



HYDRA-MATIC 4L40-E/5L40-E

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INTRODUCTION

HYDRA-MATIC 4/5L40-E

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Beginning at the start of production for some 1999 models, BMW has introduced a new 5 speed automatic transmission that is designed and manufactured by General Motors Powertrain division in Strasbourg, France and is illustrated in Figure 1. This new transmission is designated as follows:

GM Designation - 5L40-E BMW Designation - A5S 360R

Model year 1999 applications are as follows:

3 Series BMW, with 2.5L Gasoline Engine, Used in USA and Japan.

3 Series BMW, with 2.8L Gasoline Engine, Used in USA and Japan.

5 Series BMW, with 3.0L Diesel Engine, Used Worldwide.

Model year 2003 applications are as follows:

Cadillac CTS model, Gasoline Engine, Used Worldwide

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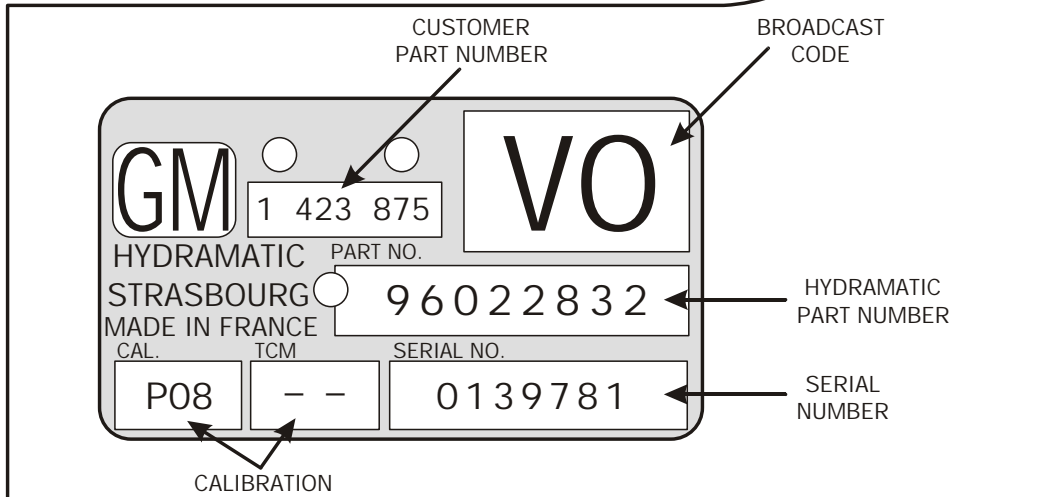
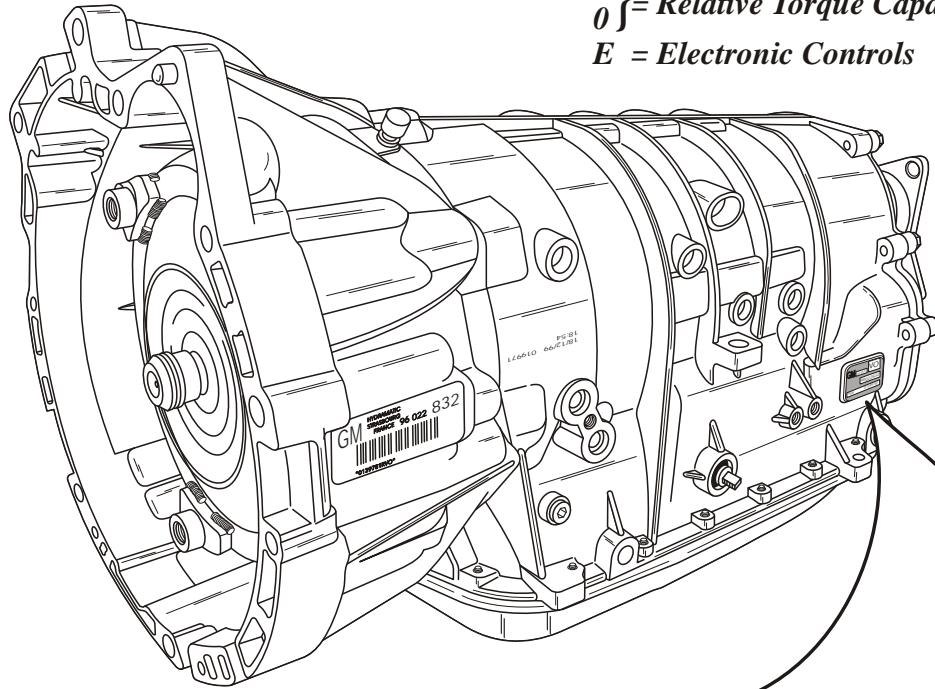
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5 = 5 Forward Speeds
L = Longitudinal (Rear Drive)
4 } = Relative Torque Capacity
0 }
E = Electronic Controls



Production Location = Strasbourg, France
Torque Converter Size = 245mm and 258mm (Model Sensitive)
Pressure Taps = Line Pressure Only
Transmission Fluid Type = Dexron™ III
Transmission Fluid Capacity (Approx.) = Complete Overhaul: Dry 8.5L (9.0 Qt)

Figure 1

5L40-E CUT-AWAY VIEW AND COMPONENT LOCATIONS

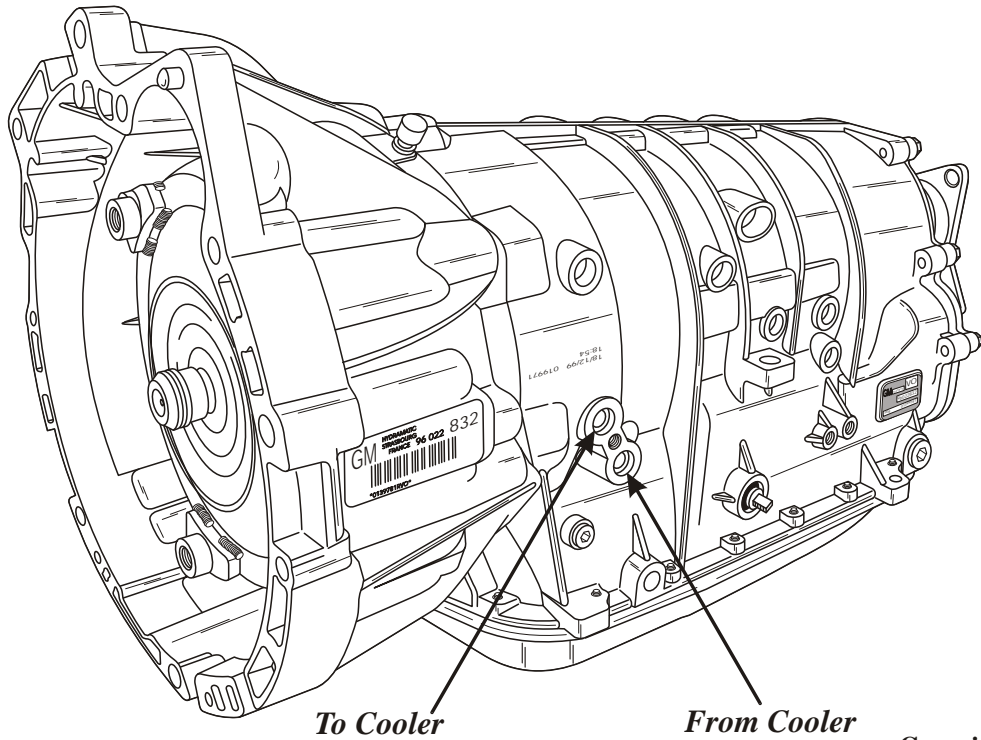
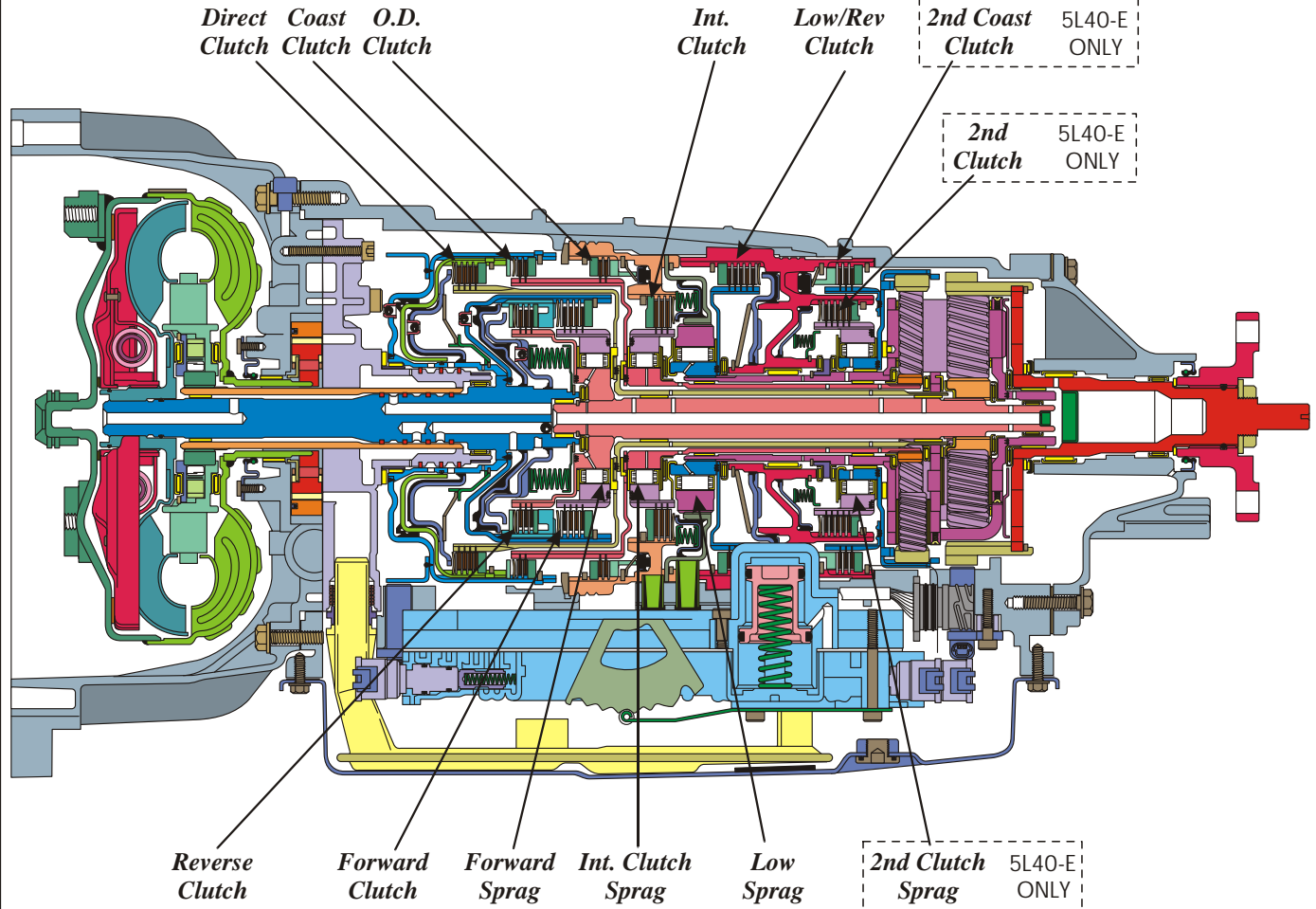


Figure 2



Technical Service Information

COMPONENT APPLICATION CHARTS

5L40-E COMPONENT APPLICATION CHART

RANGE	GEAR	Engine Braking	Direct Clutch	Coast Clutch	Reverse Clutch	Fwd. Clutch	2nd Clutch	Int. Clutch	O.D. Clutch	Low/Reverse Clutch	2nd Coast Clutch	Fwd. Clutch Sprag	Low Clutch Sprag	2nd Clutch Sprag	Int. Clutch Sprag	Gear Ratio
Park/Neutral																
Reverse	R	Yes			On					On						3.03
D, 4, 3, 2,	1st	No*		On		On						Hold	Hold			3.42
	1st	Yes		On		On				On		Hold	Hold			3.42
	2nd	No*		On		On	On					Hold		Hold		2.21
	2nd	Yes		On		On	On				On	Hold		Hold		2.21
	3rd	No*		On		On	On	On				Hold			Hold	1.60
	3rd	Yes		On		On	On	On	On			Hold			Hold	1.60
	4th	Yes		On	On		On	On	On			Hold				1.00
5th	Yes		On			On	On	On	On							0.75

* Engine braking is electronically controlled by the TCM, and is available as calibrated for each model and application.
On = Clutch Applied.

4L40-E COMPONENT APPLICATION CHART

RANGE	GEAR	Engine Braking	Direct Clutch	Coast Clutch	Reverse Clutch	Fwd. Clutch		Int. Clutch	O.D. Clutch	Low/Reverse Clutch		Fwd. Clutch Sprag	Low Clutch Sprag		Int. Clutch Sprag	Gear Ratio
Park/Neutral																
Reverse	R	Yes			On					On						3.03
D, 4, 3, 2,	1st	No*		On		On						Hold	Hold			2.82
	1st	Yes		On		On				On		Hold	Hold			2.82
	2nd	No*		On		On						Hold				1.54
	2nd	Yes		On		On						Hold				1.54
	3rd	No*		On		On		On				Hold			Hold	1.00
	3rd	Yes		On		On		On	On			Hold			Hold	1.00
	4th	Yes		On	On		On		On			Hold				0.70

* Engine braking is electronically controlled by the TCM, and is available as calibrated for each model and application.
On = Clutch Applied.

Figure 3

5L40-E SOLENOID APPLICATION CHART

RANGE	GEAR	Engine Braking	Direct Clutch	Coast Clutch	Reverse Clutch	Fwd. Clutch	2nd Clutch	Int. Clutch	O.D. Clutch	Low/Reverse Clutch	2nd Coast Clutch	1-2 Shift Sol.	2-3 Shift Sol.	4-5 Shift Sol.	TCC Sol.	Gear Ratio
Park/Neutral												***	***	***	Off	
Reverse	R	Yes			On					On		On			Off	3.03
D, 4, 3, 2,	1st	No*		On		On						Off	On	Off	Off	3.42
	1st	Yes		On		On				On		Off	On	On	Off	3.42
	2nd	No*		On		On	On					On	On	Off	On**	2.21
	2nd	Yes		On		On	On				On	On	On	On	On**	2.21
	3rd	No*		On		On	On	On				On	Off	Off	On**	1.60
	3rd	Yes		On		On	On	On	On			On	Off	On	On**	1.60
	4th	Yes	On	On		On	On	On				Off	Off	On	On**	1.00
5th	Yes	On				On	On	On	On			Off	Off	Off	On**	0.75

* Engine braking is electronically controlled by the TCM, and is available as calibrated for each model and application.

** Dependant upon various sensors including vehicle speed and throttle position.

*** Calibrated for particular model and application.

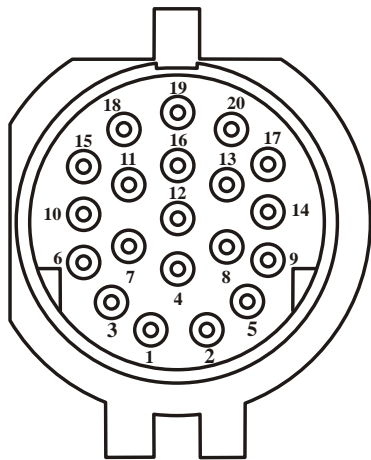
On = Clutch Applied.

On = Solenoid Energized.

Off = Solenoid De-Energized.

5L40-E COMPONENT RESISTANCE CHART

COMPONENT	CASE CONN TERMINALS	RESISTANCE @ 20°C (68°F)
1-2 Shift Solenoid "A" (On/Off - N/C)	14 And 17	15-17 Ohms
2-3 Shift Solenoid "B" (On/Off - N/C)	9 And 17	15-17 Ohms
4-5 Shift Solenoid "C" (On/Off - N/C)	5 And 17	15-17 Ohms
TCC Solenoid (PWM - N/C)	20 And 17	10.0-11.5 Ohms
Pressure Control Solenoid (PWM - N/C)	8 And 13	3.5-4.6 Ohms
Input Speed Sensor	18 And 15	325-485 Ohms
Output Speed Sensor	1 And 3	325-485 Ohms
Transmission Fluid Temperature Sensor	10 And 6	See Chart Below
Internal Mode Switch	See Wire Schematic	See Chart



View Looking Into Transmission Case Connector

TFT Sensor Resistance Chart

Temperature C° (F°)	Resistance In Ohms		
	Minimum	Nominal	Maximum
-30C (-22F)	50264	52594	54924
-20C (-8F)	27439	28582	29725
-10C (14F)	15540	16120	16700
0C (32F)	9097	9399	9701
10C (50F)	5493	5658	5823
20C (68F)	3418	3511	3604
30C (86F)	2185	2240	2295
40C (104F)	1430	1465	1500
50C (122F)	958	980	1002
60C (140F)	656	671	686
70C (158F)	459	469	479
80C (176F)	327	334	341
90C (194F)	237	242	247
100C (212F)	174	178	182
110C (230F)	130	133	136
120C (248F)	98	101	104
130C (266F)	75	78	80

Figure 4

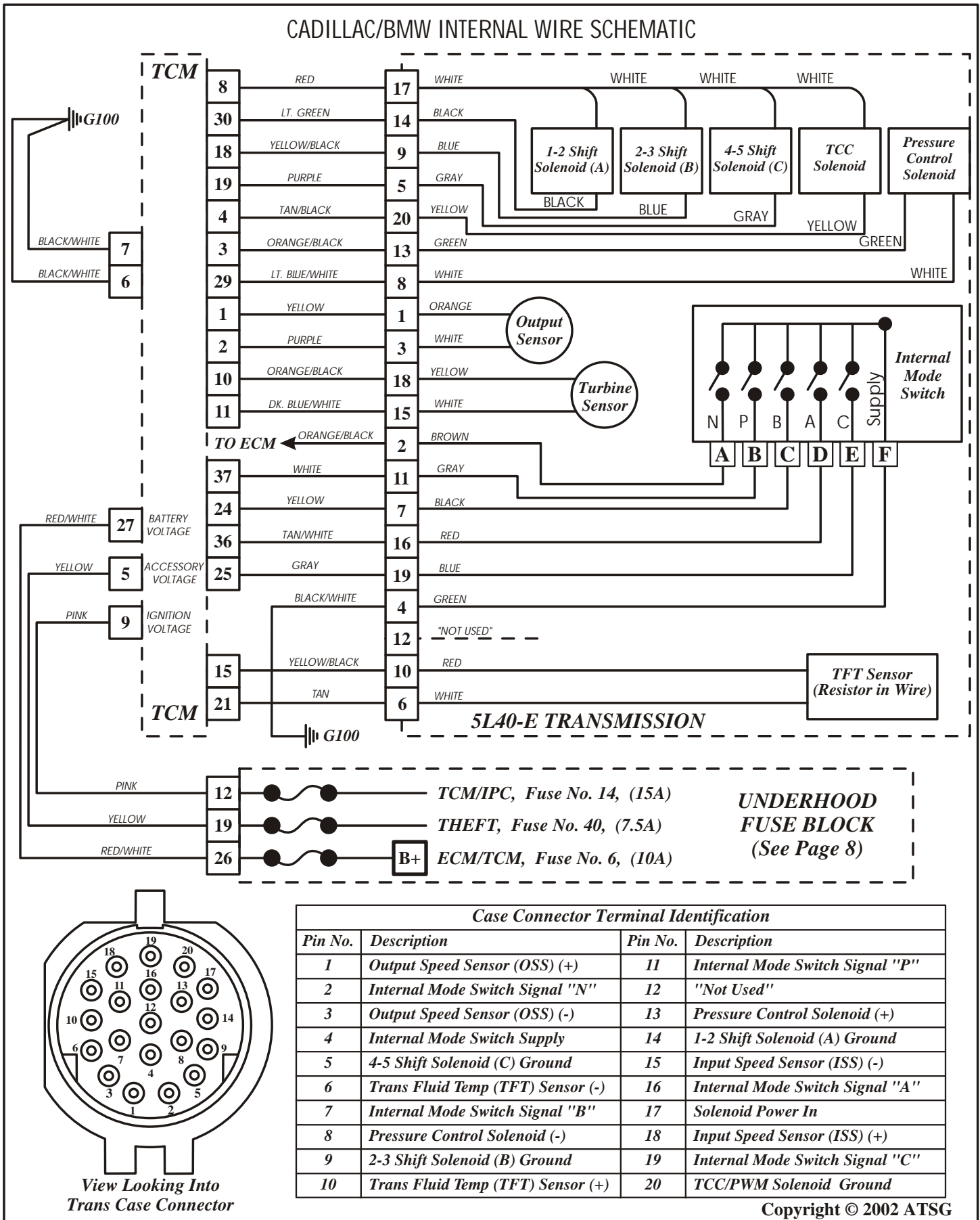
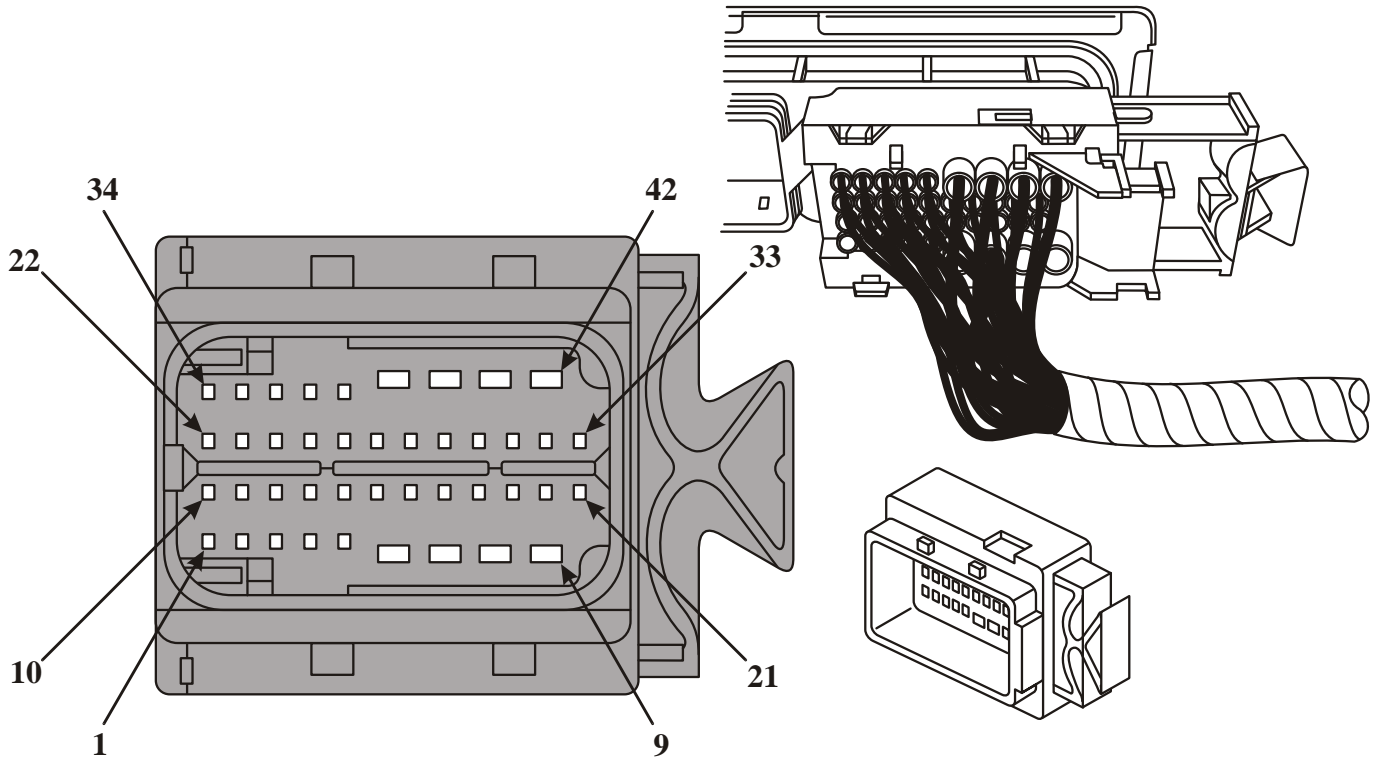
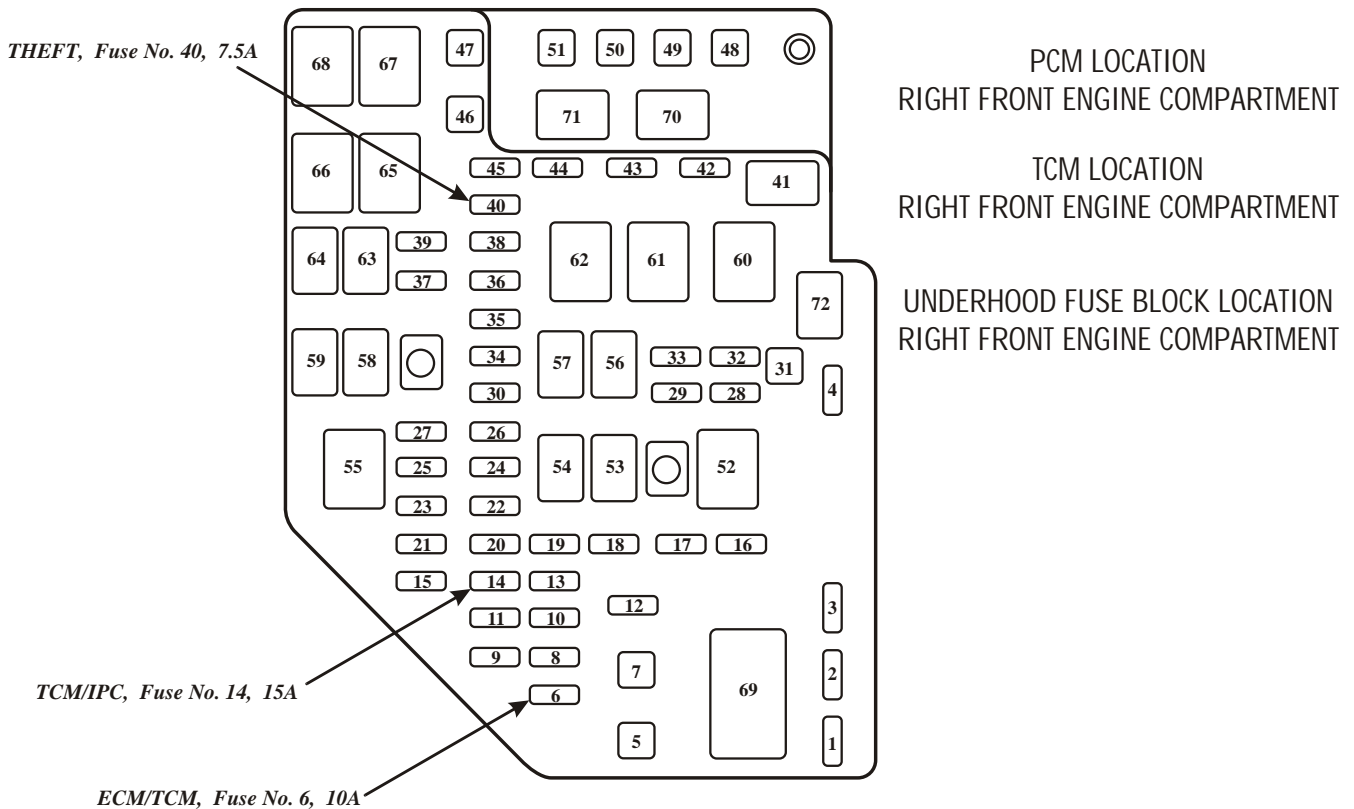


Figure 5

TRANSMISSION CONTROL MODULE (TCM) CONNECTOR IDENTIFICATION



UNDERHOOD FUSE BLOCK LOCATIONS AND IDENTIFICATION



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Figure 6



Technical Service Information

TRANSMISSION CONTROL MODULE (TCM) CONNECTOR IDENTIFICATION			
PIN NO.	WIRE COLOR	CIRCUIT NO.	FUNCTION
1	Yellow	400	Output Shaft Speed (OSS) Sensor High Signal
2	Purple	401	Output Shaft Speed (OSS) Sensor Low Signal
3	Orange/Black	1228	Pressure Control Solenoid High Control
4	Tan/Black	422	Torque Converter Clutch Solenoid Ground Control Signal
5	Yellow	343A	Accessory Voltage
6	Black/White	1551E	Ground
7	Black/White	1551C	Ground
8	Orange	1525	Solenoid Power Feed
9	Pink	239C	Ignition Switch Voltage
10	Orange/Black	1230	Transmission Input Shaft (ISS) High Signal
11	Dk. Blue/White	1231	Transmission Input Shaft (ISS) Low Signal
13	White/Black	5043B	Serial Data
15	Yellow/Black	1227	Transmission Fluid Temperature (TFT) High Signal
18	Yellow/Black	1223	2-3 Shift Solenoid "B" Ground Signal
19	Purple	898	4-5 Shift Solenoid "C" Ground Signal
21	Tan	2762	Transmission Fluid Temperature (TFT) Low Signal
24	Yellow	772	Transmission Range Switch Signal "B"
25	Gray	773	Transmission Range Switch Signal "C"
27	Red/White	1440D	Battery Positive Voltage
29	Lt. Blue/White	1229	Pressure Control Solenoid Low Control
30	Lt. Green	1222	1-2 Shift Solenoid "A" Ground Signal
32	White	2500	High Speed GMLAN Serial Data Bus + (CAN)
33	Green	2501	High Speed GMLAN Serial Data Bus - (CAN)
36	Tan/White	771	Transmission Range Switch Signal "A"
37	White	776	Transmission Range Switch Signal "P"
38	Purple	420E	TCC Brake Switch Signal

Special Note: Pins 12, 14, 16, 17, 20, 22, 23, 26, 28, 31, 34, 35, 39, 40, 41, 42 are "Not Used".

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Figure 7



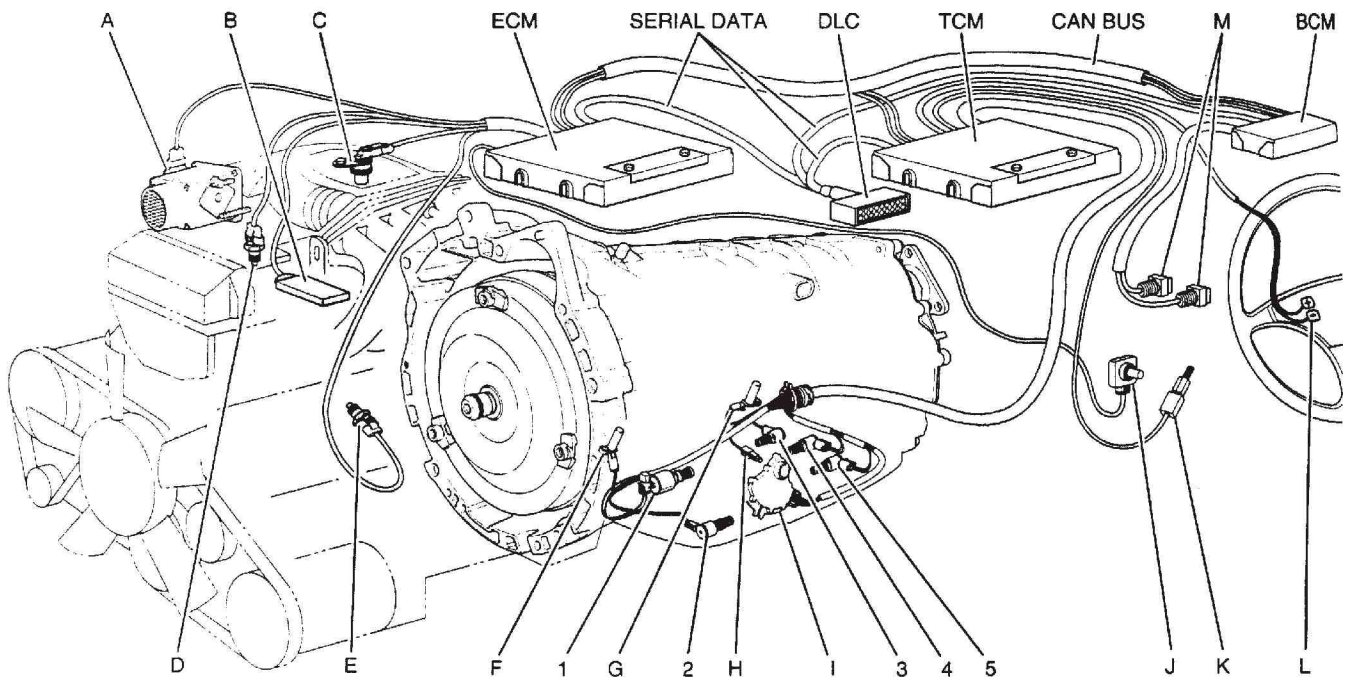
Technical Service Information

ELECTRICAL COMPONENTS

Electrical signals from various sensors provide information to the TCM or PCM, about vehicle speed, throttle position, engine coolant temp, range selector position, engine speed and converter turbine speed. The TCM or PCM uses this information to determine upshift and downshift speeds, apply or release of the TCC and what fluid pressure is needed to apply the clutch packs. This type of control provides consistent shift points and shift quality based on the operating conditions of the vehicle.

If for any reason the entire electronic control system of the transmission becomes disabled, all three shift solenoids will be turned off. This "Safety Mode" operating state forces the transmission to operate in 5th gear when the range selector is in any forward range. Also, the pressure control solenoid is turned off which will increase line pressure to the maximum.

Note: Some models use an Engine Control Module (ECM) and a Transmission Control Module (TCM) and some models use a Powertrain Control Module (PCM) for both engine and transmission management.



INFORMATION SENSORS

- A. THROTTLE POSITION SENSOR (TPS)
- B. MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR
- C. ENGINE SPEED SENSOR
- D. MANIFOLD AIR TEMPERATURE (MAT) SENSOR
- E. ENGINE COOLANT TEMPERATURE (ECT) SENSOR
- F. INPUT SPEED SENSOR (ISS)
- G. OUTPUT SPEED SENSOR (OSS)
- H. TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR
- I. INTERNAL MODE SWITCH (IMS)
- J. ACCELERATOR PEDAL POSITION (APP) SENSOR
- K. TCC BRAKE SWITCH

ELECTRONIC CONTROLLERS

- * TRANSMISSION CONTROL MODULE (TCM) *SOME MODELS*
- * POWERTRAIN CONTROL MODULE (PCM)
- * ENGINE CONTROL MODULE (ECM) *SOME MODELS*
- * BODY CONTROL MODULE (BCM)
- * DIAGNOSTIC LINK CONNECTOR (DLC)

TRANSMISSION COMPONENTS

1. PRESSURE CONTROL SOLENOID
2. TCC/PWM SOLENOID
3. 1-2 SHIFT SOLENOID
4. 2-3 SHIFT SOLENOID
5. 4-5 SHIFT SOLENOID

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Figure 8