10 INTERMITTENT FAULT

10.1 INTERMITTENT CODE OR A SYMPTOM AND NO CODES

The following procedure will diagnose an intermittent code or symptom.

10.1.1 Diagnosis by Symptom

Perform the following steps to diagnose an intermittent code or symptom.

NOTE:
Do not use any other procedures (except for the suggestions listed in this manual) when trying to solve an intermittent problem. Use of any other procedures for this type 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. For example, an intermittent code 35 (Oil Pressure Sensor High Voltage) would indicate a problem in the following areas associated with the Oil Pressure Sensor.

- ❑ Wires #530 (signal line), #416 (+5 volt line), or #452 (ground line)
- ❑ The Oil Pressure Sensor connector or ECM connector
- ❑ An intermittent problem in the Oil Pressure Sensor (least likely)

Use the following checklist:

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 inspected to determine proper contact tension. Use a mating terminal to test the 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.
4. Verify alternator grounds are clean and making good contact. Disconnect the alternator belt to test.
5. Wiggle wires and harnesses to try to make the problem active, or re–occur.

10.1.2 Verify Repairs

Perform the following steps to verify repairs.

1. Clear codes.
2. Confirm the CEL does not come on (except for the five second ignition ON bulb check).
3. Run the engine for one minute.
4. If the CEL stays ON, refer to section 9.1.2.

10.2 ENGINE CRANKS BUT WILL NOT START

The following procedures will diagnose engine cranks but will not start.

10.2.1 Check Engine Light

Perform the following steps to check the CEL:

1. Turn ignition on while observing the Check/Stop Engine Light.
   [a] If the light comes on and stays on, refer to section 9.1.
   [b] If the light comes on for up to five seconds, and then goes off, refer to section 10.2.2.
   [c] If the lights are off, refer to section 10.2.14.

10.2.2 Fuel Check

Perform the following steps to check the fuel supply:

1. Disconnect the fuel return line.
2. Check for fuel flow while cranking the engine.
   [a] If fuel flow is okay, refer to section 10.2.3.
   [b] If fuel supply is not okay, refuel the vehicle. The system may need to be re-primed. Refer to the appropriate engine service manual.

10.2.3 White Smoke Check

Perform the following steps to check for white smoke:

1. Reconnect fuel return line.
2. Look for white smoke coming out of the exhaust stack while cranking the engine.
   [a] If white smoke is present, refer to section 10.2.4.
   [b] If white smoke is not present, refer to section 10.2.28.

10.2.4 Check Timing Reference Sensor Status

Perform the following steps to check the TRS status via a r/min readout:

1. Select engine speed and active codes on the DDR.
2. Crank the engine for ten seconds while observing DDR display. A battery voltage surge while cranking with electric starters may blank or reset the DDR.
   [a] If the display reads greater than or equal to 60 r/min, refer to section 10.2.9.

[b] If the display reads less than 60 r/min or constantly reads 60 r/min, refer to section 10.2.5.

[c] If code 41 is displayed, refer to section 41.3.1.

[d] If code 42 is displayed, refer to section 42.3.1.

10.2.5 Check Timing Reference Sensor

Perform the following steps to check the TRS:

1. Turn vehicle ignition OFF.
2. Disconnect engine harness connector at the ECM.
3. Measure resistance between sockets T1 and T2 at the engine harness connector.

   [a] If the resistance measurement is greater than 200 Ω, refer to section 41.3.3.

   [b] If the resistance measurement is less than 100 Ω, refer to section 41.3.2.

   [c] If the resistance measurement is between 100 and 200 Ω, refer to section 10.2.6.

10.2.6 Check Synchronous Reference Sensor / Timing Reference Sensor Mounting

Perform the following steps to check the SRS/TRS mounting and the bracket:

1. Inspect SRS/TRS mounting.

   [a] If the sensor and mount are secure, refer to section 10.2.7.

   [b] If the sensor and mount are not secure, tighten the bolt or replace if necessary. Refer to section 10.2.27.

10.2.7 Check Pulse Wheel

Perform the following steps to check the pulse wheel:

1. Inspect DDEC® pulse wheel for loose wheel or chipped or missing teeth.

   [a] If the pulse wheel is damaged, repair or replace as necessary. Refer to section 10.2.27.

   [b] If the pulse wheel is not damaged, refer to section 10.2.8.

10.2.8 Check ECM Connectors

Perform the following steps to check the ECM connectors:

1. Turn vehicle ignition OFF.
2. Disconnect all connectors at the ECM.
3. Check terminals at all ECM connectors (both the ECM and harness side) for damaged, bent, corroded or unseated pins or sockets.
   [a] If the terminals and connectors are damaged, repair them. Refer to section 10.2.27.
   [b] If the terminals and connectors are not damaged, replace the ECM. Refer to section 10.2.27. (Try a test ECM first.)

10.2.9 Check for Good Synchronous Reference Sensor Signal

Perform the following steps to check for a good SRS signal:

1. Select engine data list on DDR.
2. Crank engine while observing DDR display of SRS received. Battery voltage surges while cranking with electric starters may blank or reset the DDR.
   [a] If the SRS RECEIVED signal is YES, refer to section 10.2.11.
   [b] If the SRS RECEIVED signal is NO, refer to section 10.2.10.

10.2.10 Check Synchronous Reference Sensor

Perform the following steps to check the SRS:

1. Turn vehicle ignition OFF.
2. Disconnect engine harness connector at the ECM.
3. Measure resistance between sockets S1 and S2 at the engine harness connector.
   [a] If the resistance measurement is greater than 200 Ω, refer to section 41.3.3.
   [b] If the resistance measurement is less than 100 Ω, refer to section 41.3.2.
   [c] If the resistance measurement is between 100 and 200 Ω, refer to section 10.2.6.

10.2.11 Check for Open

Perform the following steps to check if the injector return wires are open:

1. Turn ignition OFF.
2. Disconnect the 5-way injector harness connector at the ECM.
3. Measure resistance between the injector return pin and all the power driver pins on both harness connectors.
   [a] If the resistance measurement is greater than 5 Ω on any reading, an open exists in one of the injector power driver or return wires. Repair the open. Refer to section 10.2.27.
   [b] If the resistance measurement is less than or equal to 5 Ω on any reading, refer to section 10.2.12.

10.2.12 Short to Ground

Perform the following steps to check if the injector lines are shorted to the ground:

1. Disconnect the 5-way injector harness connector at the ECM.
2. Measure resistance between socket D of the 5-way power harness connector to the following sockets on the injector harness connector: A, B, C, D, E, G, H, J, K and L.
   [a] If the resistance measurement is greater than or equal to 10,000 Ω or open on all readings, refer to section 10.2.13.
   [b] If the resistance measurement is less than 10,000 Ω on any reading, there is a short to ground on the wire where resistance was less than 10,000 Ω. Repair the short and refer to section 10.2.27.

10.2.13 Injector Drive Pulses

Perform the following steps to check the injector drive pulses:

1. Turn ignition OFF.
2. Reconnect all ECM connectors. See Figure 10-1.
3. Remove rocker covers.
4. Disconnect return wire #619 or #620 from one injector.
5. Place a 6-volt test light across the previously disconnected injector return side and a good ground.
6. Crank engine and note the test light to see if it lights (flashes).

7. Reconnect the return wire.
8. Repeat the above procedure with all other injectors until all have been tested or until one test fails.
   [a] If all tests pass, the problem does not appear to be in the DDEC system.
   [b] If all tests do not pass and the test light is flashing for one or more tests, check for proper parts (e.g. bull gear) then try a test ECM. Refer to section 10.2.27.
   [c] If all tests do not pass and the test light is not flashing for one or more tests, refer to section 10.2.8.

WIRE NO.	CAVITY
240	A BATT (+)
150	D BATT (-)
151	B BATT (-)
150	E BATT (-)
241	C BATT (+)

CONNECTOR DESCRIPTION AND P/N	
CONNECTOR	12124634
TERMINAL	12077413
CABLE SEAL	12015193
SECONDARY LOCK	12052816

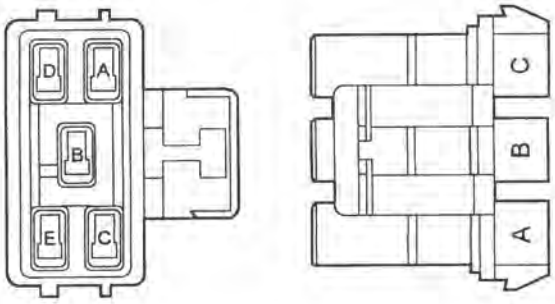

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Figure 10–1 5–Way ECM Power Harness Connector

10.2.14 Check DDEC Fuses

Perform the following steps to check the DDEC fuses:

1. Check both ECM power fuses or circuit breakers.
   [a] If both fuses are okay, refer to section 10.2.15.
   [b] If either fuse is not okay, refer to section 10.2.25.

10.2.15 Battery Volts Check

Perform the following steps to check for battery volts at the 5-way connector:

NOTE:
A high resistance in these wires may prevent engine starting but measure correct voltage. Proper resistance based on wire length and size is listed in Table 46-2.

1. Turn ignition OFF.
2. Disconnect the 5-way power harness connector at the ECM. See Figure 10-2.
3. Measure voltage from socket A (red lead) of 5-way power harness connector to a good ground.
4. Measure voltage from socket C (red lead) of 5-way power harness connector to a good ground.
   [a] If the voltage measurement is greater than 11.5 volts on all readings, refer to section 10.2.18.
   [b] If the voltage measurement is less than 11.5 volts on any readings, refer to section 10.2.16.

WIRE NO.	CAVITY	CONNECTOR DESCRIPTION AND P/N	
240	A BATT (+)	CONNECTOR	12124634
150	D BATT (-)	TERMINAL	12077413
151	B BATT (-)	CABLE SEAL	12015193
150	E BATT (-)	SECONDARY LOCK	12052816
241	C BATT (+)		

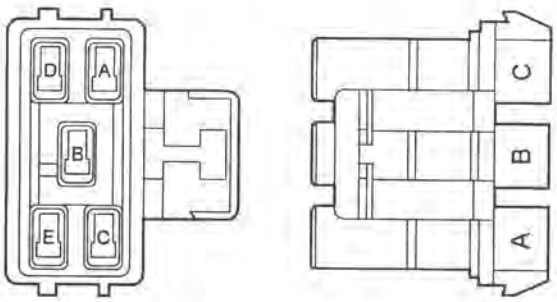

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Figure 10-2 5-Way ECM Power Harness Connector

10.2.16 ECM Power Line Check

Perform the following steps to check if the ECM power lines are open:

1. Measure voltage between battery side of one ECM fuse or circuit breaker (red lead) and a good ground (black lead).
2. Measure voltage at other ECM fuse or circuit breaker. Note that battery side does not contain #240 or #241 wires. See Figure 10–3.
   [a] If the voltage measurement is less than 11.5 volts on any reading, refer to section 10.2.17.
   [b] If the voltage measurement is greater than 11.5 volts on all readings, an open exists in either power wire (#240 or #241). Repair the open; refer to section 10.2.27.

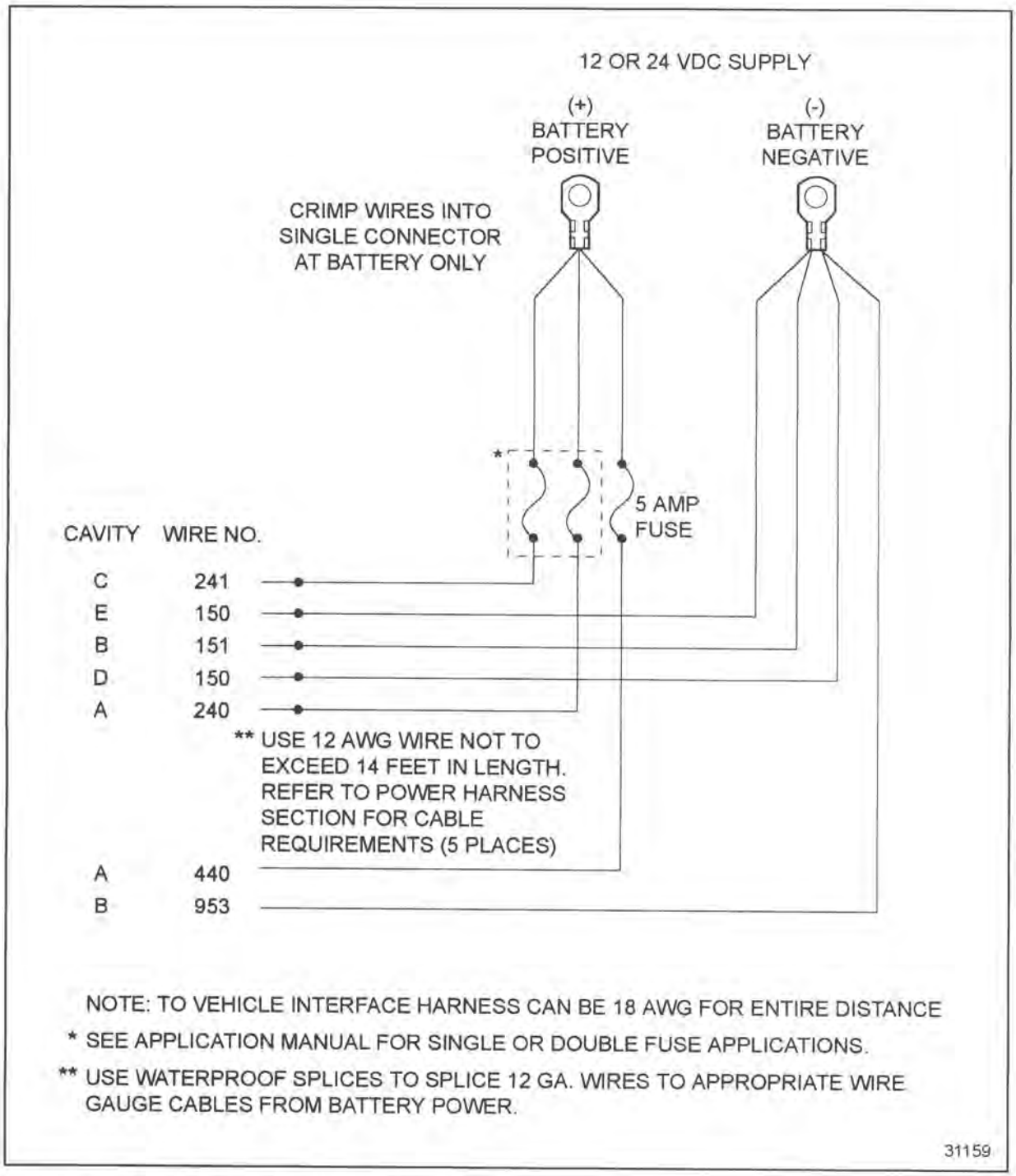

Figure 10–3 Power Harness Diagram

10.2.17 Check Battery

Perform the following steps to check the battery:

1. Connect all connectors.
2. Turn ignition ON.
3. Measure voltage at battery (+) terminal (red lead) to the battery (-) terminal (black lead).
   [a] If the voltage reading is less than 11.5 volts, service the discharged battery. Refer to section 10.2.27.
   [b] If the voltage reading is greater than or equal to 11.5 volts, an open or short to ground exists in the battery (+) line. Repair the open. Refer to section 10.2.27.

10.2.18 Check Volts at Ignition Wire

Perform the following steps to check for +12 or +24 volts at the ignition wire:

1. Turn ignition OFF.
2. Disconnect the vehicle harness connector at the ECM. For vehicle harness schematic, see Figure 10–4.
3. Turn ignition ON.
4. Measure voltage between socket B3 on the vehicle harness connector (red lead) and a good ground (black lead).
   [a] If the voltage measurement is greater than or equal to 11.5 volts, refer to section 10.2.19.
   [b] If the voltage measurement is less than 11.5 volts, refer to section 10.2.20.

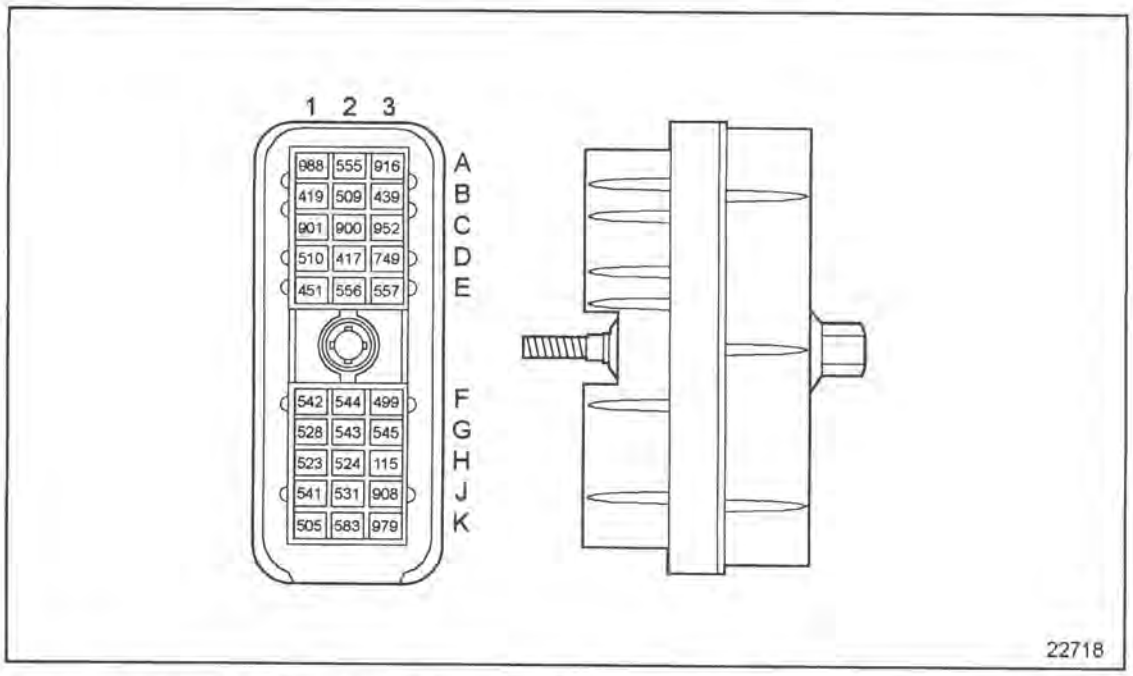

Figure 10–4 ECM Vehicle Interface Harness Connector

10.2.19 Ground Wire Check

Perform the following steps to check for a good ground wire:

1. Measure voltage between socket B3 on the vehicle harness connector (red lead) and sockets D and E of the 5-way power harness connector. For 5-way ECM power harness schematic, see Figure 10–5.
   [a] If the voltage measurement is greater than or equal to 11.5 volts, refer to section 10.2.8.
   [b] If the voltage measurement is less than 11.5 volts, the ECM ground wire (ck#150) is open or has a poor connection. Repair open; refer to section 10.2.27.

WIRE NO.	CAVITY
240	A BATT (+)
150	D BATT (-)
151	B BATT (-)
150	E BATT (-)
241	C BATT (+)

CONNECTOR DESCRIPTION AND P/N	
CONNECTOR	12124634
TERMINAL	12077413
CABLE SEAL	12015193
SECONDARY LOCK	12052816

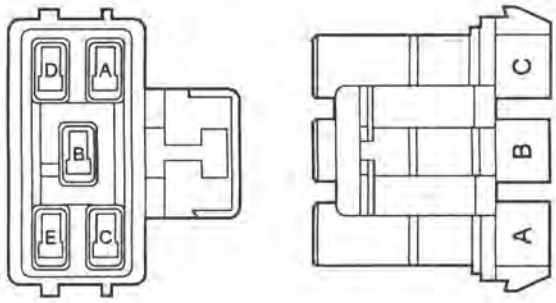

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Figure 10–5 5–Way ECM Power Harness Connector

10.2.20 Check Ignition Fuse

Perform the following steps to check the ignition fuse:

1. Turn ignition OFF.
2. Check 5-amp ignition fuse or circuit breaker.
   [a] If both the fuse and circuit breaker are okay, refer to section 10.2.21.
   [b] If the fuse or circuit breaker are not okay, refer to section 10.2.22.

10.2.21 Check for Open

Perform the following steps to check if the ignition wire is open:

1. Measure voltage between battery side (hot side) of the 5-amp ignition fuse (red lead) and a good ground (black lead).
   [a] If the voltage measurement is less than 11.5 volts, refer to section 10.2.24.
   [b] If the voltage measurement is greater than or equal to 11.5 volts, the ignition line (circuit#439) is open. Repair the open; refer to section 10.2.27.

10.2.22 Check for Ground

Perform the following steps to check if the ignition wire is shorted to ground:

1. Replace blown fuse or reset open circuit breaker.
2. Turn ignition ON for ten seconds.
3. Run engine for one minute.
4. Turn ignition OFF.
5. Check 5-amp ignition fuse or circuit breaker again.
   [a] If both the fuse and circuit breaker are okay, refer to section 10.2.23.
   [b] If the fuse and circuit breaker are not okay, the ignition line (circuit#439) is shorted to ground. Repair the short; refer to section 10.2.27.

10.2.23 Check Fuse or Circuit Breaker

Perform the following steps to check if the ignition fuse or breaker is okay:

1. Reconnect all harness connectors at the ECM.
2. Start the engine.
3. Run engine for one minute.
4. Turn ignition OFF.

5. Check 5-amp ignition fuse or circuit breaker again. For 5-way ECM power harness schematic, see Figure 10-6.
   [a] If both the fuse and circuit breaker are okay, no short is currently present. Be warned of an intermittent short that could shut down the engine or blow a fuse due to reverse voltage at the battery. Refer to section 10.2.27.
   [b] If the fuse or circuit breaker are not okay, refer to section 10.2.8.

WIRE NO.	CAVITY
240	A BATT (+)
150	D BATT (-)
151	B BATT (-)
150	E BATT (-)
241	C BATT (+)

CONNECTOR DESCRIPTION AND P/N	
CONNECTOR	12124634
TERMINAL	12077413
CABLE SEAL	12015193
SECONDARY LOCK	12052816

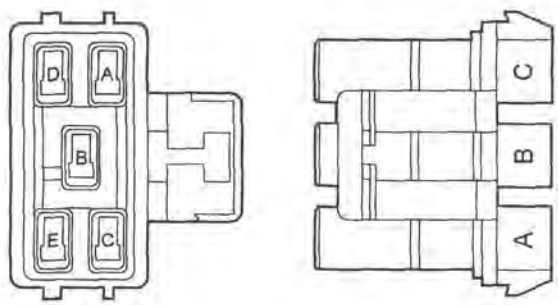

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Figure 10–6 5–Way ECM Power Harness Connector

10.2.24 Check Battery

Perform the following steps to check the battery:

1. Disconnect the battery cables at the battery.
2. Measure voltage at the battery (+) terminal (red lead) to the battery (-) terminal (black lead).
   [a] If the voltage measurement is less than 11.5 volts, service the discharged battery. Refer to section 10.2.27.
   [b] If the voltage measurement is greater than or equal to 11.5 volts, an open or short to ground exists in unfused ignition line. Repair the open. Refer to section 10.2.27.

10.2.25 Check for Blown Fuses

Perform the following steps to check for blown fuses:

1. Turn ignition OFF.
2. Disconnect the 5-way power harness connector at the ECM.
3. Replace blown fuse(s) or reset the circuit breaker(s).
4. Wait ten seconds.
5. Check whether fuse(s) or circuit breaker(s) have blown or opened up again.
   [a] If the fuse and circuit breaker are okay, refer to section 10.2.23.
   [b] If the fuse or circuit breaker are not okay, refer to section 10.2.26.

10.2.26 Check for Short to Ground

Perform the following steps to check for a short to ground:

1. Disconnect the batteries.
2. Measure resistance between #240 and a good ground (black lead).
3. Measure resistance between #241 and a good ground (black lead).
   [a] If the resistance measurement is greater than or equal to 10,000 Ω on all readings, refer to section 10.2.8.
   [b] If the resistance measurement is less than 10,000 Ω on any readings, a short to ground exists. Repair the short. Refer to section 10.2.27.

10.2.27 Verify Repairs

Perform the following steps to verify repairs:

1. Turn ignition OFF.
2. Reconnect all connectors.
3. Turn ignition ON.
4. Clear codes.
5. Start and run the engine for one minute.
6. Stop the engine.
7. Read inactive codes.
   [a] If the engine starts and no codes are displayed, troubleshooting is complete.
   [b] If the engine does not start, refer to section 10.2.1.
   [c] If the engine starts and codes display, refer to section 9.1.

10.2.28 Check Fuel Filters

Perform the following steps to check fuel filters:

1. Turn ignition OFF.
2. Check primary and secondary fuel filters to be sure they are not clogged and they are filled with clean fuel.
   [a] If the fuel filters are clean, refer to section 10.2.4.
   [b] If the fuel filters are not clean, replace the filters. Prime the system if required. Refer to section 10.2.27.

NOTE:
For information concerning Fuel Filters, refer to section 29.4.11 in the appropriate service manual. For information concerning Fuel Filter Replacement, refer to section 18 in the appropriate service manual.

10.3 ERRATIC PERFORMANCE AND NO CODES

The following troubleshooting chart resolves erratic performance and no codes displayed. For troubleshooting procedures, refer to the appropriate engine service manual.

10.3.1 Erratic Performance and No Codes

Check the following symptoms to determine possible fault, listed in Table 10–1.

Symptom	Possible Fault
Cannot get full power.	Plugged fuel filters. Hose not connected to Turbo Boost Sensor. Verify injector calibration(s) are correct.
Cannot get full throttle.	Mis–calibrated Throttle Position Sensor.
Runs rough; misses and occasionally stalls.	Improper gapping of Timing Reference and Synchronous Reference Sensor. Fuel leaks. Loose battery power, ignition or ground wires. Injector failure. Vehicle speed sensor failure. Injector harness failure.
Engine idles high after warm–up or hangs.	Incorrect calibration of Throttle Position Sensor. TPS linkage or pedal problem. VSG signal wire shorted to voltage source.
Low road speed.	Determine road speed specifications for vehicle manufacturer data. If road speed is less than specified and all mechanical checks are correct, then cruise control calibration is suspected.
Vehicle surges or bucks.	VSS may be supplying incorrect data to the ECM.

Table 10–1 Troubleshooting Erratic Performance and No Code

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10.4 CHECK ENGINE LIGHT AND STOP ENGINE LIGHT FAULT

The following steps will troubleshoot a fault with the check engine or stop engine lights. These lights are used to alert the operator of engine faults; flash any trouble codes stored in the ECM; and illuminate for five seconds and then go out during a start sequence, as a bulb check.

10.4.1 Determine Fault

Perform the following to determine fault:

1. If the CEL or SEL is always on, refer to section 10.4.2.
2. If the CEL or SEL never lights, refer to section 10.4.5.

10.4.2 Display ECM Light Status

Perform the following steps to display light status:

1. While the light is lit, plug in the DDR (ignition ON).
2. Select switch light status.
3. View the displayed status for the problem light.
   [a] If status reads OFF, refer to section 10.4.4.
   [b] If status reads ON, refer to section 10.4.3.

10.4.3 Determine Reason for ECM Request

Perform the following steps to determine the reason the ECM is requesting the light to be ON:

1. Verify the diagnostic request is not ON.
   [a] If the diagnostic request is ON, refer to section 10.10.
   [b] If the diagnostic request is not ON, refer to section 9.1, (troubleshoot code).

10.4.4 Check for Grounded Wire

Perform the following steps to check for a grounded wire:

1. Turn ignition OFF.
2. Unplug VIH 30-pin connector.
3. Turn ignition ON.
   [a] If the light stays on, drive (#509 or #419) wire is shorted to the ground. Repair or replace the wire. Refer to section 10.4.9.
   [b] If the light goes off, clean the connectors of the VIH 30-pin and re-assemble. Then, refer to section 10.4.9.

10.4.5 Activate Light With Diagnostic Data Reader

Perform the following steps to activate the light with the DDR:

1. Turn ignition ON.
2. Plug in DDR.
3. Select Activate Outputs.
4. Activate affected light; watch status.
   [a] If the light stays off. Refer to section 10.4.6.
   [b] If the light illuminates, the problem no longer exists. Refer to *DDEC III Application and Installation* manual, 7SA800, to review the light operation.

10.4.6 Check Bulb

Perform the following steps to check the bulb:

1. Turn ignition OFF.
2. Refer to OEM recommendations for checking bulb.
   [a] If the bulb is bad, replace the bulb and refer to section 10.4.9.
   [b] If the bulb is okay, refer to section 10.4.7.

10.4.7 Check for Voltage Supply

Perform the following steps to check the voltage supply:

1. Disconnect the power supply to the light.
2. Turn ignition ON.
3. Measure voltage between the removed connection and battery ground.
   [a] If the voltage is correct based on the system of the vehicle (12/24V), refer to section 10.4.8.
   [b] If the voltage is too low to expect the bulb to light, refer to the OEM recommendations to resolve the problem. Refer to section 10.4.9.

10.4.8 Check for Open Output Wire

Perform the following steps to check for an open output wire:

1. Measure the resistance between the ground side of the connector of the light and the battery ground.
   [a] If the measured resistance is 45,000 to 48,000 Ω, clean the connections. Refer to section 10.4.9.
   [b] If the measured resistance is less than 45,000 Ω or greater than 48,000 Ω, the wire is shorted to voltage, or is opened. Repair wire. Refer to section 10.4.9.

10.4.9 Verify Repairs

Perform the following steps to verify repairs.

1. Ensure all removed connections are installed.
2. Turn ignition ON.
   [a] If the light comes on for five seconds, then goes out, troubleshooting is complete.
   [b] If the light comes on and stays on, refer to section 10.4.1.
   [c] If the light does not turn on, all troubleshooting is complete. Review this section and contact Detroit Diesel Technical Service.

10.5 NO DATA TO DIAGNOSTIC DATA READER

Before using this procedure, all basic mechanical checks and physical inspections should have been performed with no problem found. Also the diagnosis of the DDEC system in Section 9 referred you to this section.

10.5.1 Read Codes on the Check Engine Light

Perform the following steps to read the codes on the CEL or SEL:

1. Unplug the DDR.
2. Ignition should be ON; engine not running.
3. Enable diagnostic request switch.
4. Read codes flashing on the CEL and SEL.
   [a] If codes are flashing out, refer to section 10.5.4.

NOTE:
If you wish to bypass diagnosis of a potential data line of the DDR problem for now, diagnose the active code by referring to the section that matches the code number.

   [b] If CEL and SEL are not flashing out codes, refer to section 10.5.2.

10.5.2 Check Diagnostic Request Circuit

Perform the following steps to check the diagnostic request circuit:

1. Ensure ignition is ON.
2. Plug in DDR.
3. Select Calibration Configuration.
4. Determine port assigned to diagnostic request on the ECM input switches.
5. Go to switch light status.
6. Depress and hold the diagnostic request switch.
7. Read status of diagnostic request.
   [a] If the switch reads OFF, the diagnostic request circuit (#528) is open or the ground is poor or open. Repair the open wire or the bad ground. Refer to section 10.5.8.
   [b] If the switch reads ON, refer to section 10.5.3.

10.5.3 Check ECM Connectors

Follow this procedure to check the ECM connectors:

1. Check the terminals at the vehicle harness and 5-way power harness connectors (both ECM and harness side) for damage: bent, corroded and unseated pins or sockets. See Figure 10–7.
   [a] If terminals and connectors are okay, replace the ECM. Refer to section 10.5.8.
   [b] If the terminals and connectors are damaged, repair them. Refer to section 10.5.8.

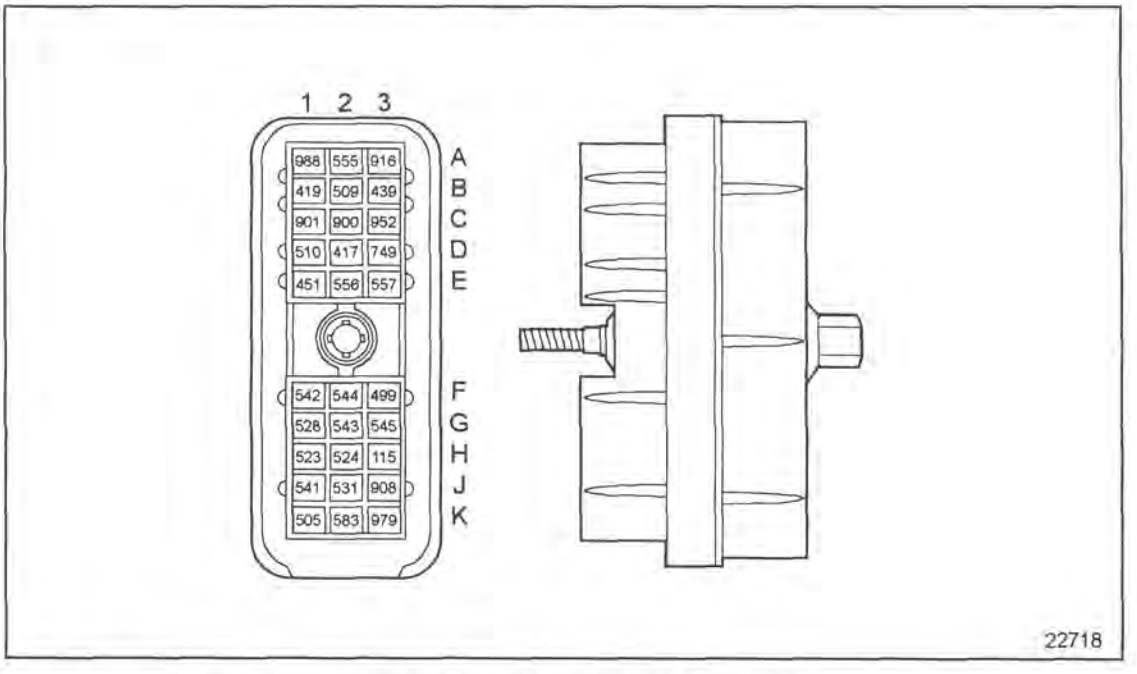

Figure 10–7 ECM Vehicle Interface Harness Connector

10.5.4 Check for Open

Perform the following steps to check for an open:

1. Turn ignition OFF.
2. Place a jumper wire across pins A (#900) and B (#901) of the DDL connector. Unplug the vehicle harness connector and measure resistance between sockets C1 and C2.
3. Turn ignition ON, and again measure resistance between sockets C1 and C2. See Figure 10–8.
   [a] If both readings are greater than 5 Ω, one or both data wires (circuit #900 or #901) are open. Repair the open and refer to section 10.5.8.
   [b] If either reading is less than 5 Ω, refer to section 10.5.5.

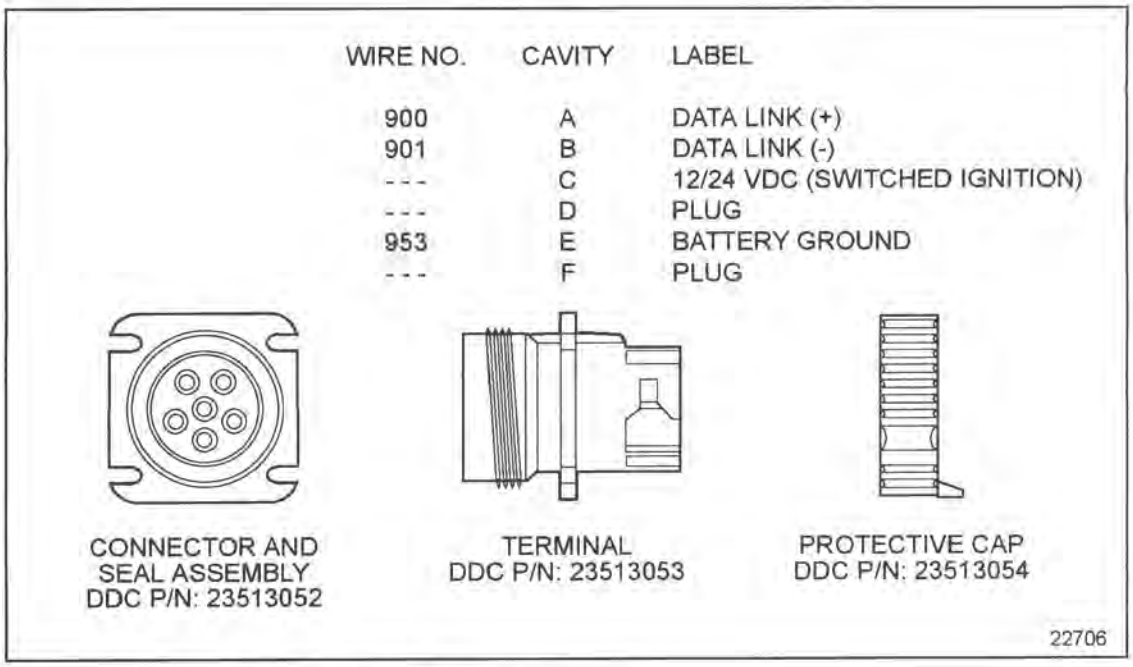

Figure 10–8 Diagnostic Connector

10.5.5 Check for Short

Perform the following steps to check for a short:

1. Remove the jumper wire from the DDL connector.
2. Measure resistance between sockets C1 (#901) and C2 (#900) of the vehicle harness connector.
   [a] If the resistance measurement is less than 5 Ω, two data wires (circuit #900 or #901) are shorted together. Repair the short and refer to section 10.5.8.
   [b] If the measured resistance is greater than 5 Ω, refer to section 10.5.6.

10.5.6 Check for Short to Ignition and Ground

Perform the following steps to check for a short to ignition and ground:

1. Remove all jumpers for the DDL connector.
2. Measure resistance between sockets A (#900) and C (ignition switch), A (#900) and E (ground), B (#901) and E (ground), and B (#901) and C (ignition switch) of the DDL connector.
   [a] If the measured resistance is less than 5 Ω on any reading, a short exists between the data wires and ignition or ground. Repair the short and refer to section 10.5.8.
   [b] If the measured resistance is greater than 5 Ω, refer to section 10.5.7.

10.5.7 Check Diagnostic Data Reader on Another Engine

Follow this procedure to check the DDR on another engine:

1. Connect the DDR to another engine and read any parameter in the menu.
   [a] If the procedure worked okay, refer to section 10.5.8.
   [b] If the procedure did not work, the DDR is probably defective. Refer to the DDR instruction manual for repair.

10.5.8 Verify Repairs

Perform the following steps to verify repairs:

1. Turn ignition OFF.
2. Reconnect all connectors.
3. Turn ignition ON.
4. Clear codes.
5. Turn ignition OFF.
6. Turn ignition ON.
7. Note status of CEL.
8. Start and run the engine for one minute.
9. Read inactive codes.
   [a] If the DDR display reads NO DATA BEING RECEIVED FROM DATA LINK or DDEC SYSTEM NOT RESPONDING, all system diagnostics are complete. Review this section from the first step to find the error. Refer to section 10.5.1.
   [b] If the engine starts and no codes are read on the DDR, repairs are complete.
   [c] If the engine starts and code displays, refer to section 9.1.

10.6 DIAGNOSTIC REQUEST SWITCH INOPERATIVE

Before using this procedure, all basic mechanical checks and physical inspections should have been performed with no problem found. Also the diagnosis of the DDEC system in Section 9 referred you to this section.

10.6.1 Check Diagnostic Request Circuit

Perform the following steps to check the diagnostic request circuit:

1. Turn ignition ON; engine not running.
2. Plug in DDR.
3. Select Switch/Light Status.
4. Depress and hold diagnostic request switch.
5. Observe the Diagnostic Request Status on the DDR.
   [a] If the display reads ON, refer to section 10.6.2.
   [b] If the display reads OFF, the diagnostic request line (#528) is open, or is not being grounded when the switch is depressed. Check the #528 wire and ground for diagnostic request switch. Repair the problem; refer to section 10.6.4.
   [c] If no diagnostic request on the DDR input list, the ECM is not configured for diagnostic request operation. Refer to the *DDEC Application and Installation* manual, 7SA800.

10.6.2 Check Stop Engine Light and Check Engine Light Bulbs

Perform the following steps to check the SEL and CEL bulbs:

1. Turn ignition OFF.
2. Remove CEL and SEL bulbs. Check to see if either is burned out or damaged.
   [a] If the bulbs are okay, refer to section 10.6.3.
   [b] If the bulbs are defective, replace the bulbs. Refer to section 10.6.4.

10.6.3 Check 12 / 24V Ignition Line

Perform the following steps to check the 12/24V ignition line:

1. Turn ignition ON.
2. Disconnect vehicle harness connector at ECM.
3. Measure voltage at cavity B3 (#439).
   [a] If voltage measurement is less than 11.5V, the 5 amp fuse or circuit breaker is blown, and the ignition line could be open or shorted to ground.
   [b] If the voltage measurement is greater than 11.5V, the circuit #419 or #509 is open. Repair the open. Refer to section 10.6.4.

10.6.4 Verify Repairs

Perform the following steps to verify repairs:

1. Reconnect all connectors.
2. Turn ignition ON.
3. Press diagnostic request switch.
   [a] If codes flash, the system is working. Repairs are complete. If any other problems exist, refer to section 9.1.
   [b] If the system does not function, all system diagnostics are complete. Review this section to find the error. Refer to section 10.6.1.

10.7 CRUISE CONTROL INOPERATIVE

Before using this procedure, all basic mechanical checks and physical inspections should have been performed with no problem found. Also the diagnosis of the DDEC system in Section 9 referred you to this section.

10.7.1 Determine Type of Cruise Control System

Perform the following to determine the type of cruise control system:

1. Check that this is a DDEC cruise control system.
2. Turn ignition ON.
3. Plug DDR into DDL connector.
4. Select calibration configuration (cruise control).
5. Is cruise control enabled?
   [a] If cruise control is enabled, refer to section 10.7.3.
   [b] If cruise is not enabled, refer to *DDEC III Installation and Application* manual, 7SA800, for requirements of installing cruise control.

10.7.2 Check ECM Connectors

Perform the following to check the ECM connectors:

1. Disconnect the vehicle harness connector at the ECM.
2. Check the terminals at the ECM vehicle harness connector (both ECM and harness side) for damaged, corroded, or unseated pin or sockets.
   [a] If terminals and connectors are not damaged, reprogram the ECM. Refer to section 10.7.16.
   [b] If the terminals or connectors are damaged, repair them. Refer to section 10.7.16.

10.7.3 Check Pin Assignments

Perform the following to check pin assignments:

1. Turn ignition ON.
2. Plug in the DDR.
3. Select calibration configuration (ECM Ins/Outs).
4. Write/print pin assignments.

   [a] An example listed in Table 10–2 shows pins, wires and functions. Refer to section 10.7.4.

Pin	Wire	Function
J1	#541	set/coast on
F2	#544	cruise enable
G2	#543	svc brk rel
J2	#531	clutch rel
G3	#545	res/accel on

Table 10–2 Pin Assignments

   [b] If the functions are not assigned, reprogram the ECM. Refer to section 10.7.16.

10.7.4 Checking Out of Cruise Control Switch and Wiring

To speed up the checking out of cruise control switches, quick check tables have been developed. These tests are to be run with the ignition ON, and the engine not running. A DDR must be plugged into the connector. All three quick check tables must be gone through to completely check out the cruise control wiring and switches.

For Example: Listed in Table 10–3, step 2, you would do the following:

1. Ignition ON; engine not running; DDR plugged in.
2. Turn the cruise enable switch to ON.
3. Select switch/light status on the DDR.
4. Note the DDR display; if ON, check out brake and clutch switch as listed in Table 10–4.

Step	Cruise Enable Switch	Set / Coast Switch	Res / Accel Switch	DDR Readout Being Looked At	DDR Display	Okay	Go To
1.	Off	Off	Off	Cruise Enable	Off On	Yes No	Refer to step 2 Refer to section 10.7.5
2.	On	Off	Off	Cruise Enable	Off On	No Yes	Refer to section 10.7.6 Listed in Table 10–4, step 1

Table 10–3 Cruise Control Quick Check Table I, Check Out Cruise Enable Switch and Wiring (Ignition ON Not Running)

Step	Cruise Enable Switch	Brake Pedal	Clutch Pedal	DDR Readout Being Looked At	DDR Display	Okay	Go To
1.	On	Released	Released	Service Brake Release	On Off	Yes No	Refer to step 2 Refer to section 10.7.7
2.	On	Depressed	Released	Service Brake Release	On Off	No Yes	Refer to section 10.7.8 Refer to step 3
3.	On	Released	Released	Clutch Release	On Off	Yes No	Refer to step 4 Refer to section 10.7.9
4.	On	Released	Depressed	Clutch Release	On Off	No Yes	Refer to section 10.7.10 Listed in Table 10–5, step 1

Table 10–4 Cruise Control Quick Check Table II, Check Out Brake and Clutch Switch and Wiring (Ignition ON Not Running)

Step	Cruise Enable Switch	Set / Coast Switch	Res / Accel Switch	DDR Readout Being Looked At	DDR Display	Okay	Go To
1.	On	Off	Off	Set/Coast On	Off On	Yes No	Refer to step 2 Refer to section 10.7.11
2.	On	On	Off	Set/Coast On	Off On	No Yes	Refer to section 10.7.12 Refer to step 3
3.	On	Off	Off	Res/Accel On	Off On	Yes No	Refer to step 4 Refer to section 10.7.13
4.	On	Off	On	Res/Accel On	Off On	No Yes	Refer to section 10.7.14 Refer to section 10.7.15

Table 10–5 Cruise Control Quick Check Table III, Check Out Set/Coast and Resume/Accel Switches and Wiring (Ignition ON Not Running)

10.7.5 Check for Short at the Cruise Enable Circuit

Perform the following steps to check for a short at the cruise enable circuit:

1. Turn ignition ON.
2. Turn cruise engage switch to off.
3. Disconnect the vehicle harness connector at the ECM.
4. Measure resistance between the cruise enable cavity (i.e. F2) on the vehicle harness connector and a good ground.

   [a] If the resistance measurement is less than or equal to 10,000 Ω, reconnect the vehicle harness. Turn the ignition on. Then run steps listed in Table 10–4; and listed in Table 10–5. If any DDR display received is not okay, refer to the indicated step. If all steps listed in Table 10–4 and listed in Table 10–5, pass, then the cruise engage wire is shorted to the ground. Repair the short, or replace the switch. Refer to section 10.7.16.

   [b] If the resistance measurement is greater than 10,000 Ω, refer to section 10.7.2.

10.7.6 Check for Open at the Cruise Enable Circuit

Perform the following steps to check for an open at the cruise enable circuit:

1. Turn ignition ON.
2. Disconnect the vehicle harness connector at the ECM.
3. Turn cruise enable switch to ON.
4. Measure resistance between the cruise enable cavity (i.e. F2) on the vehicle harness connector and a good ground.
   [a] If the resistance measurement is greater than 5 Ω, or open, the cruise engage switch is bad, circuit #953 is open or the cruise enable wire is open. Repair the open or replace the switch. Refer to section 10.7.16.
   [b] If the resistance measurement is less than or equal to 5 Ω, refer to section 10.7.2.

10.7.7 Check for Open or Miswired Brake Switch

Perform the following steps to check for an open or miswired brake switch:

1. Turn ignition OFF.
2. Disconnect the vehicle harness connector at the ECM.
3. Ensure the service brake is not engaged.
4. Measure resistance between the service brake cavity (i.e. G2) on the vehicle harness connector and a good ground.
   [a] If the resistance measurement is greater than 5 Ω, or open, the brake switch is miswired or faulty, circuit #953 is open or the ground is bad. Repair the open, rewire or replace the switch. Refer to section 10.7.16.
   [b] If the resistance measurement is less than or equal to 5 Ω, refer to section 10.7.2.

10.7.8 Check for Short at the Brake Switch or Circuit

Perform the following steps to check for a short at the brake switch or circuit:

1. Turn ignition OFF.
2. Disconnect the vehicle harness connector at the ECM.
3. Engage the service brake.
4. Measure resistance between the service brake cavity (i.e. G2) on the vehicle harness connector and a good ground.
   [a] If the resistance measurement is less than or equal to 10,000 Ω, the brake switch is miswired or the service brake circuit is shorted to ground. Rewire, repair the short or replace the switch. Refer to section 10.7.16.
   [b] If the resistance measurement is greater than10,000 Ω, or open, refer to section 10.7.2.

10.7.9 Check for Open or Miswired Clutch Switch

Perform the following steps to check for an open or miswired clutch switch:

1. Turn ignition OFF.
2. Disconnect the vehicle harness connector at the ECM.
3. Ensure the clutch is not engaged.
4. Measure resistance between the clutch cavity (i.e. J2) on the vehicle harness connector and a good ground.
   [a] If the resistance measurement is greater than 5 Ω, or open, the clutch switch is miswired or faulty, circuit #953 is open, or there is a bad battery ground. Rewire, repair the short or replace the switch. Refer to section 10.7.16.
   [b] If the resistance measurement is less than or equal to 5 Ω, refer to section 10.7.2.

10.7.10 Check for Short at the Clutch Release/Circuit

Perform the following steps to check for a short:

1. Turn ignition OFF.
2. Disconnect the vehicle harness connector at the ECM.
3. Engage the clutch.
4. Measure resistance between the clutch cavity (i.e. J2) on the vehicle harness connector and a good ground.
   [a] If the resistance measurement is less than or equal to 100 Ω, the clutch switch is miswired or faulty, or the clutch circuit is shorted to ground. Rewire, repair the short or replace the switch. Refer to section 10.7.16.
   [b] If the resistance measurement is greater than 100 Ω, or open, refer to section 10.7.2.

10.7.11 Check for Short at the Set/Coast Circuit

Perform the following steps to check for a short:

1. Turn ignition OFF.
2. Disconnect the vehicle harness connector at the ECM.
3. Measure resistance between the set/coast cavity (i.e. J2) and a good ground.
   [a] If the resistance measurement is less than or equal to 100 Ω, the set/coast switch is shorted, or a short to ground exists in the set/coast circuit (i.e. #541). Repair the short or replace the switch. Refer to section 10.7.16.
   [b] If the resistance measurement is greater than 100 Ω, refer to section 10.7.2.

10.7.12 Check for Open at the Set/Coast Circuit

Perform the following steps to check for an open:

1. Turn ignition OFF.
2. Disconnect the vehicle harness connector at the ECM.
3. Find a means to press and hold the set/coast switch.
4. Measure resistance between the set/coast cavity (i.e. J1) and a good ground.
   [a] If the resistance measurement is greater than 5 Ω, or open, the set/coast switch is open or miswired, circuit #953 is open, or there is a bad battery ground. Rewire, repair the short or replace the switch. Refer to section 10.7.16.
   [b] If the resistance measurement is less than or equal to 5 Ω, refer to section 10.7.2.

10.7.13 Check for Short at the Res/Accel Circuit

Perform the following steps to check for a short:

1. Turn ignition OFF.
2. Disconnect the vehicle harness connector at the ECM.
3. Measure resistance between the Res/Accel cavity (i.e. G3) and a good ground.
   [a] If the resistance measurement is less than or equal to 100 Ω, the Res/Accel switch is shorted, or a short to ground exists in the Res/Accel circuit (i.e. #541). Repair the short or replace the switch. Refer to section 10.7.16.
   [b] If the resistance measurement is greater than 100 Ω, refer to section 10.7.2.

10.7.14 Check for Open at the Res/Accel Circuit

Perform the following steps to check for an open:

1. Turn ignition OFF.
2. Disconnect the vehicle harness connector at the ECM.
3. Find a means to press and hold the Res/Accel switch.
4. Measure resistance between the Res/Accel cavity (i.e. G3) and a good ground.
   [a] If the resistance measurement is greater than 5 Ω, or open, the Res/Accel switch is open or miswired, circuit #953 is open or the battery ground is bad. Repair the short, replace the switch, or rewire. Refer to section 10.7.16.
   [b] If the resistance measurement is less than or equal to 5 Ω, refer to section 10.7.2.

10.7.15 Verify Problem Still Exists

Perform the following steps to verify the problem still exists:

1. If you were referred to this step, you have completed the switch checkout process without detecting a fault.
2. Take the vehicle for a road test and check the cruise control operation.
   [a] If the cruise control operates correctly, the problem no longer exists. If any other problems exist, refer to section 9.1.
   [b] If the cruise control does not operate correctly, check the vehicle speed sensor. Refer to section 54.1.

10.7.16 Verify Repairs

Perform the following steps to verify repairs:

1. Turn ignition OFF.
2. Reconnect all connectors.
3. Road test the vehicle.
   [a] If the cruise control operates correctly, troubleshooting is complete.
   [b] If the cruise control does not operate correctly, all system diagnostics are complete. Review this section from the start to find the error. Refer to section 10.7.1.

10.8 FAN OPERATIONAL CONCERN (ON/OFF TYPE)

This section covers only the DDEC controlled fan operation, (fan type single, dual or two-speed). If the function is assigned, see description of DDEC fan control logic, listed in Table 10-6.

Cavity	Wire#	Function	Output/Input
X#	#	Fan Control 1	Output – Required
X#	#	Aux. Fan Control	Input – Optional
X#	#	Fan Override	Input – Optional

Table 10–6 DDEC Fan Control Logic Description

10.8.1 Digital Fan Operation

Items used in digital fan operation include:

1. The ECM provides ground (output Fan Control 1) and should be wired such that when this cavity grounds, the fan should turn off. When the circuit goes open, the fan should turn on.
2. When Aux. Fan Control is configured (input), this wire must be connected to battery ground, or the fan will always be on. Typically, this is used with an air conditioning pressure switch. High pressure opens this circuit, and turns the fan on for a minimum time that can be set with the programming station on later ECM software versions.
3. Fan Override – Grounding this wire will turn the fan on. This would normally be an OEM supplied switch on the dash.

Other than these items, the ECMs fan control output opens, turning the fan on due to engine temperatures that are above the programmed limits. Once a fan output turns the fan on for whatever reason, all fan off temperatures must be met before the fan will turn off.

Temperatures for most highway applications are listed in Table 10-7.

Fan Control	Actual Fan Status	Coolant Temp	Oil Temp	Air Temp
Fan Control – 1	Fan ON	96°C / 204°F	110°C / 230°F	66°C / 150°F
Fan Control – 2	Fan ON	98°C / 208°F	113°C / 235°F	N/A
Fan Control –	Fan OFF	92°C / 197°F	104°C / 219°F	49°C / 120°F

Table 10–7 Highway Application Temperatures

These temperature limits are only changeable in the base calibration.

10.8.2 Check Output Status

Perform the following steps to troubleshoot a fan operation problem:

1. Start engine.
2. Ensure the air conditioning of the vehicle is OFF.
3. Run engine for at least three minutes.
4. Plug in DDR.
5. Select switch / light status.
6. Check the status of the Fan Control #1 while noting the actual fan status as listed in Table 10–8.

	Status	Status	Status	Status
Fan Control #1	ON	OFF	ON	OFF
Actual Fan State	OFF	ON	ON	OFF
	Refer to section 10.8.3.	Refer to section 10.8.4.	Refer to section 10.8.6	Refer to section 10.8.7

Table 10–8 Troubleshooting Fan

10.8.3 Fan Information

The steps that led to this procedure do not indicate a problem with the fan control logic in the ECM. The fan operation is normal if the steps that you checked led you to this section.

The fan status is correct according to what the ECM is requesting.

If you believe the fan state should be different, review the DDEC application and installation manual for information on fan control configuration.

10.8.4 Check Input Status

Read the status of the inputs used for fan operation listed in Table 10–9. (Note both together.)

	Status	Status	Status
Aux. Fan Control	OFF	ON	ON
Fan Override	OFF	ON	OFF
	Refer to section 10.8.5	Refer to section 10.8.8	Refer to section 10.8.3

Table 10–9 Input Status

10.8.5 Check for Input Open

Perform the following steps to check for an open:

1. Turn ignition OFF.
2. Disconnect vehicle 30–pin connector at the ECM.
3. Turn ignition ON.
4. Measure resistance between auxiliary fan control wire and a good ground.
   [a] If the measured resistance is greater than 1,000 Ω, an open exists in the auxiliary fan control wire, or auxiliary fan control is configured and not wired, or the switch is bad. Repair open or replace the switch if an auxiliary fan control is used. If this feature is not to be used, disable the auxiliary fan control with the programming station. Refer to section 10.8.10.
   [b] If the measured resistance is less than or equal to 1,000 Ω, refer to section 10.8.9.

Perform the following steps to troubleshoot fan always on. The steps that led to this procedure do not indicate a problem with the fan control logic in the ECM. The fan operation is normal if the steps that you checked led you to this section.

10.8.6 Check for Output Open

Perform the following steps to check for an output open:

1. With ignition off, locate OEM supplied wire used for Fan Control #1.
2. Determine where the wire terminates. (e.g. fan solenoid, relay, data module, etc.)
3. Disconnect the Fan Control #1 wire at the solenoid/relay.
4. Turn ignition ON.
5. Measure resistance between the fan control #1 wire and a good ground, battery (–).
   [a] If the measured resistance is greater than 48,000 Ω or open, an open exists in the FC#1 wire. Repair the open. Refer to section 10.8.10.
   [b] If the measured resistance is less than or equal to 48,000 Ω, refer to section 10.8.9.

10.8.7 Check for Output Short

Perform the following steps to check for an output short:

1. With ignition off, locate OEM supplied wire used for Fan Control #1.
2. Determine where the wire terminates. (e.g. fan solenoid, relay, data module, etc.)
3. Disconnect the Fan Control #1 wire at the solenoid/relay.
4. Measure resistance between the fan control #1 wire and a good ground, battery (–).
   [a] If the measured resistance is greater than 1,000 Ω or open, refer to section 10.8.9.
   [b] If the measured resistance is less than or equal to 1,000 Ω, the output wire is shorted to ground, keeping the fan off. Repair the short or replace the wire. Refer to section 10.8.10.

10.8.8 Check Override Request

Perform the following steps to check the fan override switch:

1. Is the fan override switch on?
   [a] If the fan override is on, and the fan override is requesting fan on, this is normal.
   [b] If the fan override is not on, the fan override wire is shorted to ground, repair the short or re-configure the input if this is an error in programming. Refer to section 10.8.10.

10.8.9 Check Connectors

Perform the following steps to check the connectors:

1. Check connectors for damaged, bent, or corroded terminals.
   [a] If the pins and terminals are not damaged, the problem may be due to the solenoid, ECM, or OEM device that operates the fan. Contact the OEM for further information or instructions. The ECM and wiring between the ECM and device appear to be operating correctly and in good repair. The ECM is requesting the fan operation correctly and the checks indicate the ECM and wire between the ECM and OEM device is okay.
   [b] If the pins or terminals are damaged, repair or replace them. Refer to section 10.8.10.

10.8.10 Verify Repairs

Perform the following steps to verify repairs:

1. Connect any removed connectors.
2. Start engine.
3. Operate engine under conditions that brought you to this section.
4. Check fan operation.
   [a] If the fan operates correctly, troubleshooting is complete.
   [b] If the fan does not operate correctly, review this section from the first step to find the error.

10.9 FAN OPERATIONAL CONCERN (VARIABLE SPEED TYPE)

The DDEC system via a PWM (Pulsewidth Modulation) signal will go to a high voltage (7–8 volts on a 12–volt system) on a cold engine for a low speed, and to a low voltage (.8 – 1.0 volts on a 12–volt system) for a high speed.

Fan speed is ramped up as temperatures increase, as listed in Table 10–10. Calibrations can vary. The table is provided only as a guide.

Coolant Temperature	Speed
up to 197°F	Low speed
about 203°F	Medium speed
208°F and above	High speed

Table 10–10 Fan Speed vs Temperature

10.9.1 Verify Correct DDEC Configuration

Perform the following steps to verify the configuration:

1. Turn ignition ON.
2. Plug in DDR.
3. Select "View Calibration" (ECM Ins/Outs).
4. Review PWM functions to determine correct pin assignment for PWM fan.
   [a] If the cavity is assigned to PWM Fan, refer to section 10.9.2.
   [b] If the cavity is not programmed, reprogram the ECM and refer to section 10.9.7.

10.9.2 Check for Signal

Perform the following steps to check for signal:

1. Start and run the engine at idle.
2. Plug in DDR.
3. Review engine data list and watch the pulsewidth modulation number x wire = # of fan assignment (normally PWM#4).
4. Verify coolant, oil and air temperatures are cooler, less than 150°F. Verify the air conditioning input is grounded (On).
   [a] If the PWM value is 80 to 90% and the fan is at Low Speed, refer to section 10.9.3.
   [b] If the PWM value is 80 to 90% and the fan is at High Speed, refer to section 10.9.4.

10.9.3 Check Signal Engine Hot

Perform the following steps to check the signal status:

1. Start engine and warm up. Road test (until coolant temp is about 200°F).
2. View DDR data list display, Coolant Temp/PWM # (normally #4).
   [a] If PWM % decreases as the temperature increases, all checks appear normal. If this is an intermittent high speed operation, check A/C Freon pressure switch or wiring for an intermittent open. Refer to section 10.9.7.
   [b] If PWM % decreases as the temperature increases, but the fan speed stays low, refer to section 10.9.5.

10.9.4 Check for Open

Perform the following steps to check for an open:

1. Turn ignition OFF.
2. Unplug PWM wire at the fan control valve.
3. Install a jumper between the PWM wire and the battery (–).
4. Unplug the engine harness connector.
5. Measure resistance between the PWM cavity and the battery (–).
   [a] If the measured resistance is greater than 1,000 Ω, the wire is open. Repair the open and refer to section 10.9.7.
   [b] If the measured resistance is less than 1,000 Ω, the valve or wiring (voltage supply) to the valve is defective. Replace.

10.9.5 Check for Short

Perform the following steps to check for a short:

1. Turn ignition OFF.
2. Unplug the engine harness connector.
3. Measure resistance between the PWM cavity and several ground sources (battery, chassis, etc.).
   [a] If the measured resistance is greater than 1,000 Ω, refer to section 10.9.6.
   [b] If the measured resistance is less than 1,000 Ω at any time, the wiring is shorting. Replace the wire and refer to section 10.9.7.

10.9.6 Check Connectors

Perform the following steps to check the connectors:

1. Check for damaged, bent or corroded connectors, pins, and terminals.
   [a] If the connectors, pins, and terminals are not damaged, contact the OEM or fan valve supplier for instructions on further troubleshooting. If the ECM and wiring to the component appear to be okay, the problems could be with the control valve or battery and wiring.
   [b] If the connectors, pins or terminals are damaged, repair or replace them and refer to section 10.9.7.

10.9.7 Verify Repairs

Perform the following steps to verify repairs:

1. Connect all removed connectors, etc.
2. Start and run the engine from cold to hot, while watching the fan speed operation.
   [a] If the operation is normal, troubleshooting is complete.
   [b] If the operation is not normal, all system diagnostics are complete. Review this section to find the error. Refer to section 10.9.1.

10.10 ENGINE BRAKE INOPERATIVE

The following procedure will troubleshoot DDEC controlled Engine Brake Inoperative.

10.10.1 Engine Brake Inoperative

Perform the following steps to troubleshoot the inoperative engine brake:

1. Turn ignition ON.
2. Plug in DDR.
3. View Diagnostic Data List to see if the correct application is programmed into the ECM.
4. Next to Engine Brake, the display should read ON or OFF. If it reads N/A, the DDC mainframe must be changed and the ECM must be reprogrammed after the change is made.
5. If the ECM is correctly configured, go to the view calibration area with the DDR and check to ensure that the two required inputs (Engine Brake Low and Engine Brake Medium) are configured.
6. If the inputs are not configured, or incorrectly configured, this must be corrected using the DDEC reprogramming station.
7. If the inputs are configured correctly, print or write down the inputs and outputs for future reference. Refer to section 10.10.2. Refer to the appropriate Application and Installation manual for engine brake operation.

10.10.2 Check Switches

Perform the following steps to troubleshoot the switches:

1. Turn ignition ON.
2. Plug in DDR.
3. Select Switch Light status – Inputs.
4. View DDR display of Eng Brk Low and Eng Brk Med.

NOTE:
Set brake dash switch position on low.

[a] If Eng Brake Low is ON and Eng Brake Med is OFF, refer to section 10.10.3.

[b] If Eng Brake Low is ON and Eng Brake Med is ON, medium and low inputs are shorted to each other. Repair. Refer to section 10.10.9.

[c] If Eng Brake Low is OFF and Eng Brake Med is ON, input wires are reversed. Correct and refer to section 10.10.9.

[d] If Eng Brake Low is OFF and Eng Brake Med is OFF, refer to section 10.10.4.

5. Turn brake enable dash switch on.

10.10.3 View Diagnostic Data Reader Display

Perform the following steps to troubleshoot the inoperative engine brake:

1. View DDR display.

NOTE:
Set brake dash switch position on medium.

[a] If Eng Brake Low is OFF and Eng Brake Med is ON, refer to section 10.9.5.

[b] If Eng Brake Low is ON and Eng Brake Med is ON, medium and low inputs are shorted to each other. Repair. Refer to section 10.10.9.

[c] If Eng Brake Low is ON and Eng Brake Med is OFF, input wires are reversed. Correct and refer to section 10.10.9.

[d] If Eng Brake Low is OFF and Eng Brake Med is OFF, refer to section 10.10.4.

10.10.4 Check for Open

Perform the following steps to check for an open:

1. Turn ignition OFF.
2. Turn engine brake switch to low.
3. Measure resistance between the engine brake low switch and a good ground (ECM side).
4. Set switch to Med. Measure resistance between medium input and a good ground.

[a] If the measured resistance is less than 10,000 Ω, either the switch is bad or the wire from the switch to the battery ground is bad. Replace the switch or repair the open.

[b] If the measured resistance is greater than 10,000 Ω, or open, an open exists in the input wire. Repair the open. Refer to section 10.10.9.

10.10.5 View Calibration – Engine Configuration

Perform the following steps to view calibration – engine configuration:

1. Go to View Cal–Eng Configuration. Check status of Eng Brk Serv Brk and Eng Brk mph. If Eng Brk Serv Brk indicates YES, or Eng Brk Min mph has number other than "0", check with the operator to ensure he or she understands how these functions operate.
   [a] If the Eng Brk Serv Brk indicates YES, the application of service brake is required for engine brake operation.
   [b] If the Eng Brk Min mph has a number other than "0", the brakes will not operate below this mph.

NOTE:
These two functions may work separately or together.

   [c] If the Eng Brk Svc Brk indicate No, and Eng Brk Min mph indicate 0, refer to section 10.10.6.

10.10.6 Check Engine Brake Operation

Perform the following steps listed in Table 10–11 to check out the brake and clutch switch, and the wiring.

NOTE:
If table below leads to section 10.11, troubleshoot clutch and brake inputs. Then check operation of engine brake. If engine brake is still inoperative, refer to section 10.10.7.

1. Turn ignition ON. Engine must not be running.
2. Plug in DDR. Select switch/light status.

Step	Brake Pedal	Clutch Pedal	DDR Readout Looked At	DDR Display	Status OK	
1.	Released	Released	Service Brake (Release)	On Off	Yes No	refer to Step 2 refer to section 10.11
2.	Depressed	Released	Service Brake Release	On Off	No Yes	refer to section 10.11 refer to Step 3
3.	Released	Released	Clutch Release	On Off	Yes No	refer to Step 4 refer to section 10.11
4.	Released	Depressed	Clutch Release	On Off	No Yes	refer to section 10.11 refer to section10.10.7

Table 10–11 Engine Brake Operation

10.10.7 Check Brake Solenoids

Perform the following steps to troubleshoot the brake solenoids:

1. Check engine brake solenoids. Refer to OEM guidelines.
   [a] If solenoids are okay, refer to section 10.10.8.
   [b] If solenoids are bad, repair or replace the solenoids. Refer to section 10.10.9.

10.10.8 Verify Conditions

Perform the following steps to verify conditions:

1. Verify proper conditions are being met to enable engine brake:
   [a] TPS % = 0 %
   [b] Pulse width = 0 (or less)
   [c] Engine speed > 850 r/min
   [d] Clutch release (input) = ON (if configured)
   [e] Engine brake disable (input) = OFF (Auto Trans)
2. Are the conditions listed in 1a through 1e met?
   [a] If conditions are not met, correct the problem (i.e. TPS). Refer to section 10.10.9.
   [b] If the conditions are met, reprogram the ECM. Contact the OEM for possible TPS repair. Then, refer to section 10.10.9.

10.10.9 Verify Repairs

Perform the following steps to verify repairs:

1. Reinstall all connectors.
2. Test drive vehicle to see if the problem is corrected.
   [a] If engine brakes operate correctly, troubleshooting is complete.
   [b] If engine brakes do not operate, all system diagnostic checks are complete. Review this section to find the error. Refer to section 10.10.1, or contact Detroit Diesel Technical Service for possible ECM replacement.

10.11 MISCELLANEOUS DIGITAL INPUT FAULT

The following procedure will cover miscellaneous input switch faults. All faults function in the same manner, allowing the same troubleshooting process to be used regardless of the function.

There are 12 digital input cavities, listed in Table 10–12, available on a DDEC ECM. Any available function can be assigned (programmed with the Programming Station) to any of the available cavities.

When a digital input wire is switched to battery ground (usually #953), it is a request to the ECM to activate the function assigned to that wire. Additional conditions may need to be met for the feature to activate. Refer to the appropriate Application and Installation Manual for these conditions.

Input Cavities		Input Cavities	
E1	#451	G2	#543
F1	#542	H2	#524
G1	#528	J2	#531
H1	#523	K2	#583
J1	#541	G3	#545
F2	#544	K3	#979

Table 10–12 Input Cavities

Available functions are listed in Table 10–13.

Functions	Functions	Functions
None	Limiting Torque Curve	Trans Retarder Status
Engine Brake Low	Diagnostic Request	Dual Throttle (LSG)
Engine Brake Med	Alt Min VSG/Fast Idle	A/C Fan Status
Aux Shutdown #1	Service Brake Release	Aux CLS
Aux Shutdown #2	Clutch Released	Fan Control Override
Park Brake / ISD	Set Coast OFF DDECII	VSG Station Change
Idle Validation	Set / Coast ON	VSG Station Complement
Pressure / RPM Mode	Resume/Accel OFF DDECII	Air Load Switch
Throttle Inhibit	Resume / Accel ON	In Neutral Switch
RPM Sync (Marine)	Cruise Enable	In Gear Switch
RPM Freeze (Marine)	PGS System Enable	KD Brake
Rating Switch #1	SEO / DIAG Request	Gas Valve Diagnostic
Rating Switch #2	Engine Brake Disable	–

Table 10–13 Available Input Functions

The following procedure will troubleshoot an input fault.

10.11.1 Verify Switch Status

Follow these steps to verify the switch status.

1. Turn ignition ON.
2. Plug in DDR.
3. Select switch light status.
4. Operate the engine or vehicle that would allow the feature to activate (e.g. activate switch, set brake, etc.).
5. Observe the status when the feature is active (or supposed to be active). See Figure 10–9.
   [a] The feature always reads OFF. Refer to section 10.11.2.
   [b] The feature switches from OFF to ON. Refer to section 10.11.3.
   [c] The feature always reads ON. This indicates the input wire is shorted to ground or the switch is faulty. Repair wire or replace switch. Refer to section 10.11.4.

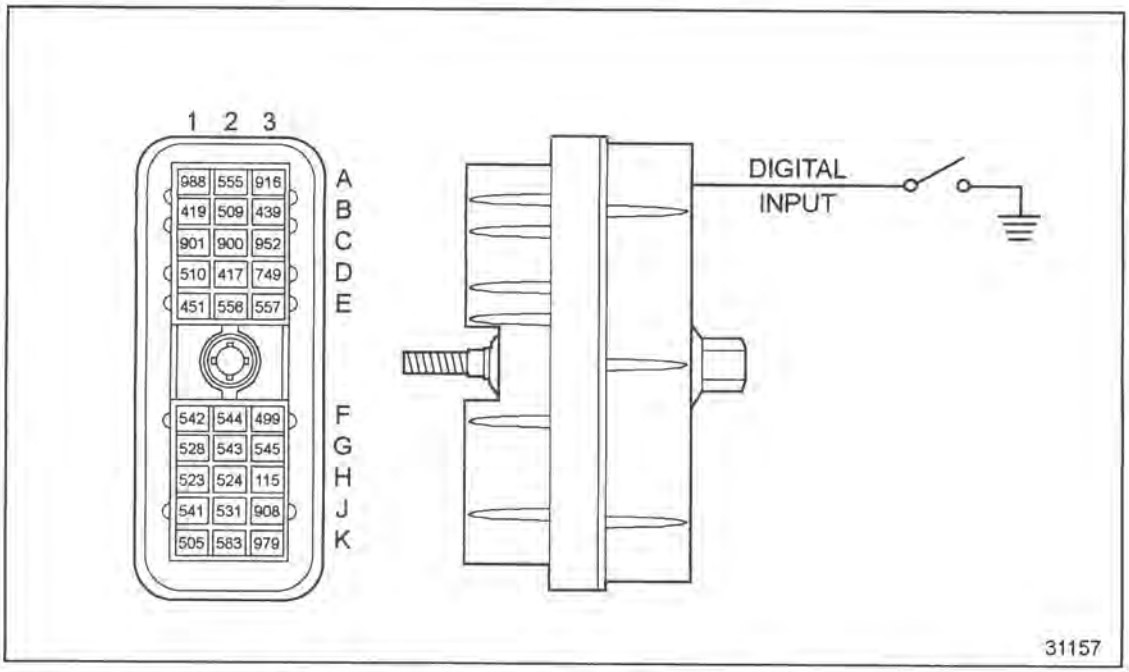

Figure 10–9 ECM Vehicle Interface Harness Connector

10.11.2 Check for Open

Perform the following steps to check for an open:

1. Turn ignition OFF.
2. Unplug the vehicle interface harness connector at the ECM.
3. Operate switch. Enable the feature.
4. Measure the resistance between the input cavity affected and the battery ground.
   [a] If the measured resistance is greater than 5 Ω, the input wire or ground wire is open, or the switch is bad. Repair the open or replace the switch. Refer to section 10.11.4.
   [b] If the measured resistance is less than 5 Ω, refer to section 10.11.3.

10.11.3 Review the Operation of the Feature

Perform the following steps to check the operation of the feature:

1. The step that led you here indicates the input, wire, and switch, are operating correctly. Review the intended operation of the feature to determine if any other conditions need to be met for the feature to operate. (e.g. appropriate Application and Installation manual for the engine). Refer to section 2.4, for a list of related troubleshooting publications.
2. To verify the repairs to the feature, refer to section 10.11.4.

10.11.4 Verify Repairs

Perform the following steps to verify repairs.

1. Hook up all connectors that were previously removed.
2. Operate the engine or vehicle.
3. Activate the feature.
   [a] If the input feature operates correctly, troubleshooting is complete.
   [b] If the input feature is not operating, contact Detroit Diesel Technical Service.

10.12 MISCELLANEOUS DIGITAL OUTPUT FAULT

This section is designed to diagnose an output fault (feature not functioning). Since all outputs operate in the same manner, this troubleshooting section can be used regardless of the function assigned.

10.12.1 DDEC ECM

The DDEC ECM has six available digital output cavities. Three are located at the engine harness connector and three at the vehicle harness connector. Output functions (features) are assigned (programmed with the programming station) to any available cavity. The ECM switches the cavity to battery (-) to allow the function to activate. Some output activation is dependent on other parameters being met. (e.g. minimum, r/min, etc.) Perform the following steps to check the DDR for codes. Available output cavities are listed in Table 10-14.

Additional outputs could be added at a later date. Available functions are listed in Table 10-15.

Output Cavities		Output Cavities	
VIH		ESH	
A1	#988	W3	#563
A2	#555	X3	#564
F3	#499	Y3	#565

Table 10–14 Output Cavities

Functions	Functions	Functions
No Function	Fan Control #2	Turbo Recirc Valve
Low DDEC Volt	Deceleration Light	Optimized Idle Active
RPM Sync Active	Engine Brake Active	Low Range Solenoid (ESS)
PGS Active Light	VSG Active Indication	High Range Solenoid (ESS)
Vehicle Power Down	Oil Pressure Low Light	Shift Solenoid (Top2)
Starter Lockout	Oil Temp High Light	Shift Lockout (Top2)
Ext Brake Enable	Coolant Temp High Light	Gas Throttle Actuator
Trans Retarder Enable	Air Comp Solenoid	Fuel Supply Solenoid
Coolant Level Low Light	Crankcase Pressure High	KD Brake Solenoid
Cruise Active Light	Coolant Pressure Low	–
Fan Control #1	Ether Start	–

Table 10–15 Available Output Functions

10.12.2 Activate Output

Perform the following steps to attempt activation to troubleshoot an output fault.

1. Turn ignition ON.
2. Plug in DDR. Select ACTIVATE OUTPUTS.
3. Activate output associated with the fault.

NOTE:
Service any other codes first.

[a] If the feature operates (e.g. light illuminates or solenoid activates, etc.) review the Application and Installation manual for the operation of the designated feature. Operation is dependent on other parameters. Refer to section 10.12.6.

[b] If the feature does not operate or cannot be activated, refer to section 10.12.3.

10.12.3 Check for Open

Perform the following steps to check for open:

1. Turn ignition OFF.
2. Locate device end of output wire (e.g. light) and disconnect wire.
3. Turn ignition ON.
4. Measure resistance between the disconnected wire and battery (-).

[a] If the measured resistance is less than 46,000-48,000 Ω, refer to section 10.12.4.

[b] If the measured resistance is greater than 48,000 Ω, the wire is open. Refer to section 10.12.6.

10.12.4 Check for Voltage

Perform the following steps to check the voltage:

1. Measure voltage between the disconnected wire and a good ground.
   [a] If voltage measurement is less than 2 volts, refer to section 10.12.5.
   [b] If voltage measurement is greater than 2 volts, the output is shorted to a voltage source. Replace the wire and refer to section 10.12.6.

10.12.5 Check for Resistance

Perform the following steps to check for resistance at the ECM:

1. Turn ignition OFF.
2. Disconnect 30-pin connector that houses the wire/function you are checking (e.g. X3-engine harness connector, A1-VIH).
3. Measure resistance between the pin on the ECM and the ECM case.
   [a] If the measured resistance is 46,000 to 48,000 Ω, contact the OEM or the hardware of the supplier of the features. For further troubleshooting, all output wiring and ECM operation appear to be operating correctly.
   [b] If greater than 48,000 Ω, try a test ECM. Refer to section 10.12.6.

10.12.6 Verify Repairs

Perform the following steps to verify repairs.

1. Connect all connectors.
2. Test the vehicle and attempt to operate the feature.
   [a] If the feature works correctly, troubleshooting is complete.
   [b] If the feature still does not work correctly, review this section to find the error. Refer to section 10.12.2.

10.13 FIRE TRUCK PRESSURE GOVERNOR FAULT

The following procedure will troubleshoot fire truck pressure governor fault.

10.13.1 Pressure Governor Operation

The Pressure Sensor Governor (PSG) System is a DDEC feature, programmed to allow the engine speed to change in order to maintain a steady water pump pressure (pressure mode) or hold a steady engine speed (RPM Mode).

10.13.2 Verify Correct Pressure Sensor Governor Configuration

Perform the following steps to verify the PSG configuration. Refer to the Application and Installation manual for the appropriate engine model to ensure correct inputs and outputs are configured. Required In / Outs are listed in Table 10–16.

1. Turn ignition ON.
2. Plug in DDR.
3. View H_2O governor enabled (engine configuration).
4. View In / Outs. Verify correct configuration.
   [a] If the system is enabled and the in/outs are correctly configured, refer to section 10.13.3.
   [b] If the problem was found, correct the settings and retest. Refer to the *DDEC III Application And Installation* manual, 7SA800 and refer to section 10.13.10.3.

Inputs	Outputs
PGS Mode, (Press / RPM)	PGS Active
PGS Enable	Cruise Active
Res / Accel	–
Set / Coast	–

Table 10–16 Required In / Outs

10.13.3 Identify Problem

Use the following procedure to identify the problem with the PSG:

- ❑ Does not operate; refer to section 10.13.4.
- ❑ No pressure mode; refer to section 10.13.6.
- ❑ No increase function; refer to section 10.13.7.
- ❑ No decrease function; refer to section 10.13.8.
- ❑ EFC Fault Information; refer to section 10.13.9.

10.13.4 Check System Ground

Perform the following steps to check the system ground:

1. Start engine.
2. Turn ON pump control switch.
3. Verify all interlocks are set (parking brake, transmission neutral, etc.).
4. Plug in DDR. Select Switch/Light status.
5. Observe the displays and PGS ENABLE.
   [a] If PGS ENABLE reads OFF, the PGS ENABLE input (circuit #543) is not grounded. Check circuit #543 for an open between battery ground or a short to a voltage source. Repair fault and retest. Refer to section 10.13.5.
   [b] If PGS ENABLE reads ON, refer to section 10.13.7.

10.13.5 Check Sensor Wiring

Perform the following steps to identify the problem:

1. Compare pressure sensor harness wiring to the diagram.
   [a] If the wiring is correct, refer to section 10.13.9. If the EFC tests okay, refer to section 10.13.6.
   [b] If the wiring is incorrect, correct the wiring and retest.

10.13.6 Verify Mode Selector Operation

Perform the following steps to identify the problem:

1. Start engine.
2. Turn ON pump control switch.
3. Verify all interlocks are set (parking brake, transmission neutral, etc.).
4. Plug in DDR. Select Switch/Light status.
5. Observe the displays and PGS MODE.
   [a] If DDR displays ON when Pressure Mode is selected, the mode selector (circuit #523) is functioning properly. Check for possible intermittent open or short to voltage source. Check for faulty pressure transducer. Refer to section 10.13.5. See Figure 10-10.
   [b] If the DDR displays OFF when Pressure Mode is selected, the mode selector wire (circuit #523) or switch is open or shorted to a voltage source. Repair the fault and retest. If the EFC tests okay, refer to section 10.13.9.

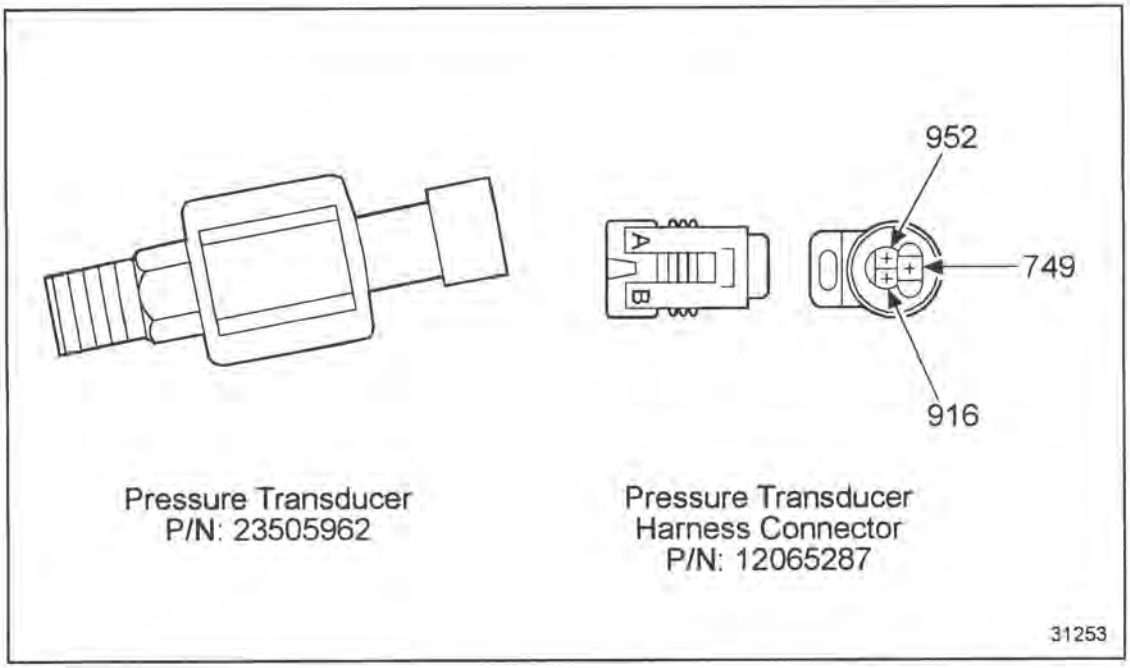

Figure 10–10 Pressure Transducer and Harness Connector

10.13.7 Check Resume / Accel Switch

Perform the following steps to identify the problem:

1. Start engine.
2. Turn ON pump control switch.
3. Verify all interlocks are set (parking brake, transmission neutral, etc.).
4. Plug in DDR. Select Switch/Light status.
5. Observe the displays and Res/Accel, while depressing the increase switch.
   [a] If DDR displays OFF to ON when increase is depressed, check the EFC. Refer to section 10.13.9.
   [b] If the DDR displays OFF when increase is depressed, circuit #541 is open or shorted to a voltage source. Repair the fault and retest.

10.13.8 Check Set / Coast Switch

Perform the following steps to identify the problem:

1. Start engine.
2. Turn ON pump control switch.
3. Verify all interlocks are set (parking brake, transmission neutral, etc.)
4. Plug in DDR. Select Switch/Light status.
5. Observe the displays and Set/Coast, while depressing the decrease switch.
   [a] If DDR displays OFF to ON when Set/Coast decrease is depressed, check the EFC. Refer to section 10.13.9.
   [b] If the DDR displays OFF when decrease is depressed, circuit #541 is open or shorted to a voltage source. Repair the fault and retest.

10.13.9 Electronic Fire Commander

The Detroit Diesel Electronic Fire Command™ (EFC) is designed to support Detroit Diesel engines in the fire fighting market. It combines a Pressure Sensor Governor (PSG) controller, a system monitor, and a display for vital engine operating parameters into one compact, durable package. It also provides complete control and monitoring of the DDEC engine control system on a fire truck when pumping.

10.13.9.1 Pressure Sensor Governor Operating Modes

The EFC commands the Detroit Diesel PSG system to operate in one of two modes. The RPM Mode controls the engine speed to a constant number of revolutions per minute, and the Pressure Mode varies the engine speed to maintain a constant pump discharge pressure. The operating mode of the PSG can be changed from RPM Mode to Pressure Mode and back by pressing the MODE button. When the unit is first turned on, the RPM Mode is active. Pressing MODE switch engages the Pressure Mode and another press brings the system back to RPM Mode. The PSG system utilizes the engine speed or pump pressure that is current at the time the button is pressed.

In the Pressure Mode, the PSG system operates like cruise control for the water pump pressure, and maintains the pressure at a chosen setting. Engine speed is constantly adjusted to maintain the desired pump discharge pressure. A pressure sensor in the output side of the fire pump is used to measure and feed this pressure back to the DDEC Electronic Control Module (ECM).

The RPM Mode keeps the engine speed constant even when the load varies within the engine's operating capability. The pump output pressure may vary in this mode, but the engine speed does not. The driver/engineer uses the EFC to choose which of these two modes the PSG uses. The EFC also allows the driver/engineer to finely adjust the pressure setting or the engine speed setting to match prevailing conditions.

10.13.9.2 Setting the Revolutions Per Minute Mode

Perform the following steps to set the RPM Mode:

1. Start engine and ensure the EFC is ON.
2. Ensure the conditions are met for the Throttle Ready lamp to be ON. (These are usually interlocks necessary to allow increased throttle operation.)
3. The RPM Mode lamp should be lit, indicating the system is in RPM Mode.
4. Engine speed can be adjusted using the following buttons:
   - ❑ Press the PRESET button to command the engine to go to the preset speed.
   - ❑ Press the INC button to increase engine speed in 25 RPM increments each time the button is pressed.
   - ❑ Press and hold the INC button to increase the speed at a faster rate equivalent to 2 increments per second.
   - ❑ Press the DEC button to decrease engine speed in 25 RPM increments.
   - ❑ Press and hold the DEC button to decrease the speed at a faster rate equivalent to 2 increments per second.
   - ❑ Press the IDLE button to immediately return the engine to the normal idle speed.

10.13.9.3 Setting the Pressure Mode

Perform the following steps to set the Pressure Mode:

1. Start engine and adjust the system to run in the RPM Mode as described in the previous sections.
2. Ensure conditions are met for the PUMP ENGAGED and OKAY TO PUMP and THROTTLE READY lamps to be on. (This usually requires that required safety interlocks for engine speed increase and pump operation are met.)
3. Press the MODE button and the PRESSURE lamp will illuminate.
4. Pump discharge pressure can now be adjusted with the following buttons.
   - ❑ Press the PRESET button to command the engine to go to the preset pump pressure.
   - ❑ Press the INC button to increase discharge pressure in 4 PSI increments each time the button is pressed.
   - ❑ Press and hold the INC button to increase the pressure at a faster rate equivalent to 2 increments per second.
   - ❑ Press the DEC button to decrease discharge pressure in 4 PSI increments.
   - ❑ Press and hold the DEC button to decrease the pressure at a faster rate equivalent to 2 increments per second.
   - ❑ Press the IDLE button to return the engine immediately to the normal idle speed.

10.13.9.4 Cavitation

If the water pump discharge pressure falls below 30 psi and the engine r/min rises a minimum of 400 r/min above the current setpoint for more than five seconds, the system considers cavitation to have occurred. It takes the following actions:

- ❑ The engine will return to idle.
- ❑ The current engine speed and discharge pressure setpoints will be cleared.
- ❑ The check engine light will illuminate and a cavitation code will be logged.

10.13.9.5 Engine Parameter Display

Engine r/min, oil pressure, temperature, and system voltage are displayed continuously while the EFC is in operation. In addition, any diagnostic code accompanying a Check Engine or Stop Engine condition will be displayed on the Information Center message display. An audible alarm will also be activated with the code.

10.13.10 Programming the Electronic Fire Commander

Programming the EFC is simply a matter of selecting items from a menu:

- ❑ To enter the programming menu, press and hold the MODE and MENU buttons at the same time until "Press Idle to Exit" is displayed on the information center; then release both buttons.
- ❑ Moving through the menu is accomplished by pressing the MENU button.
- ❑ Changing a selection in the menu is performed by using the INC and DEC switches.
- ❑ Exiting the programming menu is accomplished in one of two ways.
  - ❑ Press IDLE to exit the menu and save changes.
  - ❑ Press MODE to exit the menu without saving changes.

10.13.10.1 Programming Menu Options

As you scroll through the menu by repeatedly pressing the MENU button, the following items, listed in Table 10–17, will appear sequentially in the Information Center display.

Item	Explanation
RPM Preset Point	preset engine speed
Pressure Set (PSI)	preset PSI
Engine Hour meter	information only
Pump Hour meter	information only
Engine degrees	oil or coolant
Pump Pressure (PSI)	pressure reading, if active
DDEC Software Version	ECM revision level
EFC Software Version	EFC revision level
Fire Commander I/O Test	test switches and outputs
Press [MODE] Test Lights	tests display panel
Set Time Clock	set clock
Units of Measure	English/Metric
Welcome Message	enable/disable
Codes Currently Active	information
Connector Data	displays connection information
Save? [Idle Y] [Mode]	exit and save options

Table 10–17 Information Center Menu

10.13.10.2 Additional Information

Engine r/mi

- ❑ The Information Center displays DDEC ECM diagnostic codes and limited engine information as well as PGS status.
- ❑ The Information Center display can be used as an aid to troubleshooting the Pressure Governor System and the Electronic Fire Commander.
- ❑ The Fire Commander I/O Test checks the outputs as well as the switches. It automatically runs through a test and displays the results for your information in troubleshooting.
- ❑ The connector data displays the cavities of inputs and outputs necessary for correct system operation.
- ❑ The interlock lamps show which interlock circuits have been closed and if that part of the system is ready for operation.

10.13.10.3 Troubleshooting the Electronic Fire Commander

This section lists some of the common troubles encountered during the installation and check out of the Electronic Fire Commander. These conditions are listed and the suggested actions follow each one. The Electronic Fire Commander wiring is listed in Table 10-18, listed in Table 10-19, listed in Table 10-20.

1. Condition: The EFC will not light up.
   - ❑ Check if the necessary switches are turned on.
   - ❑ Check if there is a 12 VDC between pins #1 and #2 at the EFC 4-pin connector.
2. Condition: The throttle will not increase in RPM Mode.
   - ❑ Check if the THROTTLE READY lamp is on. The EFC will not respond in RPM mode unless the OEM safety interlock requirements that enable the throttle are met.
   - ❑ Press the PRESET and then the INC switches. Does the EFC indicate it is increasing RPM on the data display?
   - ❑ Check the switch and outputs in the Menu I/O test.
   - ❑ Re-initialize the EFC. (Remove power to the EFC; wait ten seconds and then power the unit and try again.)

NOTE:
The EFC performs a "self-test" when it is powered up. This is indicated on the EFC by a momentary lighting of all the display segments.

3. Condition: The throttle will not increase in Pressure Mode.
   - ❑ Check that all three lamps: PUMP ENGAGED, OKAY TO PUMP, and THROTTLE READY are on.
   - ❑ Press the INC and then the PRESET buttons to increase pump pressure.
   - ❑ Check for a pump discharge pressure reading in the Menu.
   - ❑ Re-initialize the EFC.
4. Condition: The Engine Data Display is showing all zeroes.
   - ❑ Check that the connections at pins #3 and #4 of the EFC 4-pin connector are secure.
   - ❑ Check there is continuity on the 900 and 901 circuits from the ECM connector to the EFC connector.
5. Condition: The THROTTLE READY lamp will not turn on.
   - ❑ Check that the parking brake is on.
   - ❑ Check that the transmission is in neutral, or the hand throttle (PTO) is engaged.
   - ❑ Check for 12 VDC at pin #2 of the EFC 12-pin connector.
6. Condition: The PUMP ENGAGED and OK TO PUMP lamps do not turn on.
   - ❑ Check that all OEM safety requirements for pump operation are fulfilled.
   - ❑ Is the parking brake on?
   - ❑ Is the transmission in the proper range for pump operation?
   - ❑ Is the hand throttle (PTO) engaged?
   - ❑ Is there an OK TO PUMP indication in the cab?
   - ❑ Check for 12 VDC at pin #10 of the EFC 12-pin connector.
7. Condition: The mode will not change from RPM to Pressure.
   - ❑ Check: Are the PUMP ENGAGED and OKAY TO PUMP lamps on?
   - ❑ Does the MODE switch pass in the menu I/O test?

8. Condition: The PRESET switch doesn't work.
   - ❑ Check that the proper lamps are on for the mode you want to operate.
   - ❑ Is there a valid preset programmed into the menu? If not, refer to section 10.13.10 and complete the steps given there.
   - ❑ Does the PRESET switch pass the menu I/O test?

Connector 1:	Deutsch DT06–4S		
Cavity	**Circuit Description**	**DDC#**	**EFC Input/Output**
1	DDEC Accessory Power	439	(+) System Power
2	DDEC Accessory Ground	953	(–) System Ground
3	DDEC 1708 Data Link (+)	900	J1587 Serial Link
4	DDEC 1708 Data Link (–)	901	J1587 Serial Link

Table 10–18 Electronic Fire Commander Wiring

Connector 2:	DT06–12S		
Cavity	**Circuit Description**	**DDC#**	**EFC Input/Output**
1	DDEC PGS Mode Select	523	Output (ground) to DDEC
2	OEM Interlock from OEM	–	Input (+12 VDC)
3	Cavity plug	–	No connection
4	DDEC PGS Mode	499	Input (ground) from DDEC
5	DDEC PGS Enable	–	Output (ground) to DDEC
6	DDEC PGS Increase	–	Output (ground) to DDEC
7	DDEC PGS Decrease	–	Output (ground) to DDEC
8	DDEC PGS Active	–	Input (ground) from DDEC
9	Alarm	–	Output (ground) to DDEC
10	PTO Engaged	–	Input (+12 VDC) from OEM
11	Cavity Plug	–	No connection
12	Low fuel	–	Input (ground) from DDEC

Table 10–19 Electronic Fire Commander Wiring

	Pressure Sensor Connector:		
Circuit	**Cavity**	**Wire Color**	**Description**
916	B	Red/Black	Sensor Supply 5 VDC
749	C	Yellow	Fire Pump Pressure
952	A	Black	Sensor Return

Table 10–20 Electronic Fire Commander Wiring

10.14 OPTIMIZED IDLE FEATURE DOES NOT FUNCTION

The following procedure will troubleshoot Optimized Idle not functioning.

CAUTION:

To avoid personal injury from the engine starting accidently, do not replace the ECM with an ECM that is not programmed with Optimized Idle.

CAUTION:

To avoid personal injury from the engine starting while working in the engine compartment, remove the starter relay from the relay holder before performing any service or troubleshooting to the Optimized Idle system.

10.14.1 Check Diagnostic Data Reader for Codes

Perform the following steps to check the DDR for codes.

1. Plug DDR into connector.
2. Turn ignition ON.
3. Check the active and inactive codes for any Optimized Idle codes.
4. Turn ignition OFF.

NOTE:
Service any code first.

[a] If an Optimized Idle code 62, 63, or 74 is logged, go to the appropriate flash code section, based on Optimized Idle code logged.

[b] If an Optimized Idle code 62, 63 or 74 is not logged, refer to section 10.14.2.

10.14.2 Heater and Air Conditioning Fans Do Not Function

Perform the following steps to troubleshoot the heater and A/C fans.

1. Check the heater and A/C blower fuse.
2. Turn ignition ON.
3. Plug in DDR.
4. Check the vehicle power down relay switch. Select switch light status (VEH PWR DOWN).
   [a] If the output status reads ON, check the relay and relay connections for proper operation. Refer to section 10.14.3.
   [b] If the output statust does not read ON, install a test ECM. Refer to section 10.14.11.

10.14.3 Check Optimized Idle Active Light

The Optimized Idle active light should flash when all of the following occur:

1. Engine idling.
2. The transmission is in NEUTRAL and high-range, if equipped.
3. The hood is closed and the park brake is set.
4. The cruise switch is turned ON.
   [a] If the active light is not flashing, refer to section 10.14.4.
   [b] If the light is flashing, after the engine shuts down, turn the thermostat on. When the light flashes, if the alarm turns ON and the engine starts, the system is OK.
   [c] If the light is flashing, after the engine shuts down, turn the thermostat on. When the light flashes, if the alarm does not turn ON and the engine does not start, refer to section 10.14.10.

10.14.4 Check Idle Condition

Perform the following steps to troubleshoot Optimized Idle:

1. Check idle condition.
2. Verify the engine is at idle and not running on VSG. Optimized idle will not function if the engine is running on VSG, unless the idle timer is enabled on VSG.
   [a] If the engine is not at idle, turn off the ISD on the VSG. Refer to section 10.14.11.
   [b] If the engine is at idle, refer to section 10.14.5.

10.14.5 Check Idle Shutdown Enabled

Perform the following steps to troubleshoot Optimized Idle:

1. Check for idle shutdown enabled.
2. Using the DDR, view the calibration.
   [a] If idle shutdown is not enabled, enable the idle shutdown and set a shutdown time. Refer to section 10.14.11.
   [b] If the idle shutdown is enabled, refer to section 10.14.6.

10.14.6 Check Input Status

Perform the following steps to troubleshoot Optimized Idle:

1. Check for input status.
2. Using the DDR, check the park brake input status with the hood closed, the transmission in NEUTRAL (and high-range if equipped) and the park brake set.
   [a] If the park brake status is ON, refer to section 10.14.9.
   [b] If the park brake status is not ON, refer to section 10.14.7.

10.14.7 Check Hood Switch

Perform the following steps to troubleshoot the hood switch:

1. Check hood switch.
2. Measure the resistance across the hood switch contacts with the hood closed. See Figure 10-11.
   [a] If the resistance measures less than 100 Ω, refer to section 10.14.8.
   [b] If the resistance measures greater than than 100 Ω, replace or adjust the hood switch. Refer to section 10.14.11.

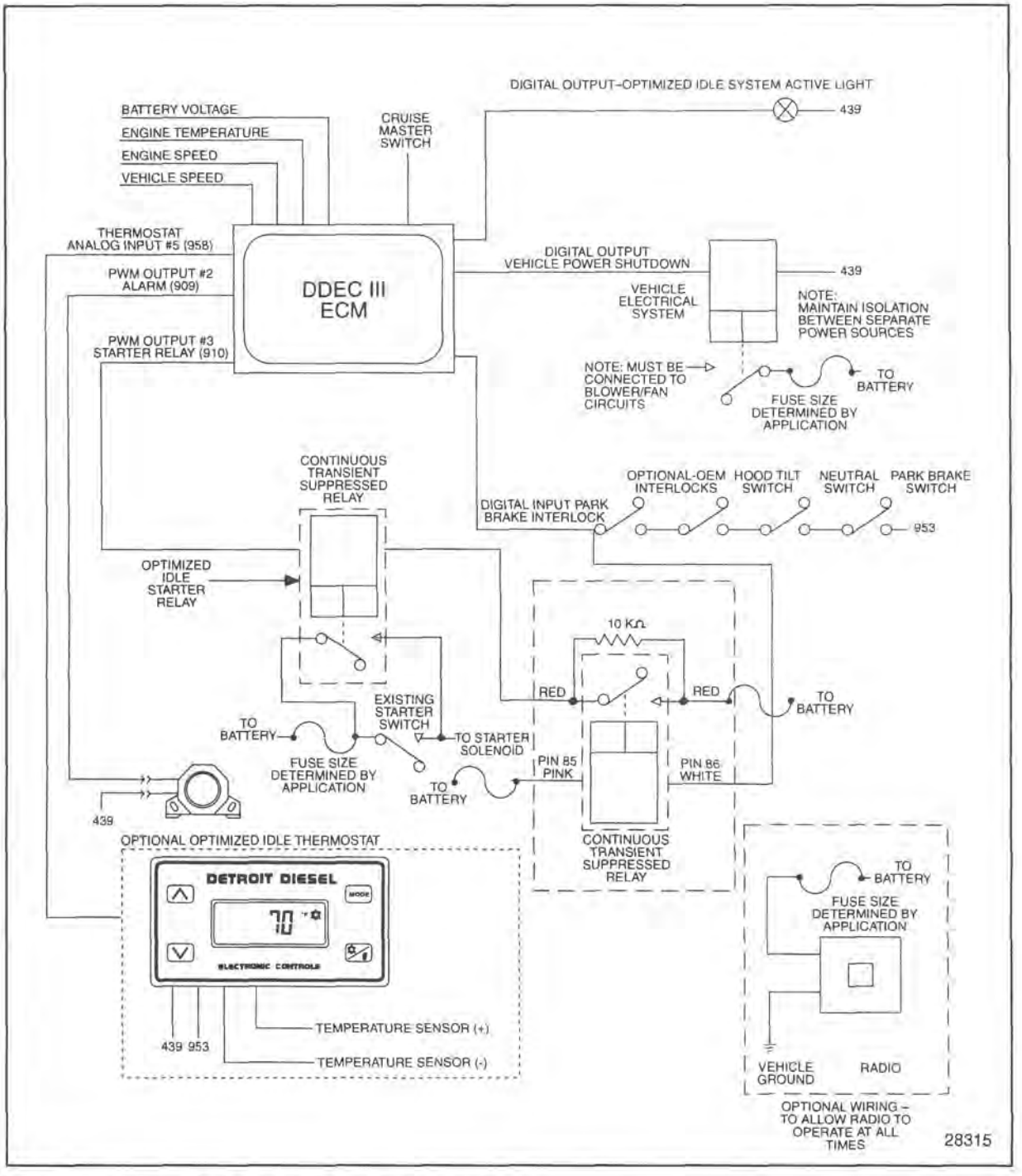

Figure 10–11 Optimized Idle Schematic

10.14.8 Check Park Brake Switch

Perform the following steps to troubleshoot the park brake switch and other OEM interlock devices.

1. Check the park brake switch and other OEM interlock devices (e.g. high-range switch).
2. Measure resistance across the park brake switch contacts with the park brake set.
   [a] If the measured resistance is less than 100 Ω, the 953 ground wire is open somewhere between the ECM and the battery. Repair the open. Refer to section 10.14.11.
   [b] If the measured resistance is more than 100 Ω, replace the park brake switch or other OEM interlock devices. Refer to section 10.14.11.

10.14.9 Check the Thermostat

Perform the following steps to check the thermostat operation:

1. Turn ignition ON.
2. Plug in the DDR.
3. Select switch light status OPIDL T-STAT.
   [a] If the display reads ON with the thermostat enabled and the alarm is turned ON and the reader shows the switch status for the starter as ON after the alarm turns OFF, check the relay and starter solenoid connections. Refer to section 10.14.11.
   [b] If the display reads ON with the thermostat enabled and the alarm is turned ON and the reader does not show the switch status for the starter as ON after the alarm turns OFF, refer to section 10.14.10.
   [c] If the display reads ON with the thermostat enabled and the alarm OFF, replace the alarm. Refer to section 10.14.11.
   [d] If the display does not read ON with the thermostat enabled, the thermostat input wire #958 is open between the thermostat and the ECM. Repair the open. Refer to section 10.14.11.

10.14.10 Oil Temperature Sensor Connection Check

Perform the following steps to troubleshoot the OTS connection:

1. Check the OTS connection.
   [a] If the OTS connector is plugged into the oil temperature sensor, reprogram the ECM. Refer to section 10.14.11.
   [b] If the OTS connector is not plugged into the OTS, plug in the OTS connector. Refer to section 10.14.11.

10.14.11 Verify Repairs

Perform the following steps to verify repairs:

1. Turn ignition OFF.
2. Reconnect all connectors.
3. Close the hood; set the park brake; put the transmission in NEUTRAL and the high-range, if equipped.
4. Start the engine.
5. Turn the cruise master switch to the ON position. If it was on before the vehicle started, turn the switch to OFF and then to ON.
6. Wait for the engine to shut down. After the idle timer expires, the engine will either shutdown or continue to run to charge the battery or keep the oil temperature between 60°F (16°C) and 104°F (40°C).
7. Turn the thermostat on, if installed. Change the set point and heating/cooling mode until the thermostat requires the engine to start. The icons will flash. If the thermostat is not installed, wait for the lube oil temperature to fall below 60°F (16°C).
8. The alarm will sound and the engine will start. Vehicle power (blower fans) will turn on approximately 30 seconds after the engine starts, due to the thermostat.
   [a] If Optimized Idle operates properly, troubleshooting is complete.
   [b] If Optimized Idle does not operate properly, troubleshooting is complete. Review this section from the first step to find the error. Refer to section 10.14.1.

10.15 TRANSMISSION INTERFACE FAULT

Numerous transmissions utilize the DDEC ECM to receive signals that are used to determine shift points, and/or other information.

10.15.1 Transmission Fault

Transmissions that currently utilize data links:

- ❑ J1587 – Allison World Transmissions
- ❑ J1939 Eaton, Allison
- ❑ J1922 Ceemat
- ❑ Advanced Interface
  - ❑ ESS™, Rockwell – Refer to ESS Troubleshooting Manual
  - ❑ Top2, Eaton – Refer to MISC Output Troubleshooting
- ❑ PWM Signal Type – DDEC provides a PWM signal that is used by the transmission or its components

10.15.2 Verify Transmission Type

Perform the following steps to check the transmission type.

1. Turn ignition ON.
2. Plug in DDR.
3. Check transmission origination.
   [a] If a manual transmission, Allison hydraulic, Allison Electronic, Voith, ZF, refer to section 10.15.3.
   [b] If a J 1939/autoshift, Allison WT, Rockwell RXX–X, refer to the troubleshooting guide of the transmission manufacturer to troubleshoot the fault.
   [c] If the transmission type does not match the transmission correctly, reprogram and refer to section 10.15.4.

10.15.3 Review PWM #1 Signal

Perform the following steps to check the DDR for codes.

1. Perform road test with assistant.
2. Plug in DDR.
3. Watch PWM #1 signal.
   [a] If the PWM varies with the load changes, Alison Electronic, Voith or ZF, the signal is normal. Review the wiring or transmission.
   [b] If the PWM signal is 0% or 100% when the signal is for Allison Hydraulic with load changes, the program is normal. Review the transmission, wiring or relay. Refer to section 10.15.4.

10.15.4 Verify Repairs

Perform the following steps to verify repairs.
Start with the Menu Selection. An assistant is needed for the following procedure.

1. Perform road test.
   [a] If the problem is resolved, troubleshooting is complete.
   [b] If the problem still exists, contact the OEM or transmission supplier. The steps that led you here do not indicate a problem with the PWM #2 output or output wire. Verify the correct configuration. Refer to the *DDEC Application and Installation* manual, 7SA800, for the appropriate engine.