

DDEC II DIAGNOSTIC TROUBLESHOOTING GUIDE

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FOREWORD

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IMPORTANT SAFETY NOTICE

Proper service and repair is important to the safe, reliable operation of all motor vehicles. The service procedures recommended by Detroit Diesel Corporation and described in this guide are effective methods of performing service operations. Some of these service operations require the use of tools especially designed for this purpose. These special tools should be used when and as recommended.

It is important to note that some admonitions against the use of specific service methods that can damage the vehicle or render it unsafe are stated in this service manual. It is also important to understand these cautions are not exhaustive. Detroit Diesel Corporation could not possibly know, evaluate, and advise the service trade of all conceivable ways in which service might be done or the hazardous consequences of each way. Consequently, Detroit Diesel Corporation has not undertaken any such broad evaluation. Accordingly, anyone who uses a service procedure or tool which is not recommended by Detroit Diesel Corporation must satisfy himself thoroughly that neither his safety nor vehicle safety will be jeopardized by the service methods he selects.

DETROIT DIESEL ELECTRONIC CONTROLS

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Section 1 HOW TO USE THIS BOOK

1. Sections 2 (Basic Knowledge Required) and 3 (Testing the DDEC II System) should be read and understood completely.
2. If basic mechanical checks have been made, no trouble was found, and the problem is now believed to be in the DDEC II System, turn to Section 4 - Troubleshooting Charts. Always start with the 1st Chart (labelled START) on Page 17. If a Diagnostic Data Reader (DDR) is not available, the chart labelled CEL (Check Engine Light) can be used.
3. Use the charts to pinpoint the problem and perform repairs. The charts are in a three-column format. The first column lists the test steps to perform and in what sequence to perform them. The second column gives the list of possible results you may obtain, based on the steps performed. The third column indicates what to do next, based on your result.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C2-9 Check ECM Connectors <ul style="list-style-type: none"> • Turn ignition off. • Disconnect all connectors at the ECM. • Check terminals at all ECM connectors (both the ECM and harness side) for damage, corrosion and unseated pins or sockets. 	Terminals and connectors are okay. Problem found.	Replace ECM. Then go to C2-30. Repair terminals/connectors. Then go to C2-30.

4. The charts will always instruct you to clear the codes after all repair work is done, and confirm the repair (typically by running the engine and checking if the codes and/or symptoms have returned).

Section 2

BASIC KNOWLEDGE REQUIRED

Before using this manual, there are some areas that you should be familiar with. With this basic knowledge, you will have success using the diagnostic charts.

A. ELECTRICAL CIRCUITS

- You should understand the theory of electricity and know the meaning of voltage and ohms. You should understand what happens in a circuit and an open or shorted wire. You should be able to read and understand a wiring diagram.
- You should be able to use jumper wires to make circuit checks.

B. USE OF DIGITAL VOLT-OHM METER

- You should be familiar with the digital volt-ohm meter. You should be able to measure voltage and resistance. You should be familiar with the controls of the meter and how to use it correctly.

Instructions for use of a typical digital volt-ohm meter are as follows:

Resistance Measurements

1. Connect the red test lead to the V- Ω (Volt-Ohm) input connector and the black lead to the com input connector on the meter.
2. Set the function/range switch to the desired Ω position. If the magnitude of the resistance is not known, set the switch to the highest range, then reduce until a satisfactory reading is obtained.
3. If the resistance being measured is connected to a circuit, turn off the power to the circuit being tested (turn off ignition).
4. Connect the test leads to the circuit being measured. When measuring high resistance, be careful not to contact adjacent points, even if they are insulated. Some insulators have a relatively low insulation resistance which can affect the resulting measurement.
5. Read the resistance value on the digital display.

Continuity Checks

In addition to measuring the specific resistance value of a circuit, some meters will also tell if a continuous electrical path exists. If a path exists, the circuit is said to have "continuity" (This continuity check can be used in any section of the DDECII Troubleshooting Guide where the test is looking for greater than, less than or equal to 5 ohms.) An open circuit (broken electrical path) would have ∞ resistance and would not have continuity. To utilize this continuity feature of certain meters:

1. Place the function/range switch in any Ω range.
2. Connect the red lead to the V- Ω connector and the black lead to the com connector on the meter. With the test leads separated or measuring an out-of-range resistance, the digital display will indicate "OL" (overlimit; some meters show "1 +", " $\uparrow$ ", or simply "1").

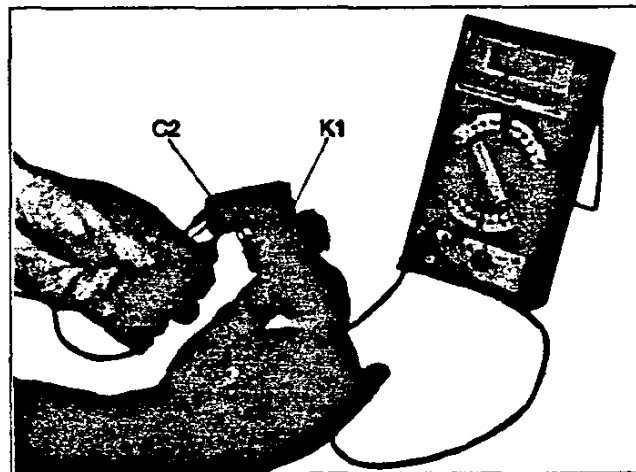
Section 2

BASIC KNOWLEDGE REQUIRED (Cont'd.)

3. Put one test lead probe at one end of the wire or circuit to be tested. Use the other test lead to trace the circuit. When continuity is established, an $\cap$ symbol will appear in the upper left corner of the digital display. If contact in the wire is maintained long enough (about 1/4 of a second), the OL will disappear and the resistance value of the wire or circuit will appear next to the symbol.
4. If your VOM does not work in the manner described above, you must know how your VOM operates in order to use this troubleshooting guide.

Voltage Measurements

1. Connect the red test lead to the V- $\cap$ input connector and the black lead to the com input on the meter. If a DC-AC switch is present, make sure it is switched to the DC position.
2. Set the function/range switch to the desired volts position. If the magnitude of the voltage is not known, set the switch to a range which will be able to read most voltages seen on a vehicle. (Typically, a 20V range will do.) Then reduce the range until a satisfactory reading is obtained.
3. Connect the test leads to the circuit being measured. In the DDEC II diagnostic procedures, voltage measurements are always given as being taken at pins, sockets, Battery + or ground. Following the voltage measurement point, the color test lead to be used is given in parenthesis (red is the V- $\cap$ connection, and black is the com connection). Example: If the procedure says, "Take voltage reading at socket C2 (red lead) to socket K1 (black lead)", the hook-up would be as follows:



C. IMPORTANT INFORMATION

The following items must be read and thoroughly understood before using this manual.

1. The engine and ignition should always be off before the harness connectors are disconnected or reconnected.
2. When disconnecting harness connectors, be sure that the pulling force is applied to the connectors themselves and not the wires extending from them.
3. After harness connectors are reconnected to the DDEC II system, the computer diagnostics should be ignored and cleared.

Section 2

BASIC KNOWLEDGE REQUIRED (Cont'd.)

D. EXPLANATION OF ABBREVIATIONS/TERMS

- A/D - Analog to Digital: The computer inside the ECM uses an A/D converter to convert a sensor voltage into a number which the computer can work with.
- ATEC - Allison Transmission Electronic Controls
- BAT - Battery
- BCSW - Brake/Clutch switch: Used in Cruise Control to determine whether the brake is depressed, thus disabling cruise.
- BOI - Beginning of Injection: The number of crank angle degrees, before Top Dead Center, that the ECM is requesting the injectors be turned on.
- CAL - "Cruise Active" Light: Typically mounted on the instrument panel. It's main function is to turn on when cruise control is operational (it does not turn on if just the cruise on/off switch has been pressed).

As a light bulb check and system check, the "Cruise Active" light will come on for about 5 seconds when the ignition turns on.

- CEL - "Check Engine" Light: Typically mounted on the instrument panel. It has two functions:
- It is used as a warning lamp to tell the driver that a problem has occurred, and that the vehicle should be taken in for service as soon as possible.
 - It is used by the technician to read out "trouble codes" to help diagnose system problems.

As a light bulb check and system check the "Check Engine" light will come on for about 5 seconds when the ignition is turned "ON". If the CEL remains on, the self-diagnostic system has detected a problem. If the problem goes away the light will go out, but a trouble code will be stored in the ECM. (See General Diagnostic Information, Section 2E for details.)

- CKT - Circuit
- CLS - Coolant Level Sensor: Monitors coolant level at the radiator tank top.
- CP - Crank Position: An ECM output generated anytime an SRS signal occurs (at the first cylinder)
- COM - Common
- CTS - Coolant Temperature Sensor: Can be used in place of the Oil Temperature Sensor for measuring engine temperature (assuming DDEC II has been set-up for the CTS).
- DDEC II - 2nd generation Detroit Diesel Electronic Controls
- DDL - Diagnostic Data Link: The lines (wires) over which the ECM communicates information can be read by a Diagnostic Data Reader. (See Section 3C)
- DDR - Diagnostic Data Reader: The hand-held tool for use in troubleshooting DDEC.
- DL + - Data Link, positive side. Used for communications to the Diagnostic Data Reader, as well as other applications.
- DL - Data Link, negative side (see above).
- DL2 + - Proprietary Data Link, positive side. It's main function is for dual engine applications where two ECM's must talk to each other.
- DL2- - Proprietary Data Link, negative side (see above).
- DREQ - Diagnostic Request Terminal: The pin on the DDL connector which must be grounded to obtain diagnostic codes (pin M).
- ECM - Electronic Control Module: The brains of DDEC II. It reads the DDEC II sensors and switches, calculates injector firing times and duration (using a built-in computer), and fires the injectors at the appropriate times.
- EEPROM - Electrically Erasable Programmable Read Only Memory. Contains the engine calibration.
- EFPA - Electronic Foot Pedal Assembly: Contains the Throttle Position Sensor.

Section 2

BASIC KNOWLEDGE REQUIRED (Cont'd.)

EUI	- Electronic Unit Injector: Replaces the Mechanical Unit Injector (MUI).
FTS	- Fuel Temperature Sensor: Monitors fuel temperature at the output of the secondary filter.
GND	- Ground: Battery -
INJ	- Injector (fuel)
N/A	- Not available at this time.
OPS	- Oil Pressure Sensor: Monitors oil pressure at the main oil gallery.
OTS	- Oil Temperature Sensor: Monitors oil temperature in the turbo oil supply line.
PC	- Power Control Switch
PTOSA	- Power Take-Off Speed Adjust Sensor
PW	- Pulsewidth: The amount of time in crank degrees that the ECM is requesting the injectors be turned on.
RASW	- Resume/Accel Switch (for cruise control)
SEL	- "Stop Engine" Light: Typically mounted on the instrument panel. Its main function is to turn on and warn the driver when a potential engine damaging condition has been detected (low oil pressure, low coolant, or engine overtemperature). As a light bulb check & system check, the "Stop Engine" light will come on for about 5 seconds when the ignition turns on.
STEO	- Stop Engine Override
SRS	- Synchronous Reference Sensor: Detects when the first cylinder in the firing order is about to be fired.
TBS	- Turbo Boost Sensor: Used to monitor turbo boost pressure. This sensor generates a voltage (from 0 to 5 volts) which is proportional to pressure.
TD	- Tachometer Driver: One of two outputs of the ECM for tach. Hook-up purposes.
TPS	- Throttle Position Sensor: Used to detect throttle request.
TRS	- Timing Reference Sensor: Detects whenever any cylinder is about to be fired.
TSG	- Two Speed Governor Switch: Detects when the vehicle is in top gear.
VIN	- Vehicle Identification Number
VSS	- Vehicle Speed Sensor: Used to detect vehicle (road) speed.
VSS OC	- Vehicle Speed Sensor, Open Collector: An ECM input which must be used in addition to the VSS positive input when certain types of vehicle speed sensors are used. (Refer to the application manual for a particular installation.)

E. GENERAL DIAGNOSTIC INFORMATION

When the Diagnostic Request terminal (pin M on the DDL connector) is grounded to pin A on the DDL connector, the diagnostic system will flash the yellow "Check Engine" light located in the cab. (More information on retrieving codes is given in Section 3C.) The light will be flashing a diagnostic code indicating the problem area.

As a bulb and system check, the "Check Engine" and "Stop Engine" lights will come on for 5 seconds when the ignition switch is first turned "on". The Cruise Active light will also turn on for 5 seconds if a DDEC cruise control is present. If the Diagnostic Request terminal (DREQ) is then grounded, the "Check Engine" light will flash a Code 25 which indicates the self-diagnostic system is working and that no faults have been detected. A Code 25 consists of two flashes followed by a short pause, then five flashes in quick succession. After a longer pause, the code will repeat.

If the "Check Engine" light remains on, the self-diagnostic system has detected a fault. If the Diagnostic Request terminal is then grounded and the engine is not running, the trouble code will be flashed. Diagnostic codes will flash in numerical order (i.e., lowest number code first). The diagnostic code series will repeat as long as the diagnostic request terminal is grounded.

A diagnostic code indicates a problem in a given circuit (i.e., diagnostic Code 14 indicates a problem in the oil or coolant temperature sensor circuit. This includes the oil or coolant temperature sensor, connector, harness and Electronic Control Module (ECM)). The procedure for finding the problem can be found in Diagnosis Chart Code 14. Similar charts are provided for each code. Remember, diagnosis should always begin at the starting chart (START). For an oil or coolant temperature sensor problem, it will quickly lead you to Chart 14—but first gets you to verify the code/symptom.

Section 2

BASIC KNOWLEDGE REQUIRED (Cont'd.)

Since the self-diagnostics do not detect all possible faults, the absence of a code does not mean there are no problems in the system. If the DDEC II problem is suspected, even in the absence of a code, go to START anyway. This chart can lead you to other charts which can aid in the troubleshooting process—where DDEC II problems may occur but do not generate a code. Basic mechanical checks, however, are not covered in this guide.

Section 3

TESTING THE DDEC II SYSTEM

A. TOOLS NEEDED TO DIAGNOSE THE SYSTEM

The following tools and equipment are required to properly diagnose a complete system:

- Voltmeter and Ohmmeter: Use a digital volt-ohmmeter J-34029 or equivalent to measure voltage and resistance where required. A digital volt-meter must be used when specified in a procedure.
- Test Light 6V: Must be used when specified in the procedure.
- Jumper Wires: To bypass a circuit and to insert between special connectors. This will permit access to the connector terminals for circuit checking.
- TRS/SRS Alignment Tool: J-34729. (Not needed for Series 60)
- Diagnostic Data Reader (DDR): J-36500

In addition, the tools listed below can be of aid in properly identifying problems, but are not required for this Troubleshooting Guide:

- Tachometer: Either a crankshaft harmonic balance revolution pickup type or electronic coil trigger signal pickup type tachometer can be used for diagnosis.
- Pressure Gauge: To monitor turbo boost pressure (for purposes of comparison with the DDEC II Turbo Boost Sensor).

B. DIFFERENCES BETWEEN DDEC II AND DDEC I

To those thoroughly familiar with DDEC I, a brief outline is given of the differences in DDEC II. From an installation and testing viewpoint, these differences are:

- 1 Box vs. 2 Box: DDEC II incorporates all the control electronics into one engine mounted Electronic Control Module (ECM) instead of the ECM and the EDU required in DDEC I.
- Added Sensor: A Fuel Temperature Sensor (FTS) has been added. It is used to develop a more accurate fuel consumption number. The ECM sends fuel consumption information out on the data link.
- Connector Changes: The Connector Configuration has changed to:
 1. One 6 way connection at the ECM for battery power and ground.
 2. Two 5 way connections at the ECM for the injectors.
 3. A 30 way connection at the ECM for all engine electrical connections, and
 4. A 30 way connection at the ECM for all cab electrical connections.
- Vehicle Speed Sensing Enhancements: DDEC II will be able to accept the vehicle speed signal from ATEC (Allison Transmission Electronic Controls) using DDEC II's Vehicle Speed O.C. input. This additional input also allows DDEC II to accept a larger variety of vehicle speed sensors.

Section 3

TESTING THE DDEC II SYSTEM (Cont'd.)

- EEPROM (Electrically Erasable, Programmable, Read Only Memory) vs. EPROM (Erasable, Programmable, Read Only Memory): In DDEC I, a calibration change was made by:

1. Pulling the ECM of the vehicle
2. Removing the PROM access cover
3. Removing the old EPROM from the ECM and installing the new EPROM

Since DDEC II now has a calibration that can be changed by communication the proper information over the data link wires, a PROM access cover is not required. The Diagnostic Data Reader can reprogram some of the calibration (see Section 3E). For more extensive reprogramming, contact your dealer/distributor.

- Diagnostic Differences: a number of changes fall into this category, including most notably:

1. Pulling fuses no longer clears the codes. This change was made so that codes aren't lost when the battery is swapped or otherwise disconnected. Now codes will have to be cleared through the use of a Diagnostic Data Reader (DDR).
2. More codes have been added to flag problems on the added sensor. Also, there are no longer any 3 digit codes. Rise time codes are now in the 60's and 70's.
3. A new tester is required to attach to the 12 pin, DDL connector. This is because of the faster data link being used by DDEC II to send out information. This tester, the Diagnostic Data Reader, works with both DDEC I and DDEC II, as well as ATEC (Allison Transmission Electronic Control) systems.
4. Both active and historical codes are available. This is explained further in Section 3C.1.

Note that codes can still be read out on the "Check Engine" light when pins A and M are shorted together. Also, with the exception of the rise time codes mentioned above, all DDEC I codes carry over to DDEC II.

C. READING THE DIAGNOSTIC CODES

NOTE: If you have turned here to begin diagnosis of a problem and already know how to read codes, as well as understand active and historical codes, turn to the first chart (labelled START) on page 17.

1. Active vs. Historical Codes:

DDEC II makes use of both types of codes. As their names imply, the difference between the two are as follows:

- a. Active Codes - These are the codes which are currently keeping the "Check Engine" light on. They can only be read using the Diagnostic Data Reader.
- b. Historical Codes - These are all the codes logged in the ECM (whether or not they are currently turning on the "Check Engine" light). These codes can be cleared by using the Diagnostic Data Reader.

Codes 22, 43-45 and 85 will show additional information. Refer to Code 85 for a discussion of this.

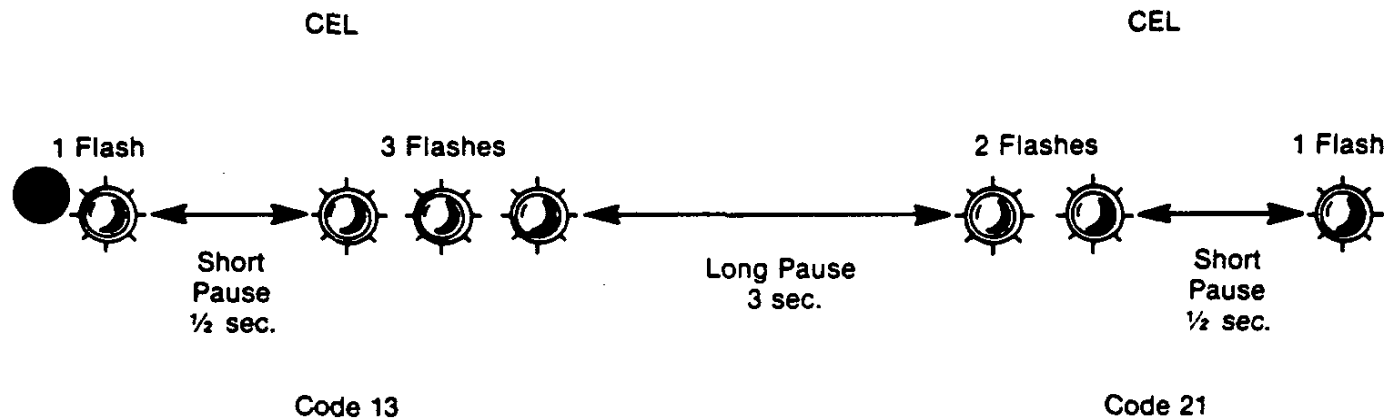
Section 3

TESTING THE DDEC II SYSTEM (Cont'd.)

2. Using the "Check Engine" Light (CEL)

This Troubleshooting Guide is intended to be used with a Diagnostic Data Reader. In certain instances, only the Reader can provide the information necessary for quick diagnosis of the problem. Should you just need to read out codes, however, and not have a Reader available, the following procedure will let you read out codes on the CEL:

- Turn ignition off.
- Jumper pin A to pin M on the 12 pin, DDL connector (typically located in the cab).
- Turn ignition on and observe the codes flashing out on the CEL. Example: Code 13 and 21.

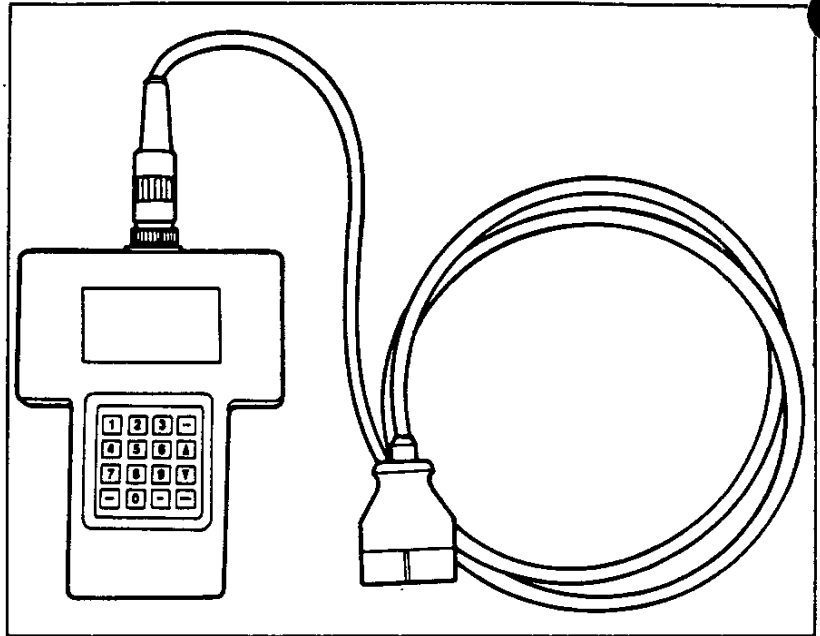


This will continue as long as the pins are jumpered with the ignition on.

Section 3

TESTING THE DDEC II SYSTEM (Cont'd.)

3. Using the Diagnostic Data Reader (DDR).



Proper use of this reader is described in the instruction manual supplied. This device is infinitely more useful in reading fault codes and diagnosing engine electronic faults than the Check Engine Light code process.

D. CLEARING CODES

This can only be done using the Diagnostic Data Reader (DDR). Refer to Mode 40 of the DDR Instruction Manual for details.

Note that removing the battery cables will not clear codes (as was the case with DDEC I).

E. EEPROM REPROGRAMMING

The Diagnostic Data Reader is equipped with capabilities to reprogram part of the engine calibration in the ECM. Specifically, the following calibration changes can be made using the DDR:

1. Change DDR, EEPROM password
2. Add/Delete 5 minute idle shutdown
3. Change droop
4. Set the initial speed if cruise control switches are used as a power take-off option
5. Set PTO droop
6. Enable/Disable cruise control
7. Add/Delete a vehicle speed sensor
8. Change road speed limit
9. Change cruise control speed limit
10. Add/Delete engine shutdown feature

For more information on how to change these features, refer to Mode 37 of the DDR Instruction Manual.

Section 3

TESTING THE DDEC II SYSTEM (Cont'd.)

F. CONNECTOR CHECKOUT

All system connections are environmentally protected. These new connectors protect the terminations from the harsh corrosive engine compartment environment. This is important since most system signals are low voltage and corrosion could make them inoperative.

Before repairing or replacing any system component (i.e., harness, sensor, ECM, etc.) as indicated by the diagnostic charts, you should:

1. Disconnect the appropriate connector(s) associated with the suspected defective component and check for bent, broken, or dirty terminals or mating tabs. Clean, straighten, or replace as required.
2. If a problem was found, reconnect all connectors previously disconnected. Then recheck the system to see if the problem has been corrected.

NOTE: Don't probe the back of a connector or pierce the DDEC II wiring for purposes of taking measurements. This can cause intermittent faults or system failures and may affect the DDEC II warranty.

Section 4

TROUBLESHOOTING CHARTS

A. THE DIAGNOSTIC PROCEDURE - WHERE TO START

When diagnosing the cause for engine performance, fuel economy or exhaust system complaints, perform normal checks (non DDEC II equipped engine) before considering DDEC II as the possible source of the problem.

When diagnosing the system, always start with the first chart (labelled "START") on Page 17. This will ultimately lead to other diagnostic charts, even in the cases where no codes were logged but a symptom(s) was noted. In fact, if no codes were recorded (but a symptom remains), the "START" chart will refer you to the "Customer Complaint" Chart 1, which can identify fault trees to use based on the customer complaint.

NOTICE: Although there are many charts connected with diagnostics, only one is needed to determine that the system is operating properly. Normally, only two charts are necessary to find a problem.

B. DIAGNOSTIC CODES - WHAT THEY MEAN

The following pages give a brief description of each diagnostic code. Basic facts about these codes are given below:

- Most problems must occur for a total of at least two (2) seconds before the "Check Engine" light comes on and a code is stored.
- If a problem goes away, the "Check Engine" light will turn off. But the code will remain stored in the ECM.

Code 25 means no codes were stored at all.

Code 11 Power Take-Off Speed Adjust (PTOSA) - System on for 2 seconds with too low a voltage at the PTOSA input to the ECM.

Code 12 Power Take-Off Speed Adjust (PTOSA) - System on for 2 seconds with too high a voltage at the PTOSA input to the ECM.

Code 13 Coolant Level Sensor (CLS) - System running for 2 seconds with too low a voltage at the ECM input. Battery voltage at the ECM must also be greater than 11 volts.

Code 14 Oil or Coolant Temperature Sensor (OTS or CTS) - Engine running for 8 minutes with too high a voltage at the OTS or CTS input to the ECM.

Code 15 Oil or Coolant Temperature Sensor (OTS or CTS)- Engine running for 2 seconds with too low a voltage at the OTS or CTS input to the ECM.

Code 16 Coolant Level Sensor (CLS) - System running for 2 seconds with too high a voltage at the ECM input. Battery voltage at the ECM must also be greater than 11 volts.

Code 21 Throttle Position Sensor (TPS) - System running for 2 seconds with too high a voltage at the TPS input to the ECM.

Code 22 Throttle Position Sensor (TPS) - System running for 2 seconds with too low a voltage at the TPS input to the ECM.

Code 23 Fuel Temperature Sensor (FTS) - Engine running for 8 minutes with too high a voltage at the FTS input to the ECM.

Code 24 Fuel Temperature Sensor (FTS) - Engine running for 2 seconds with too low a voltage at the FTS input to the ECM.

Section 4

TROUBLESHOOTING CHARTS (Cont'd.)

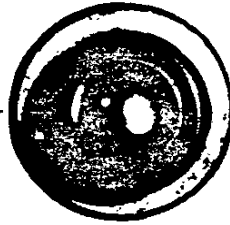
- Code 25** No Codes - No faults have been detected by DDEC-II since the last time the codes were cleared.
- Code 26** Power Control Switch - Indicates that the power control switch has been used. This switch, when thrown, turns on both the "Stop Engine" and "Check Engine" Lights. In addition, the engine will begin to power down (and eventually shutdown) the engine if the engine protection system is equipped with the shutdown feature.
- Code 31** Fault on auxiliary output: one of the following faults has been detected for more than 2 seconds:
- Open in "Check Engine" or "Stop Engine" Light circuit, or
 - Short to ground in "Check Engine", "Stop Engine", "Cruise Active" Light circuits or in the Crank Position, Engine Brake or one of three auxiliary drive (labelled PWM or AUX) circuits. Battery voltage at the ECM must also be greater than 8 volts.
- Code 32** ECM Failure - The backup system inside the ECM has failed.
- Code 33** Turbo Boost Sensor (TBS) - Engine running (at less than 800 RPM or less than 30% of maximum torque) for 5 seconds with too high a voltage at the TBS input to the ECM.
- Code 34** Turbo Boost Sensor (TBS) - Engine running for 2 seconds with too low a voltage at the TBS input to the ECM.
- Code 35** Oil Pressure Sensor (OPS) - Engine running for 2 seconds at less than 800 RPM with too high a voltage at the OPS input to the ECM. Must also have greater than 50 degrees C oil temperature to log this code.
- Code 36** Oil Pressure Sensor (OPS) - Engine running for 2 seconds with too low a voltage at the OPS input to the ECM.
- Code 41** Timing Reference Sensor (TRS) Pulses Fault - The number of TRS pulses received per revolution was incorrect or completely missing. One pulse per cylinder per revolution is required.
- Code 42** Synchronous Reference Sensor (SRS) Pulses Fault - Did not receive an SRS pulse on every firing of the #1 cylinder.
- Code 43** Low Coolant - System running with low coolant for 7 seconds. Battery voltage at the ECM must also be greater than 11 volts. This fault will cause both the "Stop Engine" and "Check Engine" lights to turn on, and will power down (and eventually shutdown) the engine if the engine protection system is equipped with the shutdown feature.
- Code 44** Oil or Coolant Over Temperature - System running for 2 seconds with the oil or coolant temperature greater than a calibrated limit. This fault will cause both the "Stop Engine" and "Check Engine" lights to turn on, and will power down (and eventually shutdown) the engine if the engine protection system is equipped with the shutdown feature. (NOTE: if the oil or coolant is only slightly overtemperature, the following occurs: the "Check Engine" light comes on after 2 seconds and a code is logged. If equipped with the shutdown feature, the engine will be reduced in power as a function of degrees overtemperature).
- Code 45** Low Oil Pressure - Engine running with the oil pressure less than the limit (different limits at different RPM's) for 7 seconds. This fault will cause both the "Stop Engine" and "Check Engine" lights to turn on, and will power down (and eventually shutdown) the engine if the engine protection system is equipped with the shutdown feature.
- Code 46** Low Battery Voltage - Engine running with low battery voltage (less than 10.0 volts) for more than 30 seconds.
- Code 47** High Fuel Pressure - Engine running with high fuel pressure.

Section 4

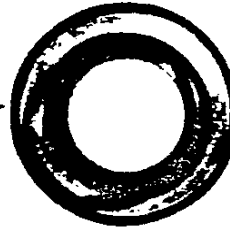
TROUBLESHOOTING CHARTS (Cont'd.)

- Code 48 Low Fuel Pressure - Engine running with low fuel pressure.
- Code 51 EEPROM Error - An error has been detected in the EEPROM (Electrically Erasable, Programmable, Read Only Memory) inside the ECM.
- Code 52 ECM Failure - The ECM was unable to correctly convert sensor voltages into numbers for computer usage.
- Code 54 Vehicle Speed Sensor (VSS) Failure - The DDEC-II system has detected a fault with the DDEC-II VSS. This fault may have been either a short, open or an inconsistency between the VSS speed reading, and an ECM calculated speed based on RPM and the injector pulsewidth.
- Code 55 Proprietary Communication Link Failure - An error has occurred in the communication link used between two ECMs on a dual engine set-up.
- Code 56 ECM Failure - The ECM was unable to correctly convert sensor voltages into numbers for computer usage.
- Code 58 Cruise Inputs Bad - An illegal cruise control switch combination has been detected. This can be due to either opens or shorts in the cruise control switch circuitry.
- Code 61, 62, 63, 64, 65, 66, 67, 68 - response time too long.
The response time of the injector was longer than the maximum limit or the injector never responded at all. Oil temperature must be greater than 30 degrees C and battery voltage must be between 11 volts and 16 volts to log this code. Also, the code is only logged at less than 2000 RPM.
- Codes 71, 72, 73, 74, 75, 76, 77, 78 - response time too short.
The response time of the injector was shorter than the minimum limit. Oil temperature must be greater than 30 degrees C and battery voltage must be between 11 volts and 16 volts to log this code. Also, the code is only logged at less than 2000 RPM.
- Code 85 The engine has been operating over 2500 RPM for at least two seconds.

SEL



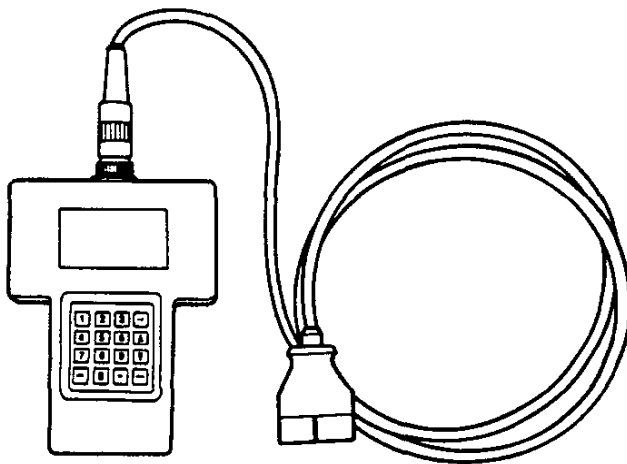
CEL



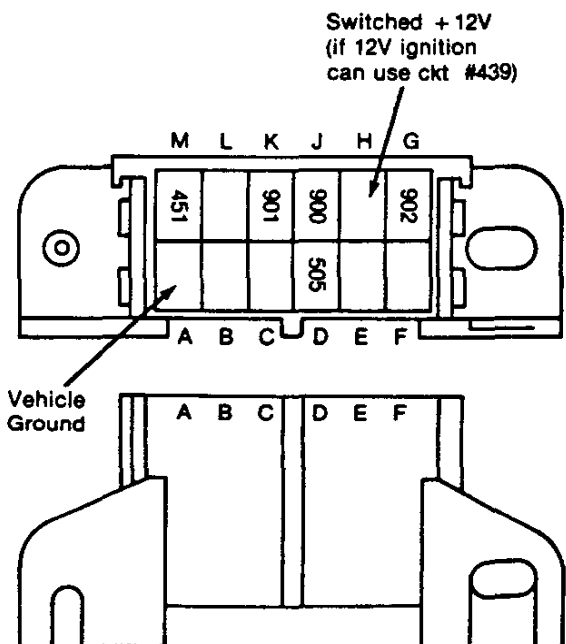
STEO



Dash Lights



Diagnostic Data Reader



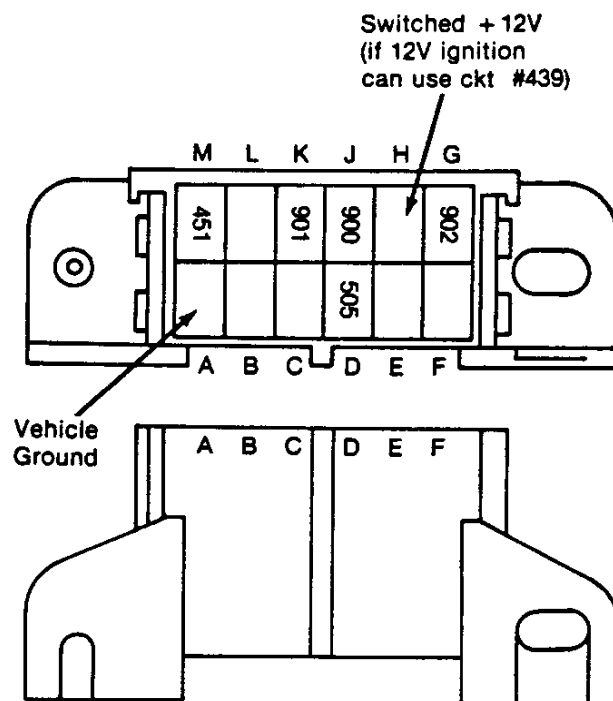
12 Pin DDL Connector P/N 12020043

Section 4

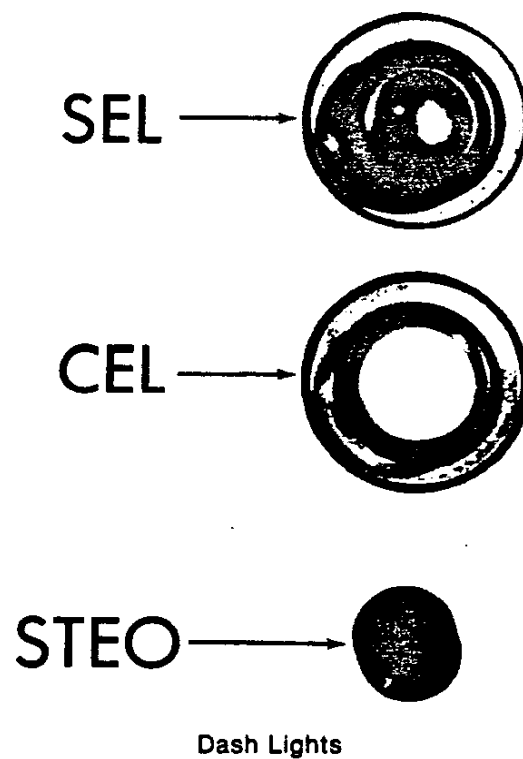
TROUBLESHOOTING CHARTS

START - FIRST CHART FOR DIAGNOSIS OF DDEC-II USING DDR

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
START-1 Note "Check Engine" Light <ul style="list-style-type: none"> • Turn ignition on while at the same time observing the "Check Engine" light. • Be sure there is not a jumper wire between pins A and M of the DDL connector and any switch for flashing out codes should be in the off position. 	Light comes on and stays on.	Go to START-2.
	Light comes on for up to 5 seconds, then goes out.	Go to START-3.
	Light is off.	Go to Chart 4, page 59.
	Erratic or intermittent light.	Go to START-7.
START-2 Read Active Codes Using DDR <ul style="list-style-type: none"> • Plug DDR into the 12 pin DDL connector. • Read active codes by selecting MODE 01 on the DDR. • Read historical codes by selecting MODE 02 on the DDR. 	Active codes (other than Code 25) on DDR.	Follow appropriate diagnostic charts for code(s) received. (See Index on page i).
	Active Code 25 and historical Code 51 (other codes may be present).	Go to Code 51, page 299.
	Active Code 25 only.	Go to Chart 5, page 65.
	DDR display reads "NO DATA BEING RECEIVED FROM DATA LINK" or "DDEC SYSTEM NOT RESPONDING".	Go to START-6.
	DDR display is blank or random.	Go to START-9.



12 Pin DDL Connector P/N 12020043

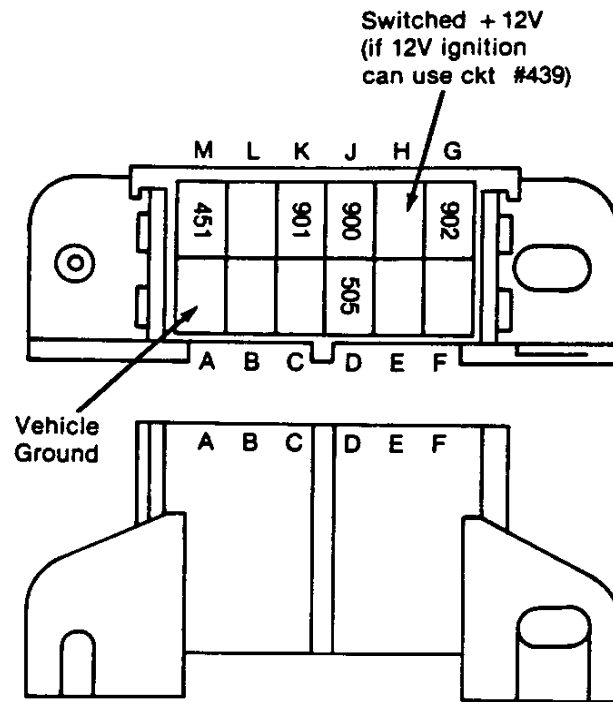


Section 4

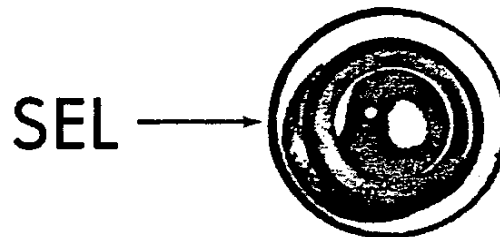
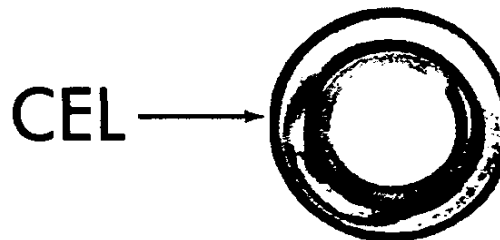
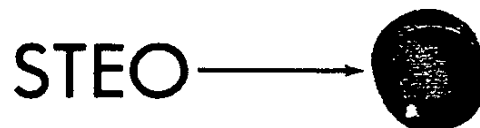
TROUBLESHOOTING CHARTS

START - FIRST CHART FOR DIAGNOSIS OF DDEC-II USING DDR (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
START-3 Read All Codes Using DDR <ul style="list-style-type: none"> ● Plug DDR into the 12 pin DDL connector. ● Read all historical codes by selecting MODE 02 on the DDR. 	<p>Codes 14,23, 58 or 85. → Follow appropriate diagnostic charts for code(s) received. (See Index on page i).</p> <p>Any codes except 14, 23, 25, 58 or 85. → Go to START-4.</p> <p>Code 25 only. → Go to Chart 1, page 32.</p> <p>DDR display reads "NO DATA BEING RECEIVED FROM DATA LINK" or "DDEC SYSTEM NOT RESPONDING". → Go to Chart 7, page 73.</p> <p>DDR display is blank or random. → Go to START-9.</p>	
START-4 Attempt to Make Codes Active <ul style="list-style-type: none"> ● Clear codes by selecting MODE 40 on the DDR. ● Attempt to start and run the engine. ● Try to get the "Check Engine" light on by: <ul style="list-style-type: none"> - warming up the engine - slowly changing the RPM from idle to no load speed. ● Run engine for 1 minute or until "Check Engine" light comes on. 	<p>Engine will not start. → Go to Chart 2, page 37.</p> <p>"Check Engine" light is on. → Read active codes (MODE 01 on DDR) while light is on and follow appropriate diagnostic chart (see Index on page i.)</p> <p>"Check Engine" light is off or only flashes briefly. → Go to Start-5.</p>	



12 Pin DDL Connector P/N 12020043



Dash Lights

Section 4

TROUBLESHOOTING CHARTS

C. START - FIRST CHART FOR DIAGNOSIS OF DDEC-II USING DDR (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
START-5 Read All Codes Again <ul style="list-style-type: none"> Read historical codes (MODE 02) on DDR. 	<p>Codes 31, 41, 42, 51-56, 61-68 or 71-78. → Follow appropriate diagnostic chart for codes received. (See Index on page i).</p> <p>Any other codes. → Go to Chart 1, page 32.</p> <p>DDR display reads "NO DATA BEING RECEIVED FROM DATA LINK" or "DDEC SYSTEM NOT RESPONDING". → Go to Chart 7, page 73.</p> <p>DDR display is blank or random. → Go to START-9.</p>	
START-6 Read Codes on the "Check Engine" Light <ul style="list-style-type: none"> Unplug the DDR. Short pin A to pin M on the 12 pin DDL connector. Read codes flashing out on the "Check Engine" Light. 	<p>Flashes out codes. → To diagnose codes, go to CEL-3 (page 27). To service DDR system, go to C7-4 (page 75).</p> <p>Does not flash out codes. → Go to Chart 6, page 69.</p>	
START-7 Intermittent Check <ul style="list-style-type: none"> Note whether flashing "Check Engine" Light is reading a valid code or if it's just erratic. 	<p>Flashing a valid code. → Go to START-8.</p> <p>Erratic or intermittent "Check Engine" light. → Go to Chart 1, page 32.</p>	

Section 4

TROUBLESHOOTING CHARTS

START - FIRST CHART FOR DIAGNOSIS OF DDEC-II USING DDR (Cont'd.)

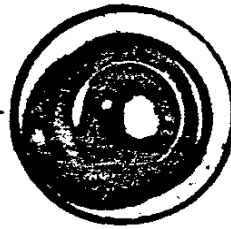
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
START-8 Check for Short <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Read resistance between pins A and M of the 12 pin, DDL connector. 	<p>Less than _____ or equal to 200 ohms.</p> <p>Greater than _____ 200 ohms or open.</p>	<p>The Diagnostic Request line (Ckt #451) is shorted to ground (either ckt #150 or chassis ground). Repair short. Then go to START-30.</p> <p>Go to START-10.</p>
START-9 Check for + 12 Volts at DDL Connector <ul style="list-style-type: none"> • Turn ignition on. • Read voltage at the 12 pin DDL connector, from pin H (red lead) to pin A (black lead). 	<p>Greater than _____ or equal to 10.0 volts.</p> <p>Less than _____ 10.0 volts.</p>	<p>There is a problem with either the DDR or the data link lines. Go to C7-4 (page 75). (For diagnosis of DDEC-II without a DDR, go to CEL-1 on page 27.)</p> <p>Either the switched + 12 volt line (ckt #439 or other appropriate circuit) or the ground line is open to the 12 pin, DDL connector. Repair open. Then go to START-30.</p>
START-10 Check ECM Connectors <ul style="list-style-type: none"> • Disconnect the 6-way power harness connector at the ECM. • Check terminals at the ECM 6-way power and vehicle harness connectors (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets. 	<p>Terminals and _____ connectors are okay.</p> <p>Problem found. _____</p>	<p>Replace ECM. Then go to START-30.</p> <p>Repair terminals/connectors. Then go to START-30.</p>

Section 4 TROUBLESHOOTING CHARTS

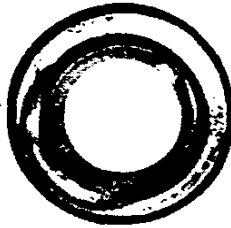
C. START - FIRST CHART FOR DIAGNOSIS OF DDEC-II USING DDR (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
START-30 Verify Repairs <ul style="list-style-type: none"> ● Turn ignition off. ● Reconnect all connectors. ● Turn ignition on. ● Clear codes. ● Turn ignition off. ● Turn ignition on. ● Observe the "Check Engine" Light. 	<p>"Check Engine" → Light comes on for up to 5 seconds, then goes out.</p> <p>"Check Engine" → Light is flashing.</p> <p>"Check Engine" → Light comes on and stays on.</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>Go to START-1.</p>

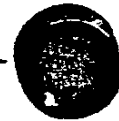
SEL →



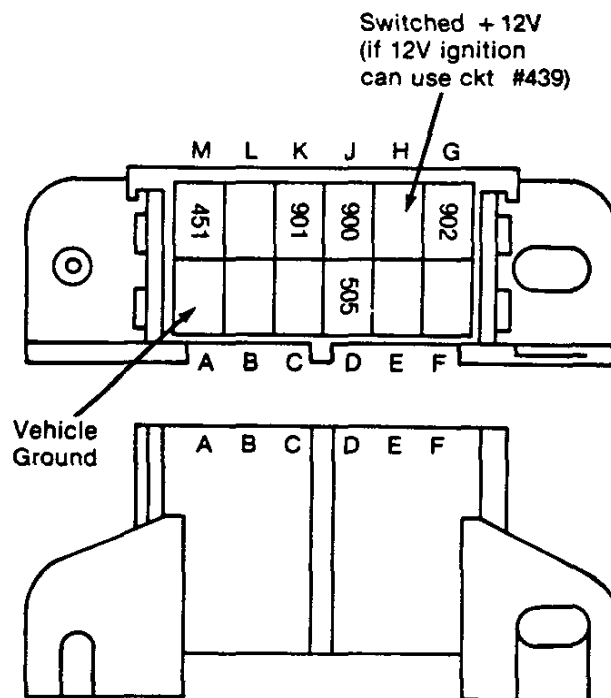
CEL →



STEO →



Dash Lights



12 Pin DDL Connector P/N 12020043

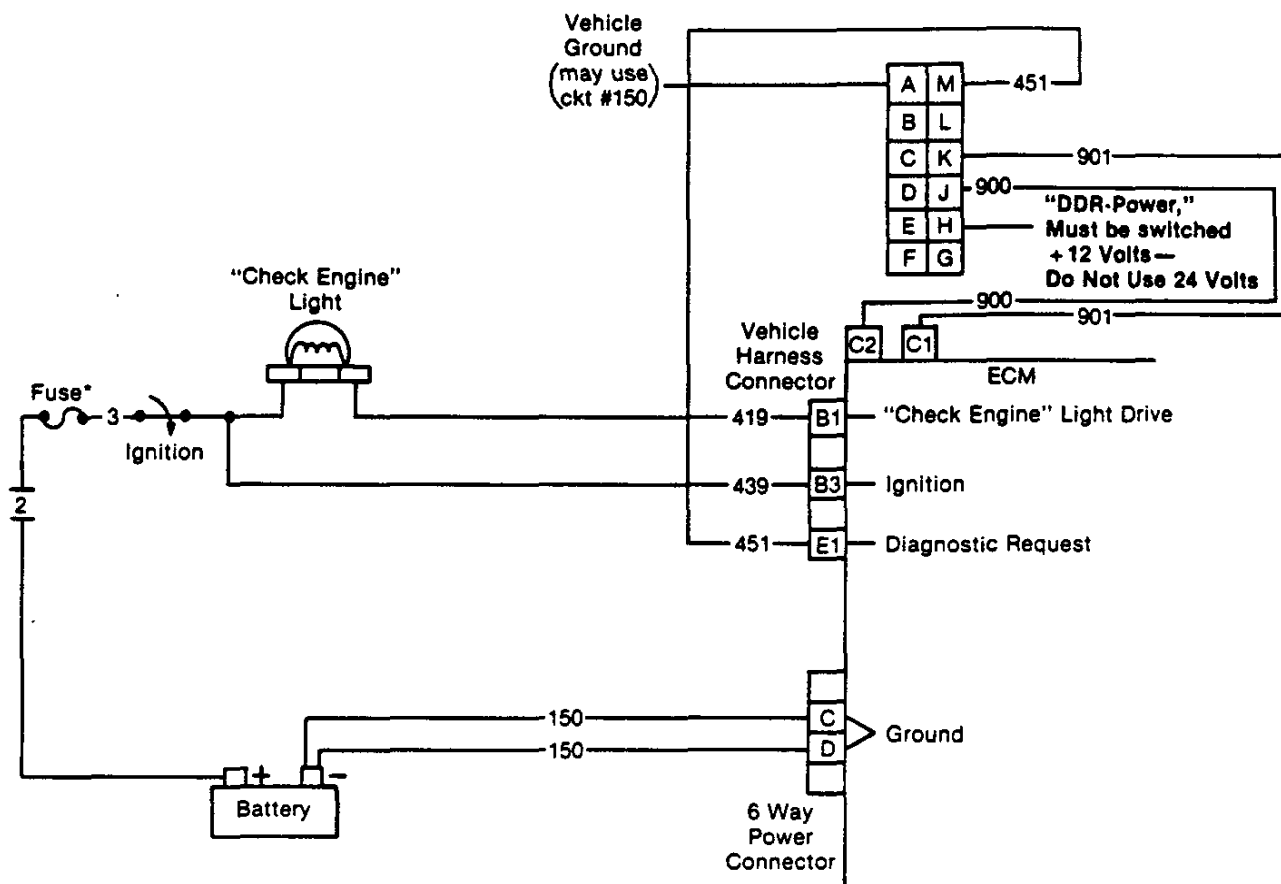
Section 4

TROUBLESHOOTING CHARTS

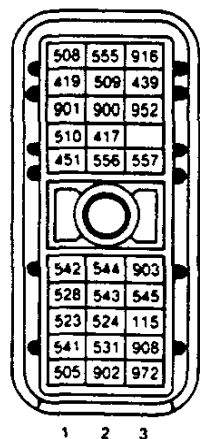
C. CEL - FIRST CHART FOR DIAGNOSIS OF DDEC-II WHEN NO DDR IS AVAILABLE

NOTE: Although this section will help you get started, later sections of the Troubleshooting Guide may require using a DDR.

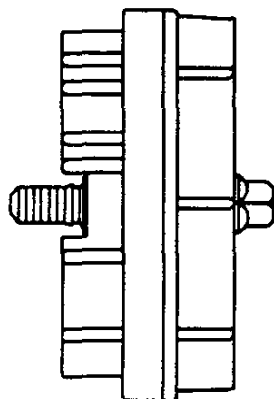
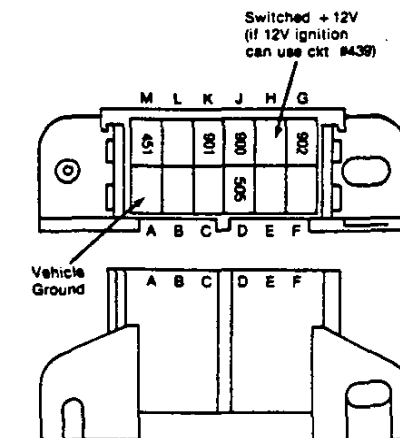
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
CEL-1 Note "Check Engine" Light <ul style="list-style-type: none"> Turn ignition on while at the same time observing the "Check Engine" light. 	Light comes on and stays on. → Light comes on for up to 5 seconds, then goes out. → Light is off. → Flashing light. →	Go to CEL-2. Go to CEL-2. Go to Chart 4, page 59. Go to CEL-8.
CEL-2 Read Codes <ul style="list-style-type: none"> Install a jumper wire between pins A and M of the 12 pin, DDL connector. 	Flashes out codes. → "Check Engine" light is always on but doesn't flash out codes. → "Check Engine" light never comes on. →	Go to CEL-3. Go to Chart 6, page 69. Go to CEL-6.
CEL-3 Follow Codes <ul style="list-style-type: none"> Note and record code(s). 	Code 14, 23, 58 or 85. → Any codes except 14, 23, 25, 58 or 85. → Code 25 only. →	Follow appropriate diagnostic charts for the code(s) received. (See Index on page i.) Go to CEL-4. If drive complaint persists, go to Chart 1, page 32.



Check Engine, Diagnostic Request, and Ignition Circuits



ECM Vehicle Harness Connector
P/N 12034398



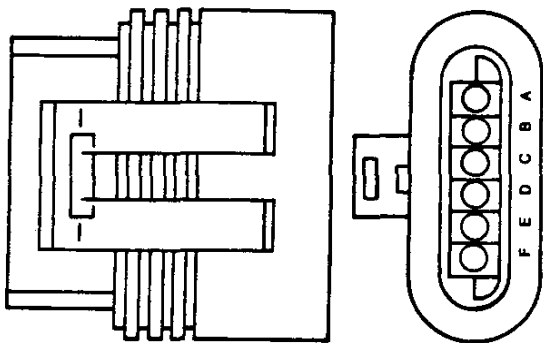
12 Pin DDL Connector P/N 12020043

Section 4

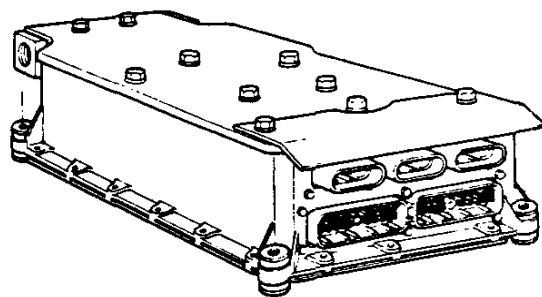
TROUBLESHOOTING CHARTS

C. CEL - FIRST CHART FOR DIAGNOSIS OF DDEC-II WHEN NO DDR IS AVAILABLE (Cont'd.)

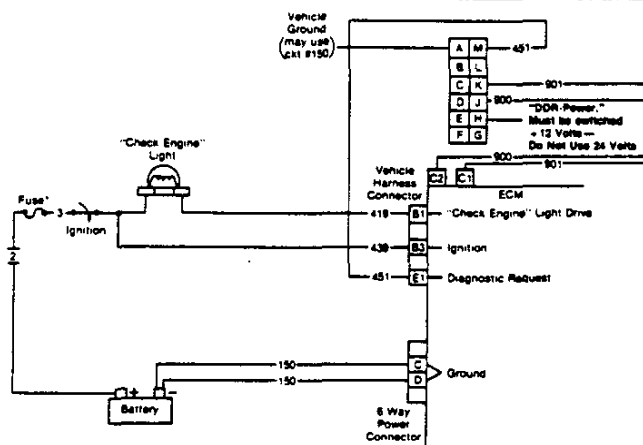
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
CEL-4 Verify Code(s) <ul style="list-style-type: none"> ● Remove jumper wire between pins A and M. ● Turn ignition on. ● Obtain a DDR. ● Clear codes. ● Turn ignition off, then back on. ● Note status of "Check Engine" light. 	<p>"Check Engine" light stays on. → Read codes (by installing jumper wire again) and follow appropriate diagnostic chart. (See Index on page i.)</p> <p>"Check Engine" light goes on for 5 seconds, then goes out. → Go to CEL-5.</p> <p>"Check Engine" light is erratic or intermittent. → Go to CEL-8.</p>	
CEL-5 Verify Code(s) with the Engine Running <ul style="list-style-type: none"> ● Attempt to start and run the engine. ● Try to get the "Check Engine" light on by: <ul style="list-style-type: none"> — warming up the engine — slowly changing the engine from idle to no load speed. ● Run engine until the "Check Engine" light comes on or for 1 minute. 	<p>Engine will not start. → Go to Chart 2, page 37.</p> <p>"Check Engine" light is off. → Previous codes should be regarded as intermittent. Go to Chart 1, page 32.</p> <p>"Check Engine" light is on. → Read codes (by installing jumper wire again) and follow appropriate diagnostic chart. (See Index on page i.)</p>	
CEL-6 Check for Open <ul style="list-style-type: none"> ● Turn ignition off. ● Disconnect the vehicle harness connector at the ECM. ● Install a jumper wire between sockets C1 and E1 of the vehicle harness connector. ● Read resistance between pins K and M of the 12 pin, DDL connector. ● Also read resistance between pin A of the DDL connector and a good ground. 	<p>Less than or equal to 5 ohms on both readings. → Go to CEL-7.</p> <p>Greater than 5 ohms or open on either reading. → An open exists either in the Diagnostic Request line (ckt #451) or in the DDL ground line (ckt #901). Repair open. Then go to CEL-30.</p>	



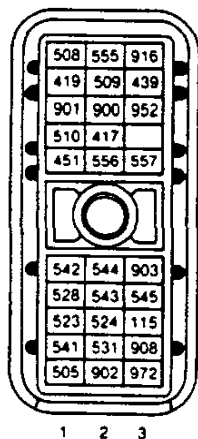
6-Way Power Harness Connector
P/N 12066317



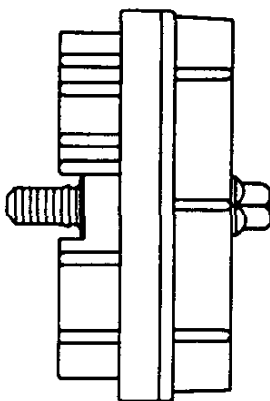
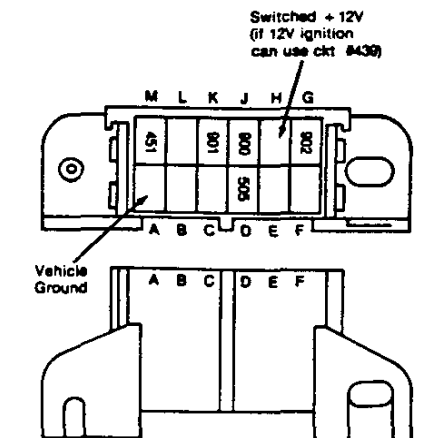
Electronic Control Module (ECM)



Check Engine, Diagnostic Request,
and Ignition Circuits



ECM Vehicle Harness Connector
P/N 12034398



12 Pin DDL Connector P/N 12020043

Section 4 TROUBLESHOOTING CHARTS

C. CEL - FIRST CHART FOR DIAGNOSIS OF DDEC-II WHEN NO DDR IS AVAILABLE (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
CEL-7 Check ECM Connectors <ul style="list-style-type: none"> • Disconnect the 6-way, power harness connector at the ECM. • Check terminals at both the 6-way power harness connector, and vehicle harness connector (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace ECM. Then go to CEL-30. Repair terminals/connectors. Then go to CEL-30.
CEL-8 Intermittent Check <ul style="list-style-type: none"> • Note whether flashing "Check Engine" light is reading a valid code or if it's just erratic. 	Flashing a valid code. → Erratic or intermittent "Check Engine" light. →	Go to CEL-9. Go to Chart 1, page 32.
CEL-9 Check for Short <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Read resistance between pins A and M of the 12-pin, DDL connector. 	Less than or equal to 200 ohms. → Greater than 200 ohms or open. →	The Diagnostic Request line (ckt #451) is shorted to ground (either ckt #150 or chassis ground). Repair short. Then go to CEL-30. Go to CEL-7.
CEL-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Turn ignition off. • Turn ignition on while at the same time observing the "Check Engine" Light. NOTE: Some calibrations will not allow clearing codes this way. Obtain a DDR or consult a dealer.	"Check Engine" light comes on for up to 5 seconds, then goes out. → "Check Engine" light is flashing. → "Check Engine" light comes on and stays on. →	Repairs are complete. All system diagnostics are complete. Please review this section from the first step to find the error. Go to CEL-1.

Section 4

TROUBLESHOOTING CHARTS

D. CHART 1 - INTERMITTENT CODE OR A SYMPTOM AND NO CODES

NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C1-1 Diagnosis by Symptom <ul style="list-style-type: none"> • Turn ignition off. • Go to appropriate result in the next column based on engine symptom. 		
	Intermittent code.	Go to C1-2, page 35.
	Engine cranks but will not start.	Go to Chart 2, page 37.
	Poor performance and no codes.	Go to Chart 3, page 57.
	No "Check Engine" Light during bulb check at key on.	Go to Chart 4, page 59.
	"Check Engine" Light always on and Code 25 on DDR.	Go to Chart 5, page 65.
	"Check Engine" Light always on, no data link and won't flash codes.	Go to Chart 6, page 69.
	No data link and bulb check Okay at key on.	Go to Chart 7, page 73.
	"Stop Engine" Light always on and no codes.	Go to Chart 8, page 79.
	No "Stop Engine" Light during bulb check at key on.	Go to Chart 9, page 81.

Section 4

TROUBLESHOOTING CHARTS

D. CHART 1 - INTERMITTENT CODE OR A SYMPTOM AND NO CODES (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C1-1 Diagnosis by Symptom (Cont'd)		
	"Stop Engine" Override switch inoperative.	Go to Chart 10, page 87.
	Power Take-Off Speed Adjust inoperative.	Go to Chart 11, page 91.
	Cruise control inoperative.	Go to Chart 12, page 101.
	"Cruise Active" Light is always on.	Go to Chart 13, page 105.
	"Cruise Active" Light is never on.	Go to Chart 14, page 109.
	Idle shut-down feature is always on.	Go to Chart 15, page 115.
	Idle shut-down feature inoperative.	Go to Chart 16, page 119.
	Engine brake (if tied into DDEC system) is always enabled.	Go to Chart 17, page 123.
	Engine brake (if tied into DDEC system) is inoperative.	Go to Chart 18, page 125.
	Power Control input inoperative. —throttle inhibit —auxiliary engine protection	Go to Chart 19, page 127.
	Two speed Governor (TSG) switch inoperative.	Go to Chart 20, page 131.
	Throttle inhibit feature always on	Go to Chart 21, page 135.

Section 4

TROUBLESHOOTING CHARTS

D. CHART 1 - INTERMITTENT CODE OR A SYMPTOM AND NO CODES (Cont'd.)

STEP/SEQUENCE

C1-2 Diagnosis of an Intermittent

NOTICE: Do not use any other procedures in this manual (except for the suggestions listed below) when trying to solve an intermittent problem. Use of any other procedures for this kind of problem can result in the replacement of non-defective parts.

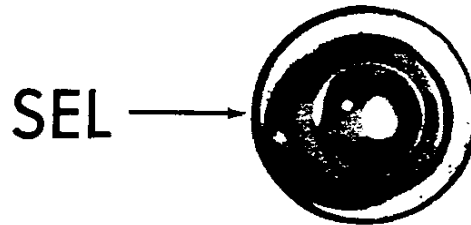
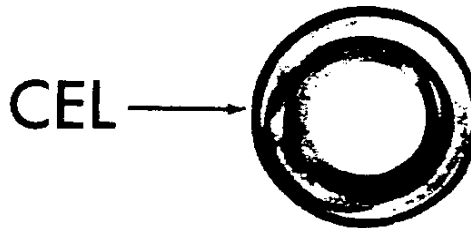
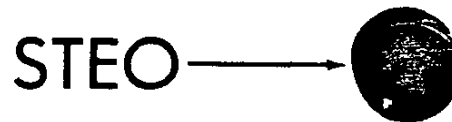
Many intermittent problems are caused by faulty electrical connectors or wiring. Diagnosis must include a careful inspection of the indicated circuit wiring and connectors. Example: an intermittent Code 35 (Oil Pressure Sensor High) should cause suspicion of a problem in the *following areas* associated with the Oil Pressure Sensor:

1. Wire #'s 530 (signal line), 416 (+ 5 Volt line) or 452 (ground line).
2. The Oil Pressure Sensor connector or ECM connector.
3. An intermittent in the Oil Pressure Sensor (least likely).

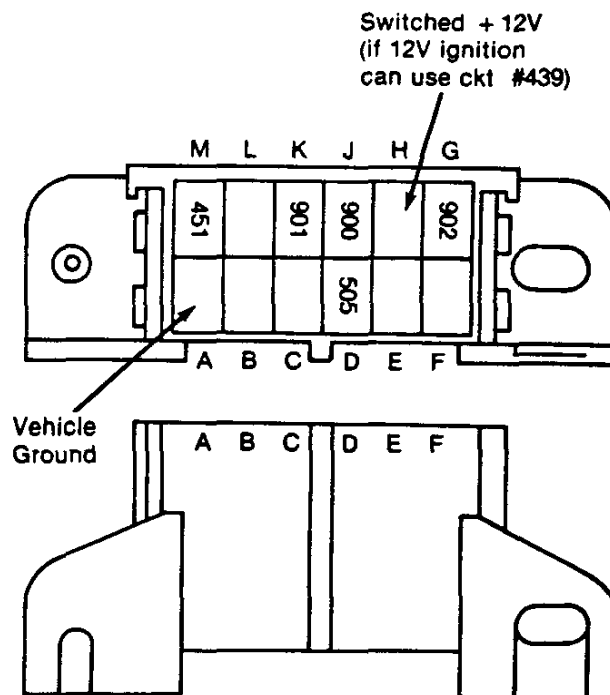
A good check list to run through includes the following:

1. Check for poor mating of the connector halves or terminals not fully seated in the connector body ("backed-out" terminals).
2. Look for improperly formed or damaged terminals. All connector terminals in the problem circuit should be carefully reformed to contact tension.
3. Electrical system interference caused by a defective relay, ECM driven solenoid, or a switch causing an electrical surge. Look for problems with the charging system (alternator, etc.). In certain cases, the problem can be made to occur when the faulty component is operated (as in the case of a relay).

After repairs or adjustments have been made, clear the codes and confirm that the "Check Engine" Light *does not come on* (except for the 5 second bulb check when the ignition is first turned on). Also run the engine to see if that problem is cured. If the "Check Engine" Light stays on, refer to the START Chart on page 17.



Dash Lights



12 Pin DDL Connector P/N 12020043

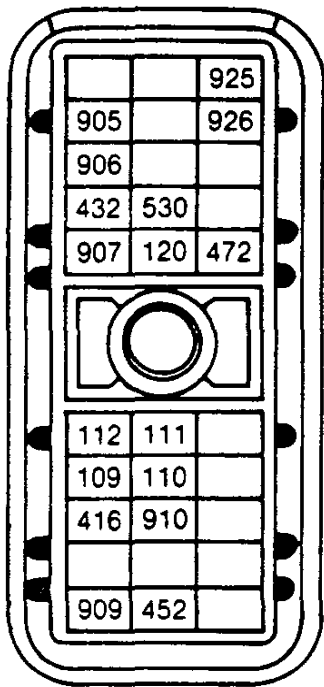
Section 4 TROUBLESHOOTING CHARTS

D. CHART 2 - ENGINE CRANKS BUT WILL NOT START

NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

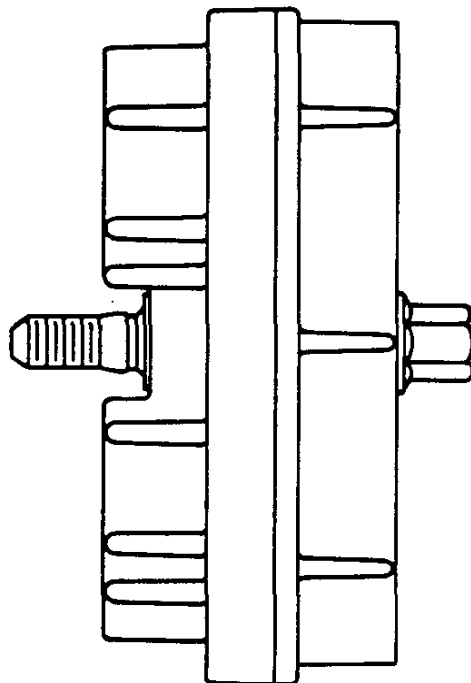
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C2-1 Observe "Check Engine" Light Status <ul style="list-style-type: none"> • Turn ignition on while observing the "Check Engine" Light. 	<p>"Check Engine" —————→ Light comes on for up to 5 seconds, then goes out.</p> <p>"Check Engine" —————→ Light does not come on at all.</p> <p>"Check Engine" —————→ Light comes on and stays on.</p>	<p>Go to C2-3.</p> <p>Go to C2-17.</p> <p>Go to C2-2.</p>
C2-2 Read Active Codes Using DDR <ul style="list-style-type: none"> • Plug DDR into the 12 pin DDL connector. • Read active codes by selecting MODE 01 on the DDR. 	<p>Active codes (other than Code 25) on DDR. —————→</p> <p>Active Code 25. —————→</p> <p>Display reads "NO DATA BEING RECEIVED FROM DATA LINK" or "DDEC SYSTEM NOT RESPONDING" or a blank or random display. —————→</p>	<p>Follow appropriate diagnostic charts for code(s) received. (See Index on page i.)</p> <p>Go to C5-1 (page 65).</p> <p>Go to START-6 (page 21).</p>
C2-3 Check If Out of Fuel <ul style="list-style-type: none"> • Check fuel supply. 	<p>Fuel supply okay. —————→</p> <p>No fuel. —————→</p>	<p>Go to C2-4.</p> <p>Refuel vehicle. May have to prime system. Then go to C2-30.</p>



1 2 3

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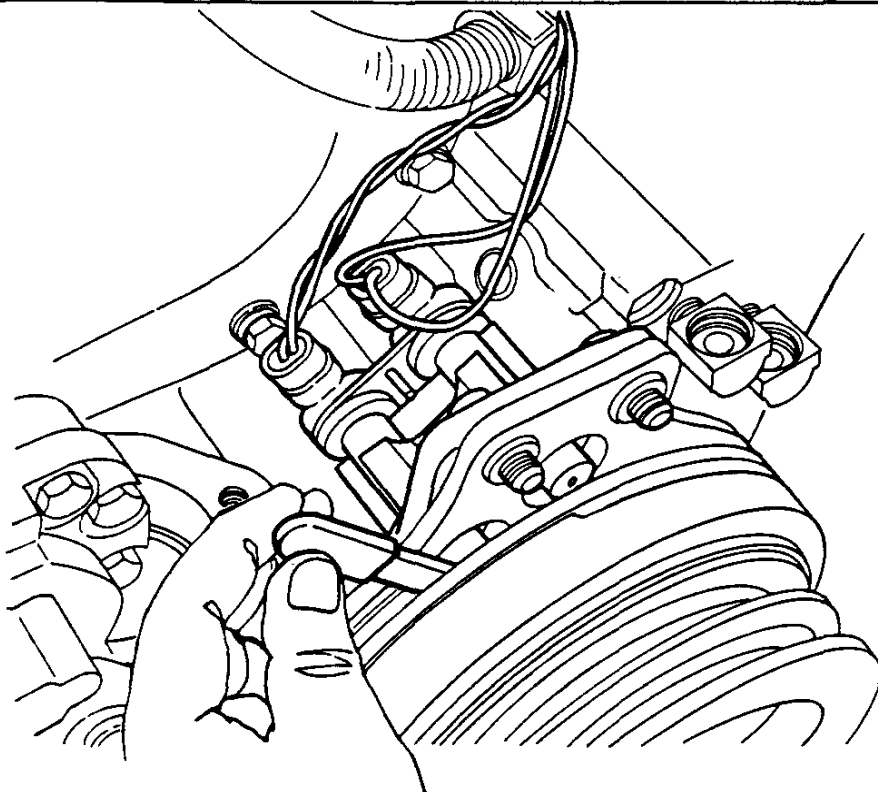
ECM Engine Harness Connector
P/N 12034400

Section 4

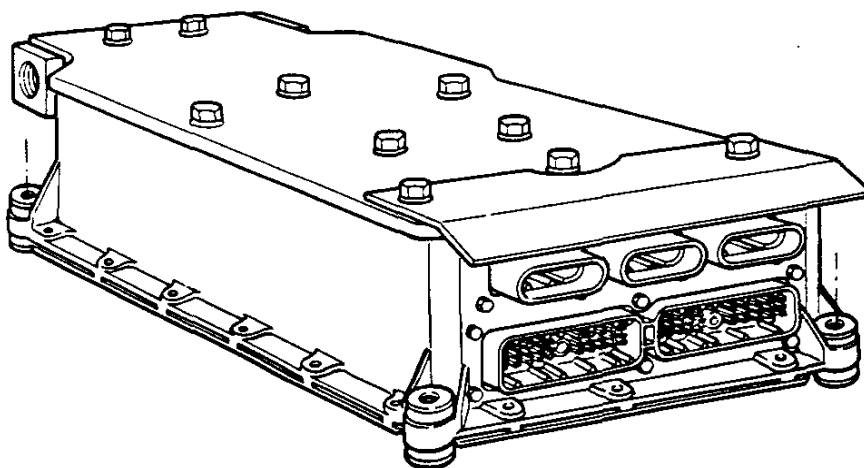
TROUBLESHOOTING CHARTS

D. CHART 2 - ENGINE CRANKS BUT WILL NOT START (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C2-4 Check for Aerated Fuel <ul style="list-style-type: none"> Loosen fuel return line. Observe fuel flow out of line while cranking. (You can direct the fuel into a bucket.) 	Flow is steady. → No flow or intermittent flow. →	Go to C2-5. Check fuel filter(s) and supply lines to determine cause of problem (refer to engine Service Manual for details).
C2-5 Check for White Smoke <ul style="list-style-type: none"> Reconnect fuel return line. Look for white smoke coming out of the exhaust stack while cranking the engine. 	White smoke. → No white smoke. →	Your problem appears to be with cylinder compression or restricted air intake. Refer to the engine Service Manual for details. Go to C2-31.
C2-6 Check TRS Status via RPM Read-out <ul style="list-style-type: none"> Select Engine RPM on DDR (Mode 04). Crank engine while observing DDR display. 	Display always reads greater than or equal to 60 RPM while cranking. → Display sometimes or always reads less than 60 RPM while cranking. →	Go to C2-12. Go to C2-7.
C2-7 Check TRS <ul style="list-style-type: none"> Turn Ignition off. Disconnect engine harness connector at the ECM. Read resistance between sockets T1 and T2 at the engine harness connector. 	Between 100 and 200 ohms, on a non Series 60 engine. → Between 100 and 200 ohms, on a Series 60 engine. → Less than 100 ohms. → Greater than 200 ohms. →	Go to C2-8. Go to C2-9. Go to 41-2, page 245. Go to 41-3, page 245.



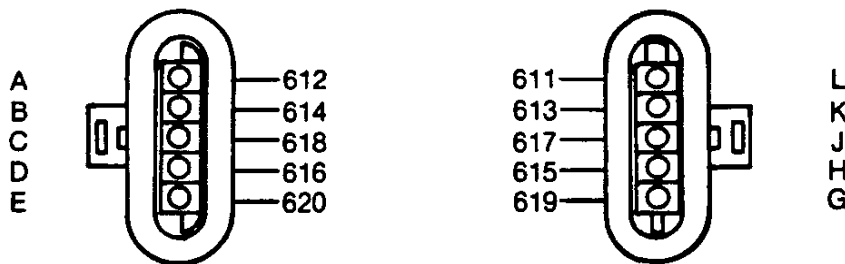
Timing Sensor with Tool
Series 92



Electronic Control Module (ECM)

D. CHART 2- ENGINE CRANKS BUT WILL NOT START (Cont'd.)

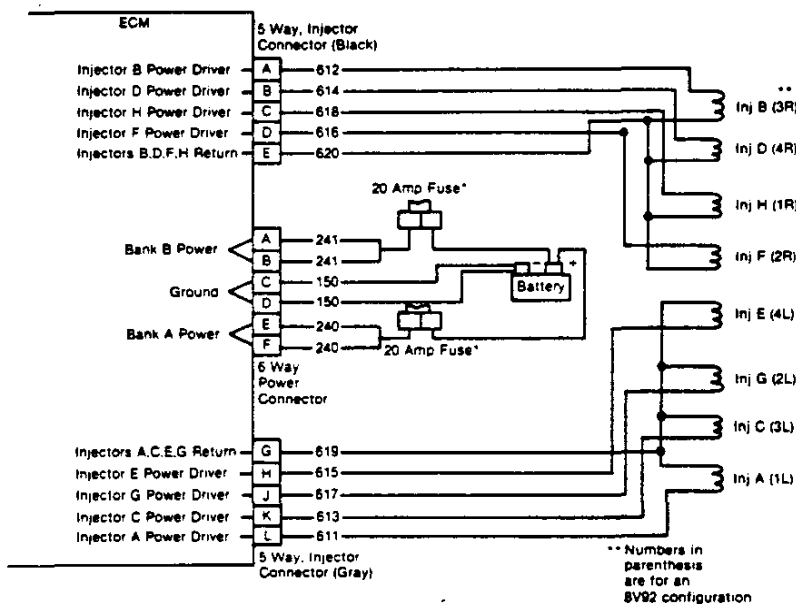
Page 41



P/N 12040947
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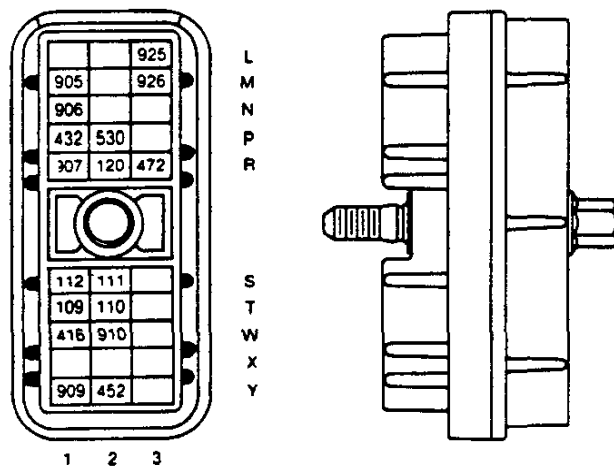
P/N 12065143
COLOR GRAY

5-Way, Injector Harness Connectors



(*Note: Some applications may have circuit breakers instead of fuses.)

ECM Power and Injector Circuits—8V92



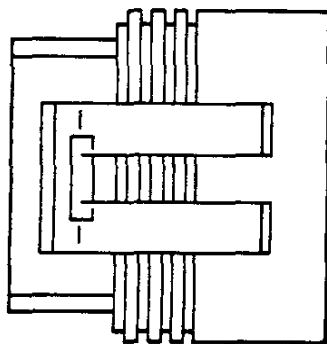
ECM Engine Harness Connector
P/N 12034400

Section 4

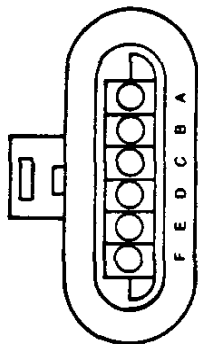
TROUBLESHOOTING CHARTS

D. CHART 2 - ENGINE CRANKS BUT WILL NOT START (Cont'd.)

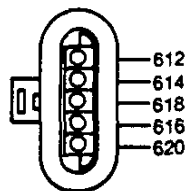
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C2-12 Check for Good SRS Signal <ul style="list-style-type: none"> • Select Misc Status on DDR (Mode 31). • Crank engine while observing DDR display of "SRS RECEIVED". 	Display reads "YES SRS RECEIVED" while cranking. → Go to C2-14. Display reads "NO SRS RECEIVED" while cranking. → Go to C2-13.	
C2-13 Check SRS <ul style="list-style-type: none"> • Turn ignition off. • Disconnect engine harness connector at the ECM. • Read resistance between sockets S1 and S2 at the engine harness connector. 	Between 100 and 200 ohms, on a non Series 60 engine. → Go to C2-8. Between 100 and 200 ohms, on a Series 60 engine. → Go to C2-9. Less than 100 ohms. → Go to 42-2, page 255. Greater than 200 ohms. → Go to 42-3, page 255.	
C2-14 Check if Injector Return Wires are Open <ul style="list-style-type: none"> • Turn ignition off. • Disconnect both 5-way injector harness connectors at the ECM. • Read resistance between the injector return pin and all the power driver pins on both harness connectors (example: G to L, and E to A). 	Less than or equal to 5 ohms for any reading. → Go to C2-15. Greater than 5 ohms on any reading. → An open exists in one of the injector power driver or return wires. Repair open. Then go to C2-30.	



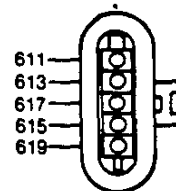
6-Way Power Harness Connector
P/N 12066317



A
B
C
D
E



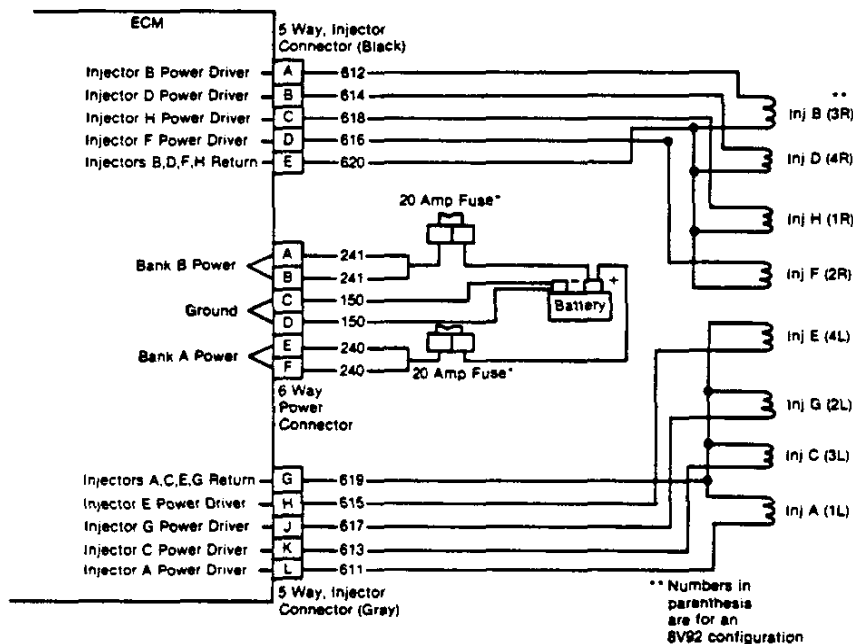
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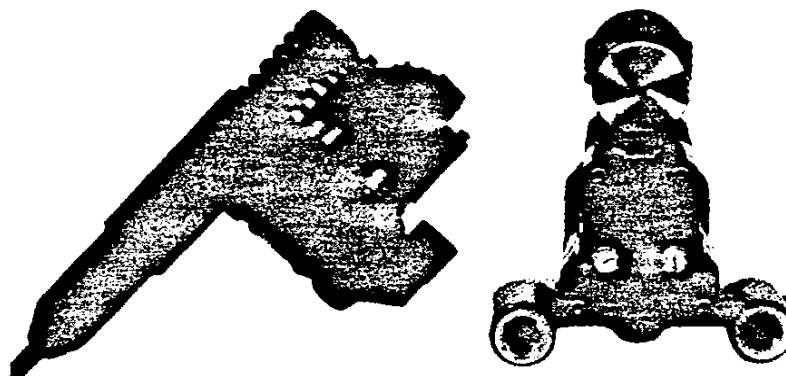
G
H
I
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K
L

5-Way, Injector Harness Connectors



(*Note: Some applications may have circuit breakers instead of fuses.)

ECM Power and Injector Circuits—8V92



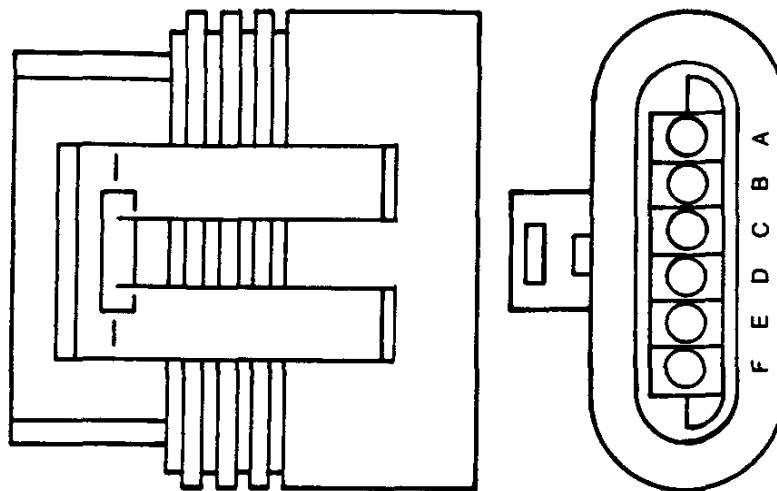
Electronic Unit Injector (EUI)

Section 4

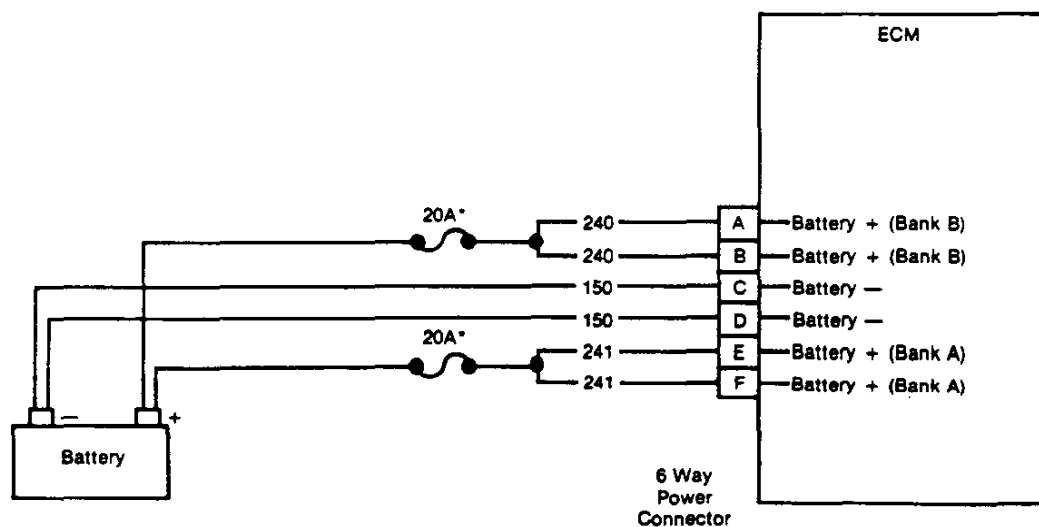
TROUBLESHOOTING CHARTS

D. CHART 2 - ENGINE CRANKS BUT WILL NOT START (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C2-15 Check If Injector Drive or Return Lines are Shorted to Ground <ul style="list-style-type: none"> ● Disconnect the 6-way power harness connector at the ECM. ● Read resistance between socket C of the 6-way, power harness connector to the following sockets on the injector harness connectors: A, B, C, D, E, G, H, J, K, and L. 	<p>Greater than _____ or equal to 10,000 ohms or open on all readings.</p> <p>Less than 10,000 ohms on any reading.</p>	<p>Go to C2-16.</p> <p>A short to ground on wire where resistance was less than 10,000 ohms. Repair short. Then go to C2-30.</p>
C2-16 Check Injector Drive Pulses <ul style="list-style-type: none"> ● Turn ignition off. ● Reconnect all ECM connectors. ● Remove rocket arm cover(s). ● Disconnect return wire from one injector (return wire #619 or #620). ● Place a 6 Volt test light across the injector return side (where wire was just removed) and a good ground. ● Crank engine and note both the test light and whether start of plunger motion coincides with light. ● Reconnect the return wire. ● Repeat the above procedure with all other injectors until all have been tested or until one test fails (no light or light and start of plunger motion don't coincide). 	<p>All tests pass.</p> <p>Light not flashing for one or more tests.</p> <p>Light and start of plunger motion don't coincide.</p>	<p>The problem does not appear to be in the DDEC system. Refer to the engine Service Manual for other possible causes of a no-start condition.</p> <p>Go to C2-11.</p> <p>Mechanical timing problem exists (may be a TRS/SRS timing adjustment). Refer to the engine Service Manual for details.</p>
C2-17 Check DDEC Fuses <ul style="list-style-type: none"> ● Check both ECM power fuses (20 Amp) or circuit breakers. 	<p>Blown fuse(s) or open circuit breaker(s).</p> <p>Both fuses or circuit breakers are okay.</p>	<p>Go to C2-28.</p> <p>Go to C2-18.</p>



6-Way Power Harness Connector
P/N 12066317



(*Some applications may have circuit breakers instead of fuses.)

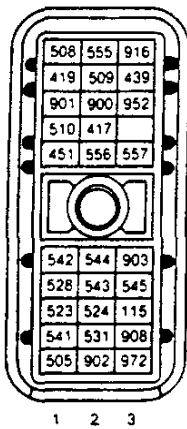
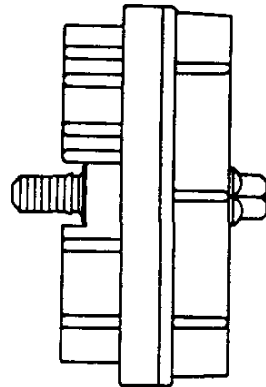
Battery Power and Ground Circuits

Section 4

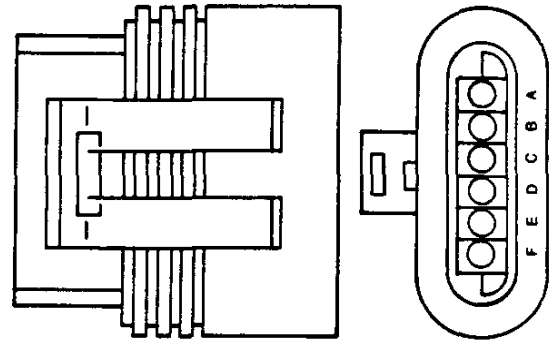
TROUBLESHOOTING CHARTS

D. CHART 2 - ENGINE CRANKS BUT WILL NOT START (Cont'd.)

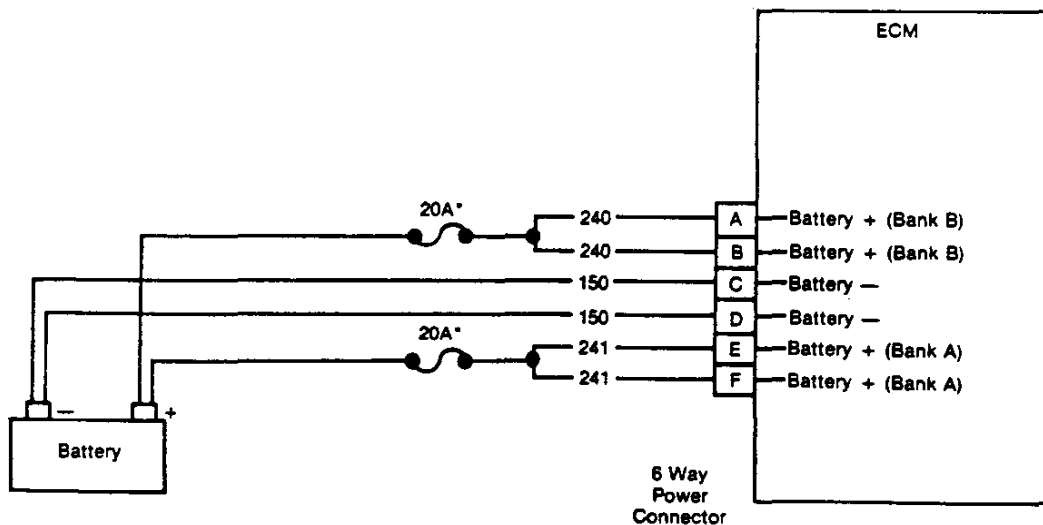
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C2-18 Check for 12 Volts at the 6-Way, Power Harness Connector <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the 6-way power harness connector. • Read voltage from socket A and B (red lead) of the 6-way power harness connector to a good ground (black lead). • Also read voltage from socket E and F (red lead) to a good ground (black lead). 	<p>Less than 11.5 volts on any reading. →</p> <p>Greater than 11.5 volts on all readings. →</p>	<p>Go to C2-19.</p> <p>Go to C2-21.</p>
C2-19 Check if ECM Power Line(s) are Open <ul style="list-style-type: none"> • Read voltage between battery side of one 20 Amp, ECM fuse or circuit breaker (red lead) and a good ground (black lead). • Read voltage reading at the other 20 Amp, ECM fuse or circuit breaker. (Note: the battery side does not contain the #240 or #241 wires.) 	<p>Less than 11.5 volts on either reading. →</p> <p>Greater than 11.5 volts on both readings. →</p>	<p>Go to C2-20.</p> <p>An open exists in either Bank A Power (ckt #240) or Bank B Power (ckt #241). Repair open. Then go to C2-30.</p>
C2-20 Check Battery <ul style="list-style-type: none"> • Connect all connectors. • Turn ignition on. • Try to start engine. • Read voltage at the battery + terminal (red lead) to the battery - terminal (black lead). 	<p>Less than 10.0 volts. →</p> <p>Greater than or equal to 10.0 volts. →</p>	<p>Service discharged battery. (Note: if a short to ground exists anywhere in a battery + circuit, the engine will shut down again if not repaired). Voltage equalizer may be bad. Then go to C2-30.</p> <p>An open or short to ground exists in the Batt + line. Repair open or short to ground. Then go to C2-30.</p>



ECM Vehicle Harness Connector
P/N 12034398



6-Way Power Harness Connector
P/N 12066317



(*Some applications may have circuit breakers instead of fuses.)

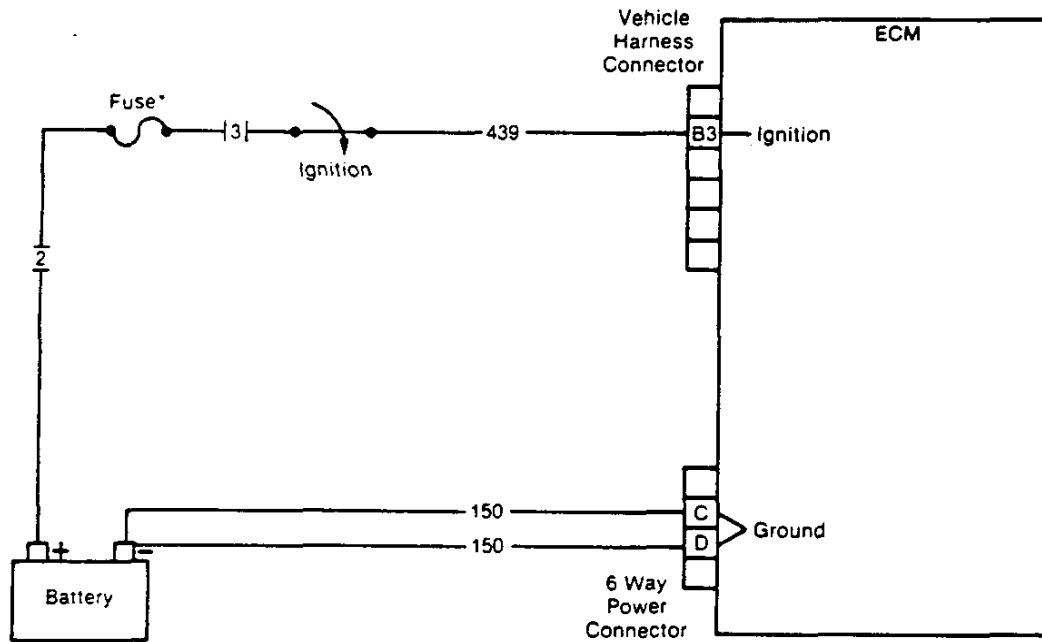
Battery Power and Ground Circuits

Section 4

TROUBLESHOOTING CHARTS

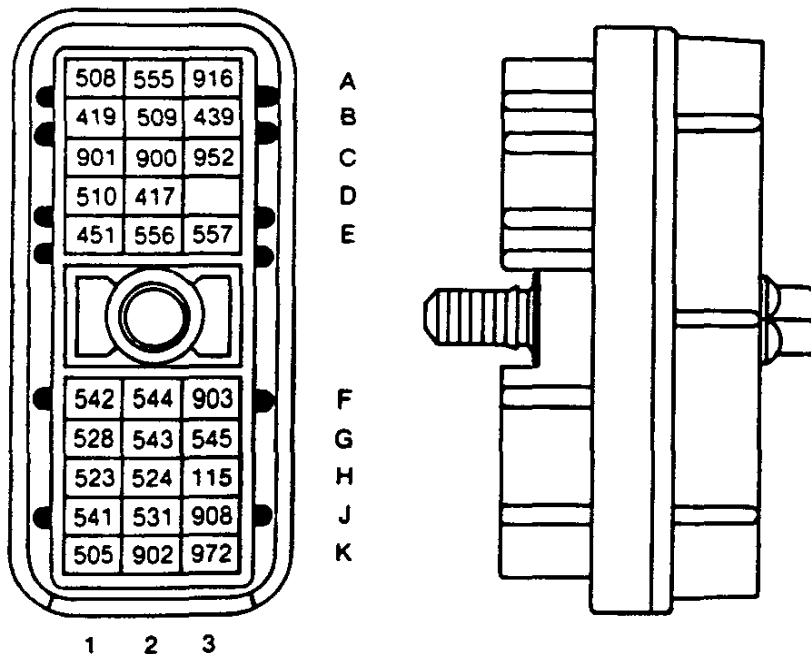
D. CHART 2 - ENGINE CRANKS BUT WILL NOT START (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C2-21 Check for + 12 or + 24 Volts at Ignition Wire <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn ignition on. • Read voltage between socket B3 on the vehicle harness connector (red lead) and a good ground (black lead). 	<p>Less than  11.5 volts (or 23 volts if using a 24 volt ignition).</p> <p>Greater than  or equal to 11.5 volts (or 23 volts if using a 24 volt ignition).</p>	<p>Go to C2-23.</p> <p>Go to C2-22.</p>
C2-22 Check for Good Ground Wire <ul style="list-style-type: none"> • Read voltage between socket B3 on the vehicle harness connector (red lead) and socket C and D on the 6-way, power harness connector (black lead). 	<p>Less than  11.5 volts (or 23 volts if using a 24 volt ignition).</p> <p>Greater than  or equal to 11.5 volts, (or 23 volts if using a 24 volt ignition).</p>	<p>The ECM ground wire (ckt #150) is open or has a poor connection. Repair open or poor connection. Then go to C2-30.</p> <p>Go to C2-11.</p>
C2-23 Check if Ignition Fuse or Circuit Breaker is Okay <ul style="list-style-type: none"> • Turn ignition off. • Check 5 Amp ignition fuse or circuit breaker. 	<p>Fuse or circuit  breaker is okay.</p> <p>Fuse blown or  circuit breaker open.</p>	<p>Go to C2-24.</p> <p>Go to C2-25.</p>



(*Note: Some applications may have circuit breakers instead of fuses)

Ignition and Ground Circuits Sketch

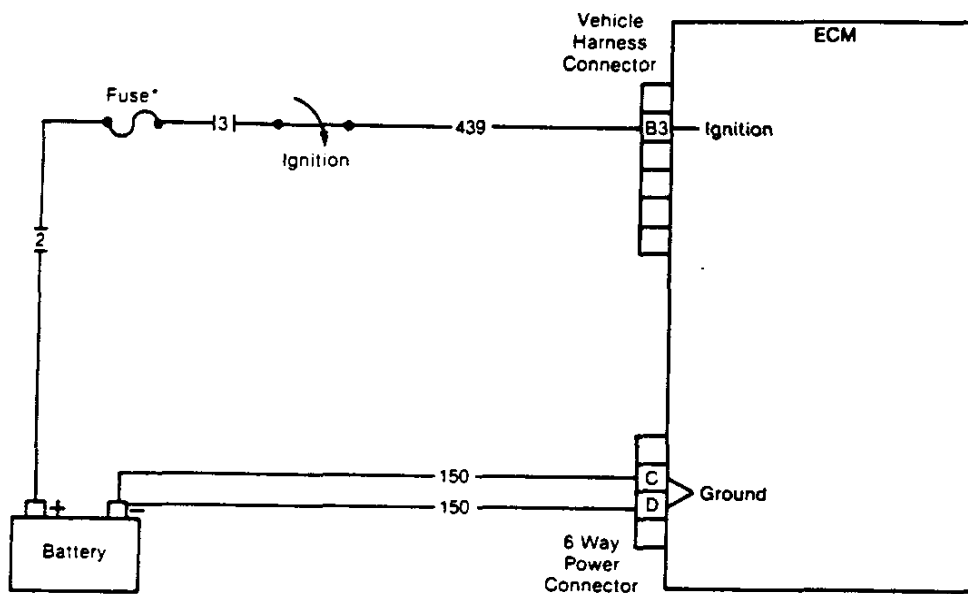


ECM Vehicle Harness Connector
P/N 12034398

Section 4 TROUBLESHOOTING CHARTS

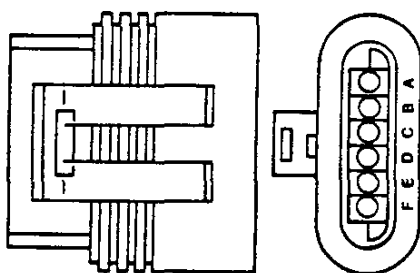
D. CHART 2 - ENGINE CRANKS BUT WILL NOT START (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C2-24 Check If Ignition Wire (Circuit #2) Is Open <ul style="list-style-type: none"> Read voltage between battery side (hot side) of the 5 Amp ignition fuse or circuit breaker (red lead) and a good ground (black lead). 	<p>Less than 11.5 volts (or 23 volts if using a 24 volt ignition) →</p> <p>Greater than or equal to 11.5 volts (or 23 volts if using a 24 volt ignition). →</p>	<p>Go to C2-27.</p> <p>The ignition line (ckt #3 or #439) is open. Repair open. Then go to C2-30.</p>
C2-25 Check If Ignition Wire Is Shorted to Ground <ul style="list-style-type: none"> Replace blown fuse or reset open circuit breaker. Turn ignition on for at least 10 seconds. Turn ignition off. Check 5 Amp ignition fuse or circuit breaker again. 	<p>Fuse or circuit breaker is still okay. →</p> <p>Fuse blown or circuit breaker open. →</p>	<p>Go to C2-26.</p> <p>The ignition line (ckt #439) is shorted to ground. Repair short. Then go to C2-30.</p>
C2-26 Check If ECM is Blowing Fuses <ul style="list-style-type: none"> Reconnect all harness connectors at the ECM. Attempt to start engine. If engine starts, run engine for at least one minute. Turn ignition off. Check 5 Amp ignition fuse or circuit breaker. 	<p>Fuse or circuit breaker is still okay. →</p> <p>Fuse blown or circuit breaker open. →</p>	<p>No short is currently present. (Warning: if there is an intermittent short, the engine will shut down again if not repaired. Also note: fuse/circuit breaker may have blown due to temporary reverse voltage at the battery). Go to C2-30.</p> <p>Go to C2-11.</p>

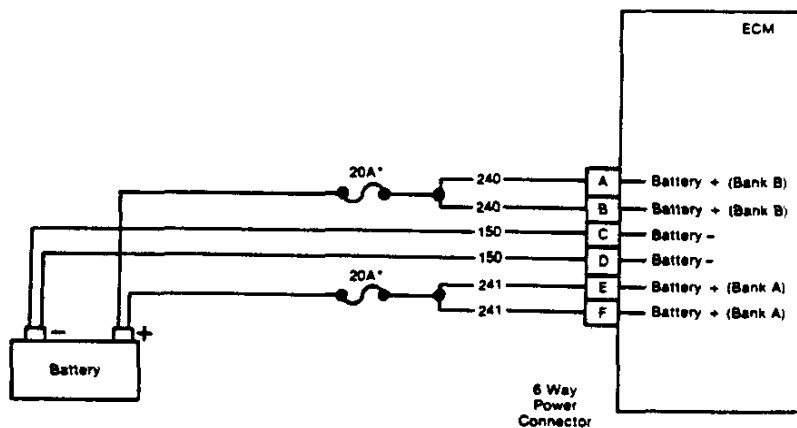


(*Note: Some applications may have circuit breakers instead of fuses)

Ignition and Ground Circuits Sketch



6-Way Power Harness Connector
P/N 12066317



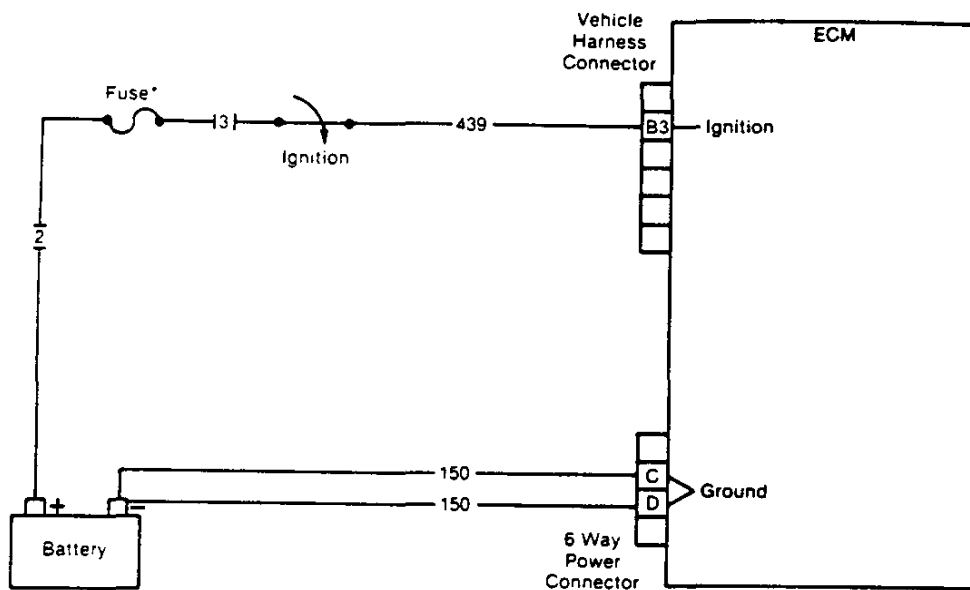
(*Some applications may have circuit breakers instead of fuses.)

Battery Power and Ground Circuits

Section 4 TROUBLESHOOTING CHARTS

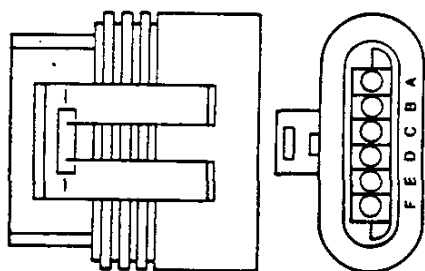
D. CHART 2 - ENGINE CRANKS BUT WILL NOT START (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C2-27 Check Battery <ul style="list-style-type: none"> • Disconnect battery cables at the 12 volt battery. • Read voltage at the battery + terminal (red lead) to the battery - terminal (black lead). 	<p>Less than 11.5 volts. →</p> <p>Greater than or equal to 11.5 volts. →</p>	<p>Service discharged battery. (Note: if a short to ground exists anywhere in a battery + circuit, this truck will shut down again if not repaired). Then go to C2-30.</p> <p>An open or short to ground exists in the unfused ignition line (ckt #2). Repair open or short to ground. Then go to C2-30.</p>
C2-28 Check If Fuses Blow Again <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the 6-way power harness connector at the ECM. • Replace blown fuse(s) or reset circuit breaker(s). • Wait 10 seconds. • Check if fuse(s) or circuit breaker(s) has blown or opened up again. 	<p>Fuse(s) or circuit breaker(s) are still okay. →</p> <p>Fuse(s) or circuit breaker(s) are blown or open again. →</p>	<p>Go to C2-26.</p> <p>Go to C2-29.</p>
C2-29 Check for Short to Ground in Wiring <ul style="list-style-type: none"> • Read resistance between Bank B power (circuit #240) and a good ground. • Read resistance between Bank A power (circuit #241) and a good ground. 	<p>Greater than or equal to 10,000 ohms or open on all readings. →</p> <p>Less than 10,000 ohms on any reading →</p>	<p>Go to C2-11.</p> <p>Short to ground exists. Repair short(s). Then go to C2-30.</p>

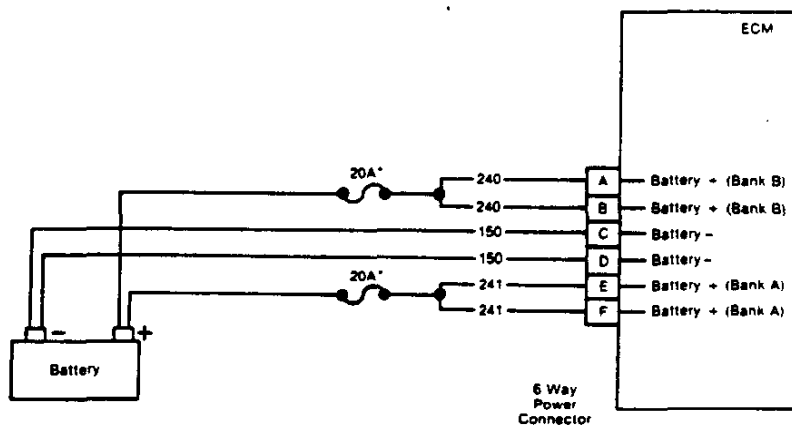


(*Note: Some applications may have circuit breakers instead of fuses)

Ignition and Ground Circuits Sketch



6-Way Power Harness Connector
P/N 12066317



(*Some applications may have circuit breakers instead of fuses.)

Battery Power and Ground Circuits

Section 4

TROUBLESHOOTING CHARTS

D. CHART 2 - ENGINE CRANKS BUT WILL NOT START (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C2-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" Light. • If "Check Engine" Light does not stay on, start engine and run for 1 minute or until "Check Engine" Light comes on. Stop engine. • Read historical codes. 	<p>Engine will not start. → All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>Engine starts and DDR reads Code 25 (no codes). → Repairs are complete.</p> <p>Engine starts and codes other than Code 25 appear. → Go to START-1, page 17, to service codes.</p>	
C2-31 Check Fuel Filters <ul style="list-style-type: none"> • Turn ignition off. • Check primary and secondary fuel filters to be sure they are not clogged and that they are full of clean fuel. 	<p>Clogged filter(s). → Replace filter(s). Prime system, if required. Then go to C2-30.</p> <p>Clean filters and no air in filters. → Go to C2-6.</p>	

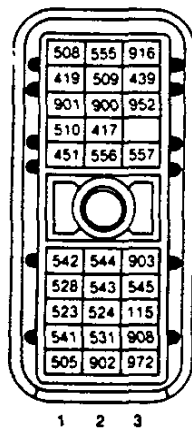
Section 4

TROUBLESHOOTING CHARTS

D. CHART 3 - POOR PERFORMANCE AND NO CODES

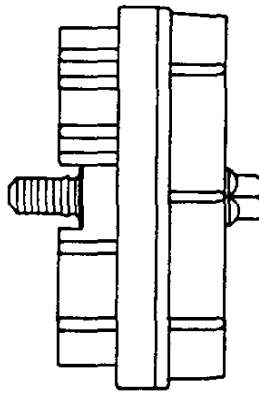
This is a helpful hints chart. It assumes that you have received no codes, made all the basic mechanical checks first, could not find the problem, and suspect the DDEC II system to be at fault. Based on the particular symptom here's what to look for:

SYMPTOM	WHAT TO LOOK FOR
1. Can't get full throttle/power.	<p>Miscalibrated Throttle Position Sensor (TPS). See Step 21-4 for TPS adjustment (page 179).</p> <p>Plugged fuel filters.</p> <p>Hose not connected to Turbo Boost Sensor (TBS).</p>
2. Runs rough, misses and/or occasionally stalls.	<p>Proper gapping of Timing Reference & Synchronous Reference Sensors (SRS and TRS). See Step C2-8 or C2-9 (page 41) on how to check this.</p> <p>Loose battery power (ckt #240 or #241) ignition (ckt #439) or ground (ckt #150) wires.</p> <p>Check pulley pulse wheel: missing teeth, dented, or loose.</p> <p>Check power contribution from each cylinder using the cylinder cut-out feature described in Diagnostic Data Reader (DDR) instruction manual.</p>
3. Engine idles high (after warm-up) or hangs during shift.	<p>Check calibration of the Throttle Position Sensor (TPS) using procedure in Step 21-4 (page 179). You may have a TPS, linkage or pedal problem</p>
4. Low road speed.	<p>Determine road speed specifications from vehicle manufacturer data. If road speed is less than specified and all mechanical (driveline, speedometer) checks are correct, then the EEPROM calibration is suspect. This portion of the calibration can be reprogrammed using Mode 37 on the Diagnostic Data Reader (DDR). Refer to DDR Instruction Manual for details.</p>

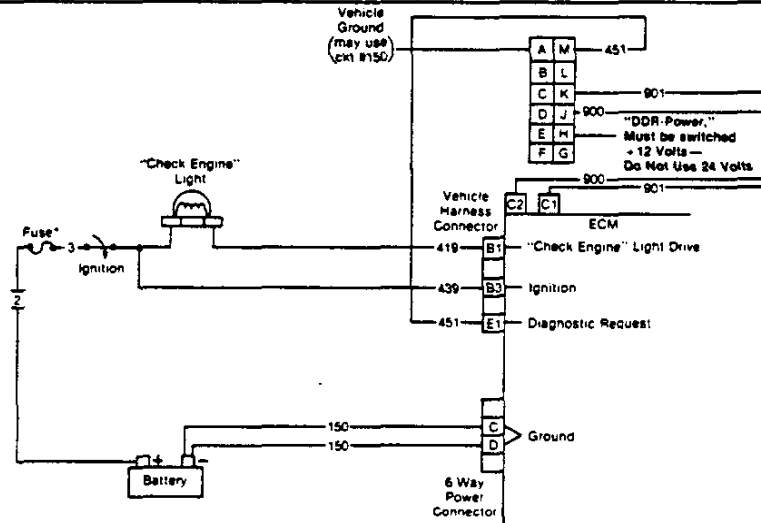


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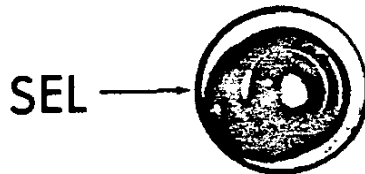
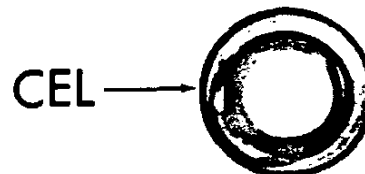
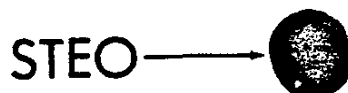


ECM Vehicle Harness Connector
P/N 12034398



(*Note: Some applications may have circuit breakers instead of fuses.)

Check Engine, Diagnostic Request, and Ignition Circuits



Dash Lights

Section 4

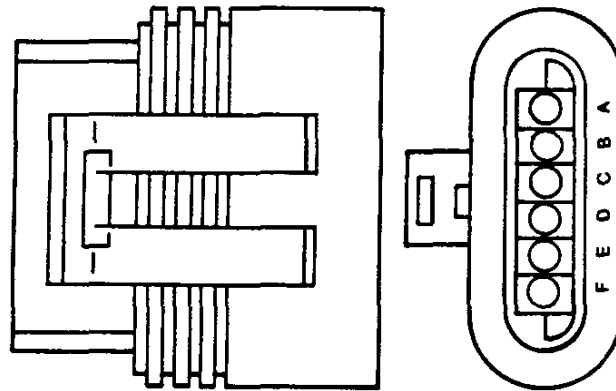
TROUBLESHOOTING CHARTS

D. CHART 4 - NO "CHECK ENGINE" LIGHT DURING BULB CHECK

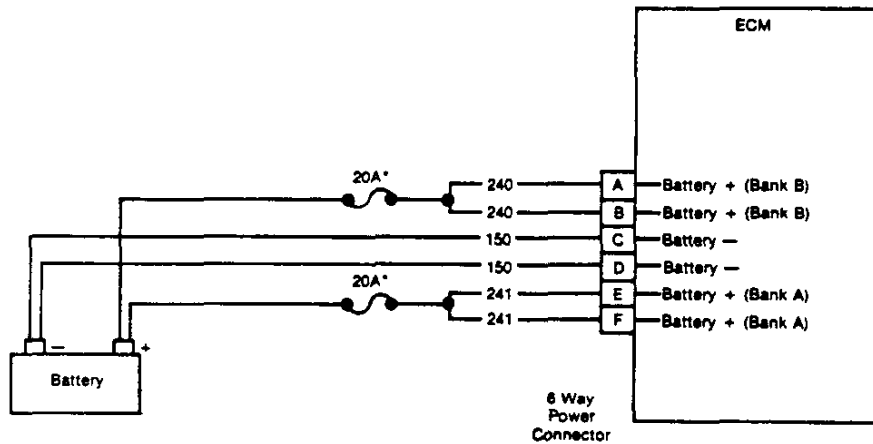
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C4-1 Try to Force CEL On <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Install a jumper wire between socket B1 on the vehicle harness connector and a good ground. • Turn the ignition on (engine not running). • Note the CEL status. 	<p>"Check Engine" light is still off. →</p> <p>"Check Engine" light is on. →</p>	<p>Go to C4-2.</p> <p>Go to C4-4.</p>
C4-2 Check for Ignition <ul style="list-style-type: none"> • Remove jumper wire. • Read voltage on vehicle harness connector, socket B3 (red lead) to a good ground (black lead) with the ignition on and engine off. 	<p>Less than 10.0 volts →</p> <p>Greater than or equal to 10.0 volts →</p>	<p>The 5 Amp, ignition fuse (or circuit breaker) is blown and/or wires #2 or #3 are open or shorted to ground, and/or the ignition line (ckt #439) is shorted to ground. Repair problem. Then go to C4-30.</p> <p>Go to C4-3.</p>
C4-3 CEL Driver Line and Bulb Check <ul style="list-style-type: none"> • Turn ignition off. • Remove CEL bulb and check whether it's burned out or otherwise damaged. 	<p>Bulb is okay. →</p> <p>Bulb is not okay. →</p>	<p>CEL Driver line (ckt #419) or ground line (ckt #150) is open. Repair open. Then go to C4-30.</p> <p>Replace bulb. Then go to C4-30.</p>

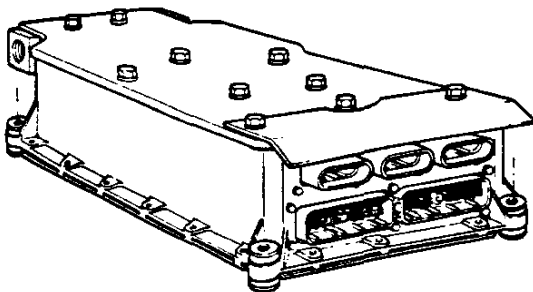


6-Way Power Harness Connector
P/N 12066317

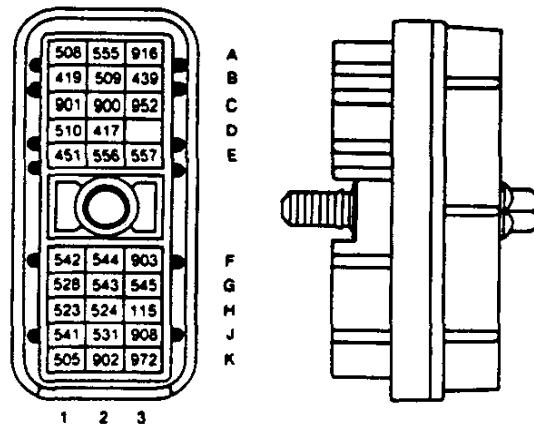


(*Some applications may have circuit breakers instead of fuses.)

Battery Power and Ground Circuits



Electronic Control Module (ECM)



ECM Vehicle Harness Connector
P/N 12034398

Section 4

TROUBLESHOOTING CHARTS

D. CHART 4 • NO "CHECK ENGINE" LIGHT DURING BULB CHECK (Cont'd.)

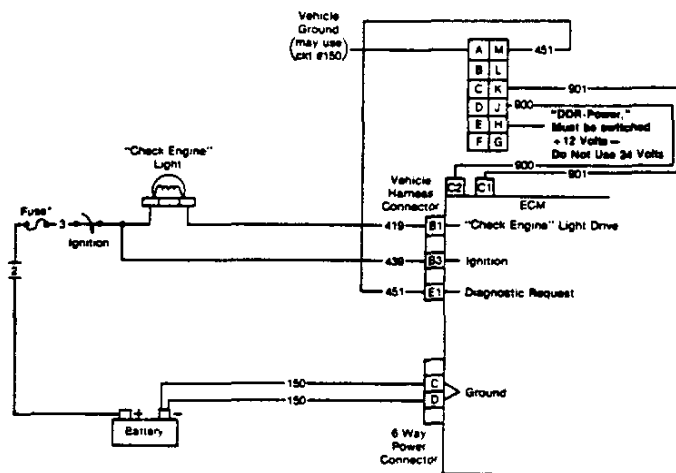
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C4-4 Check for Open <ul style="list-style-type: none"> Remove jumper wire. With ignition on, read voltage on vehicle harness connector, socket B3 (red lead) to a good ground (black lead). 	<p>Less than _____ 10.0 volts.</p> <p>Greater than _____ or equal to 10.0 volts.</p>	<p>The ignition line (ckt #439) is open. Repair open. Then go to C4-30.</p> <p>Go to C4-5.</p>
C4-5 Check for Bat + <ul style="list-style-type: none"> Turn ignition off. Disconnect the 6-way power harness connector. Read voltage at the 6-way power harness connector, Socket A (red lead) to a good ground (black lead.) Repeat voltage readings on 6-way power harness connector, keeping the black lead to a good ground and the red lead to: <ul style="list-style-type: none"> —socket B —socket E —socket F 	<p>Less than _____ 10.0 volts on any reading.</p> <p>Greater than _____ or equal to 10.0 volts on all readings.</p>	<p>Either one of the 20 Amp, ECM fuses (or circuit breakers) is blown and/or the Battery Power line (s) (ckt #240 or #241) has an open or short to ground. Repair problem. Then go to C4-30.</p> <p>Go to C4-6.</p>
C4-6 Check for Ground <ul style="list-style-type: none"> Move black lead of voltmeter to socket C (of the 6-way power connector). Read voltage using red lead at sockets A, B, E and F of the 6-way power harness connector. Move black lead of voltmeter to socket D of the 6-way power harness connector. Again read voltage at sockets A, B, E and F of the 6-way power harness connector. 	<p>Less than _____ 10.0 volts on any reading.</p> <p>Greater than _____ or equal to 10.0 volts on all readings.</p>	<p>Ground line(s) (ckt #150) has an open. Repair open. Then go to C4-30.</p> <p>Go to C4-7.</p>

Section 4

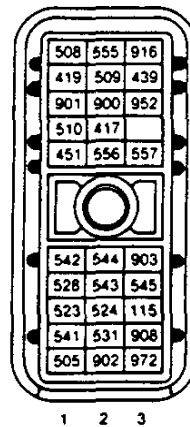
TROUBLESHOOTING CHARTS

D. CHART 4 • NO "CHECK ENGINE" LIGHT DURING BULB CHECK (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C4-7 Check ECM Connectors <ul style="list-style-type: none"> • Check terminals at the vehicle harness (especially B3 and B1) and all the terminals in the 6-way power harness connectors (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets. 	Terminals and connectors are okay.	Replace ECM. Then go to C4-30.
	Problem found.	Repair terminals/connectors. Then go to C4-30.
C4-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Turn ignition off. • Turn ignition on while at the same time observing the "Check Engine" light. 	"Check Engine" light comes on for up to 5 seconds, then goes out.	Repairs are complete.
	"Check Engine" light does not come on at all.	All system diagnostics are complete. Please review this section from the first step to find the error.
	"Check Engine" Light comes on and stays on.	Go to START-1, page 17.

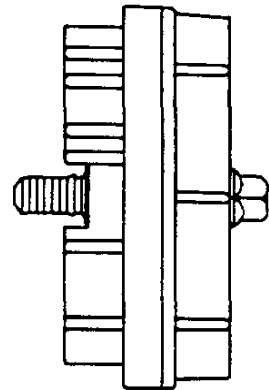


Check Engine, Diagnostic Request,
and Ignition Circuits

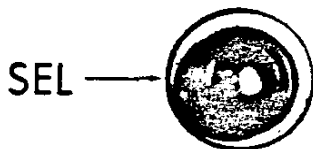
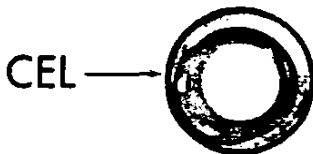
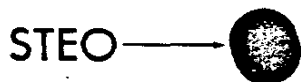


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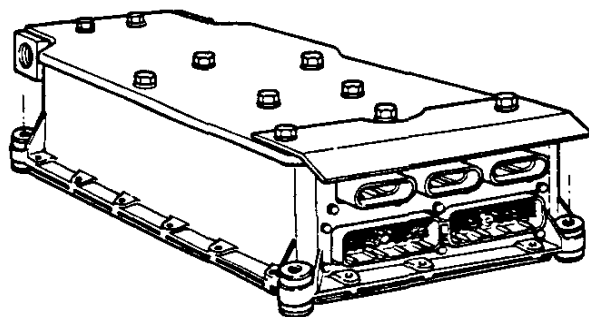
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ECM Vehicle Harness Connector
P/N 12034398



Dash Lights



Electronic Control Module (ECM)

Section 4

TROUBLESHOOTING CHARTS

D. CHART 5 - "CHECK ENGINE" LIGHT ALWAYS ON AND CODE 25 ON DDR

NOTE — This chart is only to be used if:

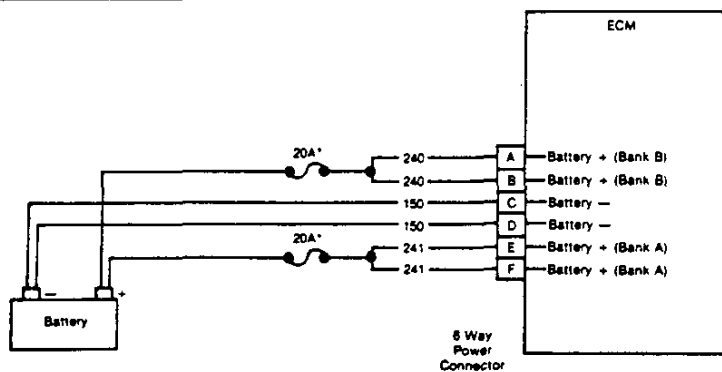
- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C5-1 Check for Short <ul style="list-style-type: none"> ● Turn ignition off. ● Disconnect the vehicle harness connector at the ECM. ● Turn ignition on (engine not running) while at the same time observing the "Check Engine" light. 	<p>"Check Engine" light comes on and stays on. →</p> <p>"Check Engine" light stays off. →</p>	<p>CEL Driver line (ckt #419) is shorted to ground. Repair short. Then go to C5-30.</p> <p>Go to C5-2.</p>
C5-2 Force CEL On <ul style="list-style-type: none"> ● Install a jumper wire between socket B1 of the vehicle harness connector and a good ground. ● Observe "Check Engine" light. 	<p>"Check Engine" light comes on and stays on. →</p> <p>"Check Engine" light stays off. →</p>	<p>Go to C5-3.</p> <p>The ignition line (ckt #439) is not correctly wired to the CEL bulb. See if the bulb has been wired into the ignition line (#439) instead of the proper #419 wire. Correct problem. Then go to C5-30.</p>
C5-3 Check ECM Connectors <ul style="list-style-type: none"> ● Turn ignition off. ● Check terminals at the vehicle harness connectors (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets. ● Check terminals in connector to be sure B1 is wire #419 and B3 is wire #439. 	<p>Terminals and connectors are okay. →</p> <p>Problem found. →</p>	<p>Replace ECM. Then go to C5-30.</p> <p>Repair terminals/connectors. Then go to C5-30.</p>

Section 4 TROUBLESHOOTING CHARTS

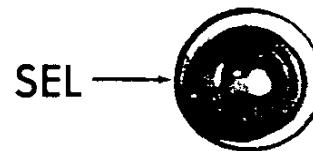
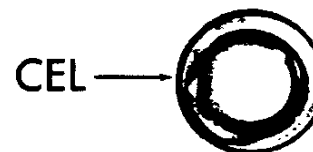
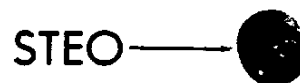
D. CHART 5 - "CHECK ENGINE" LIGHT ALWAYS ON AND CODE 25 ON DDR (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C5-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Turn ignition off. • Turn ignition on while at the same time observing the "Check Engine" light. • If "Check Engine" light stays on, read historical code. 	"Check Engine" light comes on for up to 5 seconds, then goes out.	Repairs are complete.
	"Check Engine" light does not come on at all.	Go to C4-1.
	Code 25 (no codes) and "Check Engine" light comes on and stays on.	All system diagnostics are complete. Please review this section from the first step to find the error.
	Codes other than Code 25	Go to START-1 to service other codes.

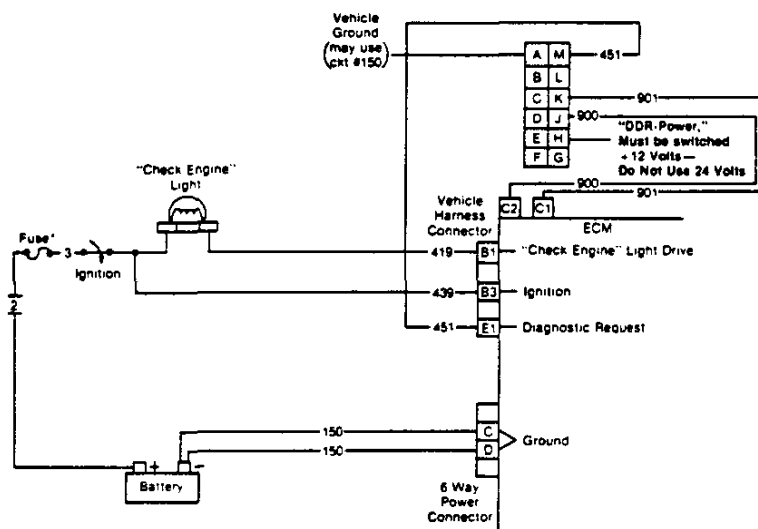


(*Some applications may have circuit breakers instead of fuses.)

Battery Power and Ground Circuits

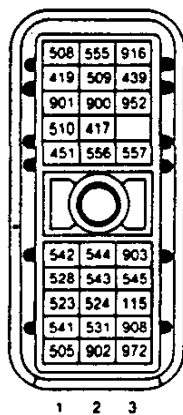


Dash Lights



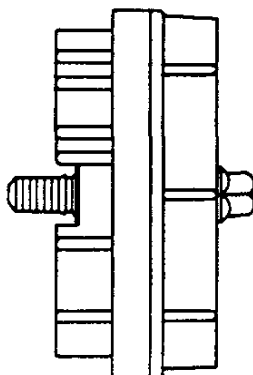
(*Note. Some applications may have circuit breakers instead of fuses.)

Check Engine, Diagnostic Request, and Ignition Circuits

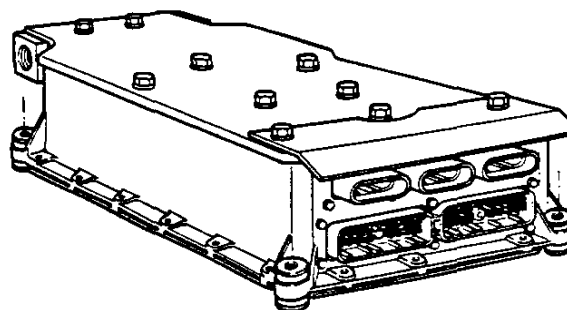


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**ECM Vehicle Harness Connector
P/N 12034398**



Electronic Control Module (ECM)

Section 4

TROUBLESHOOTING CHARTS

D. CHART 6 - "CHECK ENGINE" LIGHT ALWAYS ON, NO DATA LINK AND WON'T FLASH CODES

NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C6-1 Check ECM Fuses <ul style="list-style-type: none"> • Turn ignition off. • Check both 20 Amp fuses or circuit breakers to the ECM. 	<p>Fuses (or circuit breakers) are okay. →</p> <p>Fuse(s) (or circuit breaker(s)) is blown. →</p>	<p>Go to C6-2.</p> <p>Replace blown fuse or reset circuit breaker. Then go to C6-30 (note: the fuse may blow again if an intermittent short to ground exists in either ckt #240 or ckt #241).</p>
C6-2 Check for Short <ul style="list-style-type: none"> • Disconnect the vehicle harness connector at the ECM. • Turn ignition on (engine not running) while at the same time observing the "Check Engine" light. 	<p>"Check Engine" light comes on and stays on. →</p> <p>"Check Engine" light stays off. →</p>	<p>CEL Driver line (ckt #419) is shorted to ground. Repair short. Then go to C6-30. The DDR system also needs repair. Go to C7-4 (page 75).</p> <p>Go to C6-3.</p>
C6-3 Check ECM Connectors <ul style="list-style-type: none"> • Turn ignition off. • Check terminals at the vehicle harness connectors (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets. Pay special attention to the terminals and sockets in the 6-pin power connector and sockets B1 and B3 of the 30-pin vehicle harness. 	<p>Terminals and connectors are okay. →</p> <p>Problem found. →</p>	<p>Replace ECM. Then go to C6-30.</p> <p>Repair terminals/connectors. Then go to C6-30.</p>

Section 4

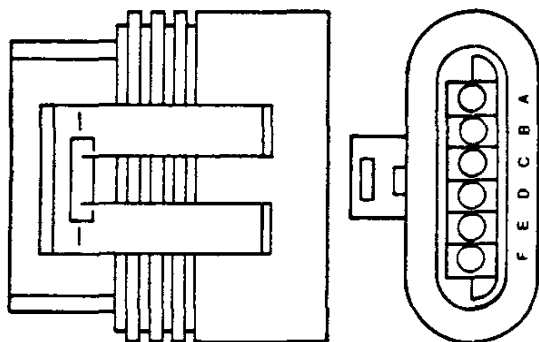
TROUBLESHOOTING CHARTS

D. CHART 6 - "CHECK ENGINE" LIGHT ALWAYS ON, NO DATA LINK AND WON'T FLASH CODES (Cont'd.)

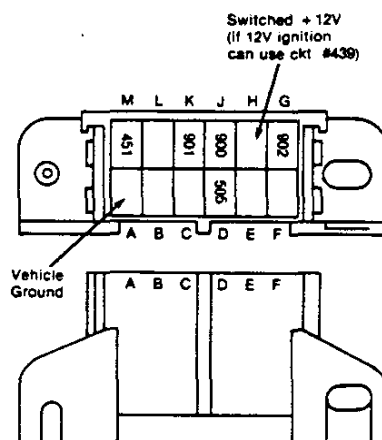
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C6-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Turn ignition off. • Turn ignition on while at the same time observing the "Check Engine" light. • If "Check Engine" light stays on, read historical codes. 	<p>"Check Engine" light comes on for up to 5 seconds, then goes out.</p> <p>"Check Engine" light does not come on at all.</p> <p>"Check Engine" light comes on and stays on, but codes don't flash out.</p> <p>Codes other than code 25.</p>	<p>Repairs are complete.</p> <p>Go to C4-1.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>Go to START-1, page 17, to service codes.</p>



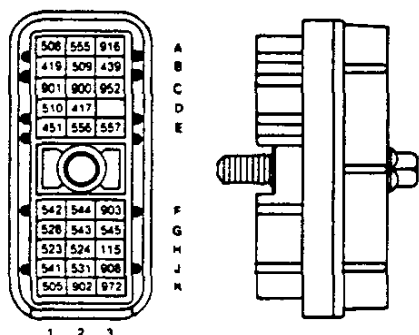
Check Engine, Diagnostic Request, and Ignition Circuits



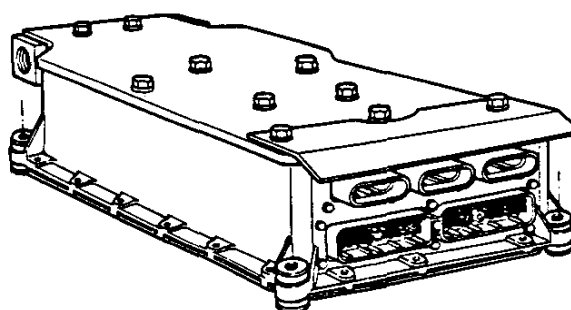
6-Way Power Harness Connector
P/N 12066317



12 Pin DDL Connector P/N 12020043



ECM Vehicle Harness Connector
P/N 12034398



Electronic Control Module (ECM)

Section 4

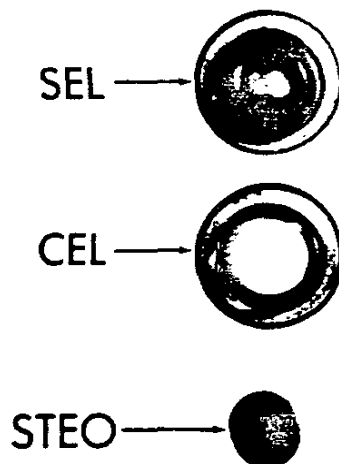
TROUBLESHOOTING CHARTS

D. CHART 7 - NO DATA LINK AND BULB CHECK OKAY

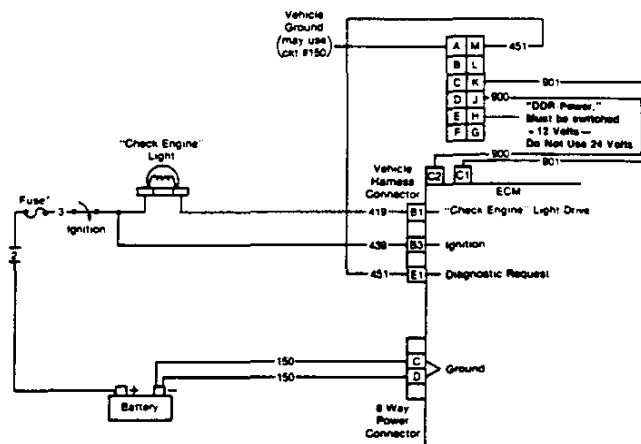
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

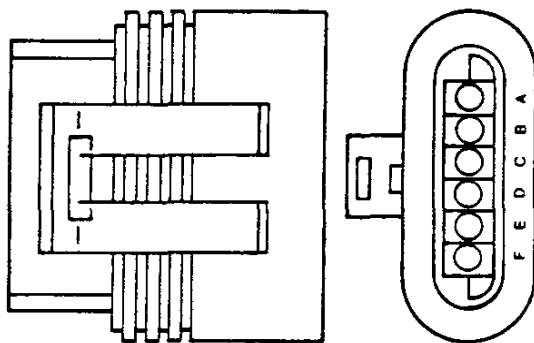
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C7-1 Read Codes on the "Check Engine" Light <ul style="list-style-type: none"> • Unplug the DDR. • Short pin A to pin M on the 12 pin DDL connector. • Read codes flashing out on the "Check Engine" light. 	<p>Flashes out codes. →</p> <p>Does not flash out codes. →</p>	<p>Go to C7-4 (note: if you wish to bypass diagnosis of a potential data link or DDR problem for now, go to CEL-3, page 27).</p> <p>Go to C7-2.</p>
C7-2 Check Diagnostic Request Line <ul style="list-style-type: none"> • Turn ignition off. • Disconnect both the vehicle harness and 6-way power harness connectors at the ECM. • Install a jumper wire between E1 of the vehicle harness connector and socket D of the 6-way power harness connector. • Read resistance between sockets A and M on the 12 pin, DDL connector. 	<p>Greater than 5 ohms or open. →</p> <p>Less than or equal to 5 ohms. →</p>	<p>The Diagnostic Request line (ckt #451) is open or an open or poor ground exists at pin A of the DDL connector. Repair open wire or bad ground. Then go to C7-30.</p> <p>Go to C7-3.</p>
C7-3 Check ECM Connectors <ul style="list-style-type: none"> • Check terminals at both the vehicle harness and 6-way power harness connectors (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets. 	<p>Terminals and connectors are okay. →</p> <p>Problem found: →</p>	<p>Replace ECM. Then go to C7-30.</p> <p>Repair terminals/connectors. Then go to C7-30.</p>



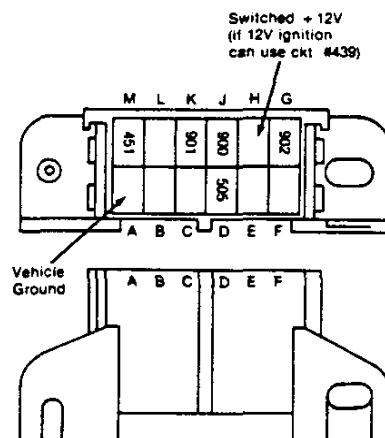
Dash Lights



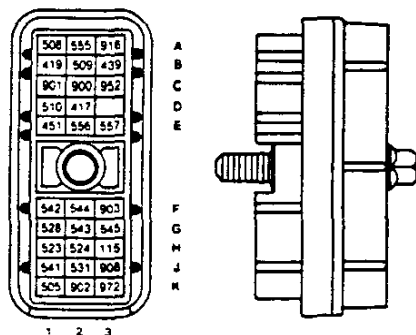
Check Engine, Diagnostic Request, and Ignition Circuits



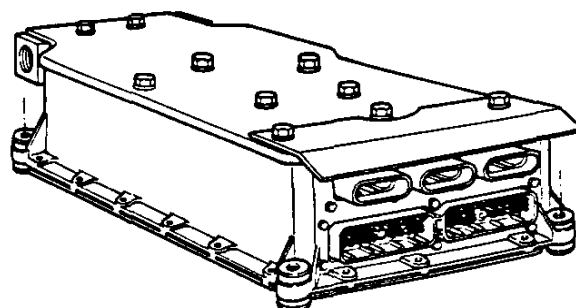
6-Way Power Harness Connector
P/N 12066317



12 Pin DDL Connector P/N 12020043



ECM Vehicle Harness Connector
P/N 12034398

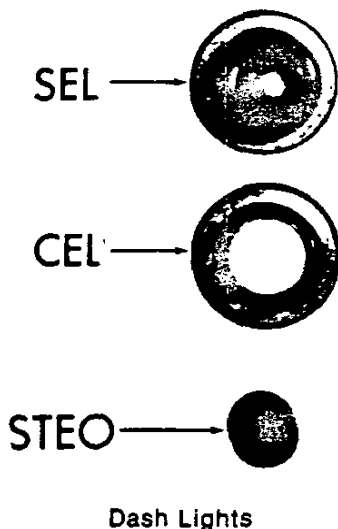
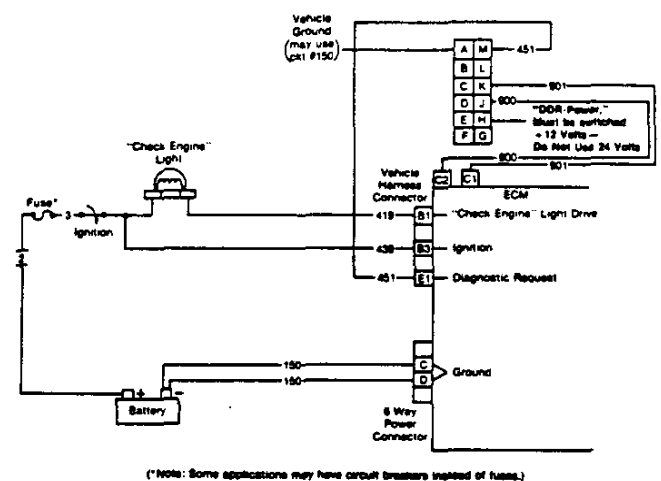


Electronic Control Module (ECM)

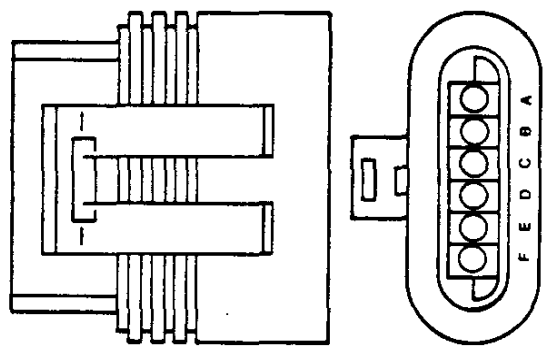
Section 4 TROUBLESHOOTING CHARTS

D. CHART 7 - NO DATA LINK AND BULB CHECK OKAY (Cont'd.)

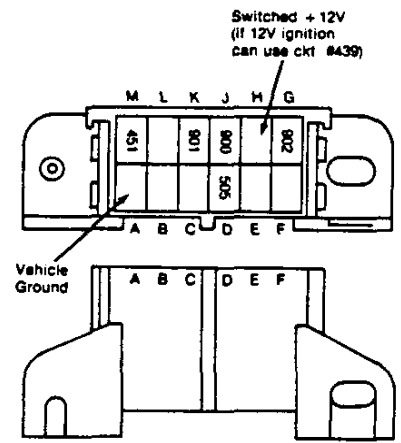
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C7-4 Check for Open <ul style="list-style-type: none"> • Turn off ignition. • Remove all jumpers from 12-pin DDL connector. • Place jumper across pins J and K on the 12-pin DDL connector. • Unplug the vehicle harness connector and measure resistance between sockets C1 and C2. 	Greater than 5 ohms. → Less than 5 ohms. →	One or both data lines (ckt #900 or #901) is open. Repair open and go to C7-30. Go to C7-5.
C7-5 Check for Short <ul style="list-style-type: none"> • Remove jumper wires from the 12-pin DDL connector. • Read resistance between sockets C1 & C2 of the vehicle harness connector. 	Less than 5 ohms. → Greater than 5 ohms. →	The two data lines are shorted together (ckt #900 and #901). Repair short and go to C7-30. Go to C7-6.
C7-6 Check for Short to Ing. & Ground <ul style="list-style-type: none"> • Remove all jumpers from the 12-pin DDL connector. • Measure resistance between sockets J and A, then J and H next. Measure resistance between sockets K and A, then K and H of the DDL connector. 	Less than 5 ohms on any reading. → Greater than 5 ohms on any reading. →	A short exists between a data line and ignition (ckt #439) or ground (ckt #150). Repair short and go to C7-30. Go to C7-7.
C7-7 Check DDR on Another Engine <ul style="list-style-type: none"> • Connect DDR to another engine and read PROM ID or any other parameter in the menu. 	Works OK. → Does not work. →	Go to C7-30. The DDR is probably defective. See DDR instruction manual for repair.



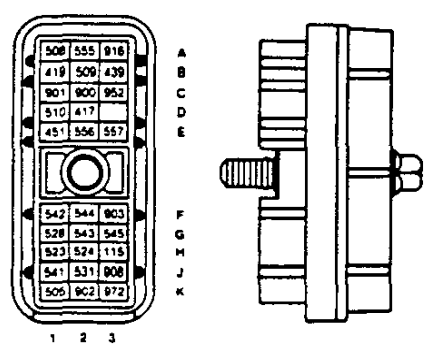
Check Engine, Diagnostic Request, and Ignition Circuits



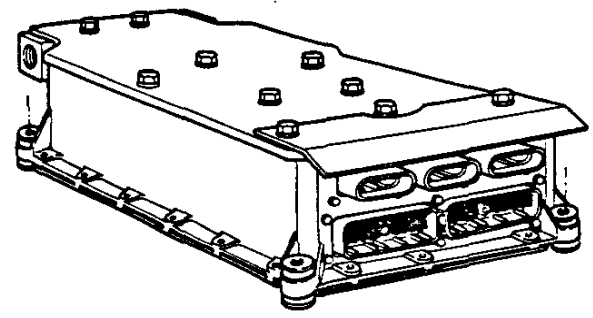
6-Way Power Harness Connector
P/N 12066317



12 Pin DDL Connector P/N 12020043



ECM Vehicle Harness Connector
P/N 12034398

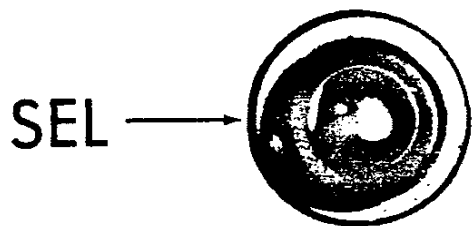
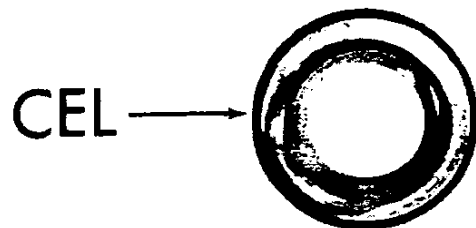
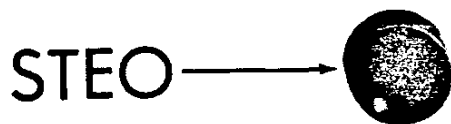


Electronic Control Module (ECM)

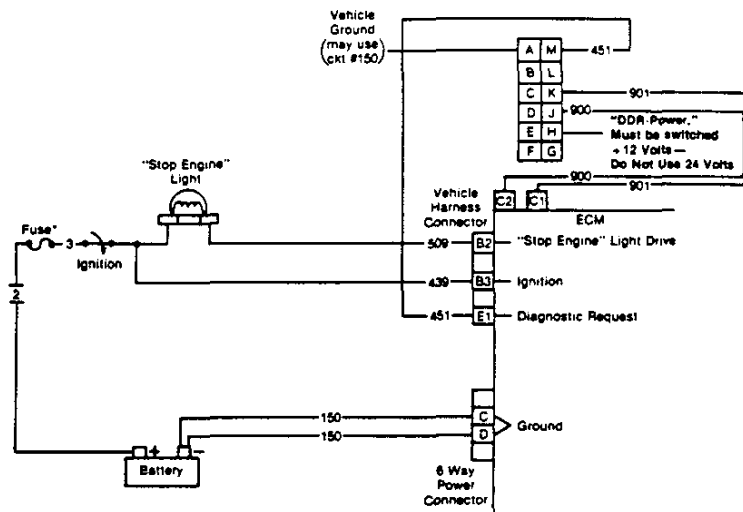
Section 4 TROUBLESHOOTING CHARTS

D. CHART 7 - NO DATA LINK AND BULB CHECK OKAY (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C7-30 Verify Repairs		
<ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Turn ignition off. • Turn ignition on. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run for 1 minute or until "Check Engine" light comes on. Stop engine. • Read historical codes. 	<p>DDR display reads "NO DATA BEING RECEIVED FROM DATA LINK" or "DDEC SYSTEM NOT RESPONDING".</p> <p>Engine starts, and DDR reads Code 25 (no codes).</p> <p>Engine starts, and codes other than Code 25 appear.</p>	<p>→ All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>→ Repairs are complete.</p> <p>→ Go to START-1, page 17, to service codes.</p>

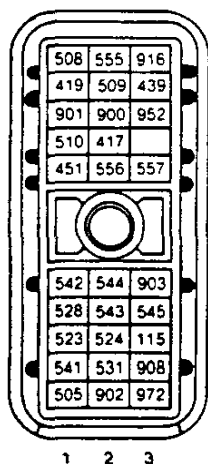


Dash Lights



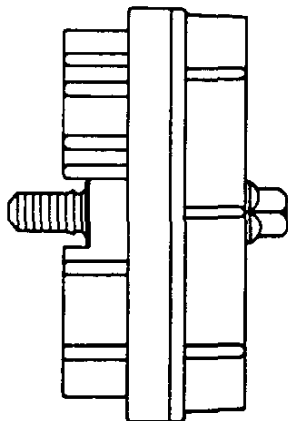
(*Note: Some applications may have circuit breakers instead of fuses.)

Stop Engine Light, Diagnostic Request, and Ignition Circuits

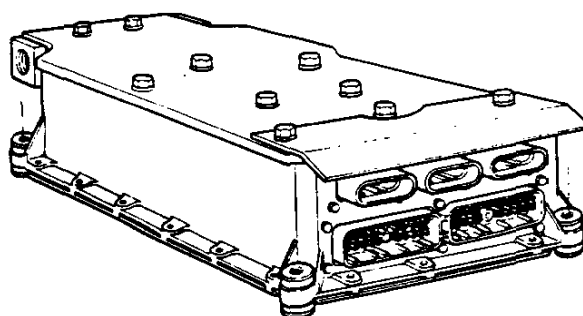


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ECM Vehicle Harness Connector
P/N 12034398



Electronic Control Module (ECM)

Section 4

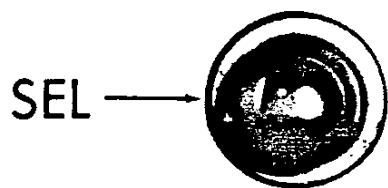
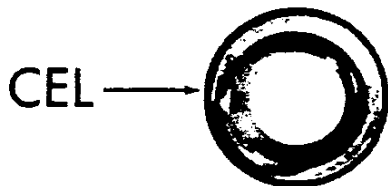
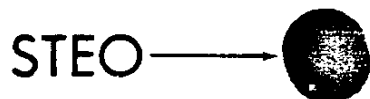
TROUBLESHOOTING CHARTS

D. CHART 8 - "STOP ENGINE" LIGHT ALWAYS ON AND CODE 25 ON DDR

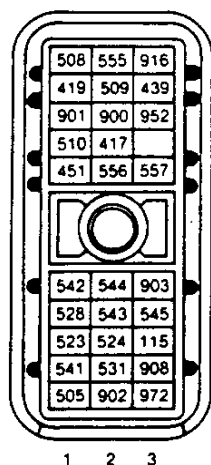
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C8-1 Determine "Stop Engine" Light Status <ul style="list-style-type: none"> Turn ignition on (engine not running) while at the same time observing the "Stop Engine" light. 	<p>"Stop Engine" light comes on for up to 5 seconds, then goes out.</p> <p>"Stop Engine" light comes on and stays on.</p>	<p>This is the normal operation. Unless other problems exist, return to service.</p> <p>Go to C8-2.</p>
C8-2 Check For Short <ul style="list-style-type: none"> Turn ignition off. Disconnect the vehicle harness connector at the ECM. Turn ignition on (engine not running) while at the same time observing the "Stop Engine" light. 	<p>"Stop Engine" light comes on and stays on.</p> <p>"Stop Engine" light stays off.</p>	<p>"Stop Engine" light driver line (ckt #509) is shorted to ground. Repair short. Then go to C8-30.</p> <p>Go to C8-3.</p>
C8-3 Check ECM Connectors <ul style="list-style-type: none"> Check terminals at the vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. Pay close attention to B2 and B3. 	<p>Terminals and connectors are okay.</p> <p>Problem found.</p>	<p>Replace ECM, then go to C8-30.</p> <p>Repair terminals/connectors. Then go to C8-30.</p>
C8-30 Verify Repairs <ul style="list-style-type: none"> Turn ignition off. Reconnect all connectors. Turn ignition on. Clear codes. Turn ignition off. Turn ignition on while at the same time observing the "Stop Engine" light. 	<p>"Stop Engine" light comes on for up to 5 seconds, then goes out.</p> <p>"Stop Engine" light comes on and stays on.</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p>

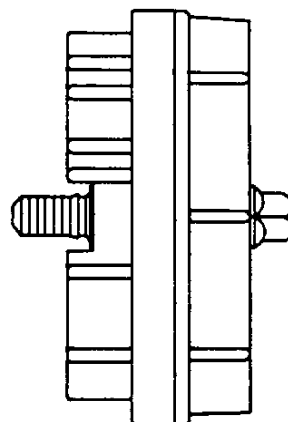


Dash Lights

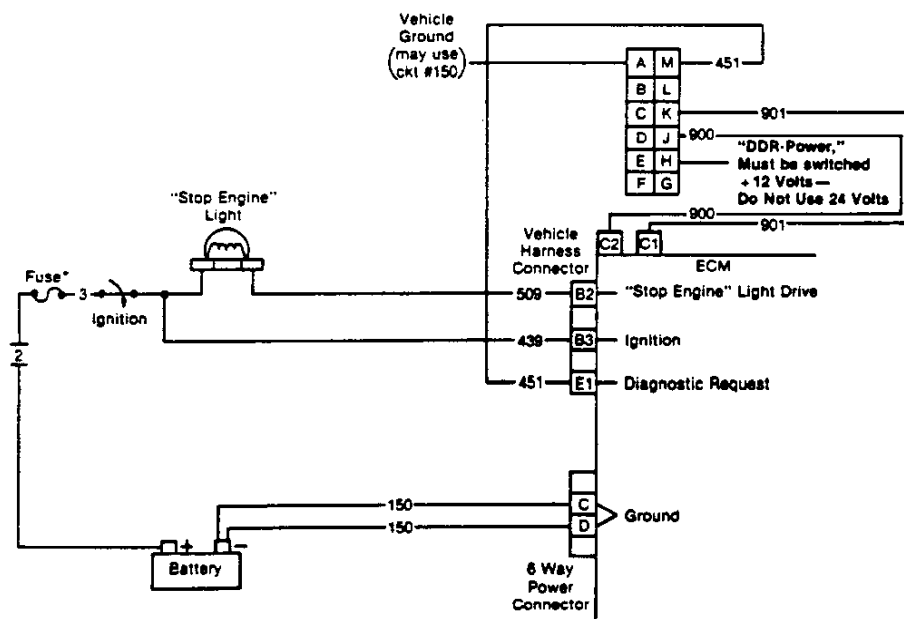


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ECM Vehicle Harness Connector
P/N 12034398



(*Note: Some applications may have circuit breakers instead of fuses.)

Stop Engine Light, Diagnostic Request,
and Ignition Circuits

Section 4

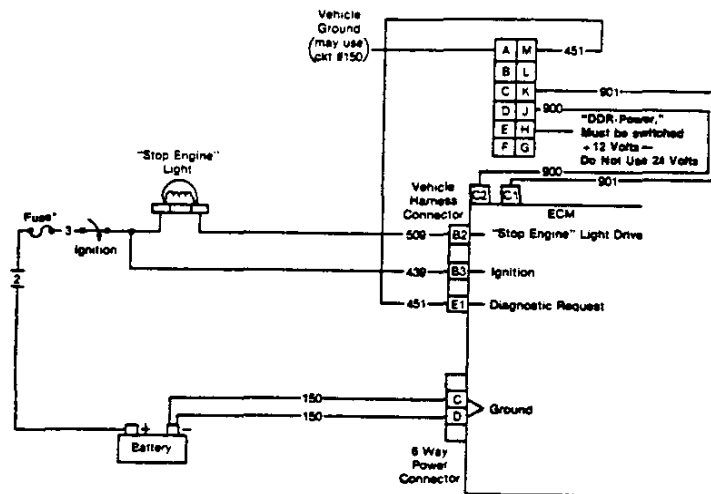
TROUBLESHOOTING CHARTS

D. CHART 9 - NO "STOP ENGINE" LIGHT (SEL) DURING BULB CHECK

NOTE — This chart is only to be used if:

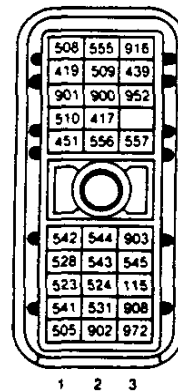
- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C9-1 Try to Force SEL On <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Install a jumper wire between socket B2 on the vehicle harness connector and a good ground. • Turn the ignition on (engine not running). • Note the "Stop Engine" light status. 	<p>"Stop Engine" light is still off. →</p> <p>"Stop Engine" light is on. →</p>	<p>Go to C9-2.</p> <p>Go to C9-4.</p>
C9-2 Check for Short <ul style="list-style-type: none"> • Remove jumper wire. • Read voltage on vehicle harness connector, socket B3 (red lead) to a good ground (black lead). 	<p>Less than 11.5 volts (or 23.0 volts if using a 24 volt ignition). →</p> <p>Greater than or equal to 11.5 volts (or 23.0 volts if using a 24 volt ignition). →</p>	<p>The 5 Amp ignition fuse (or circuit breaker) is blown, and/or the ignition line (ckt #439) is open or shorted to ground. Repair problem. Then go to C9-30.</p> <p>Go to C9-3.</p>
C9-3 Bulb Check <ul style="list-style-type: none"> • Remove SEL bulb and check whether it's burned out or otherwise damaged. 	<p>Bulb is okay. →</p> <p>Bulb is not okay. →</p>	<p>SEL Driver line (ckt #509) is open. Repair open. Then go to C9-30.</p> <p>Replace bulb. Then go to C9-30.</p>

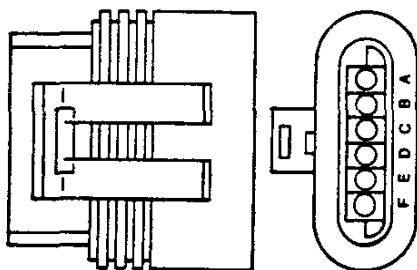


(*Note: Some applications may have circuit breakers instead of fuses.)

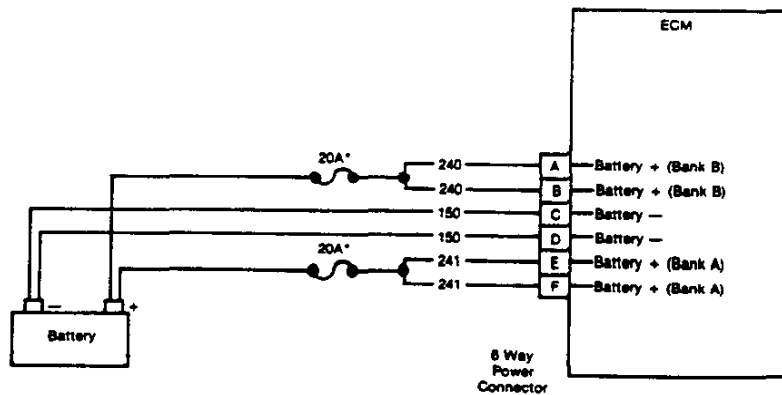
Stop Engine Light, Diagnostic Request,
and Ignition Circuits



ECM Vehicle Harness Connector
P/N 12034398



6-Way Power Harness Connector
P/N 12066317



(*Some applications may have circuit breakers instead of fuses.)

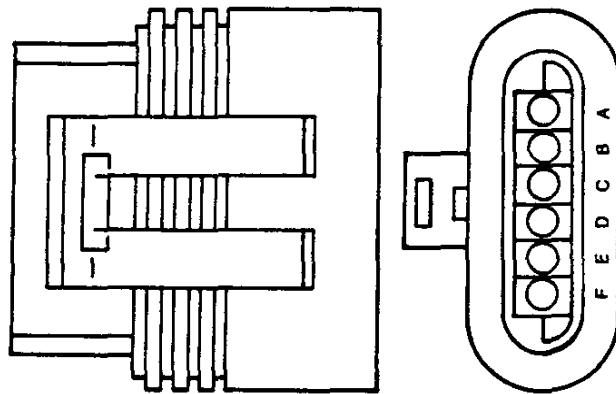
Battery Power and Ground Circuits

Section 4

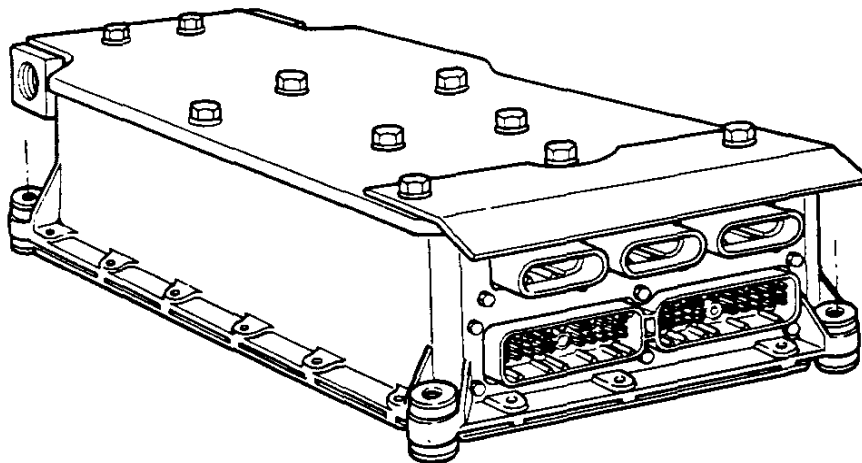
TROUBLESHOOTING CHARTS

D. CHART 9 - NO "STOP ENGINE" LIGHT (SEL) DURING BULB CHECK (Cont'd.)

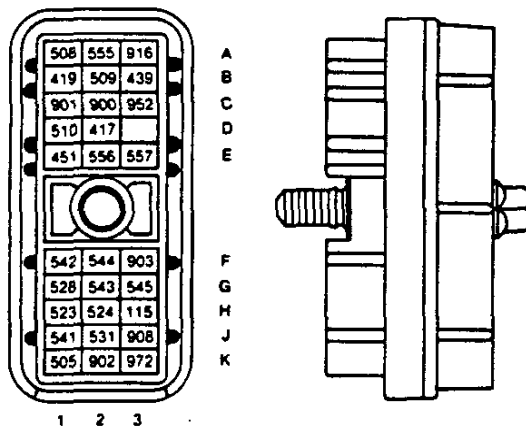
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C9-4 Check for Open <ul style="list-style-type: none"> Remove jumper wire. Read voltage on vehicle harness connector, socket B3 (red lead) to a good ground (black lead). 	<p>Less than 11.5 volts (or 23.0 volts if using a 24 volt ignition). →</p> <p>Greater than or equal to 11.5 volts (or 23.0 volts if using a 24 volt ignition). →</p>	<p>The ignition line (ckt #439) is open. Repair open. Then go to C9-30.</p> <p>Go to C9-5.</p>
C9-5 Check for Bat + <ul style="list-style-type: none"> Turn ignition off. Disconnect the 6-way power harness connector at the ECM. Read voltage on 6-way power harness connector, socket A (red lead), to a good ground (black lead). Also read voltage on socket E (red lead) to a good ground (black lead). 	<p>Less than 11.5 volts on either reading. →</p> <p>Greater than or equal to 11.5 volts on both readings. →</p>	<p>Either a 20 Amp ECM fuse (or circuit breaker) is blown, and/or the Battery Power lines(s) (ckt #240 or #241) has an open or short to ground. Repair problem. Then go to C9-30.</p> <p>Go to C9-6.</p>
C9-6 Check for Ground <ul style="list-style-type: none"> Read voltage on 6-way power harness connector, socket A (red lead) to socket C (black lead). Also read voltage on 6-way power harness connector, socket E (red lead) to socket D (black lead). 	<p>Less than 11.5 volts on either reading. →</p> <p>Greater than or equal to 11.5 volts on both readings. →</p>	<p>Ground line(s) (ckt #150) has an open. Repair open. Then go to C9-30.</p> <p>Go to C9-7.</p>



6-Way Power Harness Connector
P/N 12066317



Electronic Control Module (ECM)



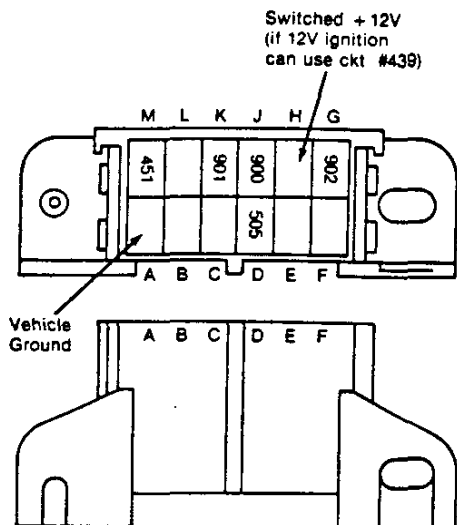
ECM Vehicle Harness Connector
P/N 12034398

Section 4

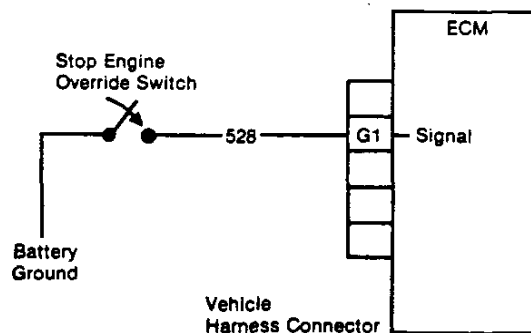
TROUBLESHOOTING CHARTS

D. CHART 9 - NO "STOP ENGINE" LIGHT (SEL) DURING BULB CHECK (Cont'd.)

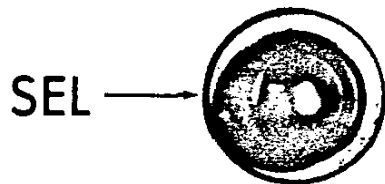
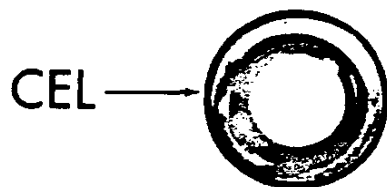
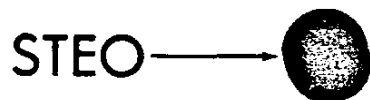
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C9-7 Check ECM Connectors <ul style="list-style-type: none"> Check terminals at both the 6-way power harness and vehicle harness connectors (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. Pay close attention to terminals B2 and B3 of the vehicle harness connector and C and D of the power harness. 	Terminals and connectors are okay. → Problem found. →	Replace ECM. Then go to C9-30. Repair terminals/connectors. Then go to C9-30.
C9-30 Verify Repairs <ul style="list-style-type: none"> Turn ignition off. Reconnect all connectors. Turn ignition on. Clear codes. Turn ignition off. Turn ignition on while at the same time observing the "Stop Engine" light. 	"Stop Engine" light comes on for up to 5 seconds, then goes out. → "Stop Engine" light does not come on at all. →	Repairs are complete. Go to START-1, page 17, if any other problems are present. All system diagnostics are complete. Please review this section from the first step to find the error.



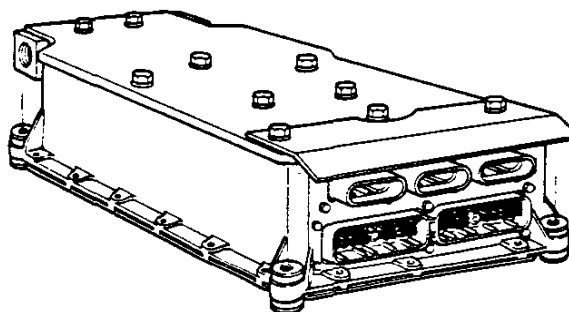
12 Pin DDL Connector P/N 12020043



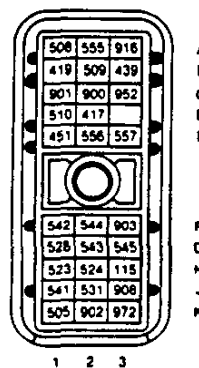
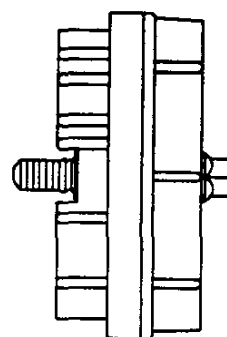
Stop Engine Override Circuit



Dash Lights



Electronic Control Module (ECM)



ECM Vehicle Harness Connector
P/N 12034398

Section 4

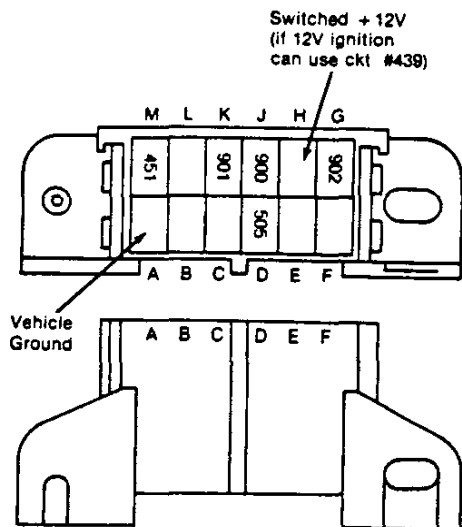
TROUBLESHOOTING CHARTS

CHART 10 - STOP ENGINE OVERRIDE (STEO) INOPERATIVE

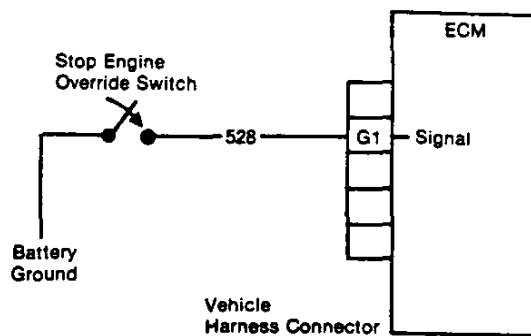
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

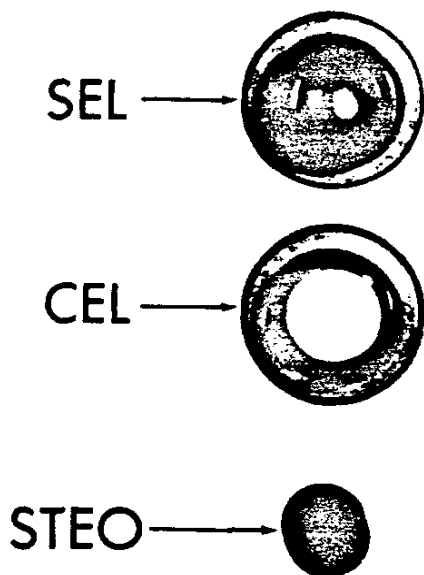
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C10-1 Check STEO Circuit <ul style="list-style-type: none"> • Turn ignition on. • Plug the DDR into the 12-pin DDL connector and select misc. switches (Mode 29) for display. • Press STEO button (or switch) while observing the display for ST ENG OVR SW (Stop Engine Override Switch) on the DDR. 	Display reads "ON". → Display reads "OFF". →	Go to C10-2. The Stop Engine Override line (ckt #528) or the STEO button switch is open and/or the STEO switch does not properly ground the STEO line when pressed. Check wiring from ECM to STEO switch to battery ground. Repair problem. Then go to C10-30. If no open found, go to C10-2.
C10-2 Check PROM ID <ul style="list-style-type: none"> • Select PROM ID (Mode 03) and observe the SHUT DOWN displays. 	Any display reads YES. → All displays read NO. →	Go to C10-3. The stop engine feature is not selected. Refer to the DDR instruction manual, Mode 37, (EEPROM CHANGES) for information on turning on this feature.
C10-3 Check ECM Connectors <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Check terminals at the vehicle harness connector (both the ECM and harness side) for damage; bent corroded and unseated pins or sockets. Check G1 of the vehicle harness and C and D of the power harness. 	Terminals and connectors are okay. → Problem(s) found. →	Replace ECM. Then go to C10-30. Repair terminals/connectors. Then go to C10-30.



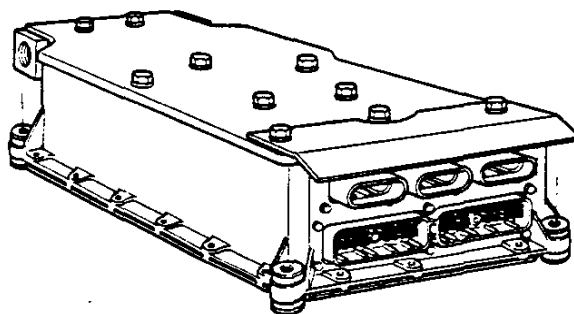
12 Pin DDL Connector P/N 12020043



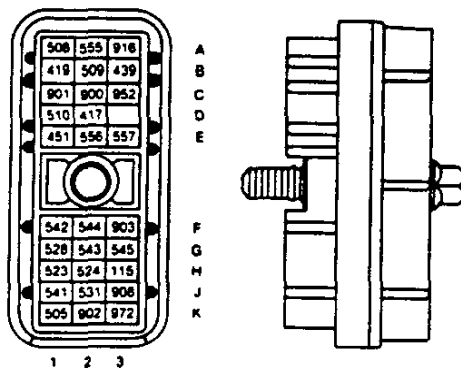
Stop Engine Override Circuit



Dash Lights



Electronic Control Module (ECM)

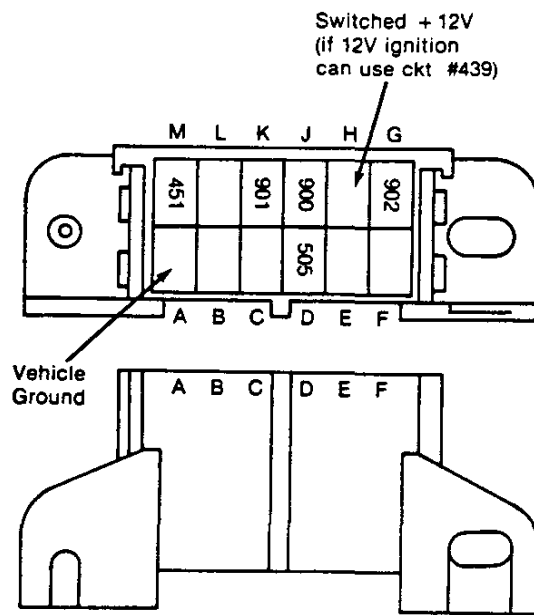


ECM Vehicle Harness Connector
P/N 12034398

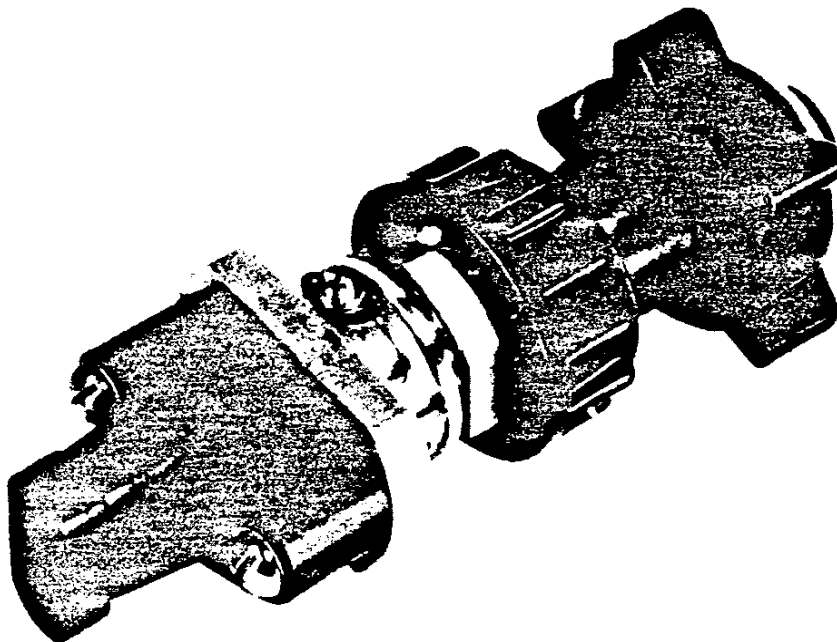
Section 4 TROUBLESHOOTING CHARTS

D. CHART 10 - STOP ENGINE OVERRIDE (STEO) INOPERATIVE (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C10-30 Verify Repairs		
<ul style="list-style-type: none"> • Turn ignition on. • Press STEO button (or switch) while observing the display for ST ENG OVR SW on the DDR. 	<p>Display reads "ON". →</p> <p>Display reads "OFF". →</p>	<p>Repairs are complete. If any other DDEC-related problems remain, go to START-1, page 17.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p>



12 Pin DDL Connector P/N 12020043



Power Take-Off Speed Adjust Sensor (PTOSA)

Section 4

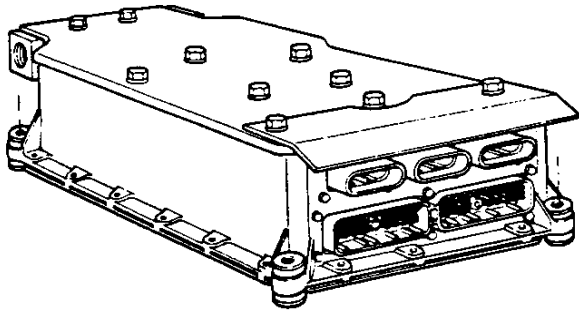
TROUBLESHOOTING CHARTS

D. CHART 11 • POWER TAKE-OFF SPEED ADJUST (PTOSA) INOPERATIVE

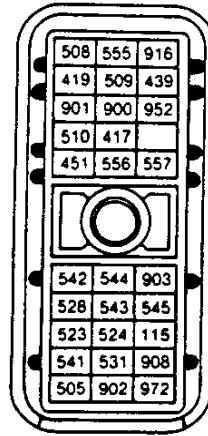
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C11-1 Identify Type of PTO <ul style="list-style-type: none"> Does DDEC system have cruise control switch PTO? 	YES. → NO. →	Go to C11-2. Go to C11-5.
C11-2 Check Calibration for Cruise Control PTO <ul style="list-style-type: none"> Turn ignition on. Plug the DDR into the 12-pin DDL connector. Select PROM ID (Mode 03). Does the DDEC system have vehicle speed sensor? On DDR select EEPROM Changes (Mode 37). Is the correct PTO initial speed programmed? 	YES to both. → NO to either. →	Go to C11-3. You do not have the proper calibration for your application. This option was not specified at the time the engine was ordered. Refer to the DDR Instruction Manual, EEPROM Changes (Mode 37) for information on enabling the correct options.
C11-3 Check Cruise Control <ul style="list-style-type: none"> Is Cruise Control working correctly? On DDR select Cruise Switches (Mode 23). Does DDR display respond correctly when the cruise SET and brake switch is enabled for PTO? 	YES. → NO. →	Go to C11-4. Fix cruise control problem first. Go to Chart 12 (page 101).
C11-4 Check Cruise Control PTO <ul style="list-style-type: none"> On the DDR select vehicle speed (Mode 25). Make sure that the speed is less than 5 MPH. Select PTO RPM Set (Mode 22). Does display show correct RPM when cruise set switch is pressed? 	YES. → NO. →	Problem no longer exists. Go to C1-2 for more information (page 35). Go to C11-8.

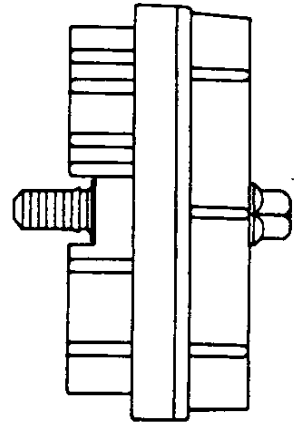


Electronic Control Module (ECM)

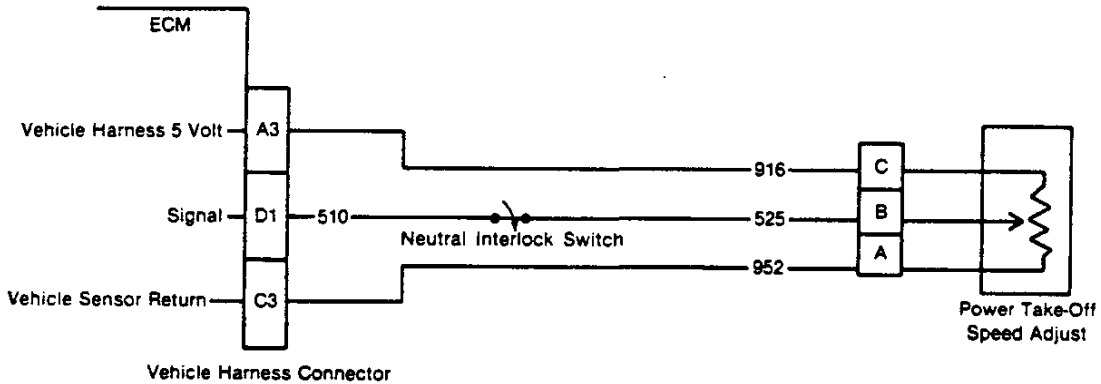


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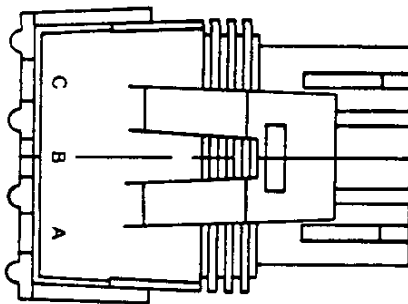
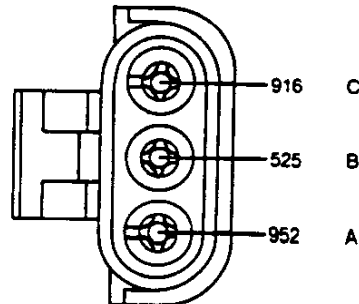
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ECM Vehicle Harness Connector
P/N 12034398



Power Take-Off Speed Adjust Circuit



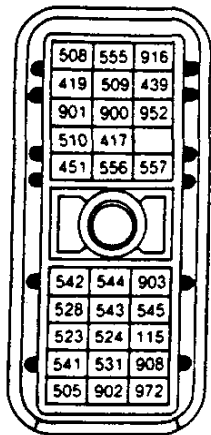
Power Take-Off Speed Adjust
Harness Connector
P/N 12015793

Section 4

TROUBLESHOOTING CHARTS

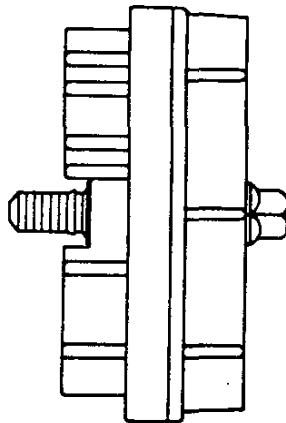
D. CHART 11 - POWER TAKE-OFF SPEED ADJUST (PTOSA) INOPERATIVE (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C11-5 Check Throttle Position Sensor <ul style="list-style-type: none"> • Turn ignition on. • Plug the DDR into the 12-pin DDL connector. • Engine at no throttle. • Read Throttle % (Mode 07) using the DDR. 	At 0% throttle. → Greater than 0% throttle. →	Go to C11-6. Check throttle position sensor adjustment. Go to 21-4 (page 179).
C11-6 Check if ECM is Reading the PTOSA Sensor <ul style="list-style-type: none"> • Turn ignition on (engine not running). • Select the PTO RPM (Mode 22) on the DDR Reader. • Turn the PTOSA sensor from fully closed to fully open while observing the DDR Reader display. 	DDR Reader display changes smoothly from idle (typically 600 RPM) to at least the top speed of the PTOSA. → DDR Reader does not change at all or does not change smoothly. →	Go to C11-8. Go to C11-9.
C11-7 Verify Complaint <ul style="list-style-type: none"> • Turn the PTOSA sensor all the way down (counter-clockwise). • Start and run the engine at idle. • Using the DDR Reader make sure that the vehicle speed is less than 5 MPH and % throttle is 0 (Mode 25 and Mode 07). • Slowly turn PTOSA sensor up (clockwise). 	RPM is increasing. → RPM does not increase. →	Problem no longer exists. Go to C1-2 for more information (page 35). Go to C11-8.

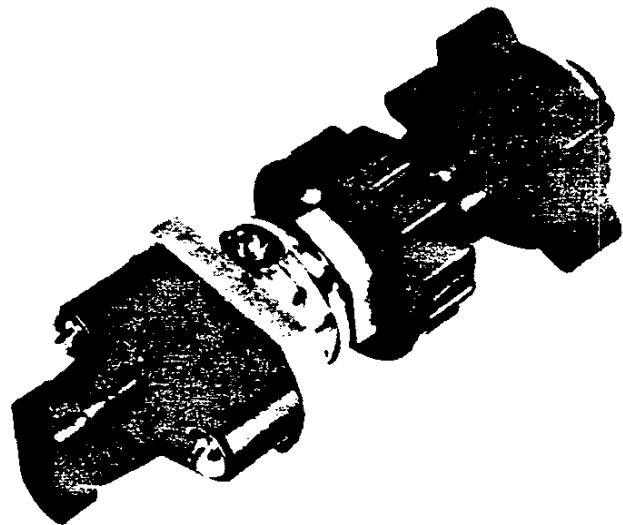


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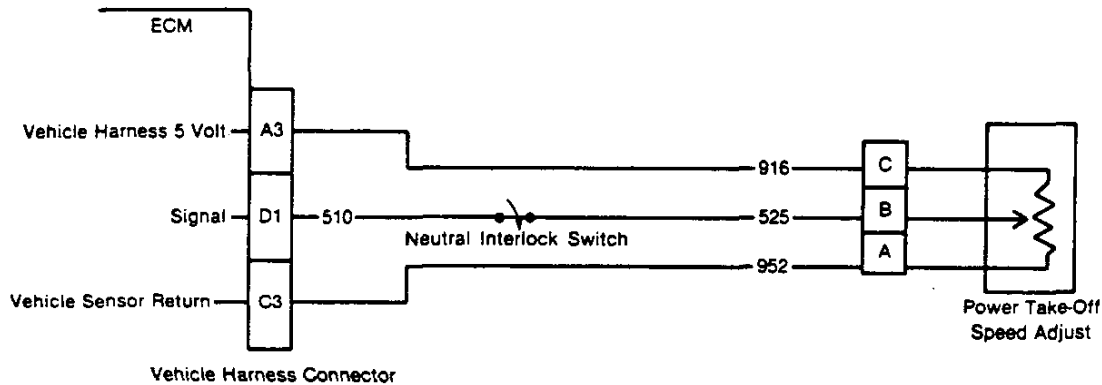
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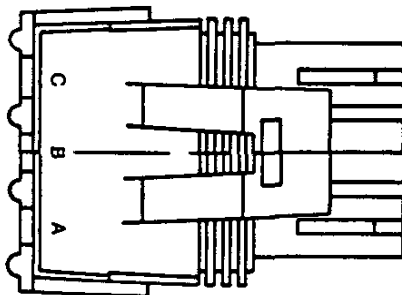
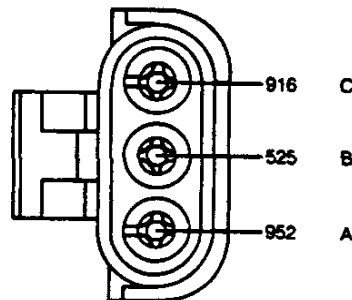
ECM Vehicle Harness Connector
P/N 12034398



Power Take-Off Speed Adjust Sensor
(PTOSA)



Power Take-Off Speed Adjust Circuit



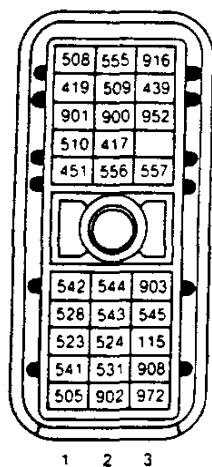
Power Take-Off Speed Adjust
Harness Connector
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Section 4

TROUBLESHOOTING CHARTS

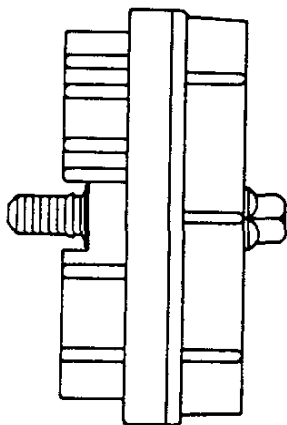
D. CHART 11 - POWER TAKE-OFF SPEED ADJUST (PTOSA) INOPERATIVE (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C11-8 Check ECM Connectors <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Check terminals at the vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and connectors are okay. Problem found.	Replace ECM. Then go to C11-30. Repair terminals/connectors. Then go to C11-30.
C11-9 Check for Open <ul style="list-style-type: none"> • Turn the ignition off. • Make sure vehicle is in neutral. • Disconnect the vehicle harness connector at the ECM. • Also disconnect the PTOSA sensor connector. • Install a jumper wire between pins A and B of the PTOSA sensor harness connector. • Read resistance between sockets D1 and C3 on the vehicle harness connector. 	Greater than 5 ohms or open. Less than or equal to 5 ohms.	Signal line (ckt #525 or #510), ground line (ckt #952) or the Neutral Interlock switch has an open. Repair open. Then go to C11-30. Go to C11-10.
C11-10 Check for +5 Volt Line Open <ul style="list-style-type: none"> • Move the jumper so that it is now between pins C and A of the PTOSA sensor harness connector. • Read resistance between sockets A3 and C3 on the vehicle harness connector. 	Greater than 5 ohms or open. Less than or equal to 5 ohms	The +5 Volt line (ckt #916) is open. Repair open. Then go to C11-30. Go to C11-11.

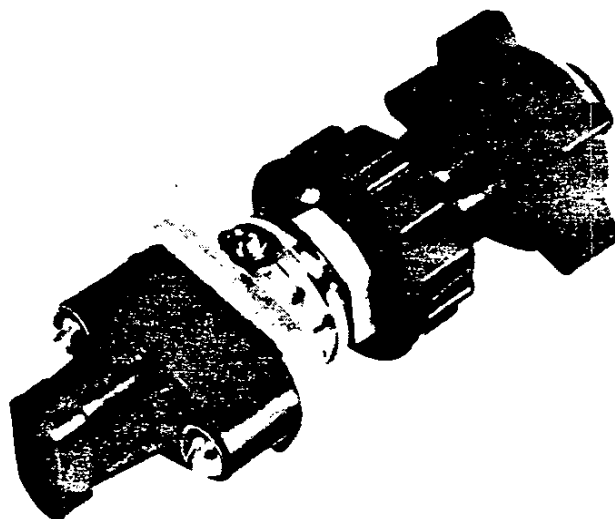


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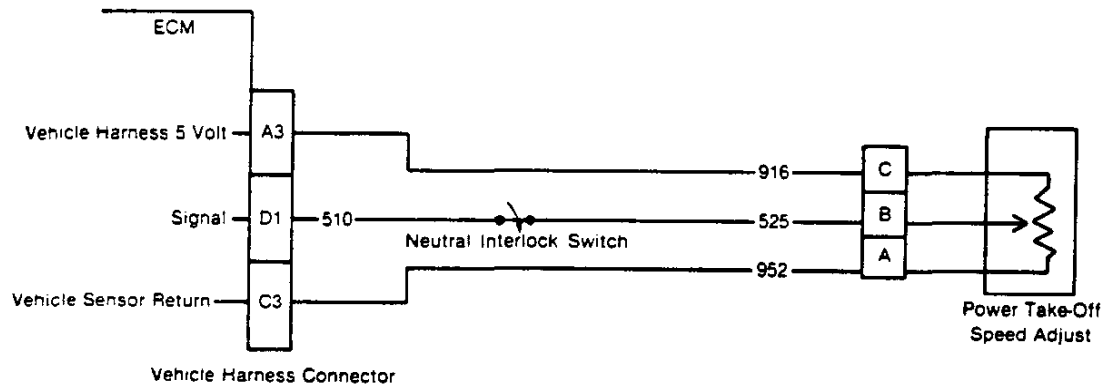
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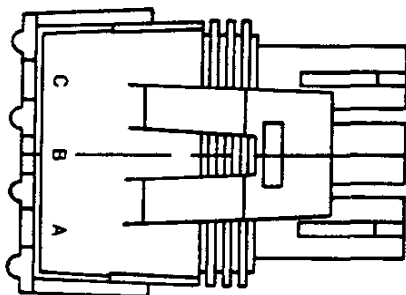
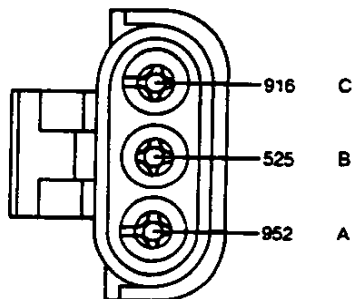
ECM Vehicle Harness Connector
P/N 12034398



Power Take-Off Speed Adjust Sensor
(PTOSA)



Power Take-Off Speed Adjust Circuit



Power Take-Off Speed Adjust
Harness Connector
P/N 12015793

Section 4

TROUBLESHOOTING CHARTS

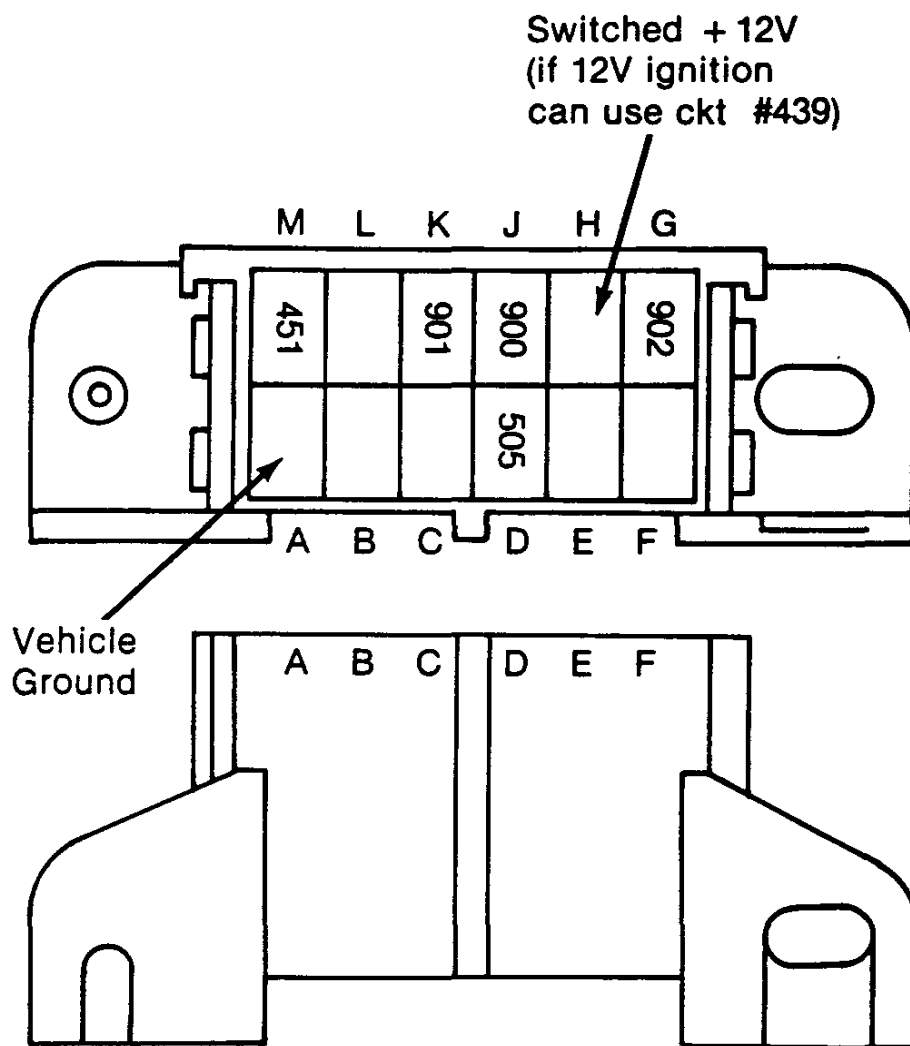
D. CHART 11 - POWER TAKE-OFF SPEED ADJUST (PTOSA) INOPERATIVE (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C11-11 Check for Short Between Signal and Ground <ul style="list-style-type: none"> Remove jumper wire. Read resistance between sockets D1 and C3 on the vehicle harness connector. Also read resistance between socket D1 and a good ground. 	<p>Both readings are greater than 10,000 ohms or open.</p> <p>Either reading is less than or equal to 10,000 ohms.</p>	<p>Go to C11-12.</p> <p>The signal line (ckt less #525 or #510) or the Neutral Interlock switch is shorted to ground (either ckt #952 or chassis ground). Repair short. Then go to C11-30.</p>
C11-12 Check for Short Between + 5 Volt Line and Ground <ul style="list-style-type: none"> Disconnect the PTOSA. Read resistance between sockets A3 and C3 on the vehicle harness connector. Also read resistance between socket A3 and a good ground. 	<p>Both readings are greater than 10,000 ohms or open.</p> <p>Either reading is less than or equal to 10,000 ohms.</p>	<p>Go to C11-13</p> <p>The + 5 Volt line (ckt #916) is shorted to ground (either ckt #952 or chassis ground). Repair short. Then go to C11-30.</p>
C11-13 Check PTOSA Connectors <ul style="list-style-type: none"> Inspect terminals at the PTOSA connectors (sensor side and harness side) for damage: bent, corroded, and unseated pins or sockets. 	<p>Terminals and connectors are okay.</p> <p>Problem found.</p>	<p>Replace PTOSA sensor. Then go to C11-30.</p> <p>Repair terminals/connectors. Then go to C11-30.</p>

Section 4 TROUBLESHOOTING CHARTS

D. CHART 11 - POWER TAKE-OFF SPEED ADJUST (PTOSA) INOPERATIVE (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C11-30 Verify Repairs <ul style="list-style-type: none"> ● Turn ignition off. ● Reconnect all connectors. ● Turn ignition on. ● Clear codes. ● Turn the PTOSA sensor all the way down (counter-clockwise). ● Slowly turn up the PTOSA sensor and observe whether RPM changes. ● Stop engine. ● Read historical codes. 	<p>PTOSA sensor still does not work.</p> <p>PTOSA sensor works and Code 25 (no codes).</p> <p>PTOSA sensor works and codes other than Code 25 appear.</p>	<p>All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>Repairs are complete.</p> <p>Go to START-1, page 17, to service codes.</p>



12 Pin DDL Connector P/N 12020043

Section 4

TROUBLESHOOTING CHARTS

D. CHART 12 - CRUISE CONTROL INOPERATIVE

NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

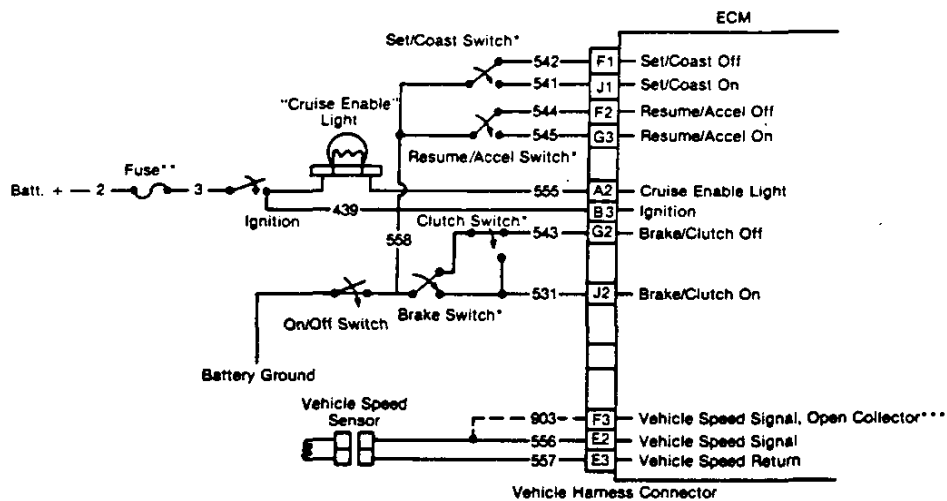
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C12-1 Determine Type of Cruise Control System <ul style="list-style-type: none"> • Check to see that this is a DDEC, cruise control system. • Plug DDR into 12-pin DDL connector. Select PROM ID (Mode 03). 	Yes. → No. →	Go to C12-2. This manual only includes diagnosis of the DDEC cruise control system. Refer to vehicle manufacturer's recommendations concerning your system.
C12-2 Determine "Cruise Active" Light Status <ul style="list-style-type: none"> • Turn ignition off. • Turn ignition on while at the same time observing the "Cruise Active" light. 	"Cruise Active" light comes on for up to 5 seconds, then goes out. → "Cruise Active" light comes on and stays on. → "Cruise Active" light does not come on at all. →	Go to C12-3. Go to C13-2, page 105. Go to C14-2, page 109.
C12-3 Check If Code 58 <ul style="list-style-type: none"> • Plug DDR into the 12-pin DDL connector. • Turn ignition on. • Clear codes (Mode 40) • Turn the cruise control on/off switch to on. • Press each of the following for at least 5 seconds each, then release: <ul style="list-style-type: none"> — SET switch — RESUME switch — Brake — Clutch (if applicable) • Read historical codes (Mode 2). 	Code 58 (and any other codes). → Code 25 (no codes) or any other codes, except Code 58. →	Go to 58-4, page 323. Go to C12-4.

Section 4

TROUBLESHOOTING CHARTS

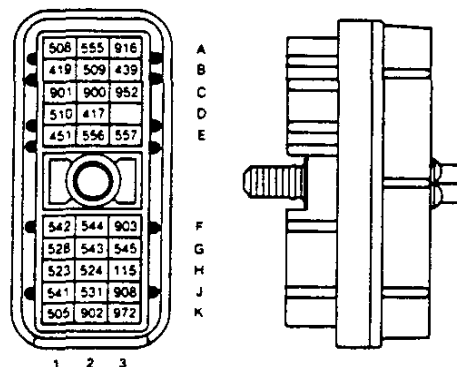
D. CHART 12 - CRUISE CONTROL INOPERATIVE (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C12-4 Determine if Vehicle Speed Sensor Used <ul style="list-style-type: none"> Does the cruise control system have a Vehicle Speed Sensor? Check PROM ID with DDR (Mode 3). 	Yes. → No. →	Go to C12-5. Go to 58-4, page 323.
C12-5 Vehicle Speed Sensor Output Check <ul style="list-style-type: none"> Turn cruise on/off switch to off. Select VEHICLE SPEED for display on the DDR (Mode 25). Drive vehicle while MPH VEH SPEED display (vehicle must be moving). 	Display does not match vehicle speed. → Display matches vehicle speed. →	Go to 54-1. Note: The section referred to diagnoses problems with the vehicle speed sensor circuit. However, if the cruise control system was improperly set-up then the ECM calibration must be changed. Refer to the DDR Instruction Manual, Mode 37 for details. Go to 58-4.

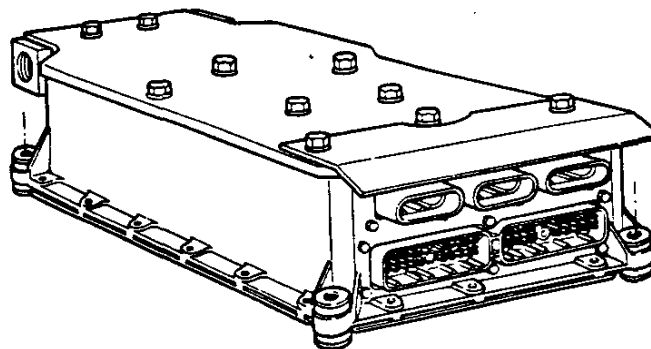


*Note: All switches are shown in the "off" position.
 **Note: (Some applications may have circuit breakers instead of fuses).
 ***Note: CKT #903 used with CKT #556 for open collector Vehicle Speed Sensors.

Cruise Control Circuits



ECM Vehicle Harness Connector
 P/N 12034398



Electronic Control Module (ECM)

Section 4

TROUBLESHOOTING CHARTS

D. CHART 13 - "CRUISE ACTIVE" LIGHT ALWAYS ON

NOTE — This chart is only to be used if:

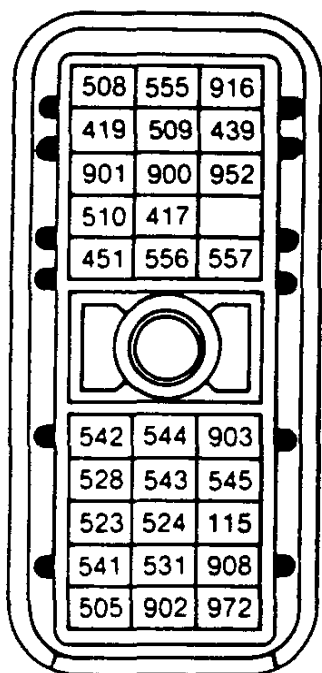
- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C13-1 Determine "Cruise Active" Light Status <ul style="list-style-type: none"> ● Turn ignition off. ● Turn ignition on while at the same time observing the "Cruise Active" light. 	<p>"Cruise Active" light comes on and stays on. → Go to C13-2.</p> <p>"Cruise Active" light comes on for up to 5 seconds, then goes out. → Light is operational. If cruise control is inoperative, go to C12-3.</p> <p>"Cruise Active" light does not come on at all. → Go to C14-2.</p>	
C13-2 Check for Short <ul style="list-style-type: none"> ● Turn ignition off. ● Disconnect the vehicle harness connector at the ECM. ● Turn ignition on (engine not running) while at the same time observing the "Cruise Active" light. 	<p>"Cruise Active" light comes on and stays on. → "Cruise Active" light driver line (ckt #555) is shorted to ground. Check wiring of bulb socket. Repair short. Then go to C13-30.</p> <p>"Cruise Active" light stays off. → Go to C13-3.</p>	
C13-3 Check ECM Connectors <ul style="list-style-type: none"> ● Turn ignition off. ● Disconnect the vehicle harness connector at the ECM. ● Check terminals at the vehicle harness connectors (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. 	<p>Terminals and connectors are okay. → Replace ECM. Then go to C13-30.</p> <p>Problem found. → Repair terminals/connectors. Then go to C13-30.</p>	

Section 4 TROUBLESHOOTING CHARTS

D. CHART 13 - "CRUISE ACTIVE" LIGHT ALWAYS ON (Cont'd.)

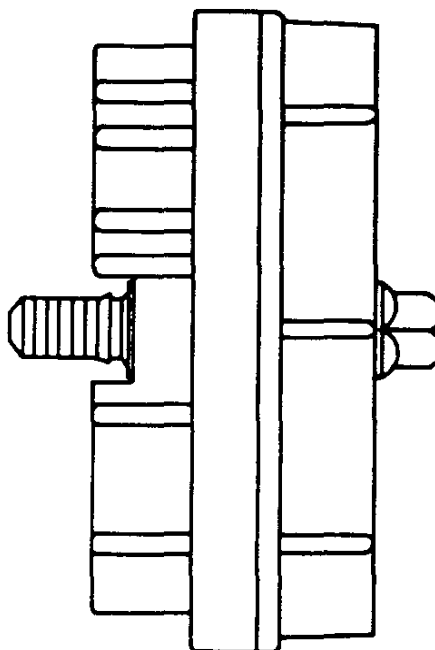
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C13-30 Verify Repairs		
<ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Turn ignition off. • Turn ignition on while at the same time observing the "Cruise Active" light. 	<p>"Cruise Active" light comes on for up to 5 seconds, then goes out.</p> <p>"Cruise Active" light is always on or does not come on at all.</p>	<p>Repairs are complete. Go to START-1, page 17, if any other problems are present.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p>



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ECM Vehicle Harness Connector
P/N 12034398

Section 4

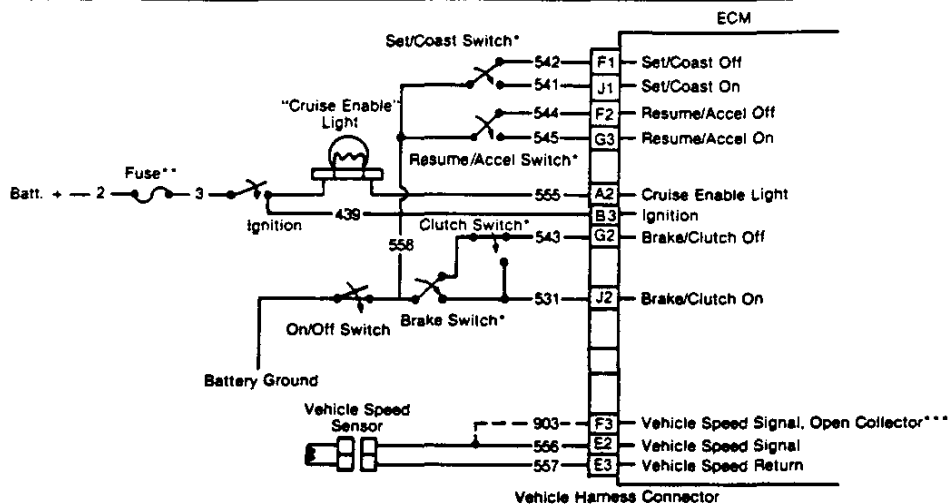
TROUBLESHOOTING CHARTS

D. CHART 14 - NO "CRUISE ACTIVE" LIGHT

NOTE — This chart is only to be used if:

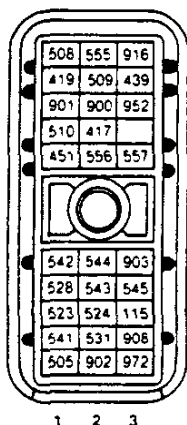
- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C14-1 Determine "Cruise Active" Light Status <ul style="list-style-type: none"> • Turn ignition off. • Turn ignition on while at the same time observing the "Cruise Active" light. 	<p>"Cruise Active" light does not come on at all. →</p> <p>"Cruise Active" light comes on for up to 5 seconds, then goes out. →</p> <p>"Cruise Active" light comes on and stays on. →</p>	<p>Go to C14-2.</p> <p>Light is operational. If cruise control is inoperative. Go to C12-3.</p> <p>Go to C13-2.</p>
C14-2 Try to Force "Cruise Active" Light On. <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Install a jumper wire between socket A2 on the vehicle harness connector and a good ground. • Turn the ignition on (engine not running). • Note the "Cruise Active" light. 	<p>"Cruise Active" light is still off. →</p> <p>"Cruise Active" light is on. →</p>	<p>Go to C14-3.</p> <p>Go to C14-5.</p>
C14-3 Bulb Check <ul style="list-style-type: none"> • Remove "Cruise Active" light bulb and check whether it's burned out or otherwise damaged. 	<p>Bulb is okay. →</p> <p>Bulb is not okay. →</p>	<p>Go to C14-4.</p> <p>Replace bulb. Then go to C14-30.</p>

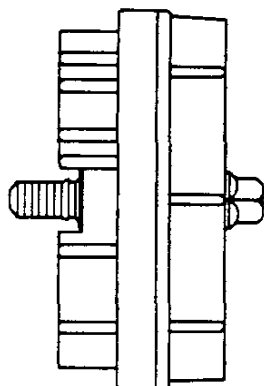
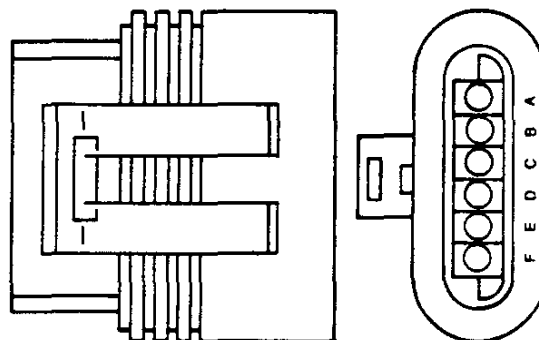


*Note: All switches are shown in the "off" position.
 **Note: (Some applications may have circuit breakers instead of fuses).
 ***Note: CKT #903 used with CKT #556 for open collector Vehicle Speed Sensors.

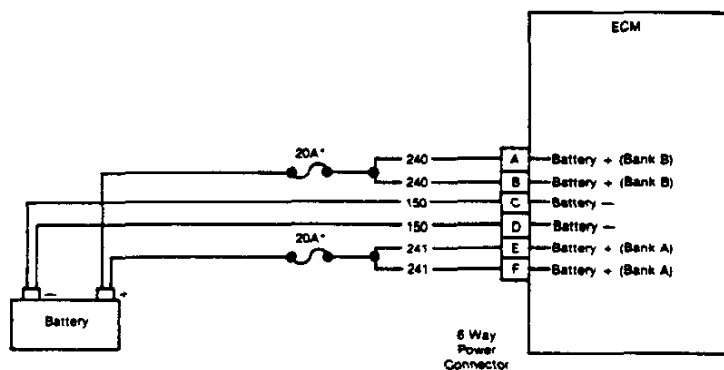
Cruise Control Circuits



ECM Vehicle Harness Connector
P/N 12034398



6-Way Power Harness Connector
P/N 12066317



(*Some applications may have circuit breakers instead of fuses.)

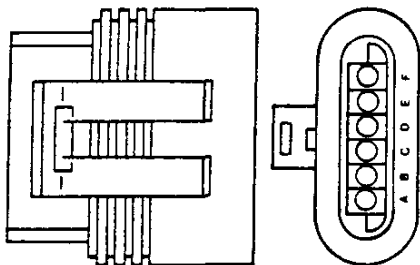
Battery Power and Ground Circuits

Section 4

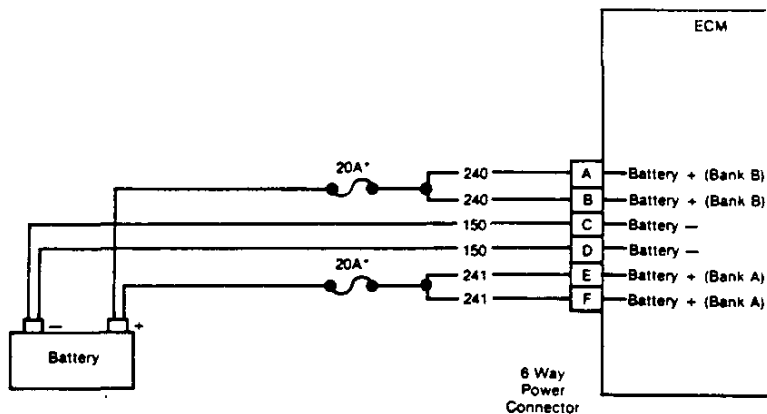
TROUBLESHOOTING CHARTS

D. CHART 14 - NO "CRUISE ACTIVE" LIGHT (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C14-4 Check for Short <ul style="list-style-type: none"> Remove jumper wire. Turn ignition on (engine not running). Read voltage on vehicle harness connector, socket B3 (red lead) to a good ground (black lead). 	<p>Less than 11.5 volts (or 23.0 volts if using a 24 volt ignition). →</p> <p>Greater than or equal to 11.5 volts (or 23.0 volts if using a 24 volt ignition). →</p>	<p>Either the 5 amp. ignition fuse is blown (or circuit breaker tripped) and/or the ignition line (ckt #439) is open or shorted to ground. Repair problem. Then go to C14-30.</p> <p>"Cruise Active" light driver line (ckt #555) is open. Repair open between ECM (ckt #555) to bulb to ckt #439. Then go to C14-30. If no open is found, go to C14-6.</p>
C14-5 Check for Open <ul style="list-style-type: none"> Remove jumper wire. Turn ignition on. Read voltage on vehicle harness connector, socket B3 (red lead) to a good ground (black lead). 	<p>Less than 11.5 volts (or 23.0 volts if using a 24 volt ignition). →</p> <p>Greater than or equal to 11.5 volts (or 23.0 volts if using a 24 volt ignition). →</p>	<p>The ignition line (ckt #439) is open. Repair open. Then go to C14-30.</p> <p>Go to C14-6.</p>
C14-6 Check for Bat + <ul style="list-style-type: none"> Turn ignition off. Disconnect the 6-way power harness connector at the ECM. Read voltage on the 6-way power harness connector, socket A and B (red lead) to a good ground (black lead). Also read voltage on socket E and F (red lead) to a good ground (black lead). 	<p>Less than 11.5 volts on any reading. →</p> <p>Greater than or equal to 11.5 volts on all readings. →</p>	<p>Either a 20 amp. ECM fuse is blown (or circuit breaker tripped) and/or the Battery Power line(s) (ckt #240 or #241) has an open or short to ground. Repair problem. Then go to C14-30.</p> <p>Go to C14-7.</p>

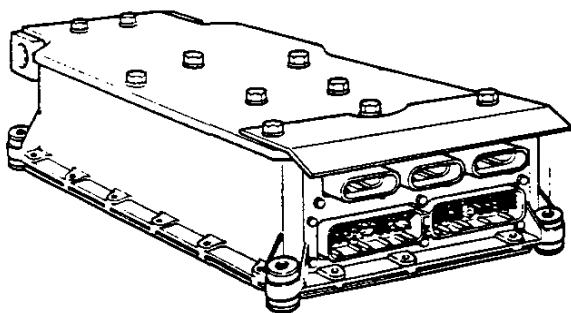


6-Way Power Harness Connector
P/N 12066317

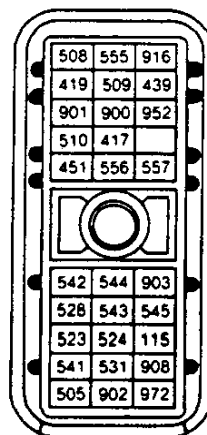


(*Some applications may have circuit breakers instead of fuses.)

Battery Power and Ground Circuits



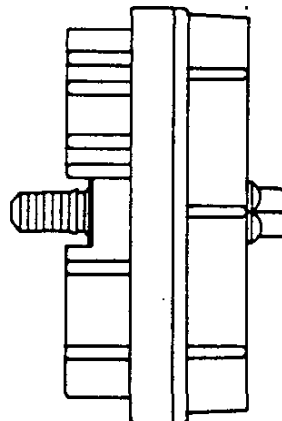
Electronic Control Module (ECM)



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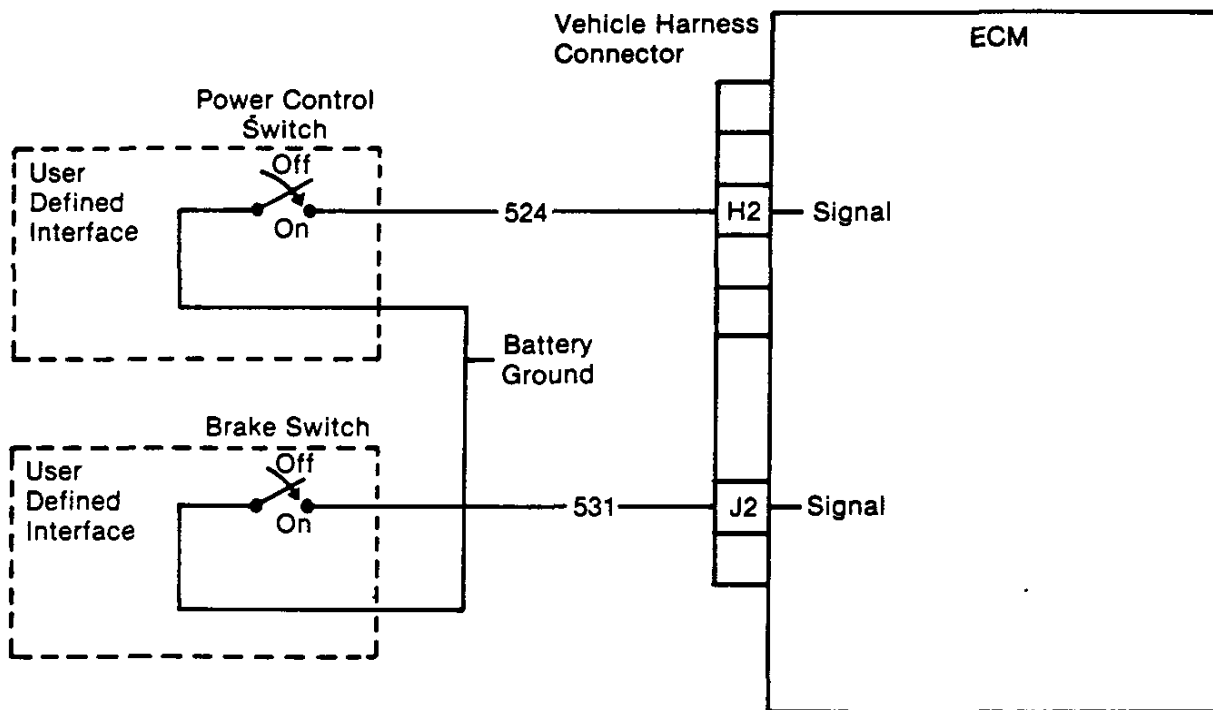
ECM Vehicle Harness Connector
P/N 12034398

Section 4

TROUBLESHOOTING CHARTS

D. CHART 14 - NO "CRUISE ACTIVE" LIGHT (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C14-7 Check for Ground <ul style="list-style-type: none"> ● Read voltage on the 6-way power harness connector, socket A or B (red lead) to socket C (black lead). ● Also read voltage on 6-way power harness connector, socket E or F (red lead) to socket D (black lead). 	<p>Less than 11.5 volts on either reading. →</p> <p>Greater than or equal to 11.5 volts on both readings. →</p>	<p>Ground line(s) (ckt #150) has an open. Repair open. Then go to C14-30.</p> <p>Go to C14-8.</p>
C14-8 Check ECM Connectors <ul style="list-style-type: none"> ● Check terminals at both the 6-way power and vehicle harness connectors (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets, especially A2 and B3 of the vehicle harness. 	<p>Terminals and connectors are okay. →</p> <p>Problem found. →</p>	<p>Replace ECM. Then go to C14-30.</p> <p>Repair terminals/connectors. Then go to C14-30.</p>
C14-30 Verify Repairs <ul style="list-style-type: none"> ● Turn ignition off. ● Reconnect all connectors. ● Turn ignition on. ● Clear codes. ● Turn ignition off. ● Turn ignition on while at the same time observing the "Cruise Active" light. 	<p>"Cruise Active" light comes on for up to 5 seconds, then goes out. →</p> <p>"Cruise Active" light does not come on at all or is always on. →</p>	<p>Repairs are complete. Go to START-1, page 17, if any other problems are present.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p>



*Note: Either the Power Control or the Brake Switch input is used for idle shutdown— but not both.

Power Control/Brake Switch Circuits

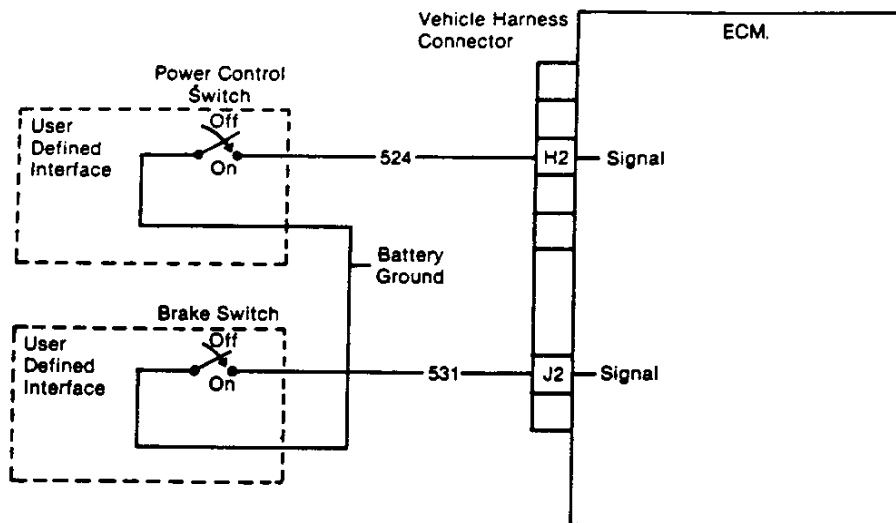
Section 4 TROUBLESHOOTING CHARTS

D. CHART 15 - IDLE SHUT-DOWN FEATURE ALWAYS ON

NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

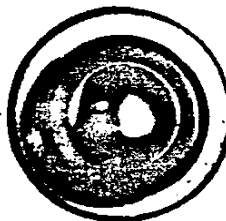
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C15-1 Determine Idle Shut-down Status <ul style="list-style-type: none"> Determine whether the Power Control input (ckt #524) or the Brake switch (ckt #531) is used for the idle shut-down feature (the standard use is with #524 but #531 can be used if the application does not have cruise control). 	<p>Power Control input (ckt #524) used.</p> <p>Brake switch (ckt #531) used.</p> <p>Don't know.</p>	<p>When asked to observe DDR display in later steps, select Mode 29 (MISC SWITCHES) and observe POWER CTL SW display. Go to C15-2.</p> <p>When asked to observe DDR display in later steps, select Mode 23 (CRUISE SWITCHES) and observe BRAKE/CLT SW display. Go to C15-2.</p> <p>When asked to observe DDR display in later steps, select both Mode 23 (CRUISE SWITCHES) and Mode 29 (MISC SWITCHES). Then observe both POWER CTL SW and BRAKE/CLT SW display. Go to C15-2</p>
C15-2 Check if Switch Can be Turned Off <ul style="list-style-type: none"> (Note: vehicle should be parked on a level surface before trying this step). Turn ignition on (engine not running). Place transmission in any gear. Disengage parking brake. Observe DDR display. 	<p>Either POWER CTL SW or BRAKE/CLT SW reads "OFF" or "OPEN".</p> <p>Either POWER CTL SW or BRAKE/CLT SW reads "ON" or "SHRT".</p>	<p>Go to C15-3.</p> <p>A short exists in the switch input being used (ckt #524 or #531). Either the switch is shorted, or the wire is shorted to ground. Repair short. Then go to C15-30.</p>



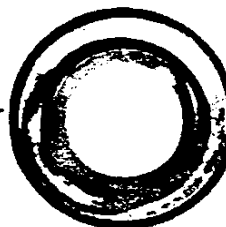
*Note: Either the Power Control or the Brake Switch Input is used for idle shutdown—but not both.

Power Control/Brake Switch Circuits

SEL →



CEL →



STEO →



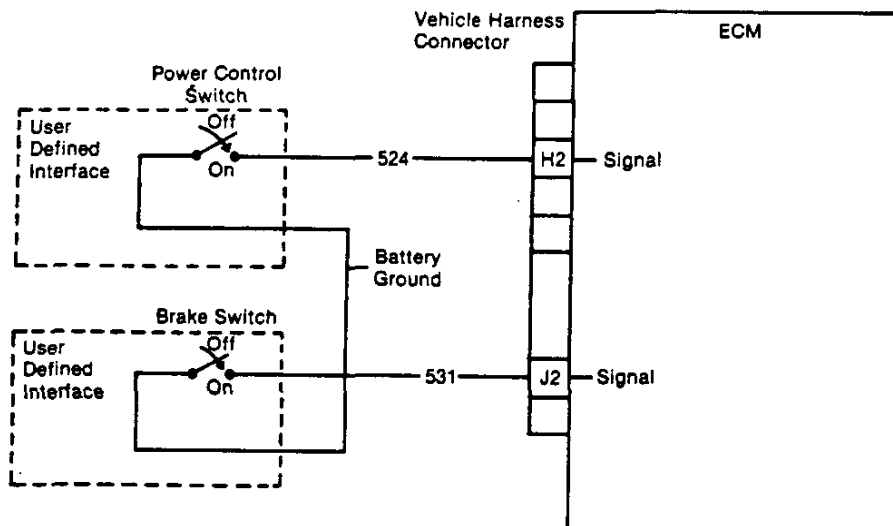
Dash Lights

Section 4

TROUBLESHOOTING CHARTS

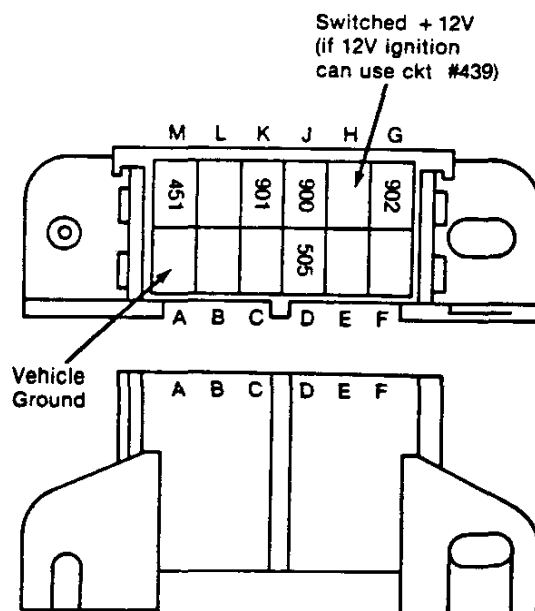
D. CHART 15 - IDLE SHUT-DOWN FEATURE ALWAYS ON (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C15-3 Check If Engine Still Shuts Down <ul style="list-style-type: none"> Place transmission in neutral. Start engine and drive vehicle until one of three things occur: <ol style="list-style-type: none"> 1) DDR reads "ON" or "SHRT", 2) engine shuts down or 3) vehicle has been driven at least 6 minutes. 	<p>Either POWER CTL SW or BRAKE/CLT SW reads "ON" or "SHRT".</p> <p>Engine shuts down.</p> <p>Vehicle driven for 6 minutes.</p>	<p>A short exists in the switch input being used (ckt #524 or #531). Either the switch is shorted, or the wire is shorted to ground. Repair short. Then go to C15-30.</p> <p>If the DDR display never read "ON" or "SHRT", then the fault is not in the idle shutdown circuit. If no codes are logged, refer to the engine service manual. If code(s) are logged, follow appropriate diagnostic charts. (See Index on page i.)</p> <p>Idle shutdown problem is not present at the moment, but may be intermittent. Refer to C1-2, page 35, for help on intermittent diagnosis.</p>
C15-30 Verify Repairs <ul style="list-style-type: none"> Turn ignition off. Reconnect all connectors. Turn ignition on. Clear codes. Start engine and drive vehicle for 6 minutes or until engine shuts down. 	<p>Vehicle driven for 6 minutes without shutdown.</p> <p>Engine shuts down.</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p>



*Note: Either the Power Control or the Brake Switch input is used for idle shutdown—but not both.

Power Control/Brake Switch Circuits



12 Pin DDL Connector P/N 12020043

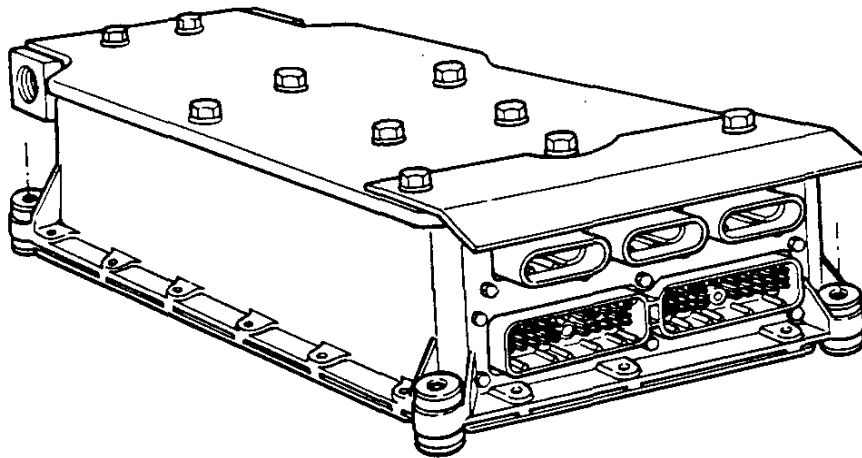
Section 4 TROUBLESHOOTING CHARTS

D. CHART 16 - IDLE SHUT-DOWN FEATURE INOPERATIVE

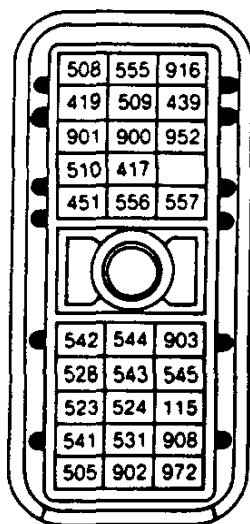
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C16-1 Check PROM ID <ul style="list-style-type: none"> • Turn on ignition. • Plug DDR in DDL connector. Select PROM ID (Mode 03) and observe status of 5 MIN IDLE. 	<p>NO. →</p> <p>YES. →</p>	<p>Idle shutdown feature is not selected. Refer to the DDR instruction Manual, MODE 37 (EEPROM CHANGES), for information on turning on this feature.</p> <p>Go to C16-2.</p>
C16-2 Determine Idle Shut-down Status <ul style="list-style-type: none"> • Determine whether the Power Control input (ckt #524) or the Brake switch (ckt #531) is used for the idle shut-down feature (the standard use is with #524 but #531 can be used if the application does not have cruise control). 	<p>Power Control input (ckt #524) used. →</p> <p>Brake switch (ckt #531) used. →</p> <p>Don't know. →</p>	<p>When asked to observe DDR display in later steps, select Mode 29 (MISC SWITCHES) and observe POWER CTL SW display. Go to C16-3</p> <p>When asked to observe DDR display in later steps, select Mode 23 (CRUISE SWITCHES) and observe BRAKE/CLT SW display. Go to C16-3.</p> <p>When asked to observe DDR display in later steps, select both Mode 23 (CRUISE SWITCHES). Then observe both POWER CTL SW and BRAKE/CLT SW display. Go to C16-3.</p>



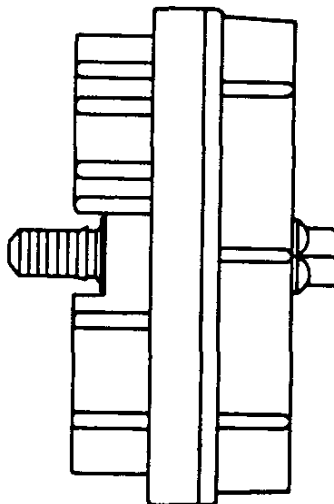
Electronic Control Module (ECM)



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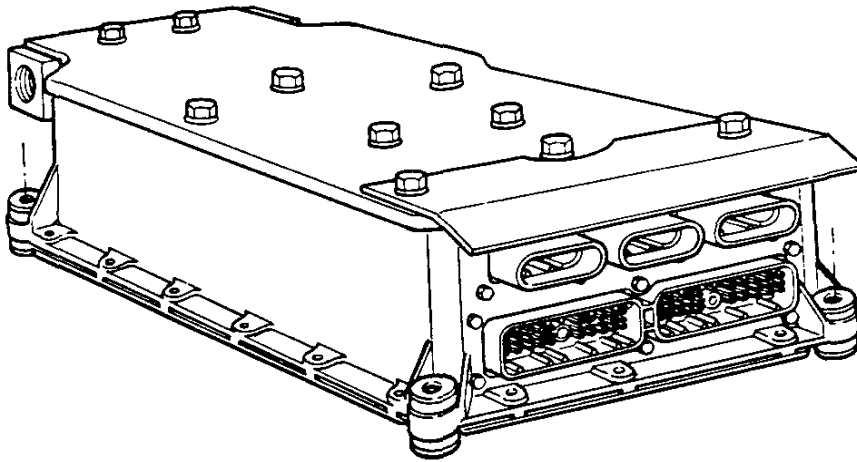
ECM Vehicle Harness Connector
P/N 12034398

Section 4

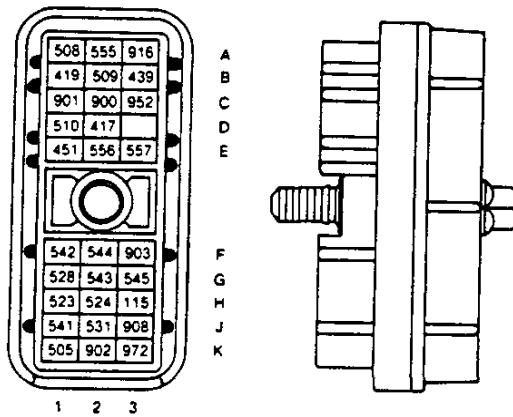
TROUBLESHOOTING CHARTS

D. CHART 16 - IDLE SHUT-DOWN FEATURE INOPERATIVE (Cont'd.)

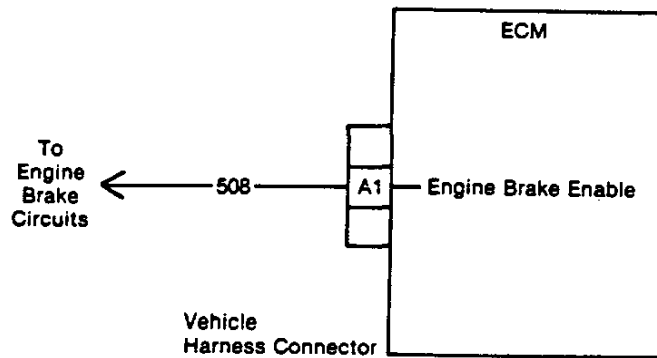
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C16-3 Verify Operation of Switches <ul style="list-style-type: none"> • Turn ignition off. • Make sure vehicle is in neutral and apply parking brake. • Plug the DDR into the 12-pin DDL connector. • Turn ignition on and observe DDR display (Mode 23 or Mode 29). 	<p>Either POWER CTL SW or BRAKE/CLT SW reads "ON" or "SHRT".</p> <p>Either POWER CTL SW or BRAKE/CLT SW reads "OFF" or "OPEN".</p>	<p>Go to C16-4.</p> <p>The switch input used for idle shutdown (ckt #524 or #531) is open or the parking brake or neutral switch is open or not making contact. Repair open or replace switches as appropriate. (If no problem found, go to C16-4.) Then go to C16-30.</p>
C16-4 Check ECM Connectors <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Check terminals at the vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. 	<p>Terminals and connectors are okay.</p> <p>Problem found.</p>	<p>Replace ECM. Then go to C16-30.</p> <p>Repair terminals/connectors. Then go to C16-30.</p>
C16-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Make sure vehicle is in neutral, and apply parking brake. • Start and run engine at idle. • Wait until engine shuts down, or about 6 minutes—whichever comes first. 	<p>Engine shuts down.</p> <p>Engine does not shut down after 6 minutes.</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p>



Electronic Control Module (ECM)



ECM Vehicle Harness Connector
P/N 12034398



Engine Brake Enable Circuit

Section 4

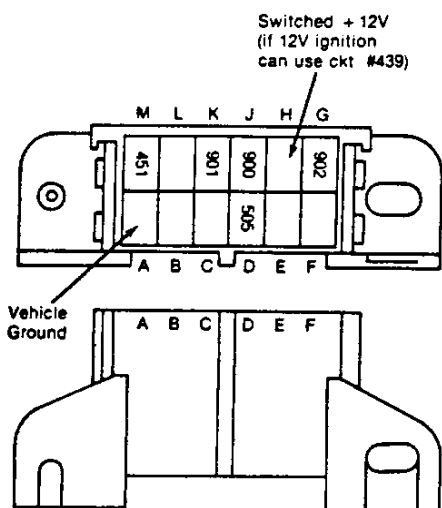
TROUBLESHOOTING CHARTS

D. CHART 17 - ENGINE BRAKE ALWAYS ENABLED

NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C17-1 Engine Brake Checkout <ul style="list-style-type: none"> Start and run engine at idle. Plug DDR in and select Mode 30 (MISC OUTPUTS) for display. Observe DDR display line labeled ENG BRK ENBLE (engine brake enable). 	Display reads "ON". Display reads "Off".	Replace ECM. Then go to C17-30. Go to C17-2.
C17-2 Check for Short <ul style="list-style-type: none"> Turn ignition off. Disconnect the vehicle harness connector at the ECM. Read resistance between socket A1 of the vehicle harness connector and a good ground. 	Less than 100 ohms. Greater than 100 ohms or open.	A short to ground exists in the engine brake wire (ckt #508). Repair short. Then go to C17-30. Go to C17-3.
C17-3 Check ECM Connectors <ul style="list-style-type: none"> Check terminals at the vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. Especially terminal A1 (ckt #508). 	Terminals and connectors are okay. Problem found.	The problem may be in the engine brake system. Refer to the manual for your engine brake system. If no problem is found with the engine brake system, replace ECM. Then go to C17-30. Repair terminals/connectors. Then go to C17-30.
C17-30 Verify Repairs <ul style="list-style-type: none"> Turn ignition off. Reconnect all connectors. Turn ignition on. Clear codes. Start and run engine. Observe ENG BRK ENBLE display on DDR (Mode 30). 	Display reads "OFF". Display reads "ON".	Repairs are complete. All system diagnostics are complete. Please review this section from the first step to find the error.



12 Pin DDL Connector P/N 12020043

To
Engine
Brake
Circuits



508

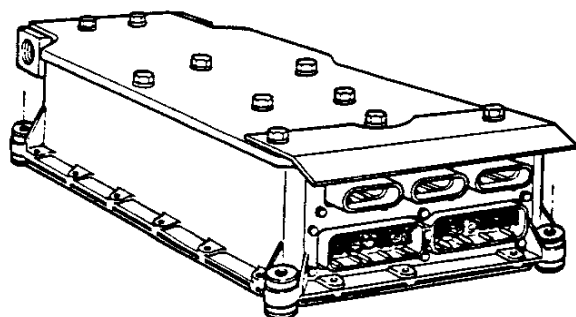


Engine Brake Enable

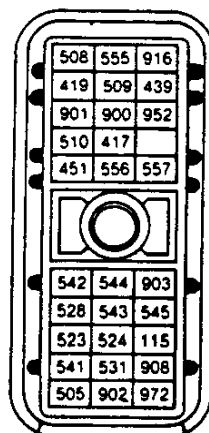
Vehicle
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Engine Brake Enable Circuit



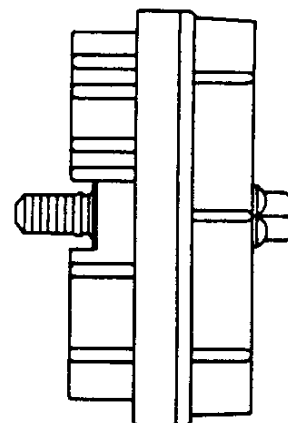
Electronic Control Module (ECM)



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ECM Vehicle Harness Connector
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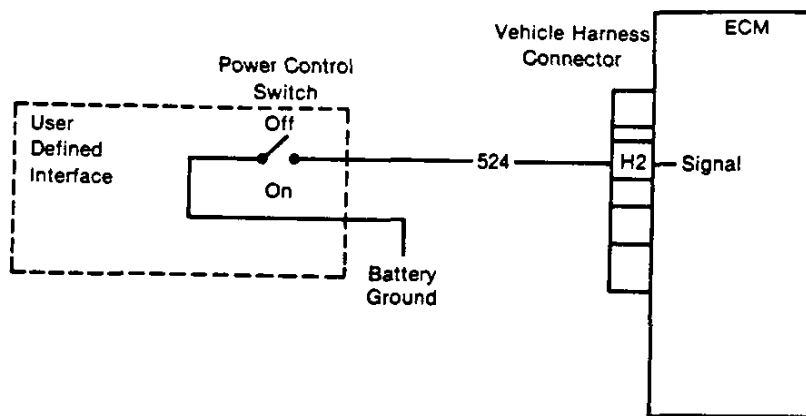
TROUBLESHOOTING CHARTS

D. CHART 18 - ENGINE BRAKE INOPERATIVE

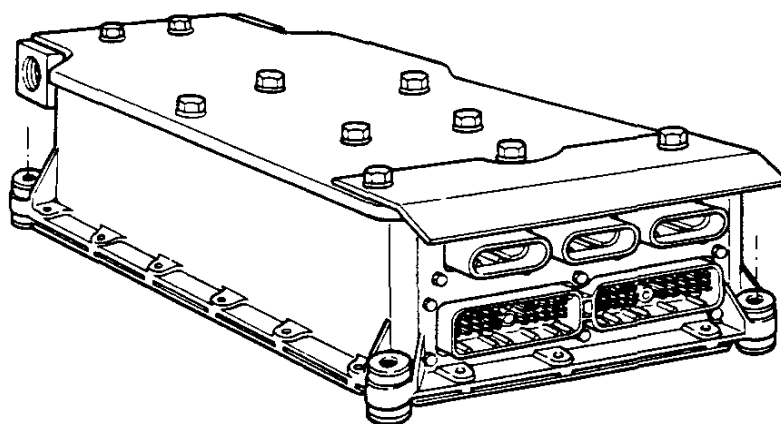
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

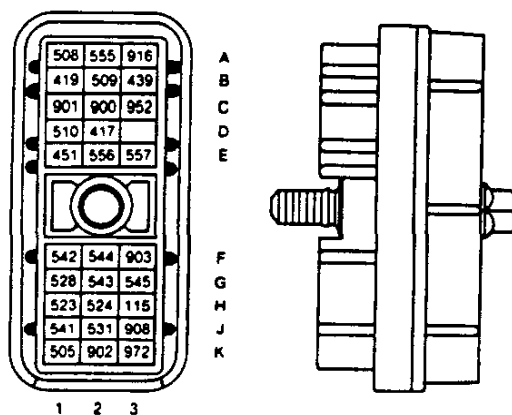
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C18-1 Verify Engine Brake Enable Operation <ul style="list-style-type: none"> • Turn ignition on. • Plug the DDR into the 12 pin DDL connector. • Select Mode 30 (Misc outputs) on DDR. • Start and run engine. • Rev up the engine and then quickly take your foot off the throttle while observing the DDR display line labeled ENG BRK ENBLE (engine brake enable) display. 	DDR is —————→ always reading "OFF".	Go to C18-2.
	DDR reads —————→ "OFF" at first, then reads "ON" when foot is let off throttle.	The ECM is operating properly. Check for open in Engine Brake Enable line (ckt #508). If no problem is found, then the fault exists outside of the DDEC system. Refer to the manual for your engine brake system.
C18-2 Check ECM Connectors <ul style="list-style-type: none"> • Turn ignition off. • Disconnect vehicle harness connector at the ECM. • Check terminals at the vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and —————→ connectors are okay.	Replace ECM. Then go to C18-30.
	Problem found. —————→	Repair terminals/connectors. Then go to C18-30.
C18-30 Verify Repairs <ul style="list-style-type: none"> • Reconnect all connectors. • Turn ignition on. • Plug the DDR into the 12-pin DDL connector. • Clear codes. • Select Mode 30 for display. • Start and run engine. • Rev up the engine and then quickly take your foot off the throttle while observing the DDR display labeled ENG BRK ENBLE. • Stop engine. 	DDR is —————→ always reading "OFF" or always reading "ON" on ENG BRK ENBLE display.	All system diagnostics are complete. Please review this section from the first step to find the error.
	DDR reads —————→ "OFF" at first, then reads "ON" when foot is let off throttle.	Repairs are complete.



Power Control Circuit



Electronic Control Module (ECM)



ECM Vehicle Harness Connector
P/N 12034398

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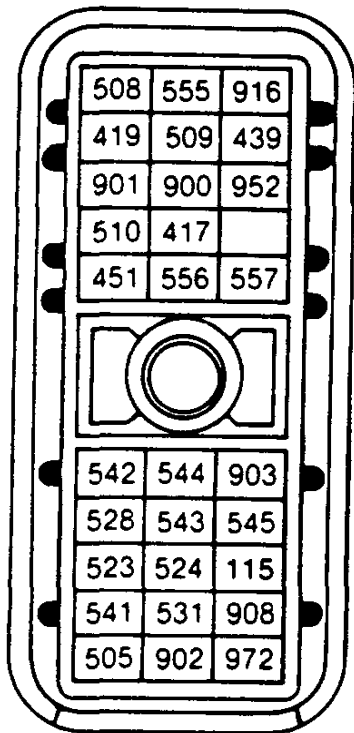
TROUBLESHOOTING CHARTS

D. CHART 19 - POWER CONTROL INPUT INOPERATIVE

NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

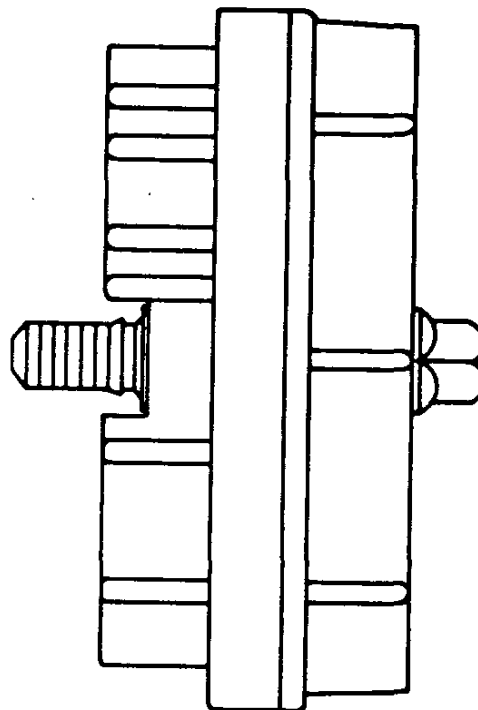
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C19-1 Identify Power Control Application <ul style="list-style-type: none"> • Determine how Power Control input (ckt #524) is being used. • Plug DDR into 12-pin DDL connector and select MODE 03 (PROM ID). 	<p>Used for —————→ idle shutdown (5 MIN IDLE).</p> <p>Used for —————→ throttle inhibit (BUS DR INTERL).</p> <p>Used for —————→ engine protection (PC SHUT DOWN).</p>	<p>Go to C16-1, page 119.</p> <p>Go to C19-2.</p> <p>Go to C19-4.</p>
C19-2 Test Throttle Inhibit Feature <ul style="list-style-type: none"> • Start and run engine. • Plug DDR into the 12 pin DDL connector and select Mode 29 (MISC SWITCHES) for display. • Place vehicle in condition where throttle inhibit is supposed to occur and observe DDR display line labeled "POWER CTL SW" (on coaches, this occurs when a passenger door is open). 	<p>DDR display reads "ON".</p> <p>DDR display reads "OFF".</p>	<p>Feature appears to operational at the moment. Problem may be intermittent. Refer to C1-2 for help on resolving intermittent faults.</p> <p>An open exists in either the Power Control line (ckt #524) or the switch (or relay) in series with it. Repair open and go to C19-30 (if an open is not found, go to C19-5).</p>
C19-3 Check ECM Connectors <ul style="list-style-type: none"> • Turn ignition off (if still on). • Disconnect the vehicle harness connector at the ECM (if not already disconnected). • Check terminals at the vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. 	<p>Terminals and connectors are okay.</p> <p>Problem found. Connectors are okay.</p>	<p>Replace ECM. Then go to C19-30.</p> <p>Repair terminals/connectors. Then go to C19-30.</p>



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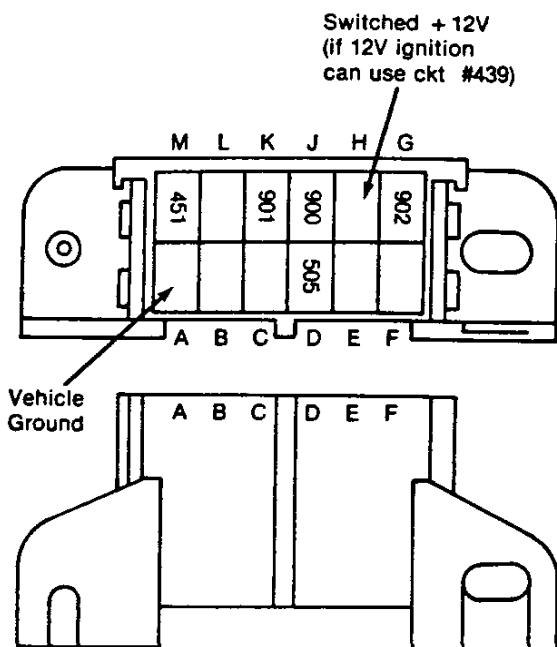
ECM Vehicle Harness Connector
P/N 12034398

Section 4

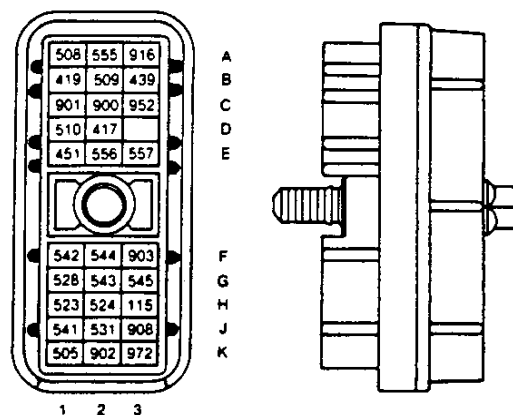
TROUBLESHOOTING CHARTS

D. CHART 19 - POWER CONTROL INPUT INOPERATIVE (Cont'd.)

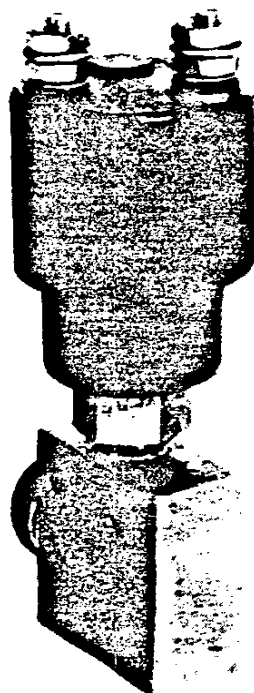
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C19-4 Check for Open <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Read resistance between socket H2 of the vehicle harness connector and the device being used to trigger the engine protection system. • Close switch (relay or triggering device). 	<p>Less than 5 ohms. →</p> <p>Greater than 5 ohms or open. →</p>	<p>A fault may exist in the device used to trigger engine shutdown (faulty switch or relay, etc.). If no fault can be found with the triggering device, go to C19-3.</p> <p>The Power Control line (ckt #524) is open. Repair open and go to C19-3. If an open is not found, go to C19-5.</p>
C19-5 Check for Ground <ul style="list-style-type: none"> • Read voltage on the 6-way power harness connector, socket A or B (red lead) to C (black lead). • Also read voltage on 6-way power harness connector, socket E or F (red lead) to socket D (black lead). 	<p>Less than 11.5 volts on either reading. →</p> <p>Greater than or equal to 11.5 volts on both readings. →</p>	<p>Ground wire(s) (ckt #150) has open. Repair open. Then go to C19-30.</p> <p>Go to C19-3.</p>
C19-30 Verify Repairs <ul style="list-style-type: none"> • (Note: if the Power Control input is being used for engine protection, you will not be able to confirm repair unless the engine protection function can be triggered). • Start and run engine. • Select Mode 29 on DDR for display. • Recreate conditions under which the Power Control input should be grounded, and observe DDR display labelled "POWER CTL SW". 	<p>DDR display reads "OFF". →</p> <p>DDR display reads "ON". →</p>	<p>All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>Repairs are complete.</p>



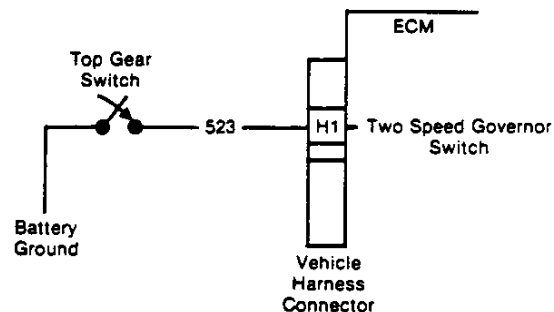
12 Pin DDL Connector P/N 12020043



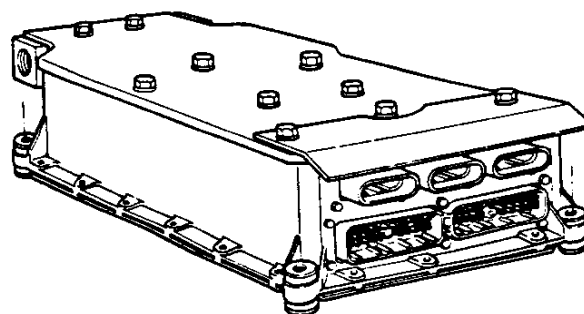
ECM Vehicle Harness Connector
P/N 12034398



Two Speed Governor Switch



Two Speed Governor Circuit



Electronic Control Module (ECM)

Section 4

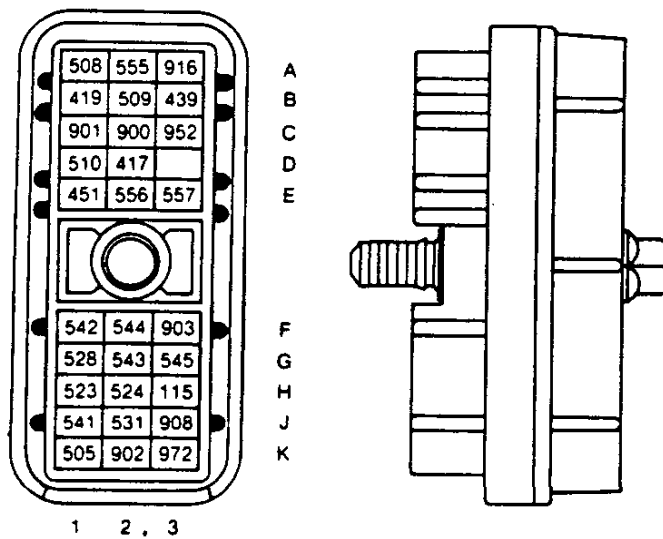
TROUBLESHOOTING CHARTS

D. CHART 20 - TWO SPEED GOVERNOR (TSG) SWITCH INOPERATIVE

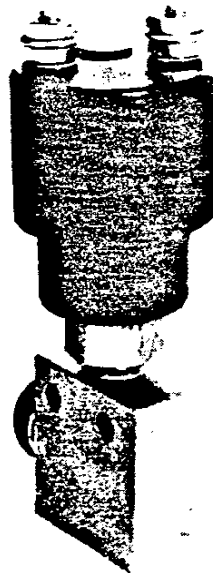
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C20-1 Verify TSG Switch Operation <ul style="list-style-type: none"> • Turn ignition on. • Plug the DDR into the 12 pin, DDL connector. • Select Mode 31 (MISC STATUS) and observe TWO SPD GOVR display. • Select Mode 29 (MISC SWITCHES) and observe HIGH GEAR SW line display in lower gears. • Also shift to top gear and again observe the DDR display. 	DDR reads —————→ "OFF" in lower gears and "OFF" in top gear.	Go to C20-2.
	DDR reads —————→ "OFF" in lower gears and "ON" in top gear.	Go to C20-4.
	DDR reads —————→ "ON" in lower gears and "ON" in top gear.	Go to C20-5.
C20-2 Check for Open <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Shift to top gear. • Read resistance on socket H1 of the vehicle harness connector to a good ground. 	Less than or —————→ equal to 5 ohms.	Go to C20-3.
	Greater than —————→ 5 ohms or open.	The Two Speed Governor line (ckt #523) or the TSG switch is open and/or the TSG switch is not properly grounding the TSG line. Repair, then go to C20-30.
C20-3 Check ECM Connectors <ul style="list-style-type: none"> • Check terminals at the vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets, especially H1 of the vehicle harness. 	Terminals and —————→ connectors are okay.	Replace ECM. Then go to C20-30.
	Problem found. —————→	Replace terminals/connectors. Then go to C20-30.



ECM Vehicle Harness Connector
P/N 12034398



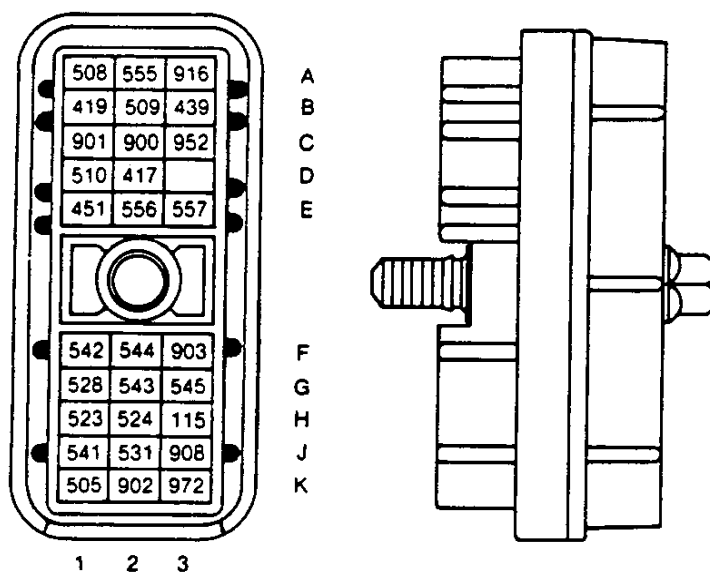
Two Speed Governor Switch

Section 4

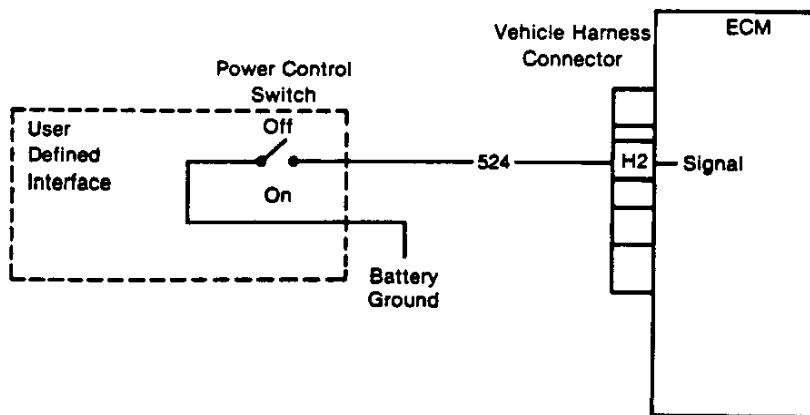
TROUBLESHOOTING CHARTS

D. CHART 20 - TWO SPEED GOVERNOR (TSG) SWITCH INOPERATIVE (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C20-4 Verify Complaint <ul style="list-style-type: none"> ● Drive vehicle while in lower gears and also when in top gear and note the top RPM achieved in each gear. 	<p>Top RPM is the same in top gear as in lower gears. →</p> <p>Top RPM is lower in top gear than in lower gears. →</p>	<p>Go to C20-5.</p> <p>System functioning properly. Problem is no longer there. See section C1-2 (page 35). If you cannot recreate the problem, go to START-1, page 17 to troubleshoot any other DDEC problems.</p>
C20-5 Check for Short <ul style="list-style-type: none"> ● Turn ignition off. ● Disconnect the vehicle harness connector at the ECM. ● Shift to any gear except top gear. ● Read resistance on socket H1 of the vehicle harness connector to a good ground. 	<p>Less than or equal 10,000 ohms. →</p> <p>Greater than 10,000 ohms or open. →</p>	<p>The Two Speed Governor to line (ckt #523) or the TSG switch is shorted to ground. Repair short. Then go to C20-30.</p> <p>Go to C20-3.</p>
C20-30 Verify Repairs <ul style="list-style-type: none"> ● Reconnect all connectors. ● Turn ignition on. ● Clear codes. ● Drive vehicle while in lower gears and also when in top gear and note the top RPM achievable in all cases. ● Stop engine. 	<p>Top RPM is the same in top gear as in lower gears. →</p> <p>Top RPM is lower in top gear than in lower gears. →</p>	<p>All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>Repairs are complete.</p>



ECM Vehicle Harness Connector
P/N 12034398



Power Control Circuit

Section 4

TROUBLESHOOTING CHARTS

D. CHART 21 - THROTTLE INHIBIT ALWAYS ON

NOTE — This chart is only to be used if:

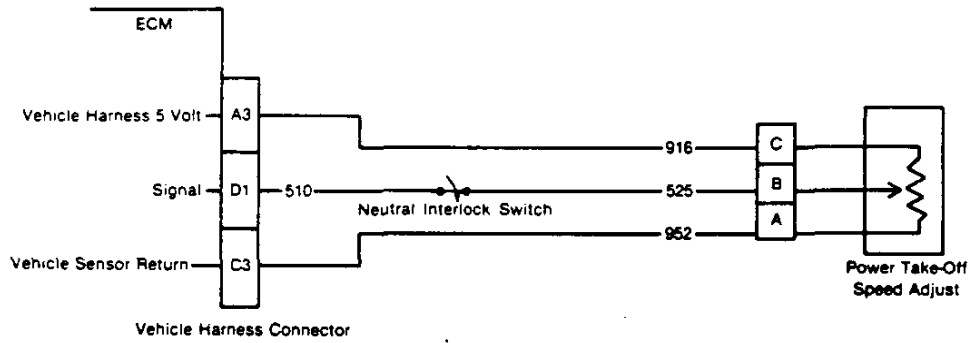
- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C21-1 Test Throttle Inhibit Feature <ul style="list-style-type: none"> • Start and run engine. • Plug DDR into the 12 pin DDL connector and select Mode 29 (MISC SWITCHES) for display. • Place vehicle in condition where throttle inhibit is supposed to occur and observe DDR display line labeled "POWER CTL SW" (on coaches, this occurs when a passenger door is open). • Then place vehicle in condition where throttle inhibit is <u>not</u> supposed to occur and observe DDR display. 	<p>DDR display —————→ reads "ON" always.</p> <p>DDR display —————→ reads "ON", then "OFF".</p>	<p>Go to C21-2.</p> <p>Go to C21-4.</p>
C21-2 Check for Short <ul style="list-style-type: none"> • Place vehicle in condition where throttle inhibit will not occur and observe DDR display (Mode 29). • Turn ignition off. • Disconnect the vehicle harness. • Read resistance between pins H2 of the vehicle harness connector and a good ground. 	<p>Less than or —————→ equal to 5 ohms.</p> <p>Greater than —————→ 5 ohms or open.</p>	<p>Either the Power Control Switch is shorted or ckt #524 is shorted to ground. Repair short. Go to C21-30.</p> <p>Go to C21-3.</p>
C21-3 Check ECM Connectors <ul style="list-style-type: none"> • Turn ignition off (if still on). • Disconnect the vehicle harness connector at the ECM (if not already disconnected). • Check terminals at the vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets, especially H2 of the vehicle harness. 	<p>Terminals and —————→ connectors are okay.</p> <p>Problem found. —————→ Connectors are okay.</p>	<p>Replace ECM. Then go to C21-30.</p> <p>Repair terminals/connectors. Then go to C21-30.</p>

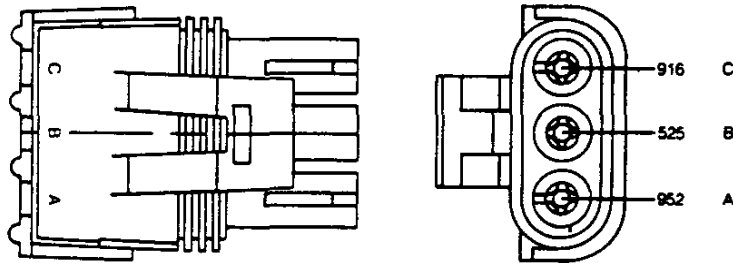
Section 4 TROUBLESHOOTING CHARTS

D. CHART 21 - THROTTLE INHIBIT ALWAYS ON (Cont'd.)

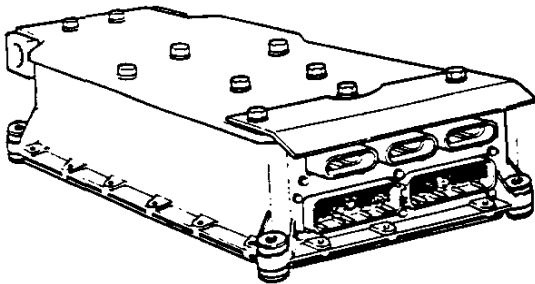
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
C21-4 Check TPS <ul style="list-style-type: none"> • Replace vehicle harness connector. • Hook up DDR to the 12-pin DDL connector and select Throttle Sensor display. • Read throttle counts at both no throttle and full throttle. 	Getting 20-30 counts at no throttle and 200-235 counts at full throttle.	Go to C21-3.
	Throttle counts do not change.	Replace TPS. Go to C21-30.
C21-30 Verify Repairs <ul style="list-style-type: none"> • (Note: if the Power Control input is being used for engine protection, you will not be able to confirm repair unless the engine protection function can be triggered). • Connect connectors to ECM. • Start and run engine. • Select Mode 29 on DDR for display. • Recreate conditions under which the Power Control input should be grounded, and observe DDR display labelled "POWER CTL SW". 	DDR display reads "OFF".	All system diagnostics are complete. Please review this section from the first step to find the error.
	DDR display reads "ON".	Repairs are complete.



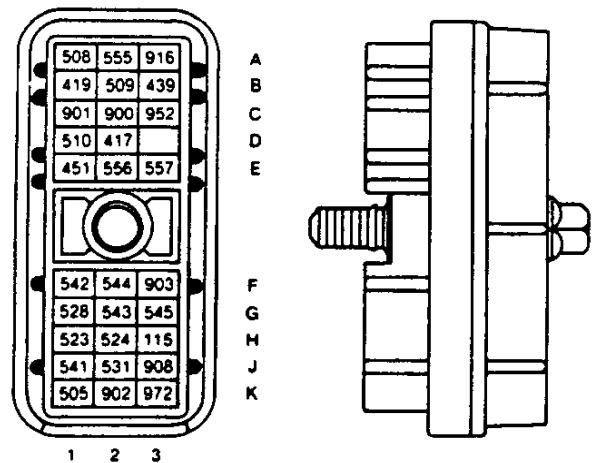
Power Take-Off Speed Adjust Circuit



Power Take-Off Speed Adjust
Harness Connector
P/N 12015793



Electronic Control Module (ECM)



ECM Vehicle Harness Connector
P/N 12034398

Section 4

TROUBLESHOOTING CHARTS

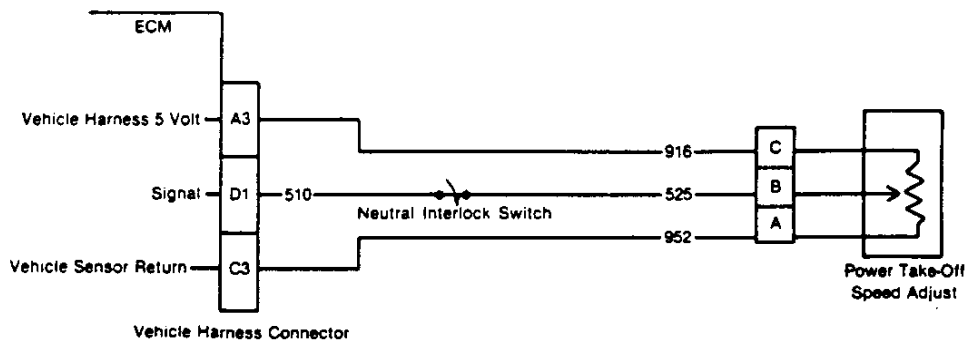
E. CODE 11 - POWER TAKE-OFF SPEED ADJUST (PTOSA) SIGNAL VOLTAGE LOW

NOTE — This chart is only to be used if:

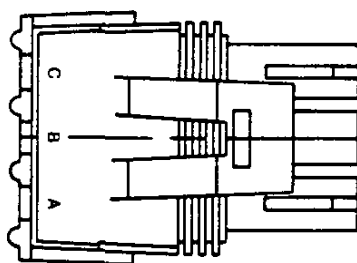
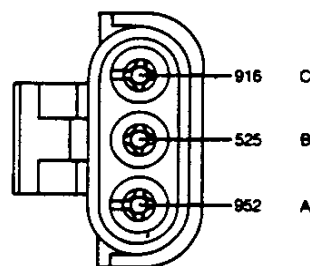
- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

When Mode 02 (Historical Codes) is displayed on the DDR, additional audit trail information is also shown. For an understanding of this information, refer to the example given in the Code 85.

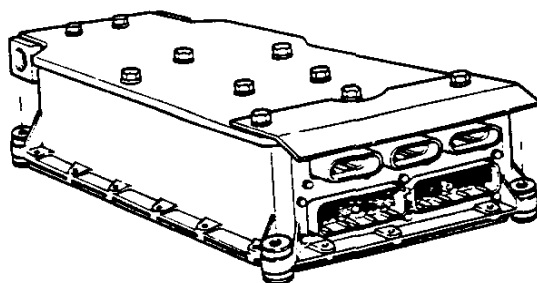
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
11-1 Multiple Code Check <ul style="list-style-type: none"> Were there any other active codes besides Code 11? 	No other active codes.	Go to 11-2.
	Yes, any or all of the following active codes: 12, 21, 22.	Go to VEH5V-1, page 373.
	Yes - but none of the above.	Go to 11-2.
11-2 Sensor Check <ul style="list-style-type: none"> Turn ignition off. Disconnect PTOSA connector. Install a jumper wire between sockets B and C of the TPS harness connector. Turn ignition on. Read active codes. 	Code 12 (and/or other codes).	Go to 11-6.
	Code 11 (and any other codes).	Go to 11-3.
11-3 Check PTOSA Adjustment <ul style="list-style-type: none"> Remove jumper and reconnect PTOSA. Hook-up DDR to the 12 pin DDL connector and PTO counts (Mode 21). Read counts. 	Getting 20 to 235 counts.	Go to 11-5.
	Not getting the above readings.	Go to 11-4.
11-4 Attempt PTOSA Adjustment <ul style="list-style-type: none"> If a variable PTOSA is installed, adjust stops on PTOSA. If fixed resistors are installed replace with new resistors. 	Corrected problem so that Throttle Counts is now correct.	Go to 11-30.
	Could not correct the problem.	Go to 11-5.



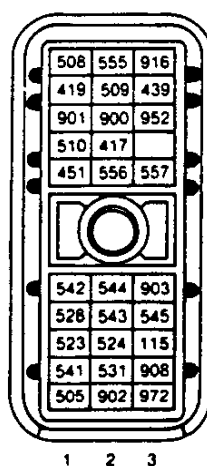
Power Take-Off Speed Adjust Circuit



Power Take-Off Speed Adjust
Harness Connector
P/N 12015793

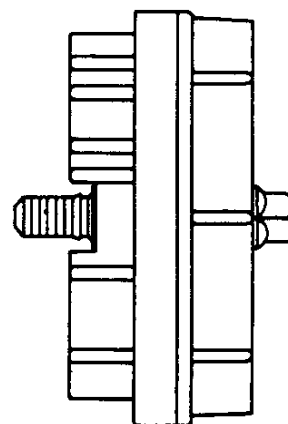


Electronic Control Module (ECM)



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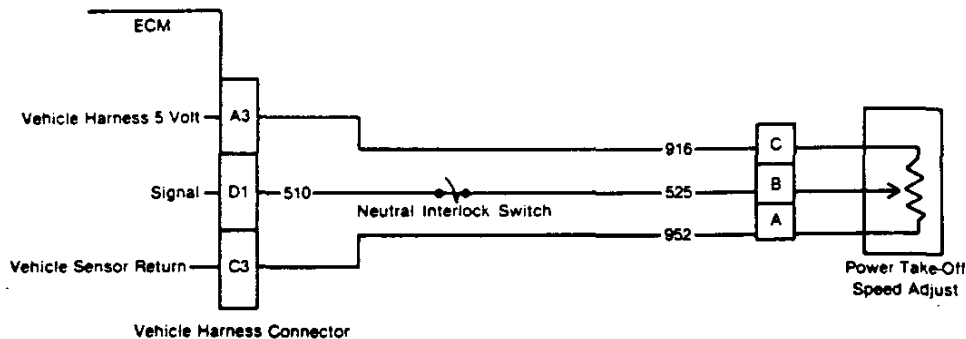
ECM Vehicle Harness Connector
P/N 12034398

Section 4

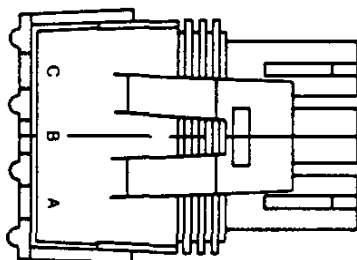
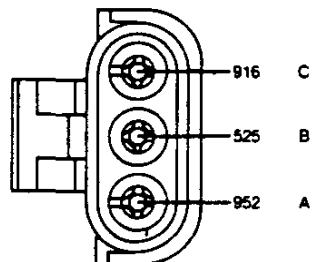
TROUBLESHOOTING CHARTS

E. CODE 11 - POWER TAKE-OFF SPEED ADJUST (PTOSA) SIGNAL VOLTAGE LOW (Cont'd.)

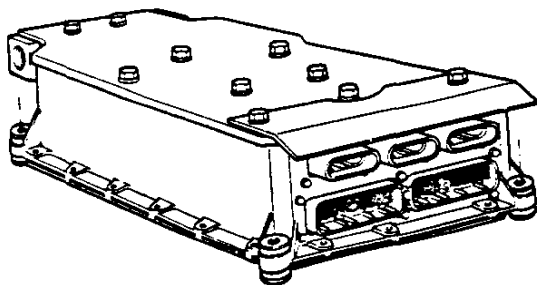
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
11-5 Check PTOSA Connectors <ul style="list-style-type: none"> Inspect terminals at the PTOSA connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace PTOSA. Then go to 11-30. Repair terminals/connectors. Then go to 11-30.
11-6 Check for + 5 Volts <ul style="list-style-type: none"> Remove jumper. Turn ignition on. Read voltage on PTOSA harness connector, socket C (red lead) to socket A (black lead). 	Between 4 to 6 volts. → Less than 4 volts. → Greater than 6 volts. →	Go to 11-7. Go to 11-10. Go to 11-12.
11-7 Check for Short <ul style="list-style-type: none"> Turn ignition off. Disconnect the vehicle harness connector at ECM. Read resistance between sockets A and B on the PTOSA harness connector. 	Less than or equal to 10,000 ohms. → Greater than 10,000 ohms or open. →	Signal line (ckt #525) is shorted to the return line (ckt #952). Repair short. Then go to 11-30. Go to 11-8.
11-8 Check for Signal Open <ul style="list-style-type: none"> Install a jumper wire between sockets A and B of the PTOSA harness connector. Read resistance between sockets D1 and C3 on the vehicle harness connector. 	Less than or equal to 5 ohms. → Greater than 5 ohms or open. →	Go to 11-9. Signal line (ckt #525) is open, and/or signal return (ckt #952) is open. Repair open. If no open was found, check ECM terminals A3, D1, C3 and TPS pins. Then go to 11-30.



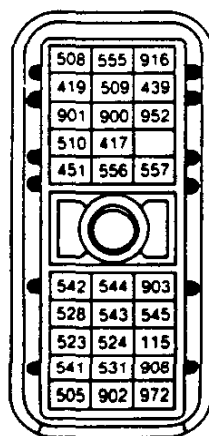
Power Take-Off Speed Adjust Circuit



Power Take-Off Speed Adjust
Harness Connector
P/N 12015793

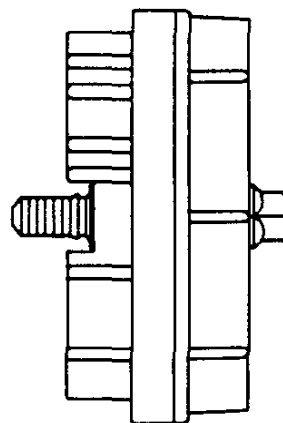


Electronic Control Module (ECM)



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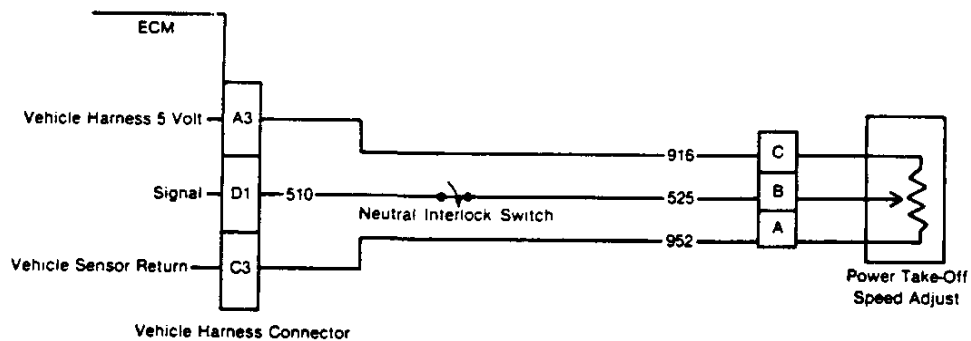
1 2 3

ECM Vehicle Harness Connector
P/N 12034398

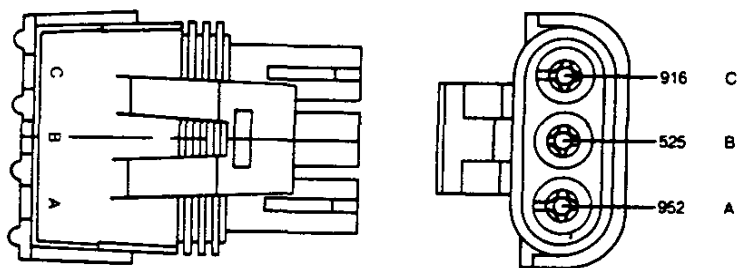
Section 4 TROUBLESHOOTING CHARTS

E. CODE 11 - POWER TAKE-OFF SPEED ADJUST (PTOSA) SIGNAL VOLTAGE LOW (Cont'd.)

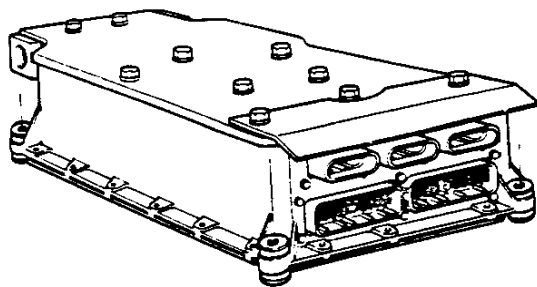
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
11-9 Check ECM Connectors <ul style="list-style-type: none"> • Check terminals at the ECM vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace ECM. Then go to 11-30. Repair terminals/connectors. Then go to 11-30.
11-10 Check for Short <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Read resistance between sockets A and C on the PTOSA harness connector. 	Less than or equal to 10,000 ohms. → Greater than 10,000 ohms or open. →	The vehicle + 5 Volt line (ckt #916) is shorted to the return line (ckt #952). Repair short. Then go to 11-30. Go to 11-11.
11-11 Check Check for Open + 5 Volt Line <ul style="list-style-type: none"> • Install a jumper wire between sockets A and C of the PTOSA harness connector. • Read resistance between sockets A3 and C3 on the vehicle harness connector. 	Less than or equal to 5 ohms. → Greater than 5 ohms or open. →	Go to 11-9. The vehicle + 5 Volt line (ckt #916) is open. Repair open. Then go to 11-30.
11-12 Check for Short to Battery + <ul style="list-style-type: none"> • Turn ignition off. • Remove both fuses to the ECM. • Disconnect 6-way power connector at the ECM. • Read resistance between sockets D1 and B3 on the vehicle harness connector. • Also read resistance between socket D1 on the vehicle harness connector and the following sockets on the 6 way power connector: C, D, E and F. 	All readings are greater than 10,000 ohms or open. → Any reading is less than or equal to 10,000 ohms. →	Go to 11-13. A short exists between sockets where less than 10,000 ohms resistance was read. Repair short and reinsert fuses. Then go to 11-30.



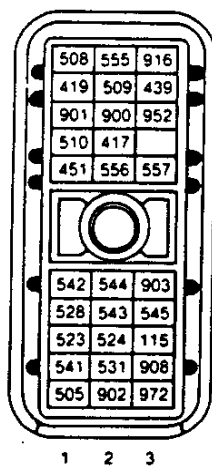
Power Take-Off Speed Adjust Circuit



Power Take-Off Speed Adjust
Harness Connector
P/N 12015793

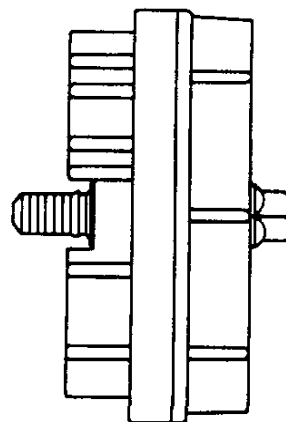


Electronic Control Module (ECM)



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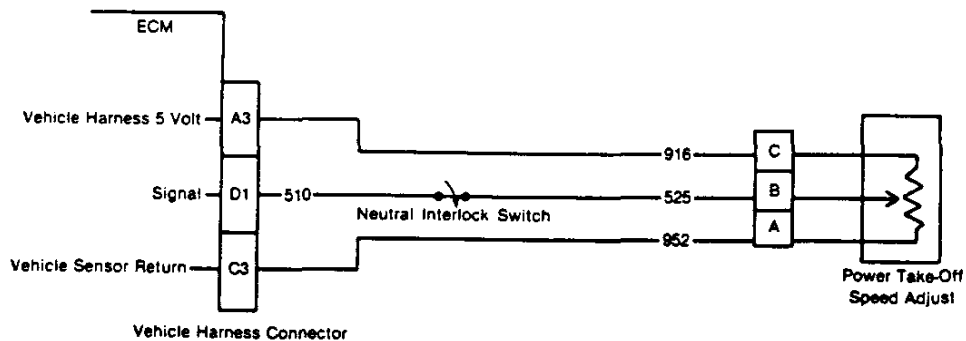
ECM Vehicle Harness Connector
P/N 12034398

Section 4

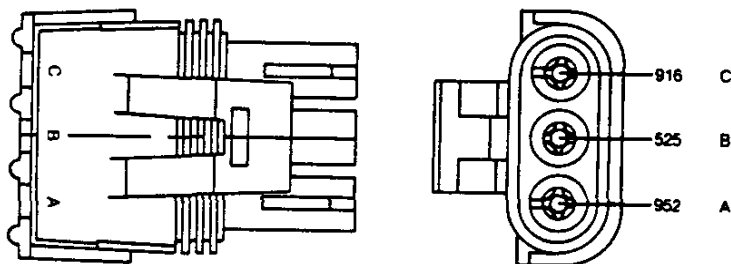
TROUBLESHOOTING CHARTS

E. CODE 11 - POWER TAKE-OFF SPEED ADJUST (PTOSA) SIGNAL VOLTAGE LOW (Cont'd.)

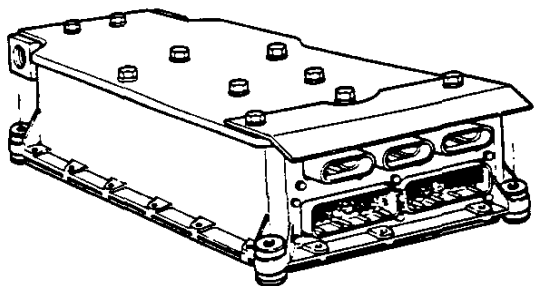
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
11-13 Check for Outside DDEC Battery + <ul style="list-style-type: none"> • Turn ignition off. • Remove ECM 6-pin power connector. • Remove ECM vehicle harness. • Turn ignition on. • Read voltage A3 (red lead) to a good ground (black lead). • Read voltage C3 (red lead) to a good ground (black lead). 	<p>All readings less than 4.0 volts. →</p> <p>Either reading greater than or equal to 4.0 volts. →</p>	<p>Go to 11-9.</p> <p>Outside power is spliced into either ckt #952 or ckt #916. Remove splice. Then go to 11-30.</p>
11-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. • Stop engine. • Read all codes. 	<p>Code 25 (no codes). →</p> <p>Code 11 (and any other codes). →</p> <p>Any other codes except Code 11. →</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>Go to START-1, page 17, to service other codes.</p>



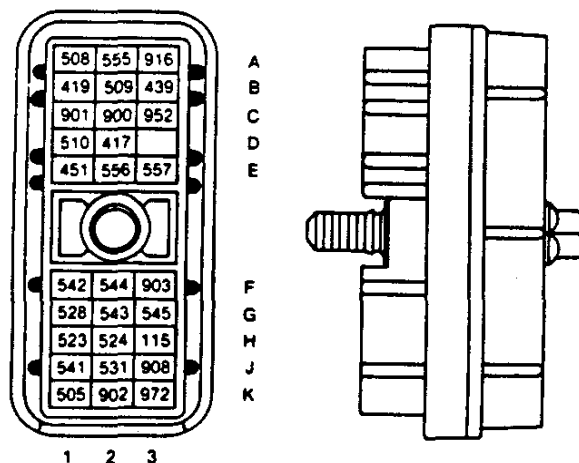
Power Take-Off Speed Adjust Circuit



Power Take-Off Speed Adjust
Harness Connector
P/N 12015793



Electronic Control Module (ECM)



ECM Vehicle Harness Connector
P/N 12034398

Section 4

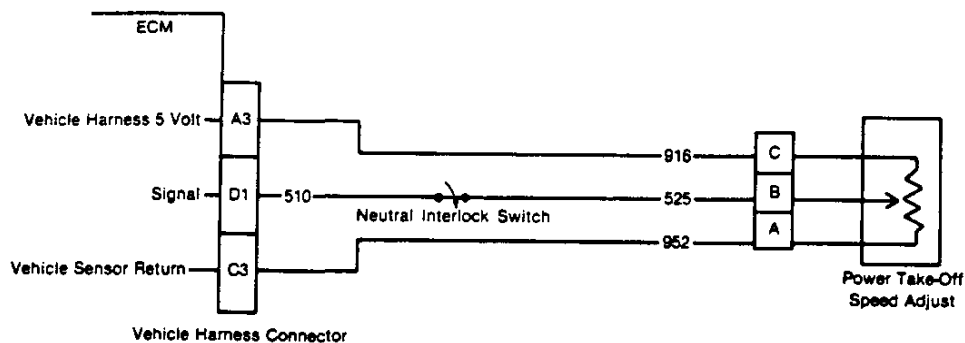
TROUBLESHOOTING CHARTS

E. CODE 12 - POWER TAKE-OFF SPEED ADJUST (PTOSA) SIGNAL VOLTAGE HIGH

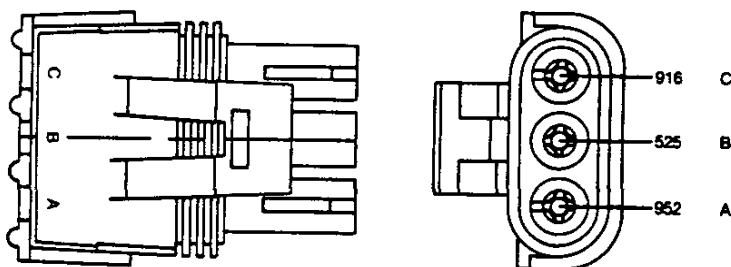
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

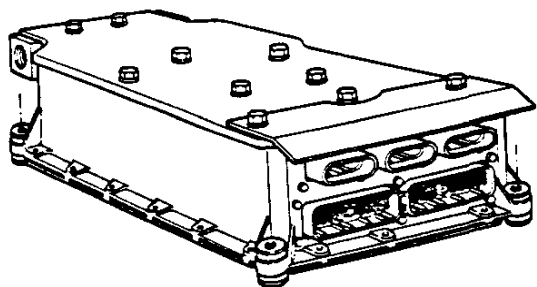
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
12-1 Multiple Code Check <ul style="list-style-type: none"> Were there any other active codes besides Code 12? 	No other active codes. → Yes, either code 21 or 22. → Yes - but not code 21 or 22. →	Go to 12-2. Go to VEHSV-1, page 373. Go to 12-2.
12-2 Sensor Check <ul style="list-style-type: none"> Turn ignition off. Unplug the PTOSA sensor connector. Turn ignition on. Read active codes (Mode 1). 	Any codes except Code 12. → Code 12 (and any other codes). →	Go to 12-3. Go to 12-5.
12-3 Return Circuit Check <ul style="list-style-type: none"> Transmission in neutral. Turn ignition off. Install a jumper wire between pin A and pin B of the PTOSA harness connector. Disconnect the vehicle harness connector at the ECM. Read resistance between sockets C3 and D1 on the vehicle harness connector. 	Less than or equal to 5 ohms. → Greater than 5 ohms or open. →	Go to 12-4. Return line (ckt #952) is open. Repair open. Then go to 12-30.
12-4 Check PTOSA Connectors <ul style="list-style-type: none"> Inspect terminals at the PTOSA connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Recalibrate PTOSA. If not recalibratable or does not fix problem then replace PTOSA sensor. Then go to 12-30. Repair terminals/connectors. Then go to 12-30.



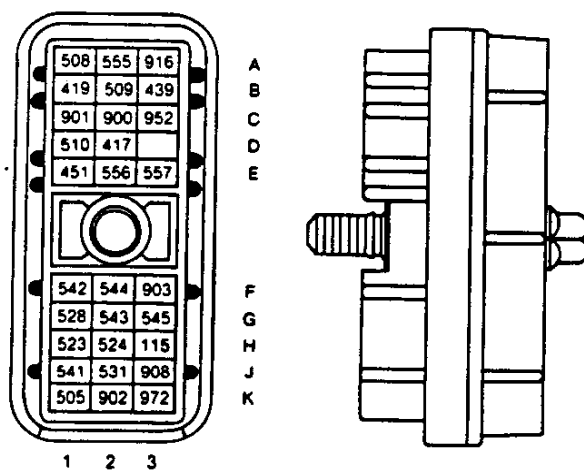
Power Take-Off Speed Adjust Circuit



Power Take-Off Speed Adjust
Harness Connector
P/N 12015793



Electronic Control Module (ECM)

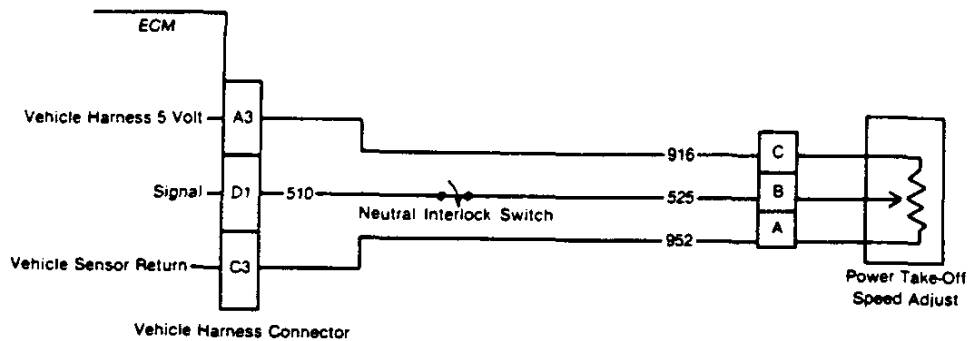


ECM Vehicle Harness Connector
P/N 12034398

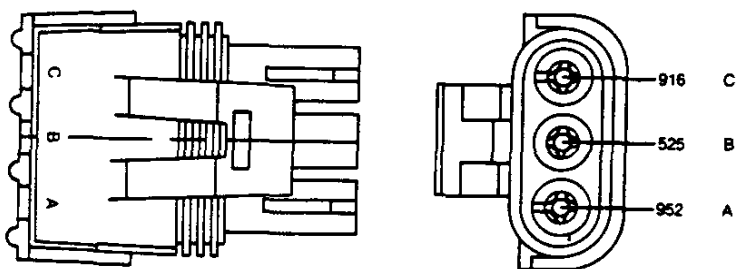
Section 4 TROUBLESHOOTING CHARTS

E. CODE 12 • POWER TAKE-OFF SPEED ADJUST (PTOSA) SIGNAL VOLTAGE HIGH (Cont'd.)

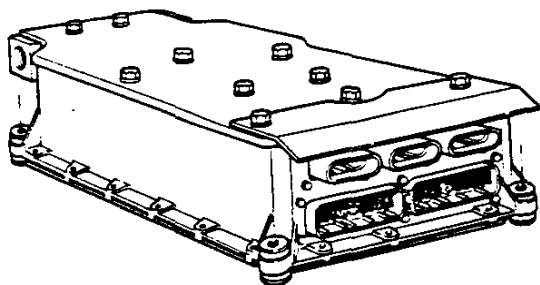
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
12-5 Check for Short to + 5 Volt Line <ul style="list-style-type: none"> • Connect all connectors to ECM. Turn ignition on. • Read voltage on PTOSA harness connector, pin B (red lead) to pin A (black lead). 	<p>Greater than 1.0 volts. →</p> <p>Less than or equal to 1.0 volts. →</p>	<p>Signal line (ckt #510 or #525) is shorted to the vehicle + 5 Volt line (ckt #916) or another voltage source. Repair short. Then go to 12-30.</p> <p>Go to 12-6.</p>
12-6 Check for Open <ul style="list-style-type: none"> • Connect all connectors to ECM. • Read voltage on PTOSA harness at Pin B (red lead) and Pin A (black lead) with ignition on. 	<p>Greater than 4.5 volts →</p> <p>Less than 4.5 volts →</p>	<p>Check for open in wire #952 between PTOSA and ECM. It may be a bad terminal in the ECM connector (C3). Repair and go to 12-30. If no problem was found, then go to 12-7.</p> <p>Go to 12-7.</p>
12-7 Check ECM Connectors <ul style="list-style-type: none"> • Disconnect the vehicle harness connector. • Check terminals at the ECM vehicle harness connector (both ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. 	<p>Terminals and connectors are okay. →</p> <p>Problem found. →</p>	<p>Replace ECM. Then go to 12-30.</p> <p>Repair terminals/connectors. Then go to 12-30.</p>



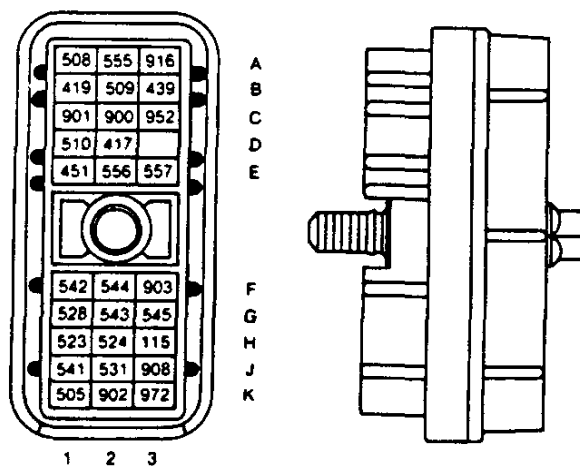
Power Take-Off Speed Adjust Circuit



Power Take-Off Speed Adjust
Harness Connector
P/N 12015793



Electronic Control Module (ECM)



ECM Vehicle Harness Connector
P/N 12034398

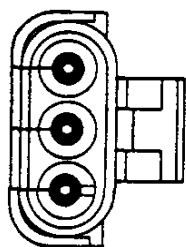
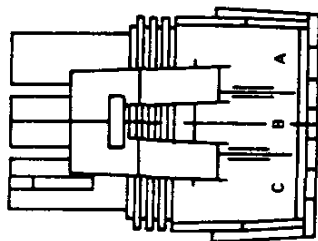
Section 4 TROUBLESHOOTING CHARTS

E. CODE 12 - POWER TAKE-OFF SPEED ADJUST (PTOSA) SIGNAL VOLTAGE HIGH (Cont'd.)

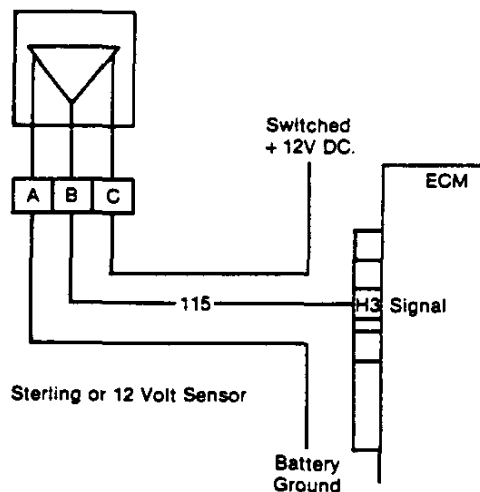
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
12-30 Verify Repairs		
<ul style="list-style-type: none"> ● Turn ignition off. ● Reconnect all connectors. ● Turn ignition on. ● Clear codes. ● Note status of "Check Engine" light. ● If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. Stop engine. ● Read historical codes. 	<p>Code 25 (no codes) →</p> <p>Code 12 (and any other codes) →</p> <p>Any other codes except Code 12. →</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>Go to START-1, page 17, to service other codes.</p>



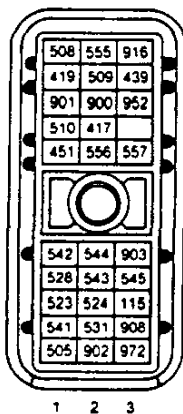
Coolant Level Sensor
(Sterling—12 Volt)



Sterling
Coolant Level Sensor
Harness Connector
P/N 12015795

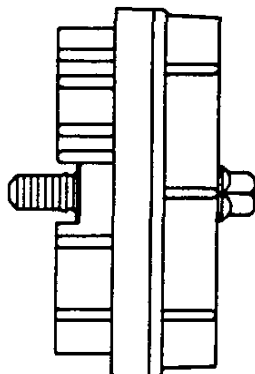


Coolant Level Sensor Circuit

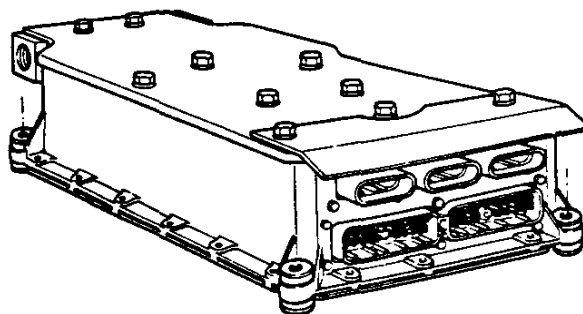


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ECM Vehicle Harness Connector
P/N 12034398



Electronic Control Module (ECM)

Section 4

TROUBLESHOOTING CHARTS

E. CODE 13 - COOLANT LEVEL SENSOR (CLS) SIGNAL VOLTAGE LOW

NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

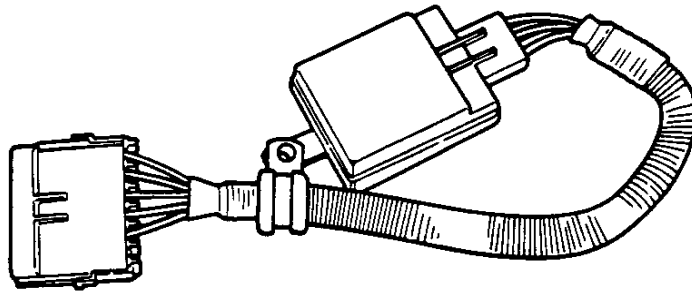
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
13-1 Sensor Check <ul style="list-style-type: none"> • Turn ignition off. • Disconnect CLS. • Turn ignition on. • Start engine. • Read active codes. • Stop engine. 	Code 16 (and any other codes). → Code 13 (and any other codes). →	Go to 13-2. Go to 13-3.
13-2 Check CLS Connectors <ul style="list-style-type: none"> • Inspect terminals at the CLS connectors (sensor side and harness side) for damage: bent, corroded, and unseated pins or sockets. • Be sure the connector is pinned properly. 	Terminals and connectors are okay. → Problem found. →	Replace CLS. Then go to 13-30. Repair terminals/connectors. Then go to 13-30.
13-3 Check for Short to Return Line <ul style="list-style-type: none"> • Turn ignition off. • Disconnect vehicle harness connector at the ECM. • Read resistance between sockets A and B on the CLS harness connector. 	Less than or equal to 10,000 ohms. → Greater than 10,000 ohms or open. →	Signal line (ckt #115) is shorted to the CLS return line. Repair short. Then go to 13-30. Go to 13-4.
13-4 Check for Open <ul style="list-style-type: none"> • Turn ignition off. • Disconnect vehicle harness. • Measure resistance between socket B of the CLS connector and H3 of the ECM connector. 	Less than or equal to 5 ohms. → Greater than 5 ohms. →	Go to 13-5. Ckt #115 has an open. Repair open. Then go to 13-30.

Section 4

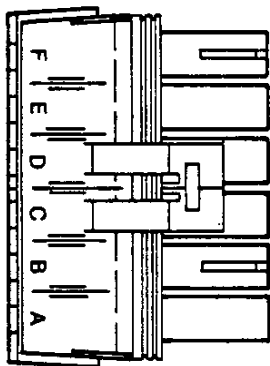
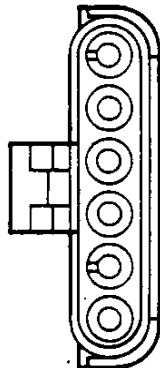
TROUBLESHOOTING CHARTS

E. CODE 13 - COOLANT LEVEL SENSOR (CLS) SIGNAL VOLTAGE LOW (Cont'd.)

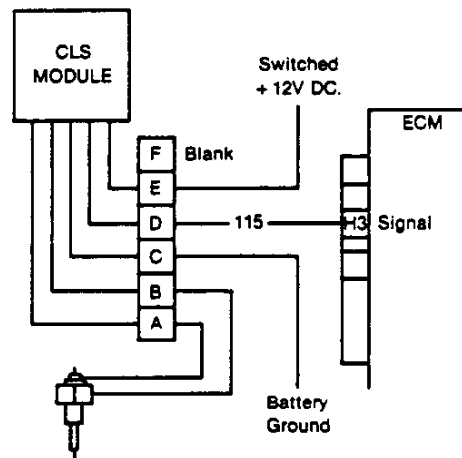
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
13-5 Check ECM Connectors <ul style="list-style-type: none"> Check terminals at the vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and connectors are okay.	Replace ECM. Then go to 13-30.
	Problem found.	Repair terminals/connectors. Then go to 13-30.
13-30 Verify Repairs <ul style="list-style-type: none"> Turn ignition off. Reconnect all connectors. Turn ignition on. Clear codes. Start engine. Note status of "Check Engine" light. If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. Stop engine. Read historical codes. Stop engine. 	Code 25 (no codes).	Repairs are complete.
	Code 13 (and any other codes).	All system diagnostics are complete. Please review this section from the first step to find the error.
	Any other codes except Code 13.	Go to START-1, page 17, to service other codes.



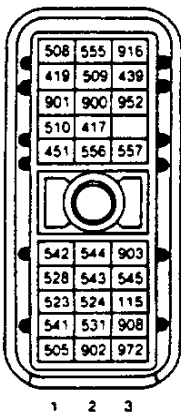
Coolant Level Sensor
P/N 23503507



ECM Vehicle Harness Connector
P/N 12015799

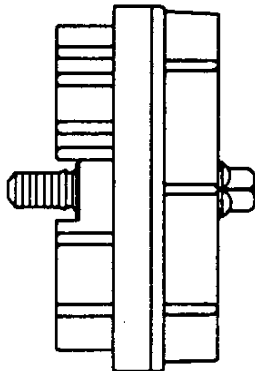


Coolant Level Sensor Circuit

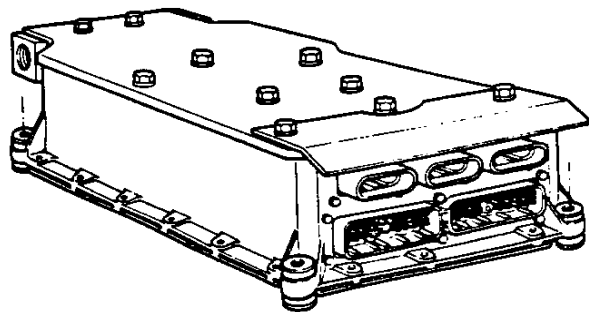


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ECM Vehicle Harness Connector
P/N 12034398



Electronic Control Module (ECM)

Section 4

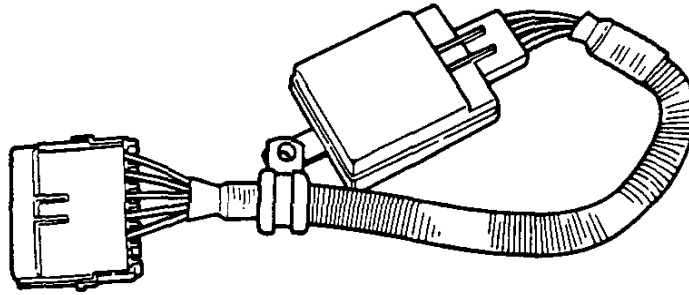
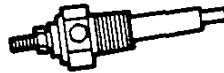
TROUBLESHOOTING CHARTS

E. CODE 13 - TWO-PIECE (DDC P/N 23503507) COOLANT LEVEL SENSOR (CLS) SIGNAL VOLTAGE LOW

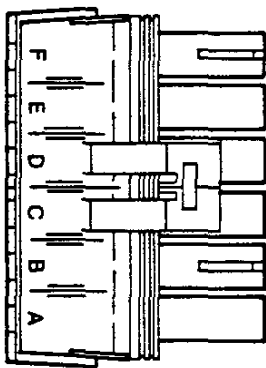
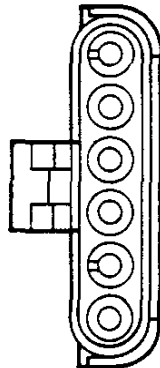
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

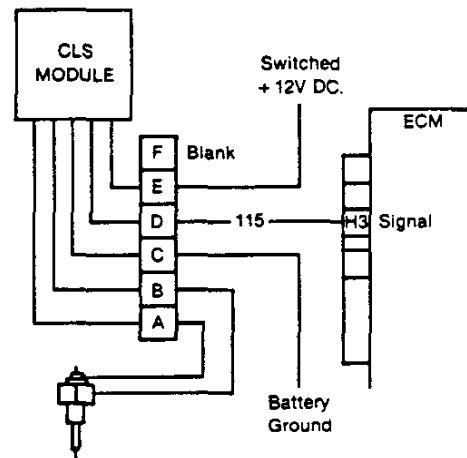
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
13-1 Sensor Check <ul style="list-style-type: none"> • Turn ignition off. • Disconnect CLS. • Turn ignition on. • Start engine. • Read active codes. • Stop engine. 	Code 16 (and any other codes). → Code 13 (and any other codes). →	Go to 16-1. Go to 13-3.
13-2 Check CLS Connectors <ul style="list-style-type: none"> • Inspect terminals at the CLS connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace CLS module. Then go to 13-30. Repair terminals/connectors. Then go to 13-30.
13-3 Check for Short to Return Line <ul style="list-style-type: none"> • Turn ignition off. • Disconnect vehicle harness connector at the ECM. • Read resistance between sockets C and D on the ECM side of the CLS harness connector. 	Less than or equal to 10,000 ohms. → Greater than 10,000 ohms or open. →	Signal line (ckt #115) is shorted to the CLS return line. Repair short. Then go to 13-30. Go to 13-2.



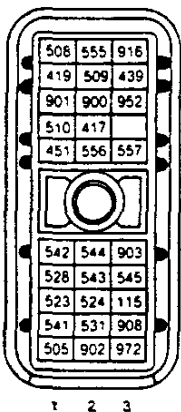
Coolant Level Sensor
P/N 23503507



ECM Vehicle Harness Connector
P/N 12015799

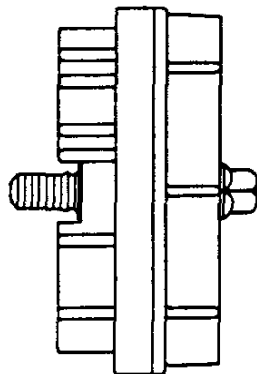


Coolant Level Sensor Circuit

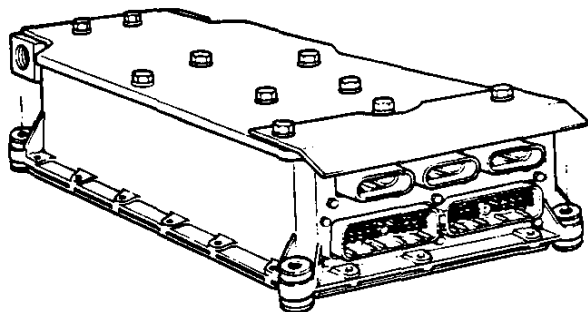


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ECM Vehicle Harness Connector
P/N 12034398



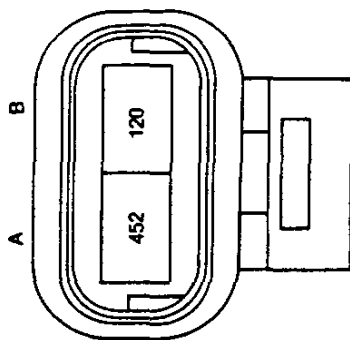
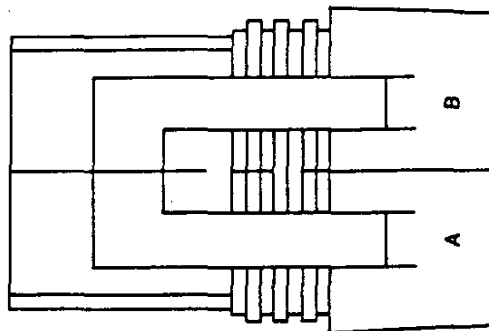
Electronic Control Module (ECM)

Section 4

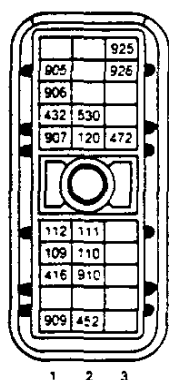
TROUBLESHOOTING CHARTS

E. CODE 13 - TWO-PIECE (DDCP/N23503507) COOLANT LEVEL SENSOR (CLS) SIGNAL VOLTAGE LOW (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
13-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Start engine. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. Stop engine. • Read historical codes. • Stop engine. 	<p>Code 25 (no codes) →</p> <p>Code 13 (and any other codes) →</p> <p>Any other codes except Code 13. →</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>Go to START-1, page 17, to service other codes.</p>

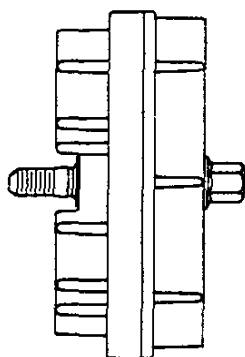


Oil or Coolant Temperature Sensor
Harness Connector
P/N 12040753

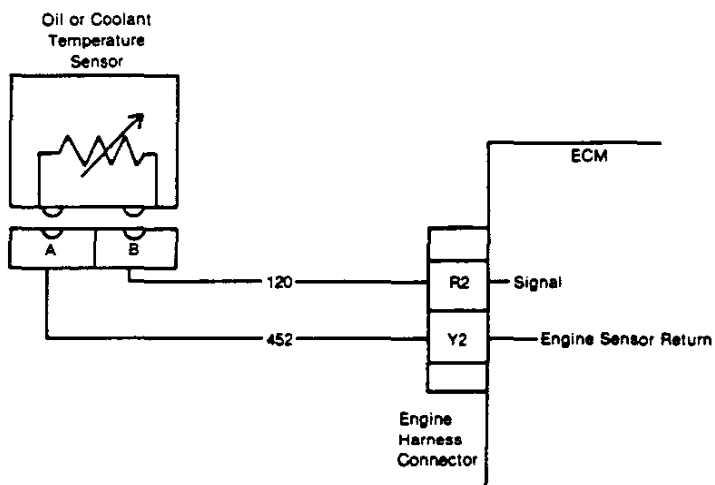


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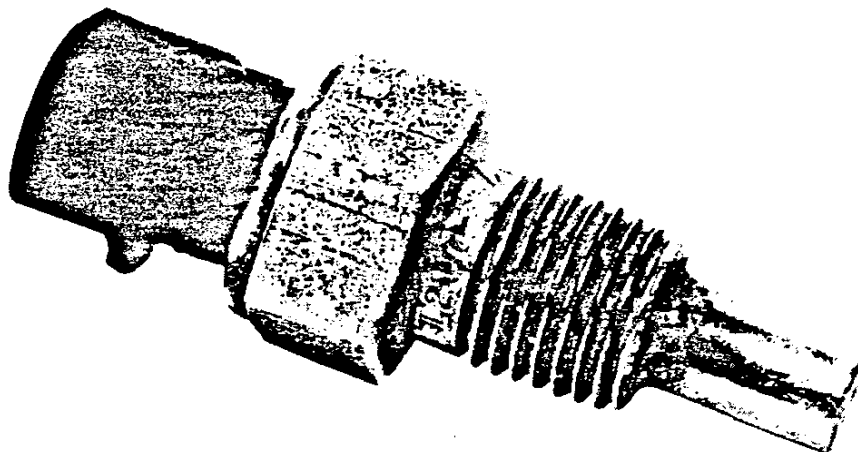
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ECM Engine Harness Connector
P/N 12034400



Oil or Coolant Temperature Circuit



Oil or Coolant Temperature Sensor
(OTS/CTS)
P/N 25036693

Section 4

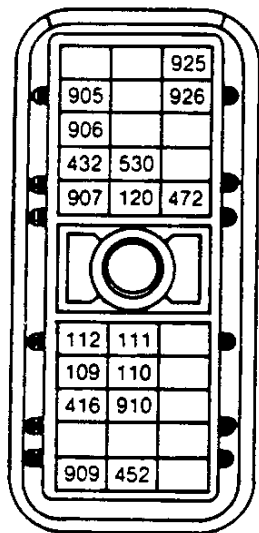
TROUBLESHOOTING CHARTS

E. CODE 14 - OIL OR COOLANT TEMPERATURE SENSOR (OTS OR CTS) SIGNAL VOLTAGE HIGH

NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

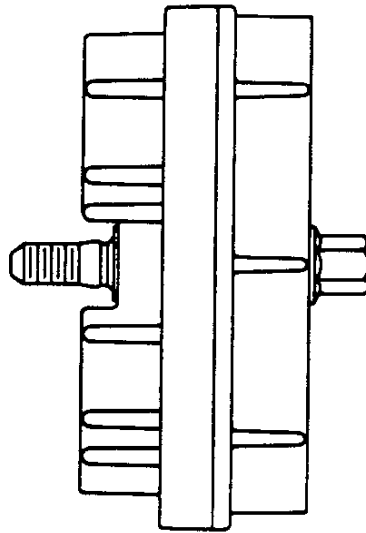
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
14-1 Sensor Check <ul style="list-style-type: none"> • Turn ignition off. • Disconnect OTS or CTS and install a jumper between the OTS or CTS connector sockets A and B. • Turn ignition on. • Read active codes. 	Code 15 (or any codes except Code 14). → Anything except Code 15. →	Go to 14-2. Go to 14-4.
14-2 Check for Short to + 5 Volt Line <ul style="list-style-type: none"> • Turn ignition off. • Remove jumper wire. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets R2 and W1 on the engine harness connector. 	Less than or equal to 10,000 ohms. → Greater than 10,000 ohms or open. →	Signal line (ckt #120) is shorted to the engine + 5 Volt line (ckt #416), and/or (ckt #120) signal line is shorted to ground and/or sensor return (ckt #452). Repair short. Then go to 14-30. Go to 14-3.
14-3 Check OTS or CTS Connectors <ul style="list-style-type: none"> • Inspect terminals at the OTS or CTS connectors (both the sensor and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace OTS or CTS. Then go to 14-30. Repair terminals/connectors. Then go to 14-30.
14-4 Open line Check <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets R2 and Y2 on the engine harness connector. 	Less than or equal to 5 ohms. → Greater than 5 ohms or open. →	Go to 14-5. Signal line (ckt #120) or return line (ckt #452) is open. Repair open. Then go to 14-30.



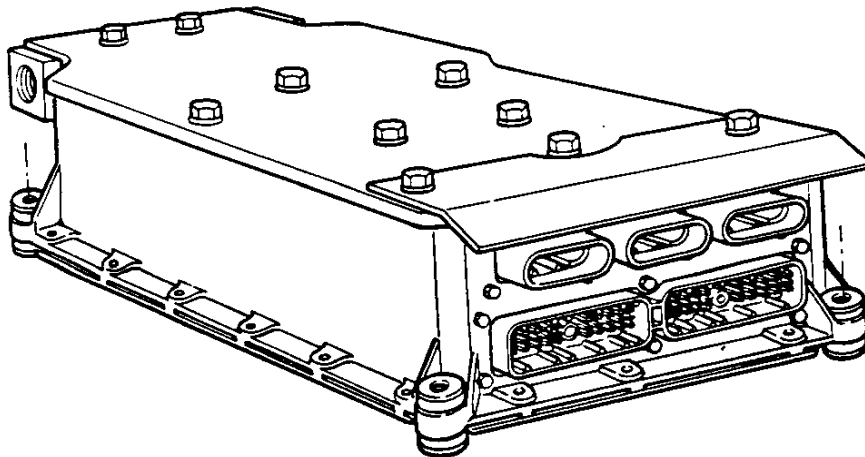
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ECM Engine Harness Connector
P/N 12034400



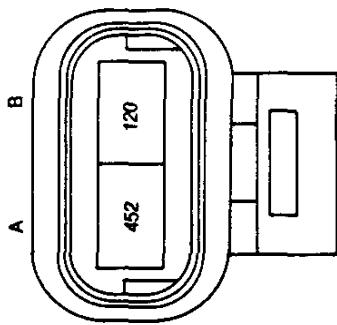
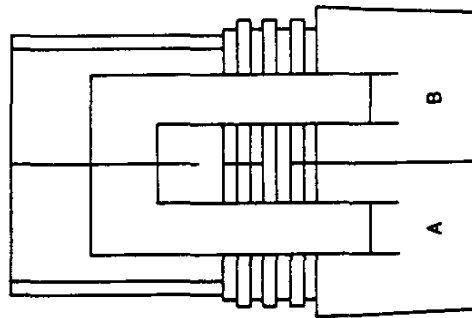
Electronic Control Module (ECM)

Section 4

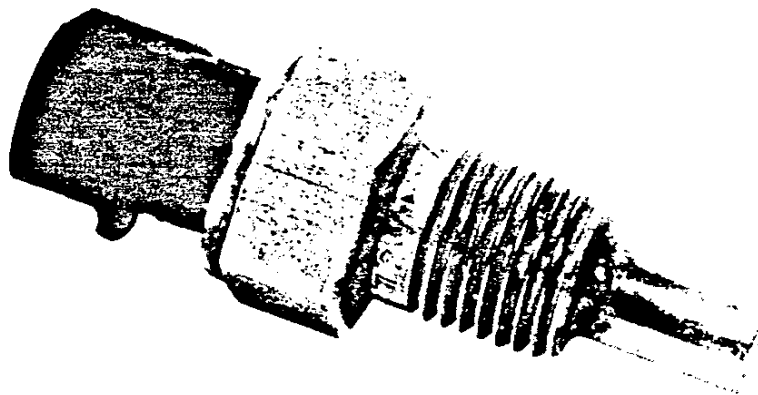
TROUBLESHOOTING CHARTS

E. CODE 14 - OIL OR COOLANT TEMPERATURE SENSOR (OTS OR CTS) SIGNAL VOLTAGE HIGH (Cont'd.)

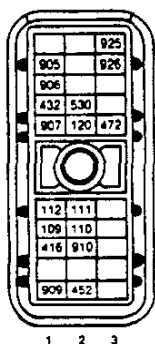
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
14-5 Check ECM Connectors <ul style="list-style-type: none"> • Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace ECM. Then go to 14-30. Repair terminals/connectors. Then go to 14-30.
14-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or after 8 minutes. Stop engine. • Read historical codes. 	Code 25 (no codes). → Code 14 (and any other codes.) → Any other codes except Code 14. →	Repairs are complete. All system diagnostics are complete. Please review this section from the start to find the error. Go to START-1, page 17, to service other codes.



Oil or Coolant Temperature Sensor
Harness Connector
P/N 12040753

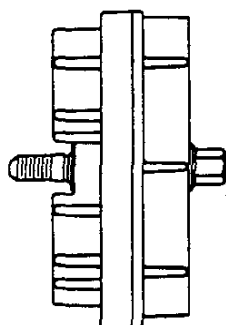


Oil or Coolant Temperature Sensor
(OTS/CTS)
P/N 25036693

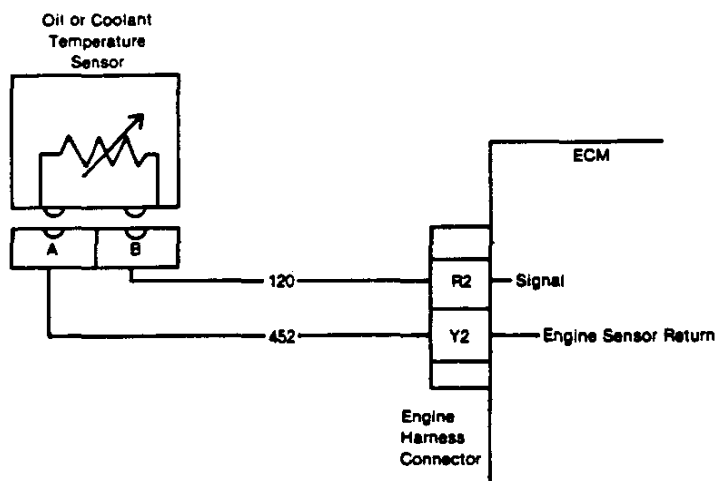


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ECM Engine Harness Connector
P/N 12034400



Oil or Coolant Temperature Circuit

Section 4

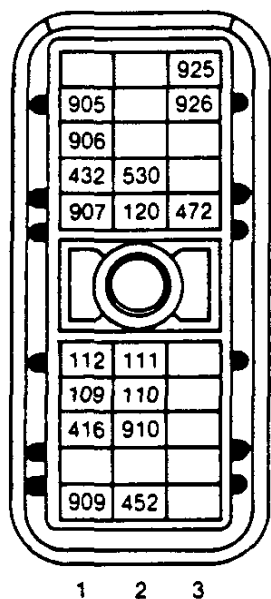
TROUBLESHOOTING CHARTS

E. CODE 15 - OIL OR COOLANT TEMPERATURE SENSOR (OTS OR CTS) SIGNAL VOLTAGE LOW

NOTE — This chart is only to be used if:

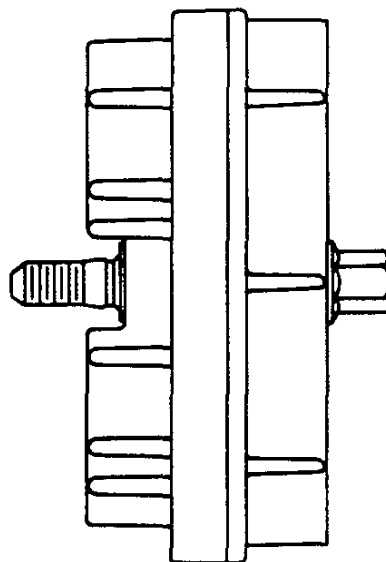
- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
15-1 Multiple Code Check <ul style="list-style-type: none"> Were there any other active codes besides Code 15? 	No other codes. —————→ Yes, any or all of the following codes: 14, 23-24, 33. —————→ Yes - but none of the above. —————→	Go to 15-2. Go to ENG5V-1, page 367. Go to 15-2.
15-2 Sensor Check <ul style="list-style-type: none"> Turn ignition off. Disconnect OTS or CTS connector. Start engine and run until "Check Engine" light comes on or after 8 minutes. Read active codes with engine still running. 	Any codes except Code 15. —————→ Code 15 (and any other codes). —————→	Go to 15-3. Go to 15-4.
15-3 Check OTS or CTS Connectors <ul style="list-style-type: none"> Inspect terminals at the OTS or CTS connectors (both the sensor and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and connectors are okay. —————→ Problem found. —————→	Replace OTS or CTS. Then go to 15-30. Repair terminals/connectors. Then go to 15-30.
15-4 Check for Short <ul style="list-style-type: none"> Turn ignition off. Disconnect engine harness connector at the ECM. Read resistance between sockets R2 and Y2 on the engine harness connector. 	Less than or equal to 10,000 ohms. —————→ Greater than 10,000 ohms or open. —————→	Signal line (ckt #120) is shorted to the return line (ckt #452). Repair short. Then go to 15-30. Go to 15-5.

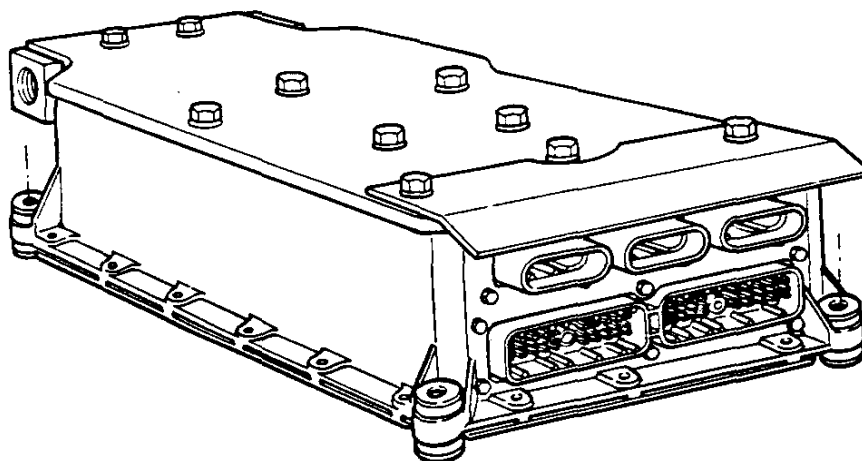


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ECM Engine Harness Connector
P/N 12034400



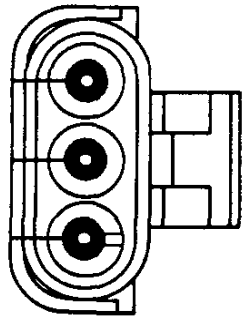
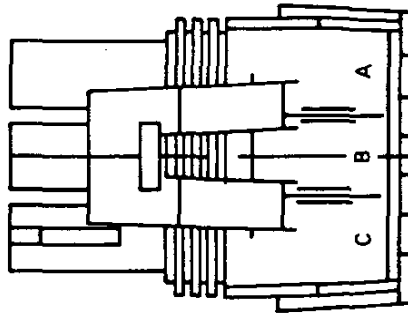
Electronic Control Module (ECM)

Section 4

TROUBLESHOOTING CHARTS

E. CODE 15 - OIL OR COOLANT TEMPERATURE SENSOR (OTS OR CTS) SIGNAL VOLTAGE LOW (Cont'd.)

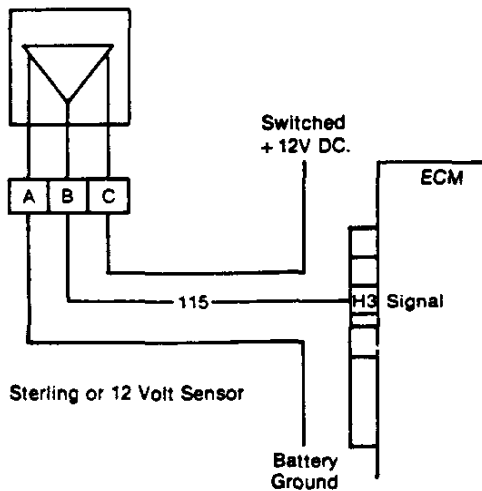
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
15-5 Check ECM Connectors <ul style="list-style-type: none"> Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. Especially terminals R2 and Y2 of the ECM connector. 	Terminals and connectors are okay. → Problem found. →	Replace ECM. Then go to 15-30. Repair terminals/connectors. Then go to 15-30.
15-30 Verify Repairs <ul style="list-style-type: none"> Turn ignition off. Reconnect all connectors. Turn ignition on. Clear codes. Note status of "Check Engine" light. If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or for 1 minute. Stop engine. Read historical codes. 	Code 25 (no codes). → Code 15 (and any other codes). → Any other codes except Code 15. →	Repairs are complete. All system diagnostics are complete. Please review this section from the start to find the error. Go to START-1, page 17, to service other codes.



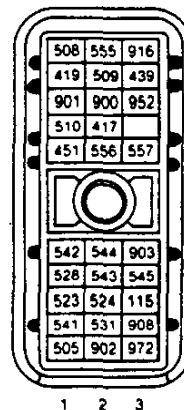
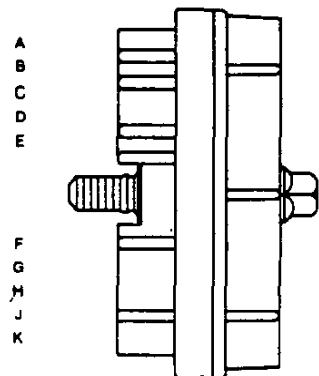
Sterling
Coolant Level Sensor
Harness Connector
P/N 12015795



Coolant Level Sensor
(Sterling—12 Volt)



Coolant Level Sensor Circuit



ECM Vehicle Harness Connector
P/N 12034398

Section 4

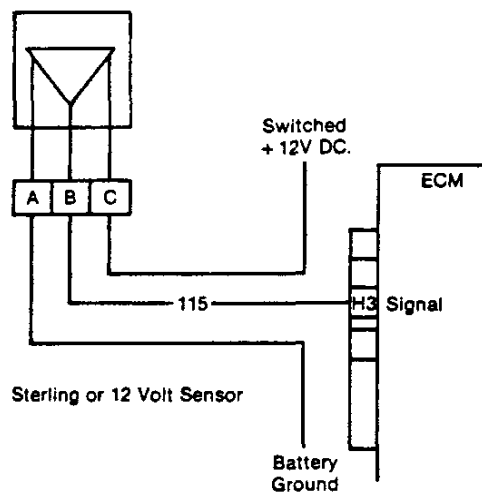
TROUBLESHOOTING CHARTS

E. CODE 16 - COOLANT LEVEL SENSOR (CLS) SIGNAL VOLTAGE HIGH

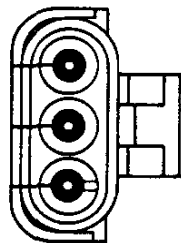
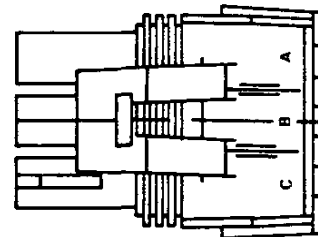
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

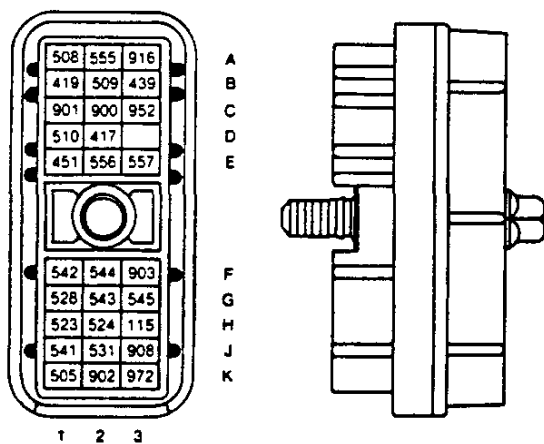
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
16-1 Sensor Check <ul style="list-style-type: none"> • Turn ignition off. • Disconnect CLS and install a jumper between sockets A and B of the CLS harness connector. • Attempt to start and run engine at idle. • Read active codes. • Stop engine. 	Engine will not start. → Go to 16-5. Code 16 (and any other codes except Code 13). → Go to 16-2. Code 13 (and any other codes). → Go to 16-3.	
16-2 Signal and Ground Circuit Check <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector. • Read resistance between socket H3 on the vehicle harness connector and a good ground. 	Less than or equal to 5 ohms. → Go to 16-7. Greater than 5 ohms or open. → Either the CLS signal line (ckt #115) or the battery ground line is open. Repair open. Then go to 16-30.	
16-3 Check CLS Ignition <ul style="list-style-type: none"> • Remove jumper wire. • Turn ignition on. • Read voltage at the CLS connector, socket C (read lead) to socket A (black lead). 	Less than or equal to 10.0 volts. → Between 4 and 6 volts, 12 volt line is wired to 5 volt supply. Else, the switched 12 volt line is open. Repair open. Then go to 16-30. Greater than 10 volts. → Go to 16-4.	
16-4 Check CLS Connectors <ul style="list-style-type: none"> • Inspect terminals at the CLS connectors (both the sensor and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and connectors are okay. → Replace CLS. Then go to 16-30. Problem found. → Repair terminals/connectors. Then go to 16-30.	



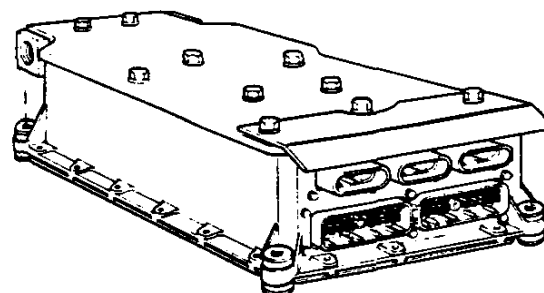
Coolant Level Sensor Circuit



Sterling
Coolant Level Sensor
Harness Connector
P/N 12015795



ECM Vehicle Harness Connector
P/N 12034398



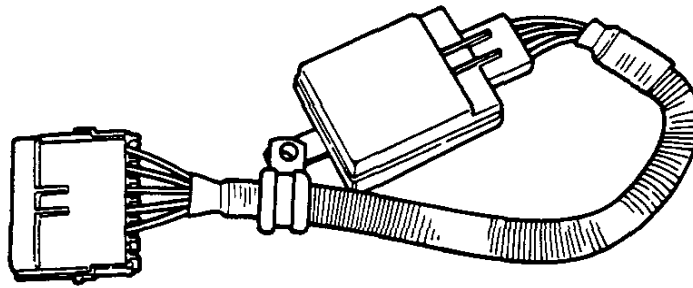
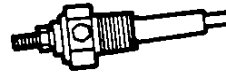
Electronic Control Module (ECM)

Section 4

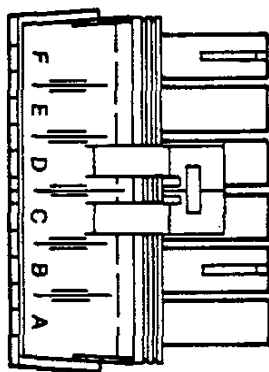
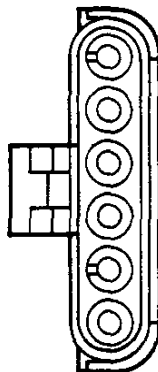
TROUBLESHOOTING CHARTS

E. CODE 16 - COOLANT LEVEL SENSOR (CLS) SIGNAL VOLTAGE HIGH (Cont'd.)

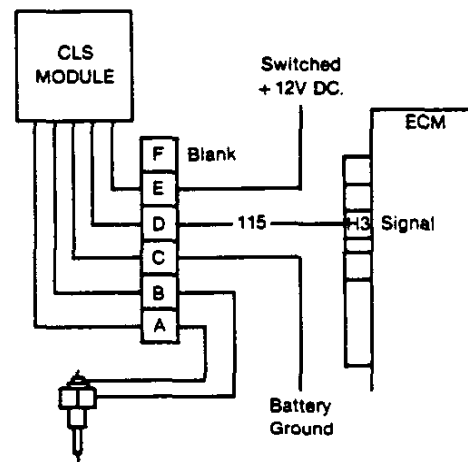
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
16-5 Check If Ignition Fuse Blown <ul style="list-style-type: none"> Check if the ignition fuse/circuit breaker is blown or open. 	Blown/open fuse —————→ or circuit breaker. Fuse or circuit breaker is okay. —————→	Replace fuse or reset circuit breaker. Then go to 16-6. Go to 16-6.
16-6 Check for Signal Short to Ignition <ul style="list-style-type: none"> Disconnect the vehicle harness connector at the ECM. Remove jumper wire at the CLS harness connector. Read resistance between sockets B and C of the CLS connector on the vehicle harness. 	Less than —————→ 10,000 ohms. Greater than —————→ or equal to 10,000 ohms or open.	The CLS signal line (ckt #115) is shorted to the switched 12 volt DC line. Repair short. Then go to 16-30. Go to 16-7.
16-7 Check ECM Connectors <ul style="list-style-type: none"> Check terminals at the vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. Check terminal and pin H3 at the ECM. 	Terminals and —————→ connectors are okay. Problem found. —————→	Replace ECM. Then go to 16-30. Repair terminals/connectors. Then go to 16-30.
16-30 Verify Repairs <ul style="list-style-type: none"> Turn ignition off. Reconnect all connectors. Turn ignition on. Clear codes. Note status of "Check Engine" light. If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. Stop engine. Read historical codes. 	Code 25 (no codes) —————→ Code 16 (and —————→ any other codes). Any other codes —————→ except Code 16.	Repairs are complete. All system diagnostics are complete. Please review this section from the first step to find the error. Go to START-1, page 17, to service other codes.



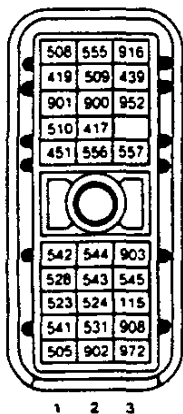
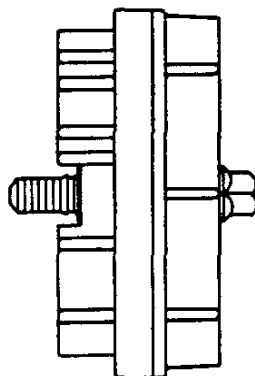
Coolant Level Sensor
P/N 23503507



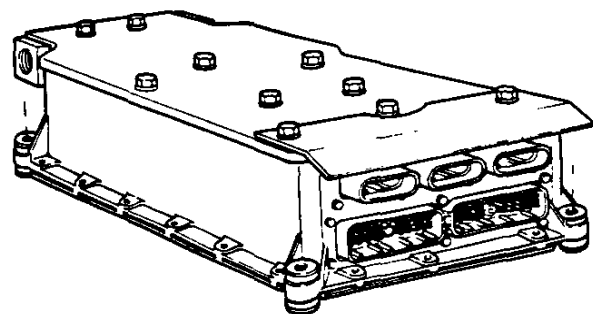
ECM Vehicle Harness Connector
P/N 12015799



Coolant Level Sensor Circuit



ECM Vehicle Harness Connector
P/N 12034398



Electronic Control Module (ECM)

Section 4

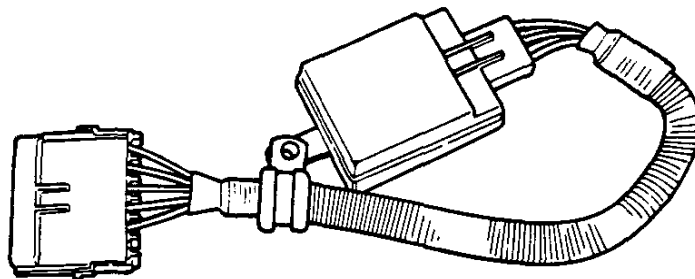
TROUBLESHOOTING CHARTS

E. CODE 16 - TWO-PIECE (DDC P/N 23503507) COOLANT LEVEL SENSOR (CLS) SIGNAL VOLTAGE HIGH

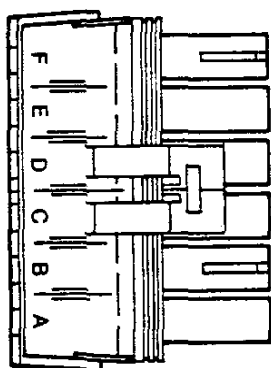
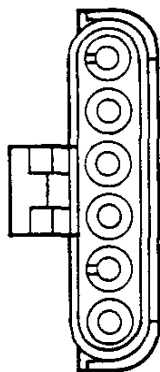
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

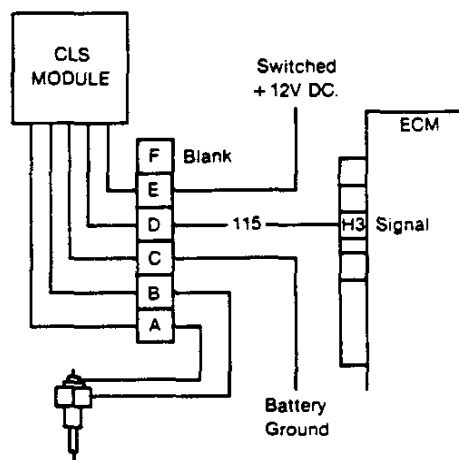
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
16-1 Sensor Check <ul style="list-style-type: none"> • Turn ignition off. • Disconnect CLS module and install a jumper between sockets D and C of the CLS harness connector. • Attempt to start and run engine at idle. • Read active codes. • Stop engine. 	Engine will not start. → Code 16 (and any other codes except Code 13). → Code 13 (and any other codes). →	Go to 16-5. Go to 16-2. Go to 16-3.
16-2 Signal and Ground Circuit Check <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector. • Read resistance between socket H3 on the vehicle harness connector and a good ground. 	Less than or equal to 5 ohms. → Greater than 5 ohms or open. →	Go to 16-7. Either the CLS signal line (ckt #115) or the battery ground line is open. Repair open. Then go to 16-30.
16-3 Check CLS Ignition <ul style="list-style-type: none"> • Remove jumper wire. • Turn ignition on. • Read voltage at the CLS connector, socket E (red lead) to socket C (black lead). 	Less than or equal to 10.0 volts. → Greater than 10 volts. →	Between 4 and 6 volts, 12 volt line is wired to 5 volt supply. Else, the switched 12 volt line is open. Repair open. Then go to 16-30. Go to 16-4.
16-4 Check CLS Connectors <ul style="list-style-type: none"> • Inspect terminals at the CLS connectors (both the sensor and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace CLS module. Then go to 16-30. Repair terminals/connectors. Then go to 16-30.



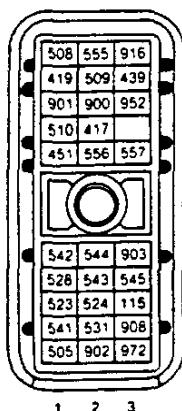
Coolant Level Sensor
P/N 23503507



ECM Vehicle Harness Connector
P/N 12015799

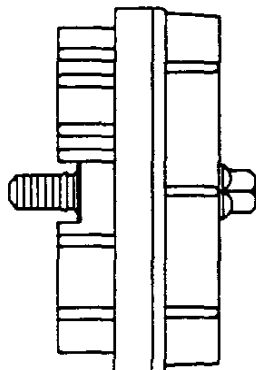


Coolant Level Sensor Circuit

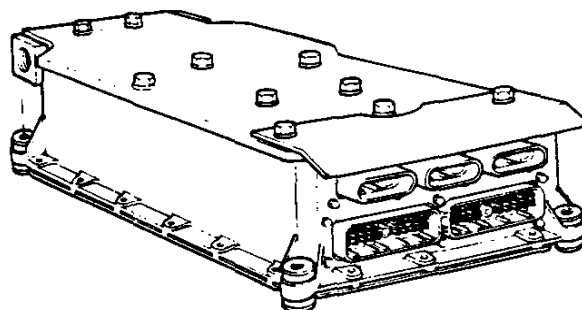


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ECM Vehicle Harness Connector
P/N 12034398



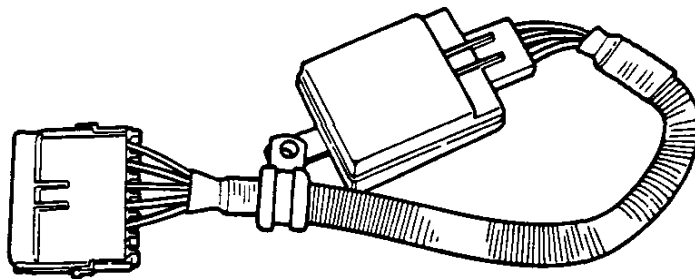
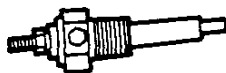
Electronic Control Module (ECM)

Section 4

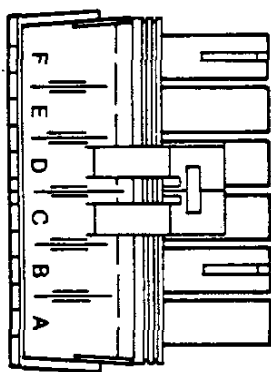
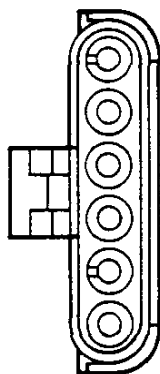
TROUBLESHOOTING CHARTS

E. CODE 16 - TWO-PIECE (DDCP/N23503507) COOLANT LEVEL SENSOR (CLS) SIGNAL VOLTAGE HIGH (Cont'd.)

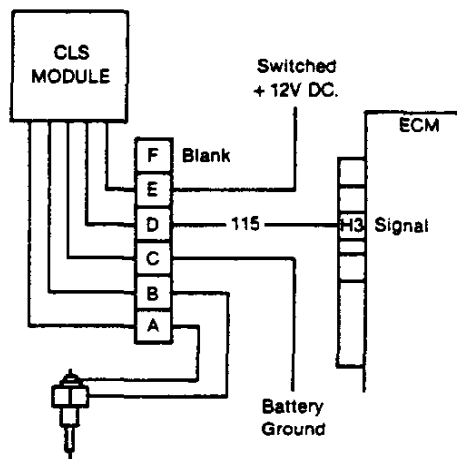
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
16-5 Check If Ignition Fuse Blown <ul style="list-style-type: none"> Check if the ignition fuse/circuit breaker is blown or open. 	Blown/open fuse —————→ or circuit breaker. Fuse or circuit breaker is okay. —————→	Replace fuse or reset circuit breaker. Then go to 16-6. Go to 16-6.
16-6 Check for Signal Short to Ignition <ul style="list-style-type: none"> Disconnect the vehicle harness connector at the ECM. Remove jumper wire at the CLS harness connector. Read resistance between sockets D and E of the CLS connector on the vehicle harness. 	Less than —————→ 10,000 ohms. Greater than —————→ or equal to 10,000 ohms or open.	The CLS signal line (ckt #115) is shorted to the switched 12 volt DC line. Repair short. Then go to 16-30. Go to 16-7.
16-7 Check ECM Connectors <ul style="list-style-type: none"> Check terminals at the vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. Check terminal and pin H3 at the ECM and all terminals and pins in the CLS module connectors. 	Terminals and connectors are okay. —————→ Problem found. —————→	Go to 16-8. Repair terminals/connectors. Then go to 16-30.
16-8 Check for 12V <ul style="list-style-type: none"> Turn ignition off. Disconnect CLS module connector. Place the red lead of a volt meter into terminal E of the CLS connector vehicle harness side. Connect the black lead to terminal C of the CLS connector vehicle harness side. Turn ignition on. Read voltage. 	Less than or equal to 10 volts. —————→ Greater than 10 volts. —————→	An open exists on the 12 volt wire. Repair open. Then go to 16-30. Replace ECM. Then go to 16-30.



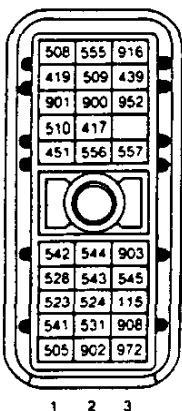
Coolant Level Sensor
P/N 23503507



ECM Vehicle Harness Connector
P/N 12015799

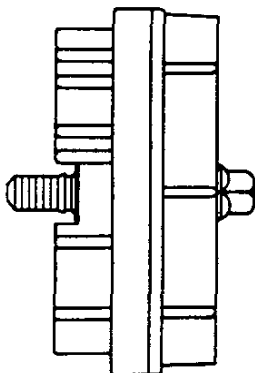


Coolant Level Sensor Circuit

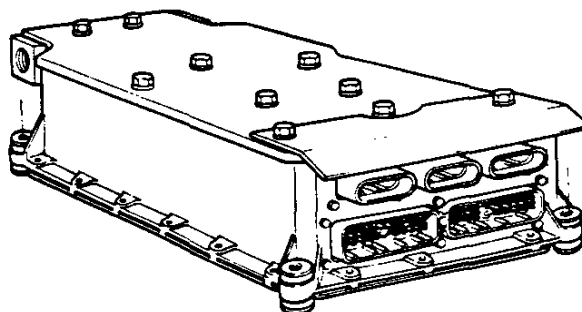


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ECM Vehicle Harness Connector
P/N 12034398



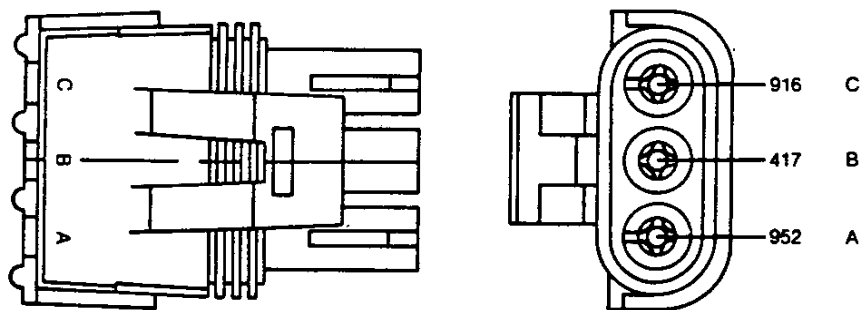
Electronic Control Module (ECM)

Section 4

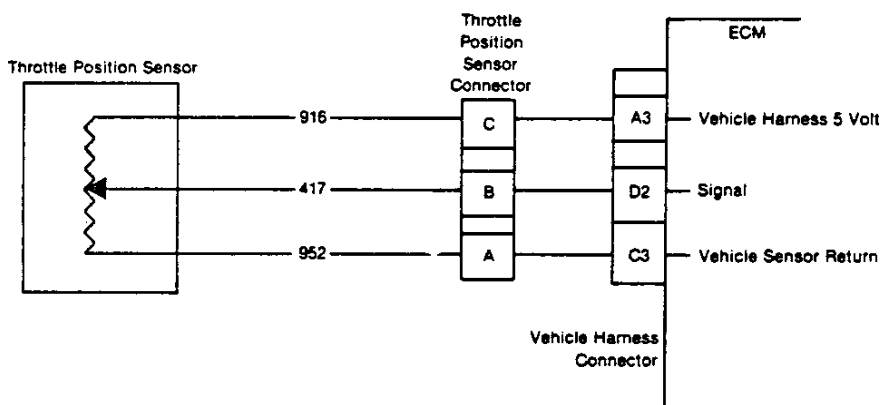
TROUBLESHOOTING CHARTS

E. CODE 16 - TWO-PIECE (DDCP/N 23503507) COOLANT LEVEL SENSOR (CLS) SIGNAL VOLTAGE HIGH (Cont'd.)

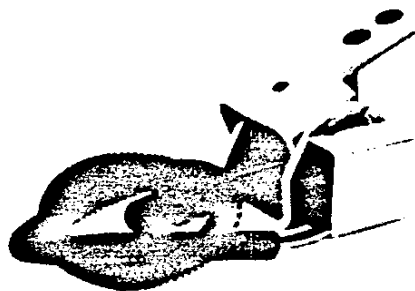
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
16-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. Stop engine. • Read historical codes. 	<p>Code 25 (no codes). →</p> <p>Code 16 (and any other codes). →</p> <p>Any other codes except Code 16. →</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>Go to START-1, page 17, to service other codes.</p>



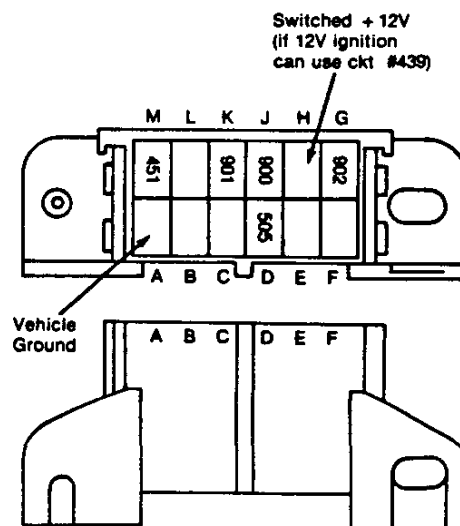
Throttle Position Sensor
Harness Connector
P/N 12015793



Throttle Position Sensor Circuit



Electronic Foot Pedal Assembly



12 Pin DDL Connector P/N 12020043

Section 4

TROUBLESHOOTING CHARTS

E. CODE 21 - THROTTLE POSITION SENSOR (TPS) SIGNAL VOLTAGE HIGH

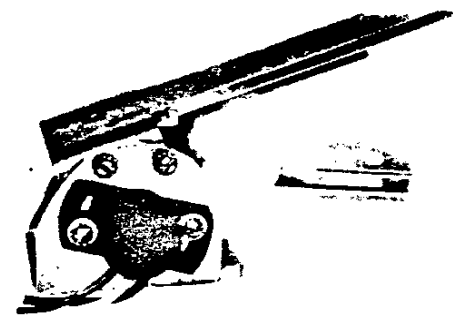
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

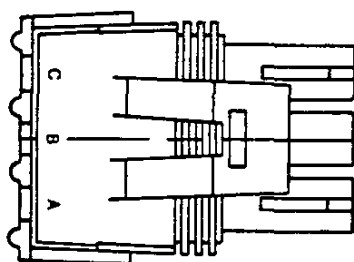
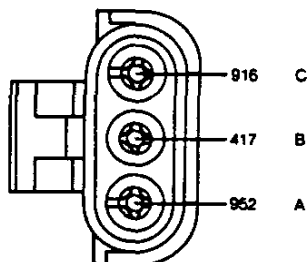
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
21-1 Multiple Code Check <ul style="list-style-type: none"> Were there any other active codes besides Code 21? 	No other active codes.	Go to 21-2.
	Yes, any or all of the following active codes: 12, 22.	Go to VEH5V-1, page 373.
	Yes - but none of the above.	Go to 21-2.
21-2 Sensor Check <ul style="list-style-type: none"> Turn ignition off. Disconnect TPS connector. Turn ignition on. Read active codes. 	Any code except Code 21.	Go to 21-3.
	Code 21 (and any other codes).	Go to 21-7.
21-3 Return Circuit Check <ul style="list-style-type: none"> Turn ignition off. Install a jumper wire between pins A and B of the TPS harness connector. Disconnect the vehicle harness connector at the ECM. Read resistance between sockets D2 and C3 on the vehicle harness connector. 	Less than or equal to 5 ohms.	Go to 21-4.
	Greater than 5 ohms or open.	Return line (ckt #952) and/or signal (ckt #417) is open. Repair open. Then go to 21-30.
21-4 Check TPS Adjustment <ul style="list-style-type: none"> Reconnect vehicle harness connector and plug TPS back in. Hook-up DDR to the 12 pin DDL connector and select Throttle Sensor display. Read Throttle Counts at both no throttle and full throttle. 	Getting 20-30 counts at no throttle and 200-235 counts at full throttle.	Go to 21-6.
	Not getting the above reading.	Go to 21-5.



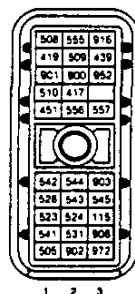
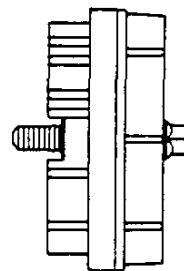
Electronic Foot Pedal Assembly



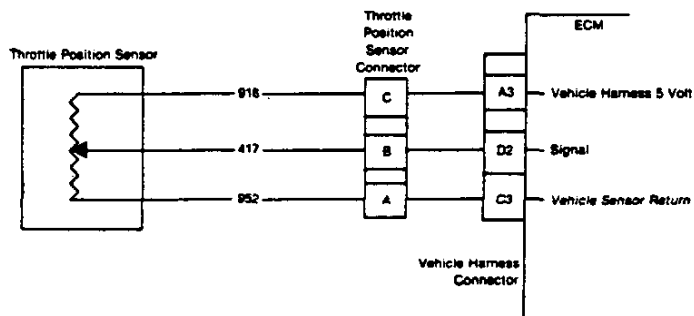
Throttle Position Sensor



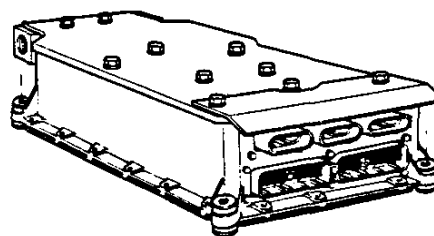
Throttle Position Sensor
Harness Connector
P/N 12015793



ECM Vehicle Harness Connector
P/N 12034398



Throttle Position Sensor Circuit



Electronic Control Module (ECM)

Section 4

TROUBLESHOOTING CHARTS

E. CODE 21 - THROTTLE POSITION SENSOR (TPS) SIGNAL VOLTAGE HIGH (Cont'd.)

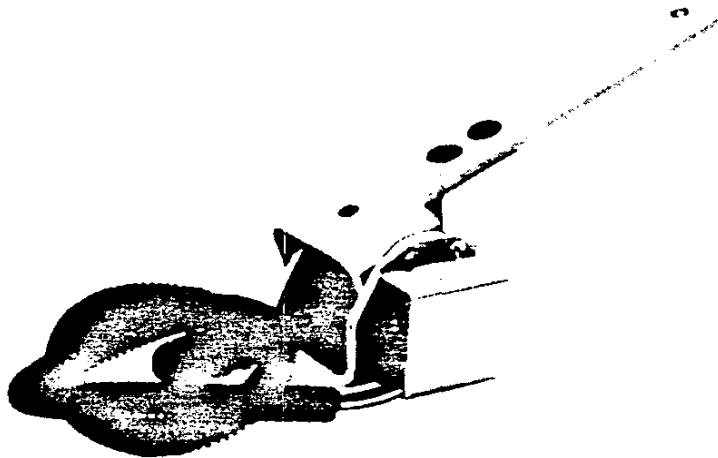
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
21-5 Attempt TPS Adjustment <ul style="list-style-type: none"> Check for pedal or linkage interferences. If linkages appear okay, loosen the TPS screws and attempt to adjust for the correct no throttle reading (20-30 counts). 	<p>Corrected —————→ Go to 21-30. problem so that Throttle Counts is now correct.</p> <p>Could not —————→ Go to 21-6. correct the problem.</p>	
21-6 Check TPS Connectors <ul style="list-style-type: none"> Inspect terminals at the TPS connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets. 	<p>Terminals and —————→ Replace TPS. Then go to 21-30. connectors are okay.</p> <p>Problem found. —————→ Repair terminals/connectors. Then go to 21-30.</p>	
21-7 Check for Short <ul style="list-style-type: none"> Turn ignition off. Disconnect the vehicle harness connector at the ECM. Read resistance between sockets D2 and A3 on the vehicle harness connector. 	<p>Less than or —————→ Signal line (ckt #417) is shorted equal to 10,000 ohms. to the vehicle +5 Volt line (ckt #916). Repair short. Then go to 21-30.</p> <p>Greater than —————→ Go to 21-8. 10,000 ohms or open.</p>	
21-8 Check for Short to Battery + <ul style="list-style-type: none"> Remove both 20 Amp fuses to the ECM. Disconnect the vehicle harness and 6-way power harness connectors at the ECM. Read resistance between socket D2 of the vehicle harness connector and socket B3 of the vehicle harness connector. Also read resistance between socket D2 on the vehicle harness connector and the following sockets on the 6-way power harness connector: A, B, E and F. 	<p>All readings are —————→ Go to 21-9. greater than 10,000 ohms or open.</p> <p>Any reading is —————→ A short exists between the less than or equal to sockets where less than 10,000 10,000 ohms. ohms resistance was read. Repair short and reinsert fuses (or reset breakers). Then go to 21-30.</p>	

Section 4

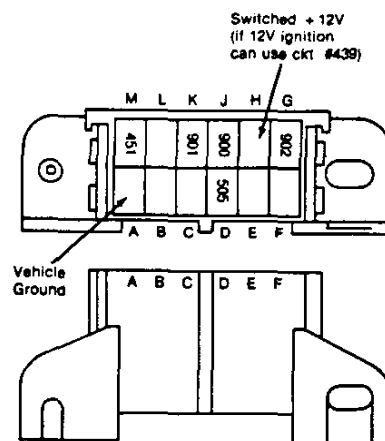
TROUBLESHOOTING CHARTS

E. CODE 21 - THROTTLE POSITION SENSOR (TPS) SIGNAL VOLTAGE HIGH (Cont'd.)

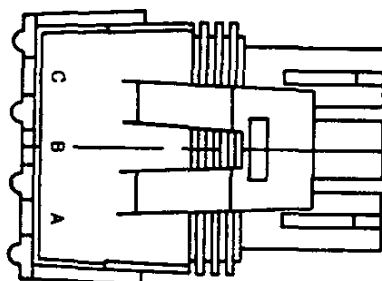
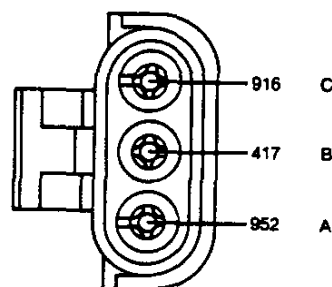
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
21-9 Check ECM Connectors <ul style="list-style-type: none"> • Check terminals at the ECM vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace ECM. Then go to 21-30. Repair terminals/connectors. Then go to 21-30.
21-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. Stop engine. • Read all codes. 	Code 25 (no codes). → Code 21 (and any other codes). → Any other codes except Code 21. →	Repairs are complete. All system diagnostics are complete. Please review this section from the first step to find the error. Go to START-1, page 17, to service other codes.



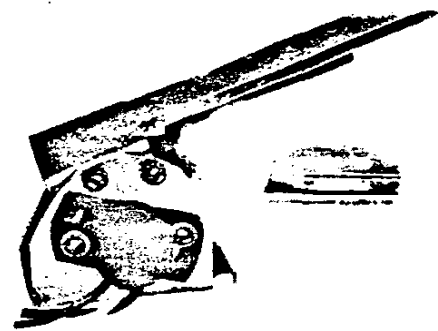
Electronic Foot Pedal Assembly



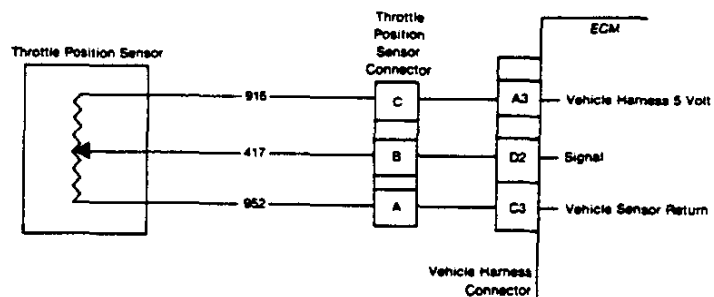
12 Pin DDL Connector P/N 12020043



Throttle Position Sensor
Harness Connector
P/N 12015793



Throttle Position Sensor



Throttle Position Sensor Circuit

Section 4 TROUBLESHOOTING CHARTS

E. CODE 22 • THROTTLE POSITION SENSOR (TPS) SIGNAL VOLTAGE LOW

NOTE — This chart is only to be used if:

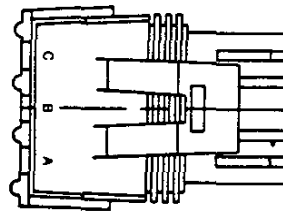
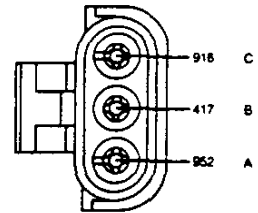
- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

When Mode 02 (Historical Codes) is displayed on the DDR, additional audit trail information is also shown. For an understanding of this information, refer to the example given in the Code 85 chart.

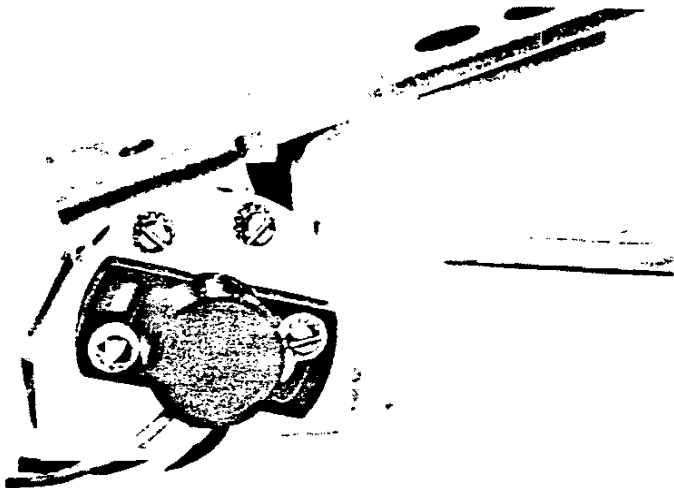
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
22-1 Multiple Code Check <ul style="list-style-type: none"> Were there any other active codes besides Code 22? 	No other active codes. —————→	Go to 22-2.
	Yes, any or all of the following active codes: 12, 21. —————→	Go to VEH5V-1, page 373.
	Yes - but none of the above. —————→	Go to 22-2.
22-2 Sensor Check <ul style="list-style-type: none"> Turn ignition off. Disconnect TPS connector. Install a jumper wire between sockets B and C of the TPS harness connector. Turn ignition on. Read active codes. 	Code 22 and/or other codes. —————→	Go to 22-6.
	Code 21 (and any other codes). —————→	Go to 22-3.
22-3 Check TPS Adjustment <ul style="list-style-type: none"> Remove jumper and reconnect TPS. Hook-up DDR to the 12 pin DDL connector and select Throttle Sensor display. Read Throttle Counts at both no throttle and full throttle. 	Getting 20-30 counts at no throttle and 200-235 counts at full throttle. —————→	Go to 22-5.
	Not getting the above readings. —————→	Go to 22-4.
22-4 Attempt TPS Adjustment <ul style="list-style-type: none"> Check for pedal or linkage interferences. If linkages appear okay, loosen the TPS screws and attempt to adjust for the correct no throttle reading (20-30 counts). 	Corrected problem so that Throttle Counts is now correct. —————→	Go to 22-30.
	Could not correct the problem. —————→	Go to 22-5.



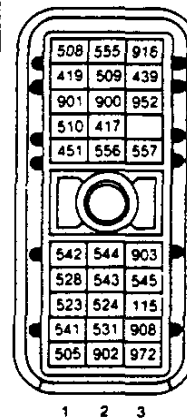
Electronic Foot Pedal Assembly



Throttle Position Sensor
Harness Connector
P/N 12015793

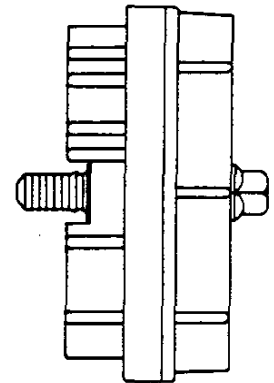


Throttle Position Sensor

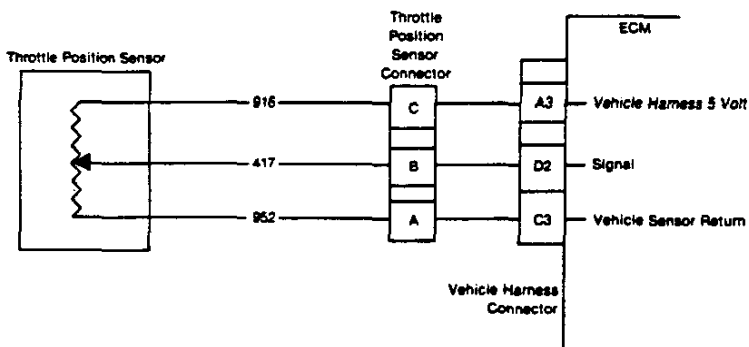


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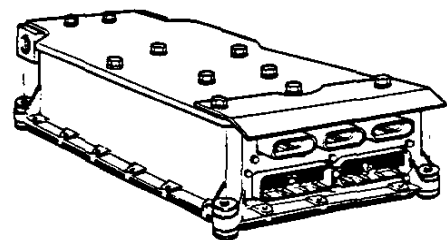
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ECM Vehicle Harness Connector
P/N 12034398



Throttle Position Sensor Circuit



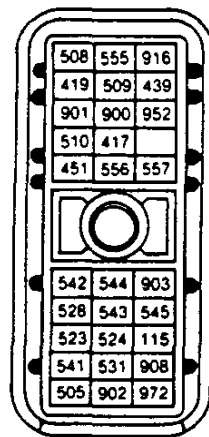
Electronic Control Module (ECM)

Section 4

TROUBLESHOOTING CHARTS

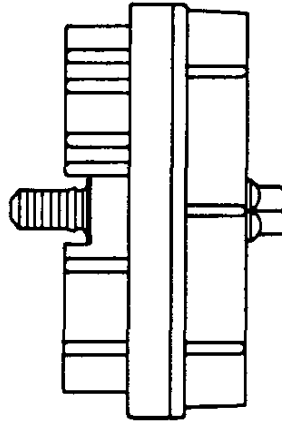
E. CODE 22 - THROTTLE POSITION SENSOR (TPS) SIGNAL VOLTAGE LOW (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
22-5 Check TPS Connectors <ul style="list-style-type: none"> Inspect terminals at the TPS connectors (sensor side and harness side) for damage, corrosion, and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace TPS. Then go to 22-30. Repair terminals/connectors. Then go to 22-30.
22-6 Check for + 5 Volts <ul style="list-style-type: none"> Remove jumper. Turn ignition on. Read voltage on TPS harness connector, socket C (red lead) to socket A (black lead). 	Between 4 to 6 volts. → Less than 4 volts. → Greater than 6 volts. →	Go to 22-7. Go to 22-10. Go to 22-12.
22-7 Check for Short <ul style="list-style-type: none"> Turn ignition off. Disconnect the vehicle harness connector at the ECM. Read resistance between sockets A and B on the TPS harness connector. 	Less than or equal to 10,000 ohms. → Greater than 10,000 ohms or open. →	Signal line (ckt #417) is shorted to the return line (ckt #952). Repair short. Then go to 22-30. Go to 22-8.
22-8 Check for Signal Open <ul style="list-style-type: none"> Install a jumper wire between sockets A and B of the TPS harness connector. Read resistance between sockets D2 and C3 on the vehicle harness connector. 	Less than or equal to 5 ohms. → Greater than 5 ohms or open. →	Go to 22-9. Signal line (ckt #417) is open, and/or signal return (ckt #952) is open. Repair open. If no open was found, check ECM terminals A3, D2, C3 and TPS pins. Then go to 22-30.

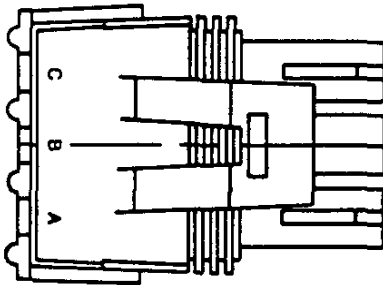
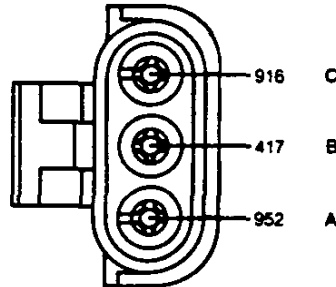


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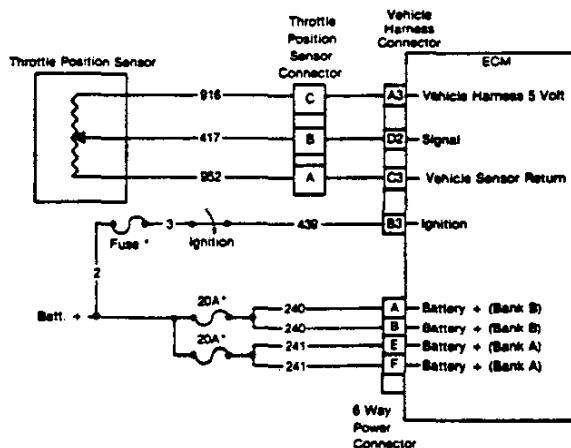
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ECM Vehicle Harness Connector
P/N 12034398

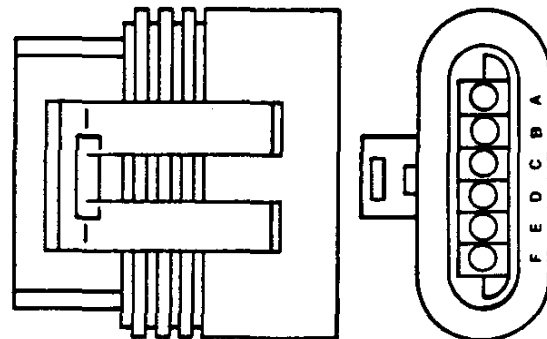


Throttle Position Sensor
Harness Connector
P/N 12015793



(*Note: Some applications may have circuit breakers instead of fuses)

Throttle Position Sensor, Battery +
and Ignition Circuits



6-Way Power Harness Connector
P/N 12066317

Section 4

TROUBLESHOOTING CHARTS

E. CODE 22 - THROTTLE POSITION SENSOR (TPS) SIGNAL VOLTAGE LOW (Cont'd.)

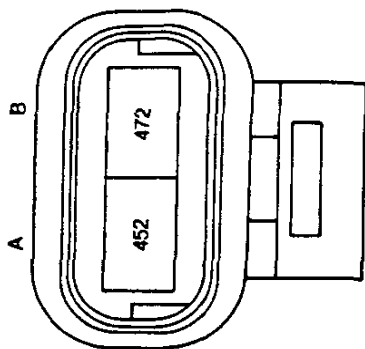
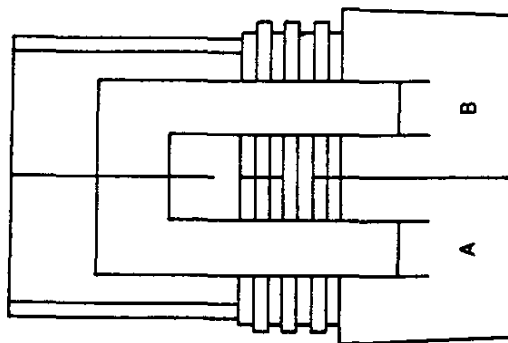
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
22-9 Check ECM Connectors <ul style="list-style-type: none"> Check terminals at the ECM vehicle harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace ECM. Then go to 22-30. Repair terminals/connectors. Then go to 22-30.
22-10 Check for Short <ul style="list-style-type: none"> Turn ignition off. Disconnect the vehicle harness connector at the ECM. Read resistance between sockets A and C on the TPS harness connector. 	Less than or equal to 10,000 ohms. → Greater than 10,000 ohms or open. →	The vehicle + 5 Volt line (ckt #916) is shorted to the return line (ckt #952). Repair short. Then go to 22-30. Go to 22-11.
22-11 Check Check for Open + 5 Volt Line <ul style="list-style-type: none"> Install a jumper wire between sockets A and C of the TPS harness connector. Read resistance between sockets A3 and C3 on the vehicle harness connector. 	Less than or equal to 5 ohms. → Greater than 5 ohms or open. →	Go to 22-9. The vehicle + 5 Volt line (ckt #916) is open. Repair open. Then go to 22-30.
22-12 Check for Short to Battery + <ul style="list-style-type: none"> Turn ignition off. Remove both fuses to the ECM. Disconnect 6-way power connector at the ECM. Read resistance between sockets D2 and B3 on the vehicle harness connector. Also read resistance between socket D2 on the vehicle harness connector and the following sockets on the 6 way power connector: C, D, E and F. 	All readings are greater than 10,000 ohms or open. → Any reading is less than or equal to 10,000 ohms. →	Go to 22-13. A short exists between sockets where less than 10,000 ohms resistance was read. Repair short and reinsert fuses. Then go to 22-30.

Section 4

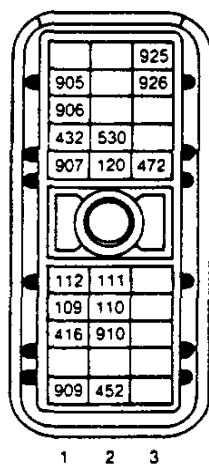
TROUBLESHOOTING CHARTS

E. CODE 22 - THROTTLE POSITION SENSOR (TPS) SIGNAL VOLTAGE LOW (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
22-13 Check for Outside DDEC Battery + <ul style="list-style-type: none"> ● Turn ignition off. ● Remove ECM 6-pin power connector. ● Remove ECM vehicle harness. ● Turn ignition on. ● Read voltage A3 (red lead) to a good ground (black lead). ● Read voltage C3 (red lead) to a good ground (black lead). 	<p>All readings less than 4.0 volts. →</p> <p>Either reading greater than or equal to 4.0 volts. →</p>	<p>Go to 22-9.</p> <p>Outside power is spliced into either (ckt #952) or (ckt #916). Remove splice. Then go to 22-30.</p>
22-30 Verify Repairs <ul style="list-style-type: none"> ● Turn ignition off. ● Reconnect all connectors. ● Turn ignition on. ● Clear codes. ● Note status of "Check Engine" light. ● If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. ● Stop engine. ● Read all codes. 	<p>Code 25 (no codes). →</p> <p>Code 22 (and any other codes). →</p> <p>Any other codes except Code 22. →</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>Go to START-1, page 17, to service other codes.</p>

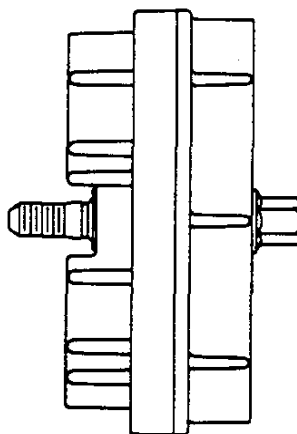


Fuel Temperature Sensor
Harness Connector
P/N 12040753

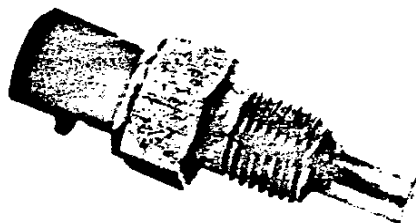


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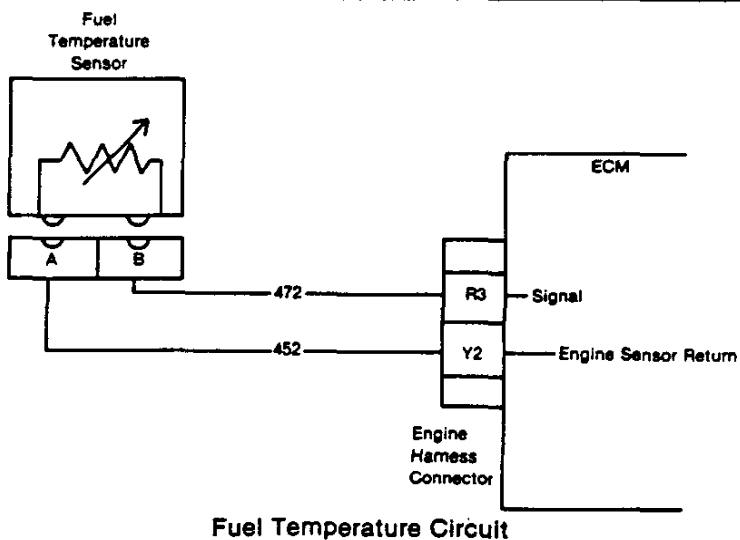
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ECM Engine Harness Connector
P/N 12034400



Fuel Temperature Sensor
P/N 25036693



Fuel Temperature Circuit

Section 4

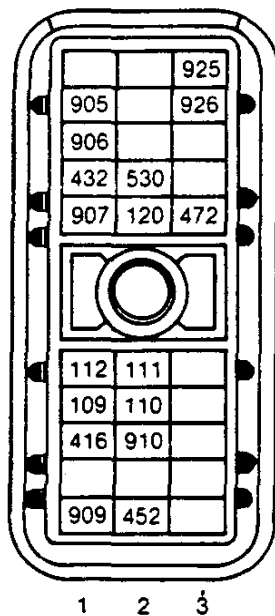
TROUBLESHOOTING CHARTS

E. CODE 23 - FUEL TEMPERATURE SENSOR (FTS) SIGNAL VOLTAGE HIGH

NOTE — This chart is only to be used if:

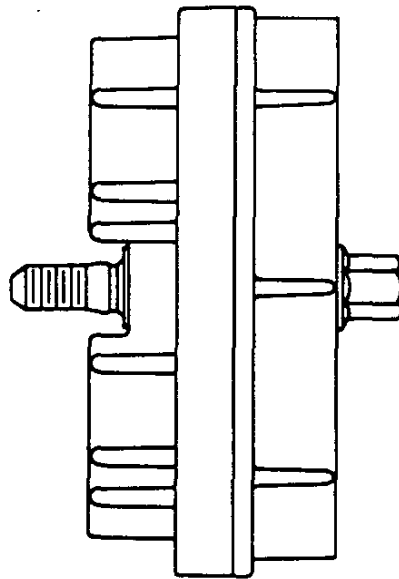
- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
23-1 Sensor Check <ul style="list-style-type: none"> • Turn ignition off. • Disconnect FTS and install a jumper wire between the FTS connector sockets A and B. • Turn ignition on. • Read active codes. 	Code 24 (or any codes except Code 23). → Anything except Code 24. →	Go to 23-2. Go to 23-4.
23-2 Check for Short to + 5 Volt Line <ul style="list-style-type: none"> • Turn ignition off. • Remove jumper wire. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets R3 and W1 on the engine harness connector. 	Less than or equal to 10,000 ohms. → Greater than 10,000 ohms or open. →	Signal line (ckt #472) is shorted to the engine + 5 Volt line (ckt #416), and/or (ckt #472) signal is shorted to (ckt #452) sensor return and/or ground. Repair short. Then go to 23-30. Go to 23-3.
23-3 Check FTS Connectors <ul style="list-style-type: none"> • Inspect terminals at the FTS connectors (both the sensor and harness side) for damage: bent, corroded, and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace FTS. Then go to 23-30. Repair terminals/connectors. Then go to 23-30.
23-4 Open line Check <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets R3 and Y2 on the engine harness connector. 	Less than or equal to 5 ohms. → Greater than 5 ohms or open. →	Go to 23-5. Signal line (ckt #472) or return line (ckt #452) is open. Repair open. Then go to 23-30.

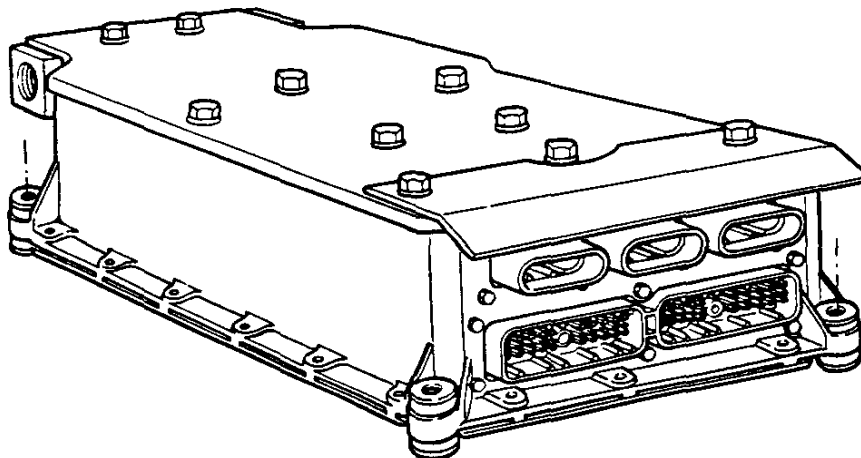


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ECM Engine Harness Connector
P/N 12034400

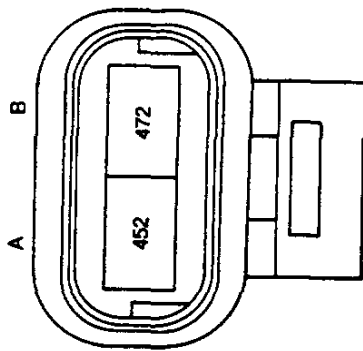
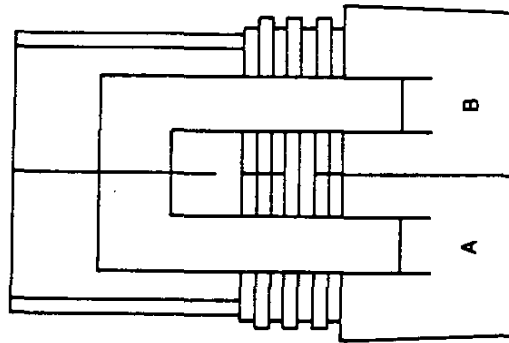


Electronic Control Module (ECM)

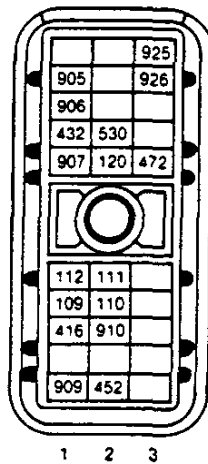
Section 4 TROUBLESHOOTING CHARTS

E. CODE 23 - FUEL TEMPERATURE SENSOR (FTS) SIGNAL VOLTAGE HIGH (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
23-5 Check ECM Connectors <ul style="list-style-type: none"> ● Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace ECM. Then go to 23-30. Repair terminals/connectors. Then go to 23-30.
23-30 Verify Repairs <ul style="list-style-type: none"> ● Turn ignition off. ● Reconnect all connectors. ● Turn ignition on. ● Clear codes. ● Note status of "Check Engine" light. ● If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 8 minutes. Stop engine. ● Read historical codes. 	Code 25 (no codes). → Code 23 (and any other codes). → Any other codes except Code 23. →	Repairs are complete. All system diagnostics are complete. Please review this section from the start to find the error. Go to START-1, page 17, to service other codes.

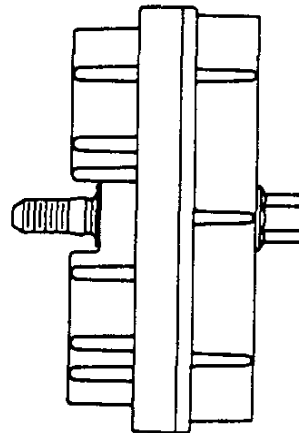


Fuel Temperature Sensor
Harness Connector
P/N 12040753

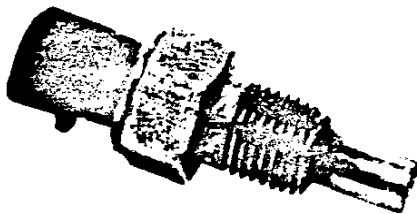


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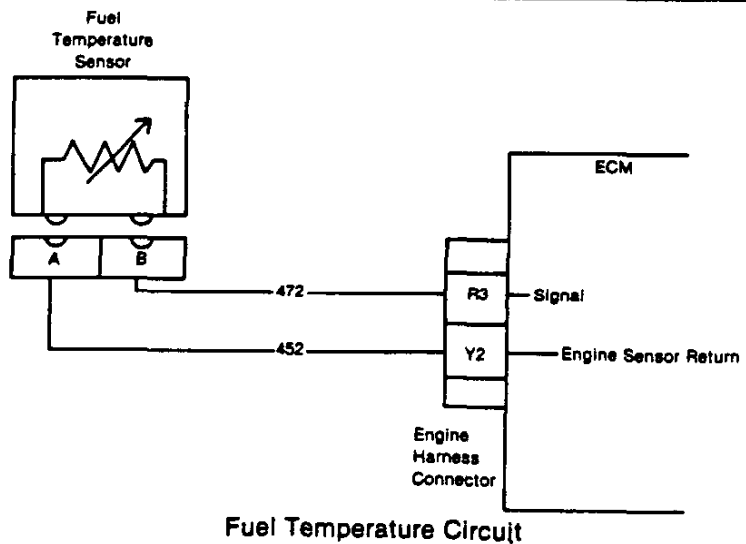
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ECM Engine Harness Connector
P/N 12034400



Fuel Temperature Sensor
P/N 25036693



Fuel Temperature Circuit

Section 4

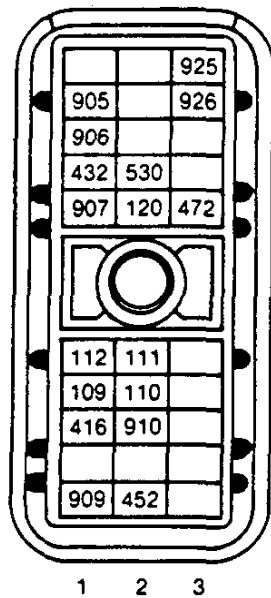
TROUBLESHOOTING CHARTS

E. CODE 24 - FUEL TEMPERATURE SENSOR (FTS) SIGNAL VOLTAGE LOW

NOTE — This chart is only to be used if:

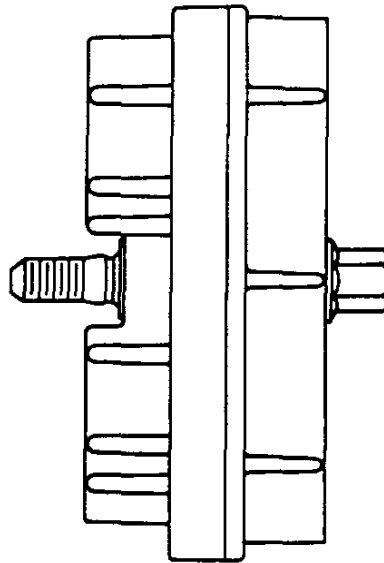
- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
24-1 Multiple Code Check <ul style="list-style-type: none"> Were there any other active codes besides Code 24? 	<p>No other codes. → Go to 24-2.</p> <p>Yes, any or all of the following codes: 14, 23, 33. → Go to ENG5V-1, page 367.</p> <p>Yes - but none of the above. → Go to 24-2.</p>	
24-2 Sensor Check <ul style="list-style-type: none"> Turn ignition off. Disconnect FTS connector. Start engine and run until "Check Engine" light comes on or for 8 minutes. Read active codes with engine still running. 	<p>Code 23 (or any other codes except Code 24). → Go to 24-3.</p> <p>Code 24 (and any other codes). → Go to 24-4.</p>	
24-3 Check FTS Connectors <ul style="list-style-type: none"> Inspect terminals at the FTS connectors (both the sensor and harness side) for damage; bent, corroded, and unseated pins or sockets. 	<p>Terminals and connectors are okay. → Replace FTS. Then go to 24-30.</p> <p>Problem found. → Repair terminals/connectors. Then go to 24-30.</p>	
24-4 Check for Short <ul style="list-style-type: none"> Turn ignition off. Disconnect engine harness connector at the ECM. Read resistance between sockets R3 and Y2 on the engine harness connector. 	<p>Less than or equal to 10,000 ohms. → Signal line (ckt #472) is shorted to the return line (ckt #452). Repair short. Then go to 24-30.</p> <p>Greater than 10,000 ohms or open. → Go to 24-5.</p>	

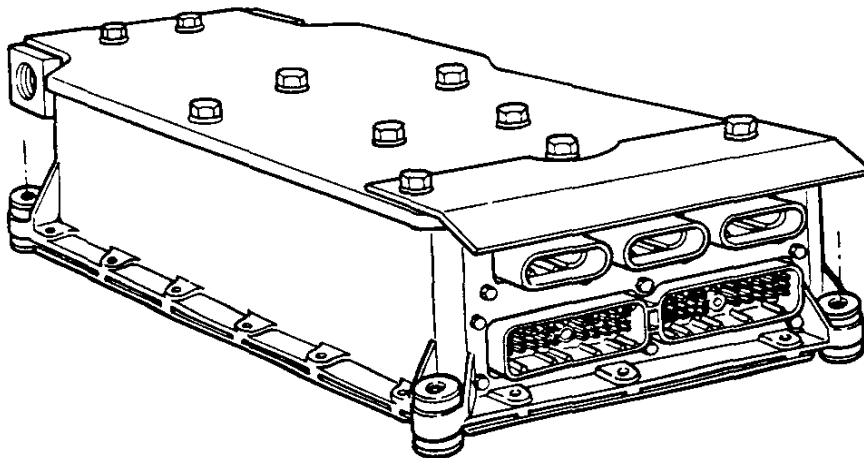


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ECM Engine Harness Connector
P/N 12034400



Electronic Control Module (ECM)

Section 4

TROUBLESHOOTING CHARTS

E. CODE 24 - FUEL TEMPERATURE SENSOR (FTS) SIGNAL VOLTAGE LOW (Cont'd.)

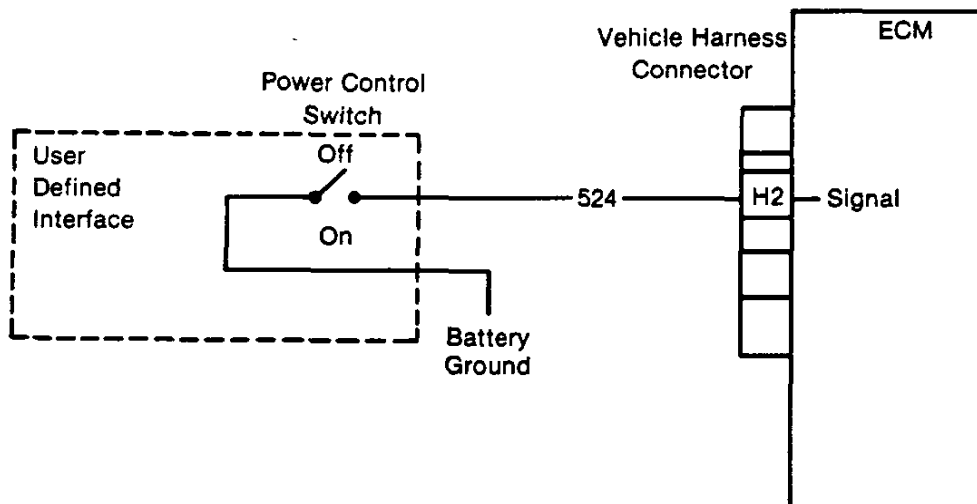
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
24-5 Check ECM Connectors <ul style="list-style-type: none"> Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. Especially R3 and Y2 of the ECM connector. 	Terminals and connectors are okay. → Problem found. →	Replace ECM. Then go to 24-30. Repair terminals/connectors. Then go to 24-30.
24-30 Verify Repairs <ul style="list-style-type: none"> Turn ignition off. Reconnect all connectors. Turn ignition on. Clear codes. Note status of "Check Engine" light. If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or for 8 minutes. Stop engine. Read historical codes. 	Code 25 (no codes). → Code 24 (and any other codes). → Any other codes except Code 24. →	Repairs are complete. All system diagnostics are complete. Please review this section from the start to find the error. Go to START-1, page 17, to service other codes.

Section 4

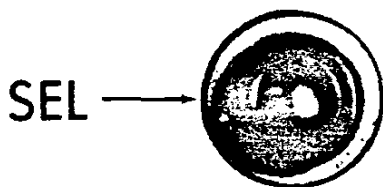
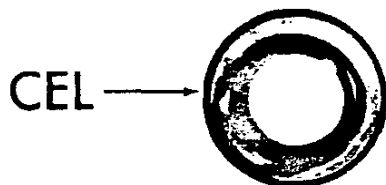
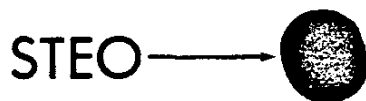
TROUBLESHOOTING CHARTS

E. CODE 25 - NO CODES

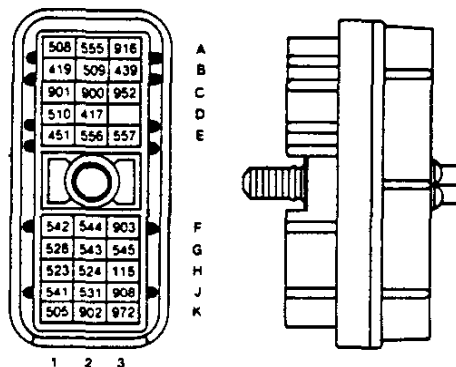
No faults have been detected by DDEC-II since the last time the codes were cleared. If symptoms remain, and all basic mechanical and visual inspections have been performed with no causes to the problem found, you can try using Chart 1 (Intermittent or Symptom Without a Code) on Page 35.



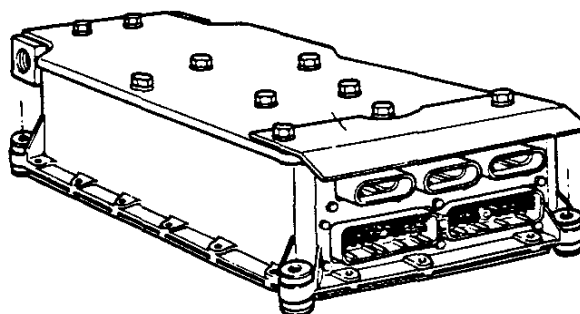
Power Control Circuit



Dash Lights



ECM Vehicle Harness Connector
P/N 12034398



Electronic Control Module (ECM)

Section 4

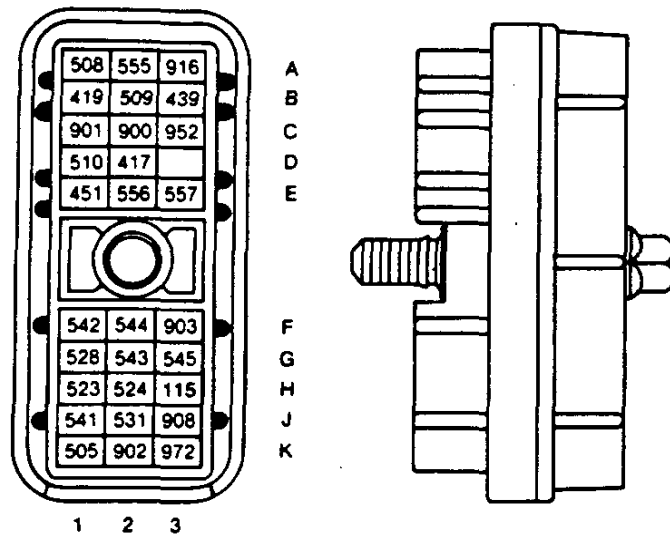
TROUBLESHOOTING CHARTS

E. CODE 26 - POWER CONTROL SWITCH

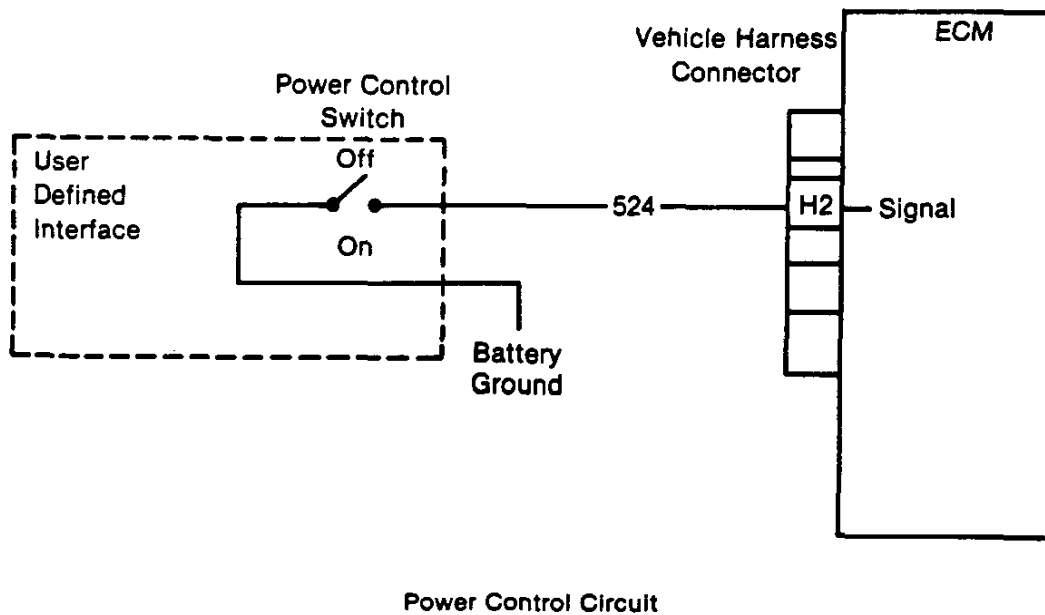
NOTE — This chart is only to be used if.

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
26-1 Verify "Stop Engine" light turned on. <ul style="list-style-type: none"> Start engine and run until the "Stop Engine" light comes on or for 1 minute. Stop the engine. 	<p>"Stop Engine" light turned on. →</p> <p>"Stop Engine" light did not turn on. →</p>	<p>Go to 26-2.</p> <p>Fault is currently not present. If you cannot get the fault to recur, you should still investigate why it happened in the first place. Go to 26-5.</p>
26-2 Determine if User Add-on Device Is Present <ul style="list-style-type: none"> Find out whether there has been a user defined device attached to the Power Control input (pin H2, ckt #524) at the vehicle harness connector. 	<p>Yes. →</p> <p>No. →</p>	<p>Go to 26-7.</p> <p>Go to 26-4.</p>
26-3 Check for Short <ul style="list-style-type: none"> Turn ignition off. Disconnect the vehicle harness connector at the ECM. Read resistance between socket H2 and ground of the vehicle harness connector. 	<p>Less than or equal to 10,000 ohms. →</p> <p>Greater than 10,000 ohms. →</p>	<p>The Power Control line (ckt #524) is shorted to ground or another return line. Repair short. Switch may be stuck closed or wired improperly. Repair. Then go to 26-30.</p> <p>Go to 26-4.</p>
26-4 Check ECM Connectors <ul style="list-style-type: none"> Check terminals at the ECM vehicle harness connector (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets. 	<p>Terminals and connectors are okay. →</p> <p>Problem found. →</p>	<p>Replace ECM. Then go to 26-30.</p> <p>Repair terminals/connectors. Then go to 26-30.</p>



ECM Vehicle Harness Connector
P/N 12034398



Section 4

TROUBLESHOOTING CHARTS

E. CODE 26 - POWER CONTROL SWITCH (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
26-5 Determine if User Add-on Device Is Present <ul style="list-style-type: none"> Find out whether there has been a user defined device attached to the Power Control input (pin H2, ckt #524) at the vehicle harness connector. 	Yes. → No. →	Go to 26-6. Clear codes and return to service.

26-6 Determine Nature of Fault

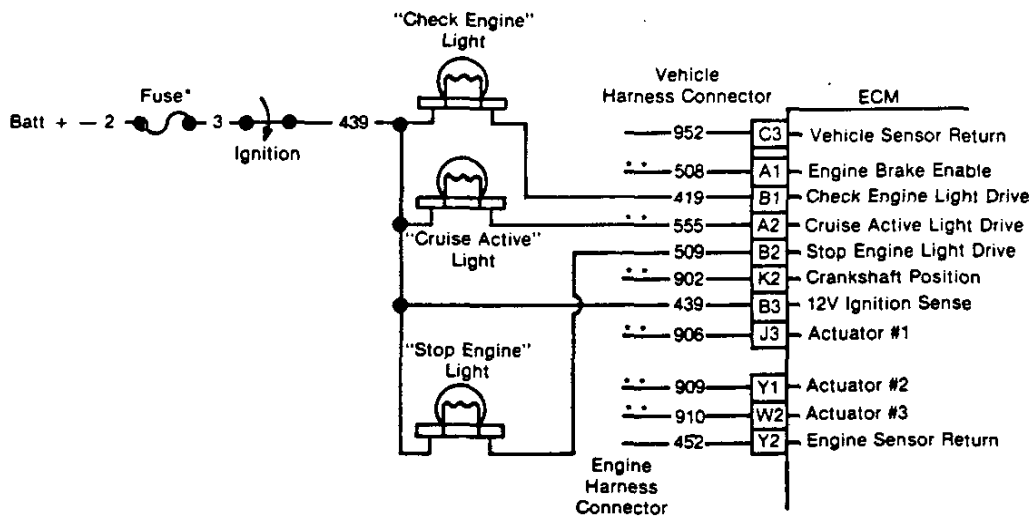
As mentioned previously, a user defined device can be attached to the Power Control Input. This way, when the add-on device detects a potentially engine-damaging problem, it grounds the Power Control Switch. This activates DDEC's engine protection system which turns on the "Stop Engine" and "Check Engine" lights and eventually shuts down the engine if the shut-down option is enabled. Refer to the vehicle manufacturer's specifications/recommendations concerning the add-on device.

26-7 Protected Device <ul style="list-style-type: none"> Refer to manufacturer's specifications on what to do when their device wants the engine shut down. Did they want the engine to shutdown? 	Yes. → No. →	Repair per their recommendations. Then go to 26-30. Go to 26-3.
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26-30 Verify Repairs

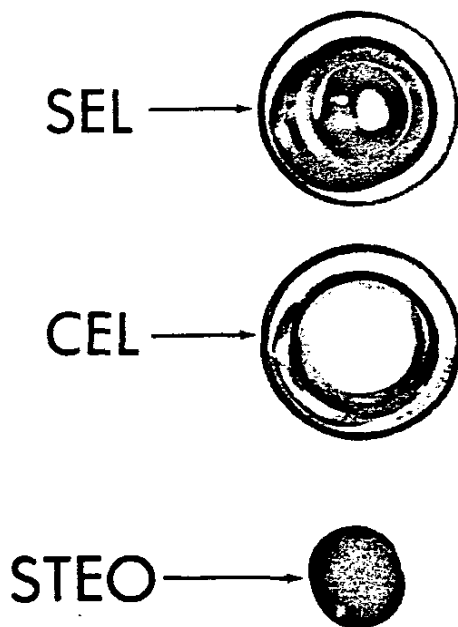
- Turn ignition off.
- Reconnect all connectors.
- Turn ignition on.
- Clear codes.
- Note status of "Check Engine" light.
- If "Stop Engine" light does not stay on, start engine and run until "Stop Engine" light comes on, or reasonable amount of time to verify repairs are completed.
- Read historical codes.

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|---------------------------------|---|---|
| Code 25 (no codes). | → | Repairs are complete. |
| Code 26 (and any other codes). | → | All system diagnostics are complete. Please review this section from the start to find the error. |
| Any other codes except Code 26. | → | Go to START-1, page 17, to service other codes. |

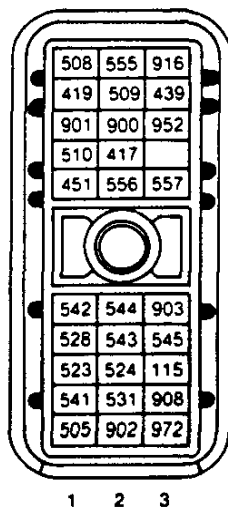


(Notes: *Some applications may have circuit breakers instead of fuses.
 **Optional, not on all applications.)

ECM Output Circuits

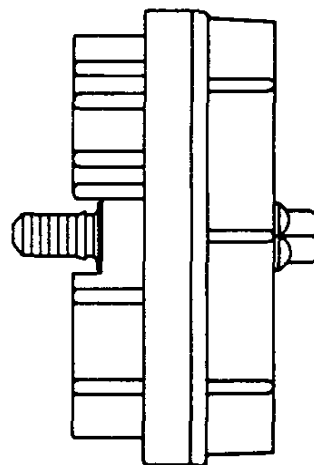


Dash Lights



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ECM Vehicle Harness Connector
 P/N 12034398

Section 4

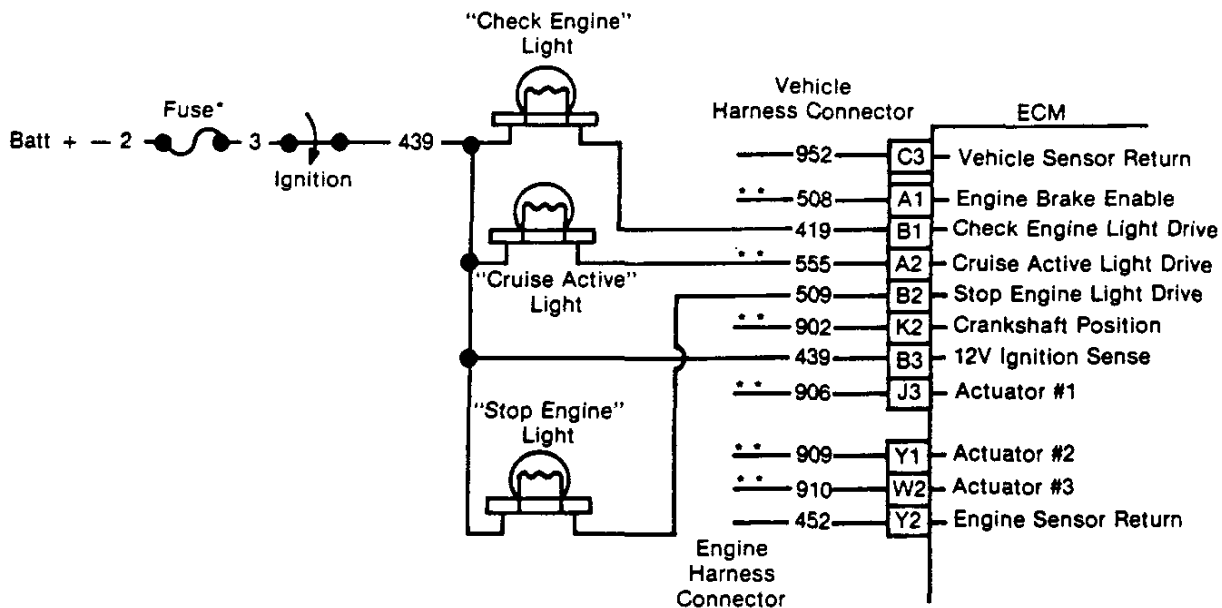
TROUBLESHOOTING CHARTS

E. CODE 31 - FAULT ON AUXILIARY OUTPUT

NOTE — This chart is only to be used if:

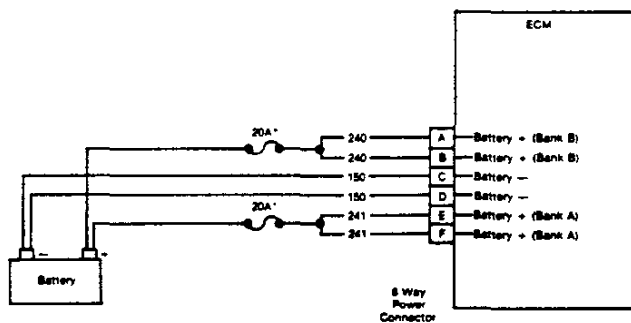
- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
31-1 Verify Bulb Operation <ul style="list-style-type: none"> • Turn ignition off. • Turn ignition on (engine not running). • Note status of the following lights: <ul style="list-style-type: none"> —“Check Engine” (CEL) —“Stop Engine” (SEL) —“Cruise Active” (CAL, if applicable) 	All lights go on for 5 seconds and then go out. → Go to 31-7. At least one of the lights never turn on. → Go to 31-2. All lights go on for 5 seconds and at least one light stays on. → Go to 31-5.	
31-2 Bulb Check <ul style="list-style-type: none"> • Turn ignition off. • Remove bulb(s) which did not turn on. • Check whether bulb(s) is (are) burned out or otherwise damaged. 	Bulb(s) is okay. → Go to 31-3. Bulb(s) is not okay. → Replace bulb(s). Then go to 31-30.	
31-3 Check for Open <ul style="list-style-type: none"> • Disconnect the vehicle harness connector at the ECM. • Turn ignition on. • Read voltage on the vehicle harness connector, keeping the black lead on a good battery ground and probing the following sockets with the red lead: <ul style="list-style-type: none"> —B1 (CEL) —B2 (SEL) —A2 (CAL) 	Greater than 10 volts on all readings. → Go to 31-4. Less than 10 volts on any reading. → Open exists in wire where less than 10 volts was read. Repair open. Then go to 31-30.	



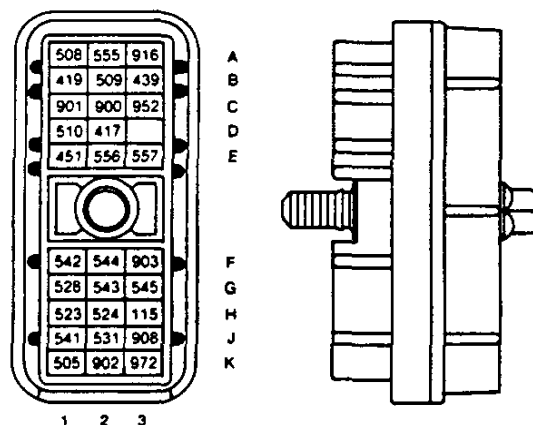
(Notes: *Some applications may have circuit breakers instead of fuses.)
 **Optional, not on all applications.)

ECM Output Circuits



(*Some applications may have circuit breakers instead of fuses.)

Battery Power and Ground Circuits



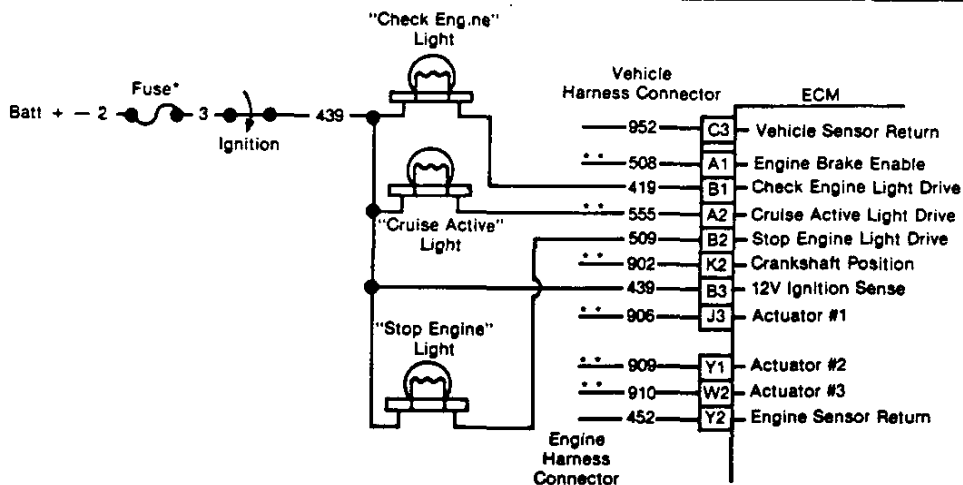
ECM Vehicle Harness Connector P/N 12034398

Section 4

TROUBLESHOOTING CHARTS

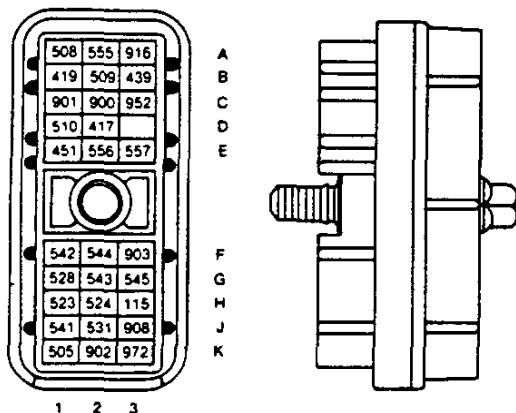
E. CODE 31 - FAULT ON AUXILIARY OUTPUT (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
31-4 Check for Short to Ignition <ul style="list-style-type: none"> • Turn ignition off. • Disconnect 6-way power connector. • Install a jumper wire between socket F on the 6-way power connector and socket B3 on the vehicle harness connector. • Install a 2nd jumper wire between socket C on the 6-way power connector and the following socket on the vehicle harness connector: <ul style="list-style-type: none"> —if CEL didn't turn on => socket B1 —if SEL didn't turn on => socket B2 —if CAL didn't turn on => socket A2 • Observe associated light. 	<p>Associated light now turns on. →</p> <p>Associated light still does not turn on. →</p>	<p>Remove jumpers. Check 5 amp ignition (circuit breakers) fuse. Check wires #2 and #3 for open. Check ignition switch for proper operation. Repair open. Then go to 31-9.</p> <p>Remove jumper. An open may exist on the circuit which did not light. If none turned on, check ckt #439 for open. Repair open, then go to 31-30. Else, a short to ignition may exist in the circuit tested, either the CEL (#419), SEL (#509) or CAL (#555). Repair short. Then go to 31-30.</p>
31-5 Check If Lights Agree with DDR Display <ul style="list-style-type: none"> • Plug in DDR and select MODE 30, MISC OUTPUTS, for display. • Observe if DDR display agrees with the CEL, SEL (and CAL if applicable). 	<p>DDR display agrees with lights. →</p> <p>DDR display does not agree with lights. →</p>	<p>Go to 31-7.</p> <p>Go to 31-6.</p>
31-6 Check for Short to Ground <ul style="list-style-type: none"> • Unplug DDR. • Turn ignition off. • Disconnect vehicle harness connector at the ECM. • Turn ignition on. • Observe the following lights: <ul style="list-style-type: none"> —"Check Engine" —"Stop Engine" —"Cruise Active" (if applicable). 	<p>All lights stay off. →</p> <p>At least one light stays on. →</p>	<p>Turn ignition off. Then go to 31-9.</p> <p>A short to ground exists in the circuit associated with the light that stayed on, either the CEL (#419), SEL (#509) or CAL (#555). Repair short. Then go to 31-30.</p>

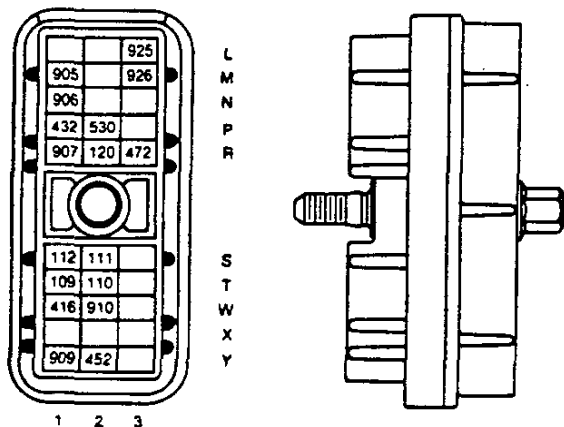


(Notes: *Some applications may have circuit breakers instead of fuses.)
 **Optional, not on all applications.)

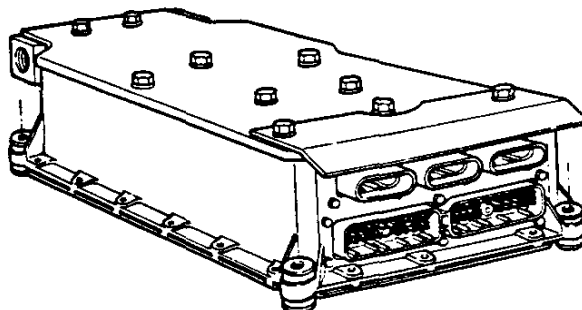
ECM Output Circuits



ECM Vehicle Harness Connector
 P/N 12034398



ECM Engine Harness Connector
 P/N 12034400



Electronic Control Module (ECM)

Section 4 TROUBLESHOOTING CHARTS

E. CODE 31 - FAULT ON AUXILIARY OUTPUT (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
31-7 Check for Short in Crankshaft Position (CP), Engine Brake (EB) or Actuator #1 Wires <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Read resistance between socket C3 and the following other sockets: A1, K2 and J3, (if they are in the harness). 	<p>All readings are greater than 5 ohms, or terminals not in harness. →</p> <p>Any reading is less than or equal to 5 ohms. →</p>	<p>Go to 31-8.</p> <p>Short to sensor return exists in the circuit where less than or equal to 5 ohms reading occurred. Repair short. Then go to 31-30.</p>
31-8 Check for Short in Actuator #2 or Actuator #3 Wires* <ul style="list-style-type: none"> • Disconnect the engine harness connector at the ECM. • Read resistance between socket Y2 and Y1. • Also read resistance between socket Y2 and W2. 	<p>Both readings are greater than 5 ohms. →</p> <p>Either reading is less than or equal to 5 ohms. →</p>	<p>Go to 31-9.</p> <p>Short to ground exists in the circuit where less than or equal to 5 ohms reading occurred (either ckt #909 or ckt #910). Repair short. Then to 31-30.</p>
31-9 Check ECM Connectors** <ul style="list-style-type: none"> • Disconnect the engine harness connector (if not already disconnected). • Check terminals at the ECM vehicle harness and engine harness connectors both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets. 	<p>Terminals and connectors are okay. →</p> <p>Problem found. →</p>	<p>Replace ECM. Then go to 31-30.</p> <p>Repair terminals/connectors. Then go to 31-30.</p>

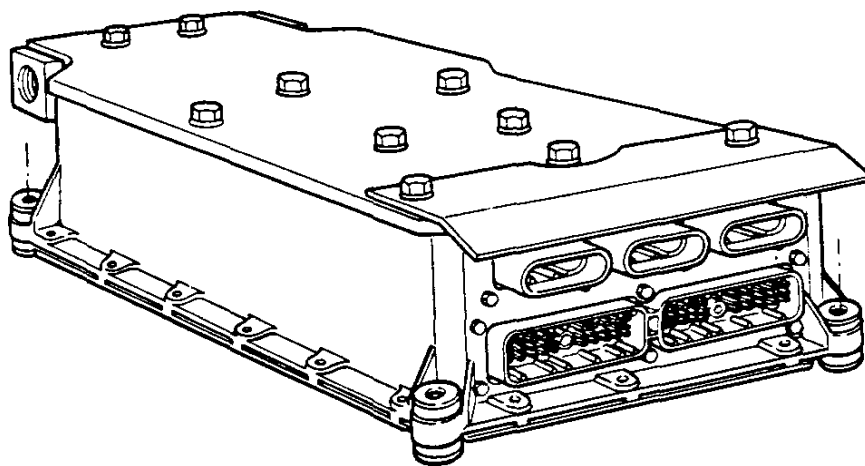
*Be sure these wires are used in this application. These are typically used in methanol applications for (ckt #909) bypass door control and (ckt #910) glow plug controller. However, they may also be used as (ckt #909) secondary oil pressure and (ckt #910) secondary oil temperature. If not used, then go to 31-9.

**Before proceeding, be sure of a good grounding of circuit #150 to the battery.

Section 4 TROUBLESHOOTING CHARTS

E. CODE 31 - FAULT ON AUXILIARY OUTPUT (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
31-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or for 1 minute. • Stop engine. • Read historical codes. 	<p>Code 25 (no codes). →</p> <p>Code 31 (and any other codes). →</p> <p>Any other codes except Code 31. →</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>Go to START-1, page 17, to service other codes.</p>



Electronic Control Module (ECM)

Section 4

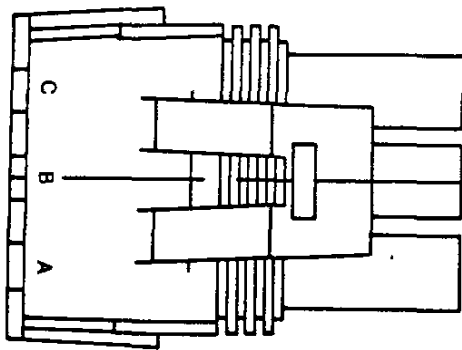
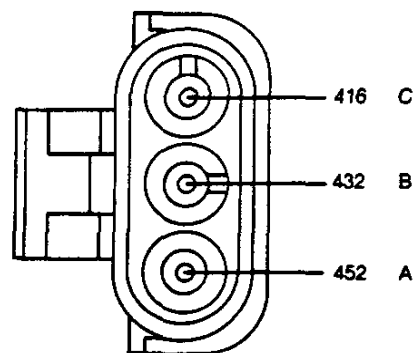
TROUBLESHOOTING CHARTS

E. CODE 32 • ECM BACKUP SYSTEM FAILURE

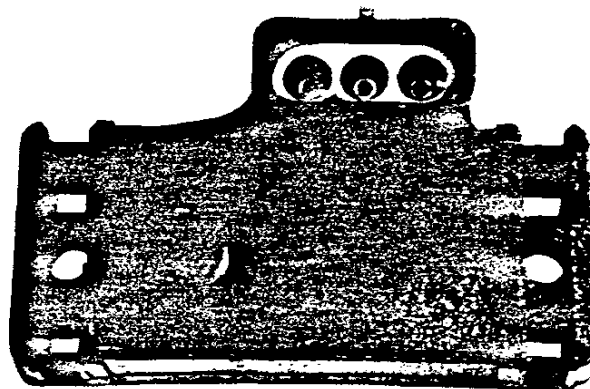
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

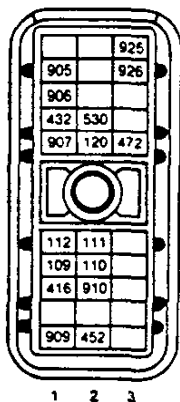
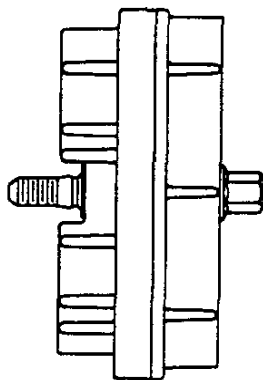
-
- The backup computer inside the ECM has failed. Replace the ECM, then go to START-1.
-



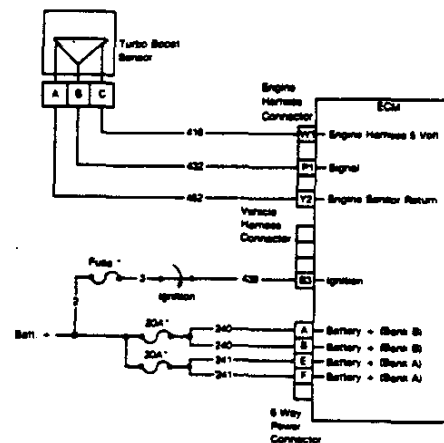
Turbo Boost Sensor
Harness Connector
12015384



Turbo Boost Sensor (TBS)
16070629



ECM Engine Harness Connector
P/N 12034400



(* Note: Some Applications have circuit breakers instead of fuses)

Turbo Boost, Battery + and Ignition Circuits

Section 4

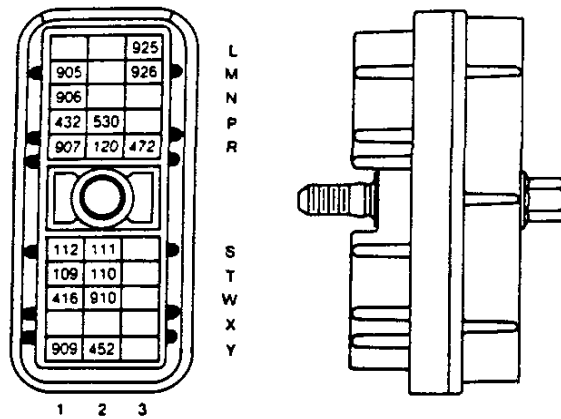
TROUBLESHOOTING CHARTS

E. CODE 33 - TURBO BOOST SENSOR (TBS) SIGNAL VOLTAGE HIGH

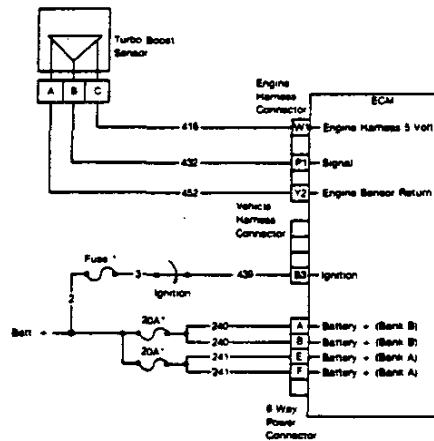
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
33-1 Multiple Code Check <ul style="list-style-type: none"> Were there any other active codes besides code 33? 	No other codes. —————→ Yes, any or all —————→ of the following codes: 14-15, 23-24, 34. Yes - but none of the —————→ above.	Go to 33-2. Go to ENG5V-1, page 367. Go to 33-2.
33-2 Sensor Check <ul style="list-style-type: none"> Turn ignition off. Disconnect TBS Connector. Start and run engine at idle. Read active codes. 	Code 34 (and —————→ any codes except Code 33). Code 33 (and —————→ any other codes).	Go to 33-3. Go to 33-5.
33-3 Return Circuit Check <ul style="list-style-type: none"> Turn ignition off. Install a jumper wire between pins A and B of the TBS harness connector. Disconnect the engine harness connector at the ECM. Read resistance between sockets P1 and Y2 on the engine harness connector. 	Less than or —————→ equal to 5 ohms. Greater than —————→ 5 ohms or open.	Go to 33-4. Return line (ckt #452) is open. Repair open. Then go to 33-30.
33-4 Check TBS Connectors <ul style="list-style-type: none"> Inspect terminals at the TBS connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and —————→ connectors are okay. Problem found. —————→	Replace TBS. Then go to 33-30. Repair terminals/connectors. Then go to 33-30.

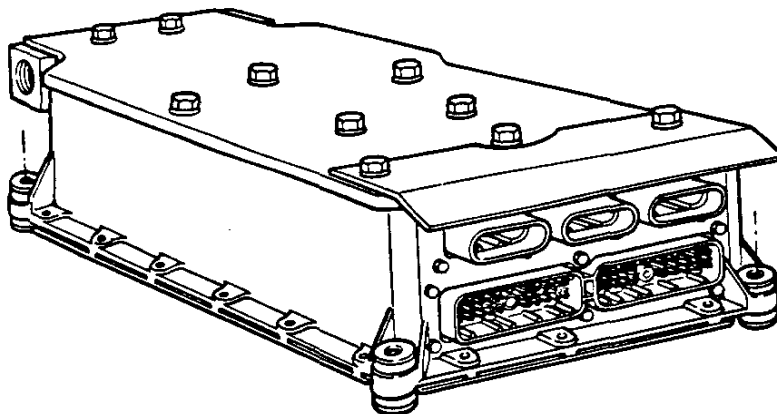


ECM Engine Harness Connector
P/N 12034400



(*Note: Some Applications have circuit breakers instead of fuses)

Turbo Boost, Battery + and Ignition Circuits

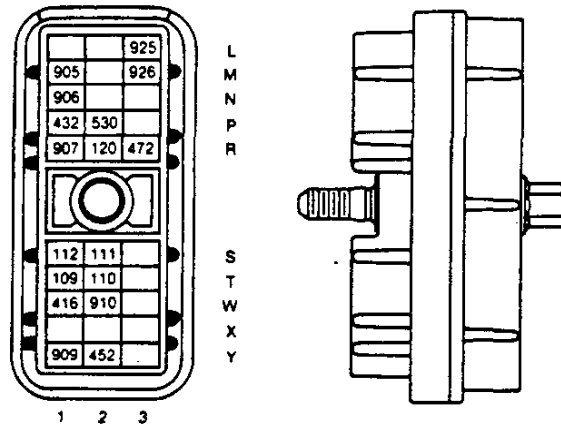


Electronic Control Module (ECM)

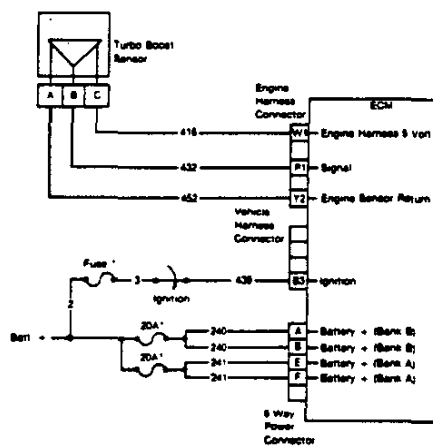
Section 4 TROUBLESHOOTING CHARTS

E. CODE 33 - TURBO BOOST SENSOR (TBS) SIGNAL VOLTAGE HIGH (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
33-5 Check for Short to +5 Volt Line <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets W1 and P1 on the engine harness connector. 	<p>Less than or equal to 10,000 ohms.</p> <p>Greater than 10,000 ohms or open.</p>	<p>Signal line (ckt #432) is shorted to the engine +5 Volt line (ckt #416). Repair short. Then go to 33-30.</p> <p>Go to 33-6.</p>
33-6 Check for Short to Battery + <ul style="list-style-type: none"> • Remove both 20 Amp fuses to the ECM. • Disconnect the vehicle harness and 6-way power harness connectors at the ECM. • Read resistance between socket P1 of the engine harness connector and socket B3 of the vehicle harness connector. • Also read resistance between socket P1 on the engine harness connector and the following sockets on the 6-way power harness connector: A, B, E and F. 	<p>All readings are greater than 10,000 ohms or open.</p> <p>Any reading is less than or equal to 10,000 ohms.</p>	<p>Go to 33-7.</p> <p>A short exists between the sockets where less than 10,000 ohms resistance was read. Repair short and reinsert fuses (or reset breakers). Then go to 33-30.</p>
33-7 Check ECM Connectors <ul style="list-style-type: none"> • Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets. 	<p>Terminals and connectors are okay.</p> <p>Problem found.</p>	<p>Replace ECM. Then go to 33-30.</p> <p>Repair terminals/connectors. Then go to 33-30.</p>

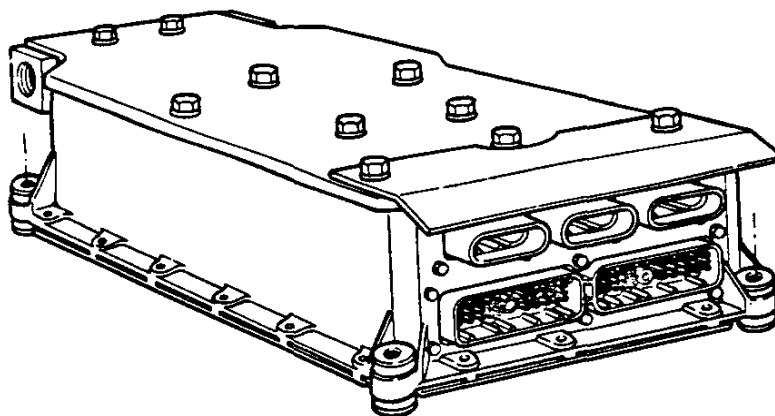


ECM Engine Harness Connector
P/N 12034400



(*Note: Some Applications have circuit breakers instead of fuses.)

Turbo Boost, Battery + and Ignition Circuits

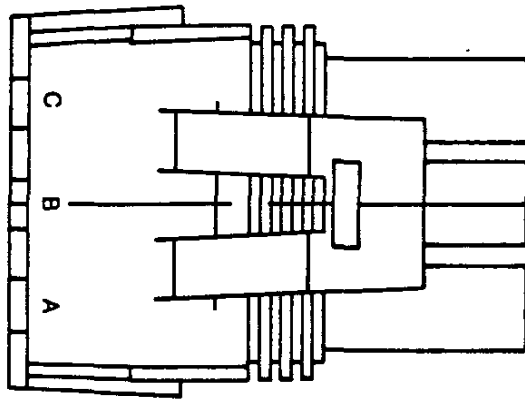
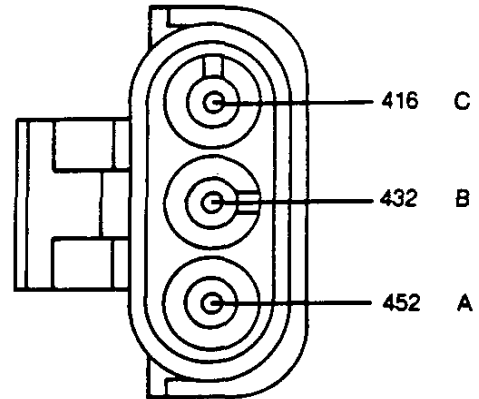


Electronic Control Module (ECM)

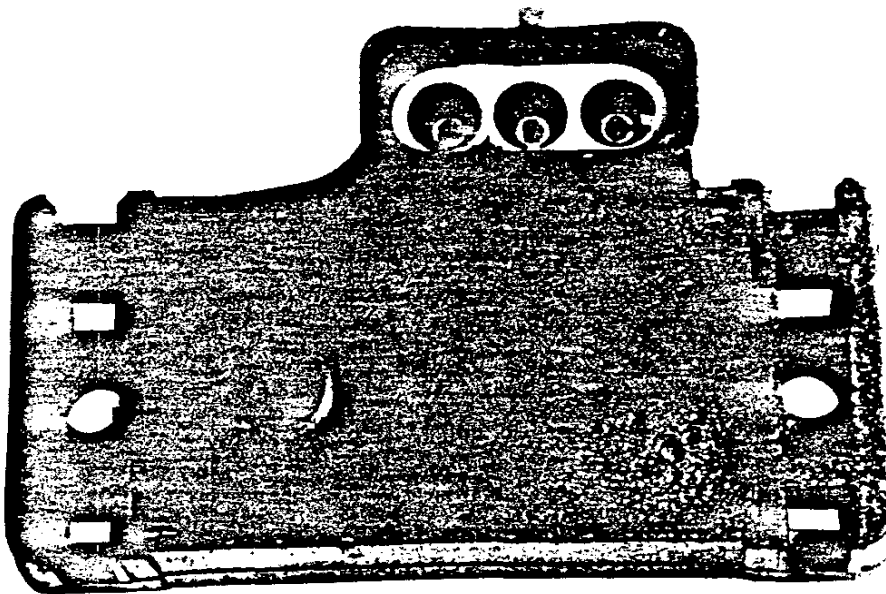
Section 4 TROUBLESHOOTING CHARTS

E. CODE 33 - TURBO BOOST SENSOR (TBS) SIGNAL VOLTAGE HIGH (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
33-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. Stop engine. • Read all codes. 	<p>Code 25 (no codes). →</p> <p>Code 33 (and any other codes). →</p> <p>Any other codes except Code 33. →</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>Go to START-1, page 17, to service other codes.</p>



Turbo Boost Sensor
Harness Connector
P/N 12015384



Turbo Boost Sensor (TBS)
P/N 16070629

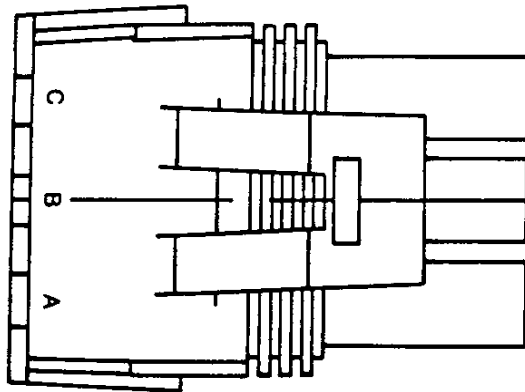
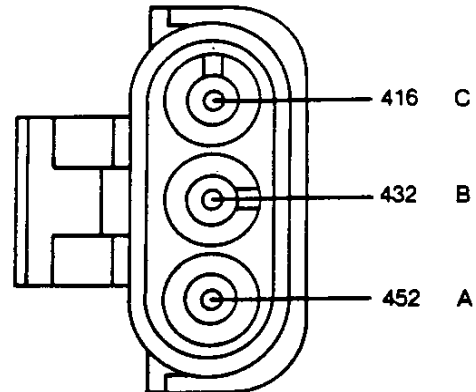
Section 4 TROUBLESHOOTING CHARTS

E. CODE 34 - TURBO BOOST SENSOR (TBS) SIGNAL VOLTAGE LOW

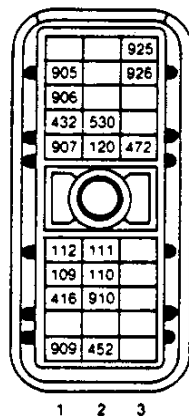
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
34-1 Multiple Code Check <ul style="list-style-type: none"> Were there any other active codes besides Code 34? 	<p>No other codes. —————→</p> <p>Yes, any or all of the following codes: 14-15, 23-24, 33, 35. —————→</p> <p>Yes - but none of the above. —————→</p>	<p>Go to 34-2.</p> <p>Go to ENG5V-1, page 367.</p> <p>Go to 34-2.</p>
34-2 Sensor Check <ul style="list-style-type: none"> Turn ignition off. Disconnect TBS connector. Install a jumper wire between sockets B and C of the TBS harness connector. Turn ignition on. Read active codes. If active Code 33 or 34 exists go to RESULT column. If no active Code 33 or 34 exists, start engine and run until either the "Check Engine" light comes on or the engine has been running warm for at least one minute at greater than 1000 RPM. Read active codes. 	<p>Code 33 (and any other codes except Code 34). —————→</p> <p>Code 34 (and any other codes). —————→</p>	<p>Go to 34-3.</p> <p>Go to 34-4.</p>
34-3 Check TBS Connectors <ul style="list-style-type: none"> Inspect terminals at the TBS connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets. 	<p>Terminals and connectors are okay. —————→</p> <p>Problem found. —————→</p>	<p>Replace TBS. Then go to 34-30.</p> <p>Repair terminals/connectors. Then go to 34-30.</p>

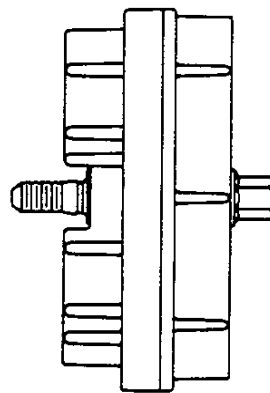


**Turbo Boost Sensor
Harness Connector**
P/N 12015384

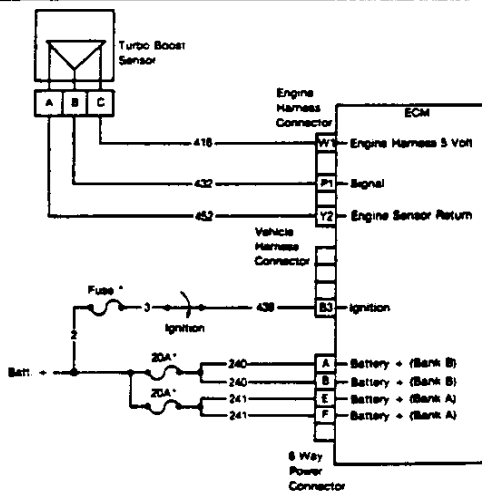


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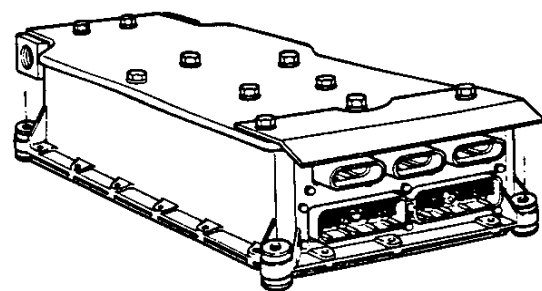
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ECM Engine Harness Connector
P/N 12034400



Turbo Boost, Battery + and Ignition Circuits



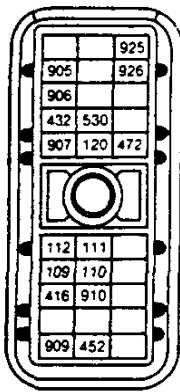
Electronic Control Module (ECM)

Section 4

TROUBLESHOOTING CHARTS

E. CODE 34 - TURBO BOOST SENSOR (TBS) SIGNAL VOLTAGE LOW (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
34-4 Check for +5 Volts <ul style="list-style-type: none"> Remove jumper wire. Turn ignition on. Read voltage on TBS harness connector, pin C (red lead) to pin A (black lead). 	Between 4 to 6 volts. → Less than 4 volts. → Greater than 6 volts. →	Go to 34-5. Go to 34-8. Go to 34-10.
34-5 Check for Signal Open <ul style="list-style-type: none"> Turn ignition off. Disconnect the engine harness connector at the ECM. Install a jumper wire between pins A and B of the TBS harness connector. Read resistance between sockets P1 and Y2 on the engine harness connector. 	Less than or equal to 5 ohms. → Greater than 5 ohms or open. →	Go to 34-6. Signal line (ckt #432) or return line (ckt #452) is open. Repeat check from pin A to Y2 and pin B to P1. Repair open. Then go to 34-30.
34-6 Check for Short <ul style="list-style-type: none"> Remove jumper. Read resistance between pins A and B on the TBS harness connector. 	Less than or equal to 10,000 ohms. → Greater than 10,000 ohms or open. →	Signal line (ckt #432) is shorted to the return line (ckt #452). Repair short. Then go to 34-30. Go to 34-7.
34-7 Check ECM Connectors <ul style="list-style-type: none"> Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace ECM. Then go to 34-30. Repair terminals/connectors. Then go to 34-30.

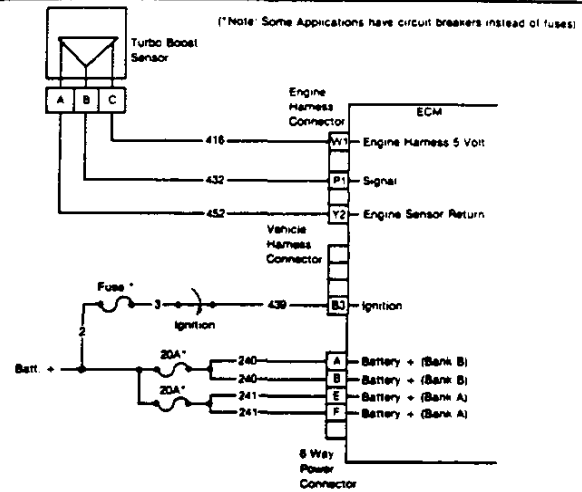


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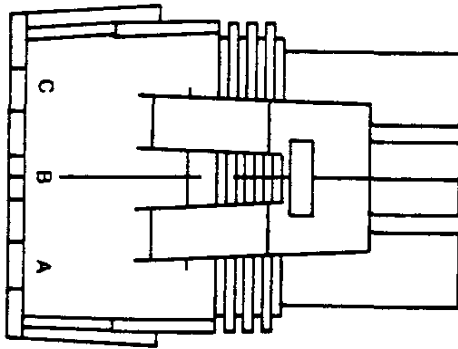
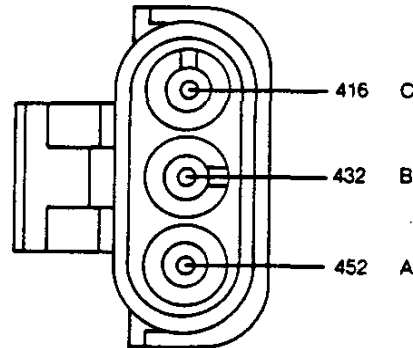
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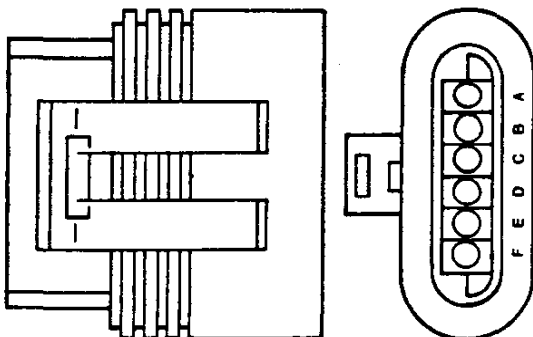
ECM Engine Harness Connector
P/N 12034400



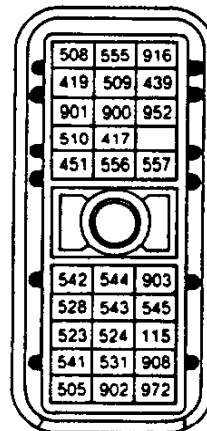
Turbo Boost, Battery + and
Ignition Circuits



Turbo Boost Sensor
Harness Connector
P/N 12015384



6-Way Power Harness Connector
P/N 12066317



A
B
C
D
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J
K

1 2 3

ECM Vehicle Harness Connector
P/N 12034398

Section 4

TROUBLESHOOTING CHARTS

E. CODE 34 • TURBO BOOST SENSOR (TBS) SIGNAL VOLTAGE LOW (Cont'd.)

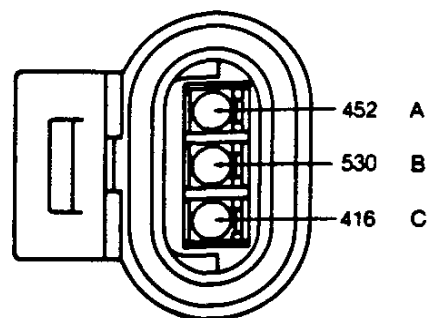
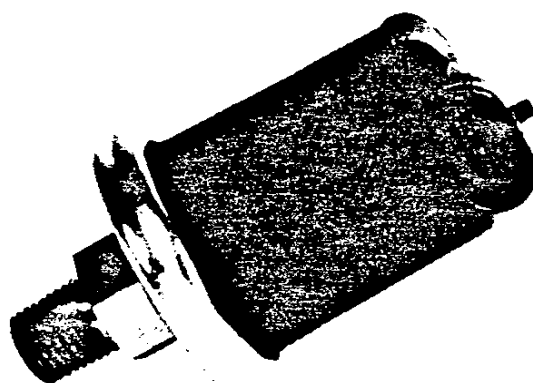
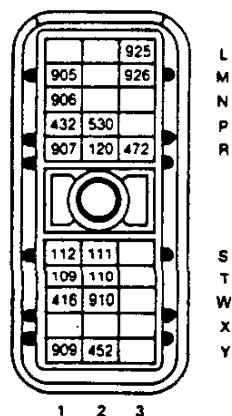
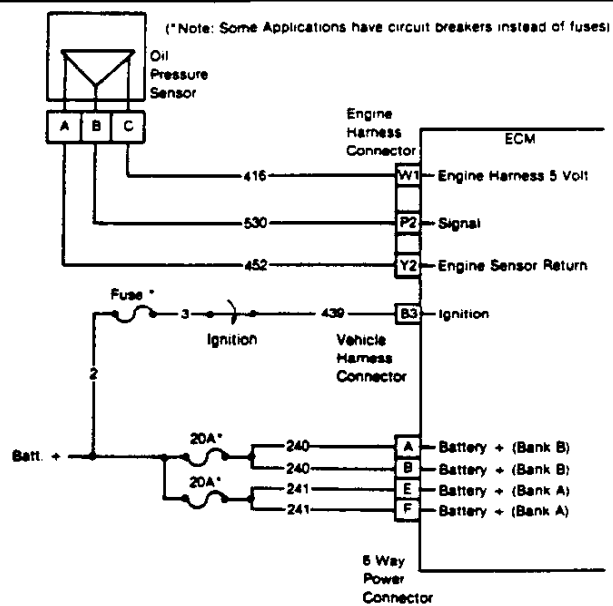
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
34-8 Check for Open + 5 Volt Line <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the engine harness connector at the ECM. • Install a jumper wire between pins A and C of the TBS harness connector. • Read resistance between sockets W1 and Y2 on the engine harness connector. 	<p>Less than or equal to 5 ohms. →</p> <p>Greater than 5 ohms or open. →</p>	<p>Go to 34-9.</p> <p>The engine + 5 Volt line (ckt #416) is open. Repair open. Then go to 34-30.</p>
34-9 Check for Short <ul style="list-style-type: none"> • Remove jumper wire. • Read resistance between pins A and C on the TBS harness connector. 	<p>Less than or equal to 10,000 ohms. →</p> <p>Greater than 10,000 ohms or open. →</p>	<p>The + 5 Volt line (ckt #416) is shorted to the return line (ckt #452). Repair short. Then go to 34-30.</p> <p>Go to 34-7.</p>
34-10 Check for Short to Battery + <ul style="list-style-type: none"> • Turn ignition off. • Remove both 20 Amp fuses to the ECM. • Disconnect the engine harness, vehicle harness and 6-way power harness connectors at the ECM. • Read resistance between socket P1 of the engine harness connector and socket B3 of the vehicle harness connector. • Also read resistance between socket P1 on the engine harness connector and the following sockets on the 6-way power harness connector: A, B, E and F. 	<p>All readings are greater than 10,000 ohms or open. →</p> <p>Any reading is less than or equal to 10,000 ohms. →</p>	<p>Go to 34-7.</p> <p>A short exists between the sockets where less than 10,000 ohms resistance was read. Repair short and reinsert fuses (or reset breakers). Then go to 34-30.</p>

Section 4

TROUBLESHOOTING CHARTS

E. CODE 34 - TURBO BOOST SENSOR (TBS) SIGNAL VOLTAGE LOW (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
34-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or 1 minute. • Stop engine. • Read historical codes. 	<p>Code 25 (no codes). →</p> <p>Code 34 (and → any other codes).</p> <p>Any other codes → except Code 34.</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>Go to START-1, page 17, to service other codes.</p>



Section 4

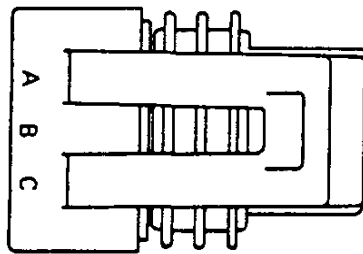
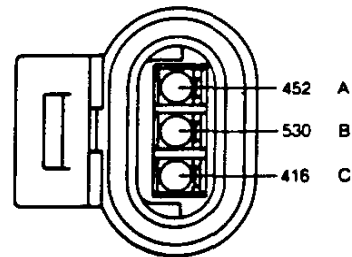
TROUBLESHOOTING CHARTS

E. CODE 35 - OIL PRESSURE SENSOR (OPS) SIGNAL VOLTAGE HIGH

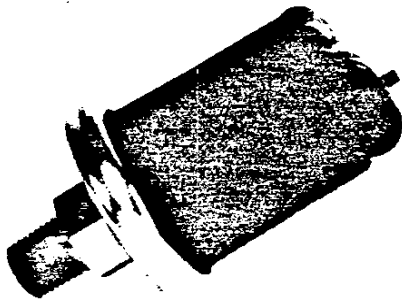
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

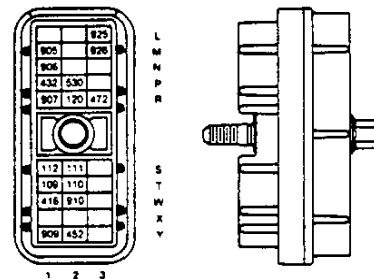
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
35-1 Multiple Code Check <ul style="list-style-type: none"> Were there any other active codes beside Code 35? 	No other codes. → Yes, any or all of the following codes: 14-15, 23-24, 33-34, 36. → Yes - but none of the above. →	Go to 35-2. Go to ENG5V-1, page 367. Go to 35-2.
35-2 Sensor Check <ul style="list-style-type: none"> Turn ignition off. Disconnect OPS connector. Turn ignition on. Start and run engine. Select Engine Temperature (Mode 13 or 18) on the DDR. Warm up engine until engine temperature reading is greater than 50 degrees C (122 degrees F). Leave engine running at idle after warm up. Read active codes. 	Code 36 (and any codes except Code 35). → Code 35 (and any other codes). →	Go to 35-3. Go to 35-5.
35-3 Return Circuit Check <ul style="list-style-type: none"> Turn ignition off. Disconnect the engine harness connector at the ECM. Install a jumper wire between pins A and B of the OPS harness connector. Read resistance between sockets P2 and Y2 on the engine harness connector. 	Less than or equal to 5 ohms. → Greater than 5 ohms or open. →	Go to 35-4. Return line (ckt #452) is open. Repair open. Then go to 35-30.



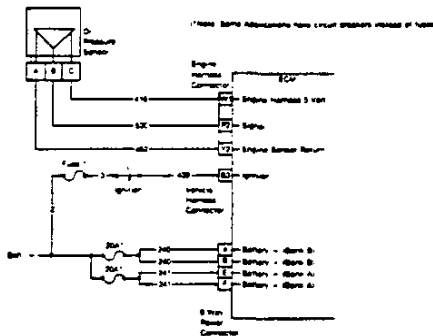
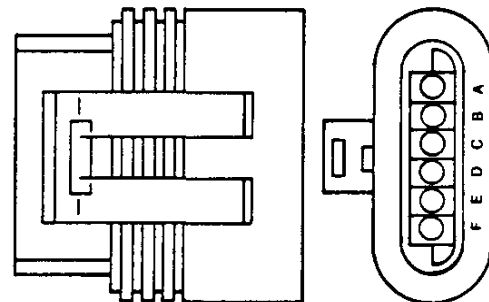
Oil Pressure Sensor
Harness Connector
P/N 12047909



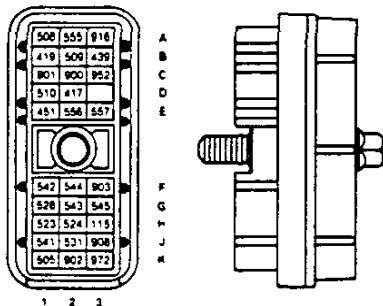
Oil Pressure Sensor (OPS)
P/N 8929184



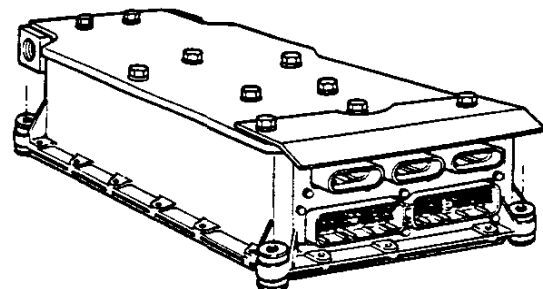
ECM Engine Harness Connector
P/N 12034400



6-Way Power Harness Connector
P/N 12066317



ECM Vehicle Harness Connector
P/N 12034398



Electronic Control Module (ECM)

Section 4 TROUBLESHOOTING CHARTS

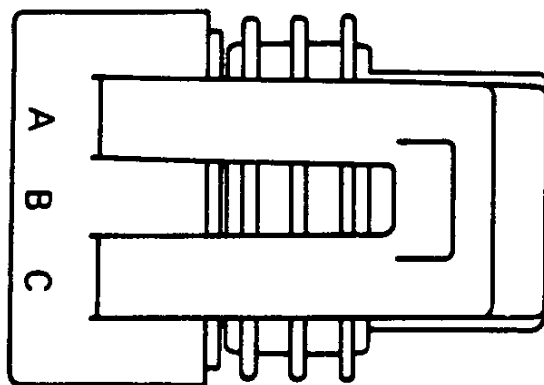
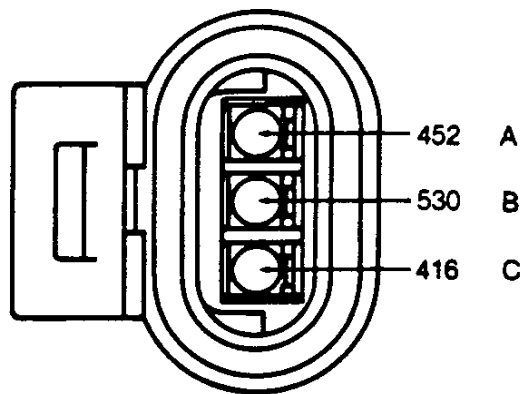
E. CODE 35 - OIL PRESSURE SENSOR (OPS) SIGNAL VOLTAGE HIGH (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
35-4 Check OPS Connectors <ul style="list-style-type: none"> Inspect terminals at the OPS connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace OPS. Then go to 35-30. Repair terminals/connectors. Then go to 35-30.
35-5 Check for Short <ul style="list-style-type: none"> Turn ignition off. Disconnect the engine harness connector at the ECM. Read resistance between sockets W1 and P2 on the engine harness connector. 	Less than or equal to 10,000 ohms. → Greater than 10,000 ohms or open. →	Signal line (ckt #530) is shorted to the engine +5 Volt line (ckt #416). Repair short. Then go to 35-30. Go to 35-6.
35-6 Check for Short to Battery + <ul style="list-style-type: none"> Remove both 20 Amp fuses to the ECM. Disconnect the vehicle harness and 6-way power harness connectors at the ECM. Read resistance between socket P2 of the engine harness connector and socket B3 of the vehicle harness connector. Also read resistance between socket P2 on the engine harness connector and the following sockets on the 6-way power harness connector: A, B, E and F. 	All readings are greater than 10,000 ohms or open. → Any reading is less than or equal to 10,000 ohms. →	Go to 35-8. A short exists between the sockets where less than 10,000 ohms resistance was read. Repair short and reinsert fuses (or reset breakers). Then go to 35-30.

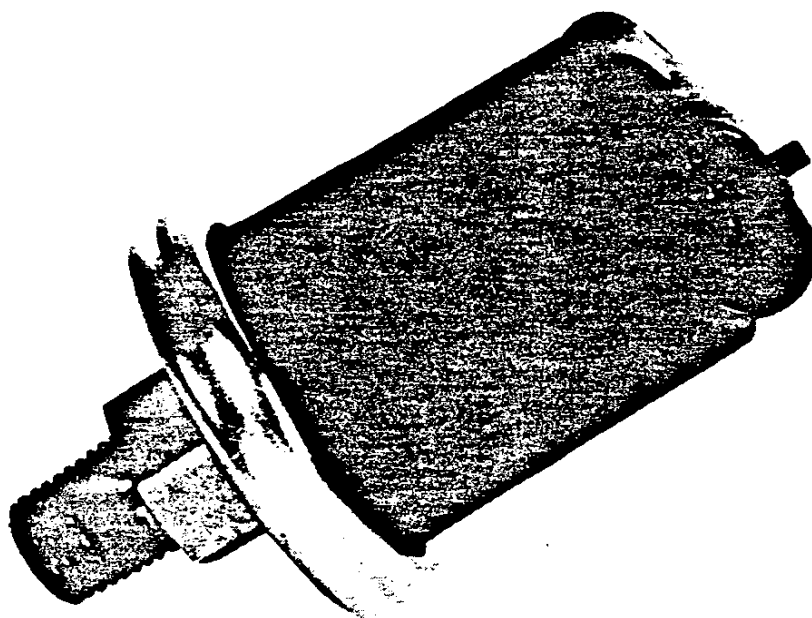
Section 4 TROUBLESHOOTING CHARTS

E. CODE 35 - OIL PRESSURE SENSOR (OPS) SIGNAL VOLTAGE HIGH (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
35-7 Final Check <ul style="list-style-type: none"> ● Reconnect all connectors. ● Turn ignition on. ● Clear codes. ● Start engine. Run for one minute or until "Check Engine" light comes on. ● Stop engine. ● Check active codes. 	Code 35. —————→ No codes. —————→ Any other codes —————→ except Code 35.	Replace ECM. Then go to 35-30. Repairs are complete. Go to START-1, page 17, to service other codes.
35-8 Check OPS Connectors <ul style="list-style-type: none"> ● Inspect terminals at OPS connectors (sensor and harness sides) for damage; bent, corroded and unseated pins or sockets. 	Terminals and —————→ connectors are okay. Problem found. —————→	Replace OPS. Then go to 35-7. Repair terminals/connectors. Then go to 35-30.
35-30 Verify Repairs <ul style="list-style-type: none"> ● Turn ignition off. ● Reconnect all connectors. ● Turn ignition on. ● Clear codes. ● Note status of "Check Engine" light. ● If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or engine has run warm (greater than 50 degrees C, 122 degrees F) for 1 minute. ● Read historical codes. 	Code 25 (no codes). —————→ Code 35 (and —————→ any other codes). Any other codes —————→ except Code 35.	Repairs are complete. All system diagnostics are complete. Please review this section from the start to find the error. Go to START-1, page 17, to service other codes.



Oil Pressure Sensor
Harness Connector
P/N 12047909



Oil Pressure Sensor (OPS)
P/N 8929184

Section 4

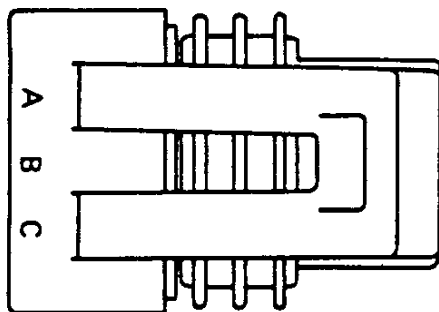
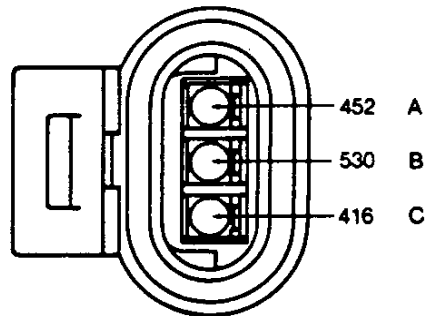
TROUBLESHOOTING CHARTS

E. CODE 36 - OIL PRESSURE SENSOR (OPS) SIGNAL VOLTAGE LOW

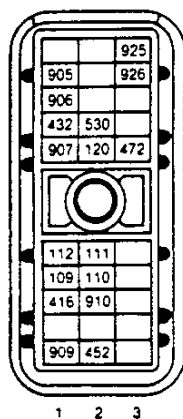
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
36-1 Multiple Code Check <ul style="list-style-type: none"> Were there any other active codes beside Code 36? 	No other codes. → Yes, any or all of the following codes: 14-15, 23-24, 33-35. → Yes - but none of the above. →	Go to 36-2. Go to ENG5V-1, page 367. Go to 36-2.
36-2 Sensor Check <ul style="list-style-type: none"> Turn ignition off. Disconnect OPS connector and install a jumper wire between sockets B and C of the OPS harness connector. Turn ignition on. Read active codes. If active Code 35 or 36 exists, go to RESULT column. If no active Code 35 or 36 exists, start and run engine until either active Code 35 or 36 appears or the engine temperature (Mode 13 or 18 on DDR) has been greater than 50 degrees C (122 deg F) for more than 1 minute. 	Code 35 (and any codes except Code 36). → Code 36 (and any other codes). → No codes. →	Check to be sure ECM and OPS connectors are wired properly. If wired properly then go to 36-3. Go to 36-4. Go to 36-4.
36-3 Check OPS Connectors <ul style="list-style-type: none"> Turn ignition off. Inspect terminals at the OPS connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and connectors are okay. Problem found.	Replace OPS. Then go to 36-30. Repair terminals/connectors. Then to 36-30.

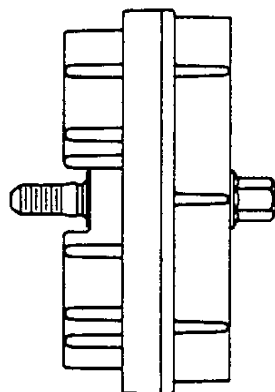


Oil Pressure Sensor
Harness Connector
P/N 12047909

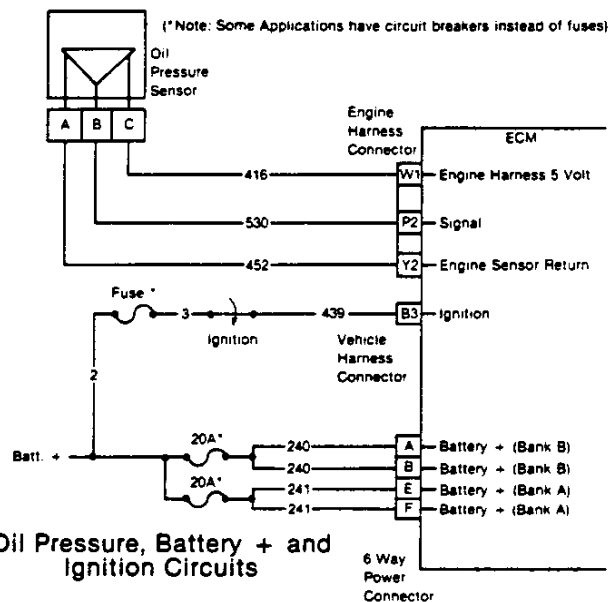


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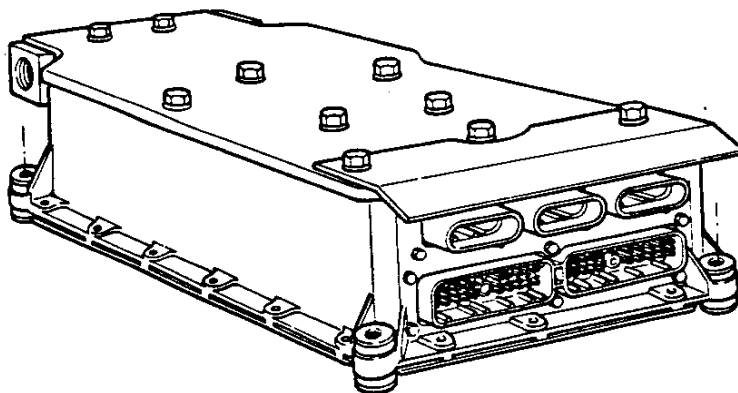
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ECM Engine Harness Connector
P/N 12034400



Oil Pressure, Battery + and
Ignition Circuits



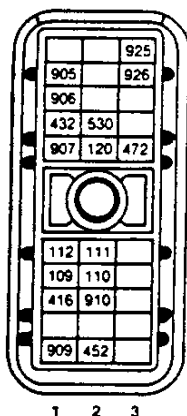
Electronic Control Module (ECM)

Section 4

TROUBLESHOOTING CHARTS

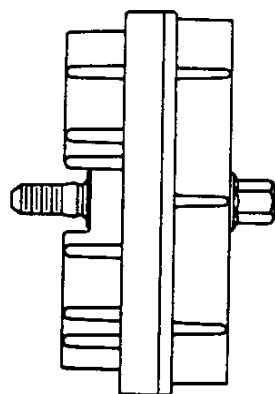
E. CODE 36 - OIL PRESSURE SENSOR (OPS) SIGNAL VOLTAGE LOW (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
36-4 Check for + 5 Volts <ul style="list-style-type: none"> • Turn ignition off. • Remove jumper wire. • Connect vehicle harness to ECM. • Turn ignition on. • Read voltage on OPS harness connector, socket C (red lead) to socket A (black lead). 	Between 4 to 6 volts. → Less than 4 volts. → Greater than 6 volts. →	Go to 36-5. Go to 36-8. Go to 36-10.
36-5 Check for Signal Open <ul style="list-style-type: none"> • Turn ignition off. • Disconnect engine harness connector at the ECM. • Install a jumper wire between sockets A and B of the OPS harness connector. • Read resistance between sockets P2 and Y2 on the engine harness connectors. 	Less than or equal to 5 ohms. → Greater than 5 ohms or open. →	Go to 36-11. Signal line (ckt #530) or return line (ckt #452) is open. Repair open. Then go to 36-30.
36-6 Check for Short <ul style="list-style-type: none"> • Remove jumper wire. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets A and B on the OPS harness connector. 	Less than or equal to 10,000 ohms. → Greater than 10,000 ohms or open. →	Signal line (ckt #530) is shorted to the return line (ckt #452). Repair short. Then go to 36-30. Go to 36-12.
36-7 Check ECM Connectors <ul style="list-style-type: none"> • Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets. Especially W1, P2 and Y2 terminals and pins at ECM. 	Terminals and connectors are okay. → Problem found. →	Replace ECM. Then go to 36-30. Repair terminals/connectors. Then go to 36-30.

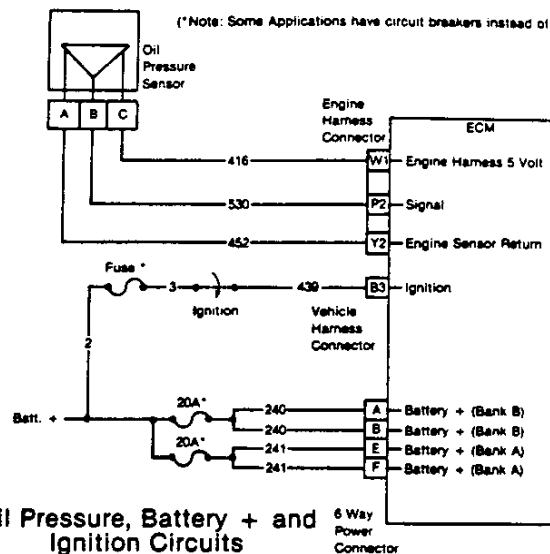


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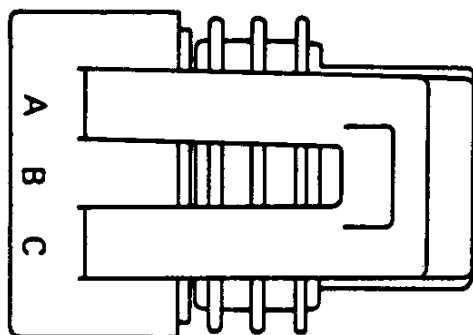
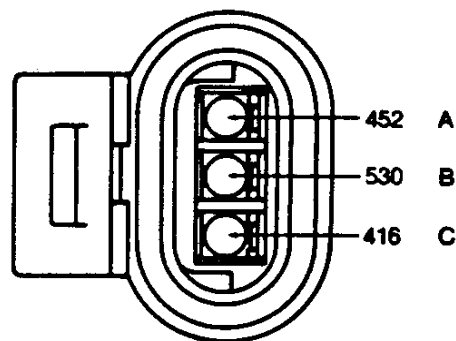
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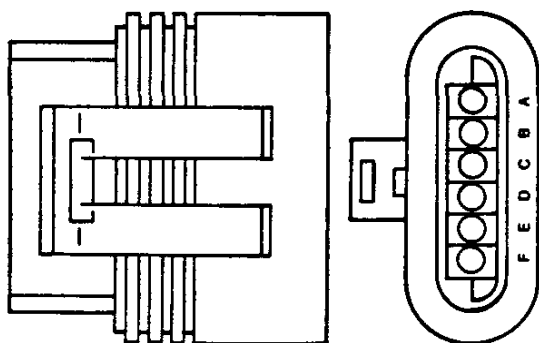
ECM Engine Harness Connector
P/N 12034400



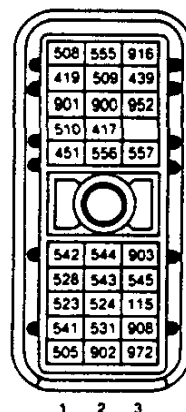
Oil Pressure, Battery + and
Ignition Circuits



Oil Pressure Sensor
Harness Connector
P/N 12047909

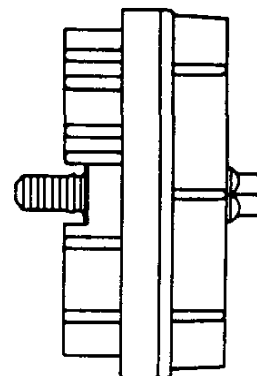


6-Way Power Harness Connector
P/N 12066317



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C
D
E

F
G
H
J
K



ECM Vehicle Harness Connector
P/N 12034398

Section 4

TROUBLESHOOTING CHARTS

E. CODE 36 - OIL PRESSURE SENSOR (OPS) SIGNAL VOLTAGE LOW (Cont'd.)

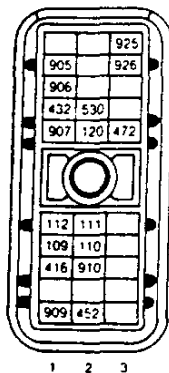
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
36-8 Check for Open + 5 Volt Line <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the engine harness connector at the ECM. • Install a jumper wire between sockets A and C of the OPS harness connector. • Read resistance between sockets W1 and Y2 on the engine harness connector. 	<p>Less than or equal to 5 ohms. →</p> <p>Greater than 5 ohms or open. →</p>	<p>Go to 36-9.</p> <p>The engine + 5 Volt line (ckt #416) is open. Repair open. Then go to 36-30.</p>
36-9 Check for Short <ul style="list-style-type: none"> • Remove jumper wire. • Read resistance between sockets A and C of the OPS harness connector. 	<p>Less than or equal to 10,000 ohms. →</p> <p>Greater than 10,000 ohms or open. →</p>	<p>The engine + 5 Volt line (ckt #416) is shorted to the return line (ckt #452). Repair short. Then go to 36-30.</p> <p>Go to 36-12.</p>
36-10 Check for Short to Battery + <ul style="list-style-type: none"> • Remove both 20 Amp fuses to the ECM. • Disconnect the vehicle harness and 6-way power harness connectors at the ECM. • Read resistance between socket P2 of the engine harness connector and socket B3 of the vehicle harness connector. • Also read resistance between socket P2 on the engine harness connector and the following sockets on the 6-way power harness connector: A, B, E and F. 	<p>All readings are greater than 10,000 ohms or open. →</p> <p>Any reading is less than or equal to 10,000 ohms. →</p>	<p>Go to 36-12.</p> <p>A short exists between the sockets where less than 10,000 ohms resistance was read. Repair short and reinsert fuses (or reset breakers). Then go to 36-30.</p>

Section 4

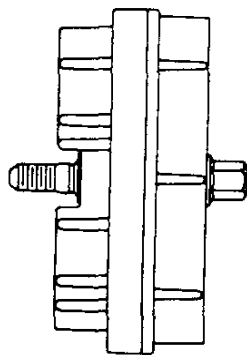
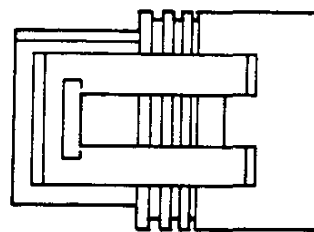
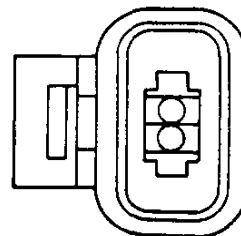
TROUBLESHOOTING CHARTS

E. CODE 36 - OIL PRESSURE SENSOR (OPS) SIGNAL VOLTAGE LOW (Cont'd.)

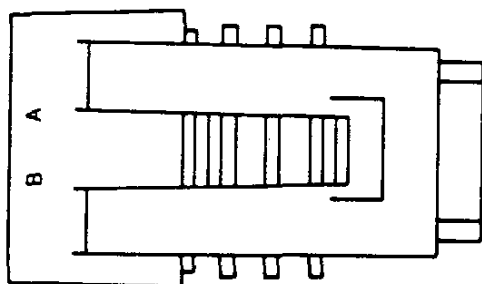
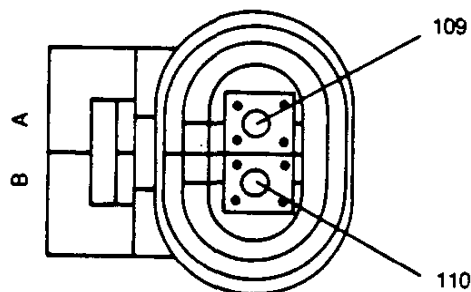
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
36-11 Check for Short on Ground <ul style="list-style-type: none"> • Turn ignition off. • Remove jumper wires. • Measure resistance between sockets P2 and Y2 on the engine harness. 	Greater than 10,000 ohms. → Less than or equal to 10,000 ohms. →	Go to 36-6. Signal line (ckt #530) and return line (ckt #452) are shorted together. Repair short. Then go to 36-30.
36-12 Replace OPS <ul style="list-style-type: none"> • Turn ignition off. • Replace OPS. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Start engine. Run until check engine light comes on or for one minute. 	Check engine light comes on. → Check engine light does not come on. →	Go to 36-7. Go to 36-30.
36-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or engine has run warm (greater than 50 degrees C, 122 degrees F) for 1 minute. • Read historical codes. 	Code 25 (no codes). → Code 36 (and any other codes). → Any other codes except Code 36. →	Repairs are complete. All system diagnostics are complete. Please review this section from the start to find the error. Go to START-1, page 17, to service other codes.



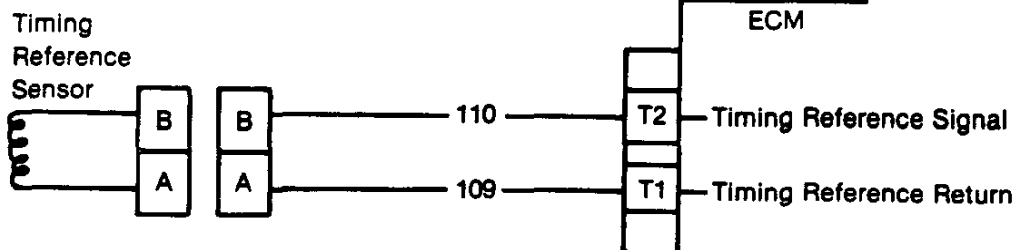
ECM Engine Harness Connector
P/N 12034400



Timing Reference Sensor
Connector (Gray)
P/N 12041411



Timing Reference Harness
Connector (Gray)
P/N 12041411



Engine Harness Connector

Timing Reference Sensor Circuit

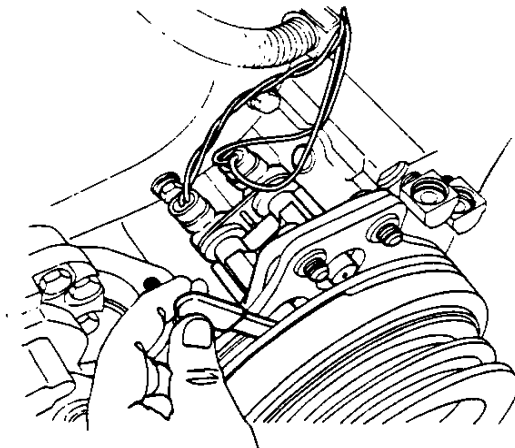
Section 4 TROUBLESHOOTING CHARTS

E. CODE 41 - TIMING REFERENCE SENSOR (TRS)

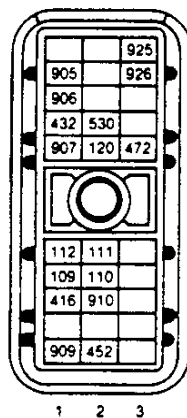
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
41-1 Resistance Check <ul style="list-style-type: none"> • Turn ignition off. • Disconnect engine harness connector at the ECM. • Read the resistance between socket T1 and T2 on the engine harness connector. 	Less than or equal to 200 ohms. → Greater than 200 ohms or open. →	Go to 41-2. Go to 41-3.
41-2 Check for Short <ul style="list-style-type: none"> • Disconnect TRS connector. • Read resistance between sockets T1 and T2 on the engine harness connector. • Also read resistance between socket T1 and ground, then between socket T2 and ground. 	Less than or equal to 10,000 ohms on any reading. → Greater than 10,000 ohms or open on all readings. →	A short exists between ckt #110 and #109 or where the resistance was less than 10,000 ohms. Repair short. Then go to 41-30. Go to 41-4.
41-3 Open TRS Line Check <ul style="list-style-type: none"> • Disconnect TRS connector and install a jumper wire between sockets A and B of the TRS harness connector. • Read resistance between sockets T1 and T2 on the engine harness connector. 	Less than or equal to 5 ohms. → Greater than 5 ohms or open. →	Go to 41-4. Signal line (ckt #110) or return line (ckt #109) is open. Repair open. Then go to 41-30.
41-4 Check TRS Resistance <ul style="list-style-type: none"> • Read resistance of the TRS across the sensor connector pins A and B. 	Less than 100 ohms. → From 100 to 200 ohms. → Greater than 200 ohms. →	Go to 41-12. Go to 41-5. Go to 41-12.

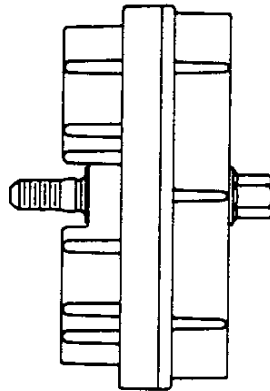


Timing Sensor with Tool
Series 92

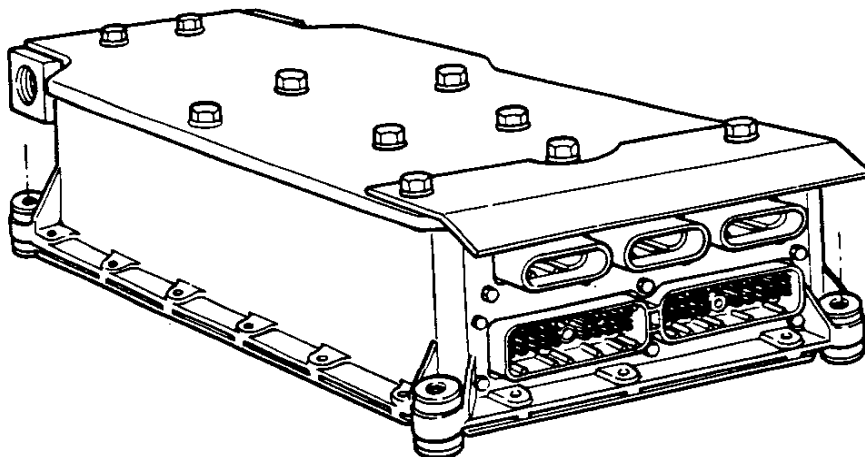


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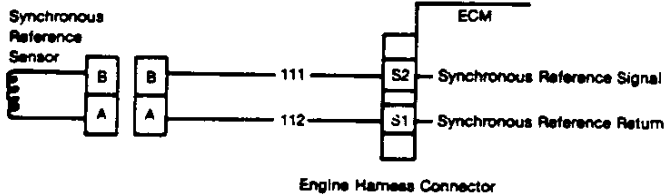
ECM Engine Harness Connector
P/N 12034400



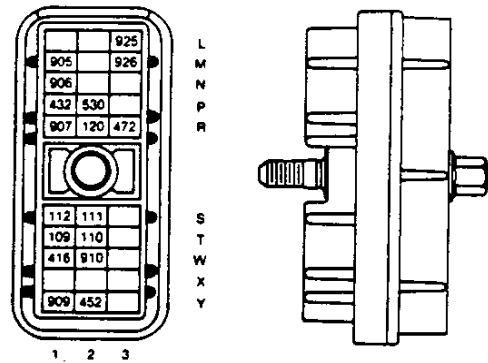
Electronic Control Module (ECM)

E. CODE 41 - TIMING REFERENCE SENSOR (TRS) (Cont'd.)

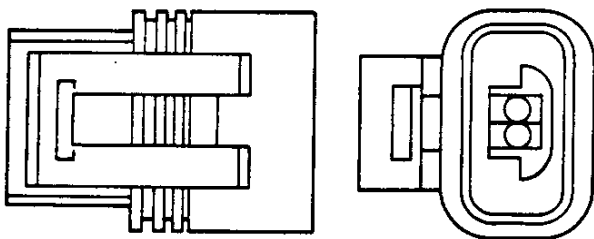
Page 247



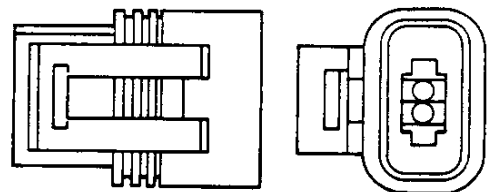
Synchronous Reference Sensor
Circuit



ECM Engine Harness Connector
P/N 12034400



Synchronous Reference Sensor
Harness Connector (Black)
P/N 12040753

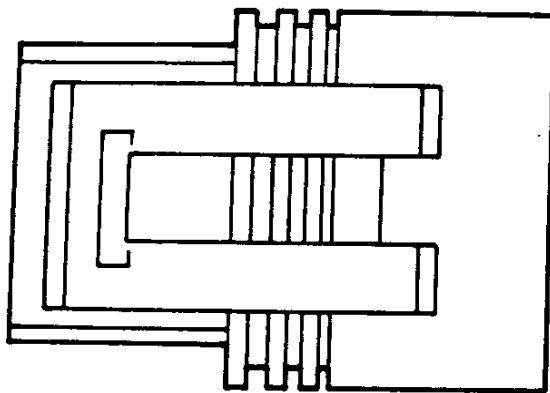
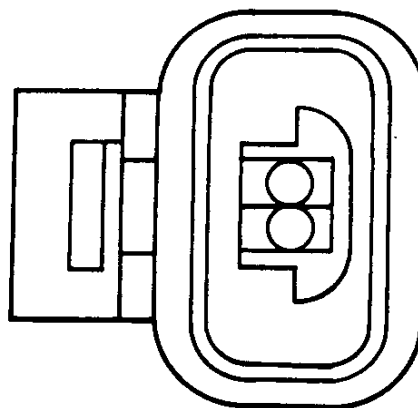


Timing Reference Sensor
Connector (Gray)
P/N 12041411

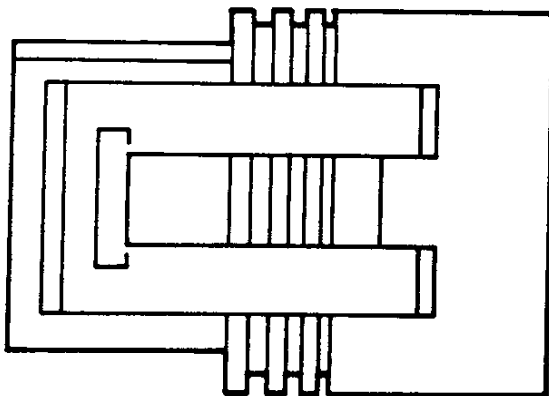
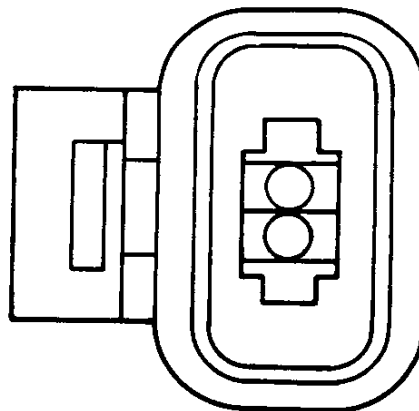
Section 4 TROUBLESHOOTING CHARTS

E. CODE 41 - TIMING REFERENCE SENSOR (TRS) (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
41-9 Check for Short <ul style="list-style-type: none"> Disconnect SRS connector. Read resistance between sockets S1 and S2 on the engine harness connector. 	Less than or equal to 10,000 ohms.	Signal line (ckt #111) is shorted to the return line (ckt #112). Repair short. Then go to 41-30.
	Greater than 10,000 ohms or open.	Go to 41-11.
41-10 Open SRS Line Check <ul style="list-style-type: none"> Install a jumper wire between sockets A and B of the SRS harness connectors. Read resistance between sockets S1 and S2 of the engine harness connector. 	Less than or equal to 5 ohms.	Go to 41-11.
	Greater than 5 ohms or open.	Signal line (ckt #111) or return line (ckt #112) is open. Repair open. Then go to 41-30.
41-11 SRS Test <ul style="list-style-type: none"> Read resistance of the Synchronous Reference Sensor across the sensor connector pins A and B. 	Less than 100 ohms.	Go to 41-13.
	From 100 to 200 ohms.	Go to 41-7.
	Greater than 200 ohms.	Go to 41-13.
41-12 Check TRS Connectors <ul style="list-style-type: none"> Check connectors at the TRS (both the harness side and the TRS side) for damage; bent, corroded or unseated pins or sockets, or bad contacts. 	Connectors are okay.	Replace TRS. Then go to 41-14.
	Problem found.	Repair terminals/connectors. Then go to 41-30.



Synchronous Reference Sensor
 Harness Connector (Black)
 P/N 12040753

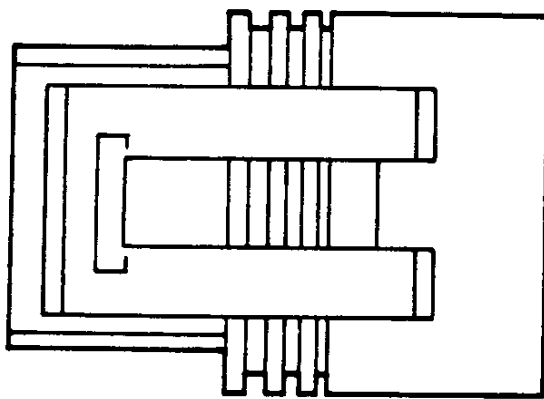
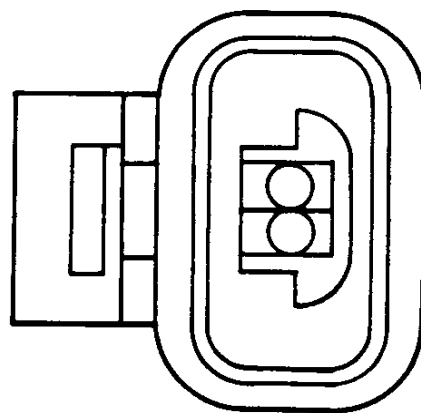


Timing Reference Sensor
 Connector (Gray)
 P/N 12041411

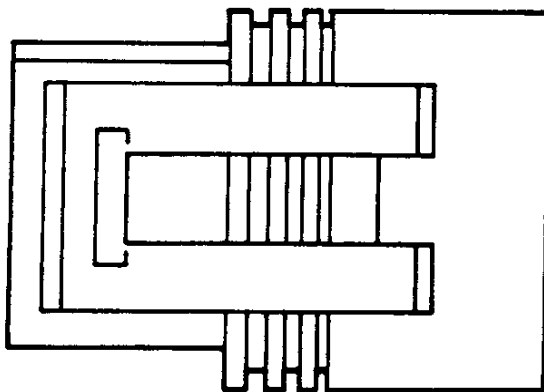
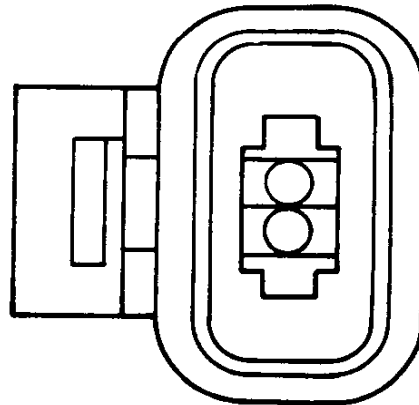
Section 4 TROUBLESHOOTING CHARTS

E. CODE 41 - TIMING REFERENCE SENSOR (TRS) (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
41-13 Check SRS Connectors <ul style="list-style-type: none"> Check connectors at the Synchronous Reference Sensor (both the harness side and the sensor side) for damage; bent, corroded or unseated pins or sockets, or bad contacts. 	Connectors are okay. → Problem found. →	Replace Synchronous Reference Sensor. Then go to 41-14. Repair terminals/connectors. Then go to 41-30.
41-14 Verify SRS/TRS <ul style="list-style-type: none"> Turn ignition off. Reconnect all connectors. Turn ignition on. Clear codes. Start and run engine until the "Check Engine" light comes on or for 1 minute. Stop engine. Read historical codes. 	Code 25 (no codes). → Code 41 reappears (and any other codes). → Code(s) other than Code 41 received. →	Repairs are complete. If the SRS was just replaced, go to 41-15. If the SRS was not replaced, go to 41-6. Go to START-1, page 17, to service other codes.
41-15 Check Cranking Voltage <ul style="list-style-type: none"> Turn ignition off. Connect 12 volts from a fully charged battery to the 6-pin power connector. Connect other connectors. Turn ignition on. Clear codes. Start engine. Run until "Check Engine" light appears or for 1 minute. Stop engine. Read active codes. 	Engine won't start and/or Code 41 (and any other codes). → Engine starts and no Code 41 →	Go to 41-7. Either battery is dead or voltage equalizer needs to be replaced. Repair, then to go 41-30.



Synchronous Reference Sensor
Harness Connector (Black)
P/N 12040753

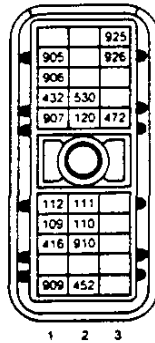
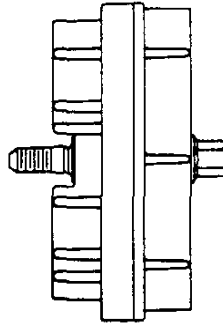


Timing Reference Sensor
Connector (Gray)
P/N 12041411

Section 4 TROUBLESHOOTING CHARTS

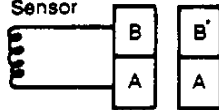
E. CODE 41 - TIMING REFERENCE SENSOR (TRS) (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
41-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or for 1 minute. • Stop engine. • Read historical codes. 	<p>Code 25 (no codes). →</p> <p>Code 41 (and → any other codes).</p> <p>Any other codes → except Code 41.</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the start to find the error.</p> <p>Go to START-1, page 17, to service other codes.</p>



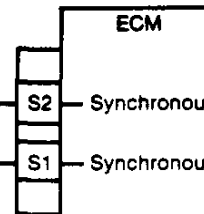
ECM Engine Harness Connector
P/N 12034400

Synchronous
Reference
Sensor



111

112



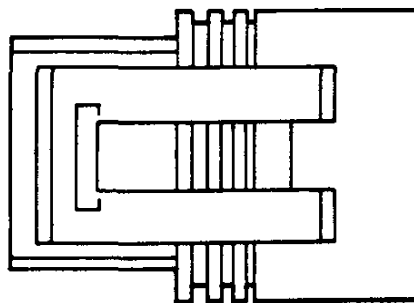
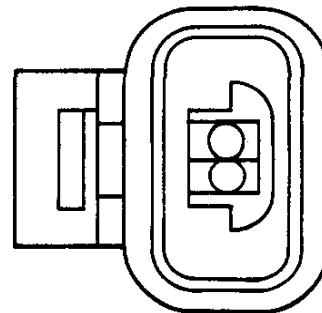
ECM

Synchronous Reference Signal

Synchronous Reference Return

Engine Harness Connector

Synchronous Reference Sensor
Circuit



Synchronous Reference Sensor
Harness Connector (Black)
P/N 12040753

Section 4

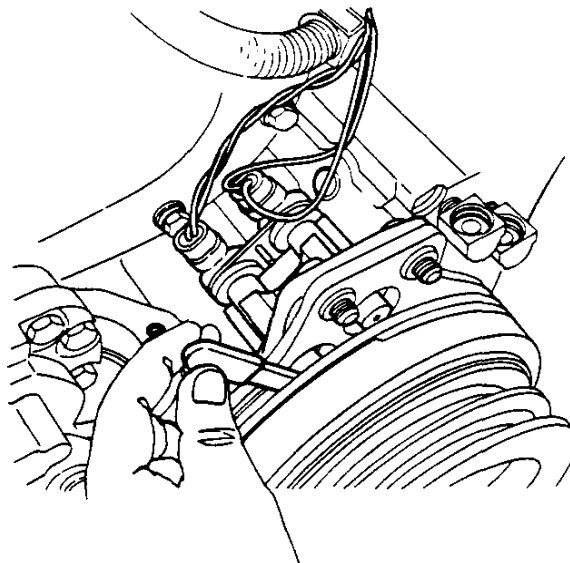
TROUBLESHOOTING CHARTS

E. CODE 42 - SYNCHRONOUS REFERENCE SENSOR (SRS)

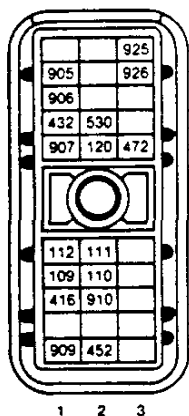
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
42-1 Resistance Check <ul style="list-style-type: none"> • Turn ignition off. • Disconnect engine harness connector at the ECM. • Read the resistance between socket S1 and S2 on the engine harness connector. 	<p>Less than or equal to 200 ohms. →</p> <p>Greater than 200 ohms or open. →</p>	<p>Go to 42-2.</p> <p>Go to 42-3.</p>
42-2 Check for Short <ul style="list-style-type: none"> • Disconnect SRS connector. • Read resistance between sockets S1 and S2 on the engine harness connector. • Also read the resistance between socket S1 and ground, then between socket S2 and ground. 	<p>Less than or equal to 10,000 ohms on any reading. →</p> <p>Greater than 10,000 ohms or open on all readings. →</p>	<p>A short exists where the resistance was less than 10,000 ohms. Repair short. Then go to 42-30.</p> <p>Go to 42-4.</p>
42-3 Open SRS Line Check <ul style="list-style-type: none"> • Disconnect SRS connector and install a jumper wire between sockets A and B of the SRS harness connector. • Read resistance between sockets S1 and S2 on the engine harness connector. 	<p>Less than or equal to 5 ohms. →</p> <p>Greater than 5 ohms or open. →</p>	<p>Go to 42-4.</p> <p>Signal line (ckt #111) or return line (ckt #112) is open. Then go to 42-30.</p>
42-4 Check SRS Resistance <ul style="list-style-type: none"> • Read resistance of the SRS across the sensor connector pins A and B. 	<p>Less than 100 ohms. →</p> <p>From 100 to 200 ohms. →</p> <p>Greater than 200 ohms. →</p>	<p>Go to 42-12.</p> <p>Go to 42-5.</p> <p>Go to 42-12.</p>

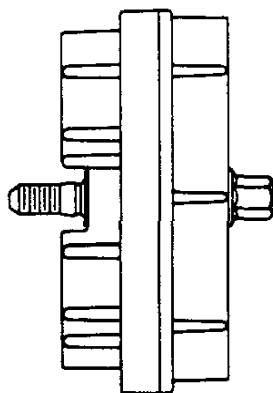


Timing Sensor with Tool
Series 92

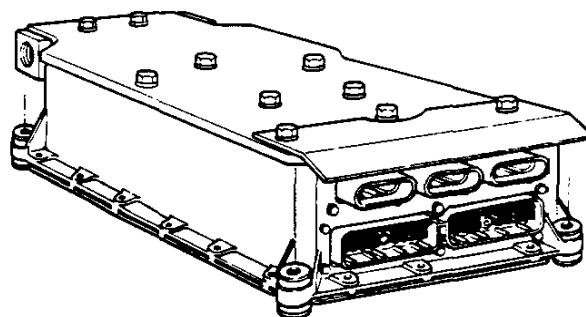


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ECM Engine Harness Connector
P/N 12034400

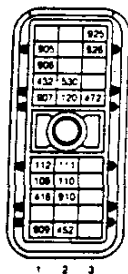


Electronic Control Module (ECM)

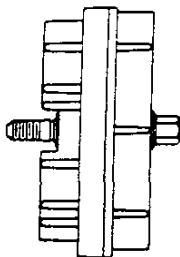
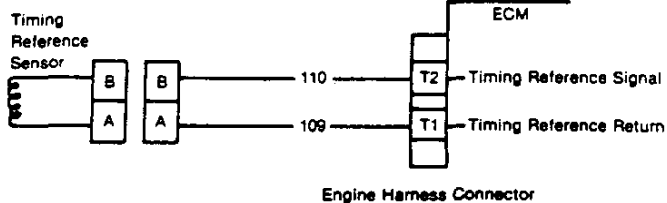
Section 4 TROUBLESHOOTING CHARTS

E. CODE 42 - SYNCHRONOUS REFERENCE SENSOR (SRS) (Cont'd.)

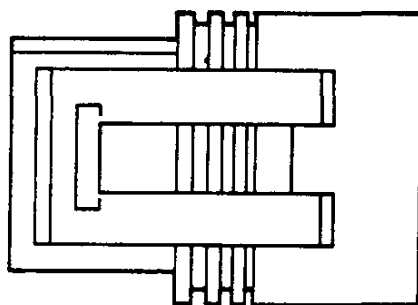
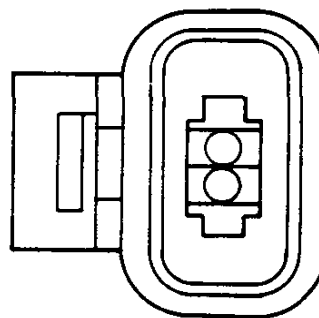
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
42-5 Check TRS/SRS Gap (Note: You'll probably have to remove the ECM to perform this check.) <ul style="list-style-type: none"> • Bar the engine until the TRS is over a TRS "tooth" of the pulse wheel. • Tap the front of the camshaft rearward with a soft hammer (to remove camshaft end play). • Install the TRS/SRS alignment tool (tool J-34729), see Service Bulletin for details) and check the gap. (nominal gap is 0.02" or 0.5 mm). 	Incorrect gap. —————→ Gap setting is correct. —————→	Loosen the screw at the top of the TRS/SRS mounting bracket (don't touch the two screws that go into block front end plate -they will affect engine timing). Adjust the TRS/SRS until the gap setting is correct. Tighten screw. (If problem returns, pulse wheel may be loose or bad.) Then go to 42-30. Go to 42-6.
42-6 Check for TRS Code <ul style="list-style-type: none"> • Was there also a Code 41? 	Yes. —————→ No. —————→	Go to 42-8. Go to 42-7.
42-7 Check ECM Connectors <ul style="list-style-type: none"> • Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and connectors are okay. —————→ Problem found. —————→	Go to 42-15. Repair terminals/connectors. Then go to 42-30.
42-8 TRS Resistance Check <ul style="list-style-type: none"> • Read resistance between sockets T1 and T2 on the engine harness connector. 	Less than or equal to 200 ohms. —————→ Greater than 200 ohms or open. —————→	Go to 42-9. Go to 42-10.



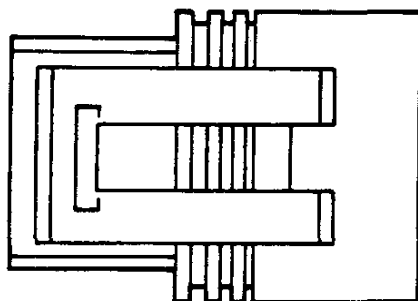
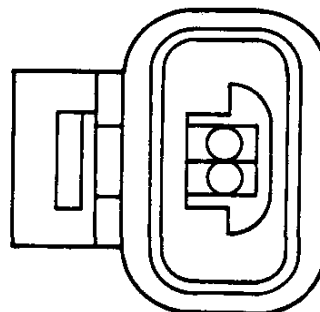
ECM Engine Harness Connector
P/N 12034400



Timing Reference Sensor
Circuit



Timing Reference Sensor
Connector (Gray)
P/N 12041411



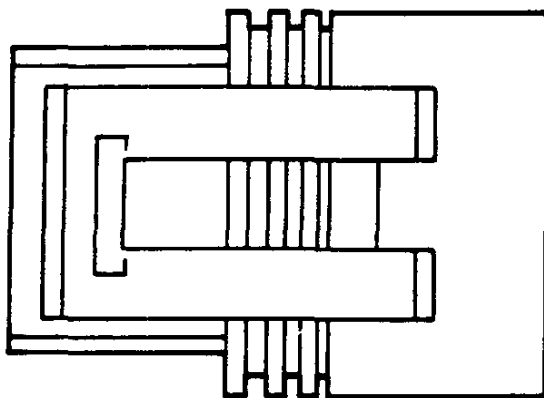
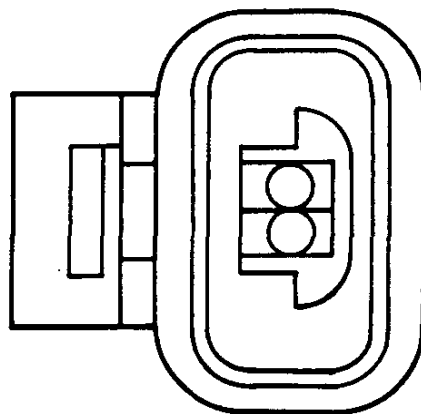
Synchronous Reference Sensor
Harness Connector (Black)
P/N 12040753

Section 4

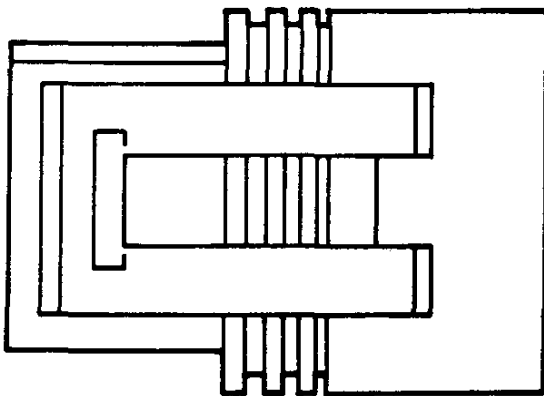
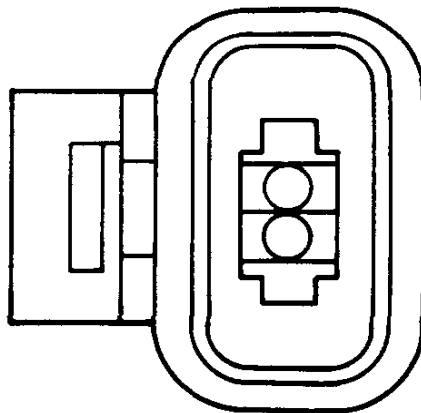
TROUBLESHOOTING CHARTS

E. CODE 42 - SYNCHRONOUS REFERENCE SENSOR (SRS) (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
42-9 Check for Short <ul style="list-style-type: none"> Disconnect TRS connector. Read resistance between sockets T1 and T2 on the engine harness connector. 	Less than or equal to 10,000 ohms. Greater than 10,000 ohms or open.	Signal line (ckt #110) is shorted to the return line (ckt #109). Repair short. Then go to 42-30. Go to 42-11.
42-10 Open TRS Line Check <ul style="list-style-type: none"> Install a jumper wire between sockets A and B of the TRS harness connectors. Read resistance between sockets T1 and T2 of the engine harness connector. 	Less than or equal to 5 ohms. Greater than 5 ohms or open.	Go to 42-11. Signal line (ckt #110) or return line (ckt #109) is open. Repair open. Then go to 42-30.
42-11 TRS Test <ul style="list-style-type: none"> Read resistance of the Timing Reference Sensor across the sensor connector pins A and B. 	Less than 100 ohms. From 100 to 200 ohms. Greater than 200 ohms.	Go to 42-13. Go to 42-7. Go to 42-13.
42-12 Check SRS Connectors <ul style="list-style-type: none"> Check connectors at the SRS (both the harness side and the SRS side) for corrosion, damaged or unseated pins or sockets, or bad contacts. 	Connectors are okay. Problem found.	Replace SRS. Then go to 42-14. Repair terminals/connectors. Then go to 42-30.



Synchronous Reference Sensor
Harness Connector (Black)
P/N 12040753



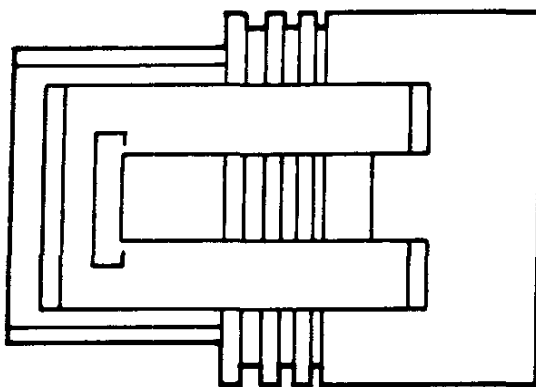
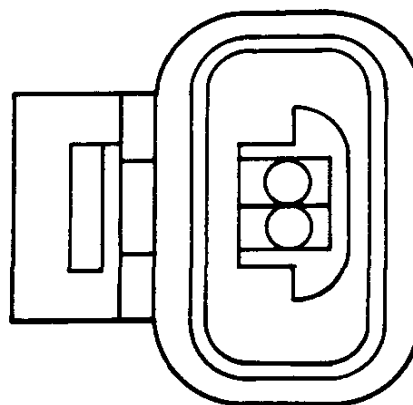
Timing Reference Sensor
Connector (Gray)
P/N 12041411

Section 4

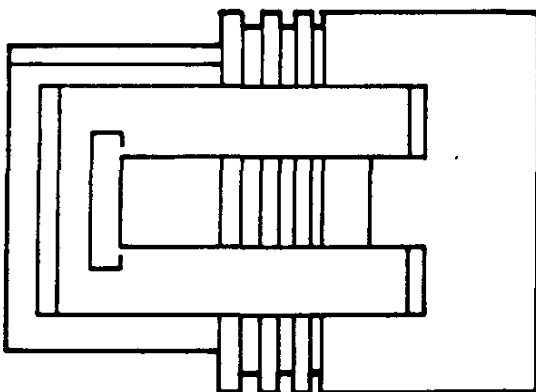
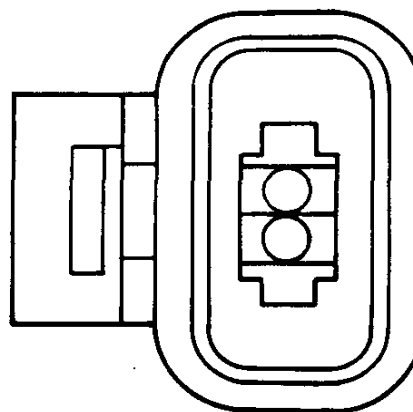
TROUBLESHOOTING CHARTS

E. CODE 42 - SYNCHRONOUS REFERENCE SENSOR (SRS) (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
42-13 Check TRS Connectors <ul style="list-style-type: none"> • Check connectors at the Timing Reference Sensor (both the harness side and the sensor side) for damage; bent, corroded or unseated pins or sockets, or bad contacts. 	Connectors are okay. → Problem found. →	Replace Timing Reference Sensor. Then go to 42-14. Repair terminals/connectors. Then go to 42-30.
42-14 Verify SRS/TRS <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Clear codes. • Start and run engine until the "Check Engine" light comes on or for 1 minute. • Stop engine. • Read historical codes. 	Code 25 (no codes). → Code 42 reappears (and any other codes). → Code(s) other than Code 42 received. →	Repairs are complete. If the TRS was just replaced, go to 42-7. If the TRS was not replaced, go to 42-6. Go to START-1, page 17, to service other codes.
42-15 Verify Cranking Voltage <ul style="list-style-type: none"> • Connect all connectors. • Turn ignition off. • Wire a 6-pin power connector to a fully charged battery (12 volt). • Connect to ECM. • Try to start engine. 	Engine starts. → Engine does not start. →	Replace battery. If a voltage equalizer is installed, check operation of equalizer. Indications are equalizer is not working. Then go to 42-30. Replace ECM, then go to 42-30.



Synchronous Reference Sensor
Harness Connector (Black)
P/N 12040753

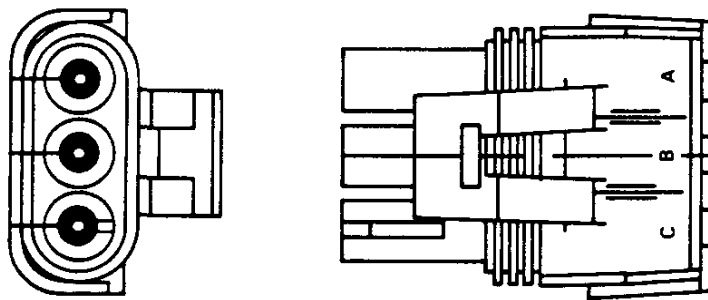


Timing Reference Sensor
Connector (Gray)
P/N 12041411

Section 4 TROUBLESHOOTING CHARTS

E. CODE 42 - SYNCHRONOUS REFERENCE SENSOR (SRS) (Cont'd.)

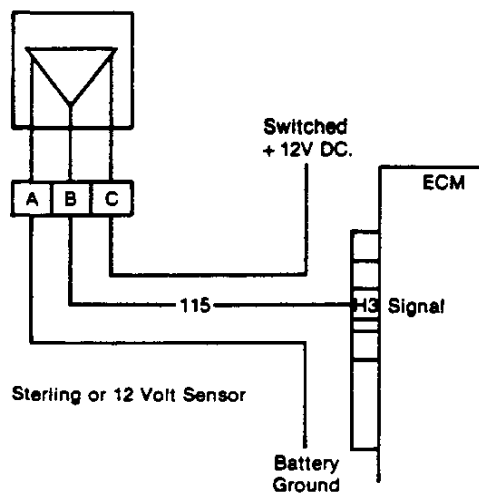
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
42-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until the "Check Engine" light comes on or for 1 minute. • Stop engine. • Read historical codes. 	<p>Code 25 (no codes) →</p> <p>Code 42 (and → any other codes);</p> <p>Any other codes → except Code 42.</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the start to find the error.</p> <p>Go to START-1, page 17, to service other codes.</p>



Sterling
Coolant Level Sensor
Harness Connector
P/N 12015795



Coolant Level Sensor
(Sterling—12 Volt)



Coolant Level Sensor Circuit

Section 4

TROUBLESHOOTING CHARTS

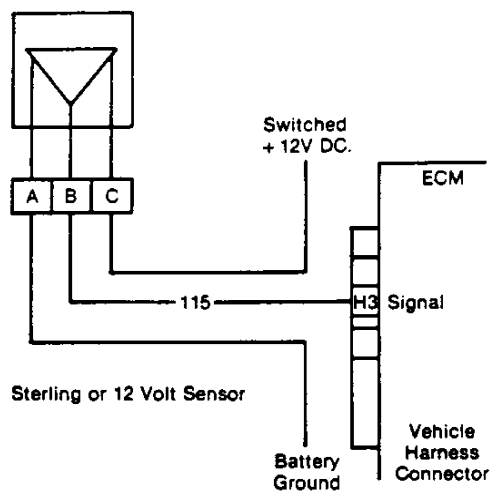
E. CODE 43 - LOW COOLANT

NOTE — This chart is only to be used if:

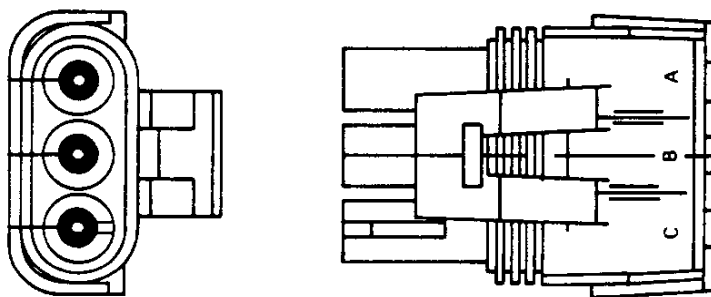
- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

When Mode 02 (Historical Codes) is displayed on the DDR, additional audit trail information is also shown. For an understanding of this information, refer to the example given in the Code 85 chart.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
43-1 Multiple Code Check <ul style="list-style-type: none"> Were there any other active codes besides Code 43? 	Yes. —————→ No. —————→	Service other codes first. Go to 43-2.
43-2 Check Coolant Level <ul style="list-style-type: none"> Check if coolant level is full. 	Full. —————→ Low. —————→	Go to 43-3. Determine causes for low coolant (see maintenance manual) and refill radiator. Then go to 43-30.
43-3 Clean Coolant Level Sensor <ul style="list-style-type: none"> Turn ignition off. Disconnect CLS connector. Unscrew CLS. Wipe sensor clean with a clean rag. Reinstall sensor and CLS connector. Turn ignition on. Clear codes. Start and run engine until the "Stop Engine" light comes on or for 1 minute. Stop engine. Read historical codes. 	Code 25 (no codes). —————→ Code 43 (and —————→ any other code). Any other codes —————→ except Code 43.	Repairs are complete. Go to 43-7. Go to START-1, page 17, to service other codes.
43-6 Ground Wire Check <ul style="list-style-type: none"> Turn ignition off. Disconnect CLS connector. Read resistance between socket A of the CLS harness connector and a good battery ground (also try shaking the wire while reading resistance). 	Always less than —————→ or equal to 5 ohms. Greater than —————→ 5 ohms or open.	Replace CLS. Then go to 43-30. The CLS ground has a bad connection or is open. Replace wire in pin A of the CLS connector. Run it to a good battery ground. Do not use chassis ground. Then go to 43-30.



Coolant Level Sensor Circuit



Sterling
Coolant Level Sensor
Harness Connector
P/N 12015795



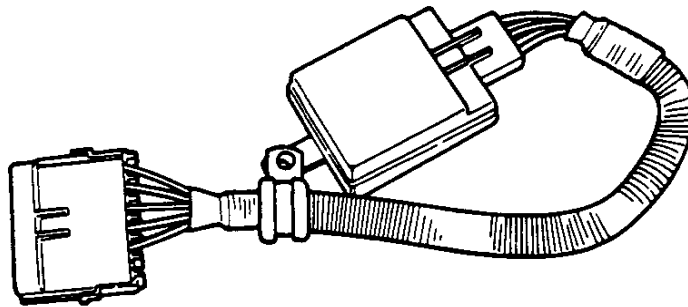
Coolant Level Sensor
(Sterling—12 Volt)

Section 4

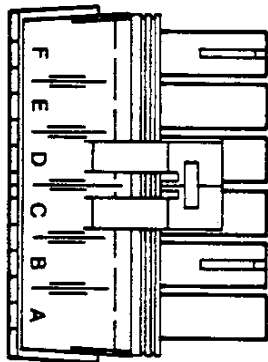
TROUBLESHOOTING CHARTS

E. CODE 43 - LOW COOLANT (Cont'd.)

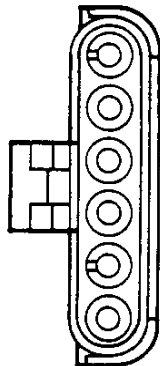
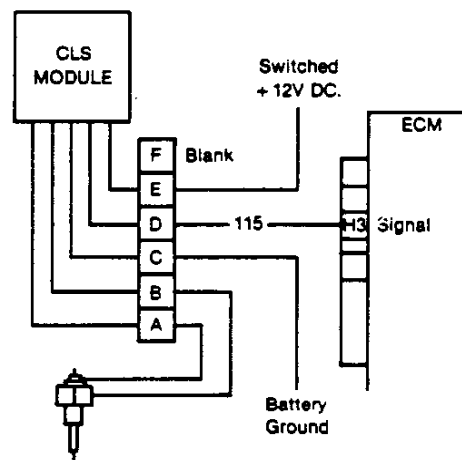
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
43-7 CLS Probe Check <ul style="list-style-type: none"> ● Ignition off. ● Unscrew CLS. ● Place CLS in a cup of water. Have threads and probe in water. ● Turn ignition on. ● Clear codes. ● Start engine. Run until "Check Engine" light comes on or for 1 minute. ● If "Check Engine" light is not on. ● Remove probe from water. ● After 30 seconds, stop engine. 	<p>"Check Engine" light always on. →</p> <p>"Check Engine" light never on. →</p> <p>No "Check Engine" light while in water and "Check Engine" light while out of water. →</p>	<p>Replace CLS. Then go to 43-30.</p> <p>Replace CLS. Then go to 43-30.</p> <p>Go to 43-6.</p>
43-30 Verify Repairs <ul style="list-style-type: none"> ● Turn ignition off. ● Reconnect all connectors. ● Turn ignition on. ● Clear codes. ● Start and run engine until the "Stop Engine" light comes on or for 1 minute. ● Stop engine. ● Read historical codes. 	<p>Code 25 (no codes) →</p> <p>Code 43 (and any other code). →</p> <p>Any other codes except Code 43. →</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the start to find the error.</p> <p>Go to START-1, page 17, to service other codes.</p>



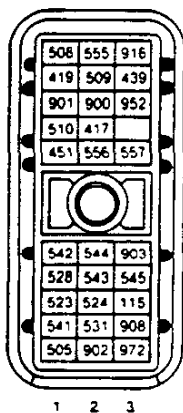
Coolant Level Sensor
P/N 23503507



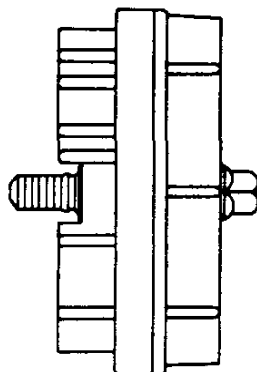
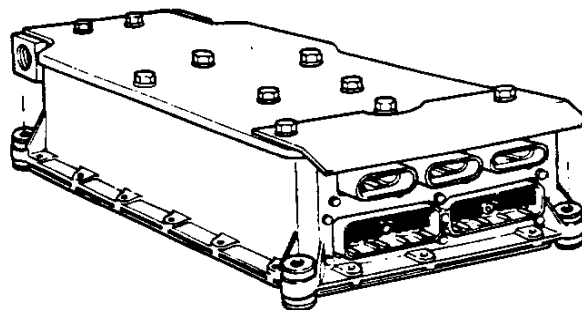
ECM Vehicle Harness Connector
P/N 12015799



Coolant Level Sensor Circuit



ECM Vehicle Harness Connector
P/N 12034398



Electronic Control Module (ECM)

Section 4

TROUBLESHOOTING CHARTS

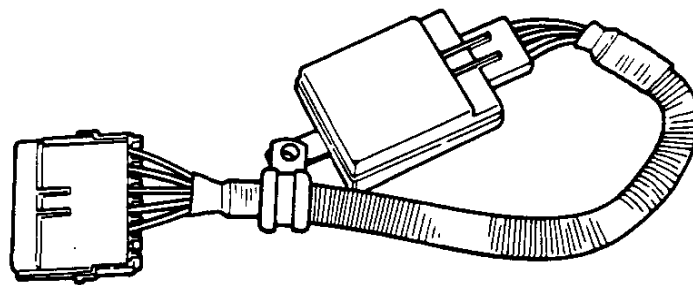
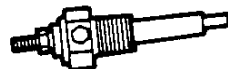
E. CODE 43 - TWO PIECE (DDC P/N 23503507) LOW COOLANT

NOTE — This chart is only to be used if:

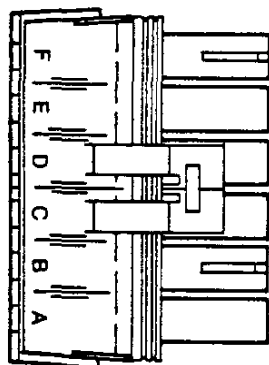
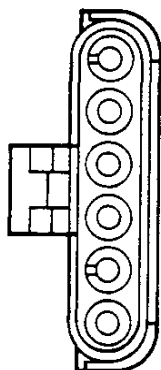
- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

When Mode 02 (Historical Codes) is displayed on the DDR, additional audit trail information is also shown. For an understanding of this information, refer to the example given in the Code 85 chart.

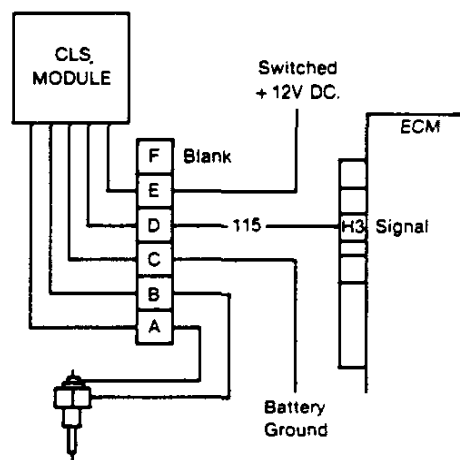
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
43-1 Multiple Code Check <ul style="list-style-type: none"> Were there any other active codes besides Code 43? 	Yes. —————→ No. —————→	Service other codes first. Go to 43-2.
43-2 Check Coolant Level <ul style="list-style-type: none"> Check if coolant level is full. 	Full. —————→ Low. —————→	Go to 43-3. Determine causes for low coolant (see maintenance manual) and refill radiator. Then go to 43-30.
43-3 Clean Coolant Level Sensor <ul style="list-style-type: none"> Turn ignition off. Disconnect wires to CLS probe. Unscrew CLS probe. Wipe probe clean with a clean rag. Reinstall probe. Connect wires to CLS probe. Turn ignition on. Clear codes. Start and run engine until the "Stop Engine" light comes on or for 1 minute. Stop engine. Read historical codes. 	Code 25 (no codes). —————→ Code 43 (and any other code). —————→ Any other codes except Code 43. —————→	Repairs are complete. Go to 43-7. Go to START-1, page 17, to service other codes.
43-6 Ground Wire Check <ul style="list-style-type: none"> Turn ignition off. Disconnect CLS connector. Read resistance between socket C of the CLS harness connector and a good battery ground (also try shaking the wire while reading resistance). 	Always less than or equal to 5 ohms. —————→ Greater than 5 ohms or open. —————→	Replace CLS module. Then go to 43-30. The CLS ground has a bad connection or is open. Replace wire in pin C of the CLS connector. Run it to a good battery ground. Do not use chassis ground. Then go to 43-30.



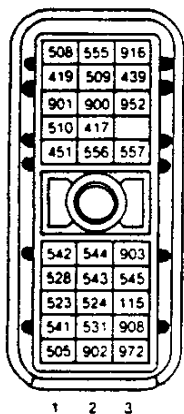
Coolant Level Sensor
P/N 23503507



ECM Vehicle Harness Connector
P/N 12015799

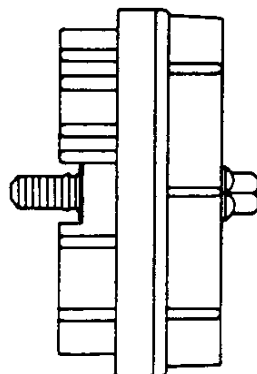


Coolant Level Sensor Circuit

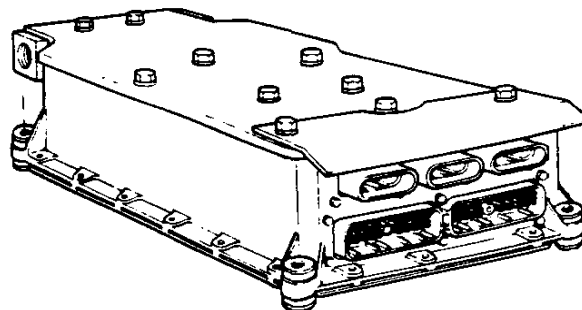


A
B
C
D
E

F
G
H
J
K



ECM Vehicle Harness Connector
P/N 12034398



Electronic Control Module (ECM)

Section 4 TROUBLESHOOTING CHARTS

E. CODE 43 - TWO PIECE (DDC P/N 23503507) LOW COOLANT (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
43-7 CLS Probe Check <ul style="list-style-type: none"> • Ignition off. • Unscrew CLS probe. • Place CLS in a cup of water. Have threads and probe in water. • Turn ignition on. • Clear codes. • Start engine. Run until "Check Engine" light comes on or for 1 minute. • If "Check Engine" light is not on. • Remove probe from water. • After 30 seconds, stop engine. 	<p>"Check Engine" light always on. →</p> <p>"Check Engine" light never on. →</p> <p>No "Check Engine" light while in water and "Check Engine" light is ON while out of water. →</p>	<p>Go to 43-8.</p> <p>Replace CLS probe. Then go to 43-30.</p> <p>Go to 43-6.</p>
43-8 Check for Open <ul style="list-style-type: none"> • Turn ignition off. • Disconnect CLS module connector. • Measure resistance between pins A and B on the vehicle harness side while probe is in coolant. 	<p>Less than 2M ohms. →</p> <p>Equal to or greater than 2M ohms. →</p>	<p>Go to 43-30.</p> <p>Go to 43-9.</p>
43-9 Check Probe Loads for Open <ul style="list-style-type: none"> • Check the connection on the CLS probe and the terminals in the CLS connector. 	<p>Everything appears to be okay. →</p> <p>Problem found. →</p>	<p>Go to 43-10.</p> <p>Repair problem. Then to 43-30.</p>
43-10 Check for Open <ul style="list-style-type: none"> • Measure resistance between pin A and the center screw on the probe. • Repeat above for pin B and the screw on the side of the probe. 	<p>Either reading is greater than 5 ohms. →</p> <p>Both readings are less than 5 ohms. →</p>	<p>Open wire. Repair. Then go to 43-30.</p> <p>Replace CLS probe. Then go to 43-30.</p>
43-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Start and run engine until the "Stop Engine" light comes on or for 1 minute. • Stop engine. • Read historical codes. 	<p>Code 25 (no codes). →</p> <p>Code 43 (and any other code). →</p> <p>Any other codes except Code 43. →</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the start to find the error.</p> <p>Go to START-1, page 17, to service other codes.</p>

Section 4 TROUBLESHOOTING CHARTS

E. CODE 44 - OIL OR COOLANT OVERTEMPERATURE

NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

When Mode 02 (Historical Codes) is displayed on the DDR, additional audit trail information is also shown. For an understanding of this information, refer to the example given in the Code 85 chart.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
44-1 Multiple Code Check <ul style="list-style-type: none"> • Were there any other codes besides Code 44? 	Yes. —————→ No. —————→	Service other codes first. Code 44 indicates that there was an engine running condition at which the temperature was higher than it should have been. Refer to the engine service manual to determine potential causes for high oil or coolant temperature.

Section 4

TROUBLESHOOTING CHARTS

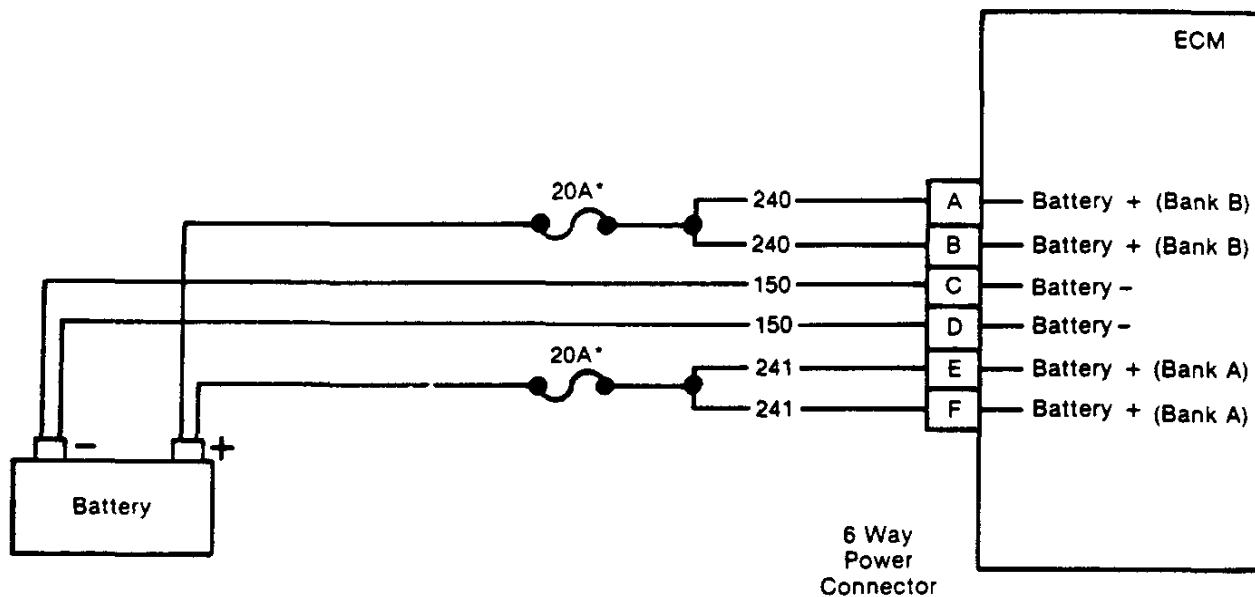
E. CODE 45 - LOW OIL PRESSURE

NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

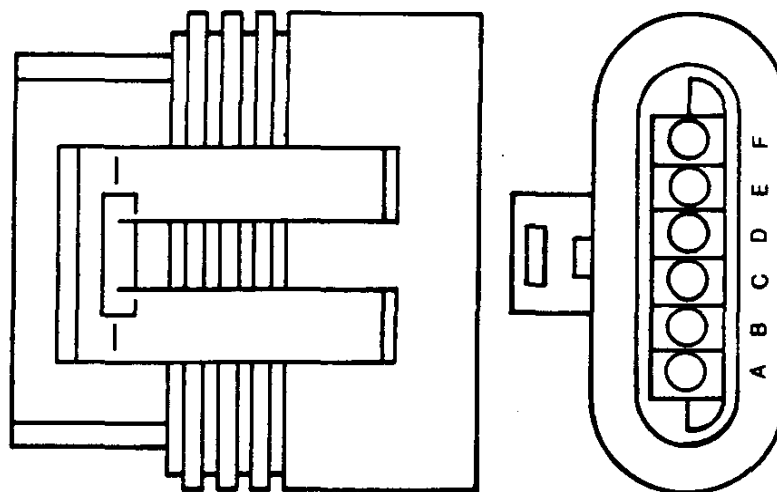
When Mode 02 (Historical Codes) is displayed on the DDR, additional audit trail information is also shown. For an understanding of this information, refer to the example given in the Code 85 chart.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
45-1 Multiple Code Check		
• Were there any other codes besides Code 45?	Yes. —————→	Service other codes first.
	No. —————→	Code 45 indicates that there was an engine running condition at which the oil pressure was lower than it should have been. Refer to the engine service manual to determine potential causes for low oil pressure.



(*Some applications may have circuit breakers instead of fuses.)

Battery Power and Ground Circuits



6-Way Power Harness Connector
P/N 12066317

Section 4

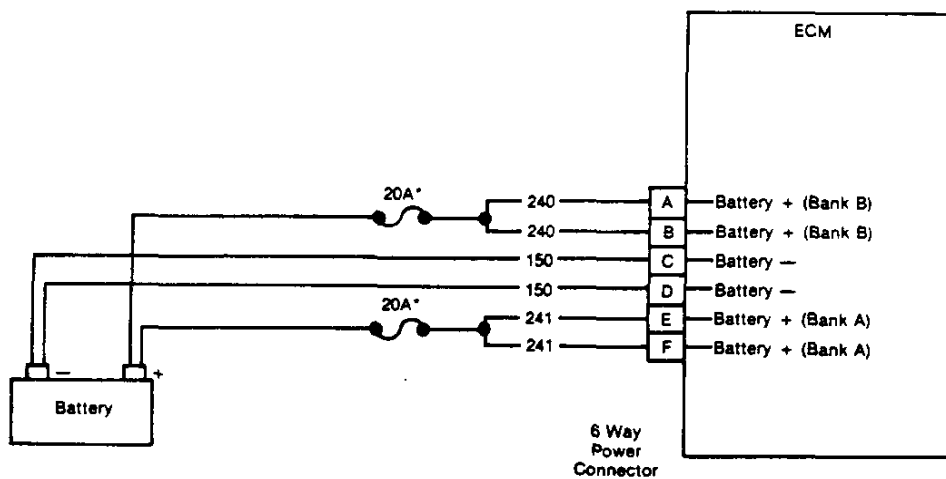
TROUBLESHOOTING CHARTS

E. CODE 46 - LOW BATTERY VOLTAGE

NOTE — This chart is only to be used if:

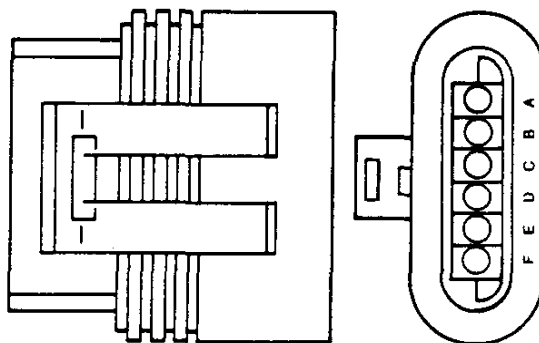
- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
46-1 Battery Check <ul style="list-style-type: none"> ● Start and run engine for 1 minute. ● Measure voltage on Battery + terminal (red lead) to Battery – terminal (black lead). 	<p>Engine does not start. →</p> <p>Less than or equal to 10.0 volts. →</p> <p>Greater than 10.0 volts. →</p>	<p>Determine cause for no-start. Start with an inspection of the battery (possibly discharged) and/or starting/charging system. Refer to Chart 2, page 37, as a further aid in no-start diagnosis if the battery and starting/charging system are okay.</p> <p>Service discharged battery and/or starting/charging system.</p> <p>Go to 46-2.</p>
46-2 Voltage Check at ECM <ul style="list-style-type: none"> ● Keep engine running. ● Select ECM INPUT VOLT (Mode 5) on the DDR for display. ● Observe ECM voltage reading on DDR. 	<p>Less than or equal to 10.0 volts. →</p> <p>Greater than 10.0 volts. →</p>	<p>Go to 46-3.</p> <p>Go to 46-5.</p>
46-3 Voltage Check at ECM Harness <ul style="list-style-type: none"> ● Turn ignition off. ● Disconnect the 6-way power harness connector at the ECM. ● Read voltage from socket E, F, A and B (red lead) of the 6-way power harness connector and a good battery ground (black lead). Don't use ckt #150 as the ground reference. 	<p>Less than or equal to 11.5 volts. →</p> <p>Greater than 11.5 volts. →</p>	<p>Go to 46-4.</p> <p>Go to 46-5.</p>

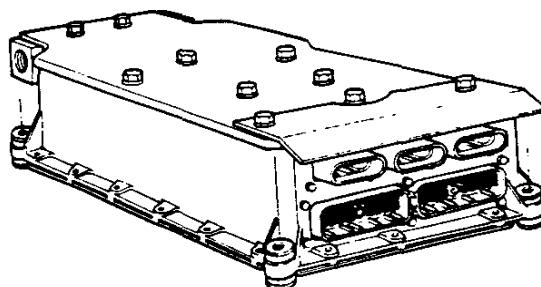


(*Some applications may have circuit breakers instead of fuses.)

Battery Power and Ground Circuits



6-Way Power Harness Connector
P/N 12066317



Electronic Control Module (ECM)

Section 4

TROUBLESHOOTING CHARTS

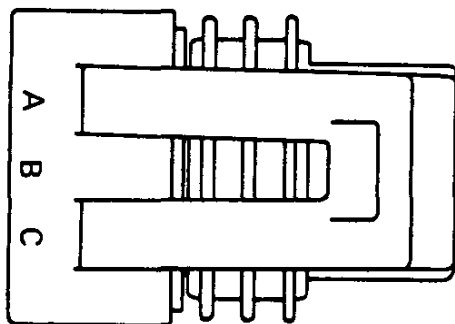
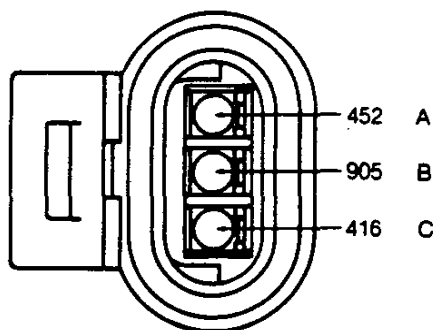
E. CODE 46 - LOW BATTERY VOLTAGE (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
46-4 Check for Bad Battery + Line <ul style="list-style-type: none"> Remove both 20 Amp ECM fuses. Read voltage at socket A of one 20 Amp fuseholder (red lead) to a good ground (black lead). Repeat voltage reading at other 20 Amp fuseholder. 	<p>Less than or equal to 11.5 volts on either reading. →</p> <p>Greater than 11.5 volts on both readings. →</p>	<p>The Battery + line near the Battery is open, or a corroded connection exists at the Battery + terminal. Repair problem. Then go to 46-30.</p> <p>The Battery + line between the fuseholder and the ECM has an open, or the ECM power connector has a corroded connection. Repair problem. Then go to 46-30.</p>
46-5 Ground Check at the ECM <ul style="list-style-type: none"> Disconnect the 6-way power harness connector at the ECM (if you have not previously done so). Read voltage on socket E of the 6-way power harness connector (red lead) to socket D (black lead). Also read voltage on socket A (red lead) to socket C (black lead). 	<p>Less than or equal to 11.5 volts on either reading. →</p> <p>Greater than 11.5 volts on both readings. →</p>	<p>The ground wire (ckt #150) is open or has a corroded connection. Repair ground wire. Then go to 46-30.</p> <p>Go to 46-6.</p>
46-6 Check ECM Connectors <ul style="list-style-type: none"> Check terminals at the ECM 6-way power harness connector (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets. 	<p>Terminals and connectors are okay. →</p> <p>Problem found. →</p>	<p>Replace ECM. Then go to 42-6.</p> <p>Repair terminals/connectors. Then go to 46-30.</p>

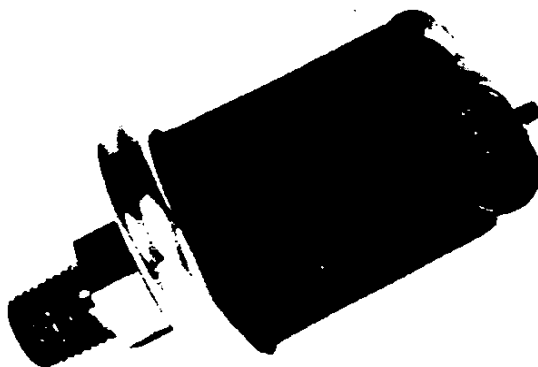
Section 4 TROUBLESHOOTING CHARTS

E. CODE 46 - LOW BATTERY VOLTAGE (Cont'd.)

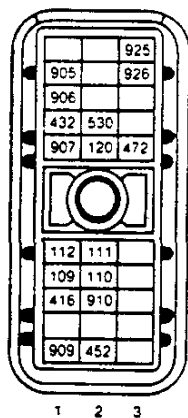
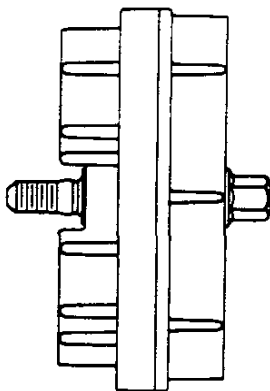
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
46-30 Verify Repairs		
<ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or for 1 minute. • Stop engine. • Read historical codes. 	<p>Code 25 (no codes). →</p> <p>Code 46 (and → any other codes).</p> <p>Any other codes → except Code 46.</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the start to find the error.</p> <p>Go to START-1, page 17, to service other codes.</p>



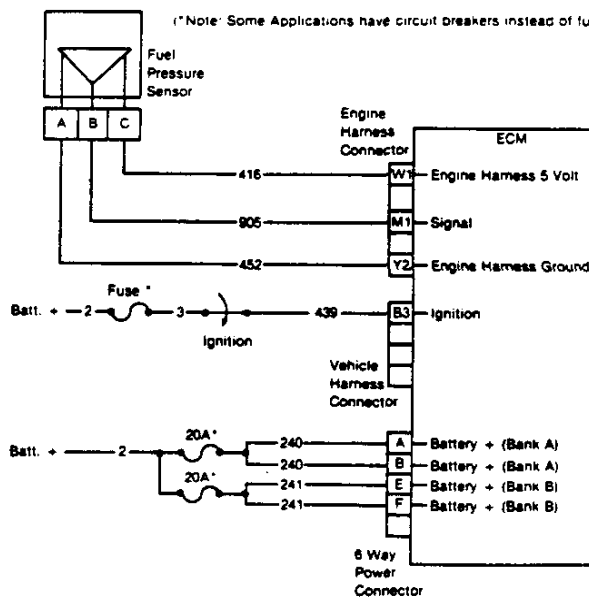
Pressure Sensor
Harness Connector
P/N 12047909



Pressure Sensor
P/N 8929184



ECM Engine Harness Connector
P/N 12034400



Fuel Pressure, Battery + and
Ignition Circuits

Section 4

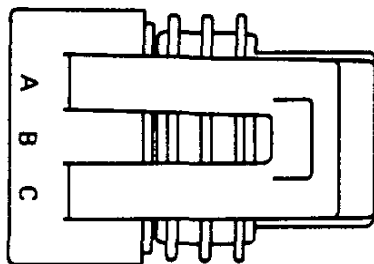
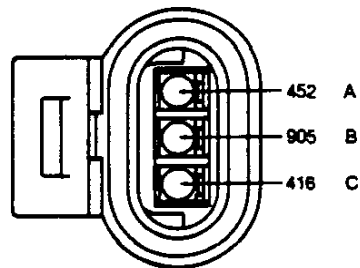
TROUBLESHOOTING CHARTS

E. CODE 47 - FUEL PRESSURE SENSOR (FPS) SIGNAL VOLTAGE HIGH

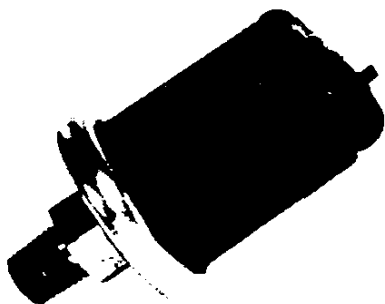
NOTE — This chart is only to be used if.

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

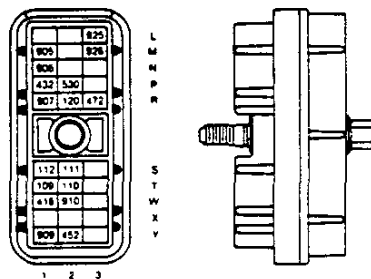
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
47-1 Multiple Code Check <ul style="list-style-type: none"> Were there any other active codes beside Code 47? 	No other codes. → Yes, any or all of the following codes: 14-15, 23-24, 33-36. → Yes - but none of the above. →	Go to 47-2. Goto ENG5V-1, page 367. Go to 47-2.
47-2 Sensor Check <ul style="list-style-type: none"> Turn ignition off. Disconnect FPS connector. Turn ignition on. Start and run engine. Select Engine Temperature (Mode 13 or 18) on the DDR. Warm up engine until engine temperature reading is greater than 50 degrees C (122 degrees F). Leave engine running at idle after warm up. Read active codes. 	Code 48 (and any codes except Code 47). → Code 47 (and any other codes). →	Go to 47-3. Go to 47-5.
47-3 Return Circuit Check <ul style="list-style-type: none"> Turn ignition off. Disconnect the engine harness connector at the ECM. Install a jumper wire between pins A and B of the FPS harness connector. Read resistance between sockets M1 and Y2 on the engine harness connector. 	Less than or equal to 5 ohms. → Greater than 5 ohms or open. →	Go to 47-4. Return line (ckt #452) is open. Repair open. Then go to 47-30.



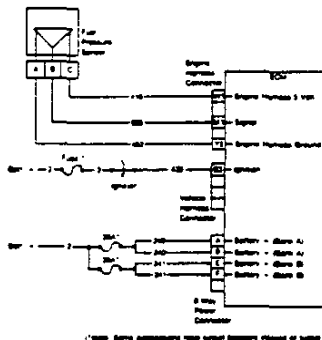
**Pressure Sensor
Harness Connector**
P/N 12047909



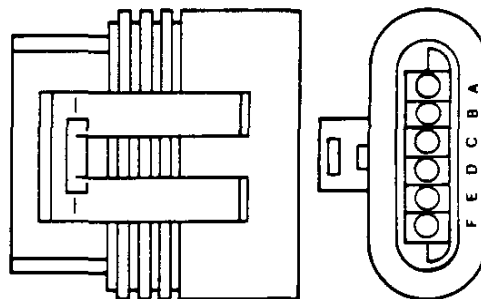
Pressure Sensor
P/N 8929184



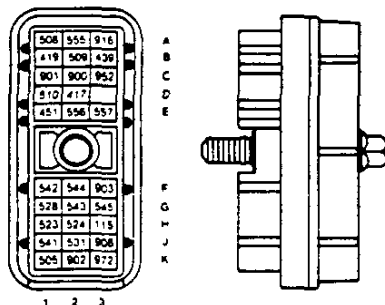
ECM Engine Harness Connector
P/N 12034400



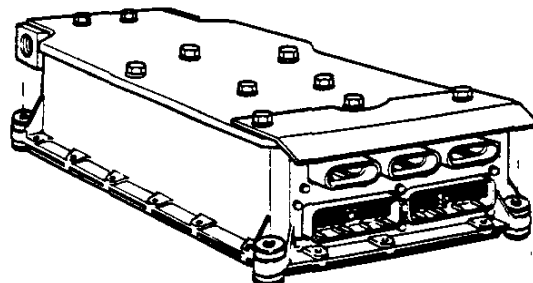
Fuel Pressure, Battery + and Ignition Circuits



6-Way Power Harness Connector
P/N 12066317



ECM Vehicle Harness Connector
P/N 12034398



Electronic Control Module (ECM)

Section 4

TROUBLESHOOTING CHARTS

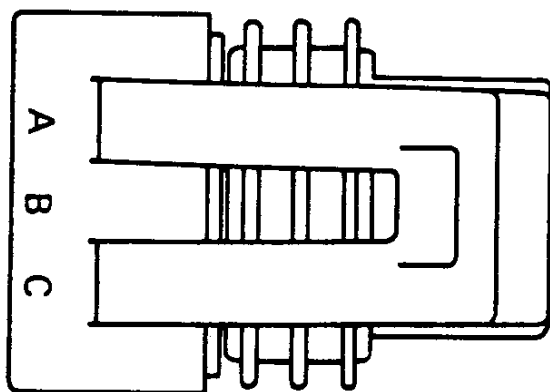
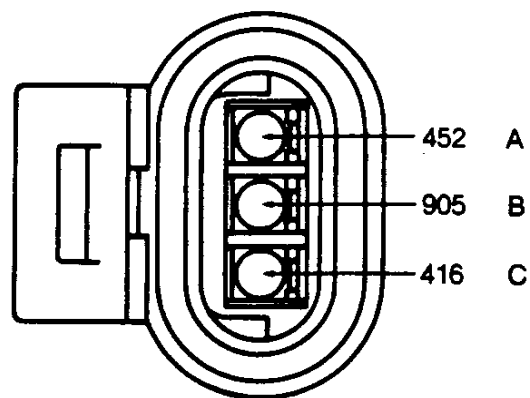
E. CODE 47 - FUEL PRESSURE SENSOR (FPS) SIGNAL VOLTAGE HIGH (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
47-4 Check FPS Connectors <ul style="list-style-type: none"> Inspect terminals at the FPS connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace FPS. Then go to 47-30. Repair terminals/connectors. Then go to 47-30.
47-5 Check for Short <ul style="list-style-type: none"> Turn ignition off. Disconnect the engine harness connector at the ECM. Read resistance between sockets W1 and M1 on the engine harness connector. 	Less than or equal to 10,000 ohms. → Greater than 10,000 ohms or open. →	Signal line (ckt #905) is shorted to the engine + 5 Volt line (ckt #416). Repair short. Then go to 47-30. Go to 47-6.
47-6 Check for Short to Battery + <ul style="list-style-type: none"> Remove both 20 Amp fuses to the ECM. Disconnect the vehicle harness and 6-way power harness connectors at the ECM. Read resistance between socket M1 of the engine harness connector and socket B3 of the vehicle harness connector. Also read resistance between socket M1 on the engine harness connector and the following sockets on the 6-way power harness connector: A, B, E and F. 	All readings are greater than 10,000 ohms or open. → Any reading is less than or equal to 10,000 ohms. →	Go to 47-8. A short exists between the sockets where less than 10,000 ohms resistance was read. Repair short and reinsert fuses (or reset breakers). The go to 47-30.

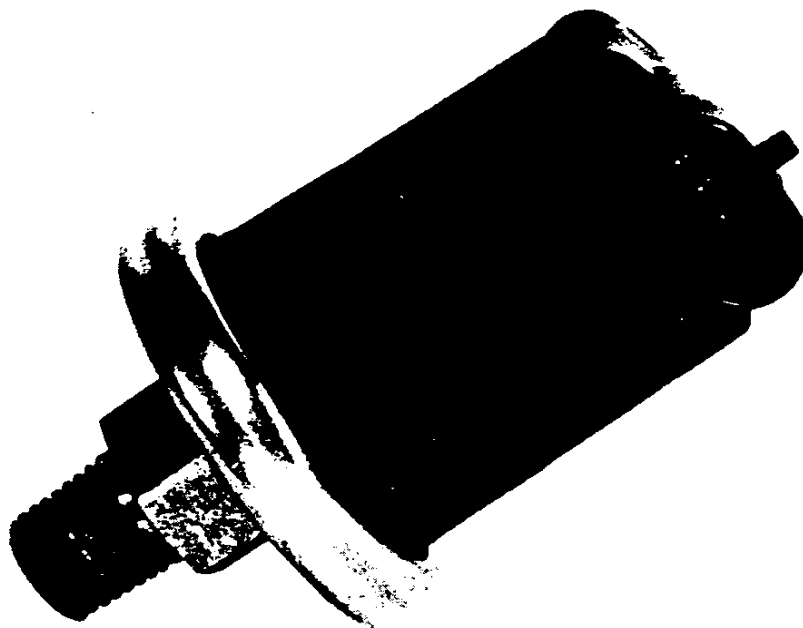
Section 4 TROUBLESHOOTING CHARTS

E. CODE 47 - FUEL PRESSURE SENSOR (FPS) SIGNAL VOLTAGE HIGH (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
47-7 Final Check <ul style="list-style-type: none"> ● Reconnect all connectors. ● Turn ignition on. ● Clear codes. ● Start engine. Run for one minute or until "Check Engine" light comes on. ● Stop engine. ● Check active codes. 	Code 47. → No codes. → Any other codes except Code 47. →	Replace ECM. Then go to 47-30. Repairs are complete. Go to START-1, page 17, to service other codes.
47-8 Check FPS Connectors <ul style="list-style-type: none"> ● Inspect terminals at FPS connectors (sensor and harness sides) for damage, bent, corroded and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace FPS. Then go to 47-7. Repair terminals/connectors. Then go to 47-30.
47-30 Verify Repairs <ul style="list-style-type: none"> ● Turn ignition off. ● Reconnect all connectors. ● Turn ignition on. ● Clear codes. ● Note status of "Check Engine" light. ● If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or engine has run warm (greater than 50 degrees C, 122 degrees F) for 1 minute. ● Read historical codes. 	Code 25 (no codes). → Code 47 (and any other codes). → Any other codes except Code 47. →	Repairs are complete. All system diagnostics are complete. Please review this section from the start to find the error. Go to START-1, page 17, to service other codes.



Pressure Sensor
Harness Connector
P/N 12047909



Pressure Sensor
P/N 8929184

Section 4

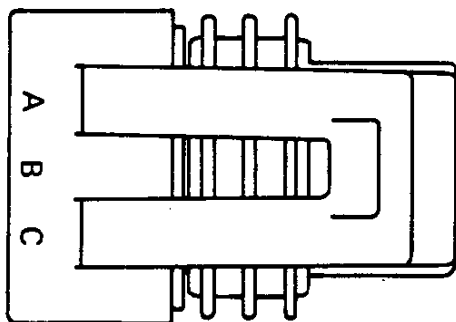
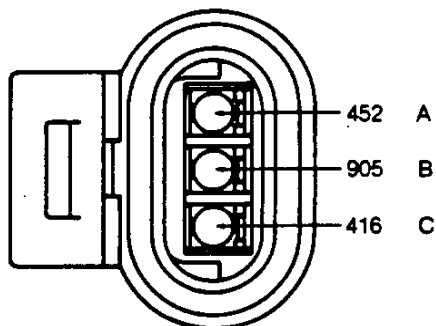
TROUBLESHOOTING CHARTS

E. CODE 48 - FUEL PRESSURE SENSOR (FPS) SIGNAL VOLTAGE LOW

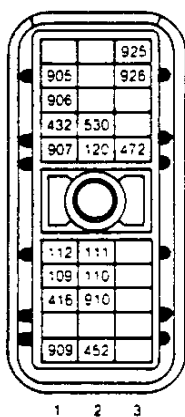
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
48-0 Check Fuel Filters <ul style="list-style-type: none"> Are fuel filters plugged? 	Yes. —————→ No. —————→	Replace Fuel Filters. Then go to 48-30. Go to 48-1.
48-1 Multiple Code Check <ul style="list-style-type: none"> Were there any other active codes beside Code 48? 	No other codes. —————→ Yes, any or all of the following codes: 14-15, 23-24, 36,47. Yes - but none of the above. —————→	Go to 48-2. Go to ENG5V-1, page 367. Go to 48-2.
48-2 Sensor Check <ul style="list-style-type: none"> Turn ignition off. Disconnect FPS connector and install a jumper wire between sockets B and C of the FPS harness connector. Turn ignition on. Read active codes. If active Code 47 or 48 exists, go to RESULT column. If no active Code 47 or 48 exists, start and run engine until either active Code 47 or 48 appears or the engine temperature (Mode 13 or 18 on DDR) has been greater than 50 degrees C (122 deg F) for more than 1 minute. 	Code 47 (and any codes except Code 48). —————→ Code 48 (and any other codes). —————→ No codes. —————→	Check to be sure ECM and FPS connectors are wired properly. If wired properly then go to 48-3. Go to 48-4. Go to 48-4.

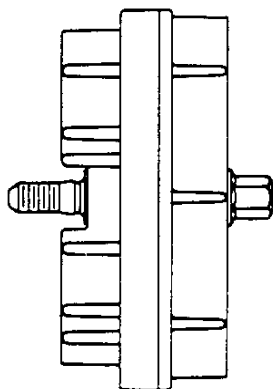


**Pressure Sensor
Harness Connector**
P/N 12047909

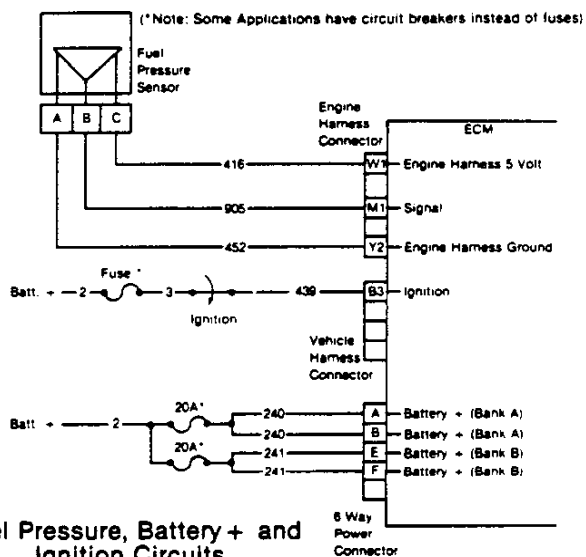


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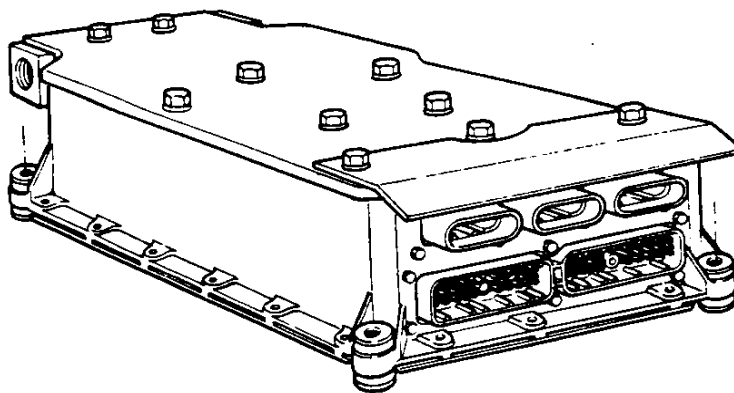
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ECM Engine Harness Connector
P/N 12034400



**Fuel Pressure, Battery + and
Ignition Circuits**



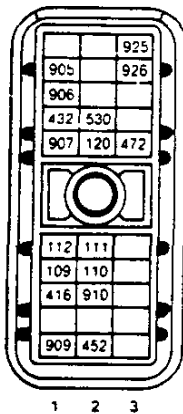
Electronic Control Module (ECM)

Section 4

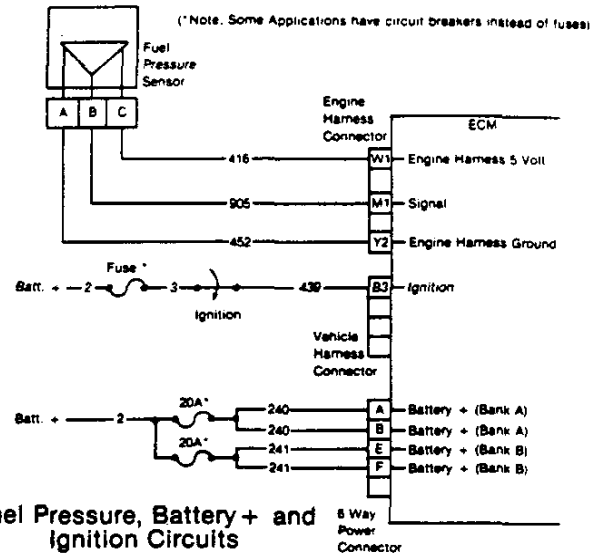
TROUBLESHOOTING CHARTS

E. CODE 48 - FUEL PRESSURE SENSOR (FPS) SIGNAL VOLTAGE LOW (Cont'd.)

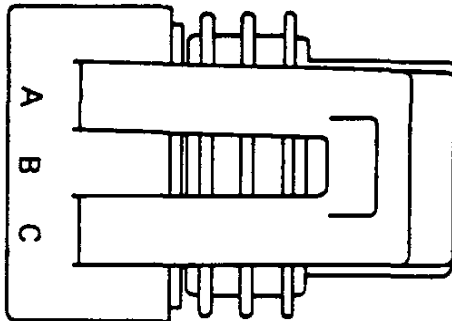
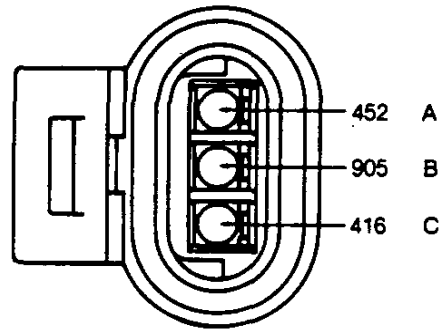
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
48-3 Check FPS Connectors <ul style="list-style-type: none"> • Turn ignition off. • Inspect terminals at the FPS connectors (sensor side and harness side) for damage; bent, corroded, and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace FPS. Then go to 48-30. Repair terminals/connectors. Then to 48-30.
48-4 Check for + 5 Volts <ul style="list-style-type: none"> • Turn ignition off. • Remove jumper wire. • Connect vehicle harness to ECM. • Turn ignition on. • Read voltage on FPS harness connector, socket C (red lead) to socket A (black lead). 	Between 4 to 6 volts. → Less than 4 volts. → Greater than 6 volts. →	Go to 48-5. Go to 48-8. Go to 48-10.
48-5 Check for Signal Open <ul style="list-style-type: none"> • Turn ignition off. • Disconnect engine harness connector at the ECM. • Install a jumper wire between sockets A and B of the FPS harness connector. • Read resistance between sockets M1 and Y2 on the engine harness connectors. 	Less than or equal to 5 ohms. → Greater than 5 ohms or open. →	Go to 48-11. Signal line (ckt #905) or return line (ckt #452) is open. Repair open. Then go to 48-30.
48-6 Check for Short <ul style="list-style-type: none"> • Remove jumper wire. • Disconnect the engine harness connector at the ECM. • Read resistance between sockets A and B on the FPS harness connector. 	Less than or equal to 10,000 ohms. → Greater than 10,000 ohms or open. →	Signal line (ckt #905) is shorted to the return line (ckt #452). Repair short. Then go to 48-30. Go to 48-12.



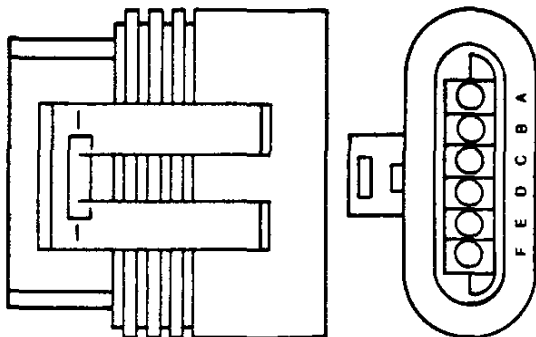
ECM Engine Harness Connector
P/N 12034400



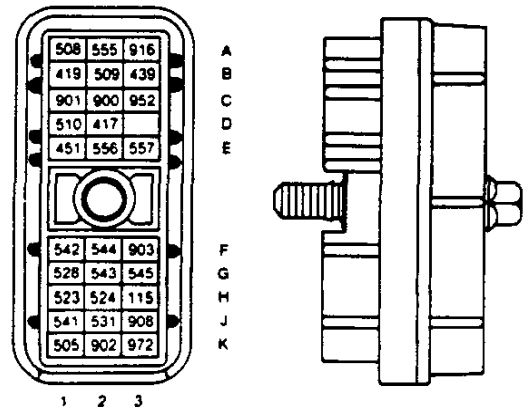
Fuel Pressure, Battery + and Ignition Circuits



Pressure Sensor
Harness Connector
P/N 12047909



6-Way Power Harness Connector
P/N 12066317

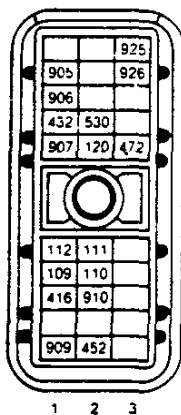


ECM Vehicle Harness Connector
P/N 12034398

Section 4 TROUBLESHOOTING CHARTS

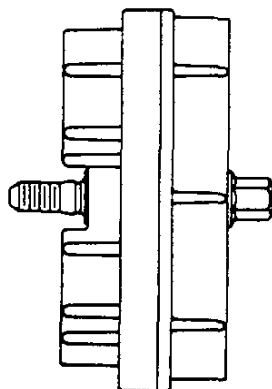
E. CODE 48 - FUEL PRESSURE SENSOR (FPS) SIGNAL VOLTAGE LOW (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
48-7 Check ECM Connectors <ul style="list-style-type: none"> • Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets. Especially W1, M1 and Y2 terminals and pins at ECM. 	Terminals and connectors are okay. → Problem found. →	Replace ECM. Then go to 48-30. Repair terminals/connectors. Then go to 48-30.
48-8 Check for Open +5 Volt Line <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the engine harness connector at the ECM. • Install a jumper wire between sockets A and C of the FPS harness connector. • Read resistance between sockets W1 and Y2 on the engine harness connector. 	Less than or equal to 5 ohms. → Greater than 5 ohms or open. →	Go to 48-9. The engine +5 Volt line (ckt #416) is open. Repair open. Then go to 48-30.
48-9 Check for Short <ul style="list-style-type: none"> • Remove jumper wire. • Read resistance between sockets A and C of the FPS harness connector. 	Less than or equal to 10,000 ohms. → Greater than 10,000 ohms or open. →	The engine +5 Volt line (ckt #416) is shorted to the return line (ckt #452). Repair short. Then go to 48-30. Go to 48-12.

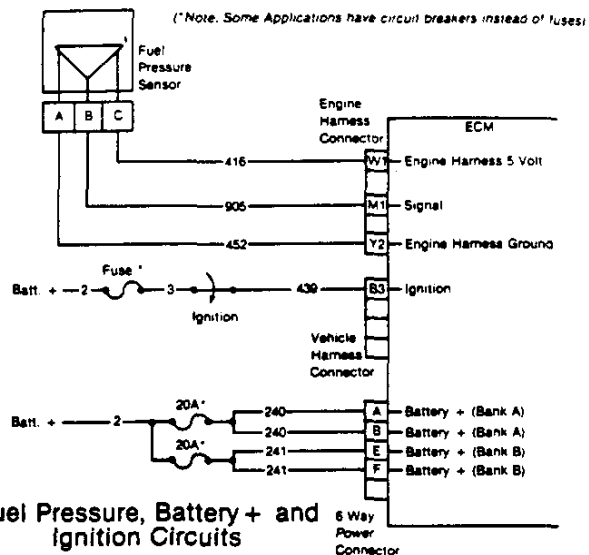


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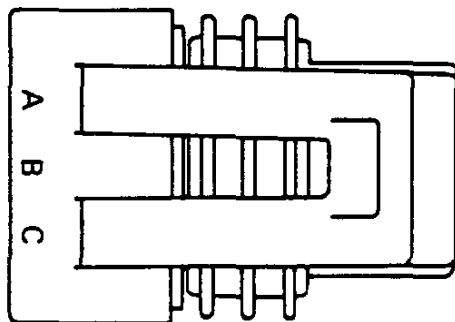
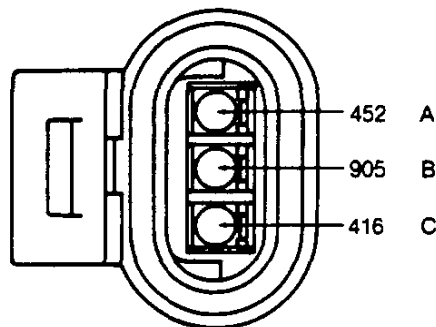
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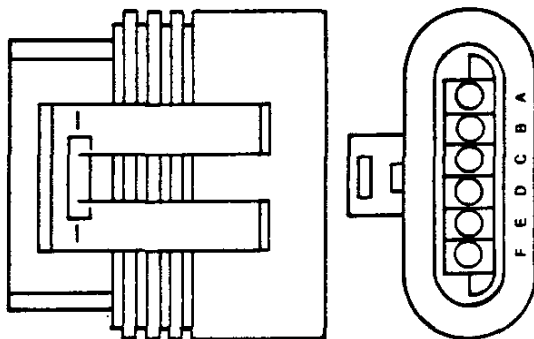
ECM Engine Harness Connector
P/N 12034400



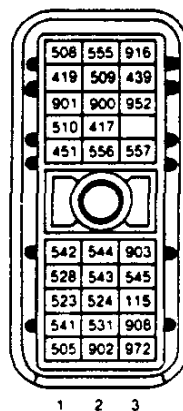
Fuel Pressure, Battery + and Ignition Circuits



Pressure Sensor
Harness Connector
P/N 12047909

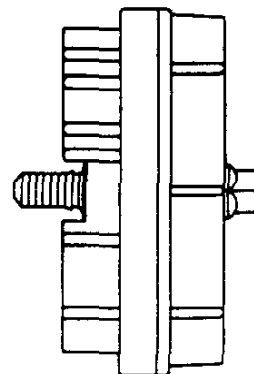


6-Way Power Harness Connector
P/N 12066317



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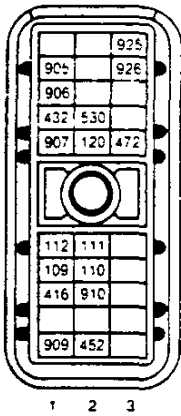
ECM Vehicle Harness Connector
P/N 12034398

Section 4

TROUBLESHOOTING CHARTS

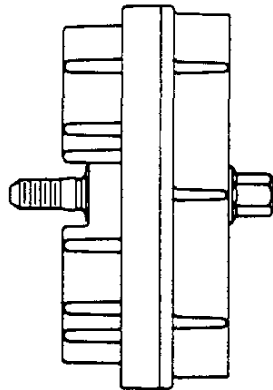
E. CODE 48 - FUEL PRESSURE SENSOR (FPS) SIGNAL VOLTAGE LOW (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
48-10 Check for Short to Battery + <ul style="list-style-type: none"> Remove both 20 Amp fuses to the ECM. Disconnect the vehicle harness and 6-way power harness connectors at the ECM. Read resistance between socket M1 of the engine harness connector and socket B3 of the vehicle harness connector. Also read resistance between socket M1 on the engine harness connector and the following sockets on the 6-way power harness connector: A, B, E and F. 	<p>All readings are greater than 10,000 ohms or open. →</p> <p>Any reading is less than or equal to 10,000 ohms. →</p>	<p>Go to 48-12.</p> <p>A short exists between the sockets where less than 10,000 ohms resistance was read. Repair short and reinsert fuses (or reset breakers). Then go to 48-30.</p>
48-11 Check for Short on Ground <ul style="list-style-type: none"> Turn ignition off. Remove jumper wires. Measure resistance between sockets M1 and Y2 on the engine harness. 	<p>Greater than 10,000 ohms. →</p> <p>Less than or equal to 10,000 ohms. →</p>	<p>Go to 48-6.</p> <p>Signal line (ckt #905) and return line (ckt #952) are shorted together. Repair short. Then go to 48-30.</p>
48-12 Replace FPS <ul style="list-style-type: none"> Turn ignition off. Replace FPS. Reconnect all connectors. Turn ignition on. Clear codes. Start engine. Run until "Check Engine" light comes on or for one minute. 	<p>"Check Engine" light comes on. →</p> <p>"Check Engine" light does not come on. →</p>	<p>Go to 48-7.</p> <p>Go to 48-30.</p>

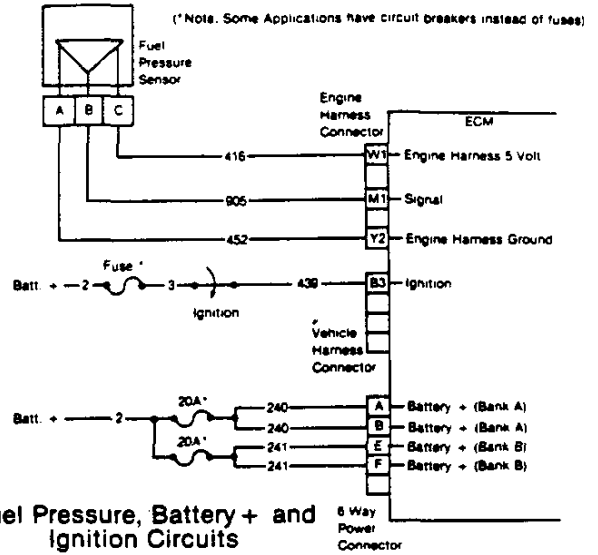


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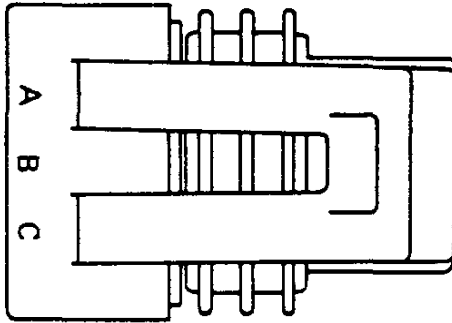
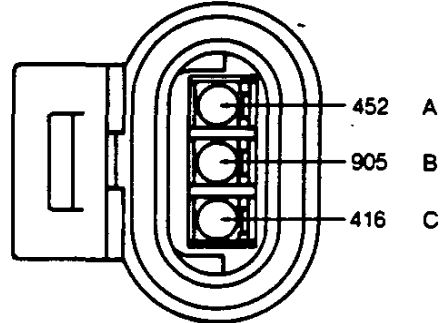
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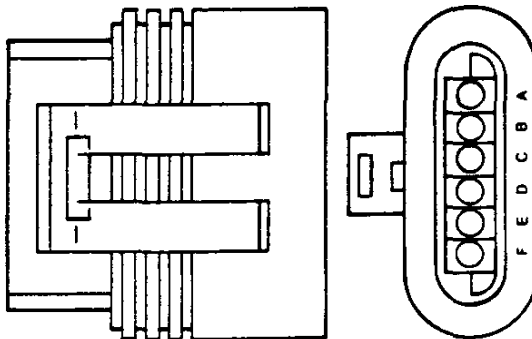
ECM Engine Harness Connector
P/N 12034400



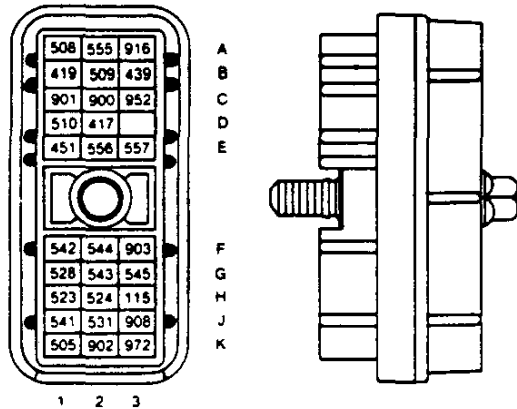
Fuel Pressure, Battery + and Ignition Circuits



Pressure Sensor
Harness Connector
P/N 12047909



6-Way Power Harness Connector
P/N 12066317

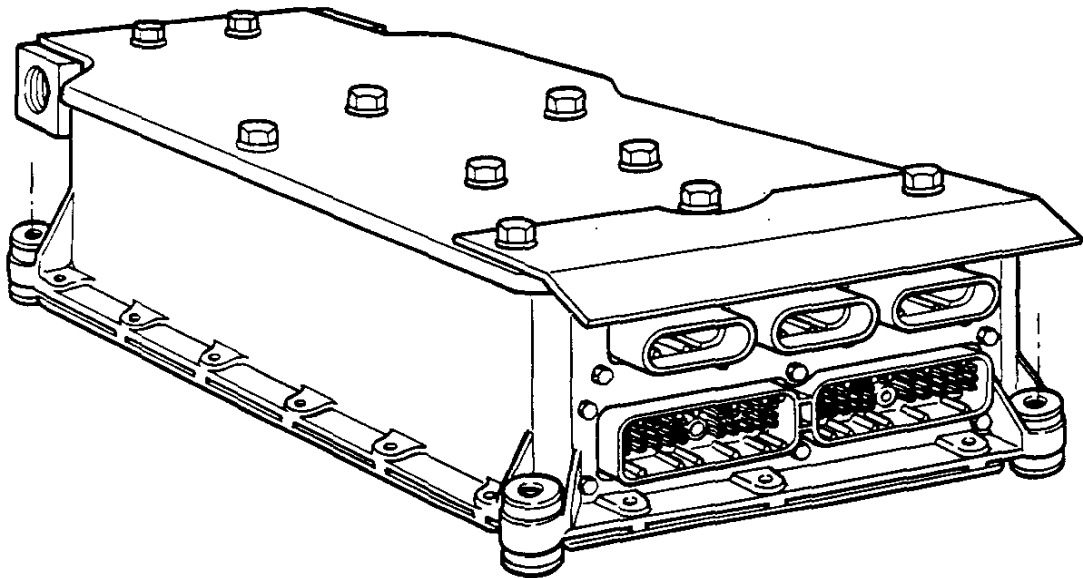


ECM Vehicle Harness Connector
P/N 12034398

Section 4 TROUBLESHOOTING CHARTS

E. CODE 48 - FUEL PRESSURE SENSOR (FPS) SIGNAL VOLTAGE LOW (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
48-30 Verify Repairs		
<ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or engine has run warm (greater than 50 degrees C, 122 degrees F) for 1 minute. • Read historical codes. 	<p>Code 25 (no codes) →</p> <p>Code 48 (and → any other codes).</p> <p>Any other codes → except Code 48.</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the start to find the error.</p> <p>Go to START-1, page 17, to service other codes.</p>



Electronic Control Module (ECM)

Section 4

TROUBLESHOOTING CHARTS

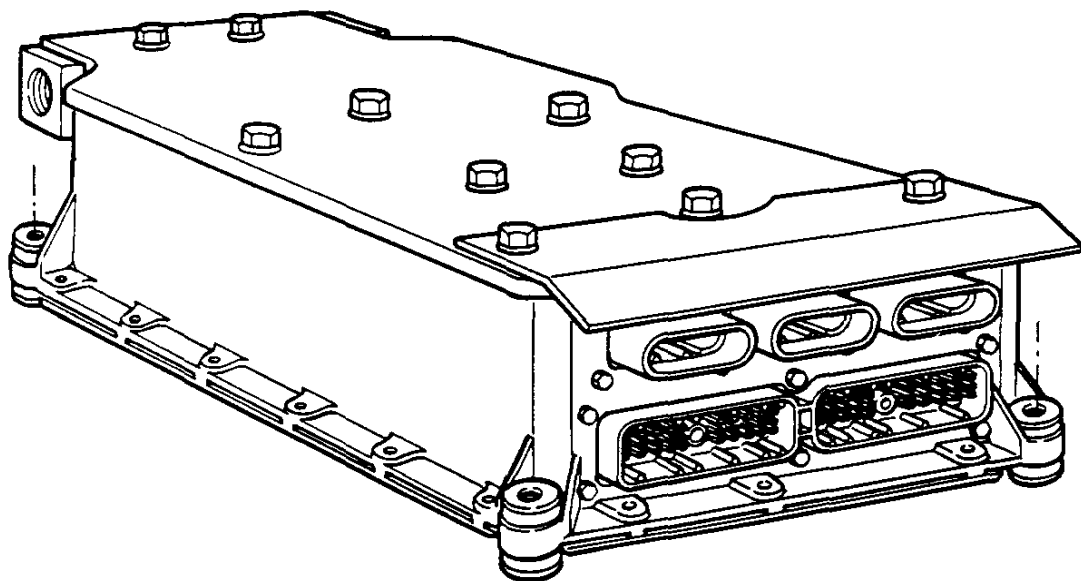
E. CODE 51 - EEPROM FAILURE (EEPROM = ELECTRICALLY ERASEABLE, PROGRAMMABLE READ ONLY MEMORY)

NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
<ul style="list-style-type: none">• An error has been detected in the EEPROM in the ECM.		Contact your distributor/dealer to have the EEPROM reprogrammed and/or ECM replaced.

NOTE—This code is historical only and forces backup operation.



Electronic Control Module (ECM)

Section 4

TROUBLESHOOTING CHARTS

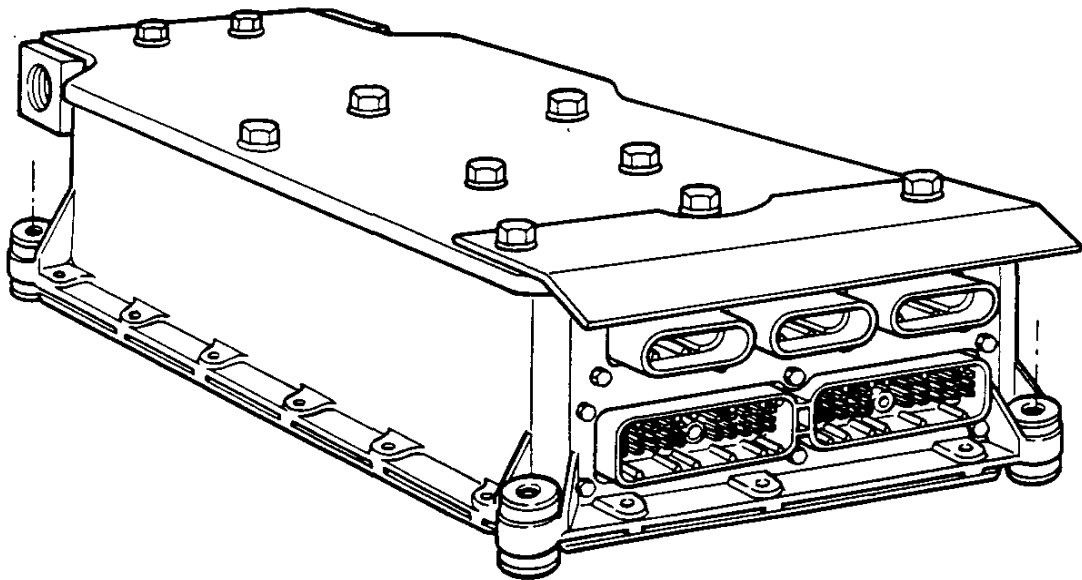
E. CODE 52 - ECM - ANALOG TO DIGITAL FAILURE

NOTE —

This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
52-1 Multiple Code Check		
• Were there any other codes besides Code 52?	Yes. _____	→ Service other codes first.
	No. _____	→ Replace the ECM. Then go to START-1, page 17.



Electronic Control Module (ECM)

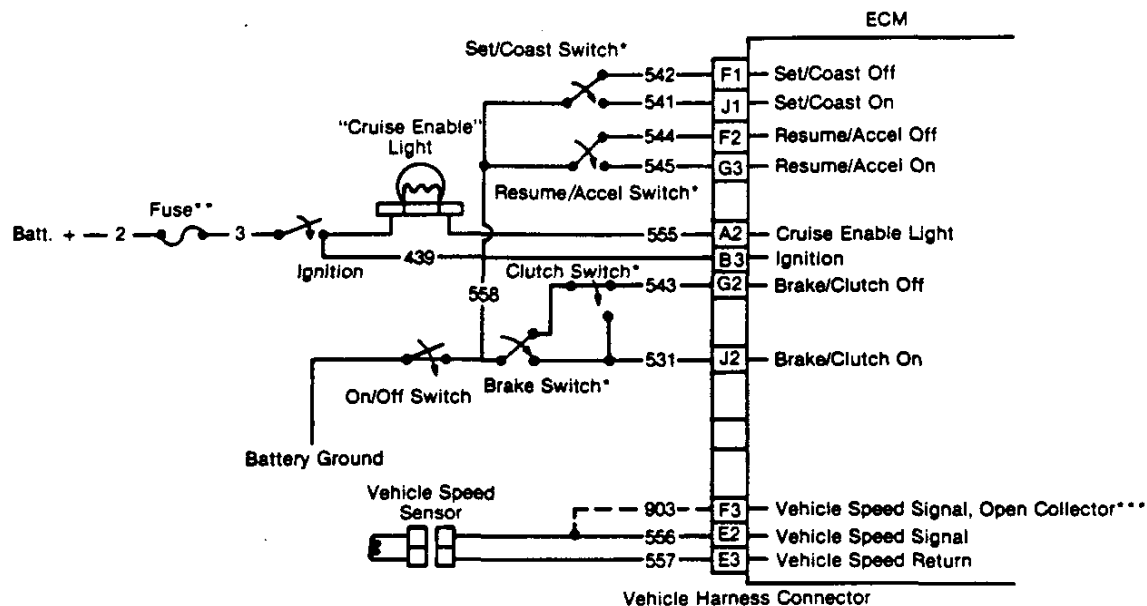
Section 4 TROUBLESHOOTING CHARTS

E. CODE 53 - EEPROM FAILURE AFFECTING CODE LOGGING (EEPROM = ELECTRONICALLY ERASEABLE, PROGRAMMABLE READ ONLY MEMORY)

NOTE — This chart is only to be used if:

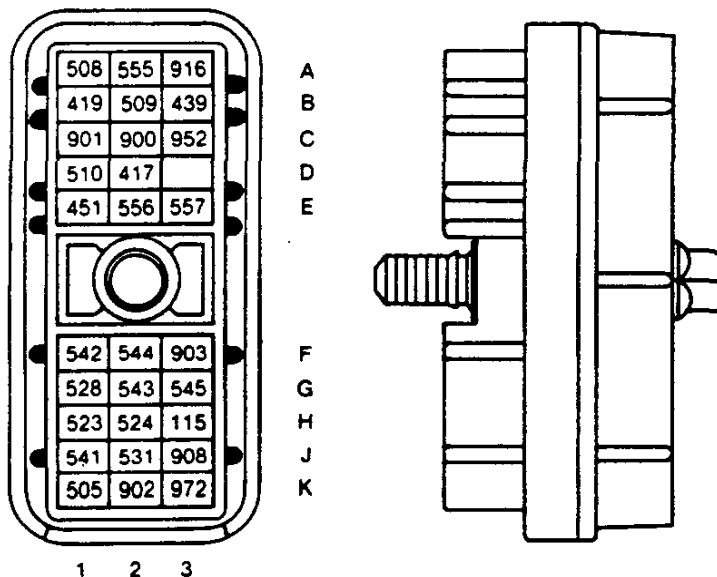
- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
<ul style="list-style-type: none">● An error has been detected in the EEPROM in the ECM which will cause it to not log codes correctly or at all.		Contact your distributor/dealer to have the EEPROM reprogrammed and/or ECM replaced.



*Note: All switches are shown in the "off" position.
 **Note: (Some applications may have circuit breakers instead of fuses).
 ***Note: CKT #903 used with CKT #556 for open collector Vehicle Speed Sensors.

Cruise Control Circuits



ECM Vehicle Harness Connector
 P/N 12034398

Section 4

TROUBLESHOOTING CHARTS

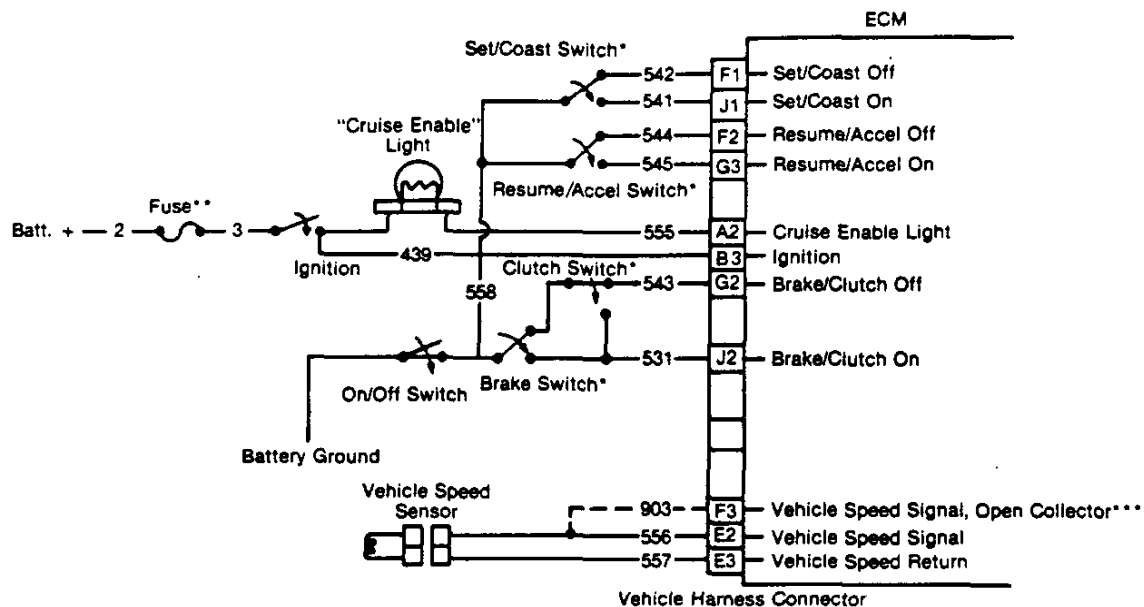
E. CODE 54 - VEHICLE SPEED SENSOR (VSS)

NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
54-1 Identify Type of Vehicle Speed Sensor Used <ul style="list-style-type: none"> • Determine whether the VSS used is either: <ul style="list-style-type: none"> — Type (1) is a magnetic pick-up and may be one of the following: <ul style="list-style-type: none"> • transmission tailshaft sensor • wheel rim sensor • mechanical speedometer cable adaptor sender generator OR — Type (2) which outputs a square wave signal and requires the additional use of ckt #903 (see sketch), this includes the ATEC (Allison Transmission Electronic Controls) electronic speedo output. 	Type (1) sensor. —————→ Type (2) sensor. —————→	Go to 54-2. Go to 54-10.
54-2 Check for Type of Failure <ul style="list-style-type: none"> • Keep ignition on, engine not running. • Select SPD SENSOR DIAG (Mode 24) on the DDR for display. • Observe VSS counts on the DDR. 	0 to 11 counts. —————→ 12 to 242 counts. —————→ 243 to 255 counts. —————→	Go to 54-3 Go to 54-9. Go to 54-7.
54-3 Check for Open <ul style="list-style-type: none"> • Disconnect the ECM vehicle harness connector. • Also disconnect the VSS connector. • Install a jumper wire between sockets A and B of the VSS harness connector. • Read resistance between sockets E2 and E3 on the ECM vehicle harness connector. 	Less than or equal to 5 ohms. —————→ Greater than 5 ohms or open. —————→	Go to 54-4. The VSS signal line (ckt #556) or return line (ckt #557) is open. Repair open. Then go to 54-30.

*Not recommended with DDEC 2.

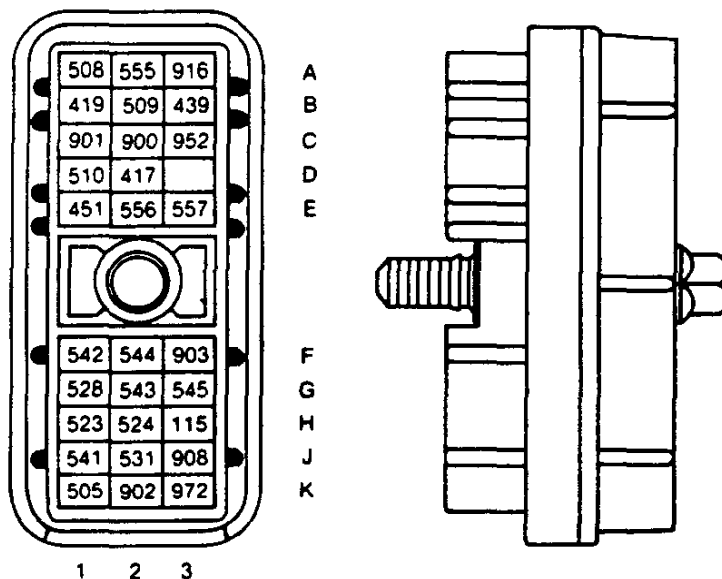


*Note: All switches are shown in the "off" position.

**Note: (Some applications may have circuit breakers instead of fuses).

***Note: CKT #903 used with CKT #556 for open collector Vehicle Speed Sensors.

Cruise Control Circuits

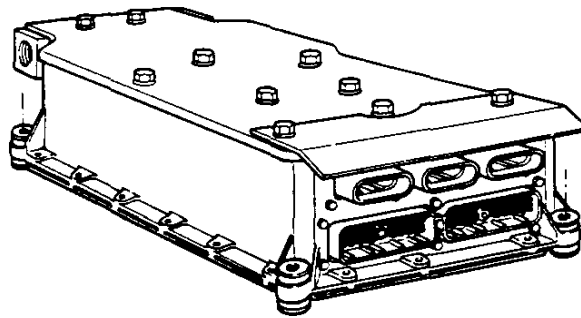


ECM Vehicle Harness Connector
P/N 12034398

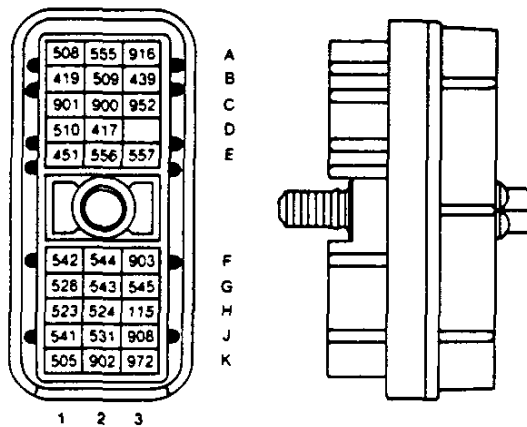
Section 4 TROUBLESHOOTING CHARTS

E. CODE 54 - VEHICLE SPEED SENSOR (Cont'd.)

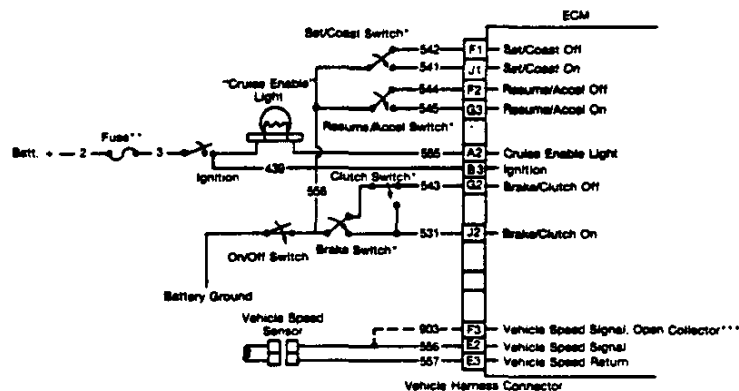
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
54-4 Check for Short to Ground <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the ECM vehicle harness connector. • Read resistance between socket E2 and a good ground. • Also read resistance between socket E3 and a good ground. 	<p>Less than or equal to 10,000 ohms on either reading. →</p> <p>Greater than 10,000 ohms on both readings. →</p>	<p>Either the signal wire (ckt #556) or the return wire (ckt #557) is shorted to ground. Repair short. Then go to 54-30.</p> <p>Go to 54-6.</p>
54-5 Check Vehicle Speed Sensor <ul style="list-style-type: none"> • Read resistance of the Vehicle Speed Sensor. 	<p>Less than 50 ohms. →</p> <p>From 50 to 3,000 ohms. →</p> <p>Greater than 3,000 ohms or open. →</p>	<p>Go to 54-6.</p> <p>Go to 54-8.</p> <p>Go to 54-6.</p>
54-6 Check VSS Connectors <ul style="list-style-type: none"> • Inspect terminals at the VSS connectors (sensor side and harness side) for damage, corrosion, and unseated pins or sockets. 	<p>Terminals and connectors are okay. →</p> <p>Problem found. →</p>	<p>Replace VSS. Then go to 54-30.</p> <p>Repair terminals/connectors. Then go to 54-30.</p>
54-7 Check for Short to Power <ul style="list-style-type: none"> • Turn ignition on. • Read voltage at the ECM vehicle harness connector, socket E3 (red lead) to a good ground (black lead). 	<p>Less than or equal to 4 volts. →</p> <p>Greater than 4 volts. →</p>	<p>Go to 54-8.</p> <p>The VSS or VSS return line (ckt #557) is shorted to battery or some other source of voltage. Repair short. Then go to 54-30.</p>



Electronic Control Module (ECM)



ECM Vehicle Harness Connector
P/N 12034398



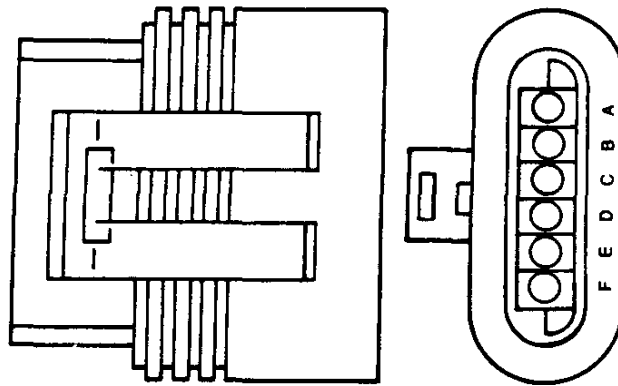
*Note: All switches are shown in the "off" position.
 **Note: (Some applications may have circuit breakers instead of fuses).
 ***Note: CKT #903 used with CKT #556 for open collector Vehicle Speed Sensors.

Cruise Control Circuits

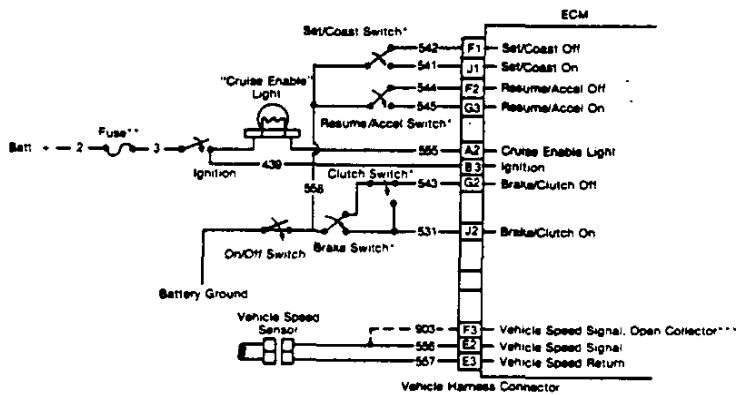
Section 4 TROUBLESHOOTING CHARTS

E. CODE 54 - VEHICLE SPEED SENSOR (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
54-8 Check ECM Connectors <ul style="list-style-type: none"> Check terminals at the ECM vehicle harness connector (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace ECM. Then go to 54-30. Repair terminals/connectors. Then go to 54-30.
54-9 Vehicle Speed Mechanical Checks <ul style="list-style-type: none"> Check if any metal, etc., is lodged between the VSS and the pulse wheel. Check if sensor is loose. Make sure VSS pulse wheel is in fixed position relative to magnetic pickup. Check for proper air gap between magnetic pickup and pulse wheel. 	Okay. → Not okay. →	Go to 54-6. Repair. Then go to 54-30.
54-10 Check for Short to Ground <ul style="list-style-type: none"> Turn ignition off. Disconnect the ECM vehicle harness connector. Read resistance between socket E2 and a good ground. 	Less than or equal to 100 ohms. → Greater than 100 ohms or open. →	The VSS signal line (ckt #556 and/or ckt #903) is shorted to ground. Repair short. Then go to 54-30. Go to 54-11.

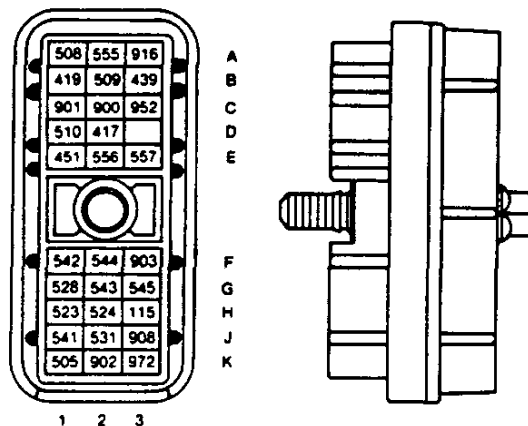


6-Way Power Harness Connector
P/N 12066317



- *Note: All switches are shown in the "off" position.
 **Note: (Some applications may have circuit breakers instead of fuses).
 ***Note: CKT #903 used with CKT #556 for open collector Vehicle Speed Sensors.

Cruise Control Circuits



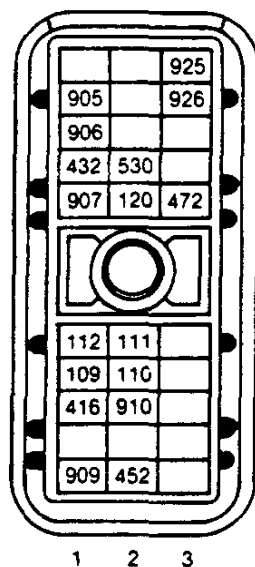
ECM Vehicle Harness Connector
P/N 12034398

Section 4

TROUBLESHOOTING CHARTS

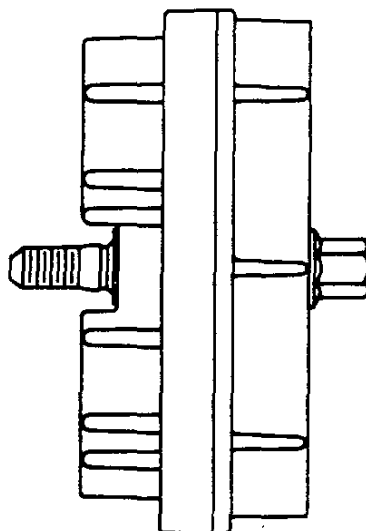
E. CODE 54 - VEHICLE SPEED SENSOR (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
54-11 Check for Open <ul style="list-style-type: none"> • Disconnect the ECM 6-way power harness connector. • Install a jumper wire between socket D of the 6-way connector and socket E2 of the ECM vehicle harness connector. • Find the VSS end (non-ECM end) of the wire for ckt #556. • Read resistance between this other end of ckt #556 and a good ground. • Repeat measurements with the jumper between socket D of the 6-way and socket F3. 	<p>Greater than 5 ohms or open. →</p> <p>Less than or equal to 5 ohms. →</p>	<p>The VSS signal line (ckt #556 and/or ckt #903 is open. Repair open. Then go to 54-30.</p> <p>The problem appears to be with the device generating the vehicle speed signal. Refer to the vehicle manufacturer's specifications/recommendations regarding diagnosis and/or replacement of the vehicle speed signal generator.</p>
54-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or for 1 minute. • Stop engine. • Read historical codes. 	<p>Code 25 (no codes). →</p> <p>Code 54 (and any other codes). →</p> <p>Any other codes except Code 54. →</p>	<p>Repairs appear complete. (Note: the only way to completely verify the repair is by road testing it. If you drive it on the road and Code 54 returns, please review this section from the first step to find the error.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>Go to START-1, page 17. to service other codes.</p>

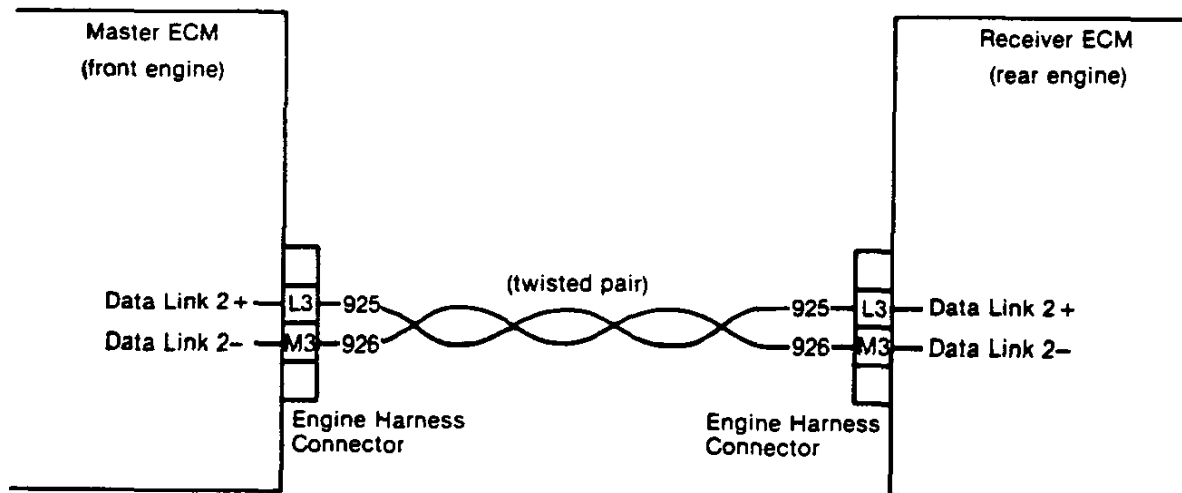


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ECM Engine Harness Connector
P/N 12034400



Proprietary Data Link Circuit

Section 4

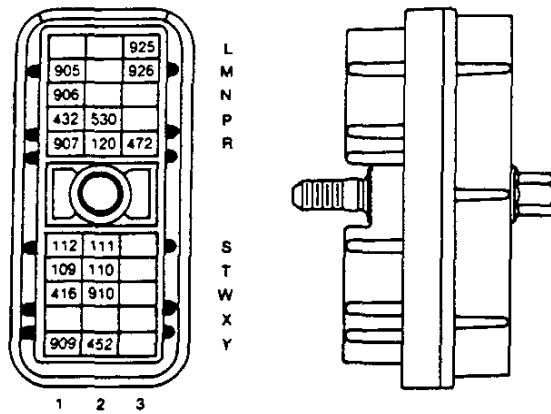
TROUBLESHOOTING CHARTS

E. CODE 55 - PROPRIETARY COMMUNICATION LINK FAILURE

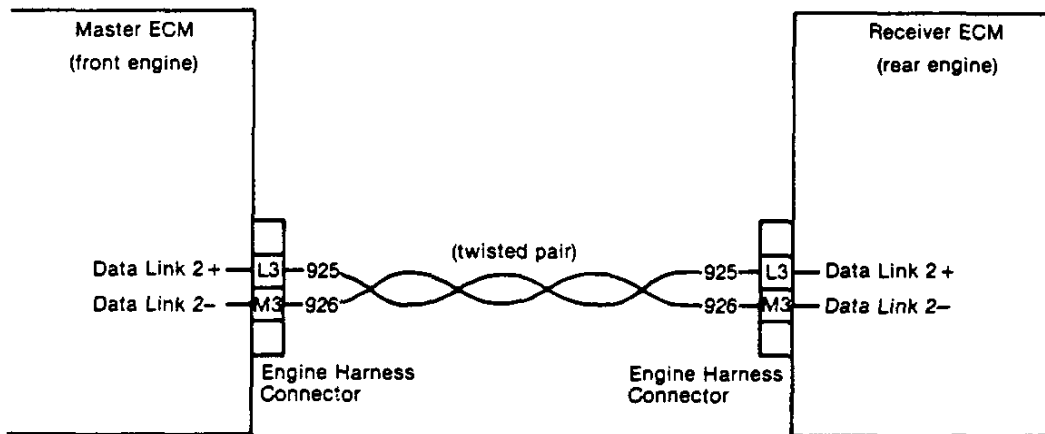
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

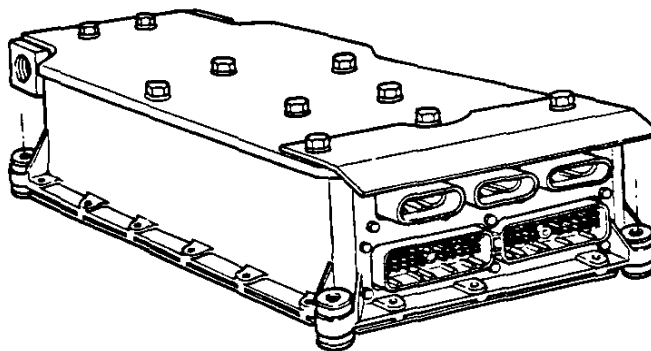
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
55-1 Identify Application <ul style="list-style-type: none"> • This code is only applicable to dual (block) engine set-ups (i.e., where 2 ECMs are required). • Identify your application. 	Single engine. —————→ Dual engine (dual ECM). —————→	Go to 55-2. Go to 55-3.
55-2 Check If Code Reappears <ul style="list-style-type: none"> • Clear codes. • Start and run engine for at least 1 minute. • Read historical codes. 	Code 55 (and any other codes). —————→ No codes. —————→ Any other codes except Code 55. —————→	Contact your distributor/dealer to have the EEPROM reprogrammed and/or ECM replaced. Return unit to service. Go to START-1, page 17, to service other codes.
55-3 Check for Open <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the engine harness connector at both ECMs. • Install a jumper wire between sockets L3 and M3 on one of the two engine harness connectors. • Read resistance between sockets L3 and M3 on the other engine harness connector (if possible, try to shake the harness while measuring resistance, look for connectors between ECMs, also shake if found). 	Always less than or equal to 5 ohms. —————→ Greater than 5 ohms or open. —————→	Go to 55-4. Either the Data Link 2 + wire (ckt #925) or the Data Link 2 – wire (ckt #926) is open. Repair open. Then go to 55-30.



ECM Engine Harness Connector
P/N 12034400



Proprietary Data Link Circuit



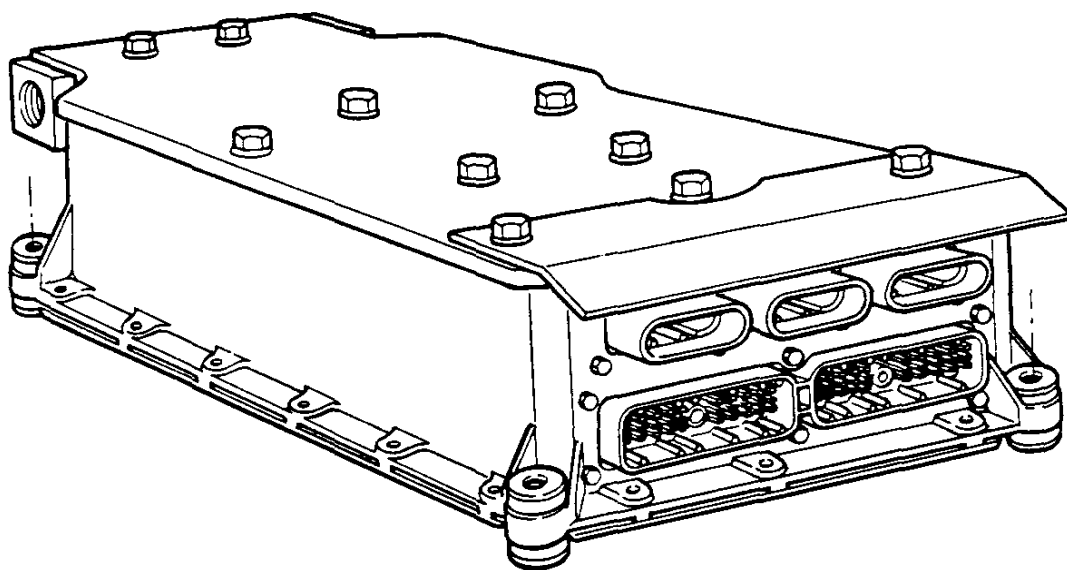
Electronic Control Module (ECM)

Section 4

TROUBLESHOOTING CHARTS

E. CODE 55 - PROPRIETARY COMMUNICATION LINK FAILURE (Con't.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
55-4 Check for Short Between Wires <ul style="list-style-type: none"> Remove jumper wire. Again read resistance between sockets L3 and M3 on one of the two engine harness connectors (if possible, shake harness while measuring resistance). 	<p>Less than or equal to 10,000 ohms at any time. →</p> <p>Always greater than 10,000 ohms. →</p>	<p>The Data Link 2 + wire (ckt #925) is shorted to the Data Link 2 - wire (ckt #926). Repair short. then go to 55-30.</p> <p>Go to 55-5.</p>
55-5 Check for Short Between Data Link 2 + and Ground <ul style="list-style-type: none"> Read resistance between socket L3 on one of the two engine harness connectors and a good ground (if possible, shake harness while measuring resistance). 	<p>Less than or equal to 10,000 ohms at any time. →</p> <p>Always greater than 10,000 ohms. →</p>	<p>The Data Link 2 + wire (ckt #925) is shorted to ground. Repair short. Then go to 55-30.</p> <p>Go to 55-6.</p>
55-6 Check for Short Between Data Link 2 - and Ground <ul style="list-style-type: none"> Read resistance between socket M3 on one of the two engine harness connectors and a good ground (if possible, shake harness while measuring resistance). 	<p>Less than or equal to 10,000 ohms at any time. →</p> <p>Always greater than 10,000 ohms. →</p>	<p>The Data Link 2 - wire (ckt #926) is shorted to ground. Repair short. Then go to 55-30.</p> <p>Go to 55-7.</p>
55-7 Check ECM Connectors <ul style="list-style-type: none"> Check terminals at both ECM engine harness connectors (check both the ECM and harness sides) for damage, corrosion and unseated pins or sockets. 	<p>Terminals and connectors are okay. →</p> <p>Problem found.</p>	<p>Replace receiver ECM (always on the rear engine). Then go to 55-8.</p> <p>Repair terminals/connectors. Then go to 55-30.</p>



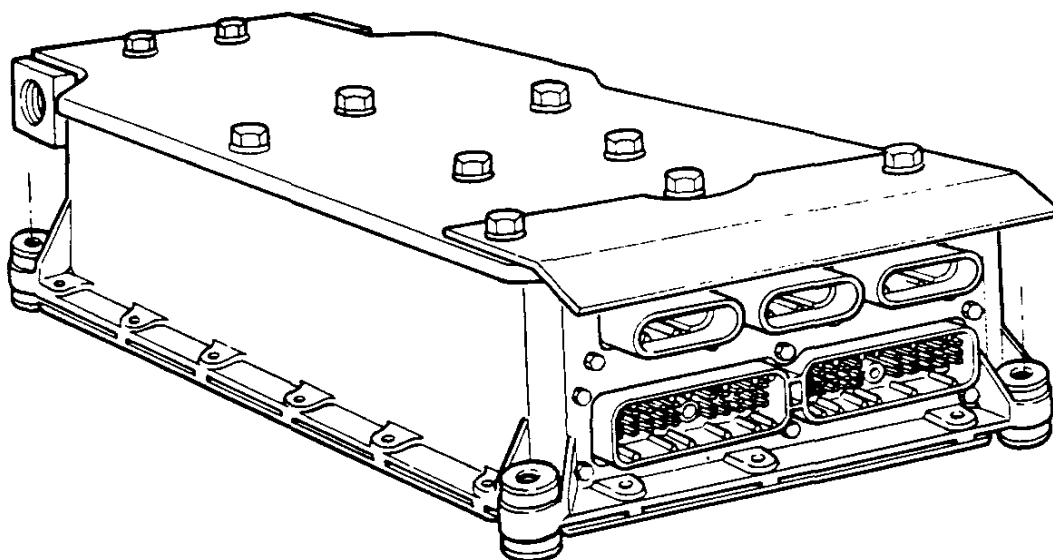
Electronic Control Module (ECM)

Section 4

TROUBLESHOOTING CHARTS

E. CODE 55 - PROPRIETARY COMMUNICATION LINK FAILURE (Con't.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
55-8 Check If Code Reappears <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or for 1 minute. • Stop engine. • Read historical codes. 	<p>Code 55 (and any other codes). →</p> <p>No codes. →</p> <p>Any other codes except Code 55. →</p>	<p>Reinstall original receiver ECM. Replace master ECM (on front engine). Then go to 55-30.</p> <p>Repairs are complete.</p> <p>Go to START-1, page 17, to service other codes.</p>
55-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Note status of "Check Engine" light. • If "Check Engine" light does not stay on, start engine and run until "Check Engine" light comes on or for 1 minute. • Stop engine. • Read historical codes. 	<p>Code 25 (no codes). →</p> <p>Code 55 (and any other codes). →</p> <p>Any other codes except Code 55. →</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>Go to START-1, page 17, to service other codes.</p>



Electronic Control Module (ECM)

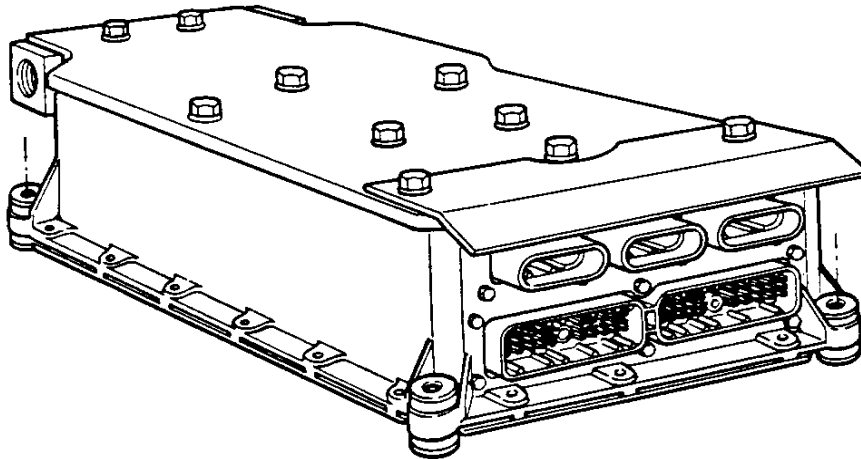
Section 4
TROUBLESHOOTING CHARTS

E. CODE 56 • ECM • ANALOG TO DIGITAL FAILURE

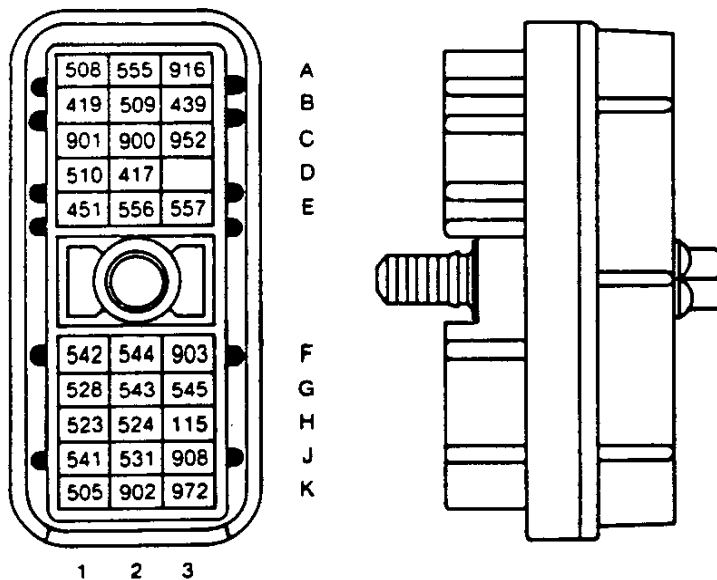
NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
56-1 Multiple Code Check		
• Were there any other codes besides Code 56?	Yes. —————→	Service other codes first.
	No. —————→	Replace the ECM. Then go to START-1, page 17.



Electronic Control Module (ECM)



ECM Vehicle Harness Connector
P/N 12034398

Section 4

TROUBLESHOOTING CHARTS

E. CODE 58 - CRUISE CONTROL SWITCHES

NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
58-1 Determine Type of Cruise Control System <ul style="list-style-type: none"> ● Check to see that this is a DDEC, cruise control system. ● If it is a DDEC cruise control system, do you know if it is either a vehicle speed or engine speed system? 	Yes. —————→ No. —————→	Go to 58-4. Go to 58-2.
58-2 Check If Calibration is Set-Up for DDEC Cruise Control <ul style="list-style-type: none"> ● Turn ignition on. ● Plug DDR into the 12 pin DDL connector. ● Select PROM ID (MODE 03) for display. ● Look through data being displayed until MPH CRUISE is found. 	Display reads: —————→ N/A MPH CRUISE. Display reads: —————→ ## MPH CRUISE (where ## = a number).	You have an engine speed cruise control system. Go to 58-4. You have a vehicle speed cruise control system. Go to 58-4.
58-3 Check ECM Connectors <ul style="list-style-type: none"> ● Disconnect the vehicle harness connector at the ECM. ● Check terminals at the ECM vehicle harness connector (both the ECM and harness side) for damage, corrosion and unseated pins or sockets. 	Terminals and —————→ connectors are okay. Problem found. —————→	Replace ECM. Then to to 58-30. Repair terminals/connectors. Then go to 58-30.

Section 4 TROUBLESHOOTING CHARTS

E. CODE 58 - CRUISE CONTROL SWITCHES (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
58-4 Checking-Out of Cruise Control Switches & Wiring *		

To speed up the check-out of cruise control switches, Quick-check tables have been developed. These tests are all to be run with the ignition on but the engine not running. Also, a DDR must be plugged into the 12 pin, DDL connector. All three Quick-Check Tables (Tables I-III) must be gone through to completely check out the cruise control switches and wiring. But the maximum number of Quick-Check steps you'll ever need to perform is $2 + 2 + 3 = 8$ steps.

Example

Taking Table I, step 2 you would do the following:

1. Ignition on, engine off, DDR plugged in.
2. Turn the Cruise Control On/Off switch to "On".
3. Select "CRUISE SWITCHES" (Mode 23) on DDR for display.
4. Note the DDR display. If, for example, it shows "??", you would proceed to Table II. If instead it shows "OFF", proceed to step 58-6.
5. Whenever you are directed to the fault trees, you are always asked to recreate the same conditions which led you there. In this example that would mean to turn the Cruise On/Off switch to "On" before taking any readings.

CRUISE CONTROL QUICK-CHECK TABLES

Table I

Check-Out of On/Off Switch & Wiring (Ignition "On", Engine Not Running)

Step	On/Off Switch Status	SET Switch	RESUME Switch	DDR Readout Being Looked At	DDR Display	Okay?	If you get this display, then go to:
1	OFF	OFF	OFF	CR ON/OFF SW	OFF ON ??	Yes No No	Table I, Step 2 58-5 Table II
2	ON	OFF	OFF	CR ON/OFF SW	OFF ON ??	No Yes No	58-6 Table II Table II

*If parking brake is wired into cruise system, block wheels and turn off parking brakes before beginning these tests.

Section 4 TROUBLESHOOTING CHARTS

E. CODE 58 - CRUISE CONTROL SWITCHES (Cont'd.)

CRUISE CONTROL QUICK-CHECK TABLES (Cont'd.)

Table II

Check-Out of Brake and Clutch Switches & Wiring (Ignition "On", Engine Not Running)*

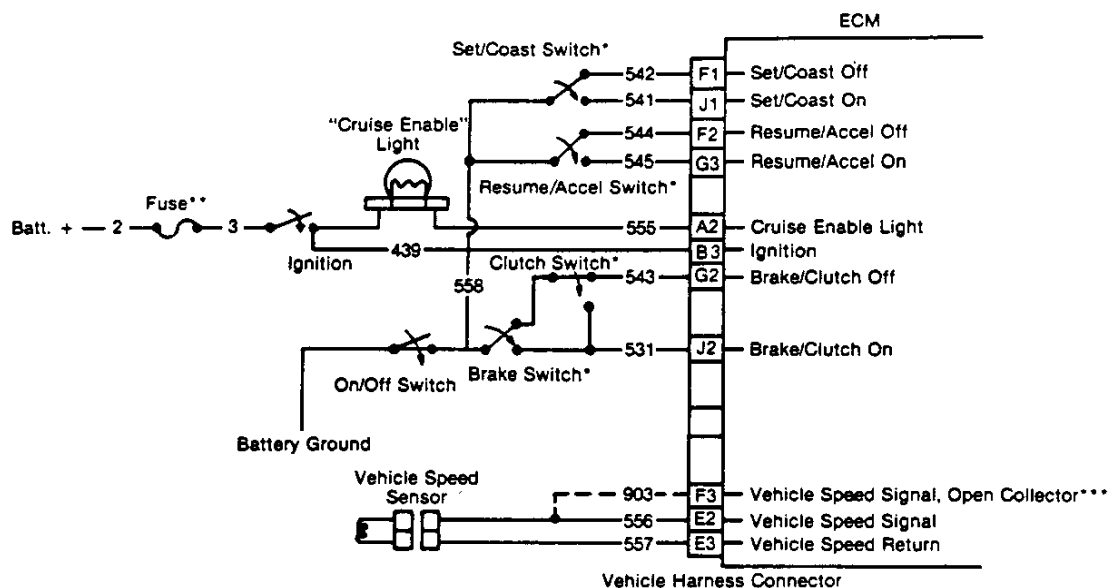
Step	On/Off Switch Status	Brake Pedal	Clutch Pedal (if any)	DDR Readout Being Looked At	DDR Display	Okay?	If you get this display, then go to:
1	ON	OFF	OFF	BRAKE/CLT SW	OFF ON OPEN SHRT	Yes No No No	Table II, Step 2 58-7* 58-8 58-9
2	ON	OFF	ON (if no clutch, skip to Step 3)	BRAKE/CLT SW	OFF ON OPEN SHRT	No Yes No No	58-10 Table II, Step 3 58-11 58-12
3	ON	ON	OFF	BRAKE/CLT SW	OFF ON OPEN SHRT	No Yes No No	58-13 Table III 58-14 58-15

Table III

Check-Out of SET and RESUME Switches & Wiring

Step	On/Off Switch Status	SET Switch	RESUME Switch	DDR Readout Being Looked At	DDR Display	Okay?	If you get this display, then go to:
1	ON	OFF	OFF	SET/COAST SW	OFF ON OPEN SHRT	Yes No No No	Table III, Step 2 58-16 58-17 58-18
2	ON	ON	OFF	SET/COAST SW	OFF ON OPEN SHRT	No Yes No No	58-19 Table III, Step 3 58-20 58-21
3	ON	OFF	OFF	RES/ACCEL SW	OFF ON OPEN SHRT	Yes No No No	Table III, Step 4 58-22 58-23 58-24
4	ON	OFF	ON	RES/ACCEL SW	OFF ON OPEN SHRT	No Yes No No	58-25 58-26 58-27 58-28

*If parking brake is wired into cruise system, block wheels and turn off parking brakes before beginning these tests.

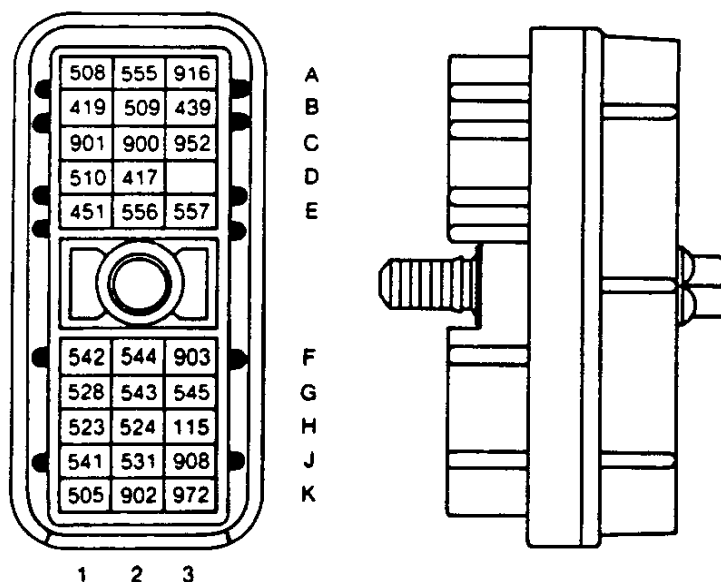


*Note: All switches are shown in the "off" position.

**Note: (Some applications may have circuit breakers instead of fuses).

***Note: CKT #903 used with CKT #556 for open collector Vehicle Speed Sensors.

Cruise Control Circuits



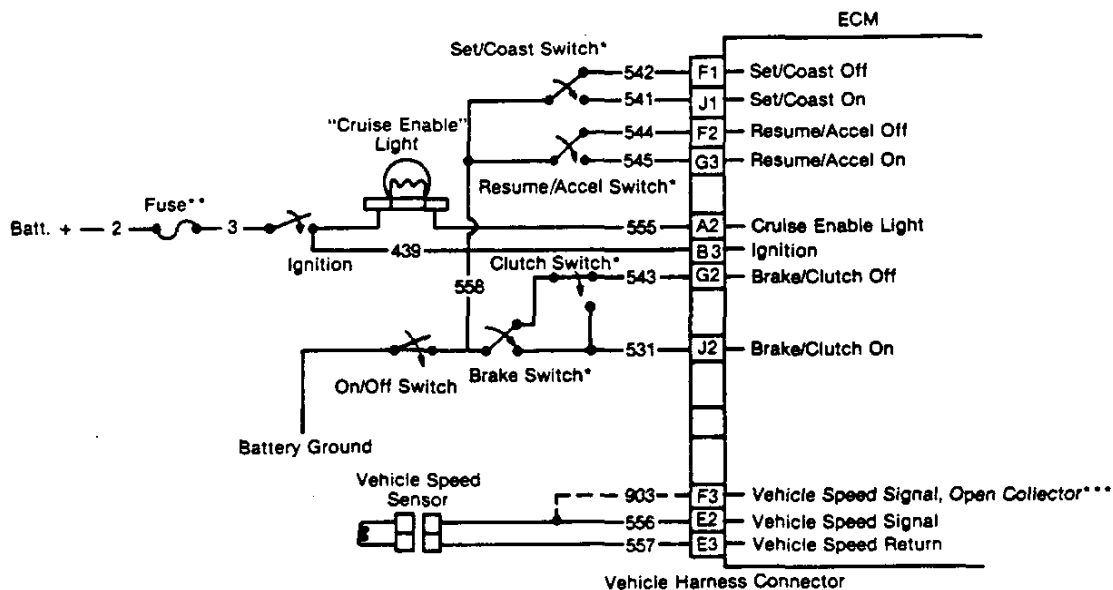
ECM Vehicle Harness Connector
P/N 12034398

Section 4

TROUBLESHOOTING CHARTS

E. CODE 58 - CRUISE CONTROL SWITCHES (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
58-5 Check for Short at the On/Off Ckt <ul style="list-style-type: none"> • Turn ignition off. • Turn Cruise On/Off switch to OFF. • Disconnect the vehicle harness connector at the ECM. • Read resistance between socket F1 on the vehicle harness connector and a good ground. 	<p>Less than or equal to 10,000 ohms on either reading.</p> <p>Greater than 10,000 ohms or open on both readings.</p>	<p>Reconnect vehicle harness connector. Turn ignition on. Then run through steps of Table II and Table III. If any DDR display received is not okay, go to step indicated. If Table II & III pass, then either the On/Off switch is shorted or a short to ground exists in ckt #558. Repair short or replace switch. Then go to 58-30.</p> <p>Go to 58-3.</p>
58-6 Check for Open at the On/Off Ckt <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn ON the Cruise On/Off switch. • Read resistance between socket F1 on the vehicle harness connector and a good ground. 	<p>Greater than 5 ohms or open.</p> <p>Less than or equal to 5 ohms.</p>	<p>Either the On/Off switch is open or ckt #558 is open, you have a bad set/coast switch, or you have a bad battery ground. Repair open or replace switch. Then go to 58-30.</p> <p>Go to 58-3.</p>
58-7 Check for Shorted or Miswired Brake Switch <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn ON the Cruise On/Off switch. • Read resistance between socket J2 on the vehicle harness connector and a good ground. 	<p>Less than or equal to 10,000 ohms.</p> <p>Greater than 10,000 ohms or open.</p>	<p>Either the Brake or Clutch switch is miswired or faulty. Rewire or replace switch. Then go to 58-30.</p> <p>Go to 58-3.</p>

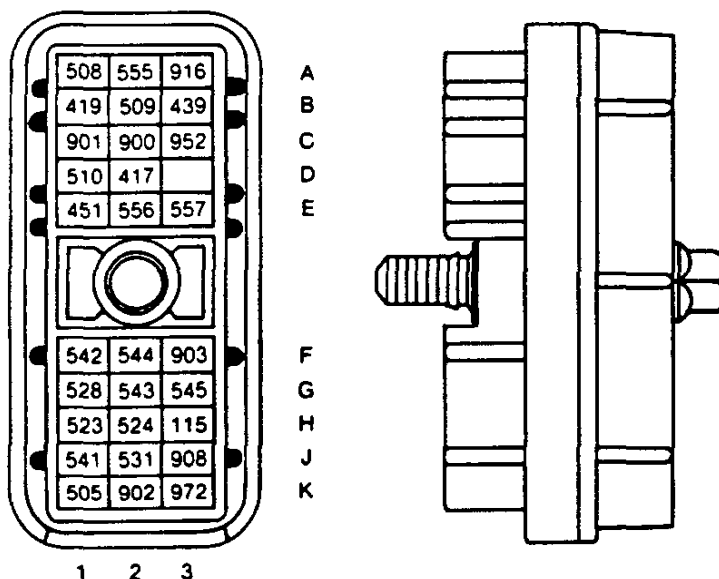


*Note: All switches are shown in the "off" position.

**Note: (Some applications may have circuit breakers instead of fuses).

***Note: CKT #903 used with CKT #556 for open collector Vehicle Speed Sensors.

Cruise Control Circuits



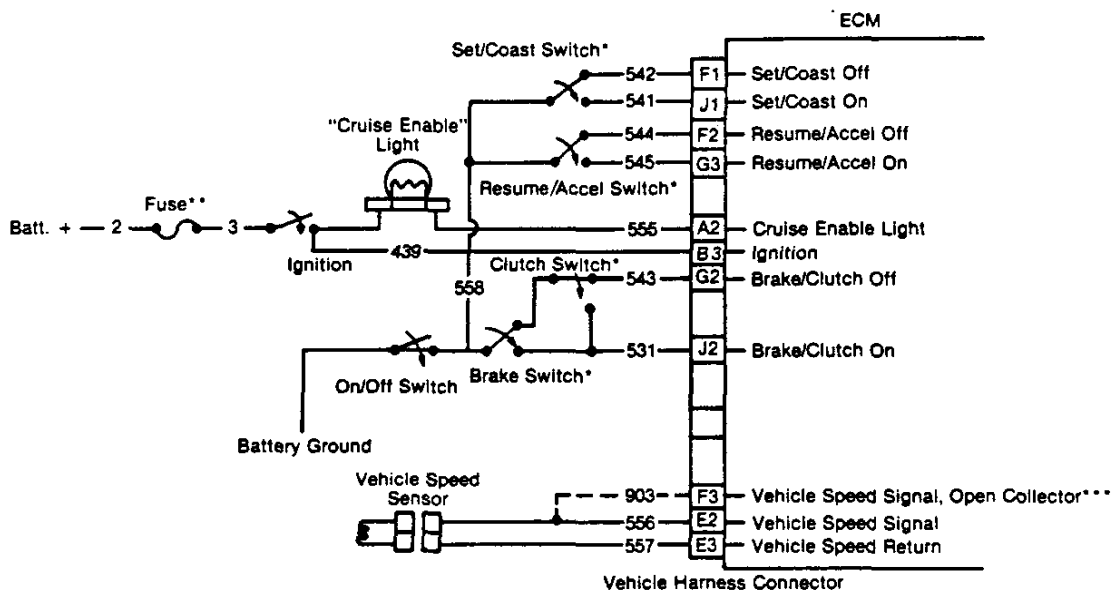
ECM Vehicle Harness Connector
P/N 12034398

Section 4

TROUBLESHOOTING CHARTS

E. CODE 58 - CRUISE CONTROL SWITCHES (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
58-8 Check for Open at the On/Off Ckt <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn ON the Cruise On/Off Switch. • Read resistance between socket G2 on the vehicle harness connector and a good battery ground. 	<p>Greater than 5 ohms or open. →</p> <p>Less than or equal to 5 ohms. →</p>	<p>Either the Brake or Clutch switch is open or miswired, or an open exists in ckt #543 or ckt #558. Repair open or replace switch. Then go to 58-30.</p> <p>Go to 58-3.</p>
58-9 Check for Short at the Brake/Clutch On Circuit <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn ON the Cruise On/Off switch. • Read resistance between socket J2 on the vehicle harness connector and a good ground. • Also read resistance between socket J2 and a good ground. 	<p>Less than or equal to 10,000 ohms on either reading. →</p> <p>Greater than 10,000 ohms or open on both readings. →</p>	<p>Either the Brake or Clutch switch is shorted or a short to ground exists in ckt #531. Repair short or replace switch. Then go to 58-30.</p> <p>Go to 58-3.</p>
58-10 Check for Bad Contact or Clutch Switch <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn on the Cruise On/Off switch. • Apply a weight (brick or other) to the clutch or have someone else press and hold the clutch pedal to the floor. • Read resistance between socket G2 on the vehicle harness connector and a good ground. 	<p>Less than or equal to 10,000 ohms. →</p> <p>Greater than 10,000 ohms or open. →</p>	<p>Check if bad mechanical contact between the Clutch switch and the Clutch. If okay, the Clutch switch is bad. Repair bad contact or replace clutch switch. Then go to 58-30.</p> <p>Go to 58-3.</p>

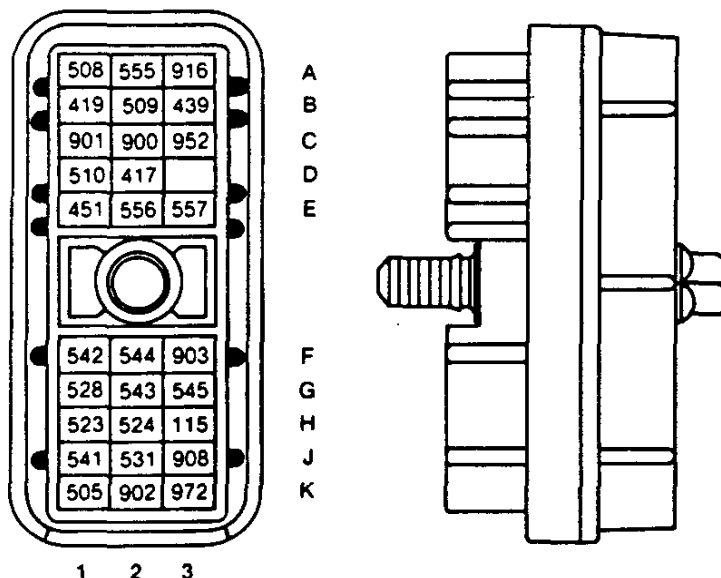


*Note: All switches are shown in the "off" position.

**Note: (Some applications may have circuit breakers instead of fuses).

***Note: CKT #903 used with CKT #556 for open collector Vehicle Speed Sensors.

Cruise Control Circuits



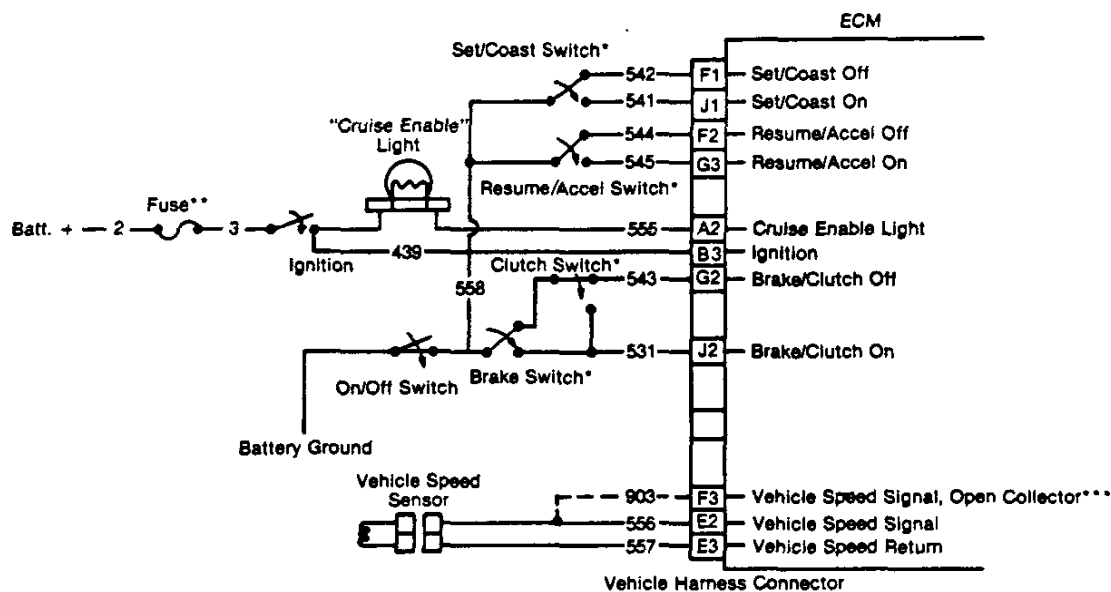
ECM Vehicle Harness Connector
P/N 12034398

Section 4

TROUBLESHOOTING CHARTS

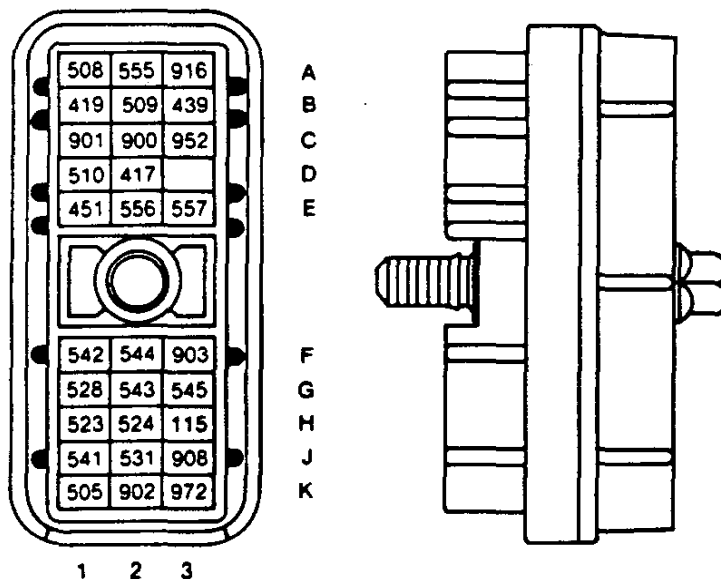
E. CODE 58 - CRUISE CONTROL SWITCHES (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
58-11 Check for Open at the Brake/Clutch Off Ckt <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn on the Cruise On/Off switch. • Apply a weight (brick or other) to the clutch or have someone else press and hold the clutch pedal to the floor. • Read resistance between socket J2 on the vehicle harness connector and a good ground. 	<p>Less than or equal to 5 ohms. →</p> <p>Greater than 5 ohms or open. →</p>	<p>Go to 58-3.</p> <p>Either the clutch switch or brake switch or ckt #531 is open. Repair open or replace switch. Then go to 58-30.</p>
58-12 Check for Short at the Brake Off/Clutch Circuit <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn on the Cruise On/Off switch. • Apply a weight (brick or other) to the clutch or have someone else press and hold the clutch pedal to the floor. • Read resistance between socket G2 on the vehicle harness connector and a good ground. 	<p>Less than or equal to 10,000 ohms on either reading. →</p> <p>Greater than 10,000 ohms or open on both readings. →</p>	<p>Either the Clutch switch is shorted or a short to ground exists in ckt #543. Repair short or replace switch. Then go to 58-30.</p> <p>Go to 58-3.</p>



- *Note: All switches are shown in the "off" position.
 **Note: (Some applications may have circuit breakers instead of fuses).
 ***Note: CKT #903 used with CKT #556 for open collector Vehicle Speed Sensors.

Cruise Control Circuits

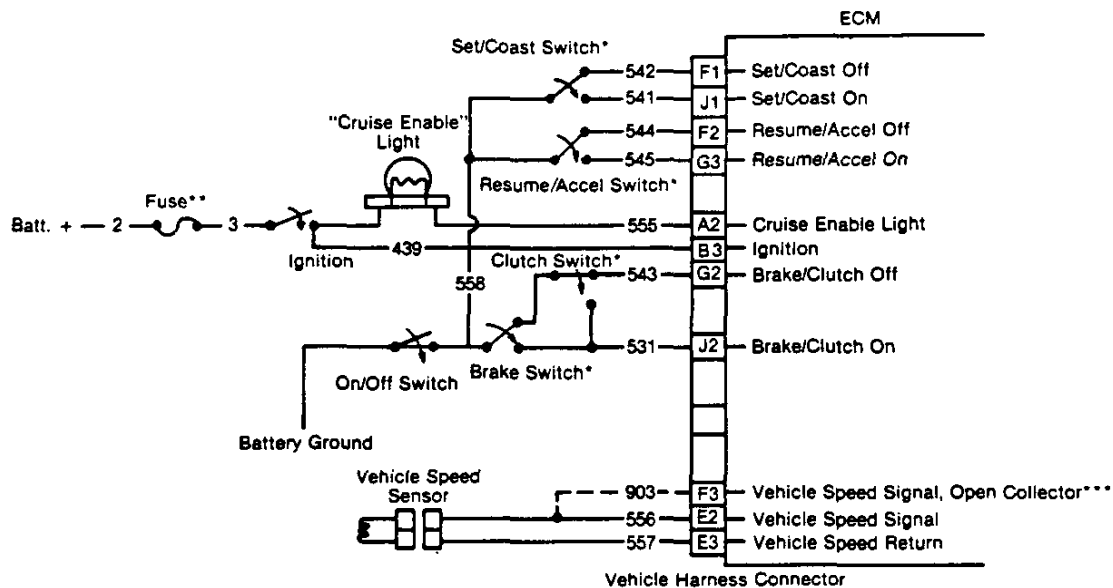


ECM Vehicle Harness Connector
 P/N 12034398

Section 4 TROUBLESHOOTING CHARTS

E. CODE 58 • CRUISE CONTROL SWITCHES (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
58-13 Check for Bad Contact at the Brake Switch <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn on the Cruise On/Off switch. • Apply a weight (brick or other) to the clutch or have someone else press and hold the clutch pedal to the floor. • Read resistance between socket G2 on the vehicle harness connector and a good ground. 	<p>Less than or equal to 5 ohms. →</p> <p>Greater than 5 ohms or open. →</p>	<ul style="list-style-type: none"> • Determine brake switch operation: <ul style="list-style-type: none"> — <u>Air Operated</u> Be sure brake switch is mounted in brake air supply circuit, and that no kinks or air leaks exist. — <u>Mechanical</u> Check switch actuator for correct alignment and/or sticking. • Test switch operation: refer to vehicle, OEM manual for switch details. • Make repairs or replace switch. • When repairs are complete, go to 58-30. <p>Go to 58-3.</p>
58-14 Check for Open at the Brake/Clutch On Ckt <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn on the Cruise On/Off switch. • Apply a weight (brick or other) to the clutch or have someone else press and hold the brake pedal to the floor. • Read resistance between socket J2 on the vehicle harness connector and a good ground. 	<p>Less than or equal to 5 ohms. →</p> <p>Greater than 5 ohms or open. →</p>	<p>Go to 58-3.</p> <p>Either the Brake switch or ckt #531 is open. Repair open or replace switch. Then go to 58-30.</p>

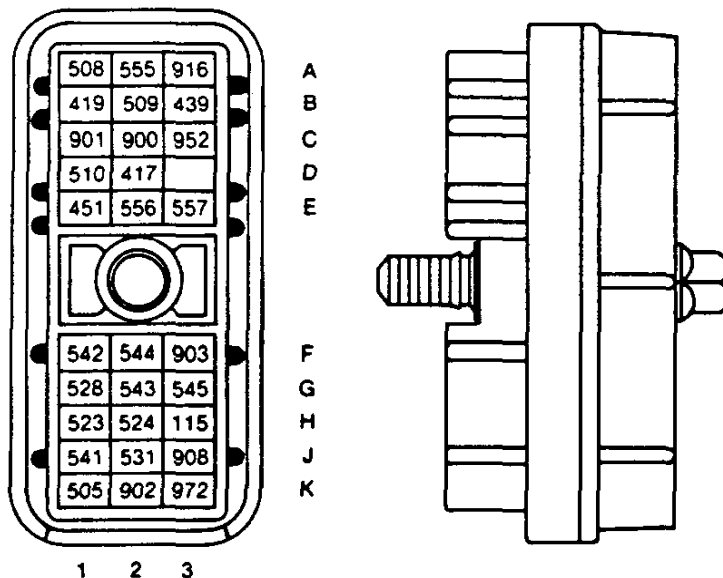


*Note: All switches are shown in the "off" position.

**Note: (Some applications may have circuit breakers instead of fuses).

***Note: CKT #903 used with CKT #556 for open collector Vehicle Speed Sensors.

Cruise Control Circuits

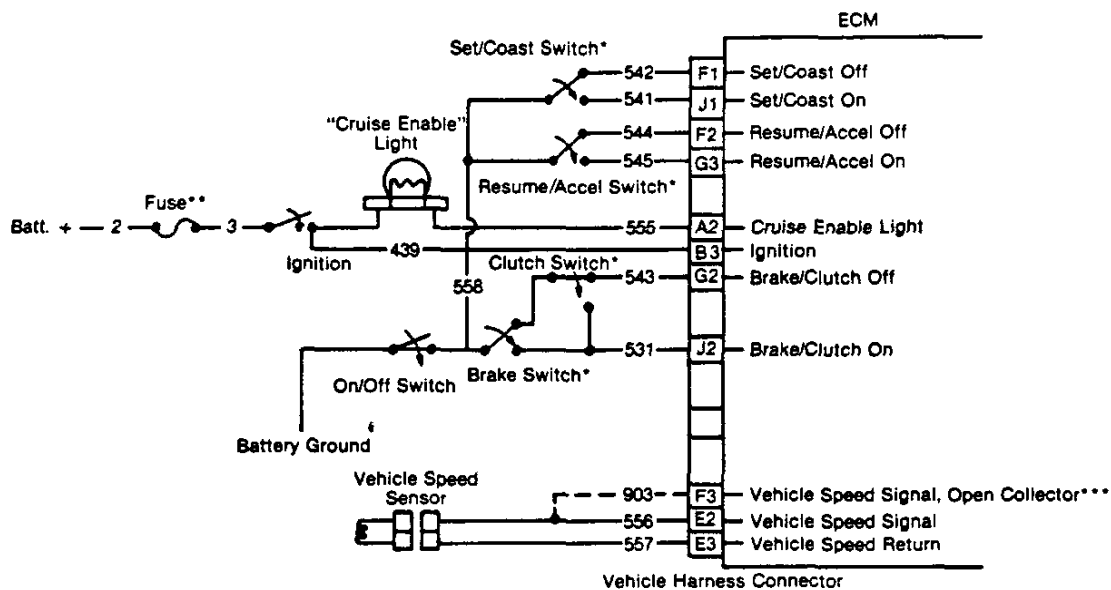


ECM Vehicle Harness Connector
P/N 12034398

Section 4 TROUBLESHOOTING CHARTS

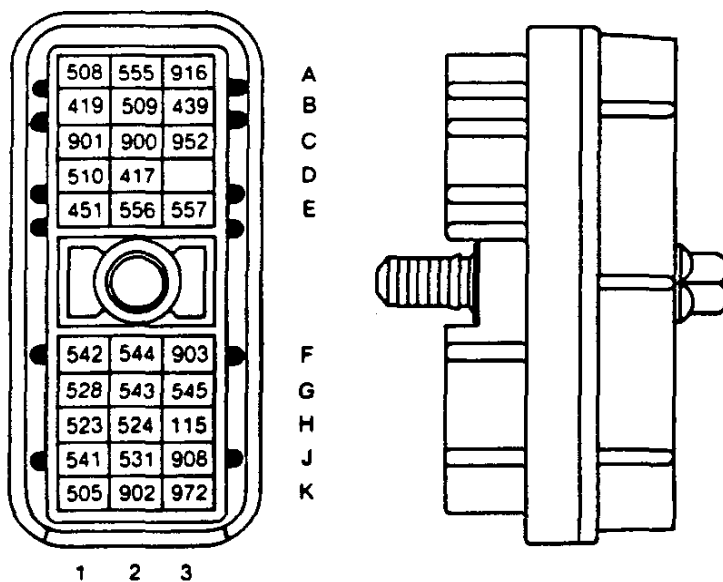
E. CODE 58 - CRUISE CONTROL SWITCHES (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
58-15 Check for Short at the Brake/Clutch Off Ckt <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn on the Cruise On/Off switch. • Apply a weight (brick or other) to the clutch or have someone else press and hold the brake pedal to the floor. • Read resistance between socket G2 on the vehicle harness connector and a good ground. 	<p>Less than or equal to 10,000 ohms on either reading. →</p> <p>Greater than 10,000 ohms or open on both readings. →</p>	<p>Either the Brake switch is shorted, or ckt #543 is shorted to ground. Repair short or replace switch. Then go to 58-30.</p> <p>Go to 58-3.</p>
58-16 Check for Shorted or Miswired Set Switch <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn on the Cruise On/Off switch. • Read resistance between socket J1 on the vehicle harness connector and a good ground. 	<p>Less than or equal to 10,000 ohms. →</p> <p>Greater than 10,000 ohms or open. →</p>	<p>Set switch is shorted or miswired. Rewire or replace switch. Then go to 58-30.</p> <p>Go to 58-3.</p>
58-17 Check for Open at the Set/Coast Off Circuit <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn on the Cruise On/Off Switch. • Read resistance between socket F1 on the vehicle harness connector and a good ground. 	<p>Greater than 5 ohms or open. →</p> <p>Less than or equal to 5 ohms. →</p>	<p>Either the Set switch is open or an open exists in ckt #542. Repair open or replace switch. Then go to 58-30.</p> <p>Go to 58-3.</p>



- *Note: All switches are shown in the "off" position.
 **Note: (Some applications may have circuit breakers instead of fuses).
 ***Note: CKT #903 used with CKT #556 for open collector Vehicle Speed Sensors.

Cruise Control Circuits



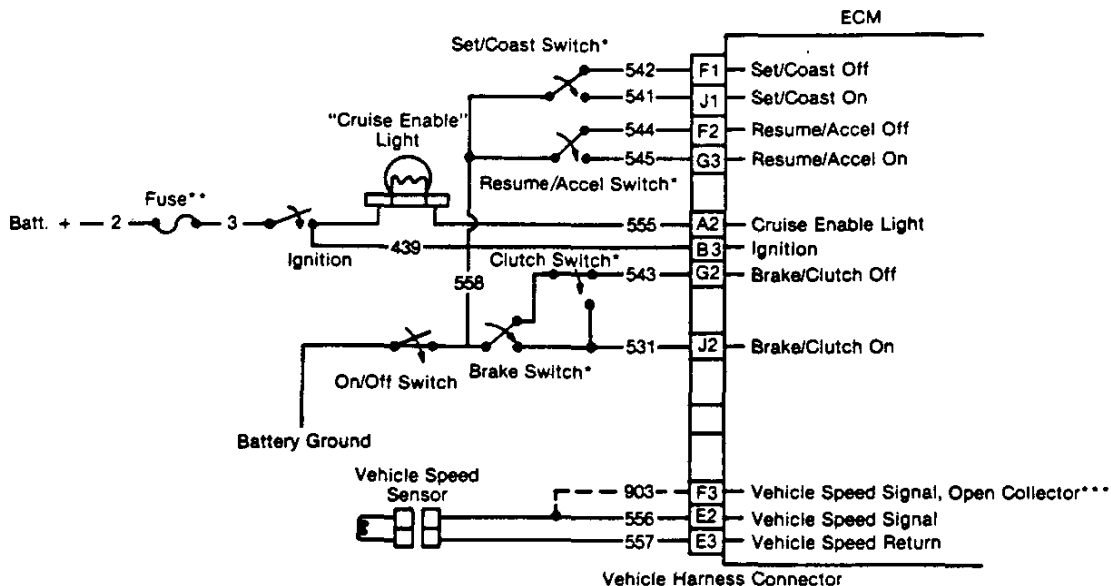
ECM Vehicle Harness Connector
 P/N 12034398

Section 4

TROUBLESHOOTING CHARTS

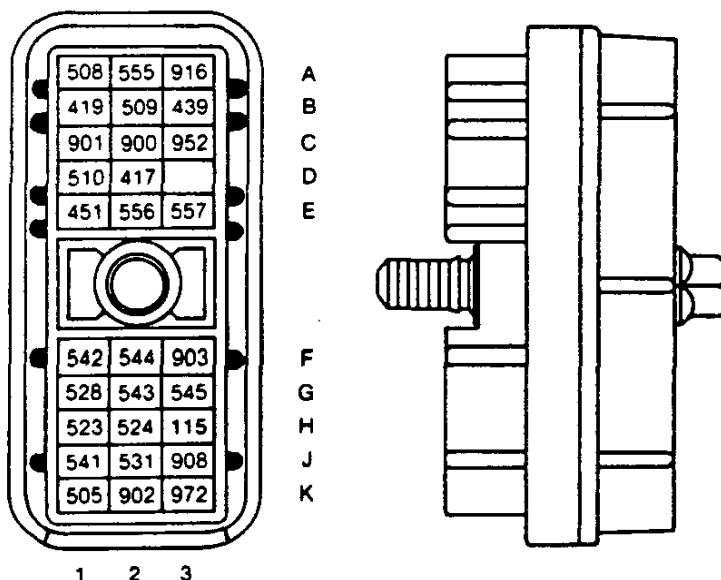
E. CODE 58 - CRUISE CONTROL SWITCHES (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
58-18 Check for Short at the Set/Coast On Circuit <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn on the Cruise On/Off switch. • Read resistance between socket J1 on the vehicle harness connector and a good ground. 	<p>Less than or equal to 10,000 ohms on either reading. →</p> <p>Greater than 10,000 ohms or open on both readings. →</p>	<p>Either the Set switch is shorted or a short to ground exists in ckt #541. Repair short or replace switch. Then go to 58-30.</p> <p>Go to 58-3.</p>
58-19 Check for Faulty or Miswired Set Switch <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn on the Cruise On/Off switch. • Find a means to press and hold the Set switch. • Read resistance between socket F1 on the vehicle harness connector and a good ground. 	<p>Less than or equal to 10,000 ohms. →</p> <p>Greater than 10,000 ohms or open. →</p>	<p>Set switch is miswired or faulty. Rewire or replace switch. Then go to 58-30.</p> <p>Go to 58-3.</p>
58-20 Check for Bad Contact or Open at the Set/Coast On Circuit <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn on the Cruise On/Off Switch. • Find a means to press and hold the Set switch. • Read resistance between socket J1 on the vehicle harness connector and a good ground. 	<p>Greater than 5 ohms or open. →</p> <p>Less than or equal to 5 ohms. →</p>	<p>Either the Set switch is open or not making a good contact, or an open exists in ckt #541. Repair open or replace switch. Then go to 58-30.</p> <p>Go to 58-3.</p>



- *Note: All switches are shown in the "off" position.
 **Note: (Some applications may have circuit breakers instead of fuses).
 ***Note: CKT #903 used with CKT #556 for open collector Vehicle Speed Sensors.

Cruise Control Circuits

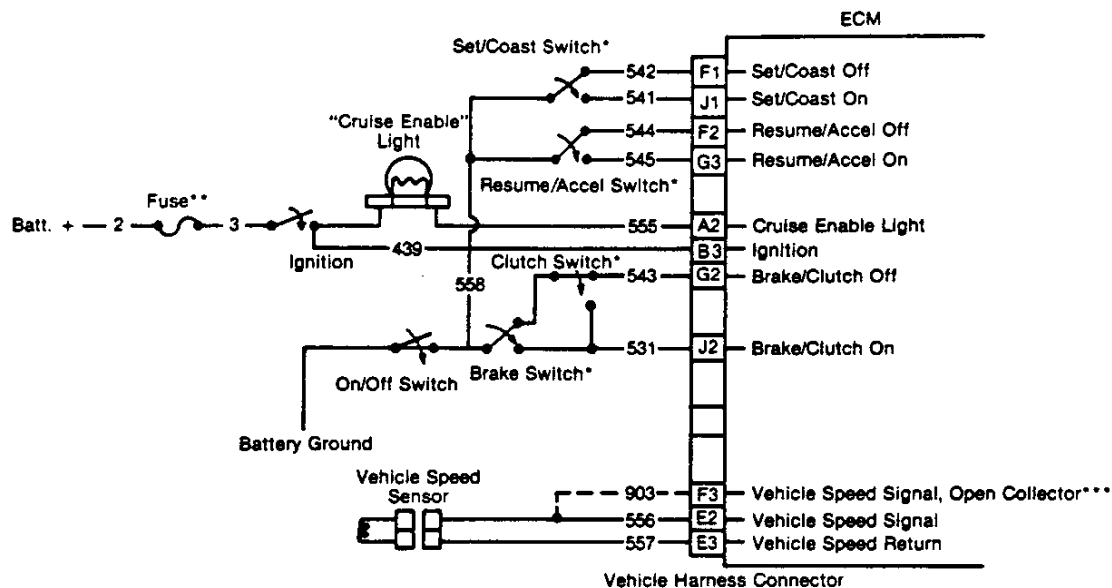


ECM Vehicle Harness Connector
 P/N 12034398

Section 4 TROUBLESHOOTING CHARTS

E. CODE 58 - CRUISE CONTROL SWITCHES (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
58-21 Check for Short at the Set/Coast Off Circuit <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn on the Cruise On/Off switch. • Find a means to press and hold the Set switch. • Read resistance between sockets F1 on the vehicle harness connector and a good ground. • Also read resistance between socket F1 and a good ground. 	<p>Less than or equal to 10,000 ohms on either reading.</p> <p>Greater than 10,000 ohms or open on both readings.</p>	<p>Either the Set switch is shorted or miswired or a short to the ground exists in ckt #542. Repair short or replace switch. Then go to 58-30.</p> <p>Go to 58-3.</p>
58-22 Check for Shorted or Miswired Resume Switch <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn on the Cruise On/Off switch. • Read resistance between sockets G3 on the vehicle harness connector and a good ground. 	<p>Less than or equal to 10,000 ohms.</p> <p>Greater than 10,000 ohms or open.</p>	<p>Resume switch is shorted or miswired. Rewire or replace switch. Then go to 58-30.</p> <p>Go to 58-3.</p>
58-23 Check for Open at the Resume/Accel Off Circuit <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn on the Cruise On/Off switch. • Read resistance between sockets F2 on the vehicle harness connector and a good ground. 	<p>Greater than 5 ohms or open.</p> <p>Less than or equal to 5 ohms.</p>	<p>Either the Resume switch is open or an open exists in ckt #544. Switch may be miswired. Repair open or replace switch. Then go to 58-30.</p> <p>Go to 58-3.</p>

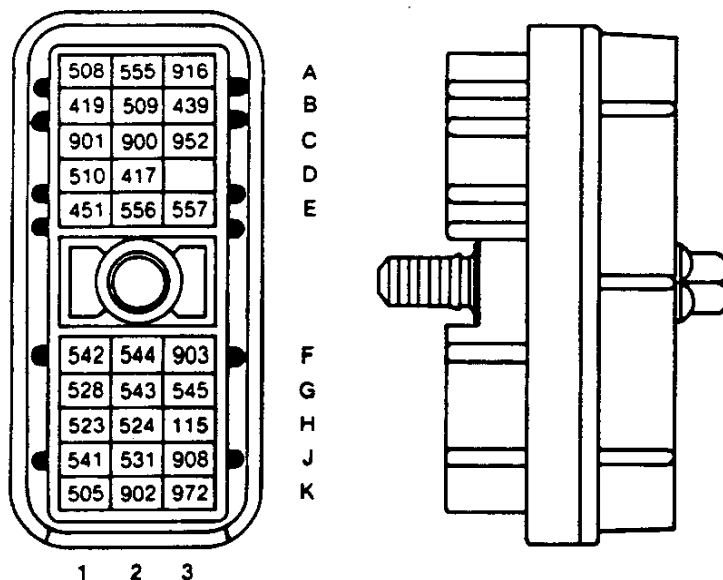


*Note: All switches are shown in the "off" position.

**Note: (Some applications may have circuit breakers instead of fuses).

***Note: CKT #903 used with CKT #556 for open collector Vehicle Speed Sensors.

Cruise Control Circuits

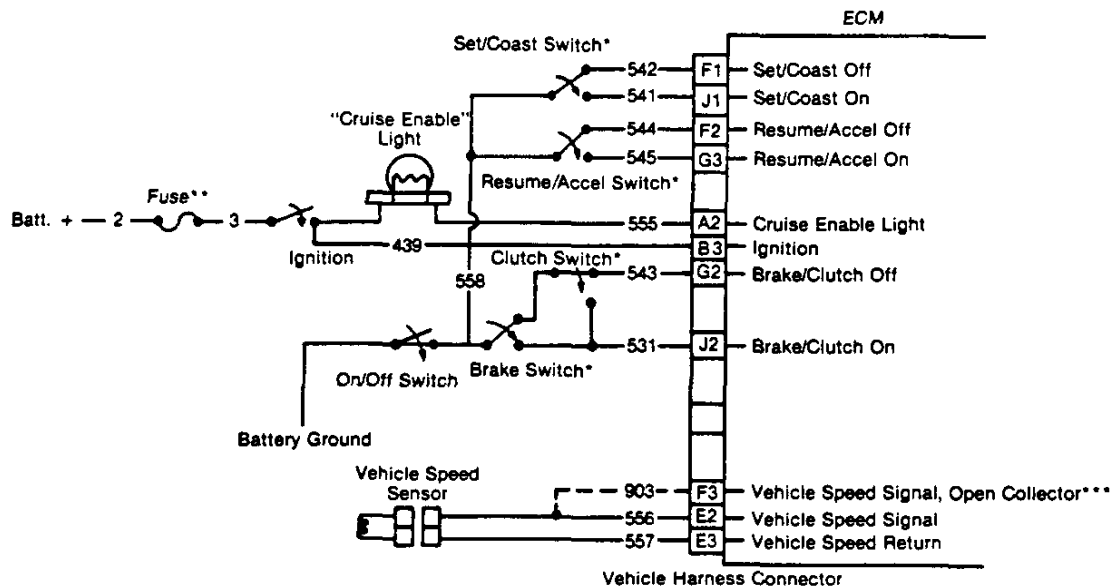


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Section 4 TROUBLESHOOTING CHARTS

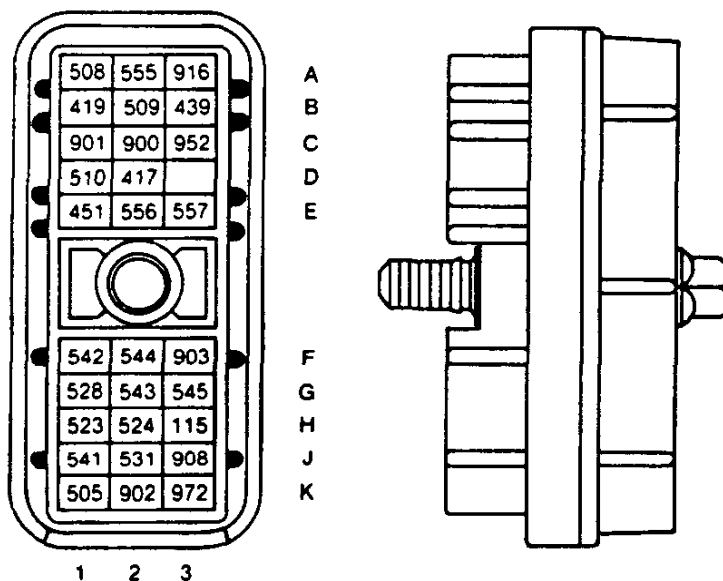
E. CODE 58 - CRUISE CONTROL SWITCHES (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
58-24 Check for Short at the Resume/Accel On Circuit		
<ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn on the Cruise On/Off switch. • Read resistance between socket G3 on the vehicle harness connector and a good ground. 	<p>Less than or equal to 10,000 ohms on either reading.</p> <p>Greater than 10,000 ohms or open on both readings.</p>	<p>Either the Resume switch is shorted or a short to ground exists in ckt #545. Repair short or replace switch. Then go to 58-30.</p> <p>Go to 58-3.</p>
58-25 Check for Faulty or Miswired Resume Switch		
<ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn on the Cruise On/Off switch. • Find a means to press and hold the Resume switch. • Read resistance between socket G3 on the vehicle harness connector and a good ground. 	<p>Greater than 5 ohms or open.</p> <p>Less than or equal to 5 ohms.</p>	<p>Resume switch is miswired or faulty. Rewire or replace switch. Then go to 58-30.</p> <p>Go to 58-3.</p>



- *Note: All switches are shown in the "off" position.
 **Note: (Some applications may have circuit breakers instead of fuses).
 ***Note: CKT #903 used with CKT #556 for open collector Vehicle Speed Sensors.

Cruise Control Circuits

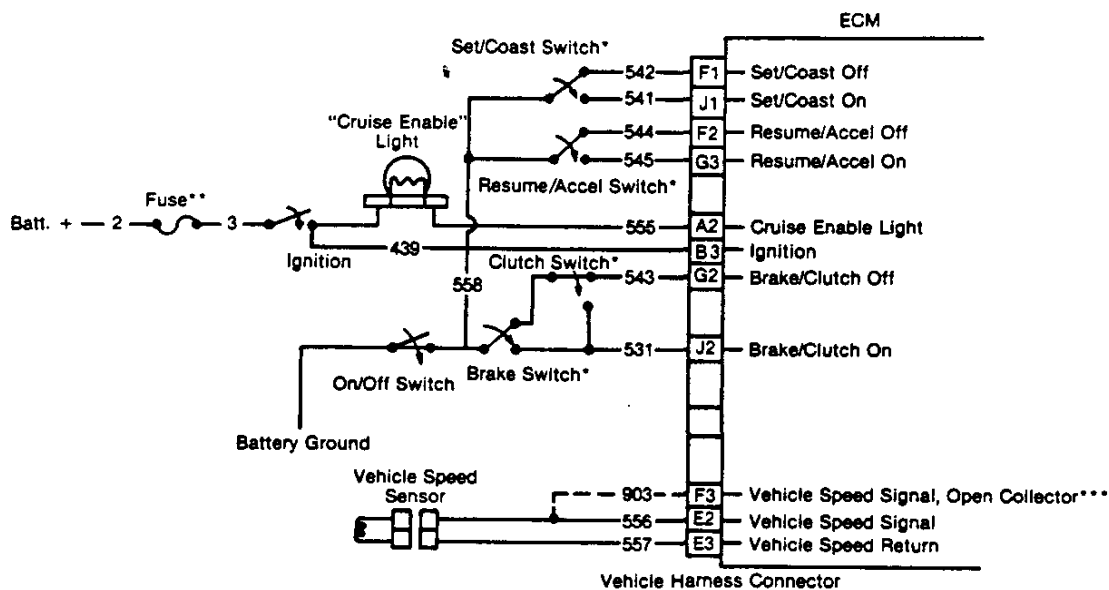


ECM Vehicle Harness Connector
 P/N 12034398

Section 4 TROUBLESHOOTING CHARTS

E. CODE 58 - CRUISE CONTROL SWITCHES (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
58-26 Verify Problem Still Exists <ul style="list-style-type: none"> ● If you were originally referred to Step 58-5 (from Quick-Check), return to the "WHAT TO DO NEXT" column of that step. ● Otherwise, you have completed the switch check-out process without detecting a fault. ● Clear codes. ● Keep the Cruise On/Off switch on. ● Press and hold the Set/Coast and Resume/Accel switches separately for at least 2 seconds each while observing the "Check Engine" light. ● Then press and hold the brake and clutch separately for at least 2 seconds each while observing the "Check Engine" light. 	<p>"Check Engine" —————→ light never comes on.</p> <p>"Check Engine" —————→ light comes on at some point.</p>	<p>The problem is no longer present. Go to C1-2, page 35. Go to START-1, page 17, if any other problems are present.</p> <p>Go to 58-4 and retrace through the Quick-Check.</p>
58-27 Check for Bad Contact or Open at the Resume/Accel On Circuit <ul style="list-style-type: none"> ● Turn ignition off. ● Disconnect the vehicle harness connector at the ECM. ● Turn on the Cruise On/Off switch. ● Find a means to press and hold the Resume switch. ● Read resistance between socket G3 on the vehicle harness connector and a good ground. 	<p>Greater than —————→ 5 ohms or open.</p> <p>Less than or —————→ equal to 5 ohms.</p>	<p>Either the Resume switch is open or not making good contact, or an open exists in the ckt #545. Repair open or replace switch. Then go to 58-30.</p> <p>Go to 58-3.</p>

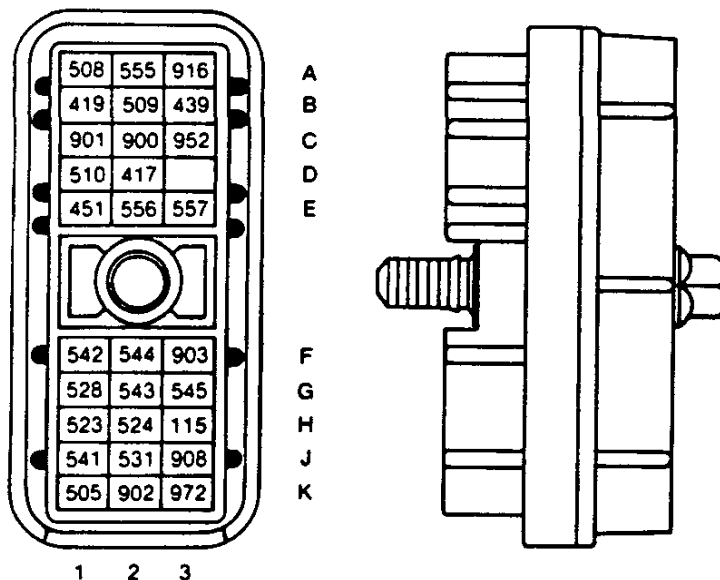


*Note: All switches are shown in the "off" position.

**Note: (Some applications may have circuit breakers instead of fuses).

***Note: CKT #903 used with CKT #556 for open collector Vehicle Speed Sensors.

Cruise Control Circuits



ECM Vehicle Harness Connector
P/N 12034398

Section 4 TROUBLESHOOTING CHARTS

E. CODE 58 - CRUISE CONTROL SWITCHES (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
58-28 Check for Short at the Resume/Accel Off Circuit		
<ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Turn on the Cruise On/Off switch. • Find a means to press and hold the Resume switch. • Read resistance between socket F2 on the vehicle harness connector and a good ground. 	<p>Less than or equal to 10,000 ohms.</p> <p>Greater than 10,000 ohms or open.</p>	<p>Either the Resume switch is shorted or a short to ground exists in ckt #544. Repair short or replace switch. Then go to 58-30.</p> <p>Go to 58-3.</p>
58-30 Verify Repairs		
<ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Turn ignition on. • Clear codes. • Turn on the Cruise On/Off switch. • Press and hold the Set/Coast and Resume/Accel switches separately for at least 2 seconds each. • Then press and hold the brake and clutch separately for at least 2 seconds each. • Read historical codes. 	<p>Code 25 (no codes).</p> <p>Code 58 (and any other codes).</p> <p>Any other codes except Code 58.</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the start to find the error.</p> <p>Go to START-1, page 17, to service other codes.</p>

TABLE 6X-1

RIGHT HAND ROTATION

Code	6V92	8V92	Series 60	6L71	12V92		16V92		8V149	12V149		16V149	
					Front	Rear	Front	Rear		Front	Rear	Front	Rear
61 or 71	1L	1L	1	1	1L	6L	1L	8L	1L	1L	5L	1L	8L
62 or 72	3R	3R	5	5	3R	5R	2R	6R	3R	3R	4R	2R	6R
63 or 73	3L	3L	3	3	3L	5L	2L	6L	3L	3L	4L	2L	6L
64 or 74	2R	4R	6	6	2R	4R	4R	5R	4R	2R	6R	4R	5R
65 or 75	2L	4L	2	2	2L	4L	4L	5L	4L	2L	6L	4L	5L
66 or 76	1R	2R	4	4	1R	6R	3R	7R	2R	1R	5R	3R	7R
67 or 77	—	2L	—	—	—	—	3L	7L	2L	—	—	3L	7L
68 or 78	—	1R	—	—	—	—	1R	8R	1R	—	—	1R	8R

LEFT HAND ROTATION

Code	6V92	8V92	6L71	12V92		16V92		8V149	12V149		16V149	
				Front	Rear	Front	Rear		Front	Rear	Front	Rear
61 or 71	1R	1R	1	1R	6R	1R	8R	1R	1R	5R	1R	8R
62 or 72	2L	2L	4	2L	4L	3L	7L	2L	2L	6L	3L	7L
63 or 73	2R	2R	2	2R	4R	3R	7R	2R	2R	6R	3R	7R
64 or 74	3L	4L	6	3L	5L	4L	5L	4L	3L	4L	4L	5L
65 or 75	3R	4R	3	3R	5R	4R	5R	4R	3R	4R	4R	5R
66 or 76	1L	3L	5	1L	6L	2L	6L	3L	1L	5L	2L	6L
67 or 77	—	3R	—	—	—	2R	6R	3R	—	—	2R	6R
68 or 78	—	1L	—	—	—	1L	8L	1L	—	—	1L	8L

Section 4

TROUBLESHOOTING CHARTS

E. CODE 6X (X = 1 to 8) - INJECTOR RESPONSE TIME TOO LONG

NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
6X-1 Non 6X Code Check <ul style="list-style-type: none"> Were there any other codes besides Code 6X? 	<p>Yes. →</p> <p>No other codes. →</p>	<p>Service other codes before proceeding to diagnose Code 6X.</p> <p>Go to 6X-2. (Note: in Step 6X-2, be sure to verify the response times of all cylinders indicated by 6X fault codes.)</p>
6X-2 Confirm Failure <ul style="list-style-type: none"> Start and warm engine to operating temperature (at least 86°). Plug in DDR and select INJ RESP TIMES (Mode 10). The DDR displays injector response time in firing order. Read the injector response times thru several cycles. The firing sequence in relation to the code received is given in Table 6X-1 (page 300). Note response time(s) of cylinder number(s) in fault code(s). 	<p>Response time(s) for code(s) received is 0.80. →</p> <p>Response time(s) is not 0.80. →</p>	<p>Failure is still present. Go to 6X-3.</p> <p>Failure is no longer present (it's intermittent). If you still have a customer complaint along with Code 6X, look for the following possible problems:</p> <ol style="list-style-type: none"> 1. Sticky valve 2. Aeration in fuel 3. Low battery 4. Broken spring or armature on the injector. 5. Problems in the charging system (loose alternator belt, etc.) or bad grounds.

TABLE 6X-2

	Engine Type						
	Right Hand Rotation				Left Hand Rotation		
	6V92	8V92, 8V149	6L71	Series 60	6V92	8V92, 8V149	6L71
Right or Rear Bank Codes	62, 64, 66	62, 64, 66, 68	62, 64, 66	62, 64, 66	61, 63, 65	61, 63, 65, 67	62, 64, 66
Left or Front Bank Codes	61, 63, 65	61, 63, 65, 67	61, 63, 65	61, 63, 65	62, 64, 66	62, 64, 66, 68	61, 63, 65

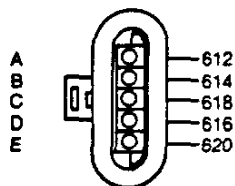
	Engine Type							
	Right Hand Rotation				Left Hand Rotation			
	12V92 Front Engine	12V92 Rear Engine	16V92 Front Engine	16V92 Rear Engine	12V92 Front Engine	12V92 Rear Engine	16V92 Front Engine	16V92 Rear Engine
Right or Rear Bank Codes	62, 64, 66	62, 64, 66	62, 64, 66, 68	62, 64, 66, 68	61, 63, 65	61, 63, 65	61, 63, 65, 67	61, 63, 65, 67
Left or Front Bank Codes	61, 63, 65	61, 63, 65	61, 63, 65, 67	61, 63, 65, 67	62, 64, 66	62, 64, 66	62, 64, 66, 68	62, 64, 66, 68

	Engine Type							
	Right Hand Rotation				Left Hand Rotation			
	12V149 Front Engine	12V149 Rear Engine	16V149 Front Engine	16V149 Rear Engine	12V149 Front Engine	12V149 Rear Engine	16V149 Front Engine	16V149 Rear Engine
Right or Rear Bank Codes	62, 64, 66	62, 64, 66	62, 64, 66, 68	62, 64, 66, 68	61, 63, 65	61, 63, 65	61, 63, 65, 67	61, 63, 65, 67
Left or Front Bank Codes	61, 63, 65	61, 63, 65	61, 63, 65, 67	61, 63, 65, 67	62, 64, 66	62, 64, 66	62, 64, 66, 68	62, 64, 66, 68

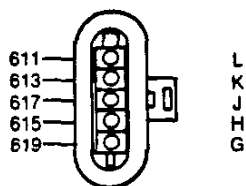
Section 4 TROUBLESHOOTING CHARTS

E. CODE 6X (X = 1 to 8) • INJECTOR RESPONSE TIME TOO LONG (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
6X-3 Check for Multiple 6X Codes • Note how many 6X Codes were logged and confirmed in Step 6X-1.	Only one 6X Code. → All 6X Codes were logged (six codes for a 6 cyl, eight codes for an 8 cyl.). → All 6X Codes for one bank of injectors (refer to Table 6X-1). →	Go to 6X-4. Go to 6X-10. Go to 6X-12.



P/N 12040947
COLOR BLACK

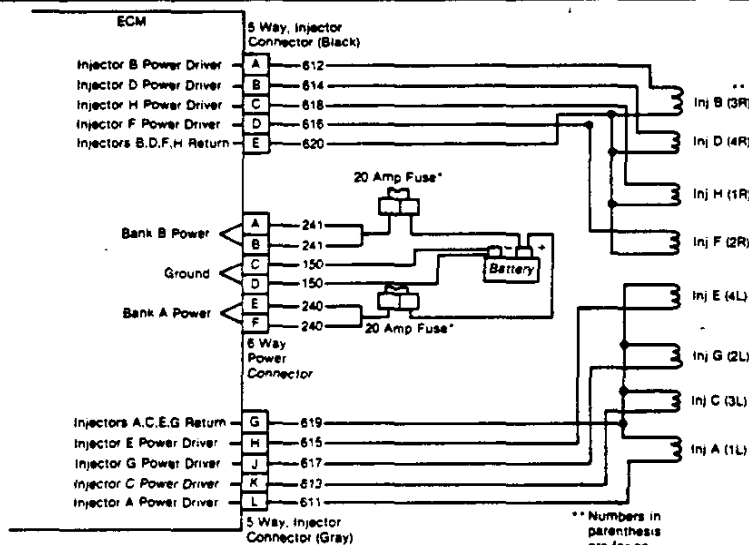


P/N 12065143
COLOR GRAY

5-Way, Injector Harness Connectors

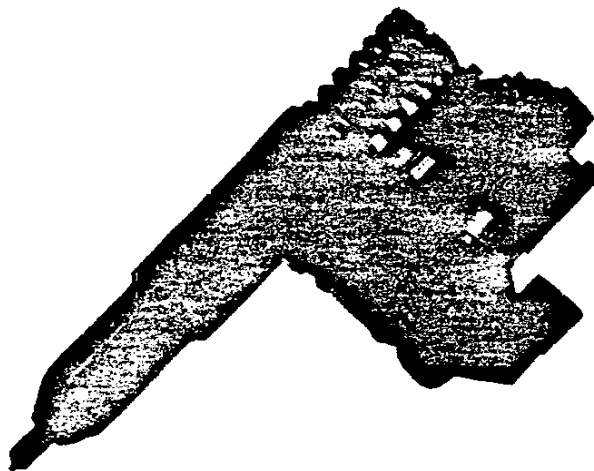
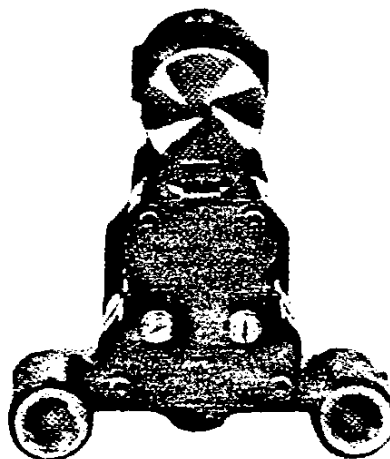
TABLE 6X-3

Code	Injector Harness Connector Socket	to	Injector Harness Connector Socket
61	L		G
62	A		E
63	K		E
64	B		E
65			E
66	D		E
67	J		E
68	C		E



(*Note: Some applications may have circuit breakers instead of fuses.)

ECM Power and Injector Circuits



Electronic Unit Injector (EUI)
Series 92

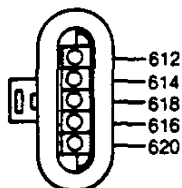
Section 4

TROUBLESHOOTING CHARTS

E. CODE 6X (X = 1 to 8) - INJECTOR RESPONSE TIME TOO LONG (Cont'd.)

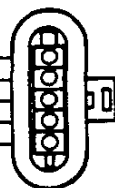
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
6X-4 Injector Resistance Check <ul style="list-style-type: none"> • Turn ignition off. • Unplug DDR. • Disconnect both 5-way injector harness connectors at the ECM. • Referring to Table 6X-3, read resistance between the 5-way injector harness connector sockets associated with the 6X Code received. (Example: read resistance between sockets G and L for a Code 61.) 	<p>Greater than 1 ohm. →</p> <p>Less than or equal to 1 ohm. →</p>	<p>Go to 6X-5.</p> <p>Go to 6X-6.</p>
6X-5 Find Open <ul style="list-style-type: none"> • Remove the rocker arm cover corresponding to the injector pointed to by Code 6X (the DDR INJ RESP TIMES screen indicated the faulty cylinder). • Disconnect the two wires of the injector being pointed to. • Short these two wires together. • Referring to Table 6X-3, read the resistance between the 5-way injector harness connector sockets associated with the 6X Code received. 	<p>Less than or equal to 1 ohm. →</p> <p>Greater than 1 ohm. →</p>	<p>Replace injector. Then go to 6X-30.</p> <p>An open exists in wires from which the resistance was just read. Find and repair open. Then to go 6X-30.</p>

A
B
C
D
E



P/N 12040947
COLOR BLACK

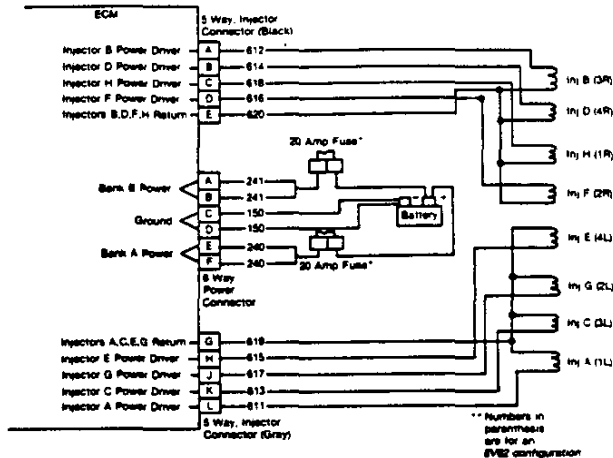
611
613
617
615
619



P/N 12065143
COLOR GRAY

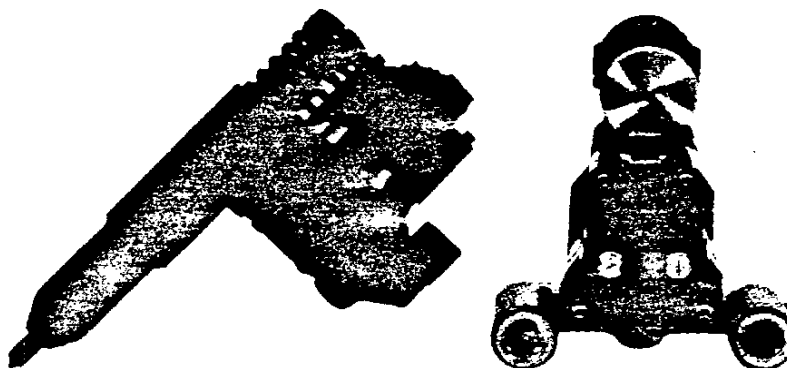
L
K
J
H
G

5-Way, Injector Harness Connectors



(*Note: Some applications may have circuit breakers instead of fuses.)

ECM Power and Injector Circuits



Electronic Unit Injector (EUI)
Series 92

TABLE 6X-3

Code	Injector Harness Connector Socket	to	Injector Harness Connector Socket
61	L		G
62	A		E
63	K		E
64	B		E
65			E
66	D		E
67	J		E
68	C		E

TABLE 6X-2

	Engine Type							
	Right Hand Rotation				Left Hand Rotation			
	6V92	6V92, 6V140	6L71	Series 90	6V92	6V92, 6V140	6L71	
Right or Rear Bank Codes	62 64 65	62 64 65 66	62 64 65	62 64 65	61 63 65	61 63 65 67	62 64 65	
Left or Front Bank Codes	61 63 65	61 63 65 67	61 63 65	61 63 65	62 64 65	62 64 65 66	61 63 65	

	Engine Type							
	Right Hand Rotation				Left Hand Rotation			
	12V100 Front Engine	12V92 Rear Engine	10V92 Front Engine	10V92 Rear Engine	12V92 Front Engine	12V92 Rear Engine	10V92 Front Engine	10V92 Rear Engine
Right or Rear Bank Codes	62 64 65	62 64 65	62 64 65 66	62 64 65 66	61 63 65	61 63 65	61 63 65 67	61 63 65 67
Left or Front Bank Codes	61 63 65	61 63 65	61 63 65 67	61 63 65 67	62 64 65	62 64 65	62 64 65 66	62 64 65 66

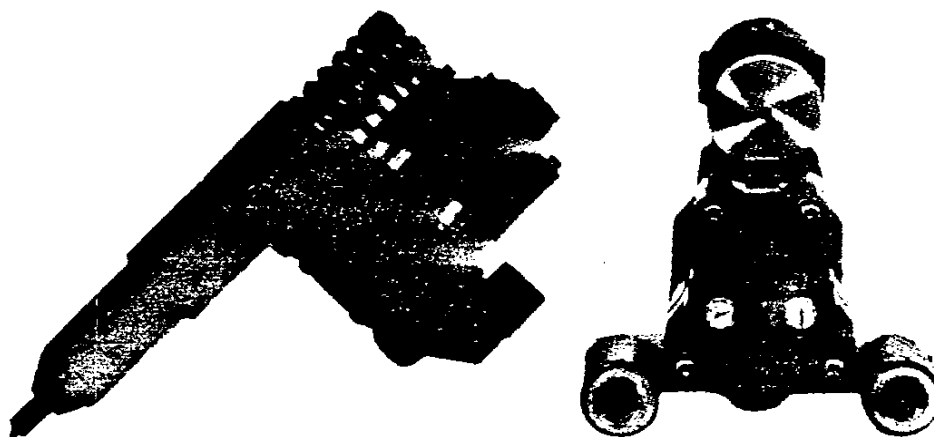
	Engine Type							
	Right Hand Rotation				Left Hand Rotation			
	12V100 Front Engine	12V100 Rear Engine	10V100 Front Engine	10V100 Rear Engine	12V100 Front Engine	12V100 Rear Engine	10V100 Front Engine	10V100 Rear Engine
Right or Rear Bank Codes	62 64 65	62 64 65	62 64 65 66	62 64 65 66	61 63 65	61 63 65	61 63 65 67	61 63 65 67
Left or Front Bank Codes	61 63 65	61 63 65	61 63 65 67	61 63 65 67	62 64 65	62 64 65	62 64 65 66	62 64 65 66

Section 4

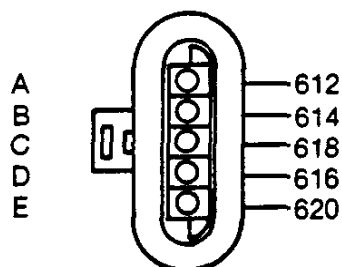
TROUBLESHOOTING CHARTS

E. CODE 6X (X = 1 to 8) - INJECTOR RESPONSE TIME TOO LONG (Cont'd.)

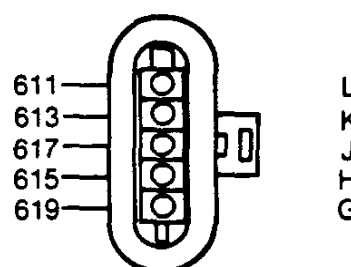
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
6X-6 Check for Short to Return <ul style="list-style-type: none"> Referring to Table 6X-2, remove the rocker arm cover corresponding to the injector that's being pointed to by Code 6X. Disconnect the two wires of the injector being pointed to. Referring to Table 6X-3, read the resistance between the 5-way injector harness connector sockets associated with the 6X Code received. 	<p>Less than or equal to 10,000 ohms. →</p> <p>Greater than or equal to 10,000 ohms. →</p>	<p>A short exists between the wires where the resistance was just read. Repair short. Then go to 6X-30.</p> <p>Go to 6X-7.</p>
6X-7 Check for Short to Ground <ul style="list-style-type: none"> Working with the injector that has its two wires disconnected, measure the resistance between the injector drive wire (the wire number in the range 611-618) and a good ground. Also measure the resistance between one of the terminals of the injector (the injector with the disconnected wires) and a good ground. 	<p>Both readings are greater than or equal to 10,000 ohms. →</p> <p>Resistance from injector drive line to ground is less than 10,000 ohms. →</p> <p>Resistance from injector to ground is less than 10,000 ohms. →</p>	<p>Go to 6X-8.</p> <p>A short exists between injector drive line (wire) and ground. Repair short. Then go to 6X-30.</p> <p>Look for cause of short. If none can be found, replace injector. Then go to 6X-30.</p>
6X-8 Check for Signal <ul style="list-style-type: none"> Reconnect both 5-way injector harness connectors at the ECM. Looking at the injector with the disconnected wires, reattach the injector drive wire. With a 6-volt test light, monitor the injector on the return side (where no wire is attached) with respect to ground while cranking the engine. 	<p>Light flashes or is steady on. →</p> <p>No light. →</p>	<p>Go to 6X-9.</p> <p>Go to 6X-10.</p>



Electronic Unit Injector (EUI)
Series 92

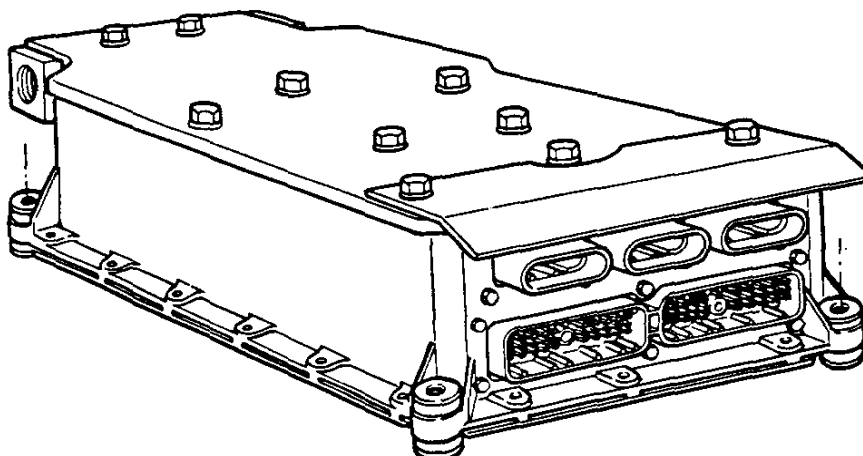


P/N 12040947
COLOR BLACK



P/N 12065143
COLOR GRAY

5 Way, Injector Harness Connectors



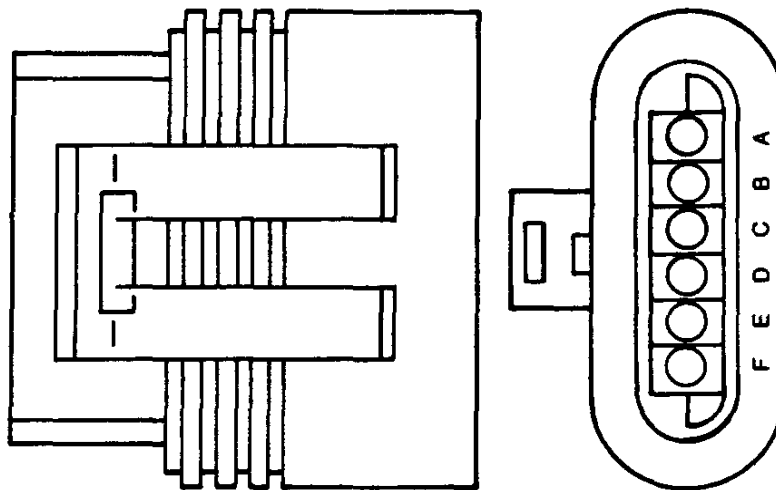
Electronic Control Module (ECM)

Section 4

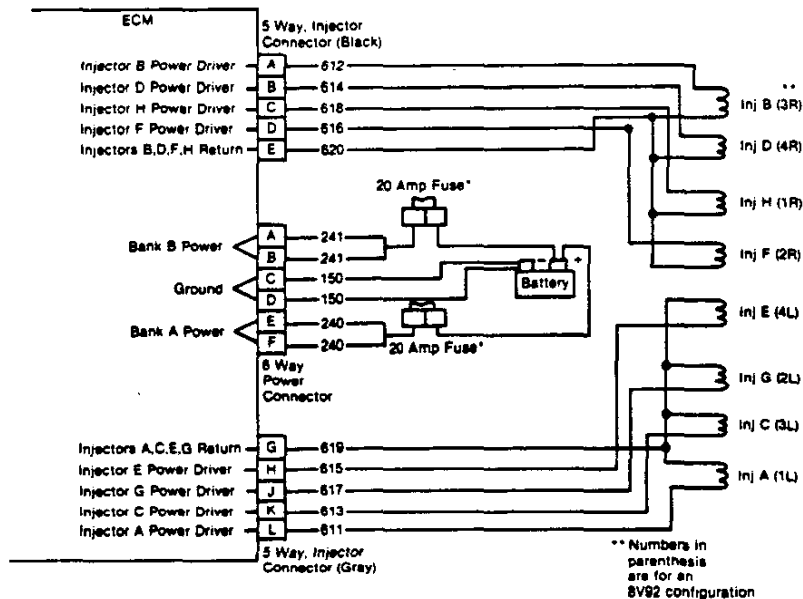
TROUBLESHOOTING CHARTS

E. CODE 6X (X = 1 to 8) - INJECTOR RESPONSE TIME TOO LONG (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
6X-9 Check Injector <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the injector drive line again. • Also disconnect the injector drive and return lines (wires) from another nearby injector. • Swap injectors and reattach all injector drive and return wires. • Clear codes. • Start and warm engine until at operating temperature or until the "Check Engine" light comes on. • Stop engine. • Read historical codes. 	<p>No Codes. →</p> <p>Same 6X Code as before. →</p> <p>6X Code now points to nearby cylinder, i.e., it followed the injector (refer to Table 6X-1 to see which cylinder is being pointed to). →</p>	<p>Go to 6X-30.</p> <p>Go to 6X-10.</p> <p>Replace original suspect injector.</p>
6X-10 Check ECM Connectors <ul style="list-style-type: none"> • Check terminals at both 5-way, injector harness connectors (both the harness and the ECM sides) for damage: bent, corroded and unseated pins or sockets. 	<p>Terminals and connectors are OKAY. →</p> <p>Problem found. →</p>	<p>Go to 6X-11.</p> <p>Repair terminals/connectors. Then go to 6X-30.</p>
6X-11 Check for Other Possible Causes <ul style="list-style-type: none"> • Check if any of the following problems are evident: <ol style="list-style-type: none"> 1. Aerated fuel or low fuel pressure. 2. Sticky valve. 3. Cold fuel. 4. Low battery. 5. Broken spring or armature on the injector. 6. Problems in the charging system (loose alternator belt, etc.) or bad grounds. 	<p>Problem found. →</p> <p>No problems found. →</p>	<p>Repair. Then go to 6X-30.</p> <p>Replace ECM. Then go to 6X-30.</p>



6-Way Power Harness Connector
P/N 12066317



(*Note: Some applications may have circuit breakers instead of fuses.)

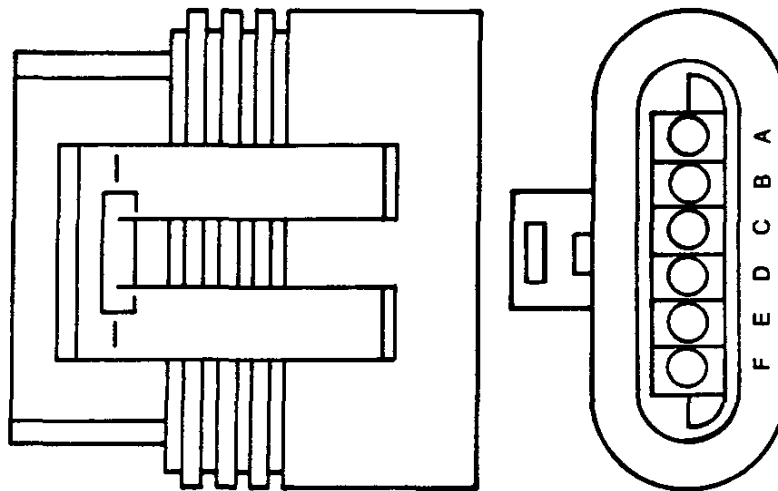
ECM Power and Injector Circuits

Section 4

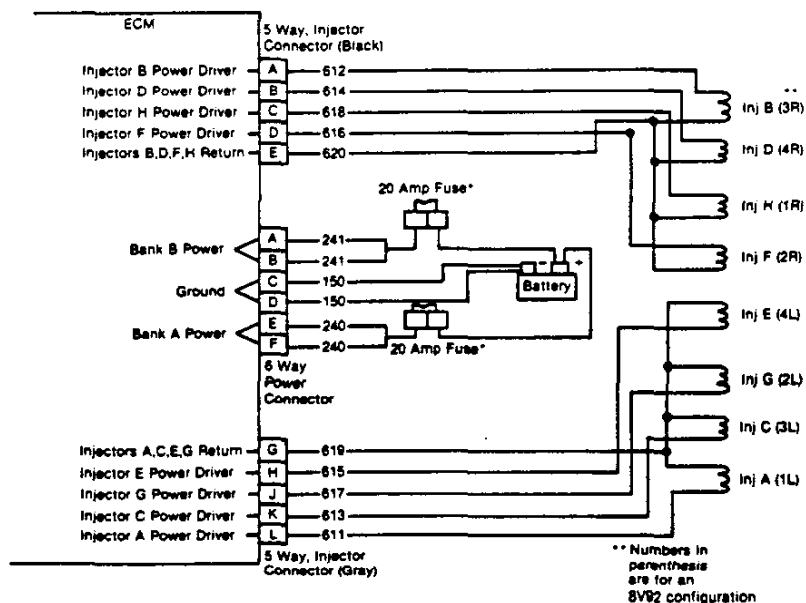
TROUBLESHOOTING CHARTS

E. CODE 6X (X = 1 to 8) - INJECTOR RESPONSE TIME TOO LONG (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
6X-12 Check ECM Fuses <ul style="list-style-type: none"> Check both 20 Amp fuses or circuit breakers to the ECM. 	Fuses or —————→ Fuses or —————→ circuit breakers blown. circuit breakers are okay.	Go to 6X-13. Go to 6X-15.
6X-13 Check for Short <ul style="list-style-type: none"> Replace fuse(s) or reset breaker(s). Run engine to see if fuses or circuit breakers blow again. 	Fuses or —————→ Fuses or —————→ circuit breakers blown. circuit breakers are okay.	Go to 6X-14. Go to 6X-30.
6X-14 Check ECM Power <ul style="list-style-type: none"> Turn ignition off. Disconnect the 6-way, power harness connector. Read voltage on socket A (red lead) to a good ground (black lead). Also read voltage on sockets B, E and F (red lead) to a good ground. 	Greater than —————→ or equal to 11.5 volts for each reading. Less than —————→ 11.5 volts on any reading.	Go to 6X-15. Short exists between Bank A Power (ckt #240) or Bank B Power (ckt #241) and ground. Repair short. Then go to 6X-30.
6X-15 Check for Open <ul style="list-style-type: none"> Read voltage on socket E or F (red lead) to socket C or D (black lead) of the 6-way, power harness connector. Also read voltage on socket A or B (red lead) to socket C or D (black lead) of the 6-way, power harness connector. 	Both readings —————→ are greater than or equal to 11.5 volts. Either reading —————→ is less than 11.5 volts.	Go to 6X-16. Bank A Power (ckt #240) or Bank B Power (ckt #241) is open. Repair open. Then go to 6X-30.



6-Way Power Harness Connector
P/N 12066317



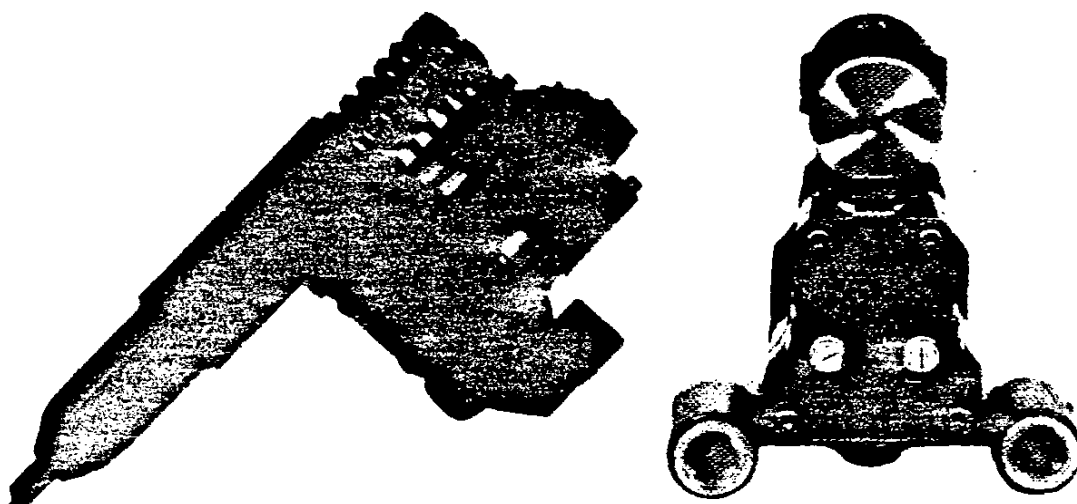
(*Note: Some applications may have circuit breakers instead of fuses.)

ECM Power and Injector Circuits

Section 4 TROUBLESHOOTING CHARTS

E. CODE 6X (X = 1 to 8) - INJECTOR RESPONSE TIME TOO LONG (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
6X-16 Check for Good Ground Line <ul style="list-style-type: none"> ● Read resistance between socket C of the 6-way power harness connector and a good ground. ● Also read resistance between socket D of the 6-way power harness connector and a good ground. 	<p>Both readings are less than or equal to 5 ohms. →</p> <p>Either reading is greater than 5 ohms. →</p>	<p>Go to 6X-17.</p> <p>Ground line (ckt #150) is open. Repair open. Then go to 6X-30.</p>
6X-17 Check Return Line <ul style="list-style-type: none"> ● Disconnect both 5-way injector harness connectors at the ECM. ● Read resistance between sockets G and L of the 5-way injector harness connector. ● Also read resistance between sockets A and E of the other 5-way injector harness connector. 	<p>Either reading is greater than 5 ohms. →</p> <p>Both readings are less than or equal to 5 ohms. →</p>	<p>Injector Driver Return line (ckt #619 or #620) is open. Repair open. Then go to 6X-30.</p> <p>Go to 6X-10.</p>
6X-30 Verify Repairs <ul style="list-style-type: none"> ● Turn ignition off. ● Reconnect all connectors. ● Turn ignition on. ● Clear codes. ● Note status of "Check Engine" light. ● If "Check Engine" light does not stay on, start engine and run for 1 minute or until "Check Engine" light comes on. Stop engine. ● Read historical codes. 	<p>Code 25 (no codes). →</p> <p>Code 6X (and any other codes). →</p> <p>Any other codes except Code 6X. →</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>Go to START-1, page 17, to service other codes.</p>



Electronic Unit Injector (EUI)
Series 92

Section 4

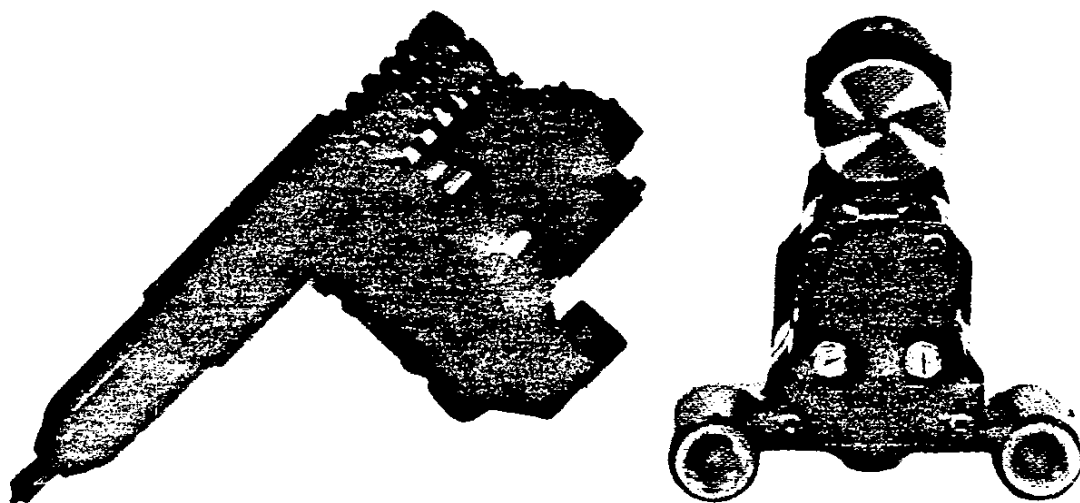
TROUBLESHOOTING CHARTS

E. CODE 7X (X = 1 to 8) - INJECTOR RESPONSE TIME TOO SHORT

NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
7X-1 General System Checks <ul style="list-style-type: none"> • Check if any of the following problems are evident: <ol style="list-style-type: none"> 1. Aerated fuel or high fuel problems. 2. Charging system problems (loose alternator belt, etc.) or a bad ground(s). 	Problem found. → No problems found. →	Repair. Then go to 7X-30. Go to 7X-2.
7X-2 Check Injector <ul style="list-style-type: none"> • Turn ignition off. • Note the cylinder(s) associated with 7X code(s) (the DDR INJ RESP TIMES screen indicated the cylinder). • Clear codes. • Remove the rocker arm cover. • Swap the injector from the cylinder being pointed to with an injector from another cylinder. • Start and warm engine to operating temperature or until "Check Engine" light comes on. • Read historical codes. 	Code 25 (no codes). → Same 7X Code as before. → 7X Code now points to nearby injector (i.e., the Code follows the injector). →	Problem may be intermittent. If you cannot get it to recur, go to START-1, page 17. Check for intermittent open or short at injector drive and return wires where original 7X Code pointed to. Repair, then go to 7X-3. Replace original suspect injector. Then go to 7X-30.
7X-3 Replace Injector Harness <ul style="list-style-type: none"> • Turn ignition off. • Replace injector harness. • Reconnect all connectors. • Clear codes. • Start engine. • Check Mode #10 and Mode #1. • Stop engine. 	No codes. → Any codes. →	Go to 7X-30. Go to START-1, page 17.



Electronic Unit Injector (EUI)
Series 92

Section 4 TROUBLESHOOTING CHARTS

E. CODE 7 (X = 1 to 8) - INJECTOR RESPONSE TIME TOO SHORT (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
7X-30 Verify Repairs		
<ul style="list-style-type: none"> ● Turn ignition off. ● Reconnect all connectors. ● Turn ignition on. ● Clear codes. ● Note status of "Check Engine" light. ● If "Check Engine" light does not stay on, start and run engine until at operating temperature or until the "Check Engine" light comes on. ● Read historical codes. 	<p>Code 25 (no codes).</p> <p>Code 7X (and any other codes).</p> <p>Any other codes except Code 7X.</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>Go to START-1, page 17, to service other codes.</p>

Section 4

TROUBLESHOOTING CHARTS

E. CODE 85 • ENGINE OVERSPEED

NOTE — This chart is only to be used if:

- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

85-1 Code 85 Information

This code is for information purposes only. It is logged whenever the engine has been operating over 2500 RPM for at least 2 seconds. To get complete information, do the following:

- 1) Turn ignition on and plug the DDR in
- 2) Select Mode 02 (Historical Codes) and 38 (Engine Hours) for display
- 3) At least part of the display will look like the following example (there will be more display if more codes are logged in addition to Code 85):

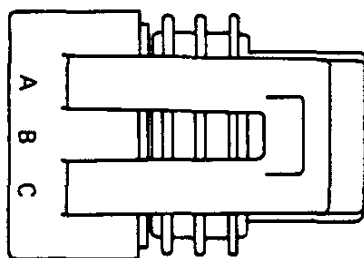
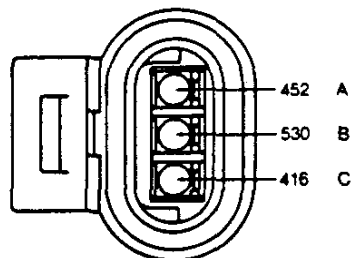
Line 1 =	85 ENG OVERSPEED	02
Line 2 =	352 START HR	02
Line 3 =	15 SECONDS	02
Line 4 =	1 OCCUR	02
Line 5 =	368 ENG HOURS	38

This is what the display means:

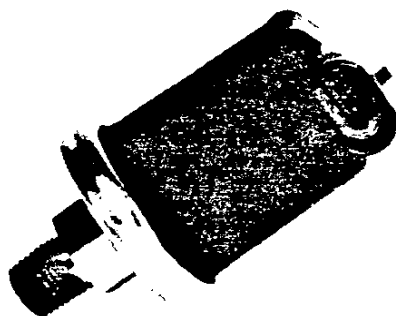
- Line 1 = A Code 85, engine overspeed was logged. It is being displayed as part of the Mode 02 display.
- Line 2 = The Code 85 condition was first seen at 352 engine hours (number of hours the engine has been in use since coming off the assembly line).
- Line 3 = The total duration of Code 85 conditions logged was 15 seconds.
- Line 4 = Only 1 continuous occurrence of Code 85 took place.
- Line 5 = The total number of engine hours at this time is 368 (this is the Mode 38 display). Putting this information together with the Mode 02 display, this means that the first Code 85 condition occurred 16 engine hours ago (368 - 352).

* Note that this additional audit trail information is only available for:

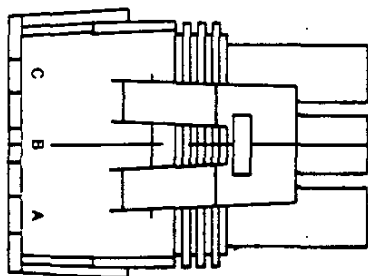
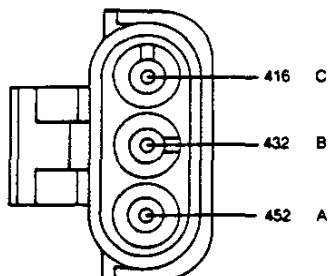
- Code 22 (Throttle Position Sensor Low)
- Code 43 (Low Coolant)
- Code 44 (Engine Overtemperature)
- Code 45 (Low Oil Pressure)
- Code 85 (Engine Overspeed)



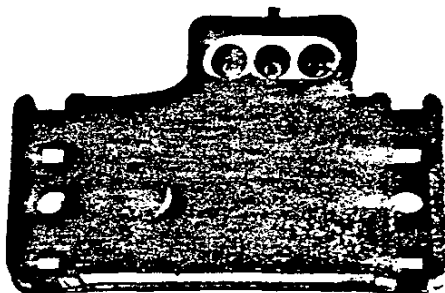
Oil Pressure Sensor
Harness Connector
P/N 12047909



Oil Pressure Sensor (OPS)
P/N 8929184



Turbo Boost Sensor
Harness Connector
12015384



Turbo Boost Sensor (TBS)
P/N 16070629

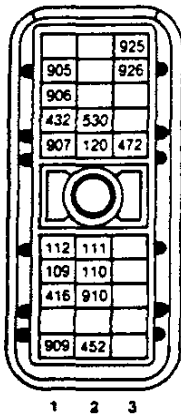
Section 4 TROUBLESHOOTING CHARTS

E. ENG5V - ENGINE HARNESS + 5 VOLT SUPPLY

NOTE — This chart is only to be used if:

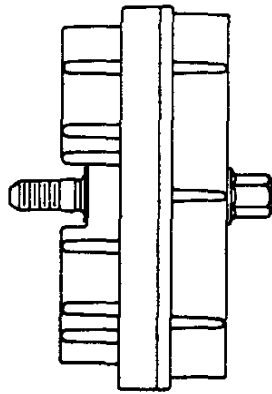
- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
ENG5V-1 Check for Low Battery Voltage <ul style="list-style-type: none"> Was there also a Code 46? 	Yes. —————→ No. —————→	Go to 46-1, page 247. Go to ENG5V-2.
ENG5V-2 Check for + 5 Volts <ul style="list-style-type: none"> Turn ignition off. Disconnect the Oil Pressure Sensor (OPS). Turn ignition on. Read voltage on the OPS harness connector, socket C (red lead) to socket A (black lead). 	Less than 4.7 volts. —————→ Greater than 5.2 volts. —————→ Between 4.7 and 5.2 volts. —————→	Go to ENG5V-6. Go to ENG5V-10. Go to ENG5V-3.
ENG5V-3 OPS Check Using the TBS <ul style="list-style-type: none"> Turn ignition off. Reconnect the Oil Pressure Sensor (OPS). Disconnect the Turbo Boost Sensor (TBS). Turn ignition on. Read voltage on the TBS harness connector, socket C (red lead) to socket A (black lead). 	Less than 4.7 volts or greater than 5.2 volts. —————→ Between 4.7 and 5.2 volts. —————→	Go to ENG5V-4. Go to ENG5V-5.
ENG5V-4 Check OPS Connectors <ul style="list-style-type: none"> Inspect terminals at the OPS connectors (sensor side and harness side) for damage; bent, corroded and unseated pins or sockets. 	Terminals and connectors are okay. —————→ Problem found. —————→	Replace OPS. Then go to ENG5V-30. Repair terminals/connectors. Then go to ENG5V-30.

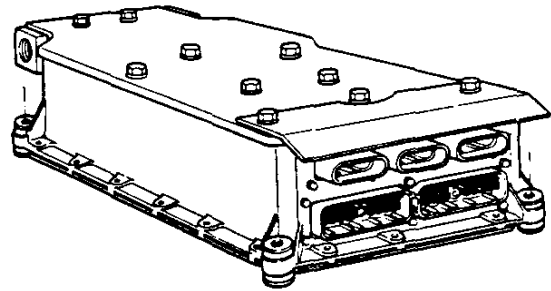


L
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P
R

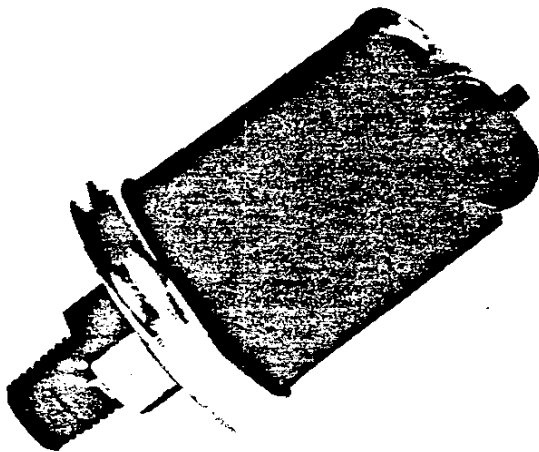
S
T
W
X
Y



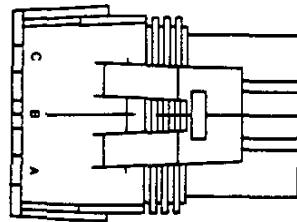
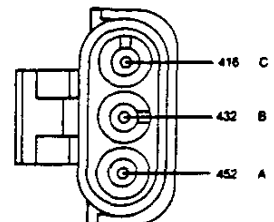
ECM Engine Harness Connector
P/N 12034400



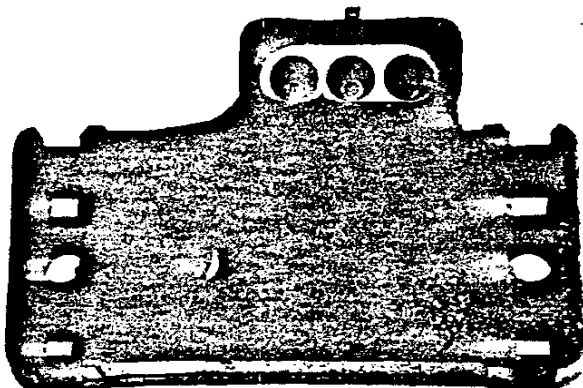
Electronic Control Module (ECM)



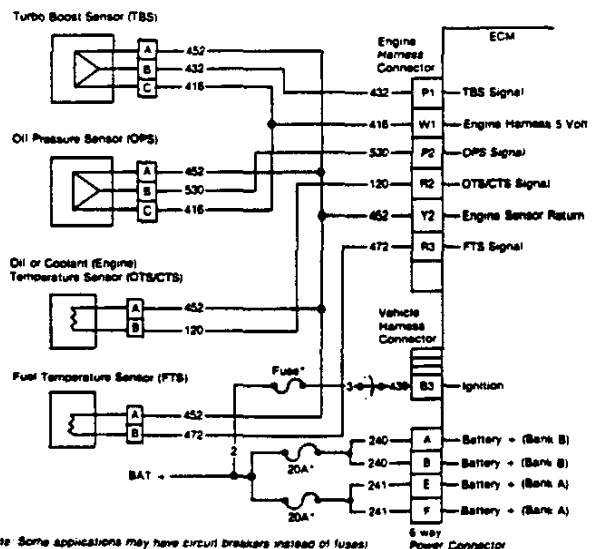
Oil Pressure Sensor
P/N 8929184



Turbo Boost Sensor
Harness Connector
P/N 12015384



Turbo Boost Sensor
P/N 16070629

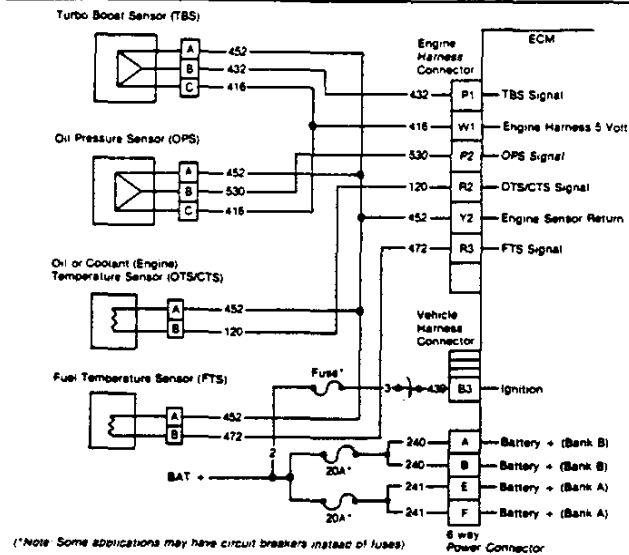


Oil/Coolant Temperature, Fuel
Temperature, Oil Pressure and
Turbo Boost Sensor Circuits

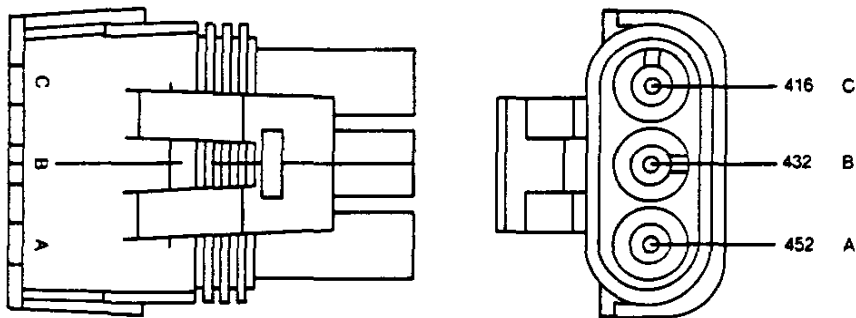
Section 4 TROUBLESHOOTING CHARTS

E. ENG5V - ENGINE HARNESS + 5 VOLT SUPPLY (Cont'd.)

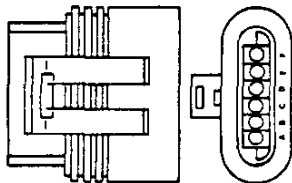
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
ENG5V-5 Check ECM Connectors <ul style="list-style-type: none"> Check terminals at the ECM engine harness connector (both the ECM and harness side) for damage, bent, corroded and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace ECM. Then go to ENG5V-30. Repair terminals/connectors. Then go to ENG5V-30.
ENG5V-6 TBS Check <ul style="list-style-type: none"> Turn ignition off. Reconnect the Oil Pressure Sensor (OPS). Disconnect the Turbo Boost Sensor (TBS). Turn ignition on. Read voltage on the TBS harness connector, socket C (red lead) to socket A (black lead). 	Less than 4.7 volts. → Greater than or equal to 4.7 volts. →	Go to ENG5V-8. Go to ENG5V-7.
ENG5V-7 Check TBS Connectors <ul style="list-style-type: none"> Inspect terminals at the TBS connectors (sensor side and harness side) for damage, corrosion, and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace TBS. Then go to ENG5V-30. Repair terminals/connectors. Then go to ENG5V-30.
ENG5V-8 Check for +5V or Return Open <ul style="list-style-type: none"> Turn ignition off. Disconnect the engine harness connector at the ECM. Install a jumper wire between sockets A and C of the TBS harness connector. Read resistance between sockets W1 and Y2 of the engine harness connector. 	Less than or equal to 5 ohms. → Greater than 5 ohms or open. →	Go to ENG5V-9. Either the engine +5 volt line (ckt #416) or the sensor return line (ckt #452) is open. Repair open. Then go to ENG5V-30.



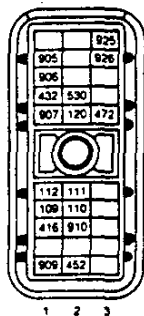
Oil/Coolant Temperature, Fuel Temperature, Oil Pressure and Turbo Boost Sensor Circuits



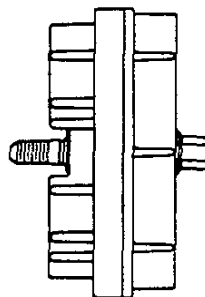
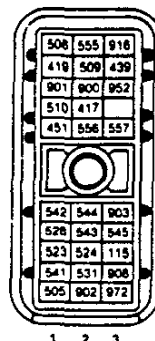
Turbo Boost Sensor Harness Connector
P/N 12015384



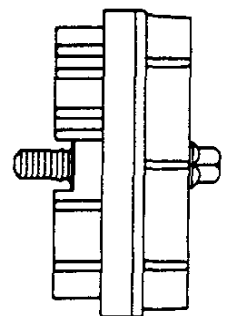
6-Way Power Harness Connector
P/N 12066317



ECM Engine Harness Connector
P/N 12034400



ECM Vehicle Harness Connector
P/N 12034398

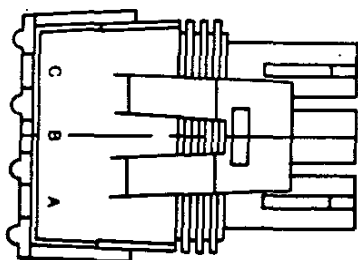
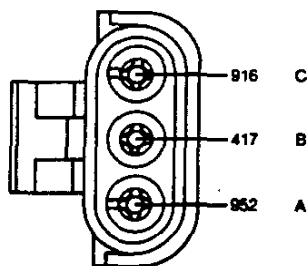


Section 4

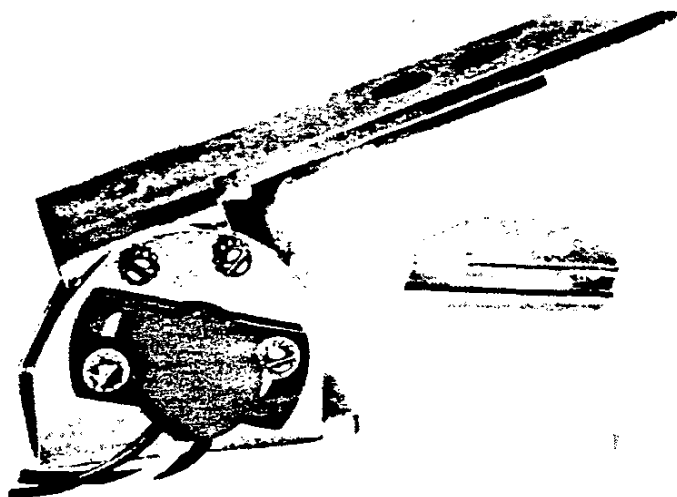
TROUBLESHOOTING CHARTS

E. ENG5V - ENGINE HARNESS + 5 VOLT SUPPLY (Cont'd.)

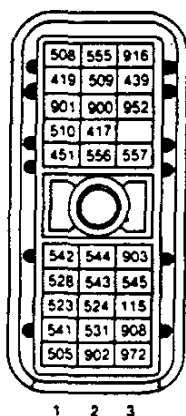
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
ENG5V-9 Check for Short to Ground <ul style="list-style-type: none"> • Turn ignition off. • Remove jumper wire. • Read resistance between sockets A and C of the TBS harness connector. • Also read resistance between socket C of the TBS harness connector and a good ground. 	<p>Both readings are greater than 10,000 ohms or open. →</p> <p>Either reading is less than or equal to 10,000 ohms. →</p>	<p>Go to ENG5V-5.</p> <p>The engine +5 volt line (ckt #416) is shorted to either the sensor return (ckt #452) or to chassis ground. Repair short. Then go to ENG5V-30.</p>
ENG5V-10 Check for Short to Battery + <ul style="list-style-type: none"> • Turn ignition off. • Remove both 20 Amp fuses to the ECM. • Disconnect all five connectors at the ECM. • Read resistance between socket W1 on engine harness connector and B3 on the vehicle harness connector. • Also read resistance between socket W1 on the engine harness connector and the following sockets on the 6-way power harness connector: A, B, E and F. 	<p>All readings are greater than 10,000 ohms or open. →</p> <p>Any reading is less than or equal to 10,000 ohms. →</p>	<p>Go to ENG5V-5.</p> <p>A short exists between sockets where less than 10,000 ohms resistance was read. Repair short. Then go to ENG5V-30.</p>
ENG5V-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Reconnect fuses or circuit breakers if necessary. • Turn ignition on. • Clear codes. • If "Check Engine" light does not stay on, start engine and run for 1 minute or until "Check Engine" light comes on. • Stop engine. • Read historical codes. 	<p>Code 25 (no codes). →</p> <p>Codes which brought you to Chart ENG5V are still there. →</p> <p>Any codes except those which brought you to Chart ENG5V. →</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>Go to START-1, page 17. to service other codes.</p>



Throttle Position Sensor
Harness Connector
P/N 12015793

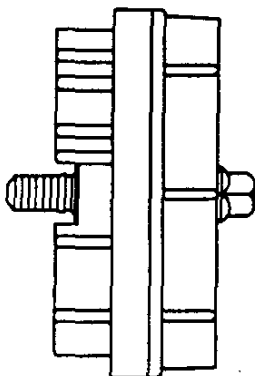


Throttle Position Sensor

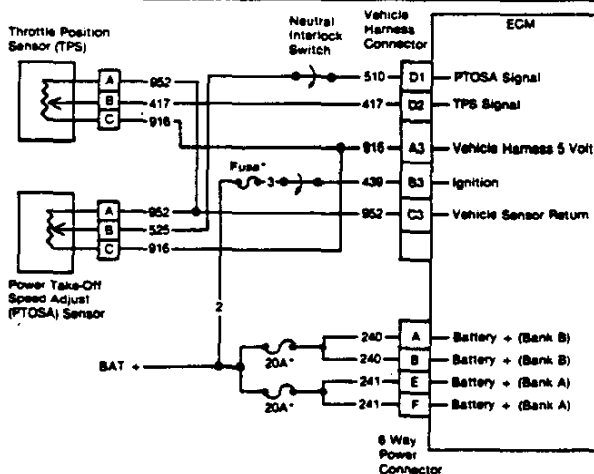


A
B
C
D
E

F
G
H
J
K



ECM Vehicle Harness Connector
P/N 12034398



(*Note: Some applications may have circuit breakers instead of fuses.)

Power Take-Off Speed Adjust
(PTOSA) and Throttle Position
Sensor (TPS) Circuits

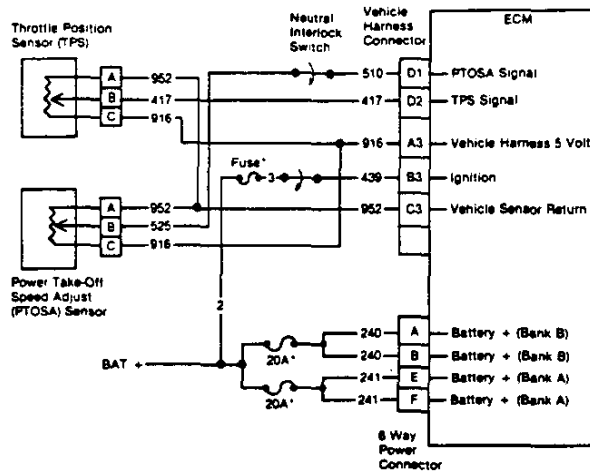
Section 4 TROUBLESHOOTING CHARTS

E. VEH5V - VEHICLE HARNESS + 5 VOLT SUPPLY

NOTE — This chart is only to be used if:

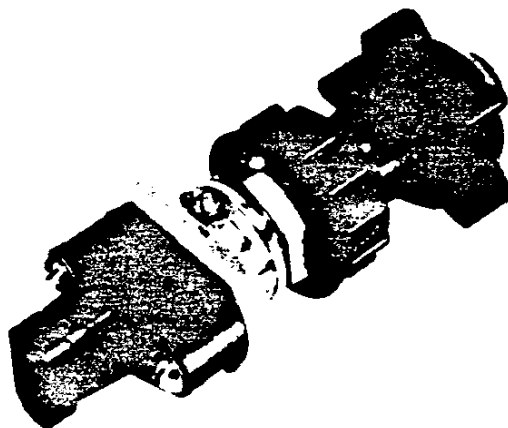
- 1) All basic mechanical checks and physical inspections have been performed with no problem found, and
- 2) Diagnosis of DDEC-II was started at step Start-1 (pg 17) and you have now been referred here.

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
VEH5V-1 Check for Low Battery Voltage • Is there also an active Code 46?	Yes. —————→ No. —————→	Goto 46-1, page 277. Go to VEH5V-2.
VEH5V-2 Check for + 5 Volts at TPS • Turn ignition off. • Disconnect the Throttle Position Sensor (TPS). • Turn ignition on. • Read voltage on the TPS harness connector, pin C (red lead) to pin A (black lead).	Less than —————→ 4.7 volts. Greater than —————→ 5.2 volts. Between 4.7 —————→ and 5.2 volts.	Go to VEH5V-3. Go to VEH5V-11. Go to VEH5V-8.
VEH5V-3 Check for +5V or Return Open • Turn ignition off. • Disconnect the vehicle harness connector at the ECM. • Install a jumper wire between pins A and C of the TPS harness connector. • Read resistance between sockets A3 and C3 of the vehicle harness connector.	Less than —————→ or equal to 5 ohms. Greater than —————→ 5 ohms or open.	Go to VEH5V-4. Either the engine + 5 volt line (ckt #916) or the sensor return line (ckt #952) is open). Repair open. Then go to VEH5V-30.

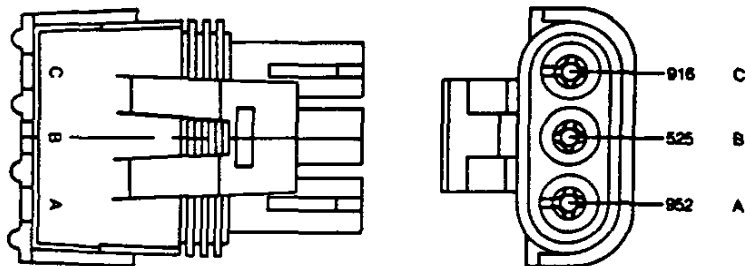


(*Note: Some applications may have circuit breakers instead of fuses.)

Power Take-Off Speed Adjust (PTOSA) and Throttle Position Sensor (TPS) Circuits



Power Take-Off Speed Adjust Sensor (PTOSA)



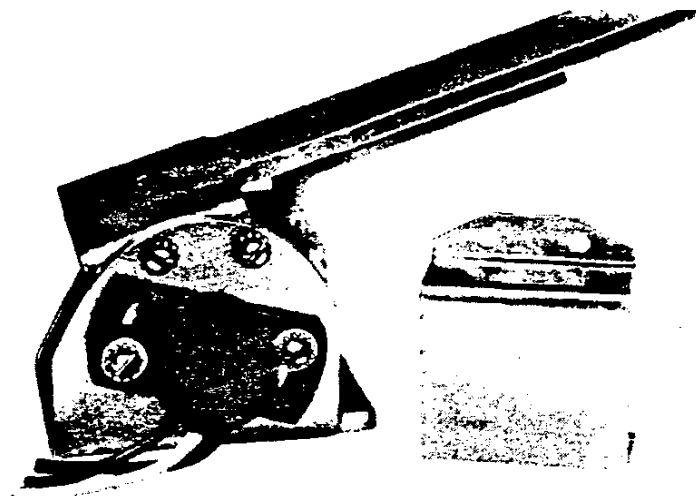
Power Take-Off Speed Adjust Harness Connector
P/N 12015793

Section 4

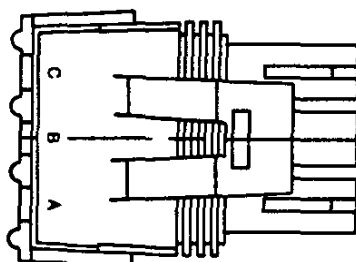
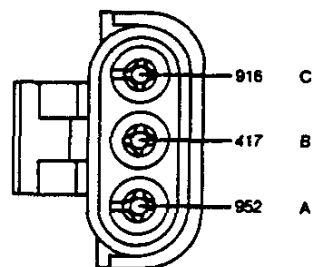
TROUBLESHOOTING CHARTS

E. VEH5V - VEHICLE HARNESS + 5 VOLT SUPPLY (Cont'd.)

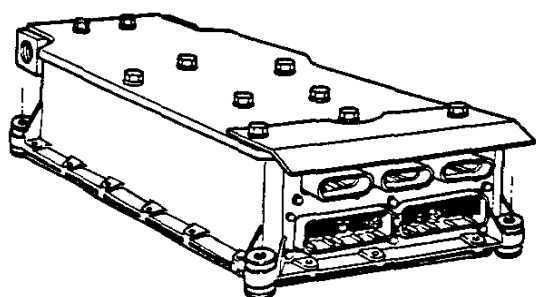
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
VEH5V-4 Check for +5 Volt Short to Ground <ul style="list-style-type: none"> ● Remove jumper wire. ● Disconnect PTOSA and/or Fast Idle resistor network if installed. ● Read resistance between pins A and C of the TPS harness connector. ● Also read resistance between pin C of the TPS harness connector and a good ground. 	<p>Both readings are greater than 10,000 ohms or open.</p> <p>Either reading is less than or equal to 10,000 ohms.</p>	<p>Go to VEH5V-10.</p> <p>Go to VEH5V-5.</p>
VEH5V-5 Check If There is a PTOSA Sensor <ul style="list-style-type: none"> ● Does the engine have a Power Take-off Speed Adjust (PTOSA) Sensor? 	<p>No.</p> <p>Yes.</p>	<p>The engine + 5 volt line (ckt #916) is shorted to either the sensor return line (ckt #952) or to chassis ground (if there is a Fast Idle switch, the short may be at the resistor network used). Repair short. Then go to VEH5V-30.</p> <p>Go to VEH5V-6.</p>
VEH5V-6 + 5 Volt Check Using the PTOSA <ul style="list-style-type: none"> ● Turn ignition off. ● Disconnect the Power Take-Off Speed Adjust (PTOSA) Sensor and/or Fast Idle resistor network. ● Turn ignition on. ● Read voltage on the PTOSA harness connector, socket C (red lead) to socket A (black lead). 	<p>Less than 4.7 volts.</p> <p>Greater than or equal to 4.7 volts.</p>	<p>The engine + 5 volt line (ckt #916) is shorted to either the sensor return line (ckt #952) or to chassis ground. Repair short. Then go to VEH5V-30.</p> <p>Go to VEH5V-12.</p>



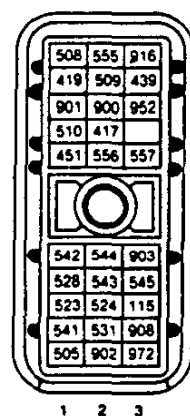
Throttle Position Sensor



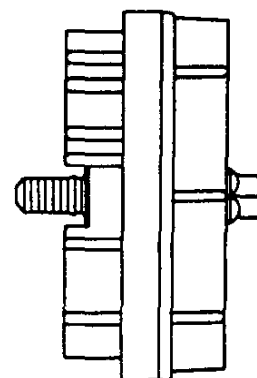
Throttle Position Sensor
Harness Connector
P/N 12015793



Electronic Control Module (ECM)



A
B
C
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H
J
K

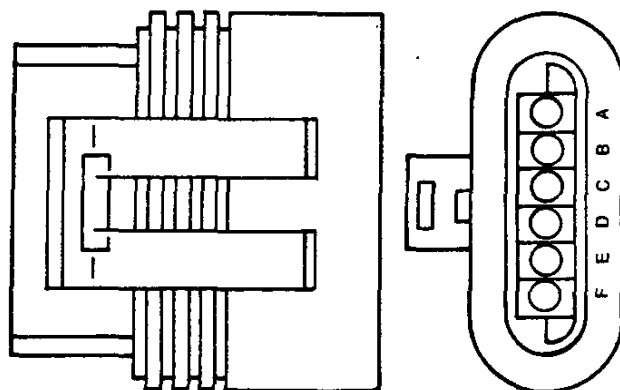


ECM Vehicle Harness Connector
P/N 12034398

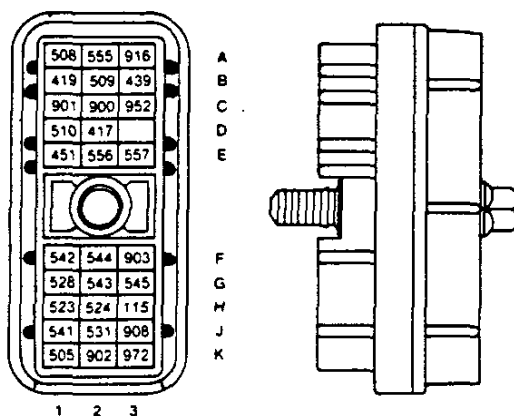
Section 4 TROUBLESHOOTING CHARTS

E. VEH5V - VEHICLE HARNESS + 5 VOLT SUPPLY (Cont'd.)

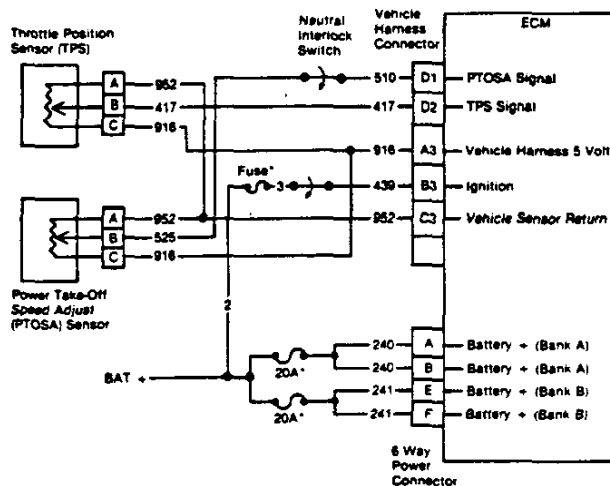
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
VEH5V-7 Check PTOSA Sensor Connectors <ul style="list-style-type: none"> Inspect terminals at the PTOSA connectors (sensor side and harness side) for damage; bent, corroded and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace PTOSA. Then go to VEH5V-30. Repair terminals/connectors. Then go to VEH5V-30.
VEH5V-8 Check TPS <ul style="list-style-type: none"> Turn ignition off. Reconnect the Throttle Position Sensor (TPS) connector. Turn ignition on. Select Throttle Sensor for display on the DDR (MODE 07). Observe throttle counts at both no throttle and full throttle (engine not running). 	Getting 20-30 counts at no throttle and no more than 235 counts at full throttle. → Not getting the above readings. →	Go to VEH5V-10. Go to VEH5V-9.
VEH5V-9 Check TPS Connectors <ul style="list-style-type: none"> Turn ignition off. Disconnect the Throttle Position Sensor (TPS). Inspect terminals at the TPS connectors (sensor side and harness side) for damage; bent, corroded and unseated pins or sockets. 	Terminals and connectors are okay. → Problem found. →	Replace TPS. Then go to VEH5V-30. Repair terminals/connectors. Then go to VEH5V-30.



6-Way Power Harness Connector
P/N 12066317



ECM Vehicle Harness Connector
P/N 12034398



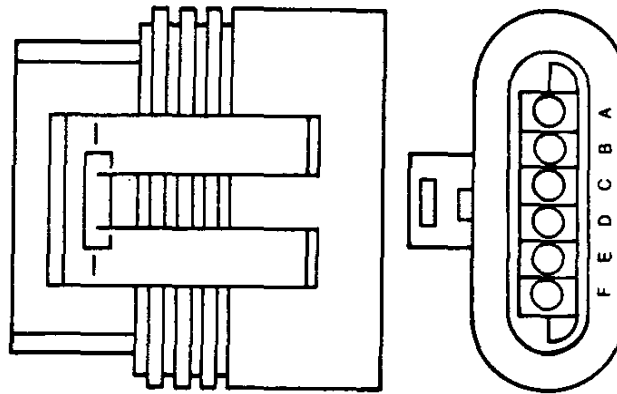
(*Note: Some applications may have circuit breakers instead of fuses.)

Power Take-Off Speed Adjust (PTOSA) and Throttle Position Sensor (TPS) Circuits

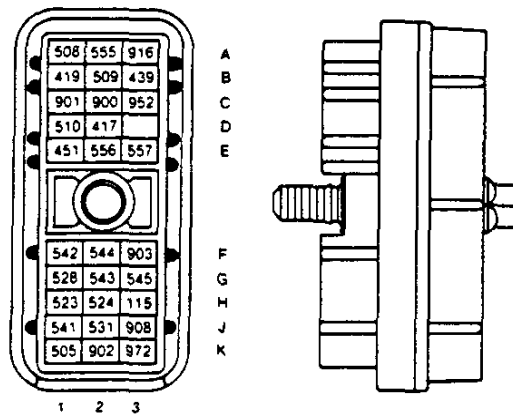
Section 4 TROUBLESHOOTING CHARTS

E. VEH5V - VEHICLE HARNESS + 5 VOLT SUPPLY (Cont'd.)

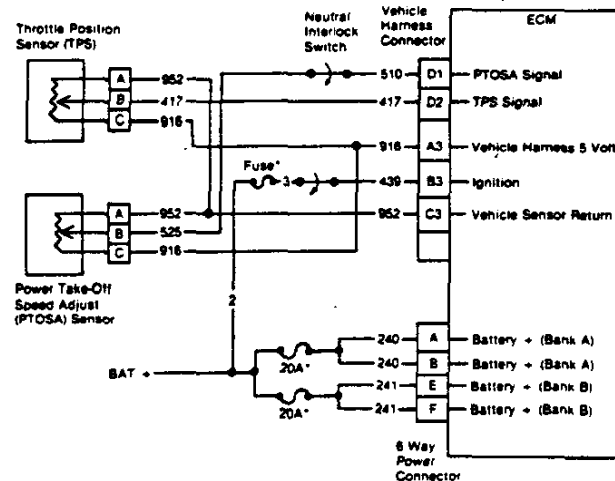
STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
VEH5V-10 Check ECM Connectors <ul style="list-style-type: none"> • Turn ignition off. • Disconnect the vehicle harness connector at the ECM (if not already disconnected). • Check terminals at the ECM vehicle harness connector (both the ECM and harness side) for damage; bent, corroded and unseated pins or sockets. Especially terminals #952, #916, #417 and #510. Install new terminal if in doubt. 	Terminals and connectors are okay. Problem found.	Replace ECM. Then go to VEH5V-30. Repair terminals/connectors. Then go to VEH5V-30.
VEH5V-11 Check for Short to Battery + <ul style="list-style-type: none"> • Turn ignition off. • Pull both 20 Amp fuses (or circuit breakers) to the ECM. • Disconnect the vehicle harness and 6-way power harness connectors at the ECM. • Read resistance between sockets A3 and B3 on the vehicle harness connector. • Also read resistance between socket A3 on the vehicle harness connector and the following sockets on the 6-way power harness connector: A, B, E and F. 	All readings are greater than 10,000 ohms or open. Any reading is less than 10,000 ohms.	Go to VEH5V-10. A short exists between the engine + 5 volt line (ckt #916) and the line(s) where less than 10,000 ohms was read (either: ckt #240, #241 or #439). Repair short. Then go to VEH5V-30.
VEH5V-12 Open Check <ul style="list-style-type: none"> • Connect TPS. • Turn ignition on. • Read voltage on PTOSA harness connector, socket C (read lead) and a good battery ground. • Repeat above only place red lead is socket A of the PTOSA connector. 	Both 4.7 to 5.2 volts. Pin C greater than 4.7 volts and Pin A is zero volts.	Repair open from ckt #952 to ECM. (Look at ECM terminal) Repair open, then go to VEH5V-30. Go to VEH5V-7.



6-Way Power Harness Connector
P/N 12066317



ECM Vehicle Harness Connector
P/N 12034398



(*Note: Some applications may have circuit breakers instead of fuses.)

Power Take-Off Speed Adjust (PTOSA) and Throttle Position Sensor (TPS) Circuits

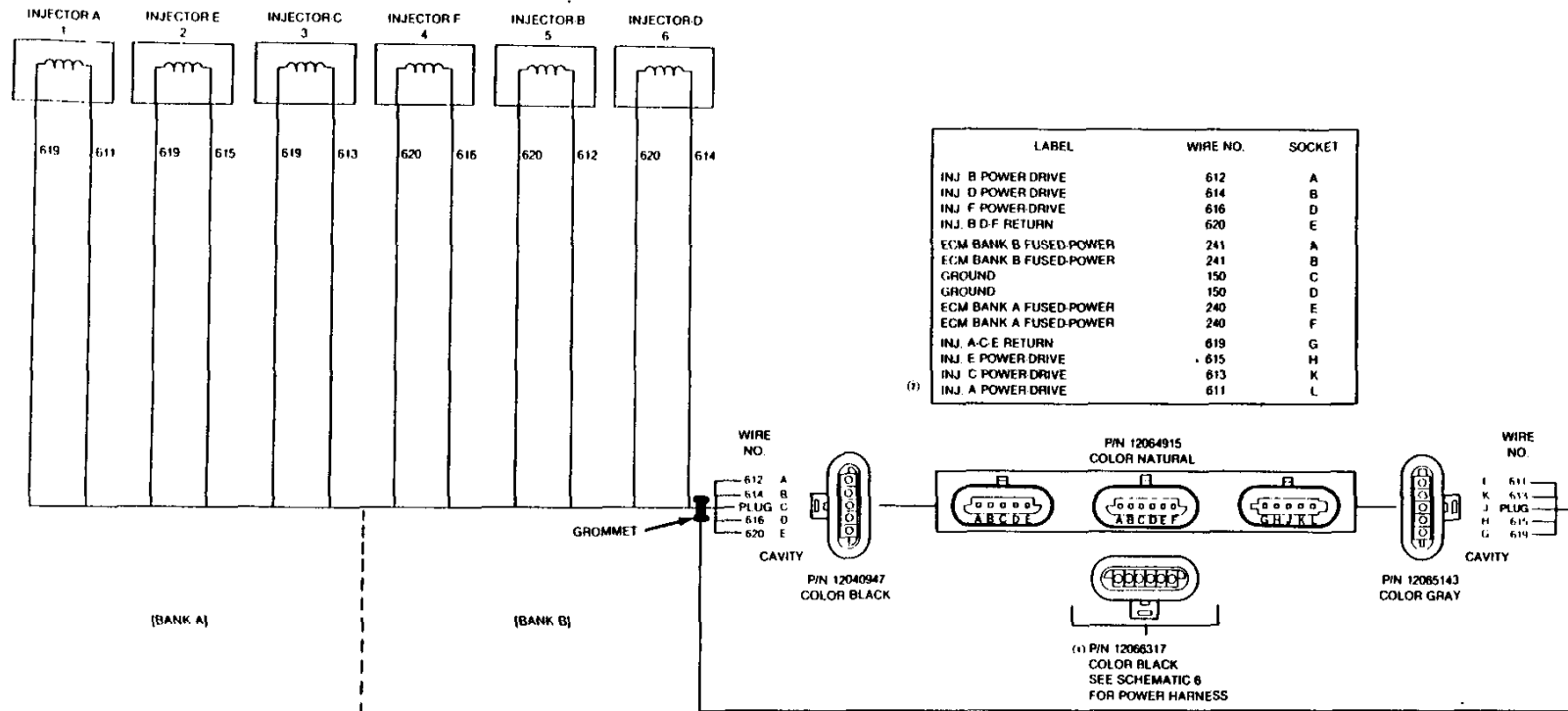
Section 4 TROUBLESHOOTING CHARTS

E. VEH5V - VEHICLE HARNESS + 5 VOLT SUPPLY (Cont'd.)

STEP/SEQUENCE	RESULT	WHAT TO DO NEXT
VEH5V-30 Verify Repairs <ul style="list-style-type: none"> • Turn ignition off. • Reconnect all connectors. • Reconnect fuses or circuit breakers if necessary. • Turn ignition on. • Clear codes. • If "Check Engine" light does not stay on, start engine and run for 1 minute or until "Check Engine" light comes on. • Stop engine. • Read historical codes. 	<p>Code 25 (no codes). →</p> <p>Codes which brought you to Chart VEH5V are still there. →</p> <p>Any codes except those which brought you to Chart VEH5V. →</p>	<p>Repairs are complete.</p> <p>All system diagnostics are complete. Please review this section from the first step to find the error.</p> <p>Go to START-1, page 17, to service other codes.</p>

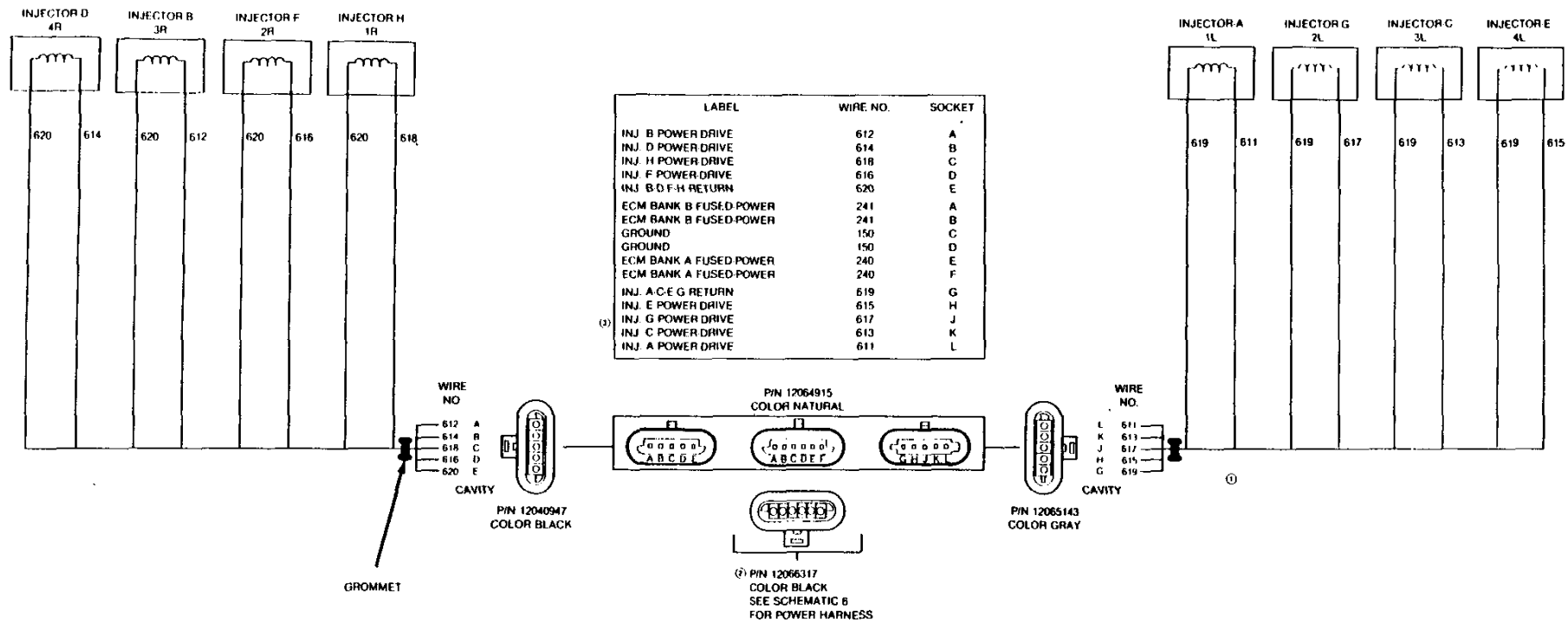
SERIES 60

ECM/INJECTOR HARNESS



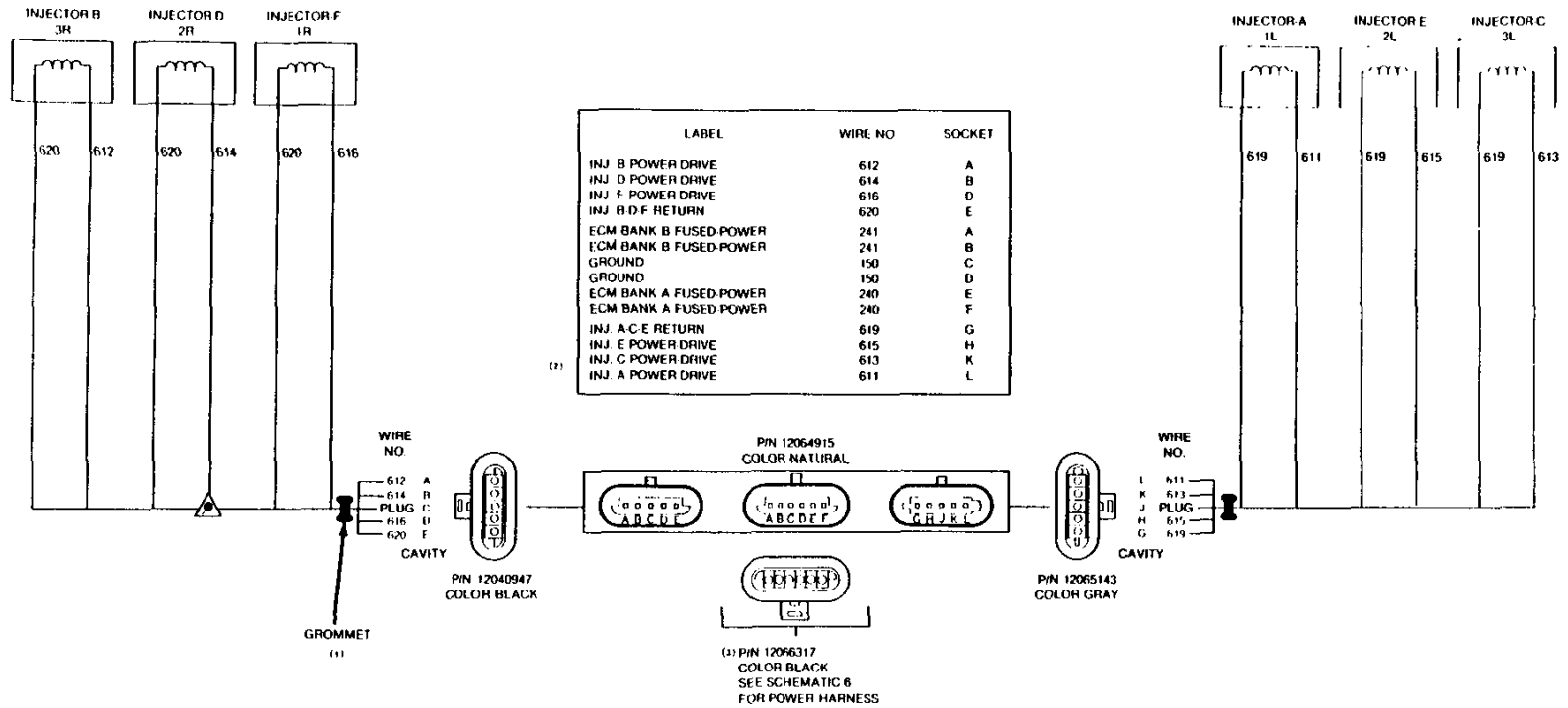
Schematic 1

ECM/INJECTOR HARNESS

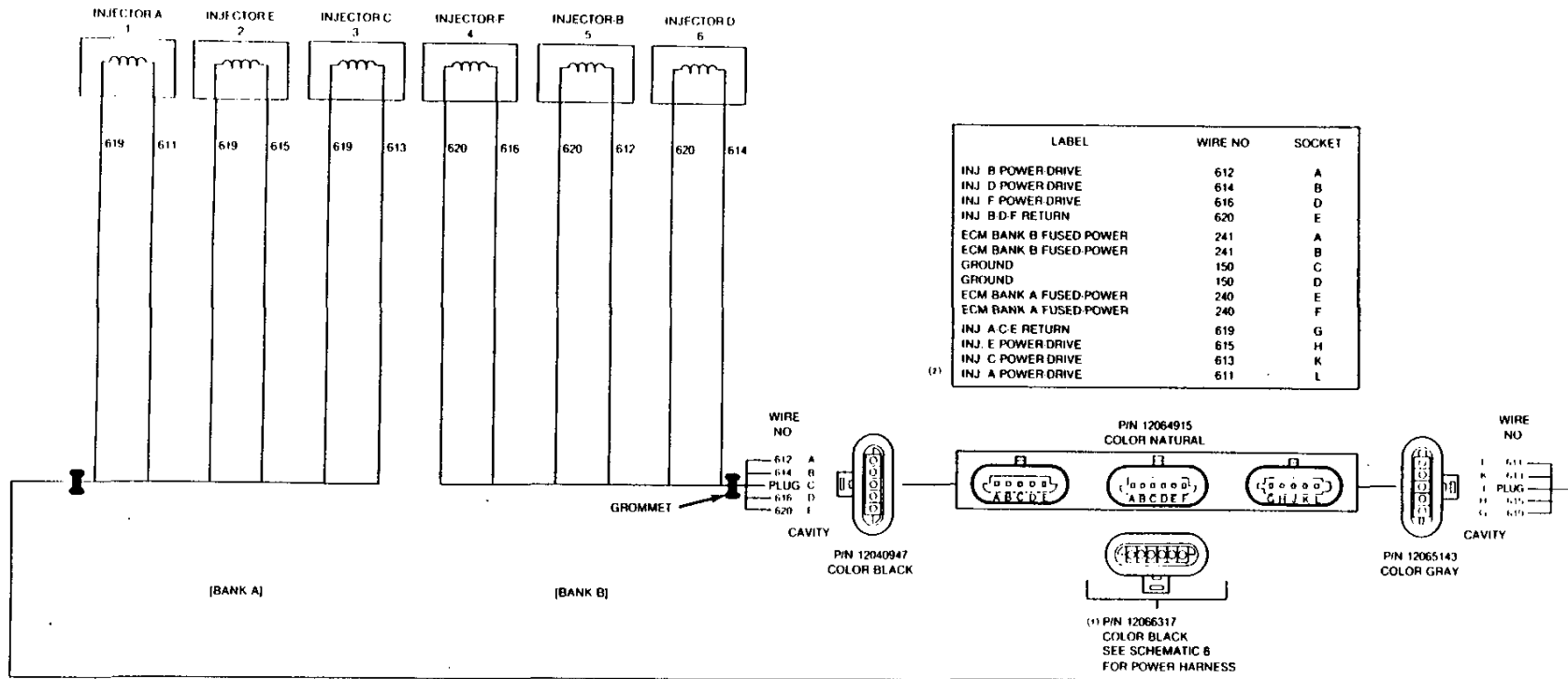


6V-92

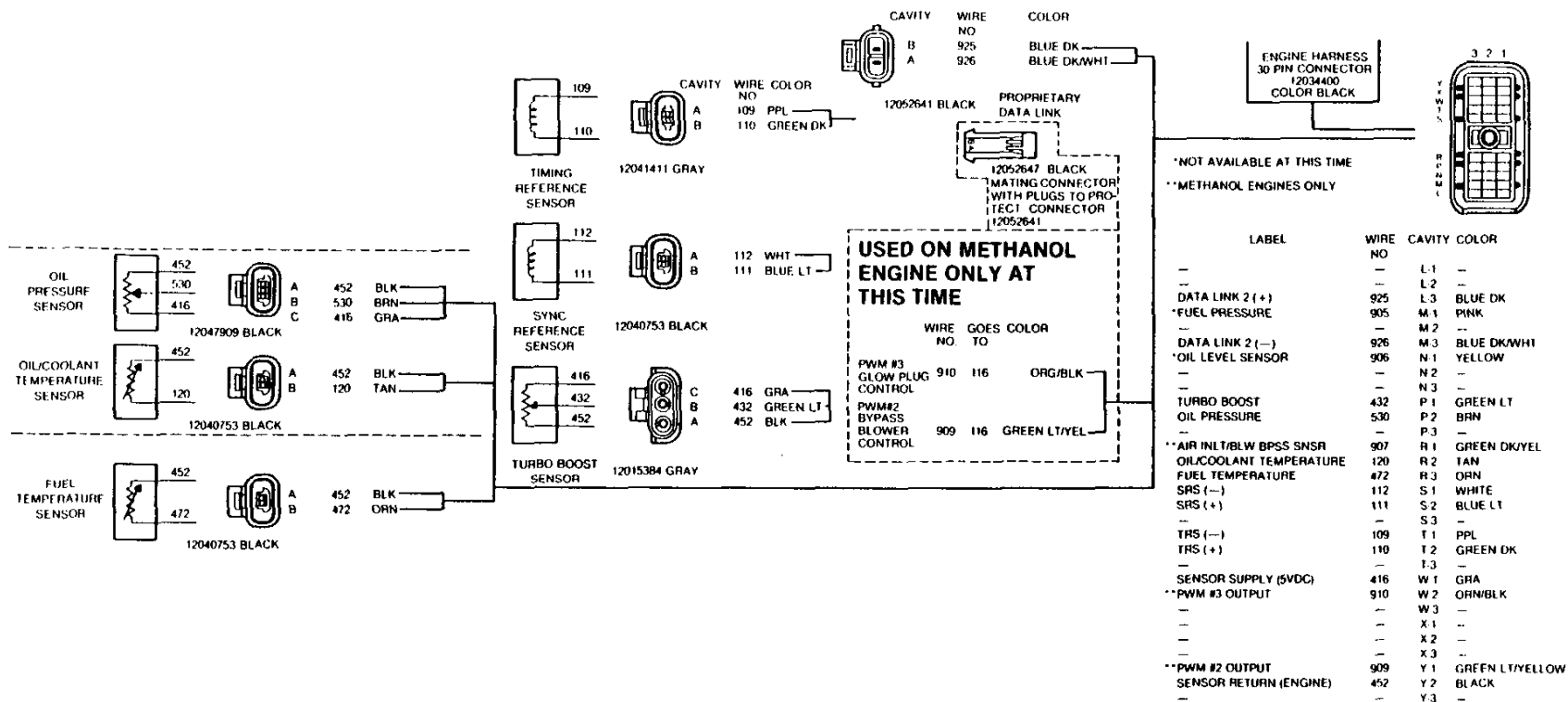
ECM/INJECTOR HARNESS



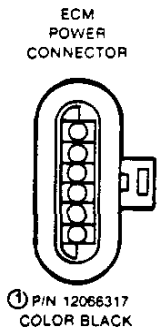
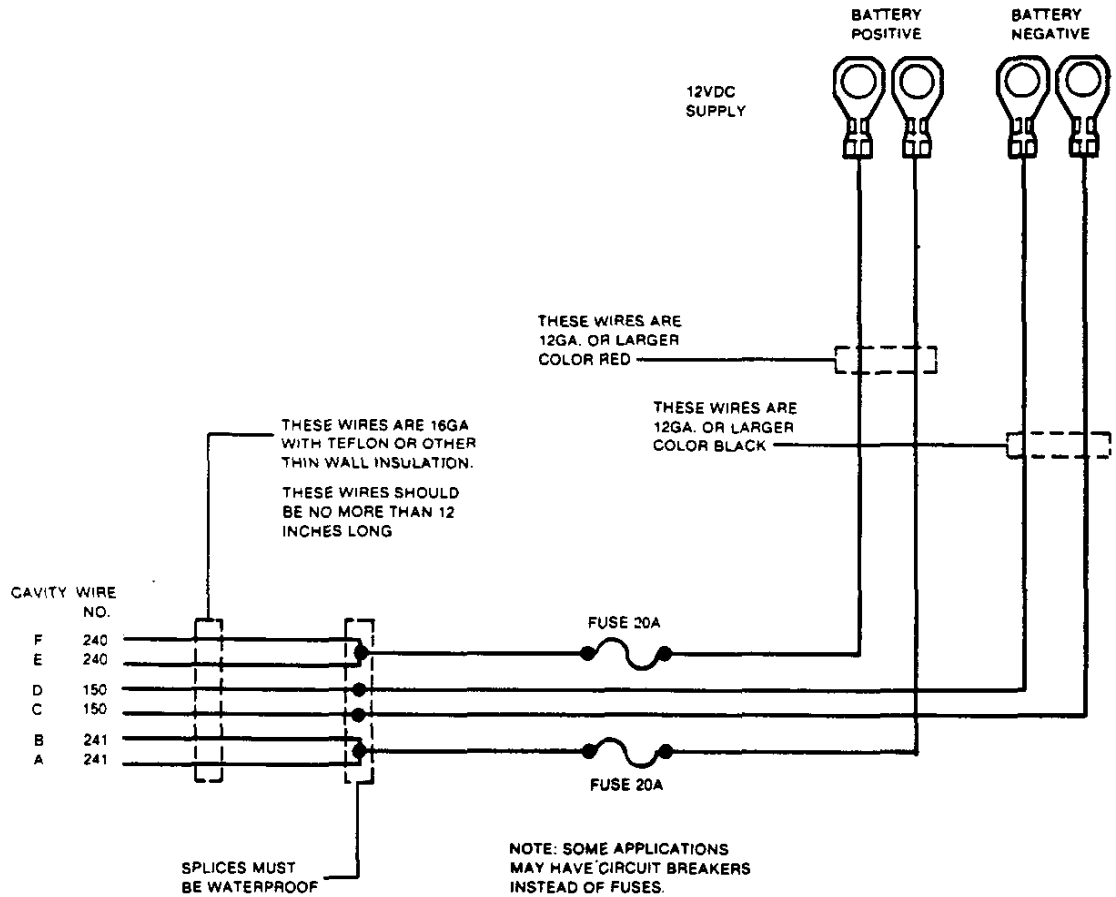
ECM/INJECTOR HARNESS



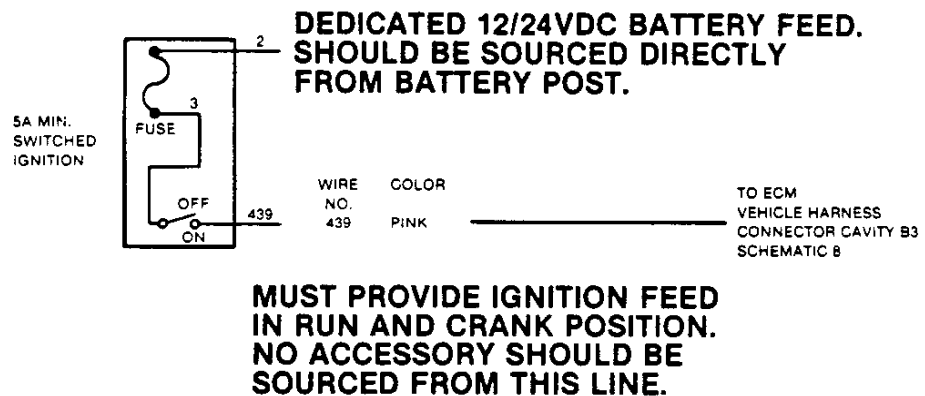
ENGINE SENSORS



DDEC II POWER HARNESS



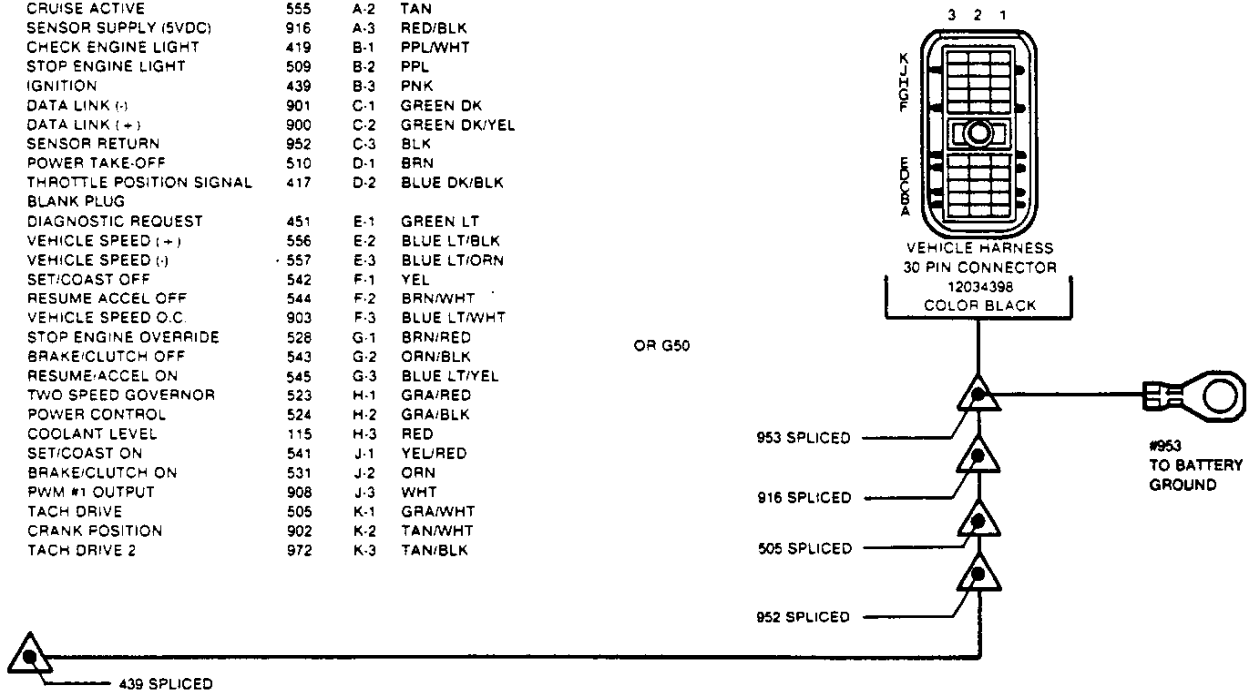
VEHICLE INTERFACE HARNESS (PARTIAL) ECM IGNITION POWER SUPPLY



VEHICLE INTERFACE HARNESS (PARTIAL) **ECM VEHICLE HARNESS** **30 PIN CONNECTOR PIN OUT**

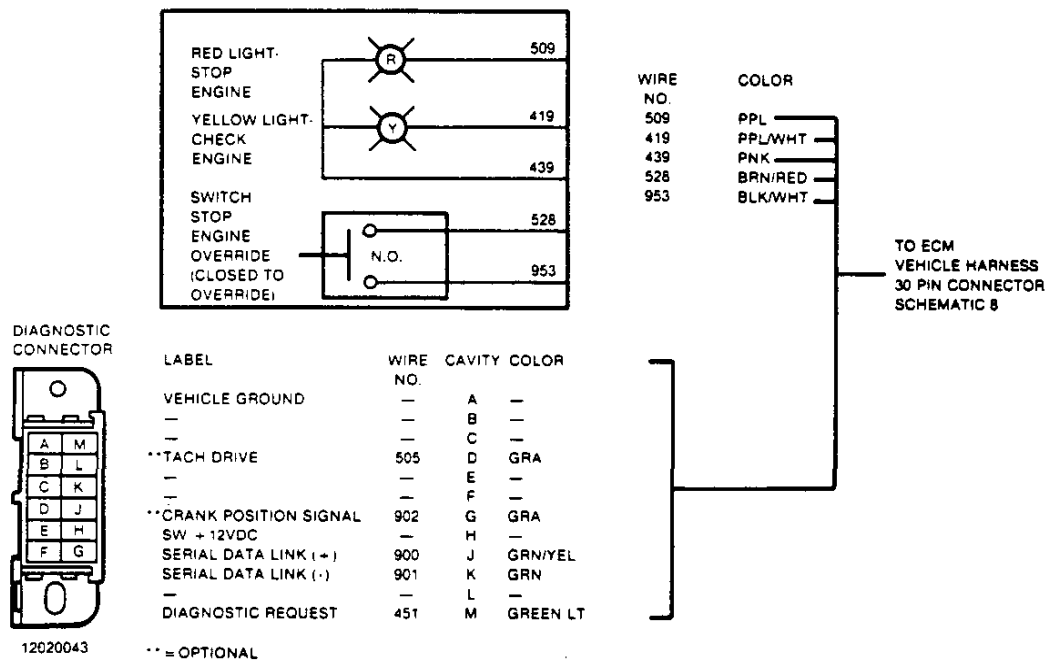
LABEL	WIRE NO.	CAVITY	COLOR *
ENGINE BRAKE	508	A-1	GRA
CRUISE ACTIVE	555	A-2	TAN
SENSOR SUPPLY (5VDC)	916	A-3	RED/BLK
CHECK ENGINE LIGHT	419	B-1	PPL/WHT
STOP ENGINE LIGHT	509	B-2	PPL
IGNITION	439	B-3	PNK
DATA LINK (-)	901	C-1	GREEN DK
DATA LINK (+)	900	C-2	GREEN DK/YEL
SENSOR RETURN	952	C-3	BLK
POWER TAKE-OFF	510	D-1	BRN
THROTTLE POSITION SIGNAL	417	D-2	BLUE DK/BLK
BLANK PLUG			
DIAGNOSTIC REQUEST	451	E-1	GREEN LT
VEHICLE SPEED (+)	556	E-2	BLUE LT/BLK
VEHICLE SPEED (-)	557	E-3	BLUE LT/ORN
SET/COAST OFF	542	F-1	YEL
RESUME ACCEL OFF	544	F-2	BRN/WHT
VEHICLE SPEED O.C.	903	F-3	BLUE LT/WHT
STOP ENGINE OVERRIDE	528	G-1	BRN/RED
BRAKE/CLUTCH OFF	543	G-2	ORN/BLK
RESUME/ACCEL ON	545	G-3	BLUE LT/YEL
TWO SPEED GOVERNOR	523	H-1	GRA/RED
POWER CONTROL	524	H-2	GRA/BLK
COOLANT LEVEL	115	H-3	RED
SET/COAST ON	541	J-1	YEL/RED
BRAKE/CLUTCH ON	531	J-2	ORN
PWM #1 OUTPUT	908	J-3	WHT
TACH DRIVE	505	K-1	GRA/WHT
CRANK POSITION	902	K-2	TAN/WHT
TACH DRIVE 2	972	K-3	TAN/BLK

ECM CONNECTOR

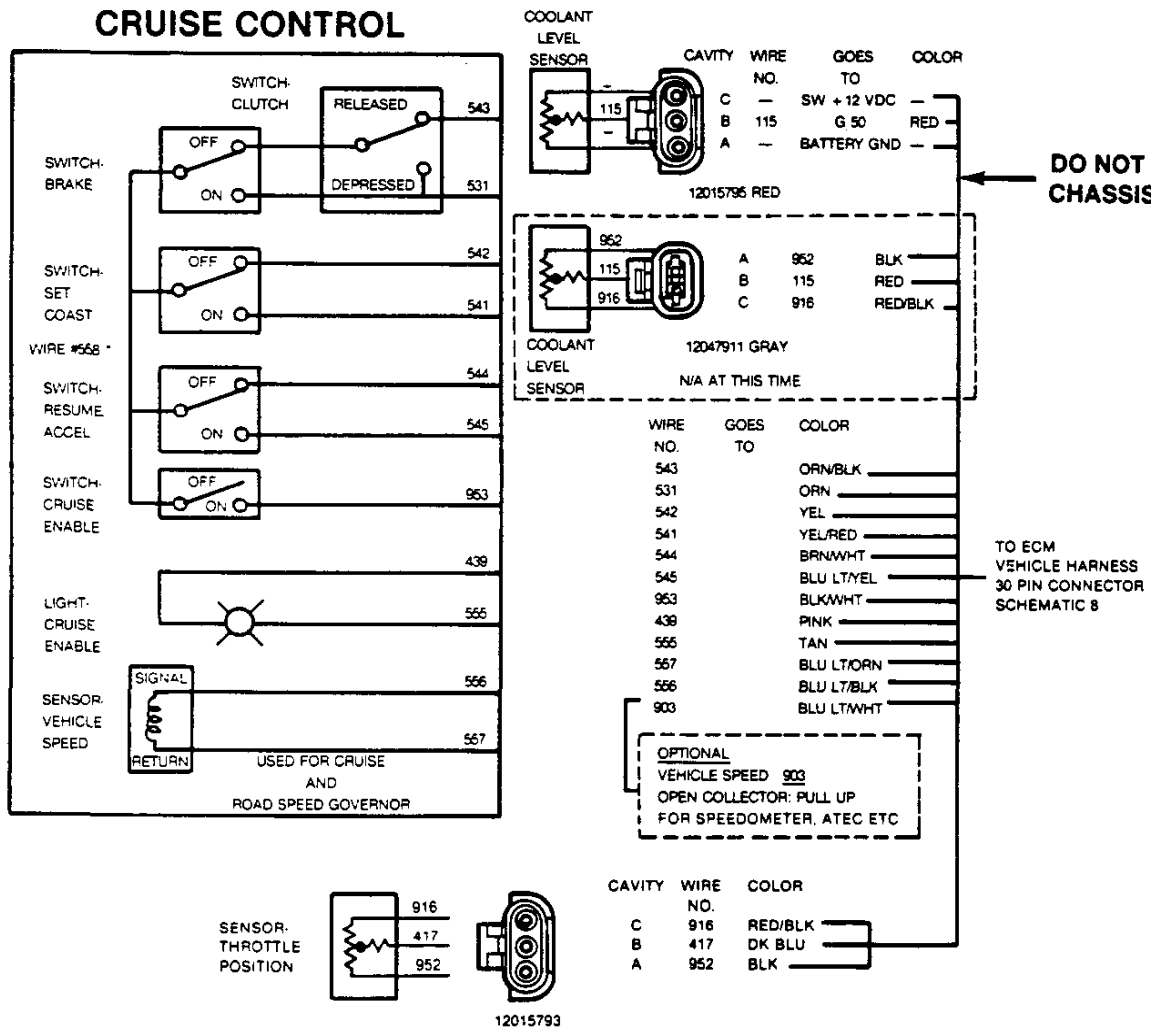


*RECOMMENDED COLORS

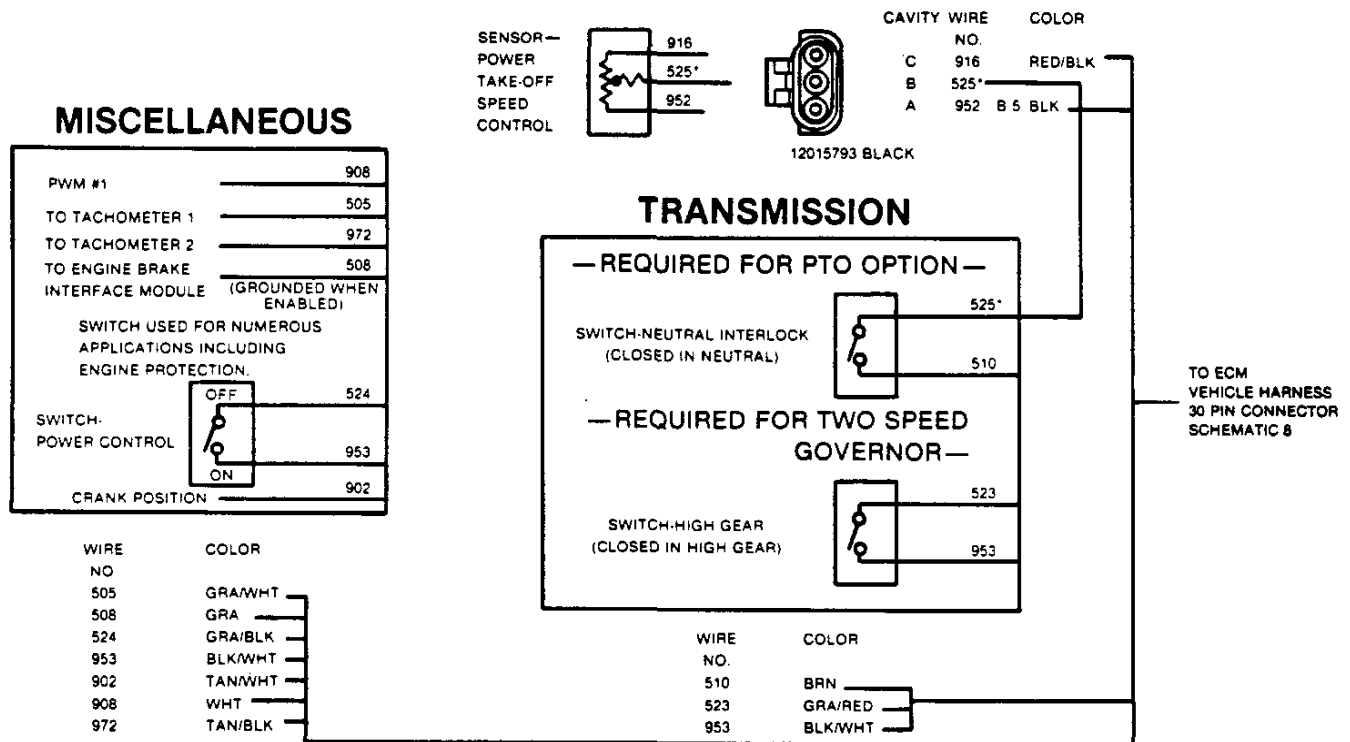
VEHICLE INTERFACE HARNESS (PARTIAL) DASH PANEL



VEHICLE INTERFACE HARNESS (PARTIAL) CRUISE CONTROL COOLANT/OIL TEMPERATURE SENSOR



VEHICLE INTERFACE HARNESS (PARTIAL) PTO/TWO SPEED GOVENOR MISCELLANEOUS



*—WIRE NOT SUPPLIED WITH DDEC II VEHICLE HARNESS

DDEC II COMPONENT ASSEMBLY/INSTALLATION

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Assemble Fuel Fitting to Cooler Plate (60, 92, 71)

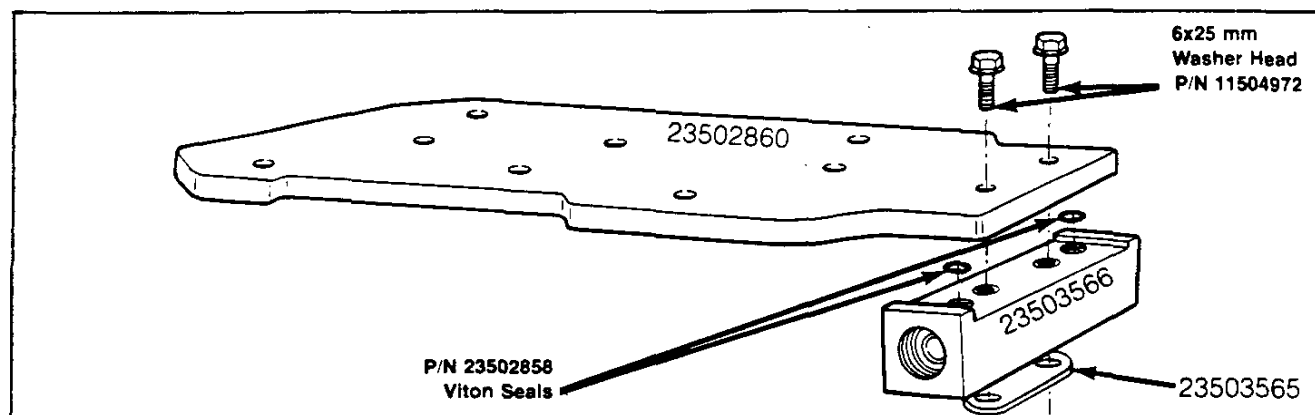


Figure 1

Assembly

Install (2) red viton seals in manifold counterbores.

Locate fuel fitting on cooler plate as shown in Figure 1.

Install (2) 6x25 mm. washer head bolts through cooler plate to fuel fitting. Torque to 7-9 lbs. ft., 9-12 N•M.

CAUTION: Do not over torque bolts, to avoid stripping threads in the fuel block.

Also, use back up wrench on fuel block when tightening or loosening fuel fittings. The fuel block housing is plastic and will crack if not supported when fittings are installed and removed.

Cooler Plate/Harness Heat Shield/ECM Assembly (60, 92, 71)

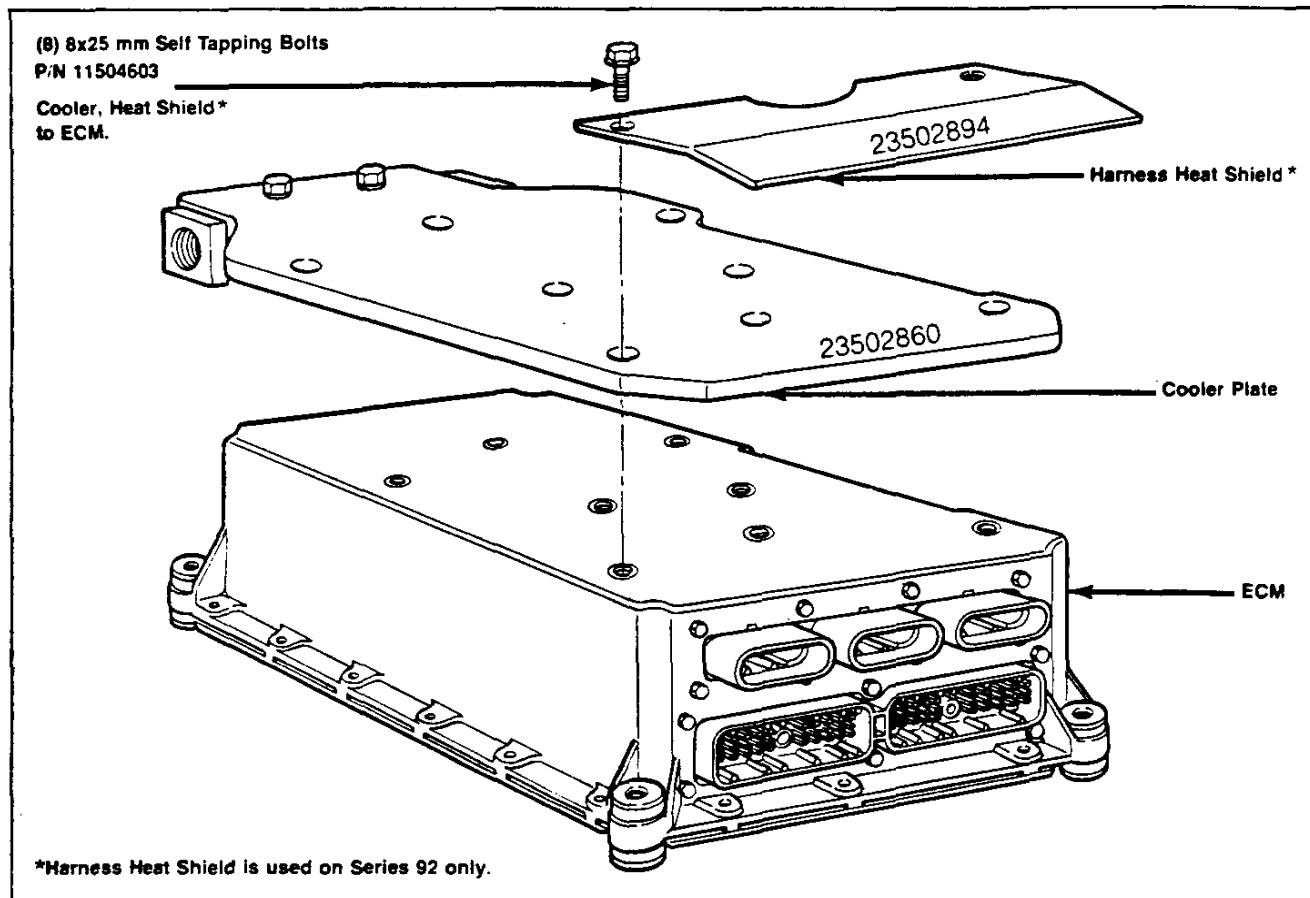


Figure 2

Assembly

Locate the cooler plate (and harness heat shield) on the ECM as illustrated in Figure 2.

Drive (8) 8x25 mm self tapping screws in the ECM through matching holes in the heat shield and cooler plate. Be sure the bolt is driven far enough to seat against the cooler plate. Torque to 13-17 lbs. ft., 17-22 N•M.

If a remanufactured ECM is being installed, 8x25 mm straight threaded bolts with LW/PW may be used in place of self-tapping bolts.

ECM Bracket to Engine (92)

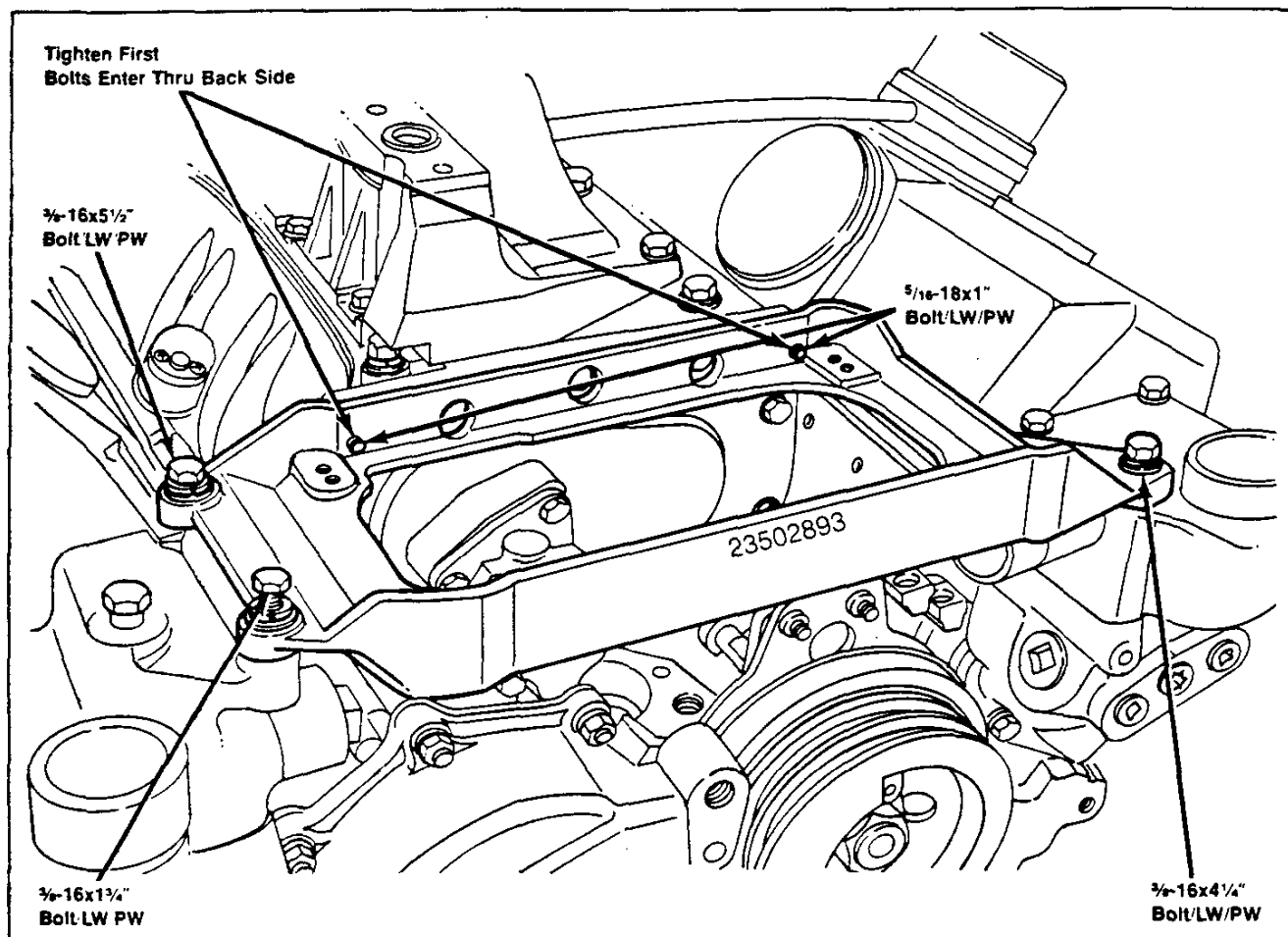


Figure 3

Mount ECM Bracket to Engine

Locate ECM Mounting Bracket as shown in Figure 3.

Take care to use correct bolt length to avoid bottoming and/or interference with ECM.

Tighten 5/16" bolts in blower end plate to ECM mount **first**.

ECM Bracket to Engine (71)

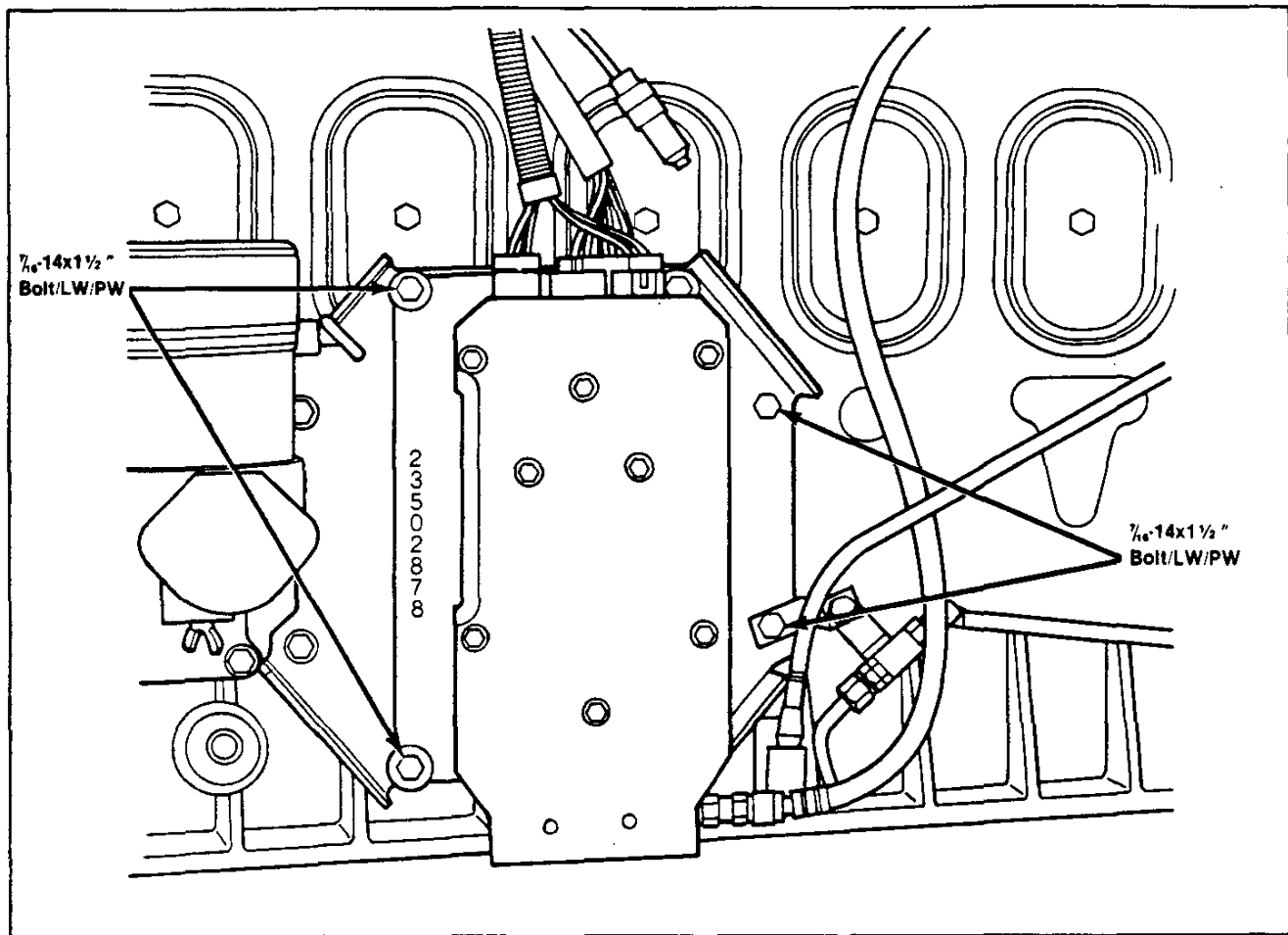


Figure 3A

Mount ECM Bracket to Engine

Locate ECM Mounting Bracket as shown in Figure 3A.

Take care to use correct bolt length to avoid bottoming and/or interference with ECM.

ECM/Cooler Plate/Heat Shield to ECM (60, 92, 71) Assembly & Removal

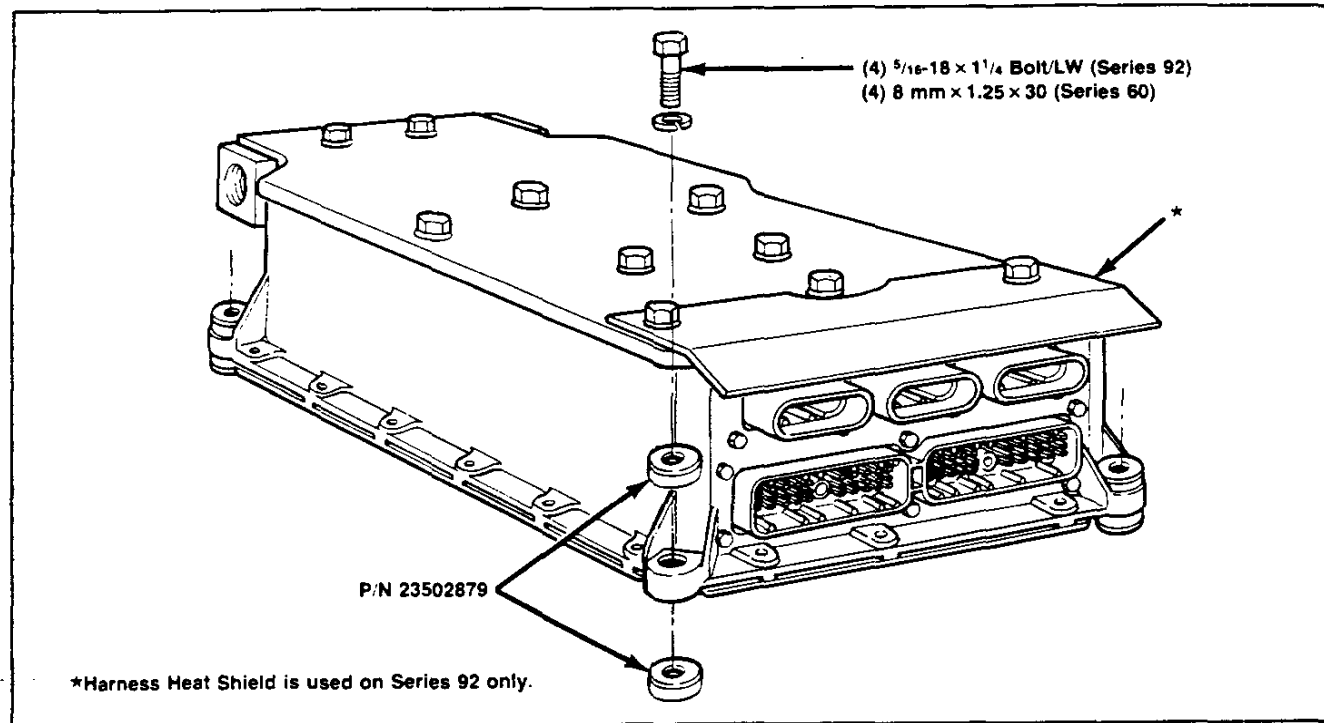


Figure 4

Assemble ECM to ECM Mount

Install (2) isolators, P/N 23502879, in each mount hole in ECM, one on top, and one on bottom, as illustrated in Figure 4.

Install (4) bolts and lock washers through ECM isolators to ECM mount as shown.

Connect (5) harness connections.

Connect fuel inlet and outlet hoses to cooler plate.

To Remove ECM

Remove any exhaust piping and/or water tubing from engine which prevents access to the ECM.

Remove fuel inlet and outlet at the fuel fitting or remove the fuel fitting from the cooler plate.
(Don't lose the seals.)

Remove (5) harness connections.

Remove (4) bolts and lift ECM from it's mount.

Do not lose the ECM isolators — they must be reinstalled.

NOTE: The fuel fitting block must be held with a wrench when installing or removing fuel lines.

Pulse Wheel (92)

The Pulse Wheel is a metal disc that is mounted to the rear of the left camshaft pulley on a V-type engine (Fig. 5).

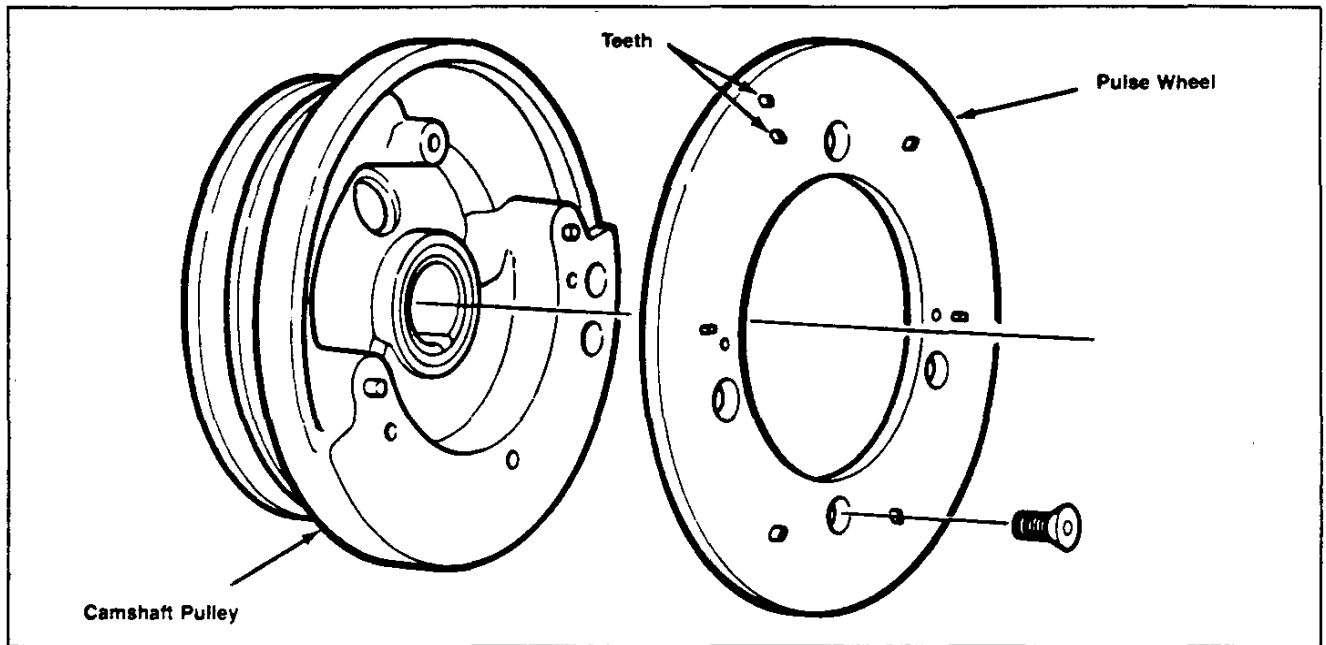


Figure 5

The raised metal teeth generate a signal in the Synchronous Reference Sensor (SRS) and Timing Reference Sensor (TRS). These signals are used by the ECM to locate piston position for injector solenoid operation.

One of three different wheels may be installed, depending on engine rotation and number of cylinders. The Pulse Wheel shown in Figure 6 is used on an 8V-92 engine.

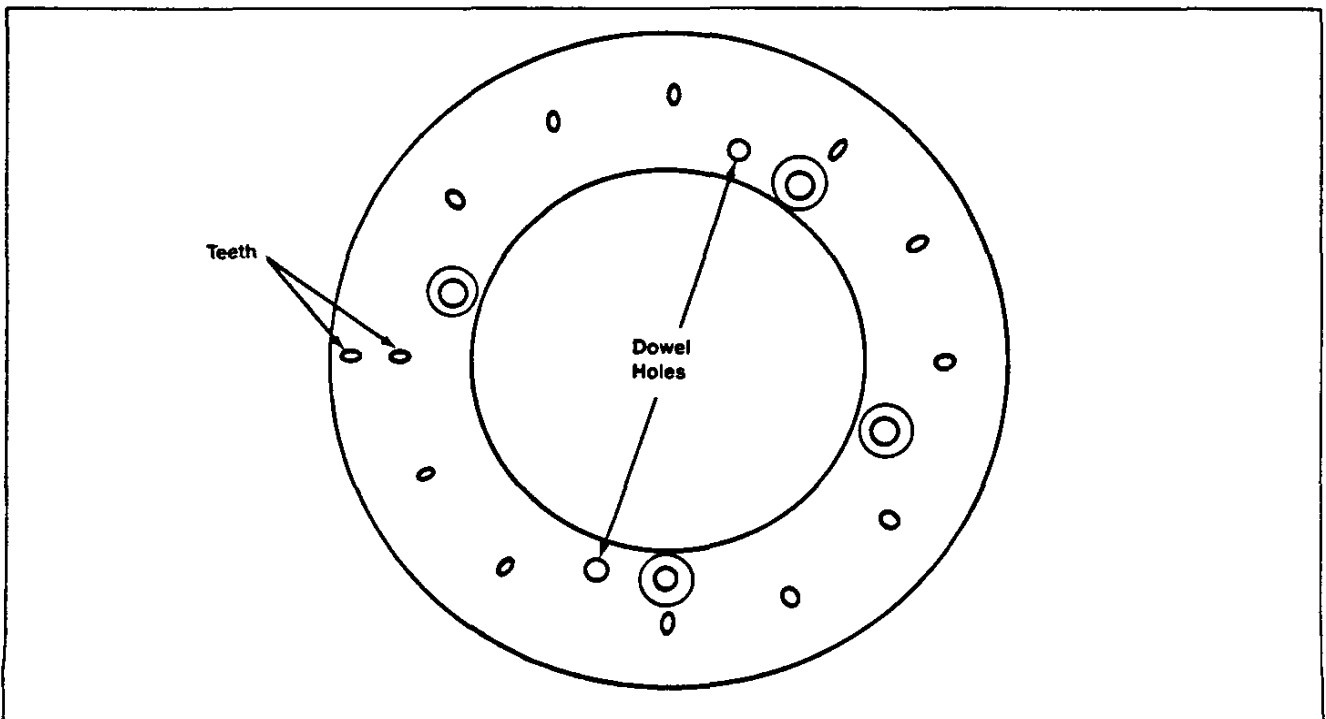


Figure 6

This wheel has a total of thirteen raised metal teeth. Two holes are provided that mate with dowels at the rear of the cam pulley. A staggered bolt pattern prohibits improper installation.

Two different Pulse Wheels are used on 6V-92 engines, depending on the direction of rotation of the engine. With the double row of teeth on the Pulse Wheel at the twelve o'clock position, note the location of the dowel holes as shown in Figure 7 to ensure the use of the proper Pulse Wheel.

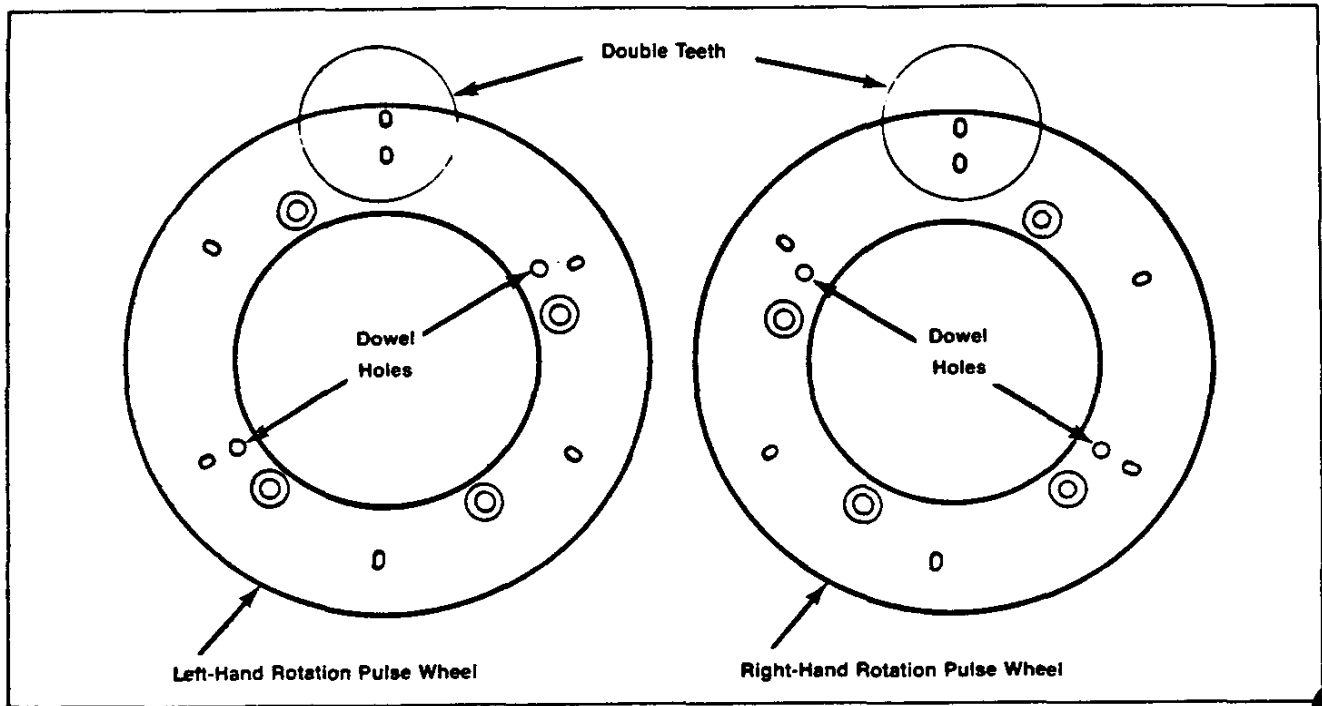


Figure 7

NOTE: The direction of engine rotation is determined by viewing the engine from the front or fan end. On right-hand rotation engines, the crank pulley rotates clockwise. On left-hand rotation engines, the crank pulley rotates counterclockwise.

Pulse Wheel Removal (92)

The replacement of the Pulse Wheel will require adjustment of the Synchronous Reference Sensor (SRS) and Timing Reference Sensor (TRS). Refer to instructions in SRS/TRS Replacement Section of this Service Bulletin. Use the following instructions to replace the Pulse Wheel:

1. Loosen and remove the drive belt(s) from the left camshaft pulley, if equipped.
2. Loosen and remove the nut and washer that secures the left cam pulley to the end of the camshaft.
3. Attach puller J24420-A to the camshaft pulley.

NOTE: Do NOT pry on the pulse wheel to remove it. You may bend the pulse wheel or damage the teeth.

4. Use adaptor J7932 between the end of the camshaft and the puller screw to protect the end of the camshaft (Fig. 8).

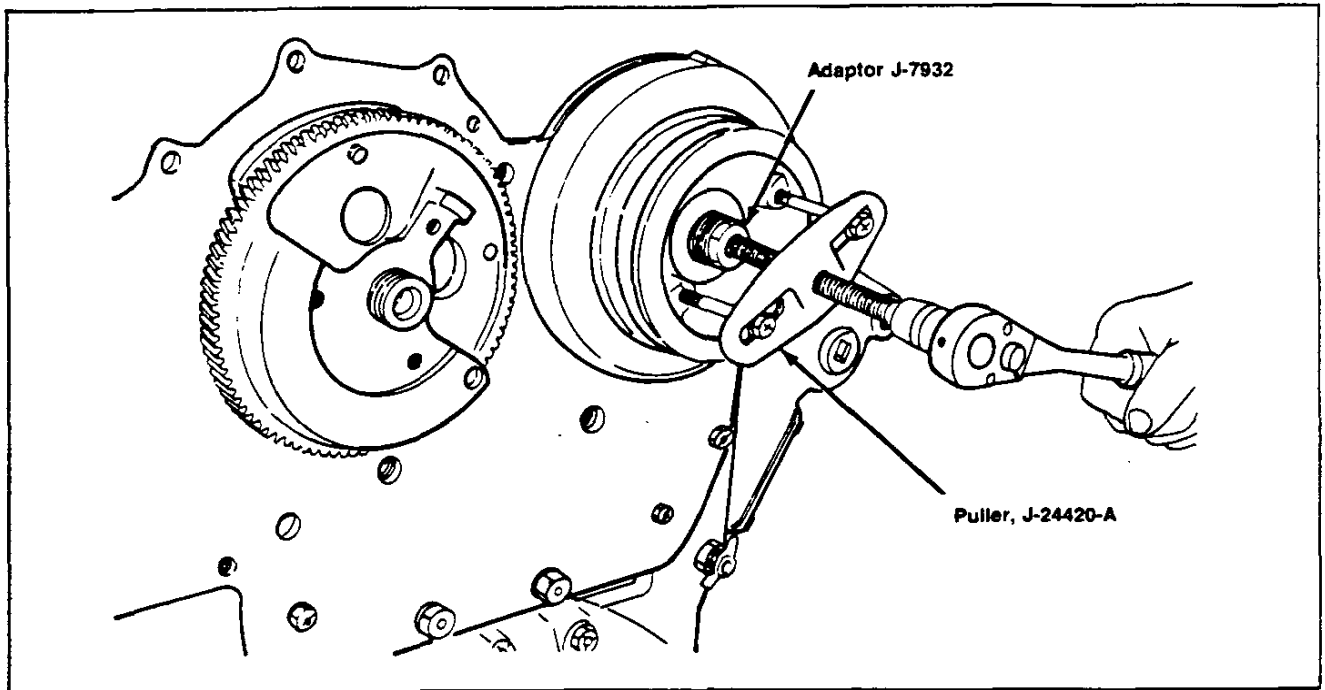


Figure 8

NOTE: Be careful not to lose the Woodruff key.

5. Remove the four Allen-type flat head screws that retain the Pulse Wheel to the cam pulley. Remove the Pulse Wheel.

Pulse Wheel Installation (92)

1. Locate the two small holes in the Pulse Wheel over the dowels in the rear of the cam pulley.
2. Use Loctite 262, or equivalent, on the four Allen-type flat head screws and secure the Pulse Wheel to the cam pulley.
3. If removed, replace the Woodruff key to the slot in the camshaft. Index the slot in the cam pulley to the Woodruff key and start the pulley on the end of the camshaft.
4. Use a fiber mallet or plastic hammer to tap the cam pulley onto the end of the camshaft.
5. Install the nut and lock washer to the end of the camshaft and tighten to 300-325 lb-ft, 407-441 N•m torque.
6. Adjust the SRS/TRS to Pulse Wheel air gap following the instructions in the SRS/TRS Adjustment Section of this Service Bulletin.
7. Install the drive belts. Adjust the belt tension as outlined in Section 15.1 of the Service Manual.

Pulse Wheel (71)

The Pulse Wheel is a metal disc that is mounted to the rear of the right balance weight (Fig. 8A).

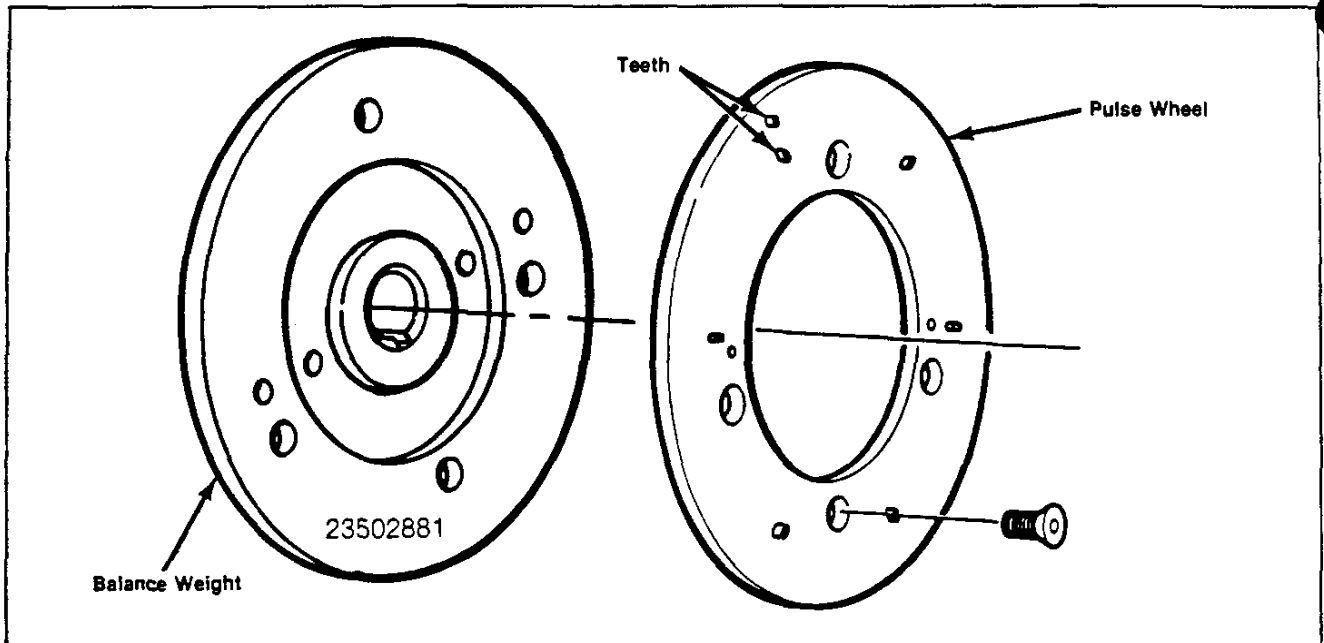


Figure 8A

The raised metal teeth generate a signal in the Synchronous Reference Sensor (SRS) and Timing Reference Sensor (TRS). These signals are used by the ECM to locate piston position for injector solenoid operation.

Pulse Wheel Removal (71)

The replacement of the Pulse Wheel will require adjustment of the Synchronous Reference Sensor (SRS) and Timing Reference Sensor (TRS). Refer to instructions in SRS/TRS Replacement Section of this Service Bulletin. Use the following instructions to replace the Pulse Wheel:

1. Loosen and remove front cover.
2. Loosen and remove the nut and washer that secures the balance weight to the shaft.
3. Attach puller J24420-A to the pulse wheel.

NOTE: Do NOT pry on the pulse wheel to remove it. You may bend the pulse wheel or damage the teeth.

4. Use adaptor J7932 between the end of the camshaft and the puller screw to protect the end of the cam (Fig. 8B).

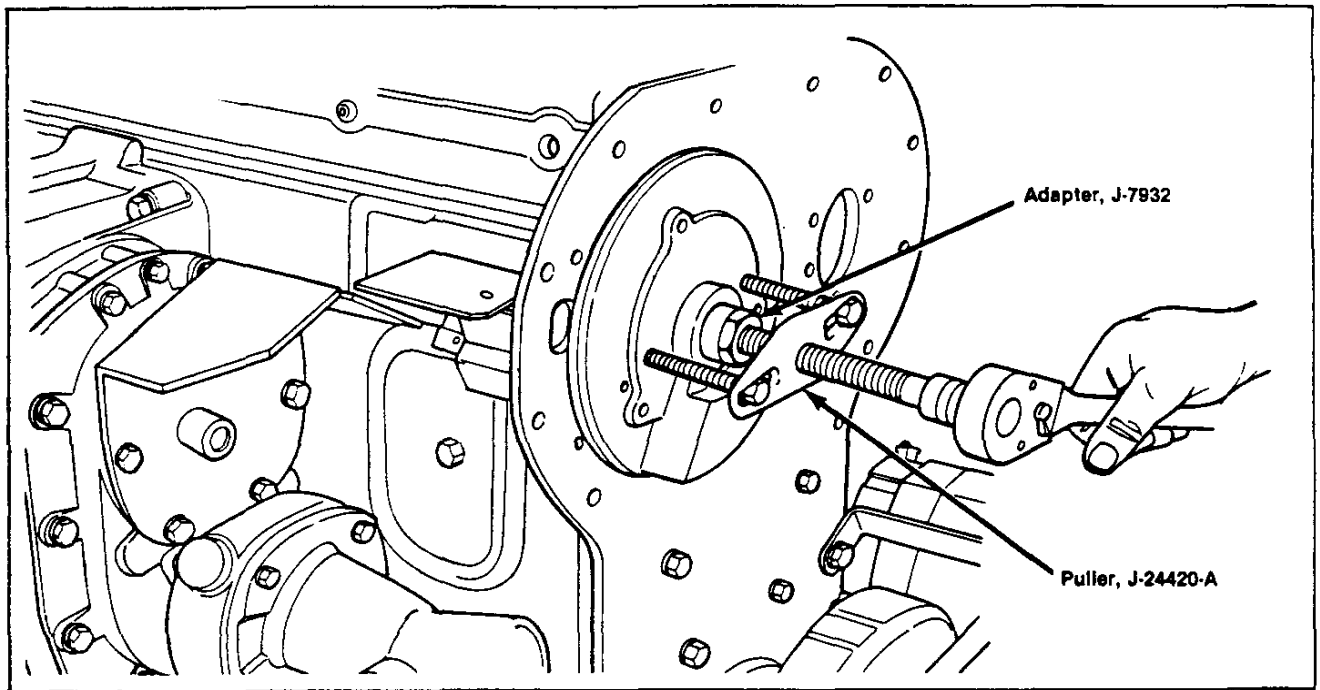


Figure 8B

NOTE: Be careful not to lose the Woodruff key.

5. Remove the four Allen-type flat head screws that retain the Pulse Wheel to the balance weight.
Remove the Pulse Wheel.

Pulse Wheel Installation (71)

1. Locate the two small holes in the Pulse Wheel over the dowels in the rear of the balance weight.
2. Use Loctite 262, or equivalent, on the four Allen-type flat head screws and secure the Pulse Wheel to the balance weight.
3. If removed, replace the Woodruff key to the slot in the balance shaft. Index the slot in the balance weight to the Woodruff key and start the weight on the end of the shaft.
4. Use a fiber mallet or plastic hammer to tap the balance weight onto the end of the balance shaft.
5. Install the nut and lock washer to the end of the balance shaft and tighten to 300-325 lb-ft, 407-441 N•m torque.
6. Adjust the SRS/TRS to Pulse Wheel air gap following the instructions in the SRS/TRS Adjustment Section of this Service Bulletin.
7. Install front cover.

Synchronous Reference Sensor (SRS) (92) Timing Reference Sensor (TRS)

The Synchronous Reference Sensor (SRS) and Timing Reference Sensor (TRS) are electronic components that send a signal to the ECM (Fig. 9).

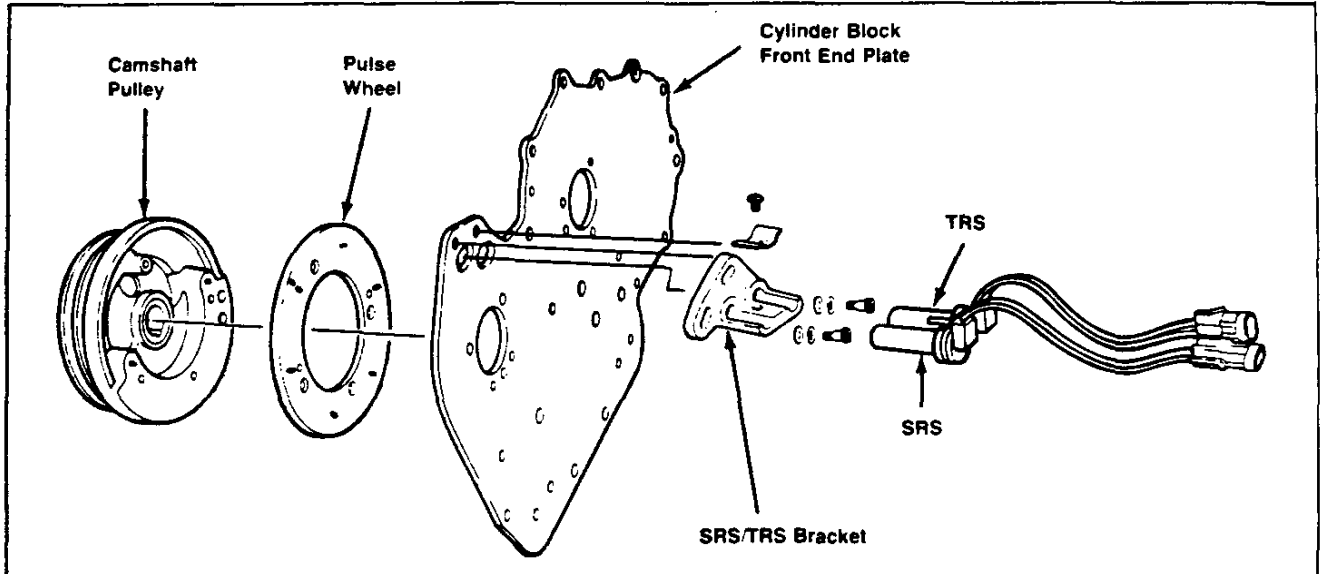


Figure 9

The SRS references firing position for the number one piston. The TRS sends a signal to indicate the firing position for each piston. The SRS/TRS assembly is mounted through the engine front end plate at the top, left corner of the engine (Fig. 10).

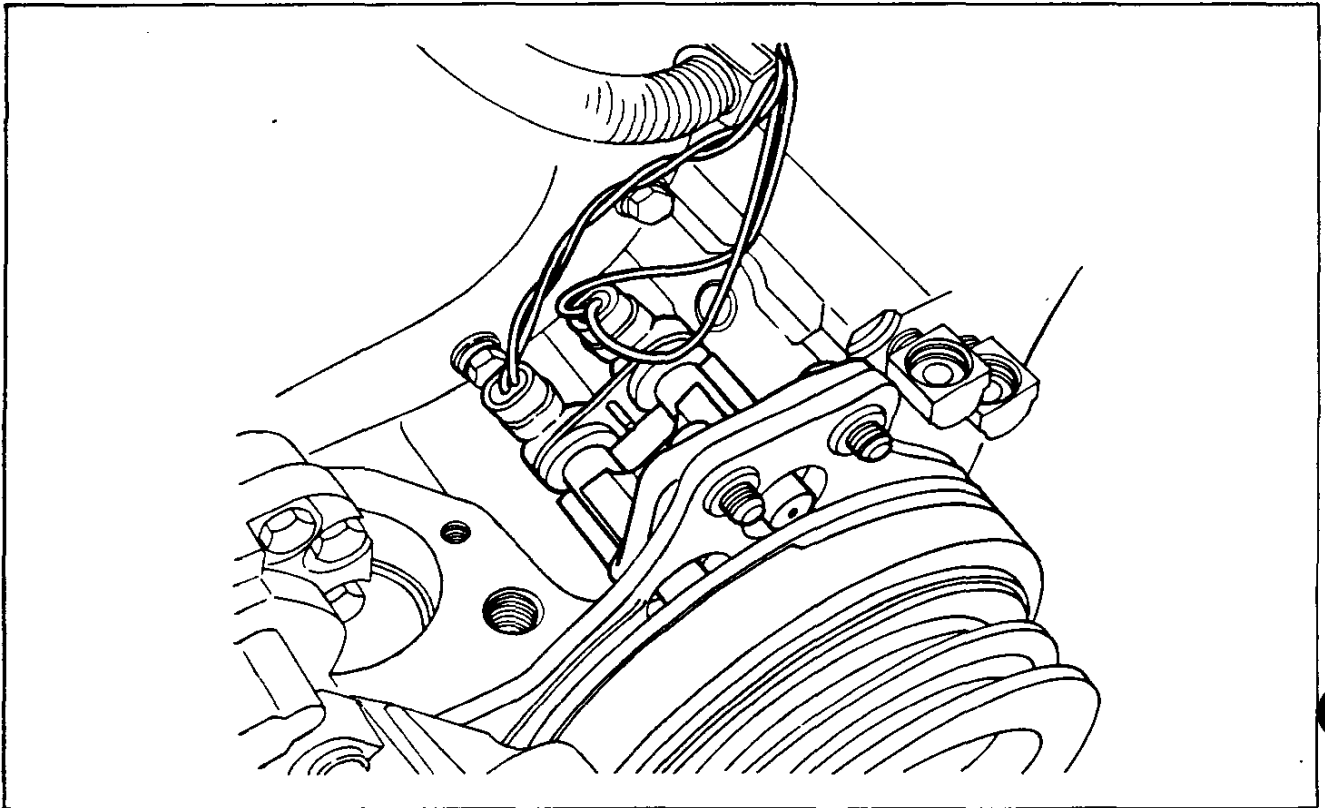


Figure 10

The sensors can be identified by the color of the connector body. The SRS connector body is black while the TRS connector is gray. The sensor connectors are keyed to prevent improper installation to the engine wiring loom.

SRS/TRS Assembly Removal and Engine Timing Procedure

1. Refer to the ECM Replacement portion of this Service Bulletin, and remove the heat shield, cold plate, and the ECM.
2. Loosen and remove the four bolts and washers retaining the ECM bracket to the engine. Loosen and remove the two bolts and washers retaining the ECM bracket to the blower end plate. Remove the ECM bracket from the engine.
3. Remove any hoses or fuel lines necessary to gain access to the sensors.
4. Disengage the locking tang on the SRS connector. Grasp the connector bodies and gently pull them apart. Repeat this procedure for the TRS.
5. Remove the SRS/TRS retaining screw and clip.
6. Remove the sensor assembly.
7. If the pulse wheel or engine front end plate has been removed or replaced, loosen the two sensor-retaining socket head screws.

SRS/TRS Installation

Use the tools shown in Figure 11 (DDEC Tool Kit) to perform the following operations:

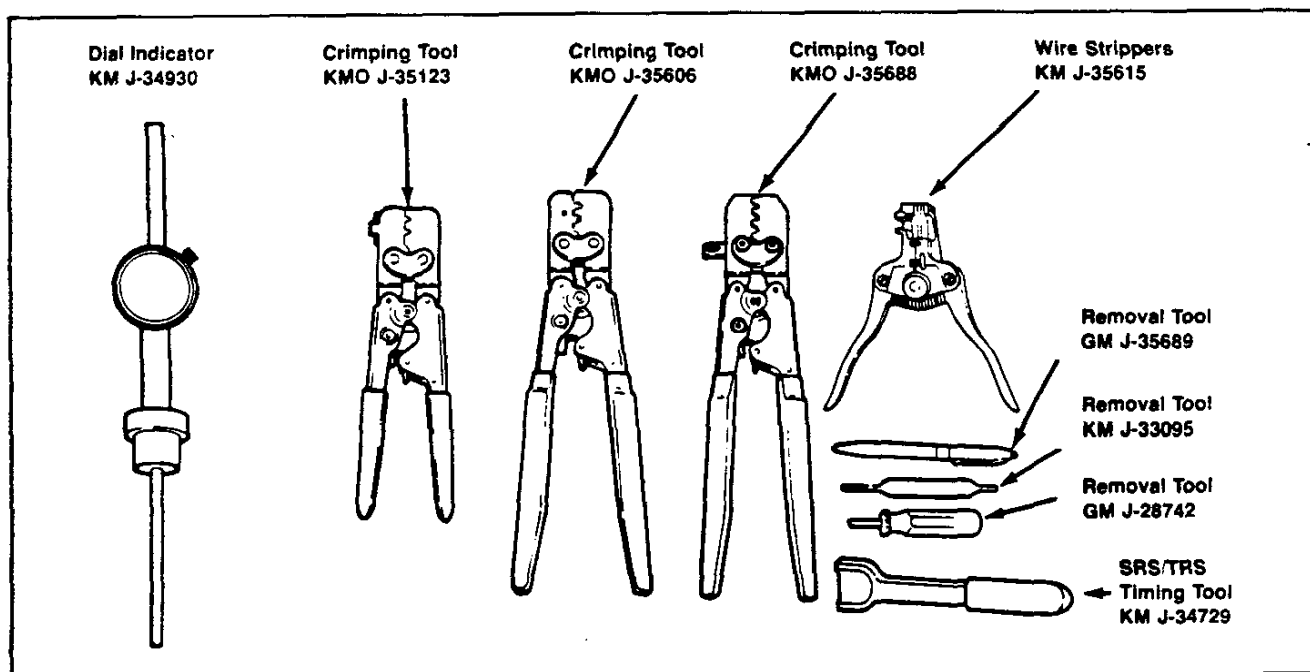


Figure 11

1. Install the sensors assembly and retaining clip.
2. Install, but do not tighten, the retaining clip screw.

SRS/TRS Adjustment

Whenever a sensor assembly is replaced, it must be aligned in relationship to the teeth on the Pulse Wheel upon installation. Use the following instructions for sensor alignment.

1. Refer to Electronic Unit Injector Replacement in this bulletin and remove the following injector:
 - a: 1R for right-hand rotation engines.
 - b: 1L for left-hand rotation engines.
2. Position the piston for this cylinder at top-dead-center, using Crankshaft Position Timing Tool, Kent-Moore tool J34930, as follows:
 - a. Install the slotted spacer on the chain between the dial indicator and the top of the holder. Tighten the clamp screw.

NOTE: Failure to insert the spacer could result in damage to the dial indicator if the piston is already at the top of travel when the tool is installed.

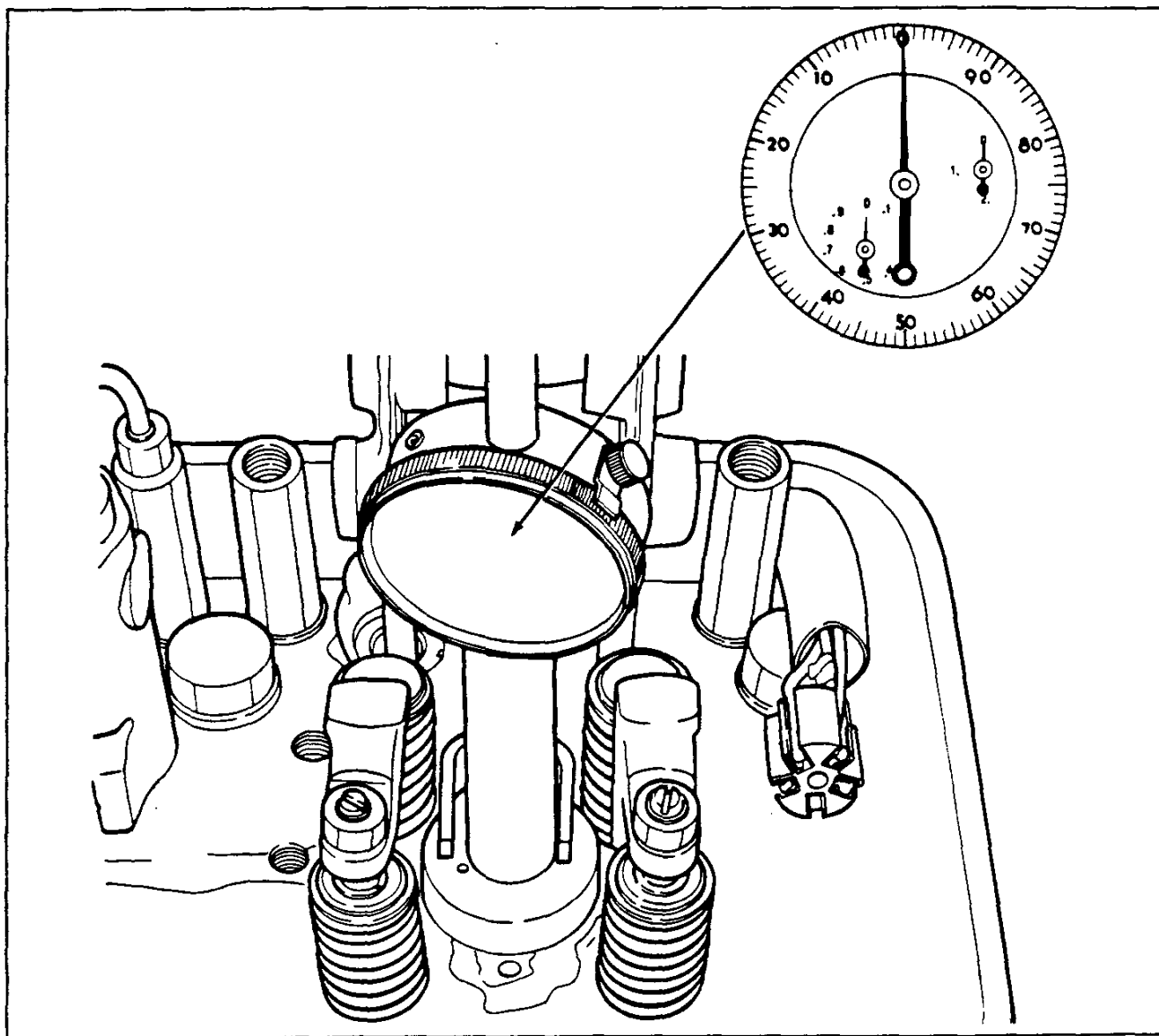


Figure 12

- b. Insert dial indicator tool into the injector bore, install injector hold-down crab and tighten the bolt.
- c. Turn the crankshaft slowly in the direction of rotation and note indicator movement. Stop turning when the dial hand just stops.
- d. Turn the crankshaft slowly, opposite the direction of rotation, until the dial indicator hand just starts to move. The piston is now at top-dead-center.

- e. Before piston downward travel can be measured, the dial indicator must be "zeroed." Loosen the clamp screw and remove the slotted spacer. Lower the dial indicator until the two smaller indicator hands are at "0" and the large hand is near "0" as shown in Figure 12.
 - f. Tighten the clamp screw and zero the large hand by turning the outer ring of the dial face. Tighten the bezel screw so the outer ring will not turn.
3. Turn the crankshaft slowly, in the direction of rotation, until the dial indicator pointer reads exactly 1.216" of piston travel as shown in Figure 13.

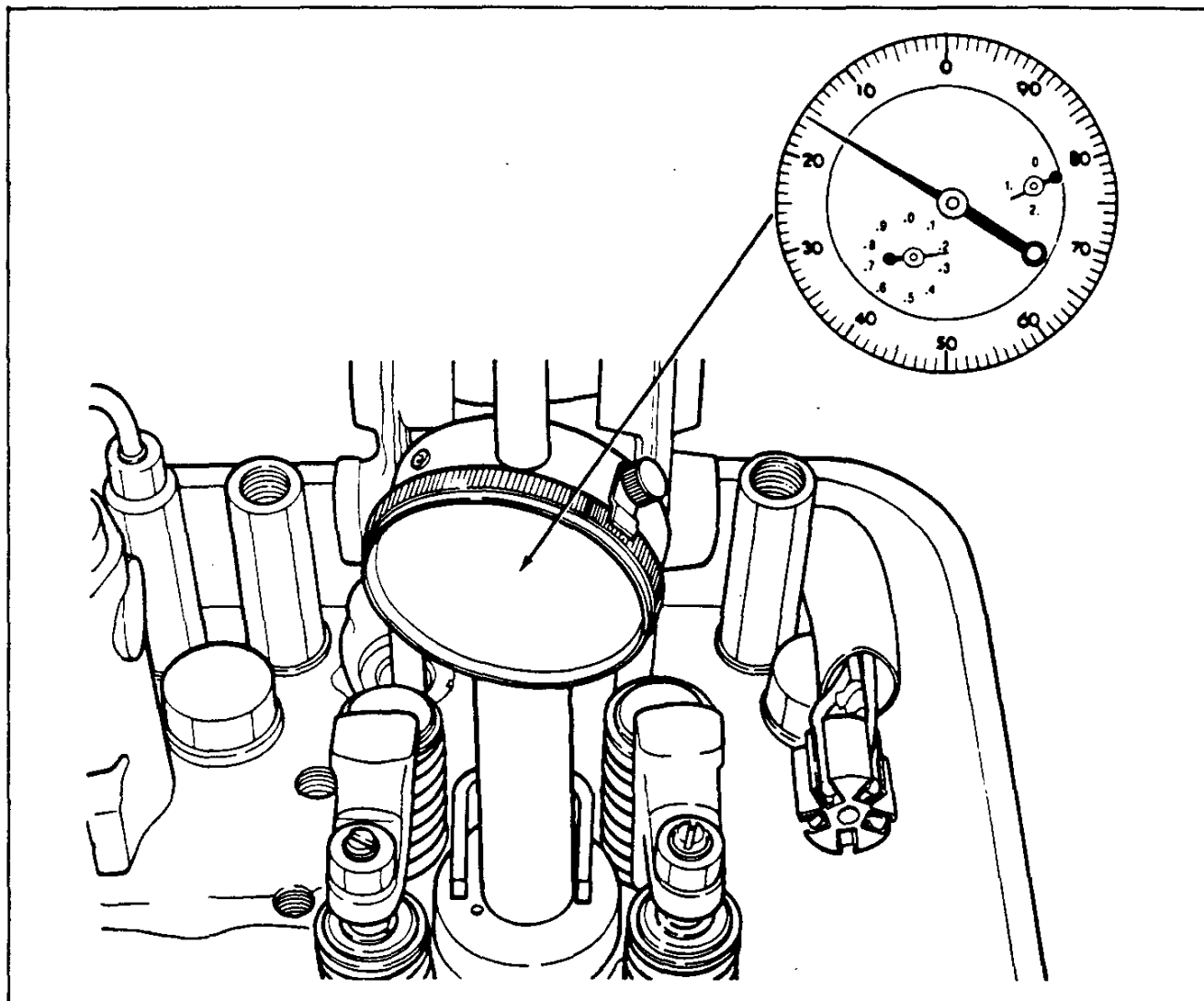


Figure 13

CAUTION: If the crankshaft pulley retaining bolt has loosened during the timing procedure, tighten it to the specified torque upon completion of the SRS/TRS positioning procedure following the instructions in Section 1.3.7 of the Series 92 Service Manual.

At this point, the teeth on the rear of the Pulse Wheel, located on the rear of the cam pulley, are in the proper location for positioning the sensors. The sensor bracket must be positioned correctly in relation to the engine front end plate. Use SRS/TRS Timing Tool No. J34729 to accomplish this task.

1. Tap the end of the camshaft pulley with a fiber mallet or rubber hammer to take up the camshaft end play.
2. Insert the SRS/TRS Timing Tool between the double teeth on the Pulse Wheel, and the TRS so that the groove at the rear of the tool slides over the teeth in the Pulse Wheel as shown in Figure 14.

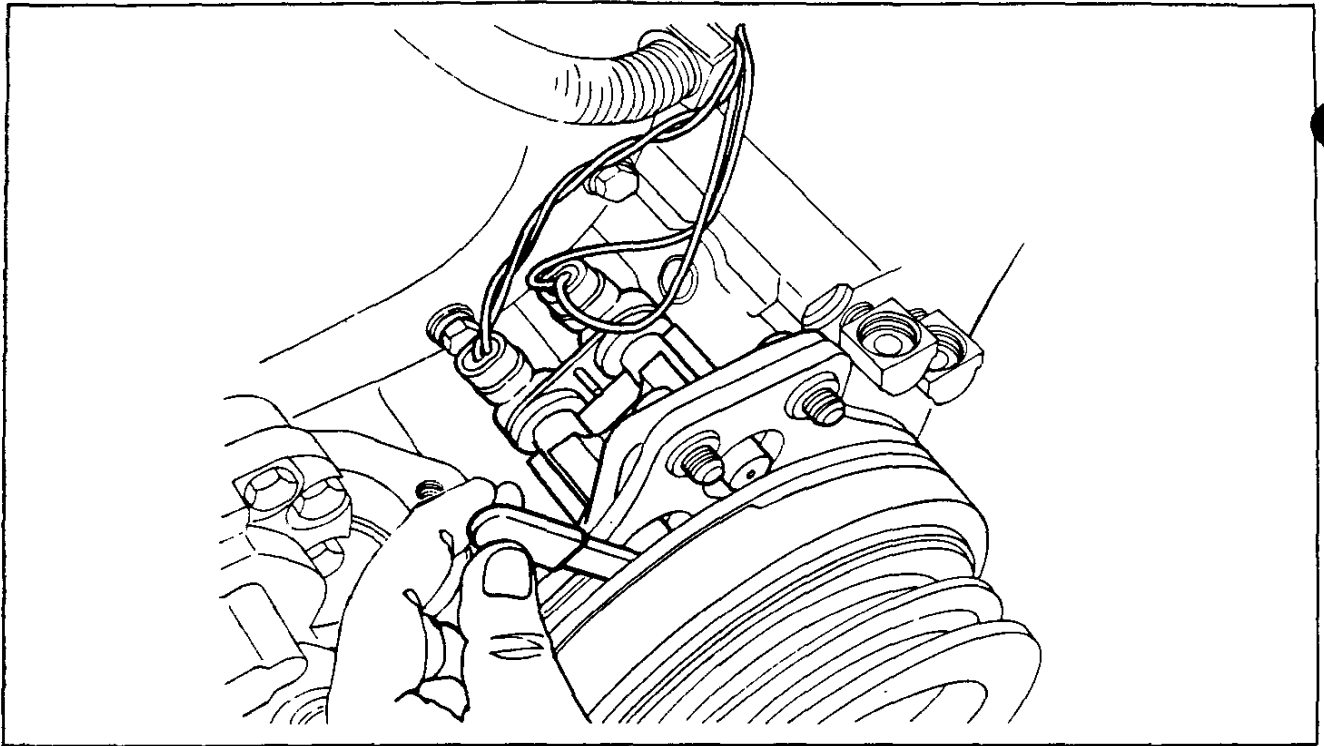


Figure 14

3. This operation is necessary if the sensor bracket has been loosened from its original mounting position. If the sensor bracket has not been loosened, go to Step 5. Position the SRS/TRS bracket so that the round end of the TRS is located in the half moon portion at the front of the Timing Tool as shown in Figure 15.

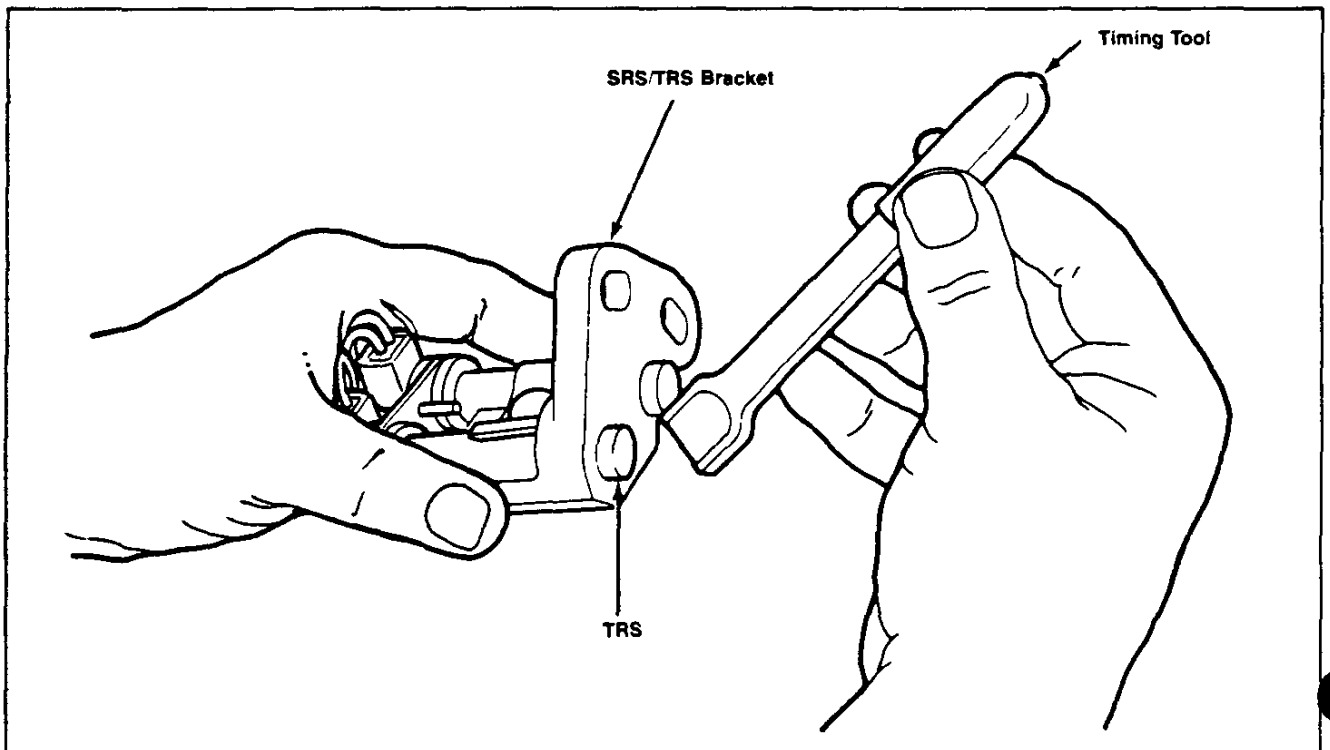


Figure 15

4. Tighten the two Allen bolts securing the SRS/TRS bracket to the engine front end plate.
5. Push gently on the end of the TRS so that the timing tool is in direct contact with the TRS and the raised metal teeth of the Pulse Wheel (Fig. 16).

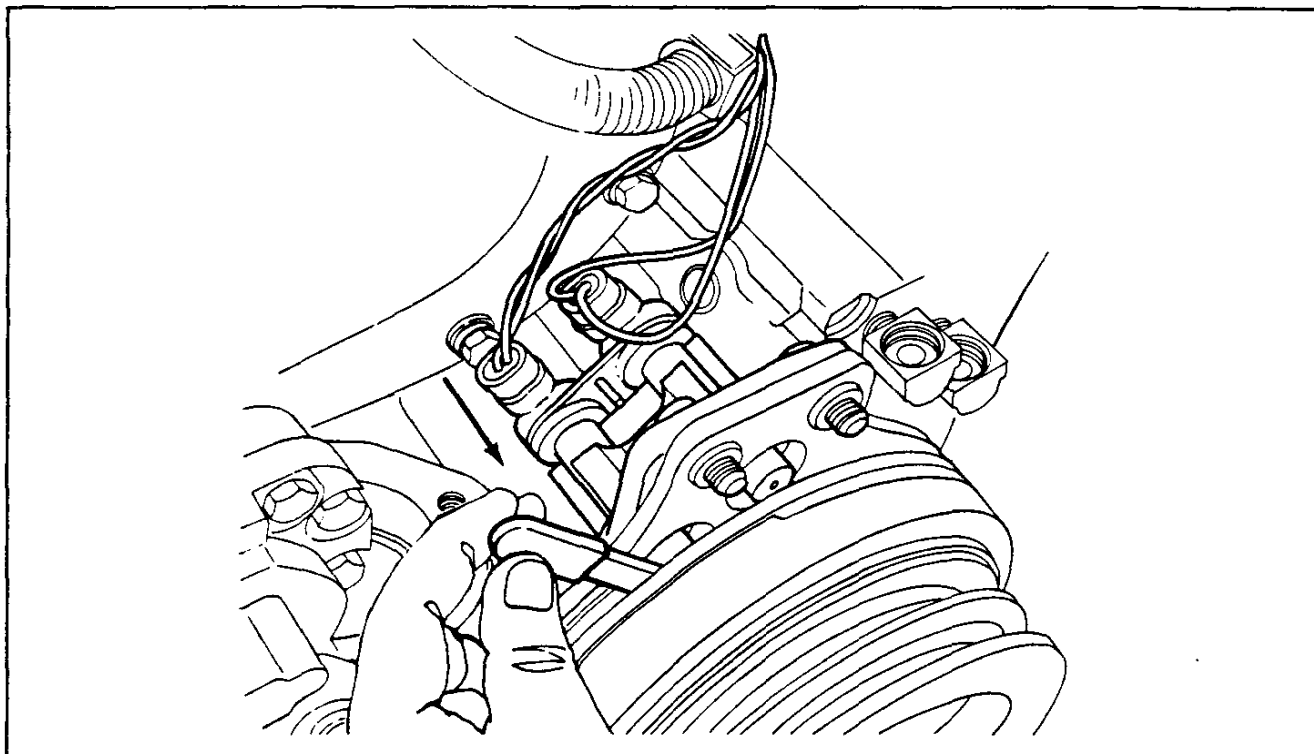


Figure 16

6. Tighten the sensor retaining clip socket head screw. If this adjustment has been done correctly, the resulting air gap between the pulse wheel teeth and the end of the sensor will be .020" ($\pm .002$).
7. Loosen and remove the injector crab hold-down bolt. Remove the injector crab.
8. Remove the Timing Tool.
9. Install the EUI, the ECM and related parts using the appropriate Sections of this Service Bulletin for reference.

Synchronous Reference Sensor (SRS) (71) Timing Reference Sensor (TRS)

The Synchronous Reference Sensor (SRS) and Timing Reference Sensor (TRS) are electronic components that send a signal to the ECM (Fig. 16A).

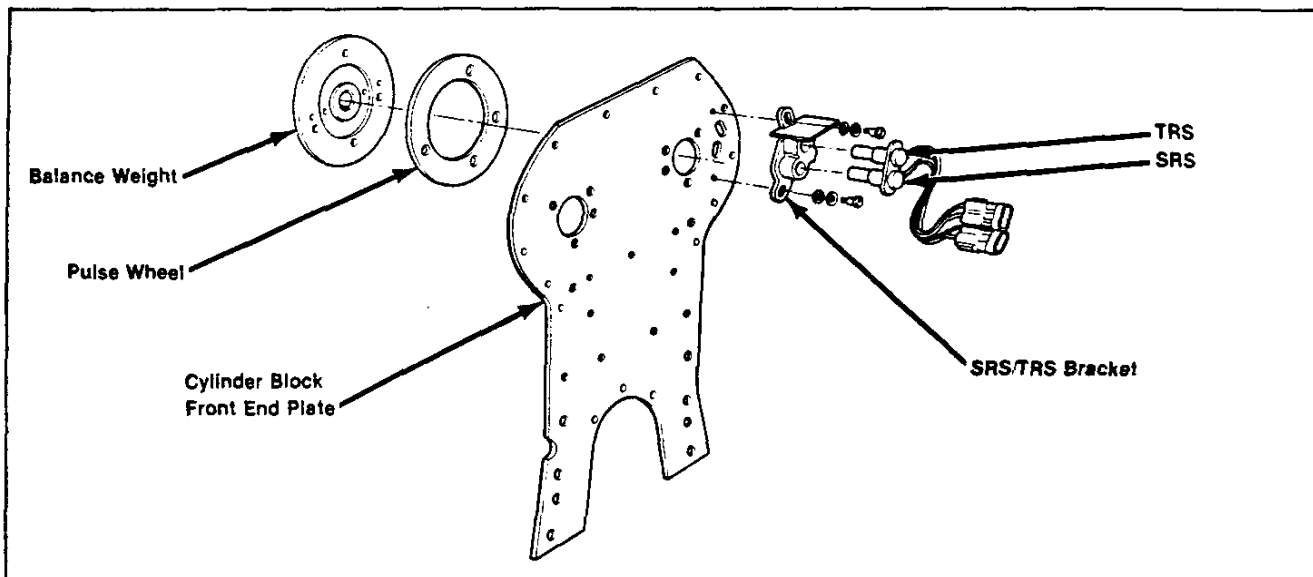


Figure 16A

The SRS references firing position for the number one piston. The TRS sends a signal to indicate the firing position for each piston. The SRS/TRS assembly is mounted through the engine front end plate at the top, right corner of the engine (Fig. 16B).

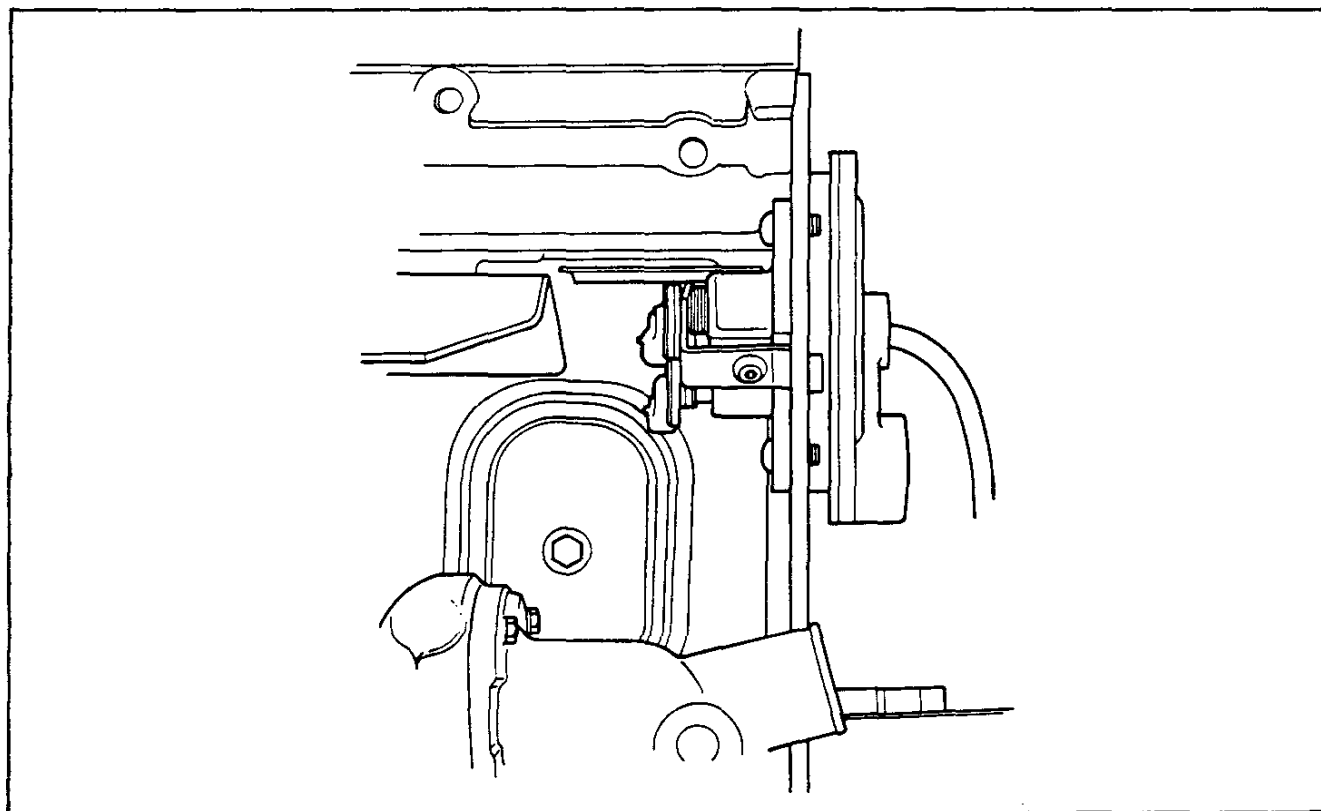


Figure 16B

The sensors can be identified by the color of the connector body. The SRS connector body is black while the TRS connector is gray. The sensor connectors are keyed to prevent improper installation to the engine wiring loom.

SRS/TRS Assembly Removal and Engine Timing Procedure

1. Loosen and remove the front cover.
2. Remove any hoses or fuel lines necessary to gain access to the sensors.
3. Disengage the locking tang on the SRS connector. Grasp the connector bodies and gently pull them apart. Repeat this procedure for the TRS.
4. Remove the SRS/TRS retaining screw and clip.
5. Remove the sensor assembly.
6. If the pulse wheel or engine front end plate has been removed or replaced, loosen the two sensor-retaining socket head screws.

SRS/TRS Installation

Use the tools shown in Figure 16C (DDEC Tool Kit) to perform the following operations:

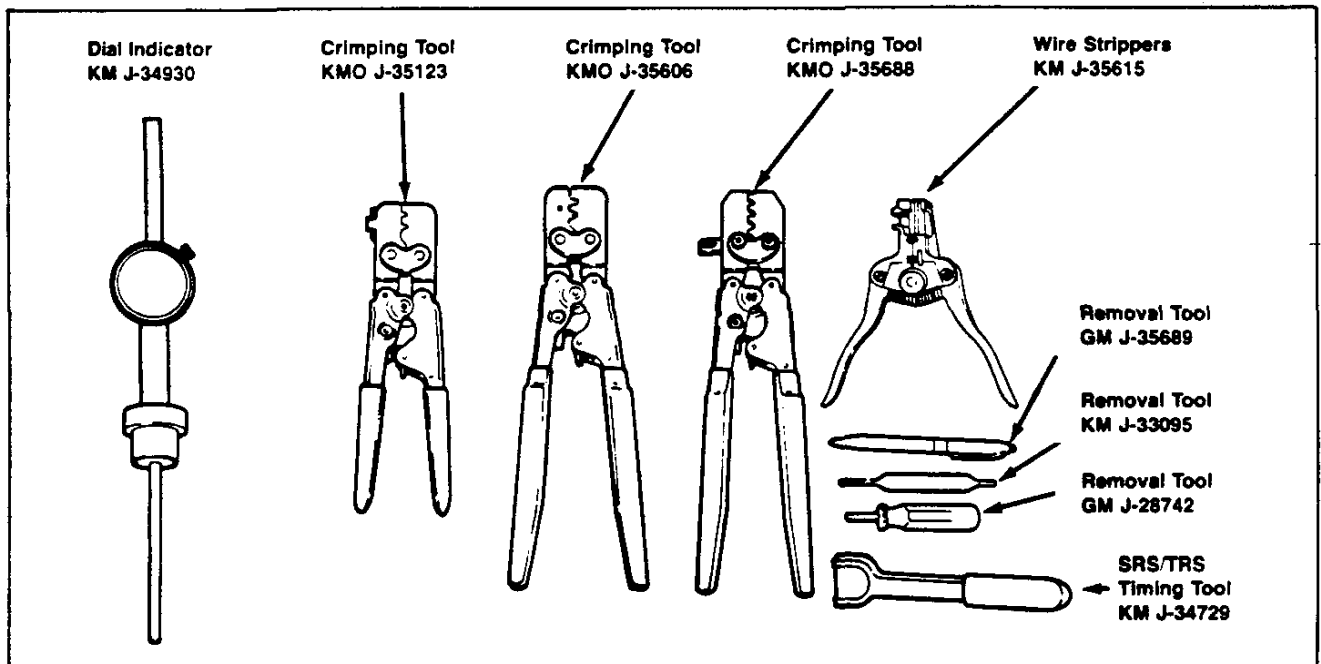


Figure 16C

1. Install the sensors assembly and retaining clip.
2. Install, but do not tighten, the retaining clip screw.

SRS/TRS Adjustment

Whenever a sensor assembly is replaced, it must be aligned in relationship to the teeth on the Pulse Wheel upon installation. Use the following instructions for sensor alignment.

1. Refer to Electronic Unit Injector Replacement in this bulletin and remove #4 injector:
2. Position the piston for this cylinder at top-dead-center, using Crankshaft Position Timing Tool, Kent-Moore tool J34930, as follows:
 - a. Install the slotted spacer on the chain between the dial indicator and the top of the holder. Tighten the clamp screw.

NOTE: Failure to insert the spacer could result in damage to the dial indicator if the piston is already at the top of travel when the tool is installed.

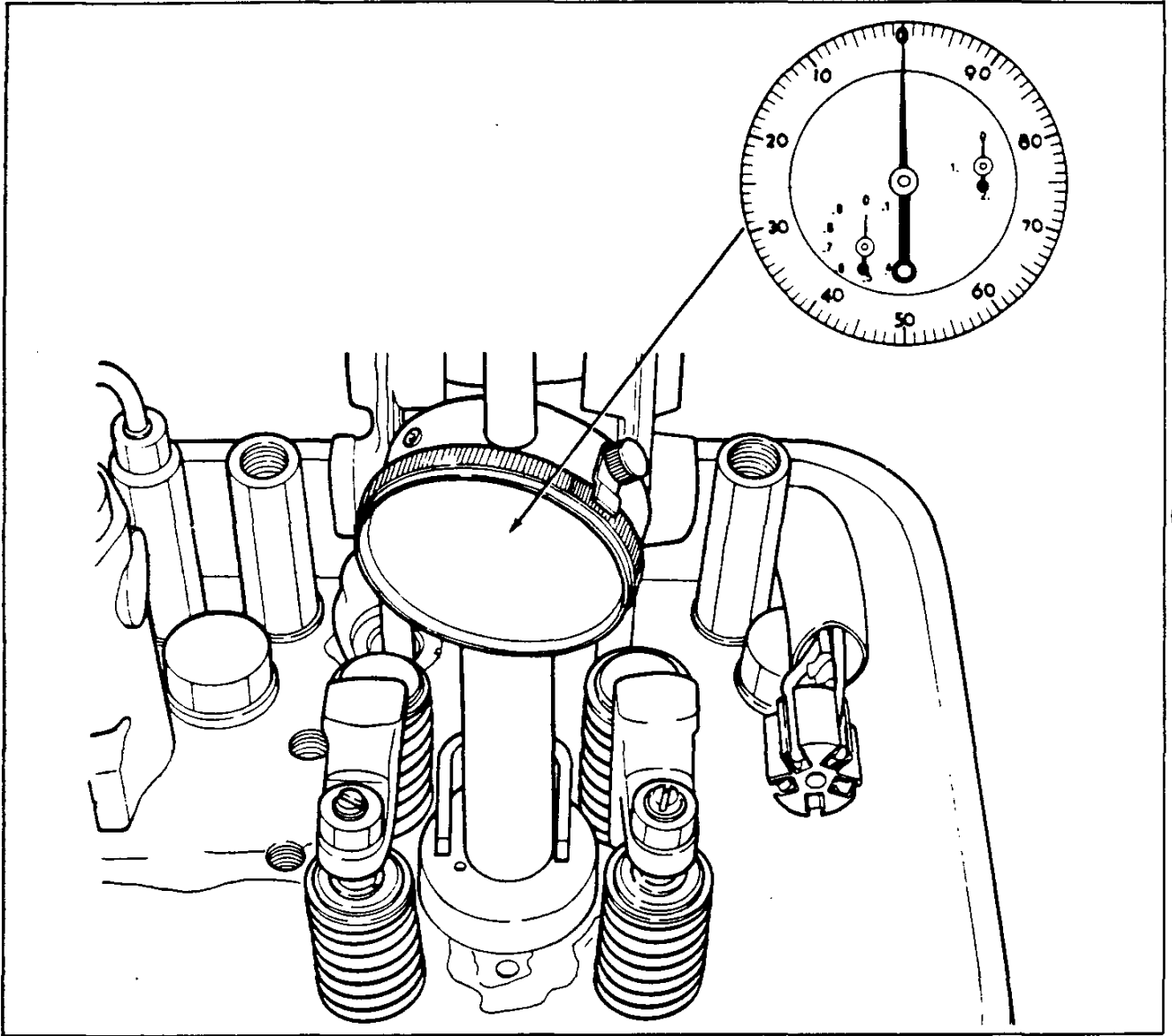


Figure 16D

- b. Insert dial indicator tool into the injector bore, install injector hold-down crab and tighten the bolt.
- c. Turn the crankshaft slowly in the direction of rotation and note indicator movement. Stop turning when the dial hand just stops.
- d. Turn the crankshaft slowly, opposite the direction of rotation, until the dial indicator hand just starts to move. The piston is now at top-dead-center.

- e. Before piston downward travel can be measured, the dial indicator must be "zeroed." Loosen the clamp screw and remove the slotted spacer. Lower the dial indicator until the two smaller indicator hands are at "0" and the large hand is near "0" as shown in Figure 16D.
 - f. Tighten the clamp screw and zero the large hand by turning the outer ring of the dial face. Tighten the bezel screw so the outer ring will not turn.
3. Turn the crankshaft slowly, in the direction of rotation, until the dial indicator pointer reads exactly 1.077" of piston travel as shown in Figure 16E.

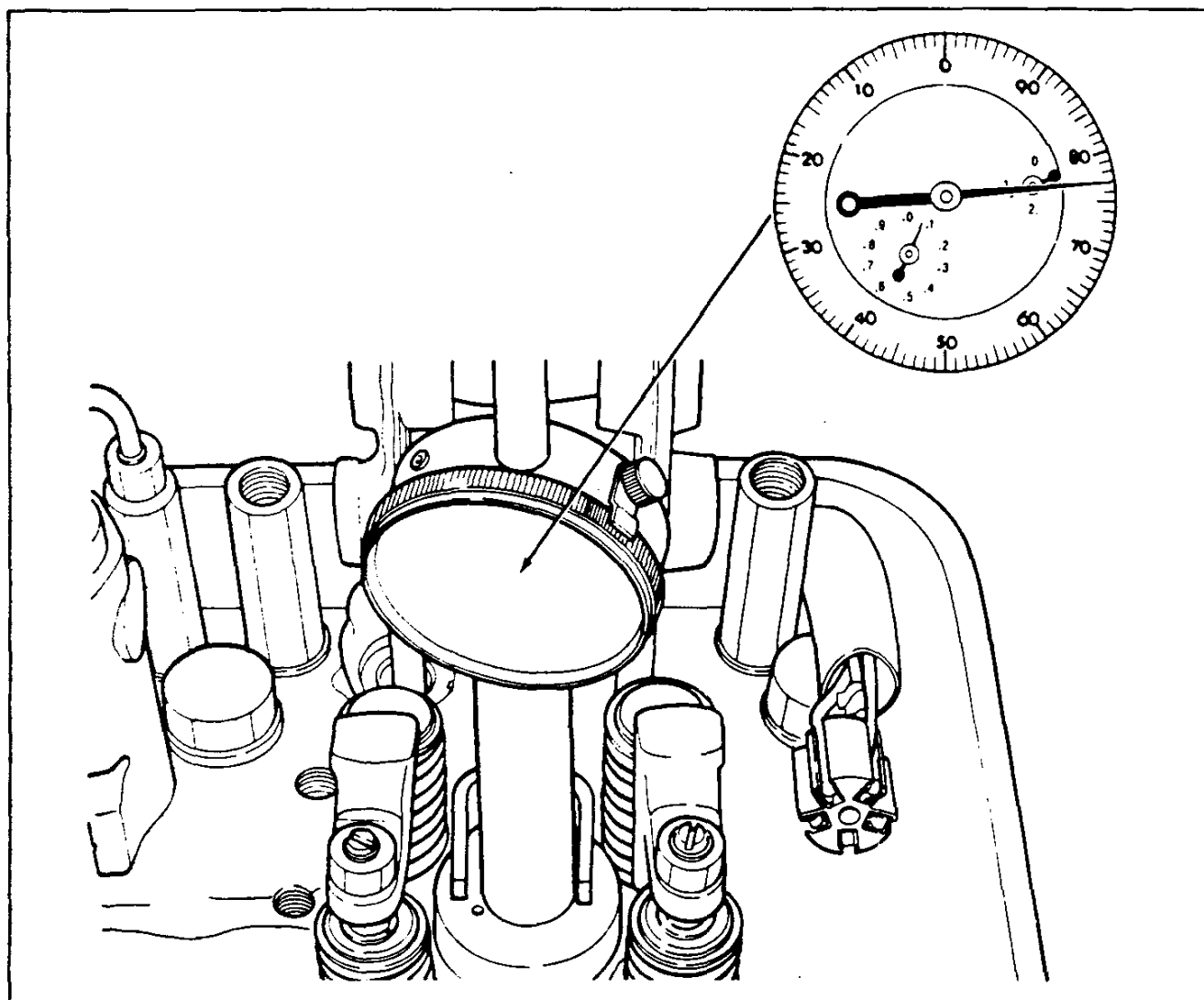


Figure 16E

CAUTION: If the crankshaft pulley retaining bolt has loosened during the timing procedure, tighten it to the specified torque upon completion of the SRS/TRS positioning procedure following the instructions in Section 1.3.7 of the Service Manual.

At this point, the teeth on the rear of the Pulse Wheel, located on the rear of the balance weight, are in the proper location for positioning the sensors. The sensor bracket must be positioned correctly in relation to the engine front end plate. Use SRS/TRS Timing Tool No. J34729 to accomplish this task.

1. Tap the end of the balance weight with a fiber mallet or rubber hammer to take up the balance shaft end play.
2. Insert the SRS/TRS Timing Tool between the double teeth on the Pulse Wheel, and the TRS so that the groove at the rear of the tool slides over the teeth in the Pulse Wheel as shown in Figure 16F.

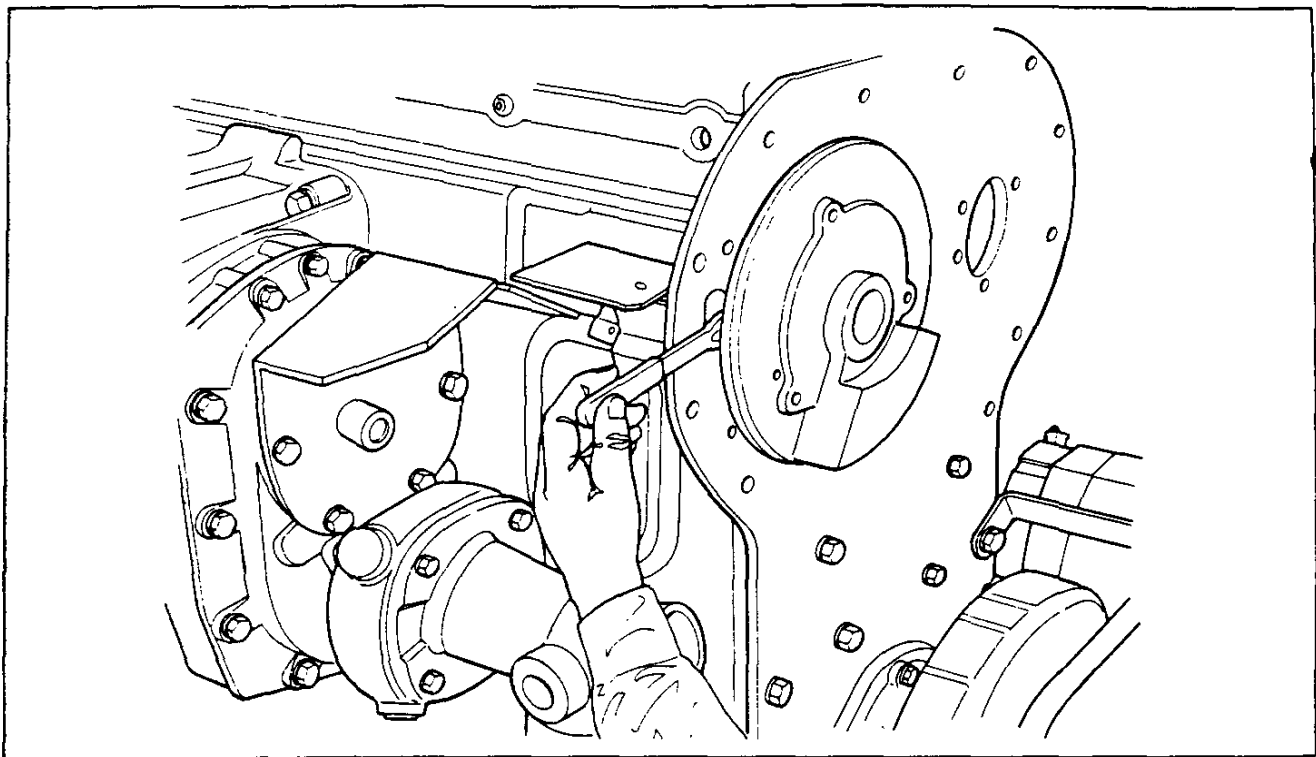


Figure 16F

3. This operation is necessary if the sensor bracket has been loosened from its original mounting position. If the sensor bracket has not been loosened, go to Step 5. Position the SRS/TRS bracket so that the round end of the TRS is located in the half moon portion at the front of the Timing Tool as shown in Figure 16G.

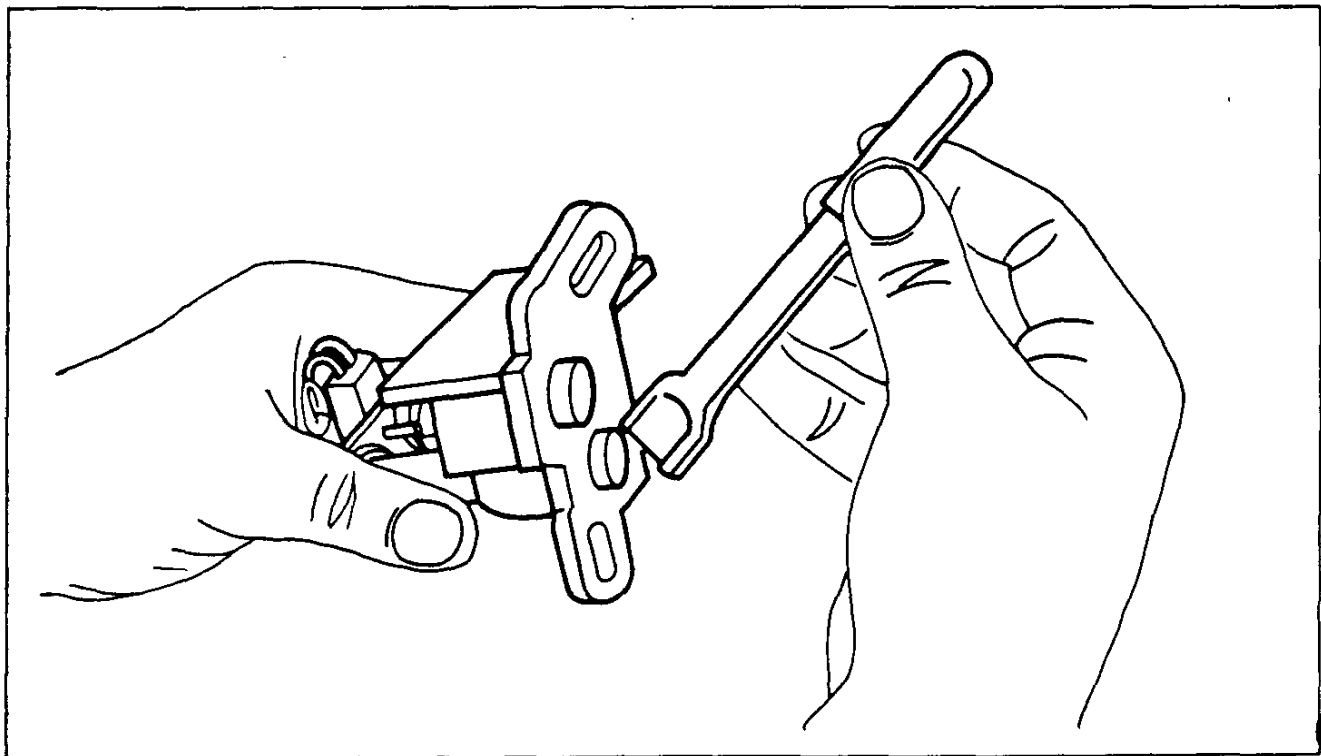


Figure 16G

4. Tighten the two Allen bolts securing the SRS/TRS bracket to the engine front end plate.
5. Push gently on the end of the TRS so that the timing tool is in direct contact with the TRS and the raised metal teeth of the Pulse Wheel (Fig. 16H).

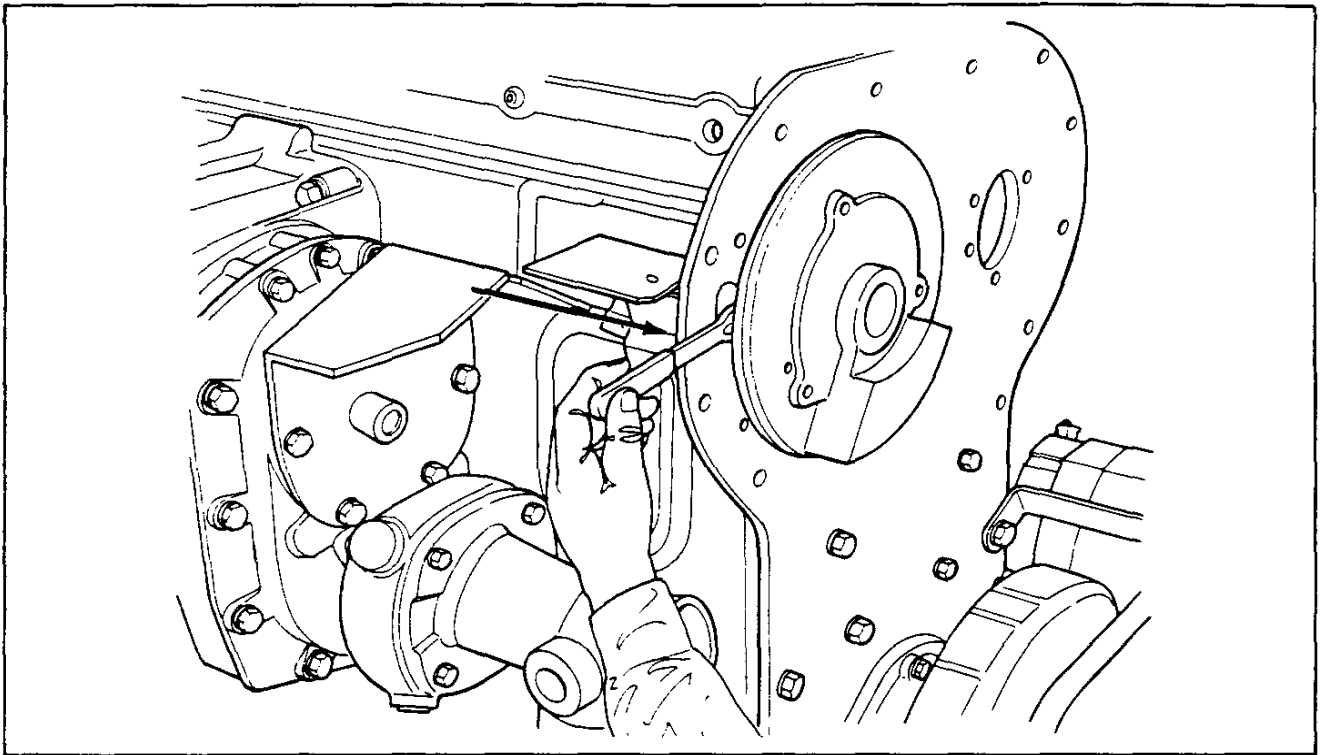
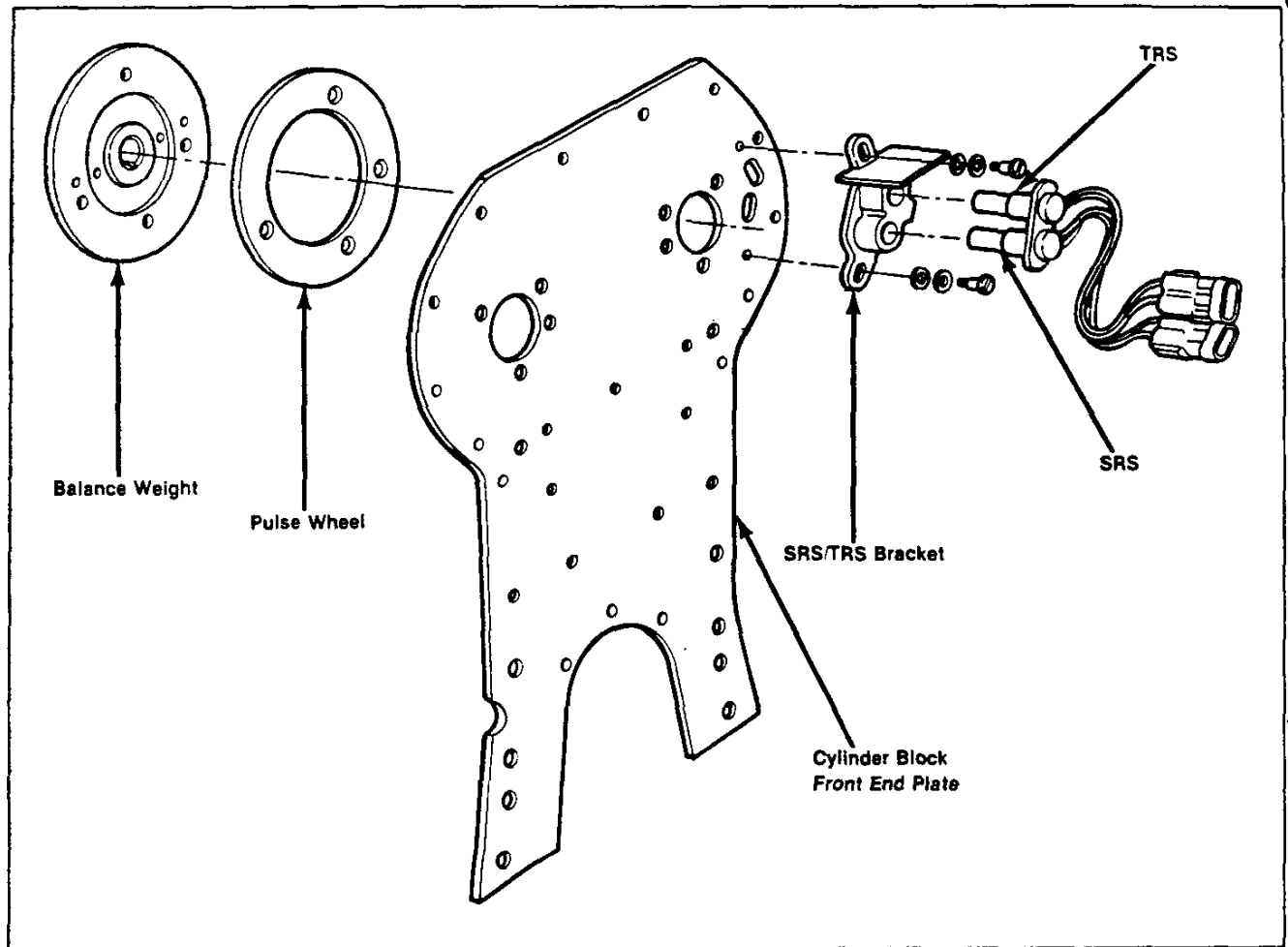


Figure 16H

6. Tighten the sensor retaining clip socket head screw. If this adjustment has been done correctly, the resulting air gap between the pulse wheel teeth and the end of the sensor will be .020" ($\pm .002$ ").
7. Loosen and remove the injector crab hold-down bolt. Remove the injector crab.
8. Remove the Timing Tool.
9. Install the EUI in the front cover and related parts using the appropriate Sections of this Service Bulletin for reference.

Cylinder Block Front End Plate (71)

DDEC equipped 71 engines utilize a new design front end plate that incorporated holes used for mounting the SRS/TRS and bracket assembly (Fig. 17).



Cylinder Block Front End Plate and Relative Location of Parts

Figure 17

Cylinder Block Front End Plate Removal

With the exception of the sensor mounting bracket, DDEC equipped engine front end plates are removed and replaced in the same manner as mechanical governed engines. Refer to Section 1.1.1 of the Service Manual for removal and installation instructions.

Synchronous Reference Sensor (SRS) (60)

The Synchronous Reference Sensor (SRS) is an electronic component that sends a signal to the ECM. The SRS is mounted to the rear of the gear case just below the fuel pump drive (Fig. 18).

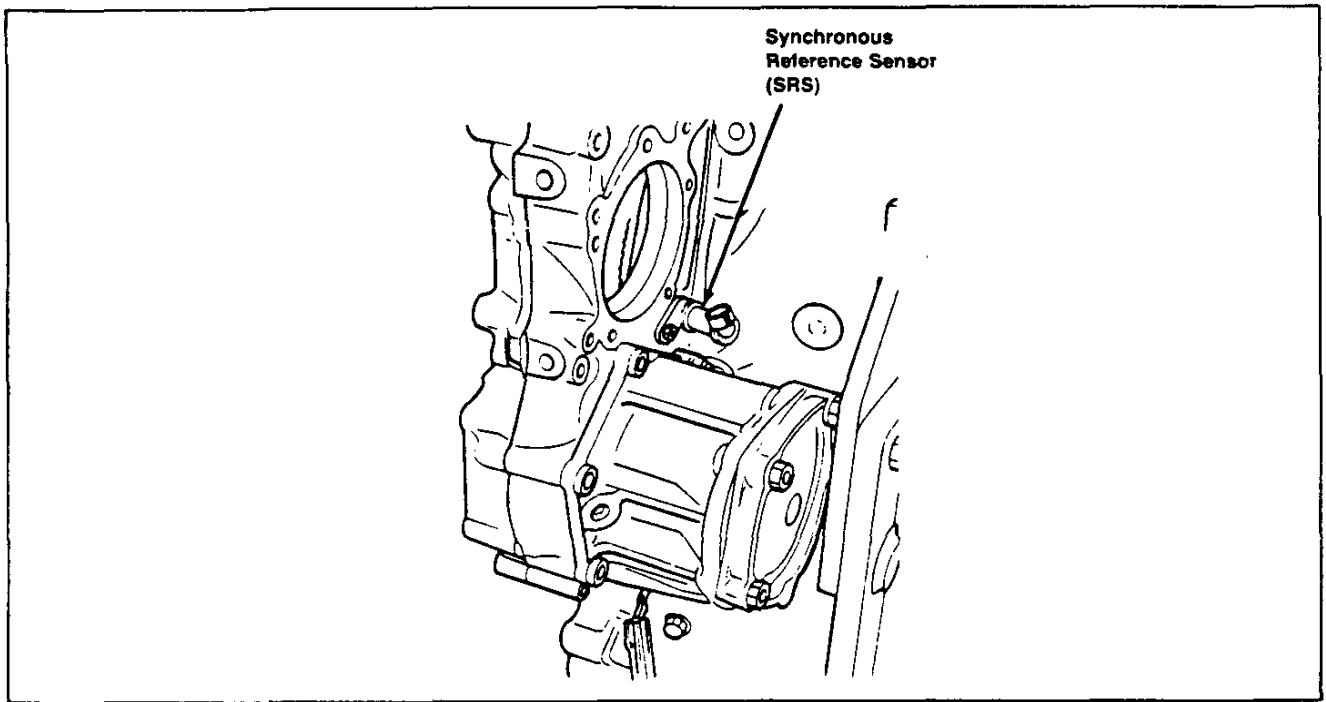


Figure 18

The SRS signal references firing position for the number one piston. This signal is generated by a raised metal pin on the rear of the bull gear. (Fig. 19).

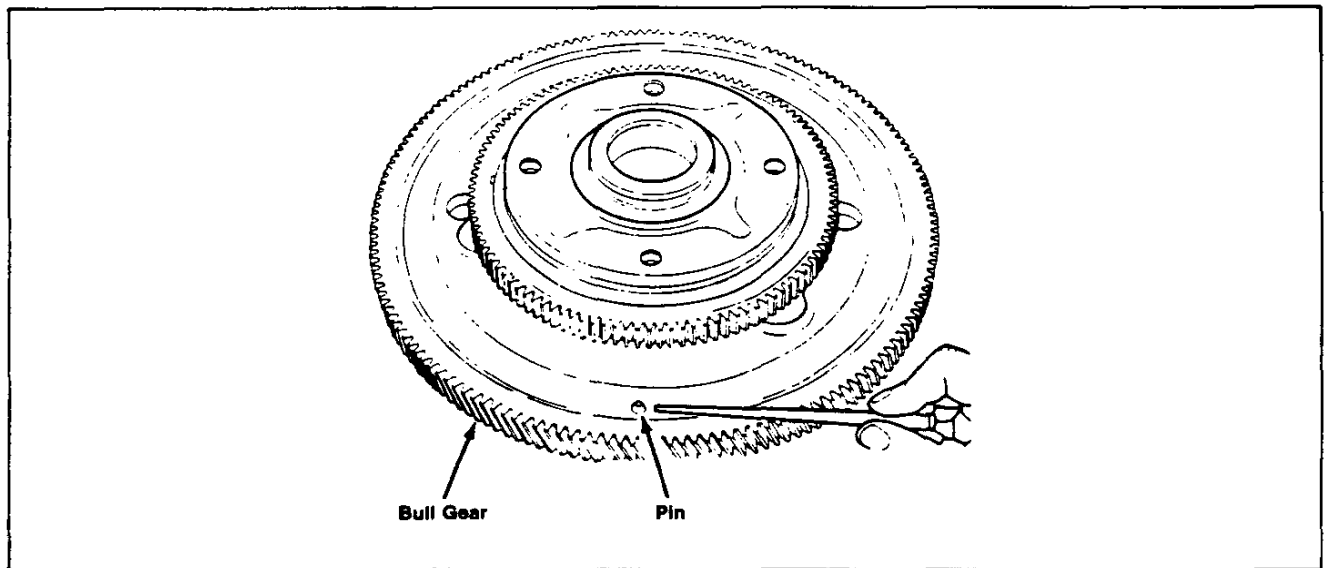


Figure 19

Timing Reference Sensor (TRS) (60)

The Timing Reference Sensor (TRS) is an electronic component that sends a signal to the ECM. The TRS is mounted to the left side of the gear case, near the crankshaft center line (Fig. 20).

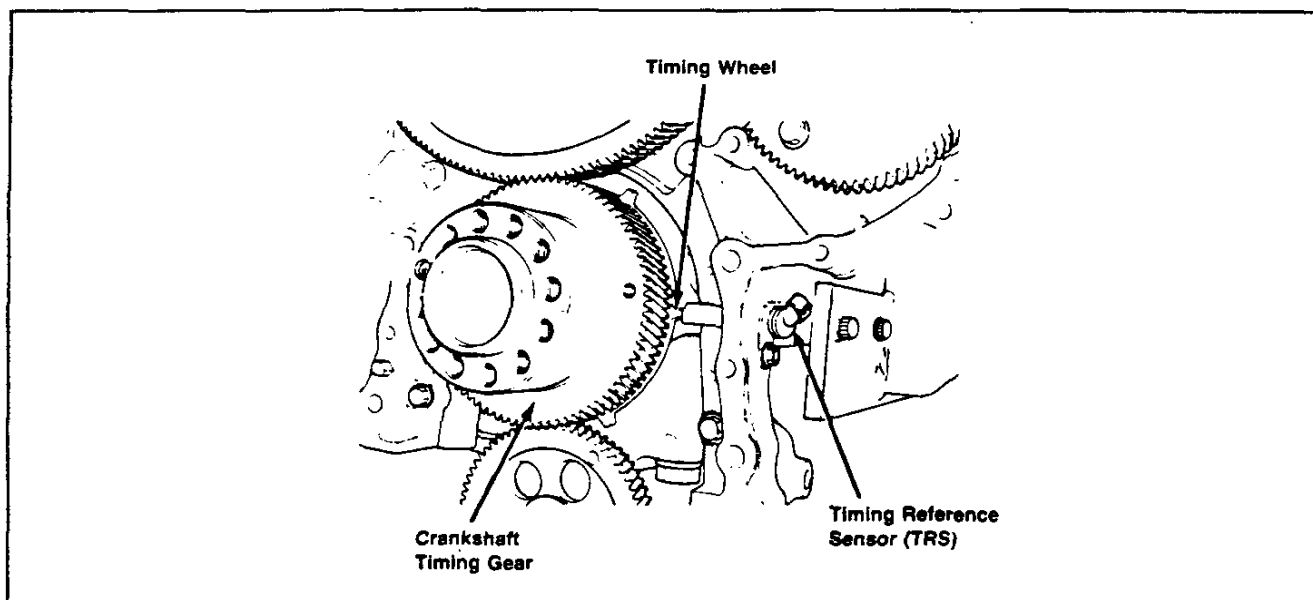


Figure 20

The TRS signal references firing position for each piston. This signal is generated by a series of evenly spaced teeth on the timing wheel. The timing wheel is mounted on the crankshaft, directly behind the crankshaft timing gear.

SRS/TRS Removal

1. Disengage the locking tang on the SRS/TRS connector. Grasp the connector bodies and gently pull them apart.
2. Remove the bolt that secures the SRS/TRS to the gear case.
3. Remove the SRS/TRS by pulling it straight out of the gear case.

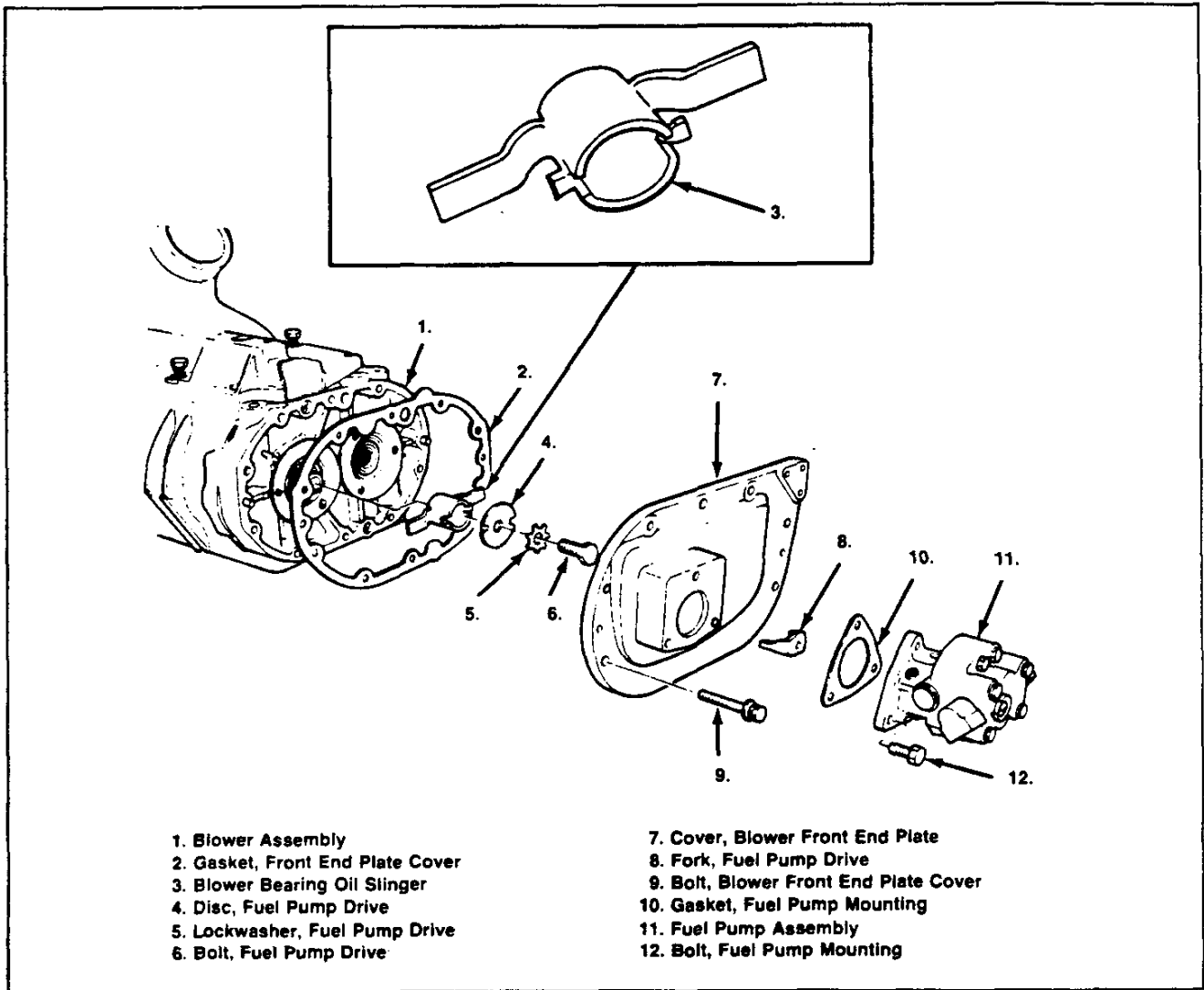
SRS/TRS Installation

1. The SRS and TRS are electronic components. Use care upon installation.
2. Insert the SRS/TRS into the gear case and index the hole in the bracket with the hole in the gear case.
3. Insert the SRS/TRS bolt and tighten it to 22-28 lbs. ft., 30-38 N•m torque.
4. Plug the connectors together, making sure the locking tang clicks into place.

NOTE: The SRS and TRS are non-serviceable items and each is replaced as a unit. No adjustment is required.

Blower Front End Plate Cover (92)

As no governor is required on DDEC-equipped engines, a blower front end plate cover that replaces the governor housing is installed. In addition, the spacer between the fuel pump drive disc and the blower rotor shaft has been changed to include extensions that act as oil slingers. This part is now called the blower bearing oil slinger.



Blower Front End Plate Cover and Relative Location of Parts

Figure 21

Blower Front End Plate Cover Removal

Use the following instructions to replace the blower front end plate cover and/or blower bearing oil slinger:

1. Open the drain cocks and drain the engine cooling system.
2. Refer to the ECM Replacement Section of this Service Bulletin and remove the heat shield, cold plate, ECM and ECM bracket.
3. Remove any accessories attached to the cylinder head, blower front end plate cover or front of the engine that interfere with the removal of the blower front end plate cover.

4. Disconnect and remove the fuel oil lines attached to the fuel pump and the crossover fuel oil line attached to each cylinder head.
5. Remove the ten bolts and washers securing the blower front end plate cover to the blower.
6. Tap the sides of the blower front end plate cover slightly with a plastic hammer to loosen it from the blower front end plate. Then pull the cover and fuel pump assembly straight out from the dowels in the blower end plate. Remove the cover to blower front end plate gasket.

NOTE: The fuel pump drive coupling fork may stay on either the fuel pump or the blower rotor shaft. Remove the drive coupling fork.

7. Remove the three bolts securing the fuel pump assembly to the blower front end plate cover. Remove the fuel pump and gasket from the cover.
8. Bend up the tang on the fuel pump drive bolt lock washer.
9. Loosen and remove the fuel pump drive bolt. Remove the drive bolt lock washer, fuel pump drive disc and blower bearing oil slinger.

Inspection

1. Clean all of the parts in solvent and dry them with compressed air. Clean any gasket material from the mating surfaces of the parts.
2. Inspect the parts for signs of excessive wear or stress cracks. Replace as necessary.

Blower Front End Plate Cover Installation

1. Affix a new gasket to the bolting flange of the fuel pump. Place the fuel pump against the blower front end plate cover in its original position and secure it in place with the three bolts and washers. Tighten the bolts to 13-17 lb-ft, 18-23 N•m torque.
2. Install the blower bearing oil slinger, fuel pump drive disc, lock washer and drive bolt to the rotor shaft.
3. Tighten the fuel pump drive bolt to 55-65 lb-ft, 75-88 N•m torque.
4. Bend one tang of the lock washer down on a flat of the drive bolt as shown in Figure 22.

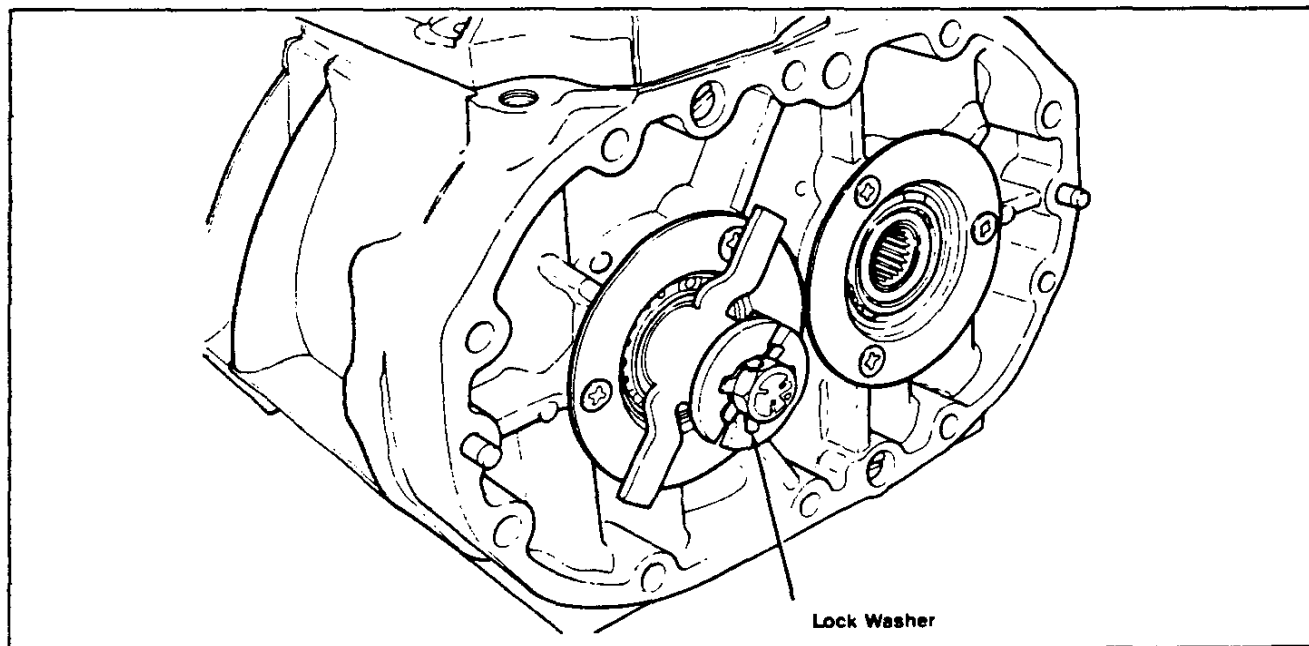


Figure 22

5. Affix a new gasket to the forward face of the blower end plate.
6. Place the fuel pump drive fork on the fuel pump shaft. Position the blower end plate cover and fuel pump assembly in front of the blower. Rotate the fuel pump drive fork until the prongs of the fork align with the slots in the drive disc.
7. Push the blower end plate cover straight in over the dowels in the blower end plate and against the gasket.
8. Install the bolts and lock washers securing the blower end plate cover to the blower end plate. Tighten the bolts to 14-17 lb-ft, 18-23 N•m torque.
9. Install and connect the crossover fuel oil line to each cylinder head and connect the fuel oil lines to the fuel pump.
10. Place the coolant bypass tube between the two thermostat housings and slide the hoses part way on the thermostat housings. Position the bypass tube so it clears the blower front end plate cover, fuel pump and fuel oil lines. Then tighten the hose clamps.
11. Install all of the accessories that were removed from the cylinder head, blower front end plate cover or the front end of the engine.
12. Close the petcocks. Refer to Section 5 of the Service Manual or the vehicle manufacturer's instructions, and refill the cooling system to the proper capacity.

Electronic Unit Injector (EUI) (92, 71)

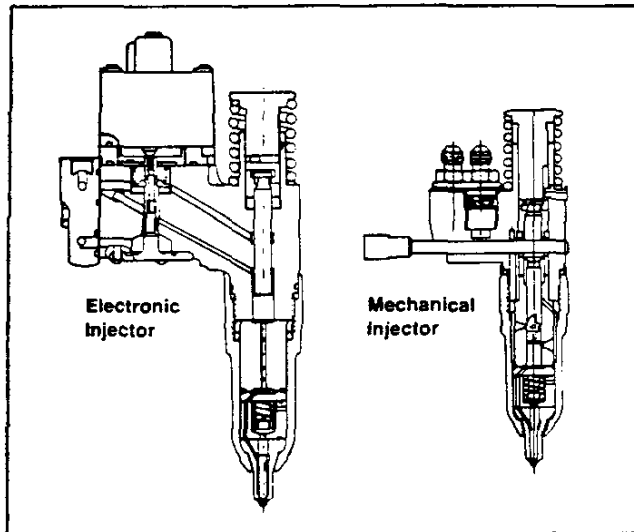


Figure 23

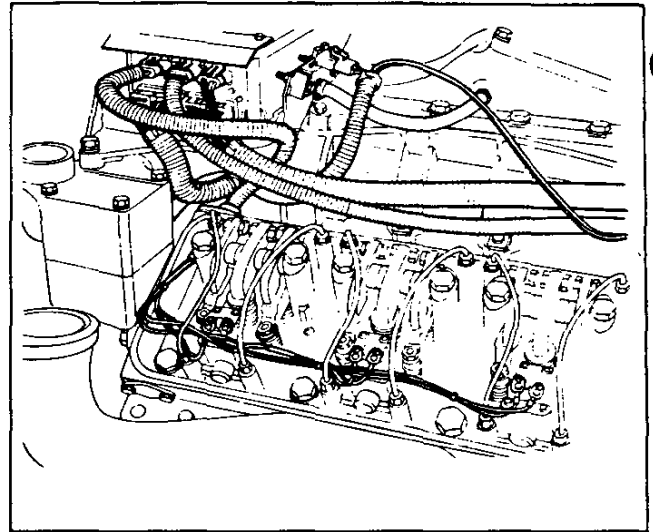


Figure 24

Remove Injector

The Electronic Unit Injector is removed in the same way as the mechanical injector as described in the service manual.

There are 2 exceptions to the above:

1. When you remove the fuel jumper lines do not lose the "O" ring seal under the flange on each end of the tube.
2. You will need to loosen the two wire terminal retaining screws. Two turns will be enough to remove the terminal. These screws are not designed to be removed so loosen them just enough to remove the terminal.

Install Injector

Install the EUI in the same way as a MUI, use the same precautions like being sure the injector tubes are clean and the seats are in good condition. See Service Manual for details.

There is no locating dowel on the under side of the EUI.

You must locate the injector visually for equal clearance between the valve springs.

Tighten injector crab bolt 20/25 ft. lbs.

Tighten the rocker shaft bolts to 90/100 ft. lbs.

Tighten the jumper tube nuts to 12/15 ft. lbs. (Be sure the "O" ring seal is in place at each end of the tube.)

Time the injector to 1.460 — (Tool J-1853).

Lash valves.

Electronic Unit Injector (EUI) (60)

The DDEC II Electronic Unit Injector for the Series 60 is identical to the DDEC I injector. Refer to the Series 60 Service Manual for removal and installation instructions.

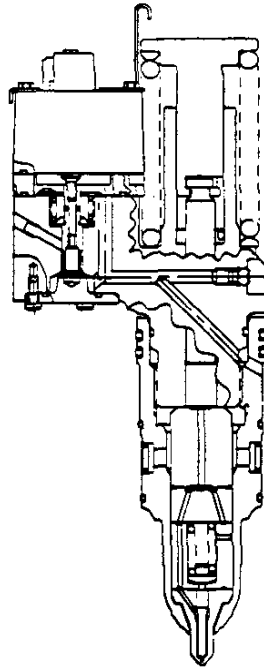


Figure 25

Turbo Boost Pressure Sensor (TBS) (92)

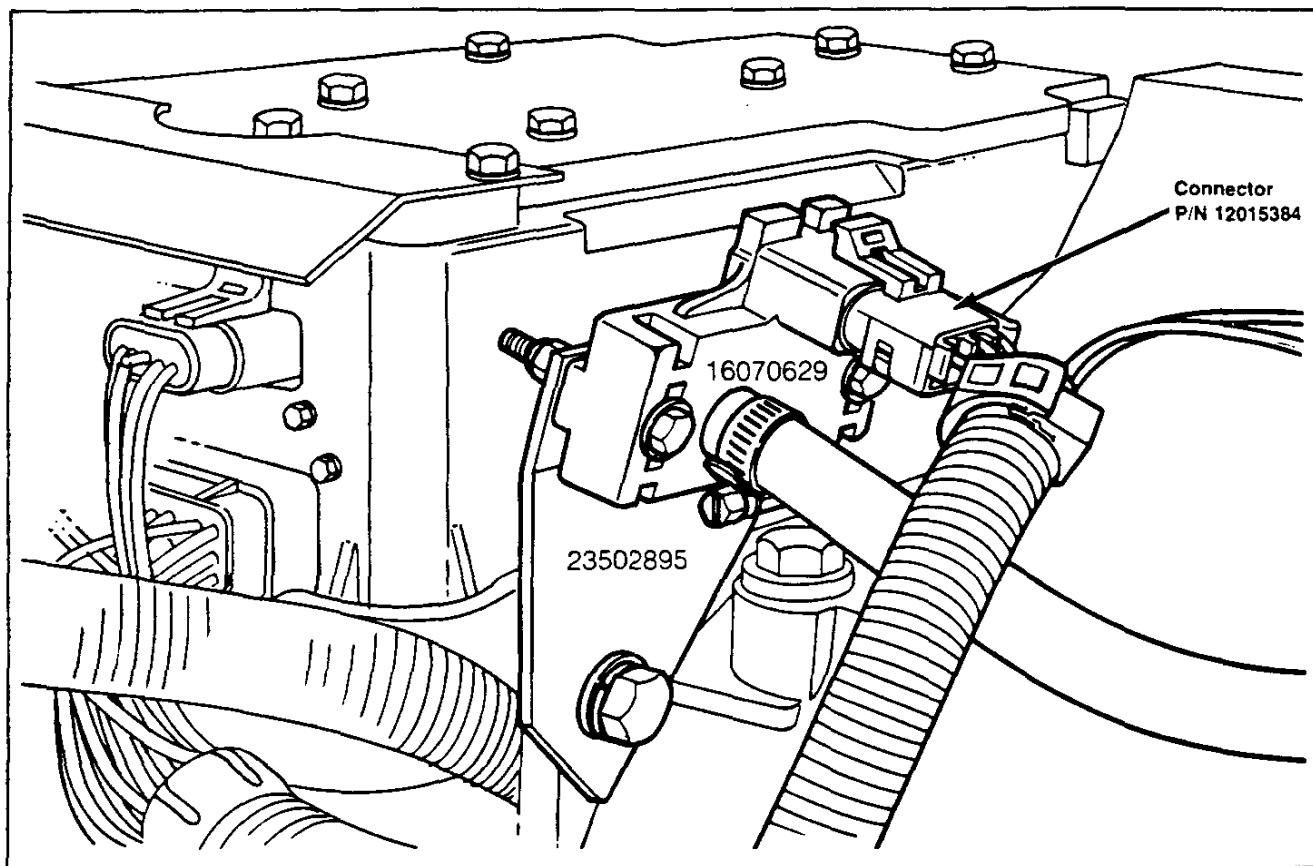


Figure 26

TBS Removal

1. Remove the clamp on the air pressure line at the sensor body. Pull the hose off.
2. Disengage the locking tang on the connector body. Grasp the terminal body and gently pull it from the sensor.
3. Loosen and remove the two nut and bolt assemblies holding the sensor to the bracket and remove the sensor.

TBS Installation

1. The TBS is an electronic device. Use care on installation.
2. Reverse the removal procedure for installation.
3. Carefully route the sensor hose from the connector at the blower inlet manifold. Do not allow loops or kinks or sags in the hose.

Turbo Boost Pressure Sensor (TBS) (71)

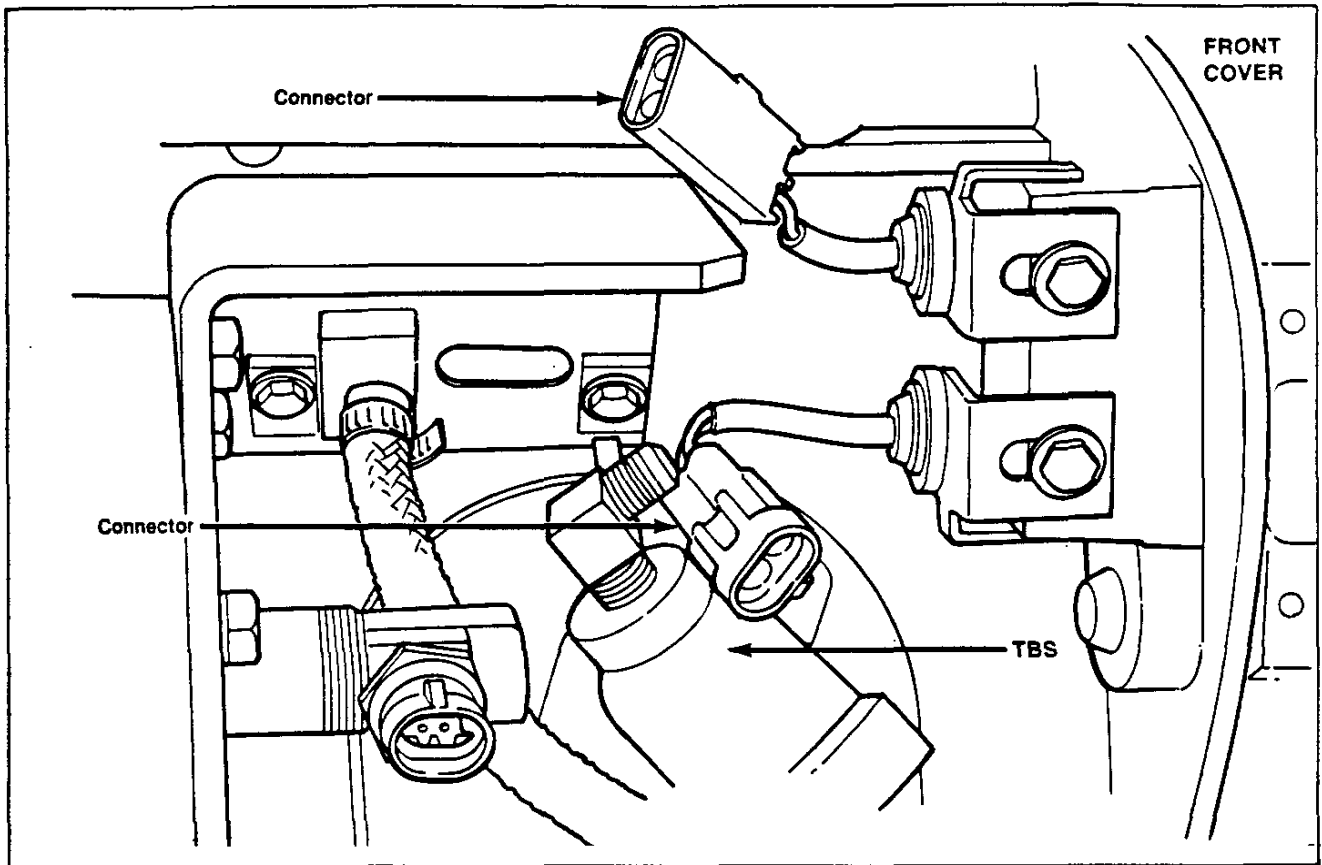


Figure 26A

TBS Removal

1. Remove the clamp on the air pressure line at the sensor body. Pull the hose off.
2. Disengage the locking tang on the connector body. Grasp the terminal body and gently pull it from the sensor.
3. Loosen and remove the two nut and bolt assemblies holding the sensor to the bracket and remove the sensor.

TBS Installation

1. The TBS is an electronic device. Use care on installation.
2. Reverse the removal procedure for installation.
3. Carefully route the sensor hose from the connector at the blower inlet manifold. Do not allow loops or kinks or sags in the hose.

Turbo Boost Pressure Sensor (TBS) (60)

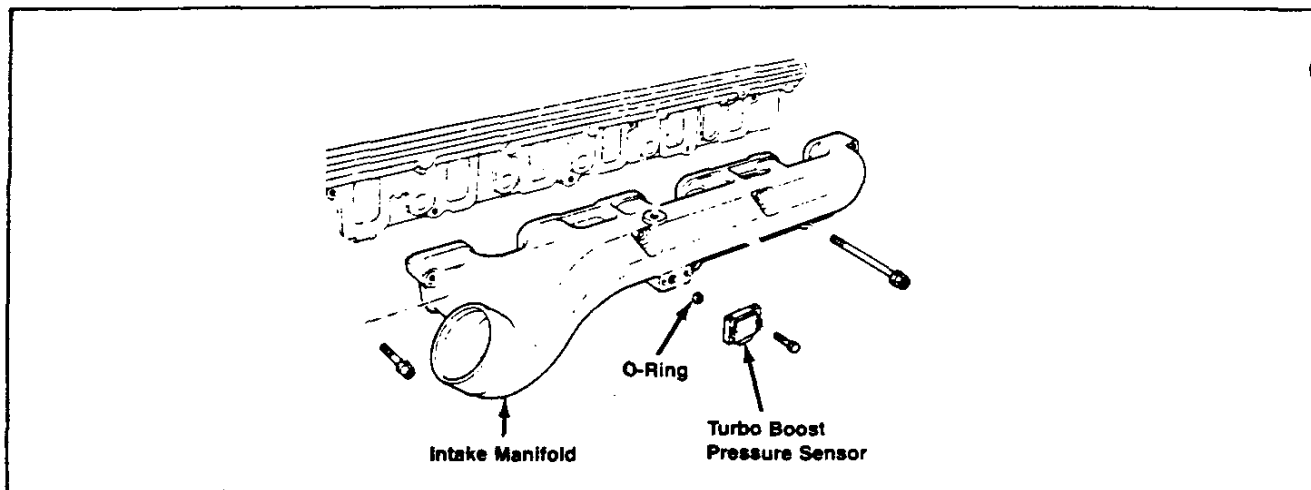


Figure 27

TBS Removal

1. Remove the clamp on the air pressure line at the sensor body. Pull the hose off.
2. Disengage the locking tang on the connector body. Grasp the terminal body and gently pull it from the sensor.
3. Loosen and remove the two nut and bolt assemblies holding the sensor to the bracket and remove the sensor.

NOTE: Be careful not to lose the O-ring.

TBS Installation

1. The TBS is an electronic device. Use care on installation.
2. Reverse the removal procedure for installation.

NOTE: Do not overtighten the bolts that mount the TBS to the intake manifold. Damage to the TBS may result. Torque the bolts to no more than 24-30 kg-cm (21-26 in-lb) torque.

Oil Temperature Sensor (OTS) Water Temperature Sensor (WTS) Fuel Temperature Sensor (FTS) (60, 92, 71)

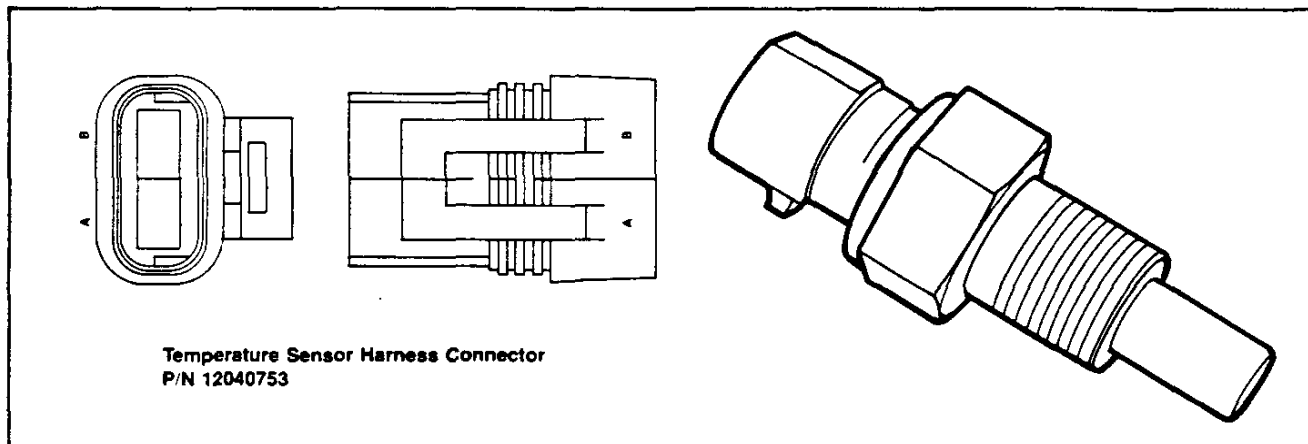


Figure 28

The oil temperature sensor is also used as a water or fuel temperature sensor. The oil temperature sensor is normally mounted in the front oil gallery to turbo oil feed line on Series 92 engines. (1) On Series 60 engines it is mounted in the oil gallery at the left rear corner of the cylinder block. If used as a water temperature sensor it will be mounted in a thermostat housing. The fuel temperature sensor is mounted in the secondary fuel filter on the Series 92 and 60 engines. (2) On the Series 71 engine it is mounted at the fuel pump to ECM cooler plate feed line.

Sensor Removal

1. Disengage the locking tang on the two-wire connector. Grasp the body of the connector and gently pull it from the socket.
2. Use the appropriate wrench on the hex portion of the sensor and unscrew it.

Sensor Installation

1. The Temperature Sensors are electronic devices. Use care in the installation process.
2. Reverse the removal procedure for installation.
3. Use a suitable pipe sealant on all but the first two threads of the sensor to prevent leaks.

Coolant Level Sensor (CLS) (60, 92, 71)

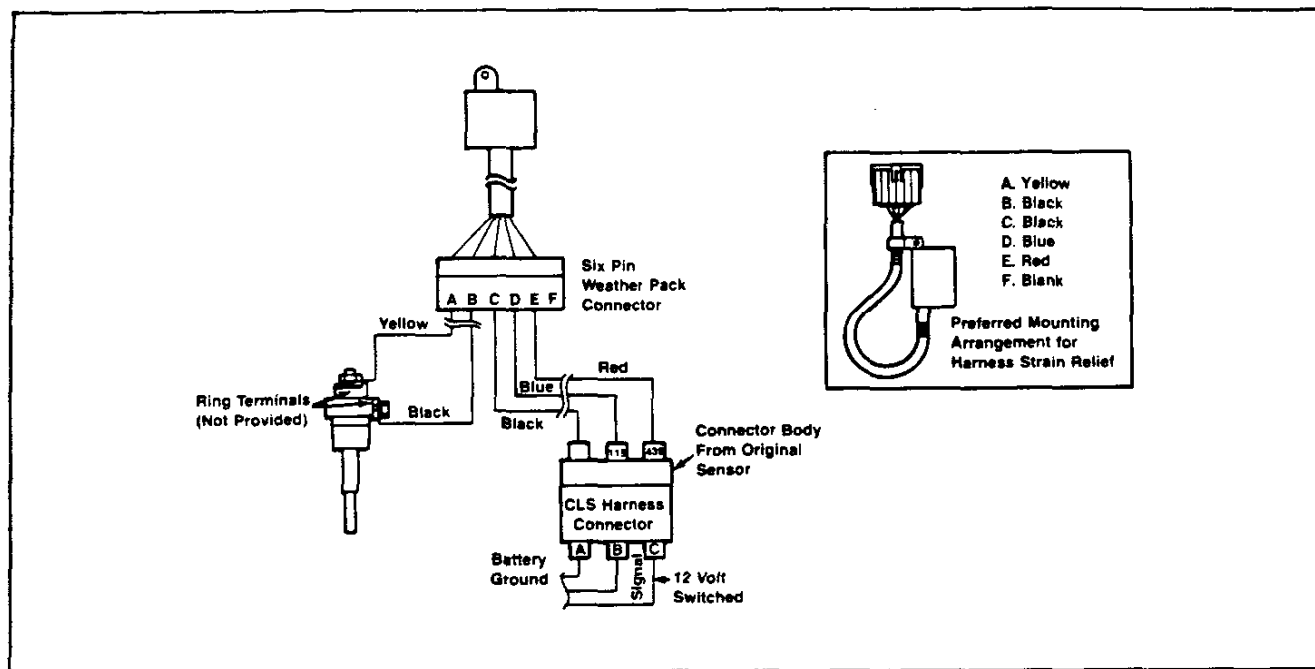


Figure 29

The Coolant Level Sensor (CLS) is mounted in the radiator, and sends an electrical signal to the ECM to indicate coolant level. Low coolant level may begin the stop engine or warning function. The CLS is non-serviceable, and should be replaced as a unit. No adjustment is required (Fig. 29).

CLS Removal

1. Open the petcock at the bottom of the radiator and drain the coolant into an appropriate container. Remove only as much coolant as is necessary to clear the CLS.
2. Disengage the locking tang on the wire connector at the sensor. Grasp the connector body and gently pull it free of the socket.
3. Use the appropriate wrench on the hex portion of the sensor and unscrew it from the radiator.

CLS Installation

1. Reverse procedure for installation.
2. Close the radiator petcock
3. Refer to Section 5 of the Service Manual and fill the cooling system.
4. Start the engine and check for leaks.
5. Turn the ignition to the "ON" position. Observe or read any diagnostic codes. If any code other than 25 or "NONE" appears, refer to the DDEC Troubleshooting Guide.

Oil Pressure Sensor (OPS) (60, 92, 71)

The Oil Pressure Sensor (OPS) is tapped into the main engine oil gallery. A typical location is at the rear oil gallery or right front corner of Series 92 engines (Fig. 30A), and the left rear corner of Series 60 engines (Fig. 30B) and the left rear of the Series 71 engine (Fig. 30C).

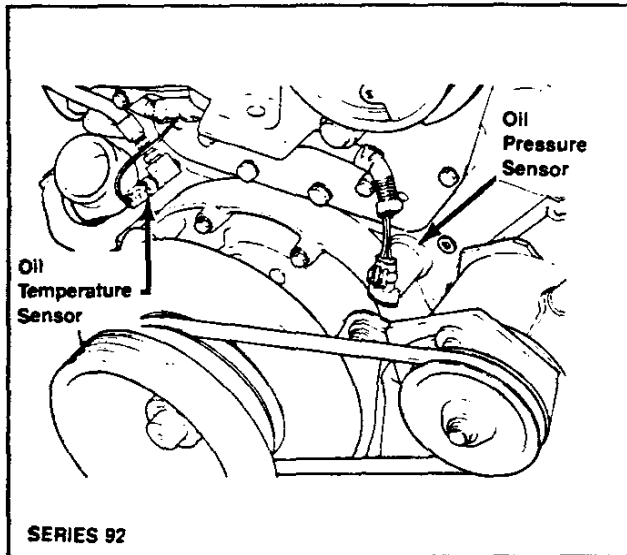


Figure 30A

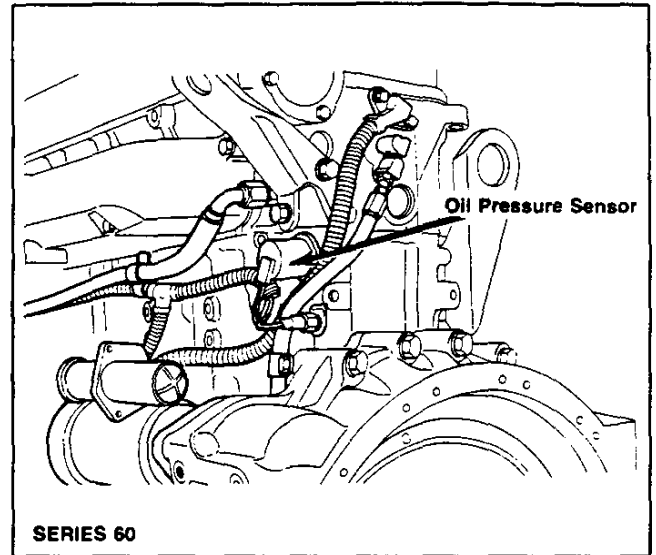


Figure 30B

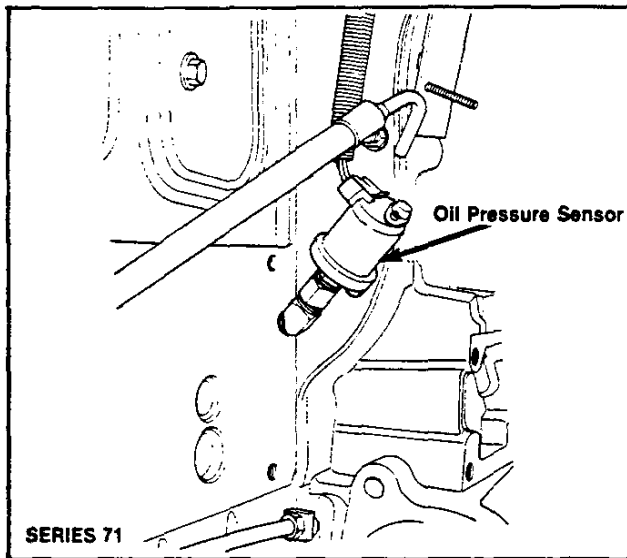


Figure 30C

OPS Removal

1. Disengage the locking tang on the three-wire connector. Grasp the body of the connector and gently pull it free of the OPS.
2. Use the appropriate wrench on the hex end of the OPS to unscrew it from the engine.

OPS Installation

1. The OPS is an electronic device. Use care on installation.
2. Reverse the removal procedure for installation.
3. Use a suitable pipe sealant on all but the first two threads of the OPS to prevent leaks.

Electronic Foot Pedal Assembly (EFPA) (60, 92, 71)

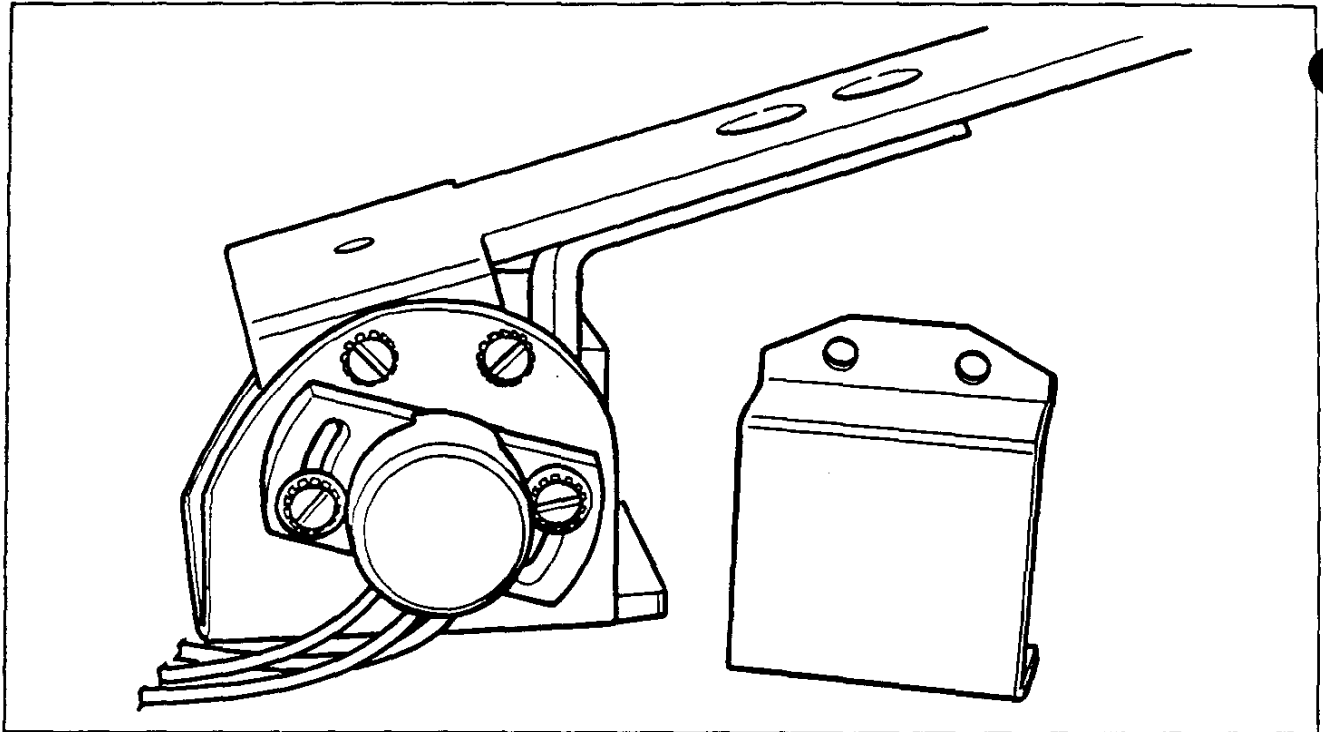


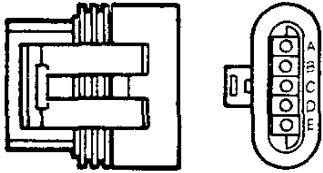
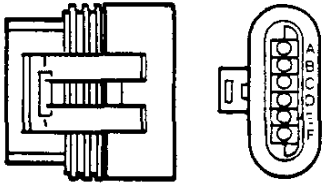
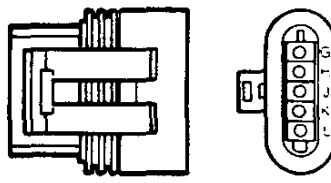
Figure 31

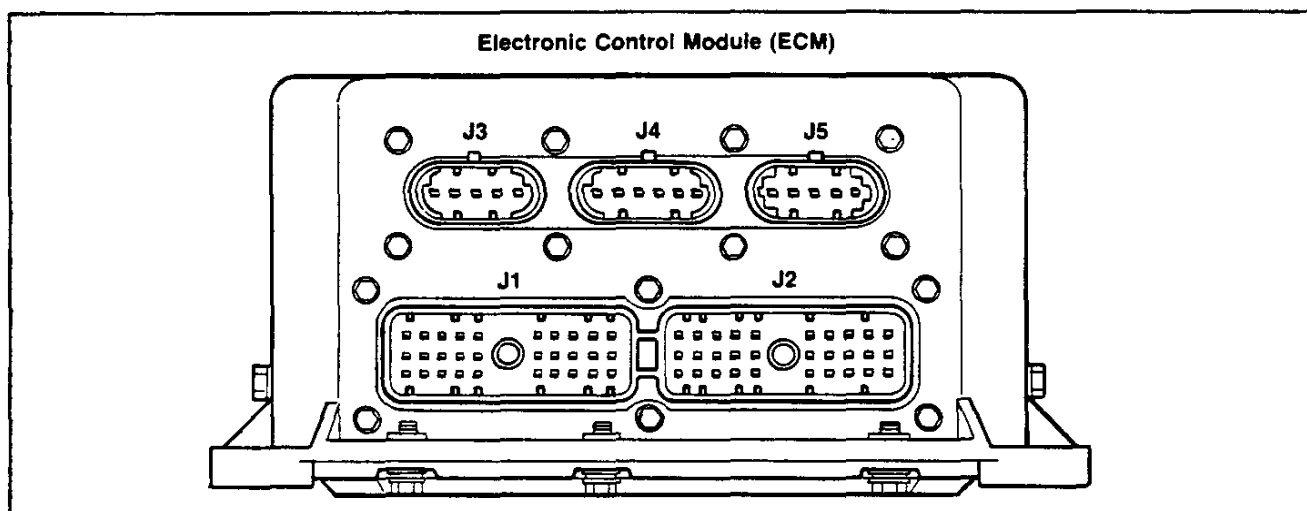
1. The EFPA is installed in place of the mechanical foot pedal by the OEM. Refer to the truck manufacturers shop manual for any special removal instructions.
2. Refer to DDEC II Troubleshooting Guide, Code 21/22, for adjustment specs.

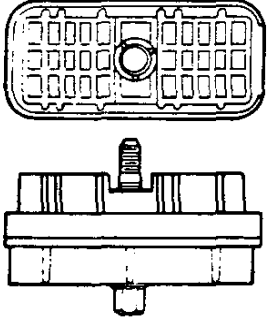
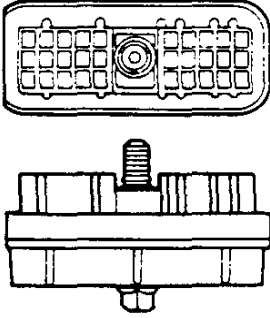
METRI-PACK Connectors (60, 92, 71)

LEGEND			
C: Connector	T: Terminal	S: Seal	P: Plug
			L: Lock

Connector Removing Tool — J-35689 Crimp Tool — J-35123

ECM J3 Harness Connector	ECM J4 Harness Connector	ECM J5 Harness Connector
		
C: 12040947 T: 12047680 S: In Connector	C: 12066317 T: 12047680 S: In Connector	C: 12065143 T: 12047680 S: In Connector



ECM J1 Harness Connector	ECM J2 Harness Connector
	
C: 12034398 T: 12047680 S: In Connector P: 12034413	C: 12034400 T: 12047680 S: In Connector P: 12034413

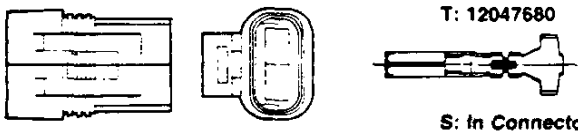
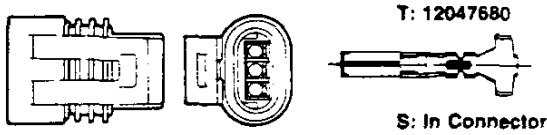
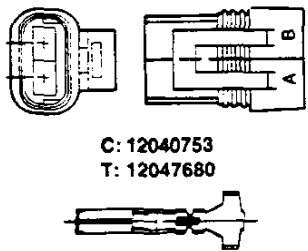
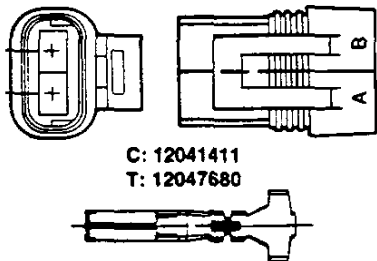
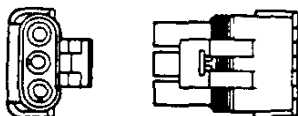
Group I Connectors: Removing Tool — J-35689 Crimp Tool — J-35123	
Temperature Sensor Harness Connector	Oil Pressure Sensor Harness Connector
 <p> C: 12040753 T: 12047680 S: In Connector P: NA </p>	 <p> C: 12047909 T: 12047680 S: In Connector P: N/A </p>
SRS Harness Connector (Black)	TRS Harness Connector (Gray)
<p>Engine Harness</p>  <p> C: 12040753 T: 12047680 S: P: NA </p>	<p>Engine Harness</p>  <p> C: 12041411 T: 12047680 S: P: NA </p>

Figure 33

Group II Connectors: Removing Tool — J-28742-A Crimp Tool — J-35688

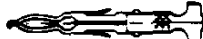
Turbo Boost Pressure Sensor

Harness Connector



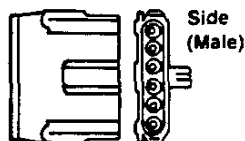
C: 12015384
T: 12033674

S: 12015323
P: NA



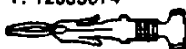
Coolant Level Sensor

Module Harness



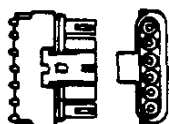
Side
(Male)

C: 12010975
T: 12033674



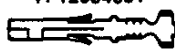
S: 12015193
P: 12010300

Probe Harness



Side
(Female)

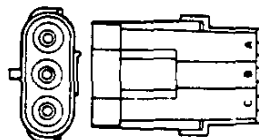
C: 12015799
T: 12034051



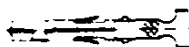
S: 12015323
P: 12010300

Throttle Position Sensor

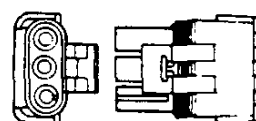
PTO Speed Adjust — Harness Side



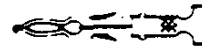
Sensor Side
C: 12010717
T: 12034051



S: 12015323
P: NA



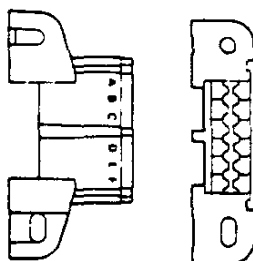
Harness Side
C: 12015793
T: 12033674



S: 12015323
P: NA

Group III Connectors: Removing Tool — KM 33095 Crimp Tool — 8913440

DDL Connector



C: 12020043
T: 12015823

Figure 34

Procedure, Remove & Install Terminals

Group I Connectors

The connectors in Group I use Weather Pack seals that are inserted into the shell of the connector instead of being installed on each individual cable (Fig. 35).

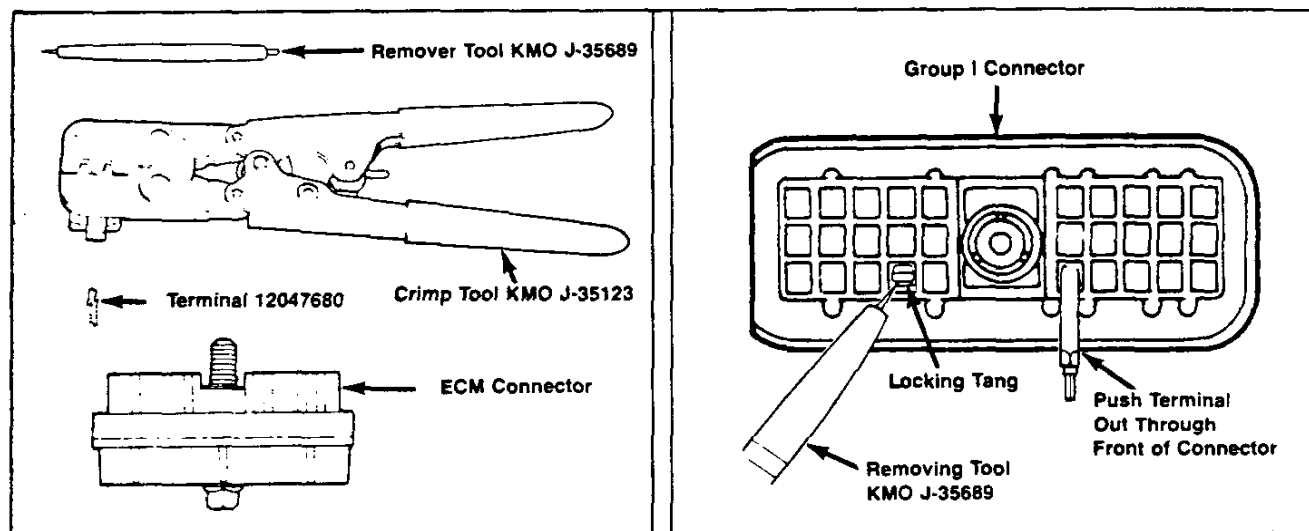


Figure 35

Removal

A tang on the terminal locks into a tab molded into the plastic connector to retain the cable assembly. Remove Group I terminals from their connectors using the following instructions:

1. Insert the removal tool J35689 into the cavity of the connector, placing the tip of the tool between the locking tang of the terminal and the wall of the connector (Fig. 35).
2. Depress the tang of the terminal to release it from the connector.
3. Push the cable forward through the terminal until the complete crimp is exposed.

Repair

To repair a Group I terminal, cut the cable immediately behind the damaged terminal.

Installation

Group I terminals are of the "pull-to-seat" design. The cable is pushed through the seal and correct cavity of the connector before crimping the terminal to the cable. To prevent damage to the individual strands of the cable, it should be stripped of insulation AFTER it is placed through the seal and connector body. Use the following instructions for Group I terminal installation:

1. Position the cable through the seal and correct cavity of the connector (Fig. 36)

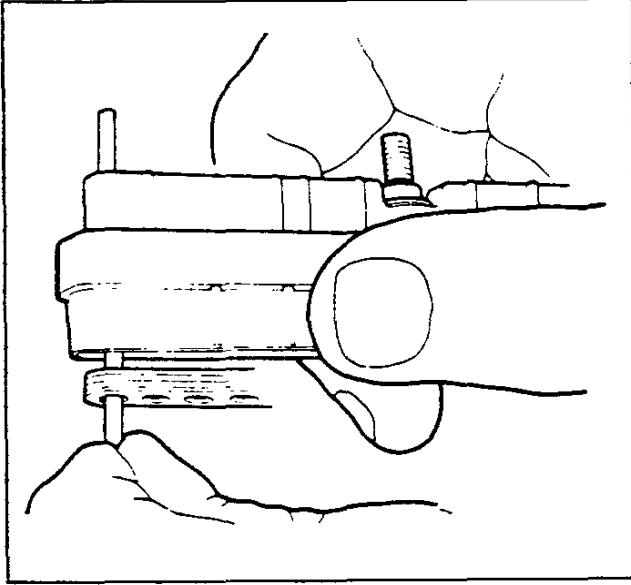


Figure 36

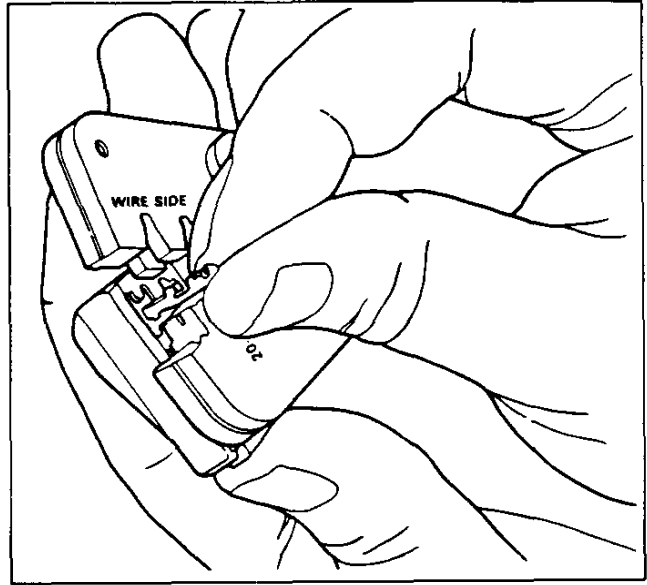


Figure 37

2. Strip the end of the cable using wire strippers to leave 5.0 mm (± 0.5 mm) of bare conductor.
3. Squeeze the handles of crimping tool J35123 together firmly to cause the jaws to automatically open.
 - Hold the tool with the words "wire side" facing you.
4. Push the terminal holder to the open position and insert the terminal until the wire attaching portion of the terminal rests on the 20-22 anvil. Be sure the wire core wings and the insulation wings of the terminal are pointing towards the upper jaw of the crimping tool (Fig. 37).

5. Insert the cable into the terminal until the stripped portion is positioned in the wire core wings, and the insulated portion ends just forward of the insulation wings (Fig. 38).

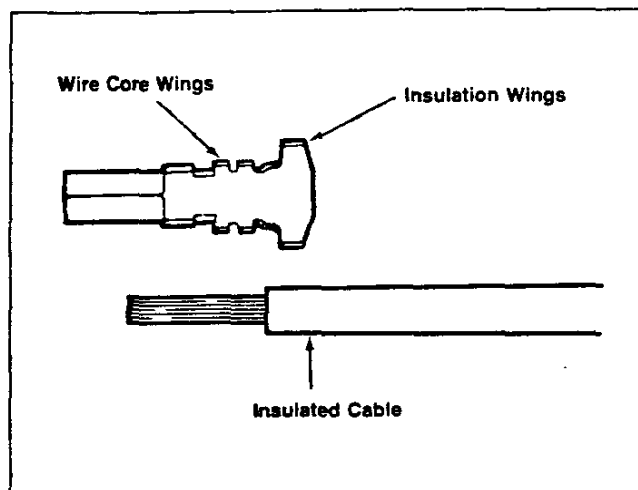


Figure 38

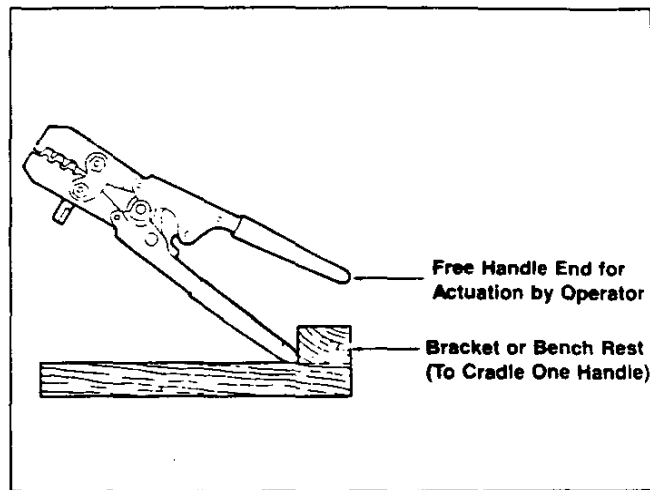


Figure 39

6. Compress the handles of the crimping tool until the ratchet automatically releases and the crimp is complete.

NOTE: For faster, more efficient crimping operation, a bracket or bench rest may be used to cradle one handle of the tool. The operator can then apply the terminals by grasping and actuating only one handle of the tool (Figure 39).

7. In case of jamming, release the crimping tool with the lock lever located between the handles.
8. Align the locking tang of the terminal with the lettered side of the connector. Pull the cable back through the connector until a click is heard. Position the seal into the connector (Fig. 40).

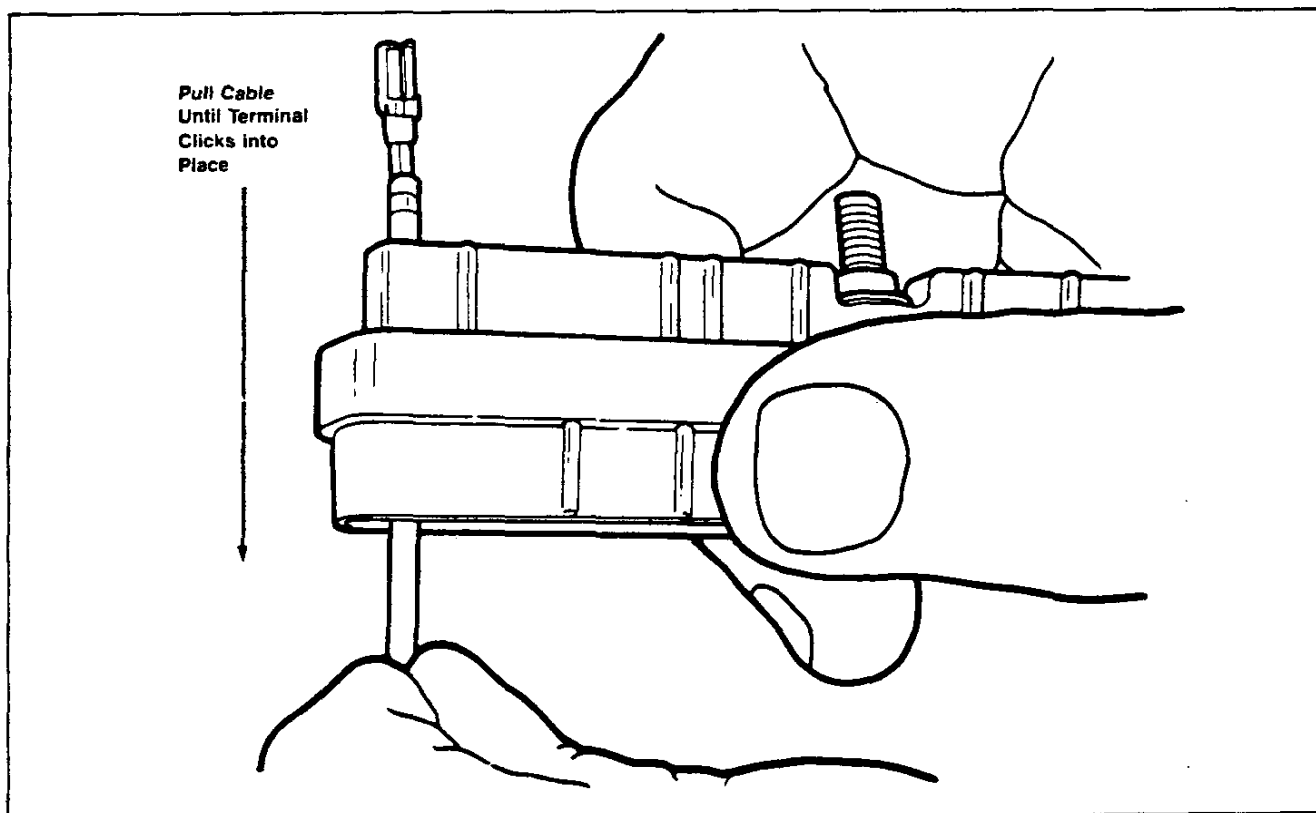


Figure 40

Group II Connectors

Group II connectors utilized individual Weather Pack seals installed on each cable as part of the crimping process. A seal is also used at the terminal end of the connector to help seal the connector cavity. A secondary lock on both male and female connector bodies snaps into place over these seals after installation (Fig. 41).

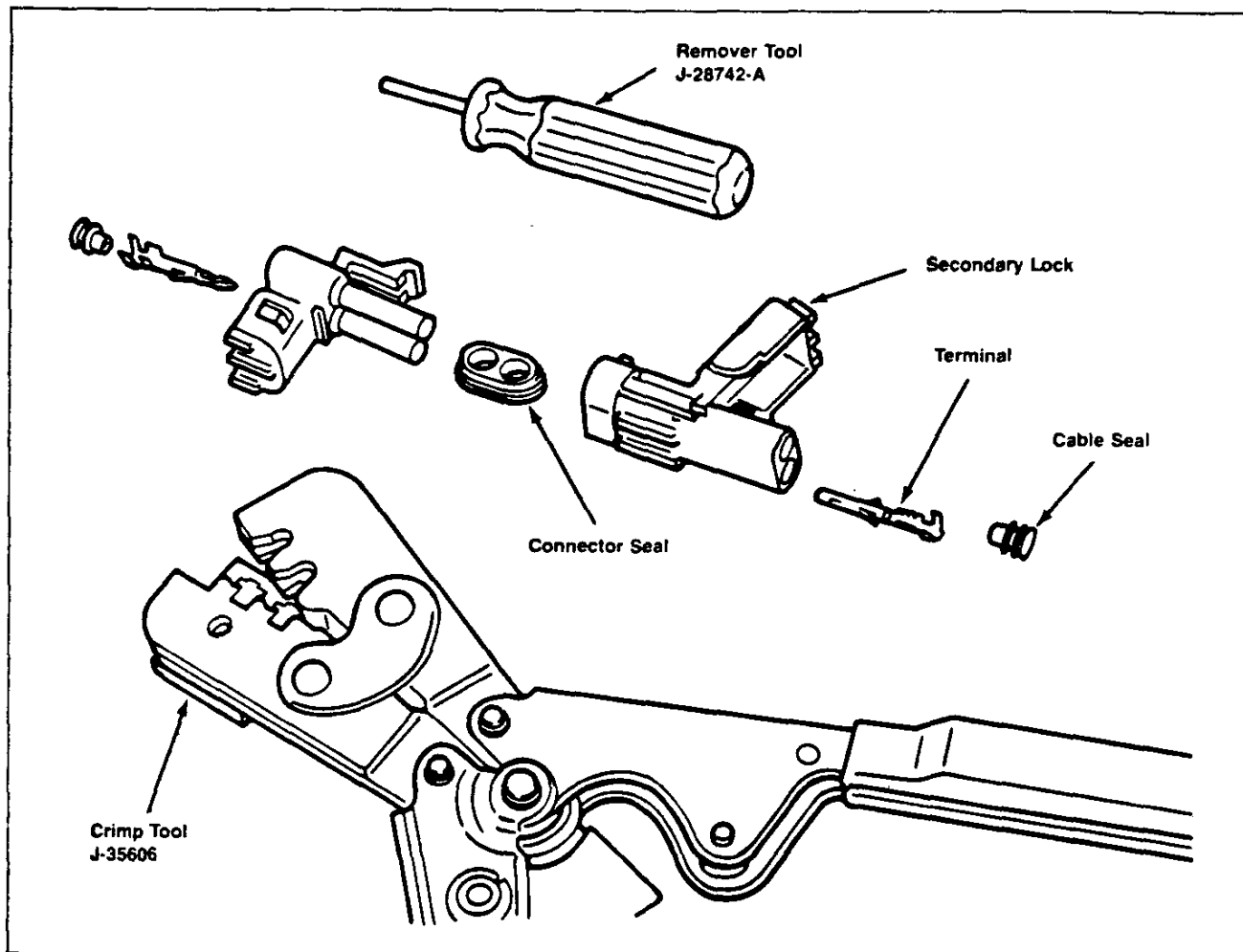


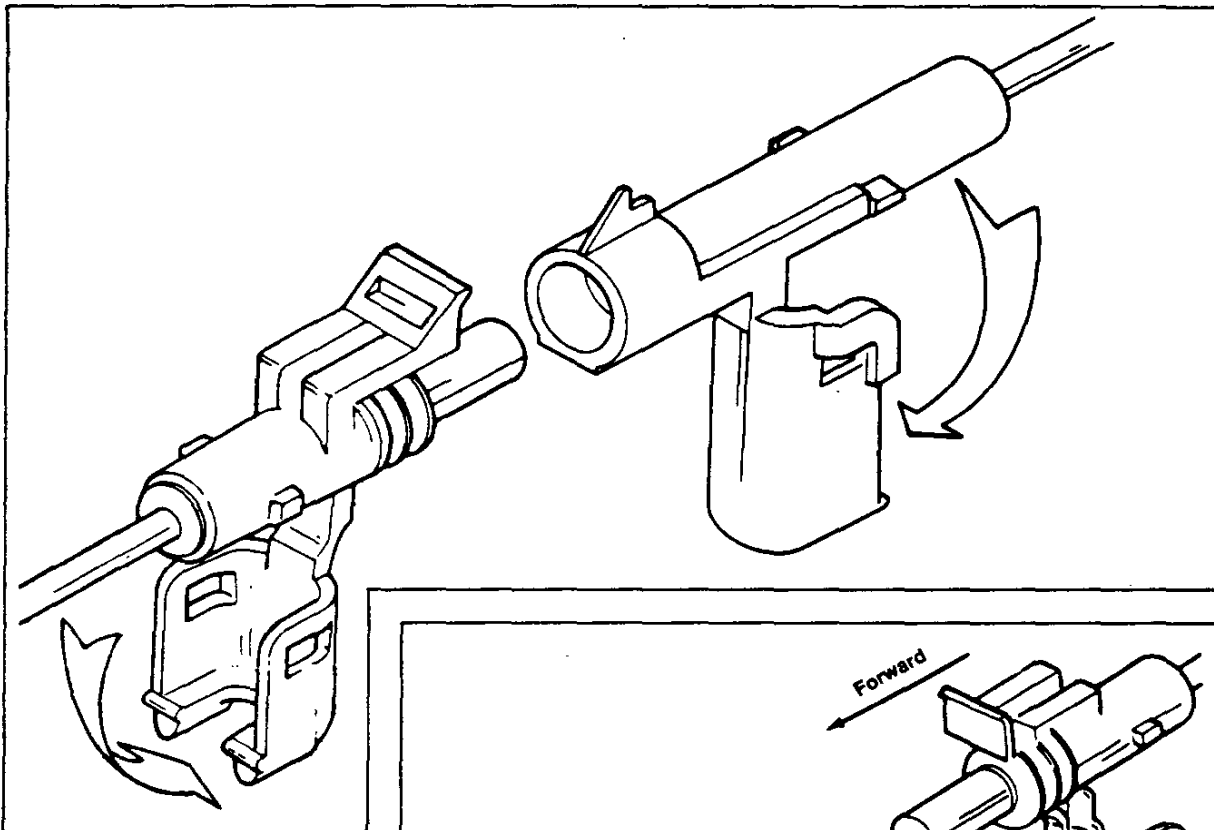
Figure 41

Removal

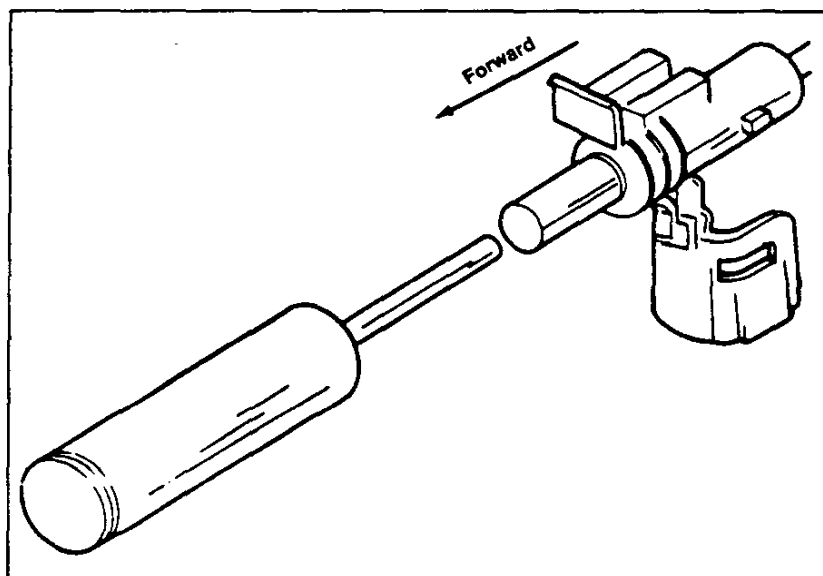
Two locking tangs are used on Group II terminals to secure them to the connector body. Use the following instructions for removing terminals from the connector body.

1. Disengage the locking tang securing the connector bodies to each other. Grasp one half of the connector in each hand, and gently pull them apart.
2. Unlatch and open the secondary lock on the connector (Fig. 42).

The following procedure should be used to repair Group II connectors



Disconnect the connector bodies. Unlatch and open secondary lock on connector.



Remove terminals using Group II Terminal removal tool (12014012).

Figure 42

3. Grasp the cable to be removed and push the terminal to the forward position.
4. Insert the removal tool J28742-A straight into the front of the connector cavity until it rests on the cavity shoulder.
5. While holding the tool securely in place, grasp the cable and push it forward through the connector cavity into the tool.
6. The tool will depress the locking tangs of the terminal. Pull the cable rearward, back through the connector. Remove the removal tool from the connector cavity.

Repair

Refer to (Fig. 43) for instructions on repairing a damaged Group II terminal.

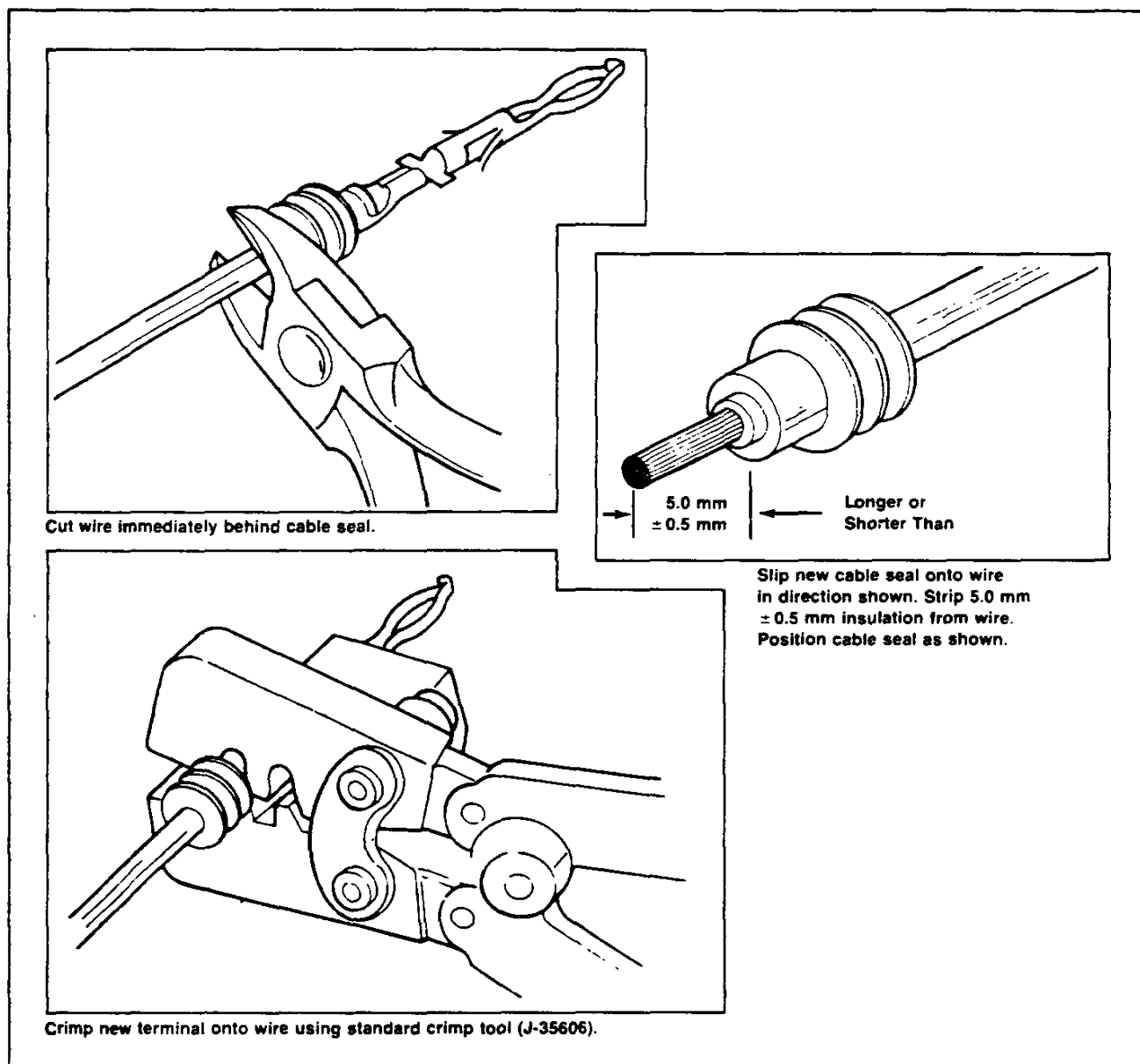


Figure 43

Installation

Use the following instructions for installing Group II terminals.

1. Insert the terminal into the locating hole of crimping tool J35606 using the proper hole according to the gage of the cable to be used (Fig. 44).

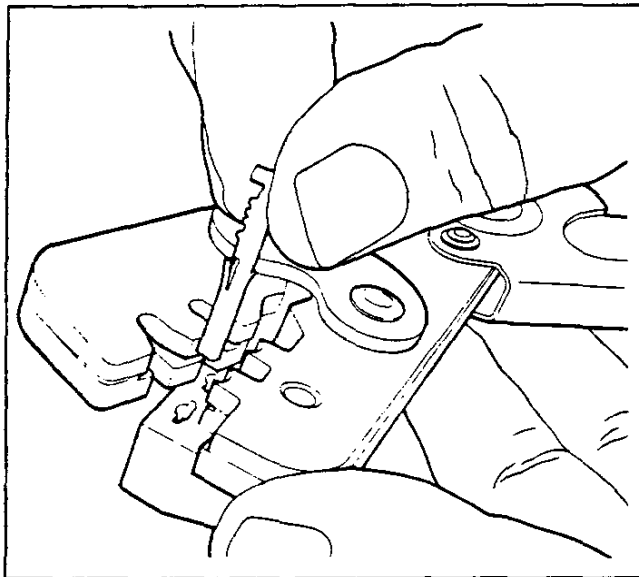


Figure 44

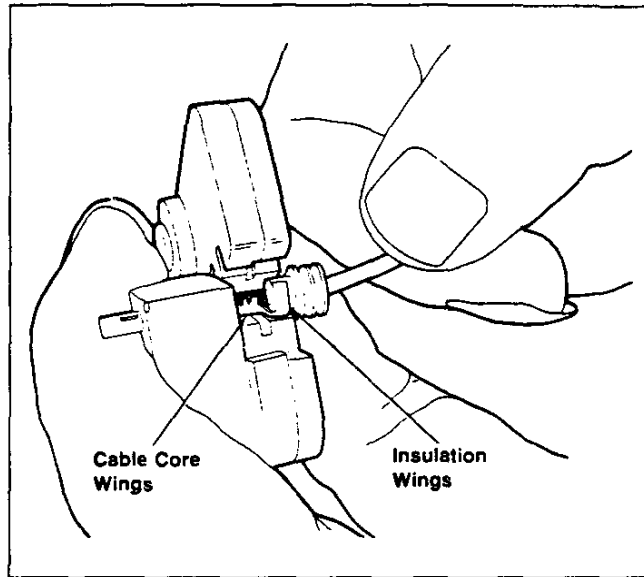


Figure 45

2. Insert the cable into the terminal until the stripped portion is positioned in the cable core wings, and the seal and insulated portion of the cable are in the insulation wings (Fig. 45).
3. Compress the handles of the crimping tool until the ratchet automatically releases and the crimp is complete. A properly crimped Group II terminal end is shown in (Fig. 46).

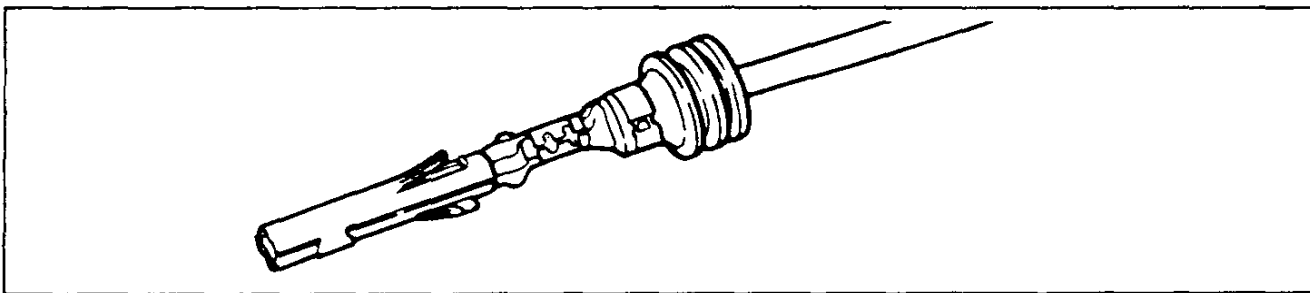


Figure 46

4. In case of jamming, release the crimping tool with the lock lever located between the handles.
5. Use (Fig. 47) for installing new terminals to the connector.

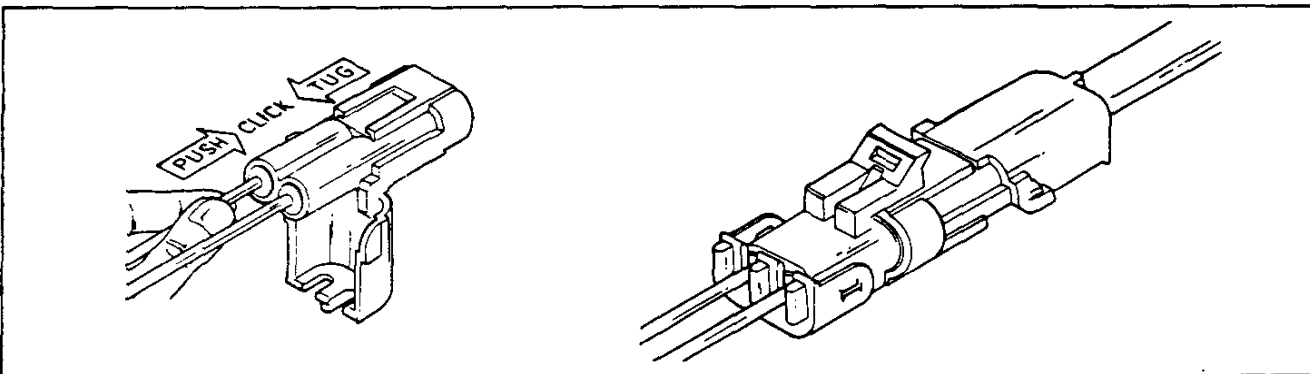


Figure 47

Group III Connectors

Group III connectors include the 7-pin and 8-pin dash connectors, and the transmission 6-pin connector for vehicles equipped with an Allison ATEC automatic transmission. These connectors do not require seals. (Fig. 48) illustrates a typical Group III connector, relative location of parts and special tools.

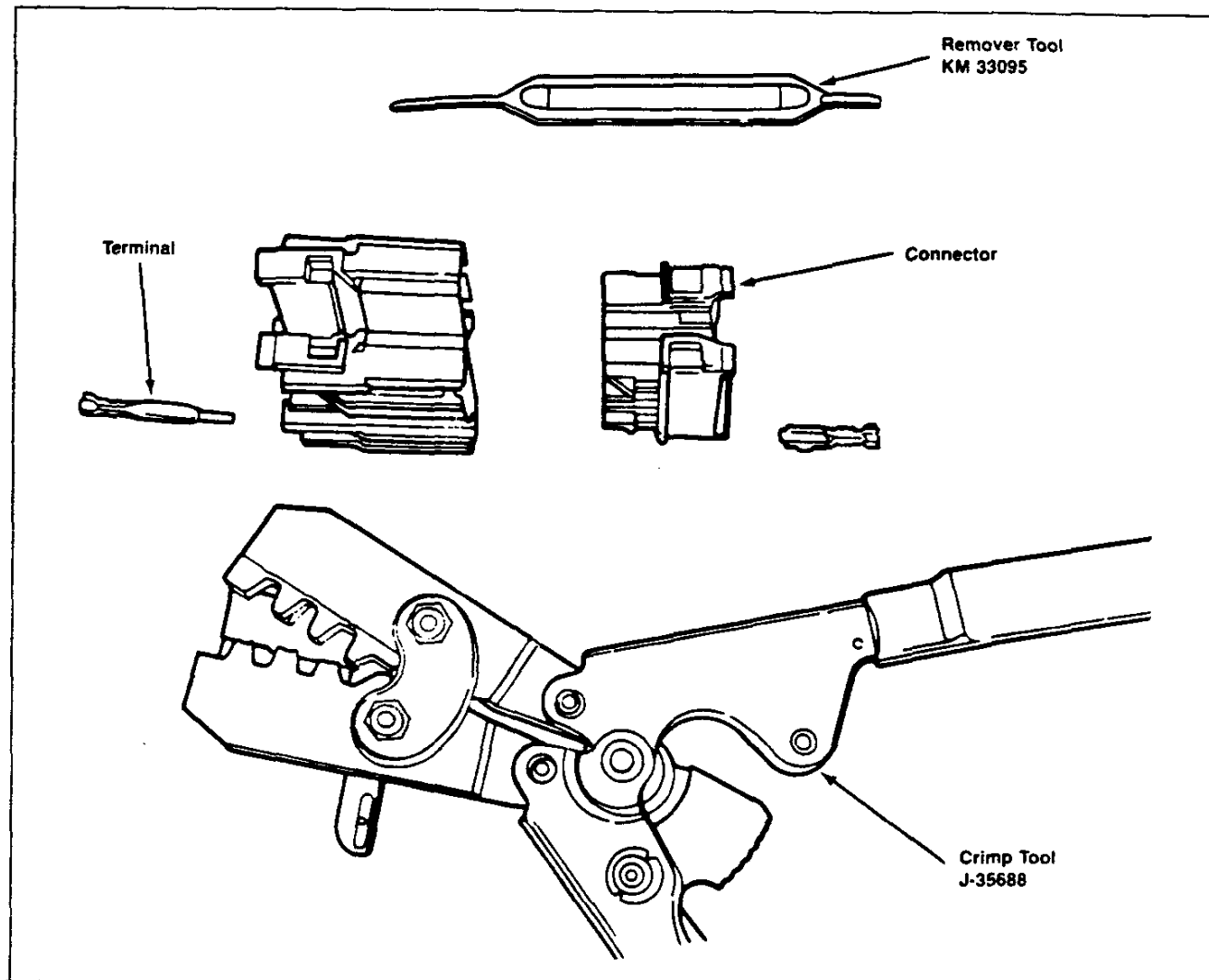


Figure 48

Removal

Use the following instructions for Group III terminal removal:

1. Disengage the locking tangs on the mating connector bodies. Grasp one half of the connector in each hand and gently pull them apart.
2. Unlatch and open the secondary lock on the connector.
3. Insert removal tool J33095 (Kent-Moore) into the small hole at the bottom of the terminal cavity as shown in (Fig. 49).

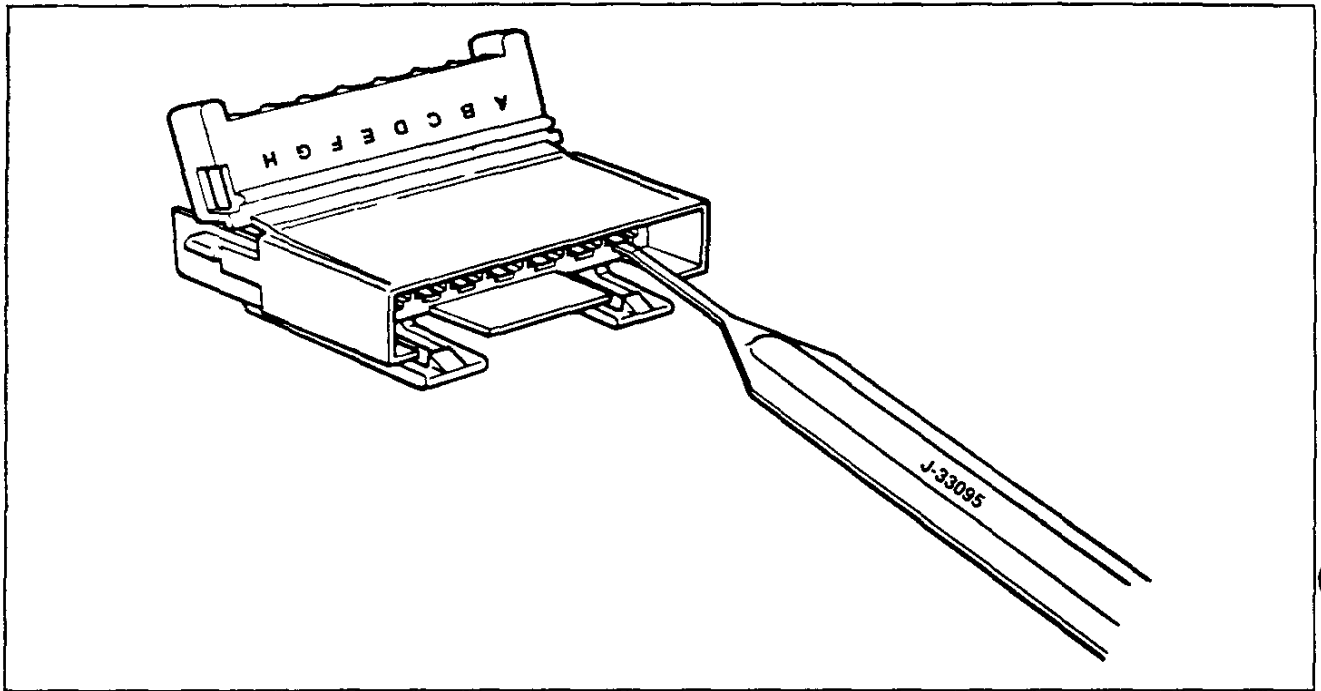


Figure 49

NOTE: The short end of removal tool J33095 is used on the male side of Group III connectors, while the long end is used on the female side.

4. Slide the tip of the removal tool in towards the connector to disengage the locking tang of the terminal.
5. Grasp the cable and pull it rearward, back through the connector.

Repair

Use the following instructions to repair a Group III terminal.

1. Cut the cable immediately behind the damaged terminal.
2. Strip the insulation from the cable as instructed in Group I and II procedures.

Installation

Refer to (Fig. 50) for Group III terminal installation instructions.

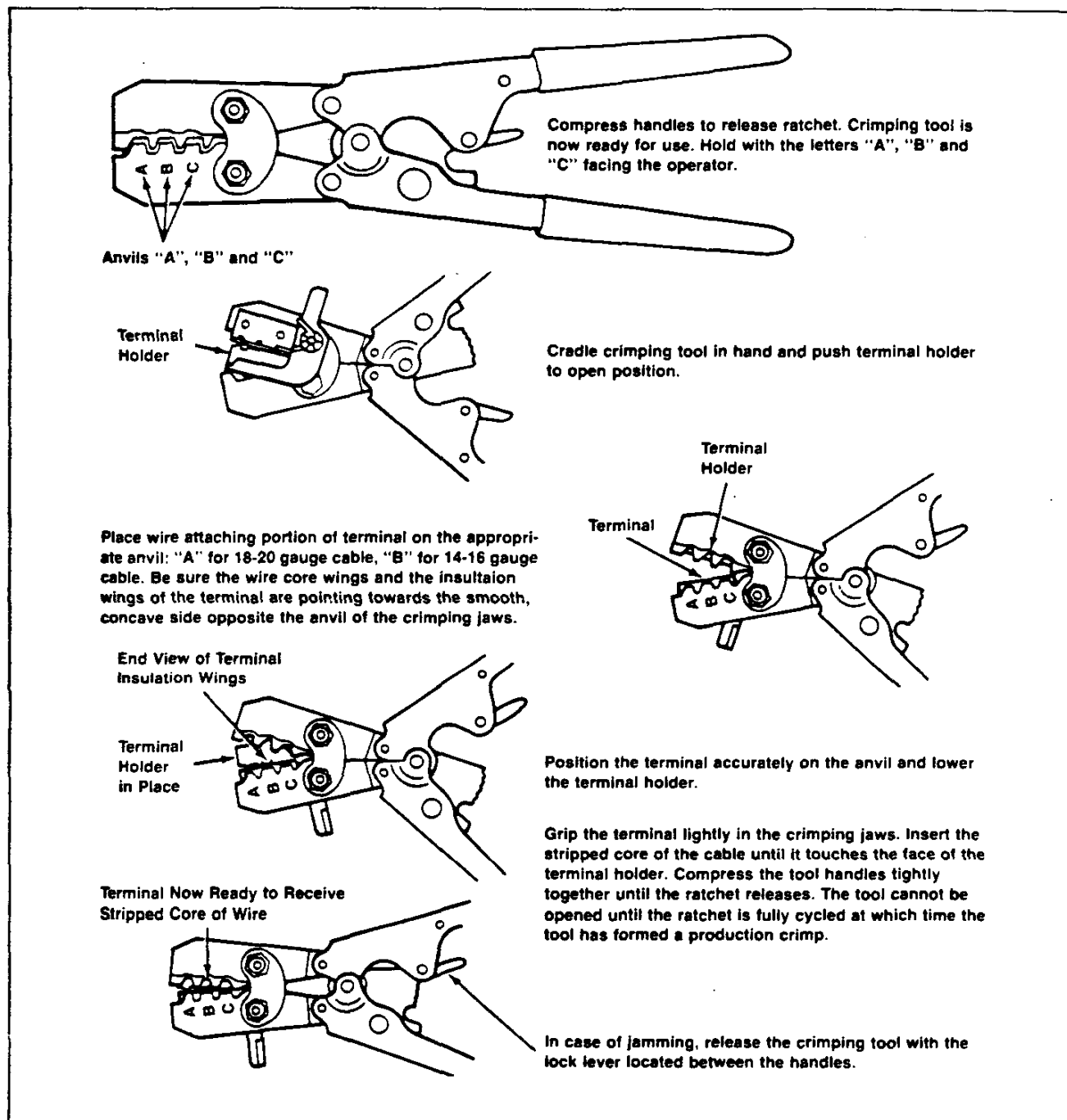


Figure 50

To install the repaired terminal back into the connector, use the following instructions:

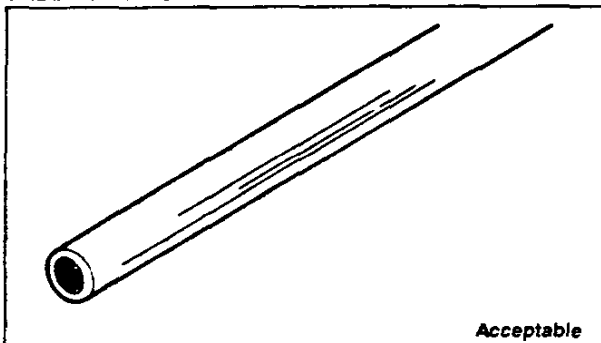
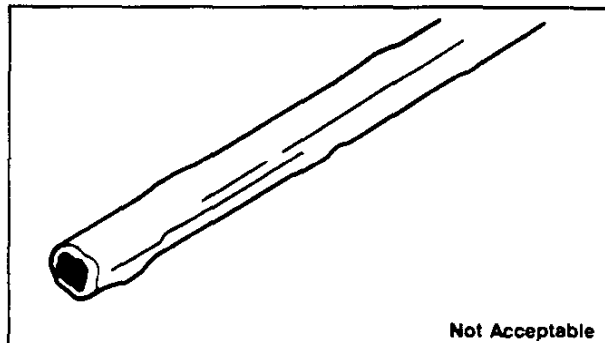
1. Insert the terminal end of the cable into the proper cavity.
2. Push the cable forward until the terminal clicks into place.
3. Gently pull the cable rearward to seat it.
4. Close the secondary lock until the tangs snap into place.

METHODS

NOTE: The repair of DDEC electrical circuits is based on Indicated fault codes leading to faulty circuits. Refer to the DDEC Troubleshooting Guide for more complete information on diagnosis of system problems.

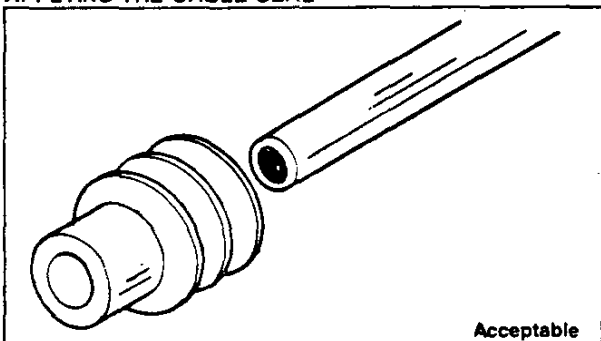
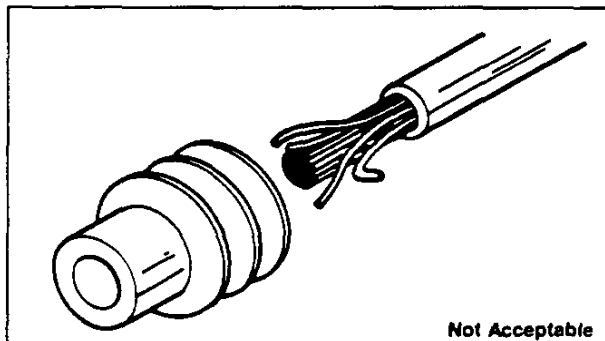
Some typical cable assembly instructions that apply to DDEC connectors are shown in Figures 51-59

CABLE SURFACE



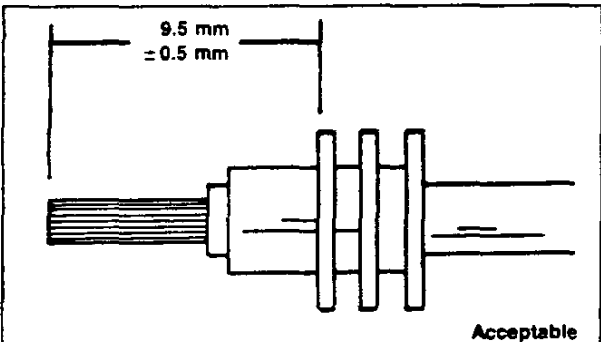
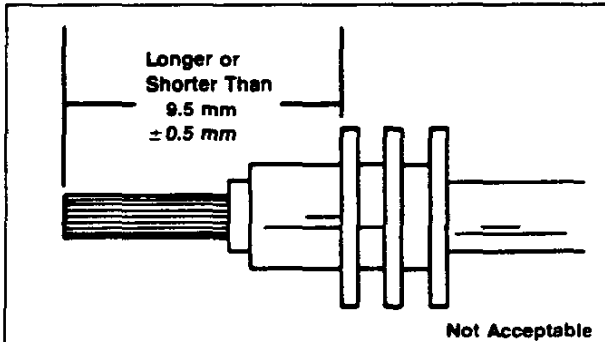
The outside diameter of the cable must be round and free of surface imperfections and dirt.

APPLYING THE CABLE SEAL



Cable seals, where used, should be applied to unstripped wire leads.

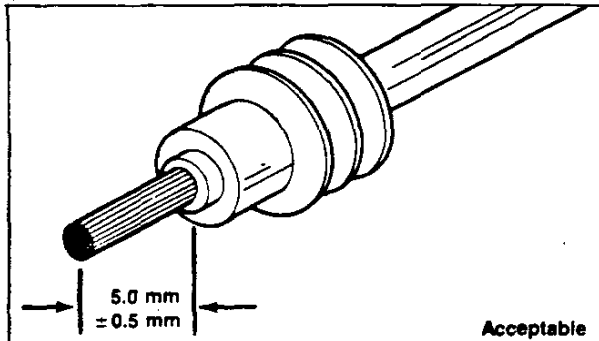
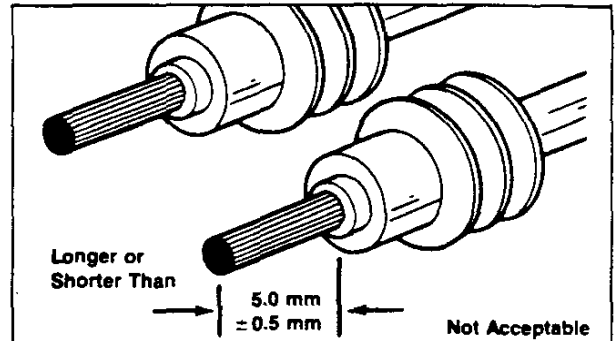
POSITIONING THE CABLE SEAL



The cable seal must be positioned properly on the cable. The distance from the end of the stripped core to the leading edge of the first sealing rib should be 9.5 mm. (Reference Dimensions)

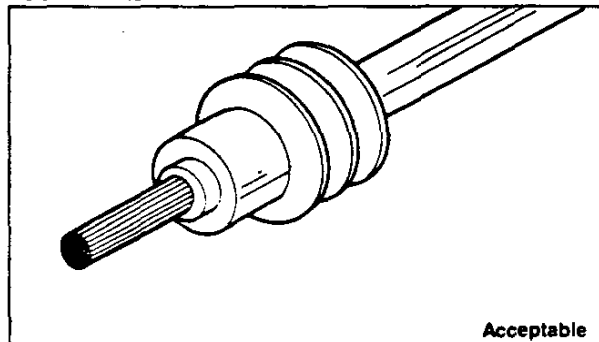
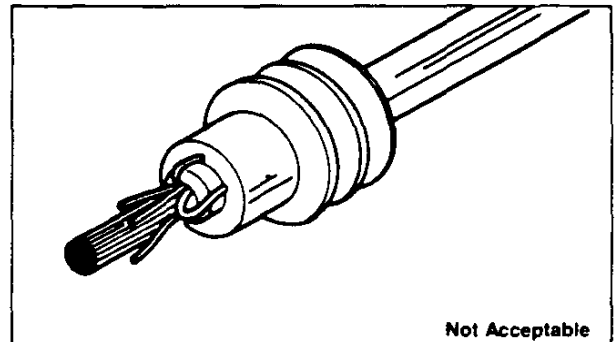
Figure 51

STRIP LENGTH



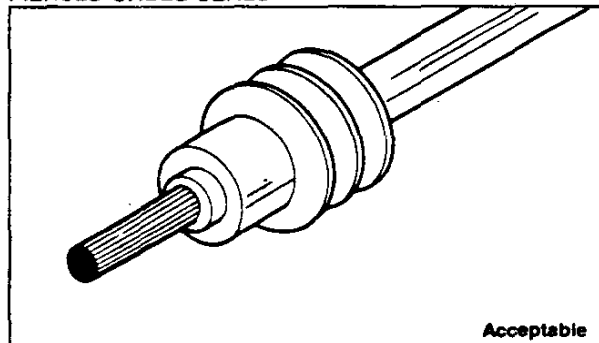
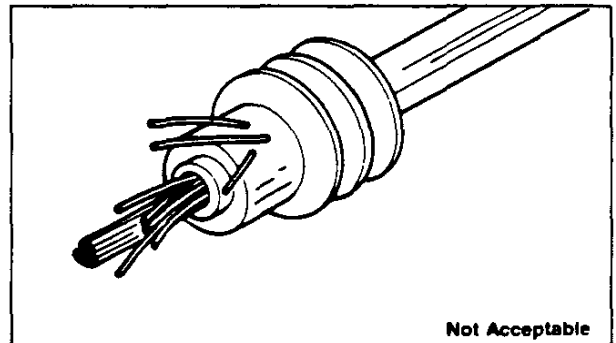
Strip length must be $5.0 \text{ mm} \pm 0.5 \text{ mm}$. Cut or nicked strands are not acceptable.

LOOSE WIRE STRANDS



Loose wire strands between the cable seal insulation are not acceptable.

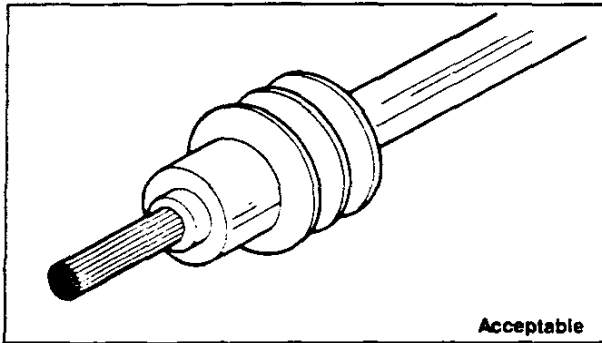
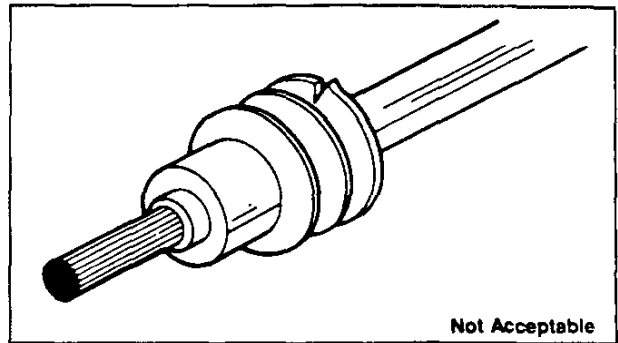
PIERCED CABLE SEALS



Wire strands must not pierce the cable seal.

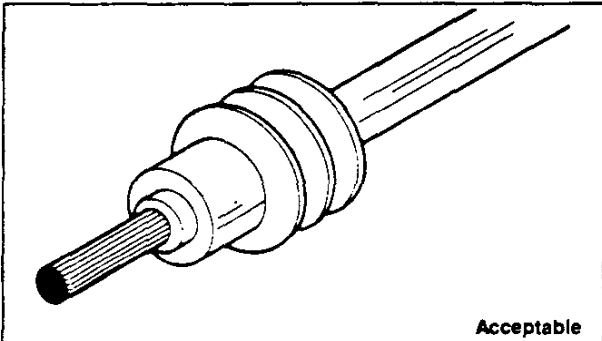
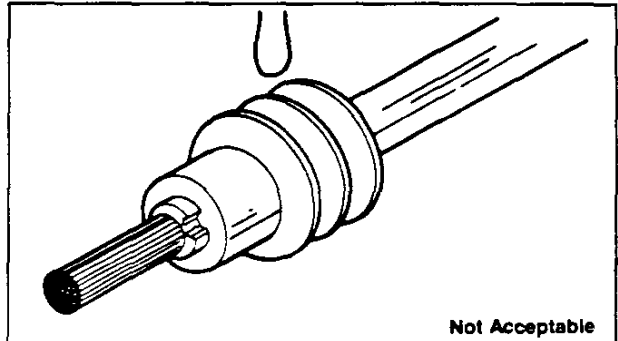
Figure 52

CABLE SEAL AND CONNECTOR SEAL RIBS



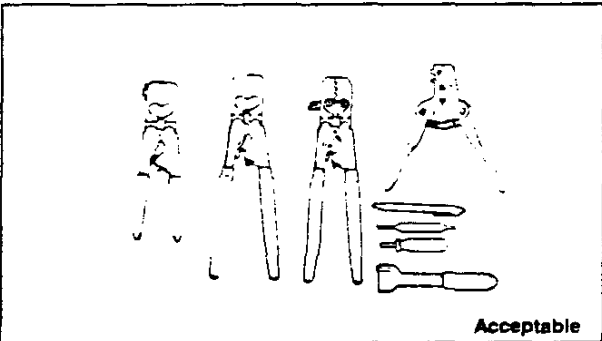
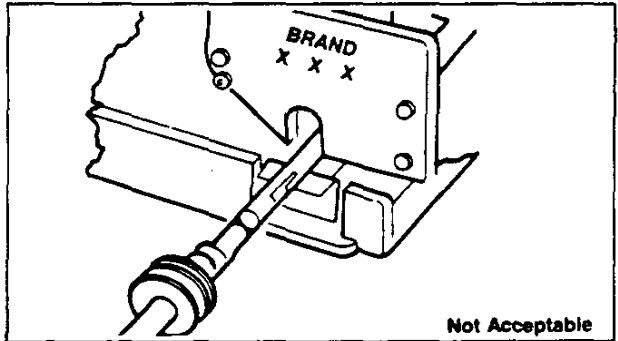
Cable seal ribs and connector seal ribs must be free of cuts. Care should be taken not to cut or tear sealing ribs when servicing the connector system.

PROCESS AIDS



Foreign material or lubricants must not be used as cable seal or connector seal assembly process aids. Care should be taken to keep cable seals and connector seals free of dust, dirt, paint and other foreign materials.

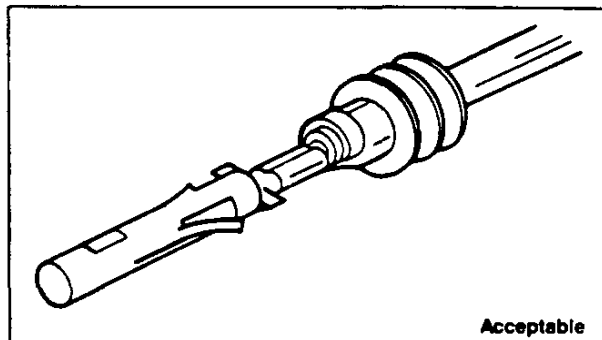
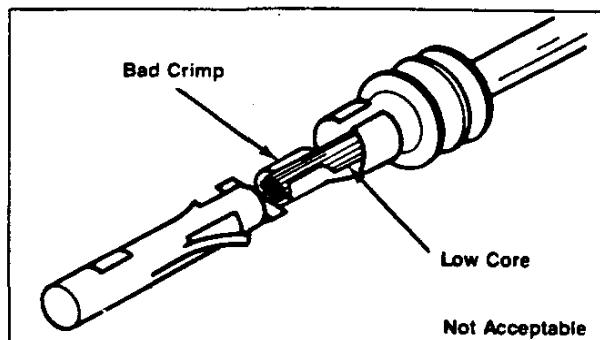
ASSEMBLY TOOLING



Assemble terminals to cable using the proper tools.

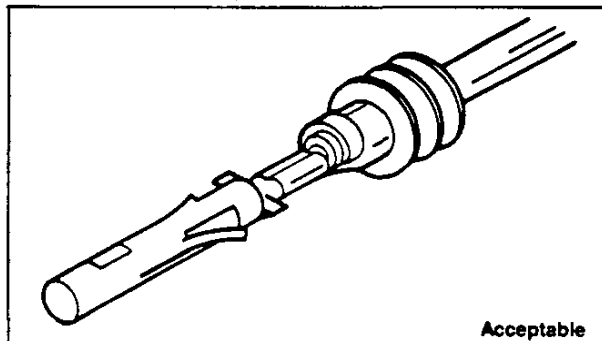
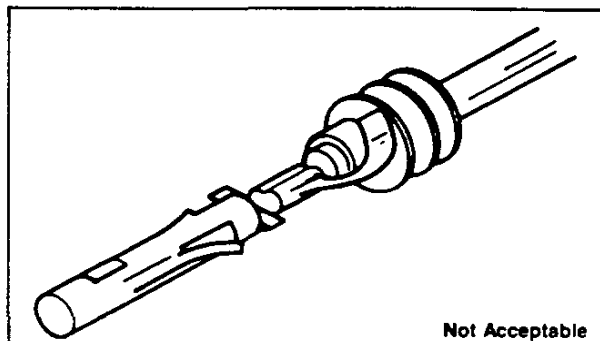
Figure 53

CORE CRIMP HEIGHTS



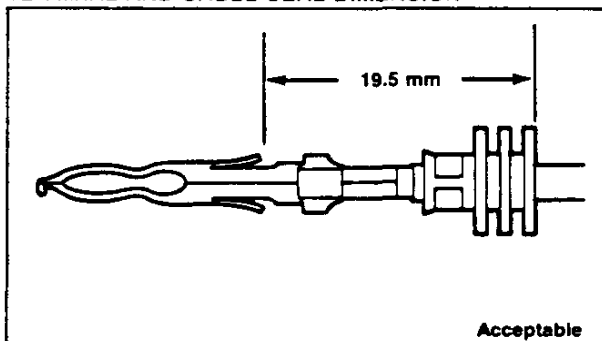
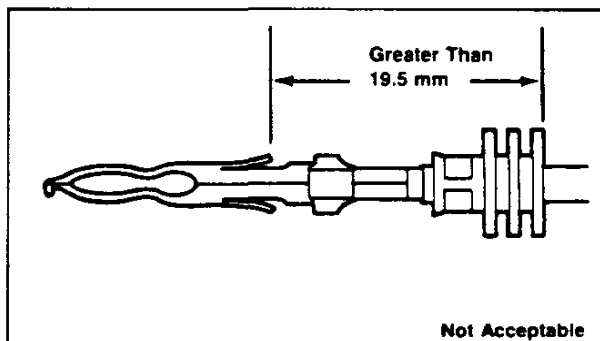
Core crimp heights must be maintained to standards. Low core (leading edge of cable core behind leading edge of terminal core crimp wings) and incorrect crimp heights are not acceptable.

DAMAGED SEAL RIBS



Seal ribs which are cut or caught under terminal insulation wings are not acceptable.

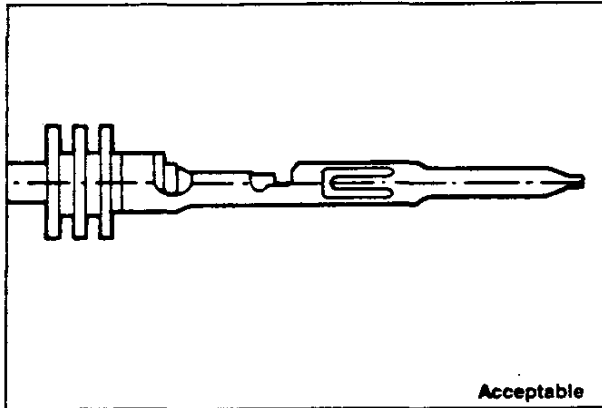
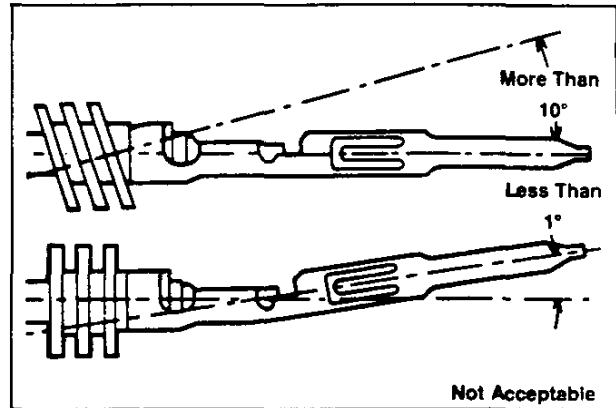
TERMINAL AND CABLE SEAL DIMENSION



The distance from the back of the terminal locking tangs to the back of the cable seal may not exceed 19.5 mm, or the terminated cable seal will not assemble properly to the connector body.

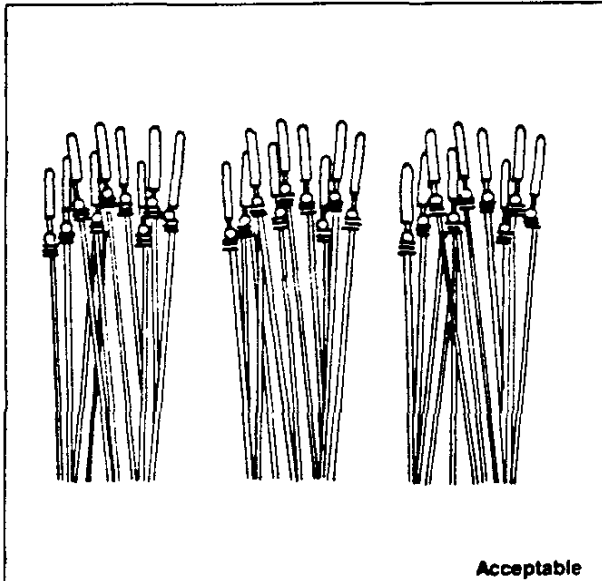
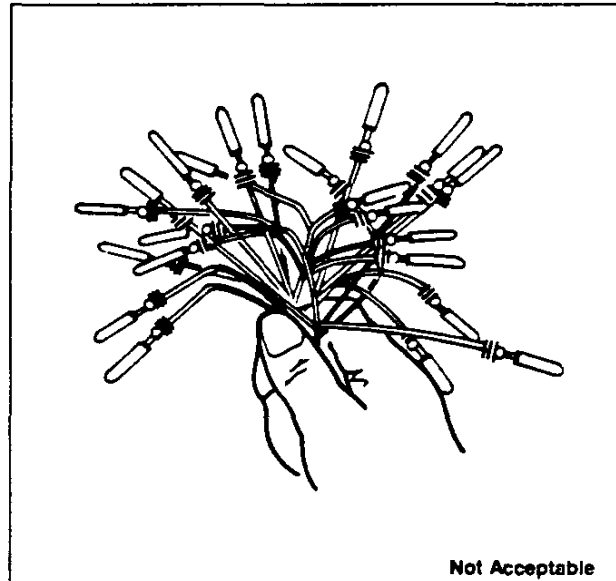
Figure 54

TERMINAL, CABLE SEAL AND CABLE ALIGNMENT



The terminal, cable seal and cable must be aligned properly. The center lines of the terminal, cable seal and cable must be aligned as shown in the illustration above. Terminal misalignment may result in excessive connector engage forces and/or terminal damage.

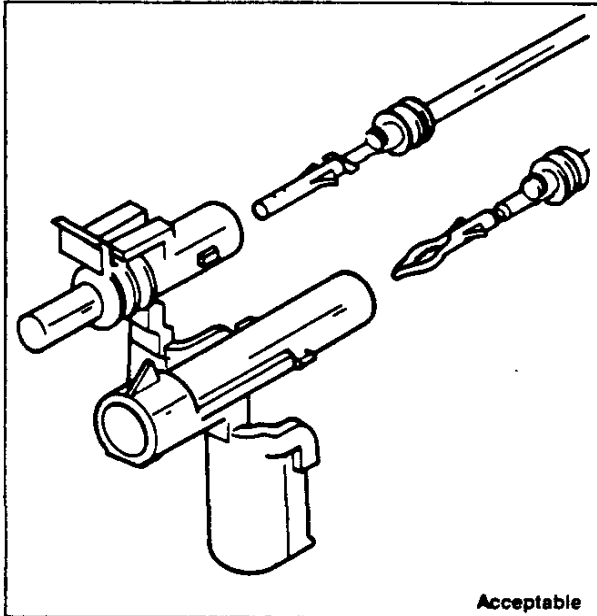
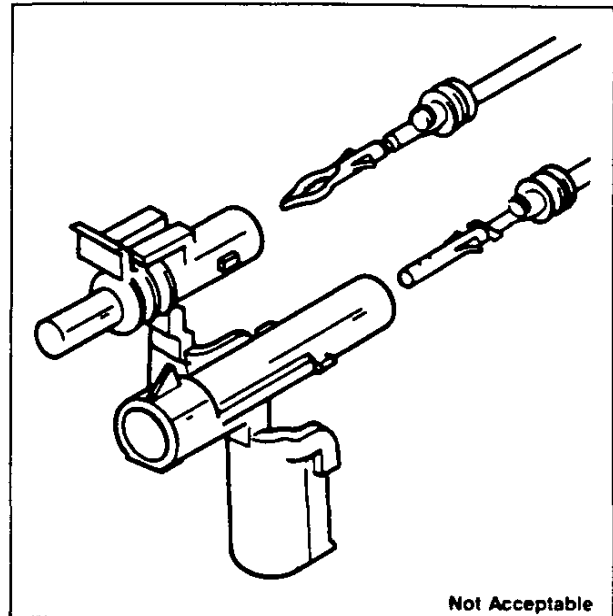
HANDLING THE TERMINATED CABLE SEAL LEAD ASSEMBLY



The terminated cable seal lead assembly must be handled with special care. Small bundles are recommended to prevent damage to the cable seal ribs.

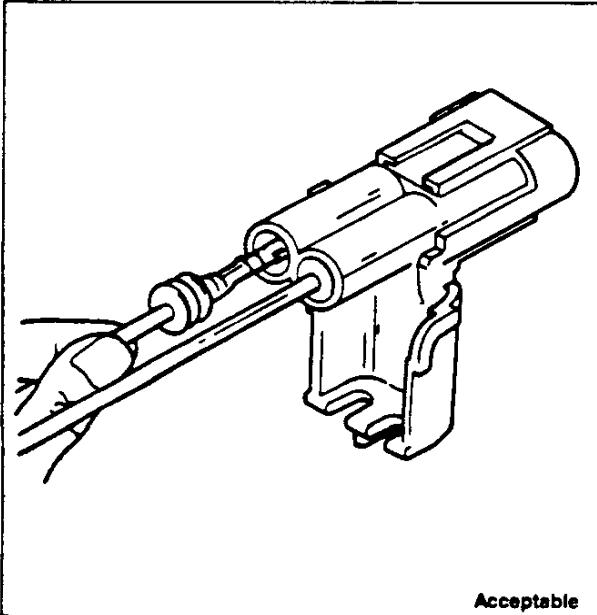
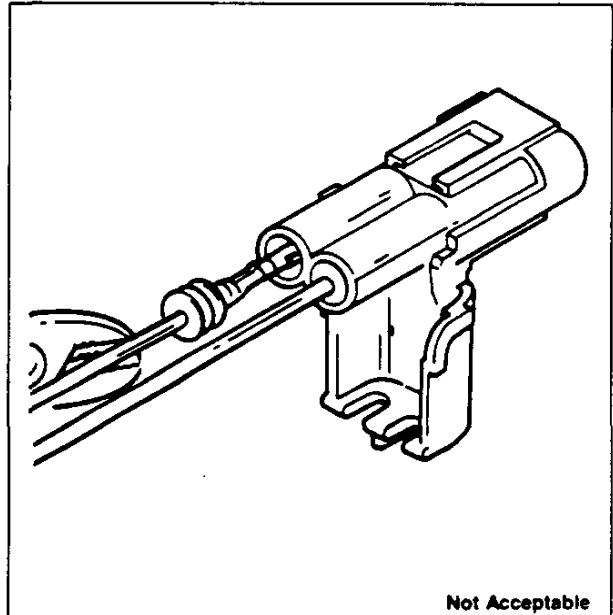
Figure 55

TERMINAL TO CONNECTOR COMPATIBILITY



For in-line applications: Sleeve terminals must be used with tower connector and connector seal assemblies, and pin terminals with shroud connectors. For panel-mount applications: Pin terminals must be used with tower connector and connector seal assemblies.

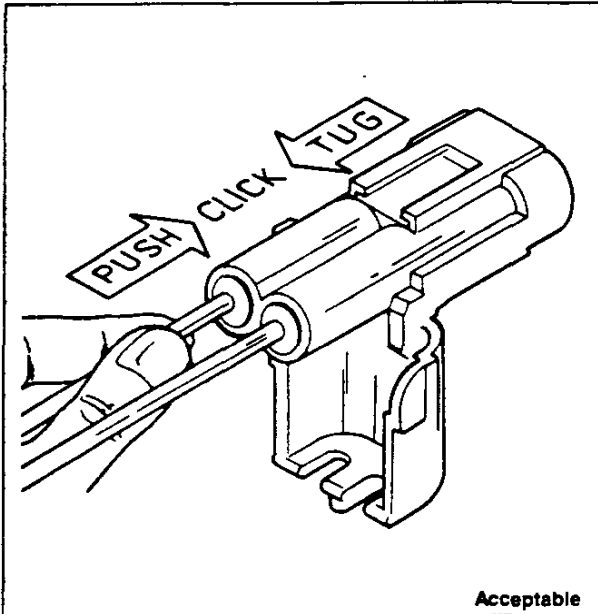
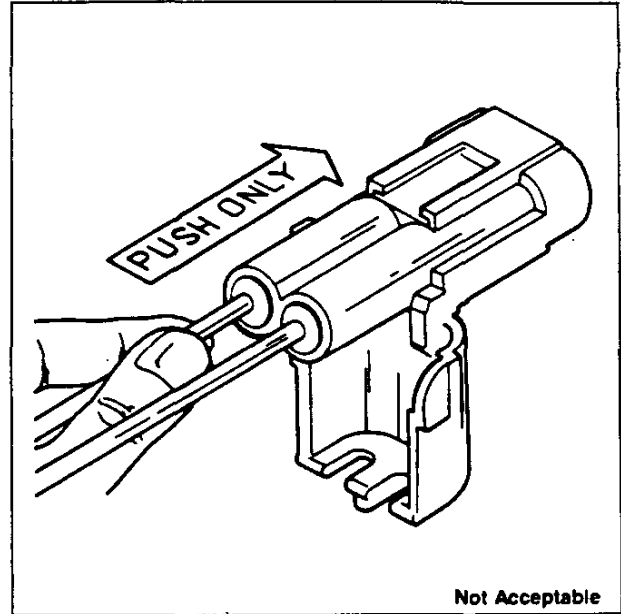
ASSEMBLY TO CONNECTOR



Assemble the terminated wire assembly to the connector manually

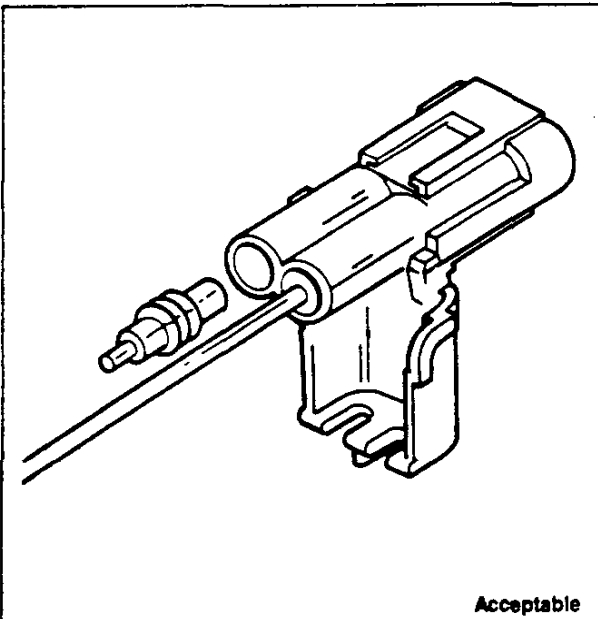
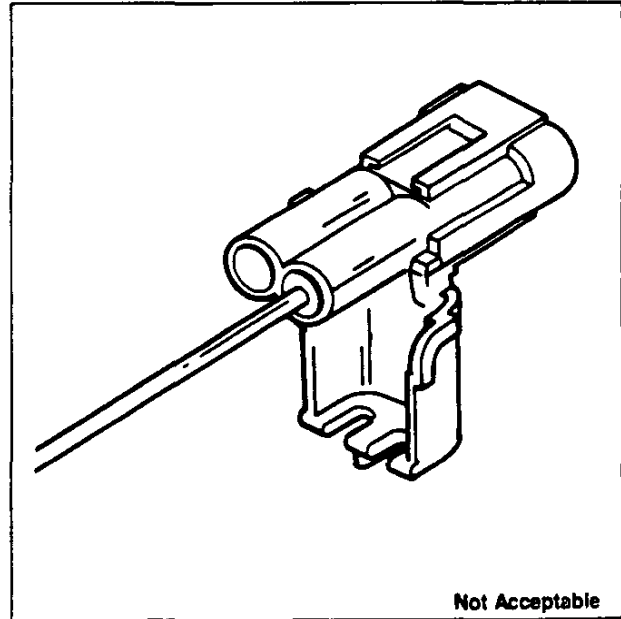
Figure 56

PLUGGING THE TERMINALS



The "push, click, tug" method of plugging is recommended to prevent unsealed terminals.

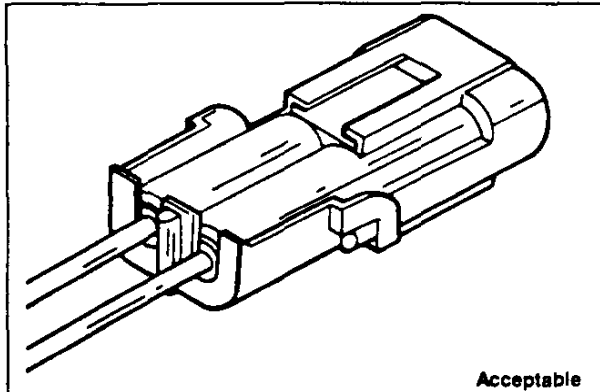
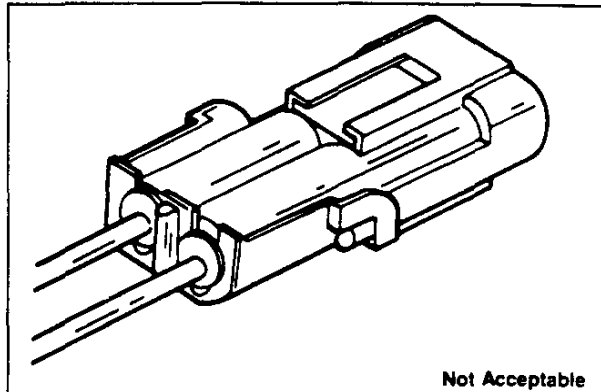
EMPTY CAVITIES



Empty terminal cavities must be filled with a cavity plug.

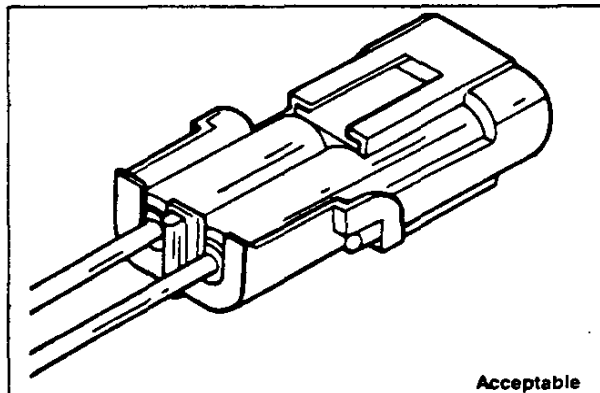
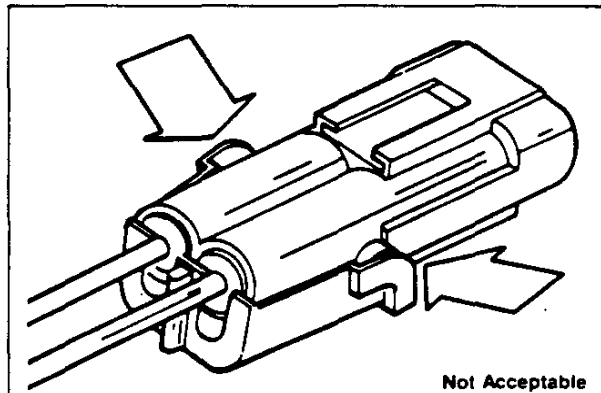
Figure 57

POSITION OF CABLE SEALS IN CONNECTOR BODY



At least two ribs of the cable seal must be inside the connector cavity. The third rib may be outside the cavity, but must not be deformed by closure of the secondary lock.

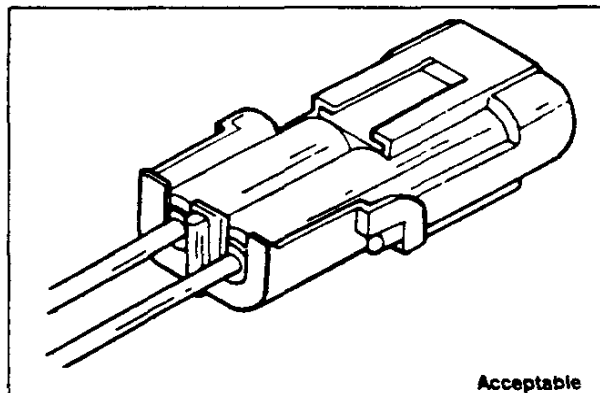
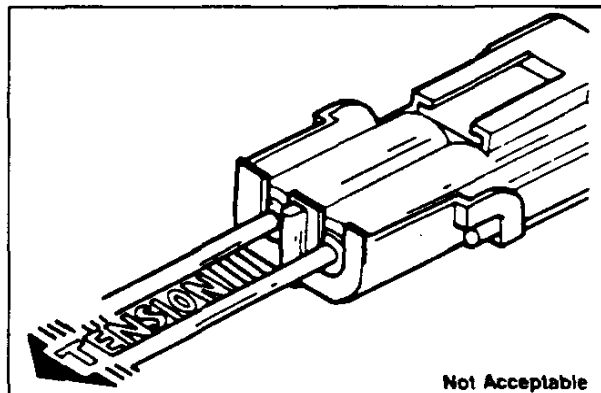
SECONDARY LOCK



The secondary lock must be latched on both sides of the connector.

Figure 58

CONNECTOR WIRE TENSION



Care should be taken to minimize tension on connector wire leads.

Figure 59

DDEC Harness Wire Splicing

In the event of a broken wire, a high quality splice is acceptable. The following information applies to all harness wiring except the harness which connects the ECM to the electronic unit injectors. Splicing the ECM to EUI harness wires is not recommended and should be replaced if damaged.

All splicing information contained herein is meant to provide information to those who are not experienced in wire repair. The methods described are not the only acceptable methods. Whatever method is chosen should produce a high quality, tight splice with durable insulation which can be expected to last for the life of the vehicle.

The selection of crimpers and splice connectors is optional. Select a high quality crimper equivalent to Kent-Moore tool J25563 and commercially available splice clips.

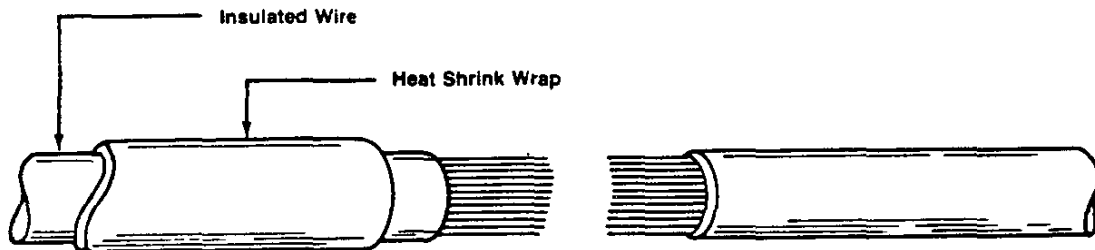
I. Tools Required:

- Soldering iron
- Rosin core solder
- Wire strippers
- Electrical tape or heat shrink tubing
- Splice clips
- Crimp pliers

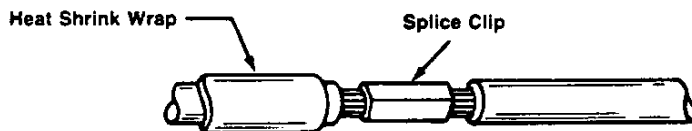
II. Procedure

Straight Leads

1. Locate broken wire
2. Remove insulation as required; be sure exposed wire is clean and not corroded. If available, slide a sleeve of shrink wrap on the wire long enough to cover the splice and overlap the wire insulation.



3. Insert one wire into splice clip (GM-5297428 or equivalent) and crimp.
4. Insert other wire into splice clip and crimp.



Solder

Soldering splice connectors is optional, but not required. Acid core solder is prohibited and only rosin core solder should be used. Be sure the exposed wire is clean before the splice is crimped in its connector.

Use a suitable electronic soldering iron to heat the wires. Apply the solder to the heated wire (not to the soldering iron) allowing sufficient solder to flow into the splice joint. Pull on connection to assure crimping and soldering integrity.

Heat Shrink Wrap

Shrink wrap is preferred over electrical tape but is not mandatory. If shrink wrap is used, select the correct diameter to allow a tight wrap when heated. Be sure the heat shrink wrap is long enough to overlap the wire insulation about 1/4 inch (on both sides of the splice). Heat the shrink wrap with a match or lighter; do not concentrate the heat in one location, but play the flame over the entire length of shrink wrap until the joint is complete.

Electrical Tape

Good quality electrical tape is an acceptable alternative to heat shrink wrap. It should be applied by wrapping the joint starting on the wire insulation across the splice to the wire insulation on the other side of the joint. Overlap the wire insulation on both sides to assure adequate insulation. Apply two or three wraps of tape to assure sufficient insulation.



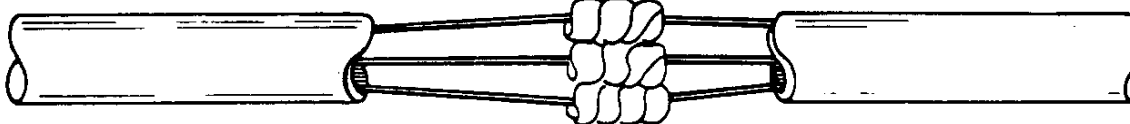
Multiple Broken Wires

When multiple splices are required in a harness, stagger the position of each splice as illustrated to prevent a large bulge in the harness, and to prevent the splices from chafing against each other, which could lead to wearing through of the insulation and subsequent "short circuits".

Correct



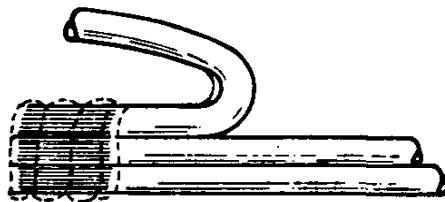
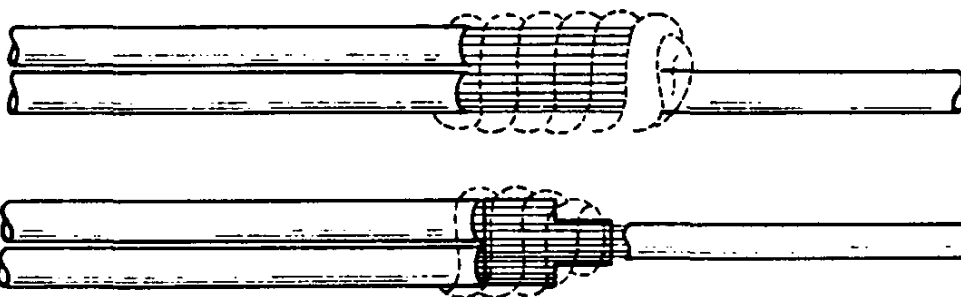
Incorrect



Three-Wire Splice

Three-way splice connectors are commercially available to accommodate three-wire splices. The technique is the same as single butt splice connectors.

Acceptable:



Notes