

Welcome



Presents

Monitors and Mode 6

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Your Instructor For This Seminar

"G" Jerry Truglia

- National Trainer, ASE World Class, Master: Auto, Truck, School Bus, L1, L3, CNG and...
- **ATTP Master Instructor, New York State, CT and New Jersey**
- STS (Service Technician Society) 2003 President
- **TST (Technicians Service Training) Founder and President**
- Author / Co Author/ Technical adviser on 25 plus books including OBD II and Mode 6, and Understanding and Diagnosing Hybrid Vehicles
- **Published articles for multiple newsletters, and magazines**
- Picked as one of the Top Instructors in the country by EPA & SAE
- **Numerous Radio, TV, Internet, and SAE Video appearances**
- PTEN, MotorAge and TST Webcast Instructor
- **Motor Magazine Top 20 award winner**
- Provider of OBD II Training for 14 states, Ontario Canada and the US EPA
- **Guest speaker at SAE Congress, IM Solutions and Clean Air Conference**

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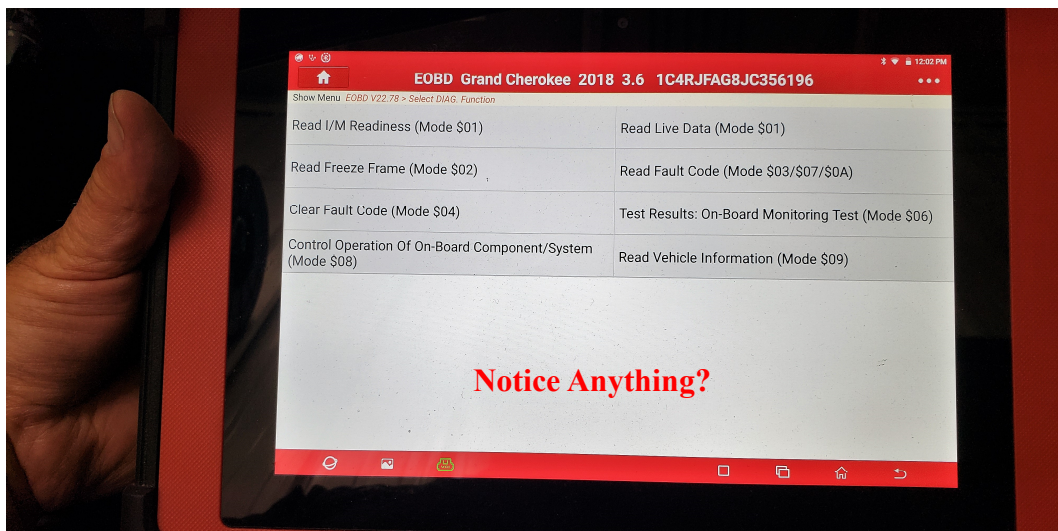
What will be covered:

- **OBD II Monitors**
- **DTC Repairs And OBD II Monitors**
- **What Is Mode 6**
- **Raw Data And Calculated Values**
- **Using Mode 6 Test Results**
- **How To Use Mode 6**
- **Repairing Vehicles Using Mode 6**
- **On Vehicle Mode 6 Testing**

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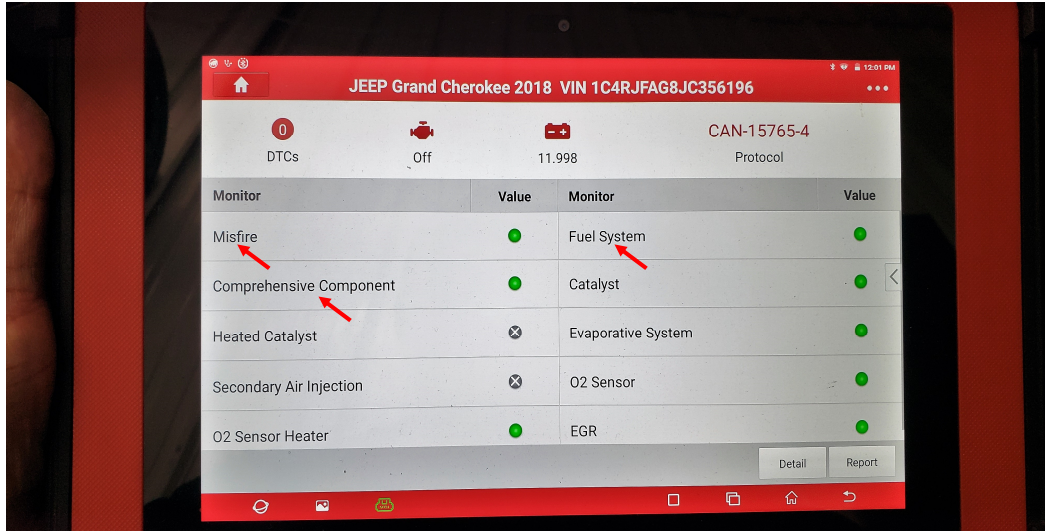
Monitors



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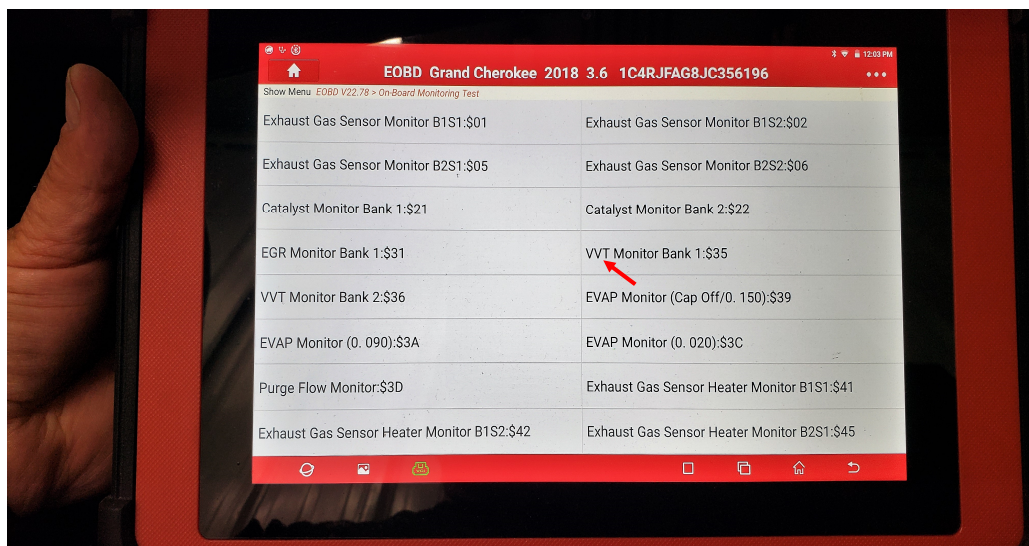
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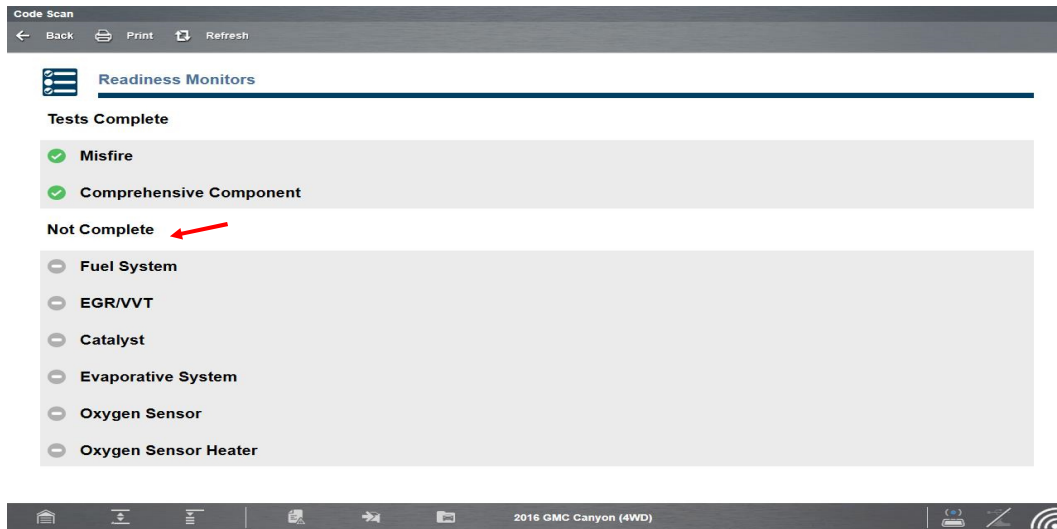
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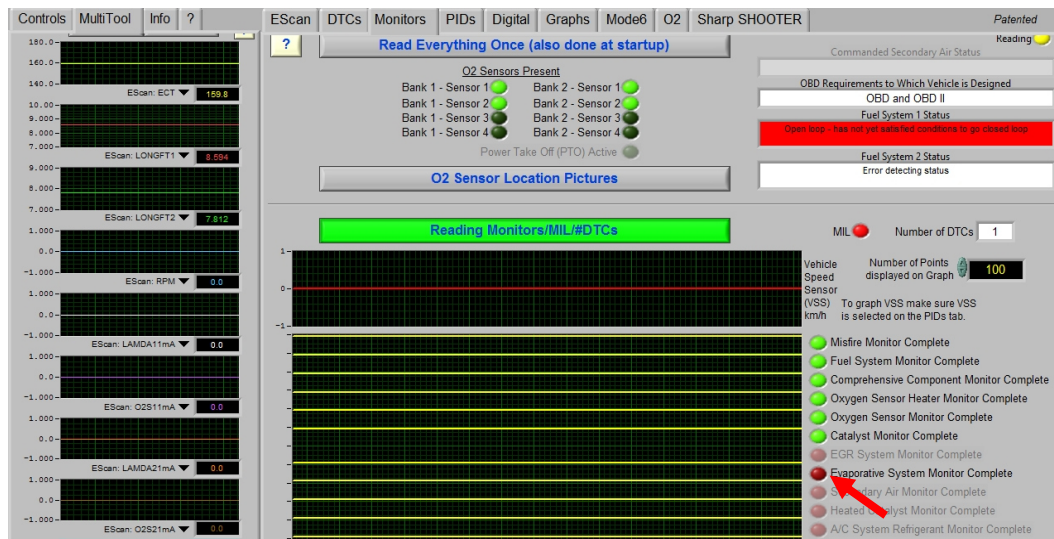
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Monitors



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Monitor Information

Monitors on OBD II systems work like this:

- ✓ **Onboard test strategies programmed into the PCM check the vehicle systems**
- ✓ **These test sequences are called “Monitors”**
- ✓ **Monitors run when conditions are right for them to run**
- ✓ **Vehicle operating conditions required to run Monitors are referred to as “Trips”**



Monitors
Not Complete

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Monitor Information

- **Just like the Hall monitor’s job is to monitor the halls, there are different kinds of Monitors in the vehicle that monitor different vehicle systems.**
- **All vehicles have at least 3 Non-Continuous Monitors:**
 - **O2 Heater, O2 Sensor & Catalyst.**
 - **Other Monitors may include EVAP, EGR, Secondary AIR, AC System & VVT.**
- **These Monitors run only after completing a “Trip,” which is a specific set of driving conditions demanded by the manufacturer.**

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Continuous Monitors

Some Monitors run *continuously* as the vehicle is operated. These are known as “Continuous Monitors.” They include the Comprehensive Component, Fuel System, and Misfire Monitors. Continuous Monitors should always appear as “Ready” when viewed on a scan tool. (Some scan tools and inspection machines may show them as “Complete,” “Done,” or “Yes.”)

Three Continuous Monitors are supported on all OBD II vehicles: Misfire, Comprehensive Component, and Fuel System.









Continuously Monitored Systems	
OnBoard Module/System	Status
Misfire Monitoring	Complete
Fuel System Monitoring	Complete
Comprehensive Component Monitoring	Complete

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Non-Continuous Monitors

Non-Continuous Monitors run once per Trip. Unlike Continuous Monitors, the status of Non-Continuous Monitors are checked as part of the OBD II emissions test. If there are too many incomplete (Not Ready) Monitors, the vehicle fails an emission test and may illuminate the MIL.

Non-Continuous Monitoring Tests		
Monitor	Availability	Status
 Catalyst	Supported	Not Complete
 Heated Catalyst	Unsupported	
 Evaporative System	Unsupported	
 Secondary Air System	Unsupported	
 A/C System	Unsupported	
 Oxygen Sensor	Supported	Not Complete
 Oxygen Sensor Heater	Supported	Not Complete
 EGR System	Supported	Not Complete









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Non-Continuous Monitors

Non-Continuous Monitors, Oxygen Sensor Heater, Oxygen Sensor, Catalyst, EVAP, EGR, Secondary Air and now VVT are used in many vehicles.

Air Conditioning and Heated Catalyst are not currently used and are listed as Unsupported. The Air Conditioning Monitor was originally intended for use only in vehicles with R-12 systems.

Non-Continuous Monitoring Tests		
Monitor	Availability	Status
 Catalyst	Supported	Not Complete
 Heated Catalyst	Unsupported	
 Evaporative System	Unsupported	
 Secondary Air System	Unsupported	
 A/C System	Unsupported	
 Oxygen Sensor	Supported	Not Complete
 Oxygen Sensor Heater	Supported	Not Complete
 EGR System	Supported	Not Complete

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Non-Continuous Monitors

Two other Non-Continuous Monitors, Thermostat Monitor (began 2000 M/Y) and PCV Monitor (began 2002 M/Y) do not have their own Monitor title on most scan tools, however they do have a set of DTCs that are checked in the Comprehensive Component Monitor (CCM).

Note: Not all light duty diesel vehicles support Non-Continuous Monitors, but new ones do.

The Non-Continuous Monitors that must be used all the time are: Oxygen Sensor Heater, Oxygen Sensor and Catalyst.

Non-Continuous Monitoring Tests		
Monitor	Availability	Status
 Catalyst	Supported	Not Complete
 Heated Catalyst	Unsupported	
 Evaporative System	Unsupported	
 Secondary Air System	Unsupported	
 A/C System	Unsupported	
 Oxygen Sensor	Supported	Not Complete
 Oxygen Sensor Heater	Supported	Not Complete
 EGR System	Supported	Not Complete

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Things That Prevent Monitors From Running – Becoming READY

1. Engine Thermostat
2. Engine Coolant/ Antifreeze Mixture
3. Crankshaft Relearn Not Completed
4. DTC's or Pending DTC's Stored
5. Vehicle Fuel Level Above 15% And Below 85 %
 - * Check Manufacturer Specs
6. Battery And Charging Voltage
7. Mode 6 data that indicates a system that is borderline failing
8. The PCM needs a soft reset



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Things That Prevent Monitors From Running – Becoming READY

No hocus pocus is necessary. The previous need to be corrected in order to run Monitors.

On extremely tough-to-run Monitors, some vehicles need you to artificially set a DTC to wake up the PCM.

After making a misfire or some other malfunction, a DTC will be set.

Erase it and afterward complete the Drive Cycle to allow Monitors to become Ready.



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Monitors Tips

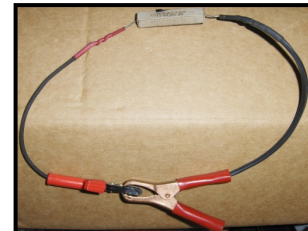
As previous stated on some vehicles you will need to force a DTC, followed by erasing the DTC. Or

If all else fails, you may need to erase the computer learned memory and start over. Disconnect the battery cables and connect a 1 ohm - 10 watt resistor for at least 5 minutes.

This erases learned computer values and place the computer in a "fast-learn" mode that accelerates Monitor completion.



Ready Scan from OTC/SPX



1 Ohm - 10 watt resistor

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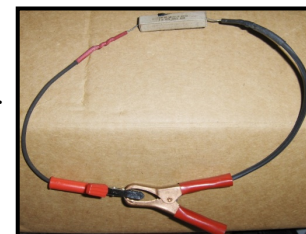
Monitors Tips

Caution: Disconnecting the battery in some vehicles can cause significant problems when some "drive by wire" throttles and radios with security codes refuse to work after the battery is reconnected. This is especially problematic on newer vehicles.

Note: If you replaced an O2, MAF or any other part with a poor quality aftermarket part and now the Monitors are not completing, you may want to replace it with an OE equivalent.



Ready Scan from OTC/SPX



1 Ohm - 10 watt resistor

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Monitors Tips

The next examples are not typical but demonstrate very odd criteria are sometimes required to run Monitors.

Readiness Monitor Drive Patterns: EVAP Monitors (Continued)

Drive Pattern Preconditions

The monitor will not run unless:

- MIL is OFF.
- Fuel level is between 1/2 to 3/4 full.
- Altitude is 7800 feet (2400 m) or less.*
- ECT (Coolant Temp) is between 40F and 95F (4.4C - 35C).
- IAT (Intake Air) is between 40F and 95F (4.4C - 35C).*
- Cold Soak Procedure has been completed.

* For 2002 MY and later vehicles: The readiness test can be completed in cold ambient conditions (less than 40F / 4.4C) and/or at high altitudes (more than 7800 feet / 2400 m) if the complete drive pattern (including Cold Soak) is repeated a second time after cycling the ignition OFF.

Courtesy of University Toyota, Toyota Motor Sales USA, Inc.

NOTE:

Before starting the engine, the difference between ECT (Coolant Temp) and IAT (Intake Air) must be less than 13F (7C). (Refer to Examples 1 and 2 on previous page.)

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Monitors Tips

Monitor Disablers You Might Not Be Thinking About:

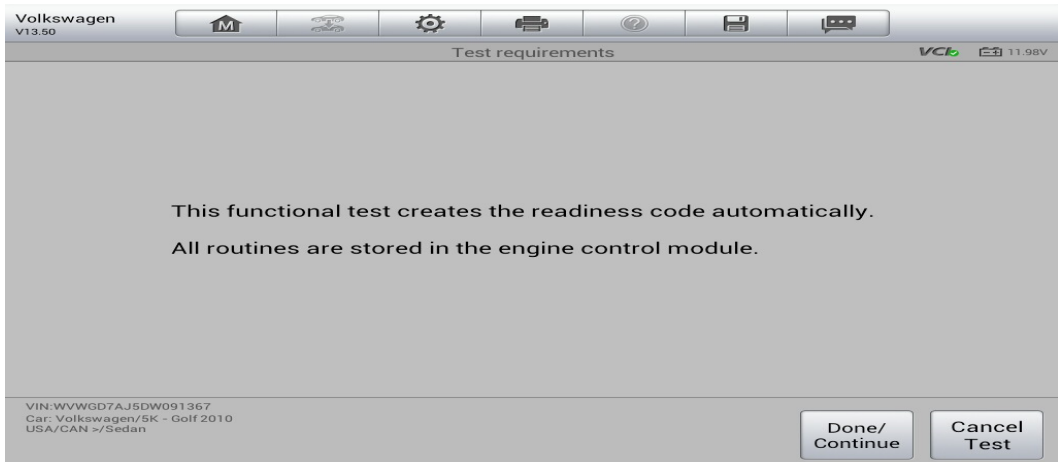
Wrong or defective thermostat. This can prevent the engine from reaching the correct operating temperature in a specific time. *Air trapped in the cooling system can have the same effect.*

Wrong coolant mix, specifically those with way too much antifreeze.

DTC		Monitor disablement (X = disabled)	
		Component/System	
P0100	P0101	MAF sensor	X
P0101	P0102	MAF sensor	X
P0102	P0103	MAF sensor	X
P0103	P0104	MAF sensor	X
P0104	P0105	MAF sensor	X
P0105	P0106	MAF sensor	X
P0106	P0107	MAF sensor	X
P0107	P0108	MAF sensor	X
P0108	P0109	MAF sensor	X
P0109	P0110	MAF sensor	X
P0110	P0111	MAF sensor	X
P0111	P0112	MAF sensor	X
P0112	P0113	MAF sensor	X
P0113	P0114	MAF sensor	X
P0114	P0115	MAF sensor	X
P0115	P0116	MAF sensor	X
P0116	P0117	MAF sensor	X
P0117	P0118	MAF sensor	X
P0118	P0119	MAF sensor	X
P0119	P0120	MAF sensor	X
P0120	P0121	MAF sensor	X
P0121	P0122	MAF sensor	X
P0122	P0123	MAF sensor	X
P0123	P0124	MAF sensor	X
P0124	P0125	MAF sensor	X
P0125	P0126	MAF sensor	X
P0126	P0127	MAF sensor	X
P0127	P0128	MAF sensor	X
P0128	P0129	MAF sensor	X
P0129	P0130	MAF sensor	X
P0130	P0131	MAF sensor	X
P0131	P0132	MAF sensor	X
P0132	P0133	MAF sensor	X
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P0140	P0141	MAF sensor	X
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P0143	P0144	MAF sensor	X
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P0295	P0296	MAF sensor	X
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P0298	P0299	MAF sensor	X
P0299	P0300	MAF sensor	X
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P0301	P0302	MAF sensor	X
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P0305	P0306	MAF sensor	X
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P0308	P0309	MAF sensor	X
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P0327	P0328	MAF sensor	X
P0328	P0329	MAF sensor	X
P0329	P0330	MAF sensor	X
P0330	P0331	MAF sensor	X
P0331	P0332	MAF sensor	X
P0332	P0333	MAF sensor	X
P0333	P0334	MAF sensor	X
P0334	P0335	MAF sensor	X
P0335	P0336	MAF sensor	X
P0336	P0337	MAF sensor	X
P0337	P0338	MAF sensor	X
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P0340	P0341	MAF sensor	X
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P0362	P0363	MAF sensor	X
P0363	P0364	MAF sensor	X
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P0366	P0367	MAF sensor	X
P0367	P0368	MAF sensor	X
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P0370	P0371	MAF sensor	X
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P0374	P0375	MAF sensor	X
P0375	P0376	MAF sensor	X
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P0377	P0378	MAF sensor	X
P0378	P0379	MAF sensor	X
P0379	P0380	MAF sensor	X
P0380	P0381	MAF sensor	X
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P0382	P0383	MAF sensor	X
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P0385	P0386	MAF sensor	X
P0386	P0387	MAF sensor	X
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P0388	P0389	MAF sensor	X
P0389	P0390	MAF sensor	X
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P0423	P0424	MAF sensor	X
P0424	P0425	MAF sensor	X
P0425	P0426	MAF sensor	X
P0426	P0427	MAF sensor	X
P0427	P0428	MAF sensor	X
P0428	P0429	MAF sensor	X
P0429	P0430	MAF sensor	X
P0430	P0431	MAF sensor	X
P0431	P0432	MAF sensor	X
P0432	P0433	MAF sensor	X
P0433	P0434	MAF sensor	X
P0434	P0435	MAF sensor	X
P0435	P0436	MAF sensor	X
P0436	P0437	MAF sensor	X
P0437	P0438	MAF sensor	X
P0438	P0439	MAF sensor	X
P0439	P0440	MAF sensor	X
P0440	P0441	MAF sensor	X
P0441	P0442	MAF sensor	X
P0442	P0443	MAF sensor	X
P0443	P0444	MAF sensor	X
P0444	P0445	MAF sensor	X
P0445	P0446	MAF sensor	X
P0446	P0447	MAF sensor	X
P0447	P0448	MAF sensor	X
P0448	P0449	MAF sensor	X
P0449	P0450	MAF sensor	X
P0450	P0451	MAF sensor	X
P0451	P0452	MAF sensor	X
P0452			

Monitors Tips

Getting Monitors Ready Via Scan Tool



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Generic Drive Cycle

The following is a Generic Drive Cycle that runs the Non-Continuous Monitors to Completion in most vehicles in about 30 minutes.

Step 1. Some vehicles must be sitting for 8 hours before the test, without a start.

This is primarily for the EVAP monitor.

Step 2. Warm the engine to normal operating temperature before driving it.

Step 3. Drive the vehicle for 10 minutes at highway speeds.

Step 4. Drive the vehicle for 20 minutes in stop and go traffic with at least four idle periods at least 2-3 minutes. Do not turn the ignition off at anytime during the cycle.

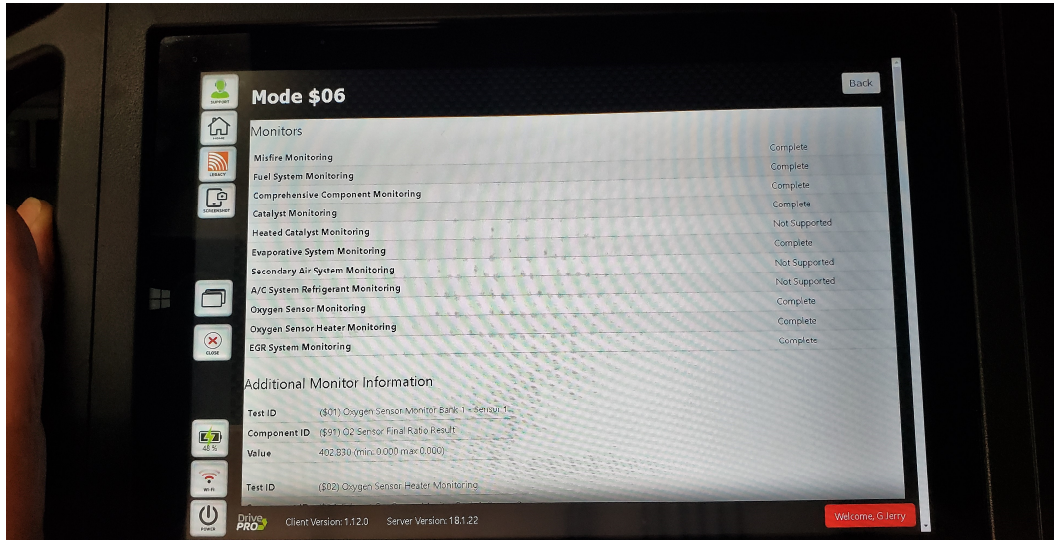
When completed turn the Key off and wait 3 minutes before checking the status.



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Monitors

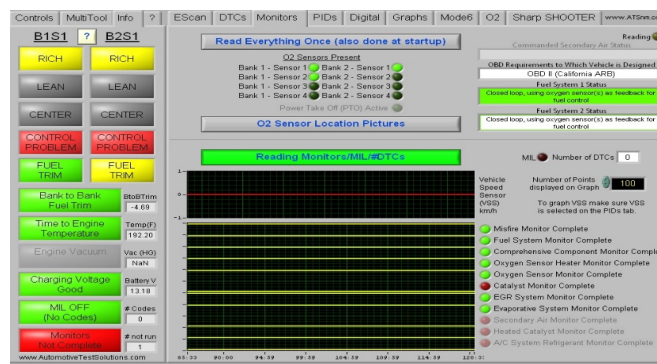


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Monitor Information

Monitors on all vehicles are Incomplete (Not Ready) until they run to completion one time. Once they are set to Ready they will NOT change back to Incomplete (Not Ready) until the DTCs are erased, battery power is disconnected, or the PCM is disconnected and/or KAM (Keep Alive Memory) is lost.



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Monitor Information

This is an example of a Ford pickup with an OBD II connector that oddly enough is not OBD II certified due to overall vehicle weight. Just because it has an OBD II 16 cavity connector does not mean it's OBD II compliant. Always check the underhood Emission Label on all vehicles to make sure.

Vehicles 8501 lb/3856 kg and above DO NOT support OBD II, even though the vehicle has an OBD II 16 cavity connector.



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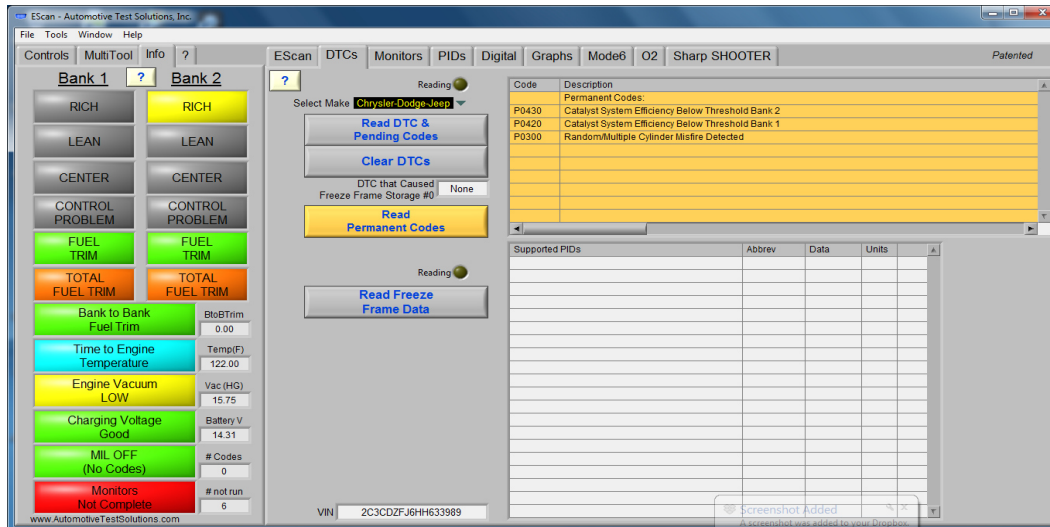
OBD II Modes

Mode	Description
01	Current PID Data
02	Freeze Frame Data
03	DTCs (Diagnostic Trouble Codes)
04	Clear DTCs (Clears Everything EXCEPT KAM)
05	O2 Sensor Data (Only Non CAN systems)
06	Most Other Quiz's / Test Results
07	Pending DTCs
08	Bi-Directional Control For Some EVAP Vent Solenoids
09	Vehicle Information (VIN / Calibration on most vehicles)
0A / 10	Permanent DTCs / Cleared DTCs

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OBD II Mode 10



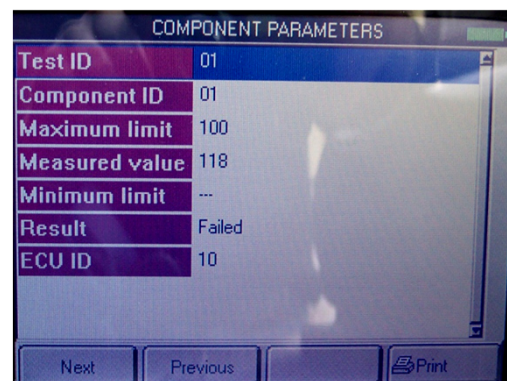
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Mode 6

What is Mode 6?

In a nutshell, Mode 6 allows a scan tool to access the results of the onboard test results for non-continuous monitors. Ideally, Mode 6 will provide us with information about the most recent test data for these monitored systems.



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Hexadecimal

Counting to 16

Decimal Numbers - Right	Hexadecimal Number - Left
\$1=1	
\$2=2	
\$3=3	
\$4=4	
\$5=5	
\$6=6	
\$7=7	
\$8=8	
\$9=9	
\$A=10	
\$B=11	
\$C=12	
\$D=13	
\$E=14	
\$F=15	
\$10=16	

The decimal number 17 is represented by the hexadecimal number 11. That's 16x1 plus 1x1 = 17.

Let's try one more. Convert \$E6 to decimal. Since \$E=14 and it's in the "16's" column, we need to multiply 14x16 and then add the 6 from the right column to get the decimal equivalent.

$$(14 \times 16) + 6 = 224 + 6 = 230.$$

Using only two hexadecimal digits, we can count all the way to the decimal number 255. \$FF = (15 x 16) + 15 = 255.

The decimal number 256 is equal to \$100 in hexadecimal. That's (1 x 256) + 0 + 0 = 256.

Windows "Calculator" does a great job converting decimal and hexadecimal numbers. From the Windows desk top, open Calculator. Then, from the View menu, select "scientific."

Type in the value you want converted and then select the correct scale radio button to display the converted value in Hexadecimal or Decimal.

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Mode 6

Pass/Fail Standards

Here is how Mode 6 is *supposed* to work:

- Vehicle manufacturers assign **Test IDs (TIDs)** and **Component IDs (CIDs)** for different systems and components used in their vehicles. Test data for many of these components and systems can be found in Mode 6.
- Mode 6 data are all manufacturer-specific — from the components listed — to the test values for each component. Mode 6 data is vehicle specific.



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Mode 6

Pass/Fail Standards

- Raw test values are numbers that indicate test limits and actual results. These numbers do not always correspond to common measurement values like miles per hour, inches of vacuum, or rpm. They may be "computer speak" that won't mean a thing to us until they are converted to those common measurement values. Raw test values should be reported only as positive (unsigned) values. (Once again, this has not always been the case, and the use of negative test values has caused some problems.)
- Pass/Fail standards are referred to as test limits. To pass, a component test result must be below a maximum, above a minimum, or fall between a minimum and a maximum level. In cases where a minimum and a maximum test limit are used, two separate tests are run on the same component; one a minimum test, the other a maximum test. Two test results will be given.



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Mode 6

Controls | MultiTool | Info | ? | EScan | DTCs | Monitors | PIDs | Digital | Graphs | Mode6 | O2 | Sharp SHOOTER

Select Make: Toyota Camry (2AZ-FE) 2004

Test Value background color: **Red** if outside of limit, **Yellow** if close to limit, **White** if close to limit

Read All Mode6 Once
Read All Mode6 Continuous
Read Selected Continuous

TestID (TID)	ComponentID (CID)	Test Value	Min Limit	Max Limit	Units
\$01: Catalyst System Monitor	\$01: Bank 1 Catalyst Deterioration	1.037		0.998	
\$02: EVAP LEVii Vacuum Monitor	\$01: EVAP VSV Stuck Closed Value	48.655	13.908		mmHg
\$02: EVAP LEVii Vacuum Monitor	\$02: EVAP VSV Stuck Open Value	16.702	4.192		sec
\$02: EVAP LEVii Vacuum Monitor	\$03: CCV Canister Closed Test Value	0.000		16.702	sec
\$02: EVAP LEVii Vacuum Monitor	\$04: 040 Leak Test	0.000		11.679	mmHg
\$04: Heated Oxygen Sensor Monitor	\$02: B1S2 Max Heater Current	4.981	0.000		amps
\$06: A/F Sensor Monitor	\$01: B1S1 A/F Sensor Response Rate	0.000		15.991	
\$08: Thermostat Monitor	\$01: ECT Sensor Output Test Result	119.375	75.000		Deg C

On the ATS EScan:

- **Red** indicates a component *Fail*
- **Yellow** indicates a component that is close to a limit
- **White** indicates a components *Pass*

The Red Test Value above 1.037 is above the Max test limit that will Prevent a Monitor from running

Click on above row of interest to get Related DTC and explanation if available.

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Get Factory Scan Tool Data Including Mode 6

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How-To Guides/Videos
Road to GREAT Techs
NASTF General Meetings
Team Pages & Projects
Non-OEM Resources
Other References
Instructors/Educators

NASTF Contact Information

For SDRM or VSP support use support@sdrm.nastf.org
For other NASTF support needs: support@nastf.org

All email and phone calls are logged by our support desk software.

810-289-4809

NASTF Has a new phone number.

ALERTS
NASTF Support Update: NASTF has a new phone number. Our 800 supplier was randomly sending our members to voice mail (not our voicemail), if you call the old number you will hear a message directing you to use the new number. Thank you for your understanding. If you would like a contact card to add to your phone or computer's address book please [click here](#) and it will download.

HEADLINES

Mode 6 On-Board Monitoring Test Results, and OBD-II Diagnostic Parameters

Identification and scaling of 1979 mode 6 test values and limits data available on GM vehicles, for use with a generic scan tool. This are equipped.

Generic Scan Tool Information - Mode 6 Data

- GM CAN - GM Powertrain
- GM Class 2 - GM Powertrain
- 2013-2016 City Express
- Cadillac Catera
- Cadillac 2002-2008 CTS, SRX, STS w/V6
- Saturn VUE w/V6
- Saturn I-series w/V6
- Solstice - Sky w/2.0L turbo
- Rendezvous w/3.6L V6
- LaCrosse, Allure w/3.6L V6
- Pontiac G8 w/3.6L V6
- 2008 Equinox, Torrent w/3.6L V6
- Aveo, Naveo, Optra and Epica

OBD II System Information

- 1996 - 2003 Metro/Tracker with mode 6 data
- 1996 - 2003 Prizm/Vibe

Courtesy of GM

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Get Factory Scan Tool Data Including Mode 6

GM mode \$06 data definitions for GM vehicles using GMLAN diagnostic data link

Some items have footnotes, defined on the last pages.

OBD Monitor ID (OBDMID)	Test ID (TID)	Units and Scaling ID (UASID)	Description	Range For Information ONLY Source information is J1979	Resolution For Information ONLY Source information is J1979
A8	0C	24 ⁽¹⁾⁽³⁾	Misfire counts since the last restart after hybrid/electric autostart	0 to 65535 counts	1 count / bit
A5	0C	24 ⁽¹⁾⁽³⁾	Misfire counts for last/current driving cycles (calculated)	0 to 65535 counts	1 count / bit
A8	A5	24	EWMA (Exponentially Weighted Moving Average) misfire counts for the last 10 driving cycles	0 to 65535 counts	1 count / bit
Misfire Cylinder & Data					
A9	0B	24	EWMA (Exponential Weighted Moving Average) misfire counts for the last 10 driving cycles	0 to 65535 counts	1 count / bit
A9	0B	24 ⁽¹⁾⁽³⁾	EWMA (Exponential Weighted Moving Average) misfire counts since the last restart after hybrid/electric autostop for the last 10 driving cycles	0 to 65535 counts	1 count / bit
A9	0B	24 ⁽¹⁾⁽³⁾	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles (calculated). Calculation: $0.1 * (\text{current counts}) + 0.9 * (\text{previous average})$. Initial value for (previous average) = 0	0 to 65535 counts	1 count / bit
A9	0C	24	Misfire counts for the last / current driving cycles	0 to 65535 counts	1 count / bit
A9	0C	24 ⁽¹⁾⁽³⁾	Misfire counts since the last restart after hybrid/electric autostart	0 to 65535 counts	1 count / bit
A9	0C	24 ⁽¹⁾⁽³⁾	Misfire counts for last/current driving cycles (calculated) ⁽¹⁾⁽³⁾	0 to 65535 counts	1 count / bit
A9	A5	24	EWMA (Exponentially Weighted Moving Average) misfire counts for the last 10 driving cycles	0 to 65535 counts	1 count / bit
AA	0B ⁽¹⁾⁽³⁾	24	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles (calculated). Calculation: $0.1 * (\text{current counts}) + 0.9 * (\text{previous average})$. Initial value for (previous average) = 0	0 to 65535 counts	1 count / bit
AA	0C ⁽¹⁾⁽³⁾	24	Misfire counts for last/current driving cycles (calculated)	0 to 65535 counts	1 count / bit
AB	0B ⁽¹⁾⁽³⁾	24	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles (calculated). Calculation: $0.1 * (\text{current counts}) + 0.9 * (\text{previous average})$. Initial value for (previous average) = 0	0 to 65535 counts	1 count / bit
AB	0C ⁽¹⁾⁽³⁾	24	Misfire counts for last/current driving cycles (calculated)	0 to 65535 counts	1 count / bit
AC	0B ⁽¹⁾⁽³⁾	24	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles (calculated). Calculation: $0.1 * (\text{current counts}) + 0.9 * (\text{previous average})$. Initial value for (previous average) = 0	0 to 65535 counts	1 count / bit
AC	0C ⁽¹⁾⁽³⁾	24	Misfire counts for last/current driving cycles (calculated)	0 to 65535 counts	1 count / bit

Footnotes are explained on the last pages of this document.

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GMLAN rev4

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Get Factory Scan Tool Data Including Mode 6

J1979 Misfire Mode \$06 Data			
Monitor ID	Test ID	Description	
A1	\$80	Total engine misfire and catalyst damage misfire rate (updated every 200 revolutions) (P030x)	percent
A1	\$81	Total engine misfire and emission threshold misfire rate (updated every 1,000 revolutions) (P030x)	percent
A1	\$82	Highest catalyst-damage misfire and catalyst damage threshold misfire rate (updated when DTC set or clears) (P030x)	percent
A1	\$83	Highest emission-threshold misfire and emission threshold misfire rate (updated when DTC set or clears) (P030x)	percent
A1	\$84	Inferred catalyst mid-bed temperature (P030x)	°C
A2 – AD	\$0B	EWMA misfire counts for last 10 driving cycles (P030x)	events
A2 – AD	\$0C	Misfire counts for last/current driving cycle (P030x)	events
A2 – AD	\$80	Cylinder X misfire rate and catalyst damage misfire rate (updated every 200 revolutions) (P030x)	percent
A2 – AD	\$81	Cylinder X misfire rate and emission threshold misfire rate (updated every 1,000 revolutions) (P030x)	percent

Ford Motor Company

Revision Date December 21, 2016

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Get Factory Scan Tool Data Including Mode 6

The following list indicates what monitors and functions have been altered from OBD-II for EMD calibrations:

Monitor / Feature	Calibration
Catalyst Monitor	Functional catalyst monitor required starting in the 2010 MY to meet EMD+.
Misfire Monitor	Calibrated in for service, all DTCs are non-MIL. Catalyst damage misfire criteria calibrated out, emission threshold criteria set to 4%, enabled between 150 °F and 220 °F, 254 sec start-up delay.
Oxygen Sensor Monitor	Front O2 sensor "lack of switching" tests and all circuit and heater tests calibrated in, response/delay test calibrated out. Rear O2 sensor functional tests and all circuit and heater tests calibrated in, response/delay test calibrated out.
EGR/VVT Monitor	Same as OBD-II calibration except that P0402 test uses slightly higher threshold.
Fuel System Monitor	Fuel monitor and FAOSC monitor (rear fuel trim for UEGO systems) same as OBD-II calibration. A/F imbalance monitor calibrated out.
Secondary Air Monitor	Not applicable, AIR not used.
Evap System Monitor	Evap system leak check calibrated out, fuel level input circuit checks retained as non-MIL. Fuel tank pressure sensor and canister vent solenoid may be deleted.
PCV Monitor	Same hardware and function as OBD-II.
Thermostat Monitor	Thermostat monitor calibrated out.
Comprehensive Component Monitor	All circuit checks, rationality and functional tests same as OBD-II.
Communication Protocol and DLC	Same as OBD-II, all generic and enhanced scan tool modes work the same as OBD-II but reflect the EMD calibration that contains fewer supported monitors. "OBD Supported" PID indicates EMD (\$11).
MIL Control	Same as OBD-II, it takes 2 driving cycles to illuminate the MIL.

EMD system implementation and operation is a subset of OBD-II and is described in the remainder of this document.

Ford Motor Company

Revision Date December 21, 2016

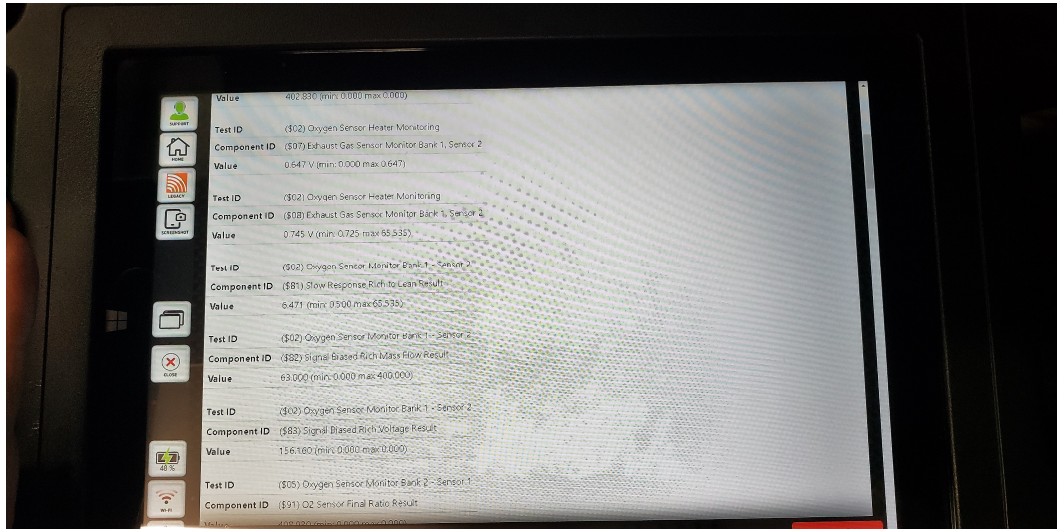
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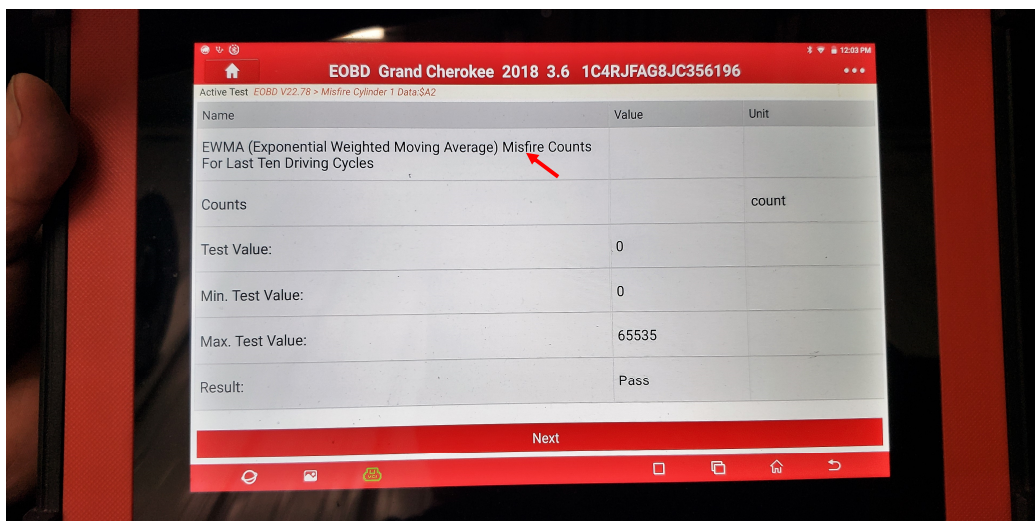
Mode 6



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Mode 6 Misfire



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Factory Enhanced Scan Data

Description	OBD MID	Test ID	Min	Max	Value
HO2SB1S1 Monitor	1				
HO2SB1S1 Switch Point	1	1	0V	7.995V	0.449V
HO2SB1S1 Voltage Amplitude	1	80	0.499V	7.995V	0.818V
HO2SB1S1 Heater Current	1	81	0.465A	3.000A	1.642A
HO2SB1S2 Monitor	2				
HO2SB1S2 Switch Point	2	1	0V	7.995V	0.449V
HO2SB1S2 Heater Current	2	81	0.220A	3.000A	0.641A
Catalyst Monitor Bank 1	21				
Rear-to-Front Switch Ratio	21	80	0:1	0.8:1	0.04:1
Stepper Motor EGR Monitor (Open Loop)	33				
EGR Degradation Index	33	82	0.249	1.998	1.225
EVAP Monitor (Large Leak)	3A				
Phase 0 Excessive Vacuum Limit	3A	80	0Pa	0Pa	0Pa
Phase 4 Purge Valve Stuck Open Limit	3A	81	0Pa	0Pa	0Pa
Phase 0 Gross Leak Limit	3A	82	0Pa	0Pa	0Pa
EVAP Monitor (0.040 inch)	3B				
Phase 2 0.040 inch Cruise Leak Check Vacuum Bleedup And Maximum 0.040 inch Leak Threshold	3B	80	32768Pa	3760Pa	1252Pa
EVAP Monitor (0.020 inch)	3C				
Phase 2 0.020 inch Idle Leak Check Vacuum Bleedup And Maximum Leak Threshold	3C	80	0Pa	0Pa	0Pa
Misfire Monitor General Data	A1				
Total Engine Misfire and Catalyst Damage Misfire Rate	A1	80	0%	15.02%	0%
Total Engine Misfire and Emission Threshold Misfire Rate	A1	81	0%	1.69%	0%
Ratio of Monitored Combustion Events	A1	82	0%	15.02%	0.49%
Highest Cylinder Misfire Rate	A1	83	0%	1.69%	0%

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Factory Enhanced Scan Data



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Mode 6 – Hyundai / Kia

Controls MultiTool Info ? EScan DTCs Monitors PIDs Digital Graphs Mode6 O2 Sharp SHOOTER Patented

Bank 1 ? Bank 2

RICH RICH

LEAN LEAN

CENTER CENTER

CONTROL PROBLEM CONTROL PROBLEM

FUEL TRIM FUEL TRIM

TOTAL FUEL TRIM TOTAL FUEL TRIM

Bank to Bank Fuel Trim 0.00

Time to Engine Temp Calculating Temp(F) 174.20

BARO Good Vac (HG) NaN

Battery Voltage Low Battery V 12.23

MIL OFF (No Codes) # Codes 0

Monitors Complete # not run 0

www.AutomotiveTestSolutions.com

Select Make Kia-Hyundai Lambda 3.3, 3.0L, Mu 2.7L 2006-2008

Test Value background color: Red if outside of limit, Yellow if close to limit

Reading

Read All Mode6 Once

Read All Mode6 Continuous

Read Selected Continuous

Test ID (TID)	Component ID (CID)	Test Value	Min Limit	Max Limit	Units
S04: Cat Efficiency	S60: B1	5.803	1.997		sec
S04: Cat Efficiency	S70: B2	5.803	1.997		sec
S0A: EVAP System	S42: Excess vacuum test	3.759		14.000	H2O
S0A: EVAP System	S03: Evap weak vacuum test	10.214	10.100		H2O
S0A: EVAP System	S06: 0.020 Leak Test	0.000		0.045	H20/s
S0A: EVAP System	S05: 0.040 Leak Test	0.014		0.155	H20/s
S0A: EVAP System	S48: Purge leak vacuum fail	0.161		1.854	H2O

Click on above row of interest to get Related DTC and explanation if available.

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Mode 6 – Acura / Honda

Controls MultiTool Info ? EScan DTCs Monitors PIDs Digital Graphs Mode6 O2 Sharp SHOOTER Patented

Bank 1 ? Bank 2

RICH RICH

LEAN LEAN

CENTER CENTER

Stoichiometric Stoichiometric

FUEL TRIM FUEL TRIM

TOTAL FUEL TRIM TOTAL FUEL TRIM

Bank to Bank Fuel Trim NaN

Time to Engine Temp Calculating Temp(F) NaN

Engine Vacuum Vac (HG) NaN

Charging Voltage Good Battery V 14.24

MIL OFF (No Codes) # Codes 0

Monitors Not Complete # not run 1

www.AutomotiveTestSolutions.com

Select Make Honda/Acura 2010-2016

Test Value background color: Red if outside of limit, Yellow if close to limit

Reading

Read All Mode6 Once

Read All Mode6 Continuous

Read Selected Continuous

OBD Monitor ID (OBDMID)	Test ID (TID)	Test Value	Min Limit	Max Limit	Units
S01: B1 AF Sensor	S80: AF sensor non-activation time check	195.000	0.000	200.000	Ohm
S01: B1 AF Sensor	S87: AF sensor non-activation time check	74.000	0.000	270.000	Ohm
S01: B1 AF Sensor	S82: AF sensor non-activation time check	0.434	0.249	0.752	V
S01: B1 AF Sensor	S88: AF sensor non-activation time check	0.430	0.249	0.752	V
S01: B1 AF Sensor	S83: AF sensor 'too lean' check	-0.020	-128.000	3.016	mA
S01: B1 AF Sensor	S84: AF sensor rationality check	3.523	1.191	5.531	mA
S01: B1 AF Sensor	S86: AF sensor 'out of range' check	0.020	-128.000	5.965	mA
S01: B1 AF Sensor	S89: AF sensor response check	800.000	0.000	65535.000	
S02: B1 Secondary HO2S	S80: Response check	0.048	0.000	0.396	V
S02: B1 Secondary HO2S	S9E: Circuit check	0.398	0.050	65.535	V
S05: B2 AF Sensor	S80: AF sensor non-activation time check	192.000	0.000	200.000	Ohm
S05: B2 AF Sensor	S87: AF sensor non-activation time check	75.000	0.000	270.000	Ohm
S05: B2 AF Sensor	S82: AF sensor non-activation time check	0.434	0.249	0.752	V
S05: B2 AF Sensor	S88: AF sensor non-activation time check	0.430	0.249	0.752	V
S05: B2 AF Sensor	S83: AF sensor 'too lean' check	0.000	-128.000	3.027	mA
S05: B2 AF Sensor	S84: AF sensor rationality check	4.262	1.191	5.531	mA
S05: B2 AF Sensor	S86: AF sensor 'out of range' check	0.062	-128.000	5.977	mA
S05: B2 AF Sensor	S89: AF sensor response check	689.000	230.000	65535.000	
S06: B2 Secondary HO2S	S9D: Response check	0.047	0.000	0.504	V
S06: B2 Secondary HO2S	S9E: Circuit check	0.138	0.050	65.535	V
S21: B1 Catalyst	S41: Catalyst capability	0.000	0.000	3.000	V
S22: B2 Catalyst	S41: Catalyst capability	1.204	0.000	3.000	V
S31: EGR System	S00: EGR valve check	0.029	0.000	0.040	inch
S31: EGR System	S01: EGR valve check	0.081	0.006	1.999	inch
S32: EGR System	S02: EGR flow check	427.880	342.680		%
S33: EGR System	S03: EGR pipe check	1615.000	0.000	22936.000	
S3A: EVAP System	S8A: Large cross leak check	32.500	26.500	8191.750	Pa

Click on above row of interest to get Related DTC and explanation if available.

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Mode 6 – Acura / Honda

Controls MultiTool Info ? EScan DTCs Monitors PIDs Digital Graphs Mode6 O2 Sharp SHOOTER Patented

Bank 1 ? Bank 2

RICH RICH

LEAN LEAN

CENTER CENTER

Stoichiometric Stoichiometric

FUEL TRIM FUEL TRIM

TOTAL FUEL TRIM TOTAL FUEL TRIM

Bank to Bank Fuel Trim BtoBTrim NaN

Time to Engine Temp Calculating Temp(F) NaN

Engine Vacuum Vac (HG) NaN

Charging Voltage Good Battery V 14.22

MIL OFF (No Codes) # Codes 0

Monitors Not Complete # not run 1

www.AutomotiveTestSolutions.com

Select Make Honda/Acura 2010-2016

Test Value background color: Red if outside of limit, Yellow if close to limit

Reading

Read All Mode6 Once

Read All Mode6 Continuous

Read Selected Continuous

OBD Monitor ID (OBDMID)	Test ID (TID)	Test Value	Min Limit	Max Limit	Units
\$06: B2 Secondary HO2S	\$D0: Response check	0.047	0.000	0.504	V
\$06: B2 Secondary HO2S	\$D0: Circuit check	0.138	0.050	65.535	V
\$21: B1 Catalyst	\$A1: Catalyst capability	0.000	0.000	3.000	V
\$22: B2 Catalyst	\$A1: Catalyst capability	1.204	0.000	3.000	V
\$31: EGR System	\$D0: EGR valve check	0.029	0.000	0.040	inch
\$31: EGR System	\$D1: EGR valve check	0.081	0.005	1.999	inch
\$31: EGR System	\$D2: EGR flow check	427.880	342.880	655.350	%
\$31: EGR System	\$D3: EGR pipe check	1815.000	0.000	22938.000	
\$3A: EVAP System	\$B4: Large gross leak check	32.500	26.500	8191.750	Pa
\$3A: EVAP System	\$C2: Large gross leak check	0.000	0.000	0.000	Pa
\$3C: EVAP System	\$B4: Leak check	0.000	0.000	0.000	
\$3C: EVAP System	\$B5: Leak check	0.000	0.000	0.000	
\$3C: EVAP System	\$B6: Leak check	0.000	0.000	0.000	Pa
\$3D: EVAP System	\$B9: Purge flow/purge valve check	100.006	30.004	100.006	%
\$A2: Misfire	\$0B: Average Misfires over last 10 driving	5.000	0.000	65535.000	Counts
\$A2: Misfire	\$0C: Total misfire counts, present drive cy	0.000	0.000	65535.000	Counts
\$A3: Misfire	\$0B: Average Misfires over last 10 driving	5.000	0.000	65535.000	Counts
\$A3: Misfire	\$0C: Total misfire counts, present drive cy	0.000	0.000	65535.000	Counts
\$A4: Misfire	\$0B: Average Misfires over last 10 driving	7.000	0.000	65535.000	Counts
\$A4: Misfire	\$0C: Total misfire counts, present drive cy	0.000	0.000	65535.000	Counts
\$A5: Misfire	\$0B: Average Misfires over last 10 driving	5.000	0.000	65535.000	Counts
\$A5: Misfire	\$0C: Total misfire counts, present drive cy	0.000	0.000	65535.000	Counts
\$A6: Misfire	\$0B: Average Misfires over last 10 driving	0.000	0.000	65535.000	Counts
\$A6: Misfire	\$0C: Total misfire counts, present drive cy	0.000	0.000	65535.000	Counts
\$A7: Misfire	\$0B: Average Misfires over last 10 driving	1.000	0.000	65535.000	Counts
\$A7: Misfire	\$0C: Total misfire counts, present drive cy	2.000	0.000	65535.000	Counts

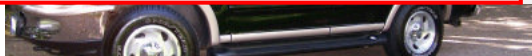
Click on above row of interest to get Related DTC and explanation if available.

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DTCs - Mode 6 Case Study

Code	Description
	DTC Codes:
P0401	Exhaust Gas Recirculation Flow Insufficient Detected
	Pending Codes:
P0300	Random/Multiple Cylinder Misfire Detected
P0308	Cylinder 8 Misfire Detected

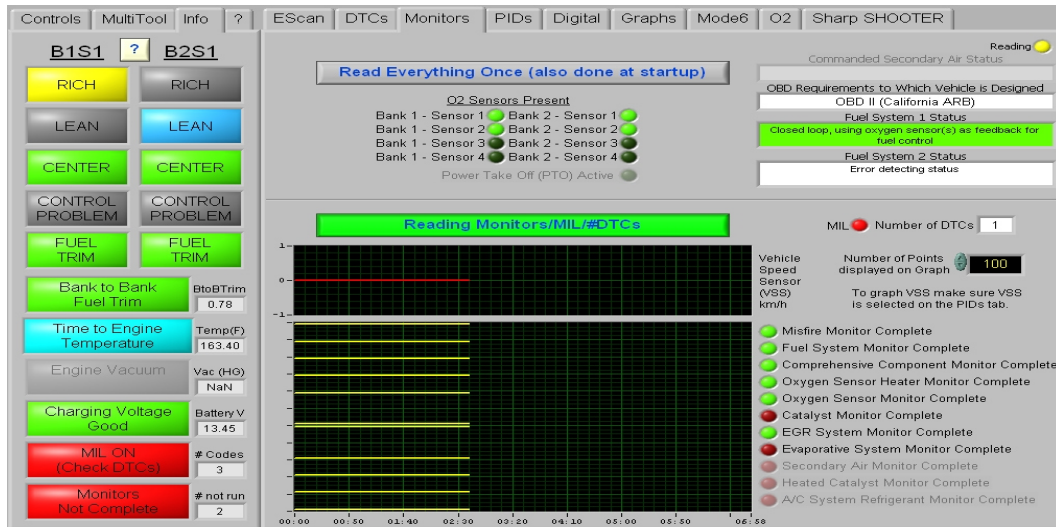


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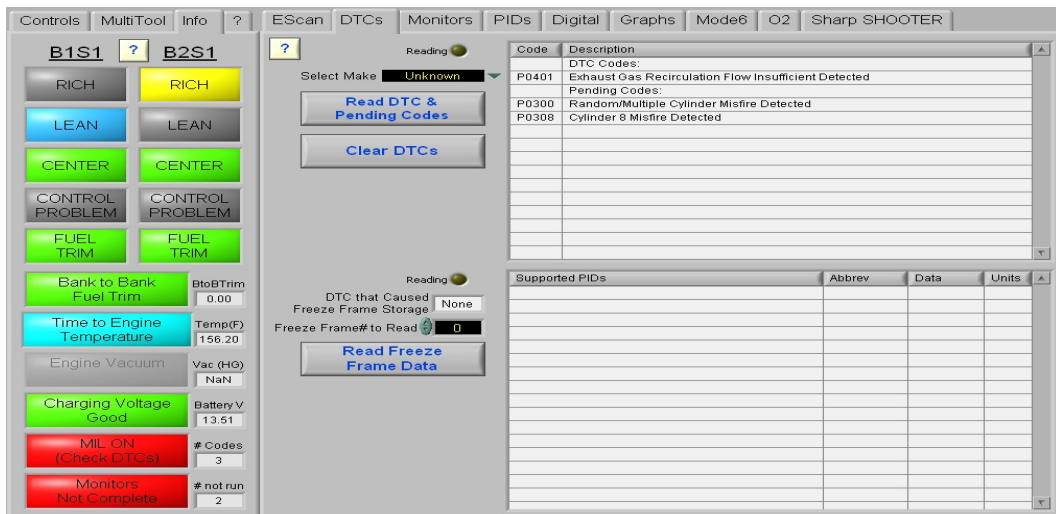
DTCs - Mode 6 Case Study



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DTCs - Mode 6 Case Study



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DTCs - Mode 6 Case Study

B1S1

B2S1

RICH

RICH

LEAN

LEAN

CENTER

CENTER

Time to Engine Temperature

Temp(F)

152.60

Engine Vacuum

Vac (HG)

NaN

Charging Voltage Good

Battery V

13.57

MIL ON (Check DTCs)

Codes

3

Monitors Not Complete

not run

2

EScan

DTCs

Monitors

PIDs

Digital

Graphs

Mode6

O2

Sharp SHOOTER

Select Make

Ford 1996 - 2006

Read All Mode6 Once

Read All Mode6 Continuous

Read Selected Continuous

TestID (TID)

ComponentID (CID)

Test Value

Min Limit

Max Limit

Units

\$01: Front Oxygen Sensor Monitor	\$11: B1S1 Voltage Amplitude	0.665	0.502		volts
\$01: Front Oxygen Sensor Monitor	\$21: B2S1 Voltage Amplitude	0.757	0.502		volts
\$03: Front Oxygen Sensor Monitor	\$01: Upstream Switch Point Voltage	0.452	0.000		volts
\$03: Rear Oxygen Sensor Monitor	\$02: Downstream Switch Point Voltage	0.502	0.000		volts
\$10: Catalyst Efficiency Monitor	\$21: Bank 2 Switch Ratio	0.733		0.749	
\$10: Catalyst Efficiency Monitor	\$11: Bank 1 Switch Ratio	0.733		0.749	
\$22: EVAP System 0.040 Leak Check	\$00: Vacuum Bleed-up Leak Check	-63.898		2.498	in H2O
\$25: EVAP System 0.040 Leak Check	\$00: Vapor Generation Pressure Rise	-63.898	1.498		in H2O
\$45: DPFE EGR System Monitor	\$20: EGR Stuck Open Test	0.655		1.282	volts
\$4A: DPFE EGR System Monitor	\$30: EGR Flow Test	-0.616	5.990		in H2O
\$4B: DPFE EGR System Monitor	\$30: EVR Duty Cycle Flow Test	88.041		79.953	%
\$51: Misfire Monitor Cylinder #5	\$05: Cylinder #5 Misfire Rate	0.000		2.457	%
\$51: Misfire Monitor Cylinder #6	\$06: Cylinder #6 Misfire Rate	0.000		2.457	%
\$51: Misfire Monitor Cylinder #7	\$07: Cylinder #7 Misfire Rate	0.000		2.457	%
\$51: Misfire Monitor Cylinder #8	\$08: Cylinder #8 Misfire Rate	0.000		2.457	%
\$52: Misfire Monitor	\$00: Consecutive cyl. events during test.	0.000		0.000	events

Click on above row of interest to get Related DTC and explanation if available.

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The Fix



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Mode 6 Buick 3.6L

Controls | MultiTool | Info | ? | EScan | DTCs | Monitors | PIDs | Digital | Graphs | Mode6 | O2 | Sharp SHOOTER | Patented

Bank 1 ? Bank 2

RICH RICH

LEAN LEAN

CENTER CENTER

CONTROL PROBLEM Stoichiometric

FUEL TRIM FUEL TRIM

TOTAL FUEL TRIM TOTAL FUEL TRIM

Bank to Bank Fuel Trim BtoBTrim NaN

Time to Engine Temperature Temp(F) 190.40

Engine Vacuum Vac (HG) NaN

Charging Voltage Good Battery V 14.15

MIL ON (Check DTCs) # Codes 3

Monitors Not Complete # not run 1

www.AutomotiveTestSolutions.com

Select Make GM

Test Value background color: red if outside of limit, yellow if close to limit

Reading

Read All Mode6 Once
Read All Mode6 Continuous
Read Selected Continuous

Test ID (TID)	Component ID (CID)	Test Value	Min Limit	Max Limit	Units
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$84: EVAP canister loading test	0.000	0.000		
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$26: EVAP excess vacuum test 1	-3276.800		-3266.800	H20V
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$36: EVAP excess vacuum fail test 2	0.000		0.000	sec
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$C6: EVAP excess vacuum pass test 2	-3276.800		-3276.800	H20V
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$90: EVAP weak vacuum pass test 1	-3239.300		-3268.900	H20V
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$20: EVAP weak vacuum fail test 1	-3239.300		-3239.300	isec
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$80: EVAP weak vacuum test 2 vacuum	0.000	0.000		sec
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$C0: EVAP weak vacuum test 2 vapor	0.000	0.000		sec
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$12: EVAP small leak test	-32.768		-32.768	H20ps
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$91: EVAP purge leak pass test	0.000	0.000		sec
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$21: EVAP purge leak vapor fail test	0.000		0.000	sec
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$31: EVAP purge leak vacuum fail test	-3276.800		-3276.800	H20V
\$06: O2 Sensor Heater Monitor	\$35: B1S1 Heater Time to Activity	16.000		53.000	sec
\$06: O2 Sensor Heater Monitor	\$41: B1S2 Heater Time to Activity	59.000		298.000	sec
\$07: Exhaust Gas Recirc Sys Monitor	\$0C: MAF High - No EGR Off-Idle Test	235.254		0.000	gm/cj
\$07: Exhaust Gas Recirc Sys Monitor	\$0D: EGR decel test	9.102		-44.999	kPa
\$0C: Catalyst Efficiency Monitor	\$20: Idle catalyst efficiency test - bank 1	-32.768		-32.699	sec

Click on above row of interest to get Related DTC and explanation if available.

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Mode 6 GM

Controls | MultiTool | Info | ? | EScan | DTCs | Monitors | PIDs | Digital | Graphs | Mode6 | O2 | Sharp SHOOTER | Patented

Bank 1 ? Bank 2

RICH RICH

LEAN LEAN

CENTER CENTER

CONTROL PROBLEM CONTROL PROBLEM

FUEL TRIM FUEL TRIM

TOTAL FUEL TRIM TOTAL FUEL TRIM

Bank to Bank Fuel Trim BtoBTrim -0.78

Time to Engine Temp Calculating Temp(F) 185.00

BARO Good Vac (HG) NaN

Battery Voltage Low Battery V 11.99

MIL OFF (No Codes) # Codes 0

Monitors Complete # not run 0

www.AutomotiveTestSolutions.com

Select Make GM

Test Value background color: red if outside of limit, yellow if close to limit

Reading

Read All Mode6 Once
Read All Mode6 Continuous
Read Selected Continuous

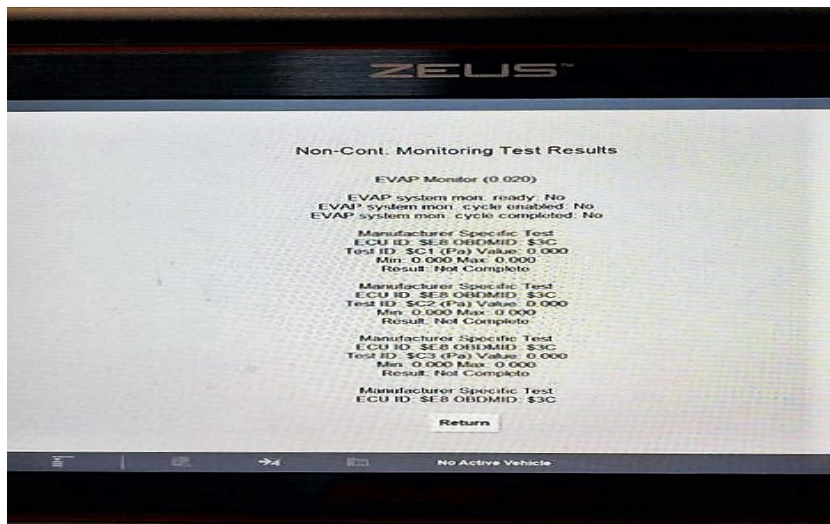
Test ID (TID)	Component ID (CID)	Test Value	Min Limit	Max Limit	Units
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$84: EVAP canister loading test	0.000	0.000		
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$68: EVAP excess vacuum test 1	0.600		7.000	H20V
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$36: EVAP excess vacuum fail test 2	0.000		4.000	sec
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$88: EVAP excess vacuum pass test 2	10.000	10.000		isec
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$D0: EVAP weak vacuum pass test 1	13.000	13.000		H20V
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$60: EVAP weak vacuum fail test 1	2.000		40.000	isec
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$80: EVAP weak vacuum test 2 vacuum	0.000	0.000		sec
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$C0: EVAP weak vacuum test 2 vapor	0.000	0.000		sec
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$52: EVAP small leak test	0.000		0.000	H20ps
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$91: EVAP purge leak pass test	37.600	37.500		sec
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$21: EVAP purge leak vapor fail test	0.000		200.000	sec
\$02: EnhEvapEmSysMon#1 (.040 Leak)	\$71: EVAP purge leak vacuum fail test	-1.400		12.000	H20V
\$05: O2 Sensor Monitors and Constants	\$0A: B1S2 catalyst sensor open test	24.000		1450.000	smpls
\$05: O2 Sensor Monitors and Constants	\$4A: B2S2 catalyst sensor open test	14.000		1450.000	smpls
\$06: O2 Sensor Heater Monitor	\$35: B1S1 Heater Time to Activity	21.000		72.000	sec
\$06: O2 Sensor Heater Monitor	\$41: B1S2 Heater Time to Activity	47.000		240.000	sec
\$06: O2 Sensor Heater Monitor	\$55: B2S1 Heater Time to Activity	19.000		87.000	sec
\$06: O2 Sensor Heater Monitor	\$61: B2S2 Heater Time to Activity	40.000		254.000	sec
\$0C: Catalyst Efficiency Monitor	\$60: Bank 1 Catalyst Test OSC	-3.632		0.040	sec
\$0C: Catalyst Efficiency Monitor	\$70: Bank 2 Catalyst Test OSC	-3.991		0.037	sec

Click on above row of interest to get Related DTC and explanation if available.

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Mode 6



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DTCs - Mode 6 Case Study

[illegible]

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De-catalyzed Cop Car

It's a cop car. Got cop tires, cop brakes... It also has a DTC -- P0420 -- low catalyst efficiency, Bank One.

Repair records show that this **2006 Impala** 3.8 has been in for repairs before. In fact, due to the presence of oxygen sensor DTCs, upstream and downstream oxygen sensors have already been replaced.


Now that it's come to us with a catalyst DTC, we want to know if the catalyst is **really** bad and, if so, **why** it is bad -- this car has only 40K on the odometer!

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De-catalyzed Cop Car

Is the catalyst really bad? We graph data from the upstream and downstream oxygen sensors. Graphed sensor values are shown here, superimposed.

Our ESCAN scan tool calculates cat efficiency at only 29%! No wonder there's a code.

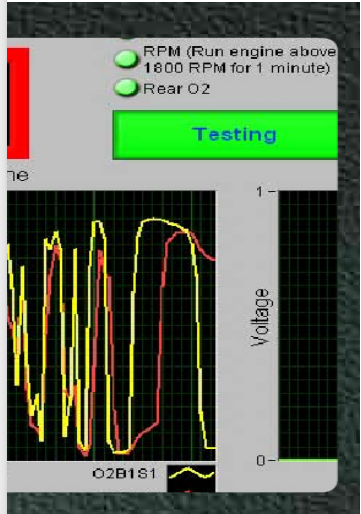
Even without the automatic calculation, it's clear that the superimposed waveforms are almost identical! This is an indication that the catalyst is **NOT** storing oxygen properly.

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DTCs - Mode 6 Case Study

De-catalyzed Cop Car

Mode 6 agrees with us. The tool flags the catalyst for low efficiency and marks that Mode 6 parameter in red.

This supports all of the other data gathered so far. We can replace this catalyst with a conscience!

De-catalyzed Cop Car

Mode 6 agrees with us. The scan tool flags the catalyst for low efficiency and marks that Mode 6 parameter in red.

This supports all of the other test data gathered so far. We can

used to verify a other diagnostic team, and an airtight case!

Test	0.000	0.00
	0.000	0.00
	0.000	

\$0A: EVAP Monitor #2 (.020 Leak)	\$05: EVPD .040" leak test	0.000
\$0A: EVAP Monitor #2 (.020 Leak)	\$07: Description Unavailable	600.000
\$0A: EVAP Monitor #2 (.020 Leak)	\$48: EVPD purge vacuum fail test	0.400
\$0A: EVAP Monitor #2 (.020 Leak)	\$06: EVPD .020" leak test	0.000
\$0C: Catalyst Efficiency Idle Monitor	\$60: Idle catalyst efficiency test - bank 1	1.467

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De-catalyzed Cop Car

Next question: Why is the catalyst dead at 40K miles?

We look at Long Term Fuel Trim and see that the PCM is making a **+17%** fuel trim correction. LTFT is adding **a lot** of fuel. STFT is also high, but comes back close to zero at 2500 rpm.

We watch fuel trim as propane is introduced near the intake manifold. STFT responds quickly as propane enters the engine through a leak at the intake manifold. We repair the leak.

Failure to correct this condition would damage the new cat as it did the old one.


De-catalyzed Cop Car

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Mode 6

Combining DTC, Freeze Frame, and Mode 6

The screenshot displays a diagnostic tool interface with three main sections:

- DTC (Diagnostic Trouble Codes):** Shows a table with columns for Module, Code, and Description. The entry is:

Module	Code	Description
Auxiliary Emission Controls	P0306	Cylinder 6 Misfire Detected
- Freeze Frame:** A box showing engine parameters at the time of the fault:
 - Engine Load 65%
 - VSS 7.46 rpm?
- Mode 6:** A table of monitored test results. The entry for Cylinder #6 is highlighted in red:

Component ID	Value	Unit
Cylinder #6 Misfire and Catalyst Damage Threshold Misfire ...	0.120	0.000 0.052 %

A red arrow points from the Freeze Frame section to the Mode 6 table, and another red arrow points from the Mode 6 table to the Freeze Frame section, indicating a correlation between the two.

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2010 Lincoln Town Car 4.6 Cat Efficiency 200K

The screenshot shows the EScan Automotive Test Solutions software interface. The main window is divided into several sections:

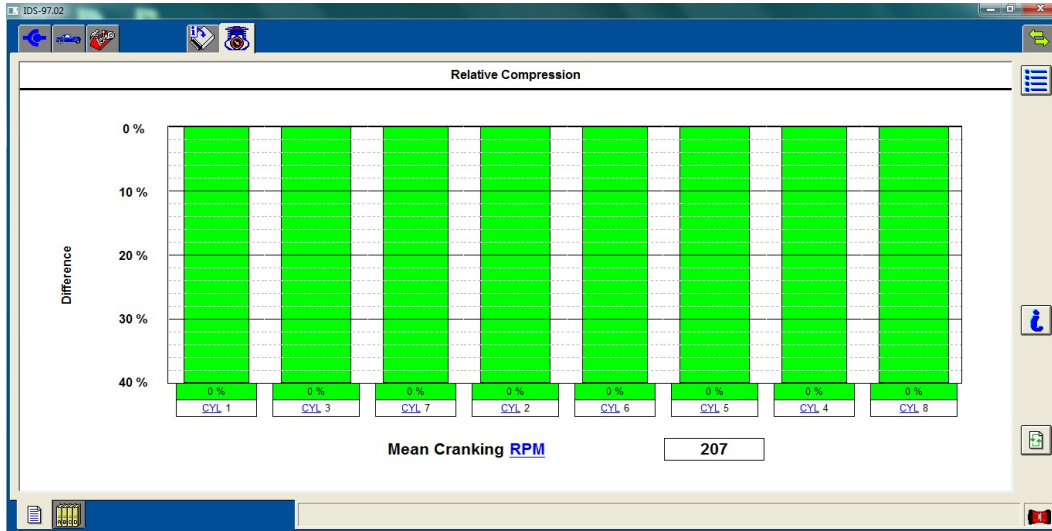
- Controls:** A sidebar with buttons for various engine parameters: RICH, LEAN, CENTER, CONTROL PROBLEM, FUEL TRIM, Bank to Bank Fuel Trim, Time to Engine Temperature, Engine Vacuum, Charging Voltage, MIL ON (Check DTCs), and Monitors. Each button has a corresponding status indicator (e.g., RICH is yellow, LEAN is blue, CENTER is green, CONTROL PROBLEM is grey, FUEL TRIM is green, Bank to Bank Fuel Trim is green, Time to Engine Temperature is green, Engine Vacuum is green, Charging Voltage is green, MIL ON is red, and Monitors is red).
- EScan DTCs:** A section for reading and clearing DTCs. It includes buttons for "Read DTC & Pending Codes", "Clear DTCs", and "Read Freeze Frame Data".
- Monitors:** A section for monitoring various engine parameters. It includes a table for "Supported PIDs" with columns for Code, Description, Abbrev, Data, and Units.
- Digital:** A section for digital data, including a table for "Supported PIDs".
- Graphs:** A section for displaying graphs.
- Mode6:** A section for Mode 6 data.
- O2:** A section for O2 data.
- Sharp SHOOTER:** A section for Sharp SHOOTER data.

The interface also displays a VIN (2LNBL8CVBA627940) and a "Patented" label.

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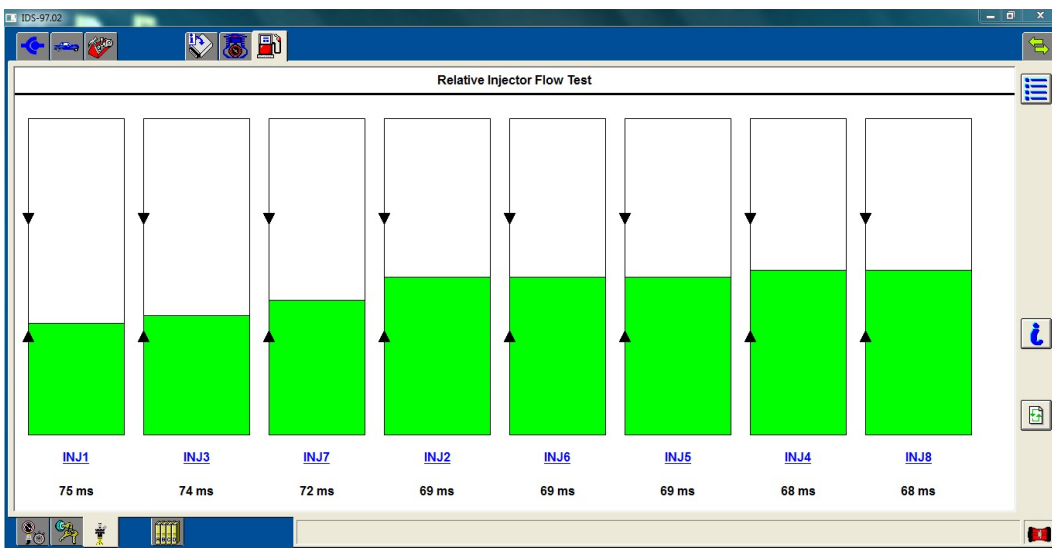
2010 Lincoln Town Car 4.6 Cat Efficiency 200K



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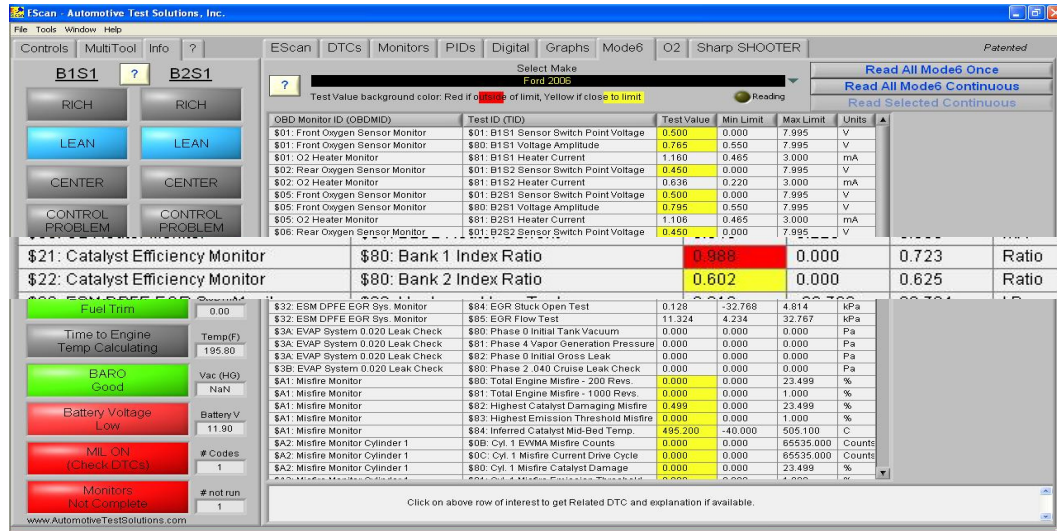
2010 Lincoln Town Car 4.6 Cat Efficiency 200K



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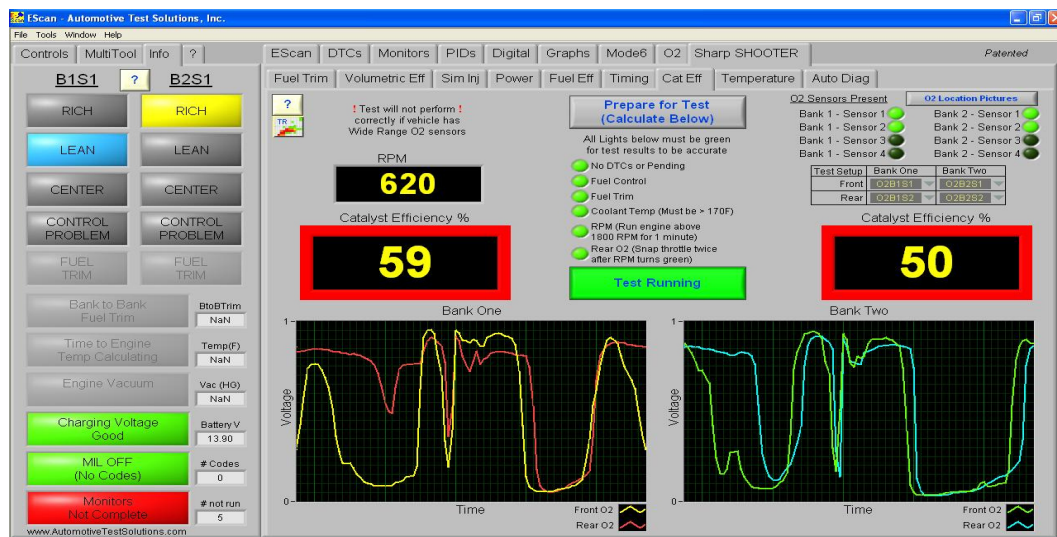
2010 Lincoln Town Car 4.6 Cat Efficiency 200K



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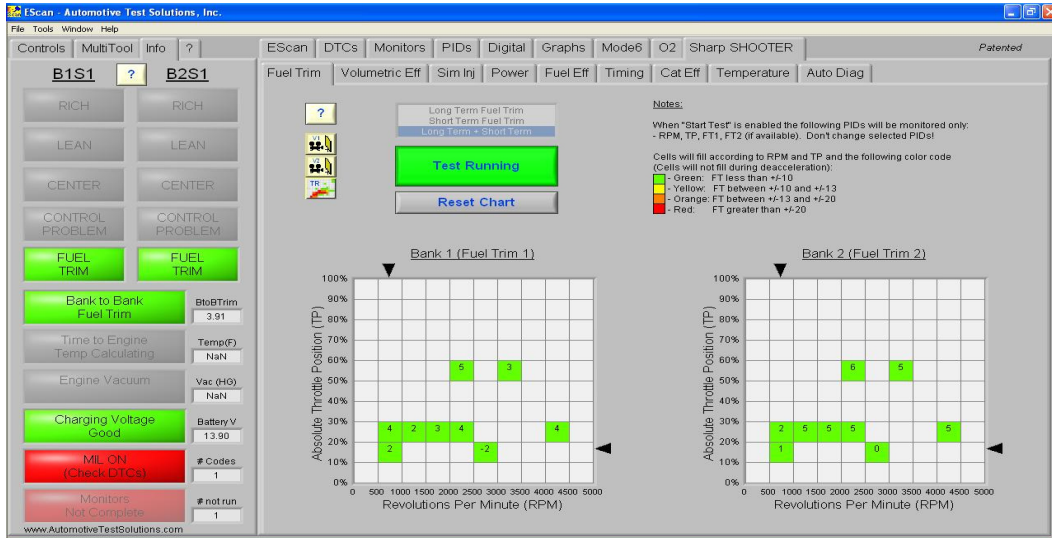
2010 Lincoln Town Car 4.6 Cat Efficiency 200K



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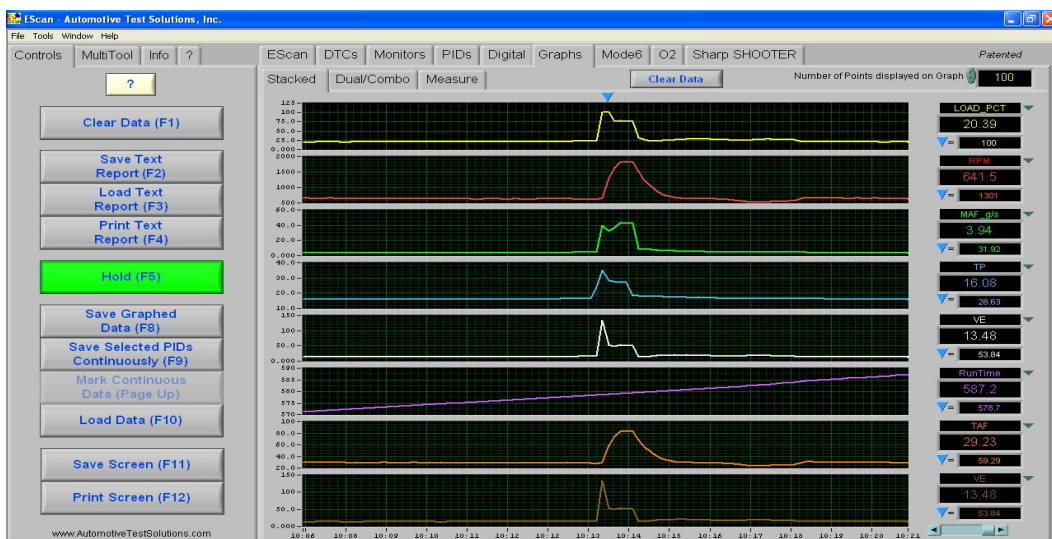
64

2010 Lincoln Town Car 4.6 Cat Efficiency 200K



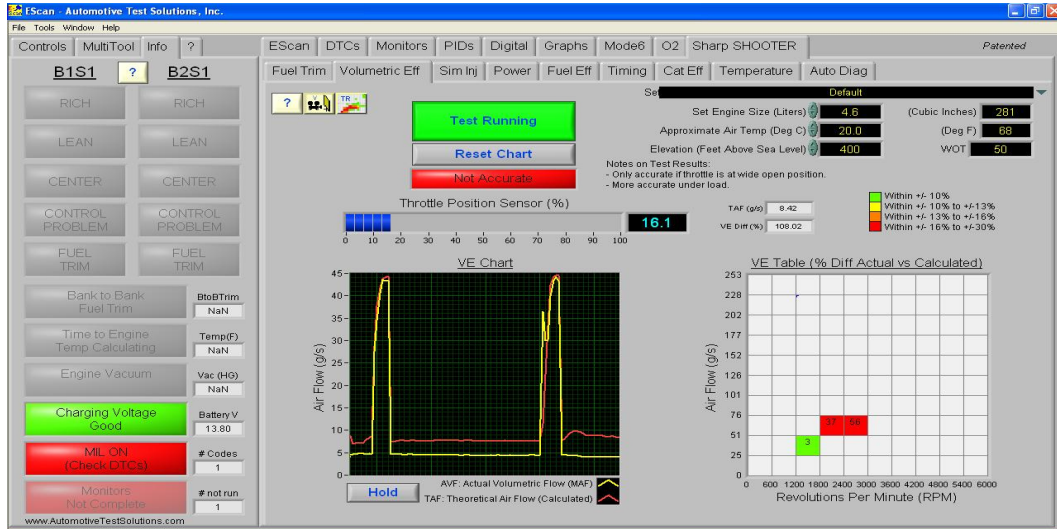
65

2010 Lincoln Town Car 4.6 Cat Efficiency 200K



66

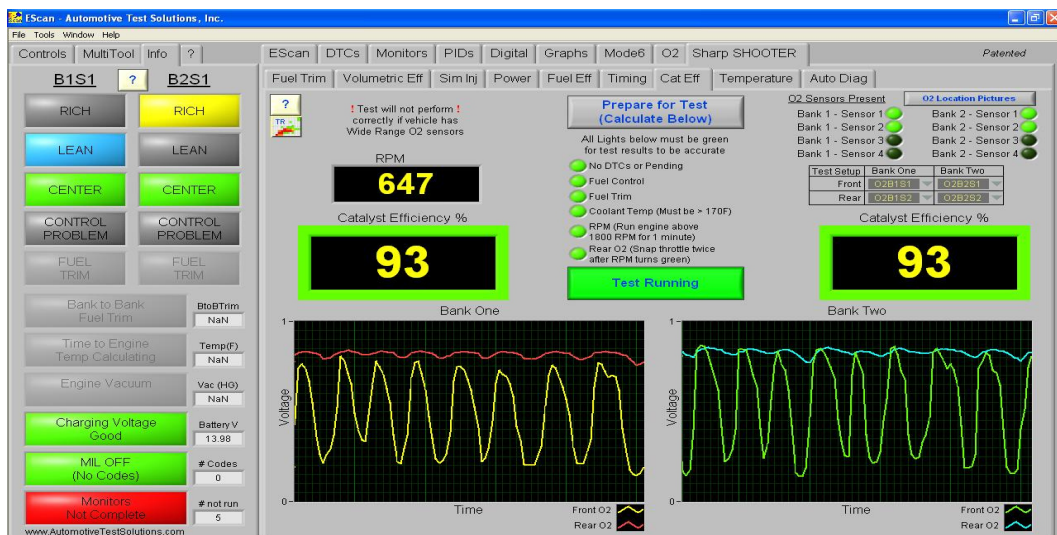
2010 Lincoln Town Car 4.6 Cat Efficiency 200K



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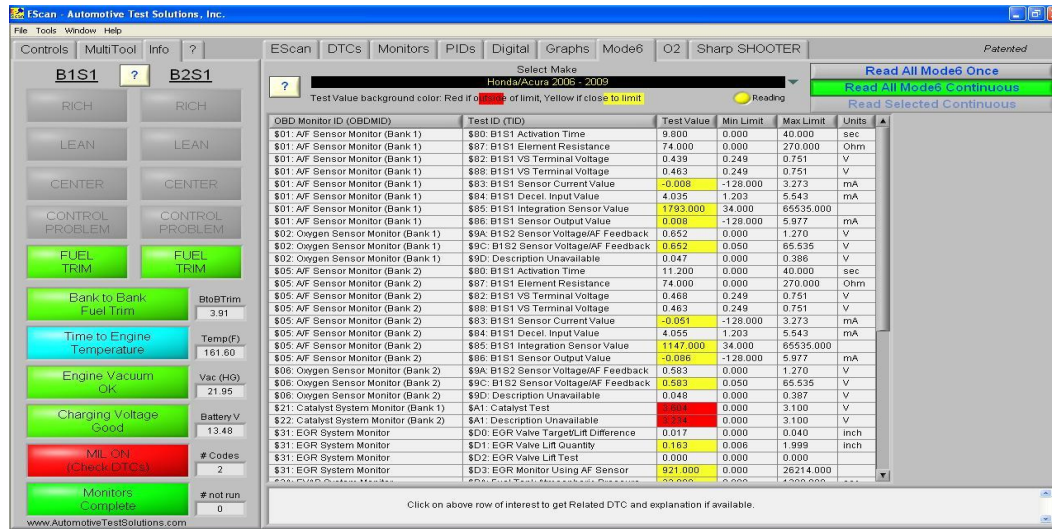
2010 Lincoln Town Car 4.6 Cat Efficiency 200K



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2009 Honda Pilot Mode 6



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Ford Enhanced Mode 6 Scan Data

Description	OBDDMI	Test ID	Min	Max	Value
HO2SB1S1 Monitor	1				
HO2SB1S1 Switch Point	1	1	0V	7.995V	0.449V
HO2SB1S1 Voltage Amplitude	1	80	0.499V	7.995V	0.818V
HO2SB1S1 Heater Current	1	81	0.465A	3.000A	1.642A
HO2SB1S2 Monitor	2				
HO2SB1S2 Switch Point	2	1	0V	7.995V	0.449V
HO2SB1S2 Heater Current	2	81	0.220A	3.000A	0.641A
Catalyst Monitor Bank 1	21				
Rear-to-Front Switch Ratio	21	80	0:1	0.8:1	0.04:1
Stepper Motor EGR Monitor (Open Loop)	33				
EGR Degradation Index	33	82	0.249	1.998	1.225
EVAP Monitor (Large Leak)	3A				
Phase 0 Excessive Vacuum Limit	3A	80	0Pa	0Pa	0Pa
Phase 4 Purge Valve Stuck Open Limit	3A	81	0Pa	0Pa	0Pa
Phase 0 Gross Leak Limit	3A	82	0Pa	0Pa	0Pa
EVAP Monitor (0.040 inch)	3B				
Phase 2 0.040 inch Cruise Leak Check Vacuum Bleedup And Maximum 0.040 inch Leak Threshold	3B	80	32768Pa	3760Pa	1252Pa
EVAP Monitor (0.020 inch)	3C				
Phase 2 0.020 inch Idle Leak Check Vacuum Bleedup And Maximum Leak Threshold	3C	80	0Pa	0Pa	0Pa
Misfire Monitor General Data	A1				
Total Engine Misfire and Catalyst Damage	A1	80	0%	15.02%	0%
Misfire Rate	A1	81	0%	1.69%	0%
Ratio of Monitored Combustion Events	A1	82	0%	15.02%	0.49%
Highest Cylinder Misfire Rate	A1	83	0%	1.69%	0%

Complete

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Mode 6 Case Study

Lean Cuisine

Is Mode 6 the best OBD diagnostic tool?

Or is it just one tool to be used with others when diagnosing a MIL-on condition?

This case study offers answers.

96 Ford Escort

135,000 mi.

MIL on

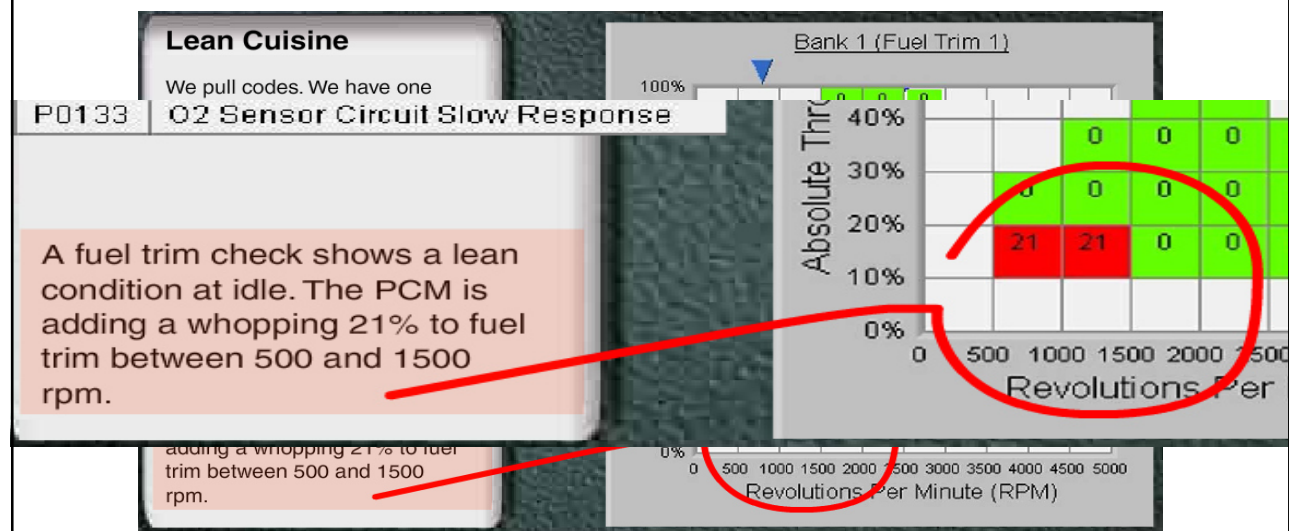
DTC P0172

Pending DTC P0133

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Mode 6 Case Study



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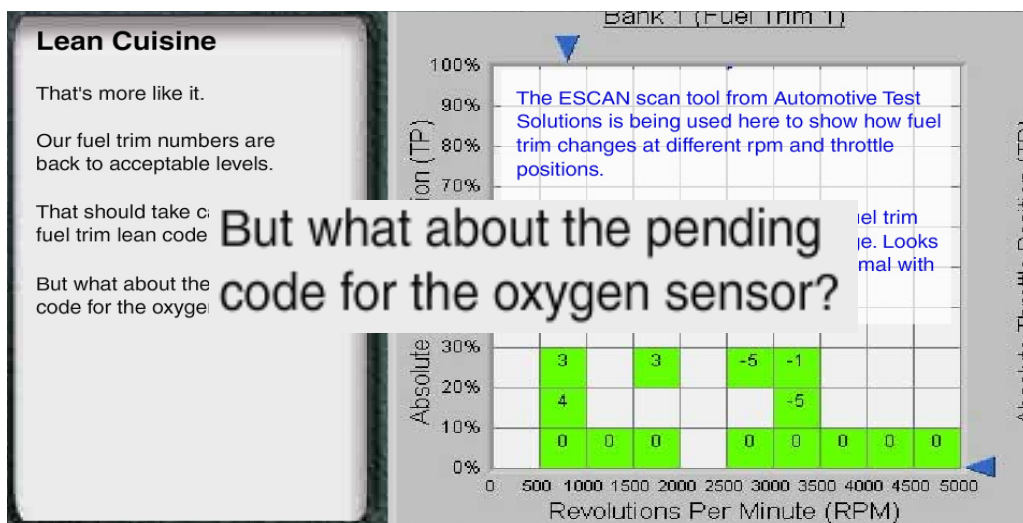
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Our Ford displays oxygen sensor test data in Mode 6, not Mode 5. Let's see if we can find a clue about our pending DTC.

The scan tool has flagged some of the HO2S parameters in red!

Mode 6 test data suggest a problem in the oxygen sensor circuit. Remember, Mode 6 is not live data, only the most recent test results. Since sensor data look normal in datastream at the moment, Mode 6 is suggesting an intermittent problem.

Component ID (CID)	Test Value	Min Limit
\$11: B1S1 Voltage Amplitude	0.000	0.471
\$21: B2S1 Voltage Amplitude	64.224	0.471
\$11: B1S1 Static Shift Min/Max	0.000	32.193
\$11: B1S1 Static Shift Min/Max	0.000	
\$21: B2S1 Static Shift Min/Max	64.224	32.193
\$21: B2S1 Static Shift Min/Max	64.224	

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We return to the engine compartment and begin to wiggle wires in the oxygen sensor circuit as we watch datastream. To speed the data update rate, we select only the oxygen sensor PID.

As we wiggle the wire at the oxygen sensor, we can make the HO2S sensor PID toggle between normal voltage and zero volts.

The sensor seems to be failing intermittently.



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With a new oxygen sensor installed, we are unable to duplicate the intermittent dropout with a wiggle test.

The new oxygen sensor total range and frequency look good when viewed on a scope.



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We decide to test drive the Escort.
DTCs are not erased yet.

It runs well.

Datastream values look normal.

Supported PIDs	Abbrev	Data	Units
Calculated Load	LOAD_PCT		%
✓ Engine Coolant Temperature	ECT	221.0000	Deg F
Short Term Fuel Trim Bank 1	SHRTFT1	2.3437	%
✓ Long Term Fuel Trim Bank 1	LONGFT1	2.8125	%
✓ Engine RPM	RPM	790.5000	RPM
Vehicle Speed Sensor	VSS		km/h
Ignition Timing Advance for #1 Cylinder	SPARKADV		deg
Intake Air Temperature	IAT		Deg C
Air Flow Rate from Mass Air Flow Sensor	MAF_g/s		g/s
Air Flow Rate from Mass Air Flow Sensor	MAF_lb/m		lb/m
Absolute Throttle Position	TP	19.2157	%
✓ O2 Bank 1 - Sensor 1	O2B1S1	0.7800	V
✓ O2 Bank 1 - Sensor 1	FTB1S1	-1.5625	%
O2 Bank 1 - Sensor 2	O2B1S2		V
O2 Bank 1 - Sensor 2	FTB1S2		%

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After a test drive, we decide to recheck DTCs.

Hello. Seems we have a new pending DTC for a cylinder misfire on cylinder number one.

Good thing we checked.

Code	Description
	DTC Codes:
P0171	System Too Lean
	Pending Codes:
P0130	O2 Sensor Circuit Slow Response
P0301	Cylinder 1 Misfire Detected

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Mode 6 Case Study

Controls | MultiTool | Info | ? | EScan | DTCs | Monitors | PIDs | Digital | Graphs | Mode6 | O2 | Sharp SHOOTER

Select Make
Ford 1996 - 2006

Test Value background color: Red if outside of limit, Yellow if close to limit Green Reading

Read All Mode6 Once
Read All Mode6 Continuous
Read Selected Continuous

TestID (TID)	ComponentID (CID)	Test Value	Min Limit	Max Limit	Units
\$01: Front Oxygen Sensor Monitor	\$11: B1S1 Voltage Amplitude	0.856	0.552		volts
\$01: Front Oxygen Sensor Monitor	\$21: B2S1 Voltage Amplitude	0.915	0.552		volts
\$03: Front Oxygen Sensor Monitor	\$01: Upstream Switch Point Voltage	0.451	0.000		volts
\$03: Rear Oxygen Sensor Monitor	\$02: Downstream Switch Point Voltage	0.451	0.000		volts
\$04: O2 Heater Monitor	\$11: B1S1 Heater Current Maximum	1.277		3.000	amps
\$04: O2 Heater Monitor	\$12: B1S2 Heater Current Maximum	0.617		3.000	amps
\$04: O2 Heater Monitor	\$21: B2S1 Heater Current Maximum	1.191		3.000	amps
\$10: Catalyst Efficiency Monitor	\$11: Bank 1 Switch Ratio	0.000		0.796	
\$50: Misfire Monitor	\$00: Total Engine Misfire	0.315		3.931	%
\$53: Misfire Monitor Cylinder #1	\$01: Cylinder #1 Misfire Rate	2.226		0.983	%
\$53: Misfire Monitor Cylinder #2	\$02: Cylinder #2 Misfire Rate	0.000		0.983	%

Bank to Bank Fuel Trim: BtoBTrim -7.81
Time to Engine Temperature: Temp(F) 190.40
Engine Vacuum: Vac (HG) NaN
Charging Voltage: Battery V 14.26
MIL OFF (Check DTCs): # Codes 4
Monitors: # not run 1

Click on above row of interest to get Related DTC and explanation if available.

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Even though the misfire monitor is continuous, the Ford reports it in Mode 6.

Cylinder number one indicates some level of misfire.

These Mode 6 data are not "live." And while the misfire levels indicated here for cylinder number 1 are below the threshold level for setting a code, they do suggest that we take a closer look, just to play it safe.

The PCM has seen something in number 1 that made it store a pending DTC.

\$01: Cylinder #1 Misfire Rate	0.310	2.605
\$02: Cylinder #2 Misfire Rate	0.000	2.605
\$03: Cylinder #3 Misfire Rate	0.000	2.605
\$04: Cylinder #4 Misfire Rate	0.000	2.605
\$05: Cylinder #5 Misfire Rate	98.302	2.605
\$06: Cylinder #6 Misfire Rate	98.302	2.605
\$07: Cylinder #7 Misfire Rate	98.302	2.605
\$08: Cylinder #8 Misfire Rate	98.302	2.605

Cyls 5-8 not used in this vehicle

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Misting the wires with a mixture of water and baking soda shows a leaking plug wire boot at number one cylinder.

At 130K, a new set of wires seems to be in order!



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Mode 6 is not some magic weapon that will shoot down all your diagnostic problems.

The Escort was repaired using a number of tools, some high tech like Mode 6, others low tech like propane and water.

A lesson to be learned here is that Mode 6 provides clues that must be proven or disproven with good automotive test procedures.

Diagnostic data sources:

DTCs
Datastream
Mode 6
Fuel Trim graphs and charts

Thorough visual inspection
Propane to find vacuum leak
Water to find leaking plug wire



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