What is the payoff for mastering readiness monitor strategies?

- Fewer MIL related comebacks
- More accurate evaluation when appraising used vehicles
- Identify what is missing in the enabling criteria to allow monitors to run

- More efficient diagnoses and shorter drive cycles
- Less time spent equals more profit!
- Reduces time to set monitors, so a vehicle can be delivered quickly
- Reduced temptation to “Clean Scan”
Understanding how OBDII works

• On Board Diagnostics generation II
• The vehicle tests itself all the time when operating
• Much more diagnostic information provided to technicians
• Required by Federal EPA regulations to be used starting on 1996 and newer gas powered vehicles, and 1997 and newer diesel powered vehicles (presently we only test vehicles 8500lbs GVWR and less)

OBDII in general

Federal Regulations resulted in standardization of:

Data Link Connector and location in vehicle
Terminology for vehicle emissions control components
Diagnostic trouble codes
Freeze Frame – storage of engine conditions at time a DTC is set
Requirements for lighting MIL (Check Engine Light)
Determination and recording of readiness status of system monitors
What are monitors?

Monitors are self-tests that the PCM runs to determine if the MIL should be commanded on

11 to 20 monitors are possible, currently no car uses them all

Most vehicles use between 5-7 monitors for inspection purposes (not all monitors are required to be ready, often only 2-3 monitors are creating a problem)

Data Link Connector

Contains 16 terminals – some dedicated OBDII and some manufacturer discretionary

Standardized Connector

Sometimes Ground

Pin 4

Pin 5

Ground

Pin 16

Power

Generic/Global OBDII
Standardized Terminology

Different manufacturers used different names / acronyms for essentially the same components / systems

The Society of Automotive Engineers, S.A.E., developed standardized terminology for engine and emissions systems

DTCs (Diagnostic Trouble Codes)

Prior to OBD II each manufacturer had its own list of trouble codes

Under OBD II all manufacturers must use a universal 5 digit code system
Continuous vs. NON-Continuous monitors

**Continuous monitors**
- Misfire
- Fuel system
- Comprehensive components

**Non-continuous monitors**
- O2 sensor
- O2 sensor heater
- Catalyst
- Evaporative system
- EGR system
- Others (if vehicle equipped) – Secondary air, Heated catalyst, A/C system

and readiness monitors

**As per Federal Requirements:**

- 1996-2000 model years can have 2 monitors that are not ready
- 2001 and newer model years can have 1 monitors that are not ready
- The monitors checked by the NYVIP unit are mandated by the EPA

**HOWEVER:** EPA allows some vehicles to receive special handing. This allows these vehicles to pass an inspection with additional monitors that are not ready. The Vehicle information must be entered correctly, and the NYVIP equipment makes this decision automatically

- Only performing an inspection on the NYVIP unit will tell you if a car passes or fails inspection, pre-scanning can be misleading
OBDII runs 3 types of tests

**Passive test** – The PCM monitors sensors for out of range and rationality (i.e. TPS shows a closed throttle condition but the MAF shows a high rate of flow, both sensors are within their operating range but taken together don’t make sense)

**Active test** – The PCM changes something and monitors for a system response (i.e. increasing injector pulse width and looking for a change in the O2 sensor reading)

**Intrusive test** – Similar to an active test, but this test may cause a noticeable symptom such as a stumble when it runs

DTCs used for inspection fall into two categories

- **1-trip or type A faults**
  - The PCM will turn on the MIL the first time a fault is detected

- **2-trip or type B codes**
  - Type B codes fall into 2 categories (pending codes mature into hard codes)
    - **Some type B codes** need to sense a failure on 2 CONSECUTIVE trips
    - **Type B fuel or misfire codes** will look for a second similar problem for 80 non-consecutive trips
Monitors that are ready, stay ready!

UNLESS...

Codes have been cleared with a scan tool

Power to the PCM has been interrupted (generally voltage that falls below 9.6)

The vehicle’s PCM needs to be updated (check for bulletins and firmware revisions)

Setting monitors to ready

Before monitors will set to ready, the manufacturer determines what “Enabling Criteria” must be met

Enabling criteria are a set of conditions that must be met before a monitor can run

Some of the enabling criteria must be met in a specific order

Drive cycles are a set of conditions that will allow a single monitor or all monitors to run
Generic OBD II "Drive Cycle"

- Most OBD II ("On-Board Diagnostics II") diagnostic monitors will run at some time during normal operation of the vehicle. However, to satisfy all of the different "Enable Criteria" and run all of the OBD II monitors, the vehicle must be driven under a variety of conditions. The following drive cycle will (theoretically) allow all monitors to run on a subject vehicle.

*Drive cycles vary by vehicle makes and models!*

- Ensure that the fuel tank is between 1/4 and 3/4 full
- Start cold (below 86°F /30°C) and warm up until engine coolant temperature is at least 160°F (typically requires at least one minute; up to 3 minutes).
- Accelerate to 40-55 MPH at 25% throttle and maintain speed for five minutes.
  
  **Coolant must reach 190°F or more and stay there**

- Decelerate without using the brake (coast down) to 20 MPH or less, then stop the vehicle. Allow the engine to idle for 10 seconds, turn the key off, and wait one minute.
- Restart and accelerate to 40-55 MPH at 25% throttle and maintain speed for two minutes.
- Decelerate without using the brake [or the clutch! ] by coasting down to 20 MPH or less, then stop the vehicle. Allow the engine to idle for 10 seconds.
- Turn the key off, and wait one minute to power down the PCM

Still Not Ready?

- Now What?
- Keep Driving it? *And hope...!*
- Send it to the Dealer? 😊

( the common misconception)

no codes, no light, no problem!
What do these Monitors have in common?

The answer is not “FUEL” or “EXHAUST”
Why do they put a "HEATER" on the O2?

To heat it up and get it to operating temperature!
Therefore the O2 must need **HEAT** to operate properly.

**What about the CAT?**

**Vehicle Inspection Questions**
- For additional information please contact the Department of Motor Vehicles. Phone: 1(888)498-8080
- Website: www.nysdmv.com/vehicledmv.htm
- Phone: 1(888)498-8080

You must display this notice on the lower left corner of the vehicle's windshield.

**Extension Expiration Date**: 02/02/2013
10/30/2012

NY State Department of Motor Vehicles

INSPECTION RECEIPT DUPLICATE

VEH: 12

MODEL: FREESTAR CARGO FWD

FUEL TYPE: Gasoline

PLATE: 12345678

INSPECTION RESULT: FAIL

INSPECTION FEE: $21.00

SAFETY STICKER NUMBER: 12345

EMISSIONS: FAIL

EXPIRATION: 9/9/2012

A car must display this notice on the lower left corner of the vehicle's windshield.

This vehicle has been failed a 14-day extension. Please bring in this receipt and the vehicle to pass inspection. This vehicle has failed its annual inspection. If not fixed, this vehicle will not pass inspection, will not receive another extension, and will not be issued a new safety sticker.

You must display this notice on the lower left corner of the vehicle's windshield.

Extension Expiration Date: 8/30/2012

Needs to reach operating temperature.

HEAT!
What is the function of the EGR on a vehicle?

To reduce NOX caused by high combustion chamber HEAT!
Would you have more fumes in the Fuel tank at 0 degrees in the WINTER or at 100 degrees in the SUMMER?

Hot at 100 degrees in the summer?
Again HEAT!
They all rely on HEAT!

Now it’s time to change the way you THINK about what you already know; when it comes to running OBD II Monitors!

This is a 2004 FORD Freestar

Did Ford install a “COMPUTER” in this vehicle?
Do you think FORD put an ECM or a PCM in this vehicle?

<table>
<thead>
<tr>
<th>ECM (Electronic Control Module)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCM (Power Train Control Module)</td>
</tr>
</tbody>
</table>

Why doesn’t any MFG call them a “COMPUTER”?
Because its NOT!

Think of it as a “PROCESSOR”
All it does is “process” specific information!
How many times do you think this “thermostat” has opened and closed at this mileage?

If it’s weak and now opens at 185 degrees instead of holding it at 190 degrees:

and the PCM is programmed to look for 190...

It will not “PROCESS” to run monitors?

(only newer cars will let you know the coolant isn’t up to temperature!)

The same applies to the IAT (intake air temperature) if the processor is set to look for 90 degrees, anything less and the “PROCESSOR” will not run the monitors!

Again, all it takes is a reading below the spec, and it will NOT “process”! Especially the “EGR” because if the IAT is to COLD the engine won’t ping or detonate, so the EGR doesn’t need to operate.
On a Cold Start the "PROCESSOR" compares:
the IAT (intake air temperature)
to the ECT (engine coolant temperature)

To run the "O2 HEATER" they must be within 10 degrees of each other!

To run the "EVAP", the Processor must detect a "Cold Start" along with a "Cold Soak" (this is a period of 8 or more hours) before the processor will initiate the EVAP test.

If it fails to detect this, these 2 monitors will not run!
Again, all it takes is a reading outside the spec. and it will NOT "process"!

The "EGR" also looks at the IAT, and if it's is to COLD, the engine won't ping or detonate, so the EGR will not run.

Have you seen any of these aftermarket air filters used?

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Have you seen any of these aftermarket air filters used?
Do you think the IAT will get up to 90 Degrees?
What is the “PROCESSOR” programmed to do with “COLD AIR”?

“COLD AIR” needs more fuel! Therefore the “PROCESSOR” will enrich the mixture!

(more fuel = more power!)
BUT do you think the O2, EGR, and CAT are going to like all that extra fuel?
Do you think the IAT will ever reach the threshold to run the monitors?
CR Part 79.25 – Emission waivers
(does not apply to vehicles being sold by a Dealer)

• A waiver may be offered, if the all of the following conditions are met:

1. Customer’s Vehicle has failed 1st emissions inspection
2. Safety Inspection has been passed
3. All Emissions Control Devices have passed
4. At least $450 of failure related emissions repairs have been made
5. Vehicle still fails emissions inspection on 2nd inspection within 30 days

Emission Waivers – cont.

• Repairs must address the reason for failure
• DMV has the right to look at the vehicle to verify repairs
• Copies of all documents must be kept by the inspection station for two years
• The waiver form must be signed by both the motorist and the inspector
Questions?

Thank you for your interest in the New York State Inspection Program.

The Office of Clean Air can be reached at 1-518-473-0597