TomcoTechtips

TM ISSUE 6

FORD EEC-IV QUICK TEST

How to read trouble codes on Ford's EEC-IV

QUICK TEST STEPS

1. Visual Check & Vehicle Preparation
2. Equipment Hookup
3. Key On Engine Off Self-Test
4. Computed Timing Check
5. Engine Running Self-Test
6. Continuous Self-Test

VISUAL CHECK (Very important - These Basic checks solve over 50% of problems)

1. Inspect the air cleaner and inlet duct. Correct if necessary.
2. Check all engine vacuum hoses for damage, leaks, cracks, blockage, proper routing, etc. - Very important if customer reports recent engine work.
3. Check EEC-IV system wiring harness for proper connections, bent or broken pins, corrosion, loose wires, proper routing, etc.
4. Check the engine coolant for proper level.
5. Make all necessary repairs before continuing with QUICK TEST.

VEHICLE PREPARATION

1. Perform ALL safety steps required to start and run vehicle tests.
2. Turn off ALL electrical loads - radios, lights, A/C-heater blower fans, etc.
3. Start engine and run until at operating temperature.
4. Turn engine off and proceed.

SELF-TEST DESCRIPTION

The Self-Test is divided into three sections. Key On Engine Off, Engine Running, and Continuous Self-Test. The computer stores the Self-Test program in its permanent memory. When activated, it checks the EEC-IV system by testing its memory integrity and processing capability, and verifies that various sensors and actuators are connected and operating properly. Most automotive computer scanners have Ford EEC-IV adaptors. They usually have a digital type read out of codes and prompting messages to help you along. Follow their instructions. An inexpensive analog (pointer type) volt meter with a 12v scale can also be used.

Find the Self-Test connector. It can be in various locations in the engine compartment. It's appearance is the same - a large six connector output and small single input connector, see Fig. #1.

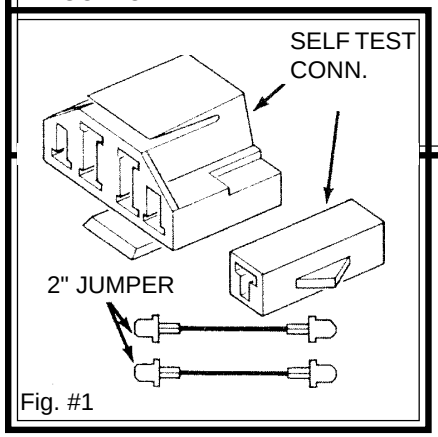


Fig. #1

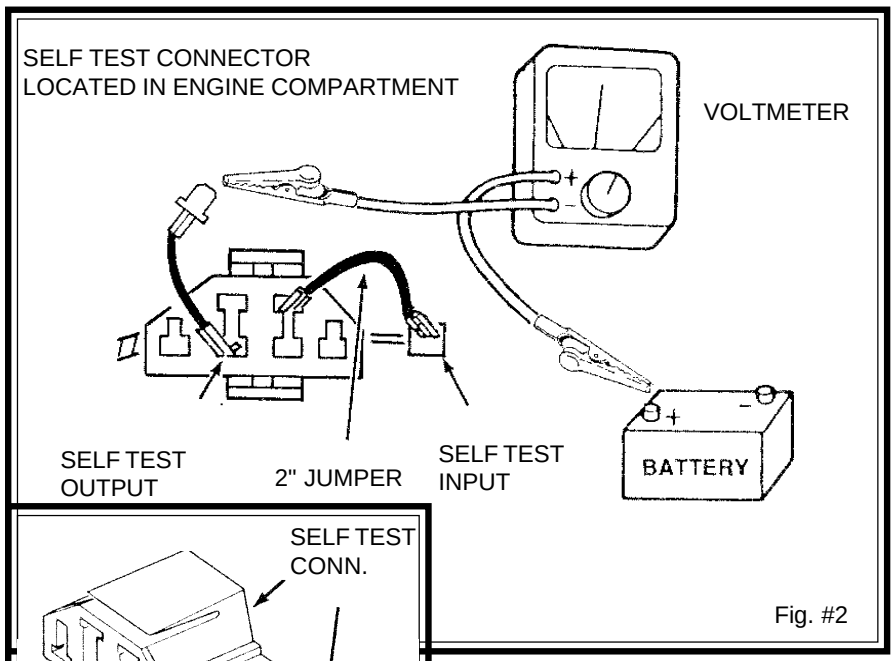


Fig. #2

KEY ON ENGINE OFF SELF-TEST

At this time, a test of the EEC-IV system is conducted with power applied and engine at rest.

For Self-Test to detect errors in the Key On Engine Off Self-Test mode, the fault must be present at the time of testing. For intermittents, refer to Continuous Memory Codes.

CONTINUOUS MEMORY CODES

Continuous Memory Codes are issued as a result of information stored while the vehicle was in normal operation during the last 40 starts. These codes are displayed after the separator code 10. These codes should be used for diagnosis only when Key On Engine Off and Engine Running Self-Tests result in pass or "ok" code 11.

EQUIPMENT HOOKUP

USING AN ANALOG VOLT/OHM METER (VOM)

1. Turn the ignition key off.
2. Two 2" long jumper wires with 1/4" male spade type connections on both ends - is helpful in making good electrical contact - see Fig. #1. Set theVOM on a DC voltage range to read from 0 to 15 volts.
3. Connect the VOM from the Battery + terminal to the Self-Test Output pin of the large Self-Test connec tor. Use one of the connectors for a better electrical connection fig. #2.
4. Connect a timing light.

USING THE "CHECK ENGINE" LIGHT (MIL)

On some late models the check engine light will flash codes in a similar manner as on GM vehicles. No special equipment hookup is required on these cars.

HOW TO RUN THE KEY ON ENGINE OFF SELF-TEST

DO

* Place ignition key in the ON position.
* Activate Self-Test.
  Analog VOM: Jumper STI to SIG RTN at the Self-Test connectors.
* Record all service codes displayed.

DON'T

* Depress throttle during Key On Engine Off Self-Test.

On all vehicles equipped with a 4.9L engine, the clutch must be depressed during the Key On Engine Off Self-Test.

READING CODES - ANALOG VOLTMETER

A service code on the analog voltmeter will represent itself as a pulsing or sweeping movement of the voltmeter's needle. For example: The Self-Tests service code of 2-3 will appear on the voltmeter as two needle pulses (sweeps), then, after a two-second pause, the needle will pulse (sweep) three times.

The continuous Memory Codes are separated from the Key On Engine Off codes by a six second delay, a single half-second sweep, and another six-second delay. See Fig. #3.

READING CODES - "CHECK ENGINE" LIGHT

The "Check Engine" Light on the front dash panel on some models will remain on when a hard fault (open or short circuit) is present.

Fig. #3

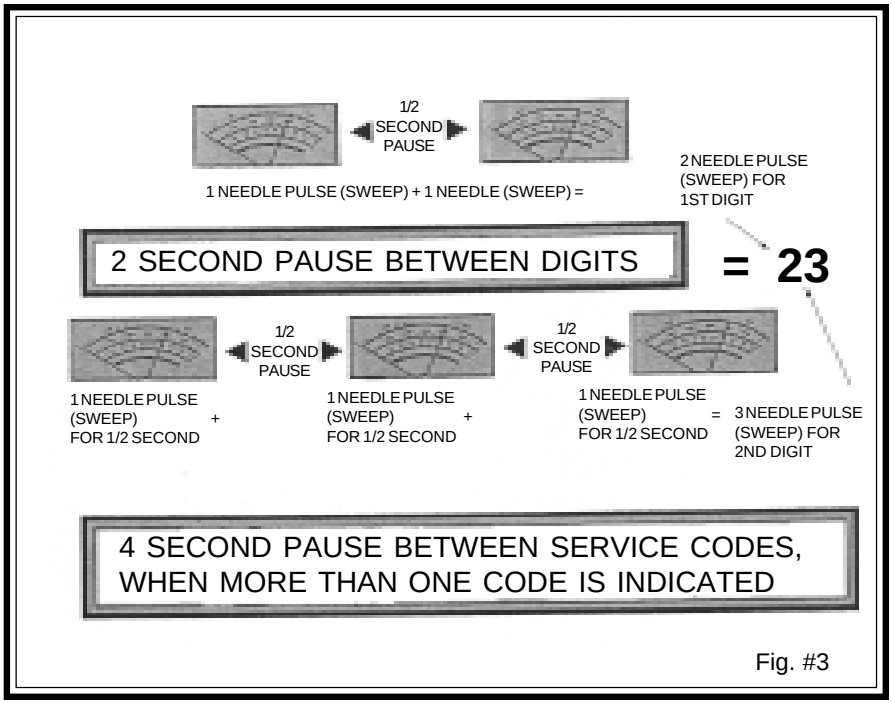


Fig. #3

On these models during Self-Test a service code is reported by the "Check Engine" Light flashing. A single-digit number of three will be reported by three flashes. To access codes using the check engine light use the same steps used in hooking up the Self-Test connector as with the voltmeter must be followed.

ENGINE RUNNING SELF-TEST

At this time, a test of the EEC-IV system is conducted with the engine running. The sensors are checked under actual operating conditions and at normal operating temperatures. The actuators are exercised and checked for corresponding results.

ENGINE IDENTIFICATION CODES (ID CODES)

Engine ID codes are issued at the beginning of the Engine Running Self-Test and are one-digit numbers represented by the number of pulses sent out. The engine ID code is equal to one-half the number of engine cylinders (i.e. 2 pulses = 4 cylinders). These codes are used to verify that the proper processor is installed and that the Self-Test has been entered.

ENGINE RUNNING SELF-TEST

On vehicles equipped with the Brake On/Off Switch (BOO),the brake pedal **MUST** be depressed and released **AFTER** the ID code.

On vehicles equipped with the Power Steering Pressure Switch (PSPS), The steering wheel must be turned at least one-half turn and released within 1 to 2 seconds after the ID code.

HOW TO RUN THE ENGINE RUNNING SELF-TEST

DO

* Deactivate Self-Test. Remove Self-Test input jumper.
* Start and run engine at 2,000 rpm for two minutes. This action warms up the EGO sensor.
* Turn engine off, wait 10 seconds.
* Start engine.
* Activate Self-Test. Plug Self-Test jumper back in.
* After the ID code, depress and release the brake pedal if appropriate. See Special Note Above.
* After the ID code, within 1 to 2 seconds, turn the steering wheel at least one-half turn and then release it, if appropriate. See Special Note Above.
* If a dynamic response code occurs, perform a brief wide-open throttle (WOT).
* Record all service codes displayed.

DON'T

* Depress the throttle unless a Dynamic Response Code is displayed.

DYNAMIC RESPONSE CHECK

The dynamic response check verifies the movement of the TP, VAF and

MAP sensors during the brief Wide-Open Throttle (WOT) performed during the Engine Running Self-Test. The signal for the operator to perform the brief WOT is a single pulse on the voltmeter.

COMPUTED TIMING CHECK

If the "Check Engine" Light (MIL) is on, do not run Quick Test timing check. Verify Key On Engine Off Self-Test is a PASS (code).

Self-Test timing is equal to Base Timing plus 20 degrees BTDC ± 3 degrees (see VECI decal for correct base timing).

Example:

If base timing is 10 degrees BTDC, Self-Test timing is equal to: 10 degrees + 20 degrees = 30 degrees BTDC ± 3 degrees or 27 degrees to 33 degrees BTDC.

HOW TO RUN QUICK TEST TIMING CHECK

1. Turn the key off and wait 10 seconds.
2. Start engine.
3. Activate Engine Running Self-Test.
4. Check timing after the last service code has been displayed. The timing will remain fixed for two minutes, unless Self-Test is deactivated.

DIAGNOSTIC AIDS

CONTINUOUS MONITOR MODE (WIGGLE TEST)

The continuous Monitor Modes allow the technician to ATTEMPT to recreate an intermittent fault.

The needle of the VOM will sweep across the face of the meter when a fault is recreated.

KEY ON ENGINE OFF

1. Hook up a VOM as shown in Quick Test.
2. DO NOT ground STI if using a VOM or "Check Engine" Light.
3. Turn the ignition key to the ON position.
4. You are now in the Continuous Monitor Mode.
5. Tap, Move and Wiggle the suspect sensor and/or harness. If a fault is detected, a Service Code will be stored in memory and will be indicated as explained previously.

ENGINE RUNNING

1. Hook up VOM as shown in Quick Test Step.
2. Start the engine.
3. Activate Self-Test, wait 10 seconds, deactivate and reactivate Self-Test. DO NOT shut the engine off.
4. You are now in the Engine Running Continuous Monitor Mode.
5. Tap, move, and wiggle thesuspect sensor and/or harness. If a fault is detected, a Service Code will be stored in memory and will be indicated as explained previously.

CYLINDER BALANCE TEST

The Cylinder Balance test on the 5.0L SEFI and 5.0L SEFI MA vehicles is designed to aid in the detection of a noncontributing cylinder.

The Cylinder Balance test, first reads engine rpm, with all injectors activated. Next, each injector is turned "off and on," one at a time. The rpm drop that results, if any, is then read. These two rpm's are compared to verify that the rpm drop was greater than a calibrated level.

The Cylinder Balance Test service codes correspond with cylinder number followed by a "O" on a scanner. Example 20 = cyl #2.

1. Perform Engine Running Self-Test.
2. After the last repeated service code is received, wait 5-10 seconds.
3. Lightly depress and release throttle (not wide-open throttle) within two mintutes of the last repeated service code.
4. Cylinder Balance Test will be per formed at the first test level.Test time is approximately three minutes.
5. Within 2 minutes after the previous Cylinder Balance Test, lightly de press and release the throttle to enter 2nd/3rd level Cylinder Balance Test.
6. If a throttle is touched (moved) during Cylinder Balance Test, Service Code 77 will appear, indicating test was not completed.

The 2nd/3rd level Cylinder Balance Test is intended to aid in the detection of any partially contributing injectors.

OUTPUT STATE CHECK

This mode is entered after all codes have been received from Key On Engine Off and Continuous Testing. At this time, leave Self-Test activated and depress the throttle. Each time the throttle is depressed, the output actuators will change state from energized to de-energized or from de-energized to energized.

1. Enter Self-Test.
2. Code Output Ends.
3. Do Brief WOT.
4. EEC-IV Output To Actuators Energized.
5. Do Brief WOT.
6. EEC-IV Output To Actuators De-Energized.

HOW TO CLEAR CONTINUOUS MEMORY CODES

1. Run the Key On Engine Off Self-Test according to Quick Test.
2. When the Service Codes begin to be displayed, deactivate Self-Test: Disconnect the jumper wire from the Self-Test connector.
3. The continuous service codes will be erased from the processor's memory.

EEC CODES 1984 TO 1988 (Difference in Years noted)

O = KOEO test key on engine off
R = KOER test key on engine running
M = in memory - after separator (10) in KOEO test

Code	Definition
11	system OK
12 (R)	Idle Speed Control (ISC) motor or Air Bypass not controlling idle properly (generally idle too slow)
13 (O)	ISC did not respond properly Electronic Control Assembly (Processor)(ECA ext/retracts for test)
(R)	RPM's out of specs (usually too high)
(M)	Idle Speed Control ISC (motor) sticking, open Idle Tracking Switch ITS circuit or Throttle Pos. Sensor TPS sticking
14 (M)	Profile Ignition Pickup PIP was erratic (poss secondary ignition arcing, wiring problem or 2-way radio interference?)
15 (O)	No keep Alive Memory power (pin 1) or bad Electronic Control Assembly (Processor) ECA
(M)	Keep Alive Memory (KAM) (pin 1) was interrupted (poss batt. was disconnected)
16 (R)	Erratic idle during test or throttle was touched (try resetting throttle stop)
17 (R)	Same as 16
18 (R)	Check base timing, advance function or ignition ground
(M)	Ignition Tachometer (TACH sig.) was erratic (poss wiring, Outside Frequency Interfer-

ence (IFI prob)
19 (O) No Voltage Power (pins 37 + 57) or bad Electronic Control Assembly (Processor) ECA
(R) Low idle Revolutions Per Minute (RPM)
21 Engine Coolant Temp. (ECT)(run for 2 minutes and retest)
22 Manifold Absolute Pressure (MAP) sensor out of range
23 Throttle Position Sensor (TPS) out of range or throttle set too high
24 Air Charge Temp Sensor (ACT)out of range (84-86 with Vane meter) Vane Air Temperature (VAT) sensor out of range
25 (R) Knock sensor not tested (ignore if not pinging)
26 Vane Air Flow sensor out of range
27 (M) Vehicle Speed Sensor problem (see 29)
28 Vane Air Temp sensor out of range
29 Vehicle Speed Sensor (VSS) problem (clear memory and test drive to confirm)
31(OR) EGR Valve Position or Pressure Feedback EGR Transducer (PFE) sensor out of range
(M) Intermittent EGR Valve Position (EVP) or Pressure Feedback (EGR) Transducer (PFE) signal (poss open or short to gnd.)
32 (O) EGR Valve Position (EVP) sensor signal too low or EGR valve problem
(R.M) Pressure Feedback EGR or (EVP) lower than normal
33 (R) EGR did not respond during test
(M) EGR Valve Position (EVP) was out of range
34 (O) MPFE: Low exh.press., blocked sensor tube or bad sensor EGR Valve Position (EVP): If CODE 84 PRESENT GOTO 84
(R) Cars with EGR cont/ vent solenoids: EGR not controlling Cars with EVR: EVP or FFE signal too high Cars with EGR cutoff solenoid: Remove shop exhaust hose and rerun test or perform output state check
(M) PFE equipped: check for blockage in PFE sensor tube EVP equipped: check EVP resistance while moving valve
35 (O) PFE or EVP too high or shorted to power
(R) Cars with EGR solenoids: RPM's too low to test EGR All others: Excess exhaust pressure (restricted?) blocked PFE tube or bad EVP, PFE sensor
(M) Intermittent EVP or PFE signal (poss open signal return or short to power)
38 (M) Idle Tracking Switch (ITS) signal was intermittent
39 (M) Intermittent in Lock-Up Solenoid (LUS) circuit
41 (R) System running lean (3.8L left if dual)(5.0L right)
(M) System was lean for 15 seconds or more
42 (R) System running rich (3.8L left if dual)(5.0L right)
(M) System was rich for 15 seconds or more
43 (R) Oxygen Sensor(EGO) not reading (Run engine at 2000 rpm's for 2 minutes and retest)/ check EGO voltage
(M) System was lean at Wide Open Thrott. for 3 sec. or more
44 (R) Thermactor air system not working
45 (R) Thermactor air not Diverting Thermactor Air Diverter (TAD)
46 (R) Thermactor air Bypass not working Thermactor Air By-Pass (TAB)
47 (R) Unmetered air getting around Air Flow box (low flow)
48 (R) Unmetered air getting around Air Flow box (high flow)
51 (O.M) Coolant sensor (ECT) signal too high or open circuit
52 Power Steering Press Switch/ circuit open
(R) Steering wheel not turned during test or PSPS problem
53 (O.M) Throttle Pos sensor too high (to power or stuck open)
54 (O.M) Air Charge Temp sensor input high or open circuit
(O.M) (84-86 with Vane meter) Vane Air Temperature (VAT) out of range/ open circuit
55 No Key Power (pin 5) to processor or charging system problem (undercharging or overcharging)
56 (O.M) Vane Air Flow sensor input too high (poss to power)
(R) Mass Air Flow sensor high or shorted to power
57 Intermittent in Neutral/ Drive Switch (NDS) circuit
58 (0.R) Idle Tracking Switch signal too high - switch or circuit open (opens when touching throttle)
(O.M) (87.88 with Vane meter) (VAT) out of range/ open circuit
59 (O.M) Automatic Overdrive Transmission (AXOD) 4/3 circuit fault (poss short to ground)
61 (O.M) Coolant (ECT) sensor too low or signal line grounded
62 (O) Automatic Overdrive Transmission (AXOD) 3/2 circuit short to ground
(R) Automatic Overdrive Transmission (AXOD) 4/3 circuit failure
63 (O.M) Throttle Position Sensor (TPS) sensor signal too low (grounded or open circuit)
64 (O.M) Air Charge Temperature Sensor (ACT) signal too low or signal line grounded
(O.M)(84-86 with Vane meter) Vane Air Temperature (VAT) out of range or grounded
65 (84 3.8L) (O.M) Battery volt too high (check for o' charging) (88)(M) Check intermittent Heated Exhaust Gas Oxygen Sensor (HEGO) orob (signal or ground)
66 (O.M) Vane Air Flow (VAF) signal low (poss short to ground or open)
(R) Mass Air Flow (MAF) sensor low (disconnected or grounded)
67 (O.R) MAKE SURE A/C IS OFF! - Neutral Drive Switch (NDS) circuit fault or WOT A/C Throttle (WAC) circuit
(O) (4.8L truck hold clutch in while running test)
(M) Intermittent Neutral Drive Switch (NDS) fault
68 (O.R) ITS closed or grounded
(O.M)(87.88 with Vane meter) (VAT) out of range or grounded
69 (O.M) Transmission Hydraulic Switch-3rd/2nd Gear THS-3/2 circuit short to ground
71 (M) Intermittent Idle Tracking Switch (ITS) (if equipped) or intermittent Vehicle Supply Voltage, Power (VPWR) Circuit (pins 37 + 57) (poss power relay problem) or Electronic Control Assembly (Processor) (ECA) case ground (pin 20 to case and/ case to chassis should be 5 ohms or less)
72 (R) No Manifold Absolute Pressure (MAP) change in "goose" test
(M) See 71
73 (R) Throttle Position Sensor (TPS) did not change in "goose" test (must get 25%)
(O) Rerun test, if 73 is still output replace Throttle Position Sensor (TPS)
74 (R) Brake-on-off Switch (B00) Did

not step on brk during test or 800 short to gnd
75 (R) (B00) signal shorted to power (brake light switch stuck on?)
76 (R) Vane Air Flow (VAF) did not respond to "goose" test
77 (R) System did not receive "goose" test or throttle was touched during balance test
78 (M) See 71
79 A/C is on or A/C clutch wire is shorted to power 89 series: CIRCUIT OR SOLENOID PROBLEMS
81 Boost control solenoid or Thermactor Air By-Pass (TAB)/ Thermactor Air Diverter (TAD) solenoid
82 Electro-Drive Fan EDF signal wire shorted to ground or Thermactor Air By-Pass (TAB)/ Thermactor Air Diverter (TAD) solenoid
83 High Speed Electro-Drive Fan HEDF circuit fault or Exhaust Gas Recirculation EGR solenoid
84(O.R) Solenoid/ circuit fault for Electronic Vacuum (or Voltage) Regulator (EVR) Exhaust Gas Recirculation (EGR) cutoff solenoid or Exhaust Gas Recirculation (EGR) solenoids, which ever is present
85 (O.R) Shift solenoid 3/4-4/3 or circuit fault Canister Purge (CANP) solenoid or circuit if equipped
(M) System has corrected a rich condition
86 (M) System has corrected a lean condition
87 (O) Fuel pump relay/ circuit fault (check inertia switch)
(M) Intermittent in fuel pump circuit (Escort with automatic seat belts normal IN MEMORY due to wiring)
88 Throttle Kicker Solenoid. Variable Voltage Choke (VVC) relay. Electro Drive Fan circuit fault or Converter Clutch Override (CCO) solenoid, whichever is present
89 Converter Clutch Override (CCO) solenoid Lock Up Sole noid (LUS) or Exhaust Heat Cross-over (EHC) solenoid, whichever is present
90 System pass during balance test 91, 92, 93, 94 fuel codes: see also 41, 42, 43, 44
91 (R.M) System running lean (3.8L right if dual)(5.0L left)
92 (R) System running rich
93 (O) Throttle linkage binding or bad Idle Speed Control (ISC) (motor)
(R) Oxygen sensor Exhaust Gas Oxygen Sensor(EGO) not reading (3.8L R. 5.0L L.)(See 43)
94 (R) Thermactor air not working
95 (O) Fuel pump: open circuit, bad ground or always on
(R) Thermactor air not Diverting
(M) Poss. bad fuel pump ground or open circuit between fuel pump circuit and pin 8 at Electronic Control Assembly (Processor) (ECA) (Fuel Pump Monitor signal)
96 (O) Fuel pump not getting power when activated
(R) Thermactor air Bypass not working (3.8L R. 5.0L L.)
(M) Service 27 code first if present) Fuel pump relay or battery power feed was open (wiggle power connections while running and check for stall)
98 (R) Vehicle did not pass Key On Engine Off (KOEO) test (Get !! in KOEO first)
99 (R) Idle Speed Control (ISC) needs to lean (idle 2 minutes, erase mem and retest)

CHECKING CANISTER PURGE VALVES

These valves, used on late carburetor equipped GM vehicles, vent fuel vapors from the carburetor bowl to the charcoal canister. They also control the purging of the bowl vapors from the canister along with any fuel vapors accumulated in the canister from the fuel tank.

When the valve is operating properly vapors are permitted to enter the intake manifold only when certain engine speeds and temperature conditions are attained.

When purge valve failure occurs fuel mixtures become very rich, stumble on acceleration, poor fuel mileage and flooded charcoal canister and overheating of the exhaust catalytic converter can occur.

Two types of external canister purge valves have been used by GM.

Single Diaphragm Type Valve

When the engine is not running, spring tension holds the valve open. This allows venting of the float bowl. When the engine is running, manifold vacuum pulls the plunger up to close the valve. see fig.#4

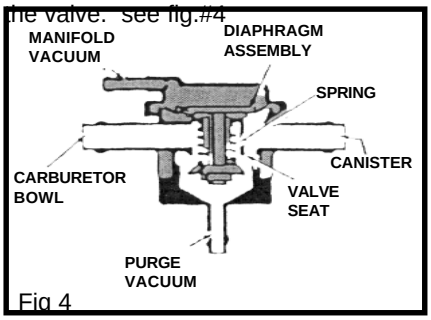


Fig 4

Double Diaphragm Type Valve

When the engine is running, manifold vacuum from the positive crankcase ventilation (PCV) System pulls the lower diaphragm upward to shut off venting of the float bowl. When the engine is running above idle speed, control vacuum pulls the upper diaphragm upward to allow purging of the canister through the PCV System.

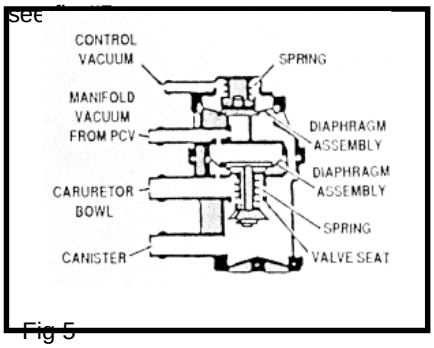


Fig 5

OFF THE CAR TESTS

Use a hand operated vacuum pump such as shown IN FIG. 6. A short rubber hose helps in blowing through the connection with lung pressure to check if the valve operates properly.

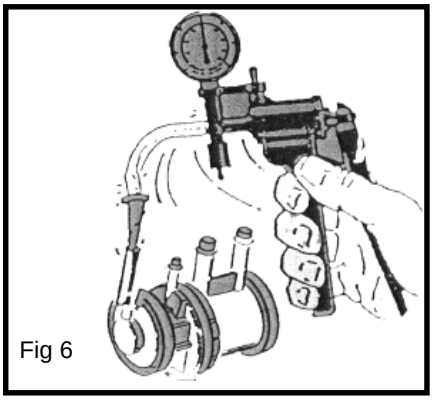


Fig 6

TESTING THE SINGLE DIAPHRAGM TYPE VALVE

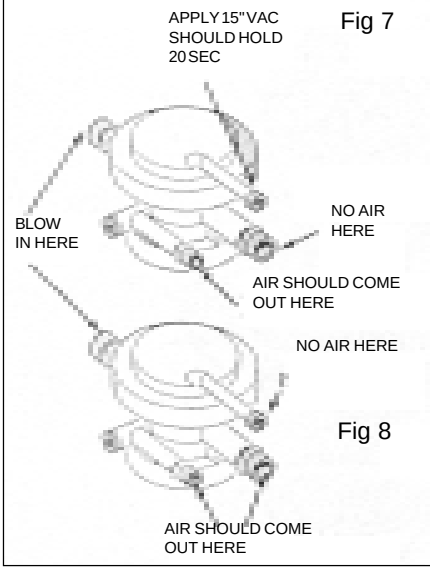


Fig 7

Fig 8

TESTING THE DOUBLE DIAPHRAGM TYPE VALVE

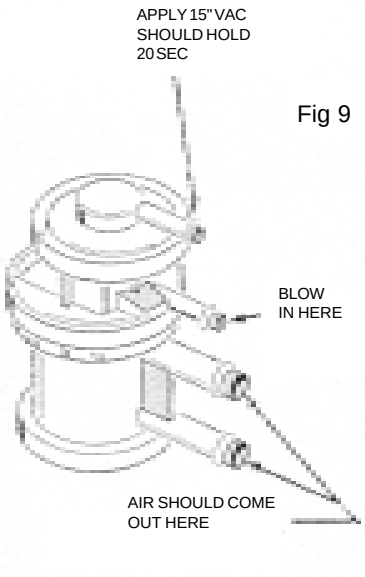


Fig 9

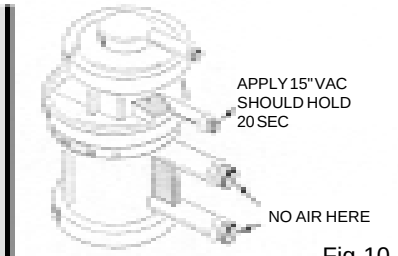


Fig 10

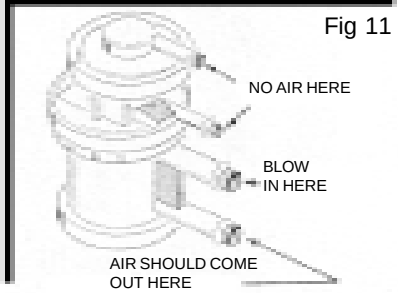


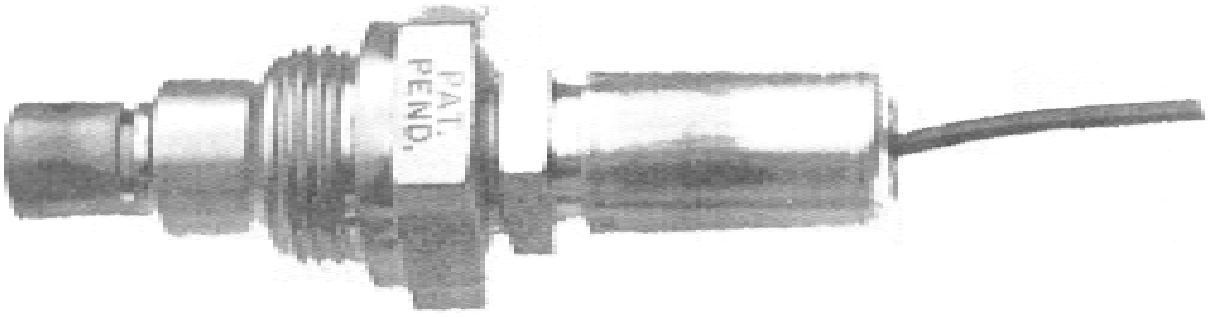
Fig 11

Fuel in the valve or hoses may come from condensation of fuel vapors and is not always an indication of a defective valve. Most problems have been due to ruptured diaphragms.

Any vacuum leak, pinched or kinked hose or intake manifold leak will upset the system. Either the ECM or Oxygen sensor, or both, will receive an incorrect signal causing their output to also be in error. The end result could be driveability complaints and higher than normal exhaust emissions.

A complete check of connecting hoses - PCV valves charcoal canister and its filter should be made when servicing the canister purge valve.

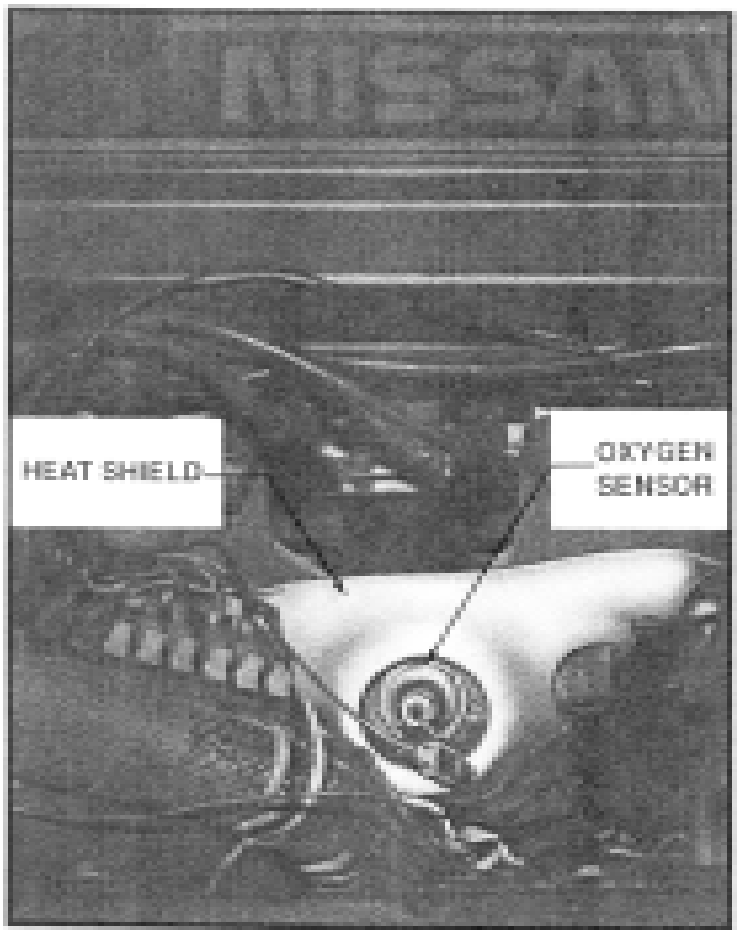
NEW PLATINUM II O_2 SENSOR

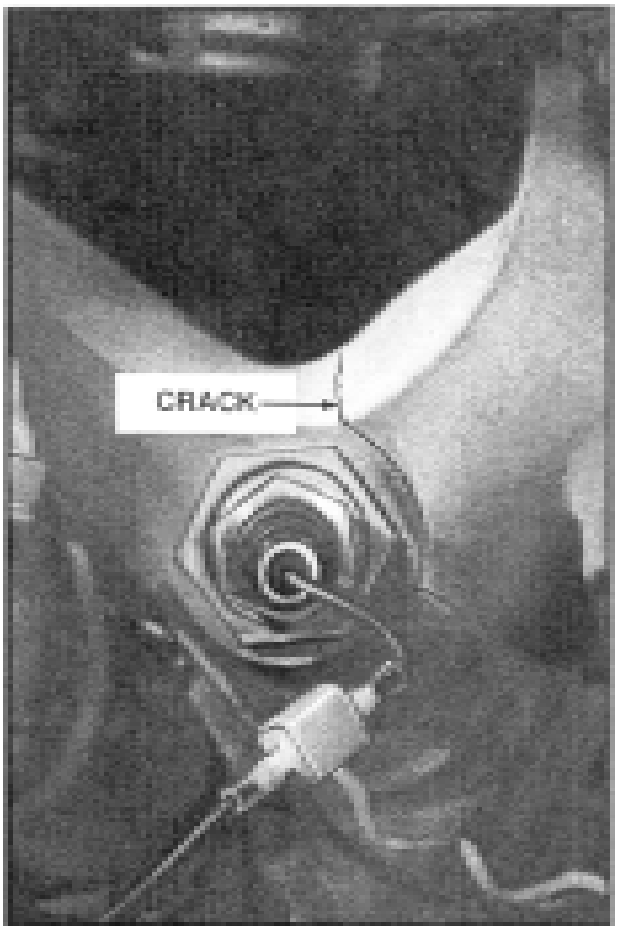


The oxygen or O2 sensor is a very critical sensing device in the automotive computer circuit. It functions as an electrical generator using exhaust heat and the presence or absence of oxygen to create a low voltage signal to the computer. As it senses oxygen in the exhaust system, it sends a voltage signal of 200 millivolts to 1 volt to the computer - indicating that the exhaust mixture is rich or lean. The sensors ability to switch quickly from a low to a high voltage is an important operating function.

Tomco's Platinum II Sensor has been designed to have the fast switching characteristics needed to operate todays high speed computer systems. The new Platinum II sensors compact design eases installation on those hard to get at locations.

EXHAUST AIR LEAKS BADLY AFFECT OXYGEN SENSOR OUTPUT





Recently we encountered a problem of an O2 sensor that always indicated a low voltage (Lean fuel mixture) when checked with a voltmeter. A slight exhaust leakage sound could be heard. The area around the manifold was covered by a sheet metal heat shield. A hairline crack in the manifold became visible when the shield was removed.

Most mechanics think of the exhaust system as having only positive pressure.

With the valve overlap present in modern engines a low pressure pulse exists in the exhaust manifold that can draw in oxygen and cause the O_2 sensor to deliver a lean (low voltage) signal to the computer.

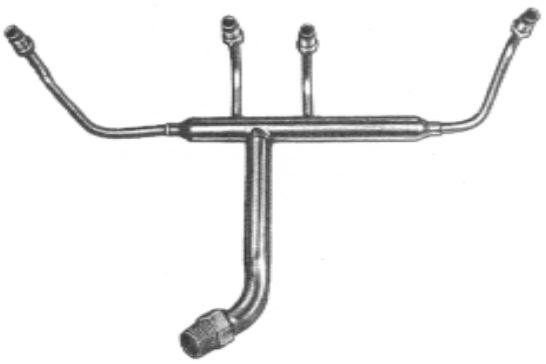
Replacment of the exhaust manifold fixed the problem.

(A.I.R.)INJECTION TUBES

A.I.R. Injection Tubes distribute air from the air pump to the exhaust system to help reduce harmful emissions. Because of the corrosive effect of exhaust gases, they rust through causing an exhaust leak.

Inspect for rust and exhaust leakage with engine running.

With engine off, grasp the tubes and check to see if they are still tight and in good condition.



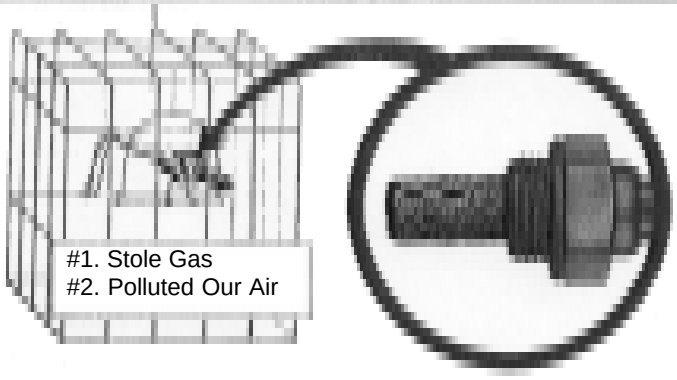
A.I.R. Injection Tubes often develop leaks and thin sections due to the corrosive effect of gases and may break off when moved during other engine service. They are in the same system as A.I.R. Pump Check Valves and should be checked when an A.I.R. Pump Check Valve is replaced.

FUEL INJECTION MANUAL T1-90

It always seems easier to diagnose and fix a mechanical problem if one understands how the device or engine system operates. Tomco's Electronic Fuel Injection Manual is designed to promote a better understanding of these computer controlled fuel systems. Our recent updated issue now contains over 900 pages cover the diagnosis and testing of domestic and import cars, light trucks and vans through the very latest models. Each fuel injection system is covered by a theory of operation section, a trouble-shooting guide, pressure, voltage and resistance specifications and complete fuel system wiring diagrams. This manual has been used as a text in fuel injection clinics held across the country. The T1-90 replaces the earlier T1-89 issue.

Contact TOMCO for ordering information.

THIS BIRD WAS JAILED ON 2 COUNTS



A BAD Oxygen Sensor STEALS GAS And POLLUTES

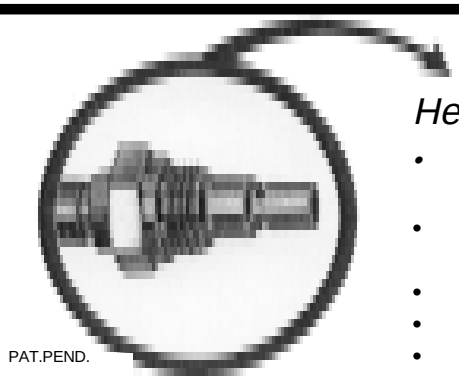
PROBLEM:

- It Works In The RED HOT Corrosive Exhaust.
- Leaded Fuel, Anti-Freeze, Excessive Oil Burning and Silicone Sprays Poison It.

A Sluggish Or Dead Oxygen Sensor...

- Wastes As Much As 3 Out of Every 10 Gallons Of Gas.
- Pollutes The Air.
- Ruins Catalytic Converters.

SOLUTION: Replace Oxygen Every 25,000 Miles With.... TOMCO'S NEW PLATINUM II SENSOR



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- Faster Action Saves Gas.
- Reduces Pollution
- Engineered For All Domestic And Import Cars.

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