CAN massages/line our RAM and ROM check watchdog timing (response) | > 500 ms Irvalid check-sum on delay time | | at power up | Immediately/cont 90 sec. 120 msec/conf. 100 msec/conce after system start | two driving cycles |

Fig. 11: 6-Cylinder Diagnosis: 6-Cylinder (9/97-8/98) Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES 6-CYLINDER (323i, 328i & 528i - 9/98-5/99)

DIAGNOSTIC TROUBLE CODES 6-CYLINDER (323i, 328i & 528i - 9/98-5/99)

| BIRTOR (OBTIC 1) | ROODEL CODES | 0 C 1 E 11 1 D E 11 (3231, 3201 & 3201 | . 7170 3177) |
|------------------|--------------|---|--|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
| P0705 | 8 | Transmission Range Sensor "A" Circuit Malfunction (PRNDL Input) | See <u>6-CYLINDER</u> <u>DIAGNOSIS (323i, 328i, 528i</u> <u>- 9/98-5/99)</u> . |
| P0715 | | Input Speed Signal | See <u>6-CYLINDER</u> <u>DIAGNOSIS (323i, 328i, 528i</u> |

| | | | <u>- 9/98-5/99)</u> . |
|--------|-------|---------------------------------|---------------------------------------|
| P0720 | 42 | Output Speed Sensor Circuit | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (323i, 328i, 528i |
| | | | <u>- 9/98-5/99)</u> . |
| P0731 | 100 | Gear 1 Incorrect Ratio | See 6-CYLINDER |
| | | | DIAGNOSIS (323i, 328i, 528i |
| | | | <u>- 9/98-5/99).</u> |
| P0732 | 100 | Gear 2 Incorrect Ratio | See 6-CYLINDER |
| 10/32 | 100 | Gear 2 meorieet Ratio | DIAGNOSIS (323i, 328i, 528i |
| | | | - 9/98-5/99). |
| D0722 | 100 | C 21 + D + | |
| P0733 | 100 | Gear 3 Incorrect Ratio | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (323i, 328i, 528i |
| | | | <u>- 9/98-5/99)</u> . |
| P0734 | 100 | Gear 4 Incorrect Ratio | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (323i, 328i, 528i |
| | | | <u>- 9/98-5/99</u>). |
| P0735 | 100 | Gear 5 Incorrect Ratio | See 6-CYLINDER |
| | | | DIAGNOSIS (323i, 328i, 528i |
| | | | - 9/98-5/99). |
| P0740 | 111 | Torque Converter Clutch | See 6-CYLINDER |
| 10/40 | 111 | Circuit/Open | DIAGNOSIS (323i, 328i, 528i |
| | | Circuit/Open | - 9/98-5/99). |
| D07.42 | 22 | T | |
| P0743 | 32 | Torque Converter Clutch Circuit | See <u>6-CYLINDER</u> |
| | | Electrical | DIAGNOSIS (323i, 328i, 528i |
| | | | <u>- 9/98-5/99</u>). |
| P0748 | 5 | Pressure Control Solenoid "A" | See <u>6-CYLINDER</u> |
| | | Electrical | DIAGNOSIS (323i, 328i, 528i |
| | | | <u>- 9/98-5/99</u>). |
| P0753 | 30 | Shift Solenoid "A" Electrical | See 6-CYLINDER |
| 20,00 | | | DIAGNOSIS (323i, 328i, 528i |
| | | | <u>- 9/98-5/99).</u> |
| P0758 | 33 | Shift Solenoid "B" Electrical | See 6-CYLINDER |
| FU/36 | 33 | Sinit Solehold B Electrical | <u>DIAGNOSIS (323i, 328i, 528i</u> |
| | | | · · · · · · · · · · · · · · · · · · · |
| D0=60 | | at : 0 a 1 | <u>- 9/98-5/99)</u> . |
| P0763 | | Shift Solenoid "C" Electrical | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (323i, 328i, 528i |
| | | | <u>- 9/98-5/99</u>). |
| P1743 | 4 | Pressure Control Solenoid "E" | See <u>6-CYLINDER</u> |
| | | Electrical (M44/M52: Brake Band | DIAGNOSIS (323i, 328i, 528i |
| | | Electrical) | <u>- 9/98-5/99</u>). |
| P1746 | 104 | Transmission Control Module | No Diagnosis Available |
| 11,10 | | Output Stage | 110 2 10 8110110 1 1 1 0110010 |
| P1747 | 150 | CAN-Bus Monitoring | See 6-CYLINDER |
| 11/7/ | 150 | CAN-Dus Monitoring | <u>DIAGNOSIS (323i, 328i, 528i</u> |
| | | | <u>- 9/98-5/99).</u> |
| D1747 | 1.7.1 | CANID M. '. ' | |
| P1747 | 151 | CAN-Bus Monitoring | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (323i, 328i, 528i |
| | | | <u>- 9/98-5/99</u>). |
| P1747 | 156 | CAN-Bus Monitoring | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (323i, 328i, 528i |
| | | | <u>- 9/98-5/99</u>). |
| P1748 | 103 | Transmission Control Module | See 6-CYLINDER |
| | | Self-Test | DIAGNOSIS (323i, 328i, 528i |
| | I | | |
| | | | <u>- 9/98-5/99)</u> . |

| P1748 | 105 | Transmission Control Module | See 6-CYLINDER |
|-------|-----|-------------------------------|--|
| | | Self-Test | DIAGNOSIS (323i, 328i, 528i - 9/98-5/99). |
| P1748 | 110 | Transmission Control Module | See <u>6-CYLINDER</u> |
| | | Self-Test | DIAGNOSIS (323i, 328i, 528i |
| | | | <u>- 9/98-5/99)</u> . |
| P1749 | 108 | Secondary Pressure Solenoid | See <u>6-CYLINDER</u> |
| | | Communication Error (M52: | DIAGNOSIS (323i, 328i, 528i |
| | | Internal Transmission Control | <u>- 9/98-5/99)</u> . |
| | | Module Memory Error) | |
| P1750 | 54 | Secondary Pressure Solenoid | See <u>6-CYLINDER</u> |
| | | Circuit Range/Performance | <u>DIAGNOSIS (323i, 328i, 528i</u> |
| | | (Voltage Input Low) | <u>- 9/98-5/99</u>). |
| P1751 | 54 | Secondary Pressure Solenoid | See <u>6-CYLINDER</u> |
| | | Circuit Range/Performance | <u>DIAGNOSIS (323i, 328i, 528i</u> |
| | | (Voltage Input High) | <u>- 9/98-5/99)</u> . |
| P1765 | 154 | CAN Throttle Valve | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (323i, 328i, 528i |
| | | | <u>- 9/98-5/99)</u> . |
| P1765 | 158 | CAN Throttle Valve | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (323i, 328i, 528i |
| | | | <u>- 9/98-5/99)</u> . |
| P1780 | 152 | CAN Torque Reduction | No Diagnosis Available |
| P1780 | 163 | CAN Torque Reduction | No Diagnosis Available |

6-Cylinder Diagnosis (323i, 328i, 528i - 9/98-5/99)

| Component/ System | Fault | Monitor Strategy Description | Malfunction Criteria | Threshold | Secondary | Enable/Disable Conditions | Time | Me . |
|-------------------------------|-------------------------|---------------------------------|--|------------------------------|--|---|---|-----------------------|
| A/T Range Switch | P0705 | rationality | unvalid code | wrong signal | engine speed | mdi 009 < | 3 sec / cont | |
| Input Speed | P0715 | rationality | input speed | no signal or < 100 rpm | gear selected engine speed vehicle speed | 1,2,3,4 or 5 > 600 rpm > 8 km/h | 3 sec / cont | |
| Output Speed | P0720 | rationality | output speed | no signal | gear selected | 1,2,3,4 or 5 | 5 sec / cont | |
| Gear Ratio | 10 10 P0735 | rationality | input - output speed f (gear ratio) | % S < ∆ | gear selected pos lever vehicle speed | 1,2,3,4,5 no P / no N / no B > 4 km/h | 2 sec / cont | |
| Torque Converter Clutch | P0740 | functional check | eng, speed - input speed (maximum slip) | > 200 prm | gear selected | 2, 3, 4 or 5 | 20 sec / cont | two driving cycles |
| Press. Contr. Valve | P0743 | circuit continuity | voltage | | | | 700 msec / conf | |
| Shift Solenoid (A) (B) (C) | P0753 P0758 P0763 | circuit continuity | voltage | | | | 700 msec / cont 700 msec / cont 700 msec / cont | |
| Power Supply | P1750 P1751 | rationality | battery voltage | V 9,5 V | engine speed | > 1500 rpm | 5 sec / cont 10 sec / cont | two driving cycles |
| Transmission Control Modul | P0727 | bus check | engine speed CAN messages/time out | \$1.4 | battery voltage | > 10V | 1 sec / cont | one |
| | P1748 | rationality | internal error | | | | once at startup | cycle |
| | P1749 | rationality | CAN (throttle position) | signal range/performance | | | once at startup | two driving cycles |

Fig. 12: 6-Cylinder Diagnosis (323i, 328i, 528i - 9/98-5/99) Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES 6-CYLINDER (M COUPE, M ROADSTER, M3, Z3, 328is, 528i - 9/98-5/99)

DIAGNOSTIC TROUBLE CODES 6-CYLINDER (M COUPE, M ROADSTER, M3, Z3, 328is, 528i - 9/98-5/99)

| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
|-------|----------|---|--|
| P0705 | 8 | Transmission Range Sensor "A" Circuit Malfunction (PRNDL Input) | See <u>6-CYLINDER</u> <u>DIAGNOSIS (M COUPE,</u> <u>M ROADSTER, M3, Z3,</u> <u>328IS, 528i - 9/98-5/99).</u> |

| P0720 | 42 | Output Speed Sensor Circuit | See <u>6-CYLINDER</u> |
|-------|-------|--|--|
| | | 1 1 | DIAGNOSIS (M COUPE, |
| | | | M ROADSTER, M3, Z3, |
| | | | 328IS, 528i - 9/98-5/99). |
| P0731 | 100 | Gear 1 Incorrect Ratio | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (M COUPE, |
| | | | M ROADSTER, M3, Z3, |
| | | | 328IS, 528i - 9/98-5/99). |
| P0732 | 100 | Gear 2 Incorrect Ratio | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (M COUPE, |
| | | | M ROADSTER, M3, Z3, |
| | | | 328IS, 528i - 9/98-5/99). |
| P0733 | 100 | Gear 3 Incorrect Ratio | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (M COUPE, |
| | | | M ROADSTER, M3, Z3, |
| | | | 328IS, 528i - 9/98-5/99). |
| P0734 | 100 | Gear 4 Incorrect Ratio | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (M COUPE, |
| | | | M ROADSTER, M3, Z3, |
| | | | <u>328IS, 528i - 9/98-5/99)</u> . |
| P0740 | 111 | Torque Converter Clutch Circuit/Open | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (M COUPE, |
| | | | M ROADSTER, M3, Z3, |
| | | | 328IS, 528i - 9/98-5/99). |
| P0743 | 32 | Torque Converter Clutch Circuit Electrical | |
| | | | DIAGNOSIS (M COUPE, |
| | | | M ROADSTER, M3, Z3, |
| | | | 328IS, 528i - 9/98-5/99). |
| P0748 | 5 | Pressure Control Solenoid "A" Electrical | See <u>6-CYLINDER</u> |
| | | | <u>DIAGNOSIS (M COUPE,</u> |
| | | | M ROADSTER, M3, Z3, |
| | | | <u>328IS, 528i - 9/98-5/99)</u> . |
| P0753 | 30 | Shift Solenoid "A" Electrical | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (M COUPE, |
| | | | M ROADSTER, M3, Z3, |
| | | | 328IS, 528i - 9/98-5/99). |
| P0758 | 33 | Shift Solenoid "B" Electrical | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (M COUPE, |
| | | | M ROADSTER, M3, Z3, |
| D1742 | 4 | D C + 10.1 110F0 F1 + 1.1 | 328IS, 528i - 9/98-5/99). |
| P1743 | 4 | Pressure Control Solenoid "E" Electrical | See <u>6-CYLINDER</u> |
| | | (M44/M52: Brake Band Electrical) | DIAGNOSIS (M COUPE, |
| | | | M ROADSTER, M3, Z3, |
| D1746 | 104 | T | 328IS, 528i - 9/98-5/99). |
| P1746 | 104 | Transmission Control Module Output | See <u>6-CYLINDER</u> |
| | | Stage | DIAGNOSIS (M COUPE, |
| | | | M ROADSTER, M3, Z3, |
| D1747 | 150 | CANI Desa Manitani | 328IS, 528i - 9/98-5/99). |
| P1747 | 150 | CAN-Bus Monitoring | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (M COUPE, |
| | | | <u>M ROADSTER, M3, Z3,</u> 328IS, 528i - 9/98-5/99). |
| D1747 | 1.5.1 | CAN Desa Manita viva | . , |
| P1747 | 151 | CAN-Bus Monitoring | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (M COUPE, M ROADSTER, M3, Z3, |
| | | | WI KOADSTER, WIS, ZS, |
| i | I | 3532 of 4036 | ı |

| | | | 328IS, 528i - 9/98-5/99). |
|-------------------------|--------------------------|---|---------------------------------------|
| P1747 | 156 | CAN-Bus Monitoring | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (M COUPE. |
| | | | M ROADSTER, M3, Z3. |
| | | | 328IS, 528i - 9/98-5/99). |
| P1748 | 103 | Transmission Control Module Self-Test | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (M COUPE, |
| | | | M ROADSTER, M3, Z3, |
| | | | 328IS, 528i - 9/98-5/99). |
| P1748 | 105 | Transmission Control Module Self-Test | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (M COUPE. |
| | | | M ROADSTER, M3, Z3. |
| | | | 328IS, 528i - 9/98-5/99). |
| P1748 | 110 | Transmission Control Module Self-Test | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (M COUPE, |
| | | | M ROADSTER, M3, Z3. |
| | | | 328IS, 528i - 9/98-5/99). |
| P1749 | 108 | Secondary Pressure Solenoid | No Diagnosis Available |
| | | Communication Error (M52: Internal | |
| | | Transmission Control Module Memory | |
| | | Error) | |
| P1750 | 54 | Secondary Pressure Solenoid Circuit | No Diagnosis Available |
| | | Range/Performance | |
| | | (M44/M52/S52/M62/M73: System | |
| D17771 | 2 | Voltage Input Low) | C (CW INDED |
| P1761 | 2 | Shiftlock Solenoid | See <u>6-CYLINDER</u> |
| | | | |
| | | | |
| D1765 | 154 | CAN Thuestle Velve | |
| P1/03 | 134 | CAN Infollie valve | · · · · · · · · · · · · · · · · · · · |
| | | | |
| | | | |
| D1765 | 150 | CAN Throttle Velve | |
| 11/05 | 136 | CAN THIOMIC VAIVE | · · · · · · · · · · · · · · · · · · · |
| | | | · · · · · · · · · · · · · · · · · · · |
| | | | |
| P1780 | 152 | CAN Torque Reduction | No Diagnosis Available |
| | | | No Diagnosis Available |
| P1765 P1765 P1780 P1780 | 154 158 152 163 | CAN Throttle Valve CAN Throttle Valve CAN Torque Reduction CAN Torque Reduction | |

6-Cylinder Diagnosis (M Coupe, M Roadster, M3, Z3, 328is, 528i - 9/98-5/99)

| MIL | 3 | | two driving | cycles | two driving dycles | | Iwo driving | cycles | | two driving | cycles | two driving | two driving | cycles | two driving | cycles | it. two driving | cycles | | [- | ę | | _ |
|---------------------------------|--|---|---------------|---------------------------|--|--------------------|-------------|------------------|----------------|--------------------|-----------------------|-------------------|----------------------|----------------|-----------------|--------------|-----------------------|-------------------|---------------|-------------------|----------------------|--------------------|--------------------------|
| Time | 200 msec/ once per engine | di inin | 500 msec/ | continuous | 2,5 sec/ continuous | 100 msec/ | continuous | 2,5 sec/ | confinous | 200 msec/ | continuous | 100 msec/ | 100 msec/ | continuous | 300 msec/ | confluence | immediately/conf. | 90 sec. | 120 msec/cont | 100 msec/once | after system start | 70 msec/cont. | 400 meac/con |
| Enable/Disable Conditions | 200 - 440 rpm | loci | | - 3000 rpm | md 0006 < | | | 3 or 4 | | | | | | ļ | > 1500 rpm | | | at power up | | | | | |
| Secondary | engine speed | multiplied by oeer rat | selected gear | eridine speed | angine speed | | | selected gear | | | | | | | engine speed | | | | | | | | |
| Threshold | no signal/multiple signal | calculated> foutput speed | no signal | 1000 | > 320 pm (gear 1) > 480 pm (gear 2) > 736 pm (gear 3) > 992 pm (gear 4) | | | > 288 rpm | | | | | | | ∧ 6 × | | > 500 ms | invalid check-sum | uo | delay time | | | signal range/performance |
| Malfunction | voltage unvalid code for P and N | no input speed sensor involved, therefore Input speed is calculated> foutput speed multiplied by page ratios? | peeds indino | tration pateliales leitos | gear ratio | voltage | | calculated slip | | voltage | | Vollage | voltage | | battery voltage | 777 | CAN messages/time out | RAM and ROM check | watchdog | timing (response) | | voltage | CAN (throttle position) |
| Monitor Strategy Description | olrault continuity rationality | no input speed sensor invo | rationality | villanollar | , sie | circuit continuity | | functional check | | circuit continuity | plantile positionite. | circui continuity | circuit continuity | | rationality | 100 M 100 M | DUS CHECK | self check | | functional check | after the second the | circuit continuity | rationality |
| Code | P0705 | | P0720 | P0731 | P0732 P0733 P0734 | P0743 | | P0740 | 00740 | 20170 | 00700 | P0758 | P1743 | | P1746 | 277.70 | 100 | 21/48 | | P1746 | 19446 | 10/11 | 60/14 |
| System | A/T Range Switch | Input Speed | Output Speed | Gear Paño | | Torque Converter | Clutch | | Dranes Control | Solenoid | Shill Solenoid A | 8 | Force Motor/Pressure | COLINGIA VAIVE | Lower Supply | Transmission | _ | inpo | (ICM) | Relay | 1 | | |

Fig. 13: 6-Cylinder Diagnosis (M Coupe, M Roadster, M3, Z3, 328is, 528i - 9/98-5/99) Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES 6-CYLINDER (Z3 - 6/99-5/00)

DIAGNOSTIC TROUBLE CODES 6-CYLINDER (Z3 - 6/99-5/00)

| 211101.021 | | 0220012112211 (20 0.55 0.00) | |
|------------|----------|---------------------------------------|-------------------------------------|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
| P0705 | 8 | Transmission Range Sensor "A" Circuit | See <u>6-CYLINDER</u> |
| | | Malfunction (PRNDL Input) | DIAGNOSIS (Z3 - 6/99-5/00). |
| P0720 | 42 | Output Speed Sensor Circuit | See <u>6-CYLINDER</u> |
| | | | <u>DIAGNOSIS (Z3 - 6/99-5/00)</u> . |
| P0731 | 100 | Gear 1 Incorrect Ratio | See <u>6-CYLINDER</u> |
| I | | | |

| | | | DIAGNOSIS (Z3 - 6/99-5/00). |
|-------|-----|---|---|
| P0732 | 100 | Gear 2 Incorrect Ratio | See <u>6-CYLINDER</u> DIAGNOSIS (Z3 - 6/99-5/00). |
| P0733 | 100 | Gear 3 Incorrect Ratio | See <u>6-CYLINDER</u> DIAGNOSIS (Z3 - 6/99-5/00). |
| P0734 | 100 | Gear 4 Incorrect Ratio | See 6-CYLINDER DIAGNOSIS (Z3 - 6/99-5/00). |
| P0740 | 111 | Torque Converter Clutch Circuit/Open | See <u>6-CYLINDER</u> DIAGNOSIS (Z3 - 6/99-5/00). |
| P0743 | 32 | Torque Converter Clutch Circuit Electrical | See <u>6-CYLINDER</u> DIAGNOSIS (Z3 - 6/99-5/00). |
| P0748 | 5 | Pressure Control Solenoid "A" Electrical | See 6-CYLINDER DIAGNOSIS (Z3 - 6/99-5/00). |
| P0753 | 30 | Shift Solenoid "A" Electrical | See 6-CYLINDER DIAGNOSIS (Z3 - 6/99-5/00). |
| P0758 | 33 | Shift Solenoid "B" Electrical | See 6-CYLINDER DIAGNOSIS (Z3 - 6/99-5/00). |
| P1743 | 4 | Pressure Control Solenoid "E" Electrical (M44/M52: Brake Band Electrical) | See 6-CYLINDER DIAGNOSIS (Z3 - 6/99-5/00). |
| P1746 | 104 | Transmission Control Module Output Stage | See 6-CYLINDER DIAGNOSIS (Z3 - 6/99-5/00). |
| P1747 | 150 | CAN-Bus Monitoring | See <u>6-CYLINDER</u> DIAGNOSIS (Z3 - 6/99-5/00). |
| P1747 | 151 | CAN-Bus Monitoring | See 6-CYLINDER DIAGNOSIS (Z3 - 6/99-5/00). |
| P1747 | 156 | CAN-Bus Monitoring | See <u>6-CYLINDER</u> DIAGNOSIS (Z3 - 6/99-5/00). |
| P1748 | 103 | Transmission Control Module Self-Test | See <u>6-CYLINDER</u> DIAGNOSIS (Z3 - 6/99-5/00). |
| P1748 | 105 | Transmission Control Module Self-Test | See 6-CYLINDER DIAGNOSIS (Z3 - 6/99-5/00). |
| P1748 | 110 | Transmission Control Module Self-Test | See 6-CYLINDER DIAGNOSIS (Z3 - 6/99-5/00). |
| P1749 | 108 | Secondary Pressure Solenoid Communication Error (M52: Internal Transmission Control Module Memory Error) | No Diagnosis Available |
| P1750 | 54 | Secondary Pressure Solenoid Circuit Range/Performance (M44/M52/S52/M62/M73: System Voltage Input Low) | No Diagnosis Available |
| P1761 | 2 | Shiftlock Solenoid | See <u>6-CYLINDER</u> <u>DIAGNOSIS (Z3 - 6/99-5/00)</u> . |
| P1765 | 154 | CAN Throttle Valve | See <u>6-CYLINDER</u> <u>DIAGNOSIS (Z3 - 6/99-5/00)</u> . |
| P1765 | 158 | CAN Throttle Valve | See <u>6-CYLINDER</u> DIAGNOSIS (Z3 - 6/99-5/00). |
| P1780 | 152 | CAN Torque Reduction | No Diagnosis Available |
| P1780 | 163 | CAN Torque Reduction | No Diagnosis Available |

6-Cylinder Diagnosis (Z3 - 6/99-5/00)

| MIL. | two driving cycles | | | | | | | | | two driving cycles | one driving | cycle | | two driving | chrice | |
|---------------------------------|--|--|-------------------------------|--|----------------------------|------------------|-------------------------|-------------------------|---------------------------------------|-------------------------|-----------------------|-------------------|----------------|------------------|--------------------|--------------------------|
| Time Required | 200 msec/ once per engine start up | | 500 msec/ continuous | 2,5 sec/ continuous | 100 msec/ | 2,5 sec/ | 200 msec/ continuous | 100 msec/ confinuous | 100 msec/ continuous | 300 msec/ continuous | immediately/cont. | 90 sec. | 120 msec/cont. | 100 msec/once | 70 msec/cont. | 400 msec/cont. |
| Enable/Disable Conditions | 200 - 440 rpm | | 1, 2, 3 or 4 > 3000 rpm | > 3000 rpm | | 3 or 4 | | | | > 1500 rpm | | at power up | | | | |
| Secondary | engine speed | | selected gear engine speed | peads eugine | | selected gear | | | | engine speed | | | | | | |
| Threshold | no signal/multiple signal | culated> foutput speed | no signal | > 320 rpm (gear 1) > 480 rpm (gear 2) > 736 rpm (gear 3) > 992 rpm (gear 4) | | > 288 rpm | | | | ∧6 × | > 500 ms | invalid check-sum | uo | delay time | | signal range/performance |
| Malfunction Criteria | voltage unvalid code for P and N | input speed sensor involved, therefore input speed is calculated> [output speed thinlied by gear ratios] | output speed | actual - calculated output gear ratio | vollage | calculated slip | voltage | voltage | voltage | battery voltage | CAN messages/time out | RAM and ROM check | watchdog | (ming (response) | voltage | CAN (throttle position) |
| Monitor Strategy Description | circuit continuity rationality | no input speed sensor invol multiplied by gear ratios] | rationality | rationality | circuit continuity | functional check | circuit continuity | circuit continuity | circuit continuity | rationality | bus check | self check | | functional check | circuit continuity | rationality |
| Fault | P0705 | | P0720 | P0731 P0732 P0733 | P0743 | P0740 | P0748 | P0753 P0758 | P1743 | P1746 | P1747 | P1748 | | P1746 | P1761 | P1765 |
| Component | A/T Range Switch | Input Speed | Output Speed | Gear Ratio | Torque Converter Clutch | | | | Force Motor/Pressure Control Valve | Power Supply | Transmission | Control Module | (TCM) | Relay | | |

Fig. 14: 6-Cylinder Diagnosis (Z3 - 6/99-5/00) Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES 6-CYLINDER (323i, 328i & 528i - 6/99-8/00)

DIAGNOSTIC TROUBLE CODES 6-CYLINDER (323i, 328i & 528i - 6/99-8/00)

| Birrerve sire inte | CEBEE COBES | 0 C 1 E 11 (D E 1 (5251, 5201 & 5201 01)) | 0,00) |
|--------------------|-------------|---|---|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
| P0705 | 60 | Transmission Range Sensor "A" Circuit Malfunction (PRNDL Input) | See <u>6-CYLINDER</u> DIAGNOSIS (323i, 328i |
| | | , , | <u>& 528i - 6/99-8/00</u>). |
| P0715 | 33 | Input/Turbine Speed Sensor "A" Circuit | See <u>6-CYLINDER</u> <u>DIAGNOSIS (323i, 328i</u> |

| | | | <u>& 528i - 6/99-8/00</u>). |
|-------|------|---|--|
| P0720 | 32 | Output Speed Sensor Circuit | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (323i, 328i |
| | 1.50 | | <u>& 528i - 6/99-8/00)</u> . |
| P0727 | 150 | Engine Speed Input Circuit No Signal | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (323i, 328i |
| P0731 | 50 | Gear 1 Incorrect Ratio | <u>& 528i - 6/99-8/00)</u> . See 6-CYLINDER |
| PU/31 | 30 | Gear 1 incorrect Ratio | DIAGNOSIS (323i, 328i |
| | | | <u>& 528i - 6/99-8/00).</u> |
| P0732 | 52 | Gear 2 Incorrect Ratio | See <u>6-CYLINDER</u> |
| 10732 | 32 | Gear 2 meoriest ratio | DIAGNOSIS (323i, 328i |
| | | | <u>& 528i - 6/99-8/00)</u> . |
| P0733 | 53 | Gear 3 Incorrect Ratio | See 6-CYLINDER |
| | | | DIAGNOSIS (323i, 328i |
| | | | <u>& 528i - 6/99-8/00</u>). |
| P0734 | 54 | Gear 4 Incorrect Ratio | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (323i, 328i |
| | | | <u>& 528i - 6/99-8/00)</u> . |
| P0735 | 55 | Gear 5 Incorrect Ratio | See <u>6-CYLINDER</u> |
| | | | <u>DIAGNOSIS (323i, 328i</u> |
| | | | <u>& 528i - 6/99-8/00</u>). |
| P0740 | 48 | Torque Converter Clutch Circuit/Open | See <u>6-CYLINDER</u> |
| | | | <u>DIAGNOSIS (323i, 328i</u> |
| 70710 | | | <u>& 528i - 6/99-8/00)</u> . |
| P0743 | 4 | Torque Converter Clutch Circuit | See <u>6-CYLINDER</u> |
| | | Electrical | DIAGNOSIS (323i, 328i |
| D0752 | 16 | Shift Solenoid "A" Electrical | <u>& 528i - 6/99-8/00</u>). |
| P0753 | 16 | Sniit Solenoid "A" Electrical | See <u>6-CYLINDER</u> DIAGNOSIS (323i, 328i |
| | | | <u>& 528i - 6/99-8/00).</u> |
| P0758 | 17 | Shift Solenoid "B" Electrical | See <u>6-CYLINDER</u> |
| 10750 | 1 / | Shift Solehold B Electrical | <u>DIAGNOSIS (323i, 328i</u> |
| | | | <u>& 528i - 6/99-8/00</u>). |
| P0763 | 18 | Shift Solenoid "C" Electrical | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (323i, 328i |
| | | | <u>& 528i - 6/99-8/00</u>). |
| P1747 | 129 | CAN-Bus Monitoring | See <u>6-CYLINDER</u> |
| | | | DIAGNOSIS (323i, 328i |
| | | | <u>& 528i - 6/99-8/00</u>). |
| P1747 | 144 | CAN-Bus Monitoring | See <u>6-CYLINDER</u> |
| | | | <u>DIAGNOSIS (323i, 328i</u> |
| | | | <u>& 528i - 6/99-8/00</u>). |
| P1748 | 81 | Transmission Control Module Self-Test | |
| | | | <u>DIAGNOSIS (323i, 328i</u> |
| 71710 | 0.0 | | <u>& 528i - 6/99-8/00)</u> . |
| P1749 | 80 | Secondary Pressure Solenoid | See 6-CYLINDER |
| | | Communication Error (M52: Internal | DIAGNOSIS (323i, 328i |
| | | Transmission Control Module Memory Error) | <u>& 528i - 6/99-8/00</u>). |
| P1750 | 96 | Secondary Pressure Solenoid Circuit | See <u>6-CYLINDER</u> |
| 11/30 | 90 | Range/Performance (System Voltage | DIAGNOSIS (323i, 328i |
| | | Input Low) | <u>& 528i - 6/99-8/00</u>). |
| P1751 | | Secondary Pressure Solenoid Circuit | See <u>6-CYLINDER</u> |
| 11/01 | | Range/Performance (System Voltage | DIAGNOSIS (323i, 328i |
| | I | 3537 of 4036 | |

| | | Input High) | <u>& 528i - 6/99-8/00)</u> . |
|-------|-----|--------------------|---|
| P1765 | 147 | CAN Throttle Valve | See <u>6-CYLINDER</u> <u>DIAGNOSIS (323i, 328i</u> <u>& 528i - 6/99-8/00)</u> . |

6-Cylinder Diagnosis (323i, 328i & 528i - 6/99-8/00)

| | Fault | Monitor Strategy Description | Malfunction Criteria | Threshold | Secondary | Enable/Disable Conditions | Time Required | MIL Illum. |
|--------------------|-----------------------------|---------------------------------|--|------------------------------|--|---|-------------------------------|--------------------|
| | P0705 | rationality | unvalid code | wrong signal | engine speed | > 600 rpm | 3 sec / cont | |
| 100 | P0715 | rationality | input speed | no signal or < 100 rpm | gear selected engine speed vehicle speed | 1,2,3,4 or 5 > 600 rpm > 8 km/h | 3 sec / cont | |
| | P0720 | rationality | output speed input speed | no signal > 1500 rpm | gear selected | 1,2,3,4 or 5 | 5 sec / cont | |
| Gear Ratio | P0731 to P0735 | rationality | input - output speed f (gear ratio) | Δ > 5 % | gear selected pos lever vehicle speed | 1,2,3,4,5 no P / no N / no R > 4 km/h | 2 sec / cont | |
| Clutch | P0740 | functional check | eng. speed - input speed (maximum slip) | > 200 pm | gear selected | 2, 3, 4 or 5 | 20 sec / cont | two driving cycles |
| - | Press, Contr. Valve P0743 | circuit continuity | voltage | | | | 700 msec / cont | |
| Shift Solenoid (A) | P0753 | circuit continuity | voltage | | | | 700 msec / cont | |
| | P0758 | | | | | | 700 msec / cont | |
| (C) | P0763 | | | | | | 700 msec / cant | |
| - | Power Supply P1750 P1751 | rationality | battery voltage battery voltage | < 9,5 V | engine speed | > 1500 rpm | 5 sec / cont 10 sec / cont | two driving cycles |
| - | P0727 | bus check | engine speed CAN messages/time out | A | battery voltage | × 10V | t sec / cont | one |
| | P1748 | rationality | internal error | | | | once at startup | cycle |
| | P1749 | self check | RAM and ROM check | invalid checksum | | | once at startup | two driving |
| | P1765 | rationality | CAN (throttle position) | signal range/performance | | | 1 sec / cont | cycles |

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Fig. 15: 6-Cylinder Diagnosis (323i, 328i & 528i - 6/99-8/00) Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES 6-CYLINDER (4/00-9/01)

DIAGNOSTIC TROUBLE CODES 6-CYLINDER (4/00-9/01)

| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
|--------|----------|--|---|
| P0560 | 96 | System Voltage | See 6-CYLINDER |
| 1 0300 | 70 | System voltage | DIAGNOSIS (4/00-9/01). |
| P0600 | 129 | Serial Communication Link | See 6-CYLINDER |
| | 12) | Serial Communication Emix | DIAGNOSIS (4/00-9/01). |
| P0600 | 144 | Serial Communication Link | See 6-CYLINDER |
| | | | <u>DIAGNOSIS (4/00-9/01)</u> . |
| P0601 | 80 | Internal Control Module Memory | See <u>6-CYLINDER</u> |
| | | Check Sum Error | DIAGNOSIS (4/00-9/01). |
| P0603 | 81 | Internal Control Module Keep | No Diagnosis Available |
| | | Alive Memory (KAM) Error | |
| P0705 | 60 | Transmission Range Sensor "A" | See <u>6-CYLINDER</u> |
| | | Circuit Malfunction (PRNDL | <u>DIAGNOSIS (4/00-9/01)</u> . |
| | | Input) | |
| P0715 | 33 | Input/Turbine Speed Sensor "A" | See <u>6-CYLINDER</u> |
| | | Circuit | <u>DIAGNOSIS (4/00-9/01)</u> . |
| P0720 | 32 | Output Speed Sensor Circuit | See <u>6-CYLINDER</u> |
| | | | <u>DIAGNOSIS (4/00-9/01)</u> . |
| P0727 | 150 | Engine Speed Input Circuit No | See <u>6-CYLINDER</u> |
| | | Signal | <u>DIAGNOSIS (4/00-9/01)</u> . |
| P0731 | 50 | Gear 1 Incorrect Ratio | See <u>6-CYLINDER</u> |
| | | | <u>DIAGNOSIS (4/00-9/01)</u> . |
| P0732 | 52 | Gear 2 Incorrect Ratio | See <u>6-CYLINDER</u> |
| | | | <u>DIAGNOSIS (4/00-9/01)</u> . |
| P0733 | 53 | Gear 3 Incorrect Ratio | See <u>6-CYLINDER</u> |
| Do-24 | | | <u>DIAGNOSIS (4/00-9/01)</u> . |
| P0734 | 54 | Gear 4 Incorrect Ratio | See 6-CYLINDER |
| D0725 | 5.5 | G 51 P | <u>DIAGNOSIS (4/00-9/01)</u> . |
| P0735 | 55 | Gear 5 Incorrect Ratio | See <u>6-CYLINDER</u> |
| D0741 | | Toward Comments of Clock 1 | <u>DIAGNOSIS (4/00-9/01)</u> . |
| P0741 | | Torque Converter Clutch Functional Check | See <u>6-CYLINDER</u> DIAGNOSIS (4/00-9/01). |
| P0743 | 4 | Torque Converter Clutch Circuit | See 6-CYLINDER |
| PU/43 | 4 | Electrical | DIAGNOSIS (4/00-9/01). |
| P0753 | 16 | Shift Solenoid "A" Electrical | See 6-CYLINDER |
| 10/33 | 10 | Sinit Solehold A Electrical | DIAGNOSIS (4/00-9/01). |
| P0758 | 17 | Shift Solenoid "B" Electrical | See 6-CYLINDER |
| 10736 | 17 | Simil Solehold B Electrical | DIAGNOSIS (4/00-9/01). |
| P0763 | 18 | Shift Solenoid "C" Electrical | See 6-CYLINDER |
| | 10 | Smit Solehold C Dicetical | DIAGNOSIS (4/00-9/01). |
| P1748 | | Transmission Control Module | See 6-CYLINDER |
| 1 1 10 | | Internal Module | DIAGNOSIS (4/00-9/01). |
| P1765 | 147 | CAN Throttle Valve | See 6-CYLINDER |
| | | | DIAGNOSIS (4/00-9/01). |
| | | | |

6-Cylinder Diagnosis (4/00-9/01)

| Component/ System | Fault | Monitor Strategy Description | Malfunction Criteria | Threshold | Secondary | Enable/Disable Conditions | Time | MIL IIIum. |
|-------------------------------|--|---------------------------------|--|------------------------------|--|---|------------------------------------|-----------------------|
| A/T Range Switch | h P0705 | rationality | unvalid code | wrong signal | engine speed | wd. 009 < | 3 sec / cont | |
| Input Speed | d P0715 | rationality | input speed | no signal or < 100 rpm | gear selected engine speed vehicle speed | 1,2,3,4 or 5 > 600 rpm > 8 km/h | 3 sec / cont | |
| Output Speed | d P0720 | rationality | output speed input speed | no signal > 1500 rpm | gear selected | 1,2,3,4 or 5 | 5 sec / cont | |
| Gear Rati | Gear Ratio P0731/0732 P0733/0734 P0735 | rationality | input - output speed f (gear ratio) | Δ > 5 % | gear selected pos lever vehicle speed | 1,2,3,4,5 no P / no N / no R > 4 km/h | 2 sec / cont | |
| forque Converter Clutch | P0741 | functional check | eng. speed - input speed (maximum slip) | > 200 prm | gear selected | 2,3,4 or 5 | 20 sec / cont | two driving cycles |
| Press. Contr. Valve | e P0743 | circuit continuity | voltage | | | | 700 msec / cont | |
| Shift Solenoid (A) | | circuit continuity | voltage | | | | 700 msec / cont | |
| (B) (C) | () P0758 | | | | | | 700 msec / cont 700 msec / cont | |
| Power Supply | y P0560 | rationality | battery voltage battery voltage | × 9,5 V | engine speed | > 1500 rpm | 5 sec / cont 10 sec / cont | two driving cycles |
| Transmission Control Modul | P0727 P0600 | bus check | engine speed CAN messages/lime out | × | battery voltage | V01 < | 1 sec / cont | one |
| | P1748 | rationality | internal error | | | | once at startup | cycle |
| | P0601 | self check | RAM and ROM check | invalid checksum | | | once at startup | two driving |
| | P1765 | rationality | CAN (throttle position) | signal range/performance | | | 1 sec / cont | cycles |

Fig. 16: 6-Cylinder Diagnosis (4/00-9/01) Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: ZF TRANSMISSION (9/01-8/02)

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: ZF TRANSMISSION (9/01-8/02)

| ROODLE CODI | BOO CIETIADER: EL TROMASIMIE | 001011 (0/01 0/02) |
|-------------|--------------------------------|---|
| BMW Code | Possible Cause | Diagnostic Parameters |
| 60 | Transmission Range Sensor "A" | See <u>6-CYLINDER: ZF</u> TRANSMISSION |
| | | <u>DIAGNOSIS (9/01-8/02 - 1 OF</u> |
| | | <u>4</u>). |
| 33 | Input/Turbine Speed Sensor "A" | See <u>6-CYLINDER: ZF</u> |
| | BMW Code 60 | 60 Transmission Range Sensor "A" Circuit Intermittent |

| | | Circuit | TRANSMISSION |
|-------|----|-----------------------------------|---|
| | | | DIAGNOSIS (9/01-8/02 - 1 OF |
| | | | <u>4)</u> |
| P0716 | 33 | Input/Turbine Speed Sensor "A" | See <u>6-CYLINDER: ZF</u> |
| | | Circuit Range/Performance | <u>TRANSMISSION</u> DIAGNOSIS (9/01-8/02 - 1 OF |
| | | | $\frac{D1AGNO515 (9/01-8/02-10F)}{4}$ |
| P0720 | 32 | Output Speed Sensor Circuit | See <u>6-CYLINDER:</u> ZF |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/01-8/02 - 1 OF</u> |
| | | | <u>4)</u> . |
| P0721 | 59 | Output Speed Sensor Circuit | See <u>6-CYLINDER: ZF</u> |
| | | Range/Performance | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 1 OF |
| P0731 | 50 | Gear 1 Incorrect Ratio | See 6-CYLINDER: ZF |
| 10/31 | 30 | Gear 1 meorreet Ratio | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 1 OF |
| | | | <u>4)</u> . |
| P0732 | 52 | Gear 2 Incorrect Ratio | See <u>6-CYLINDER: ZF</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/01-8/02 - 1 OF</u> |
| D0522 | | G 21 P : | <u>4)</u> . |
| P0733 | 53 | Gear 3 Incorrect Ratio | See <u>6-CYLINDER: ZF</u> TRANSMISSION |
| | | | <u>I RANSMISSION</u> DIAGNOSIS (9/01-8/02 - 1 OF |
| | | | 4). |
| P0734 | 54 | Gear 4 Incorrect Ratio | See 6-CYLINDER: ZF |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/01-8/02 - 1 OF</u> |
| | | | <u>4)</u> . |
| P0735 | 55 | Gear 5 Incorrect Ratio | See <u>6-CYLINDER: ZF</u> |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 1 OF |
| P0740 | 4 | Torque Converter Clutch | See <u>6-CYLINDER: ZF</u> |
| 10/40 | | Circuit/Open | TRANSMISSION |
| | | 1 | DIAGNOSIS (9/01-8/02 - 2 OF |
| | | | <u>4</u>). |
| P0741 | 48 | Torque Converter Clutch Circuit | See <u>6-CYLINDER: ZF</u> |
| | | Performance or Stuck Off | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/01-8/02 - 1 OF</u> |
| P0745 | 1 | Pressure Control Solenoid "A" | See 6 CVI INDED: 75 |
| PU/43 | 1 | Pressure Control Solenoid "A" | See <u>6-CYLINDER: ZF</u> TRANSMISSION |
| | | | <u>DIAGNOSIS (9/01-8/02 - 2 OF</u> |
| | | | 4). |
| P0750 | 16 | Shift Solenoid "A" | See <u>6-CYLINDER</u> : ZF |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/01-8/02 - 2 OF</u> |
| | | | <u>4)</u> |
| P0751 | 16 | Shift Solenoid "A" Performance or | See <u>6-CYLINDER: ZF</u> |
| | | Stuck Off | TRANSMISSION |
| | | | |
| | | | <u>DIAGNOSIS (9/01-8/02 - 2 OF</u> <u>4)</u> . |

| P0752 | 16 | Shift Solenoid "A" Stuck On | See <u>6-CYLINDER: ZF</u> |
|-------------------------|---------------------|--|--|
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/01-8/02 - 2 OF</u> |
| P0753 | 16 | Shift Solenoid "A" Electrical | Can (CVI INDED. 7E |
| P0/33 | 10 | Shift Solehold A Electrical | See <u>6-CYLINDER: ZF</u> <u>TRANSMISSION</u> |
| | | | DIAGNOSIS (9/01-8/02 - 2 OF |
| | | | <u>DIAGNOSIS (7/01-6/02 - 2 01</u> 4) |
| P0755 | 17 | Shift Solenoid "B" | See 6-CYLINDER: ZF |
| 10755 | 1 / | Sinit Solehold B | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 2 OF |
| | | | 4) |
| P0756 | 17 | Shift Solenoid "B" Performance or | See 6-CYLINDER: ZF |
| 10/30 | 1 / | Stuck Off | TRANSMISSION |
| | | Stuck Off | DIAGNOSIS (9/01-8/02 - 2 OF |
| | | | 4) |
| P0757 | 17 | Shift Solenoid "B" Stuck On | See 6-CYLINDER: ZF |
| F0/3/ | 1 / | Shift Solehold B Stuck Off | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 2 OF |
| | | | DIAGNOSIS (9/01-8/02 - 2 OF |
| P0758 | 17 | Shift Solenoid "B" Electrical | Soo 6 CVI INDED. 7E |
| PU/38 | 1 / | Silit Solehold B Electrical | See <u>6-CYLINDER: ZF</u> TRANSMISSION |
| | | | <u>1 KANSWISSION</u> DIAGNOSIS (9/01-8/02 - 2 OF |
| | | | DIAGNOSIS (9/01-8/02 - 2 OF |
| D07/0 | 1.0 | 01:0 0 1 111011 | 4 <u>/</u> . |
| P0760 | 18 | Shift Solenoid "C" | See 6-CYLINDER: ZF |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/01-8/02 - 3 OF</u> |
| D0561 | 1.0 | G1:0 G 1 :1 HGH D 0 | 4 <u>)</u> . |
| P0761 | 18 | Shift Solenoid "C" Performance or | See 6-CYLINDER: ZF |
| | | Stuck Off | TRANSMISSION DIA CNOSIS (0/01 8/02 2 OF |
| | | | <u>DIAGNOSIS (9/01-8/02 - 3 OF</u> |
| | | | |
| D07/62 | 10 | C1:0.C.1 :1#C#.C. 1.O. | 4 <u>)</u> . |
| P0762 | 18 | Shift Solenoid "C" Stuck On | See <u>6-CYLINDER: ZF</u> |
| P0762 | 18 | Shift Solenoid "C" Stuck On | TRANSMISSION |
| P0762 | 18 | Shift Solenoid "C" Stuck On | |
| | | | TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). |
| P0762 P0763 | 18 | Shift Solenoid "C" Stuck On Shift Solenoid "C" Electrical | TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). See 6-CYLINDER: ZF |
| | | | TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). See 6-CYLINDER: ZF TRANSMISSION |
| | | | TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). See 6-CYLINDER: ZF |
| P0763 | 18 | Shift Solenoid "C" Electrical | TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). |
| | | | TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). See 6-CYLINDER: ZF |
| P0763 | 18 | Shift Solenoid "C" Electrical | TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). See 6-CYLINDER: ZF TRANSMISSION |
| P0763 | 18 | Shift Solenoid "C" Electrical | TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). See 6-CYLINDER: ZF |
| P0763 P0775 | 2 | Shift Solenoid "C" Electrical Pressure Control Solenoid "B" | TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF |
| P0763 | 18 | Shift Solenoid "C" Electrical | TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF |
| P0763 P0775 | 2 | Shift Solenoid "C" Electrical Pressure Control Solenoid "B" | TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 2 OF 4). See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 2 OF 4). |
| P0763 P0775 | 2 | Shift Solenoid "C" Electrical Pressure Control Solenoid "B" | TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF |
| P0763 P0775 P0782 | 2 57 | Shift Solenoid "C" Electrical Pressure Control Solenoid "B" 2-3 Shift | TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF |
| P0763 P0775 | 2 | Shift Solenoid "C" Electrical Pressure Control Solenoid "B" | TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF |
| P0763 P0775 P0782 | 2 57 | Shift Solenoid "C" Electrical Pressure Control Solenoid "B" 2-3 Shift | TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 2 OF 4). See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). See 6-CYLINDER: ZF TRANSMISSION |
| P0763 P0775 P0782 | 2 57 | Shift Solenoid "C" Electrical Pressure Control Solenoid "B" 2-3 Shift | TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF |
| P0763 P0775 P0782 P0783 | 18 2 57 58 | Shift Solenoid "C" Electrical Pressure Control Solenoid "B" 2-3 Shift 3-4 Shift | TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF |
| P0763 P0775 P0782 | 2 57 | Shift Solenoid "C" Electrical Pressure Control Solenoid "B" 2-3 Shift | TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF |
| P0763 P0775 P0782 P0783 | 18 2 57 58 | Shift Solenoid "C" Electrical Pressure Control Solenoid "B" 2-3 Shift 3-4 Shift | TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF |
| P0763 P0775 P0782 P0783 | 18 2 57 58 | Shift Solenoid "C" Electrical Pressure Control Solenoid "B" 2-3 Shift 3-4 Shift | TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF |

| D1500 | (2 | D 11 F 0 1 1 | 4). |
|-------|-------|---------------------------------|--|
| P1700 | 62 | Double Error Output Speed and | See 6-CYLINDER: ZF |
| | | Input/Turbine Speed | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 1 OF |
| D1710 | 1.4.4 | CAN Version Error | See COVI INDED. 71 |
| P1719 | 144 | CAN Version Error | See 6-CYLINDER: ZF |
| | | | <u>TRANSMISSION</u> DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| P1720 | 129 | CAN Timeout Control Module | See 6-CYLINDER: ZF |
| F1/20 | 129 | CAN Timeout Control Wodule | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/01-8/02 - 3 OF</u> |
| | | | 4) |
| P1731 | 51 | Gear 1 manual Incorrect Ratio | See 6-CYLINDER: ZF |
| F1/31 | 31 | Geal I manual meoriect Ratio | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/01-8/02 - 1 OF</u> |
| | | | 4) |
| P1747 | 128 | CAN-Bus Monitoring | See 6-CYLINDER: ZF |
| 11/7/ | 120 | CAN-Bus Wollitoring | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | 4). |
| P1761 | 19 | Shiftlock Solenoid | See 6-CYLINDER: ZF |
| 11701 | | Simulack Solehold | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | 4). |
| P1762 | 19 | Shiftlock Solenoid High Input | See 6-CYLINDER: ZF |
| 11702 | 17 | Simulock Solenoid High input | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | 4). |
| P1763 | 19 | Shiftlock Solenoid Low Input | See 6-CYLINDER: ZF |
| 11,00 | | | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | 4). |
| P1764 | 19 | Shiftlock Solenoid Open Circuit | See <u>6-CYLINDER:</u> ZF |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | <u>4)</u> . |
| P1765 | 147 | CAN Throttle Valve | See <u>6-CYLINDER</u> : ZF |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | <u>4)</u> . |
| P1791 | 81 | Internal Transmission Control | See <u>6-CYLINDER</u> : ZF |
| | | Module Memory | TRANSMISSION |
| | | Checksum/EEPROM Error | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | <u>4</u>). |
| P1792 | 82 | Internal Transmission Control | See <u>6-CYLINDER: ZF</u> |
| | | Module Watchdog Error | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | <u>4</u>) |
| P1794 | 80 | Internal Transmission Control | See <u>6-CYLINDER: ZF</u> |
| | | Module Memory Checksum Error | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | <u>4</u>). |
| P1831 | 1 | Pressure Control Solenoid "A" | See <u>6-CYLINDER: ZF</u> |
| | | Circuit High | TRANSMISSION |
| | I . | _ | • |

| | | | DIAGNOSIS (9/01-8/02 - 2 OF |
|-------|----|--|--|
| P1832 | 2 | Pressure Control Solenoid "B" Circuit High | See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 2 OF 4). |
| P1833 | 3 | Pressure Control Solenoid "C" Circuit High | See <u>6-CYLINDER: ZF</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (9/01-8/02 - 2 OF</u> 4). |
| P1834 | 4 | Pressure Control Solenoid "D" Circuit High | See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 2 OF |
| P1841 | 1 | Pressure Control Solenoid "A" Circuit Low | See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 2 OF |
| P1842 | 2 | Pressure Control Solenoid "B" Circuit Low | See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 2 OF 4). |
| P1843 | 3 | Pressure Control Solenoid "C" Circuit Low | See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 2 OF 4). |
| P1844 | 4 | Pressure Control Solenoid "D" Circuit Low | See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 2 OF 4). |
| P1882 | 57 | 2-3 Shift Circuit High | See <u>6-CYLINDER: ZF</u> <u>TRANSMISSION</u> <u>DIAGNOSIS</u> (9/01-8/02 - 3 OF |
| P1883 | 58 | 3-4 Shift Circuit High | See <u>6-CYLINDER: ZF</u> TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). |
| P1889 | 96 | System Voltage - Electrical | See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). |
| P1892 | 96 | System Voltage Low Input | See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 4). |
| P1893 | 83 | Supply Voltage Pressure Control Solenoid/Shift Solenoid Circuit High | See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 4 OF 4). |
| P1894 | 83 | Supply Voltage Pressure Control Solenoid/Shift Solenoid Circuit Low | See 6-CYLINDER: ZF TRANSMISSION DIAGNOSIS (9/01-8/02 - 4 OF 4). |
| P1895 | 83 | Supply Voltage Pressure Control | See 6-CYLINDER: ZF |
| | | 3544 of 4036 | |

6-Cylinder: ZF Transmission Diagnosis (9/01-8/02 - 1 Of 4)

| MIL Illum. | | | driving | | | | | drying | | |
|---------------------------------|----------|----------------|--|-----------------|---|--|--------------------------------------|--|---|--|
| Time | | 0.2 sec / cont | 0,5 sec / cont | 500 msec / cont | 240 maec / cont | 400 msec / cont | 250 msoc / cont | 900 msec / cont | B00 msec / cont | 2.5 sec / cont |
| Enable | | | > 992 revitain > 224 revitain > 9V 1,2,3,4,5 | | > 255 revirtin | D, 4, 3, 2 > 1600 rpm not allowed | | no P / no N / na R > 500 rpm > 50 °C | 1st gear 1st gear > 500 rpm > 30 > 20 °C | 2, 3, 4 or 5 > input speed <= 150 Nm >= 5.24 bar |
| Secondary | | | engina speed output speed battery voltage gear selected | | wheel speed | pos lever output speed geer shifts | | pos laver output spood battory vollage transmission fluid temperature | pos lever manual moce output speed baltery voltage iranamission fluid temperature | gear selected engine speed input torque to TC (calculated) TCC advelon prossure (calculated) |
| Treshold | | wrong signed | o | > 6720 revinin | > 7744 rovimin or delta > 750 revimin | < 160 rpm | P0720 active invalid signal | deta > 5 % | delta > 5 % | - 80 rpm |
| Malfunction Criteria | | unvalid code | input speed | peads indu | output speed or outp. Spd - wheel spd * rear axie ratio | outparl speed * rear axis after atto | cutput speed | input - output speed f (gear ratio) | inpol - bulpul speed / (gear railo) | ung, speed - Input apred (maximum slip) |
| Monitor Strategy Description | | rationality | rationality | rationality | rationality | rationality | rationality | rationality | Argonomics. | functional chock |
| Fault | | P0709 | P0715 | P0716 | P0720 | P0721 | P1700 | P0731 P0732 P0734 P0734 | P1731 | P0741 |
| Component/ System | AT SHP19 | Range Switch | pedg juduj | | Output Speed | | output / wheel speed double fault | Gear Ratio | | Torque Converter Clutch |

<u>Fig. 17: 6-Cylinder: ZF Transmission Diagnosis (9/01-8/02 - 1 Of 4)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: ZF Transmission Diagnosis (9/01-8/02 - 2 Of 4)

| MIL. | | | | | | | two | cycles | | | Ī | | | | | | | | | |
|---------------------------------|--------------------------------|---------------------------|----------------------------------|--------------------------------|------------------------------------|------------------------------------|--------------------------------|---------------------------|-------------------------------------|--------------------------------|---------------------------------|---------------------------|---|---|---|--|---|--|---|--|
| Time | 70 maec / cont | | | 50 msac / cont | | | 50 msec / cont | | | 70 msec/conf | | | 800 msec / cont | 800 msec / cont | 800 msec / cont | 800 msec / cont | 800 msec / port | 800 msec / cont | 800 msec/cont | 800 msec / cont |
| Enable | 11.00 | 1/4 | | 200 | 12.4 | | 7,910-0 | 1/4 | | | V=1.5 V | | 7V < MV inp. Valt. < 16V | | | | 7V < MV inp. Volt. < 16V | | | |
| Secondary | abs(battory voltage | pcv 1 voltage | | abs(ballery voltage | pev 2 voltage | | abs(battery voltage | pov 3 voltage | | abs(battery voltage | pov 1 voltage) | | MV input voltage | | | | MV input voltage | | | |
| Treshold Value | > 150mA (if meas curr < 200mA) | 12 V | ^0 | > 150mA (if mess curr < 200mA) | 12 V | ^0 | > 150mA (if meas curr < 200mA) | 12 V | ۸٥ | > 150mA (if meas curr < 200mA) | > 1000mA (if meas curr > 200mA) | ^0 | 1V < as voltage < 1,44V, if as is under current | 1.44V < sa voltage < 5V, if sa is under current | OV < ss voltage < 0.35V, if as is not under current | 0,35V < ss valtage < 0,85V, it se is not under current | 1V <ss 1.44v,="" <="" current<br="" is="" it="" ss="" under="" voltage="">0.85V < ss voltage < 1.44V, it ss is not under current</ss> | 1.44V < ss voltage < 5V, if as is under current. | QV < ss voltage < 0.35V, it ss is not under current | 0.35V < ss voltage < 0.85V, if ss is not under current |
| Malfunction Criteria | meass, curt calc. curt. | voltage | voltage | meass, cur calt. curr. | voltage | voltage | meass, curr - calc, curr. | voltages | voltage | meass, curr - calc, curr | voltage | voltage | voltage | Aoltage | voltage | epitov | vultage | voltage | voltage | voltage |
| Monitor Strategy Description | rationality | circuit confininty, power | dreat continuty, ground short | rationality | circuit confinitty, power short | circuit continuty, ground short | rationality | circuit confininty, power | circuit contributy, ground short | rationality | circuit confiniuty, power | cirquit continuty, ground | rationality | circuit continuity, power | circuit continuity, ground short | disconnection | rationality | circuit continuity, power short | circuit confinuty, ground short | disconnection |
| Fault | P0745 | P1831 | P1841 | P0775 | P1832 | P1842 | P0795 | P1833 | P1843 | P0740 | P1834 | P1844 | P0750 | P0753 | P0752 | P0751 | P0755 | P0758 | P0757 | P0756 |
| Component | Press, Contr. Valve 1 | - | - | 2 | 2 | 2 | n | 3 | 3 | - | • | * | Shift Sciencid (A) | € | (A) | (A) | (8) | (B) | (B) | (B) |

<u>Fig. 18: 6-Cylinder: ZF Transmission Diagnosis (9/01-8/02 - 2 Of 4)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: ZF Transmission Diagnosis (9/01-8/02 - 3 Of 4)

| MIL | | | | | | | | | | TWO | cycles | | | | | | | | | | | | |
|---------------------------------|---|---|--|--|---|---|---|--|--|---|--------------|--|---|----------------------------|---------------------------|----------------|---------------------------|--|-----------------|-----------------------|------------------|------------------|--|
| Time | BUD msec / cont | 800 msec / cont | 800 msec / cont | 800 msec / cont | 500 meso / com | 500 msec / cont | 500 msec / conf | 500 meso / cont | 90 msec / cont | 90 msec/conf | | 90 msec / conf | 90 msec / cont | 25 suc/ pont | 0.3 sec / cont | 0.3 sac / cont | 0.6 sec / cont | | 0.15 sec / cont | 0.4 sec/ount | cont | orice at startup | |
| Conditions | 7V < MV inp. Volt. < 16V | | | | 7V < MV Inp. Volt. < 16V | | | | No Plino Nino R > 500 rpm | No P / no N / no R | × 500 rpm | no P./ no N/no R. | no P / no N / no R | > 1408 ram | >1408 rpm | | 8 | 76 × | NO | | | | |
| Secondary | MV input voltage | | | | MV input voltage | | | | passis and passing pas | pos Never | colput speed | pos lever | pos lever output speed | pends audine | poods suidue | | negina | battery voltage | gnillon | | | | |
| Treshold | 1V < 35 voltage x 1.44V, if se to under current 0.85V < 55 voltage < 1.44V, if se to not under current | 1,44V < as vottage < 5V, it as is under current | 0V < sa voltage < 0.35V, if sa is not under cumont | 0.35V < sa voltage < 0.85V, if as in not under current | 1V < se voltage < 1,44V, if ss is under current | 1.44V < 6s voltage < 5V, if as is under ourrent | DV < ss voltage < 0.35V, if ss is not under current | 0.35V < as voltage < 0.83V, if as is not under current | Inp spd old gear = 40 rpm > inp spd new gear | inp spd old guar + 600 rpm < inp spd new goar | | inp spd did gear - 40 rpm > inp spd new gear | inp spd old gear + 600 rpm < inp spd new gear | Gat. Volt. < 9V | 7v < bat Voit < 16V | wrong value | > 100 ms | | invalid signals | invalid signal | invalid checksum | invalid checksum | The state of the s |
| Malfunction | voltage | voltage | voltage | voltage | adajos | voltage | egulov | voltage | Input output | peeds Indu | | input output | peads Indu | battery voltage | Lattery votage | CAN level | Can message/ time out DME | The second secon | CAN bus fault | CAN throttle position | EPROM checksum | EEPROM | - Constitution |
| Monitor Strategy Description | rationality | circuit continuity, power | circuit donthruity, ground | disconnection | rationality | dimult continuity, power | direalt continuity, ground | circuit continuity, discornacion | rationality, no change | rationality, value foo big | 4 | rationality, no changer | rationality, value too big | rationality | rationality | bus check | bus check | | bus oheck | rationality | self check | self check | rationally microcopholine |
| Code | P0760 | P0783 | P0762 | P0761 | P1781 | P1762 | P1763 | P1764 | P0782 | P1882 | | P0783 | P1643 | P1889 | P1892 | P1719 | P1720 | | P1747 | P1755 | P1794 | P1791 | P1792 |
| System | 99 | 0 | 0 | 0 | (Shift Lock) | (Shiff Lock) | (Shiff Lock) | (Shift Lock) | 2/3 Shift | | | HAS X | 1 | System Vortage, electrical | System Voltage, low input | Transmission | Control Modul | | 1 | | | | |

<u>Fig. 19: 6-Cylinder: ZF Transmission Diagnosis (9/01-8/02 - 3 Of 4)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: ZF Transmission Diagnosis (9/01-8/02 - 4 Of 4)

| Component | Fault | Monitor Strategy Description | Malfunction Criteria | Treshold | Secondary | Enable | Time | MIL. |
|--------------------------|-------|-------------------------------------|-------------------------|---|--------------------|-------------------------|------------------|------|
| Supply Voltage Pressure | P1893 | order confinuly, power short | voltage | ss and pcv vollage > buffery voltage - 1.0V | as and pov voltage | 75 ugaloy yolagu 7V | once at startup | |
| Cantrol Salenoid / Shirt | P1894 | circuit continuity, ground short | vollage | ss and per voltage < 25V | as and pov voltage | VS- agatery voltage -21 | once at startup. | |
| Solenoid | | | vollage | ss and pcv voltage < 30% * ballery voltage | as and pov vollage | 8 | 0.03 sec./ cont. | |
| | P1895 | disconnection | voltage | ss and pov voltage >= 2.6V | ss and pov vollage | AQ X | once at starture | |

Fig. 20: 6-Cylinder: ZF Transmission Diagnosis (9/01-8/02 - 4 Of 4) Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: GM TRANSMISSION (9/01-8/02)

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: GM TRANSMISSION (9/01-8/02)

| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
|-------|----------|--|--|
| P0705 | 8 | Transmission Range Sensor "A" Circuit Malfunction (PRNDL | See <u>6-CYLINDER: GM5</u> TRANSMISSION |
| | | <u> </u> | DIAGNOSIS (9/01-8/02 - 1 OF |
| | | | <u>3)</u> . |
| P0705 | 9 | Transmission Range Sensor "A" | See <u>6-CYLINDER: GM5</u> |

| | | Circuit Malfunction (PRNDL | TRANSMISSION |
|-------|-------|---|---|
| | | Input) | <u>DIAGNOSIS (9/01-8/02 - 1 OF</u> |
| D0707 | 26 | T | <u>3).</u> |
| P0705 | 36 | Transmission Range Sensor "A" Circuit Malfunction (PRNDL | See <u>6-CYLINDER: GM5</u> TRANSMISSION |
| | | Input) | DIAGNOSIS (9/01-8/02 - 1 OF |
| | | mpac) | 3). |
| P0709 | · | Range Switch Transitional Signal | See 6-CYLINDER: GM5 |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 1 OF |
| | | | <u>3)</u> . |
| P0715 | 16 | Input/Turbine Speed Sensor "A" | See <u>6-CYLINDER: GM5</u> |
| | | Circuit | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 1 OF |
| D0717 | | Lange Connell and Thom 100 DDM | See 6 CVI INDED, CM5 |
| P0717 | ••••• | Input Speed Less Than 100 RPM | See <u>6-CYLINDER: GM5</u> TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 1 OF |
| | | | 3). |
| P0720 | 42 | Output Speed Sensor Circuit | See 6-CYLINDER: GM5 |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 1 OF |
| | | | <u>3)</u> . |
| P0720 | 106 | Output Speed Sensor Circuit | See <u>6-CYLINDER: GM5</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/01-8/02 - 1 OF</u> |
| P0722 | | Output Speed Less Then 100 DDM | 2). |
| P0/22 | •••• | Output Speed Less Than 100 RPM | See <u>6-CYLINDER: GM5</u> TRANSMISSION |
| | | | <u>I KANSWISSION</u> DIAGNOSIS (9/01-8/02 - 1 OF |
| | | | 3). |
| P0727 | · | CAN Engine Speed Invalid Signal | See <u>6-CYLINDER: GM5</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/01-8/02 - 3 OF</u> |
| | | | <u>3</u>). |
| P0731 | | Gear 1 Incorrect Ratio | See <u>6-CYLINDER: GM5</u> |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 1 OF |
| P0732 | 100 | Gear 2 Incorrect Ratio | 3). See 6-CYLINDER: GM5 |
| FU/32 | 100 | Gear 2 incorrect Ratio | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 1 OF |
| | | | 3). |
| P0733 | | Gear 3 Incorrect Ratio | See 6-CYLINDER: GM5 |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/01-8/02 - 1 OF</u> |
| | | | <u>3)</u> . |
| P0734 | | Gear 4 Incorrect Ratio | See <u>6-CYLINDER: GM5</u> |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 1 OF |
| D0725 | + | Coor 5 Income (D) | 3). |
| P0735 | | Gear 5 Incorrect Ratio | See <u>6-CYLINDER: GM5</u> TRANSMISSION |
| | | | <u>I RANSWISSION</u> DIAGNOSIS (9/01-8/02 - 1 OF |
| | | | $\frac{3)}{3}.$ |
| | | | <u></u> . |

| P0741 | | TCC Stuck Off | See <u>6-CYLINDER: GM5</u> |
|-------|------|---------------------------------|---|
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 2 OF 3). |
| P0742 | •••• | TCC Stuck On | See <u>6-CYLINDER: GM5</u> TRANSMISSION |
| | | | <u>DIAGNOSIS (9/01-8/02 - 2 OF</u> |
| | | | <u>3)</u> . |
| P0743 | 4 | Torque Converter Clutch Circuit | See <u>6-CYLINDER: GM5</u> |
| | | Electrical | <u>TRANSMISSION</u> <u>DIAGNOSIS (9/01-8/02 - 2 OF</u> |
| | | | 3). |
| P0753 | 30 | Shift Solenoid "A" Electrical | See <u>6-CYLINDER: GM5</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/01-8/02 - 2 OF</u> |
| P0758 | 33 | Shift Solenoid "B" Electrical | See <u>6-CYLINDER: GM5</u> |
| 10738 | 33 | Simil Solchold B Electrical | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 2 OF |
| | | | <u>3)</u> . |
| P0763 | 32 | Shift Solenoid "C" Electrical | See <u>6-CYLINDER: GM5</u> |
| | | | <u>TRANSMISSION</u> DIAGNOSIS (9/01-8/02 - 2 OF |
| | | | 3). |
| P1719 | | CAN Level Bus Check | See 6-CYLINDER: GM5 |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| D1720 | | CAN Manage at /Time Oat | <u>3).</u> |
| P1720 | | CAN Messages/Time Out | See <u>6-CYLINDER: GM5</u> TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | <u>3)</u> . |
| P1765 | 154 | CAN Throttle Valve | See <u>6-CYLINDER: GM5</u> |
| | | | <u>TRANSMISSION</u> DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | 3). |
| P1765 | 158 | CAN Throttle Valve | See 6-CYLINDER: GM5 |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| D1700 | 1.50 | CANT | <u>3).</u> |
| P1780 | 152 | CAN Torque Reduction | See <u>6-CYLINDER: GM5</u> TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | <u>3)</u> . |
| P1790 | | RAM & ROM Check | See <u>6-CYLINDER: GM5</u> |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| P1791 | | Internal Error (NVM/RAM) | See 6-CYLINDER: GM5 |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| 7150: | | | <u>3)</u> . |
| P1794 | | ROM Check | See 6-CYLINDER: GM5 |
| | | | <u>TRANSMISSION</u> <u>DIAGNOSIS (9/01-8/02 - 3 OF</u> |
| | | | 21110110 515 (7/01-0/02 - 3 01 |
| | • | 3550 of 4036 | • |

| | 1 | | <u>3)</u> . |
|-------|------|-----------------------------|-----------------------------|
| P1801 | | Shift Solenoid "A" Short To | See <u>6-CYLINDER: GM5</u> |
| | | Ground | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 2 OF |
| | | | <u>3)</u> . |
| P1802 | | Shift Solenoid "B" Short To | See <u>6-CYLINDER: GM5</u> |
| | | Ground | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 2 OF |
| | | | <u>3)</u> . |
| P1803 | •••• | Shift Solenoid "C" Short To | See <u>6-CYLINDER: GM5</u> |
| | | Ground | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 2 OF |
| | | | <u>3)</u> . |
| P1891 | •••• | Power Supply Fault | See <u>6-CYLINDER: GM5</u> |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | <u>3)</u> . |
| P1892 | •••• | Power Supply Fault | See <u>6-CYLINDER: GM5</u> |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | <u>3)</u> . |

6-Cylinder: GM5 Transmission Diagnosis (9/01-8/02 - 1 Of 3)

| MIL | | | | driving | | | | |
|---------------------------------|---------------------------|--|--|---|--|--|--|--|
| Time | | 10 sec / cont | 0.5 sec/ cont. | 3 sec / cont | 5 sec / nont | 5 sec / cont. | 3 sec/ conf | 2 sec / conf |
| Enable | | 9V < bettery voltage < 18V 450 rom < end sed < 6500 rom | 9V < battery voltage < 19V 450 rpm < eng. spd. < 6500 rpm | > 8 km/h > 12% 6V < harten outlane < 18V | 1,2,3,4 or 5 > 8 km/h 9V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm | 1,2,34 or 5 9V < battery variage < 18V 450 rpm < eng. sed. < 6500 rpm | 70 Nan < urg brg < 400 Nm > 12 % 1500 rpm < inp spd < 6000 rpm 9V < battery voltage < 19V 450 rpm < sero. sero. sero. esto. < 6500 rpm | 1.2.3.4.5 1.0.8 10.08 10.9 10.08 10.0 10.08 20.05 4 20.00 20.05 4 20.00 0.05 4 20.00 1 |
| Secondary | | battery vollage engine speed | battery voltage engine speed | vehice speed throtte position ballary variation | guar seluciad vehicle speed battery voltage engino speed | grear selected battery violates engine speed outp stid or lest valid outp stid | engine forque introtte position input speed pattery valuage enaire speed | Speak solucited Protte position Post to |
| Treshold | | wrong signal | transitional signal | > 1000 rpm | Mq 100 P | > 1300 turn | < 100 rpm | delta > 5 %, |
| Malfunction Criteria | | invalid code | transitional code | bds duj page valle jub spd | input speed | delta culput speed | pears indino | frpui - cuthu i speed / (gree: ratio) |
| Monitor Strategy Description | | rationality | rationality | performance | rationality | porformence | rationality | rafornálity |
| Fault | | P0705 | P0709 | P0715 | 7140d | P0720 | P0722 | P0731 P0732 P0733 P0734 P0735 |
| System | AT GMS (manufacturer: GM) | Range Switch | | Input Speed | | Output Speed | | Gear Ratio |

<u>Fig. 21: 6-Cylinder: GM5 Transmission Diagnosis (9/01-8/02 - 1 Of 3)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: GM5 Transmission Diagnosis (9/01-8/02 - 2 Of 3)

| MIL | | | driving | | | | | | |
|---------------------------------|--|--|--|---|---|--|--|--|--|
| Time | 15 sec / cont | 7.5 sec/ cont | 700 msec / cont | 700 msec / cont | 700 msec / cont | 700 msec / cont | 700 msec / cont | 700 msec / cont | 700 msec/cont |
| Enable | 2.3.4 or 6 12% - 4 or 6 12% - 4 brel pos - 90 % 20°C - 6 brans brenp - 130 °C 55 Nm - eng trq - 400 Nm 9V - battley violige - 18V 450 rem - eng. sed 6500 rem | lock off 12% c firral pas < 80 % 600 par < 800 speed < 4500 80 Mm c eng fir < 4500 Nm 90 Mm c eng gad < 255 kph 9V s belley v older | 9V < battary voltage < 18V 450 rpm < eng. spd. < 6500 rpm | 9V < battery vollage < 18V 450 rpm < evo. and < 6500 rpm | 9V < battery voltage < 18V 450 rpm < eng. spd < 6500 rpm | on 9V < battery voltage < 18V 450 rpm < eno. sed. < 6500 rpm | 9V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm | 9V < battery votiage < 18V 450 rpm < eno. sed. < 6500 rpm | 9V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm |
| Secondary | TCC mode gear selected through the problem transmission formuse and transmission formuse the problem to the pro | TCC mode TCC mode front selected front sele | battery voltage engine speed | Shift Solenold A battery voltage engine sneed | battery voltage angine speed | Shift Solenold B battery voltage engine speed | battery voltage engine speed | Shift Solemoid C battery voltage entities scheed | battery voltage angine speed |
| Treshold | > 200 pm | -30 rpm < settle < 20 rpm | duty cycle (pwm signal) <= 10% or duty cycle (cwm signal) >= 80% | power short | ground shart | power short | prompt short | power short | ground short |
| Malfunction Criteria | eng speed inpul speed (maximum slip) | faller munipul | octage | voltage | voltage | voltage | Voltage | votage | voltage |
| Monitor Strategy Description | functional check TCC stuck off | Austional chock. TCC stuck on | circuit continuity | circuit continuity, power short | ciruit continuity, ground short | circuit confinulty, power short | druit continuity, ground short | circuit continuity, power short | ciruit continuity, ground short |
| Code | P0741 | P0742 | P0743 | P0753 | P1801 | P0758 | P1802 | P0763 | P1803 |
| System | Torque Converter Clutch | | Press. Confr. Valve | Shift Solenoid (A) | € | Shift Solemoid (B) | (8) | Shift Solenoid (C) | (D) |

<u>Fig. 22: 6-Cylinder: GM5 Transmission Diagnosis (9/01-8/02 - 2 Of 3)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: GM5 Transmission Diagnosis (9/01-8/02 - 3 Of 3)

| nt | Fault | Monitor Strategy | Malfunction | Treshold | Secondary | | Enable |
|----------|-------|------------------|----------------------------|------------------|---------------------------------|--------------------------------|--|
| r Supply | P1892 | rafichalty | Dattery voltage | 76.0 | people speed | | > 1600 mm |
| | P1891 | resonally | ballery voltage | V81 < | | | |
| 5.3 | P0727 | rafonality | CAN engine speed | lengis bileviri | battory voltage | gy < batter) | 9V < battery voltage < 16V |
| | P1750 | Underly | CAM torque reduction | Investo signal | battery voltage engine speed | 9V < baltony 450 rpm < eng. | 9V < battery voltage < 16V 450 rpm < eng. spd. < 6500 rpm |
| | 99214 | rationality | CAM finodle position | impis bilimii | battery voltage | gV < ballery | 9V < ballery voltage < 18V |
| | D1790 | desired and | CAM residence and a second | | engine speed | 450 rpm < eng | 450 rpm < eng spd < 6500 rpm |
| _ | p1719 | bus check | CAN level | wrong value | butteev vottage | 9V < battery | SV < battery voltage < 18V |
| _ | P1791 | rationality | internal error (NVM / RAM) | | | | |
| | P1790 | self check. | RAM and ROM check | invalid chacksum | | | |
| | P1794 | self check | ROM shack | not programmed | | | |

<u>Fig. 23: 6-Cylinder: GM5 Transmission Diagnosis (9/01-8/02 - 3 Of 3)</u> Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: 5HP19 TRANSMISSION (9/02-2003)

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: 5HP19 TRANSMISSION (9/02-2003)

| DITIONODITE | I ROODEL CODE | 5 0 C I ETI I DER. 3111 17 I RATION | 11001011 (7/02 2003) |
|-------------|---------------|--|---|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
| P0709 | 60 | Transmission Range Sensor "A" Circuit Intermittent | See <u>6-CYLINDER: 5HP19</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (9/02-2003 - 1</u> <u>OF 3)</u> . |
| P0715 | 33 | Input/Turbine Speed Sensor "A" | See <u>6-CYLINDER: 5HP19</u> |

| | | Circuit | TRANSMISSION |
|-------|-----|--|--|
| | | | DIAGNOSIS (9/02-2003 - 1 |
| P0716 | 33 | Langut/Typhing Smood Songan !! A!! | OF 3). See 6-CYLINDER: 5HP19 |
| FU/10 | 33 | Input/Turbine Speed Sensor "A" Circuit Range/Performance | TRANSMISSION |
| | | Circuit Range/1 crioimance | <u>DIAGNOSIS (9/02-2003 - 1</u> |
| | | | OF 3). |
| P0720 | 32 | Output Speed Sensor Circuit | See 6-CYLINDER: 5HP19 |
| 10,20 | 32 | Sulput Speed Sensor English | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 1 |
| | | | OF 3). |
| P0721 | 59 | Output Speed Sensor Circuit | See <u>6-CYLINDER: 5HP19</u> |
| | | Range/Performance | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 1 |
| | | | <u>OF 3)</u> . |
| P0731 | 50 | Gear 1 Incorrect Ratio | See 6-CYLINDER: 5HP19 |
| | | | <u>TRANSMISSION</u> |
| | | | <u>DIAGNOSIS (9/02-2003 - 1</u> |
| | | | <u>OF 3)</u> . |
| P0732 | 52 | Gear 2 Incorrect Ratio | See <u>6-CYLINDER: 5HP19</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/02-2003 - 1</u> |
| D0522 | | G AV P | <u>OF 3).</u> |
| P0733 | 53 | Gear 3 Incorrect Ratio | See <u>6-CYLINDER: 5HP19</u> |
| | | | TRANSMISSION DIACNOSIS (0/02 2002 1 |
| | | | <u>DIAGNOSIS (9/02-2003 - 1</u> OF 3). |
| P0734 | 54 | Gear 4 Incorrect Ratio | See 6-CYLINDER: 5HP19 |
| PU/34 | 34 | Gear 4 incorrect Ratio | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 1 |
| | | | OF 3). |
| P0735 | 55 | Gear 5 Incorrect Ratio | See 6-CYLINDER: 5HP19 |
| 10733 | | Gear 5 meonreet Ratio | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 1 |
| | | | OF 3). |
| P0741 | 48 | Torque Converter Clutch Circuit | See 6-CYLINDER: 5HP19 |
| | | Performance or Stuck Off | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 1 |
| | | | <u>OF 3)</u> . |
| P0745 | 1 | Pressure Control Solenoid "A" | See 6-CYLINDER: 5HP19 |
| | | | <u>TRANSMISSION</u> |
| | | | <u>DIAGNOSIS (9/02-2003 - 2</u> |
| | | | <u>OF 3)</u> . |
| P0750 | 16 | Shift Solenoid "A" | See <u>6-CYLINDER: 5HP19</u> |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 2 |
| | | | <u>OF 3)</u> . |
| P0751 | 16 | Shift Solenoid "A" Performance or | See <u>6-CYLINDER: 5HP19</u> |
| | | Stuck Off | TRANSMISSION DIAGNOSIS (0/02-2002-2 |
| | | | <u>DIAGNOSIS (9/02-2003 - 2</u> |
| D0752 | 1.0 | 01:001 1114110 10 | <u>OF 3).</u> |
| P0752 | 16 | Shift Solenoid "A" Stuck On | See <u>6-CYLINDER: 5HP19</u> |
| | | | TRANSMISSION DIAGNOSIS (0/02 2002 2 |
| | | | <u>DIAGNOSIS (9/02-2003 - 2</u> <u>OF 3).</u> |
| | 1 | + | <u>O1 3)</u> . |
| | ı | 3555 of 4036 | |

| P0753 | 16 | Shift Solenoid "A" Electrical | See 6-CYLINDER: 5HP19 |
|-------|----------|-----------------------------------|--|
| | | | <u>TRANSMISSION</u> <u>DIAGNOSIS (9/02-2003 - 2</u> |
| | | | <u>OF 3)</u> . |
| P0755 | 17 | Shift Solenoid "B" | See <u>6-CYLINDER: 5HP19</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/02-2003 - 2</u> |
| | | | <u>OF 3)</u> . |
| P0756 | 17 | Shift Solenoid "B" Performance or | See 6-CYLINDER: 5HP19 |
| | | Stuck Off | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 2 |
| | | | OF 3). |
| P0757 | 17 | Shift Solenoid "B" Stuck On | See 6-CYLINDER: 5HP19 |
| 10/5/ | 17 | Shift Solehold B Stack On | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/02-2003 - 2</u> |
| | | | OF 3). |
| D0750 | 1.7 | GI'C G I 'I I'D II EI . ' I | |
| P0758 | 17 | Shift Solenoid "B" Electrical | See <u>6-CYLINDER: 5HP19</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/02-2003 - 2</u> |
| | | | <u>OF 3)</u> . |
| P0760 | 18 | Shift Solenoid "C" | See <u>6-CYLINDER: 5HP19</u> |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 3 |
| | | | <u>OF 3)</u> . |
| P0761 | 18 | Shift Solenoid "C" Performance or | See 6-CYLINDER: 5HP19 |
| | | Stuck Off | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 3 |
| | | | OF 3). |
| P0762 | 18 | Shift Solenoid "C" Stuck On | See 6-CYLINDER: 5HP19 |
| 10,02 | | Similaria e Suata en | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 3 |
| | | | OF 3). |
| P0763 | 18 | Shift Solenoid "C" Electrical | See 6-CYLINDER: 5HP19 |
| 10703 | 10 | Shift Solehold C Electrical | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 3 |
| | | | OF 3). |
| P0775 | 1 | Pressure Control Solenoid "B" | |
| P0//3 | 2 | Pressure Control Solenoid "B" | See 6-CYLINDER: 5HP19 |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 2 |
| | | 2.2.74.12 | <u>OF 3).</u> |
| P0782 | 57 | 2-3 Shift | See <u>6-CYLINDER: 5HP19</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/02-2003 - 3</u> |
| | | | <u>OF 3)</u> . |
| P0783 | 58 | 3-4 Shift | See <u>6-CYLINDER: 5HP19</u> |
| | | | <u>TRANSMISSION</u> |
| | | | <u>DIAGNOSIS (9/02-2003 - 3</u> |
| | <u> </u> | | <u>OF 3)</u> . |
| P0795 | 3 | Pressure Control Solenoid "C" | See <u>6-CYLINDER: 5HP19</u> |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 2 |
| | | | OF 3). |
| P0962 | 1 | Pressure Control Solenoid "A" | See 6-CYLINDER: 5HP19 |
| | 1 | Control Circuit Low | TRANSMISSION |
| | | Control Circuit Dow | DIAGNOSIS (9/02-2003 - 2 |
| | | | 21110110010 (7:02 2003 2 |
| • | 1 | | |

| | | | <u>OF 3).</u> |
|---------------|-----|---|---|
| P0963 | 1 | Pressure Control Solenoid "A" | See <u>6-CYLINDER: 5HP19</u> |
| | | Control Circuit High | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/02-2003 - 2</u> |
| D 0066 | | | <u>OF 3).</u> |
| P0966 | 2 | Pressure Control Solenoid "B" | See 6-CYLINDER: 5HP19 |
| | | Control Circuit Low | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/02-2003 - 2</u> |
| D007 | 2 | D C + 10.1 111011 | OF 3). |
| P0967 | 2 | Pressure Control Solenoid "B" | See 6-CYLINDER: 5HP19 |
| | | Control Circuit High | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/02-2003 - 2</u> OF 3). |
| P0970 | 3 | Pressure Control Solenoid "C" | |
| P0970 | 3 | Control Circuit Low | See <u>6-CYLINDER: 5HP19</u> TRANSMISSION |
| | | Control Circuit Low | <u>I KANSWISSION</u> DIAGNOSIS (9/02-2003 - 2 |
| | | | OF 3). |
| D0071 | 3 | Pressure Control Solenoid "C" | |
| P0971 | 3 | | See <u>6-CYLINDER: 5HP19</u> TRANSMISSION |
| | | Control Circuit High | DIAGNOSIS (9/02-2003 - 2 |
| | | | <u>DIAGNOSIS (9/02-2003 - 2</u> <u>OF 3).</u> |
| P1700 | 62 | Dayble Eman Output Smeed and | See 6-CYLINDER: 5HP19 |
| P1/00 | 02 | Double Error Output Speed and Input/Turbine Speed | TRANSMISSION |
| | | input/Turome speed | <u>DIAGNOSIS (9/02-2003 - 1</u> |
| | | | <u>DIAGNOSIS (9/02-2003 - 1</u> <u>OF 3)</u> . |
| P1719 | 144 | CAN Version Error | See <u>6-CYLINDER: 5HP19</u> |
| F1/19 | 144 | CAN Version Error | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/02-2003 - 3</u> |
| | | | OF 3). |
| P1720 | 129 | CAN Timeout Control Module | See <u>6-CYLINDER: 5HP19</u> |
| 11/20 | 12) | CAIV Timeout Control Wodule | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 3 |
| | | | OF 3). |
| P1731 | 51 | Gear 1 manual Incorrect Ratio | See 6-CYLINDER: 5HP19 |
| 11731 | | Gear 1 mandar mediteet Ratio | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 1 |
| | | | OF 3). |
| P1732 | 65 | Gear Monitoring 4 at Electrical | See <u>6-CYLINDER</u> : 5HP19 |
| | | Substitute Program | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 1 |
| | | | <u>OF 3)</u> . |
| P1747 | 128 | CAN-Bus Monitoring | See 6-CYLINDER: 5HP19 |
| | | 8 | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 3 |
| | | | <u>OF 3)</u> . |
| P1761 | 19 | Shiftlock Solenoid | See 6-CYLINDER: 5HP19 |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 3 |
| | | | <u>OF 3)</u> . |
| P1762 | 19 | Shiftlock Solenoid High Input | See <u>6-CYLINDER: 5HP19</u> |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 3 |
| | | | <u>OF 3)</u> . |
| P1763 | 19 | Shiftlock Solenoid Low Input | See <u>6-CYLINDER</u> : 5HP19 |
| | | · | TRANSMISSION |
| | 1 | | |
| | | 3557 of 4036 | |

| | | | <u>DIAGNOSIS (9/02-2003 - 3</u> OF 3). |
|-------|-----|--|---|
| P1764 | 19 | Shiftlock Solenoid Open Circuit | See 6-CYLINDER: 5HP19 TRANSMISSION DIAGNOSIS (9/02-2003 - 3 OF 3). |
| P1765 | 147 | CAN Throttle Valve | See 6-CYLINDER: 5HP19 TRANSMISSION DIAGNOSIS (9/02-2003 - 3 OF 3). |
| P1791 | 81 | Internal Transmission Control Module Memory Checksum/EEPROM Error | See 6-CYLINDER: 5HP19 TRANSMISSION DIAGNOSIS (9/02-2003 - 3 OF 3). |
| P1792 | 82 | Internal Transmission Control Module Watchdog Error | See 6-CYLINDER: 5HP19 TRANSMISSION DIAGNOSIS (9/02-2003 - 3 OF 3). |
| P1794 | 80 | Internal Transmission Control Module Memory Checksum Error | See 6-CYLINDER: 5HP19 TRANSMISSION DIAGNOSIS (9/02-2003 - 3 OF 3). |
| P1882 | 57 | 2-3 Shift Circuit High | See 6-CYLINDER: 5HP19 TRANSMISSION DIAGNOSIS (9/02-2003 - 3 OF 3). |
| P1883 | 58 | 3-4 Shift Circuit High | See 6-CYLINDER: 5HP19 TRANSMISSION DIAGNOSIS (9/02-2003 - 3 OF 3). |
| P1889 | 96 | System Voltage - Electrical | See <u>6-CYLINDER: 5HP19</u> TRANSMISSION DIAGNOSIS (9/02-2003 - 3 OF 3). |
| P1892 | 96 | System Voltage Low Input | See 6-CYLINDER: 5HP19 TRANSMISSION DIAGNOSIS (9/02-2003 - 3 OF 3). |
| P1893 | 83 | Supply Voltage Pressure Control Solenoid/Shift Solenoid Circuit High | Diagnosis Not Available |
| P1894 | 83 | Supply Voltage Pressure Control Solenoid/Shift Solenoid Circuit Low | Diagnosis Not Available |
| P1895 | 83 | Supply Voltage Pressure Control Solenoid/Shift Solenoid No Signal | Diagnosis Not Available |
| P2761 | 4 | Torque Converter Clutch Pressure Control Solenoid Control Circuit/Open | See 6-CYLINDER: 5HP19 TRANSMISSION DIAGNOSIS (9/02-2003 - 2 OF 3). |
| P2763 | 4 | Torque Converter Clutch Pressure Control Solenoid Control Circuit High | See 6-CYLINDER: 5HP19 TRANSMISSION DIAGNOSIS (9/02-2003 - 2 OF 3). |
| P2764 | 4 | Torque Converter Clutch Pressure | See <u>6-CYLINDER: 5HP19</u> |

6-Cylinder: 5HP19 Transmission Diagnosis (9/02-2003 - 1 Of 3)

| MIL | | driving | - | | | | driving | | driving | driving |
|---------------------------------|---------------------------|---|-----------------|---|--|--------------------------------|--|---|---|---|
| Time | 0,2 sec / cont | 0.5 sec / cont | 500 msec / cont | 240 msec / cont | 400 msec / cont | 250 msec / cont | 900 msec / cont | 900 mseic / cont | 40 msec / conf | 2.5 sec / cont |
| Conditions | | > 992 revirain > 224 revirain > 9V | | > 255 revimin < 8000 revimin | D, 4, 3, 2 > 1600 rpm not allowed | | > 500 rpm > 90v > 90v > 20°C | 151 gear 151 gear > 500 rpm > 9V > 20 °C | > 500 tpm > 90 cpm > 20 °C + st open | 2, 3, 4 or 5 > input speed <= 180 Nm >= 5.24 bar |
| Secondary | | engine apeud output speed battery voltage coers selected | | Front wheel speed | pos lever output speed gear shifts | | pos lever output speed battery voltage transmission fluid temperature | pos levor manual mode output speed battety voltage transmission fluid temperature | pos lever output speed buttor vollage transmission fluid emperature Substitude function | gear selected engine speed input forque to TC (calcusted) TCC activation pressure (calcusted) |
| Treshold | wrong signal | ٥ | > 6720 rev/min | > 7744 revirain of of delta > 750 revirain | < 160 rpm < 160 rpm | P0720 active invalid signal | de(ta > 5 % | delta > 5 % | detta > 5 % | - 40 rpm |
| Malfunction Criteria | unvalid code | input speed. | input speed | output speed or or or output Spd - wheel spd "rear axle railo | output speed wheel speed wheel speed " rear axle ratio | output speed wheel speed | Input - output speed f (gear ratio) | input - culturi speed f (glear railo) | ingut - culturi speed ((gear ratio) | eng. speed - input speed (maximum sép) |
| Monitor Strategy Description | rationality | rationality | rationality | rationality | rationality | rationality | rationality | rationality | rationality | functional check |
| Code | P0709 | P0715 | P0716 | P0720 | P0721 | P4700 | P0731 P0732 P0733 P0734 | P1731 | P1732 | P0741 |
| System | A/T 5HP19 Range Switch | paeds Indul | 1 | paads Indino | | beed speed course fault | Gear Ratio | | Gear Ratio for substitude function 4.the gear | Torque Converter Cluich |

<u>Fig. 24: 6-Cylinder: 5HP19 Transmission Diagnosis (9/02-2003 - 1 Of 3)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: 5HP19 Transmission Diagnosis (9/02-2003 - 2 Of 3)

| MIL IIIum. | | | driving cycles | | | |
|---------------------------------|---|--|--|--|--|---|
| Time | 70 msec / cont | 50 msoc/cont | 50 msec / cont | 70 msec / cont | 800 msec / cont 800 msec / cont 800 msec / cont 800 msec / cont | 800 msec / cont 800 msec / cont 800 msec / cont 800 msec / cont |
| Enable | V2.15V | V8.18.V | V6.5V | V8,1=> V7 < | 7V < MV inp. Volt. < 16V | 7V < MV Inp. Vail. < 18V |
| Secondary Parameter | - pov 1 voltage - pov 1 voltage) prov 1 voltage | abs(ballery voltage - pov 2 voltage) pov 2 voltage | abs(baftery voltage - pov 3 voltage) pov 3 voltage | abs(battery voltage - pcv 1 voltage) pcv 1 voltage | MV input voltage | MV input voltage |
| Treshold | > 150mh (if meas curr < 200mh) > 1000mh (if meas curr > 200mh) TV V | > 160mA (if meas curr > 200mA) > 1000mA (if meas curr > 200mA) 12 V 0 V | > 150mA (if meas curr > 200mA) > 1000mA (if meas curr > 200mA) 12 V 0 V | > 150mh (if meas curr < 200mk) > 1000mh (if meas curr > 200mk) 12 V 0 V | 1V < ss voltage < 14V/, if ss in under career B.BVV < se voltage < 14V/, if ss is under career 1.44V < se voltage < V/, if ss is under career IV < se voltage < V/, if ss is not under career IV < se voltage < 0.35V, if ss is not under career 0.35V < se voltage < 0.85V, if ss is not under career 0.35V < se voltage < 0.85V, if ss is not under career | 1V < sa voltaga < 1,4V, if sis is inder current C.BSV < sa voltaga < 1,4V, if sis is under current 1,44V < sa voltaga < 0,39V, if sis is not under current 0V < sa voltaga < 0,39V, if sis is not under current 0,35V < sa voltaga < 0,89V, if sis is not under current |
| Malfunction Criteria | meass, cur celc. cur. voltage voltage | meass, curr calc. curr. voltage voltage | meass, curr calc. curr. voltage voltage | meass, curr, - celc, curr, voltage voltage | egelov egelov egelov | voltage voltage voltage |
| Monitor Strategy Description | circuit continuty, power short circuit confiniuty, ground | circuit conlimuty, power short circuit conlimuty, ground short | retantily circul continuty, power short circuit continuty, ground short | rationality circuit continuty, power circuit continuty, ground about | rationally power short continuity, power short continuity, ground affort birout continuity, disconnection disconnection | rasonality citcuit continuity, power short circuit continuity, ground short circuit continuity, disconnection |
| Fault | P0745 P0963 | P0966 | P0785 P0970 | P2761 P2763 P2764 | P0750 P0753 P0752 | P0755 P0758 P0757 |
| Component/ System | Press. Contr. Valve 1 | | п п п | 4 4 4 | (A) (A) (A) | (B) (E) (E) |

<u>Fig. 25: 6-Cylinder: 5HP19 Transmission Diagnosis (9/02-2003 - 2 Of 3)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: 5HP19 Transmission Diagnosis (9/02-2003 - 3 Of 3)

| MIL III | | | | | | | | | | detwing | - | | | | | | | | | | | |
|---------------------------------|---|--|---|--|--|---|---|--|--|--|--|---|----------------------------|---------------------------------|----------------|---------------------------|-----------------|-----------------|-----------------------|------------------|------------------|-----------------------------|
| Time | 800 msec / cont | 800 msec / cont | 600 msec / cont | BOD missis / cont | 500 mass / conf | 500 meet / cont | 500 maec / pont | 500 msec / cont | 90 maec / conf | 90 maso / gont | 90 msec / cont | 90 miec / cont | 2.5 sec / cont | 0.3 sec / cont | 0.3 sec / cont | 0.6 sec / pont | | 0.15 sec / cont | 0.4 sec / port | poor | once at startup | America int are inclined. |
| Enable | 7V < MV inp. Volt. < 16V | | | | 7V < MV Inp. Volt. < 16V | | | | no Pl no N I no R | * 540 rpm no P./ no N/ ne R * 540 rpm | TOP/NON/NOR | > 500 rpm no P/ no N/ no R > 500 rpm | > 1408 rpm | >1408 rpm | | 10 | ∧6 < | uo. | | | | |
| Secondary | MV Input vollage | | | | MV input votage | | | | pos lever | output spaed pog lever | pas leve | outpul speed pos laver outpul speed | pades aujoua | paads aufilia | | ignition | battery voltage | ignebon | | | | |
| Treshold | 1V < as voltage < 1.44V, if as it under partent 0.85V < as voltage < 1.44V, if se is not under current | 1,44V < ss vovage < 5V, if ss is under current | OV < se voltage < 0.35V, if as is not under current | 0.35V < ss voltage < 0.85V, if ss is not under current | 1V < ss voltage < 1,44V, if as la under purent 0,85V < ss voltage < 1,44V, if as is not under current | 1,44V < 15 vollage < 5V, if sicis under current | OV < 33 vallage < 0.35V, It se ta not under current | 0.35V < ss voltage < 0.85V, if ss is not under current | was wan by and and an analysis and any and any | ing spid old gaar + 600 rpm + imp and new good | ing spd old gear - 40 rpm > ing spd naw gear | inp spd old grar + 800 rum < inp spd naw your | bat. Volt < 9V | bat Volt < 7V or 15V < bat Vult | wrong value | > 100 ms | | invalid signals | invalid signal | invalid checksum | Invalid checksum | Invalid chanks m |
| Malfunction | voltage | adition | voltage | voltage | voltage | voirage | Voltage | voitage | indui output | peads Indus | uppet output | input speed | battery voltage | battery voltage | CANTENE | Can message/ time out DME | | CAN bias fault | CAN throttle position | EPROM checksum | EEPROW | watchnon |
| Monitor Strategy Description | railonality | circuit continuity, power | circuit continuity, ground | disconnection | Agenopei | circuit continuity, power | circuit confinulty, ground | disconneton | rationality, no change | rationality, value too big | rationality, ne change | rationality, value too big | rationality | Ajjeuogei | bus check. | bus check | | bus check | rattenality | self check | self check | rationality microcontroller |
| Code | P0750 | P0769 | P0702 | P0761 | P1761 | P-1762 | P1763 | P1764 | P0782 | P1882 | P0783 | P1883 | P1889 | P1692 | P1719 | P1720 | | P1747 | P1765 | P1794 | 18114 | P1792 |
| System | Shift Solemoid (C) | (0) | (0) | (0) | (Shill Look) | (Shill Lock) | (Striff Lock) | (Shiff Lords) | 273 Svall | | Sing % | | System Voltage, electrical | System Voltage, low input | Transmission | Control Modul | | | | | | |

<u>Fig. 26: 6-Cylinder: 5HP19 Transmission Diagnosis (9/02-2003 - 3 Of 3)</u> Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: GM5 TRANSMISSION (9/02-2003)

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: GM5 TRANSMISSION (9/02-2003)

| BITTOTTOBITE | TROUBLE COD | Es o e l'Ell (BEIC GIVIS l'ICH (SIVI | 1881011 (2702 2005) |
|--------------|-------------|---|---|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
| P0705 | 60 | Transmission Range Sensor "A" Circuit Malfunction (PRNDL Input) | See <u>6-CYLINDER: GM5</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (9/02-2003 - 1</u> <u>OF 3)</u> . |
| P0709 | 60 | Transmission Range Sensor "A" | See <u>6-CYLINDER: GM5</u> |

| 1 | | Circuit Intermittent | TRANSMISSION |
|-------|-----|---|---|
| | | | <u>DIAGNOSIS (9/02-2003 - 1</u> |
| D0715 | 22 | In mod/Total in a Control Control HAII | OF 3). |
| P0715 | 33 | Input/Turbine Speed Sensor "A" Circuit | See <u>6-CYLINDER: GM5</u> TRANSMISSION |
| | | Circuit | <u>TRANSWISSION</u> DIAGNOSIS (9/02-2003 - 1 |
| | | | OF 3). |
| P0717 | 33 | Input/Turbine Speed Sensor "A" | See 6-CYLINDER: GM5 |
| | | Circuit No Signal | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 1 |
| | | | <u>OF 3)</u> . |
| P0720 | 32 | Output Speed Sensor Circuit | See <u>6-CYLINDER: GM5</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/02-2003 - 1</u> |
| | | | <u>OF 3)</u> . |
| P0722 | 32 | Output Speed Sensor Circuit No | See <u>6-CYLINDER: GM5</u> |
| | | Signal | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/02-2003 - 1</u> OF 3). |
| P0727 | 150 | Engine Speed Input Circuit No. | See 6-CYLINDER: GM5 |
| F0/2/ | 130 | Engine Speed Input Circuit No Signal | TRANSMISSION |
| | | Signai | DIAGNOSIS (9/02-2003 - 3 |
| | | | OF 3). |
| P0731 | 50 | Gear 1 Incorrect Ratio | See 6-CYLINDER: GM5 |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 1 |
| | | | <u>OF 3)</u> . |
| P0732 | 52 | Gear 2 Incorrect Ratio | See <u>6-CYLINDER: GM5</u> |
| | | | <u>TRANSMISSION</u> |
| | | | DIAGNOSIS (9/02-2003 - 1 |
| | | | <u>OF 3)</u> . |
| P0733 | 53 | Gear 3 Incorrect Ratio | See <u>6-CYLINDER: GM5</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/02-2003 - 1</u> <u>OF 3)</u> . |
| P0734 | 54 | Gear 4 Incorrect Ratio | See 6-CYLINDER: GM5 |
| 10734 | 34 | Geal 4 incorrect Ratio | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 1 |
| | | | OF 3). |
| P0735 | 55 | Gear 5 Incorrect Ratio | See 6-CYLINDER: GM5 |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (9/02-2003 - 1 |
| | | | <u>OF 3)</u> . |
| P0741 | 48 | Torque Converter Clutch Circuit | See 6-CYLINDER: GM5 |
| | | Performance or Stuck Off | <u>TRANSMISSION</u> |
| | | | <u>DIAGNOSIS (9/02-2003 - 2</u> |
| | | | <u>OF 3)</u> . |
| P0742 | 48 | Torque Converter Clutch Circuit | See <u>6-CYLINDER: GM5</u> |
| | | Stuck On | TRANSMISSION |
| | | | <u>DIAGNOSIS (9/02-2003 - 2</u> |
| D0752 | 1.0 | 01:0.0.1 1144471 114 | OF 3). |
| P0753 | 16 | Shift Solenoid "A" Electrical | See <u>6-CYLINDER: GM5</u> |
| | | | <u>TRANSMISSION</u> DIAGNOSIS (9/02-2003 - 2 |
| | | | <u>DIAGNOSIS (9/02-2003 - 2</u> <u>OF 3).</u> |
| | | | <u>01 </u> |
| | • | 3562 of 4036 | • |

| P0758 | 17 | Shift Solenoid "B" Electrical | See <u>6-CYLINDER: GM5</u> |
|-------|-----|---|--|
| | | | <u>TRANSMISSION</u> <u>DIAGNOSIS (9/02-2003 - 2</u> OF 3). |
| P0763 | 18 | Shift Solenoid "C" Electrical | See <u>6-CYLINDER: GM5</u> <u>TRANSMISSION</u> |
| | | | <u>DIAGNOSIS (9/02-2003 - 3</u> <u>OF 3)</u> . |
| P0973 | 16 | Shift Solenoid "A" Control Circuit Low | See <u>6-CYLINDER: GM5</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (9/02-2003 - 2</u> |
| P0976 | 17 | Shift Solenoid "B" Control Circuit Low | OF 3). See <u>6-CYLINDER: GM5</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (9/02-2003 - 2</u> |
| P0979 | 18 | Shift Solenoid "C" Control Circuit Low | See 6-CYLINDER: GM5 TRANSMISSION DIAGNOSIS (9/02-2003 - 3 |
| P1719 | 144 | CAN Version Error | OF 3). See 6-CYLINDER: GM5 TRANSMISSION DIAGNOSIS (9/02-2003 - 3 OF 3). |
| P1720 | 129 | CAN Timeout Control Module | See 6-CYLINDER: GM5 TRANSMISSION DIAGNOSIS (9/02-2003 - 3 OF 3). |
| P1765 | 147 | CAN Throttle Valve | See 6-CYLINDER: GM5 TRANSMISSION DIAGNOSIS (9/02-2003 - 3 |
| P1780 | | CAN Throttle Valve | See 6-CYLINDER: GM5 TRANSMISSION DIAGNOSIS (9/02-2003 - 3 OF 3). |
| P1790 | 80 | Internal Transmission Control Module Memory Checksum/EPROM Error | See 6-CYLINDER: GM5 TRANSMISSION DIAGNOSIS (9/02-2003 - 3 OF 3). |
| P1791 | 81 | Internal Transmission Control Module Memory Checksum/EEPROM Error | See 6-CYLINDER: GM5 TRANSMISSION DIAGNOSIS (9/02-2003 - 3 OF 3). |
| P1794 | 80 | Internal Transmission Control Module Memory Checksum Error | See <u>6-CYLINDER: GM5</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (9/02-2003 - 3</u> <u>OF 3).</u> |
| P1891 | 96 | System Voltage High Input | See 6-CYLINDER: GM5 TRANSMISSION DIAGNOSIS (9/02-2003 - 3 OF 3). |
| P1892 | 96 | System Voltage Low Input | See 6-CYLINDER: GM5 TRANSMISSION DIAGNOSIS (9/02-2003 - 3 |
| | ı | 3563 of 4036 | |

| | | <u>OF 3</u>). |
|---|--|--|
| 4 | Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical | See <u>6-CYLINDER: GM5</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (9/02-2003 - 2</u> |
| | 4 | Control Solenoid Control Circuit |

6-Cylinder: GM5 Transmission Diagnosis (9/02-2003 - 1 Of 3)

| System | A/T GM5 | Range Switch | | Input Speed | | Onlput Speed | | Gear Ratio |
|---------------------------------|---------|--|--|---|--|--|--|--|
| Fault | | P0705 | P0709 | P0715 | P0717 | P0720 | P0722 | P0731 P0732 P0733 P0734 |
| Monitor Strategy Description | | rationality | rationality | performance | rationality | performance | rationality | rationality |
| Malfunction Criteria | | Invalid oode | franslitonal code | pds dui pijev isej - pds duj | paids India | delta outpul speed | peed andino | input - output sciend { (grear reliu) |
| Treshold | | wrong signal | transitional signal | × 1000 rpm | < 100 rpm | × 1300 rpm | < 100 rpm | % 5 ~ 6 Mab |
| Secondary | | battery voltage engine speed | bailery voltage engine speed | vehicle speed throttle position battery voltage | grear selected vehicle speed battery voltage engine speed | gear selected battery voltage engine speed outb spd or last valid outb spd | engine lorque Proble position inclus speed beats inclus speed centines peed engine | goar steleted trottles position position position temperature english levyen english suprature english valide english valide tratemission ratio battava valide anglish suprature anglish suprature tratemission ratio position suprature anglish suprature anglish suprature position and anglish suprature anglish suprature andlish suprature |
| Enable | | 9V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm | 9V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm | > 8 km/h 12% 9V < battery vollage < 18V | 1,2,3,4 or 5 > 8 km/h 9V < battery voltage < 18V 456 rpm < eng. spd. < 6500 rpm | 1,2,3,4 or 5 9V < battery voltage < 18V 450 rpm < eng. spt. < 6500 rpm > 1300 rpm | 70 Nm < eng bq < 400 Nm > 12 % 1500 rpm < inp spd < 6000 rpm 9V < battery voltage < 18V 450 rpm < eng, spd. < 6600 rpm | 112,3,4,5 1105,4,6 1105,4,6 1105,4,6,7,6,7,6,7,6,7,6,7,6,7,6,7,6,7,6,7,6 |
| Time | | 10 sec / ppnt | 0.5 sec/ cont | 3 sec / cont | S sec / cont | 5 sec / cont | 3 sec / cont. | 2 sec / cont |
| MIL. | | | | driving | | | | two driving cycles |

<u>Fig. 27: 6-Cylinder: GM5 Transmission Diagnosis (9/02-2003 - 1 Of 3)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: GM5 Transmission Diagnosis (9/02-2003 - 2 Of 3)

| MIL IIIum. | | two driving cycles | | | | | |
|---------------------------------|--|--|--|--|--|--|--|
| Time | 15 sec / cont | 7.5 sec/ cont | 700 msec / cont | 700 msea / cont | 700 msec / conf | 700 msec / cont | 700 msec / conf |
| Enable Conditions | 2.3, 4 or 5 12% - 4 or 5 12% - 4 or 5 12% - 4 or 5 50.5 - 4 or 5 50.6 - 4 or 5 50.6 - 4 or 5 50.6 - 4 or 5 60.6 - 400.0 or 6 60.6 - 60.6 or 6 60.6 or | lock off 12% c throt pos < 90 % 50 pra < eng spot < 450 80 km < eng tra < 400 km 15 kp) < eng stor < 250 kph 9V < ballery vicines < 18V 450 rpm < eng. spot < 6500 rpm | 9V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm | 9V < battery voltage < 18V 450 rom < eng. sod. < 6500 rom | 9V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm | 9V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm | 9V < battery voltage < 18V 450 rpm < eng. sad. < 6500 rpm |
| Secondary | TCC mode ger selected throttle position transmission temperature engine troque bettery voltage engine stoed | TCC mode goar selected through the position angine speed ending the speed engine torque verifice speed battery voltage. | battery voltage engine speed | Shift Solencid A battery voltage engine speed | battery voltage engine speed | Shift Solenoid B battery voltage engine speed | battery voltage engine speed |
| Treshold Value | ≥ 200 prim | -20 rpm < delta < 20 rpm | duty cycle (pwm signal) <= 10% or duty cycle (pwm signal) >= 90% | power short | ground short | power short | ground short |
| Malfunction Criteria | TCC_Sip_Terpet -TCC_Sip (maximum alip) | (dig.um-unique) | voltage | voltage | voltage | voltage | voltage |
| Monitor Strategy Description | functional check TCC stuck off | Inredomal check TCC stuck on | circui continuity | circuit continuity, power short | ainti confinally, ground short | circuit continuity, power short | cirult continuity, ground short |
| Fault | P0741 | P0742 | P2759 | P0753 | P0973 | P0758 | P0976 |
| Component/ System | Torque Converter Clutch | | Press, Contr. Valve | Shiff Solenoid (A) | 3 | Shiff Solandid (B) | (8) |

<u>Fig. 28: 6-Cylinder: GM5 Transmission Diagnosis (9/02-2003 - 2 Of 3)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: GM5 Transmission Diagnosis (9/02-2003 - 3 Of 3)

| OBD II Requirements, Summary Table | Secondary Enable Time MIL Parameter Conditions Recuired Illum. | RV 700 misec / cont O rom | 450 rpm < eng, spd. < 6500 rpm | engine speed > 1500 mm S sec./ cont. No. | 10 sec / cont | bettery voltage 9V < battery voltage < 18V T sec / conii | thattery voltage 9V < battery voltage < 18V 1 sec (cont thruthe speed 450 rpm < ent., stot. < 6500 rpm | 9V < ballery valtage < 18V | 3 9V < battery voltage < 16V 1 sec / cont | 9V < battery voltage < 18V | 1 | |
|------------------------------------|---|---------------------------------|--------------------------------|--|-----------------|--|---|----------------------------|---|----------------------------|----------------------------|-----------------------|
| OBD II Re | Treshold Value | power short | ground strart | V9.6 > | > 18 \ | lengis blavni | fivalid signal | invalid signal | 215 | wrong value | | Journally observer on |
| Enhanced Evap | Malfunction Criteria | egation | yotage | battery voltage | battery voltage | CAN engine speed | CAM torque reduction | CAN thruttle position | CAN messages/line out | CAN level | internal error (NVM / RAM) | RAM and ROM chank |
| Certification Standard ULEV II | Monitor Strategy Description | circuit continuity, power short | ciruit continuty, ground short | rationality | rationality | rationality | rationality | rationality | bus check | bus check. | rationally | salf chack |
| Certifi | Fault | P0763 | P0879 | P1892 | P1891 | P0727 | P1780 | P1765 | P1720 | P1719 | P1751 | P1790 |
| Test Group 3BMXV03.0UL2 | Component | Shift Solenoid (C) | 0 | Power Supply | | Control Modul | | | | | | |

<u>Fig. 29: 6-Cylinder: GM5 Transmission Diagnosis (9/02-2003 - 3 Of 3)</u> Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: SMG TRANSMISSION (3/03-2003)

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: SMG TRANSMISSION (3/03-2003)

| DIAGNOSTIC I | ROODLL CODL | 5 0-C I LINDLK. SWIG I KANSWI | 1551011 (5/05-2005) |
|--------------|-------------|-----------------------------------|--|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
| P0932 | 20215 | Hydraulic Pressure Sensor Circuit | See <u>6-CYLINDER: SMG</u> TRANSMISSION |
| | | | DIAGNOSIS (3/03-2003 - 1 OF 5). |
| P0934 | 20215 | Hydraulic Pressure Sensor Circuit | See <u>6-CYLINDER: SMG</u> |

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| | I | Low | TRANSMISSION |
|-------|-------|---|---|
| | | | DIAGNOSIS (3/03-2003 - 1 |
| | | | <u>OF 5)</u> . |
| P0935 | 20215 | Hydraulic Pressure Sensor Circuit | See <u>6-CYLINDER: SMG</u> |
| | | High | TRANSMISSION |
| | | | <u>DIAGNOSIS (3/03-2003 - 1</u> OF 5). |
| D1720 | 2000 | CAN Timeout Control Module | |
| P1720 | 20800 | CAN Timeout Control Module | See <u>6-CYLINDER: SMG</u> TRANSMISSION |
| | | | <u>TRANSWISSION</u> DIAGNOSIS (3/03-2003 - 1 |
| | | | OF 5). |
| P1721 | 20801 | CAN Timeout ASC/DSC | See 6-CYLINDER: SMG |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (3/03-2003 - 1 |
| | | | <u>OF 5)</u> . |
| P1747 | 52999 | CAN-Bus Monitoring | See 6-CYLINDER: SMG |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (3/03-2003 - 1</u> |
| | | | <u>OF 5)</u> . |
| P1765 | 20904 | CAN Throttle Valve | See <u>6-CYLINDER: SMG</u> |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (3/03-2003 - 1 |
| D17// | 20702 | Death Francisco Const | OF 5). |
| P1766 | 20702 | Double Error Engine Speed CAN/Direct Wiring | See <u>6-CYLINDER: SMG</u> TRANSMISSION |
| | | CAN/Direct wiring | <u>I RANSMISSION</u> DIAGNOSIS (3/03-2003 - 1 |
| | | | OF 5). |
| P1767 | 20913 | CAN Wheel Speeds Rear Axle | See 6-CYLINDER: SMG |
| 11/0/ | 20713 | Crit wheel Speeds real rime | TRANSMISSION |
| | | | DIAGNOSIS (3/03-2003 - 3 |
| | | | OF 5). |
| P1771 | 20901 | CAN Torque Interface Plausibility | See 6-CYLINDER: SMG |
| | | 1 1 | TRANSMISSION |
| | | | DIAGNOSIS (3/03-2003 - 4 |
| | | | <u>OF 5)</u> . |
| P1782 | 20910 | CAN Brake Signal | See <u>6-CYLINDER: SMG</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (3/03-2003 - 2</u> |
| | | | <u>OF 5)</u> . |
| P1791 | 20401 | Internal Transmission Control | See <u>6-CYLINDER: SMG</u> |
| | | Module Memory | TRANSMISSION |
| | | Checksum/EEPROM Error | DIAGNOSIS (3/03-2003 - 4 |
| D1706 | 20406 | Internal Transmission Control | OF 5). |
| P1796 | 20406 | Module Error 7 (High Side Driver) | See <u>6-CYLINDER: SMG</u> <u>TRANSMISSION</u> |
| | | Wiodule Effor / (High Side Driver) | <u>TRANSWISSION</u> DIAGNOSIS (3/03-2003 - 4 |
| | | | <u>OF 5).</u> |
| P1817 | 20606 | Gear Selector Lever GSL0 Cable | See <u>6-CYLINDER</u> : SMG |
| 11017 | 20000 | High Input | TRANSMISSION |
| | | | DIAGNOSIS (3/03-2003 - 4 |
| | | | OF 5) |
| P1818 | 20606 | Gear Selector Lever GSL0 Cable | See 6-CYLINDER: SMG |
| | | Low Input | TRANSMISSION |
| | | · | DIAGNOSIS (3/03-2003 - 4 |
| | | | OF 5). |
| | | | |
| | | 3567 of 4036 | |

| P1819 | 20606 | Gear Selector Lever GSL0 Cable Plausibility | See <u>6-CYLINDER: SMG</u> <u>TRANSMISSION</u> |
|-------|-------|--|--|
| | | | DIAGNOSIS (3/03-2003 - 4 OF 5). |
| P1820 | 20607 | Gear Selector Lever GSL1 Cable High Input | See <u>6-CYLINDER: SMG</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (3/03-2003 - 4</u> |
| P1821 | 20607 | Gear Selector Lever GSL1 Cable | OF 5). See 6-CYLINDER: SMG |
| 11021 | 20007 | Low Input | TRANSMISSION DIAGNOSIS (3/03-2003 - 4 OF 5). |
| P1822 | 20607 | Gear Selector Lever GSL1 Cable Plausibility | See <u>6-CYLINDER: SMG</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (3/03-2003 - 4</u> |
| P1823 | 20611 | Gear Selector Lever Digital Cable | OF 5). See 6-CYLINDER: SMG |
| 11025 | 20011 | Plausibility | TRANSMISSION DIAGNOSIS (3/03-2003 - 3 OF 5). |
| P1850 | 20213 | Shift Angle Sensor High Input | See <u>6-CYLINDER: SMG</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (3/03-2003 - 2</u> |
| P1851 | 20213 | Shift Angle Sensor Low Input | OF 5). See 6-CYLINDER: SMG TRANSMISSION DIAGNOSIS (3/03-2003 - 2 |
| P1852 | 20213 | Shift Angle Sensor Plausibility | OF 5). See 6-CYLINDER: SMG TRANSMISSION DIAGNOSIS (3/03-2003 - 2 OF 5). |
| P1859 | 20217 | Clutch Speed Sensor Plausibility | See <u>6-CYLINDER: SMG</u> TRANSMISSION DIAGNOSIS (3/03-2003 - 5 OF 5). |
| P1860 | 20612 | Gear Selector Lever Hall Sensor Error 1 | See 6-CYLINDER: SMG TRANSMISSION DIAGNOSIS (3/03-2003 - 5 OF 5). |
| P1866 | 20608 | Gear Selector Lever GSL2 Cable High Input | See 6-CYLINDER: SMG TRANSMISSION DIAGNOSIS (3/03-2003 - 4 OF 5). |
| P1867 | 20608 | Gear Selector Lever GSL2 Cable Low Input | See 6-CYLINDER: SMG TRANSMISSION DIAGNOSIS (3/03-2003 - 4 OF 5). |
| P1868 | 20608 | Gear Selector Lever GSL2 Cable Plausibility | See 6-CYLINDER: SMG TRANSMISSION DIAGNOSIS (3/03-2003 - 4 OF 5). |
| P1869 | 20609 | Gear Selector Lever GSL3 Cable High Input | See <u>6-CYLINDER: SMG</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (3/03-2003 - 4</u> |

| | | | <u>OF 5)</u> . |
|-------|-------|--------------------------------|----------------------------|
| P1870 | 20609 | Gear Selector Lever GSL3 Cable | See <u>6-CYLINDER: SMG</u> |
| | | Low Input | <u>TRANSMISSION</u> |
| | | | DIAGNOSIS (3/03-2003 - 4 |
| | | | <u>OF 5)</u> . |
| P1876 | 20609 | Gear Selector Lever GSL3 Cable | See <u>6-CYLINDER: SMG</u> |
| | | Plausibility | <u>TRANSMISSION</u> |
| | | | DIAGNOSIS (3/03-2003 - 4 |
| | | | <u>OF 5)</u> . |
| P1887 | 20335 | Hydraulic Pump | See <u>6-CYLINDER: SMG</u> |
| | | | <u>TRANSMISSION</u> |
| | | | DIAGNOSIS (3/03-2003 - 2 |
| | | | <u>OF 5)</u> . |

6-Cylinder: SMG Transmission Diagnosis (3/03-2003 - 1 Of 5)

| MIL Illum | 2nd driving cycle | | | | | 2nd driving cycle | 2. | - 6 | 23 | 6 |
|---------------------------------|---|---|------------------------------------|------------------|--------------------------------|--|--|--|---|---|
| Time | y v | 150 | < 500ms, continuous | | | < 105 ms, continuous | < 210 ms. conf. | × × | < 20 ms conf | |
| Enable Conditions | FINISHED NOT IN PROGRESS ON (B.5-107, 17.01-17.5) | ON ON (8.5-10V, 17.01-17.5) IN PROGRESS >20 cm ² | ON ON (6.5-107, 17.01-17.5) | NO O | [6.5-10V, 17.01-17.5] | ON ON ON 18.5-10.77, 0.01-17.5] | ON ON 17-17-17-17-51 | ON ON [6.5-10V, 17.01-17.5] ON acknowledged since timeout | ON since timeout (6.5-10V, 17.01-17.5) | Validated ON ON ON |
| Secondary | Pump activation = & GEARSHIFT & A.R.Y. & NOT CRANKING = & Ksupply = | A KEY " A NOT CRANKING = 8 VSUPPY = 8 GERSHIFT 8 ESTIMATED USED OIL | KEY = & NOT CRANKING = & Vsupply = | & NOT CRANKING = | & Vsupply = | KEY = & NOT CRANKING = & Vsupply = | KEY = & NOT CRANKING = & Vsupily = | & NOT CRANKING = & NOT CRANKING = & Vsupply = & Engine = | KEY= & ECU = & Vsupply = | failure on CAN engine speed = & NOT CRANKING = & VOT CRANKING = & Vernance = |
| Threshold Value | della pressura + + i,5 par | della pressure > -3 bar | signal gradient > 5V | > 0.4 > langis | signal > 4,7 V | Irrecul | Imeout | Bmeout | signal = FFhex | 0 = leaned shoots |
| Malfunction Criteria | GNE) resnes no noticinatri | sersor malfunction, but of dynamic range | inferruption or s.p.to GMD | a c. to supply | signal is not available on CAN | signal is not available on CAN | CAN bus Off | mailunction on lirrotte valve potent/cmeter | sensor disconnected or multitle fault | |
| Monitor Strategy Description | Allicamed | | | lower threshold | upper threshold | pleusibility | dispensed. | plaus buty | yingpus | Ajjiqisnejo |
| Code | P0932 | | | P0934 | P0935 | P1720 | P1721 | P1747 | P1765 | P1766 |
| System | Transmission SMG | | | | | CAN Timeout DME | CAN Timeout ASC/DSC | CAN-Bus Monitoring | CAN Throttle Valva | Engine Speed |

<u>Fig. 30: 6-Cylinder: SMG Transmission Diagnosis (3/03-2003 - 1 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: SMG Transmission Diagnosis (3/03-2003 - 2 Of 5)

| III MIL | 2nd driving cycle | 2 | | | | 2nd dawing |
|---------------------------------|------------------------------------|---------------------------------|-----------------|-------------------------|---|---|
| Time | < Sty s, cont. | < 800 ms cont | The sail of | | | Of the second |
| Enable Conditions | Commanded | 200 | NO TON | [6.5-107, 17.01-17.5] | (gear position, EQL turned values) ON NOTON (6.5-10V, 17.01-17.5) NOT IN PROGRESS | ON since timeout |
| Secondary Parameter | Pump = & errar counter >= | KEYa | & CRANKING = | & Vaupply = | selection thresholds = & KEY = & CRANKING = & Vauptly = & GENEHIT = | KEY = & ECU = & Vancely = |
| Threshold | pump switched on for more than 30s | V5.4 > 4.5V | signal < 0.5 V | signal gradient > 4,4 V | signal outside salection (meskolds | CAN label F BS = 1 |
| Malfunction Criteria | damage on hydraulic pump | open circuit or e.c. to Vsupply | Short to GND | out of dynamic range | Out of position range | failure on brake switch system detected by engine control unit |
| Monitor Strategy Description | plausibility | upper threshold | lower throshold | plausibility | | Kiligishejd |
| Fault | P1987 | P1850 | P1851 | P1852 | | P1782 |
| Component | Hydraulic Pump Fallum | Shin Position Sensor | | | | CAN Brake Signal |

Fig. 31: 6-Cylinder: SMG Transmission Diagnosis (3/03-2003 - 2 Of 5) Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: SMG Transmission Diagnosis (3/03-2003 - 3 Of 5)

| Test Group 3BMXV03.0UL2 | Certi | Certification Standard ULEV II | Enhanced Evap yes | OBDIIF | Requiremen | OBD II Requirements, Summary Table | y Table | |
|----------------------------|-------|-----------------------------------|--|-----------------------------|---|--|----------------|-------------------|
| Component System | Fault | Monitor Strategy Description | Malfunction Criteria | Threshold | Secondary | Enable | Time | MIL |
| Geer Lever Dioles Live | 200 | le contraction of the | had red in set militalism on vision and in | signal = 1 | CODE <> & KEY = & CRANKING = & VSUDDY = | NO NOT ON 15.01-17.51 | | |
| | 680 | BURGE CLI | riai cei is not switching of wring problem | signal = 0 | CODE :: & KEY :: & CRANKING :: & Vsupply :: | NOT ON 16.5-10V, 17.01-17.51 | < 20 ms, cont. | 2nd driving cycle |
| | | | out of dynamic range | signal gradient > 1000 rpm | ENGINE = & KEY = & NOT CRANKING = & VSUDDY = & GEMR = & CLUTCH = | ON ON ON (6.5-10V, 17.01-17.5) ENGAGED CLOSED | | |
| CAN Speed Rear Wheels | P1767 | yllidisusiq. | sicnal not available for fireness | O = leave le beneve | ENGINE = 8 KEY | ON ON ON [6.5-10V, 17.01-17.5] ENGAGED CLOSED | < 1 s, cont. | 2nd driving cyde |
| | | | | | BNGINE: 8 KEY = 8 NOT CRANKING = 8 VSHOPLY = 8 GEAR = 8 CLUTCH SPEED > | ON ON ON [6.5-107,17.5] ENGAGED 500 min. | | |

Fig. 32: 6-Cylinder: SMG Transmission Diagnosis (3/03-2003 - 3 Of 5) Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: SMG Transmission Diagnosis (3/03-2003 - 4 Of 5)

| System | Fault | Monitor Strategy Description | Malfunction | Threshold Value | Secondary | Enable | Time | MIL |
|-----------------------------|-------|---------------------------------|---|---|---|--|--------------------------------|-------------------|
| CAN Speed Baar Wheels | | | speed signal<>engine speed/gear ratio +e. AND speed signal<>edulch speed/gear ratio +e. | tolerance e = 500 min.". gear rato = flengaged gear). diutch speed | ENGINE = & KEY = & NOT CRANKING = & Vaupkly = & A GRAR = & CUTCH = | ON ON ON [F6.5-10V, 17.51, 5] ENGAGED CLOSED | | |
| | | | failure on speed signal detected by DSC control unit. | cins of the speed sagnals from CAN = 1FFFh | & KEY = & KEY = & NOT CRANKING = & VSUGAY = & GEAR = & CLUTCH = | ON ON ON (6.5-10V, 17.01-17.5) ENGAGED CLOSED | < 1 s, spill | 2nd driving cycle |
| CAN Generated Engine Torque | P1771 | plausibility | engine ECU not working properly | slgnał = FFnex | KEY = & ECU = & Vsupply = | ON since timeout (6.5-10V, 17.01-17.5) | < 20 ms, conf. | 2nd driving cycle |
| EEPROM failure | P1791 | plausibility | checksum failure | | | Socia all FCU power on | toer divine code | 1st deloine corte |
| | | | unintended drivers relay opening (open circuit on pin (1,7), Eumed fuse | Logic relay commanded AND power latch voltage > 5V AND drivers relay commanded on | NOT CRANKING = & TCU internal RELAY | N N | <150ms, conf. | 1st diving cycle |
| Power Latch Relays | P1796 | Villatering | drivers relay parmanently closed logic relay permanently closed | power latch voltage > 5V AND drivers relay commanded off ECU not switched off AND | | ECU switch off request | < 20 ms. Ther driving cycle | Znd driwing cycle |
| Gear lever analog lines | | | | togic relay contranced on | | | | |
| (0) | P1817 | Upper threshold | open circul at s.c.to Vsupply or s.c.to +5V | Egnal > 4.2 V | KEY | 700 | | |
| | P1818 | lawer threshold | short to GND | V 8,0 > lights | & CRANKING = | NOTON | < 1.s. conf | 2nd thiving twels |
| | P1819 | plausibility | signal gradient to high | signal gradient > 4,40 V | 8 V supply = | (E.S-10V, 17.01-17.5) | | and a second |
| (4) | P1820 | upper fineshold | open grout or s.c.to Vsupply or s.c.to +5V | signal > 4,2 V | | | | |
| | P1821 | lower threshold | short to GND | signal < 0.8 V | | | < 1.9. cont | |
| | P1822 | plausibility | Signal gradient to high | signal gradient > 4,40 V | | | | |
| (2) | P1866 | upper Breshold | open circuit or s.c.to Vaupply or s.c.to +5V | signal > 4,2 V | | | | |
| | P1867 | Diodes threshold | Short to GND | signal < 0,8 V | | | < 1 & cont. | |
| | P1866 | - Aggrand | signal gradient to high | signal gradient > 4,4 V | | | | |
| E) | P1869 | upper threshold | open circuit or s.c. to Vsupply or s.c.to +5V | signal > 4,2 V | | | | |
| | P1870 | lower threshold | Short to GND | signal < 0,8 V | | | < 1 s. conf. | |
| | P1876 | plausibility | signal gradient to high | signal gradient > 4,4 V | | | | |

<u>Fig. 33: 6-Cylinder: SMG Transmission Diagnosis (3/03-2003 - 4 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: SMG Transmission Diagnosis (3/03-2003 - 5 Of 5)

| MIL Illum. | 2nd driving cycle | 2nd driving cycle | | |
|---------------------------------|--|--|--|---|
| Time | < 20 ms, cont. | s 1s. cont. | | |
| Enable Conditions | NOT ON NOT ON [6.5-10V, 17.01-17.5] | ON ON NOT ON [6.5-107, 17.01-17.5] CLOSED ENGAGED | ON ON ON CONSTON (17.01-17.5) (ON ON ON CONSED ENGAGED ON ON ON ON CONSED ENGAGED ENGAGED ENGAGED ENGAGED ENGAGED ON | ON NOTO-175] (6.5-107, 17.01-17.5] CLOSED ENGAGED (engage gear) |
| Secondary | KEY = & CRANKING = & V_supply = | ENGINE = & KEY = & CRANKING = & VSupply = & CLUTCH = & GEAR = | A CRAINE = 8 KRV = 8 KRV = 8 KRV = 8 CRANING = 8 CBARING = 8 CBARING = 8 KRV = 8 KRV = 8 CRANING = 8 C | & KEY = & CRANKING = & Vsupply = & CLUTCH = & GEAR = & GEAR = & goar nails = & door nails = |
| Threshold | code not valid for a tmeout (Code is compared to valid gear position codes) | Signal gradient > 9000 rpm | speed signal = 0 | tolerance e = 2000 min ** |
| Malfunction Criteria | hall cell is not switching | out of dynamic range | signal not evallable for limocut | speed signal <> engine speed+e AND speed signal- driveline speed fear rafio +e |
| Monitor Strategy Description | leusis ou | plausibility | | |
| Fault | P1860 | P1859 | | |
| Component | Gear Lever Hallsensors | Clutch Speed | | |

<u>Fig. 34: 6-Cylinder: SMG Transmission Diagnosis (3/03-2003 - 5 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION (2004)

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION (2004)

| DIAGNOSTIC II | ROODLL CODL | 5 0-C I LINDLK. JIII 17 NON-AV | VD TRAINBINIBBION (2004) |
|---------------|-------------|--|---|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
| P0709 | 60 | Transmission Range Sensor "A" Circuit Intermittent | See <u>6-CYLINDER: 5HP19</u> <u>NON-AWD TRANSMISSION</u> <u>DIAGNOSIS (2004 - 1 OF 4)</u> . |
| P0715 | 33 | Input/Turbine Speed Sensor "A" Circuit | See <u>6-CYLINDER: 5HP19</u> NON-AWD TRANSMISSION |

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| | 1 | | DIAGNOSIS (2004 - 1 OF 4). |
|-------|----|---|---|
| P0716 | 33 | Input/Turbine Speed Sensor "A" Circuit Range/Performance | See 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 1 OF 4). |
| P0720 | 32 | Output Speed Sensor Circuit | See <u>6-CYLINDER: 5HP19</u> NON-AWD TRANSMISSION DIAGNOSIS (2004 - 1 OF 4). |
| P0721 | 59 | Output Speed Sensor Circuit Range/Performance | See <u>6-CYLINDER: 5HP19</u> <u>NON-AWD TRANSMISSION</u> <u>DIAGNOSIS</u> (2004 - 1 OF 4). |
| P0731 | 50 | Gear 1 Incorrect Ratio | See 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 1 OF 4). |
| P0732 | 52 | Gear 2 Incorrect Ratio | See <u>6-CYLINDER: 5HP19</u> NON-AWD TRANSMISSION DIAGNOSIS (2004 - 1 OF 4). |
| P0733 | 53 | Gear 3 Incorrect Ratio | See <u>6-CYLINDER: 5HP19</u> <u>NON-AWD TRANSMISSION</u> <u>DIAGNOSIS</u> (2004 - 1 OF 4). |
| P0734 | 54 | Gear 4 Incorrect Ratio | See 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 1 OF 4). |
| P0735 | 55 | Gear 5 Incorrect Ratio | See <u>6-CYLINDER: 5HP19</u> <u>NON-AWD TRANSMISSION</u> <u>DIAGNOSIS</u> (2004 - 1 OF 4). |
| P0741 | 48 | Torque Converter Clutch Circuit Performance or Stuck Off | See <u>6-CYLINDER: 5HP19</u> <u>NON-AWD TRANSMISSION</u> <u>DIAGNOSIS (2004 - 2 OF 4)</u> . |
| P0745 | 1 | Pressure Control Solenoid "A" | See 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 4). |
| P0750 | 16 | Shift Solenoid "A" | See 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 4). |
| P0751 | 16 | Shift Solenoid "A" Performance or Stuck Off | See 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 4). |
| P0752 | 16 | Shift Solenoid "A" Stuck On | See 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 4). |
| P0753 | 16 | Shift Solenoid "A" Electrical | See <u>6-CYLINDER: 5HP19</u> <u>NON-AWD TRANSMISSION</u> <u>DIAGNOSIS</u> (2004 - 2 OF 4). |
| P0755 | 17 | Shift Solenoid "B" | See <u>6-CYLINDER: 5HP19</u> <u>NON-AWD TRANSMISSION</u> <u>DIAGNOSIS</u> (2004 - 3 OF 4). |
| P0756 | 17 | Shift Solenoid "B" Performance or Stuck Off | See 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 3 OF 4). |
| P0757 | 17 | Shift Solenoid "B" Stuck On | See 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 3 OF 4). |
| P0758 | 17 | Shift Solenoid "B" Electrical | See 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 3 OF 4). |

| P0760 | 18 | Shift Solenoid "C" | See 6-CYLINDER: 5HP19 |
|-----------|-----|-----------------------------------|----------------------------------|
| F 0 / 00 | 10 | Shift Solehold C | NON-AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF 4) |
| P0761 | 18 | Shift Solenoid "C" Performance or | See 6-CYLINDER: 5HP19 |
| 10/01 | 10 | Stuck Off | NON-AWD TRANSMISSION |
| | | Stuck Off | DIAGNOSIS (2004 - 3 OF 4) |
| P0762 | 18 | Shift Solenoid "C" Stuck On | See 6-CYLINDER: 5HP19 |
| 10702 | 10 | Simil Solchold C Stuck On | NON-AWD TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 3 OF 4)</u> |
| P0763 | 18 | Shift Solenoid "C" Electrical | See 6-CYLINDER: 5HP19 |
| 10703 | 10 | Shift Solehold C Electrical | NON-AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF 4) |
| P0775 | 2 | Pressure Control Solenoid "B" | See <u>6-CYLINDER</u> : 5HP19 |
| 10775 | 2 | Tressure Control Solenoid | NON-AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 2 OF 4). |
| P0782 | 57 | 2-3 Shift | See 6-CYLINDER: 5HP19 |
| 10702 | | 2 3 Shift | NON-AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF 4). |
| P0783 | 58 | 3-4 Shift | See 6-CYLINDER: 5HP19 |
| 10703 | | 3 4 Shift | NON-AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF 4). |
| P0795 | 3 | Pressure Control Solenoid "C" | See 6-CYLINDER: 5HP19 |
| 10755 | | Tressure Control Solenoid | NON-AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 2 OF 4). |
| P0962 | 1 | Pressure Control Solenoid "A" | See 6-CYLINDER: 5HP19 |
| 1 0 0 0 2 | | Control Circuit Low | NON-AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 2 OF 4). |
| P0963 | 1 | Pressure Control Solenoid "A" | See 6-CYLINDER: 5HP19 |
| 1 0 0 0 5 | | Control Circuit High | NON-AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 2 OF 4). |
| P0966 | 2 | Pressure Control Solenoid "B" | See 6-CYLINDER: 5HP19 |
| | | Control Circuit Low | NON-AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 2 OF 4). |
| P0967 | 2 | Pressure Control Solenoid "B" | See 6-CYLINDER: 5HP19 |
| | | Control Circuit High | NON-AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 2 OF 4). |
| P0970 | 3 | Pressure Control Solenoid "C" | See 6-CYLINDER: 5HP19 |
| | | Control Circuit Low | NON-AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 2 OF 4). |
| P0971 | 3 | Pressure Control Solenoid "C" | See 6-CYLINDER: 5HP19 |
| | | Control Circuit High | NON-AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 2 OF 4). |
| P1700 | 62 | Double Error Output Speed and | See 6-CYLINDER: 5HP19 |
| | | Input/Turbine Speed | NON-AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 1 OF 4). |
| P1719 | 144 | CAN Version Error | See 6-CYLINDER: 5HP19 |
| | | | NON-AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 4 OF 4). |
| P1720 | 129 | CAN Timeout Control Module | See <u>6-CYLINDER: 5HP19</u> |
| | | | NON-AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 4 OF 4). |
| P1731 | 51 | Gear 1 manual Incorrect Ratio | See 6-CYLINDER: 5HP19 |
| | | | NON-AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 1 OF 4). |
| 1 | - | | ` |

| P1732 | 65 | Gear Monitoring 4 at Electrical Substitute Program | See 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 1 OF 4). |
|-------|-----|--|---|
| P1747 | 128 | CAN-Bus Monitoring | See 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 4 OF 4). |
| P1761 | 19 | Shiftlock Solenoid | See 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 3 OF 4). |
| P1762 | 19 | Shiftlock Solenoid High Input | See 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 3 OF 4). |
| P1763 | 19 | Shiftlock Solenoid Low Input | See <u>6-CYLINDER: 5HP19</u> NON-AWD TRANSMISSION DIAGNOSIS (2004 - 3 OF 4). |
| P1764 | 19 | Shiftlock Solenoid Open Circuit | See <u>6-CYLINDER: 5HP19</u> NON-AWD TRANSMISSION DIAGNOSIS (2004 - 3 OF 4). |
| P1765 | 147 | CAN Throttle Valve | See 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 4 OF 4). |
| P1791 | 81 | Internal Transmission Control Module Memory Checksum/EEPROM Error | See 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 4 OF 4). |
| P1792 | 82 | Internal Transmission Control Module Watchdog Error | See 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 4 OF 4). |
| P1794 | 80 | Internal Transmission Control Module Memory Checksum Error | See 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 4 OF 4). |
| P1882 | 57 | 2-3 Shift Circuit High | See <u>6-CYLINDER: 5HP19</u> NON-AWD TRANSMISSION DIAGNOSIS (2004 - 3 OF 4). |
| P1883 | 58 | 3-4 Shift Circuit High | See <u>6-CYLINDER: 5HP19</u> <u>NON-AWD TRANSMISSION</u> <u>DIAGNOSIS</u> (2004 - 3 OF 4). |
| P1889 | 96 | System Voltage - Electrical | See 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 3 OF 4). |
| P1892 | 96 | System Voltage Low Input | See <u>6-CYLINDER: 5HP19</u> <u>NON-AWD TRANSMISSION</u> <u>DIAGNOSIS (2004 - 3 OF 4)</u> . |
| P1893 | 83 | Supply Voltage Pressure Control Solenoid/Shift Solenoid Circuit High | See <u>6-CYLINDER: 5HP19</u> NON-AWD TRANSMISSION DIAGNOSIS (2004 - 4 OF 4). |
| P1894 | 83 | Supply Voltage Pressure Control Solenoid/Shift Solenoid Circuit Low | See <u>6-CYLINDER: 5HP19</u> NON-AWD TRANSMISSION DIAGNOSIS (2004 - 4 OF 4). |
| P1895 | 83 | Supply Voltage Pressure Control Solenoid/Shift Solenoid No Signal | See <u>6-CYLINDER: 5HP19</u> NON-AWD TRANSMISSION DIAGNOSIS (2004 - 4 OF 4). |
| P2761 | 4 | Torque Converter Clutch Pressure Control Solenoid Control Circuit/Open | See 6-CYLINDER: 5HP19 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 4). |
| | | | I |

| P2763 | 4 | Torque Converter Clutch Pressure | See <u>6-CYLINDER: 5HP19</u> |
|-------|---|----------------------------------|------------------------------------|
| | | Control Solenoid Control Circuit | NON-AWD TRANSMISSION |
| | | High | <u>DIAGNOSIS (2004 - 2 OF 4)</u> . |
| P2764 | 4 | Torque Converter Clutch Pressure | See <u>6-CYLINDER: 5HP19</u> |
| | | Control Solenoid Control Circuit | NON-AWD TRANSMISSION |
| | | Low | DIAGNOSIS (2004 - 2 OF 4). |

6-Cylinder: 5HP19 Non-AWD Transmission Diagnosis (2004 - 1 Of 4)

| MIL | | dwing gwyng | | | | Te. | driving | | two driving cycles |
|---------------------------------|---------------------------|--|-----------------|---|--|--------------------------------------|---|---|---|
| Time | 0.2 sec / cont | 0.5 sec / cont | 500 mase / cont | 240 msec / cont | 400 msec / cont | 250 msec / cont | 900 msec / cont | 900 manc / cont | 40 msec / cont |
| Conditions | | > 992 rev/min > 224 rev/min > 9V 1.2.3.4.5 | | > 255 revimin < 8000 revimin | D, 4, 3, 2 > 1600 rpm not allowed | | no P / no N / no R > 500 rpm > 9V > 20 ° C | no P / no N / no R 1st gear > 500 rpm > 20 v c | no P / no N / no R > 500 rpm > 9v > 20 °C |
| Secondary | | engine speed output speed battery vollega geer selected | | Front wheel speed speed | pos lever output speed geer shifts | | pos fever culpul speed battery voltage fransmission fluid terrperature | pos lever menual mode uniput speed battery voltaga bransmission fluid temperature | pos fever output speed battery vollage transmission fluid femperature Substitute function |
| Treshold | wrong signal | . 0 | > 6720 rev/min | > 7744 revimin or delta > 750 revimin | < 160 rpm < 160 rpm | P0720 actives invested signal | delts > 5 % | % 5 < eHeb | detta > 5 %. |
| Malfunction Criteria | invalid code | input speed | Input speed | output speed or output speed or outp. Spd - wheel spd * rear safe ratio | output speed wheel speed "rear axle ratio | wheel speed | (dest ratio) / | input - output speed / (geer ratio) | iriput - output speed / (gene ratio) |
| Monitor Strategy Description | raforality | rationality | rationality | rationality | rationality | rationality | rationalty | rationality | rationality |
| Code | P0709 | P0715 | P0716 | P0720 | P0721 | P1700 | P0731 P0732 P0733 P0734 | F1731 | P1732 |
| System | A/T 5HP19 Range Switch | peeds indu | | peeds indino | | output / wheel speed double fault | Gear Ratio | | Gear Ratio for substitute function 4th gear |

<u>Fig. 35: 6-Cylinder: 5HP19 Non-AWD Transmission Diagnosis (2004 - 1 Of 4)</u> Courtesy of BMW OF NORTH AMERICA, INC.

| MIL MIL | Briwing Briwing | | | two driving cycles | | |
|---------------------------------|--|---|---|--|--|--|
| Time | 2.5 she/ cart | 70 msec / cont | 50 misec / cont | 50 meec / cont | 70 meec / cont | 800 msec / port 800 msec / cont. 500 msec / port 800 msec / port |
| Enable | 2, 3, 4 or 5 > input append <= 160 Nm >= 5.24 bar | V 2/12 v | V 4.7 v | V415V | V=4.5V V7.4 | 70 < MV inp. Volt. < 16V |
| Secondary | pear selected angine speed input torque to TC (calculated) TCC activation pressure (calculated) | abatbatrary voltaga - pov 1 voltaga) pov 1 voltaga | elbejtatlery voltage - pov 2 voltage) pov 2 voltage | abs[bailery voltage - pcv 3 voltage) pcv 3 voltage | uba(haltery voltage - pev 1 voltage) pev 1 voltage | MV input vollage |
| Treshold | » 80 rpm | > 150mA (if meas curr < 200mA) > 1000mA (if meas curr > 200mA) 12 V 0 V | > 150nA (if meas curr = 200nA) > 1000nA (if meas curr > 200nA) 12 V 0 V | > 156mh (if nees cur > 200mh) > 1050mh (if nees cur > 200mh) 12 V 0 V | > 150mA (if meas cur < 200mA) > 100mA (if meas cur > 200mA) 12 V | V cas voltage - 1,44V; as is under current 0,82V cas voltage - 1,44V; as is not under current 1,44V cas voltage - 6,4V; it is is under current 0V cas voltage - 0,35V; it as is not under current 0,35V c as voltage - 0,35V, it as is not under current |
| Malfunction | eng, speed • input speed (maximum silp) | meas, cum, calc, cum, voltage voltage | mas cum - calc. cum, voltage voltage | meas, curr calc, curr. voltage voltage | meas, curr - calc. curr, voltage voltage | voltage Voltage voltage voltage |
| Monitor Strategy Description | functional check | rationality cutait cominuty, power short circuit continuity, ground stoot | rationality circuit controlluty, power about controlly, ground chault controlluty, ground short | rationality circuit continuity, power short circuit confiniuty, ground | rationality clear short circuit controllity, power about carcuit confinity, ground short | rafonaky drout continuity, power short crout condituity, ground short circuit continuity, disconnection |
| Code | PU741 | P0745 P0963 P0962 | P0775 P0967 | PO\$70 | P2761 P2763 P2764 | P0750 P0753 P0752 |
| System | Torque Converter Civich | Press, Contr. Valve 1 | 8 8 8 | | 4 4 4 | Shift Solemoid (A) (A) (A) |

<u>Fig. 36: 6-Cylinder: 5HP19 Non-AWD Transmission Diagnosis (2004 - 2 Of 4)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: 5HP19 Non-AWD Transmission Diagnosis (2004 - 3 Of 4)

| MIL MIL | | | - | carif | oout | cont | CORM | cont | con: | cont | COM | cent | cent two driving | 12 | cont | Just 1 | sort |
|---------------------------------|--|--|--|--|--|---|---|--|---|---|--|---|--|--|--|----------------------------|---------------------------------|
| Time | 800 manu/carl | 800 msoc / con | 800 msec / cont | 800 msec/cont | 800 reed/our | 800 mags / cont | 800 resc./ Local | 500 rase/ cost | SUD TIBEC / CON! | bou meed / cont | 500 msec / com | 90 srauci con | 90 mags cont | 90 magazoni | 90 msec/cont | 7.5 sectore | C 3 sec/cont |
| Conditions | 7V < MV inp. Volt < 15V | | | TV < MV inp Volt < 15V | | | | 2V < MV inp. Valt < 15V | | | | no P/no N/no R | no P / ne N no R | nc P / no N / no R | ng P / 10 N / 10 R | × 1408 mm | >1408 rpm |
| Secondary | MV input voltage | | | agettoy tuddi VA | | | | MV input vottage | | | | Son leuer | para special control c | pes lever | pose lever pose lever cutturi speed | andine spine | peds eugine |
| Treshold | 1V < 83 Voltage < 1.44V, if as is under outrent 0.86V < 69 voltage < 1.44V, if as is not under current 1.44V < 89 voltage < 5V, if as is under current | OV < se vollage < D 35V, it as is not under cument | 0 35V < ss vollage < 0.85V, if as is not under current | 1V = es voltage < 1.44V. Fee la under current o ass V et a notice < 1.44V. Fee en anti-more | 1.44V < ss vokage < 5V, Tss is union current | UV < es voltage < 0.35V, if so is not under current | 0.35V < 69 votage < 0.55V, if ss is not under current | 1V < as yollage < 1.44V, Fasis under current | 0,000 < s6 voltage < 1,440, il as e not under current 1,440 < s6 voltage < 50, if as a under carrent | 00 < 85 voltage < 0.35V, Biss tamble rever commit | 0.35V < es voltage < 0.65V, 0.35 a not under current | inp upd old gaze - 40 pm > inp apd haw gent | inp spd old gear + 600 spm < ms spd mov gaar | into and old galar - 40 rpm > ind such new grown | inp and old gear # 600 pms < no apd new goar | bat Volt. < BV | bat Voll < 7V or 16V < bat Volt |
| Malfunctio | voltage | voltage | vortage | atierjox | voluge | voltage | ediepos | voltaga | Stuppet | volume | *Bellov | Indian octions | input speed | Indino Indul | pands Indul | belleny rollege | battery voltage |
| Monitor Strategy Description | circuit continuity, power short | circui confinity, ground | discornector | Allacolar | circuit continuity, power short | ahort continuity grains | disconnection | rationality | circuit continuity, power short | circus confinity, grains: | disconnection | egusta or villenden | rationality, value too big | rationality, no obsings | reforally, value too big | miraelly | radonality |
| Code | P0755 | P0757 | P0755 | 09/04 | P0763 | P0762 | P0761 | P1761 | 291.d | P1763 | P+764 | POTRZ | 28814 | P0793 | PIRIC | P1880 | P1892 |
| Camponent | (a) (b) | (8) | (B) | Shift Salerod (C) | <u>Q</u> | 0 | (5) | (SMITLOCK) | (SAIT LOCK) | Shift Locky | (Shift Lock) | 20 Suit | | #15 X | | System Voltage, electrical | System Vollage, overinged |

Fig. 37: 6-Cylinder: 5HP19 Non-AWD Transmission Diagnosis (2004 - 3 Of 4) Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: 5HP19 Non-AWD Transmission Diagnosis (2004 - 4 Of 4)

| System | Fault | Monitor Strategy Description | Malfunction | Treshold | Secondary | Enable | Time | MI |
|--------------------------|-------|---------------------------------|---------------------------|---|---------------------|-------------------------|------------------|----------|
| ransmission | P1719 | bus check | CAN level | Wrong value | | | 0.3 sac/con | |
| Control Medule | P1720 | bus check. | CAN message/ time out DME | > 100 ms | Ignition | uo. | 0.6 suc/cont | |
| | | | | | hatteny voltage | 76 A | | |
| | P1747 | bus check. | CAN bus fault | invalid signals | landon | 00 | 6.15 sec./ med | Inne |
| | P1765 | raffemally | CAN throttle position | invalid storel | | | D. d. sar-Treat | No. |
| | P1784 | self check. | EPROM checksum | invalid chacksum | | | Lucial Control | ractor |
| | P1791 | self check | EEPROM | invalid checksum | | | coce at startion | - |
| | P1792 | rationally microconfroller | watchdog | Invalid checksum | | | Once of artaclor | |
| Supply Voltage Pressure | P1893 | drout confinutly, power | adejox | ss and pcv vollege > battery voltage - 1.0V | se and prevediage | = buttery voltage -2V | once at startup | |
| Control Solenpid / Shift | P1894 | circuit confinally, graund | voltage | ss and pcv voltage < 2.5V | as and per voltage | V5- ballery voltage -2V | phose at startup | DWG |
| pigualdo | | | voltage | se and provious < 20% * hartery vollage | 55 and pov voltage | 00 | 0.03 sec/conf | Julying. |
| | P1835 | decondantity. | voltage | as and pey voltage >= 2.5V | ss and por voltage. | | conce at startup | Cycles |

<u>Fig. 38: 6-Cylinder: 5HP19 Non-AWD Transmission Diagnosis (2004 - 4 Of 4)</u> Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: 5HP19 (5-SPEED) - AWD TRANSMISSION (2004)

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: 5HP19 (5-SPEED) - AWD TRANSMISSION (2004)

| 211101.00110 | | 22 0 0 1211 (2210 0111 1) (0 21 22 | 2) 11112 111111 (21111221311 (21 |
|--------------|----------|--|---|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
| P0709 | 60 | Transmission Range Sensor "A" Circuit Intermittent | See <u>6-CYLINDER: 5HP19</u> <u>AWD TRANSMISSION</u> <u>DIAGNOSIS (2004 - 1 OF 3)</u> . |
| P0710 | | Transmission Fluid Check | See <u>6-CYLINDER: 5HP19</u> <u>AWD TRANSMISSION</u> |

| | | 1 | DIAGNOSIS (2004 - 1 OF 3). |
|--------|-------|-----------------------------------|--|
| P0711 | | Transmission Temperature Sensor | See 6-CYLINDER: 5HP19 |
| | | | AWD TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 1 OF 3)</u> . |
| P0712 | | Transmission Fluid Check | See <u>6-CYLINDER: 5HP19</u> |
| | | | AWD TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 1 OF 3).</u> |
| P0713 | | Transmission Fluid Check | See 6-CYLINDER: 5HP19 |
| | | | AWD TRANSMISSION DIAGNOSIS (2004 - 1 OF 3). |
| P0714 | | Transmission Fluid Check | |
| P0/14 | ••••• | Transmission Fluid Check | See <u>6-CYLINDER: 5HP19</u> AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 1 OF 3). |
| P0715 | 33 | Input/Turbine Speed Sensor "A" | See 6-CYLINDER: 5HP19 |
| 10713 | | Circuit | AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 1 OF 3). |
| P0716 | 33 | Input/Turbine Speed Sensor "A" | See 6-CYLINDER: 5HP19 |
| | | Circuit Range/Performance | AWD TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 1 OF 3)</u> . |
| P0720 | 32 | Output Speed Sensor Circuit | See <u>6-CYLINDER: 5HP19</u> |
| | | | <u>AWD TRANSMISSION</u> |
| | | | <u>DIAGNOSIS (2004 - 1 OF 3).</u> |
| P0721 | 59 | Output Speed Sensor Circuit | See 6-CYLINDER: 5HP19 |
| | | Range/Performance | AWD TRANSMISSION |
| D0721 | 50 | Committee and the Committee | <u>DIAGNOSIS (2004 - 1 OF 3).</u> |
| P0731 | 50 | Gear 1 Incorrect Ratio | See <u>6-CYLINDER: 5HP19</u> AWD TRANSMISSION |
| | | | <u>AWD TRANSMISSION</u> <u>DIAGNOSIS (2004 - 1 OF 3).</u> |
| P0732 | 52 | Gear 2 Incorrect Ratio | See 6-CYLINDER: 5HP19 |
| 10732 | 32 | Gear 2 meditest Ratio | AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 1 OF 3). |
| P0733 | 53 | Gear 3 Incorrect Ratio | See <u>6-CYLINDER: 5HP19</u> |
| | | | AWD TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 1 OF 3)</u> . |
| P0734 | 54 | Gear 4 Incorrect Ratio | See <u>6-CYLINDER: 5HP19</u> |
| | | | AWD TRANSMISSION |
| D0725 | | G. CI. | <u>DIAGNOSIS (2004 - 1 OF 3)</u> . |
| P0735 | 55 | Gear 5 Incorrect Ratio | See 6-CYLINDER: 5HP19 |
| | | | AWD TRANSMISSION DIAGNOSIS (2004 - 1 OF 3). |
| P0741 | 48 | Torque Converter Clutch Circuit | See 6-CYLINDER: 5HP19 |
| 10741 | 40 | Performance or Stuck Off | AWD TRANSMISSION |
| | | Terrormance of Stack off | DIAGNOSIS (2004 - 1 OF 3). |
| P0745 | 1 | Pressure Control Solenoid "A" | See 6-CYLINDER: 5HP19 |
| | _ | | AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 2 OF 3). |
| P0750 | 16 | Shift Solenoid "A" | See <u>6-CYLINDER: 5HP19</u> |
| | | | AWD TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 2 OF 3)</u> . |
| P0751 | 16 | Shift Solenoid "A" Performance or | See 6-CYLINDER: 5HP19 |
| | | Stuck Off | AWD TRANSMISSION |
| D07.50 | 1.5 | glig g l line g l c | <u>DIAGNOSIS (2004 - 2 OF 3)</u> . |
| P0752 | 16 | Shift Solenoid "A" Stuck On | See 6-CYLINDER: 5HP19 |
| | | | AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3). |
| I | I | 1 | DIAUIIUSIS (2004 - 2 OF 3). |

| P0755 | ı | 1 | 1 | |
|--|----------|-----|--------------------------------------|---|
| P0755 | P0753 | 16 | Shift Solenoid "A" Electrical | See <u>6-CYLINDER: 5HP19</u> <u>AWD TRANSMISSION</u> |
| P0756 | | | | <u>DIAGNOSIS (2004 - 2 OF 3)</u> |
| P0756 | P0755 | 17 | Shift Solenoid "B" | See 6-CYLINDER: 5HP19 |
| P0756 | | | | AWD TRANSMISSION |
| Stuck Off | | | | <u>DIAGNOSIS (2004 - 2 OF 3).</u> |
| P0757 | P0756 | 17 | | See 6-CYLINDER: 5HP19 |
| P0757 | | | Stuck Off | <u>-</u> |
| P0758 | | | | |
| P0758 | P0757 | 17 | Shift Solenoid "B" Stuck On | · |
| P0758 | | | | · |
| P0760 | D0550 | 1.7 | G1:0 G 1 11#P# F1 1 1 | |
| P0760 | P0758 | 17 | Shift Solenoid "B" Electrical | |
| P0760 | | | | |
| P0761 | D0760 | 1.0 | g1:0 g 1 - 11 ugu | |
| P0761 | P0/60 | 18 | Shift Solenoid "C" | |
| P0761 | | | | · · · · · · · · · · · · · · · · · · · |
| Stuck Off | D0761 | 10 | Shift Salaraid IICII Danfarranananan | |
| P0762 | PU/61 | 18 | | |
| P0762 | | | Stuck Off | · |
| AWD TRANSMISSION DIAGNOSIS (2004 - 3 OF 3) | D0762 | 1 0 | Shift Solenoid "C" Stuck On | |
| DIAGNOSIS (2004 - 3 OF 3) | 10702 | 10 | Shift Solehold C Stuck On | • |
| P0763 | | | | • |
| P0775 2 Pressure Control Solenoid "B" See 6-CYLINDER: 5HP19 AWD TRANSMISSION DIAGNOSIS (2004 - 3 OF 3) | P0763 | 18 | Shift Solenoid "C" Flectrical | |
| Pressure Control Solenoid "B" See 6-CYLINDER: 5HP19 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) P0782 | 10703 | 10 | Shift Solehold C Electrical | \ <u>\</u> |
| P0775 2 Pressure Control Solenoid "B" See 6-CYLINDER: 5HP16 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) | | | | |
| AWD TRANSMISSION | P0775 | 2 | Pressure Control Solenoid "B" | <u> </u> |
| DIAGNOSIS (2004 - 2 OF 3) P0782 | _ ,,,, | _ | | AWD TRANSMISSION |
| AWD TRANSMISSION | | | | DIAGNOSIS (2004 - 2 OF 3). |
| AWD TRANSMISSION | P0782 | 57 | 2-3 Shift | See 6-CYLINDER: 5HP19 |
| P0783 | | | | AWD TRANSMISSION |
| AWD TRANSMISSION | | | | <u>DIAGNOSIS (2004 - 3 OF 3)</u> . |
| DIAGNOSIS (2004 - 3 OF 3) Pressure Control Solenoid "C" See 6-CYLINDER: 5HP19 | P0783 | 58 | 3-4 Shift | See 6-CYLINDER: 5HP19 |
| Pressure Control Solenoid "C" See 6-CYLINDER: 5HP 19 | | | | AWD TRANSMISSION |
| P0962 1 Pressure Control Solenoid "A" See 6-CYLINDER: 5HP19 Control Circuit Low DIAGNOSIS (2004 - 2 OF 3) P0963 1 Pressure Control Solenoid "A" See 6-CYLINDER: 5HP19 Control Circuit High See 6-CYLINDER: 5HP19 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) P0966 2 Pressure Control Solenoid "B" See 6-CYLINDER: 5HP19 Control Circuit Low AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) P0967 2 Pressure Control Solenoid "B" See 6-CYLINDER: 5HP19 Control Circuit High See 6-CYLINDER: 5HP19 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) P0967 3 Pressure Control Solenoid "C" See 6-CYLINDER: 5HP19 Control Circuit Low AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) P0970 3 Pressure Control Solenoid "C" See 6-CYLINDER: 5HP19 Control Circuit Low AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) | | | | |
| DIAGNOSIS (2004 - 2 OF 3) Pressure Control Solenoid "A" See 6-CYLINDER: 5HP19 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) Pressure Control Solenoid "A" See 6-CYLINDER: 5HP19 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) Pressure Control Solenoid "B" Control Circuit Low See 6-CYLINDER: 5HP19 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) Pressure Control Solenoid "B" Control Circuit Low See 6-CYLINDER: 5HP19 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) Pressure Control Solenoid "B" Control Circuit High See 6-CYLINDER: 5HP19 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) Pressure Control Solenoid "C" See 6-CYLINDER: 5HP19 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) Pressure Control Solenoid "C" See 6-CYLINDER: 5HP19 Control Circuit Low AWD TRANSMISSION AWD TRANSMIS | P0795 | 3 | Pressure Control Solenoid "C" | See <u>6-CYLINDER: 5HP19</u> |
| Pressure Control Solenoid "A" See 6-CYLINDER: 5HP19 | | | | • |
| Control Circuit Low | | | | |
| P0963 1 Pressure Control Solenoid "A" Control Circuit High P0966 2 Pressure Control Solenoid "B" Control Circuit Low P0967 2 Pressure Control Solenoid "B" Control Circuit Low P0967 3 Pressure Control Solenoid "B" Control Circuit High P0970 3 Pressure Control Solenoid "C" Control Circuit Low P0970 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) See 6-CYLINDER: 5HP19 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) P0970 See 6-CYLINDER: 5HP19 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) P0970 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) P0970 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) | P0962 | 1 | | |
| P0963 1 Pressure Control Solenoid "A" Control Circuit High P0966 2 Pressure Control Solenoid "B" Control Circuit Low P0967 2 Pressure Control Solenoid "B" Control Circuit Low P0967 3 Pressure Control Solenoid "B" Control Circuit High See 6-CYLINDER: 5HP19 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) See 6-CYLINDER: 5HP19 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) P0970 3 Pressure Control Solenoid "C" Control Circuit Low See 6-CYLINDER: 5HP19 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) P0970 See 6-CYLINDER: 5HP19 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) | | | Control Circuit Low | · |
| P0966 2 Pressure Control Solenoid "B" See 6-CYLINDER: 5HP19 Control Circuit Low Pressure Control Solenoid "B" See 6-CYLINDER: 5HP19 Control Circuit Low Pressure Control Solenoid "B" See 6-CYLINDER: 5HP19 Control Circuit High P0967 2 Pressure Control Solenoid "B" See 6-CYLINDER: 5HP19 Control Circuit High P0970 3 Pressure Control Solenoid "C" See 6-CYLINDER: 5HP19 Control Circuit Low AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) Control Circuit Low AWD TRANSMISSION AWD TRANSMISSION Control Circuit Low | 70062 | | 7 2 121 1111 | |
| P0966 2 Pressure Control Solenoid "B" See 6-CYLINDER: 5HP19 Control Circuit Low DIAGNOSIS (2004 - 2 OF 3) P0967 2 Pressure Control Solenoid "B" See 6-CYLINDER: 5HP19 Control Circuit High AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) P0970 3 Pressure Control Solenoid "C" See 6-CYLINDER: 5HP19 Control Circuit Low AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) P0970 3 Pressure Control Solenoid "C" See 6-CYLINDER: 5HP19 Control Circuit Low AWD TRANSMISSION | P0963 | 1 | | |
| P0966 2 Pressure Control Solenoid "B" Control Circuit Low P0967 2 Pressure Control Solenoid "B" Control Circuit High Control Circuit High See 6-CYLINDER: 5HP19 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) P0970 3 Pressure Control Solenoid "C" Control Circuit Low See 6-CYLINDER: 5HP19 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) Control Circuit Low AWD TRANSMISSION AWD TRANSMISSION | | | Control Circuit High | · · · · · · · · · · · · · · · · · · · |
| P0967 2 Pressure Control Solenoid "B" See 6-CYLINDER: 5HP19 Control Circuit High P0970 3 Pressure Control Solenoid "C" See 6-CYLINDER: 5HP19 Control Circuit Low AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) Po970 See 6-CYLINDER: 5HP19 Control Circuit Low AWD TRANSMISSION | D0066 | | P C + 1C 1 111DII | |
| P0967 2 Pressure Control Solenoid "B" See 6-CYLINDER: 5HP19 Control Circuit High BY AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) P0970 3 Pressure Control Solenoid "C" See 6-CYLINDER: 5HP19 Control Circuit Low AWD TRANSMISSION | P0966 | 2 | | |
| P0967 2 Pressure Control Solenoid "B" See 6-CYLINDER: 5HP19 Control Circuit High AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) P0970 3 Pressure Control Solenoid "C" See 6-CYLINDER: 5HP19 Control Circuit Low AWD TRANSMISSION | | | Control Circuit Low | · |
| Control Circuit High AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3) Possure Control Solenoid "C" Control Circuit Low See 6-CYLINDER: 5HP19 AWD TRANSMISSION | D0067 | 2 | Programa Control Salara id IIDII | |
| P0970 3 Pressure Control Solenoid "C" See 6-CYLINDER: 5HP19 Control Circuit Low AWD TRANSMISSION | 17090/ | 2 | | · · · · · · · · · · · · · · · · · · · |
| P0970 3 Pressure Control Solenoid "C" See <u>6-CYLINDER: 5HP19</u> Control Circuit Low <u>AWD TRANSMISSION</u> | | | Control Circuit riigh | · · · · · · · · · · · · · · · · · · · |
| Control Circuit Low AWD TRANSMISSION | P0070 | 2 | Praccura Control Salancid "C" | |
| | F U7 / U | 3 | | |
| <u>DINGINOSIS (2004 - 2 01 3)</u> | | | Control Circuit Low | · · · · · · · · · · · · · · · · · · · |
| | | + | | <u>DITTOTTO DID (2007 - 2 OT 3)</u> . |

| P0971 | 3 | Pressure Control Solenoid "C" | See 6-CYLINDER: 5HP19 |
|-------|-----|-------------------------------------|---|
| | | Control Circuit High | <u>AWD TRANSMISSION</u> <u>DIAGNOSIS (2004 - 2 OF 3).</u> |
| P1700 | 62 | Double Error Output Speed and | See 6-CYLINDER: 5HP19 |
| | | Input/Turbine Speed | AWD TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 1 OF 3).</u> |
| P1719 | 144 | CAN Version Error | See 6-CYLINDER: 5HP19 |
| | | | <u>AWD TRANSMISSION</u> DIAGNOSIS (2004 - 3 OF 3). |
| P1720 | 129 | CAN Timeout Control Module | See <u>6-CYLINDER: 5HP19</u> |
| | | | AWD TRANSMISSION |
| D1721 | 5.1 | C 1 11 (P) | <u>DIAGNOSIS (2004 - 3 OF 3).</u> |
| P1731 | 51 | Gear 1 manual Incorrect Ratio | See <u>6-CYLINDER: 5HP19</u> AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 1 OF 3). |
| P1732 | 65 | Gear Monitoring 4 at Electrical | See <u>6-CYLINDER: 5HP19</u> |
| | | Substitute Program | AWD TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 1 OF 3).</u> |
| P1747 | 128 | CAN-Bus Monitoring | See <u>6-CYLINDER: 5HP19</u> AWD TRANSMISSION |
| | | | <u>AWD TRANSMISSION</u> <u>DIAGNOSIS (2004 - 3 OF 3).</u> |
| P1761 | 19 | Shiftlock Solenoid | See 6-CYLINDER: 5HP19 |
| | | | AWD TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 3 OF 3).</u> |
| P1762 | 19 | Shiftlock Solenoid High Input | See <u>6-CYLINDER: 5HP19</u> |
| | | | <u>AWD TRANSMISSION</u> <u>DIAGNOSIS (2004 - 3 OF 3)</u> . |
| P1763 | 19 | Shiftlock Solenoid Low Input | See 6-CYLINDER: 5HP19 |
| | | | AWD TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 3 OF 3)</u> . |
| P1764 | 19 | Shiftlock Solenoid Open Circuit | See 6-CYLINDER: 5HP19 |
| | | | <u>AWD TRANSMISSION</u> DIAGNOSIS (2004 - 3 OF 3). |
| P1765 | 147 | CAN Throttle Valve | See 6-CYLINDER: 5HP19 |
| 11,00 | 1., | 0121 (1211 00020 | AWD TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 3 OF 3)</u> . |
| P1791 | 81 | Internal Transmission Control | See 6-CYLINDER: 5HP19 |
| | | Module Memory Checksum/EEPROM Error | <u>AWD TRANSMISSION</u> DIAGNOSIS (2004 - 3 OF 3). |
| P1792 | 82 | Internal Transmission Control | See 6-CYLINDER: 5HP19 |
| 11/92 | 02 | Module Watchdog Error | AWD TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 3 OF 3)</u> . |
| P1794 | 80 | Internal Transmission Control | See <u>6-CYLINDER: 5HP19</u> |
| | | Module Memory Checksum Error | AWD TRANSMISSION |
| P1882 | 57 | 2-3 Shift Circuit High | DIAGNOSIS (2004 - 3 OF 3). See 6-CYLINDER: 5HP19 |
| 1002 | 37 | 2-3 Smit Circuit High | AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF 3). |
| P1883 | 58 | 3-4 Shift Circuit High | See <u>6-CYLINDER: 5HP19</u> |
| | | | AWD TRANSMISSION |
| D1000 | 07 | Creations VI-14 F1 4 1 | <u>DIAGNOSIS (2004 - 3 OF 3).</u> |
| P1889 | 96 | System Voltage - Electrical | See <u>6-CYLINDER: 5HP19</u> AWD TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 3 OF 3).</u> |
| P1892 | 96 | System Voltage Low Input | See <u>6-CYLINDER: 5HP19</u> |
| - | • | | • |

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| | | | AWD TRANSMISSION DIAGNOSIS (2004 - 3 OF 3). |
|-------|----|--|---|
| P1893 | 83 | Supply Voltage Pressure Control Solenoid/Shift Solenoid Circuit High | See 6-CYLINDER: 5HP19 <u>AWD TRANSMISSION</u> <u>DIAGNOSIS</u> (2004 - 3 OF 3). |
| P1894 | 83 | Supply Voltage Pressure Control Solenoid/Shift Solenoid Circuit Low | See <u>6-CYLINDER: 5HP19</u> <u>AWD TRANSMISSION</u> <u>DIAGNOSIS (2004 - 3 OF 3)</u> . |
| P1895 | 83 | Supply Voltage Pressure Control Solenoid/Shift Solenoid No Signal | See 6-CYLINDER: 5HP19 AWD TRANSMISSION DIAGNOSIS (2004 - 3 OF 3). |
| P2761 | 4 | Torque Converter Clutch Pressure Control Solenoid Control Circuit/Open | See <u>6-CYLINDER: 5HP19</u> <u>AWD TRANSMISSION</u> <u>DIAGNOSIS (2004 - 2 OF 3)</u> . |
| P2763 | 4 | Torque Converter Clutch Pressure Control Solenoid Control Circuit High | See 6-CYLINDER: 5HP19 <u>AWD TRANSMISSION</u> <u>DIAGNOSIS</u> (2004 - 2 OF 3). |
| P2764 | 4 | Torque Converter Clutch Pressure Control Solenoid Control Circuit Low | See 6-CYLINDER: 5HP19 AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3). |

6-Cylinder: 5HP19 AWD Transmission Diagnosis (2004 - 1 Of 3)

| MIL | | driving | | | | | | | | | | | driving graving | San Charles | driving cycles | driving |
|---------------------------------|---------------------------|---|------------------|---------------------------------|---|---|---|-------------------------------------|--------------------------------|---|--|--------------------------------------|--|---|---|---|
| Time | 0.2 sec / cont | 0.5 sec / conf | 500 mean / count | 1000 | | 100 mseciconi | | 240sec/cont. | 300msec/conf. | 240 msec / cont | 400 msac / cont | 250 msec / conf | 900 msec / cont | 900 msec / cont | 40 msec/cont | 2.5 sec / cont |
| Enable | | > 992 revinin > 224 revinin > 9V 1,2.3.4.5 | | | | | | < 20° C > 800 revimin | | > 255 ravímin < 8000 ravímin | D. 4, 3, 2 > 1600 rpm | | 70 P / no N / no R > 500 rpm > 9V > 20 °C | 141 gear 151 gear > 500 rpm > 90 > 20 °C | + 500 rpm + 500 rpm + 9V + 20 °C | 2, 3, 4 or 5 > reput speed <= 160 Nm >= 5.24 bar |
| Secondary | | engine speed output speed battery voltage speer selected | | | | | | TFT at engine start pulpul speed | | Front wheel speed speed - back wheel | selector levar position pulpul speed pear shifts | | selector lever postlon output speed battery vitage transmission fluid temperature | selector lever position manual mode output speed batter y voltage batterission fluit emoerature | selector lever position output speed tattery voltage transmission fluid temperature Substitute la unction | gear selected engine speed input forque to TC (calculated) TCC activation pressure (calculated) |
| Treshold | Wrong signal | o | > 6720 rev/min | 2.3V < sensor conhectors < 2.7V | sensor plus < 4.5V and sensor ninus < 0.5V | sensor plus > 4.5V and sensor minus > 0.5V | sensor plus > 4.5V and sensor minus < 0.5V | A temp. < 5°C within 200 sec | A temp: > 10°C within 100 msec | > 7744 revirain or delta > 750 revirain | < 160 rpm < 160 rpm | P0720 active invalid signal | dalta > 5 % | delta > 5 % | delta > 5 % | mq1 08 4 |
| Malfunction Criteria | unvalid code | peads Indui | input speed | | voltage | | | stuck temperature | terroperature variation | autput speed or or outp. Spd – wheel spd * rear axia railo | output speed wheel speed " rear axle railo | peeds Indino | iriput - output spaed / (Gear ratio) | ligaar rako) j (gear rako) | Iriput - output speed / (goar ratio) | pands (dije umurxeu) |
| Monitor Strategy Description | rationality | rationality | rationality | sensor internal shorted | shorted to ground | shorted to battery | disconnection | rationality | | rationality | relionality | rationality | radonality | rationality | rationalty | functional check |
| Fault | P0709 | P0715 | P0716 | P0711 | P0712 | P0713 | P0714 | 01704 | | P0720 | P0721 | P1700 | P0731 P0732 P0734 P0734 | P1731 | P1732 | P0741 |
| Component | A/T 5HP19 Range Switch | Input Speed | | Temperature Sansar | Transmission Fluid | | | | | Output Speed | | dutput / wheel speed double fault | Gear Ratio | | Gear Ratio for substitude function 4,the gear | Torque Canverler Clutch |

Fig. 39: 6-Cylinder: 5HP19 AWD Transmission Diagnosis (2004 - 1 Of 3) Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: 5HP19 AWD Transmission Diagnosis (2004 - 2 Of 3)

| MIL IIIum. | | | | | | | and | cycles | 1 | | | | | | | | | | | |
|---------------------------------|---|--------------------------|-------------------------------------|---|------------------------------------|-------------------------------------|---|-----------------------------------|-------------------------------------|---|------------------------------------|--------------------------|---|---|---|--|---|---|---|--|
| Time | 70 msec / cont | | | 50 meet / con | | Ī | 50 msec / conf | | | 70 msec / cont | | | 800 msec/cont | 800 msec / conf | 800 msec / conf | 800 msec / cont | 800 resec / cont | 800 maec / cont. | 800 msec / cont | 800 msec / cont |
| Enable Conditions | V 2,1=> | V7 « | | V6:13V | 7. | | V21.5 | 2.4 | | V2(12) | 7.4 | | 7V < MV inp. Volt. < 16V | | | | 7V < MV inp. Volt. < 16V | | | |
| Secondary | abs(battery voltage - pcv 1 voltage) | pcv 1 voltage | | abs(battery voltage - pcv 2 voltage) | pcv 2 voltage | | abs(bettery voltage - pcv 3 voltage) | pcv 3 valtage | | abs(battery voltage | pov 1 voltage | | MV input voltage | | | | MV input voltage | | | |
| Treshold | > 150mA (if meas curt < 200mA) > 1000mA (if meas curt > 200mA) | 12 V | >0 | > 150mA (if meas cur < 200mA) > 1000mA (if meas cur > 200mA) | 12.V | ^0 | > 150mA (if meas curr < 200mA) > 1000mA (if meas curr > 200mA) | 12.V | ^0 | > 150mA (if meas curt < 200mA) > (000mA (if meas curt > 200mA) | 12.V | Λ6 | 10 < ss voltage < 1.44V, if as is under current | 1.44V < ss voltage < 5V, if ss is under current | 0V < ss voltage < 0.35V, if ss is not under current | 0.35V < ss voltage < 0.85V, if ss is not under current | 1V < ss voltage < 1.44V, if ss is under current 0.85V < ss voltage < 1.44V, if ss is not under current | 1.44V < ss voltage < 5V, if ss is under current | DV < es voltage < 0,35V, if ss is not under current | 0.35V < ss voltage < 0.85V, it ss is not under current |
| Malfunction Criteria | mens, curr calc, curr, | vollage | vollage | meas, cur calc. curr. | voltage | voltage | meatt, curr cale, curr. | afirjox | voltage | meas, our, - calc, curr, | voltage | voltage | voltage | voltage | voltage | voltage | egetiov | vollage | voltage | voltage |
| Monitor Strategy Description | rationality | circuit continuty, power | circuit confiniuty, ground short | rationality | circuit confinitty, power short | circuit continiuty, ground short | rationality | circuit confinity, power short | circuit continiuty, ground short | rationality | circuit cartiniuly, power short | dreuit cardniuty, ground | rationality | circuit continuity, power | circuit continuity, ground short | disconnection | rationality | circuit confinulty, power short | circuit continuity, ground | disconnection |
| Fault | P0745 | E960d | P0962 | P0775 | P0967 | 9960d | P0795 | P0971 | P0970 | P2761 | P2763 | P2764 | P0750 | P0753 | P0752 | P0751 | P0756 | P0758 | 1910d | P0756 |
| System | Press, Confr, Valve 1 | - | 1 | 14 | 2 | 2 | 60 | m | to. | 4 | * | 4 | Shift Solenoid (A) | ₹ | (A) | (A) | (8) | (B) | (a) | (B) |

<u>Fig. 40: 6-Cylinder: 5HP19 AWD Transmission Diagnosis (2004 - 2 Of 3)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: 5HP19 AWD Transmission Diagnosis (2004 - 3 Of 3)

| - | ed Illum. | oout | non | tion | luos | cont | ioni | inos | Mos | jug | powith that | L | and. | juo | ora | Tuo. | out | | tho: | nuc | | dnu | 4 | riup Iwo | | DOC Cycles |
|------------------|-------------|---|---|---|---|---|---|---|--|---|---|--|---|----------------------------|--|--------------|---------------------------|-----------------|------------------|-----------------------|------------------|-----------------|-------------------------|---|-------------------------------------|---|
| Time | Required | 800 msec / cont | 800 msec/ pon! | 800 msec / cont | 800 msec/ con | 500 msec / cont | 500 msec / cont | 500 msec / con | 500 maso / con | 90 msec/cont | 90 msec/conf | 90 msec/con | 30 msep/con | 2.5 sec / conf | 0,3 sec / cont | 0.3 sec/o | 0.6 sec / cont | | 0,15 spc / cortl | 0.4 sec / c | cont | once at startup | once al sriariup | once at startup | once al startup | 0.03 sec / cont. |
| Enable | Conditions | 7V < MV inp. Valt. < 16V | | | | 70 < MV Inp. Volt. < 16V | | | | na P./ no N./ no R | > 500 rpm no P / no N / no R > 500 rpm | Ron/Non/Pon | > 500 rpm no F / no N / no R > 500 rpm | > 1408 rpm | >1408 rp.m | | no | \A5 < | 180 | | | | | := battery voltage -2V | V⊊- agalery voltage -2V | 5 |
| Secondary | Parameter | MV input vortage | | | | MV input votage | | | | selector lever position | selector lever position outbut speed | selector fever position | peads Indino peads Indino peads Indino | Deeds engine | angine speed | | rapitan | battery vritage | ignition | | | | | as and per voltage | ss and pev watage | as and per voltage |
| Treshold | Value | 1V < se vollage < 1.44V, if se le under current 0.85V < se vollage < 1.44V, if as is not under current | 1,44V < as voltage < 5V, if as is under current | 0V < as voltage < 0.35V, if as its not under outern | 0.35V < as voltage < 0.85V, if as it not under current. | 1V < sa voltage < 1 44V, if sa la under current | 1.44V < so voltage < 5V, it so is under current | OV < 65 voltage < 0.35V, il ss is not under current | 0.35V < sa valege < 0.85V, itss is not under current | inp stot nid gonr - 40 rpm > inp spd new gear | inp spd old geer + 670 rpm < inp spd new gear | ing spd old gear - 40 rpm > inp apd now genr | inp spil bid gear + 600 rpm < inp spil new gear | battery violage * 9V | battery voltage < 7V or 16V < battery voltage | wrong value | > 100 ms | | Invalid signals | invalid signal | invalid thecksum | nvalid checksum | mvalid Diecksum | ss and proviolings > battary vollage - 1.0V | as and pov voltage < 2.5V | as and the vollage a core or dailed y to appear |
| Malfunction | Criteria | valtage | voltage | Voltago | voltage | voltage | waltage | voltage | voltage | Input output | peads Indu | input autput | peeds mulu | battery vollage | battery vallage | CAN level | CAN mossago/ time out DME | | CAN bus fault | CAN throttle position | EPRCM charlesum | EEPROM | Vestchdog | vollage | vidiage | Wolfage |
| Monitor Strategy | Description | rationality | circuit continuity, power | circuit continuity, ground | disconnection | rationality | stream continuity, power | afreuil conlinuity, ground short | chearl continuity, | rationality, no change | retionality, value too big | rationality, no change | rationality, value too big | rationality | rationality | bus check | bus check | | bus check | rationality | self check | self check. | drain continuity, power | short | circuit confinalty, ground short | circuit confinally. |
| Fault | Code | P0760 | P0763 | P0762 | P0761 | P1761 | P1762 | PH763 | P1764 | P0782 | P1882 | P0783 | P1683 | P1889 | P1892 | P1719 | P1720 | - | P1747 | P1/65 | P1794 | 16214 | 26/14 | 1093 | P1894 | P1895 |
| Component | system | Shift Solenoid (C) | (0) | (0) | (5) | (Shift Lock) | (Shift Lack) | (Shiff Lack) | (Shirtode) | 2/3 Shift | | AL SIM | | System Voltage, electrical | System Voltage, low input | Transmission | Contral Modul | 1 | 1 | - | 4 | 1 | Crowder Voltage Duction | Bunesail abelian hidden | Control Sciencial / Shift | |

Fig. 41: 6-Cylinder: 5HP19 AWD Transmission Diagnosis (2004 - 3 Of 3) Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: 6HP19 (6-SPEED) - AWD TRANSMISSION (2004)

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: 6HP19 (6-SPEED) - AWD TRANSMISSION (2004)

| | (| , |
|-------|-------------------------------------|---|
| PCode | Possible Cause | Diagnostic Parameters |
| P0705 | Range Position Switch | See <u>6-CYLINDER: 6HP19</u> <u>TRANSMISSION DIAGNOSIS</u> (2004 - 4 OF 5). |
| P0710 | Oil Temperature Sensor Plausibility | See <u>6-CYLINDER: 6HP19</u> TRANSMISSION DIAGNOSIS |

| l | | (2004 - 1 OF 5). |
|-------|---|------------------------------|
| P0711 | Oil Temperature Sensor General | See <u>6-CYLINDER: 6HP19</u> |
| | _ | TRANSMISSION DIAGNOSIS |
| | | (2004 - 1 OF 5). |
| P0712 | Oil Temperature Sensor Lower Threshold | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | (2004 - 1 OF 5). |
| P0713 | Oil Temperature Sensor Upper Threshold | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | (2004 - 1 OF 5). |
| P0714 | Oil Temperature Sensor No Signal | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | (2004 - 1 OF 5). |
| P0715 | Input/Turbine Speed Sensor "A" Circuit | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | (2004 - 4 OF 5). |
| P0720 | Output Speed Sensor Circuit | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | (2004 - 4 OF 5). |
| P0721 | Output Speed Sensor Circuit | See <u>6-CYLINDER: 6HP19</u> |
| | Range/Performance | TRANSMISSION DIAGNOSIS |
| | | (2004 - 4 OF 5). |
| P0731 | Gear 1 Incorrect Ratio | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | (2004 - 2 OF 5). |
| P0732 | Gear 2 Incorrect Ratio | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | (2004 - 2 OF 5). |
| P0733 | Gear 3 Incorrect Ratio | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 2 OF 5)</u> . |
| P0734 | Gear 4 Incorrect Ratio | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 2 OF 5)</u> . |
| P0735 | Gear 5 Incorrect Ratio | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 2 OF 5)</u> . |
| P0741 | Torque Converter Clutch Circuit | See <u>6-CYLINDER: 6HP19</u> |
| | Performance or Stuck Off | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 2 OF 5)</u> . |
| P0745 | Pressure Control Solenoid "A" | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 1 OF 5)</u> . |
| P0748 | Pressure Control Solenoid "A" No Signal | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 1 OF 5)</u> . |
| P0751 | Shift Solenoid "A" Performance or Stuck | See <u>6-CYLINDER: 6HP19</u> |
| | Off | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 1 OF 5)</u> . |
| P0753 | Solenoid Valve Upper Threshold | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 1 OF 5)</u> . |
| P0775 | Pressure Control Solenoid "B" | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | (2004 - 1 OF 5). |
| | 3589 of 4036 | |

| I | 1 | ı |
|-------|--|------------------------------|
| P0778 | Pressure Control Solenoid "B" No Signal | See 6-CYLINDER: 6HP19 |
| | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 1 OF 5)</u> . |
| P0781 | Range Shift Monitoring General | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 2 OF 5)</u> . |
| P0782 | Range Shift Monitoring General | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 2 OF 5)</u> . |
| P0783 | 3-4 Shift | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 3 OF 5)</u> . |
| P0784 | 4-5 Shift | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | (2004 - 3 OF 5). |
| P0795 | Pressure Control Solenoid "C" | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 1 OF 5)</u> . |
| P0798 | Pressure Control Solenoid "C" No Signal | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 1 OF 5)</u> . |
| P0829 | 5-6 Shift | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 3 OF 5)</u> . |
| P0962 | Pressure Control Solenoid "A" Control | See <u>6-CYLINDER: 6HP19</u> |
| | Circuit Low | TRANSMISSION DIAGNOSIS |
| | | (2004 - 1 OF 5). |
| P0963 | Pressure Control Solenoid "A" Control | See <u>6-CYLINDER: 6HP19</u> |
| | Circuit High | TRANSMISSION DIAGNOSIS |
| | | (2004 - 1 OF 5). |
| P0966 | Pressure Control Solenoid "B" Control | See <u>6-CYLINDER: 6HP19</u> |
| | Circuit Low | TRANSMISSION DIAGNOSIS |
| | | (2004 - 1 OF 5). |
| P0967 | Pressure Control Solenoid "B" Control | See <u>6-CYLINDER: 6HP19</u> |
| | Circuit High | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 1 OF 5)</u> . |
| P0970 | Pressure Control Solenoid "C" Control | See <u>6-CYLINDER: 6HP19</u> |
| | Circuit Low | TRANSMISSION DIAGNOSIS |
| | | (2004 - 1 OF 5). |
| P0971 | Pressure Control Solenoid "C" Control | See <u>6-CYLINDER: 6HP19</u> |
| | Circuit High | TRANSMISSION DIAGNOSIS |
| | | (2004 - 1 OF 5). |
| P0973 | Solenoid Valve Lower Threshold | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | (2004 - 1 OF 5). |
| P0979 | Solenoid Valve Lower Threshold | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| D1505 | B 11 7 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 | (2004 - 1 OF 5). |
| P1702 | Double Error Output Or Not Allowed | See 6-CYLINDER: 6HP19 |
| | Actuation Of Valves | TRANSMISSION DIAGNOSIS |
| 7.500 | | (2004 - 5 OF 5). |
| P1720 | CAN Timeout Control Module | See 6-CYLINDER: 6HP19 |
| | | TRANSMISSION DIAGNOSIS |
| | | (2004 - 5 OF 5). |

| P1721 | CAN Timeout Control Module | See 6-CYLINDER: 6HP19 |
|-------|---------------------------------------|--|
| | | TRANSMISSION DIAGNOSIS |
| | | (2004 - 5 OF 5). |
| P1727 | Engine Speed Signal | See 6-CYLINDER: 6HP19 |
| | | TRANSMISSION DIAGNOSIS (2004 - 4 OF 5). |
| P1728 | Engine Speed | See 6-CYLINDER: 6HP19 |
| 11/20 | Eligine Speed | TRANSMISSION DIAGNOSIS |
| | | (2004 - 4 OF 5). |
| P1736 | Gear Ratio Monitoring | See 6-CYLINDER: 6HP19 |
| | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 2 OF 5)</u> . |
| P1747 | CAN-Bus Monitoring | See 6-CYLINDER: 6HP19 |
| | | TRANSMISSION DIAGNOSIS |
| D1771 | E ' E N 'I'' | (2004 - 4 OF 5). |
| P1771 | Engine Torque Plausibility | See <u>6-CYLINDER: 6HP19</u> TRANSMISSION DIAGNOSIS |
| | | (2004 - 3 OF 5). |
| P1790 | Internal Transmission Control Module | See 6-CYLINDER: 6HP19 |
| 11750 | Memory Checksum/EEPROM Error | TRANSMISSION DIAGNOSIS |
| | | (2004 - 5 OF 5). |
| P1791 | Internal Transmission Control Module | See <u>6-CYLINDER: 6HP19</u> |
| | Memory Checksum/EEPROM Error | TRANSMISSION DIAGNOSIS |
| | | (2004 - 5 OF 5). |
| P1792 | Internal Transmission Control Module | See 6-CYLINDER: 6HP19 |
| | Watchdog Error | <u>TRANSMISSION DIAGNOSIS</u> (2004 - 5 OF 5). |
| P1793 | TCM Hot Disabling | See 6-CYLINDER: 6HP19 |
| F1/93 | 1 CW Hot Disabiling | TRANSMISSION DIAGNOSIS |
| | | (2004 - 5 OF 5). |
| P1798 | Internal Transmission Control Module | See 6-CYLINDER: 6HP19 |
| | Memory Checksum/EEPROM Error | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 5 OF 5)</u> . |
| P1804 | Solenoid Valve Shiftlock | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| D1010 | Truling Const Const House These 1, 11 | (2004 - 1 OF 5). |
| P1810 | Turbine Speed Sensor Upper Threshold | See <u>6-CYLINDER: 6HP19</u> TRANSMISSION DIAGNOSIS |
| | | (2004 - 4 OF 5). |
| P1811 | Turbine Speed Sensor Lower Threshold | See 6-CYLINDER: 6HP19 |
| | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 4 OF 5)</u> . |
| P1812 | Output Speed Sensor Upper Threshold | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| D1010 | | (2004 - 4 OF 5). |
| P1813 | Output Speed Sensor Lower Threshold | See 6-CYLINDER: 6HP19 |
| | | <u>TRANSMISSION DIAGNOSIS</u> (2004 - 4 OF 5). |
| P1814 | Output Speed Sensor Plausibility | See 6-CYLINDER: 6HP19 |
| 1017 | Output speed sensor Flaustonity | TRANSMISSION DIAGNOSIS |
| | | (2004 - 4 OF 5). |
| P1861 | 2-1 Shift Circuit General | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 3 OF 5)</u> . |
| P1862 | 3-2 Shift Circuit General | See <u>6-CYLINDER: 6HP19</u> |

| 1 | | TRANSMISSION DIAGNOSIS |
|--------|---------------------------------------|--|
| | | (2004 - 3 OF <u>5</u>). |
| P1863 | 4-3 Shift Circuit General | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 3 OF 5)</u> . |
| P1864 | 5-4 Shift Circuit General | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | (2004 - 3 OF 5). |
| P1865 | 6-5 Shift Circuit General | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| -1001 | 7112 (12) 72 | (2004 - 3 OF 5). |
| P1881 | Range Shift (1-2) Monitoring Upper | See <u>6-CYLINDER: 6HP19</u> |
| | Threshold | TRANSMISSION DIAGNOSIS |
| 71000 | 2 2112 (2 2) 17 1 1 1 1 1 | (2004 - 2 OF 5). |
| P1882 | Range Shift (2-3) Monitoring Upper | See <u>6-CYLINDER: 6HP19</u> |
| | Threshold | TRANSMISSION DIAGNOSIS |
| D1002 | 2.461'0.6' '.11'1 | (2004 - 2 OF 5). |
| P1883 | 3-4 Shift Circuit High | See 6-CYLINDER: 6HP19 |
| | | TRANSMISSION DIAGNOSIS (2004 - 3 OF 5). |
| D1004 | 4.5 Chi G. Cinnai 4 Hi al | 7 |
| P1884 | 4-5 Shift Circuit High | See <u>6-CYLINDER: 6HP19</u> TRANSMISSION DIAGNOSIS |
| | | (2004 - 3 OF 5). |
| P1885 | 5 (Chift Cinavit High | See 6-CYLINDER: 6HP19 |
| P1883 | 5-6 Shift Circuit High | TRANSMISSION DIAGNOSIS |
| | | (2004 - 3 OF 5). |
| P1890 | Power Supply General | See 6-CYLINDER: 6HP19 |
| 1090 | rower supply General | TRANSMISSION DIAGNOSIS |
| | | (2004 - 2 OF 5). |
| P1891 | Power Supply Upper Threshold | See 6-CYLINDER: 6HP19 |
| 1 1071 | Tower Suppry Opper Timeshold | TRANSMISSION DIAGNOSIS |
| | | (2004 - 2 OF 5). |
| P1892 | System Voltage Low Input | See 6-CYLINDER: 6HP19 |
| 11092 | System vertage 20 " imput | TRANSMISSION DIAGNOSIS |
| | | (2004 - 2 OF 5). |
| P1893 | Supply Voltage Pressure Control | See 6-CYLINDER: 6HP19 |
| | Solenoid/Shift Solenoid Circuit High | TRANSMISSION DIAGNOSIS |
| | | (2004 - 5 OF 5). |
| P1894 | Supply Voltage Pressure Control | See <u>6-CYLINDER: 6HP19</u> |
| | Solenoid/Shift Solenoid Circuit Low | TRANSMISSION DIAGNOSIS |
| | | (2004 - 5 OF 5). |
| P1895 | Supply Voltage Pressure Control | See <u>6-CYLINDER: 6HP19</u> |
| | Solenoid/Shift Solenoid No Signal | TRANSMISSION DIAGNOSIS |
| | | (2004 - 5 OF 5). |
| P1896 | Valve Voltage Supply | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 5 OF 5)</u> . |
| P1897 | Valve Voltage Supply Upper Threshold | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 5 OF 5)</u> . |
| P1898 | Sensor Voltage Supply Lower Threshold | See <u>6-CYLINDER: 6HP19</u> |
| 1 | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 5 OF 5)</u> . |
| P2713 | Pressure Regulator Valve Plausibility | See <u>6-CYLINDER: 6HP19</u> |
| 1 | | TRANSMISSION DIAGNOSIS |

| | | <u>(2004 - 1 OF 5)</u> . |
|-----------|--|--|
| P2716 | Pressure Regulator No Signal | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | (2004 - 1 OF 5). |
| P2720 | Pressure Regulator Valve Lower | See <u>6-CYLINDER: 6HP19</u> |
| | Threshold | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 1 OF 5)</u> . |
| P2721 | Pressure Regulator Valve Upper | See <u>6-CYLINDER: 6HP19</u> |
| | Threshold | TRANSMISSION DIAGNOSIS |
| 70700 | | (2004 - 1 OF 5). |
| P2722 | Pressure Regulator Valve Plausibility | See 6-CYLINDER: 6HP19 |
| | | TRANSMISSION DIAGNOSIS |
| D2725 | D D 1 (V 1 N C' 1 | (2004 - 1 OF 5). |
| P2725 | Pressure Regulator Valve No Signal | See <u>6-CYLINDER: 6HP19</u> TRANSMISSION DIAGNOSIS |
| | | (2004 - 1 OF 5). |
| P2729 | Pressure Regulator Valve Lower | See 6-CYLINDER: 6HP19 |
| 1 2 1 2 9 | Threshold | TRANSMISSION DIAGNOSIS |
| | 1 in conord | (2004 - 1 OF 5). |
| P2730 | Pressure Regulator Valve Upper | See 6-CYLINDER: 6HP19 |
| | Threshold | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 1 OF 5)</u> . |
| P2759 | Torque Converter Clutch No Signal | See <u>6-CYLINDER: 6HP19</u> |
| | | TRANSMISSION DIAGNOSIS |
| | | <u>(2004 - 2 OF 5)</u> . |
| P2761 | Torque Converter Clutch Pressure | See <u>6-CYLINDER: 6HP19</u> |
| | Control Solenoid Control Circuit/Open | TRANSMISSION DIAGNOSIS |
| | | (2004 - 2 OF 5). |
| P2763 | Torque Converter Clutch Pressure | See 6-CYLINDER: 6HP19 |
| | Control Solenoid Control Circuit High | TRANSMISSION DIAGNOSIS |
| D07.64 | T. C. Cl. 1.P. | (2004 - 2 OF 5). |
| P2764 | Torque Converter Clutch Pressure Control Solenoid Control Circuit Low | See 6-CYLINDER: 6HP19 |
| | Control Solenoid Control Circuit Low | TRANSMISSION DIAGNOSIS |
| | | (2004 - 2 OF 5). |

6-Cylinder: 6HP19 Transmission Diagnosis (2004 - 1 Of 5)

| System A/T 6HP19 | System Code | Monitor Strategy Description | Malfunction Criteria | Threshold value | Secondary | Enable | | Time Require d |
|------------------------------|-------------|---------------------------------|--|--|--|--|---|-----------------------|
| Pressure Regulator Valves | | | | | | | 1 | |
| | Ē | lower Breshold | Interruption or short circuit to gnd | | Low-side and high-side FET | activated | l | Zünsec/ |
| | P0745 | plausibility | current higher or lower than threshold | >220nA (p~l) | Power supply | 784 | | continous |
| | P0963 | upper threshold | short circuit to supply | | Voltage-drip at FET | View | | |
| | P0748 | no signal | interruption | | Salaread supply | ∧64 | | |
| | (2)P0966 | lower threshold | interruption or short circuit to and | | Desired PWM-Slana | Not 0% and not 100% | | |
| | P0775 | plausibility | current higher or lower than threshold | >730mA (p-1) | | | | |
| | P0967 | upper threshold | short circuit to supply | | | | | |
| | P0778 | no signal | interruption | | | | | |
| | (3)P0970 | lower threshold | interruption or short circuit to gnd | | | | | |
| | P0795 | plausibility | current higher or lower than threshold | >220mA (b-i) | | | | |
| | P0971 | upper threshold | short circuit to supply | | | | | |
| | P0798 | no signal | interruption | | | | | |
| | (4)P2720 | lower threshold | interruption or short circuit to gnd | | | | | |
| | P2713 | plausibility | current higher or lower than threshold | >730mA (p-l) | | | | |
| | P2721 | Appar threshold | shart circuit to supply | | | | | |
| | P2716 | no signal | interruption | | | | | |
| | (5)P2729 | lower fireshold | interruption or short circuit to gnd. | | | | | |
| | P27722 | plausibility | Current higher or lower than threshold | no monitoring | | | | |
| | P2750 | upper threshold | short circuit to supply | | | | | |
| | P2725 | no signal | interuction | | | | | |
| Solunoid Valves | | | | The state of the s | | | t | |
| | (1)P0973 | tower threshold | interruption or short circuit to gnd. | Diagnosis by ASIC if PWM-signal const. at 0%, 100%, vollage return load (low/high) <0,15V 0,15V < voltage return load (low) ego, <0,00 0,15V < voltage return load (low) <0,00 V | high-side FET high-side FET low-sida FET | Votage drop <=1V enabled enabled | | 20mileo/ continous |
| | P0753 | upper threshold | strort prouil to suppy | Diagnosis by ASIC if PWM-signal const. at 0%, 100% voltage return lead (Night) >0.3V | | | | |
| | P0751 | lengis ou | interruption | Diagnosis by ASIC if PWM-signal canst. at 0%, 100% 0.15V-voltage return lead (low) <0.8V | | | - | |
| (2) | (2) | Not used | Not used | Notused | | | | |
| arteck (only PLZ) | 87607(1) | lower threshold | interruption or short circuit to gnd. | Diagnosis brily by ASIC due to ordeff-controlling | | | _ | |
| Shifflock | 3 | lower threshold | Interruption or short circuit to grid. | Diagnosis only by ASIC due to anioff-controlling | | | i | |
| Oil Temp Sensor | P0711 | genoral | Short circuit (within sensor) | Voltage at connectors between 2,3 and 2,7V | | | - | 1500msec/ |
| | P0713 | upper threshold | short circuit to supply | Sensor-plus >4.5V and Sensor-minus >0.5V | | | | confincia |
| | P0712 | lower thrushold | short circuit to gnd | Sensor-plus <4.5V and Sensor-minus <0.5V | | | | |
| | P0714 | no signal | Interruption | Sensor-plus >4.5V and Sensor-minus <0,5V | | | | |
| | P0710 | plausibility | Gradient lower than threshold | Increase of 20°C / 100 msec | | | | |
| | 1 | | | or Increase of 4°C / 4 min | Chiput speed Engine speed | >400rpm and status OK >400rpm and status OK | | |

<u>Fig. 42: 6-Cylinder: 6HP19 Transmission Diagnosis (2004 - 1 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: 6HP19 Transmission Diagnosis (2004 - 2 Of 5)

| Component | Code | Monitor Strategy Description | Malfunction Criteria | Threshold | Secondary | Enable | Time | MIL. |
|---|--|---------------------------------|---|---|---|--|------------------------|-----------------------|
| Torque Converter Clutch (TCC) | P0741 | genera | differgine speed, input speed) > threshold officed lime | >diff.speed=fengine tarque) engine torquel-50.300/km; diff.speed[25, 25)pm >300ec | forgue converter dutch | clutch not appening | 2500msec/ continous | two driving cycles |
| 5 | WeP2764 | inwer threshold | interruption or short circuit to gnd. | | | | | |
| | P2761 | plausibility | current higher or lower than threshold | no monitorina | | | | |
| | P2763 | upper Preshold | short circuit to supply | | | | | |
| | P2759 | no signal | Interruption | | | | | |
| Power Supply | P1891 | upper fireshold | battery voltage > tireshold | >=16V | engine speed FET | >=400rpm erabled | 10 msec/ continous | two driving cycles |
| | P1892 | lower threshold | | V/=> | angine speed | >=400rpm enabled | _ | |
| | P1890 | general | | A6> | engine speed FET | >=400rpm and status OK enabled | | |
| Geer Ratio Monitoring (1) (2) (4) (5) (5) | (1)P0731 (2)P0732 (3)P0733 (4)P0734 (5)P0735 (6)P1736 | Plausing | (boutput spread x ratio - imput spread) > Breathadd | characteristic speed-diference* (evgine speed) regine speed (0. 200; 600d) tym speed-difference (400; 200; 400) tym | fransmission of temp. actus Range output speed ergins speed infut speed input speed | 2,0,4 md00- md00- md00- md00- md00- md00- md00- md00- md00- md0- md | 30msec/ cantinous | Cycles Cycles |
| Range Shift monitoring | Buju | - | < (ottal x beed - butbut speed x ratio) | - | Stand by Control SBC | inactive | Зопин | (wo driving |
| | 19.00 PE (1) | upper mmshaid | Invasional (input speed x ratio)(1)- (input speed - output speed x ratio)(1=0) < thesitual | -30/pm < calc. value < 40/pm | output speed transmission oil lemp. engine speed | >300rpm >= 500rpm | cantinous | cycles |
| (2) +(3 | (2) +(3) AP1862 | upper threshold | (input speed - output speed x ratio) > threshold | >300pm | output speed | -300pm | Γ | |
| | BP0782 | general | (input speed - autput speed x ratio)(() - (input speed - autput speed x ratio)((+0) > threshold | -30rpm < calc, value < 40rpm | transmission oil temp. engine speed rance position | D.0=< | | |

<u>Fig. 43: 6-Cylinder: 6HP19 Transmission Diagnosis (2004 - 2 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: 6HP19 Transmission Diagnosis (2004 - 3 Of 5)

| System | Code | Monitor Strategy Description | Malfunction Criteria | Threshold | Secondary | Enable Conditions | | Time |
|---------------|------------------|---------------------------------|---|--|--|--|-----------|----------------------|
| (4)+- (c) | (3) -+(4) AP1883 | hoper threshold | (input speed - output speed x railo) → | ~300fpm | output speed | >300 pm | | 30msec/ continous |
| | BP0783 | general | (input speed - output speed x ratio)(t) - (input speed - output speed x ratio)(t=0) > threshold | -Sürpm < calc. value < 40rpm | fransmission oil temp. engine speed range position | orps < 0.0 mg | | |
| A (8) (8) | AP1684 | pioussi di pioni | (Input speed - output speed x rato) > | >300pm | peeds indino | ~300rpm | | |
| | BP0784 | general | (rigul speed - output speed x railo)((+0) - threshold | -30rpm < calc. valum < 40rpm | transmission oil temp. engine speed range position | >=0.0 0.00pm | | |
| (9) ← (6) | AP1885 | upper threshold | (input speed - output speed a ratio) > | >100mm | output speed | -300mm | | |
| | BPORZS | general | (input speed - output speed x rasio)(t)- (input speed - output speed x rasio)(t=0) > threshold | -30rpm < calc. value < 40rpm | transmission of lemp. engine speed. range position | >=600pm | | |
| (2) -(3) | | upper threshold | по тапівата | | output speed | >250mm | | |
| | 1981861 | general | (imput speed - output speed x ratio(t) - (imput speed - output speed x ratio(t=0) > threshold | -30rpm < celc value < 40rpm | transmission of leng. ungive speed range position | >=600rpm | | |
| (3) +(Z) | 4 | upper threshold | no mentanna | | page India | >500ram | | |
| | BP1862 | general | (input speed - output speed x ratio(t)- (input speed - output speed x ratio(t=0) > threshold | -30rpm < calc, value < 40rpm | transmission oil temp. engine speed cange position | Dome C | | |
| (4) 1(3) | - | Upper Birteshold | no manitoring | | peeds Indino | >700rem | | |
| | BP1863 | general | (input speed - culput speed a ratio)(1-0) (input speed - culput speed a ratio)(1-0) > inreshold | -30rpm < calc, value < 40rpm | transmission oil temp. engine speed range position | >=0.C >=100rpm not P. R. N | | |
| (5) + (6) | 4 | upper threshold | no monitoring | | cutput speed | ×800rem | | |
| | BP1864 | general | (input speed - putput speed a ratio)(i) - (input speed - putput speed a ratio)(i=0) > threshold | -30rpm < calc, value < 40rpm | Fansmission oil temp. Grigine speed | D.Os. | | |
| (6) +(5) | A | upper threshold | no monitoring | | Deads Lighto | -1100ram | | |
| | BP1865 | general | (input speed - output speed x ratio)(i=0) (input speed - output speed x ratio)(i=0) > fiveshold | -30rpm < calc. value < 40rpm | frankmission oil temp. engine speed | Digues of the state of the stat | | |
| Engine Torque | 12214 | plausibility | CAN-Meissage signal error-flag | | DME-CAN Connection | Status OK | 96 | 600 тыес/ |
| | | | Alive-Counter or checksum | no alteration of alive-counter or wrong Checksum | CAN-Bus | Status OK | continous | 20175 |

<u>Fig. 44: 6-Cylinder: 6HP19 Transmission Diagnosis (2004 - 3 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: 6HP19 Transmission Diagnosis (2004 - 4 Of 5)

| Component Fault Monitor Strategy Malfunction System Code Description Criteria | | Engine Speed Signal P1727 pieusbility CAN-Mossagu nignia error-dag allve-counter or checksum | Flange Position Switch P0705 plausibility (Trahsmission Position Sonsur (Driver's request) | CAN-Bus P1747 plausibility CAN-Bus disabled | Turbine Speed Sensor P1810 Upper Breashold Shurt circuit to supply (hiput Speed NTU) P1811 Lower Breshold Interrugion or short circuit to grid. | P0715 plausibility | | Output Speed Sensor P0720 plausibility Speed Ulfremme to shoot spread And sufficement spread | P1812 Upper threeshold Short croud to suprily | Lower threshold Intern | general | | P1814 plausbility Negative gradient of signal > threshold |
|---|---|--|---|---|---|---|---|---|---|------------------------|---|--|---|
| Threshold | 76560pm | =1 no alteration of ailve-counter or wrong Chacksum | Invalid code | x | | >7700rpm, <20rpm | | >25/0pm (output speed <pre>>26/0pm (output speed <pre>>20/0pm (output speed <pre></pre></pre></pre> | | | >=8400pm (default but variant specific) | Different to converted wheel speed >250mm | 100dipin / 10mec |
| Secondary | Range Pusition engina speed Park-Lock Sensor | DME CAN-Connection ignition signal CAN-Bus | | fgnilden | Sensor supply | Service supply (NTU>7700rpm) Service (NTU>7700rpm) | Senser supply Senser Fraine speed Dutput speed Paring boston Transmission roadding | Transmission condition Shift flag Turbine spead Sensor supply | Wheel speed | Author mains | Sensor supply sensor | Sensor supply sensor Wheel spead | Transmission condition Turbine speed sensor |
| Enable | not P, R, N, Z and status OK status OK or substitute values status OK | status OK | | status on | Status OK | Status OK No electr, error | Status OK No electric return Status OK vo electric return Status OK ve Stoffen Status OK or subsettlettle value Status of Kor subsettlettle value felicitien of Konsent or background | Middle Food (Governor or backward) Middle Food (Governor or backward) Status OK Status OK | Status OK | NO PERSON | Status OK No starts | Sint-si OK Near spend of driven wheels OK Mean spend of driven wheels OK Mean spend of non-driven wheels OK Convorted wheel spend or Softpur Off, Chifwon and non-driven wheels efform | Function-locked (forward) |
| Time | 2,6soc/ continous | 600msec/ confinate | 100mass/ confinens | 160msac/ | 600msac/ | | | | 1 | | | | 600msec/ confidens |
| MIL. | two driving sycles | two driving cycles | two driving | one driving | two driving | - | | | | | | | |

<u>Fig. 45: 6-Cylinder: 6HP19 Transmission Diagnosis (2004 - 4 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: 6HP19 Transmission Diagnosis (2004 - 5 Of 5)

| Component | Fault | Monitor Strategy Description | Malfunction Criteria | Threshold | Secondary | Enable Conditions | Time | MIC Hilum. |
|---|---------|---------------------------------|---|--|---|--|--|-----------------------|
| Colliding Functions or not allowed actuating of valves (at detected interruption or short- circuit to supply) | P1702 | Jeneral | SW-Functions. actualing solenoid yalves | colliding of 2 Substitute-Functions same priority threin sciencid Valves have short-clicul to supply or interruption | nons | | 20msed continous | two driving sycles |
| Watch-Dog | P1792 | Quineral | emor-counter | exceeding diff. thresholds | Status-Counter | initalization: 0 or 1 | tômsaci | two driving |
| | | | | | filtered battery voltage | V7< | and in | cycles |
| Imaged Diffe CAM. | | | | | | IN ORIENTION, DEDUG-TROOF DESCRIVERED | ILITERIZECON | |
| Connection | P1720 | plausibility | CAN-Connection DME | Timedul | CAN-Bus | no Error and ready-to-transmit | 750mset/ | Guyup aug |
| | | | | | TCM-CAN | no transmission of wake-up signal | confinens | cycle |
| | | | | | battery voltage | \\dec | | |
| Connection | P1721 | plausbility | CAN-Connection DSC | Timestat | CAN-Bus | no Error and ready-to-transmit | 2800msesc/ | Dulying Owl |
| | | | | | TCM-CAN | no transmission of wake-up signal | continous | cycles |
| | | | | | battery voltage | Afric | | |
| TCM Hot Disabiling | P1713 | general | mas(Chip Temp. + 0°C, Trens - Cli-Temp 10°C) > breshold=(tastlery-voltage) | > characteristic vultage[16.4, 18.5, 19.5, 25, 25]V Temp[141, 121, 111, 61, 61]°C | Rone | 100 | 100msec/ pontrious and in initelization | two driving. |
| Valve Voltage Supply | P1896 | plausibility | FET dive | not possible | Status-Counter | midelization: 0 or 1 | 30msec/ conlineus | two driving |
| | P1893 | upper Breshold | short-chall to supply | 7 | Sliemd traffery vollage | VTe | and in | cycles |
| | P1894 | lower threshold | shan-arout to gnd or sensor supply voltage < finished or FET-drop-valtage > threshold | Annacr supply <0.5V, drop-vollage>1V | high-side and low-side-FET battery voltage | in operation: enabled >7V | | |
| | P1395 | ba signal | inlampion | | | and the second s | and the same | |
| Sensor Voltage Supply P1897 | V P1897 | blonser threshold | bonson to your age of westerd | ABe | battery-visitage | V20.8< | continous | DATA DEVINE |
| 2 46 4 5 1 A A A | P1898 | lower threshold | sensor supply Voltage citreshold | <5,42 | | | | cycles |
| EEPROM | P1791 | ptairsibility | Checksum-End | ī | none | 2 | 20msec/ continous | driving cycles |
| EPROM | P1790 | plausibility | Checksum-Erior | 10 | rone | 7 | 10msec/ | two driving |
| | P1798 | | SW-Verify-Error due to Update of EEPROM-Emulation | | | | confined | cycles |

<u>Fig. 46: 6-Cylinder: 6HP19 Transmission Diagnosis (2004 - 5 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: NON-AWD TRANSMISSION (2004)

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: NON-AWD TRANSMISSION (2004)

| DITTOT (D D T T D T | | | (- * * * *) |
|----------------------|----------|--|--|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
| P0705 | 60 | Transmission Range Sensor "A" | See <u>6-CYLINDER: GM5</u> NON-AWD TRANSMISSION |
| | | Circuit Malfunction (PRNDL Input) | DIAGNOSIS (2004 - 1 OF 3). |
| P0709 | 60 | Transmission Range Sensor "A" Circuit Intermittent | See 6-CYLINDER: GM5 NON-AWD TRANSMISSION |

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| I | 1 | | DIAGNOSIS (2004 - 1 OF 3). |
|-------|-----|---|--|
| P0715 | 33 | Input/Turbine Speed Sensor "A" Circuit | See <u>6-CYLINDER: GM5</u> NON-AWD TRANSMISSION DIAGNOSIS (2004 - 1 OF 3). |
| P0717 | 33 | Input/Turbine Speed Sensor "A" Circuit No Signal | See <u>6-CYLINDER: GM5</u> NON-AWD TRANSMISSION DIAGNOSIS (2004 - 1 OF 3). |
| P0720 | 32 | Output Speed Sensor Circuit | See <u>6-CYLINDER: GM5</u> NON-AWD TRANSMISSION DIAGNOSIS (2004 - 1 OF 3). |
| P0722 | 32 | Output Speed Sensor Circuit No Signal | See <u>6-CYLINDER: GM5</u> <u>NON-AWD TRANSMISSION</u> <u>DIAGNOSIS</u> (2004 - 1 OF 3). |
| P0727 | 150 | Engine Speed Input Circuit No Signal | See <u>6-CYLINDER: GM5</u> <u>NON-AWD TRANSMISSION</u> <u>DIAGNOSIS</u> (2004 - 3 OF 3). |
| P0731 | 50 | Gear 1 Incorrect Ratio | See <u>6-CYLINDER: GM5</u> NON-AWD TRANSMISSION DIAGNOSIS (2004 - 1 OF 3). |
| P0732 | 52 | Gear 2 Incorrect Ratio | See <u>6-CYLINDER: GM5</u> <u>NON-AWD TRANSMISSION</u> <u>DIAGNOSIS</u> (2004 - 1 OF 3). |
| P0733 | 53 | Gear 3 Incorrect Ratio | See <u>6-CYLINDER: GM5</u> <u>NON-AWD TRANSMISSION</u> <u>DIAGNOSIS</u> (2004 - 1 OF 3). |
| P0734 | 54 | Gear 4 Incorrect Ratio | See <u>6-CYLINDER: GM5</u> <u>NON-AWD TRANSMISSION</u> <u>DIAGNOSIS</u> (2004 - 1 OF 3). |
| P0735 | 55 | Gear 5 Incorrect Ratio | See <u>6-CYLINDER: GM5</u> NON-AWD TRANSMISSION DIAGNOSIS (2004 - 1 OF 3). |
| P0741 | 48 | Torque Converter Clutch Circuit Performance or Stuck Off | See 6-CYLINDER: GM5 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3). |
| P0742 | 48 | Torque Converter Clutch Circuit Stuck On | See <u>6-CYLINDER: GM5</u> NON-AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3). |
| P0753 | 16 | Shift Solenoid "A" Electrical | See <u>6-CYLINDER: GM5</u> NON-AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3). |
| P0758 | 17 | Shift Solenoid "B" Electrical | See <u>6-CYLINDER: GM5</u> NON-AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3). |
| P0763 | 18 | Shift Solenoid "C" Electrical | See 6-CYLINDER: GM5 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 3 OF 3). |
| P0973 | 16 | Shift Solenoid "A" Control Circuit Low | See 6-CYLINDER: GM5 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3). |
| P0976 | 17 | Shift Solenoid "B" Control Circuit Low | See 6-CYLINDER: GM5 NON-AWD TRANSMISSION DIAGNOSIS (2004 - 2 OF 3). |
| P0979 | 18 | Shift Solenoid "C" Control Circuit Low | See <u>6-CYLINDER: GM5</u> <u>NON-AWD TRANSMISSION</u> <u>DIAGNOSIS</u> (2004 - 3 OF 3). |

| <u></u> | | 1 | <u> </u> |
|---------|-----|----------------------------------|------------------------------------|
| P1719 | 144 | CAN Version Error | See <u>6-CYLINDER: GM5</u> |
| | | | NON-AWD TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 3 OF 3)</u> . |
| P1720 | 129 | CAN Timeout Control Module | See <u>6-CYLINDER: GM5</u> |
| | | | NON-AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF 3). |
| P1765 | 147 | CAN Throttle Valve | See <u>6-CYLINDER: GM5</u> |
| | | | NON-AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF 3). |
| P1780 | | CAN Throttle Valve | See <u>6-CYLINDER: GM5</u> |
| | | | NON-AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF 3). |
| P1790 | 80 | Internal Transmission Control | See <u>6-CYLINDER: GM5</u> |
| | | Module Memory | NON-AWD TRANSMISSION |
| | | Checksum/EPROM Error | DIAGNOSIS (2004 - 3 OF 3). |
| P1791 | 81 | Internal Transmission Control | See <u>6-CYLINDER: GM5</u> |
| | | Module Memory | NON-AWD TRANSMISSION |
| | | Checksum/EEPROM Error | DIAGNOSIS (2004 - 3 OF 3). |
| P1794 | 80 | Internal Transmission Control | See <u>6-CYLINDER: GM5</u> |
| | | Module Memory Checksum Error | NON-AWD TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 3 OF 3)</u> . |
| P1891 | 96 | System Voltage High Input | See <u>6-CYLINDER: GM5</u> |
| | | | NON-AWD TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF 3). |
| P1892 | 96 | System Voltage Low Input | See <u>6-CYLINDER: GM5</u> |
| | | | NON-AWD TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 3 OF 3)</u> . |
| P2759 | 4 | Torque Converter Clutch Pressure | See <u>6-CYLINDER: GM5</u> |
| | | Control Solenoid Control Circuit | NON-AWD TRANSMISSION |
| | | Electrical | DIAGNOSIS (2004 - 2 OF 3). |
| | | | |

6-Cylinder: GM5 Non-AWD Transmission Diagnosis (2004 - 1 Of 3)

| MIL MIL | ₽ | luc | ho | driving grades | 1. | TE . | THE STATE OF | IND BANDED CONCRES |
|---------------------------------|---------|----------------------------|--|---|--|---|--|--|
| Time | | 10 sec / cont | 0.5 sec/ conf | 3 sec / conf | 5 sec / cont | 5 sec / cont | 3 sec / cont | 2 sec / cont |
| Enable | | 9V < battery voltage < 18V | 9V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm | > 8 km/h > 12% 9V < battery voltane < 18V | 1,2,3,4 or 5 > 8 km/h 9V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm | 1,2,3,4 or 5 9V < baltery voltage < 18V 450 rpm < 450 rpm > 1300 rpm | 70 Nm < eng trq < 400 Nm > 12 % 1500 rpm < inp spd < 6000 rpm 9V < battery voltage < 18V 450 rpm < ens. spd < 6500 rpm | 1, 2, 3, 4, 5 10, 2, 3, 4, 5 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, |
| Secondary | | battery voltage | battery voltage engine speed | vehicle speed throttle position battery voltage | gear selected vehicle speed battery voltage engine speed | gear solected battery voltage engine speed outp sod on hast valid outp said | engine lorque linotie position input speed battery vollage enuline speed | total selected thredite possition thredite possition yos lever vehicle speed transmission lemperature transmission ratio parametrission ratio parametrission ratio |
| Treshold | | wrong signal | transitional signal | > 1000 rpm: | < 100 rpm | > 1300 rpm | 4 100 pm | After 5 G visit |
| Malfunction Criteria | | invalid code | transitional code | Inp spd - last valid inp apit | paids Indui | della output speed | peeds Indino | (inpul - outpul speed |
| Monitor Strategy Description | | rationality | rationality | репотивное | rationally | реготналов | rationality | rationality |
| Fault | | P0705 | P0709 | P0715 | P0717 | P0720 | P0722 | P0731 P0732 P0733 P0734 P0735 |
| Component | A/T GM5 | Range Switch | | paed Produi | | Output Speed | | Geer Ratio |

Fig. 47: 6-Cylinder: GM5 Non-AWD Transmission Diagnosis (2004 - 1 Of 3) Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: GM5 Non-AWD Transmission Diagnosis (2004 - 2 Of 3)

| MIL. | | driving sydes | | | | | |
|---------------------------------|--|--|--|--|--|---|---------------------------------|
| Time | 15 sec / cont | 7.5 seu' cont | 700 msec / cont | 700 msec / cont | 700 msec / cont | 700 msec / cont | 700 msec / cont |
| Enable | 2, 3, 4 or 5 2, 3, 4 or 5 2, 3, 4 or 5 20°C, 4 brans lemp 4 (30°C, 20°C, 4 brans lemp 4 (30°C, 55°C) Mm 9V 4 brans lemp 4 (30°C, 40°C) Mm 9V 4 brans 4 c 65°C prans 45°C prans 4 | lock off 12% e throt pus e 90 % 800 pm e e en spes e 4500 80 hm e en gros e 4500 km 16 km e en gros e 250 km 9V e battery ochage e 18V 450 pm e eng. spel e 5600 pm | 9V < battery voltage < 16V 450 rpm < eng. spd. < 6500 rpm | 9V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm | 9V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm | 9V < battery voltage < 18V 450 nm < éng. abd. < 6500 npm | 450 mm cent. spd < 6500 mm |
| Secondary | TCC mode gent selected throttle positions throttle positions bransmesion temperalure cingine temperalure ballery vidilige femilies steed | TCC mode prov selected provide posterior fractis posterior fractis posterior fractis posterior fractis posterior fractis posterior variate posterior trattistry value provide preser trattistry value provide preser provide preser provide preser provide preser provide preser provide preservanta provide prese | battery voltage engine speed | Shift Solenoid A battery voltage engine speed | battery voltage engine speed | Shiff Suterold B bettery voltage engine speed | battery voltage angine speed |
| Treshold | > 200 pmn | mb < deta < 20 pm - deta < 20 pm | duty cycle (pwm signat) <= 10% or duty cycle (pwm signat) >= 80% | power short | ground short | power short | ground short |
| Malfunction | TCC Sip Tarpet - TCC Sip (maximum silp) | eng spade - Irpul speed (mhimum alp) | voltage | agaticy | ellelle | voltage | voltage |
| Monitor Strategy Description | functional check T.C.C. stuck off | Interioral check TCC stuck, on | circuit continuity | circuit centinuity, power short | civil continuity, ground short | circuit continuity, power short | ciruit continuity, ground short |
| Fault | P0741 | P0742 | P2759 | P0753 | P0973 | P0758 | P0976 |
| System | Torque Conventer Clutch | | Press. Confr. Valve | Shift Salenoid (A) | 3 | Shift Salenoid (B) | (ii) |

<u>Fig. 48: 6-Cylinder: GM5 Non-AWD Transmission Diagnosis (2004 - 2 Of 3)</u> Courtesy of BMW OF NORTH AMERICA, INC.

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6-Cylinder: GM5 Non-AWD Transmission Diagnosis (2004 - 3 Of 3)

| MIL MIL | | sont. cycles | nt two | ant driving cycles | | | of driving for | | - | tup | dra | tuo |
|---------------------------------|--|--|-----------------|--------------------|-------------------------------|---------------------------------|--|----------------------------|----------------------------|-----------------------------|-------------------|-------------------|
| Time | 700 msec / con | 700 msec / con | 5 sec / conf | 10 500 / 000 | 1 990 / 0001 | 1 9ec/con | 1 sec / conf | 1 sec/cont | 5 34C / CON | concer at startup | Curton at Starfup | none at starting |
| Enable | 9V < balleny voltage < 18V 450 rgm < ang. spd. < 6500 rpm | 5V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm | > 1500 rpm | | Ve buttery vollage < 18V | 450 ram < mag spd < 6500 rpm | 9V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm | 9V < battery voltage < 18V | 9V < battery voltage < 10V | | | |
| Secondary | Snift Solehold C battery votage diignes speed | padit autus autus | origine appea | | agelicy vollage | battery vollege engine speed | battery vollage angine speed | ballery voltage | battery voltage | | | |
| Treshold | power short | ground short | V2.5 > | V81 < | invest sgnal | lenge bilevni | invalid signal | >15 | wrong value | | invalid checksum | Not retoriational |
| Malfunction Criteria | voltage | vellage | battery voltage | battery vollage | CAN srigine spaed | CAN lorque restuction | CAN mouth position | CAN messages/firms out | CAN level | internal error (NVM / RAM). | RAM and ROM check | ROM chief |
| Monitor Strategy Description | birant confinity, power short | olnul qualinutty, ground abort | retonality | raitmality | redistality | raturality | rationality | bus check | bus check | rationality | self check | tall chark |
| Fault | P0763 | P097g | P1892 | P1891 | P0727 | P1780 | P1765 | P(720 | P1719 | P1791 | P1790 | P1704 |
| Component | Shift Solended (C) | Đ | Power Supply | | Transmission Control Modul | | | | | | | |

<u>Fig. 49: 6-Cylinder: GM5 Non-AWD Transmission Diagnosis (2004 - 3 Of 3)</u> Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: GM5 - AWD (2004)

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: GM5 - AWD (2004)

| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
|-------|----------|--|--|
| P0705 | 60 | Transmission Range Sensor "A" | See 6-CYLINDER: GM5 AWD |
| | | Circuit Malfunction (PRNDL Input) | (2004 - 1 OF 3). |
| P0709 | 60 | Transmission Range Sensor "A" Circuit Intermittent | See <u>6-CYLINDER: GM5 AWD</u> TRANSMISSION DIAGNOSIS |

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| | | 1 | (2004 - 1 OF 3). |
|----------|-----|---------------------------------|---|
| P0710 | | Transmission Fluid Temperature | See 6-CYLINDER: GM5 AWD |
| | | Sensor | TRANSMISSION DIAGNOSIS |
| | | | (2004 - 1 OF 3). |
| P0712 | | Transmission Fluid Temperature | See 6-CYLINDER: GM5 AWD |
| | | Sensor | TRANSMISSION DIAGNOSIS |
| | | | (2004 - 1 OF 3). |
| P0713 | | Transmission Fluid Temperature | See 6-CYLINDER: GM5 AWD |
| 1 0 , 10 | | Sensor | TRANSMISSION DIAGNOSIS |
| | | | (2004 - 1 OF 3). |
| P0715 | 33 | Input/Turbine Speed Sensor "A" | See 6-CYLINDER: GM5 AWD |
| 0715 | | Circuit | TRANSMISSION DIAGNOSIS |
| | | | (2004 - 1 OF 3). |
| P0717 | 33 | Input/Turbine Speed Sensor "A" | See 6-CYLINDER: GM5 AWD |
| 10/1/ | 33 | Circuit No Signal | TRANSMISSION DIAGNOSIS |
| | | Circuit No Signal | (2004 - 1 OF 3). |
| P0720 | 32 | Ontant Sand Sandar Cinquit | ` ` ` |
| P0/20 | 32 | Output Speed Sensor Circuit | See 6-CYLINDER: GM5 AWD |
| | | | TRANSMISSION DIAGNOSIS |
| 7072 | | | (2004 - 1 OF 3). |
| P0722 | 32 | Output Speed Sensor Circuit No | See 6-CYLINDER: GM5 AWD |
| | | Signal | TRANSMISSION DIAGNOSIS |
| | | | (2004 - 1 OF 3). |
| P0727 | 150 | Engine Speed Input Circuit No | See <u>6-CYLINDER: GM5 AWD</u> |
| | | Signal | TRANSMISSION DIAGNOSIS |
| | | | (2004 - 3 OF 3). |
| P0731 | 50 | Gear 1 Incorrect Ratio | See <u>6-CYLINDER</u> : GM5 AWD |
| | | | TRANSMISSION DIAGNOSIS |
| | | | (2004 - 2 OF 3). |
| P0732 | 52 | Gear 2 Incorrect Ratio | See <u>6-CYLINDER</u> : GM5 AWD |
| | | | TRANSMISSION DIAGNOSIS |
| | | | (2004 - 2 OF 3). |
| P0733 | 53 | Gear 3 Incorrect Ratio | See 6-CYLINDER: GM5 AWD |
| | | | TRANSMISSION DIAGNOSIS |
| | | | (2004 - 2 OF 3). |
| P0734 | 54 | Gear 4 Incorrect Ratio | See 6-CYLINDER: GM5 AWD |
| | | | TRANSMISSION DIAGNOSIS |
| | | | (2004 - 2 OF 3). |
| P0735 | 55 | Gear 5 Incorrect Ratio | See 6-CYLINDER: GM5 AWD |
| | | | TRANSMISSION DIAGNOSIS |
| | | | <u>(2004 - 2 OF 3).</u> |
| P0741 | 48 | Torque Converter Clutch Circuit | See 6-CYLINDER: GM5 AWD |
| | 10 | Performance or Stuck Off | TRANSMISSION DIAGNOSIS |
| | | Terrormance of Stack of | (2004 - 2 OF 3). |
| P0742 | 48 | Torque Converter Clutch Circuit | See 6-CYLINDER: GM5 AWD |
| 10/42 | 40 | Stuck On | TRANSMISSION DIAGNOSIS |
| | | Stuck On | (2004 - 2 OF 3). |
| P0753 | 16 | Shift Solenoid "A" Electrical | ` / |
| P0/33 | 10 | Silit Solehold A Electrical | See 6-CYLINDER: GM5 AWD |
| | | | TRANSMISSION DIAGNOSIS (2004 - 2 OF 3). |
| D0759 | 17 | CL:0 C-1: 1 D E1 - : 1 | ` ` ` ` |
| P0758 | 17 | Shift Solenoid "B" Electrical | See 6-CYLINDER: GM5 AWD |
| | | | TRANSMISSION DIAGNOSIS |
| D0763 | 4.0 | 91:0 9 1 11:0:0:71 | (2004 - 2 OF 3). |
| P0763 | 18 | Shift Solenoid "C" Electrical | See 6-CYLINDER: GM5 AWD |
| | | | TRANSMISSION DIAGNOSIS |
| l | | | (2004 - 3 OF 3). |

| P0973 | 16 | Shift Solenoid "A" Control Circuit | See <u>6-CYLINDER: GM5 AWD</u> |
|-------|-----|------------------------------------|--------------------------------|
| | | Low | TRANSMISSION DIAGNOSIS |
| | | | (2004 - 2 OF 3). |
| P0976 | 17 | Shift Solenoid "B" Control Circuit | See 6-CYLINDER: GM5 AWD |
| | | Low | TRANSMISSION DIAGNOSIS |
| | | | (2004 - 2 OF 3). |
| P0979 | 18 | Shift Solenoid "C" Control Circuit | See 6-CYLINDER: GM5 AWD |
| | | Low | TRANSMISSION DIAGNOSIS |
| | | | (2004 - 3 OF 3). |
| P1719 | 144 | CAN Version Error | See 6-CYLINDER: GM5 AWD |
| | | | TRANSMISSION DIAGNOSIS |
| | | | (2004 - 3 OF 3). |
| P1720 | 129 | CAN Timeout Control Module | See 6-CYLINDER: GM5 AWD |
| | | | TRANSMISSION DIAGNOSIS |
| | | | <u>(2004 - 3 OF 3)</u> . |
| P1765 | 147 | CAN Throttle Valve | See 6-CYLINDER: GM5 AWD |
| | | | TRANSMISSION DIAGNOSIS |
| | | | (2004 - 3 OF 3). |
| P1790 | 80 | Internal Transmission Control | See 6-CYLINDER: GM5 AWD |
| | | Module Memory | TRANSMISSION DIAGNOSIS |
| | | Checksum/EPROM Error | (2004 - 3 OF 3). |
| P1791 | 81 | Internal Transmission Control | See 6-CYLINDER: GM5 AWD |
| | | Module Memory | TRANSMISSION DIAGNOSIS |
| | | Checksum/EEPROM Error | (2004 - 3 OF 3). |
| P1794 | 80 | Internal Transmission Control | See 6-CYLINDER: GM5 AWD |
| | | Module Memory Checksum Error | TRANSMISSION DIAGNOSIS |
| | | | (2004 - 3 OF 3). |
| P1891 | 96 | System Voltage High Input | See 6-CYLINDER: GM5 AWD |
| | | | TRANSMISSION DIAGNOSIS |
| | | | (2004 - 3 OF 3). |
| P1892 | 96 | System Voltage Low Input | See 6-CYLINDER: GM5 AWD |
| | | | TRANSMISSION DIAGNOSIS |
| | | | (2004 - 3 OF 3). |

6-Cylinder: GM5 AWD Transmission Diagnosis (2004 - 1 Of 3)

| MIL | | | | | | | DWD | driving | cycles | | |
|---------------------------------|---------|---|--|---|---|---|--------------------------------|---|---|--|---|
| Time | | 10 sec / cont | 0.5 sec/ cont | 10 sec/cont. | S sections | 100saciones per DC | Tresections. | 3 sec / cont | 5 sec / cont | 5 sec / con | 3 sec / cont |
| Conditions | | 9V < battery voltage < 18V 450 fpm < eng. styd. < 6500 rpm | 9V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm | | > 120 rpm' > 8 km/h > 200 sec | > 120 tpm > 8 km/h > 70 ° C | | > 8 km/h. > 12% 9V < battery voltage < 18V | 1,2,3,4 or 5 > 8 kmh 9V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm | 1,2,3,4 or 5 9V < battery voltage < 18V 450 rpm < eng, spd. < 6500 rpm > 1300 rpm | 70 Nm < eng trq < 400 Nm > 12 % 1500 rpm < inp spd < 6000 rpm 9V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm |
| Secondary | | battery voltage engine streed | battery voltage engine speed | | input speed – output speed vehicle speed fransmission warm-up | input speed – output speed vehicle speed engine codant femperature and ongine codant femperature. | | vahicle speed throttle position battery voltage | gear selected vehicle speed battery voltage angine speed | gear selected battery votrage engine speed outp sood or hart valid outp sod | engine krque ihrotie position input speed baltery votage engine speed |
| Treshold | | wrong signal | transitional signal | ×0,12V | V644 | Å temp. < 2°C within 100 sec. | A temp. > 20°C within 250 meac | → 1000 rpm | < 100 tpm | * 1300 rpm | < 100 rpm |
| Malfunction | | invalid code | transitional code | vollage | | stuck temperature | temperature gradient | in_speed - last valid in_speed | input speed | della output speed | paods indino |
| Monitor Strategy Description | | rationality | gllennalty | short to ground or sensor informal short | short to battery or open | rationality | | performance | rabonality | performence | rationality |
| Code | | P0705 | P0709 | P0712 | P0/13 | D170d | | P0715 | P0717 | P0720 | P0722 |
| Component | A/T GM5 | Range Switch | | Temperature Sensor | Transmission Fluid | | | peeds indu | | Output Speed | |

<u>Fig. 50: 6-Cylinder: GM5 AWD Transmission Diagnosis (2004 - 1 Of 3)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: GM5 AWD Transmission Diagnosis (2004 - 2 Of 3)

| MIL Illum. | two driving cycles | | Iwo driving cycles | | | | | |
|---------------------------------|--|--|--|--|--|--|--|--|
| Time | 2 sec / cont | 15 suc / cont | 7.5 sect cant | 700 msec / con | 700 msec/conf | 700 msec / cont | 700 msec / conf | 700 msec / conf |
| Enable | 1, 2, 3, 4, 5 100, 100, 100, 100, 100, 100, 100, 100, | 2, 3, 4 or 5 2, 3, 4 or 5 12% - throt pos × 90 % 20°C < Irans temp × 130 °C 55 Nm < erg lar × 400 Nm 9 V > balley vivides × 18V 450 mm < erg or 4 or 5 | lock off 12% c thrut pox c 80 % 600 pm c verig salet 46500 80 hm c sng tu c 460 Nm 15.4ph c verig salet 25% kpt 9V c battery vollage c 18V 450 pm c eng. spd. 45500 pm | 9V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm | 9V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm | 9V < battery voltage < 18V 450 rpm < ung. spd. < 6500 rpm | 9V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm | 9V < battery voltage < 18V 450 rpm < eng. spd. < 6500 rpm |
| Secondary | gear selectron Princite position Princite position Selectro fewer position verificia speed framstrission furmperature mistion furmperature mistion furmperature mistion furmperature mistion furmstrission railo patrission railo patrissio | TCC mode gara selected through the position transmission temperature engine tempe battery voltage engine severe | TCC mode poar selected throate position engine speed engine bioque vertice speed battery vertage engine stpeed | battery voltage engine speed | Shift Solenoid A battery voltage engine speed | battery voltage ongine speed | Shift Solenoid B battery voltage engine speed | battery voltage engine speed |
| Treshold | And the state of t | > 200 pmm | -20 rpm < delta < 20 rpm | duty cycle (pwm signal) <= 10% of duty cycle (pwm signal) >= H0% | puwer short | ground short | power short | ground short |
| Malfunction Criteria | input - cutous speed | TCC_Sip_Terget - TCC_Sip (maximum elip) | ang, spead - inpul speed (mkrimum allp). | ade;;aA | voltage | vutage | vallage | ageriov |
| Monitor Strategy Description | rationality | functional chack TCC sluck off | Institute of TCC stuck on | circuit continuity | circuit confinuity, power shart | drul continuity, ground short. | circuit continuity, power short | cirult ponlinuty, ground short |
| | | P0741 | P0742 | P2759 | P0753 | P0973 | P0758 | P0976 |
| System | Geer Rabo | Torque Converter Clutch | | Press. Confr. Valve | Shift Satenard (A) | 8 | Shift Solenoid (B) | (9) |

<u>Fig. 51: 6-Cylinder: GM5 AWD Transmission Diagnosis (2004 - 2 Of 3)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: GM5 AWD Transmission Diagnosis (2004 - 3 Of 3)

| MIL | Ped | верия | | | O#O | driving | | | | | |
|---------------------------------|--|---|-----------------|-----------------|-------------------------------|---------------------------------|----------------------------|----------------------------|----------------------------|--------------------|------------------|
| Time | 700 msec / conf | 700 msec / conf | 5 sec / conf | 10 sec / conf | 1 sec / cont | 1 sec/cont | 1 \$00 / 0001 | 5 sec / cont | phon at alactum | CHANGE OF ADMITTED | once is starting |
| Enable | 9V < battery voltage < 13V 450 rpm < eng. spd. < 6500 rpm | 9V < bishey vollage < 18V 450 rpm < eng. spd. < 6500 rpm | > 1500 rpm | | 3V * hallery voltage < 18V | 9V < traffory vollage < 18V | 2V < tallery voltage < 18V | 9V < battery voltage < 18V | | | |
| Secondary | Shift Science C battery voltage engine spend | battery voltage engine speed | basic succes | | ballery voltage | battery voltage engine soest | battery voltage | battery voltage | | | |
| Treshold | power short | graund short | 78.65 | V 18 V | lengis blevni | invalid signal | >18 | wrong value | | invalid checksum | not programmed |
| Malfunction Criteria | valtage | egestov | battery voltage | battery vollage | CAN engine speed | CAN throttle position | CAN messagea/lime out | CAN level | internal error (NVM / RAM) | RAM and ROM check. | ROM check. |
| Monitor Strategy Description | circuit continuity, power short | cirul continuity, ground short | rationality | rationality | thenoter | rationatty | bus check | bus dieck | rationality | self check | soff chack |
| Code | P0763 | P0979 | P1892 | P1891 | Pútzr | P1765 | P1720 | P1719 | P1791 | P1790 | P1734 |
| Component | Shift Solenoid (C) | Ó. | Power Supply | * | Transmission Control Modul | | | | | | |

<u>Fig. 52: 6-Cylinder: GM5 AWD Transmission Diagnosis (2004 - 3 Of 3)</u> Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: SMG TRANSMISSION (2004)

DIAGNOSTIC TROUBLE CODES 6-CYLINDER: SMG TRANSMISSION (2004)

| 211101102110 | THE CALL CORES | O CIETIBETT SITE THE TOTAL | ==== (= ===) |
|--------------|----------------|-----------------------------------|----------------------------|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
| P0932 | 20215 | Hydraulic Pressure Sensor Circuit | See <u>6-CYLINDER: SMG</u> |
| | | | <u>TRANSMISSION</u> |
| | | | DIAGNOSIS (2004 - 1 OF 5). |
| P0934 | 20215 | Hydraulic Pressure Sensor Circuit | See <u>6-CYLINDER: SMG</u> |
| | | Low | TRANSMISSION |
| | | | |

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| | 1 | | DIAGNOSIS (2004 - 1 OF 5). |
|----------|--------|-----------------------------------|--|
| P0935 | 20215 | Hydraulic Pressure Sensor Circuit | See 6-CYLINDER: SMG |
| | | High | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 1 OF 5). |
| P1720 | 20800 | CAN Timeout Control Module | See <u>6-CYLINDER: SMG</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 1 OF 5)</u> . |
| P1721 | 20801 | CAN Timeout ASC/DSC | See <u>6-CYLINDER: SMG</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 1 OF 5)</u> . |
| P1747 | 52999 | CAN-Bus Monitoring | See <u>6-CYLINDER: SMG</u> |
| | | | TRANSMISSION |
| D4 = 6 = | 20004 | G 137 ml 1 77 1 | <u>DIAGNOSIS (2004 - 1 OF 5)</u> . |
| P1765 | 20904 | CAN Throttle Valve | See <u>6-CYLINDER: SMG</u> |
| | | | TRANSMISSION |
| D1766 | 20702 | D 11 E E ' C 1 | <u>DIAGNOSIS (2004 - 1 OF 5)</u> . |
| P1766 | 20702 | Double Error Engine Speed | See 6-CYLINDER: SMG |
| | | CAN/Direct Wiring | TRANSMISSION DIAGNOSIS (2004 - 1 OF 5). |
| P1767 | 20913 | CANIWheat Speeds Door Ards | ` ′ |
| P1/6/ | 20913 | CAN Wheel Speeds Rear Axle | See <u>6-CYLINDER: SMG</u> TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 3 OF 5)</u> . |
| P1771 | 20901 | CAN Torque Interface Plausibility | |
| | 20901 | CAN Torque interface Flausionity | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 4 OF 5)</u> . |
| P1782 | 20910 | CAN Brake Signal | See 6-CYLINDER: SMG |
| 11702 | 20710 | Of his Brake Signal | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 2 OF 5). |
| P1791 | 20401 | Internal Transmission Control | See 6-CYLINDER: SMG |
| | | Module Memory | TRANSMISSION |
| | | Checksum/EEPROM Error | DIAGNOSIS (2004 - 4 OF 5). |
| P1796 | 20406 | Internal Transmission Control | See <u>6-CYLINDER: SMG</u> |
| | | Module Error 7 (High Side | TRANSMISSION |
| | | Driver) | DIAGNOSIS (2004 - 4 OF 5). |
| P1817 | 20606 | Gear Selector Lever GSL0 Cable | See <u>6-CYLINDER: SMG</u> |
| | | High Input | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 4 OF 5)</u> . |
| P1818 | 20606 | Gear Selector Lever GSL0 Cable | See <u>6-CYLINDER: SMG</u> |
| | | Low Input | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 4 OF 5)</u> . |
| P1819 | 20606 | Gear Selector Lever GSL0 Cable | See <u>6-CYLINDER: SMG</u> |
| | | Plausibility | TRANSMISSION |
| 71070 | | | <u>DIAGNOSIS (2004 - 4 OF 5)</u> . |
| P1820 | 20607 | Gear Selector Lever GSL1 Cable | See <u>6-CYLINDER: SMG</u> |
| | | High Input | TRANSMISSION DIA CNOSIS (2004 4 OF 5) |
| D1001 | 20.607 | 0 01 1 011 | <u>DIAGNOSIS (2004 - 4 OF 5)</u> . |
| P1821 | 20607 | Gear Selector Lever GSL1 Cable | See 6-CYLINDER: SMG |
| | | Low Input | TRANSMISSION DIAGNOSIS (2004 - 4 OF 5). |
| D1922 | 20607 | Coor Salastan Layer CSI 1 C-1.1 | ` ′ |
| P1822 | 20607 | Gear Selector Lever GSL1 Cable | See <u>6-CYLINDER: SMG</u> TRANSMISSION |
| | | Plausibility | <u>I RANSMISSION</u> DIAGNOSIS (2004 - 4 OF 5). |
| P1823 | 20611 | Gear Selector Lever Digital Cable | ` / |
| 1 1023 | 20011 | Plausibility | TRANSMISSION |
| | | 1 iausionity | <u>DIAGNOSIS (2004 - 3 OF 5)</u> . |
| I | 1 | I . | <u>=====================================</u> |

| P1850 | 20213 | Shift Angle Sensor High Input | See <u>6-CYLINDER: SMG</u> |
|---------------|--------|----------------------------------|---|
| | | | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 2 OF 5). |
| P1851 | 20213 | Shift Angle Sensor Low Input | See <u>6-CYLINDER: SMG</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 2 OF 5)</u> . |
| P1852 | 20213 | Shift Angle Sensor Plausibility | See <u>6-CYLINDER: SMG</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 2 OF 5)</u> . |
| P1859 | 20217 | Clutch Speed Sensor Plausibility | See <u>6-CYLINDER: SMG</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 5 OF 5)</u> . |
| P1860 | 20612 | Gear Selector Lever Hall Sensor | See 6-CYLINDER: SMG |
| | | Error 1 | TRANSMISSION |
| P1 066 | 20.600 | G G 1 | <u>DIAGNOSIS (2004 - 5 OF 5)</u> . |
| P1866 | 20608 | Gear Selector Lever GSL2 Cable | See <u>6-CYLINDER: SMG</u> |
| | | High Input | TRANSMISSION DIAGNOSIS (2004 - 4 OF 5). |
| D1967 | 20608 | Care Calastan Lavan CSL 2 Cabla | |
| P1867 | 20008 | Gear Selector Lever GSL2 Cable | See <u>6-CYLINDER: SMG</u> TRANSMISSION |
| | | Low Input | <u>TRANSMISSION</u> <u>DIAGNOSIS (2004 - 4 OF 5)</u> . |
| P1868 | 20608 | Gear Selector Lever GSL2 Cable | See 6-CYLINDER: SMG |
| 1 1 0 0 0 | 20008 | Plausibility | TRANSMISSION |
| | | Tiadstonity | <u>DIAGNOSIS (2004 - 4 OF 5)</u> . |
| P1869 | 20609 | Gear Selector Lever GSL3 Cable | See 6-CYLINDER: SMG |
| 1 1007 | 2000) | High Input | TRANSMISSION |
| | | Inga mpuv | DIAGNOSIS (2004 - 4 OF 5). |
| P1870 | 20609 | Gear Selector Lever GSL3 Cable | See 6-CYLINDER: SMG |
| 11070 | 20009 | Low Input | TRANSMISSION |
| | | 1 | DIAGNOSIS (2004 - 4 OF 5). |
| P1876 | 20609 | Gear Selector Lever GSL3 Cable | See 6-CYLINDER: SMG |
| | | Plausibility | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 4 OF 5). |
| P1887 | 20335 | Hydraulic Pump | See 6-CYLINDER: SMG |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 2 OF 5). |

6-Cylinder: SMG Transmission Diagnosis (2004 - 1 Of 5)

| Component | Fault | Monitor Strategy Description | Malfunction Criteria | Threshold Value | Secondary | Enable Conditions | Time | MIL |
|---|-------|---------------------------------|--|-------------------------|---|--|-------------------------|----------------------|
| Transmission SMG Nydraulic Pressure Sensor | P0932 | Alliquireld | CINE neuron on sensor GND | æq ç'(+ > einssaid mjep | pump activation = & GEAGSHIFT & KEY = & NOT GRANING = & Vsupply = | FINISHED NOT IN PROCREESS ON ON CAN [6.5-107, 17.01-17.5] | 8 | 2nd driving cycle |
| | | | | delta pressure > -3 bar | & NOT CRANKING = & NOT CRANKING = & VSURPY = & GEATSHIFT & ESTIMATED USED OIL | ON ON (8.5-10V, 17.01-17.5) (IN PROGRESS >20 cm | , | |
| | | | sensor malfunction, out of dynamic range | signal gradient > 5V | & NOT CRANKING = & Vsupply = | ON ON (6.5-10V, 17.01-17.5) | < 500ms, confinuous | |
| | P0934 | lawer threshold | Interruption or s.c.to GND | V 4.0 > Brunia | 8 NOT CRANKING ** | NO SO | | |
| | P0935 | upper threshold | s.c. to supply | V 7, P < Bridge | & Vsupply # | [6.5-10V, 17.01-17.5] | | |
| CAN Timeout DIME | P1720 | plausbilly | signal is not available on CAN | fineout | & NOT CRANKING = & Vsupply = | ON ON (6.5-10V, 17.01-17.5) | < 105 ms, continuous | 2nd driwing cycle |
| CAN Timeout ASC/DSC | P1721 | ymatshity | signal is not available on CAN | limeani | & NOT CRANKING = & Vsupply = | ON ON ON 16.5-10.71,17.51 | < 210 ms. conf. | 2nd driving cycle |
| CAN-Bus Monitoring | P1747 | Villetsend | CAN bis Off | gmeoni | & NOT CRANKING = & Vsupply = & Engine = | ON ON (6.5-10V, 17.01-17.5) ON acknowledded since timeout | 5 s son | 2nd driving cycle |
| CAN Throttle Valve | P1765 | yillidistraid | malfunction on throttle valve potentiometer | signal = FFbax | KEY = & ECU = & Vsupply = | ON Since timeout 15.5-10V, 17.01-17.51 | < 20 ms. conf. | 2nd driving |
| Engine Speed | P1766 | plausibility | sensor disconnected or multiple fault | speed signal = 0 | failure on CAN engine speed = 8 KEY = 8 NOT CRANKING = 8 VOLPON = 8 VSUPDIN = 1 | Validated ON ON ON ON 17.01-17.5] | < 1 s. cont. | 2nd driving cycle |

<u>Fig. 53: 6-Cylinder: SMG Transmission Diagnosis (2004 - 1 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: SMG Transmission Diagnosis (2004 - 2 Of 5)

| MIL | 2nd driving cycle | 2nd driving | | | | 2nd daving |
|---------------------------------|------------------------------------|--------------------------------|----------------|-------------------------|---|---|
| Time | < 50.5, cont. | < 500 ms cont | 1 | | | 2nd divis |
| Enable | Commended | NO | NOTON | [6.5-107, 17,01-17.5] | ((gnar position, EOL tuned values) OY NOTON [65-10V-17.5] NOT IN PROGRESS | ON since fination |
| Secondary | Pump n & error counter >= | MEV= | & CRANKING = | & Vsupply = | selector bresholds = & KEY = & CRANKING = & Vaughy = & GEARSHIFT = | KEY = 8 ECU = 8 Vamely = |
| Threshold | pump switched on for more than 30s | V2,4 < lengths | Ngnal < 0,5 V | signal gradient > 4,4 V | Signal outside selection (fresholds | CAN abe F BS - 1 |
| Malfunction Criteria | damage on hydraulic pump | open aroult or s.c. to Vsupply | short to GND | out of dynamic range | Out of position range | failure on brake willth system delected by engine control unit |
| Monitor Strategy Description | plausibility | upper Broshold | lower Breshold | plausibility | | plausibility |
| Fault | P1887 | P1850 | P1851 | P1852 | | P1782 |
| Component | Hydraulic Pump Fallure | Shift Position Sensor | | | | CAN Brake Signal |

<u>Fig. 54: 6-Cylinder: SMG Transmission Diagnosis (2004 - 2 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: SMG Transmission Diagnosis (2004 - 3 Of 5)

| Component System | Code | Monitor Strategy Description | Malfunction Criteria | Threshold Value | Secondary | Enable | Time | MIL |
|-------------------------|-------|---------------------------------|--|------------------------------|--|---|----------------|-------------------|
| Gear Lever Diottal Line | PIROS | out since | mental in the second se | signal = 1 | CODE <> & KEY = & CRANKING = & VSupply = | .R. ON NOT ON [6.5-10V, 17:01-17:5] | | |
| | | and the cu | tion cas is not awarding or with process | signal = 0 | CODE = & KEY = & CRANKING = & VSUDDIV = | .R. ON NOT ON 16.5-107, 77.01-17.51 | < 20 ms, cont. | 2nd driving cycle |
| | | | | | & KEY = & KEY = & NOT CRANKING = & Vennole = | NO NO NO NO NO NO NO NO NO NO NO NO NO N | | |
| | | | out of dynamic range | signal gradient > 1000 rpm | & GEAR = | ENGAGED CLOSED | | |
| CAN Speed Rear Wheels | P1767 | plausibility | | | B KEYNE & KEYNE & NOT CRANKING = & Vsupply = & GLUTCH = | ON ON ON [6.5-10V, 17.01-17.5] ENGAGED CLOSED | < 1 s, cont. | 2nd driving cycle |
| | | | spool in the season of integral | o enfis park | ENGINE = & KEY = & NOT CRANKING = & Vsupply = & GEAR = & GLUTCH SPEED > | ON ON ON [6.5-10V, 17.01-17.5] ENGAGED 500 min. ⁴ | | |

Fig. 55: 6-Cylinder: SMG Transmission Diagnosis (2004 - 3 Of 5) Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: SMG Transmission Diagnosis (2004 - 4 Of 5)

| System | Fault | Monitor Strategy Description | y Malfunction Criteria | Threshold | Secondary | Enable Conditions | Time | MIL Illum. |
|-----------------------------|--------|---------------------------------|--|--|--|---|-------------------|-------------------|
| CAN Street Rear Wheels | | | speed signal->engine spood/gosr rato +e | loierence e e 5:00 min ⁻¹ . gear into = flongaged gear), glidich spreed | S NOT CRANKING = 8 VENDER = 8 CLUTCH = | NO NO NO NO NO NO NO NO NO NO NO NO NO N | | |
| | | | failure on speed signs detected by DSC control anit | one of the speed signate from CAN = 1FFFh | ENGINE = & KEY = & NOT CRANKING = & Vstuply = & CLUTCH = & CLUTCH = | CN CN CN CN CN CN ENGAGED CLOSED | < 1 s, cont. | Zud unving cycle |
| CAN Generated Engine Torque | P17714 | ylineibilly | engine ECU not working properly | signal – FFHox | KEY = 8 ECU = 8 Vsupply = | ON singa timeout [6:5-10V, 17.01-17.5] | < 20 ms, conf. | 2nd driving eyela |
| EEPROM failure | P1791 | plausibility | checkgum fullure | | | onth at ECU power on | < 20 ms, | 1st driving excla |
| | | | Hintended drivers may opening (open clicuit on pin (1/7), burned fuse | Logic relay commanded AND power latch voltage > 5V AND drives relay commended on | NOT CRANKING = 8 TCU Internal RELAY | 800 | <150ms. com | tal criving card |
| Power Latch Relays | PH796 | plausibility | drivers relay permanently closed | power latch voltage > 5V AND drivers ralay commanded off | | | < 20 ms | |
| | | | togic relay permanently closed | ECU not switched off AND logic relay commended off | | ECU switch off request | ther driving eyds | 2nd driving cycle |
| Gear lever analog lines | | | | | | | | |
| (0) | P1817 | upper threated | Open circuit or a r.th Vsupply or s.c.to +5V | V 2,4 < tables | KEY | NO | | |
| | P1818 | Joven Breeftold | short to GND | V 8,0 > tengar | & CRANKING = | NOTON | < 1 s. cont. | 2nd driving eyele |
| | P1819 | plausibility | signal gradient to high | signal gradient [> 4,40 V | # Vidicus V.8 | 16.5-107, 17.01-17.51 | | |
| (1) | P1820 | upper flyrsshold | open dreath or s.e.to Vsupply or s.e.to +5V | signal > 4,2 V | | | | |
| | P1821 | Jower threshold | short to GND | V B'O ≥ IBUDIS | | | < 18, pont. | |
| | P1822 | claus Billy | signal gradient to high | signal gradient > 4,40 V | | | | |
| (2) | PTBSE | upper finashoid | open chault or s.c.ta Vaupply or s.c.ta +5V | signal > 4,2 V | | | | |
| | P1887 | lower threshold | Sthort to GND | signal < 0,8 V | | | < 13, pont. | |
| | P1868 | plausibility | signal gradient to high | algriai gradient > 4,4 V | | | | |
| ĉ | P1669 | Upper Byreshold | open circuit an sicula Veupply or simila +5V | a grad > 4,2 V | | | | |
| | P1870 | lower threshold | Short to GND | V 8,0 × lange | | | < 1s, pont. | |
| | P1876 | l plausibility | algrial gradiant to high | signal gradient > 4,4 V | | | | |

<u>Fig. 56: 6-Cylinder: SMG Transmission Diagnosis (2004 - 4 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder: SMG Transmission Diagnosis (2004 - 5 Of 5)

| MIL IIIum. | 2nd driving cyde | 2nd driving exces | | | | | |
|---------------------------------|---|---|--|--|--|--|--|
| Time | < 20 ms, cont. | | | | | | |
| Enable Conditions | ON NOT ON [6.5-10V, 17.01-17.5] | ON ON NOT ON [8.5-10%, 77.01-17.5] CLOSE-17.5 ENGANGED | ON ON ON ON ON ON (6.5-10), 7.0 (1-7.5) ENGAGED ON (6.5-10), 7.0 (1-7.5) ENGAGED ENGAG | ON (5.5-107, 1-7 01-17.5] CLOSED ENGAGED (On)page goar) (AN) Asi F | | | |
| Secondary | KEY = & CRANKING = & V. supply = | | | BAGINE = & KEY | | | |
| Threshold Value | code not valid for a limeout (Code is compared to valid gear position codes) | isignal gradient > 9000 pm | speed signal = 0 | the min's | | | |
| Malfunction Criteria | hall cell is not switching | oul of synamic range | signal not evallable for Emecut. | speed signal to engine speed+g- AND to signal to signal to the signal to | | | |
| Monitor Strategy Description | lengis ou | Applement | | | | | |
| Fault | P1860 | P1859 | | | | | |
| Component | Gear Lever Hallsensors | Clutch Speed | | | | | |

<u>Fig. 57: 6-Cylinder: SMG Transmission Diagnosis (2004 - 5 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES V8: TRANSMISSION (1/96-8/97)

DIAGNOSTIC TROUBLE CODES V8: TRANSMISSION (1/96-8/97)

| DITTOTTO DITTO II | philotic incoped copes vo. Harristmestor (170 6/77) | | | | | | | | | |
|-------------------|---|---|--|--|--|--|--|--|--|--|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters | | | | | | | |
| P0705 | 8 | Transmission Range Sensor "A" Circuit Malfunction (PRNDL Input) | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (1996-8/97)</u> . | | | | | | | |
| P0715 | 16 | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (1996-8/97)</u> . | | | | | | | | |
| | | | | | | | | | | |

| P0720 | 42 | Output Speed Sensor Circuit | See <u>V8 TRANSMISSION</u> DIAGNOSIS (1996-8/97). |
|-------|-----|---|--|
| P0730 | 102 | Incorrect Gear Ratio | See V8 TRANSMISSION DIAGNOSIS (1996-8/97). |
| P0731 | | Incorrect Gear Ratio | See V8 TRANSMISSION DIAGNOSIS (1996-8/97). |
| P0732 | 100 | Gear 2 Incorrect Ratio | See V8 TRANSMISSION DIAGNOSIS (1996-8/97). |
| P0733 | | Gear 2 Incorrect Ratio | See V8 TRANSMISSION DIAGNOSIS (1996-8/97). |
| P0734 | | Gear 2 Incorrect Ratio | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (1996-8/97)</u> . |
| P0735 | 101 | Gear 5 Incorrect Ratio | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (1996-8/97)</u> . |
| P0740 | 111 | Torque Converter Clutch Circuit/Open | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (1996-8/97)</u> . |
| P0743 | 4 | Torque Converter Clutch Circuit Electrical | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (1996-8/97)</u> . |
| P0748 | 5 | Pressure Control Solenoid "A" Electrical | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (1996-8/97)</u> . |
| P0753 | 30 | Shift Solenoid "A" Electrical | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (1996-8/97)</u> . |
| P0758 | 33 | Shift Solenoid "B" Electrical | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (1996-8/97)</u> . |
| P0763 | 32 | Shift Solenoid "C" Electrical | See V8 TRANSMISSION DIAGNOSIS (1996-8/97). |
| P1734 | 1 | Pressure Control Solenoid "B" Electrical | See V8 TRANSMISSION DIAGNOSIS (1996-8/97). |
| P1738 | 29 | Pressure Control Solenoid "C" Electrical | See <u>V8 TRANSMISSION</u> DIAGNOSIS (1996-8/97). |
| P1743 | 51 | Pressure Control Solenoid "E" Electrical | See V8 TRANSMISSION DIAGNOSIS (1996-8/97). |
| P1746 | 104 | Transmission Control Module Output Stage | See V8 TRANSMISSION DIAGNOSIS (1996-8/97). |
| P1747 | 150 | CAN-Bus Monitoring | See <u>V8 TRANSMISSION</u> DIAGNOSIS (1996-8/97). |
| P1747 | 151 | CAN-Bus Monitoring | See V8 TRANSMISSION DIAGNOSIS (1996-8/97). |
| P1747 | 156 | CAN-Bus Monitoring | See V8 TRANSMISSION DIAGNOSIS (1996-8/97). |
| P1748 | 103 | Transmission Control Module Self-Test | See V8 TRANSMISSION DIAGNOSIS (1996-8/97). |
| P1748 | 105 | Transmission Control Module Self-Test | See V8 TRANSMISSION DIAGNOSIS (1996-8/97). |
| P1748 | 110 | Transmission Control Module Self-Test | See V8 TRANSMISSION DIAGNOSIS (1996-8/97). |
| P1750 | 54 | Secondary Pressure Solenoid Circuit Range/Performance System Voltage Input Low) | See V8 TRANSMISSION |

V8 Transmission Diagnosis (1996-8/97)

| MIL. | two driving cycles | two driving cycles | two driving cycles | two driving cycles | Iwo driving oveles | | Iwo driving | two driving eycles | two driving aycles | two driving cycles | two driving oycles |
|---------------------------------|--|---|-------------------------------|--|----------------------------|--|--------------------|-------------------------|----------------------------|-------------------------|--|
| Time | 200 msec/ once per engine start up | 200 msec/ continuous | 200 msec/ | 200 msec/ continuous | 100 msec/ continuous | 2,5 sec/ once per lock | 100 msec/ | 30 msec/ continuous | 100 msec/ continuous | 300 msec/ confinuous | immediately/cont. two driving 90 sec 120 msec/cont. 100 msec/once after system start |
| Enable | 200 < rpm < 440 | 1,2,3,4 or 5 > 600 rpm > 250 rpm | 1,2,3,4 or 5 > 1700 rpm | 1,2,3,4 / 5 > 420 rpm > 250 rpm | | 3, 4 or 5 | | | | > 1500 rpm | |
| Secondary | engine speed | gear selected engine speed output speed | gear selected engine speed | gear selected input speed output speed | | gear selected | | | | engine speed | at power up |
| Threshold | no signa/multiple signal | no signal | no signal | > 360 rpm | | > 100 rpm | | | | \ 6 × | > 500 msec irvalid check-sum on delay time |
| Malfunction Criteria | voltage unvalid code for P and N | peeds Indu | peads indino | input - output speed f (gear ratio) | egeilov | eng. speed - input speed (maximum slip) | voltage | vollage | voltage | battery voltage | CAN massages/time out RAM and ROM check watchdog timing (response) |
| Monitor Strategy Description | circuit continuity rationality | rationality | rationality | rationality | circuit continuity | functional check | circuit continuity | droult continuity | circuit continuity | rationality | bus check self check functional check |
| Fault | P0705 | P0715 | P0720 | P0730/ P0735 | P0743 | P0740 | P0748 | P0753 P0758 P0763 | P1734 P1738 P1743 | P1750 | P1747 P1748 P1746 |
| System | A/T Range Switch | Input Speed | Output Speed | Gear Ratio | Torque Converter Clutch | | Pressure Control | Shift Solenoid A B | Pres. Control Valve 2 3 | Power Supply | Transmission Control Modul (TCM) |

Fig. 58: V8 Transmission Diagnosis (1996-8/97)

Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES V8 TRANSMISSION (9/97-8/00)

DIAGNOSTIC TROUBLE CODES V8 TRANSMISSION (9/97-8/00)

| | | (| -) |
|-------|----------|---|--|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
| P0705 | 8 | Transmission Range Sensor "A" Circuit Malfunction (PRNDL Input) | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/97-8/00)</u> . |
| P0715 | 16 | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/97-8/00)</u> . | |
| | | | |

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| P0720 | 42 | Output Speed Sensor Circuit | See <u>V8 TRANSMISSION</u> DIAGNOSIS (9/97-8/00). |
|-------|-----|--|--|
| P0732 | 100 | Gear 2 Incorrect Ratio | See V8 TRANSMISSION DIAGNOSIS (9/97-8/00). |
| P0735 | 101 | Gear 5 Incorrect Ratio | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/97-8/00)</u> . |
| P0740 | 111 | Torque Converter Clutch Circuit/Open | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/97-8/00)</u> . |
| P0743 | 4 | Torque Converter Clutch Circuit Electrical | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/97-8/00)</u> . |
| P0748 | 5 | Pressure Control Solenoid "A" Electrical | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/97-8/00)</u> . |
| P0753 | 30 | Shift Solenoid "A" Electrical | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/97-8/00)</u> . |
| P0758 | 33 | Shift Solenoid "B" Electrical | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/97-8/00)</u> . |
| P0763 | 32 | Shift Solenoid "C" Electrical | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/97-8/00)</u> . |
| P1734 | 1 | Pressure Control Solenoid "B" Electrical | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/97-8/00)</u> . |
| P1738 | 29 | Pressure Control Solenoid "C" Electrical | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/97-8/00)</u> . |
| P1743 | 51 | Pressure Control Solenoid "E" Electrical | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/97-8/00)</u> . |
| P1746 | 104 | Transmission Control Module Output Stage | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/97-8/00)</u> . |
| P1747 | 150 | CAN-Bus Monitoring | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/97-8/00)</u> . |
| P1747 | 151 | CAN-Bus Monitoring | See V8 TRANSMISSION DIAGNOSIS (9/97-8/00). |
| P1747 | 156 | CAN-Bus Monitoring | See V8 TRANSMISSION DIAGNOSIS (9/97-8/00). |
| P1748 | 103 | Transmission Control Module Self- Test | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/97-8/00)</u> . |
| P1748 | 105 | Transmission Control Module Self- Test | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/97-8/00)</u> . |
| P1748 | 110 | Transmission Control Module Self- Test | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/97-8/00)</u> . |
| P1750 | 54 | Secondary Pressure Solenoid Circuit Range/Performance | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/97-8/00)</u> . |
| P1761 | 2 | Shiftlock Solenoid | See V8 TRANSMISSION DIAGNOSIS (9/97-8/00). |
| P1765 | | TCM Rationality | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/97-8/00)</u> . |

V8 Transmission Diagnosis (9/97-8/00)

| MIL Illum. | | | | | | | two driving | | | | 9;0-0 | | two driving cycles | | | _ | | | |
|---------------------------------|--|---|----------------|-------------------------------|----------------------|---------------|--|---------------------|-----------------------|---|---|-----------------|------------------------------------|-----------------------|----------------------|----------------|----------------|--------------------|--------------------------|
| Time | 200 msec/ once per engine start up | 200 msec/ confinuous | 250 msec/cont. | 200 msec/cont. | 10 msec/ | Commission | 70 msec/ once per lock | 2.5 sec/ | 70 msec/cont. | 50 msec/cont. 50 msec/cont. 70 msec/cont. | 50 msec/cont. 50 msec/cont. 70 msec/cont. | 300 msec/cont. | 30 msec/once after system start | immediately/cont. | 30 sec | 200 msec/cont. | 100 msec/cont. | 70 msec/cont. | 400 msec/cont. |
| Enable | 200 < rpm < 440 | 1,2,3,4 or 5 > 600 rpm > 200 rpm | > 400 rpm. | 1,2,3,4 or 5 < 160 rpm | 2,3,4,5 | > 250 rpm | 3,4 or 5 | | | | | > 1400 rpm | | > 10\ | | 1, 2, 3, 4, 5 | | | |
| Secondary | paeds eugine | gear selected engine speed output speed | wheel speed | gear selected output speed | gear selected | output speed | gear selected | | | | | engine speed | | battery voltage | at power up | gear selected | | | |
| Threshold | no signal/multiple signal | no signal | no signal. | > 1700 rpm | > 400 rpm | | → 80 rpm | | | | | \6> | | > 700 msec | invalid check-sum on | > 6300 rpm | | | signal range/performance |
| Malfunction Criteria | voltage unvalid code for P and N | juput speed | output speed | input speed | Input - output speed | (opp. post) (| eng, speed - input speed (maximum slip) | voltage | voltage | voltage | voltage | battery voltage | voltage | CAN messages/time out | RAM and ROM check | peeds engine | check sum | voltage | CAN (throttle position) |
| Monitor Strategy Description | circuit continuity rationality | rationality | rationality | | rationality | | functional check | circuit continuity | circult continuity | circuit continuity | circuit continuity | rationality | functional check | bus check | self check | rationality | | circuit continuity | rationality |
| Fault | P0705 | P0715 | P0720 | | P0732 | P0735 | P0740 | P0743 | P0748 | P1734 P1738 P1743 | P0753 P0758 P0763 | P1750 | P1746 | P1747 | P1748 | | | P1761 | P1765 |
| Component/ System | AT Range Switch | Input Speed | Output Speed | | Gear Ratio | | Torque Converter Clutch | Press, Contr. Vaive | Press. Cont. Solenoid | Pressure Control (2) Valves (3) (4) | Strift Solenoid (A) (B) (C) | Power Supply | Transmission Control Module | | | | | | |

Fig. 59: V8 Transmission Diagnosis (9/97-8/00) Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES V8 TRANSMISSION (9/00-8/01)

DIAGNOSTIC TROUBLE CODES V8 TRANSMISSION (9/00-8/01)

| BITCH CONTROL THE CODES TO THEIR COMPANIES FOR (STOUGHT) | | | | | | | | | | | |
|--|----------|---------------------------|--|--|--|--|--|--|--|--|--|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters | | | | | | | | |
| P0560 | 96 | System Voltage | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/00-8/01)</u> . | | | | | | | | |
| P0600 | 129 | Serial Communication Link | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/00-8/01)</u> . | | | | | | | | |
| P0600 | 144 | Serial Communication Link | See V8 TRANSMISSION | | | | | | | | |

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| | 1 | | DIAGNOSIS (9/00-8/01). |
|-------|-----|--|--|
| P0603 | 81 | Internal Control Module Keep | See V8 TRANSMISSION |
| | | Alive Memory (KAM) Error | DIAGNOSIS (9/00-8/01) |
| P0606 | 82 | ECM/PCM Processor | See V8 TRANSMISSION |
| | | | <u>DIAGNOSIS (9/00-8/01)</u> |
| P0705 | 60 | Transmission Range Sensor "A" | See V8 TRANSMISSION |
| | | Circuit Malfunction (PRNDL | <u>DIAGNOSIS (9/00-8/01)</u> |
| D0715 | 22 | Input) | C. VO TO ANGMISSION |
| P0715 | 33 | Input/Turbine Speed Sensor "A" Circuit | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/00-8/01)</u> |
| P0720 | 32 | Output Speed Sensor Circuit | See V8 TRANSMISSION |
| FU/20 | 32 | Output Speed Sensor Circuit | <u>DIAGNOSIS (9/00-8/01)</u> |
| P0720 | 59 | Output Speed Sensor Circuit | See V8 TRANSMISSION |
| 10/20 | | Output Speed Sensor Circuit | DIAGNOSIS (9/00-8/01) |
| P0731 | 50 | Gear 1 Incorrect Ratio | See V8 TRANSMISSION |
| 10/51 | | Gent i medirect radio | DIAGNOSIS (9/00-8/01) |
| P0731 | 51 | Gear 1 Incorrect Ratio | See V8 TRANSMISSION |
| | | | DIAGNOSIS (9/00-8/01) |
| P0732 | 52 | Gear 2 Incorrect Ratio | See V8 TRANSMISSION |
| | | | DIAGNOSIS (9/00-8/01). |
| P0733 | 53 | Gear 3 Incorrect Ratio | See V8 TRANSMISSION |
| | | | DIAGNOSIS (9/00-8/01). |
| P0733 | 57 | Gear 3 Incorrect Ratio | See V8 TRANSMISSION |
| | | | DIAGNOSIS (9/00-8/01) |
| P0734 | 54 | Gear 4 Incorrect Ratio | See V8 TRANSMISSION |
| | | | <u>DIAGNOSIS (9/00-8/01)</u> . |
| P0734 | 58 | Gear 4 Incorrect Ratio | See V8 TRANSMISSION |
| | | | <u>DIAGNOSIS (9/00-8/01)</u> . |
| P0735 | 55 | Gear 5 Incorrect Ratio | See V8 TRANSMISSION |
| D0=44 | 40 | | <u>DIAGNOSIS (9/00-8/01)</u> . |
| P0741 | 48 | Torque Converter Clutch Circuit | See V8 TRANSMISSION |
| D0742 | 4 | Performance or Stuck Off | DIAGNOSIS (9/00-8/01). |
| P0743 | 4 | Torque Converter Clutch Circuit Electrical | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/00-8/01)</u> |
| P0748 | 1 | Pressure Control Solenoid "A" | See V8 TRANSMISSION |
| FU/40 | 1 | Electrical | DIAGNOSIS (9/00-8/01). |
| P0753 | 16 | Shift Solenoid "A" Electrical | See V8 TRANSMISSION |
| 10755 | 10 | Sinit Solenoid A Electrical | DIAGNOSIS (9/00-8/01). |
| P0758 | 17 | Shift Solenoid "B" Electrical | See V8 TRANSMISSION |
| 10,00 | 1, | Simil serencia B Electrical | DIAGNOSIS (9/00-8/01). |
| P0763 | 18 | Shift Solenoid "C" Electrical | See V8 TRANSMISSION |
| | | | DIAGNOSIS (9/00-8/01). |
| P0778 | 2 | Pressure Control Solenoid "B" | See V8 TRANSMISSION |
| | | Electrical | DIAGNOSIS (9/00-8/01). |
| P0798 | 3 | Pressure Control Solenoid "C" | See V8 TRANSMISSION |
| | | Electrical | DIAGNOSIS (9/00-8/01) |
| P1743 | 5 | Pressure Control Solenoid "E" | See V8 TRANSMISSION |
| | | Electrical (M44/M52: Brake Band | DIAGNOSIS (9/00-8/01) |
| | | Electrical) | |
| P1746 | 83 | Transmission Control Module | See V8 TRANSMISSION |
| | | Output Stage | <u>DIAGNOSIS (9/00-8/01)</u> . |
| P1747 | 128 | CAN-Bus Monitoring | See V8 TRANSMISSION |
| | | | DIAGNOSIS (9/00-8/01). |

| P1748 | 15 | Transmission Control Module Self-Test | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/00-8/01)</u> . |
|-------|-----|--|--|
| P1765 | 147 | CAN Throttle Valve | See V8 TRANSMISSION DIAGNOSIS (9/00-8/01). |

V8 Transmission Diagnosis (9/00-8/01)

| MIL Illum, | | | | | two driving cycles | | | | | | two driving | cycles | | | | | |
|---------------------------------|--|---|----------------------------------|--|--|---------------------|-----------------------|---|---|-----------------|------------------|--------------------|----------------------|----------------------|----------------|----------------|------------------------------|
| Time | 200 msec/ once per engine start up | 200 msec/ continuous | 250 msec/cont. 200 msec/cont. | 10 msec/ continuous | 70 msec/ once per lock | 2,5 sec/ | 70 msec/cont. | 50 msec/cont. 50 msec/cont. 70 msec/cont. | 50 msec/cont. 50 msec/cont. 70 msec/cont. | 300 msec/cont. | 30 msec/once | after system start | immediately/cont. | 90 sec | 200 msec/cont. | 100 msec/cont. | 400 msec/cont. |
| Enable Conditions | 200 < rpm < 440 | 1,2,3,4 or 5 > 600 rpm > 200 rpm | > 400 rpm 1,2,3,4 or 5 | 2,3,4,5 > 400 rpm > 250 rpm | 3,4 or 5 | | | | | > 1400 rpm | | . 4000 | 2014 | | 1,2,3,4,5 | | |
| Secondary | peeds eugine | gear selected engine speed output speed | wheel speed gear selected | gear selected input speed output speed | gear selected | | | | | engine speed | | | pattery voltage | at power up | gear selected | | |
| Threshold | no signal/multiple signal | no signal | no signal > 1700 rpm | > 400 rpm | > 80 rpm | | | | | \6> | | 780 | DBSILL OO / A | invalid check-sum on | > 6300 rpm | | signal range/ performance |
| Malfunction Criteria | voltage unvalid code for P and N | input speed | output speed input speed | Input - output speed f (gear ratio) | eng. speed - input speed (maximum slip) | egation | voltage | voltage | voltage | battery voltage | voltage | CAN-bus check | CAN messages/ume out | RAM and ROM check | engine speed | watchdog | (CAN messages) |
| Monitor Strategy Description | circuit continuity rationality | rationality | rationality | rationality | functional check | circuit continuity | circuit continuity | drouit continuity | drouft continuity | rationality | functional check | | rationality | seif check | rationality | | rationality |
| Fault | P0705 | P0715 | P0720 | P0731/0732 P0733/0734 P0735 | P0741 | P0743 | P0748 | P0778 P0798 P1743 | P0753 P0758 P0763 | P0560 | P1746 | P1747 | ODGO- | P0603/0606 | P1748 | | P1765 |
| Component | AT Range Switch | luput Speed | Output Speed | Gear Ratio 1 / 2 P0731/0732 Gear Ratio 3 / 4 P0733/0734 Gear Ratio 5 P0735 | Torque Converter Clutch | Press. Contr. Valve | Press. Cont. Solenoid | Pressure Control (2) Valves (3) (4) | Shift Solenoid (A) (B) (C) | Power Supply | Transmission | Control Modul | | L.C. | | | |

Fig. 60: V8 Transmission Diagnosis (9/00-8/01)

Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES V8 TRANSMISSION (9/01-8/02)

DIAGNOSTIC TROUBLE CODES V8 TRANSMISSION (9/01-8/02)

| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
|-------|----------|-----------------------------------|------------------------------------|
| P0709 | 60 | Transmission Range Sensor "A" | See V8 TRANSMISSION |
| | | Circuit Intermittent | DIAGNOSIS (9/01-8/02 - 1 OF |
| | | | 5). |
| P0715 | 33 | Input/Turbine Speed Sensor "A" | See V8 TRANSMISSION |
| 10715 | | Circuit | DIAGNOSIS (9/01-8/02 - 1 OF |
| | | Circuit | 5) |
| P0716 | 33 | Input/Turbine Speed Sensor "A" | See V8 TRANSMISSION |
| 10/10 | 33 | Circuit Range/Performance | DIAGNOSIS (9/01-8/02 - 1 OF |
| | | Circuit Range/Ferrormance | DIAGNOSIS (9/01-8/02 - 1 OF |
| D0720 | 22 | 0 + 10 - 0' ' | <u>7</u> J. |
| P0720 | 32 | Output Speed Sensor Circuit | See V8 TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 1 OF |
| | | | <u>5)</u> . |
| P0721 | 59 | Output Speed Sensor Circuit | See <u>V8 TRANSMISSION</u> |
| | | Range/Performance | <u>DIAGNOSIS (9/01-8/02 - 1 OF</u> |
| | | | <u>5</u>). |
| P0731 | 50 | Gear 1 Incorrect Ratio | See V8 TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 1 OF |
| | | | 5). |
| P0732 | 52 | Gear 2 Incorrect Ratio | See V8 TRANSMISSION |
| 10732 | 32 | Gear 2 meorreet Ratio | DIAGNOSIS (9/01-8/02 - 1 OF |
| | | | 5). |
| D0722 | 52 | Cara 2 In a sum of Datis | |
| P0733 | 53 | Gear 3 Incorrect Ratio | See V8 TRANSMISSION |
| | | | <u>DIAGNOSIS (9/01-8/02 - 1 OF</u> |
| | | | <u>3)</u> . |
| P0734 | 54 | Gear 4 Incorrect Ratio | See <u>V8 TRANSMISSION</u> |
| | | | DIAGNOSIS (9/01-8/02 - 1 OF |
| | | | <u>5</u>). |
| P0735 | 55 | Gear 5 Incorrect Ratio | See <u>V8 TRANSMISSION</u> |
| | | | DIAGNOSIS (9/01-8/02 - 1 OF |
| | | | <u>5)</u> . |
| P0740 | 4 | Torque Converter Clutch | See V8 TRANSMISSION |
| | · | Circuit/Open | DIAGNOSIS (9/01-8/02 - 2 OF |
| | | | 5). |
| P0741 | 48 | Torque Converter Clutch Circuit | See V8 TRANSMISSION |
| 10/41 | 70 | Performance or Stuck Off | DIAGNOSIS (9/01-8/02 - 2 OF |
| | | Terrormance of Stuck Off | <u>DIAGNOSIS (9/01-6/02 - 2 OF</u> |
| D0745 | 1 | D C + 1C 1 111A11 | C VO TO ANGMICCIÓN |
| P0745 | 1 | Pressure Control Solenoid "A" | See V8 TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 2 OF |
| | | | <u>5)</u> . |
| P0750 | 16 | Shift Solenoid "A" | See <u>V8 TRANSMISSION</u> |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | <u>5</u>). |
| P0751 | 16 | Shift Solenoid "A" Performance or | See <u>V8 TRANSMISSION</u> |
| | | Stuck Off | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | <u>5)</u> . |
| P0752 | 16 | Shift Solenoid "A" Stuck On | See V8 TRANSMISSION |
| 10,02 | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | 5) |
| P0753 | 16 | Shift Solenoid "A" Electrical | Saa VA TD ANGMICCION |
| 10/33 | 10 | Sint Solenoid A Electrical | See V8 TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | 2116 211 | <u>5)</u> . |
| P0755 | 17 | Shift Solenoid "B" | See <u>V8 TRANSMISSION</u> |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | |

| | | | <u>5)</u> . |
|-------|-----|-----------------------------------|------------------------------------|
| P0756 | 17 | Shift Solenoid "B" Performance or | See V8 TRANSMISSION |
| | | Stuck Off | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | <u>5)</u> . |
| P0757 | 17 | Shift Solenoid "B" Stuck On | See <u>V8 TRANSMISSION</u> |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | <u>5)</u> . |
| P0758 | 17 | Shift Solenoid "B" Electrical | See <u>V8 TRANSMISSION</u> |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | <u>5</u>). |
| P0760 | 18 | Shift Solenoid "C" | See <u>V8 TRANSMISSION</u> |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | <u>5</u>). |
| P0761 | 18 | Shift Solenoid "C" Performance or | See <u>V8 TRANSMISSION</u> |
| | | Stuck Off | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | <u>5)</u> . |
| P0762 | 18 | Shift Solenoid "C" Stuck On | See <u>V8 TRANSMISSION</u> |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | <u>5)</u> . |
| P0763 | 18 | Shift Solenoid "C" Electrical | See <u>V8 TRANSMISSION</u> |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | <u>5</u>). |
| P0775 | 2 | Pressure Control Solenoid "B" | See <u>V8 TRANSMISSION</u> |
| | | | <u>DIAGNOSIS (9/01-8/02 - 2 OF</u> |
| | | | <u>5)</u> . |
| P0782 | 57 | 2-3 Shift | See V8 TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 4 OF |
| | | | <u>5</u>). |
| P0783 | 58 | 3-4 Shift | See V8 TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 4 OF |
| | | | <u>5)</u> . |
| P0795 | 3 | Pressure Control Solenoid "C" | See <u>V8 TRANSMISSION</u> |
| | | | DIAGNOSIS (9/01-8/02 - 2 OF |
| | | | <u>5)</u> . |
| P1719 | 144 | CAN Version Error | See <u>V8 TRANSMISSION</u> |
| | | | DIAGNOSIS (9/01-8/02 - 5 OF |
| | | | <u>5)</u> . |
| P1720 | 129 | CAN Timeout Control Module | See <u>V8 TRANSMISSION</u> |
| | | | DIAGNOSIS (9/01-8/02 - 5 OF |
| | | | <u>5)</u> . |
| P1731 | 51 | Gear 1 manual Incorrect Ratio | See <u>V8 TRANSMISSION</u> |
| | | | DIAGNOSIS (9/01-8/02 - 1 OF |
| | | | <u>5)</u> . |
| P1745 | 5 | Pressure Control Solenoid "E" | See V8 TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | <u>5)</u> . |
| P1747 | 128 | CAN-Bus Monitoring | See V8 TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 5 OF |
| | | | <u>5).</u> |
| P1748 | 15 | Transmission Control Module Self- | See V8 TRANSMISSION |
| | | Test | DIAGNOSIS (9/01-8/02 - 3 OF |
| | | | <u>5).</u> |
| P1761 | 19 | Shiftlock Solenoid | See V8 TRANSMISSION |
| | | | DIAGNOSIS (9/01-8/02 - 4 OF |
| | | | <u>5).</u> |
| • | 1 | I | ı → I |

| I | | 1 | 1 |
|-------|-----|---|---|
| P1762 | 19 | Shiftlock Solenoid High Input | See <u>V8 TRANSMISSION</u> DIAGNOSIS (9/01-8/02 - 4 OF |
| P1763 | 19 | Shiftlock Solenoid Low Input | See V8 TRANSMISSION DIAGNOSIS (9/01-8/02 - 4 OF 5). |
| P1764 | 19 | Shiftlock Solenoid Open Circuit | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/01-8/02 - 4 OF</u> 5). |
| P1765 | 147 | CAN Throttle Valve | See V8 TRANSMISSION DIAGNOSIS (9/01-8/02 - 5 OF 5). |
| P1791 | 81 | Internal Transmission Control Module Memory Checksum/EEPROM Error | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/01-8/02 - 5 OF</u> <u>5)</u> . |
| P1792 | 82 | Internal Transmission Control Module Watchdog Error | See <u>V8 TRANSMISSION</u> DIAGNOSIS (9/01-8/02 - 5 OF <u>5</u>). |
| P1794 | 80 | Internal Transmission Control Module Memory Checksum Error | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/01-8/02 - 5 OF</u> <u>5)</u> . |
| P1831 | 1 | Pressure Control Solenoid "A" Circuit High | See <u>V8 TRANSMISSION</u> DIAGNOSIS (9/01-8/02 - 2 OF 5). |
| P1832 | 2 | Pressure Control Solenoid "B" Circuit High | See <u>V8 TRANSMISSION</u> DIAGNOSIS (9/01-8/02 - 2 OF 5). |
| P1833 | 3 | Pressure Control Solenoid "C" Circuit High | See <u>V8 TRANSMISSION</u> DIAGNOSIS (9/01-8/02 - 2 OF |
| P1834 | 4 | Pressure Control Solenoid "D" Circuit High | See V8 TRANSMISSION DIAGNOSIS (9/01-8/02 - 2 OF |
| P1835 | 5 | Pressure Control Solenoid "E" Circuit High | See V8 TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF |
| P1841 | 1 | Pressure Control Solenoid "A" Circuit Low | See V8 TRANSMISSION DIAGNOSIS (9/01-8/02 - 2 OF 5). |
| P1842 | 2 | Pressure Control Solenoid "B" Circuit Low | See V8 TRANSMISSION DIAGNOSIS (9/01-8/02 - 2 OF 5). |
| P1843 | 3 | Pressure Control Solenoid "C" Circuit Low | See V8 TRANSMISSION DIAGNOSIS (9/01-8/02 - 2 OF 5). |
| P1844 | 4 | Pressure Control Solenoid "D" Circuit Low | See V8 TRANSMISSION DIAGNOSIS (9/01-8/02 - 2 OF 5). |
| P1845 | 5 | Pressure Control Solenoid "E" Circuit Low | See V8 TRANSMISSION DIAGNOSIS (9/01-8/02 - 3 OF 5). |
| P1882 | 57 | 2-3 Shift Circuit High | See V8 TRANSMISSION DIAGNOSIS (9/01-8/02 - 4 OF 5). |
| l | 1 | - | |

| P1883 | 58 | 3-4 Shift Circuit High | See <u>V8 TRANSMISSION</u> <u>DIAGNOSIS (9/01-8/02 - 4 OF</u> |
|-------|----|-----------------------------------|--|
| | | | <u>5)</u> . |
| P1889 | 96 | System Voltage - Electrical | See <u>V8 TRANSMISSION</u> |
| | | | DIAGNOSIS (9/01-8/02 - 4 OF |
| | | | <u>5)</u> . |
| P1892 | 96 | System Voltage Low Input | See <u>V8 TRANSMISSION</u> |
| | | | DIAGNOSIS (9/01-8/02 - 4 OF |
| | | | <u>5</u>). |
| P1893 | 83 | Supply Voltage Pressure Control | See <u>V8 TRANSMISSION</u> |
| | | Solenoid/Shift Solenoid Circuit | DIAGNOSIS (9/01-8/02 - 5 OF |
| | | High | <u>5)</u> . |
| P1894 | 83 | Supply Voltage Pressure Control | See <u>V8 TRANSMISSION</u> |
| | | Solenoid/Shift Solenoid Circuit | DIAGNOSIS (9/01-8/02 - 5 OF |
| | | Low | <u>5</u>). |
| P1895 | 83 | Supply Voltage Pressure Control | See V8 TRANSMISSION |
| | | Solenoid/Shift Solenoid No Signal | DIAGNOSIS (9/01-8/02 - 5 OF |
| | | | <u>5)</u> . |

V8 Transmission Diagnosis (9/01-8/02 - 1 Of 5)

| MIL III III | | | | | two driving cycles | | |
|---------------------------------|----------------------------|--|-----------------|--|---|--|---|
| Time | 0.2 sec / cont | 0.5 sec / cont | 500 msec / cont | 240 msec / cont | 400 msec / cont | 200 msec / cont | 200 msec / cont |
| Enable | | > 508 revirrin > 224 revirrin > 5V 1,2,3,4,5 | | > 400 rev/min | D, 4, 3, 2 > 1696 rpm not allowed | 10 P / 10 N / 10 R > 256 rpm > 9V > 2 °C | 1st gear 1st gear > 256 pm > 9V |
| Secondary | | engine speed output speed battory voltage gaar actiocited | | wheel speed | pas lever output speed gear shifts | pas lever authut speed battery voltage transmission fluid lemperature | pos fever manual mode output speed battery voltage transmission flud ferroceature |
| Threshold | wrong signal | o | > 6800 revimin | > 8190 revimin or delta > 1930 revimin | < 160 rpm | delfa > 6 % | defta > 5 % |
| Malfunction Criteria | unvalid code | poads įvduį | input speed | output speed or or outp. spd - wheel spd * rear sxie ratio | output speed wheel speed * rear ade ratio | input - output speed | inpur - output speed f (gear railo) |
| Monitor Strategy Description | rationality | rationality | rationality | rationality | rationality | rationality | rationality |
| Fault | P0709 | P0715 | P0716 | P0720 | P0721 | P0731 P0732 P0733 P0734 | P1731 |
| Component | A/T GS8602 Range Switch | Input Speed | | Output Speed | | Gear Ratio | |

<u>Fig. 61: V8 Transmission Diagnosis (9/01-8/02 - 1 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 Transmission Diagnosis (9/01-8/02 - 2 Of 5)

| MIL Illum, | | two driving | | | | | | | | | | |
|---------------------------------|---|---|--|---|--|--|--|--|--|--|--|--|
| Time | 2.5 sec / cont | 70 msec / cont | 50 msec / cont | 50 misec / cont | 70 msac/cont | | | | | | | |
| Enable | 2, 3, 4 or 5 > input speed <= 140 Nm >= 5.24 bar | νε1.5ν νγ < | V2.1 => V7 < | va 1.5 V | v 1.5 V | | | | | | | |
| Secondary | gest selected engine speed input torque to TC (calculated) TCC activation pressure (calculated) | abelbattery voltage - por 1 voltage | abalbattery voltage - pov 2 voltage) pov 2 voltage | aba(battery voltage - pov 3 voltage) pov 3 voltage | abs(battary voltage) - pov 1 voltage) pov 1 voltage | | | | | | | |
| Threshold | wd. 69 € | > 150mA (F meas our < 200mA) > 1000mA (If meas cur > 200mA) 12 V 0 V | > 150m/k (if meas curr < 200m/k) > 1000m/k (if meas curr > 200m/k) 12 V 0 V | > 150mA (if meas our < 200mA) > 1000mA (if meas our > 200mA) 12 V 0 V | > 150nA (if mass our < 200mA) > 1000mA (if mass quir > 200mA), 12 V 0 V | | | | | | | |
| Malfunction Criteria | eng, speed - input spood (maximum alip) | meass, curr, calc. curr, voltage | masss.currcalc.curr. voltage | meass, curr calc. curr. voltage | moass. curr calo. curr, voltage | | | | | | | |
| Monitor Strategy Description | functional check | rationality circuit continuty, power short circuit continuty, ground short | cationality circuit continuty, power short circuit continuty, ground short | rationally circuit continuty, power short circuit continuty, ground short | rationality clicuit continiuty, power short clicuit continiuty, power short | | | | | | | |
| Fault | P0741 | P0745 P1831 | P0775 P1832 P1842 | P0795 P1833 P1843 | P0740 P1834 | | | | | | | |
| Component/ System | Torque Converter Clutch | Press. Contr. Valve 1 | 2 2 2 | n o o | 4 4 4 | | | | | | | |

<u>Fig. 62: V8 Transmission Diagnosis (9/01-8/02 - 2 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 Transmission Diagnosis (9/01-8/02 - 3 Of 5)

| MIL. | | | | | | | | | | two driving | cycles | | | | | | | | | | |
|---------------------------------|--------------------------------|---------------------------------|---------------------------------|-------------------------------|------------------------|---------------------|---|--|---|---|--|--|--|---|---|--|---|--|---|---|--|
| Time | 70 msec / cont | | | | 200 msec / cont | | 800 msec / cont | | 800 mase/ cent | 800 msec / cont | 800 msec / cont | 800 msec / cont | | 800 msac / cont | 800 msec / cont | 800 msec / cont | 800 msec / cont. | | 800 msec / cont | 800 msec / conf | 800 msec / conf |
| Enable | | v=1.5 ∨ | 12 | | not allowed | | 7V < MV inp. volt. < 16V | | | | | 7V < MV inp, valt. < 16V | | | | | 7V < MV Inp. voit. < 16V | | | | |
| Secondary | abs(ballery voltage | · press confr valve 1 voltage) | press confrivalive 1 voltage. | | gearshift | | MV input voitage | | | | | MV hput vollage | | | | | MV Input voltage | | | | |
| Threshold | > 150mA (if meas curr < 200mA) | > 1000mA (if mets curr > 200mA) | 120 | ^0 | > 0.15 A | | 1V < as voltage < 1,44V, if as is under current | 0.85V < ss voltage < 1.44V, if ss is not under current | 1.44V < as voltage < 5V, if se is under current | QV < ss voltage < 0.35V, it ss is not under current | 0.35V < ss voltage < 0.85V, if ss is not under current | 1V < ss vollage < 1,44V, if ss is under current. | 0.85V < se voltage < 1.44V, if se is not under current | 1.44V < ss voltage < 5V, if as is under current | 0V < 3s voltage < 0.35V, it ss is not under current | 0.35V < ss voltage < 0.85V, if ss is not under current | 1V < ss voltage < 1.44V, if ss is under current | 0.85V < ss voltage < 1.44V, if ss is not under current | 1,44V < ss voltage < 5V, if ss is under current | 0V < ss voltage < 0.35V, if as is not under current | 0,35V < ss voltage < 0,85V, if ss is not under current |
| Malfunction Criteria | meass, curr calc. curr. | | voltage | voltage | current | | Voltage | | voltage | Voltage | voltage | voltage | | egettov | voltage | voltage | Voltage | | vortage | voltage | voltage |
| Monitor Strategy Description | rationality | | circuit continuity, power short | prout continuty, ground short | abs(sum current of PCV | - sum of each PCVI) | rationality | | circuit continuity, power short | circuit continuity, ground short | circuit confinulty, disconnection | rationality | | circuit continuity, power short | circuit confinity, ground short | circuit continuity, disconnection | rationality | | drouit continuity, power short | circuit continuity, ground short. | dirault continuity, disconnection |
| Fault | P1745 | 20000 | F1630 | P1845 | P1748 | | P0750 | | P0753 | P0752 | P0751 | P0755 | | P0758 | P0757 | P0756 | P0760 | | P0763 | P0762 | P0761 |
| Component | Press, Confr. Valve 5 | , | n | 10 | Press. Confr. Valve | sum current | Shift Solenoid (A) | | (A) | (4) | 3 | (B) | | (B) | (B) | (B) | (a) | | (0) | (C) | (0) |

<u>Fig. 63: V8 Transmission Diagnosis (9/01-8/02 - 3 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 Transmission Diagnosis (9/01-8/02 - 4 Of 5)

| MIL Illum, | | | | | two driving cycles | | | |
|---------------------------------|---|--|---|--|---|---|-----------------|-----------------------|
| Time | 500 msec / cont | 500 msec / cont | 90 msec / cont | 90 msec / cont | 90 msec / cont | 90 msec / cont | 2.5 sec / conf | 0.3 sec / cont |
| Enable | 7V < MV inp. volt. < 16V | | no P / no N / no R > 500 rpm > 30°C | no P / no N / no R > 500 rpm > 30 °C | no P / no N / rro R > 500 rpm > 30 °C | no P / no N / no R > 500 rpm > 30 °C | > 1408 rpm | >1408 rpm |
| Secondary Parameter | MV input voltage | | pos lever nutput speed transmission oil temperature | pos fever output speed framamission of temperature | pos lever output speed transmission oil temperature | pos laver autput speed transmission oil formerature | peeds audine | pands autition |
| Threshold | 1V < as voltage < 1.44v, if as is under current 0.85v < as voltage < 1.44v, if as is not under current 1.44v < ce unistance EV if se is not under current | 0V < ss voltage < 0.35V, if sa is not under current 0.35V < ss voltage < 0.35V, if sa is not under current | Inp spd old gear - 40 rpm > Inp apd new gear | Inp spd old gear + 600 pm < inp spd new gear | l'in spot old gear - 40 rum > l'in spd new gear | reed wau pas nių > uoti pog + mati po pris au | bat.Volt. < 5V | 9V < bat, Volt. < 16V |
| Malfunction Criteria | voltage | voltage | anni authu | peeds India | Input autput | input speed | buttery voltage | battery voltage |
| Monitor Strategy Description | rationality | circuit continuity, ground short | ratonality, no change | rationality, value too big | rationality, no change | rationality, value too big | rationality | rationality |
| Fault | P1761 | P1763 | P0782 | P1882 | P0783 | P1883 | P1889 | P1892 |
| Component | (Shift Lock) | (Shiff Leck) | 2/3 Shift | | 3.4 Shin | | System Voltage, | System Voltage, low |

<u>Fig. 64: V8 Transmission Diagnosis (9/01-8/02 - 4 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 Transmission Diagnosis (9/01-8/02 - 5 Of 5)

| Secondary Enable Time MIL Parameter Conditions Required Illum. | 0.3 suc / conf | galifor on 0.6 sec / cont. | Agnillion on 0.15 sec? unit | 0.4 sac / conf | con | once at startup | once at artartup | 1.0V ss and pov voltaga =: battery voltage -2V once at startup | se and pov voltage == battery voltage -2V conce at stands as and pov voltage on on | |
|--|----------------|----------------------------|-----------------------------|----------------------|------------------|------------------|-----------------------------|--|--|-------------------------------------|
| Threshold | Wrong velue | > 100 ms | signals signals | lengie blievni | invalid checksum | invalid chacksum | invalid chucksurv | ss and pov voitage > battery voitage - 1.0V | ss and pcv voltage < 2.5V | |
| Malfunction Criteria | CAN love | Can message/time out DME | CAN bus fault | CAN Prottle position | EPROM checksum | EEPROM | walchdog | voltage | wottage vratage | the silent |
| Monitor Strategy Description | bus pheck | bus chuck | bus check | rationality | self check | self check | rationality microcontroller | circuit continuity, power short | olroult continuity, ground short | place of a construction of a second |
| Fault | P1719 | P1720 | P1747 | P1765 | P1794 | P1791 | P1792 | P1893 | P1894 | 04808 |
| Component | Transmission | Control Modul | | | | | | Supply Voltage | Control Solenoid / Shift Solenoid | |

<u>Fig. 65: V8 Transmission Diagnosis (9/01-8/02 - 5 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES V8 TRANSMISSION (5-SPEED - 9/02-2003)

DIAGNOSTIC TROUBLE CODES V8 TRANSMISSION (5-SPEED - 9/02-2003)

G00383765

| DIAGNOSTIC TROUBLE CODES V6 TRANSMISSION (5-SI EED - 7/02-2003) | | | | | | | | | |
|---|----------|--|--|--|--|--|--|--|--|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters | | | | | | |
| P0709 | 60 | Transmission Range Sensor "A" Circuit Intermittent | See <u>V8 TRANSMISSION 5-</u> <u>SPEED DIAGNOSIS (9/02-2003</u> | | | | | | |
| | | | <u>- 1 OF 5)</u> . | | | | | | |
| P0715 | 33 | Input/Turbine Speed Sensor "A" Circuit | See <u>V8 TRANSMISSION 5-</u> <u>SPEED DIAGNOSIS (9/02-2003</u> | | | | | | |

| | | | <u>- 1 OF 5</u>). |
|-----------|-----|-----------------------------------|---------------------------------------|
| P0716 | 33 | Input/Turbine Speed Sensor "A" | See V8 TRANSMISSION 5- |
| | | Circuit Range/Performance | SPEED DIAGNOSIS (9/02-2003 |
| | | | - 1 OF 5). |
| P0720 | 32 | Output Speed Sensor Circuit | See V8 TRANSMISSION 5- |
| 10720 | 32 | Sutput Speed Sensor Chedit | SPEED DIAGNOSIS (9/02-2003 |
| | | | -1 OF 5). |
| P0721 | 59 | Output Speed Sensor Circuit | See V8 TRANSMISSION 5- |
| FU/21 | 39 | Range/Performance | SPEED DIAGNOSIS (9/02-2003 |
| | | Range/1 crioimanee | -1 OF 5). |
| D0721 | 50 | C 11 (P) | |
| P0731 | 50 | Gear 1 Incorrect Ratio | See V8 TRANSMISSION 5- |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | | | <u>- 1 OF 5</u>). |
| P0732 | 52 | Gear 2 Incorrect Ratio | See <u>V8 TRANSMISSION 5-</u> |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | | | <u>- 1 OF 5</u>). |
| P0733 | 53 | Gear 3 Incorrect Ratio | See V8 TRANSMISSION 5- |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | | | - 1 OF 5). |
| P0734 | 54 | Gear 4 Incorrect Ratio | See V8 TRANSMISSION 5- |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | | | - 1 OF 5). |
| P0735 | 55 | Gear 5 Incorrect Ratio | See V8 TRANSMISSION 5- |
| 10733 | 33 | Gear 5 meorreet Ratio | SPEED DIAGNOSIS (9/02-2003 |
| | | | - 1 OF 5). |
| D07.4.1 | 40 | T. C. (1.1.0) | |
| P0741 | 48 | Torque Converter Clutch Circuit | See V8 TRANSMISSION 5- |
| | | Performance or Stuck Off | SPEED DIAGNOSIS (9/02-2003 |
| | | | <u>- 2 OF 5</u>). |
| P0745 | 1 | Pressure Control Solenoid "A" | See <u>V8 TRANSMISSION 5-</u> |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | | | <u>- 2 OF 5</u>). |
| P0750 | 16 | Shift Solenoid "A" | See <u>V8 TRANSMISSION 5-</u> |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | | | <u>- 3 OF 5)</u> . |
| P0751 | 16 | Shift Solenoid "A" Performance or | See V8 TRANSMISSION 5- |
| | | Stuck Off | SPEED DIAGNOSIS (9/02-2003 |
| | | | - 3 OF 5). |
| P0752 | 16 | Shift Solenoid "A" Stuck On | See V8 TRANSMISSION 5- |
| 0,02 | 10 | Similar Selection 11 States on | SPEED DIAGNOSIS (9/02-2003 |
| | | | - 3 OF 5). |
| P0753 | 16 | Shift Solenoid "A" Electrical | See V8 TRANSMISSION 5- |
| 10733 | 10 | Simi Solehold A Electrical | SPEED DIAGNOSIS (9/02-2003 |
| | | | -3 OF 5). |
| D07.5.5 | 177 | C1 'C C 1 '1 D | , , , , , , , , , , , , , , , , , , , |
| P0755 | 17 | Shift Solenoid "B" | See V8 TRANSMISSION 5- |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | | | <u>- 3 OF 5</u>). |
| P0756 | 17 | Shift Solenoid "B" Performance or | See <u>V8 TRANSMISSION 5-</u> |
| | | Stuck Off | SPEED DIAGNOSIS (9/02-2003) |
| | | | <u>- 3 OF 5</u>). |
| P0757 | 17 | Shift Solenoid "B" Stuck On | See <u>V8 TRANSMISSION 5-</u> |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | | | <u>-3 OF 5</u>). |
| P0758 | 17 | Shift Solenoid "B" Electrical | See V8 TRANSMISSION 5- |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | | | - 3 OF 5). |
| ı l | | | 3 01 31. |

| D0760 | 10 | Shift Solenoid "C" | Cas VO TD ANGMICCION 5 |
|-----------|-----|-----------------------------------|--|
| P0760 | 18 | Shift Solenoid "C" | See <u>V8 TRANSMISSION 5</u> SPEED DIAGNOSIS (9/02-2003 |
| | | | - 3 OF 5) |
| P0761 | 18 | Shift Solenoid "C" Performance or | |
| PU/01 | 18 | Stuck Off | SPEED DIAGNOSIS (9/02-200) |
| | | Stuck Off | |
| D07.63 | 1.0 | g1:0 g 1 | - 3 OF 5) |
| P0762 | 18 | Shift Solenoid "C" Stuck On | See V8 TRANSMISSION 5 |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | | | <u>- 3 OF 5)</u> |
| P0763 | 18 | Shift Solenoid "C" Electrical | See <u>V8 TRANSMISSION 5</u> |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | | | <u>- 3 OF 5</u>) |
| P0775 | 2 | Pressure Control Solenoid "B" | See <u>V8 TRANSMISSION 5</u> |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | | | - 2 OF 5) |
| P0782 | 57 | 2-3 Shift | See V8 TRANSMISSION 5 |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | | | - 4 OF 5) |
| P0783 | 58 | 3-4 Shift | See V8 TRANSMISSION 5 |
| 10703 | | 3-4 Smit | SPEED DIAGNOSIS (9/02-2003 |
| | | | - 4 OF 5) |
| D0705 | 3 | Pressure Control Solenoid "C" | |
| P0795 | 3 | Pressure Control Solenoid "C" | See V8 TRANSMISSION 5 |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | _ | | <u>- 2 OF 5)</u> |
| P0962 | 1 | Pressure Control Solenoid "A" | See <u>V8 TRANSMISSION 5</u> |
| | | Control Circuit Low | SPEED DIAGNOSIS (9/02-2003 |
| | | | <u>- 2 OF 5)</u> |
| P0963 | 1 | Pressure Control Solenoid "A" | See <u>V8 TRANSMISSION 5</u> |
| | | Control Circuit High | SPEED DIAGNOSIS (9/02-2003 |
| | | _ | - 2 OF 5) |
| P0966 | 2 | Pressure Control Solenoid "B" | See V8 TRANSMISSION 5 |
| | | Control Circuit Low | SPEED DIAGNOSIS (9/02-2003 |
| | | | - 2 OF 5) |
| P0967 | 2 | Pressure Control Solenoid "B" | See V8 TRANSMISSION 5 |
| 1 0 2 0 7 | 2 | Control Circuit High | SPEED DIAGNOSIS (9/02-2003 |
| | | Control Chedit High | - 2 OF 5) |
| P0970 | 3 | Pressure Control Solenoid "C" | |
| P09/0 | 3 | Control Circuit Low | See V8 TRANSMISSION 5 |
| | | Control Circuit Low | SPEED DIAGNOSIS (9/02-2003 |
| D00=4 | | 7 2 12 1 11 21 | - 2 OF 5) |
| P0971 | 3 | Pressure Control Solenoid "C" | See <u>V8 TRANSMISSION 5</u> |
| | | Control Circuit High | SPEED DIAGNOSIS (9/02-2003 |
| | | | <u>- 2 OF 5)</u> |
| P1719 | 144 | CAN Version Error | See V8 TRANSMISSION 5 |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | | | - 5 OF 5) |
| P1720 | 129 | CAN Timeout Control Module | See V8 TRANSMISSION 5 |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | | | - 5 OF 5) |
| P1731 | 51 | Gear 1 manual Incorrect Ratio | See V8 TRANSMISSION 5 |
| 11/31 | J1 | Ocai i mamuai meomeet Katio | SPEED DIAGNOSIS (9/02-2003 |
| | | | * |
| | 100 | GIVE NO. | -1 OF 5) |
| 71-15 | 100 | CAN-Bus Monitoring | See V8 TRANSMISSION 5 |
| P1747 | 128 | | |
| P1747 | 128 | | <u>SPEED DIAGNOSIS (9/02-2003</u> - 5 OF 5) |

| P1748 | 15 | Transmission Control Module Self- | |
|----------------|-----|---|-------------------------------|
| | | Test | SPEED DIAGNOSIS (9/02-2003 |
| | | | <u>- 3 OF 5</u>). |
| P1761 | 19 | Shiftlock Solenoid | See <u>V8 TRANSMISSION 5-</u> |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | | | <u>- 4 OF 5</u>). |
| P1762 | 19 | Shiftlock Solenoid High Input | See <u>V8 TRANSMISSION 5-</u> |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | | | <u>- 4 OF 5</u>). |
| P1763 | 19 | Shiftlock Solenoid Low Input | See <u>V8 TRANSMISSION 5-</u> |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | | | <u>- 4 OF 5</u>). |
| P1764 | 19 | Shiftlock Solenoid Open Circuit | See <u>V8 TRANSMISSION 5-</u> |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | | | <u>- 4 OF 5</u>). |
| P1765 | 147 | CAN Throttle Valve | See V8 TRANSMISSION 5- |
| | | | SPEED DIAGNOSIS (9/02-2003 |
| | | | <u>- 5 OF 5</u>). |
| P1791 | 81 | Internal Transmission Control | See V8 TRANSMISSION 5- |
| | | Module Memory | SPEED DIAGNOSIS (9/02-2003 |
| | | Checksum/EEPROM Error | <u>- 5 OF 5</u>). |
| P1792 | 82 | Internal Transmission Control | See V8 TRANSMISSION 5- |
| | | Module Watchdog Error | SPEED DIAGNOSIS (9/02-2003 |
| | | | <u>- 5 OF 5)</u> . |
| P1794 | 80 | Internal Transmission Control | See V8 TRANSMISSION 5- |
| | | Module Memory Checksum Error | SPEED DIAGNOSIS (9/02-2003 |
| | | ĺ | - 5 OF 5). |
| P1882 | 57 | 2-3 Shift Circuit High | See V8 TRANSMISSION 5- |
| 1 100 2 | | 2 0 511110 0110 1111811 | SPEED DIAGNOSIS (9/02-2003 |
| | | | - 4 OF 5). |
| P1883 | 58 | 3-4 Shift Circuit High | See V8 TRANSMISSION 5- |
| | | 2 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 | SPEED DIAGNOSIS (9/02-2003 |
| | | | - 4 OF 5). |
| P1889 | 96 | System Voltage - Electrical | See V8 TRANSMISSION 5- |
| 11009 | | System verage Electron | SPEED DIAGNOSIS (9/02-2003 |
| | | | - 4 OF 5). |
| P1892 | 96 | System Voltage Low Input | See V8 TRANSMISSION 5- |
| 110,2 | | System voltage 20 w input | SPEED DIAGNOSIS (9/02-2003 |
| | | | - 4 OF 5). |
| P1893 | 83 | Supply Voltage Pressure Control | See V8 TRANSMISSION 5- |
| 1 10/3 | 0.5 | Solenoid/Shift Solenoid Circuit | SPEED DIAGNOSIS (9/02-2003 |
| | | High | - 5 OF 5). |
| P1894 | 83 | Supply Voltage Pressure Control | See V8 TRANSMISSION 5- |
| 1 1094 | 65 | Solenoid/Shift Solenoid Circuit | SPEED DIAGNOSIS (9/02-2003 |
| | | Low | - 5 OF 5). |
| P1895 | 83 | Supply Voltage Pressure Control | See V8 TRANSMISSION 5- |
| 1093 | 63 | Solenoid/Shift Solenoid No Signal | SPEED DIAGNOSIS (9/02-2003) |
| | | Solchold/Sillit Solchold No Signal | - 5 OF 5). |
| P2722 | 5 | Pressure Control Solenoid "E" | See V8 TRANSMISSION 5- |
| 1 4 1 4 4 | | Fressure Control Solenoid "E" | SPEED DIAGNOSIS (9/02-2003) |
| | | | ` |
| D2720 | | Description 10.1 11000 | -3 OF 5). |
| P2729 | 5 | Pressure Control Solenoid "E" | See V8 TRANSMISSION 5- |
| | | Control Circuit Low | SPEED DIAGNOSIS (9/02-2003 |
| D2726 | | | <u>-3 OF 5).</u> |
| P2730 | 5 | Pressure Control Solenoid "E" | See <u>V8 TRANSMISSION 5-</u> |

| | | Control Circuit High | <u>SPEED DIAGNOSIS (9/02-2003 - 3 OF 5).</u> |
|-------|---|--|---|
| P2761 | 4 | Torque Converter Clutch Pressure Control Solenoid Control Circuit/Open | See V8 TRANSMISSION 5- SPEED DIAGNOSIS (9/02-2003 - 2 OF 5). |
| P2763 | 4 | Torque Converter Clutch Pressure Control Solenoid Control Circuit High | See <u>V8 TRANSMISSION 5-SPEED DIAGNOSIS (9/02-2003 - 2 OF 5)</u> . |
| P2764 | 4 | Torque Converter Clutch Pressure Control Solenoid Control Circuit Low | See V8 TRANSMISSION 5- SPEED DIAGNOSIS (9/02-2003 - 2 OF 5). |

V8 Transmission 5-Speed Diagnosis (9/02-2003 - 1 Of 5)

| MIL Illum. | | | Swo driving cycles | | |
|---------------------------------|---------------------------|---|--|--|--|
| Time | 200 msec / pont | 500 msec / cont. | 240 msec / corr. 400 msec / corr. | 200 msec / cont | 200 msec / cont |
| Enable Conditions | | > 608 rev/mln > 224 rev/min > 5V 1,2,3,4,5 | > 400 rev/min < 8000 rev/min D, 4, 3, 2 > 1696 rpm not allowed | no P / no N / no R > 256 rpm > 9V > 2 °C | 1st gear 1st gear > 256 pm > 9V > 2*C |
| Secondary Parameter | | engine speed output speed parter valented battery voltage | Front wheel speed - buck wheel speed Pront wheel speed - buck wheel speed pos lover output speed goar shifts | pos lever output speed battery voltage transmission fluid temperature | pos lever manual mode cutput speed bestery voltage transmission fuld temperature |
| Threshold | wrong signal | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | > 5160 rev/min or deta > 1500 rev/min < 160 p.m. < 160 p.m. | % o ← alter | delta > 5 % |
| Malfunction Criteria | epoo pijnann | peads indial | ourput speed or outp. spd - wheel spd * rear axie ratio outp. spd output speed wheel speed * rear axie ratio | irput - output speed { (gear ratio) | Input - output spreed |
| Monitor Strategy Description | rationality | rationality | rationality rationality rationality | rationality | rationality |
| Fault | P0709 | P0715 | P0720 | P0731 P0732 P0733 P0734 | P1731 |
| Component/ System | A/T 5HP24 Range Switch | Input Speed | Output Speed | Goar Ratio | |

<u>Fig. 66: V8 Transmission 5-Speed Diagnosis (9/02-2003 - 1 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 Transmission 5-Speed Diagnosis (9/02-2003 - 2 Of 5)

| MIL Illum, | | | two driving cycles | | |
|---------------------------------|---|---|--|---|--|
| Time | 2,5 sec / wart | 70 msec / com | 50 msac / port | 50 msec / cont | 70 msec / cont |
| Enable | 2, 3, 4 or 5 > Input speed <= 140 Nm | × 1.5 V | V V V ∨ | V 1.5 V V V | v=1.5 v √7 < |
| Secondary | goer selected engine speed input forque to TC (calculated) TCC activation pressure (calculated) | ehs(batiery voltage - pov 1 voltage) pov 1 voltage | abs(battery vottage - pov 2 vottage) pov 2 vottage | abe(battery voltage) - pov 3 voltage) por 3 voltage | abe(battery voltage - pov 1 voltage) pov 1 voltage |
| Threshold | > 80 rpm | > 160mA (if meas curr < 200mA) > 1000mA (if meas curr > 200mA) 12 V 0 V | > 150mA (if mess curr < 200mA) > 100mA (if mess curr > 200mA) 12 V 0 V | > 150mk (if meas our < 200mk) > 100mh (if meas our > 200mk) 12 V 0 V | > 150mA (if meas our < 200mA) > 1000mA (if meas our > 200mA) 12 V 0 V |
| Malfunction Criteria | baeds tupin sobed geo (maximum sipi) | messe. cum calc. cum. voltage voltage | meaes, curr calc, curr. voltage voltage | mosss. curr calc, curr. vdtage | meass, curr, - celc, curr, voltage voltage |
| Monitor Strategy Description | functional check | rationality circuit continuty, power short, circuit continuty, ground short | rationality circuit continuty, power short circuit continuty, ground short | rationality ofrcuit continuty, power short circuit confiniuty, ground short | rationality circuit continuty, power short dirout continuty, ground short |
| Fault | P0741 | P0745 P0963 P0962 | P0775 | P0795 P0971 P0970 | P2761 P2763 P2764 |
| Component | Torque Converter Clutch | Press, Contr. Valve 1 | 8 8 8 | n n n | य उप |

<u>Fig. 67: V8 Transmission 5-Speed Diagnosis (9/02-2003 - 2 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 Transmission 5-Speed Diagnosis (9/02-2003 - 3 Of 5)

| MIL Mum. | | | | two driving cycles | | |
|---------------------------------|--|---|--|---|---|---|
| Time | 70 msec / cont | 200 msec / cont | 900 msec / cont 800 msec / cont | 800 msec / cont | 800 msec / cont 800 msec / cont 800 msec / cont 800 msec / cont | 800 msec / cont 800 msec / cont 800 msec / cont 800 msec / cont |
| Enable | v=1.5 V ×7 < | not allowed | 7V < MV inp. valt. < 16V | | 7V < MV inp. volt. < 16V | 7V < MV Inp. valt. < 16V |
| Secondary | abs(baltery voltage - pross contr valve 1 voltage) press contr valve 1 voltage | Desertifi | MV input voltage | | MV input yotiage | MrV input voltage |
| Threshold | > 150mA (it meas out? < 200mA) > 100mA (it meas out? > 200mA) 12 V | 0 V > 0.15 A | 1V e se voltage < 1,44V, if as le under current 0,89V e se voltage < 1,44V, if se le not under current 1,44V e se voltage < 5V, if se le under current | 0V < as voltaga < 0.35V, if ss is not under current 0.35V < ss voltage < 0.85V, if ss is not under current | 1V < ss valtaga < 1.44V, if ss is undar current 0.85V < ss voltaga < 1.44V, if ss is not under current 1.44V < ss voltaga < 5V, if se is undar current DV < ss voltaga < 0.35V, if se is not under current 0.35V < ss voltaga < 0.85V, if se is not under current | TV s sv voltage < 1,44V, it as is under current 0.85V s as voltage < 1,44V, it as is not under current 1.44V < as voltage < 50, it as is under current 0V < as voltage < 0,35V, it as is not under current 0V < as voltage < 0,35V, it as is not under current 0.35V < as voltage < 0,55V, it as is not under current |
| Malfunction Criteria | messs, curr calc, curr. voltage | voltage | vallage volsage | voltage | voltage voltage voltage voltage | voltage voltage voltage |
| Monitor Strategy Description | rationality circuit continuts, power short | abs(sum current of PCV - sum of each PCV) | rationality oroul conlinuity, power short | circuit continuity, ground short airouit continuity, disconnection | rationality circuit continuity, power short circuit continuity, ground short circuit continuity, disconnection | rationality drout continuity, power short circuit continuity, ground ahort circuit continuity, ground ahort circuit continuity, disconnection |
| Fault | P2722 | P2729 P1748 | P0750 | P0752 | P0755 P0758 P0757 | P0760 P0763 P0761 |
| Component/ System | Press, Contr. Valve 5 | Press. Contr. Valve sum current | Shift Solenoid (A) | 88 | (a) (b) (c) (a) | 0 0 0 |

<u>Fig. 68: V8 Transmission 5-Speed Diagnosis (9/02-2003 - 3 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 Transmission 5-Speed Diagnosis (9/02-2003 - 4 Of 5)

| MIL Illum, | | | | | | twa driving cycles | | | |
|---------------------------------|---|---|---|---|--|--|--|-------------------------------|------------------------------------|
| Time | 500 maec / cont | 500 msec / cont | 500 msec / cont | 90 msec/con | 90 msec / conf | 90 msec / cont | 90 msec / cont | 2.5 sec / con! | 0.3 sec / cont |
| Enable | 7V < MV inp. volt. < 16V | | | .no P / no N / na R > 500 rpm > 30°C | 10 P / 110 N / 110 R > 500 rpm > 30 °C | 10 P / 110 N / 110 R > 500 rpm > 30 °C | 100 P / 110 N / 110 R > 500 rpm > 30 °C | > 1408 rpm | >1408 rpm |
| Secondary Parameter | MV input voltage | | | pos lever output speed transmission oil temperature | poo lever ourput speed transmission on lemperature | pos lever output speed transmission of temperature | pos lever curput speed transmission of lemperature | peads augue | paeds augua |
| Threshold | 1V < ss voltage < 1.44V, if ss is under current 0.85V < ss voltage < 1.44V, if ss is not under current | 1,44V < ss vottage < 5V, if as is under current. | 0.35V < ss voltage < 0.85V, if se is not under current. | ing spo oid gear - 40 Ipm > Ing spd new gear | Inp spd old gear + 600 rpm < linp spd heie gear | inp spd oid gear - 40 rpm > inp spd new goar | ing spd old gear + 600 rpm < irp spd new gear | bat,Volt, < 9V | bat, Volt < 9V or 16V < bat, Volt. |
| Malfunction Criteria | afletjov | voltage | voltage | input output | peads indu | Input output | peeds tridui | battery voltage | battery voltage |
| Monitor Strategy Description | rationality | circuit continuity, power short circuit continuity, around short | dreuit confinuity, disconnection | rationality, no change | rasonality, value too big | rationality, no change | rationality, value too big | rationality | rationality |
| Fault | P1761 | P1762 | P1764 | P0782 | P1882 | P0783 | P1883 | P1889 | P1892 |
| Component | (Snift Lock) | (Shift Lock) | (Shift Lock) | 23 Shift | | and Shin | | System Voltage, electrical | System Voltage, low |

<u>Fig. 69: V8 Transmission 5-Speed Diagnosis (9/02-2003 - 4 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 Transmission 5-Speed Diagnosis (9/02-2003 - 5 Of 5)

| System Code | Transmission P1719 | Control Modul P1720 | P1747 | P1765 | P1784 | P1791 | P1792 | Supply Voltage P1893 | Control Solenoid / P1894 Shift Solenoid | P1895 |
|---------------------------------|--------------------|-----------------------------|-----------------|-----------------------|------------------|------------------|-----------------------------|---|--|--|
| Monitor Strategy Description | bus check | bus check | bus check | rationality | self check | self check | reflorality microcontroller | circuit confinuity, power steet | circuit continuity, ground short | relizationally utilitation through |
| Malfunction Criteria | CAN level | Can message/ time out DME | CAN bus fault | CAN throttle position | EPROM chacksum | EEPROM | watchdog | voltage | voltage | or establishment |
| Threshold | wing value | > 100 ms | invalid signals | invalid signal | invalid checksum | invalid checksum | invalid checksum | ss and pcv voltage - battury voltage - 1,0V | us and poy voltage < 2.5V ss and poy voltage < 30% * battery voltage | And the state of the second |
| Secondary | | ignition battery voltage | ignition | | | | | as and per voltage | ss and pev voltage as and pev voltage | and the state of t |
| Enable | | N6 4 | ua | | | | | ≥ battery voltage -2V | := battery voltage -2V | 1 |
| Time | 0,3 sec / cont | 0,6 aug / cont | 0.15 sec / cont | 0,4 sec / cont | cont | once at startup | once at straitup | once at startup | once at startup | |
| MIL Illum. | | | | two driving | cycles | | | | | |

<u>Fig. 70: V8 Transmission 5-Speed Diagnosis (9/02-2003 - 5 Of 5)</u> Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES V8: TRANSMISSION (SMG - 2004)

DIAGNOSTIC TROUBLE CODES V8: TRANSMISSION (SMG - 2004)

| billottostie ikoebee eebes vo. ikirkisiinssieri (siilo 2001) | | | | | | | | | | |
|--|----------|---------------------------|------------------------------------|--|--|--|--|--|--|--|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters | | | | | | | |
| P1765 | 20904 | CAN Throttle Valve | See V8 SMG | | | | | | | |
| | | | TRANSMISSION | | | | | | | |
| | | | <u>DIAGNOSIS (2004 - 1 OF 4)</u> . | | | | | | | |
| P1766 | 20702 | Double Error Engine Speed | See V8 SMG | | | | | | | |
| | | CAN/Direct Wiring | TRANSMISSION | | | | | | | |
| | | | | | | | | | | |

| | | | <u>DIAGNOSIS (2004 - 1 OF 4)</u> . |
|-------|-------|-----------------------------------|------------------------------------|
| P1767 | 20913 | CAN Wheel Speeds Rear Axle | See <u>V8 SMG</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 1 OF 4)</u> . |
| P1771 | 20901 | CAN Torque Interface | See <u>V8 SMG</u> |
| | | Plausibility | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 2 OF 4)</u> . |
| P1782 | 20910 | CAN Brake Signal | See <u>V8 SMG</u> |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 4 OF 4). |
| P1791 | 20401 | Internal Transmission Control | See <u>V8 SMG</u> |
| | | Module Memory | TRANSMISSION |
| | | Checksum/EEPROM Error | <u>DIAGNOSIS (2004 - 2 OF 4)</u> . |
| P1796 | 20406 | Internal Transmission Control | See V8 SMG |
| | | Module Error 7 (High Side | TRANSMISSION |
| | | Driver) | <u>DIAGNOSIS (2004 - 2 OF 4)</u> . |
| P1817 | 20606 | Gear Selector Lever GSL0 Cable | See <u>V8 SMG</u> |
| | | High Input | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 3 OF 4)</u> . |
| P1818 | 20606 | Gear Selector Lever GSL0 Cable | See <u>V8 SMG</u> |
| | | Low Input | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF 4). |
| P1819 | 20606 | Gear Selector Lever GSL0 Cable | See V8 SMG |
| | | Plausibility | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF 4). |
| P1820 | 20607 | Gear Selector Lever GSL1 Cable | See V8 SMG |
| | | High Input | <u>TRANSMISSION</u> |
| | | | DIAGNOSIS (2004 - 3 OF 4). |
| P1821 | 20607 | Gear Selector Lever GSL1 Cable | See V8 SMG |
| | | Low Input | <u>TRANSMISSION</u> |
| | | - | <u>DIAGNOSIS (2004 - 3 OF 4)</u> . |
| P1822 | 20607 | Gear Selector Lever GSL1 Cable | See V8 SMG |
| | | Plausibility | <u>TRANSMISSION</u> |
| | | | DIAGNOSIS (2004 - 3 OF 4). |
| P1823 | 20611 | Gear Selector Lever Digital Cable | |
| | | Plausibility | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 1 OF 4)</u> . |
| P1850 | 20213 | Shift Angle Sensor High Input | See V8 SMG |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 4 OF 4)</u> . |
| P1851 | 20213 | Shift Angle Sensor Low Input | See V8 SMG |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 4 OF 4). |
| P1852 | 20213 | Shift Angle Sensor Plausibility | See V8 SMG |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 4 OF 4). |
| P1859 | 20217 | Clutch Speed Sensor Plausibility | See V8 SMG |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF 4). |
| P1860 | 20612 | Gear Selector Lever Hall Sensor | See V8 SMG |
| | | Error 1 | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF 4). |
| P1866 | 20608 | Gear Selector Lever GSL2 Cable | See V8 SMG |
| | | High Input | <u>TRANSMISSION</u> |
| | | β <u>r</u> ··· | <u>DIAGNOSIS (2004 - 3 OF 4)</u> . |
| • | 1 | I | ı |

| P1867 | 20608 | Gear Selector Lever GSL2 Cable | See <u>V8 SMG</u> |
|-------|-------|--------------------------------|------------------------------------|
| | | Low Input | <u>TRANSMISSION</u> |
| | | | <u>DIAGNOSIS (2004 - 3 OF 4)</u> . |
| P1868 | 20608 | Gear Selector Lever GSL2 Cable | See V8 SMG |
| | | Plausibility | <u>TRANSMISSION</u> |
| | | | DIAGNOSIS (2004 - 3 OF 4). |
| P1869 | 20609 | Gear Selector Lever GSL3 Cable | See V8 SMG |
| | | High Input | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF 4). |
| P1870 | 20609 | Gear Selector Lever GSL3 Cable | See V8 SMG |
| | | Low Input | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF 4). |
| P1876 | 20609 | Gear Selector Lever GSL3 Cable | See V8 SMG |
| | | Plausibility | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF 4). |
| P1887 | 20335 | Hydraulic Pump | See <u>V8 SMG</u> |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 4 OF 4). |

V8 SMG Transmission Diagnosis (2004 - 1 Of 4)

| Secondary Parameter | | Threshold value | Malfunction Threshold Criteria value | |
|--|---|-----------------------------------|--|--|
| KEY = & ECU = & Vsupply = | | signal = FFhex | matfunction on signal = FFhex | |
| fallure on CAN engine speed = & KEY = & NOT CRANKING = & Vsupply = | | speed signal = 0 | sansor discormected or multiple fault speed signal = 0 | |
| CODE <> | | signal a | | no signal hait œell is not switching or wining problem |
| CODE = 8 KEY = 8 CRANKING = 8 Vsupply = | | signal = 0 | | |
| 2 4 | | leional oracidisas (s. 410th rese | n (OT) s Complete and Complet | |
| 2 si | 3 | speed signal = 0 | ont | slignal for available for fineout |
| ENGNE = 8 KEY = 8 NOT CRANKING = 8 Vsupply = 8 GEAR = 8 GLUTCH SPEED > | | | | |

Fig. 71: V8 SMG Transmission Diagnosis (2004 - 1 Of 4) Courtesy of BMW OF NORTH AMERICA, INC.

V8 SMG Transmission Diagnosis (2004 - 2 Of 4)

| System System SMG | Fault | Monitor Strategy Description | Malfunction Criteria | Threshold Value | Secondary | Enable Conditions | Time Required | MIL Illum, |
|-----------------------------|-------|---------------------------------|---|---|--|--|---------------------------------|-------------------|
| | | | a+ oper read/peads an Bracherdie beads ONV a+ oper read/peads an Bracherdie beads | tolerance e a 500 mfm ⁻¹ . geur ratio = frongsad goar), clutch speed | ENGINE ** & KEY = & NOT CRANKING = & VSUPDY = & GEAR = & CLUTCH = | ON ON ON (0.5-10/, 17.01-17.5] ENGAGED CLOSED | < 1 s. comit. | 2nd driving cycle |
| | | | failure on speed signal detected by DSC control unit | tine of the speed signals from CAN = | ENGINE = 8 KEY = 8 NOT CRANKING = 8 Vsupply = 8 GEAR = 8 CLUTCH = | ON ON ON (6.5-10v, 17.01-17.5) ENGAGED CLOSED | | |
| CAN Generated Engine Torque | P1771 | plausibility | engine ECU not working properly | signal = FFhex. | KEY = & ECU = & Vsitpsly = | ON since timeout [6.5-10V, 17.01-17.5] | < 20 ms, cont. | 2nd driving cycle |
| EEPROM failure | P1791 | plausibility | checksum fallure | | | once at ECU power on | < 20 ms, tper driving cycle | |
| Power Latch Relays | P1796 | plausibility | unintended drivers ralay opening (open circuit on pin (1,7), burned tuse | Logic relay commanded AND power latch voltage > 5V AND drivers relay commanded on | NOT CRANKING = & TCU Internal RELAY = | So | <150ms, cont. | |
| | | | drivers relay permanently closed | power latch voltage > 5V AND drivers relay commanded off | | ECU switch off request | < 20 ms, 1 par driving cycle | |
| | | | logic rolay purmaryerity closed | ECU not switched off AND logic relay commanded off | | | | |

Fig. 72: V8 SMG Transmission Diagnosis (2004 - 2 Of 4) Courtesy of BMW OF NORTH AMERICA, INC.

V8 SMG Transmission Diagnosis (2004 - 3 Of 4)

| Time MIL Required Illum. | | | < 1 s, cont. 2nd driving eycle | | | < 1 8, cant | | | < 1 s, cont. | | | < 1 s, cont. | | < 20 ms, cont. 2nd driving cycle | < 15, cont. 2nd driving cycle | |
|---------------------------------|-------------------------|--|--------------------------------|----------------------------|---|-----------------|----------------------------|---|-----------------|-------------------------|--|-----------------|-------------------------|---|---|--|
| Enable Conditions R | | NO | NOT ON | -17.51 | | • | | | | | | * | | ON NOT ON (8.5-107, 17.01-17.5] | ON ON NOTON [6.5-107, 17.01-17.5] CLOSED ENGAGED | ON O |
| Secondary | | KEY = | & CRANKING = | & V supply = | | | | | | | | | | KEY = & CRANKING = & V_supply = | ENGINE = & KEY = & CRANKING = & VSUPDY = & CLUTCH = & GEAR = | BUGINE = RKEY = RCRANKING = RCRANKING = RCLT/CH = RCLT/C |
| Threshold value | | signal > 4.2 V | signal < 0.8 V | signal gradient > 4,40 V | signal > 4.2 V | signal < 0.8 V | signal gradient > 4.40 V | signal > 4.2 V | signal < 0.8 V | signal gradient > 4.4 V | signal > 4.2 V | signal < 0.8 V | signal gradient > 4.4 V | code its compared to valid gear position codes) | signal gradient > 9000 rpm | 0 = leutis peeds |
| Malfunction Criteria | | open circuit or s.c.to Vsupply or s.c.to | short to GND | signal gradient to high | open circuit or s.c.to Vsupply or s.c.to +5V | short to GND | signal gradient to high | open circuit or s.c.to Vsupply or s.c.to +5V | short to GND | signal gradient to high | open circuit or s.c.to Vsupply or s.c.to +5V | short to GND | signal gradient to high | hall cell is not switching | out of dynamic range | signal not available for timeout |
| Monitor Strategy Description | | upper threshold | lower threshold | plausibility | Upper threshold | lower threshold | ylindisusidi | upper threshold | lower threshold | yliidisusid | upper threshold | lower threshold | plausibility | no signal | Vijensibility | |
| Fault | | P1817 | P1818 | P1819 | | | P1822 | P1866 | | P1868 | P1869 | | P1876 | P1860 | P1859 | |
| Component/ System SMG | Gear lever analog lines | (0) | | | £ | | | (3) | | | (6) | | | Gear Lever Hallsensors | Clutch Speed | |

<u>Fig. 73: V8 SMG Transmission Diagnosis (2004 - 3 Of 4)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 SMG Transmission Diagnosis (2004 - 4 Of 4)

| MIL Illum. | 2nd driving cycle | 2nd driving cycle | 2nd driving cycle | | | | < 20 ms. cont 2nd driving cards |
|------------------------------------|---|------------------------------------|---------------------------------|-----------------|-------------------------|--|---|
| Time | < 1s, conf. | < 50 s, cont. | < 500 ms. cont. | | | | < 20 ms. cont |
| Enable Conditions | ON ON NOT ON [6.5-10/1, 701-17.5] CLOSED F(GRAGED F(GRAGED F(GRAGED F(GRAGED F(GRAGED) | Commanded 5 | NO | NO LON | [6,5-10V, 17,01-17,5] | f(gaar position, EOL tuned values) ON NOT ON [6.5-10V, 17.01-17.5] NOT IN PROGRESS | ON since timeout |
| Secondary Parameter | ENGINE = & KEY = & CRANKING = & VSUDPY = & CLUTCH = & GEAR = & GEAR = & Gear ratio = & Governine speed = | Pump = & error counter >= | KEY= | & CRANKING = | & Vsupply = | selection thresholds = & KEY = & CRANKING = & Vsupply = & GEARSHIFT = | KEY = & ECU = & Vsupbly = |
| Threshold value | loerance e= 2000 min | pump switched on for more than 30s | signal > 4,5V | signal < 0,5 V | signal gradient > 4,4 V | signai outside salection thresholds | CAN label F BS = 1 |
| Malfunction Criteria | e+paeds aujūra os jeugis paeds OND Washeds supplies paeds | damage on hydraulic pump | open circuit or s.c. to Vsupply | Short to GND | out of dynamic range | Out of position range | fallure on brake switch system delected by engine control unit |
| Monitor Strategy Description | | plausibility | upper threshold | lower threshold | plausibility | | plausibility |
| Fault | | P1887 | P1850 | P1851 | P1852 | | P1782 |
| Component/ System SMG | | Hydraulic Pump Fallure | Shift Position Sensor | | | | CAN Brake Signal |

Fig. 74: V8 SMG Transmission Diagnosis (2004 - 4 Of 4) Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES V8 & V12 TRANSMISSION (6-SPEED - 2003)

DIAGNOSTIC TROUBLE CODES V8 & V12 TRANSMISSION (6-SPEED - 2003)

| BITTOTTOBITE | INCODED CODE | 2 . 0 00 . 12 11011101111001011 (0 | 21 22 2000) |
|--------------|--------------|------------------------------------|------------------------------------|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
| P0715 | 20200 | Input/Turbine Speed Sensor "A" | See <u>V8 & V12 6-SPEED</u> |
| | | Circuit | TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 1 OF 6)</u> . |
| P0720 | 20201 | Output Speed Sensor Circuit | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| I | | | |

| | 1 | | <u>DIAGNOSIS (2003 - 1 OF 6)</u> . |
|-------|-------|-----------------------------------|--|
| P0729 | 20306 | Gear 6 Incorrect Ratio | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (2003 - 3 OF 6). |
| P0731 | 20301 | Gear 1 Incorrect Ratio | See <u>V8 & V12 6-SPEED</u> |
| | | | <u>TRANSMISSION</u> |
| | | | <u>DIAGNOSIS (2003 - 3 OF 6)</u> . |
| P0732 | 20302 | Gear 2 Incorrect Ratio | See <u>V8 & V12 6-SPEED</u> |
| | | | <u>TRANSMISSION</u> |
| | | | DIAGNOSIS (2003 - 3 OF 6). |
| P0733 | 20303 | Gear 3 Incorrect Ratio | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 3 OF 6)</u> . |
| P0734 | 20304 | Gear 4 Incorrect Ratio | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 3 OF 6)</u> . |
| P0735 | 20305 | Gear 5 Incorrect Ratio | See V8 & V12 6-SPEED |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 3 OF 6)</u> . |
| P0741 | 20307 | Torque Converter Clutch Circuit | See V8 & V12 6-SPEED |
| | | Performance or Stuck Off | TRANSMISSION |
| D0545 | 20000 | D G . 10.1 | <u>DIAGNOSIS (2003 - 3 OF 6)</u> . |
| P0745 | 20000 | Pressure Control Solenoid "A" | See V8 & V12 6-SPEED |
| | | | TRANSMISSION DIA CNOSIS (2002 1 OF 6) |
| D0740 | 20000 | D G . 10.1 | <u>DIAGNOSIS (2003 - 1 OF 6)</u> . |
| P0748 | 20000 | Pressure Control Solenoid "A" | See V8 & V12 6-SPEED |
| | | Electrical | TRANSMISSION DIACNOSIS (2002 1 OF 6) |
| P0751 | 20100 | Shift Solenoid "A" Performance or | DIAGNOSIS (2003 - 1 OF 6). |
| P0/31 | 20100 | Stuck Off | See <u>V8 & V12 6-SPEED</u> TRANSMISSION |
| | | Stuck Off | <u>I KANSWISSION</u> DIAGNOSIS (2003 - 2 OF 6). |
| P0753 | 20100 | Shift Solenoid "A" Electrical | See V8 & V12 6-SPEED |
| 10733 | 20100 | Simi Solehold A Electrical | TRANSMISSION |
| | | | DIAGNOSIS (2003 - 2 OF 6). |
| P0756 | 20101 | Shift Solenoid "B" Performance or | See V8 & V12 6-SPEED |
| 10730 | 20101 | Stuck Off | TRANSMISSION |
| | | | DIAGNOSIS (2003 - 2 OF 6). |
| P0758 | 20101 | Shift Solenoid "B" Electrical | See V8 & V12 6-SPEED |
| | 20101 | | TRANSMISSION |
| | | | DIAGNOSIS (2003 - 2 OF 6). |
| P0761 | 20102 | Shift Solenoid "C" Performance or | See V8 & V12 6-SPEED |
| | | Stuck Off | TRANSMISSION |
| | | | DIAGNOSIS (2003 - 2 OF 6). |
| P0763 | 20102 | Shift Solenoid "C" Electrical | See V8 & V12 6-SPEED |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (2003 - 2 OF 6). |
| P0766 | | Reserved For Later Versions | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 2 OF 6)</u> . |
| P0768 | | Reserved For Later Versions | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 2 OF 6)</u> . |
| P0775 | 20001 | Pressure Control Solenoid "B" | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (2003 - 1 OF 6). |

| I | 1 | 1 | |
|-----------|-------|---|---|
| P0778 | 20001 | Pressure Control Solenoid "B" | See V8 & V12 6-SPEED |
| | | Electrical | TRANSMISSION DIAGNOSIS (2003 - 1 OF 6). |
| P0781 | 20311 | 1-2 Shift | See V8 & V12 6-SPEED |
| 10701 | 20311 | 1 2 Silit | TRANSMISSION |
| | | | DIAGNOSIS (2003 - 3 OF 6). |
| P0782 | 20312 | 2-3 Shift | See <u>V8 & V12 6-SPEED</u> |
| | | | <u>TRANSMISSION</u> DIAGNOSIS (2003 - 3 OF 6). |
| P0783 | 20313 | 3-4 Shift | See V8 & V12 6-SPEED |
| | | | TRANSMISSION DIAGNOSIS (2003 - 4 OF 6). |
| P0784 | 20314 | 4-5 Shift | See V8 & V12 6-SPEED |
| 10764 | 20314 | 4-3 31111 | TRANSMISSION |
| | | | DIAGNOSIS (2003 - 4 OF 6). |
| P0795 | 20002 | Pressure Control Solenoid "C" | See <u>V8 & V12 6-SPEED</u> |
| | | | <u>TRANSMISSION</u> <u>DIAGNOSIS (2003 - 1 OF 6)</u> . |
| P0798 | 20002 | Pressure Control Solenoid "C" | See V8 & V12 6-SPEED |
| 10,750 | 20002 | Electrical | TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 1 OF 6)</u> . |
| P0829 | 20315 | 5-6 Shift | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION DIAGNOSIS (2003 - 4 OF 6). |
| P0962 | 20000 | Pressure Control Solenoid "A" | See V8 & V12 6-SPEED |
| 10902 | 20000 | Control Circuit Low | TRANSMISSION |
| | | 0.0000000000000000000000000000000000000 | DIAGNOSIS (2003 - 1 OF 6). |
| P0963 | 20000 | Pressure Control Solenoid "A" | See <u>V8 & V12 6-SPEED</u> |
| | | Control Circuit High | TRANSMISSION DIAGNOSIS (2003 - 1 OF 6). |
| P0966 | 20001 | Pressure Control Solenoid "B" | See V8 & V12 6-SPEED |
| 1 0 9 0 0 | 20001 | Control Circuit Low | TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 1 OF 6)</u> . |
| P0967 | 20001 | Pressure Control Solenoid "B" | See <u>V8 & V12 6-SPEED</u> |
| | | Control Circuit High | <u>TRANSMISSION</u> DIAGNOSIS (2003 - 1 OF 6). |
| P0970 | 20002 | Pressure Control Solenoid "C" | See V8 & V12 6-SPEED |
| 10070 | 20002 | Control Circuit Low | TRANSMISSION |
| | | | DIAGNOSIS (2003 - 1 OF 6). |
| P0971 | 20002 | Pressure Control Solenoid "C" | See <u>V8 & V12 6-SPEED</u> |
| | | Control Circuit High | TRANSMISSION (2002) 1 OF (|
| D0072 | 20100 | Cl. iA C. l i l II A II C 1 Ci i A | DIAGNOSIS (2003 - 1 OF 6). |
| P0973 | 20100 | Shift Solenoid "A" Control Circuit Low | See <u>V8 & V12 6-SPEED</u> TRANSMISSION |
| | | Low | <u>DIAGNOSIS (2003 - 2 OF 6).</u> |
| P0976 | 20101 | Shift Solenoid "B" Control Circuit | See V8 & V12 6-SPEED |
| | | Low | TRANSMISSION |
| D0050 | 20405 | 91:0 9 1 11:0 9 | <u>DIAGNOSIS (2003 - 2 OF 6)</u> . |
| P0979 | 20102 | Shift Solenoid "C" Control Circuit | See V8 & V12 6-SPEED |
| | | Low | <u>TRANSMISSION</u> <u>DIAGNOSIS (2003 - 2 OF 6)</u> . |
| P1701 | 20700 | Double Error Position Information | See V8 & V12 6-SPEED |
| | 20,00 | CAN/Serial Line | TRANSMISSION |
| 1 | | | <u>DIAGNOSIS (2003 - 5 OF 6)</u> . |
| I | 1 | I . | |

| I | I | I | |
|----------|-------|--|---|
| P1702 | 20701 | Combination Substitute Function | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| D1720 | 20000 | CANT' AC A 1M 11 | <u>DIAGNOSIS (2003 - 5 OF 6)</u> . |
| P1720 | 20800 | CAN Timeout Control Module | See <u>V8 & V12 6-SPEED</u> TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 5 OF 6)</u> . |
| P1721 | 20801 | CAN Timeout ASC/DSC | See V8 & V12 6-SPEED |
| 11,21 | 20001 | | TRANSMISSION |
| | | | DIAGNOSIS (2003 - 5 OF 6). |
| P1727 | 20903 | CAN Engine Speed | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | 2000 | | <u>DIAGNOSIS (2003 - 5 OF 6)</u> . |
| P1728 | 20336 | Engine Overspeed Condition | See V8 & V12 6-SPEED |
| | | | TRANSMISSION DIAGNOSIS (2003 - 5 OF 6). |
| P1747 | 52999 | CAN-Bus Monitoring | See V8 & V12 6-SPEED |
| F1/4/ | 32999 | CAN-Bus Monitoring | TRANSMISSION |
| | | | DIAGNOSIS (2003 - 5 OF 6). |
| P1765 | | Throttle Valve Signal | See V8 & V12 6-SPEED |
| | | 5 | TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 5 OF 6)</u> . |
| P1771 | 20901 | CAN Torque Interface Plausibility | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 4 OF 6)</u> . |
| P1782 | | Brake Pedal Signal | See V8 & V12 6-SPEED |
| | | | <u>TRANSMISSION</u> DIAGNOSIS (2003 - 5 OF 6). |
| P1790 | 20400 | Internal Transmission Control | See V8 & V12 6-SPEED |
| 1 1 / 90 | 20400 | Module Memory | TRANSMISSION |
| | | Checksum/EPROM Error | DIAGNOSIS (2003 - 6 OF 6). |
| P1791 | 20401 | Internal Transmission Control | See <u>V8 & V12 6-SPEED</u> |
| | | Module Memory | <u>TRANSMISSION</u> |
| | | Checksum/EEPROM Error | <u>DIAGNOSIS (2003 - 6 OF 6)</u> . |
| P1792 | 20402 | Internal Transmission Control | See <u>V8 & V12 6-SPEED</u> |
| | | Module Watchdog Error | TRANSMISSION |
| D1702 | 20220 | ETC Cost Off Day To | DIAGNOSIS (2003 - 5 OF 6). |
| P1793 | 20330 | ETC Cut-Off Due To Overtemperature Condition | See <u>V8 & V12 6-SPEED</u> TRANSMISSION |
| | | Overtemperature Condition | <u>DIAGNOSIS (2003 - 6 OF 6).</u> |
| P1804 | | Reserved For Later Versions | See <u>V8 & V12 6-SPEED</u> |
| 11001 | | Tessived for Editor versions | TRANSMISSION |
| | | | DIAGNOSIS (2003 - 2 OF 6). |
| P1806 | 20105 | Shift Solenoid "A" or "B" | See <u>V8 & V12 6-SPEED</u> |
| | | Mechanically Stuck | TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 2 OF 6)</u> . |
| P1810 | 20200 | Input/Turbine Speed Sensor Circuit | |
| | | High | TRANSMISSION DIAGNOSIS (2003 - 1 OF 6). |
| P1811 | 20200 | Input/Turbing Speed Sensor Circuit | · |
| 1,011 | 20200 | Input/Turbine Speed Sensor Circuit Low | See <u>V8 & V12 6-SPEED</u> TRANSMISSION |
| | | Low | <u>DIAGNOSIS (2003 - 1 OF 6).</u> |
| P1812 | 20201 | Output Speed Sensor Circuit High | See V8 & V12 6-SPEED |
| | | Input | TRANSMISSION |
| | | • | DIAGNOSIS (2003 - 1 OF 6). |
| | | _ | · |

| P1813 | 20201 | Output Speed Sensor Circuit Low | See V8 & V12 6-SPEED |
|--------|-------|-----------------------------------|--|
| | | Input | TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 1 OF 6)</u> . |
| P1814 | 20203 | Output Speed Sensor Gradient Too | See V8 & V12 6-SPEED |
| | | High | TRANSMISSION DIAGNOSIS (2003 - 1 OF 6). |
| P1830 | 20006 | Pressure Control Solenoid Current | See V8 & V12 6-SPEED |
| | 2000 | Error in P/R/N | TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 2 OF 6)</u> . |
| P1836 | 20005 | Torque Converter Clutch Circuit | See <u>V8 & V12 6-SPEED</u> |
| | | High | TRANSMISSION DIAGNOSIS (2003 - 3 OF 6). |
| P1846 | 20005 | Torque Converter Clutch Circuit | See V8 & V12 6-SPEED |
| 11040 | 20003 | Low | TRANSMISSION |
| | | | DIAGNOSIS (2003 - 3 OF 6). |
| P1861 | 20316 | 2-1 Shift | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| D1072 | 20217 | 2.2.01.0 | <u>DIAGNOSIS (2003 - 4 OF 6)</u> . |
| P1862 | 20317 | 3-2 Shift | See <u>V8 & V12 6-SPEED</u> TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 4 OF 6)</u> . |
| P1863 | 20318 | 4-3 Shift | See V8 & V12 6-SPEED |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 4 OF 6)</u> . |
| P1864 | 20319 | 5-4 Shift | See V8 & V12 6-SPEED |
| | | | <u>TRANSMISSION</u> <u>DIAGNOSIS (2003 - 4 OF 6).</u> |
| P1865 | 20320 | 6-5 Shift | See V8 & V12 6-SPEED |
| 1 1003 | 20320 | 0-3 Silit | TRANSMISSION |
| | | | DIAGNOSIS (2003 - 4 OF 6). |
| P1871 | 20316 | 2-1 Shift Circuit High | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| P1872 | 20317 | 2.2 Shift Cinavit High | DIAGNOSIS (2003 - 4 OF 6). |
| P10/2 | 20317 | 3-2 Shift Circuit High | See <u>V8 & V12 6-SPEED</u> TRANSMISSION |
| | | | DIAGNOSIS (2003 - 4 OF 6). |
| P1873 | 20318 | 4-3 Shift Circuit High | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| D1074 | 20210 | 7 4 01 10 01 1 1 TT 1 | <u>DIAGNOSIS (2003 - 4 OF 6)</u> . |
| P1874 | 20319 | 5-4 Shift Circuit High | See <u>V8 & V12 6-SPEED</u> TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 4 OF 6)</u> . |
| P1875 | 20320 | 6-5 Shift Circuit High | See V8 & V12 6-SPEED |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 4 OF 6)</u> . |
| P1881 | 20311 | 1-2 Shift Circuit High | See V8 & V12 6-SPEED |
| | | | <u>TRANSMISSION</u> <u>DIAGNOSIS (2003 - 3 OF 6).</u> |
| P1882 | 20312 | 2-3 Shift Circuit High | See V8 & V12 6-SPEED |
| 1 1002 | 20312 | 2 5 Smit Chedit High | TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 3 OF 6)</u> . |
| P1883 | 20313 | 3-4 Shift Circuit High | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION DIA CNOSIS (2002 4 OF 6) |
| | | | <u>DIAGNOSIS (2003 - 4 OF 6)</u> . |
| 1 | | | |

| l P1884 | 20314 | 4-5 Shift Circuit High | See V8 & V12 6-SPEED |
|----------------|-------|---|--|
| 1 100 1 | 20311 | 3 Smit Shout High | TRANSMISSION |
| | | | DIAGNOSIS (2003 - 4 OF 6). |
| P1885 | 20315 | 5-6 Shift Circuit High | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 4 OF 6)</u> . |
| P1888 | 20337 | CAN Timeout Instrument Pack | See V8 & V12 6-SPEED |
| | | during Operation Parking Interlock Emergency Release | TRANSMISSION DIAGNOSIS (2003 - 5 OF 6). |
| P1890 | 20500 | System Voltage | See V8 & V12 6-SPEED |
| 1 1000 | 20300 | System voltage | TRANSMISSION |
| | | | DIAGNOSIS (2003 - 3 OF 6). |
| P1891 | 20500 | System Voltage High Input | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 3 OF 6)</u> . |
| P1892 | 20500 | System Voltage Low Input | See V8 & V12 6-SPEED |
| | | | TRANSMISSION DIAGNOSIS (2003 - 3 OF 6). |
| P1893 | 20501 | Supply Voltage Pressure Control | See V8 & V12 6-SPEED |
| F 1093 | 20301 | Solenoid/Shift Solenoid Circuit | TRANSMISSION |
| | | High | DIAGNOSIS (2003 - 6 OF 6). |
| P1894 | 20501 | Supply Voltage Pressure Control | See V8 & V12 6-SPEED |
| | | Solenoid/Shift Solenoid Circuit | TRANSMISSION |
| | | Low | <u>DIAGNOSIS (2003 - 6 OF 6)</u> . |
| P1895 | 20501 | Supply Voltage Pressure Control | See <u>V8 & V12 6-SPEED</u> |
| | | Solenoid/Shift Solenoid No Signal | TRANSMISSION |
| D1006 | 20701 | | <u>DIAGNOSIS (2003 - 6 OF 6)</u> . |
| P1896 | 20501 | Supply Voltage Pressure Control Solenoid/Shift Solenoid | See <u>V8 & V12 6-SPEED</u> TRANSMISSION |
| | | Solellold/Slift Solellold | <u>I KANSMISSION</u> <u>DIAGNOSIS (2003 - 6 OF 6).</u> |
| P1897 | 20502 | Supply Voltage Sensors High Input | ` |
| 11057 | 20302 | Supply voltage sensors riigh input | TRANSMISSION |
| | | | DIAGNOSIS (2003 - 6 OF 6). |
| P1898 | 20502 | Supply Voltage Sensors Low Input | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 6 OF 6)</u> . |
| P2713 | 20003 | Pressure Control Solenoid "D" | See V8 & V12 6-SPEED |
| | | | TRANSMISSION DIAGNOSIS (2003 - 1 OF 6). |
| P2716 | 20003 | Pressure Control Solenoid "D" | See V8 & V12 6-SPEED |
| 12/10 | 20003 | Electrical | TRANSMISSION |
| | | | DIAGNOSIS (2003 - 1 OF 6). |
| P2720 | 20003 | Pressure Control Solenoid "D" | See V8 & V12 6-SPEED |
| | | Circuit Low | TRANSMISSION |
| | | | <u>DIAGNOSIS (2003 - 1 OF 6)</u> . |
| P2721 | 20003 | Pressure Control Solenoid "D" | See <u>V8 & V12 6-SPEED</u> |
| | | Control Circuit High | TRANSMISSION |
| D2722 | 20004 | Day 200 C (1 C 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | DIAGNOSIS (2003 - 1 OF 6). |
| P2722 | 20004 | Pressure Control Solenoid "E" | See <u>V8 & V12 6-SPEED</u> TRANSMISSION |
| | | | <u>I RANSMISSION</u> <u>DIAGNOSIS (2003 - 2 OF 6)</u> . |
| P2725 | 20004 | Pressure Control Solenoid "E" | See V8 & V12 6-SPEED |
| | 2000 | Electrical | TRANSMISSION |
| | | | DIAGNOSIS (2003 - 2 OF 6). |
| P2729 | 20004 | Pressure Control Solenoid "E" | See <u>V8 & V12 6-SPEED</u> |
| | | | |

| 1 | | Control Circuit Low | <u>TRANSMISSION</u> |
|-------|-------|----------------------------------|------------------------------------|
| | | | <u>DIAGNOSIS (2003 - 2 OF 6)</u> . |
| P2730 | 20004 | Pressure Control Solenoid "E" | See <u>V8 & V12 6-SPEED</u> |
| | | Control Circuit High | <u>TRANSMISSION</u> |
| | | | <u>DIAGNOSIS (2003 - 2 OF 6)</u> . |
| P2759 | 20005 | Torque Converter Clutch Pressure | See <u>V8 & V12 6-SPEED</u> |
| | | Control Solenoid Control Circuit | <u>TRANSMISSION</u> |
| | | Electrical | <u>DIAGNOSIS (2003 - 3 OF 6)</u> . |
| P2761 | 20005 | Torque Converter Clutch Pressure | See <u>V8 & V12 6-SPEED</u> |
| | | Control Solenoid Control | <u>TRANSMISSION</u> |
| | | Circuit/Open | <u>DIAGNOSIS (2003 - 3 OF 6)</u> . |

V8 & V12 6-Speed Transmission Diagnosis (2003 - 1 Of 6)

| Fault | Monitor Strategy Description | Malfunction Criteria | Threshold | Secondary | Enable Conditions | Required | MIL Illum. |
|----------------------------|---------------------------------|---|---|--|--|-----------------------|-----------------------|
| Turbing Speed Sensor P1810 | upper threshold | shart circuit to supply | | sensor subbly | status OK | 20msec, confincuts | Iwo driving |
| 21811 | lower threshold | interruption or short circuit to gnd. | | | | | cycles |
| 10 | plausibility | signal greater or tower than threshold | >7700rpm, <20rpm | sensor supply (NTU>7700rpm) sensor (NTU>7700rpm) | status OK no electr, error | | |
| | | | | sensor surpply sensor surpply sensor engine speed output speed range position transmission condition | status OK no electri error status OK - soloripm status OK - soloripm status OK or substitute vizilus of or substitute vizilus of or substitute vizilus informico-seu (farvant or back-and) | | |
| P0720 | plausibility | signal greater than threshold | N62 4,4t: >=7300rpm | Addrs Joseph | status OK. | 20msec, | two driving |
| | | | or or | SENSOF | no electr, error | | cycles |
| | | | difference to converted wheel speed >250 pm | sonsor aupply sonsor wheel speed | ratus OK no alect, unto o leteri, o leter | | |
| P1812 | upper threshold | short circuit to supply | | Vlogue susses | status OK | 1 | |
| P1813 | | interruption or short circuit to gnd. | | End down town to the last of t | | | |
| 71814 | plausibility | negative gradient of signal > threshold | 1000tpm / 10maup | transmission condition furbine speed sensor difference (converted output- speed, turbine-speed) or shift-lag | friction-locked (forward) status OK >200rpm | Zomsec, condingus | two driving cycles |
| | | | | | monitoring short-circuit to gnd., supply | 10msec, | two driving |
| 1)P0962 | lower Breshold | Interruption or short circuit to gnd. | | | ocinterration | STOUBLING | cycles |
| P0745 | | current higher or lower than threshold | >220m4 (p-1) | low-side and high-side FET | activated | | |
| 83 | p | short arount to supply | | power supply | A6< | | |
| P0748 | | interruption | | voltage-drop at FET | Vt-so- | | |
| 9 | | interruption or short circuit to and. | | solenoid supply | A8c | | |
| H0775 | plausibility | current higher or lower than threshold | <730mA (p-1/l) | | | | |
| 1030 | upper meshod | short circuit to supply | | | monitoring current | | |
| 0 | no signal | interruption | | see above and | see above and | | |
| 3) 20870 | lower threshold | interruption or short circuit to grid. | | destred PWM-Signal | not 0% or not 100% | | |
| P0795 | | current higher or lower than thrushold | >220mA (p-1) | | | | |
| 37.1 | 'n | short clicuil to supply | | | | | |
| 86 | no signal | Interruption | | | | | |
| (4) P2720 | lower threshold | Interruption or shart circuit to gnd. | | | | | |
| 13 | | current higher or lower than threshold | <730mA (p-1/l) | | | | |
| P2721 | upper threshold | short circuit to supply | | | | | |
| 18 | no alona | Information | | | | | |

<u>Fig. 75: V8 & V12 6-Speed Transmission Diagnosis (2003 - 1 Of 6)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 & V12 6-Speed Transmission Diagnosis (2003 - 2 Of 6)

| inveri threshold plausability current tig plausability current tig the state of the | | | Conditions | | Required |
|--|---|--|--|----------------------|----------|
| Solenoid Valves (1) P0973 (April 1700) P2730 (April 1700) P0753 (April 1700) P0753 (April 1700) P0754 (April 1700) P0755 (April 1700) P0755 (April 1700) P0756 (April 1700) P0756 (April 1700) P0757 (April 1700) P0758 (April 1700) P0758 (April 1700) P0758 (April 1700) P0759 | | | | | |
| P.2722 Planta-Bildy | out circuit to gnd. | | | | |
| (1) PO 12730 upper inneshold PO 12730 upper inneshold PO 1751 inneshold PO 1751 inneshold PO 1751 inneshold PO 1751 inneshold PO 1756 inne | wer than threshold | | | | - |
| (1)P1535 no signal (1)P0973 lower threshold P0753 upper threshold P0751 no signal (2)P0976 lower threshold P0756 upper threshold P0756 no signal (3)P0879 lower threshold P0756 no signal | to supply | | | | |
| (1)P0973 [Inner threshold P0753 upper fireshold P0754 upper fireshold P0754 upper fireshold P0756 upper fireshold F0758 upper fireshold P0759 upper fireshold P0769 upper fireshold P0761 upper firesh | uojid | | | | |
| (1)P0973 (Inwer threshold P0753 upper threshold P0751 no signal no signal P0759 upper threshold P0759 upper threshold P0759 nower threshold P0763 upper threshold P0763 upper threshold P0763 upper threshold P0761 no signal | >220mA (p-l) | shift-direction dof. time after shift-and | from D to P. R. N 2sec after shift-end for 1sec | 10msec, continues | |
| upper threshold no signal lower threshold upper threshold no signal lower threshold upper threshold no signal | Diagnosis by ASIO if PMN-signal corst, at 0%, 100% ort circuit to gnd. To diagnosis by ASIO if PMN-signal corst, at 0%, 100% ort circuit to gnd. Outsign extern lead (low) 44,89V Outsign extern lead (low) 44,89V | high-side FET high-side FET low-side FET | Vitage drap 4=1V renatived renatived renatived | 10msec. confinuis | |
| iower threefold upper threefold upper threefold no signal lower threefold upper threefold no signal | to supply Diagnosis by ASIC if PV/M-signal zonst. at 0%, 100% voltage return lead (high) >0,3V | | | | |
| upper threathold ro signal lower threathold upper threathold upper threathold no signal | Diagnosis 0,1 | | | | |
| upper threshold no signal lower threshold upper threshold no signal | | | | | |
| lower threshold upper threshold no signal | | | | | |
| lower threshold upper threshold no signal | Diagnosis 0,1 | | | | |
| upper threshold no signal | Diagnosis by ASIC if PVMA signal cares, at 05s, 1005s voltage return lead (live) 4C,15V voltage return lead (live) 4C,15V voltage return lead (live) 4C,15V 0.15V voltage return lead (live) 4C,15V 0.15V voltage return lead (live) 4C,15V voltage | | | | |
| no signal | Diagno | | | | |
| 200,000 | Diagnosis 0, | | | | |
| (1) of (2) - sous | | angine speed | Orpm to >100rpm (engine start) | 10msec | |
| | D | range position | ٩ | encine start | |
| Reserved for later present tower threshold interruption or short circuit to grid. | ort circuit to gnd. | | | | |
| P0768 upper threshold short circuit to supply | to supply | | | _ | |

<u>Fig. 76: V8 & V12 6-Speed Transmission Diagnosis (2003 - 2 Of 6)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 & V12 6-Speed Transmission Diagnosis (2003 - 3 Of 6)

| Component | Fault | Monitor Strategy Description | Malfunction Criteria | Threshold value | Secondary | Enable Conditions | Time | MIL. |
|-------------------------------------|------------------|---------------------------------|--|---|---|-----------------------------------|-----------------------|-----------------------|
| Torque Converter Clutch (TCC) | P0741 | genoral | diffengine speed, nour speed) > treshold over def. time | *diff-speed-rifengine torque) engine torque(-50; 300)/mr; diff-speed[25; 25]rpm: >30sec | terque converter clutch | clutch not opened | 10msec, continous | two driving cycles |
| val | ve >1846 | lower threshold | Interruption or short circuit to gnd. | | | | | |
| | P2761 | plausibility | current higher or lower than threshold | no monitoring | | | | |
| | P1836 | Upper Breshold | short circuit to supply | | | | | |
| | P2759 | langle on | interruption | | | | | |
| ower Supply | F1891 | upper threshold | battery voltage = threshold | V91=< | PET FET | >=400rpm enabled | 10 msec, continous | two driving cycles |
| | P1892 | lower threshold | battery voltage < threshold | VL-0 | engine speed | >=400pm | | |
| | P1880 | gerieral | battery voltage < threshold | \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\ | angina spead | >=400rpm and status OK enabled | | |
| Bear Ratio Monitoring | n | | | | | | 30msec, | two driving |
| | (1)-0731 | plausibility | output speed x ratio - input speed >- | > characteristic speed-difference=f(engine speed) | transmission oil temp. | D.0x | | cyclos |
| | (2) 20732 | plausibility | output speed x ratio - input speed >- | angine speed (0: 1000; 5000) rpm | actual Range | 1, 2, 3, 4, 5, 6 | | |
| | (3) P0733 | phausibility | output speed x ratio - Input speed > | speed-diffurence (200; 200; 400) rpm | peeds indino | >258rpm | | |
| | (4) 20734 | Alignospility | [output speed x ratio - input speed] > Unashold | | peadine speed | ™q1001< | | |
| - | (S)P0735 | piausibility | output speed x ratio - input speed > | | paods Indu | ™d16rpm | | |
| | (e) P0729 | phausibility | [output speed x ratio - input speed] > | | peeds indu | status OK | | |
| | | | | | Stand by Control SBC | inactiv | | |
| Range Shift monitoring | B ₁ L | | | | | | 3drisec, | two driving |
| (1) →(2) AP1881 | AP1881 | Upper threshold | (input speed - output speed x railo) > | >500rpm. | paeds indino | >300rpm | | cycles |
| | BP0781 | general | (input speed - output speed x ratio)(f) - (input speed - output speed x ratio)(f=0) < threshold | -30rpm < raic, value < 30rpm | fransmission oil temp. engine speed range poelition | >=800rpm not P, R, N | | |
| (2) +(3) | (2) -(3) AP1882 | upper threshold | (input speed - output speed x ratto) >- | Hidings- | paeds indino | >300rpm | | |
| | B-0782 | general | (input speed - output speed x ratio)(i) - (input speed - output speed x ratio)(t=0) | -30rpm < calc. value < 30rpm. | transmission oil temp. engine speed | D,0=< | | |

Fig. 77: V8 & V12 6-Speed Transmission Diagnosis (2003 - 3 Of 6) Courtesy of BMW OF NORTH AMERICA, INC.

V8 & V12 6-Speed Transmission Diagnosis (2003 - 4 Of 6)

| Required Illum. | British dwil | septio | | | | | | | | | | | | | | | | 50msec. two driving | cycles |
|---------------------------------|------------------------|---|---|--|---|---|---|------------------|---|-------------------|--|------------------|---|-------------------|---|------------------|---|-------------------------------|---|
| Enable | | >340rpm | >=0°C >=600nm not P. R. N | ×300rpm | 2,0=4 >=600pm not 9, 8, N | >300rpm | >=0°C >=600pm not P. S. N | >250rpm | >=0.0 >=4000pm | >500rpm | >=0.0 >=600gm | >700rpm | >=0°C >=500rpm not P. R. N | >800rpm | >=0°C >=800rpm not P. R. N | >1100mm | >=0°C >=600mm not P. R. N | Status OfC | Status OK |
| Secondary | | peeds inding | bansvission oil lomp. engine speed range position | peeds Indino | banamisalon oil temp. engine speed range position | peeds indino | transmission oil temp. engine speed range position | peeds Indino | transmission oil temp. engine speed range position | paper speed | transmission oil rump. angine speed range position | paribut speed | transmission oil tamp. engine speed range position | pads indiac | transmission oil temp. angine speed rearge position | pads spead | transmission oil temp. engine speed rearge position | DME-CAN Connection | CAN-Bus |
| Threshold | | >400rpm | -Sorpm < calc. value < dopm | >400rpm | -Strpm < calc, valve < 30rpm | >400rpm | -Збрян « саю, уакур « 25крт | | 30rpm < calc. value < 30rpm | | -30rpm < calc. value < 30rpm | | -30rpm < celo, value < 30rpm | | -SOrpm < calc. value < 30rpm | | -30pm < calc. value < 30pm | | no afteration of all/re-counter or wrong Checksum |
| Malfunction Criteria | | (Input speed - output speed x ratio) >- | (input speed - output speed x ratio)(t=0) (input speed - output speed x ratio)(t=0) > threshold | (input speed - output speed x ratio) >- threshold | (input speed - output speed x ratio)(() - ((input speed x parto)(i=0) - threshold | (input speed - autput speed x ratio) > threshold | (input speed - output speed x ratb)(t) - (input speed - output speed x ratb)(t=0) > threshold | no monitoring | (input speed - output speed x ratio)(f) = (input speed - output speed x ratio)(t=0) > threshold | no monitoring | (input speed - output speed x ratio)(t) - (input speed - output speed x ratio)(t=0) > breshold | no monitoring | (input speed - output speed x ratio)(t) - (input speed - output speed x ratio)(t=0) > timashold | no monitoring | (input speed - output speed x ratio)(i) - (input speed - output speed x ratio)(in0) - treathold | no monitoring | (input speed - output speed x ratio)() - (input speed x ratio)((=0) x threshold | CAN-Message signal error-tlag | alive-counter or theologum |
| Monitor Strategy Description | | upper threshold | guneral | upper threshold | general | upper threshold | general | blodsatthrapper | general | upper threshold | general | upper threshold | general | blodser threshold | panaral | upper threshold | general | plausibility | |
| System Code | Range Shift monitoring | (3) -+(4) AP-1883 | BP0783 | (4) -1(5) AP1884 | B 20784 | (5) →(6) AP1885 | B-0828 | (2) -x(1) AP1871 | B >1881 | (3) -+(Z) A P1872 | B>1862 | (4) -x(3) AP1873 | B 21863 | (5) +(4) AP1874 | B ² 1864 | (6) -+(5) AP1675 | B 24365 | Engine Torque P1771. | |

<u>Fig. 78: V8 & V12 6-Speed Transmission Diagnosis (2003 - 4 Of 6)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 & V12 6-Speed Transmission Diagnosis (2003 - 5 Of 6)

| Enable Time MIL Conditions Required Illum. | not P, R, N, Z and stutus OK SOmeso, Iwo driving status OK or substitute value confirmus OK status OK | no Error and ready-fo-transmit 20msov. one driving no transmission of wake-up signal cyclin cyclin cyclin -59V. | no Error and roady-to-trainsmit continous two driving no transmission of wake-up signal cycles sylv | Sultus OK Zürnsec, two driving Status OK confirmus cycles status on | Steaus OK Software, No criving Software OK Software OK Software OK Software OK Software OK Steaus OK Software OK Steaus OK Software OK Steaus OK Software OK | status OK Someoc, two driving on frous status OK | 20msec. two driving cycles cycles | Zünseit, two-criving confinous cycles | Stafus on 20msec, che driving confinence continues covicing | Zonrasc. Neo driving continous cydats | Initialization: 0 or 1 continuos two driving continuos and in and in |
|---|---|---|---|---|--|---|---|---|---|---|--|
| Secondary | Range Position engine speed Park-Lock Sensor | CAN-Bus TCM-CAN battery voltage | CAN-Bus TCM-CAN battery voltage | DME-CAN Connection CAN-Bus (gnifton | DME-CAN Connection DSC-CAN Connection CAN-Bus (grifton) | DME CAN-Connection ignition signal CAN-Bus | | BUOLI | ignition | none | Status-Counter |
| Threshold value | */000rpm | Timpoult | Титеоцк | 7 | Status not OK Status not OK | =1 no alteration of alive-counter or wrong Checksum | | Park-Look dispbled Timeout | £ | colliding of 2 Energency-Functions same priority of them solarid Valve have aloricalized to suppy or interruption | exceeding diff. thresholds. |
| Malfunction Criteria | engine speed | CAN-Connection DME | CAN-Connection DSC | Message Signal Error-Flag | brake ine-pressure brake switch | CAN-Message signal error-flag allive-counter or checksum | Message Signal-Error | Manual Park-Lock Disabling Instrument-Pack | CAM-Bus disabled | SW-Functions actuating sciencid valves | arror-counter |
| Monitor Strategy Description | plausibility | plausibility | plausibility | plausibility | plausibility | filldisusiq | plausibility | dallidsne/d | plausibility | general | general |
| Fault | P1728 | P1720 | P1721 | P1765 | P1782 | F1727 | 107191 | P1888 | P1747 | P1702 | P1792 |
| Component/ System | Engine Overspeed | Timeout DME CAN- Connection | Timeout DSC CAN- Connection | Throttle Valve Signal | Brake Pedal Signal | Engine Speed Signal | Range Position Switch P1701 (Driver's request) | Manual Park-Lock disabling and Instrument-Pack Timeout | CAN-Bus | Colliding Functions or not allowed actualing of valves (at detected interruption or short- circuit to supply) | Watch-Dog |

<u>Fig. 79: V8 & V12 6-Speed Transmission Diagnosis (2003 - 5 Of 6)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 & V12 6-Speed Transmission Diagnosis (2003 - 6 Of 6)

| Component/ System | Fault | Monitor Strategy Description | Malfunction Criteria | Threshold value | Secondary | Enable Conditions | Time | MIL Illum. |
|-----------------------------|--------|---------------------------------|---|--|--|--|---|----------------------|
| CM Hot Disabiing | P1783 | goneral | max(Chip-1emp, + 0°C, TransC&-Temp 10°C) > Investroid=i(taillery-voilage) | > cnaracteristic voltaga 16.4, 16.5, 18.5, 25, 25JV Temp[141, 121, 111, 61, 81]°C. | nene | | 100msec, continuus and in initialization | two driving cydes |
| /aive Voitage Supply | P1896 | plausibility | FET drive | not passible | Status-Counter | Initialization: 0 or 1 | 10msec, | two driving |
| | P1893 | upper threshold | short-circuit to supply | X | filtered battery voltage | V/× | andin | cydes |
| | P1894 | lower Brreshold | short-circuit to grut, or sensor supply voltage < threshold or FET-drop-voltage > threshold | nensor supply <0.5V, drop-voltage>1V | high-side and low-side-FET buttery voltage | in operation: enabled >7V | | |
| | P1695 | no signal | Interuption | | | The second secon | | |
| Sensor Voltage Supply P1897 | /P1887 | upper threshold | sensor supply Volkage >ffreshold | А₿к | battery-voltage | V20.8v | 20msec, | nwa driving |
| | P1898 | lower threshold | sensor supply Voltage chineshold | <5.5V | | | | cycles |
| EPROM | P1791 | plausibility | Checksum-Error | 4 | none | | 20msec, continous | one driving cycle |
| PROM | D1790 | plausibility | Checksum Error | 10 | лопа | | 10msec, confinous | (wo driving |

<u>Fig. 80: V8 & V12 6-Speed Transmission Diagnosis (2003 - 6 Of 6)</u> Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES V8 & V12 TRANSMISSION (6-SPEED - 2004)

DIAGNOSTIC TROUBLE CODES V8 & V12 TRANSMISSION (6-SPEED - 2004)

| DIAGNOSTIC | TROUBLE CODES | 5 V 6 & V 12 T KANSIVII SSION (0-2 | SPEED - 2004) |
|------------|---------------|------------------------------------|---------------------------------|
| PCode | BMW Code | Possible Cause | Diagnostic Parameter |
| P0668 | | Chip Temp | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 10 OF</u> |
| | | | <u>10)</u> |
| P0669 | | Chip Temp | See <u>V8 & V12 6-SPEED</u> |
| 1 | | | |

| | | | TRANSMISSION |
|--------|-------|--------------------------------|---|
| | | | <u>DIAGNOSIS (2004 - 10 OF</u> |
| | | | <u>10</u>) |
| P0701 | | Range Position Switch | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 9 OF</u> |
| D0702 | | XX 4 1 1 | 10). |
| P0702 | ••••• | Watchdog | See <u>V8 & V12 6-SPEED</u> TRANSMISSION |
| | | | DIAGNOSIS (2004 - 9 OF |
| | | | 10). |
| P0705 | | Range Position Switch | See V8 & V12 6-SPEED |
| - 0,00 | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 9 OF</u> |
| | | | <u>10)</u> . |
| P0710 | | Oil Temperature Sensor | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 2 OF</u> |
| D0511 | | 0.11.00 | <u>10)</u> . |
| P0711 | | Oil Temperature Sensor | See V8 & V12 6-SPEED |
| | | | <u>TRANSMISSION</u> DIAGNOSIS (2004 - 2 OF |
| | | | 10). |
| P0712 | | Oil Temperature Sensor | See V8 & V12 6-SPEED |
| 10/12 | | on reinperature sensor | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 2 OF |
| | | | <u>10</u>). |
| P0713 | | Oil Temperature Sensor | See V8 & V12 6-SPEED |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 2 OF |
| | | | <u>10)</u> . |
| P0714 | | Oil Temperature Sensor | See V8 & V12 6-SPEED |
| | | | <u>TRANSMISSION</u> DIAGNOSIS (2004 - 2 OF |
| | | | 10). |
| P0715 | 20200 | Input/Turbine Speed Sensor "A" | See <u>V8 & V12 6-SPEED</u> |
| 10713 | 20200 | Circuit | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 1 OF |
| | | | <u>10)</u> . |
| P0720 | 20201 | Output Speed Sensor Circuit | See V8 & V12 6-SPEED |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 2 OF |
| | | | <u>10)</u> . |
| P0721 | | Output Speed Sensor Circuit | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 1 OF 10)</u> |
| P0729 | | Gear Ratio Monitoring | See V8 & V12 6-SPEED |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 6 OF |
| | | | <u>10)</u> . |
| P0731 | 20301 | Gear 1 Incorrect Ratio | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 6 OF</u> |
| _ | | | <u>10)</u> . |
| | I | I 3658 of 4036 | I |

| P0732 | 20302 | Gear 2 Incorrect Ratio | See <u>V8 & V12 6-SPEED</u> |
|-------|-------|-----------------------------------|---------------------------------|
| | | | <u>TRANSMISSION</u> |
| | | | DIAGNOSIS (2004 - 6 OF |
| | | | <u>10</u>). |
| P0733 | 20303 | Gear 3 Incorrect Ratio | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 6 OF</u> |
| | | | <u>10)</u> . |
| P0734 | 20304 | Gear 4 Incorrect Ratio | See <u>V8 & V12 6-SPEED</u> |
| | | | <u>TRANSMISSION</u> |
| | | | DIAGNOSIS (2004 - 6 OF |
| | | | <u>10)</u> . |
| P0735 | 20305 | Gear 5 Incorrect Ratio | See <u>V8 & V12 6-SPEED</u> |
| | | | <u>TRANSMISSION</u> |
| | | | DIAGNOSIS (2004 - 6 OF |
| | | | <u>10</u>). |
| P0736 | | Gear Ratio Monitoring | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 6 OF |
| | | | <u>10)</u> . |
| P0741 | 20307 | Torque Converter Clutch Circuit | See <u>V8 & V12 6-SPEED</u> |
| | | Performance or Stuck Off | <u>TRANSMISSION</u> |
| | | | DIAGNOSIS (2004 - 5 OF |
| | | | <u>10)</u> . |
| P0745 | 20000 | Pressure Control Solenoid "A" | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF |
| | | | <u>10</u>). |
| P0748 | 20000 | Pressure Control Solenoid "A" | See <u>V8 & V12 6-SPEED</u> |
| | | Electrical | <u>TRANSMISSION</u> |
| | | | DIAGNOSIS (2004 - 3 OF |
| | | | <u>10</u>). |
| P0751 | 20100 | Shift Solenoid "A" Performance or | See <u>V8 & V12 6-SPEED</u> |
| | | Stuck Off | <u>TRANSMISSION</u> |
| | | | <u>DIAGNOSIS (2004 - 4 OF</u> |
| | | | <u>10</u>). |
| P0753 | 20100 | Shift Solenoid "A" Electrical | See <u>V8 & V12 6-SPEED</u> |
| | | | <u>TRANSMISSION</u> |
| | | | DIAGNOSIS (2004 - 4 OF |
| | | | <u>10)</u> . |
| P0756 | 20101 | Shift Solenoid "B" Performance or | See <u>V8 & V12 6-SPEED</u> |
| | | Stuck Off | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 5 OF |
| | | | <u>10)</u> . |
| P0758 | 20101 | Shift Solenoid "B" Electrical | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 4 OF |
| | | | <u>10)</u> . |
| P0775 | 20001 | Pressure Control Solenoid "B" | See <u>V8 & V12 6-SPEED</u> |
| | | | <u>TRANSMISSION</u> |
| | | | DIAGNOSIS (2004 - 3 OF |
| | | | <u>10</u>). |
| P0778 | 20001 | Pressure Control Solenoid "B" | See <u>V8 & V12 6-SPEED</u> |
| | | Electrical | <u>TRANSMISSION</u> |
| | | | DIAGNOSIS (2004 - 3 OF |
| | | | |

| | | 1 2 71 10 | 10). |
|------------------------|-------|-------------------------------|---|
| P0781 | 20311 | 1-2 Shift | See V8 & V12 6-SPEED |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 6 OF</u> 10) |
| P0782 | 20312 | 2-3 Shift | See V8 & V12 6-SPEED |
| FU/02 | 20312 | 2-3 Silit | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 6 OF |
| | | | 10) |
| P0783 | 20313 | 3-4 Shift | See V8 & V12 6-SPEED |
| 20,00 | 20010 | | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 6 OF |
| | | | 10) |
| P0784 | 20314 | 4-5 Shift | See <u>V8 & V12 6-SPEE</u> I |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 7 OF</u> |
| | | | <u>10)</u> |
| P0795 | 20002 | Pressure Control Solenoid "C" | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 3 OF</u> |
| D 0 5 00 | 20002 | | <u>10)</u> |
| P0798 | 20002 | Pressure Control Solenoid "C" | See V8 & V12 6-SPEED |
| | | Electrical | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 3 OF</u> |
| P0829 | | Range Shift Monitoring | See V8 & V12 6-SPEED |
| FU029 | ••••• | Range Shift Monitoring | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF |
| | | | 10). |
| P0962 | | Pressure Regulator Valve | See V8 & V12 6-SPEED |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF |
| | | | <u>10)</u> |
| P0963 | | Pressure Regulator Valve | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 3 OF</u> |
| | | | 10) |
| P0966 | | Pressure Regulator Valve | See V8 & V12 6-SPEED |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 3 OF</u> 10) |
| D0067 | | Dungaryan Dansylaton Valera | |
| P0967 | | Pressure Regulator Valve | See <u>V8 & V12 6-SPEED</u> TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 3 OF</u> |
| | | | 10) |
| P0970 | | Pressure Regulator Valve | See <u>V8 & V12 6-SPEED</u> |
| _ 0, 10 | | 11035aio 100gaiatoi vaivo | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF |
| | | | 10) |
| P0971 | | Pressure Regulator Valve | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF |
| | | | <u>10)</u> |
| | | Solenoid Valve | See <u>V8 & V12 6-SPEED</u> |
| P0973 | ••••• | Bolenola valve | |
| P0973 | •••• | Solehold valve | TRANSMISSION |

| | | | <u>DIAGNOSIS (2004 - 3 OF</u> 10) |
|-------|-------|---|--|
| P0979 | | Interlock Lower Threshold | See V8 & V12 6-SPEED TRANSMISSION DIAGNOSIS (2004 - 5 OF |
| P0982 | | Shiftlock Interruption Or Short To Ground | 10) See <u>V8 & V12 6-SPEEI</u> TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 5 OI</u> |
| P1720 | 20800 | CAN Timeout Control Module | See <u>V8 & V12 6-SPEEI</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (2004 - 8 OI</u> 10) |
| P1721 | 20801 | CAN Timeout ASC/DSC | See <u>V8 & V12 6-SPEET</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (2004 - 8 OF</u> 10) |
| P1727 | 20903 | CAN Engine Speed | See <u>V8 & V12 6-SPEEI</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (2004 - 8 OF 10)</u> |
| P1728 | 20336 | Engine Overspeed Condition | See <u>V8 & V12 6-SPEEI</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (2004 - 8 OF 10)</u> |
| P1747 | 52999 | CAN-Bus Monitoring | See <u>V8 & V12 6-SPEEI</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (2004 - 9 OF 10</u> |
| P1771 | 20901 | CAN Torque Interface Plausibility | See <u>V8 & V12 6-SPEED</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (2004 - 8 OF</u> <u>10)</u> |
| P1790 | 20400 | Internal Transmission Control Module Memory Checksum/EPROM Error | See <u>V8 & V12 6-SPEEI</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (2004 - 10 OI</u> <u>10</u>) |
| P1791 | 20401 | Internal Transmission Control Module Memory Checksum/EEPROM Error | See <u>V8 & V12 6-SPEED</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (2004 - 10 OF</u> <u>10)</u> |
| P1792 | 20402 | Internal Transmission Control Module Watchdog Error | See <u>V8 & V12 6-SPEED</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (2004 - 9 OF</u> 10) |
| P1793 | 20330 | ETC Cut-Off due to Overtemperature Condition | See <u>V8 & V12 6-SPEEI</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (2004 - 9 OI</u> <u>10)</u> |
| P1798 | | EPROM Plausibility | See <u>V8 & V12 6-SPEEL</u> <u>TRANSMISSION</u> <u>DIAGNOSIS (2004 - 10 OF</u> <u>10)</u> |
| P1810 | 20200 | Input/Turbine Speed Sensor | See V8 & V12 6-SPEEI |

| I | 1 | Circuit High | TRANSMISSION | | | | | | |
|--------|-------|---|--|--|--|--|--|--|--|
| | | Cheuit High | <u>1 KANSWISSIO</u> <u>DIAGNOSIS (2004 - 1 O</u> | | | | | | |
| | | | <u>10)</u> . | | | | | | |
| P1811 | 20200 | Input/Turbine Speed Sensor | See <u>V8 & V12 6-SPEED</u> | | | | | | |
| | | Circuit Low | TRANSMISSION | | | | | | |
| | | | <u>DIAGNOSIS (2004 - 1 OF</u> | | | | | | |
| P1812 | 20201 | Overtage Consol Consol Cinquit High | <u>10)</u> . See V8 & V12 6-SPEED | | | | | | |
| P1812 | 20201 | Output Speed Sensor Circuit High Input | TRANSMISSION | | | | | | |
| | | При | DIAGNOSIS (2004 - 2 OF | | | | | | |
| | | | <u>10).</u> | | | | | | |
| P1813 | 20201 | Output Speed Sensor Circuit Low | See <u>V8 & V12 6-SPEED</u> | | | | | | |
| | | Input | TRANSMISSION | | | | | | |
| | | | <u>DIAGNOSIS (2004 - 2 OF</u> | | | | | | |
| D1014 | 20202 | Onton Continue Continue Tra | 10). | | | | | | |
| P1814 | 20203 | Output Speed Sensor Gradient Too High | See <u>V8 & V12 6-SPEED</u> TRANSMISSION | | | | | | |
| | | Tilgii | DIAGNOSIS (2004 - 2 OF | | | | | | |
| | | | <u>10).</u> | | | | | | |
| P1861 | 20316 | 2-1 Shift | See . <u>V8 & V12 6-SPEED</u> | | | | | | |
| | | | <u>TRANSMISSION</u> | | | | | | |
| | | | <u>DIAGNOSIS (2004 - 3 OF 10)</u> | | | | | | |
| P1862 | 20317 | 3-2 Shift | See V8 & V12 6-SPEED | | | | | | |
| | | | <u>TRANSMISSION</u> <u>DIAGNOSIS (2004 - 3 OF</u> | | | | | | |
| | | | <u>DIAGNOSIS (2004 - 3 OF</u> 10). | | | | | | |
| P1863 | 20318 | 4-3 Shift | See V8 & V12 6-SPEED | | | | | | |
| 11005 | 20310 | 1 3 Silit | TRANSMISSION | | | | | | |
| | | | DIAGNOSIS (2004 - 3 OF | | | | | | |
| | | | <u>10</u>). | | | | | | |
| P1864 | 20319 | 5-4 Shift | See <u>V8 & V12 6-SPEED</u> | | | | | | |
| | | | TRANSMISSION DIACNOSIS (2004 - 2 OF | | | | | | |
| | | | <u>DIAGNOSIS (2004 - 3 OF</u> 10). | | | | | | |
| P1865 | 20320 | 6-5 Shift | See V8 & V12 6-SPEED | | | | | | |
| P1865 | 20320 | | TRANSMISSION | | | | | | |
| | | | DIAGNOSIS (2004 - 8 OF | | | | | | |
| | | | <u>10</u>). | | | | | | |
| P1881 | 20311 | 1-2 Shift Circuit High | See <u>V8 & V12 6-SPEED</u> | | | | | | |
| | | | TRANSMISSION DIAGNOSIS (2004 - 6 OF | | | | | | |
| | | | <u>DIAGNOSIS (2004 - 6 OF</u> 10). | | | | | | |
| P1882 | 20312 | 2-3 Shift Circuit High | See V8 & V12 6-SPEED | | | | | | |
| 1 1002 | 20312 | 2 5 Smit Chedit High | TRANSMISSION | | | | | | |
| | | | DIAGNOSIS (2004 - 6 OF | | | | | | |
| | | | <u>10</u>). | | | | | | |
| P1883 | 20313 | 3-4 Shift Circuit High | See <u>V8 & V12 6-SPEED</u> | | | | | | |
| 1 1000 | | | TRANSMISSION | | | | | | |
| | | | DIAGNOSIS (2004 - 6 OF | | | | | | |
| P1884 | 20314 | 4-5 Shift Circuit High | See V8 & V12 6-SPEED | | | | | | |
| 11004 | 20314 | 7-3 Smit Cheuit High | TRANSMISSION | | | | | | |
| | | | DIAGNOSIS (2004 - 7 OF | | | | | | |
| | | | <u>10)</u> . | | | | | | |
| P1885 | 20315 | 5-6 Shift Circuit High | See <u>V8 & V12 6-SPEED</u> | | | | | | |
| | 1 | I | | | | | | | |

| ı | I | 1 | TRANSMISSION | | | | | | |
|--------|-------|--|--|--|--|--|--|--|--|
| | | | <u>DIAGNOSIS (2004 - 7 OF 10)</u> | | | | | | |
| P1888 | 20337 | CAN Timeout Instrument Pack | See V8 & V12 6-SPEED | | | | | | |
| | | during Operation Parking Interlock | | | | | | | |
| | | Emergency Release | DIAGNOSIS (2004 - 9 OF | | | | | | |
| | | | <u>10</u>). | | | | | | |
| P1890 | 20500 | System Voltage | See V8 & V12 6-SPEED | | | | | | |
| | | | TRANSMISSION DIA CNOSIS (2004 5 OF | | | | | | |
| | | | <u>DIAGNOSIS (2004 - 5 OF</u> | | | | | | |
| P1891 | 20500 | System Voltage High Input | See V8 & V12 6-SPEED | | | | | | |
| F 1091 | 20300 | System voltage High lilput | TRANSMISSION | | | | | | |
| | | | DIAGNOSIS (2004 - 5 OF | | | | | | |
| | | | 10). | | | | | | |
| P1892 | 20500 | System Voltage Low Input | See V8 & V12 6-SPEED | | | | | | |
| | | | TRANSMISSION | | | | | | |
| | | | DIAGNOSIS (2004 - 5 OF | | | | | | |
| | | | <u>10</u>). | | | | | | |
| P1893 | 20501 | Supply Voltage Pressure Control | See <u>V8 & V12 6-SPEED</u> | | | | | | |
| | | Solenoid/Shift Solenoid Circuit | TRANSMISSION | | | | | | |
| | | High | <u>DIAGNOSIS (2004 - 10 O</u> | | | | | | |
| 71001 | 20701 | | 10). | | | | | | |
| P1894 | 20501 | Supply Voltage Pressure Control | See V8 & V12 6-SPEED | | | | | | |
| | | Solenoid/Shift Solenoid Circuit Low | <u>TRANSMISSION</u> DIAGNOSIS (2004 - 10 OF | | | | | | |
| | | Low | 10). | | | | | | |
| P1895 | 20501 | Supply Voltage Pressure Control | See V8 & V12 6-SPEED | | | | | | |
| 1 10/5 | 20301 | Solenoid/Shift Solenoid No Signal | TRANSMISSION | | | | | | |
| | | Solemora Simit Solemora 1 to Signar | DIAGNOSIS (2004 - 10 OF | | | | | | |
| | | | <u>10).</u> | | | | | | |
| P1896 | 20501 | Supply Voltage Pressure Control | See <u>V8 & V12 6-SPEED</u> | | | | | | |
| | | Solenoid/Shift Solenoid | <u>TRANSMISSION</u> | | | | | | |
| | | | <u>DIAGNOSIS (2004 - 10 OF</u> | | | | | | |
| | | | <u>10)</u> . | | | | | | |
| P1897 | 20502 | Supply Voltage Sensors High Input | | | | | | | |
| | | | TRANSMISSION | | | | | | |
| | | | <u>DIAGNOSIS (2004 - 10 OF</u> | | | | | | |
| D1000 | 20502 | Consultar Valtaria Consultaria Luccia | 10). | | | | | | |
| P1898 | 20502 | Supply Voltage Sensors Low Input | See <u>V8 & V12 6-SPEED</u> <u>TRANSMISSION</u> | | | | | | |
| | | | <u>IRANSWISSION</u> <u>DIAGNOSIS (2004 - 10 OF</u> | | | | | | |
| | | | 10). | | | | | | |
| P2713 | | Pressure Regulator Valve | See V8 & V12 6-SPEED | | | | | | |
| | | | TRANSMISSION | | | | | | |
| | | | DIAGNOSIS (2004 - 3 OF | | | | | | |
| | | | <u>10</u>). | | | | | | |
| P2716 | | Pressure Regulator Valve | See <u>V8 & V12 6-SPEED</u> | | | | | | |
| | | | TRANSMISSION | | | | | | |
| | | | DIAGNOSIS (2004 - 3 OF | | | | | | |
| | | | <u>10).</u> | | | | | | |
| P2721 | | Pressure Regulator Valve | See V8 & V12 6-SPEED | | | | | | |
| | | | TRANSMISSION DIAGNOSIS (2004 - 3 OF | | | | | | |
| | | | <u>DIAGNOSIS (2004 - 3 OF 10).</u> | | | | | | |
| P2722 | | Pressure Regulator Valve | See <u>V8 & V12 6-SPEED</u> | | | | | | |
| | •••• | Tressure regulator valve | Sec vo & viz 0-SFEED | | | | | | |
| | | • | • | | | | | | |

| | | | TRANSMISSION |
|-----------|-------|--------------------------|---|
| | | | <u>DIAGNOSIS (2004 - 3 OF</u> |
| 70.50.5 | | | 10). |
| P2725 | | Pressure Regulator Valve | See V8 & V12 6-SPEED |
| | | | <u>TRANSMISSION</u> DIAGNOSIS (2004 - 3 OF |
| | | | <u>DIAGNOSIS (2004 - 3 OF</u> 10). |
| P2729 | | Pressure Regulator Valve | See V8 & V12 6-SPEED |
| 1 2 / 2 9 | ••••• | Tressure Regulator varve | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF |
| | | | <u>10).</u> |
| P2730 | ***** | Pressure Regulator Valve | See V8 & V12 6-SPEED |
| | | <u> </u> | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 3 OF |
| | | | <u>10</u>). |
| P2759 | | TCC Valve | See <u>V8 & V12 6-SPEED</u> |
| | | | TRANSMISSION |
| | | | <u>DIAGNOSIS (2004 - 5 OF</u> |
| D0=64 | | maa vii | 10). |
| P2761 | | TCC Valve | See V8 & V12 6-SPEED |
| | | | TRANSMISSION DIAGNOSIS (2004 5 OF |
| | | | <u>DIAGNOSIS (2004 - 5 OF</u> 10). |
| P2763 | | TCC Valve | See V8 & V12 6-SPEED |
| 1 2 / 03 | | Tee valve | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 5 OF |
| | | | <u>10).</u> |
| P2764 | •••• | TCC Valve | See V8 & V12 6-SPEED |
| | | | TRANSMISSION |
| | | | DIAGNOSIS (2004 - 5 OF |
| | | | <u>10</u>). |

V8 & V12 6-Speed Transmission Diagnosis (2004 - 1 Of 10)

| MIL Illum. | two driving cycles | | hwo | driving | | | | | Dw0 | cycles | | | | | | |
|---|---|--|-------------------------|-----------------|------------------|----------------------|--|---------------------------------------|--|------------------|---|------------------|--------------------------------|------------------------------------|-------------------------------|---------------------------------------|
| Time Required | 20 msec, cont. | | 20 msec, cont. | | | | | | 20 msec, cont. | | | | | | | |
| Enable Conditions | status OK | status OK | no electr, error | status OK | no electr. error | status OK, > 600 rpm | status OK or substitute value, > 250 rpm status OK or substitute value | friction-locked (forward or backward) | status OK | no electr. error | Stafus OK | no electr, error | mean speed of driven wheels OK | mean speed of non-driven wheels DK | converted wheel speed >500rpm | diff, of driven and non-driven wheels |
| Secondary Parameter | sonsor supply | sensor supply (NTU > 7700 rpm) | sensor (NTU > 7700 rpm) | Apidons socials | sensor | ongine speed | coutput speed range position | transmission condition | sensor supply | sensor | Sensor supply | sensor | wheel speed | | | |
| Threshold value | L 1 | > 7700 rpm, < 20 rpm | | | | | | | >= 8400 rpm (default but variant-specific) | ъ | difference to converted wheel speed > 250 rpm | | | | | |
| Malfunction Criteria | short dreuit to supply interruption or short circuit to ground | signal greater or lower than threshold | | | | | | | signal greater than threshold | | | | | | | |
| Monitor Fault Strategy Code Description | upper threshold | plausibility | | | | | | | general | | | | | | | |
| Fault | P1810 | P0715 | | | | | | | P0721 | | | | | | | |
| Component System AT 6HP26 | Turbine Speed Sensor (Input Speed NTU) | | | | | | | | Output Speed Sensor | | | | | | | |

<u>Fig. 81: V8 & V12 6-Speed Transmission Diagnosis (2004 - 1 Of 10)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 & V12 6-Speed Transmission Diagnosis (2004 - 2 Of 10)

| MIL Illum. | | | two driving cycles | driving | change | | | | |
|---|---|---|--|--|--|--|--|-------------------------------|---|
| Time Required | | | 20 msec, cont. | 100 msec, continous | | | | | |
| Enable Conditions | status OK | friction locked backward or forward =0 (no shift) status OK status OK status OK | friction-locked (forward) status OK >200pm =1 | | | | | | > 400 rpm and status OK > 400 rpm and status OK |
| Secondary Parameter | sensor supply | ahili Ma ahili Ma hutrine peed sensor supply wheel speed | transmission condition turbin spend sensor difforence (converted outpuir eyeed, furbine-speed) or shiff-lag, | voltage at sensor-connectors between 2.3V and 2.7V | | | | | peeds tugni peeds engue |
| Threshold value | | > 280mm > 200mm | 1000rpm / 10msec | voltage at sensor- | sensor-plus > 4.5V and sensor-minus > 0.5V | sensor-plus < 4.5V and sensor-minus < 0.5V | sensor-plus > 4.5V and sensor-minus < 0.5V | increase of +20*C / 100 misec | OR diff(ol-temp, TCU-temp) >thrushold threshold = toleramae between 25°C and 40°C |
| Malfunction Criteria | short drouit to supply interruption or short circuit to ground | speed difference to wheel speed and turbine speed | nogative gradient of signal > fineshold | short circuit in sensor | short circuit to supply | short circuit to ground | interruption | | gradient > throshold or deviation of oll-temp to TCU-temp |
| Monitor Fault Strategy Code Descripti on | threshold lower | plausibility | plausibility | general | upper | fowar | no signal | | plausibility |
| Fault | P1812 P1813 | P0720 | P1814 | P0711 | P0713 | P0712 | P0714 | | P0710 |
| Component/ System A/T 6HP26 | | | | Oil-Temperature Sensor | | | | | |

<u>Fig. 82: V8 & V12 6-Speed Transmission Diagnosis (2004 - 2 Of 10)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 & V12 6-Speed Transmission Diagnosis (2004 - 3 Of 10)

| MIL III | two | cycles | | | | | | | | | | | | | | | | | | | |
|---|-------------------------------------|---|--|-------------------------|---------------------|---|--|-------------------------|---------------|---|--|-------------------------|--------------|---|--|-------------------------|--------------|---|--|-------------------------|---------------|
| Time MIL Required Illum. | 10 msec, cont. | | | | | | | | | | | | | | | | | | | | |
| Enable Conditions | manitoring shart-circuit to ground, | supply or interruption | activated | N6 < | V1 => | A6 < | | monitoring current | see above and | not 0% or not 100% | | | | | | | | | | | |
| Secondary Parameter | | | low-side and high-side FET | Apdra sawod | voltage-drop at FET | Vigna supply | | | see above and | desired PWM-Signal | | | | | | | | | | | |
| Threshold value | | | > 220mA (p-1) | | | ť | < 730mA (p-1/l) | 3.1 | | , | > 220mA (p-I) | | | | < 730mA (p-1/l) | | | • | no monitoring | | |
| Malfunction Criteria | | interruption or short circuit to ground | current higher or lower than threshold | short circuit to supply | interruption | interruption or short circuit to ground | current higher or lower than threshold | short circuit to supply | interruption | Interruption or short circuit to ground | current higher or lower than threshold | short circuit to supply | interruption | interruption or short aircuit to ground | current higher or lower than threshold | short circuit to supply | Interruption | interruption or short circuit to ground | current higher or lower than threshold | short circuit to supply | intermination |
| Monitor Fault Strategy Code Descripti on | | lower | piansibility | neddn | no signal | lower throughold | plausibility | upper | lengis on | lower | plausibility | upper | no signal | lower | plausibility | upper | no signal | lower | plausibility | upper | no signal |
| Fault | | (1) P0962 | P0745 | P0963 | P0748 | (z) P0966 | P0775 | P0967 | P0778 | (3) P0970 | P0795 | P0971 | P0798 | (4) P2720 | P2713 | P2721 | P2716 | (5) P2729 | P2722 | P2730 | P2725 |
| Component/ System A/T 6HP26 | Pressure Regulator Valves | 9 | | | | ٺ | | | | 9 | | | | 4 | | | | 2 | | | |

<u>Fig. 83: V8 & V12 6-Speed Transmission Diagnosis (2004 - 3 Of 10)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 & V12 6-Speed Transmission Diagnosis (2004 - 4 Of 10)

| MIL Illum. | cwd driving selbyo | | | | |
|---|--|--|---|---|---|
| Time MIL Required IIIum. | 10 msec, cont. | | | | |
| Enable Conditions | voltage drop <=1V onabled enabled | | | | |
| Secondary Parameter | high-side FET high-side FET low-side FET | | | | |
| Threshold value | Diagnosis by ASIC if PWM+ signal const. at 0%, 100% vollage return lead (high) < 0.15V vollage return lead (high) < 0.15V vollage return lead (high) < 0.15V c. voltage return lead (low) < 0.8V | Diagnosis by ASIC if PWM-signal const. at 0%, 100% voltage return lead (high) > 0.3V | Diagnosis by ASIC if PMM-signal const. at 0%, 100% of | Diagnosis by ASIC if PWMA signal const. at 0%, voltage return load (evy. < 0.15V voltage return load (evy. < 0.15V voltage return load (nigh) < 0.15V c. voltage return load (loay) < 0.28V | Diagnosis by ASIG if PWM-signal const. at 0%, 100% voltage return lead fright) > 0.3V |
| Malfunction Criteria | interuption or short circuit to ground | short circuit to supply | interruption | interruption or short circuit to ground | short circuit to supply |
| Monitor Fault Strategy Code Descripti on | lower | upper | no signal | lower | upper |
| Fault | (1) P0973 | P0753 | P0751 | P0976 | P0758 |
| Component/ System A/T 6HP26 | | | | (only for "Shift by Wire" | |

<u>Fig. 84: V8 & V12 6-Speed Transmission Diagnosis (2004 - 4 Of 10)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 & V12 6-Speed Transmission Diagnosis (2004 - 5 Of 10)

| MIL Illum. | | | | two driving cycles | | OW | cycles | | | two | cycles | | | | | |
|---|--|--|--|---|----------|---|--|-----------------------|-----------------|-----------------------------|---------|------------|-----------------------------|---------|-----------------------------|---------|
| Time Required | | | | 10 msec, cont. | | 10 msec, cont. | | | | 10 msec, cont. | | | | | | |
| Enable Conditions | ter tour tours | | | clutch not operad | | activated | A6 < | V1 x> | A6 < | >= 400 rpm | chabled | na | >≃ 400 rpm | enabled | >= 400 rpm and status OK | enabled |
| Secondary Parameter | | | | forque converter clutch | | low-side and high-side FET | power supply | voltage drop at FET | solenoid supply | congine speed | FET | Jump-Start | peads augue | FET | peads auflue | FE |
| Threshold value | Diagnosis by ASIC if PWM-signal const. at 0%, 100%, 0.15V < voltage return lead (low) < 0.5V | Diagnosis only by ASIC due to on/off-controlling | Diagnosis only by ASIC due to enforf-controlling | >dffspeed-f(engine torque) engine torque[-50; 300]Nm; dffspeed[25; 25)rpm | > 30 sec | | no monitoring | | 1 | >= 16V | | | VZ => | | A8 > | |
| Malfunction Criteria | Interuption | interruption or short circuit to ground | Interruption or short circuit to ground | diff(engine speed, input speed) > threshold over dof. Une | | interruption or short circuit to ground | current higher or lower than threshold | short drout to supply | interuption | battery voltage > threshold | | , | battery voltage < threshold | | battery voltage < threshold | |
| Monitor Fault Strategy Code Descripti | no signal | lower | lower | general | | lower | plausibility | upper | no signal | hreehold | 200 | | lower | | general | |
| Fault | P0756 | P0979 | P0982 | P0741 | | P2764 | P2761 | P2763 | P2759 | P1891 | | | P1892 | | P1890 | |
| Component System A/T 6HP26 | | (3) P0979 Interlock (for Shiff by Lever) OR Parking-Lock-Actuator (for Shift by Wire) | (4) P0982 Shiftlock | Torque Converter Clutch (TCC) | | (6) valve P2764 | | | | Power Supply | | | | | | |

Fig. 85: V8 & V12 6-Speed Transmission Diagnosis (2004 - 5 Of 10) Courtesy of BMW OF NORTH AMERICA, INC.

V8 & V12 6-Speed Transmission Diagnosis (2004 - 6 Of 10)

| MIL Illum. | bwo | driving | | | | | | | bwo | cycles | | | | | |
|------------------------------------|-----------------------|---|--|--|--|---|---|---|------------------------|--|--|--|---|--|---|
| Time | 30 msec, cont. | | | | | | | | 30 msec, cont. | | | | | | |
| Enable Conditions | | >0.0 | 1, 2, 3, 4, 5, 6 | mdi 0 < | > 400 rpm | mdi 0 « | Status OK | inactive | | > 300 rpm | >= 600 rpm not P, R, N | > 300 rpm | >= 0°C >= 600 rpm not P, R, N | >300rpm | >=0°C >=600rpm not P, R, N |
| Secondary Parameter | | transmission oil temperature | actual Range | peds indino | beeds engine | peed ships | input speed | Stand by Control SBC | | pands indino | transmission oil temperatura engine speed ratige position | culput speed | transmission oil temperatum engine speed range position | paods indino | transmission oil temperature engine speed ritinge position |
| Threshold value | | > characteristic speed-difference=f(output speed) | output spined [0; 200; 6000] rpm | speed-difference [400; 200; 400] rpm | | | | | | >300rpm | -30rpm < celc. value < 40rpm | >300rpm | -30rpm < calc. value < 40rpm | >300rpm | -30rpm < calc. value < 40rpm |
| Maffunction Criteria | | lourput speed x ratio - input speed] > threshold | louiput speed x ratio - input speed > fireshold | loutput speed x ratio - input speed) > threshold | louiput speed x ratio - input speed! > threshold | output speed x ratio - input speed > threshold | output speed x ratio - input speed > threshold | loutput speed x ratio - Input speed > threshold | | (input speed - output speed x ratio) > threshold | (input speed – output speed x ratio)(1) – (input speed – output speed x ratio)(≒0) < threshold | (Input speed - output speed x ratio) > threshold | (input speed – output speed x ratio)(!) – (input speed – output speed x ratio)(!=0) > inrestold | (input spead - autput spead x retio) > threshold | (input speed – output speed x ratio)(t) – (input speed = output speed x ratio)(t=0) = btreshold |
| Monitor Strategy Description | | plausibility | plausibility | plausibility | plausibiliy | plausibility | pleusibility | plausibility | | upper threshold | general | upper threshold | general | upper threshold | general |
| Fault | | (1) P0731 | (z) P0732 | (3) P0733 | (4) P0734 | (5) P0735 | (6) P0729 | ® P0736 | | A P1881 | B P0781 | A P1882 | B P0782 | A P1883 | B P0783 |
| Component System | Gear Ratio Monitoring | 1) | (2) | 2 | 45) | (2) | 9) | | Range Shiff monitoring | (1) →(2) A P1881 | - | (2) →(3) A P1882 | | (3) ->(4) A P1883 | |

<u>Fig. 86: V8 & V12 6-Speed Transmission Diagnosis (2004 - 6 Of 10)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 & V12 6-Speed Transmission Diagnosis (2004 - 7 Of 10)

| MIL. | | | | | | driving | sapka | | | | | |
|----------------------------------|--|---|---|---|-----------------|---|-----------------|--|-----------------|--|-----------------|---|
| Time | | | | | | ЗОтнес, сопт. | | | | | | - |
| Enable Conditions | > 300 rpm | >= 0°C >= 600 rpm not P, R, N | > 300 rpm | >= 0°C >= 600 rpm not P, R, N | > 250 rpm | >= 600 rpm nat P, R, N | > 500 rpm | >=600 rpm not P, R, N | > 700 rpm | >= 0°C >= 600 rpm aut P, R, N | > 800 rpm | >= 0°C >= 600 rpm not P. R. N |
| Secondary Parameter | output speed | transmission oil temperature engine speed range position | output speed | transrvission oil temperature engine speed range position | peeds indino | transmission oil temperature engine speed range posilion | output speed | transmission oil temperature engine speed range position | peeds and no | transmission off temperature engine speed range position | output speed | transmission oil temperature angine speed range position |
| Threshold | > 300 rpm | -30 rpm < calc, value < 40 rpm | > 300 rpm | -30 pm < calc, valua < 40 pm | | .30 rpm < calc. value < 40 rpm | | -30 rpm < calc. value < 40 rpm | | -30rpm < caic, value < 40rpm | | -30 rpm < calc. value < 40 rpm |
| Malfunction Criteria | (input speed - output speed x ratio) > threshold | (input speed - output speed x raiso)(t) - (input speed - output speed x raiso)(t=0) > threshold | bindisenti < (otes x beed sudino - beeds inqui) | (input speed - output speed x ratioχ() - (input speed - output speed x ratioχ(=0) > threshold | по тиапії рабив | (input speed - output speed x ratio(t) - (input speed - output speed x ratio(t=0) > throshold | no monitaring | (input speed - output speed x ratio)(!) - (input speed - output speed x ratio)(1−0) > tinestoid | no monitoring | (input a peed – output apeed \times ratio)(!) – (input apeed – output apeed \times ratio)(* σ) > fineshold | no monitoring | (input speed - bulput speed x ratio)(1) - (input speed - bulput speed x ratio)(1=0) > threshold |
| _ | upper threshold | general | upper threshold | general | upper threshold | general | upper threshold | general | upper threshold | general | upper threshold | general |
| - a | P1884 | B P0784 | P1885 | B P0829 | 1 | B P1861 | 1 | B P1862 | 1 | B P1863 | ı | B P1864 |
| Component System A/T 6HP26 | (4) →(5) A P1884 | a | (5) →(6) A P1885 | ď | (2) →(1) A | es. | (3) →(2) A | ď | (4) →(3) A | an and an | (5) →(4) A | a |

<u>Fig. 87: V8 & V12 6-Speed Transmission Diagnosis (2004 - 7 Of 10)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 & V12 6-Speed Transmission Diagnosis (2004 - 8 Of 10)

| MIL Illum. | | two | cycles | | cycles | | _ | cycle | | | cycles | | _ | cycles | |
|------------------------------------|---|-------------------------------|--|---|-------------------------------|------------------|----------------------------------|-----------------------------------|-----------------|----------------------------------|-----------------------------------|-----------------|-------------------------------|--|-----------|
| Time MIL Required IIIum. | | 50 msec, cont. | | 30 msec, cont. | | | 20 msec, cont. | | | 20 mвес, cont. | | | 50 msec, cont. | 2007 | |
| Enable Conditions | > 1100 rpm >= 0°C >= 600 rpm not P, R, N | Status OK | Status OK | not P. R. N. Z and status OK | status OK or substitute value | status OK | no Error and ready-to-transmit | no transmission of wake-up signal | ∧8< | no Error and ready-to-transmit | no transmission of wake-up signel | ∧6 < | status OK | 8 | status OK |
| Secondary Parameter | output speed transmission oil temperature engine speed range position | DME-CAN Connection | CAN-Bus | graten Range Position | poods aubue | Park-Lock Sensor | CAN-Bus | TCM-CAN | battery voltage | CAN-Bus | TCM-CAN | battery voltage | DME CAN-Connection | ignition signal | CAN-Bus |
| Threshold value | -30 pm < calc. value < 40 pm | T | no alteration of alive-counter or wrong Checksum | > 6500 rpm (default but variant-specific) | | | Tirwsout | | | Timeout | | | T | no alteration of alive-counter or wrong Checksum | |
| Malfunction Criteria | no monitoring (inpul speed - outpul speed x ratio)(t) - (inpul speed - outpul speed x ratio)(t=0) > threshold | CAN-Message signal error-flag | alive-counter or checksum | engine speed | | | CAN-Connection DME | | | CAN-Connection DSC | | | CAN-Massage signal error-flag | alive-counter or checksum | |
| Monitor Strategy Description | upper threshold general | plausibility | | plausibility | | | plausibility | | | plausibility | | | plausibility | | |
| Fault | B P1865 | P17714 | | P1728 | | | P1720 | | | P1721 | | | P1727 | | |
| Component System A/T 6HP26 | (6) → (5) A B | Engine Torque | | Engine Overspeed | | | Timeout DME CAN-Connection P1720 | | | Timeout DSC CAN-Connection P1721 | | | Engine Speed Signal | | |

<u>Fig. 88: V8 & V12 6-Speed Transmission Diagnosis (2004 - 8 Of 10)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 & V12 6-Speed Transmission Diagnosis (2004 - 9 Of 10)

| Monitor Fault Strategy Code Description | P0705 plausibility | P1701 plausibility | P1888 plausibility | P1747 plausibility | P1702 general | P1792 general | | P1793 general max(Chi |
|---|---|---|---|-----------------------------------|---|----------------------------|---|---|
| Malfunction Criteria | Transmission Position Sensor | Mossage Signal Error | Manual Park-Lock Disabling Instrument Pack | CAN-Bus disabled | SW Functions actualing acteroid valves | error-counter | | max(Chip-Temp. + 0*C, TransOil-Temp 10*C) > threshold=f(battary-voltage) |
| Threshold value | 1 | Υ. | Park-Lock disabled Timesul | 7 | coffiding of 2 Substitute Functions same priority driven scleroid valves have short circuit to supply of interruption | exceeding diff. thresholds | | > characteristic voltage(16.4, 18.5, 19.5, 25, 25)V Tomp(141, 121, 111, 61, 61)°C |
| Secondary Parameter | , A. | | Anon | Ignitian | ₩о | Status Counter | filtered battery voltage | попе |
| Enable Conditions | | n. | | Status on | | initalization: 0 or 1 | >7V In operation: debug-mode deactivated | |
| Time MIL Required Illum | 20 msec, cont. two driving cycles | 20 msec, cont. two driving cycles | 20 msec, cont. Iwa driving cycles | 20 msec, cont. one driving cycles | 20 msec, cont. two driving cycles | 10 msec, cont. | and in cycles initialization | 100 msec, two cont. driving and in cycles initialization |

<u>Fig. 89: V8 & V12 6-Speed Transmission Diagnosis (2004 - 9 Of 10)</u> Courtesy of BMW OF NORTH AMERICA, INC.

V8 & V12 6-Speed Transmission Diagnosis (2004 - 10 Of 10)

| MIL Illum. | two | cycles | | OWI | driving | driving | cycle | driving | two | cycles |
|------------------------------------|------------------------|--------------------------|--|-----------------------------------|-----------------------------------|----------------|----------------|--|----------------------------------|-----------------------------------|
| Time MIL Required Illum. | 10 msec, conf. | and in | Ne sirano | 20 msec, cont. | | 20 msec, cont. | 10 msec, cont. | | 100 msec, cont. | |
| Enable Conditions | initialization: 0 or 1 | 7.4 | In operation; enabled > 7V | > 6.05V | | ٠ | | | | |
| Secondary Parameter | Status Counter | fittered battery voltage | high-side and low-side-FET battery voltage | battory-voltage | | evou | none | none | none | none |
| Threshold value | not possible | | sensor supply <0.5V, drop-vollage> 1V | \8x | <6.42V | Ti II | ī | ī | > 4.96V | v.0.1V |
| Malfunction Criteria | FET drive | short circuit to supply | short-circuit to ground or sensor supply voltage < threshold or FET-drop-voltage > threshold inferruption inferruption | sonsor supply Voltage > threshold | sensor supply Voltage < threshold | Checksum Error | Checksum Error | SW-Verify-Error due to Update of EEPROM- | sensor supply Voltage attreshold | sensor supply Voltage < threshold |
| Monitor Strategy Description | plausibility | upper threshold | lower threshold no signal | upper Breshold | lower threshold | plausibility | plausibility | plausibility | upper fireshold | lower threshold |
| Fault | P1896 | P1893 | P1894 | P1897 | P1898 | P1791 | P1790 | P1798 | P0668 | 6990d |
| Component/ System A/T 6HP26 | Valve Voltage Supply | | | Sensor Voltage Supply | | EEPROM | EPROM | | Chip-Temp | |

<u>Fig. 90: V8 & V12 6-Speed Transmission Diagnosis (2004 - 10 Of 10)</u> Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES V12 TRANSMISSION (1996)

DIAGNOSTIC TROUBLE CODES V12 TRANSMISSION (1996)

| | | (-, -) | |
|-------|----------|---|--|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
| P0705 | 8 | Transmission Range Sensor "A" Circuit Malfunction (PRNDL Input) | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1996)</u> . |
| P0715 | 16 | Input/Turbine Speed Sensor "A" Circuit | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1996)</u> . |
| | 1 | | |

| P0720 | 42 | Output Speed Sensor Circuit | See <u>V12 TRANSMISSION</u> DIAGNOSIS (1996). |
|-------|-----|--|--|
| P0730 | 100 | Incorrect Gear Ratio | See V12 TRANSMISSION DIAGNOSIS (1996). |
| P0730 | 102 | Incorrect Gear Ratio | See V12 TRANSMISSION DIAGNOSIS (1996). |
| P0735 | 101 | Gear 5 Incorrect Ratio | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1996)</u> . |
| P0740 | 111 | Torque Converter Clutch Circuit/Open | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1996)</u> . |
| P0743 | 4 | Torque Converter Clutch Circuit Electrical | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1996)</u> . |
| P0748 | 5 | Pressure Control Solenoid "A" Electrical | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1996)</u> . |
| P0753 | 30 | Shift Solenoid "A" Electrical | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1996)</u> . |
| P0758 | 33 | Shift Solenoid "B" Electrical | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1996)</u> . |
| P0763 | 32 | Shift Solenoid "C" Electrical | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1996)</u> . |
| P1734 | 1 | Pressure Control Solenoid "B" Electrical | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1996)</u> . |
| P1738 | 29 | Pressure Control Solenoid "C" Electrical | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1996)</u> . |
| P1743 | 51 | Pressure Control Solenoid "E" Electrical | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1996)</u> . |
| P1746 | 104 | Transmission Control Module Output Stage | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1996)</u> . |
| P1747 | 150 | CAN-Bus Monitoring | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1996)</u> . |
| P1747 | 151 | CAN-Bus Monitoring | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1996)</u> . |
| P1747 | 156 | CAN-Bus Monitoring | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1996)</u> . |
| P1748 | 103 | Transmission Control Module Self-Test | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1996)</u> . |
| P1748 | 105 | Transmission Control Module Self-Test | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1996)</u> . |
| P1748 | 110 | Transmission Control Module Self-Test | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1996)</u> . |
| P1750 | 54 | Secondary Pressure Solenoid Circuit Range/Performance | See V12 TRANSMISSION DIAGNOSIS (1996). |
| P1761 | 2 | Shiftlock Solenoid | See V12 TRANSMISSION DIAGNOSIS (1996). |

V12 Transmission Diagnosis (1996)

| System/Component | Fault Cod | te Man | agem | ent | | Monitoring | Type of |
|--|--|------------------|-----------------------|-----------------------|-----------------------|---|---------|
| | Fault Code | pl | sg | mn | mx | Method | Signal |
| Transmission Control Modul (EGS) | | | | | | | |
| CAN EGS | P 1747 P 1748 | x x | x | | | CAN Bus-check EPROM check-sum | E |
| EGS Relay Power Supply Voltage | P 1746 P 1750 | | x x | | | final stage check | В |
| Transmission Range Input Speed Output Speed Incorrect Gear Ratio 1/4 Gear 5 incorrect Ratio Torque Converter Clutch | P 0705 P 0715 P 0720 P 0730 P 0735 P 0743 P 0740 | x x x x | x x x x x | x | x | plausibility/ check circuit continuity | E C |
| Pressure Control Solenoid Shift Solenoid A B C Pressure Control Valve 2 Pressure Control Valve 3 Pressure Control Valve 4 | P 0748 P 0753 P 0758 P 0763 P 1734 P 1738 P 1743 | | x x x x x | x x x x x | X X X X X | check circuit continuity | С |

Fig. 91: V12 Transmission Diagnosis (1996)
Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES V12 TRANSMISSION (1997)

DIAGNOSTIC TROUBLE CODES V12 TRANSMISSION (1997)

| PCode | BMW Code | Possible Cause | Diagnostic Parameters |
|---------|----------------|--|--|
| P0705 | 8 | Transmission Range Sensor "A" Circuit Malfunction (PRNDL | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1997)</u> . |
| | | Input) | <u>DIAGNOSIS (1777)</u> . |
| P0715 | 16 | Input/Turbine Speed Sensor "A" Circuit | See V12 TRANSMISSION |
| P0720 | 42 | Output Speed Sensor Circuit | DIAGNOSIS (1997). See V12 TRANSMISSION |
| _ , _ , | , - | o arp at a post a succession of | DIAGNOSIS (1997). |
| P0732 | 100 | Gear 2 Incorrect Ratio | See V12 TRANSMISSION |
| D0722 | 100 | G 21 P : | DIAGNOSIS (1997). |
| P0733 | 100 | Gear 3 Incorrect Ratio | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1997)</u> . |
| P0734 | 100 | Gear 4 Incorrect Ratio | See V12 TRANSMISSION |
| | | | DIAGNOSIS (1997). |
| P0735 | 101 | Gear 5 Incorrect Ratio | See V12 TRANSMISSION |
| | | | <u>DIAGNOSIS (1997)</u> . |
| P0740 | 111 | Torque Converter Clutch Circuit/Open | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1997)</u> . |
| P0743 | 4 | <u> </u> | |
| PU/43 | 4 | Torque Converter Clutch Circuit Electrical | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1997)</u> . |
| P0748 | 5 | Pressure Control Solenoid "A" | See V12 TRANSMISSION |
| | | Electrical | DIAGNOSIS (1997). |
| P0753 | 30 | Shift Solenoid "A" Electrical | See V12 TRANSMISSION |
| | | | DIAGNOSIS (1997). |
| P0758 | 33 | Shift Solenoid "B" Electrical | See V12 TRANSMISSION |
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| | | | <u>DIAGNOSIS (1997)</u> . |
|-------|-----|-------------------------------|---------------------------|
| P0763 | 32 | Shift Solenoid "C" Electrical | See V12 TRANSMISSION |
| | | | DIAGNOSIS (1997). |
| P1734 | 1 | Pressure Control Solenoid "B" | See V12 TRANSMISSION |
| | | Electrical | DIAGNOSIS (1997). |
| P1738 | 29 | Pressure Control Solenoid "C" | See V12 TRANSMISSION |
| | | Electrical | DIAGNOSIS (1997). |
| P1743 | 51 | Pressure Control Solenoid "E" | See V12 TRANSMISSION |
| | | Electrical | <u>DIAGNOSIS (1997)</u> . |
| P1746 | 104 | Transmission Control Module | See V12 TRANSMISSION |
| | | Output Stage | <u>DIAGNOSIS (1997)</u> . |
| P1747 | 150 | CAN-Bus Monitoring | See V12 TRANSMISSION |
| | | | <u>DIAGNOSIS (1997)</u> . |
| P1747 | 151 | CAN-Bus Monitoring | See V12 TRANSMISSION |
| | | | DIAGNOSIS (1997). |
| P1747 | 156 | CAN-Bus Monitoring | See V12 TRANSMISSION |
| | | | DIAGNOSIS (1997). |
| P1748 | 103 | Transmission Control Module | See V12 TRANSMISSION |
| | | Self-Test | DIAGNOSIS (1997). |
| P1748 | 105 | Transmission Control Module | See V12 TRANSMISSION |
| | | Self-Test | <u>DIAGNOSIS (1997)</u> . |
| P1748 | 110 | Transmission Control Module | See V12 TRANSMISSION |
| | | Self-Test | <u>DIAGNOSIS (1997)</u> . |
| P1750 | 54 | Secondary Pressure Solenoid | See V12 TRANSMISSION |
| | | Circuit Range/Performance | <u>DIAGNOSIS (1997)</u> . |

V12 Transmission Diagnosis (1997)

| MIL Illum. | two driving cycles | two driving cycles | two driving cyales | two driving cycles | two driving cycles | | two driving cycles | two driving cycles | two driving cycles | t. two driving cycles | 1_ == |
|---------------------------------|--|---|-------------------------------|---|----------------------------|--|------------------------------|-------------------------|-------------------------|---|--------------------|
| Time Required | 200 msec/ once per engine start up | 200 msec/ continuous | 200 msec/ continuous | 200 msec/ continuous | 100 msec/ continuous | 2,5 sec/ once per lock | 100 msec/ continuous | 30 msec/ continuous | 100 msec/ continuous | immediately/cont. 90 sec 120 msec/cont. | after system starr |
| Enable Conditions | 200 < rpm < 440 | 1,2,3,4 or 5 > 600 rpm > 250 rpm | 1,2,3,4 or 5 > 1700 rpm | 1>2/2>3/3>4/4>5 > 420 rpm > 250 rpm | | 3, 4 or 5 | | | | | 0000 |
| Secondary | engine speed | gear selected engine speed cutput speed | gear selected engine speed | shift occurs input speed output speed | | gear selected | | | | at power up | |
| Threshold | no signal/multiple signal | no signal | no signal | > 350 rpm | | > 100 rpm | | | | > 500 msec invalid check-sum | delay time |
| Malfunction Criteria | voltage unvalid code for P and N | input speed | peeds indino | Input - output speed f (gear ratio) | voltage | eng. speed - Input speed (maximum slip) | voltage | voltage | voitage | CAN massages/time out RAM and ROM check. | timing (response) |
| Monitor Strategy Description | circuit continuity rationality | rationality | rationality | rationality | cfroult continuity | functional check | circuit continuity | circuit continuity | circuit continuity | bus check self check | functional check |
| Fault | P0705 | P0715 | P0720 | P0732 to P0735 | P0743 | P0740 | P0748 | P0753 P0758 P0763 | P1734 P1738 P1743 | P1747 | P1746 |
| Component/ System | A/T Range Switch | Input Speed | Output Speed | Gear Ratio (2) to (5) | Torque Converter Clutch | | Pressure Control Solenoid | Shift Solemoid A | Pres. Control Valve 2 | Transmission Control Modul | Relay P1745 |

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Fig. 92: V12 Transmission Diagnosis (1997)

Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES V12 TRANSMISSION (1998-2000)

DIAGNOSTIC TROUBLE CODES V12 TRANSMISSION (1998-2000)

| Brightesile into ebbe cobes via intrinspositi (1990 2000) | | | | | | | | | | |
|---|----------|---|---|--|--|--|--|--|--|--|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters | | | | | | | |
| P0705 | 8 | Transmission Range Sensor "A" Circuit Malfunction (PRNDL Input) | See V12 TRANSMISSION DIAGNOSIS (1998-2000). | | | | | | | |
| P0715 | 16 | Input/Turbine Speed Sensor "A" Circuit | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1998-2000)</u> . | | | | | | | |
| | | | | | | | | | | |

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| P0720 | 42 | Output Speed Sensor Circuit | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
|-------|-----|--|---|
| P0732 | 100 | Gear 2 Incorrect Ratio | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
| P0733 | 100 | Gear 3 Incorrect Ratio | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
| P0734 | 100 | Gear 4 Incorrect Ratio | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
| P0735 | 101 | Gear 5 Incorrect Ratio | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1998-2000)</u> . |
| P0740 | 111 | Torque Converter Clutch Circuit/Open | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (1998-2000)</u> . |
| P0743 | 4 | Torque Converter Clutch Circuit Electrical | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
| P0748 | 5 | Pressure Control Solenoid "A" Electrical | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
| P0753 | 30 | Shift Solenoid "A" Electrical | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
| P0758 | 33 | Shift Solenoid "B" Electrical | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
| P0763 | 32 | Shift Solenoid "C" Electrical | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
| P1734 | 1 | Pressure Control Solenoid "B" Electrical | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
| P1738 | 29 | Pressure Control Solenoid "C" Electrical | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
| P1743 | 51 | Pressure Control Solenoid "E" Electrical | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
| P1746 | 104 | Transmission Control Module Output Stage | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
| P1747 | 150 | CAN-Bus Monitoring | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
| P1747 | 151 | CAN-Bus Monitoring | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
| P1747 | 156 | CAN-Bus Monitoring | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
| P1748 | 103 | Transmission Control Module Self-Test | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
| P1748 | 105 | Transmission Control Module Self-Test | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
| P1748 | 110 | Transmission Control Module Self-Test | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
| P1750 | 54 | Secondary Pressure Solenoid Circuit Range/Performance | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
| P1761 | | Transmission Control Module | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |
| P1765 | | Transmission Control Module | See V12 TRANSMISSION DIAGNOSIS (1998-2000). |

V12 Transmission Diagnosis (1998-2000)

| MIL Illum. | | two driving cycles | | | | | | | | two driving cycles | | | | | | | |
|---------------------------------|--|--|---------------------------------------|--|--|---------------------|-----------------------|---|---|-----------------------|------------------------------------|-----------------------|----------------------|----------------|----------------|--------------------|--------------------------|
| Time Required. | 200 msec/ once per engine start up | 200 msec/ continuous | 250 msec/cont. 200 msec/cont. | 10 msec/ continuous | 70 msec/ once per lock | 2,5 sec/ | 70 msec/cont. | 50 msec/cont. 50 msec/cont. 70 msec/cont. | 50 msec/cont. 50 msec/cont. 70 msec/cont. | 300 msec/cont. | 30 msec/once after system start | immediately/cont. | 90 sec | 200 msec/cont. | 100 msec/cont. | 70 msec/cont. | 400 msec/cont. |
| Enable Conditions | 200 < rpm < 440 | 1,2,3,4 or 5 > 600 rpm > 200 rpm | > 400 rpm 1,2,3,4 or 5 < 160 mm | 2,3,4,5 > 400 rpm > 250 rpm | 3,4 or 5 | | | | | > 1400 rpm | | > 100 | | 1,2,3,4,5 | | | |
| Secondary Parameter | peeds augue | gear selected output speed | wheel speed gear selected | gear selected input speed output speed | gear selected | | | | | engine speed | | battery voltage | at power up | gear selected | | | |
| Threshold | no signal/multiple signal | no signal | no signal | > 400 rpm. | ™du 08 < | | | | | \6 × | | > 700 msec | invalid check-sum on | > 6300 rpm | | | signal range/performance |
| Malfunction Criteria | voltage unvalid code for P and N | Input speed | output speed Input speed | input - output speed f (gear ratio) | eng. speed - input speed (maximum slip) | voltage | voltage | voltage | voltage | battery voltage | voltage | CAN messages/time out | RAM and ROM check | peads eugine | check sum | voltage | CAN (throttle position) |
| Monitor Strategy Description | circuit continuity rationality | rationality | rationality | rationality | functional check | circuit continuity | circuit continuity | circuit continuity | circuit continuity | rationality | functional check | bus check | self check | rationality | | circuit continuity | rationality |
| Fault | P0705 | P0715 | P0720 | P0732 to P0735 | P0740 | P0743 | P0748 | P1734 P1738 P1743 | P0753 P0758 P0763 | P1750 | P1746 | P1747 | P1748 | | | P1761 | P1765 |
| Component | AT Range Switch | Input Speed | Output Speed | Gear Ratio | Torque Converter Clutch | Press. Contr. Valve | Press, Cont. Solenoid | Pressure Control (2) Valves (3) (4) | Shift Salenoid (A) (B) (C) | Power Supply | Transmission Control Modul | | | | | | |

Fig. 93: V12 Transmission Diagnosis (1998-2000) Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSTIC TROUBLE CODES V12 TRANSMISSION (2001)

DIAGNOSTIC TROUBLE CODES V12 TRANSMISSION (2001)

| DINGINOSTIC TROUBLE CODES VIZ TRANSMISSION (2001) | | | | | | | | | | | |
|---|----------|------------------------------|--|--|--|--|--|--|--|--|--|
| PCode | BMW Code | Possible Cause | Diagnostic Parameters | | | | | | | | |
| P0560 | 96 | System Voltage | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (2001)</u> . | | | | | | | | |
| P0600 | 144 | Serial Communication Link | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (2001)</u> . | | | | | | | | |
| P0603 | 81 | Internal Control Module Keep | See V12 TRANSMISSION | | | | | | | | |

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| l | | Alive Memory (KAM) Error | DIAGNOSIS (2001). |
|-------|-----|--|--|
| P0606 | 82 | ECM/PCM Processor | See V12 TRANSMISSION |
| | | | DIAGNOSIS (2001). |
| P0705 | 60 | Transmission Range Sensor "A" | See V12 TRANSMISSION |
| | | Circuit Malfunction (PRNDL | DIAGNOSIS (2001) |
| | | Input) | |
| P0715 | 33 | Input/Turbine Speed Sensor "A" | See V12 TRANSMISSION |
| | | Circuit | DIAGNOSIS (2001). |
| P0720 | 59 | Output Speed Sensor Circuit | See V12 TRANSMISSION |
| | | | DIAGNOSIS (2001). |
| P0731 | 50 | Gear 1 Incorrect Ratio | See V12 TRANSMISSION |
| | | | DIAGNOSIS (2001). |
| P0731 | 51 | Gear 1 Incorrect Ratio | See V12 TRANSMISSION |
| | | Som Timestreet Ruste | DIAGNOSIS (2001). |
| P0732 | 52 | Gear 2 Incorrect Ratio | See V12 TRANSMISSION |
| 10732 | | Gear 2 meetreet Raite | DIAGNOSIS (2001). |
| P0733 | 53 | Gear 3 Incorrect Ratio | See V12 TRANSMISSION |
| 10733 | | Gear 5 meorreet Ratio | DIAGNOSIS (2001). |
| P0734 | 54 | Gear 4 Incorrect Ratio | See V12 TRANSMISSION |
| 10/34 |] | Geal 4 incorrect Ratio | DIAGNOSIS (2001). |
| P0735 | 55 | Gear 5 Incorrect Ratio | See V12 TRANSMISSION |
| 10/33 | 33 | Geal 3 incorrect Ratio | DIAGNOSIS (2001). |
| P0735 | 64 | Gear 5 Incorrect Ratio | See V12 TRANSMISSION |
| r0/33 | 04 | Gear 3 incorrect Ratio | DIAGNOSIS (2001). |
| P0741 | 10 | Tanana Cananatan Chutah Cinanit | |
| PU/41 | 48 | Torque Converter Clutch Circuit Performance or Stuck Off | See <u>V12 TRANSMISSION</u> <u>DIAGNOSIS (2001)</u> . |
| D0742 | 4 | | |
| P0743 | 4 | Torque Converter Clutch Circuit Electrical | See V12 TRANSMISSION |
| D0740 | 1 | | DIAGNOSIS (2001). |
| P0748 | 1 | Pressure Control Solenoid "A" | See V12 TRANSMISSION |
| D0752 | 1.6 | Electrical | DIAGNOSIS (2001). |
| P0753 | 16 | Shift Solenoid "A" Electrical | See V12 TRANSMISSION |
| 70770 | 1- | 21:0 2 1 11:0 21 1 1 | DIAGNOSIS (2001). |
| P0758 | 17 | Shift Solenoid "B" Electrical | See V12 TRANSMISSION |
| D0762 | 10 | 21:0 2 1 11:0 21 1 1 | DIAGNOSIS (2001). |
| P0763 | 18 | Shift Solenoid "C" Electrical | See V12 TRANSMISSION |
| | | | DIAGNOSIS (2001). |
| P0778 | 2 | Pressure Control Solenoid "B" | See V12 TRANSMISSION |
| | | Electrical | DIAGNOSIS (2001). |
| P0798 | 3 | Pressure Control Solenoid "C" | See V12 TRANSMISSION |
| | | Electrical | DIAGNOSIS (2001). |
| P1743 | 5 | Pressure Control Solenoid "E" | See V12 TRANSMISSION |
| | | Electrical | <u>DIAGNOSIS (2001)</u> . |
| P1746 | 83 | Transmission Control Module | See V12 TRANSMISSION |
| | | Output Stage | <u>DIAGNOSIS (2001)</u> . |
| P1747 | 128 | CAN-Bus Monitoring | See V12 TRANSMISSION |
| | | | DIAGNOSIS (2001). |
| P1748 | 15 | Transmission Control Module | See V12 TRANSMISSION |
| | | Self-Test | DIAGNOSIS (2001). |
| P1765 | 147 | CAN Throttle Valve | See V12 TRANSMISSION |
| | | | DIAGNOSIS (2001). |

V12 Transmission Diagnosis (2001)

| MIL | | | | | | | | two driving | cycles | | | | | | two driving | cycles | | | | | |
|------------------------------|------------------------------|---------------|------------------------------|----------------|-------------------------------|------------------------|-----------------------------|--------------------------|--|---------------------|-----------------------|---|---|-----------------|------------------|--------------------|-----------------------|----------------------|----------------|----------------|-------------------------------------|
| Time | 200 msec/ once per engine | 200 msec/ | continuous | 250 msec/cont. | 200 msec/cont. | 10 msec/ | continuous | 70 msec/ | once per lock | 2,5 sec/ | 70 msec/cont. | 50 msec/cont. 50 msec/cont. 70 msec/cont. | 50 msec/cont. 50 msec/cont. 70 msec/cont. | 300 msec/cont. | 30 msec/once | after system start | immediately/cont. | oes 06 | 200 msec/cont. | 100 msec/cont. | 400 msec/cont. |
| Conditions | 200 < rpm < 440 | 1,2,3,4 or 5 | > 600 rpm > 200 rpm | > 400 rpm | 1,2,3,4 or 5 < 160 rpm | 1,2,3,4,5 | > 400 rpm > 250 rpm | 3,4 or 5 | | | | | | > 1400 rpm | | | > 10V | | 1,2,3,4,5 | | |
| Secondary | engine speed | gear selected | engine speed output speed | peeds leeyw | gear selected output speed | gear selected | input speed autput speed | gear selected | | | | | | engine speed | | | battery voltage | at power up | gear selected | | |
| Threshold | no signal/multiple signal | no signal | | no signal | > 1700 rpm | > 400 rpm | | > 80 rpm | | | | | | \6 × | | | > 700 msec | invalid check-sum on | > 6300 rpm | | signal range/ performance |
| Malfunction | voltage unvalid code | input speed | | peeds total | input speed | input - output speed | f (gear ratio) | eng. speed - Input speed | (dissimum sip) | voltage | voltage | voltage | voltage | battery voltage | voltage | CAN-bus check | CAN messages/time out | RAM and ROM check | engine speed | check sum | (CAN messages) throttle position |
| Monitor Strategy Description | circuit continuity | rationality | | rationality | | rationality | | functional check | The same of the sa | circuit continuity | circuit continuity | | circuit continuity | rationality | functional check | | bus check | self check | rationality | | rationality |
| Fault | P0705 | P0715 | | P0720 | | Gear Ratio P0731/0732/ | P0733/0734/ P0735 | P0741 | 200310 | P0/43 | P0748 | P0778 P0798 P1743 | P0753 P0758 P0763 | P0560 | P1746 | P1747 | P0600 | P0603/0606 | P1748 | | P1765 |
| Component/ System | A/T Range Switch | Input Speed | | Output Speed | | Gear Ratio | | Torque Converter | Clutch | Press. Contr. Valve | Press. Cont. Solenoid | Pressure Control (2) Valves (3) (4) | Shift Solenoid (A) (B) | Power Supply | Transmission | Control Modul | | | | | |

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Fig. 94: V12 Transmission Diagnosis (2001) Courtesy of BMW OF NORTH AMERICA, INC.

Article GUID: A00161495

2001-02 BRAKES

Pedal Assembly - Tightening Torques - Z3 Roadster & Coupe (3.0L/E36)

PEDALS MOUNTING BLOCK

35 11 PEDAL ASSEMBLY CONSOLE

PEDAL ASSEMBLY CONSOLE - TIGHTENING TORQUE SPECIFICATIONS

| Application | Type | Thread | Tightening Specification | Measure |
|----------------------|----------------|--------|--------------------------|---------|
| 1AZ Bearing pedestal | E38, E39, E52 | Â | Â | 31 Nm |
| to brake assembly | | | | |
| and body | | | | |
| Â | E36, E46 | Â | Â | 25 Nm |
| Â | E53, E65, E66, | Â | Retighten 1x on brake | 26 Nm |
| | E67, E60, E61, | | booster after 30 min. | |
| | E63, E64, E83 | | | |
| Â | E85 | M8 | Retighten 1x on brake | 22 Nm |
| | | | booster after 30 min | |
| 2AZ Bracket to | E85 | M6 | Â | 9 Nm |
| bearing block | | | | |

BRAKE PEDAL AND LINKAGE

35 21 BRAKE PEDAL AND LINKAGE

BRAKE PEDAL AND LINKAGE - TIGHTENING TORQUE SPECIFICATIONS

| Application | Type | Measure |
|--|------|---------|
| 1AZ Piston rod lock nut | All | 27 Nm |
| 2AZ Nut on shaft | All | 27 Nm |
| 3AZ Pull rod Nut for pivot | All | 27 Nm |
| 4AZ Left and right reversing lever Nut on shaft bolt | All | 27 Nm |
| 5AZ Support to console Brake booster | All | 22 Nm |
| 6AZ Support to console Reversing lever | All | 27 Nm |

CLUTCH PEDAL AND LINKAGE

35 31 CLUTCH PEDAL AND LINKAGE

CLUTCH PEDAL AND LINKAGE - TIGHTENING TORQUE SPECIFICATIONS

| Application | Type | Measure |
|--|------|---------|
| 1AZ Piston rod lock nut | All | 6 Nm |
| 2AZ Spring lock nut | All | 6 Nm |
| 3AZ Piston rod shaft bolt | All | 22 Nm |
| 5AZ Bearing pin, spring pedal | All | 22 Nm |
| 6AZ Clutch pedal Nut on eccentric bolt | All | 22 Nm |

ACCELERATOR PEDAL

34 41 PARKING BRAKE

PARKING BRAKE - TIGHTENING TORQUE SPECIFICATIONS

| Application | Type | Thread | Measure |
|-------------|------|--------|---------|
| | | | |

| 1AZ Handbrake lever to body | E52, E53, E60, | Â | 21 Nm |
|--|----------------|-----|-------|
| | E61, E63, E64 | | |
| 2AZ Housing cover to parking brake | E65, E66, E67 | Â | 2 Nm |
| 3AZ Actuating unit and control unit of | E65, E66, E67 | Â | 4 Nm |
| parking brake | | | |
| 4AZ Mounting pan to tunnel | E85 | M6 | 8 Nm |
| 5AZ Spring clip to wheel carrier | E60, E61, E63, | M6 | 8 Nm |
| | E64 | | |
| 6AZ Support Duo-Servo to wheel carrier, rear | E60, E61, E63, | M10 | 60 Nm |
| | E64 | | |

35 11 PEDAL ASSEMBLY CONSOLE

PEDAL ASSEMBLY CONSOLE - TIGHTENING TORQUE SPECIFICATIONS

| Application | Type | Thread | Tightening Specification | Measure |
|---|---|--------|---|---------|
| 1AZ Bearing pedestal to brake assembly and body | E38, E39, E52 | Â | Â | 31 Nm |
| Â | E36, E46 | Â | Â | 25 Nm |
| Â | E53, E65, E66, E67, E60, E61, E63, E64, E83 | Â | Retighten 1x on brake booster after 30 min. | 26 Nm |
| Â | E85 | M8 | Retighten 1x on brake booster after 30 min | 22 Nm |
| 2AZ Bracket to bearing block | E85 | M6 | Â | 9 Nm |

35 40 PEDALS

PEDALS - TIGHTENING TORQUE SPECIFICATIONS

| Application | Туре | Thread | Measure |
|--------------------------------------|---------------------|--------|---------|
| 1AZ Accelerator pedal module to body | All | Â | 19 Nm |
| Â | E65, E66, E83, E85 | M6 | 9 Nm |
| Â | E60, E61, E63, E64, | M6 | 8 Nm |
| | E67 | | |

KICK - DOWN

35 41 ACCELERATOR PEDAL AND LINKAGE

ACCELERATOR PEDAL AND LINKAGE - TIGHTENING TORQUE SPECIFICATIONS

| Application | Type | Measure |
|-----------------------------|------|---------|
| 1AZ Accelerator travel stop | All | 10 Nm |

Article GUID: A00202657

2001-2002 BRAKES

Pedal Assembly - Z3 Roadster & Coupe

GENERAL

35 00... PEDAL ASSEMBLY

Inspection dimensions for gaps beside pedal:

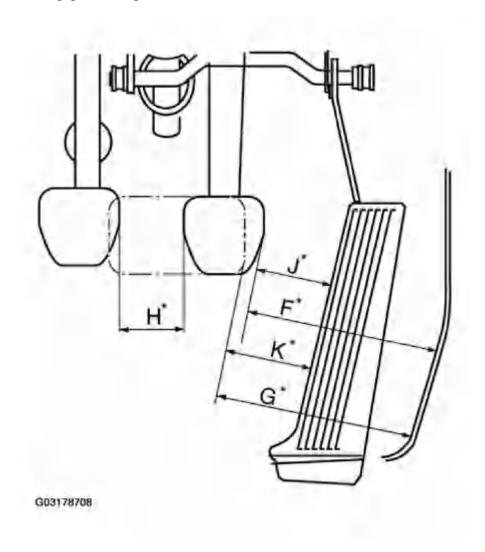


Fig. 1: Identifying Dimensions For Pedal Gaps

Courtesy of BMW OF NORTH AMERICA, INC.

Dimension H, J, K, F, G, refer to 35 00 REAR AXLE IN GENERAL E36.

Inspection dimension (B) from underside of pedal to face wall for:

Clutch pedal (dimension B), refer to 35 31 CLUTCH PEDAL AND LINKAGES E36.

Brake pedal (dimension A), refer to 35 21 BRAKE PEDAL AND LINKAGES E36.

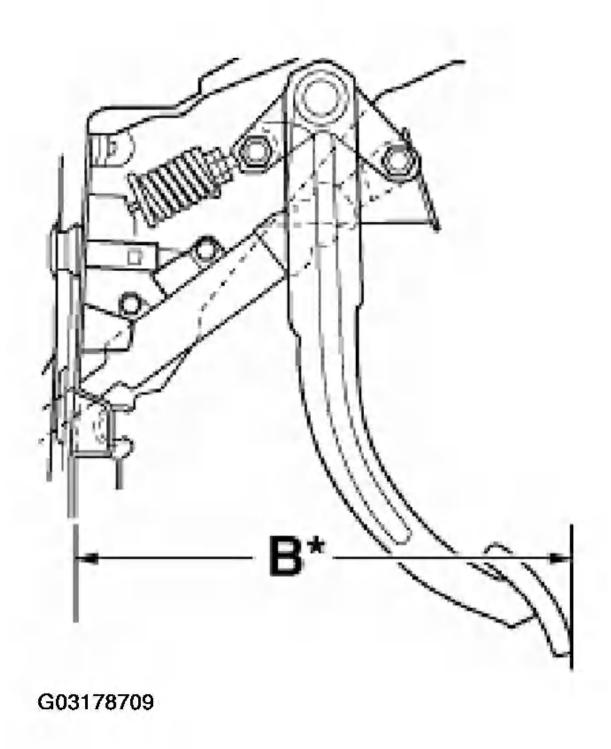
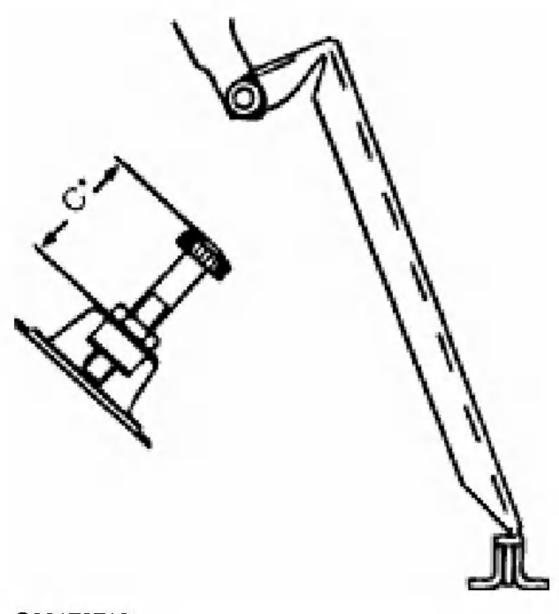


Fig. 2: Identifying Dimension B (Underside Of Pedal To Face Wall) Courtesy of BMW OF NORTH AMERICA, INC.

Inspection dimension (C) for accelerator pedal, refer to $\underline{35\ 41\ ACCELERATOR\ PEDAL\ AND\ LINKAGES}$ $\underline{E36}$.



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Fig. 3: Identifying Dimension C (Accelerator Pedal) Courtesy of BMW OF NORTH AMERICA, INC.

PEDAL MOUNTING BLOCK

35 11 000 REMOVING AND INSTALLING MOUNTING BLOCK FOR PEDALS

NOTE:

Remove and install panel for instrument panel, refer to <u>51 45 180 REMOVING AND INSTALLING/REPLACING TRIM FOR INSTRUMENT PANEL, BOTTOM LEFT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)</u>. Remove brake light switch, if necessary remove clutch switch, refer to <u>61 31 310 REPLACING BRAKE-LIGHT SWITCH</u>.

Unscrew and pull out screws (1 and 3). Take off holder for brake-light and clutch switches.

Place clutch cylinder to one side.

Installation:

Replace self-locking nut of screw (1).

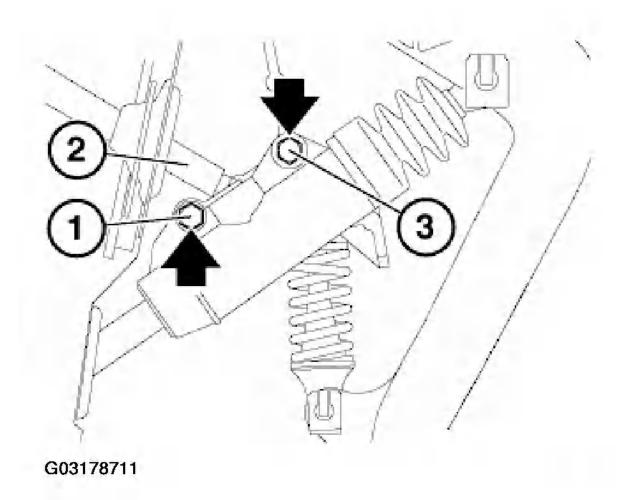


Fig. 4: Removing Switch Holder Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Screw (3) holds retaining plate for clutch and brake-light switches.

Installation:

Make sure line (2) is laid without kinks.

(1) and (3) = clutch-cylinder screws.

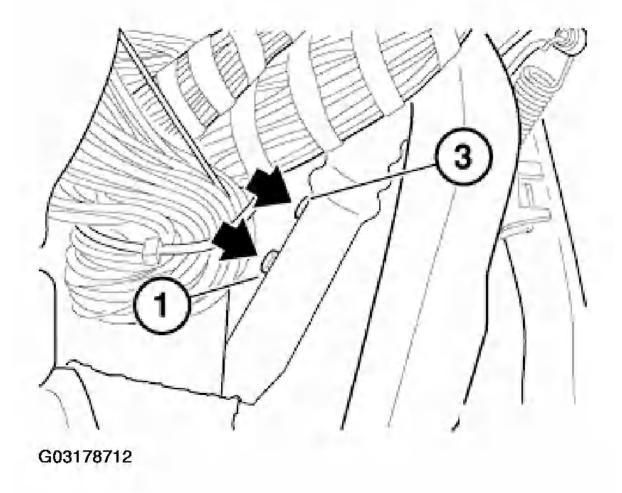


Fig. 5: Identifying Clutch-Cylinder Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove locking clip for shaft pin of clutch cylinder.

Version with return spring for clutch pedal:

Disconnect return spring.

Push out shaft pin.

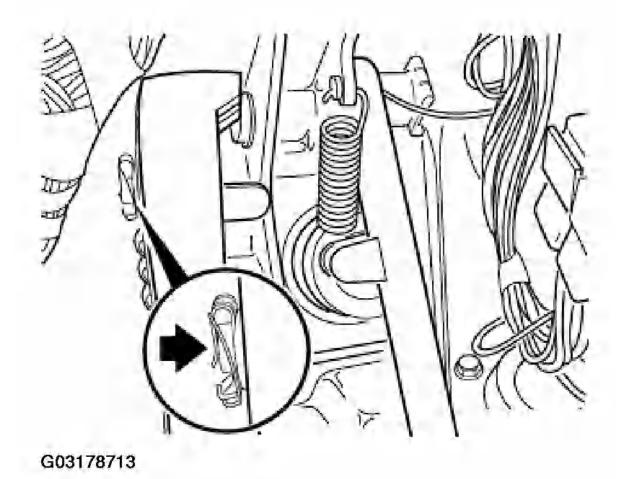


Fig. 6: Identifying Clutch Cylinder Locking Clip And Clutch Pedal Return Spring Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Grease sliding surfaces, refer to 35 41 ACCELERATOR PEDAL AND LINKAGES E36.

Version with over-center helper spring for clutch pedal:

Hold clutch pedal tightly.

Push out shaft pin.

Pull up clutch pedal slowly.

Take off over-center helper spring.

Installation:

Grease sliding surfaces, refer to 35 41 ACCELERATOR PEDAL AND LINKAGES E36.

Make sure spring holder is seated correctly in mounting block.

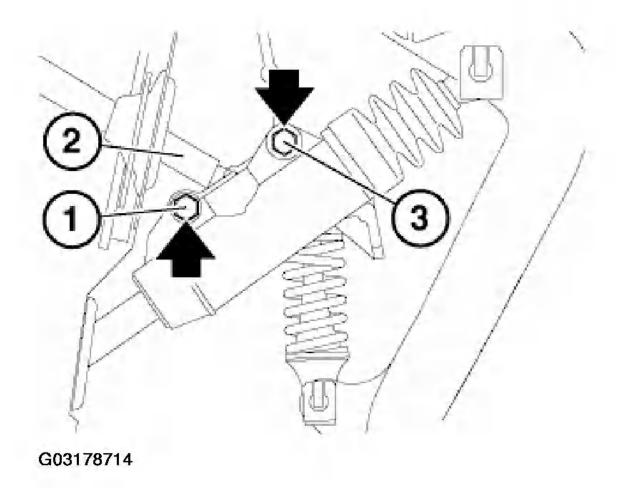
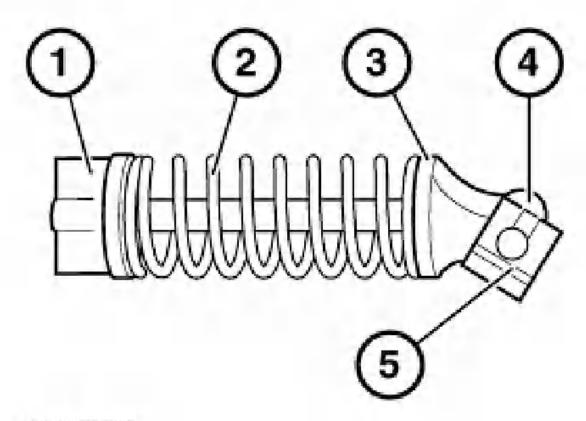


Fig. 7: Identifying Switch Holder Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assembly of over-center helper spring:

- 1. Spring retainer.
- 2. Over-center helper spring.
- 3. Guide pin.
- 4. Bearing shaft.
- 5. Locking clip.



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<u>Fig. 8: Identifying Over-Centre Helper Spring Components</u> Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect return spring for brake pedal.

Take off locking clip for shaft pin of brake pedal.

Push out shaft pin.

Installation:

Grease sliding surfaces, refer to <u>35 41 ACCELERATOR PEDAL AND LINKAGES E36</u>.

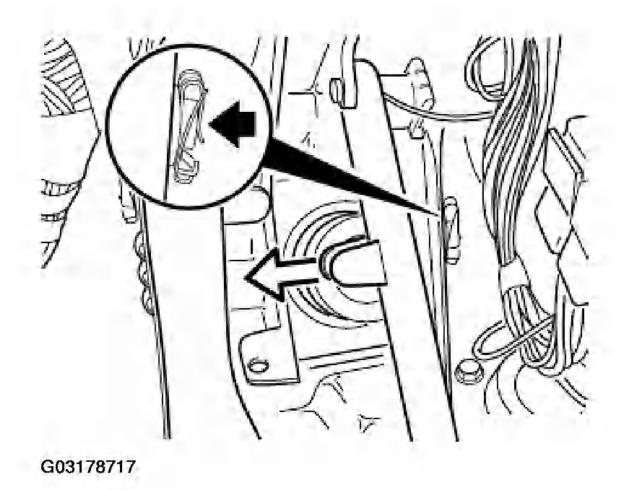
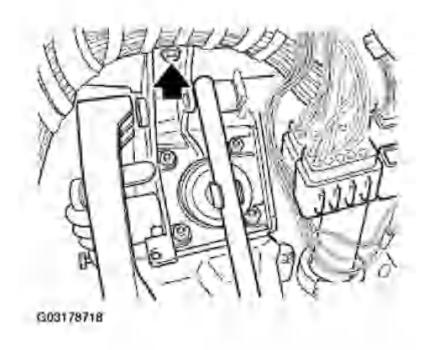


Fig. 9: Disconnecting Return Spring For Brake Pedal Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew screw.

Installation:

Tightening torque, 35 11 1AZD. Refer to 35 11 PEDAL ASSEMBLY CONSOLE.



<u>Fig. 10: Removing Screw</u> Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew self-locking nuts.

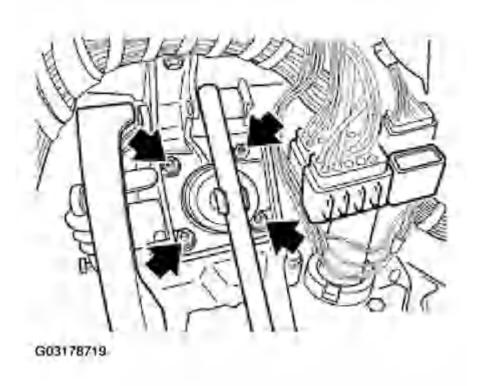


Fig. 11: Removing Self-Locking Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Remove mounting block.

Installation:

Replace self-locking nuts.

Tightening torque, 35 11 1AZD. Refer to 35 11 PEDAL ASSEMBLY CONSOLE.

35 11 001 REPLACING MOUNTING BLOCK FOR PEDAL ASSEMBLY

NOTE: Remove and install mounting block for pedal assembly, see <u>35 11 000 REMOVING AND INSTALLING MOUNTING BLOCK FOR PEDALS</u>.

Take off locking clips.

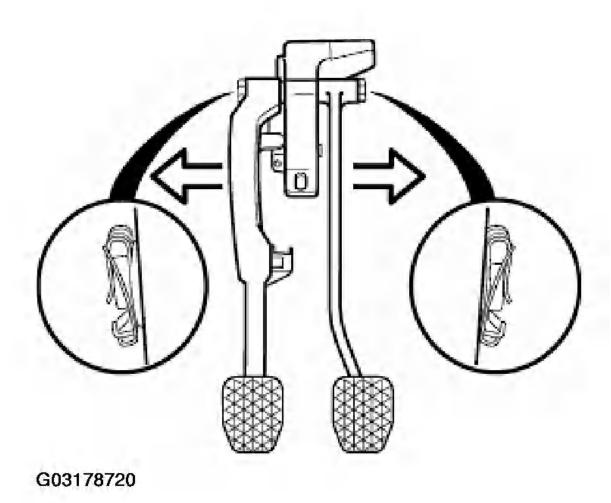


Fig. 12: Removing Locking Clips

Courtesy of BMW OF NORTH AMERICA, INC.

Pull brake and clutch pedals off shaft.

Installation:

Make sure locking clips are seated correctly.

Clutch-pedal assembly:

- 1. Bearing sleeves check or replace.
- 2. Locking clip.
- 3. Clutch pedal.
- 4. Grommet for clutch-pedal return spring.
- 5. Mounting block.

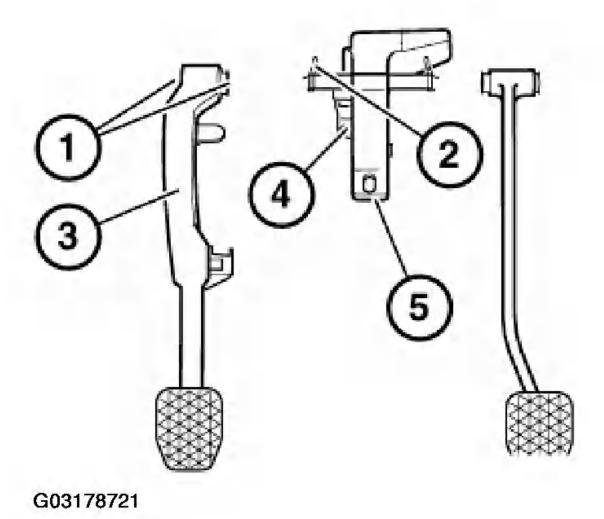


Fig. 13: Identifying Clutch-Pedal Assembly Courtesy of BMW OF NORTH AMERICA, INC.

Brake-pedal assembly:

- 1. Bearing sleeves check or replace.
- 2. Brake pedal.
- 3. Locking clip.
- 4. Grommet.
- 5. Mounting block.

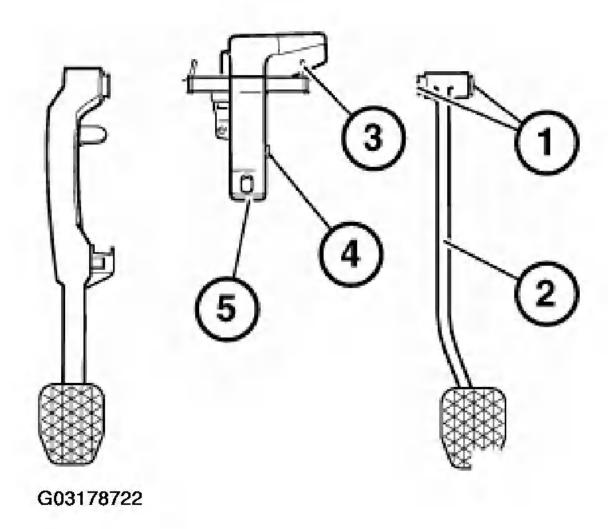
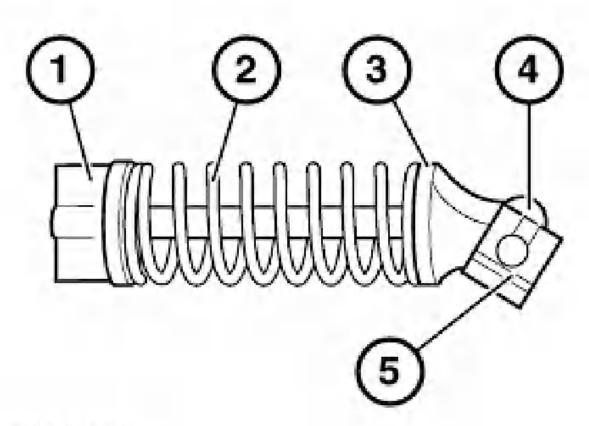


Fig. 14: Identifying Brake-Pedal Assembly Courtesy of BMW OF NORTH AMERICA, INC.

Assembly of over-center helper spring.

- 1. Spring retainer.
- 2. Over-center helper spring.
- 3. Guide pin.
- 4. Bearing shaft.
- 5. Locking clip.



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Fig. 15: Identifying Over-Center Helper Spring Assembly Courtesy of BMW OF NORTH AMERICA, INC.

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Check grommet on clutch pedal, replacing if necessary.

Check grommet on shaft for brake pedal, replacing if necessary.

Transfer brake and clutch pedals with bearing sleeves. Check grommets on pedals, replacing if necessary.

Transfer grommet for brake pedal return spring, replacing if necessary.

Transfer grommet for clutch pedal return spring, replacing if necessary.

Grease sliding faces, see 35 41 ACCELERATOR PEDAL AND LINKAGES E36.

BRAKE PEDAL WITH LINKAGE

35 21 000 REMOVING AND INSTALLING BRAKE PEDAL

NOTE:

Remove and install panelling for instrument panel, see <u>51 45 180 REMOVING AND INSTALLING/REPLACING TRIM FOR INSTRUMENT PANEL, BOTTOM LEFT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)</u>. Remove brake-light switch, see <u>61 31 310 REPLACING BRAKE-LIGHT SWITCH</u>.

Disconnect return spring for brake pedal.

Take off locking clip for shaft pin of brake pedal.

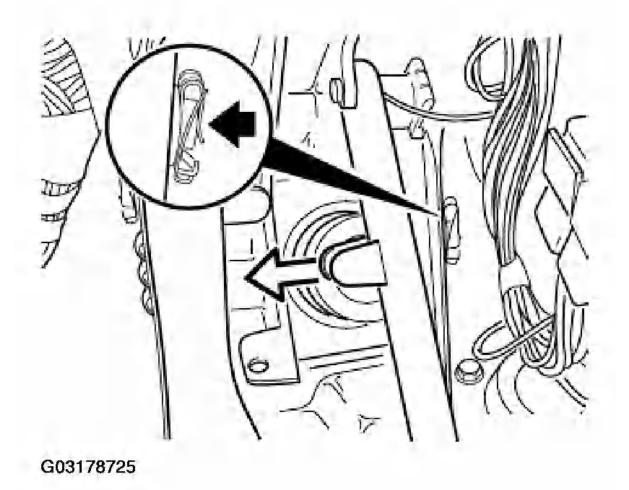


Fig. 16: Removing Locking Clip For Shaft Pin Of Brake Pedal Courtesy of BMW OF NORTH AMERICA, INC.

Push out shaft pin.

Installation:

Lubricate sliding surfaces with grease, see <u>35 41 ACCELERATOR PEDAL AND LINKAGES E36</u>.

Take off locking clip (1) for brake pedal.

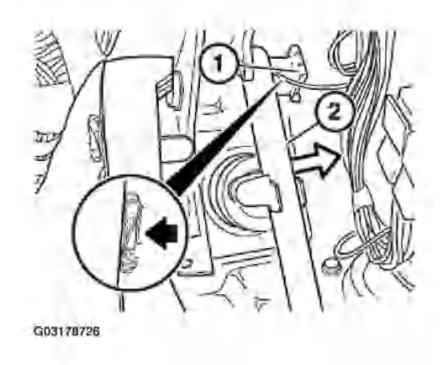
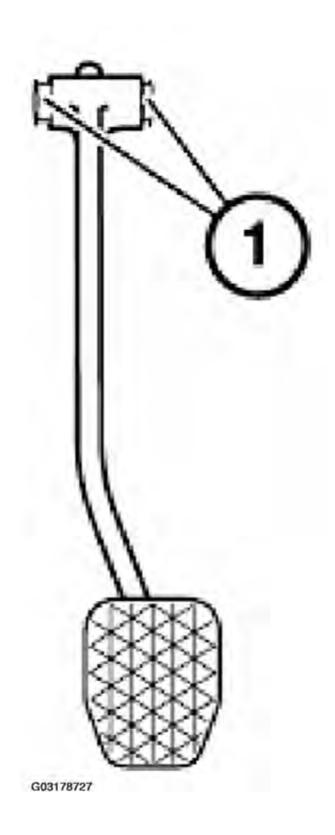


Fig. 17: Removing Locking Clip For Brake Pedal Courtesy of BMW OF NORTH AMERICA, INC.

Pull off brake pedal (2).

Installation:

Check bearing sleeves (1), replacing if necessary.



<u>Fig. 18: Checking Bearing Sleeves</u> Courtesy of BMW OF NORTH AMERICA, INC.

Lubricate sliding surfaces with grease, see <u>35 41 ACCELERATOR PEDAL AND LINKAGES E36</u>.

CLUTCH PEDAL WITH LINKAGE

35 31 000 REMOVING AND INSTALLING CLUTCH PEDAL

NOTE:

Remove brake light switch, refer to $\underline{61\ 31\ 310\ REPLACING\ BRAKE-LIGHT}$ \underline{SWITCH} . If applicable, remove clutch switch. Remove retaining plate, refer to $\underline{35\ 11\ 000\ REMOVING\ AND\ INSTALLING\ MOUNTING\ BLOCK\ FOR\ PEDALS}$.

Take off locking clip for shaft pin of clutch-sensor cylinder.

Version with return spring for clutch pedal:

Disconnect return spring. Push out shaft pin.

Installation:

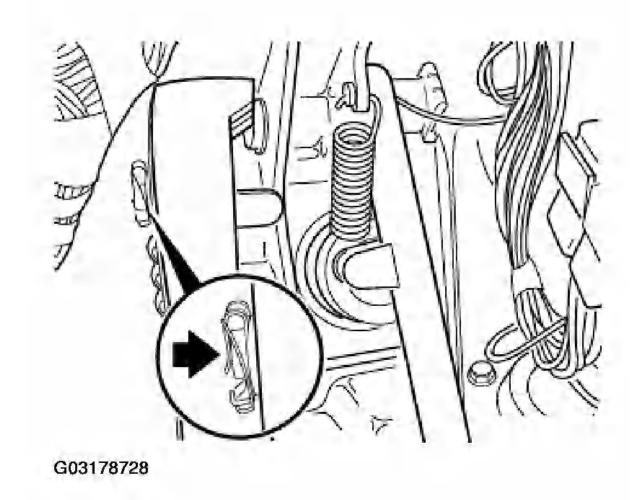


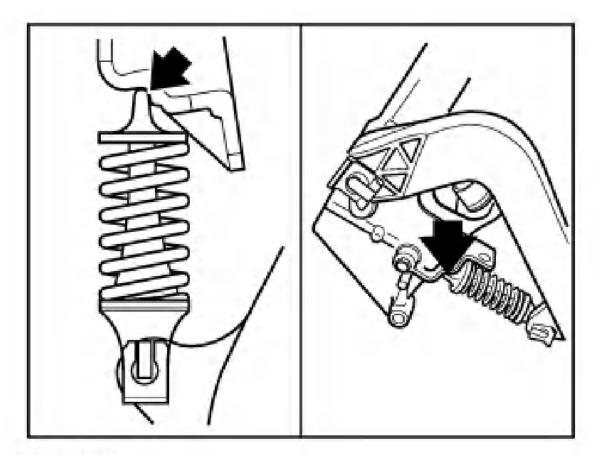
Fig. 19: Removing Locking Clip For Shaft Pin Of Clutch-Sensor Cylinder Courtesy of BMW OF NORTH AMERICA, INC.

Version with over-center helper spring:

Hold clutch pedal tightly, push out shaft pin, pull up clutch pedal slowly and take off over-center helper spring.

Installation:

Check for correct seating of spring holder in mounting block!

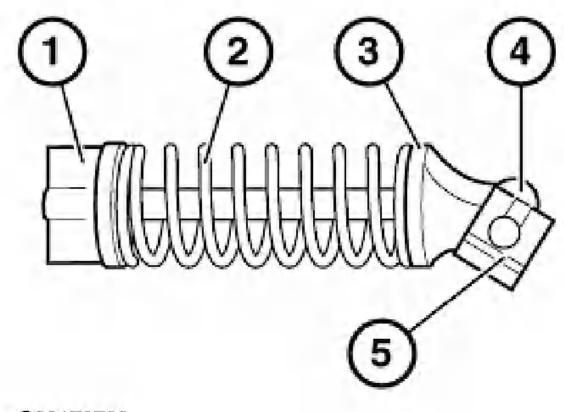


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Fig. 20: Identifying Over-Centre Helper Spring Courtesy of BMW OF NORTH AMERICA, INC.

Assembly of over-center helper spring:

- 1. Spring retainer.
- 2. Over-Center Helper Spring.
- 3. Guide Pin.
- 4. Bearing Pin.
- 5. Locking Clip.



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Fig. 21: Identifying Over-Centre Helper Spring Assembly Courtesy of BMW OF NORTH AMERICA, INC.

Take off locking clip (1) for clutch pedal.

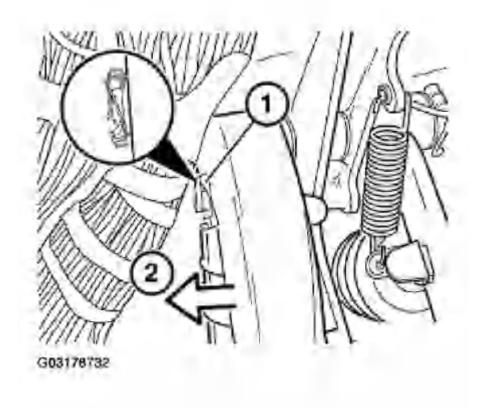


Fig. 22: Removing Locking Clip For Clutch Pedal Courtesy of BMW OF NORTH AMERICA, INC.

Pull off clutch pedal (2).

Installation:

Check bearing sleeves, replacing if necessary.

KICK-DOWN

35 41 ... THROTTLE-CABLE ADJUSTING PROCEDURES

Adjusting Instruction For Throttle Cable:

For Vehicles With Manual Transmission:

- 1. Accelerator-pedal plate in idling position (accelerator pedal on idling stop).
- 2. Throttle in idling position.
- 3. Adjust throttle cable so that it is free from tension (adjusting screw on throttle cable).
- 4. Adjust adjustment screw on "full-throttle stop of pedal assembly" so that it rests against accelerator-pedal plate when engine is at full load and there is still play of 0.5 mm at throttle full-load stop.

Unscrewing adjusting screw by 1.5 turns is equal to 0.5 mm play.

5. Lock with M8 nut.

For Vehicles With Automatic Transmission:

1. to 3., refer to manual transmission.

Without override element:

4. Adjust pressed full-throttle stop so that it rests against accelerator-pedal plate when transmission is at 3705 of 4036

full load and there is still play of 0.5 mm at throttle full-load stop.

Unscrewing adjusting screw by 1.5 turns is equal to 0.5 mm play.

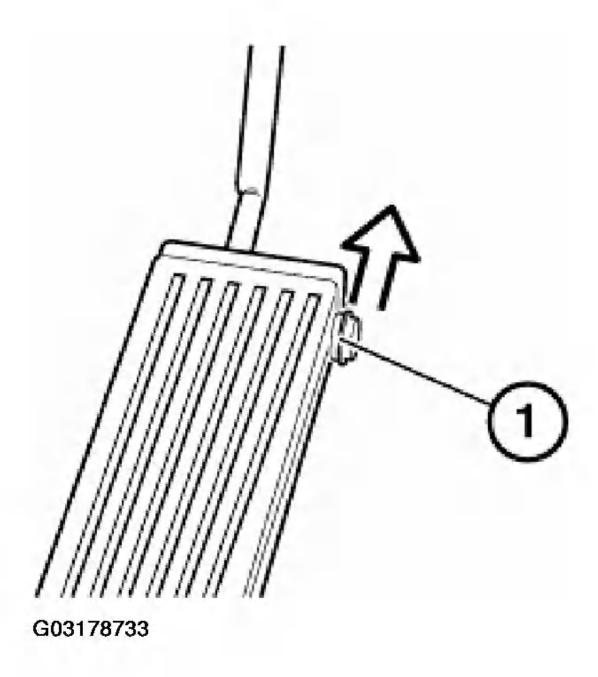
5. Lock with M8 nut.

35 41 000 REPLACING ACCELERATOR PEDAL

CAUTION:

A removed accelerator pedal must always be replaced as removing will damage the retaining clips. This would allow the pedal to slide out of its holder and could cause an accident!

Press off locking washer (1).



<u>Fig. 23: Removing Locking Washer From Accelerator Pedal</u> Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect pedal.

Installation:

Lubricate sliding surfaces with grease, refer to 35 41 ACCELERATOR PEDAL AND LINKAGES E36.

Press down on carpet, unbend retaining clips and lever out accelerator pedal in upwards direction.

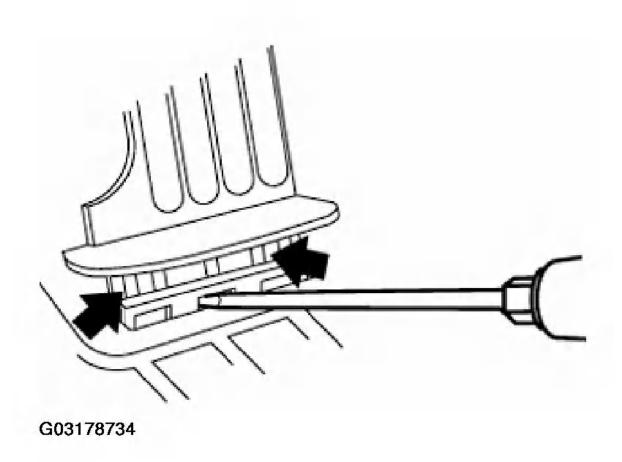


Fig. 24: Removing Accelerator Pedal Using Screwdriver Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Install accelerator pedal with pocket on holder on floor plate and snap retaining clips into place.

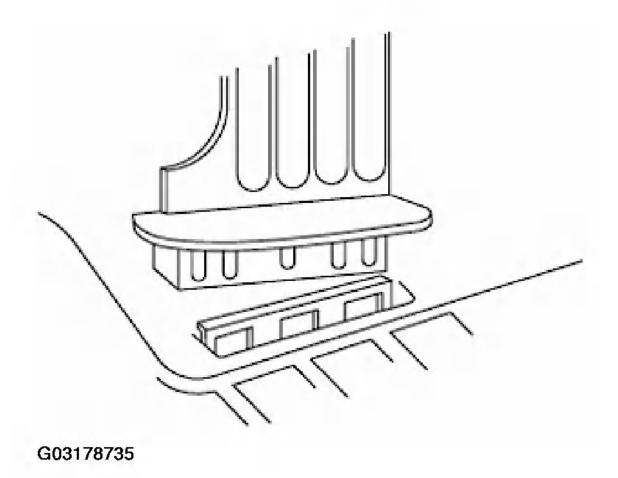


Fig. 25: Installing Accelerator Pedal Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: To be absolutely sure, check that retaining clips have snapped into place.

35 41 010 REMOVING AND INSTALLING OR REPLACING ACCELERATOR LEVER

NOTE: Remove paneling for instrument panel, see <u>51 45 180 REMOVING AND</u>

INSTALLING/REPLACING TRIM FOR INSTRUMENT PANEL, BOTTOM LEFT (Z3

ROADSTER, M ROADSTER, Z3 COUPE, M COUPE).

Disconnect Bowden cable on accelerator-lever shaft.

Fig. 26: Disconnecting Bowden Cable On Accelerator-Lever Shaft Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check rubber grommet, replacing if necessary.

Press off locking washer (1).

Fig. 27: Removing Locking Washer From Accelerator Pedal Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect pedal. Installation: Grease anti-friction faces, refer to 35 41 ACCELERATOR PEDAL AND LINKAGES E36. Take off locking clip. Fig. 28: Removing Locking Clip Courtesy of BMW OF NORTH AMERICA, INC. Installation: Check for correct seating of locking clip. Disconnect return spring. Fig. 29: Disconnecting Return Spring Courtesy of BMW OF NORTH AMERICA, INC. Slide accelerator-lever shaft to the left and remove. Installation: Check for correct installation position of return spring. Fig. 30: Checking Return Spring Installation Position Courtesy of BMW OF NORTH AMERICA, INC. 35 41 421 REPLACING BOWDEN CABLE FOR THROTTLE VALVE ACTUATION Adjust throttle cable after installation, refer to 35 41 ... THROTTLE-CABLE **CAUTION:** ADJUSTING PROCEDURES. Remove and install panelling for instrument panel, refer to 51 45 180 REMOVING AND INSTALLING/REPLACING TRIM FOR INSTRUMENT PANEL, BOTTOM LEFT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE). Disconnect Bowden cable on accelerator-lever shaft. Fig. 31: Disconnecting Bowden Cable On Accelerator-Lever Shaft Courtesy of BMW OF NORTH AMERICA, INC. Installation:

Check rubber grommet (1), replace if necessary.

Compress retaining hook and pull Bowden cable out of engine-compartment wall.

Fig. 32: Removing Bowden Cable Out Of Engine-Compartment Wall

Courtesy of BMW OF NORTH AMERICA, INC.

6-Cylinder:

Compress nipple mounts on both lugs and press out of operating lever.

Fig. 33: Locating Nipple Mounts

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Intake pipe was removed for demonstration purposes.

Press nipple out of nipple mounts.

Take Bowden cable out of nipple mounts.

Fig. 34: Removing Bowden Cable Out Of Nipple Mounts

Courtesy of BMW OF NORTH AMERICA, INC.

Remove protective cap using a screwdriver.

Pull out Bowden cable towards rear of vehicle.

Fig. 35: Removing Bowden Cable Towards The Rear

Courtesy of BMW OF NORTH AMERICA, INC.

Take rubber pad out of retainer.

Installation:

Guide in Bowden cable as far as stop.

Overview of throttle cable to throttle-valve assembly:

- 1. Nipple.
- 2. Accelerator Bowden cable.
- 3. Protective cap.
- 4. Rubber mount.
- 5. Sleeve.
- 6. Adjusting screw.

Fig. 36: Identifying Throttle Cable To Throttle-Valve Assembly Components Courtesy of BMW OF NORTH AMERICA, INC.

4-Cylinder:

Unscrew screw.

Fold up cover.

Fig. 37: Removing Cover And Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Press nipple mount apart at both lugs and press out of operating lever.

Fig. 38: Removing Nipple Mount

Courtesy of BMW OF NORTH AMERICA, INC.

Press nipple out of nipple mounts.

| Installation: |
|--|
| Check installed position (rear take-up) |
| Fig. 39: Removing Nipple From Nipple Mounts Courtesy of BMW OF NORTH AMERICA, INC. |
| Unbend nipple mounts using a screwdriver and remove Bowden cable. |
| Fig. 40: Removing Bowden Cable Courtesy of BMW OF NORTH AMERICA, INC. |
| Installation: |
| Replace nipple mounts. |
| Remove protective cap using a screwdriver. |
| Pull out Bowden cable towards rear of vehicle. |
| Fig. 41: Removing Bowden Cable Towards The Rear Courtesy of BMW OF NORTH AMERICA, INC. |
| Installation: |
| Guide in Bowden cable as far as stop. |
| 35 41 480 REPLACING KICKDOWN SWITCH (EH TRANSMISSION) |
| Testing - see Status List Diagnosing Program 03 EGS and use BMW SERVICE TESTER or MODIC. |
| Pull off flat male connector (1). |
| Fig. 42: Removing Flat Male Connector Courtesy of BMW OF NORTH AMERICA, INC. |
| Unscrew nut (2). |
| Unscrew switch. |
| Installation: |
| Adjust nut to control distance C, see 35 41 ACCELERATOR PEDAL AND LINKAGE. |
| Fig. 43: Adjusting Nut To Control Distance C Courtesy of BMW OF NORTH AMERICA, INC. |
| Make final adjustment after installation. |
| |

Article GUID: A00202361

2001-2002 BRAKES

Pedals - Z3 Roadster & Coupe

GENERAL

35 00 REAR AXLE IN GENERAL E36

REAR AXLE IN GENERAL E36 TECHNICAL SPECIFICATION

| Spacing between accelerator pedal and | | |
|---|------|-----------|
| Brake pedal | | |
| Measuring points, refer to 35 00 PEDAL ASSEMBLY. | | |
| Manual transmission J | mm | 50 |
| Autom. transmission K | mm | 60 |
| Distance tunnel-brake pedal | | |
| Measuring points, refer to 35 00 PEDAL ASSEMBLY. | •••• | •••• |
| Manual transmission F | mm | 135 +/- 5 |
| Automatic transmission G | mm | 145 +/- 5 |
| Spacing H between brake pedal and | | |
| Clutch pedal | mm | 50 |
| Measuring points, refer to 35 00 PEDAL ASSEMBLY. | | |
| Specified distances are reference values only and do not account for installation tolerances. | | |
| Distances without consideration for carpets. | •••• | •••• |

BRAKE PEDAL WITH LINKAGE

35 21 BRAKE PEDAL AND LINKAGES E36

BRAKE PEDAL AND LINKAGES E36 TECHNICAL SPECIFICATION

| Distance A pedal underside - bulkhead | 122.122 | 225 ± 10 |
|--|---------|----------|
| Measuring points, refer to 35 00 PEDAL ASSEMBLY. | mm | 223 + 10 |

35 31 CLUTCH PEDAL AND LINKAGES E36

CLUTCH PEDAL AND LINKAGES E36 TECHNICAL SPECIFICATION

| Distance B pedal underside - bulkhead Measuring points, refer to 35 00 PEDAL ASSEMBLY. | mm | 260 + 10 |
|--|----|----------|
| Specified distances are reference values only and do not account for installation tolerances. Distances without consideration for carpets. | | •••• |

CLUTCH PEDAL WITH LINKAGE

35 31 CLUTCH PEDAL AND LINKAGES E36

CLUTCH PEDAL AND LINKAGES E36 TECHNICAL SPECIFICATION

| Distance B pedal underside - bulkhead Measuring points, refer to 35 00 PEDAL ASSEMBLY. | mm | 260+10 |
|--|----|--------|
| Specified distances are reference values only and do not account for installation tolerances. Distances without consideration for carpets. | | |

KICK-DOWN

35 41 ACCELERATOR PEDAL AND LINKAGES E36

ACCELERATOR PEDAL AND LINKAGES E36 TECHNICAL SPECIFICATION

| Thread adjustment dimension C at full throttle stop Measuring points, refer to 35 00 PEDAL ASSEMBLY. | | |
|--|----|----|
| Manual transmission | mm | 62 |
| Automatic transmission | mm | 54 |
| EH transmission | mm | 51 |
| Lubricant for bearings: Renocal FN 745 Fa. Fuchs Mannheim | | |
| Specified distances are reference values only and do not account for installation tolerances. Distances without consideration for carpets. | | |

Article GUID: A00202377

1995-04 ELECTRONIC TRANSMISSION

Overview - BMW

PURPOSE OF SYSTEM

Electronically controlled transmissions were introduced on BMW products in 1986 on 5 and 7 series vehicles. Currently EH (Electro-hydraulic) transmissions are offered on almost every production model (Except E46 M3 and E39 M5). EH transmissions offer the following benefits the to driver:

- Increased driving safety by reducing fatigue. All shifts are automatic as opposed to manual transmissions which require more driver interaction.
- Increased fuel economy through use of lock up torque converter.
- Increased fuel economy through optimized shift points.
- Improved shift comfort by use of "Overlap Shift" technology (ZF).
- More available features through the use of CAN bus technology. See Fig. 1.

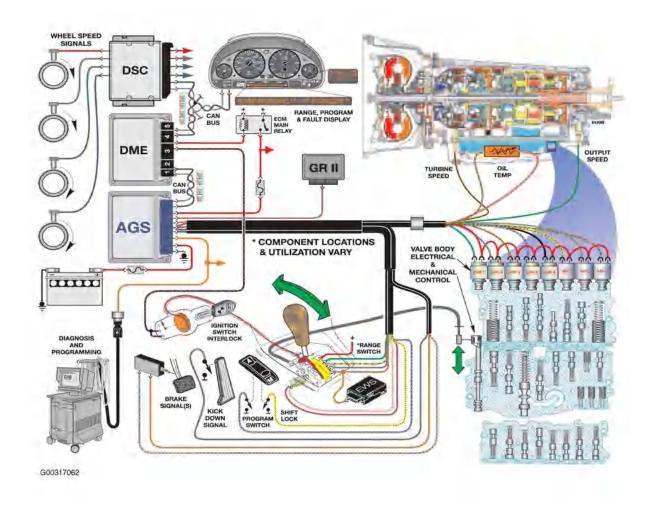


Fig. 1: Identifying Transmission Control System Courtesy of BMW OF NORTH AMERICA, INC.

The EH Control System is designed to work in conjunction with the engine electronics for precise shift control. The TCM receives information on engine RPM, load and throttle position to provide optimum shift points to maximize fuel economy and driver comfort. See <u>Fig. 2</u>. The function of an EGS System is to:

- Monitor all operating conditions through input signals
- Continually assess operating conditions by processing input data and select the appropriate operating program for current conditions.
- Activate transmission system components and to communicate with other drivetrain control systems.

• Respond to driver selected driving program (Economy, Sport or Manual).

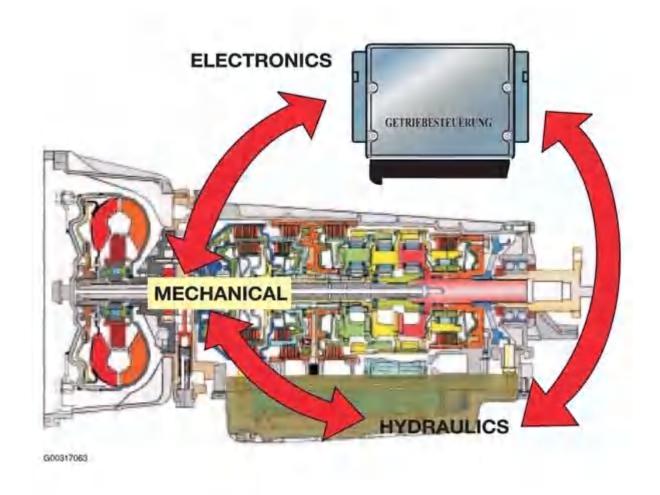


Fig. 2: Identifying Electrical, Mechanical & Hydraulic Systems Courtesy of BMW OF NORTH AMERICA, INC.

In addition to providing shift control, the TCM also adapts to changing conditions within the transmission by monitoring slip ratios and modifying line pressure. This increases the life of the transmission and reduces maintenance and adjustments. The TCM controls the operation of the Lock-Up Torque Converter which further increases economy.

On current models, the TCM also has the capability of adapting to driver habits and responds to changing environmental conditions. Items such as rate of throttle input and kickdown requests are monitored to select the most appropriate shift program.

The EGS system is also required to maintain occupant safety, safeguard drivetrain damage, improve vehicle emissions and operate in failsafe mode when a malfunction occurs.

TRANSMISSION VERSIONS & CONTROL SYSTEMS

Each BMW Electro-hydraulic transmission has a corresponding control system. They are designated "GS" which stands for Transmission Control. This acronym is from the German words Getriebe Steurung. Each transmission can have more than one control system, this depends upon application (model year, series etc.). See <u>Fig. 3</u> and <u>Fig. 4</u>.

| Transmission BMW ID # | Manufacturer ID | Model/Year | Control System | Engine |
|--------------------------|----------------------|---|---|---|
| 4HP22 (EH) | 4HP22 (EH) | 86 535i 86 635i 86 735i | GS 1.2X GS 1.2X GS 1.2X | M30 M30 M30 |
| 4HP24 (EH) | 4HP24 (EH) | 88-9/91 750iL (E32) 92-94 750iL (E32) 90-94 850i/Ci (E31) | GS 1.27 GS 1.29 GS 1.29 | M70 M70 M70 |
| A5S310Z | 5HP18 | 93 530i/iT (E34) 94 530i/iT (E34) 95 M3 (E36) 96-99 M3 (E36) | GS 7.3 GS 7.32 GS 7.11 GS 8.32 | M60 M60 S50 (US) S52 |
| A5S325Z | 5HP19 | 00 323i/Ci/CiC (3/00-8/00) 01 323iT (from 4/01) | GS 8.60 GS 8.60 | M52 TU M52 TU |
| | | 01-02 325i/Ci/CiC from 9/00 00-01 330i/Ci/CiC from 6/00 01- 525 from 3/01 01- 530 from 3/01 03 Z4 (E85) 2.5i and 3.0i | GS 8.60.4 GS 8.60.4 GS 8.60.4 GS 8.60.4 GS 8.60.4 | M54 M54 M54 M54 M54 M54 |
| A5S440Z | 5HP24 | 97 840Ci (E31) from 9/96 97 540i (E39) 1/97-8/97 97 740i/iL (1/97 - 4/97) 97 740i/iL (5/97-8/97) 98-03 540i 98-01 740i/iL 00- X5 4.4i | GS 8.55 (CAN index 50) GS 8.55 (CAN index 50) GS 8.55 (CAN index 50) GS 8.55 (CAN index 60) GS 8.60.2 (CAN index 60) GS 8.60.2 (CAN index 60) GS 8.60.2 (CAN index 60) GS 8.60.2 | M62 M62 M62 M62 M62, M62 TU 99-02 M62, M62 TU 99-01 M62TU |
| A5S560Z | 5HP30 | 93-94 740i/iL (E32) 93 540i (E34) 94-95 540i (E34) 94-95 840Ci (E31) 95 740i/iL (E38) | GS 9.2 GS 9.2 GS 9.22 GS 9.22 GS 9.22 | M60 M60 M60 M60 M60 |
| | | 95-01 750iL (E38) 96-97 740i/iL (-1/97) 96 840Ci (E31) 95-97 850Ci | GS 9.22.1 GS 9.22.1 GS 9.22.1 GS 9.22.1 | M73/M73TU M62 M62 M73 |
| GA6HP26Z | GA6HP26Z GA6HP26Z | 02- 745Li (E65/E66) 03- 760Li (E66) | GS 19 GS 19 | N62 N73 |

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Fig. 3: Identifying ZF Control Systems
Courtesy of BMW OF NORTH AMERICA, INC.

| Transmission BMW ID # | Manufacturer ID # | Model/Year | Control System | Engine |
|--------------------------|----------------------|--|--|--|
| A4S310R (THM-R1) | 4L30-E(A4S310R) >>> | 90-92 525i (E34) 93-95 525i (E34) 92 325i,is,ic (E36) 93-95325i,is,ic (E36) 92-95 318ti (E36) | GS 4.14 GS 4.16 GS 4.14 GS 4.16 GS 4.14 & GS 4.16 | M50 M50 TU M50 M50 TU M42 |
| A4S270R | 4L30-E(A4S270R) >>> | 96-98 328i (is,ic -97) 96-98 318i (is,ic-97) 96-98 318i (E36/5) 96-98 Z3 1.9 (E36/7) 96-98 Z3 2.8 97-98 528i (E39) | GS 8.34 GS 8.34 GS 8.34 GS 8.34 GS 8.34 GS 8.34 | M52 M44 M44 M44 M52 M52 |
| A5S360R (GM5) | 5L40-E (A5S360R) >> | 99-00 323i/Ci (7/98-3/00) 99-00 328i/Ci (6/98-5/00) 99-00 528i (E39) 9/99-8/00 99-00 Z3 (E36/7) 2.3/2.8 | GS 20 GS 20 GS 20 GS 20 | M52 TU M52 TU M52 TU M52 TU |
| A5S390R (GM5) | 5L40-E (A5S390R) >> | 00-03 X5 3.0i (4/00 -) 01 325iT (8/00-3/01) 01-03 325xi/xiT & 330Xi (-8/00) 01 525i/IT (9/00-3/01) 01 530i (9/00-3/01) 01-02 Z3 2.5/3.0 (6/00-) | GS 20 GS 20 GS 20 GS 20 GS 20 GS 20 GS 20 | M54 M54 M54 M54 M54 M54 |



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GS 20 TCM (Siemens)

Fig. 4: Identifying Hydramatic Control Systems
Courtesy of BMW OF NORTH AMERICA, INC.

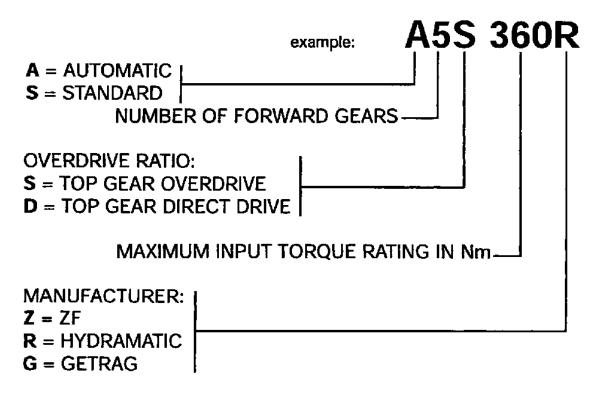
TRANSMISSION IDENTIFICATION

BMW automatic transmission are manufactured by two suppliers for the US market:

- Zahnradfabrik Friedrichshafen: Commonly referred to as ZF. ZF manufactures both manual as well as automatic transmissions.
- GM Powertrain Hydramatic: Hydramatic is a manufacturing division of General Motors located in Strasbourg, France. Hydramatic supplies automatic transmissions to BMW for four and six-cylinder vehicles.

BMW has developed an internal numbering system for their transmissions for ordering parts, information research and identification. Also, each transmission manufacturer uses an internal identification system. Here is a breakdown of these identification codes:

Hydramatic Transmissions have internal designations, however they are not used often. The internal code for the A4S310/270R is 4L30-E and the A5S360/390R is 5L40-E. See <u>Fig. 5</u> and <u>Fig. 6</u>.



Each manufacturer has it's own internal identification for it's products. For example: the A5S 360R is the GM 5L40E, and the A5S 325Z is the ZF 5HP 19.

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Fig. 5: BMW Transmission Identification Code (1 Of 2) Courtesy of BMW OF NORTH AMERICA, INC.

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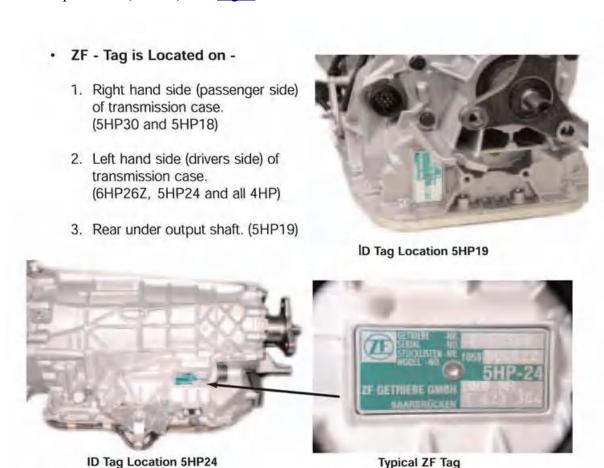
Fig. 6: BMW Transmission Identification Code (2 Of 2) Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION ID TAG LOCATION

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In order to identify BMW transmissions there are identification tags located externally on the transmission case. The tag contains information such as Manufacturer, Serial number, transmission type etc. This information is needed when ordering parts, referencing bulletins and calling for technical assistance. ZF tag is located on:

- Right hand side (passenger side) of transmission case. (5HP30 and 5HP18).
- Left hand side (drivers side) of transmission case. (6HP26Z, 5HP24 and all 4HP).
- Rear under output shaft. (5HP19). See Fig. 7.



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Fig. 7: Identifying ZF Identification Tag Location Courtesy of BMW OF NORTH AMERICA, INC.

GM tag is located on:

• Left side (driver's side) of transmission case. See Fig. 8.

 GM - Located on left hand side (drivers side) of transmission case.



GM ID Tag (GM 5)



Hydramatic ID Tag Location (GM5)

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Fig. 8: Identifying GM Identification Tag Location Courtesy of BMW OF NORTH AMERICA, INC.

SYSTEM COMPONENTS

TRANSMISSION CONTROL MODULE

The TCM receives inputs, processes information and actuates the output elements to provide optimal shift points. See <u>Fig. 9</u>. The TCM is programmed for maximum shift comfort and fuel economy. The TCM on most BMW vehicles is located in the E-Box next to the ECM (DME). There are several types of TCM housings:

- 35 Pin TCM (TCU) used on the 4HP transmissions.
- 55 Pin TCM used on the A4S310R (THM-R1).
- 88 Pin TCM used on all others up to 1998.
- 134 Pin TCM used on all BMW transmission from the 1999 model year. (Note- the 134 pin TCM was introduced on the 1998 Models equipped with the A5S440Z).

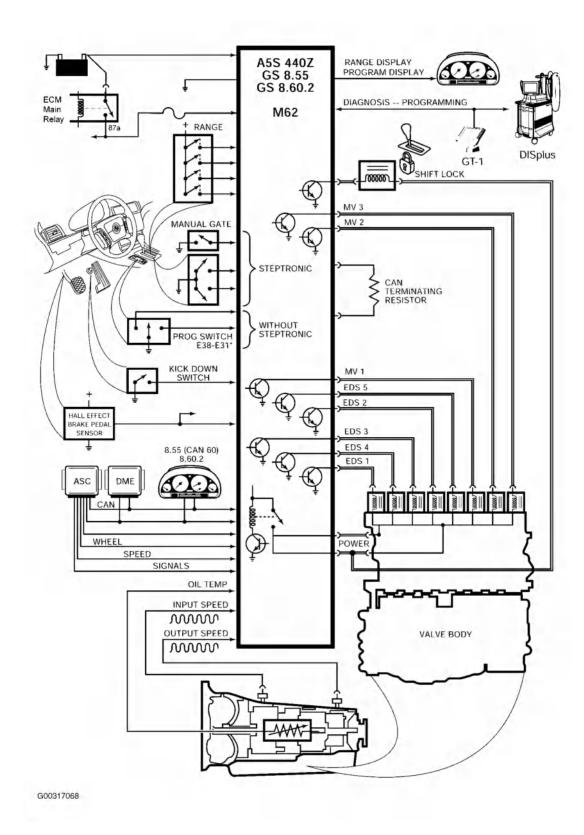


Fig. 9: Electrical System Components
Courtesy of BMW OF NORTH AMERICA, INC.

The 134 Pin TCM is also referred to as SKE (Standard Shell Construction). The SKE housing uses 5 separate connectors. On transmission applications only three connectors 1, 3 and 4) are used. Connectors 2 and 5 are blank and are NOT used. The connectors are blue in color to avoid confusion with the ECM (DME) connectors which are black. See <u>Fig. 10</u>.

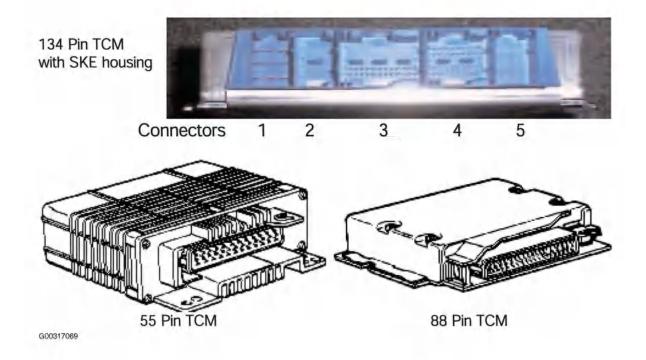


Fig. 10: Identifying Transmission Control Module & Connectors Courtesy of BMW OF NORTH AMERICA, INC.

TURBINE SPEED SENSOR

The Turbine Speed Sensor is used to provide input (turbine) shaft speed information to the TCM (EGS). The input shaft speed signal is used in conjunction with the output shaft speed signal to determine gear range and slip time information for processing in the TCM. Not all BMW transmissions use a turbine speed sensor. Some TCM's use the TD (engine speed) signal to determine input shaft speed. All transmissions with the exception of the A5S325Z use an inductive type sensor which generates an A/C analog signal. The A5S325Z currently uses a Hall Effect Turbine Speed Sensor which will send a digital square wave signal to the TCM.

4HP22/24 (EH), A4S310/270R

These transmissions do not use a Turbine Speed Sensor. The TD signal is used to determine input shaft speed. The TD signal is an output signal of the DME control unit.

A5S310Z, A5S325Z, A5S440Z, A5S560Z, A5S360/390R

These transmission use a turbine speed sensor. The TD signal is also used with the turbine speed signal to allow the TCM to monitor Torque Converter Clutch operation. The TCM can control torque converter clutch slippage and also monitor for faults.

OUTPUT SHAFT SPEED SENSOR

The Output Shaft Speed Sensor is used to provide output shaft speed information to the TCM. The output shaft speed signal is used in conjunction with the turbine speed signal to provide the TCM with information on gear ranges and slip times. All BMW electronic transmissions have an output shaft speed sensor. The output shaft speed sensor is an inductive type which will generate an A/C analog signal to the TCM. The frequency and amplitude of the signal will increase as output shaft speed increases. See <u>Fig. 11</u>. The exact location of the output shaft speed sensor varies by transmission model.

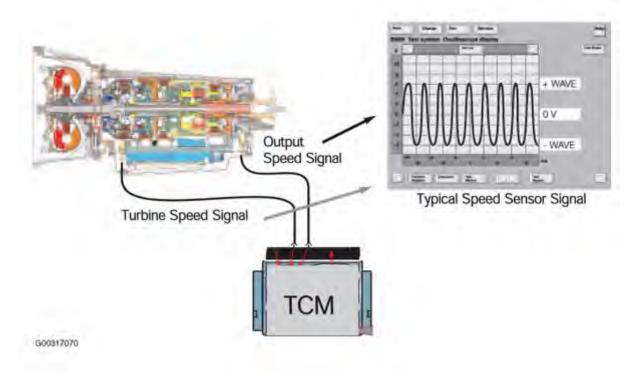


Fig. 11: Identifying Speed Sensor Output Signal Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION OIL TEMPERATURE SENSOR

The TCM is provided with transmission oil temperature information via a temperature sensor. See <u>Fig. 12</u>. On most BMW transmissions, the sensor is an NTC element which is part of the transmission internal wiring harness.

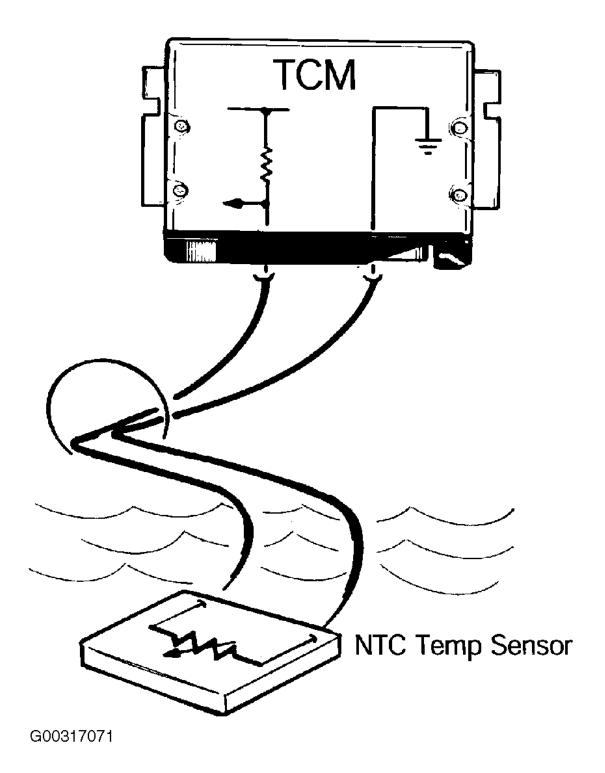


Fig. 12: Identifying Transmission Oil Temperature Sensor Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Mechatronics Module is not currently serviceable at this time. Do not attempt any repair or replacement of the Mechatronics Module.

The transmission oil temperature information is used to:

- Initiate the Warm Up Program
- To inhibit TCC operation until a specified temperature has been reached.
- For determining fluid level when used with diagnostic equipment.

The transmission oil temperature sensor is connected to the TCM via a 5 Volt reference and a circuit ground. As transmission oil temperature increases, the circuit resistance and voltage decrease proportionately.

4HP22/24 (EH)

These transmissions do not use a transmission oil temperature sensor. There are no transmission oil temperature influenced features on the 4HP transmissions.

All Except A5S360/390R, GA6HP26Z

The transmission fluid temp sensor is part of the transmission internal wiring harness. On these transmissions, the sensor cannot be replaced separately. The harness must be replaced.

A5S360/390R Transmission

The sensor is a separate, replaceable sensor that can be unplugged from the harness.

GA6HP26Z

The sensor is located in the Mechatronics Module, which is located inside of the transmission.

KICKDOWN SWITCH

The TCM receives a kickdown request via one of two possible methods:

• The kickdown signal is a direct ground input to the TCM. The kickdown input is provided by a kickdown switch located under the accelerator pedal. See <u>Fig. 13</u>. This method is used on most BMW vehicles without electronic throttle control systems (except M52TU with MDK).



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Fig. 13: Identifying Kickdown Switch Location

Courtesy of BMW OF NORTH AMERICA, INC.

• The kickdown request is provided by the ECM (DME) via the CAN bus. The kick down request originates from the PWG. There is no separate switch in the PWG. When the PWG voltage reaches approximately 4.5 volts, the ECM will process a kickdown request to the TCM via CAN. The PWG contains a kickdown detent to simulate the feel of a kickdown switch. This method is used on the M62TU, M54, M73, M73TU, N73 and N62 engines. See Fig. 14.

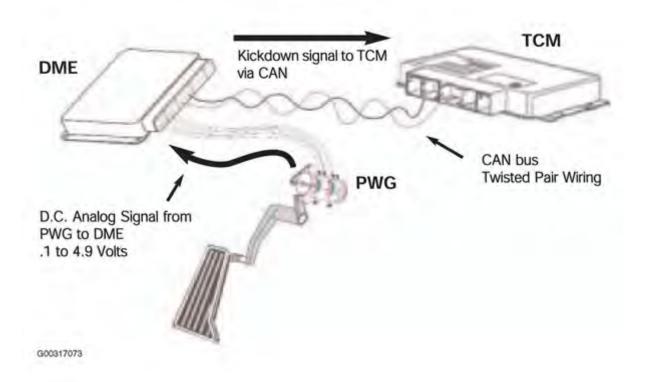


Fig. 14: Identifying Kickdown Switch Circuit Courtesy of BMW OF NORTH AMERICA, INC.

BRAKE SWITCH

The brake switch is located on the brake pedal linkage. See <u>Fig. 15</u>. The brake switch signal is an input to the TCM which is used for:

- De-activation of the shift lock solenoid. When the ignition key is turned to KL15 the shift lock is active. The shift lock solenoid is de-activated when the brakes are applied.
- De-activate the Torque Converter . The TCC is deactivated whenever the brake is applied. (only on Hydramatic Transmissions).

There are two types of brake switches used on BMW vehicles:

- On early vehicles such as E32, E34, E36, E24, E28 and E31 the brake switch is a double-contact mechanical switch. There is a brake light circuit and a brake test circuit. The brake test circuit is used for a plausibility check to indicate faults within the brake light circuit.
- On the E38, E39, E46, E65/66, E85 and E53 the brake switch is a hall effect type switch. The electronic switch is also monitored for faults and plausibility.

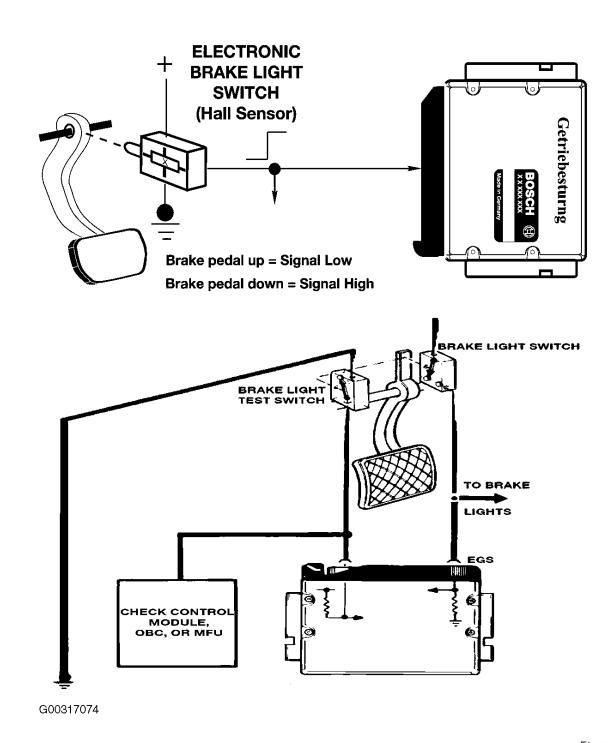


Fig. 15: Identifying Brake Light Switch Components Courtesy of BMW OF NORTH AMERICA, INC.

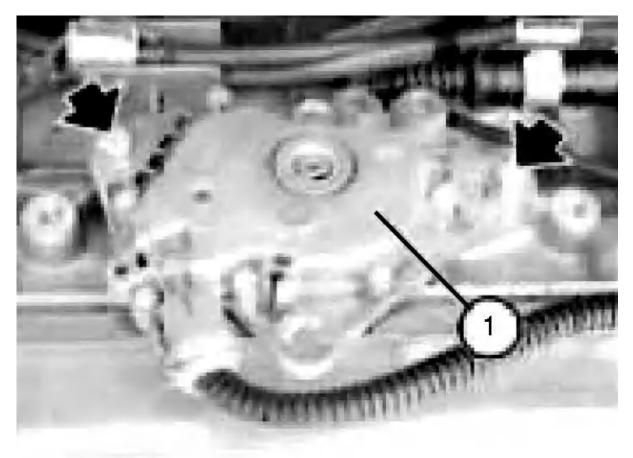
TRANSMISSION RANGE SELECTOR SWITCH

The range selector switch is an input to the TCM. The input is used by the TCM to determine the position of the manual valve. The range switch uses the familiar "coded input" signal to determine selector lever position. See Fig. 16. On all transmissions except the A5S360/390R, the range switch uses a 4 wire configuration to determine 7 range selector positions. The A5S360/390R uses a five wire arrangement.

Most range switches are located on the transmission case with some exceptions. The E36 with the A4S270/310R the range switch is located in the center console on the selector lever assembly. The E39 with A4S270R the range switch is located on the transmission case and is adjustable. The range selector switch on the A5S360/390R is located inside the transmission housing. GA6HP26Z is part of the Mechatronics Module.

The range switch can be checked by using "Status Requests" in the DISplus or GT-1. A multimeter or an oscilloscope can also be used to check the range switch. If the reading on "Status Requests" does not match the actual selector lever position, there will be various transmission malfunctions. Always refer to the proper ETM when diagnosing the range selector switch. Use the switch logic chart to diagnose faults in the switch.

In the example below, the range switch is in neutral. Using the logic chart, switches L1, L2 and L3 are closed providing B+ voltage to the corresponding pins of the TCM. Switch L4 is open and no voltage is sent to the TCM. Malfunctions in the range switch or wiring can cause various shifting complaints and possible no-start complaints. See <u>Fig. 17</u>.



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Fig. 16: Identifying Transmission Range Switch Courtesy of BMW OF NORTH AMERICA, INC.

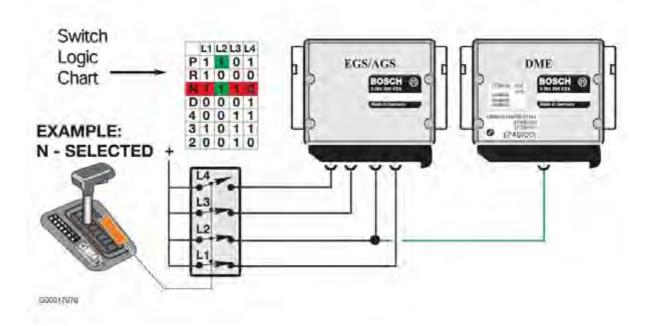


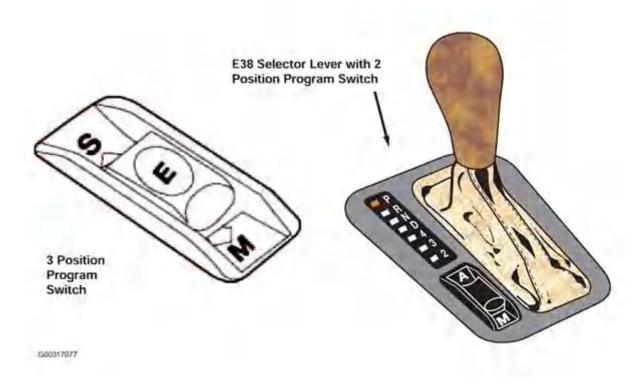
Fig. 17: Identifying Transmission Range Switch Circuit Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION PROGRAM SWITCH

The transmission program switch is used to switch between various operating modes of the transmission. The normal default mode of the TCM is Economy which is indicated in the program display as "E". Economy mode allows the transmission to operate in the most efficient mode. Shift priorities are for maximum economy and shift comfort. On some vehicles the program switch is designated "A" for economy mode. Program switches come in 2 or 3 position configurations. Early vehicles with the 4HP (Early E7) used a rotary program switch.

The TCM can also be switched to "Manual Mode" which on some vehicles is designated "Winter Mode". Manual mode is used to start the vehicle off in a higher gear when encountering slippery conditions. The program display will indicate "M" (manual) or an asterisk symbol for "Winter Mode".

Sport Mode is the third operating mode that is available. Sport mode allows for a slightly delayed and more aggressive shift. Sport mode is obtained a number of ways. On vehicles with 2 position program switches, moving the selector lever out of drive to 4, 3, or 2 with the program switch in Economy will allow Sport mode. On vehicles with 3 position program switches, Sport mode can be obtained by switching to "S". See Fig. 18.



<u>Fig. 18: Identifying Transmission Program Switch</u> Courtesy of BMW OF NORTH AMERICA, INC.

STEPTRONIC COMPONENTS

The Steptronic system uses additional components not found on a conventional system. These components consist of a manual switch and an Up/Down microswitch. Otherwise, the Steptronic system uses the same transmission and TCM. The TCM monitors the Steptronic shifter position from P through D via the conventional range selector switch located on the transmission. The Range Selector Switch provides positions P through D to the TCM because the automatic gate of the shifter only travels through these positions. See <u>Fig. 19</u>.

When the Steptronic Shifter is moved to the left 15 degrees into the manual gate, the TCM receives a ground input from the manual gate switch. The ground signal is provided to the TCM through the Transmission Position Indicator. The transmission position indicator also provides range position signaling to the range position indicator in the shift console.

Steptronic was introduced on the E31 850Ci (10/94) and the 840Ci (1/96). Steptronic was subsequently introduced into the E38, E39, E46, E36/7 and the E53. The Steptronic system can be diagnosed through "Status Requests" with the DISplus or GT-1. From 2002 model year the Steptronic shifter has changed slightly. Downshifts are now achieved by moving the selector lever forward and upshifts are now rearward.

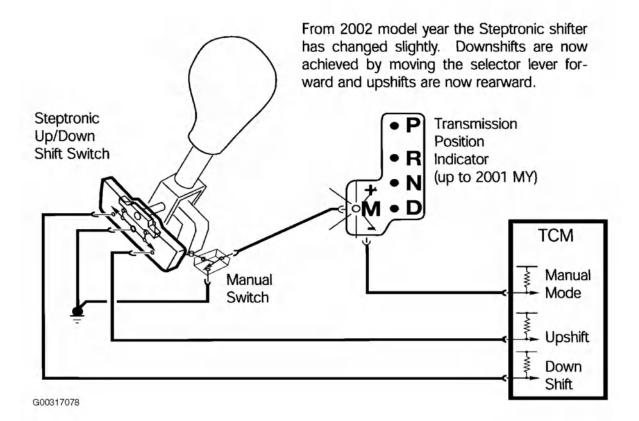


Fig. 19: Identifying Steptronic Components
Courtesy of BMW OF NORTH AMERICA, INC.

MAGNETIC VALVES

Magnetic Valves (MV) are used to electronically control hydraulic fluid flow to the various shift elements within the transmission. See <u>Fig. 20</u>. Magnetic valves are located on the valve body and replaceable as separate components. In ZF transmissions, MV valves are designated MV1, MV2, MV3 etc. In Hydramatic transmissions, they are designated Shift Valve A, Shift Valve B, Shift Valve C etc.

The magnetic valves are controlled by the TCM. They are supplied power by an internal TCM relay and are ground controlled. The TCM switches one or more of the MV's on or off in various combinations to achieve various shifts. Most transmission have 2 or 3 MV's to control shifting.

In addition to controlling shifts within the transmission, magnetic valves are also used for overlap shifting and pressure regulation on some transmission applications. For example MV4 and MV5 are used for overlap shifting in the A5S310Z. MV5 is used for pressure regulation on the 4HP22/24EH transmissions. When used for pressure regulation, the magnetic valves are pulse width modulated by the TCM.

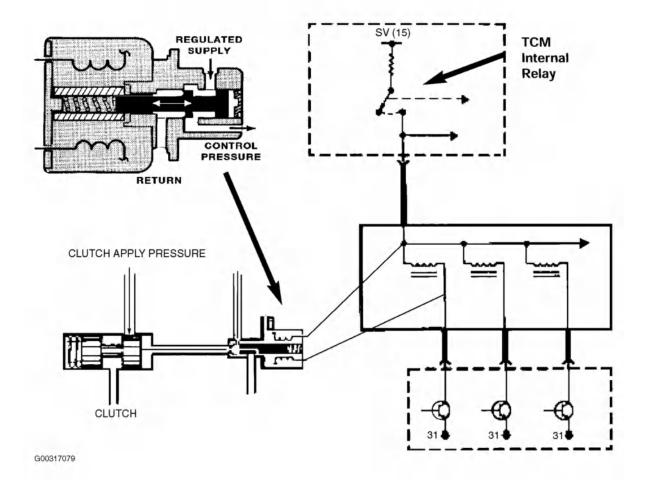


Fig. 20: Identifying Magnetic Valve Operation Courtesy of BMW OF NORTH AMERICA, INC.

PRESSURE REGULATING SOLENOIDS

Pressure Regulating Solenoids are used to modify line pressure for use in the transmission. See <u>Fig. 21</u>. There are numerous terms for these solenoids depending upon transmission type and manufacturer. ZF transmissions use the term EDS, while Hydramatic Transmissions use the term DR solenoid, Force Motor Solenoid and Variable Bleed Solenoid (VBS). EDS valves are used for main line pressure regulation, TCC application and Overlap Shift Pressure Control on the A5S440Z and A5S560Z.

All pressure regulating solenoids are controlled by Pulse Width Modulation. Using the example in the picture below, this is a section of the A5S440Z/560Z valve body. The EDS valves are used for the following:

- EDS 1 is used for main line pressure regulation.
- EDS 2, 3 and 5 are used Overlap Shift Pressure Control.
- EDS 4 is used for TCC application. (GWK) Gradually applied TCC.



Fig. 21: Identifying Pressure Regulating Solenoids Courtesy of BMW OF NORTH AMERICA, INC.

HYDRAMATIC PRESSURE REGULATOR

The valve body shown in illustration is from the A5S360/390R. Note location of main pressure regulator. Depending upon the reference text, the pressure regulator is also known as the Force Motor Solenoid, Variable Bleed Solenoid or PC Solenoid. See $\underline{Fig. 22}$ and $\underline{Fig. 23}$.

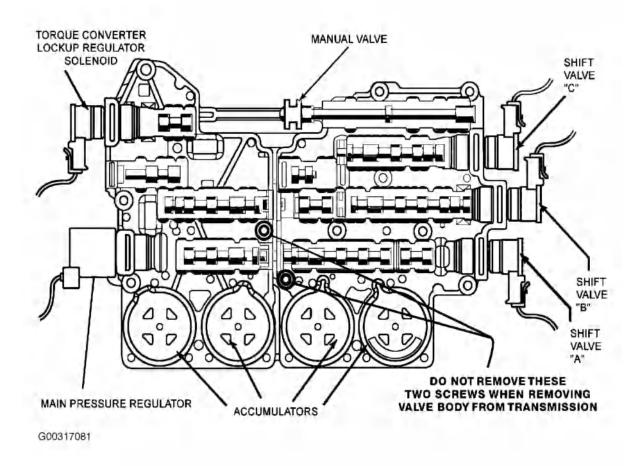
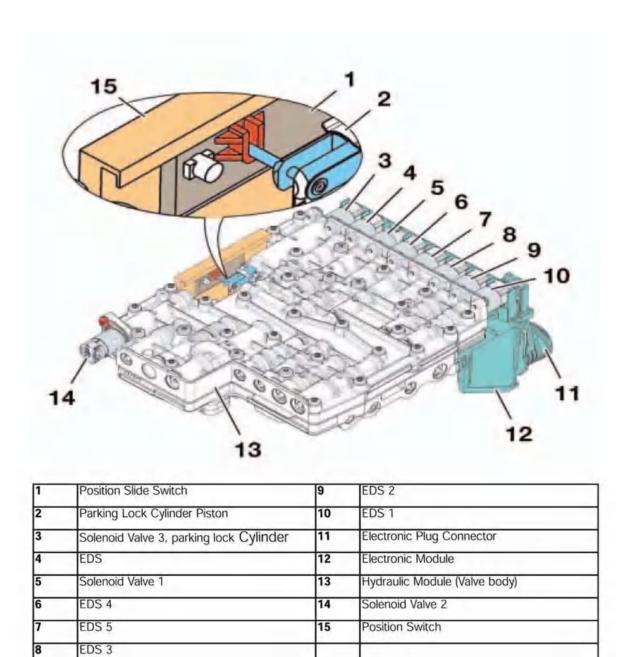


Fig. 22: Identifying Valve Body Components (1 Of 2) Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 23: Identifying Valve Body Components (6HP26Z) Courtesy of BMW OF NORTH AMERICA, INC.

INSTRUMENT CLUSTER

The cluster is used to report information to the driver regarding transmission status. There are three items of information needed by the driver:

Transmission Range

This indicates the position of the range selector lever. The driver needs to know whether the transmission is in P, R, N, D, 4, 3, or 2.

Transmission Program

This indicates the mode of operation. There are 3 modes, Economy, Manual and Sport.

Transmission Fault Information

The driver needs to know of there is a malfunction in the transmission. Depending upon application,

transmission faults can be indicated by an icon or by a "Transmission Program" message in the instrument cluster display matrix. See <u>Fig. 24</u>.

Depending upon vehicle model and transmission, these pieces of information arrive at the cluster through different methods:

- The most current method for this information to arrive at the cluster is through the CAN bus. The cluster processes this information from the TCM via CAN.
- On early E38 and E39 vehicles these is a "One Way Data Signal" from the TCM to the cluster. There is a one way serial data line that transfers this information to the cluster. On later vehicles, the cluster was introduced to the CAN bus and this method was no longer used. This was used on the E38 vehicles to 5/97 and E39 vehicles to 8/97 production. See Fig. 25.
- Early vehicles such as E32, E34, E36 etc. used a various combination of methods to transfer this data. Some clusters use the "Coded Input" method for the program indicator. Fault indication is done by a ground circuit through the TCM. Transmission range indication is achieved by a direct connection between the range switch and cluster or by a coded input to cluster.



Fig. 24: Identifying Instrument Cluster Transmission Information Courtesy of BMW OF NORTH AMERICA, INC.

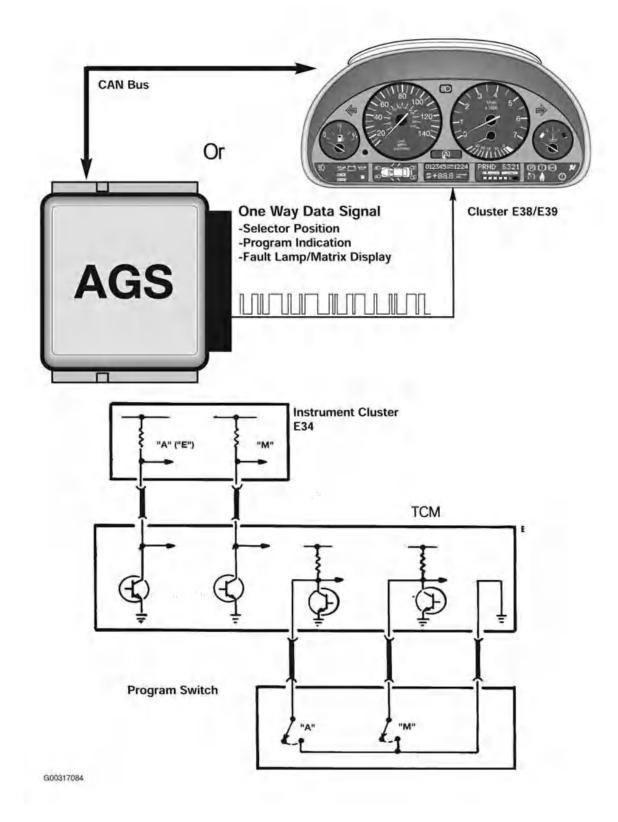


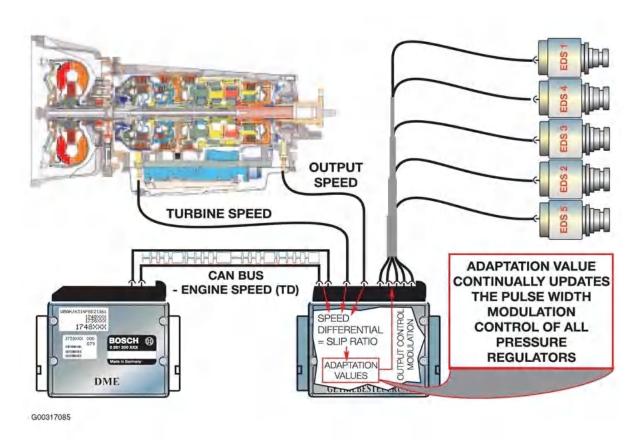
Fig. 25: Identifying E38/E39 CAN Bus Cluster & E34 Circuit Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION FEATURES & PRINCIPLES OF OPERATION

ADAPTIVE HYDRAULIC PRESSURE CONTROL

Pressure adaptation has been a feature of ZF automatic transmissions since the 4HP22EH. The TCM will maximize shift quality by adapting to transmission wear over time. The TCM will adjust transmission shift pressures to compensate for wear in the multi-plate clutches. This is accomplished by monitoring the input and output speeds of the transmission. When the transmission shifts, the TCM monitors the time that it takes to accomplish the shift. The time change in gear ratio is monitored and compared to an internal time value in the

TCM. If the ratio change takes more time than the stored value, the TCM will compensate by adjusting the transmission shift pressures via the EDS valve solenoids. The adaptation value is stored in the TCM. This adaptation values can only be cleared by the diagnostic tester (DIS plus or GT-1). See <u>Fig. 26</u>.



<u>Fig. 26: Identifying Adaptive Hydraulic Pressure Control</u> Courtesy of BMW OF NORTH AMERICA, INC.

NOTE:

DO NOT clear adaptation values unless directed to do so by technical assistance. Clearing pressure adaptations should not be done to resolve a customer complaint. The only time that you would need to do so is after a transmission or valve body replacement or software change. Also it is important not to confuse pressure adaptation with AGS features. AGS features will be discussed later in this chapter. AGS features are not stored on a long term basis and will not be cleared when the pressure adaptations are cleared. Driving style is NOT stored.

DOWNSHIFT PROTECTION

Downshift protection is a feature that prevents unwanted or improper downshifting. If the range selector were moved to a lower gear at a high road speed, engine damage could occur from an unintended over-rev. This feature will prevent engine over-rev by delaying or preventing the unwanted downshift until the proper road speed is achieved. The result is increased safety by preventing unwanted deceleration slip.

REVERSE LOCKOUT

The TCM will lockout reverse above 3 MPH to prevent drivetrain damage. The range selector lever will go into the reverse detent, but reverse will not engage. This is achieved by the TCM through hydraulic intervention. The transmission will appear to be in neutral.

NOTE: Reverse Lockout is not operative when in failsafe.

ENGINE WARM UP CYCLE

The transmission shift points are modified after cold start to raise engine RPM during shifting. This allows for a faster engine warm up and reduction of catalyst warm up time. The TCM uses the transmission oil temperature information to determine the implementation of this function. The warm up phase program will be terminated if any of the following conditions exist:

- The vehicle exceeds 25 MPH.
- Transmission oil temperature exceeds 60ŰC.
- A Maximum of three minutes is exceeded.

ASC/DSC SHIFT INTERVENTION

During ASC/DSC regulation upshifts are inhibited to enhance the effectiveness of tractional control. Depending upon vehicle model, this action can take place via the CAN bus or a dedicated shift intervention signal wire. On later model vehicles where the ASC/DSC module is connected to the CAN bus, the shift intervention signal is sent to the TCM via CAN.

TORQUE REDUCTION

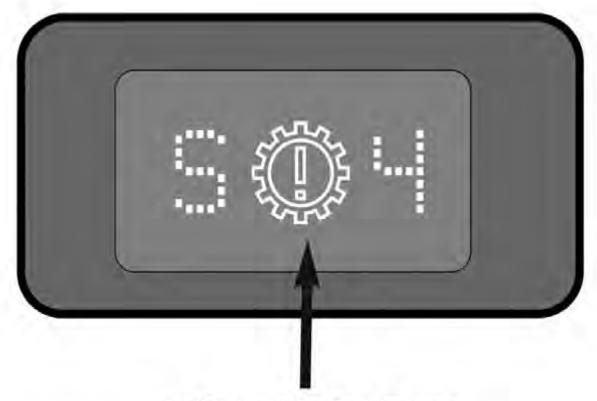
In order to allow a smoother shift and reduce load on the transmission, engine torque is reduced during shifting. This is accomplished by a signal that is sent from the TCM (EGS) to the ECM (DME) during shifting. The ECM will retard timing momentarily during the shift for a few milliseconds. This timing change is transparent to the driver. Depending upon application, the torque reduction signal is sent over a dedicated wire or a signal over the CAN bus.

EMERGENCY PROGRAM

When a malfunction occurs within the transmission, the emergency program (failsafe mode) will be initiated. The emergency program will prevent unintended gear engagement and ensure driver safety. The following will occur during failsafe operation:

- All shift solenoids are de-energized via TCM internal relay.
- The pressure regulation solenoid is de-energized resulting in maximum line pressure.
- The Torque Converter Clutch is de-activated.
- The Reverse Lockout function is canceled.
- Shift lock solenoid is de-energized.
- Fault indicators are active.

The fault indicator varies depending upon model, year and cluster type etc. See Fig. 27. High version instrument cluster will display a message in the matrix display. Vehicles with low version clusters will display a fault symbol in the cluster. During failsafe mode the transmission will be shifted into a higher gear to allow the vehicle to be driven to a service location. Depending upon application, the transmission will shift into 3rd or 4th gear (on a 4 spd) and 4th or 5th gear (on a 5 spd). For example the A5S360R transmission will go into 5th gear when there is a malfunction and 4th when there is a power failure to the TCM. Since pressure regulation ceases, the shift to failsafe mode will be abrupt or harsh, unless the transmission is already in the failsafe gear. On newer OBD II complaint vehicles, the MIL light will also be illuminated by the ECM (DME).



E46 Transmission Fault Indicator

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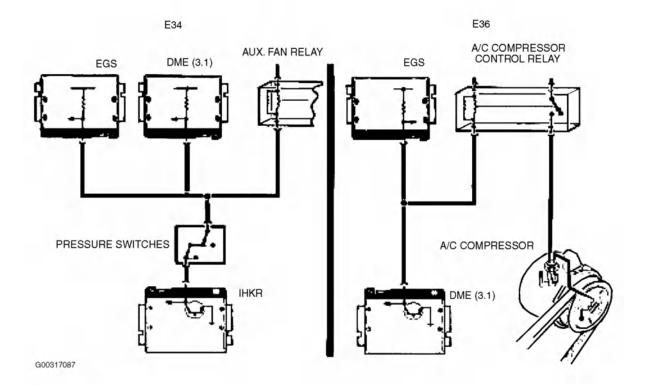
Fig. 27: E46 Transmission Fault Indicator Courtesy of BMW OF NORTH AMERICA, INC.

NOTE:

Note: When diagnosing transmission related complaints, it is possible to have an erroneous fault indicator warning. Faults in the cluster can cause a false indication or "Trans Program" message. One indication of this scenario would be a transmission fault message in the cluster with no transmission faults stored in the TCM.

A/C COMPRESSOR LOAD SENSING (HYDRAMATIC TRANSMISSIONS)

When the A/C Compressor is switched on, additional load is placed on the engine. To compensate for the additional load, the TCM modifies line pressure and shift points. On the THMR-1, the TCM receives these signals via a direct connection to the A/C compressor control circuit. On vehicles equipped with CAN bus technology, the "AC on" signal is sent to the TCM from the DME as a CAN bus message. See <u>Fig. 28</u>.



<u>Fig. 28: A/C Compressor Load Sensing</u> Courtesy of BMW OF NORTH AMERICA, INC.

SHIFT LOCK

The shift lock solenoid is mounted on the selector lever assembly and locks the selector lever in Park or Neutral when the ignition is ON. See <u>Fig. 29</u>. This prevents the selection of a gear unless the brake pedal is depressed. The solenoid is activated by a switched ground from the TCM. Power is supplied by the TCM internal relay. During failsafe operation, the shift lock is disabled. On later models, the shift lock will also be active when the TD signal is present and the shifter will remain locked above an engine speed of 2500 RPM regardless of brake application.

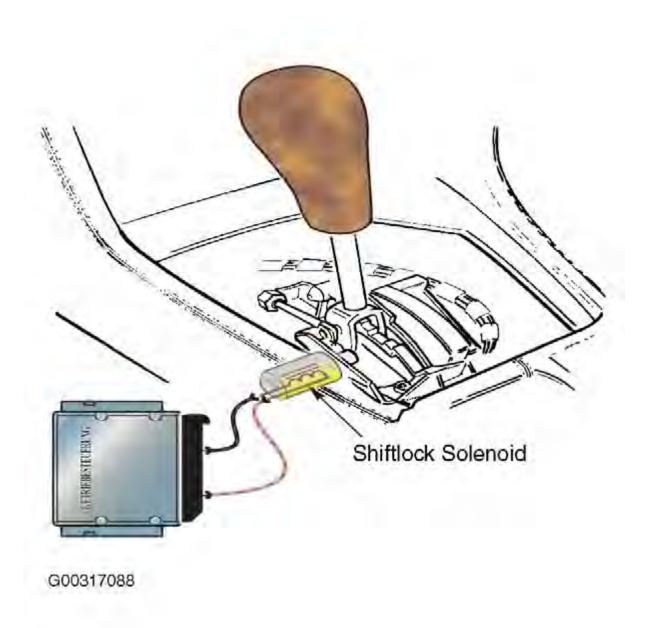


Fig. 29: Identifying Shift Lock Solenoid Courtesy of BMW OF NORTH AMERICA, INC.

TORQUE CONVERTER CLUTCH

A torque converter clutch was added on EH controlled transmissions. The torque converter clutch locks the turbine to the converter housing. This creates a mechanical coupling with a ratio of 1:1. This can only be achieved at higher engine speeds, the torque converter clutch must be disengaged at low engine speeds to prevent stalling. There are two methods for controlling the torque converter clutch on BMW transmissions:

- A4S310/270R, 4HP22/24 EH, A5S310Z These transmissions use an on/off control method to lock and unlock the torque converter. The Torque Converter Clutch is either completely engaged or disengaged. This method of engagement provides an abrupt sensation when the TCC is locking and unlocking. This abrupt sensation can be undesirable to some drivers.
- A5S560Z, A5S440Z, A5S325Z, GA6HP26Z, A5S360/390R These transmissions use a gradual approach to TCC control. The TCC is gradually applied and released, this method reduces the abrupt feel of the on/off type TCC. The TCC solenoid is controlled by pulse width modulation. This allows fluid to be gradually introduced and released to the TCC.

The TCC is spring loaded to the engaged position. Pressurized fluid releases the TCC, when the pressurized fluid is released, the TCC is engaged. Depending on transmission application, the TCC can be engaged in 3rd, 4th or 5th gear. The TCC must be disengaged at low speeds to prevent stalling. See <u>Fig. 30</u> and <u>Fig. 31</u>.

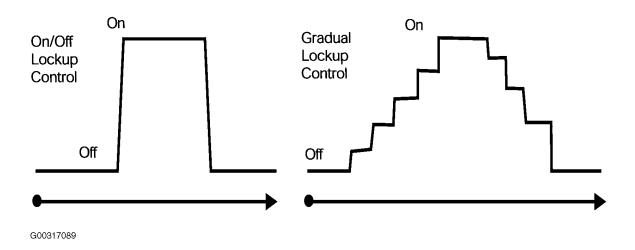


Fig. 30: Torque Converter Clutch Operation Courtesy of BMW OF NORTH AMERICA, INC.

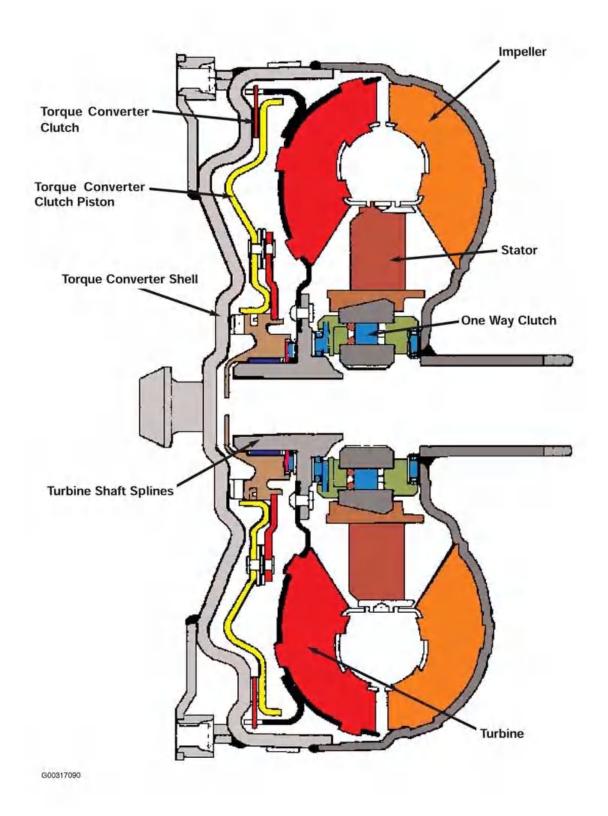


Fig. 31: Identifying Lock-Up Torque Converter Components Courtesy of BMW OF NORTH AMERICA, INC.

SHIFT SOLENOID CONTROL

Magnetic valves are used to direct the flow of transmission fluid to control shift elements in the transmission. Another Term for "Magnetic Valve" is "Shift Valve". Magnetic valves (MV) are solenoids controlled by the TCM. They can be switched by B+ or B-. On ZF transmissions, magnetic valves are designated MV1, MV2, MV3 etc. On GM transmissions they are designated Shift Valve A, Shift Valve B, Shift Valve C etc. Either valve can be checked for proper resistance using a multi-meter, DISplus or GT-1. Also, the "Activate Components" function can be used to check the Magnetic valves. Most all magnetic valves are switched on/off instead of Pulse Width Modulation (PWM). All magnetic valves (except THM R-1 to 12/95) are supplied

power from an internal relay located in the TCM. The magnetic valves are switched on and off by final stage transistors in the TCM. During failsafe operation, power to all MV's is switched off by the internal relay. Magnetic valves are located on the valve body. They can be replaced individually. Refer to proper repair instructions for installation and removal procedures. See Fig. 32.

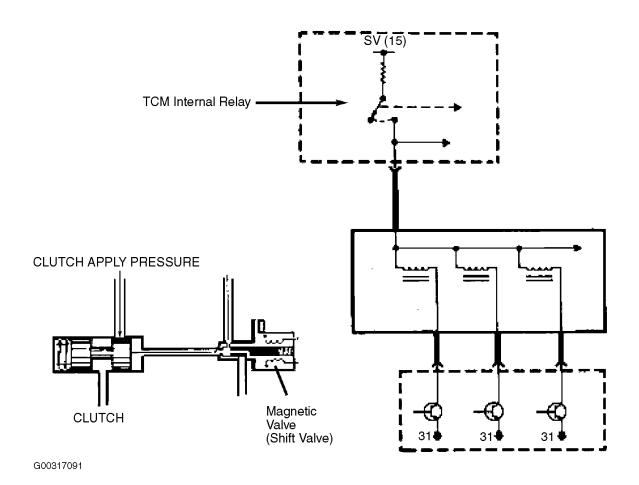


Fig. 32: Identifying Shift Solenoid Control Components Courtesy of BMW OF NORTH AMERICA, INC.

PRESSURE REGULATION

Pressure regulating solenoids modify line pressure for hydraulic operation. Solenoids for pressure regulation are referred to as EDS valves in ZF transmissions. GM transmissions have a few terms such as Force Motor Solenoid, Variable Bleed Solenoid, and DR solenoid. Regardless of the name used, they are all used to control main line pressure based on throttle position and engine load. On ZF transmissions, EDS valves are also used to control "Overlap Shifting". This allows for improved shift comfort by controlling pressures during shifting. Depending upon transmission application, pressure regulating solenoids can be controlled using Pulse Width Modulation on B+ or B-. The TCM will increase line pressure by regulating current flow to the pressure regulator. Current flow is controlled by pulse width modulation. When the duty cycle is low, the current flow to the solenoid is low. This allows spring pressure to close the valve. Therefore maximum line pressure is achieved. As the duty cycle increases, the current flow also increases. The valve opening increases, which allows pressure to be released through the pressure discharge which in turn decreases line pressure. Main line pressure is also increased during failsafe operation and when needed during "Adaptive Hydraulic Pressure Control" functions. Mainline pressure will also default to maximum pressure when power to the TCM is switched off. See Fig. 33.

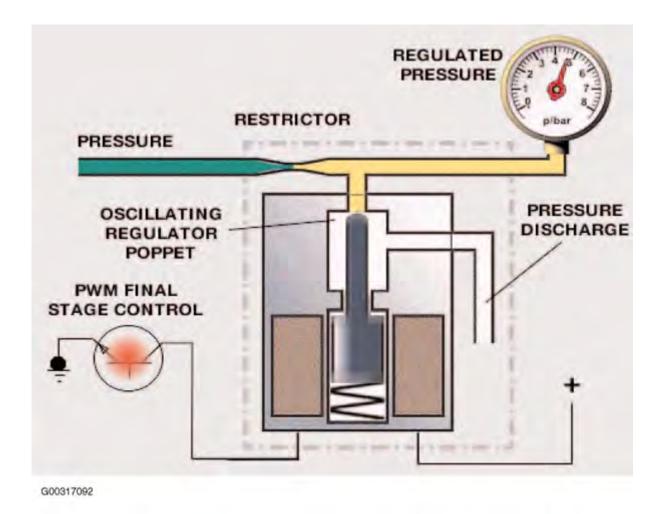


Fig. 33: Identifying Pressure Regulation
Courtesy of BMW OF NORTH AMERICA, INC.

SHIFT PROGRAMS

BMW EH transmissions have selectable shift programs (or modes) to suit driver needs and operating conditions. See <u>Fig. 34</u>. There are 3 basic shift programs available:

- Economy Program The economy program is the default program which is adopted every time the vehicle is started. When in economy mode, the operating priority is for maximum economy and shift comfort. Shifts will take place at low engine RPM and road speed. The economy mode is indicated by an "A" on the program switch. The cluster will display an "E" to indicate economy mode.
- Manual Mode (Winter Mode) Manual mode is used to start out the vehicle in a higher gear on slippery surfaces when more traction is needed. A higher gear will reduce torque to the rear wheels. Manual mode can also be used to select a lower gear when needed such as when climbing a hill. Depending upon vehicle application an "M" will appear in the cluster when in Manual Mode or an asterisk (*) symbol will appear in the instrument cluster to indicate Winter Mode.
- Sport Mode Sport Mode provides raised shift points and a more aggressive shift program for the "Enthusiastic" BMW driver. The cluster will display an "S" when in sport mode.

Regardless of vehicle application, the program switch provides a momentary ground to the TCM to switch between modes. There have been numerous designs of the program switch since it's introduction. The program switch configurations are as follows:

- 2 Position Slide Switch This switch has the "A" and the "M" selection. Sport mode is achieved by moving the selector lever from "D" to 4, 3 or 2 when in the Economy Mode. The 2 Position slide switch is used on most models. These vehicles usually have a range and program display located in the instrument cluster.
- 2 Position Rocker Switch This switch operates the same as the slide switch, but it is used exclusively on

- the E36. The E36 does not have a program indicator in the cluster. The rocker switch will illuminate, indicating the current program.
- 3 Position Slide Switch This switch has the added position for sport mode. The shifter does not have to be moved out of drive (D) to be in sport mode. This switch is used on the E36 M3 and the 4HP22/24 EH (Version Late E-7).
- 3 Position Rotary Switch This switch is used only on the Early 4HP22 EH trans missions (Version Early E-7).
- No Program Switch On some vehicles with AGS features, there is no program switch. Shift modes are obtained by moving the shift lever out of "D" range or automatically by adaptive shift functions. (Example E39).

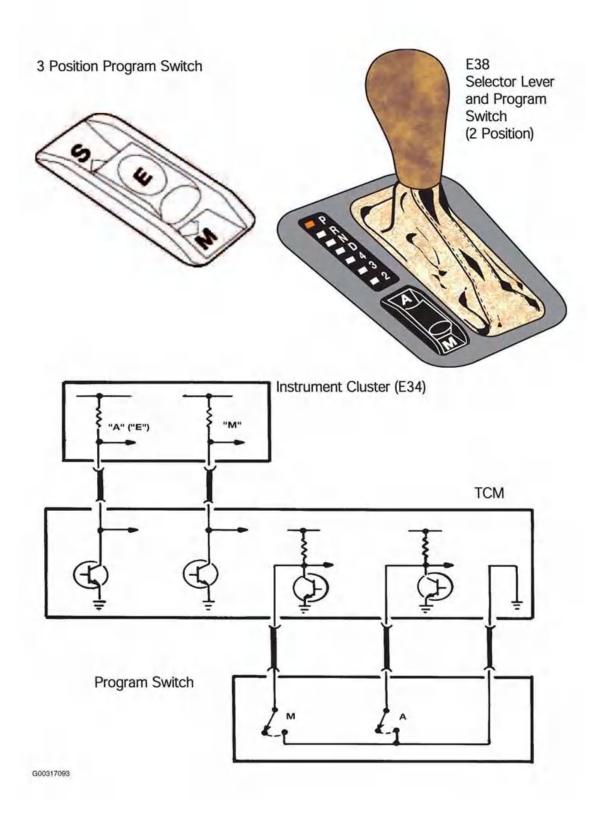


Fig. 34: Identifying Shift Program Courtesy of BMW OF NORTH AMERICA, INC.

STEPTRONIC SHIFT MODES

The Steptronic shifting system was introduced to the BMW model line on the 95 E31 850Ci (from 10/94). Steptronic was subsequently added to other BMW models and is available on all BMW models with automatic transmissions. Other than a few additional components in the shifter mechanism, Steptronic equipped vehicles use the same transmission and TCM as non-Steptronic equipped vehicles. Since the introduction of Steptronic, there have been several variations in Steptronic function. Regardless of version, the Steptronic system provides the driver with two modes of operation:

- To operate the transmission in fully automatic mode as with a non-Steptronic transmission.
- To operate the transmission in the manual shift mode by tilting the shift lever forward or backward when in the manual gate.

The Steptronic shift lever console contains and automatic and a manual shift gate. The automatic gate contains the gear lever positions P/R/N/D. When the lever is placed in "D" all of the shifting takes place based on the shift map programming in the TCM. To enter the manual gate the shift lever is moved 15 degrees to the left. Depending upon application, there are three possible configurations of the manual gate:

- On the E31 850Ci, the gate is marked as "M" only. There is a plus and minus sign for manual shifting. Upshifts are achieved by momentarily moving the shifter forward. Downshifts are achieved by moving the shifter rearward. When placing the shifter into the "M" gate, the transmission will adopt the current gear that is engaged. The transmission will stay in that gear until an upshift or down shift request is made.
- On all other vehicles until the 2002 model year, the gate is marked M/S. There is also a plus and minus sign for manual shifting. When placing the shifter into the M/S gate, the transmission will adopt Sport mode. All shifts will still be automatic. Full manual mode is achieved when an upshift or downshift request is made. Upshifts are achieved by moving the shifter forward momentarily and downshifts are achieved by moving the shifter rearward.
- On all models with Steptronic from 2002, the only change is to the manual shifting modes. In order to be consistent with SMG operation, the positions were reversed. Upshifts are now achieved by moving the shifter rearward and downshifts are now forward. Otherwise, Steptronic operation is identical to the previous models.

AUTOMATIC FUNCTIONS IN MANUAL MODE

When in manual mode there are certain functions which occur automatically to prevent drivetrain damage and improve driveability:

- Engine Overspeed Prevention: To prevent engine over-rev, the TCM will upshift automatically just prior to maximum engine cutoff.
- Kickdown: If plausible, the TCM will automatically shift down to the next lower when a kickdown request is received.
- Decelerating: If in 5th gear and coasting to a stop, the TCM will automatically down shift to 4th gear at approximately 31 mph and then 3rd gear at approximately 19 mph. The automatic downshift allows for an acceptable gear when re-accelerating. (6 cylinder models will shift to 2nd gear when stopping vehicle).
- Implausible Gear Requests: Certain shift requests are ignored by the TCM. For example, requesting a downshift at a high rate of speed would be ignored. Any shift request that would cause the engine to exceed the maximum RPM limit would not be allowed. Also starting out in a high gear is also not allowed. Only 1st, 2nd or third gear is allowed when accelerating from a stop. See Fig. 35.

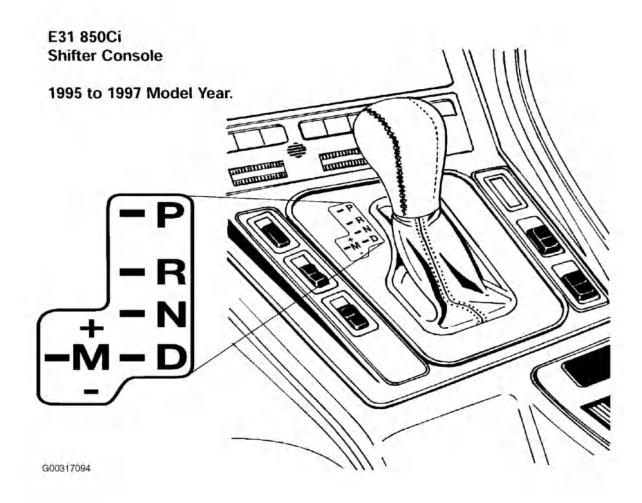
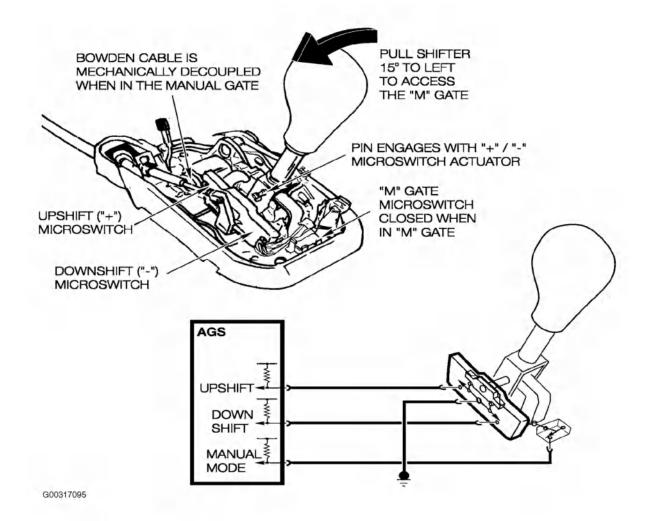


Fig. 35: Identifying 850Ci (E31) Shifter Console Courtesy of BMW OF NORTH AMERICA, INC.

STEPTRONIC SHIFTER CIRCUIT

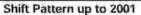
In order to achieve manual shifts with Steptronic, the selector lever is moved 15 degrees to the left. A pin on the selector lever engages the "up/down" microswitches which are a ground input to the TCM. The selector lever also triggers the "M" gate microswitch which is also a ground input to the TCM. The example in illustration shows a typical shift console for an E31. See <u>Fig. 36</u>. Note the shift pattern, upshifts are forward and downshifts are rearward. This shift pattern was used on vehicles up to the end of 2001 production. On vehicles from 2002 production, the shift pattern is reversed. See <u>Fig. 37</u>.



<u>Fig. 36: Identifying Steptronic Shifter</u> Courtesy of BMW OF NORTH AMERICA, INC.

Steptronic System Comparison

| Detail | E31 850Ci 1995 to 1997 | All model except E31 850Ci up to 2001 Model year with Steptronic. | All Models from 2002 model year with Steptronic |
|--------------------------------|--|--|--|
| Shift Console Layout | "M" Gate | M/S Gate | M/S Gate |
| Selection of Manual Mode | Shift to "M" gate | Shift to "M/S" gate and move lever momentarily to "+" or to "-". | Shift to "M/S" gate and move lever momentarily to "+" or to "-". |
| Gear Range in Manual Mode. | 2nd to 5th gear (1st gear only accepted for 2 min- utes after cold start. If the throttle is pressed 100% a 2-1 shift will occur | | 1st to 5th gears |
| Un-allowable gear requests. | 4th and 5th gear after vehicle standstill. Downshifts that can cause engine over-rev. 1st gear after engine warm up, | 4th and 5th gear after vehicle standstill. Downshifts that can cause engine over-rev. | 4th and 5th gear after vehicle standstill. Downshifts that can cause engine over-rev. |
| Upshifts/Downshifts | Upshifts - Forward Downshifts - Rear | Upshifts - Forward Downshifts - Rear | Upshifts - Rear Downshifts - Forward |





Shift Pattern from 2002



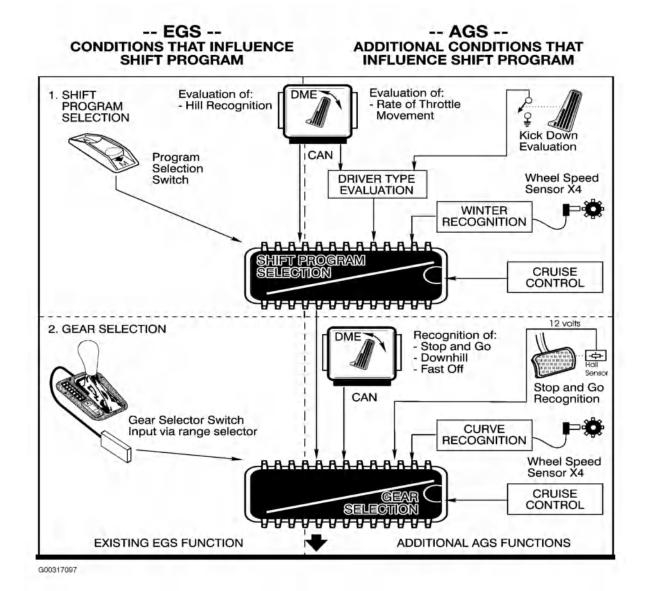
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Fig. 37: Steptronic System Comparison Courtesy of BMW OF NORTH AMERICA, INC.

ADAPTIVE FEATURES (AGS)

AGS features were introduced in 1994 with the A5S560Z transmission. AGS control consists of adaptive features that will modify transmission operation according to various factors. See $\underline{\text{Fig. 38}}$. AGS operation can be influenced by two major functional groups:

- Driver influenced features (influenced by throttle and kickdown input).
- Environmental influences (such as road conditions icy, traffic etc.).



<u>Fig. 38: Identifying AGS Features</u> Courtesy of BMW OF NORTH AMERICA, INC.

The driving program selection is not adapted on a long term basis - nor is it stored in the control module memory when the ignition is switched off. It continually changes as the driver of the vehicle changes driving habits.

DRIVER INFLUENCED FEATURES OF AGS

The adaptive drive program is based primarily on throttle input. The throttle information comes from the ECM (DME) via the CAN bus. The TCM continuously monitors the throttle input for:

- The current throttle position.
- The rate of change in pedal movement.
- The number of acceleration requests.
- The number of kickdown requests. See Fig. 39.

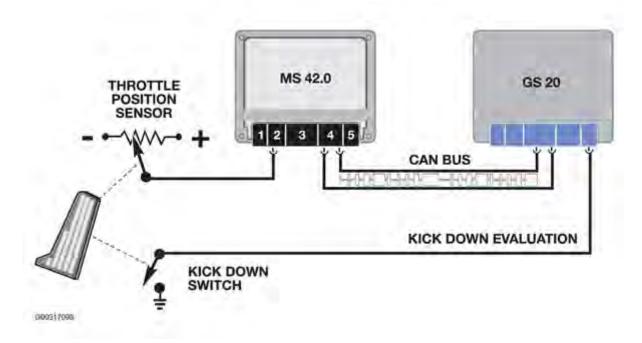


Fig. 39: Identifying Driver Influenced Features Of AGS Courtesy of BMW OF NORTH AMERICA, INC.

DRIVE AWAY EVALUATION

The AGS system selects the appropriate shift program based on the amount of acceleration that occurs during takeoff. When driving away under full throttle the transmission will shift from XE to E.

KICK FAST FEATURE

Based on these inputs, the AGS will select one of three different driving programs as follows:

- Extreme Economy Shift points are at low speeds for maximum comfort and economy.
- Economy The shift points are raised for more performance with economy as priority.
- Sport The shift points are higher to take advantage of full engine performance.

Under full throttle acceleration at high speed, single gear downshifts are possible. A two gear downshift is possible if the accelerator pedal is moved quickly to kick-down. The Extreme Sport program was eliminated as part of the kick-fast feature. See <u>Fig. 40</u>.

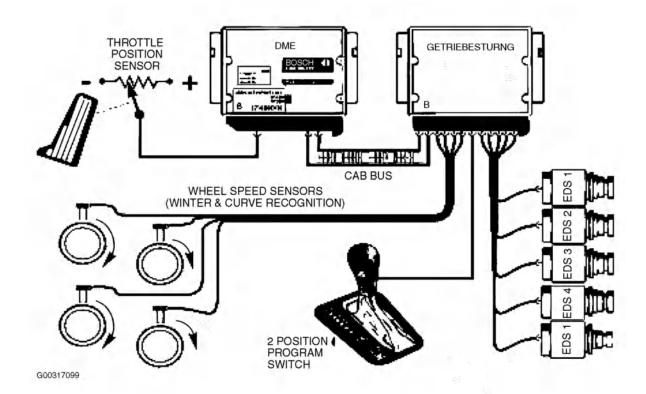


Fig. 40: Identifying Environmentally Influenced AGS Features Courtesy of BMW OF NORTH AMERICA, INC.

STOP & GO

The feature is activated by defined sequence of shifts which are as follows:

• Upshift from first to second - followed by a downshift from second to first - followed by another upshift from first to second. This is then followed by the vehicle coming to a complete stop.

After this sequence occurs, the transmission will stay in second gear. The AGS control has recognized stop and go driving and this function will prevent excessive shifting during heavy conditions. The second gear start will be cancelled when:

- The vehicle speed exceeds 40 MPH.
- The throttle pedal is pressed more than 90%.
- The range selector is moved to Park, Neutral, Reverse or Sport (4, 3 or 2).
- The vehicle is in Sport Mode.

WINTER DRIVE PROGRAM

This feature is activated when the TCM detects slippage at the rear wheels by comparing front and rear wheel speed signals. When slippage is detected by the TCM, the transmission will start in second gear and the shift points will be lowered. This will reduce torque to the rear wheels allowing improved driveability and traction on slippery roads.

HILL RECOGNITION PROGRAM

There are two hill recognition programs, one for Uphill and one for Downhill. The TCM will activate this feature when it receives a high engine load signal at slower road speeds. The TCM will perceive this information as being consistent with climbing a hill. The shift points will be raised to prevent constant up and down shifting. This is referred to as the pendulum shift effect. When driving downhill, road speed will increase with minimal throttle input. The TCM will detect a downhill situation and hold the current gear to prevent an upshift when going downhill.

CURVE RECOGNITION

This feature will inhibit upshifts when the vehicle is in a curve. This is to improve stability when the vehicle is cornering at high speeds. The TCM will initiate this feature when it detects a difference between left and right (front) wheel speed signals. The difference in these signals will indicate that the vehicle is in a curve. Be aware that improper tire sizes, brands and inflation pressures can influence this feature. Always address these issues first when diagnosing delayed upshift complaints.

CRUISE CONTROL DRIVE PROGRAM

A special cruise control shift map is selected by the TCM when cruise control is active. The TCM will prevent unwanted locking and unlocking of the torque converter clutch. Also, upshifting and downshifting will be minimized. Depending upon application, the cruise control interfaces with TCM via a single wire data link or as on vehicles with electronic throttle control, the TCM will interface with the ECM (DME).

MANUALLY SELECTED "EXTREME SPORT" PROGRAM

This feature is activated by moving the shift lever to position 4, 3 or 2. This activates the "Extreme Sport Program" where the shift points are raised for maximum RPM and performance. On Steptronic equipped vehicles, the sport program is obtained by moving the shifter to the manual gate to initiate the "Sport Program".

MODIFICATIONS TO AGS FEATURES

Since the introduction of AGS features in 1994, there have been some software changes to address customer concerns. Some AGS features have been perceived by the customer as malfunctions. To correct this, some of the AGS features were modified with updated software. The AGS features previously discussed in this text reflect the updated modifications.

CAN BUS COMMUNICATION

The CAN bus is a serial communications bus in which all connected control units can send as well as receive information. Data over the CAN bus operates at a rate of up to 1Mb/s (megabits per second). The CAN protocol was developed by Intel and Bosch in 1988 for use in the automotive industry to provide a standardized, reliable and cost-effective communications bus to combat the increasing size of wiring harnesses. The CAN bus was originally introduced on BMW automobiles in the 1993 E32 740i/IL as a data link between the TCM (EGS) and the ECM (DME).

On earlier EGS systems, various signals were transmitted on individual signal wires. This reduced reliability and increased the amount of wiring needed. The CAN bus allows faster signal transmission and increased versatility. For example, the signals listed in the chart below were previously transmitted on individual wires, now these signals are all on the CAN bus. This chart represents only some of the signals on the CAN bus, there are many more signals transmitted between the TCM and ECM. See Fig. 41 and Fig. 42.

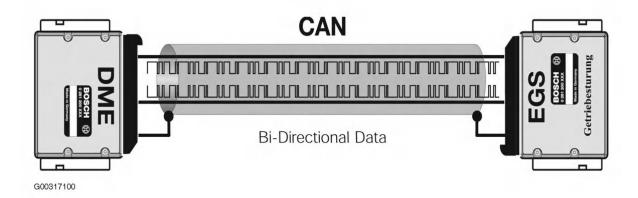


Fig. 41: Identifying CAN Bus Communication (1 Of 2) Courtesy of BMW OF NORTH AMERICA, INC.

| Sender | Information Item | Receiver | Signal Use |
|--------|------------------------------|----------|---|
| ECM | Engine Temperature | TCM | Shift Point Calculation |
| ECM | Engine Load (tL) | TCM | Shift Point Calculation |
| ECM | Engine RPM (TD) | TCM | TCC Slippage |
| ECM | Throttle Position (DKV) | TCM | Shift Point Calculation |
| ECM | A/C Compressor ON | ТСМ | Fine tune shift points to compensate for increased engine load. |
| TCM | Transmission Range | ECM | Engine Idle Speed Control |
| TCM | Torque Reduction Signal (ME) | ECM | Timing Retard during shifts. |
| TCM | TCC Lockup Status | ECM | Engine Timing Map adjustment. |

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Fig. 42: Identifying CAN Bus Communication (2 Of 2) Courtesy of BMW OF NORTH AMERICA, INC.

CAN BUS TOPOLOGY

The CAN bus consists of two twisted copper wires. Each wire contains an opposing signal with the exact same information (CAN-High, CAN-Low). The opposing signals transmitted through the twisted wire serve to suppress any electrical interference. Early CAN bus wiring included a grounded shield around the two wires, later vehicles discarded the shield in favor of the unshielded twisted pair wiring. Due to the linear structure of the network, the CAN bus is available for other modules in the event of a disconnected or failed control unit. This is referred to as a "Tree" structure with each control unit occupying a branch. See Fig. 43 and Fig. 44.

As previously mentioned, the CAN bus initially was used as a high speed communication link between the DME and AGS control units. With the introduction of the E38 750iL (95 M.Y.), the CAN bus was expanded to include the EML and DSC control modules. The 750iL made exclusive use of the "star coupler" to link the individual CAN bus ends to a common connector. The 1998 model year introduced new users of the CAN bus. The instrument cluster and the steering angle sensor were linked to expand the signal sharing capabilities of the vehicle. The 1999 750iL was the last vehicle to use the shielded cable, after which the entire CAN bus went to twisted pair wiring.

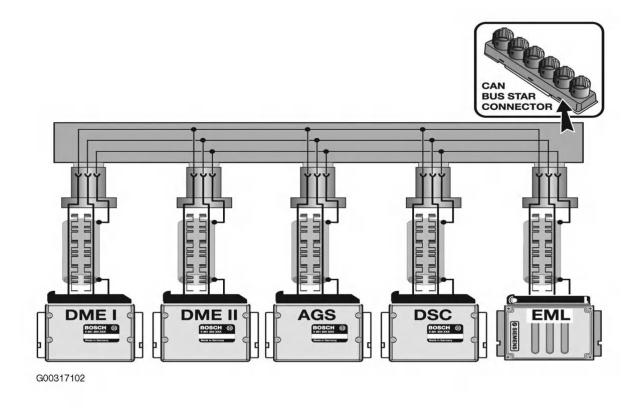


Fig. 43: Identifying CAN Bus Wiring (1 Of 2) Courtesy of BMW OF NORTH AMERICA, INC.

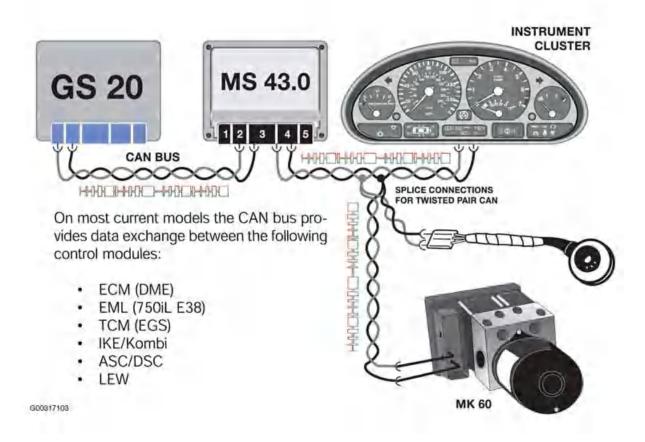


Fig. 44: Identifying CAN Bus Wiring (2 Of 2) Courtesy of BMW OF NORTH AMERICA, INC.

On most current models the CAN bus provides data exchange between the following control modules:

• ECM (DME).

- EML (750iL E38).
- TCM (EGS).
- IKE/Kombi.
- ASC/DSC.
- LEW.

On models that use twisted pair, the wire color of the CAN bus is uniform throughout the vehicle with CAN-Low GE/BR and CAN-High GE/SW or GE/RT. Shielded wiring is easily identified by the black sheath surrounding the CAN bus.

TROUBLESHOOTING THE CAN BUS

The failure of communication on the CAN bus can be caused by several sources:

- Failure of the CAN bus cables.
- Failure of one of the control units attached to the CAN.
- Failure of the voltage supply or ground to individual modules.
- Interference in the CAN bus cables.

FAILURE OF THE CAN BUS CABLES

The following faults can occur to the CAN bus wiring:

- CAN-H/L interrupted.
- CAN-H/L shorted to battery voltage.
- CAN-H/L shorted to ground.
- CAN-H shorted to CAN-L.
- Defective plug connections (damaged, corroded, or improperly crimped).

In each instance, the connected control units will store a fault due to the lack of information received over the CAN bus.

The voltage of the CAN bus is divided between the two data lines: CAN-High and CAN-Low for an average of 2.5V per line. The voltage measurement is taken from each data line to ground. Each module on the CAN contributes to this voltage. The fact that 2.5V are present does not mean that the CAN bus is fault free, it just means that the voltage level is sufficient to support communication.

TERMINAL RESISTORS

Terminal resistors are used in the CAN bus circuit to establish the correct impedance to ensure fault free communication. A 120 Ohm resistor is installed in two control units of the CAN between CAN-H and CAN-L. Because the CAN is a parallel circuit, the effective resistance of the complete circuit is 60 Ohms. On some vehicles there is a jumper wire that connects the two parallel branches together, others have an internal connection at the instrument cluster.

The resistance is measured by connecting the appropriate adapter to any of the modules on the CAN and measuring the resistance between CAN-L and CAN-H. The resistance should be 60 Ohms. The CAN bus is very stable and can continue to communicate if the resistance on the CAN bus is not completely correct; however, sporadic communication faults will occur. The terminal resistors are located in the ASC/DSC control unit and either the instrument cluster or in the DME. Early 750iL vehicles that used the star connector have a separate external resistor which connect CAN-H and CAN-L together. Modules which do not have the terminal resistor can be checked by disconnecting the module and checking the resistance directly between the pins for CANH and CAN-L. The value at these control units should be between 10k Ohms and 50k Ohms.

DIAGNOSIS & TROUBLESHOOTING

Due to the cost and complexity of today's electronic transmissions, BMW recommends that the following procedures followed before any repairs are performed. It is important that the technician perform some basic diagnostic procedures:

- Always verify customer complaint, make sure the complaint is not related to normal operation. (i.e. Warm Up Phase, AGS operation etc.).
- Survey Fault Memory Perform complete quick test. There may be other systems that interface with EGS that could cause faults. (i.e DME, ASC/DSC, IKE/Kombi etc.).
- Print out all fault codes with fault conditions. Also print out copy of Identification page and diagnostic report.
- Check to see if there are any service bulletins that apply to your specific complaint.
- Ensure that battery voltage is sufficient. Battery voltage must be greater than 12.5 with ignition switched off. Check battery connections for tightness and condition.
- Check ground connections. (chassis to engine, grounds to bulkhead and shock tower).
- Check over vehicle to look for transmission leaks, physical damage, loose connections etc.
- If necessary, check fluid level and condition using DISplus or GT-1.
- Check to see if any aftermarket or performance components have been installed that could effect transmission operation. (DME or EGS software as well as any engine modifications).
- Check repair history to see if there were any recent repairs that could effect the proper operation of the transmission (i.e. engine replacement with damaged dowel pin etc.).

ESTABLISHING A DIAGNOSTIC PLAN

Once all of the pre-diagnostic criteria has been satisfied, a logical diagnostic plan should be followed. A logical, well organized diagnostic plan will help avoid improper diagnosis, unnecessary parts replacement and lost diagnostic time. The productivity of the technician can also be improved by following a logical, common-sense approach to problem solving. The following steps are recommended to form a diagnostic plan:

- Verify the Customer Complaint This step is the most important, but also the most overlooked. The focus should always be on the exact customer concern. Make sure that the customer complaint is not a misunderstanding of proper vehicle operation. This step can avoid unnecessary diagnosis and lost time. Also make sure that the conditions under which the concern has occurred are duplicated. For example: If the customer is complaining about a shifting concern after a cold start, then the vehicle should be road tested under those conditions.
- Analyze the Problem Once the complaint has been verified, then all available resources should be used to find the "root cause" of the complaint. Start out by checking technical service bulletins. Use the DISplus or GT-1 to access the diagnostic program and perform Diagnostic Test Modules where applicable. Wiring diagrams should also be used when needed.
- Isolate the Problem Now, the problem can be narrowed down into the final steps of diagnosis. Using proper tools and procedures, the technician can "Isolate" by using the process of elimination and common sense. Perform all necessary electrical checks such as Voltage Drop, resistance measurements etc.
- Repair the Problem Once the concern has been correctly identified, perform all necessary repairs.
- Verify the Repair Make sure the customer concern has been rectified. Road test the vehicle under the same conditions whenever possible.

FAULT CODES

When diagnosing transmission fault codes, always print out the fault code(s) and the fault conditions. When referring to the fault code itself, be aware that there are actually 3 formats for the fault code. See <u>Fig. 45</u>.

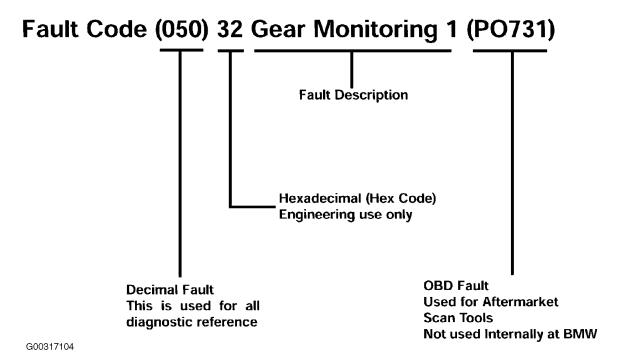


Fig. 45: Identifying Fault Code Components
Courtesy of BMW OF NORTH AMERICA, INC.

FAULT CONDITIONS

When a fault code is set, it is stored with a set of environmental conditions. The environmental conditions are used to aid in pinpointing the root cause of the fault. Some of the information found in the fault conditions contain information on transmission temperature, engine speed and road speed etc. This information is also helpful when trying to duplicate the customer complaint. For example, if a customer complains about a shifting complaint when cold, check the fault conditions to verify this complaint. Remember to always print out the fault codes with the fault conditions. This information is helpful to the technician as well as technical assistance.

IDENTIFICATION PAGE

The ID page is helpful to determine the transmission and control system used as well as the chassis number and current software version. Always print out a copy of the ID page when performing any diagnosis or programming procedures.

DIAGNOSIS PROGRAM

There are two diagnostic formats (programs) used on current model BMW vehicles. The earlier diagnostic program was used on the E38 and E39. The latter diagnostic program was introduced as the "E46 Diagnostic Concept". This is used on the E46, E65 and the E52 (Z8). The E53 X5 uses a mixture of both diagnostic programs depending upon engine/transmission options. Below is an example of the earlier diagnostic program.

The diagnostic program contains the following features:

- Fault Symptoms This is a symptom driven program that will lead the technician into guided diagnostics. It contains several possible fault scenarios that are common to electronic transmissions. This path is helpful when the technician is not sure where to start in his diagnostic plan.
- Function Test There are no function tests for electronic transmissions.
- Service Functions This is where you will find the ATF level check function. Also Test Codes can be obtained and printed out for warranty purposes. The Adaptation values can be cleared as well as printed

out.

• Expert Mode - Expert Mode should be used when the technician has a thorough working knowledge of the system. You will find several items in expert mode: Read/Clear fault memory, Diagnosis (Status) requests, Component Activation and Test Modules.

TEST MODULES

Test modules are found in the diagnosis program of the DISplus and GT-1. These allow the technician to take advantage of a guided diagnostic plan. The program will direct the technician through the various steps using a "trouble tree" format. When using test modules it is important to follow the instructions exactly. Due to the complex nature of some faults, the test modules are not always conclusive. The test module is only as effective as the information provided by the technician. The technician also needs to rely on his experience and some common sense. The test modules should be used to assist the technician, not as a replacement for good diagnostic skills.

DIAGNOSTIC TIPS

The following consists of some helpful hints to assist the BMW diagnostic technician. It is designed to assist the technician to form a logical path of diagnosis. These suggestions should be used in conjunction with other approved diagnostic routines. Transmission concerns can be broken down into several categories:

- Shift Quality Complaints Shift Quality complaints consist of harsh up or down shifts, improper shift points and erratic shifting. These complaints could be related to electronic/software issues or hydraulic/mechanical problems. Perform quick test and check TSB's before proceeding. As with most concerns, check the transmission fluid level and condition as well.
- Delayed/No Upshifts Before proceeding on delayed upshift complaints, make sure you are aware of the conditions that this occurs. This could be normal operation, such as the "Warm-up Phase" program.
 Always check front tires for proper inflation pressures, correct size and type. Also check for uneven tire wear. Variations in front tire size from left to right can activate the AGS "Curve Recognition" feature.
 The TCM will interpret the difference in wheel speed signals as being a turn and suppress (or delay) upshifts.
- Slipping This type of issue is usually associated with a fault code. Be sure to check the transmission fluid level and condition.
- Noise, Vibration Noises and vibrations should be checked over by a good visual inspection. Look for loose transmission or engine mounts. Check the driveshaft, center bearing and flexible coupling (or constant velocity joints). Also check the lateral alignment of the driveshaft.
- No Forward or Reverse Gear Start by checking transmission fluid level and note the fluid condition. Inspect for leaks and external transmission damage.
- Leaks When investigating transmission leaks, be sure to verify that the suspected leak is actually transmission fluid. Engine oil, hydraulic and brake fluid can be mistaken for a transmission leak. Check the transmission cooler lines, transmission cooler and transmission pan gasket. Try to locate the source of the leak.
- Fault Codes Perform COMPLETE short test (Quick test) on all vehicle systems. It is important to survey all systems in the event that a related system is causing the transmission fault. Always print out the ID Page, Fault codes and fault conditions.

TCM CODING & PROGRAMMING

As with other control modules used on BMW systems, the TCM must be programmed and/or coded for the vehicle. Over the years, these methods have varied from system to system.

CODING

Coding will assign the control unit to a particular application. Information such as differential ratio, tire size, vehicle series, engine, engine control system, with or without A/C etc., are some of the possible variants that have to be considered. Transmission control units are coded using various methods:

- Grounding pins in wiring harness connector On early models equipped with the 4HP22/24 EH transmissions, the TCM was coded to the vehicle by means of grounding pins in the wiring harness connector for the TCM. By selectively grounding specific pins in the harness, the TCM was assigned to that vehicle. For example, TCM could be installed in a 535, 635, or a 735. This only applies to the early 7-series (E23, E24, E28).
- TCM ordered for specific application On some later models, the TCM was ordered for a specific vehicle application, coding was not necessary.
- Coding performed during programming On systems that use a flash programmable TCM, the coding process is done during flash programming. See <u>Fig. 46</u>.

PROGRAMMING

Programming refers to the instructions that the TCM is to follow. The TCM is programmed to apply certain shift maps according to operating conditions such as vehicle speed, engine speed, engine temperature, engine load and throttle position. This information can be entered into the TCM via an updated EPROM or through flash programming. Flash programmable control units use a EEPROM which is Electronically Erasable. The EEPROM is also soldered into the TCM and cannot be removed or replaced. Flash programmable TCM's can be programmed up to 14 times (with a new TCM). See Fig. 46.

NOTE: Always clear adaptations after programming.

NOTE: Do not program a TCM to correct a complaint unless there is a specific TSB

that covers the issue.

| Control System | Transmission | Coding | Programming | TCM Type |
|---|-----------------------------------|--|-------------------------------|---|
| GS 1.26 GS 1.27 GS 1.29 | 4HP22 EH (Early E-7) | Harness. (Early E-7 Only) | Replaceable EPROM | 35 Pin |
| | 4HP22/24 EH (Late E-7 and E-9) | TCM ordered for specific application. Coding not needed. | Replaceable EPROM | 35 Pin |
| GS 7.3 GS 7.32 GS 7.11 GS 8.32 | A5S310Z (5HP18) | TCM ordered for specific application. Coding not needed. | | 88 Pìn |
| GS 8.60 GS 8.60.4 | A5S325Z (5HP19) | Coding done when Programmed | Flash Programming (EEPROM) | 134 Pin SKE |
| GS 8.55 GS 8.60.2 | A5S440Z (5HP24) | Coding done when programmed | Flash Programming (EEPROM) | 88 Pin up to 98 (E38 M62) 134 Pin SKE from 98 to present. |
| GS 9.2 GS 9.22 GS 9.22.1 | A5S560Z (5HP30) | TCM ordered for specific application. Coding not needed. | Replaceable EPROM | 88 Pin |
| GS 8.60.3 | A5S560Z (5HP30) (E38 M73TU) | Coding done when programmed. | Flash Programming (EEPROM) | 134 Pin |
| GS 4.14 GS 4.16 | A4S310R (THMR-1) | TCM ordered for specific application. Coding not needed. | Replaceable EPROM | 55 Pin |
| GS 8.34 | A4S270R (THMR-1) | TCM ordered for specific application. Coding not needed. | Replaceable EPROM | 88 Pin |
| GS 20 | A5S360R A5S390R | Coding done when programmed | Flash Programming (EEPROM) | 134 Pin SKE |

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Fig. 46: Identifying TCM Coding & Programming Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION FLUID INFORMATION

TRANSMISSION FLUID (OIL)

The automatic transmission provides filtered, pressure regulated hydraulic fluid for all of the transmissions functional requirements. All BMW automatic transmissions are designed to operate with specific fluids. Use of non-approved oil will cause malfunctions and irreparable transmission damage which is not covered by BMW warranty. The transmission fluid provides the following functions:

- Lubricates mechanical components (planetary gears, bearings etc.).
- Removes heat and transfers heat to transmission cooling system. (Heat Exchanger).
- Removes debris and contaminants to sump and filter when circulated.
- Provides a transfer of kinetic energy in the torque converter.
- Allows hydraulic operation of mechanical components (clutches, brakes) via control of the valve body.

Also, transmission fluid has various properties to prevent oxidation and breakdown from heat and friction. Each type of transmission fluid has properties specific for each transmission application. Fluid level is crucial in the proper operation of an automatic transmission. Improper fluid levels will cause improper operation and eventually irreparable transmission damage. Improper fluid level can cause:

- A low fluid level can cause an interruption in oil flow during fast acceleration or hard braking which can cause gear shift malfunctions and noises.
- An excessively high fluid level can cause the rotating mechanical components to paddle in the oil. This produces foam which introduces air into the hydraulic system.
- A low fluid level can also cause transmission overheating causing premature transmission failure.

TRANSMISSION FLUID CHECKING PROCEDURES

Transmission fluid checking is accomplished using the DISplus or GT-1. The DISplus or GT-1 is used to monitor transmission fluid temperature to insure the transmission is not over or under-filled. As with most other current ZF transmissions there is no dipstick, the fluid level is checked and filled at the fill plug. The location of the fill plug varies between transmissions. See <u>Fig. 47</u>. Transmission fluid should be checked between 30 and 50 degrees Celsius (unless otherwise specified). Use the DISplus and/or GT-1 to determine transmission temperature. When checking transmission fluid, observe the following items:

- Transmission in Park.
- Parking brake applied.
- Engine Running.
- Vehicle level.
- No engine load.
- Trans Temp 30-50C.
- Observe correct drain plug torque.
- Use correct fluid.

When replacing parts on transmissions that use lifetime fluid, drain fluid into a clean container and reuse.

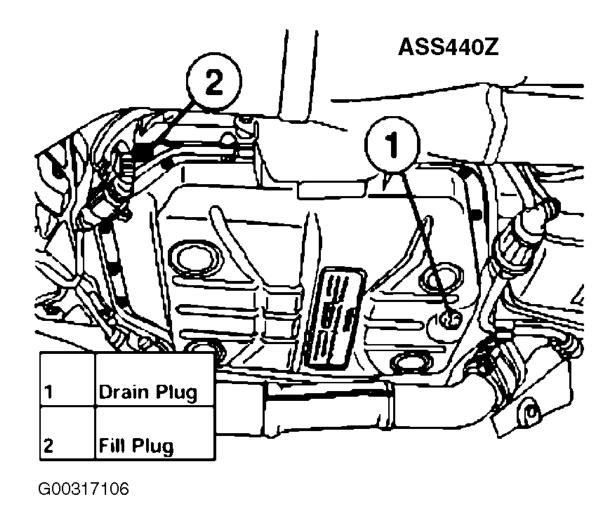


Fig. 47: Identifying Drain & Fill Plug (Typical) Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION FLUID APPLICATION

There are numerous types of transmission fluid used in BMW transmissions. With the exception of the early transmissions (4HP22/24, A4S310/270R and the A5S310Z in the E34) all current BMW transmissions use "Lifetime Fill" transmission fluid. See Fig. 48. There is no maintenance required for these transmissions. It is important to use the correct fluid. Incorrect use of the transmission fluid can cause non-warrantable transmission damage. When performing repairs on transmissions with lifetime fluid, it is important to drain the transmission fluid in to a clean container for re-use. New fluid should only be used for transmission replacement and for topping off after repairs. Also, transmission fluid level is vital to the proper operation of the transmission.

| Transmission | Fluid Type | BMW Part # | Container | SIB Ref. |
|--|----------------------|--|--------------------|------------|
| 4HP22 4HP24 | Dexron III Mercon | Available Commercially (Castrol or Texaco) | N/A | |
| A5S310Z 530i/iT (E34) | Dexron III | Available Commercially (Castrol or Texaco) | N/A | |
| M3 (E36) | ESSO LT 71141 | 83 22 9 407 807 | 20 liter container | B 24 03 95 |
| A5S325Z | ESSO LT 71141 | 83 22 9 407 807 | 20 liter container | |
| A5S440Z | ESSO LT 71141 | 83 22 9 407 807 | 20 liter container | |
| A5S560Z 740 (E32), 540 (E34) 840Ci (E31- 6/93-12/94) 740i/iL-750iL (E38) | Shell LA2634 | 83 22 9 407 765 | 5 liter container | B 24 11 92 |
| 540i (3/96-12/96) 850Ci (10/94-6/97) | ESSO LT 71141 | 83 22 9 407 807 | 20 liter container | B 24 02 94 |
| A4S310R A4S270R (THM-R1) | Dexron III Mercon | Available Commercially (Castrol or Texaco) | N/A | |
| A5S360R | Texaco ETL 7045E | 83 22 0 026 922 | 25 liter container | |
| A5S390R | Texaco ETL 8072B | 83 22 0 024 359 | 25 liter container | |
| GA6HP26Z GA6HP32Z | Shell M-1375.4 | 83 22 0 142 516 | 20 liter container | |

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<u>Fig. 48: Transmission Fluid Application</u> Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION SERVICE

OVERVIEW OF ALLOWABLE REPAIRS

Currently, service of transmissions is limited to electrical, minor mechanical and hydraulic repairs as well as service adjustments. See <u>Fig. 49</u>. Part availability is limited to include the repair of the following:

- Oil Leaks Radial seals and gaskets.
- Mechanical/Hydraulic Faults Torque converter, valve body, parking pawl, oil pan, output shaft bearing.
- Electrical Faults Solenoid valves, pressure regulator valves, wiring harness.
- Signal Sensing Turbine and output speed sensors, CAN bus, temp sensor.

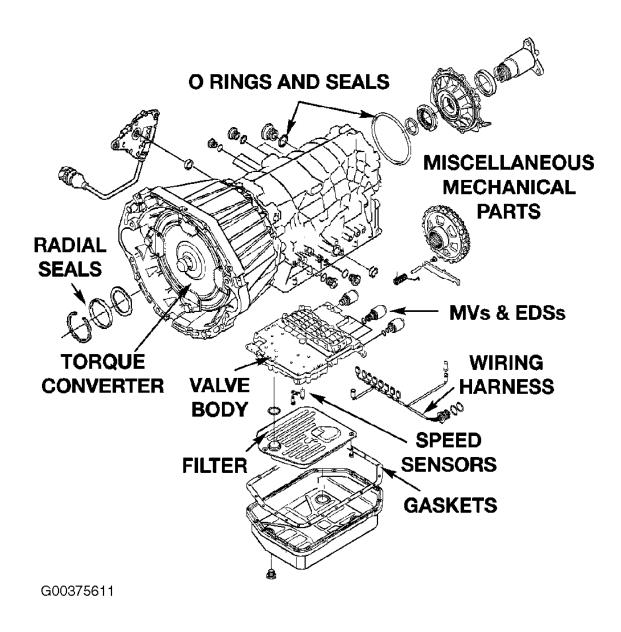


Fig. 49: Identifying Allowable Repairs
Courtesy of BMW OF NORTH AMERICA, INC.

Article GUID: A00169288

2001-02 ENGINE

Engine & Gearbox Suspension - Tightening Torques - Z3 Roadster & Coupe

ENGINE SUSPENSION

22 11 ENGINE SUSPENSION

ENGINE SUSPENSION - TIGHTENING TORQUE SPECIFICATIONS

| Application | Туре | Thread | Tightening Specification | Measure |
|-----------------------|-------------------------------|----------|--------------------------|---------|
| 1AZ Engine mount to | | Â | Â | 42 Nm |
| front axle support | | | | |
| Â | E60 / E61 / E63 / | M8-8 | Â | 19 Nm |
| | E64 / E65 / E66 / | | | |
| | E67 | | | |
| Â | E53 | M8-10.9 | Â | 30 Nm |
| Â | E83 | M8 | Â | 21 Nm |
| Â | E87 / E90 | M8 10.9 | Â | 28 Nm |
| 2AZ Engine mount to | | M10 10.9 | Â | 56 Nm |
| engine support arm | E64 / E65 / E66 / | | | |
| | E67 / E53 / E83 / | | | |
| • | E87 / E90 | | ^ | 40077 |
| Â | E65 / E66 / E67 | M12 10.9 | Â | 100 Nm |
| Â | E85 / E52 | Â | Â | 42 Nm |
| 3AZ Engine support | E60 / E61 / E63 / | M10 8.8 | Â | 38 Nm |
| arm to engine | E64 / E65 / E66 / | | | |
| ^ | E67 / E87 / E90 | | | ^ |
| Â | E60/61 N52 / | M12 | Aluminium screws | Â |
| | E63/64 N52 / | | marked blue must be | |
| | E83/85 N52 / E87/ 90 N52 / | | replaced | |
| | E65 N52 | | | |
| Â | Â | Â | Jointing torque | 34 Nm |
| Â | Â | Â | Torque angle | 90-110° |
| Â | E60 / E61 / E65 / | M8 8.8 | Â | 19 Nm |
| | E66 / E67 | | | |
| Â | E85 / E83 | M8 8.8 | Â | 21 Nm |
| Â | E53 (N62/ M54) | Â | Â | 38 Nm |
| Â | E53 (M57) | Â | Â | 65 Nm |
| 4AZ Engine mount to | E65 / E60 / E61 / | M8 8.8 | Â | 19 Nm |
| mounting bracket | E63/E64 | | | |
| 5AZ Mounting | E65 / E60 / E61 / | M8-8 | Â | 19 Nm |
| bracket to front axle | E63 / E64 | | | |
| carrier | | | | |

22 32 TRANSMISSION MOUNTS

TRANSMISSION MOUNTS - TIGHTENING TORQUE SPECIFICATIONS

| Application | Type | Thread | Measure |
|--------------------------|-------------------------|--------|---------|
| 1AZ Bolt to transmission | E60 / E65 / E66 / E67 | Â | 30 Nm |
| cross-member | | | |
| 2AZ Transmission support | E60 / E61 / E65 / E66 / | Â | 38 Nm |
| block to transmission | E67 / E85 / E63 / E64 / | | |
| | E87 / E90 | | |

| 3AZ Transmission mount to transmission / transmission crossmember | E60 / E61 / E63 / E64 / E67 / E85 / E87 / E90 | M8 | 19 Nm |
|---|--|--------|-------|
| 4AZ Transmission cross- member to body | E85 / E46 / E83 | M8 8.8 | 21 Nm |
| Â | E60 / E61 / E63 / E64 / E67 / E87 / E90 | Â | 19 Nm |
| Â | E53 | M10 | 41 Nm |
| 5AZ Transmission cross member to rubber mounts | E46 / E53 / E83 | M12 | 74 Nm |

TRANSMISSION SUSPENSION

22 32 TRANSMISSION MOUNTS

TRANSMISSION MOUNTS - TIGHTENING TORQUE SPECIFICATIONS

| Application | Type | Thread | Measure |
|---|---|--------|---------|
| 1AZ Bolt to transmission cross-member | E60 / E65 / E66 / E67 | Â | 30 Nm |
| 2AZ Transmission support block to transmission | E60 / E61 / E65 / E66 / E67 / E85 / E63 / E64 / E87 / E90 | Â | 38 Nm |
| 3AZ Transmission mount to transmission / transmission crossmember | E60 / E61 / E63 / E64 / E67 / E85 / E87 / E90 | M8 | 19 Nm |
| 4AZ Transmission cross- member to body | E85 / E46 / E83 | M8 8.8 | 21 Nm |
| Â | E60 / E61 / E63 / E64 / E67 / E87 / E90 | Â | 19 Nm |
| Â | E53 | M10 | 41 Nm |
| 5AZ Transmission cross member to rubber mounts | E46 / E53 / E83 | M12 | 74 Nm |

Article GUID: A00202655

GENERAL INFORMATION

Electronic Transmission Control - Overview

ELECTRONIC TRANSMISSION CONTROL

PURPOSE OF THE SYSTEM

Electronically controlled transmissions were introduced on BMW products in 1986 on 5 and 7 series vehicles. Currently EH (Electro-hydraulic) transmissions are offered on almost every production model (Except E46 M3 and E39 M5). EH transmissions offer the following benefits the to driver:

- Increased driving safety by reducing fatigue. All shifts are automatic as opposed to manual transmissions which require more driver interaction.
- Increased fuel economy through use of lock up torque converter.
- Increased fuel economy through optimized shift points.
- Improved shift comfort by use of "Overlap Shift" technology (ZF).
- More available features through the use of CAN bus technology.

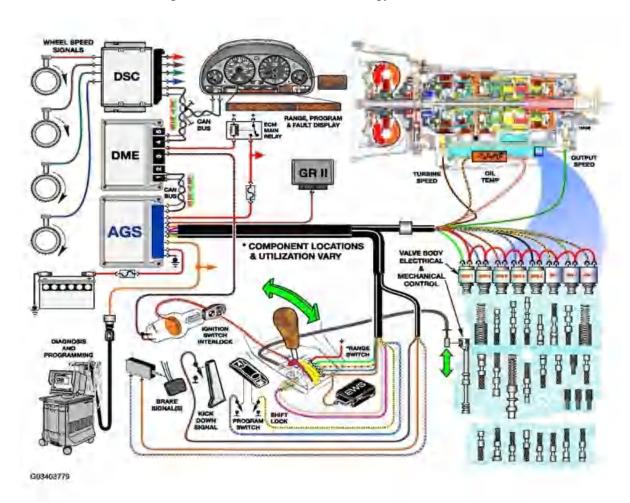


Fig. 1: Identifying Electro-Hydraulic Transmission Inputs/Outputs Courtesy of BMW OF NORTH AMERICA, INC.

The EH Control System is designed to work in conjunction with the engine electronics for precise shift control. The TCM receives information on engine RPM, load and throttle position to provide optimum shift points to maximize fuel economy and driver comfort.

The function of an EGS System is to:

• Monitor all operating conditions through input signals

- Continually assess operating conditions by processing input data and select the appropriate operating program for current conditions.
- Activate transmission system components and to communicate with other drivetrain control systems.
- Respond to driver selected driving program (Economy, Sport or Manual).

In addition to providing shift control, the TCM also adapts to changing conditions within the transmission by monitoring slip ratios and modifying line pressure. This increases the life of the transmission and reduces maintenance and adjustments. The TCM controls the operation of the Lock-Up Torque Converter which further increases economy.

On current models, the TCM also has the capability of adapting to driver habits and responds to changing environmental conditions. Items such as rate of throttle input and kickdown requests are monitored to select the most appropriate shift program.

The EGS system is also required to maintain occupant safety, safeguard drivetrain damage, improve vehicle emissions and operate in fail-safe mode when a malfunction occurs.

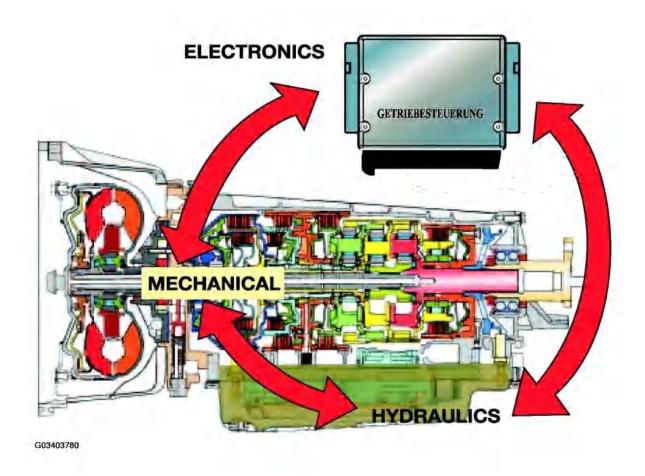


Fig. 2: Identifying EGS System
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION VERSION AND CONTROL SYSTEMS

Each BMW Electro-hydraulic transmission has a corresponding control system. They are designated "GS" which stands for Transmission Control. This acronym is from the German words G etriebe S teurung. Each transmission can have more than one control system, this depends upon application (model year, series etc.). Below is a listing of ZF control systems used on BMW vehicles, Hydramatic control systems are shown on the opposing page.

ZF Control Systems

ZF CONTROL SYSTEMS SPECIFICATIONS

| Transmission BMW ID# | Manufacturer ID | Model/Year | Control System | Engine |
|-------------------------|-----------------|-------------------------------|----------------|-------------------|
| 4HP22 (EH) | 4HP22 (EH) | 86 535i | GS 1.2X | M30 |
| | | 86 635i | GS 1.2X | M30 |
| | | 86 735i | GS 1.2X | M30 |
| 4HP24 (EH) | 4HP24 (EH) | 88-9/91 750iL | GS 1.27 | M70 |
| ` , | | (E32) | GS 1.29 | M70 |
| | | 92-94 750iL (E32) | GS 1.29 | M70 |
| | | 90-94 850i/Ci (E31) | | |
| A5S310Z | 5HP18 | 93 530i/iT (E34) | GS 7.3 | M60 |
| | | 94 530i/iT (E34) | GS 7.32 | M60 |
| | | 95 M3 (E36) 96-99 | GS 7.11 | S50 (US) |
| | | M3 (E36) | GS 8.32 | S52 |
| A5S325Z | 5HP19 | 00 323i/Ci/CiC | GS 8.60 | M52 TU |
| | | (3/00-8/00) | GS 8.60 | M52 TU |
| | | 01 323iT (from | GS 8.60.4 | M54 |
| | | 4/01) | GS 8.60.4 | M54 |
| | | 01-02 325i/Ci/CiC | GS 8.60.4 | M54 |
| | | from 9/00 | GS 8.60.4 | M54 |
| | | 00-01 330i/Ci/CiC | GS 8.60.4 | M54 |
| | | from 6/00 | | |
| | | 01- 525 from 3/01 | | |
| | | 01- 530 from 3/01 | | |
| | | 03 Z4 (E85) 2.5i | | |
| | | and 3.0i | | |
| A5S440Z | 5HP24 | 97 840Ci (E31) | GS 8.55 (CAN | M62 |
| | | from 9/96 | index 50) | M62 |
| | | 97 540i (E39) 1/97- | GS 8.55 (CAN | M62 |
| | | 8/97 | index 50) | M62 |
| | | 97 740i/iL (1/97 - | GS 8.55 (CAN | M62, M62 TU 99-02 |
| | | 4/97) | index 50) | M62, M62 TU 99-01 |
| | | 97 740i/iL (5/97- | GS 8.55 (CAN | M62TU |
| | | 8/97) | index 60) | |
| | | 98-03 540i | GS 8.60.2 (CAN | |
| | | 98-01 740i/iL | index 60) | |
| | | 00- X5 4.4i | GS 8.60.2 (CAN | |
| | | | index 60) | |
| | | | GS 8.60.2 | |
| A5S560Z | 5HP30 | 93-94 740i/iL (E32) | GS 9.2 | M60 |
| | | 93 540i (E34) | GS 9.2 | M60 |
| | | 94-95 540i (E34) | GS 9.22 | M60 |
| | | 94-95 840Ci (E31) | GS 9.22 | M60 |
| | | 95 740i/iL (E38) | GS 9.22 | M60 |
| | | 95-01 750iL (E38) | GS 9.22.1 | M73/M73TU |
| | | 96-97 740i/iL | GS 9.22.1 | M62 |
| | | (-1/97) | GS 9.22.1 | M62 |
| | | 96 840Ci (E31) 95-97 850Ci | GS 9.22.1 | M73 |
| GA6HP26Z | GA6HP26Z | 02- 745Li | GS 19 | N62 |
| GHOIII ZUZ | GA6HP26Z | (E65/E66) | GS 19 | N73 |
| | 5110111 202 | 03- 760Li (E66) | | 1173 |

Hydramatic Control Systems

HYDRAMATIC CONTROL SYSTEMS SPECIFICATIONS

| TI DIGINALITE CONTROL STOTEME STECHTOTICS | | | | | | | |
|---|--|--|--|--|--|--|--|
| Transmission | | | | | | | |
| | | | | | | | |

| BMW ID# | Manufacturer ID# | Model/Year | Control System | Engine |
|---------------|------------------|-----------------------|-------------------|--------|
| A4S310R (THM- | 4L30-E(A4S310R) | 90-92 525i (E34) | GS 4.14 | M50 |
| R1) | >>> | 93-95 525i (E34) | GS 4.16 | M50 TU |
| | | 92 325i, is, ic (E36) | GS 4.14 | M50 |
| | | 93-95325i, is, ic | GS 4.16 | M50 TU |
| | | (E36) | GS 4.14 & GS 4.16 | M42 |
| | | 92-95 318ti (E36) | | |
| A4S270R | 4L30-E(A4S270R) | 96-98 328i (is, ic | GS 8.34 | M52 |
| | >>> | -97) | GS 8.34 | M44 |
| | | 96-98 318i (is, ic- | GS 8.34 | M44 |
| | | 97) | GS 8.34 | M44 |
| | | 96-98 318ti (E36/5) | GS 8.34 | M52 |
| | | 96-98 Z3 1.9 | GS 8.34 | M52 |
| | | (E36/7) | | |
| | | 96-98 Z3 2.8 | | |
| | | 97-98 528i (E39) | | |
| A5S360R (GMS) | 5L40-E (A5S360R) | 99-00 323i/Ci (7/98- | GS 20 | M52 TU |
| | >> | 3/00) | GS 20 | M52 TU |
| | | 99-00 328i/Ći (6/98- | GS 20 | M52 TU |
| | | 5/00) | GS 20 | M52 TU |
| | | 99-00 528i (E39) | | |
| | | 9/99-8/00 | | |
| | | 99-00 Z3 (E36/7) | | |
| | | 2.3/2.8 | | |
| A5S390R (GM5) | 5L40-E (A5S390R) | 00-03 X5 3.0i (4/00 | GS 20 | M54 |
| | >> | -) | GS 20 | M54 |
| | | 01 325iT (8/00- | GS 20 | M54 |
| | | 3/01) | GS 20 | M54 |
| | | 01-03 325xi/xiT & | GS 20 | M54 |
| | | 330Xi (-8/00) | GS 20 | M54 |
| | | 01 525i/iT (9/00- | | |
| | | 3/01) | | |
| | | 01 530i (9/00-3/01) | | |
| | | 01-02 Z3 2.5/3.0 | | |
| | | (6/00-) | | |



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<u>Fig. 3: Hydramatic Control Systems - GS 20 TCM (Siemens)</u> Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION IDENTIFICATION

BMW automatic transmission are manufactured by two suppliers for the US market:

- Zahnradfabrik Friedrichshafen: Commonly referred to as ZF. ZF manufactures both manual as well as automatic transmissions.
- GM Powertrain Hydramatic: Hydramatic is a manufacturing division of General Motors located in Strasbourg, France. Hydramatic supplies automatic transmissions to BMW for four and six-cylinder vehicles.

BMW has developed an internal numbering system for their transmissions for ordering parts, information research and identification. Also, each transmission manufacturer uses an internal identification system. Here is a breakdown of these identification codes:

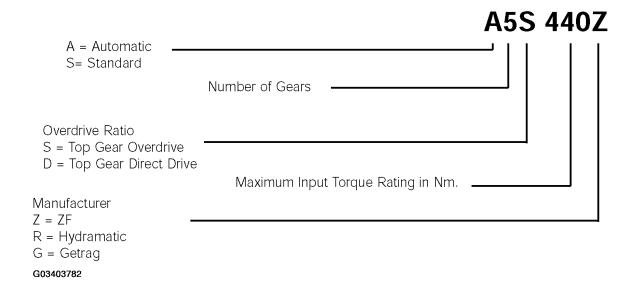


Fig. 4: Identifying BMW Identification Code Breakdown

Courtesy of BMW OF NORTH AMERICA, INC.

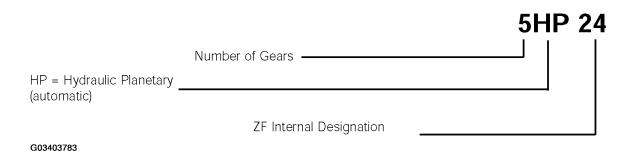


Fig. 5: Identifying ZF Identification Code Breakdown

Courtesy of BMW OF NORTH AMERICA, INC.

Hydramatic Transmissions have internal designations, however they are not used often. The internal code for the A4S310/270R is 4L30-E and the A5S360/390R is 5L40-E.

Transmission ID Tag Location

In order to identify BMW transmissions there are identification tags located externally on the transmission case. The tag contains information such as Manufacturer, Serial number, transmission type etc. This information is needed when ordering parts, referencing bulletins and calling for technical assistance.

- ZF Tag is Located on -
 - 1. Right hand side (passenger side) of transmission case. (5HP30 and 5HP18)
 - 2. Left hand side (drivers side) of transmission case. (6HP26Z, 5HP24 and all 4HP)
 - 3. Rear under output shaft. (5HP19)

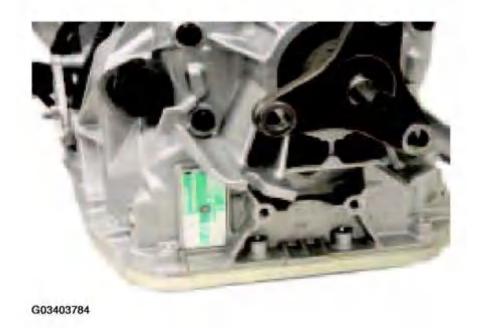


Fig. 6: Identifying ID Tag Location 5HP19 Courtesy of BMW OF NORTH AMERICA, INC.

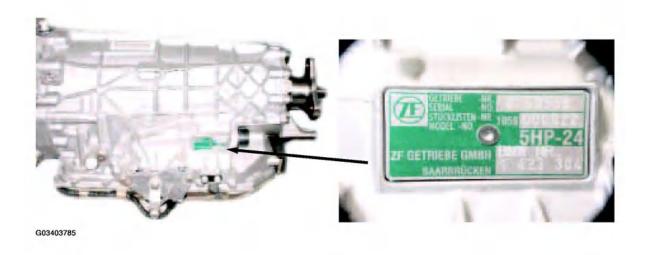


Fig. 7: Identifying Typical ZF Tag Courtesy of BMW OF NORTH AMERICA, INC.

• GM - Located on left hand side (drivers side) of transmission case.



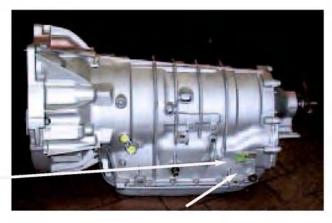


Fig. 8: Identifying GM ID Tag (GM 5)
Courtesy of BMW OF NORTH AMERICA, INC.

SYSTEM COMPONENTS (ELECTRICAL)

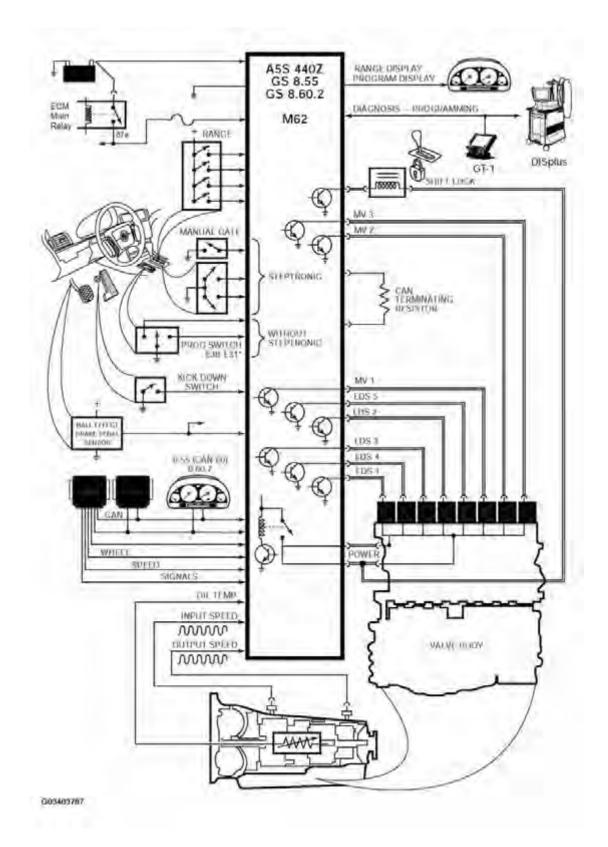


Fig. 9: Identifying System Components (Electrical) Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Control Module

The TCM receives inputs, processes information and actuates the output elements to provide optimal shift points. The TCM is programmed for maximum shift comfort and fuel economy. The TCM on most BMW vehicles is located in the E-Box next to the ECM (DME).

There are several types of TCM housings:

- 35 Pin TCM (TCU) used on the 4HP transmissions
- 55 Pin TCM used on the A4S310R (THM-R1)

- 88 Pin TCM used on all others up to 98
- 134 Pin TCM used on all BMW transmission from the 99 model year. (Note- the 134 pin TCM was introduced on the 98 Models equipped with the A5S440Z).

The 134 Pin TCM is also referred to as SKE (Standard Shell Construction). The SKE housing uses 5 separate connectors. On transmission applications only three connectors 1, 3 and 4) are used. Connectors 2 and 5 are blank and are NOT used. The connectors are blue in color to avoid confusion with the ECM (DME) connectors which are black.

!34 Pin control modules are supplied by Bosch for ZF transmissions and Siemens for Hydramatic transmissions. Bosch and Siemens control modules are NOT interchangeable.

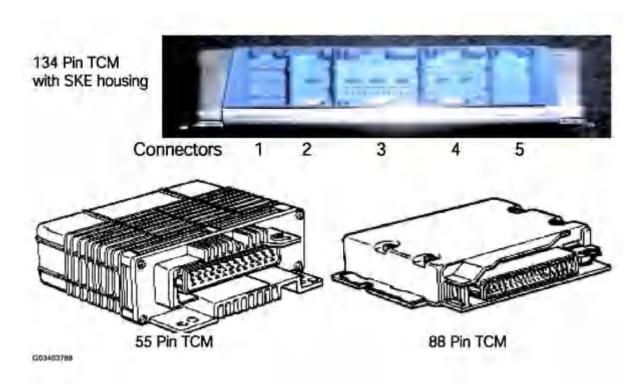


Fig. 10: Identifying Transmission Control Module Courtesy of BMW OF NORTH AMERICA, INC.

Turbine Speed Sensor

The Turbine Speed Sensor is used to provide input (turbine) shaft speed information to the TCM (EGS). The input shaft speed signal is used in conjunction with the output shaft speed signal to determine gear range and slip time information for processing in the TCM. Not all BMW transmissions use a turbine speed sensor. Some TCM's use the TD (engine speed) signal to determine input shaft speed. All transmissions with the exception of the A5S325Z use an inductive type sensor which generates an AC analog signal. The A5S325Z currently uses a Hall Effect Turbine Speed Sensor which will send a digital square wave signal to the TCM.

4HP22/24 (EH), A4S310/270R: These transmissions do not use a Turbine Speed Sensor. The TD signal is used to determine input shaft speed. The TD signal is an output signal of the DME control unit.

A5S310Z, A5S325Z, A5S440Z, A5S560Z, A5S360/390R: These transmission use a turbine speed sensor. The TD signal is also used with the turbine speed signal to allow the TCM to monitor Torque Converter Clutch operation. The TCM can control torque converter clutch slippage and also monitor for faults.

Output Shaft Speed Sensor

The Output Shaft Speed Sensor is used to provide output shaft speed information to the TCM. The output shaft speed signal is used in conjunction with the turbine speed signal to provide the TCM with information on gear ranges and slip times.

All BMW electronic transmissions have an output shaft speed sensor. The output shaft speed sensor is an inductive type which will generate an AC analog signal to the TCM. The frequency and amplitude of the signal will increase as output shaft speed increases. The exact location of the output shaft speed sensor varies by transmission model.

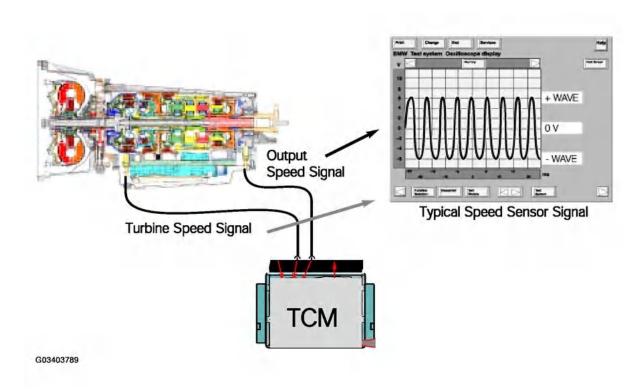


Fig. 11: Identifying Output Shaft Speed Sensor Graph Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Oil Temp Sensor

The TCM is provided with transmission oil temperature information via a temperature sensor. On most BMW transmissions, the sensor is an NTC element which is part of the transmission internal wiring harness.

4HP22/24 (EH): These transmissions do not use a transmission oil temperature sensor. There are no transmission oil temperature influenced features on the 4HP transmissions.

All Except A5S360/390R, GA6HP26Z: The transmission fluid temp sensor is part of the transmission internal wiring harness. On these transmissions, the sensor cannot be replaced separately. The harness must be replaced.

A5S360/390R transmission: the sensor is a separate, replaceable sensor that can be unplugged from the harness.

GA6HP26Z: the sensor is located in the Mechatronics Module, which is located inside of the transmission.

NOTE:

The Mechatronics Module is not currently serviceable at this time. Contact the BMW Technical Hotline in the event of a failure. Do not attempt any repair or replacement of the Mechatronics Module.

The transmission oil temperature information is used to:

- Initiate the Warm Up Program
- To inhibit TCC operation until a specified temperature has been reached.
- For determining fluid level when used with diagnostic equipment.

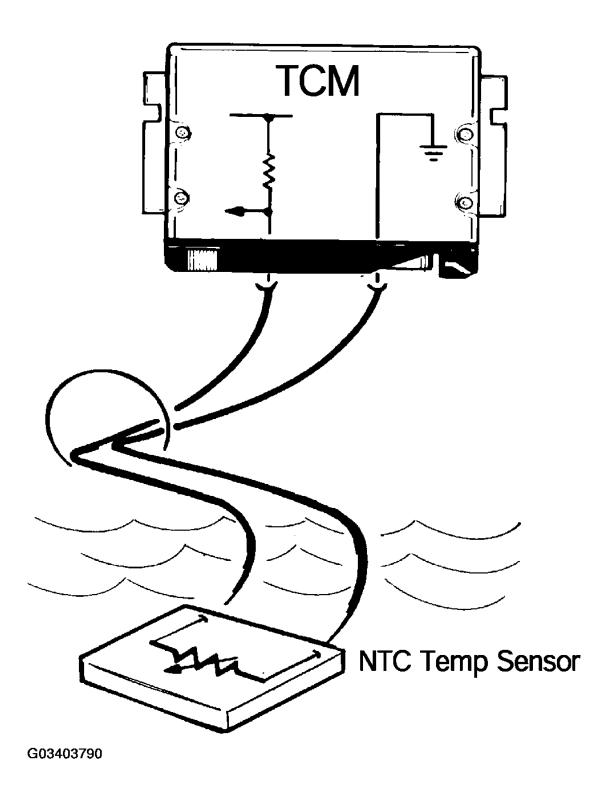


Fig. 12: Transmission Oil Temperature Sensor Is Connected To TCM Courtesy of BMW OF NORTH AMERICA, INC.

The transmission oil temperature sensor is connected to the TCM via a 5 Volt reference and a circuit ground. As transmission oil temperature increases, the circuit resistance and voltage decrease proportionately.

Kickdown Switch

The TCM receives a kickdown request via one of two possible methods:

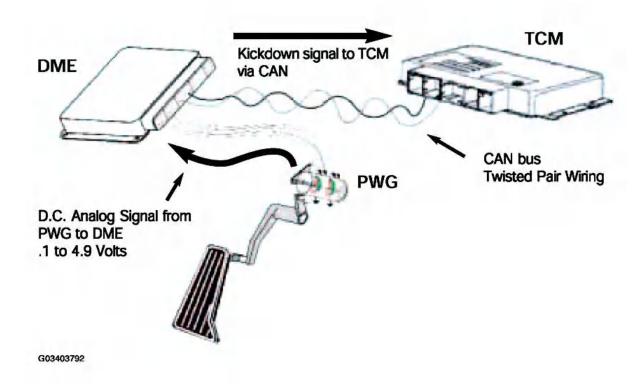
• The kickdown signal is a direct ground input to the TCM. The kickdown input is provided by a kickdown switch located under the accelerator pedal. This method is used on most BMW vehicles without electronic throttle control systems (except M52TU with MDK).



Fig. 13: Identifying Kickdown Switch
Courtesy of BMW OF NORTH AMERICA, INC.

• The kickdown request is provided by the ECM (DME) via the CAN bus. The kick down request originates from the PWG. There is no separate switch in the PWG. When the PWG voltage reaches approximately 4.5 volts, the ECM will process a kickdown request to the TCM via CAN. The PWG contains a kickdown detent to simulate the feel of a kickdown switch.

This method is used on the M62TU, M54, M73, M73TU, N73 and N62 engines.



<u>Fig. 14: Identifying Kickdown Signal Is A Direct Ground Input To</u> Courtesy of BMW OF NORTH AMERICA, INC.

Brake Switch

The brake switch is located on the brake pedal linkage. The brake switch signal is an input to the TCM which is used for:

- De-activation of the shift lock solenoid. When the ignition key is turned to KL15 the shift lock is active. The shift lock solenoid is de-activated when the brakes are applied.
- De-activate the Torque Converter. The TCC is deactivated whenever the brake is applied. (only on Hydramatic Transmissions).

There are two types of brake switches used on BMW vehicles:

- On early vehicles such as E32, E34, E36, E24, E28 and E31 the brake switch is a double-contact mechanical switch. There is a brake light circuit and a brake test circuit. The brake test circuit is used for a plausibility check to indicate faults within the brake light circuit.
- On the E38, E39, E46, E65/66, E85 and E53 the brake switch is a hall effect type switch. The electronic switch is also monitored for faults and plausibility.

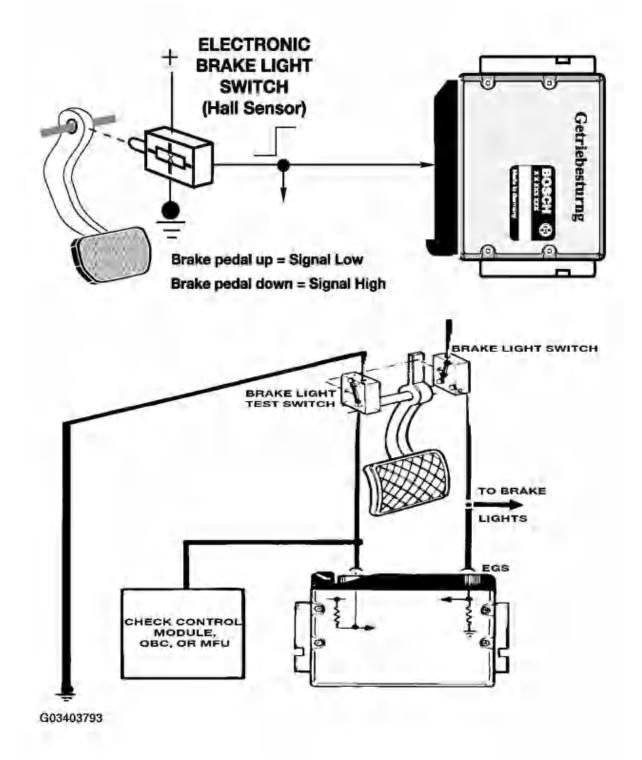
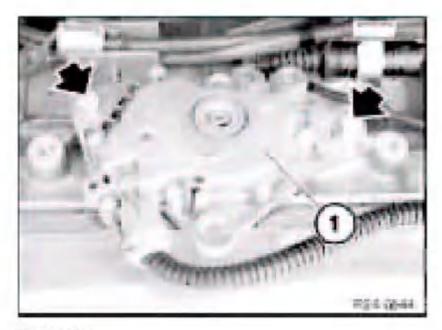


Fig. 15: Identifying Brake Switch Signal Is An Input To TCM Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Range Selector Switch

The range selector switch is an input to the TCM. The input is used by the TCM to determine the position of the manual valve. The range switch uses the familiar "coded input" signal to determine selector lever position. On all transmissions except the A5S360/390R, the range switch uses a 4 wire configuration to determine 7 range selector positions. The A5S360/390R uses a five wire arrangement.

Most range switches are located on the transmission case with some exceptions. The E36 with the A4S270/310R the range switch is located is the center console on the selector lever assembly. The E39 with A4S270R the range switch is located on the transmission case and is adjustable. The range selector switch on the A5S360/390R is located inside the transmission housing. GA6HP26Z is part of the Mechatronics Module.



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<u>Fig. 16: Identifying Transmission Range Selector Switch</u> Courtesy of BMW OF NORTH AMERICA, INC.

The range switch can be checked by using "Status Requests" in the DISplus or GT-1.

A multimeter or an oscilloscope can also be used to check the range switch. If the reading on "Status Requests" does not match the actual selector lever position, there will be various transmission malfunctions.

Use the switch logic chart to diagnose faults in the switch.

In the example below, the range switch is in neutral. Using the logic chart, switches L1, L2 and L3 are closed providing B+ voltage to the corresponding pins of the TCM. Switch L4 is open and no voltage is sent to the TCM. Malfunctions in the range switch or wiring can cause various shifting complaints and possible No-Start complaints.

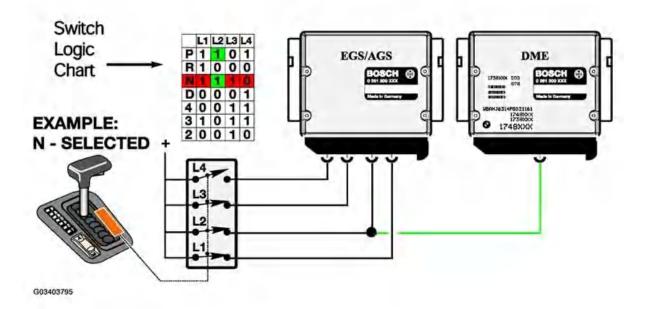


Fig. 17: Identifying Transmission Range Selector Switch Logic Chart Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Program Switch

The transmission program switch is used to switch between various operating modes of the transmission. The normal default mode of the TCM is Economy which is indicated in the program display as "E". Economy mode allows the transmission to operate in the most efficient mode. Shift priorities are for maximum economy and shift comfort. On some vehicles the program switch is designated "A" for economy mode. Program switches come in 2 or 3 position configurations. Early vehicles with the 4HP (Early E7) used a rotary program switch.

The TCM can also be switched to "Manual Mode" which on some vehicles is designated "Winter Mode". Manual mode is used to start the vehicle off in a higher gear when encountering slippery conditions. The program display will indicate "M" (manual) or an asterisk symbol for "Winter Mode".

Sport Mode is the third operating mode that is available. Sport mode allows for a slightly delayed and more aggressive shift. Sport mode is obtained a number of ways. On vehicles with 2 position program switches, moving the selector lever out of drive to 4, 3, or 2 with the program switch in Economy will allow Sport mode. On vehicles with 3 position program switches, Sport mode can be obtained by switching to "S".

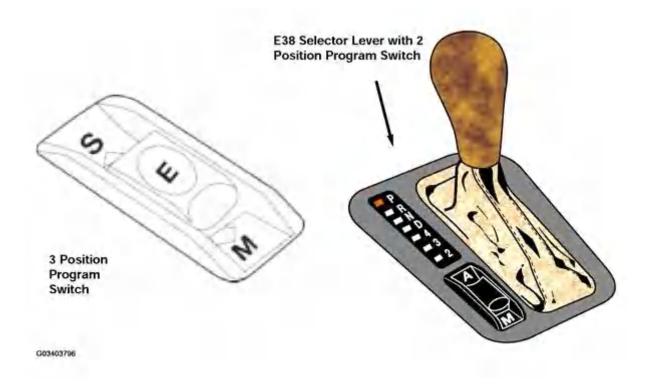


Fig. 18: Identifying Transmission Program Switch Courtesy of BMW OF NORTH AMERICA, INC.

Steptronic Components

The Steptronic system uses additional components not found on a conventional system. These components consist of a manual switch and an Up/Down microswitch. Otherwise, the Steptronic system uses the same transmission and TCM.

The TCM monitors the Steptronic shifter position from P through D via the conventional range selector switch located on the transmission. The Range Selector Switch provides positions P through D to the TCM because the automatic gate of the shifter only travels through these positions.

When the Steptronic Shifter is moved to the left 15 degrees into the manual gate, the TCM receives a ground input from the manual gate switch. The ground signal is provided to the TCM through the Transmission Position Indicator. The transmission position indicator also provides range position signaling to the range position indicator in the shift console.

Steptronic was introduced on the E31 850Ci (10/94) and the 840Ci (1/96). Steptronic was subsequently introduced into the E38, E39, E46, E36/7 and the E53.

The Steptronic system can be diagnosed through "Status Requests" with the DISplus or GT-1.

From 2002 model year the Steptronic shifter has changed slightly. Downshifts are now achieved by moving the selector lever forward and upshifts are now rearward.

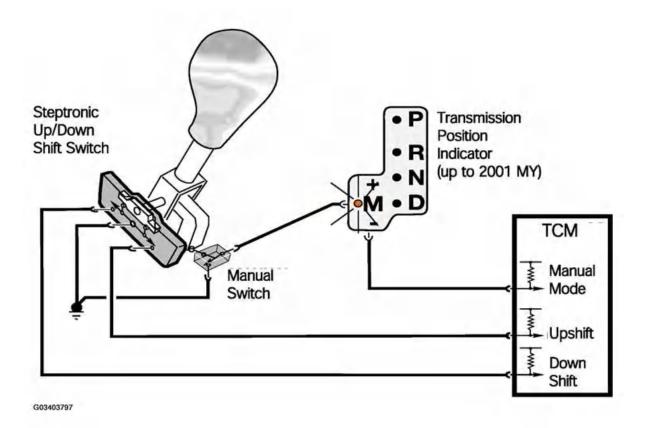


Fig. 19: Identifying Steptronic Components Courtesy of BMW OF NORTH AMERICA, INC.

Magnetic Valves

Magnetic Valves (MV) are used to electronically control hydraulic fluid flow to the various shift elements within the transmission. Magnetic valves are located on the valvebody and replaceable as separate components. In ZF transmissions, MV valves are designated MV1, MV2, MV3 etc. In Hydramatic transmissions, they are designated Shift Valve A, Shift Valve B, Shift Valve C etc.

The magnetic valves are controlled by the TCM. They are supplied power by an internal TCM relay and are ground controlled. The TCM switches one or more of the MV's on or off in various combinations to achieve various shifts. Most transmission have 2 or 3 MV's to control shifting.

In addition to controlling shifts within the transmission, magnetic valves are also used for overlap shifting and pressure regulation on some transmission applications. For example MV4 and MV5 are used for overlap shifting in the A5S310Z. MV5 is used for pressure regulation on the 4HP22/24EH transmissions. When used for pressure regulation, the magnetic valves are pulse width modulated by the TCM.

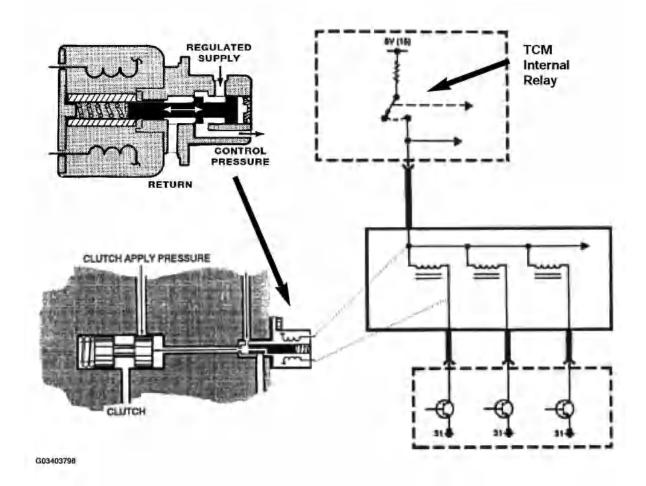


Fig. 20: Identifying Magnetic Valves Are Pulse Width Modulated By TCM Courtesy of BMW OF NORTH AMERICA, INC.

Pressure Regulating Solenoids

Pressure Regulating Solenoids are used to modify line pressure for use in the transmission. There are numerous terms for these solenoids depending upon transmission type and manufacturer. ZF transmissions use the term EDS, while Hydramatic Transmissions use the term DR solenoid, Force Motor Solenoid and Variable Bleed Solenoid (VBS).

EDS valves are used for main line pressure regulation, TCC application and Overlap Shift Pressure Control on the A5S440Z and A5S560Z. All pressure regulating solenoid are controlled by Pulse Width Modulation.

Using the example in the picture below, this is a section of the A5S440Z/560Z valve body. The EDS valves are used for the following:

- EDS 1 is used for main line pressure regulation
- EDS 2, 3 and 5 are used Overlap Shift Pressure Control
- EDS 4 is used for TCC application. (GWK) Gradually applied TCC.



Fig. 21: Identifying Pressure Regulating Solenoids Courtesy of BMW OF NORTH AMERICA, INC.

Hydramatic Pressure Regulator

The valve body shown at the right is from the A5S360/390R. Note the location of the main pressure regulator. Depending upon the reference text, the pressure regulator is also known as the Force Motor Solenoid, Variable Bleed Solenoid or PC Solenoid.

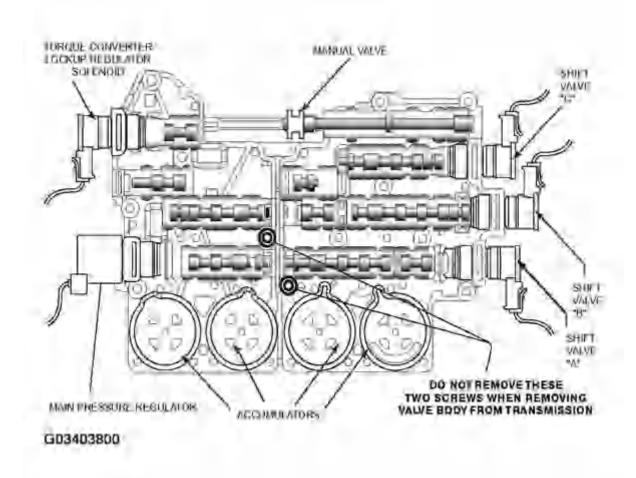
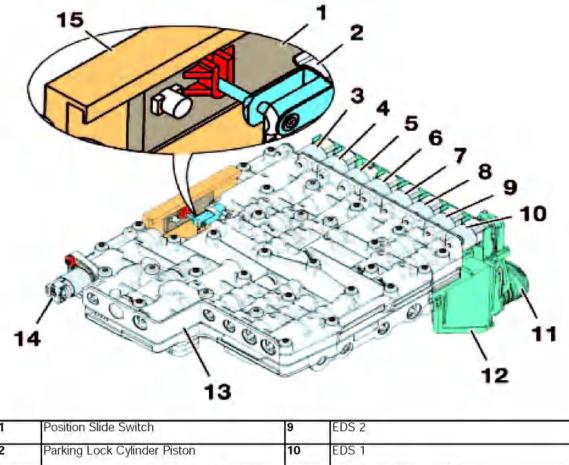


Fig. 22: Identifying Hydramatic Pressure Regulator Courtesy of BMW OF NORTH AMERICA, INC.

Mechatronics Module GA 6HP26Z



| 1 | Position Slide Switch | 9 | EDS 2 | |
|---|---|----|-------------------------------|--|
| 2 | Parking Lock Cylinder Piston | 10 | EDS 1 | |
| 3 | Solenoid Valve 3, parking lock Cylinder | 11 | Electronic Plug Connector | |
| 4 | EDS | 12 | Electronic Module | |
| 5 | Solenoid Valve 1 | 13 | Hydraulic Module (Valve body) | |
| 6 | EDS 4 | 14 | Solenoid Valve 2 | |
| 7 | EDS 5 | 15 | Position Switch | |
| 8 | EDS 3 | | | |

G03403801

Fig. 23: Identifying Mechatronics Module GA 6HP26Z Courtesy of BMW OF NORTH AMERICA, INC.

Instrument Cluster

The cluster is used to report information to the driver regarding transmission status. There are three items of information needed by the driver:

- Transmission Range this indicates the position of the range selector lever. The driver needs to know whether the transmission is in P, R, N, D, 4, 3, or 2.
- Transmission Program this indicates the mode of operation. There are 3 modes, Economy, Manual and Sport.
- Transmission Fault Information the driver needs to know of there is a malfunction in the transmission. Depending upon application, transmission faults can be indicated by an icon or by a "Transmission Program" message in the instrument cluster display matrix.



<u>Fig. 24: Identifying Instrument Cluster</u> Courtesy of BMW OF NORTH AMERICA, INC.

Depending upon vehicle model and transmission, these pieces of information arrive at the cluster through different methods.

- The most current method for this information to arrive at the cluster is through the CAN bus. The cluster processes this information from the TCM via CAN.
- On early E38 and E39 vehicles these is a "One Way Data Signal" from the TCM to the cluster. There is a one way serial data line that transfers this information to the cluster. On later vehicles, the cluster was introduced to the CAN bus and this method was no longer used. This was used on the E38 vehicles to 5/97 and E39 vehicles to 8/97 production.
- Early vehicles such as E32, E34, E36 etc. used a various combination of methods to transfer this data. Some clusters use the "Coded Input" method for the program indicator. Fault indication is done by a ground circuit through the TCM. Transmission range indication is achieved by a direct connection between the range switch and cluster or by a coded input to cluster.

There will be a FC6 in the Kombi when the TCM goes into fail-safe mode.

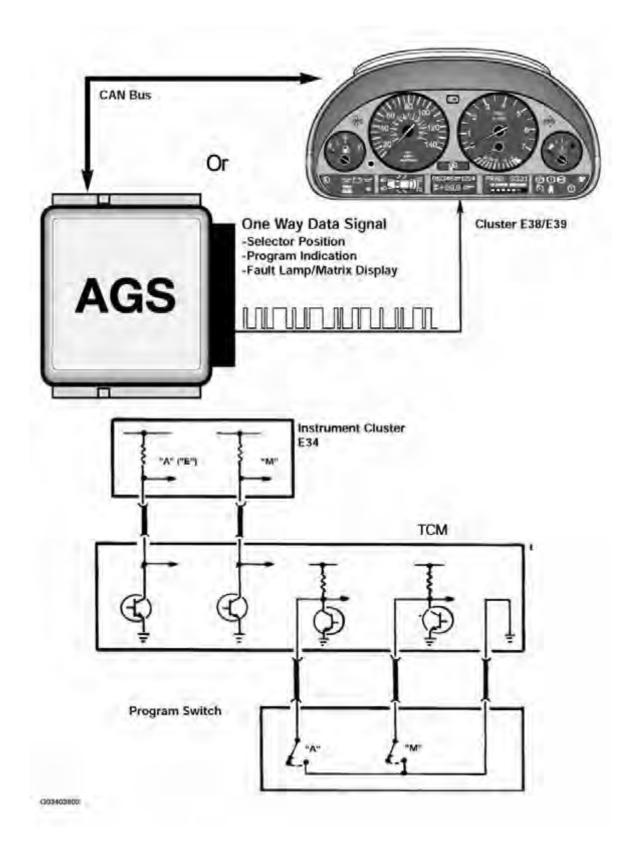


Fig. 25: Identifying Instrument Cluster Circuit Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION FEATURES AND PRINCIPLES OF OPERATION

Adaptive Hydraulic Pressure Control

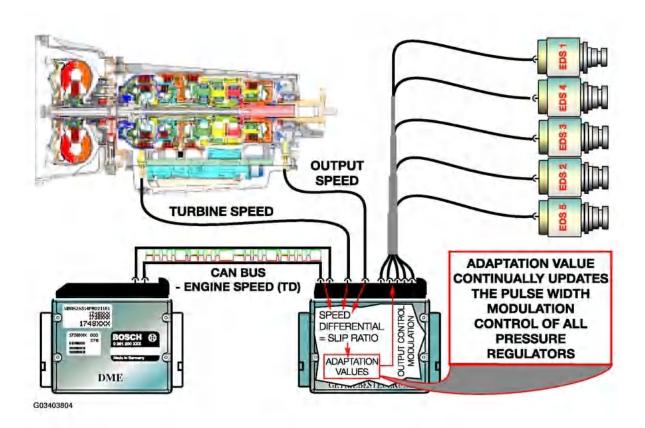
Pressure adaptation has been a feature of ZF automatic transmissions since the 4HP22EH. The TCM will maximize shift quality by adapting to transmission wear over time. The TCM will adjust transmission shift pressures to compensate for wear in the multi-plate clutches. This is accomplished by monitoring the input and output speeds of the transmission. When the transmission shifts, the TCM monitors the time that it takes to accomplish the shift. The time change in gear ratio is monitored and compared to an internal time value in the TCM. If the ratio change takes more time than the stored value, the TCM will compensate by adjusting the

transmission shift pressures via the EDS valve solenoids. The adaptation value is stored in the TCM. This adaptation values can only be cleared by the diagnostic tester (DIS plus or GT-1).

NOTE:

DO NOT clear adaptation values unless directed to do so by technical assistance. Clearing pressure adaptations should not be done to resolve a customer complaint. The only time that you would need to do so is after a transmission or valve body replacement or software change.

Also it is important not to confuse pressure adaptation with AGS features. AGS features will be discussed later in this chapter. AGS features are not stored on a long term basis and will not be cleared when the pressure adaptations are cleared. Driving style is NOT stored.



<u>Fig. 26: Identifying Adaptive Hydraulic Pressure Control</u> Courtesy of BMW OF NORTH AMERICA, INC.

Downshift Protection

Downshift protection is a feature that prevents unwanted or improper downshifting. If the range selector were moved to a lower gear at a high road speed, engine damage could occur from an unintended over-rev. This feature will prevent engine over-rev by delaying or preventing the unwanted downshift until the proper road speed is achieved. The result is increased safety by preventing unwanted deceleration slip.

Reverse Lockout

The TCM will lockout reverse above 3 MPH to prevent drivetrain damage. The range selector lever will go into the reverse detent, but reverse will not engage. This is achieved by the TCM through hydraulic intervention. The transmission will appear to be in neutral.

NOTE: Reverse Lockout is not operative when in fail-safe.

Engine Warm Up Cycle

The transmission shift points are modified after cold start to raise engine RPM during shifting. This allows for a faster engine warm up and reduction of catalyst warm up time. The TCM uses the transmission oil temperature

information to determine the implementation of this function.

The warm up phase program will be terminated if any of the following conditions exist:

- The vehicle exceeds 25 MPH or
- Transmission oil temperature exceeds 60 Degrees Celsius or
- A Maximum of three minutes is exceeded.

ASC/DSC Shift Intervention

During ASC/DSC regulation upshifts are inhibited to enhance the effectiveness of tractional control. Depending upon vehicle model, this action can take place via the CAN bus or a dedicated shift intervention signal wire. On later model vehicles where the ASC/DSC module is connected to the CAN bus, the shift intervention signal is sent to the TCM via CAN.

Torque Reduction

In order to allow a smoother shift and reduce load on the transmission, engine torque is reduced during shifting. This is accomplished by a signal that is sent from the TCM (EGS) to the ECM (DME) during shifting. The ECM will retard timing momentarily during the shift for a few milliseconds. This timing change is transparent to the driver. Depending upon application, the torque reduction signal is sent over a dedicated wire or a signal over the CAN bus.

Emergency Program

When a malfunction occurs within the transmission, the Emergency program (fail-safe mode) will be initiated. The Emergency Program will prevent unintended gear engagement and ensure driver safety. The following will occur during Fail-safe Operation:

- All shift solenoids are de-energized via TCM internal relay.
- The pressure regulation solenoid is de-energized resulting in maximum line pressure.
- The Torque Converter Clutch is de-activated.
- The Reverse Lockout function is cancelled.
- Shift lock solenoid is de-energized.
- Fault indicators are active.

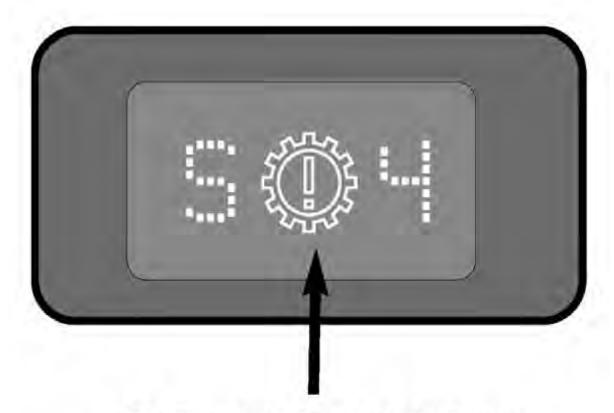
The fault indicator varies depending upon model, year and cluster type etc. High version instrument cluster will display a message in the matrix display. Vehicles with low version clusters will display a fault symbol in the cluster.

During fail-safe mode the transmission will be shifted into a higher gear to allow the vehicle to be driven to a service location. Depending upon application, the transmission will shift into 3rd or 4th gear (on a 4spd) and 4th or 5th gear (on a 5 spd). For example the A5S360R transmission will go into 5th gear when there is a malfunction and 4th when there is a power failure to the TCM. Since pressure regulation ceases, the shift to fail-safe mode will be abrupt or harsh, unless the transmission is already in the fail-safe gear.

On newer OBD II compliant vehicles, the MIL light will also be illuminated by the ECM (DME).

NOTE:

When diagnosing transmission related complaints, it is possible to have an erroneous fault indicator warning. Faults in the cluster can cause a false indication or "Trans Program" message. One indication of this scenario would be a transmission fault message in the cluster with no transmission faults stored in the TCM.



E46 Transmission Fault Indicator

G03403805

Fig. 27: Identifying E46 Transmission Fault Indicator Courtesy of BMW OF NORTH AMERICA, INC.

AC Compressor Load Sensing (Hydramatic Transmissions)

When the AC Compressor is switched on, additional load is placed on the engine. To compensate for the additional load, the TCM modifies line pressure and shift points. On the THMR-1, the TCM receives these signals via a direct connection to the AC compressor control circuit.

On vehicles equipped with CAN bus technology, the "AC on" signal is sent to the TCM from the DME as a CAN bus message.

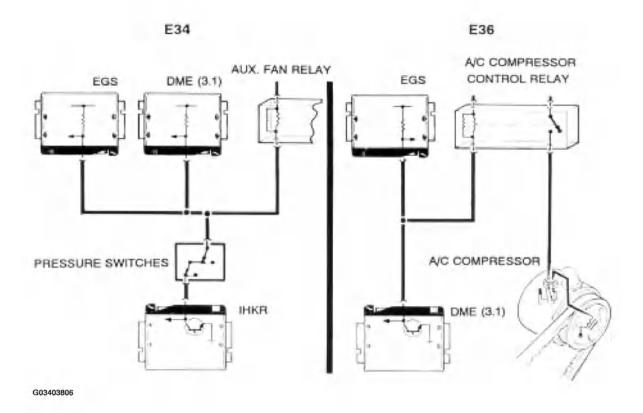


Fig. 28: Identifying AC Compressor Load Sensing (Hydramatic Transmissions) Courtesy of BMW OF NORTH AMERICA, INC.

Shift Lock

The shift lock solenoid is mounted on the selector lever assembly and locks the selector lever in Park or Neutral when the ignition is ON. This prevent the selection of a gear unless the brake pedal is depressed. The solenoid is activated by a switched ground from the TCM. Power is supplied by the TCM internal relay. During fail-safe operation, the shift lock is disabled. On later models, the shift lock will also be active when the TD signal is present and the shifter will remain locked above an engine speed of 2500 RPM regardless of brake application.

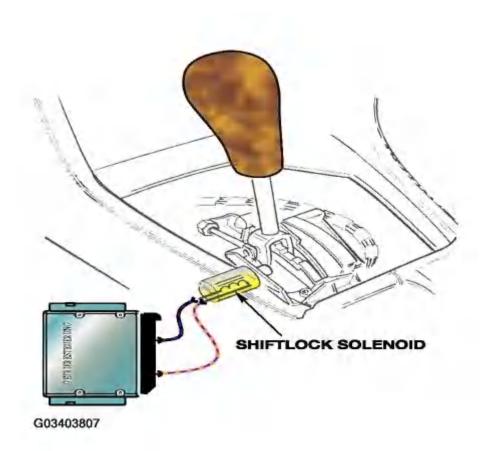


Fig. 29: Identifying Shift Lock Solenoid Courtesy of BMW OF NORTH AMERICA, INC.

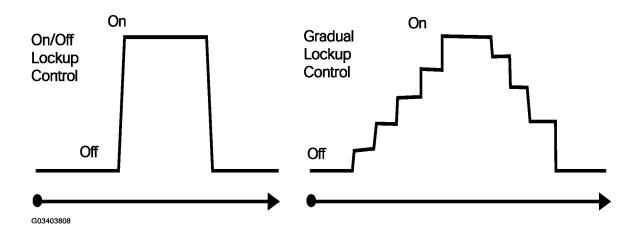
Torque Converter Clutch

Since the efficiency of the torque converter at coupling speed is approximately 1.1 to 1, fuel economy is compromised. To offset this a torque converter clutch was added on EH controlled transmissions. The torque converter clutch locks the turbine to the converter housing. This creates a mechanical coupling with a ratio of 1:1. This can only be achieved at higher engine speeds, the torque converter clutch must be disengaged at low engine speeds to prevent stalling.

There are two methods for controlling the torque converter clutch on BMW transmissions:

- A4S310/270R, 4HP22/24 EH, A5S310Z These transmissions use an on/off control method to lock and unlock the torque converter. The Torque Converter Clutch is either completely engaged or disengaged. This method of engagement provides an abrupt sensation when the TCC is locking and unlocking. This abrupt sensation can be undesirable to some drivers.
- A5S560Z, A5S440Z, A5S325Z, GA6HP26Z, A5S360/390R These transmissions use a gradual approach to TCC control. The TCC is gradually applied and released, this method reduces the abrupt feel of the on/off type TCC. The TCC solenoid is controlled by pulse width modulation. This allows fluid to be gradually introduced and released to the TCC.

The TCC is spring loaded to the engaged position. Pressurized fluid releases the TCC, when the pressurized fluid is released, the TCC is engaged. Depending on transmission application, the TCC can be engaged in 3rd, 4th or 5th gear. The TCC must be disengaged at low speeds to prevent stalling.



<u>Fig. 30: Identifying Two Methods For Controlling Torque Converter Clutch On BMW Transmissions</u> Courtesy of BMW OF NORTH AMERICA, INC.

Lock-Up Torque Converter

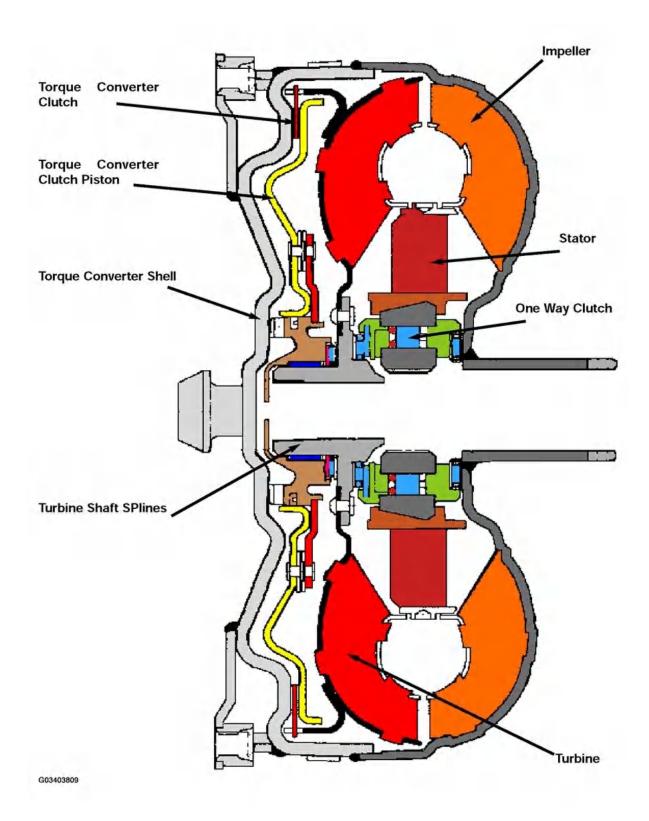


Fig. 31: Identifying Cross Section View Of Lock-Up Torque Converter Courtesy of BMW OF NORTH AMERICA, INC.

Shift Solenoid Control

Magnetic valves are used to direct the flow of transmission fluid to control shift elements in the transmission. Another Term for "Magnetic Valve" is "Shift Valve". Magnetic valves (MV) are solenoids controlled by the TCM. They can be switched by B+ or B-.

On ZF transmissions, magnetic valves are designated MV1, MV2, MV3 etc. On GM transmissions they are designated Shift Valve A, Shift Valve B, Shift Valve C etc.

Either valve can be checked for proper resistance using a multi-meter, DISplus or GT-1. Also, the "Activate Components" function can be used to check the Magnetic valves. Most all magnetic valves are switched on/off

instead of Pulse Width Modulation (PWM).

All magnetic valves (except THM R-1 to 12/95) are supplied power from an internal relay located in the TCM. The magnetic valves are switched on and off by final stage transistors in the TCM. During fail-safe operation, power to all MV's is switched off by the internal relay.

Magnetic valves are located on the valve body. They can be replaced individually.

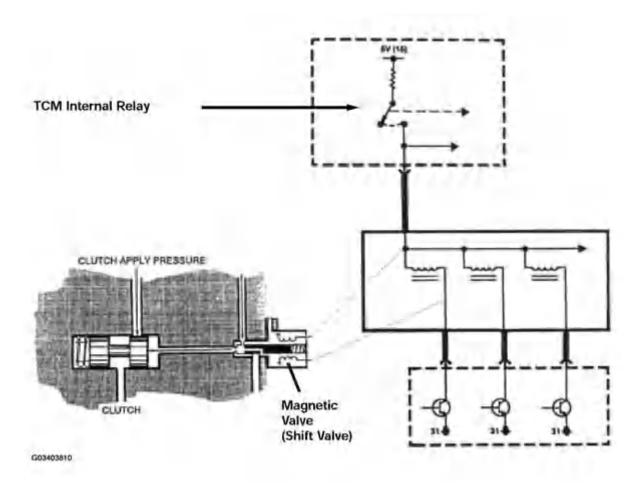


Fig. 32: Identifying Shift Solenoid Control Circuit Diagram Courtesy of BMW OF NORTH AMERICA, INC.

Pressure Regulation

Pressure regulating solenoids modify line pressure for hydraulic operation. Solenoids for pressure regulation are referred to as EDS valves in ZF transmissions. GM transmissions have a few terms such as Force Motor Solenoid, Variable Bleed Solenoid, and DR solenoid. Regardless of the name used, they are all used to control main line pressure based on throttle position and engine load.

On ZF transmissions, EDS valves are also used to control "Overlap Shifting". This allows for improved shift comfort by controlling pressures during shifting.

Depending upon transmission application, pressure regulating solenoids can be controlled using Pulse Width Modulation on B+ or B-.

The TCM will increase line pressure by regulating current flow to the pressure regulator. Current flow is controlled by pulse width modulation. When the duty cycle is low, the current flow to the solenoid is low. This allows spring pressure to close the valve. Therefore maximum line pressure is achieved. As the duty cycle increases, the current flow also increases. The valve opening increases, which allows pressure to be released through the pressure discharge which in turn decreases line pressure.

Main line pressure is also increased during fail-safe operation and when needed during "Adaptive Hydraulic Pressure Control" functions. Mainline pressure will also default to maximum pressure when power to the TCM

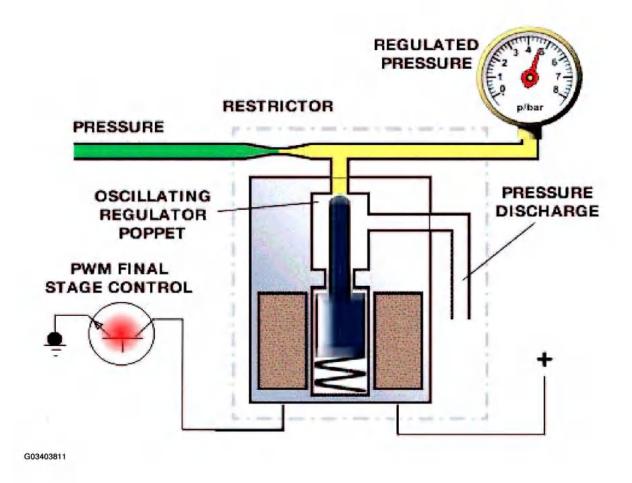


Fig. 33: Identifying Pressure Regulation Courtesy of BMW OF NORTH AMERICA, INC.

Shift Programs

BMW EH transmissions have selectable shift programs (or modes) to suit driver needs and operating conditions. There are 3 basic shift programs available:

- Economy Program The economy program is the default program which is adopted every time the vehicle is started. When in economy mode, the operating priority is for maximum economy and shift comfort. Shifts will take place at low engine RPM and road speed. The economy mode is indicated by an "A" on the program switch. The cluster will display an "E" to indicate economy mode.
- Manual Mode (Winter Mode) Manual mode is used to start out the vehicle in a higher gear on slippery surfaces when more traction is needed. A higher gear will reduce torque to the rear wheels. Manual mode can also be used to select a lower gear when needed such as when climbing a hill. Depending upon vehicle application an "M" will appear in the cluster when in Manual Mode or an asterisk (*) symbol will appear in the instrument cluster to indicate Winter Mode.
- Sport Mode Sport Mode provides raised shift points and a more aggressive shift program for the "Enthusiastic" BMW driver. The cluster will display an "S" when in sport mode.

Regardless of vehicle application, the program switch provides a momentary ground to the TCM to switch between modes. There have been numerous designs of the program switch since it's introduction. The program switch configurations are as follows:

• 2 Position Slide Switch - This switch has the "A" and the "M" selection. Sport mode is achieved by moving the selector lever from "D" to 4, 3 or 2 when in the Economy Mode. The 2 Position slide switch is used on most models. These vehicles usually have a range and program display located in the instrument cluster.

- 2 Position Rocker Switch This switch operates the same as the slide switch, but it is used exclusively on the E36. The E36 does not have a program indicator in the cluster. The rocker switch will illuminate, indicating the current program.
- 3 Position Slide Switch This switch has the added position for sport mode. The shifter does not have to be moved out of drive (D) to be in sport mode. This switch is used on the E36 M3 and the 4HP22/24 EH (Version Late E-7).
- 3 Position Rotary Switch This switch is used only on the Early 4HP22 EH trans missions (Version Early E-7).
- No Program Switch On some vehicles with AGS features, there is no program switch. Shift modes are obtained by moving the shift lever out of "D" range or automatically by adaptive shift functions. (Example E39)

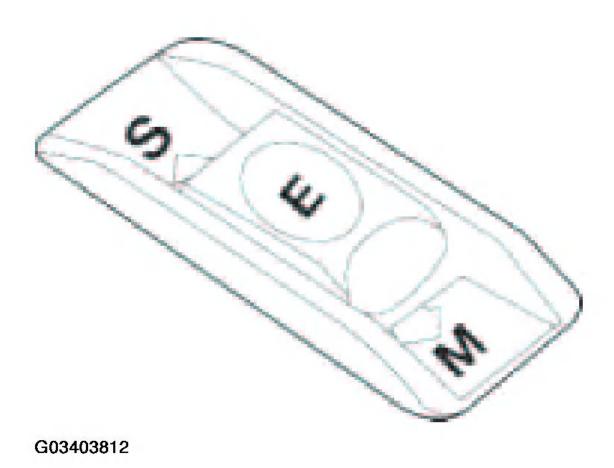


Fig. 34: Identifying 3 Position Program Switch Courtesy of BMW OF NORTH AMERICA, INC.



Fig. 35: Identifying E38 Selector Lever And Program Switch (2 Position) Courtesy of BMW OF NORTH AMERICA, INC.

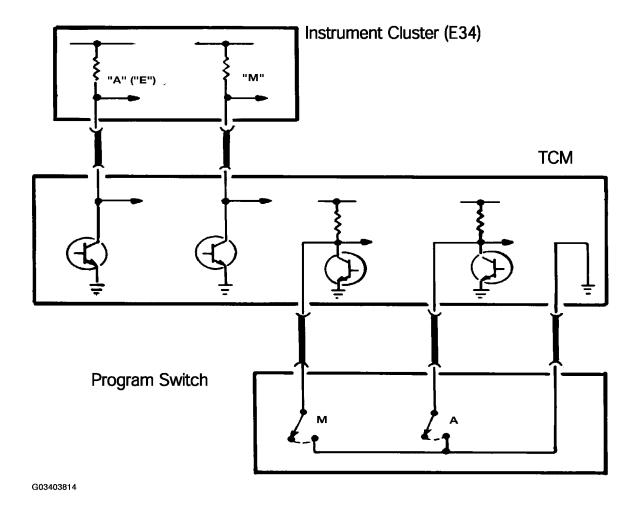


Fig. 36: Shift Programs Circuit

Courtesy of BMW OF NORTH AMERICA, INC.

Steptronic Shift Modes

The Steptronic shifting system was introduced to the BMW model line on the 95 E31 850Ci (from 10/94). Steptronic was subsequently added to other BMW models and is available on all BMW models with automatic transmissions. Other than a few additional components in the shifter mechanism, Steptronic equipped vehicles use the same transmission and TCM as non-Steptronic equipped vehicles.

Since the introduction of Steptronic, there have been several variations in Steptronic function. Regardless of version, the Steptronic system provides the driver with two modes of operation:

- To operate the transmission in fully automatic mode as with a non-Steptronic transmission.
- To operate the transmission in the manual shift mode by tilting the shift lever forward or backward when in the manual gate.

The Steptronic shift lever console contains and automatic and a manual shift gate. The automatic gate contains the gear lever positions P/R/N/D. When the lever is placed in "D" all of the shifting takes place based on the shift map programming in the TCM. To enter the manual gate the shift lever is moved 15 degrees to the left. Depending upon application, there are three possible configurations of the manual gate:

- On the E31 850Ci, the gate is marked as "M" only. There is a plus and minus sign for manual shifting. Upshifts are achieved by momentarily moving the shifter forward. Downshifts are achieved by moving the shifter rearward. When placing the shifter into the "M" gate, the transmission will adopt the current gear that is engaged. The transmission will stay in that gear until an upshift or down shift request is made.
- On all other vehicles until the 2002 model year, the gate is marked M/S. There is also a plus and minus sign for manual shifting. When placing the shifter into the M/S gate, the transmission will adopt Sport

mode. All shifts will still be automatic. Full manual mode is achieved when an upshift or downshift request is made. Upshifts are achieved by moving the shifter forward momentarily and downshifts are achieved by moving the shifter rearward.

• On all models with Steptronic from 2002, the only change is to the manual shifting modes. In order to be consistent with SMG operation, the positions were reversed. Upshifts are now achieved by moving the shifter rearward and downshifts are now forward. Otherwise, Steptronic operation is identical to the previous models.

Automatic Functions In Manual Mode

When in manual mode there are certain functions which occur automatically to prevent drivetrain damage and improve driveability:

- Engine Overspeed Prevention: To prevent engine over-rev, the TCM will upshift automatically just prior to max engine cutoff.
- Kickdown: If plausible, the TCM will automatically shift down to the next lower when a kickdown request is received.
- Decelerating: If in 5th gear and coasting to a stop, the TCM will automatically down shift to 4th gear at approximately 31 mph and then 3rd gear at approximately 19 mph. The automatic downshift allows for an acceptable gear when re-accelerating. (6 cylinder models will shift to 2nd gear when stopping vehicle)
- Implausible Gear Requests: Certain shift requests are ignored by the TCM. For example, requesting a downshift at a high rate of speed would be ignored. Any shift request that would cause the engine to exceed the maximum RPM limit would not be allowed. Also starting out in a high gear is also not allowed. Only 1st, 2nd or third gear is allowed when accelerating from a stop.

E31 850Ci Shifter Console

1995 to 1997 Model Year.

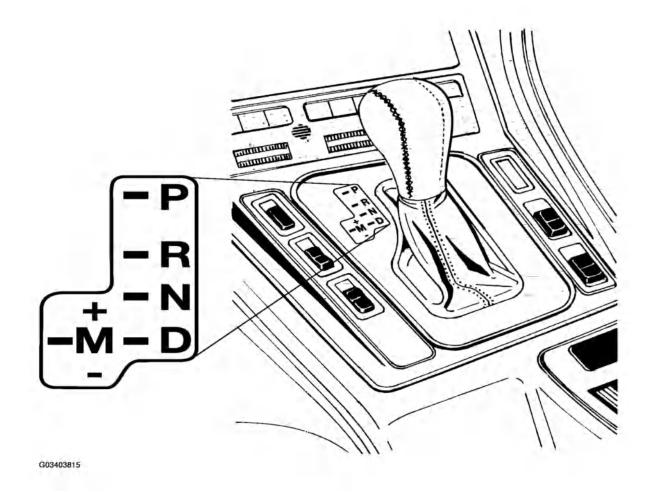


Fig. 37: Identifying E31 850Ci Shifter Console Courtesy of BMW OF NORTH AMERICA, INC.

Steptronic Shifter Circuit

In order to achieve manual shifts with Steptronic, the selector lever is moved 15 degrees to the left. A pin on the selector lever engages the "up/down" microswitches which are a ground input to the TCM. The selector lever also triggers the "M" gate microswitch which is also a ground input to the TCM.

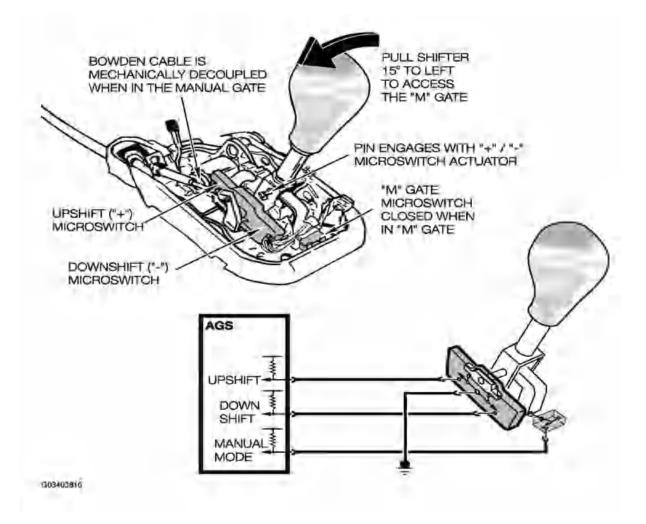


Fig. 38: Identifying Steptronic Shifter Circuit Courtesy of BMW OF NORTH AMERICA, INC.

The example on the right shows a typical shift console for an E31. Note the shift pattern, upshifts are forward and downshifts are rearward. This shift pattern was used on vehicles up to the end of 2001 production. On vehicles from 2002 production, the shift pattern is reversed.

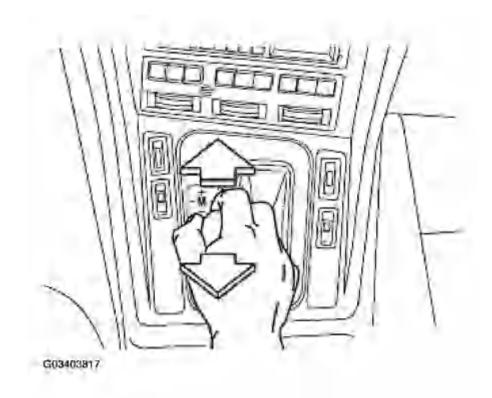
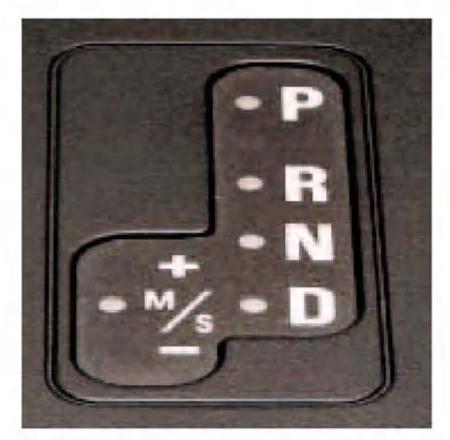


Fig. 39: Identifying Shift Pattern
Courtesy of BMW OF NORTH AMERICA, INC.

Steptronic System Comparison

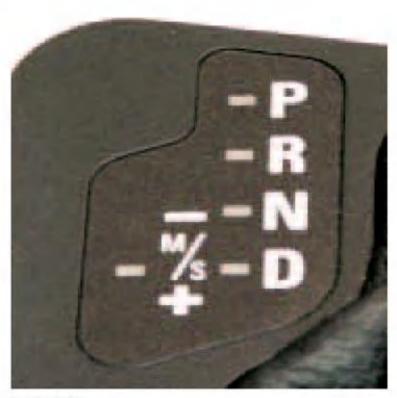
STEPTRONIC SYSTEM COMPARISON

| | 1 | 411 1 1 E21 | 11137 1 1 0 2002 |
|-------------------------------|---|-------------------------|-------------------------|
| | | All model except E31 | All Models from 2002 |
| | | 850Ci up to 2001 Model | model year with |
| Detail | E31 850Ci 1995 to 1997 | year with Steptronic. | Steptronic |
| Shift Console Layout | "M" Gate | M/S Gate | M/S Gate |
| Selection of Manual | Shift to "M" gate | Shift to "M/S" gate and | Shift to "M/S" gate and |
| Mode | | move lever momentarily | move lever momentarily |
| | | to "+" or to "-". | to "+" or to "-". |
| Gear Range in Manual Mode. | 2nd to 5th gear (1st gear only accepted for 2 | 1st to 5th gears | 1st to 5th gears |
| | minutes after cold start. | | |
| | If the throttle is pressed | | |
| | 100% a 2-1 shift will | | |
| | occur | | |
| Un-allowable gear | 4th and 5th gear after | 4th and 5th gear after | 4th and 5th gear after |
| requests. | vehicle standstill. | vehicle standstill. | vehicle standstill. |
| l - | Downshifts that can | Downshifts that can | Downshifts that can |
| | cause engine over-rev. | cause engine over-rev. | cause engine over-rev. |
| | 1st gear after engine | | |
| | warm up. | | |
| Upshifts/Downshifts | Upshifts - Forward | Upshifts - Forward | Upshifts - Rear |
| | Downshifts - Rear | Downshifts - Rear | Downshifts - Forward |



G03403818

Fig. 40: Identifying Shift Pattern Up To 2001 Courtesy of BMW OF NORTH AMERICA, INC.



G03403819

Fig. 41: Identifying Shift Pattern From 2002 Courtesy of BMW OF NORTH AMERICA, INC.

ADAPTIVE FEATURES (AGS)

AGS features were introduced in 1994 with the A5S560Z transmission. AGS control consists of adaptive features that will modify transmission operation according to various factors. AGS operation can be influenced by two major functional groups:

- Driver influenced features (influenced by throttle and kickdown input)
- Environmental influences (such as road conditions icy, traffic etc.)
- --EGS-- CONDITIONS THAT INFLUENCE SHIFT PROGRAM
- --AGS-- ADDITIONAL CONDITIONS THAT INFLUENCE SHIFT PROGRAM

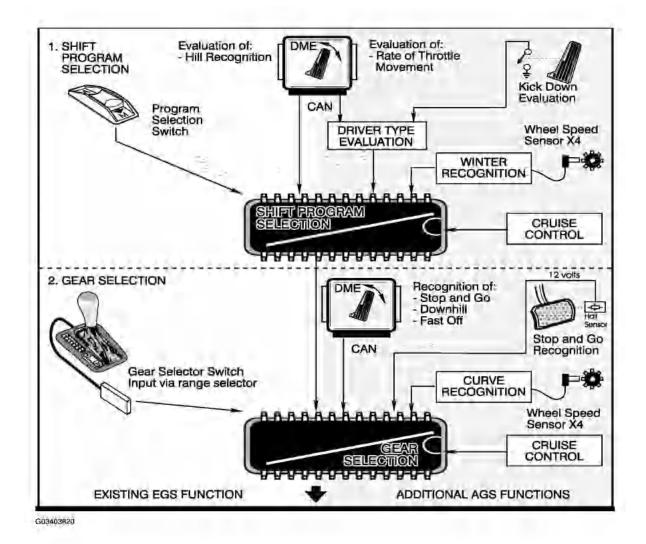


Fig. 42: Identifying Adaptive Features (AGS)

Courtesy of BMW OF NORTH AMERICA, INC.

The driving program selection is not adapted on a long term basis - nor is it stored in the control module memory when the ignition is switched off. It continually changes as the driver of the vehicle changes driving habits.

Driver Influenced Features Of AGS

The adaptive drive program is based primarily on throttle input. The throttle information comes from the ECM (DME) via the CAN bus. The TCM continuously monitors the throttle input for:

- The current throttle position
- The rate of change in pedal movement
- The number of acceleration requests
- The number of kickdown requests

Drive Away Evaluation

The AGS system selects the appropriate shift program based on the amount of acceleration that occurs during takeoff. When driving away under full throttle the transmission will shift from XE to E.

Kick Fast Feature

Based on these inputs, the AGS will select one three different driving programs as follows:

• Extreme Economy - Shift points are a low speeds for maximum comfort and economy

- Economy The shift points are raised for more performance with economy as priority
- Sport The shift points are higher to take advantage of full engine performance.

Under full throttle acceleration at high speed, single gear downshifts are possible. A two gear downshift is possible if the accelerator pedal is moved quickly to kick-down. The Extreme Sport program was eliminated as part of the kick-fast feature.

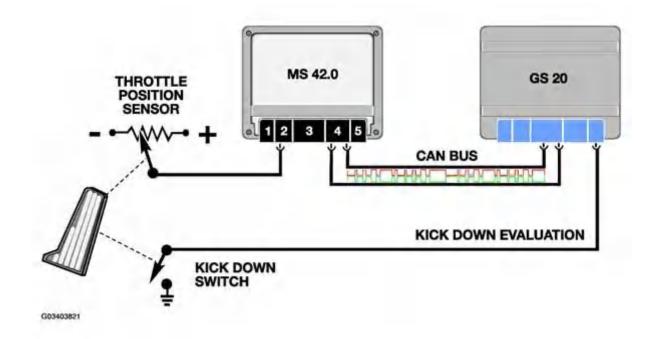


Fig. 43: Identifying Kick Fast Feature
Courtesy of BMW OF NORTH AMERICA, INC.

Environmentally Influenced AGS Features

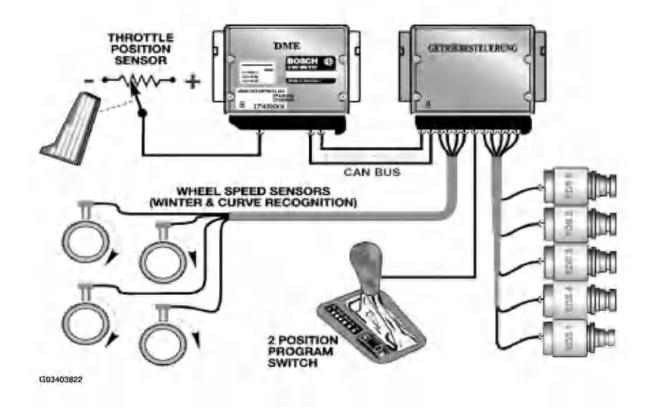


Fig. 44: Identifying Environmentally Influenced AGS Features Courtesy of BMW OF NORTH AMERICA, INC.

STOP And GO

The feature is activated by defined sequence of shifts which are as follows:

• Upshift from first to second - followed by a downshift from second to first - followed by another upshift from first to second. This is then followed by the vehicle coming to a complete stop.

After this sequence occurs, the transmission will stay in second gear. The AGS control has recognized stop and go driving and this function will prevent excessive shifting during heavy conditions. The second gear start will be cancelled when:

- The vehicle speed exceeds 40 MPH
- The throttle pedal is pressed more than 90%
- The range selector is moved to Park, Neutral, Reverse or Sport (4, 3 or 2)
- The vehicle is in Sport Mode

Winter Drive Program

This feature is activated when the TCM detects slippage at the rear wheels by comparing front and rear wheel speed signals. When slippage is detected by the TCM, the transmission will start in second gear and the shift points will be lowered. This will reduce torque to the rear wheels allowing improved driveability and traction on slippery roads.

Hill Recognition Program

There are two hill recognition programs, one for Uphill and one for Downhill. The TCM will activate this feature when it receives a high engine load signal at slower road speeds. The TCM will perceive this information as being consistent with climbing a hill. The shift points will be raised to prevent constant up and down shifting. This is referred to as the pendulum shift effect. When driving downhill, road speed will increase with minimal throttle input. The TCM will detect a downhill situation and hold the current gear to prevent an upshift when going downhill.

Curve Recognition

This feature will inhibit upshifts when the vehicle is in a curve. This is to improve stability when the vehicle is cornering at high speeds. The TCM will initiate this feature when it detects a difference between left and right (front) wheel speed signals. The difference in these signals will indicate that the vehicle is in a curve. Be aware that improper tire sizes, brands and inflation pressures can influence this feature. Always address these issues first when diagnosing delayed upshift complaints.

Cruise Control Drive program

A special cruise control shift map is selected by the TCM when cruise control is active. The TCM will prevent unwanted locking and unlocking of the torque converter clutch. Also, upshifting and downshifting will be minimized. Depending upon application, the cruise control interfaces with TCM via a single wire data link or as on vehicles with electronic throttle control, the TCM will interface with the ECM (DME).

Manually Selected "Extreme Sport" Program

This feature is activated by moving the shift lever to position 4, 3 or 2. This activates the "Extreme Sport Program" where the shift points are raised for maximum RPM and performance. On Steptronic equipped vehicles, the sport program is obtained by moving the shifter to the manual gate to initiate the "Sport Program".

Modifications To AGS Features

Since the introduction of AGS features in 1994, there have been some software changes to address customer concerns. Some AGS features have been perceived by the customer as malfunctions. To correct this, some of the AGS features were modified with updated software. The AGS features previously discussed in this text reflect the updated modifications.

CAN BUS COMMUNICATION

The CAN bus is a serial communications bus in which all connected control units can send as well as receive information. Data over the CAN bus operates at a rate of up to 1Mb/s (megabits per second).

The CAN protocol was developed by Intel and Bosch in 1988 for use in the automotive industry to provide a standardized, reliable and cost-effective communications bus to combat the increasing size of wiring harnesses.

The CAN bus was originally introduced on BMW automobiles in the 1993 E32 740i/IL as a data link between the TCM (EGS) and the ECM (DME).

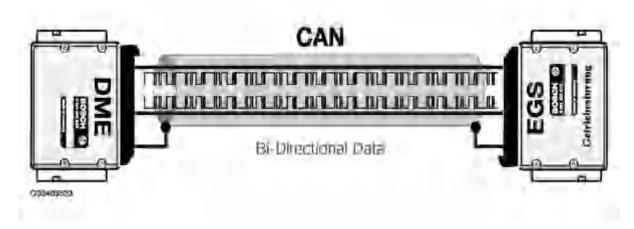


Fig. 45: Identifying CAN Bus

Courtesy of BMW OF NORTH AMERICA, INC.

On earlier EGS systems, various signals were transmitted on individual signal wires. This reduced reliability and increased the amount of wiring needed. The CAN bus allows faster signal transmission and increased versatility. For example, the signals listed in the chart below were previously transmitted on individual wires, now these signals are all on the CAN bus. This chart represents only some of the signals on the CAN bus, there are many more signals transmitted between the TCM and ECM.

EGS SYSTEMS SIGNALS

| Sender | Information Item | Receiver | Signal Use |
|--------|------------------------------|---------------------|---|
| ECM | Engine Temperature | TCM | Shift Point Calculation |
| ECM | Engine Load (tL) | TCM | Shift Point Calculation |
| ECM | Engine RPM (TD) | Engine RPM (TD) TCM | |
| ECM | Throttle Position (DKV) | TCM | Shift Point Calculation |
| ECM | A/C Compressor ON | TCM | Fine tune shift points to compensate for increased engine load. |
| TCM | Transmission Range | ECM | Engine Idle Speed Control |
| TCM | Torque Reduction Signal (ME) | ECM | Timing Retard during shifts. |
| TCM | TCC Lockup Status | ECM | Engine Timing Map adjustment. |

CAN Bus Topology

The CAN bus consists of two twisted copper wires. Each wire contains an opposing signal with the exact same information (CAN-High, CAN-Low). The opposing signals transmitted through the twisted wire serve to suppress any electrical interference. Early CAN bus wiring included a grounded shield around the two wires, later vehicles discarded the shield in favor of the unshielded twisted pair wiring.

Due to the linear structure of the network, the CAN bus is available for other modules in the event of a

disconnected or failed control unit. This is referred to as a "Tree" structure with each control unit occupying a branch.

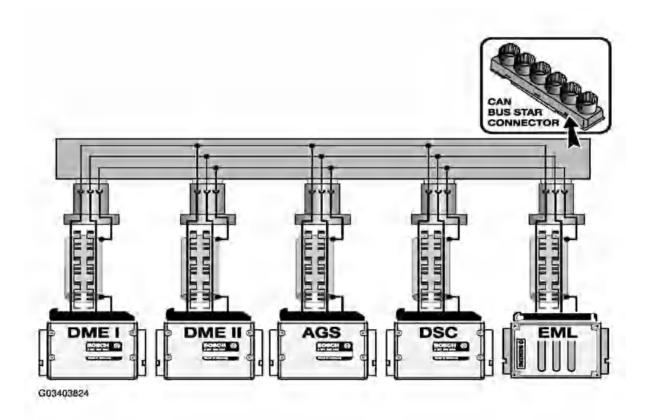


Fig. 46: Identifying CAN Bus Topology

Courtesy of BMW OF NORTH AMERICA, INC.

As previously mentioned, the CAN bus initially was used as a high speed communication link between the DME and AGS control units.

With the introduction of the E38 750iL (95 M.Y.), the CAN bus was expanded to include the EML and DSC control modules. The 750iL made exclusive use of the "star coupler" to link the individual CAN bus ends to a common connector.

The 1998 model year introduced new users of the CAN bus. The instrument cluster and the steering angle sensor were linked to expand the signal sharing capabilities of the vehicle.

The 1999 750iL was the last vehicle to use the shielded cable, after which the entire CAN bus went to twisted pair wiring.

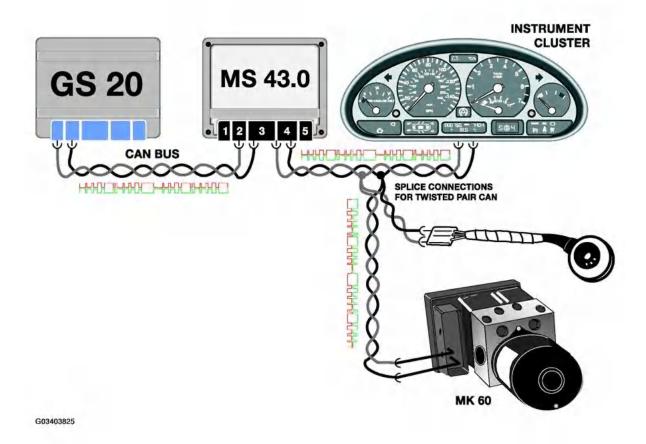


Fig. 47: Identifying CAN Bus Signal Sharing Capabilities Courtesy of BMW OF NORTH AMERICA, INC.

On most current models the CAN bus provides data exchange between the following control modules:

- ECM (DME)
- EML (750iL E38)
- TCM (EGS)
- IKE/Kombi
- ASC/DSC
- LEW

On models that use twisted pair, the wire color of the CAN bus is uniform throughout the vehicle with: CAN-Low GE/BR and CAN-High GE/SW or GE/RT. Shielded wiring is easily identified by the black sheath surrounding the CAN bus.

Troubleshooting The CAN Bus

The failure of communication on the CAN bus can be caused by several sources:

- Failure of the CAN bus cables.
- Failure of one of the control units attached to the CAN.
- Failure of the voltage supply or ground to individual modules.
- Interference in the CAN bus cables.

Failure of the CAN bus cables

The following faults can occur to the CAN bus wiring:

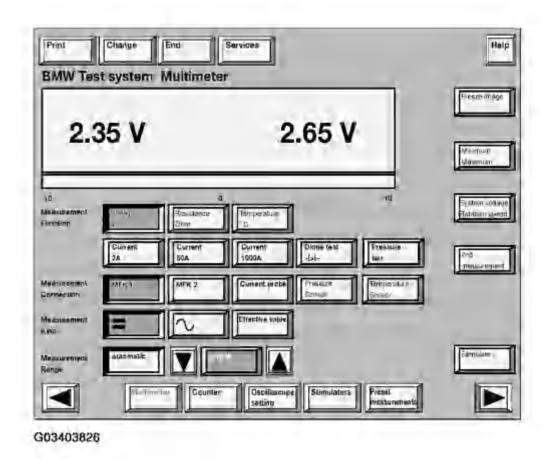
- CAN-H/L interrupted
- CAN-H/L shorted to battery voltage

- CAN-H/L shorted to ground
- CAN-H shorted to CAN-L
- Defective plug connections (damaged, corroded, or improperly crimped)

In each instance, the connected control units will store a fault due to the lack of information received over the CAN bus.

The voltage of the CAN bus is divided between the two data lines: CAN-High and CAN-Low for an average of 2.5V per line. The voltage measurement is taken from each data line to ground. Each module on the CAN contributes to this voltage.

The fact that 2.5V are present does not mean that the CAN bus is fault free, it just means that the voltage level is sufficient to support communication.



<u>Fig. 48: Identifying BMW Test System Multimeter Display</u> Courtesy of BMW OF NORTH AMERICA, INC.

Terminal Resistors: are used in the CAN bus circuit to establish the correct impedance to ensure fault free communication. A 120 Ohm resistor is installed in two control units of the CAN between CAN-H and CAN-L. Because the CAN is a parallel circuit, the effective resistance of the complete circuit is 60 Ohms. On some vehicles there is a jumper wire that connects the two parallel branches together, others have an internal connection at the instrument cluster.

The resistance is measured by connecting the appropriate adapter to any of the modules on the CAN and measuring the resistance between CAN-L and CAN-H. The resistance should be 60 Ohms. The CAN bus is very stable and can continue to communicate if the resistance on the CAN bus is not completely correct; however, sporadic communication faults will occur.

The terminal resistors are located in the ASC/DSC control unit and either the instrument cluster or in the DME.

Early 750iL vehicles that used the star connector have a separate external resistor which connect CAN-H and CAN-L together.

Modules which do not have the terminal resistor can be checked by disconnecting the module and checking the resistance directly between the pins for CANH and CAN-L. The value at these control units should be between 10 kOhms and 50 kOhms.

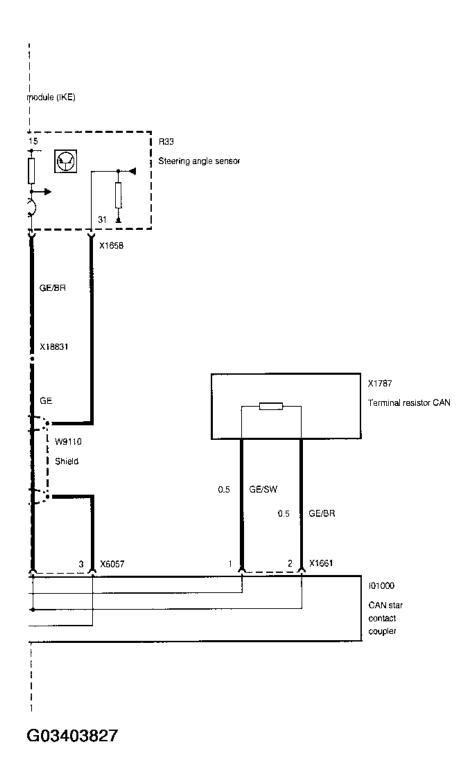


Fig. 49: Identifying Terminal Resistor Circuit Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSIS AND TROUBLESHOOTING

Due to the cost and complexity of today's electronic transmissions, BMW recommends that the technical 3816 of 4036

hotline be contacted before any repairs are performed. It is important that the technician perform some basic diagnostic procedures before contacting technical assistance. The following procedures should be followed:

- Always Verify customer complaint, make sure the complaint is not related to normal operation. (i.e. Warm Up Phase, AGS operation etc.)
- Survey Fault Memory Perform complete quick test. There may be other systems that interface with EGS that could cause faults. (i.e DME, ASC/DSC, IKE/Kombi etc.)
- Print out all fault code with fault conditions. Also print out copy of Identification page and diagnostic report.
- CHECK TO SEE IF THERE ARE ANY SERVICE BULLETINS THAT APPLY TO YOUR SPECIFIC COMPLAINT. THIS INCLUDES THE SERVICE ROUND TABLE.
- Ensure that battery voltage is sufficient. Battery voltage must be greater than 12.5 with ignition switched off. Check battery connections for tightness and condition.
- Check ground connections. (chassis to engine, grounds to bulkhead and shock tower.)
- Check over vehicle to look for transmission leaks, physical damage, loose connections etc.
- If necessary, check fluid level and condition using DISplus or GT-1.
- Check to see if any aftermarket or performance components have been installed that could effect transmission operation. (DME or EGS software as well as any engine modifications).
- Check repair history to see if there were any recent repairs that could effect the proper operation of the transmission (i.e. Engine replacement with damaged dowel pin etc.).
- Check DCS for any open campaigns or recalls pertaining to drivetrain.
- Check and record chassis number, production date and transmission serial # before contacting technical assistance.

Establishing A Diagnostic Plan

Once all of the pre-diagnostic criteria has been satisfied, a logical diagnostic plan should be followed. A logical, well organized diagnostic plan will help avoid improper diagnosis, unnecessary parts replacement and lost diagnostic time. A technician's goal should be to satisfy the customer by "Fixing it the first time, on time, every time". The productivity of the technician can also be improved by following a logical, common-sense approach to problem solving. The following steps are recommended to form a diagnostic plan:

- Verify the Customer Complaint This step is the most important, but also the most overlooked. The focus should always be on the exact customer concern. Make sure that the customer complaint is not a misunderstanding of proper vehicle operation. This step can avoid unnecessary diagnosis and lost time. If the customer concern is not exactly identified, any subsequent repairs can not be verified as being effective. This is the most common cause of "comeback" repairs. Communication between the customer to advisor and the advisor to technician must be clear. Vague or misunderstood customer complaints are often improperly diagnosed. Also make sure that the conditions under which the concern has occurred are duplicated. For example: If the customer is customer is complaining about a shifting concern after a cold start, then the vehicle should be road tested under those conditions.
- Analyze the Problem Once the complaint has been verified, then all available resources should be used to find the "root cause" of the complaint. Start out by checking Service Information Bulletins, DCS messages, and Service Round table information. Use the DISplus or GT-1 to access the diagnostic program and per form Diagnostic Test Modules where applicable. Electrical Troubleshooting Manuals (ETM's) should also be used when needed.
- Isolate the Problem Now, the problem can be narrowed down into the final steps of diagnosis. Using proper tools and procedures, the technician can "Isolate" by using the process of elimination and common sense. Having a working knowledge of BMW systems is helpful in this area. When applicable, use all available BMW special tools and equipment. Perform all necessary electrical checks such as Voltage Drop, resistance measurements etc.
- Repair the Problem Once the concern has been correctly identified, perform all necessary repairs as
 per BMW guidelines. Make sure all repairs are properly documented to comply with warranty policies
 and procedures.

• Verify the Repair - Make sure the customer concern has been rectified. Road test the vehicle under the same conditions whenever possible. Failure to complete this step properly is almost a guaranteed comeback. Repeat repair attempts are costly to the BMW Center and the BMW Service Technician.

REMEMBER - Fix it the first time, On Time, Every time.

Fault Codes

When diagnosing transmission fault codes, always print out the fault code(s) and the fault conditions. When referring to the fault code itself, be aware that there are actually 3 formats for the fault code. The fault code breakdown is as follows:

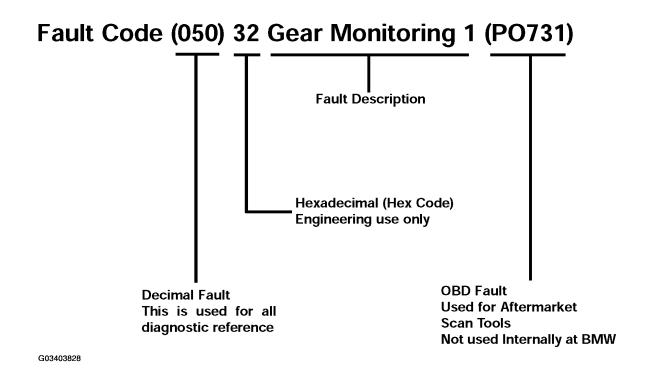


Fig. 50: Identifying Fault Codes

Courtesy of BMW OF NORTH AMERICA, INC.

When referring to the "Fault Code" during diagnosis always use the fault that is in Decimal Format. The Decimal fault is referred to in all reference material such as Service Information Bulletins, Test Modules and DCS messages etc. In the example above, FC 050 would be the correct choice.

Fault Conditions

When a fault code is set, it is stored with a set of environmental conditions. The environmental conditions are used to aid in pinpointing the root cause of the fault. Some of the information found in the fault conditions contain information on transmission temperature, engine speed and road speed etc. This information is also helpful when trying to duplicate the customer complaint. For example, if a customer complains about a shifting complaint when cold, check the fault conditions to verify this complaint. Remember to always print out the fault codes with the fault conditions. This information is helpful to the technician as well as technical assistance.

Identification Page

The ID page is helpful to determine the Transmission and control system used as well as the chassis number and current software version. Always print out a copy of the ID page when performing any diagnosis or programming procedures.

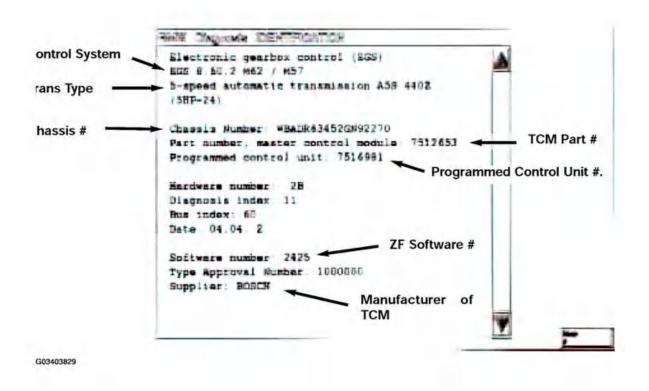


Fig. 51: Identifying Identification Page Courtesy of BMW OF NORTH AMERICA, INC.

Diagnosis Program

There are two diagnostic formats (programs) used on current model BMW vehicles. The earlier diagnostic program was used on the E38 and E39. The latter diagnostic program was introduced as the "E46 Diagnostic Concept". This is used on the E46, E65 and the E52 (Z8). The E53 X5 uses a mixture of both diagnostic programs depending upon engine/transmission options. Below is an example of the earlier diagnostic program.

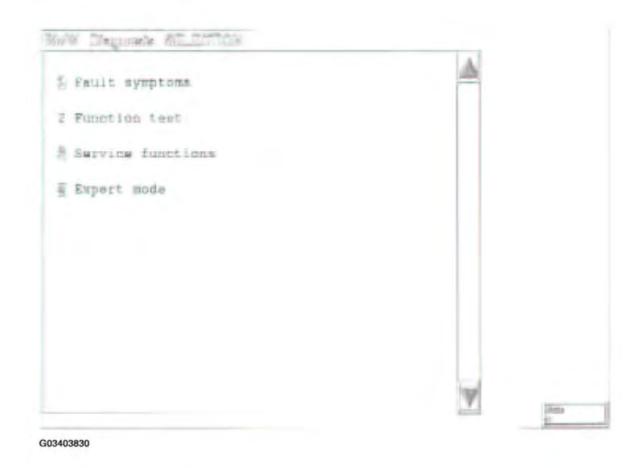


Fig. 52: Identifying Diagnosis Program

Courtesy of BMW OF NORTH AMERICA, INC.

The diagnostic program contains the following features:

- Fault Symptoms This is a symptom driven program that will lead the technician into guided diagnostics. It contains several possible fault scenarios that are common to electronic transmissions. This path is helpful when the technician is not sure where to start in his diagnostic plan.
- Function Test There are no function tests for electronic transmissions.
- Service Functions This is where you will find the ATF level check function. Also Test Codes can be obtained and printed out for warranty purposes. The Adaptation values can be cleared as well as printed out.
- Expert Mode Expert Mode should be used when the technician has a thorough working knowledge of the system. You will find several items in expert mode: Read/Clear fault memory, Diagnosis (Status) requests, Component Activation and Test Modules.

Test Modules

Test modules are found in the diagnosis program of the DISplus and GT-1. These allow the technician to take advantage of a guided diagnostic plan. The program will direct the technician through the various steps using a "trouble tree" format. When using test modules it is important to follow the instructions exactly. Due to the complex nature of some faults, the test modules are not always conclusive. The test module is only as effective as the information provided by the technician. The technician also needs to rely on his experience and some common sense. The test modules should be used to assist the technician, not as a replacement for good diagnostic skills.

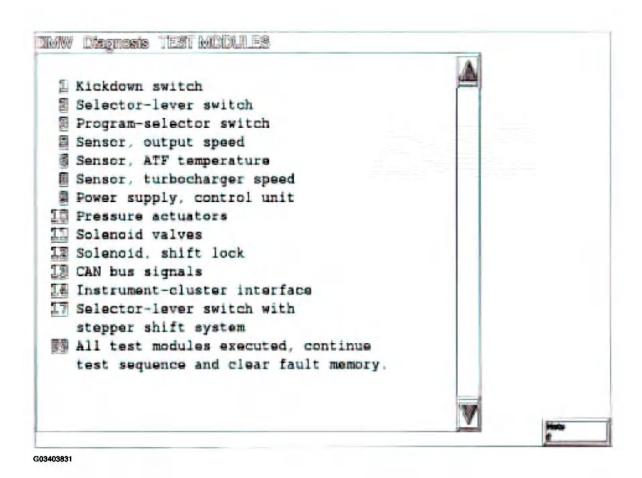


Fig. 53: Identifying Test Modules

Courtesy of BMW OF NORTH AMERICA, INC.

Test modules come in two formats. The one shown above is used on E38/E39 vehicles and the E53 with 4.4 and

4.6 engines. The E46, E65 and E53 (with 3.0 M54) uses the new "E46 Diagnostic Concept" which was introduced with the E46 in the 1999 model year. Regardless of the format used, the technician is still guided through a step by step procedure.

Diagnostic Tips

The following consists of some helpful hints to assist the BMW diagnostic technician. It is designed to assist the technician to form a logical path of diagnosis. These suggestions should be used in conjunction with other approved diagnostic routines. This does not exclude the technician from the responsibility to contact technical assistance. All major repairs and transmission replacement must be pre-approved by the BMW Technical Hotline. Transmission concerns can be broken down into several categories:

• Shift Quality Complaints - Shift Quality complaints consist of harsh up or down shifts, improper shift points and erratic shifting. These complaints could be related to electronic/software issues or hydraulic/mechanical problems. Perform quick test and check SIB's before proceeding. As with most concerns, check the transmission fluid level and condition as well.

Do not clear adaptation values unless instructed to do so by BMW Technical Hotline.

- Delayed/No Upshifts Before proceeding on delayed upshift complaints, make sure you are aware of the
 conditions that this occurs. This could be normal operation, such as the "Warm-up Phase" program.
 Always check front tires for proper inflation pressures, correct size and type. Also check for uneven tire
 wear. Variations in front tire size from left to right can activate the AGS "Curve Recognition" feature.
 The TCM will interpret the difference in wheel speed signals as being a turn and suppress (or delay)
 upshifts.
- Slipping This type of issue is usually associated with a fault code. Be sure to check the transmission fluid level and condition.
- Noise, Vibration Noises and vibrations should be checked over by a good visual inspection. Look for loose transmission or engine mounts. Check the driveshaft, center bearing and flexible coupling (or constant velocity joints). Also check the lateral alignment of the driveshaft. There are several SIB's pertaining to noise and vibration.
- No Forward or Reverse Gear Start by checking transmission fluid level and note the fluid condition. Inspect for leaks and external transmission damage.
- Leaks When investigation transmission leaks, be sure to verify that the suspected leak is actually transmission fluid. Engine oil, hydraulic and brake fluid can be mistaken for a transmission leak. Check the transmission cooler lines, transmission cooler and transmission pan gasket. Try to locate the source of the leak. Do not make any major repairs until the technical hotline is contacted.
- Fault Codes Perform COMPLETE short test (Quick test) on all vehicle systems. It is important to survey all systems in the event that a related system is causing the transmission fault. Always print out the ID Page, Fault codes and fault conditions.

Information Resources

When diagnosing transmission related concerns it is important to use all information resources available. The following information sources should be utilized at all times:

- Service Information Bulletins
- Technical Data
- ETM Electrical Troubleshooting Manual
- DCS (Dealer Communication System)
- Repair Instructions
- Tightening Torques
- Technical Training Manuals
- Special Tool Information

Most of the above information can be accessed by using the BMW TIS CD or by logging on the BMW TIS website through www.bmwcenternet.com. The BMW TIS website contains a wealth of helpful information for the technician. The information is updated on a regular basis.

Service Round Table

In addition to the above sources of information, the technician should be up to date on the latest edition of the BMW Service Round table. The round table will cover the most recent topics and offer some hints that will assist the technician. The Service Round table is broadcast live on a monthly basis via the BMW Visionwerke Network. In addition to live broadcasts, the round table is rebroadcast on a regular schedule during the month.

TCM CODING AND PROGRAMMING

As with other control modules used on BMW systems, the TCM must be programmed and/or coded for the vehicle. Over the years, these methods have varied from system to system.

Coding

Coding will assign the control unit to a particular application. Information such as differential ratio, tire size, vehicle series, engine, engine control system, w/wo AC etc.are some of the possible variants that have to be considered. Transmission control units are coded using various methods.

- Grounding pins in wiring harness connector On early models equipped with the 4HP22/24 EH transmissions, the TCM was coded to the vehicle by means of grounding pins in the wiring harness connector for the TCM. By selectively grounding specific pins in the harness, the TCM was assigned to that vehicle. For Example: The TCM could be installed in a 535, 635, or a 735. This only applies to the Early E-7 Versions. (E23, E24, E28)
- TCM ordered for Specific Application On some later models, the TCM was ordered for a specific vehicle application, coding was not necessary.
- Coding performed during programming On systems that use a flash programmable TCM, the coding process is done during flash programming.

Programming

Programming refers to the instructions that the TCM is to follow. The TCM is programmed to apply certain shift maps according to operating conditions such as vehicle speed, engine speed, engine temperature, engine load and throttle position. This information can be entered into the TCM via an updated EPROM or through flash programming.

Flash programmable control units use a EEPROM which is Electronically Erasable. The EEPROM is also soldered into the TCM and cannot be removed or replaced. Flash programmable TCM's can be programmed up to 14 times (with a new TCM).

NOTE: Always clear adaptations after programming.

NOTE: Do not program a TCM to correct a complaint unless there is a specific SIB that

covers the issue. Only program when installing a new TCM or when instructed to do so by BMW Technical Assistance. Always have the ID page available

when calling for technical assistance.

TCM PROGRAMMING

| Control System | Transmission | Coding | Programming | TCM Type |
|----------------|--------------------|-----------------------|-------------------|----------|
| GS 1.26 | 4HP22 EH (Early E- | Grounding pins in | Replaceable EPROM | 35 Pin |
| GS 1.27 | 7) | Harness. (Early E-7 | Replaceable EPROM | 35 Pin |
| GS 1.29 | 4HP22/24 EH (Late | Only) | | |
| | E-7 and E-9) | TCM ordered for | | |
| | | specific application. | | |
| | | Coding not needed. | | |

| GS 7.3 GS 7.32 GS 7.11 GS 8.32 | A5S310Z (5HP18) | TCM ordered for specific application. Coding not needed. | Replaceable EPROM | 88 Pin |
|---|----------------------|--|-------------------------------|--|
| GS 8.60 GS 8.60.4 | A5S325Z (5HP19) | Coding done when Programmed | Flash Programming (EEPROM) | 134 Pin SKE |
| GS 8.55 GS 8.60.2 | A5S440Z (5HP24) | Coding done when programmed | Flash Programming (EEPROM) | 88 Pin up to 98 (E38 M62) 134 Pin SKE from 98 to present. |
| GS 9.2 | A5S560Z (5HP30) | TCM ordered for | Replaceable EPROM | 88 Pin |
| GS 9.22 | A5S560Z (5HP30) | specific application. | Flash Programming | 134 Pin |
| GS 9.22.1 | (E38 M73TU) | Coding not needed. | (EEPROM) | |
| GS 8.60.3 | | Coding done when programmed. | | |
| GS 4.14 | A4S310R (THMR- | TCM ordered for | Replaceable EPROM | 55 Pin |
| GS 4.16 | 1) | specific application. Coding not needed. | 1 | |
| GS 8.34 | A4S270R (THMR- 1) | TCM ordered for specific application. Coding not needed. | Replaceable EPROM | 88 Pin |
| GS 20 | A5S360R A5S390R | Coding done when programmed | Flash Programming (EEPROM) | 134 Pin SKE |

TRANSMISSION FLUID INFORMATION

Transmission Fluid (Oil)

The automatic transmission provides filtered, pressure regulated hydraulic fluid for all of the transmissions functional requirements. All BMW automatic transmissions are designed to operate with specific fluids. Use of non-approved oil will cause malfunctions and irreparable transmission damage which is not covered by BMW warranty.

The transmission fluid provides the following functions:

- Lubricates mechanical components (planetary gears, bearings etc.).
- Removes heat and transfers heat to transmission cooling system. (Heat Exchanger).
- Removes debris and contaminants to sump and filter when circulated.
- Provides a transfer of kinetic energy in the torque converter.
- Allows hydraulic operation of mechanical components (clutches, brakes) via control of the valve body.

Also, transmission fluid has various properties to prevent oxidation and breakdown from heat and friction. Each type of transmission fluid has properties specific for each transmission application.

Fluid level is crucial in the proper operation of an automatic transmission. Improper fluid levels will cause improper operation and eventually irreparable transmission damage. Improper fluid level can cause:

- A low fluid level can cause an interruption in oil flow during fast acceleration or hard braking which can cause gear shift malfunctions and noises.
- An excessively high fluid level can cause the rotating mechanical components to paddle in the oil. This produces foam which introduces air into the hydraulic system.
- A low fluid level can also cause transmission overheating causing premature transmission failure.

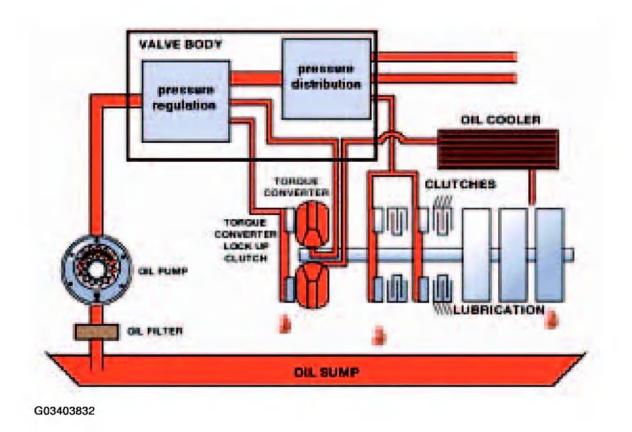


Fig. 54: Identifying Transmission Fluid Flow Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Fluid Checking Procedures

Transmission fluid checking is accomplished using the DISplus or GT-1. The DISplus or GT-1 is used to monitor transmission fluid temperature to insure the transmission is not over or under-filled. As with most other current ZF transmissions there is no dipstick, the fluid level is checked and filled at the fill plug. The location of the fill plug varies between transmissions.

Transmission fluid should be checked between 30 and 50 degrees Celsius (unless otherwise specified). Use the DISplus and/or GT-1 to determine transmission temperature. The transmission temperature information can be found in the diagnosis section under Service Functions.

Proper procedures for checking and filling transmission fluid can be found in BMW Service Information Bulletin B 24 01 98.

When checking transmission fluid, observe the following items:

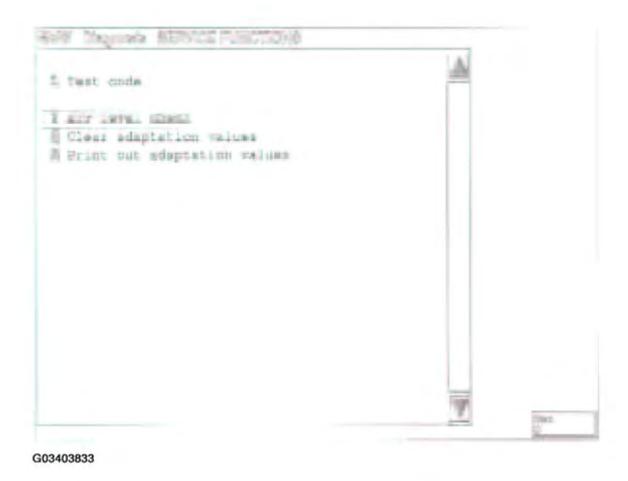


Fig. 55: Identifying Transmission Fluid Checking Procedures Courtesy of BMW OF NORTH AMERICA, INC.

- Transmission in Park
- Parking brake applied
- Engine Running
- Vehicle level
- No engine load
- Trans Temp 30-50C
- Observe correct drain plug torque
- Use correct fluid

When replacing parts on transmissions that use lifetime fluid, drain fluid into a clean container and reuse.

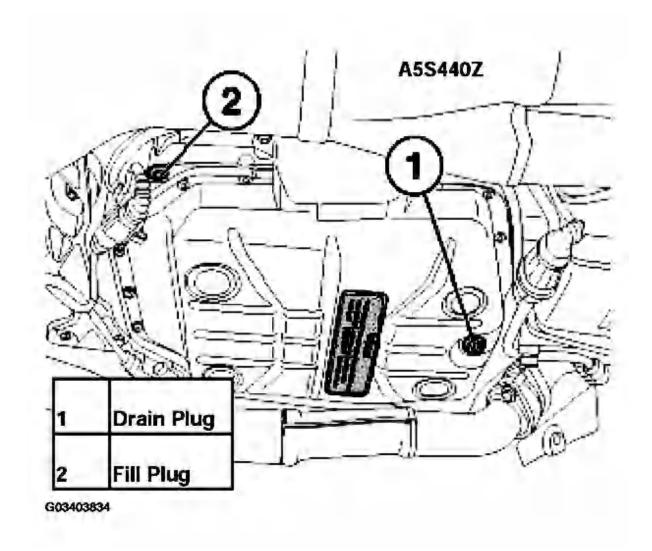


Fig. 56: Identifying Transmissions Drain Plug And Fill Plug Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Fluid Application

There are numerous types of transmission fluid used in BMW transmissions. With the exception of the early transmissions (4HP22/24, A4S310/270R and the A5S310Z in the E34) all current BMW transmissions use "Lifetime Fill" transmission fluid. There is no maintenance required for these transmissions. It is important to use the correct fluid. Incorrect use of the transmission fluid can cause non-warrantable transmission damage.

When performing repairs on transmissions with lifetime fluid, it is important to drain the transmission fluid in to a clean container for re-use. New fluid should only be used for transmission replacement and for topping off after repairs.

Also, transmission fluid level is vital to the proper operation of the transmission.

When servicing or repairing BMW automatic transmissions, refer to TIS for fluid capacities.

TRANSMISSION FLUID

| TIMENTIONION | LOID | | | |
|---------------|---------------|---------------------|--------------------|------------|
| Transmission | Fluid Type | BMW Part # | Container | SIB Ref. |
| 4HP22 | Dexron III | Available | N/A | Â |
| 4HP24 | Mercon | Commercially | | |
| | | (Castrol or Texaco) | | |
| A5S310Z | Dexron III | Available | N/A | Â |
| 530i/iT (E34) | | Commercially | | |
| | | (Castrol or Texaco) | | |
| M3 (E36) | ESSO LT 71141 | 83 22 9 407 807 | 20 liter container | B 24 03 95 |
| | | | | |

| A5S325Z | ESSO LT 71141 | 83 22 9 407 807 | 20 liter container | Â |
|---|--------------------------------------|--|--|------------|
| A5S440Z | ESSO LT 71141 | 83 22 9 407 807 | 20 liter container | Â |
| A5S560Z 740 (E32), 540 (E34) 840Ci (E31- 6/93- 12/94) 740i/iL-750iL (E38) | Shell LA2634 | 83 22 9 407 765 | 5 liter container | B 24 11 92 |
| 540i (3/96-12/96) 850Ci (10/94-6/97) | ESSO LT 71141 | 83 22 9 407 807 | 20 liter container | B 24 02 94 |
| A4S310R A4S270R (THM-R1) | Dexron III Mercon | Available Commercially (Castrol or Texaco) | N/A | Â |
| A5S360R A5S390R | Texaco ETL 7045E Texaco ETL 8072B | | 25 liter container 25 liter container | Â |
| GA6HP26Z GA6HP32Z | Shell M-1375.4 | 83 22 0 142 516 | 20 liter container | Â |

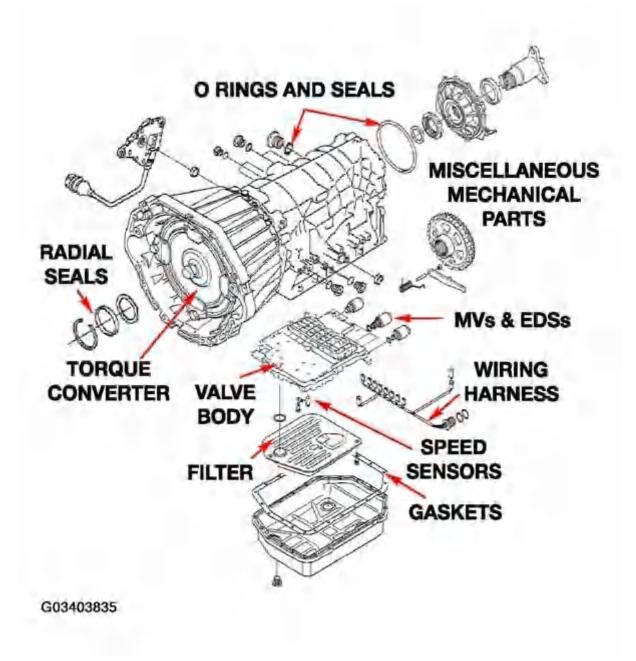
TRANSMISSION SERVICE

Overview Of Allowable Repairs

Currently, service of transmissions covered under warranty is limited to level I. Level I service includes electrical, minor mechanical and hydraulic repairs as well as repair manual provided service adjustments.

Part availability is limited to include the repair of the following:

- Oil Leaks Radial Seals and gaskets.
- Mechanical/Hydraulic Faults Torque Converter, Valve Body, parking pawl, oil pan, output shaft bearing.
- Electrical Faults Solenoid Valves, pressure regulator valves, wiring harness.
- Signal Sensing Turbine and Output Speed Sensors, CAN bus, Temp Sensor.



<u>Fig. 57: Exploded View Of Transmission Parts</u> Courtesy of BMW OF NORTH AMERICA, INC.

BMW Technical Hotline

Before performing any majors repairs or transmission replacement, always contact the BMW Technical Hotline at 1-800-472-7222. When prompted to do so, select option 1 for the Drivetrain Group. Be prepared will all necessary information such as transmission serial number, ID page, fault codes etc. Failure to contact the technical hotline could result in the non payment of warranty claims.

BMW Value Line Program

The Value-Line replacement transmission program provides the availability of factory certified rebuilt units at a very competitive cost.

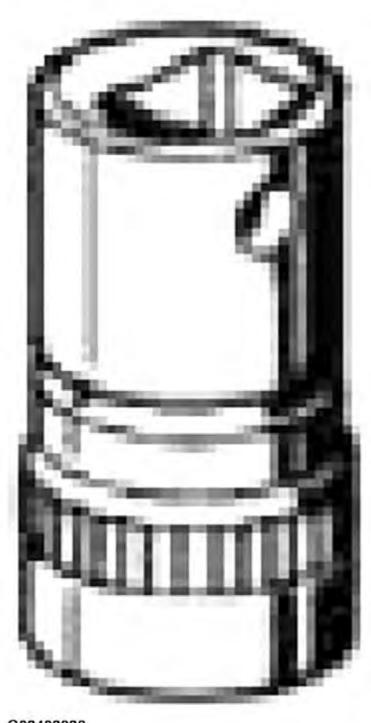
BMW SPECIAL TOOLS (TRANSMISSION)

The following pages contain information about BMW special tools, this is not an all inclusive list. This is a list of tools that would be helpful in the diagnosis and service of BMW transmissions.

Transmission Removal And Installation

Tool # 24 1 110

This tool is used to remove the torque converter to flexplate bolts. It is a 17 mm socket with 3/8" drive. There is a magnet to help retain the bolt during installation and removal.



G03403836

<u>Fig. 58: Identifying BMW Special Tools - Tool # 24 1 110</u> Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 4 130

During transmission installation and removal the oil pump must be protected from damage. This tool helps keep the torque converter in place, to prevent oil pump damage due to misalignment.

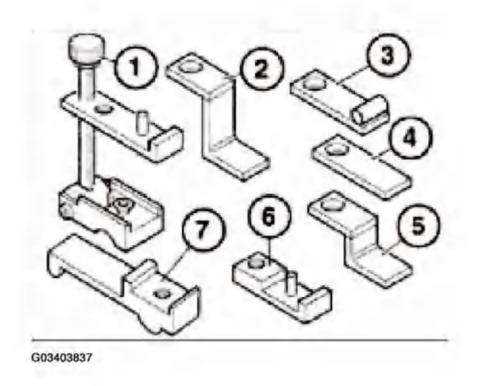


Fig. 59: Identifying BMW Special Tools - Tool # 24 4 130 Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 2 300

Used to align torque converter with flexplate during installation. Use on all BMW automatic transmissions.

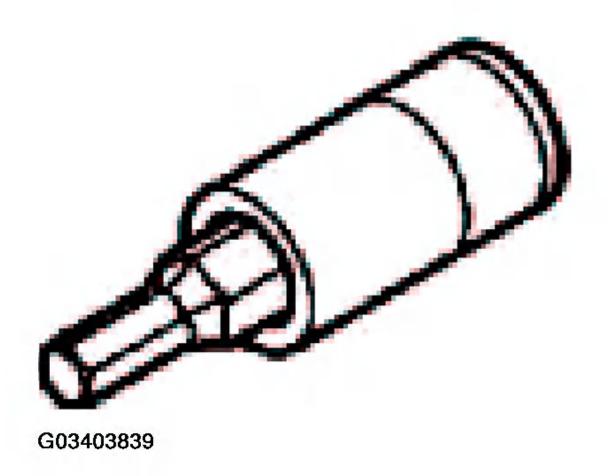


<u>Fig. 60: Identifying BMW Special Tools - Tool # 24 2 300</u> Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Adjustments

Tool # 24 2 320

3/16" socket head cap screw (hex) with 1/4" drive. Used to adjust brake band on the THMR-1.



<u>Fig. 61: Identifying BMW Special Tools - Tool # 24 2 320</u> Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 2 330

1/2 open end wrench used to turn lock-nut on the brake band servo when adjusting the brake band. Used only on the THMR-1 transmissions.



<u>Fig. 62: Identifying BMW Special Tools - Tool # 24 2 330</u> Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 1 120

Used as guide to lock the range selector switch in "P" when installing. It is used on the A4S270R transmission. Used only for applications which have the selector switch mounted on the transmission case.



Fig. 63: Identifying BMW Special Tools - Tool # 24 1 120 Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Diagnostic Tools

Tool # 24 6 000

8-pin test cable used to test the transmission at the "Cannon Plug" located on transmission case. This cable is used for the 4HP22/24 EH. Used in conjunction with 61 1 459.

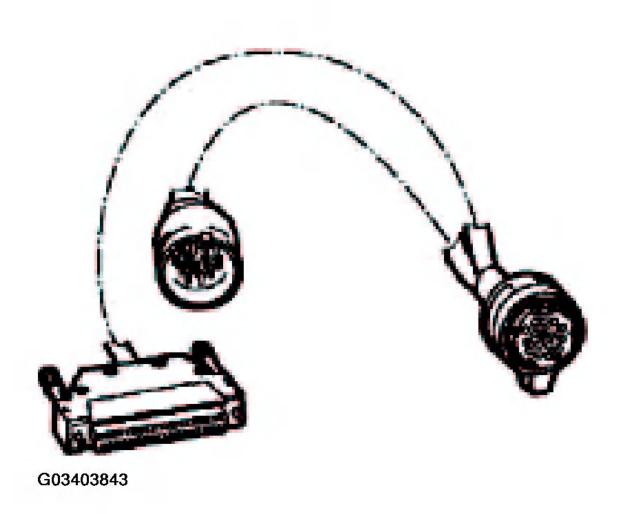


Fig. 64: Identifying Transmission Diagnostic Tools - Tool # 24 6 000

Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 6 060

16 pin test cable used to test the transmission at the "Cannon Plug" located on the transmission case. This cable is used for the A5S310Z and A5S560Z. Used in conjunction with 61 1 459.

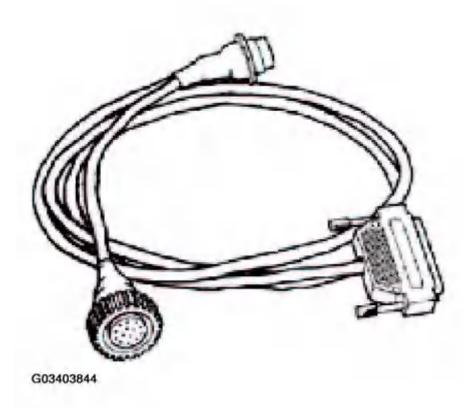


<u>Fig. 65: Identifying Transmission Diagnostic Tools - Tool # 24 6 060</u> Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 6 020

14 pin test cable used to test the transmission at the "Cannon Plug" located on the transmission case. This cable is used on the A5S310Z.

Used in conjunction with 61 1 459.



<u>Fig. 66: Identifying Transmission Diagnostic Tools - Tool # 24 6 020</u> Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 6 010

8-pin test cable used to test the transmission at the "Cannon Plug" located on transmission case. This cable is used for the A4S270/310R.

Used in conjunction with 61 1 459.



Fig. 67: Identifying Transmission Diagnostic Tools - Tool # 24 6 010 Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 6 080

16-pin test cable used to test the transmission at the "Cannon Plug" located on transmission case. This cable is used for the 6HP26Z.

Used in conjunction with 61 1 459.



G03403846

Fig. 68: Identifying Transmission Diagnostic Tools - Tool # 24 6 080 Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 6 070

20-pin test cable used to test the transmission at the "Cannon Plug" located on transmission case. This cable is used for the A5S360/390R.

Used in conjunction with 61 1 459.

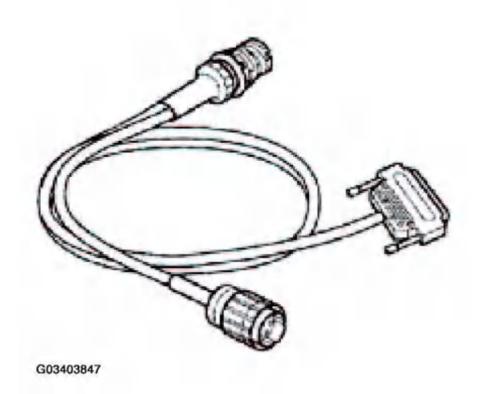
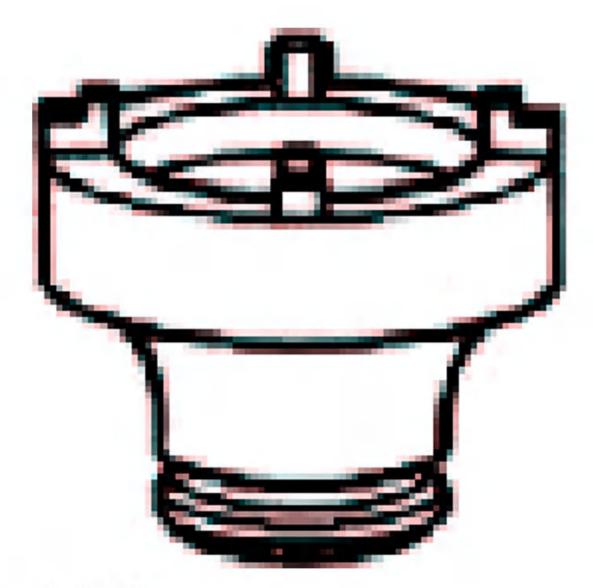


Fig. 69: Identifying Transmission Diagnostic Tools - Tool # 24 6 070 Courtesy of BMW OF NORTH AMERICA, INC.

Service and Repair Tools

Tool # 24 1 170

For loosening and tightening slotted nut on output drive flange. Used on 5HP18 (A5S310Z). Use in conjunction with tool #24 1 220.



G03403848

<u>Fig. 70: Identifying Service And Repair Tools - Tool # 24 1 170</u> Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 4 110

For loosening and tightening slotted nut on output drive flange. Used on 5HP24 and 5HP30. Use in conjunction with tool #24 1 220.

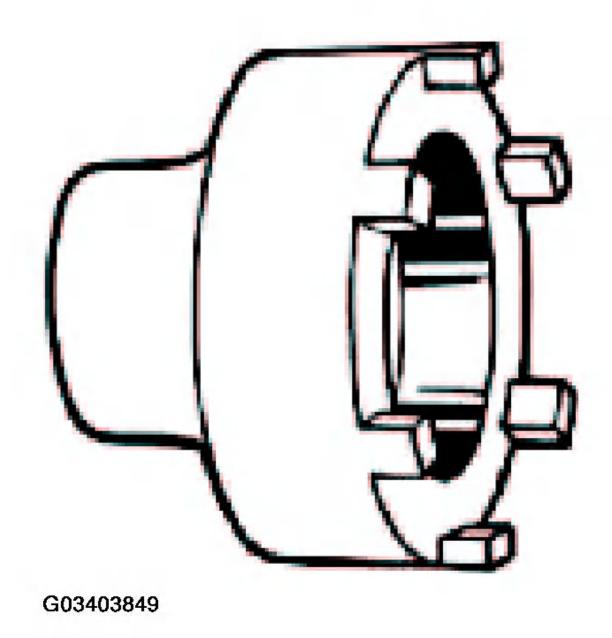


Fig. 71: Identifying Service And Repair Tools - Tool # 24 4 110 Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 1 220

Take up support for drive flange. Used when tightening of loosening slotted nut on output drive flange. Used with tool numbers 24 4 170 and 24 4 110.

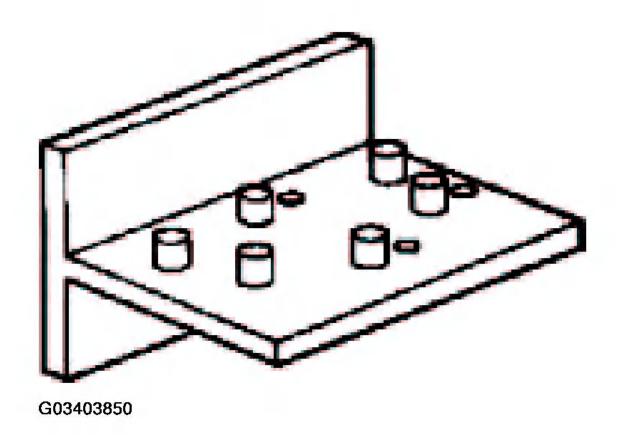


Fig. 72: Identifying Service And Repair Tools - Tool # 24 1 220 Courtesy of BMW OF NORTH AMERICA, INC.

Too1 # 24 2 380

34 mm Socket used to tighten and loosen nut on output drive flange. Used with special tool 23 0 020. For GA6HP26Z transmission.



G03403631

Fig. 73: Identifying Service And Repair Tools - Tool # 24 2 380 Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 2 310

Set of tools used to re-seal intermediate plate. Used on A4S310R and A4S270R. Tool Set Consists of:

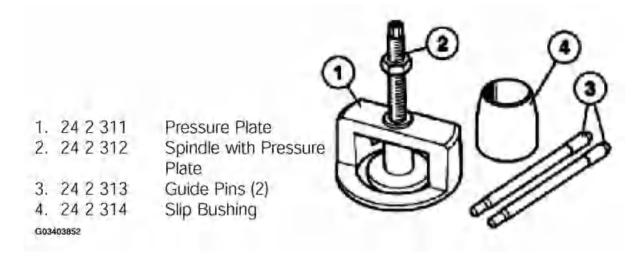


Fig. 74: Identifying Service And Repair Tools - Tool # 24 2 310 Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 1 200

Used to prevent damage to rotary shift shaft seal when fitting new seal on shift shaft. Used on A5S310Z (5HP18).



Fig. 75: Identifying Service And Repair Tools - Tool # 24 1 200 Courtesy of BMW OF NORTH AMERICA, INC.

Article GUID: A00232781

1999-2002 MANUAL TRANSMISSION

Removal & Installation - Z3

REMOVAL & INSTALLATION

NOTE: After completion of work, check transmission oil level. See <u>SERVICING - M/T</u>

article.

NOTE: On vehicles with ASC+T, the throttle assembly and/or the expansion tank on the

master brake cylinder can become damaged when the transmission is lowered.

Remove throttle assembly (ASC+T). See THROTTLE BODY.

Disconnect battery. See DISCONNECTING AND CONNECTING BATTERY.

Remove exhaust system. See REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM (Z3 M54).

Unflange propeller shaft from transmission and tie up to one side. See <u>DRIVE SHAFT</u>.

Remove retainer (1). See <u>Fig. 1</u>. Withdraw selector rod (3) from selector linkage joint and remove shims (2). Upon installation, apply thin coat of grease to selector rod.

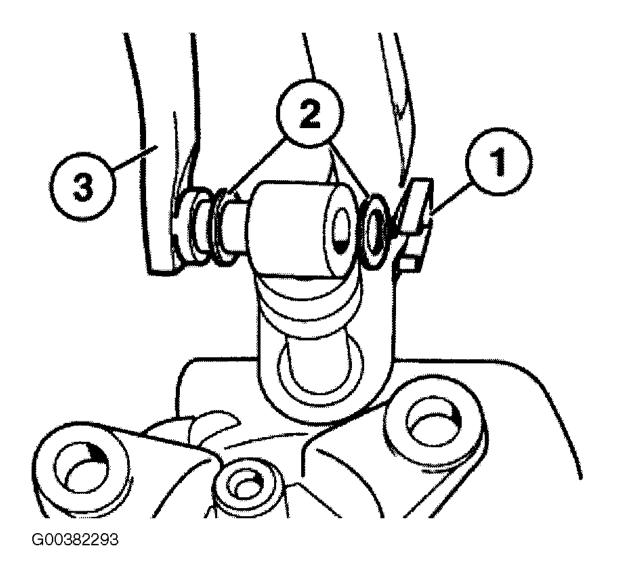


Fig. 1: Withdrawing Selector Rod From Selector Linkage

Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION:

Relieve clutch slave cylinder slowly, as otherwise air will be sucked in via the sealing sleeve.

Release nuts, remove clutch slave cylinder. See $\underline{\text{Fig. 2}}$. Pressure line remains connected. Upon installation, tighten nuts to specification. See $\underline{\text{TORQUE SPECIFICATIONS}}$.

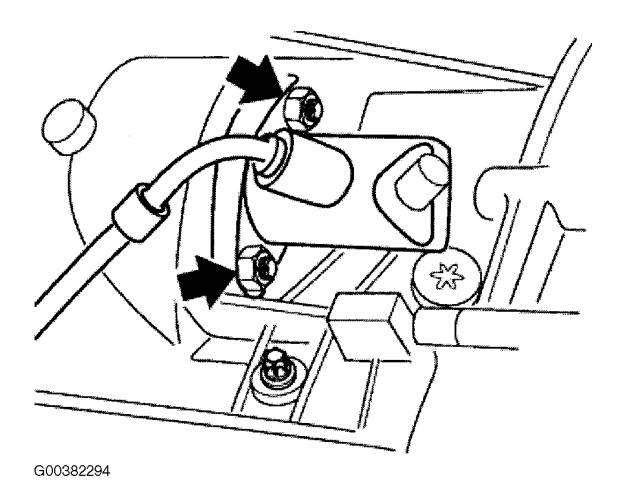


Fig. 2: Removing Clutch Slave Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.

Pull wires off reverse-gear switch. Detach oxygen-sensor plug from bracket. See Fig. 3.

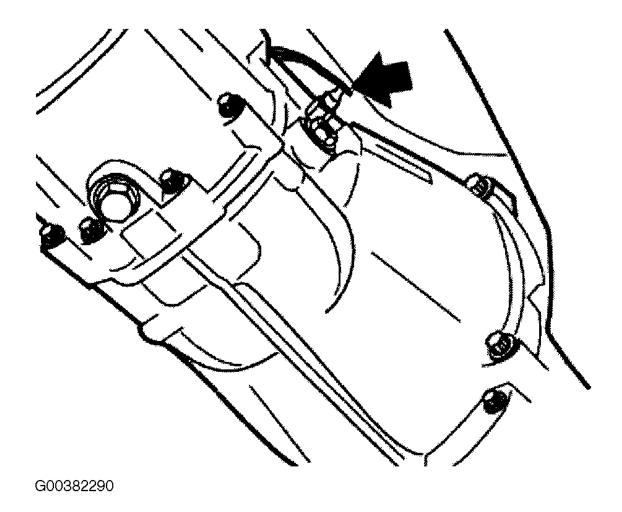
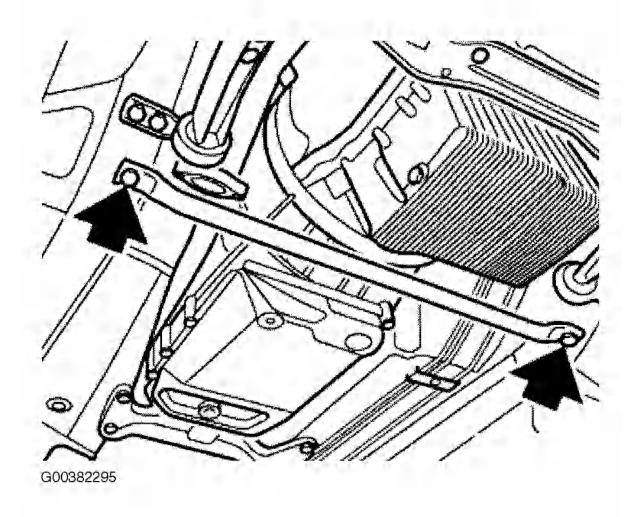


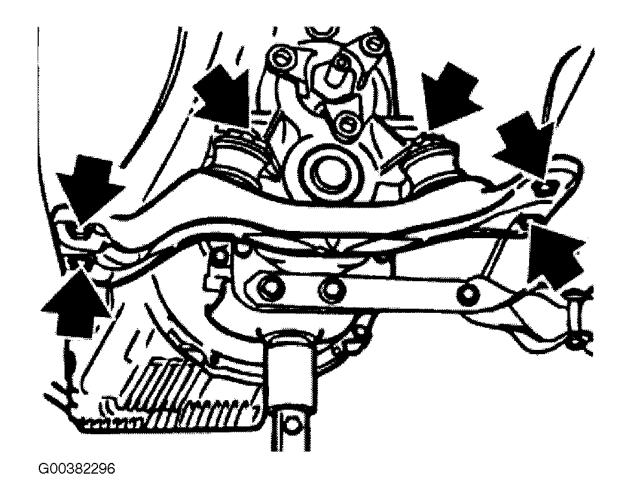
Fig. 3: Locating Reverse-Gear Switch Plug Courtesy of BMW OF NORTH AMERICA, INC.

Remove cross tube. See Fig. 4.



<u>Fig. 4: Removing Cross Tube</u> Courtesy of BMW OF NORTH AMERICA, INC.

Support transmission with a workshop hoist. See <u>Fig. 5</u>. Unfasten screws and remove cross member with rubber mount. Lower workshop hoist. Upon installation, tighten screws to specification. See \underline{TORQUE} $\underline{SPECIFICATIONS}$.



<u>Fig. 5: Removing Cross Member</u> Courtesy of BMW OF NORTH AMERICA, INC.

Use a screwdriver to lift out spring (1) from the lug (2) on the housing and swivel upwards. See $\underline{\text{Fig. 6}}$. Pull out shaft. Upon installation, apply thin coat of grease to bearing pin.

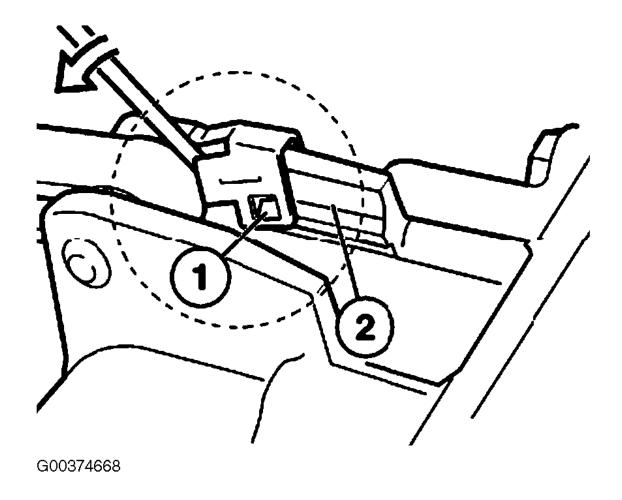


Fig. 6: Levering Out Spring

Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION:

Do not allow transmission to hang on transmission input shaft when removing and installing, as the clutch disc will be deformed.

Support transmission with a workshop hoist. Unfasten screws. See $\underline{\text{Fig. 7}}$. Pull transmission downwards and remove. Upon installation, always fit screws with washers. Tighten screws to specification. See $\underline{\text{TORQUE}}$ $\underline{\text{SPECIFICATIONS}}$.

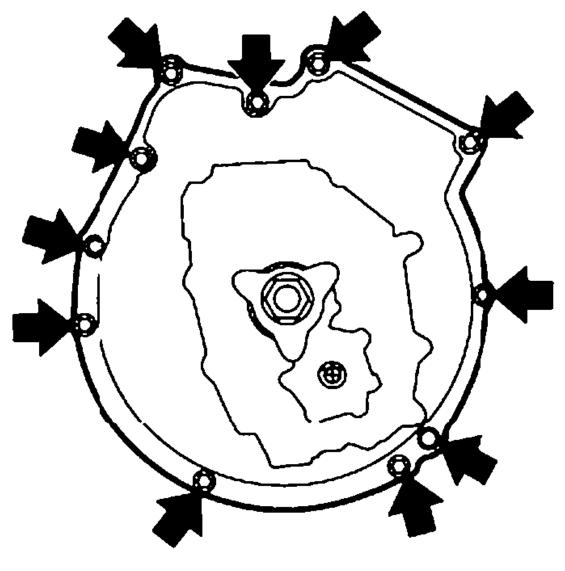


Fig. 7: Locating Transmission Mounting Screws Courtesy of BMW OF NORTH AMERICA, INC.

Installation: pay attention to guide sleeves (1, 2), replace if necessary. See <u>Fig. 8</u>. Ensure correct position of cover plate.

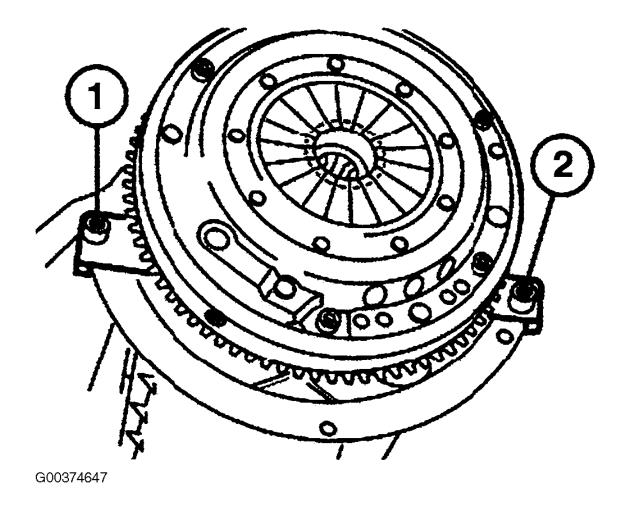
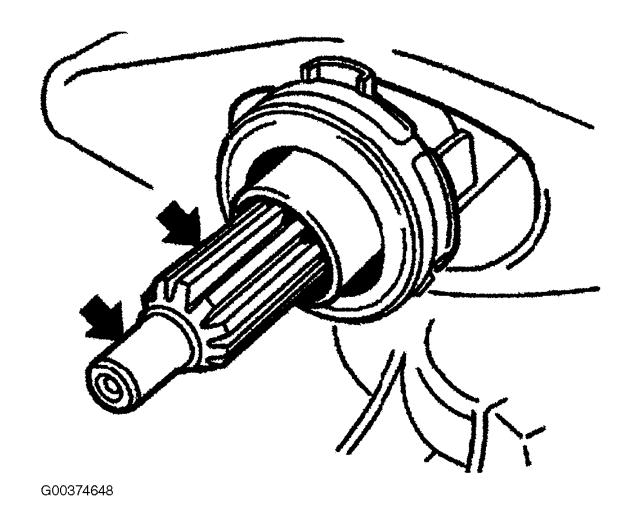


Fig. 8: Checking Dowel Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

Installation: remove and clean release unit and release lever and grease appropriate points.

Installation: Check lubrication of transmission input shaft for sticky consistency. See <u>Fig. 9</u>. Replace clutch disk if grease is sticky. Check clutch disk for friction rust in taper splines and replace if necessary. Mechanically remove old grease and lining abrasion from the taper splines of the clutch disk (with a cloth). Clean and grease taper grooves and guide pin of transmission input shaft.



<u>Fig. 9: Checking Lubrication Of Transmission Input Shaft</u> Courtesy of BMW OF NORTH AMERICA, INC.

To complete installation, reverse removal procedure.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

| TORQUE SI DELI TETHTOTAS | |
|---|-----------------|
| Application | Ft. Lbs. (N.m) |
| Clutch Slave Cylinder-To-Clutch Housing/Transmission Case | 16 (22) |
| Transmission Cross Member-To-Body | |
| M10 Thread | 31 (42) |
| M8 Thread | (21) |
| Transmission Mounts (Rubber)-To-Body | 31 (42) |
| Transmission-To-Engine | |
| Hex Screws | |
| M8 Thread | 18 (25) |
| M10 Thread | 36 (49) |
| M12 Thread | 55 (74) |
| Screw With Torx Head | |
| M8 Thread | 16 (22) |
| M10 Thread | 32 (43) |
| M12 Thread | 53 (72) |
| | INCH Lbs. (N.m) |

| ansmission-To-Engine M6 Thread |
|--------------------------------|
|--------------------------------|

80 (9)

2001-05 MANUAL TRANSMISSIONS

Servicing

APPLICATION

MANUAL TRANSMISSION APPLICATION

| Application | Transmission Model |
|---|-----------------------------------|
| M Coupe & M Roadster (E36/7) | Trunsmission woder |
| 2001-02 | ZF Type C |
| M3 (E46) | Zi Type C |
| 2001-05 | Getrag Type D Or Getrag |
| M5 (E39) | Type D With SMG |
| 2001-03 | S6S-420G |
| X3 (E83) | 505 4200 |
| 2004-05 | ZF G56X337BZ |
| X5 (E53) | |
| 3.0L (2001-05) | ZF Type H |
| Z3 (E36/7) | 71 |
| 2001-02 | ZF G56X37BZ |
| Z4 (E85) | |
| 2003-05 (2.5) | Getrag Type B+ |
| 2003-05 (3.0L) | ZF Type H & ZF Type H With SMG |
| Z8 (E52) | |
| 2001-03 | Getrag |
| 3-Series (E46) | |
| 325i (4/01 To 2005), 330 & 330Ci (6/00 To 2005) & 325i & 325Ci (9/00 To 2005) | S5D-280Z Or ZF Type H |
| 330xi (6/00 To 2005) | S5D-280Z Or ZF Type H |
| 5-Series (E39) | |
| 525i & 530i (3/01 To 2003) | S5D-280Z |
| 540i (1/97 To 2003) | S6S-420G |
| 5-Series (E60) | |
| 525i, 530i & 545i (8/03 To 2005) | ZF Type H & ZF Type G |
| 6-Series (E63) | |
| 645Ci (2004-05) | ZF Type G |

LUBRICATION

SERVICE INTERVALS

Inspect fluid level when vehicle is serviced. DO NOT drain fluid, transmission has lifetime fluid except for the following exceptions:

- M3 Change oil at 1200 mile service and each Inspection II.
- M5 Change oil at 1200 mile service, then fill with lifetime oil.

CHECKING FLUID LEVEL

Check lubricant at fill hole. Lubricant should be at bottom of filler plug hole.

RECOMMENDED FLUID

For model years 1998-2003, all manual transmissions are filled with Esso/Exxon MTF-LT-1 lifetime fluid. A Yellow label with the letters MTF-LT-1 is located next to the oil filler plug. Except for models specified under <u>SERVICE INTERVALS</u>, no oil change is required for the service life of the transmission.

From model year 2004, some manual transmissions are filled with Castrol MTF-LT-2 lifetime fluid. This fluid has the same properties as the MTF-LT-1 fluid. The MTF-LT-1 fluid may be mixed or substituted for the MTF-LT-2 manual transmission fluid.

NOTE: The following does not apply to transmissions filled with lifetime fluid.

Cold Shift Effort

Transmission cold shift effort is reduced by replacing the original oil (SAE 80 or Mobil SHC 630) with a reputable brand single-grade HD engine mineral oil of API-SE standards (SAE 20, SAE 30, or SAE 40). Thinner oils run the risk of increased gear noise. A further reduction in shift effort can be obtained by using ATF, but gear noise will be more noticeable compared to single-grade engine mineral oils. For summer operation it is recommended that ATF or engine oil be drained and replaced by the original lubricant, either SAE 80 or Mobil SHC 630 transmission fluid.

FLUID CAPACITIES

Fluid capacity is approximately 1.4 qts. (1.3L). Transmission should be filled to bottom of filler plug hole.

ADJUSTMENTS

GEARSHIFT LINKAGE

No external adjustment is necessary.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

| Application | Ft. Lbs. (N.m) |
|--------------------------------|----------------|
| Drain & Fill Plug (All Models) | 37 (50) |

Operating Fluids - Automatic Transmission - All Models

1.0 GENERAL INFORMATION ON AUTOMATIC TRANSMISSION FLUIDS

Automatic Transmission Fluid was developed especially for automatic transmissions. It requires additives which are carefully matched with each other, a high viscosity index and a solidification point below -40 \hat{A} °F/-40 \hat{A} °C.

Friction behavior of Automatic Transmission Fluid in plate-type clutches under very different operating conditions is extremely important. Other important factors are:

- Wear Protection
- Oil Film Shear Resistance
- Adhesive Property
- Oxidation Resistance
- Corrosion Inhibition
- Sludge Prevention
- Temperature-Dependent Viscosity Changes
- Compatibility With Sealing Materials

2.0 OIL ADDITIVES

Automatic transmissions are designed so that oil additives are not necessary. BMW disapproves the use of any oil additives and cannot accept the liability for any consequential damage which results from using oil additives.

3.0 APPROVED AUTOMATIC TRANSMISSION FLUIDS FOR INITIAL FILLINGS AND CORRECTING FLUID LEVELS

3.1 GM TRANSMISSIONS

USE OF ANY OTHER OIL WILL CAUSE A NON WARRANTABLE TRANSMISSION FAILURE

*Transmission identification plate can be utilized to determine proper transmission fitted in vehicle

A4S 270R (THM-R1W)

E36

318i/is/iC/ti from 1996 to 1999 production

323i/is/iC from 1998 to 1999 production

328i/is/iC from 1996 to 1998 production

Z3 1.9 from 1996 to 1999 production

Z3 2.3/2.8 from 1997 to 2000 production

All reputable brand name Automatic Transmission Fluids of the Dexron® III formulation.

E39

528i/iT from1997-1999 production

All reputable brand name Automatic Transmission Fluids of the Dexron® III formulation.

A4S 310R (THM-R1)

E34

525i from 1990 to 1995 production

All reputable brand name Automatic Transmission Fluids of the Dexron® III formulation.

E36

318i/is/iC/ti from 1992 to 1995 production

325i/is/iC from 1992 to 1995 production

All reputable brand name Automatic Transmission Fluids of the Dexron® III formulation.

A5S 360R (GM5)

E46

323i/Ci/Cic from 6/98 to 3/00 production

323iT from 1//00 to 3/01 to production

328i/Ci/Cic from 6/98 to 3/01 production

The transmission oil pan will be labeled with either Texaco ETL - 7045 or Dexron® III, please fill or top off with the proper fluid only. Do not mix Texaco ETL - 7045 and Dexron® III fluids.

See S.I. Bulletin B 24 01 98.

A5S 390R (GM 5)

E46

330xi from 6/00 production to present

325xiT from 9/00 production to present

E53

X5 3.0 from 8/03 production to present

E83

X3 2.5, 3.0 from 8/03 production to present

The transmission oil pan will be labeled with either Texaco ETL - 7045 or Dexron® III, please fill or top off with the proper fluid only. Do not mix Texaco ETL - 7045 and Dexron® III fluids.

See S.I. Bulletin B 24 01 98.

3.2 ZF TRANSMISSIONS

USE OF ANY OTHER OIL WILL CAUSE A NON WARRANTABLE TRANSMISSION FAILURE

*Transmission identification plate can be utilized to determine proper transmission fitted in vehicle

ZF 3HP22, 4HP22, 4HP24

Utilizes Castrol TQ or Texaco Havoline Automatic Transmission Fluids of the Dexron® III formulation.

3856 of 4036

Never mix any other oil with this transmission fluid when doing repairs or topping up.

A5S 310Z (5HP18)

E36

M3 from 1995 to 1999 production

Utilizes a lifetime filling of synthetic transmission fluid, ESSO LT 71141, no subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 71141, BMW Part No. 83 22 9 407 807.

See S.I. Bulletin B 24 01 98.

E34

530i/iT from 1993 through 1995 production

Utilizes Castrol TQ or Texaco Havoline Automatic Transmission Fluids of the Dexron® III formulation. Never mix any other oil with this transmission fluid when doing repairs or topping up.

A5S325Z (5HP19)

E46

323i/Ci/Cic from 3/00 to 8/00 production

325iT from 4/01production to present

330i/Ci/Cic from 6/00 production to present

325i/Ci/Cic from 9/00 production to present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 71141, BMW Part No. 83 22 9 407 807.

See S.I. Bulletin B 24 01 98.

E39

525i/iT from 3/01 production to present

530i from 3/01 production to present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 71141, BMW Part No. 83 22 9 407 807.

See S.I. Bulletin B 24 01 98.

E83

X3 All Models

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 71141, BMW Part No. 83 22 9 407 807.

See S.I. Bulletin B 24 01 98.

E85

Z4 3.0 from 9/02 production to present

Z4 2.5 from 9/02 production to present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 71141, BMW Part No. 83 22 9 407 807.

See S.I. Bulletin B 24 01 98.

A5S 440Z (5HP24)

E31

840Ci from 9/96 to the present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 71141, BMW Part No. 83 22 9 407 807.

See S.I. Bulletin B 24 01 98.

E38

740i/iL from 1/97 production to present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 71141, BMW Part No. 83 22 9 407 807.

See S.I. Bulletin B 24 01 98.

E39

540i/iT from 1/97 production to present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 711 41, BMW Part No. 83 22 9 407 807.

See S.I. Bulletin B 24 01 98.

E53

X5 4.4i from 9/99 production to present

X5 4.6i from 9/01 production to present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 711 41, BMW Part No. 83 22 9 407 807.

See S.I. Bulletin B 24 01 98.

A5S 560Z (5HP30)

E31

840Ci equipped with M60 engine

Utilizes a lifetime fill of transmission fluid, no subsequent oil changes are necessary on this transmission. If transmission fluid is required for repair purposes, use only the oil approved for this transmission. It is not permitted to mix this oil with other grades of transmission fluid.

Shell LA 2634, BMW Part No. 83 22 9 407 765.

See S.I. Bulletin B 24 01 98.

E31

840Ci equipped with M62 engine

850Ci equipped with M73 Engine

Utilizes lifetime fill of transmission fluid, no subsequent transmission fluid changes are necessary.

Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 711 41, BMW Part No. 83 22 9 407 807.

See S.I. Bulletin B 24 01 98.

E32

740i/iL from 1993 through 1994 production

Utilizes a lifetime fill of transmission fluid, no subsequent oil changes are necessary on this transmission. If transmission fluid is required for repair purposes, use only the oil approved for this transmission. It is not permitted to mix this oil with other grades of transmission fluid.

Shell LA 2634, BMW Part No. 83 22 9 407 765.

See S.I. Bulletin B 24 01 98.

E34

540i/iT from 1993 through 1995 production

Utilizes a lifetime fill of transmission fluid, no subsequent oil changes are necessary on this transmission. If transmission fluid is required for repair purposes, use only the oil approved for this transmission. It is not permitted to mix this oil with other grades of transmission fluid.

Shell LA 2634, BMW Part No. 83 22 9 407 765.

See S.I. Bulletin B 24 01 98.

Effective with model year 1995 and later:

E31

850Ci from 10/94 to 6/97 production

840Ci from 12/95 to 8/96 production

Utilizes lifetime fill of transmission fluid, no subsequent transmission fluid changes are necessary.

Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 711 41, BMW Part No. 83 22 9 407 807.

See S.I. Bulletin B 24 01 98.

E38

750iL from 1/95 production to present

740i/iL from 7/94 to 12/96 production

Utilizes lifetime fill of transmission fluid, no subsequent transmission fluid changes are necessary.

Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 711 41, BMW Part No. 83 22 9 407 807.

See S.I. Bulletin B 24 01 98.

E39

540i/iT from 3/96 to 12/96 production

Utilizes lifetime fill of transmission fluid, no subsequent transmission fluid changes are necessary.

Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 711 41, BMW Part No. 83 22 9 407 807.

See S.I. Bulletin B 24 01 98.

GA6HP19Z

E90

325i, 330i All

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles; please refer to S.I. B00 07 02 for further information. Never mix any other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

GA6HP26Z

E60/61

525i, 530i from 8/03 production to present

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles; please refer to S.I. B00 07 02 for further information. Never mix any other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

GA6HP26Z

E60

545i from 8/03 production to present

550i All

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles; please refer to S.I. B00 07 02 for further information. Never mix any other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

E63, E64

645Ci, 645CiC from start of production to present

650Ci, 650CiC All

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles; please refer to S.I. B00 07 02 for further information. Never mix any other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

E65

745i from 11/2001 production to present

750i All

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles; please refer to S.I. B00 07 02 for further information. Never mix any other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

E66

745Li from 3/2002 production to present

750Li All

760Li from 9/2002 production to present

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles; please refer to S.I. Bulletin B 00 07 02 for further information. Never mix any other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

4.0 CHECKING TRANSMISSION FLUID LEVEL

Due to the substantial expansion of transmission fluid when heated it is only possible to measure the oil level correctly at specified oil temperatures (after driving a distance of about 12 mi./20 km).

ZF 3HP AND 4HP

Due to the substantial expansion of transmission fluid when heated it is only possible to measure the oil level correctly at specified oil temperatures (after driving a distance of about 12 mi./20 km).

See S.I. Bulletins B 24 02 85 (1027) and B 24 01 98.

A5S 560Z, A5S440Z, GA6HP19Z, GA6HP26Z, GA6HP26Z, A5S325Z, A5S 310Z

All 5 and 6 speed transmissions require the fluid to be checked when fluid temperature is between $30-50\hat{A}^{\circ}$ Celsius using DIS Plus or GT1. Do not check fluid level after temperature has exceeded $50\hat{A}^{\circ}$ Celsius.

See S.I. Bulletin B 24 01 98.

A4S 270R, A4S 310R AND A5S 360R

For vehicles with or without a dipstick See S.I. Bulletin B 24 01 98.

5.0 TRANSMISSION FLUID CHANGE INTERVALS (IF APPLICABLE)

Please refer to applicable Service and Maintenance Checklist for each vehicle.

Operating Fluids - Clutch - All Models

1.0 GENERAL INFORMATION

Brake fluid is used as an operating fluid for hydraulic clutch operation.

Refer to appropriate BRAKES article for complete details about brake fluid.

See S.I. Bulletin 21 01 93 (3789) of 5/93.

2.0 SMG: SEQUENTIAL MANUAL GEAR BOX

All models SMG Hydraulic Unit require the use of Pentosin CHF 11S fluid.

3.0 OTHER OPERATING FLUIDS

CLUTCH COMPONENT GREASE

Use UNIREX S2 (replaces Klueber Microlube GL 261) for the lubrication of splines on the transmission input shaft, lubricating groove of the clutch release bearing, piston rod sleeve, clutch master cylinder and front push rod of the clutch slave cylinder.

UNIREX S2 Grease BMW Part No. 83 23 9 416 138

See S.I. Bulletin 23 01 99 of 2/99.

As of 11/93 the clutch release bearings are available as a replacement part which have plastic sliding sleeves instead of aluminum. Such updated bearings should not be lubricated at all. This applies to all models with manual transmission except for 8 Series models.

See S.I. Bulletin 21 01 94 (3953) of 1/94.

Operating Fluids - Gear Shift Mechanism - All Models

1.0 GENERAL INFORMATION

Components of the gear shift mechanism located outside of the transmission housings, such as ball cups, bearing bushings, gearshift joints, etc. may be lubricated with Polylub GLY 801 (BMW Part No. 81 22 9 407 647).

Operating Fluids - Manual Transmission - All Models

1.0 GENERAL INFORMATION ON GEAR LUBRICANTS

Gear lubricants for manual transmissions must conform to the following requirements due to the different transmission designs with considerable variation in loads, temperature and speeds.

The qualities of a recommended gear lubricant are:

- A. Load carrying capacity, i.e. high-pressure resistance.
- B. Noise reduction.
- C. Non-corrosive to various metals.
- D. Non-foaming.
- E. Non-separation of additives at operating temperatures.
- F. Non-sludge forming.
- G. Prevention of swelling, hardening and shrinking of seals.

These properties are already provided in manual transmission oil by:

- High-pressure additives.
- Corrosion inhibitors.
- Oxidation inhibitors (inhibitors which limit or prevent chemical reactions).
- Anti-foaming agents.

2.0 OIL ADDITIVES

BMW manual transmissions are designed so that they do not require aftermarket oil additives.

BMW disapproves the use of any oil additives and cannot accept the liability for any consequential damage that results from using oil additives.

3.0 MANUAL TRANSMISSION OIL REQUIREMENTS AND SPECIFICATIONS

- A. All reputable brand mineral-based transmission oils of viscosity class SAE 80 according to specifications MIL-L-2105 or API GL-4 (no label on transmission bell housing).
- B. Synthetic transmission fluid, Mobil SHC 630 (325e/528e without dual mass flywheel, produced before mid-1986). Manual transmissions which are filled with Mobil SHC 630 synthetic gear lube have a green label with the words "Special Oil" located next to the oil filter plug.

Special-Oil!

HWB Best. Nr. 81 22 9 407 306

G03582836

Fig. 1: Identifying Label For Oil Specification (Special Oil) Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Mobil SHC 630 is available in 5-gallon pails or 55-gallon drums from:

Mobil Oil Corporation - Contact your local Mobil oil distributor.

Filling BMW transmissions with unapproved synthetic gear lubes could cause the following damage:

- Premature synchromesh ring wear
- Reduced service life of bearings
- Tooth profile damage
- Faster wear of selector forks
- Damage to radial shaft oil seals

Transmission gear clashing will eventually result.

NOTE: Do not use synthetic fluid Mobil SHC 630 in other vehicles. The

> transmission synchronizers of cars other than listed above are not compatible with synthetic fluid and premature wear will result.

NOTE: To reduce the physical effort required to change gear at low ambient

temperatures, the following oils can be used in the transmission during

the winter:

- Single-grade HD mineral engine oils SAE40, SAE30, SAE20
- In countries where the ambient temperatures are particularly low, ATF oils can also be used.

This has the disadvantage that the transmission tends to rattle or knock while in neutral at higher temperatures.

CAUTION: These transmissions must never be filled with synthetic engine oils or multigrade engine oils, since these oils contain coefficient of frictionreducing agents that can adversely affect operation of the synchromesh mechanism.

- C. Automatic Transmission Fluid (ATF) of Dexron(R) II or Dexron(R) III formulation on any of the following:
 - Dual mass flywheel
 - Direct drive fifth gear as of 9/90
 - Six-speeds

Manual transmissions which are filled with ATF have 17mm external hex plugs in the filler and drain openings as well as an orange label on the transmission bell housing next to the filler plug.

ATF-Oil! Automatic-Transmission Fluid

HWB Beet Nr. 81 22 8 400 275

G03582837

Fig. 2: Identifying Orange Label For Oil Specification (Automatic Transmissions Fluid) Courtesy of BMW OF NORTH AMERICA, INC.

D. From model year 1998 (9/97 production) all manual transmissions are filled with Esso/Exxon "MTF-LT-1" lifetime fluid. A yellow label with the letters "MTF-LT-1" is located next to the oil filler plug.

No oil change is required for the entire service life of these transmissions.

In the event of a repair, the transmission must only be filled with the lifetime oil.

Esso/Exxon MTF-LT-1

BMW P/N 83 22 9 408 942.

E. From model year 2004 some manual transmissions are filled with Castrol "MTF-LT-2" lifetime fluid. This fluid has the same properties as the "MTF-LT-1" fluid indicated above in section D. The "MTF-LT-1" fluid may be mixed and/or substituted for the "MTF-LT-2" manual transmission fluid.

2006 MY E60 M5 equipped with SMG utilizes only MTF-LT-2 fluid.

MTF-LT-2 Fluid

F. From Model Year 2006 all vehicles equipped with a manual transmission and the N52 engine require the MTF-LT-3 lifetime fluid.

N52 equipped vehicles:

- E60 from 3/2005 production
- E85 from 9/2005 production
- E90 from 3/2005 production

MTF-LT-3

BMW P/N 83 22 0 409 878

No oil change is required for the entire service life of these transmissions.

MANUAL TRANSMISSION COLD SHIFT EFFORT

NOTE: The following information does not apply to transmissions filled with lifetime fluid

Transmission cold shift effort is reduced by replacing the original oil (SAE 80 or Mobil SHC 630) with a reputable brand single-grade HD engine mineral oil of API-SE standards (SAE 20, SAE 30, or SAE 40). Thinner oils will run the risk of increased gear noise.

A further reduction in shift effort can be obtained by using ATF, but gear noise will be more noticeable compared to single-grade engine mineral oils.

For summer operation it is recommended that ATF or engine oil be drained and replaced by the original lubricant, either SAE 80 or Mobil SHC 630 (as specified) transmission fluid.

CAUTION:

Never fill a manual transmission with synthetic engine oils or multigrade mineral-based engine oils, since they have friction-reducing components that could impair the function of the synchronizers.

4.0 TRANSMISSION OIL CHANGE INTERVAL

Refer to Service Maintenance checklists for the respective model year.

Starting with 1998 models all manual transmissions are filled with lifetime fluid and require no fluid changes for the life of the vehicle.

2001-02 TRANSMISSION

Clutch - Special Tools - M-CoupeRoadster & Z3 (E36)

21 2 070 GAUGE

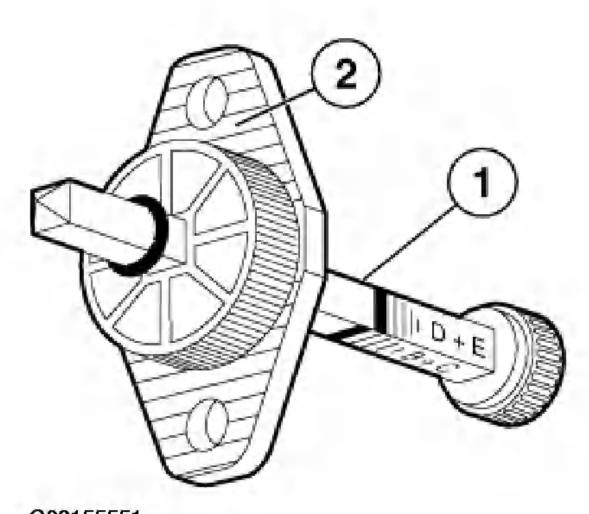
NOTE: Note: For checking lining thickness on clutch drive plate. Replaced in 8/95 by

21 2 080.

Transmission: S5D 200G, S5D 250G, S5D 260Z, S5D 310Z, S6S 420G, S6S 560G

Order number: 21 2 070

Gauge



G03155551

<u>Fig. 1: Identifying Special Tool - Gauge</u> Courtesy of BMW OF NORTH AMERICA, INC.

21 2 100 DRIFT

Minimum set: Mechanical tools

NOTE: Note: For centering clutch disc while installing clutch

Transmission: 240/5, 260/5, 265/5, 265/5Sport, 280/5Sport

Storage location: C22

Order number: 21 2 100

Drift

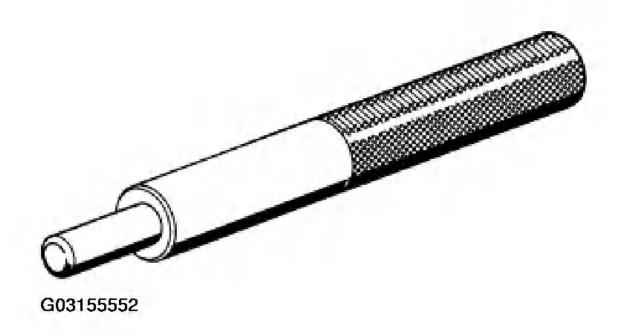


Fig. 2: Identifying Special Tool - 21 2 100 Drift Courtesy of BMW OF NORTH AMERICA, INC.

21 2 120 DRIFT

Minimum set: Mechanical tools

NOTE: Note: For centering clutch disc while installing clutch

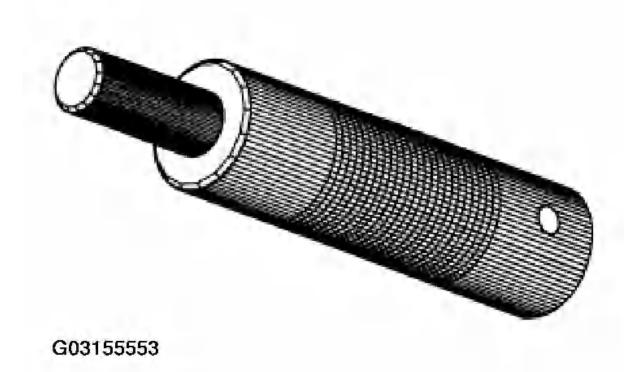
Transmission: S6S 420G, S6S 560G

Storage location: C22

SI number: 1 05 90(207)

Order number: 21 2 120

Drift



<u>Fig. 3: Identifying Special Tool - 21 2 120 Drift</u> Courtesy of BMW OF NORTH AMERICA, INC.

21 2 130 DRIFT

Minimum set: Mechanical tools

NOTE: Note: For centering clutch disc while installing clutch

Transmission: S5D 200G, S5D 250G, S5D 260Z, S5D 310Z

Storage location: C22

SI number: 1 01 91(312)

Order number: 21 2 130

Drift

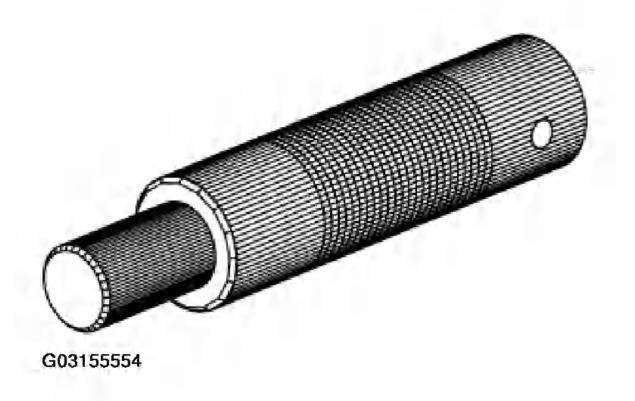


Fig. 4: Identifying Special Tool - 21 2 130 Drift Courtesy of BMW OF NORTH AMERICA, INC.

21 2 140 CLUTCH CENTERING MANDREL (2 X)

Minimum set: Mechanical tools

NOTE: Note: For centering clutch disc on flywheel while installing self-adjusting clutch

(SAC) - Phase-in of SAC in E46, 09/97

Transmission: S5D 200G, S5D 250G, S5D 260Z, S5D 310Z, S6S 420G, S6S 560G

Storage location: C5

SI number: 1 13 96 (104)

Order number: 21 2 140

Clutch centering mandrel (2 x)

Consisting of:

1 = 21 2 141 Clutch centering tool

NOTE: With M10 screw - Transmission: S6S 420G, S6S 560G

 $2 = 21 \ 2 \ 142$ Clutch centering tool

NOTE: With M10 screw - Transmission: S5D 200G, S5D 250G, S5D 260Z, S5D 310Z

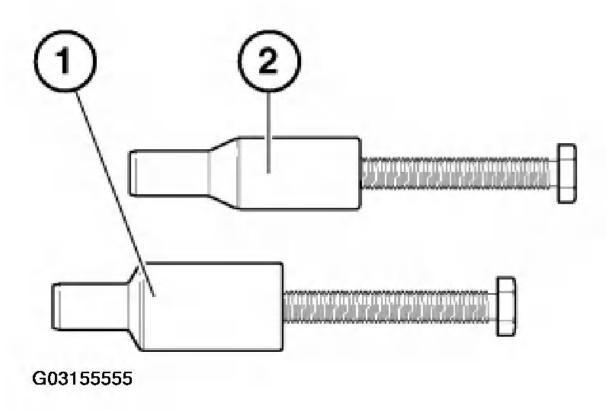


Fig. 5: Identifying Special Tool - Clutch Centering Mandrel (2 X) Courtesy of BMW OF NORTH AMERICA, INC.

21 2 170 TENSIONING TOOL

Minimum set: Mechanical tools

In conjunction with: 21 2 180, 21 2 190, 21 2 141, 21 2 142

NOTE: Note: For resetting adjustment ring and installing self adjusting clutch (SAC) on

flywheel without tension.

Series: E34, E36, E38, E39, E46, E52, E53, E60, E61, E85, E87

SI number: 1 16 00 (622)

Order number: 21 2 170

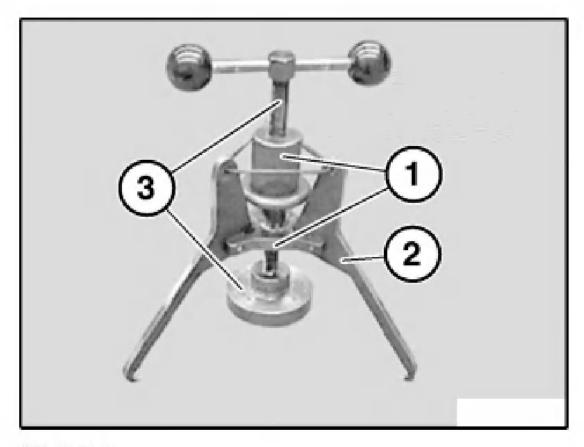
Tensioning tool

Consisting of:

 $1 = 21 \ 2 \ 171$ Star with adjusting spindle

 $2 = 21 \ 2 \ 172 \ Clamping \ claw (1 \ x)$

 $3 = 21 \ 2 \ 173$ Pressure spindle with disk



<u>Fig. 6: Identifying Special Tool - Tensioning Tool</u> Courtesy of BMW OF NORTH AMERICA, INC.

21 2 180 LOCATING RING

Minimum set: Mechanical tools

In conjunction with: 21 2 170

NOTE: Note: For locating and resetting adjustment ring of SAC clutch on all 6- and 8-

cylinder engines.

Series: E34, E36, E38, E39, E46, E52, E53, E60, E85

Storage location: A44

SI number: 1 16 00 (622)

Order number: 21 2 180

Locating ring

Consisting of:

 $1 = 21 \ 2 \ 181 \ Outer ring$

 $2 = 21 \ 2 \ 182 \ Inner ring$

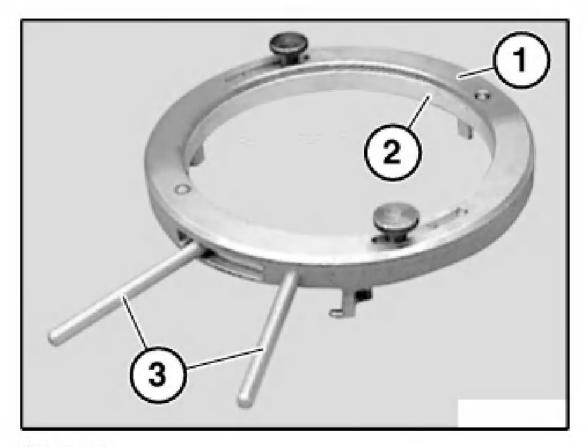


Fig. 7: Identifying Special Tool - 21 2 180 Locating Ring Courtesy of BMW OF NORTH AMERICA, INC.

21 2 190 LOCATING RING

Minimum set: Mechanical tools

In conjunction with: 21 2 170

NOTE: Note: For locating and resetting adjustment ring of SAC clutch on all 4-cylinder

engines.

Series: E34, E36, E38, E39, E46, E52, E53, E87

Storage location: A44

SI number: 1 16 00 (622)

Order number: 21 2 190

Locating ring

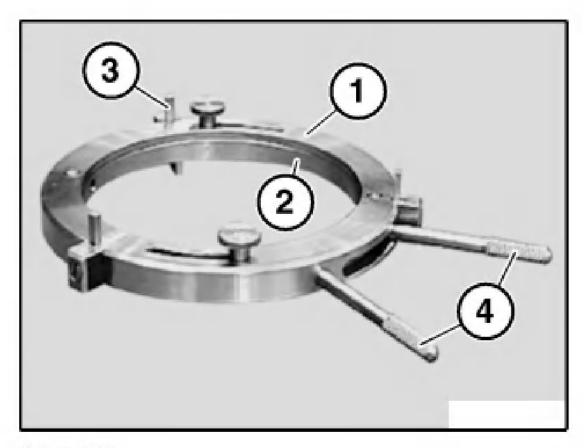
Consisting of: $1 = 21 \ 2 \ 191$

Outer ring

 $2 = 21 \ 2 \ 192 \ Inner ring$

 $3 = 21 \ 2 \ 193 \ Driver (1 \ x)$

 $4 = 21 \ 2 \ 194 \ Pin set$



G03155558

Fig. 8: Identifying Special Tool - 21 2 190 Locating Ring Courtesy of BMW OF NORTH AMERICA, INC.

21 2 200 CLUTCH CENTERING TOOL

Minimum set: Mechanical tools

NOTE: Note: For centering clutch plate during installation. H-transmission

Transmission: GS6-37BZ, GS6-37DZ

Storage location: B44, C44

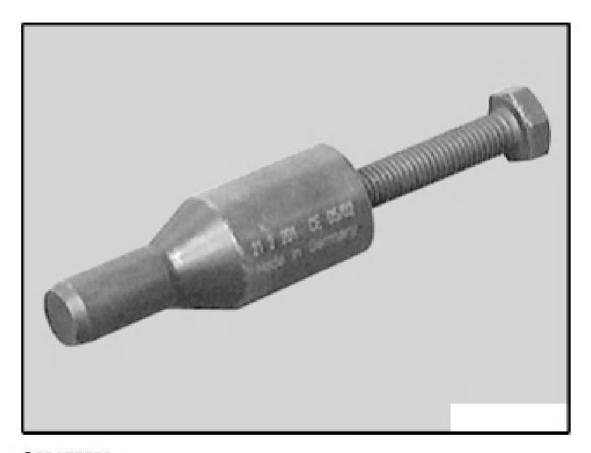
SI number: 01 10 02 (907)

Order number: 21 2 200

Clutch centering tool

Consisting of:

NOTE: With M10 screw Transmission: GS6-37BZ/DZ (H-transmission)



G03155559

Fig. 9: Identifying Special Tool - 21 2 200 Clutch Centering Tool Courtesy of BMW OF NORTH AMERICA, INC.

21 2 230 CLUTCH CENTERING TOOL

Minimum set: Mechanical tools

NOTE: Note: With M10 screw (G-transmission)

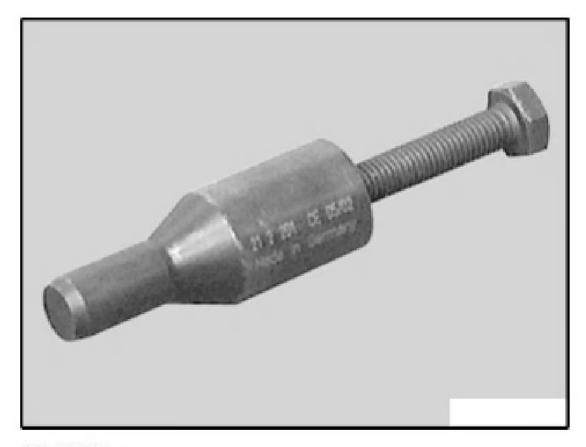
Transmission: GS6-53BZ, GS6-53DZ

Storage location: A47

SI number: 1 03 03 (960)

Order number: 21 2 230

Clutch centering tool



<u>Fig. 10: Identifying Special Tool - 21 2 230 Clutch Centering Tool</u> Courtesy of BMW OF NORTH AMERICA, INC.

21 2 240 GREASE SCRAPER RING

Minimum set: Mechanical tools

NOTE: Note: For scraping grease on spline shaft teeth of transmission input shaft (G-

transmission)

Transmission: GS6-53BZ, GS6-53DZ

Storage location: A47

SI number: 1 03 03 (960)

Order number: 21 2 240

Grease scraper ring

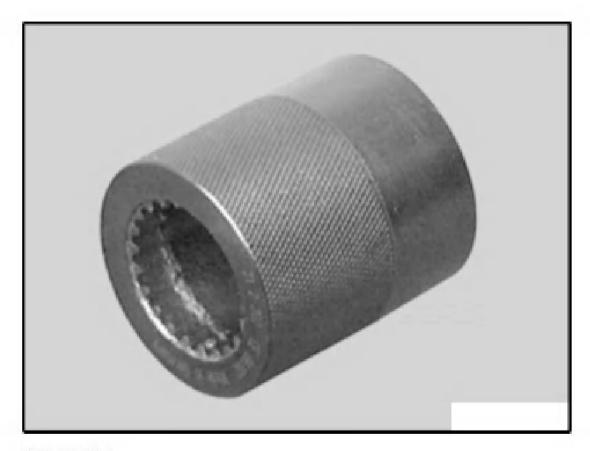


Fig. 11: Identifying Special Tool - Grease Scraper Ring Courtesy of BMW OF NORTH AMERICA, INC.

21 5 010 ADAPTER

In conjunction with: 17 0 002

NOTE: Note: For expansion tank when bleeding hydraulic clutch system on automatic

transmission

Transmission: S6S 420G

Storage location: C17

SI number: 1 06 97 (186)

Order number: 21 5 010

Adapter

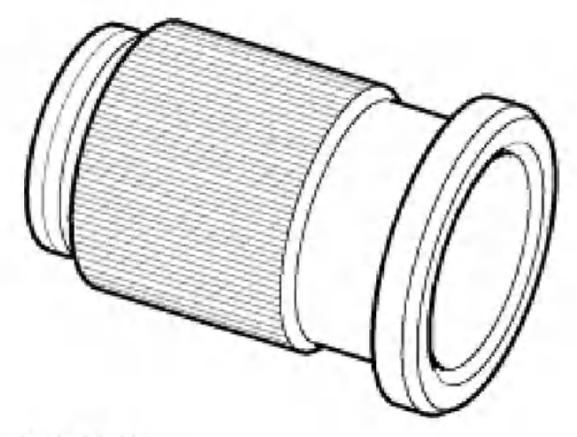


Fig. 12: Identifying Special Tool - Adapter Courtesy of BMW OF NORTH AMERICA, INC.

21 5 020 BLEEDER FLASK

In conjunction with: 21 5 030

NOTE: Note: For hydraulic fluid (Pentosin) - for bleeding hydraulic clutch system on

sequential M-transmission.

Transmission: S6S 420G

SI number: 1 15 97 (211)

Order number: 21 5 020

Bleeder flask



Fig. 13: Identifying Special Tool - Bleeder Flask Courtesy of BMW OF NORTH AMERICA, INC.

21 5 030 FIXTURE

NOTE: Note: For bleeding clutch hydraulics.

Series: E30, E31, E32, E34, E36, E38, E39, E85, E87, R53

Storage location: A8

SI number: 1 14 97 (210)

Order number: 21 5 030

Fixture

Consisting of:

1 = 21 5 031 Spindle

2 = 21 5 032 Locating bracket

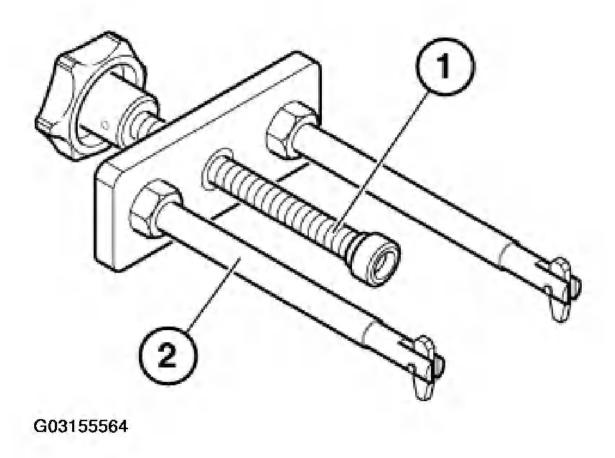


Fig. 14: Identifying Special Tool - 21 5 030 Fixture Courtesy of BMW OF NORTH AMERICA, INC.

Article GUID: A00202804

2006-07 TRANSMISSION

Clutch - Tightening Torques - 5 Series, 6 Series, X3, X5, & Z4

11 CLUTCH HOUSING

21 11 BELL HOUSING

BELL HOUSING TIGHTENING TORQUE SPECIFICATIONS

| Â | | Туре | Thread | Tightening specification | Measure |
|-----|-----------------------------|--|--------|--------------------------|---------|
| 1AZ | Clutch housing to crankcase | E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E87 / E90 / E91 | M8 | Â | 28 Nm |
| Â | | E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E87 / E90 / E91 | M10 | Â | 56 Nm |
| Â | | E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E87 / E90 / E91 | M12 | Â | 98 Nm |

21 CLUTCH WITH DRIVING DISC

21 21 CLUTCH DISC AND DRIVE PLATE

CLUTCH DISC AND DRIVE PLATE TIGHTENING TORQUE SPECIFICATIONS

| Â | Type | Thread | Work instruction | Measure |
|-----------------------------------|--|---------|---|---------|
| 1AZ Clutch to flywheel | E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E86 / E87 / E90 / E91 | M8 8.8 | Replace screws | 25 Nm |
| Â | E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E86 / E87 / E90 / E91 | M8 10.9 | Replace screws | 34 Nm |
| Clutch to flywheel With ZNS bolts | Â | Â | Replace ZNS bolts Jointing torque and angle of rotation must be observed without fail | Â |

| Â | E60 S85, E61 S85 | Â | Jointing torque | 15 Nm |
|---|--|---------|-----------------|------------|
| Â | Â | Â | Torque angle | 25° |
| Â | N52, N53, M47T2, N46T, N54, E92 N54 N46T, N43, N45K, N47, M57T2 | M8 10.9 | Jointing torque | 15 Nm |
| Â | Â | Â | Torque angle | 90° +/- 5° |

52 CLUTCH OPERATION (HYDRAULIC)

21 52 CLUTCH OPERATION (HYDRAULIC)

CLUTCH OPERATION TIGHTENING TORQUE SPECIFICATIONS

| | | | | Tightening | |
|-----|---|---|-------------|---------------|-----------|
| Â | | Туре | Thread | specification | Measure |
| 1AZ | Hydraulic line to clutch slave cylinder or throttle. | E36 / E38 / E39 / E52 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E86 / E81 / E87 / E90 / E91 / E92 | Â | Â | 14.5 Nm |
| Â | | E46 | Â | Â | 20 + 5 Nm |
| 2AZ | Clutch master cylinder to bearing block | E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E85 / E86 / E81 / E87 / E90 / E91 / E92 / E93 | Â | Â | 22 Nm |
| Â | | E83 | Â | Â | 8 Nm |
| 3AZ | Fitting screw, clutch master cylinder | E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E86 / E81 / E87 / E90 / E91 / E92 / E93 | Â | Â | 22 Nm |
| 4AZ | Clutch master cylinder to pedal assembly | E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E86 / E87 / E90 / E91 / E92 / E93 / E81 | Â | Â | 9 Nm |
| 5AZ | Clutch slave cylinder to clutch housing/transmission case | E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E86 / E87 / E90 / E91 / E92 / E93 / E81 | Â | Â | 22 Nm |
| Â | | E60 / E63 | 7-speed SMG | Â | 25 Nm |
| 6AZ | Pressure accumulator to hydraulic unit | E36 / M3 | Â | Â | 35 Nm |
| | | 388 | 4 of 4036 | | |

| 7AZ | Coupling bolts for hydraulic pipes | E46 / M3 | Â | Â | 14 Nm |
|------|---|--------------------------------------|-------------|---|--------|
| 8AZ | Pressure accumulator for hydraulic unit | E46 / M3 | Â | Â | 40 Nm |
| 9AZ | Clutch position sensor to clutch slave cylinder | E46 / E60 / E61 / E63 / E64 / E85 | 6-speed SMG | Â | 2.5 Nm |
| Â | | E60 / E61 / E63 | 7-speed SMG | Â | 3.5 Nm |
| 10AZ | Banjo bolt, pipe, actuator/pump block | E60 / E61 / E63 | 7-speed SMG | Â | 18 Nm |
| 11AZ | Filler plug, expansion tank, pump block | E60 / E61 / E63 | 7-speed SMG | Â | 2.1 Nm |
| 12AZ | Throttle valve to clutch slave cylinder | E60, E61 | Â | Â | 17 Nm |

Article GUID: A00267746

2001-02 TRANSMISSION

Gear Shift Mechanism - Special Tools - M-Coupe/Roadster & Z3 (E36)

GEARSHIFT MECHANISM

25 1 110 PIN WRENCH

ORDER NUMBER: 25 1 110 SPECIAL TOOL SPECIFICATION

| Note: | For removing shift lever. Replaced by 25 1 120. |
|-------------------|---|
| Series: | E31, E36, E60, E85 |
| Storage location: | B19 |
| SI number: | 1 05 90 (207) |
| Order number: | 25 1 110 |
| Â | Pin wrench |

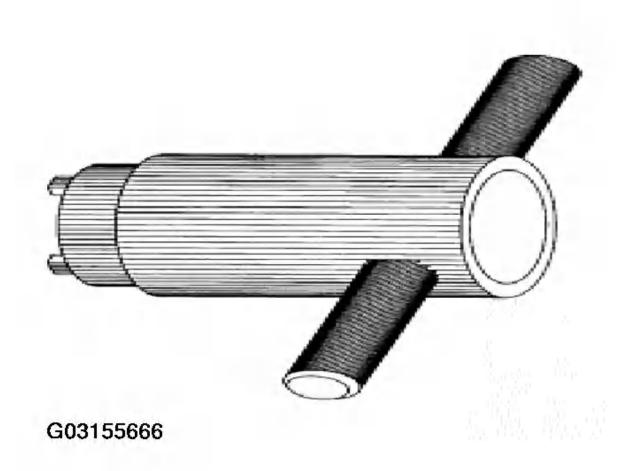


Fig. 1: Identifying Special Tool 25 1 110 Pin Wrench For Removing Shift Lever Courtesy of BMW OF NORTH AMERICA, INC.

25 1 120 PIN WRENCH

Minimum set: Mechanical tools

ORDER NUMBER: 25 1 120 SPECIAL TOOL SPECIFICATION

| Note: | For removing gear lever (releasing gear lever |
|---------|---|
| | bearing). |
| Series: | E31, E36, E60, E61, E83, E85, E87, E90 |

| Storage location: | B19 |
|-------------------|---------------|
| SI number: | 1 24 03 (040) |
| Order number: | 25 1 120 |
| Â | Pin wrench |

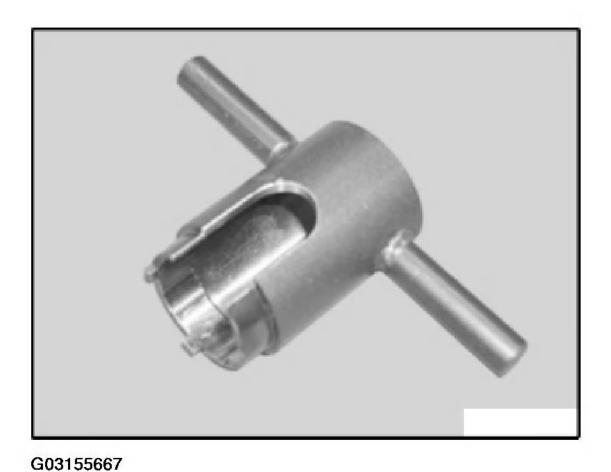


Fig. 2: Identifying Special Tool 25 1 120 Pin Wrench For Removing Gear Lever Courtesy of BMW OF NORTH AMERICA, INC.

Article GUID: A00202806

2001-02 TRANSMISSION

Manual Transmission - Special Tools - M-Coupe/Roadster & Z3 (E36)

23 0 000 ATTACHMENT

ORDER NUMBER: 23 0 000 SPECIAL TOOL SPECIFICATION

| Note: | For car jack, for removing and installing manual |
|---------------|--|
| | and automatic transmissions |
| Order number: | 23 0 000 |
| Â | Attachment |

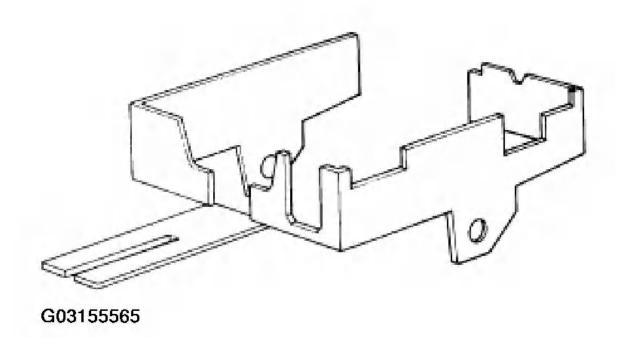


Fig. 1: Identifying Special Tools 23 0 000 For Attachment Courtesy of BMW OF NORTH AMERICA, INC.

23 0 030 SUPPORT

ORDER NUMBER: 23 0 030 SPECIAL TOOL SPECIFICATION

| Note: | For Getrag transmission |
|---------------|-------------------------|
| Transmission: | 280/5 Sport |
| Order number: | 23 0 030 |
| Â | Support |

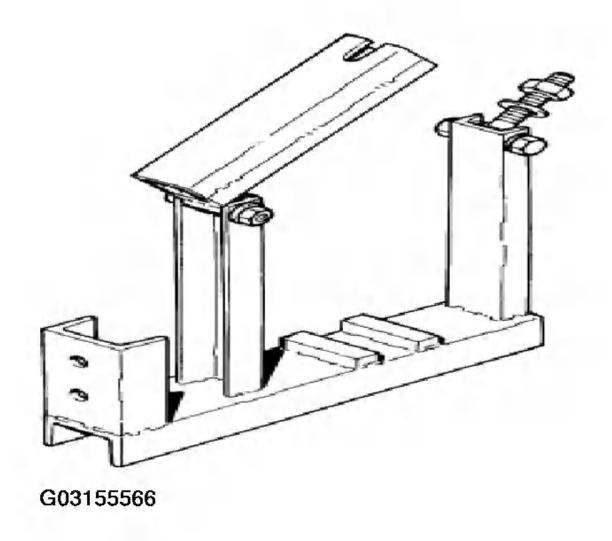


Fig. 2: Identifying Special Tools 23 0 030 For Support Courtesy of BMW OF NORTH AMERICA, INC.

23 0 040 SUPPORT

| ORDER NUMBER: 23 0 040 SPEC | CIAL TOOL SPECIFICATION |
|-----------------------------|---|
| In conjunction with: | 00 2 030 |
| Note: | For transmissions for removal and installation. |
| | Replaced by 23 0 110. |
| Transmission: | S6S 420G, S6S 560G |
| SI number: | 1 05 90(207) |
| Order number: | 23 0 040 |
| Â | Support |
| Consisting of: | Â |
| 1 = 23 0 041 | Locating cage |
| Â | NOTE: |
| | Transmission: S6S 560G |
| 2 = 23 0 042 | Support bracket |
| Â | NOTE: |
| | |

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Transmission: S6S 420G

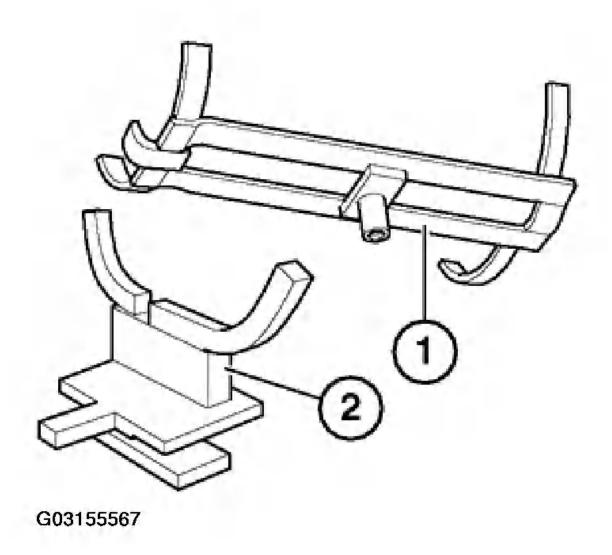
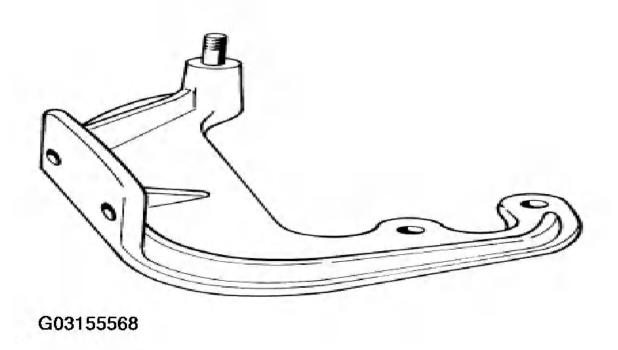


Fig. 3: Identifying Special Tools 23 0 040 For Support Courtesy of BMW OF NORTH AMERICA, INC.

23 0 050 SUPPORT

ORDER NUMBER: 23 0 050 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 1 450 |
|----------------------|---|
| Note: | For all 4-speed and 5-speed transmissions |
| Transmission: | 242/4 |
| Order number: | 23 0 050 |
| Â | Support |



<u>Fig. 4: Identifying Special Tools 23 0 050 For Support</u> Courtesy of BMW OF NORTH AMERICA, INC.

23 0 060 SUPPORT

ORDER NUMBER: 23 0 060 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 1 450 |
|----------------------|-------------------------|
| Note: | For Getrag transmission |
| Transmission: | 245/5, 245/5 Sport |
| Order number: | 23 0 060 |
| Â | Support |

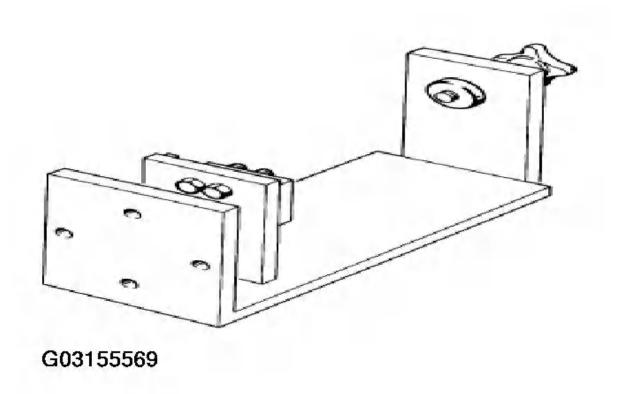
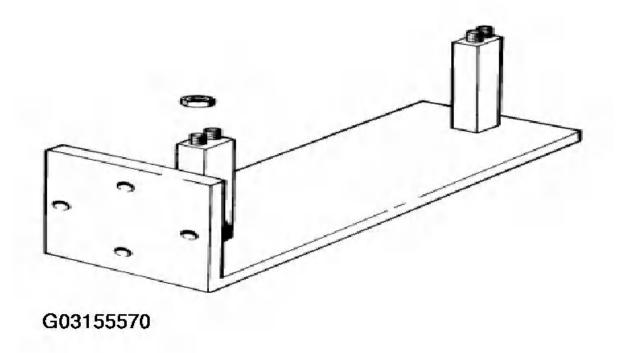


Fig. 5: Identifying Special Tools 23 0 060 For Support Courtesy of BMW OF NORTH AMERICA, INC.

23 0 070 MOUNTING BRACKET

ORDER NUMBER: 23 0 070 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 1 450 |
|----------------------|-------------------------|
| Note: | For Getrag transmission |
| Transmission: | 265/5, 265/5 Sport |
| Order number: | 23 0 070 |
| Â | Mounting bracket |



<u>Fig. 6: Identifying Special Tools 23 0 070 For Mounting Bracket</u> Courtesy of BMW OF NORTH AMERICA, INC.

23 0 080 FIXTURE

ORDER NUMBER: 23 0 080 SPECIAL TOOL SPECIFICATION

| Note: | For removing 5th gear wheel |
|----------------|---------------------------------|
| Transmission: | 265/5, 265/5 Sport, 280/5 Sport |
| Order number: | 23 0 080 |
| Â | Fixture |
| Consisting of: | Â |
| 23 0 081 | Puller jaws (2) |

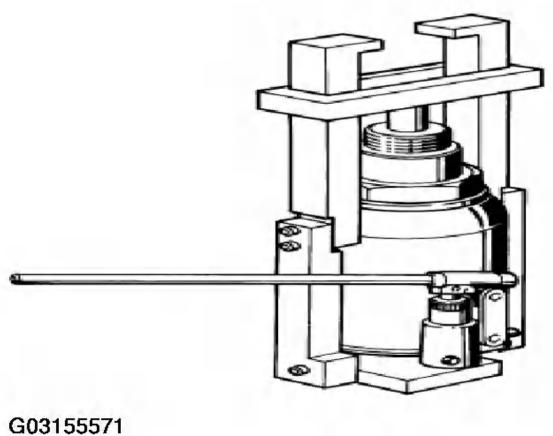


Fig. 7: Identifying Special Tools 23 0 070 For Fixture Courtesy of BMW OF NORTH AMERICA, INC.

23 0 090 SUPPORT

ORDER NUMBER: 23 0 090 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 1 450 |
|----------------------|---------------------------------|
| Note: | For ZF and Getrag transmissions |
| Transmission: | 240/5, 260/5, ZF S5-16 |
| Order number: | 23 0 090 |
| Â | Support |

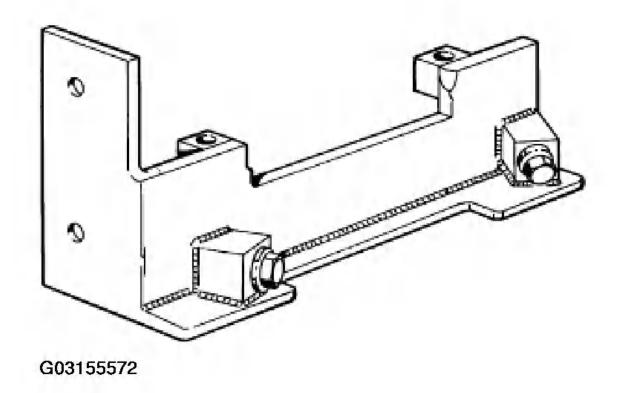


Fig. 8: Identifying Special Tools 23 0 090 For Support Courtesy of BMW OF NORTH AMERICA, INC.

23 0 100 SUPPORT

ORDER NUMBER: 23 0 100 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 1 450 |
|----------------------|---|
| Note: | For mounting transmission on assembly stand |
| Transmission: | S5D 200G, S5D 250G, S5D 260Z, S5D 310Z, S5D |
| | 320Z |
| SI number: | 1 07 90 (244) |
| Order number: | 23 0 100 |
| Â | Support |

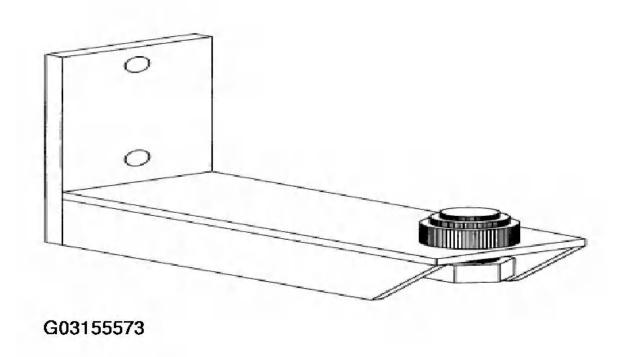
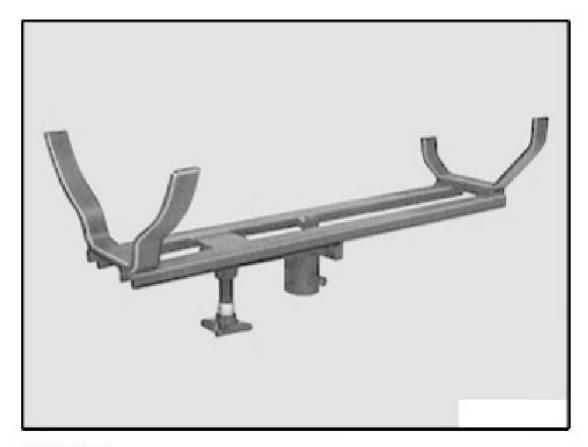


Fig. 9: Identifying Special Tools 23 0 100 For Support Courtesy of BMW OF NORTH AMERICA, INC.

23 0 110 SUPPORT

ORDER NUMBER: 23 0 110 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 2 030 |
|----------------------|---|
| Note: | For removing and installing transmission. |
| Transmission: | S6S 420G, S6S 560G |
| SI number: | 1 02 00 (551) |
| Order number: | 23 0 110 |
| Â | Support |
| Consisting of: | Â |
| 1 = 23 0 111 | Take-up support |
| Â | NOTE: |
| | Transmission: S6S 560G |
| 2 = 23 0 112 | Locating bracket (not shown) |
| Â | NOTE: |
| | Transmission: S6S 420G |
| Â | In conjunction with: 21 0 111 Take-up support |



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Fig. 10: Identifying Special Tools 23 0 110 For Support Courtesy of BMW OF NORTH AMERICA, INC.

23 0 140 SUPPORT

ORDER NUMBER: 23 0 140 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 2 030 |
|----------------------|--|
| Note: | For accommodating transmission during removal and installation. Transmission: F-transmission |
| Transmission: | S5D 320Z, S5D 390Z |
| SI number: | 1 20 98(378) |
| Order number: | 23 0 140 |
| Â | Support |

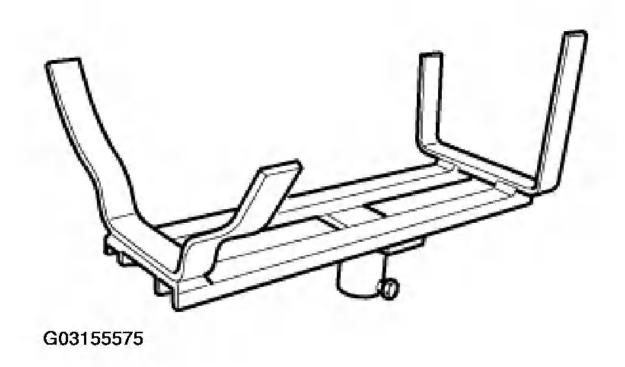


Fig. 11: Identifying Special Tools 23 0 140 For Support Courtesy of BMW OF NORTH AMERICA, INC.

23 0 150 SUPPORT

ORDER NUMBER: 23 0 150 SPECIAL TOOL SPECIFICATION

| ORDER TOWNSER. 25 VIEW STEEME TO OE STEEM TOTAL | |
|---|--|
| In conjunction with: | 00 1 450 |
| Note: | For accommodating transmission on assembly |
| | stand. For ZF transmission. |
| Transmission: | ZF S5-16 |
| Order number: | 23 0 150 |
| Â | Support |

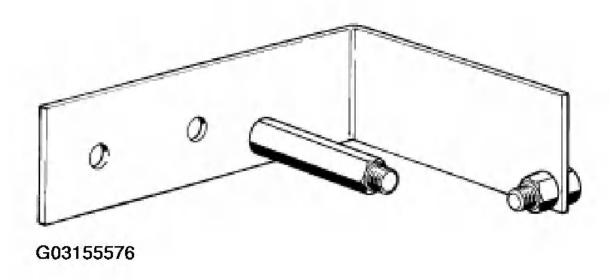
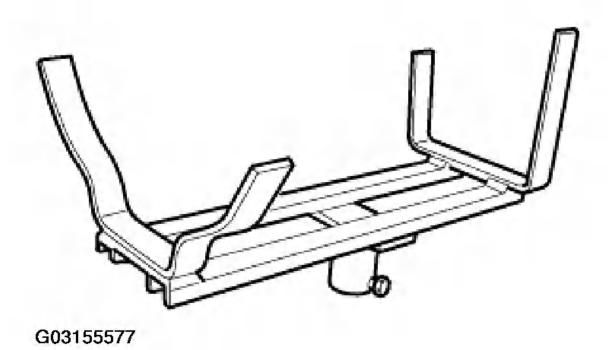


Fig. 12: Identifying Special Tools 23 0 150 For Support Courtesy of BMW OF NORTH AMERICA, INC.

23 0 160 SUPPORT

ORDER NUMBER: 23 0 160 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 1 450 |
|----------------------|-------------------------|
| Note: | For Getrag transmission |
| Transmission: | 262/4 |
| Order number: | 23 0 160 |
| Â | Support |

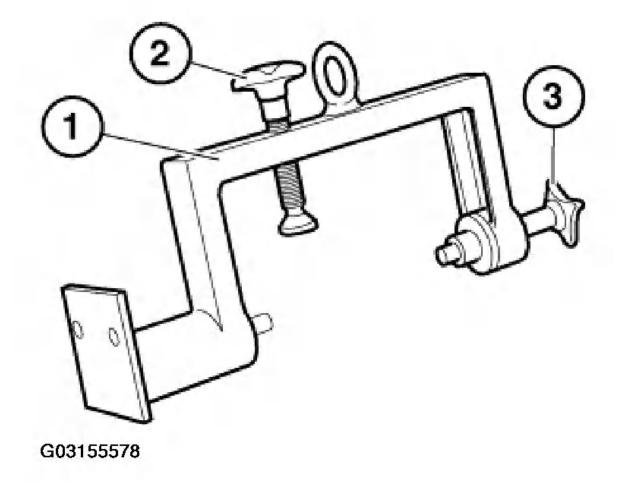


<u>Fig. 13: Identifying Special Tools 23 0 160 For Support</u> Courtesy of BMW OF NORTH AMERICA, INC.

23 0 170 SUPPORT

ORDER NUMBER: 23 0 170 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 1 450 |
|----------------------|---|
| Note: | For mounting F-transmission on assembly stand |
| Transmission: | S5D 390Z |
| SI number: | 1 14 99(482) |
| Order number: | 23 0 170 |
| Â | Support |
| Consisting of: | Â |
| 1 = 23 0 171 | Basic body |
| 2 = 23 0 172 | Spindle (2) |
| Â | NOTE: |
| | With handle |
| | |



<u>Fig. 14: Identifying Special Tools 23 0 170 For Support</u> Courtesy of BMW OF NORTH AMERICA, INC.

23 0 180 IMPACT RING WITH SLIP SLEEVE

Minimum set: Mechanical tools

ORDER NUMBER: 23 0 180 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 23 2 491 |
|----------------------|--|
| Note: | For driving in radial shaft seal on drive side - F |
| | transmission |
| Transmission: | S5D 390Z |
| SI number: | 1 14 99(482) |
| Order number: | 23 0 180 |
| Â | Impact ring with slip sleeve |
| Consisting of: | Â |
| 1 = 23 0 181 | Impact ring |
| 2 = 23 0 182 | Slip sleeve |

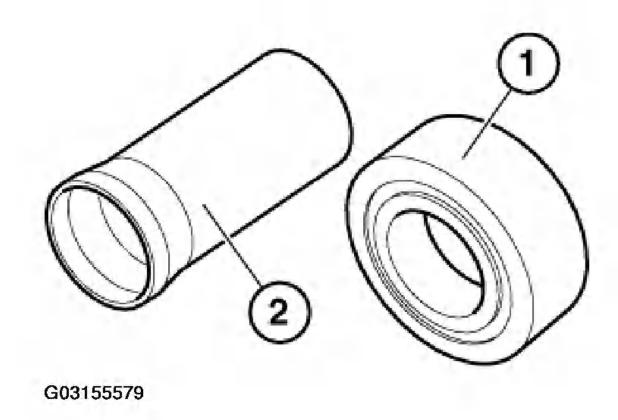


Fig. 15: Identifying Special Tools 23 0 180 Impact Ring With Slip Sleeve Courtesy of BMW OF NORTH AMERICA, INC.

23 0 190 IMPACT BUSH

Minimum set: Mechanical tools

ORDER NUMBER: 23 0 190 SPECIAL TOOL SPECIFICATION

| Note: | For driving in radial shaft seal on output side - F |
|-------------------|---|
| | transmission |
| Transmission: | S5D 280Z, S5D 320Z, S5D 390Z |
| Storage location: | B39 |
| SI number: | 1 14 99(482) |
| Order number: | 23 0 190 |

Impact bush

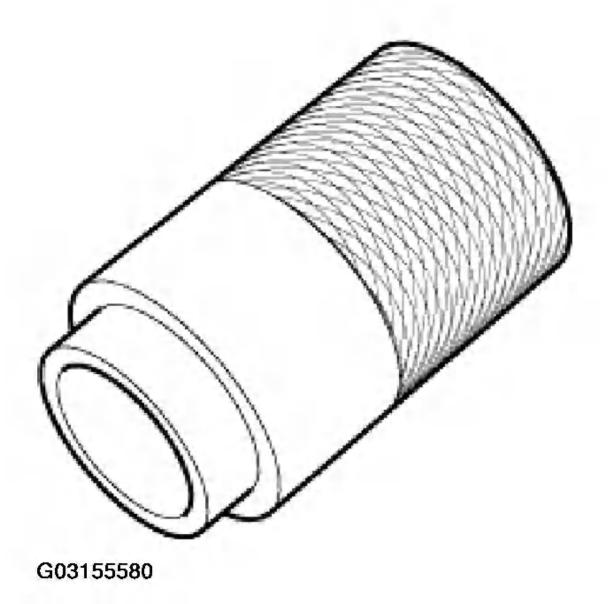


Fig. 16: Identifying Special Tools 23 0 190 Impact Bush Courtesy of BMW OF NORTH AMERICA, INC.

23 0 200 SOCKET 41 A/F

Minimum set: Mechanical tools

ORDER NUMBER: 23 0 200 SPECIAL TOOL SPECIFICATION

| Note: | Long version for releasing and tightening down |
|---------------|--|
| | output flange - F-transmission |
| Transmission: | S5D 390Z |
| SI number: | 1 14 99(482) |
| Order number: | 23 0 200 |
| Â | Socket 41 A/F |



Fig. 17: Identifying Special Tools 23 0 200 Socket 41 A/F Courtesy of BMW OF NORTH AMERICA, INC.

23 0 250 HOLDER

Minimum set: Mechanical tools

ORDER NUMBER: 23 0 250 SPECIAL TOOL SPECIFICATION

| Note: | Assistance in releasing and tightening down output |
|-------------------|--|
| | flange |
| Transmission: | GS5-39DZ, S5D 280Z, S5D 320Z |
| Storage location: | B41 |
| SI number: | 1 06 00(575) |
| Order number: | 23 0 250 |
| Â | Holder |

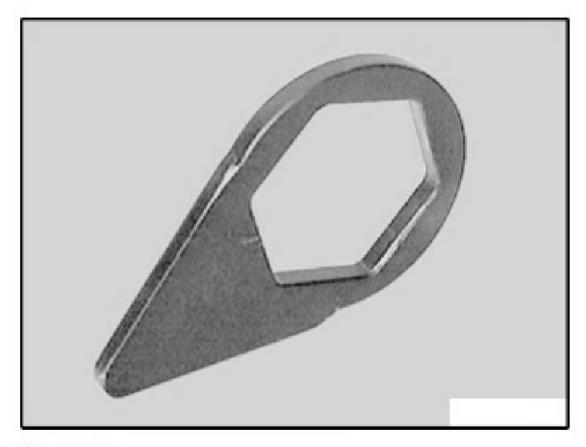


Fig. 18: Identifying Special Tools 23 0 250 Holder Courtesy of BMW OF NORTH AMERICA, INC.

23 0 490 EXTRACTOR

ORDER NUMBER: 23 0 490 SPECIAL TOOL SPECIFICATION

| | R: 25 U 49U SPECIAL TOOL SPECIFICATION |
|--------------------|--|
| Note: | For removing shaft seal |
| Series: | E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E39, E39PL, E39tou, |
| | E46, E46/16, E46/2, E46/3, E46/5, E46/C, E53, E60, E61, E63, E64, E83, E85, E87, |
| | E90, E91, R50, R52 |
| Transmission: | GS5-39DZ, GS5-65BH, GS6-17BG, GS7S47BG, S5D 200G, S5D 250G, S5D 260Z, |
| | S5D 280Z, S5D 310Z, S5D 320Z, S5D 390Z, S6S 420G, S6S 560G |
| Storage location: | B6, C6 |
| SI number: | 1 15 96 (106) |
| Order number: | 23 0 490 |
| Extractor | |
| Consisting of: | |
| 1 = 23 0 491 | Rod |
| NOTE: | |
| With self-tap | ping screw |
| · | |
| $2 = 23 \ 0 \ 492$ | Impact weight |

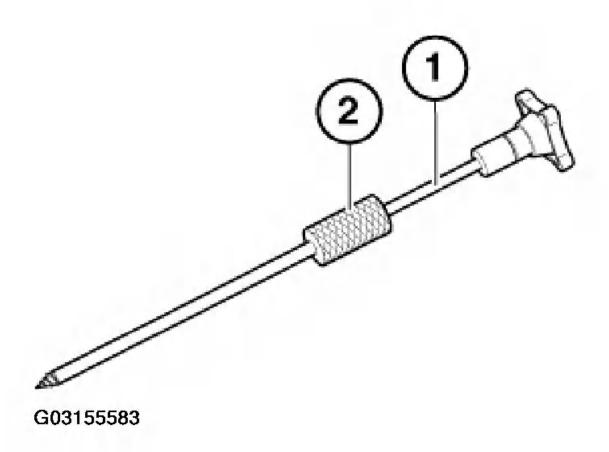


Fig. 19: Identifying Special Tools 23 0 490 Extractor Courtesy of BMW OF NORTH AMERICA, INC.

23 1 000 FIXTURE

ORDER NUMBER: 23 1 000 SPECIAL TOOL SPECIFICATION

| | ECIAL TOOL SPECIFICATION |
|-------------------|---|
| Note: | For pressing-on transmission casing and deep |
| | groove ball bearing on transmission input shaft and |
| | in transmission casing |
| Transmission: | 240/5, 242/4, 245/5, 245/5Sport, 260/5, 262/4, |
| | 265/5, 265/5Sport, 280/5Sport, 3 HP 12, 3 HP 20, 3 |
| | HP 22, 4 HP 22, 4 HP 24, A4S 270R, A4S 310R, |
| | A5S 300J, A5S 310Z, A5S 440Z, A5S 560Z, BW |
| | 65, S5D 260Z |
| Storage location: | C15, C16 |
| Order number: | 23 1 000 |
| Â | Fixture |
| Consisting of: | Â |
| 1 = 23 1 001 | Sleeve |
| 2 = 23 1 002 | Dowel pin (2 x) |
| 3 = 23 1 003 | Thrust piece, long |
| 4 = 23 1 004 | Thrust piece, short |
| 5 = 23 1 005 | Handle |
| 7 = 23 1 007 | Thrust piece for Getrag transmissions |

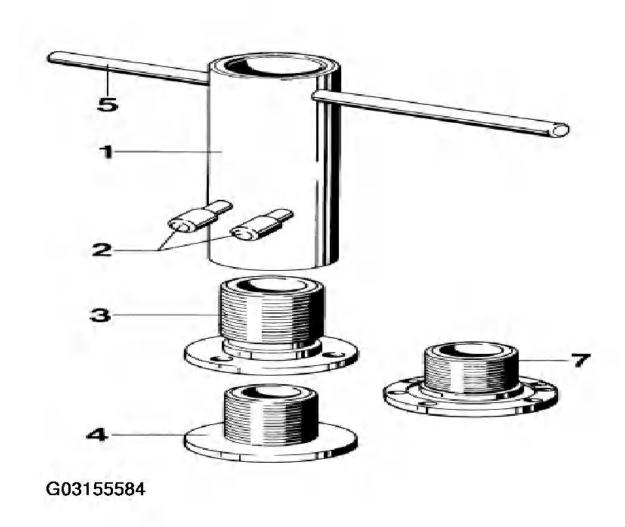


Fig. 20: Identifying Special Tools 23 1 000 Fixture Courtesy of BMW OF NORTH AMERICA, INC.

23 1 010 FIXTURE FOR REMOVING REAR SECTION OF TRANSMISSION CASING

ORDER NUMBER: 23 1 010 SPECIAL TOOL SPECIFICATION

| Transmission: | 280/5 Sport |
|---------------|---|
| Order number: | 23 1 010 |
| Â | Fixture for removing rear section of transmission |
| | casing |

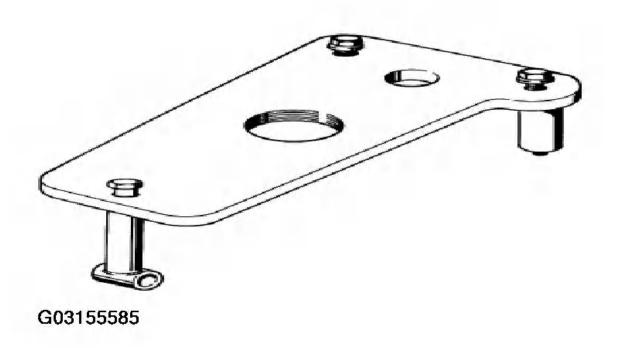


Fig. 21: Identifying Special Tools 23 1 010 Fixture For Removing Rear Section Of Transmission Casing Courtesy of BMW OF NORTH AMERICA, INC.

23 1 020 FIXTURE FOR REMOVING TRANSMISSION CASING (FRONT AND REAR SECTION)

ORDER NUMBER: 23 1 020 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 33 1 301 |
|----------------------|---|
| Transmission: | 245/5 Sport |
| Storage location: | C32 |
| Order number: | 23 1 020 |
| Â | Fixture for removing transmission casing (front and |
| | rear section) |

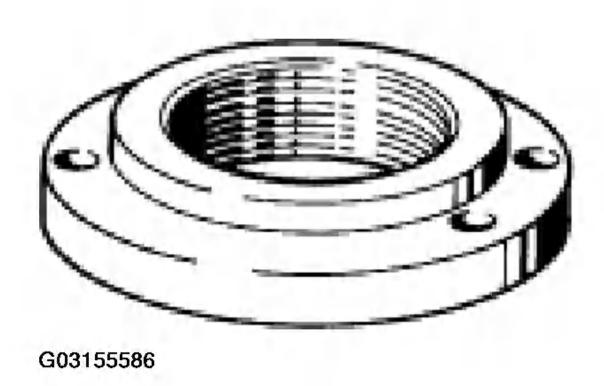


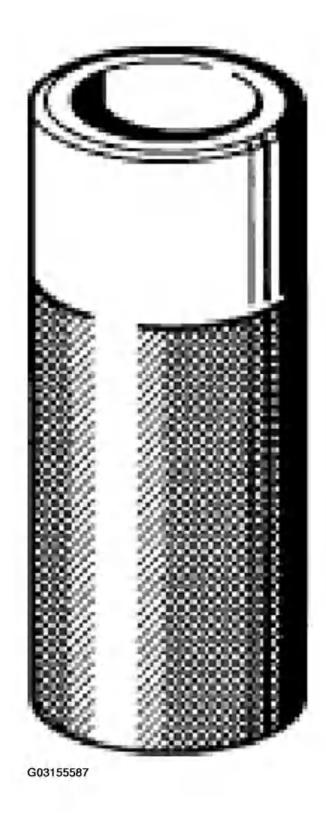
Fig. 22: Identifying Special Tools 23 1 020 Fixture For Removing Transmission Casing (Front And Rear Section)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 030 DRIFT FOR FITTING INNER BEARING RACE ON COUNTERSHAFT

ORDER NUMBER: 23 1 030 SPECIAL TOOL SPECIFICATION

| Transmission: | 245/5, 265/5 |
|-------------------|--|
| Storage location: | C22 |
| Order number: | 23 1 030 |
| Â | Drift for fitting inner bearing race on countershaft |



<u>Fig. 23: Identifying Special Tools 23 1 030 Drift For Fitting Inner Bearing Race On Countershaft</u> Courtesy of BMW OF NORTH AMERICA, INC.

23 1 040 DRIFT

ORDER NUMBER: 23 1 040 SPECIAL TOOL SPECIFICATION

| ORDER NUMBER. 25 1 040 SI ECIAL TOOL SI ECITICATION | |
|---|---|
| Note: | For mounting sliding section (5th gear) and driving |
| | water pipe out of crankcase Engine: N73 |
| Transmission: | 245/5Sport, S5D 200G, S5D 250G |
| Storage location: | C23 |
| Order number: | 23 1 040 |
| | |

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Drift



<u>Fig. 24: Identifying Special Tools 23 1 040 Drift</u> Courtesy of BMW OF NORTH AMERICA, INC.

23 1 050 PULLER (KUKKO)

ORDER NUMBER: 23 1 050 SPECIAL TOOL SPECIFICATION

| Note: | For 5th gear as well as reverse gear wheel |
|---------------|---|
| Transmission: | 240/5, 245/5, 260/5, 265/5Sport, 280/5Sport, ZF S5- |
| | 16 |
| Order number: | 23 1 050 |

| Â | Puller (Kukko) |
|----------------|--------------------|
| Consisting of: | Â |
| 1 = 23 1 051 | Link (Kukko 20-20) |

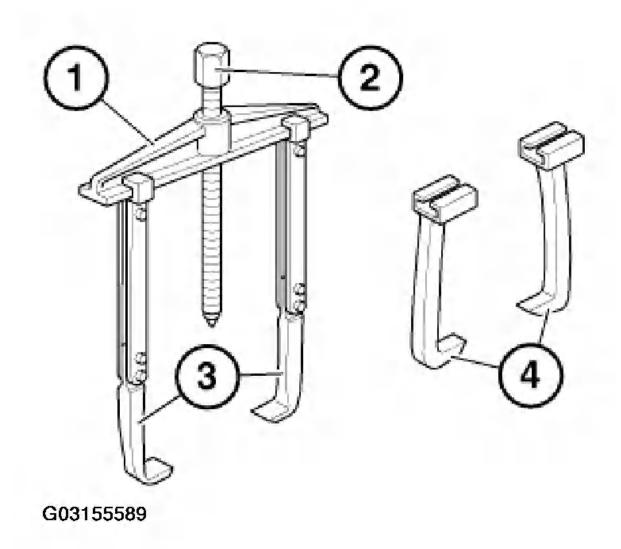


Fig. 25: Identifying Special Tools 23 1 050 Puller (Kukko) Courtesy of BMW OF NORTH AMERICA, INC.

23 1 060 FIXTURE

ORDER NUMBER: 23 1 060 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 33 1 301 |
|----------------------|--|
| Note: | For removing inner bearing race - reverse gear |
| | wheel |
| Transmission: | 245/5, 265/5 Sport |
| Storage location: | B20 |
| Order number: | 23 1 060 |
| Â | Fixture |
| Consisting of: | Â |
| 1 = 23 1 061 | Shells (2) |
| 2 = 23 1 062 | Threaded ring |
| 3 = 23 1 063 | Holding sleeve |

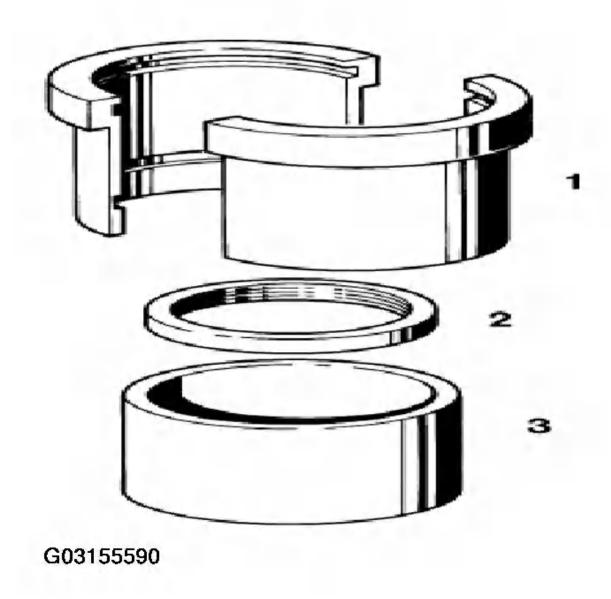


Fig. 26: Identifying Special Tools 23 1 060 Fixture Courtesy of BMW OF NORTH AMERICA, INC.

23 1 070 MEASURING RING

ORDER NUMBER: 23 1 070 SPECIAL TOOL SPECIFICATION

| Note: | For determining shim ring between outer bearing race and circlip of countershaft |
|-------------------|--|
| Transmission: | 245/5 |
| Storage location: | B28 |
| Order number: | 23 1 070 |
| Â | Measuring ring |



Fig. 27: Identifying Special Tools 23 1 070 Measuring Ring Courtesy of BMW OF NORTH AMERICA, INC.

23 1 080 DRIFT

ORDER NUMBER: 23 1 080 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 5 500 |
|----------------------|--|
| Note: | For removing and installing outer bearing race in |
| | front section of transmission casing/center section |
| | of countershaft and of ball bearing in rear section of |
| | transmission casing, input shaft |
| Transmission: | 245/5, 265/5 |
| Storage location: | A28 |
| Order number: | 23 1 080 |
| Â | Drift |

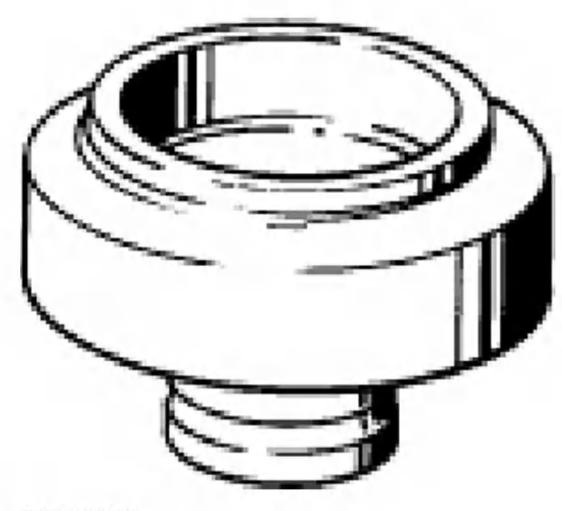
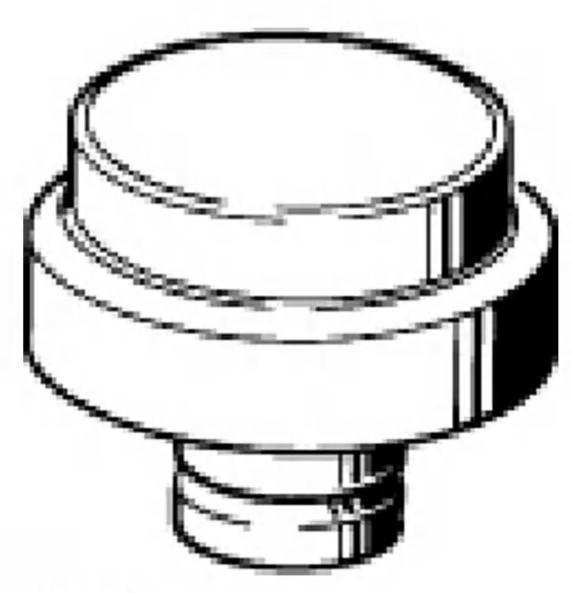


Fig. 28: Identifying Special Tools 23 1 080 Drift Courtesy of BMW OF NORTH AMERICA, INC.

23 1 090 DRIFT

ORDER NUMBER: 23 1 090 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 5 500 |
|----------------------|---|
| Note: | For removing and installing outer bearing race of input shaft in front section of transmission casing |
| Transmission: | 245/5, 265/5, GS5-65BH |
| Storage location: | A28 |
| Order number: | 23 1 090 |
| Â | Drift |



<u>Fig. 29: Identifying Special Tools 23 1 090 Drift</u> Courtesy of BMW OF NORTH AMERICA, INC.

23 1 100 PULLER CLAWS

ORDER NUMBER: 23 1 100 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 7 500 |
|----------------------|--------------------------|
| Note: | For speedometer gear |
| Transmission: | 245/5, 265/5, 280/5Sport |
| Storage location: | B29 |
| Order number: | 23 1 100 |
| Â | Puller claws |

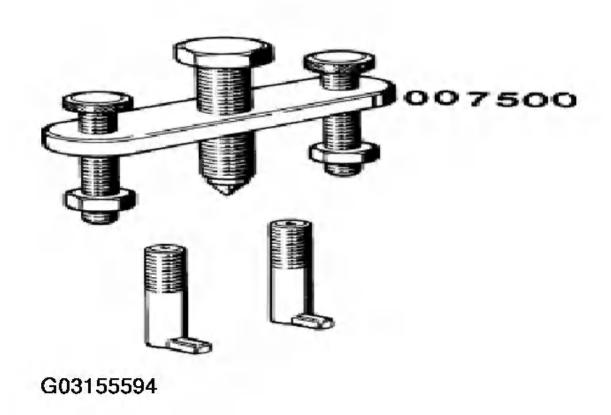


Fig. 30: Identifying Special Tools 23 1 100 Puller Claws Courtesy of BMW OF NORTH AMERICA, INC.

23 1 110 DRIFT

ORDER NUMBER: 23 1 110 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 5 500 |
|----------------------|--|
| Note: | For installing bearing of output shaft in rear section |
| | of transmission casing |
| Transmission: | 245/5 |
| Storage location: | A28 |
| Order number: | 23 1 110 |
| Â | Drift |

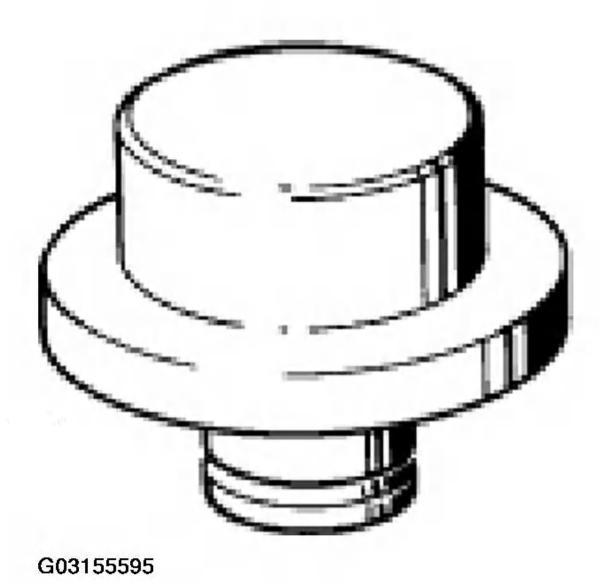


Fig. 31: Identifying Special Tools 23 1 110 Drift Courtesy of BMW OF NORTH AMERICA, INC.

23 1 120 DRIFT

ORDER NUMBER: 23 1 120 SPECIAL TOOL SPECIFICATION

| ORDER NOMBER. 25 1 120 St Echte 1 0 0 E St Echt 101111011 | |
|---|--|
| In conjunction with: | 00 5 500 |
| Note: | For removing outer bearing race of countershaft in |
| | center section of transmission casing |
| Transmission: | 240/5, 245/5, 260/5, 280/5Sport, ZF S5-16 |
| Storage location: | A29 |
| Order number: | 23 1 120 |
| Â | Drift |

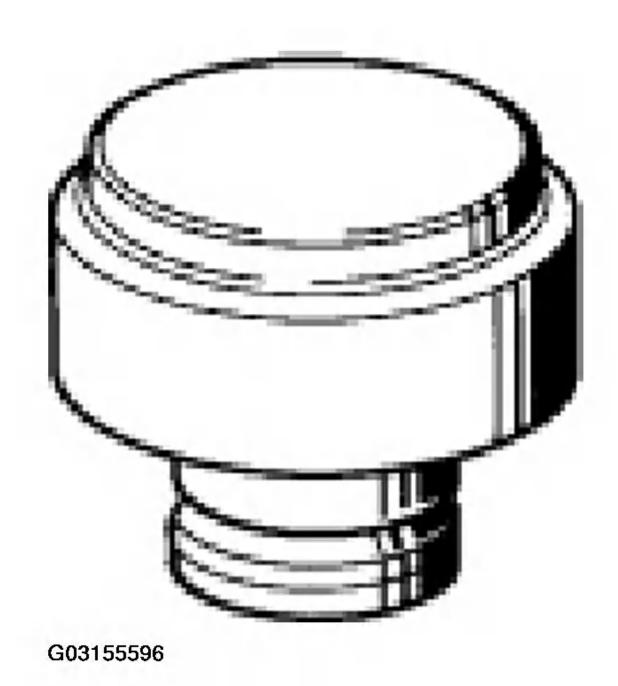
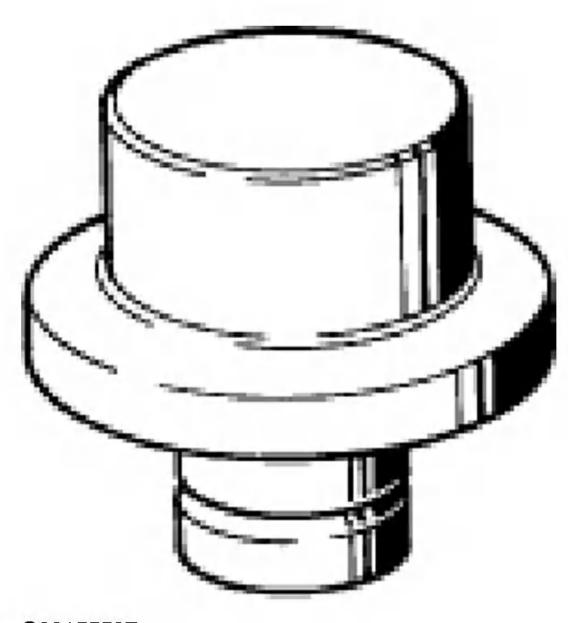


Fig. 32: Identifying Special Tools 23 1 120 Drift Courtesy of BMW OF NORTH AMERICA, INC.

23 1 130 DRIFT

ORDER NUMBER: 23 1 130 SPECIAL TOOL SPECIFICATION

| ORDER NOMBER: 23 1 130 St Ectric 100E St Ectric 1010 | |
|--|--|
| Note: | For removing bearing of input shaft and roller |
| | bearing in center section of transmission casing |
| Transmission: | 245/5, 280/5Sport |
| Storage location: | A29 |
| Order number: | 23 1 130 |
| Â | Drift |



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Fig. 33: Identifying Special Tools 23 1 130 Drift Courtesy of BMW OF NORTH AMERICA, INC.

23 1 160 DRIFT

ORDER NUMBER: 23 1 160 SPECIAL TOOL SPECIFICATION

| Note: | For fitting inner bearing race and bearing sleeve on output shaft (245) - fitting slide (5th gear - 265/5) - mounting output flange - mounting bearing on countershaft (S5D 310Z) - mounting center bearing on propeller shaft, E46 |
|-------------------|---|
| Series: | E36, E38, E46, E65, E85, E87, E90 |
| Transmission: | 242/4, 245/5, 265/5, 280/5Sport, A5S 310Z, S5D 260Z, S5D 310Z, S5D 320Z |
| Storage location: | C22, C23 |

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| Order number: | 23 1 160 |
|---------------|----------|
| Â | Drift |



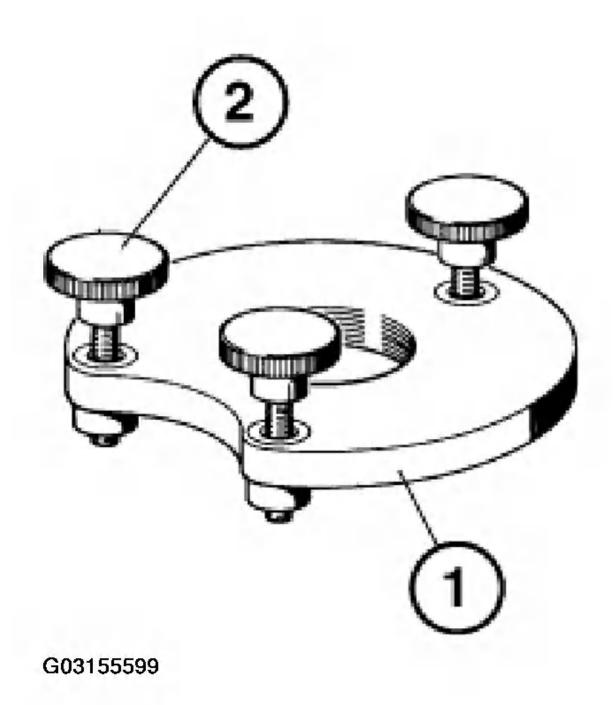
Fig. 34: Identifying Special Tools 23 1 160 Drift Courtesy of BMW OF NORTH AMERICA, INC.

23 1 170 FIXTURE

ORDER NUMBER: 23 1 170 SPECIAL TOOL SPECIFICATION

| Note: | For removing front section of transmission casing |
|---------------|---|
| Transmission: | 265/5 |
| | |

| Order number: | 23 1 170 |
|----------------|-------------------|
| Â | Fixture |
| Consisting of: | Â |
| 1 = 23 1 171 | Plate |
| 2 = 23 1 172 | Knurled screw (3) |



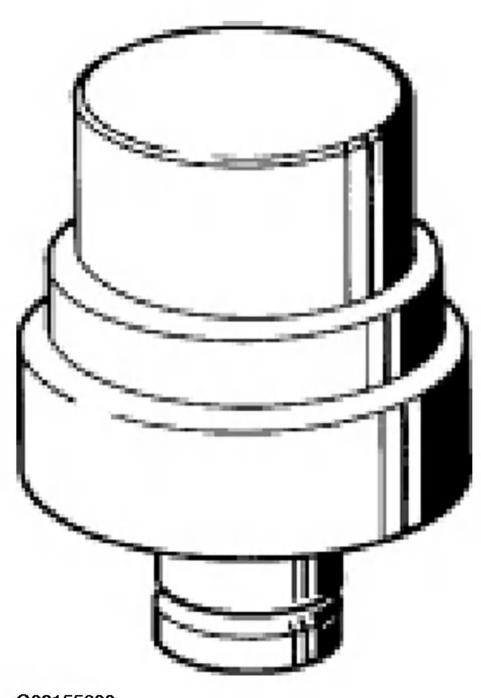
<u>Fig. 35: Identifying Special Tools 23 1 170 Fixture</u> Courtesy of BMW OF NORTH AMERICA, INC.

23 1 180 DRIFT

ORDER NUMBER: 23 1 180 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 0 500 |
|----------------------|---|
| Note: | For fitting rotary shaft seal in guide tube of clutch |
| 3921 of 4036 | |

| | release mechanism |
|-------------------|--------------------------------------|
| Transmission: | 260/5, 265/5, 265/5Sport, 280/5Sport |
| Storage location: | A29 |
| Order number: | 23 1 180 |
| Â | Drift |



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Fig. 36: Identifying Special Tools 23 1 180 Drift Courtesy of BMW OF NORTH AMERICA, INC.

23 1 190 DRIFT

ORDER NUMBER: 23 1 190 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 5 500 |
|----------------------|---|
| Note: | For removing and installing ball bearing of input |
| | shaft in front section of transmission casing |
| Transmission: | 265/5, 280/5 Sport |
| Order number: | 23 1 190 |
| Â | Drift |

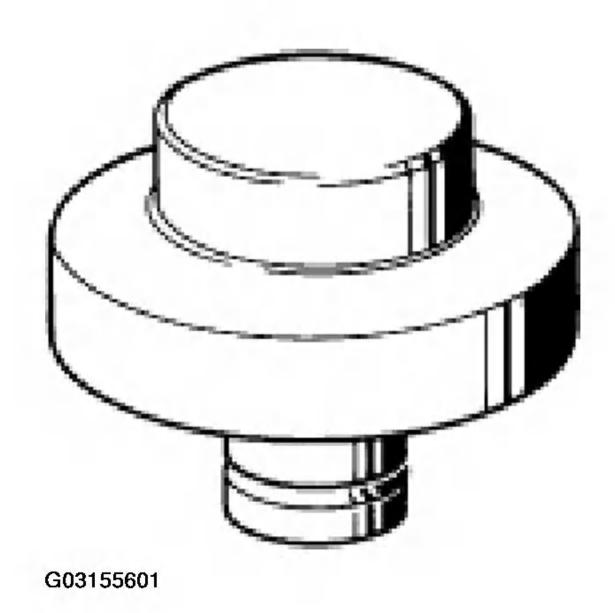


Fig. 37: Identifying Special Tools 23 1 190 Drift Courtesy of BMW OF NORTH AMERICA, INC.

23 1 200 GUIDE BUSH

ORDER NUMBER: 23 1 200 SPECIAL TOOL SPECIFICATION

| ORDER TOMBER. 25 1 200 STECHEL TO SE STECHTSTRICT | |
|---|---|
| In conjunction with: | 23 1 210 |
| Note: | For centering wrench socket when releasing and tightening transmission output flange and input flange of rear axle differential |
| | |

| Transmission: | 265/5 |
|-------------------|------------|
| Storage location: | B30 |
| Order number: | 23 1 200 |
| Â | Guide bush |

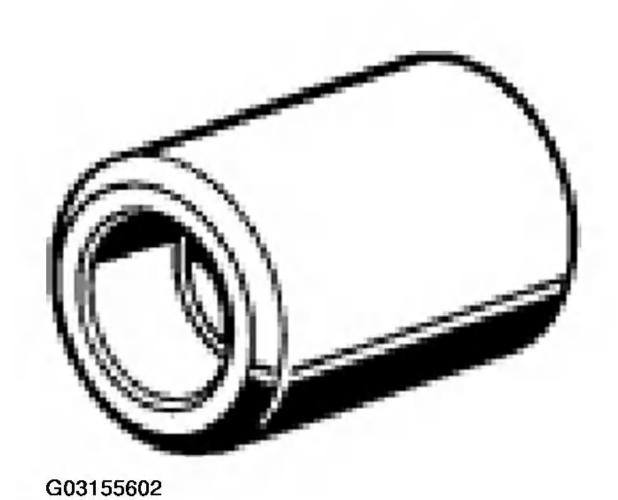
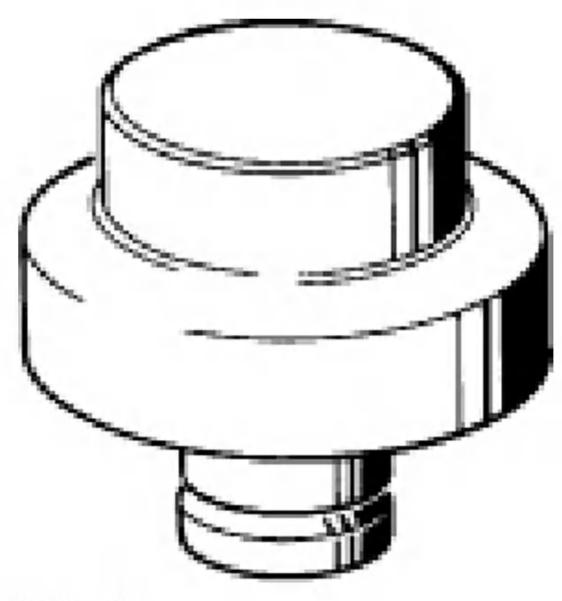


Fig. 38: Identifying Special Tools 23 1 200 Guide Bush Courtesy of BMW OF NORTH AMERICA, INC.

23 1 220 DRIFT

ORDER NUMBER: 23 1 220 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 5 500 |
|----------------------|---|
| Note: | For removing and installing roller bearing of countershaft shaft in front section of transmission |
| | casing |
| Transmission: | 260/5, 265/5, A5S 310Z |
| Storage location: | A29 |
| Order number: | 23 1 220 |
| Â | Drift |



G03155603

Fig. 39: Identifying Special Tools 23 1 220 Drift Courtesy of BMW OF NORTH AMERICA, INC.

23 1 230 SPINDLE (2)

ORDER NUMBER: 23 1 230 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 7 500 |
|----------------------|---|
| Note: | For removing inner bearing race from input shaft in |
| | front section of transmission casing |
| Transmission: | 265/5 |
| Order number: | 23 1 230 |
| Â | Spindle (2) |

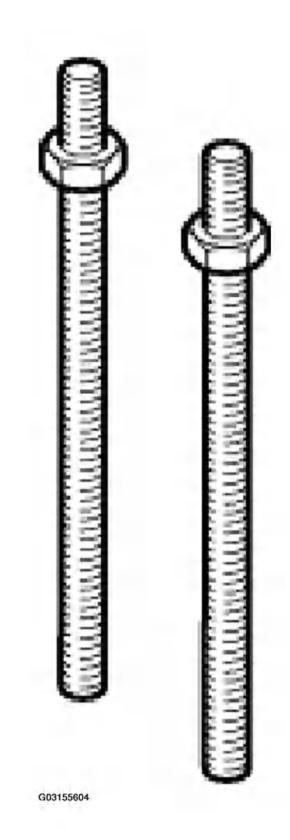


Fig. 40: Identifying Special Tools 23 1 230 Spindle (2) Courtesy of BMW OF NORTH AMERICA, INC.

23 1 270 DRIFT

ORDER NUMBER: 23 1 270 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 5 500 |
|----------------------|--|
| Note: | For removing outer bearing race on countershaft in front section of transmission casing as well as for removing seal and needle bearing from oil pump housing (A5S 560Z) |
| Transmission: | 240/5, 260/5, A5S 560Z |

| Storage location: | A29 |
|-------------------|----------|
| Order number: | 23 1 270 |
| Â | Drift |

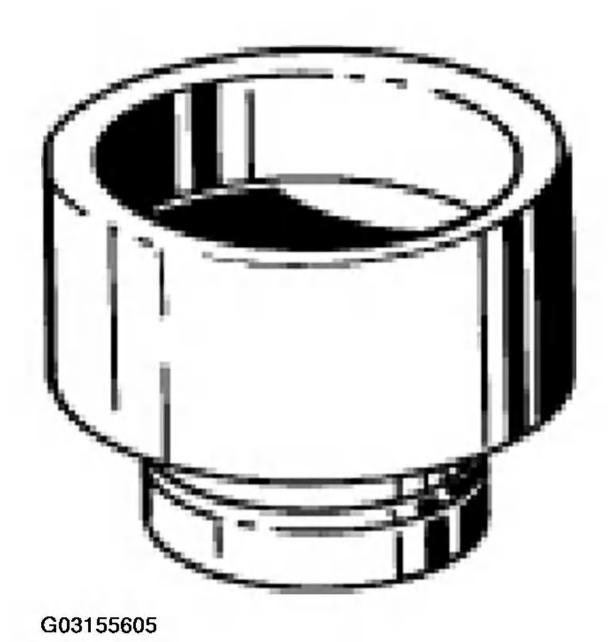


Fig. 41: Identifying Special Tools 23 1 270 Drift Courtesy of BMW OF NORTH AMERICA, INC.

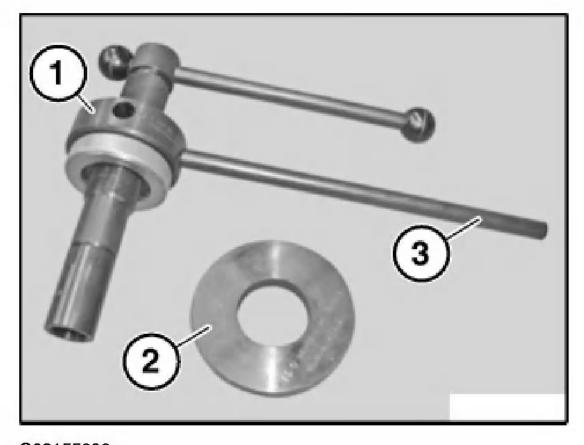
23 1 300 FIXTURE

Minimum set: Mechanical tools

ORDER NUMBER: 23 1 300 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 23 2 150 |
|----------------------|--|
| Note: | For fitting output flange on all manual and automatic transmissions, for installing deep groove ball bearing on transmission output shafts and for |

| | fitting input flange on all rear axle differentials |
|-------------------|---|
| Series: | E36, E36/2, E36/3, E36/5, E36/7, E36/C, E38, E39, |
| | E46, E52, E53, E61, E63, E64, E65, E66, E67, E83, |
| | E85, E87, E90, E91 |
| Transmission: | HAG 188kom, HAG 220kom, HAG 225kom, HAG |
| | Type G, HAG Type K, HAG Type M, S5D 200G, |
| | S5D 250G |
| Storage location: | B15, B16 |
| Order number: | 23 1 300 |
| Â | Fixture |
| Consisting of: | Â |
| 1 = 23 1 301 | Adapter |
| 2 = 23 1 302 | Support disk |
| Â | NOTE: |
| | For pressing drive flange onto rear |
| | differential |
| | |
| Â | In conjunction with: 33 1 341, 23 1 300 |
| 3 = 23 1 303 | Mandrel |

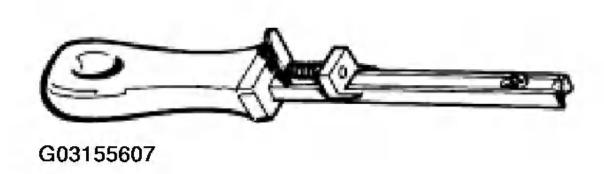


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Fig. 42: Identifying Special Tools 23 1 300 Fixture Courtesy of BMW OF NORTH AMERICA, INC.

ORDER NUMBER: 23 1 310 SPECIAL TOOL SPECIFICATION

| Note: | For fitting locking device on deflection lever |
|---------------|--|
| Transmission: | 280/5 Sport |
| Order number: | 23 1 310 |
| Â | Tool |



<u>Fig. 43: Identifying Special Tools 23 1 310 For Fitting Locking Device On Deflection Lever</u> Courtesy of BMW OF NORTH AMERICA, INC.

23 1 350 PULLER FIXTURE

ORDER NUMBER: 23 1 350 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 33 1 301 |
|----------------------|---|
| Note: | For rear section of transmission casing |
| Transmission: | 265/5 |
| Order number: | 23 1 350 |
| Â | Puller fixture |
| Consisting of: | Â |
| 1 = 23 1 351 | Plate |
| 2 = 23 1 352 | Screw, short (2) |
| 3 = 23 1 353 | Screw, long (2) |

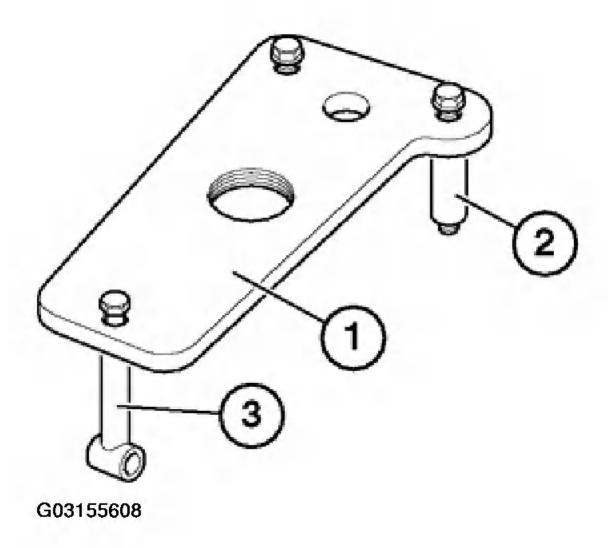


Fig. 44: Identifying Special Tools 23 1 350 Puller Fixture Courtesy of BMW OF NORTH AMERICA, INC.

23 1 360 DRIFT

ORDER NUMBER: 23 1 360 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 5 500 |
|----------------------|---|
| Note: | For fitting rotary shaft seal on transmission input |
| | shaft |
| Transmission: | 240/5, 245/5, 262/4, ZF S5-16 |
| Storage location: | A35 |
| Order number: | 23 1 360 |
| Â | Drift |

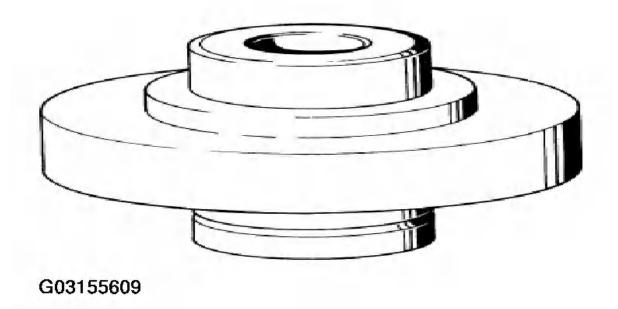


Fig. 45: Identifying Special Tools 23 1 360 Drift Courtesy of BMW OF NORTH AMERICA, INC.

23 1 370 DRIFT

ORDER NUMBER: 23 1 370 SPECIAL TOOL SPECIFICATION

| Note: | For fitting rotary shaft seals on transmission output |
|-------------------|---|
| | flanges |
| Transmission: | 242/4, 262/4, 265/5, 265/5Sport |
| Storage location: | B28 |
| Order number: | 23 1 370 |
| Â | Drift |

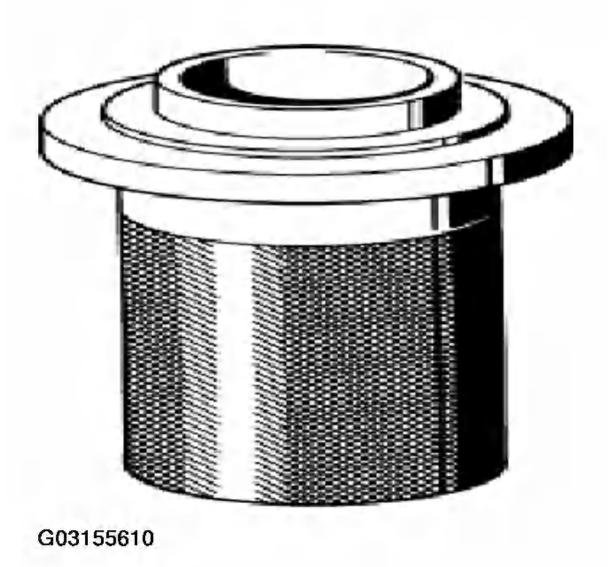
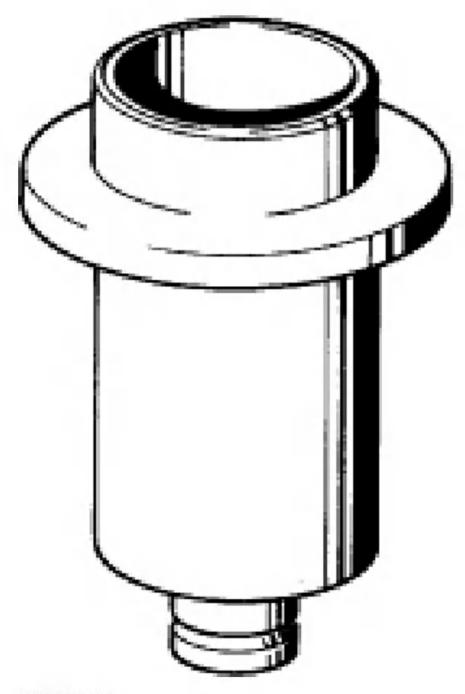


Fig. 46: Identifying Special Tools 23 1 370 Drift Courtesy of BMW OF NORTH AMERICA, INC.

23 1 380 DRIFT

ORDER NUMBER: 23 1 380 SPECIAL TOOL SPECIFICATION

| 00 0 500 | |
|--|--|
| For installing roller bearing of countershaft shaft in | |
| rear section of transmission casing | |
| 240/5, 245/5, 260/5, 280/5Sport | |
| B30 | |
| 23 1 380 | |
| Drift | |
| | |



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Fig. 47: Identifying Special Tools 23 1 380 Drift Courtesy of BMW OF NORTH AMERICA, INC.

23 1 390 DRIFT

ORDER NUMBER: 23 1 390 SPECIAL TOOL SPECIFICATION

| ORDER NOMBER: 25 1 570 SI ECIRE 100E SI ECH ICATION | |
|---|--|
| In conjunction with: | 00 5 500 |
| Note: | For installing roller bearing of countershaft shaft in |
| | rear section of transmission casing |
| Transmission: | 265/5, 280/5 Sport |
| Storage location: | A29 |
| | |

I 3933 of 4036

| Order number: | 23 1 390 |
|---------------|----------|
| Â | Drift |

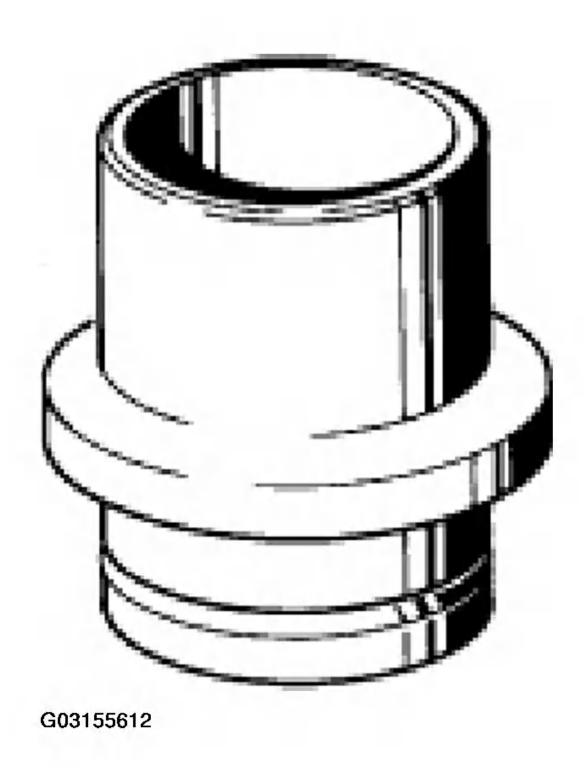


Fig. 48: Identifying Special Tools 23 1 390 Drift Courtesy of BMW OF NORTH AMERICA, INC.

23 1 400 FIXTURE

ORDER NUMBER: 23 1 400 SPECIAL TOOL SPECIFICATION

| Note: | For fitting rotary shaft seal in bush of speedometer |
|---------------|--|
| | pinion |
| Transmission: | 242/4, 262/4 |

| Order number: | 23 1 400 |
|----------------|---------------|
| Â | Fixture |
| Consisting of: | Â |
| 1 = 23 1 401 | Fitting shaft |
| 2 = 23 1 402 | Radial plug |
| 3 = 23 1 403 | Union sleeve |

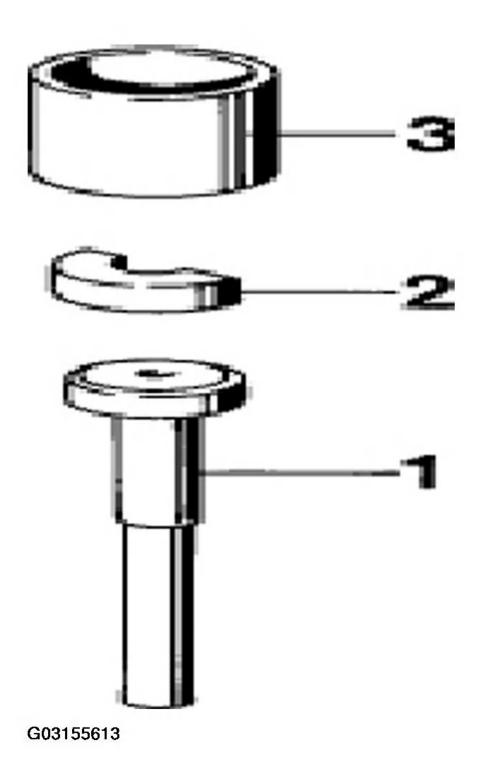


Fig. 49: Identifying Special Tools 23 1 400 Fixture Courtesy of BMW OF NORTH AMERICA, INC.

23 1 410 DRIFT

ORDER NUMBER: 23 1 410 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 5 500 |
|----------------------|---|
| Note: | For fitting ball bearing of output shaft in rear section of transmission casing and roller bearing of output shaft in center section of transmission casing |
| Transmission: | 260/5, 265/5 |
| Storage location: | A29 |
| Order number: | 23 1 410 |
| Â | Drift |

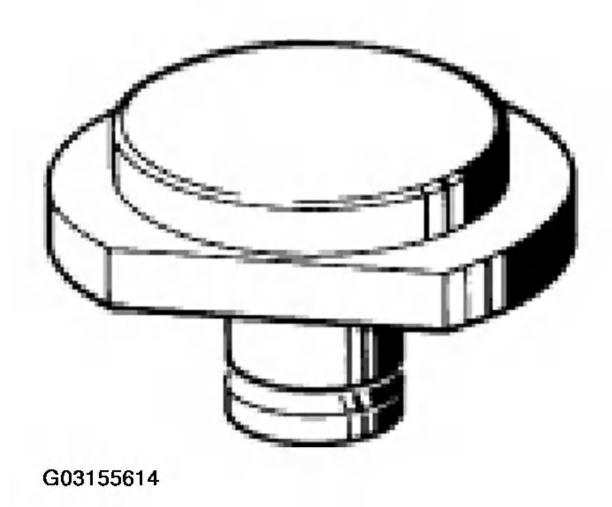


Fig. 50: Identifying Special Tools 23 1 410 Drift Courtesy of BMW OF NORTH AMERICA, INC.

23 1 420 FIXTURE

ORDER NUMBER: 23 1 420 SPECIAL TOOL SPECIFICATION

| ORDER NOMBER: 23 1 120 St Ective 1002 St Ecti 10/11/10/1 | |
|--|-------------------------------|
| In conjunction with: | 33 1 301 |
| Note: | For removing slide (5th gear) |
| Transmission: | 265/5 |
| Storage location: | C31 |
| Order number: | 23 1 420 |
| Â | Fixture |
| | |

| Consisting of: | Â |
|----------------|----------------|
| 23 1 421 | Clamping screw |

Fig. 51: Identifying Special Tools 23 1 420 Fixture

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 430 THRUST PIECE

ORDER NUMBER: 23 1 430 SPECIAL TOOL SPECIFICATION

| Note: | For fitting 5th gear wheel |
|-------------------|----------------------------|
| Transmission: | 265/5, 280/5 Sport |
| Storage location: | A35 |
| Order number: | 23 1 430 |
| Â | Thrust piece |

Fig. 52: Identifying Special Tools 23 1 430 Thrust Piece

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 440 HOLDING SLEEVE

ORDER NUMBER: 23 1 440 SPECIAL TOOL SPECIFICATION

| Note: | For fitting bearing bush and inner bearing race on |
|-------------------|--|
| | output shaft as well as for removing bearing on |
| | output shaft (S5D 310Z) |
| Transmission: | 265/5, 265/5Sport, 280/5Sport, S5D 310Z |
| Storage location: | C22, C23 |
| Order number: | 23 1 440 |
| Â | Holding sleeve |

Fig. 53: Identifying Special Tools 23 1 440 Holding Sleeve

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 450 GUIDE PINS (2 X)

ORDER NUMBER: 23 1 450 SPECIAL TOOL SPECIFICATION

| Note: | For fitting bearing bush in locking device of guide |
|-------------------|---|
| | sleeve |
| Transmission: | 245/5, 265/5 |
| Storage location: | C3 |
| Order number: | 23 1 450 |
| Â | Guide pins (2 x) |

Fig. 54: Identifying Special Tools 23 1 450 Guide Pins (2 X)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 460 PULLER PLATE

ORDER NUMBER: 23 1 460 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 33 1 301 |
|----------------------|--|
| Note: | For front section of transmission casing |
| | |

| Transmission: | 260/5, 280/5Sport, ZF S5-16 |
|-------------------|-----------------------------|
| Storage location: | A27 |
| Order number: | 23 1 460 |
| Â | Puller plate |

Fig. 55: Identifying Special Tools 23 1 460 Puller Plate

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 480 DRIFT

ORDER NUMBER: 23 1 480 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 5 500 |
|----------------------|---|
| Note: | For removing and installing deep groove ball |
| | bearing in front section of transmission casing |
| Transmission: | 240/5, 242/4, 260/5, 280/5Sport |
| Storage location: | A29 |
| Order number: | 23 1 480 |
| Â | Drift |

Fig. 56: Identifying Special Tools 23 1 480 Drift

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 490 FIXTURE

ORDER NUMBER: 23 1 490 SPECIAL TOOL SPECIFICATION

| Note: | For removing gear wheels |
|----------------|--|
| Transmission: | 240/5, 260/5, 280/5Sport, S5D 200G, ZF S5-16 |
| Order number: | 23 1 490 |
| Â | Fixture |
| Consisting of: | Â |
| 23 1 491 | Spacer |

Fig. 57: Identifying Special Tools 23 1 490 Fixture

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 000 RILLEX BALL BEARING EXTRACTOR 6206

ORDER NUMBER: 23 2 000 SPECIAL TOOL SPECIFICATION

| Note: | 9 balls with steel cage - for removing deep groove ball bearing of transmission input shaft |
|----------------|---|
| Order number: | 23 2 000 |
| Â | Rillex ball bearing extractor 6206 |
| Consisting of: | Â |
| 1 = 23 2 001 | Claw for Rillex 6206 (9 x) |
| 2 = 23 2 002 | Union sleeve |
| 3 = 23 2 003 | Pressure spindle |

Fig. 58: Identifying Special Tools 23 2 000 Rillex Ball Bearing Extractor 6206

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 010 RILLEX BALL BEARING EXTRACTOR 6206 E

ORDER NUMBER: 23 2 010 SPECIAL TOOL SPECIFICATION

| Note: | 8 balls with plastic cage - for removing deep groove ball bearing of transmission input shaft |
|----------------|---|
| Transmission: | 242/4, 245/5Sport, 265/5 |
| Order number: | 23 2 010 |
| Â | Rillex ball bearing extractor 6206 E |
| Consisting of: | Â |
| 1 = 23 2 011 | Claw for Rillex 6206 E (8) |
| 2 = 23 2 012 | Union sleeve |
| 3 = 23 2 013 | Pressure spindle |

Fig. 59: Identifying Special Tools 23 2 010 Rillex Ball Bearing Extractor 6206 E Courtesy of BMW OF NORTH AMERICA, INC.

23 2 020 RILLEX BALL BEARING EXTRACTOR

ORDER NUMBER: 23 2 020 SPECIAL TOOL SPECIFICATION

| Note: | 7 balls - for removing deep groove ball bearing of |
|----------------|--|
| | transmission input shaft |
| Transmission: | 245/5 Sport, 265/5 Sport |
| Order number: | 23 2 020 |
| Â | Rillex ball bearing extractor |
| Consisting of: | Â |
| 1 = 23 2 021 | Claw for Rillex (7) |
| 2 = 23 2 022 | Union sleeve |
| 3 = 23 2 023 | Pressure spindle |

Fig. 60: Identifying Special Tools 23 2 020 Rillex Ball Bearing Extractor Courtesy of BMW OF NORTH AMERICA, INC.

23 2 050 RILLEX BALL BEARING EXTRACTOR 6205

ORDER NUMBER: 23 2 050 SPECIAL TOOL SPECIFICATION

| Note: | For removing deep groove ball bearing of |
|----------------|---|
| | transmission countershaft and transmission output |
| | shaft |
| Transmission: | 245/5 Sport, 262/4, 265/5 Sport |
| Order number: | 23 2 050 |
| Â | Rillex ball bearing extractor 6205 |
| Consisting of: | Â |
| 1 = 23 2 051 | Claw for Rillex 6305 (8) |
| 2 = 23 2 052 | Union sleeve |
| 3 = 23 2 053 | Pressure spindle |

Fig. 61: Identifying Special Tools 23 2 050 Rillex Ball Bearing Extractor 6205 Courtesy of BMW OF NORTH AMERICA, INC.

23 2 060 RILLEX BALL BEARING EXTRACTOR 6306

ORDER NUMBER: 23 2 060 SPECIAL TOOL SPECIFICATION

| Note: | For removing deep groove ball bearing of input and |
|----------------|--|
| | output shaft |
| Transmission: | 242/4, 262/4 |
| Order number: | 23 2 060 |
| Â | Rillex ball bearing extractor 6306 |
| Consisting of: | Â |
| 1 = 23 2 061 | Claw for Rillex 6306 (8) |
| 2 = 23 2 062 | Union sleeve |
| 3 = 23 2 063 | Pressure spindle |

Fig. 62: Identifying Special Tools 23 2 060 Rillex Ball Bearing Extractor 6306 Courtesy of BMW OF NORTH AMERICA, INC.

23 2 080 ADAPTER

ORDER NUMBER: 23 2 080 SPECIAL TOOL SPECIFICATION

| Note: | For removing guide sleeve - 2nd/3rd gear |
|-------------------|--|
| Transmission: | 260/5 |
| Storage location: | C21 |
| Order number: | 23 2 080 |
| Â | Adapter |

Fig. 63: Identifying Special Tools 23 2 080 Adapter Courtesy of BMW OF NORTH AMERICA, INC.

23 2 100 PLIERS

ORDER NUMBER: 23 2 100 SPECIAL TOOL SPECIFICATION

| Note: | For removing and installing circlip on transmission |
|---------------|---|
| | output shaft |
| Transmission: | 240/5, 242/4, 245/5, 245/5Sport, 260/5, 262/4, |
| | 265/5, 265/5Sport, 280/5Sport, 3 HP 12, 3 HP 20, 3 |
| | HP 22, 4 HP 22, 4 HP 24, A4S 270R, A4S 310R, |
| | A5S 300J, A5S 310Z, A5S 440Z, A5S 560Z, BW |
| | 65, S5D 200G, S5D 250G, S5D 260Z, S5D 310Z, |
| | S6S 420G, S6S 560G, ZF S5-16 |
| Order number: | 23 2 100 |
| Â | Pliers |

Fig. 64: Identifying Special Tools 23 2 100 Pliers Courtesy of BMW OF NORTH AMERICA, INC.

23 2 150 PRESSURE SLEEVE

ORDER NUMBER: 23 2 150 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 23 1 300 |
|----------------------|--|
| Note: | For fitting deep groove ball bearing of transmission output shaft (260/5, 245/5), for fitting front tapered roller bearing on drive pinion in all rear axle differentials as well as for mounting cover of |

| | countershaft (S5D 310Z) |
|-------------------|--|
| Transmission: | 245/5Sport, 260/5, S5D 260Z, S5D 310Z, S5D |
| | 320Z |
| Storage location: | B29 |
| Order number: | 23 2 150 |
| Â | Pressure sleeve |

Fig. 65: Identifying Special Tools 23 2 150 Pressure Sleeve

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 160 IMPACT BUSH

ORDER NUMBER: 23 2 160 SPECIAL TOOL SPECIFICATION

| Note: | For rotary shaft seal in rear section of transmission |
|-------------------|---|
| | housing - output shaft |
| Transmission: | 280/5Sport, ZF S5-16 |
| Storage location: | B28 |
| Order number: | 23 2 160 |
| Â | Impact bush |

Fig. 66: Identifying Special Tools 23 2 160 Impact Bush

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 170 FIXTURE

ORDER NUMBER: 23 2 170 SPECIAL TOOL SPECIFICATION

| Note: | For tensioning transmission leaf spring |
|---------------|---|
| Transmission: | ZF S5-16 |
| Order number: | 23 2 170 |
| Â | Fixture |

Fig. 67: Identifying Special Tools 23 2 170 Fixture

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 180 GUIDE BUSH

ORDER NUMBER: 23 2 180 SPECIAL TOOL SPECIFICATION

| Note: | For mounting front section of transmission casing |
|---------------|---|
| | on selector shaft |
| Transmission: | ZF S5-16 |
| Order number: | 23 2 180 |
| Â | Guide bush |

Fig. 68: Identifying Special Tools 23 2 180 Guide Bush

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 200 CIRCLIP PLIERS (STRAIGHT)

ORDER NUMBER: 23.2.200 SPECIAL TOOL SPECIFICATION

| ORDER TOWNDER, 25 2 200 St Editie To 02 St Edit Territor, | |
|---|--|
| Note: | For removing and installing external circlips on |
| | |

| | transmission shafts |
|---------------|--|
| Transmission: | 240/5, 242/4, 245/5, 245/5Sport, 260/5, 262/4, |
| | 265/5, 265/5Sport, 280/5Sport, 3 HP 12, 3 HP 20, 3 |
| | HP 22, 4 HP 22, 4 HP 24, A4S 270R, A4S 310R, |
| | A5S 300J, A5S 310Z, A5S 440Z, A5S 560Z, BW |
| | 65, S5D 200G, S5D 250G, S5D 260Z, S5D 310Z, |
| | S6S 420G, S6S 560G, ZF S5-16 |
| Order number: | 23 2 200 |
| Â | Circlip pliers (straight) |

Fig. 69: Identifying Special Tools 23 2 200 Circlip Pliers (Straight) Courtesy of BMW OF NORTH AMERICA, INC.

23 2 210 CIRCLIP PLIERS (STRAIGHT)

ORDER NUMBER: 23 2 210 SPECIAL TOOL SPECIFICATION

| | ORDER TOWNSER. 25 2 210 ST BOTTE TO 02 ST BOTT FORTHOR | |
|---------------|--|--|
| | For removing and installing internal circlips in | |
| Note: | transmission casings when replacing deep groove | |
| | ball bearings | |
| | 240/5, 242/4, 245/5, 245/5Sport, 260/5, 262/4, | |
| | 265/5, 265/5Sport, 280/5Sport, 3 HP 12, 3 HP 20, 3 | |
| Transmission: | HP 22, 4 HP 22, 4 HP 24, A4S 270R, A4S 310R, | |
| Transmission. | A5S 300J, A5S 310Z, A5S 440Z, A5S 560Z, BW | |
| | 65, S5D 200G, S5D 250G, S5D 260Z, S5D 310Z, | |
| | S6S 420G, S6S 560G, ZF S5-16 | |
| Order number: | 23 2 210 | |
| Â | Circlip pliers (straight) | |

Fig. 70: Identifying Special Tools 23 2 210 Circlip Pliers (Straight) Courtesy of BMW OF NORTH AMERICA, INC.

23 2 220 DRIFT

ORDER NUMBER: 23 2 220 SPECIAL TOOL SPECIFICATION

| Note: | For bearing of countershaft shaft in front and rear |
|---------------|---|
| Thore. | section of transmission casing |
| Transmission: | ZF S5-16 |
| Order number: | 23 2 220 |
| Â | Drift |

Fig. 71: Identifying Special Tools 23 2 220 Drift Courtesy of BMW OF NORTH AMERICA, INC.

23 2 230 DISC

ORDER NUMBER: 23 2 230 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 7 500 |
|----------------------|--|
| Note: | For removing guide sleeve from gear wheel or output shaft with toothed lock washer |
| Transmission: | 280/5 Sport |
| Order number: | 23 2 230 |
| Â | Disc |

Fig. 72: Identifying Special Tools 23 2 230 Disc

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 250 BRACKET

ORDER NUMBER: 23 2 250 SPECIAL TOOL SPECIFICATION

| Note: | For tensioning main shaft to countershaft |
|-------------------|---|
| Transmission: | S5D 310Z |
| Storage location: | C20, C24 |
| SI number: | 1 07 90(244) |
| Order number: | 23 2 250 |
| Â | Bracket |

Fig. 73: Identifying Special Tools 23 2 250 Bracket

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 260 INSTALLATION DRIFT

Minimum set: Mechanical tools

ORDER NUMBER: 23 2 260 SPECIAL TOOL SPECIFICATION

| Note: | For fitting rotary shaft seal on selector shaft of rear |
|-------------------|---|
| | section of transmission casing |
| Transmission: | S5D 310Z |
| Storage location: | A20 |
| SI number: | 1 07 90(244) |
| Order number: | 23 2 260 |
| Â | Installation drift |

Fig. 74: Identifying Special Tools 23 2 260 Installation Drift

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 270 FIXTURE

ORDER NUMBER: 23 2 270 SPECIAL TOOL SPECIFICATION

| Note: | For centering selector shaft while mounting front |
|-------------------|---|
| inote. | section of transmission casing |
| Transmission: | S5D 310Z |
| Storage location: | C30 |
| SI number: | 1 07 90(244) |
| Order number: | 23 2 270 |
| Â | Fixture |

Fig. 75: Identifying Special Tools 23 2 270 Fixture

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 280 PULLER PLATE

ORDER NUMBER: 23 2 280 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 33 1 301 |
|----------------------|----------|
| | |

| Note: | For front section of transmission casing |
|-------------------|--|
| Transmission: | S5D 310Z |
| Storage location: | C31 |
| SI number: | 1 07 90(244) |
| Order number: | 23 2 280 |
| Â | Puller plate |

Fig. 76: Identifying Special Tools 23 2 280 Puller Plate

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 290 FIXTURE

ORDER NUMBER: 23 2 290 SPECIAL TOOL SPECIFICATION

| Note: | For mounting front section of transmission casing |
|-------------------|---|
| Transmission: | S5D 310Z |
| Storage location: | C18 |
| SI number: | 1 07 90(244) |
| Order number: | 23 2 290 |
| Â | Fixture |
| Consisting of: | Â |
| 1 = 23 2 291 | Base frame |
| 2 = 23 2 292 | Support |
| 3 = 23 2 293 | Ring |
| 4 = 23 2 294 | Set of shells |

Fig. 77: Identifying Special Tools 23 2 290 Fixture

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 300 DRIFT

Minimum set: Mechanical tools

ORDER NUMBER: 23 2 300 SPECIAL TOOL SPECIFICATION

| Note: | For fitting rotary shaft seal of output shaft in rear |
|-------------------|---|
| Note. | section of transmission casing |
| Transmission: | S5D 310Z |
| Storage location: | B28 |
| SI number: | 1 07 90(244) |
| Order number: | 23 2 300 |
| Â | Drift |

Fig. 78: Identifying Special Tools 23 2 300 Drift

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 310 FIXTURE

ORDER NUMBER: 23 2 310 SPECIAL TOOL SPECIFICATION

| Note: | For removing 3rd and 4th gear wheel from |
|---------------|--|
| | countershaft |
| Transmission: | S5D 310Z |
| | |

| Storage location: | C30 |
|-------------------|--------------|
| SI number: | 1 07 90(244) |
| Order number: | 23 2 310 |
| Â | Fixture |

Fig. 79: Identifying Special Tools 23 2 310 Fixture

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 320 SOCKET FOR SOCKET WRENCH WAF 36

Minimum set: Mechanical tools

ORDER NUMBER: 23 2 320 SPECIAL TOOL SPECIFICATION

| Note: | For loosening and tightening flanged nut |
|-------------------|--|
| Transmission: | S5D 310Z, S6S 420G, S6S 560G |
| Storage location: | B30 |
| SI number: | 1 07 90(244) |
| Order number: | 23 2 320 |
| Â | Socket for socket wrench WAF 36 |

<u>Fig. 80: Identifying Special Tools 23 2 320 Socket For Socket Wrench WAF 36</u> Courtesy of BMW OF NORTH AMERICA, INC.

23 2 330 FIXTURE

ORDER NUMBER: 23 2 330 SPECIAL TOOL SPECIFICATION

| Note: | For installing complete gear train in rear section of |
|-------------------|---|
| | transmission housing |
| Transmission: | S5D 310Z |
| Storage location: | C18 |
| SI number: | 1 07 90(244) |
| Order number: | 23 2 330 |
| Â | Fixture |

Fig. 81: Identifying Special Tools 23 2 330 Fixture

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 340 DRIFT

Minimum set: Mechanical tools

ORDER NUMBER: 23 2 340 SPECIAL TOOL SPECIFICATION

| Note: | For fitting rotary shaft seal in front section of |
|-------------------|---|
| | transmission casing |
| Transmission: | S5D 310Z |
| Storage location: | B29, C29 |
| SI number: | 1 07 90(244) |
| Order number: | 23 2 340 |
| Â | Drift |

Fig. 82: Identifying Special Tools 23 2 340 Drift

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 350 DRIFT

ORDER NUMBER: 23 2 350 SPECIAL TOOL SPECIFICATION

| Note: | For fitting sealing cover for notch pin of selector |
|-------------------|---|
| | shaft |
| Transmission: | S5D 310Z |
| Storage location: | B14, C14 |
| SI number: | 1 07 90(244) |
| Order number: | 23 2 350 |
| Â | Drift |

Fig. 83: Identifying Special Tools 23 2 350 Drift

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 360 DRIFT

ORDER NUMBER: 23 2 360 SPECIAL TOOL SPECIFICATION

| Note: | For fitting end cover for notch pin |
|-------------------|-------------------------------------|
| Transmission: | S5D 310Z |
| Storage location: | B14, C14 |
| SI number: | 1 07 90(244) |
| Order number: | 23 2 360 |
| Â | Drift |

Fig. 84: Identifying Special Tools 23 2 360 Drift

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 370 FIXTURE

ORDER NUMBER: 23 2 370 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 23 1 050 |
|----------------------|-------------------------|
| Note: | For removing gear train |
| Transmission: | S5D 310Z |
| Storage location: | C30 |
| SI number: | 1 02 91(330) |
| Order number: | 23 2 370 |
| Â | Fixture |

Fig. 85: Identifying Special Tools 23 2 370 Fixture

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 380 INSTALLATION SLEEVE

ORDER NUMBER: 23 2 380 SPECIAL TOOL SPECIFICATION

| Note: | For retaining ring on input shaft |
|-------------------|-----------------------------------|
| Transmission: | S5D 310Z |
| Storage location: | A5 |
| | |

| SI number: | 1 02 91(330) |
|---------------|---------------------|
| Order number: | 23 2 380 |
| Â | Installation sleeve |

Fig. 86: Identifying Special Tools 23 2 380 Installation Sleeve

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 470 IMPACT BUSH

ORDER NUMBER: 23 2 470 SPECIAL TOOL SPECIFICATION

| Note: | For fitting tab washer of securing nut on output |
|-------------------|--|
| | flange |
| Transmission: | S6S 420G, S6S 560G |
| Storage location: | A25 |
| SI number: | 1 10 93(689) |
| Order number: | 23 2 470 |
| Â | Impact bush |

Fig. 87: Identifying Special Tools 23 2 470 Impact Bush

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 480 IMPACT BUSH

ORDER NUMBER: 23 2 480 SPECIAL TOOL SPECIFICATION

| Note: | For installing radial seal on output shaft |
|-------------------|--|
| Transmission: | S6S 420G, S6S 560G |
| Storage location: | A19 |
| SI number: | 1 10 93(689) |
| Order number: | 23 2 480 |
| Â | Impact bush |

Fig. 88: Identifying Special Tools 23 2 480 Impact Bush

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 490 IMPACT BUSH AND SLIP SLEEVE

Minimum set: Mechanical tools

ORDER NUMBER: 23 2 490 SPECIAL TOOL SPECIFICATION

| Note: | For fitting rotary shaft seal on input shaft |
|-------------------|--|
| | <u> </u> |
| Transmission: | GS5-65BH, S6S 420G, S6S 560G |
| Storage location: | C29 |
| SI number: | 1 10 93(689) |
| Order number: | 23 2 490 |
| Â | Impact bush and slip sleeve |
| Consisting of: | Â |
| 1 = 23 2 491 | Impact bush |
| 2 = 23 2 492 | Slip sleeve (2-part) |

Courtesy of BMW OF NORTH AMERICA, INC.

23 3 010 FIXTURE

ORDER NUMBER: 23 3 010 SPECIAL TOOL SPECIFICATION (1 OF 2)

| Note: | For fitting output flange on output shaft |
|-------------------|---|
| Transmission: | S6S 420G, S6S 560G |
| Storage location: | A26 |
| SI number: | 1 10 93(689) |
| Order number: | 23 3 010 |
| Â | Fixture |
| Consisting of: | Â |
| 1 = 23 3 011 | Adapter spindle |
| 2 = 23 3 012 | Pressure sleeve |
| 3 = 23 3 013 | Pressure nut with bearing |

Fig. 90: Identifying Special Tools 23 3 010 Fixture (1 Of 2)

Courtesy of BMW OF NORTH AMERICA, INC.

23 3 010 FIXTURE

ORDER NUMBER: 23 3 010 SPECIAL TOOL SPECIFICATION (2 OF 2)

| Note: | For fitting output flange on output shaft |
|-------------------|---|
| Transmission: | S65 420G, S6S 560G |
| Storage location: | A26 |
| SI number: | 1 10 93(689) |
| Order number: | 23 3 010 |
| Â | Fixture |
| Consisting of: | Â |
| 1 = 23 3 011 | Adapter |
| 2 = 23 3 012 | Pressure sleeve |
| 3 = 23 3 013 | Pressure nut with bearing |

Fig. 91: Identifying Special Tools 23 3 010 Fixture (2 Of 2)

Courtesy of BMW OF NORTH AMERICA, INC.

23 3 020 MOUNTING SLEEVE

ORDER NUMBER: 23 3 020 SPECIAL TOOL SPECIFICATION

| Note: | For installing gaiter of selector rod |
|-------------------|---------------------------------------|
| Transmission: | S6S 560G |
| Storage location: | A14, B14 |
| SI number: | 1 10 93(689) |
| Order number: | 23 3 020 |
| Â | Mounting sleeve |

Fig. 92: Identifying Special Tools 23 3 020 Mounting Sleeve

Courtesy of BMW OF NORTH AMERICA, INC.

23 3 110 DRIFT

ORDER NUMBER: 23 3 110 SPECIAL TOOL SPECIFICATION

| Note: | For driving in guide bushings for catch pins on |
|---------------|---|
| | manual transmissions. |
| Transmission: | GS5-39DZ, S5D 280Z, S5D 320Z, S5D 390Z |
| SI number: | 1 12 02 (918) |
| Order number: | 23 3 110 |
| Â | Drift |

Fig. 93: Identifying Special Tools 23 3 110 Drift

Courtesy of BMW OF NORTH AMERICA, INC.

23 3 160 SET OF TOOLS

Minimum set: Mechanical tools

ORDER NUMBER: 23 3 160 SPECIAL TOOL SPECIFICATION

| Note: | Removing and installing shaft seal on output shaft |
|----------------|--|
| Transmission: | GS6-37BZ, GS6-51BZ |
| SI number: | 01 10 02 (907) |
| Order number: | 23 3 160 |
| Â | Set of tools |
| Consisting of: | Â |
| 1 = 23 3 161 | Extractor |
| 2 = 23 3 162 | Drift |

Fig. 94: Identifying Special Tools 23 3 160 Extractor And Drift

Courtesy of BMW OF NORTH AMERICA, INC.

23 3 169 SET OF TOOLS

Minimum set: Mechanical tools

ORDER NUMBER: 23 3 169 SPECIAL TOOL SPECIFICATION

| Note: | Removing and installing shaft seals on output side |
|---------------|--|
| Transmission: | GS6-37BZ |
| Order number: | 23 3 169 |
| Â | Set of tools |

23 3 200 EXTRACTOR

Minimum set: Mechanical tools

ORDER NUMBER: 23 3 200 SPECIAL TOOL SPECIFICATION

| Note: | For removing shaft seal on drive shaft |
|-------------------|--|
| Transmission: | GS6-53BZ, GS6-53DZ |
| Storage location: | A49, A50 |
| SI number: | 1 11 04 (093) |
| Order number: | 23 3 200 |
| Â | Extractor |

Courtesy of BMW OF NORTH AMERICA, INC.

23 3 210 EXTRACTOR

Minimum set: Mechanical tools

ORDER NUMBER: 23 3 210 SPECIAL TOOL SPECIFICATION

| Note: | For removing shaft seal on output shaft |
|-------------------|---|
| Transmission: | GS6-53BZ, GS6-53DZ |
| Storage location: | A50 |
| SI number: | 1 11 04 (093) |
| Order number: | 23 3 210 |
| Â | Extractor |

Fig. 96: Identifying Special Tools 23 3 210 Extractor

Courtesy of BMW OF NORTH AMERICA, INC.

23 3 220 DRIFT

Minimum set: Mechanical tools

ORDER NUMBER: 23 3 220 SPECIAL TOOL SPECIFICATION

| Note: | For driving in shaft seal on drive shaft (G- |
|-------------------|--|
| | transmission) |
| Transmission: | GS6-53BZ, GS6-53DZ |
| Storage location: | A49 |
| SI number: | 1 11 04 (093) |
| Order number: | 23 3 220 |
| Â | Drift |

Fig. 97: Identifying Special Tools 23 3 220 Drift

Courtesy of BMW OF NORTH AMERICA, INC.

23 3 230 DRIFT

Minimum set: Mechanical tools

ORDER NUMBER: 23 3 230 SPECIAL TOOL SPECIFICATION

| Note: | For driving in shaft seal on output shaft (G- |
|-------------------|---|
| Note. | transmission) |
| Transmission: | GS6-53BZ, GS6-53DZ |
| Storage location: | A49 |
| SI number: | 1 11 04 (093) |
| Order number: | 23 3 230 |
| Â | Drift |

Fig. 98: Identifying Special Tools 23 3 230 Drift

Courtesy of BMW OF NORTH AMERICA, INC.

23 4 000 DRIFT SET

Minimum set: Mechanical tools

ORDER NUMBER: 23 4 000 SPECIAL TOOL SPECIFICATION

| In conjunction with: | 00 5 500 |
|----------------------|--|
| Note: | For driving shaft seal into transmission |
| Transmission: | GS6-85BG |
| Storage location: | A49, B84 |
| SI number: | 1 02 02(823) |
| Order number: | 23 4 000 |
| Â | Drift set |
| Consisting of: | Â |
| 1 = 23 4 001 | Drift dia. 67 mm |
| 2 = 23 4 002 | Drift dia. 53 mm |

Fig. 99: Identifying Special Tools 23 4 000 Drift Set Courtesy of BMW OF NORTH AMERICA, INC.

23 4 010 REMOVAL TOOL

Minimum set: Mechanical tools

ORDER NUMBER: 23 4 010 SPECIAL TOOL SPECIFICATION

| Note: | For pressing connector out of transmission |
|-------------------|--|
| Transmission: | GS6-85BG |
| Storage location: | B83 |
| SI number: | 1 02 02 (823) |
| Order number: | 23 4 010 |
| Â | Removal tool |

Fig. 100: Identifying Special Tools 23 4 010 For Pressing Connector Out Of Transmission Courtesy of BMW OF NORTH AMERICA, INC.

23 4 020 DRIFTS

ORDER NUMBER: 23 4 020 SPECIAL TOOL SPECIFICATION

| Note: | For driving in bearing bushings for locking pins, 5th |
|-------------------|---|
| | and reverse gears. |
| Transmission: | GS5-39DZ, S5D 320Z |
| Storage location: | B49 |
| SI number: | 1 03 04 (070) |
| Order number: | 23 4 020 |
| Â | Drifts |
| Consisting of: | Â |
| 1 = 23 4 021 | Drift |
| Â | NOTE: |
| | For driving in cover caps on gear notch, 5th and reverse gears. |
| 2 = 23 4 022 | Drift |
| Â | NOTE: For driving in bearing bushing for locking pin, 5th gear. |

| 3 = 23 4 023 | Drift |
|--------------|---|
| Â | NOTE: |
| | For driving in bearing bushing for locking pin, reverse gear. |

Fig. 101: Identifying Special Tools 23 4 020 Drifts Courtesy of BMW OF NORTH AMERICA, INC.

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