

### Handle Fluids Safely—Avoid Fires

When you work around fuel, do not smoke or work near heaters or other fire hazards.

Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.

Make sure machine is clean of trash, grease, and debris.

Do not store oily rags; they can ignite and burn spontaneously.



TS227 -JUN-23AUG88

DX,FLAME -19-29SEP98-1/1

### Handle Starting Fluid Safely

Starting fluid is highly flammable.

Keep all sparks and flame away when using it. Keep starting fluid away from batteries and cables.

To prevent accidental discharge when storing the pressurized can, keep the cap on the container, and store in a cool, protected location.

Do not incinerate or puncture a starting fluid container.



TS1356 -JUN-18MAR92

DX,FIRE3 -19-16APR92-1/1

### Service Cooling System Safely

Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.



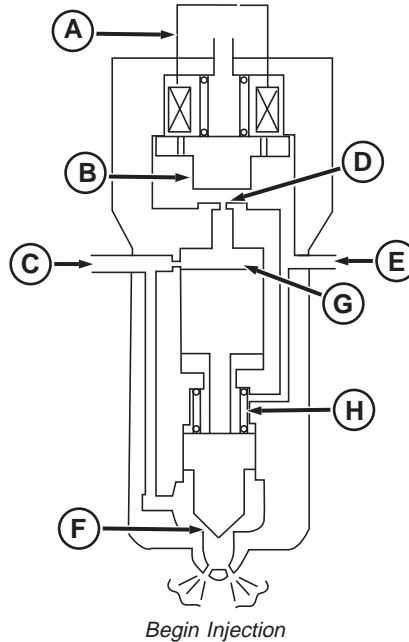
TS281 -JUN-23AUG88

DX,RCAP -19-04JUN90-1/1

### EI - Begin Injection

Injection begins when current is supplied from the ECU to the TWV (A). The electromagnetic force pulls the solenoid valve (B) up, causing the orifice seat (D) to open. The fuel in the control chamber (G) flows out of the injector to the fuel leakoff (E) line. Fuel is then routed back to the fuel tank. As the fuel exits the injector, the force is removed from the hydraulic piston allowing fuel through the nozzle (F) to start the injection process.

- A—Two-Way Valve (TWV)
- B—Solenoid Valve
- C—Fuel Inlet
- D—Orifice Seat
- E—Fuel Leakoff
- F—Nozzle
- G—Control Chamber
- H—Valve Spring



RG11557A -UN-26FEB01

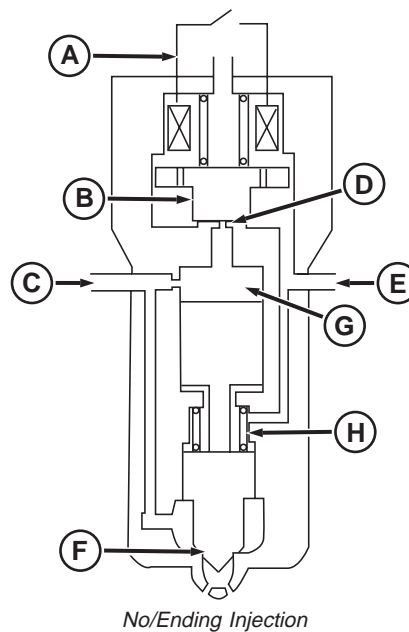
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RG40854.0000128 -19-19JUN02-3/4

### EI - Ending Injection

Injection ends when the current is removed from the TWV (A). The solenoid valve (B) closes causing fuel to fill the control chamber (G). The valve spring and the hydraulic force from the fuel in the control chamber cause the hydraulic piston to push the needle down and close the nozzle. At this time the injection is complete.

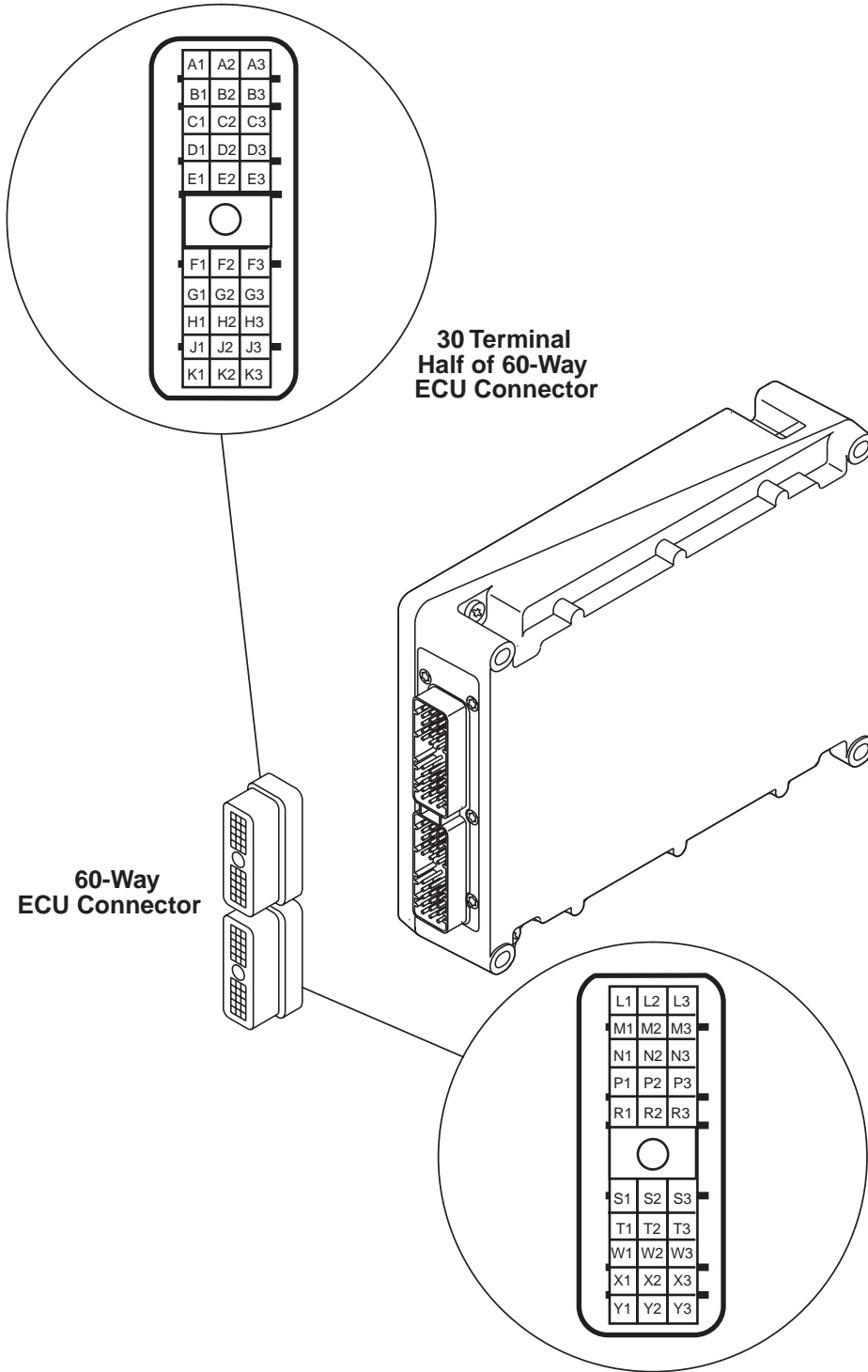
- A—Two-Way Valve (TWV)
- B—Solenoid Valve
- C—Fuel Inlet
- D—Orifice Seat
- E—Fuel Leakoff
- F—Nozzle
- G—Control Chamber
- H—Valve Spring



RG11556A -UN-16FEB01

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Engine Control Unit (ECU)



60-Way ECU Connector

30 Terminal Half of 60-Way ECU Connector

30 Terminal Half of 60-Way ECU Connector

John Deere Level 11 ECU

RG11390 -19-17NOV00

Continued on next page

RG40854,00000EC -19-20MAY02-1/2

Observable Diagnostics and Tests

<p><b>5 Governor Droop Selection Mode Check</b></p>	<p><i>NOTE: This check is not required for applications that either do not select different droop modes or use droop mode selection over the Controller Area Network (CAN). For these applications, GO TO 6</i></p> <ol style="list-style-type: none"> <li>1. Operate engine and attempt to recreate the low power condition.</li> <li>2. Read the desired speed governor curve and the maximum speed governor curve .</li> <li>3. Compare governor selection to the appropriate governor mode chart. See APPLICATION SPECIFICATIONS in Section 06, Group 210 of this manual and refer to the corresponding maximum speed and desired speed governor curves for your application.</li> </ol>	<p><b>Governor droop mode is correct:</b> GO TO <b>6</b></p> <p><b>Governor droop mode is incorrect:</b> Refer to machine manual to determine components that could prevent the correct governor droop from being selected. OR Investigate droop mode selection problems including checking for open, short, and grounded circuits in the droop mode selection wiring.</p> <p style="text-align: right;">-- -1/1</p>
<p><b>6 Compression and Misfire Test</b></p>	<ol style="list-style-type: none"> <li>1. Using the DST or Service ADVISOR, perform the Compression Test. For instructions, see ENGINE TEST INSTRUCTIONS - COMPRESSION TEST in Section 04, Group 160 of this manual.</li> <li>2. Make note of the results.</li> <li>3. Using the DST or Service ADVISOR, perform the Misfire Test. For instructions, see ENGINE TEST INSTRUCTIONS - MISFIRE TEST in Section 04, Group 160 of this manual.</li> <li>4. Make note of the results.</li> </ol>	<p><b>All cylinders scored within 10% of each other:</b> GO TO <b>7</b></p> <p><b>One or more cylinders scored 10% or more lower than other cylinders:</b> See E2 - ENGINE MISFIRE/RUNS IRREGULARLY DIAGNOSTIC PROCEDURE earlier in this Group.</p> <p style="text-align: right;">-- -1/1</p>
<p><b>7 Throttle Test</b></p>	<ol style="list-style-type: none"> <li>1. Operate engine at full load rated speed.</li> <li>2. At these operating conditions, read throttle position data parameter.</li> </ol>	<p><b>97% or above:</b> GO TO <b>8</b></p> <p><b>Below 97%:</b> Refer to your machine manual and perform the throttle calibration procedure; then retest.</p> <p style="text-align: right;">-- -1/1</p>

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Observable Diagnostics and Tests

**10 CAN High and Low Voltage Test**

*NOTE: For wiring information, see D1 - ECU DOES NOT COMMUNICATE WITH DST OR SERVICE ADVISOR supporting information.*

1. Ignition OFF
2. Reconnect both 30-way ECU connectors.
3. Ignition ON
4. Using a multimeter, measure voltage between a good chassis ground and:
  - Terminal C in the diagnostic connector.
  - Terminal D in the diagnostic connector.

**Both measurements between 1.5 - 3.5 volts:**  
Faulty ECU/Cab Harness connection  
OR  
Faulty diagnostic cable  
OR  
Faulty diagnostic connector  
OR  
Faulty Parallel Port Data Module (PDM)  
OR  
Faulty diagnostic software/computer configuration  
OR  
Faulty ECU

**Either measurement less than 1.5 volts or greater than 3.5 volts:**  
CAN wiring shorted to ground or voltage  
OR  
Faulty ECU

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d. Connect the meter leads across two of the affected circuits. The meter should show no continuity between the two circuits. Repeat the check across another combination of two circuits until all affected circuits have been checked.

e. Then, connect a meter lead to each affected circuit one at a time and touch the other meter leads to all terminals in the connector. The meter should show no continuity between any two circuits.

Example: A 37 pin connector contains three wires to a sensor. With one meter probe attached to each of the three wires, one at a time, touch the other meter probe to the remaining 36 wires. If there is continuity between any two wires, the circuit is shorted. Repair the circuit.

f. Alternate Method to Check for Shorted Circuit.

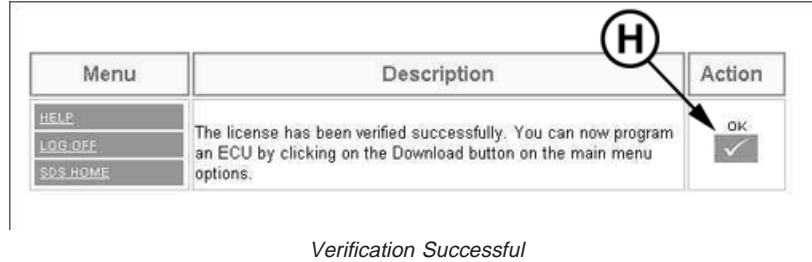
With the components disconnected at each end of the suspected circuits, turn the key switch on.

Connect one meter lead to a good frame ground. With the other meter probe, touch each of the suspected circuits one at a time. If there is a voltage reading, the circuit is shorted to another voltage wire. Repair the circuit.

g. Repair the "Shorted Circuit" as follows:

- Wires not in a loom: Wrap individual wires with electrical tape or replace the damaged wire and band as required.
- Wires in a loom: If hot spots exist in shorted area of the harness, replace the harness. If hot spots are not noticeable, install a new wire of proper gauge between the last two connections. Use tie bands to secure the wire to outside of the harness.

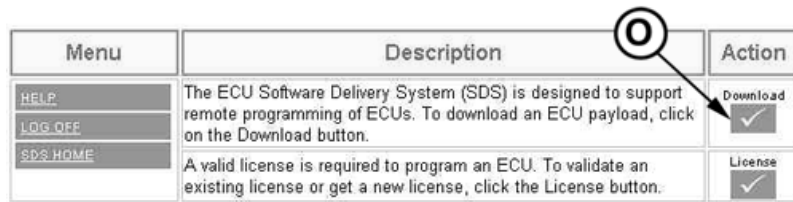
h. Perform an operational check-out on the component after completing the repair.



RG12631 -19-19SEP02

- Click "OK" (H) when license verification has completed.

RG41221.0000097 -19-04NOV02-5/11

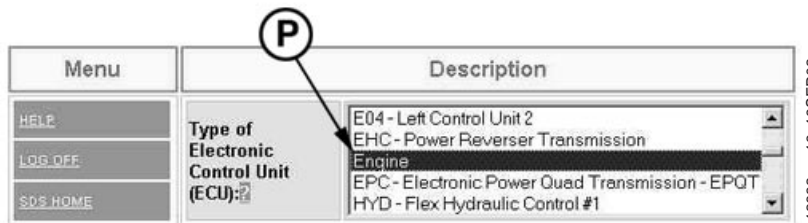


RG12579 -19-06SEP02

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- Click on "Download" button (O). A screen will appear as the system verifies that a valid license file is present.

RG41221.0000097 -19-04NOV02-6/11



RG12632 -19-19SEP02

Selecting Engine for ECU Type

- Scroll down and click on "Engine" (P).

Continued on next page

RG41221.0000097 -19-04NOV02-7/11

## Trouble Code Diagnostics and Tests

71	000174	16	Fuel Temperature Moderately High
74	000100	18	Engine Oil Pressure Moderately Low
75	000100	01	Engine Oil Pressure Extremely Low
76	000654	07	Cylinder #4 EI Delivery Failure
77	001347	05	Pump Control Valve Current Mismatch
78	001347	07	Fuel Rail Pressure Control Error
79	001347	03	Pump Control Valve Current High
82	001110	31	Engine Protection Shutdown
83	000970	31	Auxiliary Engine Shutdown Switch Active
84	000971	31	External Fuel Derate Switch Active
85	000094	17	Fuel Rail Pressure Not Developed
86	000094	10	Fuel Rail Pressure Loss Detected
88	N/A <sup>a</sup>	N/A <sup>a</sup>	When reading blink codes, signifies that no fault codes are in buffer.
91	000651	06	Cylinder #1 EI Circuit Shorted
92	000652	06	Cylinder #2 EI Circuit Shorted
93	000653	06	Cylinder #3 EI Circuit Shorted
94	000654	06	Cylinder #4 EI Circuit Shorted
95	000655	06	Cylinder #5 EI Circuit Shorted
96	000656	06	Cylinder #6 EI Circuit Shorted
97	000627	01	Electronic Injector Supply Voltage Problem
98	000611	03	Electronic Injector Wiring Shorted to Power Source
99	000611	04	Electronic Injector Wiring Shorted to Ground

<sup>a</sup>N/A = Not Applicable

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53

RG40854,0000103 -19-20MAY02-4/4

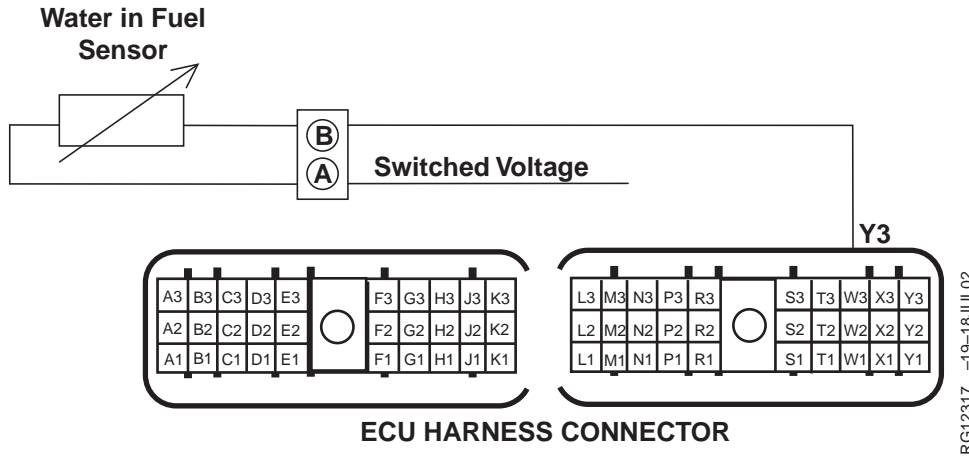


## Trouble Code Diagnostics and Tests

<p><b>③ Throttle Travel Voltage Test</b></p>	<p><i>NOTE: For wiring and theory of operation, see T5 - ANALOG THROTTLE (B) INPUT HIGH supporting information.</i></p> <ol style="list-style-type: none"> <li>Slowly operate analog throttle (B) through its full travel.</li> <li>Using the ECU diagnostic software, read the analog throttle (B) input voltage</li> </ol> <p><i>NOTE: For OEM applications, the high analog throttle (B) input voltage specification is 4.7V. For the high voltage specification on non-OEM applications, see APPLICATION SPECIFICATIONS in Section 06, Group 210 later in this manual.</i></p>	<p><b>Goes above 4.7 volts:</b>            Faulty analog throttle (B) sensor connector            OR            Open in analog throttle (B) sensor ground circuit            OR            Faulty analog throttle (B) sensor</p> <p><b>Never goes above 4.7 volts:</b>            Problem is intermittent. If no other codes are present, see INTERMITTENT FAULT DIAGNOSTICS earlier in this Group</p> <p style="text-align: right;">-- -1/1</p>
<p><b>④ Throttle Position Input Shorted Test</b></p>	<p><i>NOTE: For wiring and theory of operation, see T5 - ANALOG THROTTLE (B) INPUT HIGH supporting information.</i></p> <ol style="list-style-type: none"> <li>Ignition OFF</li> <li>Disconnect analog throttle (B) sensor connector behind instrument panel.</li> <li>Ignition ON, Engine OFF</li> <li>Using the ECU diagnostic software, read the analog throttle (B) input voltage</li> </ol> <p><i>NOTE: For OEM applications, the low analog throttle (B) input voltage specification is 0.3V. For the low voltage specification on non-OEM applications, see APPLICATION SPECIFICATIONS in Section 06, Group 210 later in this manual.</i></p>	<p><b>0.3 volts or less:</b>            GO TO ⑤</p> <p><b>Above 0.3 volts:</b>            Short to voltage in analog throttle (B) input circuit            OR            Faulty ECU</p> <p style="text-align: right;">-- -1/1</p>
<p><b>⑤ Throttle Position Ground Circuit Open Test</b></p>	<p><i>NOTE: For wiring and theory of operation, see T5 - ANALOG THROTTLE (B) INPUT HIGH supporting information.</i></p> <ol style="list-style-type: none"> <li>Ignition OFF</li> <li>Analog throttle (B) sensor connector disconnected.</li> <li>Using a test light connected to battery (+), probe the ground terminal (terminal A) in the analog throttle (B) sensor connector on the engine harness.</li> </ol>	<p><b>Light ON:</b>            Faulty analog throttle (B) sensor connector            OR            Faulty analog throttle (B) sensor</p> <p><b>Light OFF:</b>            Open in analog throttle (B) ground circuit</p> <p style="text-align: right;">-- -1/1</p>

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**000097.04 — Water in Fuel Signal Voltage Low**



**NOTE:** Wiring schematic shows OEM engine applications only. For wiring information on other applications, see APPLICATION SPECIFICATIONS in Section 06, Group 210 of this manual.

**Water in Fuel (WIF) Sensor**

- The WIF sensor uses the resistance of water and fuel to detect the presence of water in the fuel system. This uses the principle that water is a better conductor of electricity than fuel is. Because of this, water in fuel sensor will read a lower voltage when water is present than when it is not present. For further WIF sensor information, see WATER IN FUEL (WIF) SENSOR in Section 03, Group 140.

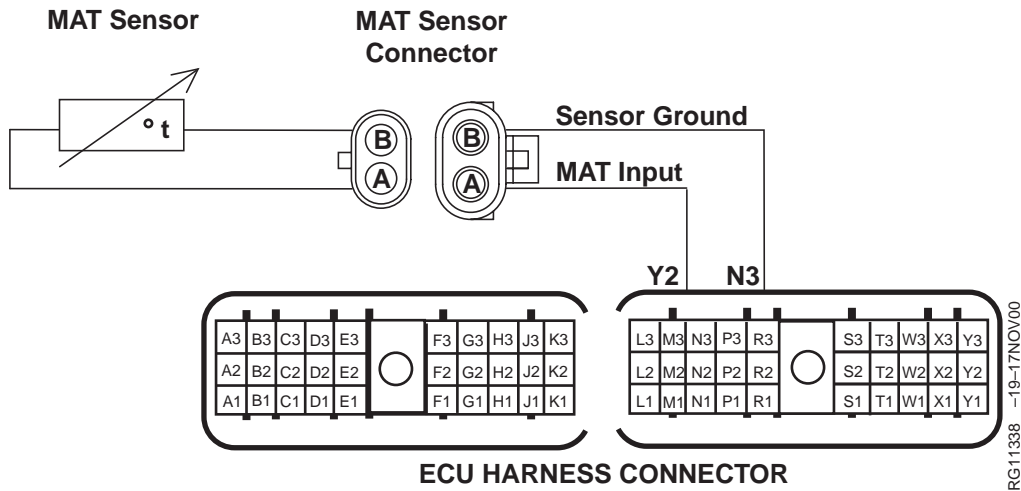
**DTC 000097.04 will set if:**

- The WIF input voltage drops below the sensor's low voltage specification. The voltage corresponds to an amount of water in fuel that is not possible.
  - For OEM applications, the low WIF input voltage specification is 0.5 volts.
  - For other applications, see APPLICATION SPECIFICATIONS in Section 06, Group 210 later in this manual for the low WIF input voltage specification.

**If DTC 000097.04 sets, the following will occur:**

- ECU's WIF engine protection feature disabled.

### 000105.04 — Manifold Air Temperature Input Voltage Low



**NOTE:** Wiring schematic shows OEM engine applications only. For wiring information on other applications, see APPLICATION SPECIFICATIONS in Section 06, Group 210 of this manual.

#### MAT (Manifold Air Temperature) Sensor

- The MAT sensor is a thermistor (temperature sensitive resistor) mounted in the intake manifold. The MAT sensor is used to measure the temperature of the intake air. The MAT sensor's variable resistance causes the input voltage to the ECU to vary. Higher intake air temperatures result in lower MAT input voltages to the ECU; lower temperatures result in higher voltages. For further MAT sensor information, see MEASURING TEMPERATURE in Section 03, Group 140.

**DTC 000105.04 will set if:**

- The manifold air temperature input voltage drops below the sensor's low voltage specification. The voltage corresponds to a pressure that is lower than what is physically possible for manifold air temperature.
  - For OEM applications, the low manifold air temperature input voltage specification is 0.1 volts.
  - For other applications, see APPLICATION SPECIFICATIONS in Section 06, Group 210 of this manual for the low manifold air temperature input voltage specification.

**If DTC 000105.04 sets, the following will occur:**

- The ECU will use a MAT default "limp-home" MAT value of 50°C (122°F).
- ECU's high manifold air temperature engine protection feature disabled.

RG40854,0000028 -19-30APR02-1/1

## 000110.04 — Engine Coolant Temperature Input Voltage Low

The engine coolant temperature input voltage drops below the sensor's low voltage specification.

RG40854,0000037 -19-30APR02-1/1

### 000110.04 Engine Coolant Temperature Input Voltage Low Diagnostic Procedure

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160  
,173

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<p><b>❶ Connection Check</b></p>	<p><b>IMPORTANT: Do not force probes into connector terminals or damage will result. Use JT07328 Connector Adapter Test Kit to make measurements in connectors. This will ensure that terminal damage does not occur.</b></p> <p><i>NOTE: For wiring and theory of operation information, see DTC 000110.04 ENGINE COOLANT TEMPERATURE INPUT VOLTAGE LOW supporting information.</i></p> <p>Perform a preliminary inspection of the ECU connectors and the ECT sensor connector looking for dirty, damaged, or poorly positioned terminals.</p>	<p><b>No faulty connection(s):</b> GO TO <b>❷</b></p> <p><b>Faulty connection(s):</b> Repair faulty connection(s).</p>
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<p><b>❷ Intermittent Fault Test</b></p>	<p><i>NOTE: For wiring and theory of operation information, see DTC 000110.04 ENGINE COOLANT TEMPERATURE INPUT VOLTAGE LOW supporting information.</i></p> <ol style="list-style-type: none"> <li>1. Connect the DST or SERVICE ADVISOR™. For instructions on connecting to the DST or SERVICE ADVISOR™, see CONNECTING TO DIAGNOSTIC SCAN TOOL (DST) OR SERVICE ADVISOR earlier in this Group.</li> <li>2. Ignition ON, engine OFF</li> <li>3. Start the ECU diagnostic software</li> <li>4. Make note of any DTCs, then clear all DTCs.</li> <li>5. Ignition ON, engine OFF or running</li> <li>6. Read DTCs using DST or SERVICE ADVISOR™.</li> </ol>	<p><b>000110.04 reoccurs:</b> GO TO <b>❸</b></p> <p><b>000110.04 does not reoccur:</b> Problem is intermittent. If no other codes are present, see INTERMITTENT FAULT DIAGNOSTICS earlier in this Group.</p>
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## 000174.16 — Fuel Temperature High Moderately Severe

The ECU senses a fuel temperature above specification.

RG40854,0000048 -19-30APR02-1/1

### 000174.16 Fuel Temperature High Moderately Severe Diagnostic Procedure

04  
160  
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<p><b>1 Preliminary Check</b></p>	<p>Before using this diagnostic procedure:</p> <ol style="list-style-type: none"> <li>1. Ensure that fuel level in fuel tank is not extremely low.</li> <li>2. If engine is equipped with a fuel cooler, make sure cooler is clean.</li> </ol>	<p><b>No problem found:</b> GO TO <b>2</b></p> <p><b>Problem found:</b> Repair and retest</p> <p>--1/1</p>
<p><b>2 Connection Check</b></p>	<p><b>IMPORTANT: Do not force probes into connector terminals or damage will result. Use JT07328 Connector Adapter Test Kit to make measurements in connectors. This will ensure that terminal damage does not occur.</b></p> <p><i>NOTE: For wiring and theory of operation information, see DTC 000174.16 FUEL TEMPERATURE HIGH MODERATELY SEVERE supporting information.</i></p> <p>Perform a preliminary inspection of the ECU connectors and the fuel temperature sensor connector looking for dirty, damaged, or poorly positioned terminals.</p>	<p><b>No faulty connection(s):</b> GO TO <b>3</b></p> <p><b>Faulty connection(s):</b></p> <p>--1/1</p>
<p><b>3 Fuel Supply Pressure Test</b></p>	<p><i>NOTE: For wiring and theory of operation information, see DTC 000174.16 FUEL TEMPERATURE HIGH MODERATELY SEVERE supporting information.</i></p> <p>Determine the fuel supply pressure. See CHECK FUEL SUPPLY PRESSURE in Section 04, Group 150 of this manual.</p>	<p><b>Fuel pressure within specification:</b> GO TO <b>4</b></p> <p><b>Fuel pressure below specification:</b> Determine cause of low supply pressure as outlined in CHECK FUEL SUPPLY PRESSURE in Group 150 of this manual. Repair problem and retest.</p> <p>--1/1</p>

## 000620.04 — Sensor Supply 2 Voltage Low

The ECU detects a supply voltage below specification on the ECU 5 volt supply circuit.

RG40854,0000053 -19-30APR02-1/1

### 000620.04 Sensor Supply 2 Voltage Low Diagnostic Procedure

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<p><b>1 Connection Check</b></p>	<p><b>IMPORTANT: Do not force probes into connector terminals or damage will result. Use JT07328 Connector Adapter Test Kit to make measurements in connectors. This will ensure that terminal damage does not occur.</b></p> <p><i>NOTE: For wiring and theory of operation information, see DTC 000620.04 SENSOR SUPPLY 2 VOLTAGE LOW supporting information.</i></p> <p>Perform a preliminary inspection of the ECU connectors and all of the sensor connectors using this 5V supply looking for dirty, damaged, or poorly positioned terminals.</p>	<p><b>No faulty connection(s):</b> GO TO <b>2</b></p> <p><b>Faulty connection(s):</b> Repair faulty connection(s).</p>
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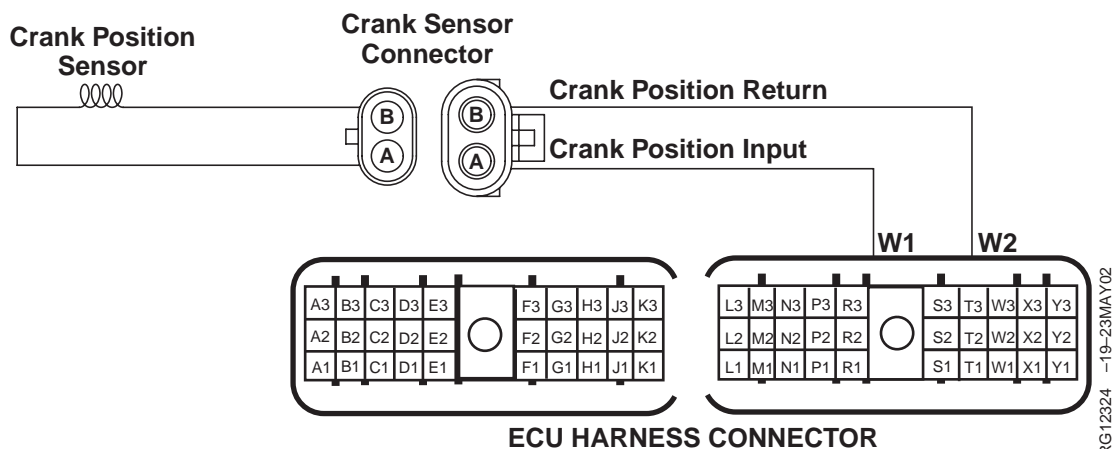
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<p><b>2 Intermittent Fault Test</b></p>	<p><i>NOTE: For wiring and theory of operation information, see DTC 000620.04 SENSOR SUPPLY 2 VOLTAGE LOW supporting information.</i></p> <ol style="list-style-type: none"> <li>1. Connect the DST or SERVICE ADVISOR™. For instructions on connecting to the DST or SERVICE ADVISOR™, see CONNECTING TO DIAGNOSTIC SCAN TOOL (DST) OR SERVICE ADVISOR earlier in this Group.</li> <li>2. Ignition ON, engine OFF</li> <li>3. Start the ECU diagnostic software</li> <li>4. Make note of all active DTCs, then clear all DTCs.</li> <li>5. Ignition OFF</li> <li>6. Disconnect the components supplied voltage by the ECU terminal P1.</li> <li>7. Ignition ON, engine running</li> <li>8. Read DTCs using DST or SERVICE ADVISOR™.</li> </ol>	<p><b>000620.04 reoccurs:</b> GO TO <b>3</b></p> <p><b>000620.04 does not reoccur:</b> GO TO <b>4</b></p>
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## 000637.10 — Crank Position Input Pattern Error



**NOTE:** Wiring schematic shows OEM engine applications only. For wiring information on other applications, see APPLICATION SPECIFICATIONS in Section 06, Group 210 of this manual.

### Crank Position Sensor

- The crank position sensor is an inductive type pickup sensor that detects notches on the crank timing wheel. The crank timing wheel has 44 narrow teeth and 1 wide tooth. The ECU uses the crank position input to determine engine speed and precision piston position in relation to TDC. The ECU monitors the pump position sensor input to determine piston position in relation to the firing order. Based on information from the crank and pump position sensors, the ECU calculates the correct start of injection and amount of fuel to inject, then commands the EIs accordingly. For further crank position sensor information, see MEASURING ENGINE SPEED in Section 03, Group 140.

### DTC 000637.10 will set if:

- The ECU detects an improper pattern on the crank position input.

### If DTC 000637.10 sets, the following will occur:

- If a pump position sensor trouble code accompanies DTC 000637.10, the engine will die and won't restart until at least one of the two codes is repaired.
- ECU will use only the pump position sensor input to determine piston position.
- The moment that the trouble codes sets, the engine may hesitate or die, but it will restart.
- Prolonged cranking time may be required to start the engine.
- Engine protection is enabled. See ENGINE PROTECTION in Section 03, Group 140 earlier in this manual.
  - With Derate Feature: See APPLICATION SPECIFICATIONS in Section 06, Group 210 later in this manual.

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