

PDL5600

User Manual



ZEEMSEG141A Rev. A

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IMPORTANT:

Before operating or maintaining this unit, please read this manual carefully paying extra attention to the safety warnings and precautions.

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Safety Information

READ ALL INSTRUCTIONS

For your own safety, the safety of others, and to prevent damage to the product and vehicles upon which it is used, it is important that all instructions and safety messages in this manual and the accompanying *Important Safety Instructions* manual be read and understood by all persons operating, or coming into contact with the product, before operating. We suggest you store a copy of each manual near the product in sight of the operator.

For your safety, read all instructions. Use your diagnostic tools only as described in the tool user's manual. Use only manufacturer recommended parts and accessories with your diagnostic tools.

This product is intended for use by properly trained and skilled professional automotive technicians. The safety messages presented throughout this manual and the accompanying *Important Safety Instructions* manual are reminders to the operator to exercise extreme care when using this product.

There are many variations in procedures, techniques, tools, and parts for servicing vehicles, as well as in the skill of the individual doing the work. Because of the vast number of test applications and variations in the products that can be tested with this instrument, we cannot possibly anticipate or provide advice or safety messages to cover every situation. It is the responsibility of the automotive technician to be knowledgeable of the system being tested. It is essential to use proper service methods and test procedures. It is important to perform tests in an appropriate and acceptable manner that does not endanger your safety, the safety of others in the work area, the equipment being used, or the vehicle being tested.

It is assumed that the operator has a thorough understanding of vehicle systems before using this product. Understanding of these system principles and operating theories is necessary for competent, safe and accurate use of this instrument.

Before using the equipment, always refer to and follow the safety messages and applicable test procedures provided by the manufacturer of the vehicle or equipment being tested. Use the product only as described in its user manual. Use only manufacturer recommended parts and accessories with your product.

Read, understand and follow all safety messages and instructions in this manual, the accompanying *Important Safety Instructions* manual, and on the test equipment.

Environmental Conditions:

- This product is intended for indoor use only
- This product is rated for Pollution Degree 2 (normal conditions)

Safety Signal Words

All safety messages contain a safety signal word that indicates the level of the hazard. An icon, when present, gives a graphical description of the hazard. Safety Signal words are.

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury to the operator or to bystanders.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to the operator or to bystanders.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in moderate or minor injury to the operator or to bystanders.

Safety Message Conventions

Safety messages are provided to help prevent personal injury and equipment damage. Safety messages communicate the hazard, hazard avoidance and possible consequences using three different type styles:

- Normal type states the hazard.
- **Bold type states how to avoid the hazard.**
- *Italic type states the possible consequences of not avoiding the hazard.*

An icon, when present, gives a graphical description of the potential hazard.

Safety Message Example

WARNING



Risk of unexpected vehicle movement.

- **Block drive wheels before performing a test with engine running.**

A moving vehicle can cause injury.

Important Safety Instructions

For a complete list of safety messages, refer to the accompanying *Important Safety Instructions manual*.

SAVE THESE INSTRUCTIONS

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1.1 Content

This manual contains basic operating instructions and is structured in a manner to help you become familiar with your diagnostic tool features and perform basic operations.

The illustrations in this manual are intended as reference only and may not depict actual screen results, information, functions or standard equipment. Contact your sales representative for availability of other functions and optional equipment.

1.2 Conventions

The following conventions are used.

1.2.1 Terminology

The terms “Scanner” and “Scanner function” are used to describe the Scanner Function(s) of the diagnostic tool.

Examples:

- Select **Scanner** from the Home screen.
- From the Scanner main menu select **Continue**.
- The Scanner function provides many diagnostic tests.

The term “select” describes tapping/touching an icon on the touch screen, or highlighting an icon or menu choice and then selecting the confirmation menu choice such as **Continue, Accept, OK, Yes, or other similar** choice.

Abbreviated example for the following procedure: “Select **Brightness**”

1. Navigate to and highlight the **Brightness** selection.
2. Select **OK, or similar**, button.

1.2.2 Symbols

Different types of arrows are used. The “greater than” arrow (>) indicates an abbreviated set of selection (navigation) instructions.

Abbreviated example for the following procedure: “Select **Tools > Connect-to-PC**”

1. Select **Tools** from the home screen.
2. Highlight **Connect-to-PC** on the Tools menu.
3. Select **Connect-to-PC**.

The solid arrows (◀, ▶, ▼, ▲) are navigational instructions for the four directions of the directional buttons.

Example: Press the down ▼ arrow.

1.2.3 Bold Text

Bold emphasis is used in procedures to highlight selectable items such as control buttons, icons and menu options.

Example: Press the **OK** button

1.2.4 Notes and Important Messages

The following messages are used.

Notes

A NOTE provides helpful information such as additional explanations, tips, and comments.

Example:

**NOTE:**

For additional information refer to...

Important

IMPORTANT indicates a situation which, if not avoided, may result in damage to the test equipment or vehicle.

Example:

IMPORTANT:

Do not disconnect the data cable while the diagnostic tool is communicating with the ECM.

1.2.5 Hyperlinks

Hyperlinks, or hot links, that take you to other related articles, procedures, and illustrations are available in electronic documents. Blue colored text indicates a selectable hyperlink.

Example:

IMPORTANT:

Read all applicable [Safety Information](#) before using this diagnostic tool!

1.2.6 Procedures

An arrow icon in the left-margin area indicates a procedure.

Example:

**To change screen views:**

1. Select the **Graph** icon.
The dropdown menu displays.
2. Select an option from the menu.
The screen layout changes to the format selected.



This chapter introduces the basic features of the diagnostic tool, including the control buttons, data connections, battery pack and power sources. Technical Specifications are provided at the end of this chapter.

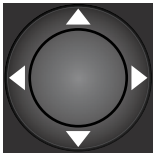


2.1 Control Buttons

There are four “push type” control buttons and one “thumb pad rocker type” multi-directional button located on the right side of the diagnostic tool. All other diagnostic tool operations are controlled through the touch screen.



Figure 2-1 Front view

Item	Button	Description	
1		N/X or Cancel - Push type button	<ul style="list-style-type: none"> To exit a menu or program. To close an open list and return to the previous menu or screen. To answer “No” when a yes/no choice is given.
2		Y/✓ or Accept - Push type button	<ul style="list-style-type: none"> To confirm a selection from a menu or program To select an item that was highlighted using the direction arrows. To advance to the next screen in a series. To answer “Yes” when a yes or no choice is given.

Item	Button	Description	
3		Directional - Thumb pad rocker type buttons	Buttons move the cursor or highlight in their respective direction: <ul style="list-style-type: none"> • Up (▲) • Down (▼) • Left (◀) • Right (▶)
4		Shortcut - Push type button	Programmable function button that can provide a shortcut for performing a variety of routine tasks. Refer to Configure Shortcut Button , on page 81 for additional information.
5		Power (On/Off) - Push type button	Turns the diagnostic tool on and off. Also, press and hold for 5 seconds for emergency shutdown

2.2 Data and Power Connections

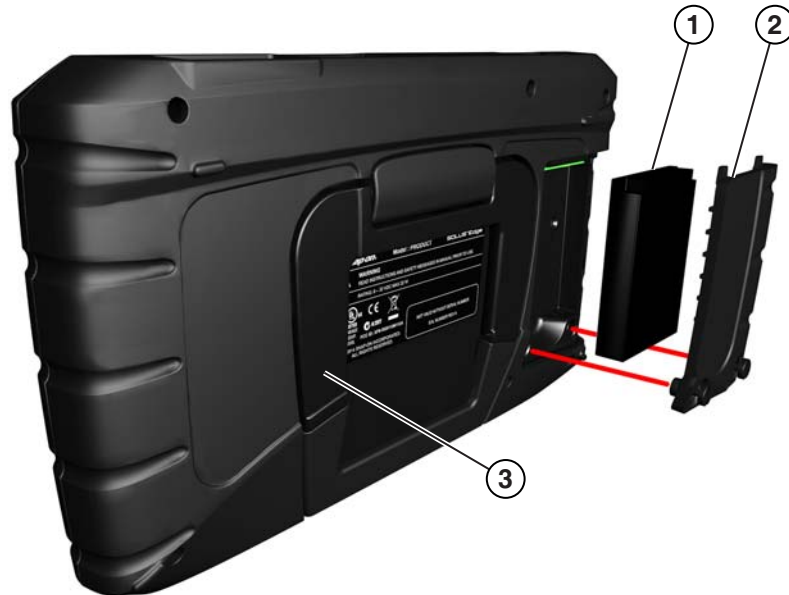
Connectors and jacks for data communication cables and the AC Power Supply are located on the top of the diagnostic tool.



Figure 2-2 Top view

Item	Description
1	Battery Status Indicator LED <ul style="list-style-type: none"> • Green - battery is fully charged • Red - battery is charging • Amber - indicates a battery issue
2	AC Power Supply Jack - AC power supply connection
3	Scope/Multimeter Jacks - Scope and multimeter lead connections
4	Mini USB Jack - USB cable connection used to transfer saved data files to a personal computer
5	Micro secure digital (uSD) Card - contains operating system programming. IMPORTANT The uSD card must be installed for the diagnostic tool to operate. Do not remove the uSD card while the diagnostic tool is powered on.
6	Data Cable Connector - Data cable connection used to connect the diagnostic tool to a vehicle data link connector

2.3 Battery Pack and Stand



- 1— Battery Pack
- 2— Battery Cover
- 3— Built in-Stand (shown open) - The built-in stand extends from the back of the diagnostic tool and clips into the diagnostic tool for storage.

Figure 2-3 Back view

2.4 Power Sources

Your diagnostic tool can receive power from any of the following sources:

- [Internal Battery Pack](#)
- [AC Power Supply](#)
- [Vehicle Power](#)

2.4.1 Internal Battery Pack

The diagnostic tool can be powered from the internal rechargeable battery pack. A fully charged battery provides sufficient power for about 3.5 hours of continuous operation.

The battery is recharged when an external power source is connected. Battery charging occurs when the diagnostic tool is connected to a vehicle data link connector (DLC) using the Data Cable or when the AC Power Supply is connected to a live AC power source.

The Battery Status Indicator LED (located next to the power supply jack) indicates battery status ([Figure 2-3](#)).

- **Green** - indicates battery is fully charged
- **Red** - indicates battery is charging
- **Amber** - indicates a battery issue. This is usually caused by excessive battery temperature (above 104°F/40°C), which disables charging. Allow the diagnostic tool to cool down before continuing operation.

2.4.2 AC Power Supply

The diagnostic tool can be powered from a standard AC outlet using the AC power supply. The connector on the end of the output cable of the AC power supply attaches to the power supply input jack on top of the diagnostic tool. Use only the AC power supply provided.

IMPORTANT:

Never connect the AC power supply to the diagnostic tool when the diagnostic tool is communicating with a vehicle.

2.4.3 Vehicle Power

All OBD-II/EOBD vehicles have vehicle battery power (B+) available on the DLC. The diagnostic tool is powered through the Data Cable when connected to the vehicle DLC. A green LED indicator on the DLC end of the data cable, illuminates when power is being supplied to the cable. If the LED fails to illuminate, check that the data cable is properly connected and then check the DLC power circuit. See [Data Cable Connection](#), on page 18 for additional data cable information.

An optional power cable is required when testing non-OBD-II/EOBD models that do not have vehicle battery power (B+) available on the DLC. Contact your sales representative for availability.

IMPORTANT:

Never connect the optional power cable to the diagnostic tool when the diagnostic tool is communicating with a vehicle.

2.5 Technical Specifications

Item	Description / Specification
Touch Screen	Resistive Touch Panel
Display	8.0 inch diagonal, Color LCD
	800 x 480 resolution SWVGA
Meter	Category 1
Battery	Rechargeable lithium-ion battery pack
	Approximately 3 hour run time
	Approximately 5 hour charge time
Power Supply	Supply Rating; 15VDC, 2A
DC Operating Voltage	10 to 30VDC
Width	11.06 in. (281.0 mm)
Height	6.29 in. (160.0 mm)
Depth	1.58 in. (40.3 mm)
Weight (including battery):	2.65 lb (1.20 kg)
Operating Temperature Range (ambient)	At 0 to 90% relative humidity (non-condensing) 32 to 113°F (0 to 45°C)
Storage Temperature (ambient)	At 0 to 70% relative humidity (non-condensing) -4 to 140°F (-20 to 60°C)
Operating Altitude	Maximum 2000 m
Environmental Conditions	This product is intended for indoor use only
	This product is rated for Pollution Degree 2 (normal conditions)

Basic Operation and Navigation

This chapter describes basic diagnostic tool operation, navigation, screen layout, icon functions, and screen messages. Before you operate the diagnostic tool, make sure the battery pack is fully charged or the diagnostic tool is powered by the AC power supply.

3.1 Turning On/Off and Emergency Shutdown

The following sections describe how to turn the diagnostic tool on and off and how to perform an emergency shutdown.

3.1.1 Turning On

The diagnostic tool will automatically turn on and open the Home screen ([Figure 3-1](#)) when power is supplied through the Data Cable or by the AC Power Supply. If the diagnostic tool does not automatically turn on, press and release the Power button on the front of the diagnostic tool to turn the diagnostic tool on.

3.1.2 Turning Off

IMPORTANT:

All vehicle communication must be terminated **BEFORE** turning off the diagnostic tool. A warning message displays if you attempt to turn the diagnostic tool off while communicating with the vehicle. Forcing a shut down while communicating may lead to ECM problems on some vehicles. Never disconnect the Data Cable when the diagnostic tool is communicating with the vehicle ECM.

**To turn off the diagnostic tool:**

1. Press the **N/X** button or select the **Back** or **Home** icon to navigate to the Home screen.
The “stopping communication” message appears briefly before the Home screen displays.
2. Disconnect the diagnostic tool Data Cable from the vehicle.
3. Press and release the **Power** button.
A confirmation screen displays.
4. Press the **Y/✓** button or select **OK** from the menu to turn the diagnostic tool off. To continue operating, press the **N/X** button or select **Cancel** from the menu.

3.1.3 Emergency Shutdown

IMPORTANT:

Using the emergency shutdown procedure while communicating with the vehicle ECM may lead to ECM problems on some vehicles.

During normal operation turn the diagnostic tool off using the *Turning Off* procedure above. The emergency shutdown procedure should only be used if the diagnostic tool does not respond to navigation or control buttons or exhibits erratic operation. To force an emergency shutdown, press and hold the **Power** button for five seconds until the diagnostic tool turns off.

3.2 Basic Navigation

3.2.1 Home Screen Layout

The Home screen includes a title bar and main body. The Home screen contains icons, one for each of the primary diagnostic tool functions.



Figure 3-1 Home screen

3.2.2 Title Bar

The title bar at the top of the screen provides basic information about current diagnostic tool operating conditions. Title bar options vary depending upon vehicle make and model, what function is active, what test is being performed, or what menu is selected. The title bar contains information only, there are no selectable items.

Elements of the Title bar let you know at a glance:

- What diagnostic tool function is currently active.
- The current time.
- The source and status of the power being supplied to the diagnostic tool.





An active function icon is always displayed along the left-hand edge of the Title bar. These icons resemble their Home screen icon counterparts in appearance and color. The name of the function displays to the right of the icon on some screens.

A real time clock displays to the left of the power supply icon. The clock is powered by a dedicated internal battery, so the correct time is maintained even when the main battery pack is discharged. Use the Tools function to set the clock and format how time is displayed. See [Clock Settings](#), on page 87 for additional information.

The Title bar displays other information that varies depending upon what functions are being performed. Other information may include:

- The identification (ID) of the test vehicle
- The name of the active menu or function
- The name of the test being performed

Table 3-1 Title Bar Icons







Icon	Function	Icon	Function
	Full Battery Charge Level - Indicates power is being supplied by the internal battery pack. Horizontal bars diminish as the battery discharges.		External Power Connected - Indicates power is being supplied through the data cable connection to a vehicle or by the AC Power Supply.
	Low Battery Charge Level - Indicates the internal battery pack is low and needs to be recharged immediately. A warning message will also display on the screen when the battery gets low.		Active Vehicle Communication - Indicates the diagnostic tool is actively communicating with a vehicle.

3.2.3 Home Screen Icons

Each available diagnostic tool function is represented by an icon on the home screen. The table below provides descriptions of the icon functions.










Select an icon from the Home screen to launch a function. You can also use the control buttons to activate a function, a yellow border around the icon indicates it is highlighted, or in focus. Use the Directional buttons (◀, ▶, ▲, ▼) to highlight the desired function and then press the Y/✓ button to select it. A “please wait” message may display briefly, then automatically clear once the function is loaded and ready for use.

Table 3-2 Home screen icons

Function Name	Function Icon	Description
Scanner		Used to communicate with the electronic control systems of a vehicle. This function allows you to retrieve diagnostic trouble codes (DTCs), view PID data and perform diagnostic tests. See Scanner , on page 19 for details.
OBD-II/EOBD		Allows you to access generic OBD-II/EOBD data and tests without identifying the vehicle being tested. See OBD-II/EOBD , on page 38 for details.
Guided Component Tests		Allows you to perform diagnostic tests for the identified vehicle. See Guided Component Tests , on page 50.
Scope Multimeter		Allows you to perform lab scope, graphing multimeter and digital multimeter tests and measurements. See Scope Multimeter , on page 58.
Previous Vehicle & Data		Allows you to quickly reconfigure the diagnostic tool to a recently tested vehicle and to access saved data files. See Previous Vehicles and Data , on page 48 for details.
Tools		Allows you to adjust diagnostic tool settings to your personal preferences and perform other special functions. See Tools , on page 80 for details.

3.2.4 Common Toolbar Control Icons

Common control icon functions are described in the following table. Specific function control icons are described in their applicable chapters. Displayed control icons vary depending on the active function or test. Select a control icon on a screen to activate a control function. You can also use the control buttons to activate a function, a yellow border around the icon indicates it is highlighted, or in focus. Use the Directional buttons (◀, ▶, ▲, ▼) to highlight the desired function and then press the Y/✓ button to select it.

Icon	Function	Icon	Function
	Back - Returns to the previously viewed screen. Icon is located on the left-hand edge of the toolbar.		Record - Indicates the data being displayed is paused and not being updated. Selecting resumes data collection.
	Home - Returns to the Home screen. Icon is located next to the Back icon on the left side of the toolbar.		Tools - Opens the tools menu.
	Save - Writes data from buffer memory to a file. The saved "movie" file can be accessed for future reference by selecting Previous Vehicles and Data > View Saved Data .		
<i>The control icons below are used to navigate through paused or saved "movie" files during playback.</i>			
	Step Forward - allows forward movement in singular steps. To quickly step forward, select this icon (yellow frame appears) then press and hold the Y/✓ button. (Note: To quickly step forward during Scanner data playback, press and hold the icon down until a red frame appears around the icon.)		Step Back - allows backward movement in singular steps. To quickly step backward, select this icon (yellow frame appears) then press and hold the Y/✓ button. (Note: To quickly step backward during Scanner data playback, press and hold the icon down until a red frame appears around the icon.)
	Skip Forward - allows forward movement in multiple steps. To quickly skip forward, select this icon (yellow frame appears around icon) then press and hold the Y/✓ button		Skip Back - allows backward movement in multiple steps. To quickly skip backward, select this icon (yellow frame appears around icon) then press and hold the Y/✓ button.

3.2.5 Scroll Bar

A vertical scroll bar appears along the right-hand edge of the screen when additional data expands above or below what is currently on the screen (Figure 3-2).

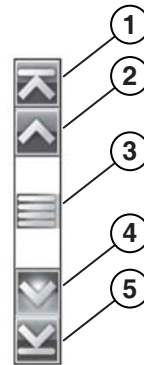


Figure 3-2 Scroll bar

- 1— **Beginning** - Moves to beginning of data displayed
- 2— **Step up** - Moves up one increment of the data displayed
- 3— **Slider (position indicator)** - Select and drag the **Slider** to scroll through data. The slider indicates the relative position of the current screen to the total available data.
- 4— **Step down** - Moves down one increment of the data displayed
- 5— **End** - Moves to end of data displayed

The Up (▲) and Down (▼) directional buttons can also be used to move through the data one line at a time. Press and hold a directional button to rapidly scroll through data.

3.3 Screen Messages

3.3.1 System Messages

There are four types of system messages that may be displayed:

Message Type	Description
Loading and Connecting	Loading and connecting messages display when the diagnostic tool is performing an internal operation, such as loading a database, establishing communications with the vehicle, or initiating a test. The message automatically clears once the internal operation is complete.
Confirmation	Confirmation messages inform you when you are about to perform an action that cannot be reversed or when an action has been initiated that requires a confirmation to continue. When a response is not required, the message displays briefly, then disappears.
Warning	Warning messages inform you when completing the selected action may result in an irreversible change or in the loss of data. A confirmation is required to continue.
Error	Error messages inform you when a system or procedural error has occurred, for example if the data cable becomes disconnected during operation.

3.3.2 Communication Messages

When “no communication” messages are displayed, it indicates the diagnostic tool and the vehicle electronic control module are not communicating.

The following conditions cause “no communication” messages to display:

- The diagnostic tool is unable to establish a communication link with the vehicle.
- The vehicle is not equipped with the system that was selected.
- There is a loose connection.
- There is a blown vehicle fuse.
- There is a wiring fault on the vehicle.
- There is a circuit fault in the data cable or adapter.
- Incorrect vehicle identification was entered.

Refer to the Vehicle Communication Software manuals for manufacturer-specific problems.

3.4 Data Cable Connection

Connection of the data cable to the diagnostic tool and vehicle DLC is required for Scanner and OBD-II/EOBD testing.

Depending on the vehicle, the supplied DA-4 data cable may be used alone or may require optional adapters.

- **All OBD-II/EOBD compliant vehicles** - Use the supplied DA-4 data cable. The 26-pin end of the cable attaches to the data cable connector on the top of the diagnostic tool. The 16-pin end connects to the vehicle DLC. The cable connectors are secured with captive screws.
- **All non-OBD-II/EOBD (OBD-I) compliant vehicles** - Use the supplied DA-4 data cable with the optional DA-5 adapter and a manufacturer specific adapter. The 26-pin end of the cable attaches to the data cable connector on the top of the diagnostic tool. The 16-pin end connects to the DA-5 adapter, the DA-5 adapter connects to the manufacturer specific adapter and then connects to the vehicle DLC. The cable connectors are secured with captive screws.

On-screen cable and adapter connection instructions are provided while using the Scanner and OBD-II/EOBD functions. The instructions may also include the location of the vehicle DLC ([Figure 3-3](#)). If required, additional connection information can be found in the appropriate vehicle communication software manual for the vehicle. Vehicle communication software manuals are available online, see the website information at the front of this manual

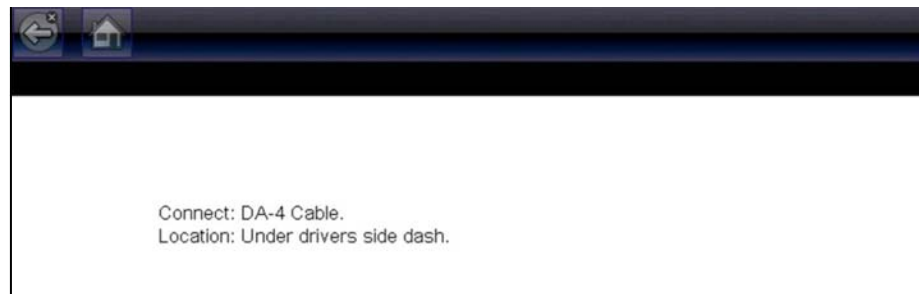


Figure 3-3 Vehicle connection data cable message

For data cable vehicle power connection information, see [Vehicle Power](#), on page 9.



To connect the data cable to the vehicle:

1. Follow the on-screen instructions for connecting to the vehicle ([Figure 3-3](#)).
2. Select **Continue** once the data cable is connected.
The diagnostic tool establishes communication then displays a list of available tests. If the diagnostic tool is unable to establish a communications link, a "no communications" message displays.
3. Select from the available tests to open a submenu of test options.

This chapter describes the basic operation of the Scanner function.

The **Scanner** icon is located on the Home screen.

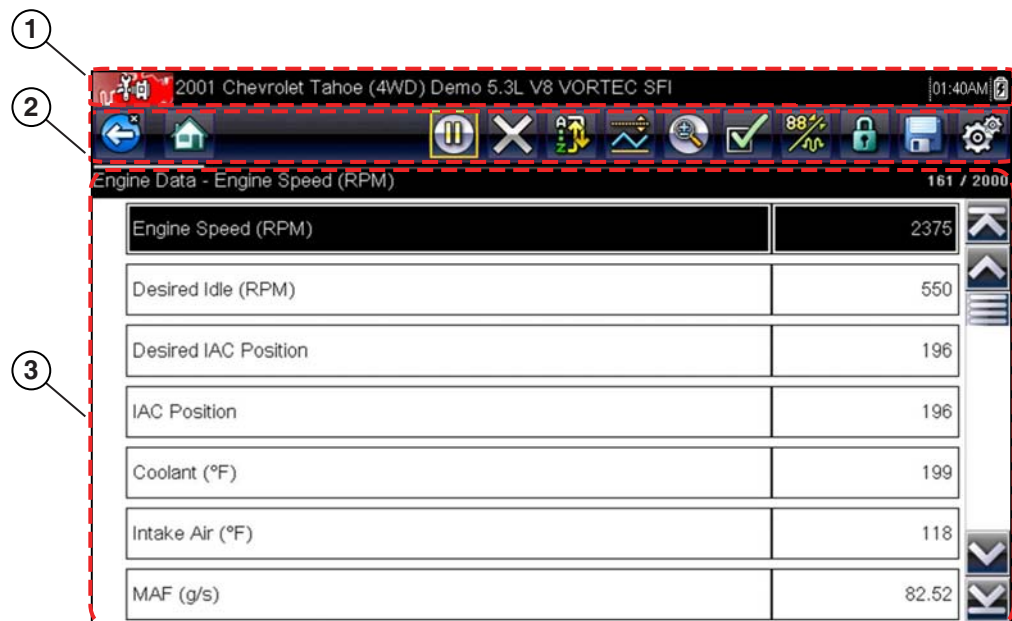


The Scanner function allows your diagnostic tool to communicate with the electronic control systems of a vehicle. This allows you to retrieve diagnostic trouble codes (DTCs), view PID data and perform diagnostic tests.

4.1 Screen Layout and Toolbar Icons

The following screen layout and toolbar controls apply to both the Scanner and the OBD-II/EOBD functions.

4.1.1 Screen Layout











- 1— **Title bar**—shows active test, vehicle and diagnostic tool status
- 2— **Toolbar**—contains control icons
- 3— **Main body**—displays menus, PID and test data

Figure 4-1 Screen layout

The Title bar appears for all functions and displays information only, there are no selectable items. Refer to [Title Bar](#), on page 13 for details.

4.1.2 Scanner Control Icons

The scanner toolbar contains control icons. Control icons may vary depending on the active function or test. A yellow frame surrounding an icon (highlighted), indicates it is selected. Other control icons (not shown) are described in [Common Toolbar Control Icons](#), on page 15.

Icon	Function	Icon	Function
	Pause - Indicates PID data from the vehicle is being displayed. Selecting pauses data collection.		Custom Data List - Opens a menu for selecting which PIDs display in the list.
	Clear - Erases all the PID data in the buffer and begins a new recording. Selecting opens a confirmation message.		Change View - Changes display options between PID list or graph displays.
	Trigger - Opens a menu that allows you to set, arm, and clear threshold values that automatically trigger PID data to be saved from buffer memory to a file.		Lock/Unlock - Locks or unlocks the highlighted parameter. Locked PIDs move to the top of the list and do not scroll as you move through the data.
	Zoom - Incrementally increases and decreases the scale of the data being displayed.		Sort - Determines the order in which PIDs are listed on the screen.

4.2 Scanner Demonstration Program

The Scanner demonstration program contains actual ECM PID data that allows you to navigate and become familiar with the many capabilities of the Scanner function without actually connecting to a vehicle. The following sections in this chapter provide detailed information on navigating through the Scanner function and various menus. As you navigate through the Demonstration program, refer to the applicable section for additional information.



To start the demonstration program:

1. From the Home screen, select the **Scanner** icon.
The manufacturer menu displays.
2. Select the **Demonstration** icon.

IMPORTANT:

Do not connect a vehicle to the diagnostic tool while using the Demonstration program.

3. Follow the on-screen instructions and make the selection as needed until the confirmation screen displays.
4. Select **OK** on the confirmation screen to load the demonstration database.
A message displays "Demo mode: Do not connect to vehicle."
5. Select **Continue**.
A systems menu, which shows all of the systems available for testing, displays.
6. Select a system from the menu, then select submenus as applicable to display the desired demonstration information.

4.3 Scanner Operation

Launching Scanner opens a menu list of vehicle manufacturers and begins the process by identifying the vehicle being tested. After the vehicle is identified, a vehicle system is selected and then a specific test or function is selected to allow you to retrieve diagnostic trouble codes (DTCs), view and save PID data, or perform diagnostic tests.



Basic Scanner Testing Procedure

1. **Launch Scanner**—Select the **Scanner** icon on the Home screen.
2. **Identify the vehicle**—Identify the test vehicle by selecting from the menu options.
3. **Connect the data cable to the vehicle**—Follow the on-screen connection instructions to connect the diagnostic tool to the test vehicle.
4. **Select the system**—Select the system to be tested from the systems menu.
5. **Select the test from the main menu**—Select the desired test.

4.3.1 Vehicle Identification

The diagnostic tool displays PID data provided by the vehicle ECM. The vehicle must be correctly identified for the diagnostic tool to communicate and display PID data correctly. The vehicle identification sequence is menu driven, follow the screen prompts to enter the information. Exact procedures may vary by the make, model, and year of the vehicle.



To identify a vehicle for testing:

1. Select the **Scanner** icon on the Home screen.
A list of manufacturers displays ([Figure 4-2](#)).



Figure 4-2 Manufacturer list

The list includes Demonstration, which opens the Demonstration program (see [Scanner Demonstration Program](#), on page 20).

2. Select the vehicle manufacturer from the list.
A model year menu displays.
3. Select the vehicle year from the menu.
A list of vehicle types or models displays. Several selections may be required to complete the vehicle identification, follow the screen prompts to enter the required information.
A confirmation screen displays once all the required information has been entered (Figure 4-3).

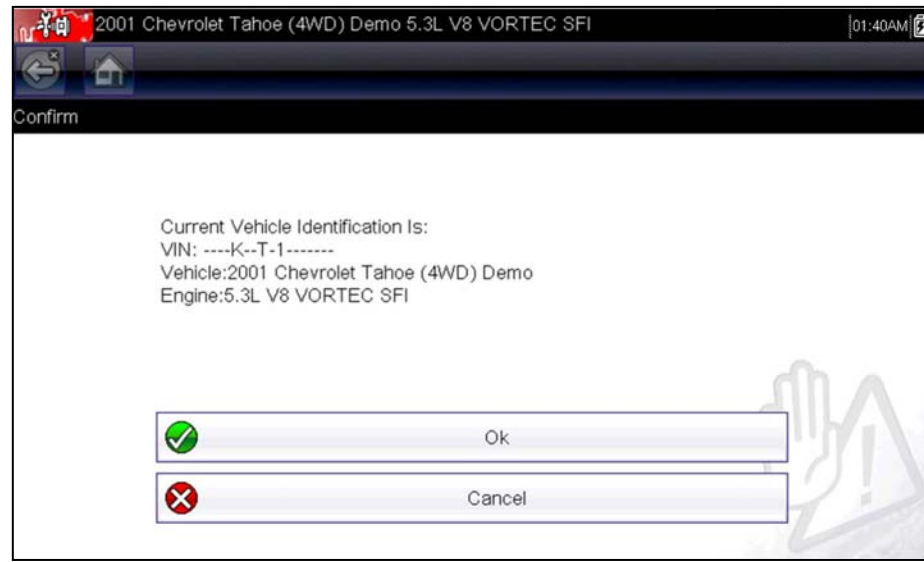


Figure 4-3 Vehicle confirmation screen

4. From the Confirm Vehicle screen select:
 - a. **OK** to continue.
 - b. **Cancel** to return to the previous screen.

4.3.2 Connecting the Data Cable

Connection of the data cable to the diagnostic tool and vehicle DLC is required for Scanner testing, see [Data Cable Connection](#), on page 18.

4.3.3 System and Test Selection

After a vehicle is selected, a menu of available systems is displayed. Select a system to continue.



Figure 4-4 Available systems list



NOTE:

Only the systems available for testing on the identified vehicle are included in the list.

After a system is selected and the diagnostic tool establishes communication with the vehicle, a menu of available tests is displayed.

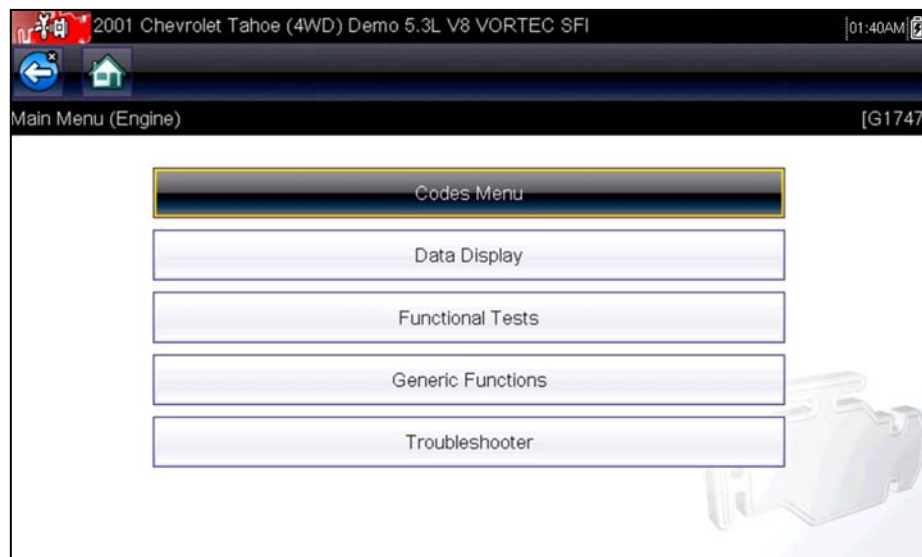


Figure 4-5 Main menu

Main menu options vary slightly by the year, make, and model of the test vehicle. The main menu may include:

- **Codes Menu**—displays diagnostic trouble code (DTC) records from the vehicle electronic control module. Selecting may open a submenu of viewing options.
- **Clear Codes**—erases DTC records and other data from the ECM. This selection is found on a Codes submenu for some models.
- **Data Display**— displays PID data from the vehicle electronic control module. Selecting may open a submenu of viewing options.
- **Functional Tests**—provides specific subsystem tests. The tests vary depending on the manufacturer and model.
- **Actuator Tests**—similar to functional tests, checks the operation of certain actuators, such as solenoid valves and relays.
- **Memory Resets**—allows you to reprogram adaptive values for certain components after making repairs. Selecting opens a submenu. These options are found on the Functional Tests Menu for some models.
- **System Tests**—provides specific subsystem testing. Performing these tests is similar to functional tests.
- **Generic Functions**—lets you access certain available Generic OBD II functions from a proprietary menu (1996 and newer vehicles only).

Codes Menu

This selection may appear as Codes, Codes Menu, Codes Only, Codes (No Data), Service Codes or something similar on the menu. Selecting opens a list of viewing options that includes:

- [Display Codes](#)
- [Clear Codes](#), on page 27
- [Freeze Frame/Failure Records](#), on page 27

Display Codes

This function opens either a list of diagnostic trouble codes (DTCs) stored in the selected vehicle electronic control module (ECM), or a submenu of DTC viewing options. The code list includes the DTC and a brief description (Figure 4-6).

If SureTrack® (optional) is active and data is available for a selected DTC, additional troubleshooting information from SureTrack (e.g. Common Replaced Parts data (Figure 4-6), Real Fix and Related Fixes) will also be available.

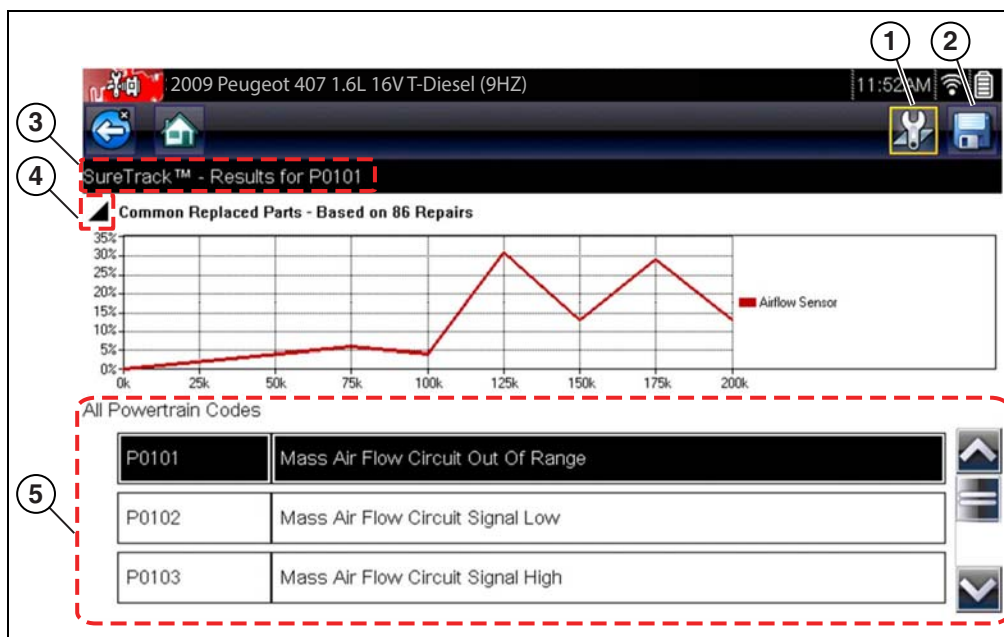


Figure 4-6 DTC results

- 1— **Fix It! Icon** — opens SureTrack Dashboard
- 2— **Save Icon** — saves the displayed DTCs to an (.XML) file
- 3— **SureTrack Status Bar** — displays active SureTrack status or result
- 4— **Common Replaced Parts Graph Icon** — toggles graph display on/off
- 5— **DTC Results List** — displays current DTCs

Submenu options may include:

- **Trouble Code Information**—opens a list of codes in ECM memory
- **History Codes**—opens a list of codes whose symptoms are not currently present. History codes indicate an intermittently occurring problem.
- **Failed This Ignition**—opens a list of codes that set during the current ignition cycle.
- **MIL SVS or Message Requested**—displays ECM requests to turn on the malfunction indicator lamp (MIL) or service vehicle soon (SVS) lamp, or display a driver information alert.
- **Last Test Failed**—displays a complete list of failed tests.
- **Test Failed Since Code Cleared**—displays a list of tests that failed since the last time codes were cleared from ECM memory.

Saving and Reviewing Codes

Selecting the **Save icon** (Figure 4-6) saves the displayed DTC results list as an (.XML) file. The (.XML) file can be reviewed later, by selecting **Previous Vehicles and Data > View Saved Data** and then selecting the (.XML) file from your saved file list (Figure 4-7). When opened, the (.XML) file displays basic vehicle information and a list of DTCs with a brief description of each.



Figure 4-7 Typical - DTC (.XML) files in the **View Saved Data** list

Saved (.XML) files can also be transferred to a personal computer (PC) using ShopStream Connect (Figure 4-8). Once the Diagnostic Tool is connected to the PC, (.XML) files can be printed, transferred, and copied. ShopStream Connect is a companion program that is available online, at no charge. See the ShopStream Connect website information at the front of this manual to visit the website and download the application.



NOTE:

(.XML) files transferred with ShopStream Connect are text files containing vehicle information, and the DTC list. The files can be viewed and printed from ShopStream Connect (Figure 4-8).

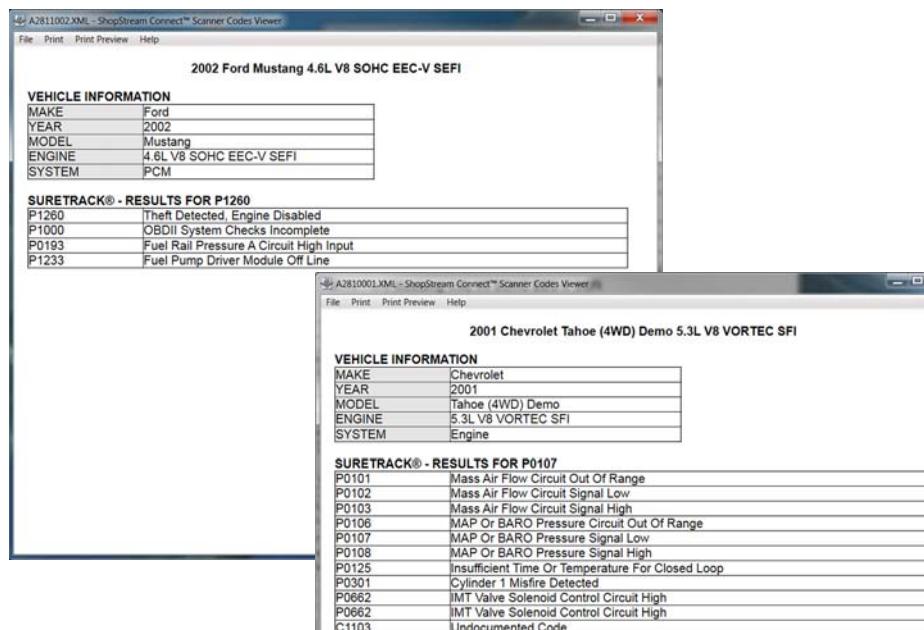


Figure 4-8 Typical - (.XML) files, viewed in ShopStream Connect

Clear Codes

The diagnostic tool clears codes from the vehicle electronic control module memory on most vehicles. If this function is not available on the test vehicle, Clear Codes does not appear as a menu option.



NOTE:

Clear Codes is also available from OBD-II Health Check (see [OBD Health Check](#), on page 38).



To clear codes:

1. Select **Clear Codes** from the Codes Menu.
A confirmation message displays.
2. Make sure any conditions shown on the confirmation message are met, then select **Yes**.
A “codes cleared” message displays once the operation is complete.
3. Select **Continue** to return to the Codes Menu.

IMPORTANT:

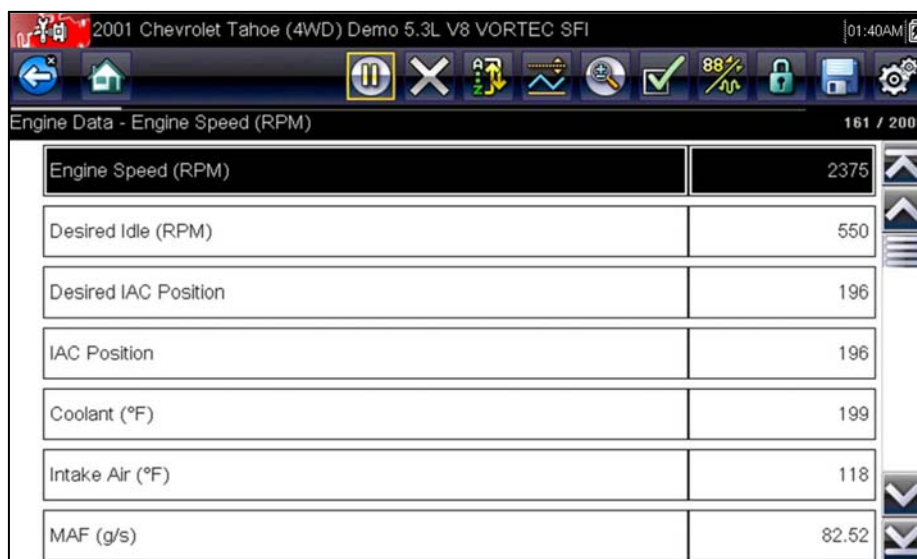
Clearing codes erases all temporary ECM information, including Freeze Frame/Failure Records. Make sure no vital diagnostic information will be lost before clearing codes.

Freeze Frame/Failure Records

This selection displays the DTC that was set, along with corresponding data, when the ECM commanded the malfunction indicator lamp (MIL) to turn on.

Data Display

Select **Data** to view PID data from the vehicle ECM. In data display mode the screen has a toolbar and a main body (Figure 4-9).



Engine Data - Engine Speed (RPM)		161 / 2000
Engine Speed (RPM)	2375	
Desired Idle (RPM)	550	
Desired IAC Position	196	
IAC Position	196	
Coolant (°F)	199	
Intake Air (°F)	118	
MAF (g/s)	82.52	

Figure 4-9 Data display screen

The toolbar control icons are described in [Scanner Control Icons](#), on page 20 and [Common Toolbar Control Icons](#), on page 15.

During data display the main body of the screen is divided into two columns; the left-hand column has a description of the parameter and the right-hand column shows the parameter value or state. Parameters are listed in the order in which they are transmitted by the ECM, so expect variations between years, makes, and models.

Up to three parameters can be locked, or fixed, at the top of the list. Locked parameters do not change as you scroll through the parameter list. The **Lock/Unlock** icon on the toolbar selects which parameters are fixed (see [Locking Parameters](#), on page 30).

Displayed data may also be paused or saved for detailed review and future reference, see [Saving Files](#), on page 33 and [Pausing and Reviewing Data Files](#), on page 34.

Customizing the Data List

The **Custom Data List** icon on the toolbar is used to determine which specific parameters display. Minimizing the number of parameters on the data list allows you to focus on any suspicious or symptom-specific data parameters. You can add or remove most parameters from the list. Certain vital parameters may not be removed. These appear in gray at the top of the list along with a lock icon, and they cannot be selected.



NOTE:

Limiting the number of parameters that display to those that apply to a particular situation results in a faster data refresh rate, and reduces the amount of memory used for saved files.



To create a custom data list:

1. Select the **Custom Data List** icon on the toolbar to select it.

The data selection screen displays and two new icons appear on the toolbar. Check marks to the left of the parameter description indicate which parameters are selected for display. A second smaller check box indicates a parameter that is locked.

The toolbar icons provide options for selecting and deselecting parameters to include or remove from the custom data list:

Icon	Description
	Select/Deselect , use to mark individual parameters to hide or display. Any locked parameters cannot be deselected.
	Select All/Deselect All , use to hide or display all of the parameters in the list. Any locked parameters cannot be hidden.

2. Create a custom data list by selecting the parameters to include. A parameter that displays has a check mark alongside the name, a parameter that does not display does not. Select which parameters to display:
 - a. Selecting the **Select All/Deselect All** icon immediately changes all of the parameters to the same condition, a second push changes them all back.
 - b. Selecting the **Select/Deselect** icon activates it. Now you can add or remove parameters by selecting individual entries in the list.

Note the following:

- Items at the top of the list that cannot be highlighted are locked and cannot be turned off.
- Use the **Select All** icon to display the complete list.
- Use the **Deselect All** icon to remove all of the highlights.

3. Select **Back** to display the updated data list.

Changing Screen Views

Selecting the **View** icon opens a drop-down menu of options:

- PID List
- 1 Graph
- 2 Graph
- 4 Graph

The PID (parameter identification) List view is a 2-column display with the name of the parameters in the left column and their current values in the right column (Figure 4-9).

The 1, 2, and 4 Graph views divide the screen horizontally to simultaneously display data graphs for the indicated number of parameters (Figure 4-10). Use the scroll bar or the **up** (▲) and **down** (▼) icons to view other parameters in the list.

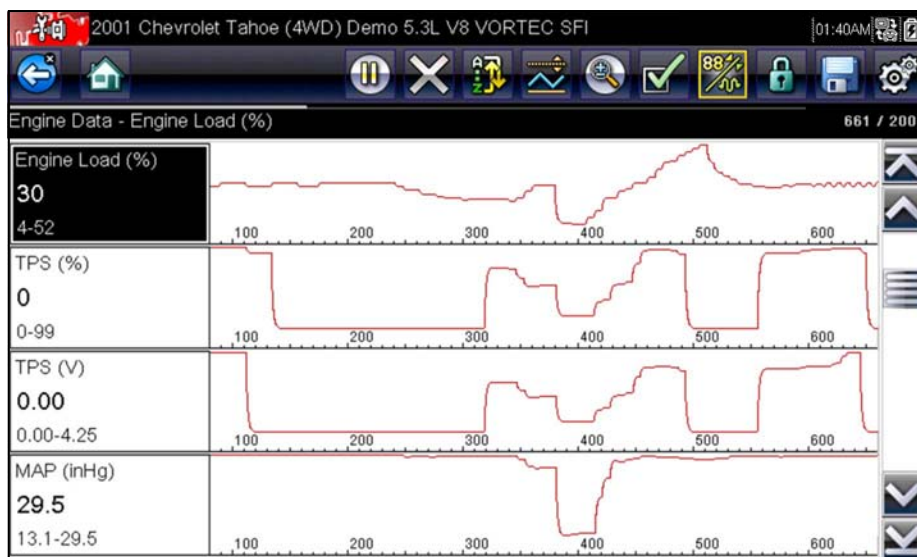


Figure 4-10 Four graph view



NOTE:

Any previously set conditions, such as held data or locked lines of data, remain in effect when the screen view is changed.

Locking Parameters

Use the **Lock/Unlock** icon to hold selected lines of the data in place and prevent them from scrolling, or to release previously locked lines of data. Up to three lines of data may be held at a time. This feature allows you to position related parameters together, making it easier to monitor their values and spot inconsistencies.

Locked parameters display as the top frames on the main body of the display screen, as well as at their usual position within the data list (Figure 4-11). A lock icon appears to the left of the parameter name to indicate it is locked.



To lock parameters:

1. Highlight the parameter to be locked.
2. Select the **Lock/Unlock** icon on the toolbar to lock it.
A copy of the locked parameter is now shown at the top of the data list, and a lock icon appears alongside the parameter name.
3. Highlight and select additional parameters to lock.
Up to three parameters can be locked at a time. Once locked, a parameter remains locked until it is manually unlocked or communication with the vehicle stopped.

Engine Data - Engine Speed (RPM)		2000 / 2000
Desired IAC Airflow (g/s)	13.36	
MAF (g/s)	68.14	
Intake Air (°F)	116	
Engine Speed (RPM)	1958	
Desired Idle (RPM)	550	
Desired IAC Position	196	
IAC Position	196	

Figure 4-11 Locked parameters

**NOTE:**

If three parameters are locked, one of them must first be unlocked before another parameter can be locked.

**To unlock parameters:**

1. Scroll through the data list and highlight the parameter to be unlocked, or released.
2. Select the **Lock/Unlock** icon on the toolbar.
The released parameter and the lock icon disappear from the list at the top of the data list.
3. Repeat Step 1 and Step 2 to release other parameters if needed.

Setting Trigger Levels

The trigger icon allows you to configure the diagnostic tool to automatically save PID data from buffer memory to a file when a parameter value crosses a threshold. When triggering is armed, a "Trigger event" pauses data collection and saves data to a file.

Selecting the **Trigger** icon opens a menu that includes:

- **Set Trigger**—establishes upper and lower signal values to initiate an event capture for the highlighted parameter.
- **Arm Trigger**—activates the diagnostic tool to capture an event when the signal crosses a threshold value.
Trigger lines change colors to indicate the trigger is armed.
- **Clear All Triggers**—deletes all previously set trigger levels.

If triggers are set the menu options are:

- **Clear Trigger**—deletes set trigger levels for the highlighted parameter.
- **Disarm Trigger**—de-activates event capture capability.
- **Clear All Triggers**—deletes all previously set trigger levels.



To set trigger levels:

1. Highlight the parameter to be used for triggering the recording.
2. Select the **Trigger** icon.
3. Select **Set Trigger** from the drop-down menu.

A graph of the highlighted parameter with a trigger toolbar above it fills the main body of the screen (Figure 4-12).

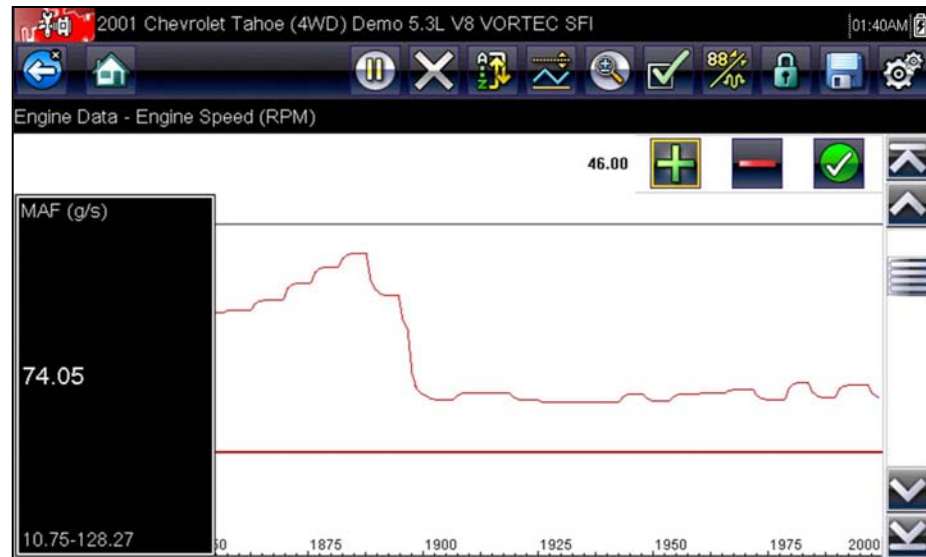


Figure 4-12 Trigger set screen

The trigger level line displays as a solid line running horizontally across the data graph. An upper and lower trigger level must be set, the upper level is set first.

4. Select the plus (+) and minus (–) icons on the toolbar, or use the up ▲ and down ▼ arrow buttons to position the upper trigger level to where you want it on the graph.
5. Select ✓ on the toolbar, or press the **Y/✓** button, to set the upper threshold.
A lower trigger level line now appears at the mid-point of the graph.
6. Select the plus (+) and minus (–) icons on the toolbar, or use the up ▲ and down ▼ arrow buttons to position the lower trigger level line to where you want it on the graph.
7. Select ✓ on the toolbar, or press the **Y/✓** button, to set the lower threshold.

The display returns to the PID data view and the trigger points appear as horizontal lines across the designated parameter graph. Repeat this procedure to establish trigger points for other parameters if desired. Once armed, any data points that register outside of your set conditions pause data collection and save data to a file.



NOTE:

Only three parameters can have trigger levels set at one time, but only one of the conditions needs to be satisfied for triggering to occur.



To arm triggers:

1. Select the **Trigger** icon on the toolbar.
2. Select **Arm Triggers** from the drop-down menu.

The trigger lines on the data graphs change color to indicate an armed condition.

Triggers for all of the graphs are armed simultaneously. Once triggering is armed, it remains in that state until you switch it off. If trigger settings are modified or are added for other parameters, they are armed as soon as you exit the setting screen.

Saving and Reviewing Scanner / OBD-II/EOBD Data Files

The following procedures are used when saving and reviewing data files for Scanner and OBD-II/EOBD.

Saving Files

During normal operation, data from the vehicle's ECM is continuously being stored in buffer memory as it is displayed onscreen. Buffer memory is limited to a predetermined "total" size and is displayed on the counter (located below the toolbar on the right side of the screen) (Figure 4-14).

Selecting **Save** writes the stored buffer memory to a file. Saving data is useful when trying to isolate an intermittent problem or to verify a repair during a road test. The saved file can be played back (similar to a movie clip) by selecting **Previous Vehicles and Data > View Saved Data**. See [View Saved Data](#), on page 48 for additional information.

NOTE:



The **Save icon** performs the same function as "Save Movie" function choice for the programmable **Shortcut** button, see [Configure Shortcut Button](#), on page 80 for details.

The saved data file can also be downloaded to a personal computer (PC) using the Mini USB jack. Once connected to the PC, the data files can be printed, transferred, and copied using ShopStream Connect. ShopStream Connect is an application that creates an interface between the diagnostic tool and a PC. The ShopStream Connect application is available free online, see the ShopStream Connect website information at the front of this manual for additional information.

The toolbar control icons are described in [Scanner Control Icons](#), on page 20 and [Common Toolbar Control Icons](#), on page 15.



To save data:

- Select **Save**.

A save dialog box displays while data is being saved. The data is saved when the message box disappears.

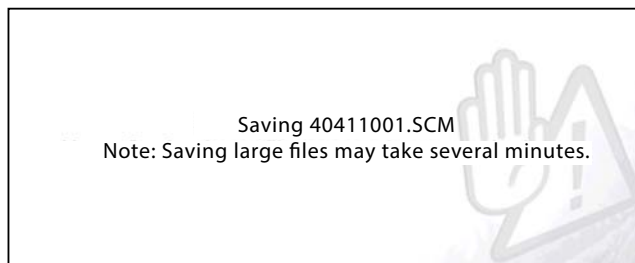


Figure 4-13 Save dialog box

Saving Screens

The **Shortcut** button can be programmed to save a snapshot of a visible screen as a bitmap file, see [Configure Shortcut Button](#), on page 81 for details. The saved file can be viewed by selecting **Previous Vehicles and Data > View Saved Data.**, see [View Saved Data](#), on page 48 for additional information.

Pausing and Reviewing Data Files

During normal operation, data from the vehicle's ECM is continuously being stored in buffer memory as it is displayed onscreen. The Pause feature, allows you to temporarily pause data collection to review it in detail.



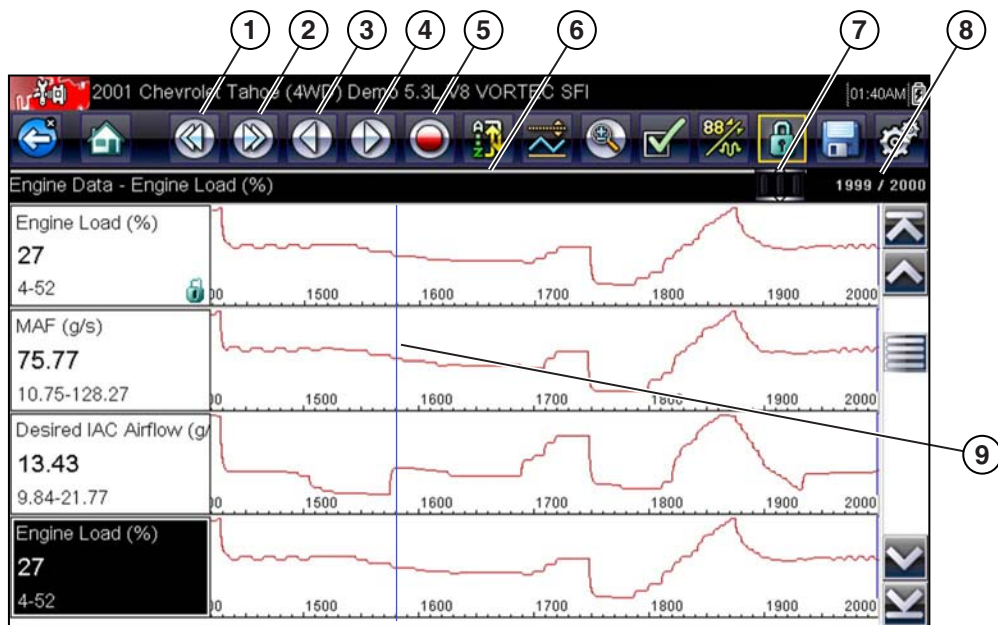
To pause and review data

Toolbar control icons are described in [Scanner Control Icons](#), on page 20 and [Common Toolbar Control Icons](#), on page 15.

1. While viewing data, select the **Pause** icon.

On the toolbar, the playback control icons are displayed. A counter displays along the right-hand edge of the screen between the toolbar and the main body. A bar graph to the left of the counter shows how much data is in the memory buffer. A slider on the bar graph indicates the position of the current screen in relation to the entire contents of the data buffer.

Use the slider to quickly scroll through the data. Use the control icons to accurately position the cursor. The cursor (vertical line), indicates your position when in the graph mode, appears once you begin navigating ([Figure 4-14](#)).



- | | |
|-----------------|---------------------------------------|
| 1— Skip Back | 6— Bar Graph |
| 2— Skip Forward | 7— Slider |
| 3— Step Back | 8— Counter (current position / total) |
| 4— Step Forward | 9— Cursor |
| 5— Record | |

Figure 4-14

2. Scroll up or down to review the list of data.
3. Select the desired control icon to move forward or back incrementally in the selected direction.

**To resume:**

- Select the **Record** icon.

The display changes back to display data and the **Pause** icon is shown on the toolbar. A vertical rule runs through the data graph to indicate data was paused at that point.

**NOTE:**

The **Shortcut** icon can be set to perform the Pause/Play function. See [Configure Shortcut Button](#), on page 80 for additional information.

Functional Tests

The **Functional Tests** selection is used to access vehicle-specific subsystem tests. Available tests vary by manufacturer, year, and model. Only the tests available for the identified vehicle display in the menu.

There are several types of functional tests:

- **Information Tests**—these are read-only tests, like selecting “VIN” from a Functional Tests menu to display the VIN of the identified vehicle.
- **Toggle Tests**—these tests switch a component, such as a solenoid, relay, or switch, between two operating states.
- **Variable Control Tests**—these tests command a certain value for a system or component, such as varying spark timing in 1° increments or EGR valve duty cycle in 10% increments.
- **Reset Tests**—these tests reset the adaptive, or learned, values that are stored in the vehicle electronic control module memory.
- **Scripted Tests**—these tests are software routines that place the vehicle into special operating modes for performing certain repairs, such as bleeding brakes with ABS.

Selecting Functional Tests opens a menu of test options that varies by make and model. Selecting a menu option either activates the test or opens a submenu of additional choices. Follow all screen instructions while performing tests. How and what information is presented on the screen varies according to the type of test being performed and the vehicle being serviced.

Toggle and variable control tests often display functional test controls on the toolbar at the top of the screen with PID data in the main body ([Figure 4-15](#)).

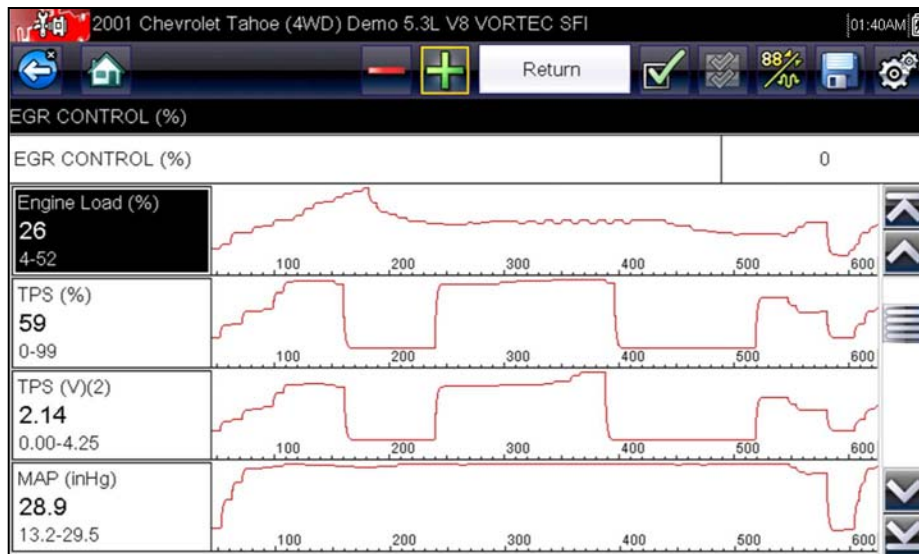


Figure 4-15 Functional test screen

A Test icon on the toolbar activates the test, and a Return, or similarly named, icon cancels the test. For variable control tests, the variable value displays between the main body and the toolbar. Plus and Minus icons on the toolbar increase and decrease the variable value.



A Data List icon, shown to the left, is available on the toolbar for some tests. This feature allows you to change which data list displays in the main body without exiting the functional test. The icon is only available when the test is inactive.

Generic Functions

Generic Functions are use to perform generic OBD-II/EObd tests, for additional information see [OBD Direct](#), on page 40.

4.4 Exiting Scanner

Scanner function remains open as long as there is an active communication link with the vehicle. You must interrupt this communication link in order to exit from tests and power down the diagnostic tool. A warning message displays if you attempt to shut down while the diagnostic tool is communicating with the vehicle.

NOTE:

Damage to the vehicle electronic control module (ECM) may occur if communication is disrupted. Make sure the data cable is properly connected at all times during testing. Exit all tests before disconnecting the data cable or powering down the diagnostic tool.

**To exit the Scanner function:**

1. From any active data screen, select the **Back** icon on the toolbar.
A “stopping communications” message briefly displays followed by the Data menu.
2. From the Data Menu, select **Back** on the toolbar.
Again, a “stopping communications” message briefly displays followed by the Main menu.

Now, the diagnostic tool is no longer communicating with the vehicle and it is safe to return to the Home screen and power down the diagnostic tool.

This chapter describes the basic operation of the OBD-II/EOBD function.



The **OBD-II/EOBD** icon is located on the Home screen.

The OBD-II/EOBD function allows you to access “generic” OBD-II/EOBD data. Generic OBD-II/EOBD data is data limited to emission related diagnostics such as:

- Checking for emissions-related diagnostic trouble codes (DTCs)
- Checking the cause of an illuminated malfunction indicator lamp (MIL)
- Checking monitor status prior to emissions certification testing

To access other available electronic control module (ECM) data for vehicle specific systems, parameters or enhanced diagnostics use the Scanner function, see [Scanner on page 19](#).



NOTE:

The OBD-II/EOBD function can also be used to access “generic” OBD-II/EOBD data for OBD-II/EOBD compliant vehicles that are not included in the Scanner function databases.

5.1 Basic Operations

5.1.1 Screen Layout and Toolbar Controls

Screen layout and toolbar controls are similar to the Scanner function, see [Screen Layout and Toolbar Icons](#), on page 19.

5.1.2 Connecting the Data Cable

Connection of the data cable to the diagnostic tool and vehicle DLC is required for OBD-II/EOBD testing, see [Data Cable Connection](#), on page 18.

5.1.3 Saving and Reviewing Data Files

Save and Pause control icon operation and data review procedures are the same as used for the Scanner function, see [Saving and Reviewing Scanner / OBD-II/EOBD Data Files](#), on page 32.

5.2 OBD-II/EOBD Menu

The following options are available from the OBD-II/EOBD menu:

- [OBD Health Check](#)
- [OBD Direct](#)

5.2.1 OBD Health Check

The OBD-II Health Check offers a way to quickly check for and clear emissions-related diagnostic trouble codes (DTCs), and to check readiness monitors for emissions testing. Selecting opens a connection message. Select **Continue** or press the **Y/✓** button to open a submenu of test options (Figure 5-1).

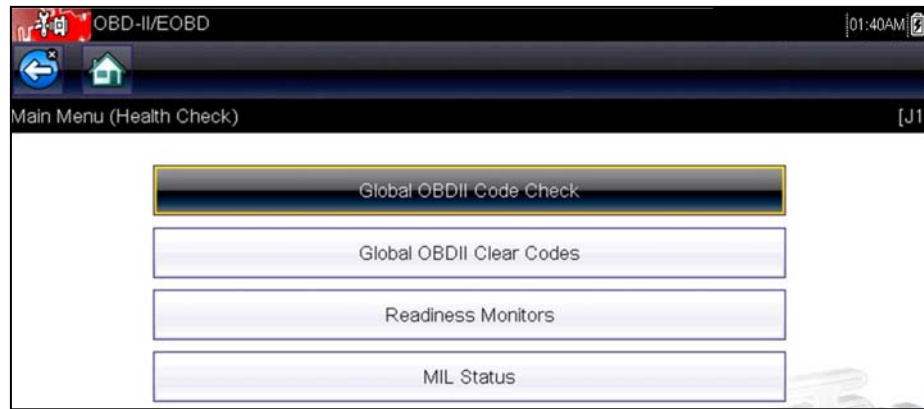


Figure 5-1 OBD Health Check menu

Global OBD II Code Check

Global OBDII Code Check displays stored emission related generic DTCs reported by the ECM. Selecting opens a submenu with two choices: Codes and Pending Codes. Either option opens a code list.

Codes

The Codes option displays a list of current emission related DTCs.

OBD-II/EOBD Codes have a priority according to their emission severity. The priority of the code determines the illumination of the MIL and the code erase procedure. Vehicle manufacturers have implemented the ranking differently, so there are differences between makes.

Pending Codes

The purpose of this service is to enable the diagnostic tool to obtain “pending” or maturing diagnostic trouble codes. These are codes whose setting conditions were met during the last drive cycle, but need to be met on two or more consecutive drive cycles before the DTC actually sets.



NOTE:

Save valuable time by using this service to verify test results after a single drive cycle following a vehicle repair and code clearing procedure.

- If a test failed during the drive cycle, the DTC associated with that test is reported. If the pending fault does not occur again within 40 to 80 warm-up cycles, the fault is automatically cleared from memory.
- Test results reported by this service do not necessarily indicate a faulty component or system. If test results indicate another failure after additional driving, then a DTC is set to indicate a faulty component or system, and the MIL is illuminated.

Refer to the *Global OBD Vehicle Communication Software Manual* for additional information.

Global OBD II Clear Codes

This option is used to clear all emission related diagnostic data, such as DTCs, freeze frame data, and test results, from the memory of the selected ECM. Although OBD-II/EOBD displays generic OBD-II/EOBD data only, clearing codes erases all of the stored data, including any enhanced codes and freeze frame information.

A confirmation screen displays when the clear codes option is selected to prevent accidental loss of data. Select to continue from the confirmation screen. Refer to the *Global OBD Vehicle Communication Software Manual* for additional information.

Readiness Monitors

This test checks the status of the readiness monitoring system. An OBD-II /EOBD control system runs continuous and periodic tests to check the status of emission-related subsystems to gauge the integrity of the electronic operations. Two options are available for Readiness Monitors:

- **Monitors Complete Since DTC Cleared**—displays the status of all monitors that have run since the last time ECM memory was erased.
- **Monitors Complete This Cycle**—displays the status of the monitors that ran during the current drive cycle only.

Select either option and test results are shown in the data viewer ([Figure 5-2](#)).



OBD-II/EOBD		01:40AM
ID : \$		255 / 2000
MISFIRE	NOT SUPPORTED	
FUEL SYSTEM	NOT SUPPORTED	
COMPONENTS	NOT SUPPORTED	
CATALYST	NOT COMPLETE	
HEATED CATALYST	TEST COMPLETE	
EVAPORATIVE SYSTEM	NOT COMPLETE	

Figure 5-2 Readiness monitor test report

Scroll to view the entire list of Readiness Monitors to ensure that all tests are complete. Select **Save** from the toolbar and follow the screen prompts to save a copy of the monitor report as part of the vehicle records.

MIL Status

This test checks the ECM commanded state (on or off) if the malfunction indicator lamp.

5.2.2 OBD Direct

OBD Direct includes the following menu and submenu choices:

- **OBD Diagnose**
 - **Start Communication** - initiates a test session
 - **Connector Information** - provides DLC location details
 - **Manual Protocol Selection** - provides choices for communication protocol
- **OBD Training Mode** - allows you to familiarize yourself with the capabilities of OBD-II/EOBD while navigating through menus without being connected to a vehicle.

Start Communication

Use the following procedure to begin an OBD-II/EOBD test session:



To perform an OBD-II/EOBD Test:

1. Connect the data cable to the test vehicle.
2. Select **Start Communications** from the OBD-II/EOBD menu.

A series of messages are displayed indicating automatic detection of vehicle type (12 or 24 V) has occurred and then the detected controllers are displayed.

The diagnostic tool establishes a communication link with the test vehicle, then opens an information screen (Figure 5-3).

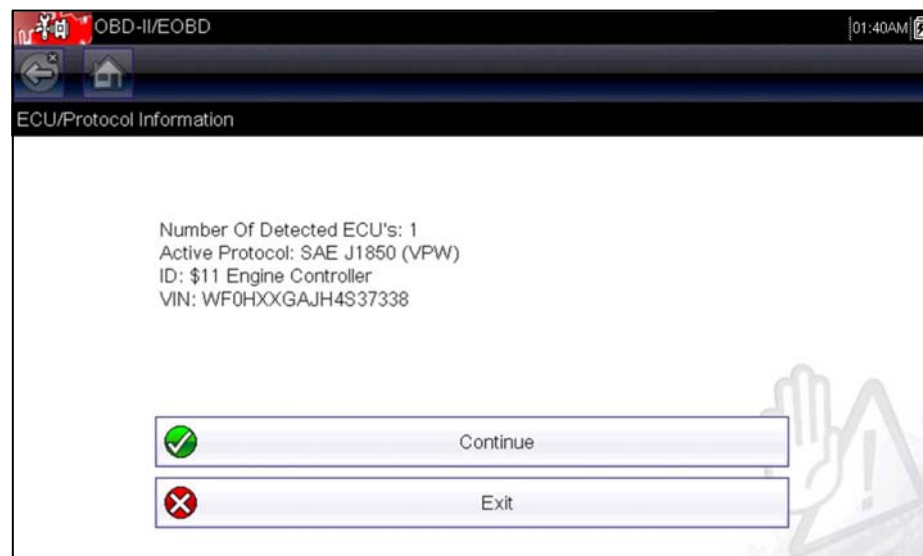


Figure 5-3 Protocol information

The information screen shows how many control modules were detected, which ECM is communicating, and which communication protocol is being used.

3. Select **Continue**.

A Select Service menu of available tests opens:

- [Readiness Monitors](#), on page 43
- [MIL Status](#), on page 43
- [Fast-Track Troubleshooter](#), on page 43
- [\(\\$01\) Display Current Data](#), on page 43
- [\(\\$02\) Display Freeze Frame Data](#), on page 44
- [\(\\$03\) Display Trouble Codes](#), on page 44
- [\(\\$04\) Clear Emissions Related Data](#), on page 44
- [\(\\$05, 06, 07\) Display Test param./Results](#), on page 45
- [\(\\$08\) Request Control of On-board System](#), on page 45
- [\(\\$09\) Read Vehicle Identification](#), on page 45
- [\(\\$09\) In-use Performance Tracking](#), on page 45
- [\(\\$0A\) Emission Related DTC with Permanent Status](#), on page 45

IMPORTANT:

All service modes are not supported by all vehicles, so the available menu selections will vary.



Figure 5-4 Service mode menu

4. Select a test to continue.

Readiness Monitors

Use this menu item to check the readiness of the monitoring system. Monitors not supported will display “not supported”. Scroll, if needed, to view the entire list of monitors (Figure 5-2). Selecting Readiness Monitors opens a submenu with two choices:

- **Monitors Complete Since DTC Cleared**—displays the results of all monitor tests that have run since the last time the vehicle electronic control module (ECM) memory was cleared.
- **Monitors Complete This Cycle**—displays only the results of monitor tests that ran during the current drive cycle, they reset when the ignition is switched off.

MIL Status

This item is used to check the current condition of the malfunction indicator lamp (MIL). Additional information, such as which ECM commanded the MIL on and the distance driven while the MIL is on (if supported), can also be displayed. The MIL Status report can also be saved as part of the vehicle records.

Fast-Track Troubleshooter

Fast-Track® Troubleshooter is a database of experience-based repair strategies and information, that has been compiled and validated by top-notch technicians. The Troubleshooter system simplifies the diagnosis process, as it contains information on virtually all common diagnostic trouble code (DTC) problems and driveability symptoms for most vehicles covered by the vehicle communication software.

(\$01) Display Current Data

Use this test to display the serial data transmitted by the selected vehicle electronic control module (ECM). The main body of the screen has two columns; the left-hand column is a description of the parameter and the right-hand column is the parameter value or state. Viewing options and operations are the same as the Scanner function, see [Data Display](#), on page 27 for more information.

ID : \$	11
ENGINE SPEED(1/min)	4128
ABSOLUTE THROTTLE POSITION(%)	50.2
INTAKE AIR TEMPERATURE (°F)	190
ENGINE COOLANT TEMPERATURE (°F)	219
AIR FLOW RATE(g/s)	11.52
INTAKE MAP (inHg)	59.6

Figure 5-5 Current data display

(\$02) Display Freeze Frame Data

Freeze frame data provides a “snapshot” of critical parameter values at the time a DTC set.

This item is used to display freeze frame data for any stored emission related diagnostic trouble codes (DTCs). In most cases the stored frame is the last DTC that occurred. Certain DTCs, those that have a greater impact on vehicle emissions, have a higher priority. In these cases, the highest priority DTC is the one for which the freeze frame records are retained.

(\$03) Display Trouble Codes

This is used to display any stored emission related DTCs reported by the ECM. The display is similar to the Scanner function code display (see [Display Codes](#), on page 25 for details). The list does not include enhanced DTCs in this mode.

(\$04) Clear Emissions Related Data

This item is used to clear all emission related diagnostic data, such as DTCs, freeze frame data, and test results, from the memory of the selected ECM.



To clear emission related Data:

1. Select **Clear Emissions Related Data** from the menu.

A confirmation message displays to help prevent loss of any vital data ([Figure 5-6](#)).

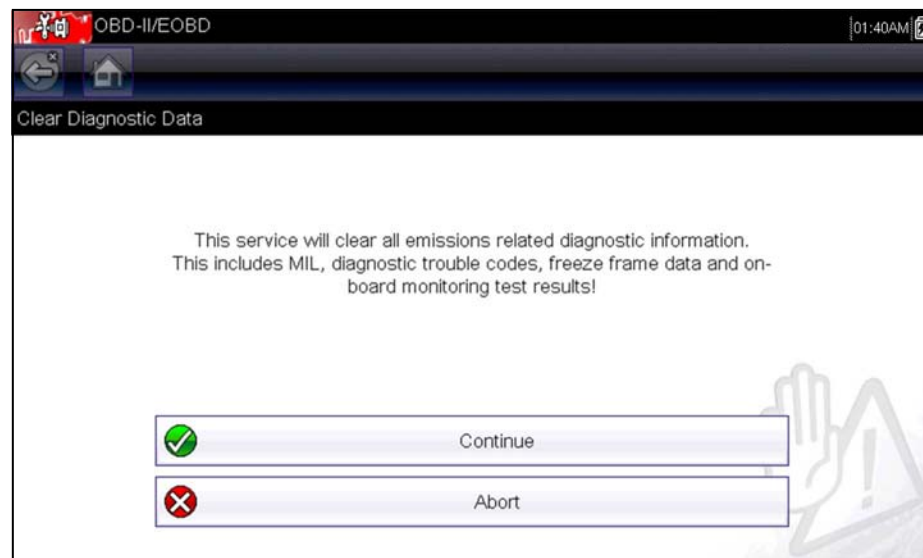


Figure 5-6 Clear codes confirmation message

2. Continue from the confirmation message.
The screen updates several times as ECM memory is erased, then a “data has been cleared” message displays.
3. Select **Continue** to return to the Select Service menu.

(\$05, 06, 07) Display Test param./Results

This option opens a submenu of parameters and test results from various sensors, monitor test results, and a record of DTC setting conditions detected during the last drive cycle. The submenu includes:

- [\(\\$05\) Oxygen Sensor Monitoring](#)
- [\(\\$06\) On-board Monitored Systems](#)
- [\(\\$07\) DTCs Detected During Last Drive](#)

(\$05) Oxygen Sensor Monitoring

This option opens a menu of tests available for checking the integrity of the oxygen (O2) sensors. Making a selection displays all of the pertinent O2 sensor parameters for the specific test. The test identification (ID) displays at the top of the data list.

(\$06) On-board Monitored Systems

This option opens a menu of tests from the monitored systems. The available data is for specific systems and components that the on-board diagnostic system monitors continuously, such as misfire, or non-continuously, such as the catalyst system. Making a menu selection displays the test results.

(\$07) DTCs Detected During Last Drive

This test opens a record of any DTCs that set during the last completed drive cycle. Select to open the DTC list.

(\$08) Request Control of On-board System

This service enables bidirectional control of the ECM. This service allows the diagnostic tool to control the operation of an on-board system, test, or component.

(\$09) Read Vehicle Identification

The purpose of this service is to enable the diagnostic tool to request and display vehicle-specific information, such as the vehicle identification number (VIN), the calibration identification, and the calibration verification number (CVN), of the test vehicle. Select a menu item to retrieve the information. Select **Return** to go back to the menu.

(\$09) In-use Performance Tracking

This option displays the “In-use Performance Tracking” of data. It is a record of the number of times each of the monitor tests have been completed. Select **Return** to go back to the menu.

(\$0A) Emission Related DTC with Permanent Status

This option displays a record of any “permanent” codes. A permanent status DTC is one that was severe enough to illuminate the MIL at some point, but the MIL may not be on at the present time.

Whether the MIL was switched off by clearing codes or because the setting conditions did not repeat after a specified number of drive cycles, a record of the DTC is retained by the ECM. Permanent status codes automatically clear after repairs have been made and the related system monitor runs successfully.

Connector Information

This option opens a database of vehicle diagnostic connector locations that includes most makes and models. The menu driven interface leads you quickly to difficult to find test connectors.



To locate a vehicle diagnostic connector:

1. Select **Connector Information** from the System menu.
A list of vehicle manufacturers displays.
2. Select a manufacturer from the list.
A list of models available from the selected manufacturer displays.
3. Select a model from the list.
If a cable adapter is needed, which one and how to connect it displays.
4. Select **Continue**.
Information on where to locate the vehicle diagnostic connector displays.
5. Select **Continue** to return to the System menu.

Manual Protocol Selection

Communication protocol is a standardized way of transferring data between an ECM and a diagnostic tool. Global OBD may use the following communication protocols:

- ISO 15765-4 (CAN)
- ISO 27145 (WWHOBd CAN)
- ISO J1939 (CAN)
- ISO 9141-2 (K-LINE)
- SAE J1850 PWM (Pulse Width Modulation)
- SAE J1850 VPW (Variable Pulse Width)
- ISO 14230-4 (Keyword Protocol 2000)
- SAE J2284/ISO 15765-4 (CAN)

When initially attempting to establish communication with the ECM the diagnostic tool attempts to communicate trying each protocol in order to determine which one is being used. During normal operation the communication protocol is automatically detected. If automatic detection fails, communication protocol can be manually selected.

IMPORTANT:

Using unsupported OBD communication protocols may activate warning lights and can set network related faults. Only use the manual selection option when OBD protocol is already known.

Select **Manual Protocol Selection** to open a menu of options ([Figure 5-7](#)).



Figure 5-7 *Manual protocol selection menu*

Select the **Back** icon or press the **N/X** button to return to the OBD-II/EOBD Main menu.

This chapter describes the basic operation of the Previous Vehicles and Data function.



The **Previous Vehicles and Data** icon is located on the Home screen. This function allows you to select recently tested vehicles and access saved data files.

6.1 Previous Vehicles and Data Menu

The following options are available from the Previous Vehicles and Data menu:

- [Vehicle History](#)
- [View Saved Data](#), on page 49
- [Delete Saved Data](#), on page 50

6.1.1 Vehicle History

The diagnostic tool stores the identification of the last twenty-five vehicles tested, so there is no need to go through the complete vehicle identification sequence when performing a retest after repairs have been made. The oldest vehicle record is deleted when a new vehicle is identified once there are twenty-five vehicles on file.



Figure 6-1 Vehicle history list

**To select from the vehicle History:**

1. Select **Previous Vehicles and Data** from the Home screen.
2. Select **Vehicle History** from the menu.
A list of up to 25 previously tested vehicles displays. Each vehicle is given a unique file name. Scroll to view the entire list.
3. With the item to be opened highlighted, either select the vehicle ID or press the **Y/✓** button.
The appropriate software loads and a vehicle ID confirmation screen displays.
4. Select **OK** or press the **Y/✓** button to continue.
The System Menu for the selected vehicle displays.

6.1.2 View Saved Data

Selecting the **View Saved Data** menu option opens a list of all the saved data (movie) files and screen images that are stored in memory. Saved files are listed in chronological order by the date and time that they were created with the most recent files are at the top of the list.

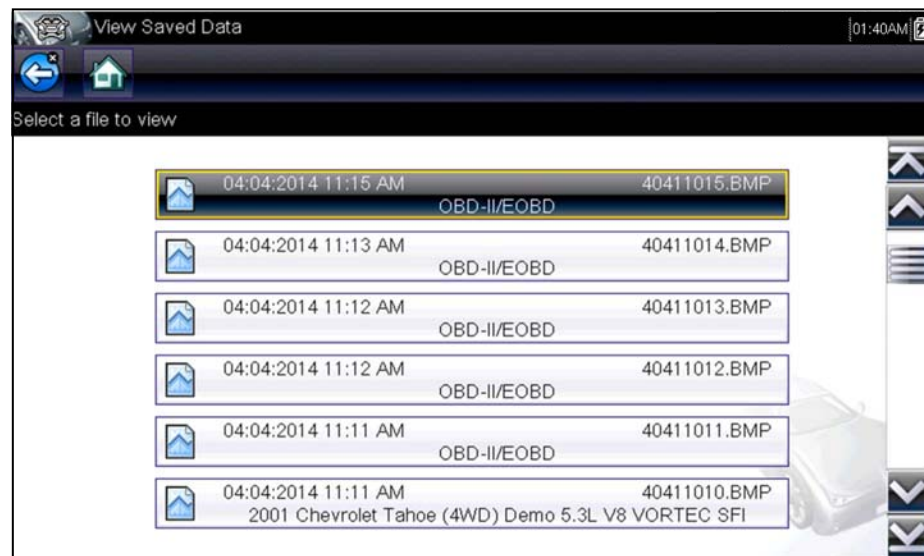


Figure 6-2 Saved data list

Saved files can either be opened directly on the diagnostic tool, or downloaded to a personal computer and opened using ShopStream Connect. See [Pausing and Reviewing Data Files](#), on page 34 and [Connect-to-PC](#), on page 81 for additional information.

**To review a saved data file or image:**

1. Select **Previous Vehicles and Data** from the Home screen.
2. Select **View Saved Data** from the menu.
3. Select a file to review from the list.

6.1.3 Delete Saved Data

This menu option is used to permanently erase saved files from memory.



To delete a saved file:

1. Select **Previous Vehicles and Data** from the Home screen.
2. Select **Delete Saved Data** from the menu.

A list of saved files displays.



NOTE:

The Select All/Deselect All and Delete icons become available on the toolbar so that you can either delete individual files or clear the entire memory buffer all at once.

3. Select a file from the list and a confirmation message displays.
4. Select an option from the confirmation message:
 - **OK**—deletes the selected file and returns to the saved files list, which no longer includes the deleted file.
 - **Cancel**—returns to the saved files list without deleting the selected file.
5. Select **Back** on the toolbar to return to the Previous Vehicles and Data menu, select **Home** to return to the Home screen.



Guided Component Tests provides you with a robust diagnostic database for use with scopes and meters. It is like having access to a complete library of shop manuals for testing engine management, transmission control, and ABS components.

Guided Component Tests helps you with everything from selecting the appropriate test for a specific part to pointing out the best location to hook-up the test leads and the pin configuration of the connector.

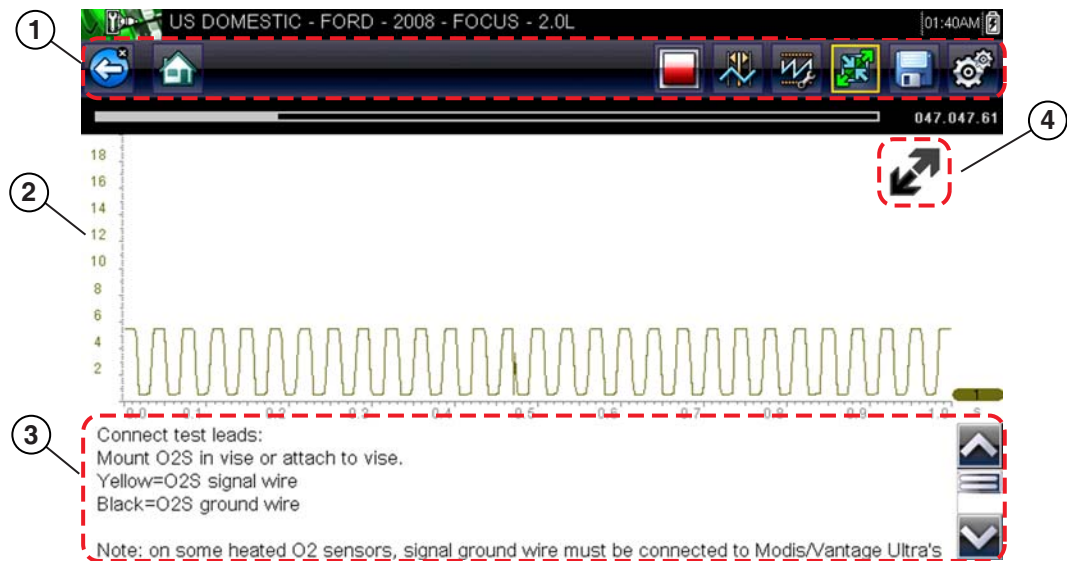
The component test procedures, tips, and meter settings reduce your overall set-up and diagnostic testing time. Vehicle-specific component tests are provided for engine, transmission, ABS, charging, transfer case and suspension systems. Availability varies by vehicle.

7.1 Screen Layout and Toolbar Icons

This section describes general navigation of the Guided Component Tests screen layout and toolbar icons.

Guided Component Test data is vehicle specific. The displayed meter is configured to perform the selected test on the identified vehicle. Also provided are test results, procedures, tips, and specifications for the selected test.

7.1.1 Screen Layout



- 1— **Toolbar**—contains control icons
- 2— **Main Body**—displays menus, information and test graph/meter display
- 3— **Information Panel**—displays test information
- 4— **Expand/Collapse icon**—toggles Main body view between full graph/meter and split information panel views

Figure 7-1 Test screen



NOTE:

The following description of terms are provided for reference, as used in this manual:

Trace - The actual line displayed on the scope screen.

Waveform - The graphic representation of a signal over time, which the trace displays on the scope screen.

Main Body

The main body of a Guided Component Test screen may display any of the following:





- A selectable menu - Select from a menu using the touch screen or the control buttons.
- Component information - Component information screens contain information to assist you with testing.
- A test meter - Test meters can display two signal traces, simultaneously. Adjustments to the display are made through the toolbar. Each trace is displayed as voltage over time on a standard oscilloscope screen. Voltage level is recorded on the vertical, or “y”, axis and time is presented on the horizontal, or “x”, axis of the screen. Values are shown for each graduation on the scales

Touch screen functionality within the main body of the screen is limited. Most adjustments are performed from the Toolbar and the Profile window, however you can adjust the baseline position (0 value) of the trace on the horizontal scale by touching and dragging the solid bar of the channel baseline indicator.

7.1.2 Guided Component Tests Control Icons

Guided Component Tests toolbar control icons may vary depending on the active function or test. A yellow frame surrounding an icon (highlighted), indicates it is selected. Other control icons (not shown) are described in [Common Toolbar Control Icons](#), on page 15.

Table 7-1

Icon	Function
	<p>Stop - Stops the collection of data</p>
	<p>Profile - Displays the profile settings at the bottom of the screen allowing adjustment of the trace signal display settings.</p>
	<p>Cursors - Toggles cursor display on/off. Cursors are two vertical rules that can be repositioned on the screen to measure intervals.</p>
	<p>Expand/Collapse - Toggles the Main body display between full information, full graph/meter, and split screen</p>

7.1.3 Extras Menu (Top Level Menu Items)

The Extras icon, also known as the Top Level Menu items, are only available on the Guided Component Tests home screen. The Extras icon opens a menu containing three selections designed to help you get the most out of the Guided Component Tests module.

- [Power User Tests](#)
- [How To Guide](#)
- [Features and Benefits](#)



Figure 7-2 Extras Icon (Top Level Menu Items)

Power User Tests

The **Power User Tests** option gives you quick access to a preconfigured meter for conducting a number of control system tests. Tests are available with or without on-screen help. Help typically provides a description of the test along with expected results and a link to the pre-set meter.

How To Guide

The **How To** option provides a list of available on-screen instructions for performing tasks. Scroll to view the entire list. Topics include:

- **10-MINUTE ELECTRONIC CLASS**—provides basic electronics and circuit instructions.
- **15-MINUTE IGNITION CLASS**—provides an introduction to basic ignition testing.
- **ILLUSTRATED TERMS & DEFINITIONS**—provides definitions of terms, drawings and tips associated with component testing.
- **NO-START BASICS**—provides a guideline for diagnosing a no-start condition.
- **O2 SENSOR & FEEDBACK SYSTEM ANALYSIS**—displays a “live” graphing component test meter with tips explaining the fundamental concepts of O2 sensor diagnostics.
- **TEST TIPS**—gives instructions for performing specific tests along with drawings and tips.
- **20-MINUTE CURRENT RAMP CLASSES**—provides an introduction to current ramp testing.

Features and Benefits

Selecting **Features and Benefits** opens a menu page that includes:

- **5-MINUTE WALK THRU WITH DEMO BOARD**—explains how to use the optional demonstration board to generate sample signals and sharpen your skills.
- **Features & Benefits**—provides descriptions and a brief overview of meter functions.
- **Accessories**—opens a menu of available optional equipment.
- **Product description**—provides descriptions and a brief overview of meter operations.

The optional demonstration board transmits a number of adjustable electronic signals similar to what is commonly found on modern vehicles. The demonstration board not only helps you learn how to use the Guided Component Tests software, it allows you to hone your skills and diagnostic techniques without an actual test vehicle. Contact your sales representative for details.

7.2 Guided Component Tests Operation

7.2.1 Vehicle Identification

The information presented is specific to the vehicle being tested. Therefore, certain attributes of the test vehicle must be entered into the Diagnostic Tool so that the correct data can be retrieved. Vehicle identification information is carried over if you enter the Guided Component Tests from Scanner or from one of the records stored in Vehicle History. However, you may need to enter additional attributes in some instances.

The vehicle identification sequence is menu driven, follow the screen prompts to enter the information. Exact procedures may vary by the make, model, and year of the vehicle.



To identify a vehicle for testing:

1. Select the **Guided Component Tests** icon on the Home screen.
2. Select a vehicle type from the menu.

A list of manufacturers displays (Figure 7-3).

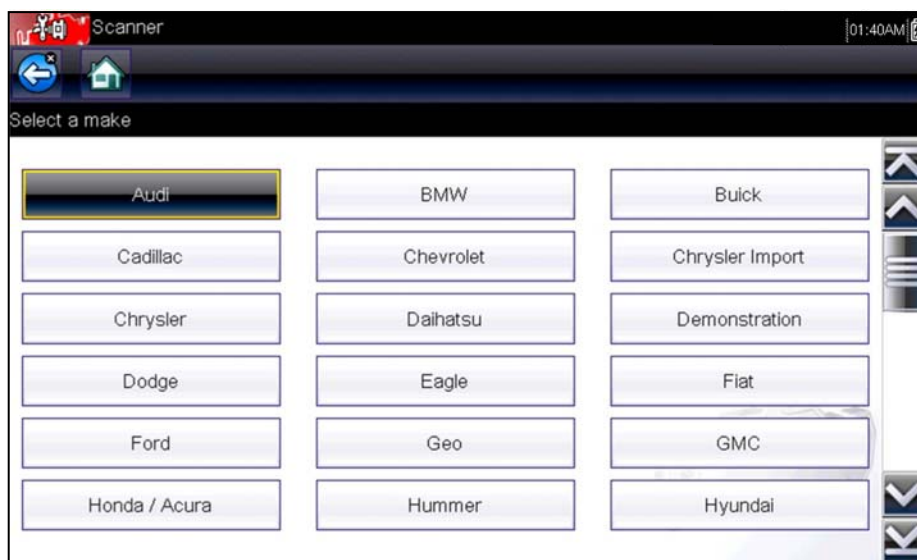


Figure 7-3 Manufacturer list

3. Select the vehicle manufacturer from the list.
A model year menu displays.
4. Select the vehicle year from the menu.
A list of vehicle models displays. Several selections may be required to complete the vehicle identification, follow the screen prompts to enter the required information.

A confirmation screen displays once all the required information has been entered (Figure 7-4).

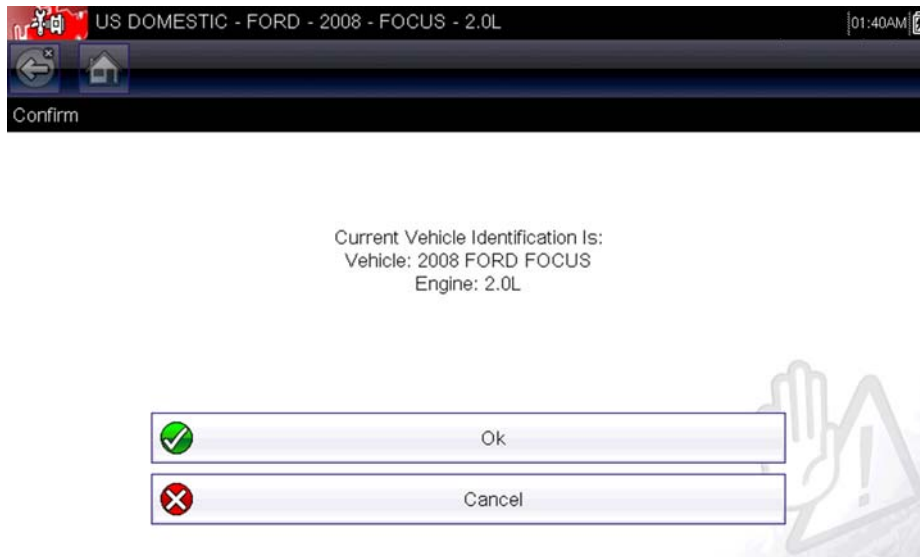


Figure 7-4 Vehicle confirmation screen

5. From the Confirm Vehicle screen select:
 - a. **OK** to continue.
 - b. **Cancel** to return to the previous screen.
 A list of systems available for testing displays (Figure 7-5).

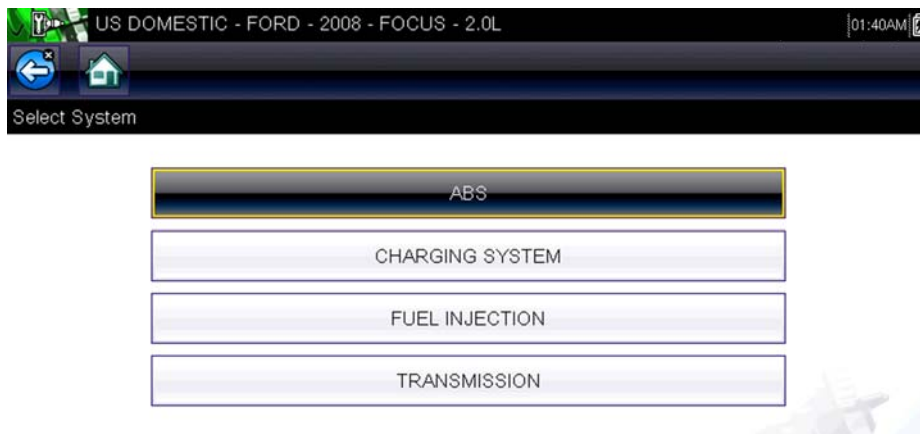


Figure 7-5 Available systems menu

6. Select a system and a list of tests available for the identified vehicle displays
 7. Select a test from the list to continue.
- The identification sequence is now complete, refer to the Operations section that follows for details on how to navigate through the Guided Component Tests information and perform tests.

7.2.2 Component Testing

The Guided Component Tests software provides vehicle specific component test procedures and information that aid in setting up scopes and meters. Once a test vehicle is identified, you can select a component test from the list of available tests. A Guided Component Tests menu displays once a component is selected, two types of information are available on the menu:

1. **COMPONENT INFORMATION**—provides information on the selected component and connector pin details that assists you in understanding the components prior to diagnosis.
2. **TESTS**—opens a preconfigured meter for performing the selected test, instructions for performing the test, and offers tips and resources to reduce setup and testing time.

7.2.3 Component Information

Use the Component Information to get details on component operation.



To view component information:

1. Select a component from the tests list.
2. Select **COMPONENT INFORMATION** from the component menu.



NOTE:

An additional selection, such as front or rear for an oxygen sensor (O2S), may be required before advancing to the component information screen.

Component information displays in the main body of the screen ([Figure 7-6](#)).

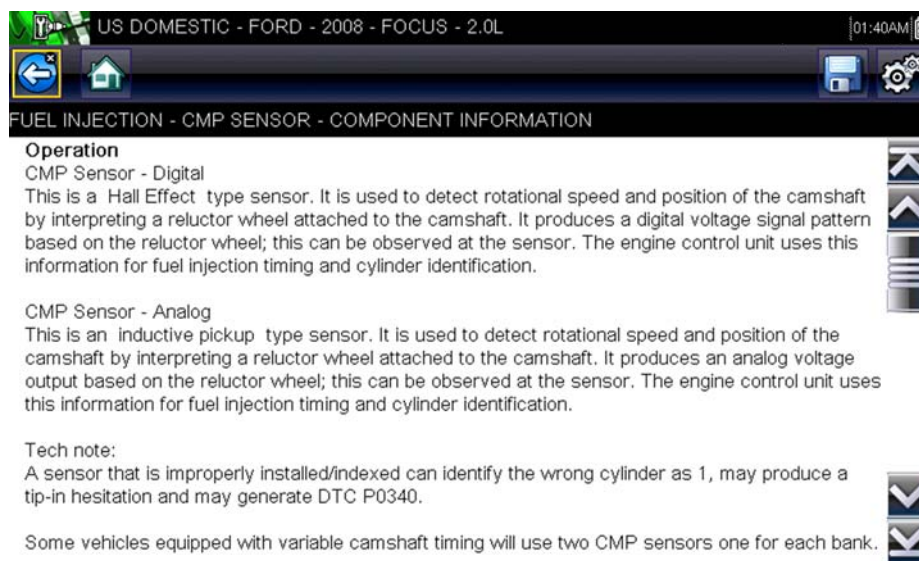


Figure 7-6 Component Information screen

Screens are divided into up to four sections to help quickly guide you to the correct information:

- **Operation**—provides a general description of normal component operation.
 - **Tech note**—provides component related tips (for example, common failures or faults) as well as information on factory updates and recalls.
 - **Connector**—displays the component connector and lists pin assignments.
 - **Location**—identifies the component location and the best place for testing it.
3. Use the scroll bar along the right edge of the screen to view any additional information.
 4. Select **Back** on the Toolbar, or press the **N/X** button, to return to the component menu.

Tests

The Tests section guides you through the process of performing tests on a specific component. Selecting a component test gives you access to specifications, tips on how and where to connect the test meter leads, and configures a meter to perform the specific test.



To select a test:

1. Select a component from the list.
2. Select a test from the component menu.

The component menu lists all of the tests available for the selected component, choices vary by the type of component as well as the make, model, and year of the vehicle.

Selecting opens an additional menu similar to the one shown in [Figure 7-7](#) when multiple choices are available.

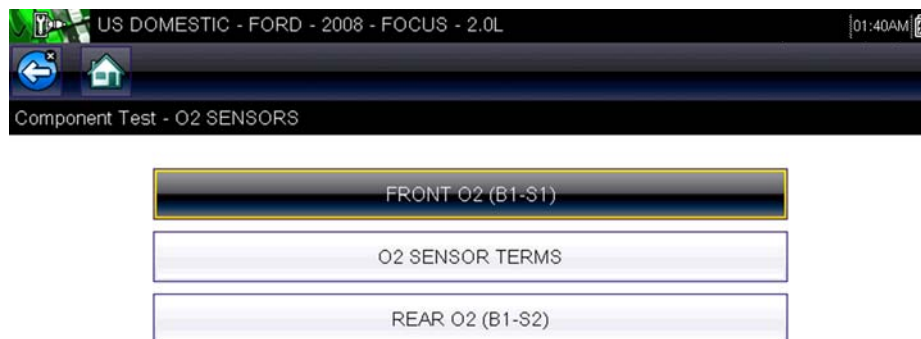


Figure 7-7 O2 Sensors submenu



NOTE:

There may be several levels of submenus for certain components. Select from the menus as needed to get to the test screen.

3. Select an option from the Guided Component Tests list and the test screen displays (Figure 7-8).

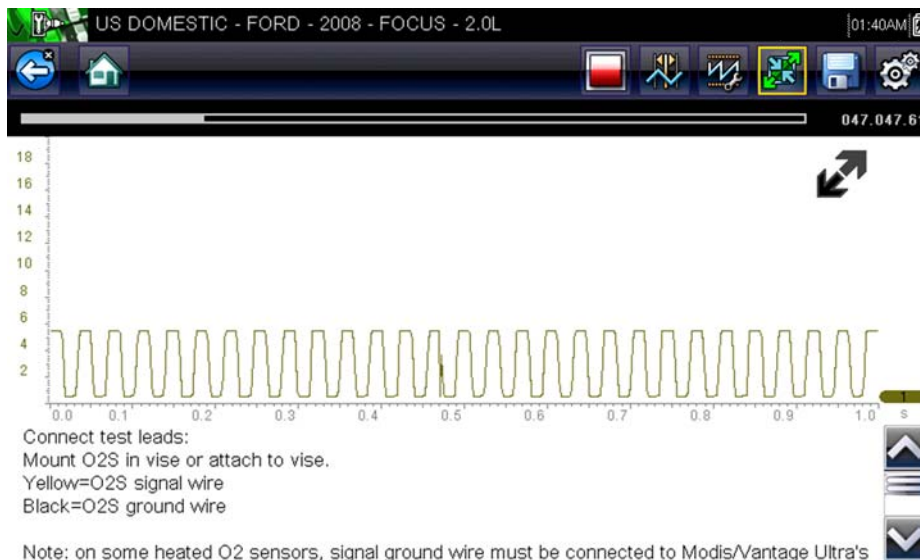


Figure 7-8 Test screen

A Guided Component Test initially opens with the information panel below the main body of the screen visible. Typically, connection information is on the screen and a scroll indicator displays along the right edge if there is additional information below what is shown.

4. Select the **Expand/Collapse** icon on the toolbar to view the test meter only.
5. Select **Back** on the toolbar to return to the menu.

Profile Controls

The preconfigured meter is used for conducting most of the component tests. However, if the need to capture a specific signal trace is needed, adjustment of the trace signal settings can be made by selecting the **Profile** icon from the toolbar.

For more detailed information about adjusting how a sampled signal displays on the screen refer to [Profile Control Icons](#), on page 67.

7.2.4 Saving and Reviewing Data Files

Save and Stop control icon operation and data review procedures are the same as used for the Scope/Multimeter function, see [Saving and Reviewing Scope / Multimeter Data Files](#), on page 74.



Scope Multimeter enables your diagnostic Diagnostic Tool to function as a digital multimeter (DMM), graphing multimeter (GMM), or 2-channel oscilloscope.

8.1 Screen Layout and Toolbar Icons

This section describes general navigation of the Scope Multimeter function.

Scope Multimeter tests are general and not vehicle specific. Vehicle identification is not required, meter setting adjustments are usually needed and supporting information is not available.



NOTE:

The following description of terms are provided for reference, as used in this manual:

Trace - The actual line displayed on the scope screen.

Waveform - The graphic representation of a signal over time, which the trace displays on the scope screen.

8.1.1 Screen Layout



- 1— **Toolbar**—contains control icons
- 2— **Expand/Collapse icon**—toggles Main body view between split and full graph/meter profile views
- 3— **Profile Controls Window**—displays profile control icons and trace display settings
- 4— **Main Body**—displays test graph/meter

Figure 8-1 Test screen

Main Body

The main body of the Scope Multimeter test screen may display the following:

- **Menu** - Select from a menu using the touch screen or the control buttons.
- **Diagnostic Tool** - Diagnostic Tools can display two circuit waveforms, simultaneously. Adjustments to the display are made through the toolbar. Each waveform is displayed as voltage over time on a standard oscilloscope screen. Voltage level is recorded on the vertical, or “y”, axis and time is presented on the horizontal, or “x”, axis of the screen. Values are shown for each graduation on the scales





Touch screen functionality within the main body of the screen is limited, most adjustments are performed from the Toolbar and the Profile Controls window. However, you can adjust the following in the main body:

- **Trigger position**; touch and drag the trigger indicator (+) to reposition it.
- **The baseline position (0 value) of the trace** can be repositioned on the horizontal scale by touching and dragging the solid bar at the right-end of the channel baseline.

8.1.2 Scope Multimeter Control Icons

Scope Multimeter toolbar control icons may vary depending on the active function or test. A yellow frame surrounding an icon (highlighted), indicates it is selected. Other control icons (not shown) are described in [Common Toolbar Control Icons](#), on page 15.

Table 8-1

Icon	Function
	<p>Stop - Stops the collection of data</p>
	<p>Profile - Displays the profile settings at the bottom of the screen allowing adjustment of the trace display settings.</p>
	<p>Zoom - Increases and decreases screen magnification.</p>
	<p>Cursors - Toggles cursor display on/off. Cursors are two vertical rules that can be repositioned on the screen to measure intervals.</p>

8.2 General Information

8.2.1 Lab Scope Information

The following describes the capabilities and specifications of the Lab Scope.

- 2 Channel Lab Scope
- Volts DC
- Low Amps (20)
- Low Amps (40)
- Low Amps (60)
- Ignition Probe
- 100 PSI Vacuum
- 100 PSI Pressure
- 500 PSI Pressure
- 5000 PSI Pressure
- MT5030 Vacuum
- MT5030 Pressure
- EEDM506D Temperature

Table 8-2

Function	Range	Accuracy/Comments
Signal Measurement	Ch. 1—banana jack, yellow Ch. 2—banana jack, green	Each channel input is referenced to common ground (GND—black banana jack)
Sample Rate	For 50uS sweep 6MSPS For 100uS sweep 3MSPS For all other sweeps 1.5 MSPS	Continuous sampling, MSPS = mega samples per second
Band Width	3 MHz	3 db point @ 3 MHz
Input Impedance	10 Mohm @ DC 4 kohm @ 3 MHz	Channel 1 and 2
VDC (Full Scale)	100mV–400V	Do not measure greater than 75VDC
VAC (Full Scale)	100mV–400V	Do not measure greater than 50 VAC (rms)
Low Amp Probe	20A scale (100mV/Amp) 40A scale (10mV/Amp) 60A scale (10mV/Amp)	Connect the positive (+) Amp Probe lead to the yellow jack on the diagnostic Diagnostic Tool for values on Ch.1, or to the green jack on the Diagnostic Tool for values on Ch. 2. Connect the negative (–) lead to GND (black jack) ¹ .
1. Do not use the Low Amp Probe to measure current on conductors at a potential greater than 46VAC peak or 70VDC.		

8.2.2 Graphing Multimeter Information

The following describes the capabilities and specifications of the Graphing Multimeter.

- Dual Graphing Meter
- Volts DC
- Volts DC - Average
- Volts AC RMS
- Ohms
- Frequency
- Pulse Width
- Injector Pulse Width
- Duty Cycle
- Low Amps (20)
- Low Amps (40)
- Low Amps (60)
- MC Dwell (60)
- MC Dwell (90)
- 100 PSI Vacuum
- 100 PSI Pressure
- 500 PSI Pressure
- 5000 PSI Pressure
- MT5030 Vacuum
- MT5030 Pressure
- EEDM506D Temperature

Table 8-3

Function	Range	Accuracy/Comments
Signal Measurement	Ch. 1—banana jack, yellow Ch. 2—banana jack, green	Each channel input is referenced to common ground (GND—black banana jack)
Sample Rate	1.5 MSPS	Continuous sampling, MSPS = mega samples per second
Band Width	3 MHz	3 db point @ 3 MHz
Input Impedance	10 Mohm @ DC 4 kohm @ 3 MHz	Channel 1 and 2
VDC (Full Scale)	75VDC	Do not measure greater than 75VDC
VAC (Full Scale)	50VAC	Do not measure greater than 50 VAC (rms)
Ohm Measurement Diode Test Continuity Test	Ch. 1— banana jack, yellow (-) Ch. 2— banana jack, green (+)	
Ohms	40 Ohm—4 Mohm	Fixed scales
Low Amp Probe	20A scale (100mV/Amp) 40A scale (10mV/Amp) 60A scale (10mV/Amp)	Connect the positive (+) Amp Probe lead to the yellow jack on the diagnostic Diagnostic Tool for values on Ch.1, or to the green jack on the Diagnostic Tool for values on Ch. 2. Connect the negative (-) lead to GND (black jack) ¹ .
1. Do not use the Low Amp Probe to measure current on conductors at a potential greater than 46VAC peak or 70VDC.		

8.2.3 Digital Multimeter Information

The following describes the capabilities and specifications of the Digital Multimeter.

- Volts DC
- Volts DC - Average
- Volts AC RMS
- Ohms
- Diode/Continuity
- Low Amps (20)
- Low Amps (40)
- Low Amps (60)

Table 8-4

Function	Range	Accuracy/Comments
Signal Measurement	Ch. 1—banana jack, yellow	Input is referenced to common ground (GND—black banana jack)
VDC (Full Scale)	75VDC	Do not measure greater than 75VDC
VAC (Full Scale)	50VAC	Do not measure greater than 50VAC (rms)
Signal Measurement Input Impedance	10 Mohm	
Ohm Measurement Diode Test Continuity Test	Ch. 1— banana jack, yellow (-) Ch. 2— banana jack, green (+)	
Ohms	40 Ohm—4 Mohm	Fixed scales or auto ranging
Glitch Capture	Approximately 50 uS	
Diode test	2V scale	

8.2.4 Measurement Out of Range

A group of arrows display when a measurement is out of range for the scale selected:

- Arrows pointing UP—measurement over maximum range
- Arrows pointing DOWN—measurement under minimum range

Voltage measurements also display arrows in place of live values when the voltage exceeds the input rating of the meter.

WARNING



Risk of electrical shock.

- **Do not exceed voltage limits between inputs as indicated on the rating label.**
- **Use extreme caution when working with circuits that have greater than 40 volts AC or 24 volts DC.**

Electrical shock can cause personal injury, equipment damage, or circuit damage.

IMPORTANT:

If arrows are displayed in the live voltage values, discontinue circuit testing.

Correct an out-of-range condition by selecting a scale setting appropriate for the signal being sampled. See [Scale](#), on page 71 for more information.

8.3 Leads, Adapters and Probes

The Scope Multimeter uses standard safety plugs that are compatible with many accessories. The leads, clips, and adapters supplied with or available for the Diagnostic Tool are explained in this section.

IMPORTANT:

When removing leads from their sockets, do not pull on the wire because it can damage the leads. Pull on the plug.

8.3.1 Channel 1 Lead

The shielded yellow lead is used for Channel 1 (Figure 8-2). The lead color matches the color of socket 1 on the Display Device and the color of trace 1 on the test screens.

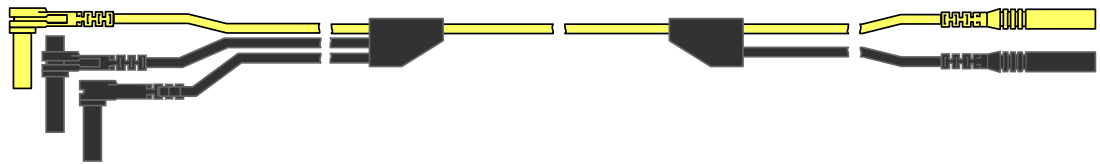


Figure 8-2 Yellow Channel 1 Lead

This yellow lead includes a black, right-angle, common ground plug and a black, stackable, common ground plug. The non-stackable ground plug always connects to the ground (GND) jack on top of the Diagnostic Tool. The stackable ground plug is used for connecting additional leads, such as the Channel 2 Lead or the Secondary Coil Adapter Lead, that require grounding. The stackable lead grounds through the non-stackable lead and does not need to be connected to the jack on the Diagnostic Tool.

8.3.2 Channel 2 Lead

The shielded green lead (Figure 8-3) is used for Channel 2. The lead color matches the color of socket 2 on the Display Device and the color of trace 2 on the test screens. This green lead includes a stackable, black, right-angle ground plug.



Figure 8-3 Green Channel 2 lead

8.3.3 Alligator Clips

Insulated alligator clips that attach to the test leads are included. The alligator clips are color coded to match each test lead. Alligator clips attach to the probe end of the test lead (Figure 8-4).

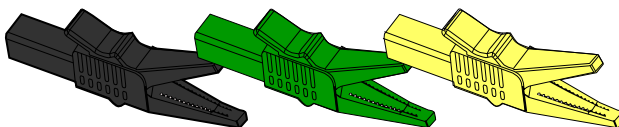


Figure 8-4 Alligator clips

8.3.4 Secondary Coil Adapter Lead (optional)

The optional Secondary Coil Adapter lead (Figure 8-5) connects to the clip-on secondary wire adapter, coil-in-cap adapter or coil-on-plug adapter to display secondary waveforms.

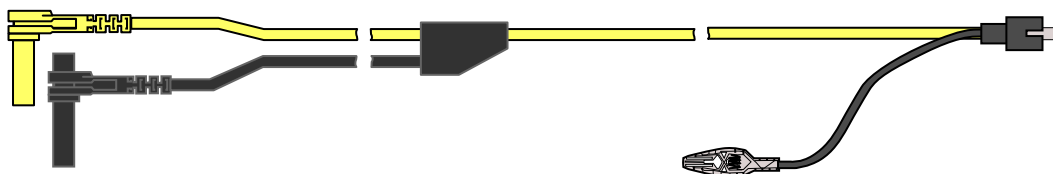


Figure 8-5 Secondary Coil Adapter lead

8.3.5 Secondary Ignition Clip-on Wire Adapter (optional)

The optional Secondary Ignition Clip-on Wire Adapter (Figure 8-6) connects the Secondary Coil Adapter lead to the vehicle secondary wire to display ignition patterns.



Figure 8-6 Secondary Ignition Clip-on Wire Adapter

8.3.6 Low Amp Current Probe (optional)

The optional Low Amp Current Probe (Figure 8-7) provides accurate and reliable non-intrusive testing of ignition coils, fuel injectors, fuel pumps, relays, electric motors, and parasitic draw. Use the Low Amp Current Probe to measure current from 10 mA to 60 Amps with a resolution of 1 mA.



Figure 8-7 Low Amp Current Probe

8.4 Scope Multimeter Operation

This section describes configuring the scope or meter and performing tests.

8.4.1 Starting Scope Multimeter



To start the scope multimeter:

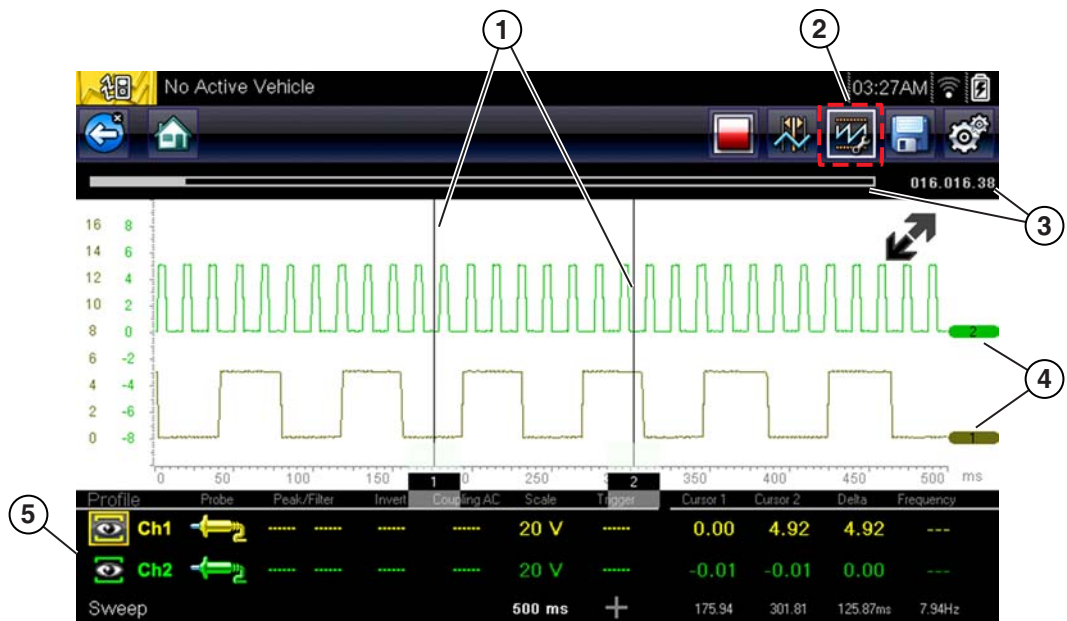
1. Select the **Scope Multimeter** icon from the Home screen.
2. Select a menu option: **Lab Scope**, **Graphing Multimeter** or **Digital Multimeter**
3. Select a test type submenu option.

The Scope Multimeter displays for the selected test.

8.4.2 Scope Multimeter Setup

The following sections explain how to adjust the scope and multimeter for the specific type of signal being sampled. A preconfigured meter, which reduces setup time, is available for many applications in Component Test, see [Power User Tests](#), on page 53 for details.

Most of the setup operations are available by selecting the **Profile** icon on the toolbar. Selecting the icon opens the Profile Controls window at the bottom of the screen and highlights (yellow frame appears) the icon. Selecting the icon again changes the highlight to a white frame (Figure 8-8) and allows manual navigation (using directional control buttons) of the Profile Control icons in the Profile Controls window.



- 1— **Cursors**—vertical rules used to measure intervals
- 2— **Profile Icon**—opens Profile Controls Window
- 3— **Position Indicator**—graphical and numerical position indicators
- 4— **Channel Indicators**—displays active channel number
- 5— **Profile Controls Window**—displays profile control icons and trace display settings

Figure 8-8



Profile Control Icons

The Profile control icons are located in the Profile Controls window and used to adjust individual characteristics of how the signal is sampled and displayed on each channel. Available options include:

- **Show/Hide**—switches the channel display on/off.
- **Trace**—adjusts trace baseline position.
- **Probe**—allows selection of test probe to be used and displays current probe.
- **Peak**—maximizes the signal sampling rate for capturing fast events, such as voltage spikes, dropouts, and glitches.
- **Filter**—removes noise or interference from the waveform.
- **Invert**—switches the polarity of the displayed signal.
- **Coupling AC**—blocks the DC portion of an input signal in order to amplify the AC portion.
- **Scale**—adjusts the scale, which is the total value of the vertical axis of the display.
- **Trigger**—switches triggering on or off, and sets which slope of the waveform triggers.
- **Refresh**—clears the digital minimum and maximum values and updates the screen.
- **Sweep**—adjusts the sweep, which is the total value of the horizontal axis of the display.

Show/Hide


The show/hide icons are used to toggle the displayed signal channel off/on.

Show/Hide	Icon	Description
On		Channel displayed
Off		Channel not displayed

Select the icon or press **Y/✓** to toggle the channel off/ on.

Trace

The trace setup icons are used to adjust the baseline position (0 value) of the displayed trace

Icon	Description
	Opens trace baseline setup adjustment

Select the icon or press **Y/✓** to display the trace scale adjustment control. Select the up/down arrows to make adjustments or press the up/down directional buttons. Press the **N/X** button, to exit. The trace baseline can also be repositioned by touching and dragging the solid bar at the right-end of the channel baseline marker on the screen.

Probe

The Probe icon is used to select the type of device being used to sample the signal. Options are:

- Test Lead - Volts DC
- Vacuum 100
- Pressure 100
- Pressure 500
- Pressure 5000
- Low Amps 20
- Low Amps 40
- Low Amps 60
- Ignition
- EEDM506D Temperature
- MT5030 Vacuum
- MT5030 Pressure
- Close



To select a probe:

1. Select the **Probe** icon for the desired channel.
The Probe selection menu opens (Figure 8-9).

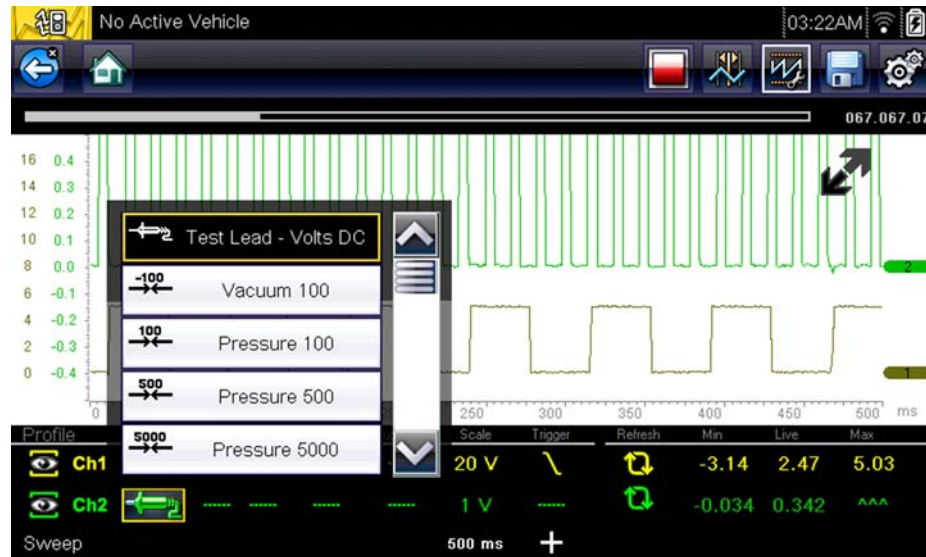






Figure 8-9 Probe selection menu

2. Highlight the desired probe in the menu.
3. Touch the highlighted probe to select it.
4. Select **Close**, the last entry on the list of probes, to close the menu window.

Peak

The peak icons are used to switch peak detect on and off.

Peak	Icon	Description
On		Peak detect is active for the designated channel.
		
Off		Peak detect is inactive for the designated channel.
		

With peak detect off; the scope collects just enough data to plot a waveform across the screen. This is the standard mode of operation for many scopes. With peak detect on; the scope samples at the maximum rate possible and captures more sample points than needed to plot the screen. These additional sample points permit fast events and glitches to be included in the waveform.





For example: with a sweep setting of 10 seconds on a screen 100 points wide, the sample rate would be 10 times a second. Decreasing the sweep to 1 second, increases the sample rate to 100 times a second. Now, a fast occurring event is likely to be captured due to the increased rate.

Peak detect puts the scope in a high speed sampling mode, which under certain circumstances may result in unwanted noise from components such as injectors and solenoids being picked up and displayed. Therefore, there are time when peak detect should not be used because the waveform may be distorted or hard to read due to noise.

An example of when not to use peak detect would be when sampling an oxygen (O₂) sensor signal. An O₂ sensor signal is relatively slow and requires, a clean, noise-free pattern for an accurate diagnosis. If peak detect is on, more noise is picked up making diagnosis difficult.

Filter

The filter icons are used to switch filtering, which removes noise and other interference from the waveform, on and off.

Filter	Icon	Description
On		Unwanted interference has been removed from the waveform displayed for the designated channel.
		
Off		Any signal interference on the sampled circuit is included in the waveform displayed for the designated channel.
		

The filter works slightly different depending upon what type of the test is being conducted:

- For a direct measurement test, such as volts, amps, or pressure, the filter minimizes the display of very fast spikes by averaging the sampled data when filter is active.
- For a calculated measurement test, such as frequency, pulse width, dwell, or duty cycle, extremely fast spikes (20 uS and faster) from sources like the ignition system are ignored when filter is active.

Filter smooths out spikes and fast variations in the waveform, which provides a good balance between noise suppression and signal integrity. The Filter setting is most useful when working with scales of 5 volts and below. The lower the volts scale, the more likely noise could be an issue.





An example of when to use Filter would be for testing an O2 sensor using a 1 or 2 volt scale, or performing a throttle position (TP) sensor sweep test using a 5 volt scale.

Filter is also beneficial for low amp probe testing. Due to the conversion factors used by the probe, a very low volts scale is used to measure the output of the probe. For a probe with a conversion factor of 100 mV/A connected to a 2 amp load, the scope uses a 200 mV scale to measure the output of the probe. The scope converts the measured output to 2 amps for display on the screen.

Invert

The Invert setting is used to switch the polarity of the waveform on the screen. For example; invert the signal of square waveform that rises from 0 volt to 5 volts and the display would show a waveform that falls from 0 volt to -5 volts.





An icon displays when the waveform on the screen has been inverted:

Invert	Icon	Description
On		The polarity of the waveform being displayed is inverted for the designated channel.
		
Off		The waveform is being displayed normally for the designated channel.
		

Coupling AC

Coupling AC subtracts the average value of a signal so that small variations display on the waveform. This is done by blocking the direct current (DC) portions of a signal in order to amplify the alternating current (AC) portions of the signal without driving the waveform off of the screen.

An icon displays when Coupling AC is active:

Coupling AC	Icon	Description
On		The DC portion of the waveform is blocked to amplify the AC portion, which displays for the designated channel.
		
Off		The DC portion of the waveform is NOT blocked for the designated channel.
		

This option is ideal for viewing items such as alternator ripple or fuel pump amperage.

Scale

The Scale setting adjusts the vertical, or y axis, value of what displays on the screen. The value shown in the Profile information panel represents the entire height of the display area for that channel. Scales can be set independently for each channel.



To adjust the scale:

1. Select **Profile** from the Scope Multimeter toolbar.
The Profile information window opens.
2. Select the **Scale** value for the channel you wish to adjust.
The Scale menu opens (Figure 8-10).

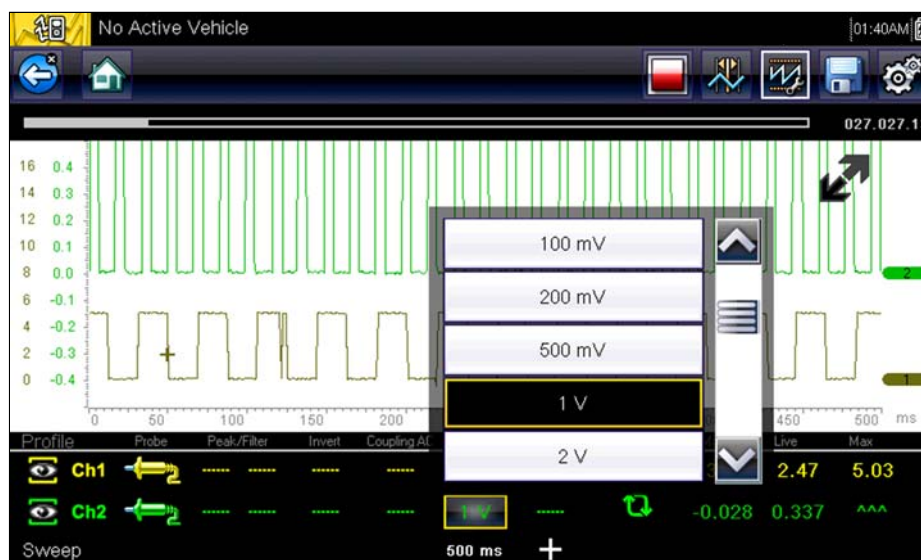


Figure 8-10 Scale menu

3. Highlight the desired scale in the menu.
4. Touch the highlighted scale to select it.
5. Select **Close**, the last entry on the list of scales, to close the menu window.

Trigger

Trigger setup allows you to set the Scope Multimeter so that it begins displaying a waveform once predetermined signal conditions, or triggers, are met. Triggering produces a much more stable waveform. The waveform always begins at the trigger point, so the image does not appear to flicker or drift as it updates. When working with a 2-channel setup, a trigger can only be set for one of the channels.

The trigger point is indicated by a plus sign (+) on the scope grid. The plus sign can be dragged across the screen to roughly position it. Use the Trigger Controls, available by selecting the large plus (+) sign at the base of the screen, to accurately adjust the trigger position. You can choose which slope of the waveform to trigger on using the Profile controls.



To set a trigger:

1. Select **Profile** from the Scope Multimeter toolbar.
The Profile information window opens.
2. Select the **Trigger** icon for the channel you want the trigger set to.
Each tap of the icon moves you progressively through the three states of triggering; rising, falling, and off.
Tapping the icon moves you sequentially through the three available setting.

Trigger	Icon	Description
Rising		The waveform for the designated channel begins as voltage rises to the threshold value, shown as a plus sign (+) in the main body of the screen.
Falling		The waveform for the designated channel begins as voltage drops to the threshold value, shown as a plus sign (+) in the main body of the screen.
Off		There is no trigger set for the designated channel.

- Once the slope is determined, select the plus sign (+) at the bottom of the information window. The trigger adjustment controls open (Figure 8-11).

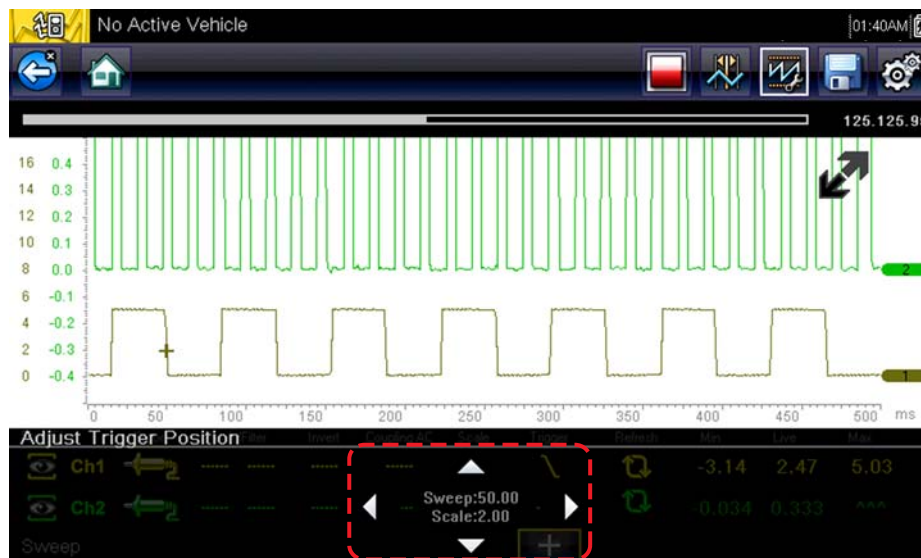


Figure 8-11 Trigger controls

- Select the arrowheads on the screen, or use the keypad to move the trigger into position. A digital readout centered between the arrowheads gives the precise position of the trigger.
- Select **Profile** from the toolbar, or press the **N/X** button, to exit.

Refresh

Selecting **Refresh** from the Profile Controls window clears the minimum and maximum digital values for both waveforms and updates the viewing screen. These digital values, which display to the right of the Refresh icon, are the highest and lowest value recorded for each waveform since the test was activated, or from the last time Refresh was selected.

Sweep

Sweep is the amount of time represented by the screen, or the horizontal scale of the display. Setting sweep adjusts the x axis of the display screen. Sweep can be adjusted in increments ranging from 5 microseconds to 20 seconds. The value on the bottom line of the Profile information panel indicates the sweep setting for both channels. Sweep applies to the entire meter and cannot be set independently for the two channels.



To adjust the sweep:

- Select **Profile** from the Scope Multimeter toolbar. The Profile information window opens.
- Select the **Sweep** value on the bottom line of the Profile Controls window. The Sweep menu opens (Figure 8-12).

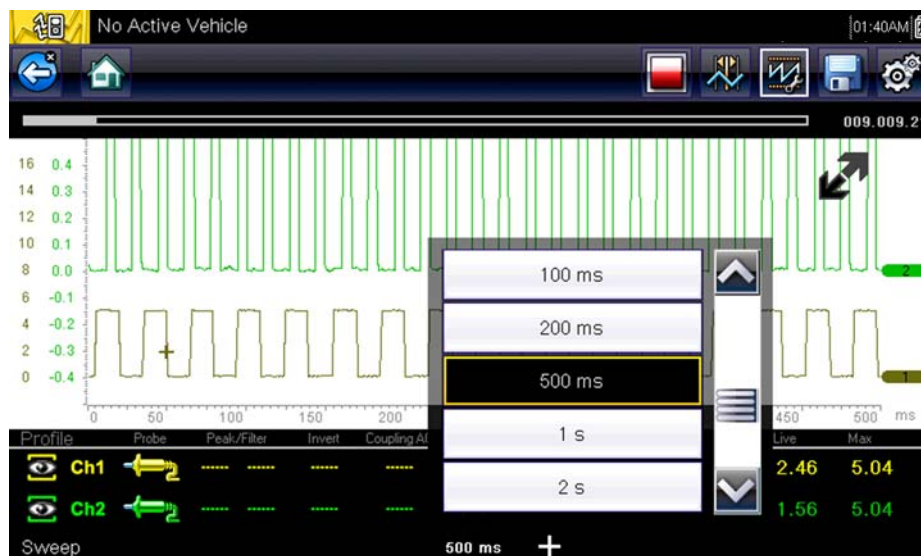


Figure 8-12 Sweep menu

3. Scroll to highlight the desired sweep value in the menu.
4. Select the sweep control.
5. Select **Close**, the last entry on the list, to close the menu window.

Cursors

Selecting the **Cursor** icon on the toolbar displays two vertical rules on the screen that can be repositioned to measure intervals (Figure 8-13). Select the **Cursor** icon again to cancel the cursors.

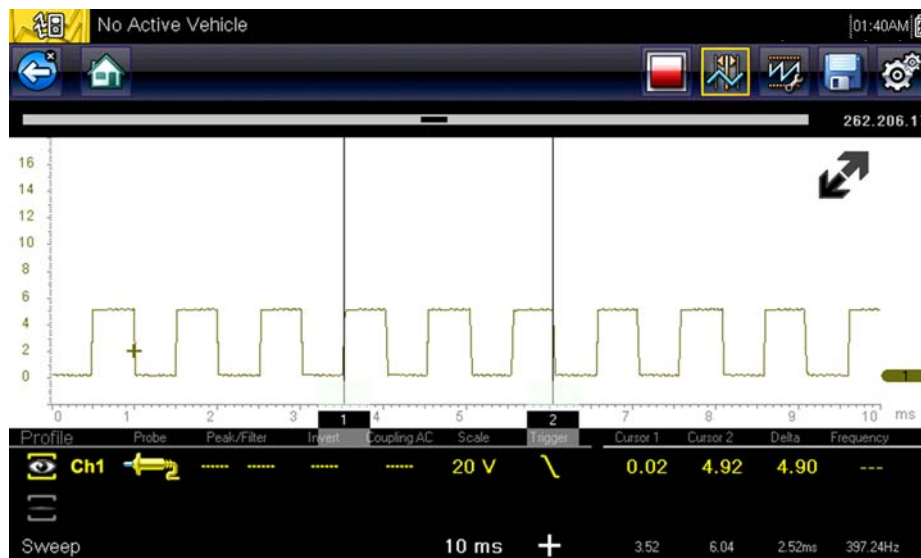


Figure 8-13 Cursor display



To reposition the cursors:

1. Select the **Cursor** icon on the toolbar to display the cursors.
2. Touch (cursor base) and drag into the desired position.
3. Repeat step 2 for other cursor.

8.4.3 Saving and Reviewing Scope / Multimeter Data Files

The following procedures are used when saving and reviewing data files for Scope/Multimeter and Guided Component Tests.

Saving Files

During normal scope multimeter operation, waveforms are continuously being stored in buffer memory as they are being displayed onscreen. Buffer memory is limited to a predetermined “total” size and is displayed on the counter (located below the toolbar on the right side of the screen) (Figure 8-15).

Selecting the **Save** icon writes the stored buffer memory to a file. Saving files is useful when trying to isolate an intermittent problem or to verify a repair during a road test. The saved file can be played back (similar to a movie clip) by selecting **Previous Vehicles and Data > View Saved Data**. See [View Saved Data](#), on page 48 for additional information.



NOTE:

The **Save icon** performs the same function as “Save Movie” function choice for the programmable **Shortcut** button, see [Configure Shortcut Button](#), on page 80 for details.

The saved file can also be downloaded to a personal computer (PC) using the Mini USB jack. Once connected to the PC, the files can be printed, transferred, and copied using ShopStream Connect. ShopStream Connect is an application that creates an interface between the Diagnostic Tool and a PC. The ShopStream Connect application is available free online, see the ShopStream Connect website information at the front of this manual for additional information.

The toolbar control icons are described in [Scope Multimeter Control Icons](#), on page 60 and [Common Toolbar Control Icons](#), on page 15.

**To save files:**

- Select the **Save** icon from the toolbar.
A save dialog box displays while files are being saved. The file is saved when the message box disappears.

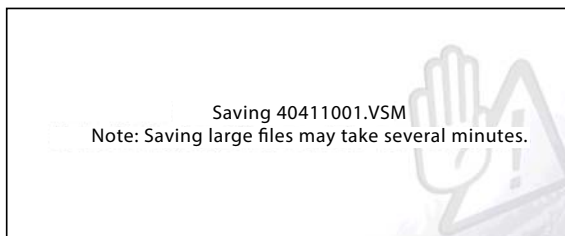


Figure 8-14 Save dialog box

Saving Screens

The **Shortcut** button can be programmed to save a snapshot of a visible screen as a bitmap file, see [Configure Shortcut Button](#), on page 80 for details. The saved file can be viewed by selecting **Previous Vehicles and Data > View Saved Data**, see [View Saved Data](#), on page 48 for additional information.

Stopping and Reviewing Data Files

During normal scope multimeter operation, waveforms are continuously being stored in buffer memory as it is displayed onscreen. The Stop feature, allows you to temporarily stop the waveform to review it in detail.



To stop and review data files

Playback control icons are described in [Scope Multimeter Control Icons](#), on page 60 and [Common Toolbar Control Icons](#), on page 15.

1. While viewing a waveform, select the **Stop** icon.
 On the toolbar, the playback control icons are displayed. A counter displays along the right-hand edge of the screen between the toolbar and the main body. A bar graph to the left of the counter shows how much captured information is in the memory buffer. A slider on the bar graph indicates the position of the current screen in relation to the entire contents of the memory buffer.
 Use the slider to quickly scroll through the waveform ([Figure 8-15](#)).



- | | |
|-----------------|-------------------------------|
| 1— Skip Back | 6— Slider |
| 2— Skip Forward | 7— Bar Graph |
| 3— Step Back | 8— Counter (current position) |
| 4— Step Forward | 9— Cursors |
| 5— Record | 10—Trigger Point |

Figure 8-15

2. Select the desired control icon to move forward or back in the selected direction.



To resume:

- Select the **Record** icon.
 The display changes back and the **Stop** icon is shown on the toolbar.

**NOTE:**

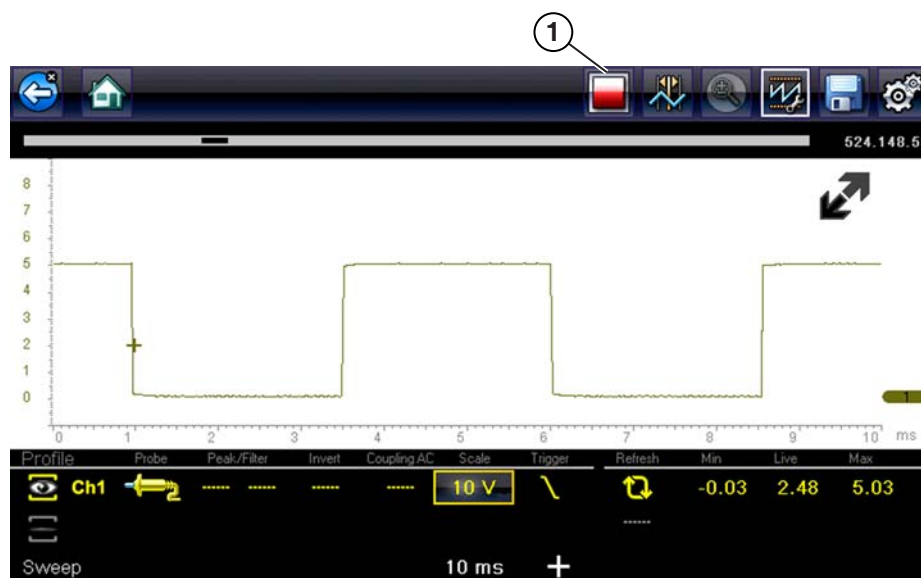
The **Shortcut** button can be set to perform the Pause/Play function. See [Configure Shortcut Button](#), on page 80 for additional information.

Using the Zoom Function

The zoom function allows you to change the magnification level of the waveform sweep during review. Changing magnification levels allows you to compress or expand multiple screens of data to quickly find glitches, or signal losses.

Example: While monitoring data during an engine MAF (Mass Air Flow Sensor) test, the waveform displays normally. As the engine continues to run, an erratic “condition” suddenly develops, but is not noticed in the waveform. Stopping the data capture when the “condition” is noticed allows you review the waveform in greater detail (higher zoom level) to look for a glitch in the waveform to see if the MAF could be at fault.

During “live” data capture, the default magnification level is 1x. The zoom function is not available until data capture is stopped by pressing the **Stop** icon ([Figure 8-17](#)).



1— Stop Control Icon

Figure 8-16 Typical “Live” Data (waveform)

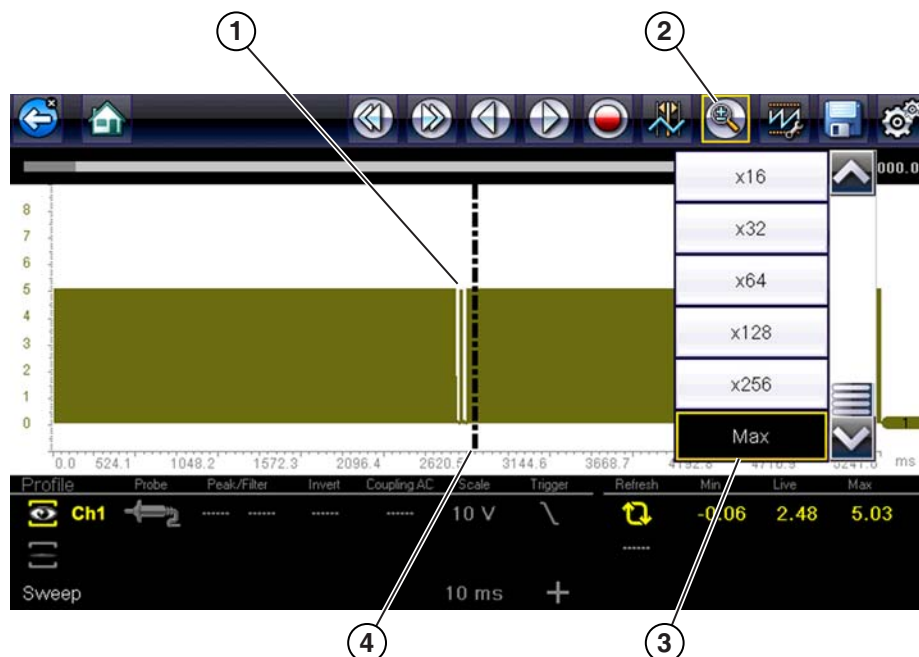
**NOTE:**

Zoom playback controls are identical to the standard playback controls used when reviewing data files, with the following exception:

Skip Forward / Skip Back control icons - (press once) moves multiple steps relative to set magnification level (e.g. 2X setting, moves 2 steps; 16X setting, moves 16 steps)

Additional information on playback control icons are described in [Scope Multimeter Control Icons](#), on page 60 and [Common Toolbar Control Icons](#), on page 15.

When the **Zoom** icon is selected the display defaults to the "Max" magnification level and a dropdown scroll menu displays. The dropdown menu allows you to select the display magnification level from a range of 1X to 256X. The "Max" (maximum) option displays all data captured on one screen (Figure 8-17).



1— Waveform Glitches
2— Zoom Icon

3— Zoom Magnification Level (Max shown)
4— Zoom Cursor

Figure 8-17 "Max" Magnification Level - displays all captured data

When zoom levels of 2X and higher are selected, a Zoom cursor (vertical dashed line) (Figure 8-17) displays onscreen. The cursor is used to quickly mark and navigate to points of interest or glitch in a captured waveform.

The Zoom cursor can be used to mark the approximate position of a glitch and can be manually dragged onscreen to the desired position. The new cursor position will be centered on the screen when a lower magnification level is selected. Figure 8-18 shows examples at 32X and 64X with the Zoom cursor positioned in the area of a signal drop glitch.



NOTE:

To quickly identify a glitch such as signal drop in a pattern, it may be easier to initially view the waveform at a higher magnification level (e.g. 256X or "Max") to display the entire captured waveform, then lower the zoom level to 8X or 2X to review in detail.



- 1— Waveform Glitches
- 2— Magnification Level at 128X
- 3— Magnification Level at 32X

Figure 8-18 Examples of Magnification Level at 32X and 128X

Figure 8-19 shows an example at 16X of the same waveform shown in Figure 8-17 and Figure 8-18. In Figure 8-19, this example at 16X the glitches are easily seen as compared to higher magnification levels.

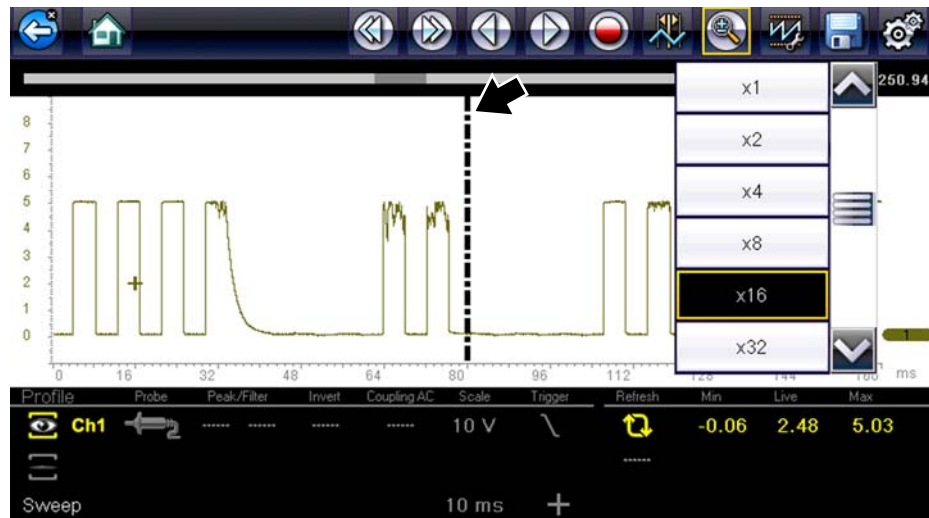


Figure 8-19 Example of Magnification Level at 16X. (For illustration purposes, the Zoom cursor has been positioned in the area of the glitches.)

This chapter describes the basic operation of the Tools function.



The **Tools** icon is located on the Home screen. This function allows you to configure diagnostic tool settings to your preferences.

9.1 Tools Menu

The following options are available from the Tools menu:

- [Connect-to-PC](#)—use to transfer and share files with a personal computer (PC)
- [Configure Shortcut Button](#), on page 81—use to change the function of the shortcut button
- [System Information](#), on page 82—use to view configuration information for the diagnostic tool
- [Settings](#), on page 82—use to configure certain characteristics of the diagnostic tool

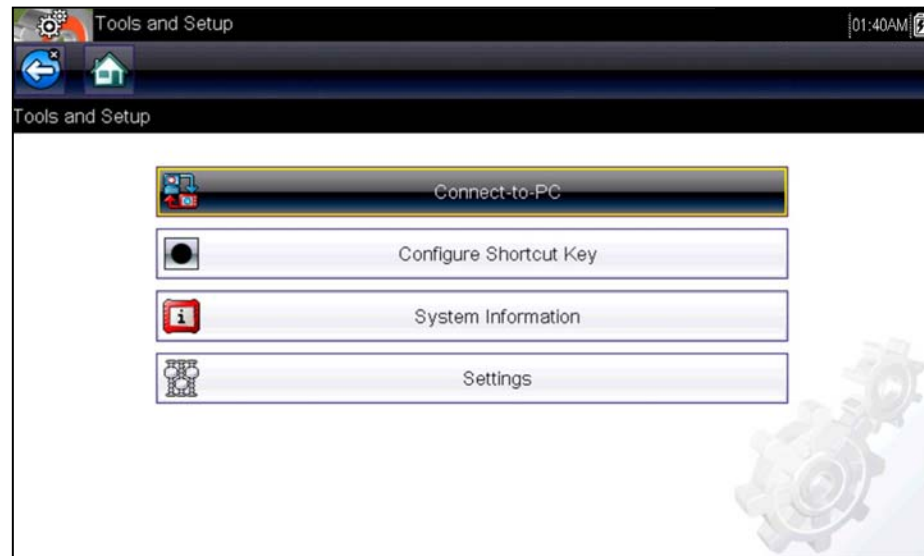


Figure 9-1 Tools menu

9.1.1 Connect-to-PC

Connect-to-PC allows you to transfer saved data files on your diagnostic tool to your personal computer using a USB cable.

The optional ShopStream Connect™ PC software allows you to view, print and save data files on your PC. In addition, you can download software updates from the PC to the diagnostic tool. These features provide an ideal way to manage saved data files. The ShopStream Connect application is available free online, see the ShopStream Connect website information at the front of this manual for additional information.



To connect the diagnostic tool to a PC:

1. Select **Tools** from the Home screen to open the menu.
2. Select **Connect-to-PC** from the Tools and Setup menu.
A screen message displays stating that the diagnostic tool can be connected to a PC as a mass storage device.
3. Connect the supplied USB cable to the diagnostic tool and then to the PC.
4. Select **Continue**.
5. Follow the instructions on the screen to complete the operation.

A USB cable, supplied with your diagnostic tool, is used to connect the diagnostic tool to the PC. When the diagnostic tool is connected to the PC a communications icon appears on the right edge of the title bar.

9.1.2 Configure Shortcut Button

This feature allows you to change the function of the **Shortcut** button. Options are:

- **Brightness**—opens the brightness setting screen.
- **Save Screen**—saves a bitmap image of the visible screen.
- **Save Movie**—writes PID data from buffer memory to a file for future playback.
- **Show Shortcut Menu**—opens the menu so you can quickly select from any of the functions.
- **Toggle Record/Pause**—programs the Shortcut button to work as the Pause and Play icons.



To assign a function to the Shortcut button:

1. Select **Tools** from the Home screen.
The Tools menu opens.
2. Select **Configure Shortcut button** from the menu.
3. Select a function from the menu.
4. Select the **Back** on the toolbar or press the **N/X** button to return to the options menu.

9.1.3 System Information

System Information allows you view patent information and system information such as the software version and serial number of your diagnostic tool.



Figure 9-2 System information



To display the System information screen:

1. Select **Tools** from the Home screen to open the menu.
2. Select **System Information** from the menu.
The System Information screen displays.
3. Scroll as needed to view all of the data.
4. Select **Back** on the toolbar or press the **N/X** button to return to the options menu.

9.1.4 Settings

This Tools selection allows you to adjust certain basic diagnostic tool functions to your personal preferences. Selecting opens an additional menu that offers the following:

- System Settings - see [System Settings](#), on page 82
- Configure Scanner - see [Configuring Scanner](#), on page 88
- Configure Units - see [Configure Units](#), on page 91

System Settings

Selecting System Settings opens a menu with two options; Display and Date & Time. Either selection opens an additional menu.

Display options include:

- [Brightness](#), on page 83—adjusts the intensity of the screen back lighting.
- [Color Theme](#), on page 84—changes the background color of the screen display.
- [High Contrast Toolbar](#), on page 84—enhances toolbar graphics for poor lighting conditions.
- [Font Type](#), on page 85—switches between standard and bold text for better visibility.
- [Backlight Time](#), on page 85—adjusts how long the screen stays on with an idle diagnostic tool.
- [Touch Screen Calibration](#), on page 86—calibrates the touch screen display.

Date & Time options include:

- [Time Zone](#), on page 86—sets the internal clock to the local time standard.
- [Clock Settings](#), on page 87—sets the time on the internal clock.
- [Daylight Savings Time](#), on page 87—configures the clock for Daylight Savings Time.
- [Time Format](#), on page 88—switches the time displays between a 12 or 24 hour clock.
- [Date Format](#), on page 88—configures how the month, date, and year displays.

Brightness

Selecting this option opens the brightness setting screen for adjusting the back lighting of the display ([Figure 9-3](#)).

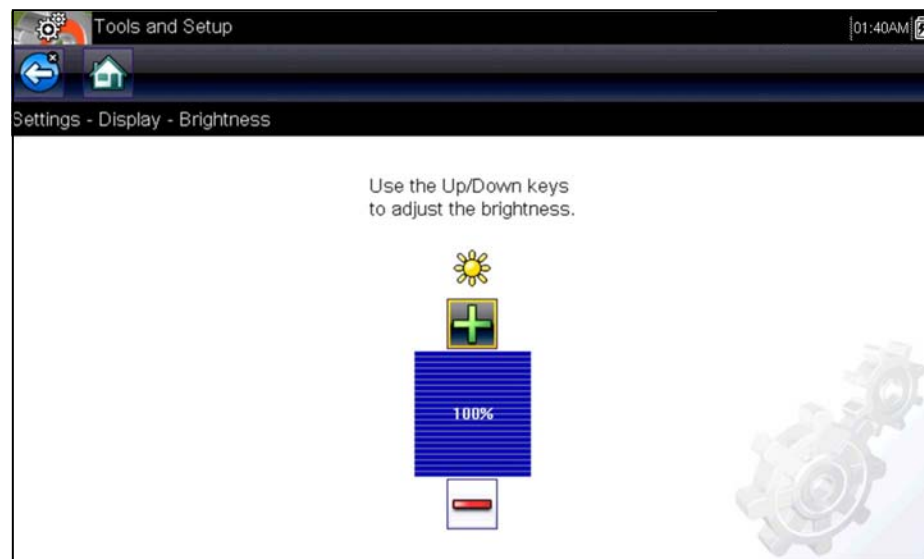


Figure 9-3 *Brightness setting*

Each push of the **Plus** and **Minus** icons, or the up (▲) and down (▼) arrows, incrementally changes the back lighting up or down respectively.

Select **Back** from the toolbar or press the **N/X** button to exit.

Color Theme

This option allows you to select between a white and black background for the screen. The black background can be beneficial when working under poor lighting conditions.

Selecting opens a menu with two choices: **Day Theme** (white background) and **Night Theme** (black background). Make a selection and a “please wait” message momentarily displays followed by the Home screen. The new toolbar setting is now active.

High Contrast Toolbar

This option allows you to switch to a high contrast toolbar. This toolbar features black and white icons with crisp graphics that are easier to see in poor lighting conditions or bright sunlight.

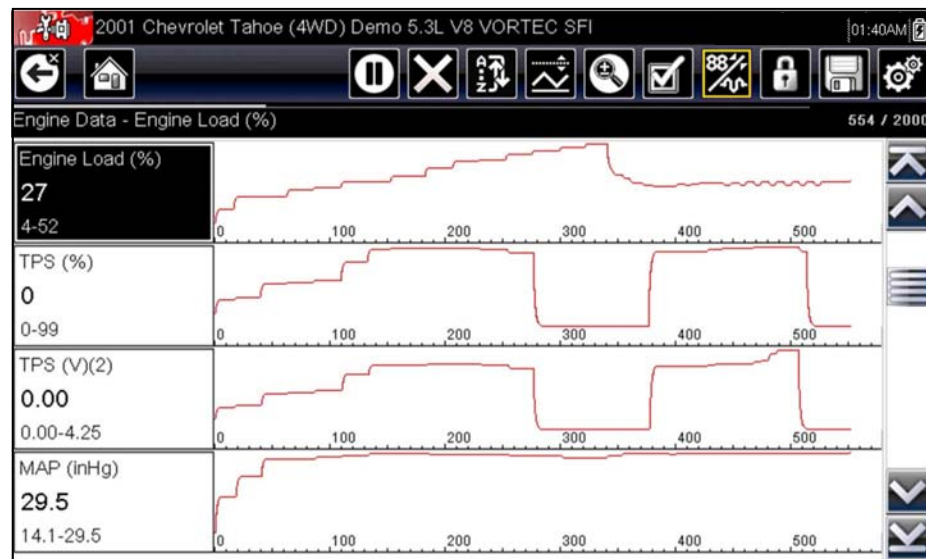


Figure 9-4 High-contrast toolbar

Selecting opens a menu with two choices; Color Toolbar and High Contrast Toolbar. Select and a “please wait” message displays followed by the Home screen. The new setting is now active.

Font Type

This option allows you to select between standard and bold faced type for the display screen. Bold type makes screen writing more legible under poor lighting or bright sunlight conditions.

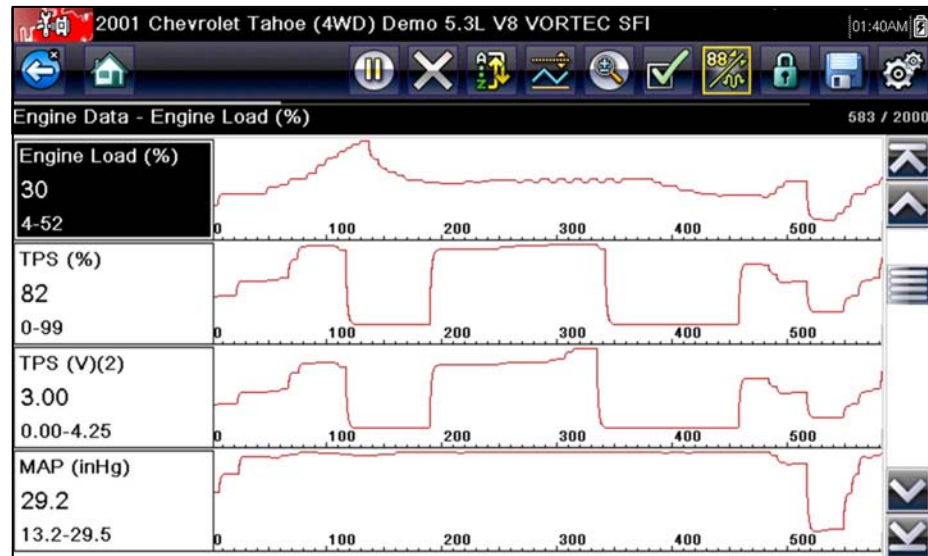


Figure 9-5 Bold type on a black background

Selecting opens a menu with two choices: Normal Font and Bold Font. Select a menu item or scroll and then press the **Y/✓** button to make a selection. The change is instantaneous. Select the Back or Home icon on the toolbar to return to either the Settings menu or the Home screen.

Backlight Time

This option allows you to configure how long the screen backlight remains on when the diagnostic tool is inactive. The following choices are available:

- Always On
- 15 Seconds
- 30 Seconds
- 45 Seconds
- 60 Seconds

Select the menu item desired, or scroll and then press the **Y/✓** button to make a selection. Select **Back** or **Home** on the toolbar to return to either the Settings menu or the Home screen.

Touch Screen Calibration

Calibrating the touch screen maintains the accuracy of the touch-sensitive display.

IMPORTANT:

To avoid serious damage to the diagnostic tool, always complete the touch screen calibration sequence once it has begun. **Never turn off the diagnostic tool while a screen calibration is in process.**

**To calibrate the touch screen:**

1. Select **Tools** from the Home screen to open the menu.
2. Select **Settings** from the menu.
3. Select **Touch Calibration** from the menu.
The calibration screen opens ([Figure 9-6](#)).



Figure 9-6 *Touch screen calibration*

4. Select each box on the screen as it displays.
The display returns to the Settings menu once the screen calibration procedure is complete.

Time Zone

This option opens a menu of time zone settings. Scroll to highlight, then select the local time zone. The display returns to the Settings menu once a time zone is selected.

Clock Settings

This option opens a window for resetting the time on the real-time clock.



To set the clock:

1. Select **Tools** from the Home screen to open the menu.
2. Select **Settings** from the menu.
3. Select **Clock Settings** from the menu.

A warning message briefly displays followed by the Clock Settings screen ([Figure 9-7](#)).

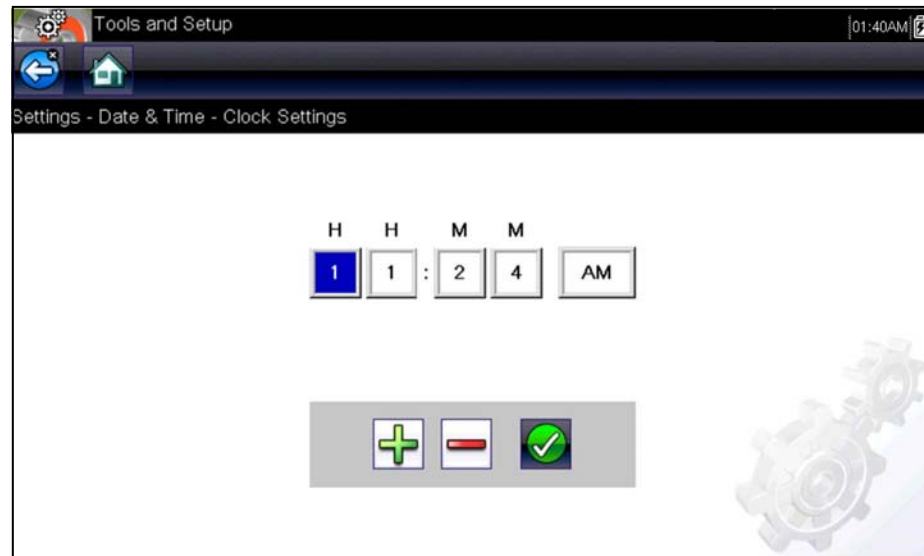


Figure 9-7 Clock settings

4. Select the **up (+)** icon on the screen or press the **up (▲)** button to incrementally increase the number in the highlighted field. Select the **down (-)** icon on the screen or press the **down (▼)** button to incrementally decrease the number.
5. Select the **check (✓)** icon on the screen or press the **Y/✓** button to move the highlight to the next field.
6. Repeat Step 4 and Step 5 until the correct time is displayed.
7. Select the **Back** icon on the toolbar or press the **N/X** button to close the Clock Settings window and return to the Settings menu.

Daylight Savings Time

This option opens a menu to configure the internal clock for Daylight Savings Time. Choose from:

- **ON**—sets the clock for Daylight Savings time.
- **OFF**—sets the clock for standard time.

Make either selection, then select the **Back** icon or press the **N/X** button to return to the menu.

Time Format

This option determines whether time is displayed on a 12 or 24 hour clock. Selecting opens a menu with two choices:

- **24 Hour Format**
- **12 Hour Format**

Make either selection, then select the **Back** icon or press the **N/X** button to return to the menu.

Date Format

This option allows you to select how date information is displayed. Select from:

- **(MM_DD_YYYY)**—Month, Day, Year
- **(DD_MM_YYYY)**—Day, Month, Year
- **(YYYY_MM_DD)**—Year, Month, Day

Make a selection, then select the **Back** icon or press the **N/X** button to return to the menu.

Configuring Scanner

This option allows you to change the scanner display to toggle scales on and off. Scales are the graduations and values that display on the horizontal axis at the base of the parameter graphs. The waveform fills the entire graph area with scales switched off.

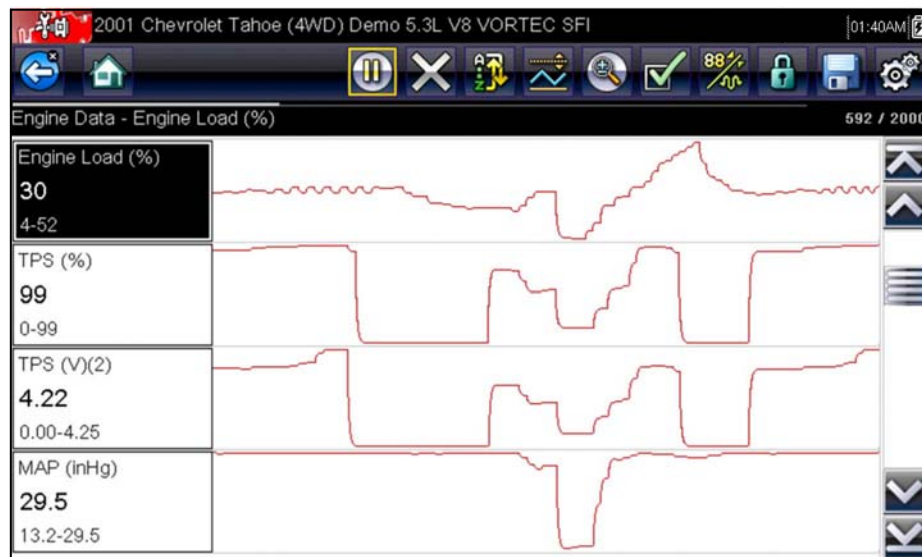


Figure 9-8 Scales hidden



To change hide/show scales:

1. Select **Tools** from the Home screen.
2. Select **Settings** from the Tools and Setup menu.
3. Select **Configure Scanner** from the Settings menu.
4. Highlight either menu entry to make a selection:
 - **Show Graph Scale**—to switch the scales on.
 - **Hide Graph Scale**—to switch the scales off.
5. Select the **Back** icon or press the **N/X** button to return to the Settings menu.

Configure Scope/Meter

This option allows you to configure how customize certain characteristics of the display screen when using the Scope Multimeter module. Selecting opens a menu with the following options:

- [Trigger Mode](#), on page 89
- [Display](#), on page 89
- [Divisions](#), on page 90

Trigger Mode

Configure Scope/Meter allows you to choose the type of trigger to begin an automatic recording, see [Trigger](#), on page 72 for additional information. Two triggering choices are available:

- **Auto Trigger**—sets the meter to automatically trigger once the signal reaches a set value.
- **Manual Trigger**—sets the meter so that you provide the trigger input with a button push.

Select a menu item, then select **Back** or press the **N/X** button to return to the Configure Scope/Meter menu.

Display

This option switches a grid pattern on the meter screen on and off.

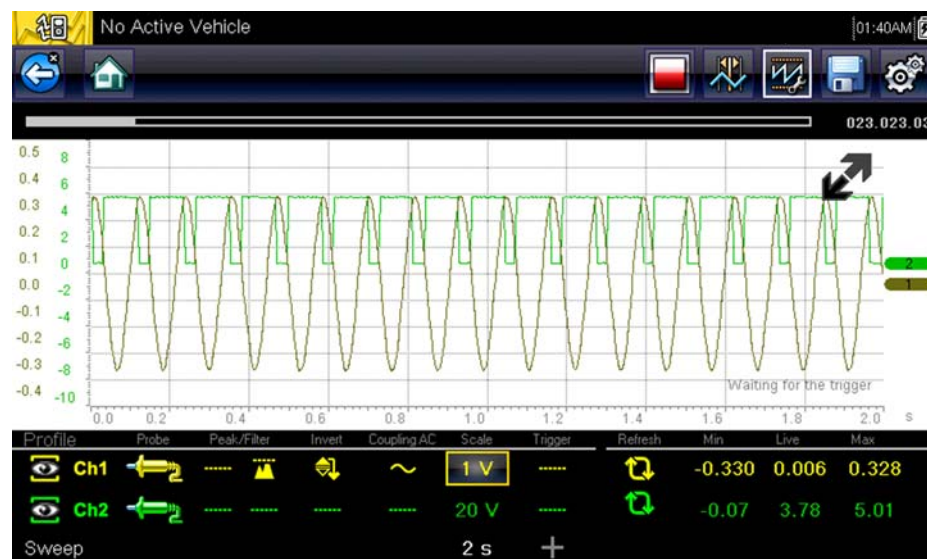


Figure 9-9 Scope multimeter screen grid



To switch the Display:

1. Select **Tools** from the Home screen.
2. Select **Settings** from the Tools and Setup menu.
3. Select **Configure Scope/Meter** from the Settings menu.
4. Select **Display** from the menu.
5. Highlight either menu entry to make a selection:
 - **Show Grid**—to switch the grid lines on.
 - **Hide Grid**—to switch the grid lines off.
6. Select the **Back** icon or press the **N/X** button to return to the Settings menu.

Divisions

The option allows you to switch between Full Scale or Per Division settings for the trace setup and the display settings. Full Scale configures the meter so one division, or unit, is the full viewing area of the screen. Per Division adjusts a single unit, or division, to one tenth of the screen.

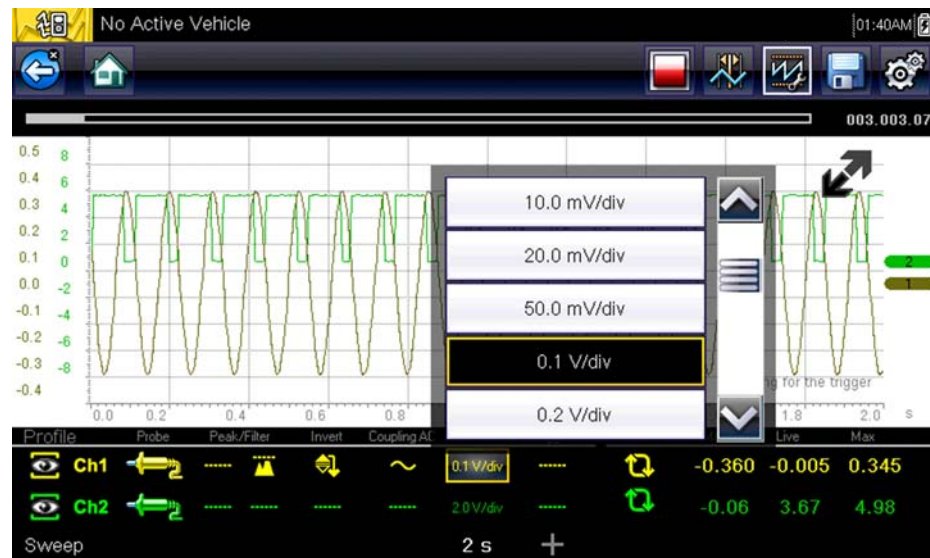


Figure 9-10 Scope Multimeter screen set to Per Division



To switch the divisions:

1. Select **Tools** from the Home screen.
2. Select **Settings** from the Tools and Setup menu.
3. Select **Configure Scope/Meter** from the Settings menu.
4. Select **Divisions** from the menu:
 - a. Highlight either menu entry to make a selection:
 - **Trace Settings**—to adjust the screen width divisions.
 - **Display Settings**—to adjust the screen height divisions.
 - b. Select from the menu:
 - **Full Scale**—one unit per screen.
 - **Per Division**—ten units per screen.

- c. Select the **Back** icon or press the **N/X** button twice to return to the menu.
- d. Select **Trace Settings** or **Display Settings**, and repeat Step 4 if needed.
5. Select the **Back** icon or press the **N/X** button to return to the Settings menu.

Configure Units

Selecting opens a dialog box that allows you to choose between US customary or metric units of measure for temperature, vehicle speed, air pressure, and other pressures.



Figure 9-11 *Configure units menu*



To change the units setup:

1. Select **Tools** from the Home screen to open the menu.
2. Select **Configure Units** to open the menu.
3. Select an item from the Configure Units menu.
4. Select a setting from the listed choices.
5. Select **Back** on the toolbar or press the **N/X** button to return to the options menu.

This chapter describes basic cleaning and battery replacement procedures for your diagnostic tool.

10.1 Cleaning and Inspecting the Diagnostic Tool

Periodically perform the following tasks to keep your diagnostic tool in proper working order:

- Check the housing, cables and connectors for dirt and damage before and after each use.
- At the end of each work day, wipe the diagnostic tool housing, cables and connectors clean with a damp cloth.

IMPORTANT:

Do not use any abrasive cleansers or automotive chemicals on the unit.

10.1.1 Cleaning the Touch Screen

The touch screen can be cleaned with a soft cloth and a mild window cleaner.

IMPORTANT:

Do not use any abrasive cleansers or automotive chemicals on the touch screen.

10.2 Battery Pack Service

Follow all safety guidelines when handling the battery pack.

⚠ WARNING

Risk of electric shock.

- **Prior to recycling the battery pack, protect exposed terminals with heavy insulating tape to prevent shorting.**
- **Disconnect all test leads and turn diagnostic tools off before removing the battery pack.**
- **Do not attempt to disassemble the battery pack or remove any component projecting from or protecting the battery terminals.**
- **Do not expose the unit or battery pack to rain, snow, or wet conditions.**
- **Do not short circuit the battery terminals.**

Electric shock can cause injury.

⚠ WARNING

Risk of explosion.

- **Use the proper factory battery pack only, incorrect replacement or tampering with the battery pack may cause an explosion.**

Explosion can cause death or serious injury.

10.2.1 Battery Pack Safety Guidelines

IMPORTANT:

The battery pack contains no user serviceable components. Tampering with the battery pack terminals or housing will void the product warranty.

Keep the following in mind when using and handling the battery pack:

- Do not short circuit battery terminals.
 - Do not immerse the diagnostic tool or battery pack in water, or allow water to enter the unit or battery compartment.
 - Do not crush, disassemble, or tamper with the battery pack.
 - Do not heat the battery pack to over 100°C (212°F), or dispose of it in a fire.
 - Do not expose the battery pack to excessive physical shock or vibration.
 - Keep the battery pack out of reach of children.
 - Do not use a battery pack that appears to have suffered abuse or damage.
 - Store the battery pack in a cool, dry, well ventilated area.
-

**NOTE:**

The battery pack should be used within a short period of time (about 30 days) after charging to prevent loss of capacity due to self-discharging.

If long-term storage of the battery pack is necessary, it should be stored in a cool, dry, well ventilated place with a 30 to 75 percent state of charge to prevent loss of characteristics.

To prolong the life of your battery, power off the unit when not in use. The diagnostic tool has a built in charger that recharges the battery on demand whenever it is connected to a power source.

10.2.2 Replacing the Battery Pack

If the battery pack no longer holds a charge, contact your sales representative to order a new one.

IMPORTANT:

Replace the battery pack with original Snap-on replacement parts only.

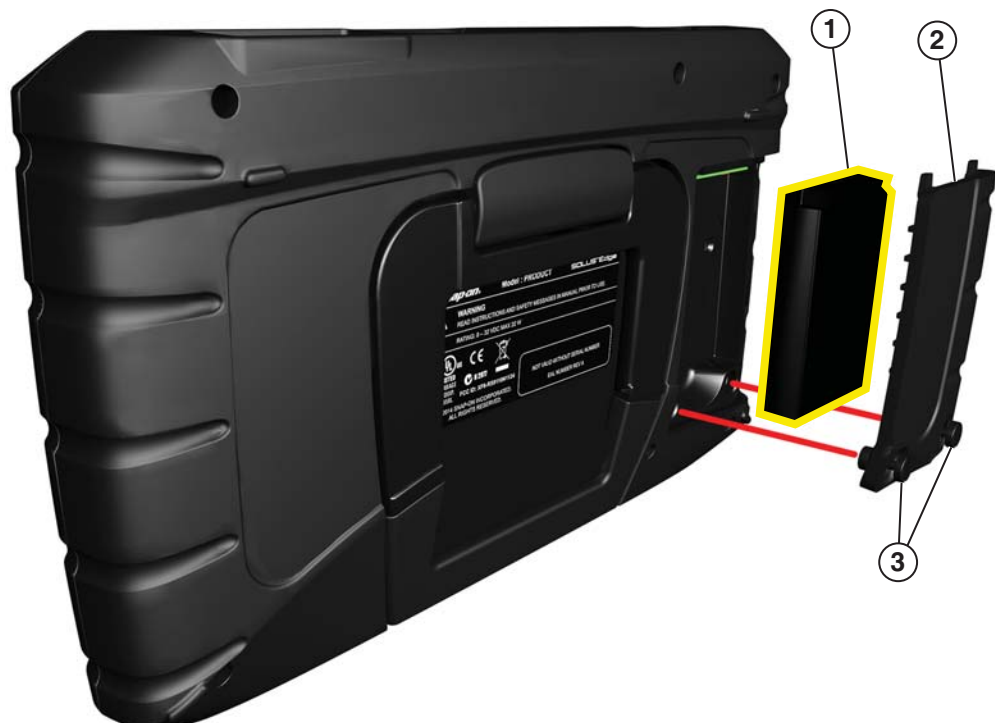
**To replace the battery pack:**

1. Loosen the two screws that retain the battery compartment cover.
2. Lift the lower edge of the battery compartment cover and slide it down slightly to clear the locating tabs and remove the cover.
3. Lift the lower edge of the battery and slide it down slightly to clear the locating tabs and remove the battery.

IMPORTANT:

During installation, do not overtighten the battery cover screws.

4. To install the new battery, reverse the removal procedures.



- 1— Battery
2— Battery Cover
3— Battery Cover Screws

Figure 10-1 Battery pack location

10.2.3 Disposing of the Battery Pack

Always dispose of the battery pack according to local regulations, which vary for different countries and regions. The battery pack, while non-hazardous waste, does contain recyclable materials. If shipping is required, ship the battery pack to a recycling facility in accordance with local, national, and international regulations. For additional information contact:

- United Kingdom—Electrical Waste Recycling Company at <http://www.electricalwaste.com>)

Products bearing the WEEE logo (Figure 10-2) are subject to European Union regulations.



Figure 10-2 sample WEEE logo



NOTE:

Always dispose of materials according to local regulations.

Contact your sales representative for details.