

How to use PID 41 “monitor status this drive cycle”

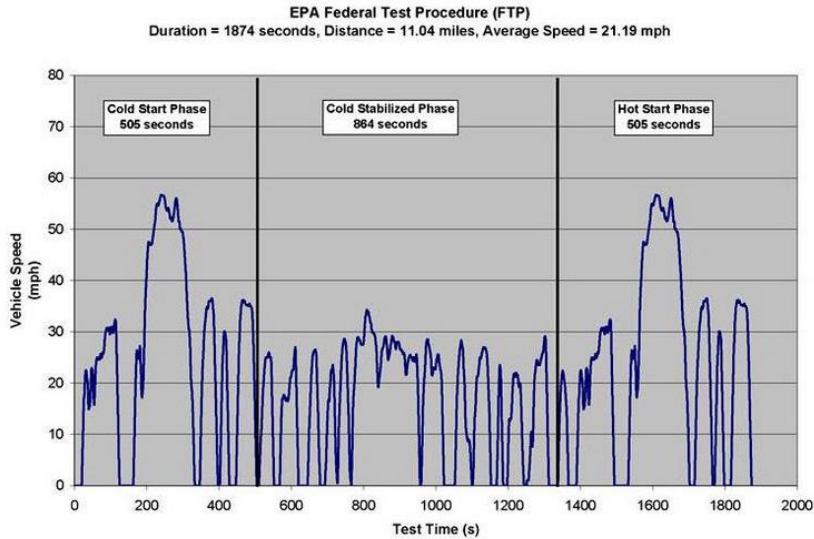
Over the last couple of months, I was involved with many groups discussing on how to run OBD II monitors.

The biggest problem being discussed was how do you know on a two-trip drive cycle, you have ran the monitor/s on the first trip. For that matter, how do you know if you are driving the vehicle in the enabling conditions to run the monitor? Service information is good, yet how do you truly know that you are driving the vehicle in the condition to run the monitor. Normally, I would say we don't know because we have not been made aware that the OBD system has been giving us monitor running information for over ten years.

There are several good sources to running monitors but, what do you do on the vehicles that are not running their monitors? Many technicians to this day, follow what they find online, or driving the vehicle hoping they are driving in the enable conditions.

This article can be used to greatly improve your understanding of the monitor enabling conditions and verifying that you are driving the vehicle in the proper conditions to run the monitors. Think of this as another tool in your arsenal to help you verify your repairs of the vehicle.

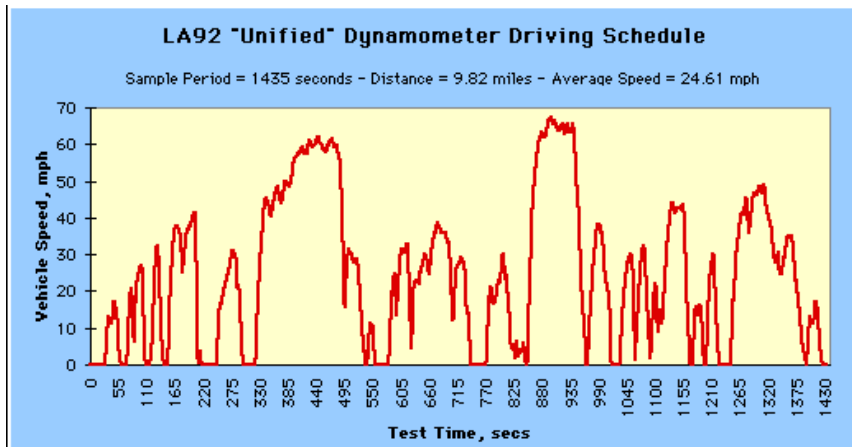
Years ago, when I learned about OBD II, I was taught that the OBD II vehicles were being driven and tested based on the Federal Test Procedure to be certified as compliant.



The Federal Test Procedure (FTP) is composed of the UDDS 'city drive cycle' followed by hot start phase. It is often called the "EPA75".

This trace consists of both California and New York driving conditions. There are many amendments or changes to this drive trace such as: SC03 with air conditioning, Urban Dynamometer Driving Schedule, and US06 high speed driving. These additional driving conditions were added because of the increasing stringency of the ever-evolving emission standards.

For model year 2003 and later (LEVII standards), the California Air Resources Board implemented the LA92 Dynamometer Driving Schedule, called the Unified Driving Schedule. This test was developed to simulate real world driving. Compared to the FTP, the LA92 is designed to be driven at a higher top speed, higher average speed, less idle time, fewer stops per mile, and a higher maximum rate of



acceleration. There is also another version of this drive trace called LA92 Short. The LA92 Short contains the first 969 seconds of the LA92 (Unified)

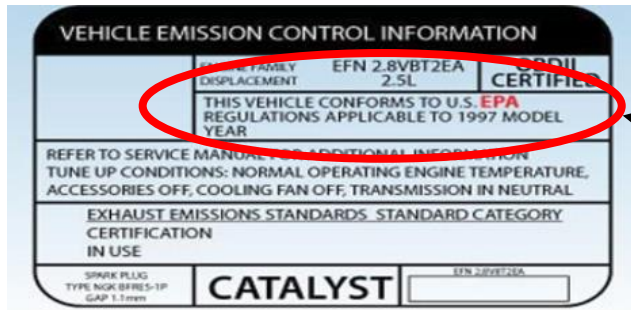
Dynamometer Driving Schedule.

The LA92 is broken into 833 micro trips (a micro trip is the portion of a travel that occurs between stops and assembled into a driving cycle of the "LA-92") representing real-world trips in about a 24-minute duration. It was designed, to mimic realistic vehicle operation (hard accelerations and other real-world driving conditions) than the FTP. The LA-92 is 9.9 miles long, while the FTP's length is 11.0 miles.

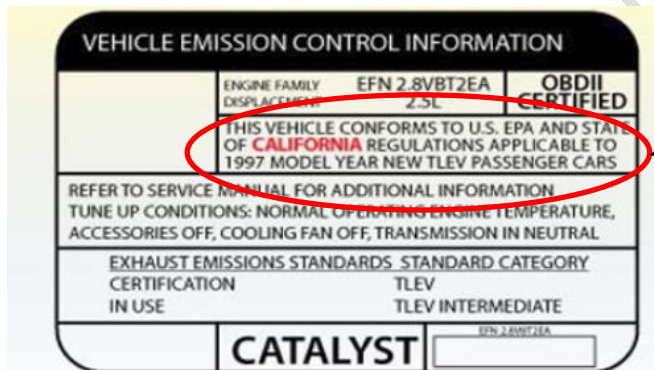
Let's put into context.

When OBD II was implemented in 1996, the EPA's FTP was the drive traced used. Whether the vehicle was California or Federal certified, both agencies use the same drive trace. In the late 90's, early 2000's, to comply with stringent emission standards, the FTP was augmented with supplemental drive traces. Based on what I have researched, CARB implemented LA92 for Low Emission Vehicles II (LEV II) vehicles. The FTP was supplements with additional different drive traces, when you start a Drive Cycle, do you know which procedure to use? There are different procedures for California and Federal emission certification, how you know which one to use?

Look at the unhood emission label.



This states that it is an EPA compliant vehicle. This vehicle is considered a Federal vehicle (49 State).



This tag states it conforms to California and US EPA standards. This vehicle is considered a California emission

I do want to mention that this is how it is supposed to work. I know that there are many anomalies that may not conform to this standard. Now that we have identified the vehicle's certification, we know what drive trace would most likely be used to run the monitors..

Using the enable criteria

Whenever I run monitors, I always look up the enable criteria first. I have wasted a lot of my time by not having the right information. There are number of places that you can look up this information, such as the manufacturer's websites or from one of the reputable automotive information services. A generic procedure may be fine in some cases, but I recommend looking up the information.

From what I have found, all vehicles when starting a drive cycle, must be properly warmed up to its operating temperature before beginning driving the vehicle. This usually means a cold start as well as checking the ECT and IAT are within 10° of each other. Later model vehicles may use the transmission fluid temperature sensor (TFT) in conjunction with the ECT and IAT.

Know the correct procedures.

For example, BMW's procedures state that you let the vehicle warmed up to operating temperature naturally. What BMW means is no throttle movement or revving the engine. This lets the vehicle know that you are starting an emission drive trace.

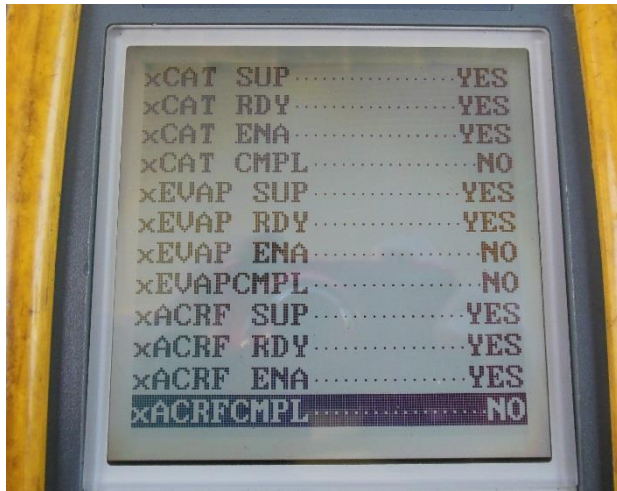
In another case, Honda's procedure states to rev the engine at a certain RPM until the cooling fans come on. These are two totally different procedures yet are very important to each one and when not followed, it will not enable the conditions for the monitors to run. Know and follow the procedures carefully.

Ok, now what do I do?

First, you got the correct information for the enabling criteria of the vehicle.

Second, check the scan data to verify that you are in enabled conditions for the monitors to run. Yes, I did say scan data. A good generic scan tool will list the Enable Condition PIDs.

PID (hex)	Description	Data Byte	Scaling/Bit	External Test Equipment SI (Metric) / English Display
41	<p>Monitor status this driving cycle</p> <p>The bit in this PID shall report two pieces of information for each monitor:</p> <p>1) Monitor enable status for the current driving cycle. This bit shall indicate when a monitor is disabled in a manner such that there is no easy way for the driver to operate the vehicle to allow the monitor to run. Typical examples are:</p> <ul style="list-style-type: none"> - engine-off soak not long enough (e.g., cold start temperature conditions not satisfied); - monitor maximum time limit or number of attempts/aborts exceeded; - ambient air temperature too low or too high; - BARO too low (high altitude). <p>The monitor shall not indicate "disabled" for operator-controlled conditions such as rpm, load, and throttle position. The monitor shall not indicate "disabled" from key-on because minimum time limit has not been exceeded or engine warm-up conditions have not been met, since these conditions will eventually be met as the vehicle continues to be driven.</p> <p>NOTE: If the operator drives the vehicle to a different altitude or ambient air temperature conditions, monitor status may change from enabled to disabled. The monitor shall not change from disable to enable if the conditions change back. This could result in a monitor showing "disabled" but eventually showing "complete".</p> <p>2) Monitor completion status for the current driving/monitoring cycle. Status shall be reset to "not complete" upon starting a new monitoring cycle. Note that some monitoring cycles can include various engine-operating conditions; other monitoring cycles begin after the ignition key is turned off. Some status bits on a given vehicle can utilize engine-running monitoring cycles while others can utilize engine-off monitoring cycles. Resetting the bits to "not complete" upon starting the engine will accommodate most engine-running and engine-off monitoring cycles; however, manufacturers are free to define their own monitoring cycles.</p> <p>PID \$41 bits shall be utilized for all non-continuous monitors which are supported, and change completion status in PID \$01. If a non-continuous monitor is not supported or always shows "complete", the corresponding PID \$41 bits shall indicate disabled and complete. PID \$41 bits may be utilized at the vehicle manufacturer's discretion for all continuous monitors which are supported, with the exception of data byte B bit 2 which shall always show CCM (Comprehensive Component Monitoring) as enabled for spark-ignition and compression-ignition engines.</p>			



The possible supported PIDs include: if the monitor shows: Supported, Ready, Enabled, and Complete. If you prepped the vehicle properly and drove it in the right conditions for that monitor to run, the Enable and Completed PIDs should read 'Yes'.

When I first started using this information, every vehicle I drove,

I could verify if I was in the condition for that monitor to run and if it ran. When all the Completed PIDs for that monitor reads 'Yes' and there are no pending codes, you know that you successfully completed a trip for that Monitor.

Starting 2005 and fully implemented by 2008, there is additional information that we can use to verify that the monitors were in the conditions to run and if they ran. This information is in Service Mode \$09 under In-use Monitor Performance Ratio Tracking or In-use Performance Ratio Tracking depending how it is written.

In-Performance Tracking

This information is used to support possible regulatory requirements for emissions testing on 2005 and later model year vehicles.

Each Completion Counts entry shall track the number of times that the vehicle has run the test.

Each Conditions Encountered entry is used to track the number of times that all conditions necessary for a test to operate have been encountered.

Description	Count
Ignition Counter	1582
Catalyst Monitor Completion Counts - Bank 1	623
Catalyst Monitor Conditions Encountered Count - Bank 1	513
Catalyst Monitor Completion Counts - Bank 2	0
Catalyst Monitor Conditions Encountered Count - Bank 2	0
O2 Sensor Monitor Completion Counts - Bank 1	623
O2 Sensor Monitor Conditions Encountered Count - Bank 1	513
O2 Sensor Monitor Completion Counts - Bank 2	0
O2 Sensor Monitor Conditions Encountered Count - Bank 2	0
EGR Monitor Completion Condition Counts (Secondary Air)	721
EGR Monitor Conditions Encountered Counts (Secondary Air)	517
Air Monitor Completion Condition Counts	0
Air Monitor Conditions Encountered Counts	0
EVAP Monitor Completion Condition Counts	90

OK

In this mode, there are two new PIDs that we must understand.

The first is the **Completions or Numerator**. This is the number of times necessary for a specific monitor to detect a malfunction that has been encountered. Was the vehicle driven properly so that the monitor had the opportunity to run?

The second is **Conditions or Denominator**. This is the number of

times that the vehicles been operated in the conditions for a specific monitor to run. Did the monitor run and report a judgment?

To further validate the information, we drove the vehicle in the proper condition, use the enabled status in Service Mode \$01 and the In-Use Monitoring tracking in service mode \$09 this in turn can verify if the car was driven in the conditions for that monitor to run on the first drive cycle. If it was, the numerator will increment by one. If the ECM determined that the conditions were right and a judgment was made, then the Completions or Denominator will increment by one. So, after the first drive, if the conditions and completions both incremented by one, and you have no pending codes you have a successful trip for that particular monitor. If the Conditions incremented by one and the

Completions did not increment it is possible that either the test ended prematurely due to driving conditions or the ECM has suspended that monitor from running because of not being able to accurately make a judgment. Now we can look at our data in service mode \$06, to determine if there are any near failing tests that may be suspending that Monitor.

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