

Scan Tool Test Procedures

Steve Zack - SPX



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PCM Input Tests

- While performing many of these tests, to obtain the fastest possible Datastream refresh rate, please select “Custom Datastream” from the Diagnostic Menu, and only select and display the PID’s you are using for your diagnostic strategy.

MAP Sensor Test

- 1) Scan Tool Datastream
 - Map Sensor Voltage
- 2) KOEO
- 3) Attach Vacuum Pump To Map Sensor Vacuum Port
- 4) 0 Vacuum, 3.9 To 4.7 Volts
- 5) 18 To 20 Inches Vacuum, .8 To 1.5 Volts

- Purpose of this test is to test sensor function.
- KOEO attach a hand held vacuum pump to the MAP Sensor nipple. Readings should match your altitude. The voltage output varies with altitude and vacuum at the sensor.

Cranking Vacuum/Pressure

- Cranking Vacuum can be tested using the MAP Sensor
- Place the engine in clear flood and crank the engine
- The voltage or pressure should decrease in response to vacuum

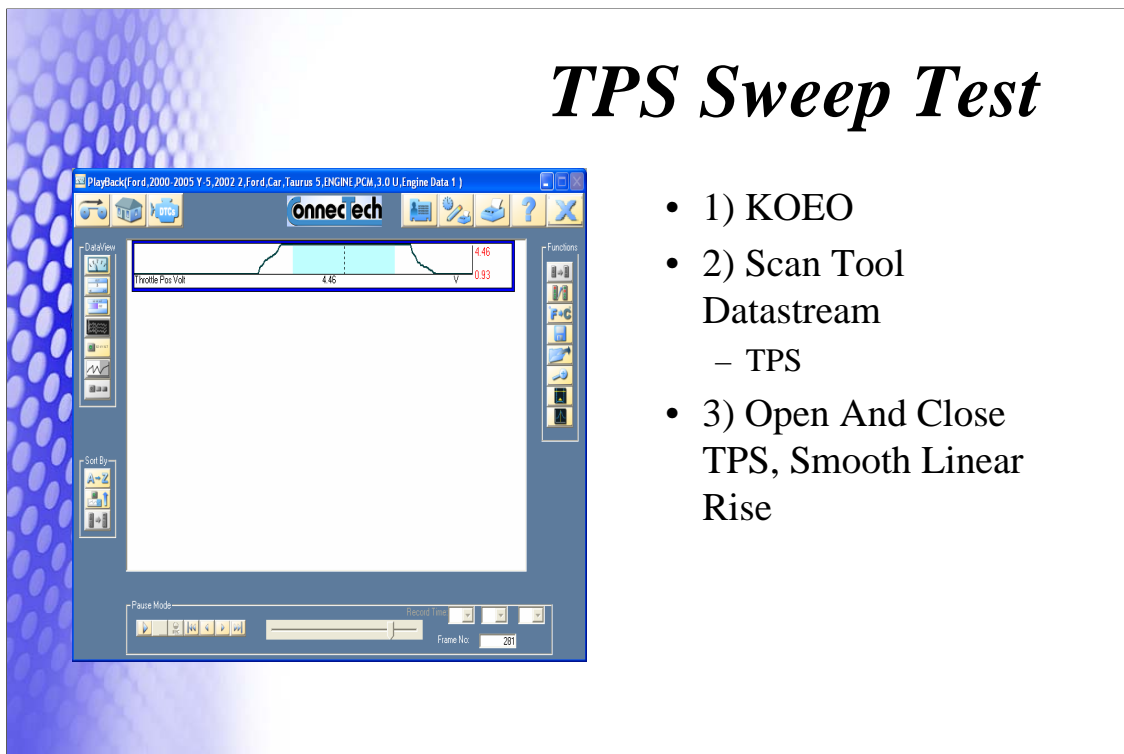
- Purpose of this test is to verify cam to crank timing
- Cranking Vacuum can be tested using the MAP Sensor.
- Graphing the MAP Sensors response while cranking should show a decrease in voltage and pressure.
- The voltage or pressure should decrease in response to vacuum.
- The voltage decreases about .3 volts indicating a good engine vacuum increase.
- The pressure drops about one PSI in the response to the negative pressure created behind the throttle plates.
- Negative pressure is considered vacuum by all standards.
- GM/Chrysler equipped with clear flood, turn key to on, press throttle to floor, then crank, if clear flood equipped it will not start.
- Non clear flood equipped vehicles pull the fuel pump fuse or relay.
- Ford, in the trunk or in the right kick panel is a Fuel Pump Roll over relay, at the top is red button which on running car will be in set about 1/4", slam it with your fist and the red button will pop up, and the fuel pump is now disconnected. crank the engine to clear the rail of fuel before starting the test at the end of the test push the red button in to start the engine.

Reaction Testing

- Testing the TPS against the MAP sensor shows the response of the sensors
- Snap the Throttle wide open
- MAP Sensor and TPS should follow one another.
- This test will verify CAM to Crankshaft timing
- The MAP test results show a good response to the snap throttle and shows the engine is breathing correctly

- Purpose of this test is to verify cam to crank timing
- Testing the TPS against MAP sensor shows the response of the sensors.
- Snap the throttle wide open, KOER.
- They should follow one another.
- This test is also used to show;
 - 1) TPS sensor reaches wide open throttle readings.
 - 2) TPS sticks when closing.
 - 3) MAP shows a good response to change and shows a good breathing engine.

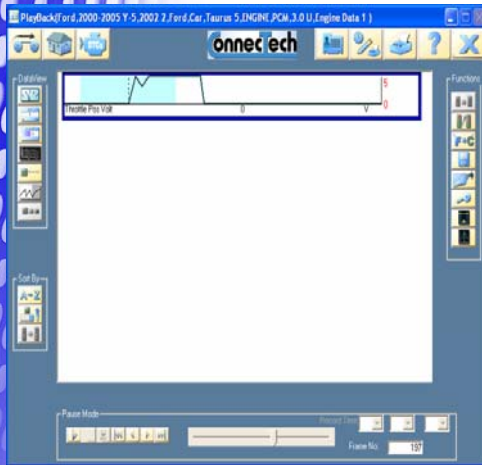
TPS Sweep Test



- 1) KOEO
- 2) Scan Tool
Datastream
– TPS
- 3) Open And Close
TPS, Smooth Linear
Rise

- Purpose of this test is to test sensor function.
- Graph TPS Sensor on the Scan Tool.
- It will also record the min and max voltages along with a voltage setting that the vehicle must exceed for wide open throttle.

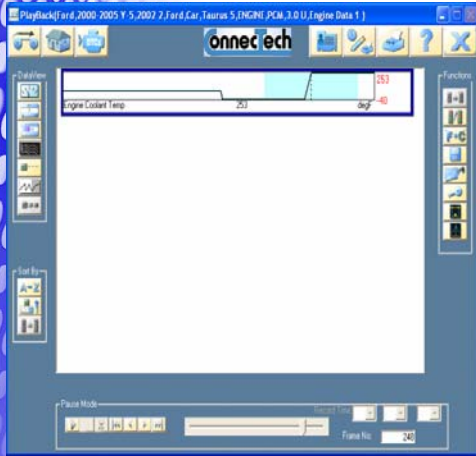
Three Wire Testing



- Check Reference Voltage
 - Specification, 4.9 to 5.1 volts
- Check for proper ground
 - Specification, less than .050mv
- Short VREF pin and Signal pin together
 - Datastream should read the same as VREF
- Short signal pin and ground pin together
 - Datastream should read zero

- Purpose of this test is to test sensor circuit.
- Reference Voltage for the sensor should range between 4.9 to 5.1 volts.
- Check for proper ground at the three wire sensor, it should be under .050 volts.
- Short the VREF to the signal wire, it should register the reference voltage at the scan tool. This checks the Voltage supply circuit and the PCM ability to read the signal.
- Shorting the signal to ground checks the ground circuit, the scan tool will display 0.

Two Wire Sensor Testing



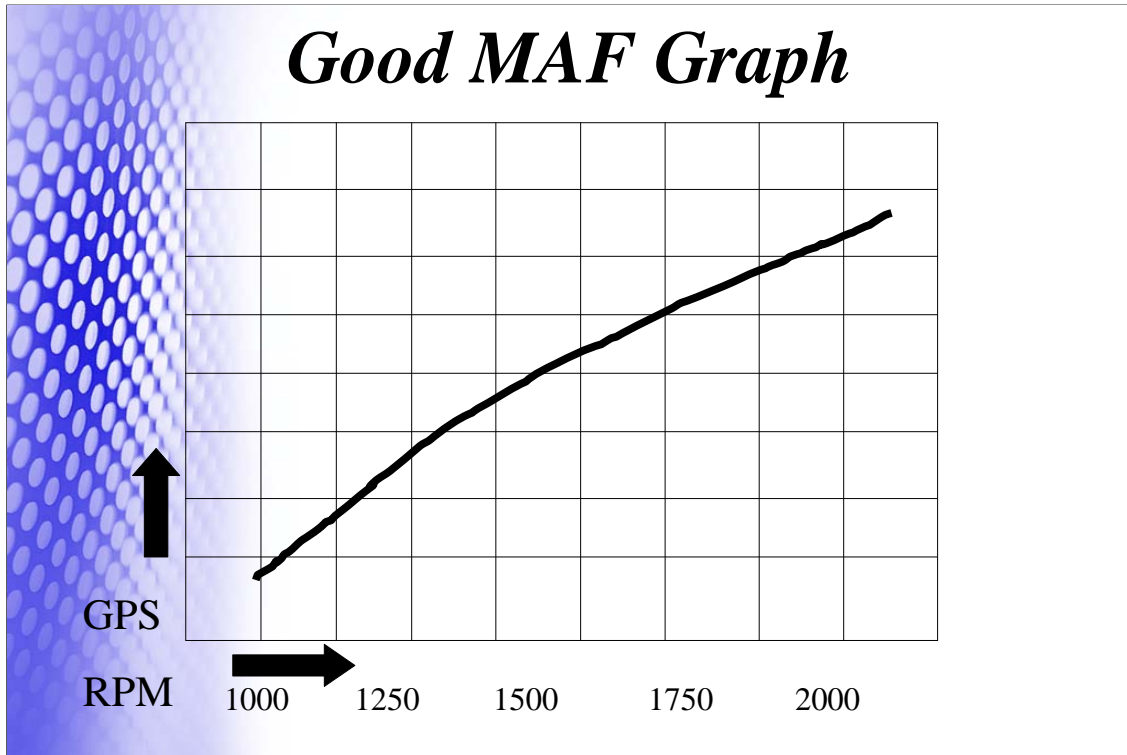
- **Disconnect the sensor**
- **Check supply voltage**
 - Specification, 4.6 volts
- **Scan tool data should display – 40°F**
- **Short the two pins connector together**
 - DVOM should display be less than .050 mv
- **Scan tool data should display above 260°F**

- Purpose of this test is to test sensor circuit.
- The voltage supply should be 4.6 volts or above. Some computer systems will display a reading of around – 40°F at the Scan Tool when the connector is disconnected.
- Second test is to check if there is a good ground circuit back to the computer. Short across the connector and check the voltage, it should be under .050 Volts. This will show at the Scan Tool as 0 volts. Some vehicles reading for a shorted connector will be above 290° F. This indicates a good ground for the sensor all the way back to the computer.
- Some vehicles will use a default reading when performing this test, make sure the voltages readings are correct.

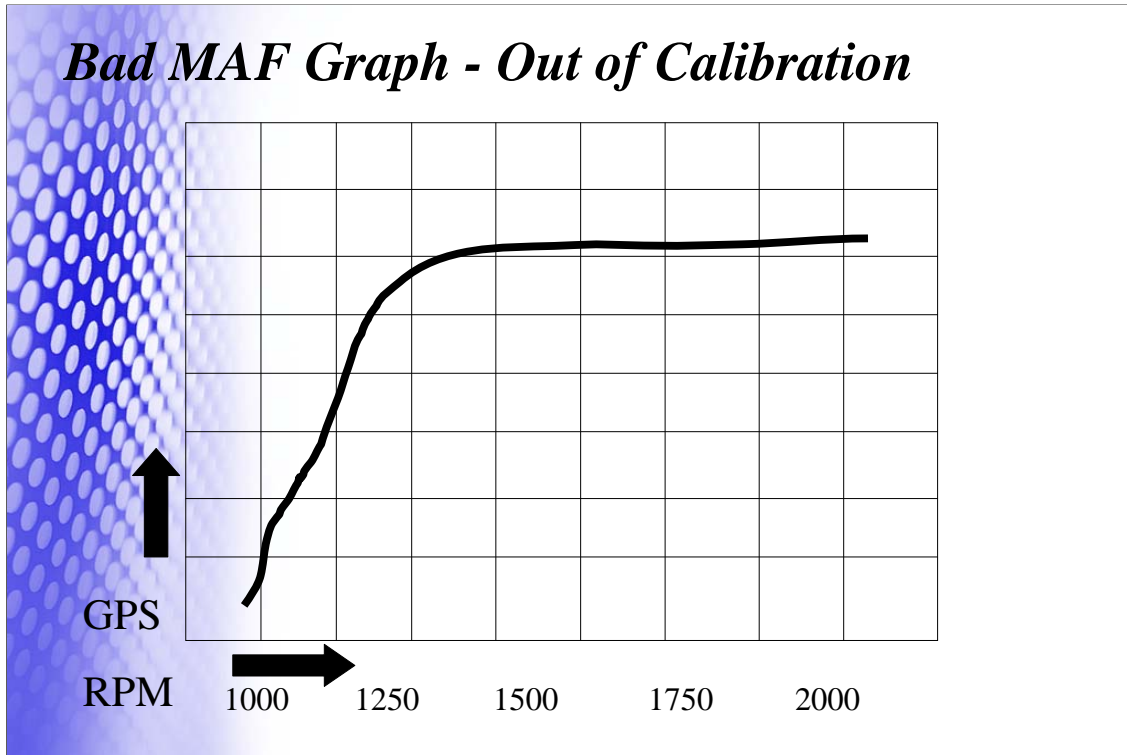
MAF Test

- 1) KOER, Engine At Operating Temperature
- 2) Scan Tool Datastream
 - MAF GPS
 - (Frequency or volts may be substituted for GPS)
- 3) Mark Points Of MAF GPS On Graph Paper
 - 1000 Rpm
 - 1250 Rpm
 - 1500 Rpm
 - 1750 Rpm
 - 2000 Rpm
- 4) Connect Plot Points, Graph Line Should rise Smoothly

- Purpose of this test is to test sensor function.
- Graph the MAF in GPS, Frequency or Voltage to allow plotting of readings.
- Pick one and graph the readings at 250 RPM increments from 1000 RPM.
- The graph plot points should be in a straight line.

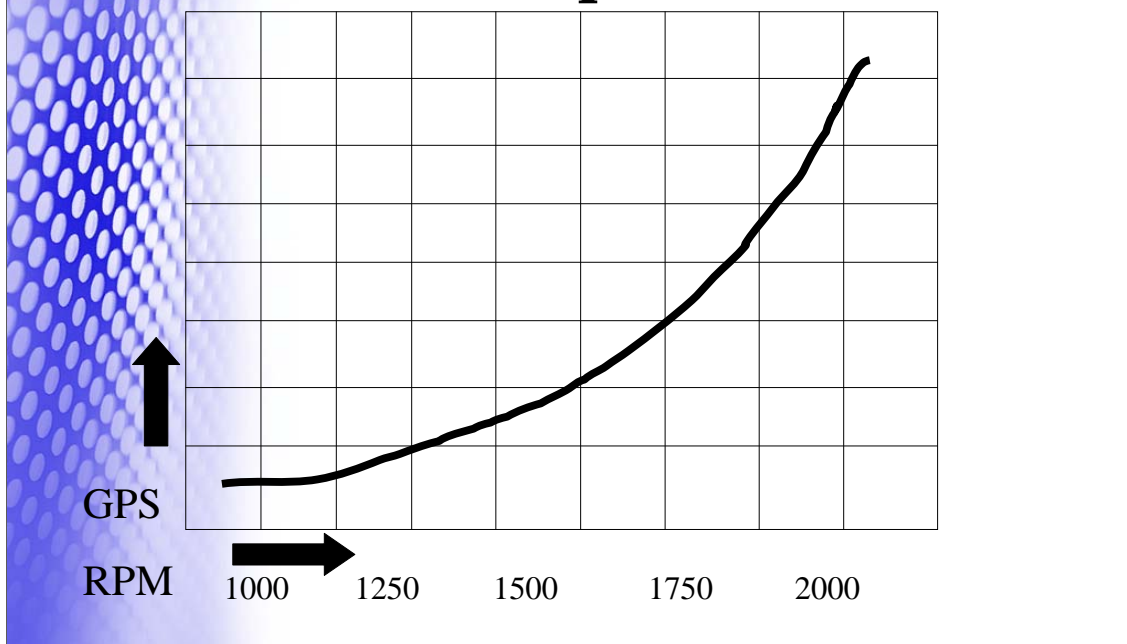


- This graph shows a good MAF as it increases with speed in a linear graph pattern.
- The TPS and MAF should follow each other with RPM increases.
- Adding a graph reading of LTFT will give an idea if the MAF is out of calibration.
- If there is a large difference in the LTFT from idle to cruise, it could mean there is a contaminated MAF sensor.



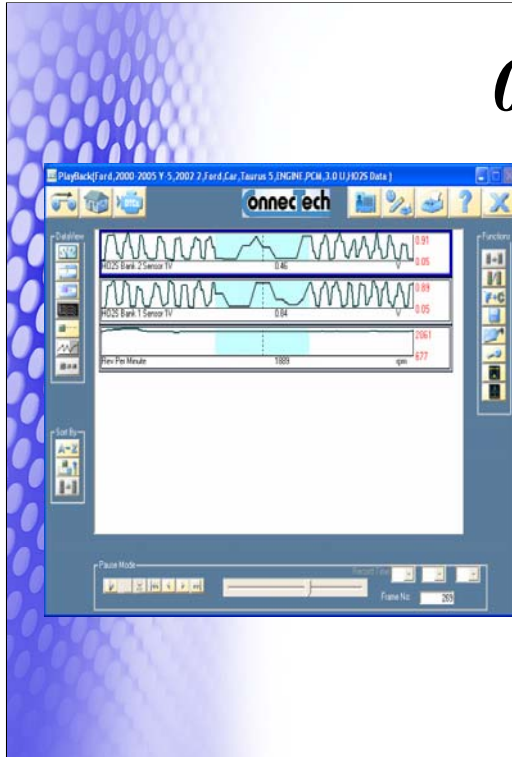
- This graph would give low power or acceleration symptoms.
- The MAF Sensor output increases too fast in reaction to increase in RPM.
- The PCM would quickly increase injector pulse-width at the lower end of the RPM scale causing a acceleration problem.
- The MAF Sensor maybe out of calibration.

Bad MAF Graph - Air Leak



- Check for dirty sensing wire on the MAF Sensor.
- This graph shows either dirty sensing wire or an air leak affecting the MAF Sensor.

02 Sensor Testing



- 2004 Pathfinder Software
 - Custom Display
 - 4 Samples per Second
 - Highlight, Select and Graph HO2S Bank 1 and 2 Sensor 1
 - Perform for each front fuel trim O2 sensor
 - Specification for Good O2 Sensor: 10 cycle from 200mv Lean to 800mv Rich and then Rich to Lean in 1 second, at 2000 RPM hot engine
 - 184 frames in the scan tool display window, divided by 4 samples per second, equals 46 seconds of record time. Datastream should display a minimum of five O2 Sensor cycles from 200mv Lean to 800mv Rich and then Rich to Lean, at 2000 RPM hot engine

- Purpose of this test is to test sensor function.
- Scroll to Custom Data Stream, Highlight, Select and Graph HO2S Bank 1 and 2 Sensor 1.
- Specification for a Good O2 Sensor: 10 cycle, 1 each of rich and then lean, from 200mv Lean to 800mv Rich and return to lean from 800mv to 200mv for a total of 10 in 1 second, at 2000 RPM hot engine, each swing up or down must be completed in less than 100ms.
- OBD II Global 2 samples second 92 seconds record time with a minimum of 9 O2 Swings up and down.
- OBD II OEM 4 Samples Second 46 seconds record time with a minimum of 5 O2 swings up and down.
- CAN OEM 7 samples second 26 seconds record time with a minimum of 3 O2 swings up and down.

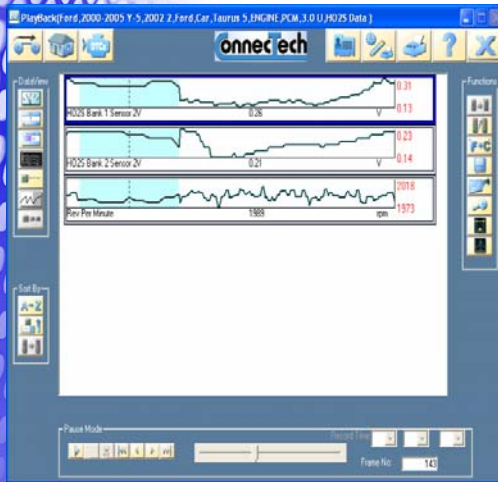
Frames/samples rate=second/10=O2 swings

O2 Sensor Propane Test

- O2 Sensor propane enrichment test
- Select, graph and zoom the Fuel Control O2 sensors
- Add propane to enrich the mixture.
- O2 voltage should increase above .91 volts, preferably 1.0 volt.
- Keep adding propane until RPM drops, to obtain maximum output
- Shut off the propane to see how fast the voltage decreases.
- It should decrease in a straight line

- Purpose of this test is to test sensor function.
- Perform a propane enrichment test to see if the O2 sensor is working properly.
- Graph the O2 sensors.
- Propane enrichment increases the O2 output above .91 volts, or higher towards 1.0 volts.
- Keep adding propane until the RPM decreases to obtain the maximum output.
- Then remove the propane to see how fast the voltage decreases. It should decrease in a straight line.

Cylinder Misfire Testing



- Engine at operating temperature
- Vehicle at cruise speed
- Monitor rear or post HO2S
 - Base line voltage .430mv to .470mv
- Rear HO2S voltage high
 - Secondary Ignition miss fire
- Rear HO2S voltage low
 - Lean Injector miss fire

- Purpose test is to determine the cause of a cylinder misfire.
- Tests for clogged injectors or Ignition Misfire by watching the rear O2 sensor output.
- Monitor rear or post HO2S
 - Base line voltage .430mv to .470mv
- If rear HO2S voltage is high;
 - Secondary Ignition miss fire
- If rear HO2S voltage is low;
 - Lean Injector miss fire



PCM Control Tests

Fuel Trim

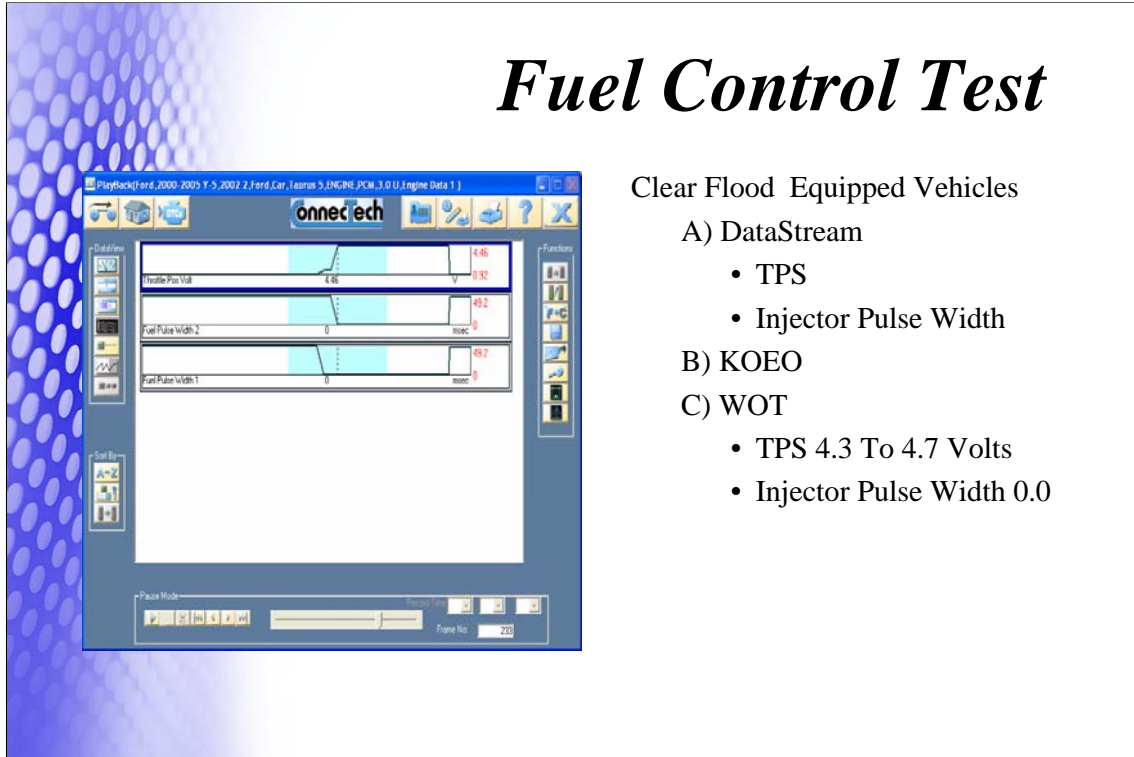
<u><i>IDLE</i></u>	<u><i>2500 RPM</i></u>	<u><i>Possible Cause</i></u>
Rich	Ideal	Vacuum Leak
Ideal	Rich	Low Fuel Volume
Rich	Rich	Low Fuel Pressure
Lean	Ideal	Contaminated Crank Case
Lean	Lean	Leaking Injectors

- Possible cause of STFT - fuel trim that is out of calibration.
- OBD II O2 monitor may pass yet the vehicle exhibits driveability complaints or fails emissions.
- Even though the O2 sensor is switching slowly the OBD II monitor only looks at 1.1 times per second as good.

The minimum for true catalyst function is 1 time in less than 100ms.

- +10, + plus numbers on STFT means the PCM has received a lean signal from the HO2S sensor and the PCM will command the Injector Pulse Width to wide for a rich correction.
- -10, - minus numbers on STFT means the PCM has received a rich signal from the HO2S sensor and the PCM will command the Injector Pulse Width to narrow for a lean correction.

Fuel Control Test



Clear Flood Equipped Vehicles

A) DataStream

- TPS
- Injector Pulse Width

B) KOEO

C) WOT

- TPS 4.3 To 4.7 Volts
- Injector Pulse Width 0.0

- Purpose of this is to verify PCM Fuel Control.

Graph TPS and IPW.

- To obtain clear flood mode, if the vehicle is equipped, turn the key to on and press the throttle to the floor, you are now in clear flood mode.
- Watch the TPS and Injector Pulse-Width at the same time while slowly opening the throttle.
- At about 4.3 to 4.7 volts on the TPS the Injector Pulse-Width should be at 0 on vehicles that support Clear Flood Mode.
- This test sees if the PCM has Fuel control capabilities based on TPS input.
- Chrysler vehicles will clear flood at 2.60 volts above stored minimum TPS voltage.

Scan Tool Fuel Control Test

- 1) Disconnect HO2S
- 2) Datastream
 - HO2S
 - Injector Pulse Width
- 3) Volt Meter at Signal Return Wire of the O2 sensor
- 4) KOER, Engine at Operating Temperature, 1000 Rpm
- 5) Place One Finger On HO2S Signal Return Wire to the PCM
- 6) Place Another Finger at Battery Positive
 - Datastream HO2S - 1 Volt
 - Datastream Injector Pulse Width - Will Drop
 - Volt Meter HO2S - 0 Volt
- 7) Place Finger At Battery Negative
 - Datastream HO2S - 0 Volt
 - Datastream Injector Pulse Width - Will Rise
 - Volt Meter HO2S - 1 Volt

- Purpose this test is to verify PCM Fuel Control based on O2 input.
- Using the battery and the resistance of your body, touching the Positive battery post and the signal return wire to the PCM will give a signal of about 1 Volt. The injector pulse-width should decrease as the PCM sees a Rich condition leaning the mixture.
- Touching the Negative battery post will send a lean O2 signal to the PCM, which then increases Injector pulse-width to richen the mixture.

Scan Tool Fuel Control Test

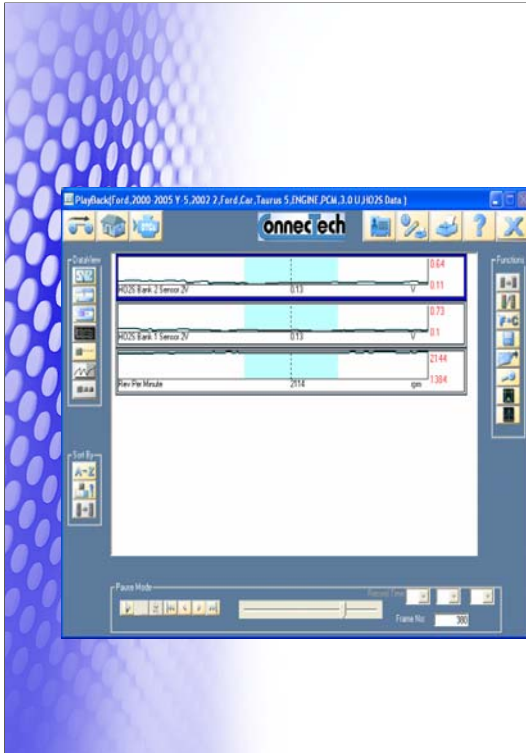
- 1) Datastream
 - HO2S
 - Injector Pulse Width
- 2) Attach a propane enriching device after the MAF Sensor
- 3) KOER, Engine At Operating Temperature, 1000 Rpm
- 4) Open propane bottle
 - Datastream HO2S - 1 Volt
 - Datastream Injector Pulse Width - Will Drop
- 5) Close propane bottle
 - Datastream HO2S - 0 Volt
 - Datastream Injector Pulse Width - Will Rise

- Purpose this test is to verify PCM Fuel Control based on O2 input.
- Add propane to create a rich mixture, the O2 voltage will rise and the PCM will decrease injector pulse width.
- When the propane is turned off the mixture will be lean, O2 voltage will drop and the PCM will increase injector pulse width



PCM Output Tests

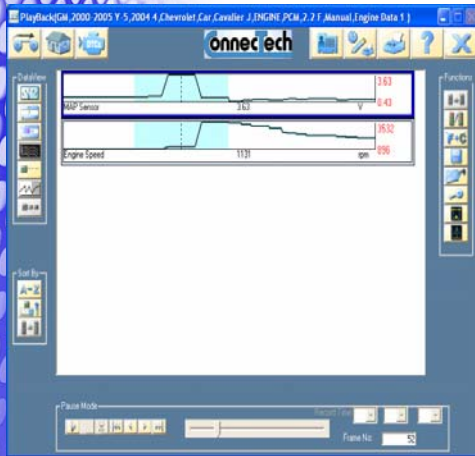
Catalyst Test 1



- 1) Engine at Operating Temperature
- 2) All Basic Engine Functions Must Be in Good Working Order
- 3) Raise Engine Rpm to 2000 and Hold Steady
- 4) 3 Minutes Minimum
- 5) Monitor HO2S Sensors Upstream and Downstream
- 6) Upstream Should Be Swinging Rich to Lean
- 7) Downstream Should Be Steady With Small Swing of 430 to 470 Mv

- Purpose of this test is to verify Catalytic function.
- The upstream O2 sensor should vary from under 200mV to above 800mV switching high and low.
- A good catalytic converter will keep the downstream O2 sensor switching in a very narrow range.

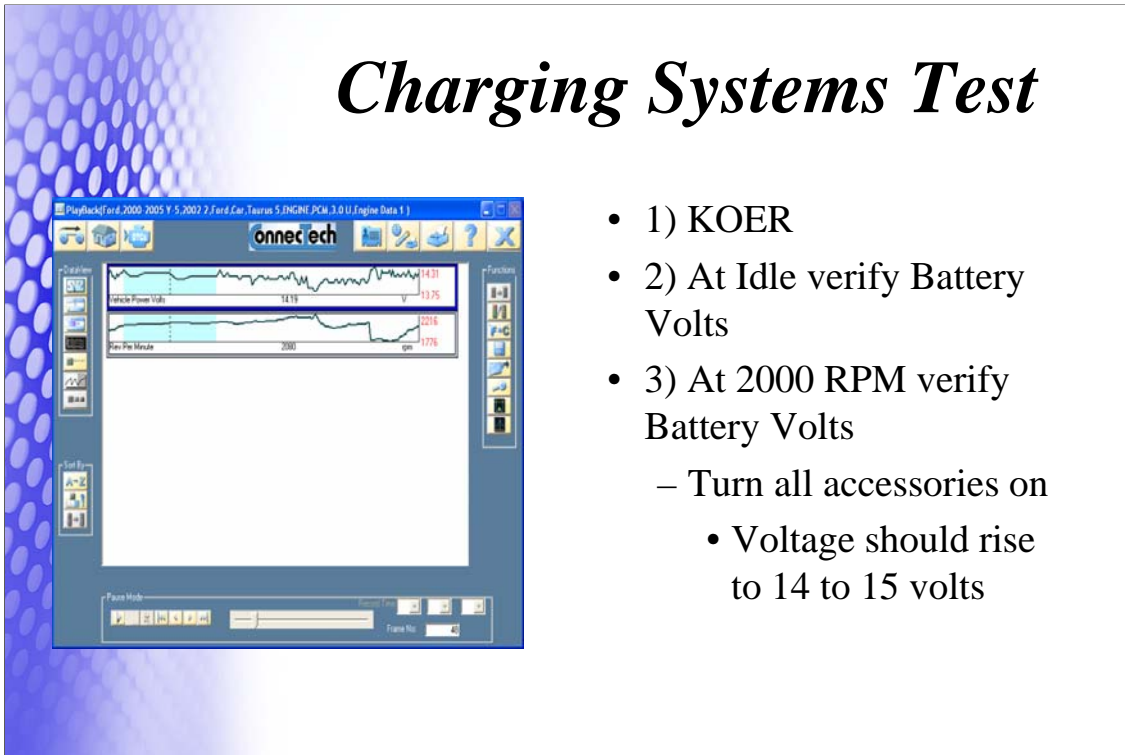
Catalyst Test 2



- To test for a plugged Catalytic Converter, highlight and graph MAP Voltage
- With the engine running at 2000 RPM for 3 minutes note what MAP Voltage is, it should be around 1.2 to 1.6 Volts
- Snap the throttle to wide open from 2000 RPM
- MAP Voltage will rise from 2000 RPM at wide open throttle to approximately 3.8 to 4.2 Volts
- When the engine returns to idle, MAP Voltage should return to 1.2 to 1.6 Volts in less than 3 seconds
- If it takes longer than 3 seconds the Catalytic Converter maybe plugged

- The purpose of this test is to test for a plugged Catalytic Converter.
- Highlight and graph MAP Voltage.
- With the engine running at 2000 RPM for 3 minutes, note what MAP Voltage is, it should be around 1.2 to 1.6 Volts.
- Snap the throttle to wide open from 2000 RPM.
- MAP Voltage will rise from 2000 RPM at wide open throttle to approximately 3.8 to 4.2 Volts.
- When the engine returns to idle MAP Voltage should return to the 1.2 to 1.6 Volts in less than 3 seconds.
- If it takes longer than 3 seconds the Catalytic Converter maybe plugged.

Charging Systems Test

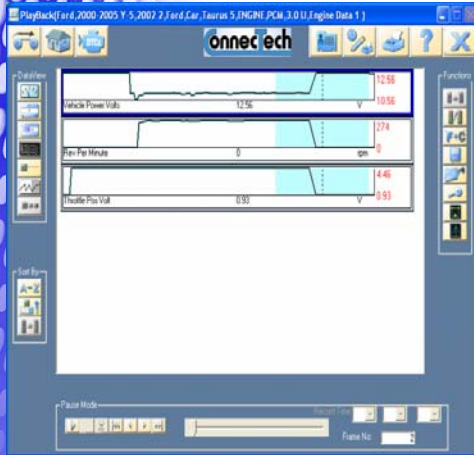


- 1) KOER
- 2) At Idle verify Battery Volts
- 3) At 2000 RPM verify Battery Volts
 - Turn all accessories on
 - Voltage should rise to 14 to 15 volts

• The voltage at idle should exceed 13.0. Many OEM's will give a target charging voltage.

• Turn all accessories on to create a demand on the charging system, to increasing Alternator output.

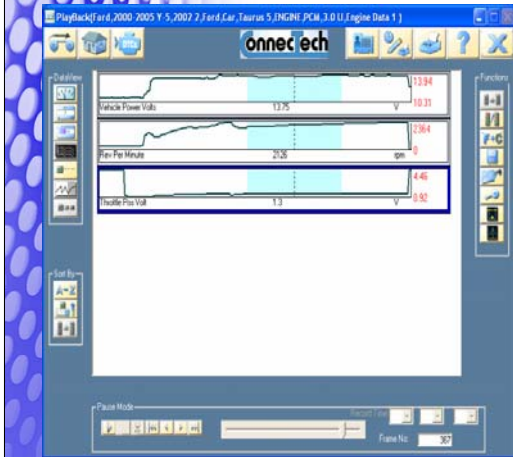
Cranking Voltage Test



- Record the voltage at start of test, KOEO
- Put the engine in Clear Flood mode
- Crank the engine for 15 seconds
- Cranking Voltage should not go under 9.6
- The time for the battery voltage to Recover from the results at the end of the test to the beginning of the test results must be less than 7 seconds

- The purpose of this test is to check battery condition and as a battery sulfation test.
- Note the Voltage before beginning this test.
- GM/Chrysler equipped with clear flood, turn key to on, press throttle to floor, then crank, if clear flood equipped it will not start.
- Non clear flood equipped vehicles pull the fuel pump fuse or relay.
- Ford, in the trunk or in the right kick panel is a Fuel Pump Roll over relay, at the top is red button which on running car will be in set about 1/4", slam it with your fist and the red button will pop up, and the fuel pump is now disconnected. crank the engine to clear the rail of fuel before starting the test. at the end of the test push the red button in to start the engine.
- Crank the engine for 15 seconds.
- The cranking Voltage should not go under 9.6 volts for a good battery and system.
- Recovery Voltage should come close to beginning voltage at the start of the test in less than 7 seconds.
- A long recovery time indicates a battery that may need to be replaced.

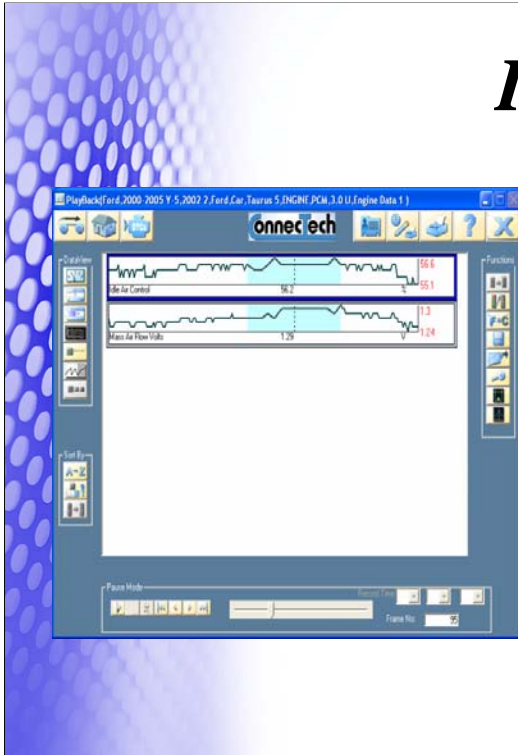
Charging Systems Test



- Put the engine in Clear Flood mode
- Crank the engine for 15 seconds
- Start the engine
- Apply load with all accessories on
- Increase engine speed to 2000 RPM
- Battery voltage should exceed 13.0

- GM/Chrysler equipped with clear flood, turn key to on, press throttle to floor, then crank, if clear flood equipped it will not start.
- Non clear flood equipped vehicles pull the fuel pump fuse or relay.
- Ford, in the trunk or in the right kick panel is a Fuel Pump Roll over relay, at the top is red button which on running car will be in set about 1/4", slam it with your fist and the red button will pop up, and the fuel pump is now disconnected. crank the engine to clear the rail of fuel before starting the test. at the end of the test push the red button in to start the engine.
- Crank the engine for 15 seconds.
- Start the engine, and immediately apply load with turning all accessories on, I.e. head lights, high beams, emergency flashers, rear defroster, blower fan, and then increase the engine speed to 2000 RPM
- Battery voltage should exceed 13.0

IAC Counts High



- High IAC Counts and LTFT over +10
 - MAP normal .8 to 1.5 Idle
 - Check ignition
 - Dirty intake valves, Injectors, or Throttle plates
 - Leaking EGR
 - Check fuel pressure and volume
 - MAP sensor high or MAF sensor low
 - Sticking IAC
 - Dirty intake valves, Injector, or Throttle plates
 - Check fuel pressure and volume
 - Low Manifold pressure or compression problems
 - IAC motor stuck open

- Possible cause of IAC Counts out of calibration.

- IAC Counts can indicate a problem with the Idle Air Control, if it is too high the throttle may need cleaning.

PCV problems can cause a low or high IAC Counts depending on the flow through the PCV.

- Low IAC Counts less than 6 may indicate a vacuum leak.

- Ford uses percentage, specifications are 10 to 40%, 20 to 35% is preferred.

- +10, + plus numbers on STFT means the PCM has received a lean signal from the HO2S sensor and the PCM will command the Injector Pulse Width to wide for a rich correction.

- -10, - minus numbers on STFT means the PCM has received a rich signal from the HO2S sensor and the PCM will command the Injector Pulse Width to narrow for a lean correction.

Bi-Directional Test

- 1) KOER
- 2) Setup datastream to read
 - Injector Pulse Width
 - HO2S
 - RPM
- 3) With scan tool controlling injector
 - Injector off
 - pulse width should drop
 - RPM should drop
 - HO2S should drop

- The purpose of this test is to use bi-directional testing to check the electrical and mechanical condition of a device.
- Injector balance test are used to determine injector fuel flow for rough running conditions and misfires.
- This is available in Special Tests under Fuel Control.
- Setup the screen to read and graph the Injector Pulse-Width, HO2 sensor for that bank, and the RPM.
- The injector disable test allows turning off injector to watch for a RPM loss and a decrease in Oxygen sensor readings.

Bi-directional Functional Test

- 1) Turn Device Normally Off To On
- 2) Device Activated
 - A) Ok Electrically
 - 1) Problem May Be Mechanical
- 3) Device Does Not Activate
 - A) Test B+ At Device
 - 1) Ok, Go To Step B)
 - 2) Bad, Repair B+ Circuit
 - B) Test B- At Device
 - 1) Ok, Replace Device
 - 2) Bad, Repair B- Circuit

- The purpose of this test is to use bi-directional testing to check the electrical and mechanical condition of a device.
- This test determines which circuit is at fault or if there is a mechanical error.
- Use a DVOM along with your scan tool for this test.
- The Power feed must be checked first at the B+ side of the device, it needs to be battery voltage.
- The device must have proper voltage supply and ground to work.
- The Next step, check the ground side of the device it needs to be at battery voltage KOEO.
- Activate the device and the voltage must go under 200mv when ground is supplied by the PCM.
- If there is no voltage changes, then the device is bad or there is a bad ground control circuit.
- Check the path from the device to the PCM, if it is OK then there maybe a bad driver in the PCM.

GM EVAP Test

- Remove fuel cap and verify tank pressure voltage, spec 1.3 to 1.7 or 0 inH2O
- Perform vent solenoid bi-directional test, block venting operation
- Apply vacuum to system using engine vacuum or an external vacuum source
- Obtain 5" of vacuum using tank pressure sensor reading
- Pinch off vacuum source and seal the system
- Monitor fuel tank pressure for 5 minutes in graph mode
- If decay is present save recorded time and decay info.
- Apply smoke to pinpoint the leak or apply very light pressure to system
- Use the HC readings of a 5 gas analyzer to pinpoint the leak.
- Repair and retest for decay of the system and compare to the previous recording

- The purpose of this test is to determine an EVAP leak.
- Remove fuel cap and verify tank pressure voltage should be 1.3 to 1.7 or 0 inH2O
- Using vent solenoid bi-directional test block venting operation. Apply vacuum to system using engine vacuum or an external vacuum source. Obtain 5" of vacuum using tank pressure sensor reading. Pinch off vacuum source and seal system. Monitor fuel tank pressure for 5 minutes in graph mode. If decay is present save recorded time and decay info. Apply smoke to pinpoint the leak, or apply very light pressure to system and use a 5gas with HC reading to pinpoint the leak. Repair and retest decay of the system and compare to previous recording.

Ford EVAP Test

- Key ON Engine Off
- Remove the connector from the Vacuum Management Valve
- Select Output Controls from Special Tests menu and then select All Outputs on
- Use an EVAP Smoke Machine to pressurize the system through the EVAP service port to check for leaks

- The purpose of this test is to determine an EVAP leak.
- Output Control allows the PCM to control the relays, solenoids, and actuators.

KOEO

- Remove the connector from the VMV - Vacuum Management Valve to prevent it from being turned on.
- Go to Special Tests and select Output Controls
- Select All Outputs ON
- Press Start to enter the test and turn the outputs on and off by selecting soft key (1) On and (0) Off, turn systems on.
- Use an EVAP Smoke Machine to pressurize the system through the EVAP service port to check for leaks

GM Electric Air Pump Test

- Select Special Tests
- Select Engine Controls
- Select Air Pump
- Press the More soft key and scroll to Select
- Select HO2S Data
- High light HO2S Bank 1 & 2 Sensors 1
- Press More, scroll To Top for each of the HO2S sensor
- Press the Start soft key then the On soft key to activate the Air Pump
- Front O2 sensors should switch below 200mv and remain there until Air Pump is deactivated.

- The purpose test verify air pump function.
- Activates air pump test and verify front O2 sensors simultaneously switch to or below 200mv and stays there until pump is deactivated or until it deactivates itself after 30 seconds.
- If only one O2 sensor goes lean inspect the other sides vacuum line, solenoid or valve
- If both front O2 sensors still cycle from rich to lean inspect common air hose or pump pressure

EGR Functional Test

(Bi-directional)

- 1) Engine At Operating Temperature, KOER
- 2) Scan Tool Datastream
 - EGR Percentage
 - Injector Pulse Width
 - HO2S
 - MAP voltage
 - RPM
- 3) With scan tool open EGR valve
- 6) Datastream
 - EGR Percentage will be High
 - Injector Pulse Width should Drop
 - HO2S should increase
 - MAP voltage should rise
 - RPM should drop

- The purpose of this test is to use bi-directional testing to check the electrical and mechanical condition of a device.
- Display on Datastream the following PIDS: EGR, Injector Pulse-Width, HO2s, MAP Voltage, RPM
- Use the special test function to open the EGR and watch for:
 - EGR Duty cycle to increase
 - Injector Pulse-width to decrease
 - HO2s should show an increase in voltage indicating a rich condition initially
 - The MAP sensor should show an increase in pressure as the EGR opens (voltage increases).
 - The RPM will drop in proportion to the percentage of the EGR opening indicating flow of the EGR.

GM EGR Bi-Directional Test

(GM Linear EGR)

- Select Special Tests
- Select EVAP/EGR
- Press More soft key and scroll to Select
- Select EGR Data
- Scroll and high light EGR Normalized Position Data
- Press Start and Increase EGR percentage
- EGR Commanded opening should be within 3% of actual Normalized Position

- The purpose of this test is to use bi-directional testing to check the electrical and mechanical condition of a devise.
- Verify actual and commanded percentages are the same at idle. Increase EGR percentage while monitoring actual or normalized position PID. Numbers should match within 3% of each other through the full range.
- Verify reprogramming has been done (instead of just shutting off the EGR valve the PCM's new software will "bounce the valve" a few times if the at-rest position is not completely closed.)
- Typically if closed positions are not reading 0% then carbon may be holding the valve slightly open. By performing this test it temporarily allows the carbon to pass until the next occurrence.

EGR Functional Test

(Non-Bi-directional)

- 1) Engine At Operating Temperature, KOER
- 2) Scan Tool Datastream
 - EGR Percentage
 - Injector Pulse Width
 - HO2S
- 3) Vacuum Gauge between EGR Valve and Vacuum Solenoid
- 4) Lab Scope On EGR Solenoid
- 5) Bring Engine RPM To 2000 Loaded
- 6) Datastream
 - EGR Percentage should be High
 - Injector Pulse Width will Drop
 - HO2S will increase
- 7) EGR Vacuum should read 3 Inches
- 8) EGR Solenoid Lab Scope pattern should pulse towards ground

- The purpose of this test to verify EGR function.
- Display on Datastream the following PIDS: EGR Percentage, Injector Pulse-Width, H02S
- Use a vacuum gauge to monitor the EGR vacuum supply by teeing into the supply hose. Ported vacuum is used for the EGR and must be greater than 3 inches for proper operation. Use a lab scope or DMM on the ground side of the solenoid to monitor the duty cycle of the EGR solenoid. Perform this test at 2000 RPM while providing a load, or during a road test.

Ford EGR Functional Test

(FORD KOER)

- 1) Engine At Operating Temperature, KOER
 - 2) Vacuum Gauge at EGR Valve vacuum hose and Solenoid
 - 3) Lab Scope On EGR Solenoid
 - 4) Perform KOER Test
 - 5) EGR Vacuum, 3 Inches Or Higher, Vacuum OK, Solenoid OK
 - 6) EGR Solenoid, Lab Scope, Pulses To Ground, Duty Cycle, Solenoid OK
 - 7) Inspect EGR Passage For Carbon
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- This Test Can Be Performed On Any FORD Actuating Device, i.e. Injector, Idle Air Control, And EGR

- The purpose of KOER test is to activate components to check the function and validity of the components.
- The Lab scope will show the duty cycle of the solenoid as it is turned on and opened up.
- Use a DVOM set to duty cycle to monitor the EGR, if a lab scope is unavailable.
- If Vacuum and the duty cycle are correct then there may be a blockage in EGR flow.
- Use Component Parameters - MODE 6 to test for the amount of EGR flow to determine if the EGR passes monitor test limits.

Ford KOEO No Start Test

- To test for a no start that may be related to fuel systems, perform the following;
 - Install a lab scope lead on the fuel pump relay ground control circuit.
 - Install a lab scope lead on the fuel pump power circuit from the relay.
 - Install a fuel pressure gauge
- Scroll to Diagnostic Trouble Codes and press Enter, scroll to Self Diagnostics and press Enter, scroll to KOEO Self Test and press Enter.
 - At the start of the KOEO test the fuel pump relay ground circuit will show battery voltage until the PCM grounds the relay circuit to energize the pump, and the voltage will go to 0.
 - The fuel pump power circuit at the start of the test should show 0 volts, and when the fuel pump relay is grounded the voltage should go to B+.
 - Fuel pressure should rise to factory specification.

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 - Fuel pressure should rise to factory specification.

FORD EGR Quick Test

- FORD quick EGR test
 - Plug the EVR which is normally open
 - The port is under the cap on the EVR near the filter assembly
 - Port plugged, RPM should drop as EGR opens
 - RPM does not drop, clean the EGR passages

• The purpose of this test to verify EGR flow. Plug off the EVR, which is normally open. This port is under the Cap on the EVR near the filter assembly of the EVR. Plugging off the port should cause RPM to drop as the EGR will open. If there is no RPM drop, clean the EGR passages.

FORD DPFE

- Run the engine at idle and graph the EGR Delta Pressure Feedback Sensor
- Apply About 6 inches of Vacuum to the EGR
- The output should rise above 4.0 volts

- The purpose of this test to verify EGR flow
- Start the engine and bring it to operating temperature. Hook up the scan tool and use data-stream readings for the DPFE sensor, HO2S and Engine RPM.
- Run the engine at idle and graph the EGR Delta Pressure Feedback Sensor. Apply 6 inches of Vacuum to the EGR. The DPFE output should increase above 4.0 volts. The RPM should decrease, and O2 voltage should increase.
- If RPM does not change, the EGR passage may be plugged.

Chrysler EGR Test

- Scroll to Special Tests and press Enter. And then scroll to Actuator Tests and press Enter. Scroll to EGR Solenoid and press Enter.
- Disconnect engine vacuum from the solenoid and install vacuum pump to the engine side of the solenoid. Bring the vacuum pump to 18 inches of vacuum. Hook a volt meter to the negative side of the solenoid, voltage should be B+. Press the Activate soft key. Vacuum should drop to zero and voltage should towards zero. If not the solenoid may be plugged or may have an electrical error. If the voltage does not drop towards zero, the computer controlled ground signal may be at fault.
- Install a vacuum gauge on the engine manifold vacuum port of the EGR solenoid. Install the vacuum pump on the EGR valve and start the engine. Engine vacuum should read approximately 18 inches. Bring the vacuum pump to 18 inches of vacuum and the EGR valve should open and the engine should run very rough and almost stall. If not the EGR passage is partially plugged.

- Scroll to Special Tests and press Enter.
- Scroll to Actuator Tests and press Enter.
- Scroll to EGR Solenoid and press Enter.
- Disconnect engine vacuum from the solenoid and install vacuum pump to the engine side of the solenoid.
- Bring the vacuum pump to 18 inches of vacuum.
- Hook a volt meter to the negative side of the solenoid, voltage should be B+.
- Press the Activate soft key. Vacuum should drop to zero and voltage should towards zero.
- If not the solenoid may be plugged or may have an electrical error. If the voltage does not drop towards zero, the computer controlled ground signal may be at fault.
- Install a vacuum gauge on the engine manifold vacuum port of the EGR solenoid. Install the vacuum pump on the EGR valve. Start the engine. Engine vacuum should read approximately 18 inches. Bring the vacuum pump to 18 inches of vacuum and the EGR valve should open and the engine should run very rough and almost stall. If not the EGR passage is partially plugged.

Chrysler Bi-Directional Testing

- Special Test
 - Install Fuel Pressure Gauge
 - ATM - Automatic Test Mode
 - Injector
 - Press the Activate soft key
 - Fuel Pressure should drop
 - » 20% is the max variable from injector to injector

- The purpose of this test is to use bi-directional testing to check the electrical and mechanical condition of a device.
- Injector balance test are used to determine injector fuel flow for rough running conditions and misfires.
- Special Test
- Install fuel pressure gauge.
- Scroll to Actuator Tests and press Enter. Then scroll to the Injector number to test and press Enter. Press the Ok soft key to accept the test, then press the Activate soft key to begin the test.
- Fuel Pressure should drop
- 20% is the max variable from injector to injector

Chrysler Bi-Directional Testing

- Special Test
 - Install Secondary Ignition Tester
 - ATM - Automatic Test Mode
 - Ignition Coil
 - Press the Activate soft key
 - Secondary Voltage should read 4K to 7K

- The purpose of this test is to use bi-directional testing to check the electrical and mechanical condition of a device.
- Ignition Coil test are used to determine secondary ignition function for rough running conditions and misfires.
- Special Test
- Install Secondary Ignition Tester
- Scroll to Actuator Tests and press Enter. Then scroll to the Ignition Coil number to test and press Enter. Press the Ok soft key to accept the test, then press the Activate soft key to begin the test.
- Secondary Voltage should read 4K to 7K