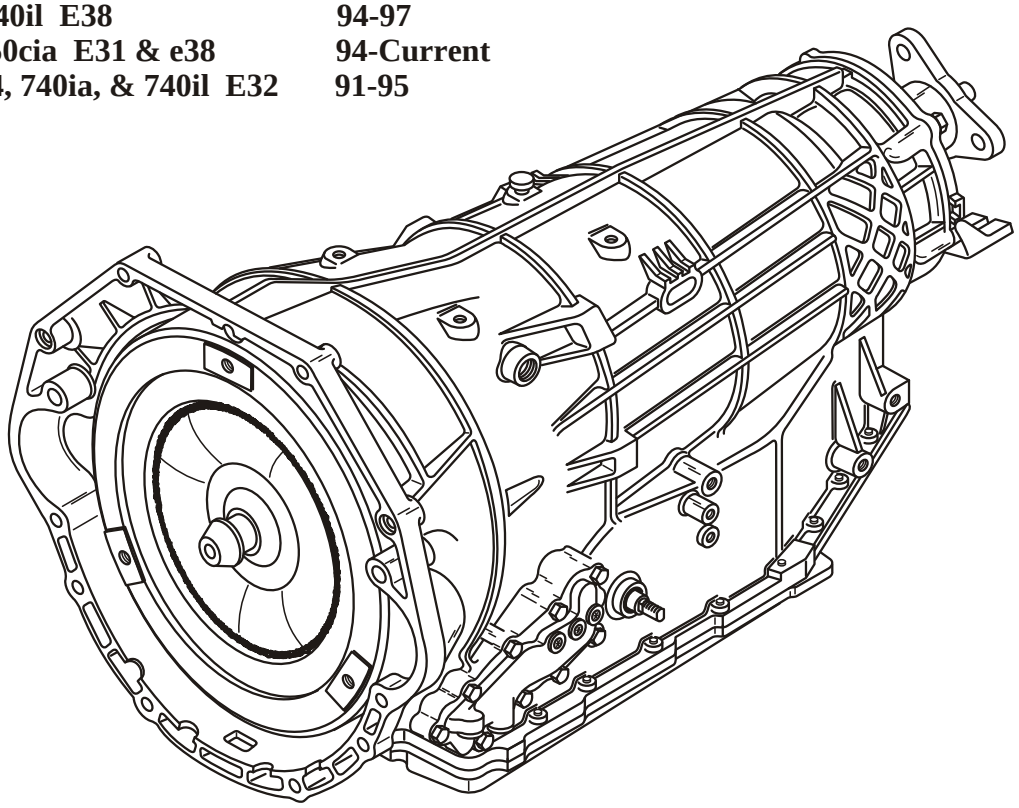
BMW ZF-5HP-30

PRELIMINARY INFORMATION

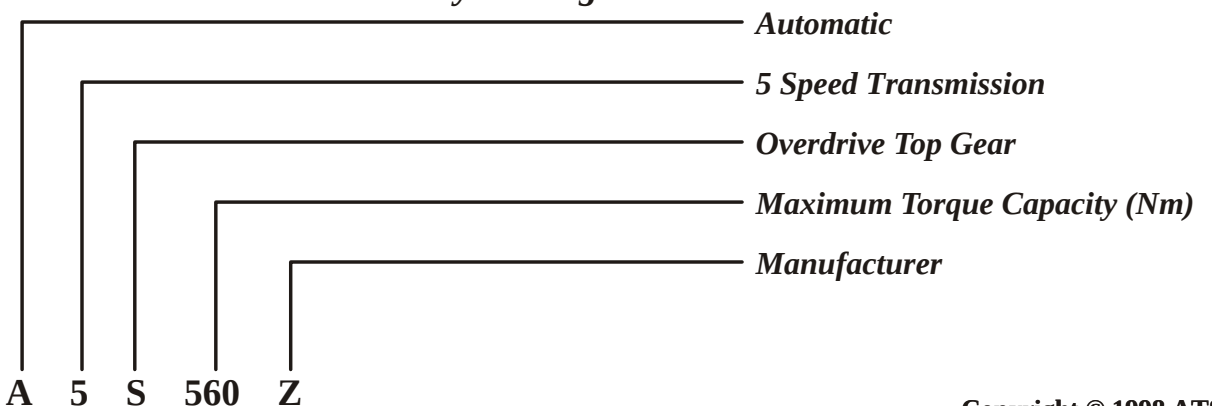
840cia E31	**92-96**
740ia & 740il E38	**94-97**
750il & 850cia E31 & e38	**94-Current**
540ia E34, 740ia, & 740il E32	**91-95**



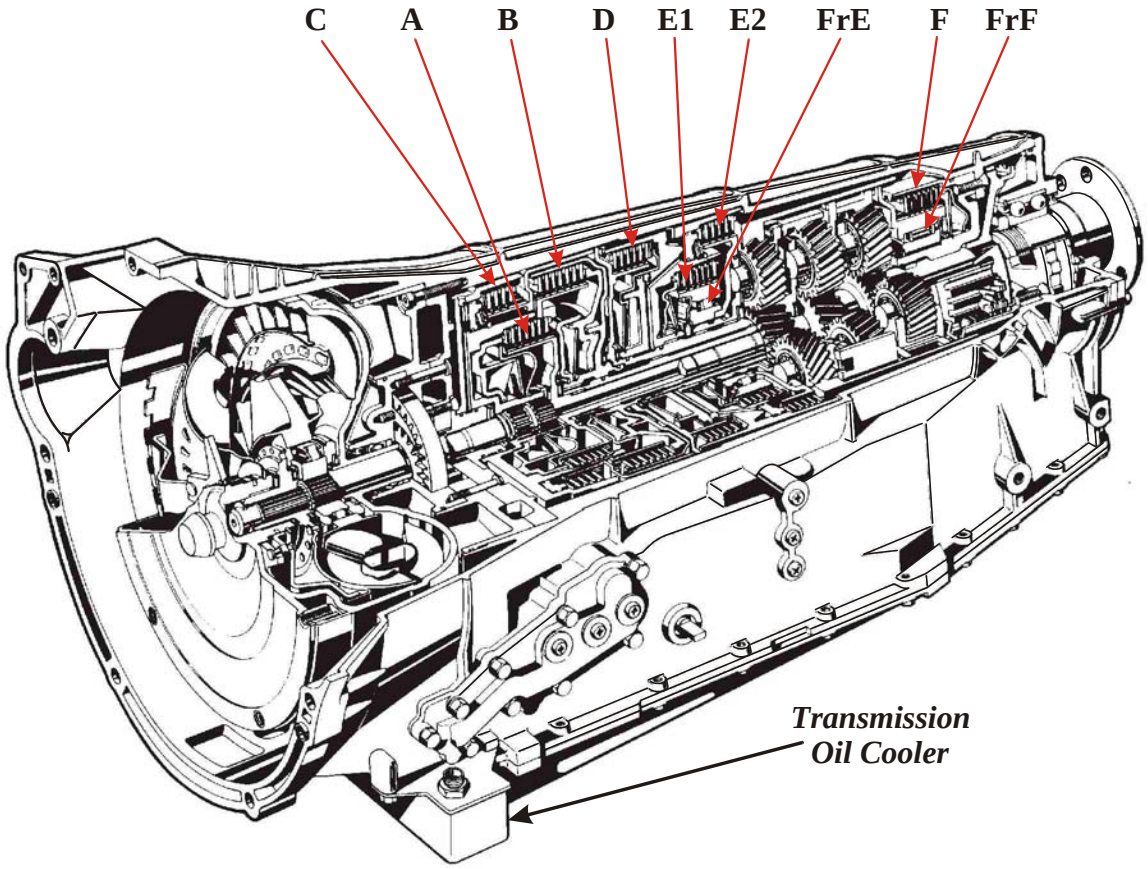
This transmission is manufactured in Germany by ZF and carries the BMW designation A5S 560Z.

The A5S 560Z is an electronically controlled, five speed automatic transmission with a lock-up clutch type torque converter. Three planetary gear sets (Wilson Gearing), three rotating multiple disc clutches, four multiple disc brake clutches, and two sprag clutches (Freewheels) are used to provide the five forward speeds and reverse.

Key to designation:



BMW ZF-5HP-30



The oil cooler is a seperate unit mounted on the underside of the transmission just ahead of the oil pan. The connections to the transmission oil supply are integrated into the mounting. The two external fittings visible are the supply and return lines for engine coolant. Full flow is maintained through the cooler at all times.

GEAR	"A" CLUT	"B" CLUT	"C" CLUT	"D" CLUT	"E1" CLUT	"E2" CLUT	"F" CLUT	"FrE" SPRAG	"FrF" SPRAG	GEAR RATIO
PARK							ON			
REV			ON	ON			ON			3.68:1
NEUT							ON			
D-1ST	ON								HOLD	3.55:1
D-2ND	ON				ON	ON		HOLD		2.24:1
D-3RD	ON			ON	ON					1.54:1
D-4TH	ON	ON			ON					1.00:1
D-5TH		ON		ON	ON					0.79:1
M-2	ON						ON			

NORMAL OPERATION:

A console mounted tip switch allows the driver to select either the Automatic or Winter mode. The Winter mode is designated by an ice crystal symbol ( ) on the program switch. When in the Winter mode, the transmission starts off in 2nd gear and the upshifts are programmed to occur earlier to reduce the torque at the drive wheels and prevent wheel spin. The following chart explains the gear selection and each program mode based on the selector lever position.

SELECTOR LEVER POSITION	PROGRAM MODE	
	AUTOMATIC (A)	WINTER (*)
P	P	P
R	R	R
N	N	N
D	*D - Economy Program*	*D - Starts In 2nd, Early Upshifts 2-5*
4	*4 - Sport Program Delayed Upshifts 1-4*	*4 - Starts In 2nd, Early Upshifts 2-4*
3	*3 - Sport Program Delayed Upshifts 1-3*	*3 - Starts In 2nd, Early Upshifts 2-3*
2	*2 - Sport Program Delayed Upshifts 1-2*	*2 - Locked In 2nd*

ADAPTIVE SHIFT CONTROL:

Stop and Go Function:

When the transmission control module detects that the vehicle is being driven in a heavy traffic situation with many stops and starts at very low road speed, it will begin using 2nd gear when pulling away. Starting in 2nd gear and not downshifting to 1st gear when stopping eliminates the feeling of excessive load reversals, and provides a more comfortable driving style in this situation.

Deceleration Rate:

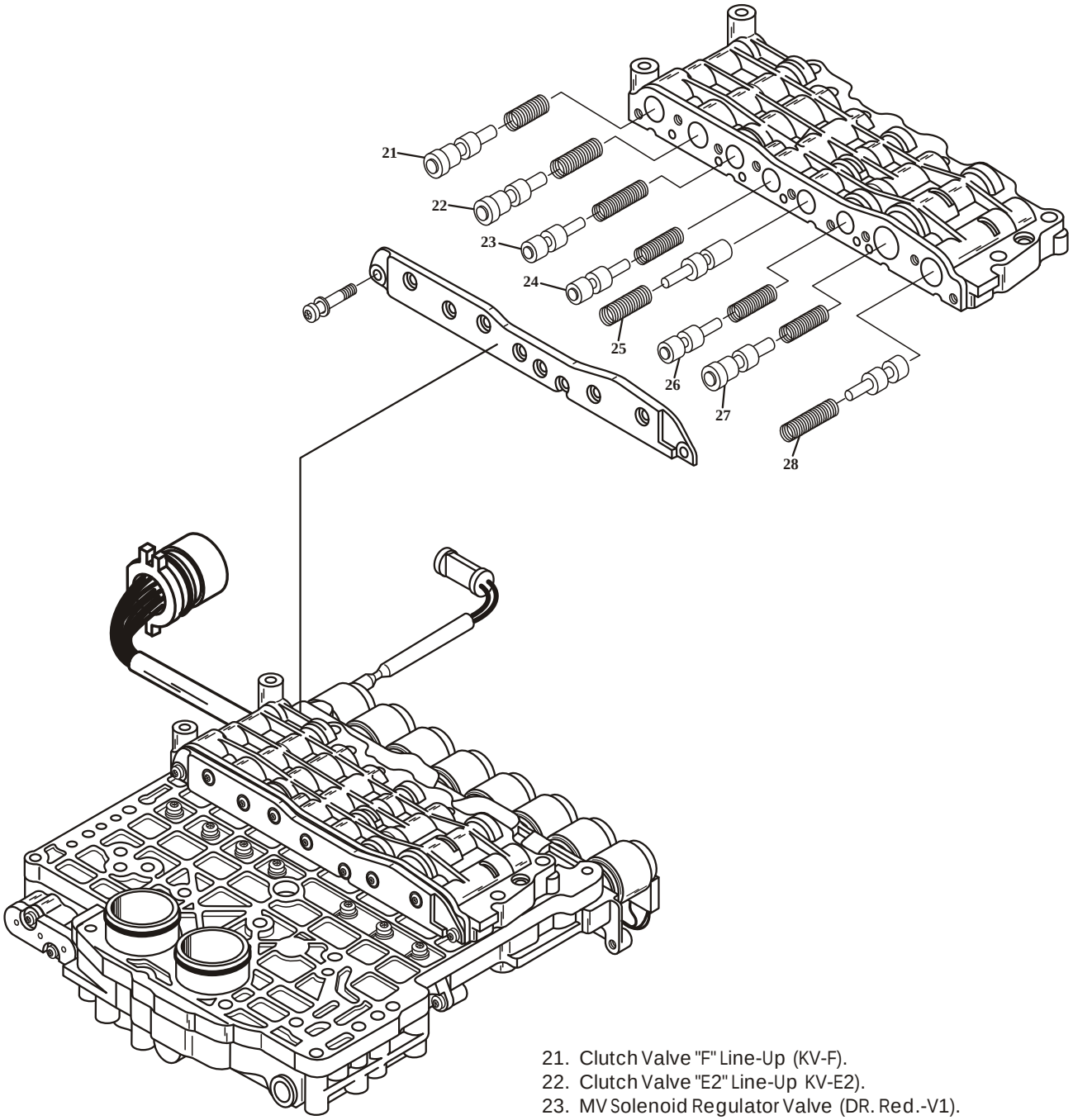
Typically, automatic transmission software programs will upshift to the highest gear possible when driven at a given road speed with no throttle application. The transmission control module on the A5S 560Z moniters the rate of change in throttle position when the throttle is released. If the throttle is released quickly, the transmission will stay in the present gear engaged, in anticipation of the drivers intent to slow down. If the throttle is gradually released, as when approaching desired road speed, the transmission will upshift to the next highest possible gear for that road speed.

FAILSAFE OPERATION:

When a system fault is detected which would impair normal reliable operation, the transmission control module interrupts the power supply to Pin 12 at the transmission case connector. The transmission control module also alerts the driver of any faults by signaling the vehicles "check control" system. To enable the vehicle to be driven to a repair shop, the following manual gear selections are permitted:

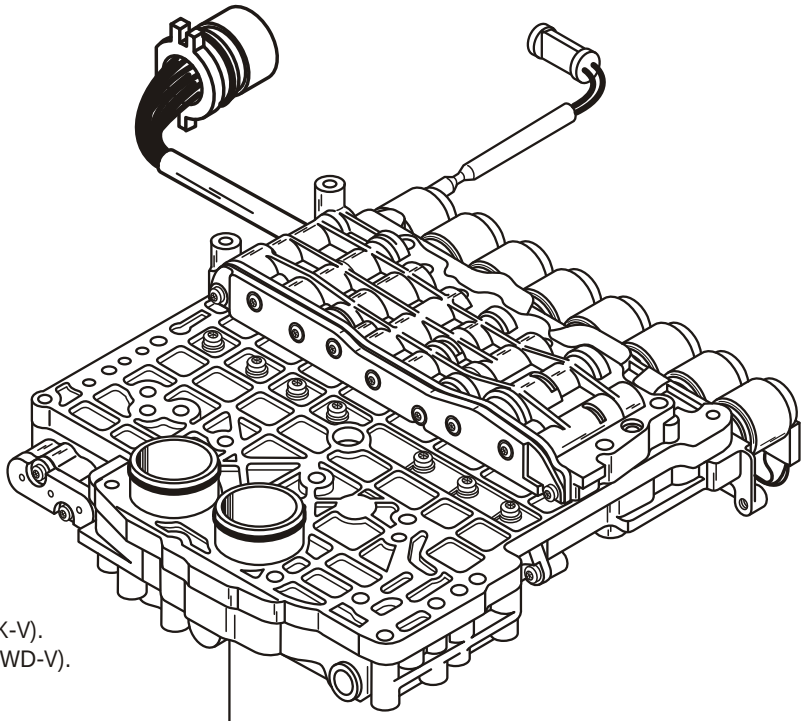
Selector Lever Position	**P R N D 4 3 2**
Actual Gear Obtained	**P R N 4 4 4 4**

ZF-5HP-30
UPPER REAR VALVE BODY

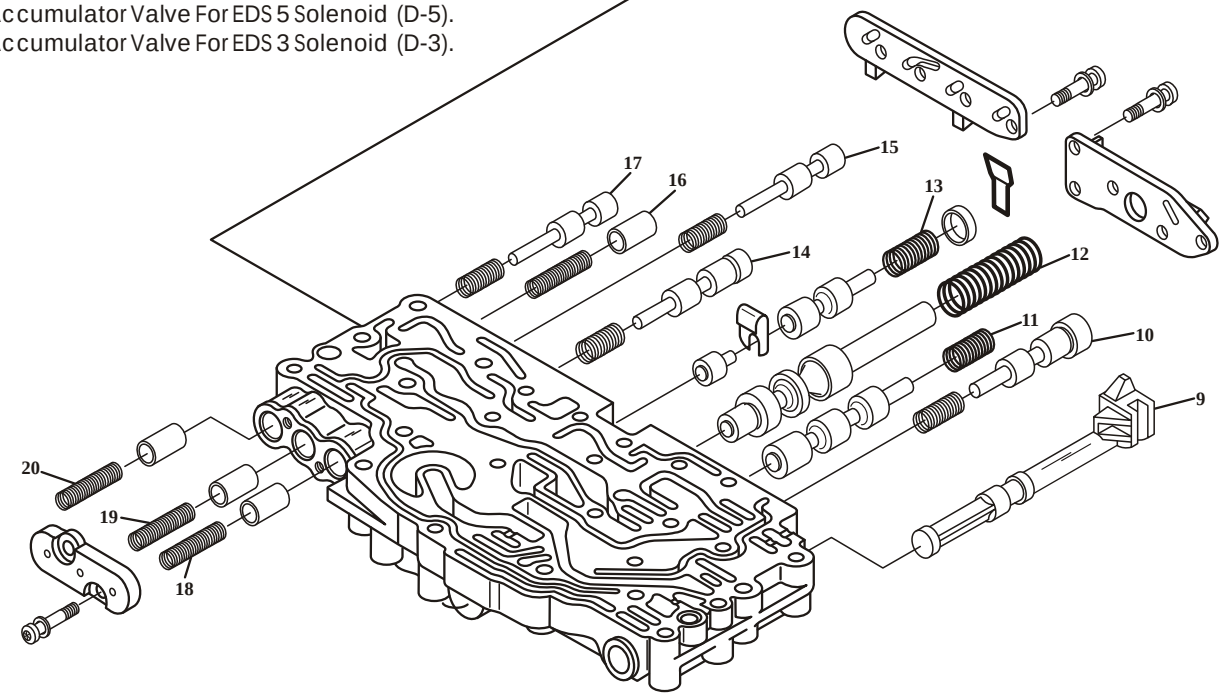


21. Clutch Valve "F" Line-Up (KV-F).
22. Clutch Valve "E2" Line-Up KV-E2).
23. MV Solenoid Regulator Valve (DR. Red.-V1).
24. EDS Solenoid Regulator Valve (DR. Red.-V2).
25. Clutch Valve "B" Line-Up (KV-B).
26. Clutch Valve "E1" Line-Up (KV-E1).
27. Switch Valve For "A" Clutch (ABSCH-V-A).

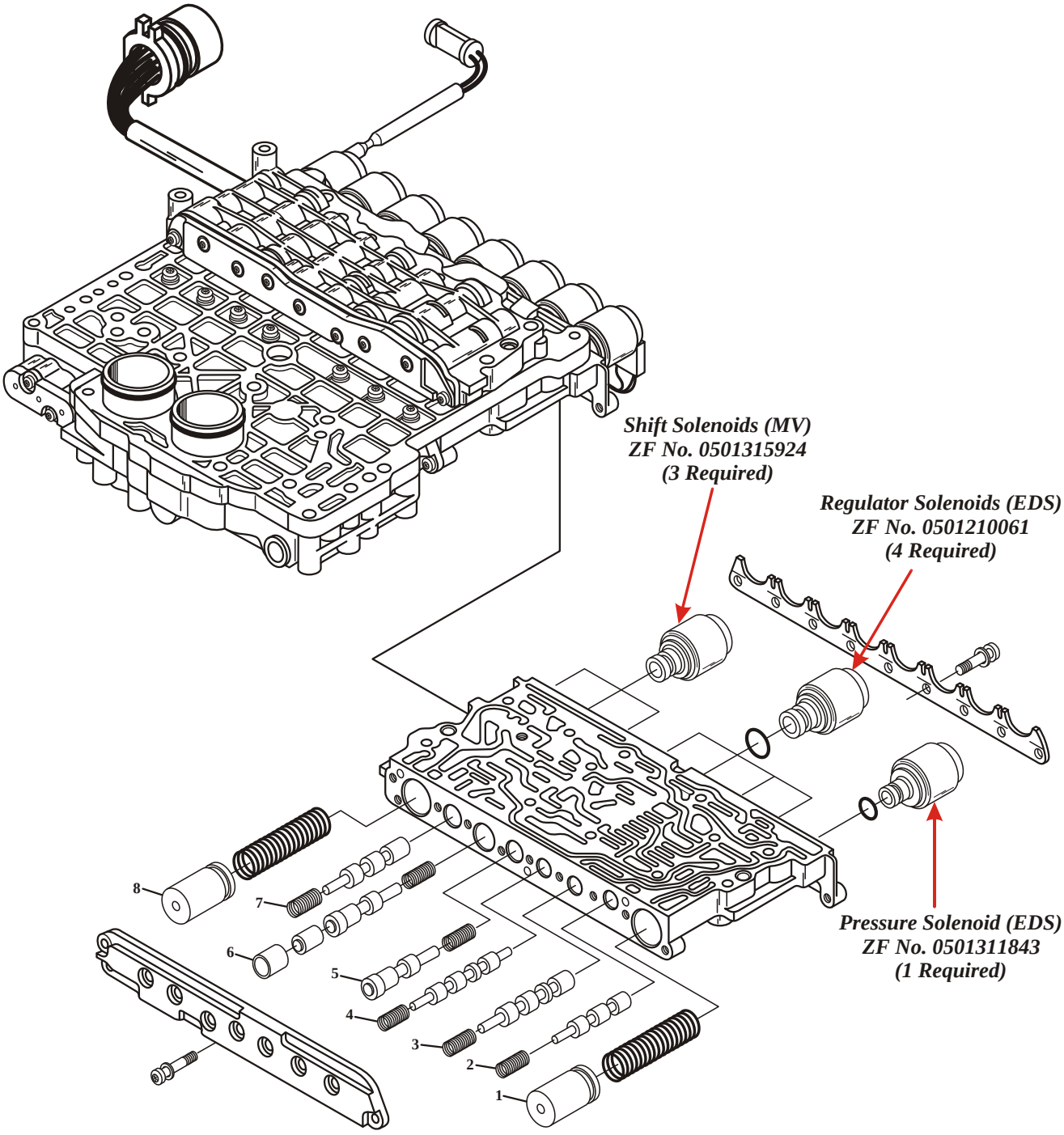
ZF-5HP-30
LOWER FRONT VALVE BODY



9. Manual Shift Valve (W-S).
10. Converter Clutch Apply Oil Control Valve (WK-V).
11. Converter Clutch Release Oil Control Valve (WD-V).
12. Main Pressure Regulator Valve Line-Up (HD).
13. Lubrication Valve (SCHM-V)
14. Modulating Valve Line-Up (MOD-V).
15. Main Regulator Valve For "B" Clutch (HV-B).
16. Accumulator Valve For EDS 2 Solenoid (D-2).
17. Main Regulator Valve For "D" Clutch (HV-D).
18. Accumulator Valve For EDS 4 Solenoid (D-4).
19. Accumulator Valve For EDS 5 Solenoid (D-5).
20. Accumulator Valve For EDS 3 Solenoid (D-3).

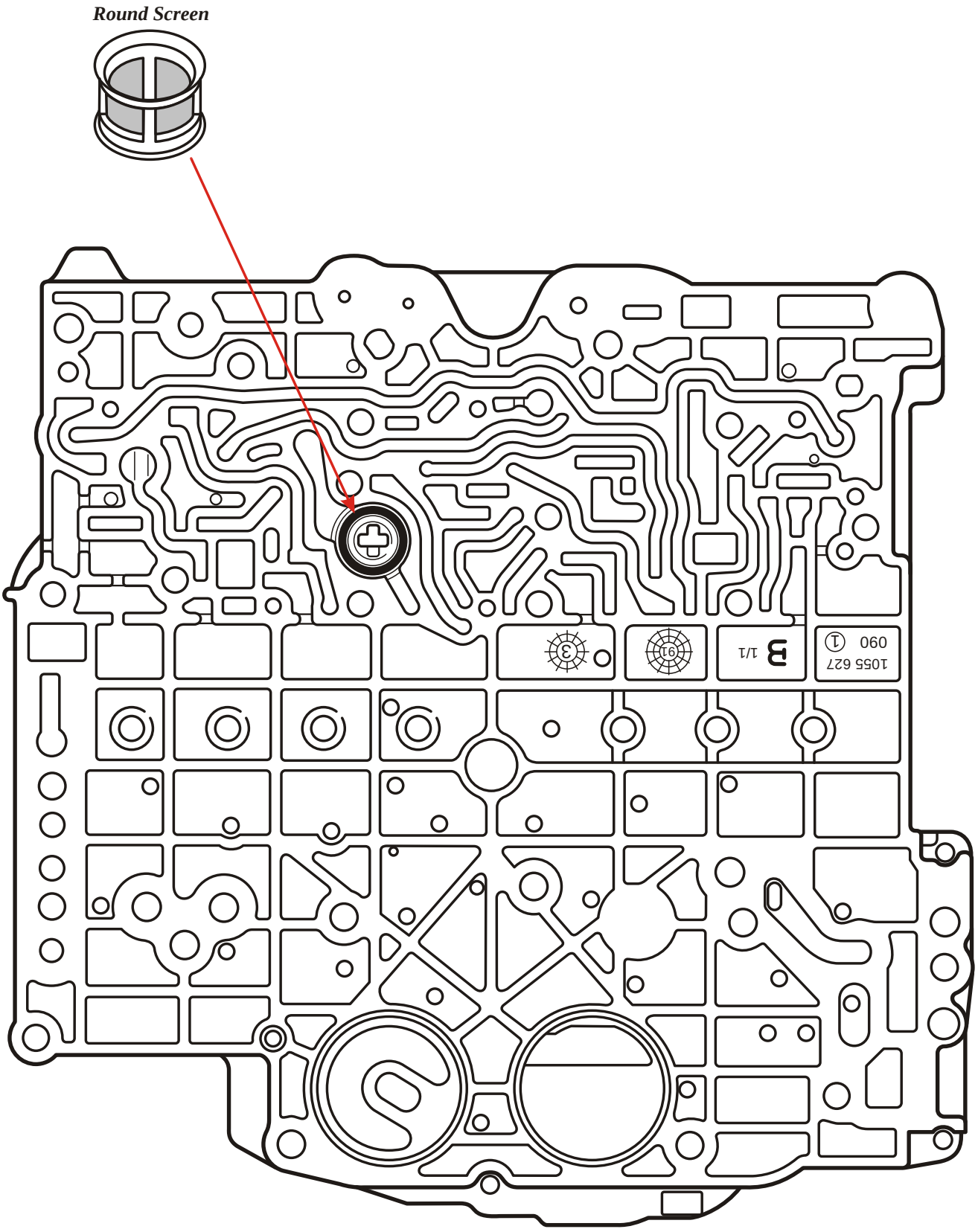


ZF-5HP-30
LOWER REAR VALVE BODY



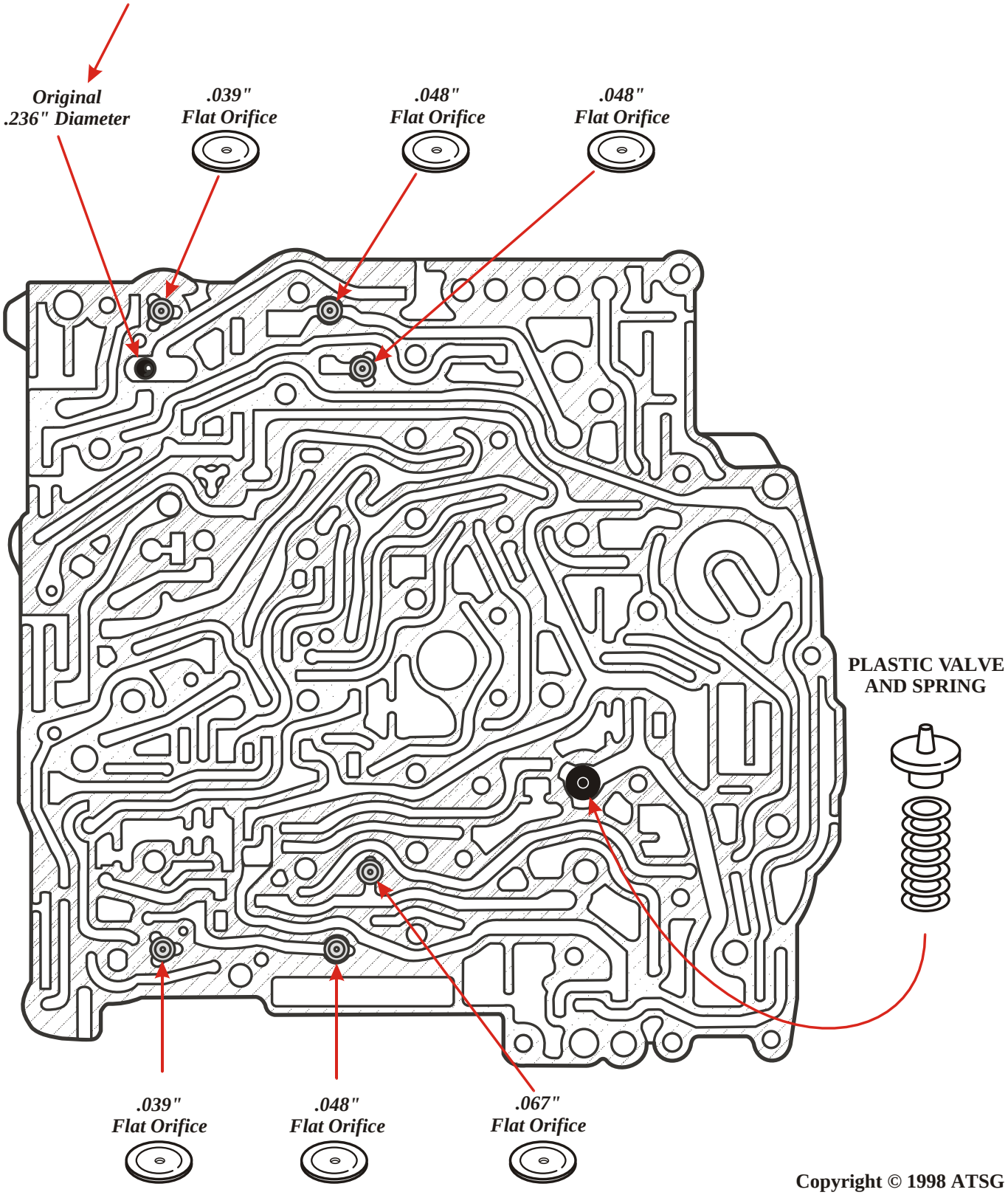
1. "A" Clutch Accumulator Line-Up (D-A).
2. Shift Valve Number 1 (SV-1).
3. Shift Valve Number 2 (SV-2).
4. Shift Valve Number 3 (SV-3).
5. Switch Valve For "D" Clutch (ABSCH-V-D).
6. Clutch Valve "D" Line-Up (KV-D).
7. Reverse Gear Valve Line-Up (RG-V).

ZF-5HP-30 CHANNEL PLATE
UPPER VALVE BODY SIDE

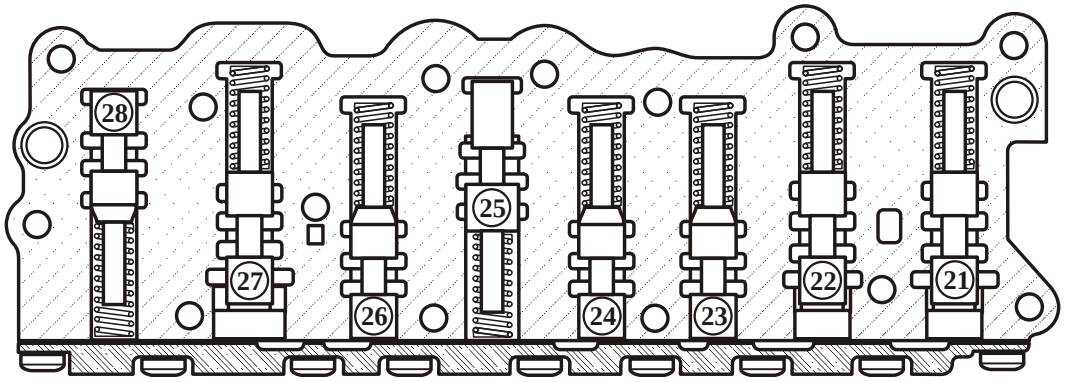


ZF-5HP-30 CHANNEL PLATE
LOWER VALVE BODY SIDE

Replace the original ball with a plastic .250" (6.35mm) ball.

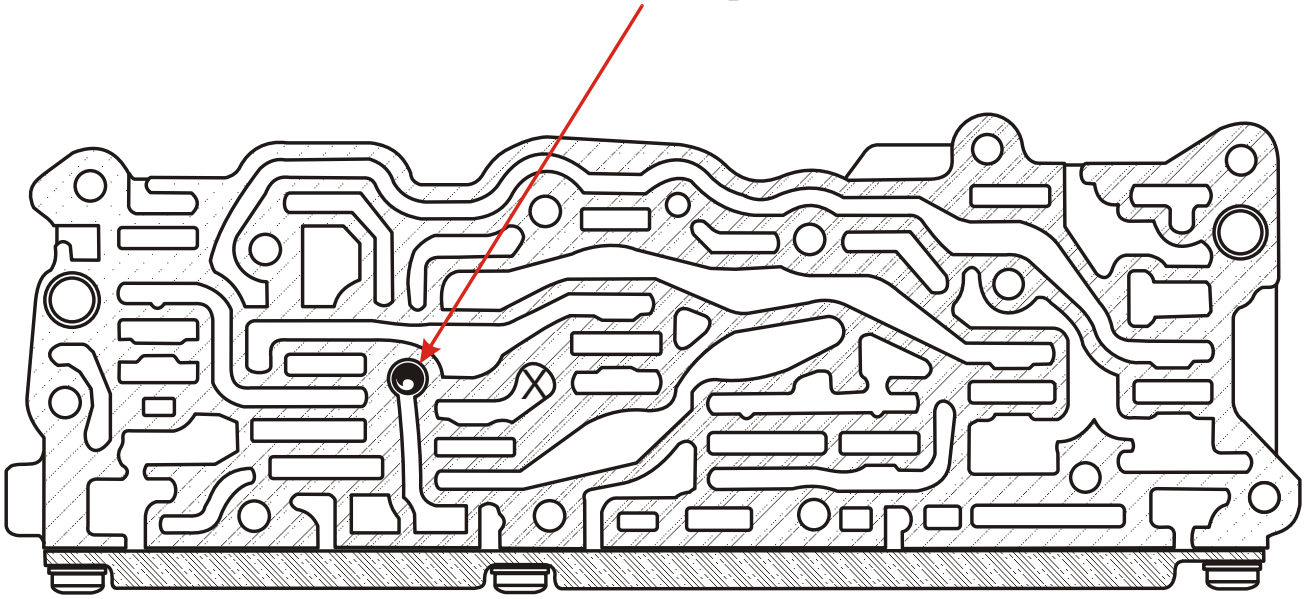


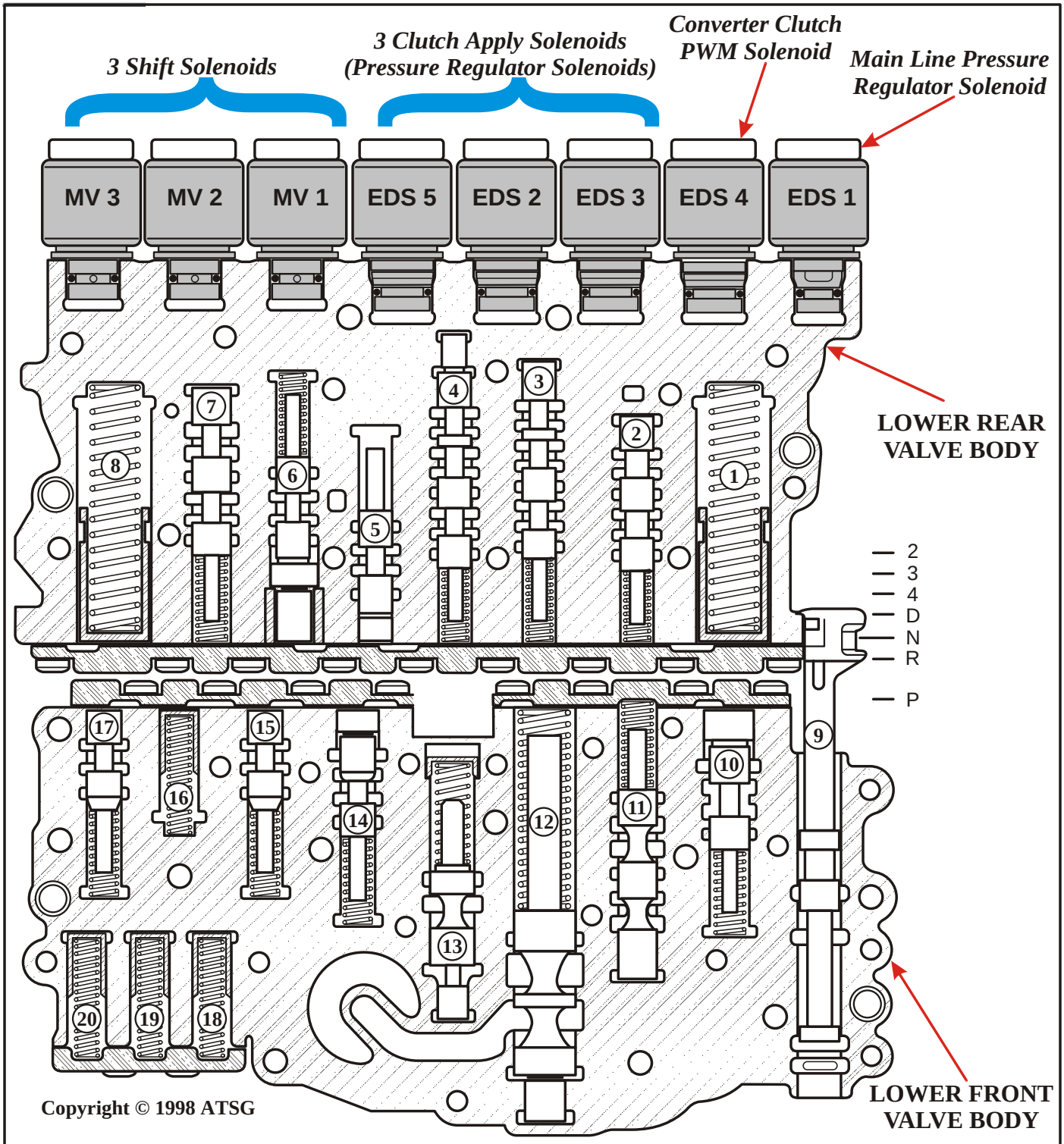
UPPER REAR VALVE BODY



21. Clutch Valve "F" Line-Up (KV-F).
22. Clutch Valve "E2" Line-Up KV-E2).
23. MV Solenoid Regulator Valve (DR. Red.-V1).
24. EDS Solenoid Regulator Valve (DR. Red.-V2).
25. Clutch Valve "B" Line-Up (KV-B).
26. Clutch Valve "E1" Line-Up (KV-E1).
27. Switch Valve For "A" Clutch (ABSCH-V-A).

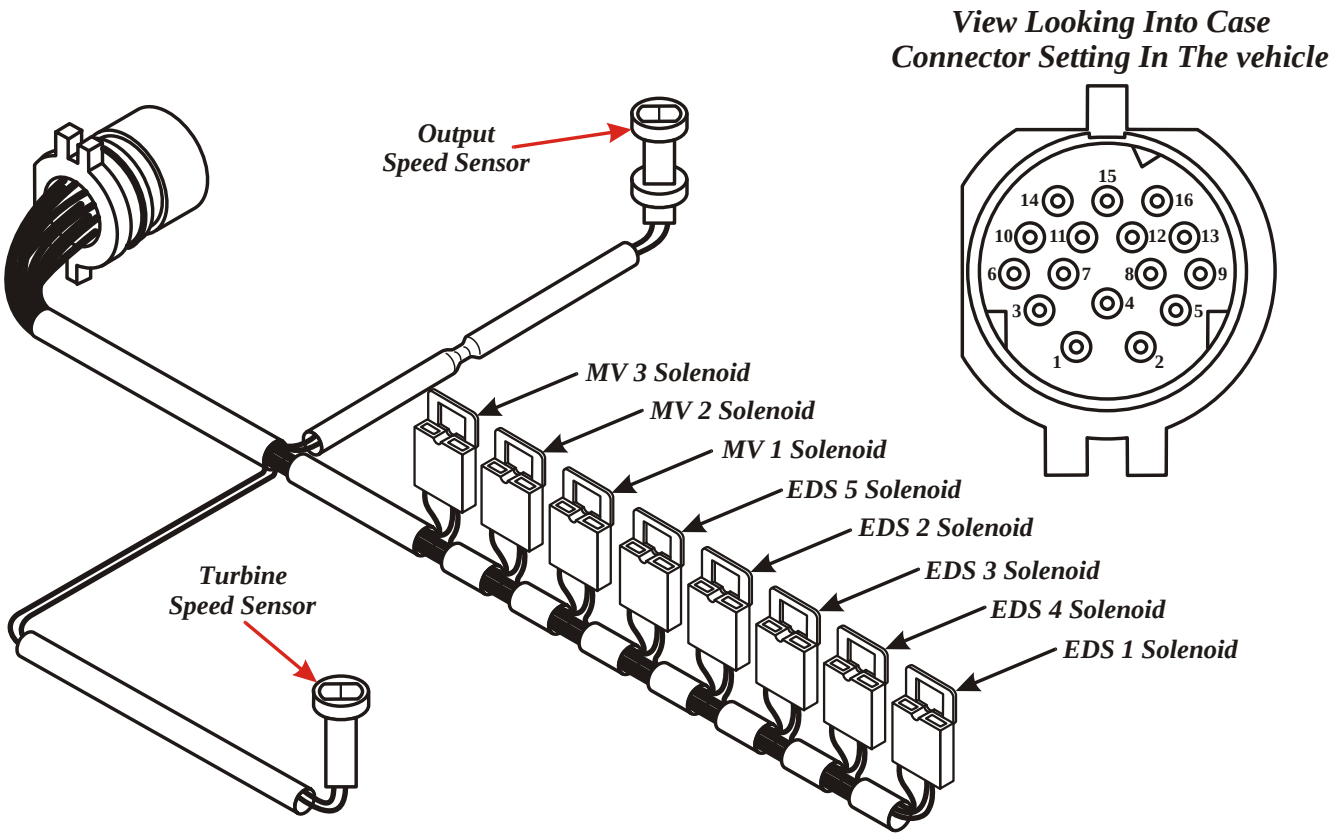
Only One .250" (6.35mm) ball is located here.
Do Not install a ball in the pocket marked X.

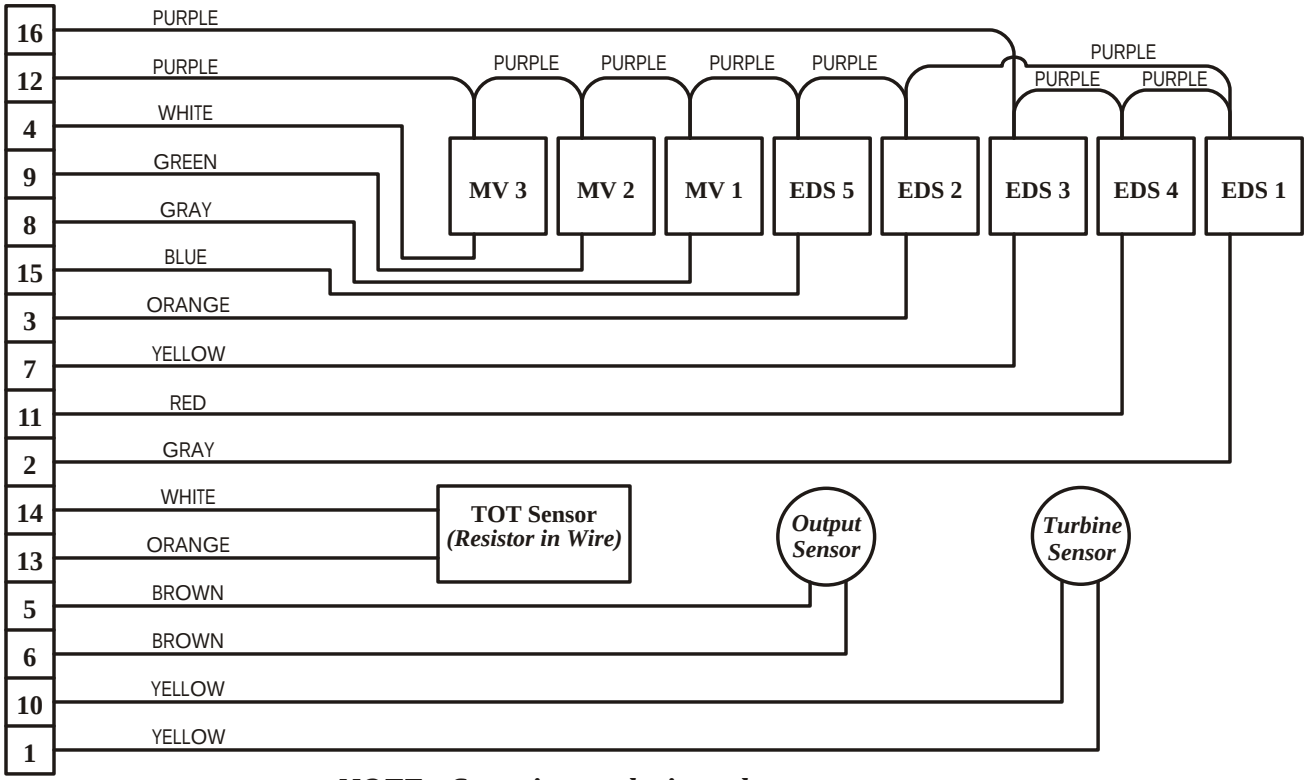




1. "A" Clutch Accumulator Line-Up (D-A).
2. Shift Valve Number 1 (SV-1).
3. Shift Valve Number 2 (SV-2).
4. Shift Valve Number 3 (SV-3).
5. Switch Valve For "D" Clutch (ABSCH-V-D).
6. Clutch Valve "D" Line-Up (KV-D).
7. Reverse Gear Valve Line-Up (RG-V).
8. "C" Clutch Accumulator Line-Up (D-C).
9. Manual Shift Valve (W-S).
10. Converter Clutch Apply Oil Control Valve (WK-V).
11. Converter Clutch Release Oil Control Valve (WD-V).
12. Main Pressure Regulator Valve Line-Up (HD).
13. Lubrication Valve (SCHM-V)
14. Modulating Valve Line-Up (MOD-V).
15. Main Regulator Valve For "B" Clutch (HV-B).
16. Accumulator Valve For EDS 2 Solenoid (D-2).
17. Main Regulator Valve For "D" Clutch (HV-D).
18. Accumulator Valve For EDS 4 Solenoid (D-4).
19. Accumulator Valve For EDS 5 Solenoid (D-5).
20. Accumulator Valve For EDS 3 Solenoid (D-3).

ZF-5HP-30 INTERNAL WIRE SCHEMATIC





NOTE: Some internal wire colors may vary.

ZF-5HP-30 SOLENOID APPLICATION CHART

Selector Lever Position	*MV 1 Solenoid*	*MV 2 Solenoid*	*MV 3 Solenoid*	*EDS 1 Solenoid*	*EDS 2 Solenoid*	*EDS 3 Solenoid*	*EDS 4 Solenoid*	*EDS 5 Solenoid*	GEAR RATIO
PARK	ON			**					
REVERSE		ON	⊛	**	*-	*		*-	3.68:1
NEUTRAL	ON			**					
D-1ST	ON			**	*-	*-		*-	3.55:1
D-2ND	ON	ON		**		*		*	2.24:1
D-3RD		ON		**	*	*		*	1.54:1
D-4TH		ON		**	*-		-*-	*-	1.00:1
D-5TH			-*	**	*		-*-	*-	0.79:1
Failsafe (4th)	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	1.00:1

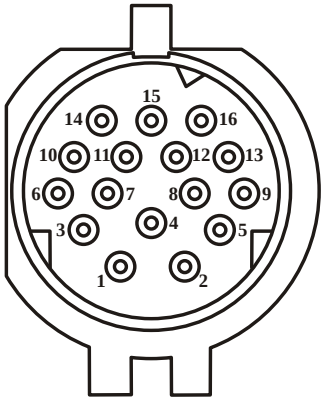
SOLENOID CHART LEGEND

Symbol	*Description*
ON	*MV 1, MV 2 and MV 3 Solenoids are energized by the Electronic Transmission Control unit and have two functions. They are Open or Closed. Energized (On), there is pressure in circuit.*
⊛	*MV 3 is turned "ON" if reverse is selected at a high vehicle speed, to inhibit reverse engagement.*
**	*EDS 1 is used for line pressure control only, and operates from 0 to 0.8 amps. When the solenoid is "OFF" (0 amps), pressure is high. EDS 1 pressure is "Lowered" as the solenoid is modulated by the*
*	*EDS 2, EDS 3, EDS 4 and EDS 5 Solenoids are also pulse modulated but are exactly the opposite of EDS 1 Solenoid. When these solenoids are "ON" oil pressure in the hydraulic circuit is high, and when they are "OFF" pressure in the hydraulic circuit is low.*
-*	*Solenoid "OFF" (hydraulic pressure low), then Solenoid "ON" (hydraulic pressure high).*
*-	*Solenoid "ON" briefly (hydraulic pressure high), then Solenoid "OFF" (hydraulic pressure low). The pressure acts briefly on regulator valves to cushion clutch application.*
-*-	*EDS 4 Solenoid is used for Torque Converter Clutch apply and release only, and depends on throttle position and vehicle speed as to its application.*

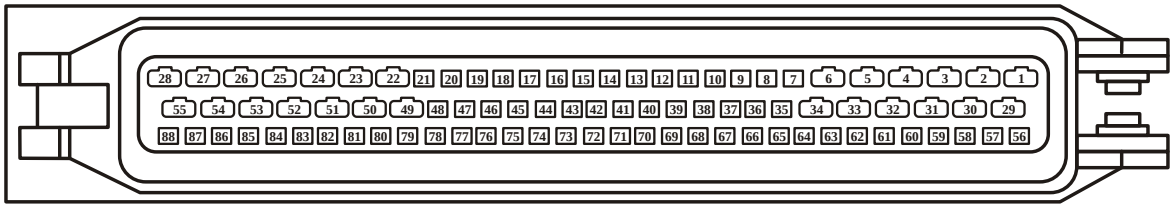
SOLENOID AND SENSOR RESISTANCE CHART

Solenoid	*Case Connector Pin Numbers* (− +)	*Control Unit Connector Pin Numbers* (− +)	*Resistance In Ohms*
MV 1	*8 and 12*	*30 and 52*	*30 - 34 Ω*
MV 2	*9 and 12*	*33 and 52*	*30 - 34 Ω*
MV 3	*4 and 12*	*32 and 52*	*30 - 34 Ω*
EDS 1	*2 and 12*	*5 and 52*	*5.2 - 6.8 Ω*
EDS 2	*3 and 12*	*1 and 52*	*6.2 - 7.8 Ω*
EDS 3	*7 and 12*	*29 and 52*	*6.2 - 7.8 Ω*
EDS 4	*11 and 12*	*4 and 52*	*6.2 - 7.8 Ω*
EDS 5	*15 and 12*	*51 and 52*	*6.2 - 7.8 Ω*
TOT	*13 and 14*	*21 and 22*	*1000 Ω at 25° C*
TSS	*1 and 10*	*44 and 16*	*292 - 358 Ω*
OSS	*5 and 6*	*14 and 42*	*292 - 358 Ω*

View Looking Into Case
Connector Setting In The vehicle



Electronic Control Unit Connector Pin Identification



RETREIVING FAULT CODES

The BMW Diagnostic Tool is ***required*** to retrieve the fault codes that are stored in the control unit. The diagnostic tool has the ability to retrieve codes, clear codes and activate individual components, and is adaptable to 3 Series, 5 Series, 7 Series and 8 Series vehicles equipped with 4HP-22/24, 4L30-E, 5HP-18, 5HP-19, and 5HP-30. The BMW Diagnostic Tool can be purchased from:

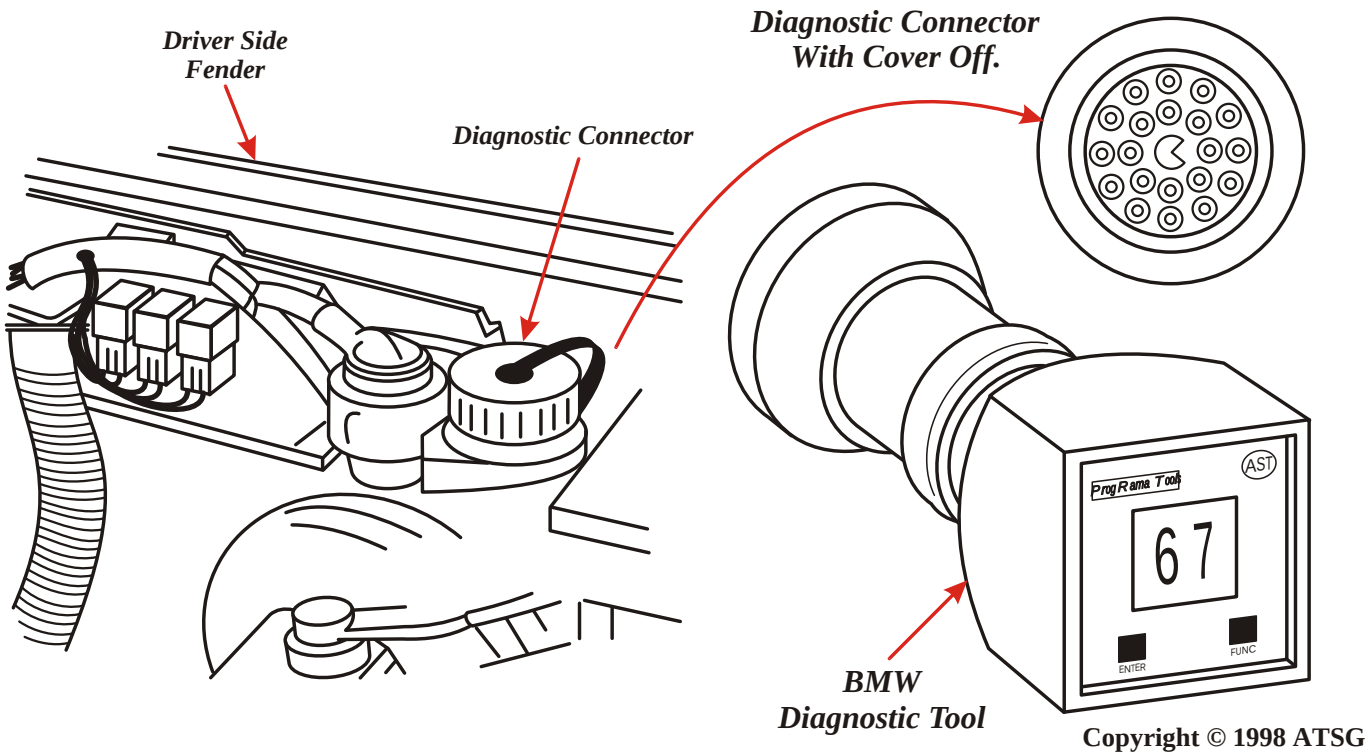
Mario Aristides Phone - (305) 666-3544, Fax - (305) 666-8238

BMW ZF-5HP-30 FAULT CODE CHART

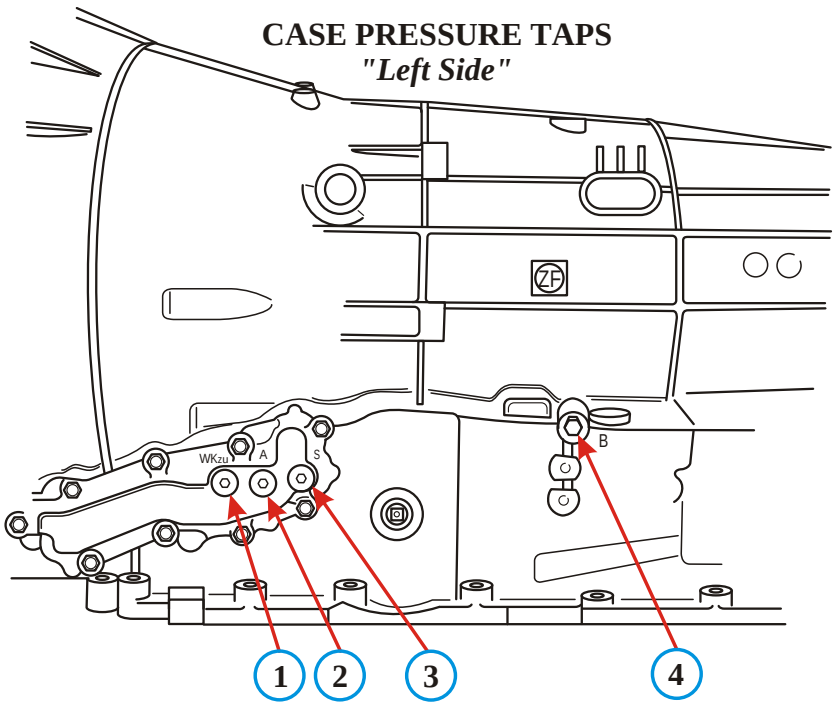
Code	*Description*	*Possible Causes*
01	Pressure Regulator, EDS 2 - Pin 1	Questionable signal, or break or short in wiring
02	Park-Neutral Lock Solenoid - Pin 2	Break or short in wiring
04	Pressure Regulator, EDS 4 - Pin 4	Questionable signal, or break or short in wiring
05	Pressure Regulator, EDS 1 - Pin 5	Questionable signal, or break or short in wiring
08	Selector Lever Position L2 - Pin 8	Vehicle acceleration detected while selector lever in P or N position, or engine has been started even though EGS control unit has not detected a selector lever position of P or N
09	Selector Lever Position L3/L4 - Pins 37 and 9	Engine has been started even though EGS control unit has not detected a selector lever position of P or N
0C	Program Selector Switch - Pins 12, 13 and 45	Short in wiring, or more than one program selector switch input is applied to ground
10	Rotational Speed Sensor, Turbocharger Pins 16 and 44	No input, or incorrect engine speed information
12	Kickdown Switch - Pin 18	Questionable signal
13	ASC Monitering - Pin 19	ASC operation has been detected while selector lever was in Park or Neutral position
16	TOT Sensor - Pins 21 and 22	Resistance of TOT Sensor not within permissible range
1A	Battery Voltage Supply - Pin 26	Break in wiring
1D	Pressure Regulator, EDS 3 - Pin 29	Questionable signal, or break or short in wiring
1E	MV 1 Solenoid - Pin 30	Break or short in wiring, or defective winding in solenoid
20	MV 3 Solenoid - Pin 32	Break or short in wiring, or defective winding in solenoid
21	MV 2 Solenoid - Pin 33	Break or short in wiring, or defective winding in solenoid
24	Selector Lever Position L1 - Pin 36	Break or short in wiring, or defective sensor
2A	Output Speed Sensor signal ans Stall Speed signal - Pins 13 and 42	No input, or incorrect engine speed information
33	Pressure Regulator, EDS 5 - Pin 51	Questionable signal, or break or short in wiring
34	Power Supply to transmission - Pin 52	Break or short in wiring

BMW ZF-5HP-30 FAULT CODE CHART

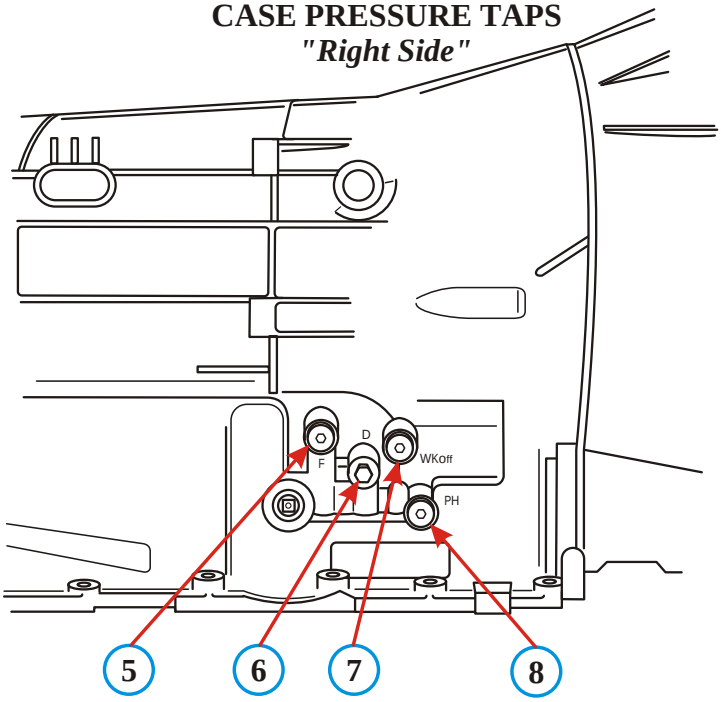
Code	*Description*	*Possible Causes*
36	Power Supply - Pin 54	Power Supply less than 9 volts at engine speeds greater than 1600 RPM
64	Speed Monitoring	Faulty Speed Sensor signal, or slip in Transmission
65	EPROM - Checksum	Program memory in Transmission Control Unit faulty
66	Incorrect Program Checksum	Program memory in Transmission Control Unit faulty
67	Transmission Relay - Pin 52	Pickup and dropout times too long
68	Over-revving Lock	Engine RPM greater than 6816 has been detected
69	Speed Monitoring	Faulty Speed Sensor signal, or slip in Transmission
6A	Speed Monitoring	Faulty Speed Sensor signal, or slip in Transmission
96	CAN Timeout 1	CAN signal not sent during initialization (Ignition On)
97	CAN Timeout 2	CAN signal not sent during operation
98	CAN Bus monitoring	Values in CAN RAM are not updated
99	CAN status fault	
9A	CAN throttle valve information	DME detects faulty throttle valve signal
9B	CAN load signal information	DME detects faulty load signal
9C	CAN engine intervention	DME cannot carry out reduction in engine torque desire by the EGS, or DME has different requirements compared to other CAN users
9D	CAN engine temperature info	DME detects faulty engine temperature signal



CASE PRESSURE TAPS
"Left Side"



CASE PRESSURE TAPS
"Right Side"



1. ***WKzu = Converter Clutch ON Pressure.***
2. ***A = "A" Clutch Pressure.***
3. ***S = Cooler Pressure.***
4. ***B = "B" Clutch Pressure (Must Drill and Tap for Access).***
5. ***F = "F" Clutch Pressure.***
6. ***D = "D" Clutch Pressure (Must Drill and Tap for Access).***
7. ***WKoff = Converter Clutch OFF Pressure.***
8. ***PH = Line Pressure.***