

RevUp - Smarter Solutions for Faster Repairs!

Presents:

"Mastering Modern Diagnostic Strategy"

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Motor-Age
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2026

Your Instructor For This Webinar

- National Trainer, ASE World Class, Master Auto, Truck, School Bus, L1, L3, CNG
- 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, Motor Age and TST Webcast Instructor - Dorman Training Director
- 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

Instructions for this webinar

- This seminar will be approx. 2 hours long
- All slides that are presented are in your handout and are numbered
- Have a pen or pencil and paper for notes
- Questions can be asked at anytime

- 01 **3-step diagnostic process**
- 02 **Building a diagnostic plan**
- 03 **Using all 10 modes of Global OBD-II**
- 04 **No code diagnostic strategies**
- 05 **Case studies**

Building The Diagnostic Game Plan

Special Tip #1 - The First Three Diagnostic Steps

- **Step 1: Verify the concern**
 - You can't fix it if you can't duplicate it
 - Intermittents are faults where you haven't figured out yet what the circumstances are that result in the concern showing itself
- **Step 2: Check the system for trouble codes**
 - Perform a full system scan
- **Step 3: What do you think the third step is?**
(Hint: It's a commonly forgotten step!)
 - Check for Technical Service Bulletins!

Special Tip #2 - Only Four Things Can Make An Engine Run Bad

- **Engine mechanical - the ability of the engine to seal and compress the air/fuel mixture**
- **Volumetric efficiency - the ability to move air in and out of the engine noted as a percentage of actual airflow versus theoretical airflow (what it did move versus how much it should have moved)**
- **Ignition - the ability to provide a good, continuous spark at the right time**
- **Fuel - the ability to deliver the precise quantity of fuel at the right time and in the proper atomization**

Diagnostic Path - Which Funnel Should I Be In



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8 Steps of Diagnostics

- 1 - Verify the customer concern**
- 2 - Perform visual inspection and simple tests**
- 3 - Retrieve diagnostic trouble codes**
- 4 - Check for TSB's**
- 5 - Look at scan tool data**
- 6 - Narrow problem down to system or cylinder**
- 7 - Find root cause and perform repair**
- 8 - Confirm repair before giving customer vehicle back**



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Build Your Diagnostic Worksheet - Test Before You Swap Parts

- **Battery, starting and charging**
- **Pre-scan report**
- **Review pre-scan tool data (enhanced and generic)**
- **Time to temperature**
- **Pre-5 gas analysis (extra credit)**
- **Engine mechanical**

Build Your Diagnostic Worksheet

- **Ignition system**
- **Fuel delivery system (extra credit)**
- **Fuel Trim and VE testing**
- **CAT efficiency testing**
- **Review post-scan tool data (enhanced and generic)**
- **Post-5 gas analysis (extra credit)**
- **Post scan report**
- **Mode 6 data**

Drive It

- A proper test drive can cut your time down and drive you halfway down the funnel before you are back in the bay.
- If properly performed, no data will be missed.
- Ask yourself, based on the customer concern, "What condition do I need to drive the vehicle under to achieve the best test results?"



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Don't Make This Mistake



Do not drive the vehicle to the scan tool



Take the scan tool to the vehicle

Starting With The Basics First

Start your diagnostic procedure by testing from the basics up, finding out what's right and what's wrong, just like the big box scope analyzers did years ago. **The good thing about the old big box analyzers was that they forced us to start at the battery, starter, alternator, engine mechanical condition, emission gas readings, ignition, fuel systems, and scan data.**



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Basics First

- **Is the battery in good condition and the correct one for the vehicle?**
- **Is there fuel in the tank?**
- **Are the fluid levels correct?**
- **Are there signs of neglect or needed maintenance?**
- **Is anything missing that should be there?**



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Gather Data

- **Take the time to read up on component and system operation**
 - Use of OE service information may be needed
 - www.NASTF.org
- **Perform general tests first - find the funnel you need to focus on**
- **Move on to pinpoint tests - use the results to guide you to the next test needed**
- **Never assume anything!**

"Once you have eliminated the impossible, whatever remains, however improbable, must be the truth." - Mr. Spock



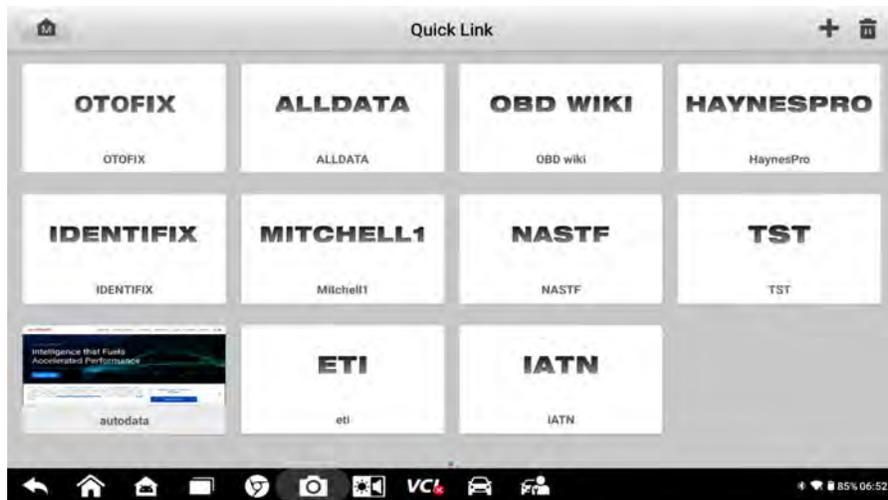
Wikipedia - Public Domain image

No Fancy Tools - Foundations

No Fancy Tools Or Equipment



Service Info In The Scan Tool



Good Visual Inspection



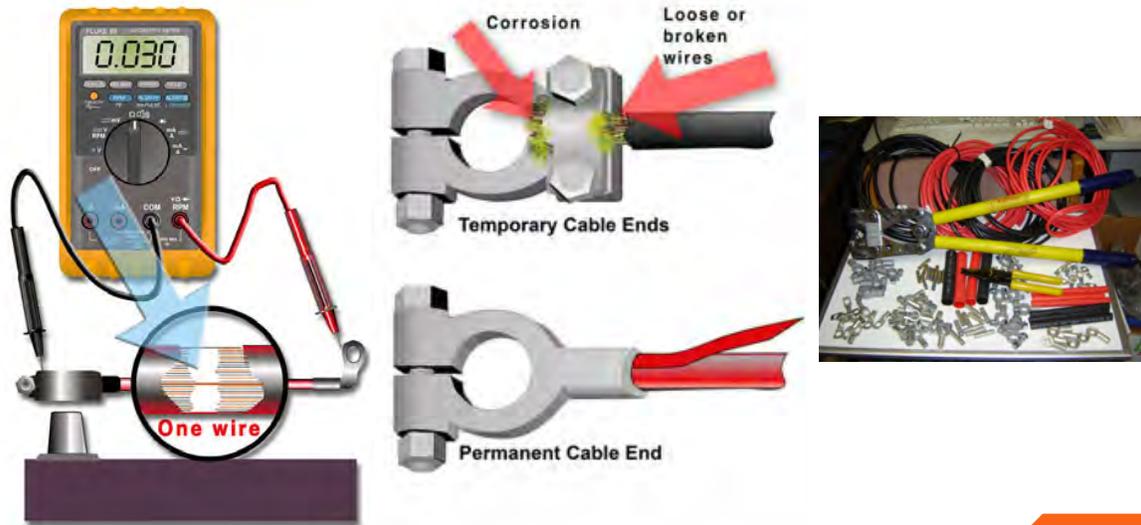
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Could This Cause A Code?



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Voltage Drop



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Initial Voltage Drop Checks

- **Battery negative at battery post to block**
- **Battery negative at battery post to chassis**
- **Engine block to chassis**
- **Battery positive at battery post to main fuse box**
- **Alternator B+ to battery positive at battery post**

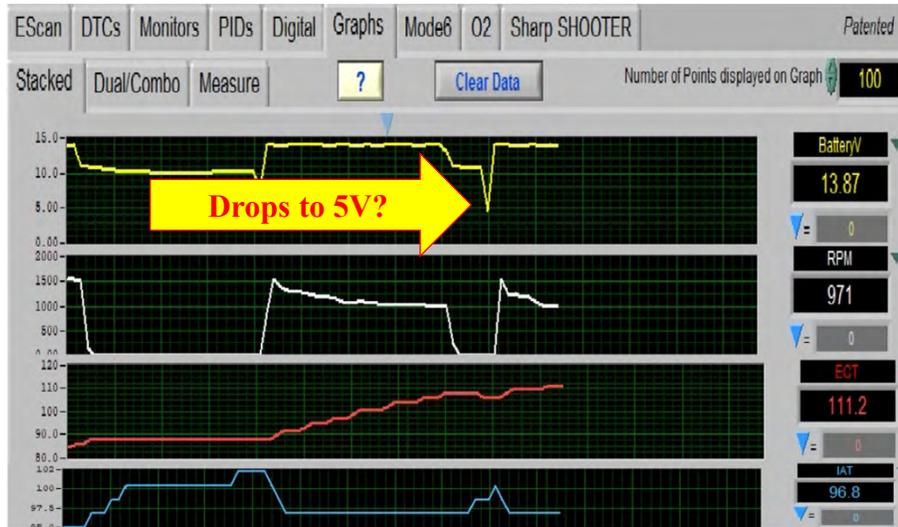
Any reading over 500 mV should be corrected before proceeding



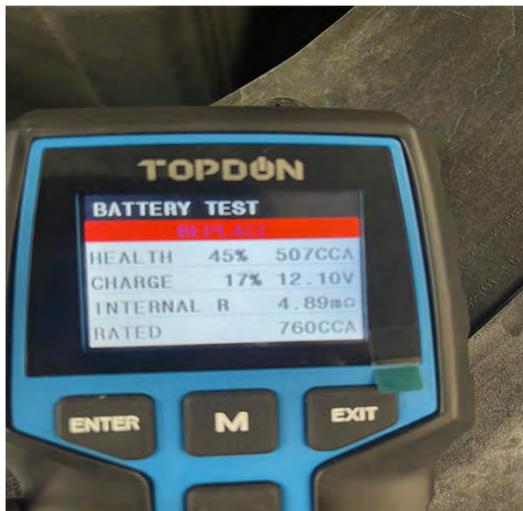
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Scan Tool Battery Test (Can Also Be Done With DVOM Or DSO)



Conventional Battery Test



Relative Compression

- **If the battery passes inspection, we should move to testing the engine's mechanical condition using the relative compression method.**
- **Fully depressing the throttle pedal while cranking should disable the engine from starting on about 80% of vehicles.**
- **Toyota and Ford OE scan tools, and the ATS EScan, can perform this test at the DLC. Otherwise, use a DSO on voltage (AC coupled) or cranking amperage (high amp probe)**
- **If you don't have either, there is always the mechanic's ear test!**
 - **Good: 1111111111111111**
 - **Bad: 11101110111011101**

Relative Compression Examples



Difference
Cylinder 1 : 0.0 (%)
Cylinder 4 : 0.2 (%)
Cylinder 2 : 0.0 (%)
Cylinder 5 : 0.2 (%)
Cylinder 3 : 0.0 (%)
Cylinder 6 : 0.1 (%)
Mean cranking RPM : 164.8



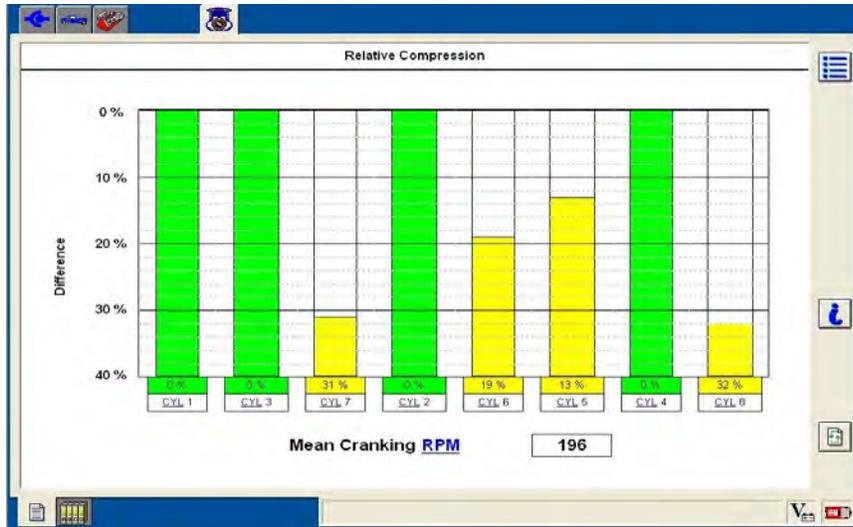
Relative Compression Examples



Basics First - EScan Relative Compression



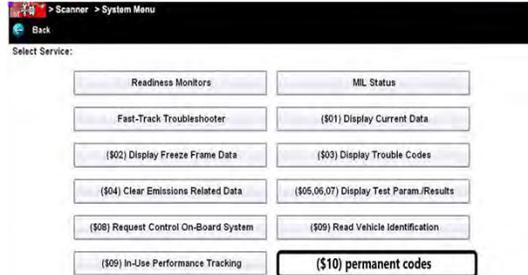
Basics First - Ford IDS Relative Compression Test



Modes, Monitors & More

10 Modes of OBD II

MODES	GENERIC TITLE
Mode 1	Powertrain Diagnostic Data
Mode 2	Powertrain Freeze Frame Data
Mode 3	Emission Related Powertrain DTCs
Mode 4	Clear/Reset Emission Related Diagnostic Information
Mode 5	Oxygen Sensor Monitoring Test Results
Mode 6	Test Results for Non-Continuously Monitoring Systems
Mode 7	Test Results for Continuously Monitored Systems
Mode 8	Request Control of On-Board System Test or Component
Mode 9	Request Vehicle Information
Mode 0A/10	Permanent Diagnostic Trouble Codes (DTCs) (Cleared DTCs)



Mode \$01 - Live Data

Code	Description	Abbrev	Data	Units
P2195	DTC Codes: O2 Sensor Signal Stuck Rich Bank 1 Sensor 1			
	Pending Codes:			
Supported PIDs				
	Short Term Fuel Trim Bank 1	SHRTFT1	0.0000	%
	Long Term Fuel Trim Bank 1	LONGFT1	4.6875	%
	Intake Manifold Absolute Pressure	MAP	8.8590	HG
	Engine RPM	RPM	1372.2500	RPM
	Vehicle Speed Sensor	VSS	0.0000	mph
	Ignition Timing Advance for #1 Cylinder	SPARKADV	9.0000	deg
	Intake Air Temperature	IAT	109.4000	Deg F
	Absolute Throttle Position	TP	11.7647	%
	O2 Bank 1 - Sensor 2	O2B1S2	0.3750	V
	O2 Bank 1 - Sensor 2	FTB1S2	99.2187	%
	Time Since Engine Start	RUNTIME	49.0000	s
	Fuel Rail Pressure	FRP	623.0824	HG
	Commanded Evaporative Purge	EVAP_PCT	0.0000	%
	Fuel Level Input	FLI	47.8432	%
	Number of Warm-ups Since DTCs Cleared	WARM_UPS	255.0000	
	Distance Since DTCs Cleared	CLR_DIST	13453.9648	miles
	Evap System Vapor Pressure	EVAP_VP	-369.2500	Pa
	Barometric Pressure	BARO	29.5300	HG
	Bank 1 - Sensor 1 (Wide Range O2S) (mA)	LAMDA11mA	0.8563	Ratio
	Bank 1 - Sensor 1 (Wide Range O2S) (mA)	O2S11mA	-0.6797	mA

Modes \$01 - Monitor Status

The screenshot shows a diagnostic tool interface for 'Modes \$01 - Monitor Status'. The interface is divided into several sections:

- Left Sidebar:** Contains fuel trim controls for Bank 1 and Bank 2, including buttons for RICH, LEAN, CENTER, Stoichiometric, FUEL TRIM, TOTAL FUEL TRIM, and MIL OFF (Check DTCs).
- Central Panel:** Features buttons for 'Read DTC & Pending Codes', 'Clear DTCs', 'Read Freeze Frame Data', and 'Read Permanent Codes'. It also displays 'DTC that Caused Freeze Frame Storage #0: P0031'.
- Right Panel:** Shows a list of DTC codes with descriptions and probable causes. Below this is a table of supported PIDs.

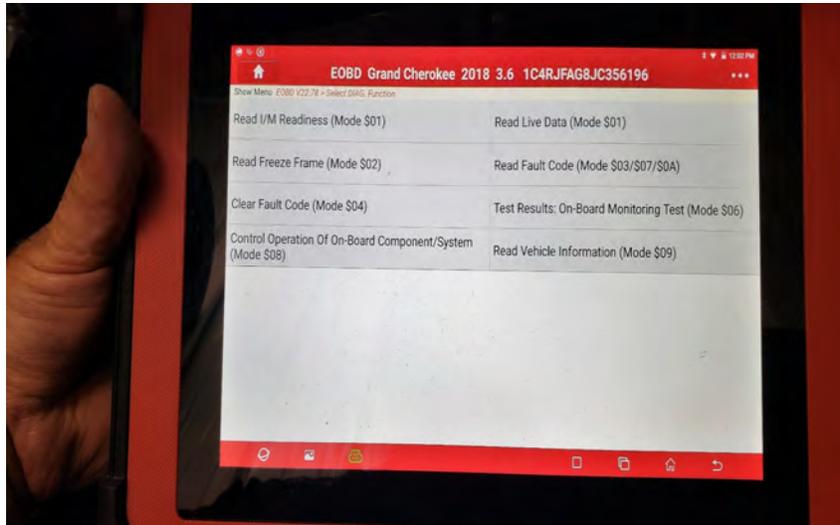
Supported PIDs	Address	Units
P0031 DTC caused Freeze Frame Storage #0:		
Calculated Load	LOAD_PCT	10.0704 %
Engine Coolant Temperature	ECT	174.2000 Deg F
Short Term Fuel Trim Bank 1	SHORTFT1	0.0000 %
Long Term Fuel Trim Bank 1	LONGFT1	6.2500 %
Intake Manifold Absolute Pressure	MAP	9.1543 INg
Engine RPM	RPM	903.0000 RPM
Vehicle Speed Sensor	VSS	0.0000 mph
Ignition Timing Advance for #1 Cylinder	SPARKADV	20.5000 deg
Intake Air Temperature	IAT	62.4000 Deg F
Air Flow Rate from Mass Air Flow Sensor	MAF_gps	3.3500 gps
Air Flow Rate from Mass Air Flow Sensor	MAF_lbmh	6.4422 lbm
Absolute Throttle Position	TP	18.9843 %
O2 Bank 1 - Sensor 2	O2B1S2	0.0000 V
O2 Bank 1 - Sensor 2	FTB1S2	0.0000 %
Time Since Engine Start	RUNTIME	4.0000 s
Commanded EGR	EGR_PCT	0.0000 %
PR Error	EGR_ERR	0.0000 %
Commanded Evaporative Purge	EVAP_PCT	0.0000 %
Oil Level Input	FLI	59.2157 %

A yellow arrow points to the 'MIL OFF (Check DTCs)' button with the text 'What's this?'.

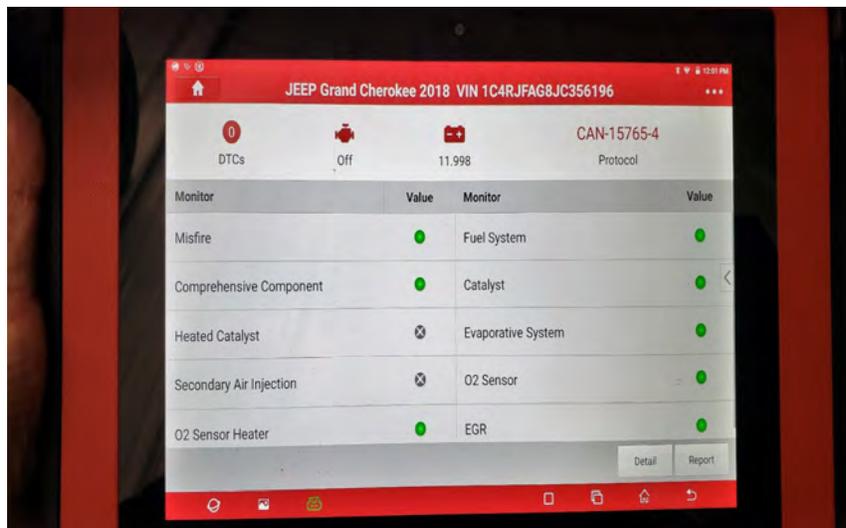
Monitors

- **Onboard test strategies are programmed into the PCM to check the vehicle systems and components**
- **These individual test sequences are grouped into monitors**
- **Monitors run when conditions are right for them to run**
- **Vehicle operating conditions required to run Monitors are referred to as "trips"**
- **Using Mode \$04 or disconnecting the battery will reset the Monitors**
- **A completed Monitor does not mean that no problems were found, only that the conditions needed to perform all the tests in that Monitor have been met**

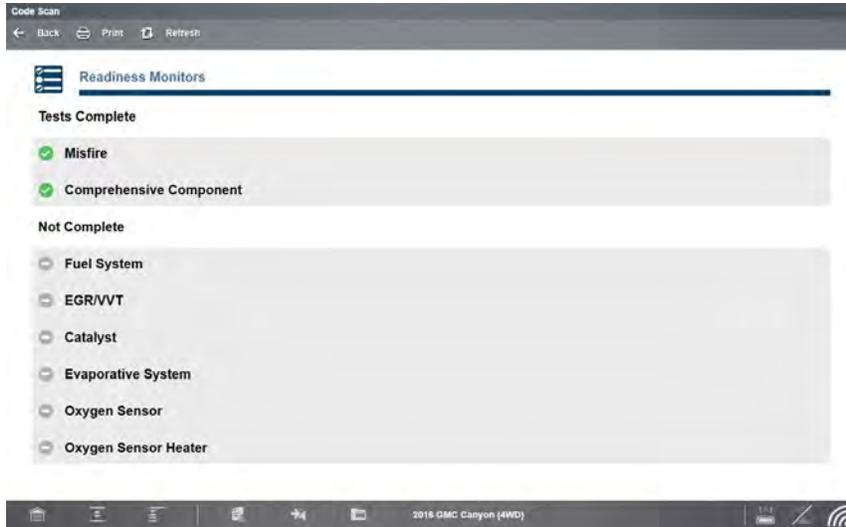
Readiness Status - Monitors



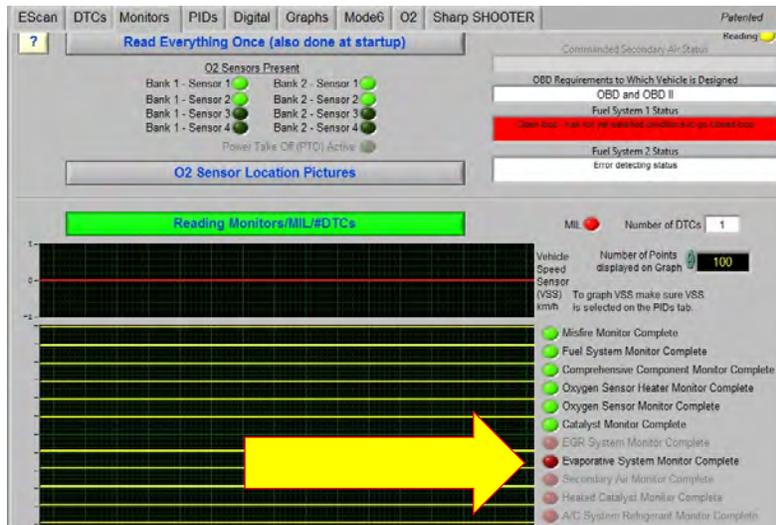
Monitors



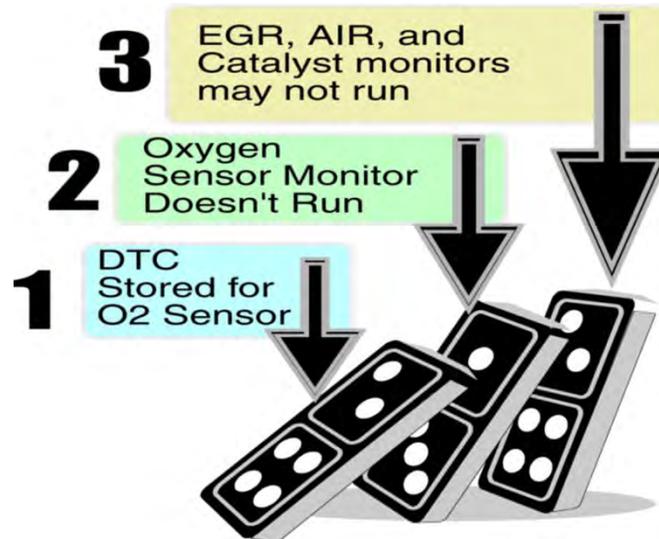
Monitors



Monitors



DTCs & The Domino Effect



Generic Drive Cycle

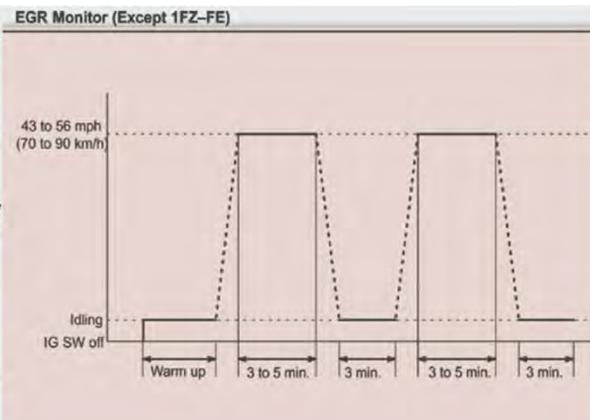
- **Some vehicles must sit for 8 hours before the test without being started. This is primarily for the EVAP monitor.**
- **Warm the engine to normal operating temperature before driving it.**
- **Drive the vehicle for 10 minutes at highway speeds.**
- **Drive the vehicle for 20 minutes in stop-and-go traffic, with at least 4 idle periods of 2-3 minutes each. Do not turn the ignition off at anytime during the cycle.**
- **When completed, turn the key off and wait 3 minutes before rechecking the status.**



OEM Drive Cycle Example1

This Toyota drive cycle is specifically for the EGR monitor, and it is engine specific. Each monitor has its own defined drive cycle.

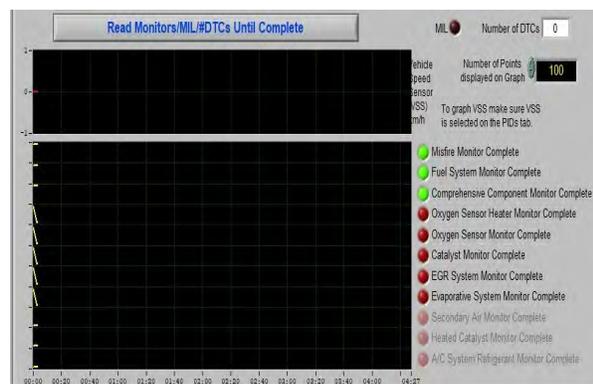
Note that one of the entry conditions listed for this monitor is that the MIL must be off. To eliminate other conditions that might result in false test results, the monitor will not run at extremely high altitude or at very low ambient temperatures. The monitor is also suspended on a cold engine.



Source Toyota Motor Company

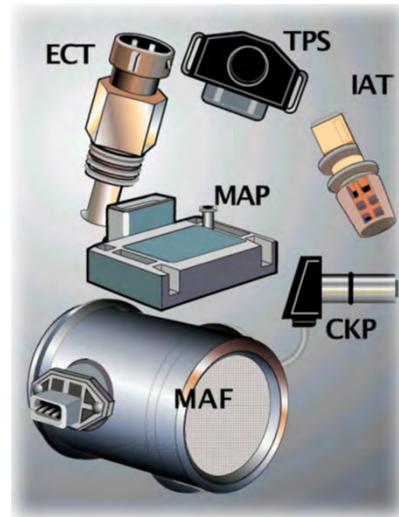
Continuous Monitors

- **Monitors that run continuously as the vehicle is operated**
- **Three Continuous Monitors: 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.")**



Comprehensive Component Monitor

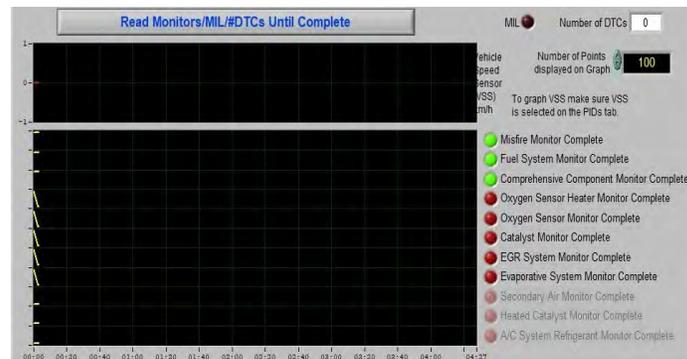
- Tests for electrical circuit condition
- Tests for sensor logic (rationality)
- Tests for actuator operation (functionality)



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Non-Continuous Monitors

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



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Modes \$02, \$03, \$04, \$07, \$0A/10

The screenshot shows a diagnostic software interface with several modes highlighted by yellow arrows:

- Mode \$04:** Points to the 'Stoichiometric' and 'FUEL TRIM' buttons on the left sidebar.
- Mode \$03:** Points to the 'Read DTC & Pending Codes' button in the center.
- Mode \$07:** Points to the 'Clear DTCs' button in the center.
- Mode \$0A/10:** Points to the 'Read Permanent Codes' button in the center.
- Mode \$02:** Points to the 'DTCs' tab at the top and the data table on the right.

The data table on the right shows various parameters with their values and units:

Code	Description	Value	Units
P0031	Heated oxygen sensor (H2O2) Bank 1 - Sensor 1	10.000	%
P0420	Catalytic converter system, bank 1 - efficiency below threshold	0.000	%
Calculated Load	LOAD_PCT	10.0704	%
Engine Coolant Temperature	ECT	174.2000	Deg F
Short Term Fuel Trim Bank 1	SHORTFT1	0.0000	%
Long Term Fuel Trim Bank 1	LONGFT1	6.2500	%
Intake Manifold Absolute Pressure	MAP	9.1543	inHg
Engine RPM	RPM	903.0000	RPM
Vehicle Speed Sensor	VSS	0.0000	mph
Ignition Timing Advance for #1 Cylinder	SPARKADV	20.5000	Deg F
Intake Air Temperature	IAT	62.4000	Deg F
Air Flow Rate from Mass Air Flow Sensor	MAF_gps	3.3500	g/s
Air Flow Rate from Mass Air Flow Sensor	MAF_lpm	6.4422	lpm
Absolute Throttle Position	TP	18.9883	%
O2 Bank 1 - Sensor 2	O2B1S2	0.0000	V
O2 Bank 1 - Sensor 2	FTB1S2	0.0000	%
Time Since Engine Start	RUNTIME	4.0000	s
Commanded EGR	EGR_PCT	0.0000	%
EGR Error	EGR_ERRR	0.0000	%
Commanded Evaporative Purge	EVAP_PCT	0.0000	%
Fuel Level Input	FLI	59.2157	%

Mode \$06

The screenshot shows the 'OBD Monitor (ORBDMD)' screen in Mode \$06. A yellow callout box contains the text: "Don't overcomplicate it. Look for MIN, MAX and the test result." The table below shows various test results:

Test ID (TID)	Test Value	Min Limit	Max Limit	Units
\$01 Front LIEGO Monitor	0.016	0.000	0.400	sec
\$01 Front LIEGO Monitor	0.003	0.000	0.400	sec
\$02 Rear O2 DFSD Response Rate	101072.000	580.000	580.000	mV/s
\$02 Rear O2 DFSD Response Rate	1.049	0.000	5.000	sec
\$21 Catalyst Efficiency Monitor	0.060	0.000	0.766	Ratio
\$35 VCT Monitor	0.020	0.000	21.210	Deg
\$35 VCT Monitor	0.000	0.000	10.000	Deg
\$35 VCT Monitor	0.000	0.000	14.140	Deg
\$35 VCT Monitor	0.100	0.000	14.140	Deg
\$3A EVAP System 0.020 Leak Check	-996.250	-996.250	8191.750	Pa
\$3A EVAP System 0.020 Leak Check	-1992.500	-1992.500	8191.750	Pa
\$3A EVAP System 0.020 Leak Check	0.000	-8192.000	1191.000	Pa
\$3B EVAP System 0.020 Leak Check	881.500	108.500	8191.750	Pa
\$3C EVAP System Monitor	0.000	0.000	0.000	Pa
\$3Z Negative Pressure Test	0.100	0.000	0.400	Pa
\$3Z Average of 4 EDW Tests	0.100	0.000	0.400	Pa
\$00 Blocked Evap Sys Line-Screening test	-2011.750	-2480.750	8191.750	Pa/sec
\$01 Blocked Evap Sys Line-Fault Confirm	0.000	0.000	0.000	Pa
\$02 Vapor blocking valve performance	0.000	0.000	0.000	Pa
\$01 B1S2 Heater Current	0.573	0.230	3.000	A
\$81 AFM Monitor	0.000	0.000	0.750	Ratio
\$41 Mixture Monitor	0.000	0.000	23.000	%
\$41 Mixture Monitor	0.150	0.000	1.000	%
\$41 Mixture Monitor	469.200	-40.000	845.100	C
\$A2 Mixture Monitor Cylinder 1	0.000	0.000	65535.000	Counts
\$A2 Mixture Monitor Cylinder 1	7.000	0.000	65535.000	Counts
\$A2 Mixture Monitor Cylinder 1	0.000	0.000	23.000	%

Example Of Mode 6 Data

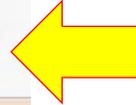
EOBD V4.90

On-Board monitor(FORD) 12.97V

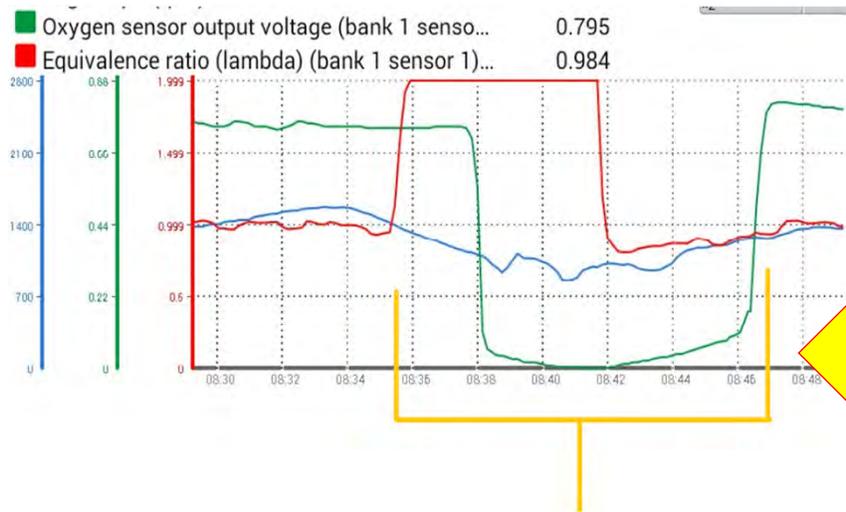
Description	MID	TID	Min	Max	Value	Unit	Result
Heated Oxygen Sensor (HO2S) (bank 1 sensor 2) fuel shut-off rich to lean response time delay	02	86	00:00	00:10	00:02	m:s	OK
Heated Oxygen Sensor (HO2S) monitor (bank 2 sensor 1)	05						
Oxygen sensor (bank 2 sensor 1) rich to lean response time	05	87	00:00	00:00	00:00	m:s	OK

VIN:1FTEW1EP0JFET2567
Car: EOBD/ISO 15765-4(CAN)

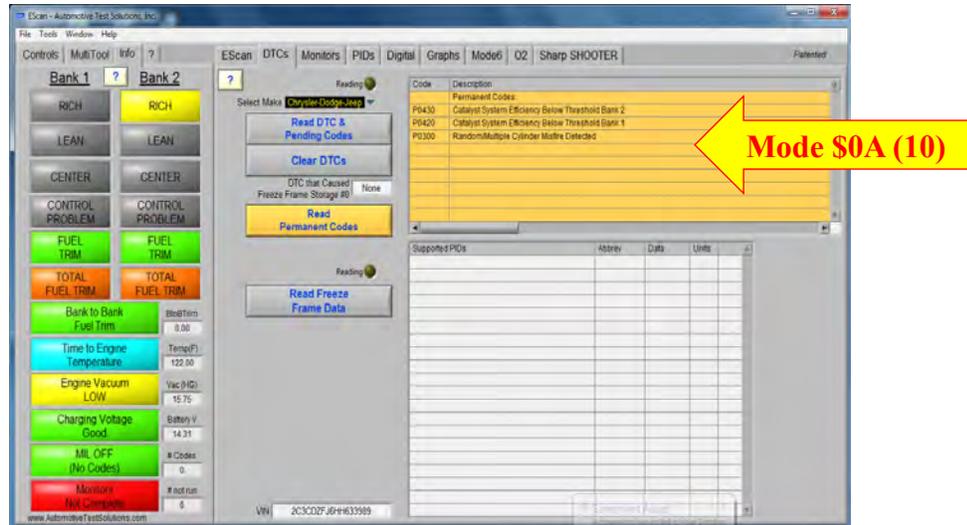
ESC



Example Of Mode 6 Data



Mode \$0A (Mode 10)



Things To Know About OBD II

Dealership (Factory)

- Increased data PIDS
- **Programming**
- **Diagnosis of all vehicle systems**



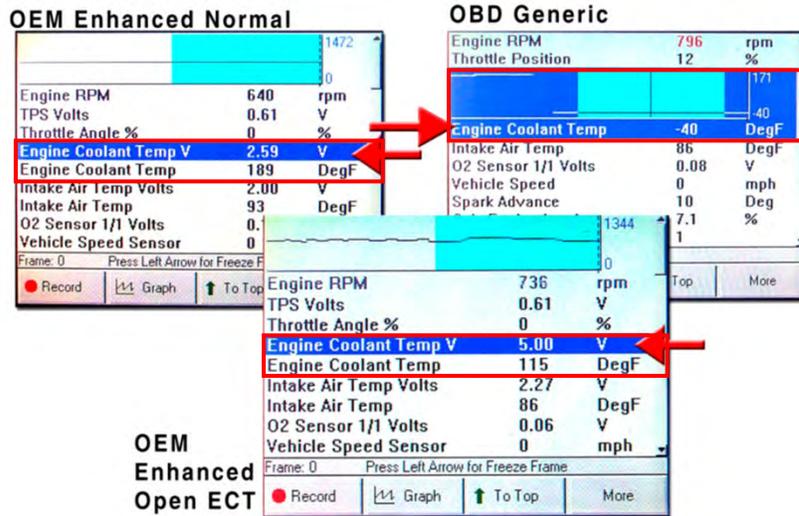
Aftermarket Enhanced

- **Full datastream**
- **Most other computer system datastreams**
- **Actuator output test**
- **Diagnosis of complete vehicle systems**

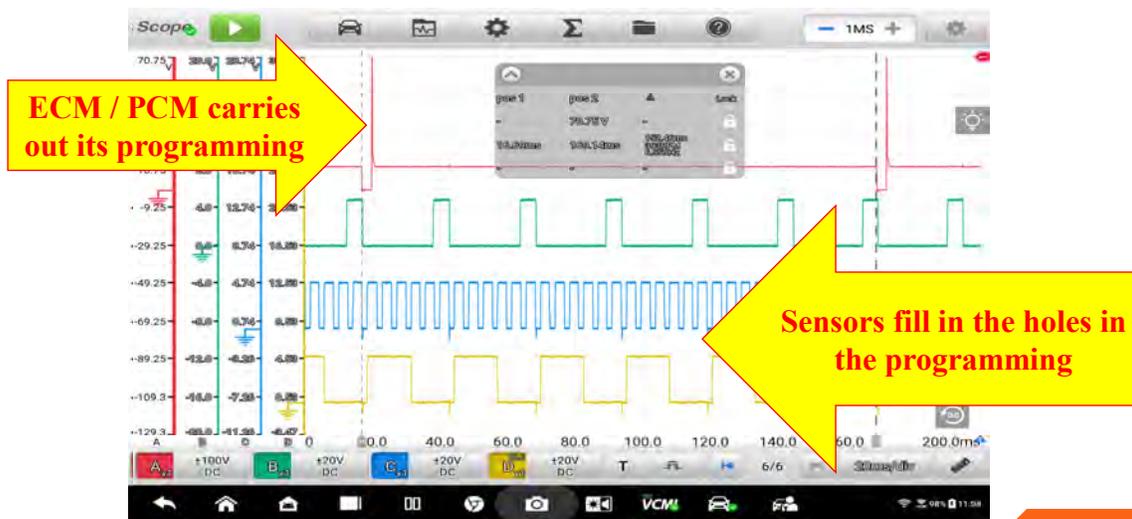
Generic OBD II

- **Read Generic/Global DTCs**
- **Read Freeze Frame**
- **Erase DTCs**
- **Monitor status**
- **10 modes**

Actual vs. Calculated Data Values



How The ECM/PCM Does It's Job



Diagnostic Strategies - With Or Without DTCs

2013 GMC Sierra 2500 6.0L Flex Fuel

- **Verify concern - MIL on**
- **Check for DTCs - P0101 Mass Air Performance, P0171, P0174 Bank 1 and 2 Lean Condition, P0172, P0715 Bank 1 & 2 Rich Condition**
- **Check for TSBs - No related bulletins found**

Code	Description
	DTC Codes:
P0101	Mass or Volume Air Flow Circuit Range/Performance
P0171	System Too Lean Bank 1
P0172	System Too Rich Bank 1
C3401	Description not available
	No Pending Codes Present

So where do we go with our diagnosis?

2013 GMC Sierra 2500 6.0L Flex Fuel

The screenshot displays the diagnostic software interface. On the left, there are control buttons for Bank 1 and Bank 2, including RICH, LEAN, CENTER, and FUEL TRIM. The main area shows DTC codes: P0101 (Mass or Volume Air Flow Circuit Range/Performance), P0171 (System Too Lean Bank 1), P0172 (System Too Rich Bank 1), and C3401 (Description not available). Below the DTC codes, there are buttons for 'Read DTC & Pending Codes', 'Clear DTCs', and 'Read Freeze Frame Data'. The supported PIDs table is as follows:

Code	Description	Abbrev	Data	Units
P0101	Mass or Volume Air Flow Circuit Range/Performance			
P0171	System Too Lean Bank 1			
P0172	System Too Rich Bank 1			
C3401	Description not available			
	No Pending Codes Present			
Supported PIDs:				
P0174 DTC caused Freeze Frame Storage #0:				
Calculated Load	LOAD_PCT		39.2157	%
Engine Coolant Temperature	ECT		91.0000	Deg C
Short Term Fuel Trim Bank 1	SHRTFT1		-14.8437	%
Long Term Fuel Trim Bank 1	LONGFT1		32.0312	%
Short Term Fuel Trim Bank 2	SHRTFT2		-13.2812	%
Long Term Fuel Trim Bank 2	LONGFT2		30.4687	%
Intake Manifold Absolute Pressure	MAP		58.0000	KPa
Engine RPM	RPM		1872.0000	RPM
Vehicle Speed Sensor	VSS		113.0000	mph
Ignition Timing Advance for #1 Cylinder	SPARKADV		41.5000	deg
Intake Air Temperature	IAT		1.0000	Deg C
Air Flow Rate from Mass Air Flow Sensor	MAF_gls		36.7800	g/s
Air Flow Rate from Mass Air Flow Sensor	MAF_lbm		4.8550	lbm
Absolute Throttle Position	TP		33.7256	%
O2 Bank 1 - Sensor 1	O2B1S1		0.8750	V
O2 Bank 1 - Sensor 1	FTB1S1		-14.8437	%
O2 Bank 1 - Sensor 2	O2B1S2		0.8450	V
O2 Bank 1 - Sensor 2	FTB1S2		99.2107	%
O2 Bank 2 - Sensor 1	O2B2S1		0.8750	V



2013 GMC Sierra 2500 6.0L Flex Fuel

The screenshot displays the diagnostic software interface with fuel trim charts. The left sidebar shows control buttons for Bank 1 and Bank 2, including RICH, LEAN, CENTER, and FUEL TRIM. The main area shows 'Test Running' and 'Reset Chart' buttons. The fuel trim charts are as follows:

Bank 1 (Fuel Trim 1)

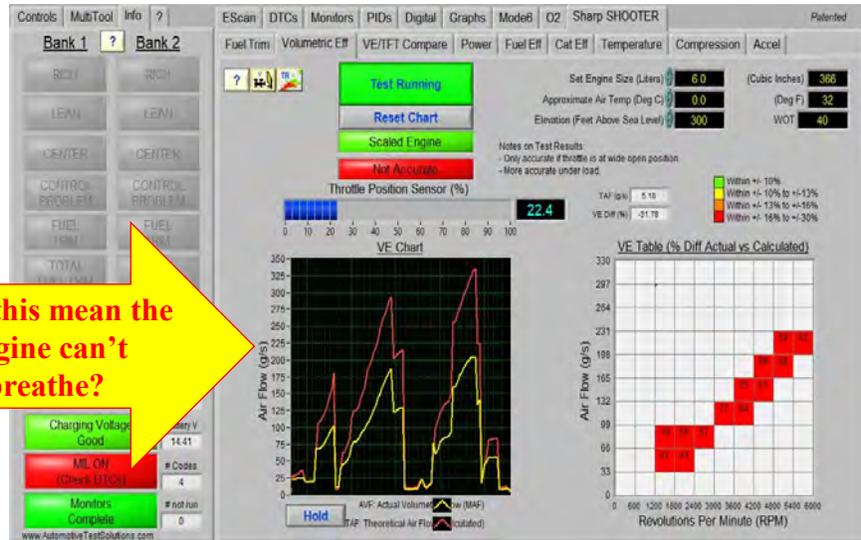
Bank 2 (Fuel Trim 2)

Notes:

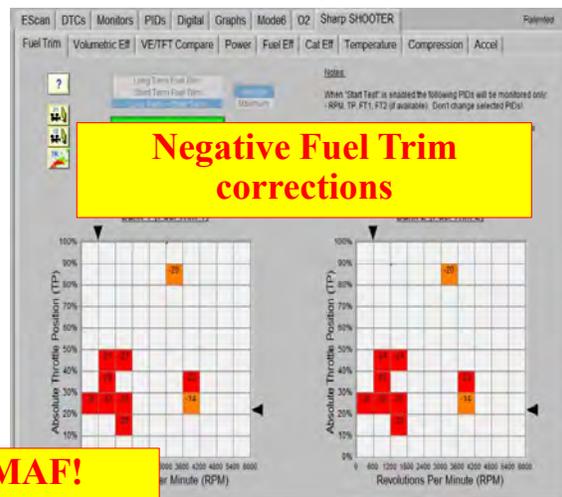
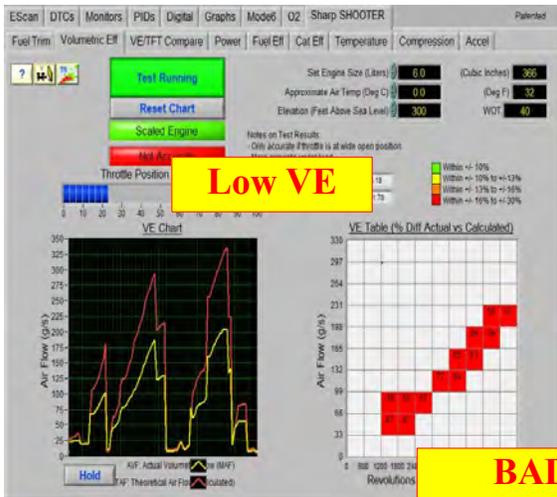
- When "Start Test" is enabled the following PIDs will be monitored only: - RPM, TP, FT1, FT2 (if available). Don't change selected PID!
- Cells will fill according to RPM and TP and the following color code (Cells will not fill during deceleration):
 - Green: FT less than +/-10
 - Yellow: FT between +/-10 and +/-13
 - Orange: FT between +/-13 and +/-20
 - Red: FT greater than +/-20



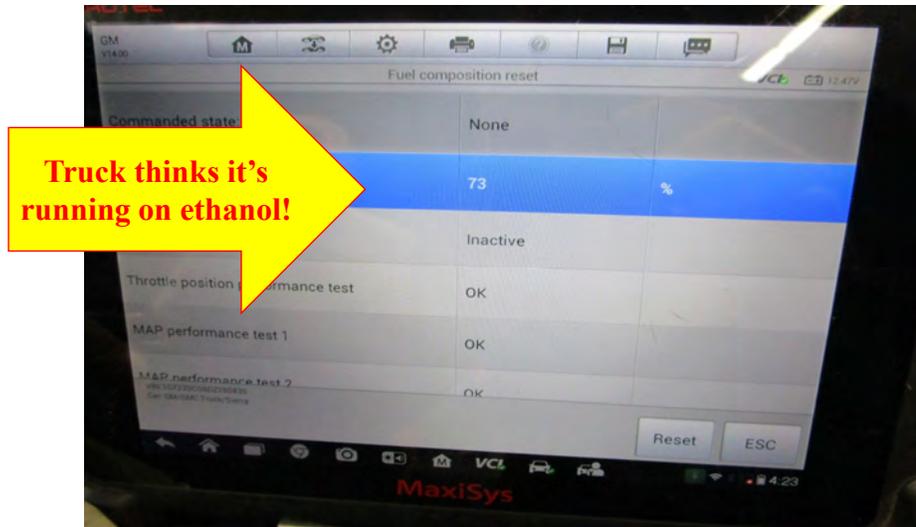
2013 GMC Sierra 2500 6.0L Flex Fuel



Consider The Data



2013 GMC Sierra 2500 6.0L Flex Fuel



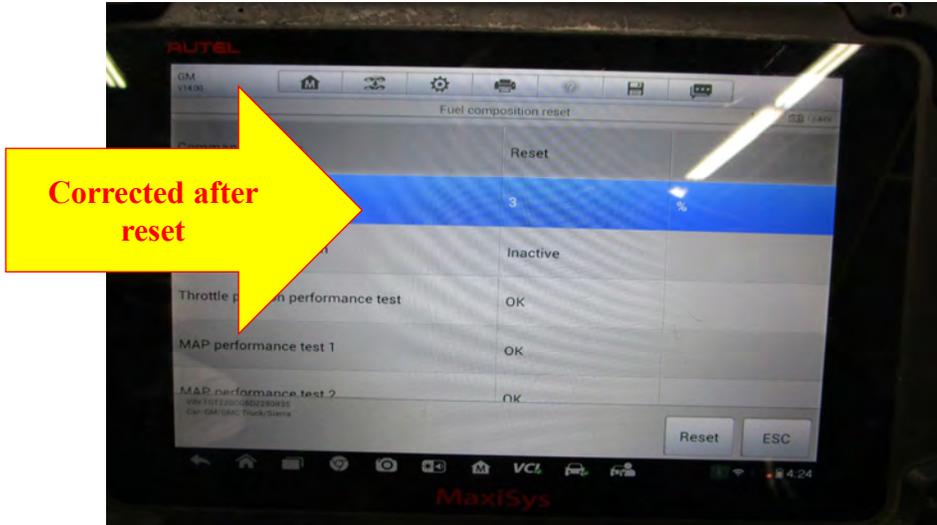
Truck thinks it's running on ethanol!

2013 GMC Sierra 2500 6.0L Flex Fuel

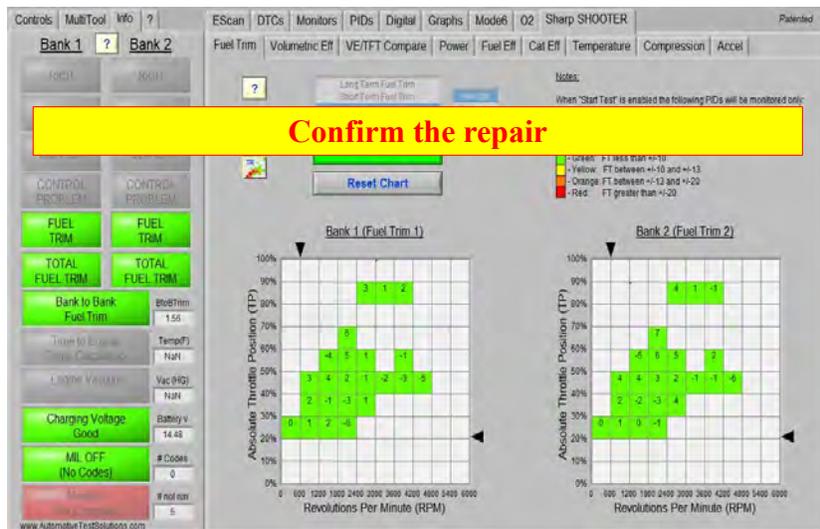


But it's not...

2013 GMC Sierra 2500 6.0L Flex Fuel



2013 GMC Sierra 2500 6.0L Flex Fuel



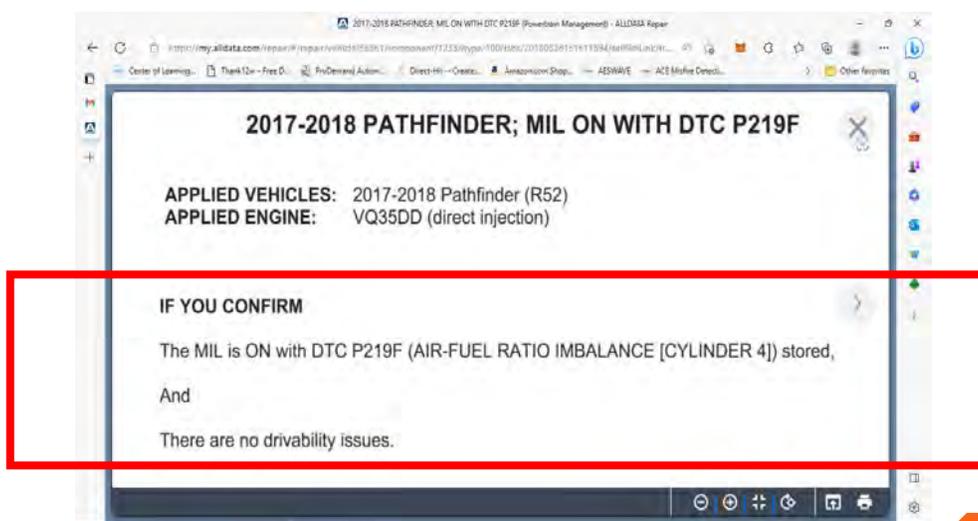
2017 Pathfinder

- **Verify the concern - MIL is on**
- **Check for DTCs - Code P219F Air Fuel Ratio Imbalance (Cylinder 4) found**

What would be your next move to continue your basic 3-step diagnostic process?

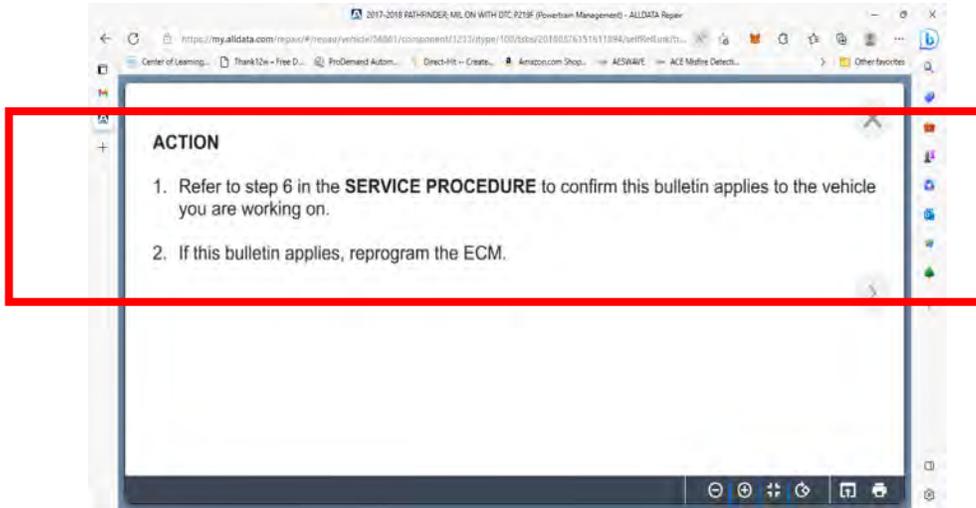


Check For TSBs



Courtesy of AllData

2017 Pathfinder

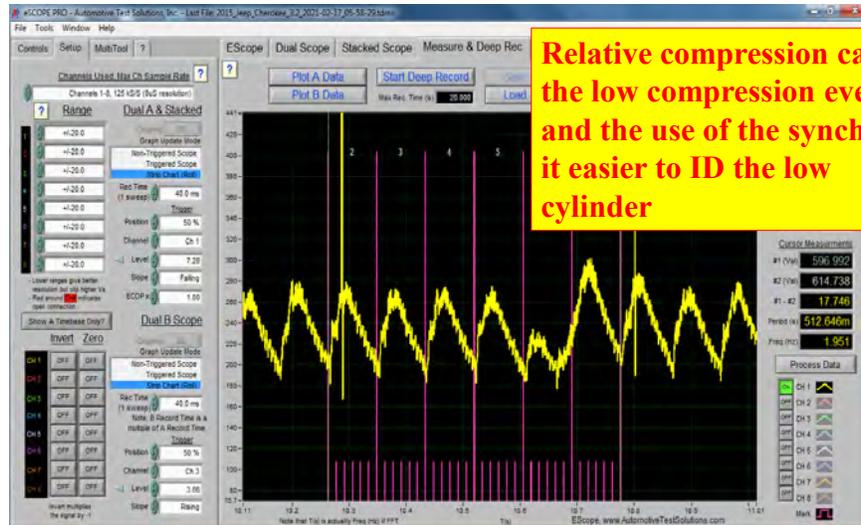


Courtesy of AllData

2015 Jeep Grand Cherokee 3.6L / 24 V



2015 Jeep Grand Cherokee 3.6L / 24 V



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2015 Jeep Grand Cherokee 3.6L / 24 V

- **Compression test, both dry and wet, did not show a problem though**
- **Leak down test also failed to show a fault**

How can that be?

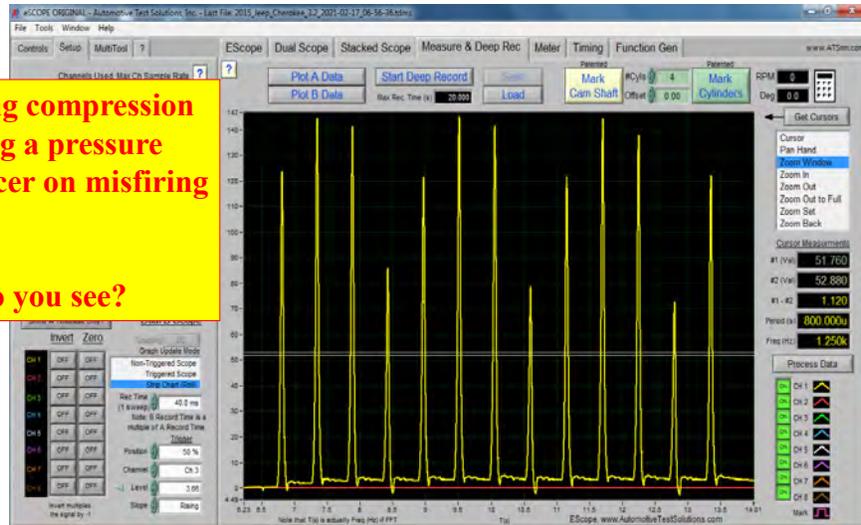


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2015 Jeep Grand Cherokee 3.6L / 24 V

Cranking compression test using a pressure transducer on misfiring cylinder

What do you see?



2015 Jeep Grand Cherokee 3.6L / 24 V



2015 Jeep Grand Cherokee 3.6L / 24 V

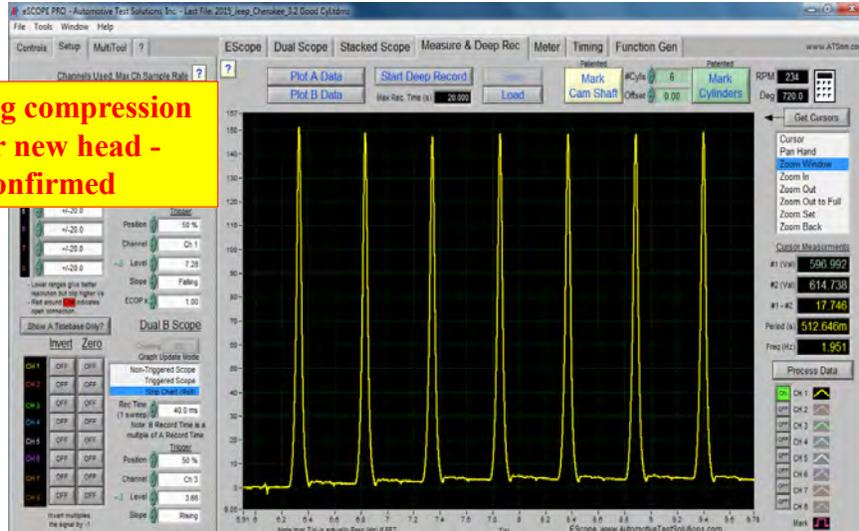


2015 Jeep Grand Cherokee 3.6L / 24 V



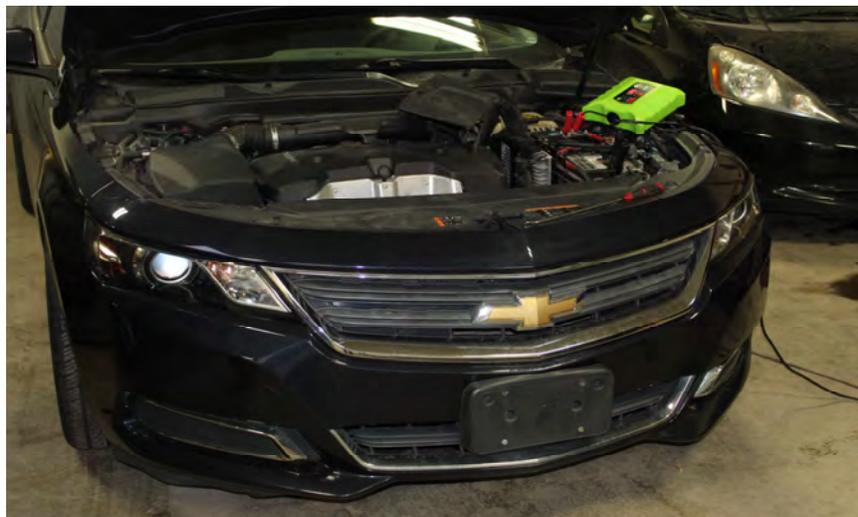
2015 Jeep Grand Cherokee 3.6L / 24 V

Cranking compression test after new head - repair confirmed



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2015 Chevrolet Impala



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Building A Diagnostic Worksheet

- **Basic 3 step diagnostic process**
- **Battery, starting and charging (building a supplemental worksheet)**
- **Pre-scan report**
- **Review pre-scan tool data (enhanced and generic)**
- **Time to temperature**
- **Pre 5 gas analysis (extra credit)**
- **Engine mechanical**

Building A Diagnostic Worksheet

- **Ignition System**
- **Fuel Delivery System (Extra Credit)**
- **Fuel Trim and VE Testing**
- **CAT Efficiency Testing**
- **Review Post-Scan Tool Data (Enhanced and Generic)**
- **Post - 5 Gas Analysis (Extra Credit)**
- **Post Scan Report**
- **Review Mode 6 Data**

P305F Dual Battery Control Module Performance Code

- **The Check Engine light is on.**
- **The technician does a code clear and takes the vehicle for a test drive. It is then noted that during a Start/Stop event, the check engine light illuminates again.**
- **A code P305F is stored in the controllers (PCM) memory.**



Image AI-generated

P305F Dual Battery Control Module Performance Worksheet

- **Obtain trouble code information**
- **Review description and operation**
- **Review any and all TSBs that may apply**
- **Check resources for pattern failure/known repairs**
- **Review wiring diagrams and the trouble code chart**



Image AI-generated

Check For DTCs - P305F Dual Battery Control Module Performance

The screenshot shows the 'DTC Display' window in Techline Connect. It lists a DTC for the Engine Control Module: P305F, Dual Battery Control Module Performance. A yellow box with red text states: **DBCM = Dual Battery Control Module**.

Status	Control Module Name	Control Module Status	DTC Count	DLC Pin
Warning	Engine Control Module	DTCs Stored	1	6,14

Control Module	Type	DTC	Symptom...	Description	Symptom Description	Status
Engine Control Module		P305F	00	Dual Battery Control Module Performance	---	Current

Check For TSBs

The screenshot shows a web browser displaying a diagnostic tip from AllData Repair. A red box highlights the main content area, which includes the title and subject of the tip.

Diagnostic Tip for Malfunction Indicator Lamp (MIL) Illuminated with DTC P305F, P058B and/or P058D

Vehicle: > Diagnostic Tip for Malfunction Indicator Lamp (MIL) illuminated with DTC P305F, P058B and/or P058D

#18-NA-367: Diagnostic Tip for Malfunction Indicator Lamp (MIL) Illuminated with DTC P305F, P058B and/or P058D - (May 1, 2019)

Subject: Diagnostic Tip for Malfunction Indicator Lamp (MIL) illuminated with DTC P305F, P058B and/or P058D

Courtesy of AllData

Need RPO Information

Diagnostic Tip for Malfunction Indicator Lamp (MIL) illuminated with DTC P300F, P056B and/or P0560 - ALLDATA Repair

2015 Chevrolet Impala L4-2.5L
This Bulletin replaces PIC6112 and PI1412A. Please discard PIC6112 and PI1412A.

Brand	Model	Model Year		VIN		Engine	Transmission
		from	to	from	to		
Chevrolet	Impala (VIN 1)	2014	2016				
	Malibu	2014	2015			2.5L (RPO LKW)	
	Malibu Limited (VIN 1)	2015	2016			2.5L (RPO LCW)	

Involved Region or Country: North America, Israel

Additional Options (RPOs): Equipped with Engine Control, Stop-Start System (RPO KLB)

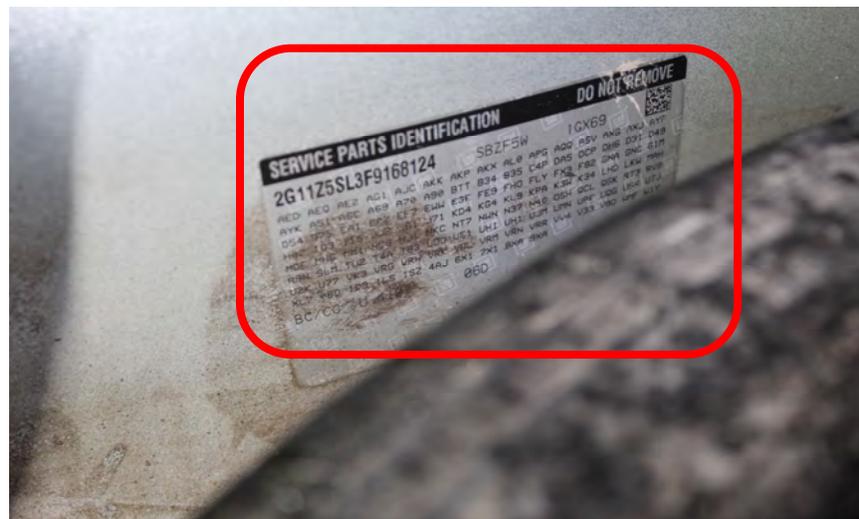
Some customers may comment that the Malfunction Indicator Lamp (MIL) is illuminated.
Some technicians may find one or more of the following DTCs set, current or in history, in the Engine Control Module (ECM):

Condition

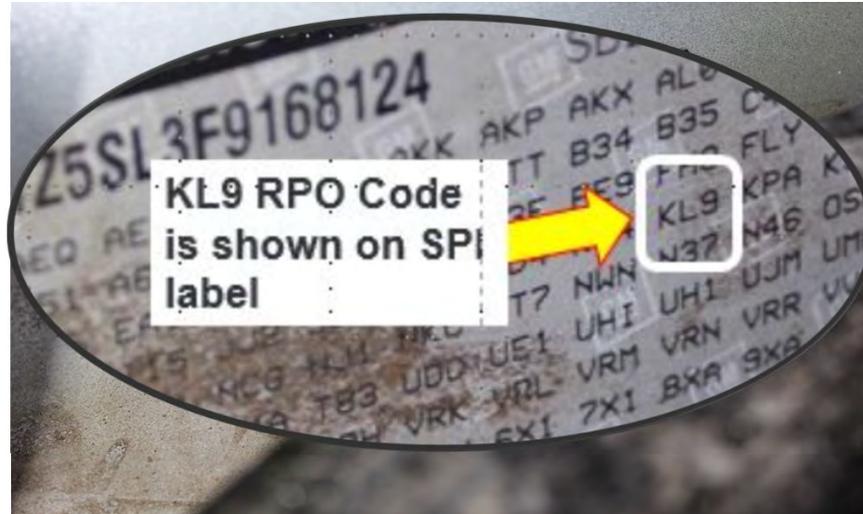
Courtesy of AllData



Determine RPO Codes That Apply



Determine RPO Codes That Apply



GM Bulletin

Diagnostic Tip for Malfunction Indicator Lamp (MIL) Illuminated with DTC P305F, P056B and/or P056D - AllData Repair

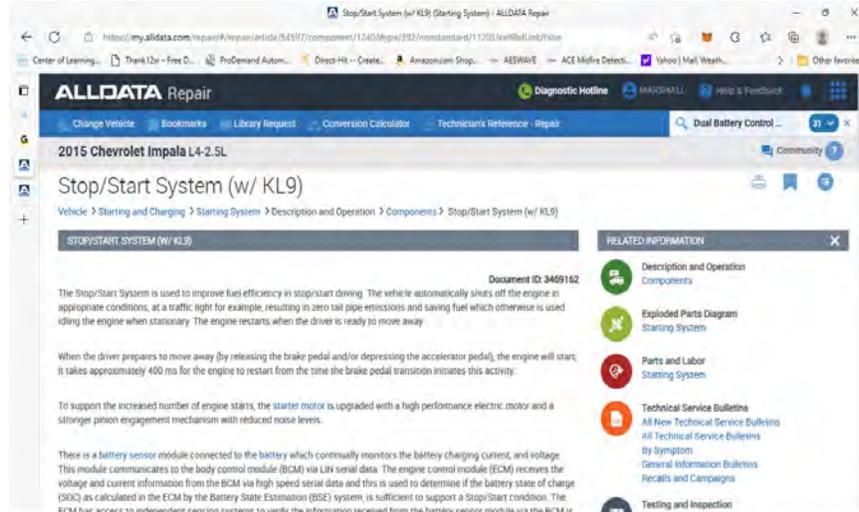
2015 Chevrolet Impala L4-2.5L

Inspect the following if DTC P305F has been set:

First step is to check battery condition - not just state of charge but state of health as well. What's the difference?

1. Check state of health of auxiliary battery with the GRB tester. Not just a state of charge check.
 - If low, replace the battery, clear codes and re-check.
 - If good, proceed to step 2.
2. Check ground resistance from the Dual Battery Isolation Module (DBIM) to G103. Wiggle the harness (1) and negative battery terminal connections during test to look for varied resistance values.
 - If resistance is greater than 0.5 ohms, or changes more than 1 ohm, then inspect ground connections and/or splice in the harness about 1.5 ft. from the connector end.
 - Fix poor connections, clear codes and re-check.
 - If resistance is less than 0.5 ohms, proceed to step 3.
3. Verify the engine harness is not pinched underneath the main battery tray (2).

Gathering Data - Description & Operation



Courtesy of AllData



Description & Operation - Dual Battery Control Module (DBCM)

- **The DBCM is used to isolate 12V primary battery from vehicle loads during cranking events**
- **It switches primary and auxiliary batteries in and out at appropriate times to support vehicle loads and battery charging**
- **It does not utilize vehicle BUS communication**



How The Primary & Auxiliary Batteries Are Used

Vehicle Load Supported by

Event	Primary Battery	Auxiliary Battery
Key off	Yes	No
Key on	Yes	Yes
*Key Crank	No	Yes
Run	Yes	Yes
Auto-stop	Yes	No
*Auto-start	No	Yes

*During a Key Crank or Auto-start event, the primary battery supplies power to the Starter Motor

Battery voltages should be monitored under actual driving conditions by using graphical analysis.

Gathering Data - Trouble Code Chart Information

The screenshot shows a web-based diagnostic tool interface for a 2015 Chevrolet Impala. The main heading is "DTC P305F". Below this, there are sections for "Diagnostic Instructions" and "DTC Descriptors". The "DTC Descriptors" section contains the text "DTC P305F Dual Battery Control Module Performance", which is highlighted with a red box. Below this is a table titled "Diagnostic Fault Information".

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	—	P305F	—	P305F
Ignition	—	P305F	—	P305F
Control	—	P305F	—	P305F
Ground	—	P305F	—	P305F

Below the table is a section for "Circuit/System Verification" with the following steps:

1. Ignition ON
2. Using the Graphical Data Display in the scan tool, verify the ECM Ignition 1 Signal is 8.9 V or greater during ignition CRANK.

⇒ If Ignition 1 Signal is below 8.9 V

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Gathering Data - Trouble Code Chart Information

Document ID: 3462696

Service Information

2013 Chevrolet Impala (VIN 31) | Impala Service Manual 7329549 | Document ID: 3462696

DTC P305F

Circuit/System Verification

1. Ignition ON
2. Using the Graphical Data Display in the scan tool, verify the ECM Ignition 1 Signal is 8.9 V or greater during Ignition CRANK.
⇒ **If Ignition 1 Signal is below 8.9 V**
 - 2.1. Verify that there is no excessive parasitic current drain, refer to [Battery Electrical Drain/Parasitic Load Test](#).
 - ⇒ If there is excessive parasitic current drain, determine cause of the excessive parasitic current drain.
 - ⇒ If there is no excessive parasitic current drain, refer to Circuit/System Testing.
- ⇒ **If Ignition 1 Signal is 8.9 V or greater**
3. All OK.

Circuit/System Testing

Note: You must perform Circuit/System Verification before Circuit/System Testing.

1. Ignition OFF
2. Perform a [Battery Inspection/Test](#) on the C1 Battery and C18 Battery – Auxiliary.
⇒ **If battery fails the battery test**
Replace the defective battery
- ⇒ **If battery passes the battery test**
3. Ignition OFF, disconnect the X1 harness connector at the K20 Engine Control Module, Ignition ON.
4. Verify a test lamp illuminates between ignition circuit terminal 51 X1 and ground.
⇒ **If the test lamp does not illuminate and the circuit fuse is good**
 - 4.1. Ignition OFF, remove the test lamp.

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Courtesy of GM



Gathering Data - IdentiFix Known Repairs

Direct-Hit - Search First (Information Available) - Asset Details

https://dhi.identifix.com/AssetDetails/Viewer/GetAssetDetailViewer?RCHID=536557408&VID=241757450/vehiclePath=18/AssetId=775141...

SOLERA Direct-Hit

HOME SEARCH FIXES SERVICE MANUALS MAINTENANCE ESTIMATING HOTLINE MY SHOP

2015 Chevrolet Impala LS 2.5L, I4, Gas, VIN L, Des LKW, 14V, USA/Canada

Ken Zan'ders - NAPA - Autotech Training

Hotline Archive With Service Manual diagrams, components, TSB

Number: 626217

Vehicle Applications: 2015 Impala 2.5 2015 Malibu 2.5
2014 Malibu 2.5 2015 Malibu Limited 2.5

Customer Concern: Code **P305F**

Average Reported Mileage: 87784

Tests/Procedures:

1. Connect a Digital Volt Ohm Meter (DVOM) to the auxiliary battery in the trunk.
2. Trigger a HDN/MAX recording.
3. Road test the vehicle to warm it up so that an Auto Stop occurs.
4. Release the brake and the engine should Auto Start on acceleration.
5. Stop the vehicle in a safe location.
6. Observe the Minimum voltage from the HDN/MAX recording.
7. If the voltage is under 10 volts, load test the both batteries with a tester approved for Absorbed Glass Mat (AGM) batteries. Replace battery if it fails the load test.
8. Check for poor cable connections at the auxiliary battery; Repair any problems found.

Author: [Bill Schumann](#)

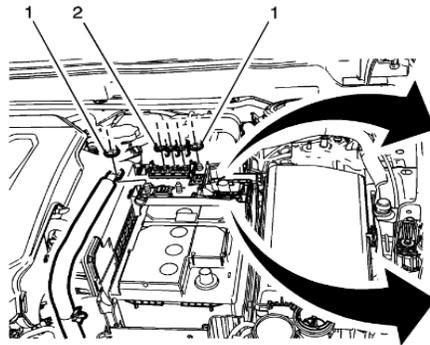
TSBs: [18-Na-367](#)

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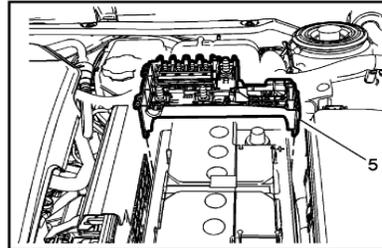
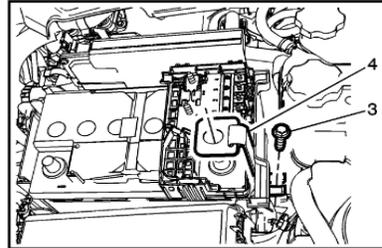
Courtesy of IdentiFix



Gathering Data - Location Of Primary Battery



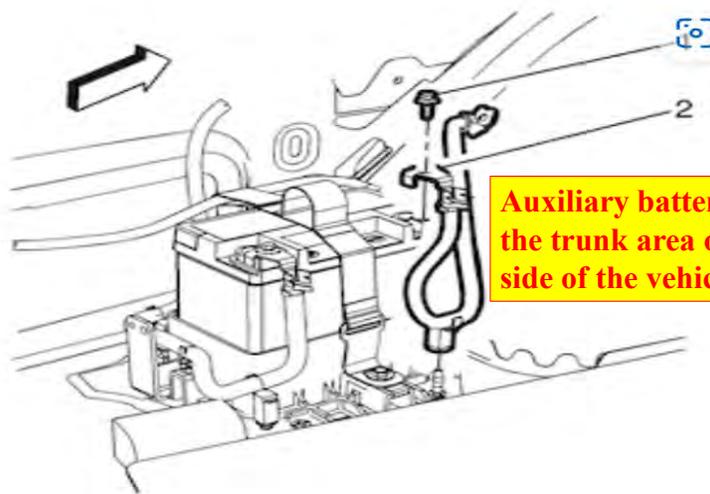
AGM (Primary) battery is located under the hood on the driver's side of the vehicle



Courtesy of AllData

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Gathering Data - Location Of Auxiliary Battery



Auxiliary battery is located in the trunk area on the driver's side of the vehicle.

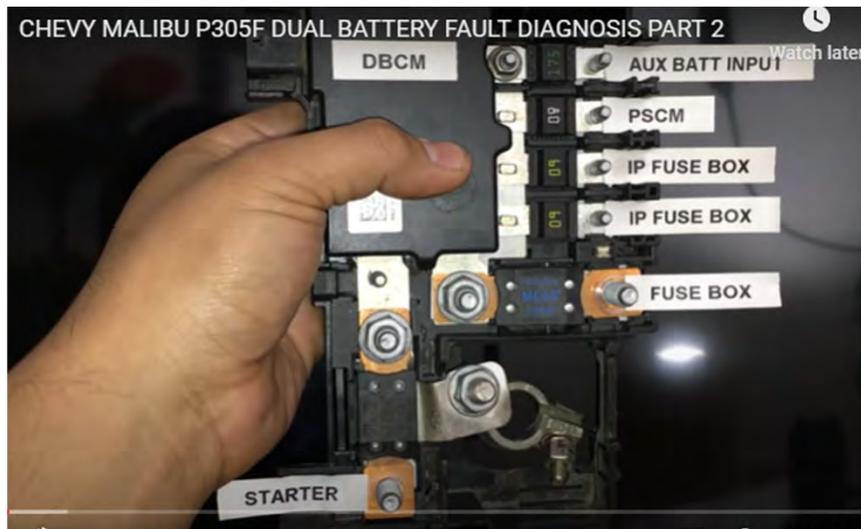
Courtesy of AllData

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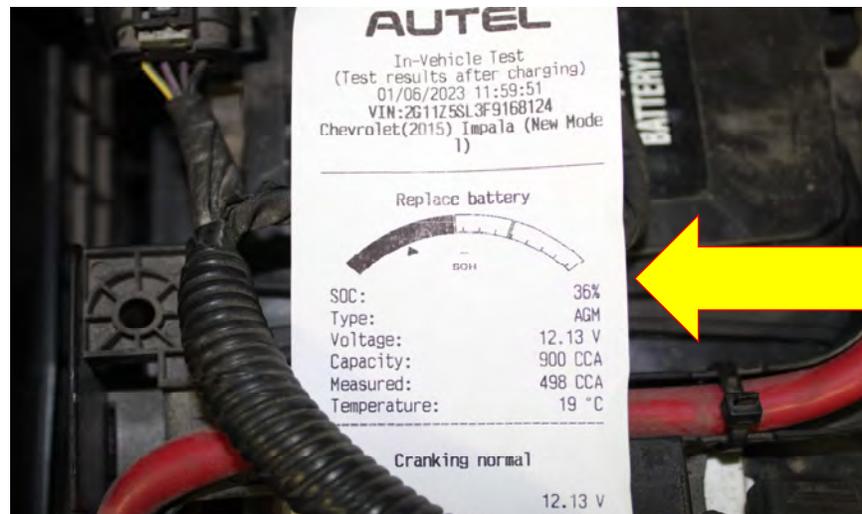
Gathering Data - Location Of DCBM



Gathering Data - DCBM Terminal Identification



Test Analysis



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Test Results & Repair

- **OCV voltage 12.13 volts (SOC)**
- **Cranking voltage 11.4 volts**
- **Measured CCA of 498 with a capacity of 900 CCA (SOH)**
- **The AGM (primary) battery has failed the battery test and was replaced**
- **The Auxiliary battery was also replaced based on the graphical analysis results**

**With batteries replaced, the code was cleared, and the vehicle was test-driven.
Repair confirmed.**

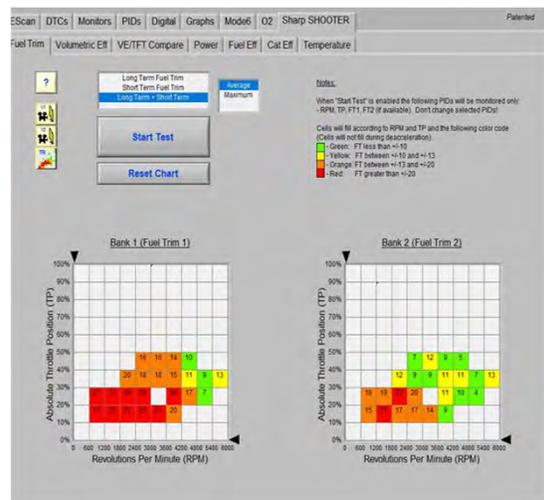
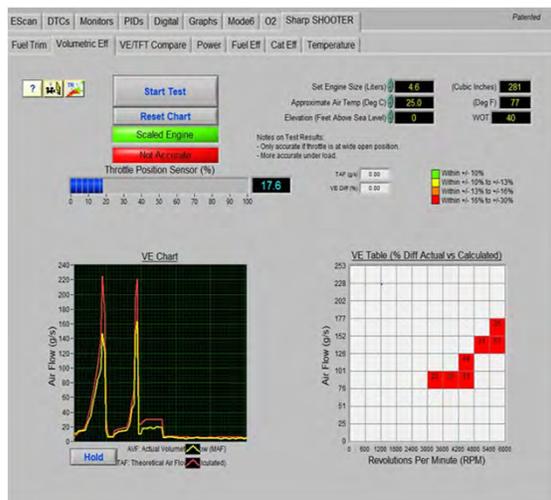
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Just For Fun - 2002 Mustang GT Eye Burner

- **2002 Mustang GT**
- **4.6L SOHC**
- **Engine performance work done**
- **Customer complaint: "Can't stand by the car, the fuel burns your eyes!"**
- **Has a custom tune in PCM, tuner says tune is ok, not the problem**
- **No codes, runs great**



2002 Mustang GT



Size Matters



Key Takeaways

- **Always verify - test drive and record data**
- **Global OBD II first**
- **Take the time to read code, component and system operation and conditions needed**
- **Check for TSBs**
- **Research similar faults and their fixes - but don't rely on them as the answer!**
- **Develop your strategy - Test before you replace**
- **Follow the data - don't make the data fit your assumptions**
- **Confirm every repair**

RevUp - Smarter Solutions for
Faster Repairs

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August-October 2026



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Questions?

Thank You !

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Webinar Survey



Facebook Group



Newsletters

