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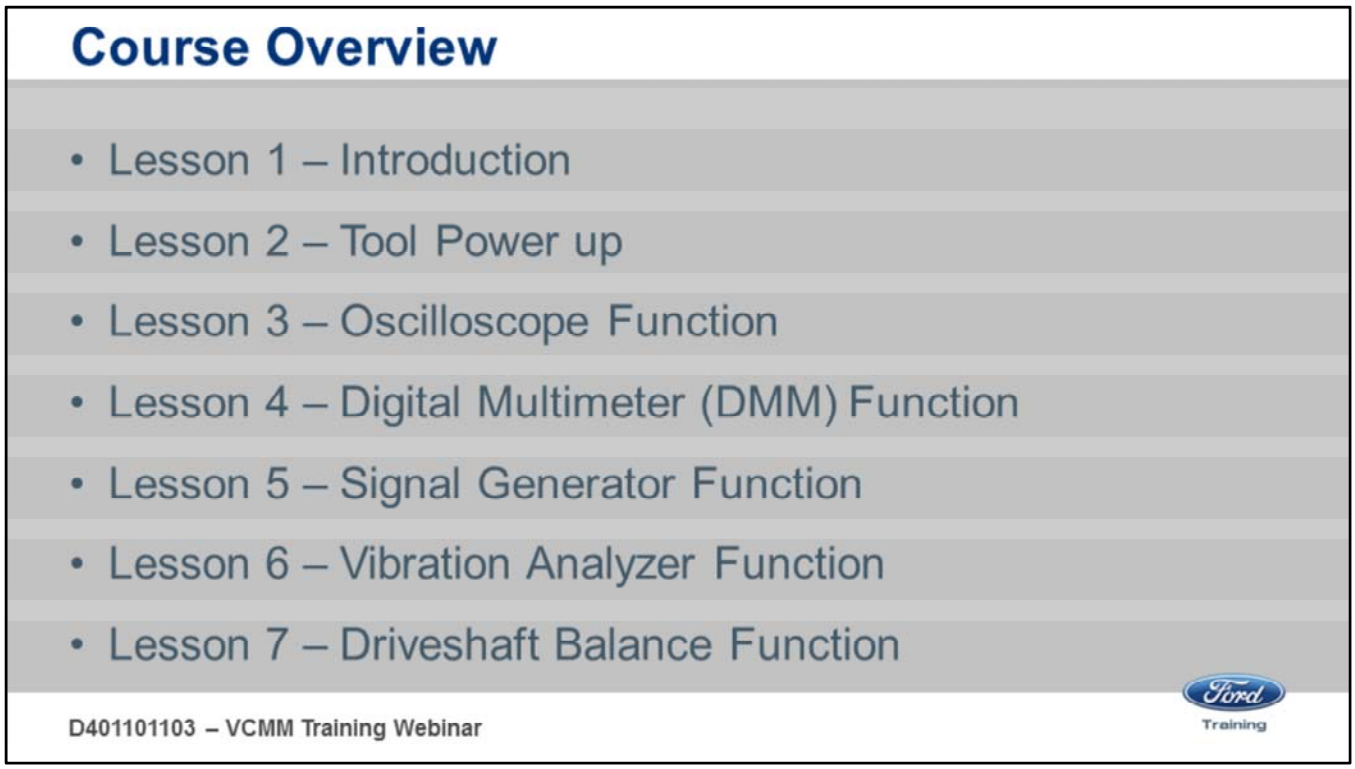
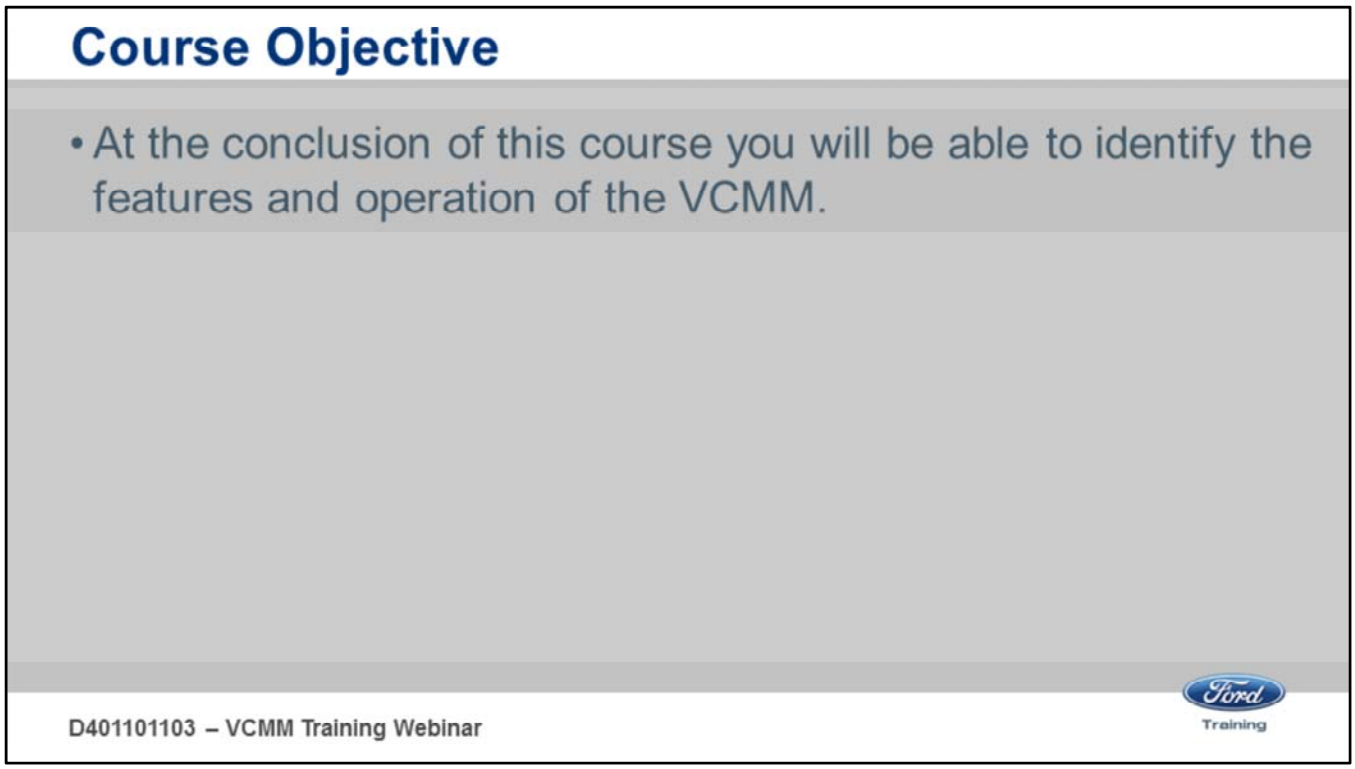
1

Welcome to the Vehicle Communication & Measurement Module (VCMM) webinar.



In this course we will cover the new features of the VCMM in the following lessons:

- Lesson 1 – Introduction
- Lesson 2 – Tool Power up
- Lesson 3 – Oscilloscope Function
- Lesson 4 – Digital Multimeter (DMM) Function
- Lesson 5 – Signal Generator Function
- Lesson 6 – Vibration Analyzer Function
- Lesson 7 – Driveshaft Balance Function



At the conclusion of this course you will be able to:

- identify the features and operation of the VCMM.

Welcome to Lesson 1, Introduction.

In this lesson we will cover:

- What is the VCMM
- Features and functions
- Safety instructions

VCMM New Tool Training

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6

- The VCMM is Ford's next generation high performance, rugged, vehicle serial communications and measurement instrumentation gateway.
- This enhanced device combines the functionality of a VCM II, a Vehicle Measurement Module (VMM) and a vibration analyzer into one unit.
- It provides multiple vehicle serial communication interfaces, including other functionality, to meet the requirements for all Ford Motor Company vehicles.

Note: The VCMM is not compatible with Windows XP

VCM II

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7

- The new VCMM can be used just like the VCM II.
- It allows communication between the scan tool and vehicle.

VMM Oscilloscope and DMM Functions

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The new VCMM replaces the old VMM which is no longer available.

The VCMM has all of the functions of the VMM including:

- A 4-channel oscilloscope
- A Digital Multimeter (DMM) function
- 5th oscilloscope channel routed directly to the Data Link Connector (DLC) pins.

- The new VCMM has time saving features and advantages such as being able to check cam timing without having to remove engine components.
- Another time saver is the fact that you do not have to connect to the DLC using separate probes when using the oscilloscope function.
- Specifically, it is not necessary to use external probes to view HS CAN signals because the 5th channel is connected directly to the VCMM DLC cable.

Signal Generator Function

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9

- The new VCMM also provides a signal generator function that can simulate vehicle sensors or other signals on the vehicle.
- It functions similar to the old VMM.
- The new VCMM hardware allows voltage frequencies and waveforms to be displayed with greater resolution.

Vibration Analyzer Function

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10

- The new VCMM also provides a vibration analyzer function.
- It can perform all of the same functions as the current Vetronix MTS 4000/4100 vibration analyzer.

VCMM Unit

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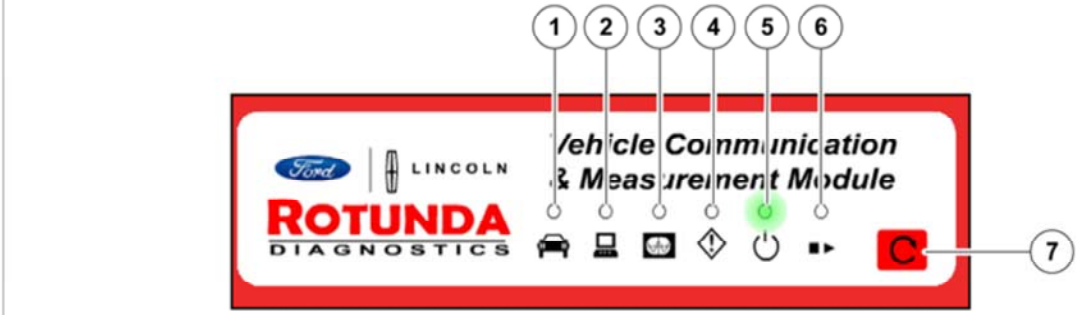
11

The following features provide increased durability and ruggedness for the VCMM:

- Protected in a shock resistant polycarbonate case with rubber end boots.
- Extended operating temperature and voltage range.

The VCMM has six LED indicators and a signaling device to provide the user with continuous visual as well as audible operating status.

VCMM Unit



134

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12

- When power is first applied to the VCMM
- The Vehicle Interface LED (1) will illuminate.
- After 5 seconds the PC Interface LED (2) will illuminate and the Vehicle Interface LED (1) will turn off.
- 10 seconds the Power LED (5) will illuminate and the PC Interface LED (2) will turn off.
- After 15 seconds the speaker will beep for 1 second.

Legend

1. Vehicle Interface LED
2. PC Interface LED
3. Measurement Active LED
4. Error LED
5. Power LED
6. Play / Stop LED
7. Recovery Mode Button

Wireless Capability

- The VCMM has wireless capability when equipped with the USB 2.0 wireless adapter.
- The VCMM still provides detachable cables for direct connection to high-speed USB host interfaces such as laptops, PCs and the vehicle being tested.

Customer Flight Recorder (CFR)

- The VCMM also supports Customer Flight Recorder (CFR) functionality when the optional Pendant Cable VP-2 is attached.
- The CFR is an application designed to be installed and run on the VCMM.
- The VCMM CFR tool is intended to be used for capturing and storing vehicle communications network data.

VCMM Kit

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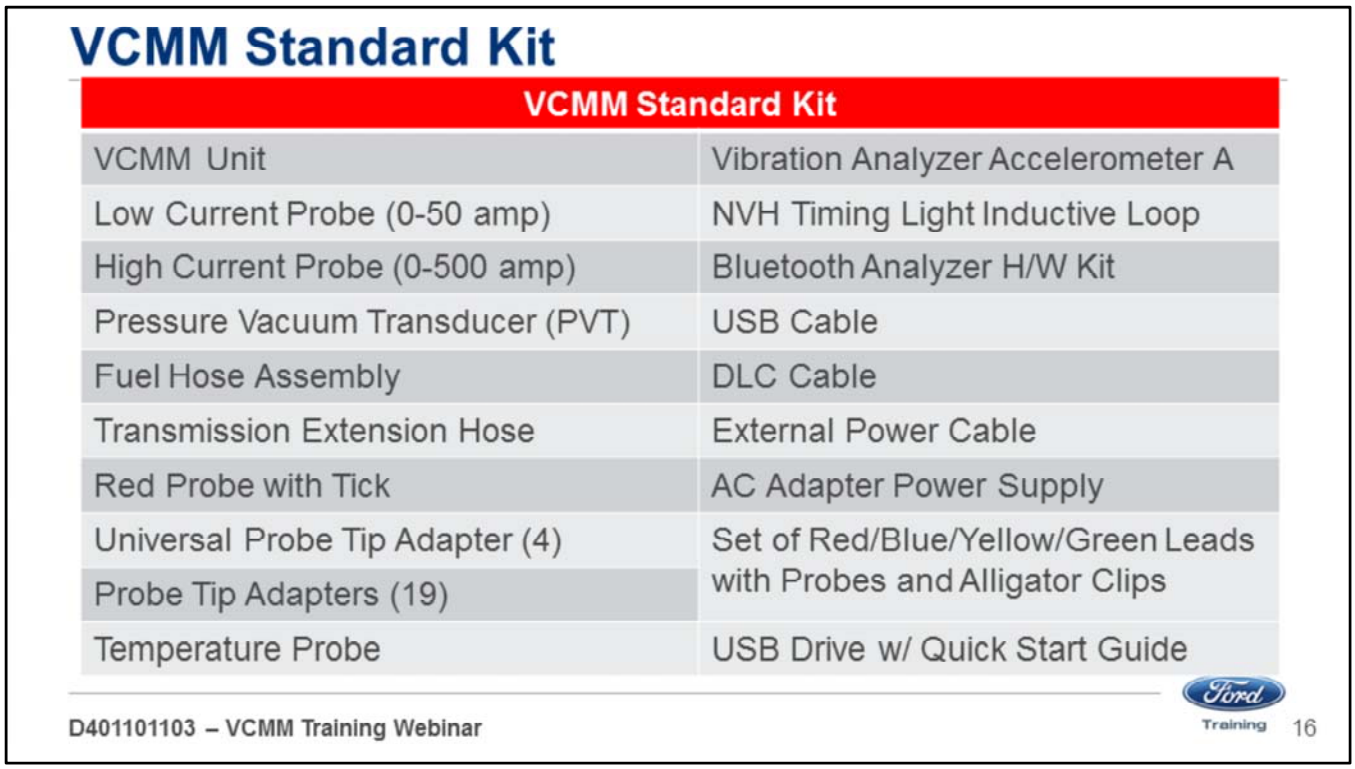
- There are 2 VCMM kits available:
- Standard kit
- Advanced kit
- The contents of the VCMM standard kit are shown here.
- All kits come with the carrying case shown here.



- The VCMM standard kit is equipped with these components.
- The standard kit is Item #164-R9822.

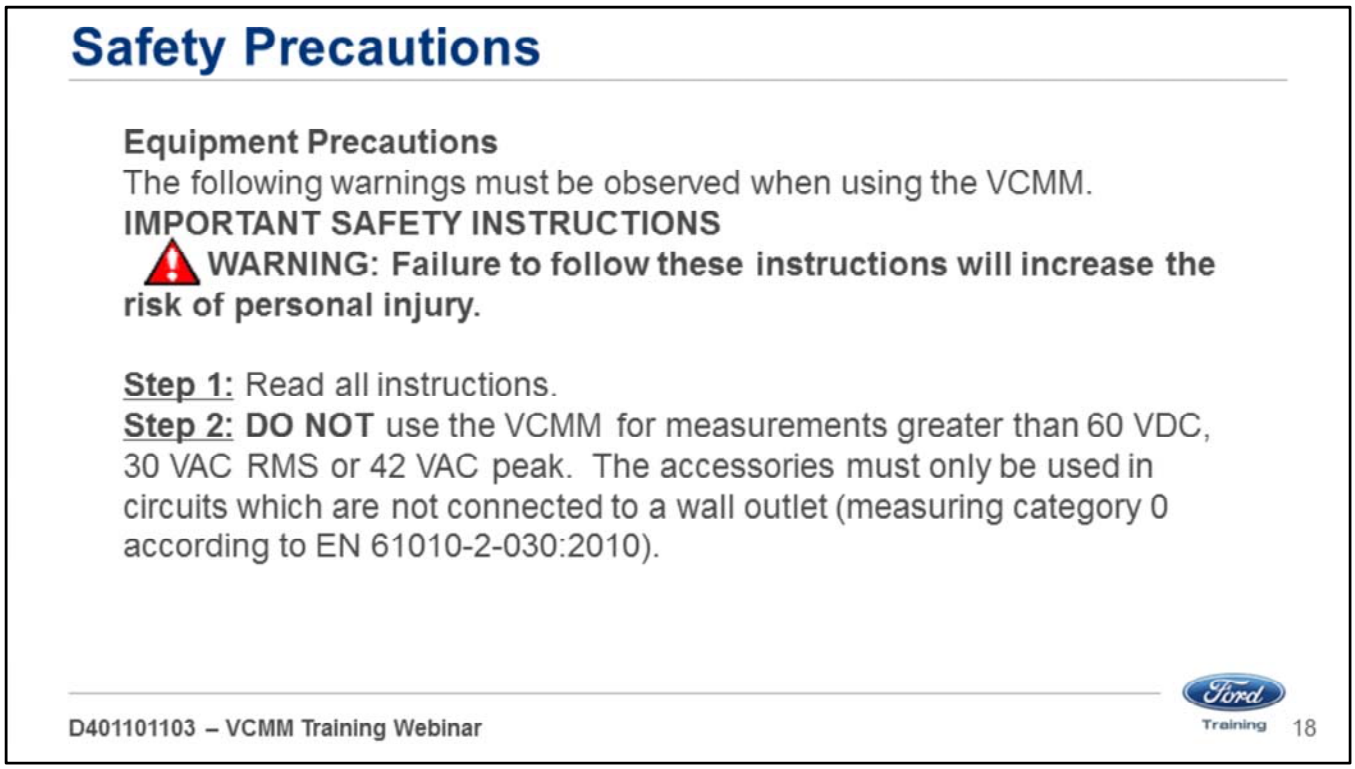
VCMM Advanced Kit

VCMM Advanced Kit
Secondary Ignition Transducer Cables (4)
Coil-On Plug (COP) Ignition Transducer Clips (4) (Older COP systems)
Secondary Ignition Transducer Probes (4)
Vibration Analyzer Accelerometer B
Driveline Balance Kit

- An advanced kit is available for the VCMM and includes all the components of the standard kit plus the components listed here.
- The advanced kit is Item #164-R9823.

- There is one other kit that includes the advanced kit as well as a touchscreen laptop (Panasonic® CF-54) it is Item #164-R9824.
- Refer to the Rotunda® tool site for prices and availability.

- Available through Rotunda®
- VMM Current Probe/ PVT adapter to VCMM adapter cable and BNC to VCMM adapter cable



WARNING: Failure to follow these instructions will increase the risk of personal injury

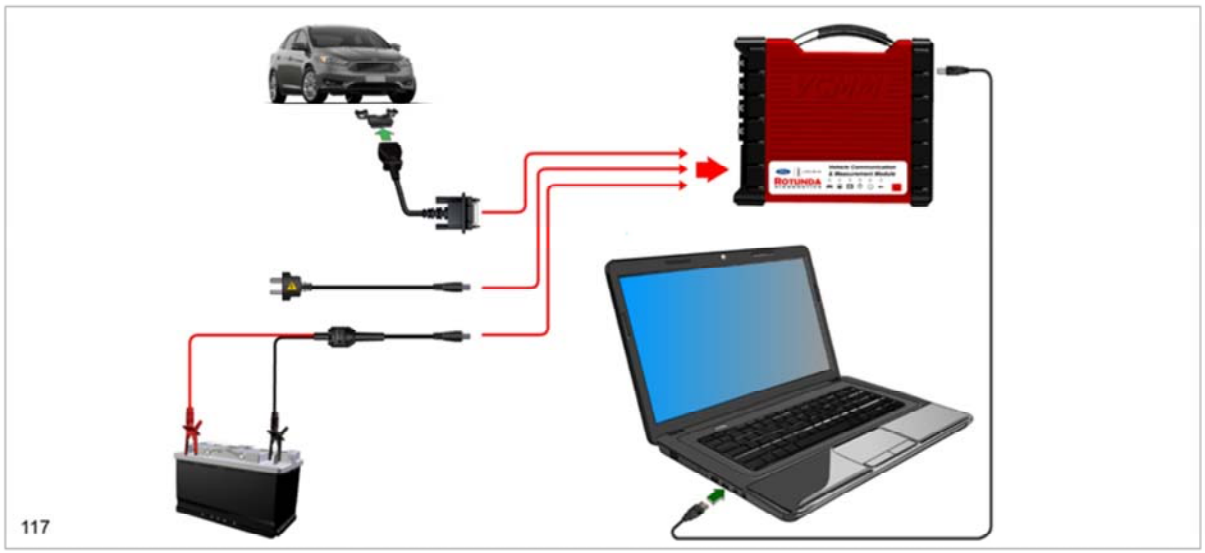
1. Read all instructions.
2. DO NOT use the VCMM for measurements greater than 60 Volts DC, 30 Volts AC RMS or 42 Volts AC peak. The accessories must only be used in circuits which are not connected to a wall outlet (measuring category 0 according to EN 61010-2-030:2010). The enclosed accessories must only be used with the VCMM and at voltages below the voltage value as imprinted on the accessories. When combining accessories, make sure you do not exceed the lowest voltage value imprinted on the accessories.
3. Care must be taken as burns can occur from touching hot parts or surfaces.
4. DO NOT operate the equipment if damage to the unit or cable is suspected.
5. DO NOT let cables hang over the edge of the table, bench or counter or come in contact with hot manifolds or moving fan blades.
6. DO NOT place tools or test equipment on vehicle fenders or other places inside the engine compartment.
7. Let equipment cool completely before putting away. Loop cables loosely around equipment when storing.
8. Adequate ventilation should be provided when working on operating internal combustion engines.
9. Keep hair, loose clothing, jewelry, fingers and all parts of the body away from moving parts of the vehicle.
10. Use this equipment only as described in the manual. Use only the manufacturer's recommended attachments.
11. **ALWAYS WEAR SAFETY GLASSES WHEN USING GARAGE EQUIPMENT.** Everyday eyeglasses only have impact resistant lenses, they are **NOT** safety glasses.

Welcome to Lesson 2, Tool Power Up.

In this lesson we will cover:

- Normal power up of the VCMM
- Software updates
- Factory reset
- Wireless connection (initial procedure)

VCMM Power Up



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There are three different ways to power the VCMM:

- Data Link Connector (DLC)
- 12 volt battery
- AC/DC adapter

VCMM Power Up

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If making the connection from a PC:

- Connect the type B end of the USB cable included in the VCMM kit to the VCMM high-speed USB client connector.

VCMM Power Up

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Connect the type A end of the USB cable to the PC USB port.

DLC Power Up

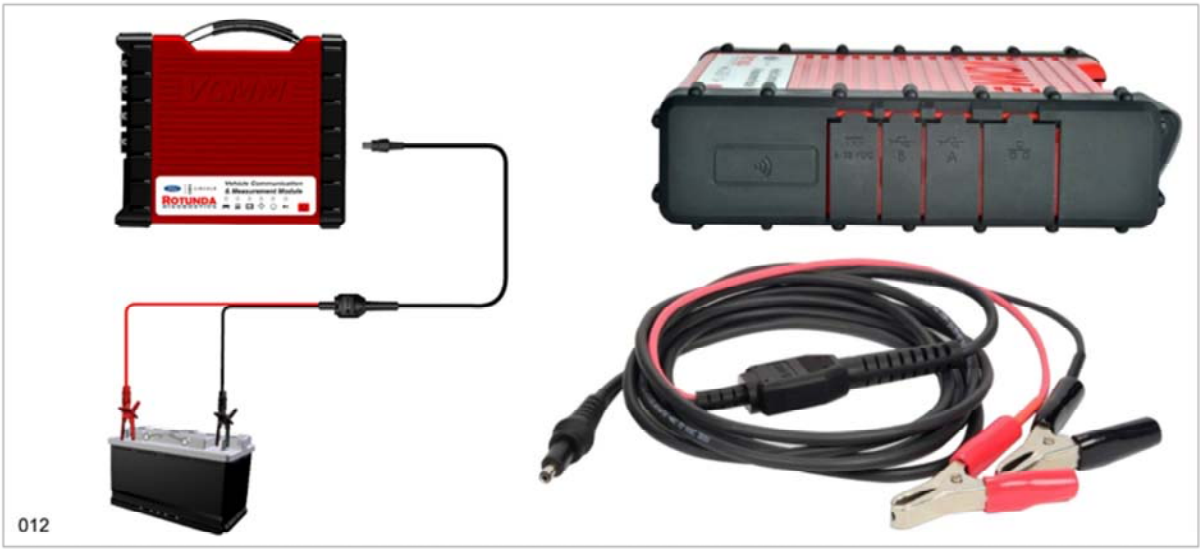
If making the connection from the vehicle:

- Connect the 26-pin end of the Data Link Connector (DLC) cable included in the VCMM kit to the VCMM vehicle interface diagnostic connector and tighten the screws.

DLC Power Up

- Connect the 16-pin end of the DLC cable to the vehicle DLC.

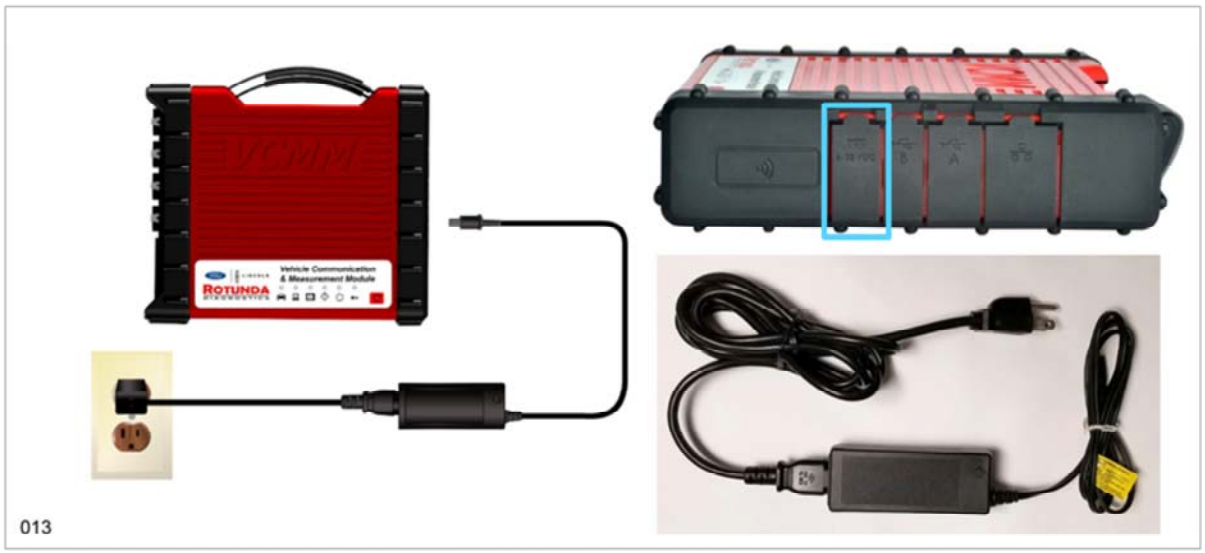
12 Volt Battery Power Supply



If making the connection from the 12 volt battery:

- Connect the positive and negative clamps to the 12 volt battery.
- Insert the DC power plug into the VCMM power port.

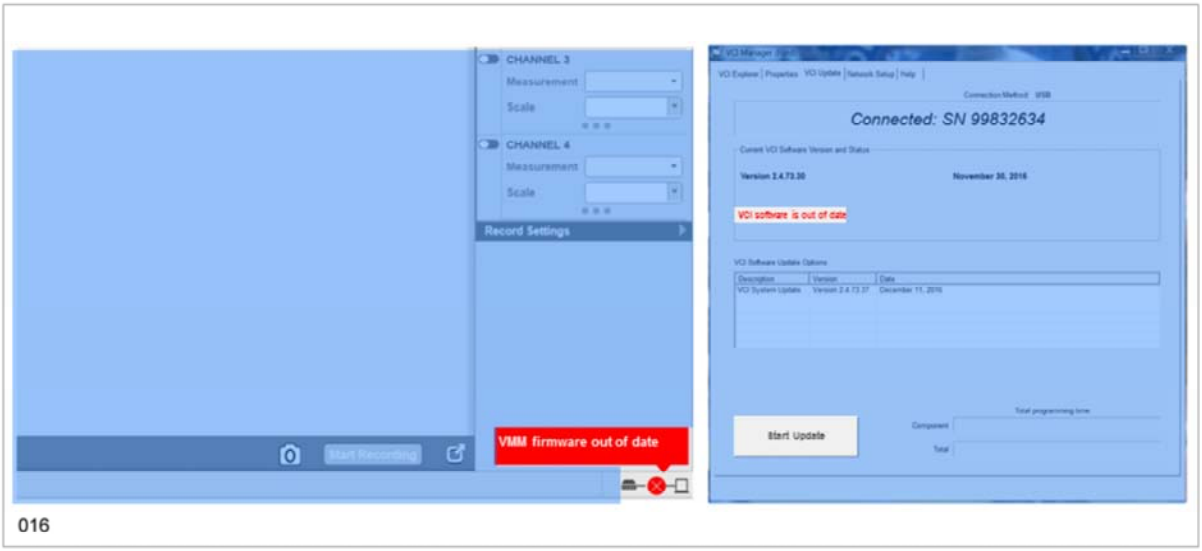
AC/DC Power Supply



If making the connection from the AC/DC power supply:

- Connect the AC/DC power supply to a 110V AC power source
- Insert the DC power plug into the VCMM power port.

Software Updates



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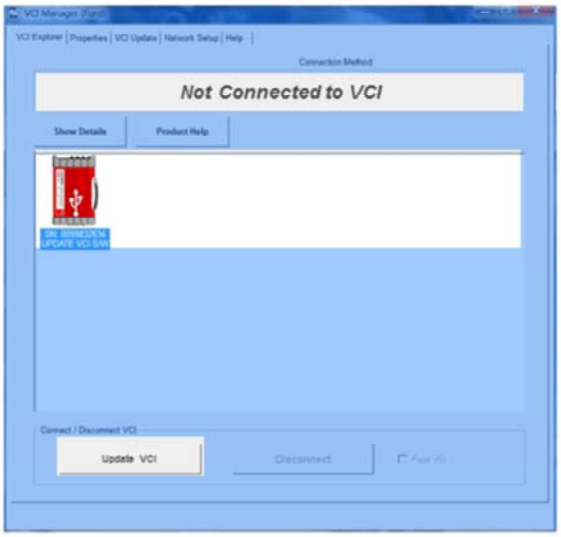
27

- Just like the VCM II, the user will be prompted to update the VCMM software using a PC when new software releases become available.
- To install an update, open the VCI Manager.
- The VCI Manager is accessed through the desktop icon or through the Start menu – Programs – Bosch – VCI software (Ford).

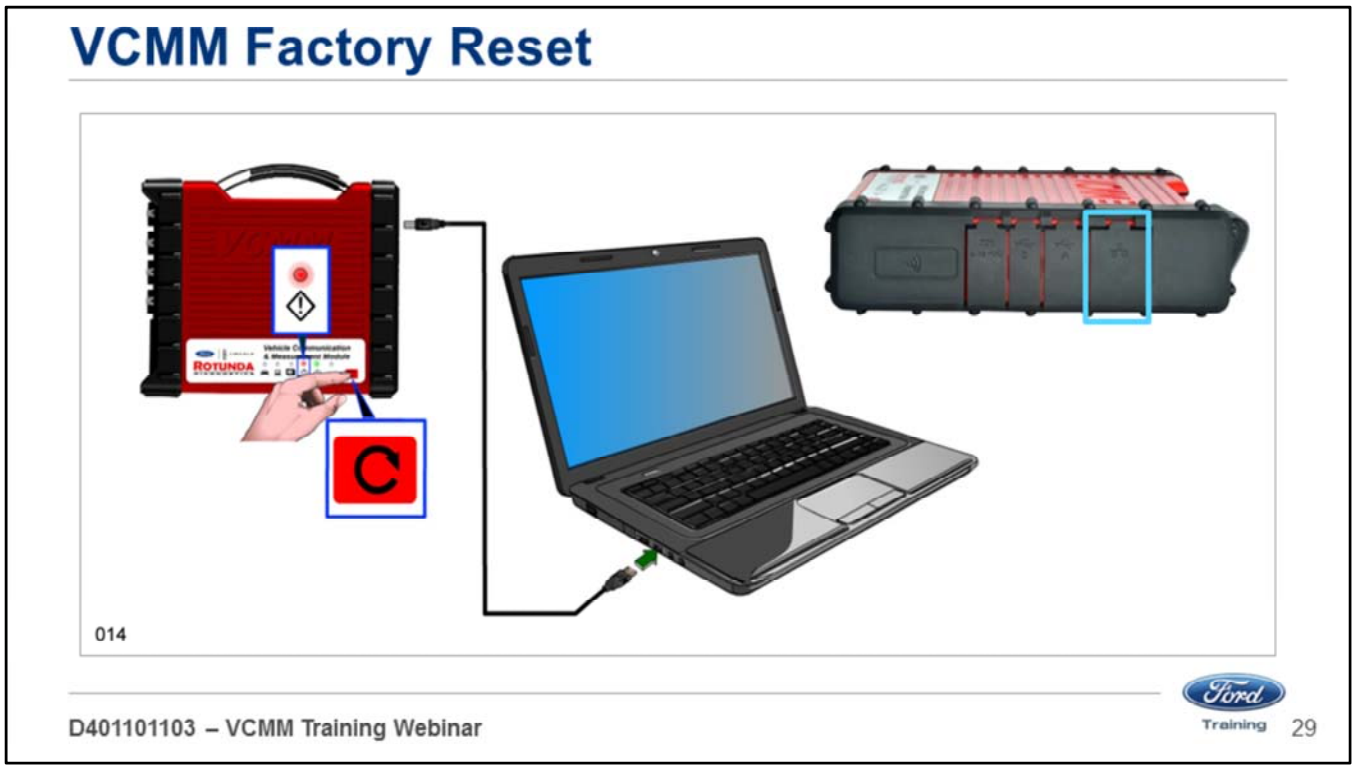
VCMM Factory Reset



017

A factory reset may be necessary:

- If the VCMM becomes inoperable.
- The VCMM will not boot-up properly.
- The VCMM LEDs are not functioning properly.



Perform the following prior to initiating a factory reset:

1. Shut down the Ford Software application if it is running.
2. Make sure the VCMM is connected to a PC.
3. Launch the VCI Manager application.
4. Press and hold the Recovery Mode button for 3 seconds until the red Error LED illuminates.
5. The VCI Manager will display an icon of a VCMM in the Recover state.
6. Click the VCMM icon to select it.
7. Follow the VCI Manager on-screen instructions to complete the software installation.

Wireless Capability

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30

The following procedure describes how to connect your VCMM to the PC using the preferred method of point-to-point wireless communication.

- Before performing this procedure make sure all components are updated to the latest software level.
- The VCMM can communicate with the PC using a USB wired connection.

Wireless Capability

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31

The VCMM ships with two adapters in the kit. These adapters must be installed in the VCMM.

For setting up a VCMM, find one of the two wireless adapters in your kit and install it in your VCMM:

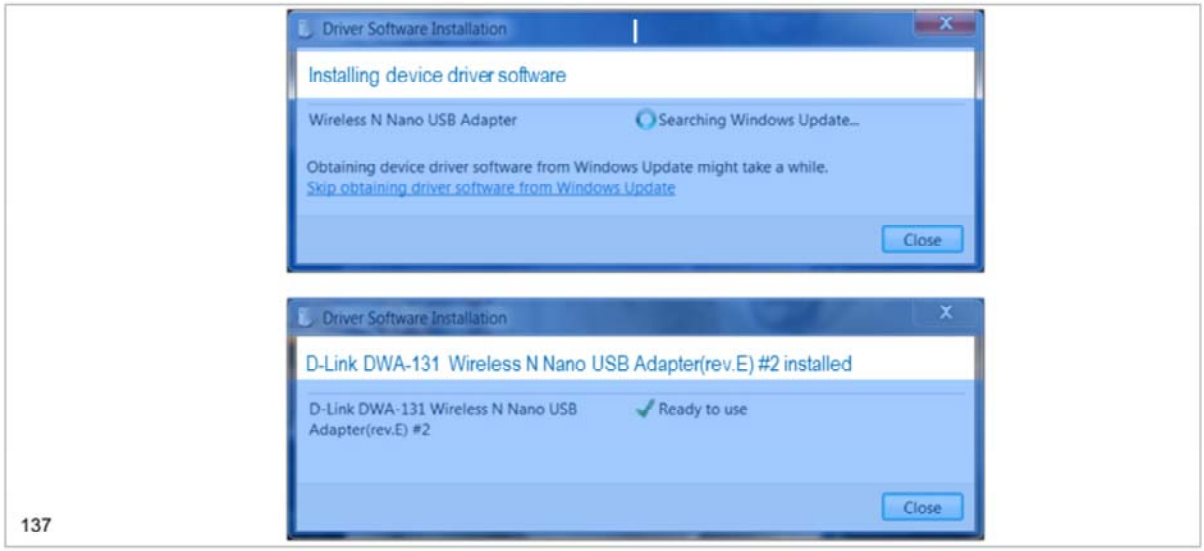
1. Remove the rubber boot from the right side of the unit (looking at the VCMM with the handle up).
2. Insert the wireless adapter into the VCMM as shown below.
3. Put the rubber boot back onto the unit.

Wireless Capability

Install the other wireless adapter from your kit and connect it to a free USB port on your PC.

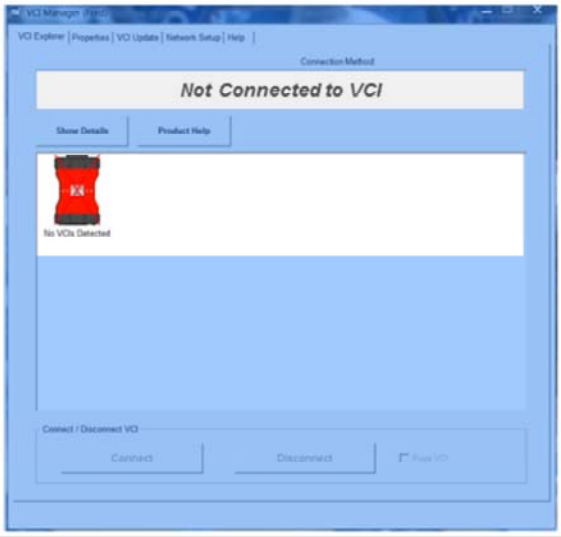
Note: If you have not installed the wireless adapter before your PC may take some time to install the drivers and software.

Wireless Capability



- The PC may display a popup that indicates it is loading drivers.
- Allow the drivers to finish loading.
- Make sure the adapter is ready to use before proceeding.

Wireless Capability



138

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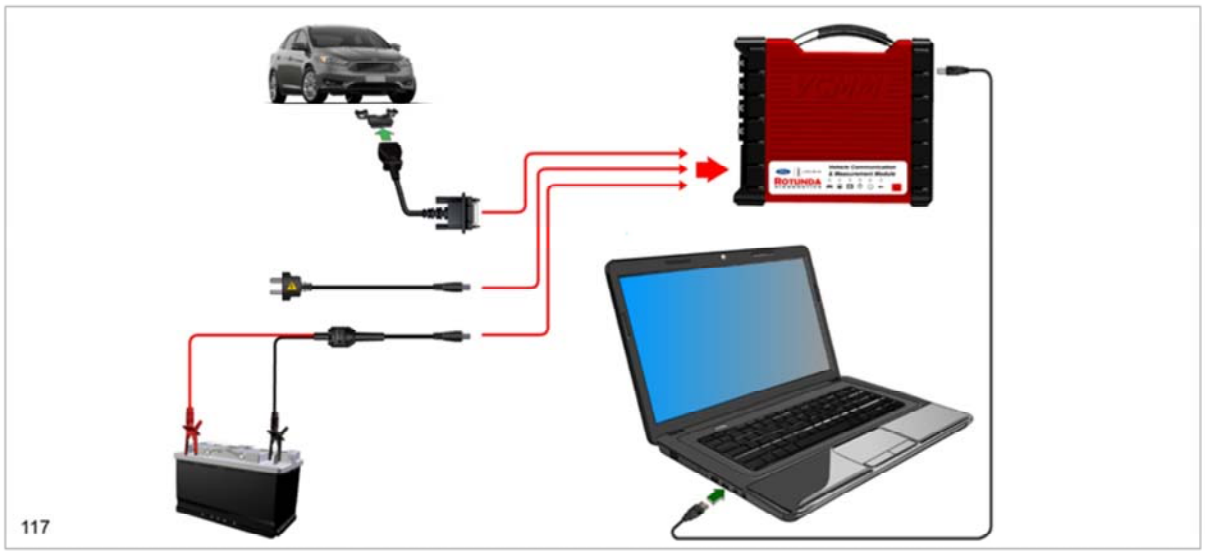
Ford Training 34

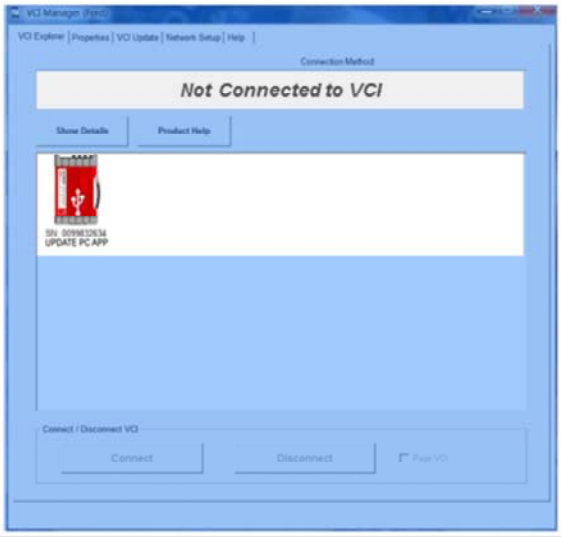
- Open the VCI Manager.
- The VCI Manager is accessed through the desktop icon or through the Start menu – Programs – Bosch – VCI software (Ford).

Wireless Capability



- Connect the VCMM to power using one of the power sources. Do not rely on USB power.
- Connect the type B end of the USB cable to the VCMM high-speed USB client connector.
- Connect the type A end of the USB cable to the PC USB port.

Wireless Capability



139

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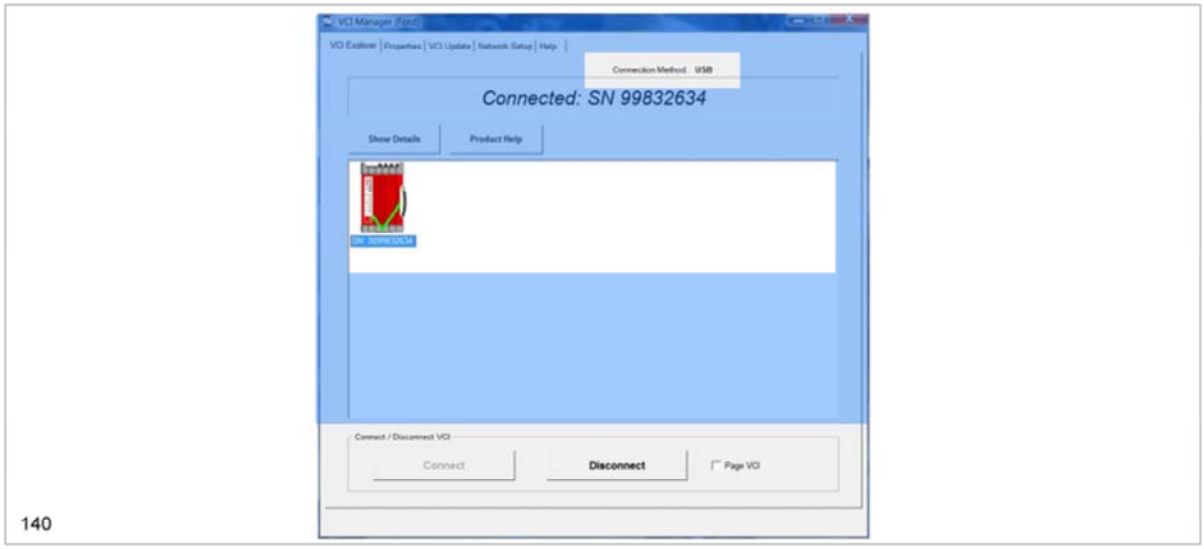
Once the connections are made the VCI Manager will show the VCMM in the USB mode.

Wireless Capability

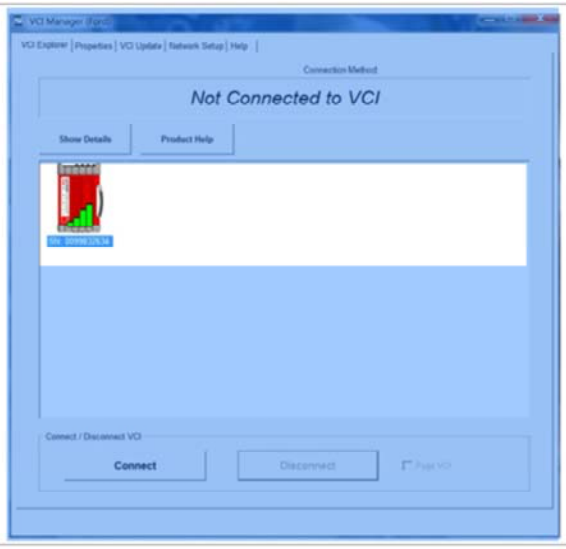


- When you click the Connect button you will see a green check mark appear over the VCMM icon.
- You are now connected to the VCMM through the USB.
- This causes the VCI Manager to transfer some needed wireless information to the VCMM.
- Click on the Disconnect button.

Wireless Capability

- Unplug the type B end of the USB cable from the VCMM high-speed USB client connector.
- VCMM needs to remain powered up.

Wireless Capability



141

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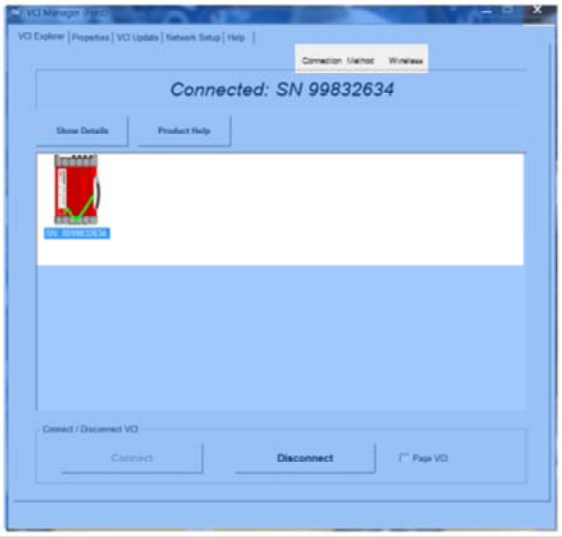
The VCI Manager displays wireless bars on the image of the VCMM to indicate wireless communications are active.

Wireless Capability



142

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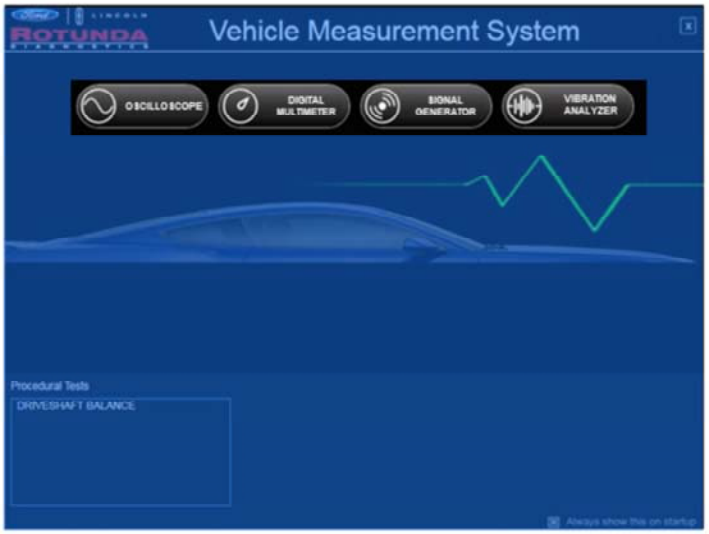
40

- Click on the Connect button to connect the VCMM wirelessly to the PC.
- When the connection is made, the VCI Manager displays a green check mark on the image of the VCMM.
- Close the VCI Manager by clicking on the “X” on the top right corner.

Wireless Capability



143

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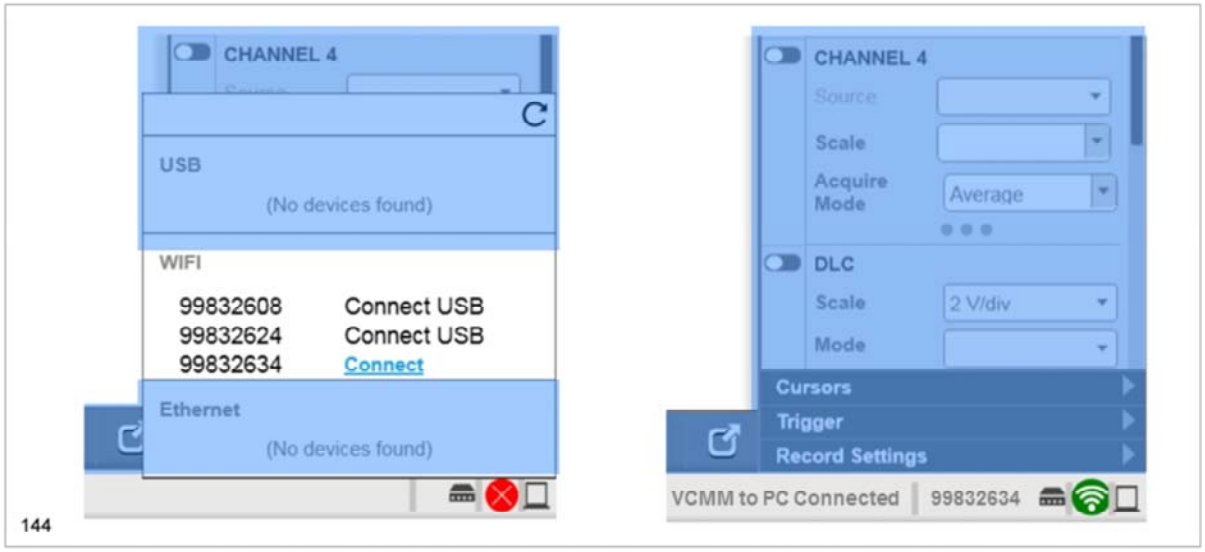
Open the Vehicle Measurement System (VMS). The VMS is accessed through the desktop icon or through the Start menu – Programs – Ford Motor Company – Vehicle Measurement System.

Click on any one of the tool icons on the black Vehicle Measurement System launch screen.

- Oscilloscope,
- Digital Multimeter
- Signal Generator
- Vibration Analyzer

Wireless Capability



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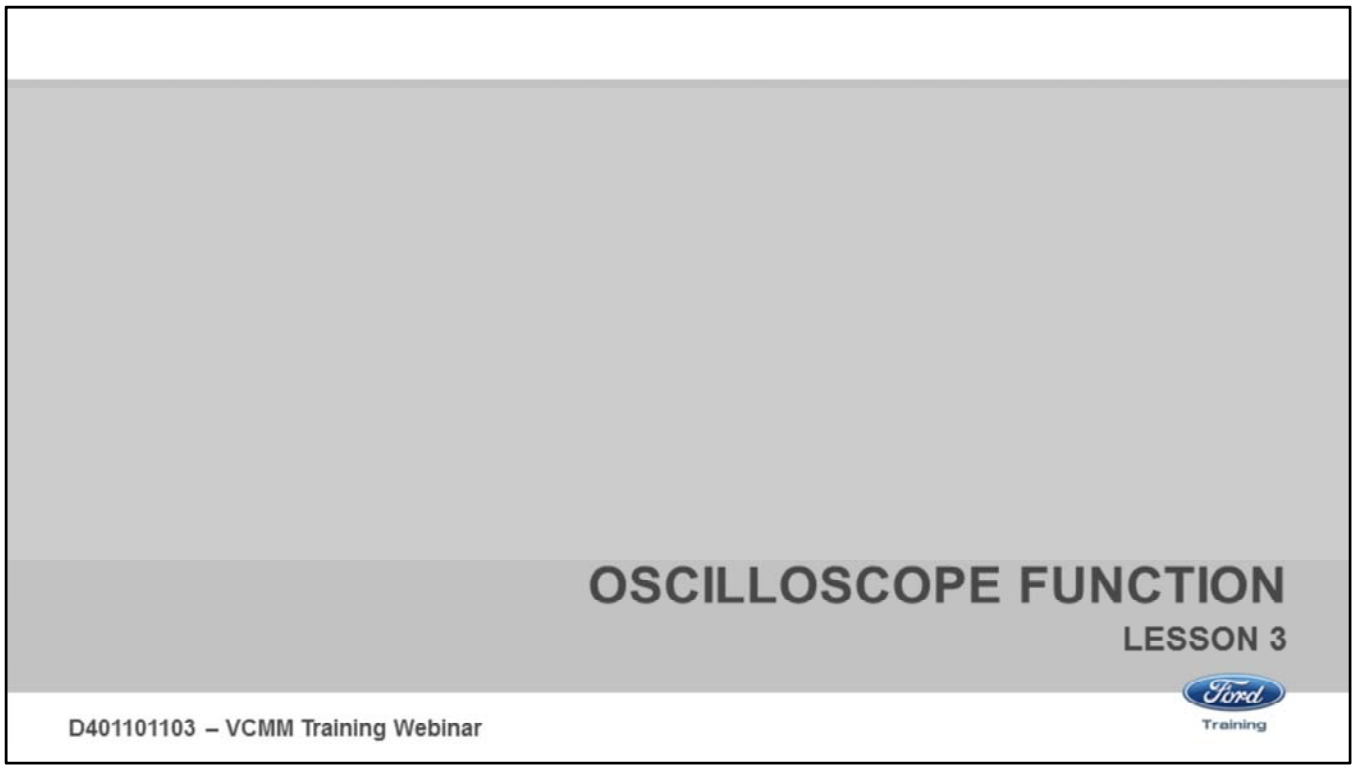
42

- In the lower right corner, click on the round red icon.
- Find the serial number of your VCMM unit and click on Connect.
- When it connects, the red round icon will turn green.
- You can now use the Vehicle Measurement System wirelessly.

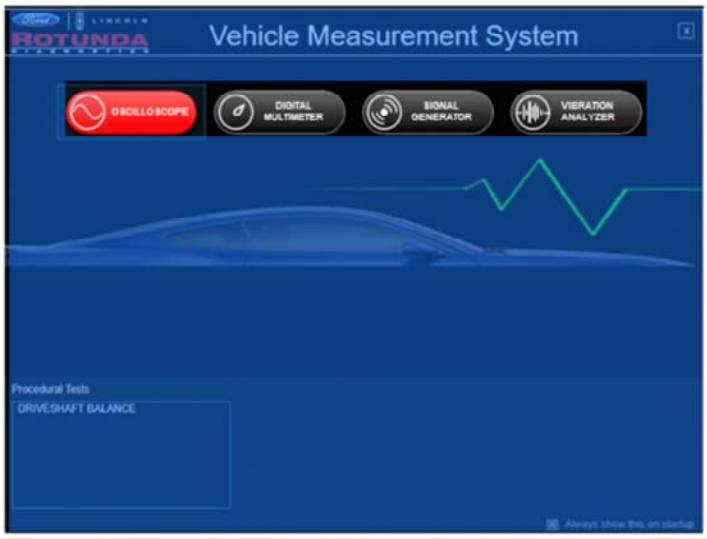


Welcome to Lesson 3, Oscilloscope Function.

In this lesson we will cover the following:

- Oscilloscope screen
- Top Menu
- Oscilloscope
- Channel configuration
- Cursors
- Trigger settings
- Recording
- Screen view
- Other screen settings

Oscilloscope



145

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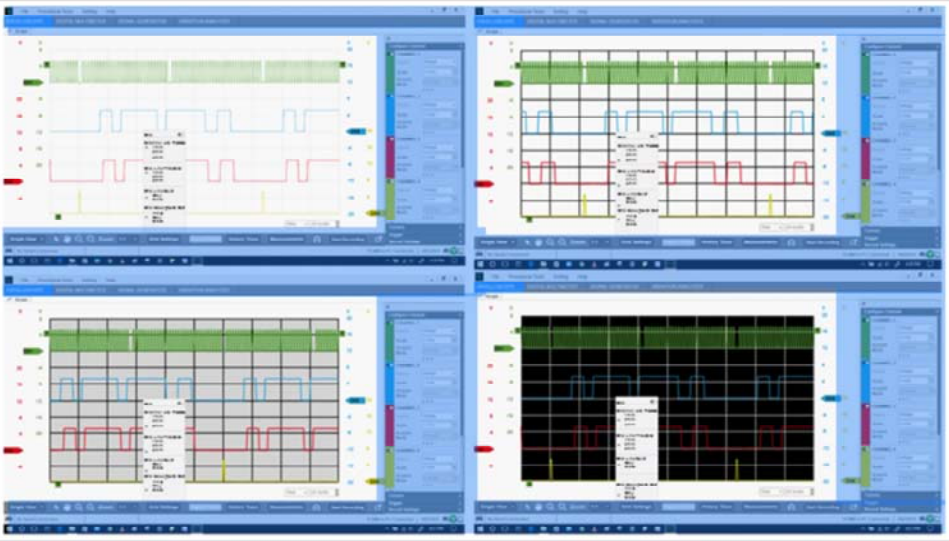
- Open the Vehicle Measurement System (VMS).
- The VMS is accessed through the desktop icon or through the Start menu
- Click Programs – Ford Motor Company – Vehicle Measurement System.
- Click on the Oscilloscope tool icon on the black Vehicle Measurement System launch screen.
- When you mouse over the button it will turn red.

Oscilloscope Screen

- The resolution of the new VCMM oscilloscope is vastly improved over the old VMM oscilloscope.
- The new screen provides much clearer images.

Oscilloscope Screen



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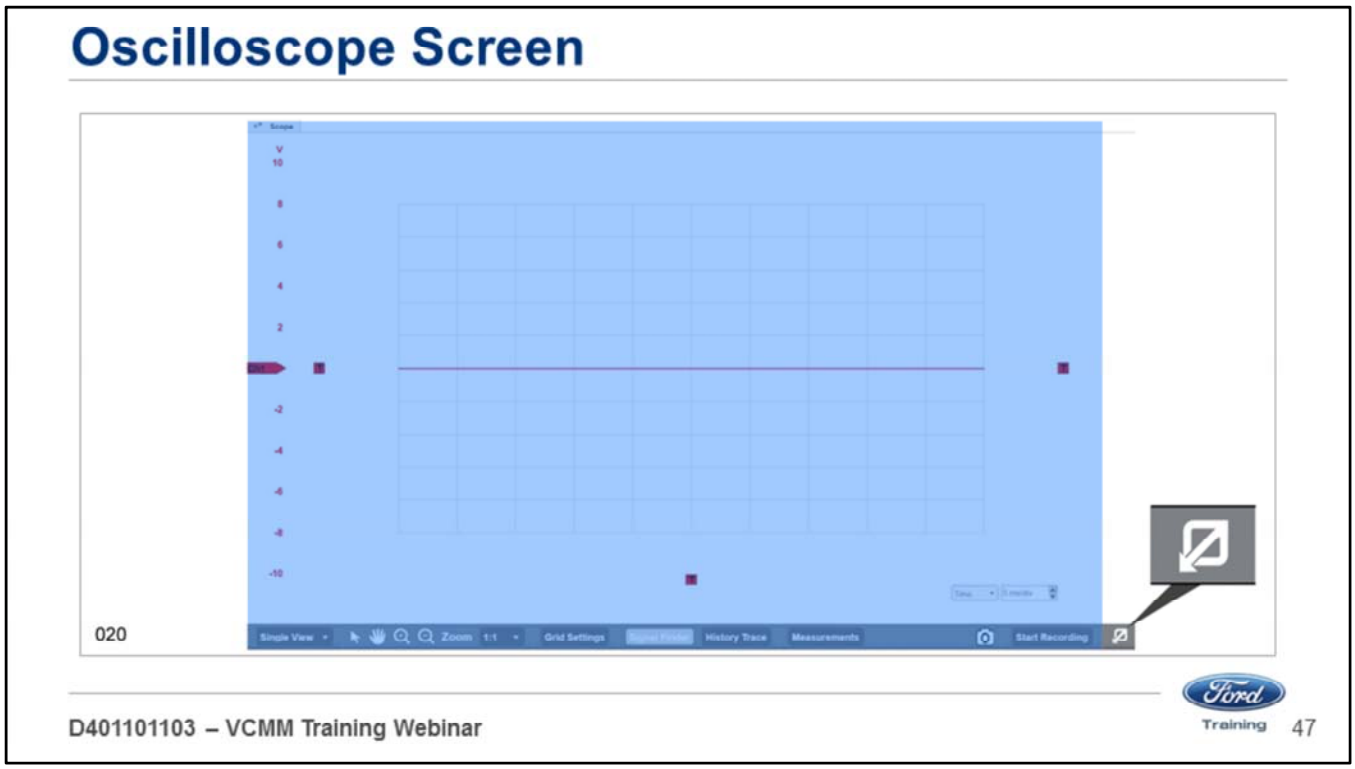
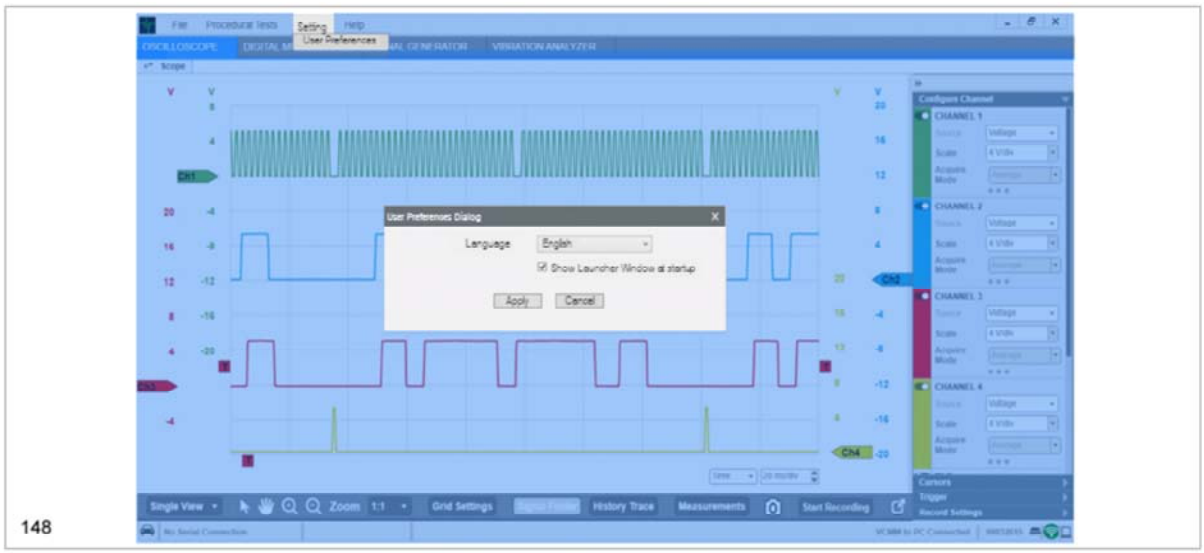
The features of the VCMM oscilloscope set up screen includes:

- The ability to turn the grid lines off.
- Choose the channel signal and grid line thickness.
- Choose grid line colors.
- Choose the background colors.



- A full screen button is located in the lower right corner.
- Selecting the full screen button will allow the oscilloscope to fill the screen.
- The configuration menu is hidden in this view.

Top Menu



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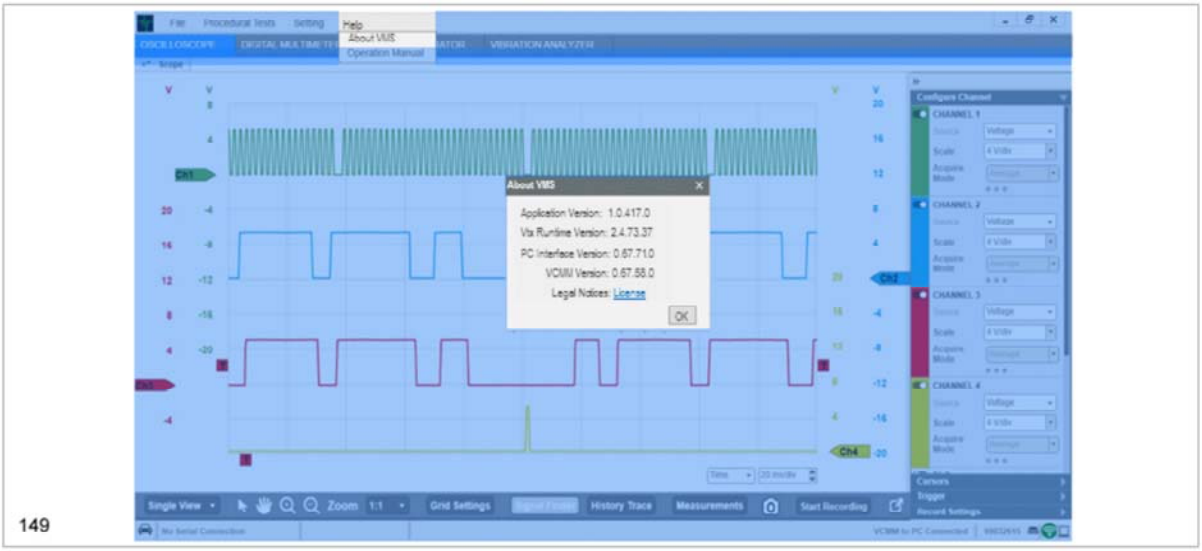
48

- Under Setting you will see User Preferences
- When User Preferences is selected a popup window will appear to allow languages to be changed

Top Menu



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- Under the Help menu you will see About VMS
- When it is selected a popup window will appear. This window displays the current version of VMS.

Top Menu

- Under the Help menu you will see Operation manual
- When it is selected a popup window will appear with the current version of the operation manual.

Oscilloscope

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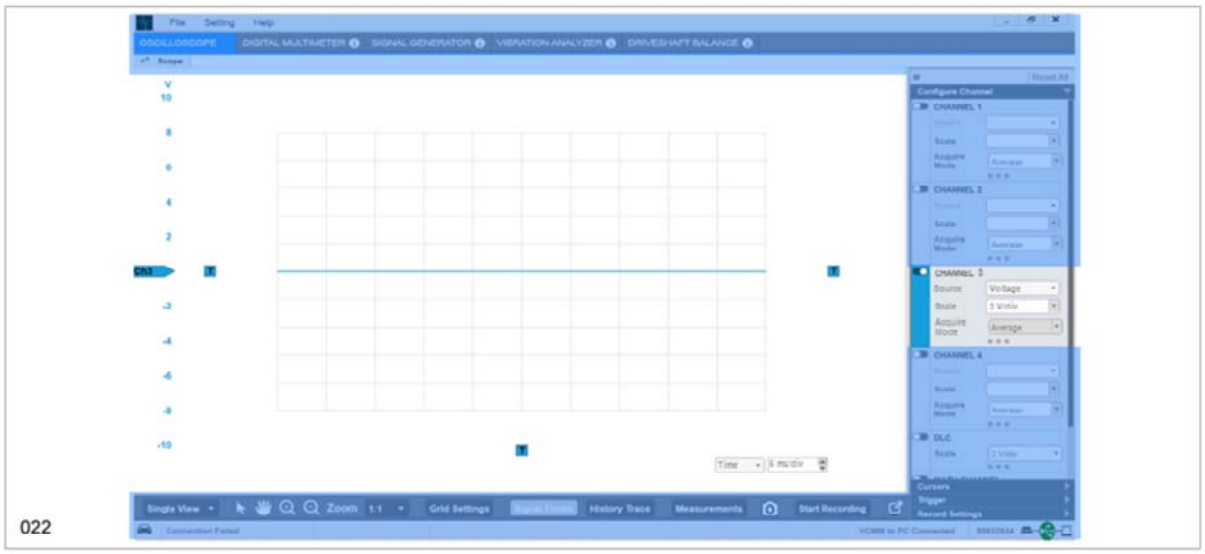
51

- The VCMM has a 4 channel oscilloscope.
- There is also a 5th scope channel routed directly to the Data Link Connector (DLC) pins.

- In this example the red signal is the Crankshaft Position (CKP) sensor 60-2 hall effect.
- Yellow signal is Camshaft Position 1 (CMP1) sensor.
- Green signal is CMP 2.

- This setup is helpful in identifying timing chain stretch or other engine timing related issues.
- In this case the yellow and green signal are almost superimposed on each other.
- This indicates that there is little to or no timing chain stretch.
- If there was an issue the signals would not be as close together.

Oscilloscope

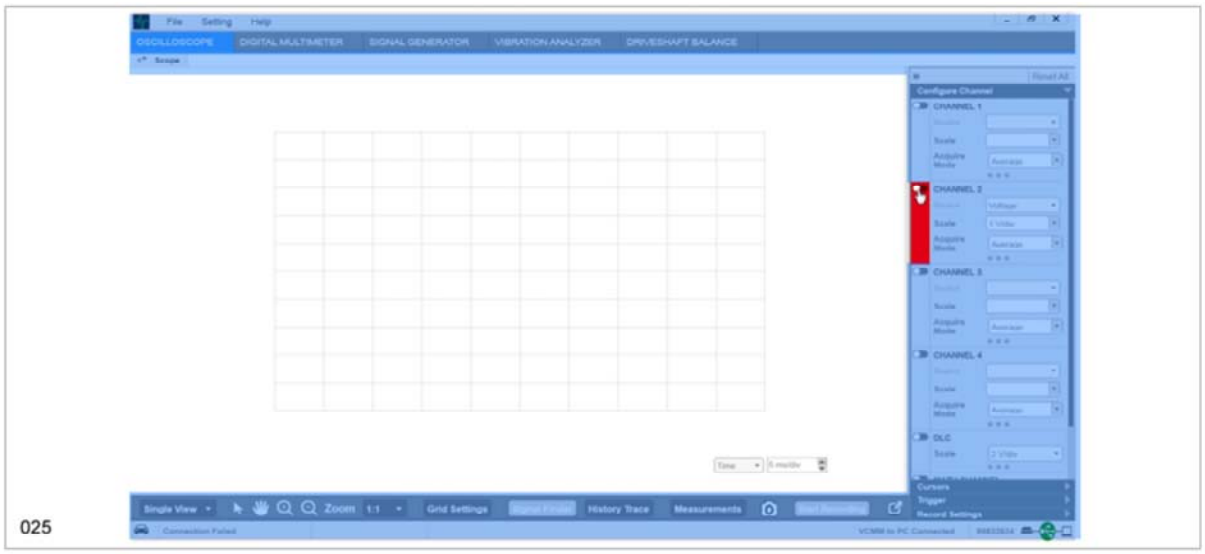


A unique feature of the VCMM is whatever probe color you choose:

- Red, blue, yellow or green
- When you place the probe in one of the channel ports
- That channel changes to the color of the probe.
- This feature helps identify which color probe is placed in which channel port.

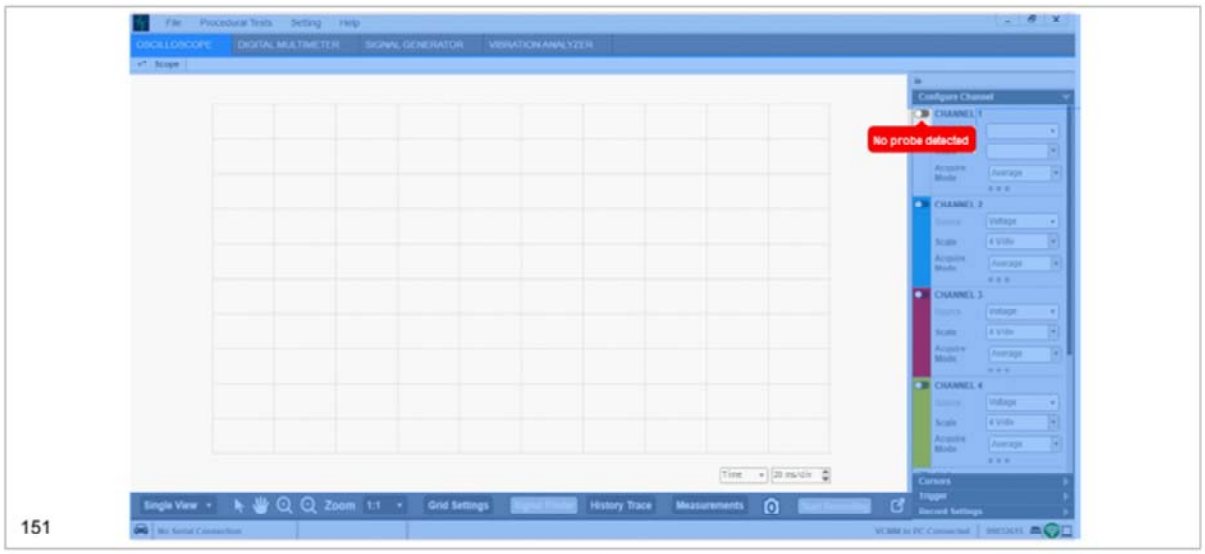
For example, if you place the blue probe in the channel 3 port channel 3 turns blue on the screen.

Oscilloscope



Each channel can be turned on or off using the on-screen toggle switch.

Oscilloscope



151

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If you turn on a channel and there in nothing in that channel you will see a message “No probe detected”.

Test Probes

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The test probes of the VCMM are configured as follows:

- The probe has a single wire on the end that is placed into the VCMM.
- The probe end is split into two wires.
- One wire is the color of the probe.
- The other wire is black. This wire should be grounded to the battery negative or chassis ground.

Test Probes

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- These probes allow you perform differential readings by placing both ends of the probe at different locations of the circuit.
- You can connect ends of the probes to the CAN positive and CAN negative circuits to measure the network using only one probe cable.

For example place the red probe into CAN positive, cavity 6 and the black probe into CAN negative, cavity 14.

- This allows you to measure the differential voltage of the HS 1 CAN with one probe cable.

Test Probes

- The probe ends are male banana jacks which allow for several different ends to be placed in the jacks.
- Probes and alligator clips of different sizes are included with the VCMM

Channel Configuration Voltage

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58

You will see a screen like this when you place a test probe in one of the channel ports to test for voltage.

- You need to ground the black wire of the probe to battery negative or chassis ground
- If you are performing a differential voltage reading place both ends of the probe at different locations of the circuit.
- You can set the scale from 100 millivolts to 10 volts per division.

Channel Configuration Voltage

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There are three small dots at the bottom of the channel. When you click them, the menu expands.

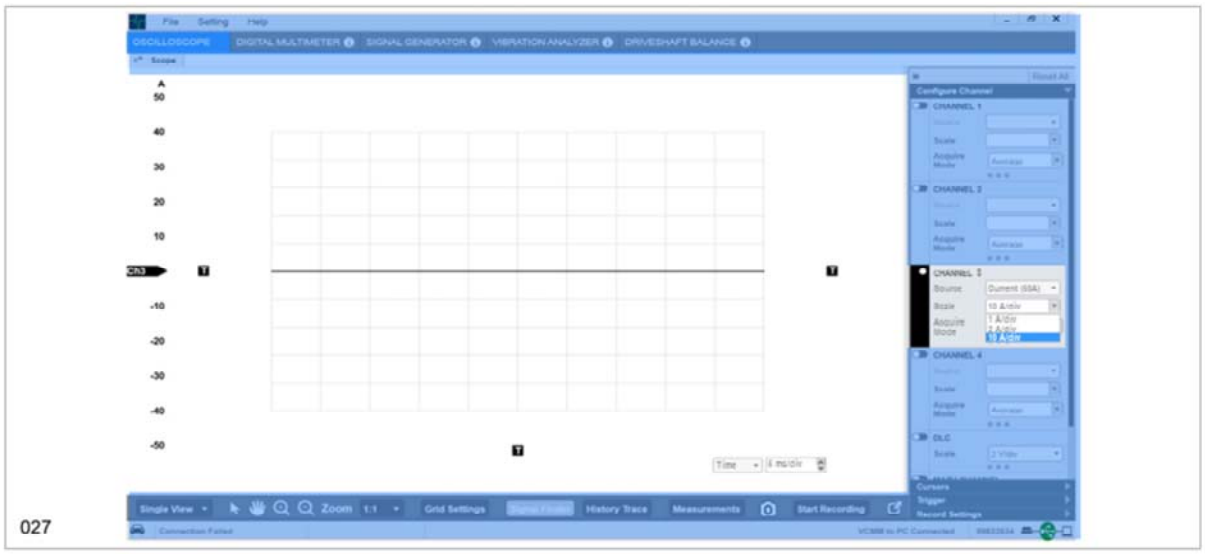
- These are defaults and may be changed to suit your testing needs.

In this example channel 2 has been expanded this allows you to select the:

- Coupling
- Filter
- Invert
- Offset

The acquire mode may be selectable or depending on what probe you are using it may be selected for you.

Channel Configuration Current



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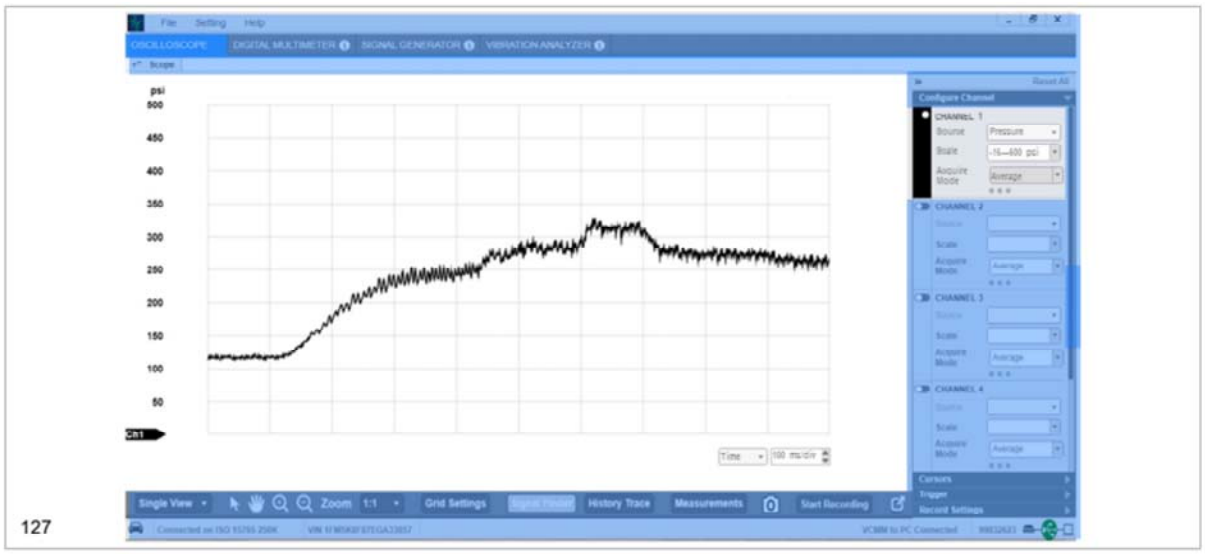
60

This screen appears when you place one of the current probes in one of the channel ports to test for current flow.

- You can set the scale from 1 amp to 10 amps per division.

Channel Configuration Pressure



This screen appears when you place the Pressure Vacuum Transducer (PVT) probe in one of the channel ports to test for pressure or vacuum.

- You can set the scale from -15 to 500 PSI.

Channel Configuration Accelerometer

This screen appears when you place the Accelerometer in one of the channel ports.

- You can set the scale from 400 milli Gs (mG/div) to 2 Gs per division (G/div).

Channel Configuration Photo-tach

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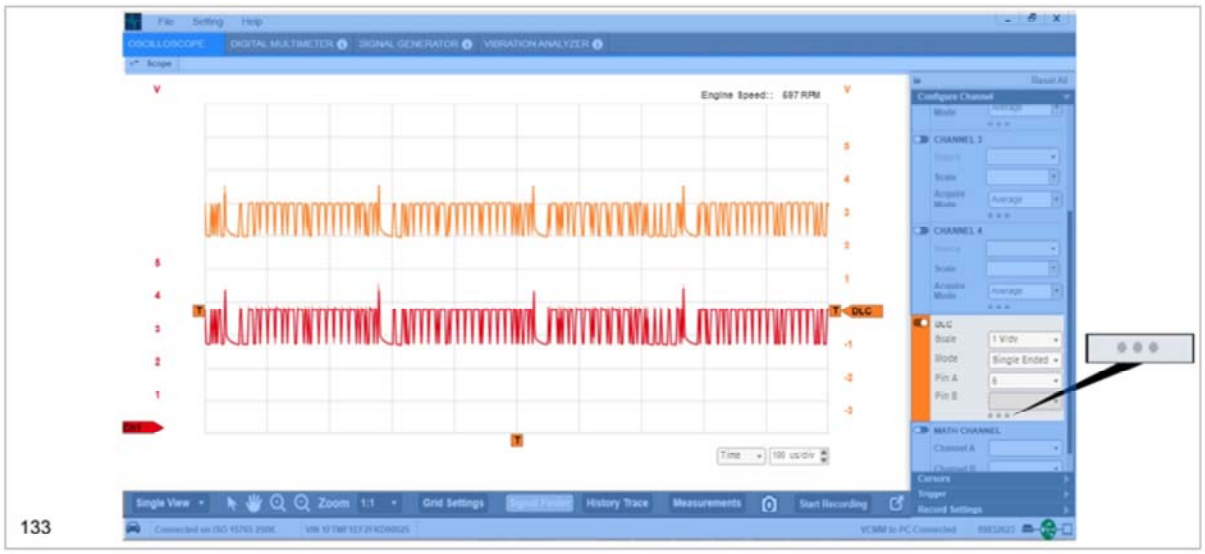
63

You will see a screen like this when you place the photo-tach in one of the channel ports.

- You can set the scale from 0 to 10 volts.
- In this example the photo-tach signal is black.
- The blue and green are accelerometers.
- This is the raw data which the vibration analyzer function processes to determine a balance solution – the position of the hose clamp or weights which should be added to the driveshaft to correct the vibration.

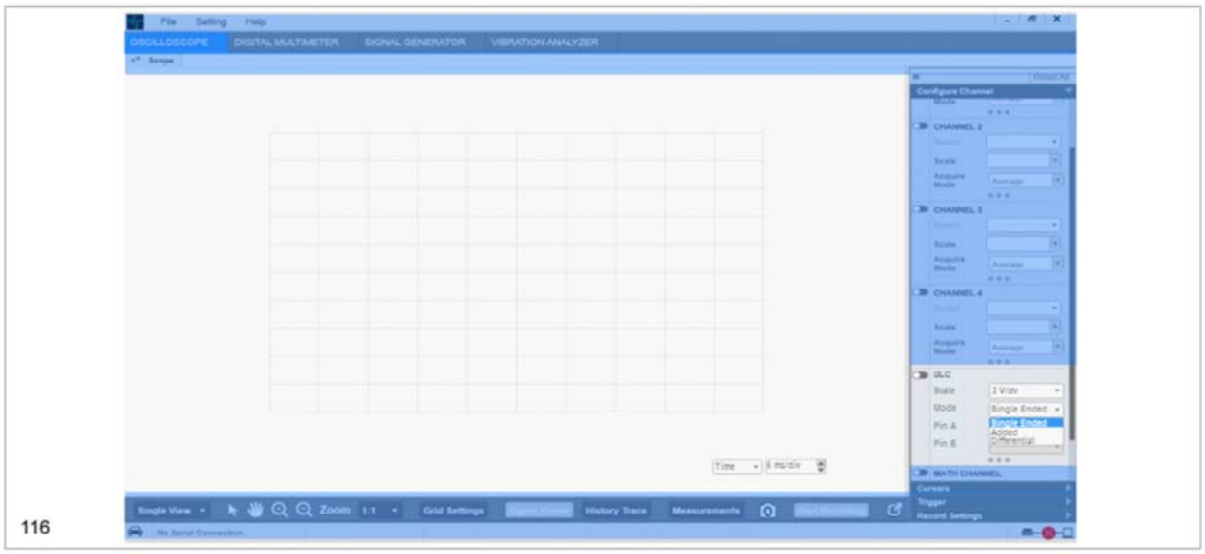
Channel Configuration DLC



This screen appears when you place the DLC cable in the DLC port and toggle it on, the DLC port turns orange.

- There are three small dots at the bottom of the channel that, when clicked, expand the menu.
- You are now able to choose the mode and which pins of the DLC to monitor.
- A time per division setting of 100us/div is being used to obtain a view which can be used to assess the overall pattern.
- A time per division setting of 50us/div can be used to identify faults with individual messages.

Channel Configuration DLC Modes



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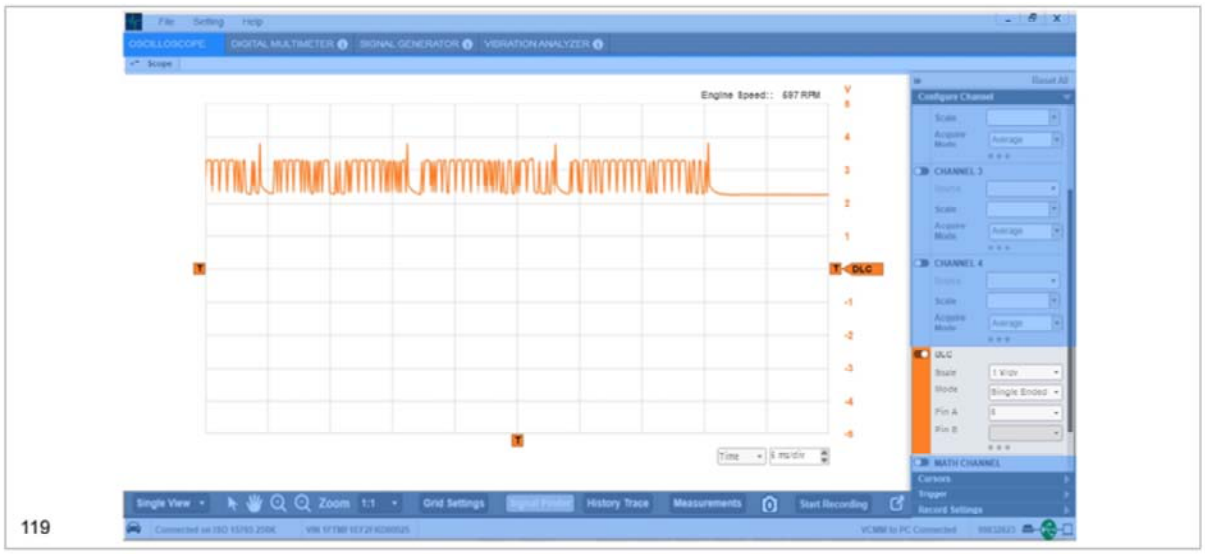
65

You can choose between three modes:

- Single ended
- Added
- Differential

Channel Configuration DLC Modes



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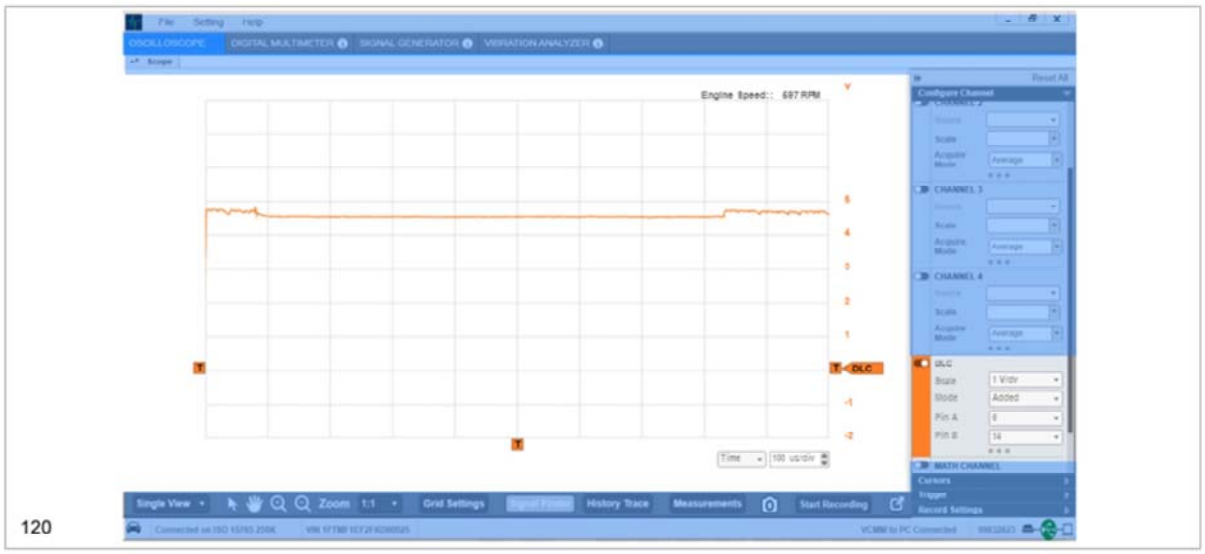
66

Single ended mode allows you to monitor any of the 16 pins in the DLC except pins 4, 5 and 16.

- You can set the scale from millivolts to 10 volts per division.
- This function allows you to display one portion either positive or negative of a typical CAN trace.

Channel Configuration DLC Modes



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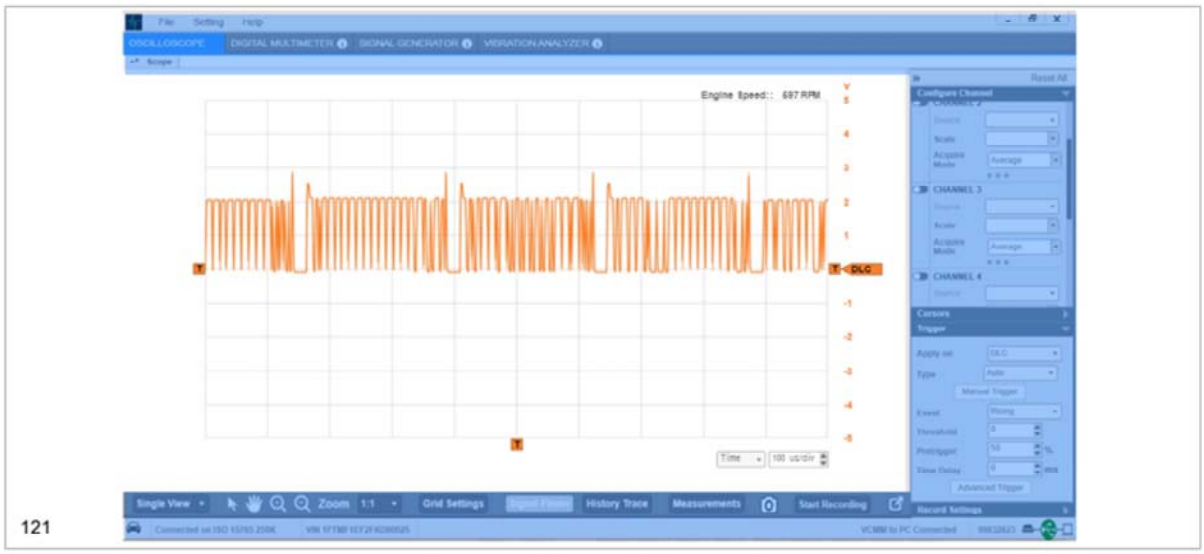
67

Added mode allows you to monitor the combined voltage of any 2 of the 16 pins in the DLC except pins 4, 5 and 16.

- You can set the scale from millivolts to 10 volts per division.

In this example, the voltages from HS-CAN 1 pins 6 and 14 are added together.

Channel Configuration DLC Modes



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68

Differential mode allows you to monitor the voltage differences between any 2 of the 16 pins in the DLC except pins 4, 5 and 16.

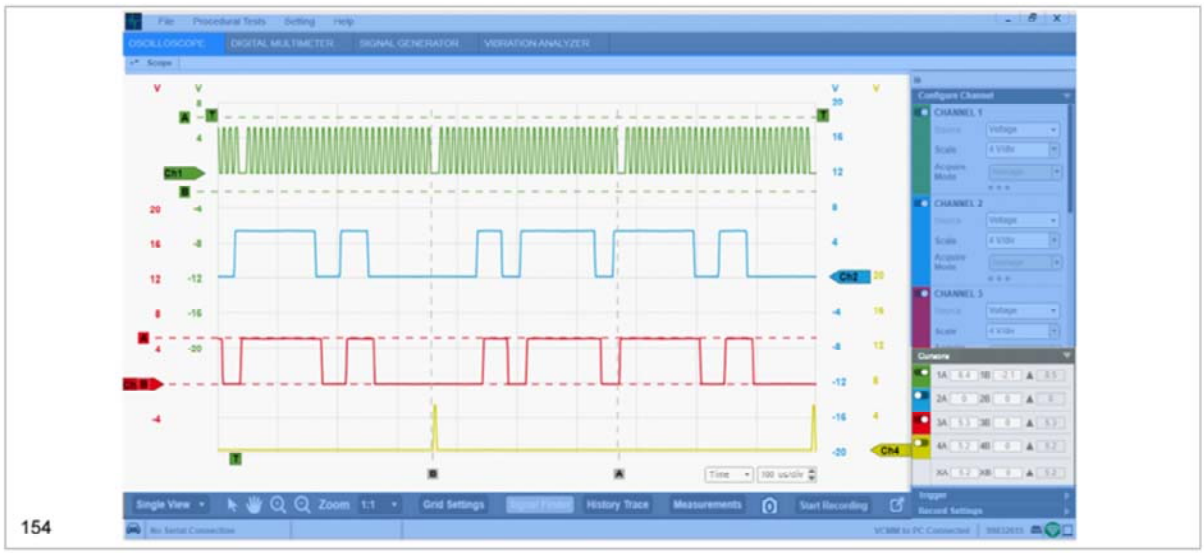
- Differential mode is the subtracted difference between CAN positive and CAN negative.
- If the CAN positive signal peaks at 3.5 volts and the CAN negative peaks in the opposite direction to 1.5 volts the subtractive difference is 2 volts.

For example if you wanted to monitor the voltage differential in the HS-CAN 1

- Select pins 6 and 14.
- Set the scale from millivolts to 10 volts per division.
- The spike at the beginning of each message is the message ID or arbitration.
- The spike at the end of each message is the message acknowledgement.
- This allows you to view the signal in the same manner that a module sees a message.
- Reference the components of a network message in the oscilloscope section of web course 39S01W1 for a description of the function of

  message acknowledgement and arbitration.

Cursors



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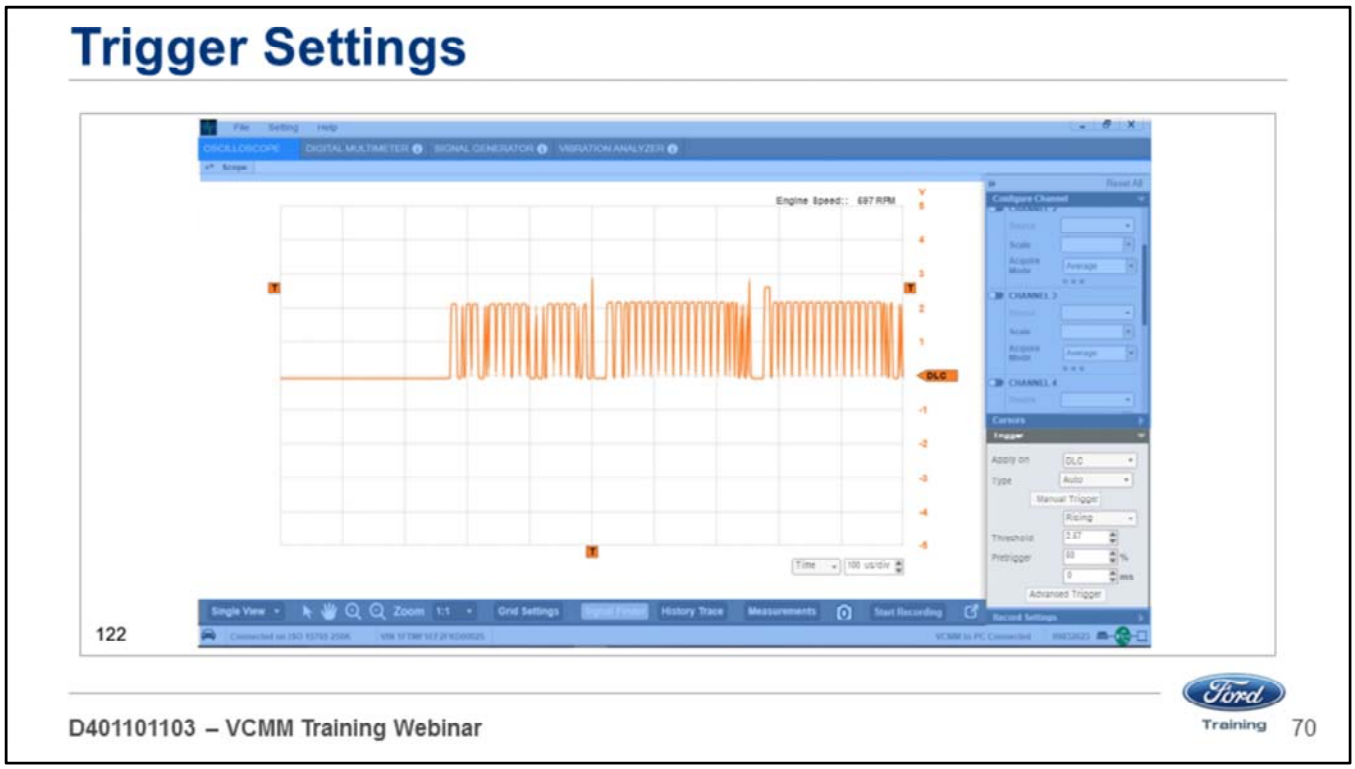
69

- Expand the Cursors section of the Configuration Pane.
- Two cursors, labeled A and B, can be displayed for each channel.
- Click on a channel's cursor On/Off button to turn cursors On and Off for the channel.
- A channel's cursors are displayed as horizontal dashed lines, extending to the channel axis, and drawn in the same color as the channel's scope traces.
- Vertical cursors are displayed in a similar manner, but are drawn in gray or black, and apply to all channels.



You can set the trigger by opening the Trigger section:

1. Select Apply on to whichever channel you want to trigger.
2. Select Type: Auto or Normal.

- Auto mode – If specific trigger conditions are not met in a predetermined amount of time, the VCMM will automatically trigger.
- Normal mode – The scope will only trigger when the set trigger conditions are met.

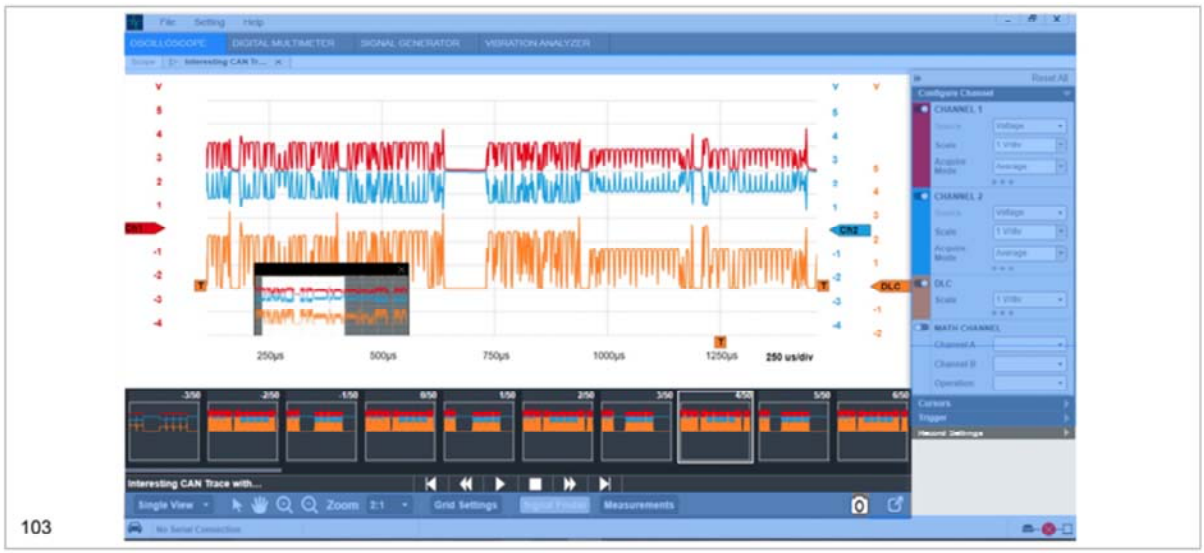
3. Select the Event to either Rising or Falling:

- Select Rising if you are trying to capture a voltage increase such as a short to voltage.
- Select Falling if you are trying to capture a voltage decrease such as short to ground.
- Please note that the filter was adjusted using the auto setting to filter by the acknowledgement spike.
- This was accomplished by sliding the trigger indicator with a mouse.

4. Pretrigger Settings

- A 50% pretrigger setting was used to allow the start point of the trigger event to occur in the center of the screen.
- The pretrigger can be adjusted so that the start of the trigger event occurs before or after the center of the screen.

Recording

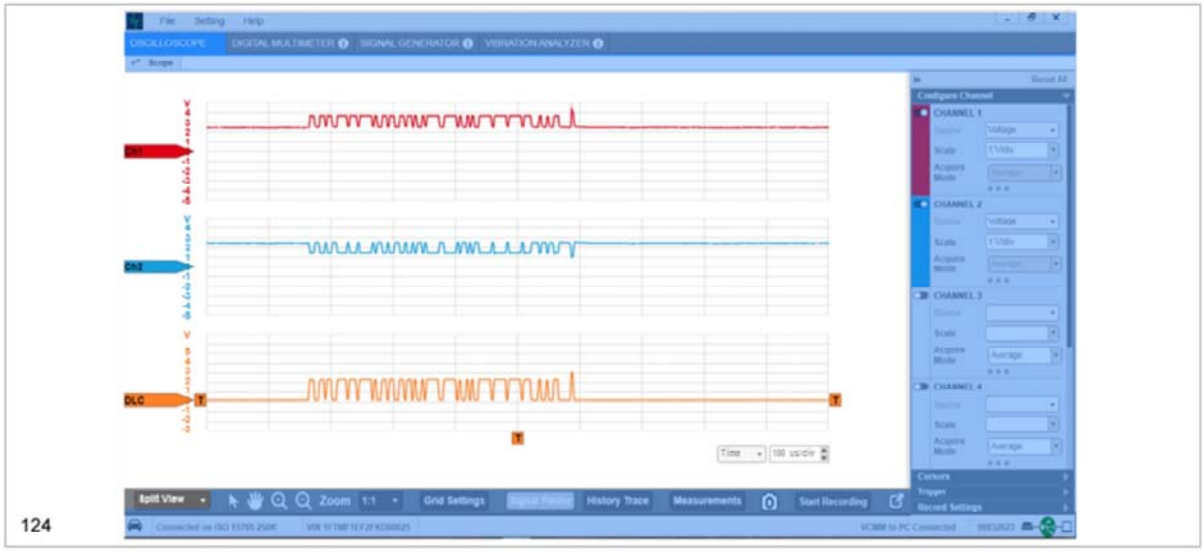


- You can change recording lengths in the Recording settings.
- You can also take a snapshot by clicking the camera icon at the bottom of the screen.
- Once you have the settings the way you want them.
- Click the start recording button to begin recording.
- Once recorded you can review the recording frame by frame.

Screen Views

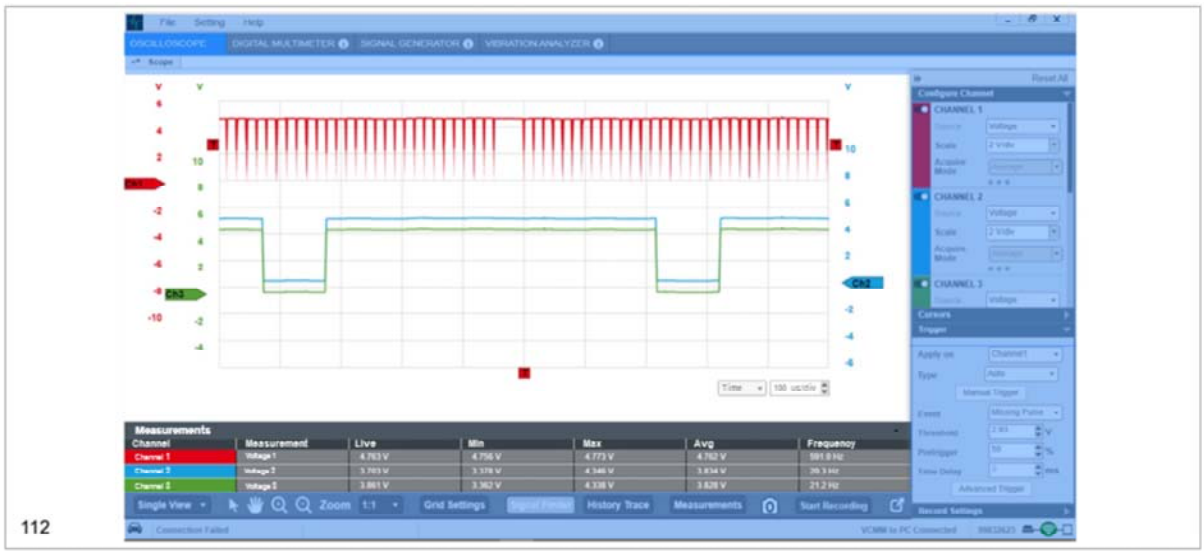
- You can choose either single or split screen view. In single view you can superimpose the signals over each other.
- Channels 1 and 2 are referenced to ground with an additional differential trace reference (DLC channel).
- A differential trace reference assists in isolating faults to individual messages.

Screen Views



In split view you can separate the signals – CAN Hi/CAN Low in a CAN circuit.

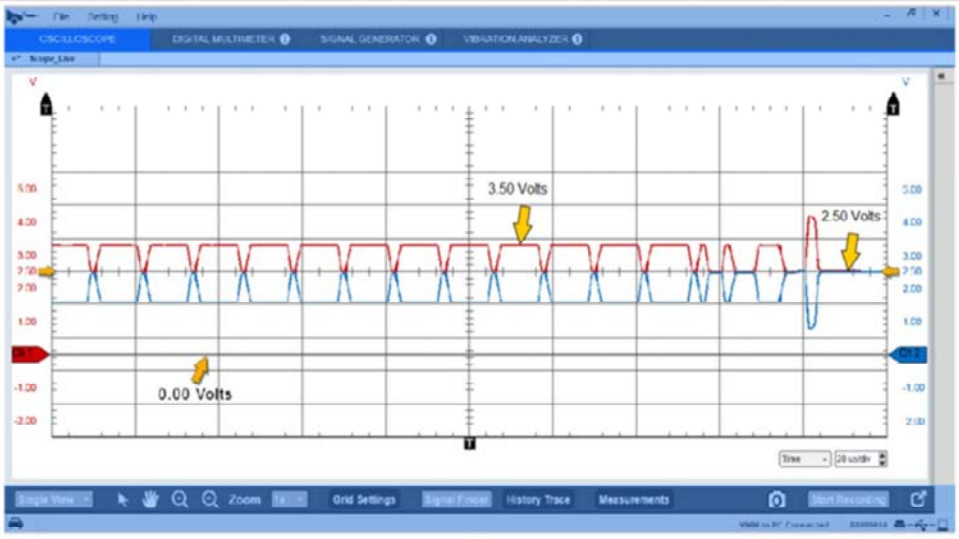
Other Screen Settings



When you click on the measurements button

- Small window appears at the bottom with digital readouts for each channel in use.

Other Screen Settings



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The VCMM can still be used to display single trace patterns in the same manner as the prior VMM.

Other Screen Settings

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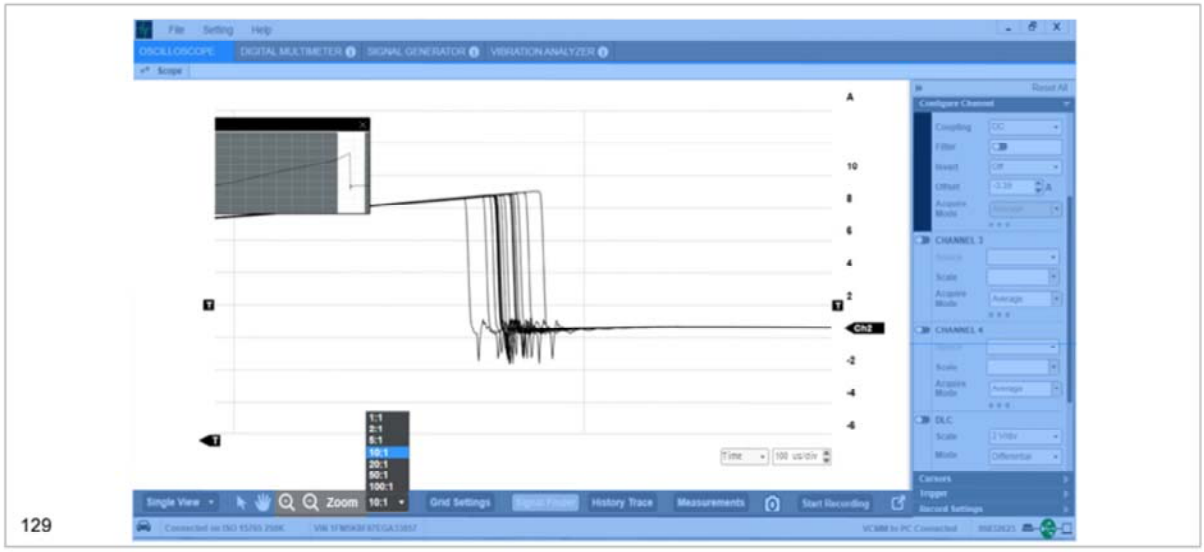
76

The channel trace history feature is accessed using the Control Bar's History Trace button. This feature retains a history of channel traces, up to a specified maximum.

- Click the On/Off button/slider to enable and disable the history feature.
- When the feature is On, set the maximum number of traces to retain.

Other Screen Settings



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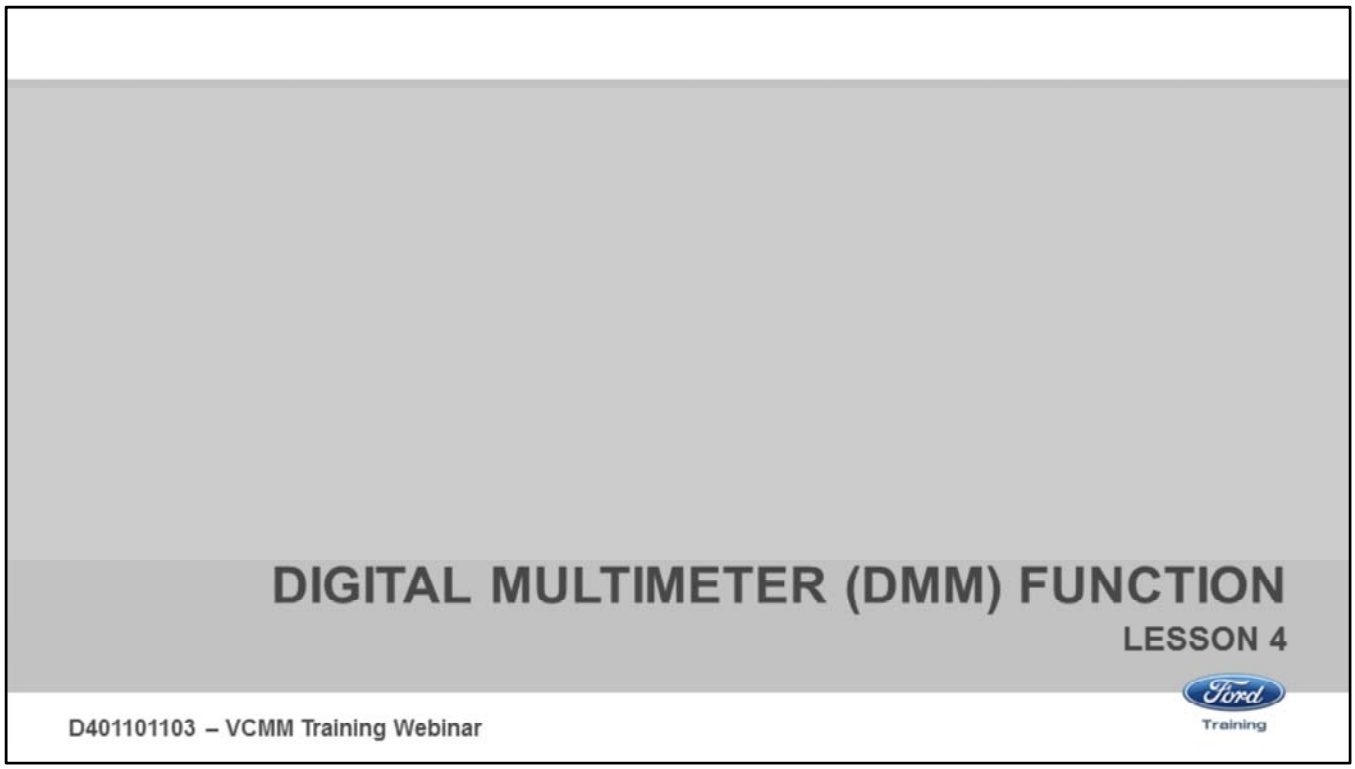
77

The Zoom feature allows you to zoom-in on a subset of a scope frame without having to change the data acquisition configuration.

- Zoom is only available in the oscilloscope tool function, and only applies to the time axis there is no vertical axis zoom.

There are three ways to control the zoom:

- Choose the zoom using the zoom combo box.
- Use the zoom icons (+/-) in the Control Bar.
- Resize the viewport within the zoom mini-window.



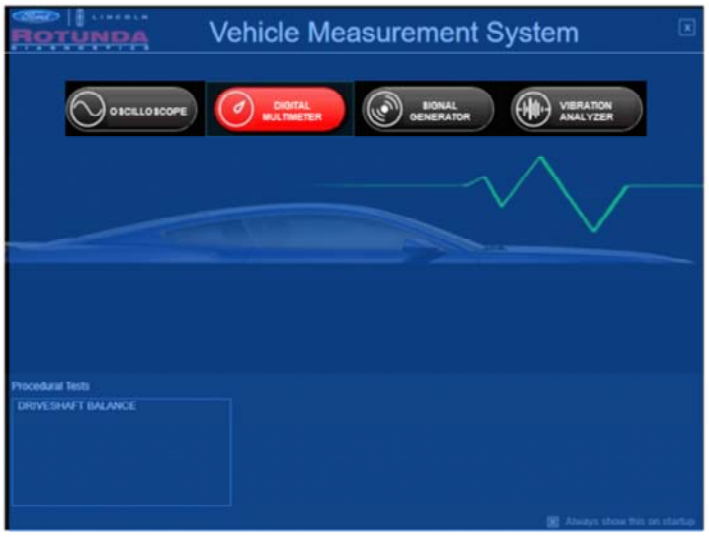
Welcome to Lesson 4, Digital Multimeter (DMM) Function.

- In this lesson we will cover: Digital Multimeter (DMM) function

Measurements:

- Voltage
- Resistance
- Continuity
- Time-based
- Current
- Pressure/Vacuum
- Temperature Settings

Digital Multimeter (DMM)



156

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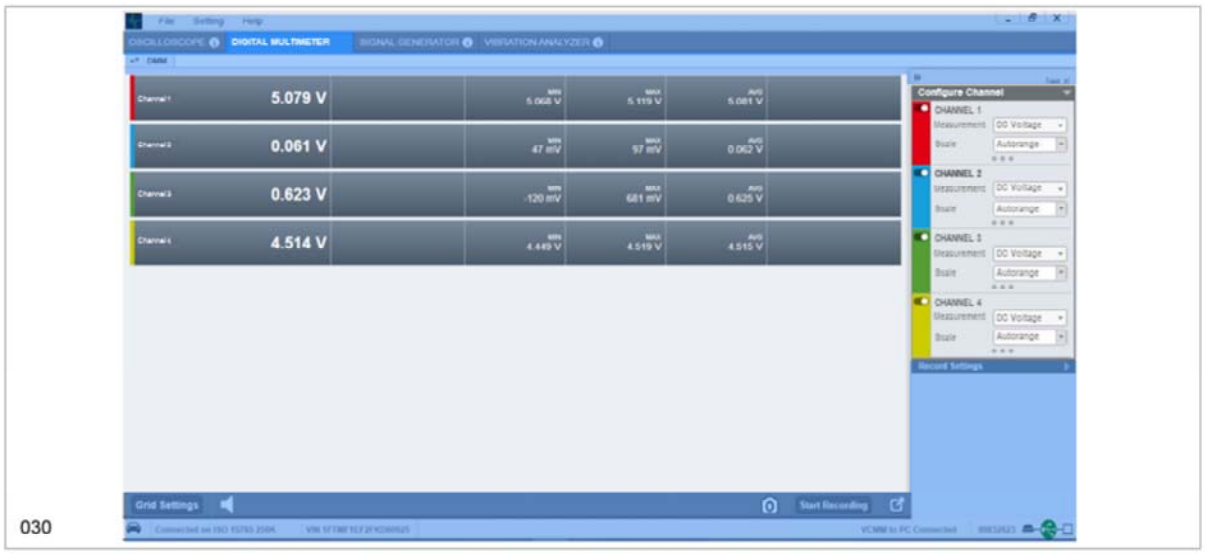
Open the Vehicle Measurement System (VMS):

- The VMS is accessed through the desktop icon or through the Start menu
- Programs – Ford Motor Company – Vehicle Measurement System.

- Click on the Digital Multimeter tool icon on the black Vehicle Measurement System launch screen.
- When you mouse over the button it will turn red.

Digital Multimeter (DMM) Function



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The DMM function allows up to 4 channels of measurement.

- If you choose more than two channels the readings are displayed in a digital output.
- If you choose less than 2 channels the readings are displayed as a graph.

You can measure:

- DC voltage
- AC voltage
- Resistance
- Continuity
- Direct Current (DC)
- Alternating Current (AC)
- Pressure / Vacuum
- Temperature
- Time based measurements
- Pulse width
- Duty cycle
- Frequency
- Period

Voltage Measurements

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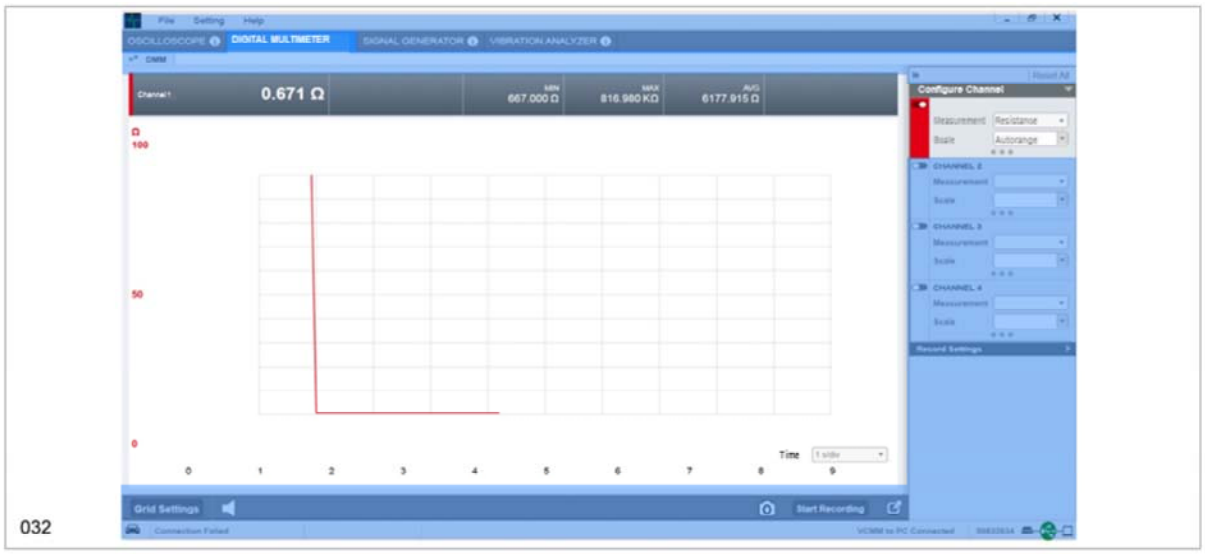
To measure DC voltage place the test probe in one of the four channels and choose DC Voltage from the drop-down menu:

- Ground the black wire of the probe to the battery negative or chassis ground
- If you are performing a differential voltage reading place both ends of the probe at different locations of the circuit.
- The system defaults to Autorange.
- If you would like to change the scale,
- Click the Scale drop-down menu and select the scale you prefer.
- This function can be used to measure AC voltage as well.

Resistance Measurements



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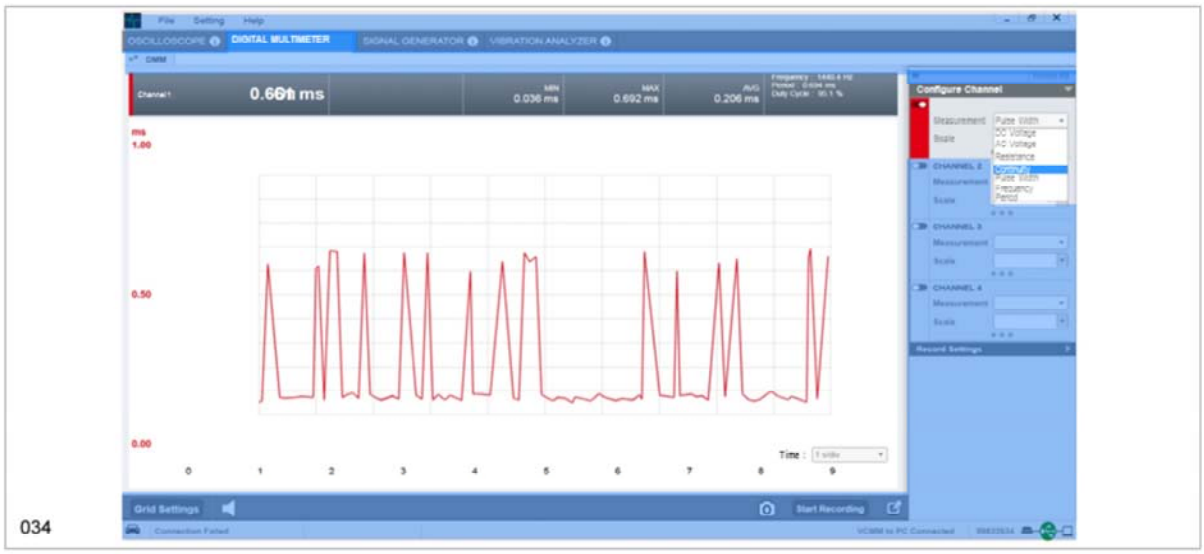
82

To measure resistance place the test probe in one of the four channels:

- Choose resistance from the drop-down menu.
- Place the appropriate leads in the male banana jacks.
- Measure resistance.

- The system defaults to Autorange.
- If you would like to change the scale.
- Click the Scale drop-down menu and select the scale you prefer.

Time Based Measurements



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To make time based measurements place the test probe in one of the four channels:

- Connect the black wire of the probe to battery negative or chassis ground.
- Connect the red wire of the probe to the location in the circuit to be measured

Your choices from the drop-down menu are:

- Pulse Width
- Duty Cycle
- Frequency
- Period

Current Measurements

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84

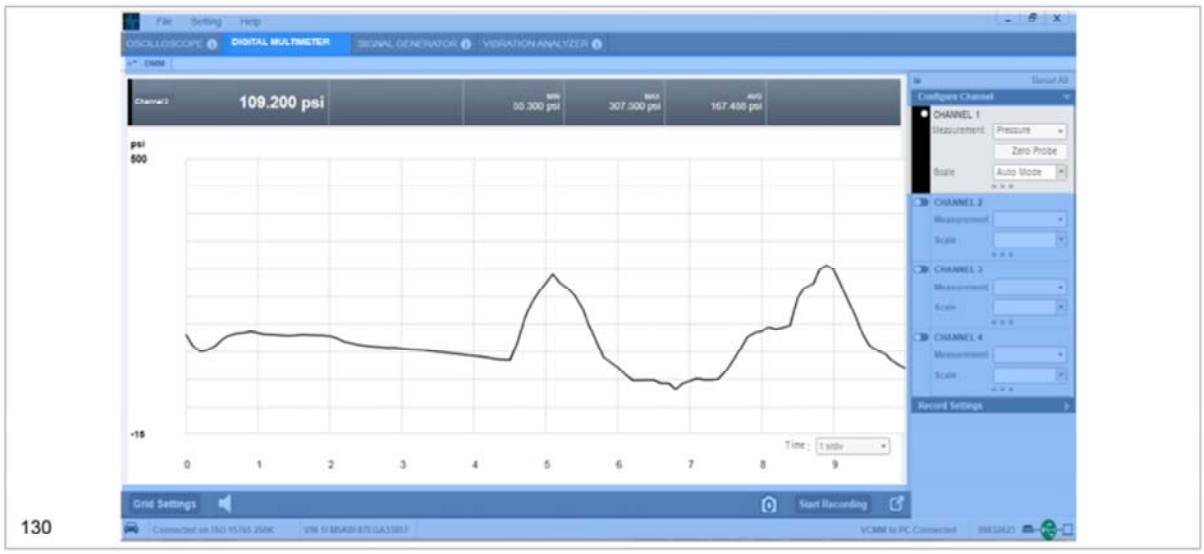
Place either the 50 amp or 500 amp inductive probe in one of the four channels:

- Choose AC or DC.
- Use the Zero Probe button.
- Choose the scale.

Note: The scale defaults to the probe range.

- Channel 2 in orange is the 0-500 amp probe.
- Channel 3 in black is the 0-50 amp probe.

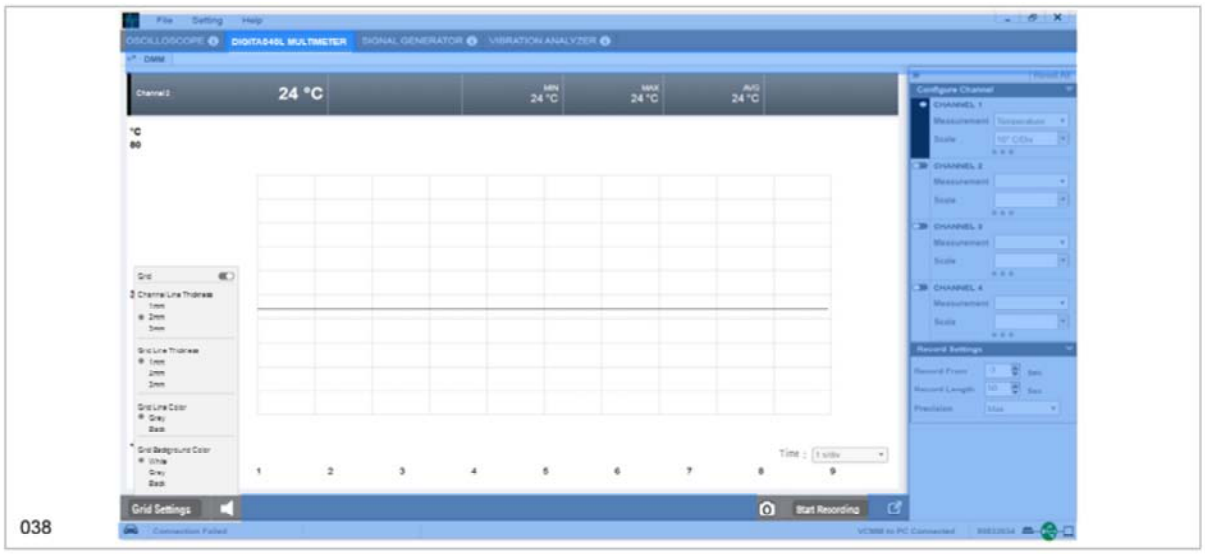
Pressure/Vacuum Measurements



To measure pressure or vacuum place the Pressure Vacuum Transducer (PVT) in one of the four channels:

- Use the Zero Probe button Choose the scale.
- The system defaults to Auto Mode for the scale.

Settings



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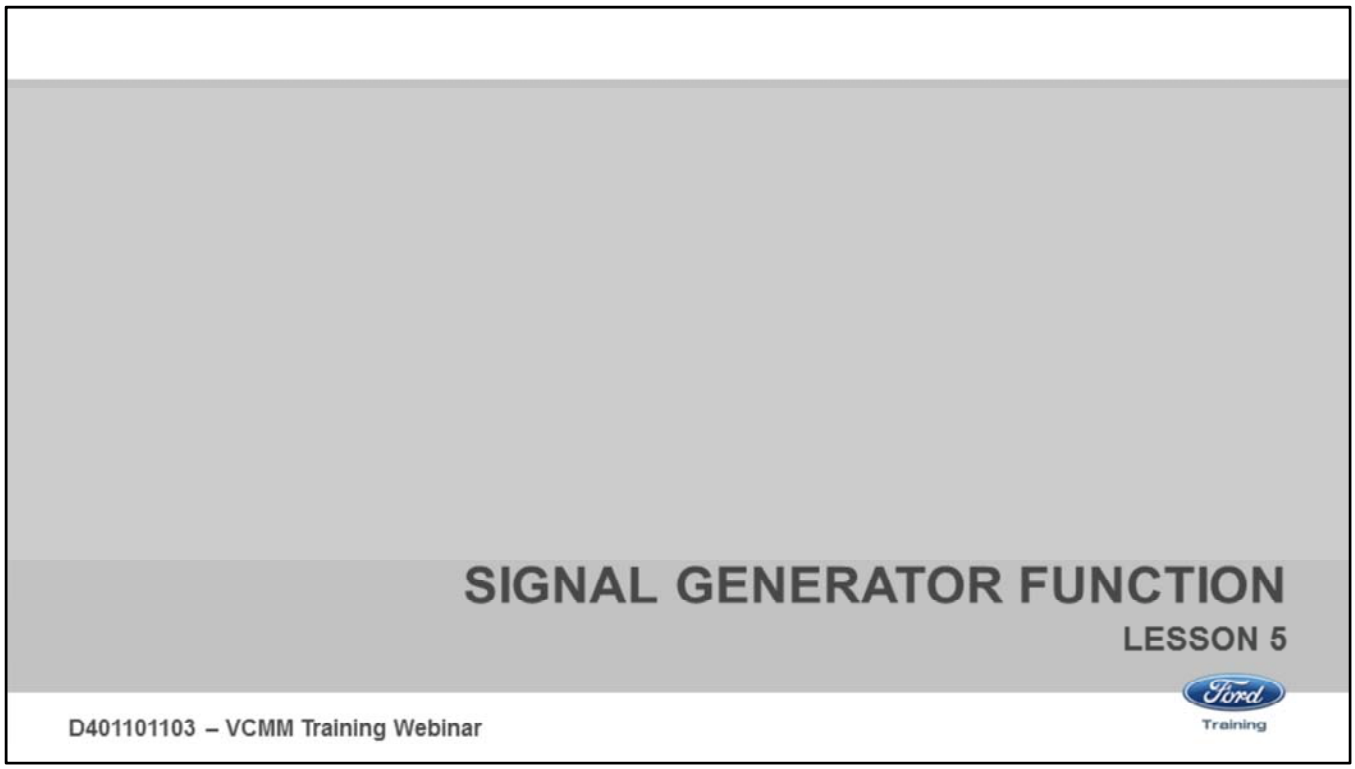
86

You can change recording lengths in Recording settings:

- You can also take a snapshot by clicking the camera icon at the bottom of the screen.
- Once you have the settings the way you want them.
- Click the start recording button to begin recording.
- There is a speaker icon in the lower left side of the screen.
- Click this icon to mute the audible sounds from the tool.



Welcome to Lesson, 5, Signal Generator Function.

In this lesson we will cover: signal generator function

Signal Generator Function

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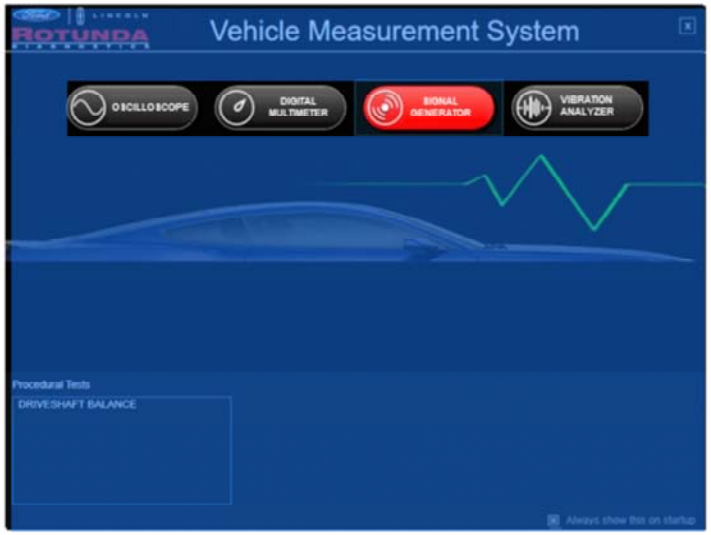
- The VCMM has all of the signal generator functionality of the VMM.
- The new VCMM hardware has greater resolution for measuring voltage frequencies and waveforms.
- The output is 0-30 volts at 100 milliamps maximum.

Signal Generator Function



157

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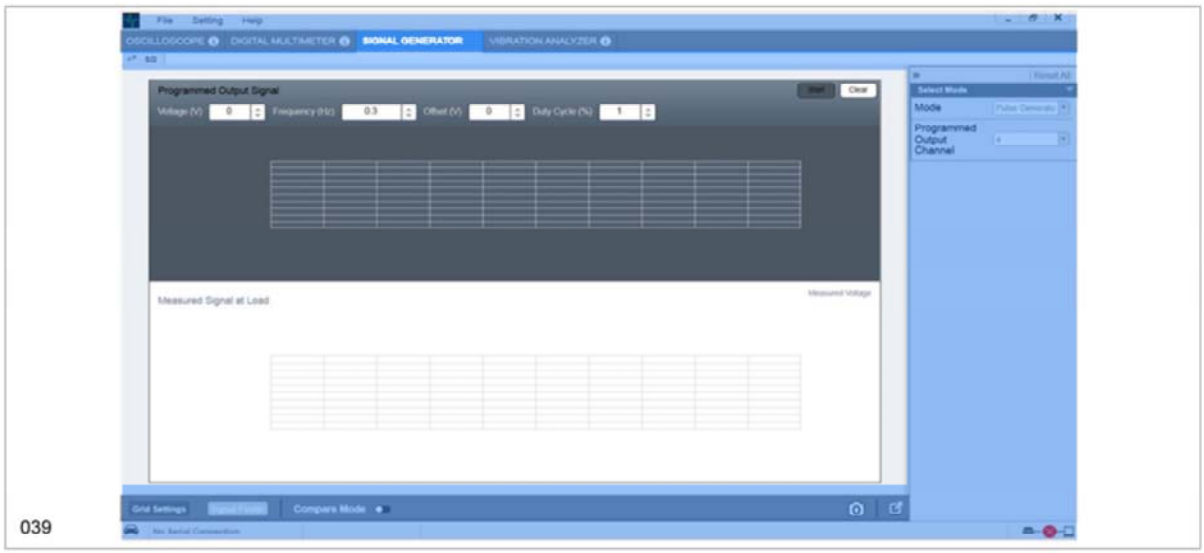
Open the Vehicle Measurement System (VMS):

- The VMS is accessed through the desktop icon or through the Start menu
- Programs – Ford Motor Company – Vehicle Measurement System.

- Click on the Signal Generator tool icon on the black Vehicle Measurement System launch screen.
- When you mouse over the button it will turn red.

Signal Generator Function



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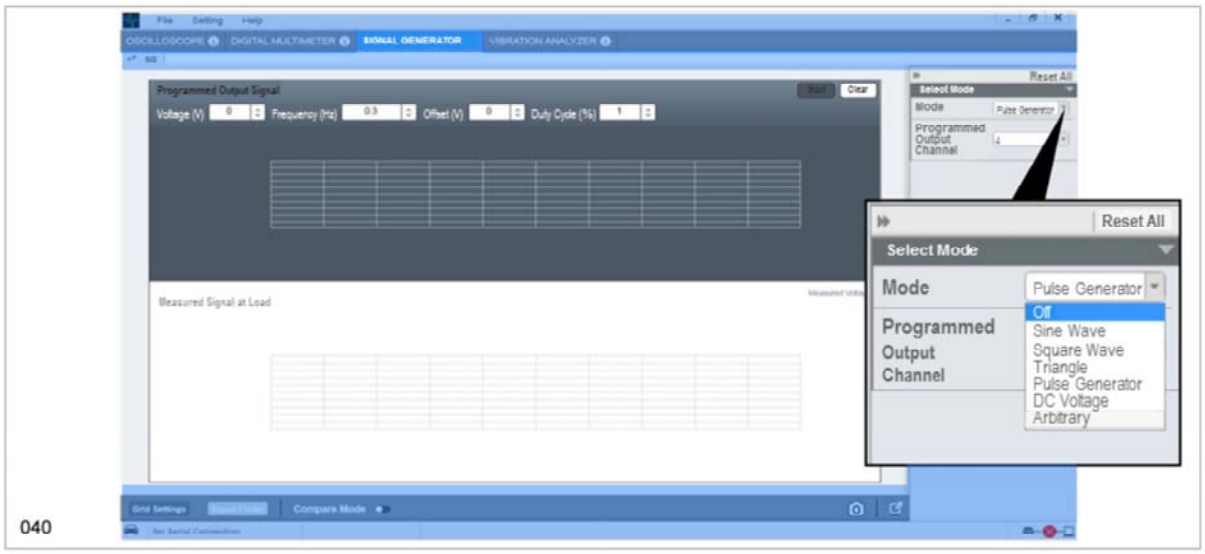
The purpose of the signal generator is to help determine if a vehicle fault is in the:

- Component
- wiring
- module
- It uses a new interface compared to the signal generator used in the old VMM.

Signal Generator Function



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91

With the VCMM signal generator function you can generate the following signals:

- Sine wave
- Square wave
- Triangle
- Pulse generator
- DC voltage
- Arbitrary (future function)

Signal Generator Function

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92

You can only choose channel 1 when using the signal generator function.

- The VCMM is hard-wired to generate the output signal on the channel 1 port.

Signal Generator Function

Here is an example of a sine wave signal at 7.5 volts and 10 hertz.

- The top of the screen shows what the signal should look like.
- The bottom of the screen shows the actual signal measured at the load. - Channel 2 is used to obtain this reading.
- This is the display with compare mode off.

Signal Generator Function

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Here is the same sine wave signal at 7.5 volts and 10 hertz in the compare mode.

- In the compare mode the signals are placed over each other or superimposed.

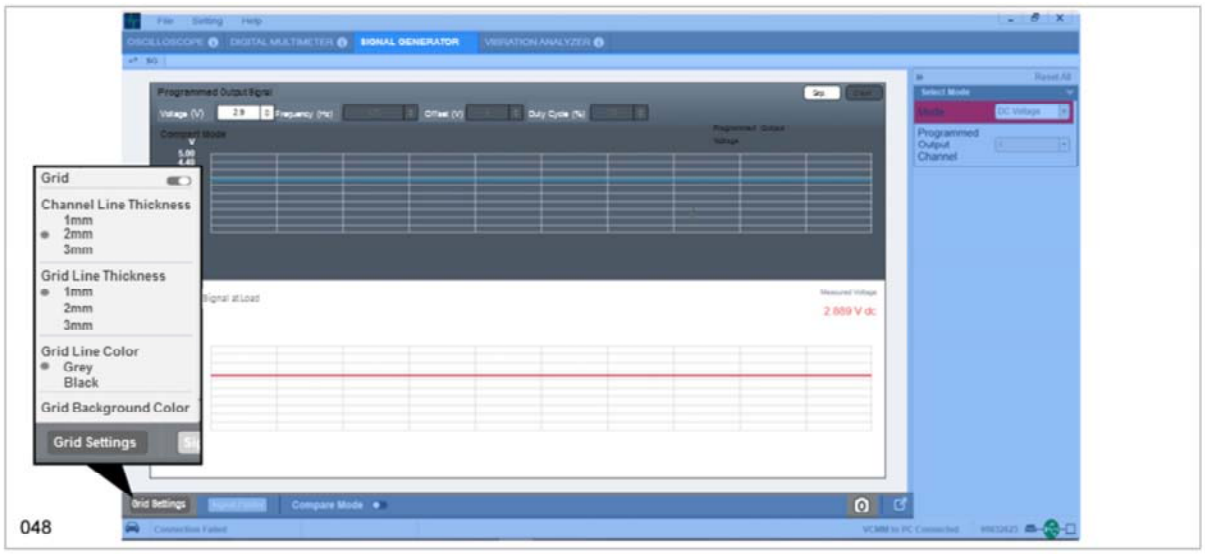
Signal Generator Function

Here is an example of a square wave signal at 7.5 volts and 10 hertz.

Signal Generator Function

Here is an example of a pulse generator signal at 7.5 volts and 125 hertz with a duty cycle of 73%.

Signal Generator Function



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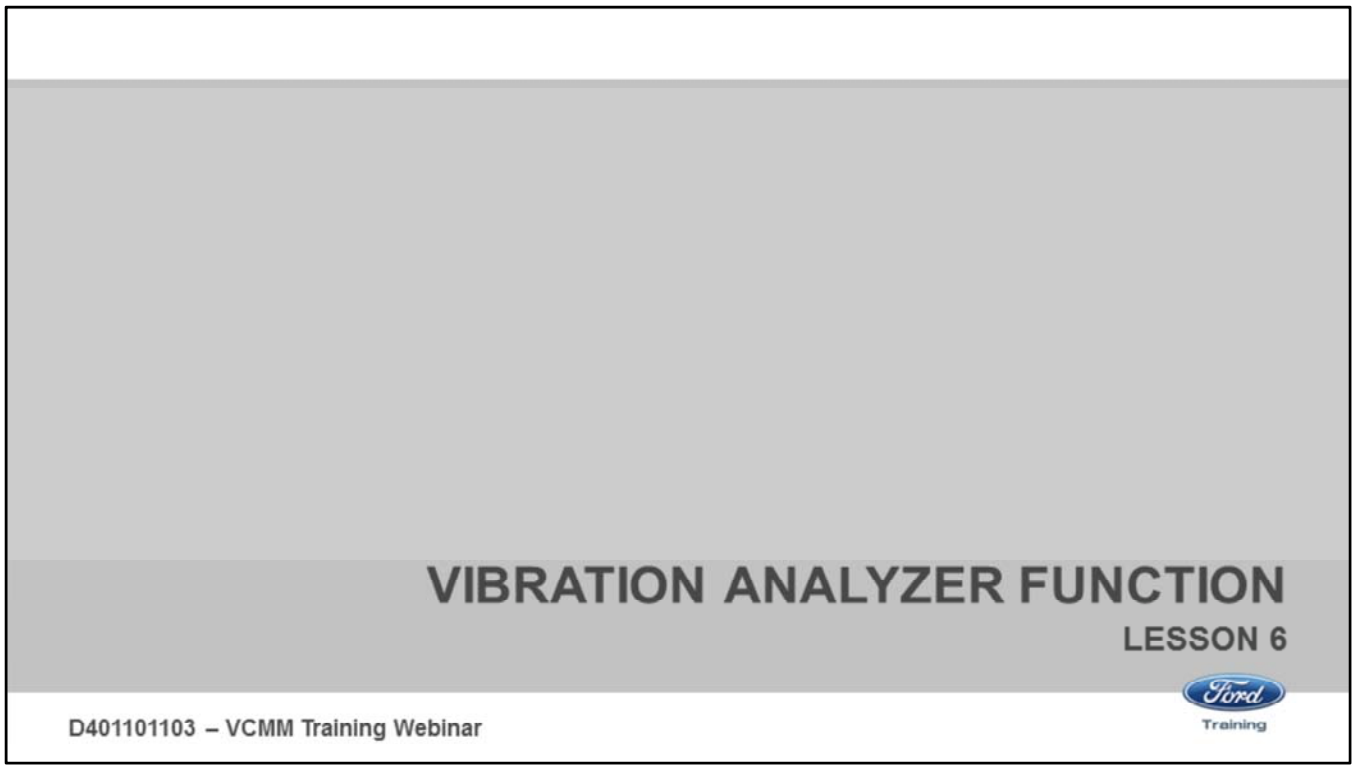
97

The VCMM signal generator function also has the following features:

- Change the grid settings
- Signal finder
- Compare mode
- Snapshot by using the camera icon at the bottom of the screen.



Welcome to Lesson 6, Vibration Analyzer Function.

In this lesson we will cover the vibration analyzer function.

Vibration Analyzer Function

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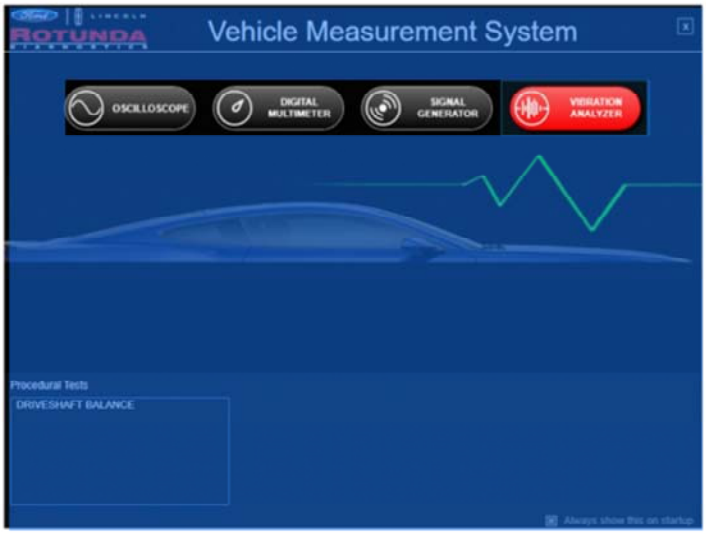
The VCMM has all of the vibration analyzer functionality of the Vetronix MTS 4000/4100.

Vibration Analyzer Function



158

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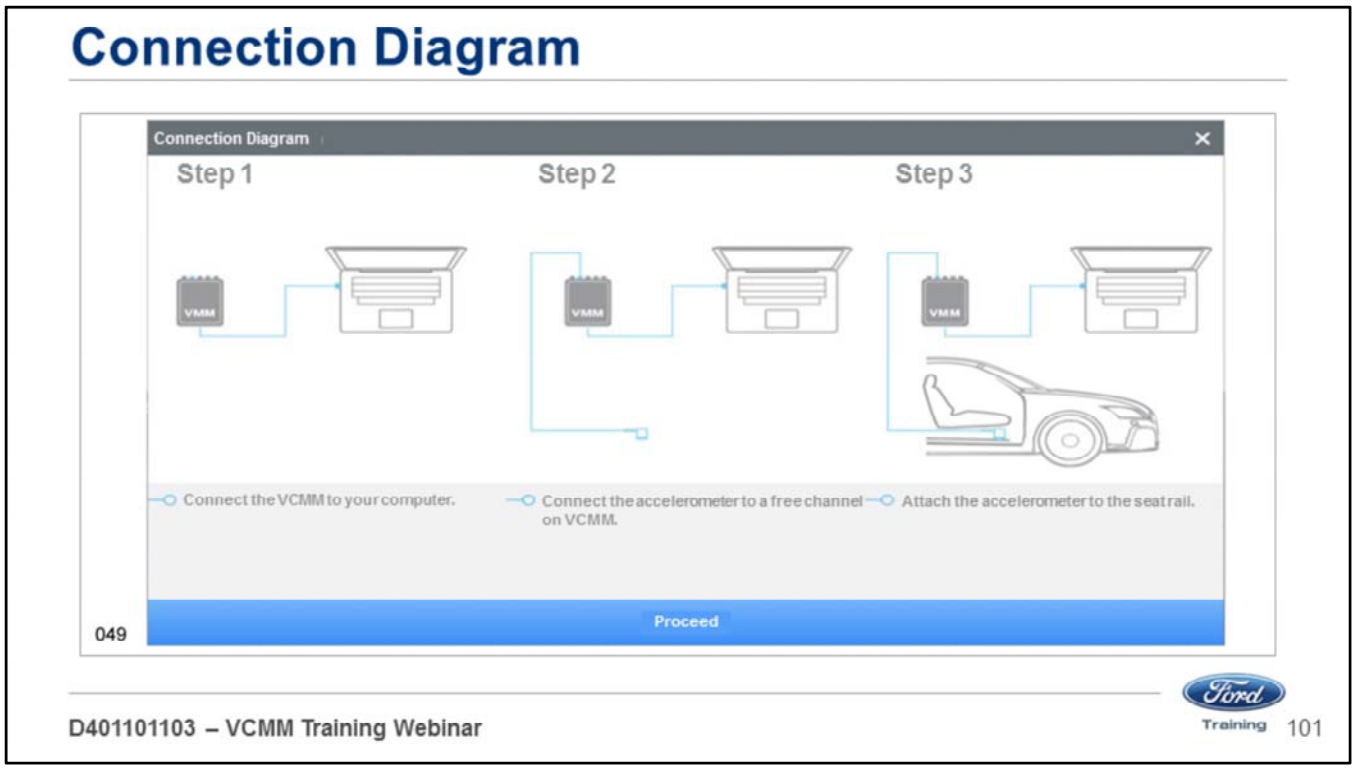
Open the Vehicle Measurement System (VMS):

- The VMS is accessed through the desktop icon or through the Start menu
- Programs – Ford Motor Company – Vehicle Measurement System.

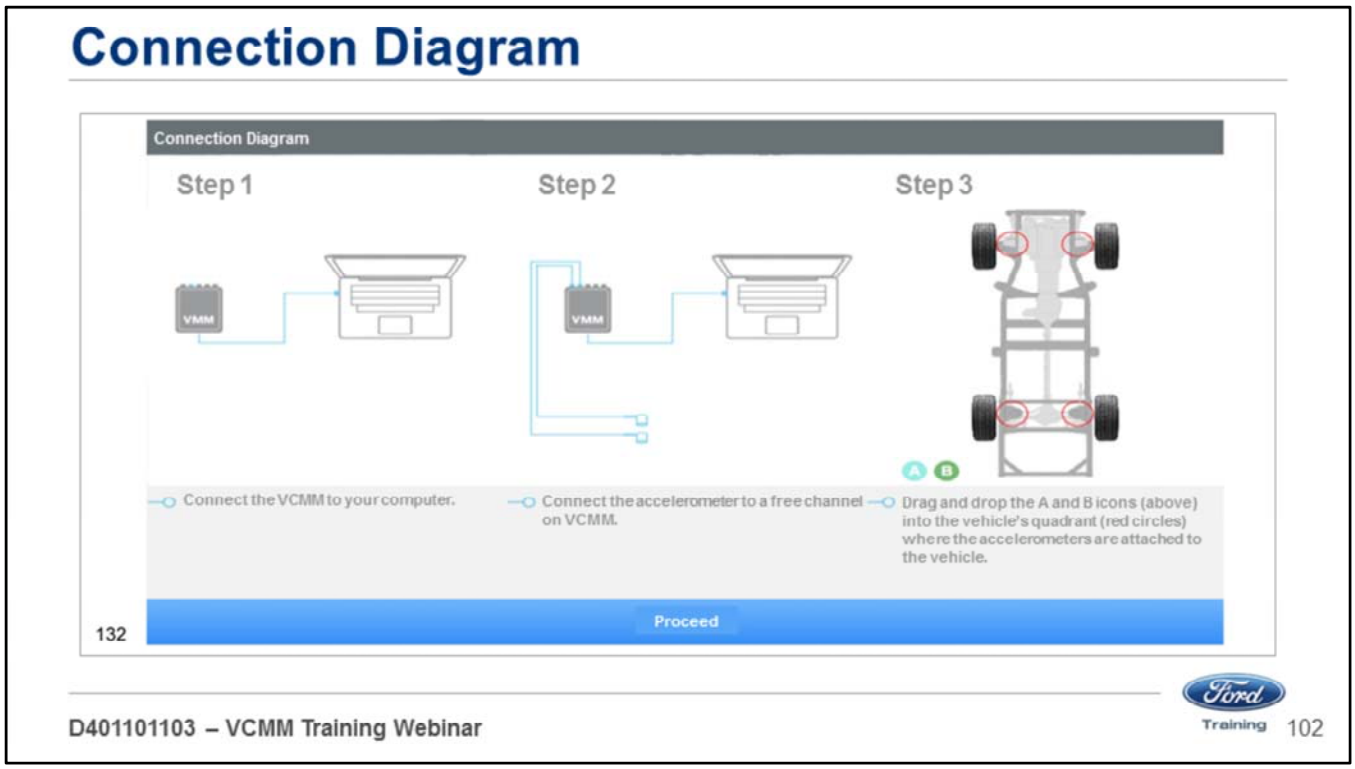
- Click on the Vibration Analyzer tool icon on the black Vehicle Measurement System launch screen.
- When you mouse over the button it will turn red.



When you open the vibration analyzer a pop-up window appears showing a connection diagram:

1. Connect the VCMM to your scan tool PC.
2. Connect the accelerometer to a free channel on the VCMM.
3. Attach the accelerometer to the seat rail.

Click the Proceed button on the bottom of the page.



If you have 2 accelerometers connected, you will see a pop up window like this showing a connection diagram:

1. Connect the VCMM to your scan tool PC.
2. Connect both accelerometers to a free channels on the VCMM.
3. Drag and drop the A and B icons into the vehicle quadrant (red circles) where the accelerometers are attached to the vehicle.

In this example if you placed accelerometer A on the right front frame.

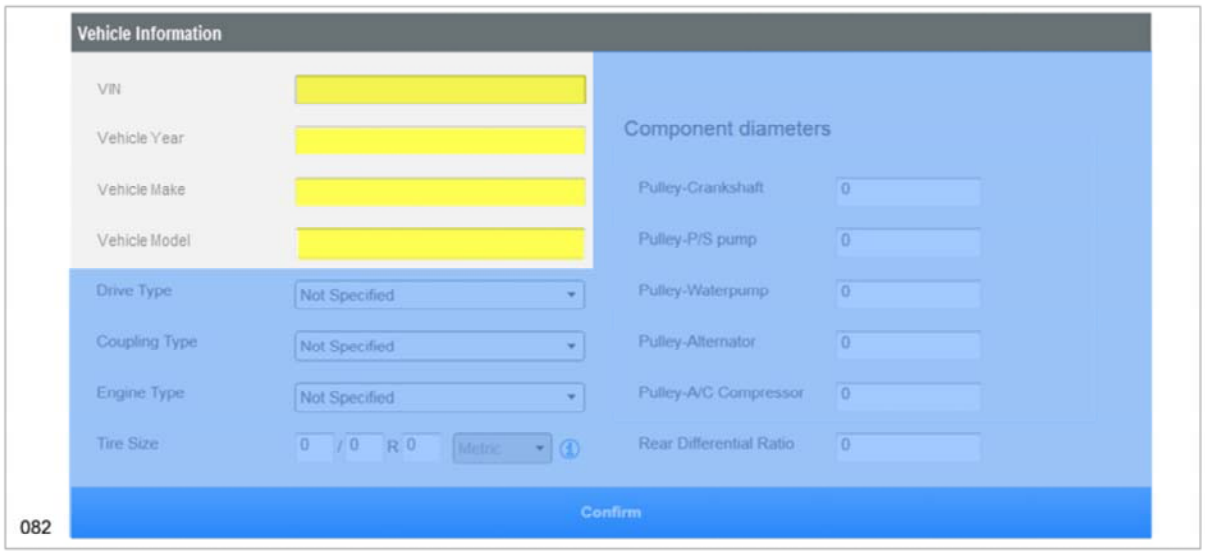
- Drag the A icon to the red circle on the right front of the frame diagram under step 3.

If you placed accelerometer B on the left rear frame.

- Drag the B icon to the red circle on the left rear of the frame diagram under step 3.

- Click the Proceed button on the bottom of the page.

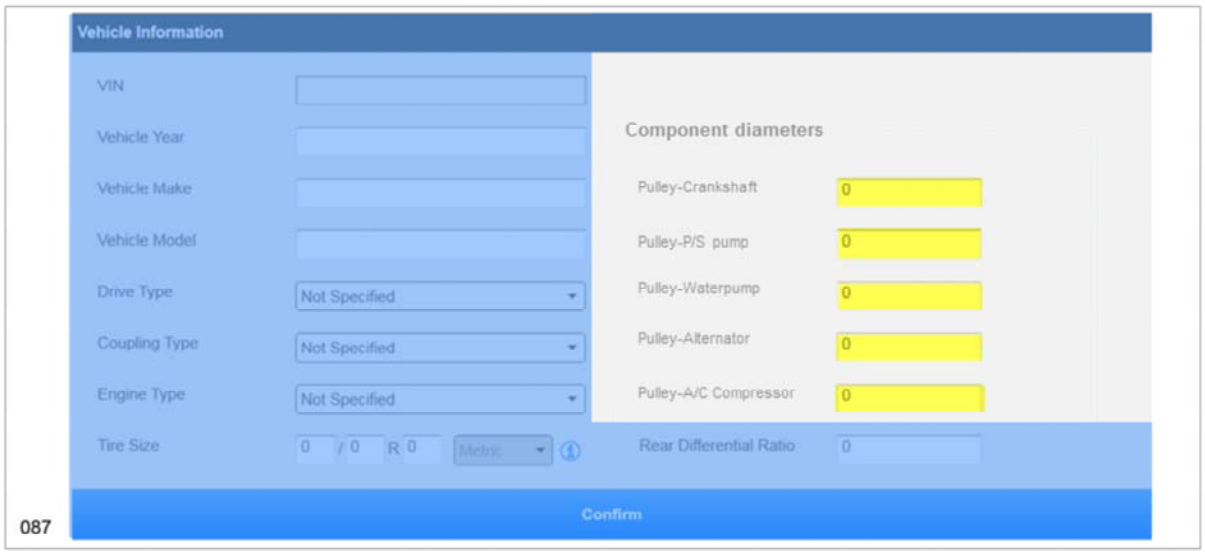
Vehicle Information



In this screen type in the VIN, year, make and model information.

Note: The Vin is pulled in automatically from the PCM.

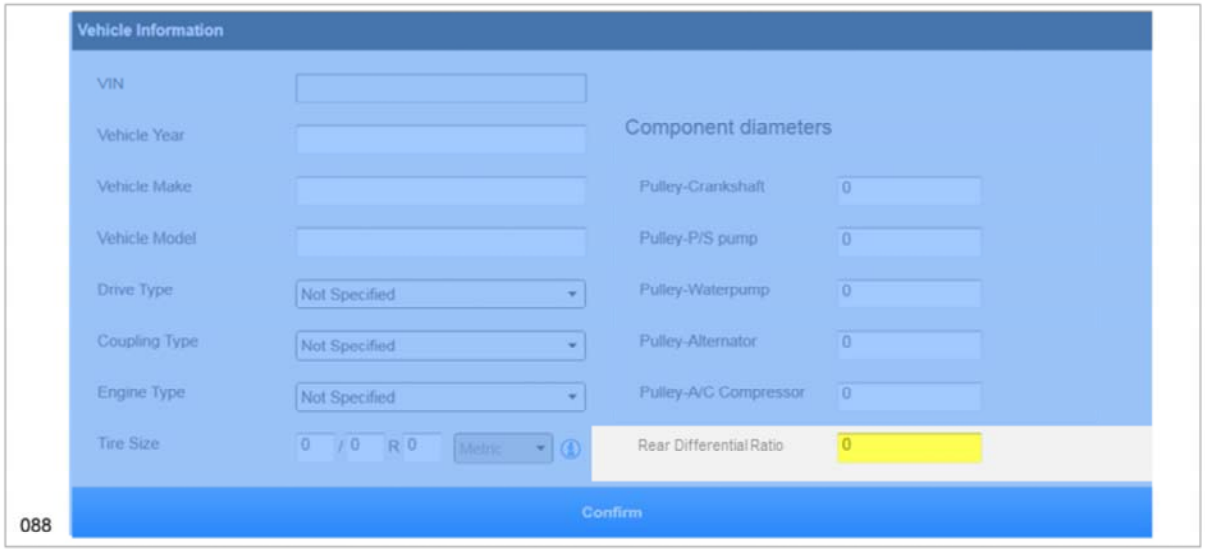
Pulley Sizes



Type in the pulley size diameters for the:

- Crankshaft
- Power Steering (PS) pump
- Waterpump
- Alternator
- Air Conditioning (A/C) compressor

Rear Differential Ratio



Type in the rear differential ratio.

Main Analyzer Screen

D401101103 – VCMM Training Webinar

Ford Training 106

Once you record all of the vehicle information you will see the main screen.

- The top half of the screen provides you a chassis diagram based on the type of Drive selected.
- This vehicle is a 4 wheel drive (4WD) truck.
- To the right of the chassis diagram is a list of components.
- accelerometers A and B readings, if you are using both.

In this example items in red indicate an issue.

- On the chassis diagram the drive shafts are red.
- Driveshaft in the components list is red.
- Accelerometer A is red.

This is a first order driveshaft vibration at 87 km/h (54 mph) with an engine speed of 1476 RPMs.

Main Analyzer Screen

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107

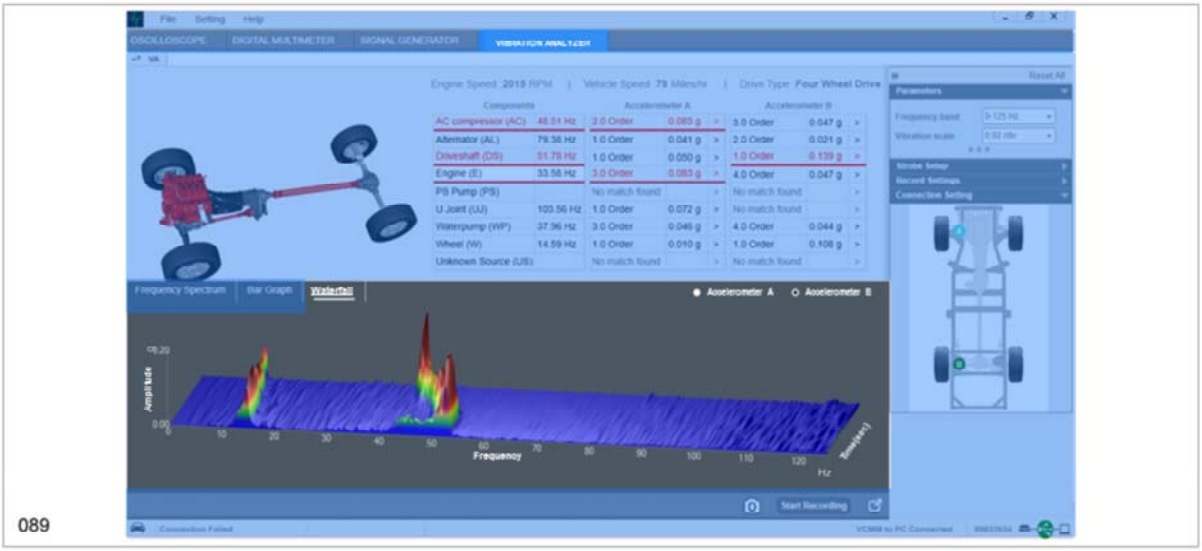
The bottom half of the screen provides you with choices on how you would like this data displayed.

- This screen is the frequency spectrum display.

Main Analyzer Screen

You can choose to have the data displayed in a bar graph format.

Main Analyzer Screen



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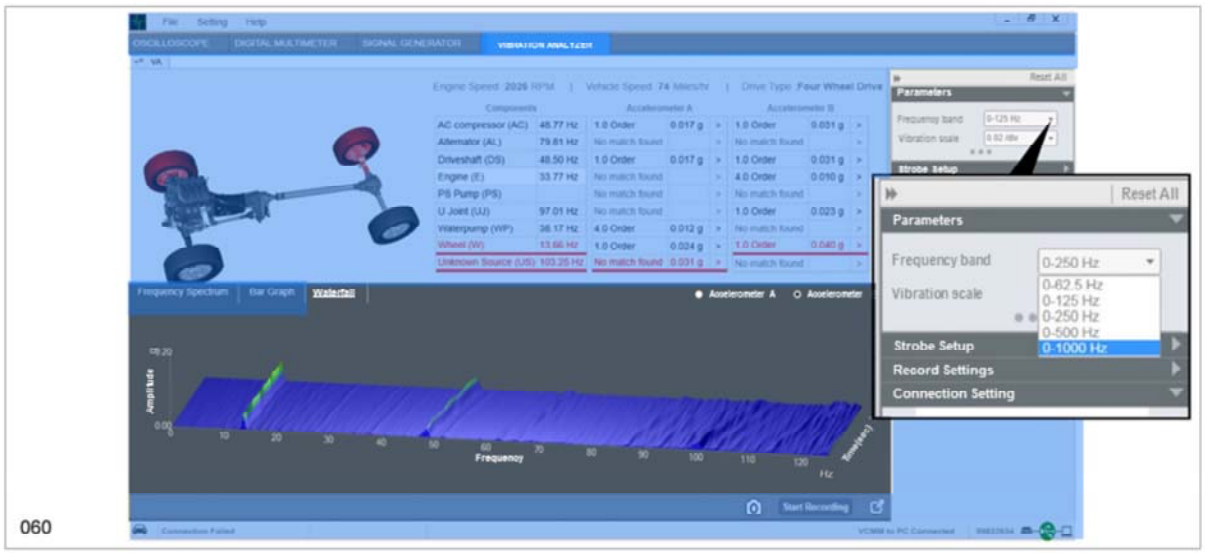
Ford Training 109

Or you can choose to have the data displayed in a waterfall format.

Parameters



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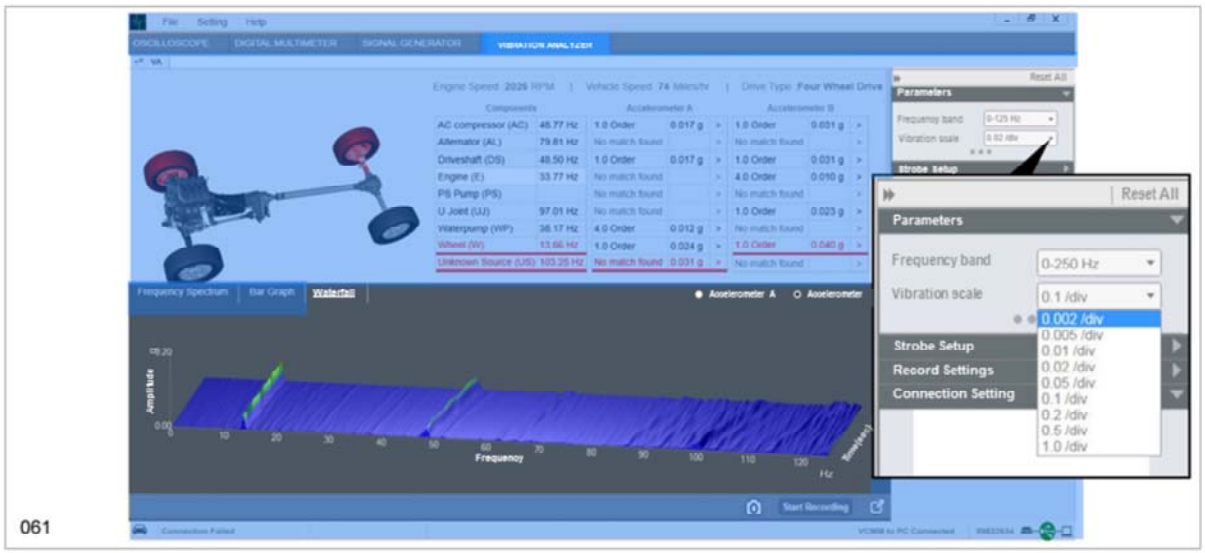
110

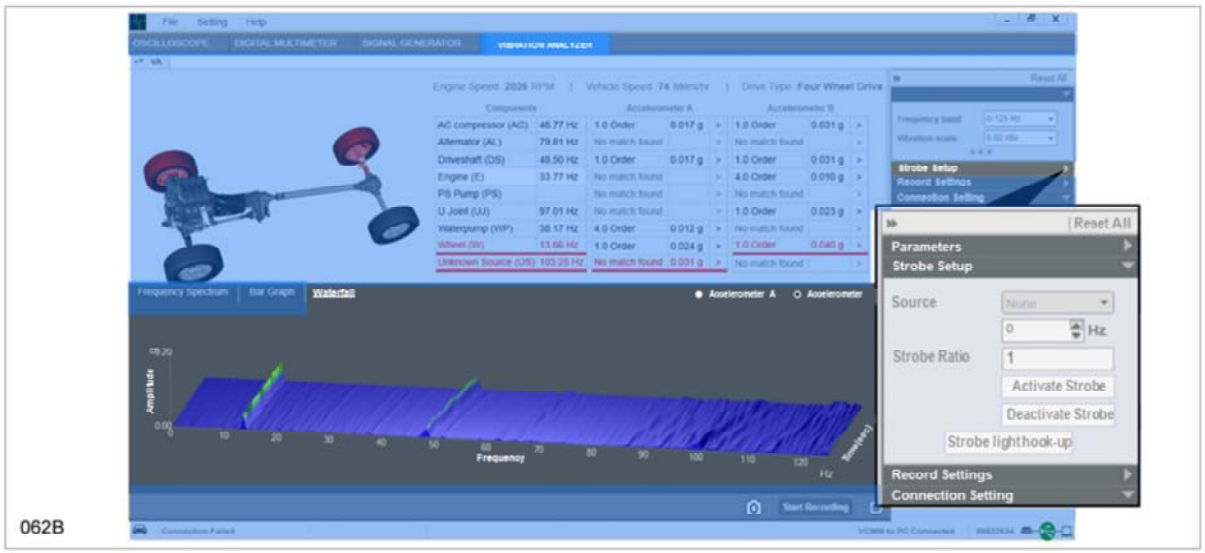
You can change the frequency band parameters from 0-62 Hz to 0-1000 Hz.

Parameters



You can change the vibration scale parameters from 0.002/div to 1.0/div.

Strobe Setup



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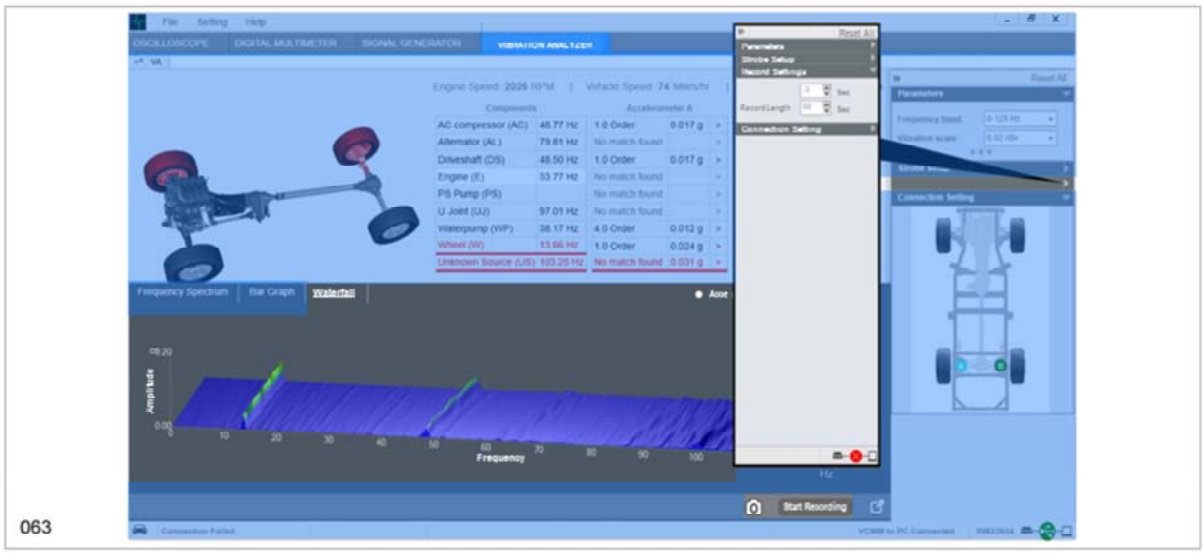
112

You can use a strobe light (timing light) to determine if a pulley is out of round or bent.

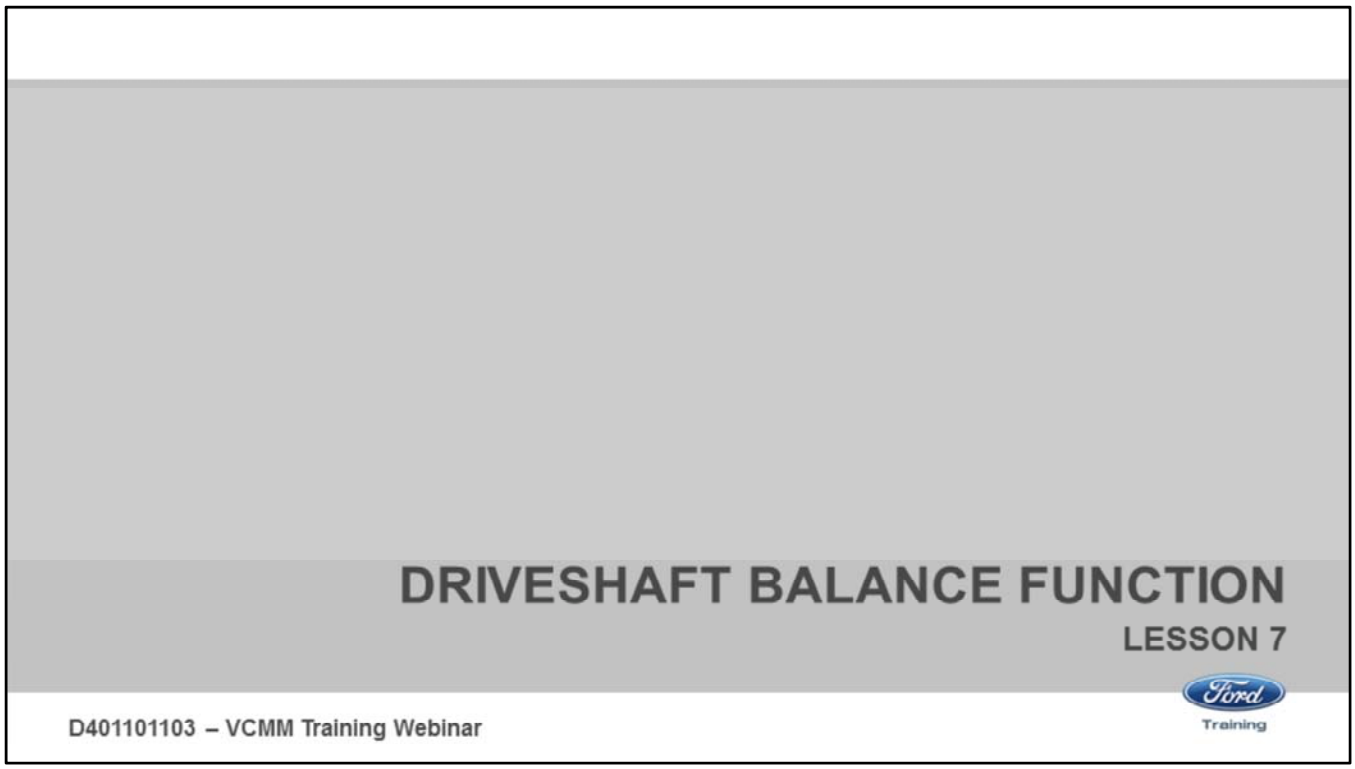
- The strobe light function triggers the strobe synchronous with a vibration to help isolate the source of the vibration.
- In order to use this feature, you must connect an Induction Loop probe on VCMM channel 1.

Recording



You can change recording lengths in the Recording settings.

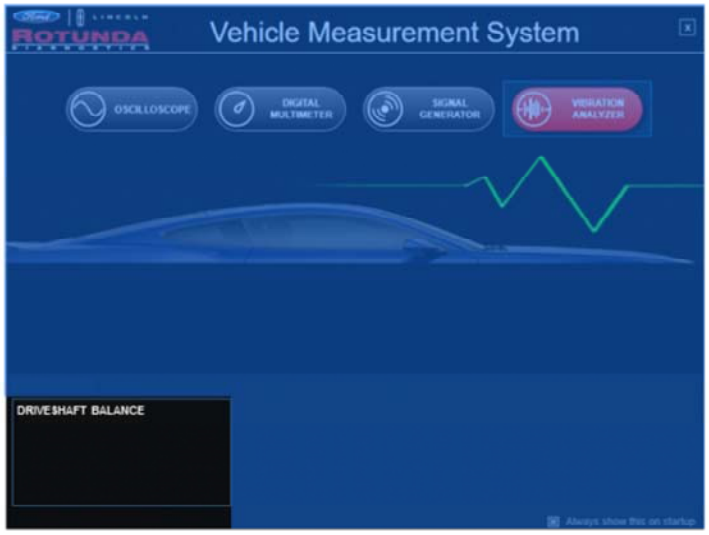
- Once you have the settings the way you want them.
- Click the start recording button to begin recording.
- Take a snapshot click the camera icon at the bottom of the screen.



Welcome to Lesson 6, Driveshaft Balance Function.

In this lesson we will cover the driveshaft balance function.

Driveshaft Balance Function



158

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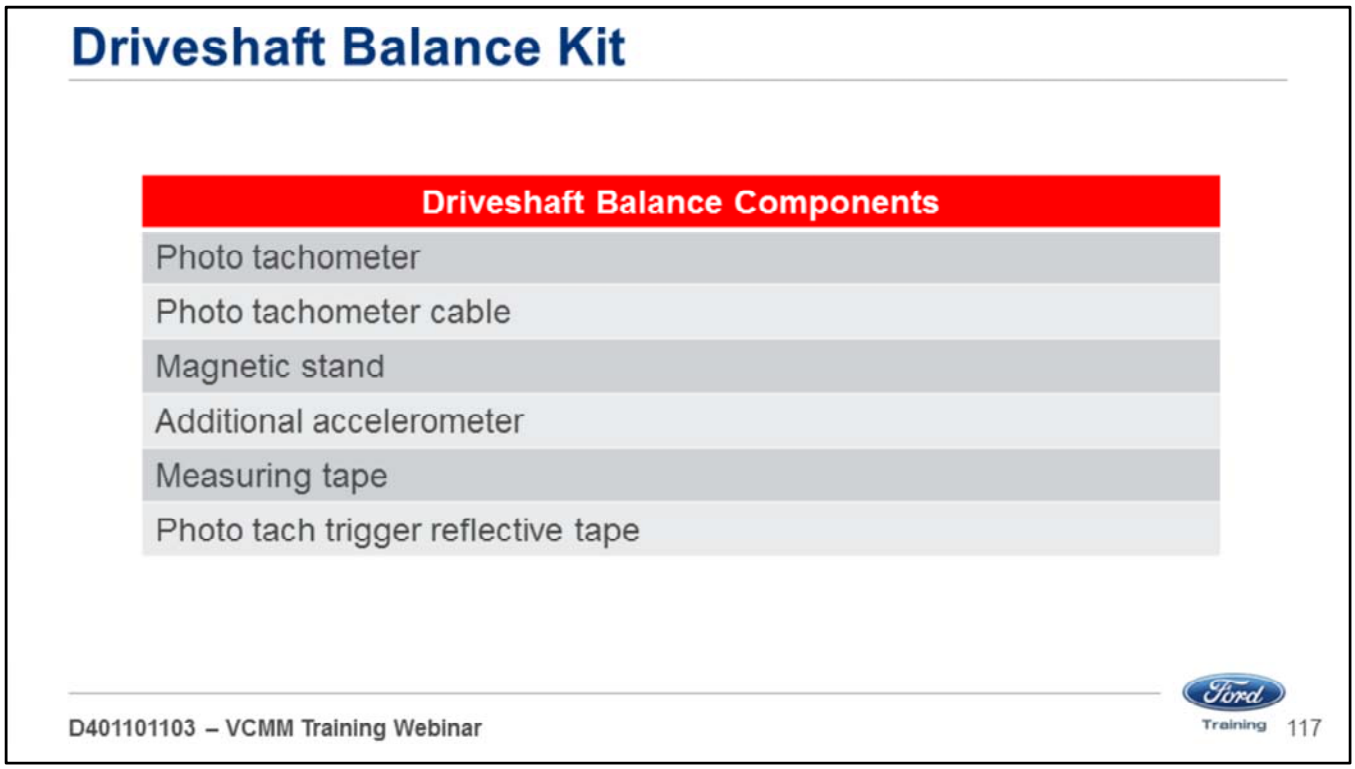
Open the Vehicle Measurement System (VMS).

- The VMS is accessed through the desktop icon or through the Start menu
- Programs – Ford Motor Company – Vehicle Measurement System.

- Click on the Driveshaft Balance link located on the left lower section of the black Vehicle Measurement System launch screen.

Driveshaft Balance Kit

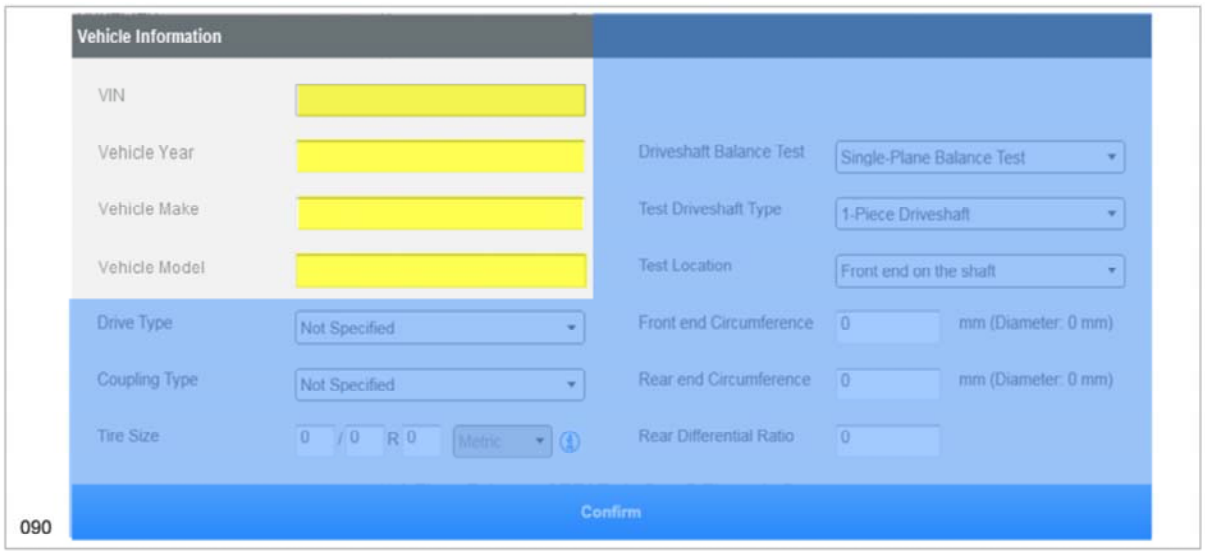
To balance drive shafts you can use the kit shown above.



The driveshaft balance kit contains the following components.

- Photo tachometer
- Photo tachometer cable
- Magnetic stand
- Additional accelerometer (B)
- Measuring tape
- Photo tach trigger reflective tape

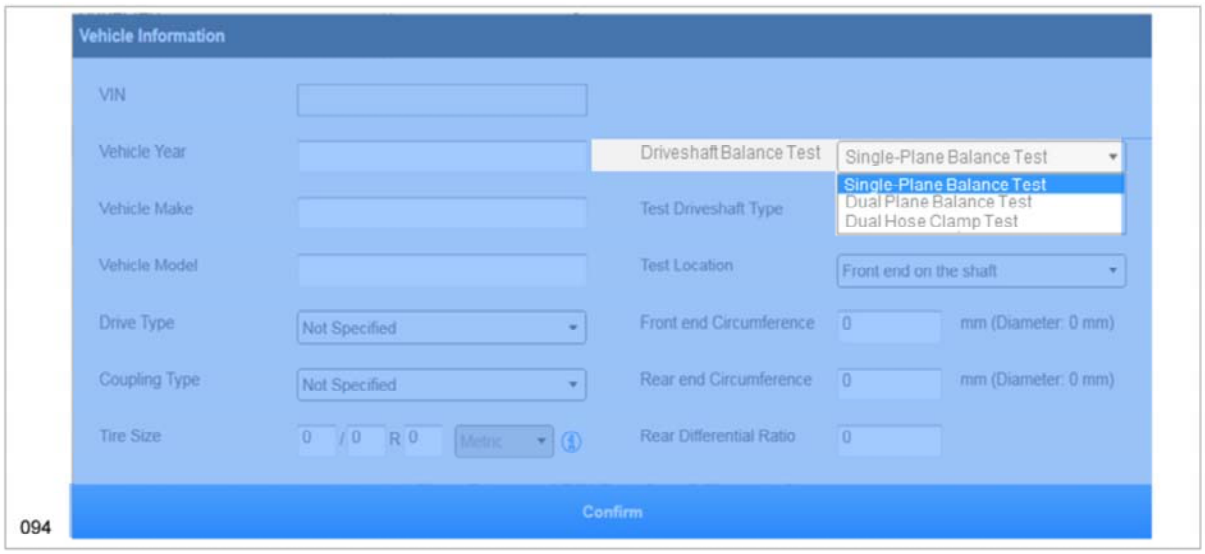
Vehicle Information



In this screen type in the VIN, year, make and model information.

Note: The Vin is pulled in automatically from the PCM.

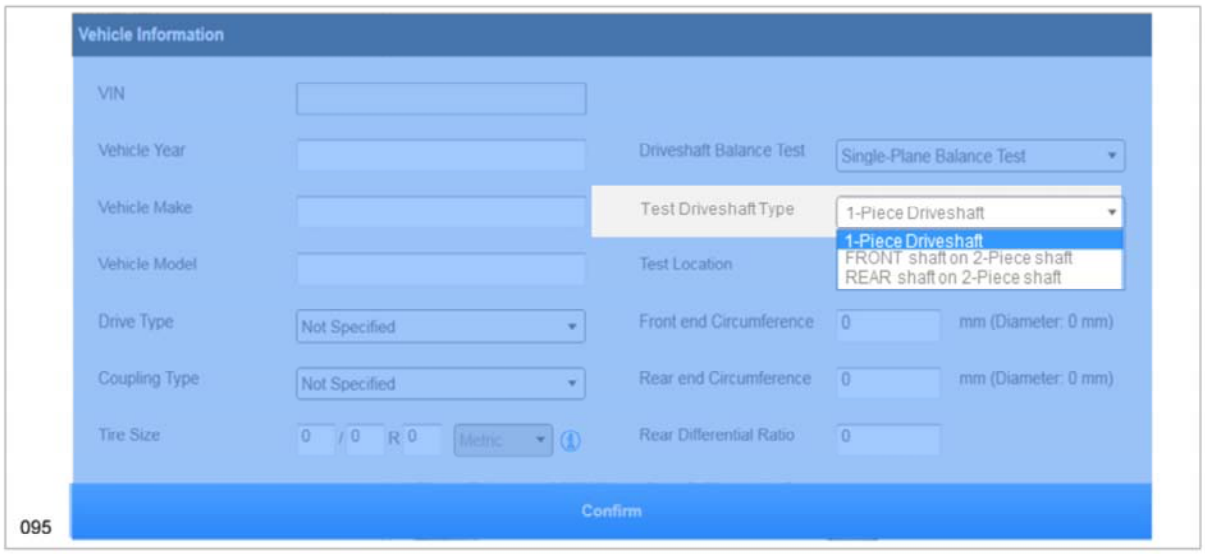
Driveshaft Balance Test



Select the driveshaft balance test you want to perform:

- Single-Plane
- Dual-Plane
- Dual Hose Clamp

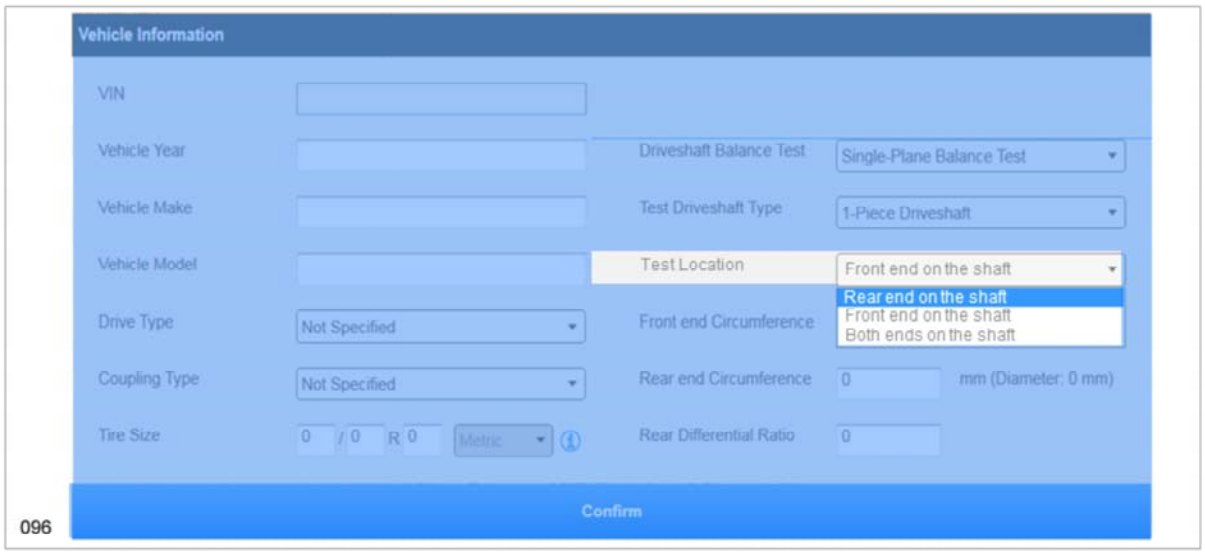
Test Driveshaft Type



Select the Test Driveshaft Type:

- 1-piece driveshaft
- Front shaft on 2-piece shaft
- Rear shaft on 2-piece shaft

Test Location



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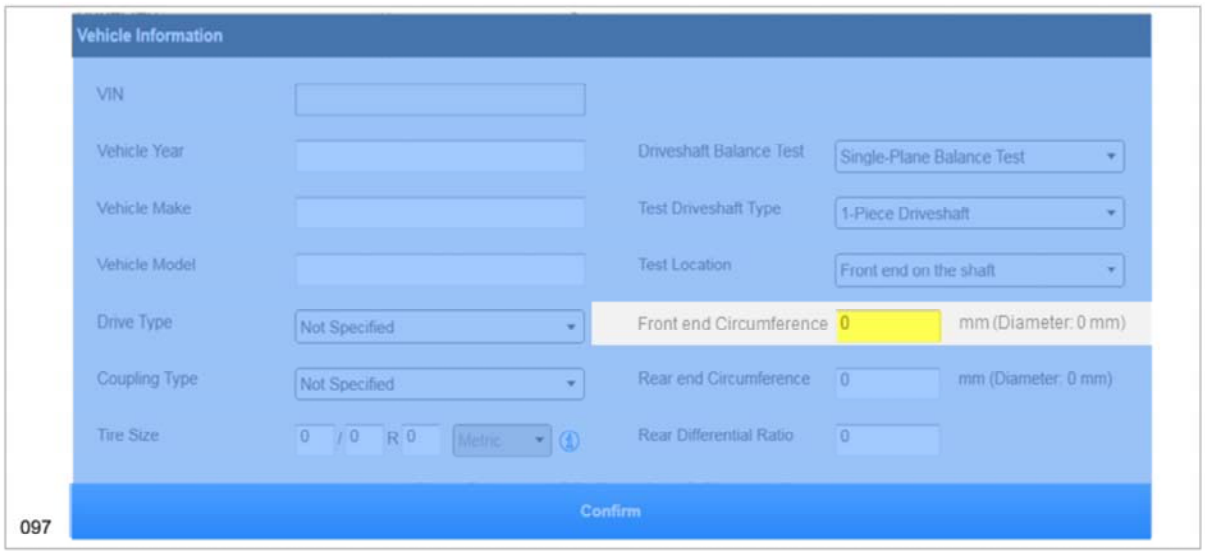
Ford Training

121

Select the Test Location:

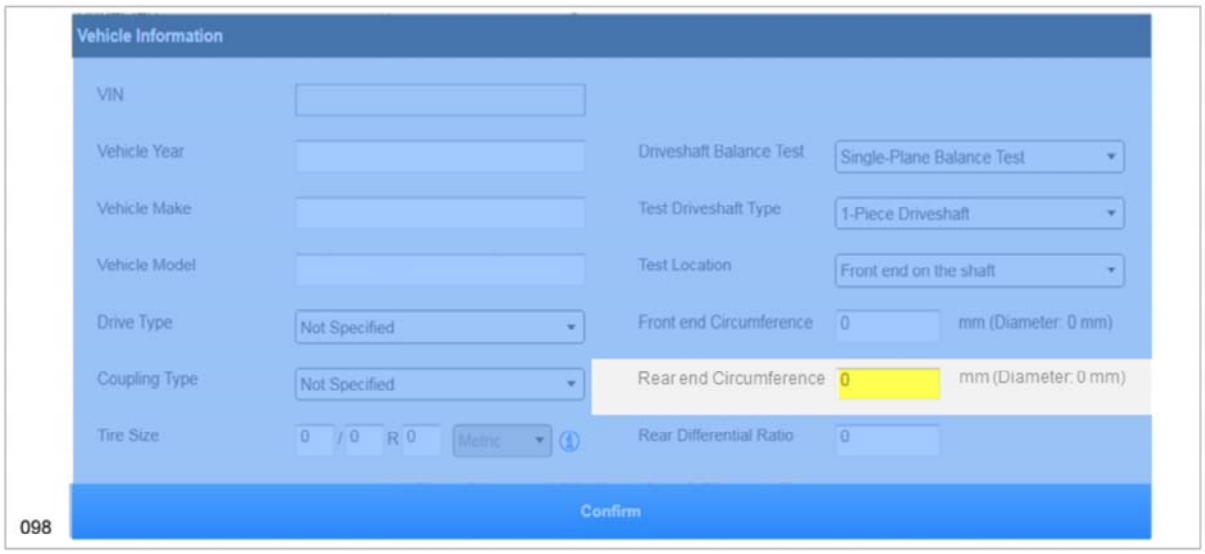
- Rear end on the shaft
- Front end on the shaft
- Both ends on the shaft

Front End Circumference



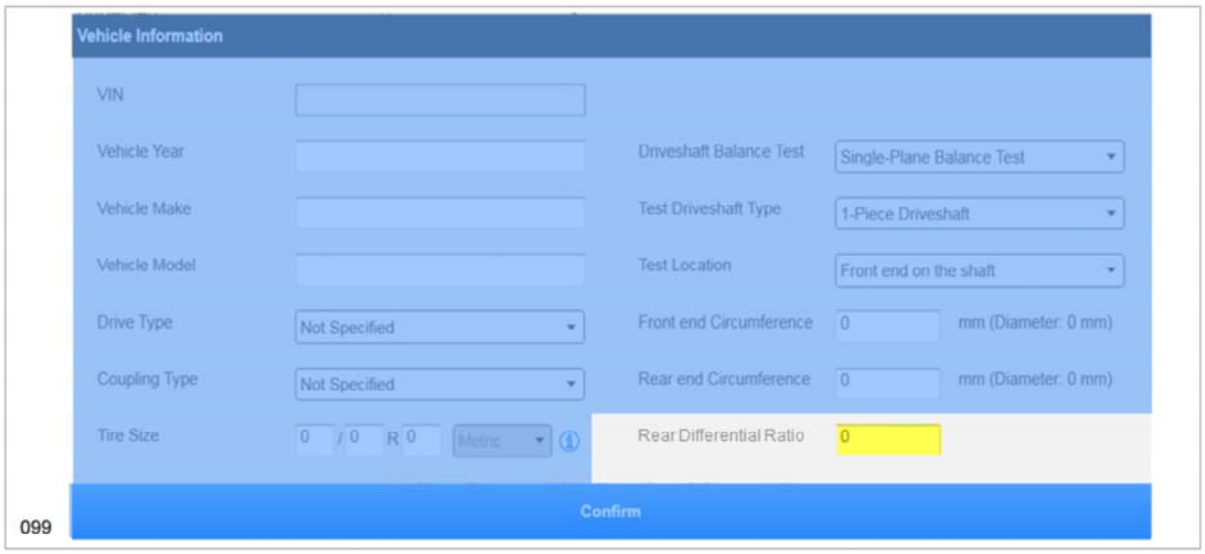
Measure the front end circumference in millimeters using the supplied measuring tape.

Rear End Circumference



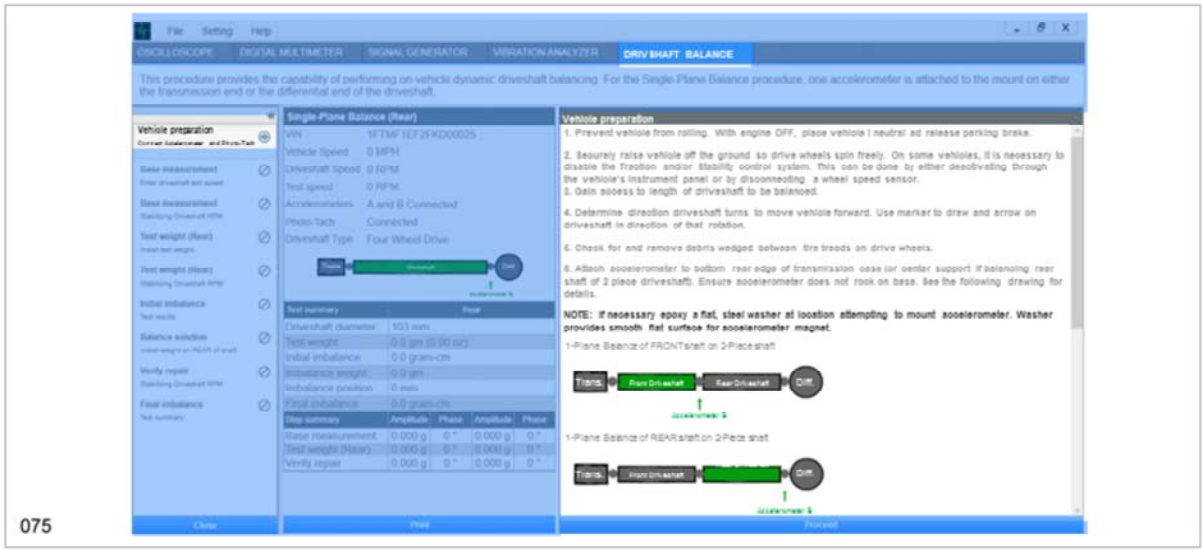
Measure the rear end circumference in millimeters using the supplied measuring tape.

Rear Differential Ratio



Type in the rear differential ratio.

Vehicle Preparation Screen



Once you record all of the vehicle information you will see the preparation screen.

- Follow the on-screen instructions.

Vehicle Preparation

1. Prevent the vehicle from rolling. With engine OFF place the vehicle in neutral and release the parking brake.
2. Securely raise vehicle off the ground so drive wheels spin freely. On some vehicles, it is necessary to disable the Traction and/or Stability control system. This can be done by either deactivating through the vehicle's instrument panel or by disconnecting a wheel speed sensor.
3. Gain access to length of driveshaft to be balanced.
4. Determine direction driveshaft turns to move vehicle forward. Use marker to draw an arrow on driveshaft in direction of that rotation.
5. Check for and remove debris wedged between tire treads on drive wheels.

1. Prevent the vehicle from rolling. With the engine OFF place the vehicle in N (Neutral) and release the parking brake.
2. Securely raise the vehicle off the ground so the drive wheels spin freely. On some vehicles, it is necessary to disable the Traction and/or Stability control system.
3. Gain access to the length of driveshaft to be balanced.
4. Determine the direction the driveshaft turns to move the vehicle forward. Use a marker to draw an arrow on the driveshaft to note direction of rotation.
5. Check for and remove debris wedged between tire treads on drive wheels.

Vehicle Preparation

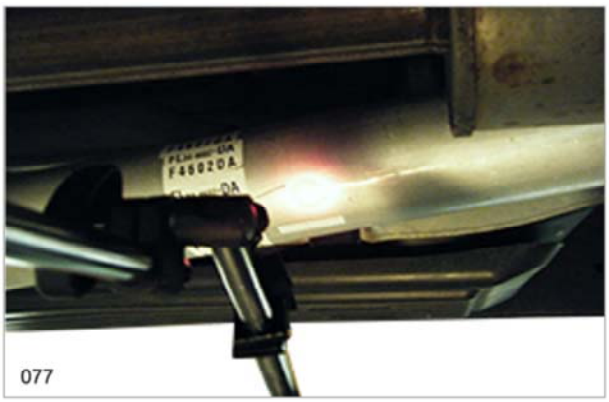
6. Attach accelerometer to bottom rear edge of transmission case (or center support if balancing rear shaft of 2 piece driveshaft). Ensure accelerometer does not rock on base. See the following drawings for details.

6. Attach the accelerometer to the bottom rear edge of the transmission case (or center support if balancing the rear shaft of a 2 piece driveshaft). Make sure the accelerometer does not rock on the base.

NOTE: If necessary epoxy a flat, steel washer at the location where you are attempting to mount the accelerometer. The washer provides a smooth flat surface for accelerometer magnet.

Vehicle Preparation

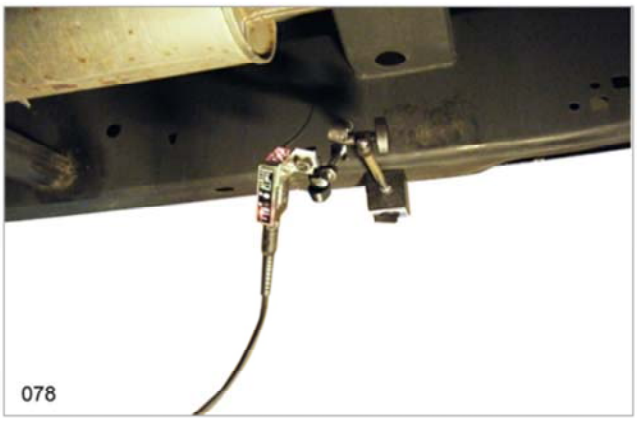
7. Connect accelerometer cable to one of the Channel inputs on VCMM.
8. Attach 1/2" x 1" strip of reflective tape, long edge lengthwise along length of driveshaft where Photo-Tach beam will be unobstructed.



7. Connect the accelerometer cable to one of the channel inputs on the VCMM.
8. Attach a 1/2" x 1" strip of reflective tape, long edge lengthwise along the length of driveshaft where Photo-Tach beam will be unobstructed.

Vehicle Preparation

9. Connect Photo-Tach cable to "Photo-Tach" connector on Analyzer.

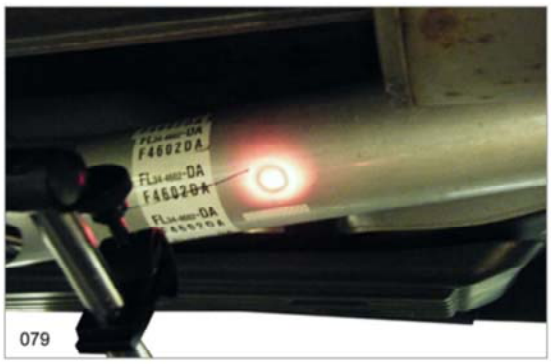


9. Connect the Photo-Tach cable to the Photo-Tach connector on Analyzer.

Note: Do not align the beam perpendicular to the driveshaft. A slight angle is recommended to help prevent shine reflection from the aluminum driveshaft.

Vehicle Preparation

10. Position Photo-Tach in location where beam illuminates reflective tape. Distance between Photo-Tach and driveshaft should be between 6" and 18" (152 to 457 mm).



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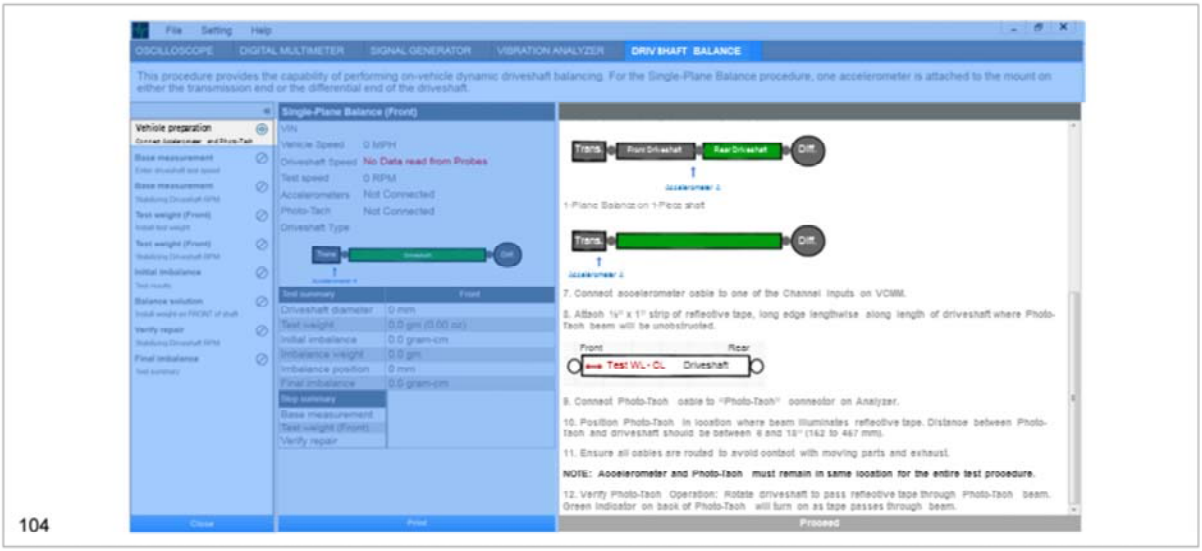
Ford Training 130

10. Position the Photo-Tach in a location where the beam illuminates the reflective tape. The distance between the Photo-Tach and the driveshaft should be between 6" and 18" (152 to 457 mm).

Vehicle Preparation



11. Make sure all cables are routed to avoid contact with moving parts and exhaust.

Vehicle Preparation

12. Verify Photo-Tach Operation: Rotate the driveshaft to pass reflective tape through Photo-Tach beam. The green indicator on back of the Photo-Tach will turn on as the tape passes through the beam.

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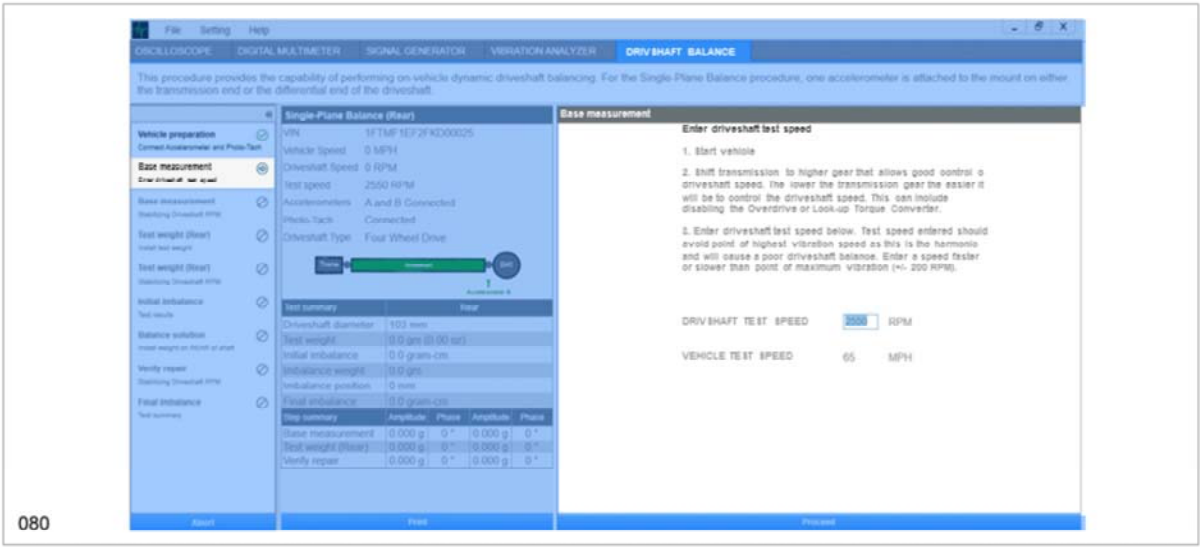
Ford Training 132

12. Verify Photo-Tach Operation: Rotate the driveshaft to pass the reflective tape through Photo-Tach beam. The green indicator on back of the Photo-Tach will turn on as the tape passes through the beam. See the picture above.

Click the Proceed button.

Base Measurement Screen

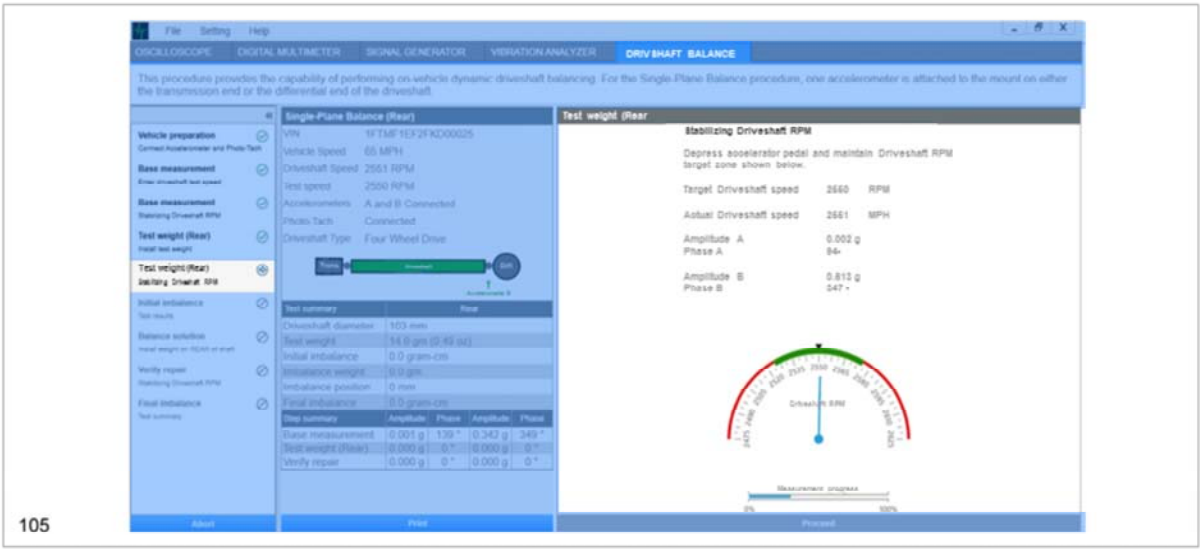


Once you click the proceed button, you will see the base measurement screen. Follow the on-screen instructions.

This screen has you:

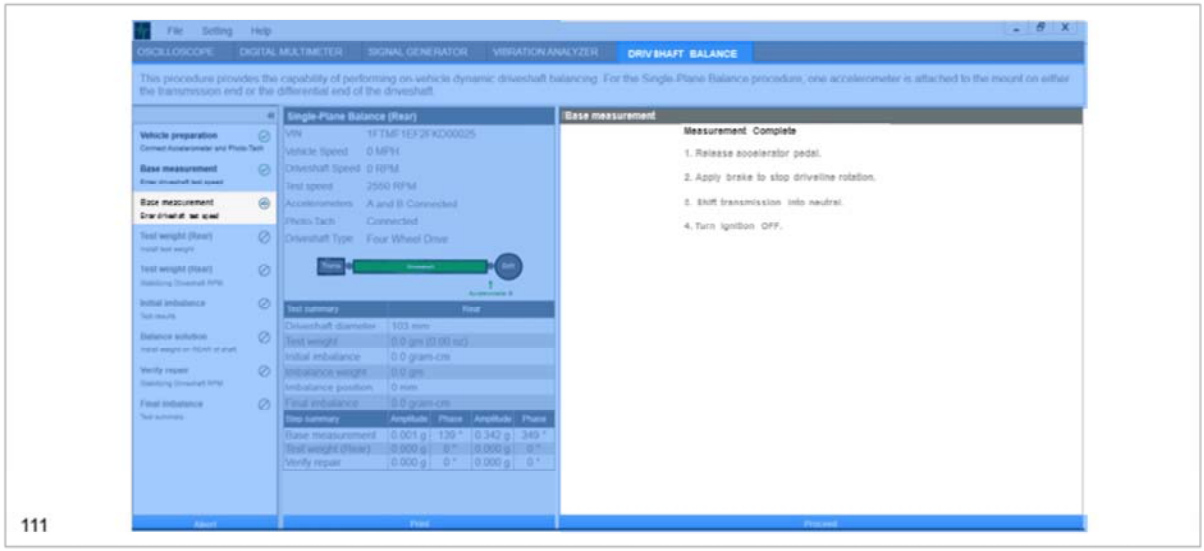
1. Start the vehicle.
2. Shift the transmission to a higher gear that allows good control of driveshaft speed.
3. Enter the driveshaft test speed. In this case we entered 2500 RPMs.

Stabilizing Driveshaft RPM



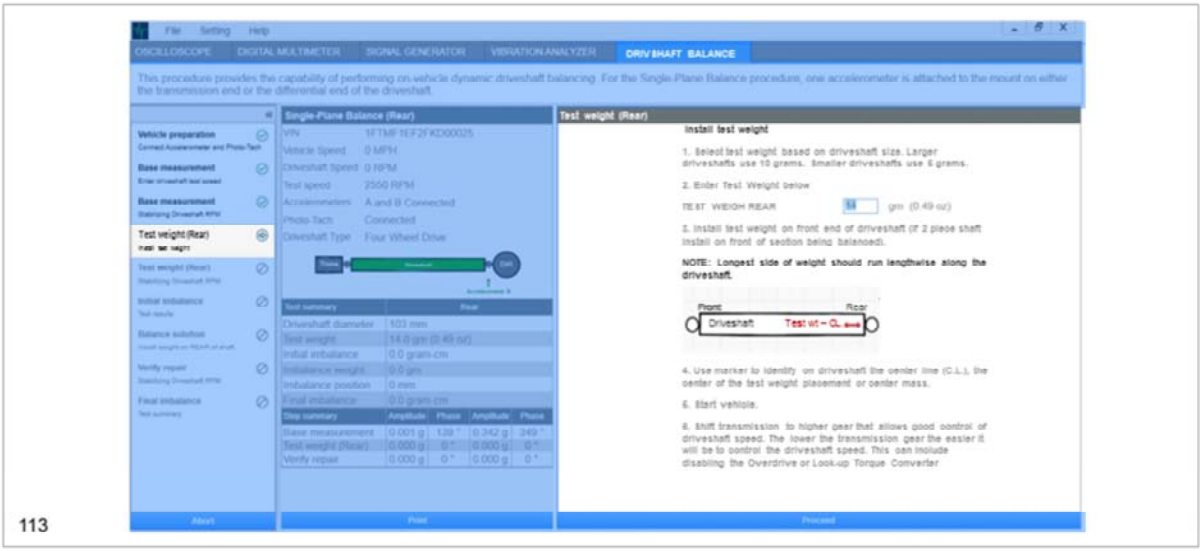
Press the accelerator and maintain the driveshaft RPM in the green target area.

Stabilizing Driveshaft RPM



Continue to do this until this message appears.

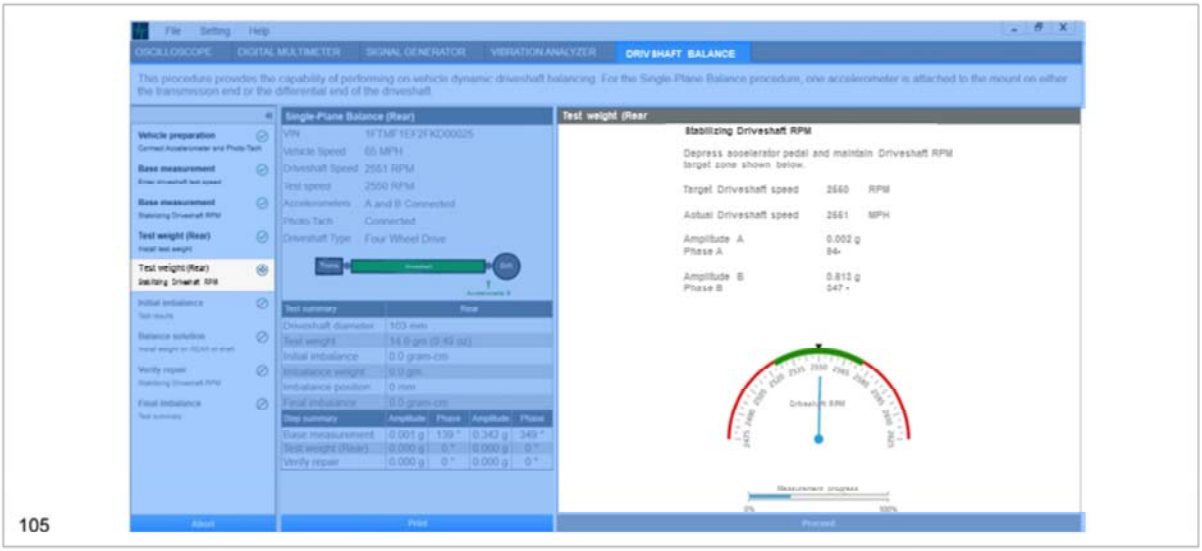
Test Weight



113

- Enter the test weight.
- We have entered 14 grams which is the approximate weight of a typical hose clamp.
- Identify the center line of the driveshaft.
- Install the center of the hose clamp mass on the center line.

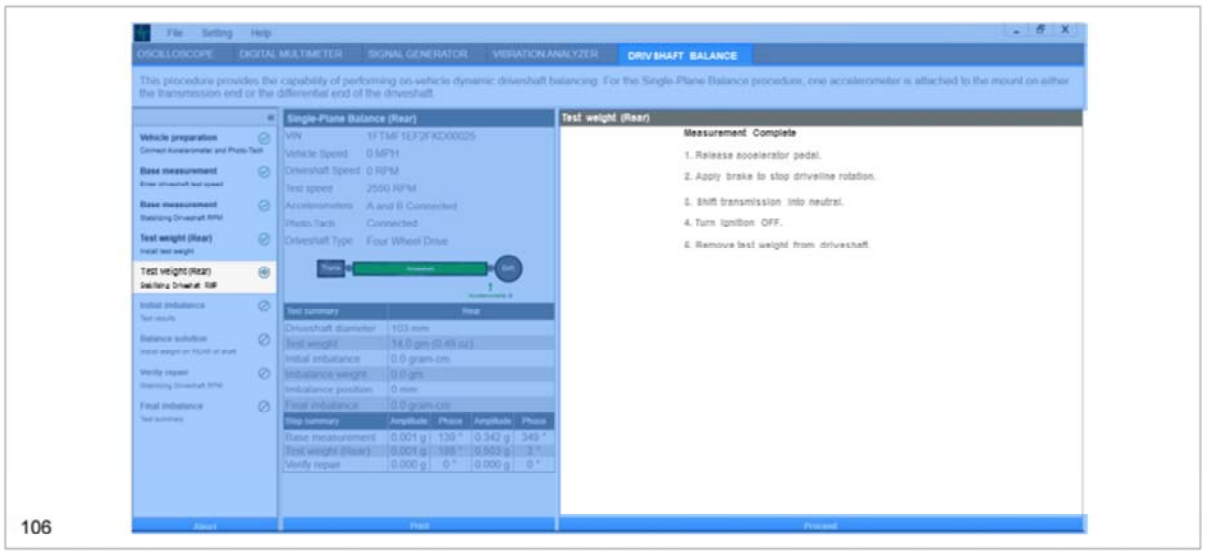
Stabilizing Driveshaft RPM



105

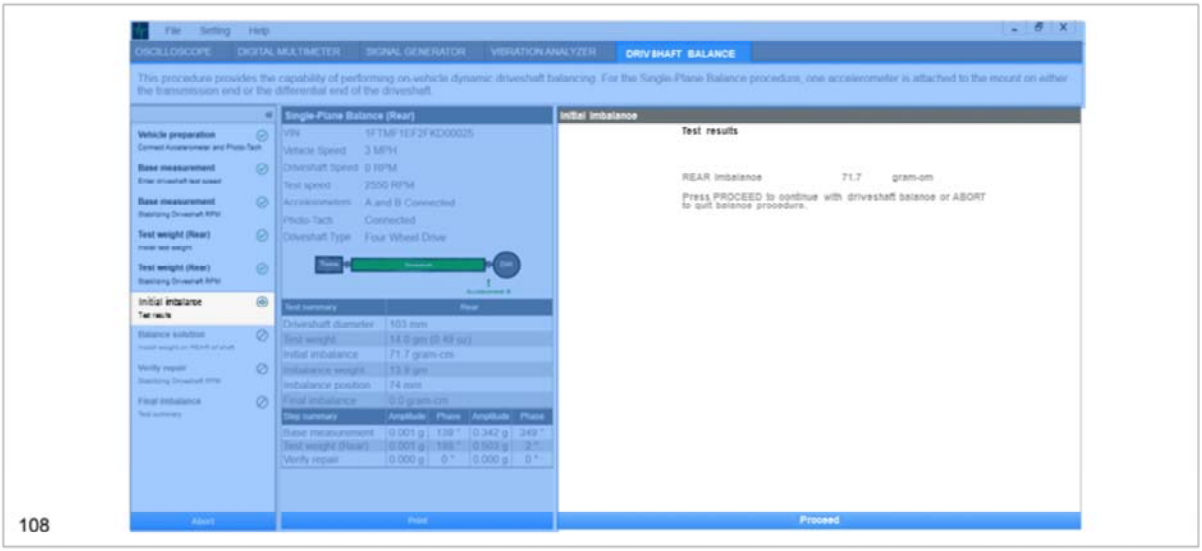
Press the accelerator and maintain the driveshaft RPM in the green target area.

Stabilizing Driveshaft RPM



Continue to do this until this message appears.

Initial Imbalance

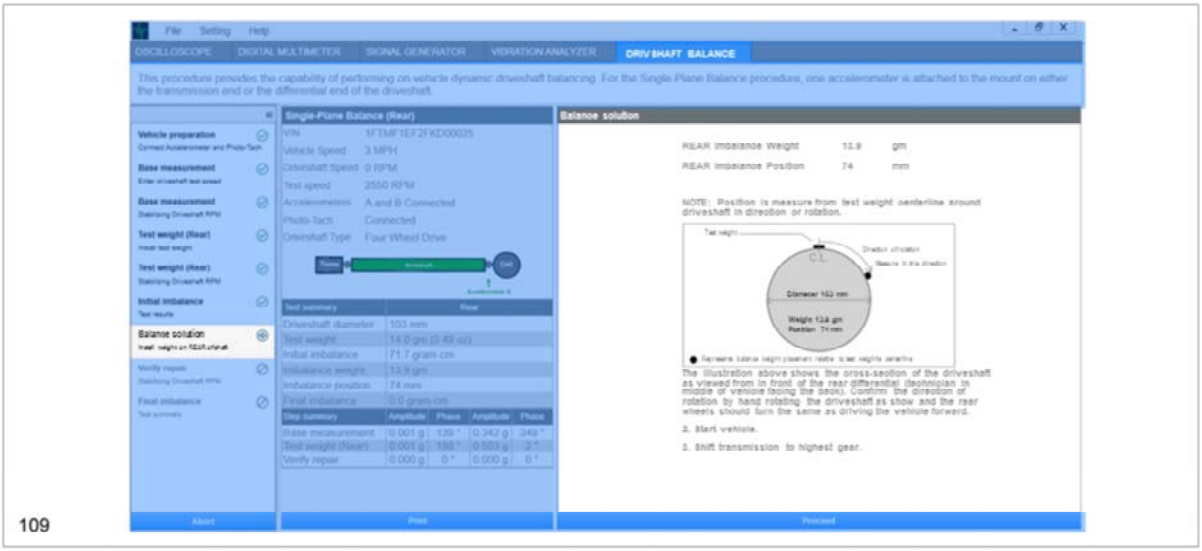


108

The results are displayed here.

- In this case there is an imbalance of approximately 71 grams.

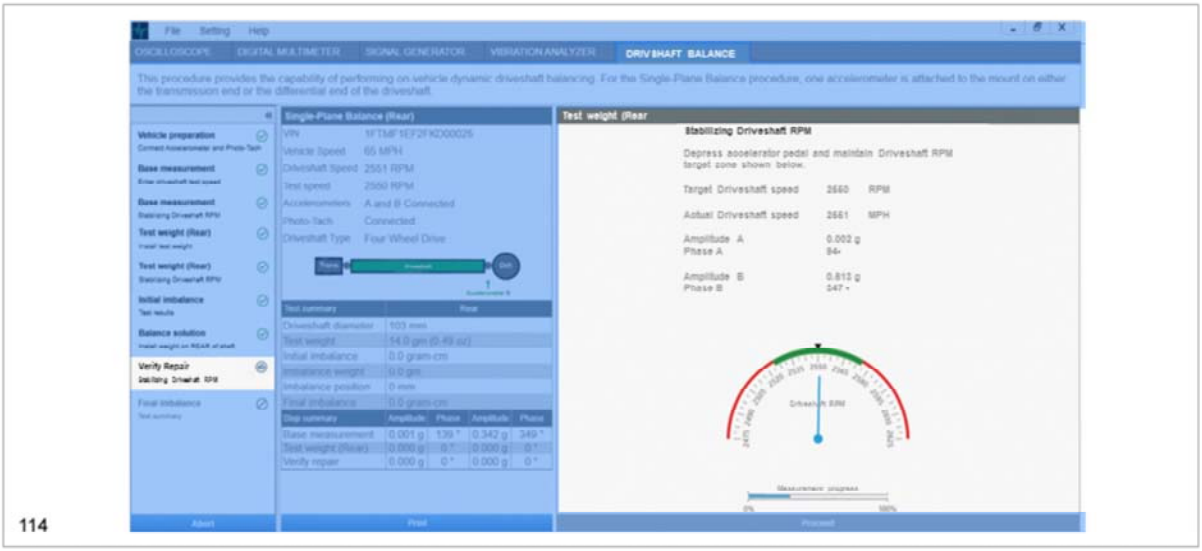
Balance Solution



This screen informs you where to place the location of the balance weight.

- In this case you would place the hose clamp 74 mm from the test weight in the direction of the driveshaft rotation.
- Then you would remove your test weight from the driveshaft and retest.

Verify Repair



114

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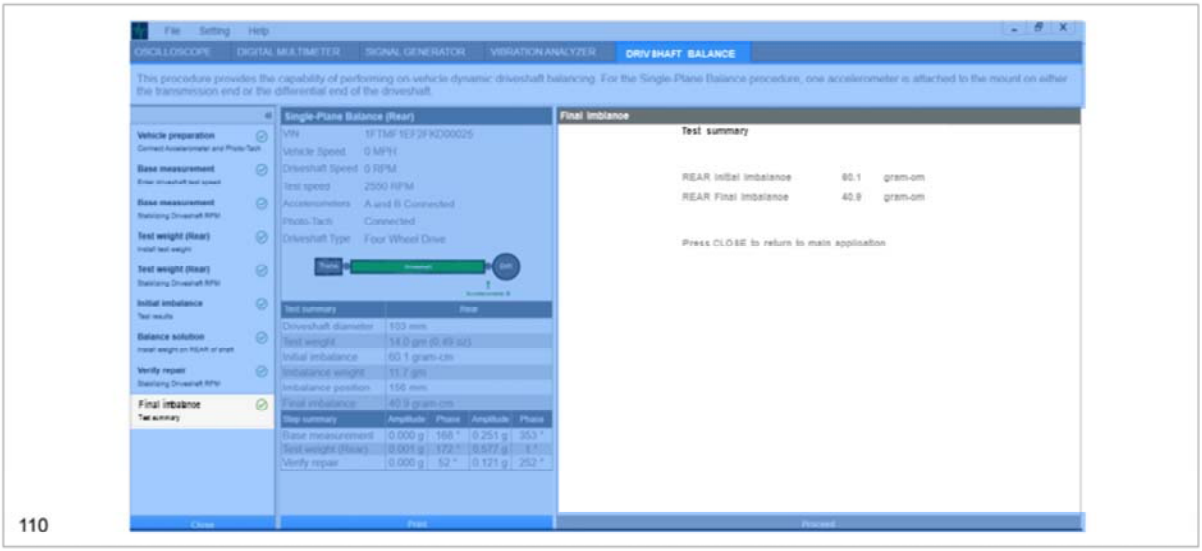
141

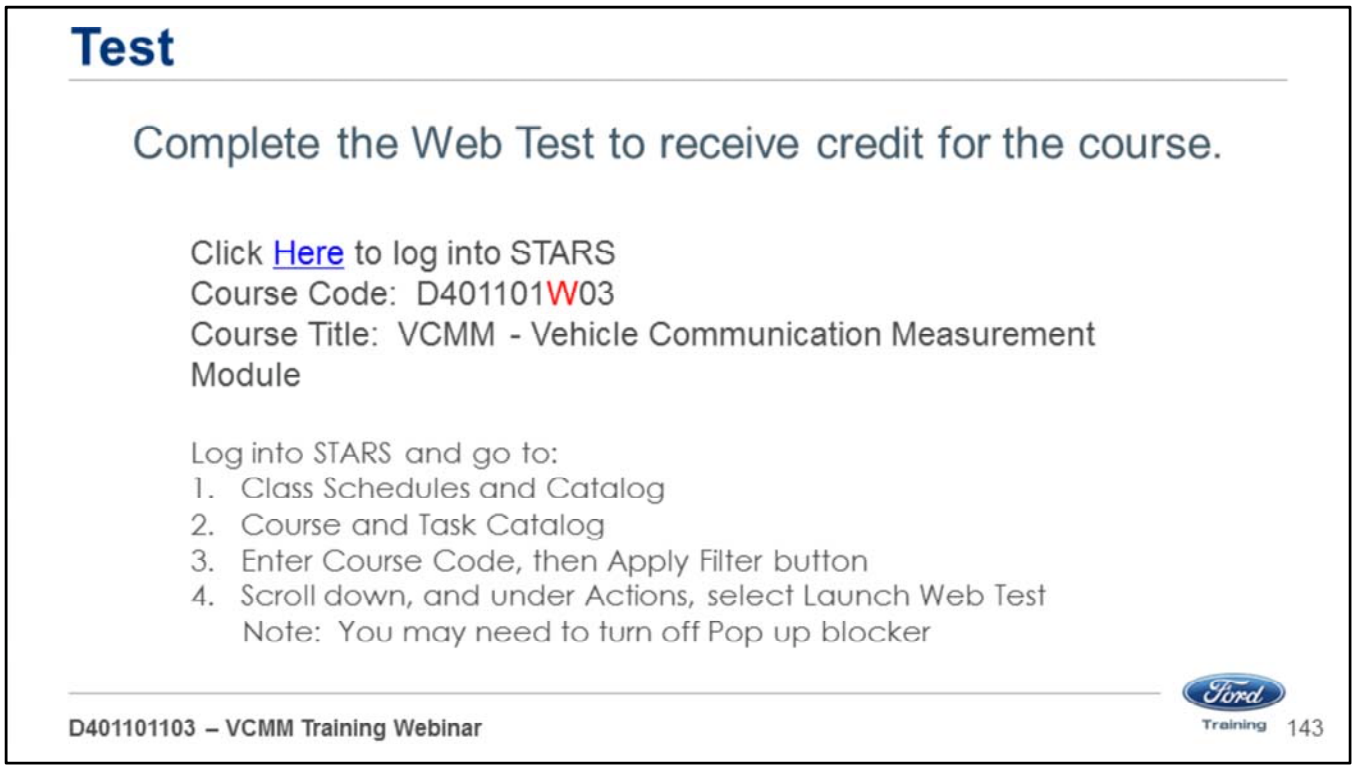
Press the accelerator and maintain the driveshaft RPM in the green target area.

Final Imbalance



This screen informs you of the final results.

- In this case the initial imbalance was approximately 61 grams.
- After performing the procedure the result is approximately 40 grams.
- An improvement of 33%.



Instructor

- Select “Sync” button at lower right to allow students to navigate PowerPoint from their screen

Appendix – Webinar Chat Questions and Answers

Q: Can the prior VMM probes and cables be used with the new VCMM?
A: Adapter cable VMM Current Probe/PVT to NGVMM, Rotunda part number 164-R9841 will allow the prior VMM 0-50 amp and 0-500 amp current probes, secondary ignition transducers and the PVT to be used with the new VCMM.

Q: Can the same PC be used to operate the VCMM and the VCM II?
A: Yes, the same PC can be used to launch and operate the VCM II and the VCMM. You can also view vehicle PIDS ect.. while using the oscilloscope and other VCMM tools by toggling between IDS and VMS function screens.

Q: Can you set a trigger to record VCMM digital multi meter readings?
A: There is not a trigger option in the VCMM digital multi meter function, however you can create a recording of digital multi meter readings.

Q: What is the purpose of the VCMM DLC channel?
A: The VCMM DLC channel allows you to access high speed CAN networks using the VCMM DLC cable without the need to use external probes.

Q: Will a signal library be available to be referenced when using the VCMM?
A: Yes, a signal reference library is currently being created.

Appendix – Webinar Chat Questions and Answers

Q: How are the VCMM probes identified?
A: VCMM probes are identified by the color of the probe. The VCMM channel in use is automatically identified by a transition of the probe color banner to the color of the probe cable being used.

Q: Will delays occur in reference to the display of data when all 4 channels are being used?
A: No, the VCMM hardware and software was designed to simultaneous display readings/outputs from all 4 channels without processing delays, ect..

Q: What new features does the VCMM provide in reference to the current VCM II,VMM and MTS 4100.
A: The VCMM has the ability to display new differential oscilloscope patterns, allows more advanced oscilloscope triggers to be used and provides the user with a much more advanced signal generator function. Additionally, the VCMM provides the ability to obtain measurements from two additional oscilloscope channels which allows readings to be obtained from 4 cam sensors (3.5L GTDI as an example), if necessary, to determine if a concern exists with the base timing of an engine or in the engine timing components. (timing chains, timing chain guides, camshaft sprockets, ect..) The additional 2 oscilloscope channels also allows traces from all 4 vehicle networks to be displayed on the same screen. The VCMM also features significantly increased recording capabilities to allow recordings to be obtained during an overnight period, ect.. Additionally, the updated capabilities of the VCMM will allow new and more advanced service functions/tests to be released in the future.

Appendix – Webinar Chat Questions and Answers

Q: Is there a guided access mode that walks you through performing a driveshaft balance procedure using the VCMM?
A: The VCMM driveshaft balance function walks you through each step of the process with specific instructions and graphics.

Q: Is a different software license required to use the VCMM?
A: No, the same software license will be able to be used to operate the VCMM and the VCM II.

Q: If we have concerns with the VCMM can we still submit a request to TIS to obtain assistance?
A: Yes, you can contact the TIS group to obtain assistance with using the VCMM.

Q: Will concerns be encountered with the use of a wireless connection between the VCMM and the PC being used to display VCMM data.
A: The VCMM uses a very reliable, upgraded wireless system. We have obtained great results in the testing performed to confirm the reliability of the wireless VCMM to PC connection.

Q: Will the VCMM be used in Ford Training Centers?
A: Yes, beginning this fall the VCMM will be used in all Ford technical training classroom courses.