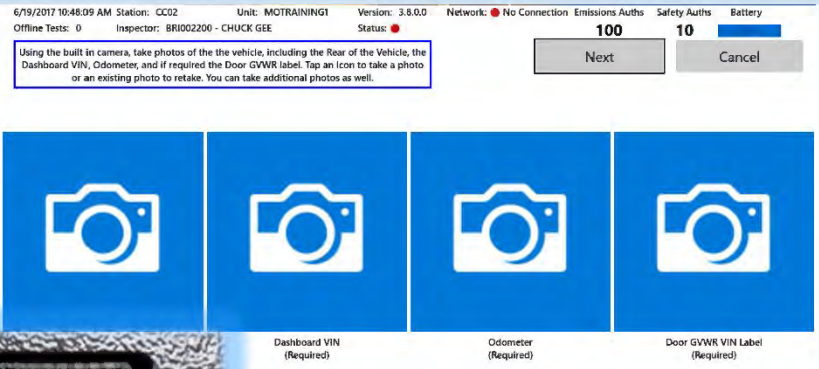
GVIP Vehicle Inspection

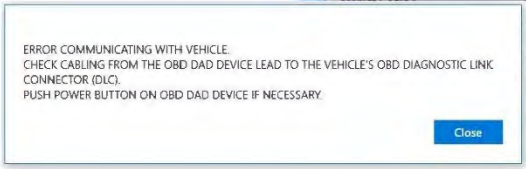
GVIP Gateway Vehicle Inspection Program

MISSOURI GATEWAY VEHICLE INSPECTION PROGRAM (GVIP) EMISSIONS INSPECTOR TRAINING GUIDEBOOK

CLASSROOM STUDY GUIDE



OBD Interface Module Self Test: Passed
Firmware: 1.05.8
Serial: WP001916
Voltage: 12.1 Pass
J1850PWM - Pass
J1850VPW - Pass
I9140808 - Pass
KWPS8FE9 - Pass
KWPF8FE9 - Pass
ICAN11bt500 - Pass
ICAN29bt500 - Pass
ICAN11bt250 - Pass
ICAN29bt250 - Pass



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Missouri GVIP Inspector Training Program

1. MO GVIP Inspector Training

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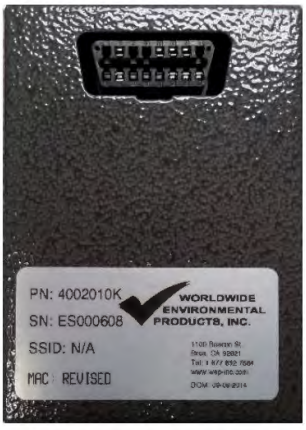


1.2 Course Outline

ABOUT THIS COURSE:

This training program provides the rules and regulations that need to be followed to correctly perform vehicle emissions inspections in accordance with the Code of State Regulations (CSR) that enact the provisions of 643.300 - 643.355 Revised Statutes of Missouri (RSMo).

This training program also details:

- **Hardware components used in the GVIP;**
- **Test equipment operation, testing sequences, and equipment maintenance;**
- **The air pollution problem in the St. Louis nonattainment area, causes and effects;**
- **The purpose, function and goals of the GVIP;**
- **Inspection regulations and procedures;**
- **Technical details of the test procedures and the rationale for their design;**
- **Emission control device function, configuration, and inspection;**
- **Quality control procedures and their purpose;**
- **Public relations; and**
- **Safety and health issues related to the inspection process.**

1.3 GVIP INSPECTOR TRAINING – IMPORTANT ACRONYMS

The acronyms/abbreviations listed below are frequently used in the emissions testing field and being familiar with these terms will aid the user in understanding the material presented in this training program.

APCP – Air Pollution Control Program
CAA – Clean Air Act
DLC – Data Link Connector
DOC – Diesel Oxidation Catalyst
DPF – Diesel Particulate Filter
DTC – Diagnostic Trouble Code
EGS – Exhaust Gas Sensor
EGR – Exhaust Gas Recirculation
GVIP – Gateway Vehicle Inspection Program
GVWR – Gross Vehicle Weight Rating
I/M – Inspector / Mechanic
IM – Inspection Maintenance
KOEO – Key On Engine Off
KOER – Key On Engine Running
MIL – Malfunction Indicator Light
MDAS – Missouri Decentralized Analyzer System
MDNR – Missouri Dept. of Natural Resources
MDOR – Missouri Dept. of Revenue
MSHP – Missouri State Highway Patrol
MVI – Motor Vehicle Inspection division
NAAQS – National Ambient Air Quality Standards
NMHC - Non-Methane HydroCarbon
NOx – Nitrogen Oxides
O2S – Oxygen Sensor
OBD – On-Board Diagnostics
PCM – Powertrain Control Module
SCR – Selective Catalyst Reduction
VID – Vehicle Inspection Database
VIPMS – Vehicle Inspection Program Management System
VIR – Vehicle Inspection Report

2. GVIP TESTING EQUIPMENT

2.1 MISSOURI DECENTRALIZED ANALYZER SYSTEM

Notes: **Ruggedized touch-screen tablet**

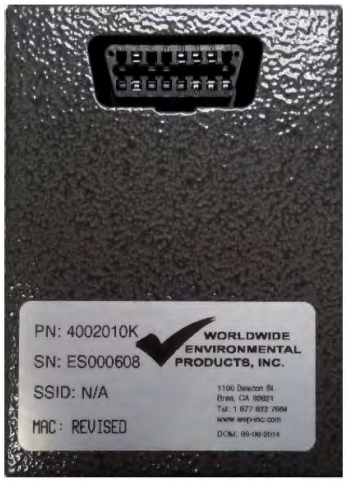
Network nano-router

Sticker printer

Vehicle Inspection Report (VIR) laser printer

Data Acquisition Device (DAD)

Self-Test Module



2.2 Network Nano-Router Overview

Network Nano-Router Overview

The nano-router serves as the connection point for all the hardware pieces and the shop's network.

The nano-router will be connected to the shop's network either wirelessly or with the existing network cable plugged in to the WAN port, completing the GVIP equipment connection to the Vehicle Inspection Program Management System (VIPMS).

The tablet, DAD and VIR printer will all connect together wirelessly through the nano-router.

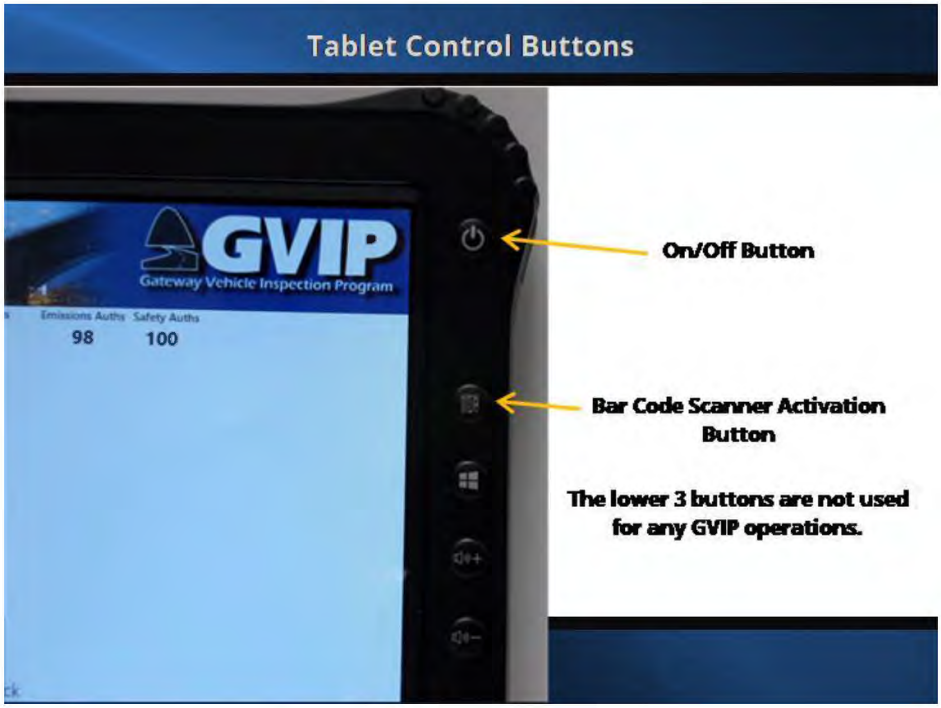
The sticker printer must connect to the nano-router LAN port through a cabled LAN connection.

2.3 GVIP Ruggedized Computer Tablet Overview

Wireless Keyboard and Optional Docking Station

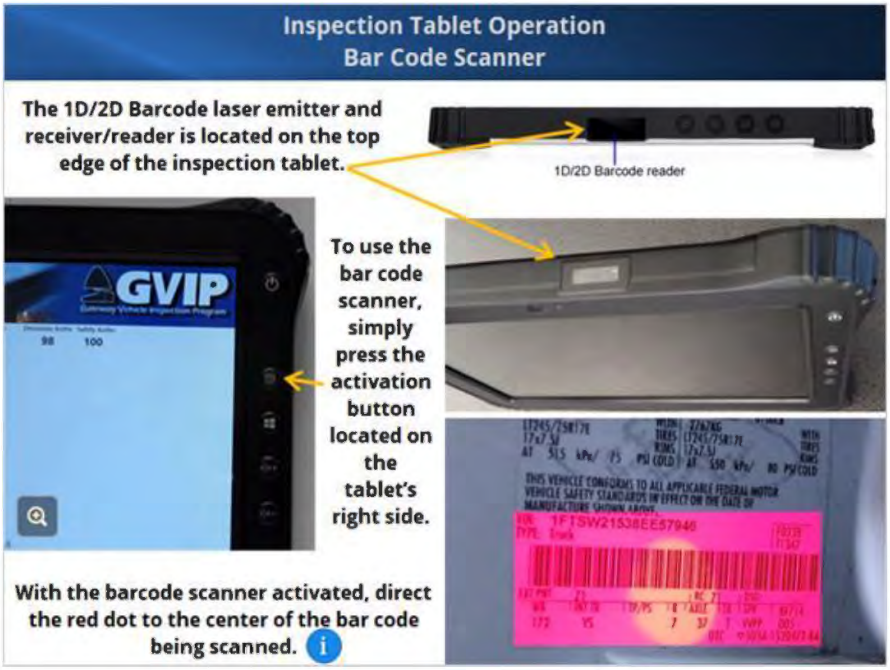
2.4 Tablet On/Off and Power Port

Zoomed In On Control Buttons



2.5 Rear Camera, Fingerprint Scanner

2.6 Bar Code Scanner



2.7 Inspection Tablet Operation

USB Ports

2.8 Tablet Usage and Care

Inspection Tablet Usage and Care

Basic care for the tablet includes using a lint-free computer monitor cleaning cloth moistened with either water or a mild display cleaner. Do not use any harsh chemical or abrasive materials to clean the screen or enclosure.

The same lint-free cloth and mild display cleaning solution can be used for both the barcode and fingerprint scanner lens.

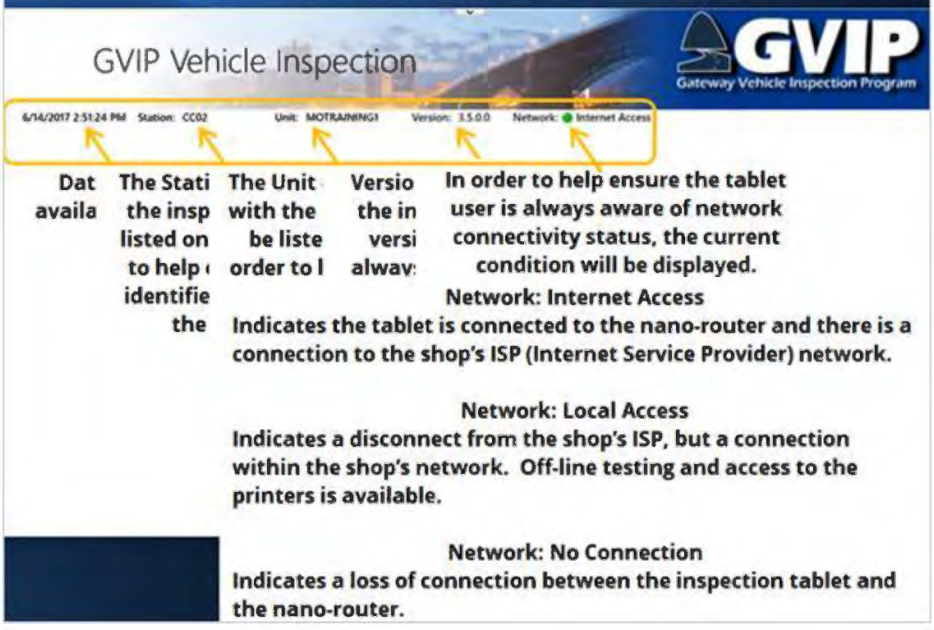
Before cleaning the tablet, turn the unit off and disconnect any attached cables such as the power supply and USB cables. Reconnect cables after cleaning is complete.

Although the inspection tablet is ruggedized and designed for use in shop environments, care should be taken in order to avoid dropping the equipment.

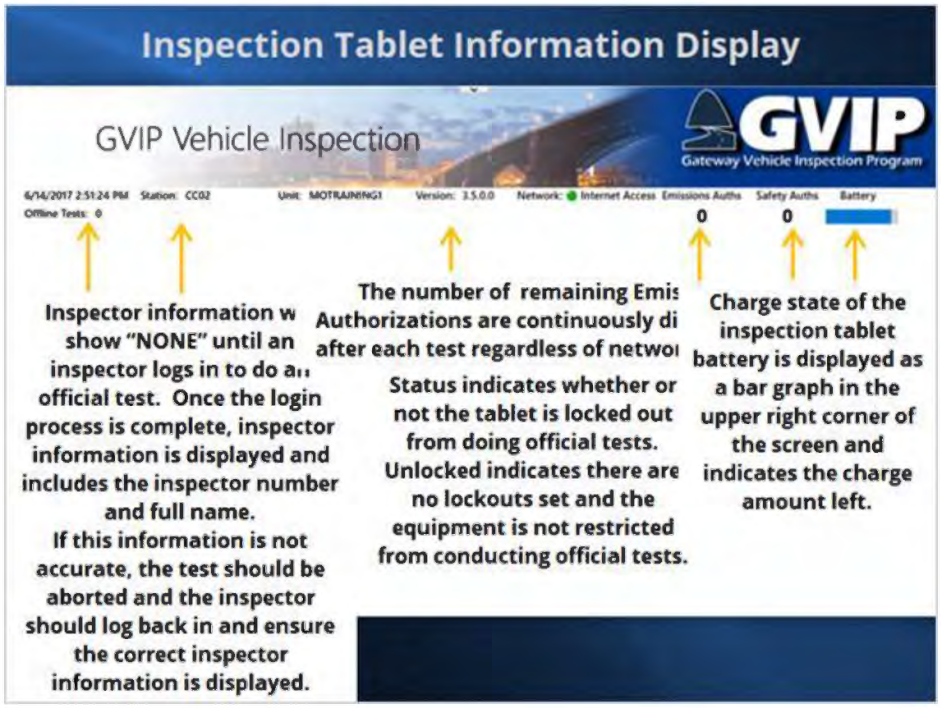
To clean the keyboard, use a can of compressed air to blow out any foreign matter. To clean the sides of the keys, use a cotton swab dipped in isopropyl alcohol and gently swab around each key.

2.9 Tablet Screen Information pg1

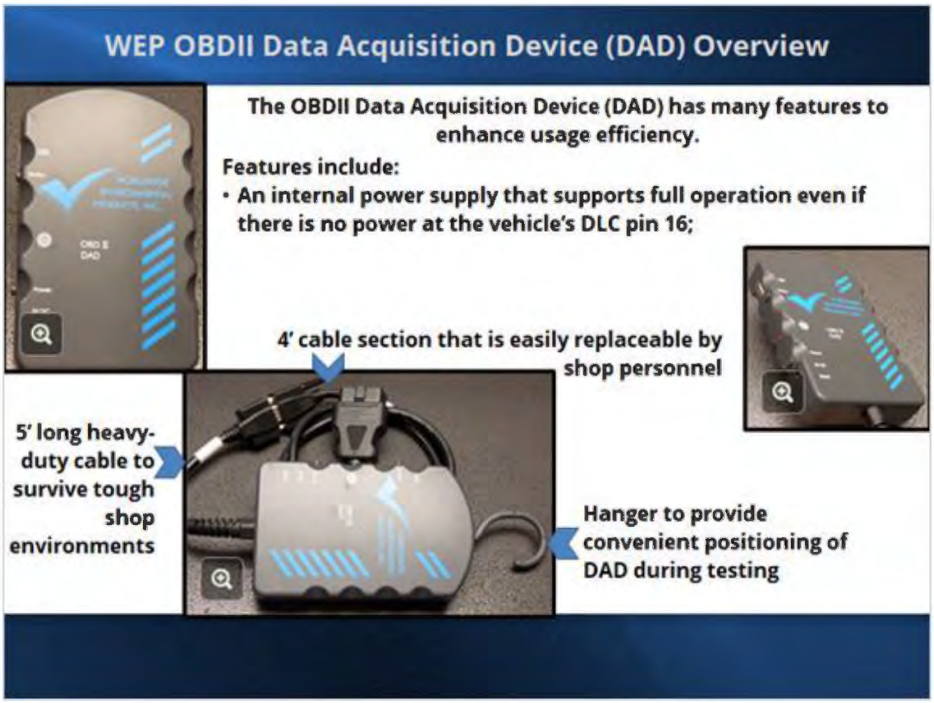
Inspection Tablet Information Display



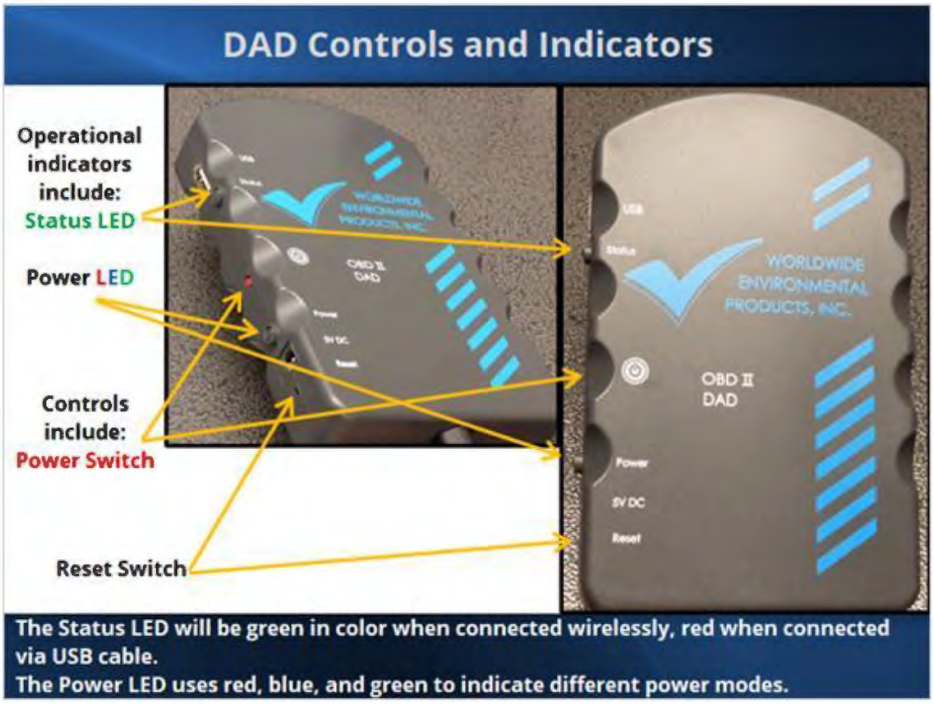
2.10 Tablet Screen Information pg2



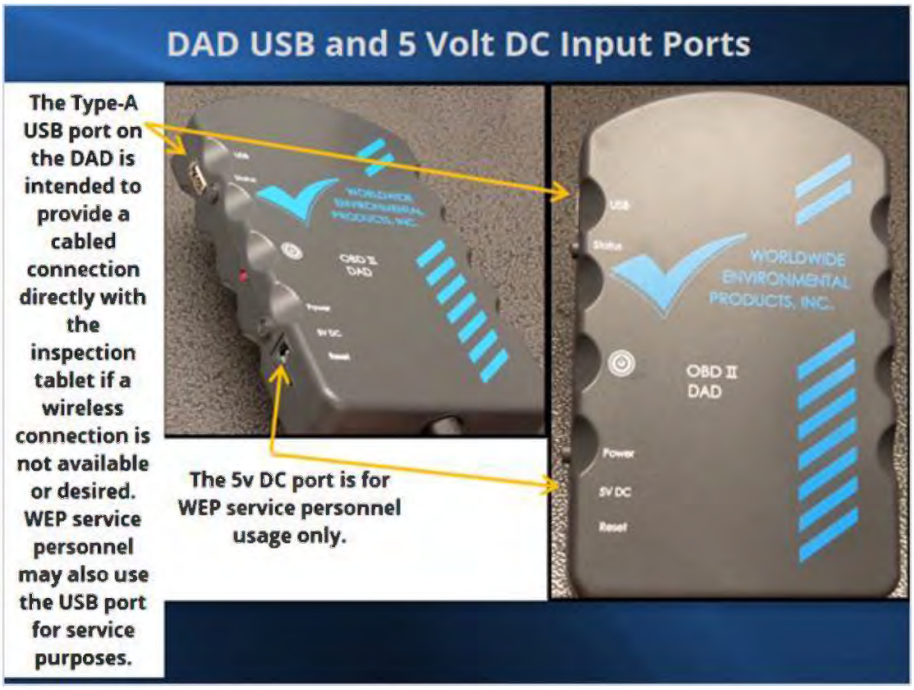
2.11 Data Acquisition Device (DAD) Overview



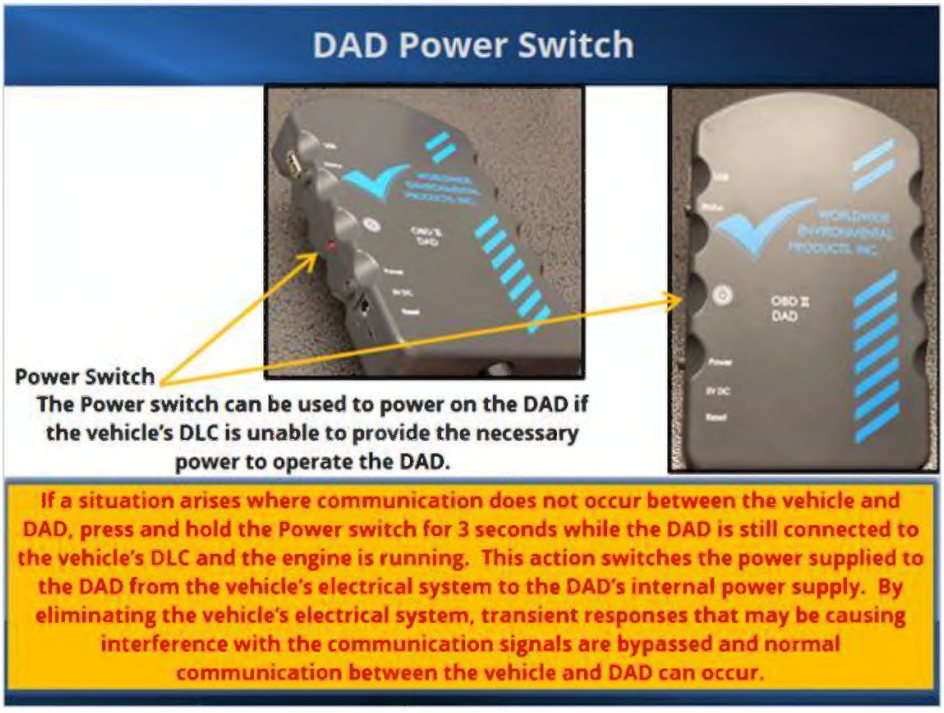
2.12 DAD Controls and Indicators



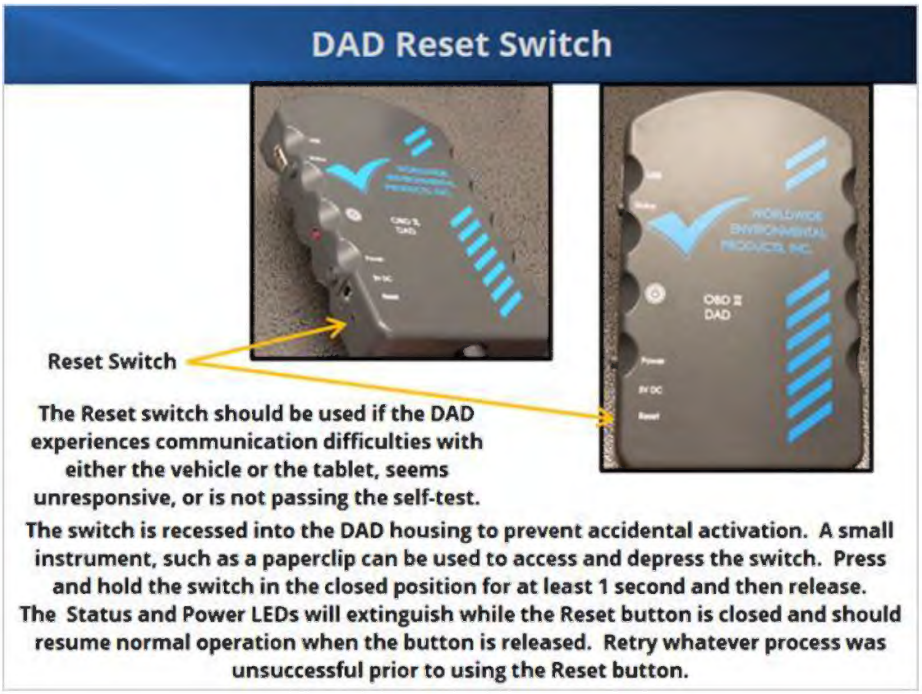
2.13 DAD USB and 5 Volt DC Input Ports



2.14 DAD Power Switch

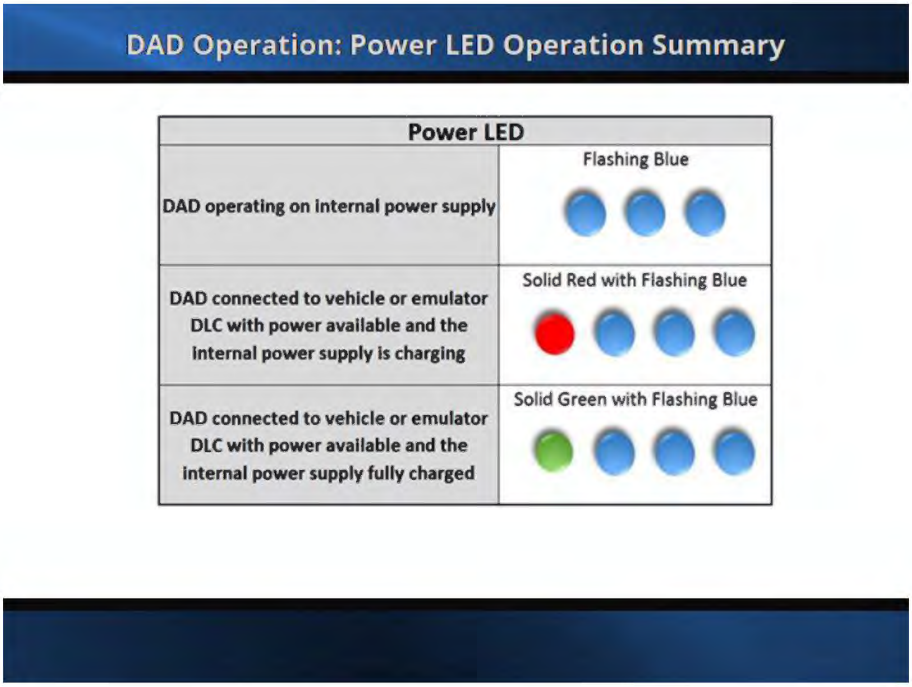


2.15 DAD Reset Switch



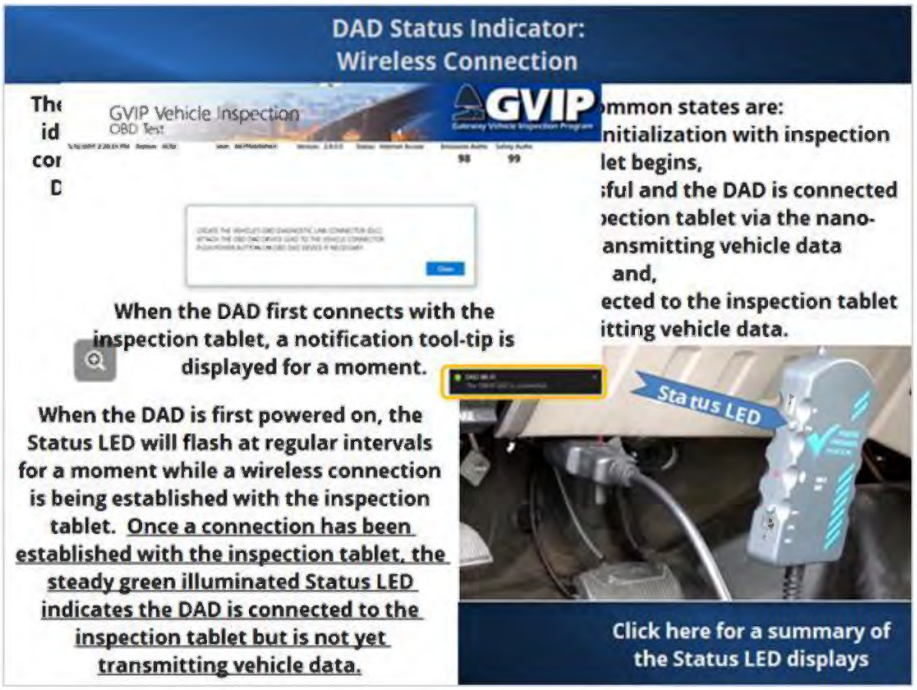
2.16 DAD Power LED Operation:

DAD Operation: Power LED Operation Summary

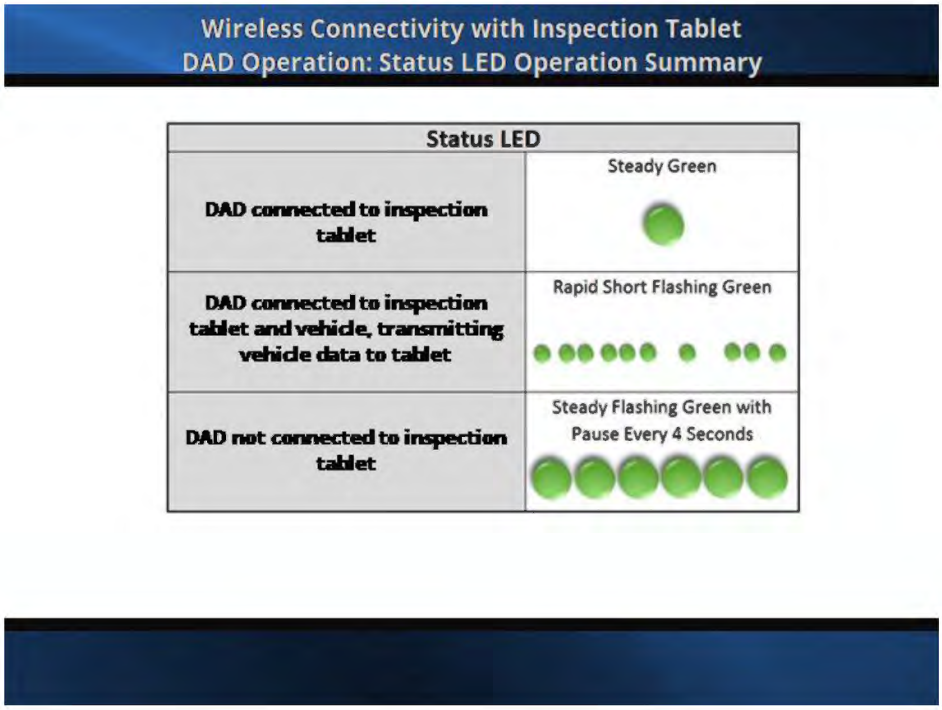


2.17 DAD Powered by Internal Supply

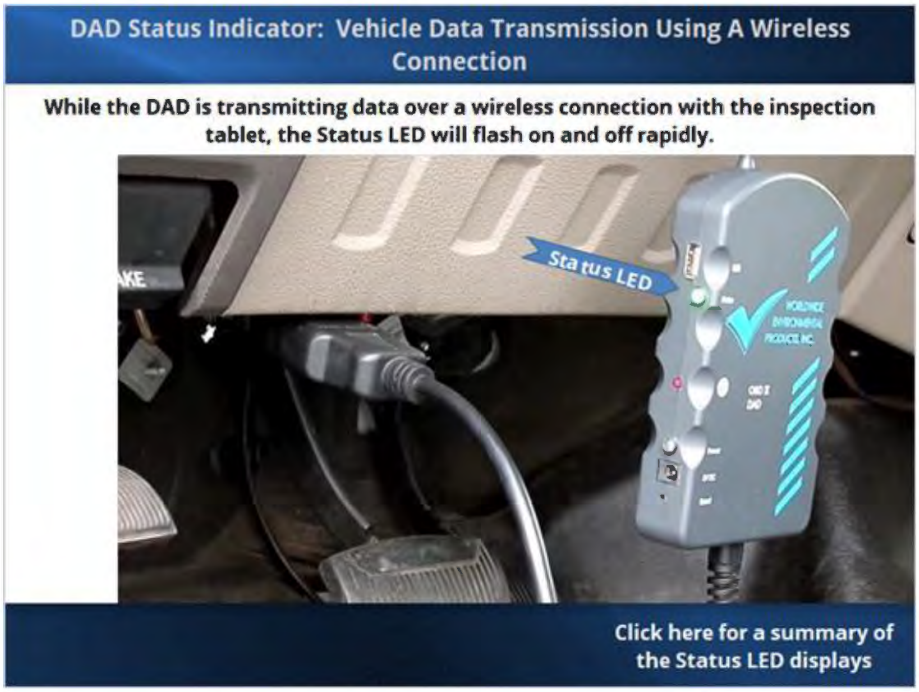
2.18 DAD Status Indicator-Wireless Connection



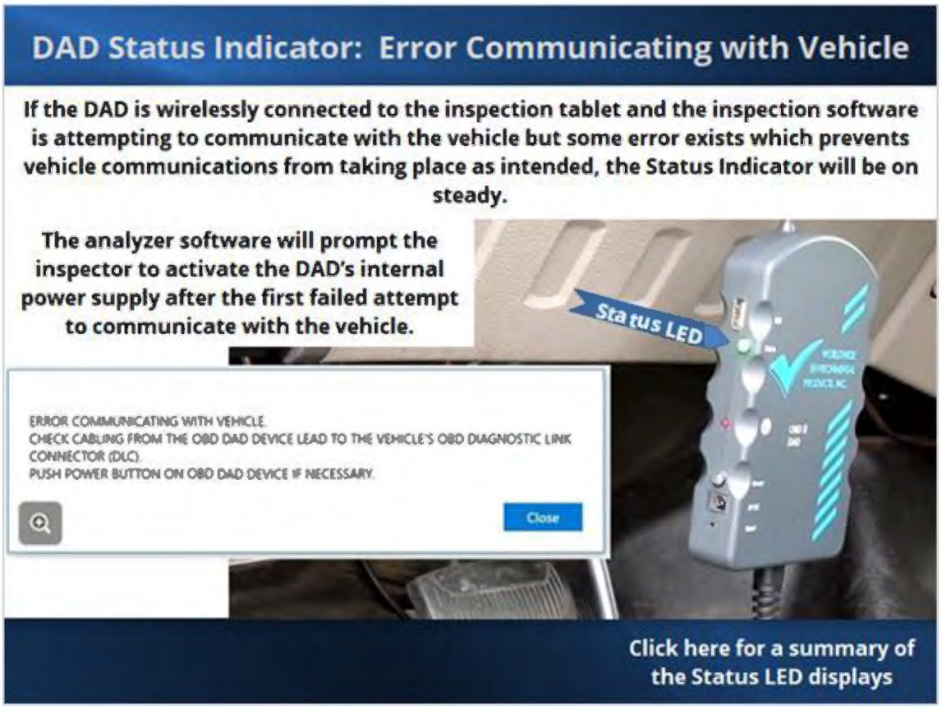
DAD Operation: Status LED Operation Summary



2.19 Wireless Connection: Status Indicator During Vehicle Data Transmission



2.20 Vehicle Communication Error



2.21 DAD No Wireless Connection To Tablet

DAD Status Indicator: No Wireless Connection to Tablet

If the DAD is unable to connect with the inspection tablet using a wireless connection, the Status LED will turn on and off at regular intervals.

The on/off times will vary as the DAD attempts different connection routines.

If the DAD indicates a wireless connection is not present, move the DAD so there is an unobstructed "line-of-site" between the DAD and nano-router. If a connection is still unavailable, move the DAD (and possibly the vehicle) closer to the nano-router location.

The DAD and nano-router must be within 30 feet (12.2 meters) of each other for a wireless connection to be possible.

Click here for DAD specifications

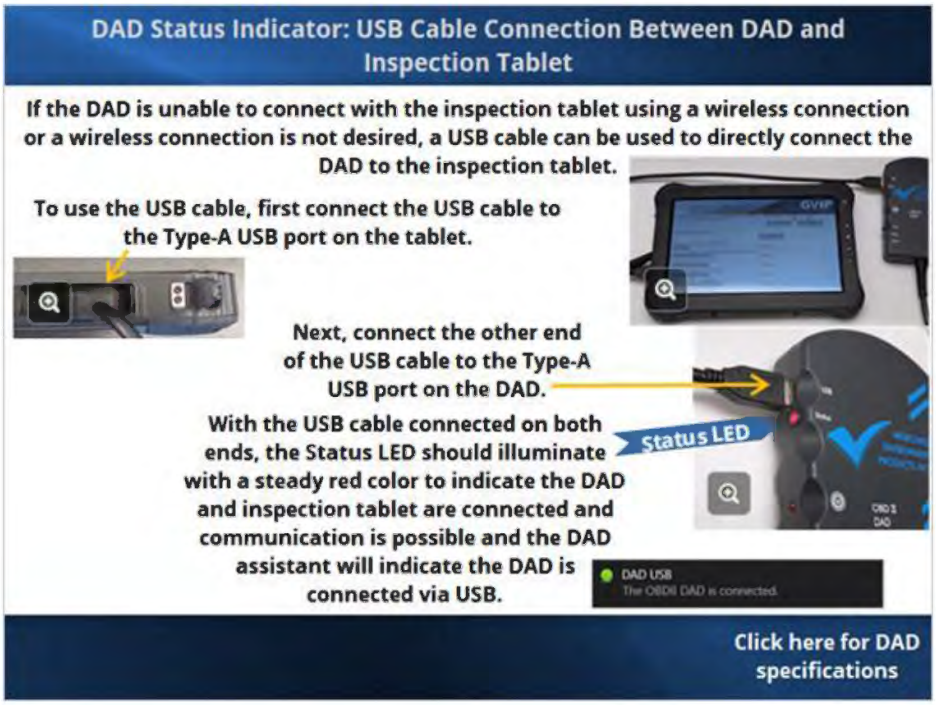
DAD Wireless Communication Specifications

DAD Wireless Communication Specifications

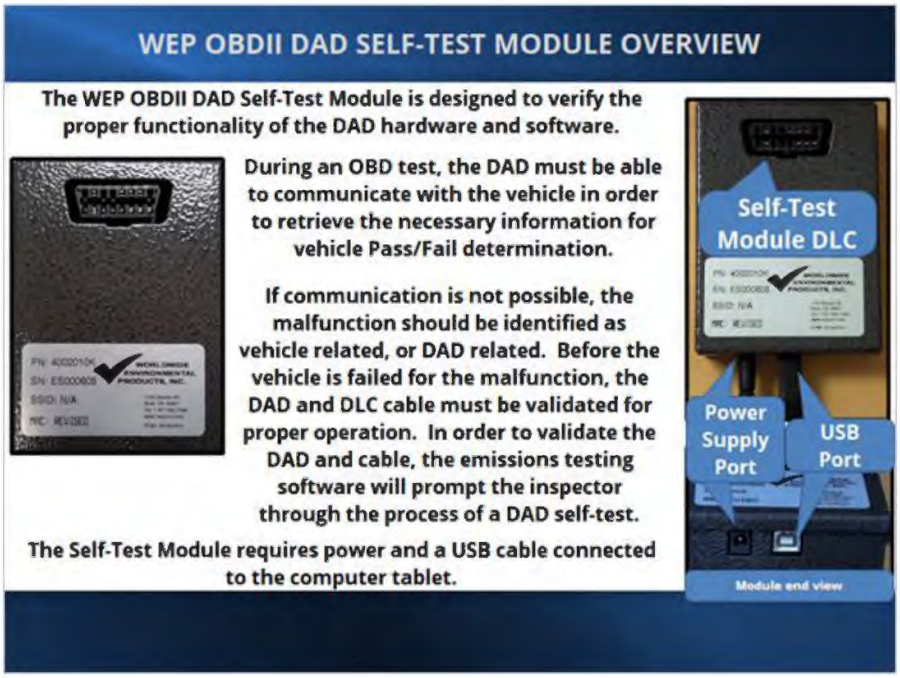
The DAD is designed to meet most shop conditions. The DAD meets the following wireless specifications:

- **No loss of communication between the DAD and nano-router when they are within 30 feet (12.2 meters) of each other with a clear path for signal transmission (no walls or other obstructions).**
- **No loss of communication between the DAD and nano-router while either the DAD or nano-router is within 2 feet (0.6 meters) of a vehicle engine's Original Equipment Manufacturer (OEM) (not modified) electronic engine controls, while the vehicle's engine is running.**
- **No loss of communication between the DAD and nano-router, while either are within 5 feet (1.5 meters) of up to a five horsepower (5-hp.) properly operating Alternating Current (AC) electric motor.**
- **No loss of communication between the DAD and nano-router, while either are subjected to Citizen's Band (CB), Emergency Band, or other types of radio transmissions.**

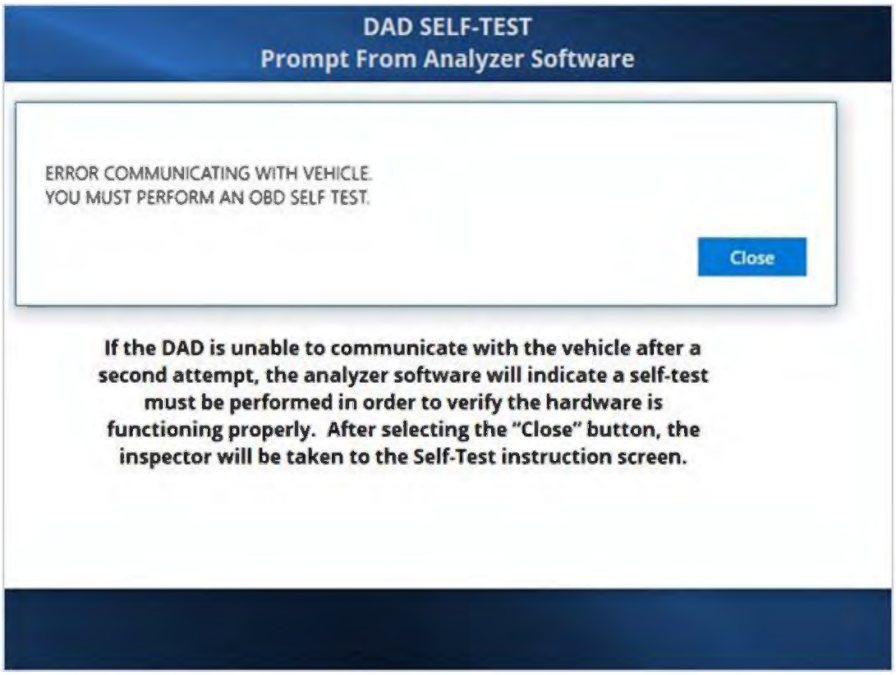
2.22 DAD USB Cable Connection To Tablet



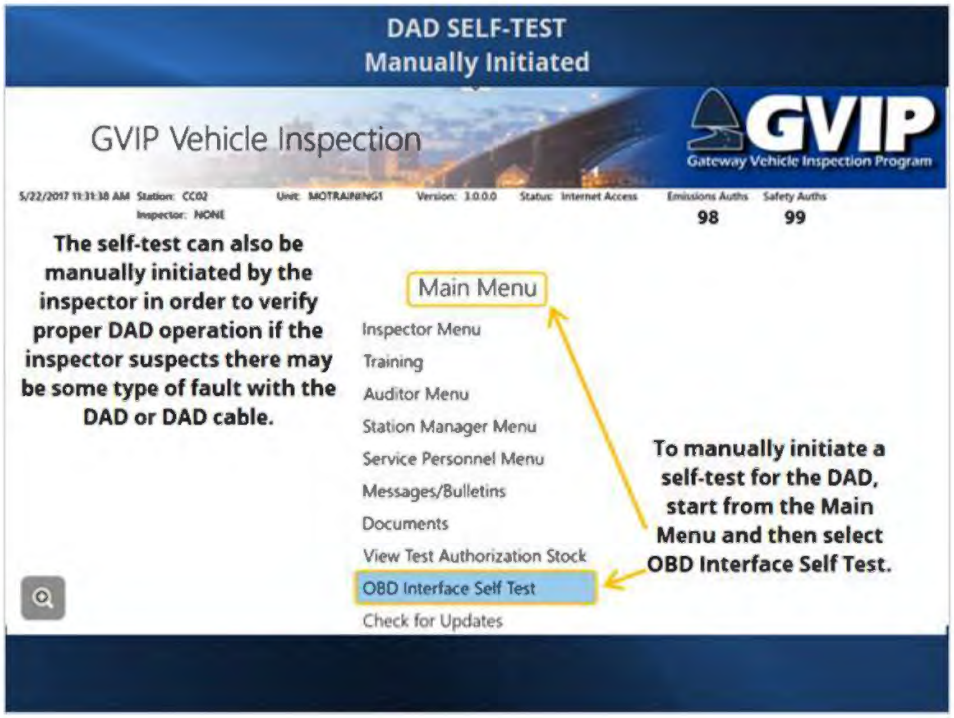
2.23 DAD Self-Test Module Overview



2.24 DAD Self-Test



2.25 DAD Self-Test

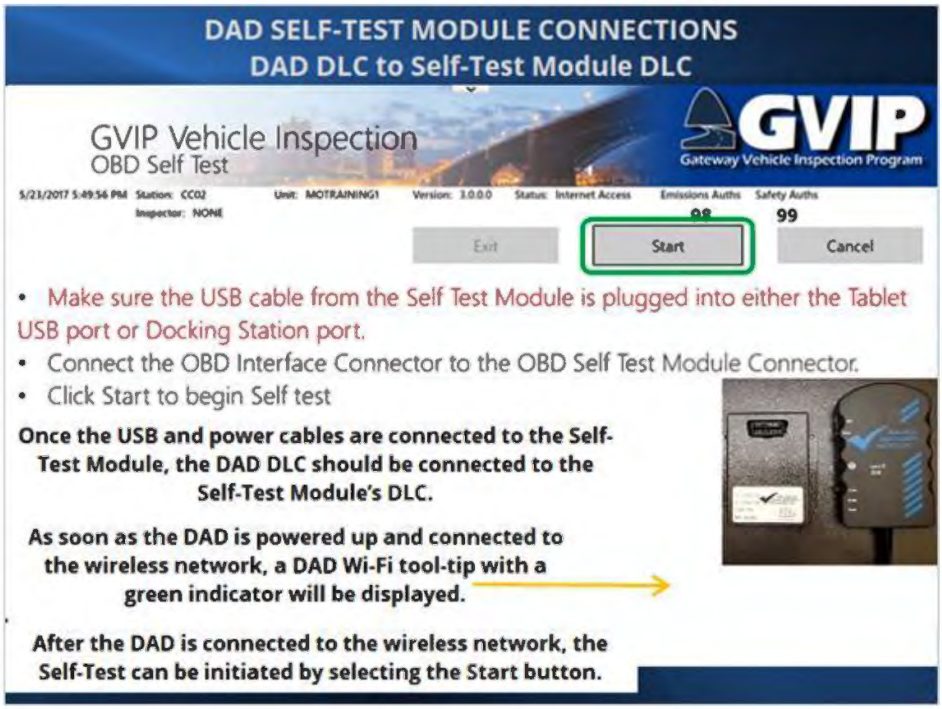


2.26 Self-Test USB Tablet Connection

2.27 Self-Test Module USB Connection

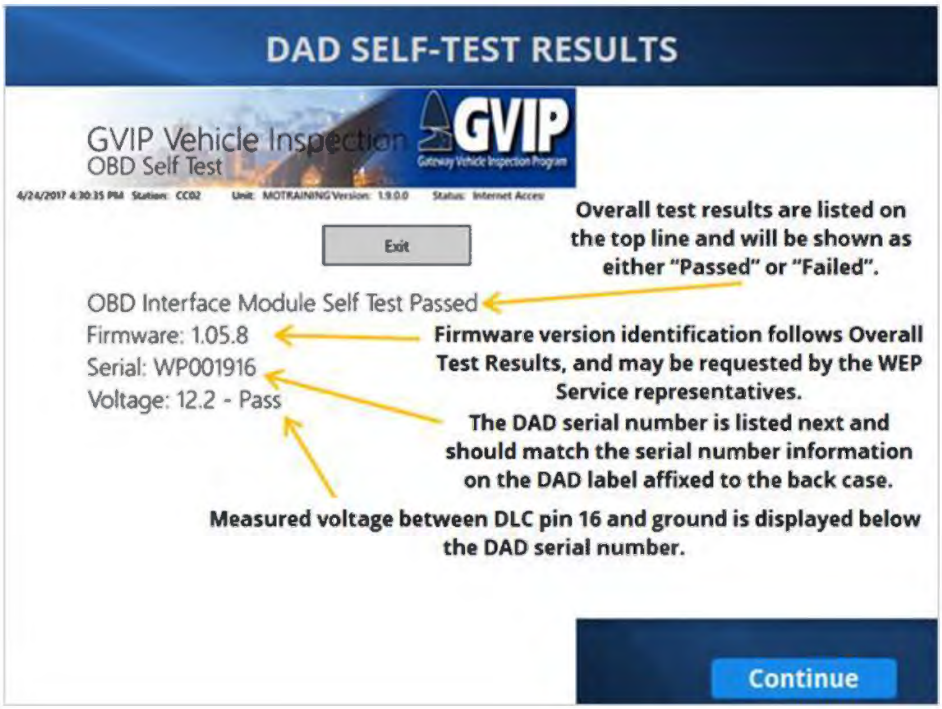
2.28 Self-Test Module Power Connection

2.29 DAD Self-Test DLC Connection

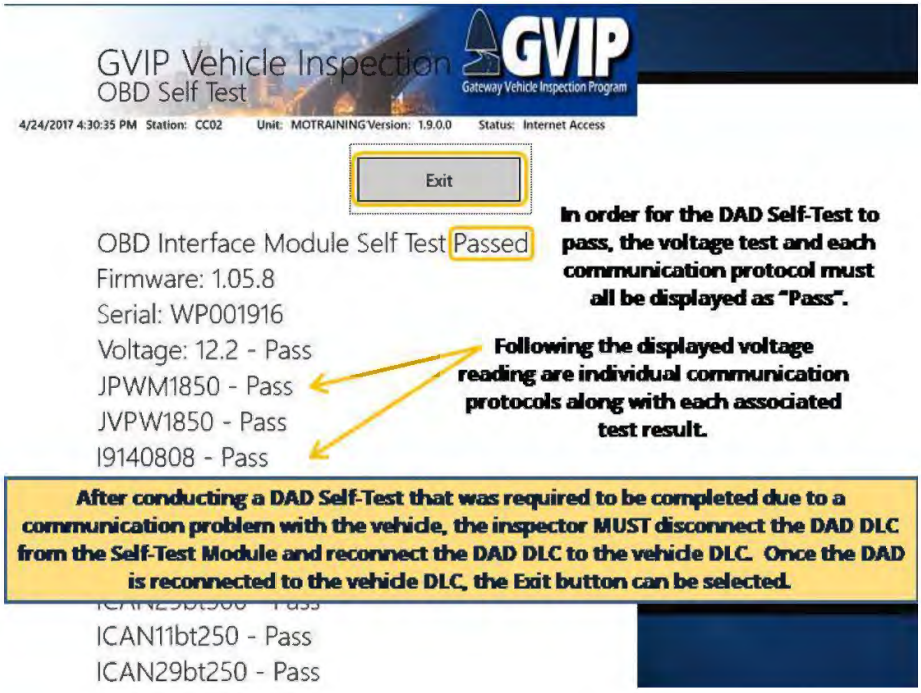


Self-Test Sequence

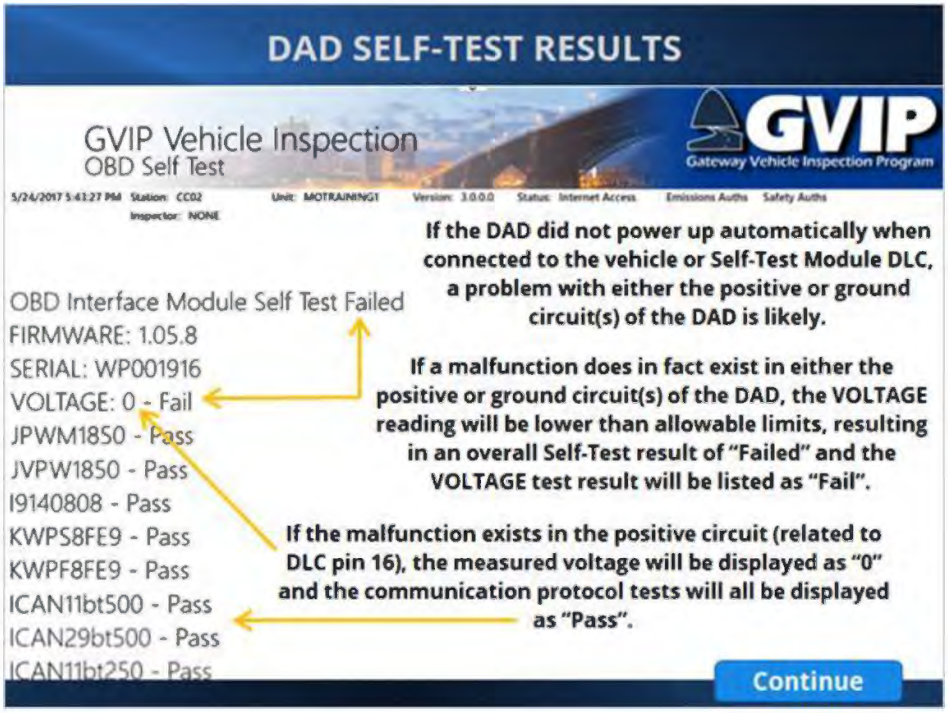
2.30 Self-Test Overall Results DAD info



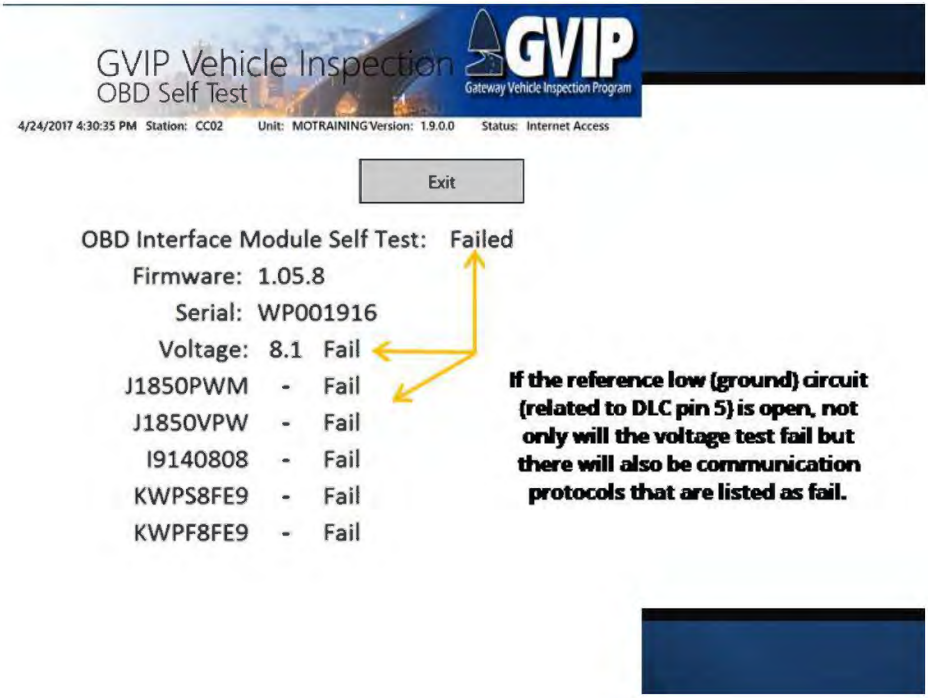
Self-Test Pass



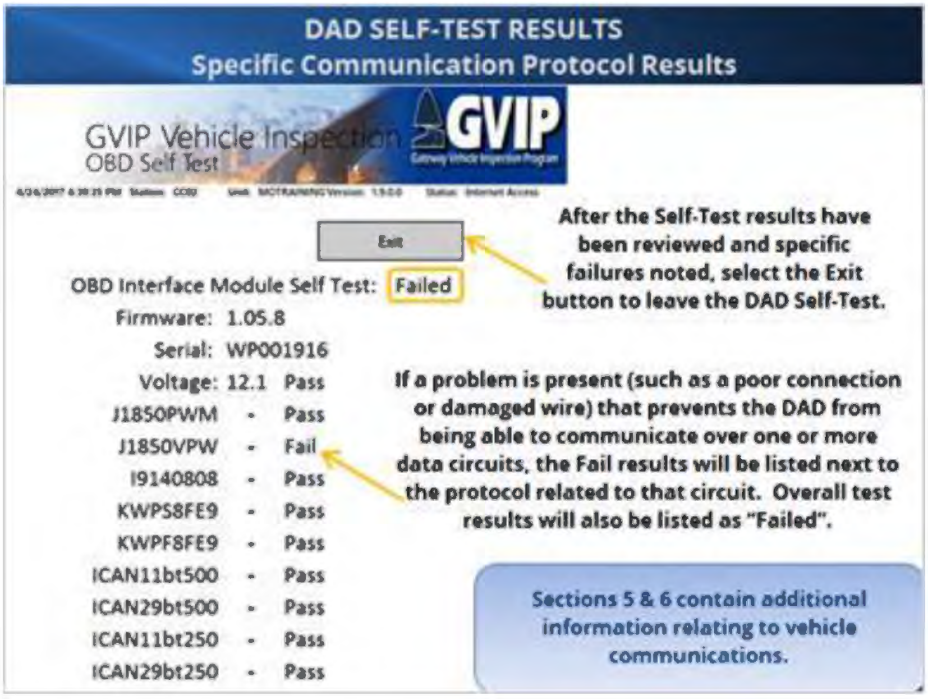
2.31 Self-Test Fail



Self-Test Voltage Failed



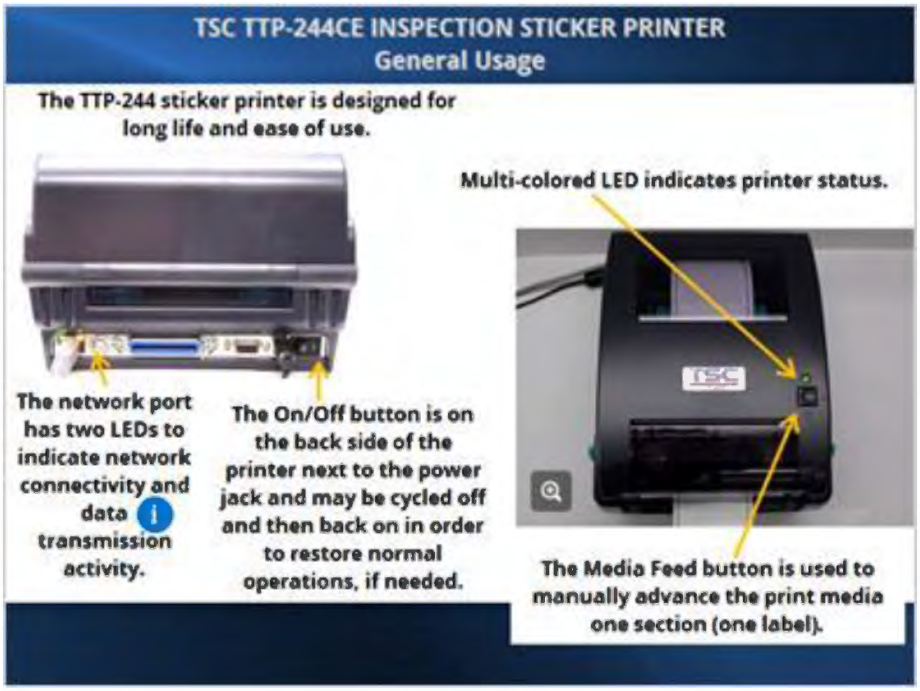
2.32 Self-Test Results: Specific Protocols



2.33 DAD Cable Service

2.34 Inspection Sticker Printer

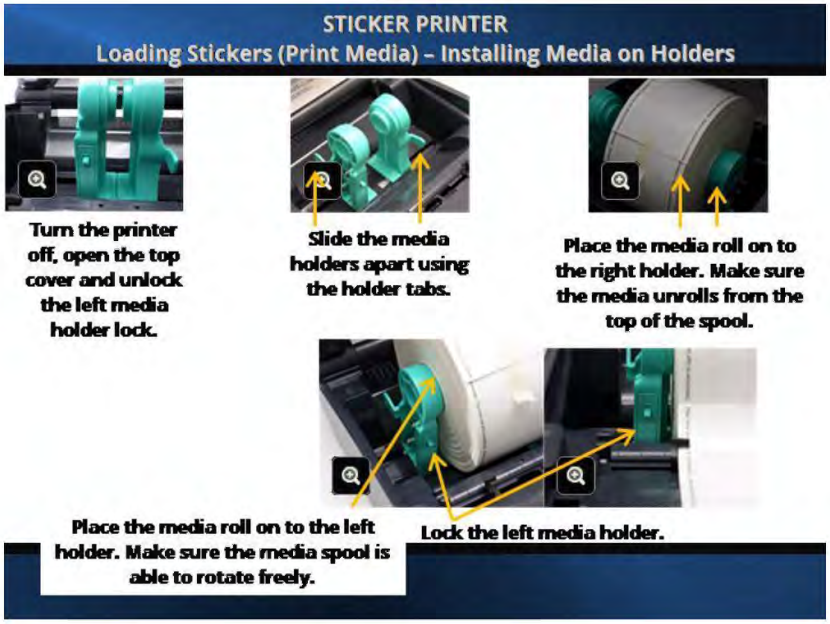
2.35 Sticker Printer General Usage



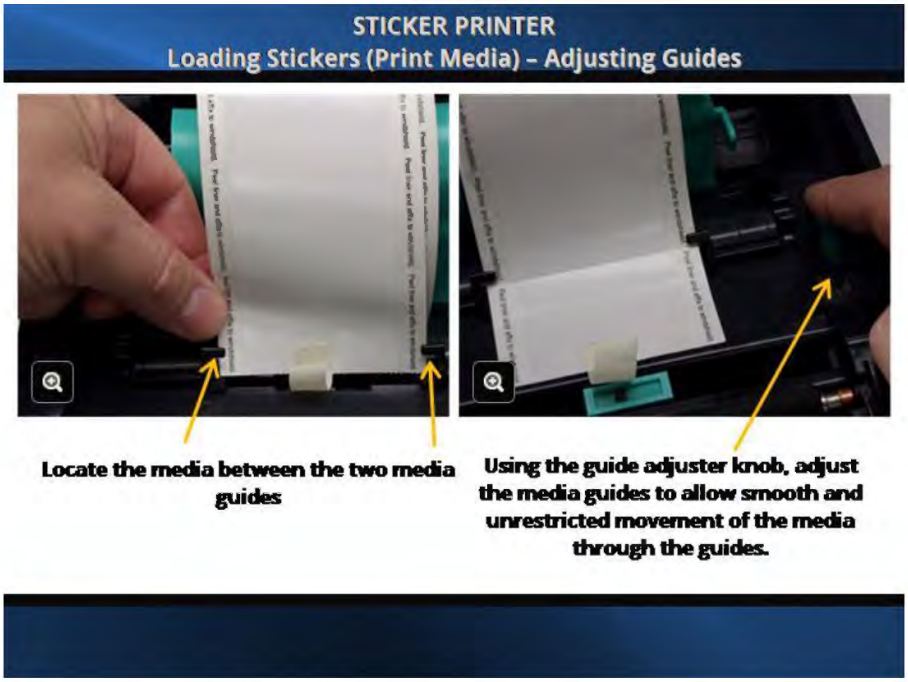
2.36 Opening Top Cover

2.37 Loading Stickers

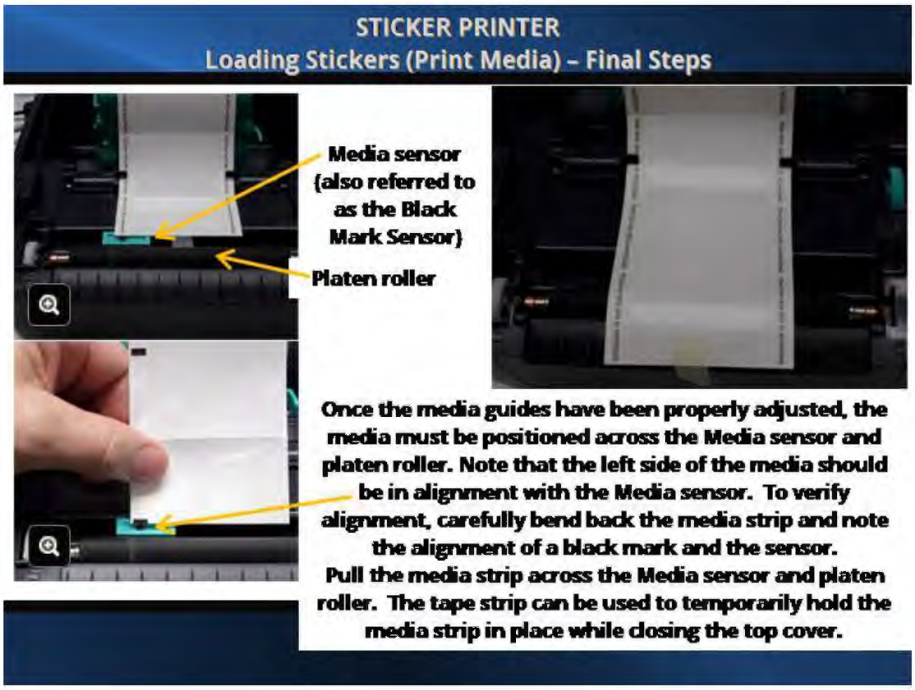
Loading Stickers (Print Media) – Installing Media on Holders



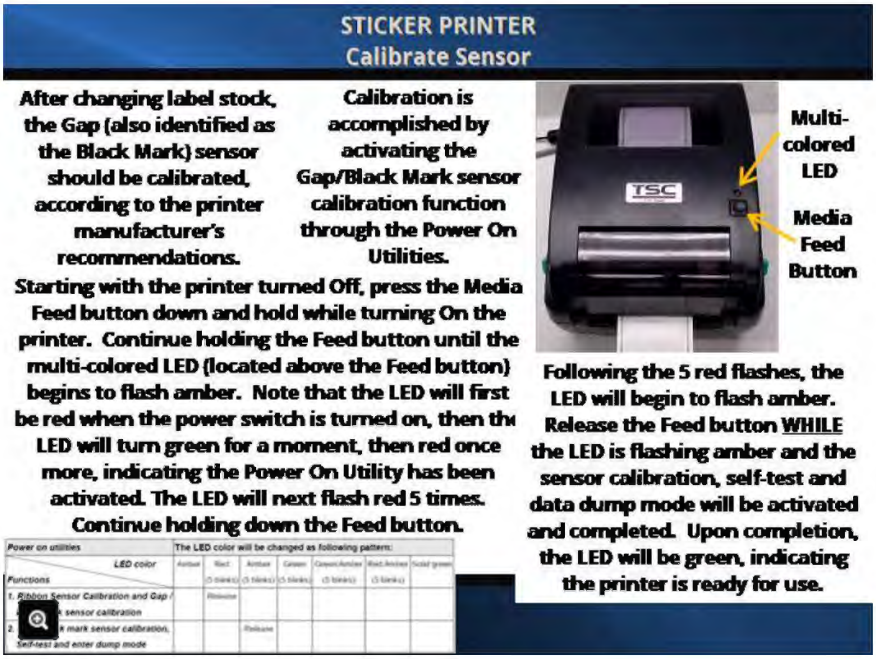
Loading Stickers (Print Media) – Adjusting Guides



Loading Stickers (Print Media) – Final Steps



Calibrate Sensor

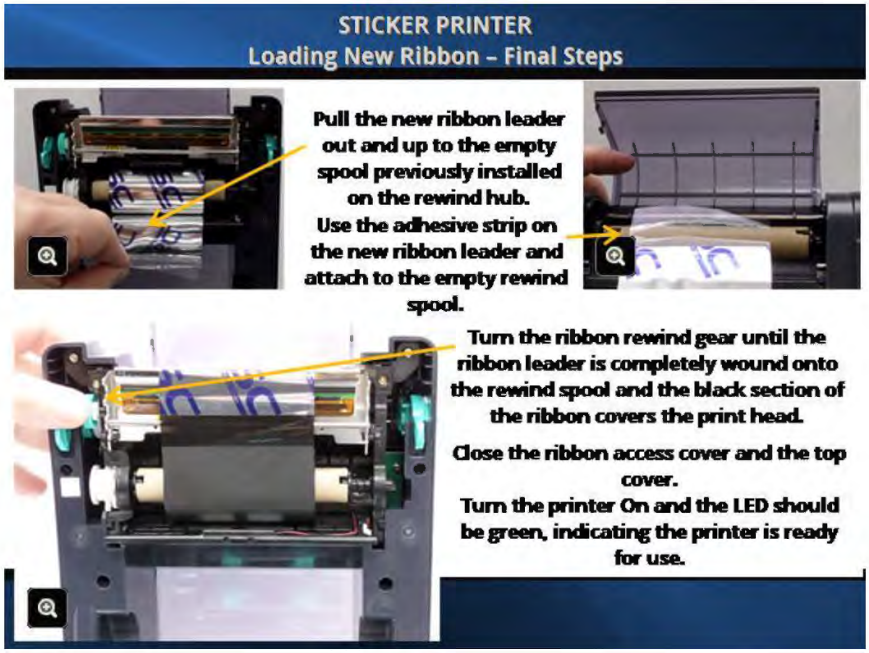


2.38 Loading Ribbon

Removing Used Ribbon and Spool

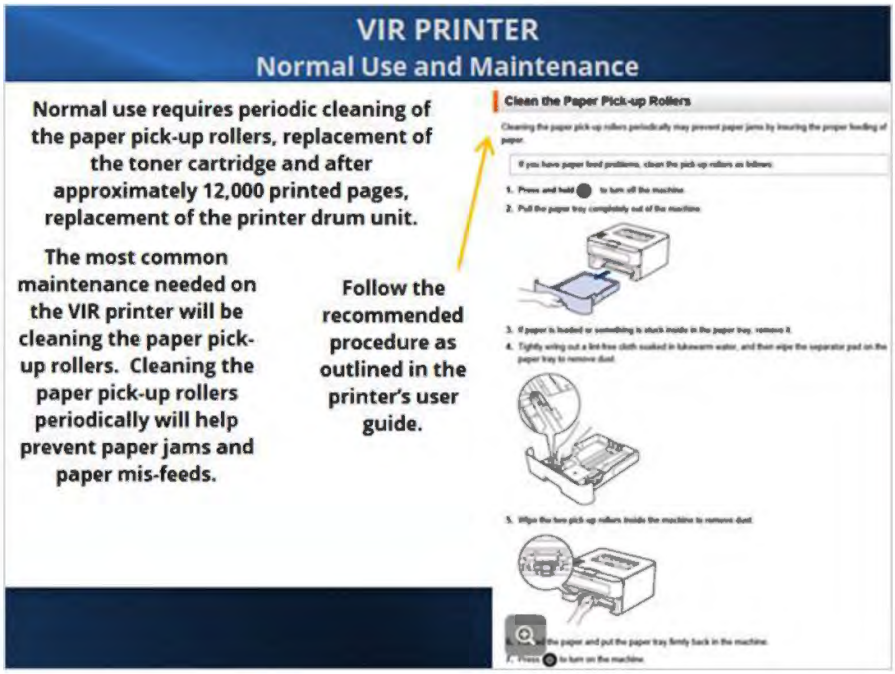
STICKER PRINTER Installing Empty Spool

Loading New Ribbon – Final Steps

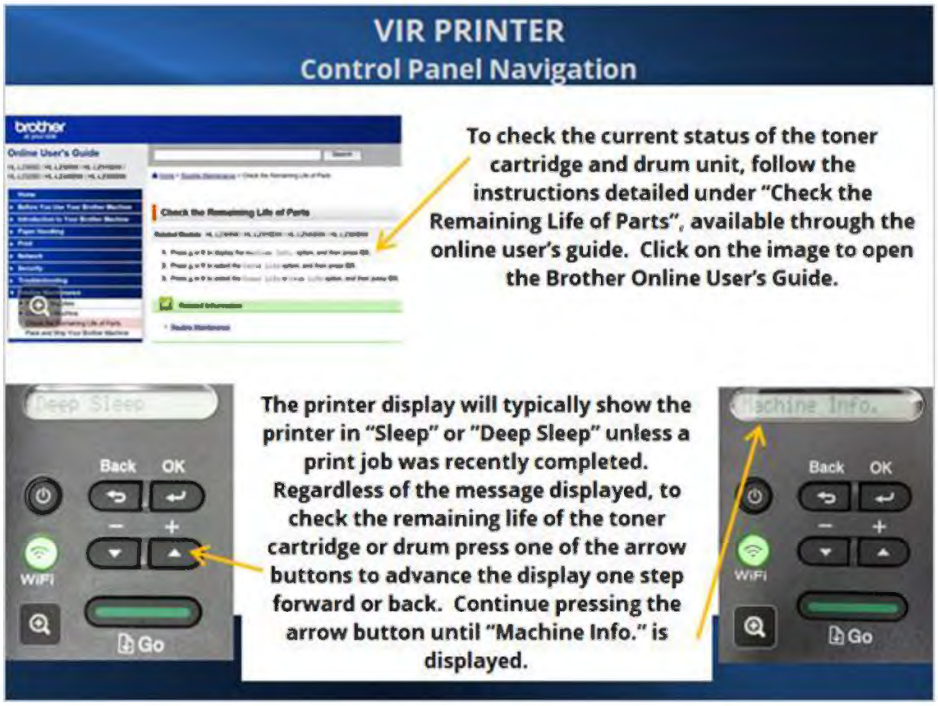


2.39 Brother Laser Printer

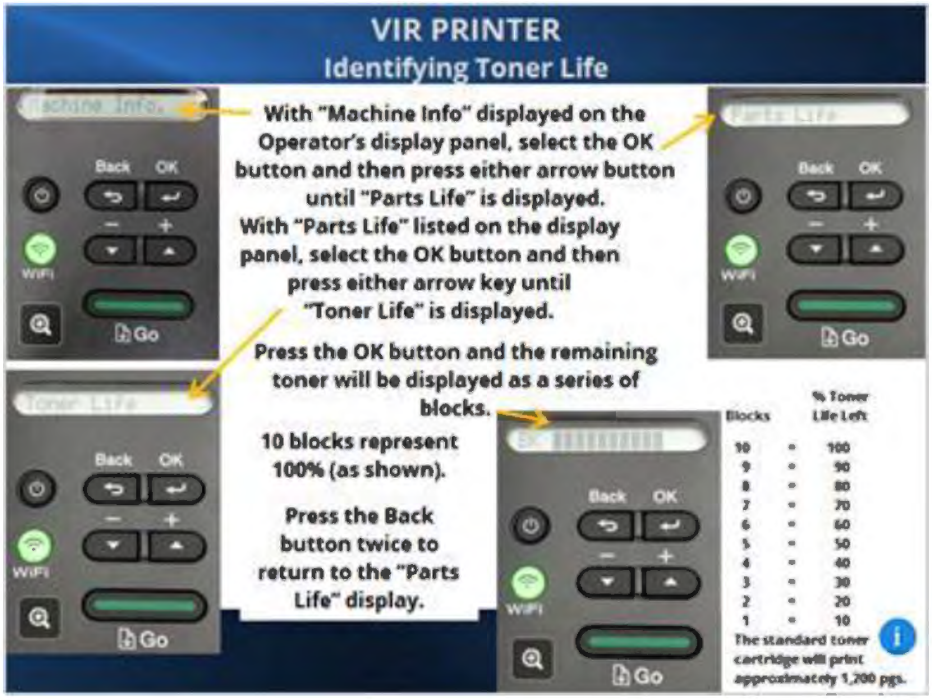
2.40 VIR Printer Normal Use and Maintenance



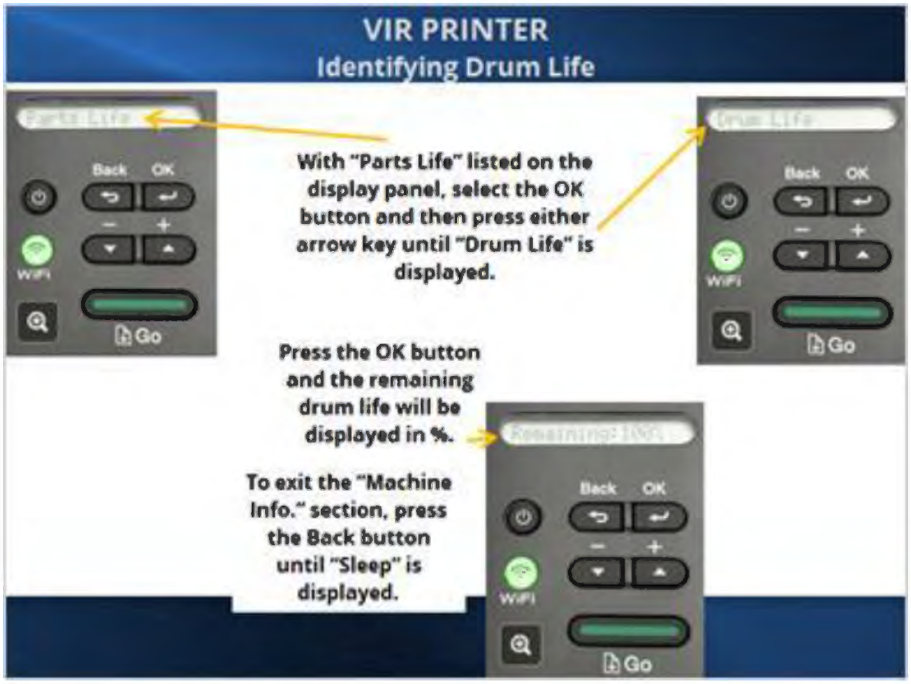
2.41 Control Panel Navigation



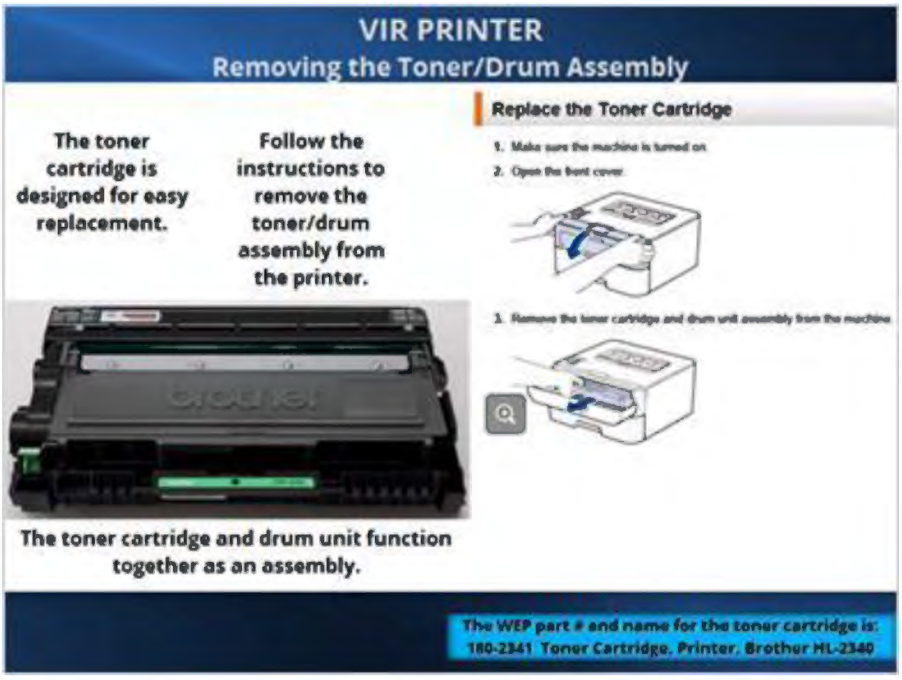
2.42 Toner Life



2.43 Drum Life



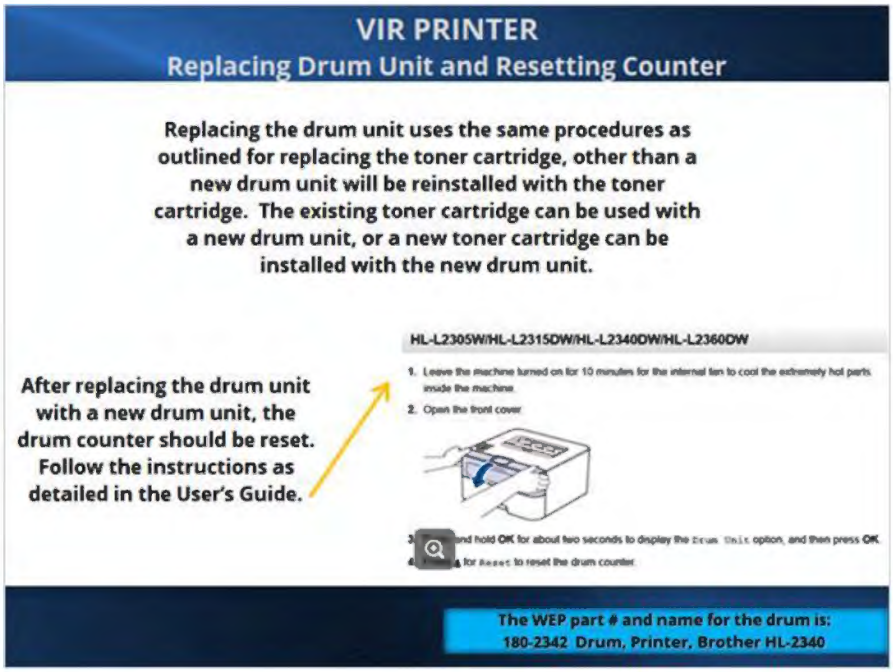
2.44 Removing Toner/Drum Assembly



2.45 Separating Toner Cartridge from Drum Unit

2.46 Installing New Toner Cartridge

2.47 Replacing Drum and Counter Reset



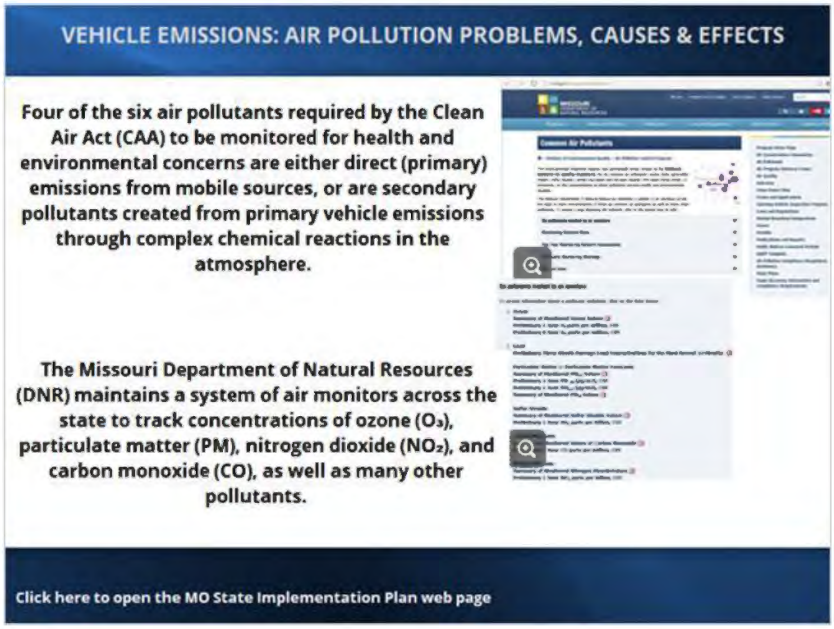
2.48 GVIP Hardware Part # and Name List

GVIP Hardware Part # and Name List

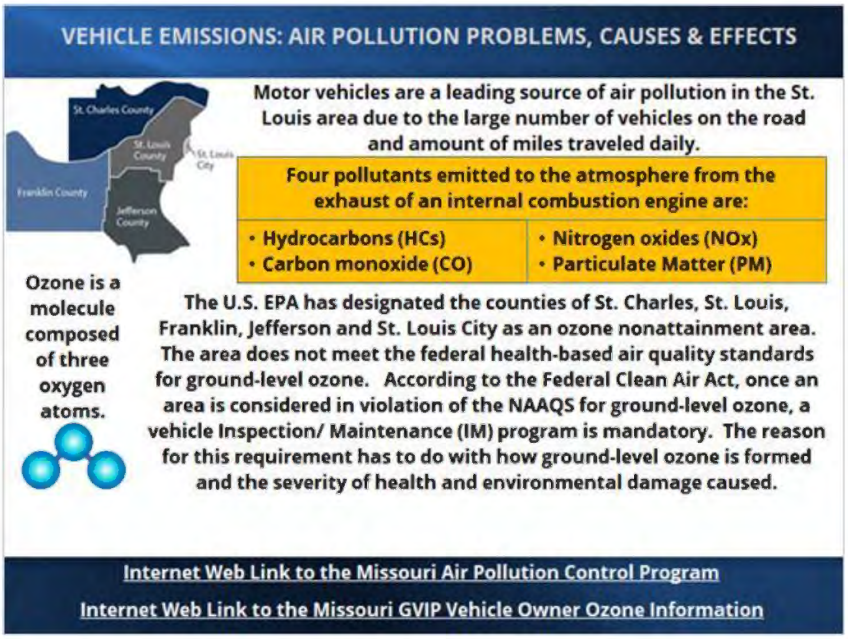
Part #:	Name:
792-1000	Rugged Tablet PC w/Barcode scanner
792-1000B	Battery, Rugged Tablet PC w/ Barcode Scanner
792-1000C	Charger, Rugged Table PC w/ Barcode Scanner
792-1000D	Docking Station, Rugged Table PC w/ Barcode Scanner
290-9055	WI Enhanced WEP OBDII, DAD
180-244CE	TSC TTP 244 CE Printer
790-6055	Roll, Thermal Transfer Label
790-6065	Thermal Transfer, Ribbon 76mm X 110m
180-2340	Printer, Brother HL-2340
180-2341	Toner Cartridge, Printer, Brother HL-2340
180-2342	Drum, Printer, Brother HL-2340
400-2011K	Standalone, ECU Simulator w/cables and power adapter
510-1528	Cat 5 Network Cable
510-1566	Wireless, Nano Router
160-0108	Mini Keyboard
160-0200	USB, Portable wall charger
510-1020	Cable, USB/Printer 6'
512-1091	Cable, DAD DB9 Female to DLCM
354-0950	Workstation Cabinet w/wheels

3. Air Pollution Problems, Causes, and Effects

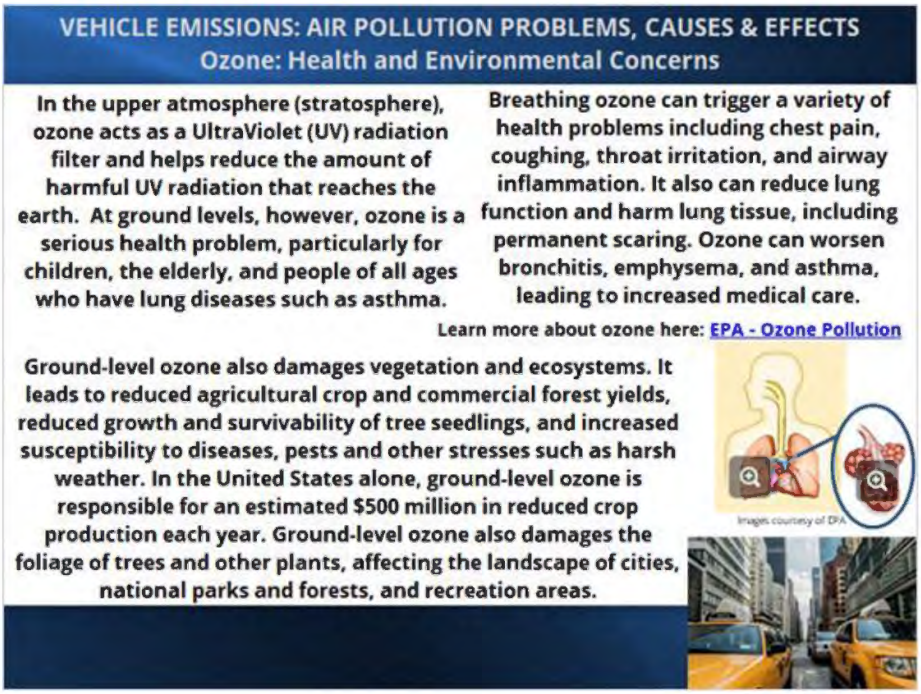
3.1 VEHICLE EMISSIONS: AIR POLLUTION PROBLEMS, CAUSES & EFFECTS



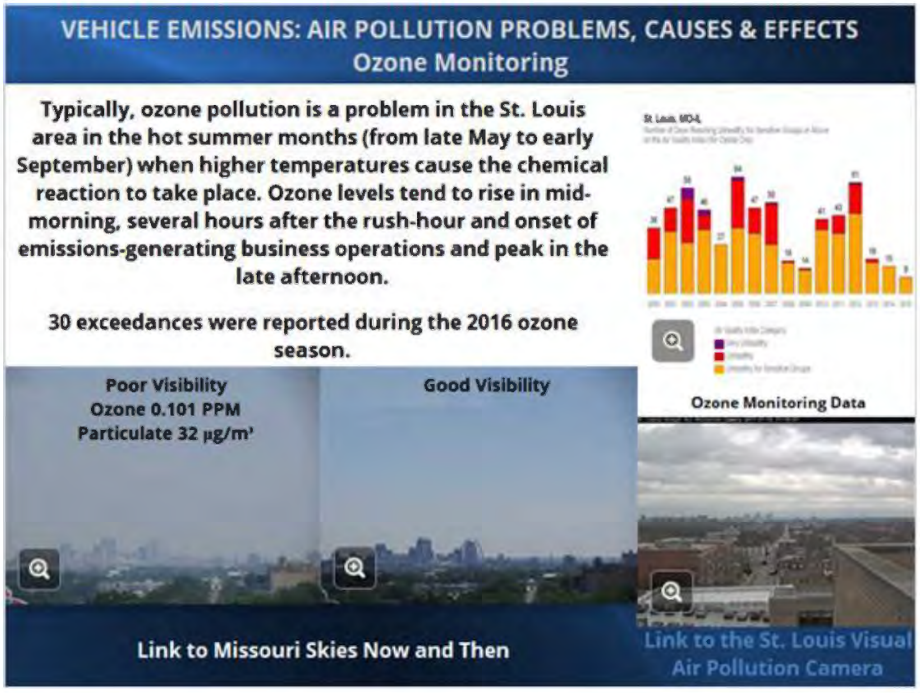
3.2 MO Air Pollution Introduction



Ozone: Health and Environmental Concerns



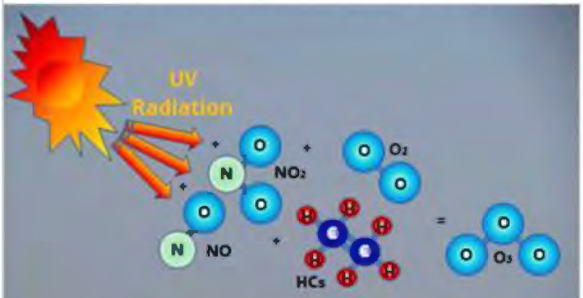
Ozone Monitoring



3.5 Ozone Formation

VEHICLE EMISSIONS: AIR POLLUTION PROBLEMS, CAUSES & EFFECTS
Ozone Formation

Ground level ozone is not emitted directly by an internal combustion engine, but is formed through complex chemical reactions, using the sun's UV radiation energy to power these processes. Along with UV radiation, oxides of nitrogen (NOx) and volatile organic compounds (VOCs - which include hydrocarbons and are sometimes also referred to as Reactive Organic Gases or ROG) play a key role in the formation of ground-level ozone, photochemical smog and small particulates.



Ozone, photochemical smog and small particulates formed from vehicle exhaust are all dangerous to our health and environment.

The MO GVIP program is an important part of the State Implementation Plan (SIP) that helps reduce the formation of these harmful pollutants.

NOx include NO (nitrogen monoxide) and NO_2 (nitrogen dioxide)
VOCs (volatile organic compounds) include hydrocarbons in gasoline and diesel fuels

3.6 CO

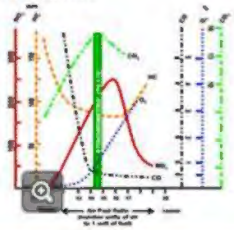
VEHICLE EMISSIONS: AIR POLLUTION PROBLEMS, CAUSES & EFFECTS
Carbon Monoxide (CO)

Carbon Monoxide (CO) is a colorless, odorless gas resulting from the incomplete combustion of hydrocarbon fuels.

Incomplete combustion occurs when there is not enough oxygen present during the combustion process and as a result, some CO is formed instead of the desired carbon dioxide (CO_2).

During combustion, the hydrogen and carbon atoms split apart and recombine with oxygen. Hydrogen will use whatever oxygen is necessary to form water (H_2O) and then whatever oxygen is left will combine with the carbon atoms. Ideally, a carbon atom will bond with 2 oxygen atoms to form CO_2, but if there is not enough oxygen, (incomplete combustion) CO molecules will form.

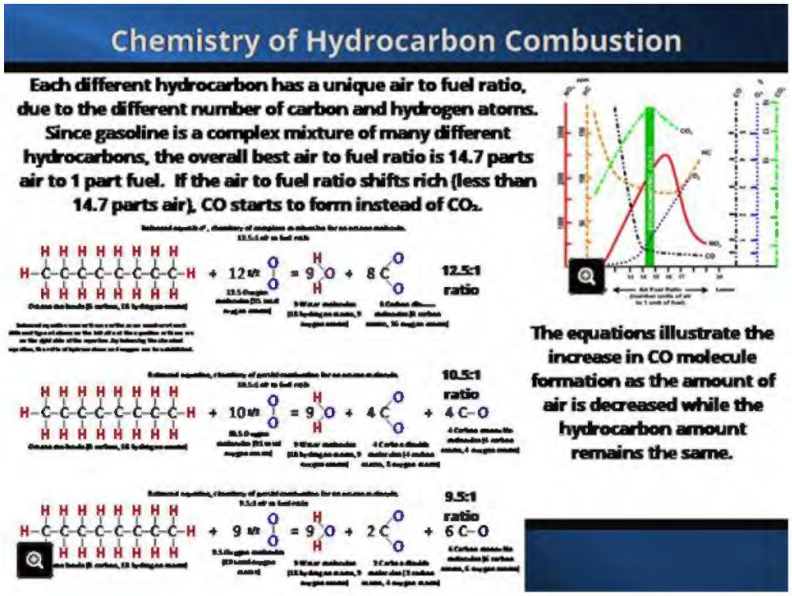
The air to fuel ratio (A:F) is very important for complete combustion to occur in gasoline and other spark-ignition engines. The fuel must also be well mixed with the air in the combustion chamber in order for complete combustion to occur. If the A:F is too rich, or the fuel is not well vaporized and properly distributed throughout the combustion chamber along with the needed oxygen, the combustion process will be adversely affected and CO emissions will increase.



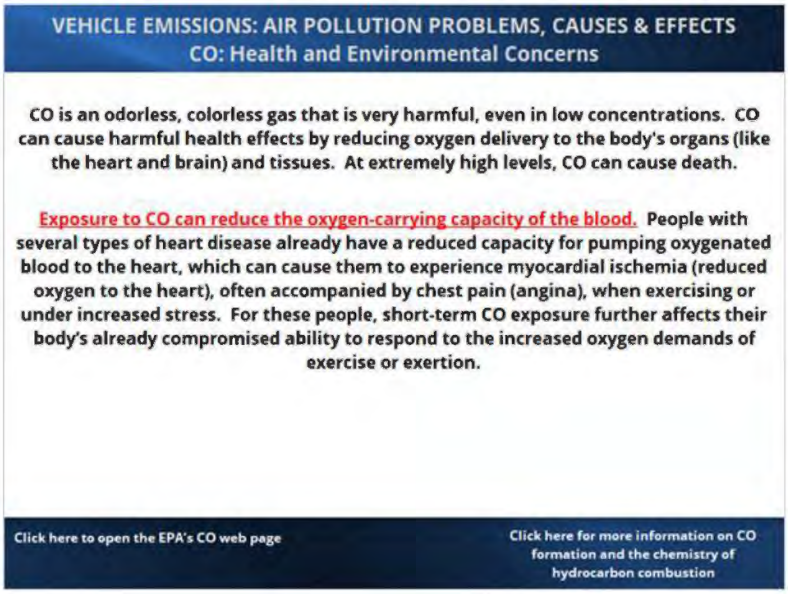
Click here for more information on CO formation and the chemistry of hydrocarbon combustion

Click here to open the EPA's CO web page

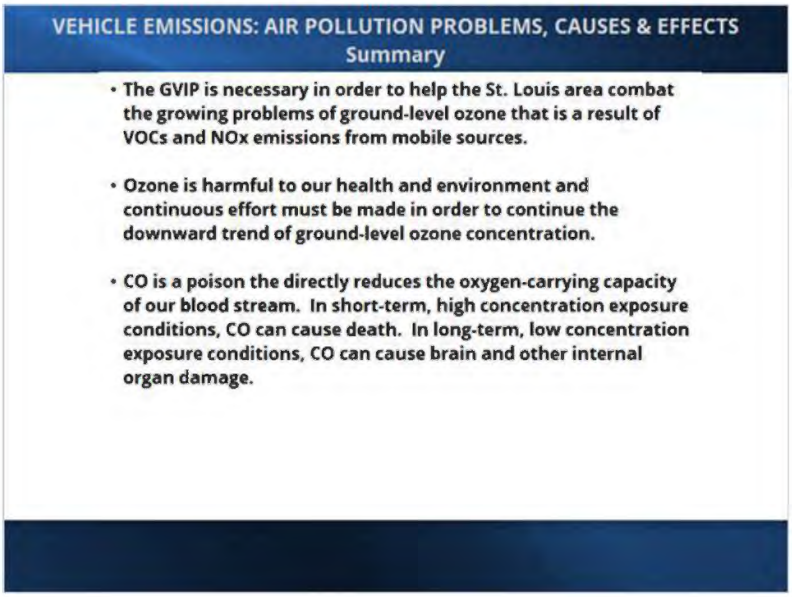
Chemistry of combustion



3.7 CO Health and Environmental Concerns



3.8 Summary-Air Pollution Problems



Notes:

4. Inspection Program Purpose, Function and Goals

4.1 Introduction to the Emissions Inspection Program

INSPECTION PROGRAM PURPOSE, FUNCTION, & GOALS
The Missouri Gateway Vehicle Inspection Program

In 1965, Missouri put in to state statute the commission to control air pollution. The intent and purpose was to maintain purity of the air resources of the state in order to protect the health, general welfare and physical property of Missouri residents.

The Gateway Vehicle Inspection Program (GVIP), which began Oct. 1, 2007, is part of Missouri's continuing effort to improve air quality and bring the St. Louis area into attainment for the 8-hour ozone standard in the St. Louis region and includes St. Louis City, as well as the counties of Franklin, Jefferson, St. Louis and St. Charles.

Click here to open the MO Air Pollution Control Program web page

Click here to open the MO GVIP web page

INSPECTION PROGRAM PURPOSE, FUNCTION, & GOALS

Motor vehicles are a leading source[1] of air pollution in the St. Louis area due to the large number of vehicles on the road and amount of miles traveled daily.

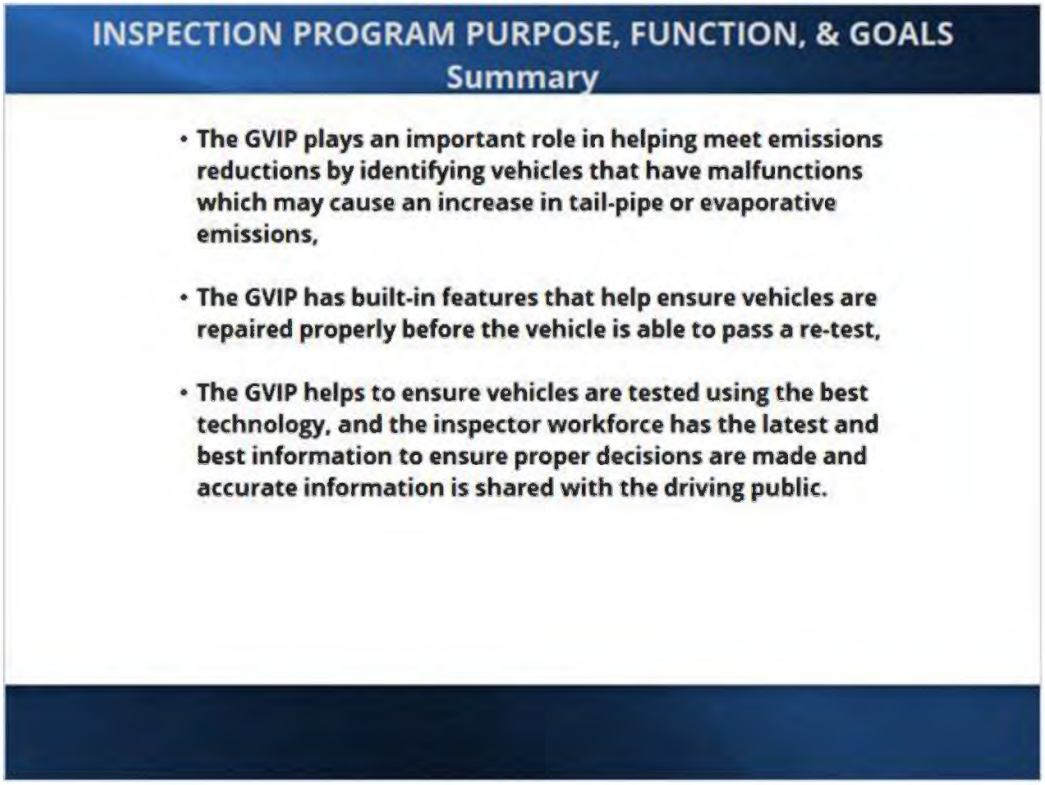
All 1996 and newer gas-powered vehicles and 1997 and newer diesel-powered vehicles 8,500 pounds or less Gross Vehicle Weight Rating (GVWR) registered in the St. Louis nonattainment area are subject to a combined emissions test and safety inspection.

The GVIP is Missouri's vehicle emissions Inspection/Maintenance (IM) program and is designed to ensure that poorly performing vehicles are identified through a state-of-the-art Inspection process, (the I in IM) and repaired/maintained (the M in IM) in a timely manner.

Because the St. Louis area is in nonattainment for ozone, the state is required to maintain an I/M program to be in compliance with the Federal Clean Air Act and applicable amendments. The Clean Air Act (CAA) is the comprehensive federal law that regulates air emissions from stationary and mobile sources.

1 Motor vehicles produce up to 57% of the pollutants that contribute to the formation of ozone.

4.3 Summary


INSPECTION PROGRAM PURPOSE, FUNCTION, & GOALS
Summary
• The GVIP plays an important role in helping meet emissions reductions by identifying vehicles that have malfunctions which may cause an increase in tail-pipe or evaporative emissions,
• The GVIP has built-in features that help ensure vehicles are repaired properly before the vehicle is able to pass a re-test,
• The GVIP helps to ensure vehicles are tested using the best technology, and the inspector workforce has the latest and best information to ensure proper decisions are made and accurate information is shared with the driving public.

5. Inspection Regulations and Procedures

5.1 Introduction to the Inspection Regulations

EMISSIONS INSPECTION REGULATIONS & PROCEDURES:
Vehicles That Are Required To Be Emissions Tested

1996 and newer gasoline and 1997 and newer diesel-powered vehicles with a gross vehicle weight rating (GVWR) of 8,500 pounds or less registered and operated in the St. Louis nonattainment area, are subject to a combined OBD emissions test and safety inspection.

Vehicles that are subject to the emissions inspection are required to be tested every other year, based on the vehicle's model year (MY).

On-Cycle Vehicle Emissions Testing Schedule

Calendar Years:	2017	2018	2019	2020	2021	2022	2023	2024	2025
Even-Numbered Vehicle Model Years: 1996, 1998, 2000, etc.		X		X		X		X	
Odd-Numbered Vehicle Model Years: 1997, 1999, 2001, etc.	X		X		X		X		X

When a vehicle registration is transferred, the vehicle is required to be inspected.

Prior to the sale of a vehicle, private sellers of vehicles are required to provide the purchaser with an emissions inspection compliance certificate or compliance waiver that is valid for registering the vehicle.

5.2 Emissions Inspection Periods

EMISSIONS INSPECTION REGULATIONS & PROCEDURES:
Emissions Inspection Periods

- Safety Inspections are valid for 60 days
- Emission Inspections are valid for:
  - § 60 days for purposes of a registration renewal
  - § 90 days for transfer/sale by a private seller
  - § 120 days for transfer/sale by a licensed motor vehicle dealer

Reinspections occurring less than 90 days after the initial emissions inspection are subject to the applicable reinspection requirements.

Reinspections occurring more than 90 days after the initial emissions inspection are considered to be an initial inspection.

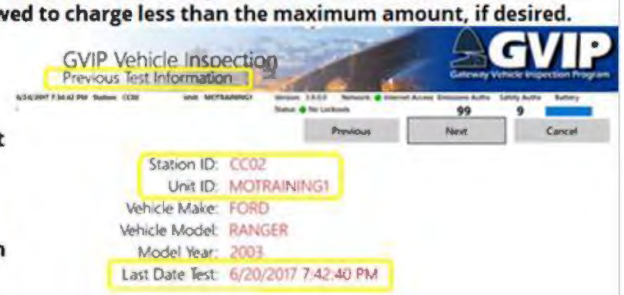
There are exemptions to the normal on-cycle emissions testing schedule that may be applicable to the vehicle being tested due to extenuating circumstances, such as being driven less than 12,000 miles between prior and currently required biennial emission inspections. To the extent possible, the analyzer software will automatically apply exemption criteria and print out the appropriate paper work. The inspector is expected to understand why a vehicle qualifies for a particular waiver or exemption.

5.3 Emissions Inspection Fees

EMISSIONS INSPECTION REGULATIONS & PROCEDURES: Emissions Inspection Fees

The maximum fee a station is allowed to charge for an initial emissions inspection is $24. The station is allowed to charge less than the maximum amount, if desired.

Each initial vehicle emissions inspection fee includes 1 free reinspection, provided that the reinspection is conducted within 20 business days of the paid initial emissions inspection and is conducted at the same inspection station that performed the initial inspection.



Following the vehicle and owner Information Review screen, the Previous Test Information screen is displayed. The Last Test Date will display the date and time of the most recent emissions test prior to the current test in progress. The station and analyzer that performed the previous test is also displayed.

As a note, fleet operations inspecting their own fleet vehicles at their own inspection facility do not need to charge themselves an inspection fee.

5.4 Emissions Inspection Oversight Fees

EMISSIONS INSPECTION REGULATIONS & PROCEDURES: Emissions Inspection Oversight Fee

Licensed emissions inspection stations shall pre-pay the state two dollars and fifty cents ($2.50) for each passing emissions inspection that they intend to perform. The fee is paid to the Director of Revenue and submitted to the Missouri State Highway Patrol (MSHP). Using the VID, the MSHP will credit the number of pre-paid emissions inspections to the licensed emissions inspection station's GVIP analyzer. The GVIP analyzer system will deduct 1 emissions credit authorization for each passing emissions inspection.

At the time that a licensed emissions inspection station discontinues operation or chooses not to renew its emissions inspection license, the department will issue the licensed emissions inspection station a full refund of $2.50 for each paid emissions inspection credit authorization that remains on the licensed emissions inspection station's GVIP analyzer.

Remaining authorizations are easily identified by the Authorization counters. The counters are displayed in the header section of every screen.

Licensed inspection stations are required to maintain a sufficient positive quantity of emissions credits on their analyzer(s) to prevent having to turn away motorists who have requested an inspection.

5.5 Emissions Inspector Requirements (1-3)

EMISSIONS INSPECTION REGULATIONS & PROCEDURES: Emissions Inspector Requirements

Emissions Inspector Requirements:

- **Every person requesting a vehicle emissions inspector license shall submit a completed vehicle emissions inspector application to the Missouri State Highway Patrol – Motor Vehicle Inspection Division. The emissions inspector application shall include a facial photograph with dimensions of two inches (2") in length and two inches (2") in width.**
- **All vehicle emissions inspectors must be at least eighteen (18) years of age and able to read and understand documents written in English. The emissions inspector written exam may include an oral component to evaluate the applicant's ability to read and understand documents written in English.**
- **Emissions inspectors must pass a written test that demonstrates their knowledge of the fundamentals of emissions testing and the procedures of the emissions inspection program. A minimum grade of eighty percent (80%) is required to pass the written examination or reexamination.**
- **Emissions inspectors must be thoroughly familiar with the emissions inspection equipment and demonstrate competency to either the department or the MSHP while performing an emissions inspection on a vehicle prior to the issuance of the inspector's license. A minimum grade of eighty percent (80%) is required to pass the practical examination or reexamination.**

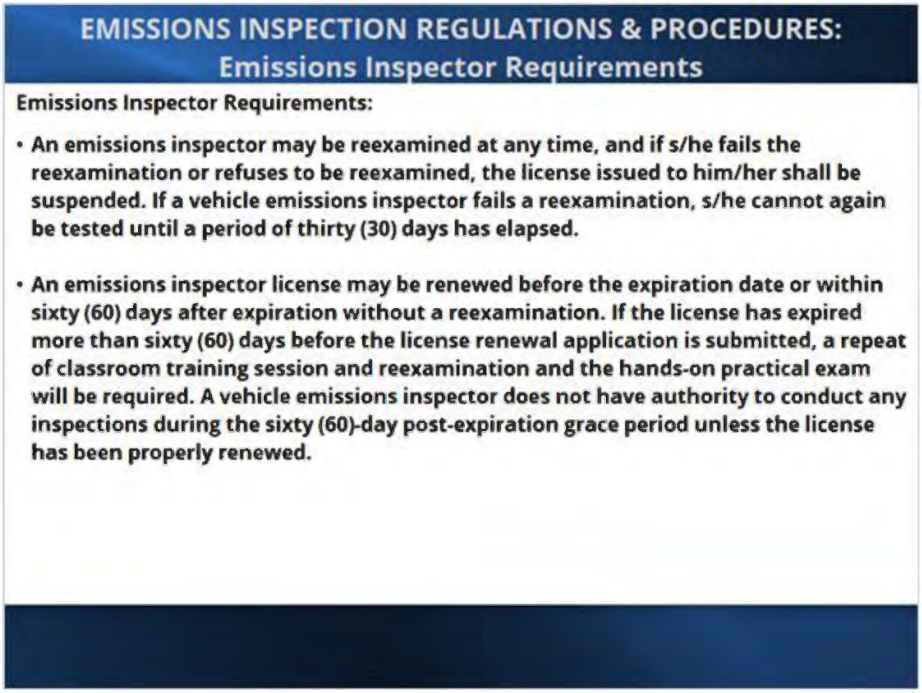
5.6 Emissions Inspector Requirements (4-6)

EMISSIONS INSPECTION REGULATIONS & PROCEDURES: Emissions Inspector Requirements

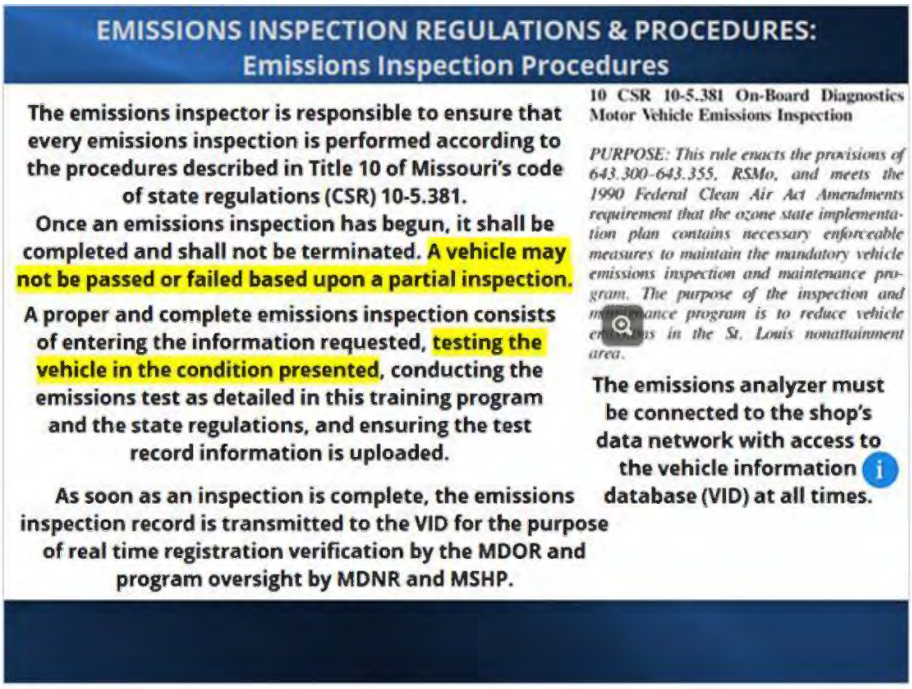
Emissions Inspector Requirements:

- **If the applicant meets the applicable requirements, an emissions inspector license will be issued without charge. Licenses are valid for a period of three (3) years from the date of issuance, or until suspended or revoked by the department or the MSHP. An emissions inspector whose license has been suspended or revoked shall be required to successfully complete a recertification training program and pass the written and practical exams.**
- **If the emissions inspector leaves the employment of one licensed emissions inspection station and enters the employment of another licensed emissions inspection station, the emissions inspection station manager of the station that the inspector is transferring to shall complete an amendment form to inform DNR and MSHP of the personnel changes. The emissions inspector's license is transferable with the licensed emissions inspector, provided the emissions inspector's license has not expired.**

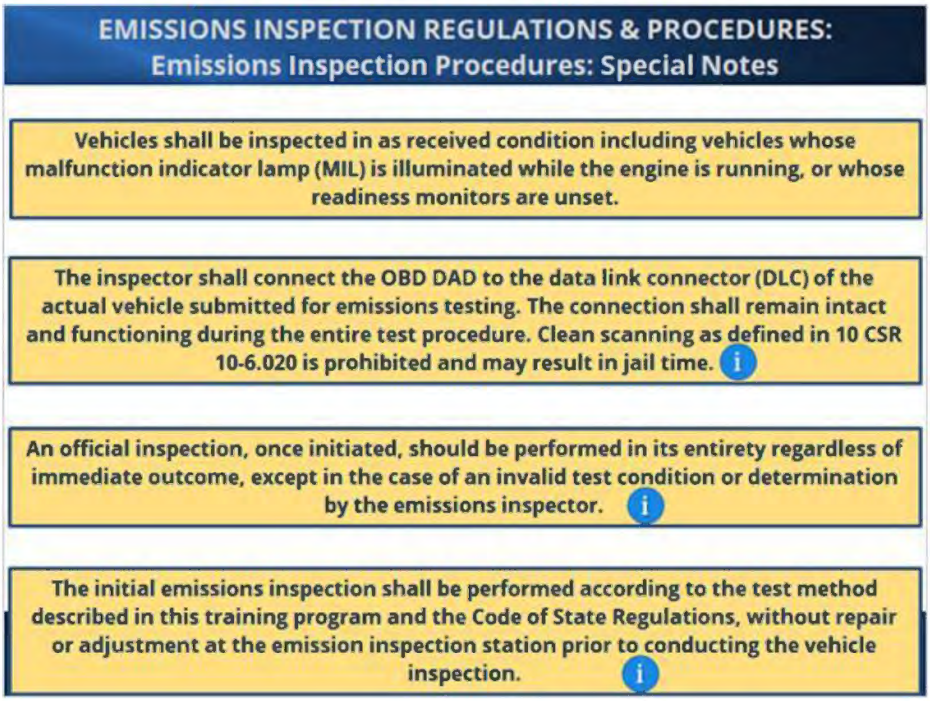
5.7 Emissions Inspector Requirements (7-8)



5.8 Emissions Inspection Procedures

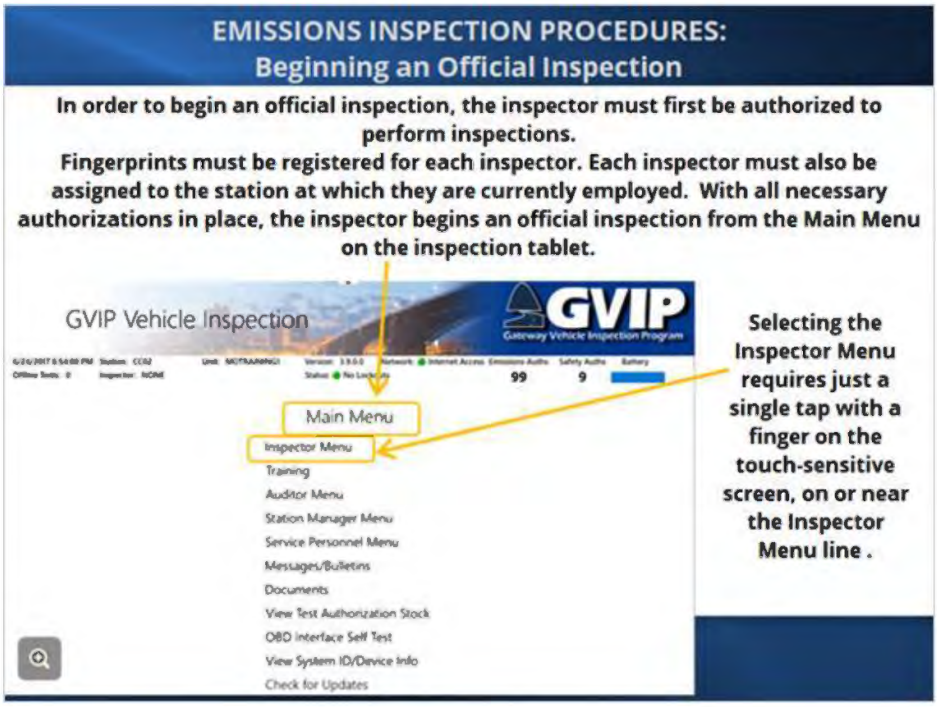


5.9 Special Notes

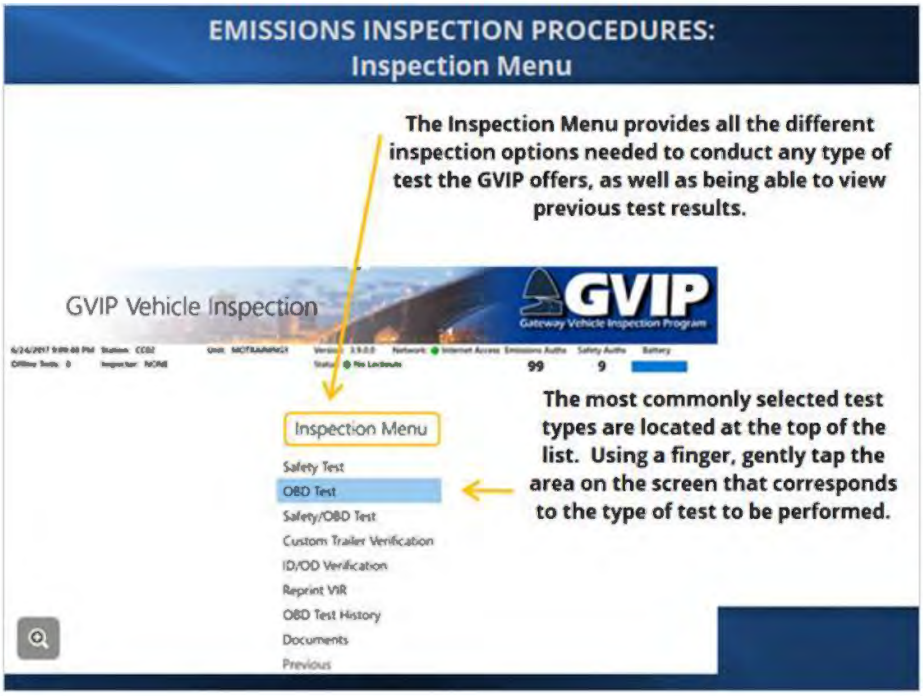


Inspecting Vehicles As Received

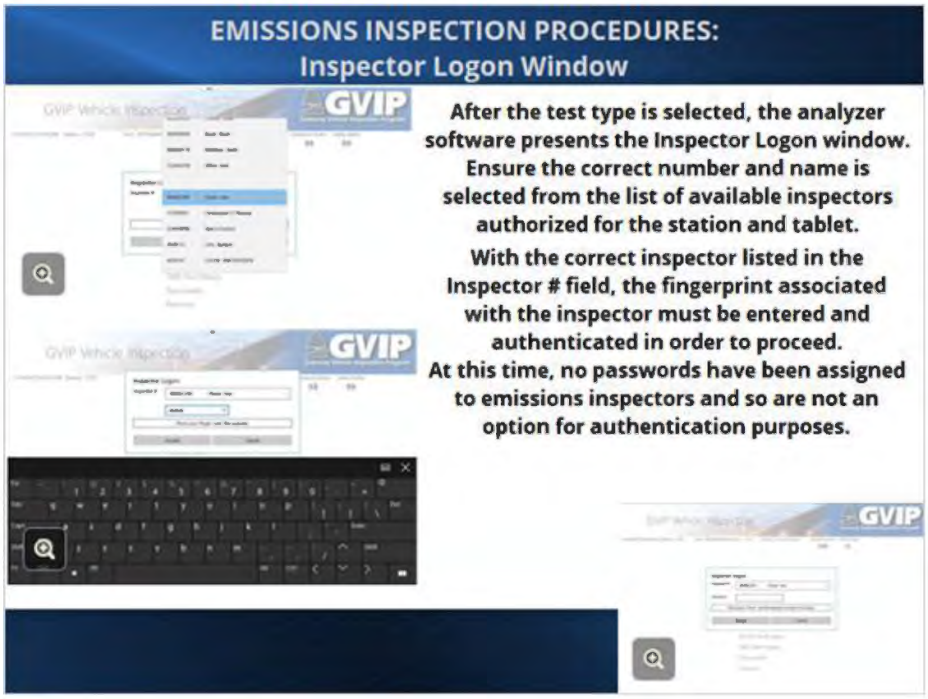
5.10 Beginning an Official Inspection



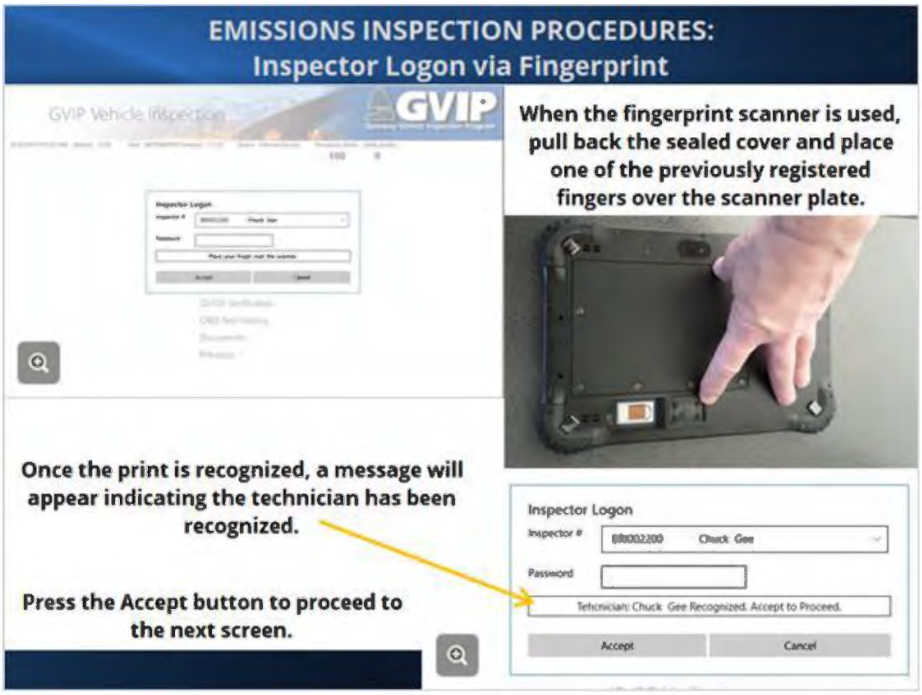
5.11 Inspection Menu



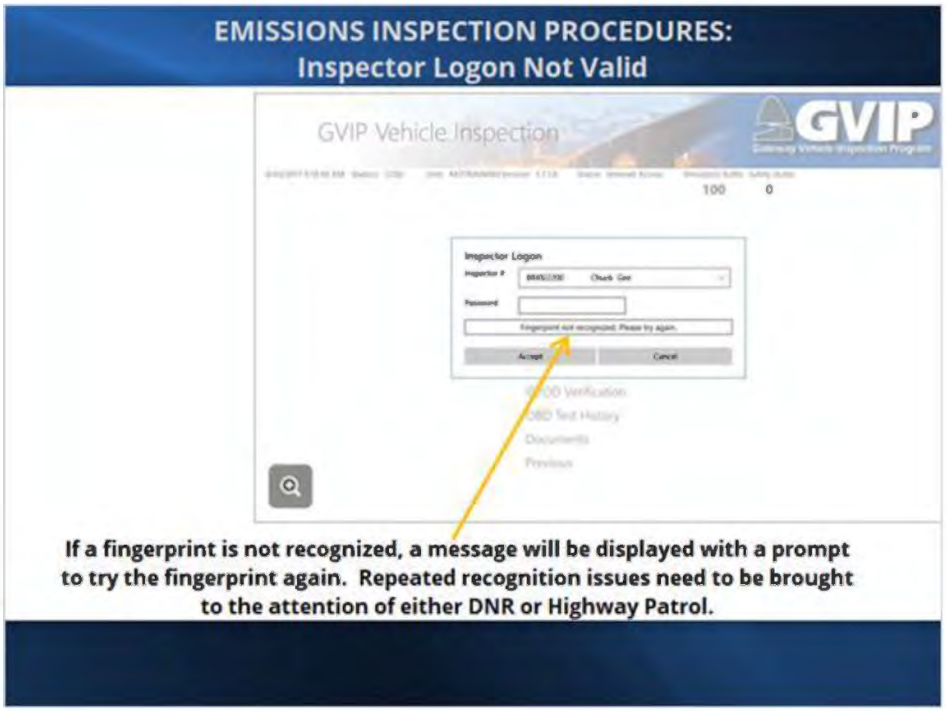
5.12 Inspector Logon



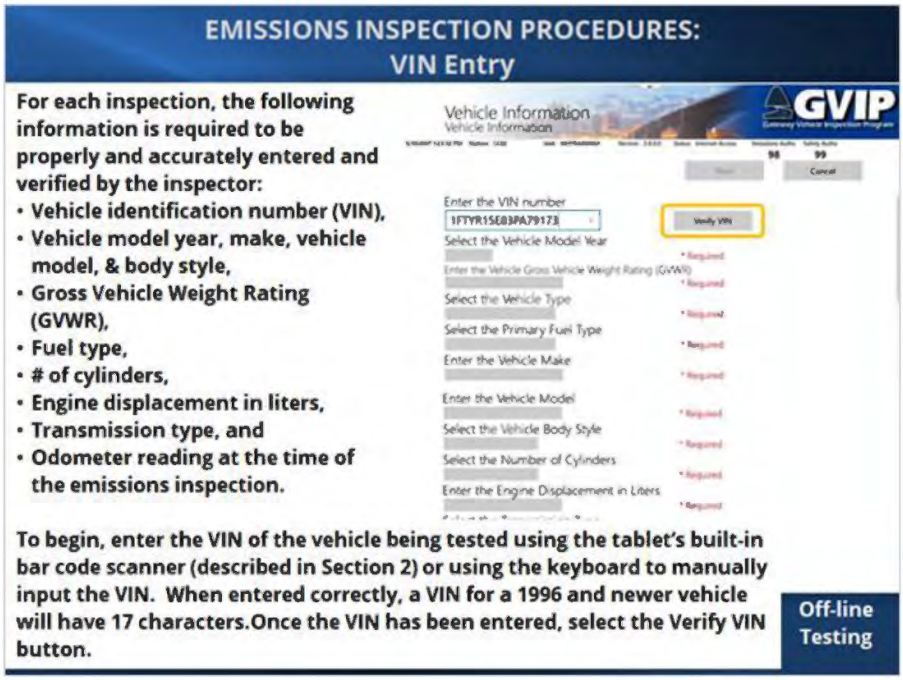
5.13 Inspector Logon via Fingerprint



5.14 Inspector Logon Not Valid

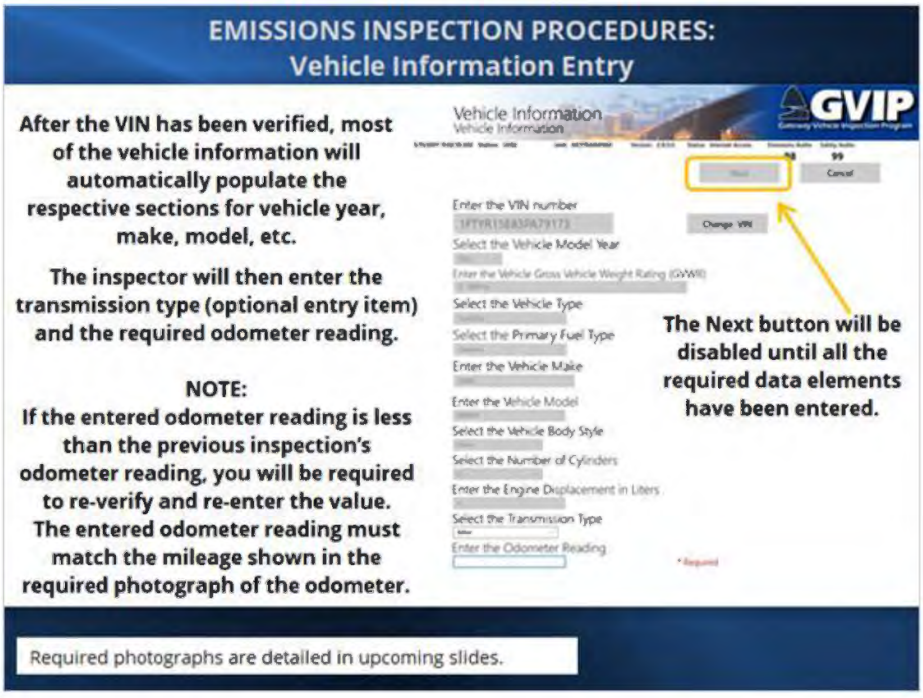


5.15 VIN Entry

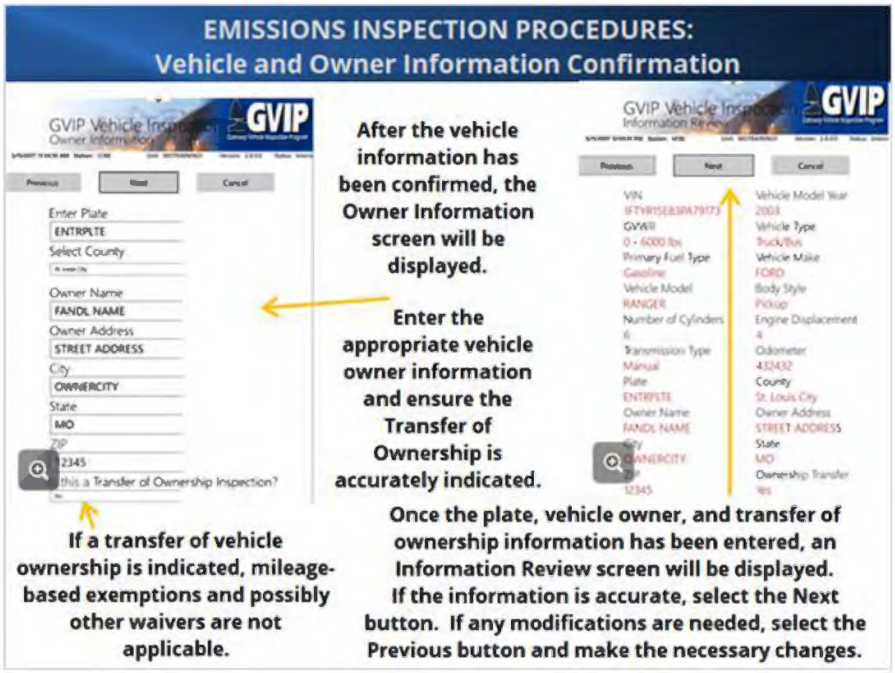


VIN Entry-Offline Testing

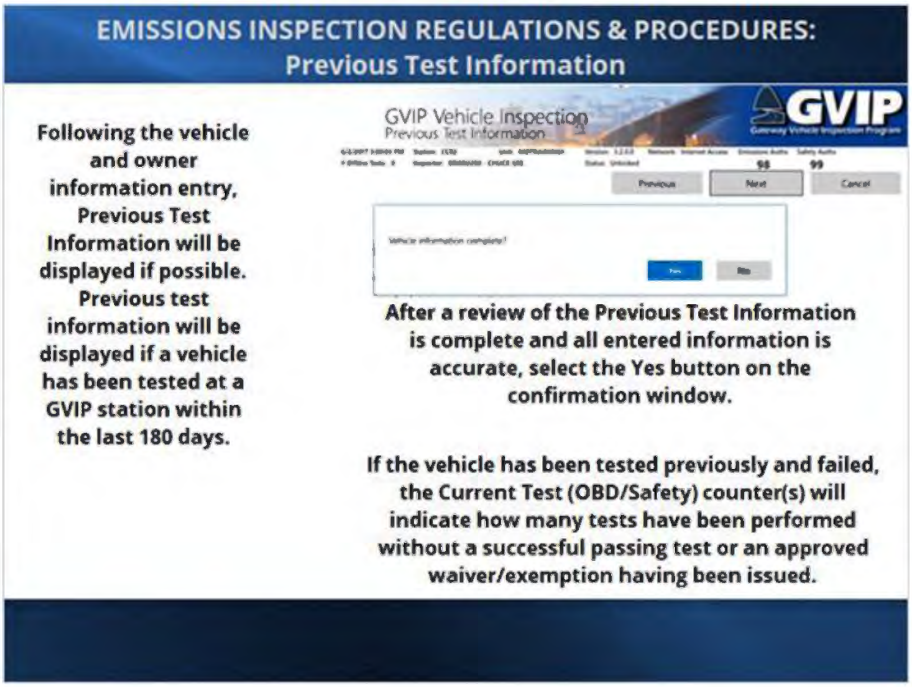
5.16 Vehicle Information Entry



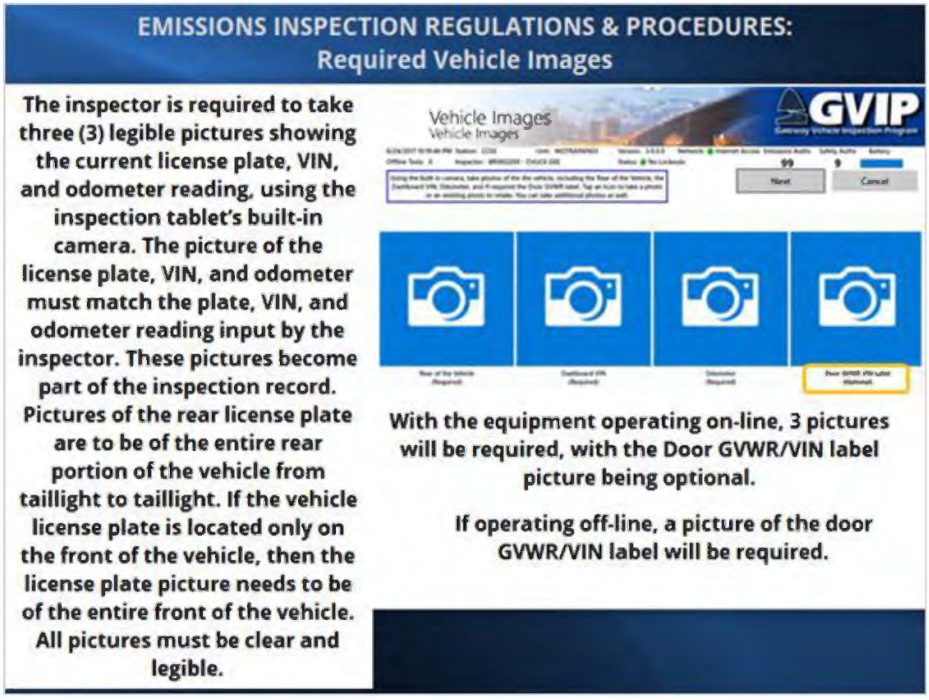
5.17 Information Confirmation



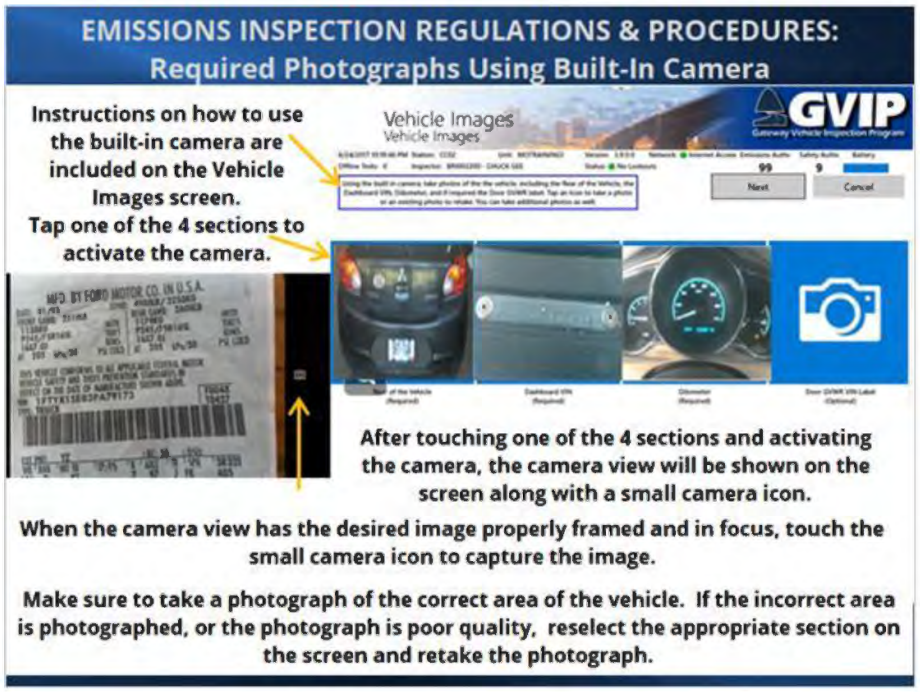
5.18 Previous Test Information



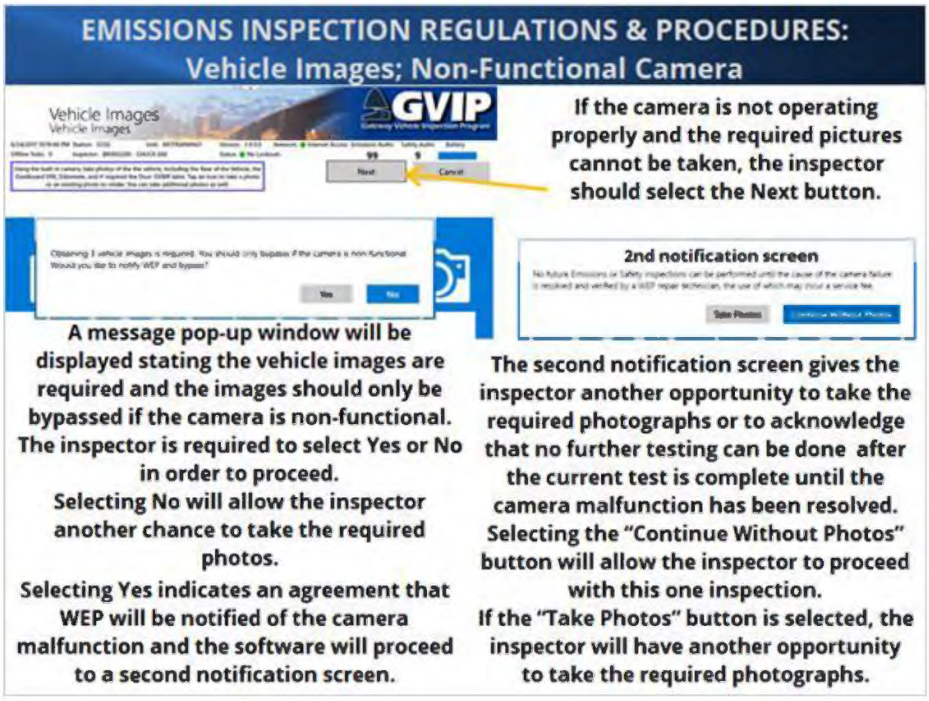
5.19 Required Vehicle Images



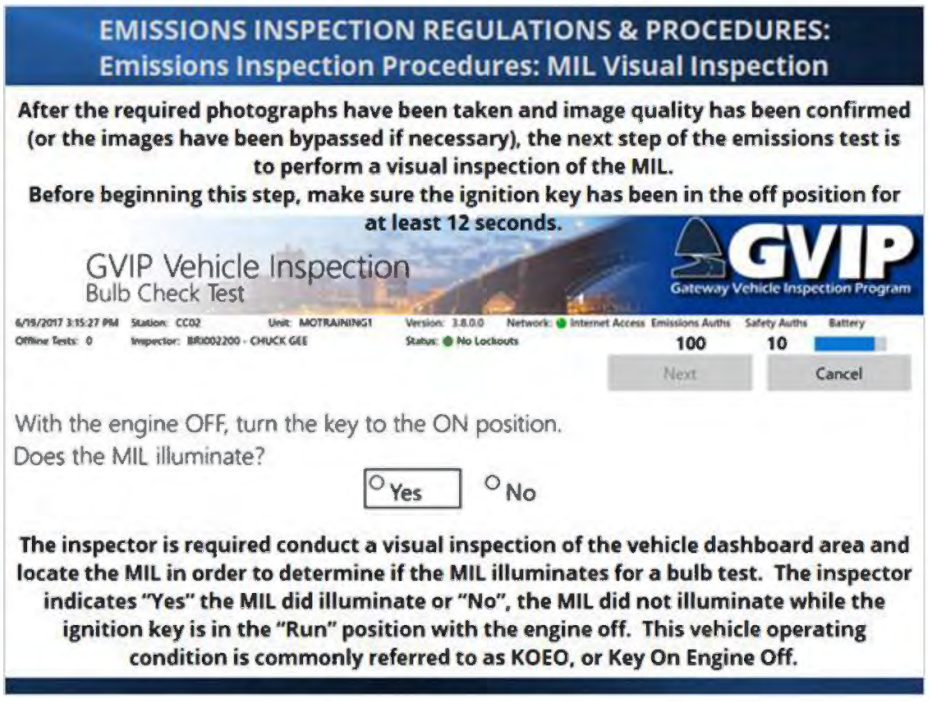
5.20 Taking Required Photos



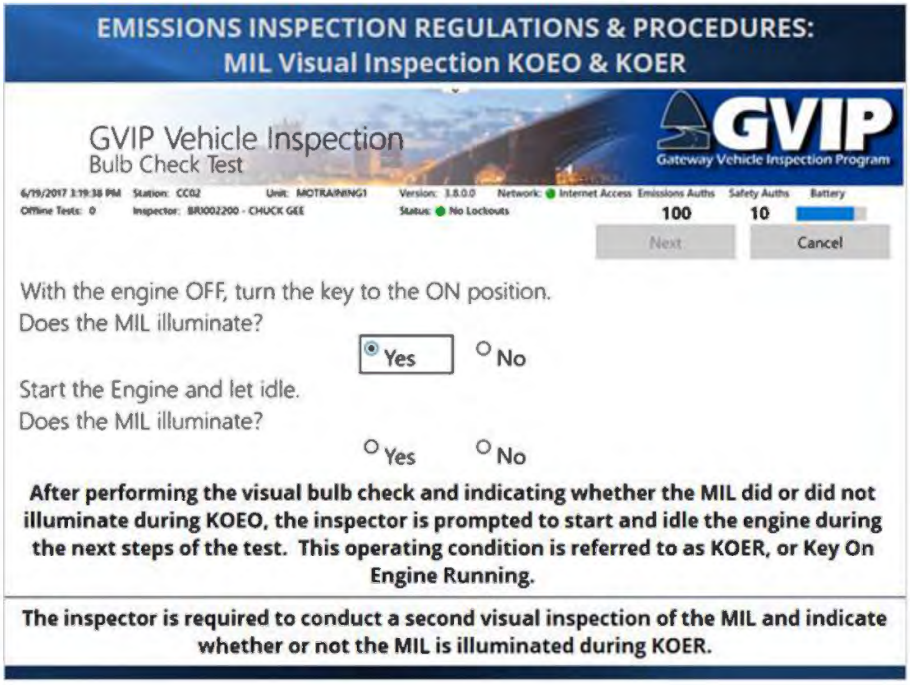
5.21 Non-Functional Camera



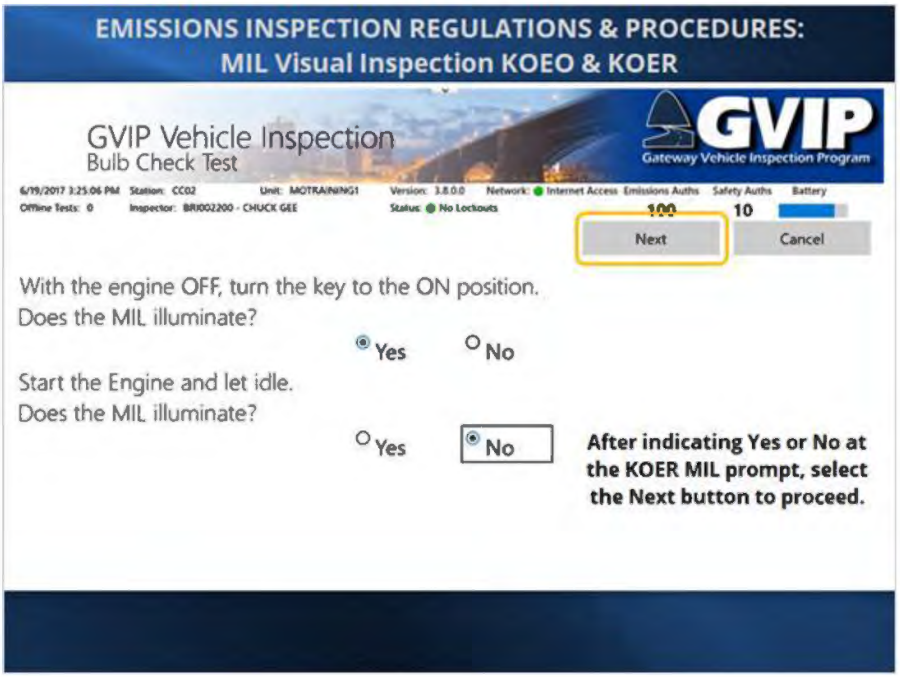
5.22 MIL Visual Inspection - KOEO



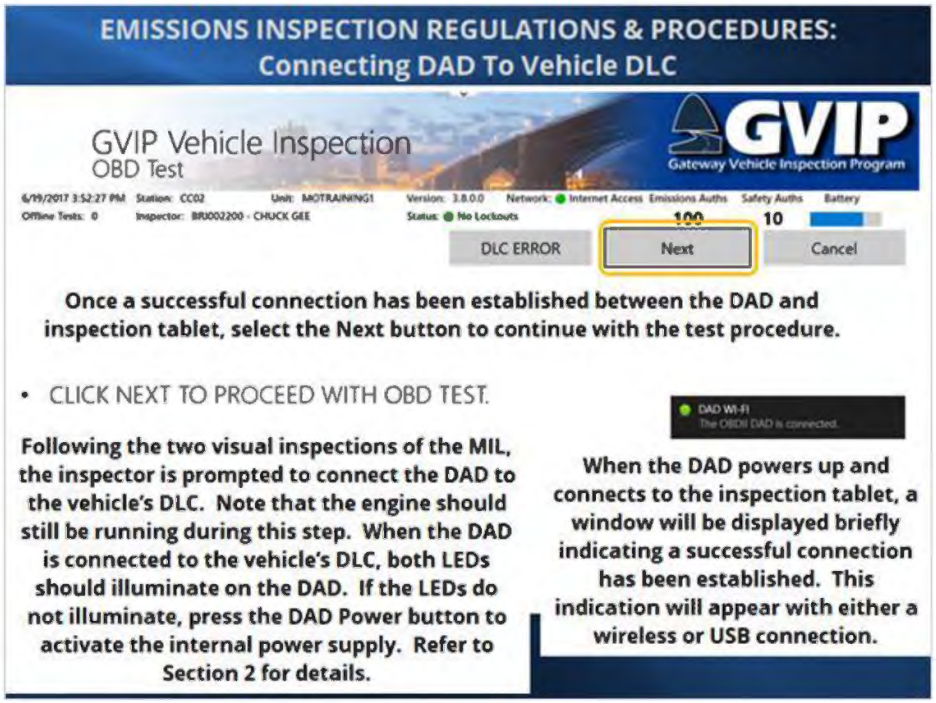
5.23 MIL Visual Inspection - KOER



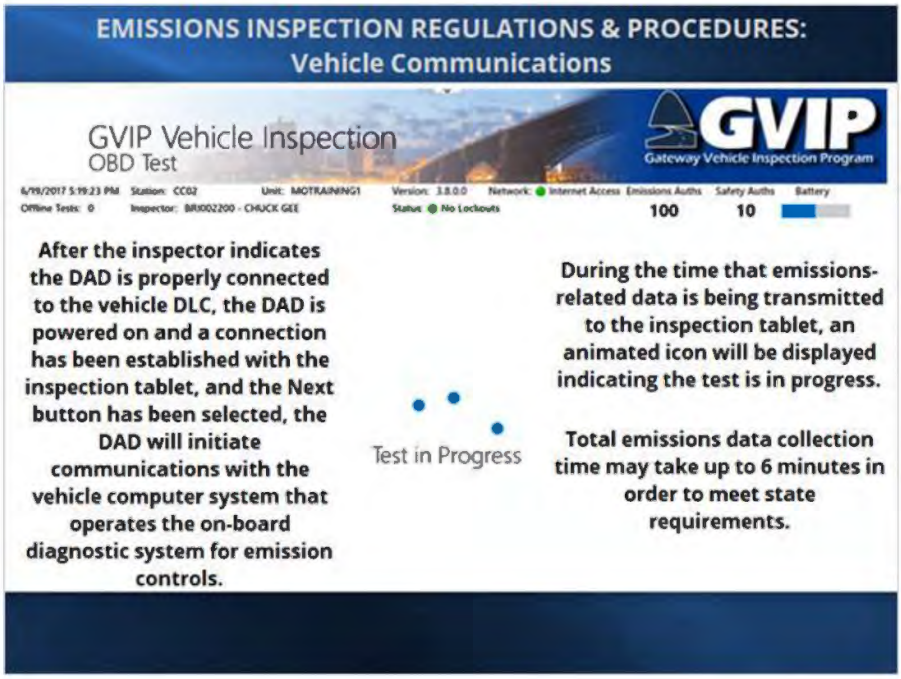
5.24 MIL Visual Inspection - Complete



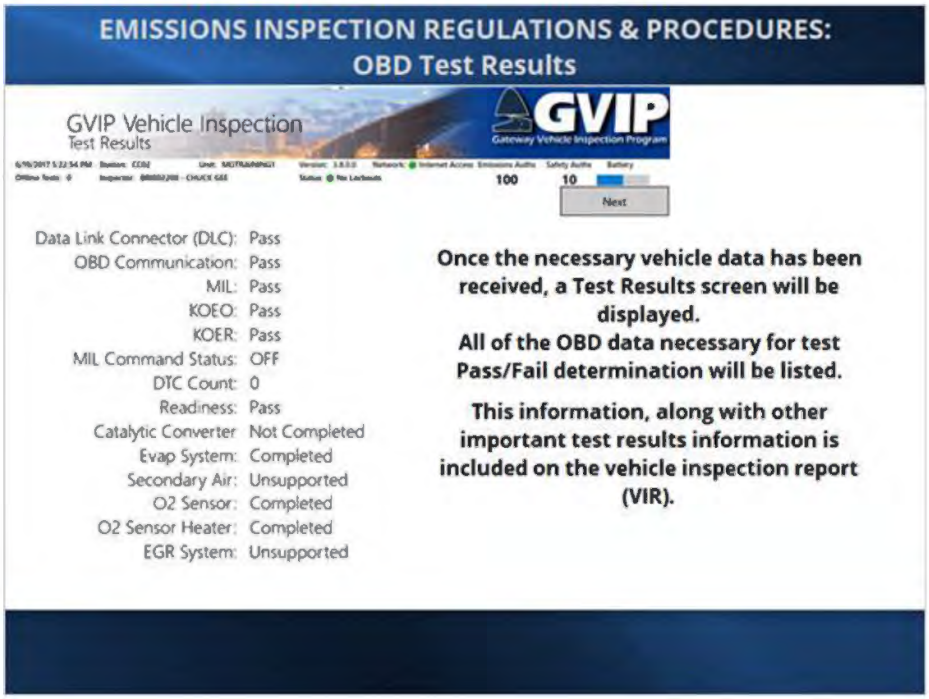
5.25 Connect DAD to Vehicle DLC



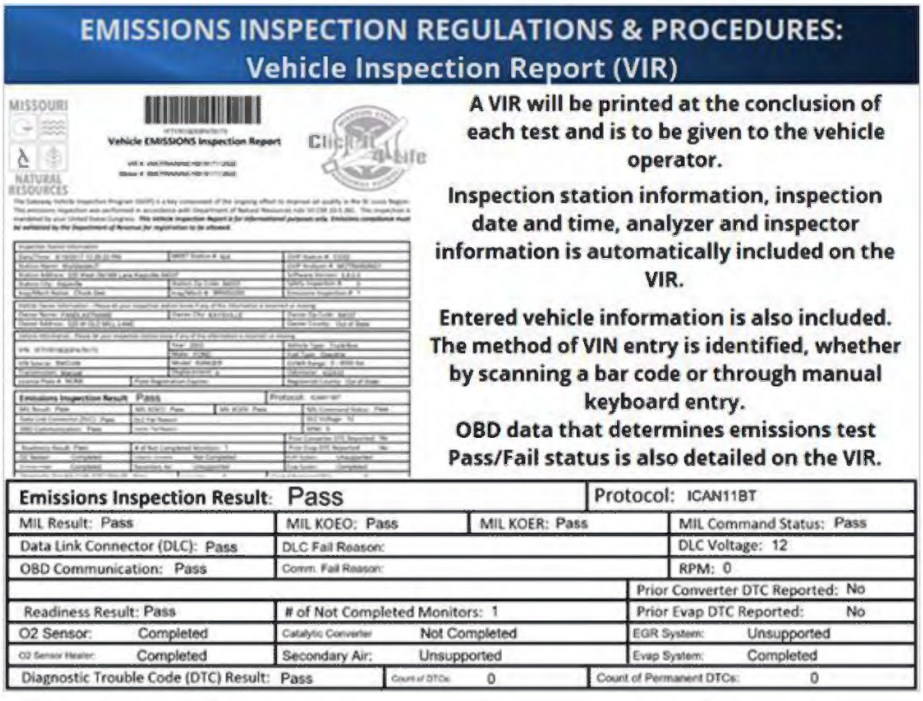
5.26 Vehicle Communications



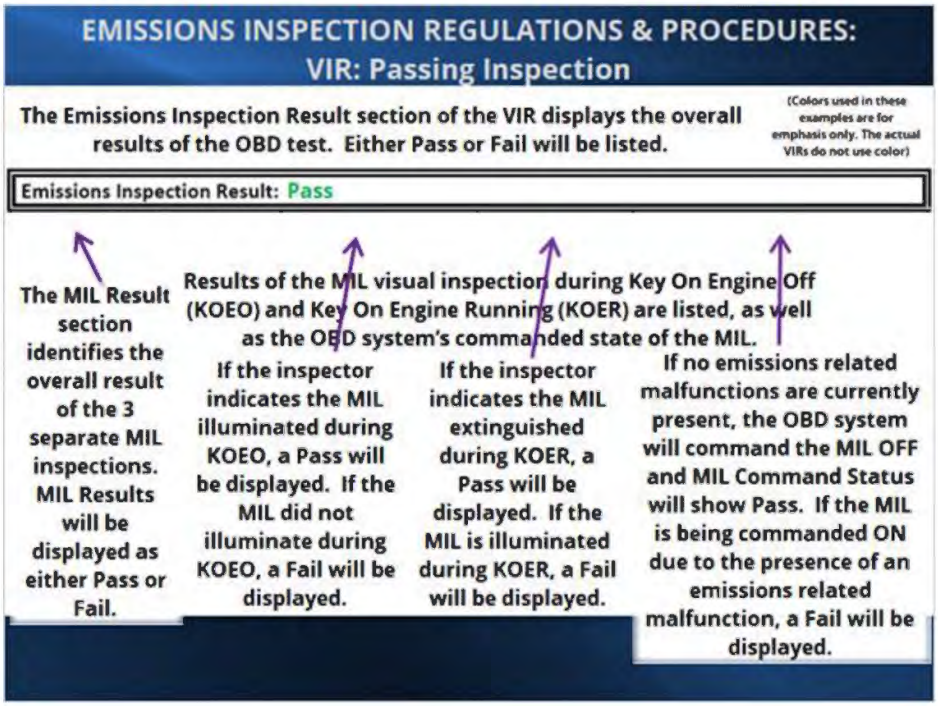
5.27 OBD Test Results Summary



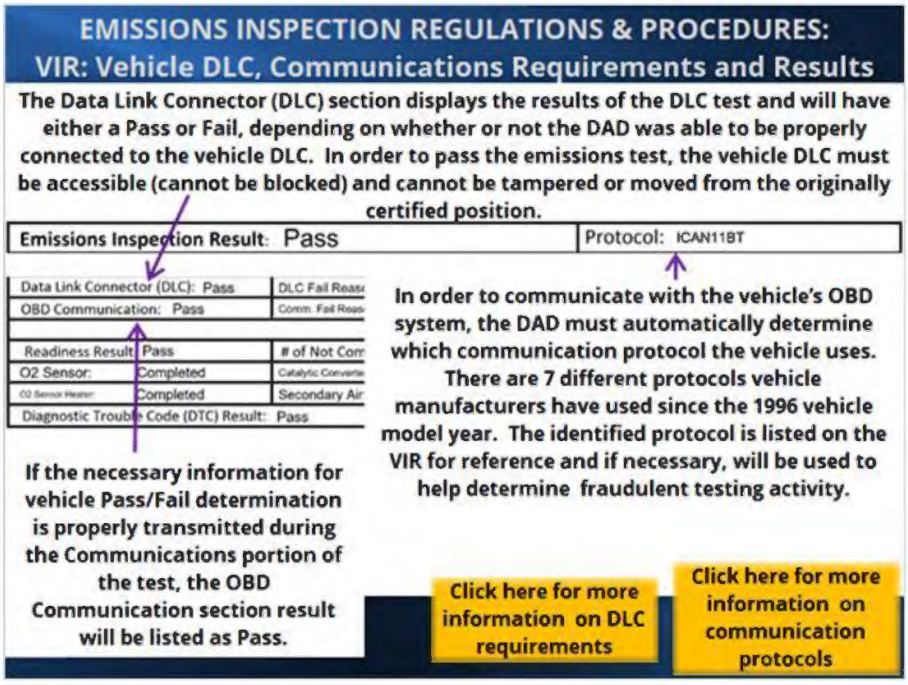
5.28 VIR



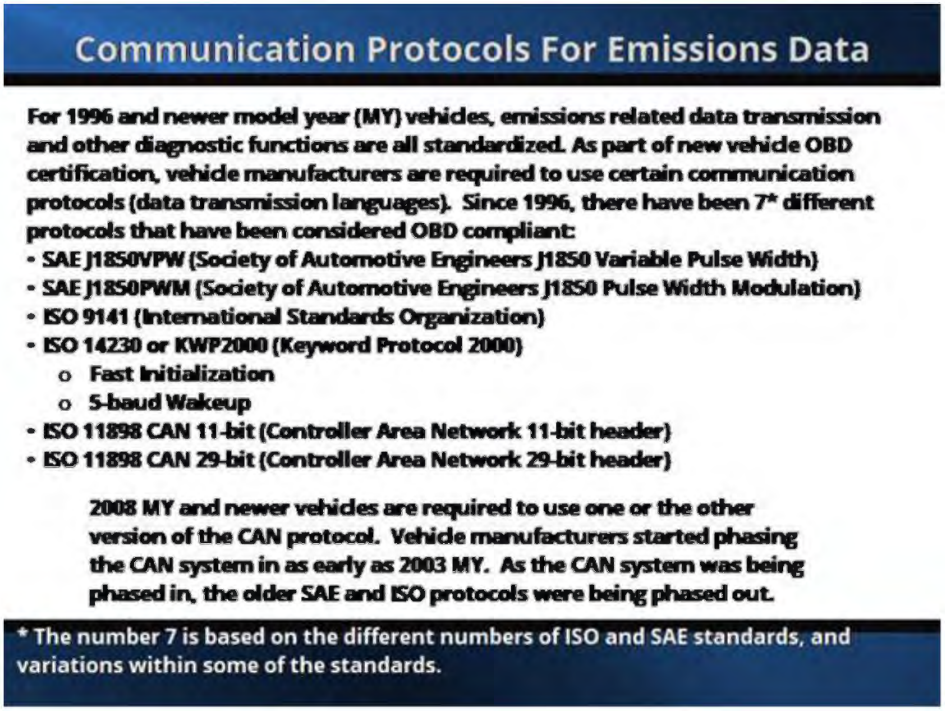
5.29 VIR-Passing Inspection



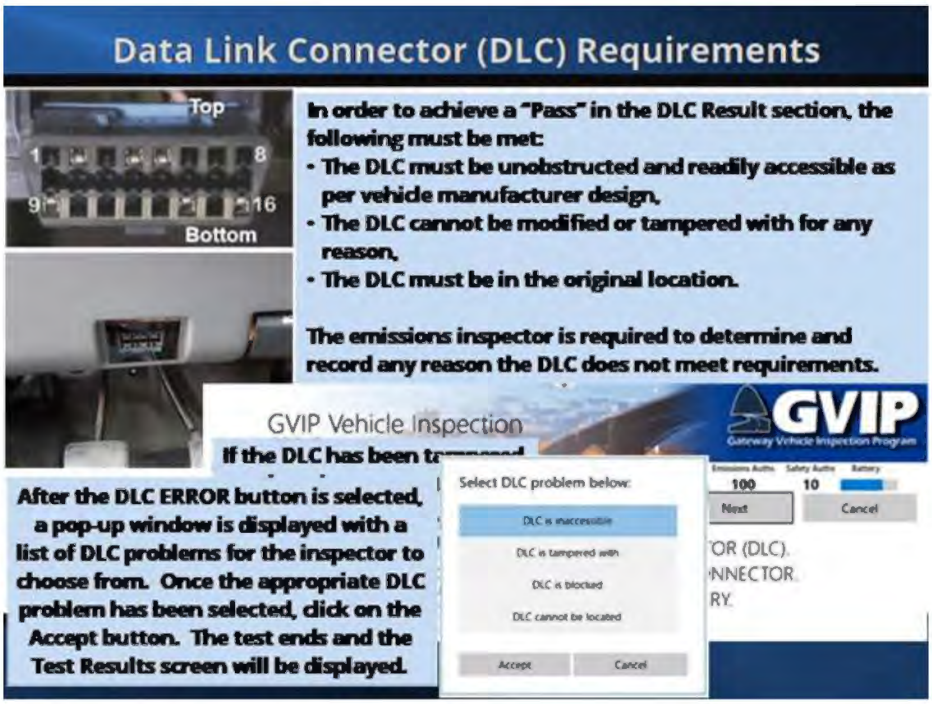
5.30 VIR: Vehicle DLC, Communications Requirements and Results



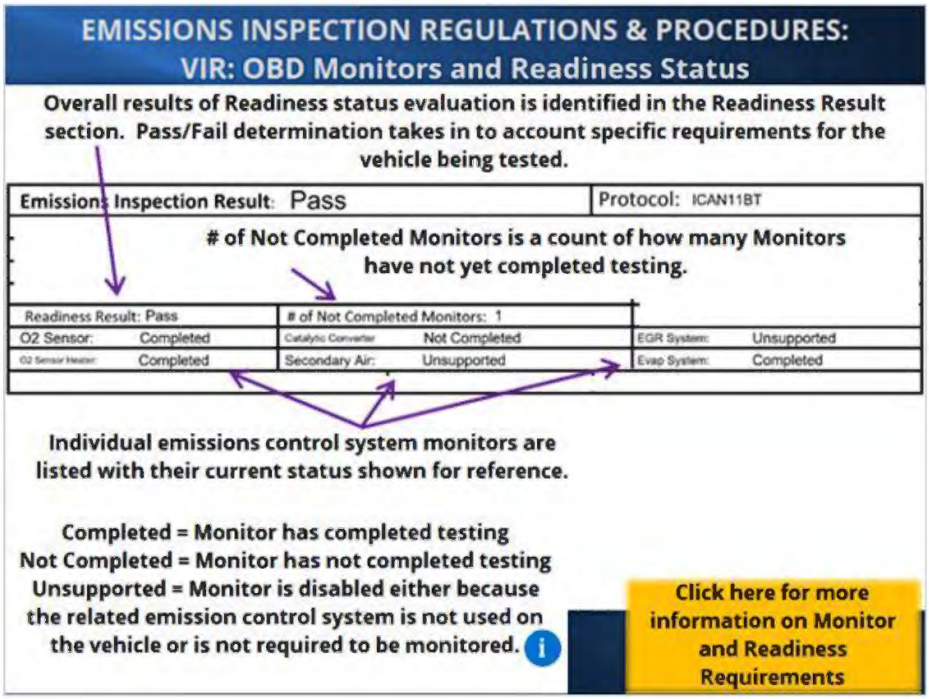
Communication Protocols



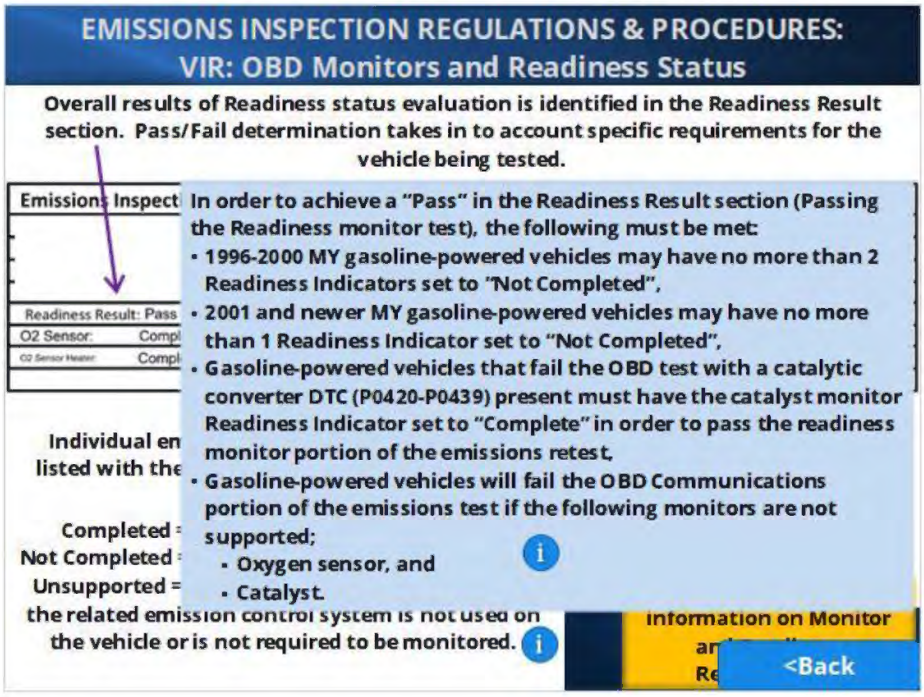
Data Link Connector



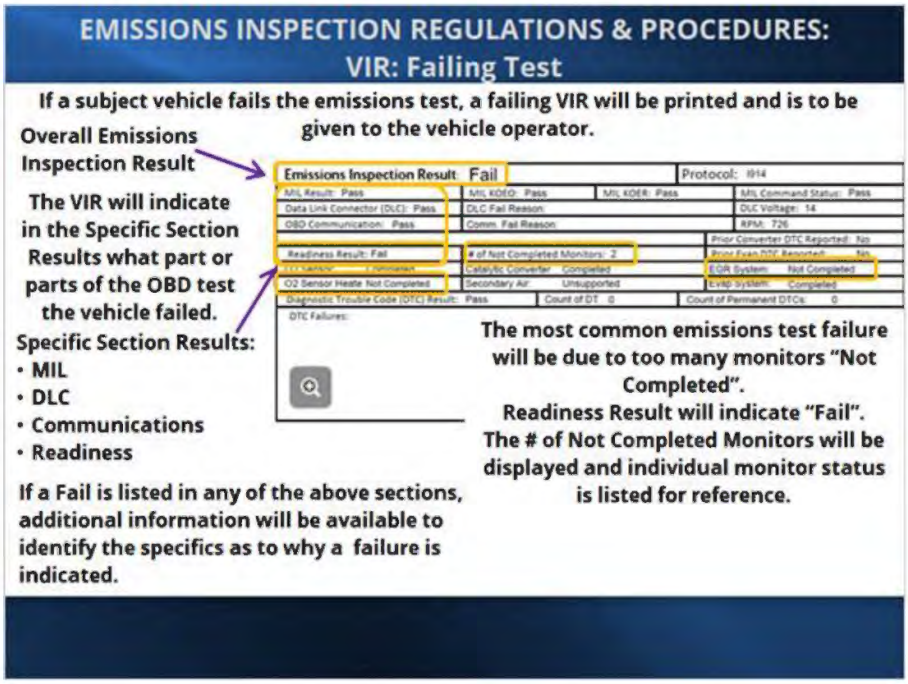
5.31 VIR-Monitors and Readiness Codes



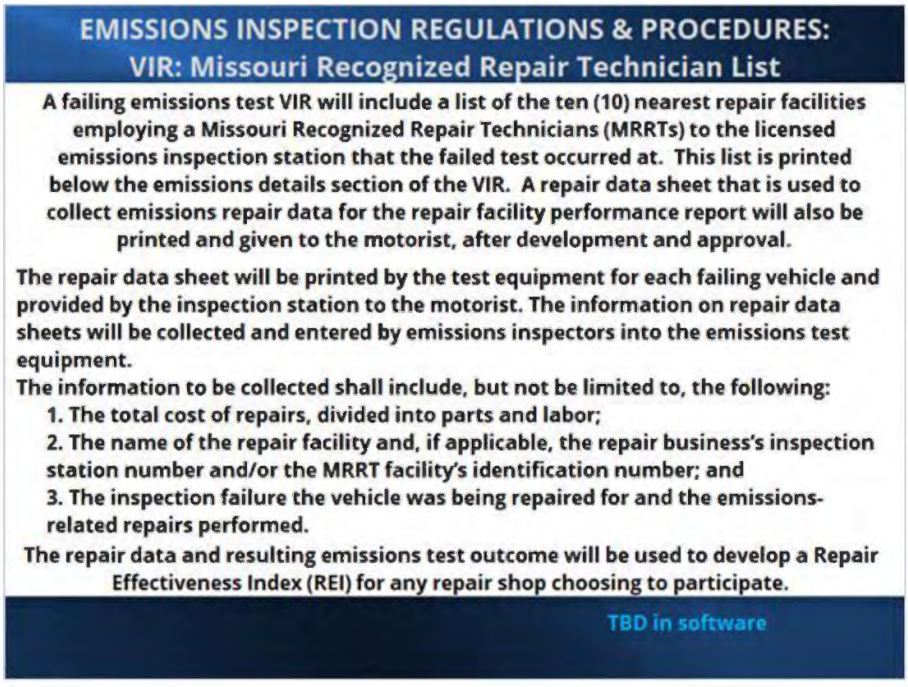
Readiness Requirements



5.32 VIR-Failure



5.33 VIR: MRRT



5.34 Emissions Inspection Procedures

EMISSIONS INSPECTION REGULATIONS & PROCEDURES: Emissions Inspection and Reinspection Procedures

If the emissions inspection is aborted by the emissions equipment software or the emissions inspector, the emissions inspection station shall provide the vehicle owner or driver with the emissions VIR that indicates that the OBD test was aborted.

Vehicles that fail an initial test are required to be repaired and then reinspected.

Vehicles that fail the emissions inspection shall be reinspected to determine if the repairs were effective at correcting failures on the previous inspection, thereby reducing or preventing an increase in present and future tailpipe or evaporative emissions.

The inspector shall enter the data from the repair data sheet into the emissions equipment prior to initiating the re-inspection, even if the vehicle receives multiple reinspections.

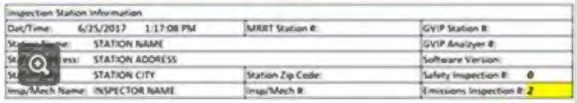
The inspector shall ensure that the VIN of the re-inspected vehicle matches the VIN of the originally inspected vehicle.

Repair Data Sheet still TBD in software

5.35 Emissions ReInspection Procedures

EMISSIONS INSPECTION REGULATIONS & PROCEDURES: Emissions Re-Inspection Procedures

Conducting an emissions re-inspection follows the procedures as an initial inspection, including taking new photographs. Upon passing a re-inspection, the emissions inspection station shall issue the vehicle owner or driver a passing VIR certifying that the vehicle has passed the emissions inspection, and provide a windshield sticker for the windshield of the subject vehicle.



Test counter information is displayed on the VIR in the Inspection Station Information section. reinspections are identified by counter #'s 2 and above.

If the subject vehicle fails a re-inspection, the vehicle owner may either:

A. Have more repairs performed on the vehicle and have the vehicle re-inspected; or

B. Apply for a cost-based waiver.

5.36 Exemptions and Waivers

EMISSIONS INSPECTION REGULATIONS & PROCEDURES: Vehicle Exemptions And Waivers

Vehicles that are exempt from emissions testing include:

- Vehicles above 8,500 GVWR and older than the listed model years are not subject to emissions testing;
- Motorcycles and motortricycles;
- Vehicles powered exclusively by electric or hydrogen power or by fuels other than gasoline, ethanol (E10 and E85), or diesel;
- Historic motor vehicles;
- School buses;
- Tactical military vehicles;
- Specially constructed vehicles;
- Plug-in hybrid electric vehicles (PHEVs).

Specific exemptions exist for the following:

- New and unused motor vehicles;
- Vehicles that qualify for mileage-based exemptions;
- Out-of-area exempted vehicles.

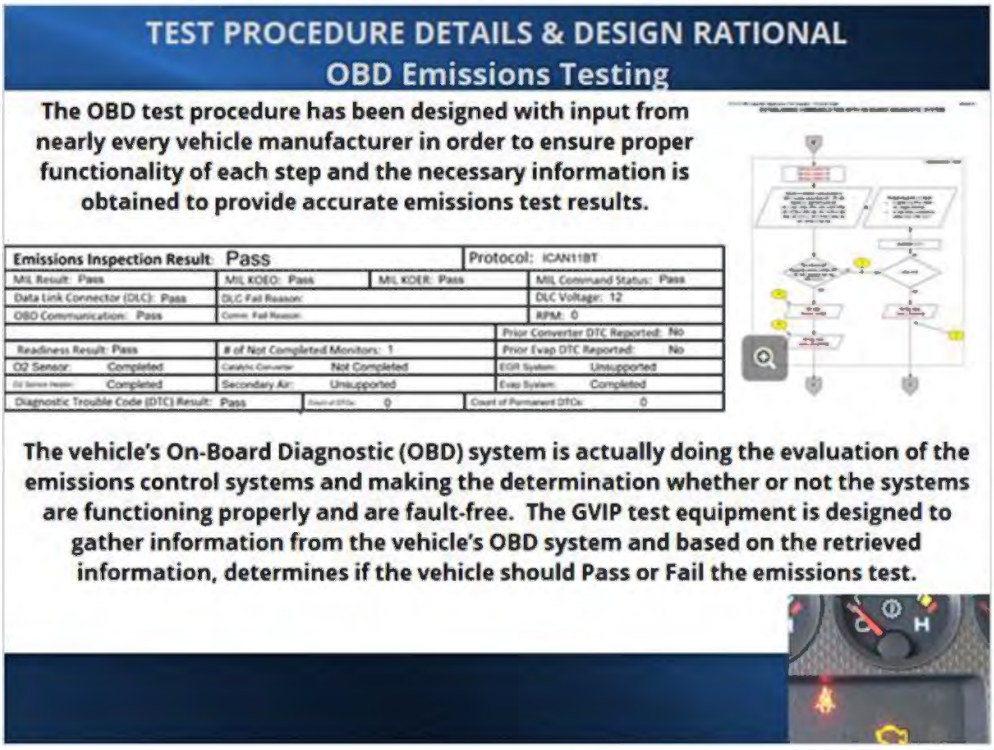
Other special circumstances may involve the vehicle owner working with the DNR and obtaining a:

- Cost-based repair waiver;
- Estimate based repair waiver;
- Out-of-area waiver;
- Reciprocity waiver.

Refer to the applicable sections of the CSR for more information.

6. Test Procedure Details and Design Rationale

6.1 Intro Test Details



Notes:

According to 10 CSR 10-5.381 (which is commonly referred to as "this rule") (5) (B):The OBD test shall follow the procedures described in 40 CFR 85.2222, which is incorporated by reference in this rule, as published by the EPA, Office of Transportation and Air Quality, 2000 Traverwood, Ann Arbor, MI 48105 on April 5, 2001. This rule does not incorporate any subsequent amendments or additions to 40 CFR 85.2222.

1. If the subject vehicle cannot be tested with the OBD test due to manufacturer design, then the subject vehicle shall be tested with only a bulb check test described in paragraph (5)(B)2. of this rule.

2. Bulb check test.

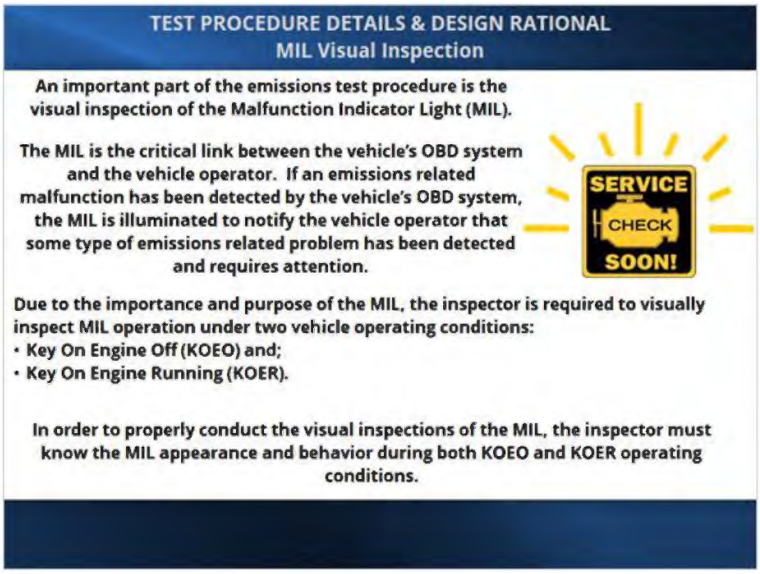
A. Vehicles will fail the bulb check portion of the OBD test if the MIL is not illuminated while the key is in the on position and the engine is off (KOEO).

B. Vehicles will fail the bulb check portion of the OBD test if the MIL is illuminated while the key is in the on position and the engine is running (KOER).

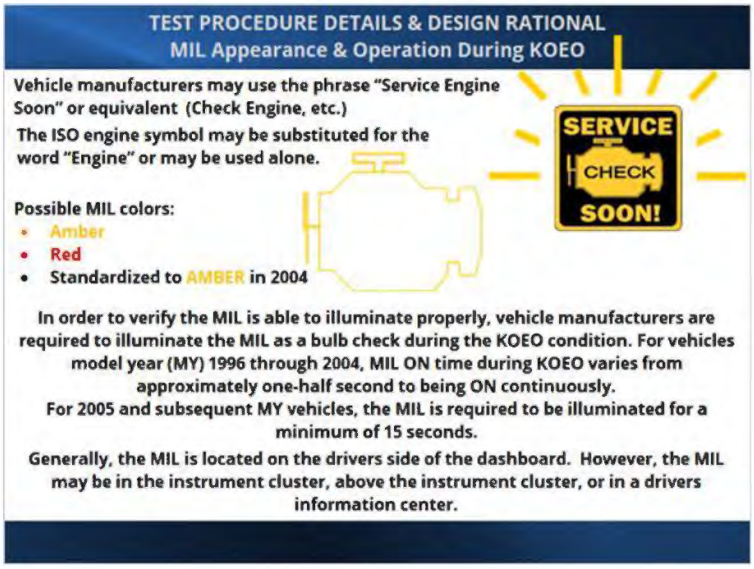
C. Vehicles with keyless ignitions shall be subject to a bulb check test.

D. Vehicles that fail the KOEO bulb check portion of the OBD test described in subparagraph (5)(B)2.A. of this rule shall fail the OBD test. Repairs made to correct bulb check failures shall not be eligible for cost-based or estimate-based waivers.

6.2 MIL Visual Inspection



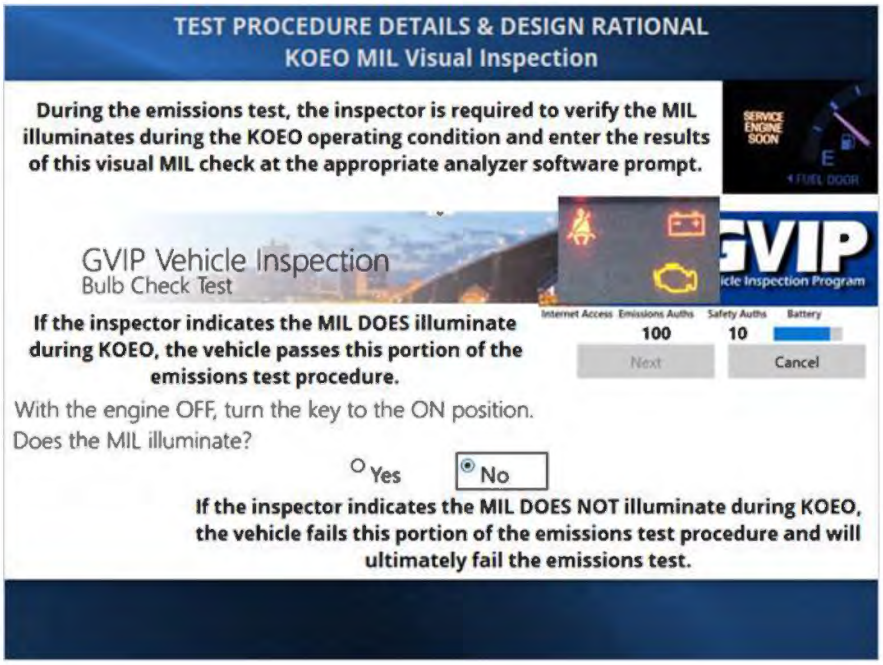
6.3 MIL Appearance/Operation



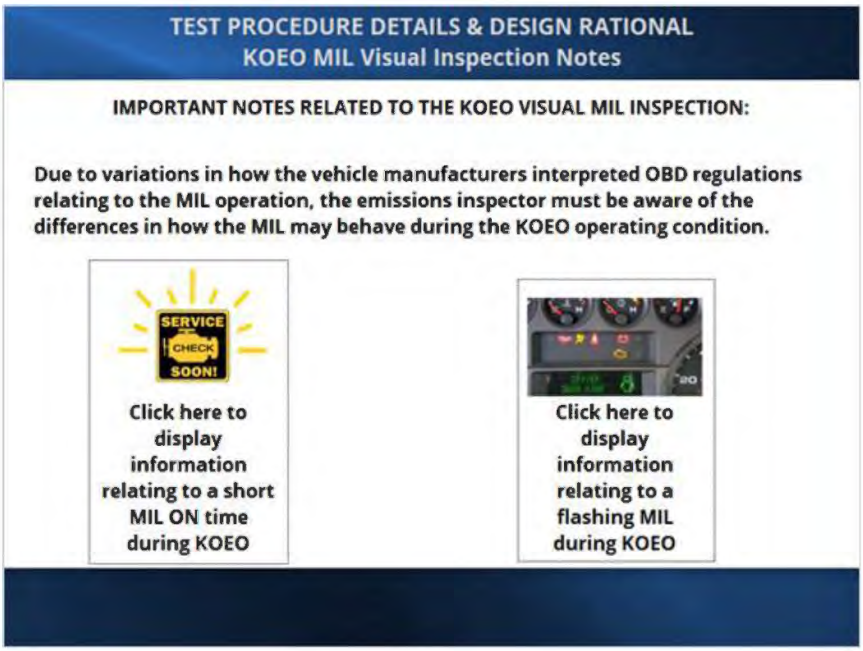
Notes:

There are other indicators such as "Service Vehicle Soon" that may be easily confused with the emissions MIL. The inspector must be careful when completing the visual inspection process.

6.4 MIL-KOEO



6.5 MIL-KOEO_NOTES



Short MIL ON Time

Test Procedure Details and Design Rational
MIL Visual Inspection Notes: Short ON Time

If the inspector is unfamiliar with the exact location of the MIL, it is possible to miss the initial MIL bulb check during KOEO. If the inspector feels the bulb check was missed, the ignition should be turned OFF for at least 12 seconds and then back to KOEO in order to initiate the MIL bulb check again. This repeat of the bulb check does not disrupt the test sequence. Once MIL operation during the bulb check has been properly verified, the inspector should continue with the vehicle test by selecting the appropriate response on the inspection tablet screen.

Flashing MIL KOEO-Readiness

Test Procedure Details and Design Rational
MIL Visual Inspection Notes: Flashing During KOEO

Beginning with the 2001 model year, some vehicle manufacturers use the MIL to indicate whether or not all Readiness Indicators are set to "Completed".

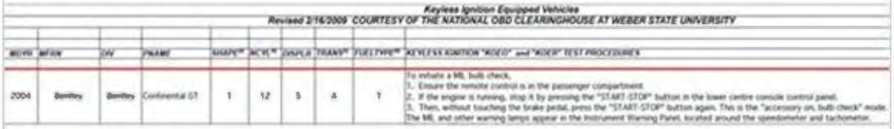
MIL operation during KOEO is as follows:

- KOEO operating state is initiated; - MIL comes on steady.
- After 20 seconds in this state the MIL will do one of two things:
  1. Cycle on and off to indicate that one or more Readiness Indicators are "Not Completed". Depending on manufacturer, the amount of time the MIL flashes varies from five to ten seconds.
  2. Remain on steady or extinguish (varies with manufacturer) for the duration of the KOEO period to indicate all Readiness Indicators are "Completed".

6.6 MIL-KOEO_NOTES pg2

TEST PROCEDURE DETAILS & DESIGN RATIONAL
KOEO MIL Visual Inspection Notes

Vehicles with keyless ignitions are subject to the visual MIL inspection during KOEO. Be aware that keyless ignition systems have been around since model year 2002. In order to properly conduct the KOEO visual inspection, inspectors are required to follow proper procedures to initiate the KOEO operating condition.
For most keyless ignition system vehicles, initiating the KOEO operating condition requires the remote control being in the vehicle or inserted into the dash slot. With the engine off, press the "START-STOP" button once without depressing the brake pedal. To start the engine for KOER, depress the brake pedal and press the "START-STOP" button a second time.


Keyless Ignition Equipped Vehicles
Revised 2/16/2009 COURTESY OF THE NATIONAL OBD CLEARINGHOUSE AT WEBER STATE UNIVERSITY

MDYR	MFGR	DIV	NAME	MAPS**	#CYL**	ENGDISPL	TRANS**	FUELTYPE**	KEYLESS IGNITION "KOEO" and "KOER" TEST PROCEDURES
2004	Bentley	Bentley	Continental GT	1	12	5	A	7	To initiate a MIL bulb check, 1. Ensure the remote control is in the passenger compartment. 2. If the engine is running, stop it by pressing the "START-STOP" button in the lower centre console control panel. 3. Then, without touching the brake pedal, press the "START-STOP" button again. This is the "accessory on, bulb check" mode. The MIL and other warning lamps appear in the Instrument Warning Panel, located around the speedometer and tachometer.

The complete Keyless Ignition reference file, available from the National OBD Clearinghouse, is available through the Resources tab in the upper right corner of the screen.

Repairs made to correct bulb check failures are not eligible for cost-based or estimate-based waivers.

6.7 MIL-KOER

TEST PROCEDURE DETAILS & DESIGN RATIONAL
KOER MIL Visual Inspection

The second visual MIL inspection performed by the emissions inspector is during the Key On Engine Running (KOER) vehicle operating condition.

Start the Engine and let idle.
Does the MIL illuminate?
○ Yes ◉ No

The analyzer software will prompt the inspector to start the engine and note the MIL illumination status, whether the MIL is ON or OFF.

If the MIL is OFF during the KOER operating condition, the OBD system is indicating that no current emissions-related malfunctions exist.
If the MIL is ON during the KOER operating condition, the OBD system is indicating that one or more emissions-related malfunctions exist. If the MIL is flashing during KOER operating conditions, the MIL is considered ON. Click here for more information.

When the inspector indicates the MIL is ON during KOER, the vehicle will Fail the OBD test.
Reminder: Vehicles shall be inspected in as received condition, including vehicles whose MIL is lit.

Inspector entered results for the MIL visual inspection during KOEO and KOER are listed on the VIR.

Emissions Inspection Result:	**Fail**	**Protocol:**	
MIL Result: Fail	MIL KOEO: Pass MIL KOER: Fail		MIL Command Status: Fail
Data Link Connector (DLC):	DLC Fail Reason:		DLC Voltage: N/A
OBD Communication: N/A	Comm. Fail Reason: N/A		RPM: N/A
			Prior Converter DTC Reported: No
Readiness Result: N/A	# of Not Completed Monitors: N/A		Prior Evap DTC Reported: No
O2 Sensor: N/A	Catalytic Converter: N/A		EGR System: N/A
O2 Sensor Heater: N/A	Secondary Air: N/A		Evap System: N/A
Diagnostic Trouble Code (DTC) Result: N/A	Count of DTCs: 0		Count of Permanent DTCs:

MIL Flashing during KOER

Test Procedure Details and Design Rational
OBD I/M Testing: Flashing MIL During KOER

Under certain circumstances, the MIL may flash during KOER. If the MIL is flashing during KOER, the inspector should indicate that the MIL is illuminated.

If the MIL is flashing during KOER, a catalyst damaging misfire has been detected by the OBD system and is indicated by flashing the MIL while the engine is running.
The vehicle operator should be encouraged to get the vehicle repaired as soon as possible in order to avoid permanent damage to the catalytic converter.

When an engine misfire occurs, engine out HCs increase. When excess HCs pass into the catalytic converter(s), internal temperatures increase due to the excess heat energy that is released as the HCs are combusted and converted into H_2O and CO_2.

6.8 DLC Details

TEST PROCEDURE DETAILS & DESIGN RATIONAL
Data Link Connector (DLC) Details

The Data Link Connector (DLC) provides both the physical and electrical connections necessary for data communications to occur between the vehicle's OBD system and an off-board computer system.

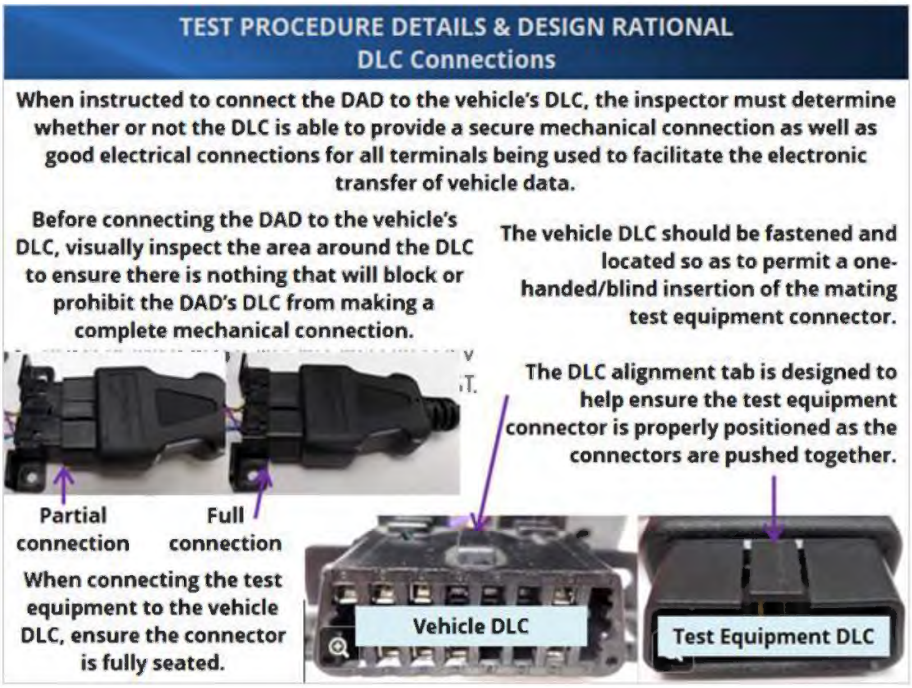
All 1996 and newer light-duty vehicles with spark-ignition engines and all 1997 and newer light-duty vehicles with compression-ignition engines have the required DLC.

If a DLC is located behind a panel or cover, be cautious when removing the panel or cover.

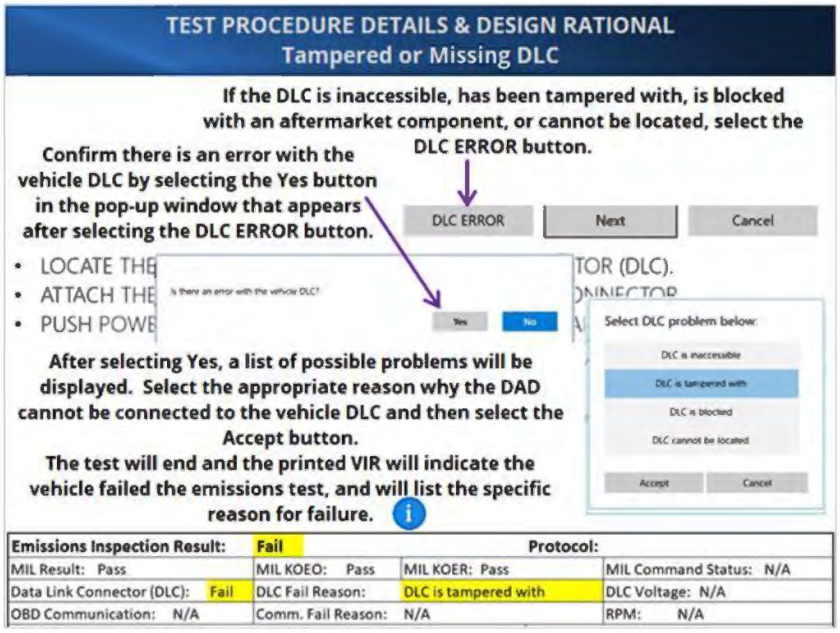
The shape, size, and 8 of the 16 cavities have been standardized in order to improve connection and communication efficiency between on-board and off-board computer systems such as the GVIP test equipment.
SAE J1962 is the Recommended Practice relating to the DLC. Click here to link to a full copy of the SAE standard.

6.9 DLC Location

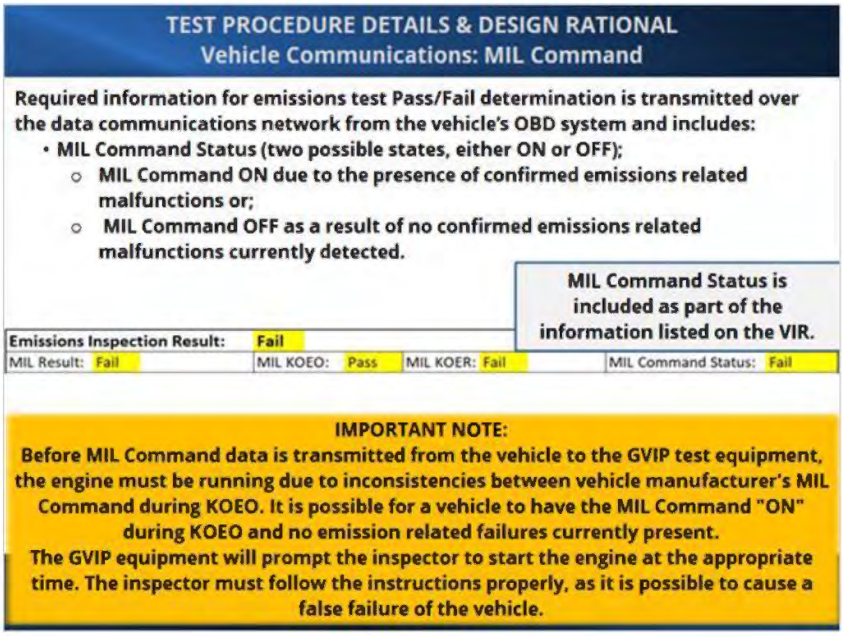
6.10 DLC Connections



6.11 Tampered or Damaged DLC



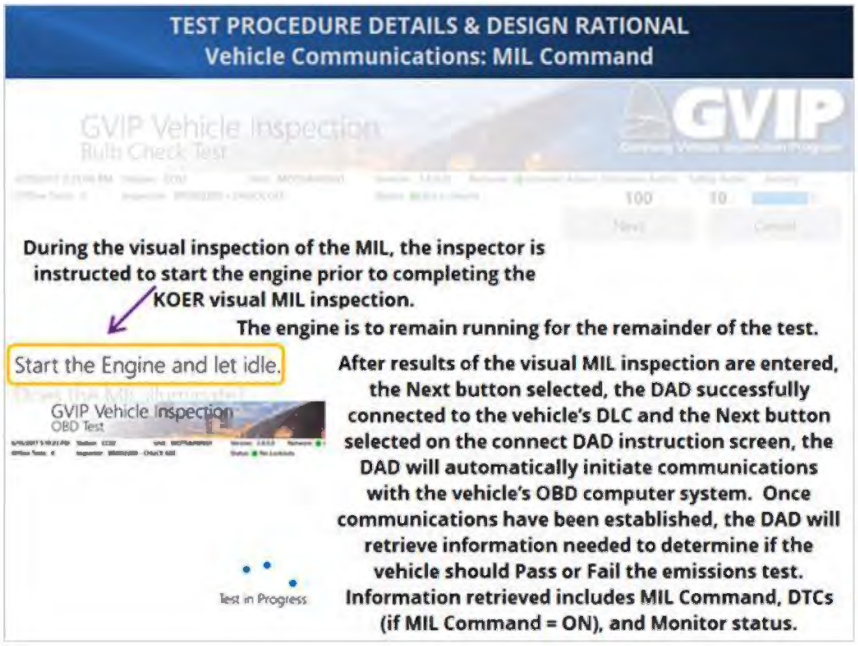
6.12 MIL Command



Notes:

For 2005 MY and subsequent vehicles, during KOEO MIL COMMAND will be "OFF" unless a confirmed failure exists.

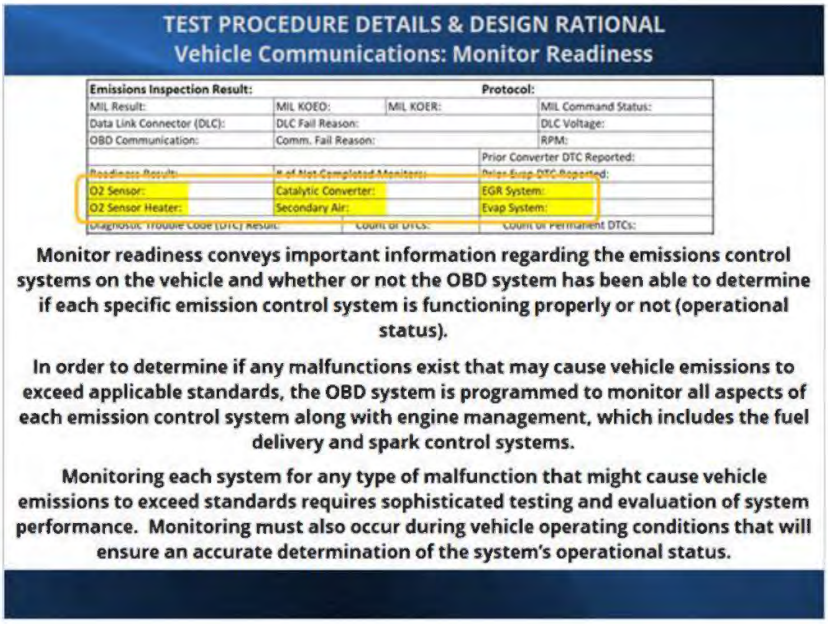
6.13 Initiate OBD Communications



Notes:

For 2005 MY and subsequent vehicles, during KOEO MIL COMMAND will be "OFF" unless a confirmed failure exists.

6.14 Monitor Readiness



6.15 VIR and Readiness Codes

TEST PROCEDURE DETAILS & DESIGN RATIONAL
VIR and Readiness Indicators

Emissions Inspection Result:	**Pass**				**Protocol:**	**ICAN11BT**	
MIL Result: Pass		MIL KOEO: Pass		MIL KOER: Pass		MIL Command Status:	Pass
Data Link Connector (DLC): Pass		DLC Fail Reason:				DLC Voltage:	12
OBD Communication: Pass		Comm. Fail Reason: N/A				RPM: 963	
						Prior Converter DTC Reported:	No
Readiness Result:	Pass	# of Not Completed Monitors:	0			Prior Evap DTC Reported:	No
O2 Sensor:	Completed	Catalytic Converter:	Completed			EGR System:	Unsupported
O2 Sensor Heater:	Completed	Secondary Air:	Unsupported			Evap System:	Completed
Diagnostic Trouble Code (DTC) Result:	Pass	Count of DTCs: 0				Count of Permanent DTCs:	0

Each emission control system that is monitored for proper operation has a Readiness Indicator. The Readiness Indicator shows when monitoring of the related system is complete (indicated as "Completed") or has not yet accomplished the system evaluations (indicated as "Not Completed"). If a Readiness Indicator is "Completed", the operational status of that emission control system has been determined. If no Diagnostic Trouble Codes (DTCs) are stored and the MIL is not commanded ON, the emission control system is functional and fault-free.

If a Readiness Indicator shows "Not Completed" for a specific emission control system, the operational status has not been determined and further evaluation is needed to determine if a malfunction exists that might cause emissions to exceed applicable standards, or the system is functional and fault-free.

Readiness Indicators do not indicate Pass/Fail status of the emissions control systems.

6.16 VIR-Monitors and Readiness Codes

EMISSIONS INSPECTION REGULATIONS & PROCEDURES:
VIR: Monitors and Readiness Indicators

Overall results of Monitor Readiness evaluation are identified in the Readiness Result section. Pass/Fail determination takes in to account specific requirements for the vehicle being tested.

Emissions Inspection Result:	**Fail**				**Protocol:**	**ICAN11BT**	
MIL Result: Pass		MIL KOEO: Pass		MIL KOER: Pass		MIL Command Status:	Pass
Data Link Connector (DLC): Pass		DLC Fail Reason:				DLC Voltage:	12
OBD Communication: Pass		Comm. Fail Reason: N/A				RPM: 963	
						Prior Converter DTC Reported:	No
Readiness Result:	Fail	# of Not Completed Monitors:	2			Prior Evap DTC Reported:	No
O2 Sensor:	Completed	Catalytic Converter:	Not Completed			EGR System:	Unsupported
O2 Sensor Heater:	Completed	Secondary Air:	Unsupported			Evap System:	Not Completed
Diagnostic Trouble Code (DTC) Result:	Pass	Count of DTCs: 0				Count of Permanent DTCs:	0

Individual Readiness Indicators are listed with their current status shown for reference.

Completed = Monitor has completed testing
Not Completed = Monitor has not completed testing
Unsupported = Monitor is disabled either because the related emission control system is not used on the vehicle or is not required to be monitored.

Count of Not Ready Monitors show how many Monitors have not been able to complete testing.

Click here for more information on unsupported emission control systems

Monitor Unsupported But Emission Control System Present On Vehicle

Monitor Unsupported But Emission Control System Present On Vehicle

There are instances where an engine may have an EGR system present on the engine but the OBD system shows the EGR monitor as Unsupported, or the EGR monitor is supported but there is no external EGR system on the engine. The reasons these combinations may be present include:

- **The EGR system being used as a fuel economy system but does not cause emissions to exceed applicable standards if a malfunction is present,**
- **The engine uses a Variable Valve Timing (VVT) system to accomplish exhaust gas recirculation (internal EGR) and does not need an external EGR system.**

There are engines manufactured by GM and Land Rover that were originally certified with AIR systems, but later were re-certified without AIR. With the new certification, the engine computer can be reprogrammed and the AIR system is rendered non-functional. With the AIR non-functional, the AIR monitor is turned off and the AIR Readiness Code displays Unsupported. In this case, the inspector would indicate that the AIR appears to be present, but the OBD system will show the AIR system as not supported.

6.17 Monitors and Readiness Code Requirements

TEST PROCEDURE DETAILS & DESIGN RATIONAL
Readiness Indicator Requirements for Emissions Testing - Gasoline

There are different requirements for vehicles to pass the Readiness Indicator portion of the OBD test, depending on vehicle model year and fuel type.

Emissions Inspection Result:	**Fail**			**Protocol: ICAN11BT**	
MIL Result: Pass	MIL KOEO: Pass	MIL KOER: Pass		MIL Command Status:	Pass
Data Link Connector (DLC): Pass	DLC Fail Reason:			DLC Voltage:	12
OBD Communication: Pass	Comm. Fail Reason: N/A			RPM:	963
				Prior Converter DTC Reported:	No
Readiness Result: Fail	# of Not Completed Monitors:	2		Prior Evap DTC Reported:	No
O2 Sensor: Completed	Catalytic Converter:	Not Completed		EGR System:	Unsupported
O2 Sensor Heater: Completed	Secondary Air:	Unsupported		Evap System:	Not Completed
Diagnostic Trouble Code (DTC) Result: Pass	Count of DTCs: 0			Count of Permanent DTCs:	0

1996 – 2000 model year gasoline-powered vehicles may pass the Readiness portion of the test if they have no more than 2 Not Completed Monitors.

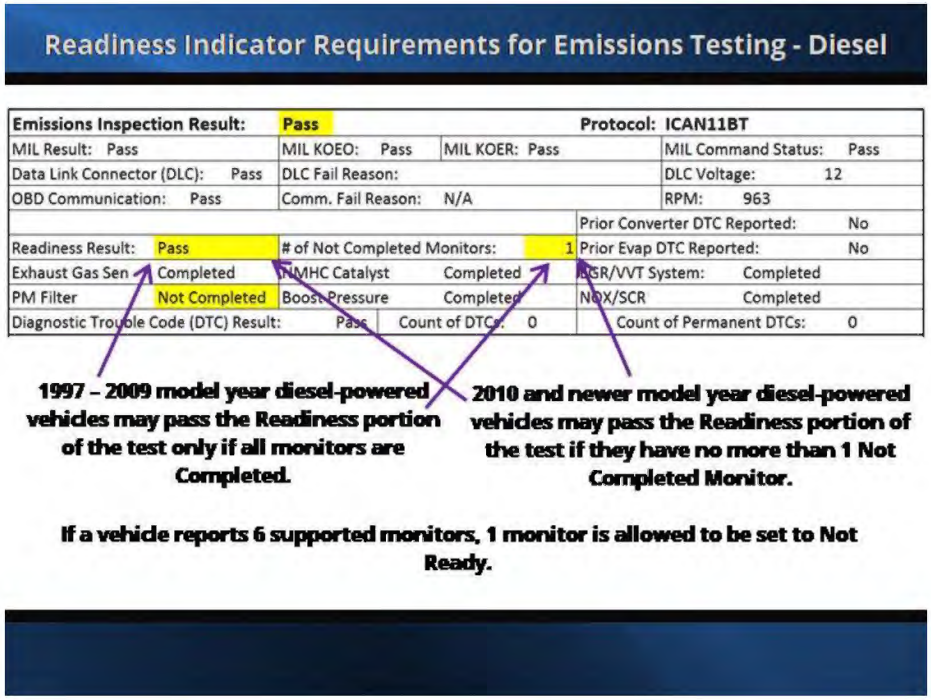
2001 and newer model year gasoline-powered vehicles may pass the Readiness portion of the test if they have no more than 1 Not Completed Monitor.

Vehicles must pass the Readiness portion of the OBD test to be eligible for a cost-based or estimate-based waiver

Monitor Readiness Requirements For Diesel-Powered Vehicles

Gasoline-powered vehicles that fail due to a catalytic converter DTC P0420 through P0439 commanding the MIL ON, must have the catalyst Readiness Indicator set to "Completed" in order to pass the Readiness portion of the emission retest.

Diesel Vehicle Readiness Requirements



Readiness Indicator Requirements for Emissions Testing - Diesel

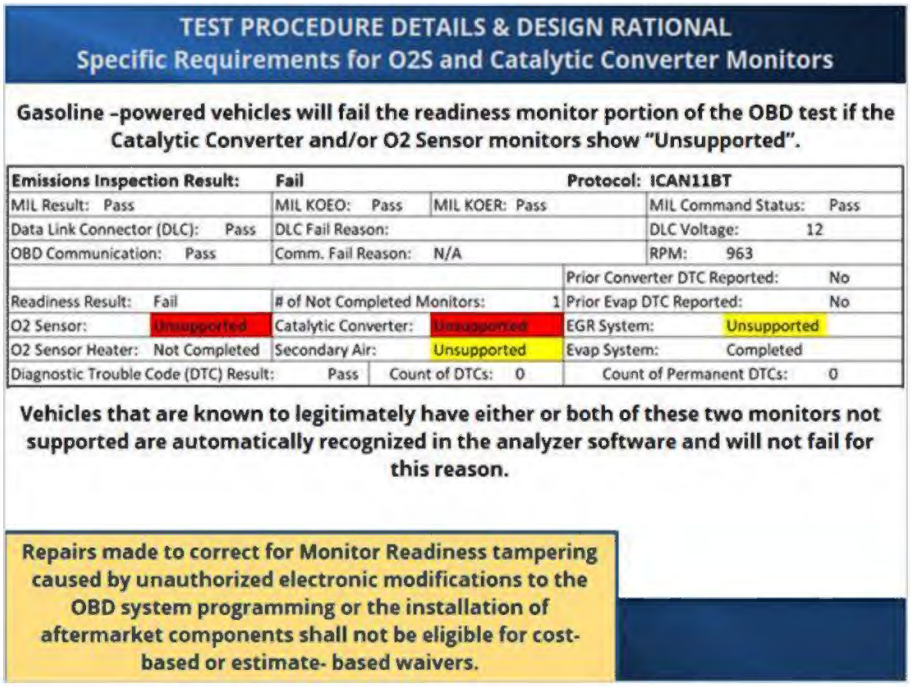
Emissions Inspection Result:	**Pass**			**Protocol:**	**ICAN11BT**
MIL Result: Pass	MIL KOEO: Pass	MIL KOER: Pass		MIL Command Status:	Pass
Data Link Connector (DLC): Pass	DLC Fail Reason:			DLC Voltage:	12
OBD Communication: Pass	Comm. Fail Reason: N/A			RPM:	963
				Prior Converter DTC Reported:	No
Readiness Result: Pass	# of Not Completed Monitors:	1		Prior Evap DTC Reported:	No
Exhaust Gas Sen Completed	NMHC Catalyst	Completed		EGR/VVT System:	Completed
PM Filter Not Completed	Boost Pressure	Completed		NOX/SCR	Completed
Diagnostic Trouble Code (DTC) Result: Pass	Count of DTCs: 0			Count of Permanent DTCs:	0

1997 – 2009 model year diesel-powered vehicles may pass the Readiness portion of the test only if all monitors are Completed.

2010 and newer model year diesel-powered vehicles may pass the Readiness portion of the test if they have no more than 1 Not Completed Monitor.

If a vehicle reports 6 supported monitors, 1 monitor is allowed to be set to Not Ready.

6.18 CAT/O2 Monitor Requirement



TEST PROCEDURE DETAILS & DESIGN RATIONAL
Specific Requirements for O2S and Catalytic Converter Monitors

Gasoline -powered vehicles will fail the readiness monitor portion of the OBD test if the Catalytic Converter and/or O2 Sensor monitors show "Unsupported".

Emissions Inspection Result:	**Fail**			**Protocol:**	**ICAN11BT**
MIL Result: Pass	MIL KOEO: Pass	MIL KOER: Pass		MIL Command Status:	Pass
Data Link Connector (DLC): Pass	DLC Fail Reason:			DLC Voltage:	12
OBD Communication: Pass	Comm. Fail Reason: N/A			RPM:	963
				Prior Converter DTC Reported:	No
Readiness Result: Fail	# of Not Completed Monitors:	1		Prior Evap DTC Reported:	No
O2 Sensor: Unsupported	Catalytic Converter:	Unsupported		EGR System:	Unsupported
O2 Sensor Heater: Not Completed	Secondary Air:	Unsupported		Evap System:	Completed
Diagnostic Trouble Code (DTC) Result: Pass	Count of DTCs: 0			Count of Permanent DTCs:	0

Vehicles that are known to legitimately have either or both of these two monitors not supported are automatically recognized in the analyzer software and will not fail for this reason.

Repairs made to correct for Monitor Readiness tampering caused by unauthorized electronic modifications to the OBD system programming or the installation of aftermarket components shall not be eligible for cost-based or estimate- based waivers.

Monitor Unsupported But Emission Control System Present On Vehicle

Test Procedure Details and Design Rational
Monitor Unsupported But Emission Control System Present On Vehicle

There are instances where an engine may have an EGR system present on the engine but the OBD system shows the EGR monitor as Unsupported, or the EGR monitor is supported but there is no external EGR system on the engine. The reasons these combinations may be present include:

- **The EGR system being used as a fuel economy system but does not cause emissions to exceed applicable standards if a malfunction is present,**
- **The engine uses a Variable Valve Timing (VVT) system to accomplish exhaust gas recirculation (internal EGR) and does not need an external EGR system.**

There are engines manufactured by GM and Land Rover that were originally certified with AIR systems, but later were re-certified without AIR. With the new certification, the engine computer can be reprogrammed and the AIR system is rendered non-functional. With the AIR non-functional, the AIR monitor is turned off and the AIR Readiness Indicator displays Unsupported. In this case, the inspector would indicate that the AIR appears to be present, but the OBD system will show the AIR system as not supported.

6.19 Readiness Code Information for Drivers

TEST PROCEDURE DETAILS & DESIGN RATIONAL
Monitor Readiness Failures and Information to Provide the Vehicle Owner

Vehicles that fail the emissions test due to too many Readiness Indicators in the "Not Completed" state need to be operated in a way that meets the enable criteria related to the monitors that have not run to completion. Vehicle operators/owners should be encouraged to operate their vehicle following these general guidelines that are known to help meet non-continuous monitor enable criteria:

- Fuel tank level should be between 1/4 and 3/4 full
- Cold start - engine coolant and ambient air temperatures should be between 40° F and 90° F and within 10° F of each other at engine start-up
- Start the engine and idle normally for 2 minutes with A/C system turned off
- Drive vehicle until normal engine temperature has been reached and is stable
- Achieve a stable cruise speed at approximately 40mph for 5 minutes. This stable cruise DOES NOT have to occur uninterrupted. Testing will resume when the cruise condition resumes.
- Accelerate to 60mph and then decelerate gradually to 30mph
  Repeat this acceleration/deceleration process 3 times.
- Stop the vehicle and allow the engine to idle for 2 minutes
- Turn the engine off for at least 2 minutes
- The stable cruise and acceleration/deceleration conditions may need to be repeated a second time.

Startup Temperature Information

Temperature Requirements for Cold Start-up

Most vehicle manufacturers do not use a fuel temperature sensor to measure fuel temperature directly, so in order to determine fuel temperature, the engine coolant and ambient air temperatures are used. When the engine and ambient air temperatures are within 10° F of each other, fuel temperature is calculated to be at the same temperature as well.

Fuel temperature information is needed by the Evaporative Emissions Control System monitor in order to calculate expected (predetermined) fuel vapor pressure changes based on operating conditions. Predetermined fuel vapor pressures are compared to actual fuel vapor pressures to identify the presence of leaks in the vapor and liquid fuel storage system.

Parking a vehicle outside for many hours in order to allow the engine temperature to equalize to ambient air will typically satisfy the start-up temperature requirements, however, be aware that if the vehicle has been parked outside over night and is started during the early dawn hours, the ambient air temperature may have dropped several degrees and the engine temperature won't be able to change as rapidly. As a result, both the engine coolant and ambient air temperatures may be within the 40° F - 90° F range, but may not necessarily be within 10° F of each other, even though the vehicle has been parked over night.

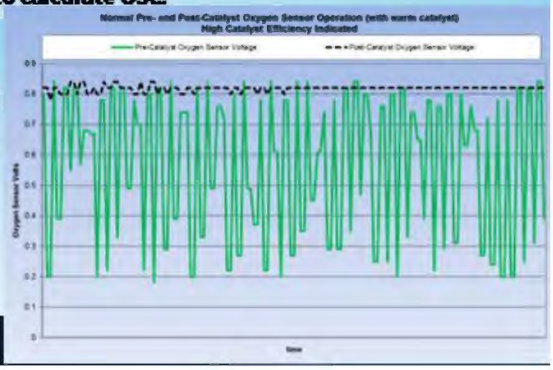
Cruise Information

Low-Speed Cruise

The low-speed cruise operating condition is important for several monitors, such as the catalyst efficiency and oxygen sensor monitors, and for some vehicles, the EGR system.

Catalytic converter efficiency determination is based on oxygen storage capacity (OSC). High OSC translates to high converter efficiency, and low OSC indicates a catalytic converter malfunction. OSC is calculated from exhaust oxygen sensors (O2Ss) located in front (pre-catalyst) and in back (post-catalyst) of the catalytic converter(s). In order to use O2S signals for catalyst efficiency determination, the catalyst must be at normal operating temperatures and engine load conditions need to be stable long enough to gather the amount of information to calculate OSC.

The most common strategy for catalytic converter efficiency determination includes monitoring pre- and post-catalyst O2S signals during a low-speed (approximately 40mph) cruise with engine load conditions steady, which results in steady exhaust flow rates. To help ensure steady exhaust flow, the A/C compressor should be off.



6.20 Readiness Codes Reset

TEST PROCEDURE DETAILS & DESIGN RATIONAL
OBD Readiness Indicator Reset

Once a Readiness Indicator indicates a system as having been monitored, the Readiness Indicator remains "Ready" until a reset occurs. A reset will occur if any of the following events take place, and result in all* Readiness Indicators for the non-continuous monitors resetting to "Not Ready":
(1) If the PCM loses connection to the battery positive or negative circuit(s).
(2) If battery voltage goes below a minimum value.
(3) When DTC information is cleared from PCM memory with a scan tool.
(4) If the PCM uses EEPROM technology and is able to be reprogrammed, Readiness Indicators will be reset during the reprogramming procedure.

*Some PCM's store Readiness Indicator information in non-volatile memory and are only reset during the scan tool DTC information clear process. These systems also store MIL status in non-volatile memory and MIL status is only reset with the DTC information clear process.

6.21 DTCs

TEST PROCEDURE DETAILS & DESIGN RATIONAL
MIL Command ON & DTCs

Diagnostic Trouble Codes (DTCs) are 5-digit alpha-numeric codes with which the OBD system uses to specify the type and general location of malfunctions.

P0420

Each DTC has an associated test that is designed to detect a failure with an emissions control system/component, or system/component that is used for monitoring an emission control system.

When an emissions related problem has been detected and confirmed to be an actual component or system malfunction that may cause emissions to exceed applicable standards, the OBD system will command the MIL ON to alert the driver that the vehicle is in need of service, and will store the applicable DTC information.

Vehicles will fail the emissions test if the OBD system has stored one or more DTCs that cause the MIL to illuminate. Vehicles will not fail the emissions test due to the presence of DTCs only.

Vehicles will fail the emissions test if the OBD system commands the MIL ON even though there may be no DTCs stored in the system.

Click here for information related to DTC Service Modes | Click here for information related to DTC operation | Click here for examples of DTCs | Click here for more information on DTC structure

DTC Details

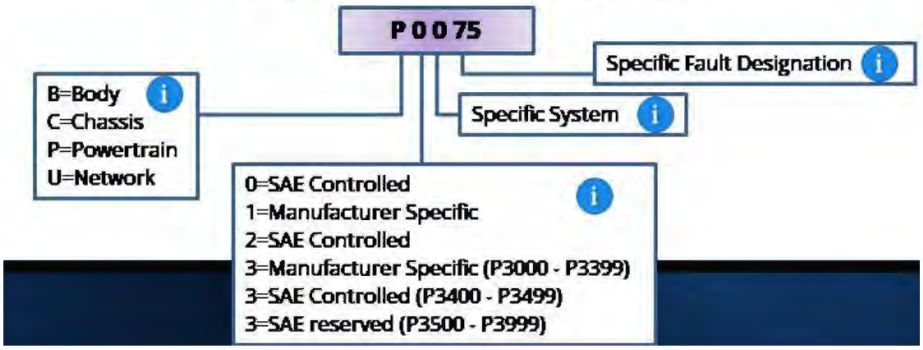
Test Procedure Details and Design Rational
DTC Structure

DTCs are intended to indicate the type and general location of emission related faults.

With OBD standardization, DTC structure, types and general operation are similar between vehicle manufacturers.

The uniform DTC numbering system used by OBD systems follows the SAE J2012 Recommended Practice for Diagnostic Trouble Code Definitions. DTCs are required to be displayed in a five-digit alpha/numeric format.

DTC Structure Example:
Intake Valve Control Solenoid Circuit Bank 1



Specific DTCs-Examples

DTC Examples

DTC	NAME/DESCRIPTION
P0170	Fuel Trim Malfunction (Bank 1)
P0171	System too lean (Bank 1)
P0172	System too rich (Bank 1)
P0300	Random or multiple cylinder misfire detected
P0301*	Cylinder #1* misfire detected
P0420	Catalyst System Efficiency Below Threshold Bank 1
P0430	Catalyst System Efficiency Below Threshold Bank 2
P0439	Catalyst Heater Control Circuit Bank 2
P0600	Serial Communication Link
P0650	MIL Control Circuit/Open
P202A	Reductant Tank Heater Control Circuit/Open
P34A3	Cylinder 12 Deactivation/Intake Valve Performance

*DTCs P0301 - P0312 are related to misfire in specific cylinders

DTC and MIL Illumination

Test Procedure Details and Design Rational
DTCs and MIL Illumination

A vehicle does not fail an emissions test due to the presence of DTCs alone. This is because of the operational rules of DTCs that have been standardized for all light-duty gasoline powered vehicles since 1996 MY.

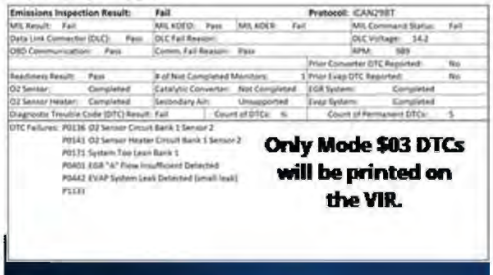
If a malfunction that caused the MIL to illuminate is not present for 3 consecutive operating events where the test(s) related to the MIL illuminating malfunction runs and passes, the MIL is allowed to extinguish, but the DTC(s) will remain in memory for a duration of 40 warm-up cycles.
Because of this allowance, a vehicle does not, and should not, fail the emissions test based solely upon the presence of DTCs.

DTC Related Service Modes

Test Procedure Details and Design Rational
MIL Command ON & DTCs

During the emissions test, communications between the vehicle OBD system and the off-board testing equipment is facilitated through the use of several different service modes. There are 3 different service modes related to retrieving DTCs:

- **Service Mode $03 retrieves DTCs that identify confirmed emissions-related malfunctions and will cause the MIL to be commanded ON when the malfunction is first confirmed. Mode $03 DTCs will be printed on the VIR if the MIL is currently commanded ON.**
- **Service Mode $07 retrieves DTCs that identify emissions-related malfunctions which have not yet been confirmed and consequently have not yet caused the MIL to illuminate. Mode $07 DTCs are not printed on the VIR.**
- **Service Mode $0A retrieves DTCs that can only be cleared by the vehicle OBD system after the malfunction has been determined to be no longer present and the MIL is no longer being commanded ON. A permanent DTC is stored when a confirmed (Mode $03) DTC is stored and is commanding the MIL to illuminate.**



*The $ identifies a hexadecimal value

6.22 Vehicle Communications

TEST PROCEDURE DETAILS & DESIGN RATIONAL
Vehicle Communications Summary

Vehicles will fail the communications portion of the emissions test if the vehicle does not maintain sufficient voltage to the DLC during OBD communication or if the OBD system does not transmit the necessary information to the inspection equipment.

If the vehicle does not communicate after the second communication attempt, inspectors shall verify that a valid communications failure exists by using the MDAS OBD verification tool to verify the communication failure according to the lane software procedures.

If the OBD verification tool determines that the DAD is not capable of communicating with the vehicle, the MDAS will automatically abort the OBD test and generate an emissions VIR to describe the failure.

If the OBD verification tool determines that the DAD is capable of communicating with the vehicle, inspectors are required to make one additional communication attempt. If the vehicle does not communicate with the MDAS, the MDAS shall determine and record the reason for this failure and print this reason on the emissions VIR.

6.23 Emissions Testing Summary

TEST PROCEDURE DETAILS & DESIGN RATIONAL
Emissions Testing Summary

To accurately conduct an emissions test, the inspector must know:

- The various appearances of the MIL and range of behaviors during KOEO;
- Normal MIL operation and possible variations during KOER;
- The appearance and location of the DLC;
- Proper on- and off-board DLC connection and disconnection procedures;
- Proper vehicle operating conditions during each step of the emissions test;
- How to properly conduct a self-test during a non-communication event to identify whether the vehicle or the equipment is at fault;
- How to accurately interpret VIR information.

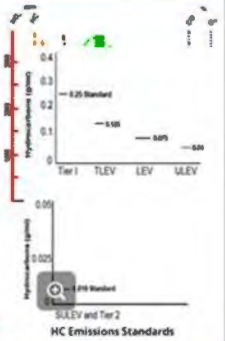
7. Emission Control Devices and Systems

7.1 Control Systems Introduction

EMISSION CONTROL DEVICE FUNCTION, CONFIGURATION, & INSPECTION

Hydrocarbons (HC), Carbon Monoxide (CO), Nitrogen Oxides (NOx), and Particulate Matter (PM) are the principle pollutants emitted to the atmosphere from the exhaust of an internal combustion engine. HC emissions are also a result of evaporating fuel and crankcase vapors.

The Clean Air Act of 1977, and subsequent amendments to the Clean Air Act, sets limits to the amounts of these pollutants that can be emitted from a vehicle. Over time, these standards have evolved and have continued to drive technological advancements in order to meet the newer and more stringent standards.



HC Emissions Standards

To address these challenges, fuels have improved, vehicle and engine manufacturers have created self-adjusting fuel and ignition control systems, made improvements in basic engine design as well as significant advancements in managing intake and exhaust valve opening/closing events, and added pollution control devices such as catalytic converters that reduce emissions by over 90% when operating properly.

7.2 Control Systems pg 2

EMISSION CONTROL DEVICE FUNCTION, CONFIGURATION, & INSPECTION
OBD Systems

Modern OBD systems represents major advancements in the detection and identification of emissions-related malfunctions. OBD requirements not only improve fault detection, OBD regulations also standardize:

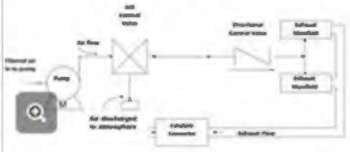
- Emissions-related terminology,
- Data communications between on-board and off-board computer systems,
- Diagnostic Link Connector (DLC),
- Malfunction Indicator Light (MIL),
- Readiness Indicator operation,
- Stored diagnostic information, including diagnostic trouble codes (DTCs) and stored engine conditions (Freeze Frame).

OBD conducts the monitoring and fault detection/notification processes related to the vehicle's emission control system and powertrain operation. Monitoring and evaluation for proper operation of the powertrain, emission control systems, and any other component or system that is part of a diagnostic strategy used in emissions controls or fault detection, occurs as often as vehicle operating conditions will allow. Diagnostic information stored in on-board computer memory is designed to aide diagnosticians more efficiently identify, repair, and verify repairs of emissions-related malfunctions.

7.3 AIR Systems

EMISSION CONTROL DEVICE FUNCTION, CONFIGURATION, & INSPECTION
Secondary Air Injection Reaction (AIR) Systems

Secondary Air Injection Reaction (AIR) Systems have been used on spark ignition engines since the 1970's. The main purpose of AIR systems is to reduce HC emissions during cold engine operating conditions. Due to the rich air/fuel ratio needed for good engine performance during cold conditions, HC emissions are much higher.



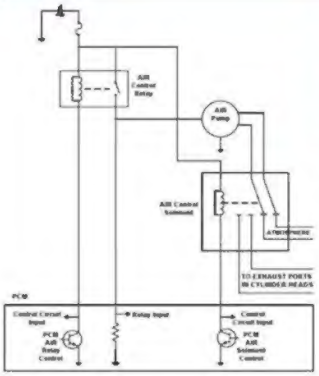
AIR systems are designed to direct fresh air under pressure into the exhaust stream immediately after the exhaust ports. The fresh air mixes with hot exhaust gases and continues the combustion of fuel (HCs) not burned in the combustion chamber. As an additional benefit, CO molecules may combine with oxygen to form CO_2, reducing CO emissions during cold start as well.

Electronically controlled AIR systems typically consist of an electrically driven pump and a solenoid operated directional control valve to either allow air to flow from the pump to the exhaust system or to be diverted away from the exhaust system, depending on engine operating conditions.

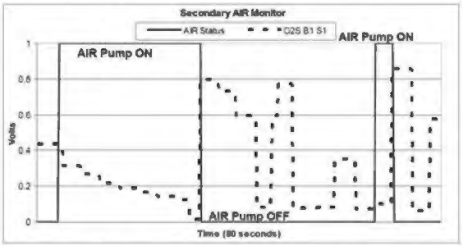
Click here for information related to AIR System OBD Monitoring

AIR OBD Monitoring

Emission Control Devices and Systems:
AIR System Monitoring



OBD monitoring of AIR systems not only identifies electrical circuit failures but also identifies system performance malfunctions such as air flow to the wrong position, physically inoperative switching valves or pumps that have restricted or no flow.



Although there are several methods used by the vehicle manufacturers to verify proper AIR system performance, a common approach includes monitoring the pre-catalyst exhaust oxygen sensor (O2S1) and comparing the change in the signal to the commanded change of the AIR pump's ON/OFF state. If the pump and related flow controls are operating properly, there will be a direct correlation.

7.4 A/C Systems

EMISSION CONTROL DEVICE FUNCTION, CONFIGURATION, & INSPECTION
Air Conditioning (A/C) Systems

Typically, the A/C system is not included in emissions inspections, however, due to OBD monitoring requirements there may be vehicles that may have the A/C system monitor supported.

1996 through 2005 model year vehicle monitoring requirements for the Air Conditioning (A/C) system is limited to refrigerant compounds that can harm the stratospheric ozone layer or are reactive in forming atmospheric ozone. Any loss of refrigerant must be detected. Monitoring of the A/ C system includes detection of any faults with the sensors for the A/C system. Once a leak has been detected, the MIL must remain illuminated until the leak has been repaired. Manufacturers using federally approved refrigerants (i.e., R-134A for automobiles) need not comply with this monitoring requirement.

According to the OBD requirements from EPA and the California Air Resources Board (CARB), beginning model year 2006, vehicle manufacturers using ". . an engine control strategy that alters off idle fuel and/or spark control when the A/C system is on, the OBD II system shall monitor all electronic air conditioning system components for malfunctions that cause the system to fail to invoke the alternate control while the A/C system is on or cause the system to invoke the alternate control while the A/C system is off. Additionally, the OBD II system shall monitor for malfunction all electronic air conditioning system components that are used as part of the diagnostic strategy for any other monitored system or component. . .If no single electronic component failure or deterioration causes emissions to exceed 1.5 times any of the appropriate applicable emission standards. . .nor is used as part of the diagnostic strategy for any other monitored system or component, manufacturers are not required to monitor any air conditioning system component. . ." CARB 1968.2

7.5 Catalytic Converter Systems

EMISSION CONTROL DEVICE FUNCTION, CONFIGURATION, & INSPECTION
Catalytic Converter Systems Used With Spark Ignition Engines

In the U.S.A., catalytic converters have been used with spark-ignition engines (engines fueled with gasoline, natural gas and propane) since the 1970's. As catalytic converters became more common, leaded fuel was phased out of use due to the lead contamination that occurred inside the catalytic converters.

Modern catalytic converters are typically referred to as 3-Way Converters (TWCs) because they are designed to split NOx (NO and NO_2) into nitrogen (N_2) and oxygen (O and O_2), as well as combine oxygen with HCs to produce water (H_2O) and carbon dioxide (CO_2) and combine oxygen with carbon monoxide (CO) to produce carbon dioxide (CO_2).

A catalyst helps promote chemical reactions under conditions the reaction wouldn't normally occur, and is not consumed in the reaction. As a result, a catalytic converter is designed to last the lifetime of the vehicle and will not "wear out" through normal use. Certain malfunctions, such as engine misfire, create conditions that can permanently damage a catalytic converter.

click for more information

Click here for information related to TWC System OBD Monitoring

Back to Section 3: HC's

Because of the importance of the Catalytic Converter, the GVIP program requires the TWC Monitor to be supported by the vehicle's OBD system.

Damaged TWC

Emission Control Devices and Systems: TWC Damage

TWC internal damage as shown in the photograph, is caused by excessive heat resulting from excessive amounts of unburned fuel passing through the engine. As the unburned fuel (HCs) come in contact with the catalyst sites, the hydrogen and carbon atoms separate, releasing a large amount of heat energy. If too much heat energy is released in a short amount of time, the metal and ceramic materials will melt.

Chemicals such as lead, glycol-based engine coolants, carbon (soot), silicon additives in fuels and sealants, and phosphorus from engine oils can poison the catalytic converter by accumulating on the surface of the catalyst sites.

Poison accumulations restrict exhaust emissions from contacting the catalyst sites, lowering catalytic converter efficiency.

Most[i] poisons will not permanently damage the catalytic converter, but if the source of the poison is not removed in time, the buildup will prohibit normal operating temperatures from being reached and the poison will not eventually burn off.

[i] Lead is a permanent poison for catalytic converters

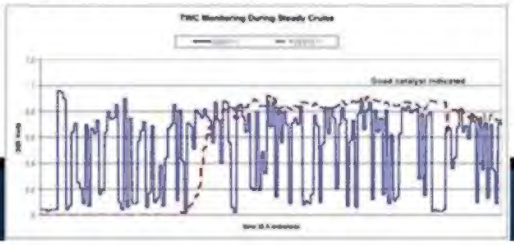
TWC OBD Monitoring

Emission Control Devices and Systems: TWC OBD Monitoring

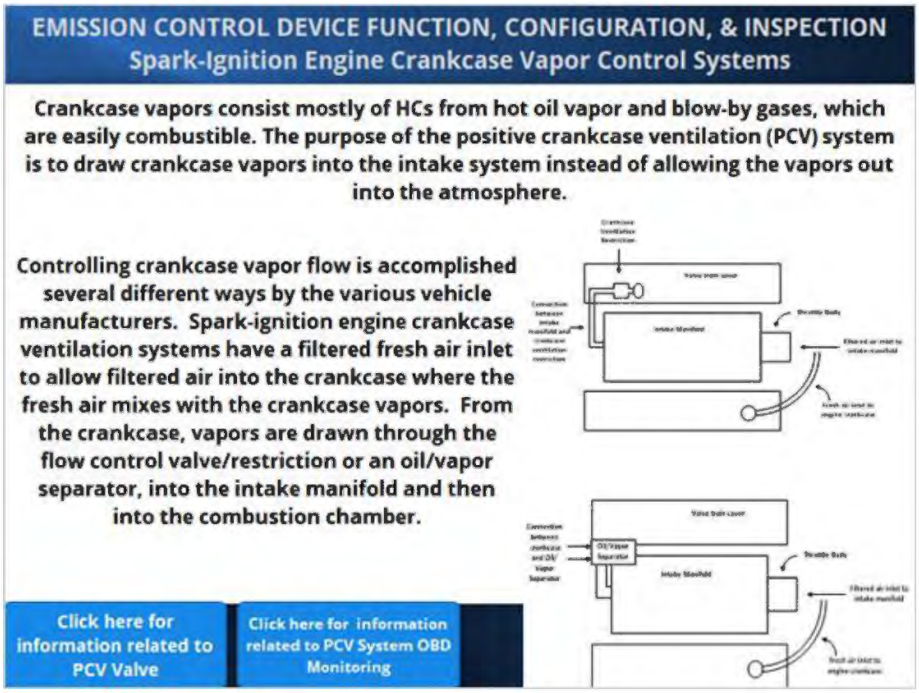
Three Way Catalyst (TWC) operation is monitored for efficiency once the TWC(s) have reached normal operating temperatures and a steady operating state has been achieved. TWC temperatures are determined by:

- **Calculations based on operating conditions since engine start and/or**
- **A TWC temperature sensor providing input to the PCM**

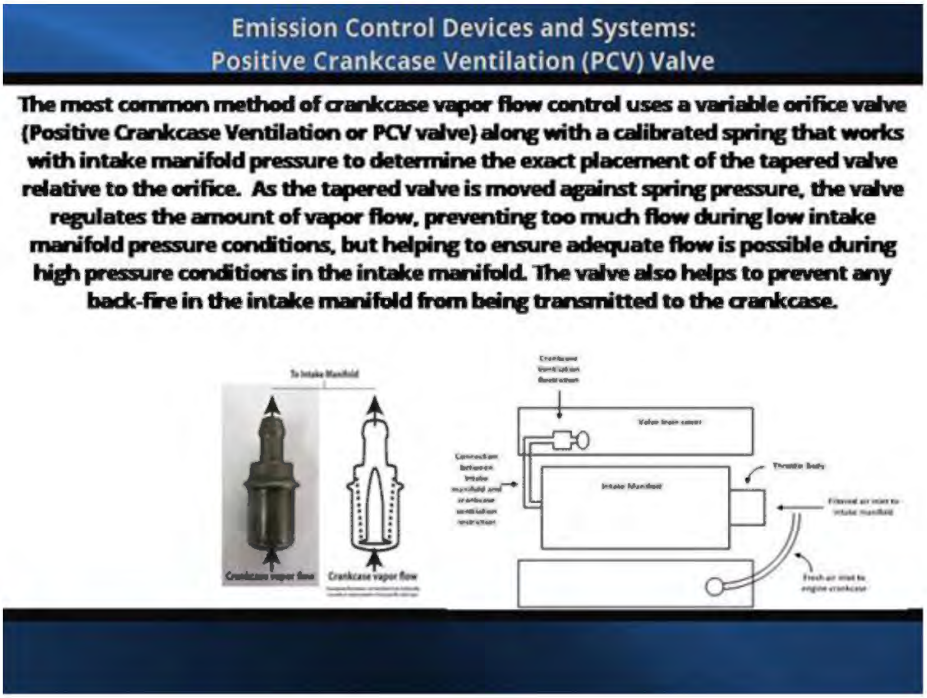
Currently vehicle manufacturers have used monitoring strategies that include HO2S's in front and back of the TWC(s). By monitoring the HO2S signals, oxygen storage capacity (OSC) of the TWC is determined and TWC efficiency can be calculated. Currently for many systems, monitoring takes place during a steady cruise while engine loads are fairly stable. For this monitoring strategy, the front and rear HO2S signals are compared over a sample period to determine TWC OSC and calculate TWC efficiency.



7.6 Crankcase Ventilation Systems - Spark Ignition Engines



PCV Valve Details



PCV System OBD Monitoring

Emission Control Devices and Systems:
OBD Monitoring Requirements for PCV Systems

PCV system monitoring requirements began with vehicle model year 2002 and were phased in through 2004. Monitoring of the PCV system is part of the Comprehensive Component Monitor and is required to identify if a disconnect occurs between the PCV valve and the engine crankcase or between the PCV valve and intake manifold. Exceptions to the monitoring requirement include the following engine design features:

- **PCV systems designed such that the PCV valve is fastened directly to the crankcase in a manner which makes it significantly more difficult to remove the valve from the crankcase rather than disconnect the line between the valve and the intake manifold (taking aging effects into consideration)**
- **Connections between the PCV valve and crankcase are resistant to deterioration or accidental disconnection, are significantly more difficult to disconnect than the line between the valve and the intake manifold, and are not subject to disconnection per manufacturer's repair procedures for non-PCV system repair work.**
- **If a disconnect between the PCV valve and the intake manifold (1) causes the vehicle to stall immediately during idle operation; or (2) is unlikely due to a PCV system design that is integral to the induction system (e.g., machined passages rather than tubing or hoses).**

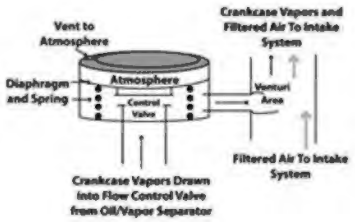
To accommodate these exceptions so PCV system monitoring is not required, manufacturers have taken different approaches to redesigning PCV systems such as using a threaded connection between the PCV valve and engine crankcase or valvetrain cover or incorporating an integrated fixed size orifice into a fitting at the crankcase or valve cover.

7.7 Crankcase Ventilation Systems - Compression Ignition Engines

EMISSION CONTROL DEVICE FUNCTION, CONFIGURATION, & INSPECTION
Compression-Ignition Engine Crankcase Vapor Control Systems

Modern compression-ignition (diesel fuel powered) engines also use a closed-crankcase ventilation (crankcase emissions control) system in order to prevent HC-rich crankcase vapors from escaping into the atmosphere.

Due to higher combustion chamber pressures and resulting blow-by gas volumes, diesel-powered engines typically do not require a filtered fresh air inlet to the crankcase area as do spark-ignition engines. Through the use of a pressure control valve (or valves), crankcase pressures are maintained at a constant level.



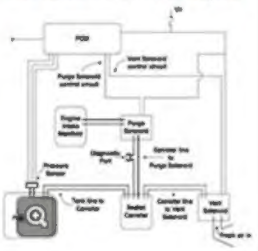
7.8 EECS

EMISSION CONTROL DEVICE FUNCTION, CONFIGURATION, & INSPECTION
Evaporative Emissions Control Systems (EECS)

Evaporative Emissions Control Systems (EECS) are designed to reduce HC emissions on gasoline powered vehicles.

HC evaporative emissions come from any area where fuel is stored on the vehicle, such as fuel tanks. In an effort to reduce fuel vapors from escaping to the atmosphere during refueling events, vehicle manufacturers have incorporated on-board fuel vapor recovery into the EECS.

The EECS is designed to store fuel vapors at times when the engine is not able to use (combust) the vapors, but release (purge) the fuel vapors during operating conditions when the engine can combust the fuel vapors. There are many different system designs, but all systems have a storage canister with a source of fresh air into the canister, some type of sealing system on the fuel refill side (fuel cap or other), control valves/ solenoids, and vacuum hoses connecting the various components together.



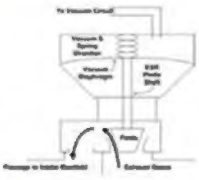
Examples of different EECS storage canisters

7.9 EGR Systems

EMISSION CONTROL DEVICE FUNCTION, CONFIGURATION, & INSPECTION
Exhaust Gas Recirculation (EGR) Systems

Exhaust Gas Recirculation (EGR) systems are designed specifically to help reduce NOx emissions in both spark (gasoline, CNG, etc.) and compression ignition (diesel) engines. Since NOx emissions are formed under high temperature conditions, the function of the EGR system is to reduce overall combustion chamber temperatures.

Temperature reductions are achieved by introducing a small, metered amount of exhaust gas back into the intake system. The exhaust gas partially fills the combustion chamber, reducing the amount of room for air, and as a result, less fuel is needed. With less air and fuel in the combustion chamber, less heat energy is released during the combustion process, and NOx emissions are reduced. Some vehicle manufacturers also list the EGR system as a fuel economy system due to the reduced fuel used while the EGR system is operational.



EGR systems use either an external valve to meter exhaust gas flow from the exhaust system to the intake manifold, or a variable timing camshaft system that varies the amount of exhaust and intake valve overlap.

Electronic EGR

7.10 EGR Systems pg 2

EMISSION CONTROL DEVICE FUNCTION, CONFIGURATION, & INSPECTION
Exhaust Gas Recirculation (EGR) Systems

EGR systems that are used on modern compression ignition (diesel fueled) engines typically include some type of cooling system to help stabilize and control exhaust gas temperatures before being directed back into the induction system.

If EGR flow is not adequate, NOx emissions increase, while too much EGR flow will cause rough running (misfire), raising HC emissions.

Diesel EGR Cooler

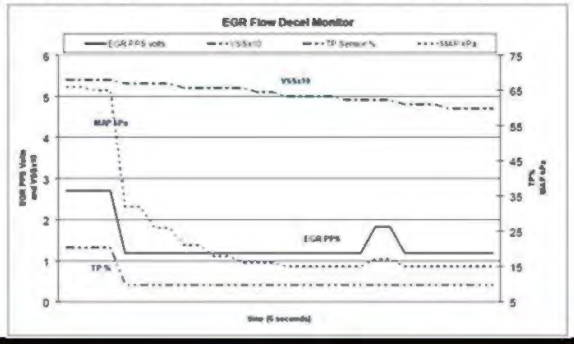
Click here for information related to EGR System variations

Click here for information related to EGR System OBD Monitoring

EGR OBD Monitor

Emission Control Devices and Systems:
EGR OBD System Monitor

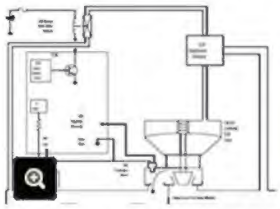
The EGR system can be monitored several different ways, but one of the most common methods to verify proper EGR functionality is to open the EGR valve during an extended deceleration event and monitor both the EGR pintle position, as well as the change in intake manifold pressure. As the EGR valve opens, exhaust gas flows into the intake manifold and causes an increase in the intake manifold pressure. The rate of pressure change should match predetermined values based on the position of the EGR valve's pintle.



EGR System Variations

Emission Control Devices and Systems: EGR System Variations

Some vacuum controlled EGR systems use an external Backpressure Transducer in order to better regulate the vacuum signal to the EGR valve. The Backpressure Transducer is a critical component to the EGR system and must have all the necessary vacuum and exhaust fittings/connections in place and secured for proper operation.



Many engines now use some type of variable valve timing (VVT) system which varies camshaft timing relative to the crankshaft on either the intake, exhaust or both camshafts. Variable valve timing provides many benefits including reduced pumping losses, increased volumetric efficiency, removal of the external exhaust gas recirculation system with improved exhaust gas recirculation distribution among cylinders which all add up to improved torque across a wider engine RPM range.

Variable Valve Timing Actuator

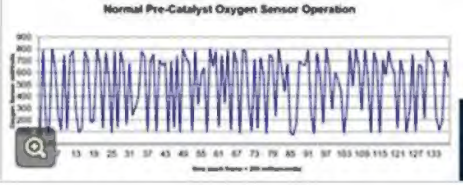
7.11 O2S Systems

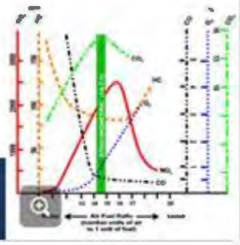
EMISSION CONTROL DEVICE FUNCTION, CONFIGURATION, & INSPECTION
Exhaust Oxygen Sensor (O2S) Systems

One of the significant advancements in vehicle emissions controls is the electronic spark and fuel injection engine management system with feedback information to more closely control the spark timing and fuel being delivered based on the amount of oxygen available in each combustion event.

With the intake air mass known, a base fuel injection pulse can be calculated for the current vehicle operating conditions. To further adjust or "trim" injector pulse width, exhaust oxygen must be determined. Conventional exhaust oxygen sensors (O2S) are able to detect oxygen in the exhaust stream and provide a signal that represents oxygen amounts above (lean) and below (rich) the target 14.7:1 air to fuel ratio.

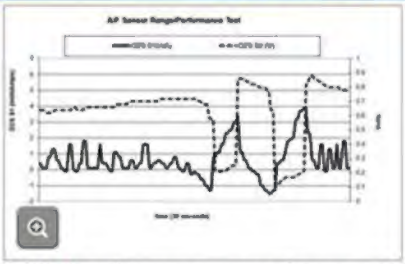
Intake air volume and density can be calculated or measured through the use of sensors that are able to provide input data that represents critical engine operating conditions such as Mass Air Flow (MAF), Manifold Absolute Pressure (MAP), Throttle Position (TP), Engine Coolant Temperature (ECT) and Engine RPM.





7.12 O2S Systems

EMISSION CONTROL DEVICE FUNCTION, CONFIGURATION, & INSPECTION
Exhaust Oxygen Sensor (O2S) Systems



Wide-band oxygen sensors (commonly referred to as A/F sensors) provide a more accurate signal relating to the actual air to fuel ratio. A/F sensors are able to accurately indicate exhaust oxygen levels from 10:1 up to atmospheric oxygen in the exhaust.

On vehicles that use A/F sensor(s), the A/F sensor(s) will be located in front of the TWC system and a conventional O2S located behind the TWC system.
All O2Ss used for fuel trim calculations (pre- and post-TWC) are included in the O2S Monitor.

Regardless of the exhaust oxygen sensor system type used, the Readiness Monitor section of the VIR will indicate O2 Sensor.

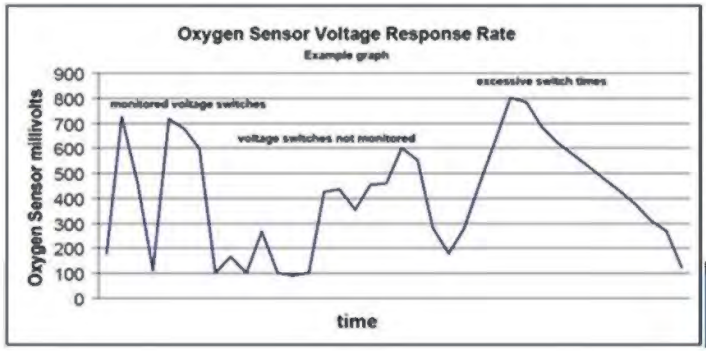
Click here for information related to O2S System OBD Monitoring

Because of the important feedback information the O2S(s) provide, the GVIP program requires the O2S Monitor to be supported by the vehicle's OBD system.

O2S System OBD Monitoring

Emission Control Devices and Systems:
O2S System OBD Monitoring

Oxygen sensors (O2S) or Heated O2S (HO2S) used for fuel control are required to be monitored for proper response rate, output voltage, and any other operating characteristic that affect emissions.
Response rate of an HO2S is the time required for the signal to switch from below/above and above/below calibrated levels, indicating the variations in exhaust oxygen content. The switching must occur within a predetermined amount of time. The ability of the HO2S to accurately respond to the changes in exhaust oxygen content is critical for accurate feedback to the PCM for proper air/fuel control.



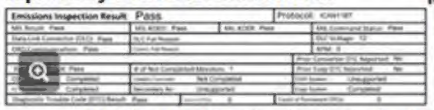
O2S signal circuits are also monitored for shorts to positive voltage, ground, and open circuit conditions.

7.13 Heated O2S Systems

EMISSION CONTROL DEVICE FUNCTION, CONFIGURATION, & INSPECTION
Heated Exhaust Oxygen Sensor (O2S) Systems

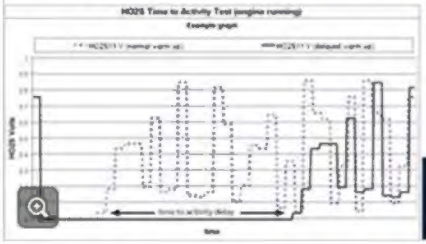
In order to provide important exhaust oxygen information as soon as possible after engine start, most exhaust oxygen sensors use some type of a heater system in order to bring the sensor element up to operating temperature quickly without causing thermal shock or other damage to the sensing element.

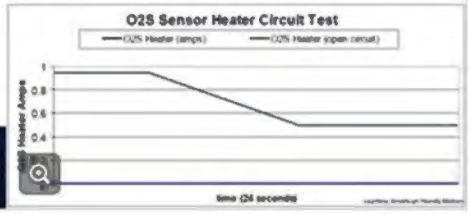
O2S heaters are built in to the sensor and are not serviced separately from the sensor itself.



The O2S Heater monitor is separate from the O2S monitor in order to allow unique Monitor Readiness display. Separate Monitor Readiness more clearly indicates monitoring progress of the complex exhaust oxygen sensing system.

O2S heater monitoring includes heater circuit continuity and performance. Performance can be determined through time-to-activity or by measuring heater amperage.



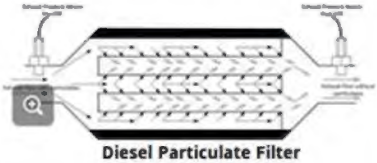


7.14 Diesel Exhaust Catalyst Systems

EMISSION CONTROL DEVICE FUNCTION, CONFIGURATION, & INSPECTION
Diesel Exhaust Catalyst Systems

Diesel Oxidation Catalysts (DOCs) use the same catalyst metals (platinum/palladium) as spark ignition engines in order to convert HC's and CO into H_2O and CO_2. DOCs are also known to help reduce particulate matter in diesel exhaust. As a result of the multiple benefits derived from the use of DOCs, some vehicle manufacturers will combine a DOC with a Diesel Particulate Filter (DPF) in order to increase the amount of particulates removed from the exhaust.

Diesel Oxidation Catalyst



Diesel Particulate Filter

Particulate filters are designed specifically to reduce harmful particulates from the exhaust.

Selective Catalyst Reduction (SCR) systems are also used on some diesel engines in order to reduce NOx emissions by injecting diesel emissions fluid (DEF) into the exhaust in front of a specialized catalyst designed to promote reactions between NOx emissions and the ammonia based DEF, which results in the formation of H_2O (water), and N_2 (nitrogen).

Selective Catalyst Reduction System

7.15 Emission Control Devices and Systems Summary

EMISSION CONTROL DEVICE FUNCTION, CONFIGURATION, & INSPECTION
Summary

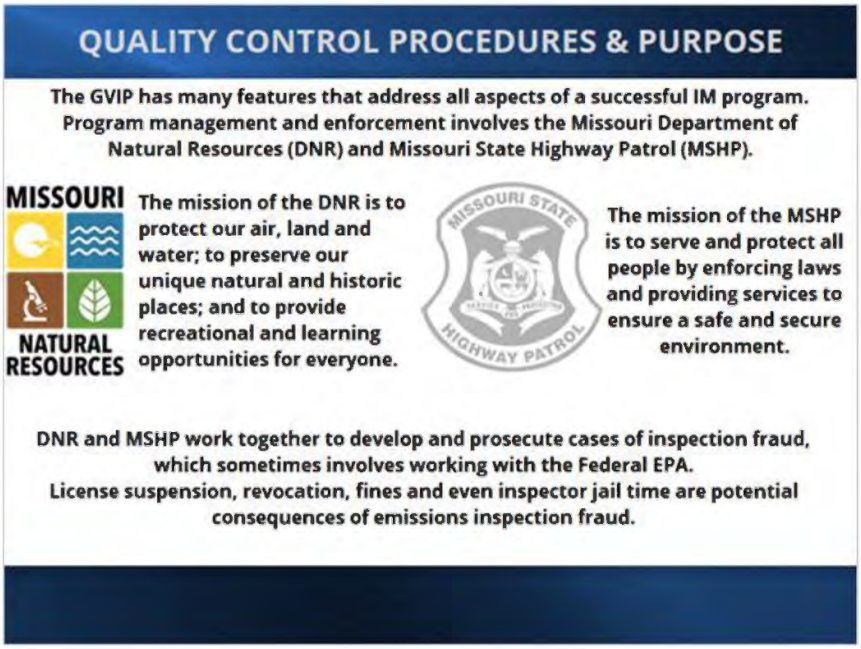
A visual inspection of the vehicle emission control systems and components should include verifying all related electrical connections are securely connected to the related device and free from corrosion, and that the wiring is properly routed away from any moving components or other abrasive surfaces.

Exhaust system plumbing should be free from corrosion and/or leaks. Post-TWC O2Ss should not be threaded in to any type of spacer or extension.

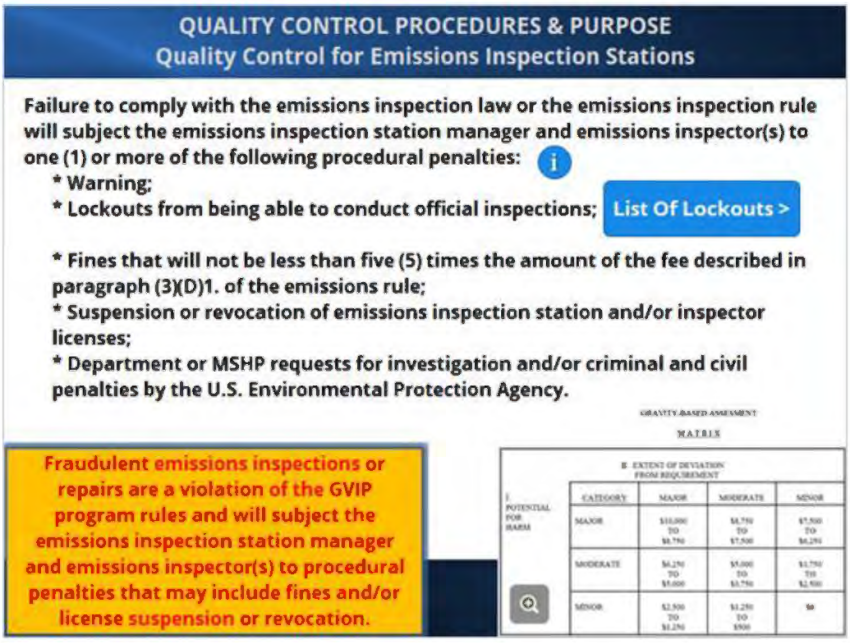
All vacuum components and hoses should be properly connected and routed properly away from heat sources or abrasive surfaces.

8. Quality Control Procedures and Purpose

8.1 Quality Control



8.2 Enforcement Actions



Lockouts pg1

Quality Control Procedures and Purpose
Quality Control for Emissions Inspection Stations: Lockouts

The department or MSHP may electronically lockout any emissions inspector, station, MRRT, or equipment if the department or MSHP identifies any irregularities within the emissions inspection database or any irregularities identified during either overt or covert audits. The lockout may precede warnings, license suspensions or revocations, or arrests. A lockout warning will be displayed on the monitor of any inspection equipment that is locked out by the department or MSHP. Lockouts shall prevent the performing of emissions inspections by the locked out party. Lockouts shall be cleared when the department or MSHP is satisfied that there is no longer a need for the lockout. Irregularities include, but are not limited to:

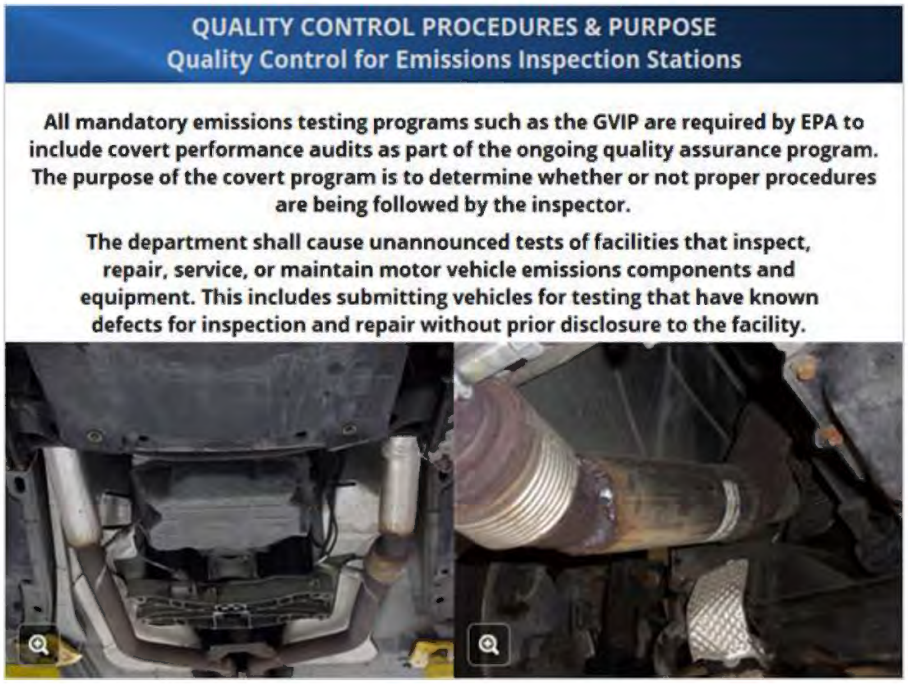
*** Failure to enter all required information properly and accurately;**
*** Uploading unclear pictures, uploading license plate pictures that do not match the license plate recorded on the VIR, or failing to upload pictures ;**
*** Clean scanning;**
*** Performing more inspections than are physically possible for a given time duration;**
*** Performing emissions inspections using another emissions inspector's fingerprint or password;**
*** Conducting off-line inspections while the emissions equipment is not connected to the VID, unless the VID is off-line;**
*** Conducting improper safety inspection of the air pollution control devices;**

Lockouts pg2

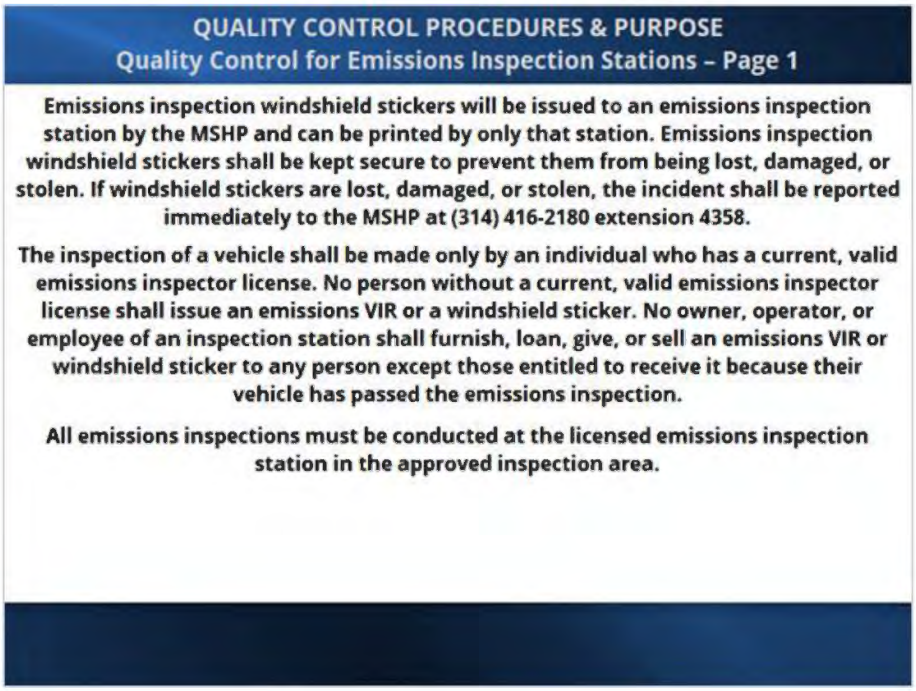
Quality Control Procedures and Purpose
Quality Control for Emissions Inspection Stations: Lockouts

*** Bad faith or fraudulent repairs performed at the emissions inspection station or MRRT repair facility where-**
(I) Vehicles repeatedly fail reinspections for the same reasons that they initially failed the OBD test;
(II) Vehicle repairs are not qualifying repairs; or
(III) Physical visual inspection of the repaired vehicles determines that the repairs were not performed as described on the submitted repair receipts;
*** Installing or assisting motorists with the installation of aftermarket catalytic converters that do not conform to EPA's AMCC enforcement policy;**
*** Installing or assisting motorists with the installation of aftermarket components that disable or compromise the capabilities of the vehicle manufacturer's EPA-certified emissions control system;**
*** Failure to maintain a positive balance of emissions inspection credit authorizations;**
*** Failure to upload the emissions inspection results to the VID immediately upon completion of the inspection ;**
*** Failure to properly re-inspect vehicles that failed an initial emissions test;**
*** Failure to pay the VID Service Fees according to the terms of the contract between the contractor and licensed emissions inspection;**
*** Failure to download and install the latest version of lane software to the MDAS; and**
*** Failure to maintain dedicated data transmission capabilities for the emissions inspection equipment to stay online with the contractor's VID.**

8.3 Covert Vehicle Program



8.4 Quality Control for Inspection Stations



8.5 Section Summary

QUALITY CONTROL PROCEDURES & PURPOSE
Summary

GVIP Gateway Vehicle Inspection Program

The best quality control for the GVIP program comes from the inspector group performing the vehicle inspections in the manner outlined in the Missouri Code of State Regulations and as detailed in this training program.

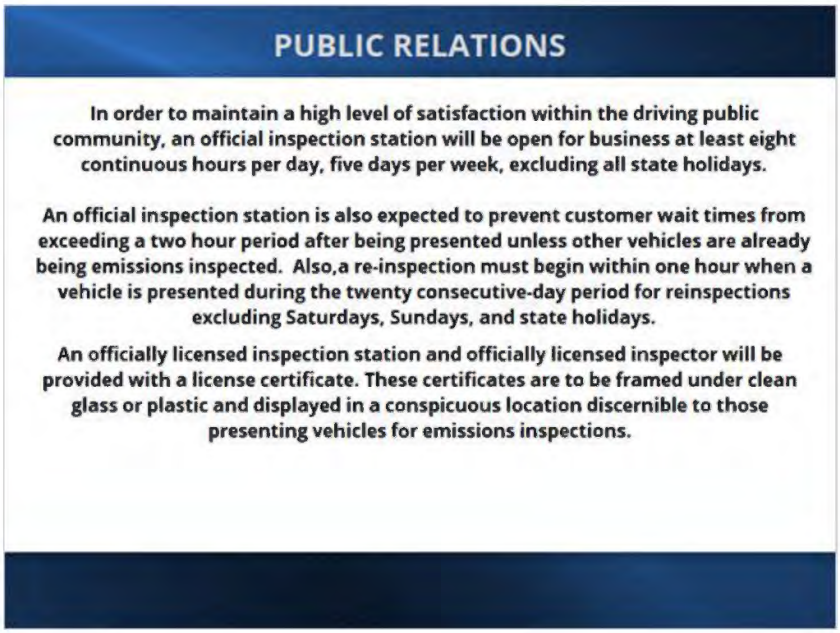
Remember that as a certified inspector, the quality of the vehicle inspection is directly under your control.
The overall integrity of the program relies on you and your fellow inspectors.
The officials at the DNR, MSHP and WEP will help in any way they can if you have questions or concerns.

Dept. Natural Resources	Highway Patrol	WEP
(314) 416-2115	(314) 416-2180	(800) 832-7664 main (714) 990-3100 fax

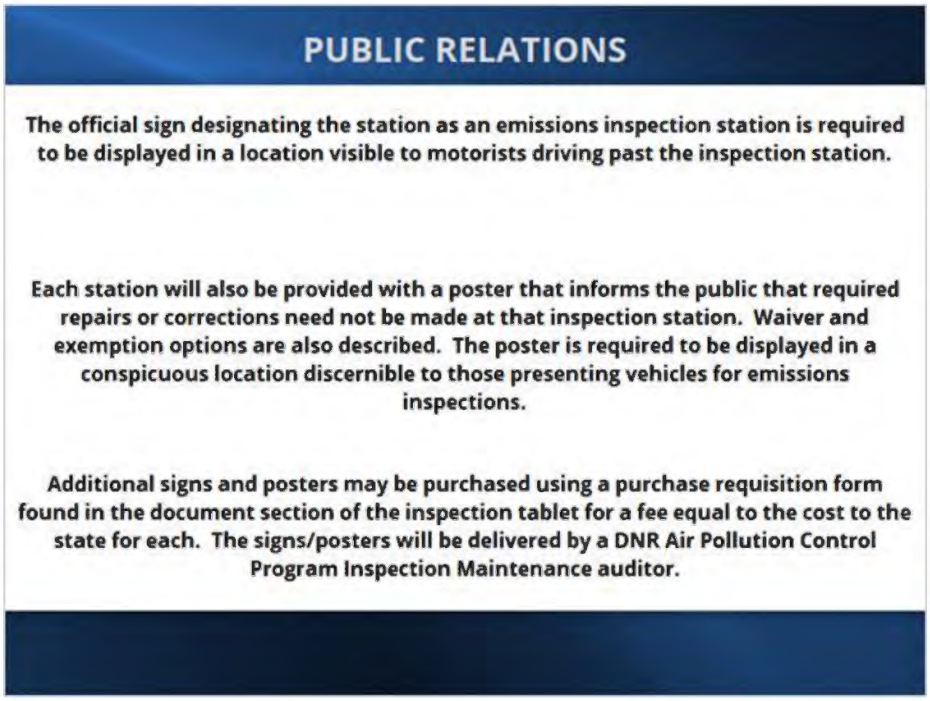
9. Public Relations

9.1 Public Relations

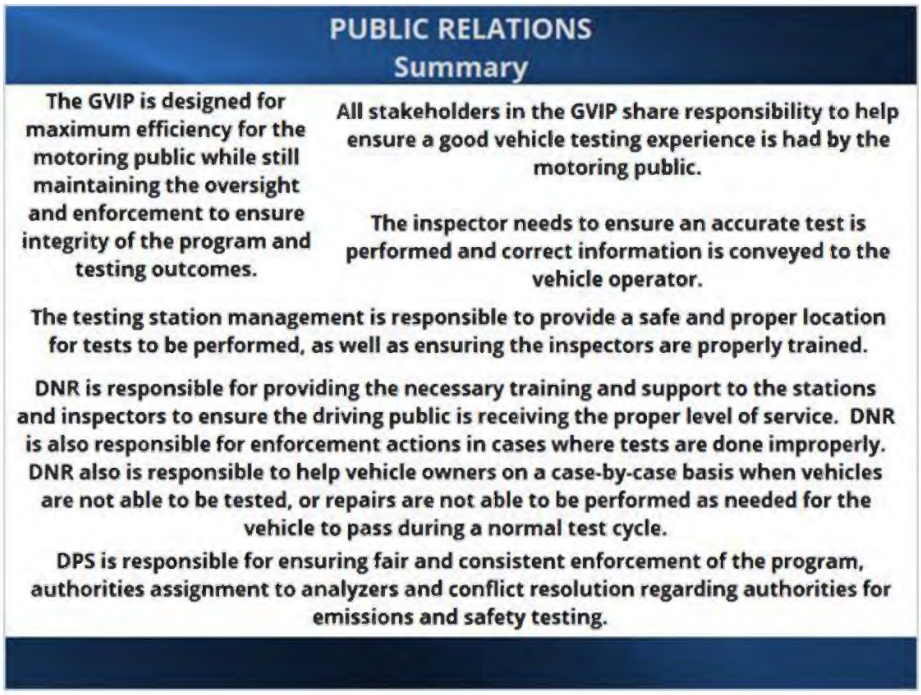
9.2 Operating Hours-Customer Wait Times



9.3 Station Signs and Poster Display



9.4 Public Relations - Summary



10. Vehicle Inspection Safety and Health Issues

10.1 Inspection Safety

VEHICLE INSPECTION SAFETY & HEALTH ISSUES

There are several safety items to be aware of when conducting the vehicle inspection.

As part of the station requirements to be licensed in the GVIP, the emissions test area is to be properly lighted, adequately heated and cooled, and properly ventilated in order to conduct an emissions test safely.

As part of the emissions test, the vehicle engine must be running. As a result of this requirement, vehicle exhaust must be properly evacuated or vented. As discussed in Section 3, CO poisoning is a serious health concern and a very real possibility when working with running vehicles in an enclosed area such as an inspection facility.

When an engine is first started and the catalytic converter is cold (not operating at peak efficiency), CO emissions may be as high as 7% - 10%. As an inspector working around vehicles that have their engine running in an enclosed area, you need to ensure that the vehicle's exhaust is not contaminating the breathable air in your work area.

10.2 Course Summary

SUMMARY

As a certified inspector in the GVIP, you are acting as a representative of the Department of Natural Resources and Highway Patrol. Every vehicle inspection you perform needs to be done with the utmost care and attention to detail.

A vehicle that is in proper operating condition should pass the vehicle inspection and a vehicle that is not operating according to vehicle manufacturer specifications for emissions controls or safety related functions should not pass the test, and as the inspector, you need to ensure that vehicle does not pass the vehicle inspection.

The GVIP has detailed instructions for each inspector to follow that help ensure consistent, repeatable, and accurate test results. At the completion of this training program, the detailed instructions will have been thoroughly covered with review questions being used to help ensure the most important points are understood. The Missouri Code of State Regulations, Title 10 – Department of Natural Resources, Division 10 – Air Conservation Commission, Chapter 5 – Air Quality Standards and Air Pollution Control Rules Specific to the St. Louis Metropolitan Area, part .381 – Onboard Diagnostics Motor Vehicle Emissions Inspection contain the specific regulations and allowances for the current GVIP.
If you have any questions, please review this training program. Also for convenience, 10 CSR 10-5.381 is available in the Resources section. If there are questions or concerns that are not addressed in the training or CSR, please call:
Department of Natural Resources (314) 416-2115