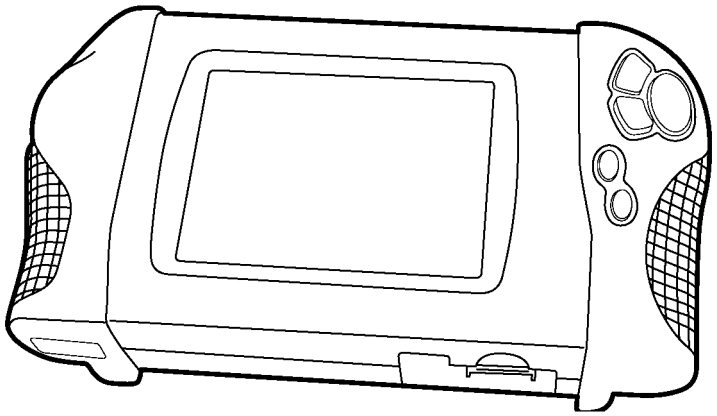
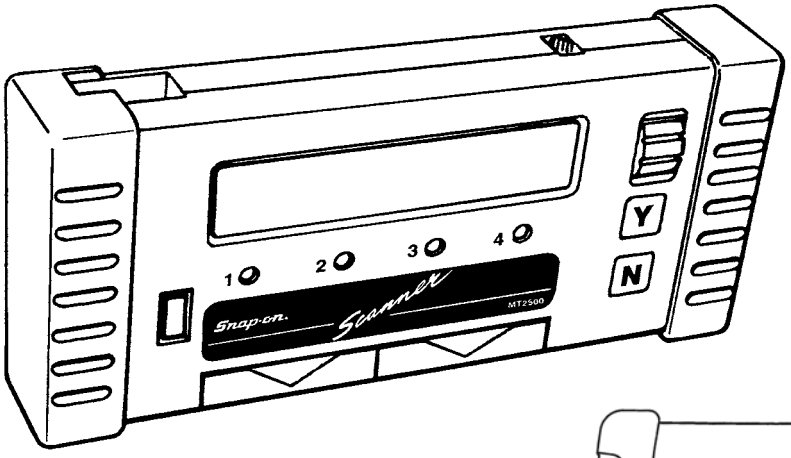
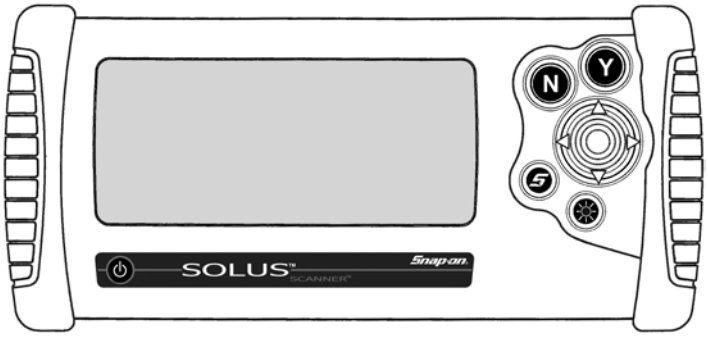
Fast-Track®

Holden Automatic Transmission Troubleshooter Reference Manual

Version 9.2 Software **February 2009**







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Use in conjunction with the applicable Scanner User's Reference Manual and Diagnostic Safety Manual.

Safety Warnings and Cautions

Refer to Diagnostic Safety Manual.

Holden Automatic Transmission Troubleshooter Reference Manual

Version 9.2
February 2009

**BEFORE OPERATING THIS UNIT,
PLEASE READ THIS MANUAL
AND ANY APPLICABLE SCANNER
AND SAFETY MANUALS.**

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Introduction

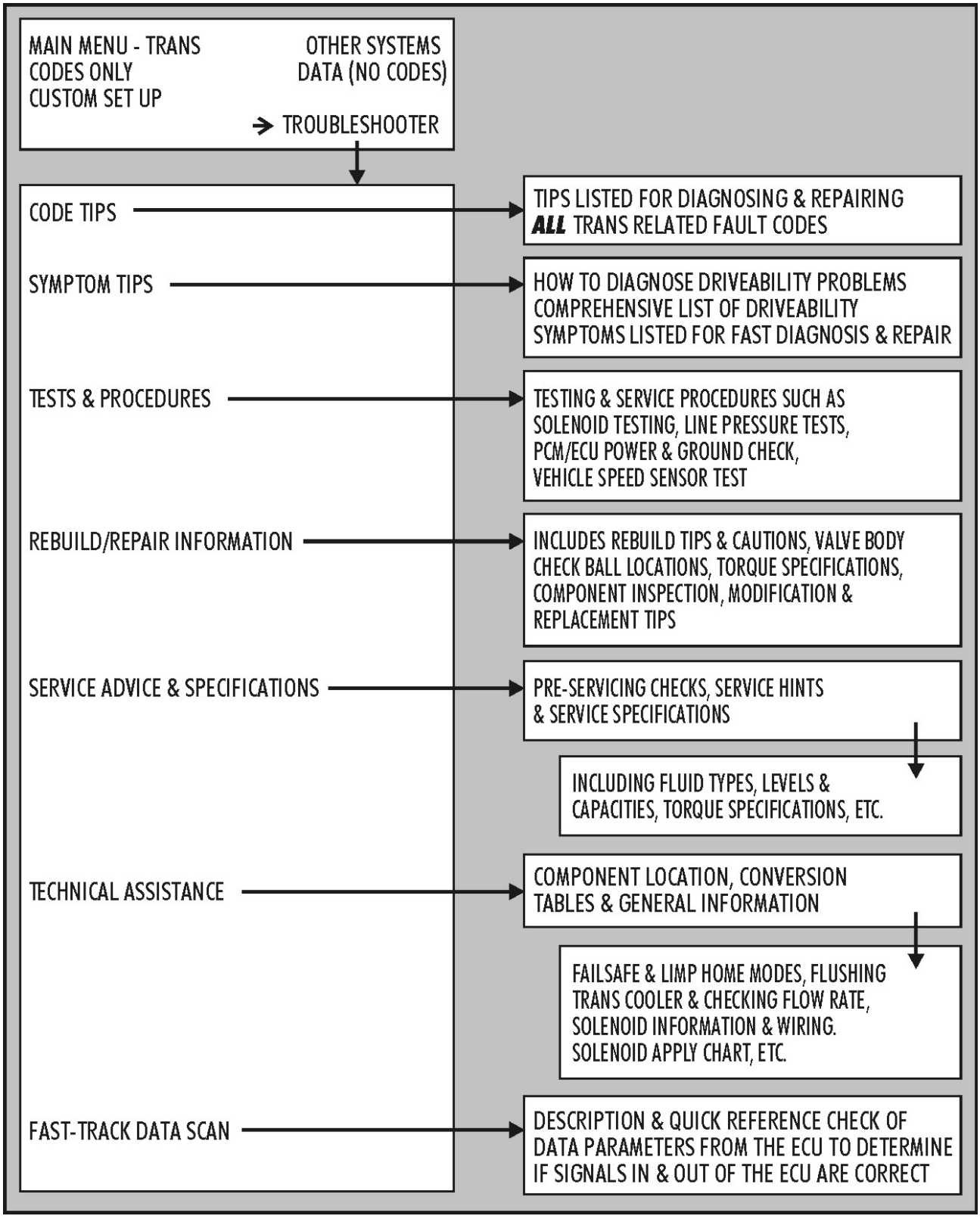
CAUTION

1. Always read Scanner and Safety Manuals first.

2. Ensure correct ID on Scanner and connections correct for vehicle.

3. Always check for fault codes first – checking KOEO, KOER and memory codes in Self Tests.

How to locate troubleshooting tips and information in the Fast-Track Automatic Transmission Troubleshooter



Using *Troubleshooter* Effectively

The checks in each *Troubleshooter* tip begin with the most likely cause of a problem or with the tests that should be made first. The checks then progress through other possible causes and tests. All checks in a tip are common causes of a problem or important basic tests, and the most important are listed first. For the most effective use of the *Troubleshooter* tips, follow the checks in the order in which they are given.

Many checks in the *Troubleshooter* tips with refer you to references in this *Troubleshooter* Manual. Consult the references as directed by the tips on the *Troubleshooter*. Trying to use the references by themselves may cause you to miss important information or to perform some test or adjustment out of sequence.

CAUTION

During procedures in the *Troubleshooter* the vehicle's ignition switch will be required to be switched OFF (eg: for disconnecting connectors etc). This will cause the communication between the Scanner and vehicle to drop out. Sometimes the Scanner will read 'No Communication' or drop completely out and sometimes it will still show *Troubleshooter* information. Note if *Troubleshooter* information remains on screen, any data parameters shown will be those prior to switching ignition off and will not change due to no ignition power. Ensure ignition is on and vehicle's PCM is communicating whenever checking any data parameters.

Begin with the basics

The *Fast-Track Troubleshooter* tips deal with automatic transmission electronic systems and controls. Many tips also contain directions to check fuel, ignition, and other electrical components. As a general rule, basic fuel system, ignition, and electrical tests, as well as a thorough inspection, should be made before performing pinpoint tests on electronic components.

Always ensure that the following systems and components are in proper operating condition:

- Battery condition
- Electrical connectors and wiring harnesses
- Vacuum lines and connectors
- General engine mechanical condition
- Brakes and differential assemblies

Troubleshooting Trouble Codes

Trouble codes should be diagnosed and serviced in a basic order: First, hard codes for currently present problems; followed by soft, or memory, codes for intermittent problems.

GM vehicles transmit codes in numerical order from the lowest to the highest. This is basically the order in which they should be serviced, with current codes being diagnosed before history codes. Code 51 and some other 50-series codes are the exceptions to this general rule. Code 51 for many GM vehicles indicates a PROM fault and should be serviced before other codes. Other 50-series codes that relate to PROM or PCM problems also should be diagnosed before other codes.

To distinguish between a current (hard) code and an intermittent (soft) code on most GM vehicles, clear the codes from PCM memory. Then drive the vehicle and watch for the code to reappear. If it reappears immediately or soon, the code usually indicates a hard fault. If the code does not reappear quickly, it was probably a soft code, indicating an intermittent problem. Some late-model GM cars also have a code history section which shows up to the last four fault codes logged with a history of when they occurred. Refer to 'Reading, using and clearing codes' in the *Troubleshooter* Technical Assistance General Information section.

General Reference

General circuit testing (voltage drop testing)

In most cases, measuring the voltage at various points in a circuit will tell you more about the circuit integrity than measuring the circuit resistance (ohms). A good circuit consists of the supply voltage, a load, and a ground. The load should be activated when current passes through it. A load is any electrical component, such as a lamp, a motor, a solenoid, or a relay. Most electrical circuits also include a fuse on the supply side to protect the load in the event of a short or power surge. Typically, mechanically-switched circuits, such as headlamps and wiper motors, have a switch on the supply side of the load. Electronically-switched circuits such as a TCC solenoid or an EGR solenoid, are usually ground-side switched. Remember, many switches actually energize a relay which, in turn, activates a circuit.

To determine if a circuit is good, check the supply voltage to the load, and check the ground. Figure 1 shows you how to test the supply voltage. Connect the positive (+) DVOM lead to pin A of the load, and the negative (-) DVOM lead to chassis ground. With the switch closed, the DVOM indicates a good supply voltage (13.00 volts) at pin A of the load. This typically indicates that the supply side of the circuit is good. It also indicates that the fuse is not blown. If the fuse was blown, the DVOM would indicate zero volts on the supply side of the circuit.

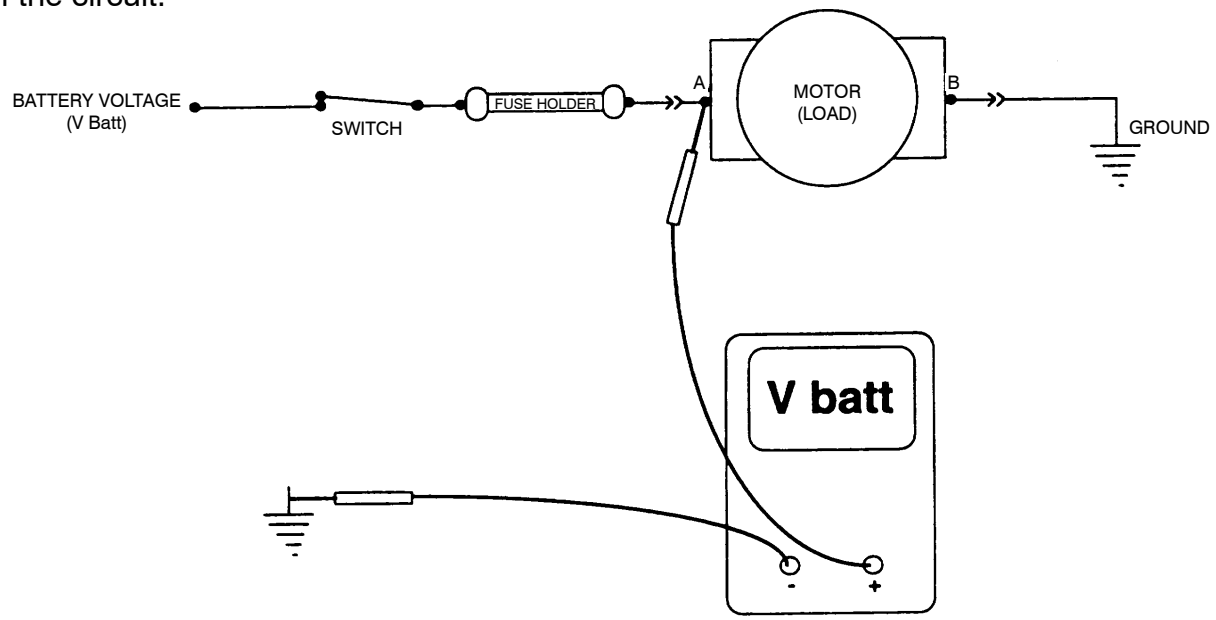
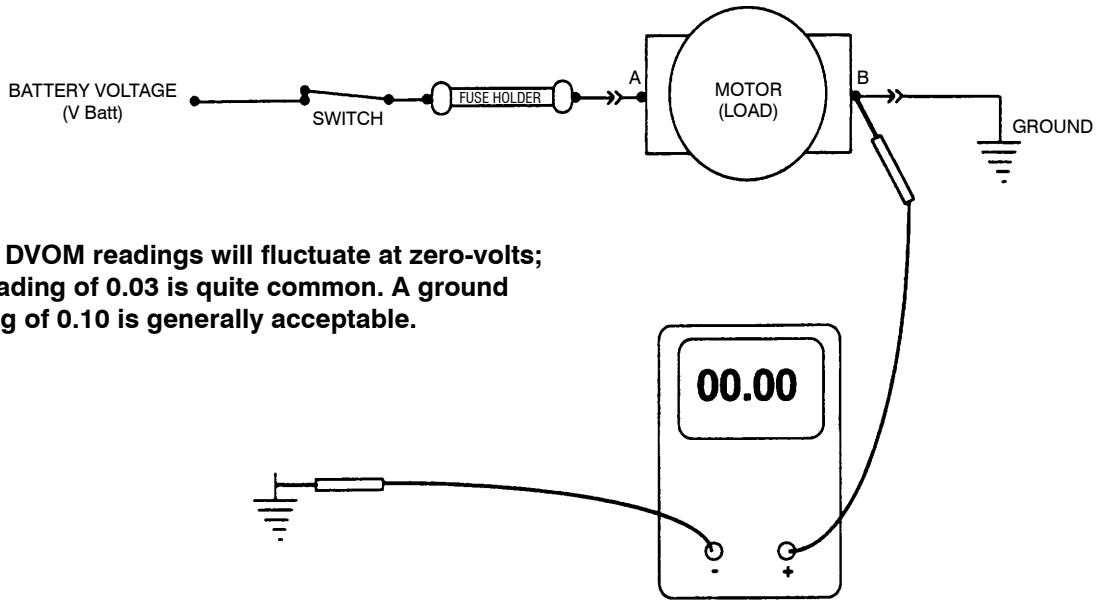


Figure 1. Good supply voltage.

Figure 2 on the next page shows you how to test the ground side of the circuit. The DVOM indicates a good ground (0.00 volts) at pin B of the load, with the switch closed. This typically indicates that the ground side of the circuit is good. (Most DVOM readings will fluctuate at zero volts; a DVOM reading of 0.03 is quite common. A ground side reading of 0.10 is an accepted reading.)

Usually, the fastest and easiest way to check a circuit is to start at the load. In general, there are only six basic types of electrical problems that can affect automotive electrical circuits:

- No supply voltage
- A voltage drop on the supply voltage side
- A voltage drop on the ground side
- An open ground
- A shorted lead
- An open load



Note: Most DVOM readings will fluctuate at zero-volts; a DVOM reading of 0.03 is quite common. A ground side reading of 0.10 is generally acceptable.

Figure 2. Good ground.

Voltage Drop Across The Load

In some cases it may be preferable to actually measure the voltage directly across a load. This may be because you suspect a poor connection, corroded terminals, or a specific open or shorted component, or simply because a known good ground is not near the portion of the circuit you are testing. Resistance can be high in long thin wires, in poor connections, and in corroded terminals. Therefore, wires, poor connections, and corroded terminals can sometimes "load" a circuit.

To measure the voltage drop across a load, connect the positive (+) DVOM lead to the supply side of the load, and the negative (-) DVOM lead to the ground side of the load, figure 3. In a normally operating circuit, most of the supplied voltage is dropped across the load. If there are two or more loads in a circuit, the voltage drop is divided in proportion to the resistance of each load. That is, the voltage drop across each component should add up to the total supply voltage.

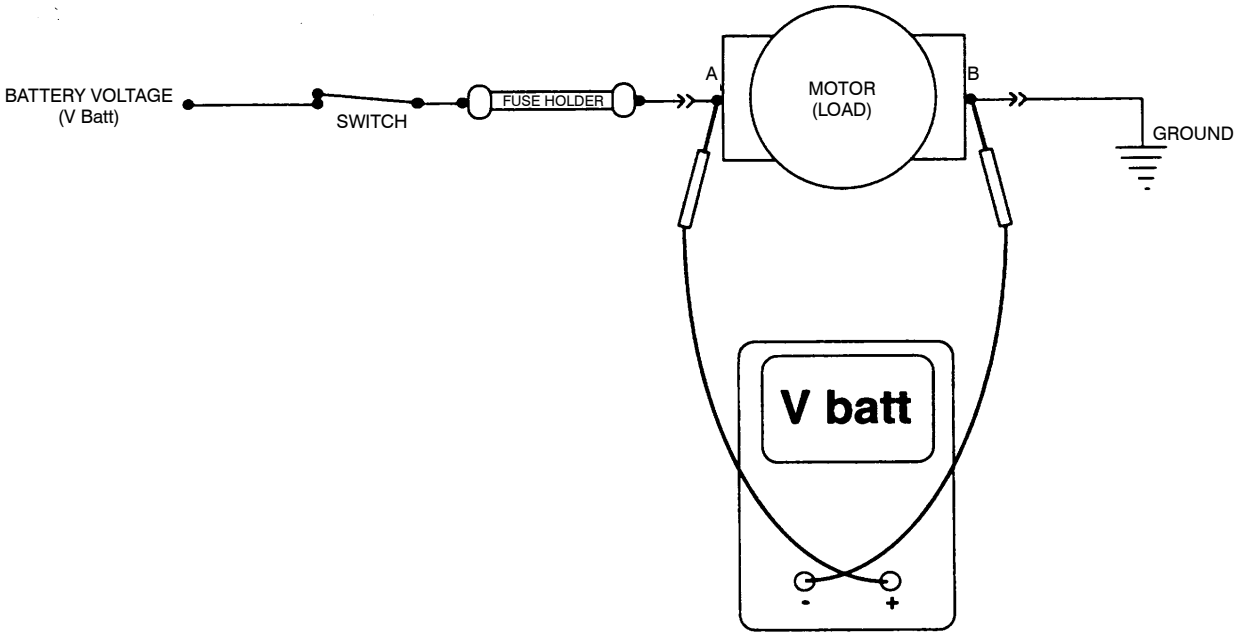


Figure 3. Voltage drop across the load.

Diagnosing Circuit Problems

Table 1 describes the symptoms, probable causes, and likely solutions for a circuit that is switched ON, but not operating properly. For a circuit that is switched OFF, but is still running, use a DVOM to probe between the load and the switch. Always start as close to the switch as possible. After isolating the problem to a specific segment of the circuit, unhook the circuit at that point to confirm that the circuit stops running. Always test the entire circuit (supply side and ground side) after fixing a problem.

Table 1. Circuit switched ON, but not operating properly. (All DVOM readings are referenced to battery ground, or a good chassis ground, separate from the circuit being tested.)

Supply Side	Ground Side	Probable Cause	Likely Solution
V batt	0.00-volts	Bad device or connections to device	Check for loose or corroded connector; if OK, replace component. Always test the entire circuit (supply side and ground side) after fixing a problem.
V batt	V batt	Open ground circuit	Use DVOM to probe circuit between ground side of component and ground source. Open circuit is located between adjacent test points having different readings. Always test the entire circuit (supply side and ground side) after fixing a problem.
0.00-volts	0.00-volts	Open supply circuit	Use DVOM to backprobe circuit between supply side of circuit and the supply source. Open circuit is located between adjacent test points having different readings. If fuse is open, check for a short to ground in section of circuit between load side of fuse and supply side of load. Always test the entire circuit (supply side and ground side) after fixing a problem.
V batt	Greater than 0.00-volts, less than V batt	High resistance ground connection	Use DVOM to probe circuit between ground side of component and ground source. High resistance circuit is located between adjacent test points having different readings. Always test the entire circuit (supply side and ground side) after fixing a problem.
Less than V batt, greater than 0.00-volts	0.00-volts	High resistance power connection	Use DVOM to backprobe circuit between supply side of circuit and supply source. High resistance circuit is located between adjacent test points having different readings. Always test the entire circuit (supply side and ground side) after fixing a problem.

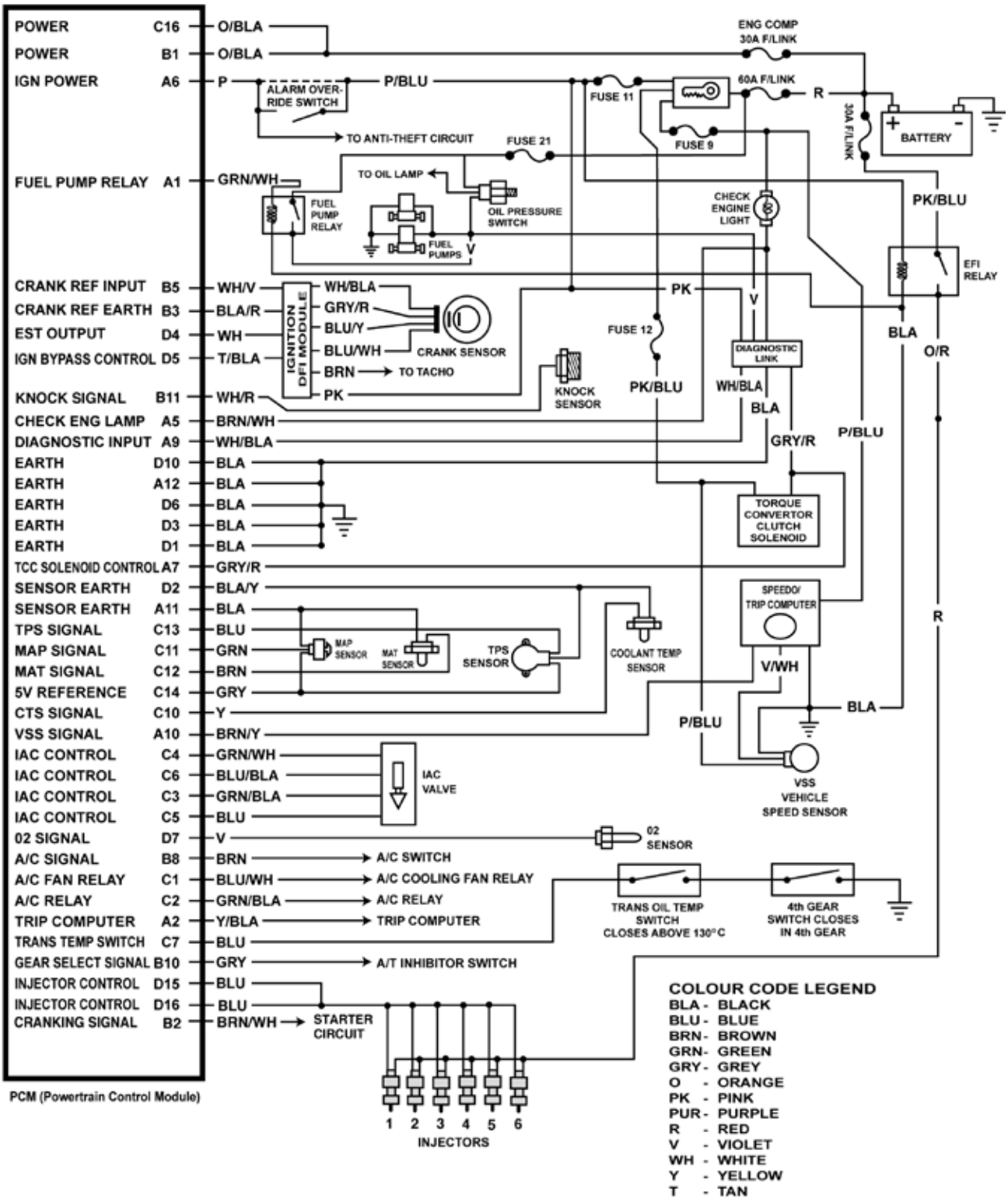
Note: Most DVOM readings will fluctuate at zero-volts; a DVOM reading of 0.03 is quite common. A ground side circuit reading of 0.10 volts is acceptable.

Holden Reference Bulletins

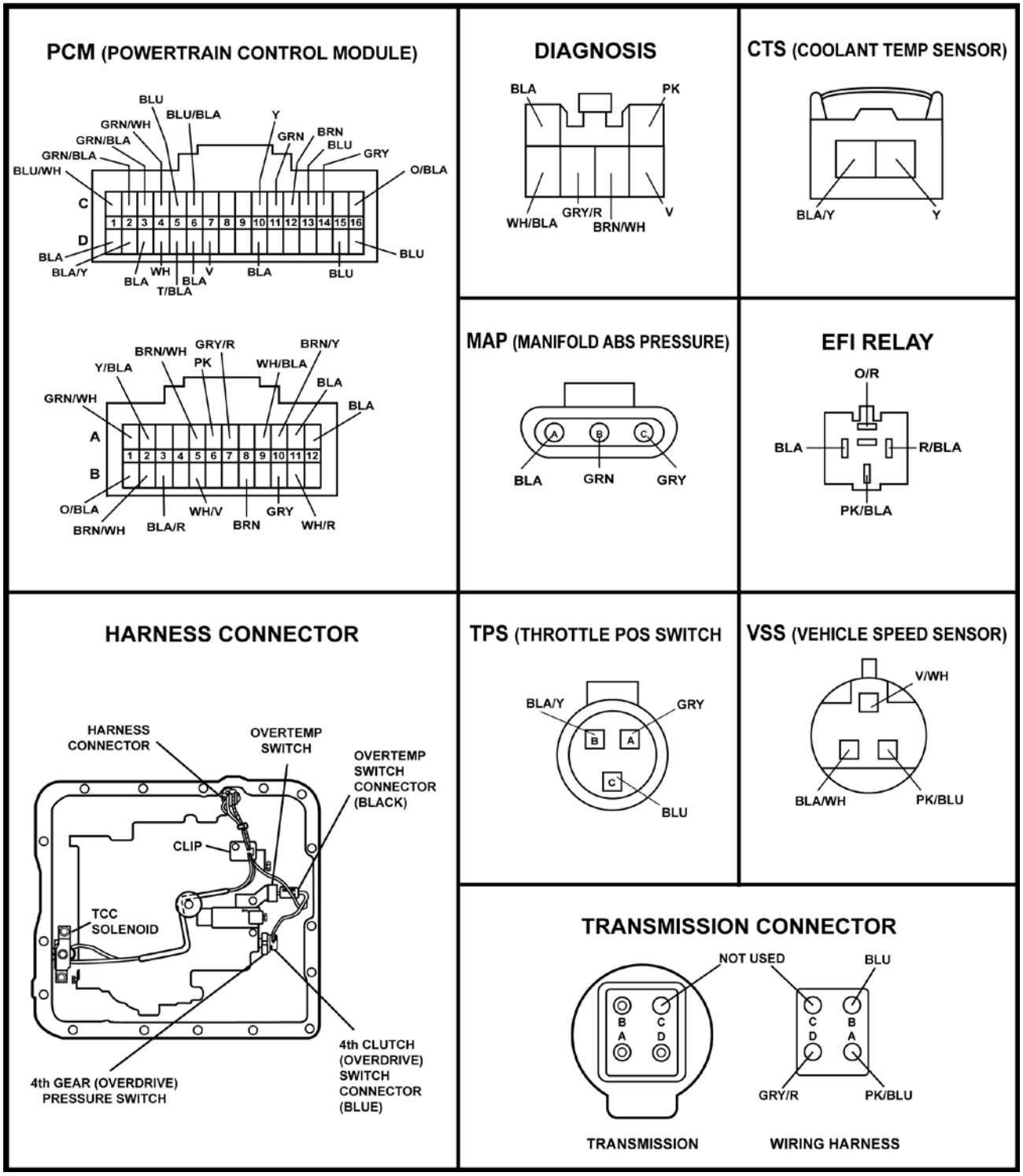
PLEASE NOTE WIRING DIAGRAM WIRE COLOURS ARE GIVEN AT THE PCM AND MAY NOT ALWAYS BE CORRECT DUE TO MANUFACTURING CHANGES IN PRODUCTION. ALSO WIRE COLOURS AT COMPONENTS AND SENSORS MAY NOT BE THE SAME AS AT THE PCM.

ALL CONNECTORS ARE VIEWED LOOKING INTO FACE OF CONNECTION.

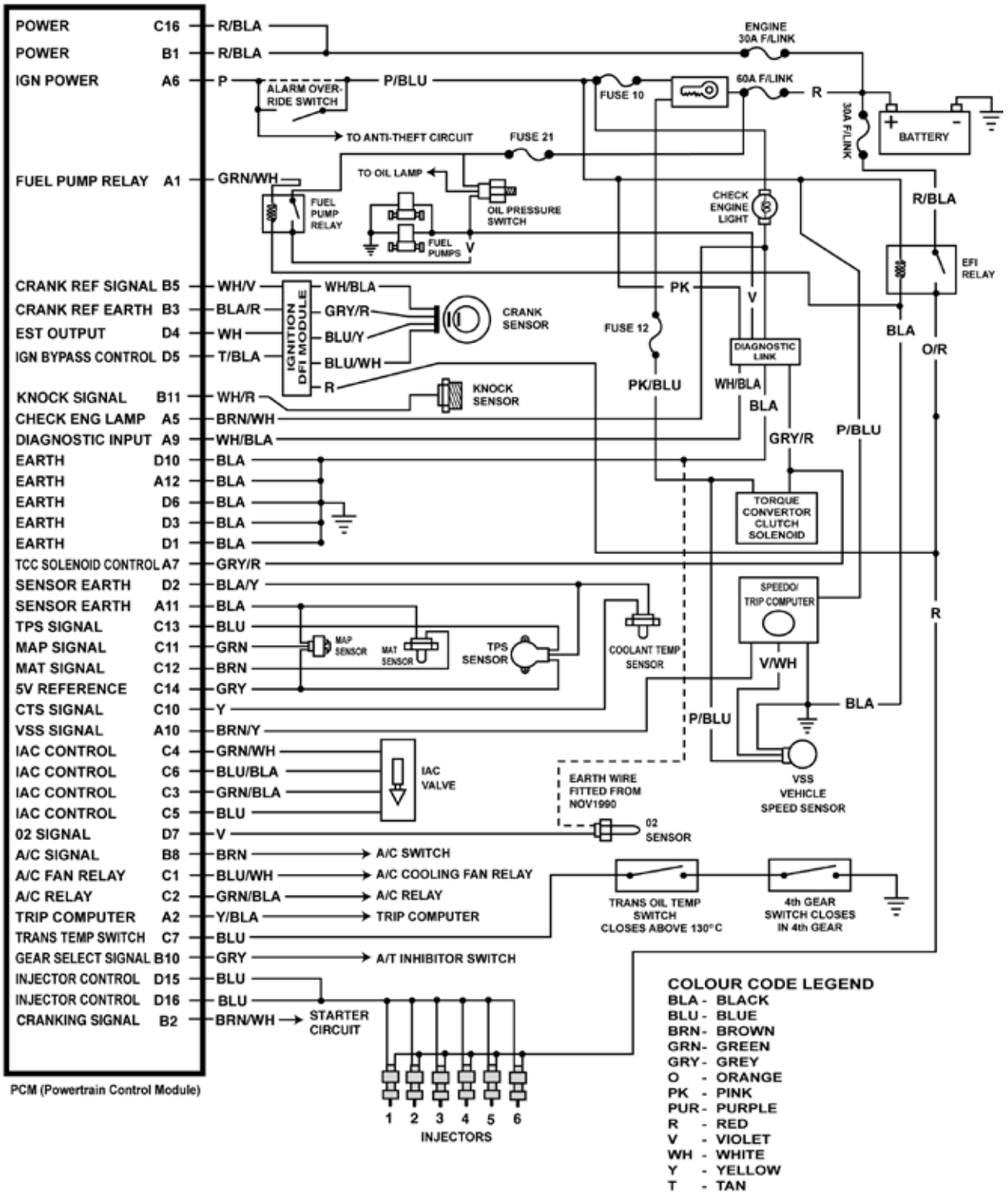
H001 VN Model (to Oct 1989) V6 wiring diagram and connectors



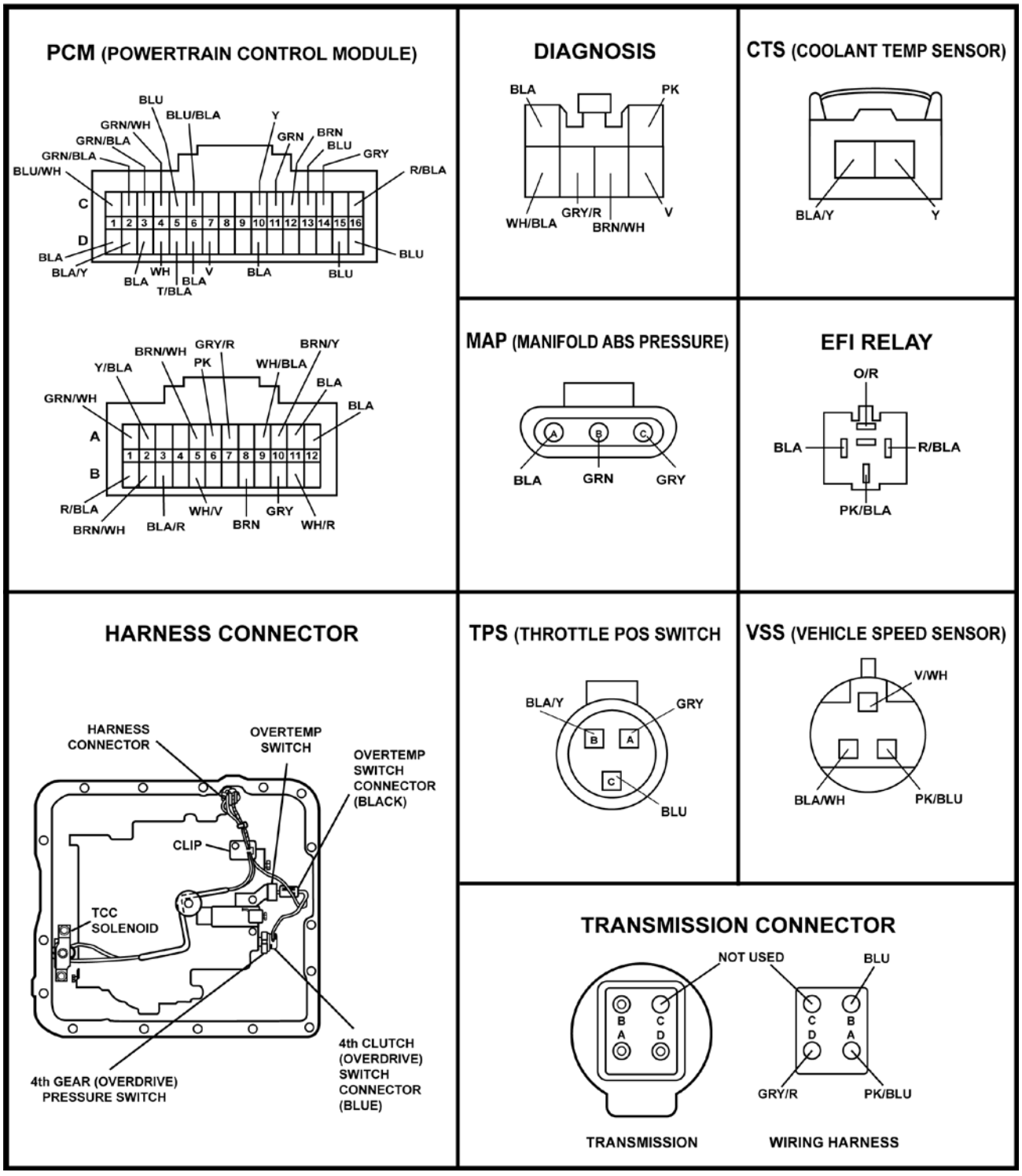
H001 Connectors



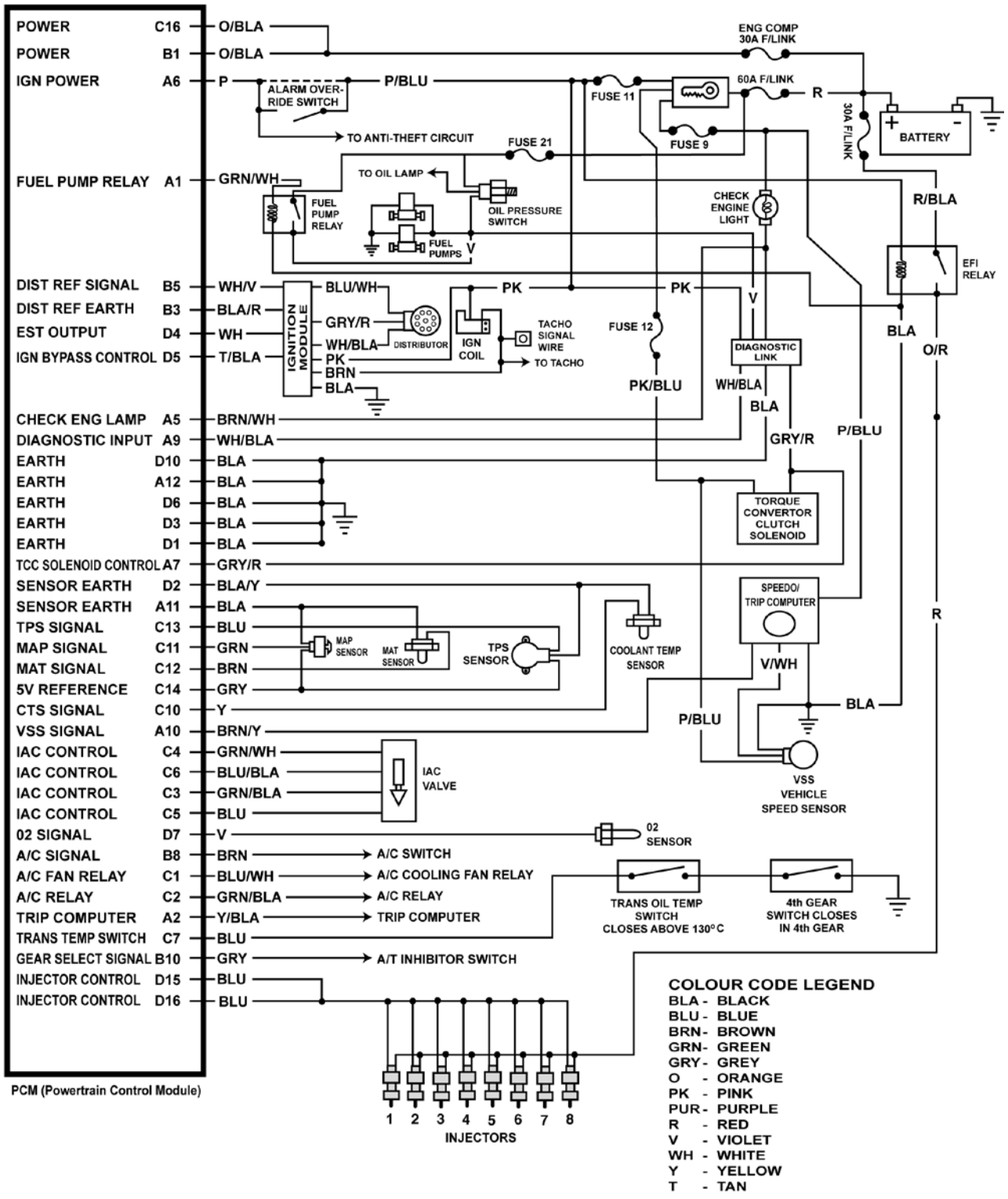
H002 VN Model (from Oct 1989) & VP Model V6 wiring diagram and connectors



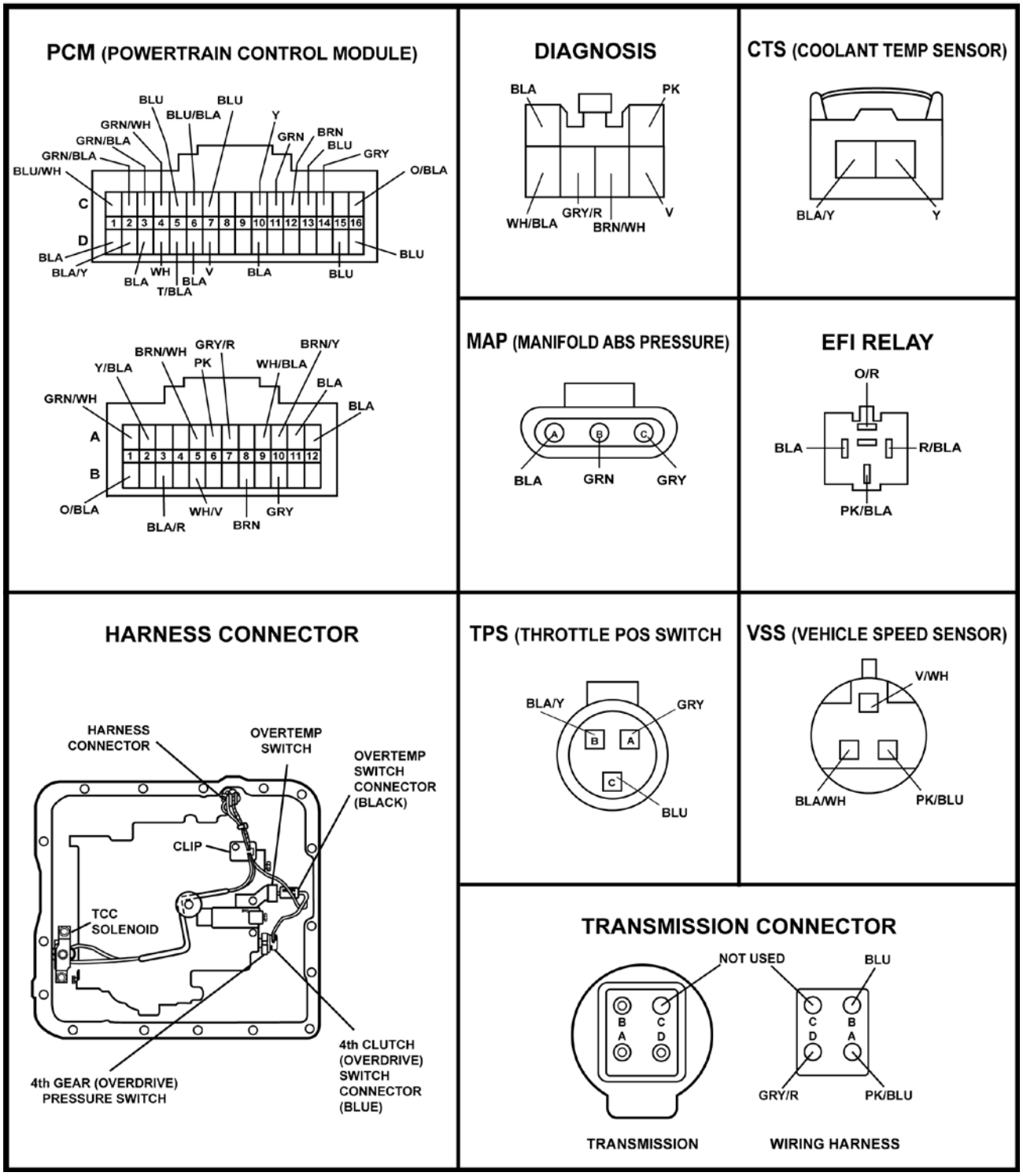
H002 Connectors



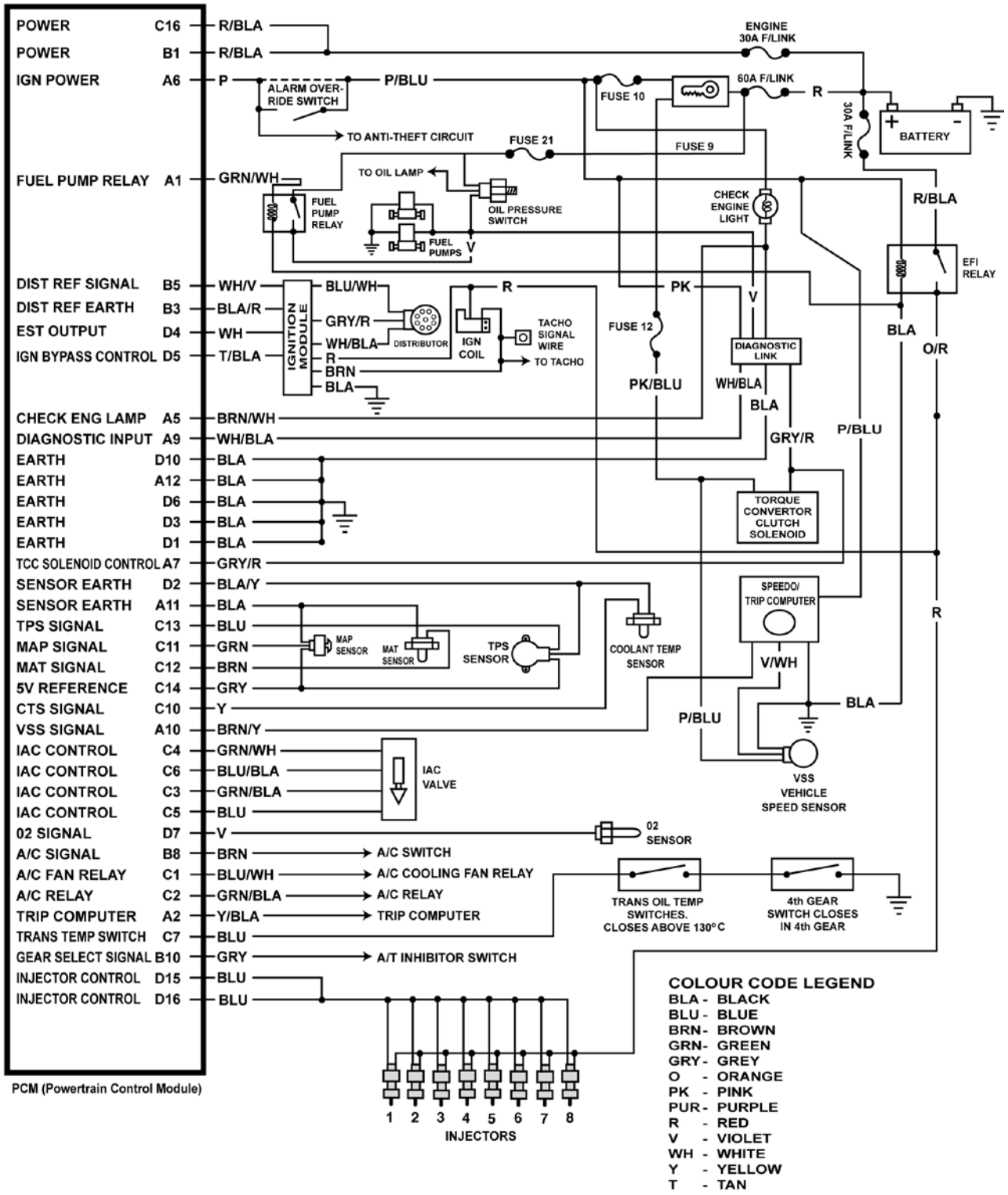
H003 VN Model (to oct 1989) V8 wiring diagram and connec-



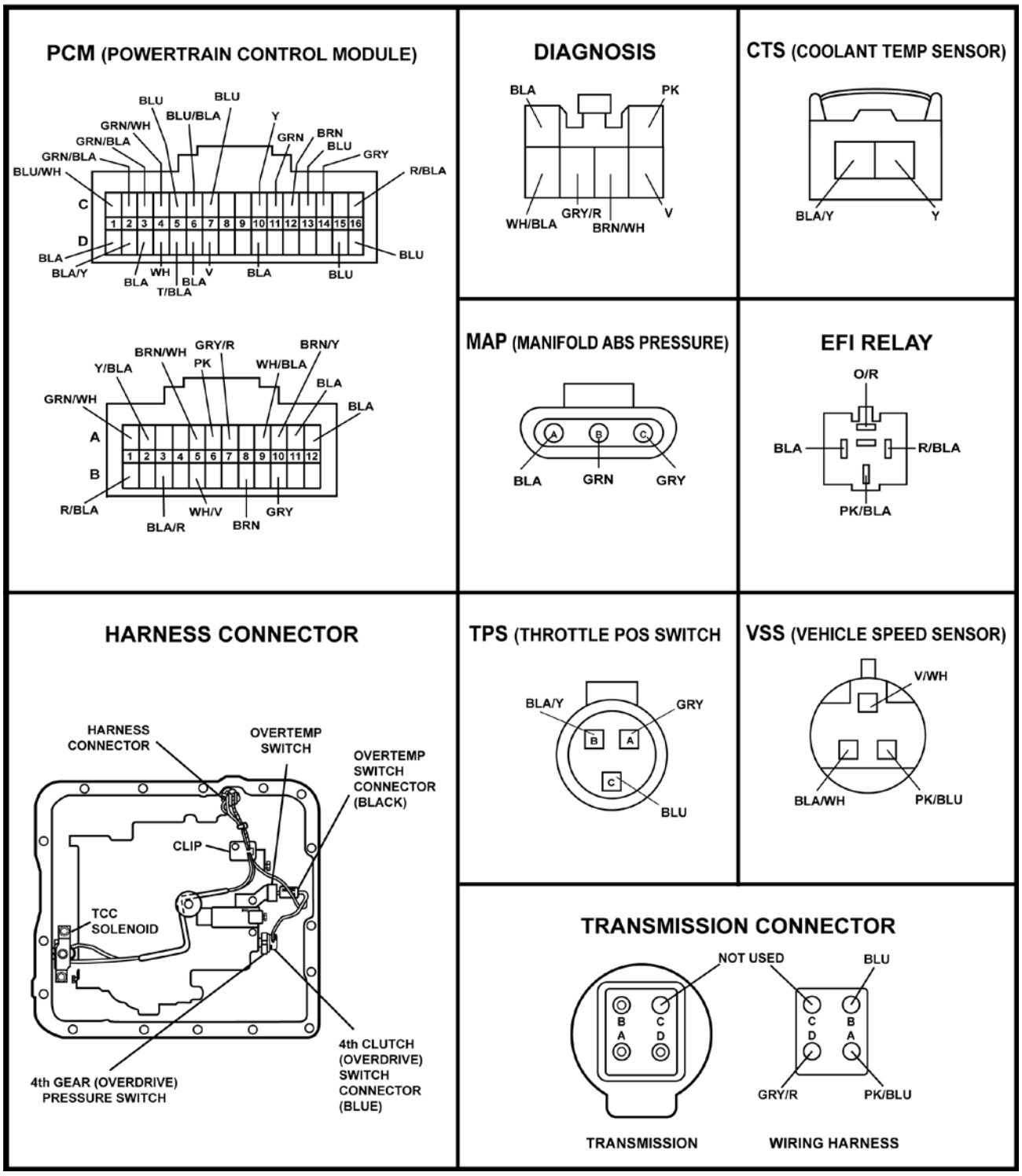
H003 Connectors



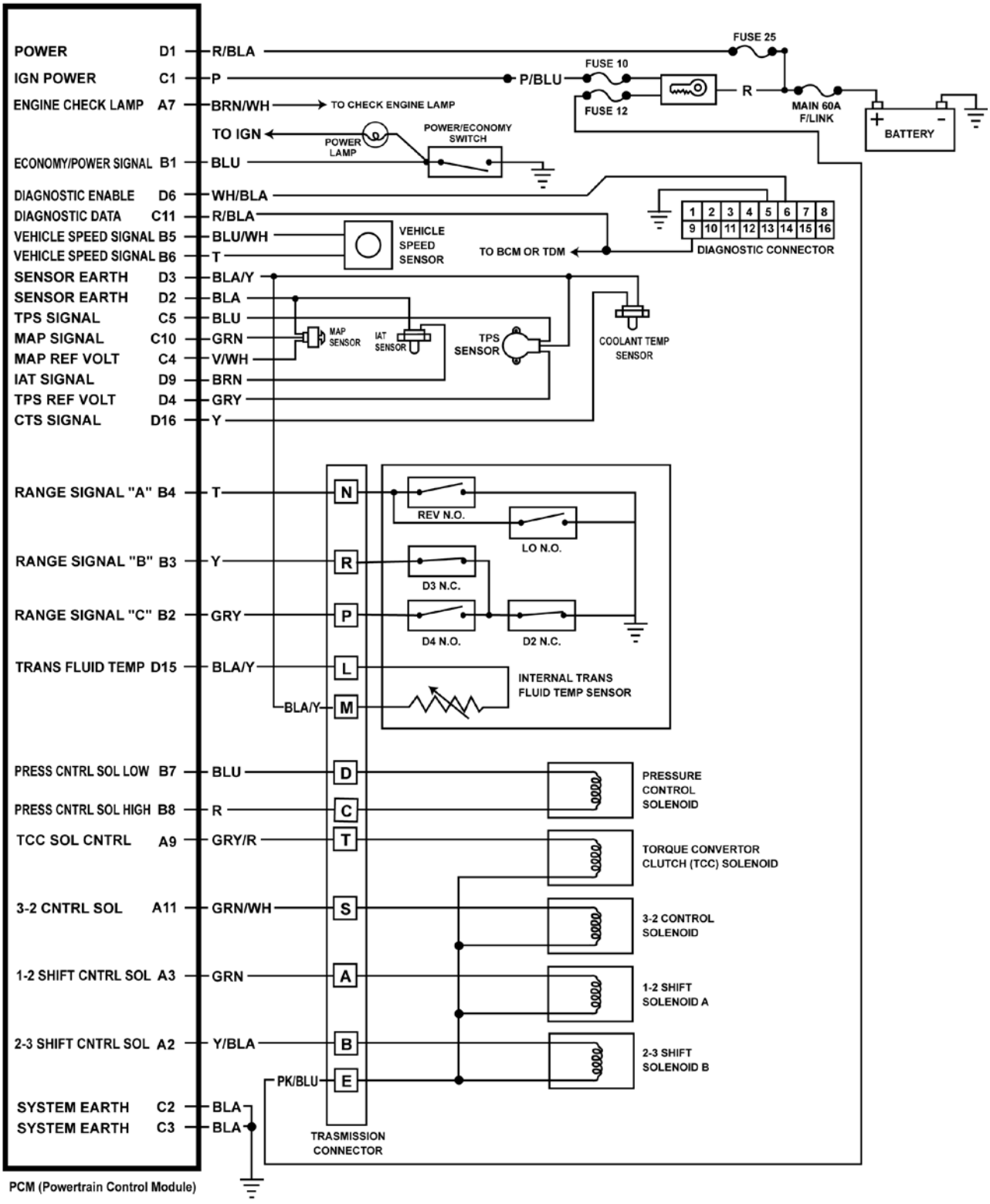
H004 VN Model (from Oct 1989) & VP Model V8 wiring diagram and connectors



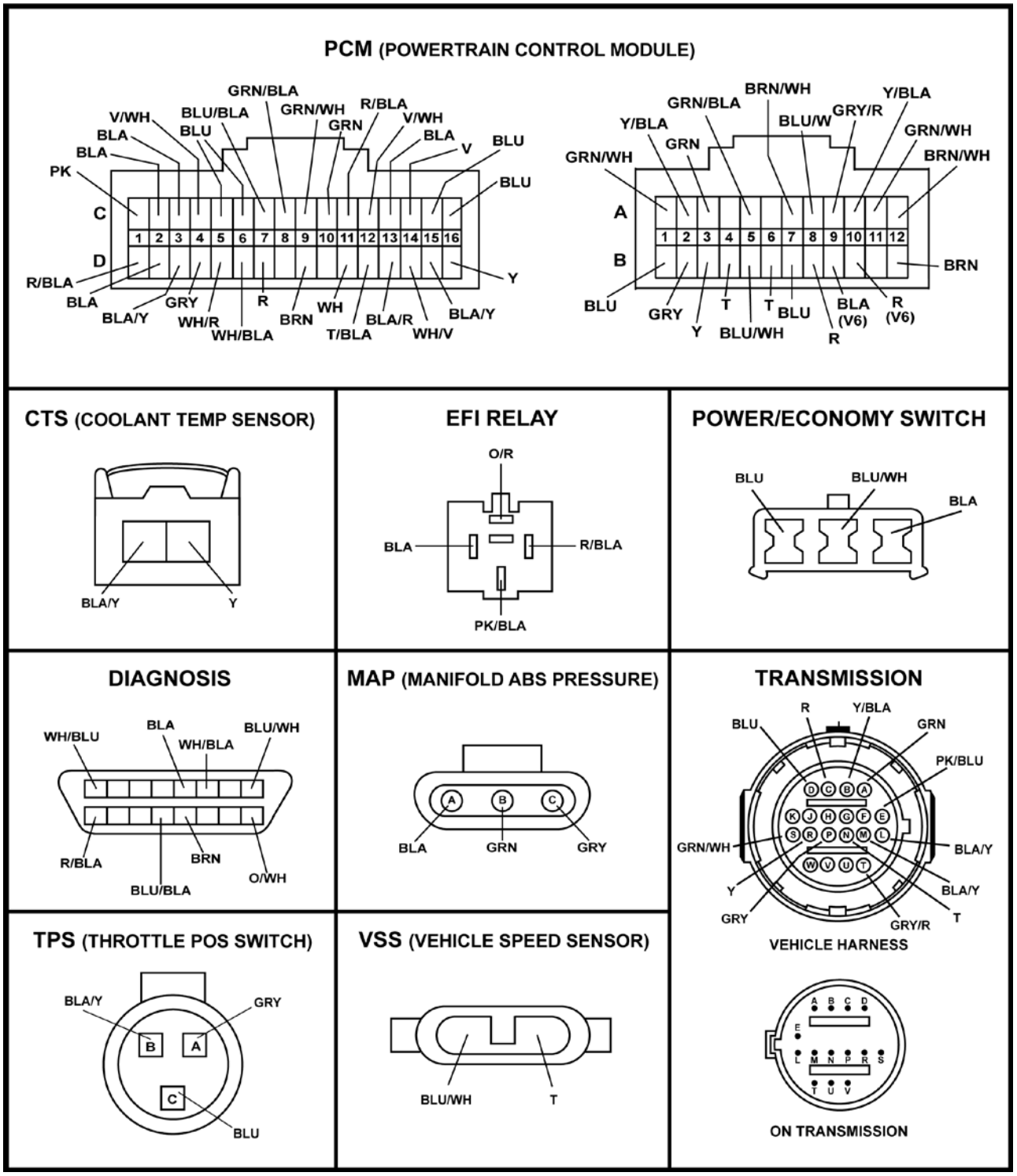
H004 Connectors



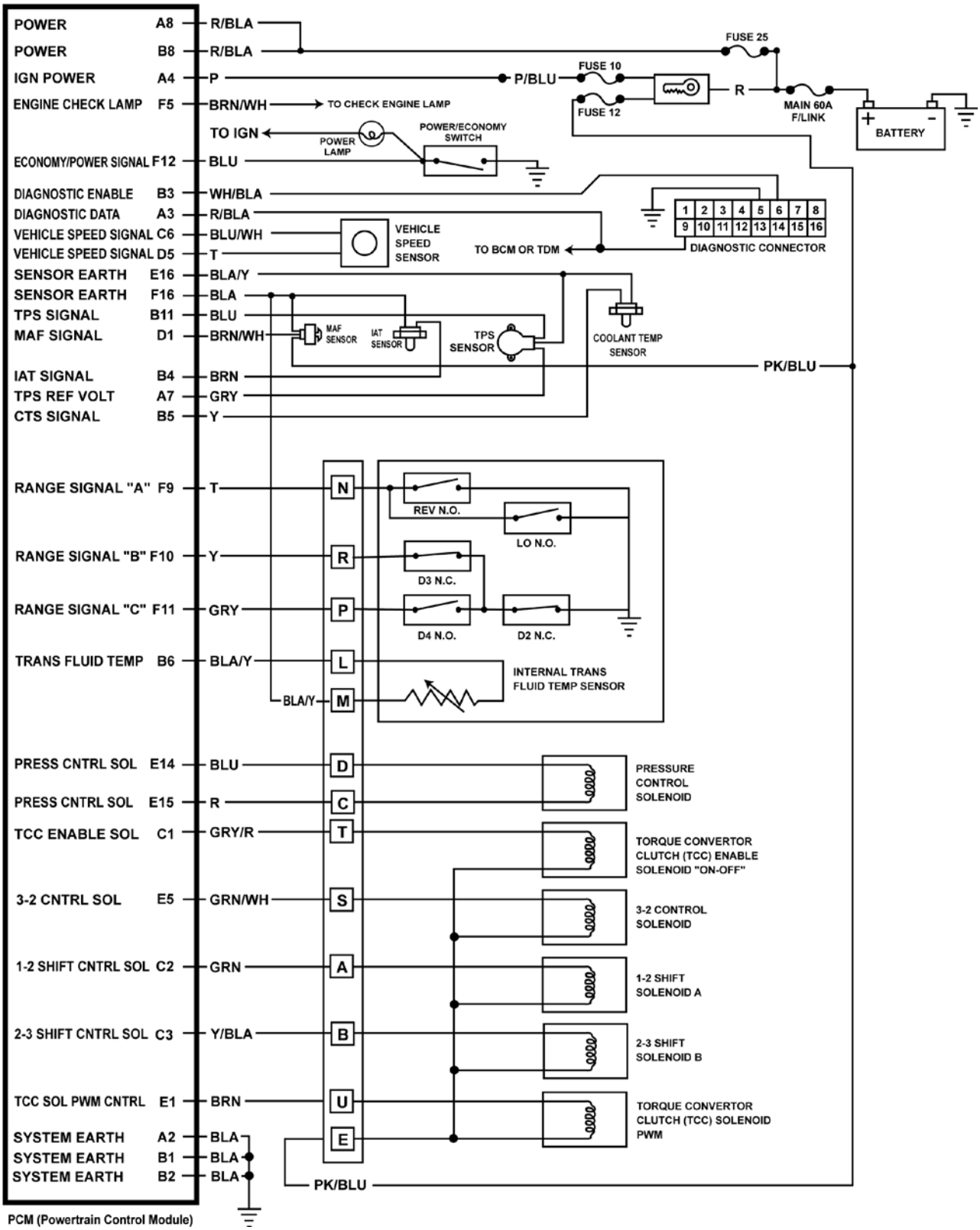
H005 VR Model V6 and VR & VS Model V8 wiring diagram and connectors



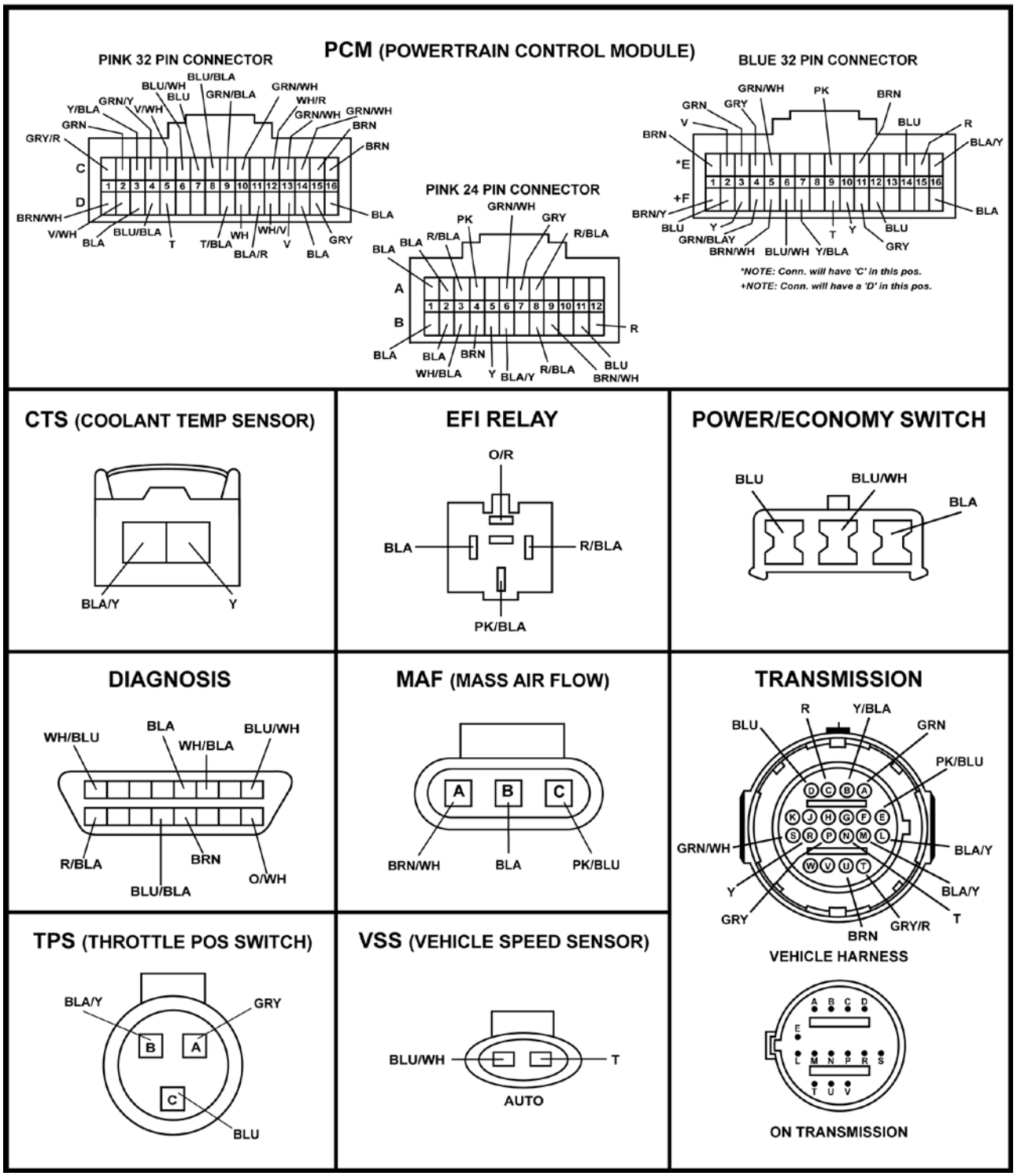
H005 Connectors



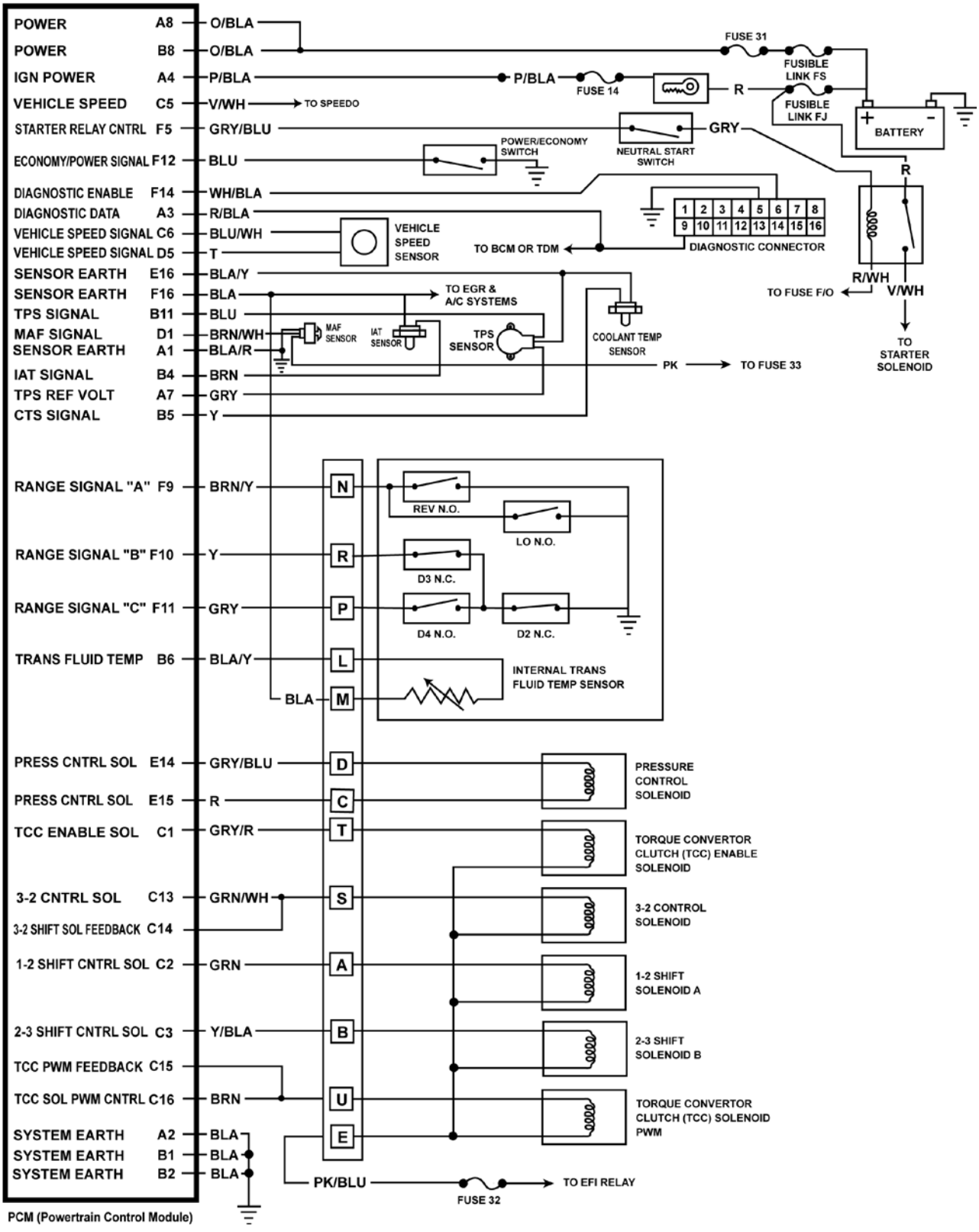
H006 VS Model V6 wiring diagram and connectors



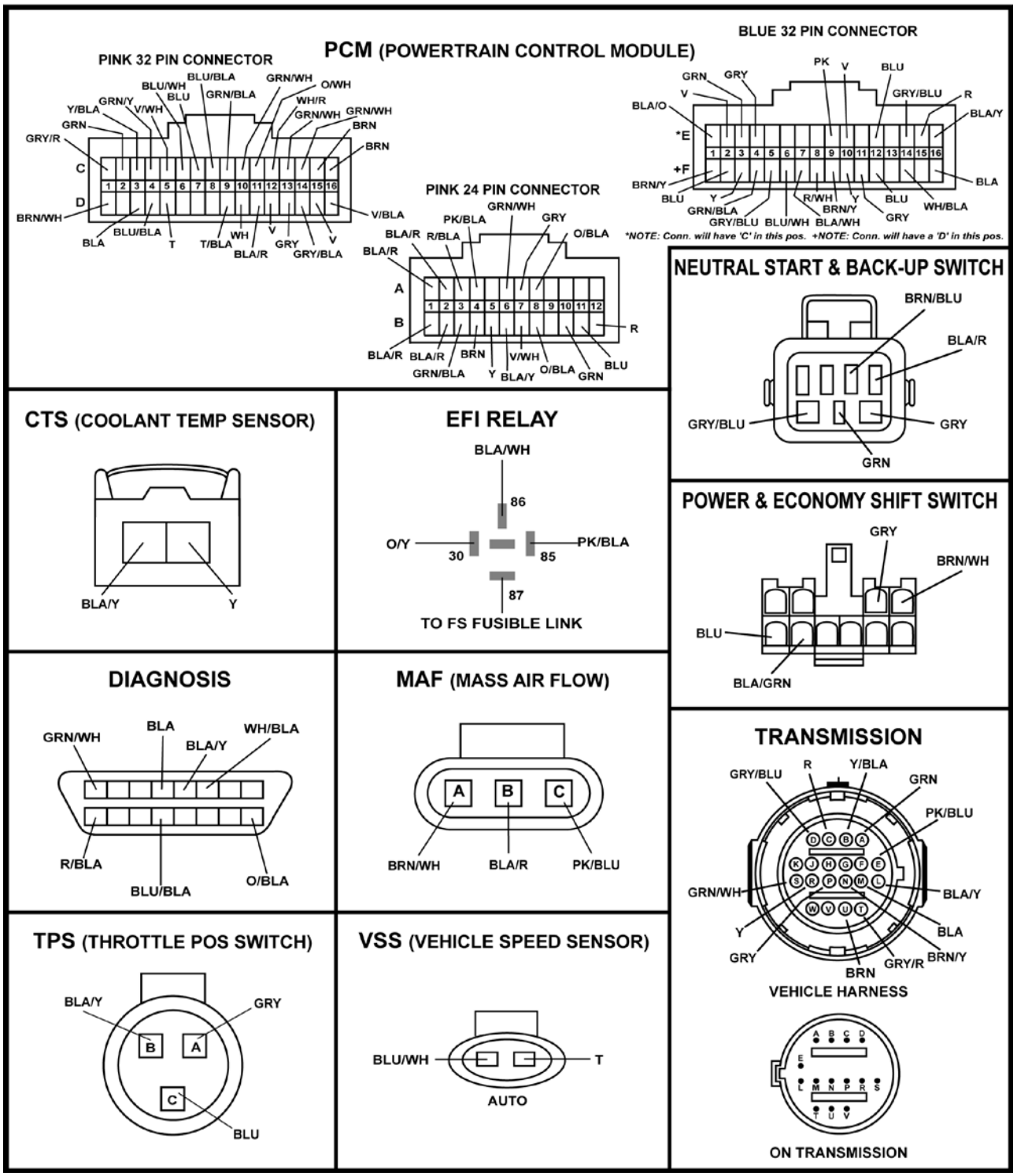
H006 Connectors



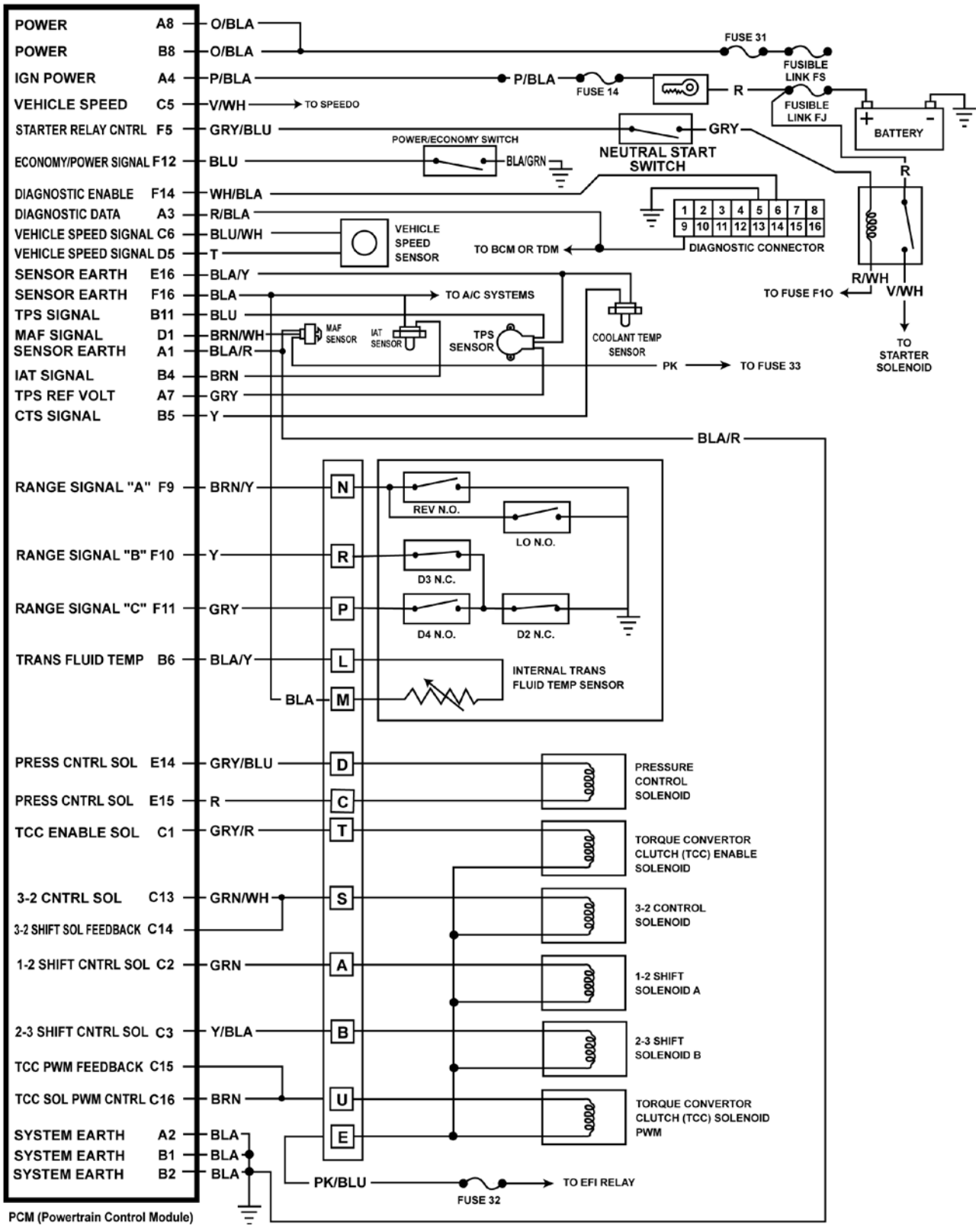
H007 VT Model V6 wiring diagram and connectors



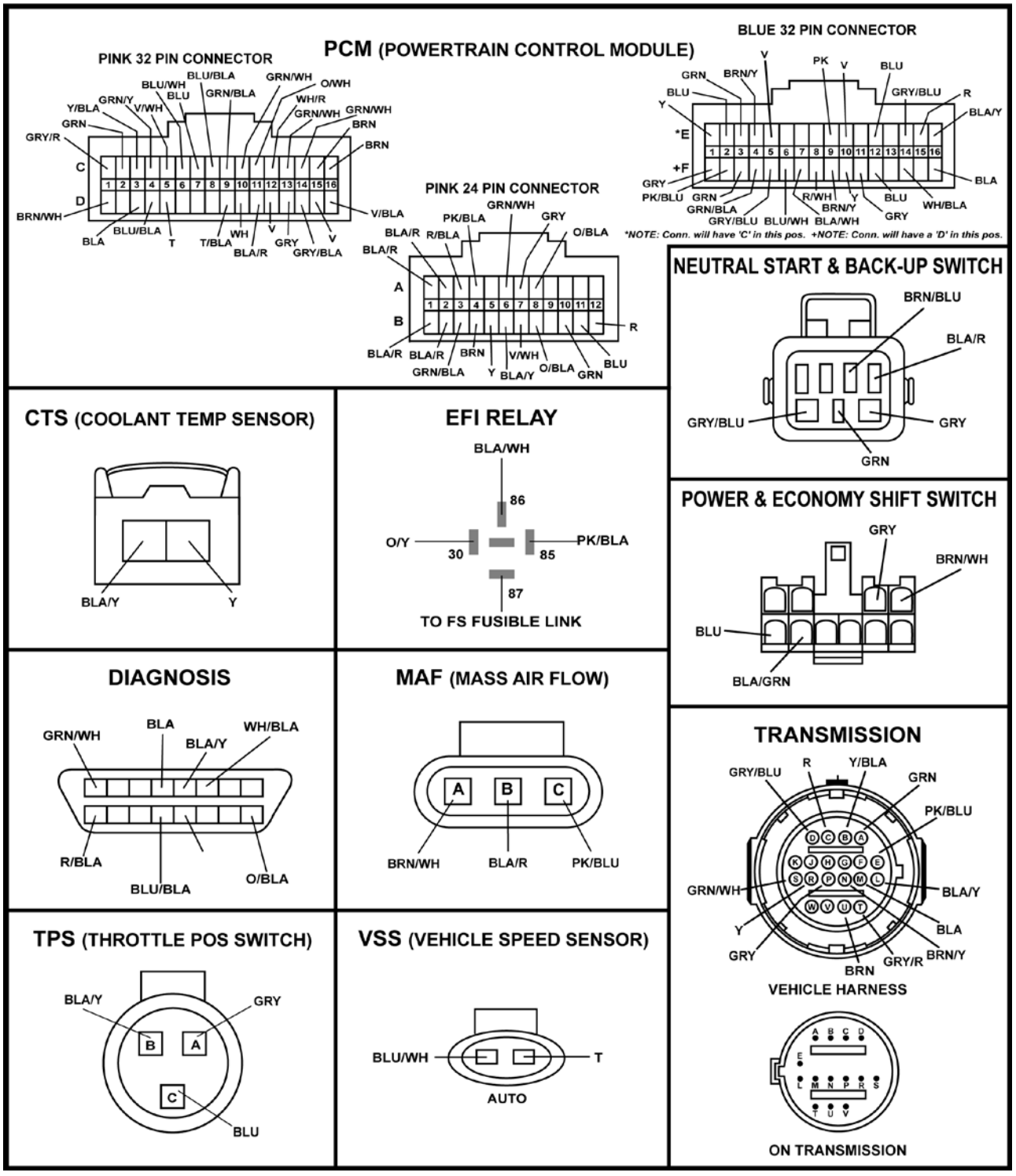
H007 Connectors



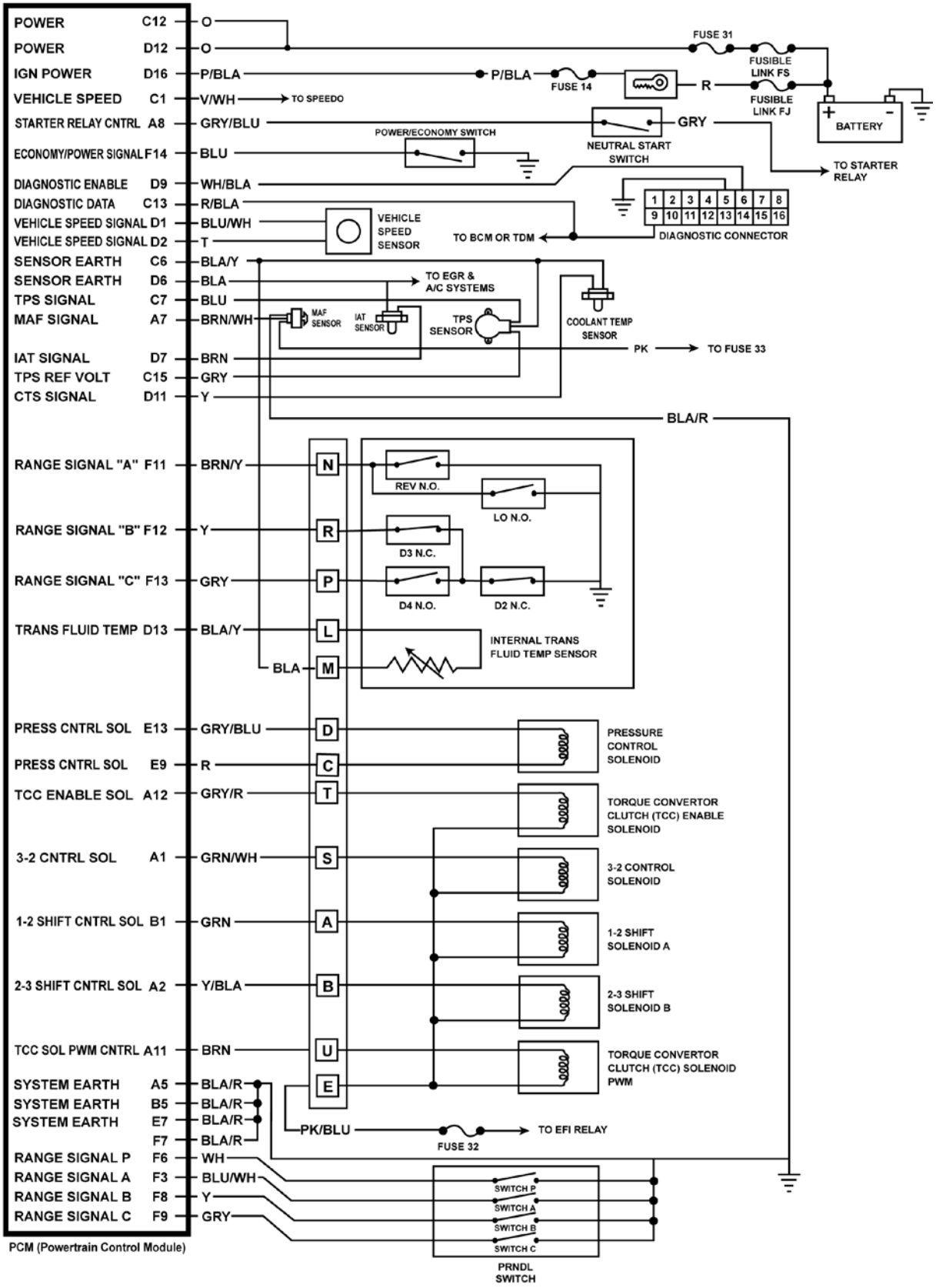
H008 VT Model 5.0 litre V8 wiring diagram and connectors



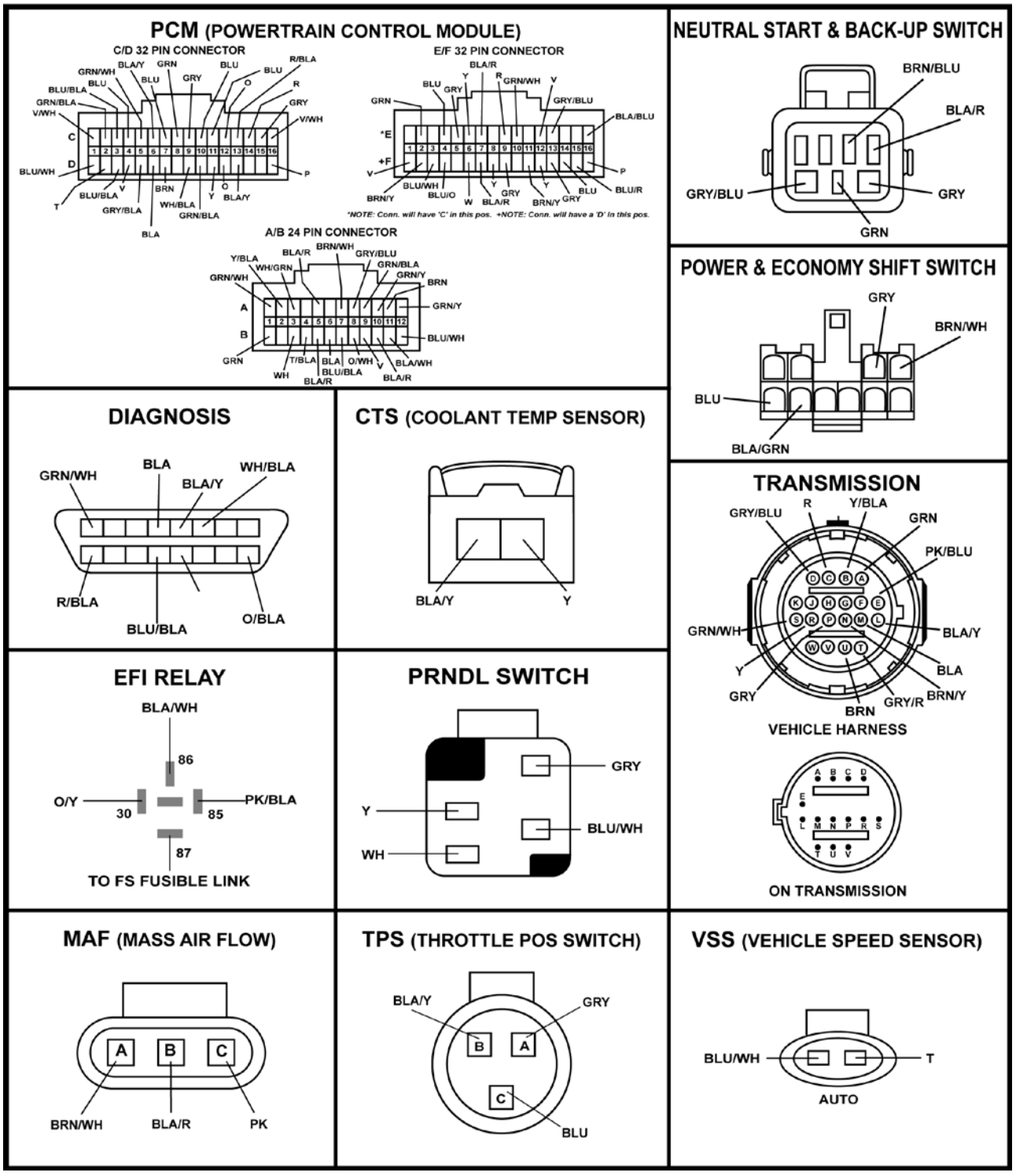
H008 Connectors



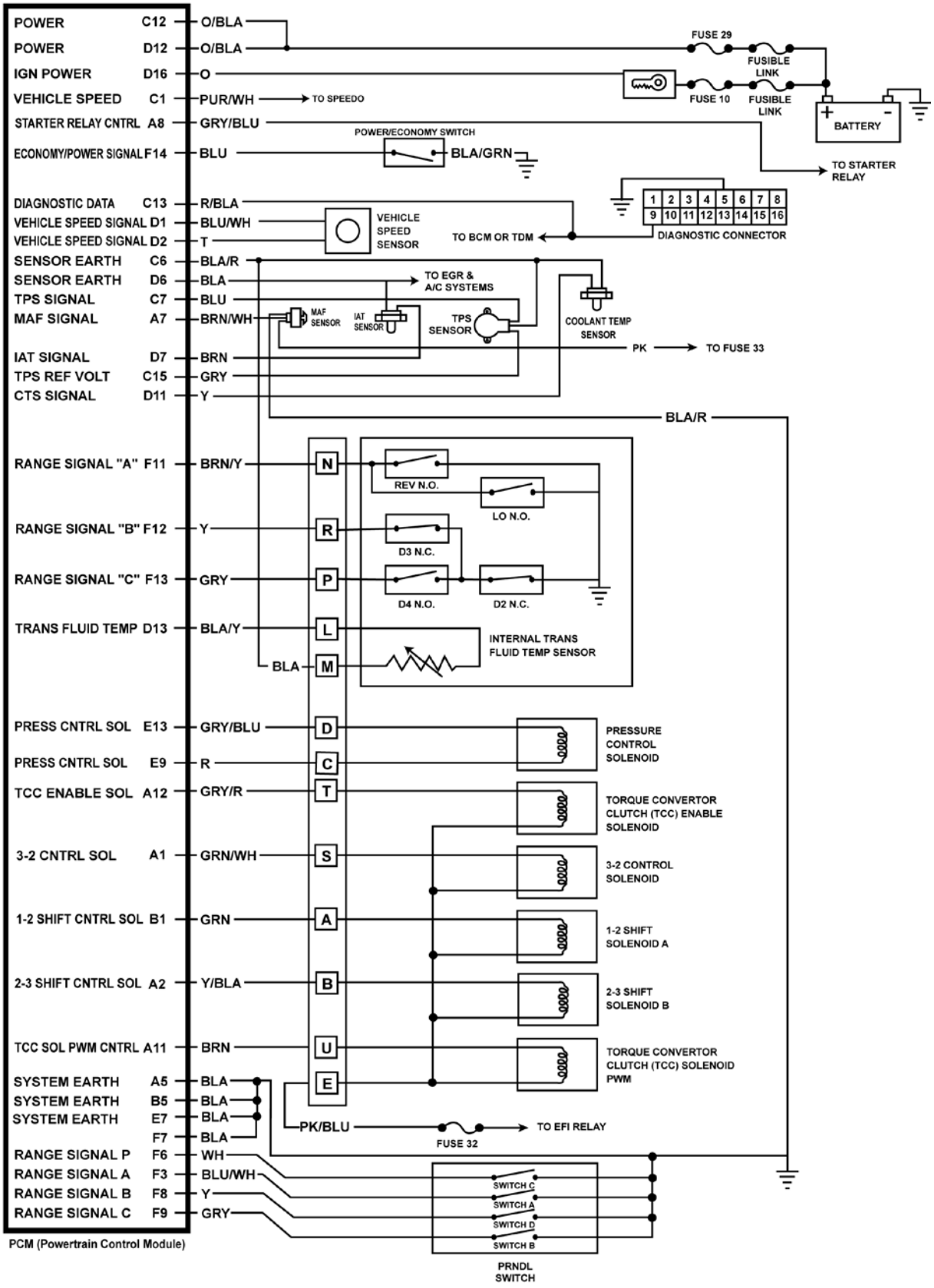
H009 VX Model V6 wiring diagram and connectors



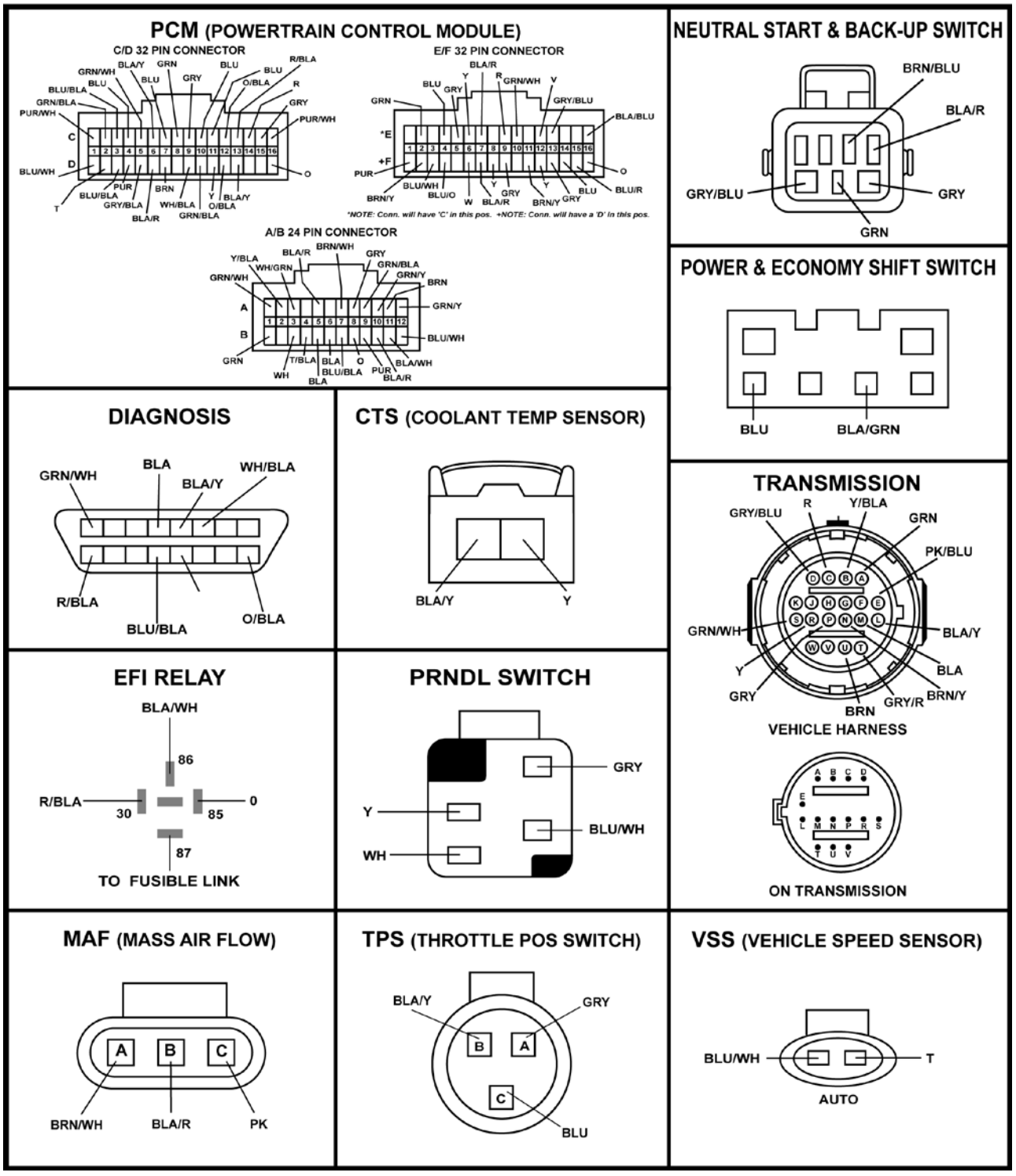
H009 Connectors



H010 VY Model V6 wiring diagram and connectors



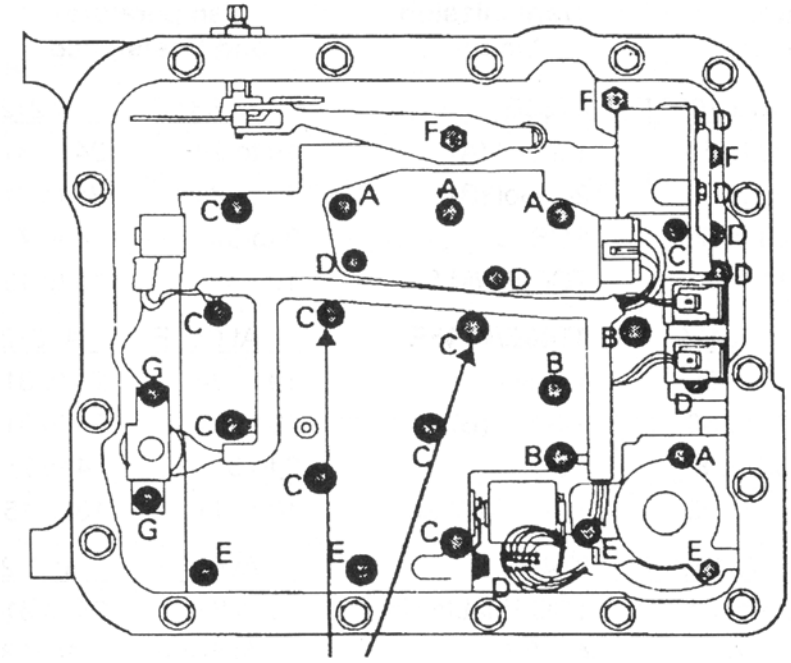
H010 Connectors



H011 **Subject:** 4L60E valve body bolt identification

Source: Snap-on Tools US Trans Troubleshooter Reference Manual

Refer to the following figures to identify valve body bolt lengths and torque sequence for 4L60E transmissions.

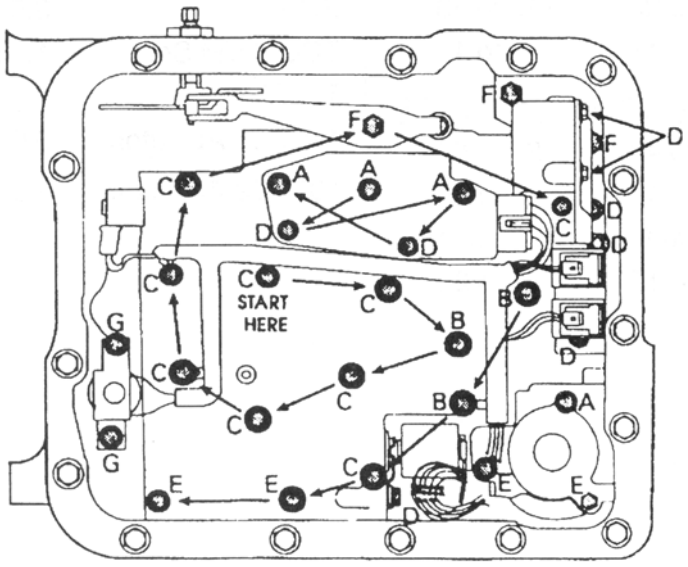


Make sure these bolts are not too long.

BOLT LENGTHS

A	65.0mm
B	54.5mm
C	47.5mm
D	18.0mm
E	35.0mm
F	20.0mm
G	12.0mm

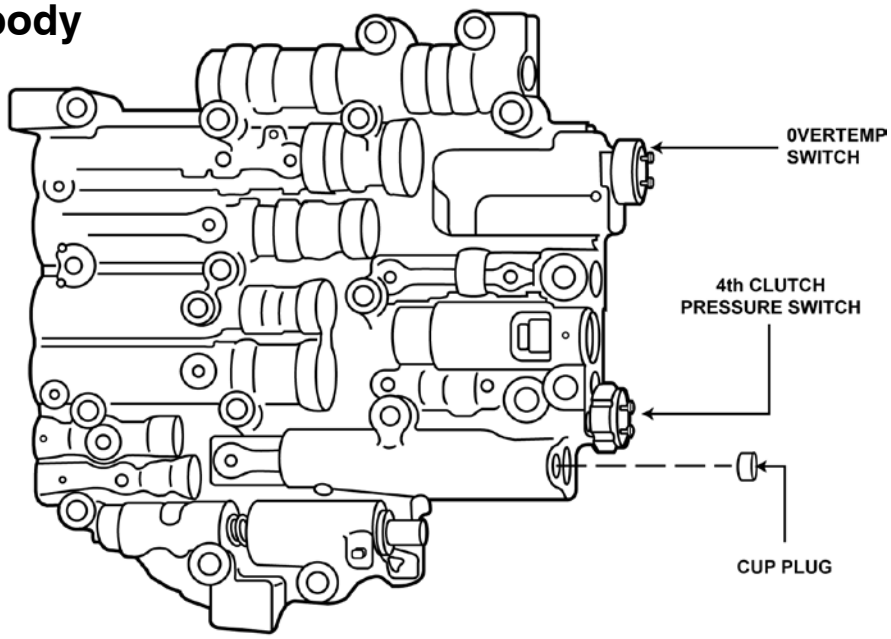
Figure 1. 4L60E valve body bolt lengths. If the two bolts in the locations indicated are too long, they may interfere with sun gear shell rotation.



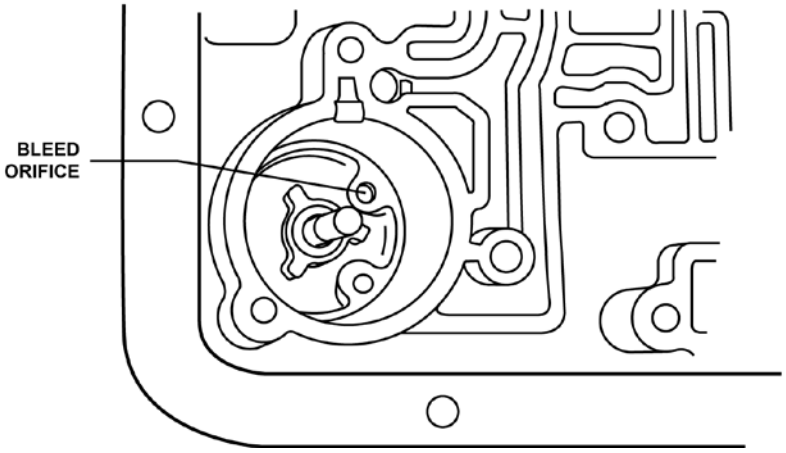
Torque all valve body bolts as shown, in a spiral fashion to 11 Nm (96 inlb).

Figure 2. 4L60E valve body bolt torque sequence.

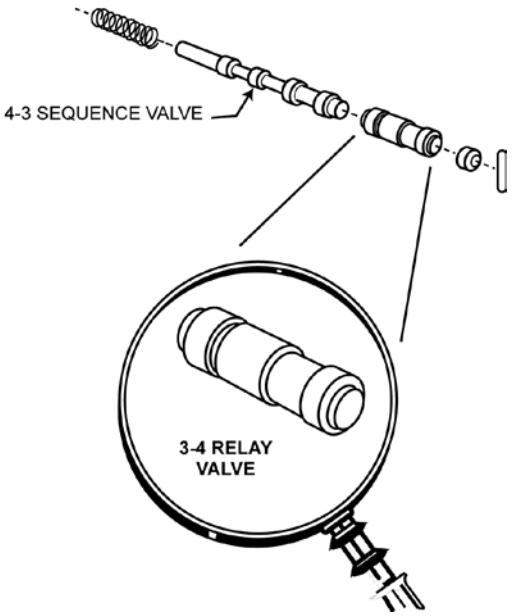
H012 4L60 valve body switch and cup plug locations



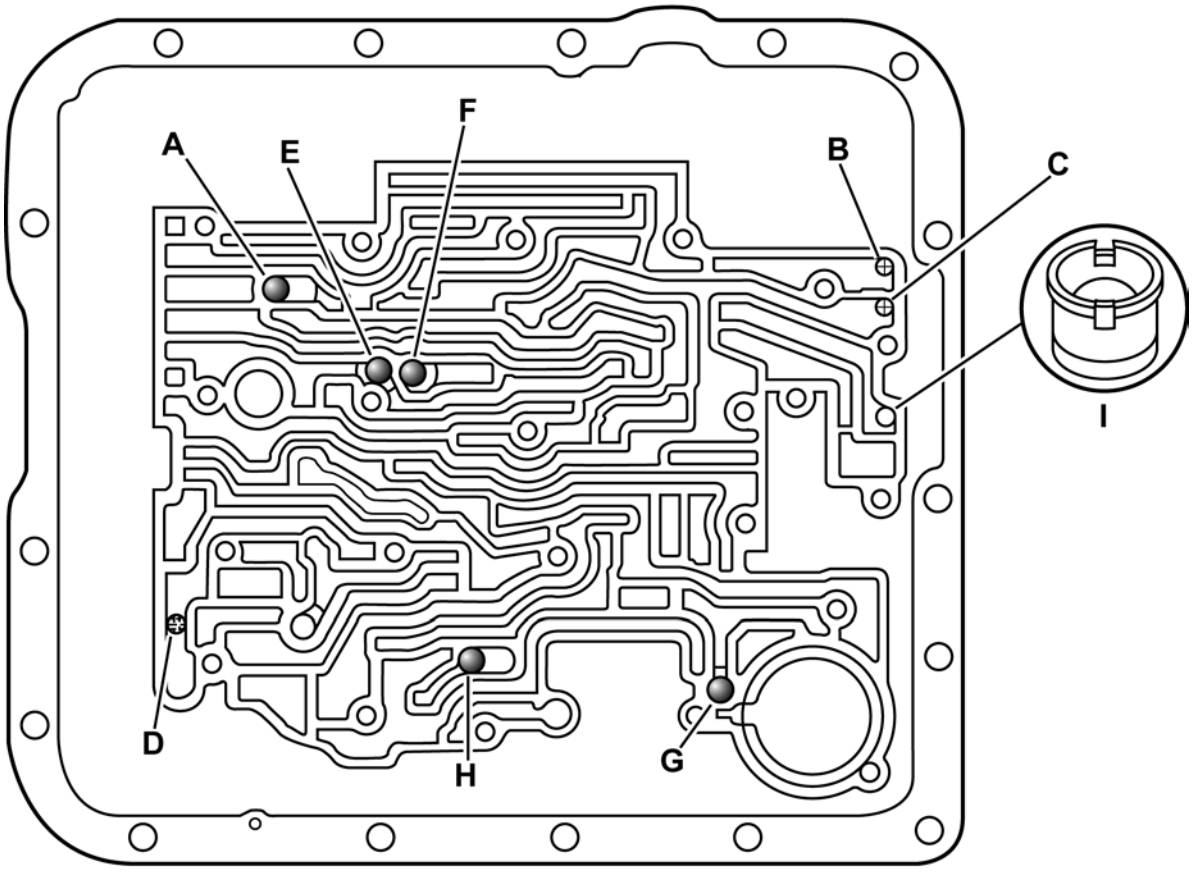
H013 4L60 Trans case bleed orifice



H014 4L60 3-4 Relay valve

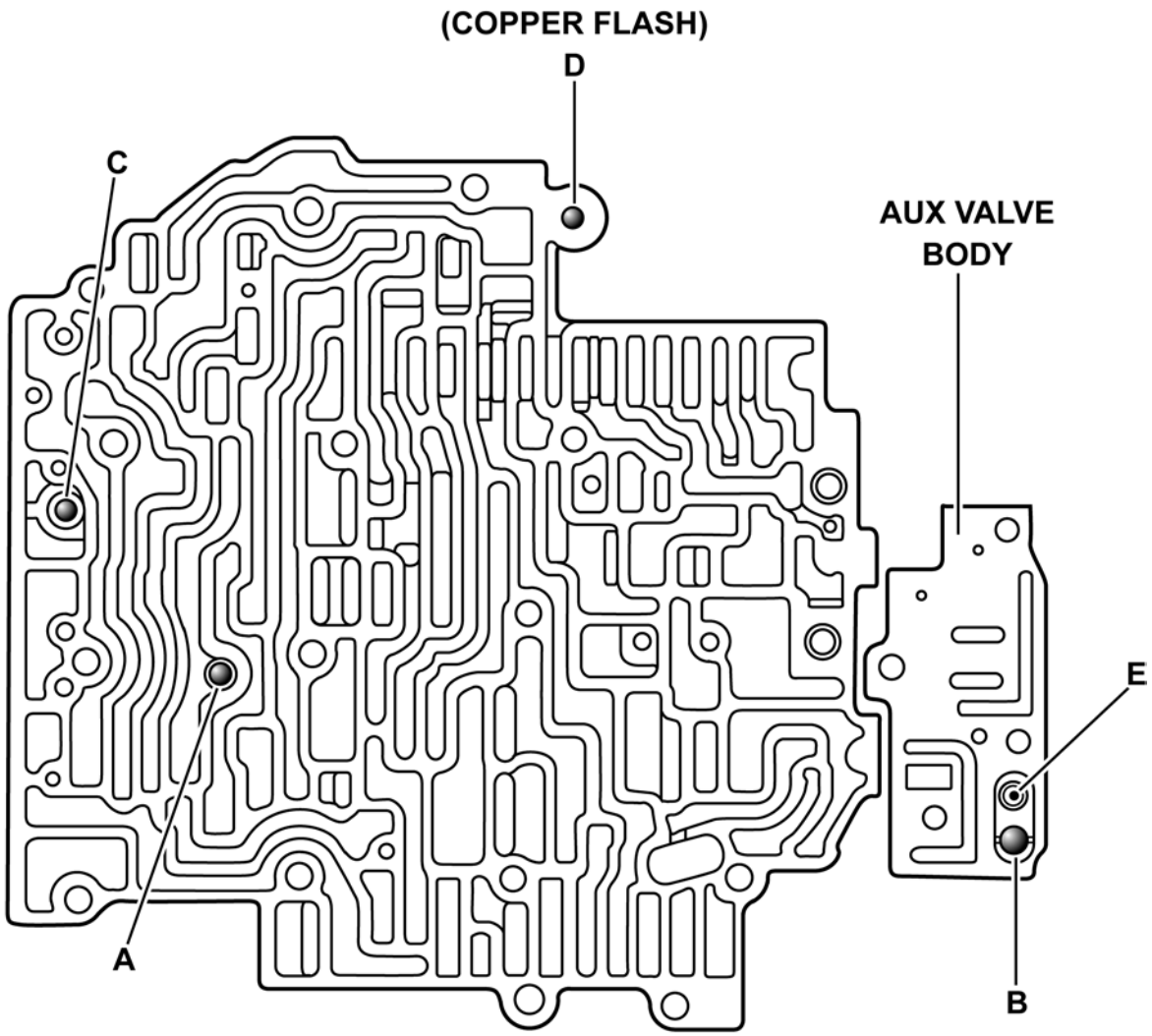


H015 4L60 Checkball and filter location



A	# 9 CHECK BALL (DETENT/LO)
B	GOVERNOR RETURN CIRCUIT FILTER
C	GOVENOR FEED CIRCUIT FILTER
D	CONVERTER CLUTCH FILTER LOCATION
E	# 4 CHECK BALL (3-4 CLUTCH/3-2 EX.)
F	# 8 CHECK BALL (2nd/1-2)
G	# 1 CHECK BALL (4th ACCUMULATOR)
H	# 3 CHECK BALL (PART THROTTLE/DRIVE 3)
I	RETAINER & BALL ASM. (DOUBLE ORIFICE)

H015 Continued



A # 2 CHECK BALL (3rd CLUTCH ACCUMULATOR)
B # 12 CHECK BALL (FORWARD CLUTCH)
C # 6 CHECK BALL (DRIVE 3)
D # 10 CHECK BALL (T.V. EXHAUST)
E CUP PLUG-ORIFICE

H016 Subject: 4L60E transmission component locations, connector pinouts, component resistance, and apply charts

Source: Snap-on Tools US Trans Troubleshooter Reference Manual

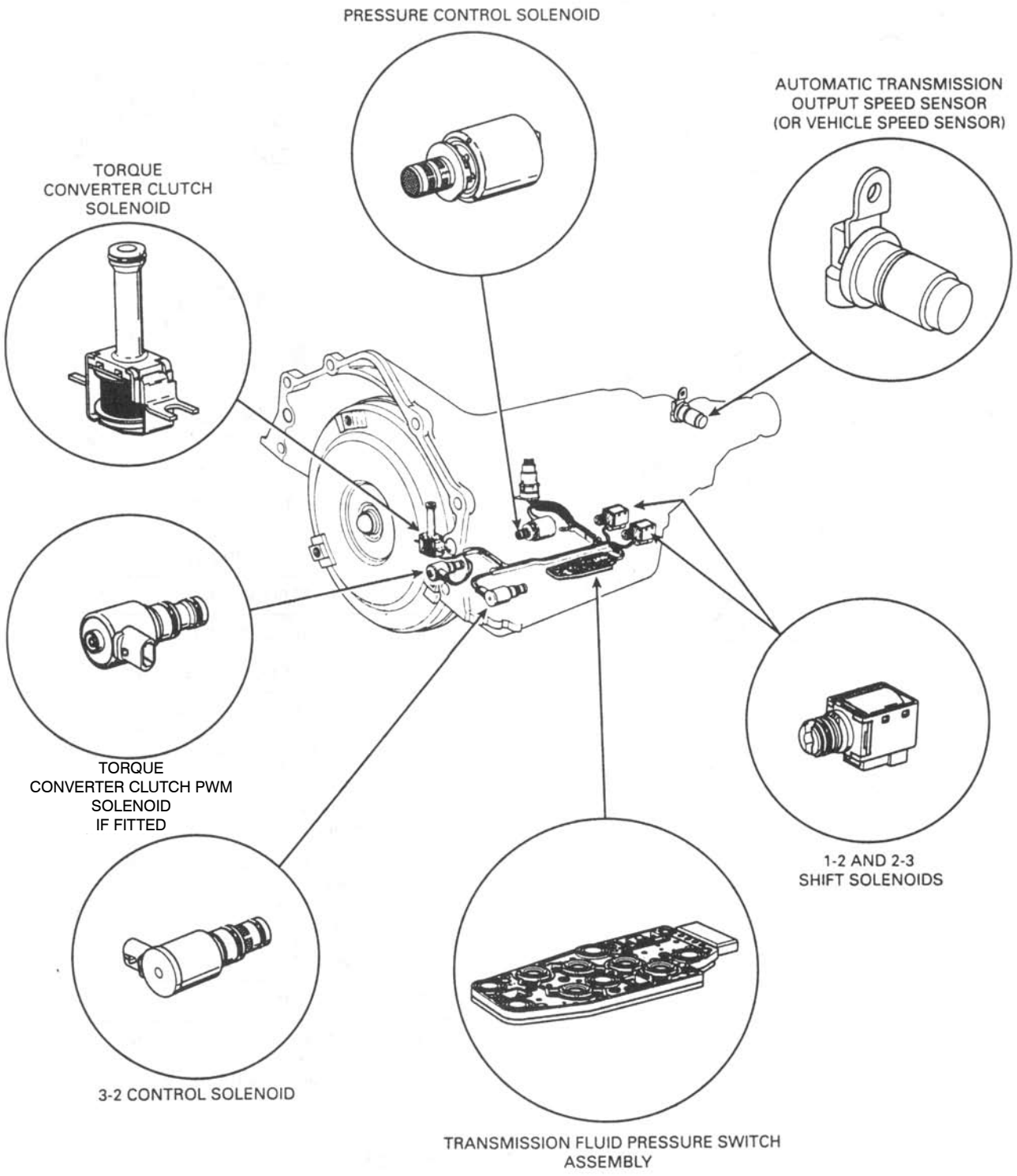


Figure 1. 4L60E component locations.

H016 Continued

Transmission Fluid Temperature Sensor Temperature To Resistance Table

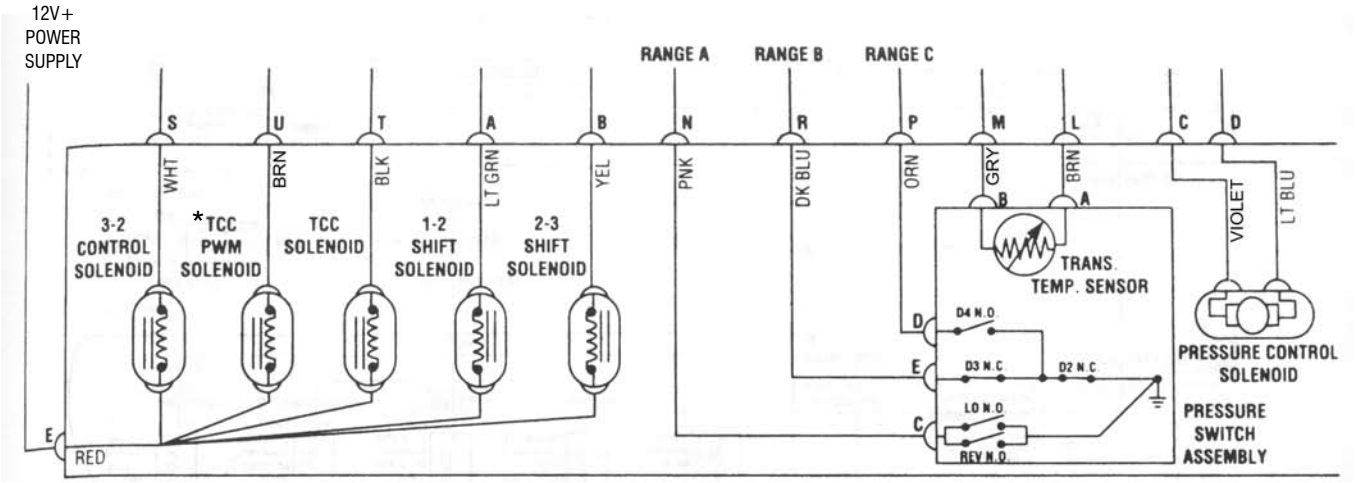
Temperature	Resistance	
Degrees °C	Minimum Ω	Maximum Ω
-40	90636	110778
-30	47416	57952
-20	25809	31545
-10	14558	17784
0	8481	10365
10	5104	6238
20	3164	3867
30	2013	2461
40	1313	1605
50	876	1070
60	600	734
70	420	514
80	299	365
90	217	265
100	159	195
110	119	145
120	89.9	109.9
130	69.1	84.5
140	53.8	65.8
150	42.5	51.9

Note: If checking trans temp sensor or solenoid resistances with transmission installed in vehicle either an extension harness needs to be fitted to trans connector or removal of trans pan to access temp sensor and solenoids.

Solenoid Resistance Table

4L60E	At 20°C	At 100°C
1-2 Sol (A)	19 to 24Ω	24 to 35Ω
2-3 Sol (B)	19 to 24Ω	24 to 35Ω
PCS	3 to 5Ω	4 to 7Ω
3-2 Sol (1993-95)	10 to 11Ω	13 to 15Ω
3-2 Sol (1996-99)	19 to 24Ω	24 to 35Ω
TCC Enable Sol	21 to 26Ω	26 to 37Ω
TCC/PWM Sol if fitted	10 to 11Ω	13 to 15Ω

H016 Continued

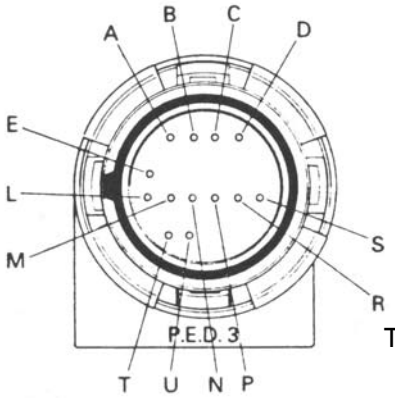


INTERNAL TRANSMISSION WIRING HARNESS

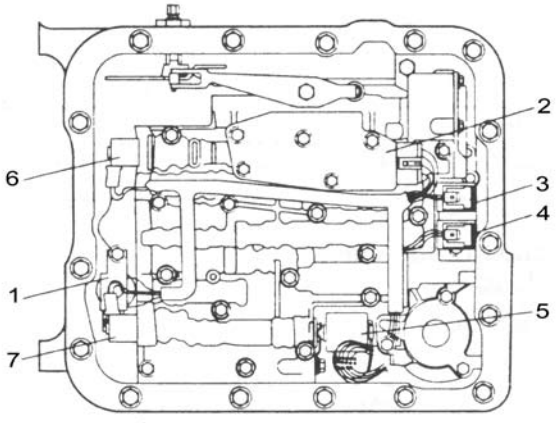
N.C. = NORMALLY CLOSED SWITCH

N.O. = NORMALLY OPEN SWITCH

*APPLICABLE TO VS MODEL ONWARDS



CONNECTOR
TRANSMISSION
SIDE

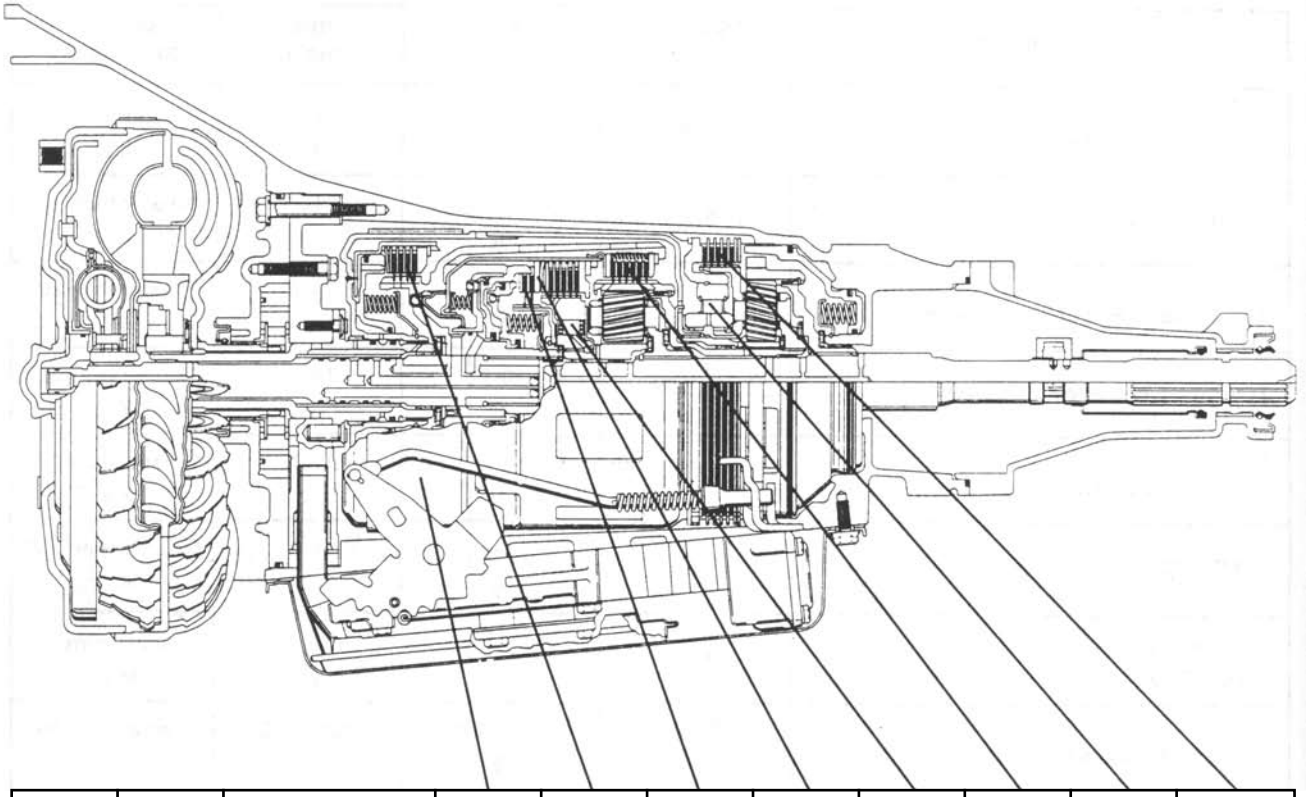


1. TCC ENABLE SOLENOID
2. SWITCH ASSEMBLY, TRANSMISSION PRESSURE
3. 1-2 SHIFT SOLENOID
4. 2-3 SHIFT SOLENOID
5. PRESSURE CONTROL SOLENOID
6. 3-2 CONTROL SOLENOID
7. TCC PWM SOLENOID (VS MODEL ONWARDS)

CAVITY	FUNCTION
A	1-2 SHIFT SOLENOID (LOW)
B	2-3 SHIFT SOLDENOID (LOW)
C	PRESSURE CONTROL SOLENOID (HIGH)
D	PRESSURE CONTROL SOLENOID (LOW)
E	BOTH SHIFT SOLENOIDS, TCC SOLENOID, AND 3-2 CONTROL SOLENOID (HIGH)
L	TRANSMISSION FLUID TEMPERATURE (HIGH)
M	TRANSMISSION FLUID TEMPERATURE (LOW)
N	RANGE SIGNAL “A”
P	RANGE SIGNAL “C”
R	RANGE SIGNAL “B”
S	3-2 CONTROL SOLENOID (LOW)
T	TCC SOLENOID (LOW)
U	TCC PWM SOLENOID

H016 Concluded

4L60E apply charts



RANGE	GEAR	SHIFT SOLENOID		2–4 BAND	REVERSE INPUT CLUTCH	OVERRUN CLUTCH	FORWARD CLUTCH	FORWARD SPRAG CL. ASSEMBLY	3–4 CLUTCH	LO/ROLLER CLUTCH	LO/REV. CLUTCH
		1–2	2–3								
PARK		ON*	ON*								APPLIED
REVERSE		ON*	ON*		APPLIED						APPLIED
NEUTRAL		ON*	ON*								
(D)	1st	ON	ON				APPLIED	HOLDING		HOLDING	
	2nd	OFF	ON	APPLIED			APPLIED	HOLDING			
	3rd	OFF	OFF				APPLIED	HOLDING	APPLIED		
	4th	ON	OFF	APPLIED			APPLIED		APPLIED		
D	1st	ON	ON				APPLIED	HOLDING		HOLDING	
	2nd	OFF	ON	APPLIED			APPLIED	HOLDING			
	3rd	OFF	OFF			APPLIED	APPLIED	HOLDING	APPLIED		
2	1st * *	ON	ON			APPLIED	APPLIED	HOLDING		HOLDING	
	2nd	OFF	ON	APPLIED		APPLIED	APPLIED	HOLDING			
1	1st	ON	ON			APPLIED	APPLIED	HOLDING		HOLDING	APPLIED
	2nd * * *	OFF	ON	APPLIED		APPLIED	APPLIED	HOLDING			

* SHIFT SOLENOID STATE IS A FUNCTION OF VEHICLE SPEED AND MAY CHANGE IF VEHICLE SPEED INCREASES SUFFICIENTLY IN PARK, REVERSE OR NEUTRAL. HOWEVER, THIS DOES NOT AFFECT TRANSMISSION OPERATION.

* * MANUAL SECOND – FIRST GEAR IS ELECTRONICALLY PREVENTED UNDER NORMAL OPERATING CONDITIONS.

* * * MANUAL FIRST – SECOND GEAR IS ONLY AVAILABLE ABOVE APPROXIMATELY 48 TO 56 KM/H (30 TO 35 MPH).

H017 Subject: Manifold Absolute Pressure (MAP) Sensor Test

VR V6 & V8 Models & VS V8 Model only

1. Before manifold absolute pressure (MAP) sensor testing, ensure vacuum pipe and connectors are not split, blocked or routed incorrectly.

2. To test MAP sensor, enter into engine data section and check MAP sensor readings with ignition on (engine not running).
   MAP sensor readings should be approximately 100 to 102kPa (at sea level) and approximately 4.9V.
   If reading is less than 0.3V, then suspect open in MAP sensor or open in wiring from PCM to MAP sensor.

3. If reading was correct, with ignition still on, disconnect MAP sensor connector. Reading should drop to less than 15kPa and 0.1V.
   If reading stays high, then suspect short to power in MAP signal line from PCM pin C10 (green) to MAP sensor (green wire).

4. If reading OK, reconnect MAP sensor connector and fit vacuum pump with gauge to MAP sensor. With ignition on, check readings while applying vacuum to MAP sensor.

VACUUM	READINGS
5 in Hg	86kPa 4.15V
10 in Hg	69kPa 3.2V
15 in Hg	52kPa 2.3V
20 in Hg	35kPa 1.35V
25 in Hg	17kPa 0.35V

   Release vacuum and readings should go back to approximately 100kPa and 4.9V. Refit MAP sensor hose and start engine.
   Check MAP sensor readings at idle at operating temperature. Readings should be approximately 35kPa and 1.35V.

5. If readings correct, then MAP sensor tested OK.
   If any readings incorrect, check 5V reference voltage to MAP sensor and sensor ground circuit.

6. Disconnect MAP sensor connector.
   With igntiion on, probe connector pin C (violet/white) with +ve of DVOM and -ve to ground.
   Reading should be 4.95 to 5.1 volts.
   If not, check reading at PCM pin C4 (violet/white), with ignition on reading should be 4.95 to 5.1 volts.
   If voltage OK at PCM but not at connector, then suspect fault in circuit wiring from PCM to MAP sensor connector.
   If voltage incorrect at PCM, then carry out PCM power and ground check. PCM power and ground check is located in troubleshooter test and procedures section.

7. If voltage supply OK at sensor, check signal ground with -ve of DVOM to connector pin A (black) and +ve to connector pin C (violet/white).
   With ignition on reading should be 4.95 to 5.1 volts.
   If not, check for fault in wiring from PCM pin D2 (black) to MAP sensor pin A (black).
   If reading was OK, check signal line from MAP sensor to PCM by disconnecting sensor connector and bridging connector pins C (violet/white) and B (green).
   With ignition on, reading should be 4.95 to 5.1 volts.
   If not, check wiring and connectors from PCM pin C10 (green) to MAP sensor pin B (green).

8. If reference voltage supply and ground circuit to sensor OK and MAP sensor readings were out, suspect faulty MAP sensor.

H018 Subject: Mass Air Flow (MAF) Sensor Test

VS 3.8 litre V6 Model only

1. Check power supply to MAF sensor by disconnecting MAF sensor connector and probing +ve of DVOM to pink/blue wire of connector and -ve to ground.
With ignition on, reading should be more than 10 volts.

   If not, check power supply from ignition switch through fuse 12.
If reading was over 10V, leaving +ve of DVOM to pink/blue wire, place -ve to black wire. Check voltage reading with ignition on.
If over 10 volts, go to Tip 2. If not over 10 volts, check and repair open or high resistance in black wire to ground.

2. With MAF connectors refitted, enter into the engine data section of the primary cartridge and check MAF frequency with ignition on.
Reading should be 0 Hz. If not, suspect MAF sensor.

3. Start engine and check mass air flow reading with engine at idle speed. Reading should be 4 to 9 grams/sec.
If not, check wiring from MAF connector terminal A (brown/white) to PCM pin D1 (brown/white) for open or short.
If wiring circuit OK and idle speed and condition were OK, then suspect faulty MAF sensor.

4. If idle reading OK, raise and hold RPM at 2500 RPM.
Reading should be 17 to 22 grams/sec.
Note if possible roadtest vehicle and check reading at the time of 1-2 gear change with wide open throttle.
Reading should go over 120 grams/sec. Ensure air element is clean as blocked air element will affect reading.

   If readings incorrect, then suspect faulty MAF sensor.

VT 3.8 litre V6 Model only

1. Check power supply to MAF sensor by disconnecting the MAF sensor connector and probing +ve of DVOM to pink wire of connector and -ve to ground.
With ignition on, reading should be more than 10 volts.

   If not, check power supply from EFI relay through fuse 33.
If reading was over 10V, leaving +ve of DVOM to pink wire, place -ve to black/red wire. Check voltage reading with ignition on.
If over 10 volts, got to Tip 2.
If not over 10 volts, check and repair open or high resistance in black/red wire to ground.

2. With MAF connector refitted, enter into the engine data section of the primary cartridge and check MAF frequency with ignition on.
Reading should be 0 Hz. If not, suspect MAF sensor.

3. Start engine and check mass air flow reading with engine at idle speed. Reading should be 4 to 9 grams/sec.
If not, check wiring from MAF connector terminal A (brown/white) to PCM pin D1 (brown/white) for open or short.
If wiring circuit OK and idle speed and condition were OK, then suspect faulty MAF sensor.

4. If idle reading OK, raise and hold RPM at 2500 RPM.
Reading should be 17 to 22 grams/sec.
Note if possible roadtest vehicle and check reading at the time of 1-2 gear change with wide open throttle.
Reading should go over 120 grams/sec. Ensure air element is clean as blocked air element will affect reading.

   If readings incorrect, then suspect faulty MAF sensor.

H018 Subject: Mass Air Flow (MAF) Sensor Test Cont.

VX & VY 3.8 litre V6 Model only

1. Check power supply to MAF sensor by disconnecting the MAF sensor connector and probing +ve of DVOM to pink wire of connector and -ve to ground.
With ignition on, reading should be more than 10 volts.

   If not, check power supply from EFI relay through fuse 33.
If reading was over 10V, leaving +ve of DVOM to pink wire, place -ve to black/red wire. Check voltage reading with ignition on.
If over 10 volts, go to Tip 2.
If not over 10 volts, check and repair open or high resistance in black/red wire to ground.

2. With MAF connector refitted, enter into the engine data section of the primary cartridge and check MAF frequency with ignition on.
Reading should be 0 Hz. If not, suspect MAF sensor.

3. Start engine and check mass air flow reading with engine at idle speed.
Reading should be 4 to 9 grams/sec.
If not, check wiring from MAF connector terminal A (brown/white) to PCM pin A7 (brown/white) for open or short.
If wiring circuit OK and idle speed and condition were OK, then suspect faulty MAF sensor.

4. If idle reading OK, raise and hold RPM at 2500 RPM.
Reading should be 17 to 22 grams/sec.
Note if possible roadtest vehicle and check reading at the time of 1-2 gear change with wide open throttle.
Reading should go over 120 grams/sec. Ensure air element is clean as blocked air element will affect reading.

   If readings incorrect, then suspect faulty MAF sensor.

VT 5.0 litre V6 Model only

1. Check power supply to MAF sensor by disconnecting the MAF sensor connector and probing +ve of DVOM to pink wire of connector and -ve to ground.
With ignition on, reading should be more than 10 volts.

   If not, check power supply from EFI relay through fuse 33.
If reading was over 10V, leaving +ve of DVOM to pink wire, place -ve to black/red wire. Check voltage reading with ignition on.
If over 10 volts, go to Tip 2.
If not over 10 volts, check and repair open or high resistance in black/red wire to ground.

2. With MAF connector refitted, enter into the engine data section of the primary cartridge and check MAF frequency with ignition on.
Reading should be 0 Hz. If not, suspect MAF sensor.

3. Start engine and check mass air flow reading with engine at idle speed.
Reading should be 5 to 10 grams/sec.
If not, check wiring from MAF connector terminal A (brown/white) to PCM pin D1 (brown/white) for open or short.
If wiring circuit OK and idle speed and condition were OK, then suspect faulty MAF sensor.

4. If idle reading OK, raise and hold RPM at 2500 RPM.
Reading should be 17 to 25 grams/sec.
Note if possible roadtest vehicle and check reading at the time of 1-2 gear change with wide open throttle.
Reading should go over 120 grams/sec. Ensure air element is clean as blocked air element will affect reading.

   If readings incorrect, then suspect faulty MAF sensor.

H019 Engine Coolant Temperature Sensor (CTS) Resistance to Temperature Values

3.8 Litre V6 Engine

VN, VP & VR Models (approximate)

°C	OHMS
110	110
100	190
90	250
70	450
40	1,200
30	1,800
20	2,500
0	6,000
-10	8,750
-20	15,000

VS, VT, VX & VY Models (approximate)

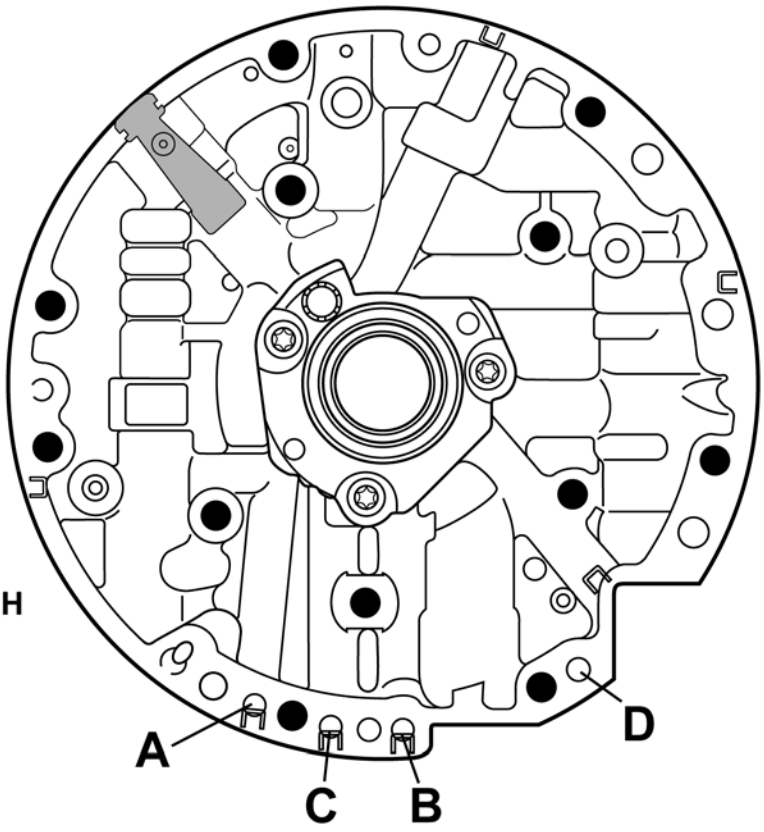
°C	OHMS
110	134
100	180
90	244
70	474
40	1,483
30	2,268
20	3,555
0	9.517
-10	16,320
-20	28,939

5.0 Litre V8 All Models (approximate)

°C	OHMS
110	110
100	190
90	250
70	450
40	1,200
30	1,800
20	2,500
0	6,000
-10	8,750
-20	15,000

H020 4L60/4L60E Air test locations

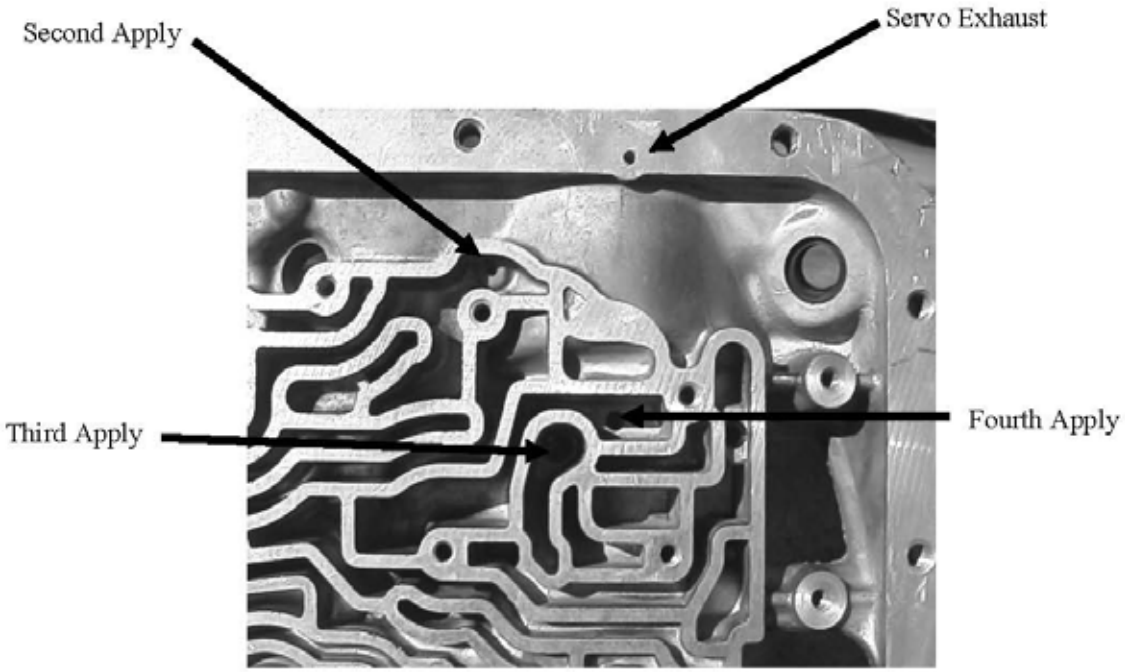
A REVERSE INPUT
B FORWARD CLUTCH FEED
C 3-4 CLUTCH
D OVERRUN CLUTCH



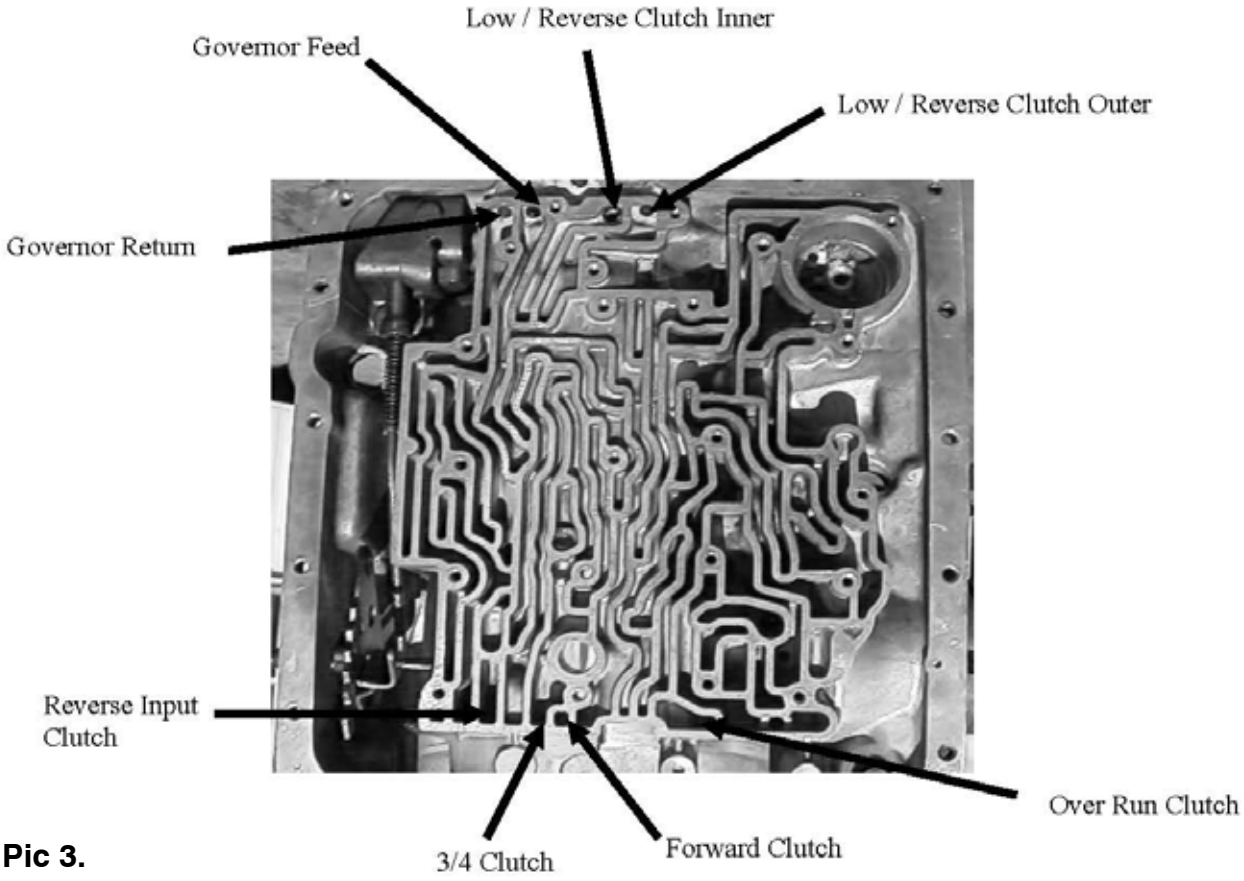
PIC 1

NOTE:-When air testing the over run clutch, the forward clutch hole must be blocked or the over run clutch will not apply.

H020 Continued



Pic 2.

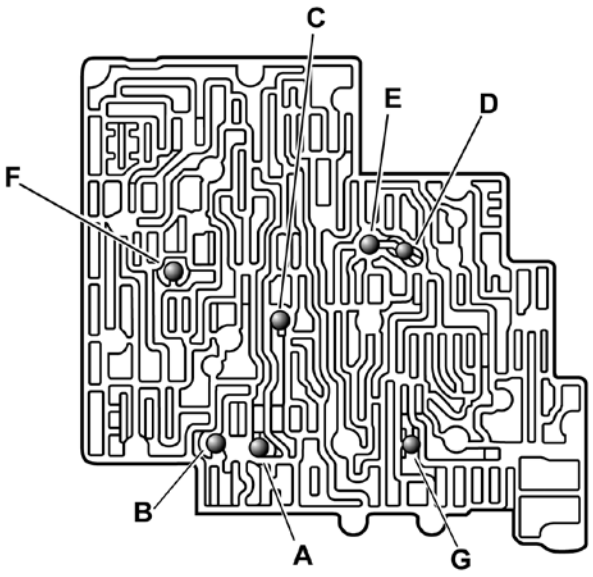


Pic 3.

H021 4L60E Checkball and filter location

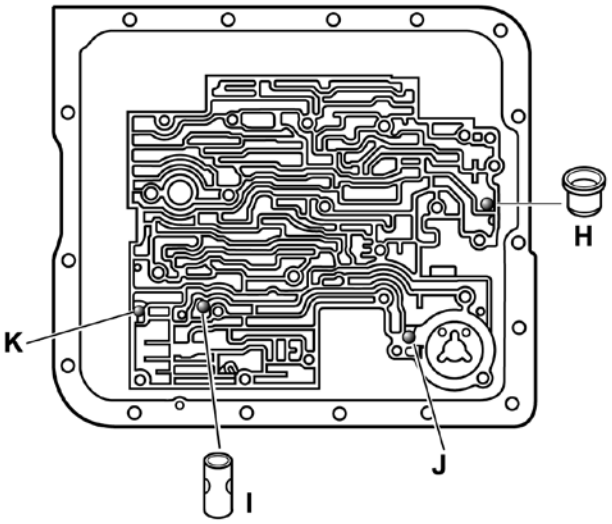
CHECKBALL-VALVE BODY

A	# 2	3rd ACCUMULATOR
B	# 3	REVERSE INPUT
C	# 4	3-4 CLUTCH EXHAUST
D	# 5	OVERRUN CLUTCH FEED
E	# 6	OVERRUN CLUTCH CONTROL
F	# 8	1-2 UPSHIFT
G	# 12	FORWARD CLUTCH ACCUM.



CHECKBALLS AND FILTERS-TRANS CASE

H	# 10	PLUG, TRANSMISSION CASE (ACCUM. BLEED)
I	# 7	RETAINER AND BALL ASSEMBLY 3rd ACCUM.
J	# 1	No 1 CHECKBALL
K		SCREEN, TCC



H022 4L60E Line Pressure Checking Charts

VR to VT V6 & 5.0 Litre V8 PCS Amperage to Line Pressure

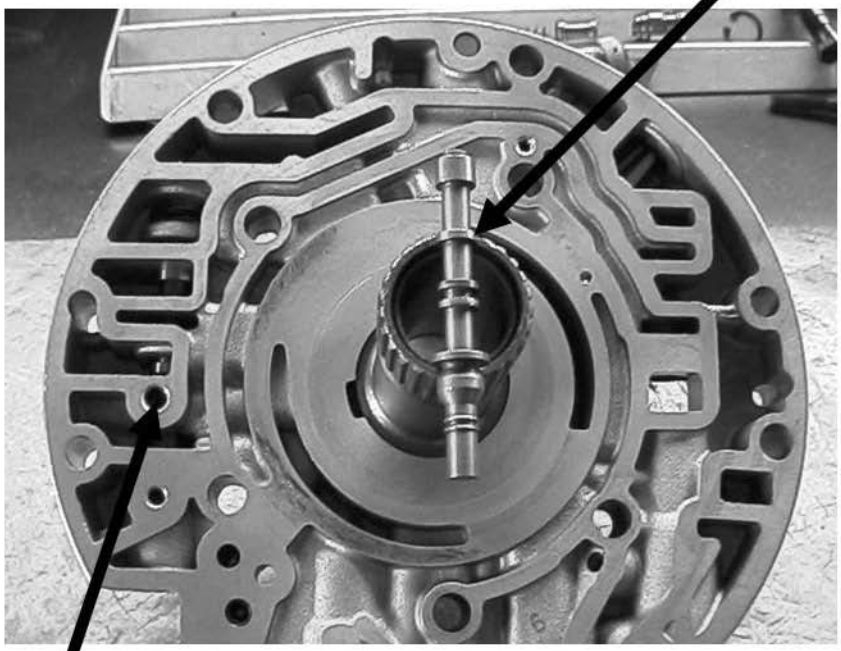
Pressure Control Solenoid Current (Amp)	Line Pressure (kPa)
0.02	1,172 – 1,310
0.10	1,138 – 1,275
0.20	1,103 – 1,241
0.30	1,069 – 1,206
0.40	1,020 – 1,158
0.50	965 – 1,103
0.60	896 – 1,000
0.70	758 – 896
0.80	620 – 793
0.90	448 – 620
0.98	379 – 448

VX & VY V6 PCS Amperage to Line Pressure

Pressure Control Solenoid Current (Amp)	Line Pressure (kPa)
0.00	1,186 – 1,324
0.10	1,179 – 1,317
0.15	1,161 – 1,300
0.25	1,123 – 1,262
0.35	1,072 – 1,210
0.45	998 – 1,141
0.55	916 – 1,058
0.65	817 – 955
0.75	692 – 831
0.85	555 – 693
0.95	441 – 579
1.00	400 – 538

H023 4L60 Oil pump modification

Grind a small flat on the second land of the pressure regulator valve



Drill the cooler and lube orifice to 3.1mm /.125" #31 drill bit