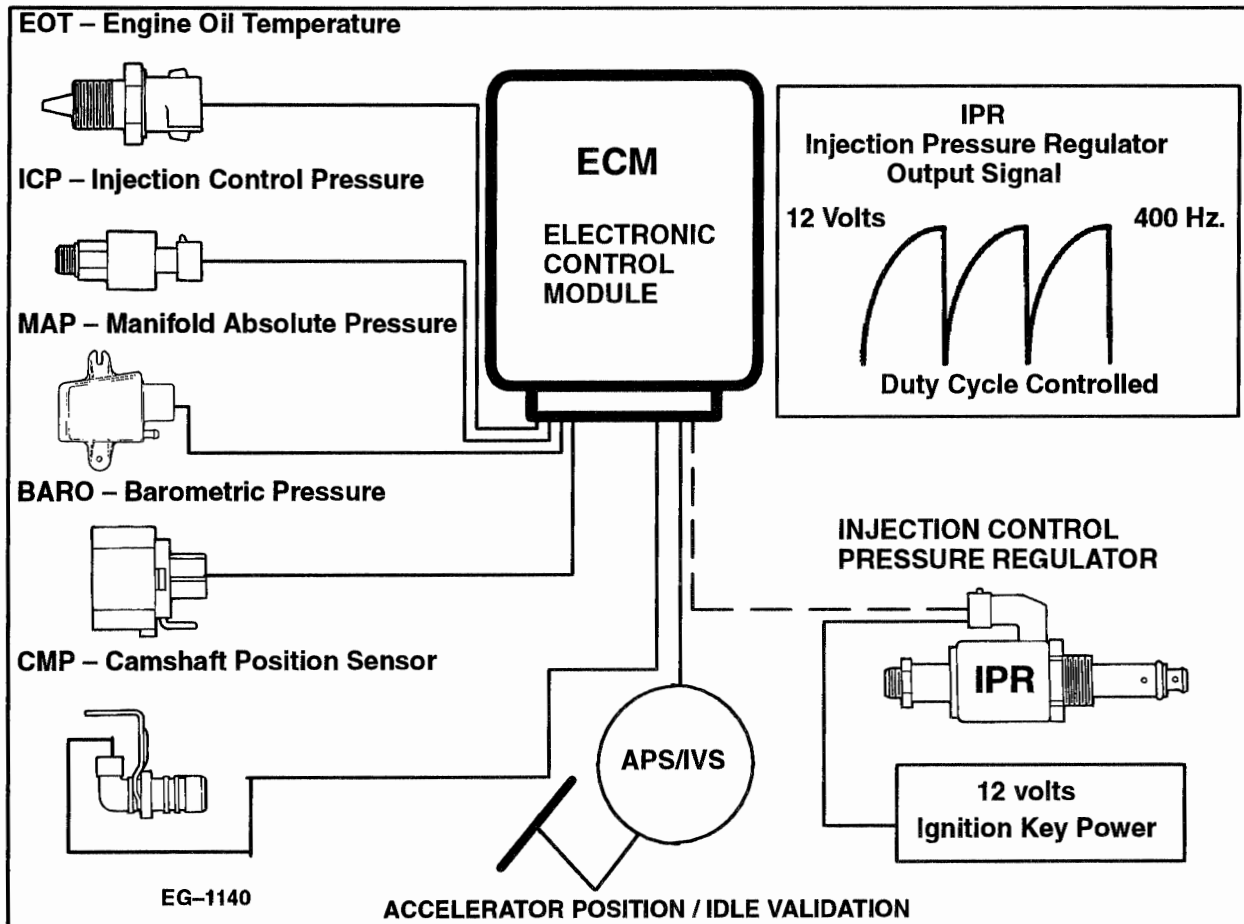


## ELECTRONIC CONTROL SYSTEM DIAGNOSTICS

### INJECTION PRESSURE REGULATOR (IPR)

#### INJECTION PRESSURE REGULATOR (IPR)



#### OUTPUT FUNCTIONS

**Injection Pressure Regulator** – Is a variable position valve that controls injection control pressure. The ECM uses many input variables to determine the desired injection control pressure.

Battery voltage is supplied to the IPR when the ignition key is in the on position. Valve position is controlled by switching the output signal circuit to ground inside the Electronic Control Module (ECM). On off time is modulated from 0–50% dependent upon the desired injection control pressure.

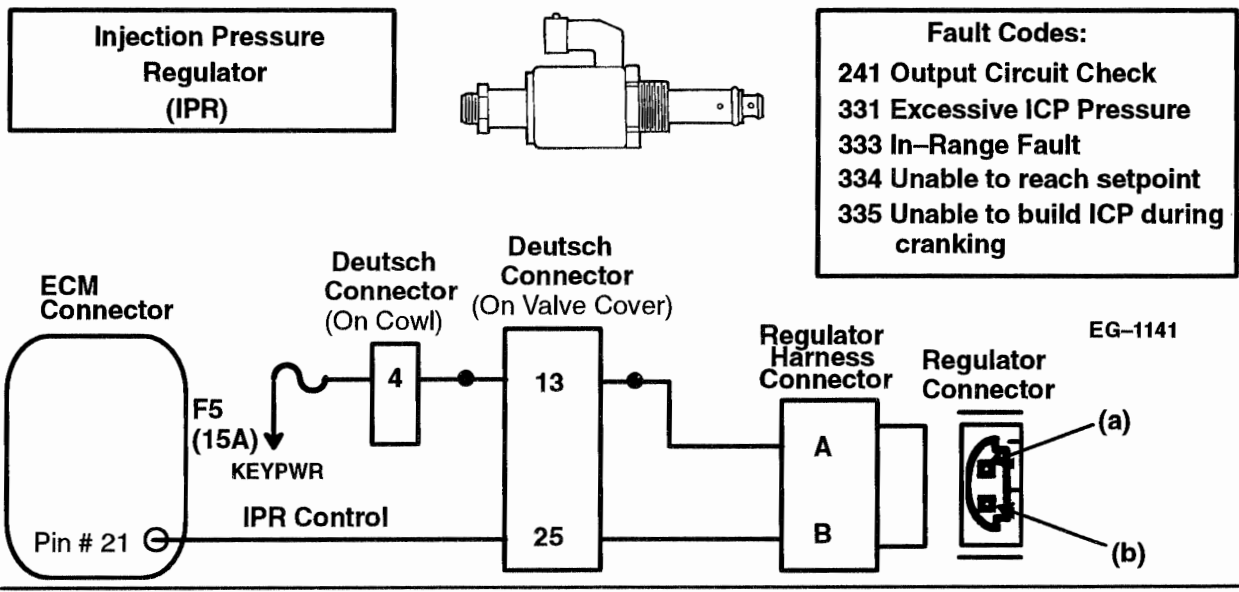
#### FAULT DETECTION/MANAGEMENT

An open or a short to ground control circuit can be detected by an on demand output circuit check performed during the engine off test.

The ECM is capable of detecting, while the engine is running, if desired injection control pressure is equal to measured injection control pressure. If the measured injection control pressure does not reasonably compare to the desired injection control pressure, the ECM ignores the measured ICP signal and attempts to control the engine with the desired value. (If the problem was in the sensor circuit, this strategy causes little performance deterioration, if the problem is in the control circuit, engine performance will probably still be unsatisfactory).

A faulty IPR or problem with the high pressure oil system can be detected by the engine running test during the injection control pressure step test. During this test, the ECM commands and measures two specific pre programmed pressures. A fault code is set, if the pressures can not be maintained.

**NOTE: THE ENGINE WILL NOT OPERATE WITH AN IPR CIRCUIT THAT IS NOT FUNCTIONING.**



***After removing connectors always check for damaged pins, corrosion, loose terminals etc.***

**Connector Checks to Ground (B-)**  
(Check with IPR Connector Disconnected and Ignition key off, all accessories off)

Test Points	Spec.	Comments
B to Grd.	> 1000 ohms	A short to ground will command full IPR pressure, code 331 may be set.

**IPR Voltage Check**  
(Check with regulator connector disconnected)

Test Points	Spec.	Comments
A to Grd.	B+	Battery voltage from F2, check with key on (GP relay coil is supplied from same fuse).
B to Grd.	0 – .25v	If greater than .25 volts, signal wire is shorted to V Ref. or battery.

**Harness Resistance Checks**  
(Check with breakout box installed) (IPR connector reconnected.)

Test Points	Spec.	Comments
#21 to F5	5 to 20 ohms	Resistance through entire IPR circuit including regulator, check with regulator connector connected.
#21 to B	< 5 ohms	Resistance from 60 pin connector to regulator connector.
F2 to A	< 5 ohms	Resistance from power supply (F2) to regulator connector.

**Fault Code Descriptions**

241= Output circuit check detected during Std. test, indicates high or low resistance in circuit.

331 = ICP pressure was greater than 3675 PSI (25 MPa) for 1.5 seconds. (possible grounded IPR control circuit.) (Refer to injection control pressure diagnostics if not electronic fault.)

333/334 = (1) If set during normal engine operation indicates engine is operating in open loop control and ICP pressure is above or below desired pressure. (Refer to ICP control system diagnostics.)

(2) If set during engine running test, indicates ICP system failed step test and could not maintain commanded pressure.

335 = ICP unable to build pressure during cranking.

## ELECTRONIC CONTROL SYSTEM DIAGNOSTICS

### INJECTION PRESSURE REGULATOR (IPR)

#### INJECTOR PRESSURE REGULATOR EXTENDED SYSTEM DESCRIPTION FUNCTION

The Navistar engine control system includes a Injection Pressure Regulator (IPR) valve that controls oil pressure in the high pressure injection control system which is used to actuate the injectors. The IPR valve consists of a solenoid, poppet and spool valve assembly and is mounted in the high pressure oil pump. The ECM regulates injection control pressure by controlling the duty cycle or (on/off time) of the injection control pressure solenoid. This increase or decrease of "on/off" time positions a poppet valve and spool valve internal to the IPR, which in turn either maintains pressure in the injection control pressure system or vents pressure to the oil sump via the front cover. (Refer to manual Sec. 1.2, Injection Control Pressure System for a more complete description of the IPR operation and function.)

#### OPERATION

The IPR valve is supplied with voltage at terminal A of the IPR connector when the ignition key is turned on thru fuse F5. Control of the injection control system is accomplished by the ECM grounding the IPR circuit from terminal B of the IPR valve thru pin #21 of the ECM. Precise control is accomplished by varying the pulse width or percentage of "on/off" time of the IPR solenoid. The frequency of the pulse-width to the IPR is 400 Hz, normal "on/off" times varies from 8% to 50%. A high duty cycle indicates a high amount of injection control pressure being commanded, a low duty cycle is an indication of less pressure being commanded.

#### ECM DIAGNOSTICS

The ECM monitors the Injection Control Pressure while the engine is in operation. If the actual pressure is greater or less than the desired pressure, the ECM will set a fault code. When this occurs, the ECM will ignore the ICP sensor and control the engine using pre programmed values for the IPR.

The Electronic Service Tool is used to Perform the Engine Running Standard Test which enables the ECM to vary the command signal to the IPR and monitor the performance of the Injection Control Pressure system. If the system does not respond within the specified parameters, the ECM will set a fault code.

Fault codes can be retrieved using the Electronic Service Tool or the Self Test Input diagnostic switch located on the vehicle dash. If the ignition key is shut off, the code will be stored as an Inactive code.

#### FLASH CODE 241

#### ATA CODE SID 42 FMI 11

#### INJECTION CONTROL PRESSURE REG. OCC

#### SELF TEST FAILED

Code 241 is set only during the Engine Off Standard Output Circuit Check. This test indicates the ECM has performed an output circuit test, measured voltage drop across the IPR circuit and determined it is below or above specification.

If this fault is present, the engine will not run. The ECM will not illuminate the Engine Warning light if this code is active, however, this code will be transmitted at the completion of the Output Circuit Check, using the STI switch or the Electronic Service Tool.

Possible causes: Open feed circuit or fuse to the IPR, open IPR solenoid, or an open or shorted IPR signal circuit.

#### FLASH CODE 331

#### ATA CODE PID 164 FMI 0

#### INJECTION CONTROL PRESSURE ABOVE SYSTEM WORKING RANGE

Code 331 indicates the ECM has detected injection control pressure greater than 3675 PSI (25 MPA) which is greater than the maximum allowable working pressure.

When this code is active, the ECM will illuminate the Engine Warning light.

Possible causes: Incorrect ICP signal due to faulty circuits or sensor, grounded IPR signal circuit, a malfunction in the injection control pressure system or a sticking or blocked IPR valve. Refer to Injection Control Pressure system diagnostics in Section 2.

#### FLASH CODE 333

#### ATA CODE PID 164 FMI 10

#### INJECTION CONTROL PRESSURE ABOVE/BE- LOW DESIRED LEVEL

Code 333 may be set during normal engine operation through the continuous monitor function or during the Engine Running Standard Test. It indicates the measured pressure does not match the expected value. The ECM will illuminate the Engine Warning light.

When this code is active, the ECM will ignore the ICP sensor signal and will control the IPR from programmed values to keep the engine operating. Perform ICP sensor diagnostics to determine if the problem exists in the ICP sensor/circuit. If diagnostic testing indicates the ICP sensor/circuit is functioning properly, perform additional diagnostic tests on the injection control pressure system. Refer to Injection Control Pressure system diagnostics in Section 2.

Possible causes: Incorrect ICP signal due to circuit or sensor malfunctions. IPR signal circuit may be grounded or contain excessive resistance. The IPR valve may be sticking or blocked. Injection control pressure system may not be functioning properly.

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### ECM DIAGNOSTICS (Continued)

#### **FLASH CODE 334**

**ATA CODE PID 164 FMI 7**

#### ***INJECTION CONTROL PRESSURE UNABLE TO REACH SETPOINT—POOR PERFORMANCE***

Code 334 indicates an injection control system response time fault and may be set during normal engine operation through the continuous monitor function or during the Engine Running Standard Test.

While the driver of the vehicle rapidly presses his foot down on the accelerator pedal, the ECM compares the actual vs the desired injection control pressure and looks for a large pressure difference (1300 PSI/9MPa) for a short period of time (3 seconds). If the injection control system does not respond quick enough Code 334 will be set and the Engine Warning Lamp will be illuminated.

Possible Causes: Low oil level, contaminated engine oil or aerated oil. Trapped air in the injection control pressure system (particularly after an injector or high pressure pump replacement). Defective or stuck Injection Pressure Regulator (IPR). Intermittent IPR valve wiring connection—spread IPR

harness terminals at IPR valve, poorly crimped terminals or pulled back pin. Leaking injector "O" rings. Problem with ICP sensor and sensor circuit, system biased high or low. Refer to Injection Control Pressure system diagnostics in Section 2.

#### **FLASH CODE 335**

**ATA CODE PID 164 FMI 1**

#### ***INJECTION CONTROL PRESSURE UNABLE TO BUILD PRESSURE DURING CRANKING***

Code 335 indicates the ECM has determined that the injection control pressure system has failed to build a pressure of at least 725 PSI/5 MPA during a programmed period of engine cranking time which will vary with engine temperature.

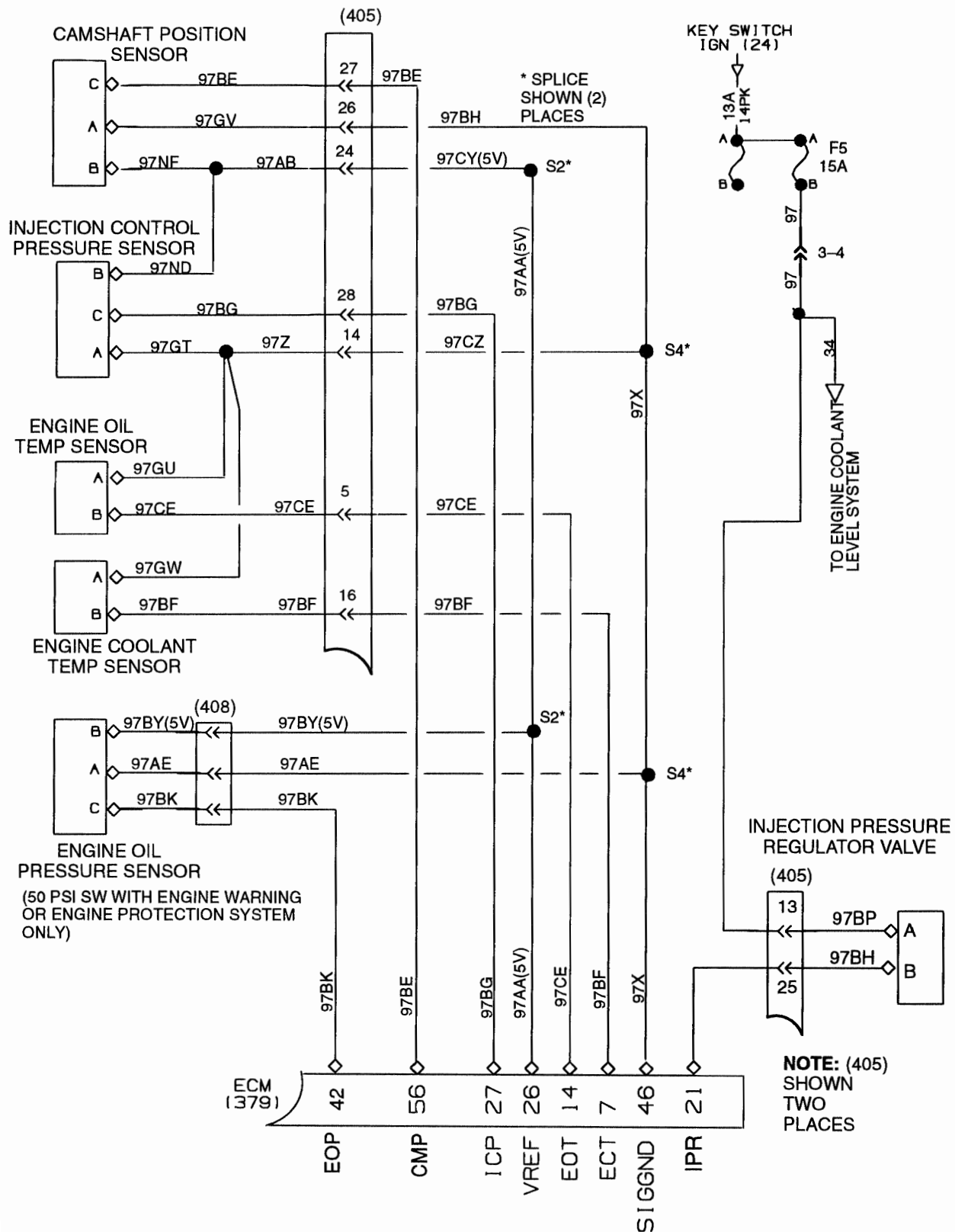
**NOTE: Engine cranking speed must be greater than 130 RPM before fault detection begins.**

Possible Causes: No oil in engine. Air in the injection control pressure system (particularly after an injector or high pressure pump replacement). Defective or stuck IPR regulator. Leaking injector "O" rings. Loose high pressure pump gear. Defective high pressure oil pump.

# ELECTRONIC CONTROL SYSTEM DIAGNOSTICS

## INJECTION PRESSURE REGULATOR (IPR)

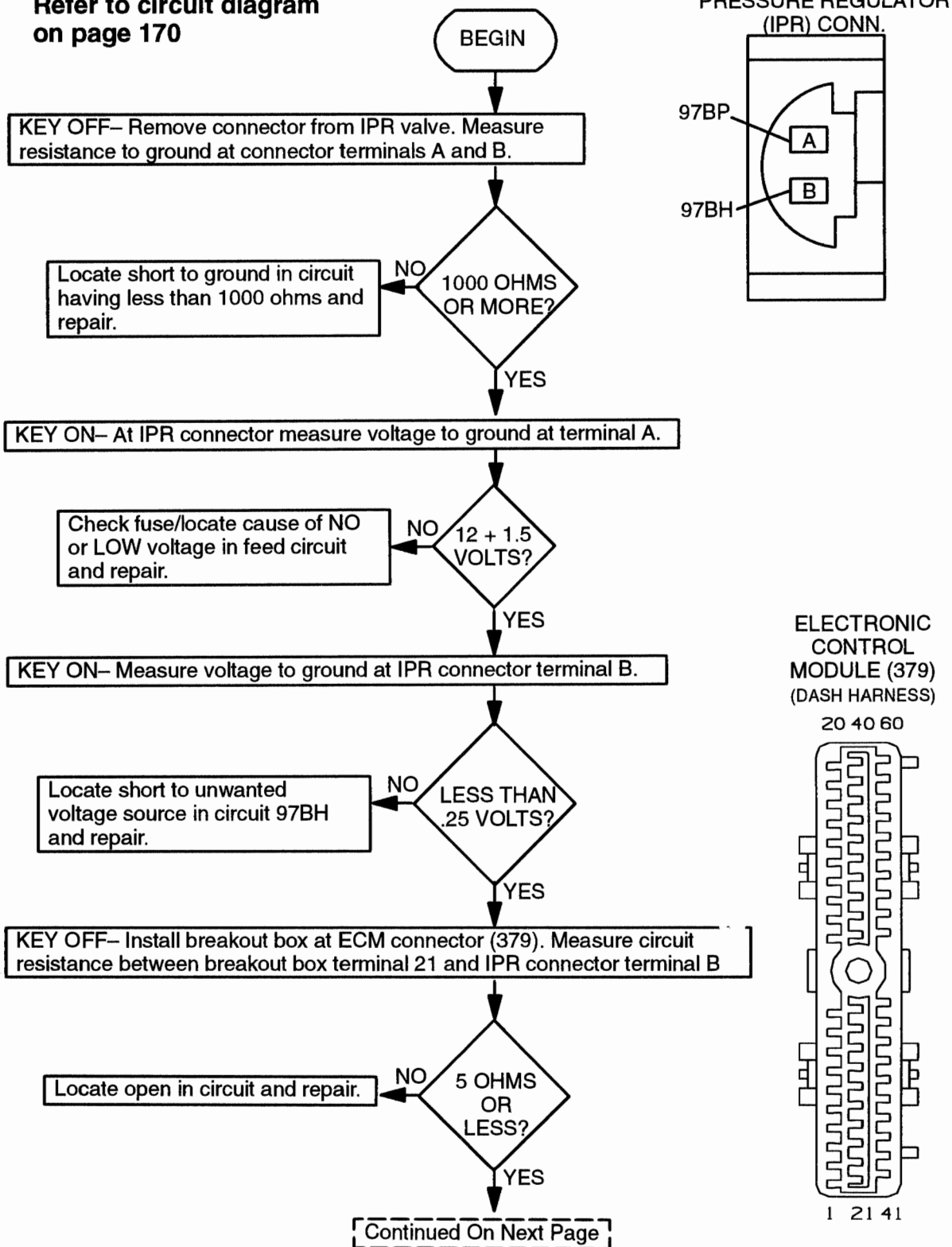
### SENSOR CIRCUIT DIAGRAM



## INJECTION PRESSURE REGULATOR (IPR)

## INJECTION CONTROL PRESSURE REGULATOR

Refer to circuit diagram  
on page 170



## ELECTRONIC CONTROL SYSTEM DIAGNOSTICS

### INJECTION PRESSURE REGULATOR (IPR)

#### INJECTION CONTROL PRESSURE REGULATOR (Continued)

