FUEL SYSTEM

Section 5E - General System Diagnostics

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5 E

Diagnostic Circuit Check

The Diagnostic Circuit Check is an organized approach to identifying a problem created by an electronic engine control system malfunction. It must be the starting point for any drive-ability complaint diagnosis because it directs the service technician to the next logical step in diagnosing the complaint.

NOTE: *A scan tool that displays faulty data should not be used, and the problem should be reported to the manufacturer. The use of a faulty scan tool can result in misdiagnosis and unnecessary parts replacement.*

The scan tool data listed in the table may be used for comparison. After completing the diagnostic circuit check and finding the on-board diagnostics functioning properly and no trouble codes displayed. The “Typical Data Values” are an average of display values recorded from normally operating vessels and are intended to represent what a normally functioning system would typically display.

Only the parameters listed below are used in this manual for diagnosing. If a scan reads other parameters, the values are not recommended for use in diagnosing. If all values are within the range illustrated, refer to “Troubleshooting.”

Scan Tool Normal Specifications (Idle / Warm Engine / Closed Throttle / Neutral)

SCAN POSITION	UNITS DISPLAYED	TYPICAL DATA VALUE
RPM	RPM	600-700 RPM
Desired RPM	RPM	600 RPM
Coolant Temp.	° F(° C)	150-170° F (66-77° C)
Manifold Air Temp.	° F (° C)	Varies with Ambient Temperature
Throttle Position	Volts	.4 to .8 Volts
Throttle Angle	0-100 %	0-1%
MAP	Volts or kPa	1-3 Volts or (45-55 kPa) (Depends on Vacuum and Baro Pressure)
Baro	Volts or kPa	3-5 Volts (Depends on Altitude and Barometric Pressure)
Bat	Volts	12.0-14.5 Volts
Spark Advance	Degrees	-10 to 30°
Knock Retard	Degrees	0°
Idle Air Control IAC	Counts (Steps)	0-40 Counts
Minimum IAC Position	Counts (Steps)	0-40 Counts
Idle Air Control Follower	Counts (Steps)	0 Counts
Injector Pulse Width	msec.	2-3 msec.
Injector On Time Cranking	msec.	2.5-3.5 msec. (Depends on Water/Air Temperature)
Fuel Consumption	GPH (L/h)	1-2 GPH(3.7-7.5 L/h)
Time From Start	0:00:00-1092:00	Varies

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Scan Tool Normal Specifications (Idle / Warm Engine / Closed Throttle / Neutral)

SCAN POSITION	UNITS DISPLAYED	TYPICAL DATA VALUE
Memory Calibration Check Sum	Calibration and Check Sum	Varies with Software revision in ECM
Oil Press/IO Level (See Note)	OK/LO	OK
Engine Overtemp	OK/Overheating	OK
Lanyard Stop Mode	OFF/ON	OFF

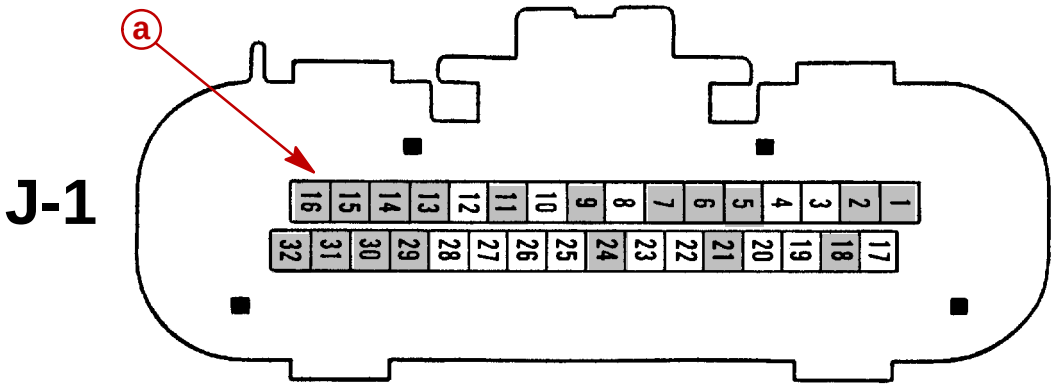
NOTE: MCM will read I/O Level and MIE will read Trans.

MEFI 1 - ECM Connector Chart For 454/502 Mag MPI and 8.2L MPI

The following chart will aid in diagnosis of symptoms. These voltages were derived from a known good engine. The voltages shown were done with the electrical system intact and operational. These are voltage requirements to operate the different circuits.

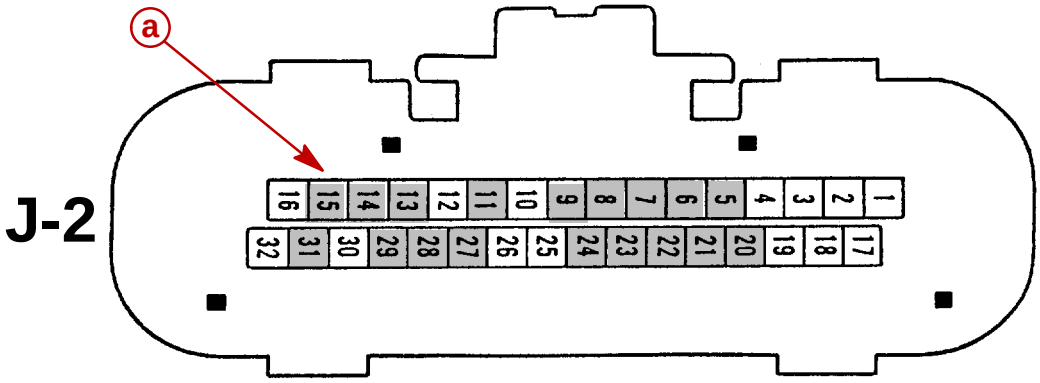
⚠ CAUTION

DO NOT attempt to obtain these voltages by probing wires and connectors. Serious damage could result in loss of engine operation or wiring damage. Voltages can vary with battery conditions



J-1 Input Connector (Front)

a - Shaded Area Denotes Pin Connector Location



J-2 Output Connector (Rear)

a - Shaded Area Denotes Pin Connector Location

IMPORTANT: The following conditions must be met before testing.

1. Engine at operating temperature.
2. Ignition on or engine running.
3. Scan tool not connected.

THESE NOTES APPLY TO FOLLOWING ECM CONNECTOR AND SYMPTOM CHARTS

The “B+” Symbol indicates a system voltage (battery).

NOTE 1: Battery voltage for first two seconds, then 0 volts.

NOTE 2: Varies with temperature.

NOTE 3: Varies with manifold vacuum.

NOTE 4: Varies with throttle movement.

NOTE 5: Less than .5 volt (500 mV).

Diagnostic Trouble Codes

MEFI 1 - Codes for the 454 / 502 Mag MPI and 8.2L MPI Engines

Code Number	Code Description
Code 14	(ECT) Engine Coolant Temperature
Code 21	(TP) Throttle Position Sensor
Code 23	(IAT) Intake Air Temperature
Code 33	(MAP) Manifold Absolute Pressure
Code 42	(IC) Ignition Control
Code 43	(KS) Knock Sensor
Code 51	Calibration Memory Failure

MEFI 2 - Codes for the 7.4L MPI Engines

Code Number	Code Description
Code 14	(ECT) Engine Coolant Temperature - Low Temperature Indicated
Code 15	(ECT) Engine Coolant Temperature - High Temperature Indicated
Code 21	(TP) Throttle Position Sensor - Signal Voltage High
Code 22	(TP) Throttle Position Sensor - Signal Voltage Low
Code 23	(IAT) Intake Air Temperature - Low Temperature Indicated
Code 25	(IAT) Intake Air Temperature - High Temperature Indicated
Code 33	(MAP) Manifold Absolute Pressure - Signal Voltage High
Code34	(MAP) Manifold Absolute Pressure - Signal Voltage Low
Code 41	(IC) Ignition Control - Open IC Circuit
Code 42	(IC) Ignition Control - Grounded IC Circuit, Open or Grounded Bypass
Code 43	(KS) Knock Sensor - Continuous Knock Detected
Code 44	(KS) Knock Sensor - No Knock Detected
Code 51	(ECM) Calibration Memory Failure
Code 52	(ECM) EEPROM Failure

MEFI 3 - Codes for the 454 cid (7.4L) / 502 cid (8.2L) Engines

Code Number	Connection	Conditions	Comments
14	ECT high	Minimum run time (10 sec) Sensor output high (cold) > 240 counts	Open circuit Faulty sensor
15	ECT low	Minimum run time (10 sec) sensor Sensor output low (hot) < 7 counts	Short circuit Faulty sensor
21	TPS high	Sensor output high (> 250 counts) anytime or, skewed high (> 70) @ < 700 rpm and < 70 kpa for at least 5 seconds	Open circuit, WOT Faulty sensor No reference ground
22	TPS low	Sensor output low (< 4 counts) anytime	Short circuit Faulty sensor No reference voltage
23	MAT high	Minimum run time (10 sec) Sensor output high (cold) > 253 counts	Open circuit Faulty sensor
25	MAT low	Minimum run time (10 sec) sensor Sensor output low (hot) < 7 counts	Short circuit Faulty sensor
33	MAP high	kpa > 80 and tps < 5% and rpm > 500 for at least 5 seconds	Open circuit Faulty sensor No Reference ground
34	MAP low	kpa < 14 and tps > 5% and rpm <300 for at least 0.5 seconds	Short circuit Faulty sensor No reference voltage
41	EST open (GM distributor only)	Ignore first 20 spark events requires 10 faults to set code	Open circuit Faulty ignition module
42	EST grounded	Ignore first 20 spark events requires 10 faults to set code	Short circuit Faulty reference pickup
43	Continuous knock	Must have continuous knock retard for at least 30 seconds	Incorrect base timing Faulty knock sensor
44	No knock	After 513 tdc knock free events, rpm > 3000 and MAP > 70 and filtered sensor noise < 0.14 volts	Disconnected sensor Broken/open circuit Faulty knock sensor

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MEFI 3 - Codes for the 454 cid (7.4L) / 502 cid (8.2L) Engines (continued)

Code Number	Connection	Conditions	Comments
45	Coil driver fault	Ignore first 20 spark events requires 8 faults to set code	Open secondary wire Open primary cable
51	Checksum error	Reserved - Invalid ECM checksum	Bad ECM
61	Fuel pressure high	Minimum run time (10 sec) Sensor output high (> 4.9 volts)	Open circuit Faulty sensor Bad/wrong regulator
62	Fuel pressure low	Minimum run time (10 sec) Sensor output low (< 0.1 volts)	Short circuit Faulty sensor No fuel pump power

Special Tools

Part Number	Tool Name	Description
J-34029-A (Note 1)	High Impedance Multimeter (DVM)	Minimum 10 megohm input impedance required on all voltage ranges. As ammeter, accurately measures low value current flow. As ohmmeter, reads 0-200 ohms, 2/20/200 kΩ, 2/20 mΩ
J-23738	Vacuum Pump with Gauge - 20 In. Hg Minimum	Gauge monitors manifold engine vacuum. Hand pump used to check fuel pressure regulator
J-34142-B (Note 2)	Unpowered Test Light	Used to check circuit wiring, short to ground, or voltage.
91-99379	Timing Light	Used to check ignition timing. Must have inductive signal pickup.
91-16850A1	Fuel Pressure Gauge	Used to check fuel system pressure.
J-34730-2A	Injector Harness Test Light	Visually indicates injector electrical impulses from the ECM.
91-823686A2	Quicksilver Scan Tool	Displays problem codes stored in the ECM. It also allows monitoring of various circuits and components in the fuel injection system.
84-822560A2	MERCRUISER Cable	
91-861538	MERCRUISER Cartridge	
94040M	EFI Scan Tool/Injector Tester (Rinda Technologies)	Displays problem codes stored in the ECM. It also allows monitoring of various circuits and components in the fuel injection system. Allows for test firing injectors.

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Special Tools (continued)

94008	Diagnostic Code Tool (Rinda Technologies)	Flashes light to display problem codes
J-35616	Harness Test Adapter	Allows multi-meter connections with wiring harness.
91-805918A2	Fuel Shut Off Tool	Used to perform fuel system pressure tests
91-802662A1	Fuel Shut Off Tool Adapter Fittings	Used with the fuel shut off tool to adapt to the fuel rail inlet line on the 7.4L MPI model. (These fittings are included in Fuel Shut Off Tool 91-805918A2)
91-805747A1	Timing Tool Jumper Plug	Used to set Ignition timing. Plug connects to DLC
91-806901	Fuel Line Connector	Allows connection of Fuel Pressure Gauge

NOTE: *The High Impedance Multimeter that comes with the existing Outboard EFI Tester (91-11001A1) meets the requirements listed above.*

NOTE: *Using a test light with 100 mA or less rating may show a faint glow when test actually states no light.*

Kent-Moore Tools, Inc.
29784 Little Mack
Roseville, MI 48066
Phone: 800-345-2233

Rinda Technologies
4563 N. Elston Ave.
Chicago, IL 60630
Phone: 773-736-6633

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MEFI 1 - 454/502 Mag MPI and 8.2L MPI Symptom Chart (J-1 Circuits)

See page 5E-4 for NOTES

Pin	Pin Function	Circuit (CKT) Number (#)	Wire Color	Normal Voltage		Diagnostic Trouble Codes DTC(s)	Possible Symptoms
				Ignition ON	Engine Running		
J1-1	Knock Sensor Signal	485	BLK	9.5V	9.5V	43	Poor Fuel Economy, Poor Performance Detonation
J1-2	ECT Signal	410	YEL	1.95V (NOTE 2)	1.95V (NOTE 2)	14	Poor Performance, Exhaust Odor, Rough Idle RPM Reduction
J1-3	Not Used	–	–	–	–	–	–
J1-4	Not Used	–	–	–	–	–	–
J1-5	Master/ Slave	916	YEL	B+	B+	None	Lack Of Data From Other Engine (Dual Engine Only)
J1-6	Discrete Switch	931	BRN	–	–	None	
J1-7	Diagnostic Test	451	WHT/ BLK	B+	B+	None	Incorrect Idle, Poor Performance
J1-8	Not Used	–	–	–	–	–	–
J1-9	Map Signal	432	LT GRN	4.9V	1.46V (NOTE 3)	33	Poor Performance, Surge, Poor Fuel Economy, Exhaust Odor
J1-10	TP Signal	417	DK BLU	.62V (NOTE 4)	.62V (NOTE 4)	21	Poor Performance And Acceleration, Incorrect Idle

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MEFI 1 - 454/502 Mag MPI and 8.2L MPI Symptom Chart (J-1 Circuits) (Continued)

Pin	Pin Function	Circuit (CKT) Number (#)	Wire Color	Normal Voltage		Diagnostic Trouble Codes DTC(s)	Possible Symptoms
				Ignition ON	Engine Running		
J1-11	Ignition Fused	439	PNK/ BLK	B+	B+	None	No Start
J1-12	Not Used	–	–	–	–	–	–
J1-13	TP and IAT Ground	813	BLK	0 (NOTE 5)	0 (NOTE 5)	21,23	High Idle, Rough Idle, Poor Performance Exhaust Odor
J1-14	ECM Ground	450	BLK/ WHT	0 (NOTE 5)	0 (NOTE 5)	None	No Start
J1-15	TP 5V Refer- ence	416	GRY	5V	5V	21	Lack Of Power, Idle High
J1-16	Battery	440	ORN	B+	B+	None	No Start
J1-17	Not Used	–	–	–	–	–	–
J1-18	Serial Data	461	ORN/ BLK	5V	5V	None	No Serial Data (NOTE 6)
J1-19	Not Used	–	–	–	–	–	–
J1-20	Not Used	–	–	–	–	–	–
J1-21	Lanyard Stop Switch	942	PNK	0	0	None	No Start
J1-22	Not Used	–	–	–	–	–	–
J1-23	Not Used	–	–	–	–	–	–
J1-24	IAT Sen- sor	472	TAN	5V	(NOTE 2)	23	Poor Fuel Economy, Exhaust Odor
J1-25	Not Used	–	–	–	–	–	–
J1-26	Not Used	–	–	–	–	–	–
J1-27	Not Used	–	–	–	–	–	–

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MEFI 1 - 454/502 Mag MPI and 8.2L MPI Symptom Chart (J-1 Circuits) (Continued)

Pin	Pin Function	Circuit (CKT) Number (#)	Wire Color	Normal Voltage		Diagnostic Trouble Codes DTC(s)	Possible Symptoms
				Ignition ON	Engine Running		
J1-28	Not Used	–	–	–	–	–	–
J1-29	MAP Ground	814	BLK	0 (NOTE 5)	0 (NOTE 5)	33	Lack Of Perfor-mance, Exhaust Odor, Stall
J1-30	ECM Ground	450	BLK/ WHT	0 (NOTE 5)	0 (NOTE 5)	None	No Start
J1-31	MAP 5V Refer-ence	416	GRY	5V	5V	33	Lack Of Power, Surge, Rough Idle, Exhaust Odor
J1-32	Battery	440	ORN	B+	B+	None	No Start

MEFI 1 - 454/502 Mag MPI and 8.2L MPI Symptom Chart (J-2 Circuits)

See page 5E-4 for NOTES

Pin	Pin Function	Circuit (CKT) Number (#)	Wire Color	Normal Voltage		Diagnostic Trouble Codes DTC(s)	Possible Symptoms
				Ignition ON	Engine Running		
J2-1	Not Used	–	–	–	–	–	–
J2-2	Not Used	–	–	–	–	–	–
J2-3	Not Used	–	–	–	–	–	–
J2-4	Not Used	–	–	–	–	–	–
J2-5	Injector Driver	468	LT GRN	B+	B+	None	Rough Idle, Lack Of Power, Stall

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MEFI 1 - 454/502 Mag MPI and 8.2L MPI Symptom Chart (J-2 Circuits) (Continued)

Pin	Pin Function	Circuit (CKT) Number (#)	Wire Color	Normal Voltage		Diagnostic Trouble Codes DTC(s)	Possible Symptoms
				Ignition ON	Engine Running		
J2-6	Ignition Control Ref. Low	463	BLK/ RED	0 (NOTE 5)	0 (NOTE 5)	None	Poor Performance
J2-7	Port Fuel Jumper	901	WHT	–	–	None	–
J2-8	Ignition Control Ref. High	430	PUR/ WHT	5V	1.6V	None	No Restart
J2-9	Fuel Pump Relay Driver	465	DK GRN/ WHT	0 (NOTE 5)	B+	None	No Start
J2-10	Not Used	–	–	–	–	–	–
J2-11	Coolant Over temp.	112	DK GRN	0	0	None	Improper Audio Warning
J2-12	Not Used	–	–	–	–	–	–
J2-13	IAC “A” Low	442	BLU/ BLK	Not Usable	Not Usable	None	Rough Unstable or Incorrect Idle
J2-14	IAC “B” Low	443	GRN/ WHT	Not Usable	Not Usable	None	Rough Unstable or Incorrect Idle
J2-15	Injector Ground	450	BLK/ WHT	0 (NOTE 5)	0 (NOTE 5)	None	Rough Running, Lack Of Power, Poor Performance
J2-16	Not Used	–	–	–	–	–	–
J2-17	Not Used	–	–	–	–	–	–
J2-18	Not Used	–	–	–	–	–	–
J2-19	Not Used	–	–	–	–	–	–
J2-20	Fuel Injector Ground	450	BLK/ WHT	0 (NOTE 5)	0 (NOTE 5)	None	Rough Running, Poor Idle, Lack Of Performance
J2-21	Injector Driver	467	DK BLU	B+	B+	None	Rough Idle, Lack Of Power, Stalling

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MEFI 1 - 454/502 Mag MPI and 8.2L MPI Symptom Chart (J-2 Circuits) (Continued)

Pin	Pin Function	Circuit (CKT) Number (#)	Wire Color	Normal Voltage		Diagnostic Trouble Codes DTC(s)	Possible Symptoms
				Ignition ON	Engine Running		
J2-22	Port Fuel Jumper	901	WHT	–	–	–	–
J2-23	Ignition Control Signal	423	WHT	0 (NOTE 5)	1.2V	42	Stall, Will Restart In Bypass Mode, Lack Of Power
J2-24	Ignition Control Bypass	424	TAN/ BLK	0 (NOTE 5)	4.5V	42	Lack Of Power, Fixed Timing
J2-25	Not Used	–	–	–	–	–	–
J2-26	Not Used	–	–	–	–	–	–
J2-27	Discrete Switch Signal	31	TAN	–	–	–	Audio Warning System Activated
J2-28	IAC “A” High	441	BLU/ WHT	Not Usable	Not Usable	None	Rough Unstable or Incorrect Idle
J2-29	IAC “B” Low	444	GRN/ BLK	Not Usable	Not Usable	None	Rough Unstable or Incorrect Idle
J2-30	Not Used	–	–	–	–	–	–
J2-31	MIL Lamp	419	BRN/ WHT	0 (NOTE 5)	0 (NOTE 5)	None	Lamp Inoperative
J2-32	Not Used	–	–	–	–	–	–

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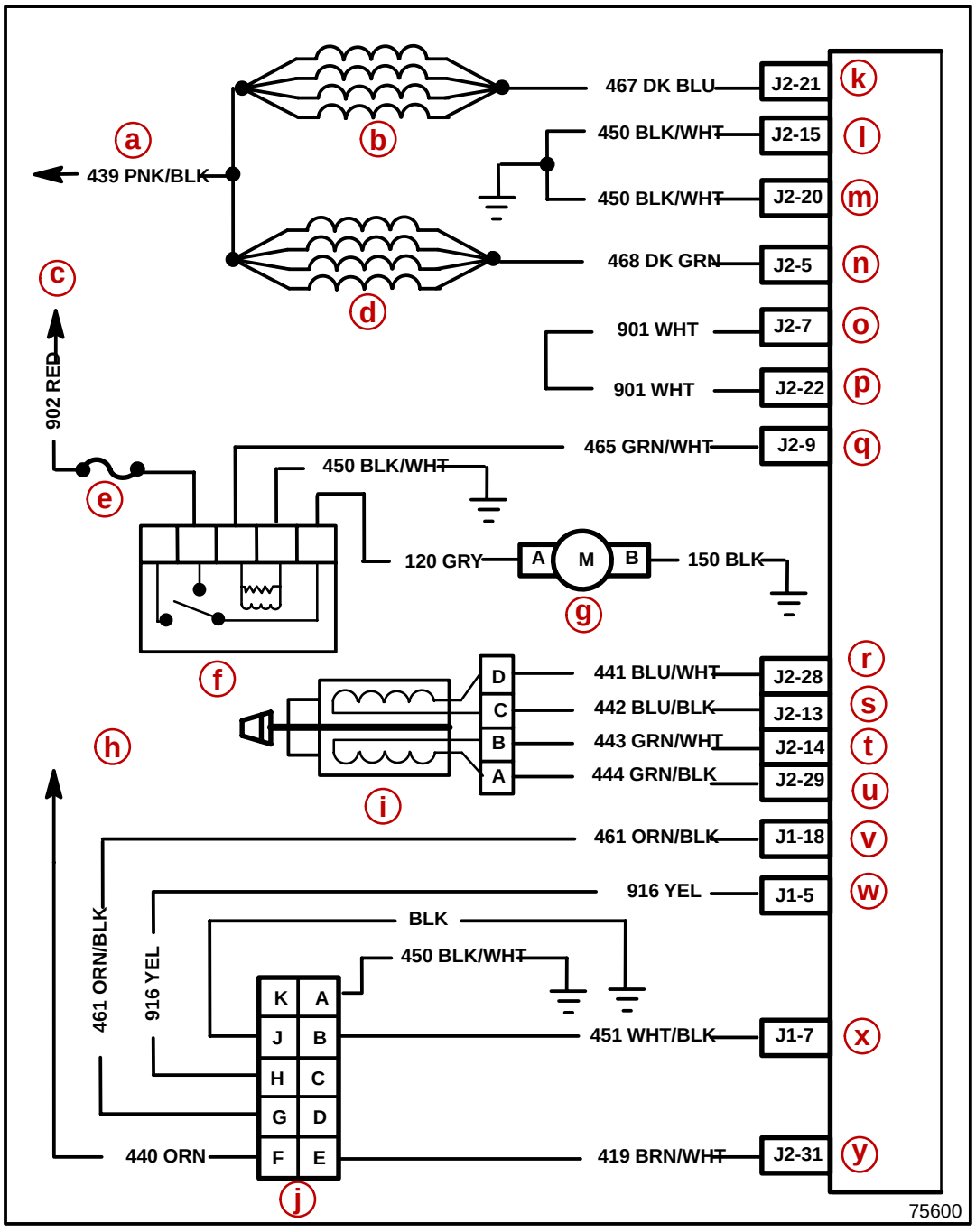
MEFI 1 - 454/502 Mag MPI and 8.2L MPI Wiring System Diagram (1 of 4)



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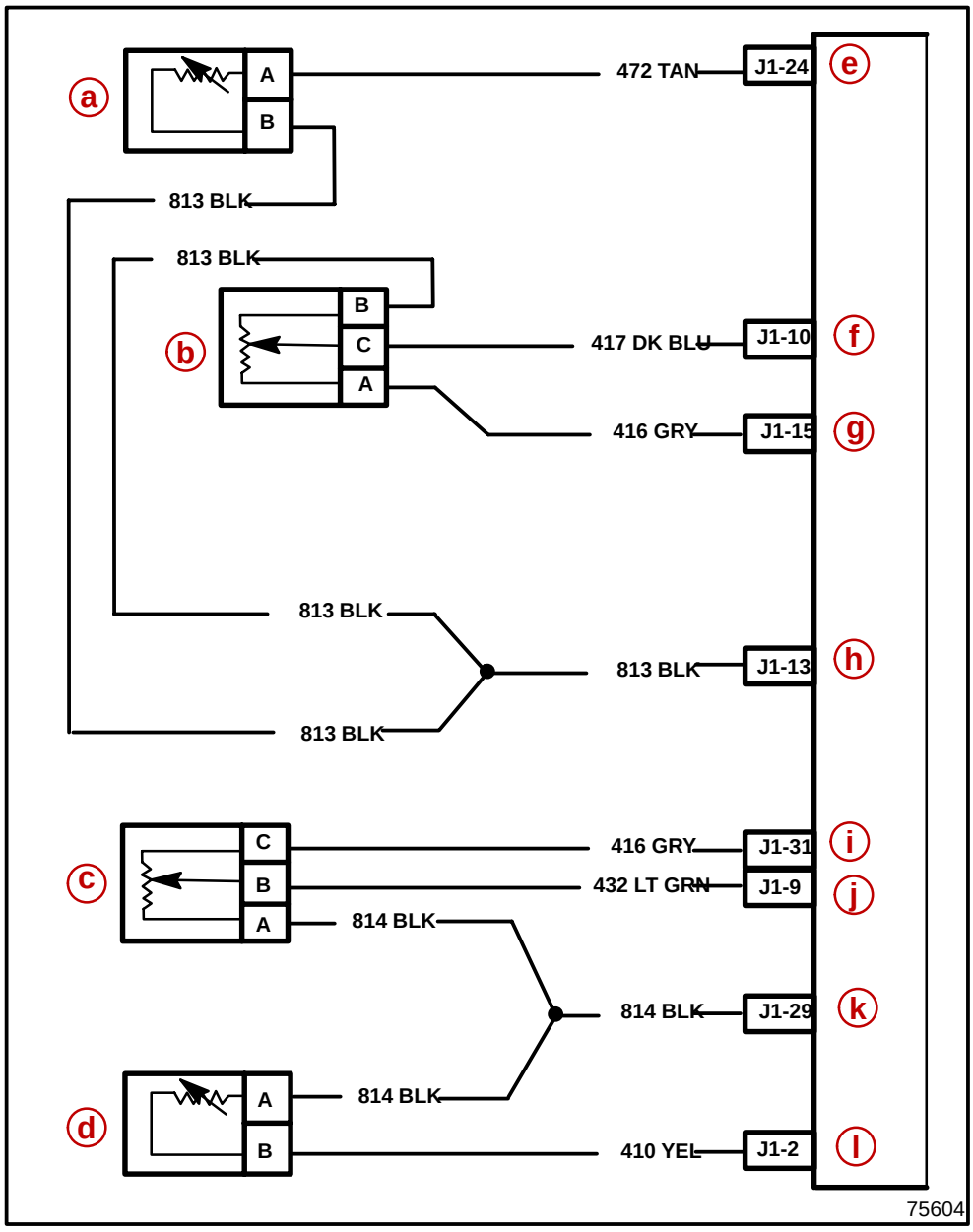
a - To Injector Fuse
b - Injectors 2,3,5,8
c - To Ignition Relay
d - Injectors 1,4,6,7
e - Fuel Pump Fuse
f - Fuel Pump Relay
g - Fuel Pump
h - To ECM/BAT Fuse
i - Idle Air Control Motor
j - Data Link Connector
k - Injector Driver
l - Injector Ground
m - Fuel Injector Ground
n - Injector Driver
o - Port Fuel Jumper
p - Port Fuel Jumper
q - Fuel Pump Driver Relay
r - IAC “A” high
s - IAC “A” low
t - IAC “B” low
u - IAC “B” high
v - Serial Data
w - Master/Slave
x - Diagnostic Test
y - MIL Lamp

MEFI 1 - 454/502 Mag MPI and 8.2L MPI Wiring System Diagram (2 of 4)



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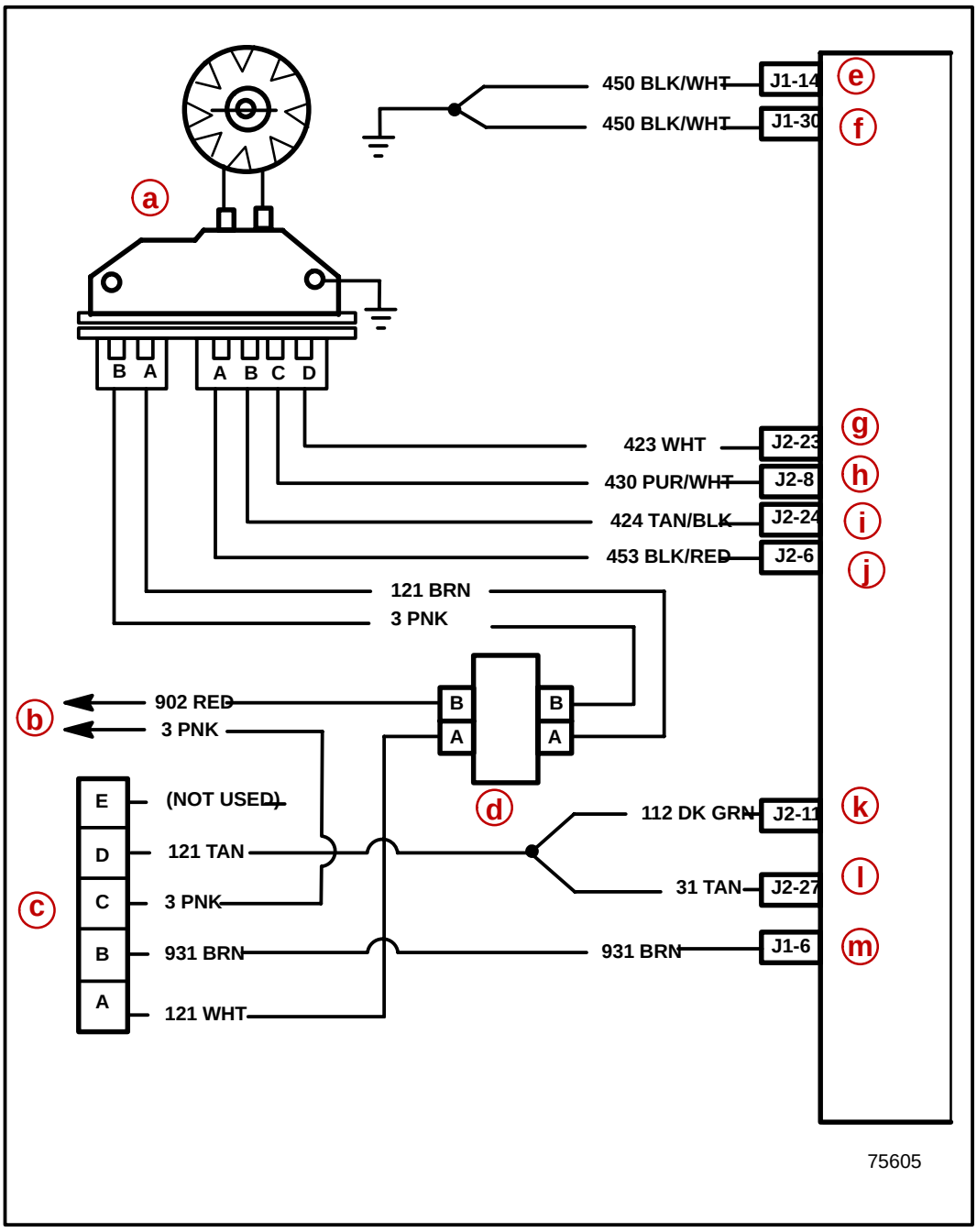
a - Intake Air Temperature Sensor
b - Throttle Position Sensor
c - Manifold Absolute Pressure Sensor
d - Engine Coolant Temperature Sensor
e - IAT Sensor
f - TP Signal
g - TP 5V Reference
h - TP and IAT Ground
i - MAP 5V Reference
j - MAP Signal
k - MAP Ground
l - ECT Signal

MEFI 1 - 454/502 Mag MPI and 8.2L MPI Wiring System Diagram (3 of 4)



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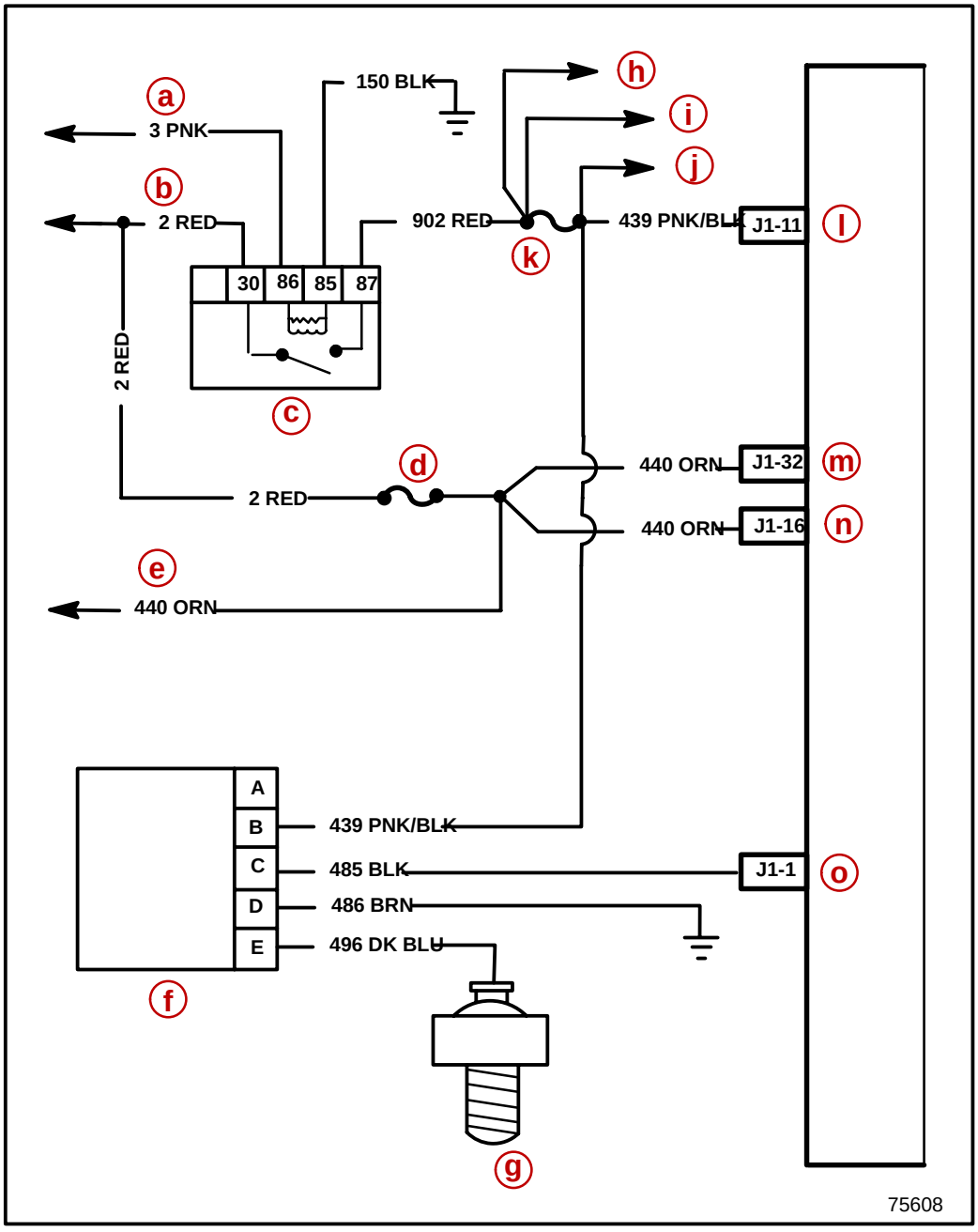
a - IC Module
b - To Drawing 4 Of 4
c - Harness Connector
d - Ignition Coil
e - ECM Ground
f - ECM Ground
g - Ignition Control Signal
h - Ignition Control Reference High
i - Ignition Control Bypass
j - Ignition Control Reference Low
k - Coolant Over Temperature
l - Discrete Switch
m - Discrete Switch

MEFI 1 - 454/502 Mag MPI and 8.2L MPI Wiring System Diagram (4 of 4)



a - To Key Switch
b - To Battery Positive
c - System/Ignition Relay
d - ECM BAT fuse 15A
e - To DLC Connector
f - Knock Module
g - Knock Sensor
h - To Fuel Pump Relay
i - To Ignition Coil B+
j - To Injectors
k - Injectors/ECM Fuse 10A
l - Ignition Fused
m - Battery
n - Battery
o - Knock Sensor Signal

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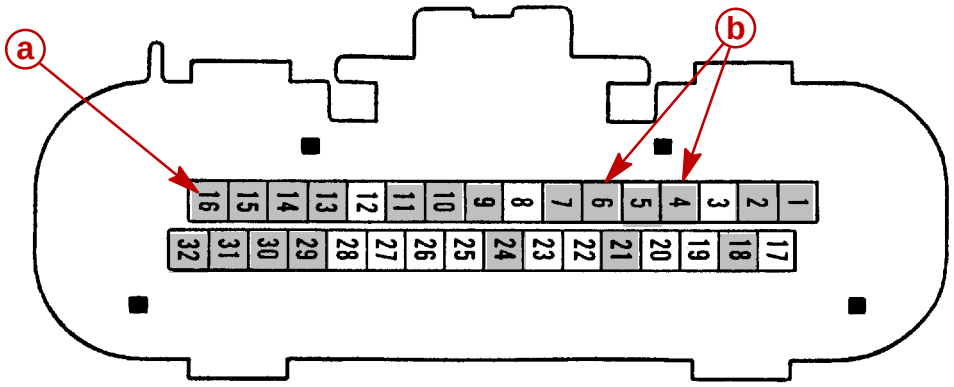
MEFI 2 - ECM Connector Chart For 7.4L MPI

The following chart will aid in diagnosis of symptoms. These voltages were derived from a known good engine. The voltages shown were done with the electrical system intact and operational. These are voltage requirements to operate the different circuits.

⚠ CAUTION

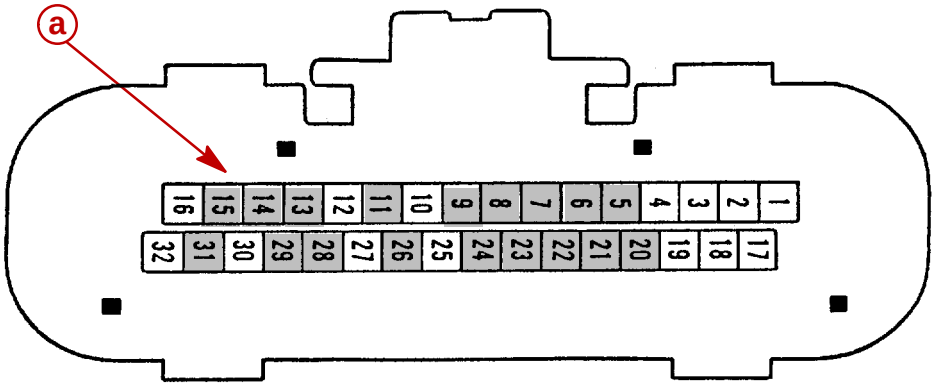
Do not attempt to obtain these voltages by probing wires and connectors. Serious damage could result in loss of engine operation or wiring damage. Voltages can vary with battery conditions.

J-1



J-1 Front 32 Pin Input Connector

J-2



J-2 Rear 32 Pin Output Connector

a - Shaded Area Denotes Pin Connector Location Used On Terminal
b - Early Models Use Pin J1-4 and Later Models Use Pin J1-6.

IMPORTANT: The following conditions must be meet before testing.

1. Engine at operating temperature.
2. Ignition on or engine running.
3. Scan tool not connected.

THESE NOTES APPLY TO FOLLOWING ECM CONNECTOR AND SYMPTOM CHARTS.
The “B+” Symbol indicates a system voltage (battery).

NOTE: *1: Battery voltage for first two seconds, then 0 volts.*

NOTE: *2: Varies with temperature.*

NOTE: *3: Varies with manifold vacuum.*

NOTE: *4: Varies with throttle movement.*

NOTE: *5: Less than .5 volt (500 mV).*

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MEFI 2 - 7.4L MPI Symptom Chart (J-1 Circuits)

Pin	Pin Function	Circuit (CKT) Number (#)	Wire Color	Normal Voltage		Diagnostic Trouble Codes DTC(s)	Possible Symptoms
				Ignition ON	Engine Running		
J1-1	Knock Sensor Signal	485	GRN	9.5V	9.5V	43	Poor Fuel Economy, Poor Performance Detonation
J1-2	ECT Signal	410	YEL	1.95V (NOTE 2)	1.95V (NOTE 2)	14	Poor Performance, Exhaust Odor, Rough Idle RPM Reduction
J1-3	Not Used	–	–	–	–	–	–
J1-4	Discrete Switches	911	BRN	–	–	None	Audio Warning Activated (Low Oil Pressure/ Low I/O Fluid/Transmission Fluid/Overheat) Note: Earlier Models Use J1-4
J1-5	Master/ Slave	916	YEL	B+	B+	None	Lack Of Data From Other Engine (Dual Engine Only)
J1-6	Discrete Switches	911	BRN	–	–	None	Audio Warning Activated (Low Oil Pressure/ Low I/O Fluid/Transmission Fluid/Overheat) Note: Later Models Use J1-6
J1-7	Diagnostic Test	451	BLK/ WHT	B+	B+	None	Incorrect Idle, Poor Performance
J1-8	Not Used	–	–	–	–	–	–

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MEFI 2 - 7.4L MPI Symptom Chart (J-1 Circuits) (Continued)

Pin	Pin Function	Circuit (CKT) Number (#)	Wire Color	Normal Voltage		Diagnostic Trouble Codes DTC(s)	Possible Symptoms
				Ignition ON	Engine Running		
J1-9	Map Signal	432	LT GRN	4.9V	1.46V (NOTE 3)	33	Poor Performance, Surge, Poor Fuel Economy, Exhaust Odor
J1-10	TP Signal	417	DK BLU	.62V (NOTE 4)	.62V (NOTE 4)	21	Poor Performance And Acceleration, Incorrect Idle
J1-11	Ignition Fused	439	PNK	B+	B+	None	No Start
J1-12	Not Used	–	–	–	–	–	–
J1-13	TP and IAT Ground	813	BLK	0 (NOTE 5)	0 (NOTE 5)	21,23	High Idle, Rough Idle, Poor Performance Exhaust Odor
J1-14	ECM Ground	450	BLK	0 (NOTE 5)	0 (NOTE 5)	None	No Start
J1-15	TP 5V Reference	416	GRY	5V	5V	21	Lack Of Power, Idle High
J1-16	Battery	440	ORN	B+	B+	None	No Start
J1-17	Not Used	–	–	–	–	–	–
J1-18	Serial Data	461	ORN	5V	5V	None	No Serial Data (NOTE 6)
J1-19	Not Used	–	–	–	–	–	–
J1-20	Not Used	–	–	–	–	–	–
J1-21	Not Used	–	–	–	–	–	
J1-22	Not Used	–	–	–	–	–	–
J1-23	Not Used	–	–	–	–	–	–
J1-24	IAT Sensor	472	TAN	5V	(NOTE 2)	23	Poor Fuel Economy, Exhaust Odor
J1-25	Not Used	–	–	–	–	–	–
J1-26	Not Used	–	–	–	–	–	–

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MEFI 2 - 7.4L MPI Symptom Chart (J-1 Circuits) (Continued)

Pin	Pin Function	Circuit (CKT) Number (#)	Wire Color	Normal Voltage		Diagnostic Trouble Codes DTC(s)	Possible Symptoms
				Ignition ON	Engine Running		
J1-27	Not Used	–	–	–	–	–	–
J1-28	Not Used	–	–	–	–	–	–
J1-29	MAP Ground	814	BLK	0 (NOTE 5)	0 (NOTE 5)	33	Lack Of Performance, Exhaust Odor, Stall
J1-30	ECM Ground	450	BLK	0 (NOTE 5)	0 (NOTE 5)	None	No Start
J1-31	MAP 5V Reference	416E	GRY	5V	5V	33	Lack Of Power, Surge, Rough Idle, Exhaust Odor
J1-32	Battery	440	ORN	B+	B+	None	No Start
J2-1	Not Used	–	–	–	–	–	–
J2-2	Not Used	–	–	–	–	–	–
J2-3	Not Used	–	–	–	–	–	–
J2-4	Not Used	–	–	–	–	–	–
J2-5	Injector Driver	468	DRK GRN	B+	B+	None	Rough Idle, Lack Of Power, Stall
J2-6	Ignition Control Ref. Low	463	RED/ BLK	0 (NOTE 5)	0 (NOTE 5)	None	Poor Performance
J2-7	Port Fuel Jumper	901	BLK	–	–	None	–
J2-8	Ignition Control Ref. High	430	PUR/ WHT	5V	1.6V	None	No Restart
J2-9	Fuel Pump Relay Driver	465	DK GRN/ WHT	0 (NOTE 1&5)	B+	None	No Start
J2-10	Not Used	–	–	–	–	–	–
J2-11	Coolant Over temp.	112	DK GRN	0	0	NONE	Improper Audio Warning

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MEFI 2 - 7.4L MPI Symptom Chart (J-1 Circuits) (Continued)

Pin	Pin Function	Circuit (CKT) Number (#)	Wire Color	Normal Voltage		Diagnostic Trouble Codes DTC(s)	Possible Symptoms
				Ignition ON	Engine Running		
J2-12	Not Used	–	–	–	–	–	–
J2-13	IAC “A” Low	442	LT BLU/ BLK	Not Usable	Not Usable	None	Rough Unstable or Incorrect Idle
J2-14	IAC “B” Low	443	LT GRN/ WHT	Not Usable	Not Usable	None	Rough Unstable or Incorrect Idle
J2-15	Injector Ground	450	BLK	0 (NOTE 5)	0 (NOTE 5)	None	Rough Running, Lack Of Power, Poor Performance
J2-16	Not Used	–	–	–	–	–	–
J2-17	Not Used	–	–	–	–	–	–
J2-18	Not Used	–	–	–	–	–	–
J2-19	Not Used	–	–	–	–	–	–
J2-20	Fuel Injector Ground	450	BLK	0 (NOTE 5)	0 (NOTE 5)	None	Rough Running, Poor Idle, Lack Of Performance
J2-21	Injector Driver	467	DK BLU	B+	B+	None	Rough Idle, Lack Of Power, Stalling
J2-22	Port Fuel Jumper	901	BLK	–	–	–	–
J2-22	Port Fuel Jumper	901	BLK	–	–	–	–
J2-23	Ignition Control Signal	423	WHT	0 (NOTE 5)	1.2V	42	Stall, Will Restart In Bypass Mode, Lack Of Power
J2-24	Ignition Control Bypass	424	TAN/ BLK	0 (NOTE 5)	4.5V	42	Lack Of Power, Fixed Timing
J2-25	Not Used	–	–	–	–	–	–

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MEFI 2 - 7.4L MPI Symptom Chart (J-1 Circuits) (Continued)

Pin	Pin Function	Circuit (CKT) Number (#)	Wire Color	Normal Voltage		Diagnostic Trouble Codes DTC(s)	Possible Symptoms
				Ignition ON	Engine Running		
J2-26	Discrete Switch Signal	31	DK GRN	–	–	–	Audio Warning System Activated Audio Warning to Buzzer
J2-27	Not Used	–	–	–	–	–	
J2-28	IAC “A” High	441	LT BLU/ WHT	Not Usable	Not Usable	None	Rough Unstable or Incorrect Idle
J2-29	IAC “B” Low	444	LT GRN/ BLK	Not Usable	Not Usable	None	Rough Unstable or Incorrect Idle
J2-30	Not Used	–	–	–	–	–	–
J2-31	MIL Lamp	419	BRN/ WHT	0 (NOTE 5)	0 (NOTE 5)	None	Lamp Inoperative
J2-32	Not Used	–	–	–	–	–	–

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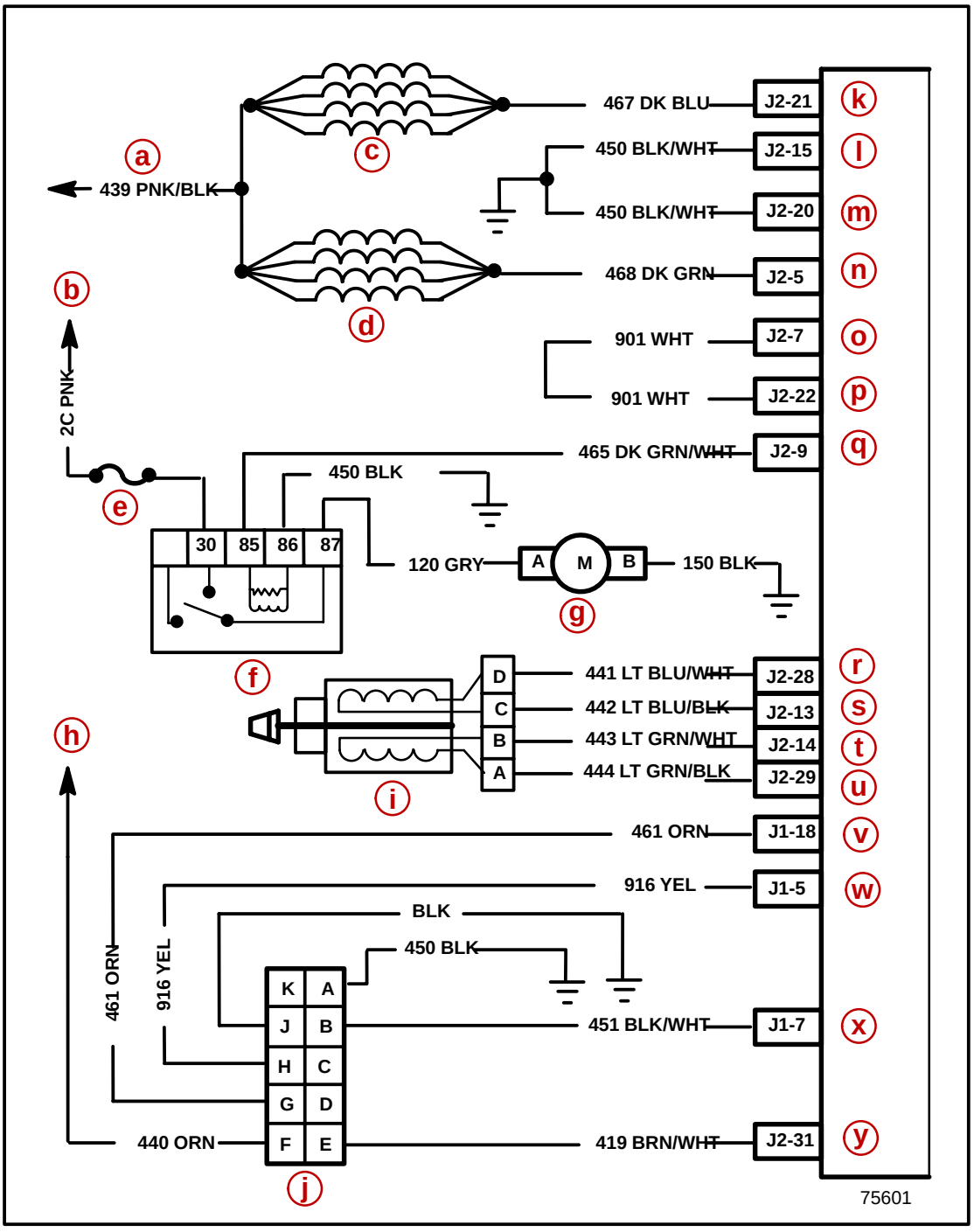
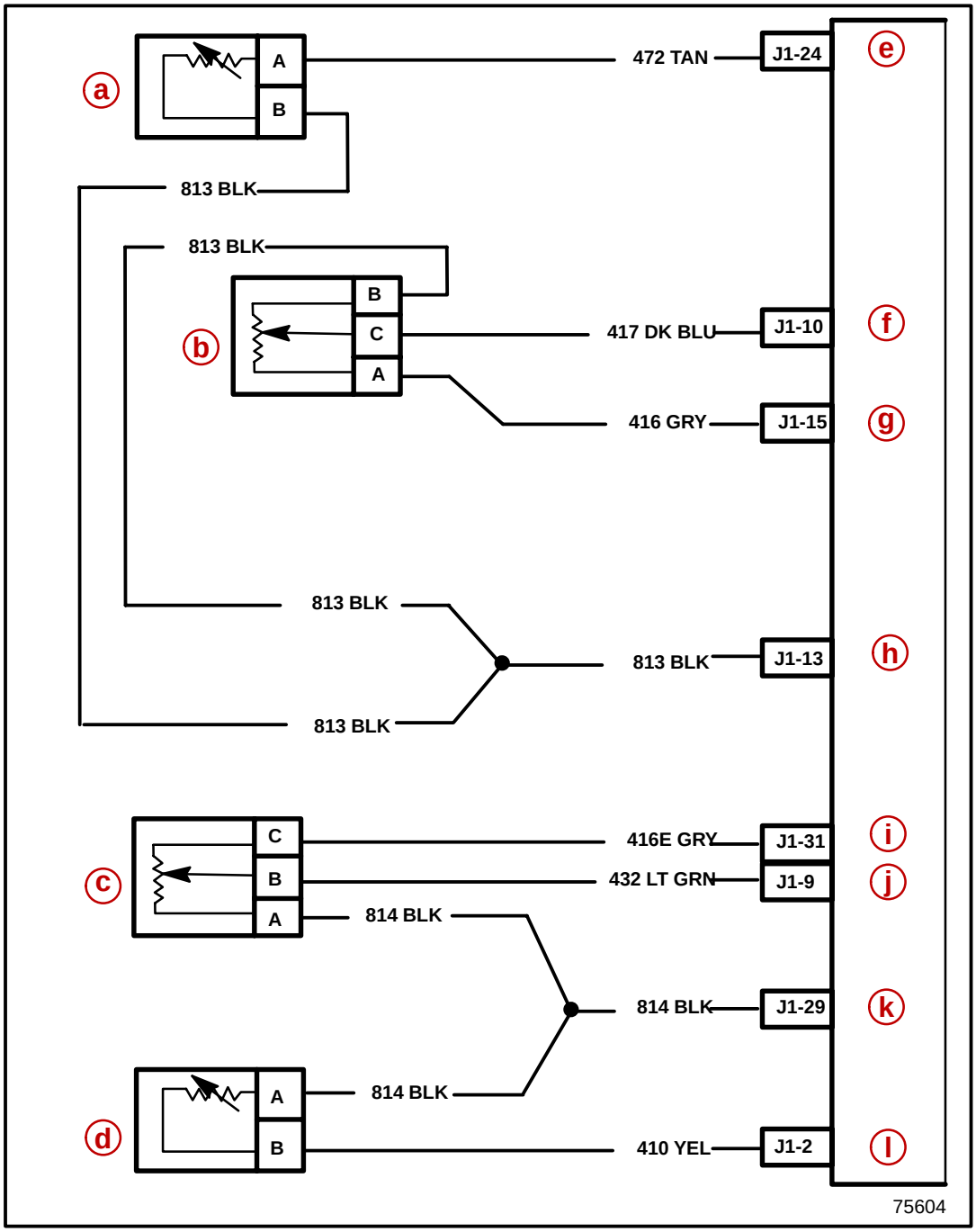
MEFI 2 - 7.4L MPI Wiring System Diagram (1 of 4)



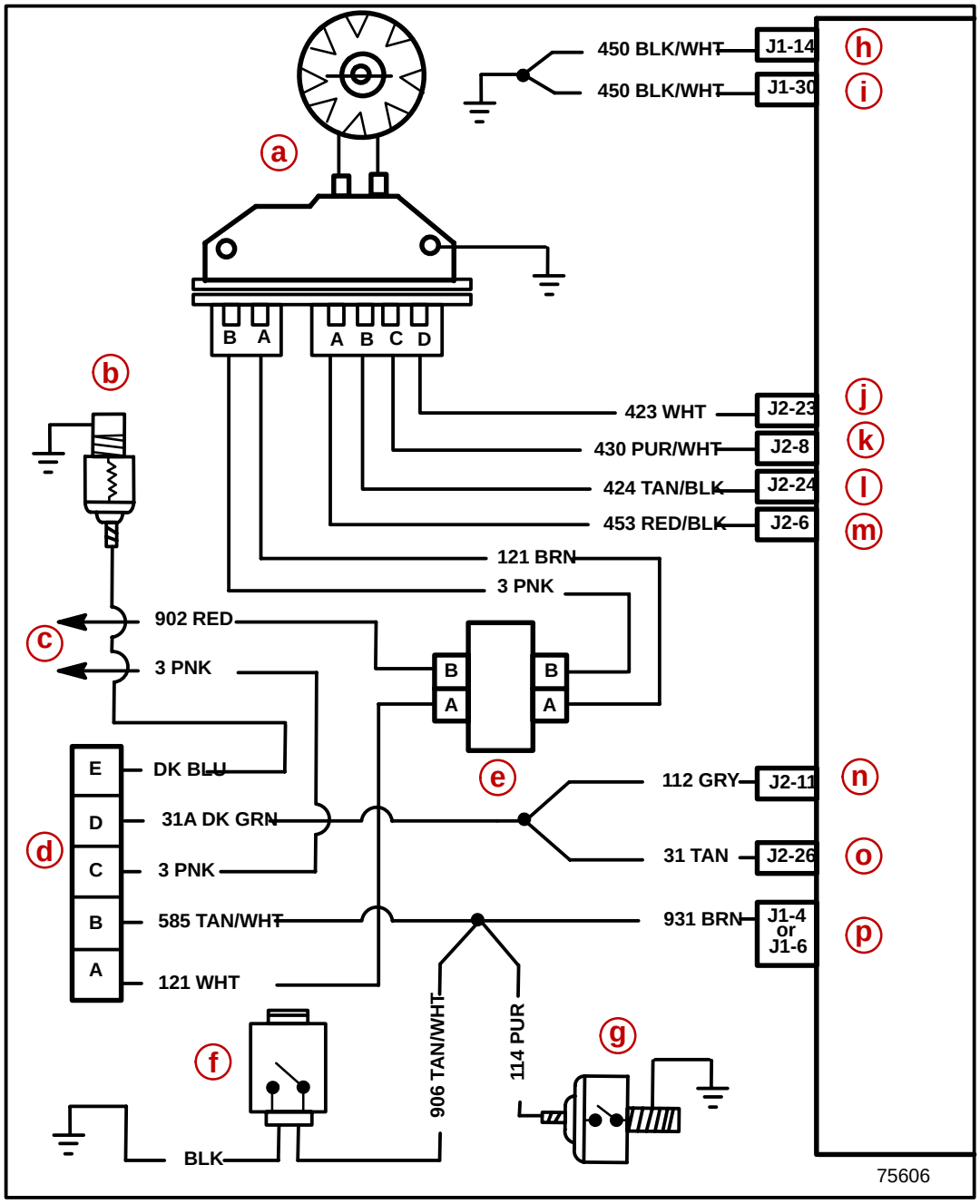
a - To Injector Fuse
b - To Ignition Relay
c - Injectors 2,3,5,8
d - Injectors 1,4,6,7
e - Fuel Pump Fuse
f - Fuel Pump Relay
g - Fuel Pump
h - To ECM/BAT Fuse
i - Idle Air Control Motor
j - Data Link Connector
k - Injector Driver
l - Injector Ground
m - Fuel Injector Ground
n - Injector Driver
o - Port Fuel Jumper
p - Port Fuel Jumper
q - Fuel Pump Driver Relay
r - IAC “A” High
s - IAC “A” Low
t - IAC “B” Low
u - IAC “B” High
v - Master/Slave
w - Diagnostic Test
x - MIL Lamp

MEFI 2 - 7.4L MPI Wiring System Diagram (2 of 4)



a - Intake Air Temperature Sensor
b - Throttle Position Sensor
c - Manifold Absolute Pressure Sensor
d - Engine Coolant Temperature Sensor
e - IAT Sensor
f - TP Signal
g - TP 5V Reference
h - TP and IAT Ground
i - MAP 5V Reference
j - MAP Signal
k - MAP Ground
l - ECT Signal

MEFI 2 - 7.4L MPI Wiring System Diagram (3 of 4)



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a - IC module
b - Water Temp Sender For Gauge
c - To Drawing 4 of 4
d - Harness Connector
e - Ignition Coil
f - Gear Lube Switch
g - Oil Pressure Switch
h - ECM Ground
i - ECM Ground
j - Ignition Control Signal
k - Ignition Control Reference High
l - Ignition Control Bypass
m - Ignition Control Reference Low
n - Coolant Over Temperature And Discrete Switch Output
o - Not Used
p - Discrete Switch Inputs (J1–4 for earlier models and J1–6 for later models)

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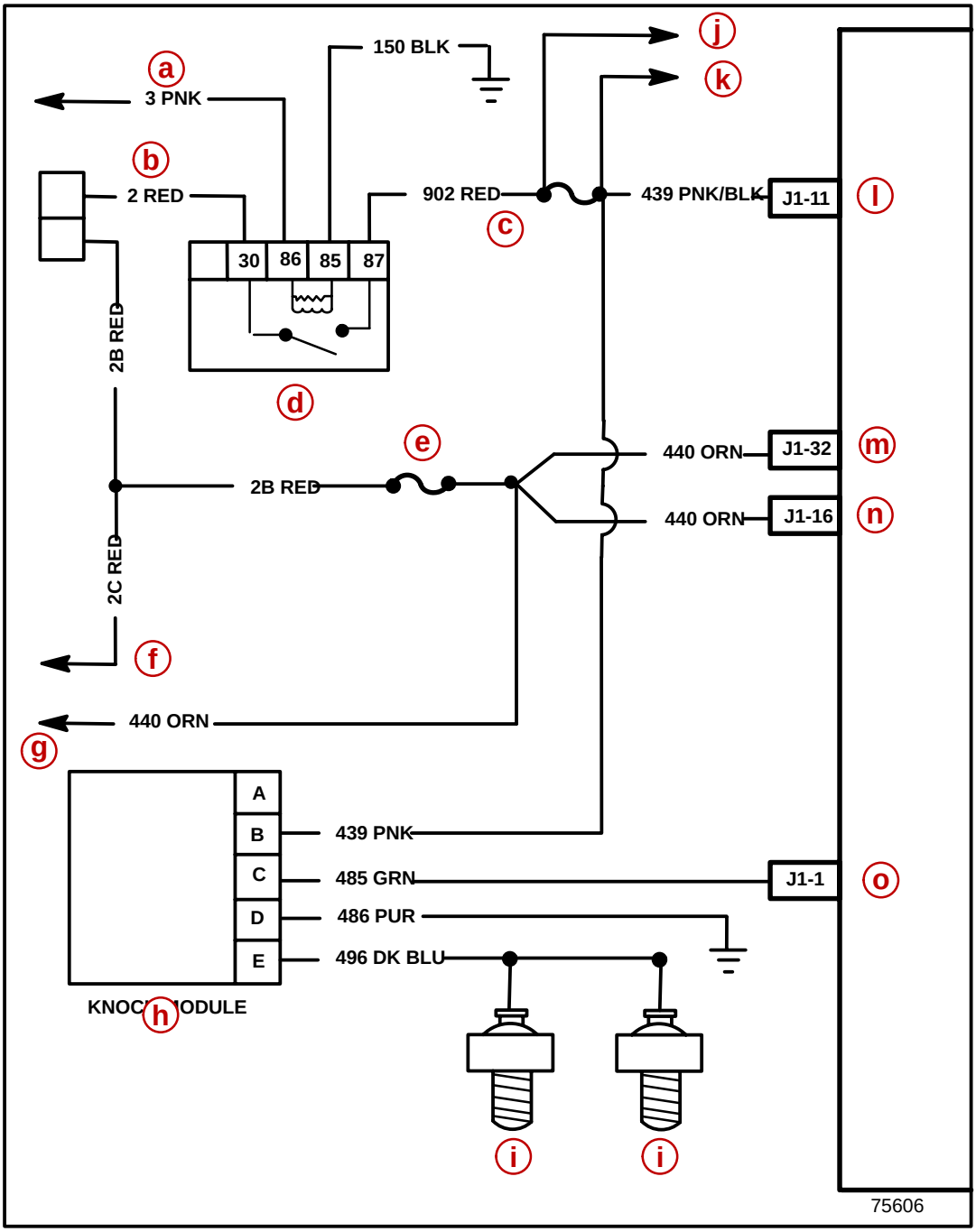
MEFI 2 - 7.4L MPI Wiring System Diagram (4 of 4)



a - To Key Switch
b - 2-Pin Harness Connector
c - Inj/ECM fuse 10A
d - System/Ignition Relay
e - ECM BAT Fuse 15A
f - To Fuel Pump Relay
g - To DLC Connector
h - Knock Module
i - Knock Sensor
j - To Ignition Coil B+
k - To Injectors
l - Ignition Fuse
m - Battery
n - Battery
o - Knock Sensor Signal

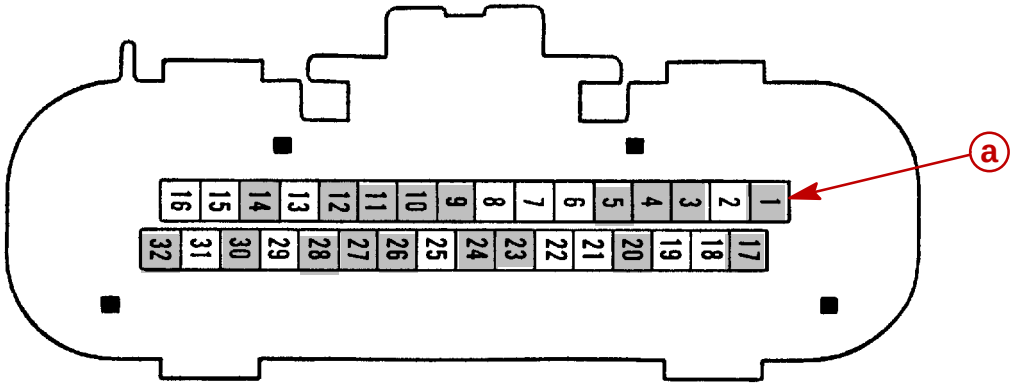
MEFI 3 - ECM Connector Chart

The following chart will aid in diagnosis of symptoms. These voltages were derived from a known good engine. The voltages shown were done with the electrical system intact and operational. These are voltage requirements to operate the different circuits.

⚠ CAUTION

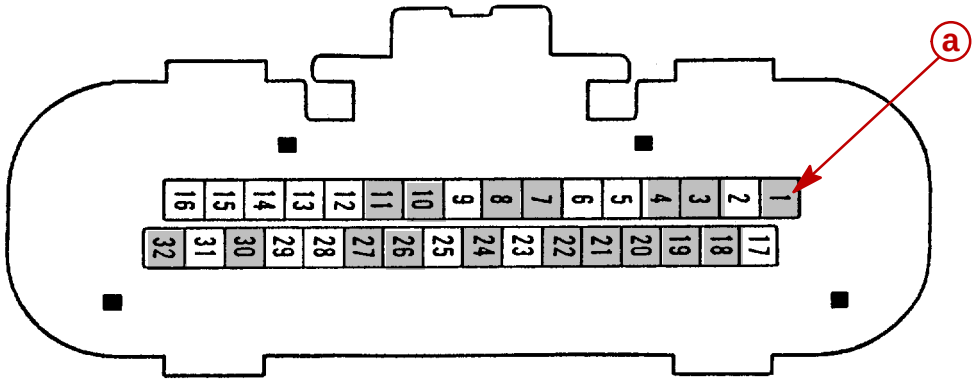
Do not attempt to obtain these voltages by probing wires and connectors. Serious damage could result in loss of engine operation or wiring damage. Voltages can vary with battery conditions.

J-1



J-1 Connector

J-2



J-2 Connector

a - Shaded Area Denotes Pin Connector Location Used On Terminal

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MEFI 3 - ECM J-1 and J-2 Circuit/Symptom Chart

In the following J-1 and J-2 Circuit/Symptom Charts only those pins which are used by the ECM are shown. Pin numbers not listed are not used.

The “B+” Symbol indicates a system voltage (battery).

IMPORTANT: The following conditions must be met before testing.

1. Engine at operating temperature.
2. Ignition on or engine running.
3. Scan tool not connected.

J-1 Circuits

Pin	Pin Function	Circuit (CKT) Number (#)	Wire Color	Normal Voltage		Diagnostic Trouble Codes DTC(s)	Possible Symptoms
				Ignition ON	Engine Running		
J1-1	Injector Driver	467	DK BLU	B+	B+	None	Rough Idle, Lack Of Power, Stalling
J1-3	Ignition Control Ref. Low	453	RED/ BLK	0 (NOTE 5)	0 (NOTE 5)	None	Poor Performance
J1-4	ECM Ground	450	BLK	0 (NOTE 5)	0 (NOTE 5)	None	No Start
J1-5	ECM Ground	450	BLK	0 (NOTE 5)	0 (NOTE 5)	None	No Start
J1-9	MIL Lamp	419	BRN/ WHT	0 (NOTE 5)	0 (NOTE 5)	None	Lamp Inoperative
J1-10	Ignition Control Signal	423	WHT	0 (NOTE 5)	1.2V	42	Stall, Will Restart In Bypass Mode, Lack Of Power
J1-11	IAC “B” Low	443	GRN/ WHT	Not Usable	Not Usable	None	Rough Unstable or Incorrect Idle
J1-12	IAC “A” Low	442	BLU/ BLK	Not Usable	Not Usable	None	Rough Unstable or Incorrect Idle

NOTE 1: Battery voltage for first two seconds, then 0 volts.

NOTE 2: Varies with temperature.

NOTE 3: Varies with manifold vacuum.

NOTE 4: Varies with throttle movement.

NOTE 5: Less than .5 volt (500 mV).

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MEFI 3 - J-1 Circuits (continued)

Pin	Pin Function	Circuit (CKT) Number (#)	Wire Color	Normal Voltage		Diagnostic Trouble Codes DTC(s)	Possible Symptoms
				Ignition ON	Engine Running		
J1-14	Knock Sensor Signal (Only used on 7.4L MPI)	496	BLU	–	–	43, 44	Poor Fuel Economy, Poor Performance Detonation
J1-17	Injector Driver	468	DK GRN	B+	B+	None	Rough Idle, Lack Of Power, Stall
J1-20	ECM Ground	450	BLK	0 (NOTE 5)	0 (NOTE 5)	None	Rough Running, Poor Idle, Lack Of Performance
J1-23	Fuel Pump Relay Driver	465	DK GRN/ WHT	0 (NOTE 1&5)	B+	None	No Start
J1-24	Ignition Control Bypass	424	TAN/ BLK	0 (NOTE 5)	4.5V	42	Lack Of Power, Fixed Timing
J1-26	Audio Warning Horn	29	DK GRN	–	–	None	–
J1-27	IAC “B” Low	444	GRN/ BLK	Not Usable	Not Usable	None	Rough Unstable or Incorrect Idle
J1-28	IAC “A” High	441	BLU/ WHT	Not Usable	Not Usable	None	Rough Unstable or Incorrect Idle
J1-30	Knock Sensor Signal	496	BLU	–	–	43, 44	Poor Fuel Economy, Poor Performance Detonation
J1-32	Serial Data	461	ORN	5V	5V	None	No Serial Data (NOTE 6)

NOTE 1: Battery voltage for first two seconds, then 0 volts.

NOTE 2: Varies with temperature.

NOTE 3: Varies with manifold vacuum.

NOTE 4: Varies with throttle movement.

NOTE 5: Less than .5 volt (500 mV).

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MEFI 3 - J-2 Circuits

Pin	Pin Function	Circuit (CKT) Number (#)	Wire Color	Normal Voltage		Diagnostic Trouble Codes DTC(s)	Possible Symptoms
				Ignition ON	Engine Running		
J2-1	Battery	440	ORN	B+	B+	None	No Start
J2-3	TP and IAT Ground	813	BLK	0 (NOTE 5)	0 (NOTE 5)	21,23	High Idle, Rough Idle, Poor Performance Exhaust Odor
J2-4	TP 5V Reference	416	GRY	5V	5V	21	Lack Of Power, Idle High
J2-7	Discrete Switch	114	BLU	–	–	None	
J2-8	Discrete Switch	585	TAN/WHT	–	–	None	–
J2-10	Ignition Control Ref. High	430	PUR/WHT	5V	1.6V	None	No Restart
J2-11	ECT Signal	410	YEL	1.95V (NOTE 2)	1.95V (NOTE 2)	14	Poor Performance, Exhaust Odor, Rough Idle RPM Reduction
J2-18	MAP Ground	814	BLK	0 (NOTE 5)	0 (NOTE 5)	33	Lack Of Performance,Exhaust Odor, Stall
J2-19	MAP 5V Reference	416	GRY	5V	5V	33	Lack Of Power, Surge, Rough Idle, Exhaust Odor
J2-20	Discrete Switch Signal	923	WHT	–	–	–	–

NOTE 1: Battery voltage for first two seconds, then 0 volts.

NOTE 2: Varies with temperature.

NOTE 3: Varies with manifold vacuum.

NOTE 4: Varies with throttle movement.

NOTE 5: Less than .5 volt (500 mV).

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MEFI 3 - J-2 Circuits (continued)

Pin	Pin Function	Circuit (CKT) Number (#)	Wire Color	Normal Voltage		Diagnostic Trouble Codes DTC(s)	Possible Symptoms
				Ignition ON	Engine Running		
J2-21	Master/ Slave	916	YEL	B+	B+	None	Lack Of Data From Other Engine (Dual Engine Only)
J2-22	Diagnostic Test	451	BLK/ WHT	B+	B+	None	Incorrect Idle, Poor Performance
J2-24	Discrete Switch	906	TAN/ WHT	–	–	NONE	
J2-26	TP Signal	417	DK BLU	.62V (NOTE 4)	.62V (NOTE 4)	21	Poor Performance And Acceleration, Incorrect Idle
J2-27	Map Signal	432	LT GRN	4.9V	1.46V (NOTE 3)	33	Poor Performance, Surge, Poor Fuel Economy, Exhaust Odor
J2-30	IAT Sensor	472	TAN	5V	(NOTE 2)	23	Poor Fuel Economy, Exhaust Odor
J2-32	Ignition Fused	439	PNK	B+	B+	None	No Start

NOTE 1: Battery voltage for first two seconds, then 0 volts.

NOTE 2: Varies with temperature.

NOTE 3: Varies with manifold vacuum.

NOTE 4: Varies with throttle movement.

NOTE 5: Less than .5 volt (500 mV).

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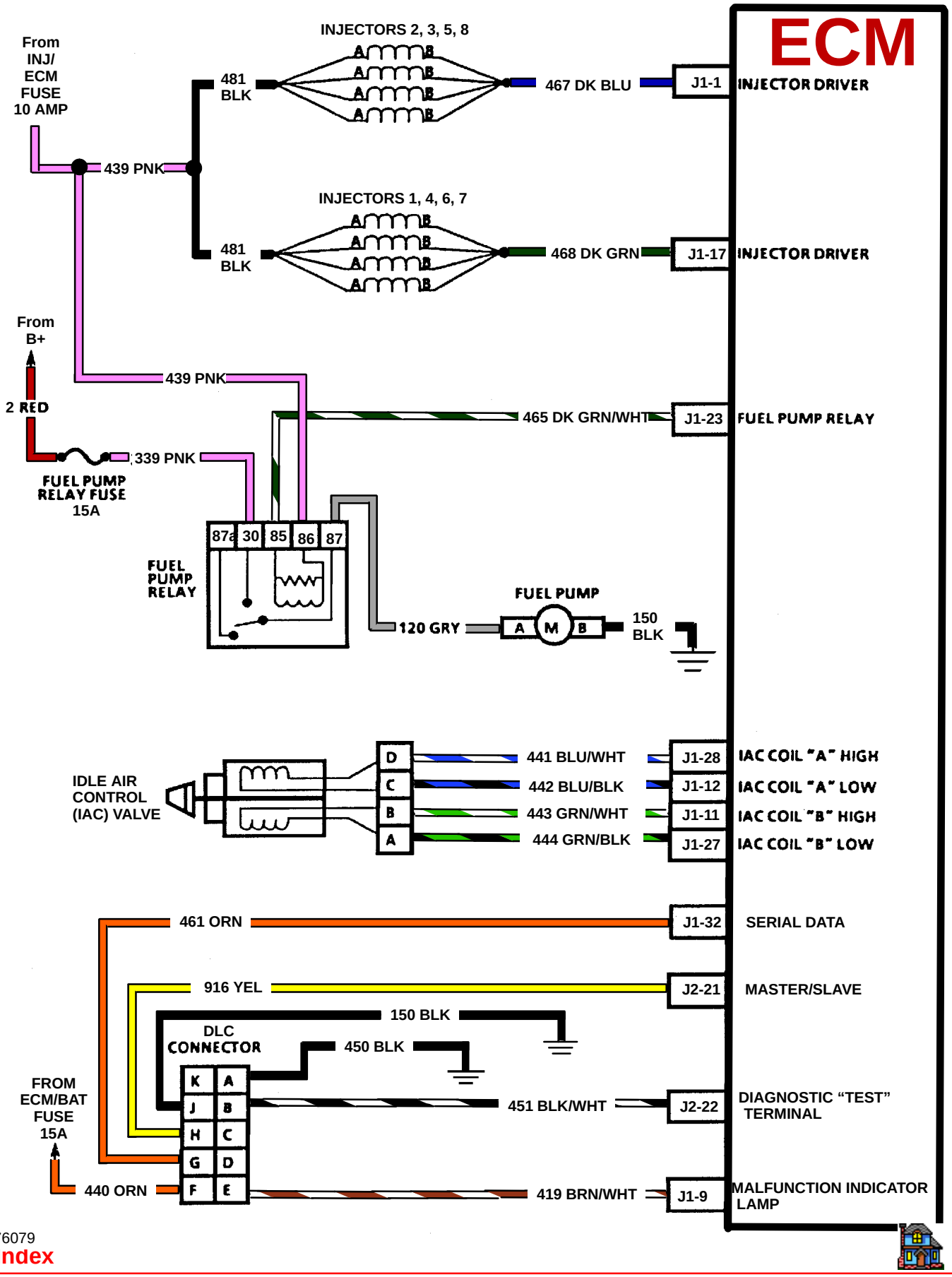
MEFI 3 - ECM Wiring PAGE 1 of 4



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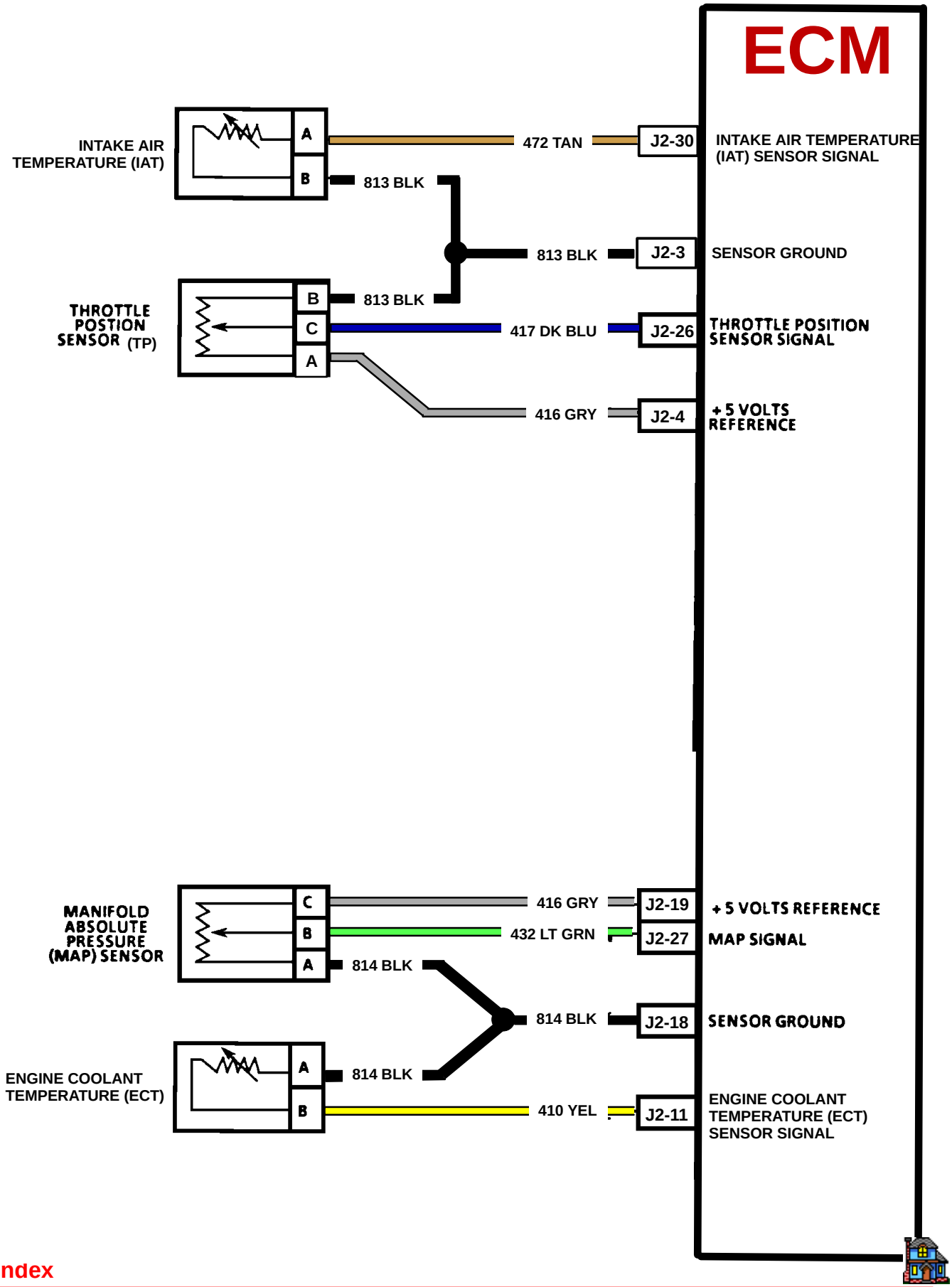
MEFI 3 - ECM Wiring PAGE 2 of 4



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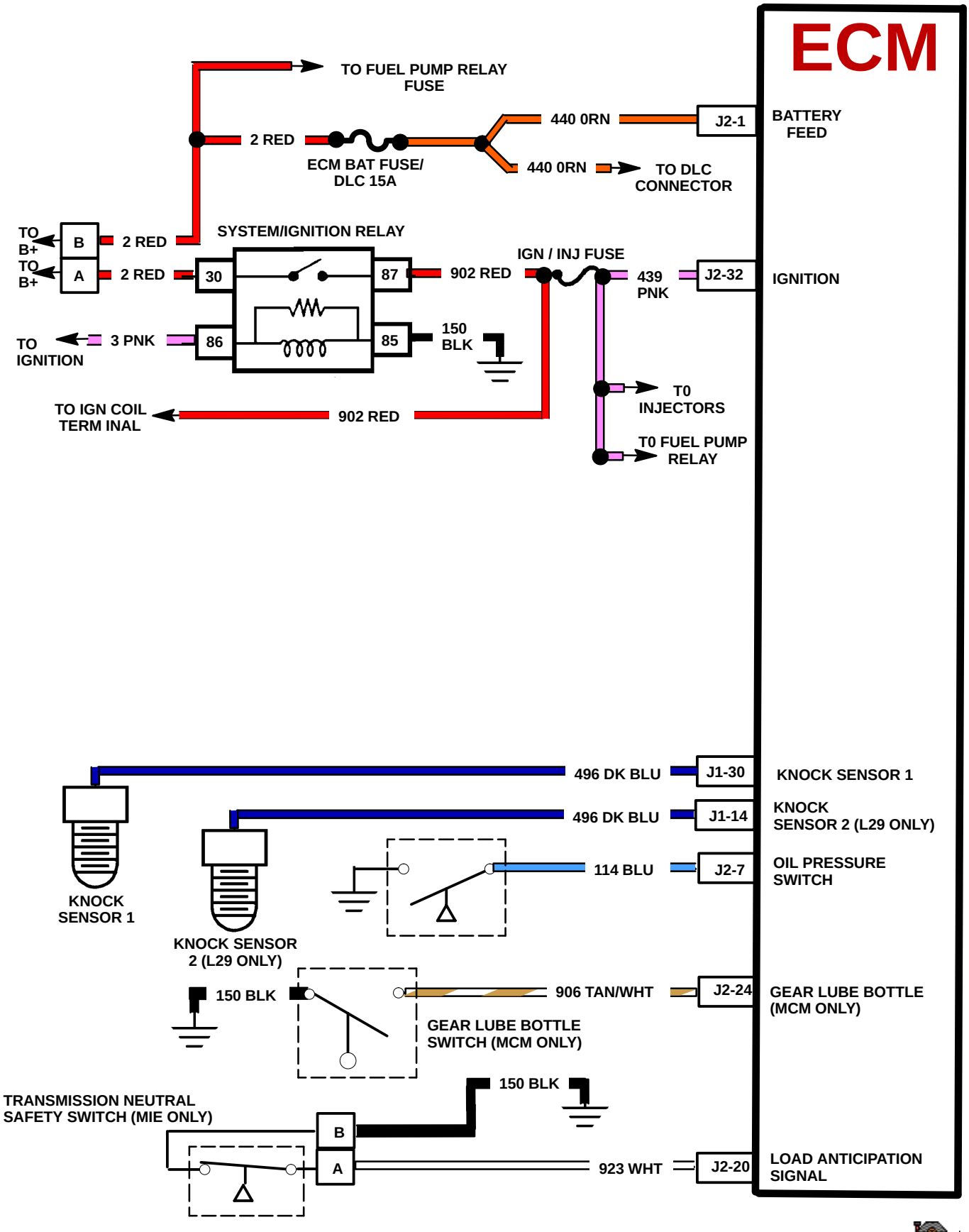

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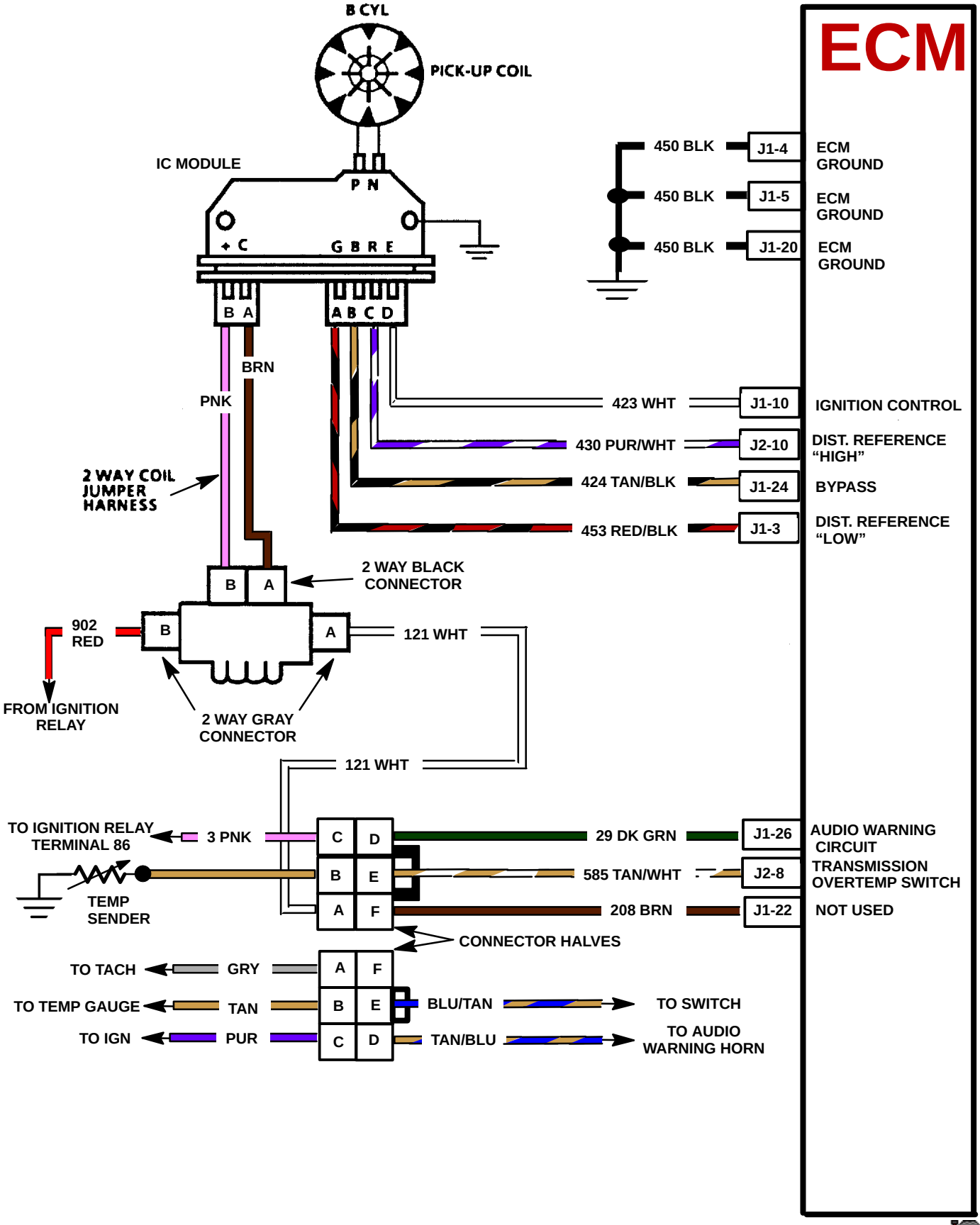
MEFI 3 - ECM Wiring PAGE 4 of 4



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Injector Balance Test

Test Procedure

(Refer to the following figure for test set-up.)

The injector balance tester is a tool used to turn the injector ON for a precise amount of time, thus spraying a measured amount of fuel into the manifold. This causes a drop in fuel rail pressure that we can record and compare between each injector. All injectors should have the same amount of pressure drop. Any injector with a pressure drop that is 1.5 PSI (or more) greater or less than the average drop of the other injectors should be considered faulty and replaced. Injector testers are available for various manufacturers. For 454 and 502 engines: the tester must be capable of selecting an injector pulse width in the range of 200-400 milliseconds (m sec). The recommended starting point for these engines is approximately 300 m sec. In any case a pulse width that drops the fuel rail pressure to half the normal operating pressure, should be used.

STEP 1

Engine cool down period (ten minutes) is necessary to avoid irregular readings due to “hot soak” fuel boiling. Relieve fuel pressure in the fuel rail as outlined in “Fuel Pressure Relief Procedure” in “Repair Procedures.” Remove plenum as outlined in “Repair Procedures.” With ignition OFF, connect fuel pressure gauge to fuel pressure tap.

Disconnect harness connectors at all injectors, and connect injector tester to one injector. Use adaptor harness furnished with injector tester to energize injectors. Follow manufacturer’s instructions for use of adaptor harness. Ignition must be OFF at least ten seconds to complete ECM shutdown cycle. Fuel pump should run about two seconds after ignition is turned ON.

At this point, insert clear tubing attached to vent valve into a suitable container and bleed air from gauge and hose to ensure accurate gauge operation. Repeat this step until all air is bled from gauge.

STEP 2

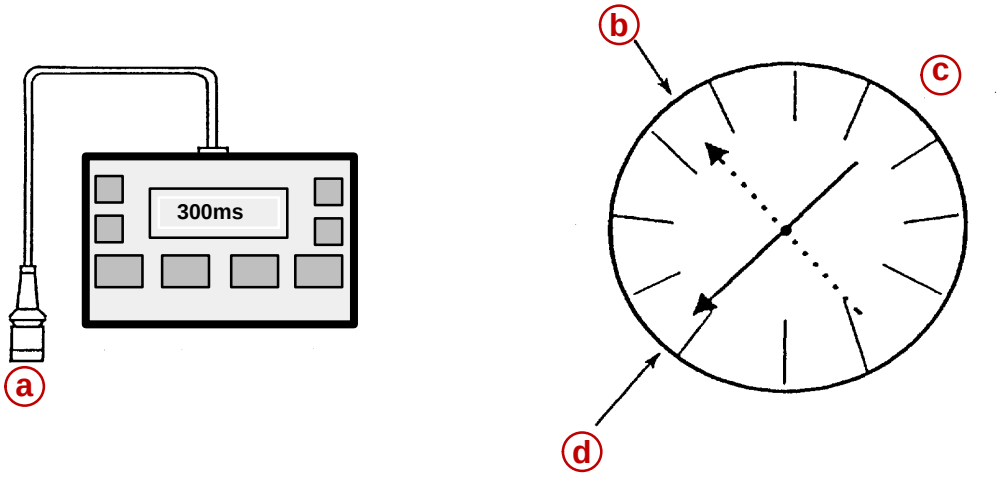
Turn ignition OFF for ten seconds and then ON again several times to get fuel pressure to its maximum. Record this initial pressure reading. Energize tester one time and note pressure drop at its lowest point. (Disregard any slight pressure increase after drop hits low point.) By subtracting this second pressure reading from the initial pressure, we have the actual amount of injector pressure drop.

STEP 3

Repeat Step 2 on each injector and compare the amount of drop. Usually, good injectors will have virtually the same drop. Retest any injector that has a pressure difference of 1.5 PSI (10 kPa), either more or less than the average of the other injectors on the engine. Replace any injector that also fails the retest. If the pressure drop of all injectors is within 1.5 PSI (10 kPa) of this average, the injectors appear to be flowing properly. Reconnect them and review “Troubleshooting.”

NOTE: *The entire test should not be repeated more than once without running the engine to prevent flooding. (This includes any retest on faulty injectors.)*

Test Example



a - Injector
b - 1st Reading (Initial Pressure)
c - Fuel Pressure Gauge
d - 2nd Reading (Pressure After Drop)

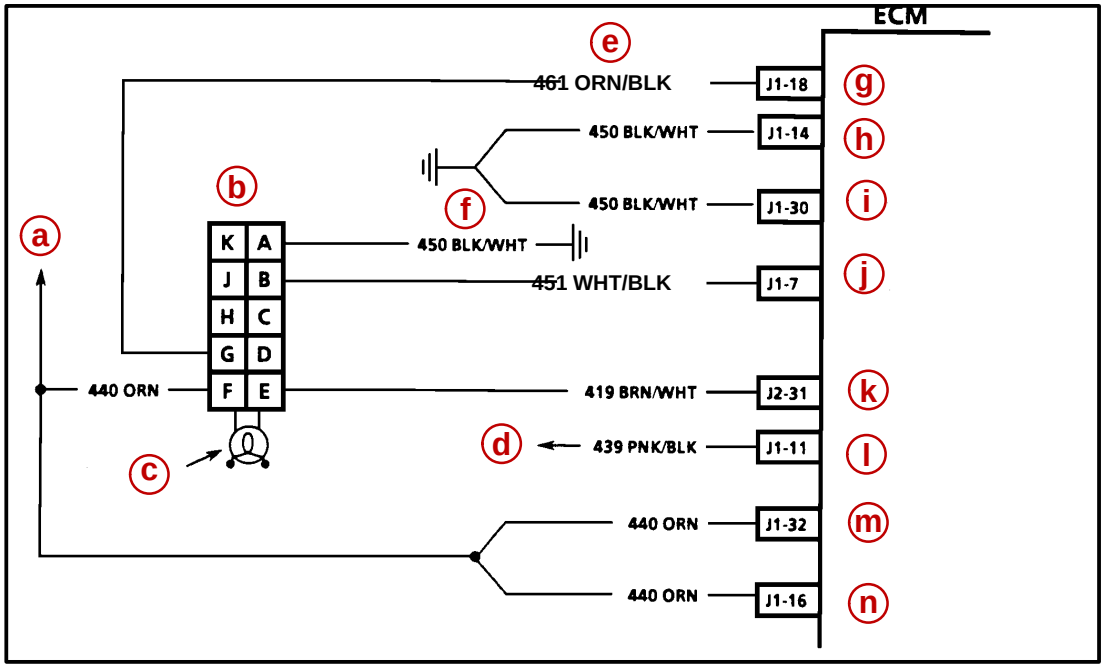
EXAMPLE								
Cylin-der	1	2	3	4	5	6	7	8
1st. Reading	38 PSI (262 kPa)	38 PSI (262 kPa)	38 PSI (262 kPa)	38 PSI (262 kPa)	38 PSI (262 kPa)	38 PSI (262 kPa)	38 PSI (262 kPa)	38 PSI (262 kPa)
2nd Reading	19 PSI (131 kPa)	17 PSI (117 kPa)	21 PSI (145 kPa)	19 PSI (131 kPa)	19 PSI (131 kPa)	19 PSI (131 kPa)	19 PSI (131 kPa)	19 PSI (131 kPa)
Amount of Drop	19 PSI (131 kPa)	21 PSI (145 kPa)	17 PSI (117 kPa)	19 PSI (131 kPa)	19 PSI (131 kPa)	19 PSI (131 kPa)	19 PSI (131 kPa)	19 PSI (131 kPa)
	OK	Rich (Too Much Fuel Drop)	Lean (Too Little Fuel Drop)	OK	OK	OK	OK	OK

General Diagnostic Tests

IMPORTANT: These tests are for MEFI 1 and MEFI 2 Engines only. MEFI 3 diagnostic tests will be provided as soon as available. References to 454 cid / 502 cid engines are MEFI 1, references to 7.4L engines are MEFI 2.

IMPORTANT: Non-scan tool refers to the CodeMate Tester.

On-Board Diagnostic (OBD) System Check (Non-Scan)



- **a** - ECM/DLC 15 Amp Fuse
- **b** - DLC Connector
- **c** - Marine Diagnostic Code Tool
- **d** - ECM, Injector Knock Sensor Module 10 Amp Fuse
- **e** - (ORN-Some models)
- **f** - (BLK-Some models)
- **g** - Serial Data
- **h** - ECM Ground
- **i** - ECM Ground
- **j** - Diagnostic Test Terminal
- **k** - Malfunction Indicator Lamp
- **l** - Ignition Feed
- **m** - Battery Feed
- **n** - Battery Feed

CIRCUIT DESCRIPTION:

The on-board diagnostic system check must be the starting point for any driveability complaint diagnosis. Before using this procedure, you should perform a careful visual/physical check of the ECM and engine grounds for being clean and tight.

The on-board diagnostic system check is an organized approach to identifying a problem created by an electronic engine control system malfunction.

DIAGNOSTIC AIDS:

An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation. Check for the following items:

- Inspect the ECM harness and connectors for improper mating, broken locks, improperly formed or damaged terminals poor terminal to wire connection, and damaged harness.

TEST DESCRIPTION:

Number(s) below refer to the Step number(s) on the Diagnostic Table:

1. The MIL should be “ON” steady with the ignition “ON,” engine “OFF.” If not, chart A-1 should be used to isolate the malfunction.
2. Checks for grounded CKT 451 and ensures that the MIL driver circuit is not shorted to ground.
3. This test ensures that the ECM is capable of controlling the MIL
4. If the engine will not start, chart A-3 should be used to diagnose the condition.
5. Refer to “ECM Diagnostic Trouble Code” chart for a list of valid Diagnostic Trouble Codes (DTC). An invalid DTC may be the result of a faulty MDTC tool, EEPROM, or ECM.
6. If the customer complaint or driveability problem does not currently exist, refer to “Diagnostic Aids” to check for an intermittent problem.

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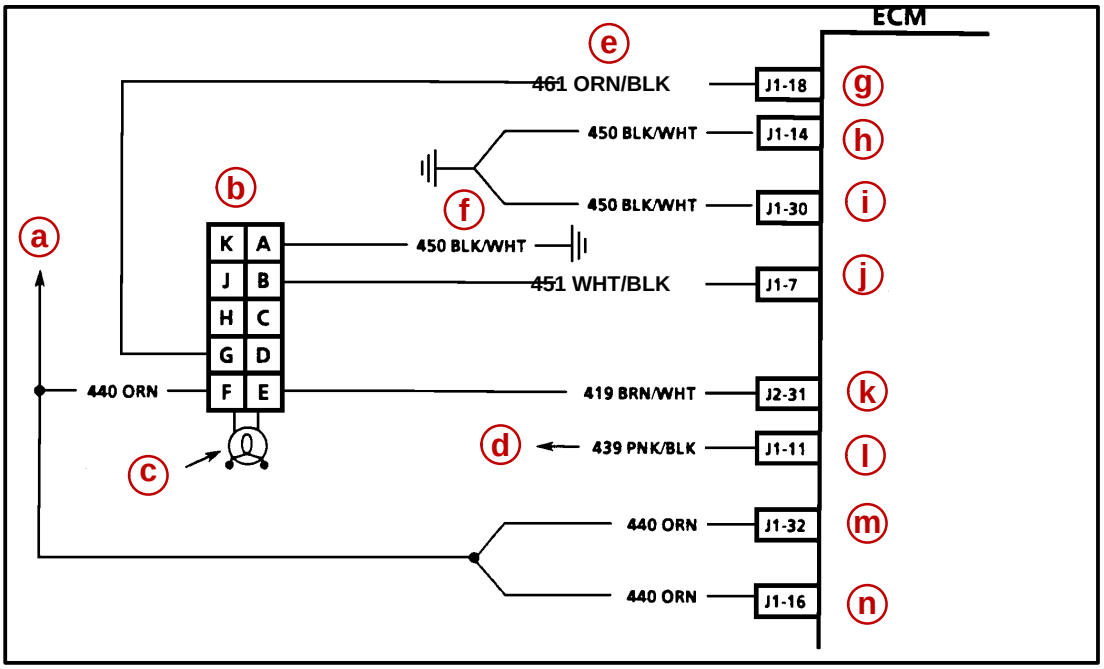
On-Board Diagnostic (OBD) System Check (Non-Scan)

Step	Action	Value(s)	Yes	No
1	1. Ignition "ON," engine "OFF." 2. install Marine Diagnostic Trouble Code (MDTC) tool and switch it to "Normal Mode." 3. Observe the Malfunction Indicator Lamp (MIL). ***Is the MIL "ON"?***	-	Go to Step *2*	Go to *Chart* A-1
2	1. With Marine Diagnostic Trouble Code Tool on "normal mode." 2. Ignition "ON," engine "OFF." 3. Observe the Malfunction Indicator Lamp on the MDTC tool. ***Does the MIL Flash DTC 12?***	-	Go to Step 7	Go to Step 3
3	1. Switch Marine Diagnostic Trouble Code Tool to "service mode." 2. Ignition "ON," engine "OFF." 3. Observe the Malfunction Indicator Lamp on the MDTC tool. ***Does the MIL Flash DTC 12?***	-	Go to Step 4	Go to *Chart* A-2
4	1. Switch MDTC tool to "Normal Mode." 2. Attempt to start the engine. ***Did The Engine Start And Continue To Run?***	-	Go to Step 5	Go to *Chart* A-3
5	1. Ignition "ON," Engine "OFF." 2. Switch MDTC tool to "Service Mode." ***Are Any Additional DTC's Stored?***	-	Go to applicable DTC Chart	Go to Step 6
6	***Does A Customer Complaint Or Driveability Problem Currently Exist?***	-	Refer to "Symptoms" section	Refer to "Diagnostic Aids"
7	1. Ignition "ON," engine "OFF." 2. Check CKT 451 for a short to ground. 3. If a problem is found, repair as necessary. ***Was A Problem Found?***	-	Repeat OBD *System Check*	Go to Step 8
8	Replace the ECM. ***Is Action Complete?***	-	Repeat OBD *System Check*	-

On-Board Diagnostic (OBD) System Check (Scan)



a - ECM/DLC 15amp fuse
b - DLC Connector
c - Marine Diagnostic Code Tool
d - ECM, Injector Knock Sensor Module 10amp Fuse
e - (ORN-Some Models)
f - (BLK-Some Models)
g - Serial Data
h - ECM Ground
i - ECM Ground
j - Diagnostic Test Terminal
k - Malfunction Indicator Lamp (MIL)
l - Ignition Feed
m - Battery Feed
n - Battery Feed

CIRCUIT DESCRIPTION:

The on-board diagnostic system check must be the starting point for any driveability complaint diagnosis. Before using this procedure, you should perform a careful visual/physical check of the ECM and engine grounds for being clean and tight.

The on-board diagnostic system check is an organized approach to identifying a problem created by an electronic engine control system malfunction.

DIAGNOSTIC AIDS:

An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation. Check for the following items:

- Inspect the ECM harness and connectors for improper mating, broken locks, improperly formed or damaged terminals poor terminal to wire connection, and damaged harness.

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TEST DESCRIPTION:

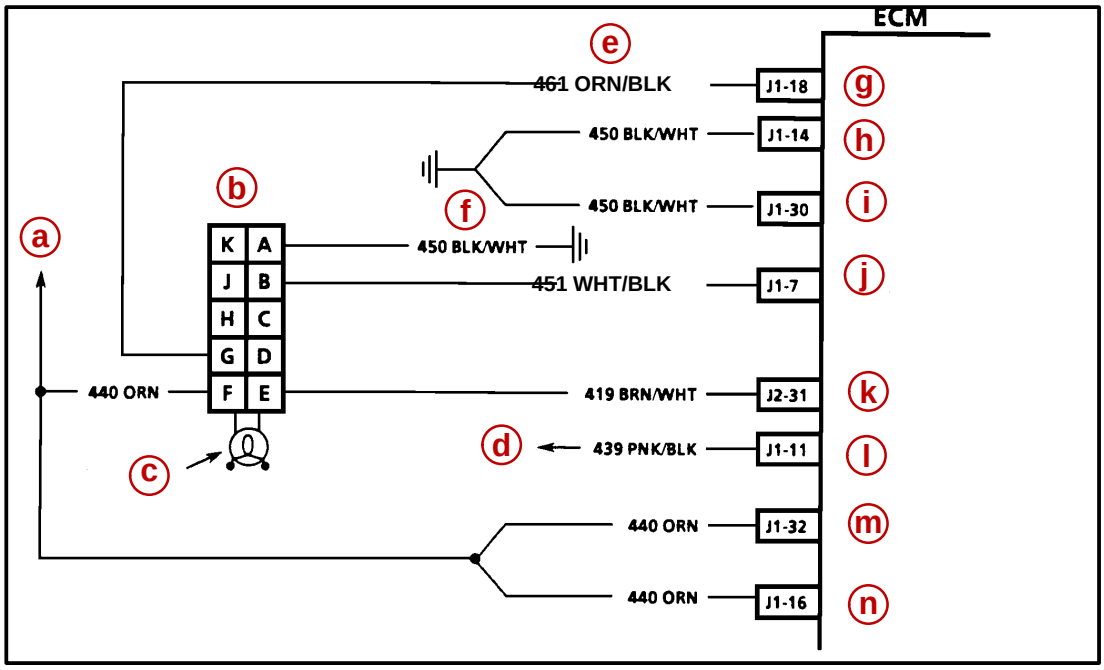
Number(s) below refer to the Step number(s) on the Diagnostic Table:

1. The MIL should be “ON” steady with the ignition “ON,” engine “OFF.” If not, chart A-1 should be used to isolate the malfunction.
2. Checks the serial data circuit and ensures that the ECM is able to transmit serial data.
3. If the engine will not start, chart A-3 should be used to diagnose the condition.
5. A scan tool parameter which is not within the typical range may help to isolate the area which is causing the problem.

On-Board Diagnostic (OBD) System Check (Scan)

Step	Action	Value(s)	Yes	No
1	1. Ignition "ON," engine "OFF." 2. Install Marine Diagnostic Trouble Code (MDTC) tool and switch it to "Normal Mode." 3. Observe the Malfunction Indicator Lamp (MIL). ***Is the MIL "ON"?***	-	Go to Step 2	Go to *Chart* A-1
2	1. Ignition "OFF." 2. Install a scan tool. 3. Ignition "ON." 4. Attempt to display ECM data with the scan tool. ***Does The Scan Tool Display ECM Data?***	-	Go to Step 3	Go to Step 7
3	Attempt to start the engine. ***Did The Engine Start And Continue To Run?***	-	Go to Step 4	Go to *Chart* A-3
4	Select "Display DTCs" with the scan tool. ***Are Any Trouble Codes Stored?***	-	Go to applicable DTC Chart	Go to Step 5
5	Compare ECM data values displayed on the scan tool to the typical scan tool data values page. ***Are The Displayed Values Normal Or Close To The Typical Values?***	-	Refer to "Trouble-shooting" section	Refer to "Diagnostic Testing"
6	1. Ignition "OFF." 2. Disconnect the ECM. 3. Check the serial data CKT 461 for an open, short to ground, or short to voltage. Also, check the DLC battery feed circuit for an open or short to ground and the DLC ground CKT 450 for an open. 4. If a problem is found, repair as necessary. ***Was A Problem Found?***	-	Repeat OBD *System Check*	Go to Step 7
7	Replace the ECM. ***Is Action Complete?***	-	Repeat OBD *System Check*	-

Chart A-1 (1 of 4): No Malfunction Indicator Lamp (MIL) - Marine Diagnostic Trouble Code (MDTC) Tool Installed



a - ECM/DLC 15amp fuse
b - DLC Connector
c - Marine Diagnostic Code Tool
d - ECM, Injector Knock Sensor Module 10amp Fuse
e - (ORN-Some Models)
f - (BLK-Some Models)
g - Serial Data
h - ECM Ground
i - ECM Ground
j - Diagnostic Test Terminal
k - Malfunction Indicator Lamp
l - Ignition Feed
m - Battery Feed
n - Battery Feed

CIRCUIT DESCRIPTION:

When the Marine Diagnostic Trouble Code (MDTC) tool is installed, it plugs into the DLC terminals “F” and “E”. It receives voltage through CKT 440 terminal “F”. Terminal “E” is ground through CKT 419 from the ECM terminal “J2-31”. There should always be a steady MIL with the ignition “ON” and the engine stopped. The Engine Control Module (ECM) turns the MIL“ON” by grounding the MIL driver circuit.

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Chart A-1 (2 of 4): No Malfunction Indicator Lamp (MIL) - (MDTC) Tool Installed

DIAGNOSTIC AIDS:

An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation. Check for the following items:

- Inspect the ECM harness and connectors for improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wire connection, and damaged harness.

If the engine runs OK, check for a faulty light bulb or an open in the MIL driver circuit (CKT 419). If the engine cranks but will not run, check for an open ECM ignition or battery feed or a poor ECM to engine ground.

TEST DESCRIPTION:

Number(s) below refer to the step number(s) on the Diagnostic Table:

3. This step ensures that battery voltage is available to terminal “F” of the DLC connector.

4 . This step checks for ground present at terminal “E” of the DLC connector. This indicates the ECM is capable of completing the ground to the MIL.

5 . This step isolates the cause of an incomplete ground circuit to either faulty wiring or faulty ECM circuitry.

7 . This step ensures that battery voltage is available to the ECM.

Chart A-1 (3 of 4): No Malfunction Indicator Lamp (MIL) -(MDTC) Tool Installed

Step	Action	Value (s)	Yes	No
1	Was the "On-Board Diagnostic" (OBD) System Check Performed?	-	Go to Step 2	Go to OBD *System Check*
2	Attempt to start the engine. ***Does The Engine Start?***	-	Go to Step 3	Go to Step 6
3	1. Remove Marine Diagnostic Trouble Code (MDTC) tool. 2. Ignition "ON," engine "OFF." 3. Using a test light connected to ground (–), probe terminal "F" of the DLC. ***Does The Test Light Illuminate Brightly?***	-	Go to Step 4	Go to Step 10
4	Using a test light connected to battery positive (B+), probe terminal "E" of the DLC. ***Does The Test Light Illuminate Brightly?***	-	Go to Step 11	Go to Step 5
5	1. Ignition "OFF." 2. Disconnect ECM "J2" connector. 3. Using a DVOM, measure the resistance between ECM harness connector terminal "J2-31" and DLC terminal "E." ***Is The Resistance Within The Specified Values?***	0 ohms	Go to Step 17	Go to Step 13
6	Check the ECM fuse. ***Is The Fuse Good?***	-	Go to Step 7	Go to Step 14
7	1. Ignition "OFF." 2. Disconnect the ECM connectors. 3. Using a test light connected to ground, probe ECM harness connector pins "J1-16" and "J1-32." ***Does The Test Light Illuminate Brightly On Both Circuits?***	-	Go to Step 8	Go to Step 15
8	1. Ignition "ON," engine "0FF." 2. Using a test light connected to ground (–), probe ECM harness connector pin "J1-11." ***Does The Test Light Illuminate Brightly?***	-	Go to Step 12	Go to Step 9
9	Check the INJ/ECM fuse. ***Is The Fuse Good?***	–-	Go to *Chart A-6*	Go to Step 16

Chart A-1 (4 of 4): No Malfunction Indicator Lamp (MIL) - Marine Diagnostic Trouble Code (MDTC) Tool Installed

Step	Action	Value(s)	Yes	No
10	Locate and repair open or short to ground in CKT 440. ***Is Action Complete?***	_	Go to OBD *System Check*	__
11	Repair or replace faulty Marine Diagnostic Trouble Code tool. ***Is Action Complete?***	_	Go to OBD *System Check*	__
12	1. Locate and repair faulty ECM grounds. 2. If a problem is found, repair as necessary. ***Is Action Complete?***	_	Go to OBD *System Check*	Go to Step 17
13	Locate and repair open in CKT 419. ***Is Action Complete?***	_	Go to OBD *System Check*	__
14	Locate and repair short to ground in the battery feed circuit. ***Is Action Complete?***	_	Go to OBD *System Check*	__
15	Locate and repair open in the circuit that did not light the test light. ***Is Action Complete?***	_	Go to OBD *System Check*	_
16	Locate and repair short to ground in CKT 439. ***Is Action Complete?***	_	Go to OBD *System Check*	_
17	Repair faulty ECM connections or replace faulty ECM. ***Is Action Complete?***	_	Go to OBD *System Check*	_

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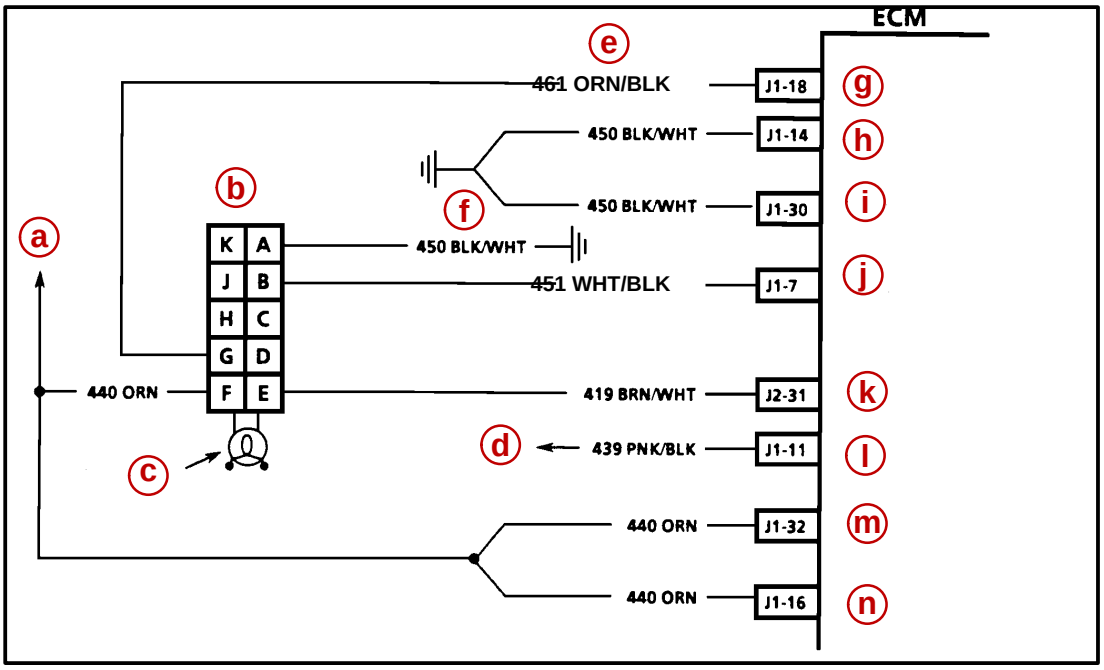
Chart A-2 (1 of 3): Malfunction Indicator Lamp “On” Steady - No DLC Data or Will Not Flash DTC 12 - Marine Diagnostic Trouble Code (MDTC) Tool Installed



- **a** - ECM/DLC 15amp fuse
- **b** - DLC Connector
- **c** - Marine Diagnostic Code Tool
- **d** - ECM, Injector Knock Sensor Module 10amp Fuse
- **e** - (ORN-Some Models)
- **f** - (BLK-Some Models)
- **g** - Serial Data
- **h** - ECM Ground
- **i** - ECM Ground
- **j** - Diagnostic Test Terminal
- **k** - Malfunction Indicator Lamp
- **l** - Ignition Feed
- **m** - Battery Feed
- **n** - Battery Feed

CIRCUIT DESCRIPTION:

When the Marine Diagnostic Trouble Code (MDTC) tool is installed, it plugs into the DLC terminals “F” and “E”. It receives voltage through CKT 440 terminal “F”. Terminal “E” is ground through CKT 419 from the ECM terminal “J2-31”. There should always be a steady MIL with the ignition “ON” and the engine stopped. The Engine Control Module (ECM) turns the MIL “ON” by grounding the MIL driver circuit.

When the diagnostic tests terminal on the DLC is grounded by jumping terminal “B” to terminal “A”, the ground circuit is completed. The MIL will flash a DTC 12 followed by any DTC’s stored in memory. A steady light suggests CKT 419 is shorted to ground or an open in CKT 451 from the ECM to the DLC.

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Chart A-2 (2 of 3): Malfunction Indicator Lamp “On” Steady - No DLC Data or Will Not Flash DTC 12 - Marine Diagnostic Trouble Code (MDTC) Tool Installed

DIAGNOSTIC AIDS:

An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation. Check for the following items.

- Poor connection or damaged harness. Inspect the ECM harness and connectors for improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wire connection, and damaged harness.

TEST DESCRIPTION:

Number(s) below refer to the Step number(s) on the Diagnostic Table.

3. If the light goes “OFF” when the ECM connectors are disconnected, CKT 419 is not shorted to ground.
4. This step will check for an open diagnostic CKT 451.
6. If there is a problem with the ECM that prevents a scan tool from reading serial data, the ECM will not flash a DTC 12. If DTC 12 is flashing, check for short to ground in CKT 451 and verify that the scan tool is working properly on another engine.
9. At this point, the MIL wiring is OK. If DTC 12 does not flash, replace the ECM.

NOTE: *Before replacing ECM, check the MDTC tool on another engine to make sure it is working properly.*

Chart A-2 (3 of 3): Malfunction Indicator Lamp "On" Steady - No DLC Data or Will Not Flash DTC 12 - Marine Diagnostic Trouble Code (MDTC) Tool Installed

Step	Action	Value(s)	Yes	No
1	Was the "On-Board Diagnostic" (OBD) System Check Performed?	-	Go to Step 2	Go to OBD *System Check*
2	1. Ignition "ON," engine "OFF." 2. Switch MDTC tool to "Service Mode." ***Does The MIL Flash DTC 12?***	-	Go to Step 6	Go to Step 3
3	1. Ignition "OFF," disconnect ECM connectors. 2. Ignition "ON," engine "OFF," observe the MIL. ***Is The MIL "ON"?***	-	Go to Step 7	Go to Step 4
4	1. Ignition "OFF." 2. With ECM "J1" connector disconnected, jump terminals "A" to "B" at the DLC. 3. Connect test light between ECM connector terminal "J1-7" and battery positive (B+). ***Does Test Light Illuminate Brightly?***	-	Go to Step 5	Go to Step 8
5	1. Verify correct operation of MDTC tool on a known good system. 2. If a problem is found, repair as necessary. ***Is Action Complete?***	–	Go to OBD *System Check*	Go to Step 9
6	1. If problem was no DLC data (using scan tool), check serial data CKT 461 for an open or short to ground. 2. If a problem is found, repair as necessary. ***Is Action Complete?***	-	Go to OBD *System Check*	Go to Step 9
7	Locate and repair short to ground in CKT 419. ***Is Action Complete?***	-	Go to OBD *System Check*	_
8	Locate and repair open in CKT 450 and/or CKT 451. ***Is Action Complete?***	-	Go to OBD *System Check*	_
9	1. Repair faulty ECM connections or replace faulty ECM. 2. Recheck for DTC 12. ***Is Action Complete?***	–	Go to OBD *System Check*	_

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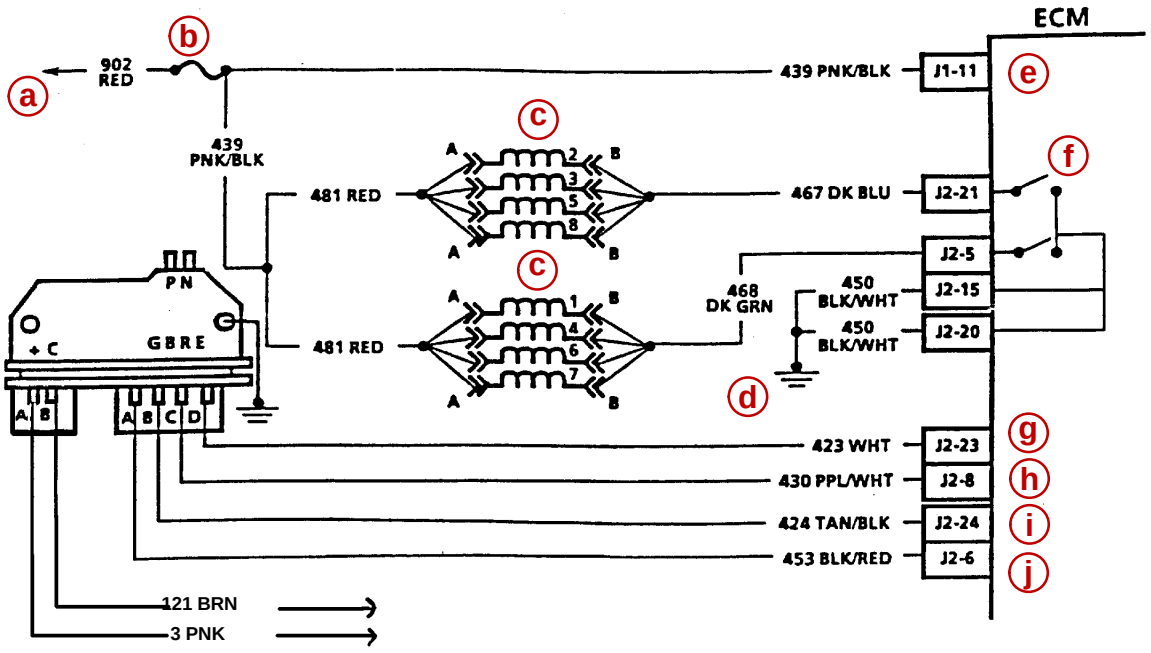
Chart A-3 (1 of 5): Engine Cranks But Will Not Run



a - To Term “87” Of System Relay
b - Injector/ECM/KS module fuse 10a
c - Injectors
d - Engine Ground
e - Ignition Feed
f - Injector Driver
g - Ignition Control
h - Dist. Reference “high”
i - Bypass
j - Dist. Reference “low”

CIRCUIT DESCRIPTION:

In the Distributor Ignition (DI) system and the fuel injector circuit, the supply voltage comes from the EFI system relay. From the EFI system relay, CKT 902 delivers supply voltage to the injector/ECM fuse, and to the ignition coil gray connector terminal “B”.

After supply voltage passes through the injector/ECM fuse, it branches out into two separate CKT’s 439. One is the supply voltage for injector harness CKT 481 and the other goes to ECM terminal “J1-11.” The ECM will control the opening and closing of the injectors through injector driver CKT 467 and CKT 468 by connecting them to ground.

The Ignition Control (IC) module receives supply voltage through CKT 3 from the gray connector at the coil where it is connected with CKT 902. The IC module will control spark from the coil through CKT 121. The IC module interfaces with the ECM through CKT 430. The ECM will control the timing of the spark through CKT 423. For further explanation of distributor ignition system, see “Distributor Ignition System Check,” CHART A-7.

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Chart A-3 (2 of 5): Engine Cranks But Will Not Run

DIAGNOSTIC AIDS:

This chart assumes that battery voltage and engine cranking speed are OK, and there is adequate fuel in the tank.

Water or foreign material in fuel system can cause a no start.

A defective MAP sensor may cause a no start or a start and stall condition. To determine if the MAP sensor is causing the problem, disconnect the electrical connector. The ECM will then use a default value for the sensor. If the condition is corrected and the connections are OK, then replace the sensor.

An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation. Check for the following items:

Poor connection or damaged harness. Inspect the ECM harness and connectors for improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wire connection, and damaged harness.

If above are all OK, refer to “Hard Start” in “Troubleshooting” section.

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic” (OBD) System Check performed?	–	Go to Step 2	Go to OBD *System Check*
2	Disconnect Throttle Position (TP) sensor. ***Does The Engine Start?***	–	Go to Step 14	Go to Step 3
3	1. Key “OFF” for minimum of 10 seconds. 2. Key “ON.” 3. Listen for fuel pump to run. ***Does Fuel Pump Run For 2 Seconds?***	–	Go to Step 4	Go to *Chart A-4*
4	Crank engine for 1 second and listen for fuel pump to run. ***Does Fuel Pump Run?***	–	Go to Step 5	Go to Step 9
5	Check for secondary ignition spark. ***Is Adequate Spark Present At All Cylinders?***	–	Go to Step 6	Go to *Chart A-7*

Chart A-3 (3 of 5): Engine Cranks But Will Not Run

Step	Action	Value(s)	Yes	No
6	1. Disconnect one injector electrical connector. 2. Connect test light J34730-2C to injector harness connector. 3. While cranking engine, check for blinking light. 4. Remove test light and reconnect injector harness connector. Repeat this test for all injectors. 5. If any lights are blinking dimly, check for shorted injector by comparing injector resistance values. ***Were All Lights Blinking Brightly?***	–	Go to Step 7	Go to Step 10
7	1. Install fuel pressure gauge. 2. Ignition "OFF" for 10 seconds. 3. Ignition "ON." Fuel pump will run for about 2 seconds 4. Note fuel pressure with pump running. The pressure may drop after the pump stops running ***Is Fuel Pressure Within Specified Value?***	34-38 psi (234-262 kPa)	Refer to Diagnostic Aids on Facing Page	Go to *Chart A-4*
8	Check for secondary ignition spark. ***Is Adequate Spark Present At All Cylinders?***	–	Go to Step 9	Refer to *Ignition System Check_*
9	1. Ignition "OFF." 2. Disconnect ECM "J2" connector. 3. Using a DVOM connected to ground, probe "J2-8" of the ECM harness connector while cranking the englne. ***Is The Voltage Within The Specified Value?***	1-2 volts	Go to Step 20	Go to Step 15
10	***Was The Test Light A Steady Light?***	–	Go to Step 11	Go to Step 12
11	Check the injector driver circuit with the steady light for a short to ground. If circuit is not shorted, check resistance across each injector in the circuit. ***Is Resistance Greater Than The Specified Value?***	10 Ohms	Go to Step 20	Go to Step 16

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Chart A-3 (4 of 5): Engine Cranks But Will Not Run

12	1. Disconnect injector that did not blink. 2. Ignition “ON”. 3. Using a test light connected to ground,probe injector harness connector terminals. ***Does Test Light Illuminate Brightly On Both Terminals?***	–	Go to Step 13	Go to Step 17
13	1. Reconnectors. 2. Ignition “OFF”. 3. Disconnect ECM. 4. Ignition “ON”. 5. Using a test light connected to ground, probe ECM harness terminals “J2-5” and “J2-21”. ***Does Test Light Illuminate Brightly?***	–	Go to *Step 19*	Go to Step 18
14	Replace faulty TP sensor. ***Is Action Complete?***	–	Go to OBD *System Check*	–
15	1. Locate and repair open or short to ground in CKT 430. 2. If OK, replace faulty ignition control module. ***Is Action Complete?***	–	Go to OBD *System Check*	–
16	Locate and repair short to ground or replace any injector that measures under 10 ohms. ***Is Action Complete?***	–	Go to OBD *System Check*	–
17	1. If the light was “OFF” on both terminals, locate and repair open in injector feed circuit. 2. Due to the injectors wired in parallel, there should be a light on both terminals. If not, locate and repair open in the harness to the tested injector. ***Is Action Complete?***	–	Go to OBD *System Check*	–

Chart A-3 (5 of 5): Engine Cranks But Will Not Run

Step	Action	Value(s)	Yes	No
18	Locate and repair open in CKT 467 or CKT 468. ***Is Action Complete?***	–	Go to OBD *System Check*	–
19	Check for short to ground in CKT 467 or CKT 468. If a problem is found, repair as necessary. ***Was A Problem Found?***	–	Go to OBD *System Check*	–
20	Check the injector driver circuit with the steady light for a short to ground. If circuit is not shorted, check resistance across injector in the circuit. ***Is Resistance Close To The Specified Value?***	–	Go to OBD *System Check*	–
21	1. All checks made to this point would indicate that the ECM is at fault. However, there is a possibility of CKT 467 and CKT 468 being shorted to a voltage source in the engine harness or the injector harness. 2. Disconnect all injectors. 3. Ignition “ON”. 4. Using a test light connected to ground, probe CKT 467 and CKT 468 on the ECM side of the injector harness (Test one injector harness on each side of the engine). If light is “ON”, locate and repair short to voltage. 5. Check injector harness connector. Be sure that terminals are not backed out of connector and contacting each other. 6. If all OK, replace faulty ECM. ***Is Action Complete?***	–	Go to OBD *System Check*	–
22	Repair faulty ECM connections or replace faulty ECM. ***Is Action Complete?***	–	Go to OBD *System Check*	–

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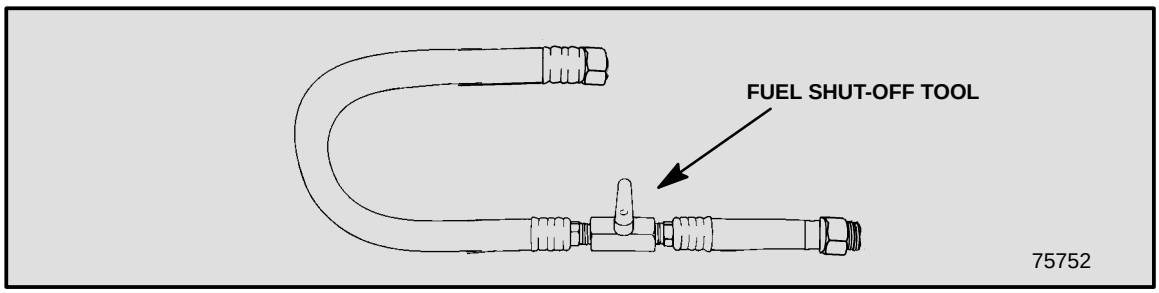
Chart A-4 (1 of 5): Fuel System Diagnosis



CIRCUIT DESCRIPTION:

When the ignition is turned “ON,” the Engine Control Module (ECM) will turn the fuel pump “ON” for 2 seconds. During engine cranking, the ECM will turn “ON” the fuel pump. It will remain “ON” as long as the engine is cranking or running, and the ECM is receiving ignition reference pulses. If there are no reference pulses, the ECM will shut “OFF” the fuel pump.

The pump will deliver fuel to the fuel rail and injectors, then to the pressure regulator, where the system pressure is controlled to about 34-38 psi (234-262 kPa). Excess fuel is then returned to the water separating fuel filter.

DIAGNOSTIC AIDS:

An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation. Check for the following items:

- Poor connection or damaged harness. Inspect the ECM harness and connectors for improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wire connection and damaged harness.
- Contaminated or dirty fuel may cause the fuel pump to seize, which will cause the fuel pump relay fuse to fail.
- The ability to maintain a constant fuel pressure is very critical in the driveability of fuel injection. If the fuel pressure drops below the specification of that application, multiple driveability problems may occur. The vessel may have to be operated under a load, or certain conditions, as the lack of fuel pressure may be intermittent.

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Chart A-4 (2 of 5): Fuel System Diagnosis

TEST DESCRIPTION:

2. Wrap a shop towel around the fuel pressure connector to absorb any small amount of fuel leakage that may occur when installing the gauge. Ignition “ON,” pump pressure should be 34-38 psi (234-262 kPa). This pressure is controlled by spring pressure within the regulator assembly.

NOTE: *Fuel pump pressure will read lower if battery is not fully charged.*

3. When engine is idling, high vacuum is applied to the fuel regulator diaphragm. This will offset the spring and result in a lower fuel pressure. This idle vacuum will vary somewhat depending on barometric pressure. However, the pressure idling should be less, indicating pressure regulator control.

6. Pressure that leaks down is caused by the fuel pressure regulator valve leaking, injector(s) sticking open, a defective fuel pump or external fuel leak.

11. Restricting the fuel return line allows the fuel pressure to build above regulated pressure. Pressure should rise to 60 psi (414 kPa) as the fuel return hose is gradually restricted.

NOTE: *Do Not allow the fuel pressure to exceed 60 psi (414 kPa). Fuel pressure in excess of 60 psi (414 kPa) may damage the Fuel Pressure Regulator.*

12. This test determines if the high fuel pressure is due to a restricted fuel return line or a pressure regulator problem.

15. If an injector is stuck open, it will send fuel to its respective cylinder, which may saturate or foul a spark plug(s). in order to determine which injector(s) is leaking, the spark plugs must be removed and inspected for fouling or saturation. Once the saturated spark plug(s) is found, replace the corresponding injector(s) and install new spark plugs.

Chart A-4 (3 of 5): Fuel System Diagnosis

Step	Action	Value(s)	Yes	No
1	Was the "On-Board Diagnostic" (OBD) System Check performed?	–	*Go to* Step 2	*Go to* OBD System Check
2	1. Install fuel pressure gauge. 2. Ignition "OFF" for 10 seconds. 3. Ignition "ON." Fuel pump will run for about 2 seconds. 4. Note fuel pressure with pump running. The pressure may drop after the pump stops running, but the press re should not drop immediately to 0 psi. System should hold pressure for at least 15 to 20 seconds. ***Is fuel pressure within specified value?***	34-38 psi (234-262) kPa	*Go to* Step 3	*Go to* Step 5
3	Start engine and idle at normal operating temperature. ***Is fuel pressure lower by the specified value?***	3-10 psi (21-69 kPa)	*Refer to* Symptoms Section	*Go to* Step 4
4	With engine still idling, connect an external vacuum source to the fuel pressure regulator and apply 10 inches of vacuum. ***Is fuel pressure lower by the specified value?***	3-10 psi (21-69 kPa)	*Go to* Step 14	*Go to* Step 16
5	***Was fuel pressure present at all?***	–	*Go to* Step 6	*Go to* Table A-5
6	***Does the system establish fuel pressure and then drop immediately to 0 psi?***	–	*Go to* Step 7	*Go to* Step 9

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Chart A-4 (4 of 5): Fuel System DiagnosisContinued)

7	1. Ignition “OFF” for 10 seconds. 2. Ignition “ON.” 3. Block fuel pressure line between the fuel pump and fuel rail using fuel shut-off valve tool. ***Does fuel pressure hold?***	–	*Go to* Step 18	*Go to* Step 8
8	1. Ignition “OFF” for 10 seconds. 2. Ignition “ON.” 3. Block fuel return line using fuel shut-off valve tool. ***Does fuel pressure hold?***	–	*Go to* Step 16	*Go to* Step 15
9	***Is fuel pressure below specified value?***	34 psi (234 kPa)	*Go to* Step 10	*Go to* Step 12
10	Check for restricted fuel lines. If a problem is found, repair as necessary. ***Was a problem found?***	–	*Go to* OBD System Check	*Go to* Step 11
11	1. Ignition “OFF” 2. Block fuel return line using fuel shut-off valve tool. 3. Ignition “ON.” ***Does fuel pressure rise above the specified value?***	38 psi (262 kPa)	*Go to* Step 16	*Go to* Step 18

Chart A-4 (5 of 5): Fuel System Diagnosis (Continued)

12	1. Ignition “OFF”. 2. Disconnect fuel return line. 3. Following manufactures recommendations, connect a hose to pressure regulator side of return line. Insert the other end into an approved gasoline container. 4. Ignition “ON.” Note fuel pressure within 2 seconds of ignition “ON.” ***Is fuel pre sure within the specified value?***	34-38 psi (234-262) kPa	*Go to* Step 17	*Go to* Step 13
13	Check for restricted fuel return line from fuel pressure regulator to water separating fuel filter adapter. ***Was a problem found?***	–	*Go to* OBD System Check	*Go to* Step 16
14	Locate and repair vacuum source to fuel pressure regulator. ***Is action complete?***	–	*Go to* OBD System Check	–
15	Locate and repair leaking injector(s). ***Is action complete?***	–	*Go to* OBD System Check	–
16	Replace faulty fuel pressure regulator. ***Is action complete?***	–	*Go to* OBD System Check	–
17	Locate and repair restricted fuel return line to water separating fuel filter adapter. ***Is action complete?***	–	*Go to* OBD System Check	–
18	Check for leaking pump fittings or lines, inlet filter, and low battery voltage. If OK, replace faulty fuel pump. ***Is action complete?***	–	*Go to* OBD System Check	–

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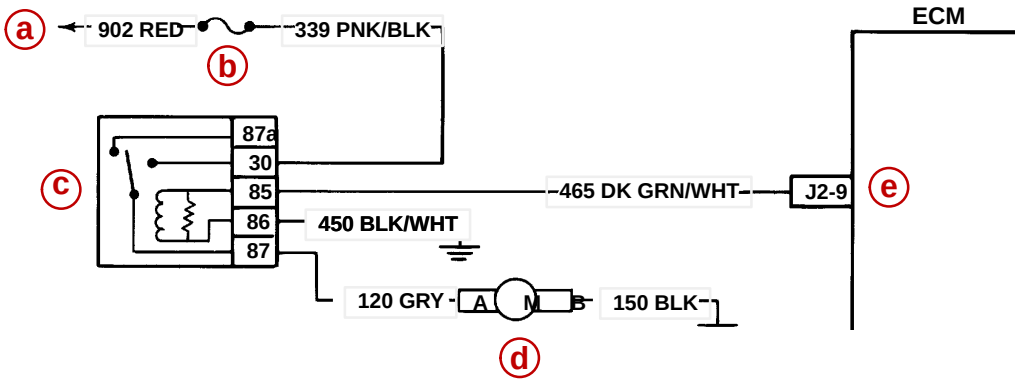
Chart A-5 (1 of 3): Fuel System Electrical Test



a - To System Relay
b - Fuel Pump Relay Fuse 15a
c - Fuel Pump Relay
d - Fuel Pump
e - Fuel Pump Relay Driver

CIRCUIT DESCRIPTION

The fuel system circuit receives a supply voltage from the system relay CKT 902. The fuel system is protected by a 15 amp fuse. After the fuse, supply voltage is delivered by CKT 339 to fuel pump relay terminal “30.” The fuel pump relay is turned on by the ECM by supplying voltage to CKT 465. The fuel pump relay will remain “ON” as long as the engine is running or cranking and the ECM is receiving reference pulses. If no reference pulses are present, the ECM de-energizes the fuel pump relay within 2 seconds after the ignition is turned “ON” or the engine is stopped.

DIAGNOSTIC AIDS

An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation. Check for the following items:

- Poor connection or damaged harness. Inspect the ECM harness and connectors for improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wire connections and damaged harness.
- Contaminated or dirty fuel may cause the fuel pump to seize, which will cause the fuel pump relay fuse to fail.

TEST DESCRIPTION

Number(s) below refer to the step number(s) on the Diagnostic Table:

2. Verifies that there is power to the fuel pump relay.
3. Bypassing the relay circuit should cause the fuel pump to run. This step should identify if the fault is in the relay or in the fuel pump circuit.
4. This step checks if there is an open in the ground circuit.
5. This step checks if the ECM is functioning properly.

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Chart A-5 (2 of 3): Fuel System Electrical Test

Step	Action	Value(s)	Yes	No
1	Was The "On-Board Diagnostic" (OBD) System Check Performed?	–	Go to Step 2	Go to OBD *System Check*
2	1. Ignition "OFF". 2. Remove fuel pump relay. 3. Ignition "ON". 4. Using test light connected to ground, probe fuel pump relay harness connector terminal "30." ***Does Test Light Illuminate Brightly?***	–	Go to Step 3	Go to Step 7
3	1. Ignition "OFF". 2. Using a fused jumper wire, connect terminals "30" and "87" of the fuel pump relay connector together. 3. Ignition "ON." ***Does Fuel Pump Run?***	–	Go to Step 4	Go to Step 12
4	1. Ignition "OFF". 2. Disconnect fused jumper wire. 3. Using a test light connected to battery positive (B+), probe terminal "86" of the fuel pump relay connector. ***Does The Test Light Illuminate Brightly?***	–	Go to Step 5	Go to Step 14
5	1. Using a test fight connected to ground, probe terminal "85" of the fuel pump relay connector. 2. Ignition "ON". ***Does Test Light Illuminate Brightly For 2 Seconds And Then Go Off?***	–	Go to Step 6	Go to Step 6
6	Locate and repair faulty ECM connection at "J2-9" or repair open in CKT 465. ***Was A Problem Found?***	–	Go to OBD *System Check*	Go to Step 15
7	Check fuel pump relay fuse. ***Is Fuse Ok?***	–	Go to Step 10	Go to Step 11
8	Replace fuel pump relay and retest. ***Is Fuel Pressure Within Specified Values?***	34-38 psi (234-262 kPa)	Go to OBD *System Check*	Go to Step 9

Chart A-5 (3 of 3): Fuel System Electrical Test

Step	Action	Value(s)	Yes	No
9	1. Check for plugged fuel filter, vapor lock condition, restricted fuel lines, disconnected hoses, and proper fuel level. 2. If a problem is found, repair as necessary. **Was A Problem Found?**	–	Go to OBD *System Check*	Go to Step 13
10	Locate and repair open in CKT 339 or CKT 902. **Is Action Complete?**	–	Go to OBD *System Check*	–
11	Locate and repair short to ground in CKT 339 or CKT 120. Also check for contamination in fuel lines or fuel tank. If OK, replace fuel pump and fuse. **Is Action Complete?**	–	Go to OBD *System Check*	–
12	Locate and repair open in CKT 120 or CKT 150. **Was A Problem Found?**	–	Go to OBD *System Check*	Go to Step 13
13	Replace faulty fuel pump. **Is Action Complete?**	–	Go to OBD *System Check*	–
14	Locate and repair open in CKT 450. **Is Action Complete?**	–	Go to OBD *System Check*	–
15	Replace faulty ECM. **Is Action Complete?**	–	Go to OBD *System Check*	–

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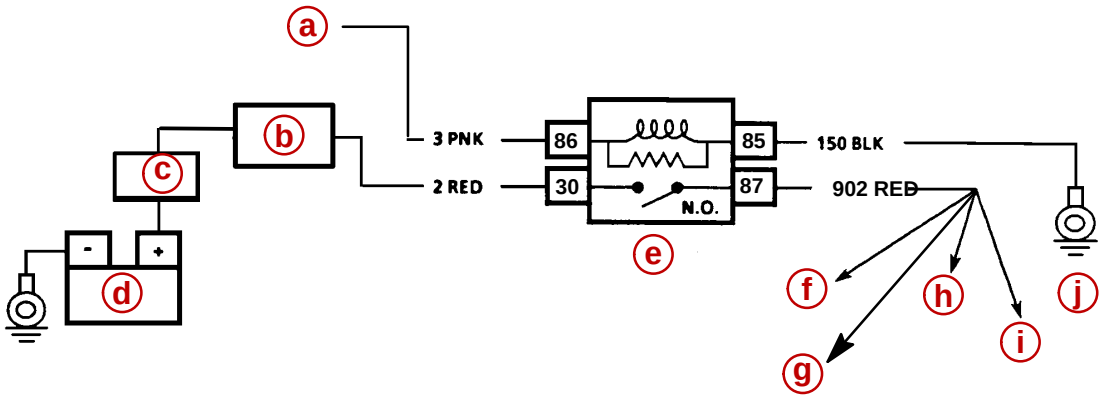
Chart A-6 (1 of 2): EFI System/Ignition Relay Check



a - From 5-pin Connector
b - 50a Circuit Breaker
c - 90 Amp Fuse
d - Battery
e - System Relay
f - To ECM Term “J1-11”
g - Injector/Ks Module Fuse 10a
h - To Fuel Pump Relay Fuse 15a
i - To Ignition Coil Term “8”
j - Engine Ground

CIRCUIT DESCRIPTION:

Battery voltage is constantly supplied to terminal “30” of the system relay. When the ignition switch is moved to the “RUN” position, battery voltage is supplied to terminal “86” of the system relay. The pull-in coil is then energized creating a magnetic field which closes the contacts of the system relay. Voltage and current are then supplied to the ignition control module, injectors, ECM, and fuel pump relay through terminal “87” CKT 902 of the system relay.

DIAGNOSTIC AIDS

An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation. Check for the following items:

- Poor connection or damaged harness. Inspect the ECM harness and connectors for improper mating,broken locks, improperly formed or damaged terminals, poor terminal to wire connection, and damaged harness.
- Contaminated or dirty fuel may cause the fuel pump to seize, which will cause the fuel pump relay fuse to fail.

TEST DESCRIPTION:

Number(s) below refer to the Step number(s) on the Diagnostic Table:

2. Verifies that there is power to the system relay.
3. This step checks if there is an open in the ground circuit.

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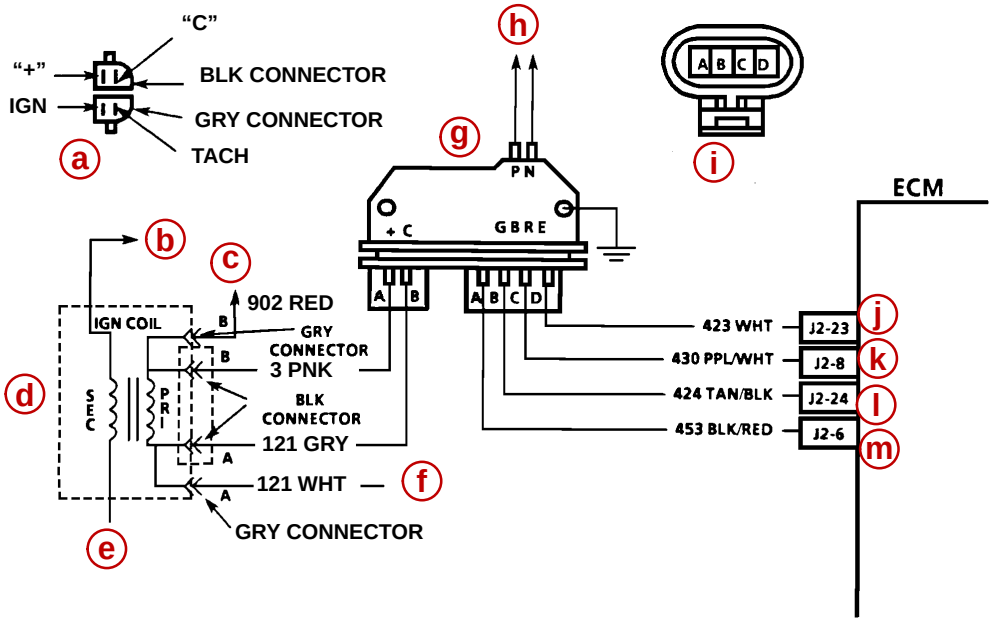
Chart A-6 (2 of 2): EFI System/Ignition Relay Check

Step	Action	Value(s)	Yes	No
1	Was The "On-Board Diagnostic" (OBD) System Check Performed?	–	Go to Step 2	Go to OBD *System Check*
2	1. Ignition "OFF." 2. Remove EFI system relay connector. 3. Ignition "ON." 4. With test light still connected to ground, probe relay harness connector terminals "86" and "30." ***Does Test Light Illuminate Brightly On Both Terminals?***	–	Go to Step 3	Go to Step 5
3	Using test light connected to battery positive (B+), probe relay harness connector terminal "85." ***Does Test Light Illuminate Brightly?***	–	Go to Step 4	Go to Step 6
4	Check relay connector for poor contact or corrosion. If OK, replace faulty EFI system relay. ***Is Action Complete?***	–	Go to OBD *System Check*	–
5	Locate and repair open or short to ground in circuit that did not light (CKT 2 and/or CKT 3). ***Is Action Complete?***	–	Go to OBD *System Check*	–
6	Locate and repair open ground CKT 150. ***Is Action Complete?***	–	Go to OBD *System Check*	–

Chart A-7 (1 of 6): Ignition System Check



a - Ignition Coil Connector
b - Distributor
c - To System Relay
d - Ignition Coil
e - Distributor
f - Tach Wire
g - Ignition Control Module
h - Pick-up Coil
i - Distributor 4 Terminal Connector
j - Ignition Control (IC)
k - Dist. Reference "high"
l - Bypass
m - Dist. Reference "low"

CIRCUIT DESCRIPTION:

The Distributor Ignition (DI) system receives supply voltage from the system relay through CKT 902 to the ignition coil gray connector "B". Inside the ignition coil, the gray connector terminal "B" is connected to the black connector terminal "B." Supply voltage is delivered from the ignition coil black connector terminal "B" to the distributor Ignition Control (IC) module "+" terminal through CKT 3.

Inside the distributor, the pick-up coil and pole piece will produce a voltage signal for cylinder spark. The voltage signals are processed in the IC module and sent to the ECM. The ECM will decide if the engine is in the cranking or running mode and adjust timing accordingly. The voltages or signals are sent between the ECM and the IC module through CKT's 423, 430, and 424. CKT 453 is the ground circuit.

The IC module will send the voltage signal to the ignition coil black connector terminal "A" through CKT 121. The signal will trigger the coil creating secondary spark to be produced. This secondary spark is sent to the distributor by a high tension lead.

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Chart A-7 (2 of 6): Ignition System Check

DIAGNOSTIC AIDS:

An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation. Check for the following items:

- Poor connection or damaged harness. Inspect the ECM harness and connectors for improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wire connection, and damaged harness
- The “tach” needs to be disconnected while testing the ignition system. You will also need a place to check coil trigger voltage. By disconnecting the “5-wire harness connector” (WHITE and PINK wires), this will give you a test terminal to check coil trigger voltage as needed in several steps. After “tach” is disconnected, try starting the engine. If the engine starts, check for a short to ground in the boat “tach” circuit.

TEST DESCRIPTION:

Number(s) below refer to the step number(s) on the diagnostic table:

2. Two wires are checked to ensure that an open is not present in a spark plug wire.
4. A spark indicates the problem must be in the distributor cap, rotor, or coil output wire.
6. Normally, there should be battery voltage at the “C” and “+” terminals. Low voltage would indicate an open or a high resistance circuit from the distributor to the coil or ignition switch. If “C” terminal voltage was low, but “+” terminal voltage is 10 volts or more, circuit from “C” terminal to ignition coil is open or primary winding of the ignition coil is open.
8. Checks for a shorted module or grounded circuit from the ignition coil to the module. The distributor module should be turned “OFF,” so normal voltage should be about 12 volts. If the module is turned “ON,” the voltage would be low, but above 1 volt. This could cause the ignition coil to fail from excessive heat. With an open ignition coil primary winding, a small amount of voltage will leak through the module from the “batt” to the “tach” terminal.
11. Applying a voltage (1.35 -1.50 volts) to the module terminal “P” should turn the module “ON” and the tach voltage should drop to about 7-9 volts. This test will determine whether the module or coil is faulty or if the pick-up coil is not generating the proper signal to turn the module “ON”. This test can be performed by using a DC test battery with a rating of 1.5 volts (Such as M, C, or D cell). The battery must be a known good battery with a voltage of over 1.35 volts.
12. This should turn the module “OFF” and cause a spark. If no spark occurs, the fault is most likely in the ignition coil because most module problems would have been found before this point in the procedure.

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Chart A-7 (3 of 6): Ignition System Check (Continued)

Step	Action	Value(s)	Yes	No
1	Was the "On-Board Diagnostic" (OBD) System Check Performed?	-	Go to Step 2	Go to OBD *System Check*
2	1. Check spark plug wires for open circuits, cracks in insulation, or improper seating of terminals at spark plugs, distributor cap, and coil tower before proceeding with this table. 2. Disconnect 5-wire harness connector (WHITE and PINK wires). 3. Install a temporary jumper wire between the 2 PINK wires at the connector of the boat harness. This is CkT 3 for the ignition circuit. 4. Check tor secondary spark. If there is "no spark" at one wire, check a few more wires. A few sparks and then nothing is considered "no spark." ***Is Adequate Spark Present At All Cylinders?***	–	Refer to Troubleshooting Section	Go to Step 3
3	Remove distributor cap and verify rotation of distributor rotor. ***Is The Distributor Rotor Turning?***	-	Go to Step 4	Go to Step 25

Chart A-7 (4 of 6): Ignition System Check (Continued)

Step	Action	Value(s)	Yes	No
4	1. Disconnect distributor 4-wire connector. 2. Check for secondary spark. ***Is Adequate Spark Present?***	–	Go to Step 18	Go to Step 5
5	1. Reconnect distributor 4-wire connector. 2. Check for secondary spark from the coil tower using a known good coil wire. ***Is Adequate Spark Present?***	–	Go to Step 19	Go to Step 6
6	1. Disconnect distributor 2-wire "C/+" connector harness. 2. Ignition "ON," engine "OFF." 3. Using DVOM, check voltage at "+" and "C" terminals of the 2-wire distributor harness connector. ***Is Voltage Reading Greater Than The Specified Value At Both Terminals?***	10 volts	Go to Step 8	Go to Step 7
7	***Is Voltage Reading Less Than The Specified Value At Both Terminals?***	10 volts	Go to Step 20	Go to Step 21
8	1. Reconnect distributor 2-wire connector. 2. Ignition "ON" engine "OFF." 3. Using DVOM, check voltage from tach terminal to ground. 4. The tach terminal can be accessed at the 5-wire boat harness connector. The tach circuit is the WHITE wire CKT 121. ***Is Voltage Reading Within The Specified Value?***	1-10 volts	Go to Step 15	Go to Step 9
9	***Is Voltage Reading Greater Than The Specified Value?***	10 volts	Go to Step 10	Go to Step 22
10	1. Using a test light connected to ground, probe tach terminal at the 5-wire harness connector. 2. Observe the test light while cranking engine. ***Is Test Light Blinking?***		Go to Step 13	Go to Step 11

Chart A-7 (5 of 6): Ignition System Check (Continued)

Step	Action	Value(s)	Yes	No
11	1. Disconnect distributor 4-wire connector. 2. Remove distributor cap. 3. Disconnect pick-up coil connector from the distributor ignition control module. 4. Connect DVOM to tach terminal at the 5-wire harness connector and ground. 5. Ignition "ON," engine "OFF". 6. Connect positive (+) end of a known good 1.5 volt test battery to the "P" terminal on the distributor ignition control module. Observe the voltage at the tach terminal as the negative (–) end of the test battery is momentarily grounded to a known good ground. ***Does The Voltage Drop?***	–	Go to Step 12	Go to Step 23
12	Check for spark from the coil wire as the test battery lead is removed? ***Is Adequate Spark Present?***	–	Go to Step 17	Go to Step 13
13	Replace ignition coil and recheck for spark as set up in steps 11 and 12. ***Is Adequate Spark Present?***	–	Go to OBD *System Check*	Go to Step 14
14	Ignition coil removed is OK. Reinstall coil and check coil wire from distributor cap. If OK, replace ignition module. ***Is Action Complete?***	–	Go to OBD *System Check*	–
15	Replace ignition module and recheck for spark as set up in steps 11 and 12. ***Is Adequate Spark Present?***	–	Go to OBD *System Check*	Go to Step 16
16	Replace ignition coil, it too is faulty. ***Is Action Complete?***	–	Go to OBD *System Check*	–
17	Is the rotating pole piece still magnetized?	–	Go to Step 18	Go to Step 24

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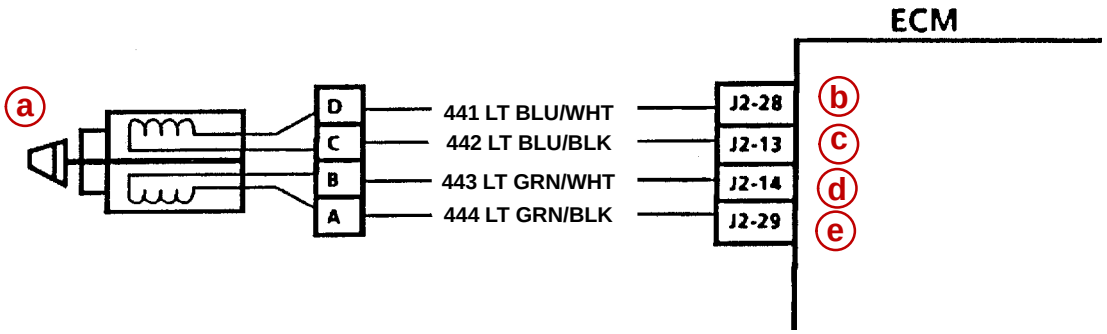
Chart A-7 (6 of 6): Ignition System Check

Step	Action	Value(s)	Yes	No
18	Replace faulty pick-up coil. ***Is Action Complete?***	–	Go to OBD *System Check*	–
19	Inspect distributor cap for water, cracks, etc. If OK, replace faulty distributor rotor. ***Is Action Complete?***	–	Go to OBD *System Check*	–
20	Check for open or short to ground in CKT 3, the pink wire from the ignition module "+" terminal to the ignition coil. Also check for open CKT 902, the red wire from the EFI system relay to the ignition coil. ***Is Action Complete?***	–	Go to OBD *System Check*	–
21	Check for open or short to ground in CKT 121, the brown wire from the ignition module "C" terminal to the ignition coil. If OK, replace faulty ignition coil. ***Is Action Complete?***	–	Go to OBD *System Check*	–
22	Repair faulty connections or open tach lead. ***Repeat Step 8.***	–	Go to OBD *System Check*	–
23	Check ignition module ground. If OK, replace faulty ignition module. ***Is Action Complete?***	–	Go to OBD *System Check*	–
24	Replace distributor pole piece and shaft assembly. ***Is Action Complete?***	–	Go to OBD *System Check*	–
25	A mechanical repair will be necessary before continuing with this test.	–	–	–

Chart A-8 (1 of 2): Idle Air Control (IAC) Functional Test



a - Idle air control (IAC) valve
b - IAC Coil “a” High
c - IAC Coil “a” Low
d - IAC Coil “b” High
e - IAC Coil “b” Low

CIRCUIT DESCRIPTION:

The ECM controls idle speed to a calibrated “desired” RPM based on sensor inputs and actual engine RPM. The ECM uses four (4) circuits to move the Idle Air Control (IAC) valve. The movement of the IAC valve varies the amount of air flow bypassing the throttle plates. The ECM controls idle speed by determining the position of the IAC valve.

DIAGNOSTIC AIDS:

An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation. Check for the following items:

- Poor connection or damaged harness. Inspect the ECM harness and connectors for improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wire connection, and damaged harness.
- Check for vacuum leaks, disconnected or brittle vacuum hoses, cuts, etc. Examine manifold and throttle body gaskets for proper seal. Check for cracked intake manifold.
- Check for poor connections, opens, or short to grounds in CKT’s 441, 442, 443, and 444. This may result in improper idle control.
- An IAC valve which is “frozen” and will not respond to the ECM, a throttle stop screw which has been tampered with, or a damaged throttle body or linkage may cause improper idle.

TEST DESCRIPTION:

Step 2 determines if the IAC valve is functioning properly.

Step 4 determines if the circuitry or the IAC valve is faulty.

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Chart A-8 (2 of 2): Idle Air Control (IAC) Functional Test

Step	Action	Value(s)	Yes	No
1	Was the "On-Board Diagnostic" (OBD) System Check performed?	–	Go to Step 2	Go to OBD *System Check*
2	1. Engine should be at normal operating temperature. 2. Start engine and allow idle to stabilize. 3. Record RPM. 4. Ignition "OFF" for 10 seconds. 5. Disconnect IAC harness connector. 6. Restart engine and record RPM. ***Is RPM Higher Than The First Recorded RPM By More Than The Specified Value?***	200 RPM	Go to Step 3	Go to Step 4
3	1. Reinstall IAC harness connector. 2. Idle speed should gradually return within 75 RPM of the original recorded RPM within 30 seconds. ***Does RPM Return To Original Recorded RPM?***	–	Go to Step 5	Go to Step 4
4	1. Ignition "OFF" for 10 seconds. 2. Disconnect IAC harness connector. 3. Restart engine. 4. Using a test light connected to ground, probe each one of the four IAC harness terminals. ***Does The Test Light Blink On All Four Terminals?***	–	Go to Step 7	Go to Step 6
5	IAC circuit is functioning properly.	–	–	–
6	Locate and repair poor connection, open, or short to ground in the IAC circuit that did not blink. If a problem was found, repair as necessary. ***Was A Problem Found?***	–	Go to OBD *System Check*	Go to Step 8
7	Check for poor IAC connections or replace the faulty IAC valve. ***Is Action Complete?***	–	Go to OBD *System Check*	–
8	Repair faulty ECM connections or replace faulty ECM. ***Is Action Complete?***	–	Go to OBD *System Check*	–

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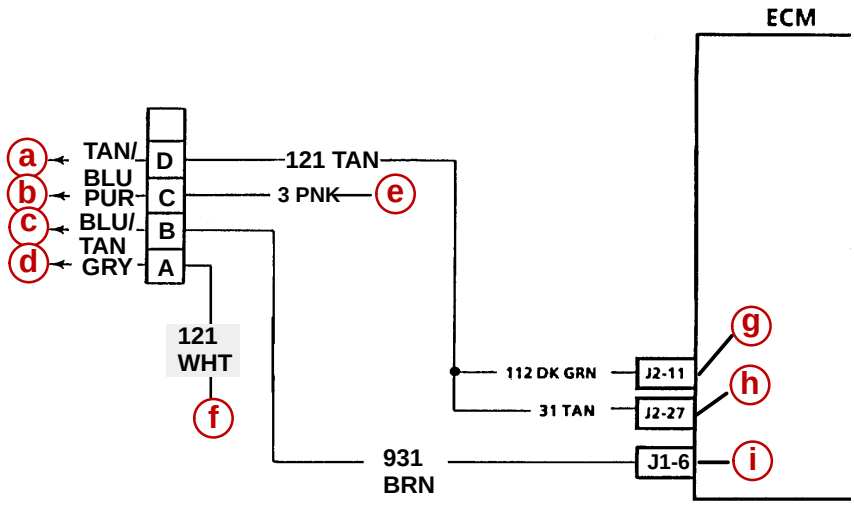
Discrete Input Circuit Check - Non-Scan - 454 / 502 Mag MPI and 8.2L MPI Only (1 of 5)



a - To Buzzer
b - To Ignition
c - To Audio Warning Switches
d - To Tach
e - To System Relay Term “87”
f - To Ignition Coil
g - Coolant Overtemp (To Buzzer)
h - Low Oil Pressure/ Low I/O Fluid (To Buzzer) (Trans. Temp. MIE)
i - To Low Oil Pressure And Gear Lube Switches (Trans. Temp. MIE)

CIRCUIT DESCRIPTION:

Several discrete switch inputs are utilized by the fuel injection system to identify abnormal conditions that may affect engine operation. A pull-up switch is currently used in conjunction with the ECM to detect critical conditions to engine operation.

If a discrete switch changes states from its normal at-rest position, that is normally open to closed (or closed to open), the ECM senses a change in voltage and responds by activating the audio warning system.

TEST DESCRIPTION:

A problem with the discrete circuit system will have to be broken down into several sub-steps. These will include the following:

- Testing the audio warning buzzer.
- Testing the individual switches.
- Testing the wiring.

Be sure that all items above have been performed prior to replacement of the ECM.

DIAGNOSTIC AIDS:

- Check engine oil and gear lube levels. Check transmission fluid for overheat condition.

An intermittent problem may be caused by a poor or corroded connection, rubbed through wire connection, or a wire that is broken inside the insulation.

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Discrete Input Circuit Check - Non-Scan 454 / 502 Mag MPI and 8.2L MPI Only (2 of 5)

NOTE: *The ECM should only be replaced after all switches and circuits have been tested and found to be functioning properly.*

TESTING BUZZER

STEP	ACTION	VALUE	YES	NO
			PROCEED TO	
1	1. Key “ON”, Engine “OFF”. ***Does buzzer sound?***		Step 2	Step 3
2	1. Start engine. ***Does buzzer sound?***		Step 6	Step 4
3	1. Disconnect TAN/BLU wire at buzzer. 2. Key “ON”, Engine “OFF”. 3. Touch TAN/BLU wire to ground (–). ***Does buzzer sound?***		Step 4	Step 5
4	Buzzer is working properly. Proceed to “Testing Switches” or “Testing Circuits”.		–	–
5	Check to ensure that there is battery power (+) to the PUR wire going to buzzer. If there is, replace buzzer and verify repair (Starting at Step 1).		–	–
6	Discrete switches may all be functioning properly. Proceed to check all discrete circuits to verify each works properly.		–	–

TESTING OIL PRESSURE SWITCH

STEP	ACTION	VALUE	YES	NO
			PROCEED TO	
1	1. Disconnect BLU/TAN wire from oil pressure switch. 2. Engine “OFF”. 3. Check for continuity between terminal on switch and ground (–). ***Is there continuity?***		Step 2	Step 3
2	1. Start engine. 2. Check for continuity between terminal on switch and ground (–). ***Is there continuity?***		Step 3	Step 4
3	Replace oil pressure switch. Verify repair.		–	–
4	Oil pressure switch is working properly.		–	–

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Discrete Input Circuit Check - Non-Scan 454 / 502 Mag MPI and 8.2L MPI Only (3 of 5)

TESTING GEAR LUBE MONITOR SWITCH

STEP	ACTION	VALUE	YES	NO
			PROCEED TO	
1	1. Disconnect BLU/TAN wire from gear lube monitor. 2. Empty gear lube from monitor. 3. Check for continuity between BLU/TAN wire and ground (–). ***Is there continuity?***		Step 2	Step 3
2	1. Refill gear lube monitor. 2. Check for continuity between BLU/TAN wire and ground (–). ***Is there continuity?***		Step 3	Step 4
3	Replace gear lube monitor. Verify repair.		–	–
4	Gear lube monitor switch is working properly.		–	–

TESTING TRANSMISSION TEMPERATURE SWITCH

STEP	ACTION	VALUE	YES	NO
			PROCEED TO	
1	1. Disconnect both wires from transmission temperature switch. 2. Ensure switch is at a cool temperature (less than normal operating temperature). 3. Check for continuity between both terminals. ***Is there continuity?***		Step 3	Step 2
2	1. Heat the switch to a temperature high enough to activate it. (Refer to Section 4D of this manual for procedure). 2. Check for continuity between both terminals. ***Is there continuity?***		Step 4	Step 3
3	Replace transmission temperature switch. Verify repair.		–	–
4	Transmission temperature switch is working properly.		–	–

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Discrete Input Circuit Check - Non-Scan 454 / 502 Mag MPI and 8.2L MPI Only (4 of 5)

TESTING CIRCUITS FOR SHORT-TO-GROUND (–)

STEP	ACTION	VALUE	YES	NO
			PROCEED TO	
1	1. Disconnect BLU/TAN wire from oil pressure switch. 2. Disconnect BLU/TAN wire from gear lube monitor. 3. Disconnect BLU/TAN wire from transmission temperature switch (if equipped). 4. Key “ON”, engine “OFF”. ***Does audio warning buzzer sound?***		Step 2	Step 3
2	1. Key “OFF”. 2. Disconnect ECM J1 connector. 3. Check for continuity between all wires disconnected in “Step 1” and engine ground (–). ***Is there continuity on BLU/TAN wire from oil pressure switch?*** ***Is there continuity on BLU/TAN wire from gear lube switch?*** ***Is there continuity on BLU/TAN wire from transmission switch?***		Step 4 Step 4 Step 4	Step 3 Step 3 Step 3
3	Circuit(s) is not shorted to ground (–).		–	–
4	Repair short-to-ground (–) in affected circuit.		–	–

Discrete Input Circuit Check - Non-Scan 454 / 502 Mag MPI and 8.2L MP Only (5 of 5)

TESTING FOR OPEN CIRCUITS

STEP	ACTION	VALUE	YES	NO
			PROCEED TO	
1	1. Disconnect PUR wire from oil pressure switch. 2. Disconnect TAN/WHT wire from gear lube monitor. 3. Disconnect BLU/TAN wire from transmission temperature switch (if equipped). 4. Key “ON”, engine “OFF”. 5. One at a time, touch each wire to ground (–) that was disconnected. ***Does audio warning buzzer sound when grounding BLU/TAN wire from oil pressure switch?*** ***Does audio warning buzzer sound when grounding BLU/TAN wire from gear lube switch?*** ***Does audio warning buzzer sound when grounding BLU/TAN wire from transmission switch?***		Step 3 Step 3 Step 3	Step 2 Step 2 Step 2
2	1. Key “OFF”. 2. Disconnect ECM J1 connector. 3. Check for continuity between all wires disconnected in “Step 1” and terminal J1-6. ***Is there continuity on BLU/TAN wire from oil pressure switch?*** ***Is there continuity on BLU/TAN wire from gear lube switch?*** ***Is there continuity on BLU/TAN wire from transmission switch?***		Step 3 Step 3 Step 3	Step 4 Step 4 Step 4
3	Circuit(s) is not open.		–	–
4	Repair open circuit.		–	–

NOTE: *The ECM should only be replaced after all switches and circuits have been tested and found to be functioning properly.*

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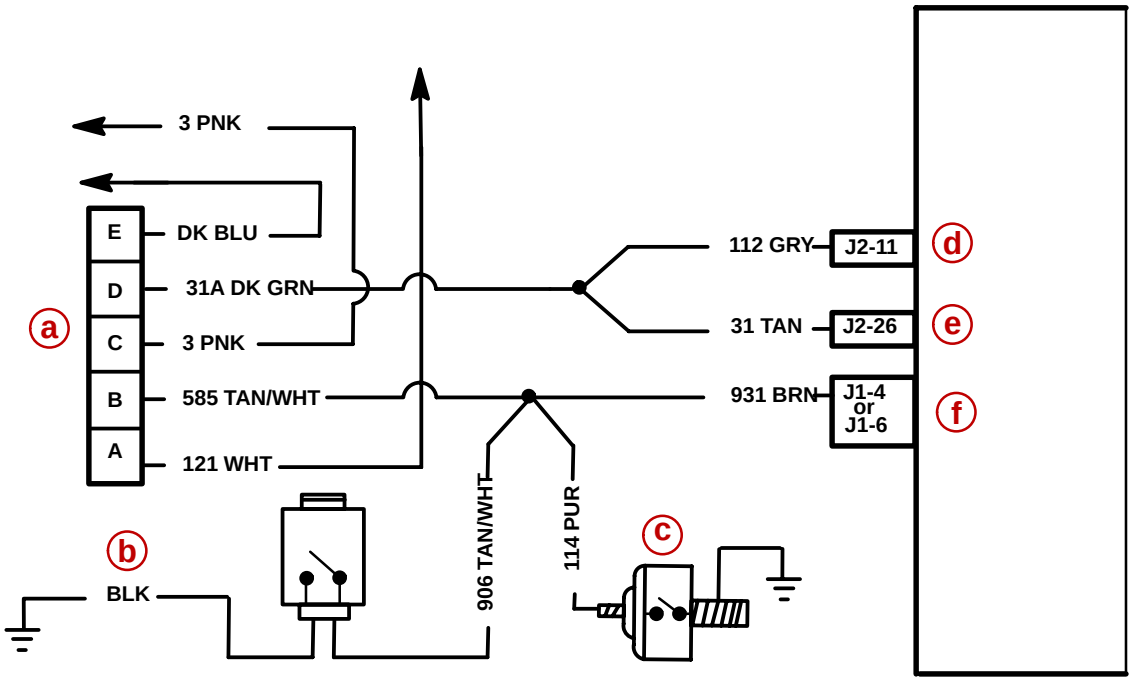
Discrete Input Circuit Check - Non-Scan - 7.4L MPI Only (1 of 5)



a - Harness Connector
b - Gear Lube Switch
c - Oil Pressure Switch
d - Coolant Over Temperature & Discrete Switch Output
e - Not Used
f - Discrete Switch Input (J1-4 For Earlier Models And J1-6 For Earlier And J1-6 For Later Models)

CIRCUIT DESCRIPTION:

Several discrete switch inputs are utilized by the fuel injection system to identify abnormal conditions that may affect engine operation. A pull-up switch is currently used in conjunction with the ECM to detect critical conditions to engine operation.

If a discrete switch changes states from its normal at-rest position, that is normally open to closed (or closed to open), the ECM senses a change in voltage and responds by activating the audio warning system.

TEST DESCRIPTION:

A problem with the discrete circuit system will have to be broken down into several sub-steps. These will include the following:

- Testing the audio warning buzzer.
- Testing the individual switches.
- Testing the wiring.

Be sure that all items above have been performed prior to replacement of the ECM.

DIAGNOSTIC AIDS:

- Check engine oil and gear lube levels. Check transmission fluid for overheat condition.

An intermittent problem may be caused by a poor or corroded connection, rubbed through wire connection, or a wire that is broken inside the insulation.

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Discrete Input Circuit Check - Non-Scan 7.4L MPI Only (2 of 5)

NOTE: *The ECM should only be replaced after all switches and circuits have been tested and found to be functioning properly.*

TESTING BUZZER

STEP	ACTION	VALUE	YES	NO
			PROCEED TO	
1	1. Key “ON”, Engine “OFF”. ***Does buzzer sound?***		Step 2	Step 3
2	1. Start engine. ***Does buzzer sound?***		Step 6	Step 4
3	1. Disconnect TAN/BLU wire at buzzer. 2. Key “ON”, Engine “OFF”. 3. Touch TAN/BLU wire to ground (–). ***Does buzzer sound?***		Step 4	Step 5
4	Buzzer is working properly. Proceed to “Testing Switches” or “Testing Circuits”.		–	–
5	Check to ensure that there is battery power (+) to the PUR wire going to buzzer. If there is, replace buzzer and verify repair (Starting at Step 1).		–	–
6	Discrete switches may all be functioning properly. Proceed to check all discrete circuits to verify each works properly.		–	–

TESTING OIL PRESSURE SWITCH

STEP	ACTION	VALUE	YES	NO
			PROCEED TO	
1	1. Disconnect PUR wire from oil pressure switch. 2. Engine “OFF”. 3. Check for continuity between terminal on switch and ground (–). ***Is there continuity?***	0 Ohms	Step 2	Step 3
2	1. Start engine. 2. Check for continuity between terminal on switch and ground (–). ***Is there continuity?***	0 Ohms	Step 3	Step 4
3	Replace oil pressure switch. Verify repair.		–	–
4	Oil pressure switch is working properly.		–	–

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TESTING GEAR LUBE MONITOR SWITCH

STEP	ACTION	VALUE	YES	NO
			PROCEED TO	
1	1. Disconnect TAN/WHT wire from gear lube monitor. 2. Empty gear lube from monitor. 3. Check for continuity between TAN/WHT wire and ground (–). ***Is there continuity?***	0 Ohms	Step 2	Step 3
2	1. Refill gear lube monitor. 2. Check for continuity between TAN/WHT wire and ground (–). ***Is there continuity?***	0 Ohms	Step 3	Step 4
3	Replace gear lube monitor. Verify repair.		–	–
4	Gear lube monitor switch is working properly.		–	–

TESTING TRANSMISSION TEMPERATURE SWITCH

STEP	ACTION	VALUE	YES	NO
			PROCEED TO	
1	1. Disconnect both wires from transmission temperature switch. 2. Ensure switch is at a cool temperature (less than normal operating temperature). 3. Check for continuity between both terminals. ***Is there continuity?***	0 Ohms	Step 3	Step 2
2	1. Heat the switch to a temperature high enough to activate it. (Refer to Section 4D of this manual for procedure). 2. Check for continuity between both terminals. ***Is there continuity?***	0 Ohms	Step 4	Step 3
3	Replace transmission temperature switch. Verify repair.		–	–
4	Transmission temperature switch is working properly.		–	–

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TESTING CIRCUITS FOR SHORT-TO-GROUND (–)

STEP	ACTION	VALUE	YES	NO
			PROCEED TO	
1	1. Disconnect PUR wire from oil pressure switch. 2. Disconnect TAN/WHT wire from gear lube monitor. 3. Disconnect BLU/TAN wire from transmission temperature switch (if equipped). 4. Key “ON”, engine “OFF”. ***Does audio warning buzzer sound?***		Step 2	Step 3
2	1. Key “OFF”. 2. Disconnect ECM J1 connector. 3. Check for continuity between all wires disconnected in “Step 1” and engine ground (–). ***Is there continuity on PUR wire?*** ***Is there continuity on TAN/WHT wire?*** ***Is there continuity on BLU/TAN wire?***	 0 Ohms 0 Ohms 0 Ohms	 Step 4 Step 4 Step 4	 Step 3 Step 3 Step 3
3	Circuit(s) is not shorted to ground (–).		–	–
4	Repair short-to-ground (–) in affected circuit.		–	–

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TESTING FOR OPEN CIRCUITS

STEP	ACTION	VALUE	YES	NO
			PROCEED TO	
1	1. Disconnect PUR wire from oil pressure switch. 2. Disconnect TAN/WHT wire from gear lube monitor. 3. Disconnect BLU/TAN wire from transmission temperature switch (if equipped). 4. Key “ON”, engine “OFF”. 5. One at a time, touch each wire to ground (–) that was disconnected.			
	Does audio warning buzzer sound when grounding PUR wire?		Step 3	Step 2
	Does audio warning buzzer sound when grounding TAN/WHT wire?		Step 3	Step 2
	Does audio warning buzzer sound when grounding BLU/TAN wire?		Step 3	Step 2
2	1. Key “OFF”. 2. Disconnect ECM J1 connector. 3. Check for continuity between all wires disconnected in “Step 1” and terminal J1-4 (J1-6 on Later Models).			
	Is there continuity on PUR wire?	0 Ohms	Step 3	Step 4
	Is there continuity on TAN/WHT wire?	0 Ohms	Step 3	Step 4
	Is there continuity on BLU/TAN wire?	0 Ohms	Step 3	Step 4
3	Circuit(s) is not open.		–	–
4	Repair open circuit.		–	–

NOTE: *The ECM should only be replaced after all switches and circuits have been tested and found to be functioning properly.*