Dorman Training Center Presents

# "Computer Diagnosis"

# Part 1: What To do With DTCs

U227 | 2026

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## Your Instructor For This Class

- 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 seminar:**

- This seminar will be approximately 1+ hour 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

- What To Do With DTCs
- Beyond Viewing Diagnostic Trouble Codes (DTCs)
- Diagnostic Insights
- Mode 6, Mode 0A/10,
- Pending Codes
- Freeze Frame


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# What To Do With DTCs


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## The First Place To Start

**The first place to start is by interrogating the driver of the vehicle. A good Q & A session may lead you to look into an area that you may have not checked without the information the driver provided.**

**The next step is to use the best tools you own; your brain, eyes, ears, nose and hands to check the problem out.**

**After a preliminary "look see", research the problem using your service information (SI) source, followed by investigating Technical Service Bulletins (TSBs) that may be related to the issue.**

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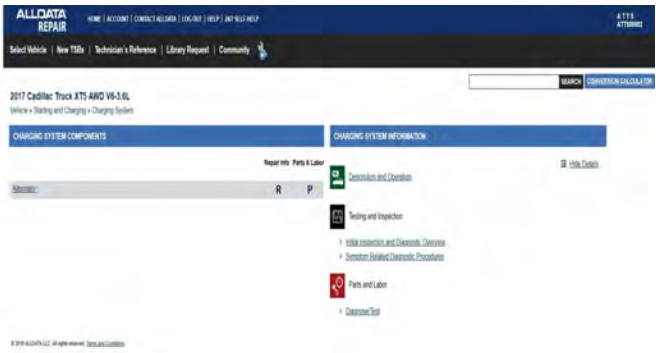
## The Game Plan

**Information on Alldata, Identifix, MotoLogic, ProDemand, iATN, Diag.net, Google, ChatGPT, Grok or even YouTube can be very helpful identifying if the vehicle you are working on needs a reflash or has a silver bullet problem.**




**Remember, when looking at a silver bullet solution always check and test the components and the system before replacing anything.**

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## Basics First

**Basics**

Check the vehicle's vital signs: make sure there is enough voltage in the battery and fuel in the gas tank.

Pop open the hood. Look for obvious signs of neglect or damage.
Are the belts tight?
Are any hoses leaking coolant or another vital fluid?
Are all fluid levels correct?
How about loose or frayed belts?
Do you hear an echo when you pull the oil dipstick and whistle down the tube?

Never look for complicated solutions to simple problems.

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## Basics First

**Supporting Cast**

- **The battery is ALWAYS the FIRST thing to check.**
- **From supplying the amps that start the engine to providing power to the alternator, computer, lights and other electrical devices.**

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## Basics First

### Supporting Cast

- **The alternator must provide enough electrical power to operate all the vehicle electrical loads.**
- **Its job does not end there as it must supply enough energy to charge the battery.**
- **Don't forget to check for AC ripple!**

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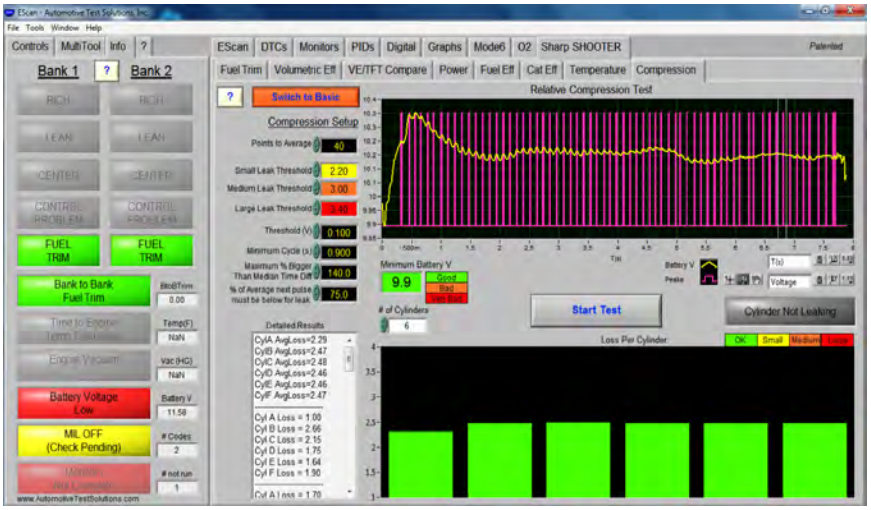
## Basics First - EScan Relative Compression

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# OBD II Generic - Monitors &

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## Why OBD II/Generic

**Before we go to deep let's get the caveats out of the way. When it comes to diagnosing engine performance, DTCs or driveability problems use a Generic/Global scan tool to expedite the diagnosis.**

**A Generic/Global OBD II scan tool allows us to view information quickly while allowing access to, Pending DTCs, Monitors, Mode 6 - 0A/10 data and Freeze Frame to name a few. You won't get all that information in the Enhanced side of your scan tool, so start with the Generic/Global side first and if you need more data PIDs or bi-directional control switch to the Enhanced side.**

**Also, Generic/Global PIDs are the same on every vehicle, whether it's a GM or a Porsche, the data PIDs are all the same and easy to understand.**

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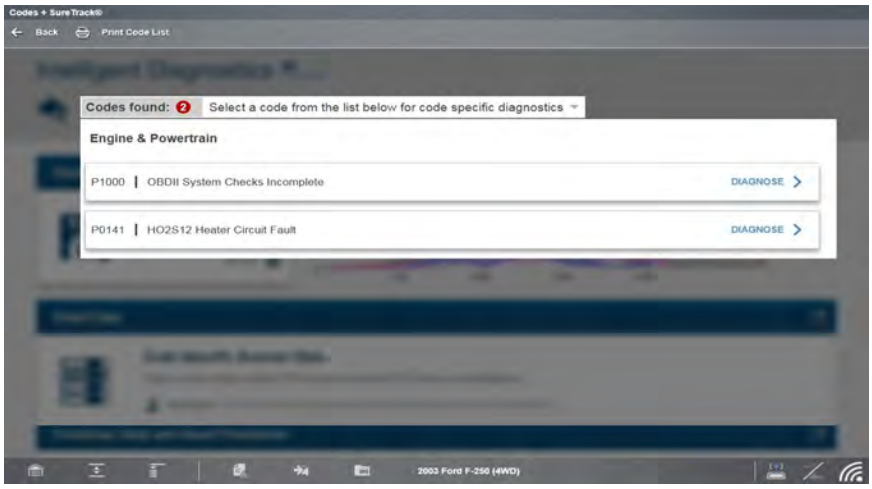
## OBD II DTCs

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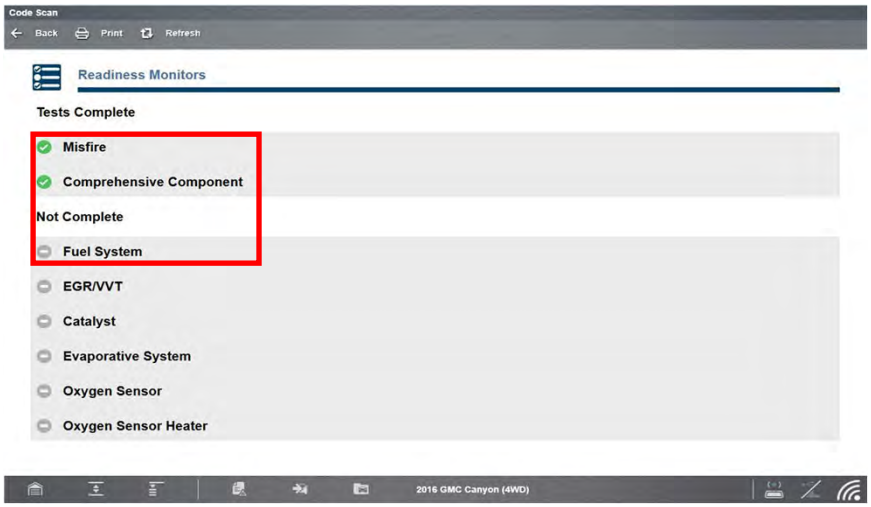
## What You Need To Know About Monitors

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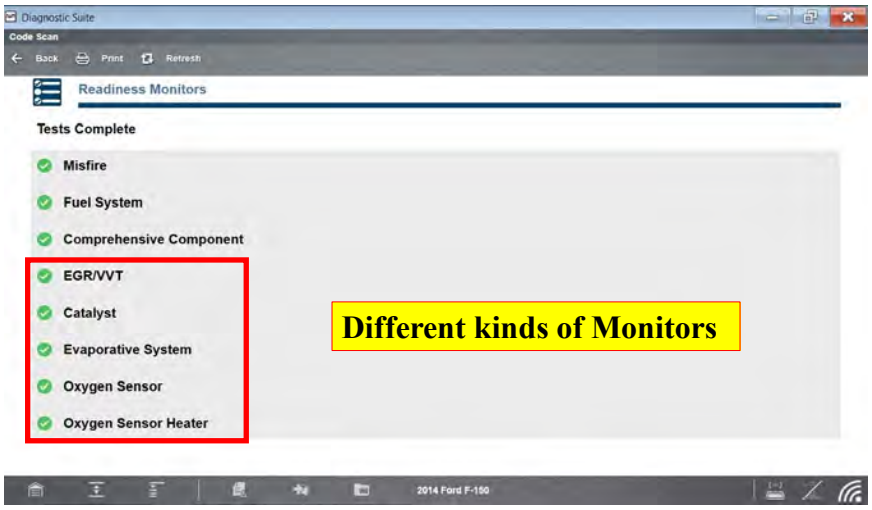
## What You Need To Know About Monitors

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## Looking At Toyota 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.

**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.)

Courtesy Toyota Motor Co.

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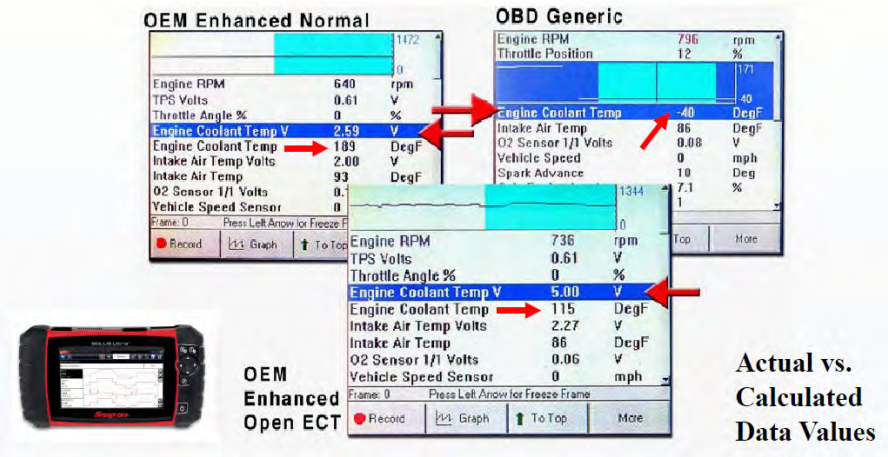
## Don’t Get Fooled Again… Use Generic /Global OBD II First

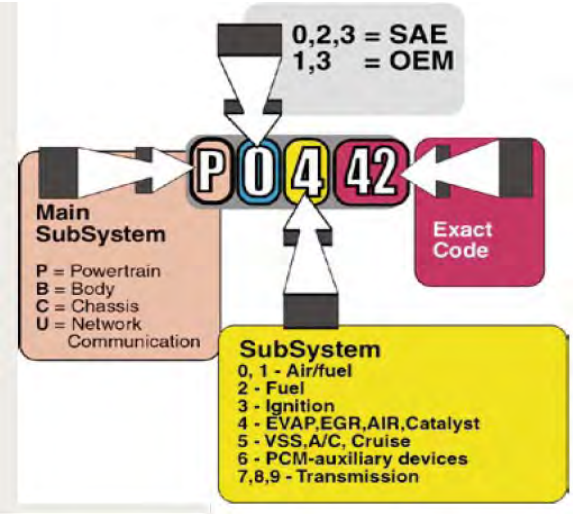







## Generic / Global OBD II Scan Data

## OBD II Code Reader

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## DTCs & Pending DTCs


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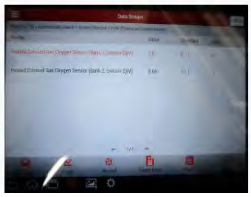
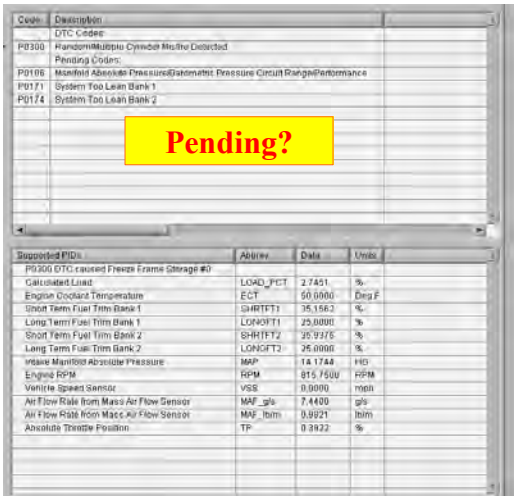
## Scan Tool Pending DTC & DTC








# OBD II Modes - Mode 6 & 0A/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) |

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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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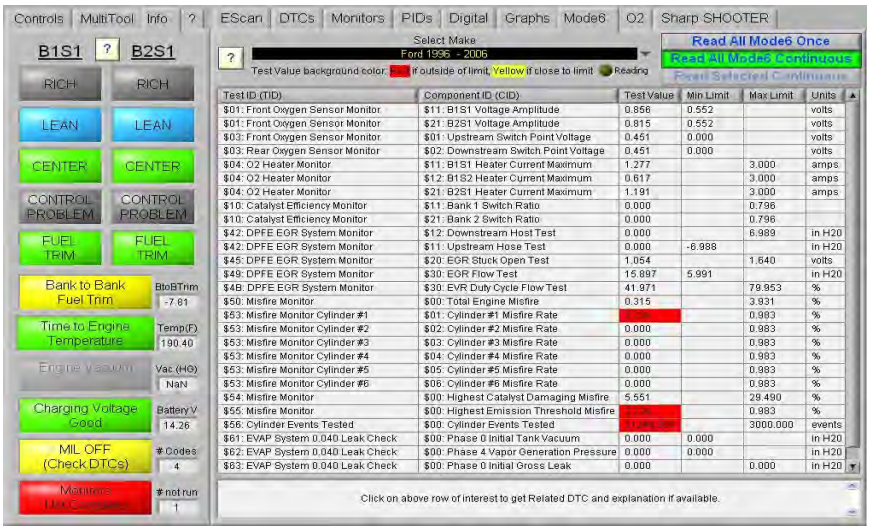
## Mode 6



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## Mode 6




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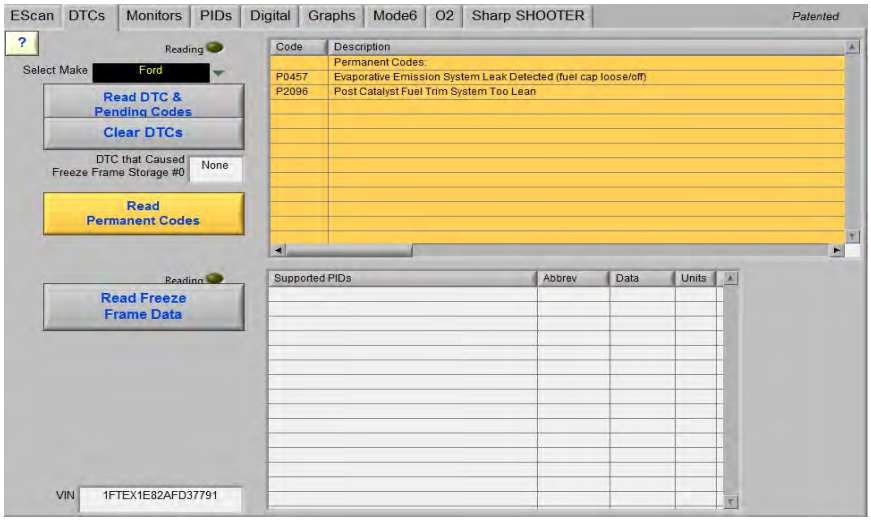
## Generic / Global OBD II Mode 0A /10



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# Why Generic OBD II First



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## Enhanced Scan Data Substituted Values

**To identify PCM limp-in mode values, compare calculated values in datastream (degrees of temperature, inches or mercury, etc.) to actual sensor voltages.**

**That's why Chrysler has sensor test mode.**

**Substituted values:**
**This scan tool display indicates an open MAP sensor circuit with a fixed voltage of 4.8 volts, even though the MAP calculated pressure reading is fluctuating.**


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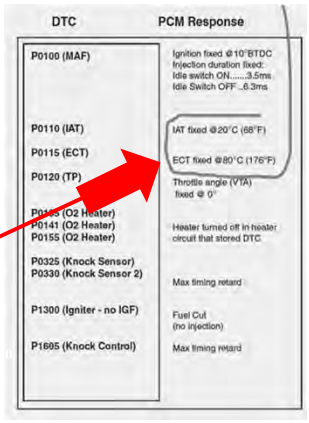
## Enhanced Scan Data Substituted Values

**What you see in datastream depends on the scan tool and the vehicle. It also depends on what scan mode or interface you are using.**

**For example, if you are scanning in OBD II mode, you may see a 284 degrees ECT value if the ECT is shorted to ground.**

**However, if the ECT is shorted and you are scanning in the OEM scan interface, you may see the substituted value of 176 degrees shown in the chart to the right. This is the value that the computer "plugs in" to keep the vehicle running when the ECT fails.**

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# Case Studies



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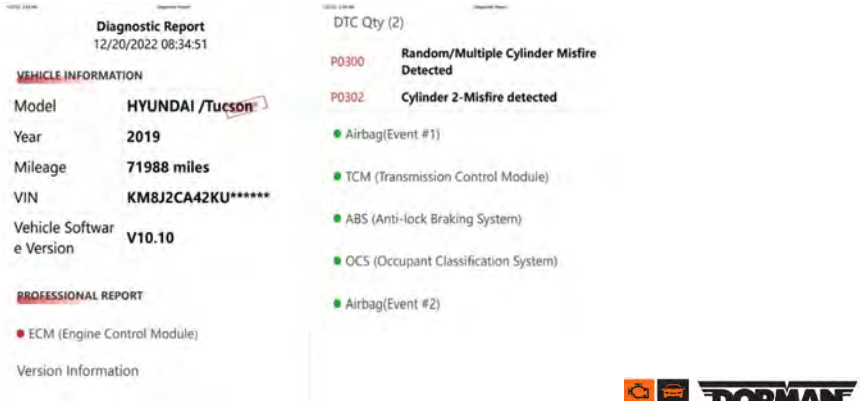
## 2019 Hyundai Tucson 2.0L 71988 Miles

**DTCs P0300 and P0302. Using my best tools first my brain, eyes, ears, nose, and hands to check everything from data stream, Mode 6, relative compression, fuel, and ignition I came up empty handed with anything that was causing the misfires.**



Diagnostic Report
12/20/2022 08:34:51

VEHICLE INFORMATION

| | |
|---|---|
| Model | HYUNDAI /Tucson |
| Year | 2019 |
| Mileage | 71988 miles |
| VIN | KM8J2CA42KU****** |
| Vehicle Software Version | V10.10 |

PROFESSIONAL REPORT

- ECM (Engine Control Module)

Version Information

DTC Qty (2)

| | |
|---|---|
| P0300 | Random/Multiple Cylinder Misfire Detected |
| P0302 | Cylinder 2-Misfire detected |

- Airbag(Event #1)
- TCM (Transmission Control Module)
- ABS (Anti-lock Braking System)
- OCS (Occupant Classification System)
- Airbag(Event #2)



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## 2019 Hyundai Tucson 2.0L 71988 Miles

**The misfires were not detectable during my test drive or testing with my scan tool, scope, or ignition tester. Could it be a COP coil failure that is common on many engines? I tried the easiest thing first, the coil swap by switching a coil from a non-misfiring cylinder to cylinder number 2 without any change in the readings. I remembered that the vehicle owner told me that the engine had a catastrophic failure at 34433 miles that was changed under a Hyundai recall with a new motor and other dealer auxiliary parts. As you can see by the picture the problem was due to a faulty spark plug that was leaking compression gases. The brown stains on the plug were causing misfires that were not detectable on misfire data, Mode 6 or by diagnosing primary or secondary ignition at idle or under load.**


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## 2019 Hyundai Tucson 2.0L 71988 Miles

**In my opinion by changing the spark plugs I confirmed that they were the cause of the misfires. The manufacturer of NGK plugs states corona stains are normal and caused by oil or dirt particles along with static electricity. My conclusion was that two of the four spark plugs that I removed with brown stains were leaking compression causing intermittent misfires, P0300 and P0302 DTCs. After removing all the plugs and installing a new set of OE NGK spark plugs, I performed a computer rescan of the vehicle resulting in no DTCs. The Hyundai was now fixed and running great again, problem solved.**


Diagnostic Report
12/20/2022 10:51:02

VEHICLE INFORMATION

| | |
|---|---|
| Model | HYUNDAI /Tucson |
| Year | 2019 |
| Mileage | 71988 miles |
| VIN | KM8J2CA42KU****** |
| Vehicle Software Version | V10.10 |

PROFESSIONAL REPORT

• ECM (Engine Control Module)

Version Information

DTC Qty (0)

Live Data Qty (6)

| | |
|---|---|
| Name | Cruise Control Main Lamp(Option) |
| Value | OFF |
| Unit | |
| Name | Cruise Control Resume Switch(Option) |
| Value | OFF |
| Unit | |
| Name | Cruise Control Set Lamp(Option) |
| Value | OFF |
| Unit | |
| Name | Current Calculated Load Value |

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## 2002 Chevy Silverado 5.3L V8 DTCs

**Looking at Freeze Frame data can be the key to repairing the DTCs. Performing a complete scan of all systems and checking Pending DTCs, Mode 6 data, Monitors and other data can lead to an affective repair.**

**Looking at our case study scan data carefully led to a proper repair.**

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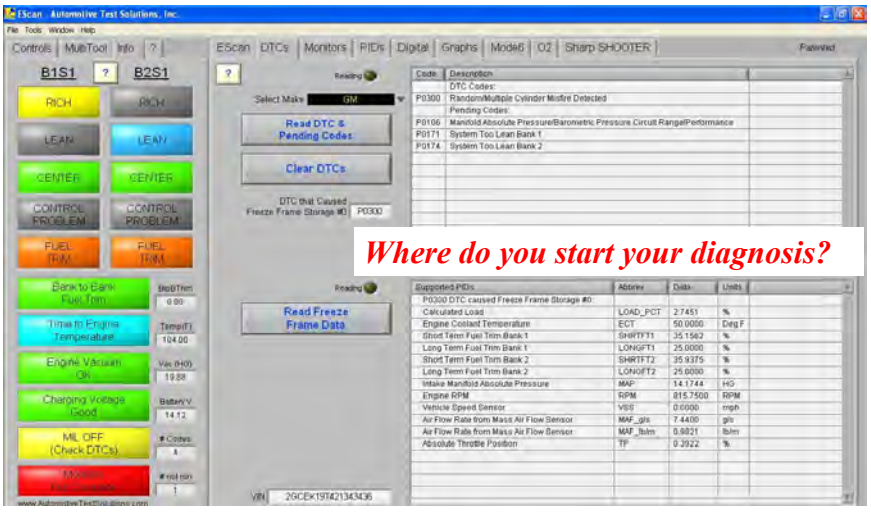
## 2002 Chevy Silverado DTCs P0300 & Pending DTCs

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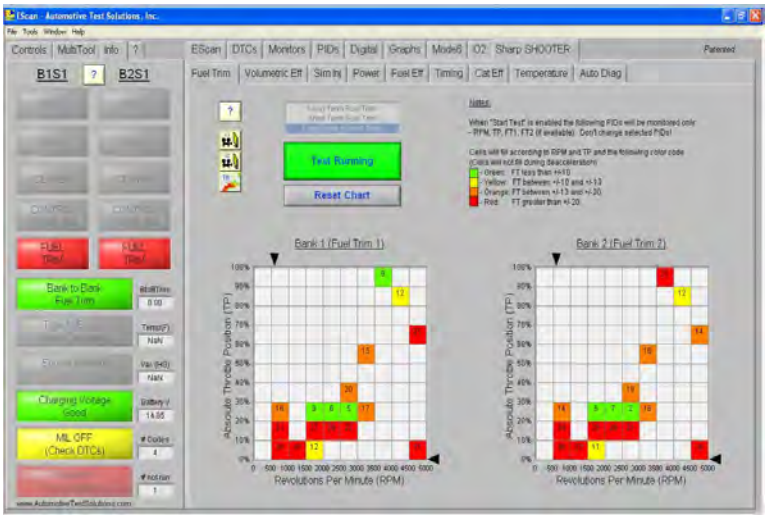
## No Fancy Tools Or Equipment

**Take a look at the fuel trim numbers, what do you think is the problem?**

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## 2002 Chevy Silverado Freeze Frame Tells The Tail

**BARO - MAP**

**29 14 (approx.) = 15 in of vacuum**

| Supported PIDs | Abbrev | Data | Units |
|---|---|---|---|
| P0300 DTC caused Freeze Frame Storage #0: | | | |
| Calculated Load | LOAD_PCT | 2.7451 | % |
| Engine Coolant Temperature | ECT | 50.0000 | Deg F |
| Short Term Fuel Trim Bank 1 | SHRTFT1 | 35.1562 | % |
| Long Term Fuel Trim Bank 1 | LONGFT1 | 25.0000 | % |
| Short Term Fuel Trim Bank 2 | SHRTFT2 | 35.9375 | % |
| Long Term Fuel Trim Bank 2 | LONGFT2 | 25.0000 | % |
| Intake Manifold Absolute Pressure | MAP | 14.1744 | HG |
| Engine RPM | RPM | 815.7500 | RPM |
| Vehicle Speed Sensor | VSS | 0.0000 | mph |
| Air Flow Rate from Mass Air Flow Sensor | MAF_g/s | 7.4400 | g/s |
| Air Flow Rate from Mass Air Flow Sensor | MAF_lb/m | 0.9821 | lb/m |
| Absolute Throttle Position | TP | 0.3922 | % |

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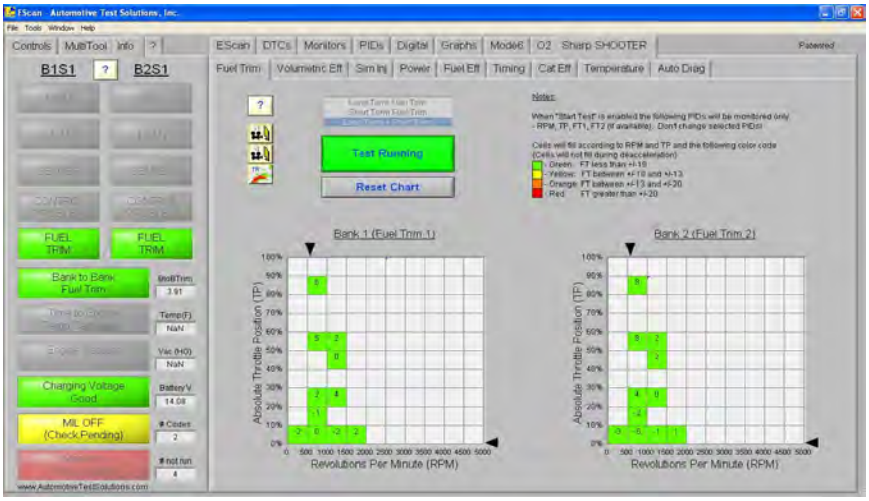
## 2002 Chevy Silverado FT Repaired



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## 2002 Chevy Silverado 5.3L V8 DTCs

**If you would have chased the P0300 you would have gone in circles. Do you now understand why you need to use a Generic scan tool for an illuminated MIL and driveability issues? In enhanced mode (GM, Toyota, VW etc…) you would have overlooked the Freeze Frame data and Pending DTCs. Always use a systematic approach when diagnosing a problem vehicle. The Game Plan we mention in the first part of this webinar should be followed for a successful diagnosis.**

**The moral of this case study is not to just jump on the DTC but to take advantage of what OBD II information has to offer and use that information to solve the problem. If this vehicle had a CAN (controller area network) system I would have suggested looking at Mode 6 data for test results on cylinder misfires.**



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"Dorman Training Center Lunch & Learn"

# *Part 2: Applying Logic Diagnosing DTCs*

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# *Questions?*

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